ATTENTION

Please notice that the Non-turbo model (except for the Convertible model) of 1993 300ZX is covered by the two Service Manuals shown below. (The convertible model is covered only by No. 1 and the Turbo model is covered only by No. 2.)

No. 1 : SM3E-0Z32U0 (Edition : Feb. 1992)
Covers vehicles with the following serial numbers;

For U.S.A.	520001 ~ 535000	Non-turbo models (Convertible model not included)
For Canada	060001 ~ 065000	

No. 2 : SM3E-0Z32U1 (This revised manual)
Covers vehicles with the following serial numbers;

For U.S.A.	535001 ~	Non-turbo models (Convertible model not included)
For Canada	065001 ~	

The serial number is found on the vehicle identification number plate.

Please attach the below label in a visible area on the cover of your former Service Manual (SM3E-0Z32U0) to prevent misunderstandings.

Applicable for
1. Convertible model.
2. Non-turbo models (Convertible model not included)
   Serial No. (On the VIN plate)
   U.S.A. 520001 ~ 535000
   Canada 060001 ~ 065000

NISSAN 300ZX

MODEL Z32 SERIES

QUICK REFERENCE INDEX

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FOREWORD

This revised manual contains maintenance and repair procedures for the 1993 Nissan 300ZX. (Turbo models and face-lifted non-turbo models except for the convertible models.) For 1993 Nissan 300ZX non-turbo models before the face-lift and convertible models, use the 1st edition Pub. No. SM3E-0Z32U0.

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

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

IMPORTANT SAFETY NOTICE

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

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

GENERAL INFORMATION

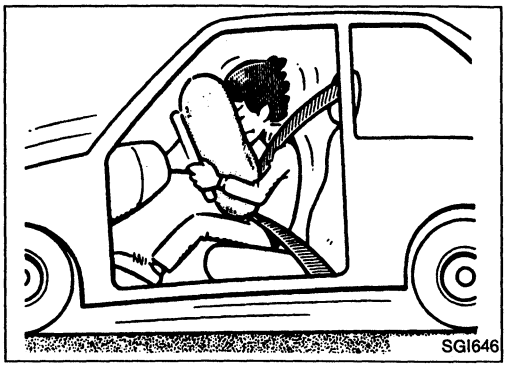
SECTION GI

CONTENTS

STARTING IDENTIFICATION NUMBER

JN1RZ24H*PX 535001 ~
JN1CZ24H*PX 535001 ~
JN1RZ26H*PX 535001 ~
JN1RZ27H*PX 005001 ~
JN1RZ24S*PX 065001 ~
JN1CZ24S*PX 065001 ~
JN1RZ26S*PX 065001 ~

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

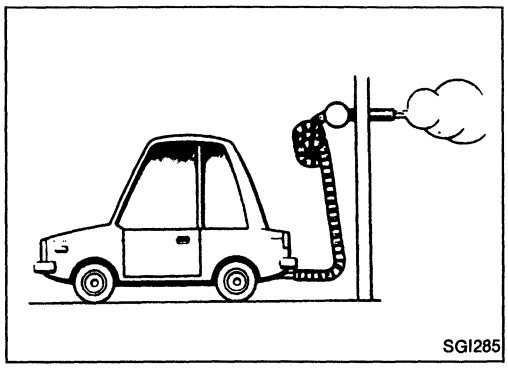

SGI646

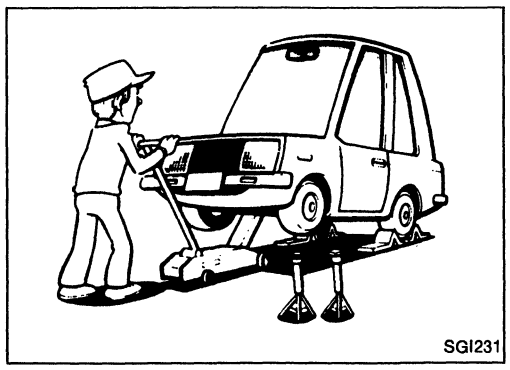
Precautions for Supplemental Restraint System "AIR BAG"

This model has a Supplemental Restraint System "Air Bag" to help reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), five sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the BF section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on these circuits.**

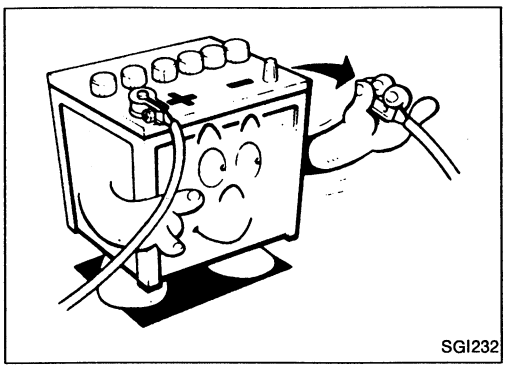

SGI285


SGI231

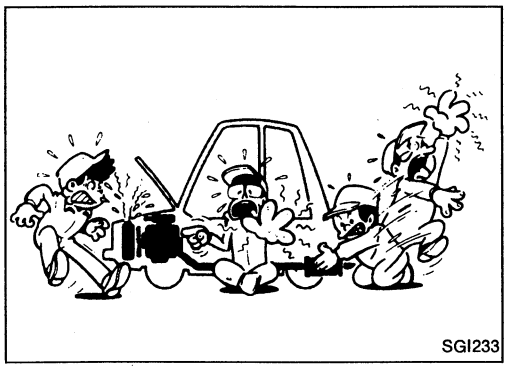
General Precautions

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.

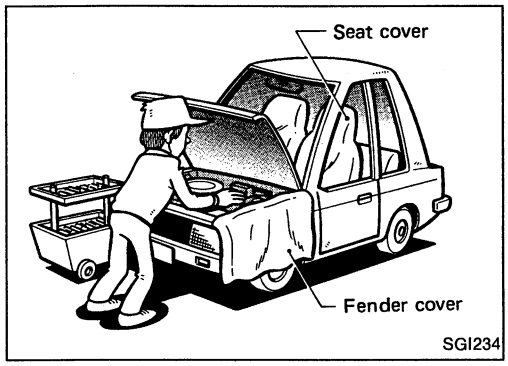
General Precautions (Cont'd)


SGI232

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


SGI233

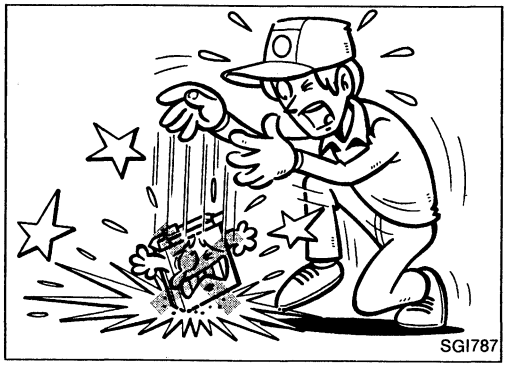
5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler. Do not remove the radiator cap when the engine is hot.



SGI234

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.


SGI787

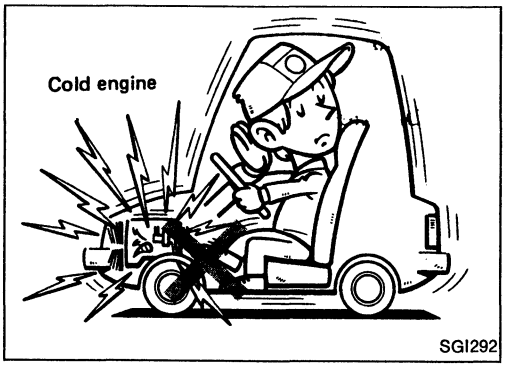
Precautions for Multiport Fuel Injection System or E.C.C.S. Engine

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.

Precautions for Three Way Catalyst

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

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



SGI292

Precautions for Turbocharger

The turbocharger turbine revolves at extremely high speeds and becomes very hot. Therefore, it is essential to maintain a clean supply of oil flowing through the turbocharger and to follow all required maintenance instructions and operating procedures.

For proper operation of the system, follow the procedure below.

1. Always use the recommended oil. Follow the instructions for proper time to change the oil and proper oil level.
2. Avoid accelerating engine to a high rpm immediately after starting.
3. If engine had been operating at high rpm for an extended period of time, let it idle for a few minutes prior to shutting it off.

Precautions for Fuel

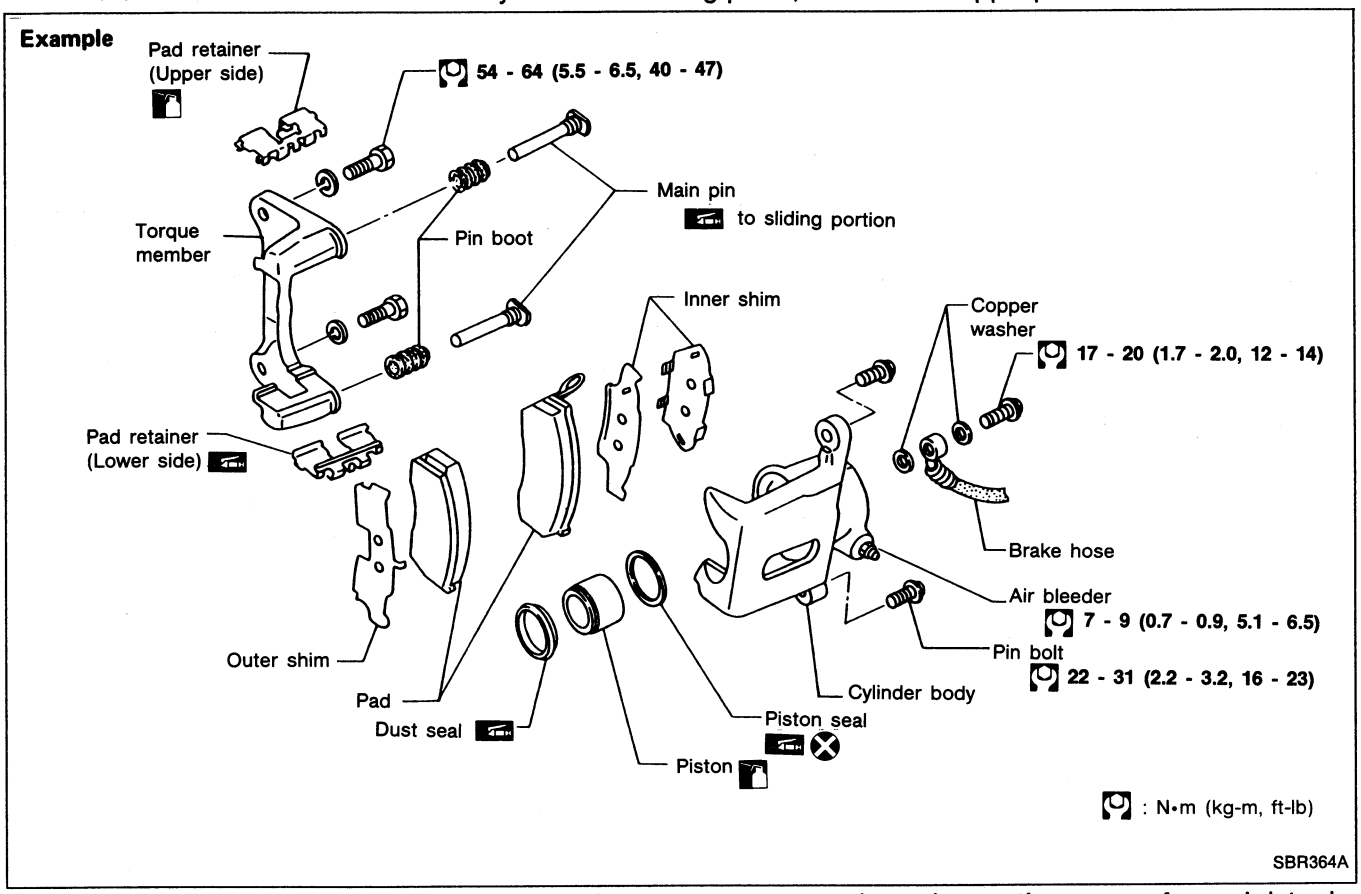
To maintain engine and exhaust system durability and performance, UNLEADED PREMIUM gasoline with an octane rating of at least 91 AKI (Research octane number 96) must be used.

If premium unleaded gasoline is not available, REGULAR UNLEADED gasoline with an octane rating of 87 AKI (Research octane number 91) may be used temporarily, but only under the following conditions:

- The fuel tank should be filled only partially with unleaded regular gasoline, and filled up with premium unleaded gasoline as soon as possible.
- Full throttle driving and abrupt acceleration should be avoided.

Use UNLEADED fuel only. Under no circumstances should leaded gasoline be used. Lead gasoline will damage the three way catalyst and increase dangerous emissions from the vehicle exhaust.

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	L.H., R.H.	: Left-Hand, Right-Hand
	: Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.	M/T	: Manual Transaxle/Transmission
		A/T	: Automatic Transaxle/Transmission
		Tool	: Special Service Tools
	: Should be lubricated with oil.	A.T.F.	: Automatic Transmission Fluid
	: Sealing point	D_1	: Drive range 1st gear
	: Checking point	D_2	: Drive range 2nd gear
	: Always replace after every disassembly.	D_3	: Drive range 3rd gear
		D_4	: Drive range 4th gear
	: Apply petroleum jelly.	O.D.	: Overdrive
ATF	: Apply A.T.F.	2_2	: 2nd range 2nd gear
★	: Select with proper thickness.	2_1	: 2nd range 1st gear
☆	: Adjustment is required.	1_2	: 1st range 2nd gear
S.D.S.	: Service Data and Specifications	1_1	: 1st range 1st gear

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:

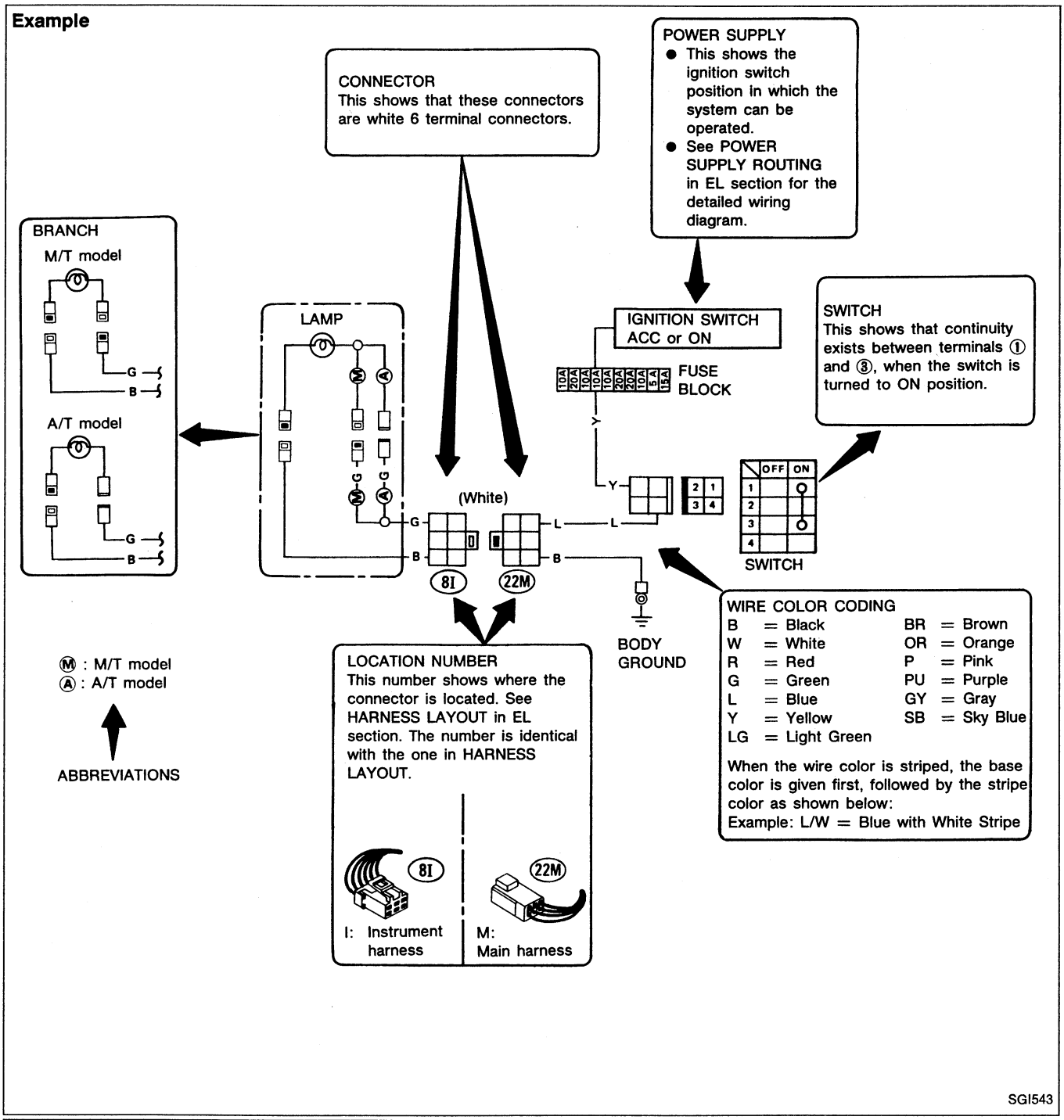
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

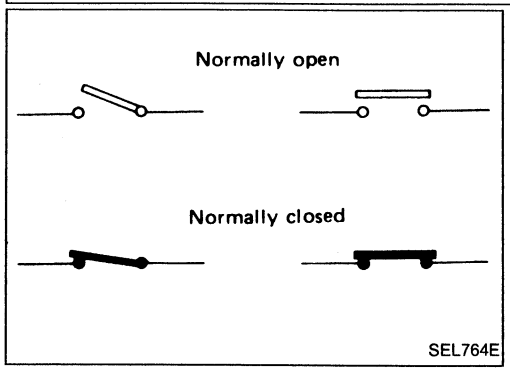
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal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

WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:



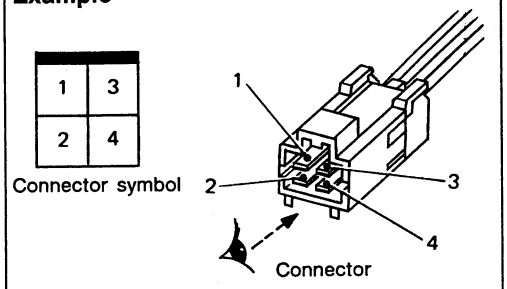


SWITCH POSITIONS

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

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

Example

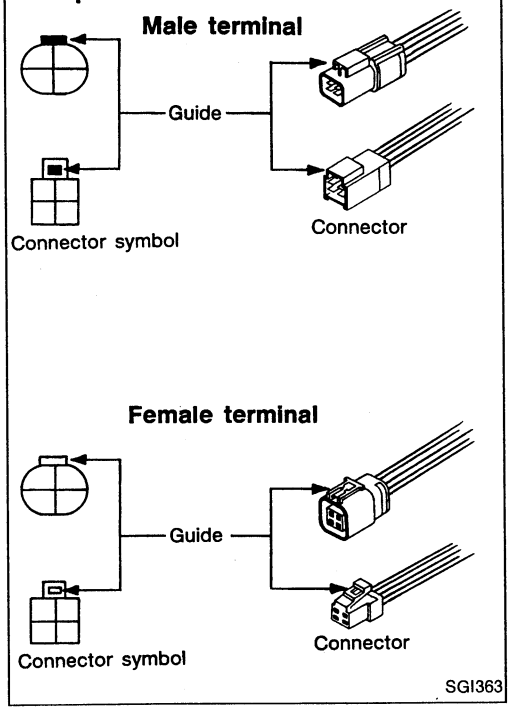


SGI362

CONNECTOR SYMBOLS

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

Example



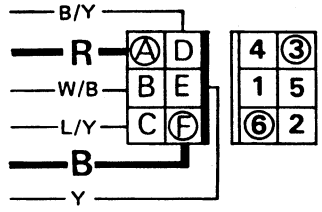
SGI363

- 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



WIPER SWITCH

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

Continuity circuit of wiper switch

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

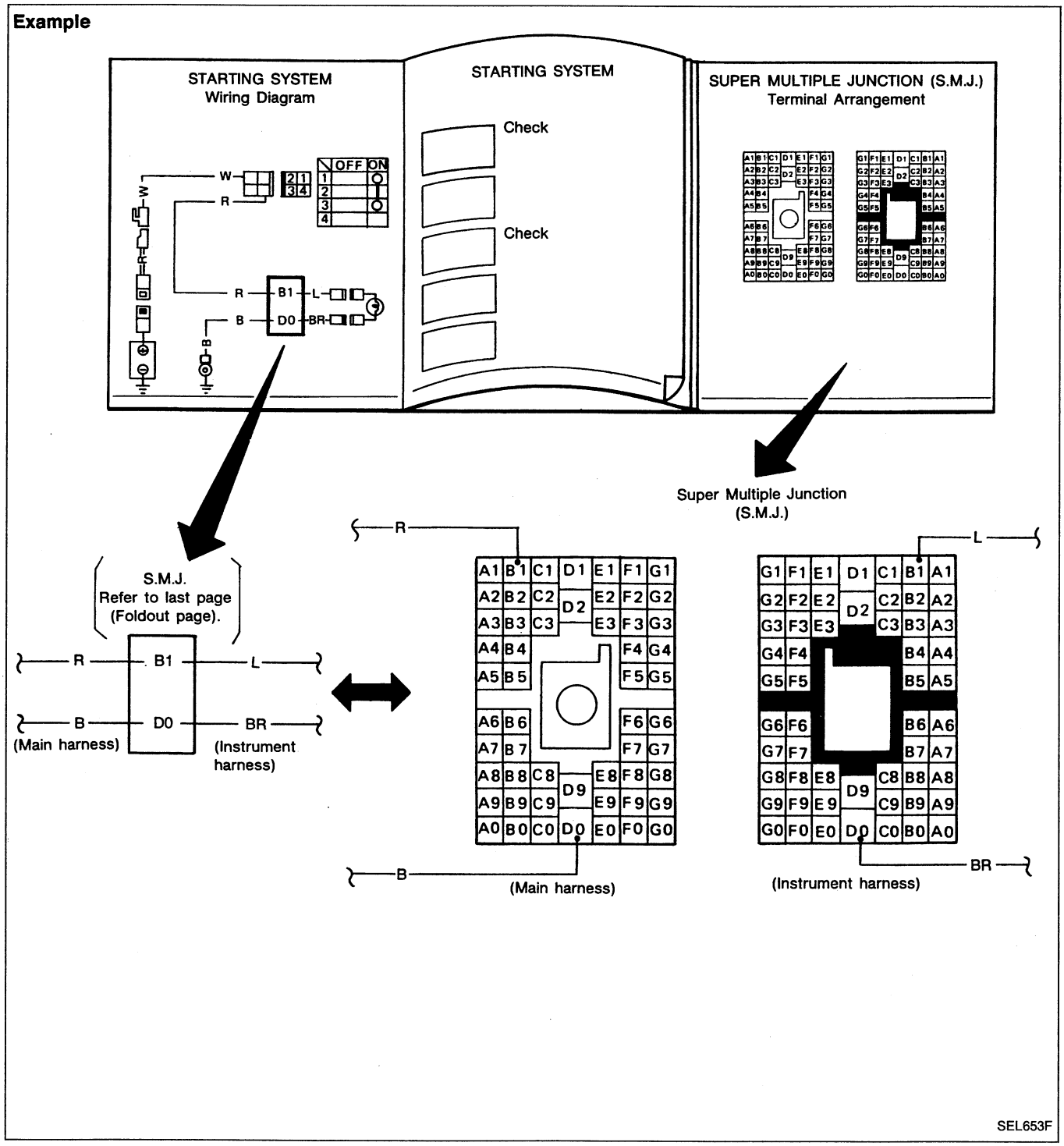
Example: Wiper switch in LO position
Continuity circuit: Red wire – Ⓐ terminal – ③ terminal – Wiper switch (● – ●: LO) – ⑥ terminal – Ⓕ terminal – Black wire

SGI365

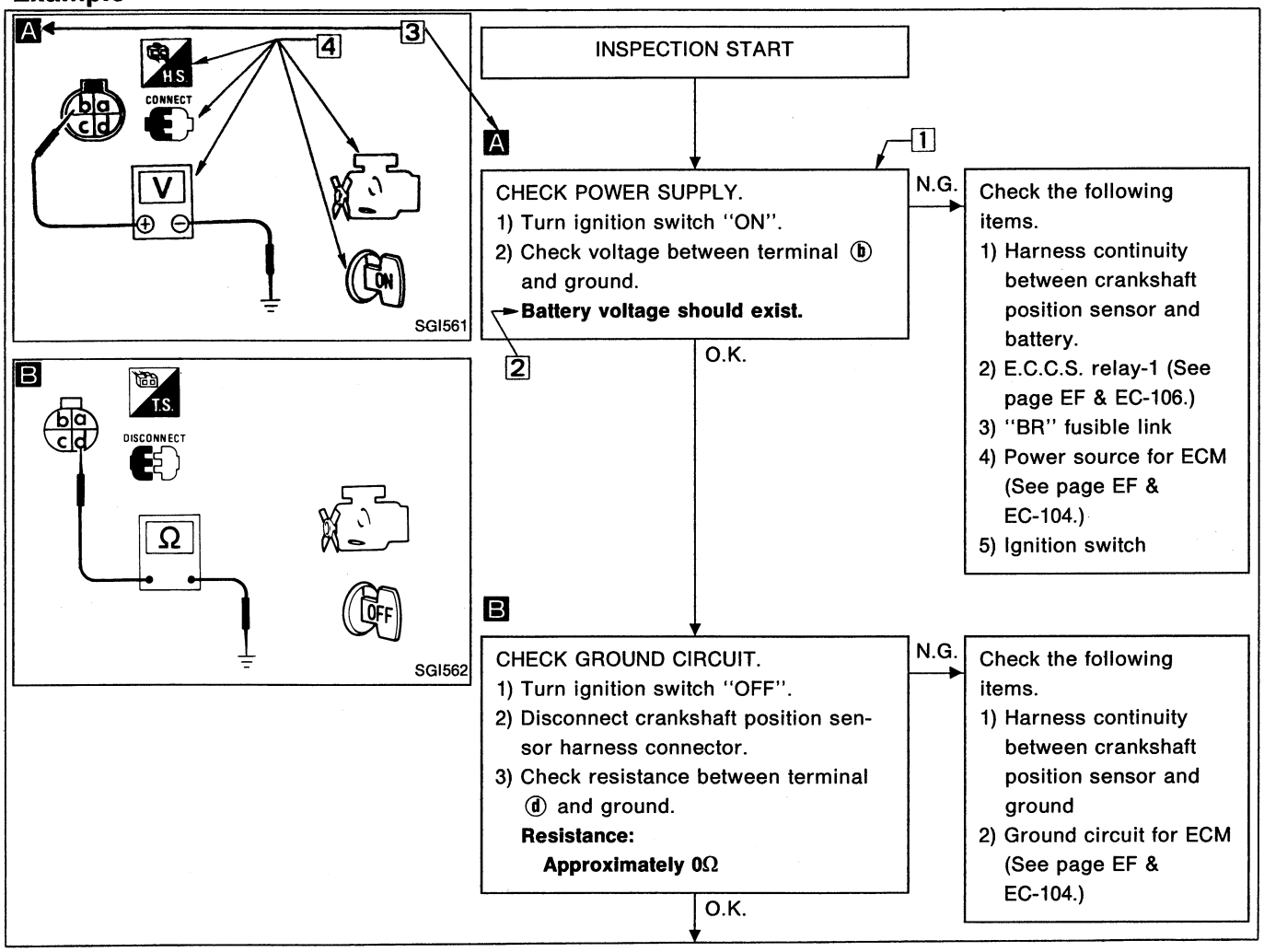
SUPER MULTIPLE JUNCTION (S.M.J.)

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

Example



Example



NOTICE

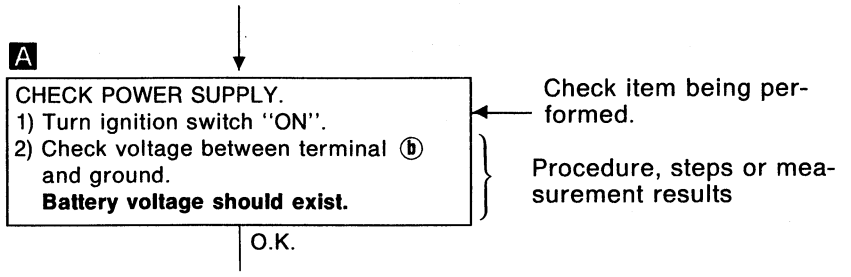
The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

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 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:

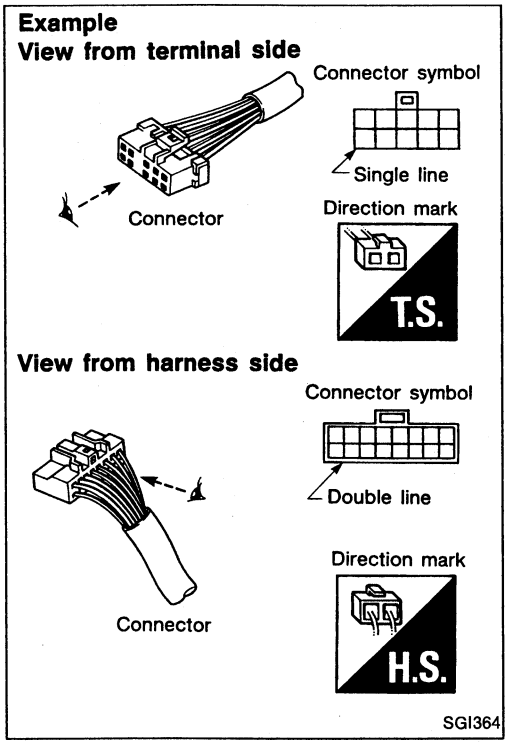
Battery voltage → 11 - 14V or approximately 12V
Voltage: Approximately 0V → Less than 1V

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 flowchart 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.

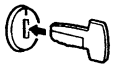
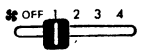
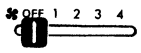
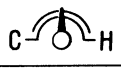
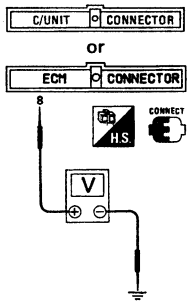
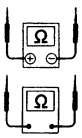
: View from terminal side ... T.S.

- **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.**

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
	Turn ignition switch to "OFF" position.		A/C switch is "OFF".
	Turn ignition switch to "ON" position.		A/C switch is "ON".
	Turn ignition switch to "START" position.		Fan switch is "ON". (At any position except for "OFF" position)
	Turn ignition switch from "OFF" to "ACC" position.		Fan switch is "OFF".
	Turn ignition switch from "ACC" to "OFF" position.		Apply battery voltage directly to components.
	Turn ignition switch from "OFF" to "ON" position.		Drive vehicle.
	Turn ignition switch from "ON" to "OFF" position.		Disconnect battery negative cable.
	Do not start engine, or check with engine stopped.		Depress brake pedal.
	Start engine, or check with engine running.		Release brake pedal.
	Apply parking brake.		Depress accelerator pedal.
	Release parking brake.		Release accelerator pedal.
	Check after engine is warmed up sufficiently.		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.**
	Voltage should be measured with a voltmeter.		
	Circuit resistance should be measured with an ohmmeter.		

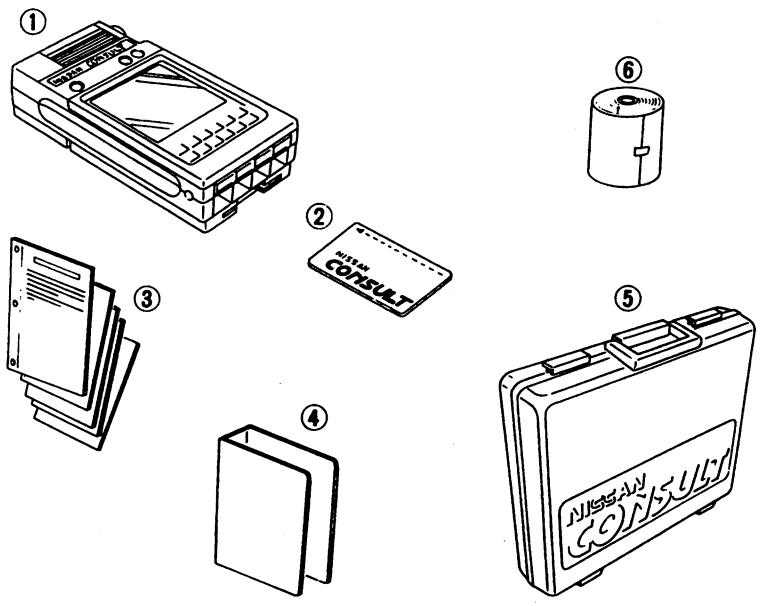
Function and System Application

Diagnostic test mode	Function	E.C.C.S.	Auto A/C	A/T	HICAS	Air bag	ASCD
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT.	X	X	—	—	—	—
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	X	X	X	X	X	X
Data monitor	Input/Output data in the ECM can be read.	X	X	X	X	—	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	X	—	X	—	—
ECM part number	ECM part number can be read.	X	—	X	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

Checking Equipment

When ordering the below equipment, contact your NISSAN distributor.

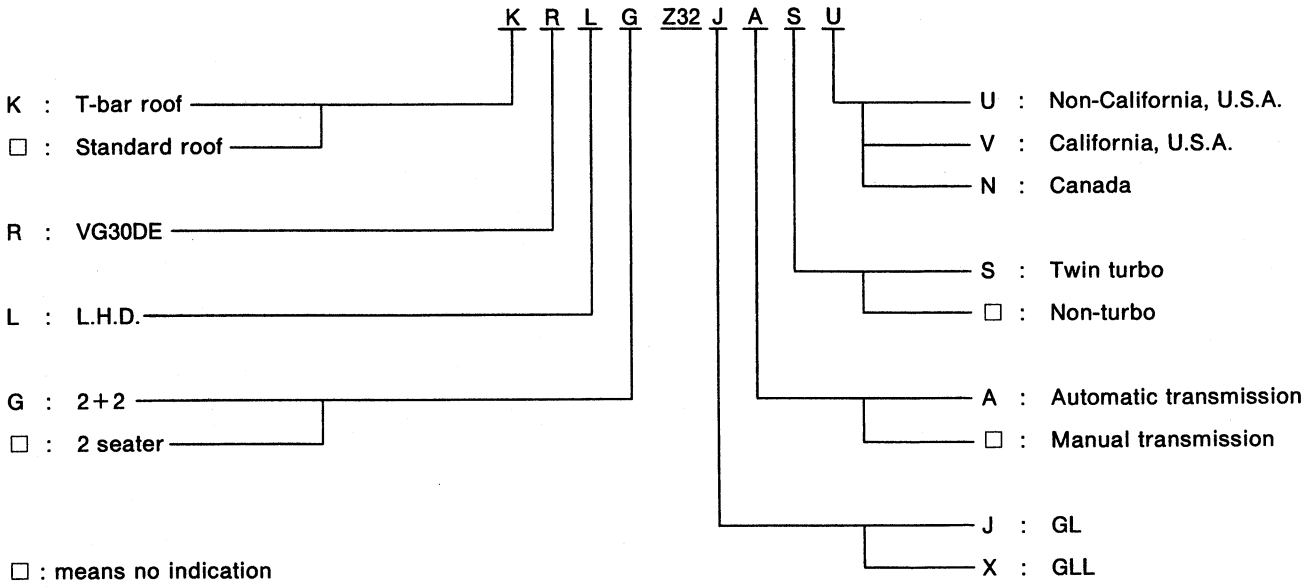
Tool name	Description
NISSAN CONSULT kit ① CONSULT unit and accessories ② Program card (UE 920) ③ Operation manuals ④ Binder ⑤ Carrying case ⑥ Thermal paper (Rolls)	

Model Variation

Body	Destination		Model		Engine	Transmission	Differential carrier	Road wheel offset mm (in)	Tire size
Standard roof	U.S.A.	Non-California	2 seater	RL-JU	VG30DE	RS5R30A	R200V	7-1/2JJ x 16 ... 45 (1.77)	P225/ 50R16 91V
				RL-JAU		RE4R01A			
				KRL-XU		RS5R30A			
				KRL-XAU		RE4R01A			
T-bar roof				KRL-XSU	VG30DETT	RS5R30A	R230V	FR, 7.5JJ-16 ... 45 (1.77) RR, 8.5JJ-16 ... 35 (1.38)	FR P225/ 50ZR16 RR P245/ 45ZR16
				KRL-XASU		RE4R01A			
			2+2	KRLG-XU	VG30DE	RS5R30A	R200V	7-1/2JJ x 16 ... 45 (1.77)	P225/ 50R16 91V
				KRLG-XAU		RE4R01A			
Standard roof		California	2 seater	RL-JV	VG30DE	RS5R30A	R200V	7-1/2JJ x 16 ... 45 (1.77)	P225/ 50R16 91V
				RL-JAV		RE4R01A			
				KRL-XV		RS5R30A			
				KRL-XAV		RE4R01A			
T-bar roof				KRL-XSV	VG30DETT	RS5R30A	R230V	FR, 7.5JJ-16 ... 45 (1.77) RR, 8.5JJ-16 ... 35 (1.38)	FR P225/ 50ZR16 RR P245/ 45ZR16
				KRL-XASV		RE4R01A			
			2+2	KRLG-XV	VG30DE	RS5R30A	R200V	7-1/2JJx16 ... 45 (1.77)	P225/ 50R16 91V
				KRLG-XAV		RE4R01A			
T-bar roof	Canada		2 seater	KRL-XN	VG30DE	RS5R30A	R200V	7-1/2JJ x 16 ... 45 (1.77)	P225/ 50R16 91V
				KRL-XAN		RE4R01A			
				KRL-XSN	VG30DETT	RS5R30A	R230V	FR, 7.5JJ-16 ... 45 (1.77) RR, 8.5JJ-16 ... 35 (1.38)	FR P225/ 50ZR16 RR P245/ 45ZR16
				KRL-XASN		RE4R01A			
			2+2	KRLG-XN	VG30DE	RS5R30A	R200V	7-1/2JJ x 16 ... 45 (1.77)	P225/ 50R16 91V
				KRLG-XAN		RE4R01A			

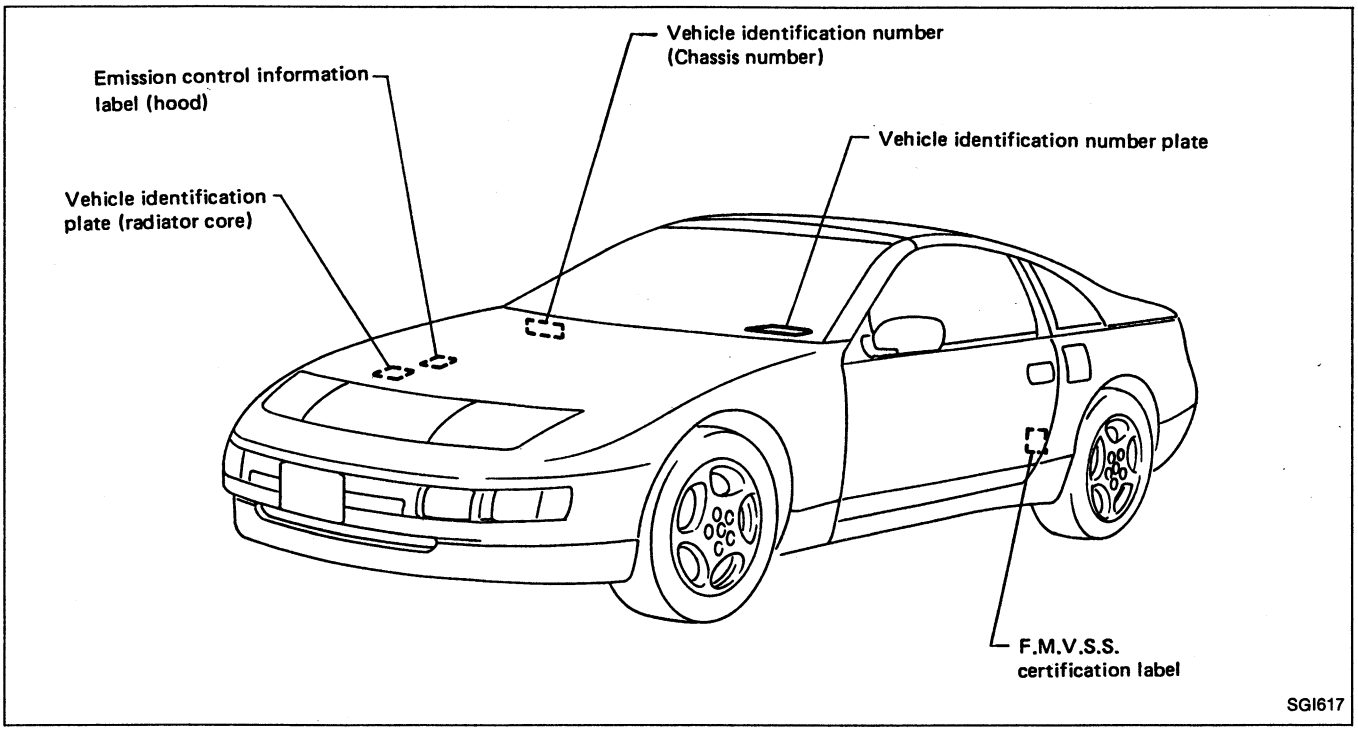
Model Variation (Cont'd)

Prefix and suffix designations:



□ : means no indication

Identification Number



VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JN1 R Z 2 4 S * P X 000001

Manufacturer
- JN1: Nissan, Passenger vehicle

Engine type
- R : VG30DE
- C : VG30DETT

Vehicle line
- Z : NISSAN 300ZX

Model change

Body type
- 4 : 2 seater
- 6 : 2+2 seater

Restraint system
- S : Standard
- A : Automatic
- H : Air bag

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

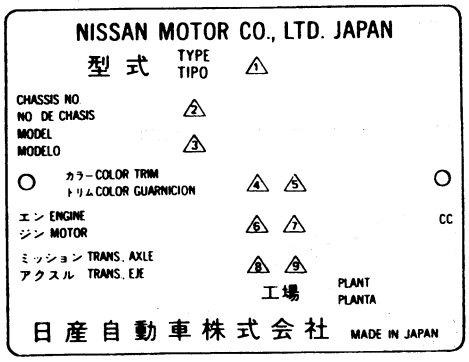
Model year
- P : 1993 year model

Manufacturer plant
- X : Hiratsuka

Vehicle serial number

Identification Number (Cont'd)

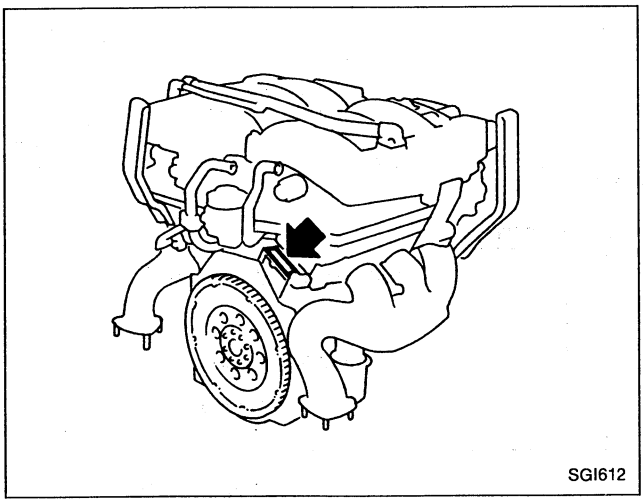
IDENTIFICATION PLATE



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

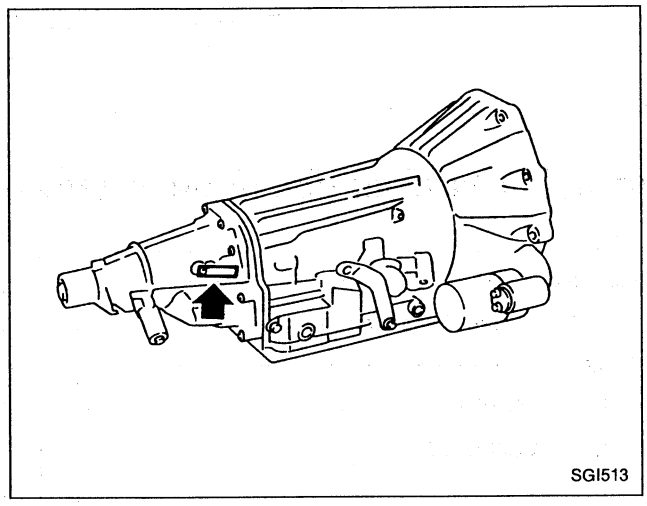
SGI315

ENGINE SERIAL NUMBER



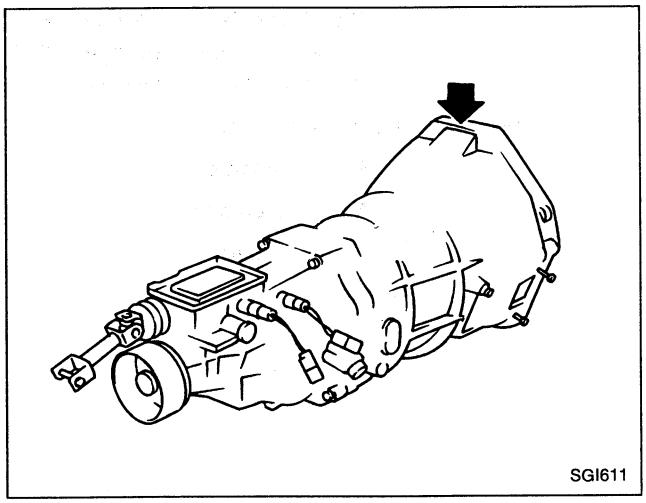
SGI612

AUTOMATIC TRANSMISSION NUMBER



SGI513

MANUAL TRANSMISSION NUMBER



SGI611

Dimensions

Unit: mm (in)

Item	Model	2 seater	2+2
Overall length		4,305 (169.5)	4,520 (178.0)
Overall width		1,790 (70.5)	1,800 (70.9)
Overall height	T-bar roof	1,250 (49.2)	1,255 (49.4)
	Standard	1,245 (49.0)	—
Wheelbase		2,450 (96.5)	2,570 (101.2)
Tread	Front	1,495 (58.9)	1,495 (58.9)
	Rear	1,535 (60.4)	1,535 (60.4)

Wheels and Tires

Road wheel	Aluminum	Steel	Offset mm (in)
Conventional	16 x 7.5JJ 16 x 8.5JJ*1	—	45 (1.77) 35 (1.38)*1
T-type	—	16 x 4T	30 (1.18)
Space-saver tire	—	15 x 5J	30 (1.18)
Tire size			
Conventional	P225/50R16 91V P225/50ZR16*2 P245/45ZR16*3		
Spare			
T-type	T125/90D16		
Space-saver tire	165/80D15FS		

*1: Rear wheel for turbo model
*2: Front tire for turbo model
*3: Rear tire for turbo model

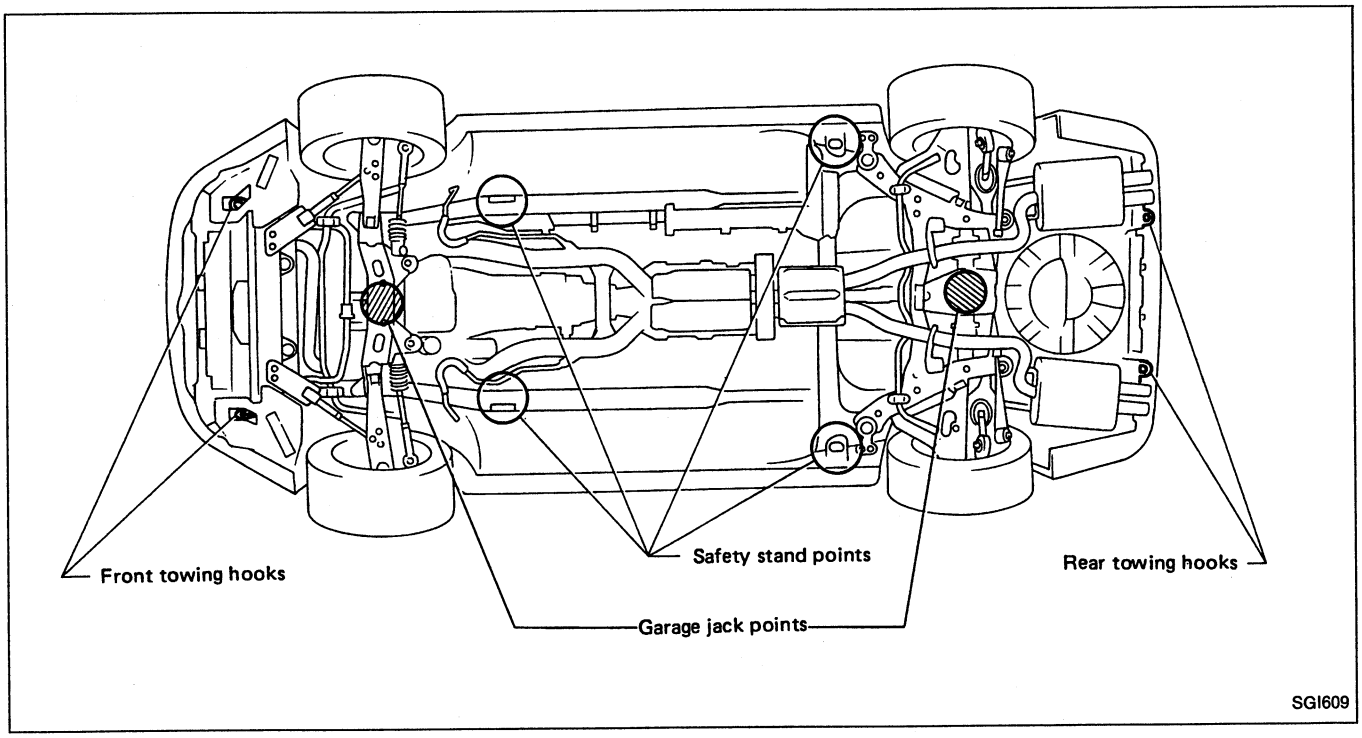
Garage Jack and Safety Stand

WARNING:

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

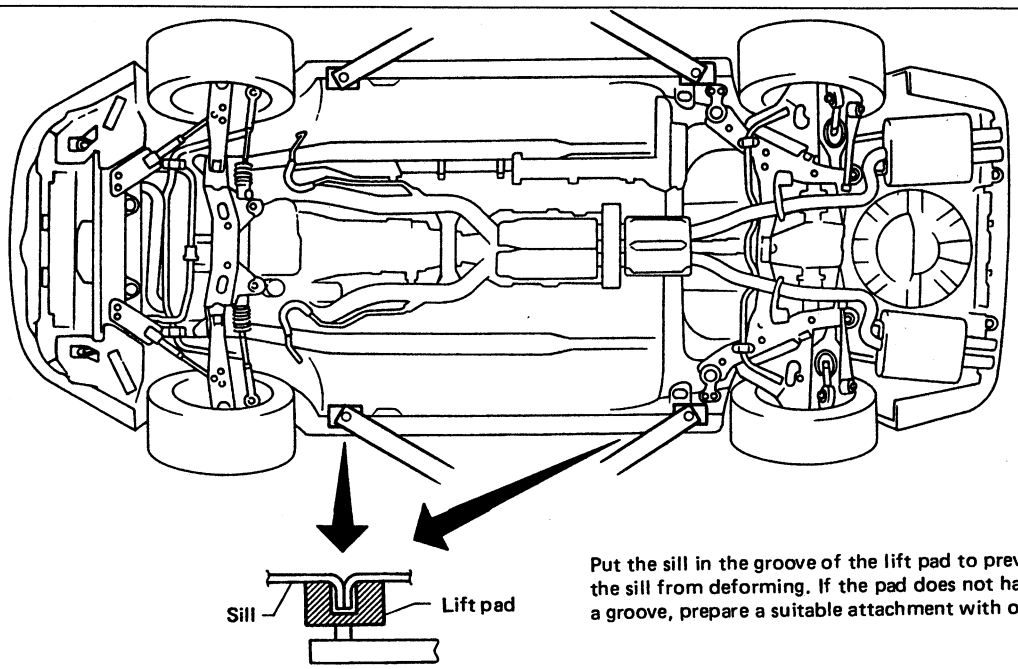
CAUTION:

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



2-pole Lift

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



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

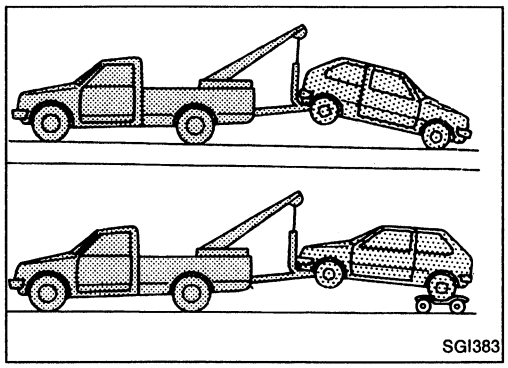
Put the sill in the groove of the lift pad to prevent the sill from deforming. If the pad does not have a groove, prepare a suitable attachment with one.

SGI610

Tow Truck Towing

CAUTION:

- **All applicable state or Provincial (in Canada) laws and local laws regarding the towing operation must be obeyed.**
- **It is necessary to use proper towing equipment to avoid possible damage to the vehicle during towing operation. Towing is in accordance with Towing Procedure Manual at dealer.**
- **When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral position ("N" position).**



SGI383

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

Tow Truck Towing (Cont'd)

TOWING AN AUTOMATIC TRANSMISSION MODEL WITH FOUR WHEELS ON GROUND OR TOWING WITH FRONT WHEELS RAISED (With rear wheels on ground)

Observe the following restricted towing speeds and distances.

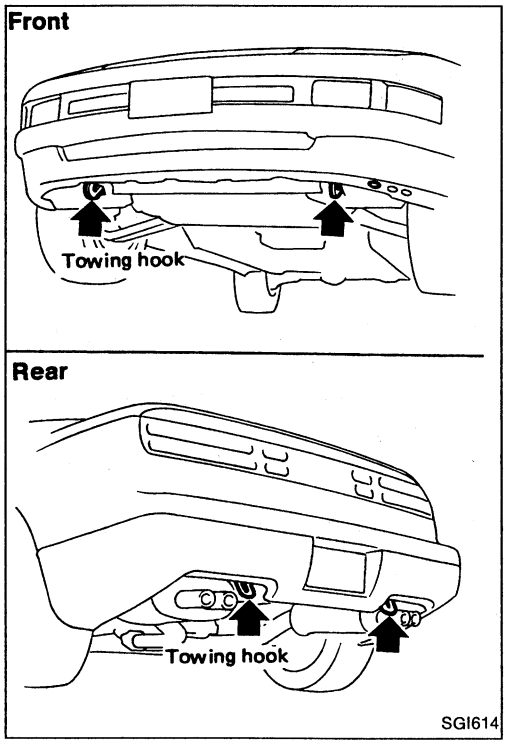
Speed:

Below 50 km/h (30 MPH)

Distance:

Less than 65 km (40 miles)

If the speed or distance must necessarily be greater, remove the propeller shaft beforehand to prevent damage to the transmission.



TOWING POINT

- **Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.**
- **Remove the first bolt under the front fender protector when using the front towing hooks.**

TIGHTENING TORQUE OF STANDARD BOLTS

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

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

Grade	Mark
4T	4
7T	7
9T	9

*: Nominal diameter

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

MAINTENANCE

SECTION MA

CONTENTS

Supplemental Restraint System "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a diagnostic unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF section** of this Service Manual.

WARNING:

a. **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.**
b. **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
c. **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**

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

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.	—
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	—
Tire rotation Tires should be rotated every 12,000 km (7,500 miles) for non-turbo models.	MA-16
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-7
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	—
Doors and engine hood Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. Also, ensure that all latches lock securely. Lubricate hinges and latches 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-19
INSIDE THE VEHICLE The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.	—
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	—
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	—
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	—
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)**	—
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 restrains 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.	—
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-19
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.	—

Item	Reference page
Brake pedal and booster 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 the floor mats away from the pedal.	BR-6 BR-9
Parking brake Check that the lever has the proper travel and confirm that you vehicle is held securely on a fairly steep hill with only the parking brake applied.	BR-17
Automatic transmission "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-11
Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections.	—
Brake and clutch fluid levels Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir.	MA-15, 17
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-13
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-18
Automatic transmission 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.	—

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.

Abbreviations: R = Replace I = Inspect. Correct or replace if necessary. [ ]: At the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL																	
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	3.00	3.75	7.5	11.25	15	18.75	22.5	26.25	30	33.75	37.5	41.25	45	48.75	52.5	56.25	60	Reference page
	(km x 1,000)	(5)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	(78)	(84)	(90)	(96)	
	Months	3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	
EMISSION CONTROL SYSTEM MAINTENANCE																			
Drive belts	See NOTE (1).																	I*	MA-9
Air cleaner filter	See NOTE (2).									[R]								[R]	MA-12
Vapor lines										I*								I*	MA-14
Fuel lines										I*								I*	MA-11
Fuel filter	See NOTE (3).*																		MA-12
Engine coolant	See NOTE (4).																	R*	MA-10
Engine oil			R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-12
Engine oil filter (Use part No. 15208-60U00 or equivalent.)			R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-13
Spark plugs (PLATINUM-TIPPED type)																		[R]	MA-13
Timing belt	See NOTE (5).																		EM-12
CHASSIS AND BODY MAINTENANCE																			
Brake lines & cables						I				I				I				I	MA-17
Brake pads & discs				I		I		I		I		I		I		I		I	MA-17
Manual & automatic transmission oil, & differential gear oil	See NOTE (6).					I				I				I				I	MA-15
Steering gear & linkage, axle & suspension parts				I		I		I		I		I		I		I		I	MA-17, FA-7, RA-5
Steering linkage ball joints & front suspension ball joints				I		I		I		I		I		I		I		I	MA-17, FA-5
Exhaust system				I		I		I		I		I		I		I		I	MA-17
Air bag system	See NOTE (7).																		BF-66

NOTE: (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
(2) If operating mainly in dusty conditions, more frequent maintenance may be required.
(3) 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.
(4) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.
(5) Replace every 105,000 miles (168,000 km).
(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) Inspect the air bag system 10 years after the date of manufacture as noted on the F.M.V.S.S. certification label.
(8) Maintenance items and intervals with " * " are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

Schedule 2

Abbreviations: R = Replace I = Inspect. Correct or replace if necessary. [ ]: At the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL									
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	5.0	7.5	15	22.5	30	37.5	45	52.5	60	Reference page
	(km x 1,000)	(8)	(12)	(24)	(36)	(48)	(60)	(72)	(84)	(96)	
	Months	6	6	12	18	24	30	36	42	48	
EMISSION CONTROL SYSTEM MAINTENANCE											
Drive belts	See NOTE (1).									I*	MA-9
Air cleaner filter						[R]				[R]	MA-12
Vapor lines						I*				I*	MA-14
Fuel lines						I*				I*	MA-11
Fuel filter	See NOTE (2)*.										MA-12
Engine coolant	See NOTE (3).									R*	MA-10
Engine oil			R	R	R	R	R	R	R	R	MA-12
Engine oil filter (Use part No. 15208-60U00 or equivalent.)				R		R		R		R	MA-13
Spark plugs (PLATINUM-TIPPED type)										[R]	MA-13
Timing belt	See NOTE (4).										EM-12
CHASSIS AND BODY MAINTENANCE											
Brake lines & cables				I		I		I		I	MA-17
Brake pads & discs				I		I		I		I	MA-17
Manual & automatic transmission oil, & differential gear oil				I		I		I		I	MA-15
Steering gear & linkage, axle & suspension parts						I				I	MA-17, FA-7, RA-5
Exhaust system						I				I	MA-17
Air bag system	See NOTE (5).										BF-66

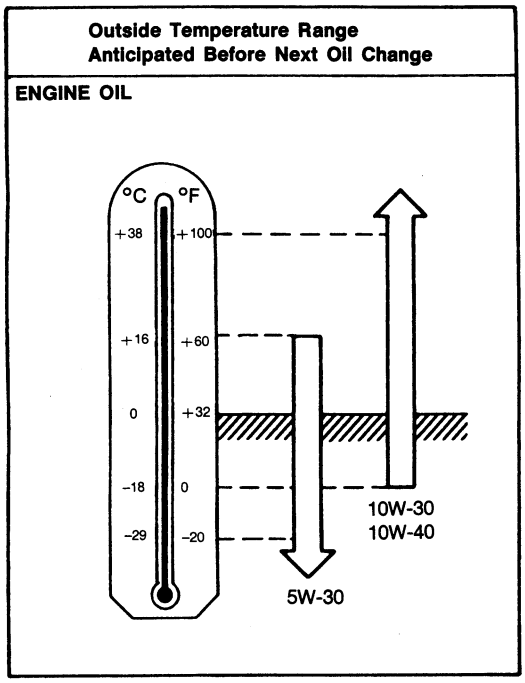
NOTE: (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
(2) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.
(3) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.
(4) Replace every 105,000 miles (168,000 km).
(5) Inspect the air bag system 10 years after the date of manufacture as noted on the F.M.V.S.S. certification label.
(6) Maintenance items and intervals with " * " are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

Fluids and Lubricants

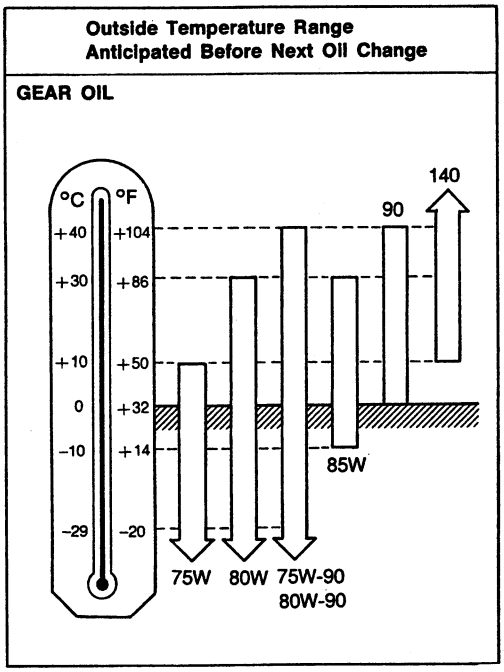
		Capacity (Approximate)			Recommended fluids and lubricants
		US measure	Imp measure	Liter	
Engine oil (Refill)					
With oil filter		3-5/8 qt	3 qt	3.4	Energy Conserving Oils of API SG*2, *3
Without oil filter		3-1/8 qt	2-5/8 qt	3.0	
Cooling system (With reservoir)		9-1/2 qt	7-7/8 qt	9.0	Anti-freeze coolant (Ethylene glycol base)
Manual transmission gear oil		5-7/8 pt	4-7/8 pt	2.8	API GL-4*2
Differential gear oil	Non-Turbo-charger	3-1/8 pt	2-5/8 pt	1.5	API GL-5*2
	Turbocharger	3-7/8 pt	3-1/8 pt	1.8	
Automatic transmission fluid	Non-Turbo-charger	8-3/4 qt	7-1/4 qt	8.3	Genuine Nissan ATF*1 or equivalent Type DEXRON™ II
	Turbocharger	8-5/8 qt	7-1/4 qt	8.2	
Power steering fluid		—	—	—	Type DEXRON™ II or equivalent
Brake and clutch fluid		—	—	—	Genuine Nissan Brake Fluid*1 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose grease		—	—	—	NLGI No. 2 (Lithium soap base)

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

SAE Viscosity Number

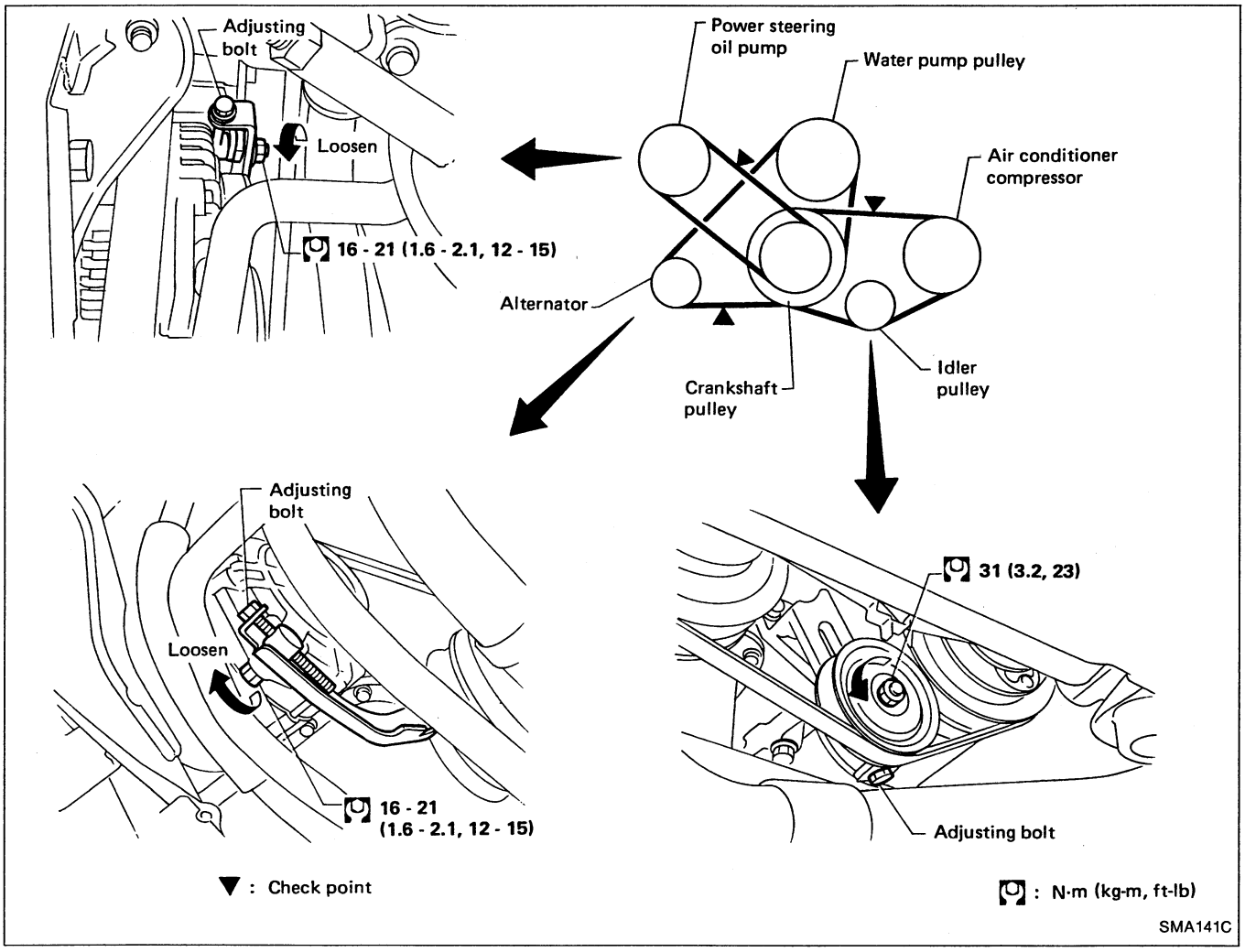


10W-30 is preferable for ambient temperatures above –18°C (0°F). 20W-40 and 20W-50 are usable for ambient temperatures above 10°C (50°F) for all seasons.



75W-90 for transmission and 80W-90 for differential gear are 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 deflection by pushing on the belt midway between pulleys.

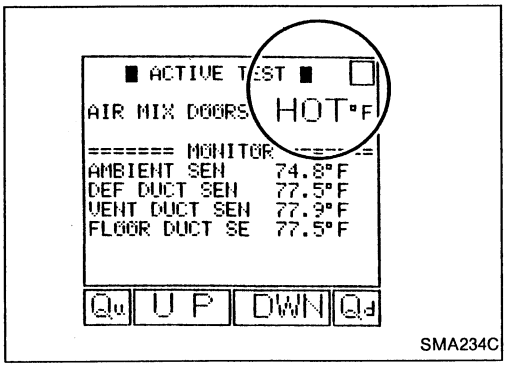
Adjust if belt deflection exceed the limit.

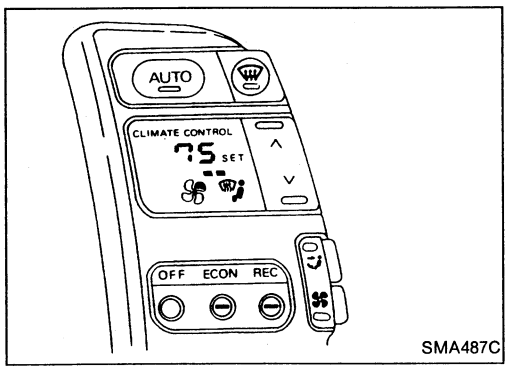
Belt deflection:

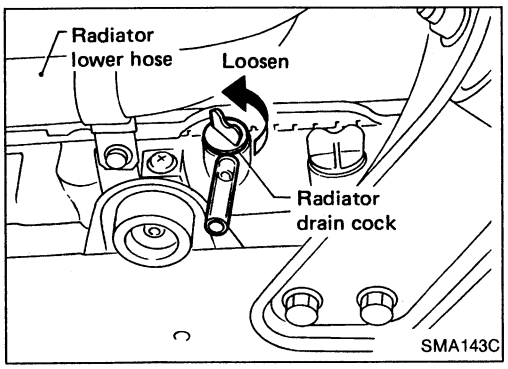
Unit: mm (in)

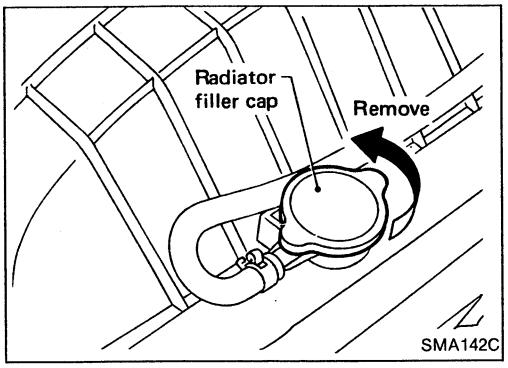
		Used belt deflection		Deflection of new belt
		Limit	Deflection after adjustment	
Alternator		11.5 (0.453)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Air conditioner compressor		12.5 (0.492)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump	Non-Turbo	19 (0.75)	12 - 13.5 (0.472 - 0.531)	10.5 - 11.5 (0.413 - 0.453)
	Turbo	16 (0.63)	10 - 11 (0.39 - 0.43)	9 - 10 (0.35 - 0.39)
Applied pushing force		98 N (10 kg, 22 lb)		

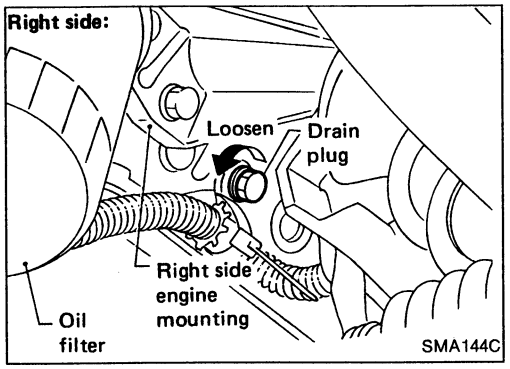
Inspect drive belt deflection when engine is cold.











Changing Engine Coolant

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

MANUAL AIR CONDITIONER MODELS

1. Turn ignition switch "ON" and set temperature control lever of manual air conditioner to maximum hot position.

AUTOMATIC AIR CONDITIONER MODELS

1. Perform "AIR MIX DOORS" test in "ACTIVE TEST" mode of "AUTO A/C" (Automatic Air Conditioner) system.
   Set "AIR MIX DOORS" at (full) HOT and wait 10 seconds before turning ignition switch off.

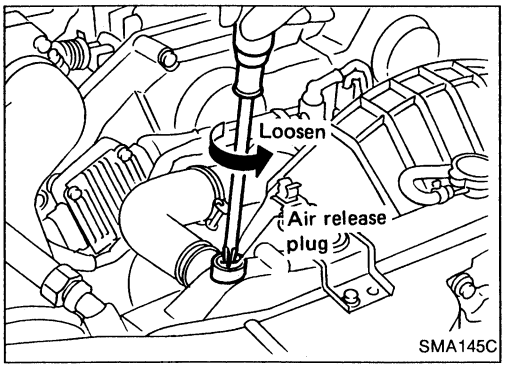
1. Perform self-diagnosis step 2 of Automatic Air Conditioner system, referring to the following notes:
   1) Turn ignition switch from "OFF" to "ON".
   2) Press both "AUTO" and "OFF" switches for at least 5 seconds.
   3) Press "AUTO" switch 1 time.
   4) Confirm indication of the A/C display shown at left.
   5) Wait 10 seconds before turning ignition switch off.

2. Open drain cock at the bottom of radiator, and remove radiator cap.

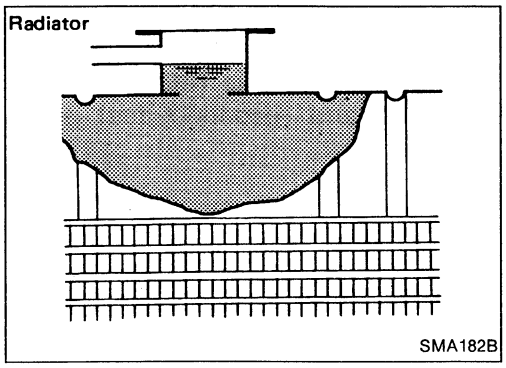
3. Open drain plugs on both sides of cylinder block.

- **Left side drain plug is located beside the left side engine mounting.**

Changing Engine Coolant (Cont'd)

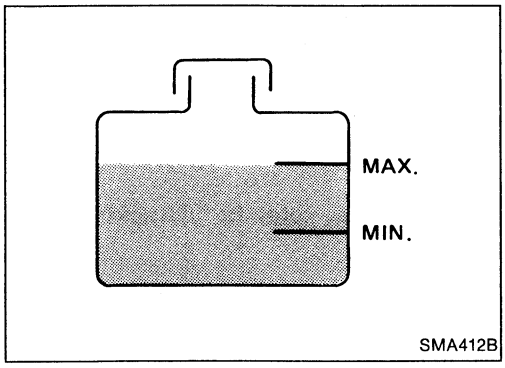


4. Open air release plug to drain coolant.
5. Flush cooling system by running fresh water through radiator.
6. Close drain cock and tighten drain plugs securely.
   - **Apply sealant to the drain plug thread.**
     : 34 - 44 N·m
     (3.5 - 4.5 kg-m, 25 - 33 ft-lb)



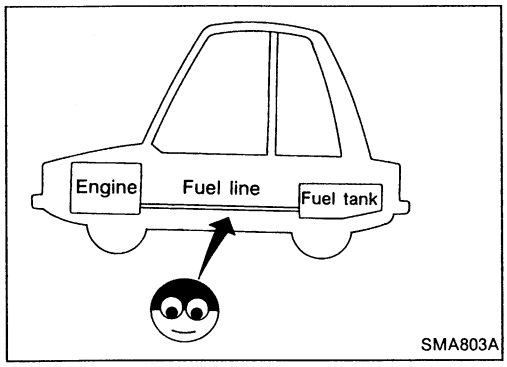
7. Fill radiator slowly with proper mixture of coolant and water. Fill reservoir tank up to the "H" level. Then install radiator cap and close air release plug.
   Coolant capacity (With reservoir tank):
   9.0ℓ (9-1/2 US qt, 7-7/8 Imp qt)
   Reservoir tank:
   0.6ℓ (5/8 US qt, 1/2 Imp qt)

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

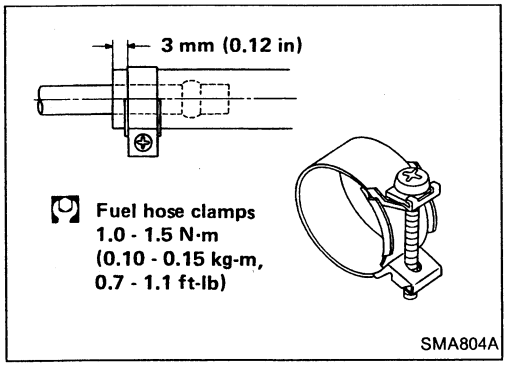


8. Start engine and warm it up until it reaches normal operating temperature. Then race engine 2 or 3 times under no-load. Watch coolant temperature gauge for signs of overheating.
9. Stop engine. After it completely cools down, refill radiator up to filler opening. Fill reservoir tank up to the "H" level.
10. Check drain cock and drain plug for any sign of leakage.

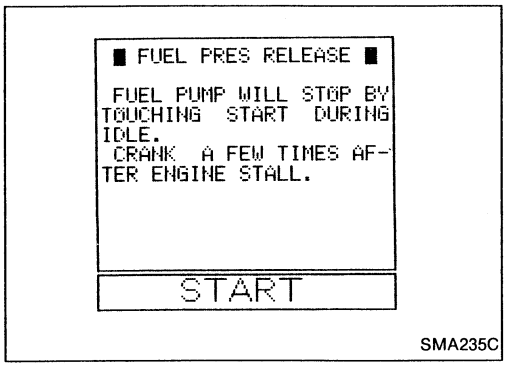
Checking Fuel Lines



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.

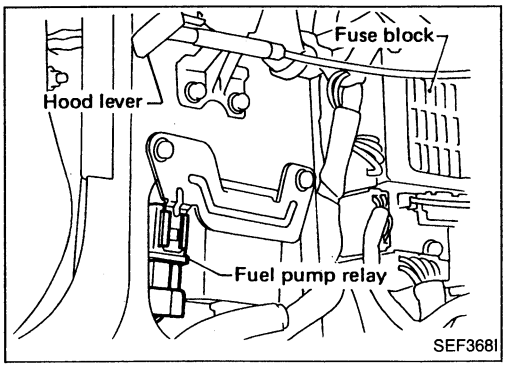


Changing Fuel Filter

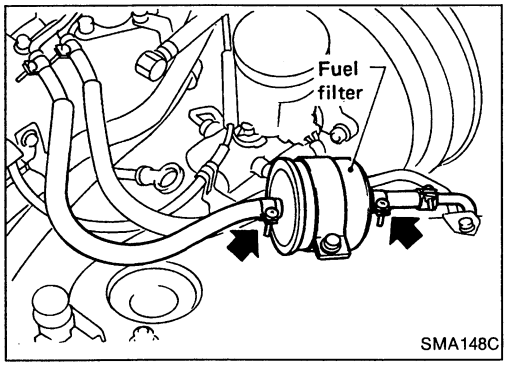
WARNING:

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.

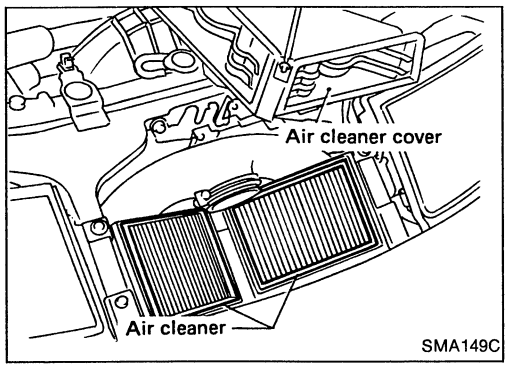


1. Disconnect fuel pump relay and start engine.
2. After engine stalls, crank engine two or three times to make sure that fuel pressure is released. Then turn ignition switch off and reconnect fuel pump relay.



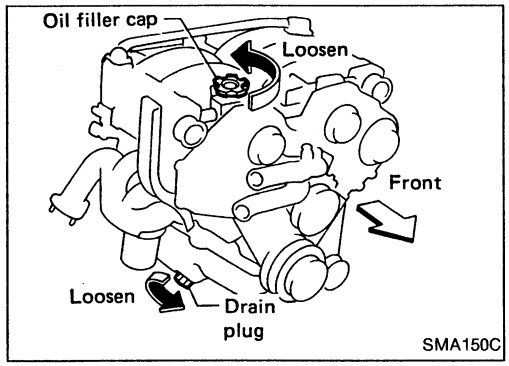
3. Loosen fuel hose clamps.
4. Replace fuel filter.

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



Changing Air Cleaner Filter

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



Changing Engine Oil

WARNING:

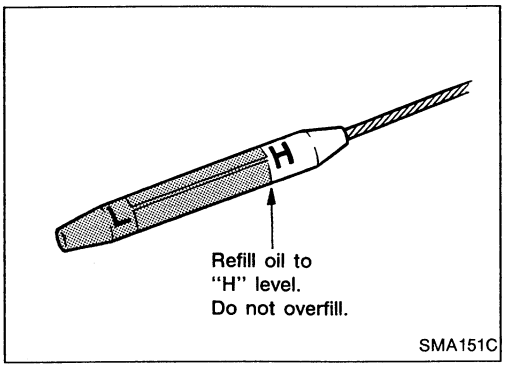
Be careful not to burn yourself, as the engine oil is hot.

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.

CAUTION:

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

Changing Engine Oil (Cont'd)

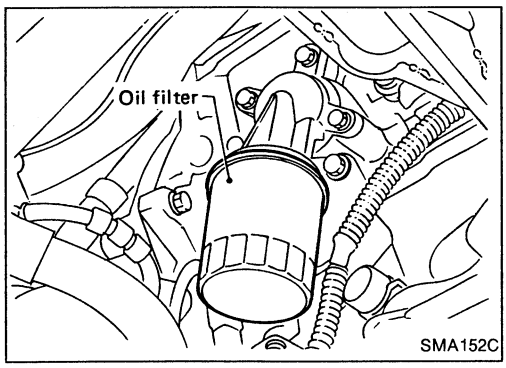


3. Drain oil and refill with new engine oil.
   Oil grade: API SG
   Viscosity:
   See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section.
   Refill oil capacity (Approximately): ℓ (US qt, Imp qt)

With oil filter	Without oil filter
3.4 (3-5/8, 3)	3.0 (3-1/8, 2-5/8)

- **Since 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.

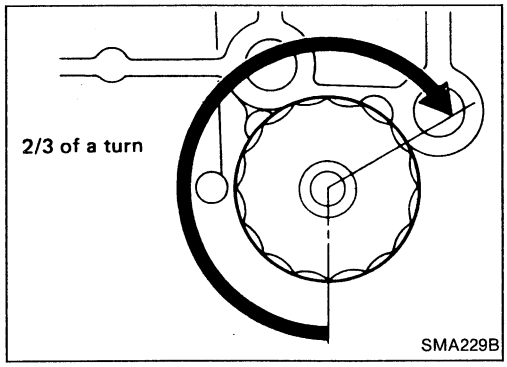


Changing Oil Filter

1. Remove oil filter with a suitable tool.

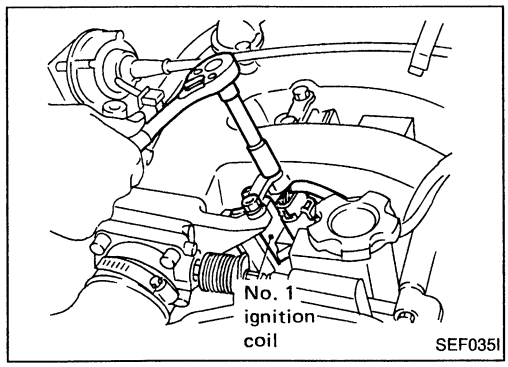
WARNING:
Be careful not to burn yourself, as the engine and engine oil are hot.

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



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

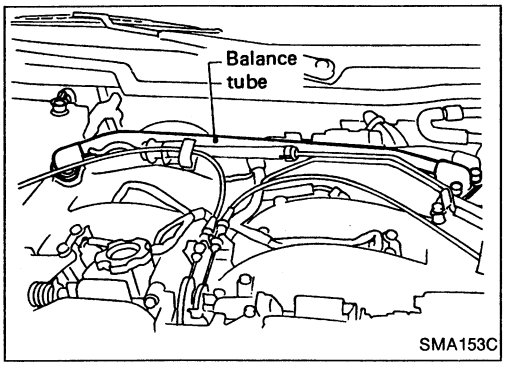
Refer to Changing Engine Oil.



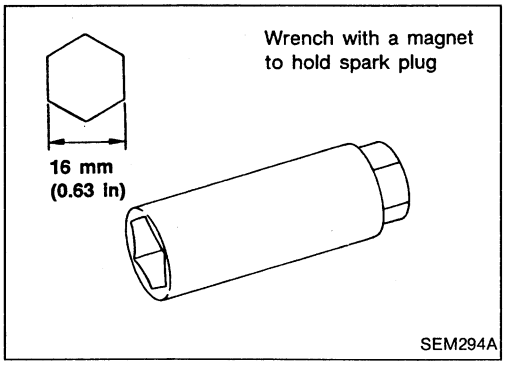
Changing Spark Plugs

1. Disconnect ignition coil harness connector.
2. Loosen ignition coil fixing bolts and pull out coil from intake manifold collector.

Changing Spark Plugs (Cont'd)



- When changing No. 5 and No. 6 cylinder spark plugs, remove balance tube first. (O-rings of balance tube may be reused, if they are not worn.)

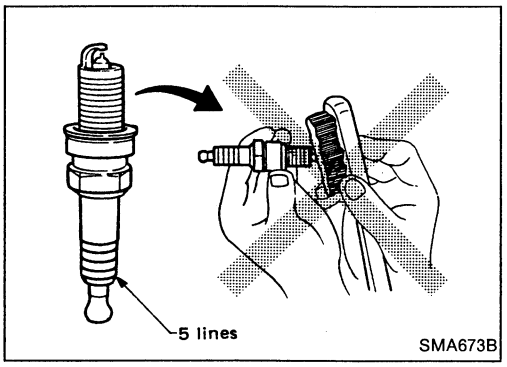


3. Remove spark plugs with suitable spark plug wrench.

Spark plug (Platinum-tipped type):

	Non-turbo	Turbo
Standard type	PFR6B-11	PFR5B-11B
Hot type	PFR5B-11	PFR5B-11B
Cold type	PFR7B-11	PFR6B-11B
		PFR6B-11

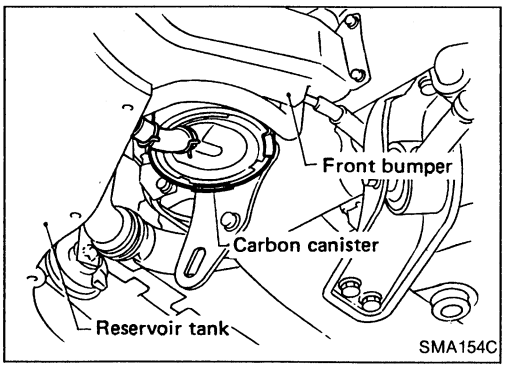
: 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)



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

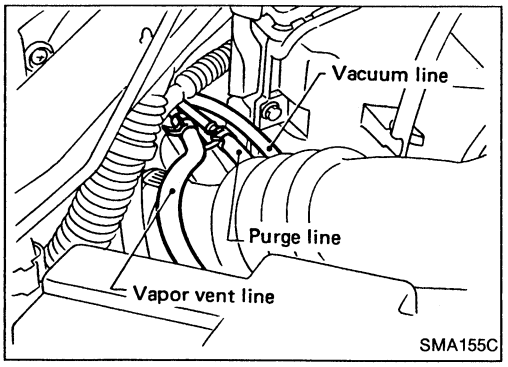
Cleaner air pressure:
Less than 588 kPa (6 kg/cm^2, 85 psi)
Cleaning time:
Less than 20 seconds

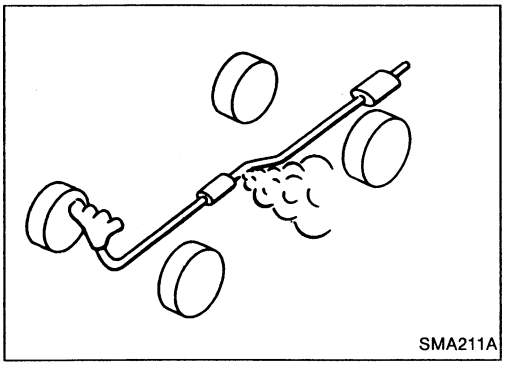
Checking Vapor Lines



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.

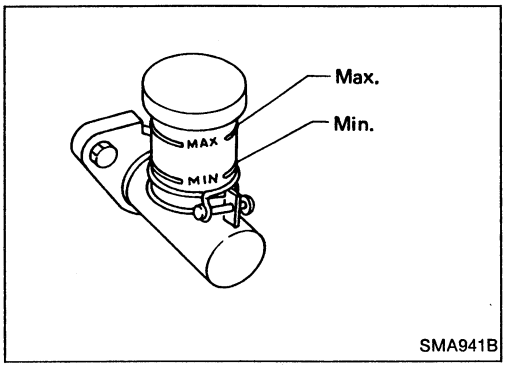
Refer to "EVAPORATIVE EMISSION SYSTEM" in EF & EC section.




SMA211A

Checking Exhaust System

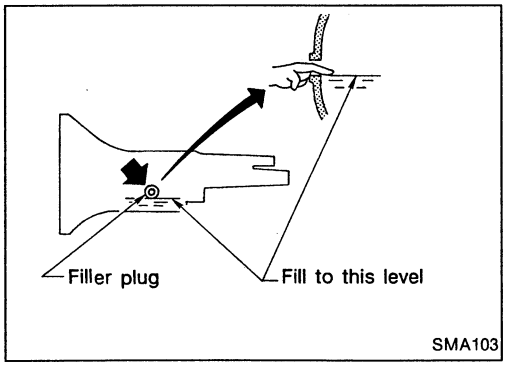
- Check exhaust pipes, muffler and mounting for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



SMA941B

Checking Clutch Fluid Level and Leaks

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



SMA103

Checking M/T Oil

- Check for oil leakage and oil level.

Never start engine while checking oil level.

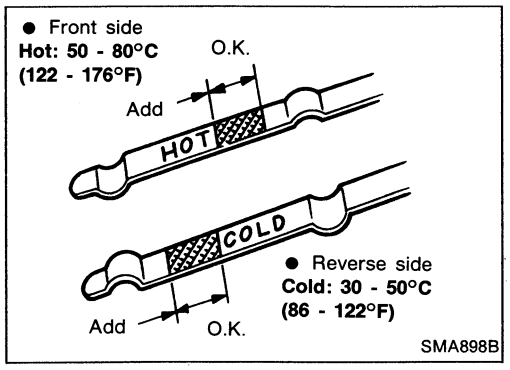
[O]: Filler plug 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

Changing M/T Oil

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

Oil capacity: 2.8 ℓ (5-7/8 US pt, 4-7/8 Imp pt)

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



SMA898B

Checking A/T Fluid

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) Reinsert 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.

Checking A/T Fluid (Cont'd)

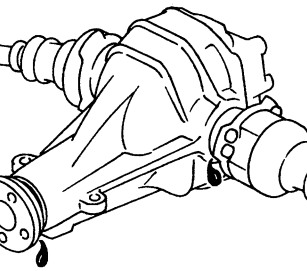

Check fluid for contamination.
SMA853B

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

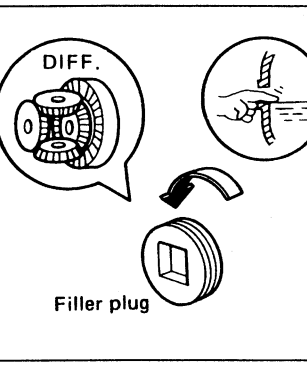
1. Drain fluid by removing oil pan.
2. Replace gasket with new one.
3. Refill with fluid and then check fluid level.
   Oil capacity (With torque converter):
   Non-Turbocharger 8.3 ℓ (8-3/4 US qt, 7-1/4 Imp qt)
   Turbocharger 8.2 ℓ (8-5/8 US qt, 7-1/4 Imp qt)

Checking Differential Gear Oil


SMA012C

- Check for oil leakage and oil level.
  Filler plug:
  [O]: 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)

Changing Differential Gear Oil

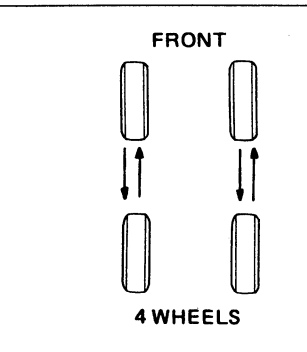


SMA257A

1. Drain oil from drain plug and refill with new gear oil.
2. Check oil level.
   Oil capacity:
   For Non-Turbocharger model
   1.5 ℓ (3-1/8 US pt, 2-5/8 Imp pt)
   For Turbocharger model
   1.8 ℓ (3-7/8 US pt, 3-1/8 Imp pt)
   Drain plug:
   Refer to S.D.S.

Balancing Wheels

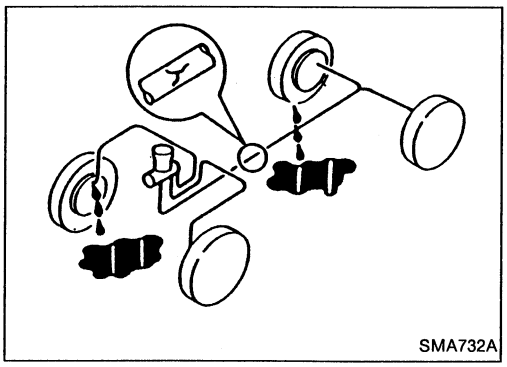
- Adjust wheel balance using road wheel center.
  Wheel balance (Maximum allowable unbalance at rim flange):
  Refer to S.D.S.



SMA652C

Tire Rotation (Non-Turbocharger model only)

- **Do not include the T-type or space saver spare tire when rotating the tires.**
  Wheel nuts:
  [O]: 98 - 118 N·m
  (10.0 - 12.0 kg-m, 72 - 87 ft-lb)

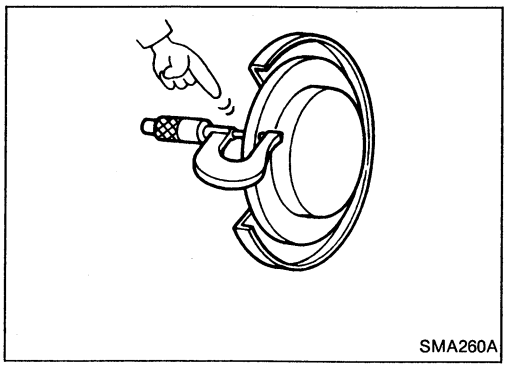

SMA732A

Checking Brake Fluid Level and Leaks

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

Checking Brake Lines and Cables

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


SMA260A

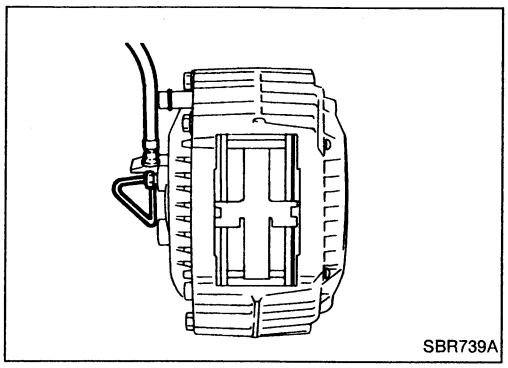
Checking Disc Brake

ROTOR

- Check condition and thickness.

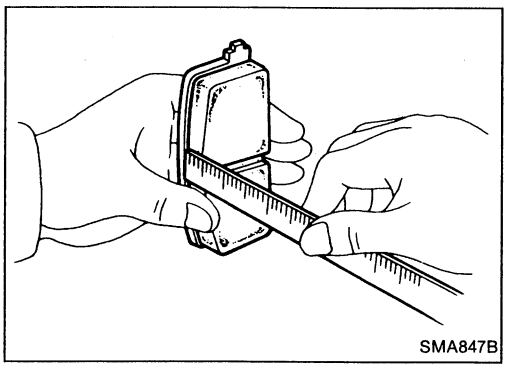
Unit: mm (in)

	Front	Rear
Standard thickness	30.0 (1.181)	18 (0.71)
Minimum thickness	28.0 (1.102)	16.0 (0.630)


SBR739A

CALIPER

- Check operation and for oil leakage.

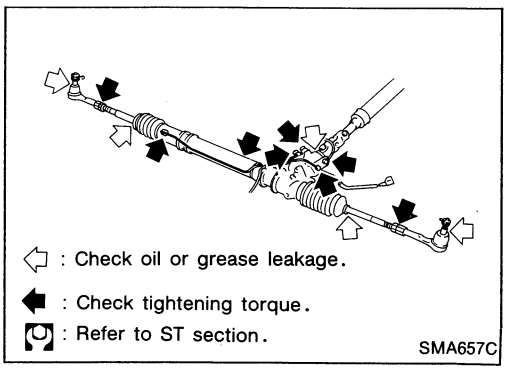

SMA847B

PAD

- Check for wear or damage.

Unit: mm (in)

	Front	Rear
Standard thickness	10.0 (0.394)	11.5 (0.453)
Minimum thickness	2.0 (0.079)	



SMA657C

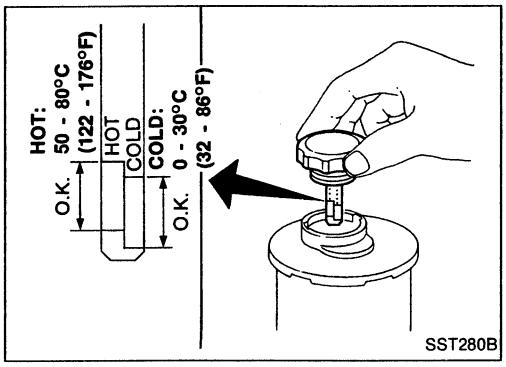
Checking Steering Gear and Linkage

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.

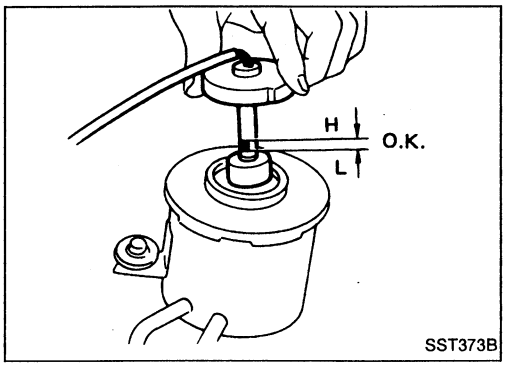


Checking Power Steering Fluid and Lines

CHECKING FLUID LEVEL (WITHOUT SUPER HICAS SYSTEM)

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.

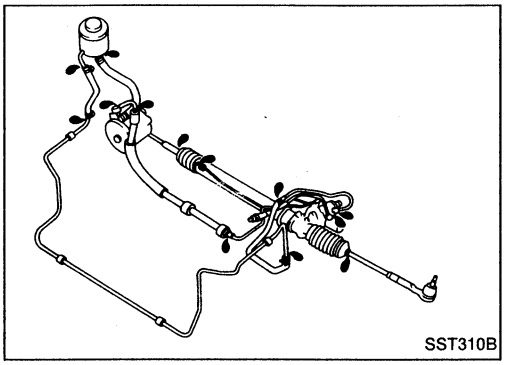


CHECKING FLUID LEVEL (WITH SUPER HICAS SYSTEM)

Maintain the fluid level so that the lower surface of the float is maintained between the "L" and "H" marks on the gauge rod. The fluid level should be checked when the engine is stopped and the fluid temperature is about 30°C (86°F).

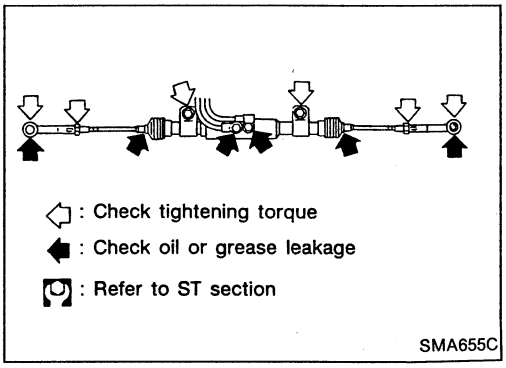
CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™ II" type or equivalent.**
- **Note that fluid level will vary with fluid temperature by approx. 1 mm/5°C (0.04 in/9°F) due to changes in fluid volume.**



CHECKING LINES

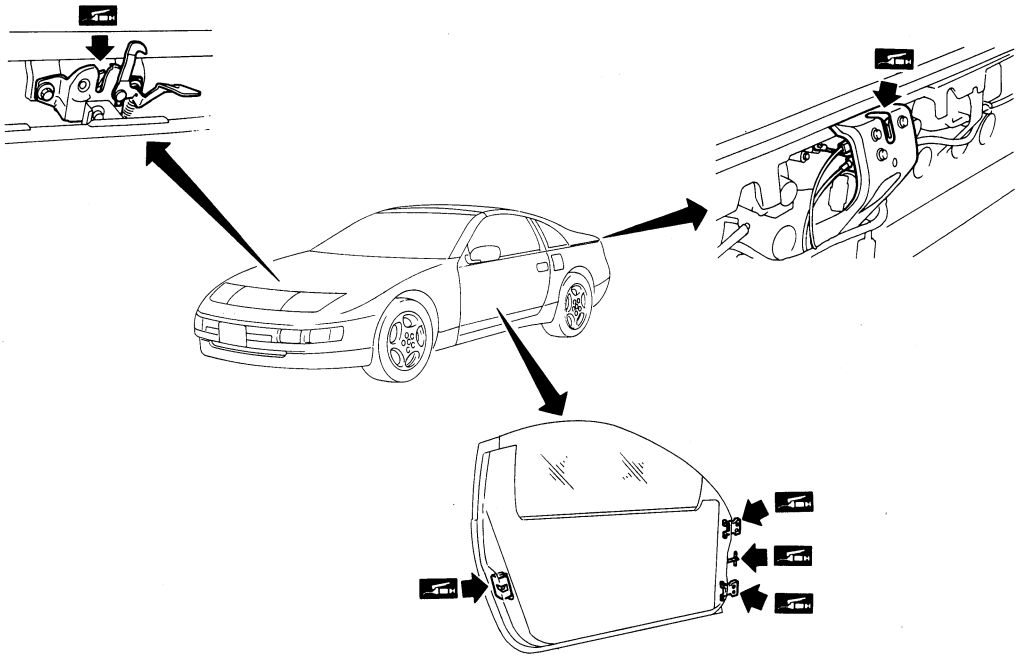
Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



Checking SUPER HICAS Linkage (With SUPER HICAS system)

- Check power cylinder and linkage for damage, looseness and leakage of oil or grease.

Lubricating Locks, Hinges and Hood Latches



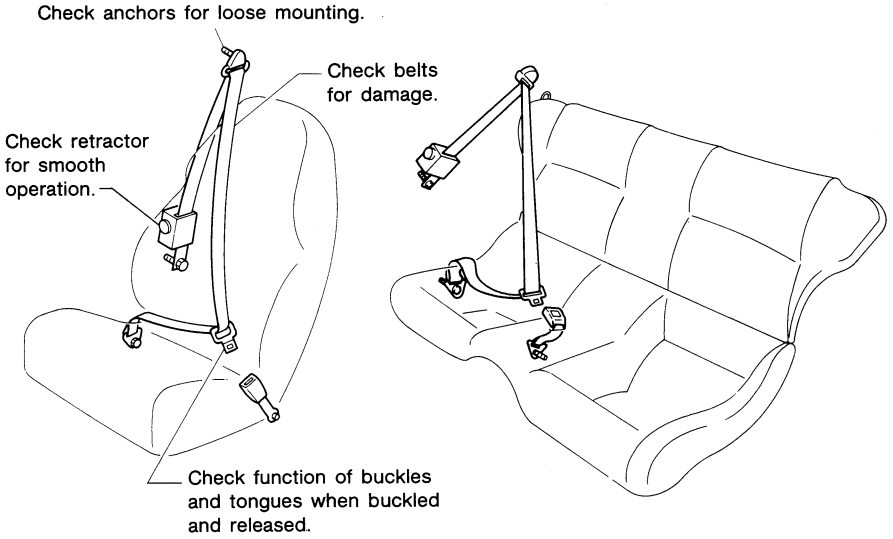
Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

1. **All seat belt assemblies, including retractors and attaching hardwares 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 NISSAN genuine seat belt assembly.**

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

For automatic seat belt details, refer to BF section.



Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	11.5 (0.453)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Air conditioner compressor	12.5 (0.492)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump			
Non-Turbocharger	19 (0.75)	12 - 13.5 (0.472 - 0.531)	10.5 - 11.5 (0.413 - 0.453)
Turbocharger	16 (0.63)	10 - 11 (0.39 - 0.43)	9 - 10 (0.35 - 0.39)
Applied pushing force	98 N (10 kg, 22 lb)		

Spark plug

Non-Turbocharger

Standard type	PFR6B-11
Hot type	PFR5B-11
Cold type	PFR7B-11

Turbocharger

Standard & hot type	PFR5B-11B
Cold type	PFR6B-11B, PFR6B-11

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Wheel balance

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

Brake

Unit: mm (in)

Disc brake mm (in)	
Pad	
Standard thickness	
Front	10.0 (0.394)
Rear	11.5 (0.453)
Minimum thickness	
Front	2.0 (0.079)
Rear	2.0 (0.079)
Rotor	
Standard thickness	
Front	30.0 (1.181)
Rear	18.0 (0.709)
Minimum thickness	
Front	28.0 (1.102)
Rear	16.0 (0.630)

ENGINE MECHANICAL

SECTION EM

CONTENTS

Supplemental Restraint System "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF section** of this Service Manual.

WARNING:

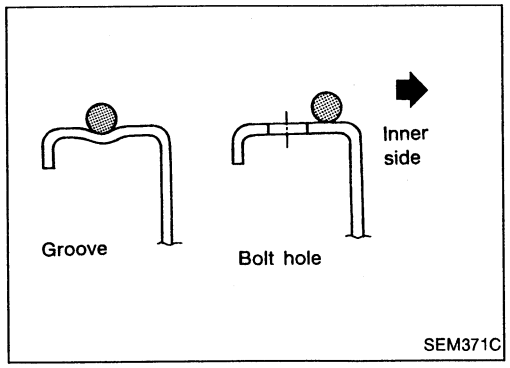
a. To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.

b. Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.

c. All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".

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) Connecting rod cap nuts



Liquid Gasket Application Procedure

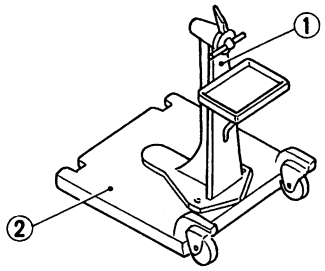
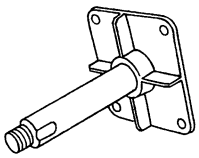
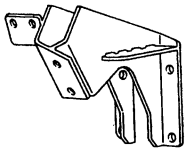
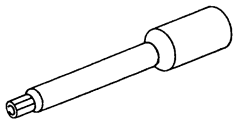
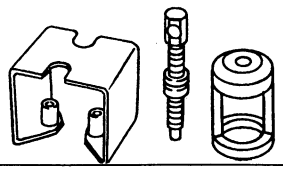
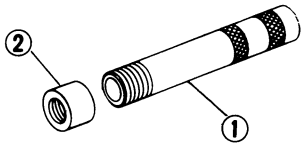
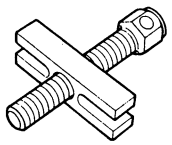
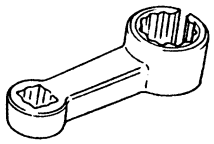
a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.

b. 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).**

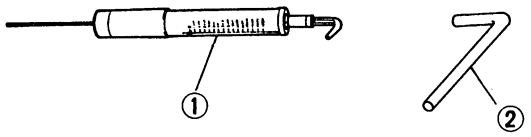
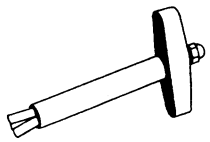
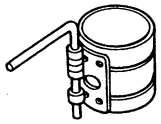
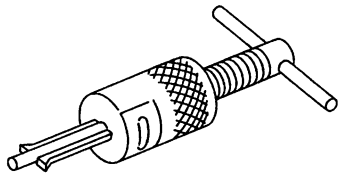
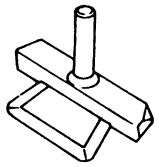
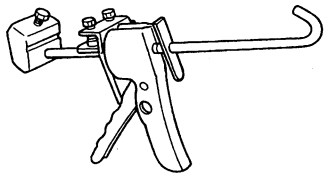
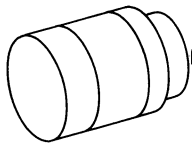
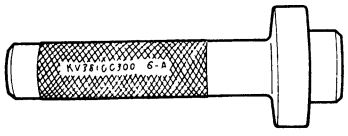
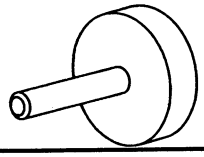
c. Apply liquid gasket to inner surface around hole perimeter area.
(Assembly should be done within 5 minutes after coating.)

d. Wait at least 30 minutes before refilling engine oil and engine coolant.

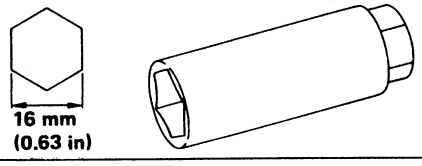
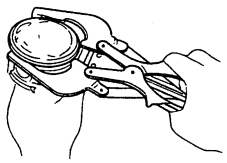
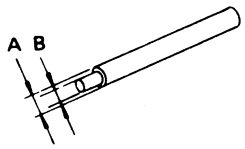
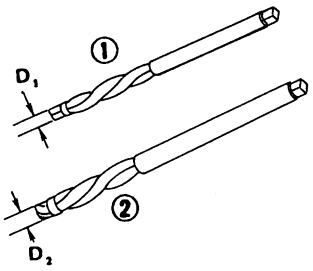
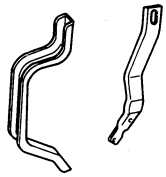
Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
ST0501S000 (—) Engine stand assembly ① ST05011000 (—) Engine stand ② ST05012000 (—) Base		Disassembling and assembling
KV10106500 (—) Engine stand shaft		
KV10110001 (—) Engine sub-attachment		
ST10120000 (J24239-01) Cylinder head bolt wrench		Loosening and tightening cylinder head bolt
KV10111300 (—) Valve spring compressor		Disassembling and assembling valve components
① KV10107501 (—) Valve oil seal drift ② KV10111400 (—) Attachment		Installing valve oil seal
ST27180001 (J25726-A) Steering wheel puller		Removing crankshaft pulley
KV10114400 (J38365) Heated oxygen sensor wrench		Loosening or tightening heated oxygen sensor

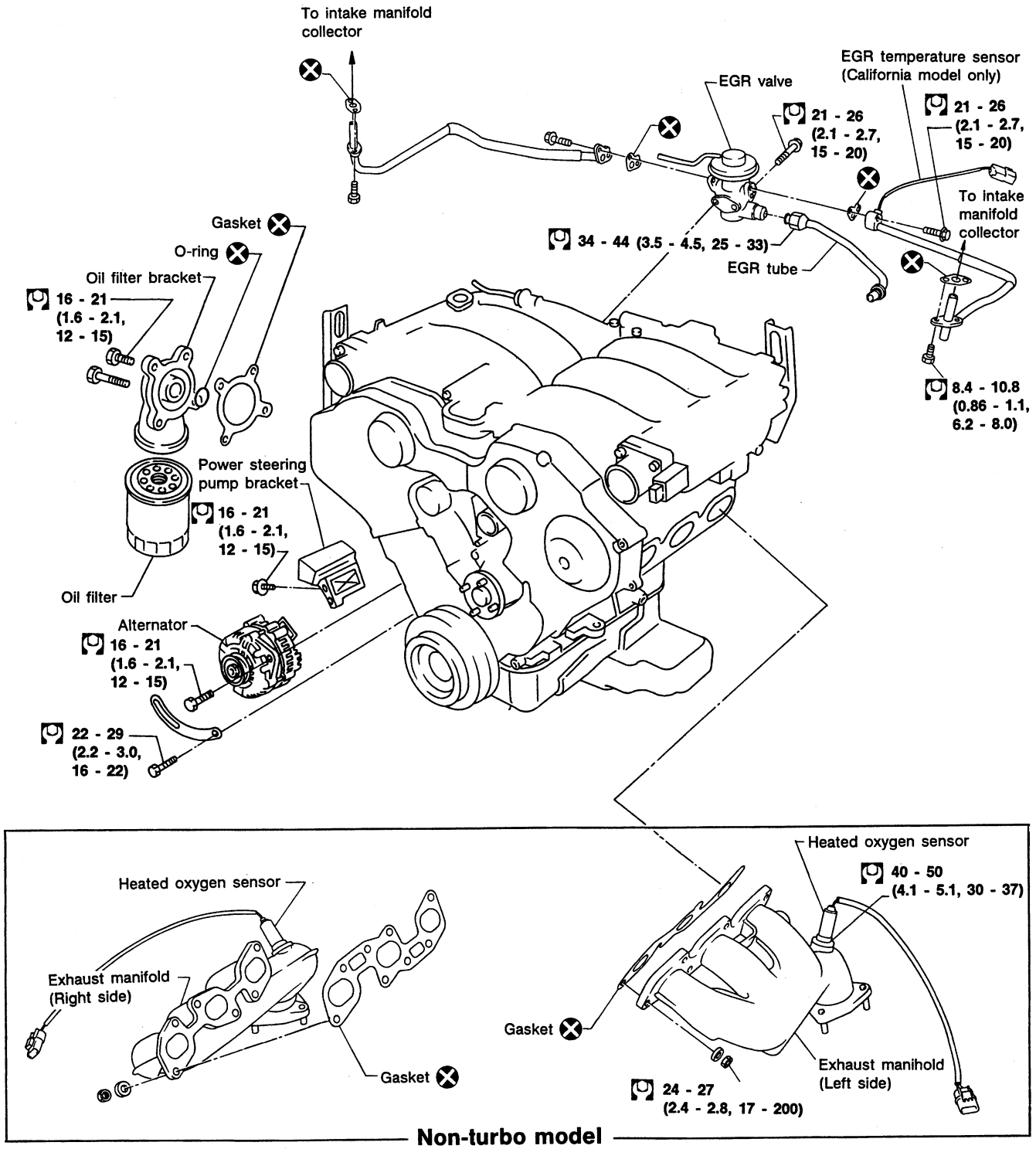
Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
① EG14860000 (J38387) Push-pull gauge ② KV10112000 (—) Hook		Adjusting timing belt tension
(J36467) Valve oil seal remover		Removing valve oil seals
EM03470000 (J8037) Piston ring compressor		Installing piston assembly into cylinder bore
ST16610001 (J23907) Pilot bushing puller		Removing crankshaft pilot bushing
KV10111100 (J37228) Seal cutter		Removing oil pan
WS39930000 (—) Tube presser		Pressing the tube of liquid gasket
ST33200000 (J26082) Drift		Installing camshaft oil seal
KV38100300 (J22888) Drift		Installing front oil seal
ST15310000 (J25640-B) Drift		Installing rear oil seal

Commercial Service Tools

Tool name	Description	
Spark plug wrench		Removing and installing spark plug
Pulley holder		Holding camshaft pulley while tightening or loosening camshaft bolt
Valve seat cutter set		Finishing valve seat dimensions
Piston ring expander		Removing and installing piston ring
Valve guide drift		Removing and installing valve guide **Intake & Exhaust:** **A = 9.5 mm (0.374 in) dia.** **B = 5.5 mm (0.217 in) dia.**
Valve guide reamer		Reaming valve guide ① or hole for oversize valve guide ② **D_1 = 6.0 mm (0.236 in) dia.** **D_2 = 10.2 mm (0.402 in) dia.**
Engine slinger		

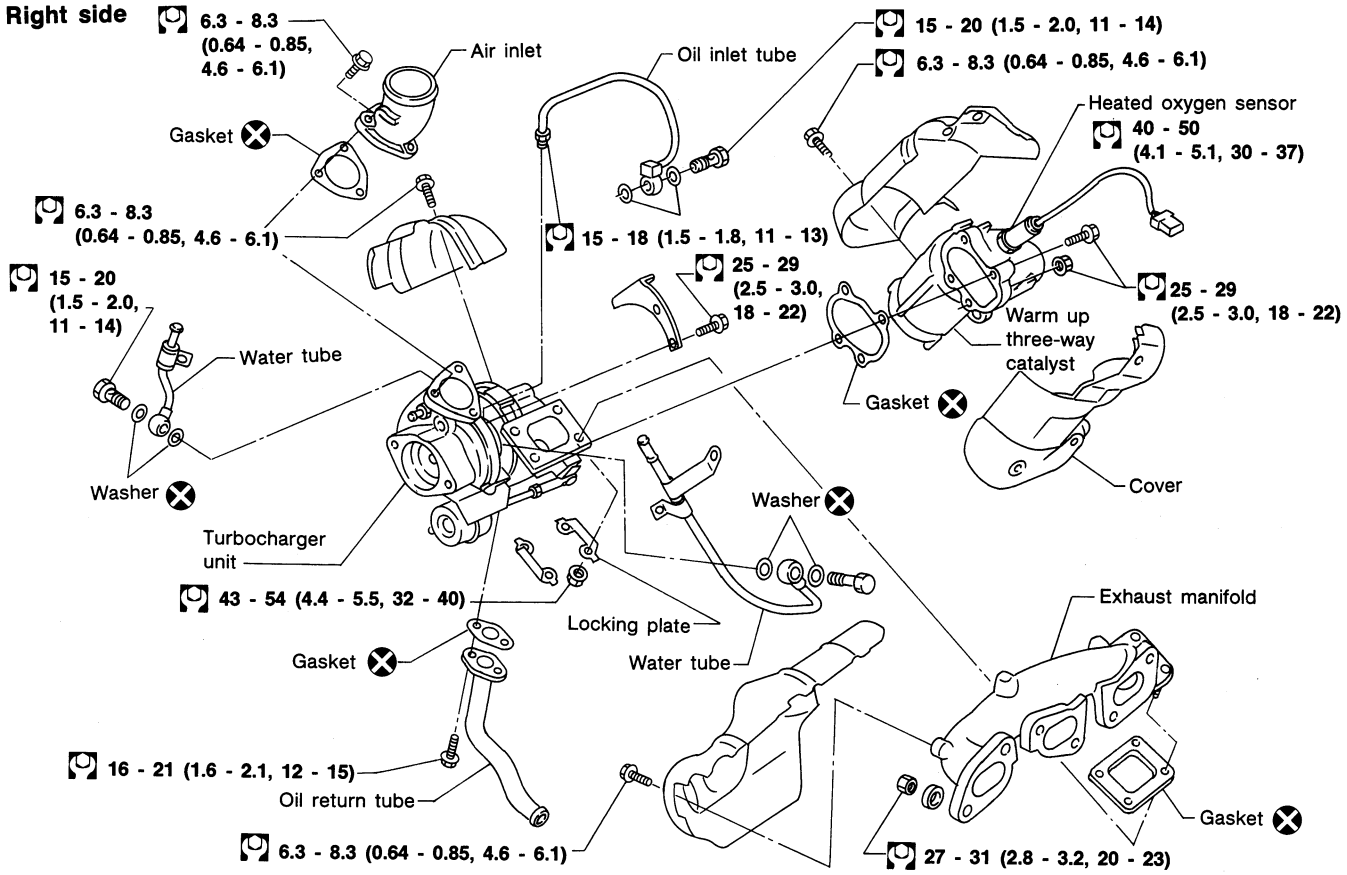
Engine	VG30DE	VG30DETT
Front	10005-30P10	10005-40P10
Rear	10006-30P10	



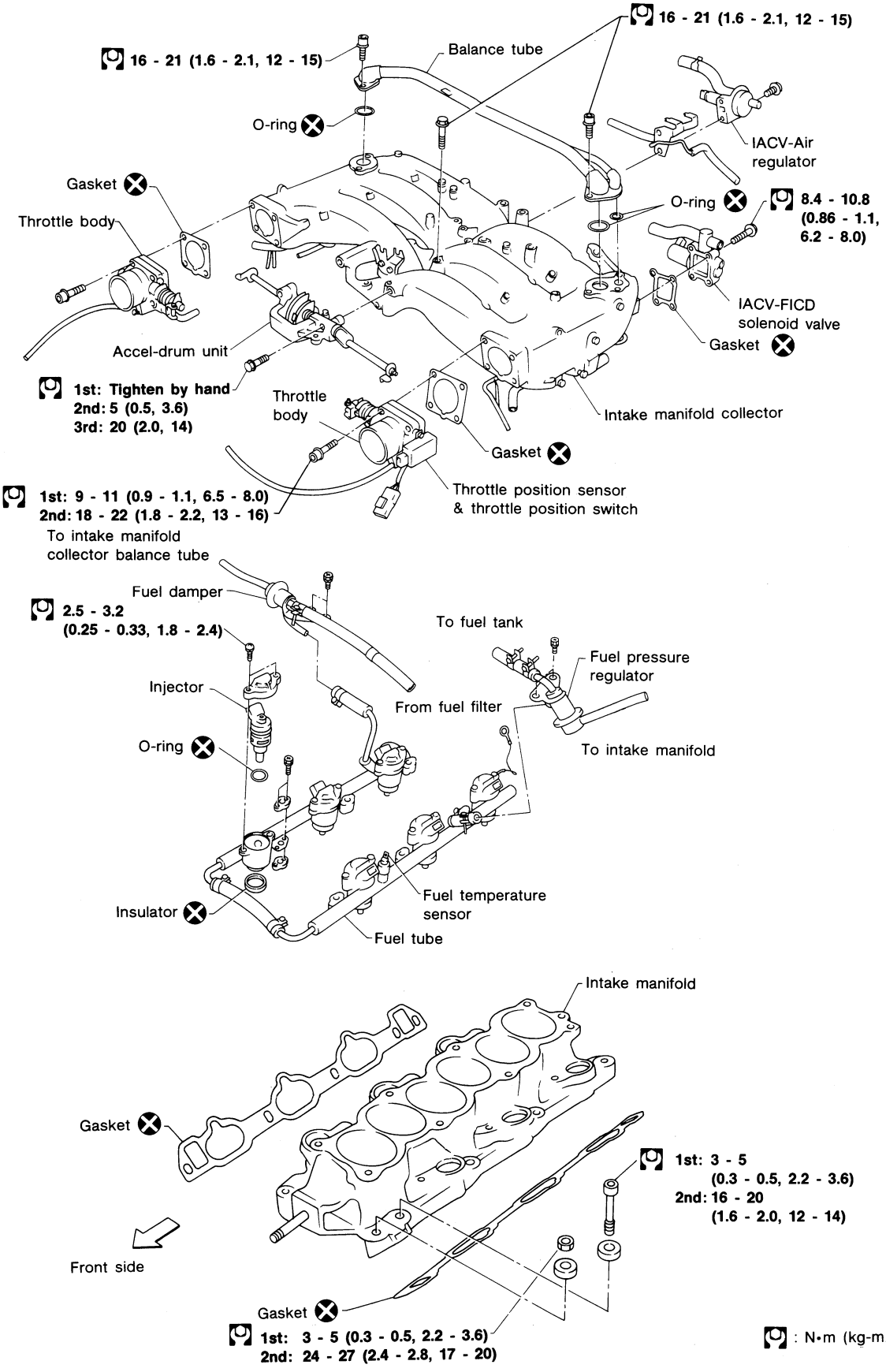
: N•m (kg-m, ft-lb)

SEM487E

Turbo model



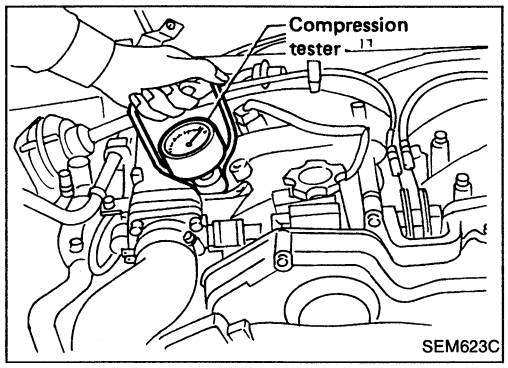
SEM488E


16 - 21 (1.6 - 2.1, 12 - 15)
16 - 21 (1.6 - 2.1, 12 - 15)
Balance tube
O-ring
IACV-Air regulator
Gasket
Throttle body
O-ring
8.4 - 10.8 (0.86 - 1.1, 6.2 - 8.0)
IACV-FICD solenoid valve
Gasket
Accel-drum unit
1st: Tighten by hand
2nd: 5 (0.5, 3.6)
3rd: 20 (2.0, 14)
Throttle body
Intake manifold collector
Gasket
Throttle position sensor & throttle position switch
1st: 9 - 11 (0.9 - 1.1, 6.5 - 8.0)
2nd: 18 - 22 (1.8 - 2.2, 13 - 16)
To intake manifold collector balance tube
Fuel damper
2.5 - 3.2 (0.25 - 0.33, 1.8 - 2.4)
To fuel tank
Fuel pressure regulator
Injector
From fuel filter
O-ring
To intake manifold
Insulator
Fuel temperature sensor
Fuel tube
Intake manifold
Gasket
1st: 3 - 5 (0.3 - 0.5, 2.2 - 3.6)
2nd: 16 - 20 (1.6 - 2.0, 12 - 14)
Front side
Gasket
1st: 3 - 5 (0.3 - 0.5, 2.2 - 3.6)
2nd: 24 - 27 (2.4 - 2.8, 17 - 20)
: N•m (kg-m, ft-lb)

SEM618C

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 crankshaft position sensor harness connector.



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.

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

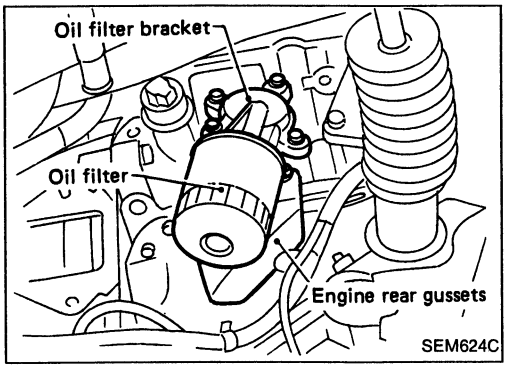
Compression pressure:

Unit: kPa (kg/cm^2, psi)/300 rpm

	VG30DE	VG30DETT
Standard	1,285 (13.1, 186)	1,177 (12.0, 171)
Minimum	981 (10.0, 142)	883 (9.0, 128)
Difference limit between cylinders	98 (1.0, 14)	

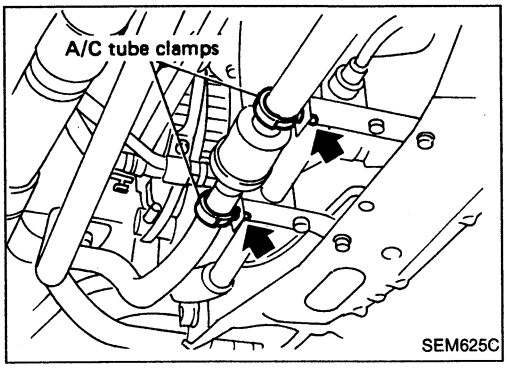
10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the spark plug holes and retest compression.

- **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 valves and valve seats. (Refer to S.D.S.) If valves or valve seats are damaged excessively, replace them.**
- **If compression in any two adjacent cylinders is low and if adding oil does not help compression, there may be leakage past gasket surface. If so, replace cylinder head gasket.**

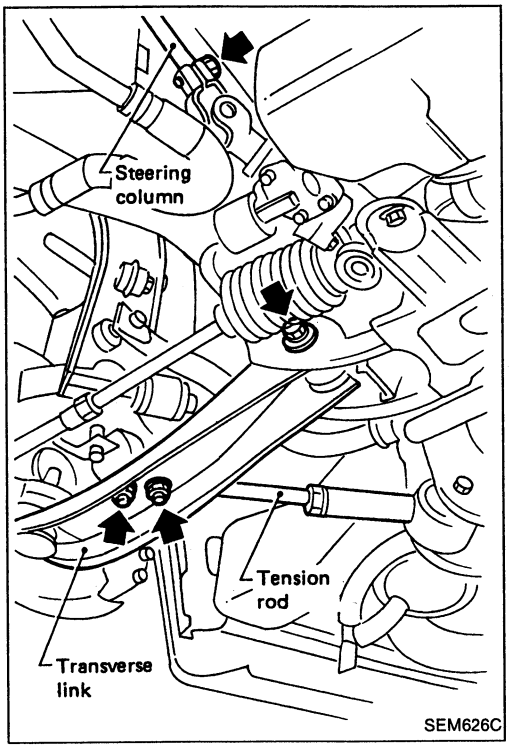


Removal

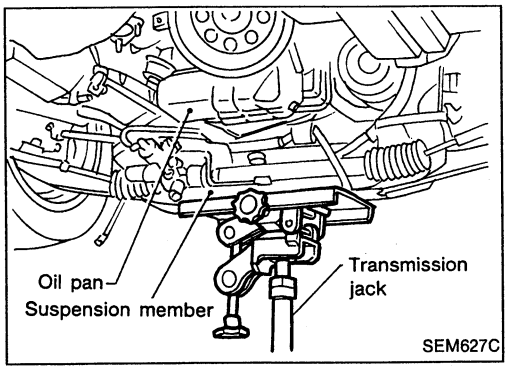
1. Drain engine oil.
2. Remove engine under cover.
3. Remove oil filter and bracket.
4. Remove engine rear gussets from both sides.



5. Disconnect A/C tube clamps as shown.

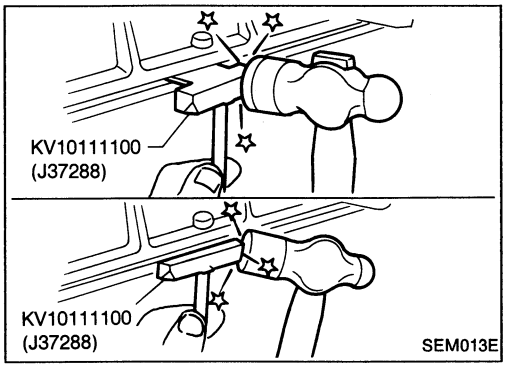


6. Disconnect steering column lower joint.
7. Remove tension rod fixing bolts from both sides.
8. Loosen transverse link bolts on both sides.



9. Set a suitable transmission jack under the suspension member.
   - At this time, hoist engine with engine slingers.
10. Remove suspension member fixing bolts.
11. Remove engine mounting bolts from both sides and then slowly lower transmission jack.
12. Remove oil pan bolts.

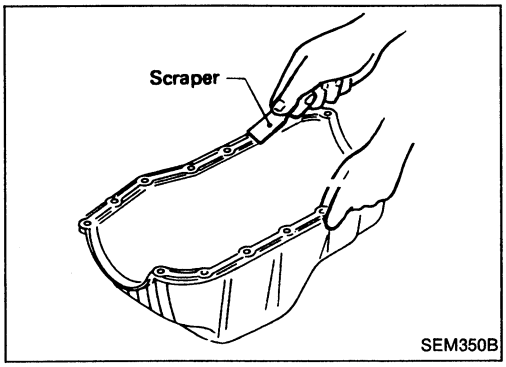
Removal (Cont'd)



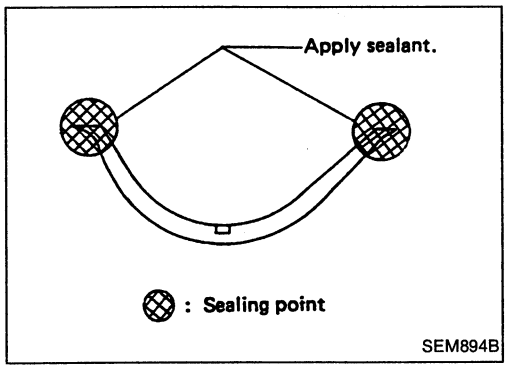
13. Remove oil pan.
(1) Insert Tool between cylinder block and oil pan.
- **Do not drive seal cutter into oil pump or rear oil seal retainer, as aluminum mating surfaces may be damaged.**
- **Do not insert screwdriver, or oil pan flange may be deformed.**

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

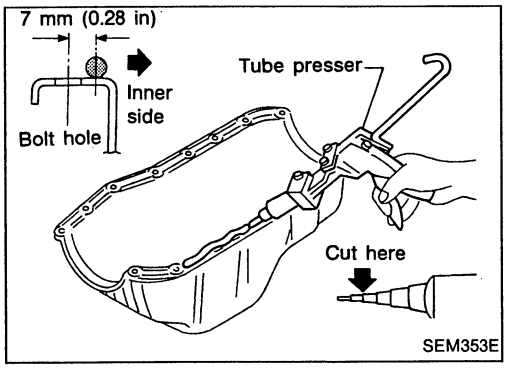
Installation



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

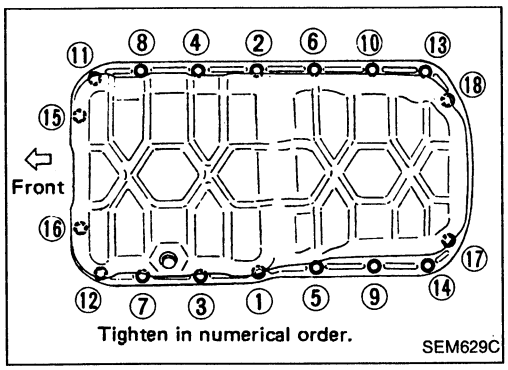


2. Apply sealant to oil pump gasket and rear oil seal retainer gasket.

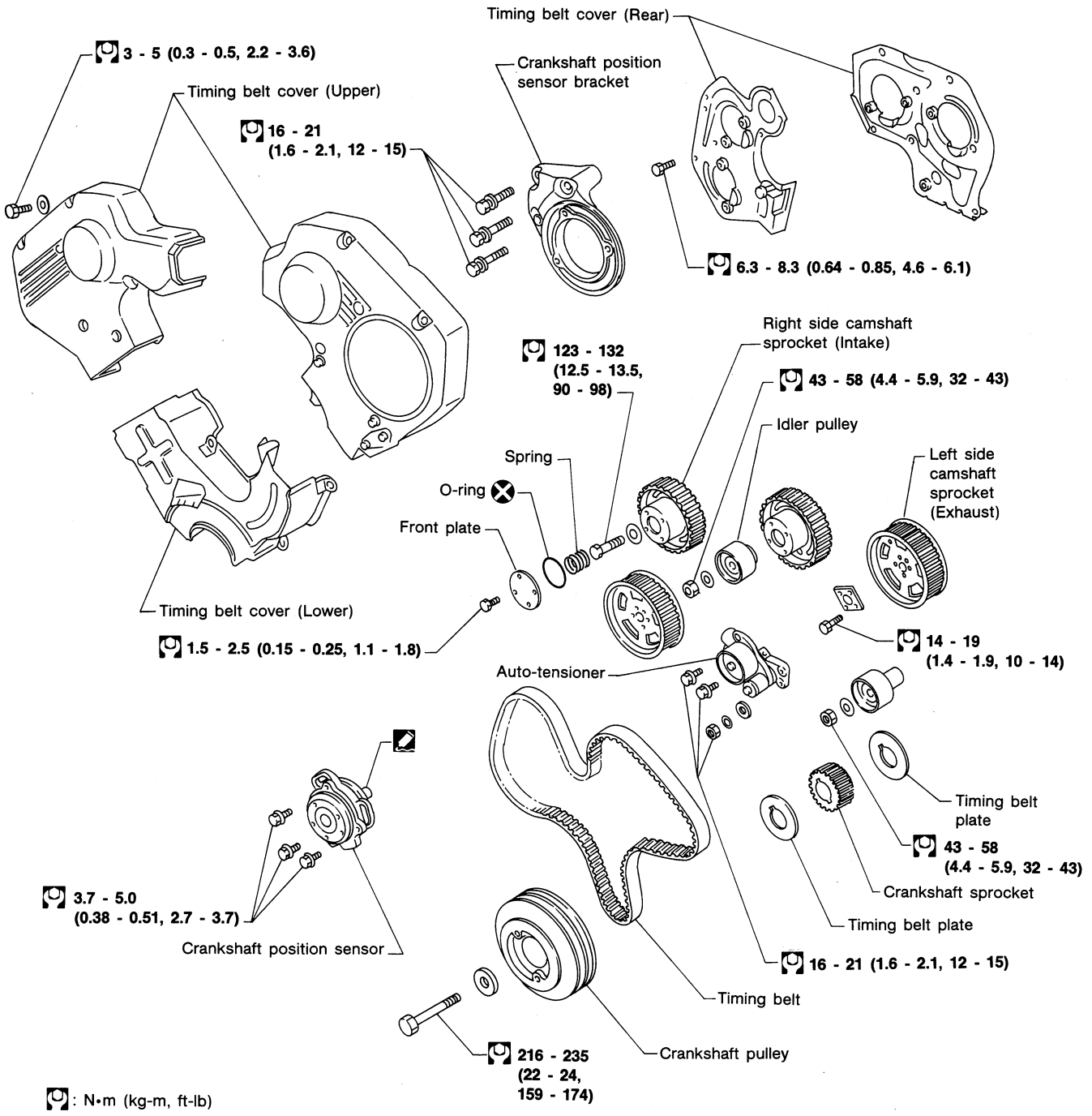


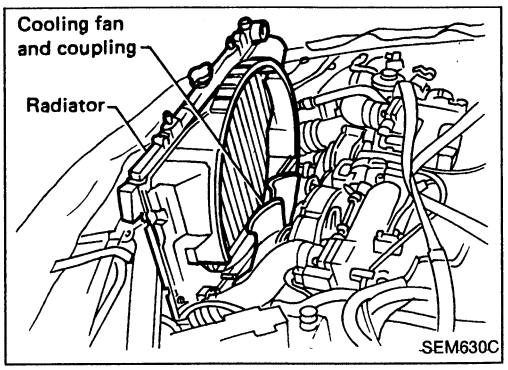
3. Apply a continuous bead of liquid gasket to oil pan mating surface.

Use Genuine Liquid Gasket or equivalent.
- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.
- Attaching should be done within 5 minutes after coating.



4. Install oil pan.
- **Install bolts/nuts in their reverse order of removal.**
- **Wait at least 30 minutes before refilling engine oil.**

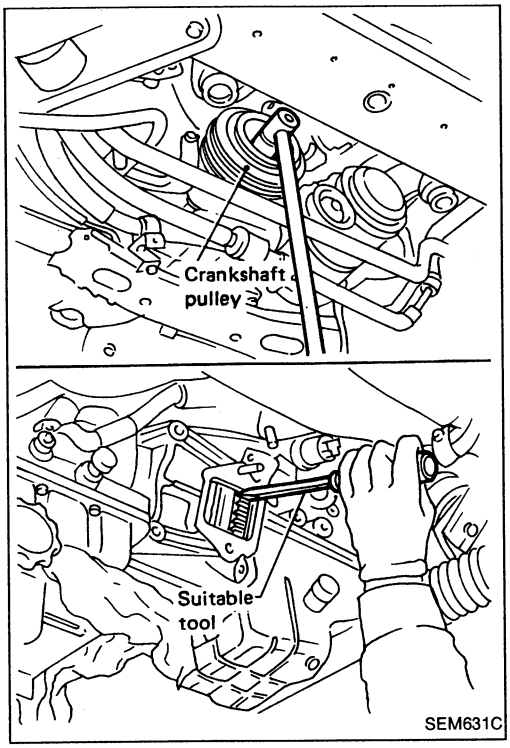




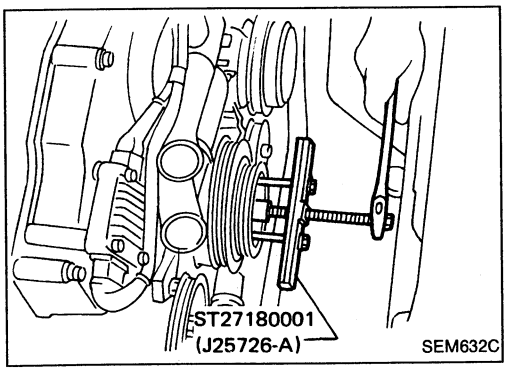
Removal

1. Remove engine under cover.
2. Drain coolant from both cylinder block drain plugs, and radiator drain cock.
3. Remove radiator.
4. Remove drive belts, cooling fan and coupling.

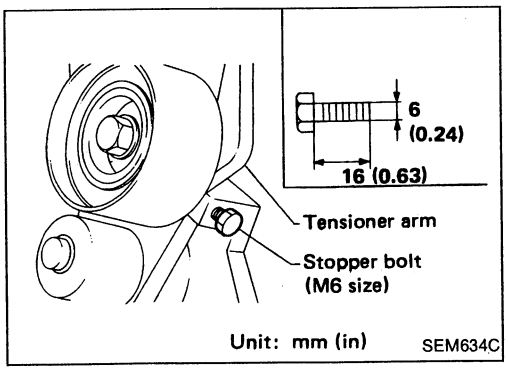
Removal (Cont'd)



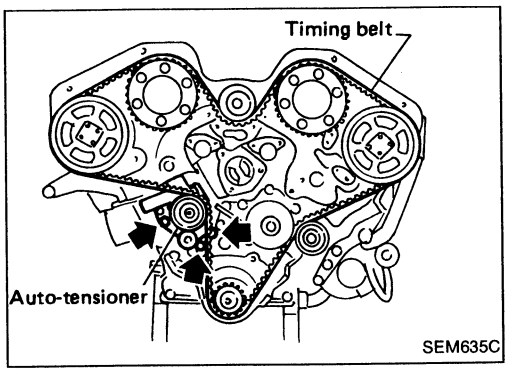
5. Remove crankshaft pulley bolt.
   (At this time, remove starter motor and set a suitable tool to ring gear so that crankshaft cannot rotate.)



6. Remove crankshaft pulley using Tool.
7. Remove water inlet and outlet.
8. Remove front timing belt covers.



9. Install a suitable stopper bolt (M6) into tensioner arm of auto-tensioner so that auto-tensioner pusher does not spread out.



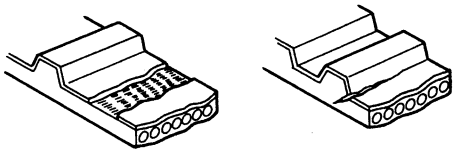
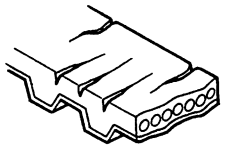
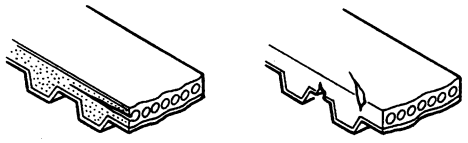
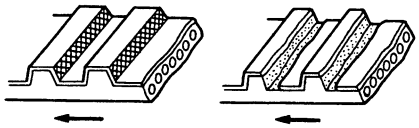
10. Set No. 1 cylinder at T.D.C. on its compression stroke.
11. Remove auto-tensioner and timing belt.

CAUTION:

a. Do not bend or twist timing belt.
b. After removing timing belt, do not turn crankshaft and camshaft separately because valves will strike piston heads.
c. Make sure that timing belt, camshaft sprocket, crankshaft sprocket, idler pulley and auto-tensioner are clean and free of oil and water.

Inspection

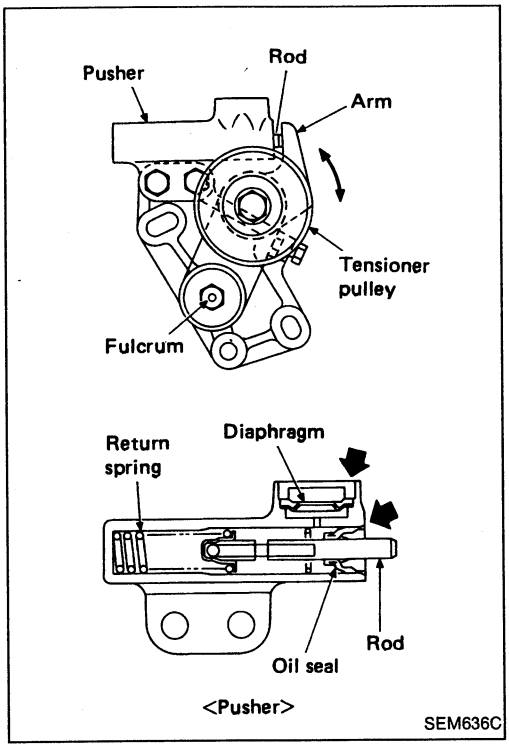
Visually check the condition of timing belt.
Replace if any abnormality is found.

Item to check	Problem	Cause
Tooth is broken/tooth root is cracked.	 SEM394A	• Camshaft jamming • Distributor jamming • Damaged camshaft/crankshaft oil seal
Back surface is cracked/worn.	 SEM395A	• Tensioner jamming • Overheated engine • Interference with belt cover
Side surface is worn.	 SEM396A • Belt corners are worn and round. • Wicks are frayed and coming out.	• Improper installation of belt • Malfunctioning crankshaft pulley plate/timing belt plate
Teeth are worn.	 Rotating direction SEM397A • Canvas on tooth face is worn down. • Canvas on tooth is fluffy, rubber layer is worn down and faded white, or weft is worn down and invisible.	• Poor belt cover sealing • Coolant leakage at water pump • Camshaft not functioning properly • Distributor not functioning properly • Excessive belt tension
Oil/Coolant or water is stuck to belt.		• Poor oil sealing • Coolant leakage at water pump • Poor belt cover sealing

Inspection (Cont'd)

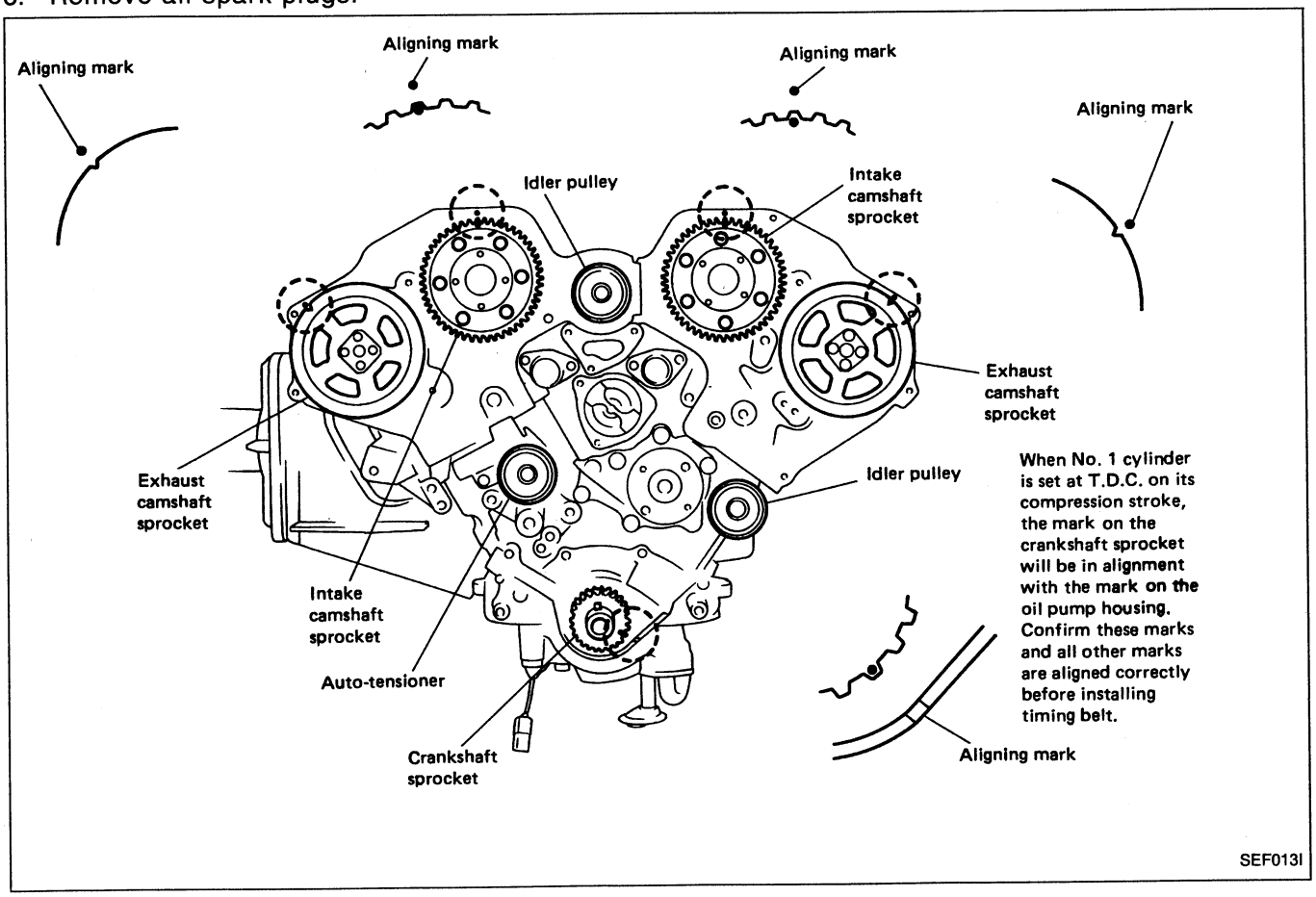
AUTO-TENSIONER

Check for oil leaks from pusher rod and diaphragm.



Installation

1. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.
2. Align matching marks on camshaft and crankshaft sprockets with aligning marks on rear belt cover and oil pump housing.
3. Remove all spark plugs.



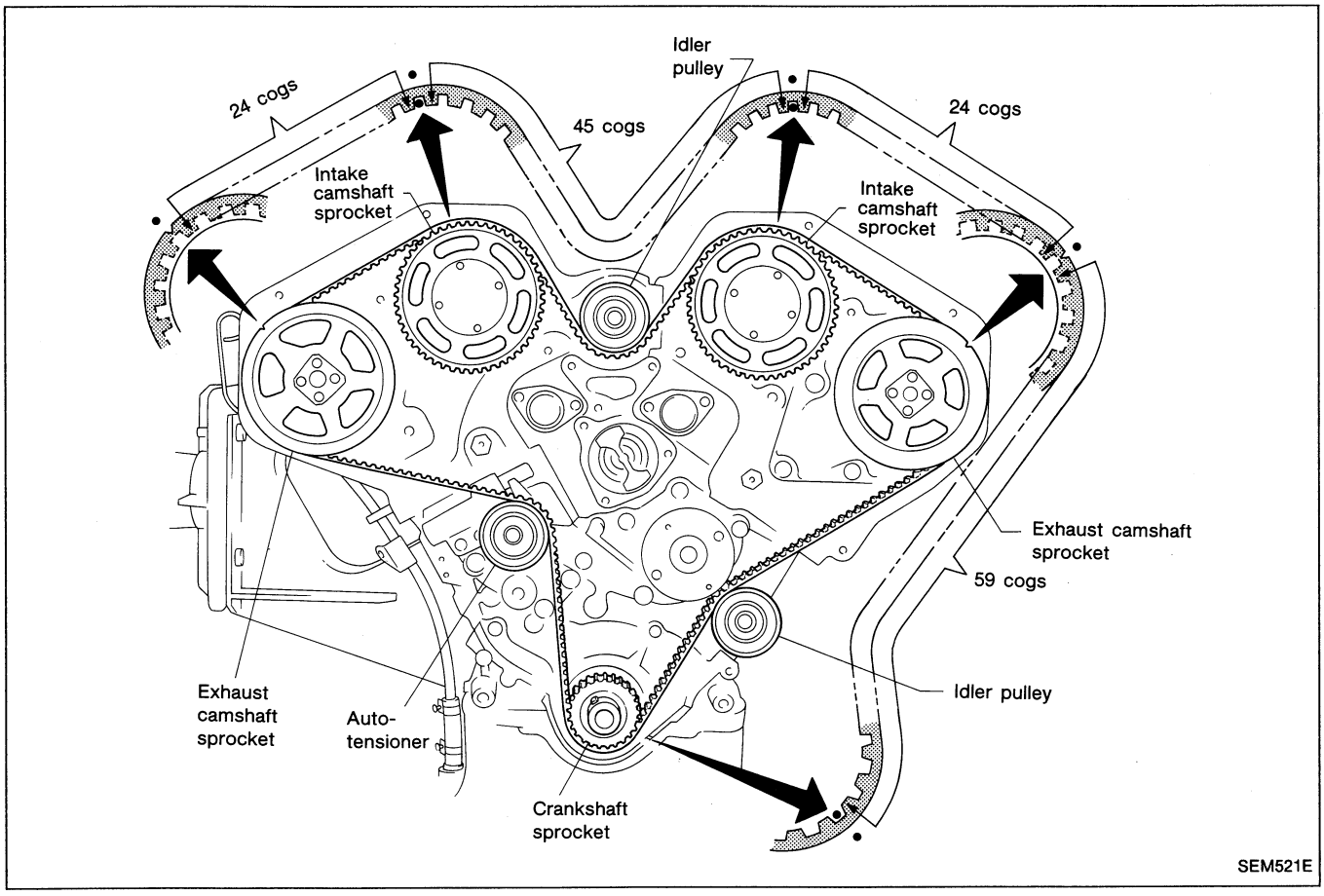
Installation (Cont'd)

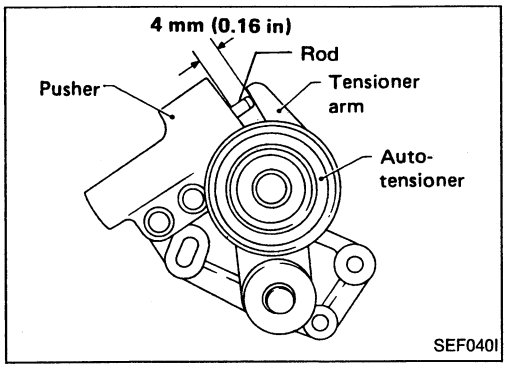
4. Set timing belt.

a. Ensure timing belt and sprockets are clean and free from oil or water. Do not bend or twist timing belt.

b. Align white lines on timing belt with matching mark on camshaft sprocket and crankshaft sprocket.

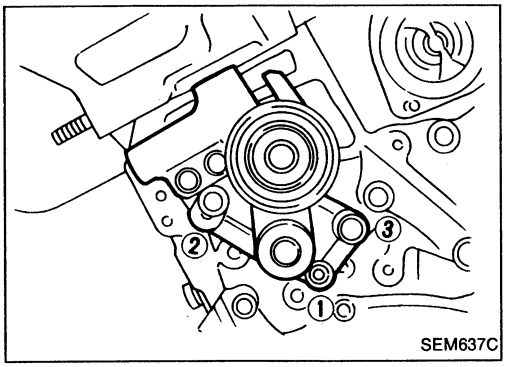
c. Point arrow on timing belt towards the front.





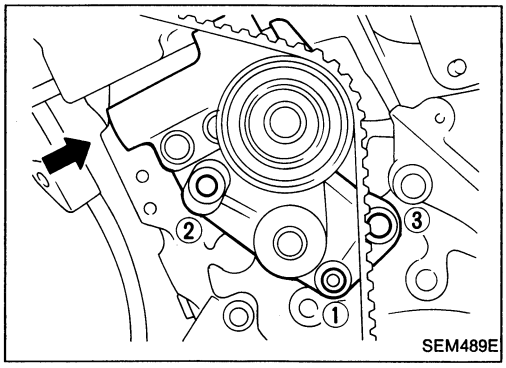
5. Adjust tensioner arm to give 4 mm (0.16 in) clearance with pusher of auto-tensioner using a suitable vise, and then insert stopper bolt into tensioner arm in order that clearance does not change.

When adjusting clearance, do not push tensioner arm with stopper bolt fitted because it will damage thread portion of stopper bolt.



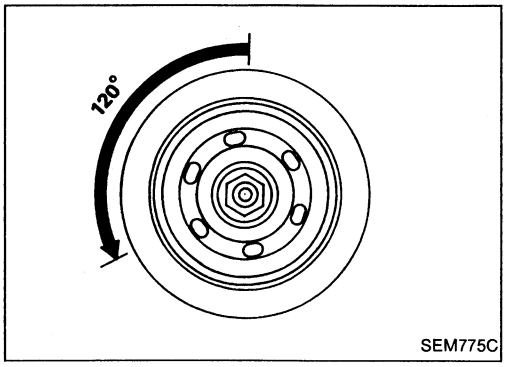
6. Install auto-tensioner and tighten nut (①) and bolts (②, ③) slightly by hand.

Installation (Cont'd)

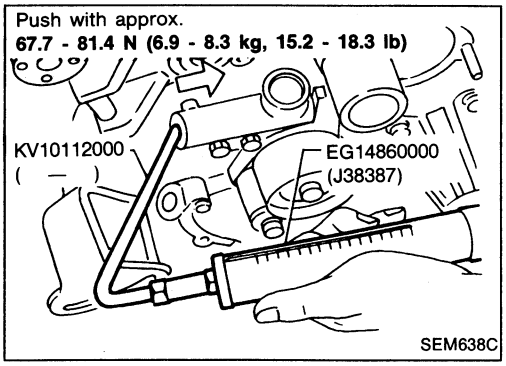


7. Push auto-tensioner slightly towards timing belt to prevent belt from slipping.
   Set tensioner slightly by pushing timing belt. Then, turn crankshaft 10 degrees clockwise and tighten nut (①) and bolts (②, ③) to 16 to 21 N·m (1.6 to 2.1 kg-m, 12 to 15 ft-lb).

At this time, do not push auto-tensioner hard, or belt will be adjusted too tightly.

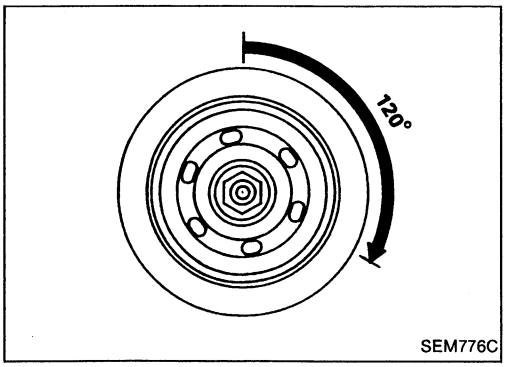


8. Turn crankshaft 120 degrees counterclockwise.
9. Loosen nut (①) and bolts (②, ③) 1/2 turn to set tensioner body as for back as it will go.
10. Turn crankshaft clockwise and set No. 1 cylinder at T.D.C. on its compression stroke.

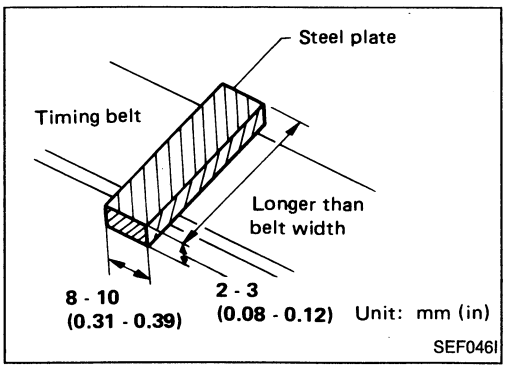


11. Push the end of pusher with approx. 58.8 N (6.0 kg, 13.2 lb) force using Tool (push-pull gauge) and tighten nut (①) and bolts (②, ③) to 16 to 21 N·m (1.6 to 2.1 kg-m, 12 to 15 ft-lb).

If deflection of timing belt exceeds specification in procedure 15., change applied pushing force.

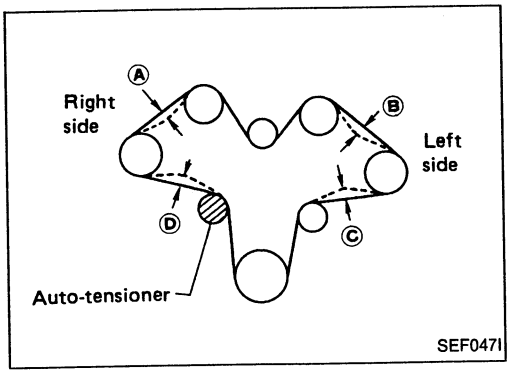


12. Turn crankshaft 120 degrees clockwise.
13. Turn crankshaft 120 degrees counterclockwise and set No. 1 cylinder at T.D.C. on its compression stroke.



14. Prepare a suitable steel plate to measure belt deflection as shown.

Installation (Cont'd)



15.
(1) Set plate and push it with 49 N (5 kg, 11 lb) force using Tool (push-pull gauge) at each position of timing belt mid-way between pulleys as shown.
(2) Measure each deflection.

Deflection:

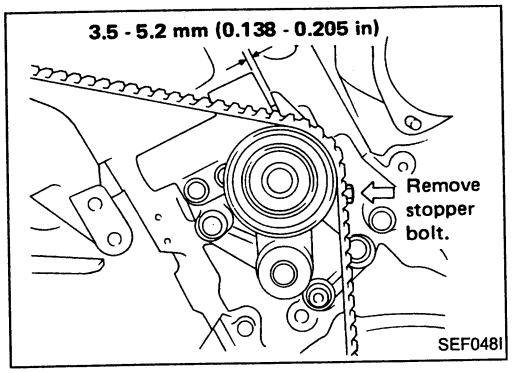
6 - 7 mm (0.24 - 0.28 in) or the average of each portion

$$\frac{Ⓐ + Ⓑ + Ⓒ + Ⓓ}{4}$$

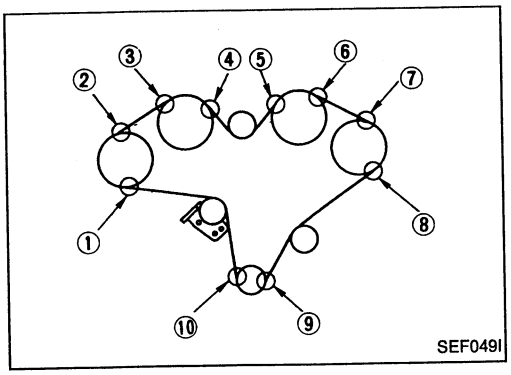
is 6 - 7 mm (0.24 - 0.28 in)

If not within specification, repeat procedure from step 7 through step 15.

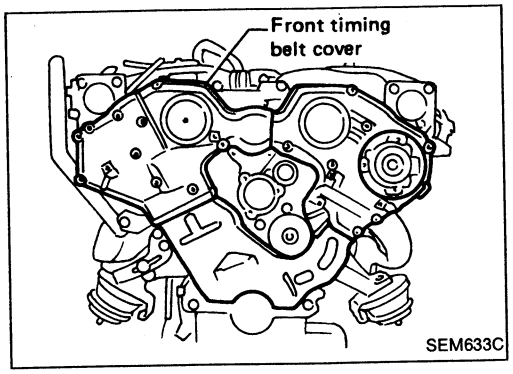
16. Confirm auto tensioner fixing nuts and bolts are tightened to 16 to 21 N·m (1.6 to 2.1 kg-m, 12 to 15 ft-lb).



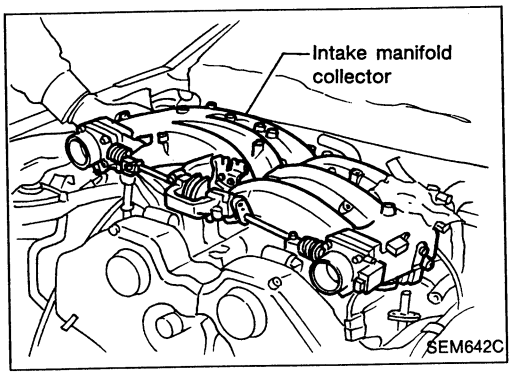
17.
- Remove the auto-tensioner stopper bolt.
- After 5 minutes check the projection of the rod (clearance between tensioner arm and pusher) stays at 3.5 - 5.2 mm (0.138 - 0.205 in).



18. Check the proper installation (no slip or misplacement) of timing belt at each position as shown.

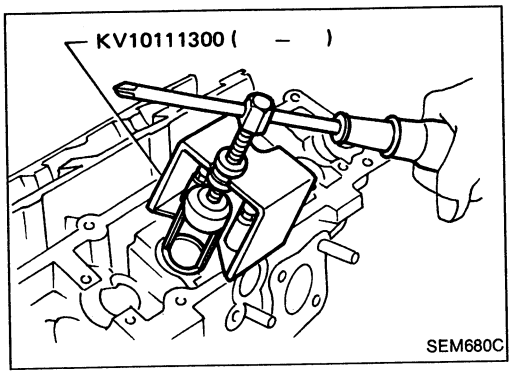


19. Install timing belt covers.

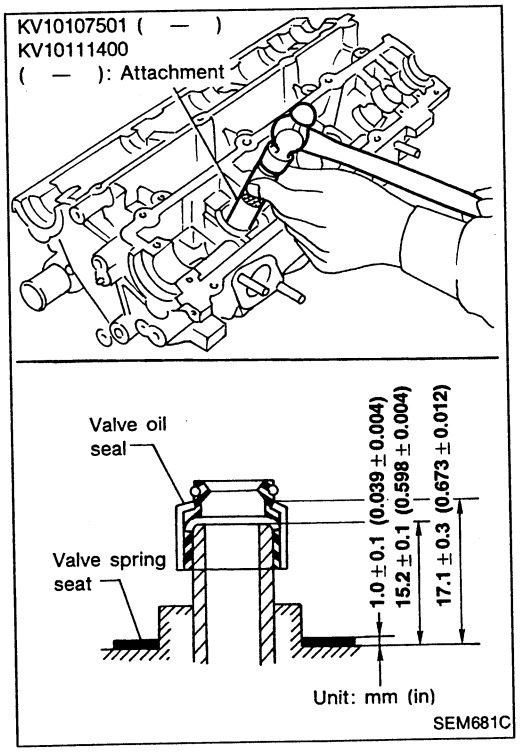


VALVE OIL SEAL

1. Remove intake manifold collector and valve cover.
2. Remove timing belt, camshaft sprocket and rear belt cover.
3. Remove camshaft brackets, camshaft and valve lifter.

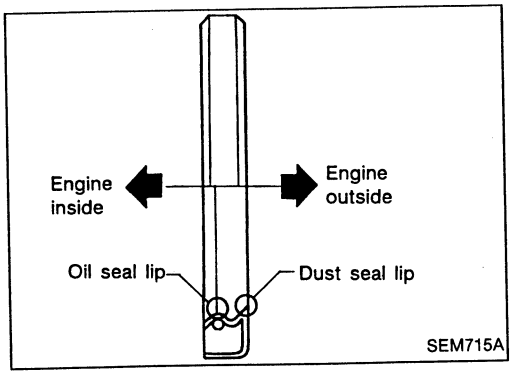


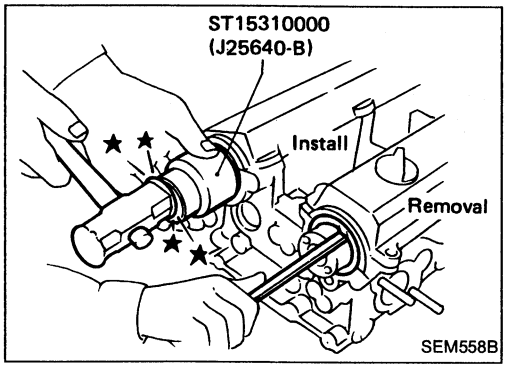
4. Remove valve spring using Tool or a suitable tool.
   - Piston concerned should be set at T.D.C. to prevent valve from falling.
5. Pry out valve oil seal.



6. Apply engine oil to new valve oil seal and install it.
   - Before installing valve oil seal, install inner valve spring seat.

OIL SEAL INSTALLATION DIRECTION



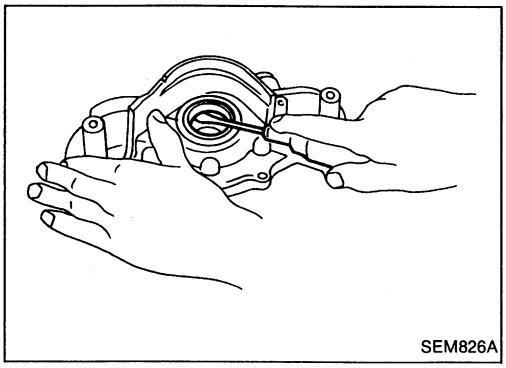


CAMSHAFT OIL SEAL

1. Remove timing belt and camshaft sprocket.
2. Remove rear belt cover and camshaft oil seal.

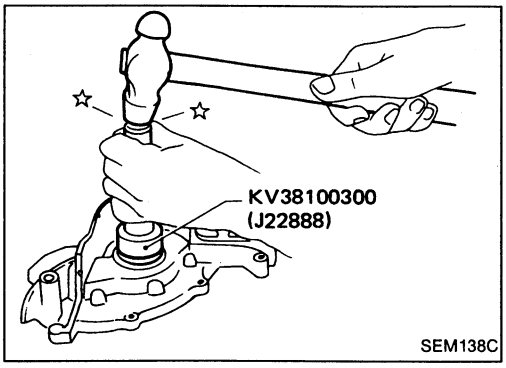
Be careful not to scratch camshaft.

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

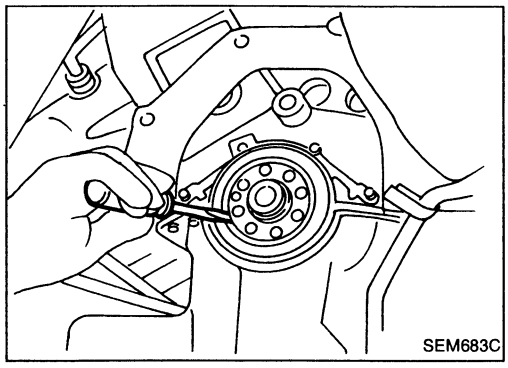


FRONT OIL SEAL

1. Remove timing belt and crankshaft sprocket.
2. Remove oil pan and oil pump assembly.
3. Remove front oil seal from oil pump body.



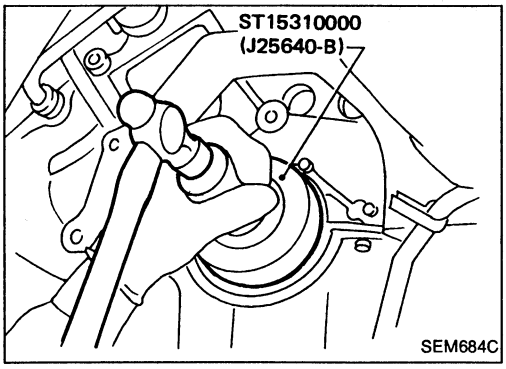
4. Apply engine oil to new oil seal and install it using Tool or a suitable tool.



REAR OIL SEAL

1. Remove flywheel or drive plate.
2. Remove rear oil seal from retainer.

Be careful not to scratch crankshaft.



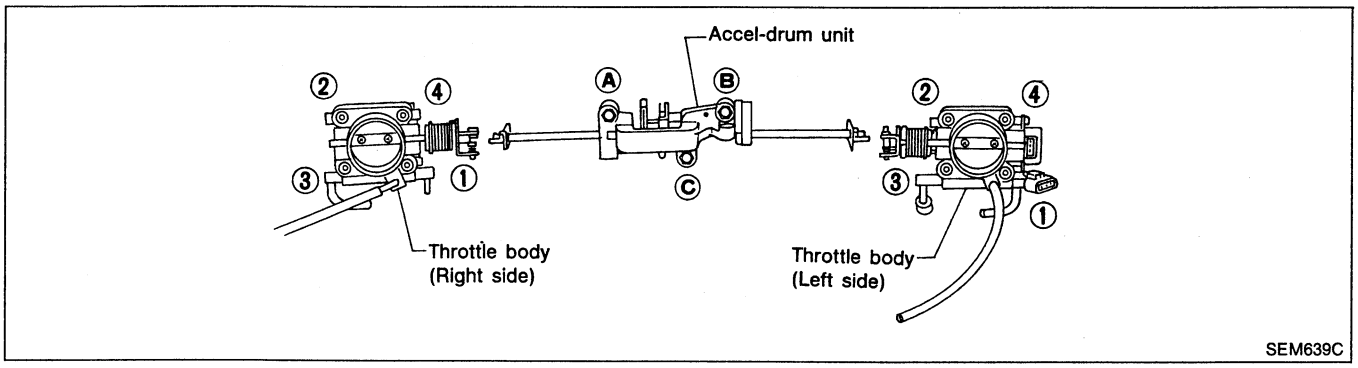
3. Apply engine oil to new oil seal and install it using Tool or a suitable tool.

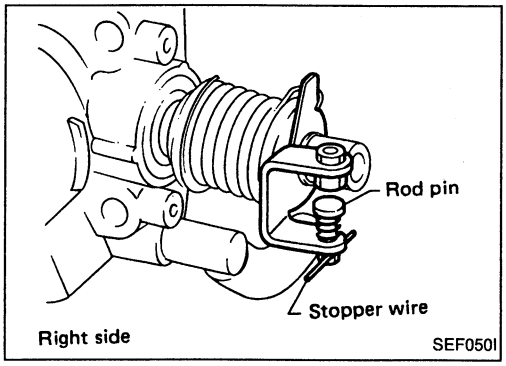
Precaution

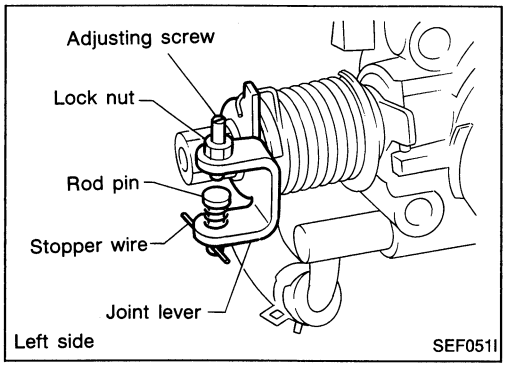
A letter, "U" or "L", is stamped on the throttle bodies. When changing throttle body, replace it with new one that has the same mark.

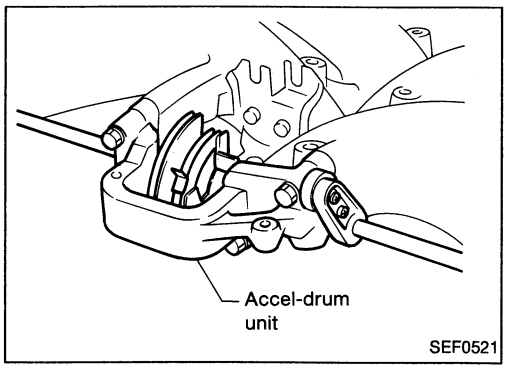
Installation

The intention of this installation and adjustment procedure is to assure accurate synchronization of the throttle body opening points.









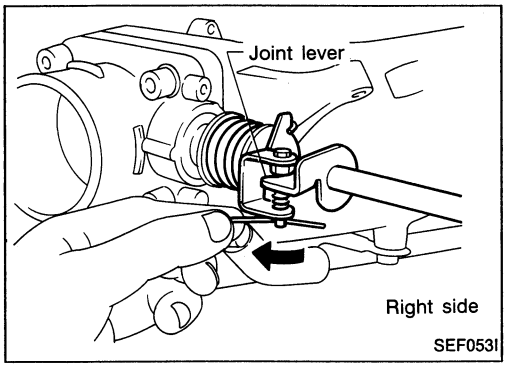
- **Before installing each throttle body, confirm that stopper wire is installed in hole of rod pin. If not, install suitable wire.**
- **When tightening bolts, free accel-drum unit so that drum unit is left under its own weight. Do not apply external force to accel-drum unit.**
- **When replacing throttle bodies only, you need not perform procedures (3), (4) and (5).**

1. Install accel-drum unit and throttle bodies (right side and left side).

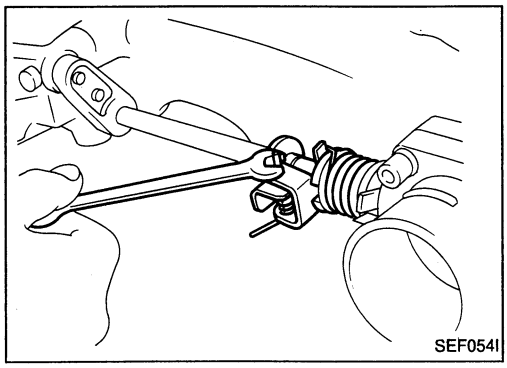
Tightening order:

(1) ① → ② → ③ → ④:
9 - 11 N·m (0.9 - 1.1 kg-m, 6.5 - 8.0 ft-lb)
(2) ① → ② → ③ → ④:
18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)
(3) Ⓐ → Ⓑ → Ⓒ: Tighten by hand
(4) Ⓐ → Ⓑ → Ⓒ:
5 N·m (0.5 kg-m, 3.6 ft-lb)
(5) Ⓐ → Ⓑ → Ⓒ:
20 N·m (2.0 kg-m, 14 ft-lb)

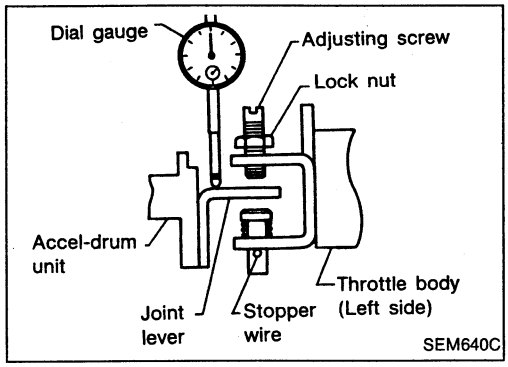
Installation (Cont'd)



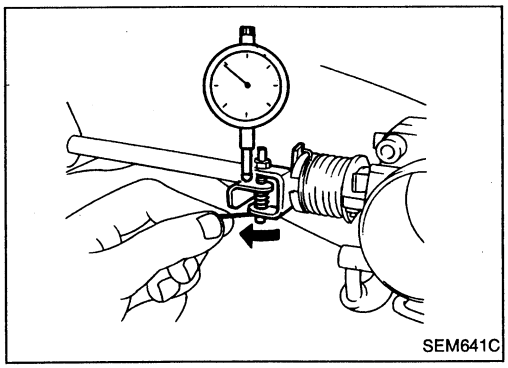
2. Pull out stopper wire of right side throttle body in order to secure right side joint lever.



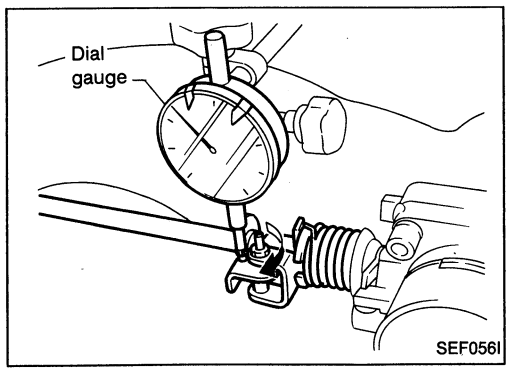
3. Loosen left side throttle body lock nut and back adjusting screw until clearance is made between the screw and joint lever.



4. Set dial gauge on joint lever and set indicator to zero. Confirm that bottom end of adjusting screw is not in contact with joint lever of accelerator drum unit.



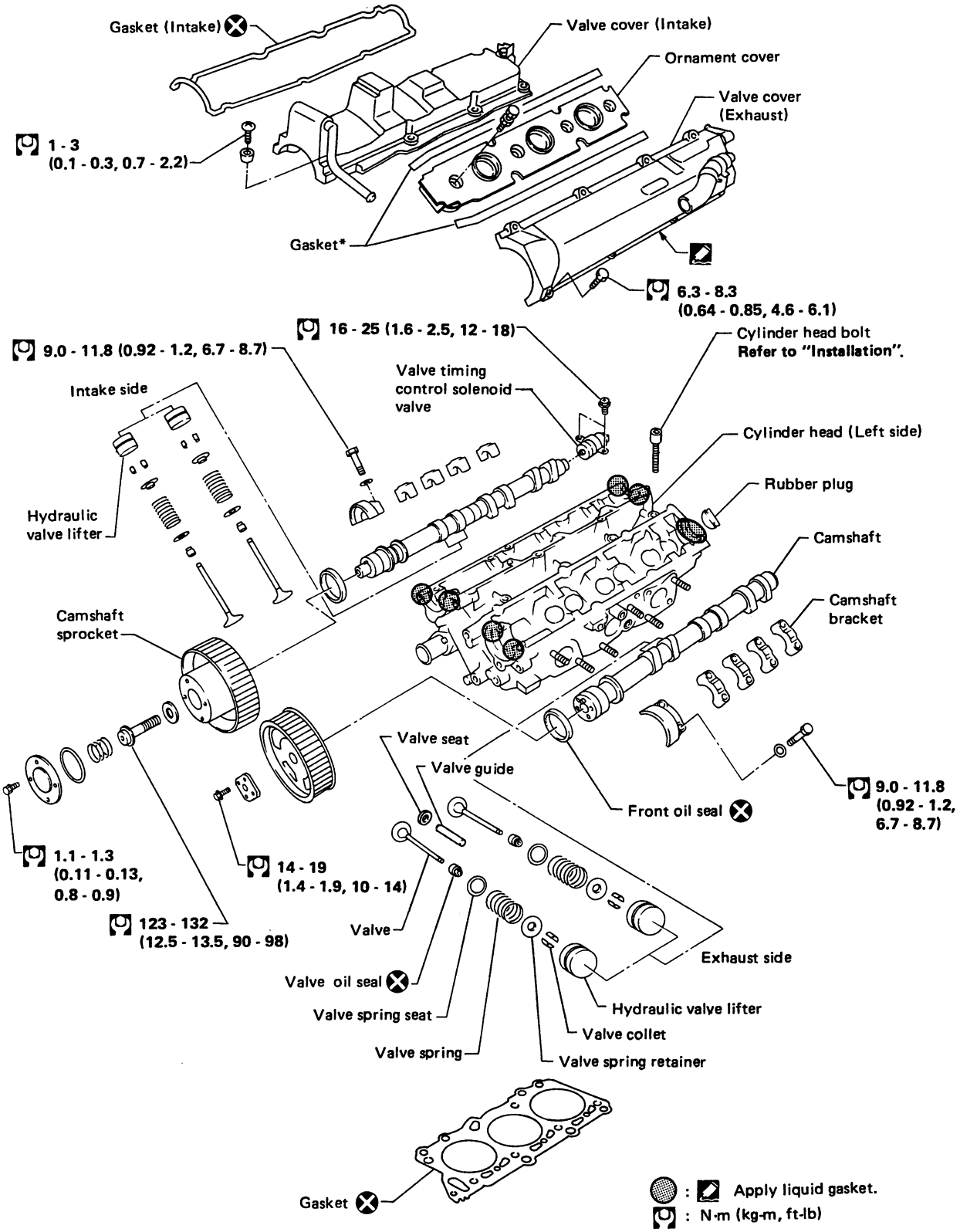
5. Pull out left side throttle body stopper wire from rod pin.



6. Turn adjusting screw until dial gauge indicates within the following range.
   Range: 0.07 - 0.13 mm (0.0028 - 0.0051 in)

Then tighten lock nut.

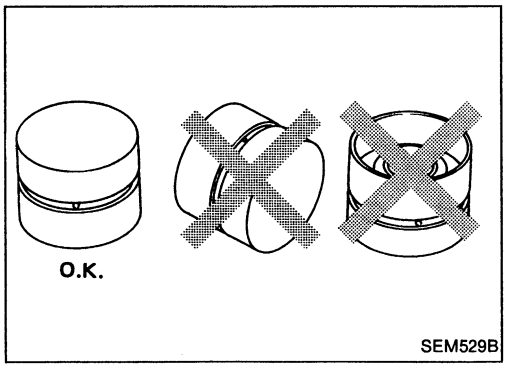
7. Confirm that the dial gauge indicator is still within the above range.


Gasket (Intake)
Valve cover (Intake)
Ornament cover
Valve cover (Exhaust)
1 - 3 (0.1 - 0.3, 0.7 - 2.2)
Gasket*
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
16 - 25 (1.6 - 2.5, 12 - 18)
9.0 - 11.8 (0.92 - 1.2, 6.7 - 8.7)
Cylinder head bolt
Refer to "Installation".
Valve timing control solenoid valve
Intake side
Cylinder head (Left side)
Rubber plug
Hydraulic valve lifter
Camshaft
Camshaft bracket
Camshaft sprocket
Valve seat
Valve guide
Front oil seal
9.0 - 11.8 (0.92 - 1.2, 6.7 - 8.7)
1.1 - 1.3 (0.11 - 0.13, 0.8 - 0.9)
14 - 19 (1.4 - 1.9, 10 - 14)
123 - 132 (12.5 - 13.5, 90 - 98)
Valve
Exhaust side
Valve oil seal
Hydraulic valve lifter
Valve spring seat
Valve collet
Valve spring
Valve spring retainer
Gasket
: Apply liquid gasket.
: N·m (kg-m, ft-lb)
* : After installing gasket, cut off any loose ends.

SEM620C

CAUTION:

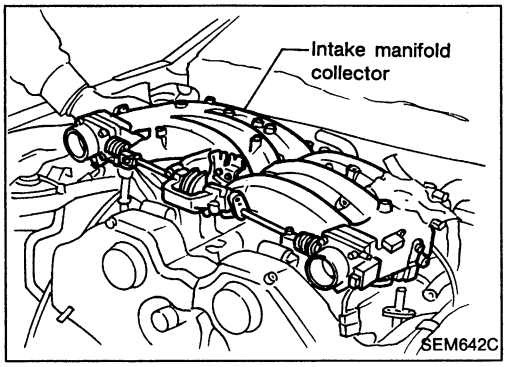
- **When installing sliding parts such as camshaft, camshaft bracket and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts, intake camshaft sprocket bolts and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces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



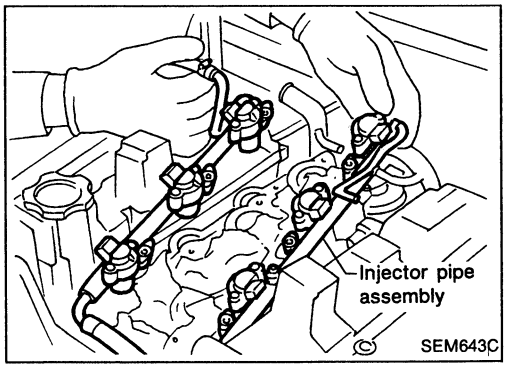
- **Do not put hydraulic valve lifters upside down, otherwise air will enter valve lifter, causing it to make a noise.**
- **Do not disassemble hydraulic valve lifter.**
- **Attach tags to valve lifters so as not to mix them up.**
- **Valve lifters should be immersed in engine oil.**

Removal

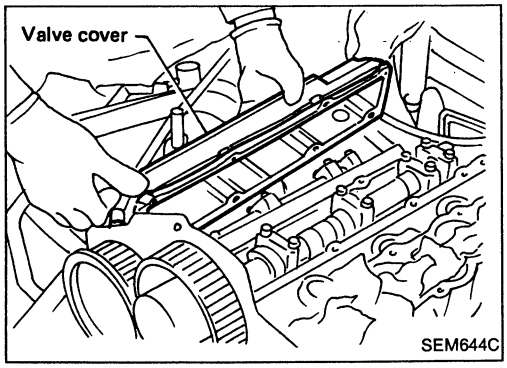
1. Remove intake manifold collector.



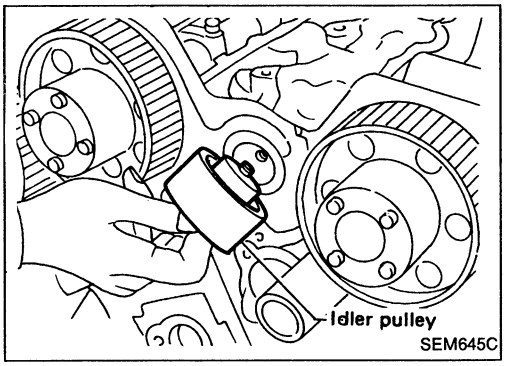
2. Remove injector pipe assembly.



3. Remove valve covers.



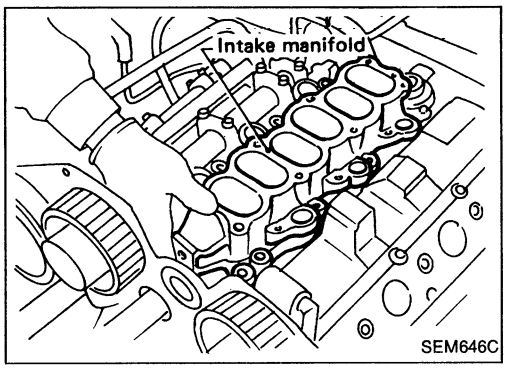
Removal (Cont'd)



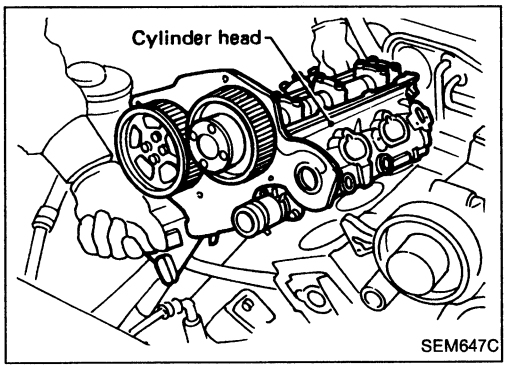
4. Remove timing belt.

Refer to "Removal" of TIMING BELT.

5. Remove idler pulley and its stud bolt.



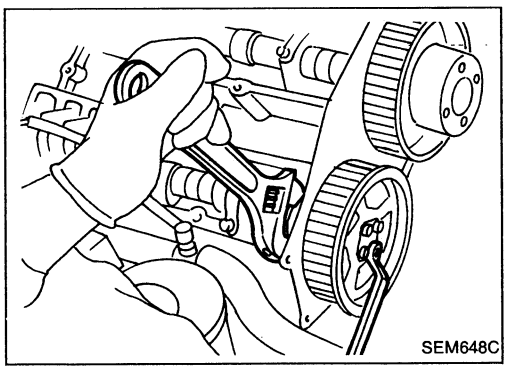
6. Remove intake manifold.



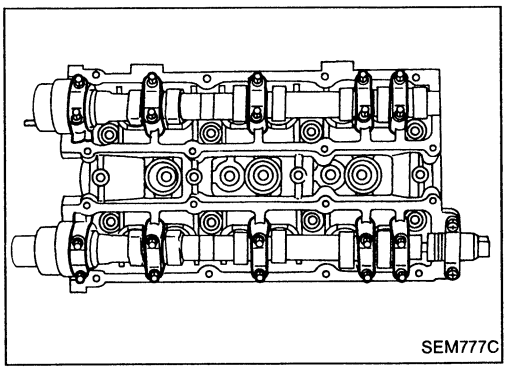
7. Disconnect front exhaust tube from exhaust manifold.
8. Remove cylinder head with exhaust manifold.

Cylinder head bolts should be loosened in two or three steps.

Disassembly



1. Remove exhaust manifold from cylinder head.
2. Remove camshaft sprockets.
3. Remove timing belt rear cover.

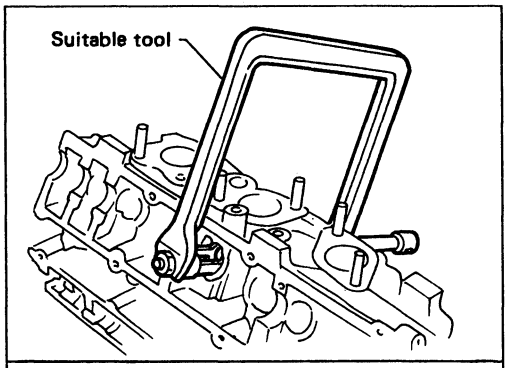


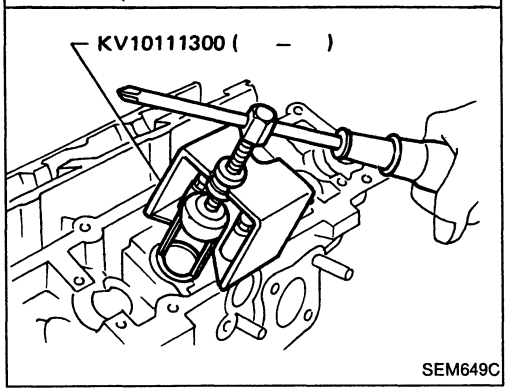
4. Remove camshaft brackets.

Bolts should be loosened in two or three steps.
Before removing camshaft, measure camshaft end play.

5. Remove oil seals, camshafts and hydraulic valve lifters.

Disassembly (Cont'd)





6. Remove valve springs with Tool or a suitable tool.
7. Pull out valve oil seals.

Inspection

CYLINDER HEAD DISTORTION

Head surface flatness:

Less than 0.1 mm (0.004 in)

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

Resurfacing limit:

The resurfacing limit of cylinder head is determined by the relation with the amount of cylinder block resurfacing.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

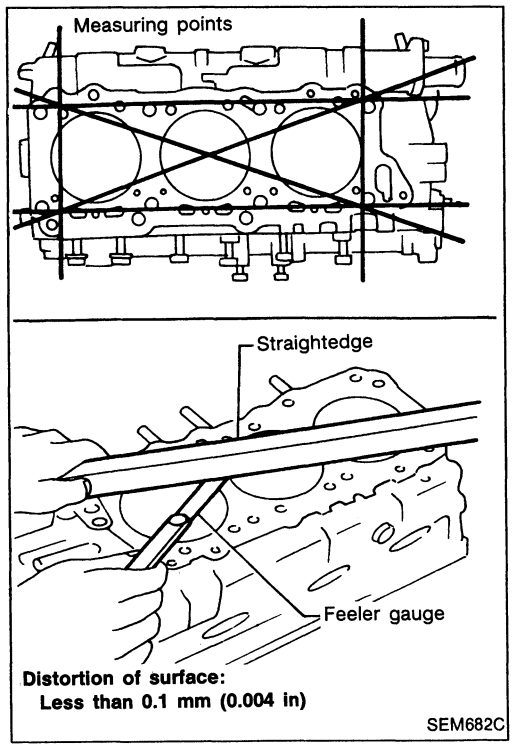
The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

After resurfacing cylinder head, check to make sure that camshaft rotates freely by hand. If not, cylinder head must be replaced.

Nominal cylinder head height from camshaft center:

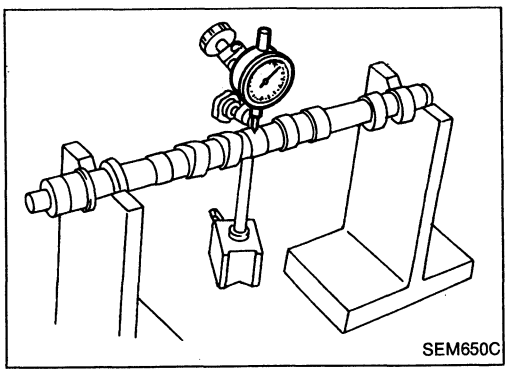
Refer to S.D.S.



CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

CAMSHAFT RUNOUT



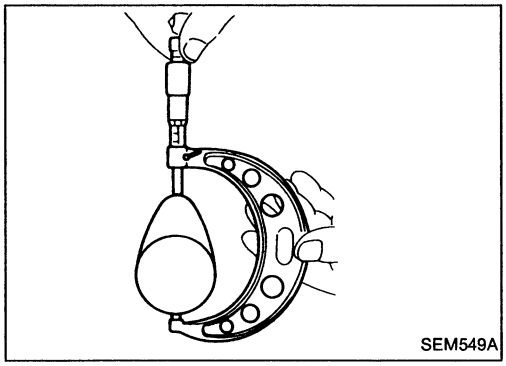
1. Measure camshaft runout at the center journal.

Runout (Total indicator reading):

Limit 0.1 mm (0.004 in)

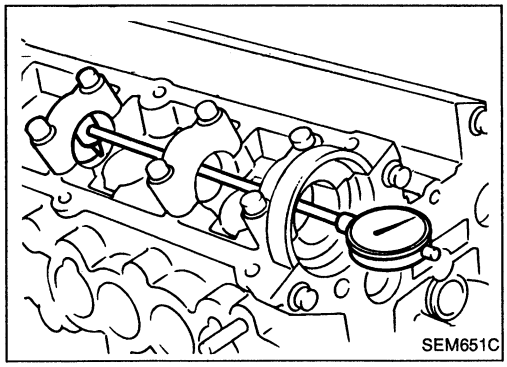
2. If it exceeds the limit, replace camshaft.

Inspection (Cont'd)


SEM549A

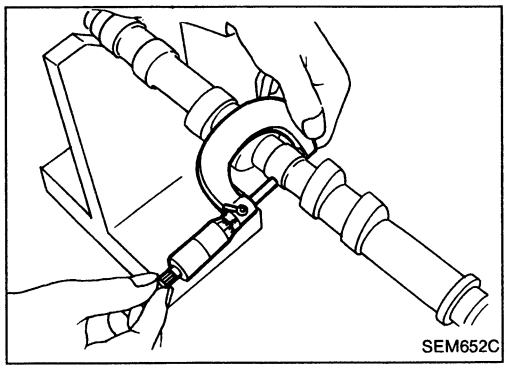
CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.
   Standard cam height:
   40.405 - 40.595 mm (1.5907 - 1.5982 in)
   Cam wear limit:
   0.15 mm (0.0059 in)
2. If wear is beyond the limit, replace camshaft.

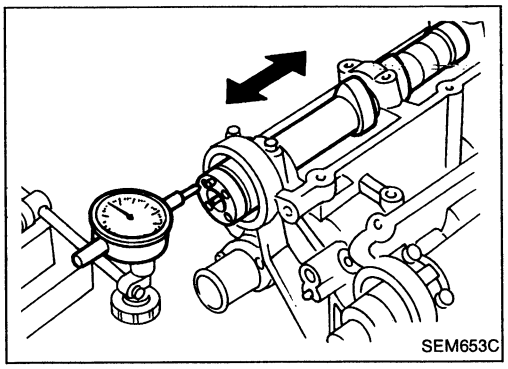

SEM651C

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)

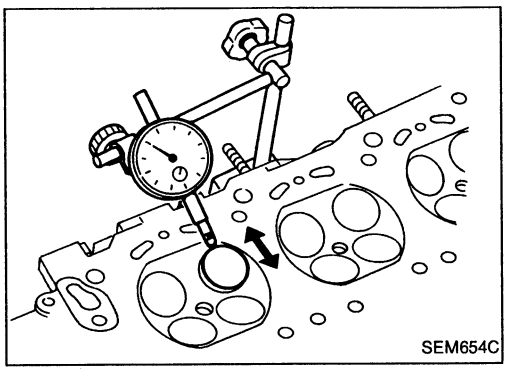

SEM652C

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 limit:
   0.15 mm (0.0059 in)


SEM653C

CAMSHAFT END PLAY

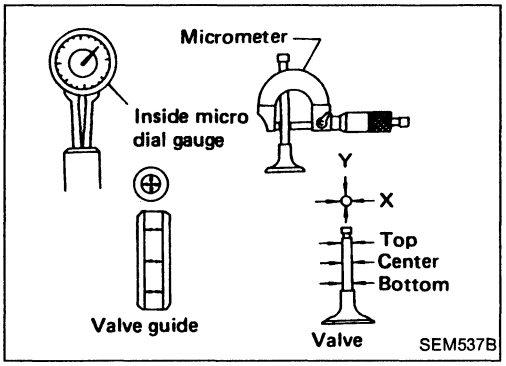
1. Install camshaft in cylinder head.
2. Measure camshaft end play.
   Camshaft end play:
   Standard
   0.03 - 0.08 mm (0.0012 - 0.0031 in)


SEM654C

VALVE GUIDE CLEARANCE

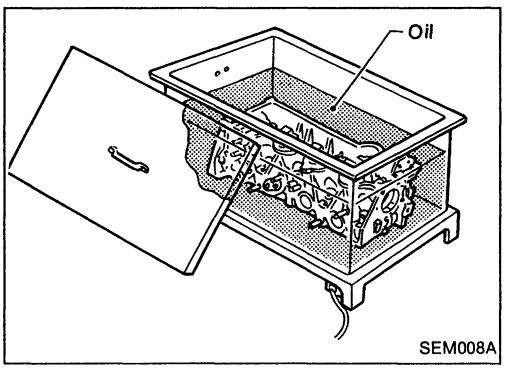
1. Push valve stem out so that its end is even with valve guide end. Measure valve runout by moving valve.
   Valve deflection limit (Dial gauge reading):
   0.20 mm (0.0079 in)

Inspection (Cont'd)

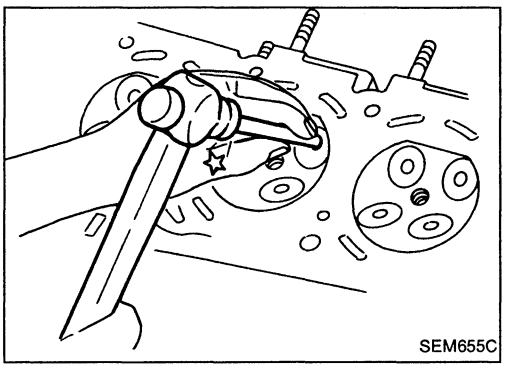


2. If it exceeds the limit, check valve to valve guide clearance.
a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.
Valve to valve guide clearance limit:
0.10 mm (0.0039 in)
c. If it exceeds the limit, replace valve or valve guide.

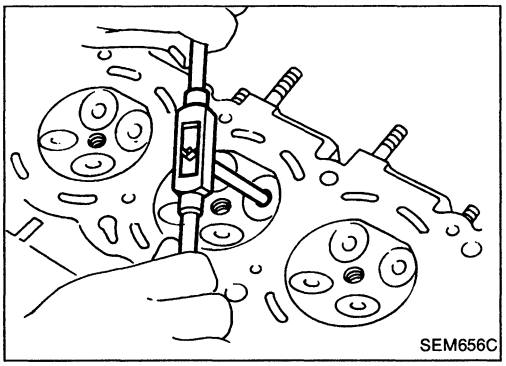
VALVE GUIDE REPLACEMENT



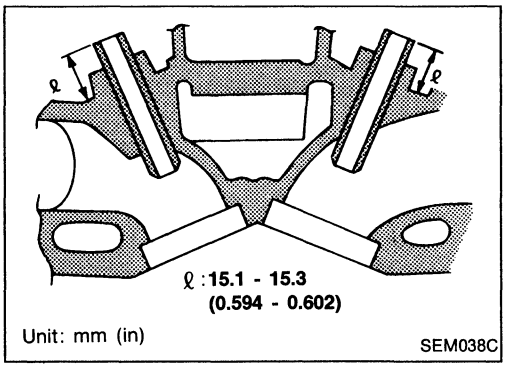
1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F).



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

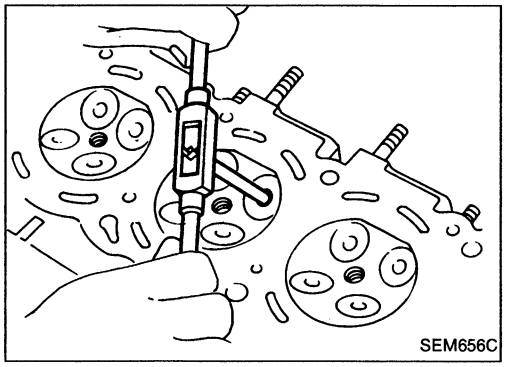


3. Ream cylinder head valve guide hole.
Valve guide hole diameter
(for service parts):
Intake and Exhaust
10.175 - 10.196 mm (0.4006 - 0.4014 in)



4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.
Projection "ℓ":
15.1 - 15.3 mm (0.594 - 0.602 in)

Inspection (Cont'd)

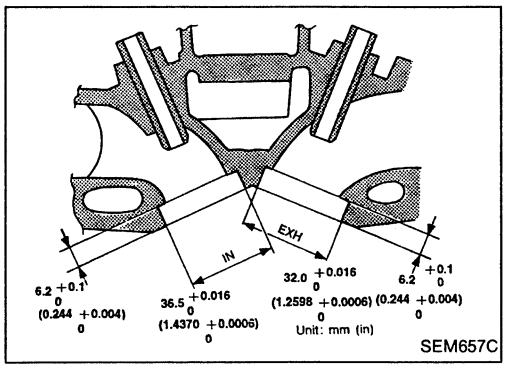

SEM656C

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

VALVE SEATS

Check valve seats for evidence of pitting at valve contact surface. Reseat or replace if it is worn 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 assure a uniform surface.**

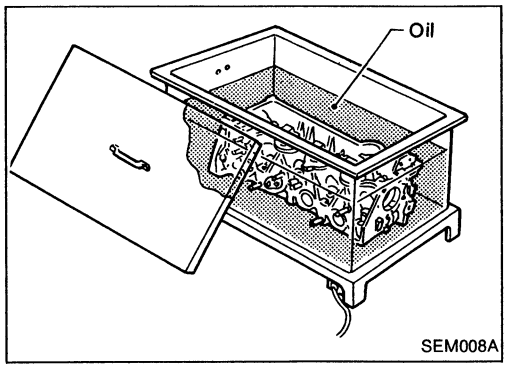


SEM657C

REPLACING VALVE SEAT FOR SERVICE PARTS

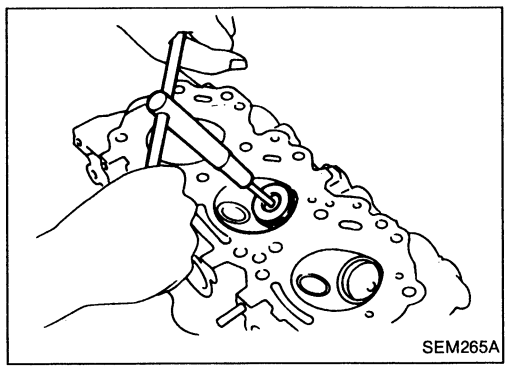
1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.
   Reaming bore for service valve seat
   Oversize [0.5 mm (0.020 in)]:
   Intake 36.500 - 36.516 mm (1.4370 - 1.4376 in)
   Exhaust 32.000 - 32.016 mm (1.2598 - 1.2605 in)

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



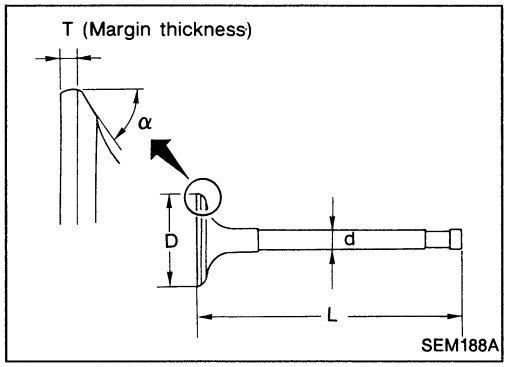
SEM008A

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


SEM265A

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

Inspection (Cont'd)

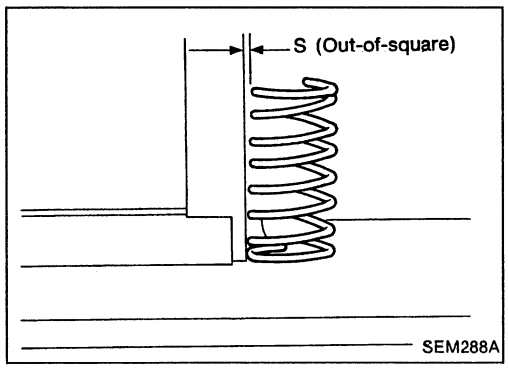


VALVE DIMENSIONS

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.

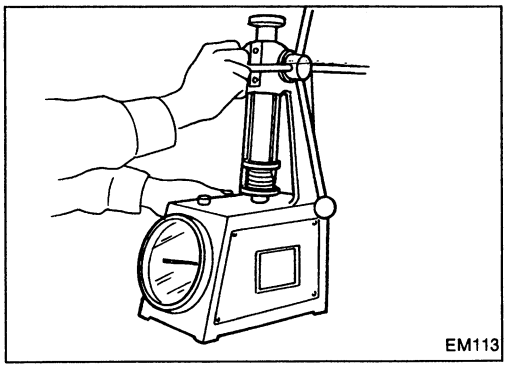
Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



VALVE SPRING

Squareness

1. Measure "S" dimension.
   Out-of-square:
   Less than 1.8 mm (0.071 in)
2. If it exceeds the limit, replace spring.

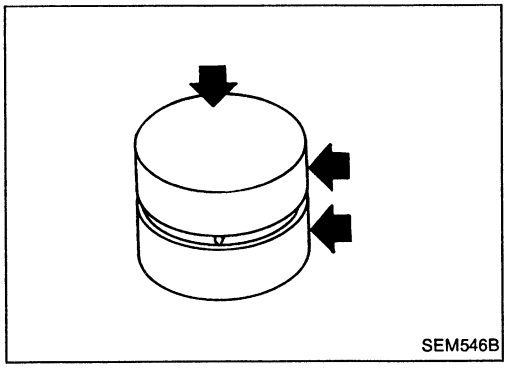


Pressure

Check valve spring pressure.

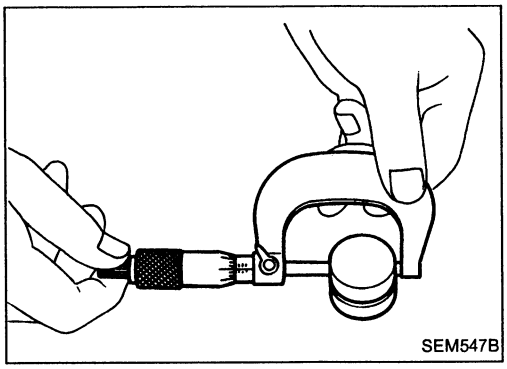
Pressure: N (kg, lb) at height mm (in)
Standard:
536.4 (54.7, 120.6) at 26.5 (1.043)
Limit:
452.79 (46.17, 101.80) at 26.5 (1.043)

If below the limit, replace spring.



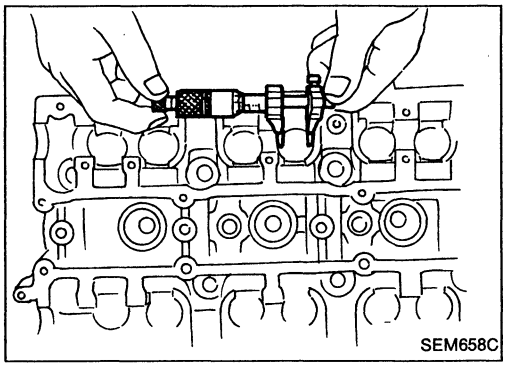
HYDRAULIC VALVE LIFTER

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



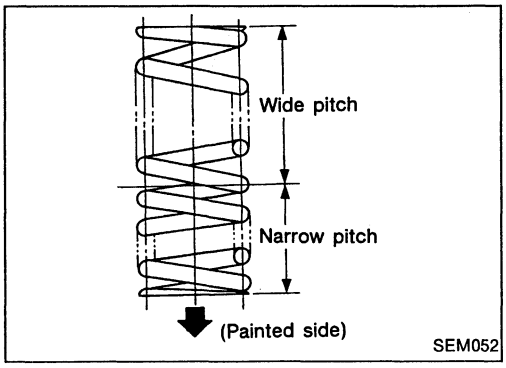
2. Check diameter of valve lifter.
   Outer diameter:
   30.955 - 30.965 mm (1.2187 - 1.2191 in)

Inspection (Cont'd)


SEM658C

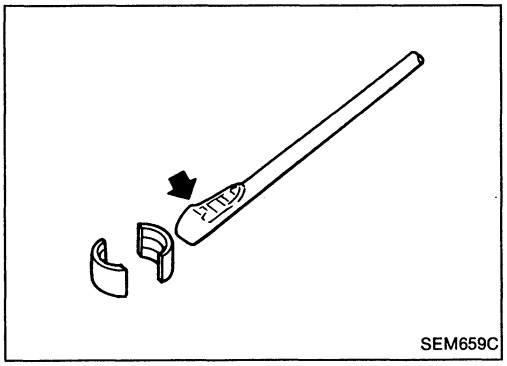
3. Check valve lifter guide inner diameter.
   Inner diameter:
   31.000 - 31.020 mm (1.2205 - 1.2213 in)
   Standard clearance between valve lifter and lifter guide:
   0.035 - 0.065 mm (0.0014 - 0.0026 in)

Assembly

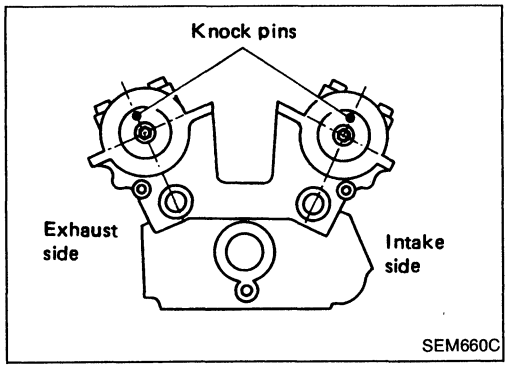


SEM052

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

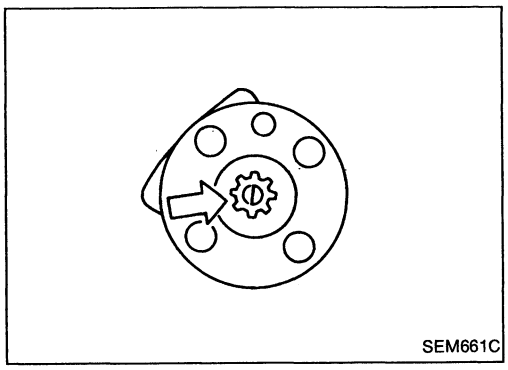

SEM659C

- To facilitate installation of collet, apply a small amount of grease to a suitable rod and attach collet to it.



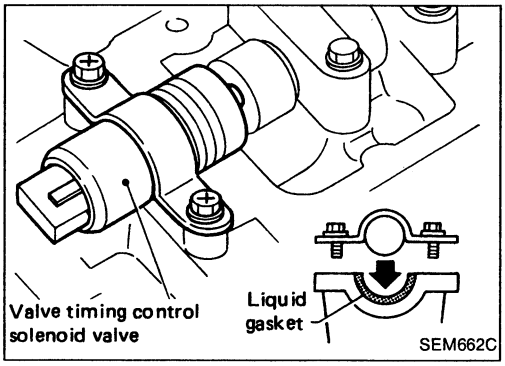
SEM660C

2. Install camshafts as shown.

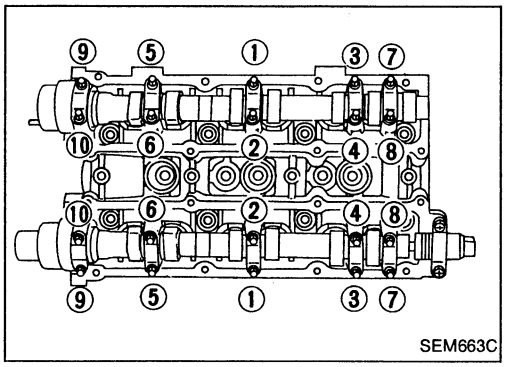

SEM661C

- Exhaust camshaft (left bank) has spline for crankshaft position sensor.

Assembly (Cont'd)

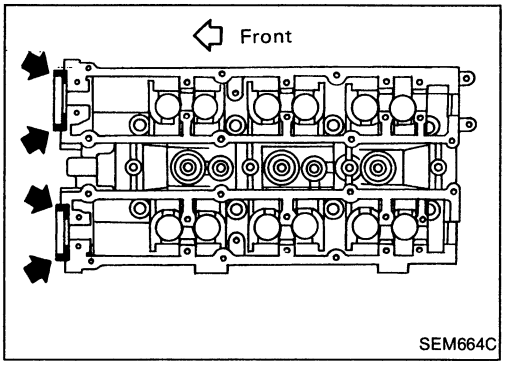


- When installing valve timing control solenoid valves, apply liquid gasket to solenoid valve surfaces.



3. Install camshaft brackets.

Tighten camshaft bracket bolts gradually in two or three stages.



When installing front side camshaft brackets, apply liquid gasket as shown.

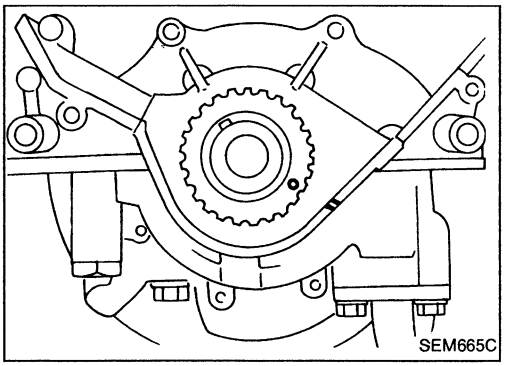
4. Apply engine oil to camshaft oil seal lip and install it in place.

Always use new camshaft oil seal.

5. Install rear timing belt cover.
6. Install camshaft sprockets.

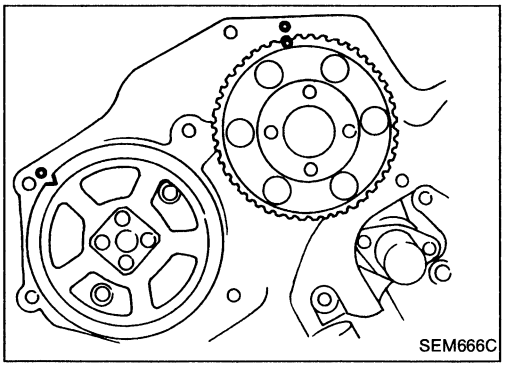
When tightening bolts, fix camshaft to prevent it from rotating.

Installation



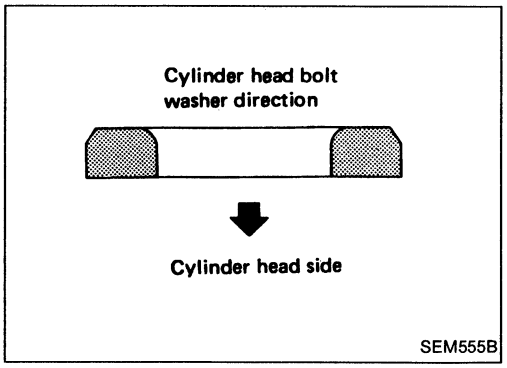
1. Set No. 1 piston at T.D.C. on its compression stroke as follows:

(1) Align crankshaft sprocket aligning mark with mark on oil pump body.



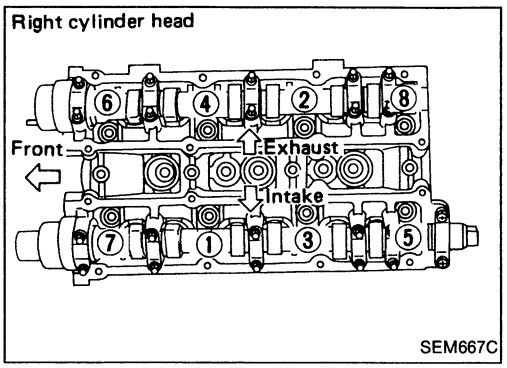
(2) Align camshaft sprocket aligning mark with mark on timing belt rear cover.

Installation (Cont'd)



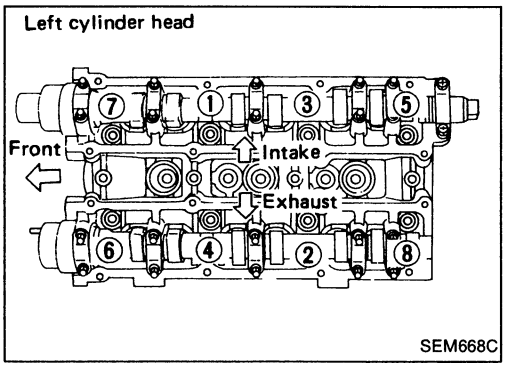
2. Install cylinder head with new gasket.
- **Be sure to install washers between bolts and cylinder head.**
- **Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.**

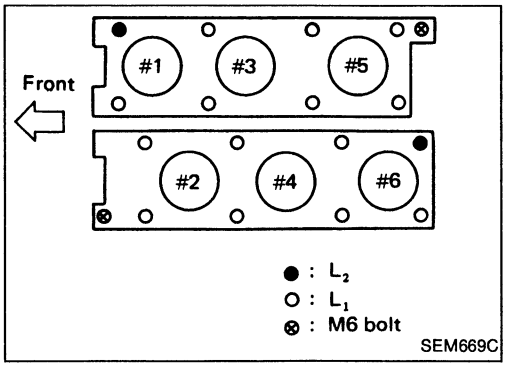
3. Install cylinder head bolts.
- **Install short bolts (L_2) into the correct holes of cylinders #1 and #6 as shown in figure of step (6).**



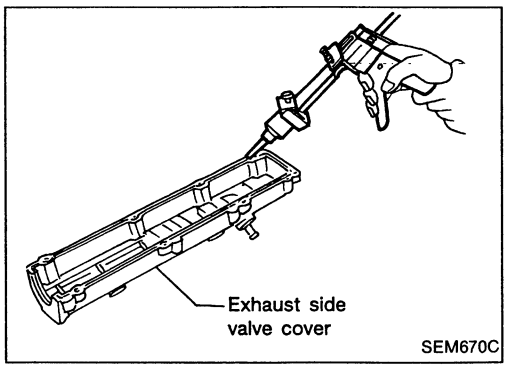
4. Tighten cylinder head bolts in numerical order.
- **Tightening procedure**

(1) Tighten all bolts to 39 N·m (4.0 kg-m, 29 ft-lb).
(2) Tighten all bolts to 123 N·m (12.5 kg-m, 90 ft-lb).
(3) Loosen all bolts completely.
(4) Tighten all bolts to 34 to 44 N·m (3.5 to 4.5 kg-m, 25 to 33 ft-lb).
(5) Tighten all bolts to 123 N·m (12.5 kg-m, 90 ft-lb) or if an angle wrench is available, tighten bolts 70 to 75 degrees (L_1), 65 to 70 degrees (L_2) clockwise.

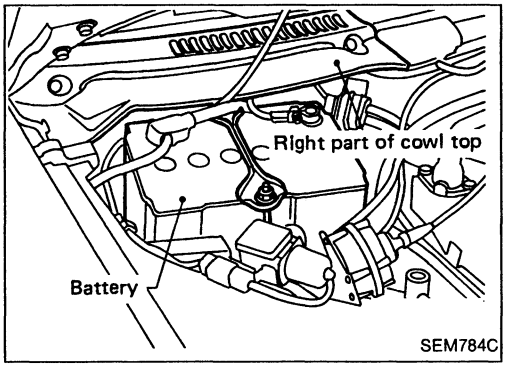




(6) Tighten bolts (Ⓧ) as shown to 10 to 12 N·m (1.0 to 1.2 kg-m, 7 to 9 ft-lb).



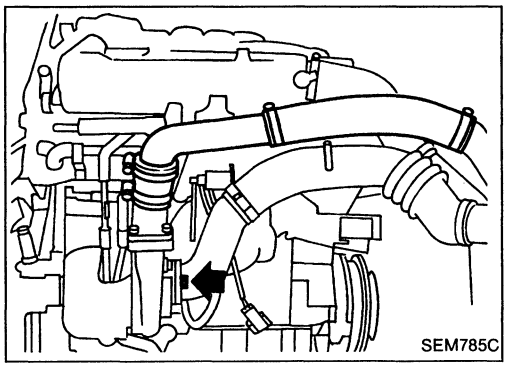
5. Install valve covers.
When installing exhaust side valve cover, apply liquid gasket as shown.
6. Install remaining parts.



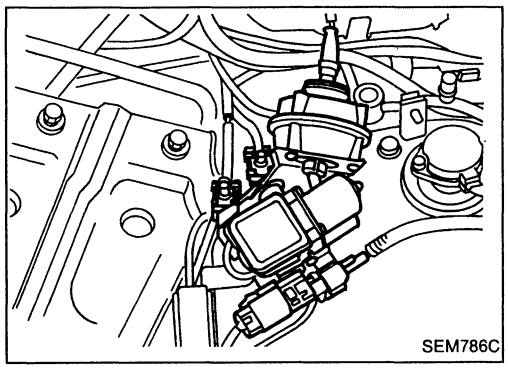
Removal

RIGHT SIDE UNIT

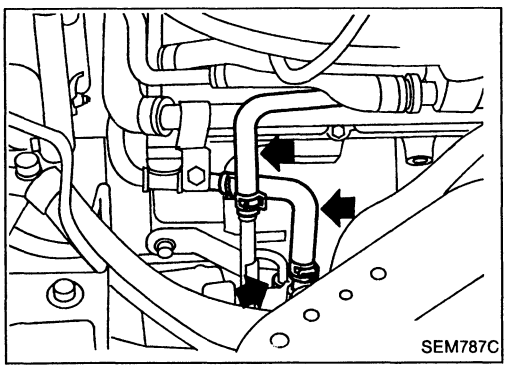
1. Remove right part of cowl top.
2. Remove battery.



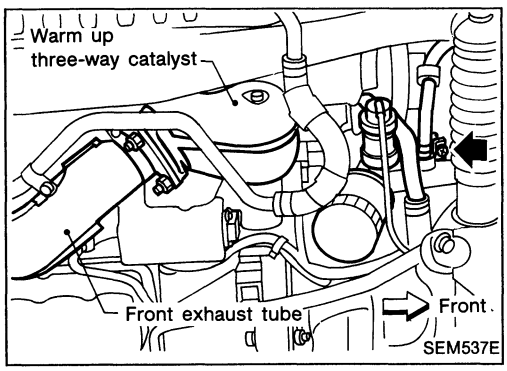
3. Remove air inlet hose and pipe.
4. Disconnect lower pipe from turbocharger unit.



5. Remove A.S.C.D. bracket with wiper motor and solenoid valves.
6. Disconnect heated oxygen sensor harness connector.

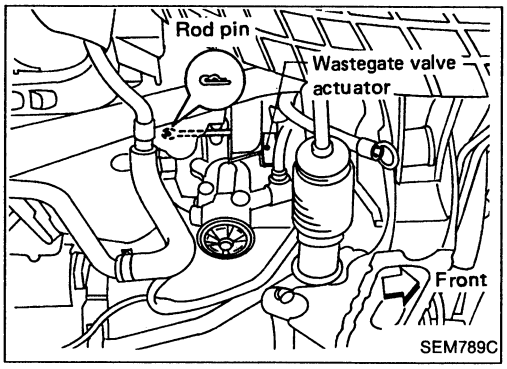


7. Remove turbocharger water hoses, and disconnect turbocharger oil inlet tube.
8. Remove two bolts fastening warm up three-way catalyst to turbocharger unit.

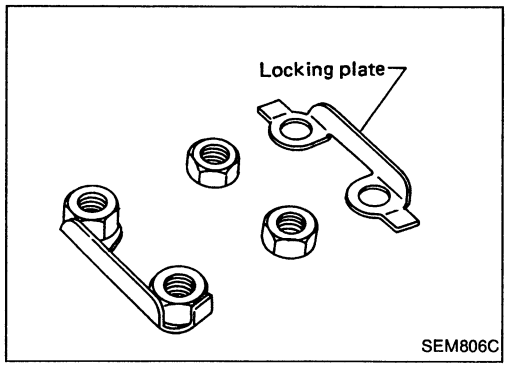


9. Remove the following parts;
   - oil pressure switch
   - oil filter
   - turbocharger oil return tube
   - front exhaust tube
   - warm up three-way catalyst
10. Disconnect oil hose from oil filter bracket, and turbocharger water tubes from turbocharger unit.

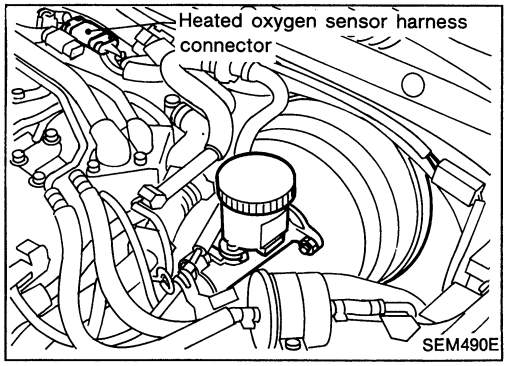
Removal (Cont'd)



11. Remove rod pin of wastegate valve actuator.
12. Remove oil filter bracket.

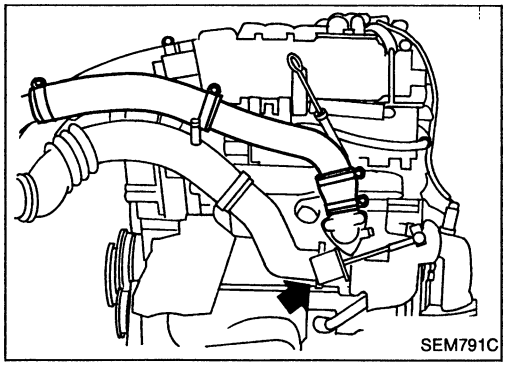


13. Unbend locking plates for fastening nuts of turbocharger unit.
14. Remove turbocharger unit.

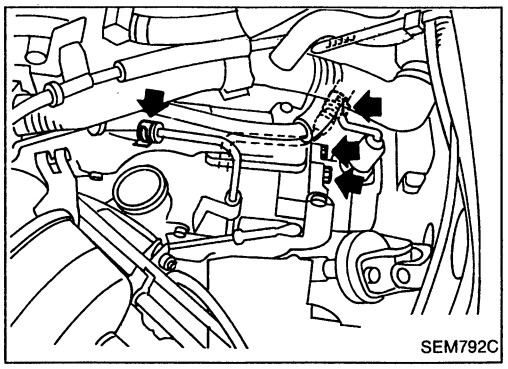


LEFT SIDE UNIT

1. Remove brake master cylinder and brake booster.
2. Disconnect heated oxygen sensor harness connector.

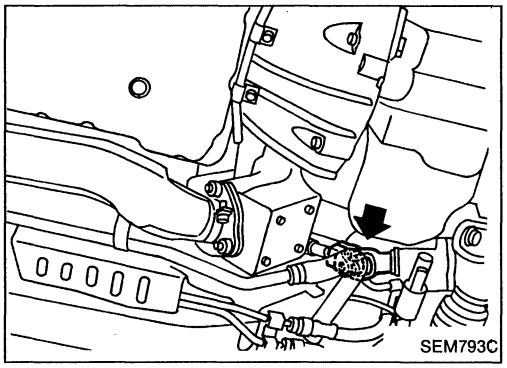


3. Remove air inlet hose and pipe.
4. Disconnect lower pipe from turbocharger unit.

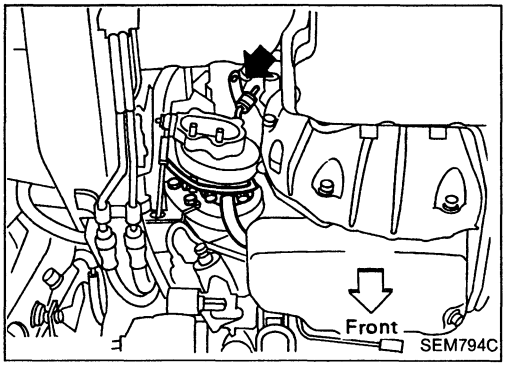


5. Disconnect water tubes.
6. Remove two bolts fastening warm up three-way catalyst to turbocharger unit.

Removal (Cont'd)

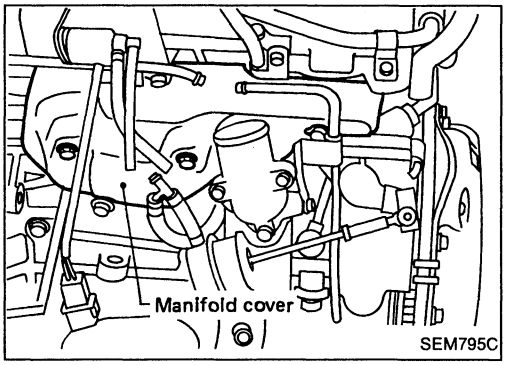

SEM793C

7. Remove front exhaust tube and warm up three-way catalyst.
8. Disconnect steering lower joint.



SEM794C

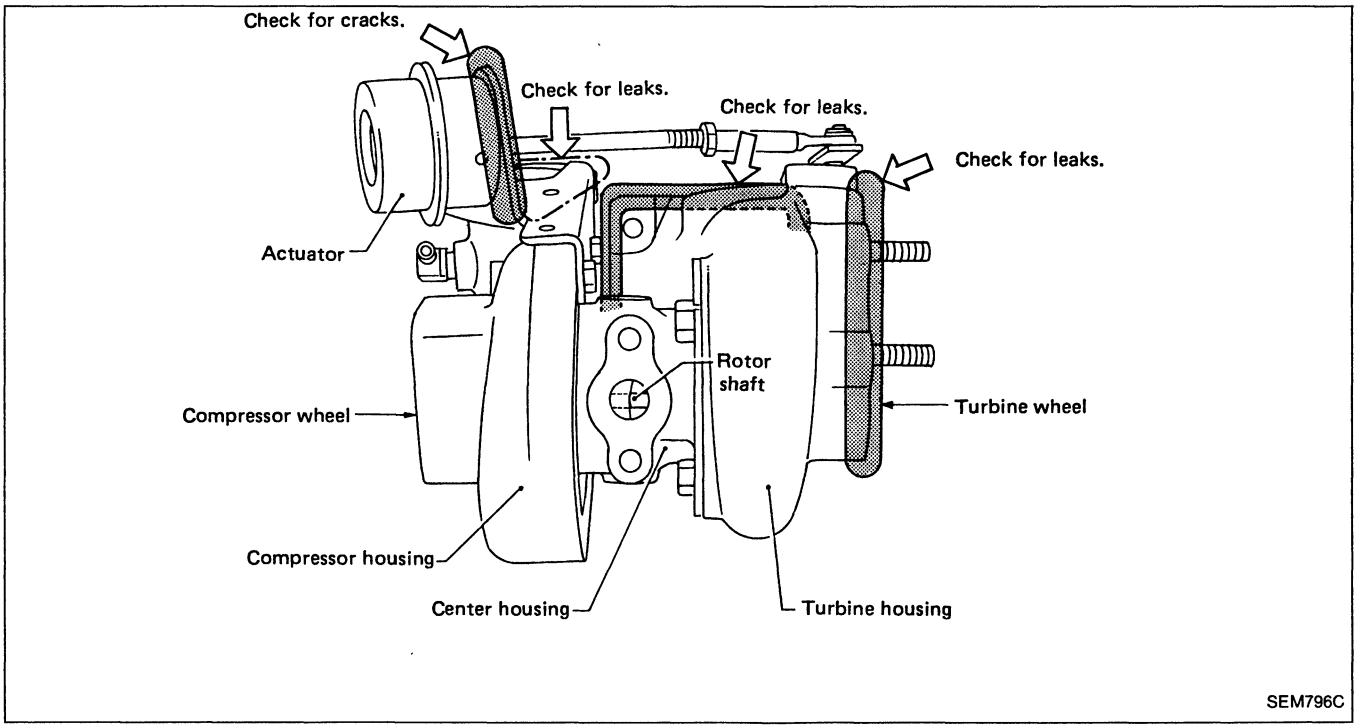
9. Remove turbocharger oil return tube and water tubes.
10. Disconnect EGR tube and actuator bracket of turbocharger wastegate valve.



SEM795C

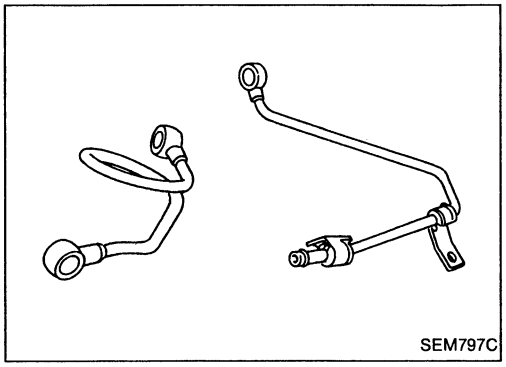
11. Remove manifold cover and fastening nuts.
12. Remove turbocharger unit with exhaust manifold.

Inspection



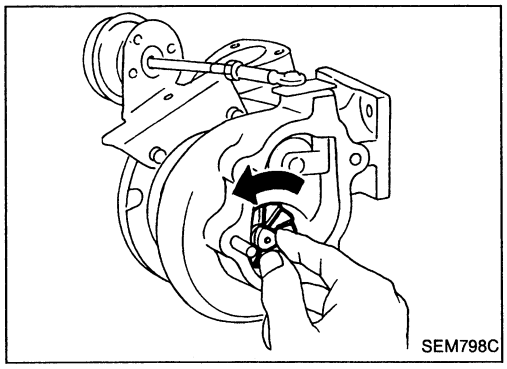
SEM796C

Inspection (Cont'd)


SEM797C

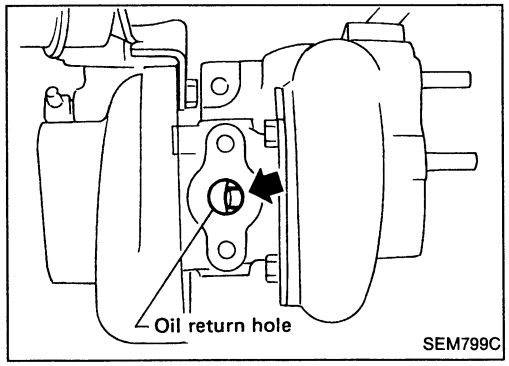
OIL AND WATER TUBES

Check tubes for clogging.


SEM798C

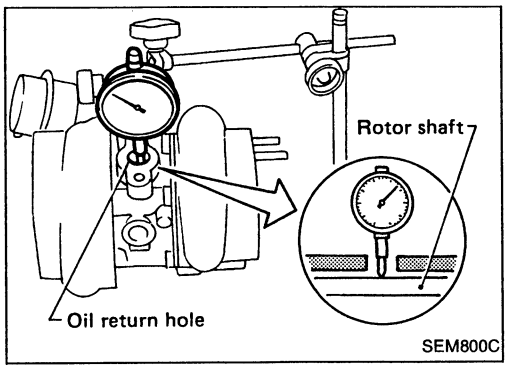
ROTOR SHAFT

1. Check rotor shaft for smooth rotating.



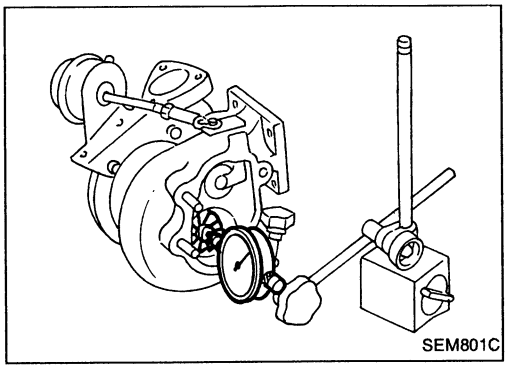
SEM799C

2. Check rotor shaft for carbon deposits.



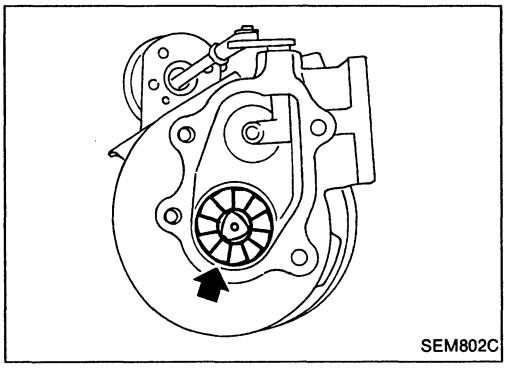
SEM800C

3. Measure runout of rotor shaft.
   Runout (Total indicator reading):
   0.056 - 0.127 mm (0.0022 - 0.0050 in)


SEM801C

4. Measure end play of rotor shaft.
   End play:
   0.013 - 0.096 mm (0.0005 - 0.0038 in)

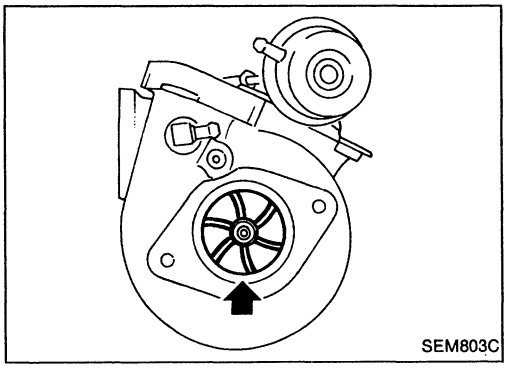
Inspection (Cont'd)


SEM802C

TURBINE WHEEL

Check turbine wheel for the following:

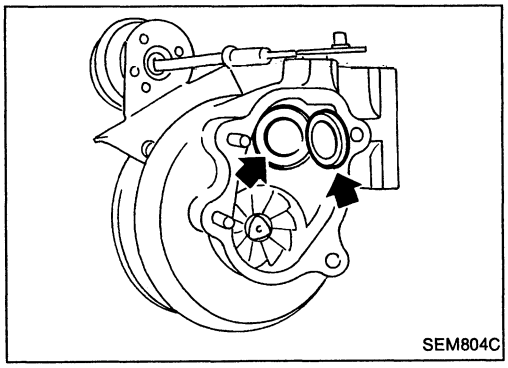
- Oil
- Carbon deposits
- Deformed fins
- Contact with turbine housing


SEM803C

COMPRESSOR WHEEL

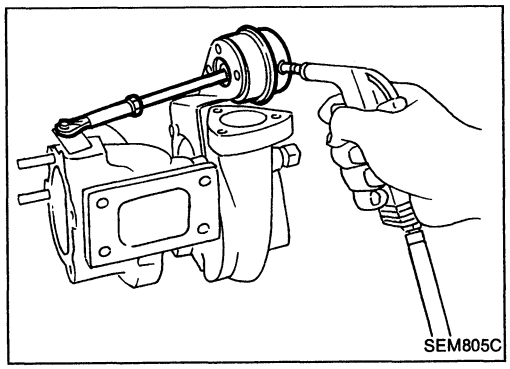
Check compressor wheel for the following:

- Oil
- Deformed fins
- Contact with compressor housing


SEM804C

WASTEGATE VALVE

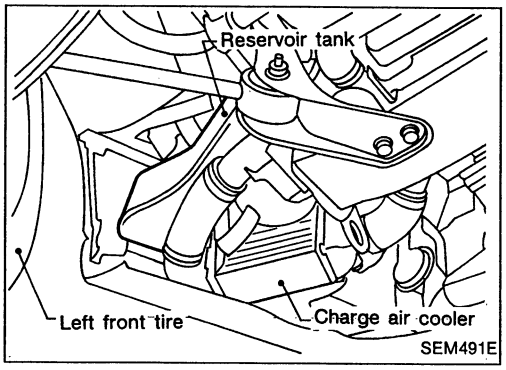
Remove rod pin and check wastegate valve for cracks, deformation and smooth movement.
Check valve seat surface for smoothness.


SEM805C

WASTEGATE VALVE ACTUATOR

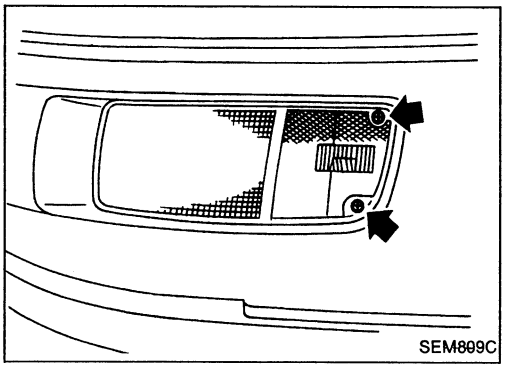
Apply air pressure to wastegate valve actuator and check it for smooth movement.

- **Do not keep applying air pressure to the actuator.**
- **The air pressure should be in the range of 78 to 88 kPa (0.8 to 0.9 kg/cm^2, 11 to 13 psi).**

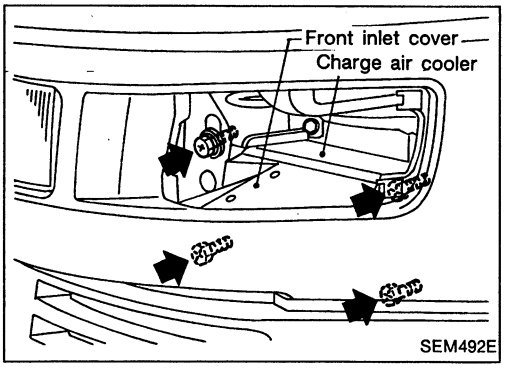


Removal

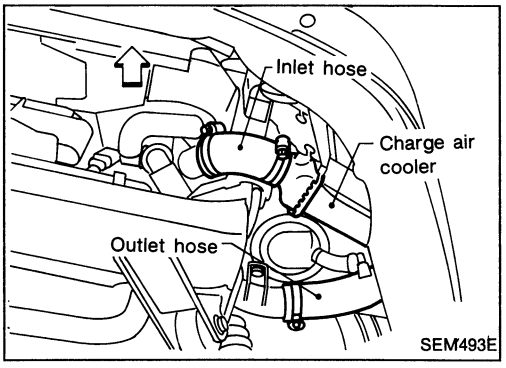
1. Remove front part of front fender protector.
2. Remove reservoir tank when servicing left side charge air cooler.



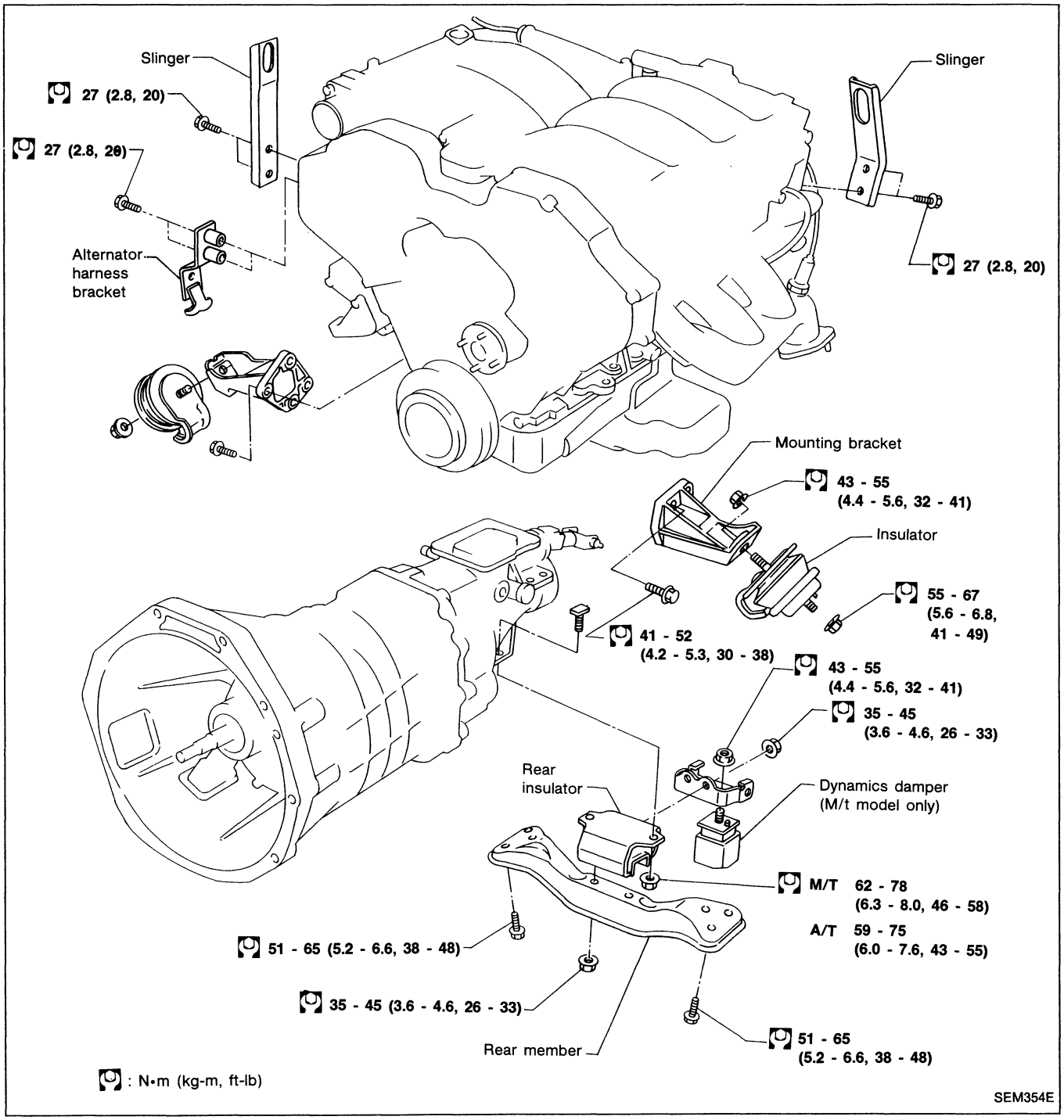
3. Remove front combination lamp.



4. Remove bolts fastening charge air cooler and front inlet cover.

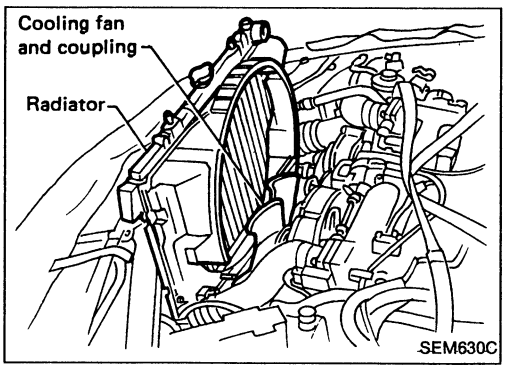


5. Remove inlet and outlet hoses.
6. Remove charge air cooler unit.



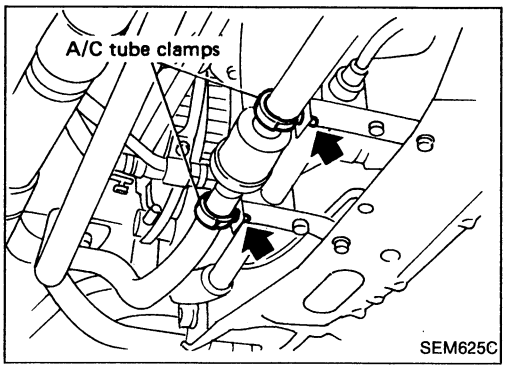
WARNING:

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 transmission in a safe manner.**
g. **For engines not equipped with engine slingers, attach and use proper slingers and bolts described in PARTS CATALOG.**
h. **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**

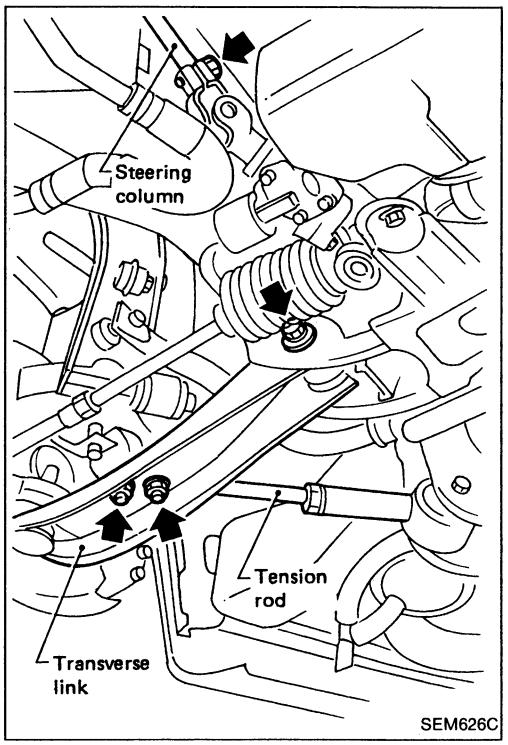


M/T model

1. Remove engine under cover and hood.
2. Drain coolant from both cylinder block drain plugs, and radiator drain cock.
3. Drain engine oil from drain plug of oil pan.
4. Remove vacuum hoses, fuel tubes, wires, harnesses and connectors and so on.
5. Remove front exhaust tubes and propeller shaft.
6. Remove radiator.
7. Remove drive belts, cooling fan and coupling.
8. Remove P/S oil pump, alternator, A/C compressor, starter motor, and clutch operating cylinder.
9. Disconnect A/C tube clamps as shown.

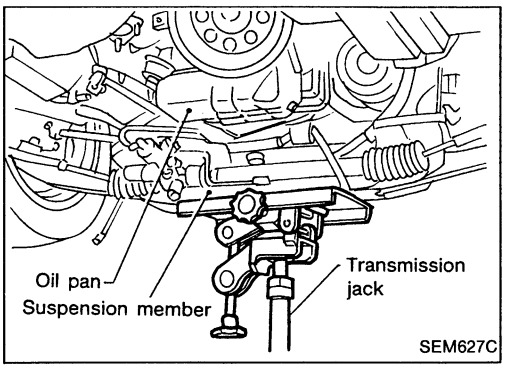


10. Disconnect steering column lower joint.
11. Remove tension rod fixing bolts from both sides.
12. Loosen transverse link bolts on both sides.

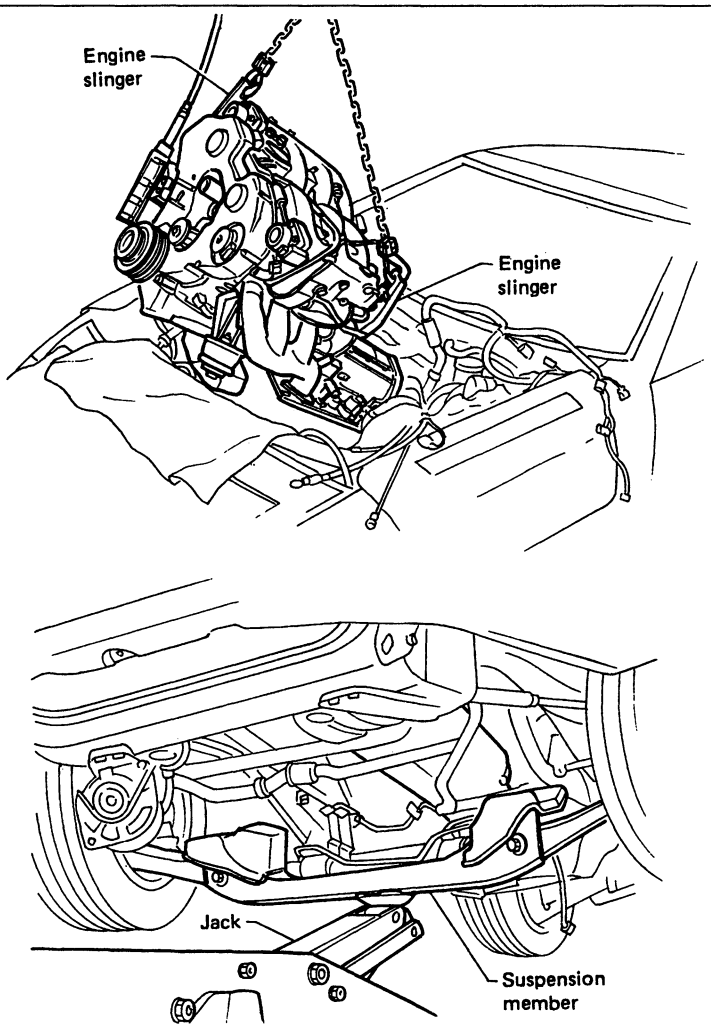


13. Set a suitable transmission jack under suspension member.
- At this time, hoist engine with engine slinger.

14. Remove suspension member fixing bolts.
15. Remove engine mounting bolts from both sides and then slowly lower transmission jack.
16. Remove engine with transmission as shown in following figure.



M/T model (Cont'd)



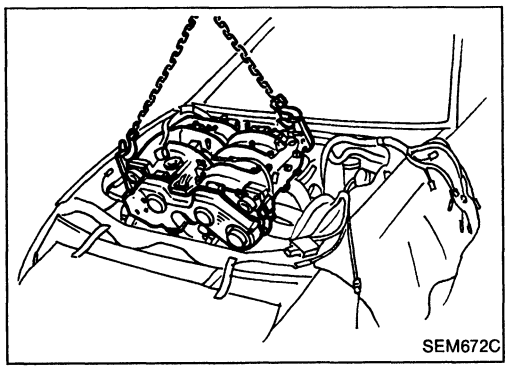
SEM671C

A/T model

1. Perform the same procedures (1 to 8) as for M/T model.
2. Remove transmission from vehicle.

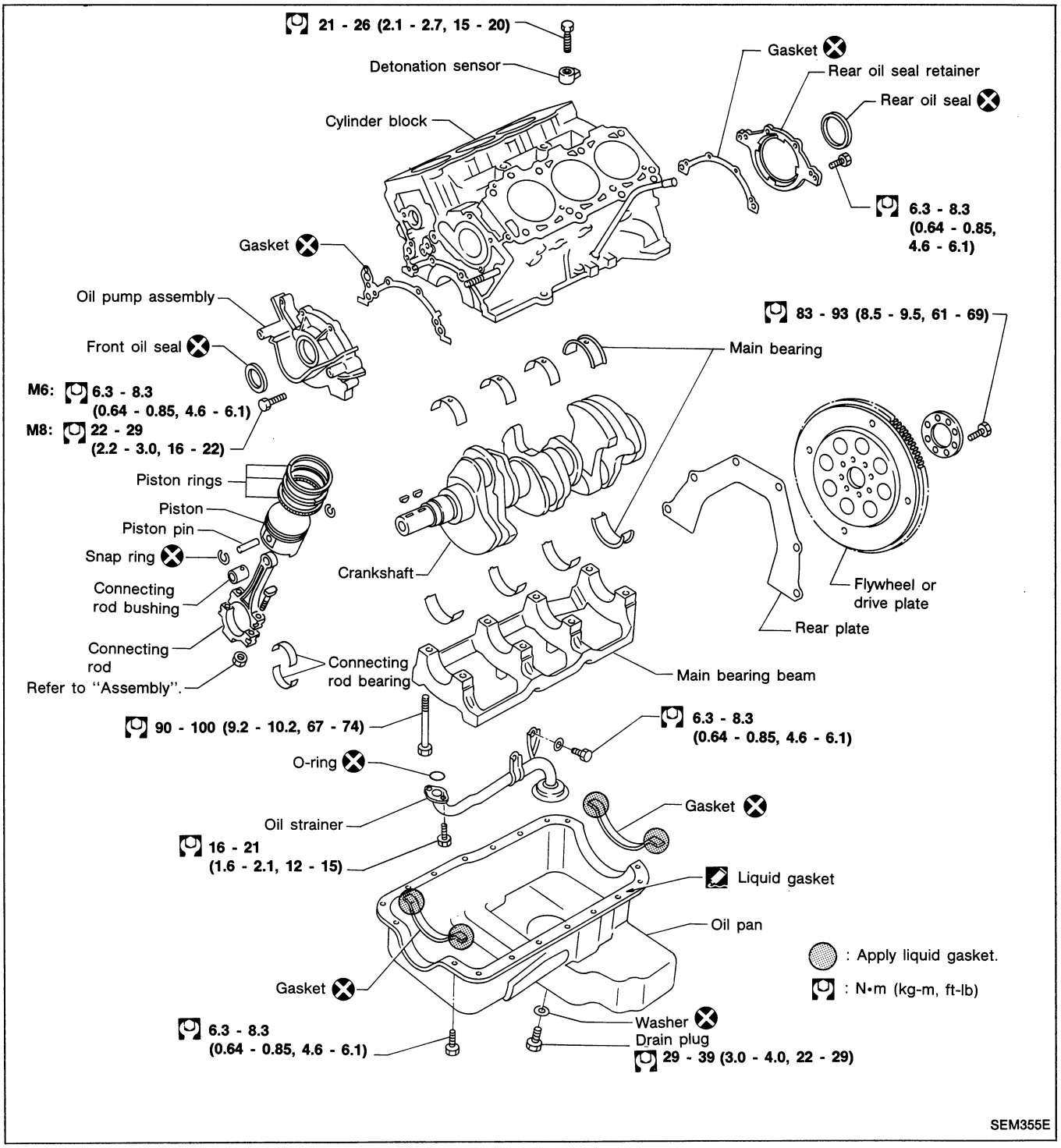
Refer to AT section.

3. Hoist engine with engine slingers and remove engine mounting bolts from both sides.



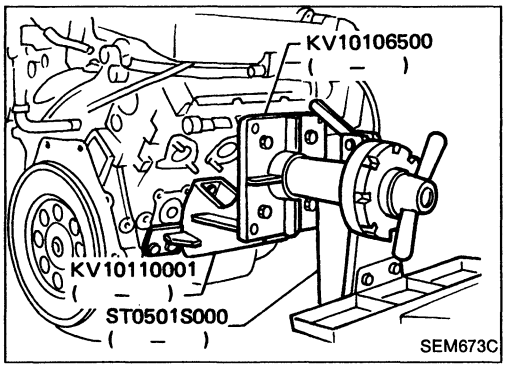
SEM672C

4. Remove engine from vehicle as shown.



CAUTION:

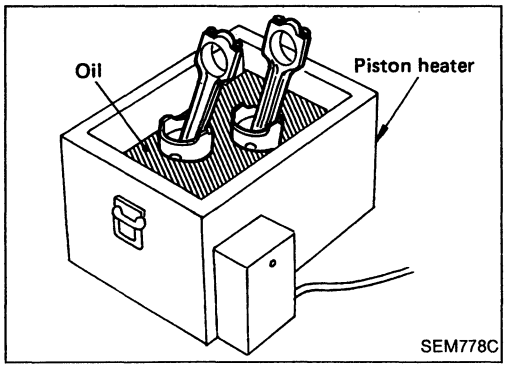
- **When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.**
- **Place removed parts such as bearings and bearing caps in their proper order and direction.**
- **When tightening connecting rod bolts and main bearing cap bolts, apply engine oil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



Disassembly

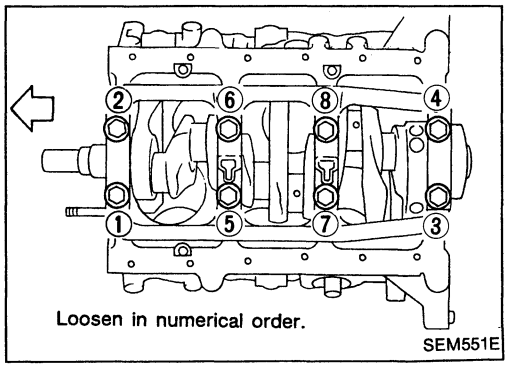
PISTON AND CRANKSHAFT

1. Place engine on a work stand.
2. Remove timing belt.
3. Drain coolant and remove water pump.
4. Drain oil.
5. Remove oil pan, oil pump and rear oil seal retainer.
6. Remove intake manifold collector, intake manifold and cylinder head.



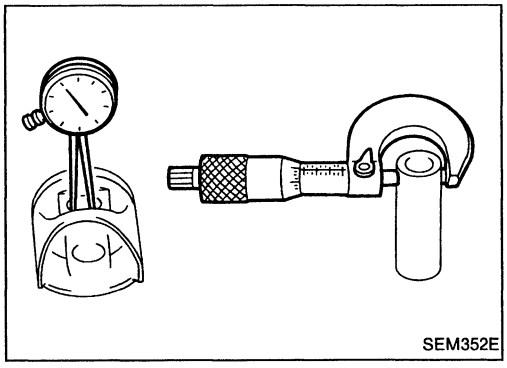
7. Remove pistons.

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



8. Remove bearing cap and crankshaft.

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



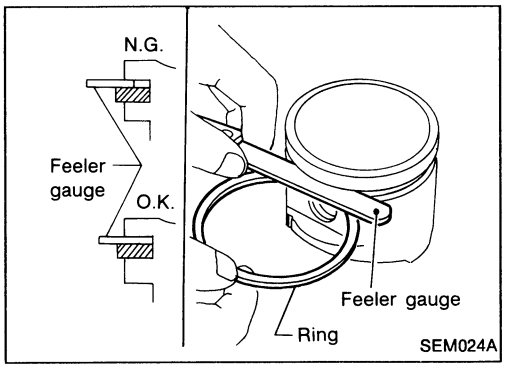
Inspection

PISTON AND PISTON PIN CLEARANCE

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

Inspection (Cont'd)



PISTON RING SIDE CLEARANCE

Side clearance:

Top ring

0.040 - 0.073 mm (0.0016 - 0.0029 in)

2nd ring

0.030 - 0.063 mm (0.0012 - 0.0025 in)

Max. limit of side clearance:

0.1 mm (0.004 in)

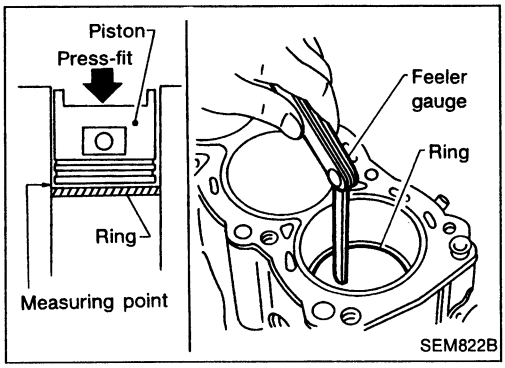
O-ring:

0.015 - 0.185 mm (0.0006 - 0.0073 in)

Max. limit of side clearance:

0.2 mm (0.008 in)

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



PISTON RING END GAP

End gap:

Top ring

0.21 - 0.40 mm (0.0083 - 0.0157 in)

2nd ring

0.50 - 0.76 mm (0.0197 - 0.0299 in)

Oil ring

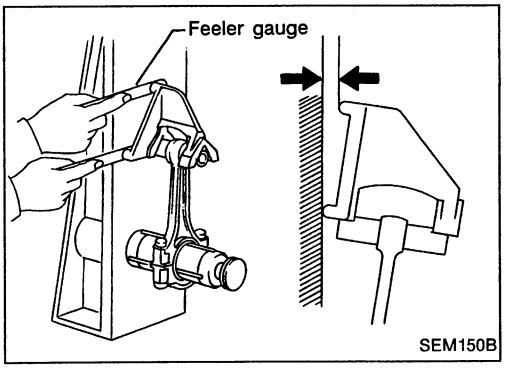
0.20 - 0.76 mm (0.0079 - 0.0299 in)

Max. limit of end 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.



CONNECTING ROD BEND AND TORSION

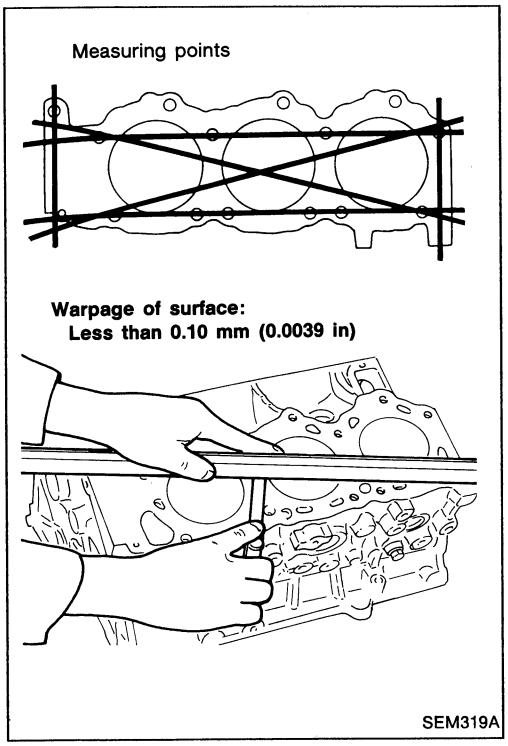
Bend:

Limit 0.15 mm (0.0059 in) per 100 mm (3.94 in) length

Torsion:

Limit 0.3 mm (0.012 in) per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.



CYLINDER BLOCK DISTORTION AND WEAR

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

   Limit:

   0.10 mm (0.0039 in)

2. If out of specification, resurface it.

   The resurfacing limit is determined by the relationship with the amount of cylinder head resurfacing.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

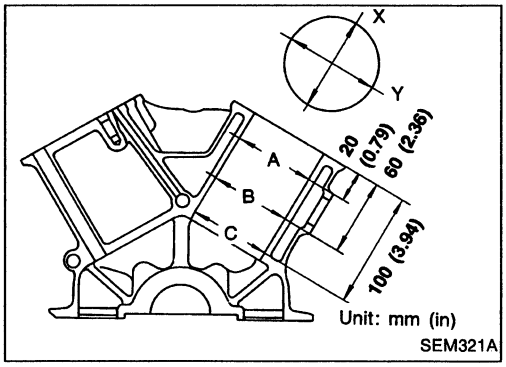
The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

3. If necessary, replace cylinder block.

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

Inspection (Cont'd)



PISTON-TO-BORE CLEARANCE

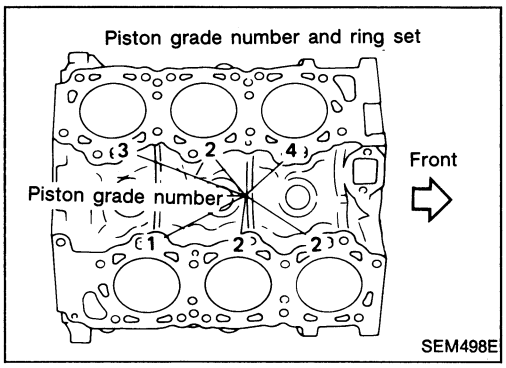
Method A (Using bore gauge and micrometer)

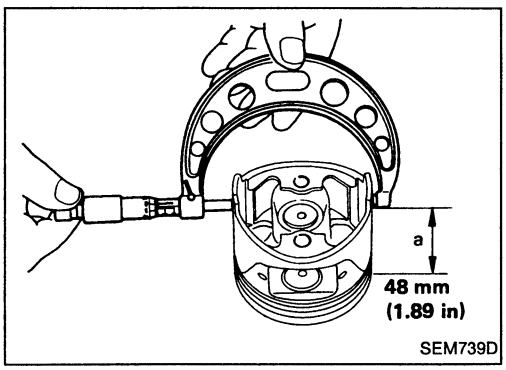
1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.
   Standard inner diameter:
   87.000 - 87.030 mm (3.4252 - 3.4264 in)
   Wear limit: 0.20 mm (0.0079 in)
   Out-of-round (X – Y) limit: 0.015 mm (0.0006 in)
   Taper (A – B – C) limit: 0.015 mm (0.0006 in)

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

2. Check for scratches and seizure. If necessary, 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 top):
   48.0 mm (1.890 in)
4. Check that piston-to-bore clearance is within specification.
   Piston-to-bore clearance "B":
   Non-turbo
   0.015 - 0.035 mm (0.0006 - 0.0014 in)
   Turbo
   0.025 - 0.045 mm (0.0010 - 0.0018 in)
5. Determine piston oversize according to amount of wear.

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

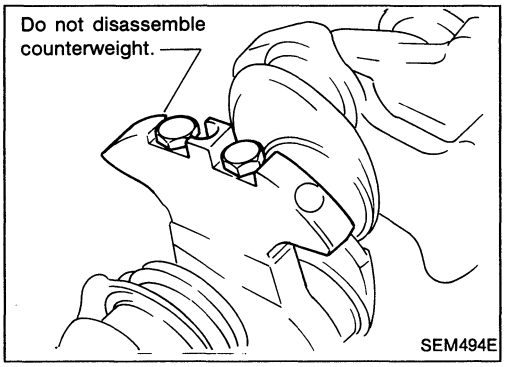
6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".
   Rebored size calculation:
   D = A + B – C
   D: Bored diameter
   A: Piston diameter as measured
   B: Piston-to-bore clearance
   C: Honing allowance 0.02 mm (0.0008 in)
7. Install main bearing caps, and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

- **When any cylinder needs boring, all other cylinders must also be bored.**
- **Do not cut more than 0.05 mm (0.0020 in) 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 cools down.**

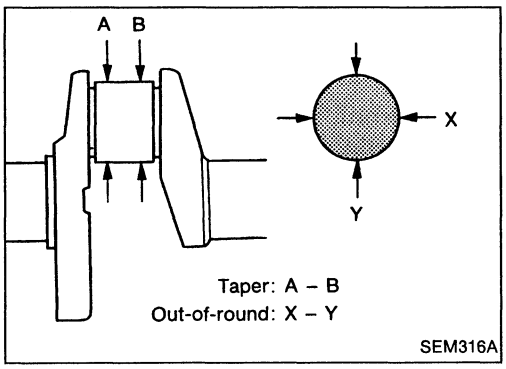
Inspection (Cont'd)



CRANKSHAFT

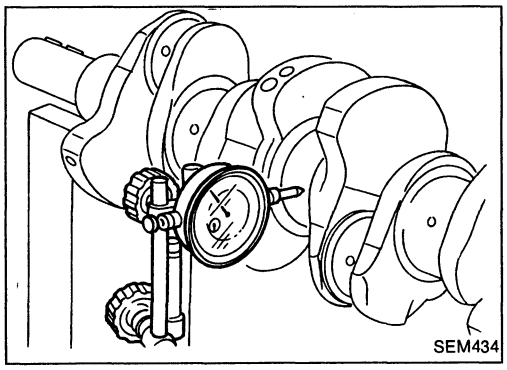
CAUTION:

Never attempt to disassemble crankshaft counter weight.



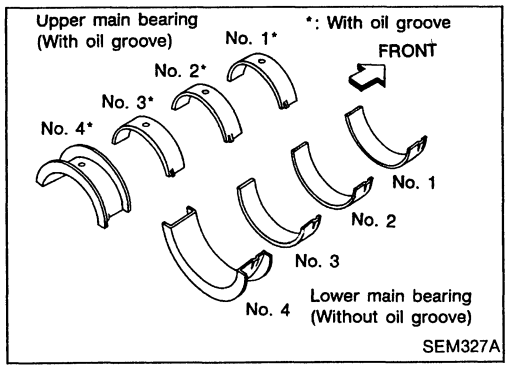
1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.

   Out-of-round (X – Y):
   Less than 0.005 mm (0.0002 in)
   Taper (A – B):
   Less than 0.005 mm (0.0002 in)
   Limit:
   0.02 mm (0.0008 in)



3. Measure crankshaft runout.

   Runout (Total indicator reading):
   Less than 0.10 mm (0.0039 in)

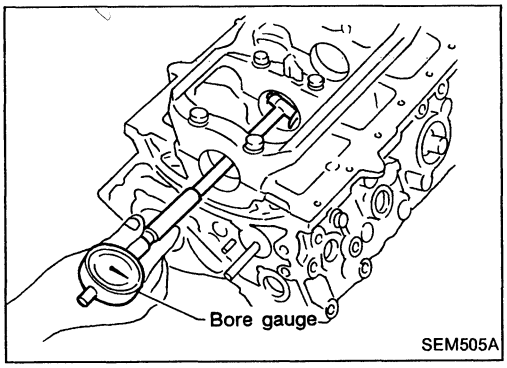


BEARING CLEARANCE

- 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.

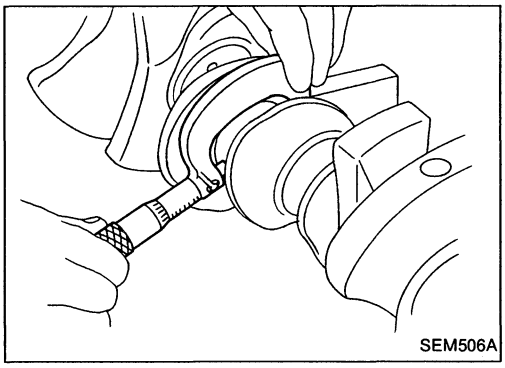


2. Install main bearing cap to cylinder block.

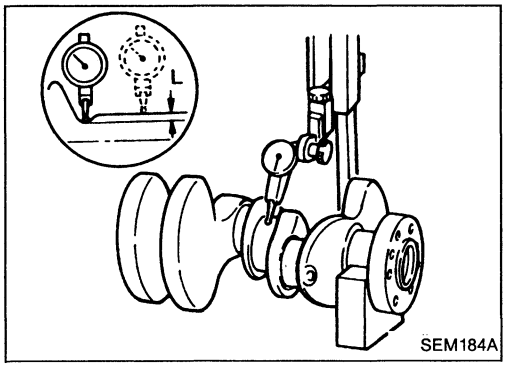
Tighten all bolts in correct order in two or three stages.

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

Inspection (Cont'd)


SEM506A

4. Measure outer diameter "Dm" of each crankshaft main journal.
5. Calculate main bearing clearance.
   Main bearing clearance (A – Dm):
   Standard
   0.028 - 0.055 mm (0.0011 - 0.0022 in)
   Limit
   0.090 mm (0.0035 in)
6. If it exceeds the limit, replace bearing.

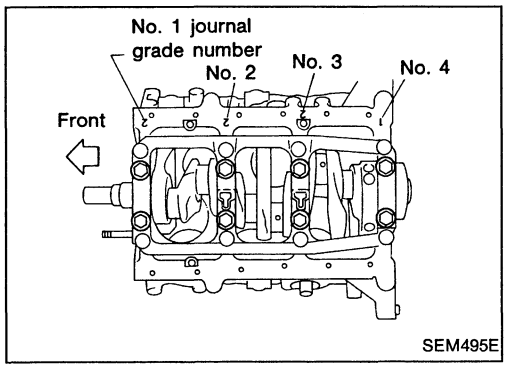


SEM184A

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)

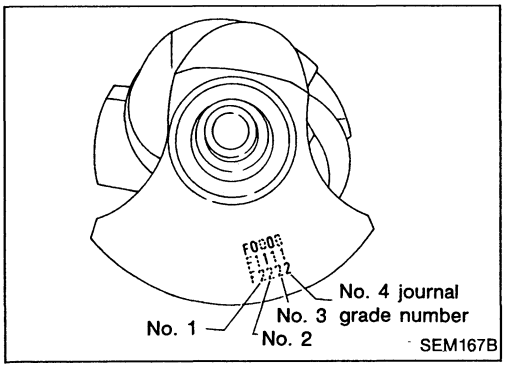
b. Refer to S.D.S. for grinding crankshaft and available service parts.



SEM495E

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

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



SEM167B

b. Grade number of each crankshaft main journal is punched on the No. 1 counter weight of crankshaft.

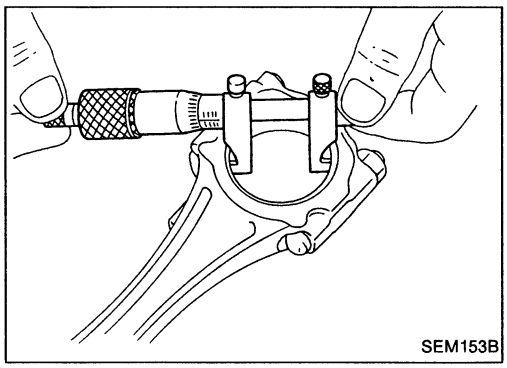
c. Select main bearing with suitable thickness according to the following table.
   For example:
   Cylinder block journal grade number: 1
   Crankshaft journal grade number: 2
   Main bearing grade number = 1 + 2
   = 3

Main bearing grade number:

		Cylinder block journal grade number		
		0	1 (I)	2 (II)
Crankshaft journal grade number	0	0	1	2
	1 (I)	1	2	3
	2 (II)	2	3	4

Grade numbers are punched in either Arabic or Roman numerals.

Inspection (Cont'd)

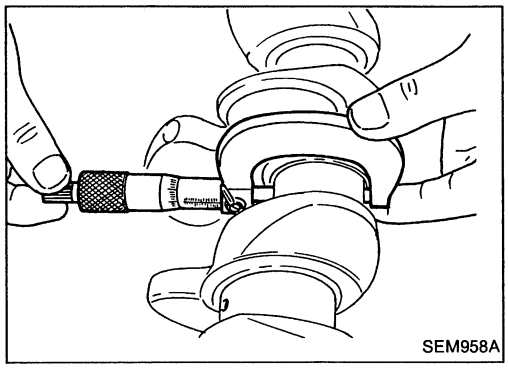

SEM153B

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.


SEM958A

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

   Connecting rod bearing clearance (C – Dp):

   Standard

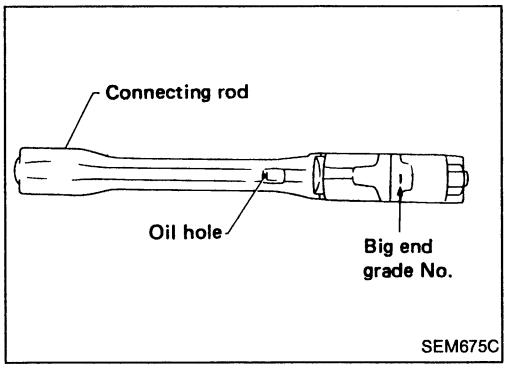
   0.028 - 0.048 mm (0.0011 - 0.0019 in)

   Limit

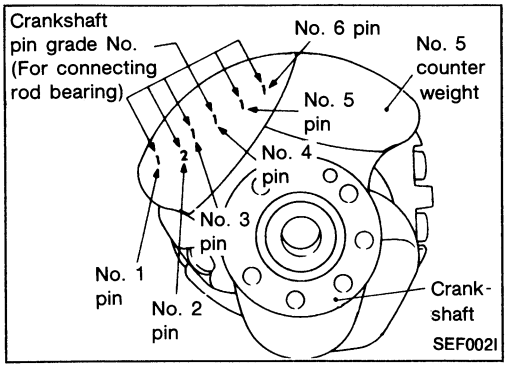
   0.090 mm (0.0035 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

   Refer to step 7 of "BEARING CLEARANCE — Main bearing".
8. If crankshaft, connecting rods or bearings are replaced with na ones, it is necWMsary to select thickness of connecting rod bearings as follows:

a. Grade number of each connecting rod big end is punched on the respective connecting rod.



SEM675C



SEF002I

b. Grade number of each crankshaft pin journal is punched on the No. 5 counter weight of crankshaft.
c. Select connecting rod bearing with suitable thickness according to the following table.

   For example:

   Connecting rod big end grade number: 1

   Crankshaft pin grade number: 2

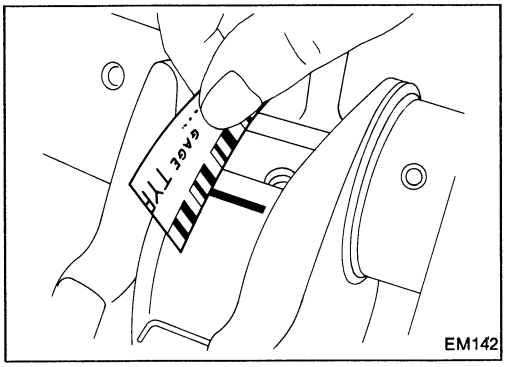
   Connecting rod bearing grade number = 1 + 2 = 3

Connecting rod bearing grade number:

		Connecting rod big end grade number	
		0	1 (I)
Crankshaft pin grade number	0	0	1
	1 (I)	1	2
	2 (II)	2	3

Grade numbers are punched in either Arabic or Roman numerals.

Inspection (Cont'd)

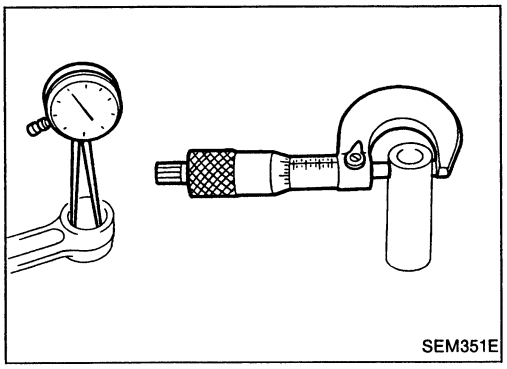


EM142

Method B (Using "plastigage")

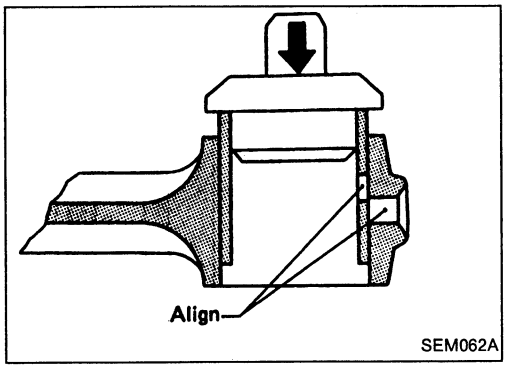
CAUTION:

- **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.**


SEM351E

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.
   C – Dp = 0.005 - 0.017 mm (0.0002 - 0.0007 in)
   Limit: 0.023 mm (0.0009 in)
   If it exceeds the specified value, replace connecting rod bushing and/or piston set with pin.



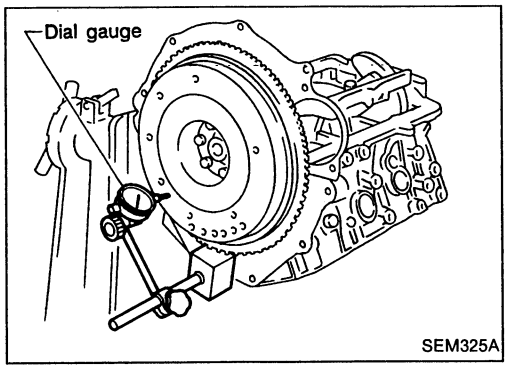
SEM062A

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.

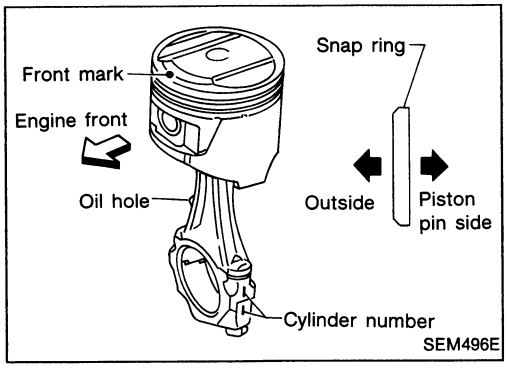
2. After driving in small end bushing, ream the bushing.
   Small end bushing inside diameter:
   Finished size
   22.000 - 22.012 mm (0.8661 - 0.8666 in)



SEM325A

FLYWHEEL/DRIVE PLATE RUNOUT

Runout (Total indicator reading):
Flywheel (M/T model)
Less than 0.15 mm (0.0059 in)
Drive plate (A/T model)
Less than 0.15 mm (0.0059 in)



SEM496E

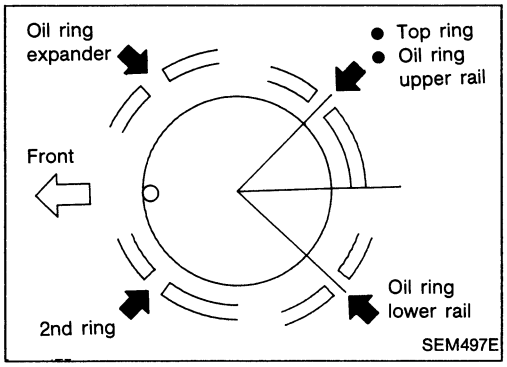
Assembly

PISTON

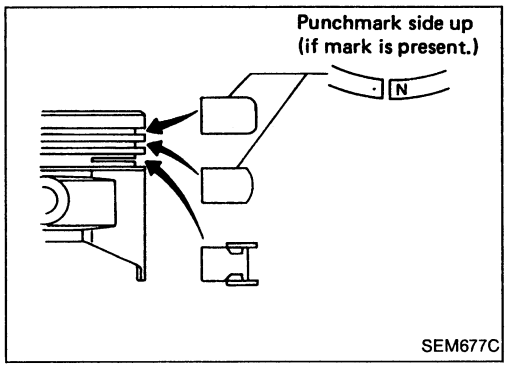
1. Install new snap ring on one side of piston pin hole.
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

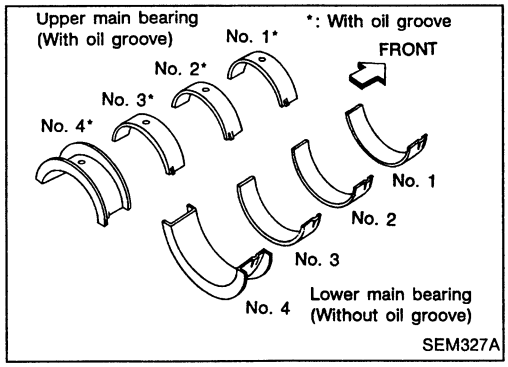
- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**
- **After assembly, make sure connecting rod swings smoothly.**

Assembly (Cont'd)



3. Set piston rings as shown.



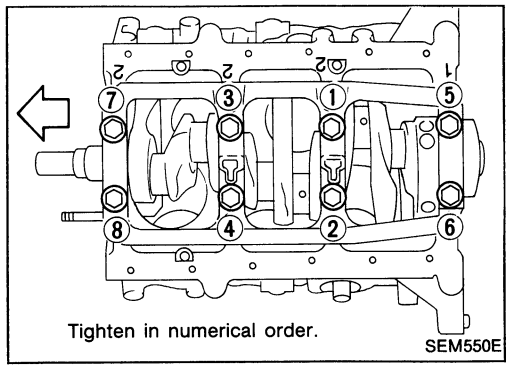


CRANKSHAFT

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

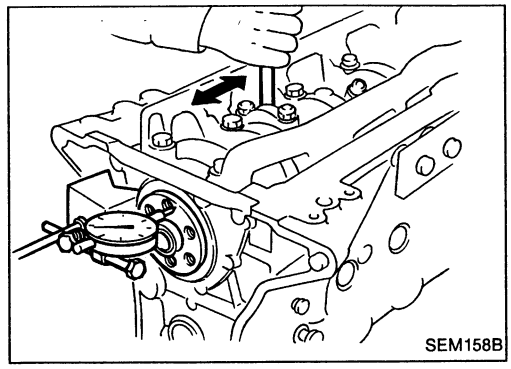
- **Confirm that correct main bearings are used.**

Refer to "Inspection".



2. Install crankshaft and main bearing caps and tighten bolts to the specified torque.

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

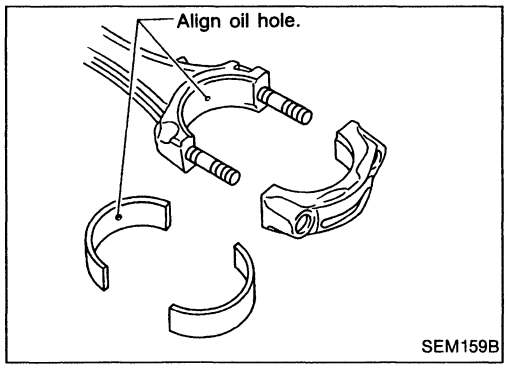


3. Measure crankshaft end play.

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

If beyond the limit, replace bearing with a new one.

Assembly (Cont'd)

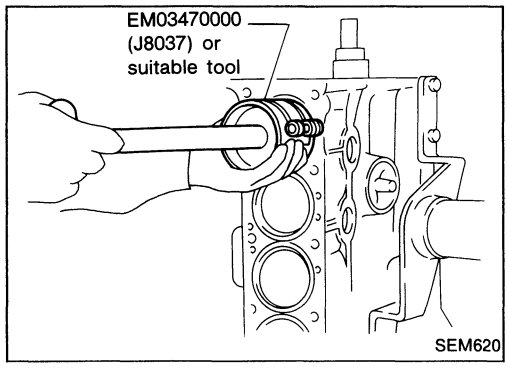


4. Install connecting rod bearings in connecting rods and connecting rod caps.

- **Confirm that correct bearings are used.**

Refer to "Inspection".

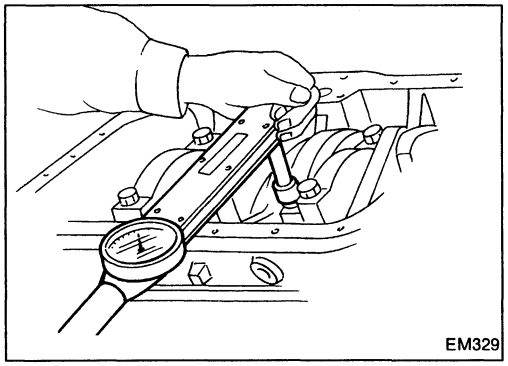
- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.



5. Install pistons with connecting rods.

a. Install them into corresponding cylinders with Tool.

- **Be careful not to scratch cylinder wall by connecting rod.**
- **Arrange so that front mark on piston head faces toward front of engine.**

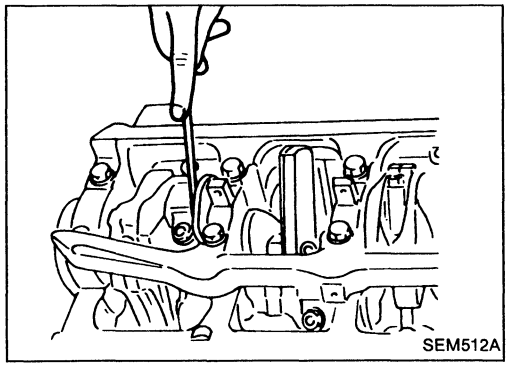


b. Install connecting rod bearing caps.
Tighten connecting rod bearing cap nuts to the specified torque.

: Connecting rod bearing nut

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

(2) Tighten to 59 to 65 N·m (6.0 to 6.6 kg-m, 43 to 48 ft-lb) or if you have an angle wrench, tighten bolts 60 to 65 degrees clockwise.



6. Measure connecting rod side clearance.

Connecting rod side clearance:

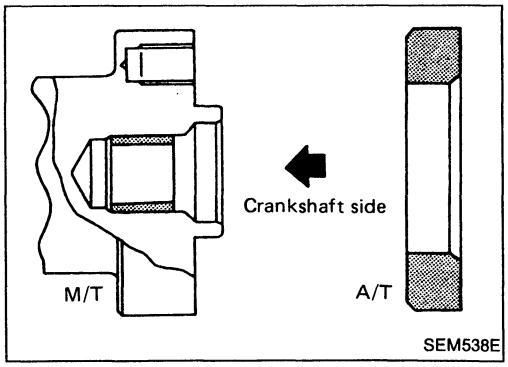
Standard

0.20 - 0.35 mm (0.0079 - 0.0138 in)

Limit

0.40 mm (0.0157 in)

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



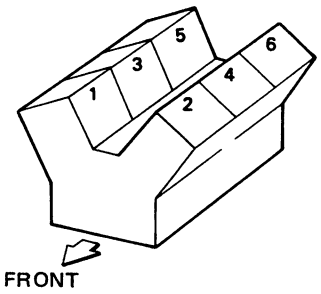
REPLACING PILOT BUSHING

1. Remove pilot bushing (M/T)/pilot converter (A/T) with suitable tool.
2. Install pilot bushing (M/T)/pilot converter (A/T).

General Specifications

Cylinder arrangement		V-6
Displacement	cm^3 (cu in)	2,960 (180.62)
Bore and stroke	mm (in)	87 x 83 (3.43 x 3.27)
Valve arrangement		D.O.H.C.
Firing order		1-2-3-4-5-6
Number of piston rings		
Compression		2
Oil		1
Number of main bearings		4
Compression ratio (Non-turbo/Turbo)		10.5/8.5

Cylinder number



SEM713A

COMPRESSION PRESSURE

Unit: kPa (kg/cm^2, psi)/300 rpm

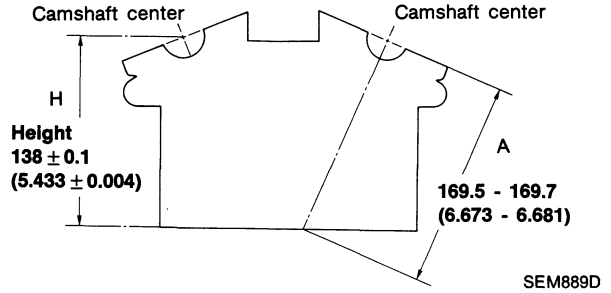
	Non-Turbo	Turbo
Compression pressure		
Standard	1,285 (13.1, 186)	1,177 (12.0, 171)
Minimum	981 (10.0, 142)	883 (9.0, 128)
Differential limit between cylinders	98 (1.0, 14)	

Inspection and Adjustment

CYLINDER HEAD

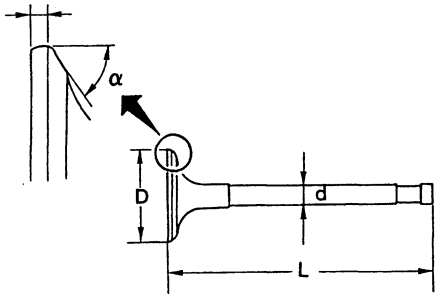
Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.05 (0.0020)	0.1 (0.004)



VALVE

Unit: mm (in)



Valve head diameter "D"	
Intake	34.0 - 34.2 (1.339 - 1.346)
Exhaust	29.5 - 29.7 (1.161 - 1.169)
Valve length "L"	
Intake	103.1 - 103.3 (4.059 - 4.067)
Exhaust	103.6 - 103.8 (4.079 - 4.087)
Valve stem diameter "d"	
Intake	5.965 - 5.980 (0.2348 - 0.2354)
Exhaust	5.945 - 5.960 (0.2341 - 0.2346)
Valve seat angle "α"	
Intake	45°15' - 45°45'
Exhaust	
Valve margin "T"	
Intake	1.15 - 1.45 (0.0453 - 0.0571)
Exhaust	1.35 - 1.65 (0.0531 - 0.0650)
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	0 (0)
Exhaust	0 (0)

Valve spring

Free height	mm (in)		43.1 (1.697)
Pressure N (kg, lb) at height mm (in)		Standard	536.4 (54.7, 120.6) at 26.5 (1.043)
		Limit	452.79 (46.17, 101.80) at 26.5 (1.043)
Out-of-square	mm (in)		Less than 1.8 (0.071)

Hydraulic valve lifter

Unit: mm (in)

Lifter outer diameter	30.955 - 30.965 (1.2187 - 1.2191)
Lifter guide inner diameter	31.000 - 31.020 (1.2205 - 1.2213)
Clearance between lifter and lifter guide	0.035 - 0.065 (0.0014 - 0.0026)

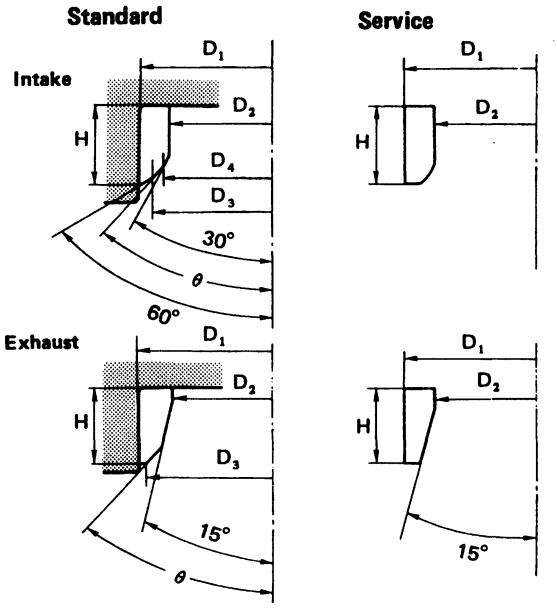
Valve guide

Unit: mm (in)

		Standard	Service
Valve guide Outer diameter		10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
Valve guide Inner diameter (Finished size)		6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter		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	Max. tolerance
Stem to guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.10 (0.0039)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	
Valve deflection limit		—	0.20 (0.0079)

Inspection and Adjustment (Cont'd)

VALVE SEAT



SEM529C

Unit: mm (in)

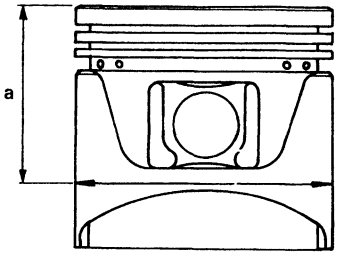
		Standard	Service*
Cylinder head seat recess diameter (D_1)	In.	36.000 - 36.016 (1.4173 - 1.4179)	36.500 - 36.516 (1.4370 - 1.4376)
	Ex.	31.500 - 31.516 (1.2402 - 1.2408)	32.000 - 32.016 (1.2598 - 1.2605)
Valve seat interference fit	In.	0.081 - 0.113 (0.0032 - 0.0044)	
	Ex.	0.064 - 0.096 (0.0025 - 0.0038)	
Valve seat outer diameter (D_1)	In.	36.097 - 36.113 (1.4211 - 1.4218)	36.597 - 36.613 (1.4408 - 1.4415)
	Ex.	31.580 - 31.596 (1.2433 - 1.2439)	32.080 - 32.096 (1.2630 - 1.2636)
Valve seat inner diameter (D_2)	In.	29.85 - 30.15 (1.1752 - 1.1870)	
	Ex.	24.35 - 24.65 (0.9587 - 0.9705)	
Height (H)	In.	5.9 - 6.0 (0.232 - 0.236)	5.35 - 5.45 (0.2106 - 0.2146)
	Ex.	5.9 - 6.0 (0.232 - 0.236)	5.9 - 6.0 (0.232 - 0.236)
Face angle (θ)	In.	45°	
	Ex.	45°	
Face inner diameter (D_4)	In.	31.5 (1.240)	*: Valve seat surface must be corrected to specified value.
Face outer diameter (D_3)	In.	33.6 - 33.8 (1.323 - 1.331)	
	Ex.	28.9 - 29.1 (1.138 - 1.146)	

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Available piston

Unit: mm (in)



SEM740D

Piston skirt diameter "A"	
Standard	
Grade No. 1	86.975 - 86.985 (3.4242 - 3.4246)
Grade No. 2	86.985 - 86.995 (3.4246 - 3.4250)
Grade No. 3	86.995 - 87.005 (3.4250 - 3.4254)
0.25 (0.0098) oversize (Service)	87.225 - 87.275 (3.4340 - 3.4360)
0.50 (0.0197) oversize (Service)	87.475 - 87.525 (3.4439 - 3.4459)
"a" dimension	48.0 (1.890)
Piston pin hole diameter	21.987 - 21.999 (0.8656 - 0.8661)
Piston clearance to cylinder block	
Non-turbo	0.015 - 0.035 (0.0006 - 0.0014)
Turbo	0.025 - 0.045 (0.0010 - 0.0018)

Piston ring

Unit: mm (in)

	Standard	Limit
Side clearance		
Top	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
2nd	0.030 - 0.063 (0.0012 - 0.0025)	
Oil	0.015 - 0.185 (0.0006 - 0.0073)	0.2 (0.008)
End gap		
Top	0.21 - 0.40 (0.0083 - 0.0157)	1.0 (0.039)
2nd	0.50 - 0.76 (0.0197 - 0.0299)	
Oil (rail ring)	0.20 - 0.76 (0.0079 - 0.0299)	

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	0.005 - 0.017 (0.0002 - 0.0007)

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

CONNECTING ROD

Unit: mm (in)

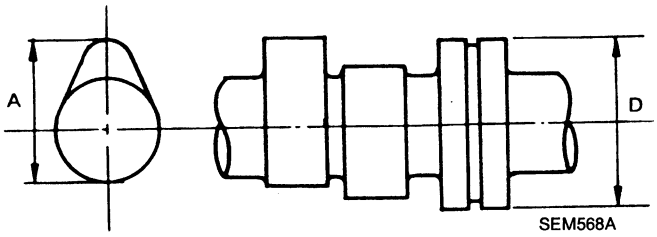
Center distance	154.1 - 154.2 (6.067 - 6.071)
Bend [per 100 (3.94)]	
Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	
Limit	0.3 (0.012)
Piston pin bushing inner diameter*	22.000 - 22.012 (0.8661 - 0.8666)
Connecting rod big end inner diameter	53.000 - 53.013 (2.0866 - 2.0871)
Side clearance	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.40 (0.0157)

* After installing in connecting rod

Inspection and Adjustment (Cont'd)

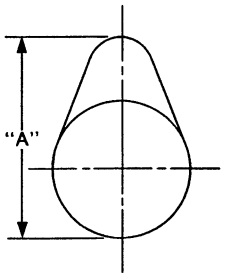
CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)



SEM568A

	Standard	Max. tolerance
Camshaft journal to bearing clearance	0.045 - 0.086 (0.0018 - 0.0034)	0.15 (0.0059)
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 0.04 (0.0016)	0.1 (0.004)
Camshaft end play	0.03 - 0.08 (0.0012 - 0.0031)	—

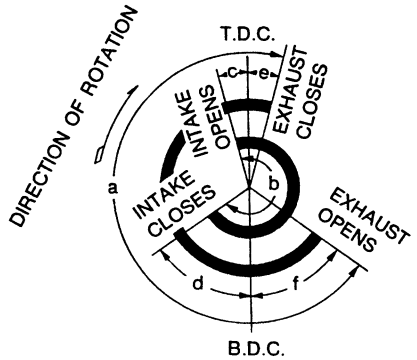


EM671

Cam height "A"	
Intake Exhaust	40.405 - 40.595 (1.5907 - 1.5982)
Wear limit of cam height	0.15 (0.0059)

*Total indicator reading

Valve timing



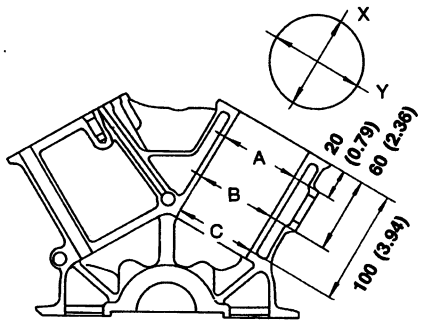
EM120

Unit: degree

a	b	c	d	e	f
248	248	–1	69	9	59

CYLINDER BLOCK

Unit: mm (in)



SEM321A

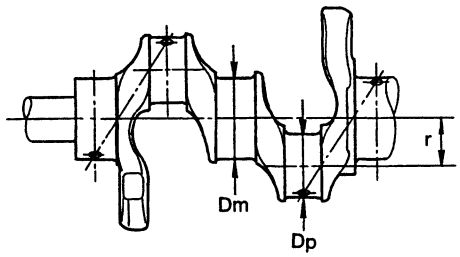
Surface flatness	
Standard	Less than 0.03 (0.0012)
Limit	0.10 (0.0039)
Cylinder bore	
Inner diameter	
Standard	
Grade No. 1	87.000 - 87.010 (3.4252 - 3.4256)
Grade No. 2	87.010 - 87.020 (3.4256 - 3.4260)
Grade No. 3	87.020 - 87.030 (3.4260 - 3.4264)
Wear limit	0.20 (0.0079)
Out-of-round (X – Y)	Less than 0.015 (0.0006)
Taper (A – B – C)	Less than 0.015 (0.0006)
Main journal inner diameter	
Grade No. 0	66.645 - 66.654 (2.6238 - 2.6242)
Grade No. 1	66.654 - 66.663 (2.6242 - 2.6245)
Grade No. 2	66.663 - 66.672 (2.6245 - 2.6249)
Difference in inner diameter between cylinders	
Standard	Less than 0.05 (0.0020)

Inspection and Adjustment (Cont'd)

CRANKSHAFT

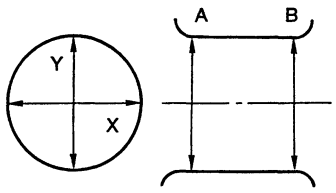
Unit: mm (in)

Main journal dia. "Dm"	
Grade No. 0	62.967 - 62.975 (2.4790 - 2.4793)
Grade No. 1	62.959 - 62.967 (2.4787 - 2.4790)
Grade No. 2	62.951 - 62.959 (2.4784 - 2.4787)
Pin journal dia. "Dp"	
Grade No. 0	49.968 - 49.974 (1.9672 - 1.9675)
Grade No. 1	49.962 - 49.968 (1.9670 - 1.9672)
Grade No. 2	49.955 - 49.962 (1.9667 - 1.9670)
Center distance "r"	41.47 - 41.53 (1.6327 - 1.6350)
Out-of-round (X – Y)	
Standard	Less than 0.005 (0.0002)
Limit	0.02 (0.0008)
Taper (A – B)	
Standard	Less than 0.005 (0.0002)
Limit	0.02 (0.0008)
Runout [T.I.R.]	
Standard	Less than 0.10 (0.0039)
Free end play	
Standard	0.05 - 0.18 (0.0020 - 0.0071)
Limit	0.30 (0.0118)



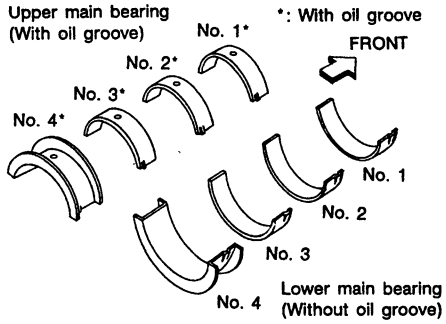
SEM645

Out-of-round X – Y
Taper A – B



EM715

AVAILABLE MAIN BEARING



SEM327A

No. 1 main bearing

Grade number	Thickness "T" mm (in)	Width "W" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)		Black
1	1.821 - 1.825 (0.0717 - 0.0719)		Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	22.4 - 22.6 (0.882 - 0.890)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)		Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)		Blue

No. 2 and 3 main bearing

Grade number	Thickness "T" mm (in)	Width "W" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)		Black
1	1.821 - 1.825 (0.0717 - 0.0719)		Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	18.9 - 19.1 (0.744 - 0.752)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)		Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)		Blue

Inspection and Adjustment (Cont'd)

No. 4 main bearing

Grade number	Thickness "T" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)	Black
1	1.821 - 1.825 (0.0717 - 0.0719)	Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)	Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)	Blue

Undersize

Unit: mm (in)

	Thickness	Main journal diameter "Dm"
0.25 (0.0098)	1.948 - 1.956 (0.0767 - 0.0770)	Grind so that bearing clearance is the specified value.

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing

Grade number	Thickness "T" mm (in)	Identification color
0	1.496 - 1.499 (0.0589 - 0.0590)	No color
1	1.499 - 1.502 (0.0590 - 0.0591)	Brown
2	1.502 - 1.505 (0.0591 - 0.0593)	Green
3	1.505 - 1.508 (0.0593 - 0.0594)	Yellow

Undersize

Unit: mm (in)

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

TURBOCHARGER

Unit: mm (in)

Rotor shaft	
Runout [T.I.R.]*	0.056 - 0.127 (0.0022 - 0.0050)
End play	0.013 - 0.096 (0.0005 - 0.0038)

*Total indicator reading

MISCELLANEOUS COMPONENTS

Unit: mm (in)

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

*Total indicator reading

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.028 - 0.055 (0.0011 - 0.0022)
Limit	0.090 (0.0035)
Connecting rod bearing clearance	
Standard	0.028 - 0.048 (0.0011 - 0.0019)
Limit	0.090 (0.0035)

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

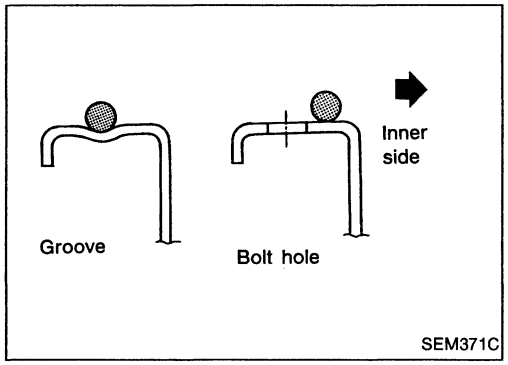
CONTENTS

Supplemental Restraint System "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF section** of this Service Manual.

WARNING:

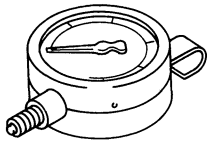
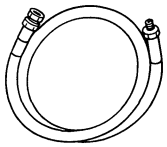
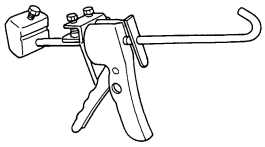
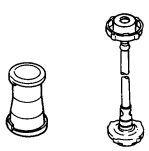
a. To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.
b. Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
c. All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".



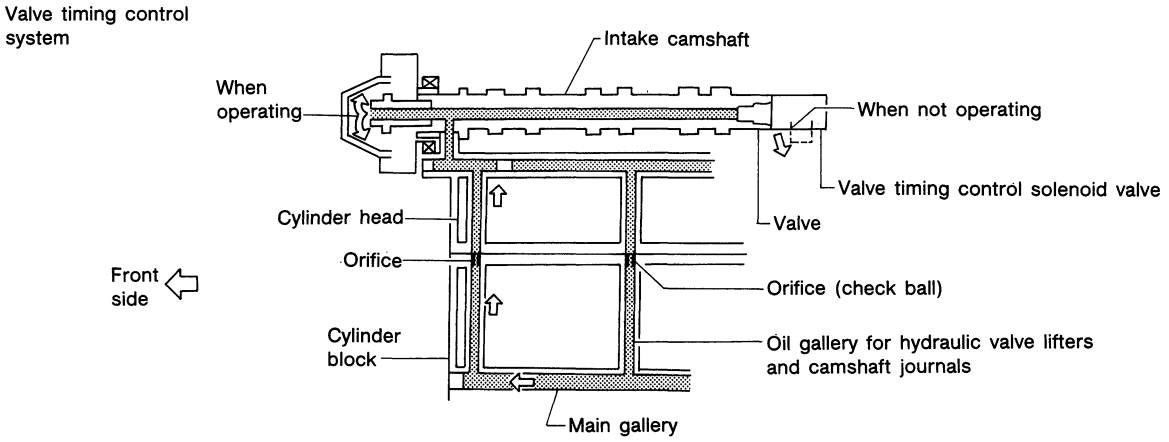
Liquid Gasket Application Procedure

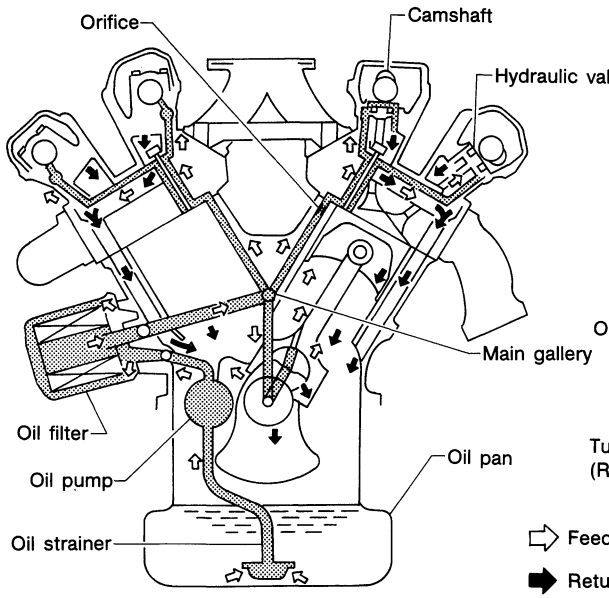
a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.
b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - Be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

Special Service Tools

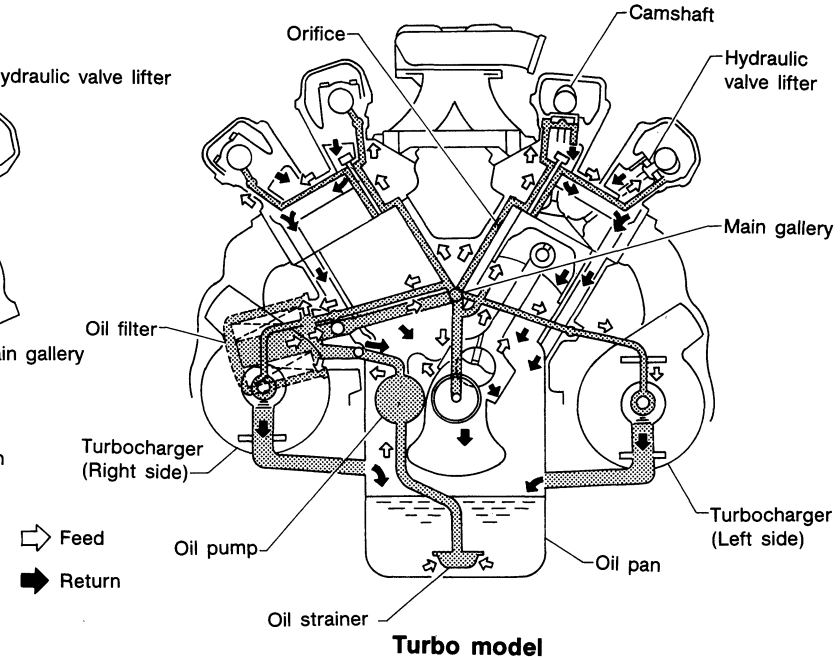
Tool number (Kent-Moore No.) Tool name	Description
ST25051001 (J25695-1) Oil pressure gauge	 SLC861A
ST25052000 (J25695-2) Hose	 SLC862A Adapting oil pressure gauge to cylinder block
WS39930000 (—) Tube presser	 SLC863A Pressing the tube of liquid gasket
EG17650301 (J33984-A) Radiator cap tester adapter	 SLC864A Adapting radiator cap tester to radiator filler neck

Lubrication Circuit

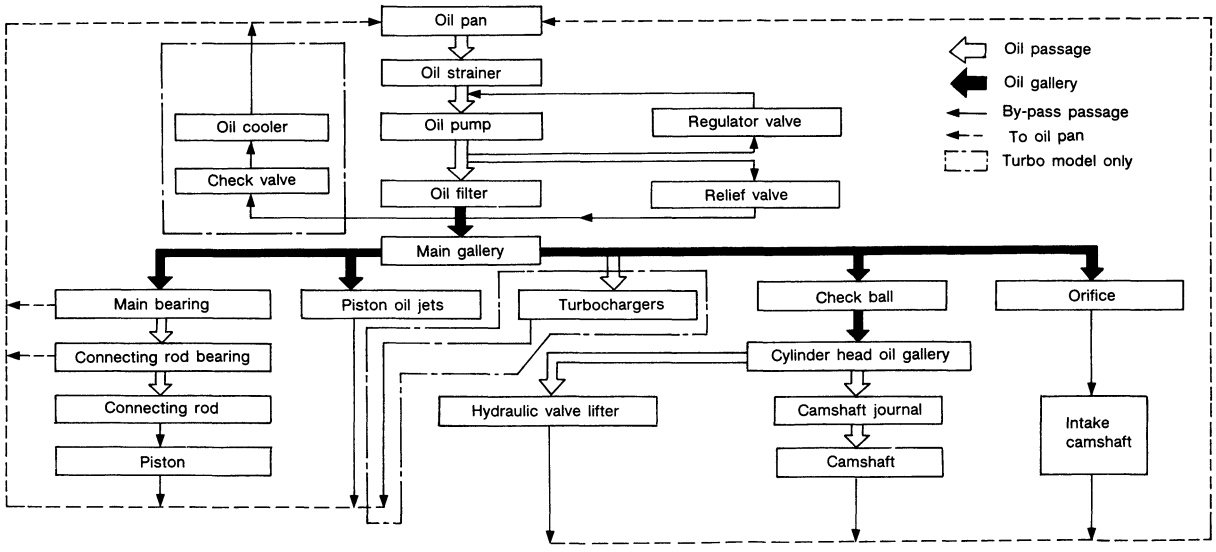




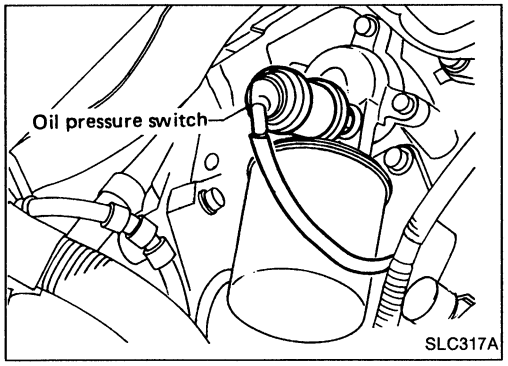
Non-turbo model



Turbo model



SLC580A

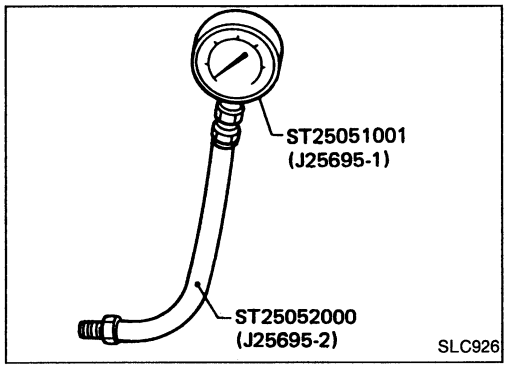


Oil Pressure Check

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.

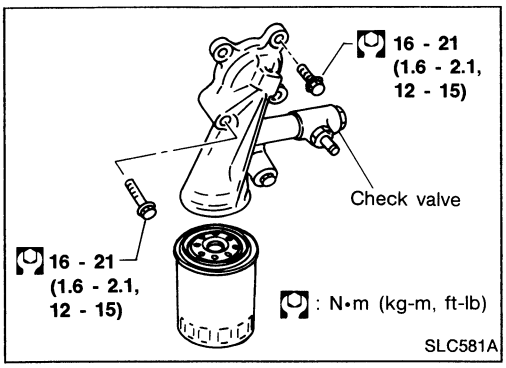


3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	More than 78 (0.8, 11)
3,000	353 - 451 (3.6 - 4.6, 51 - 65)

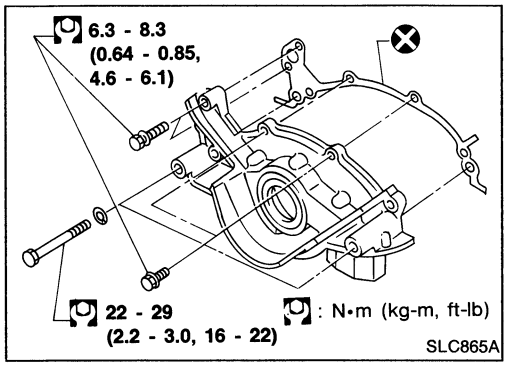
If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.



Oil Filter Bracket (Turbo model)

- Check oil cooler check valve for valve opening pressure.
  Opening pressure:
  324 - 363 kPa (3.3 - 3.7 kg/cm^2, 47 - 53 psi)



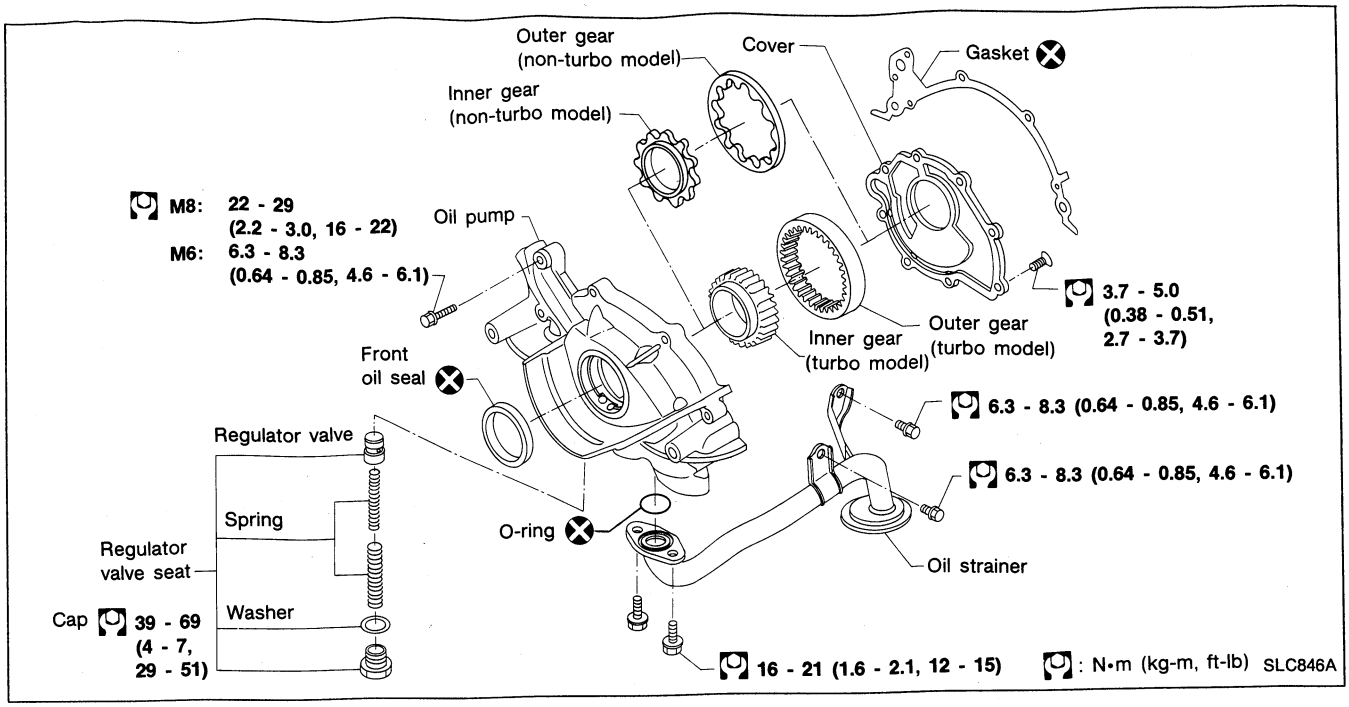
Oil Pump

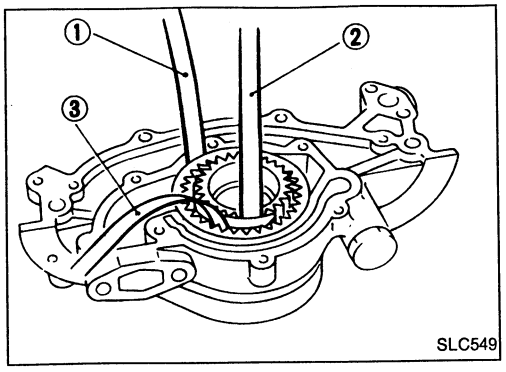
REMOVAL

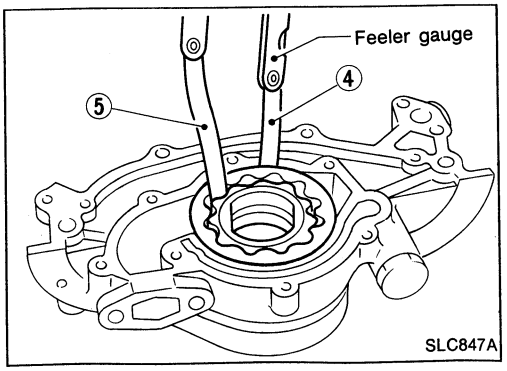
1. Drain oil.
2. Remove oil pan. (Refer to "OIL PAN — Removal" in EM section.)
3. Remove oil pump assembly.

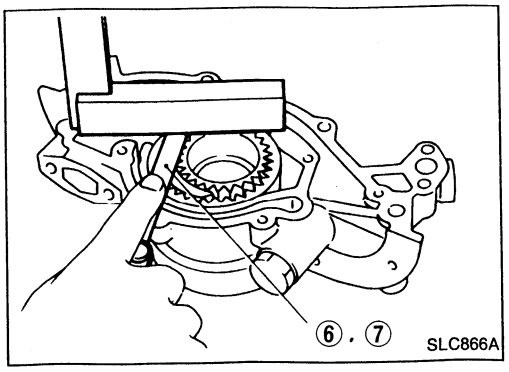
Oil Pump (Cont'd)

DISASSEMBLY AND ASSEMBLY









- **Always replace with new oil seal and gasket.**
- **When assembling, apply engine oil to inner and outer gears.**
- **Be sure that O-ring is properly installed.**

INSPECTION

Using a feeler gauge, check the following clearances:

Standard clearance:

Turbo model

Unit: mm (in)

Body to outer gear clearance ①	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.223 - 0.333 (0.0088 - 0.0131)
Outer gear to crescent clearance ③	0.210 - 0.320 (0.0083 - 0.0126)
Housing to inner gear clearance ⑥	0.050 - 0.090 (0.0020 - 0.0035)
Housing to outer gear clearance ⑦	0.050 - 0.110 (0.0020 - 0.0043)
Inner gear to brazed portion of body clearance ⑧	0.045 - 0.091 (0.0018 - 0.0036)

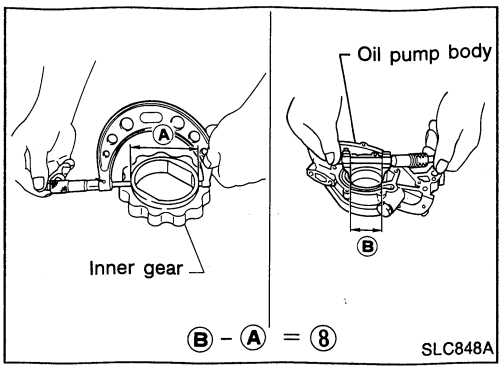
Non-turbo model

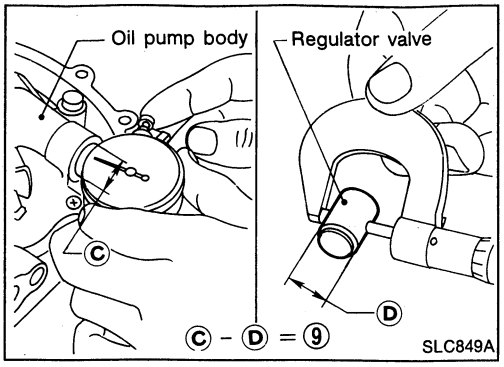
Unit: mm (in)

Body to outer gear clearance ④	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance ⑤	Less than 0.18 (0.0071)
Body to inner gear clearance ⑥	0.050 - 0.090 (0.0020 - 0.0035)
Body to outer gear clearance ⑦	0.050 - 0.110 (0.0020 - 0.0043)
Inner gear to brazed portion of body clearance ⑧	0.045 - 0.091 (0.0018 - 0.0036)

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

Oil Pump (Cont'd)





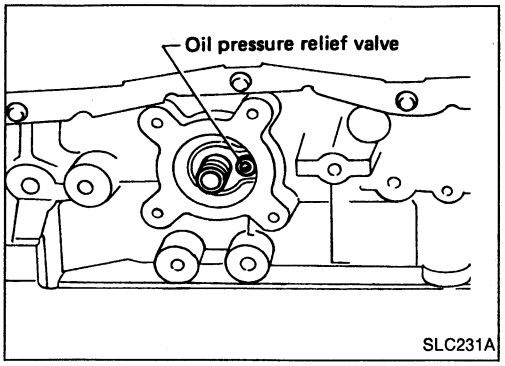
REGULATOR VALVE INSPECTION

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.
4. Check regulator valve to oil pump body clearance.

Clearance:

⑨: 0.040 - 0.097 mm (0.0016 - 0.0038 in)

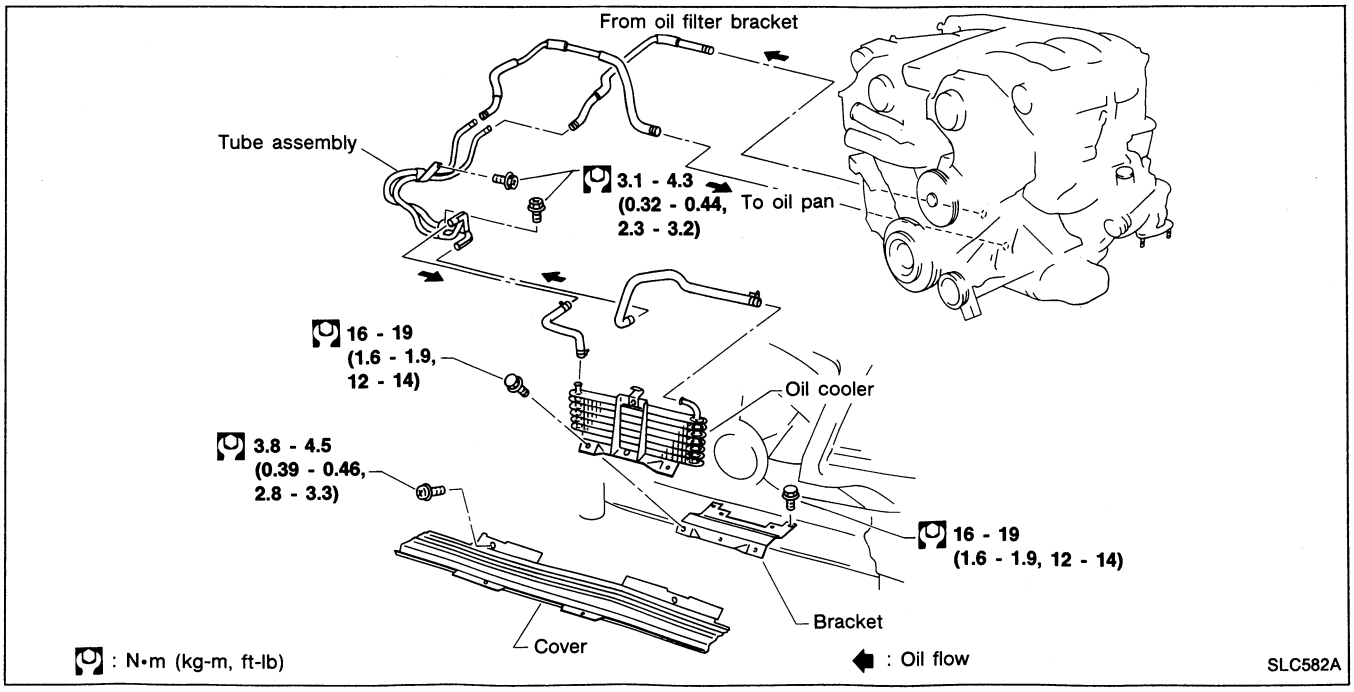
If it exceeds the limit, replace oil pump assembly.



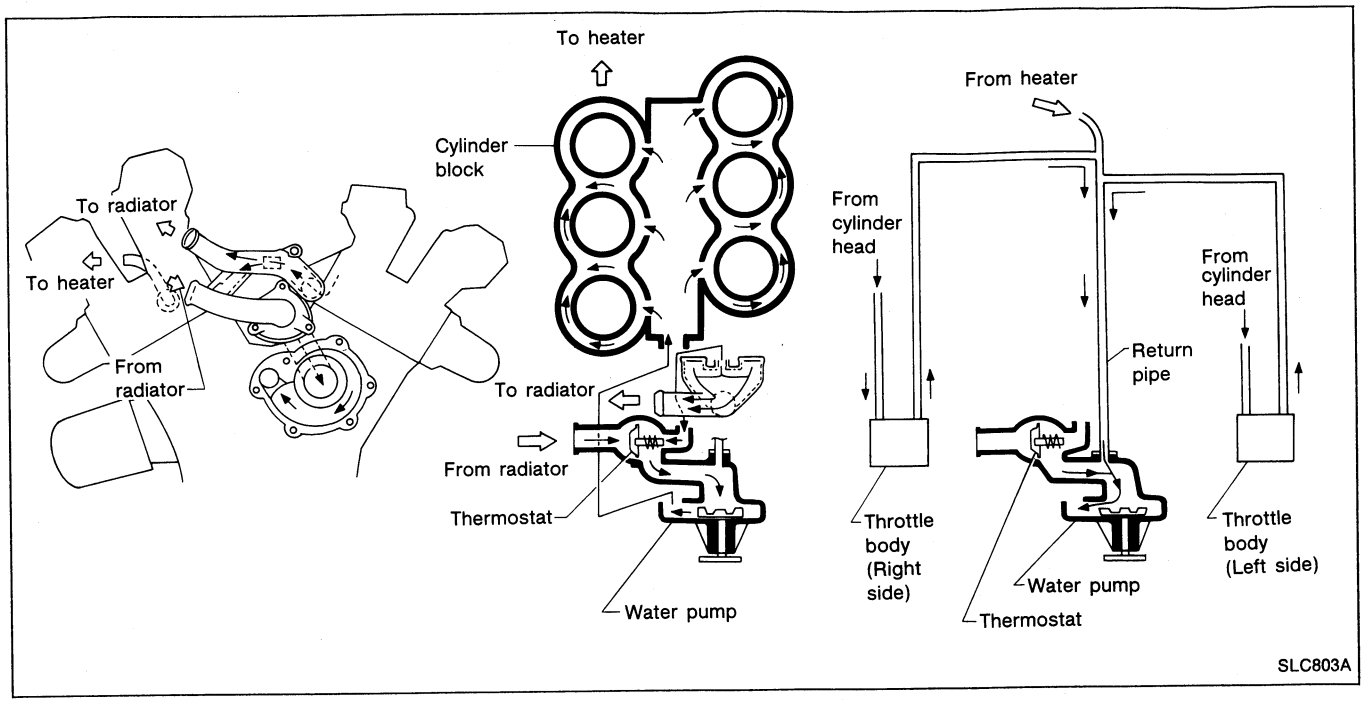
OIL PRESSURE RELIEF VALVE INSPECTION

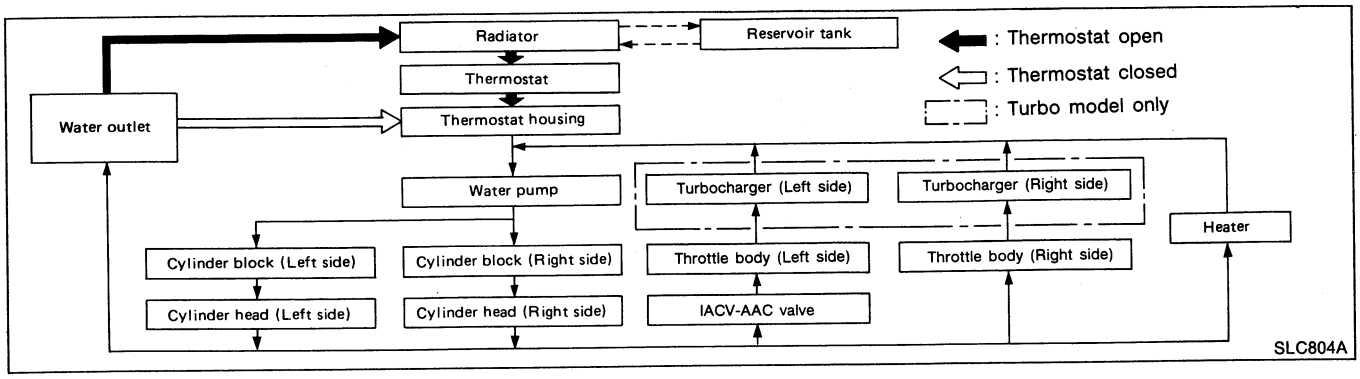
Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a suitable tool.
Install a new valve by tapping it in place.

Oil Cooler (Turbo model)



Cooling Circuit



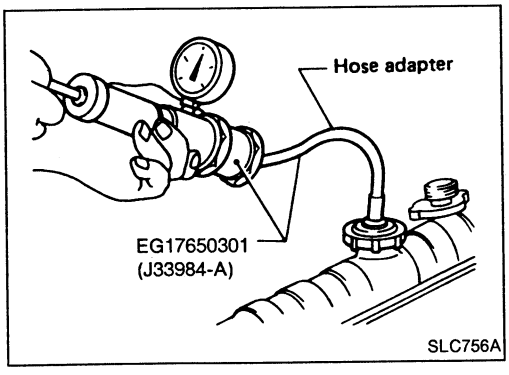


System Check

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 by turning it a quarter turn to allow built-up pressure to escape. Then continue to turn the cap until it can be removed safely.



CHECKING COOLING SYSTEM HOSES

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

CHECKING COOLING SYSTEM FOR LEAKS

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

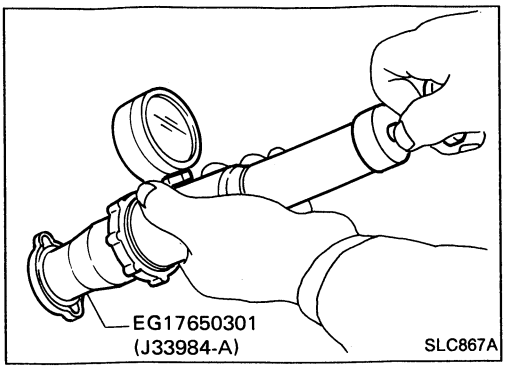
Testing pressure: 157 kPa (1.6 kg/cm^2, 23 psi)

CAUTION:

Higher than the specified pressure may cause radiator damage.

System Check (Cont'd)

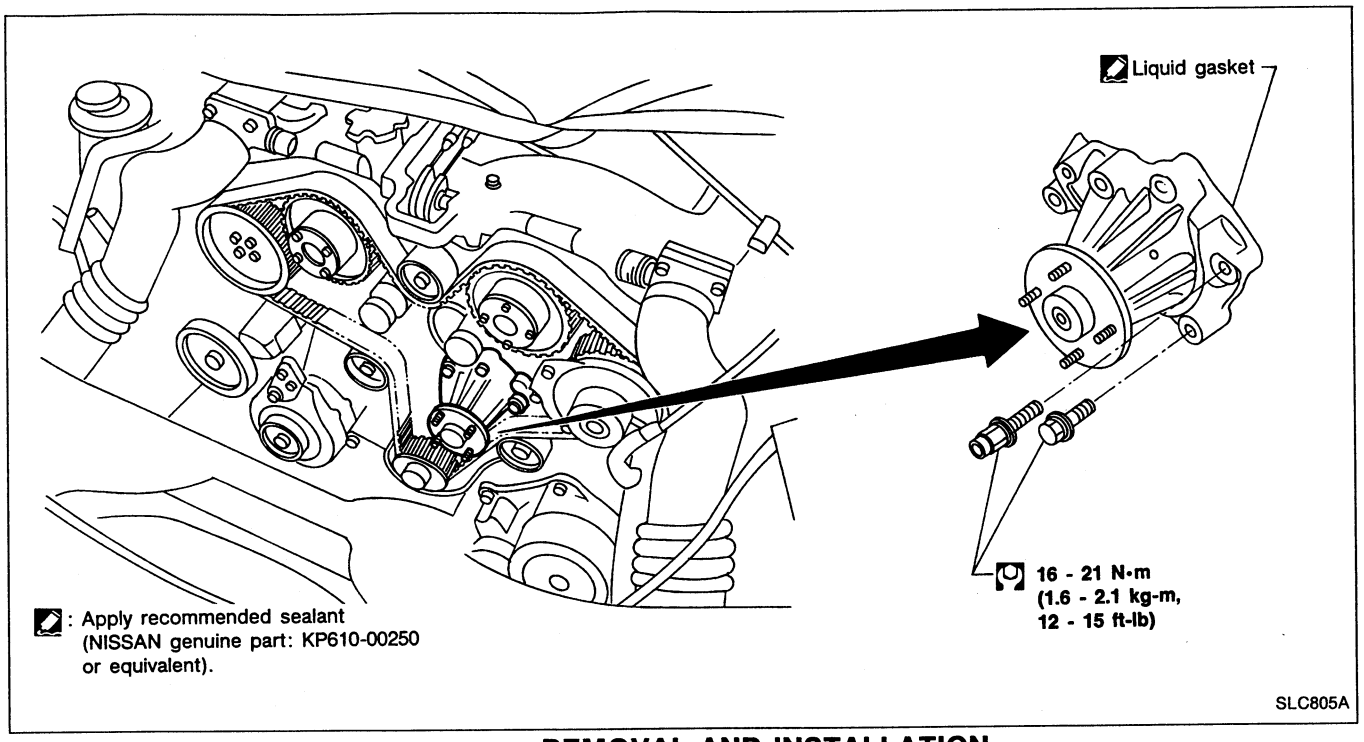
CHECKING RADIATOR CAP



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

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

Water Pump

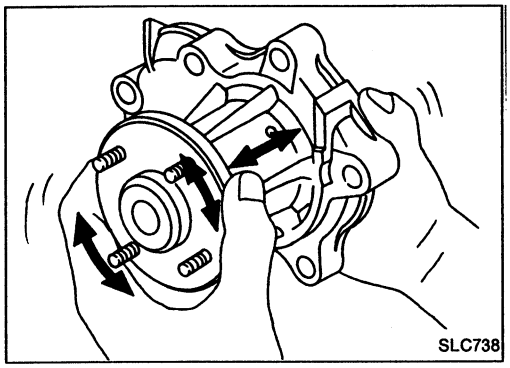


REMOVAL AND INSTALLATION

1. Drain coolant from drain cocks on both sides of cylinder block and radiator.
2. Remove the following parts:
- Under cover
- Radiator
- Drive belts
- Cooling fan and coupling
- Water inlet and outlet
- Crank pulley
- Timing belt cover
3. Remove water pump
4. After repairing or replacing water pump, install any parts removed in reverse order of removal.

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

Water Pump (Cont'd)



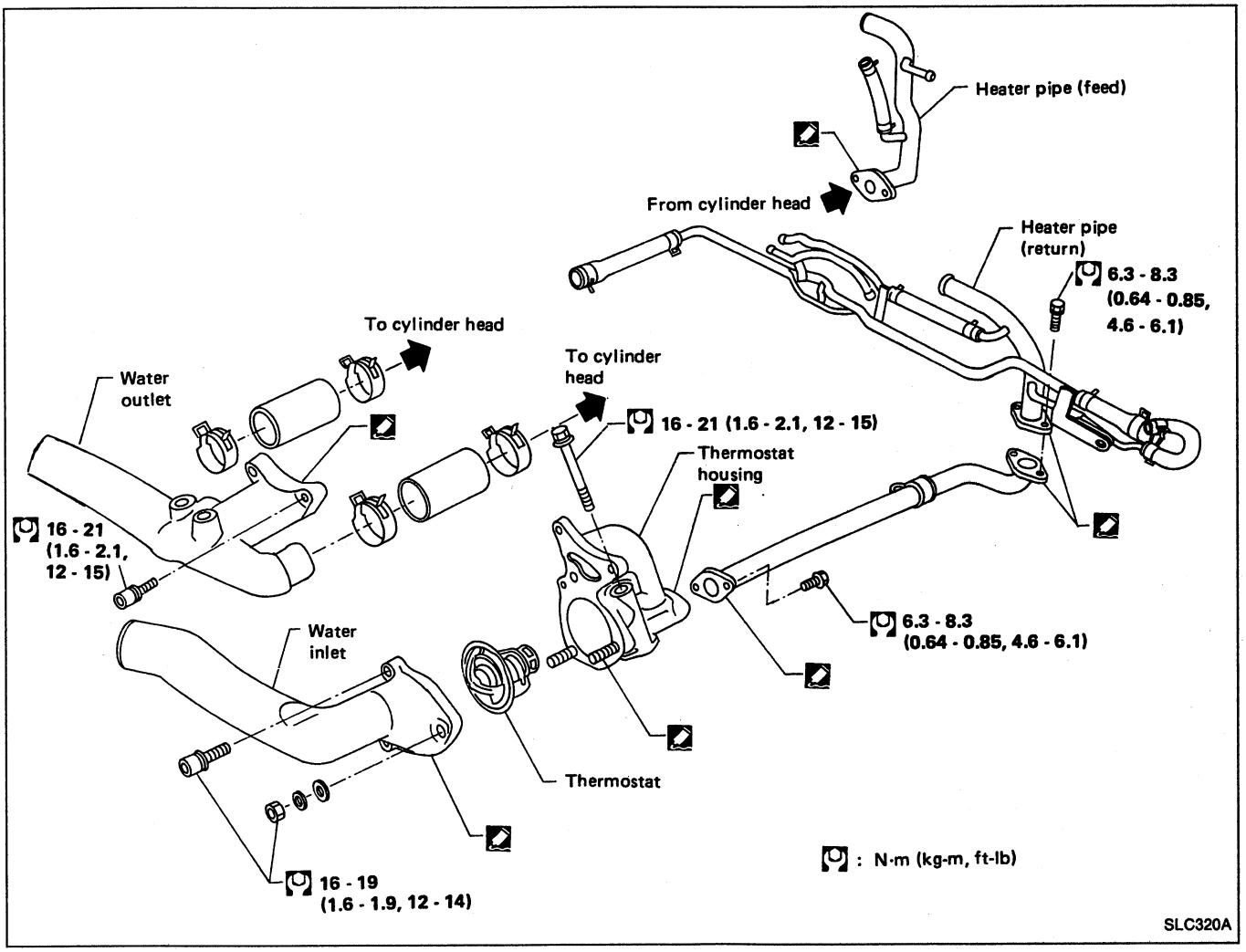
INSPECTION

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

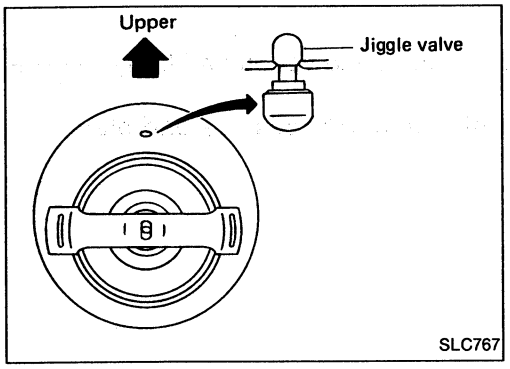
Thermostat

REMOVAL AND INSTALLATION

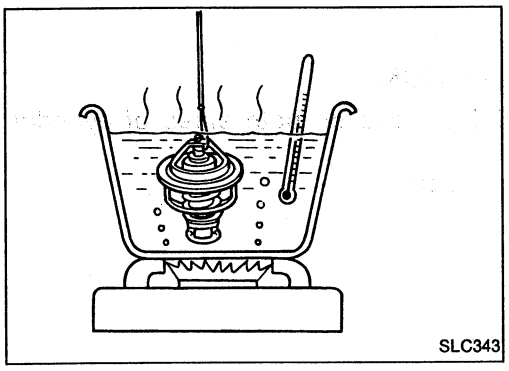
1. Drain coolant from drain cocks on both sides of cylinder block and radiator.
2. Remove the following parts:
- Under cover
- Radiator upper hose
- Radiator shroud
- Fan belt
- Cooling fan and coupling
- Water inlet
3. Remove thermostat.



Thermostat (Cont'd)



4. After repairing or replacing thermostat, install thermostat with jiggle valve facing upward.



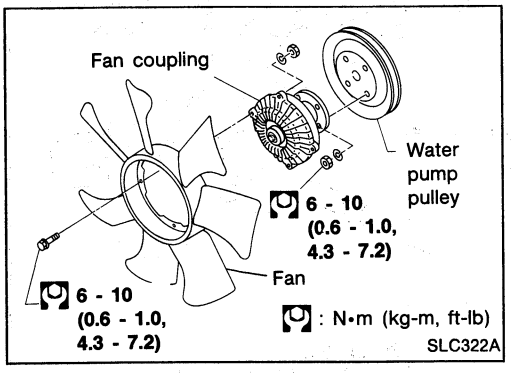
INSPECTION

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

		Standard
Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	10/90 (0.39/194)

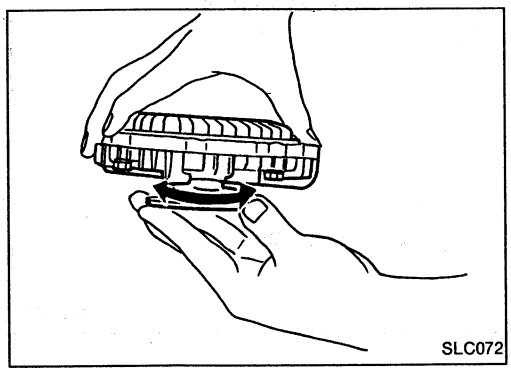
3. Then check if valve is 5°C (9°F) below valve opening temperature.

- **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.**



Cooling Fan

DISASSEMBLY AND ASSEMBLY



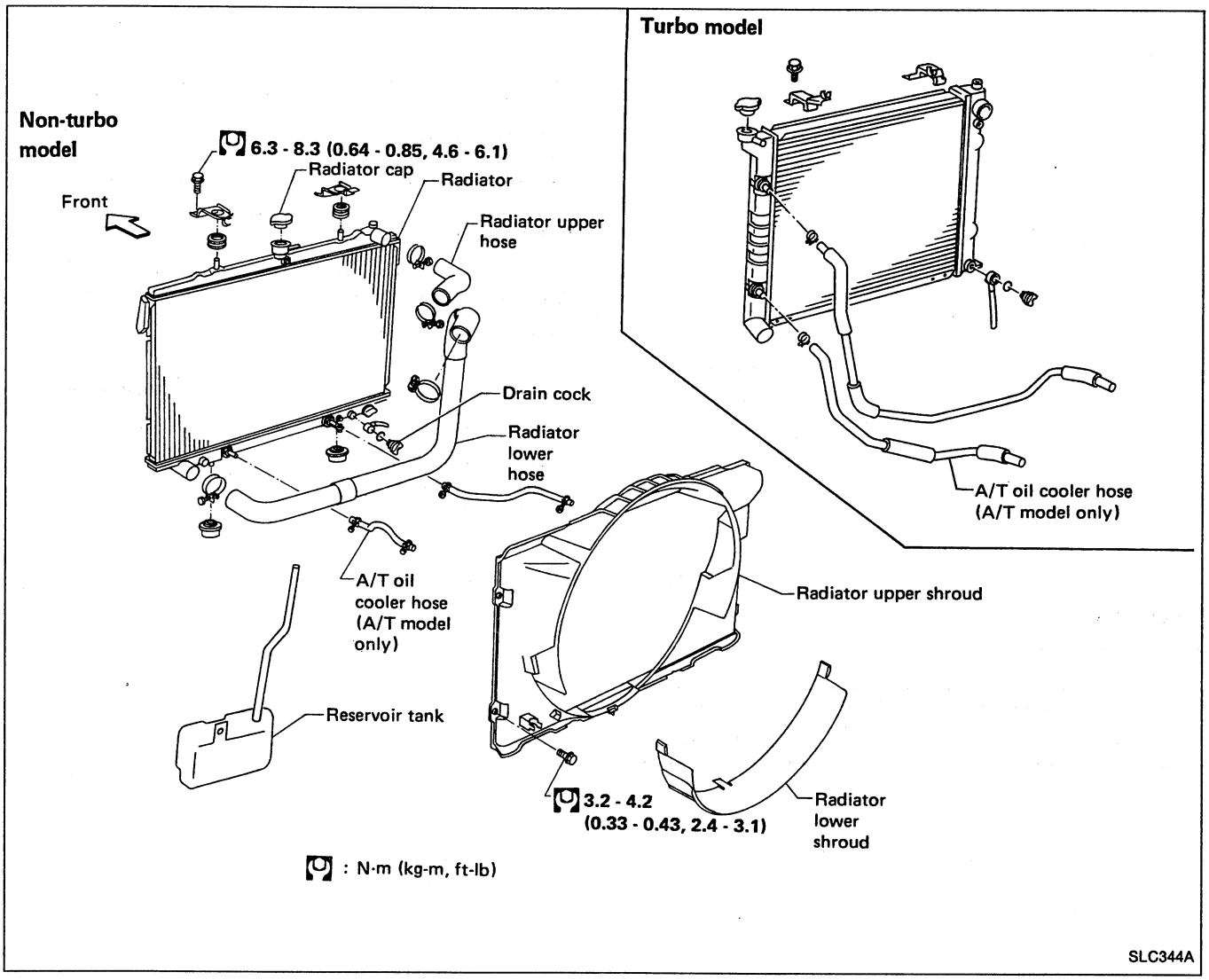
INSPECTION

Check fan coupling for rough operation, oil leakage or bent bimetal.

Radiator

REMOVAL AND INSTALLATION

1. Drain coolant from radiator drain cock.
2. Remove under cover.
3. Disconnect radiator upper and lower hoses.
4. Remove A/T oil cooler hoses. (A/T model only)
5. Remove radiator lower shroud.
6. Remove radiator.
7. After repairing or replacing radiator, install any part removed in reverse order of removal.



Electric Cooling Fan Control System

Radiator (Condenser) fan is controlled by ECM (ECCS control module). For details, refer to EF & EC section.

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)
3,000	353 - 451 (3.6 - 4.6, 51 - 65)

Oil pump

Turbo model

Unit: mm (in)

Body to outer gear clearance	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.223 - 0.333 (0.0088 - 0.0131)
Outer gear to crescent clearance	0.210 - 0.320 (0.0083 - 0.0126)
Housing to inner gear side clearance	0.050 - 0.090 (0.0020 - 0.0035)
Housing to outer gear side clearance	0.050 - 0.110 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Non-turbo model

Unit: mm (in)

Body to outer gear clearance	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance	Less than 0.18 (0.0071)
Body to inner gear clearance	0.050 - 0.090 (0.0020 - 0.0035)
Body to outer gear clearance	0.050 - 0.110 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Engine Cooling System

Thermostat

		Standard
Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	10/90 (0.39/194)

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

CONTENTS

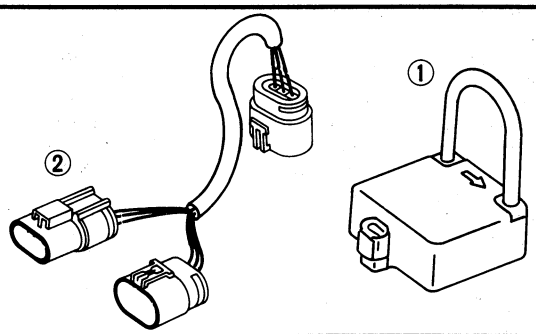
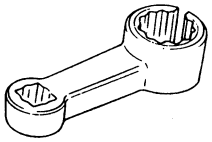
CONTENTS (Cont'd.)

For assistance with 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".

Note: Refer to Foldout page for "ECCS WIRING DIAGRAM".

Special Service Tools

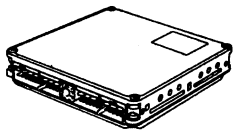
Tool number (Kent-Moore No.) Tool name	Description
① KV109D0010 (J36777-1) Ignition timing adapter coil ② KV10114200 (J38386) Adapter harness	Measuring ignition timing 
KV10114400 (J-38365) Heated oxygen sensor wrench	Loosening or tightening heated oxygen sensor 

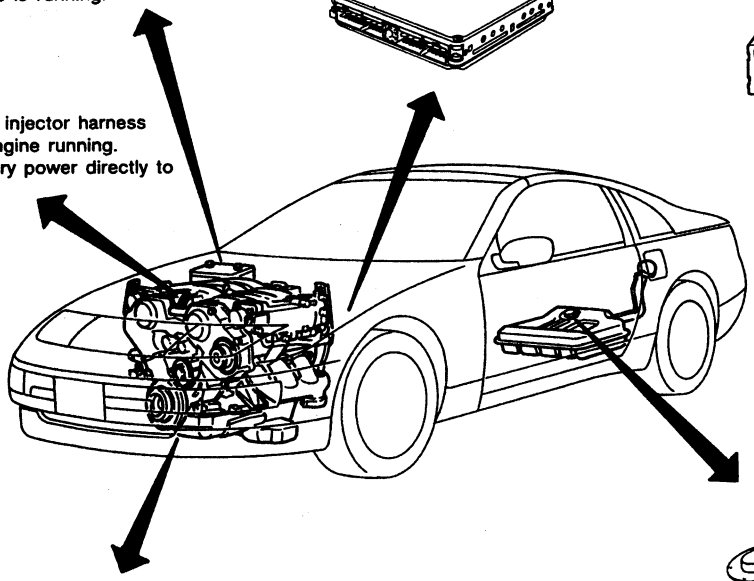
BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

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

ECCS PARTS HANDLING
- Handle air flow meter 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.

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

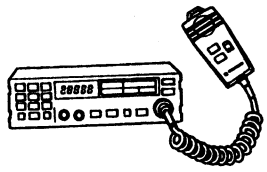


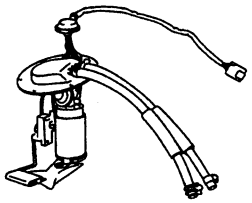


WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

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 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.





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

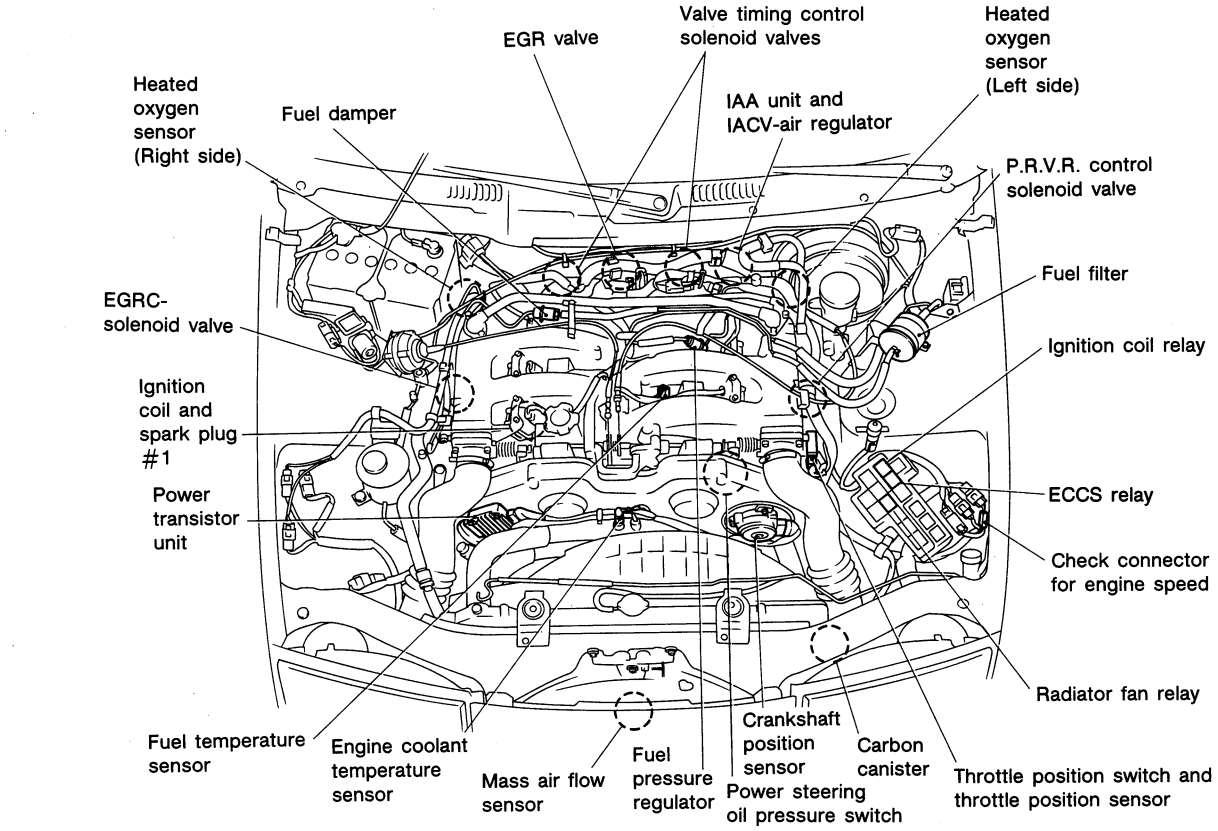
ECCS HARNESS HANDLING
- Securely connect ECCS harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECCS harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECCS system malfunction 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.

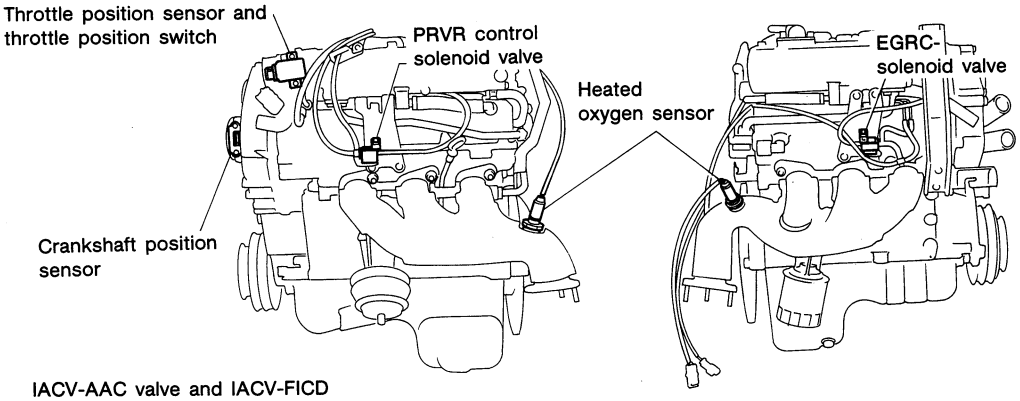
SUPPLEMENTAL RESTRAINT SYSTEM "AIR BAG"
The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a control unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF section** of this Service Manual.
WARNING:
a. To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.
b. Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
c. All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".

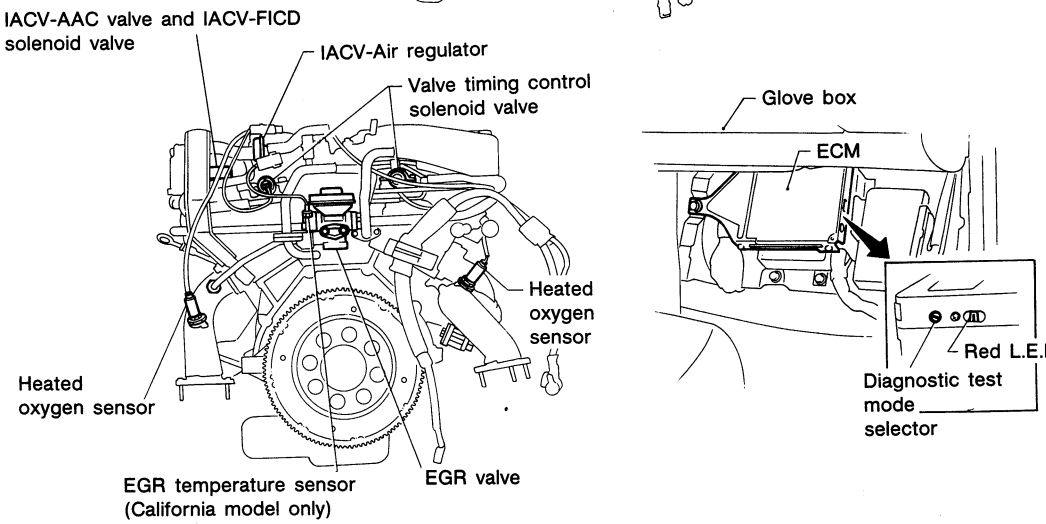
MEF436E

ECCS Component Parts Location

NON-TURBOCHARGER MODEL



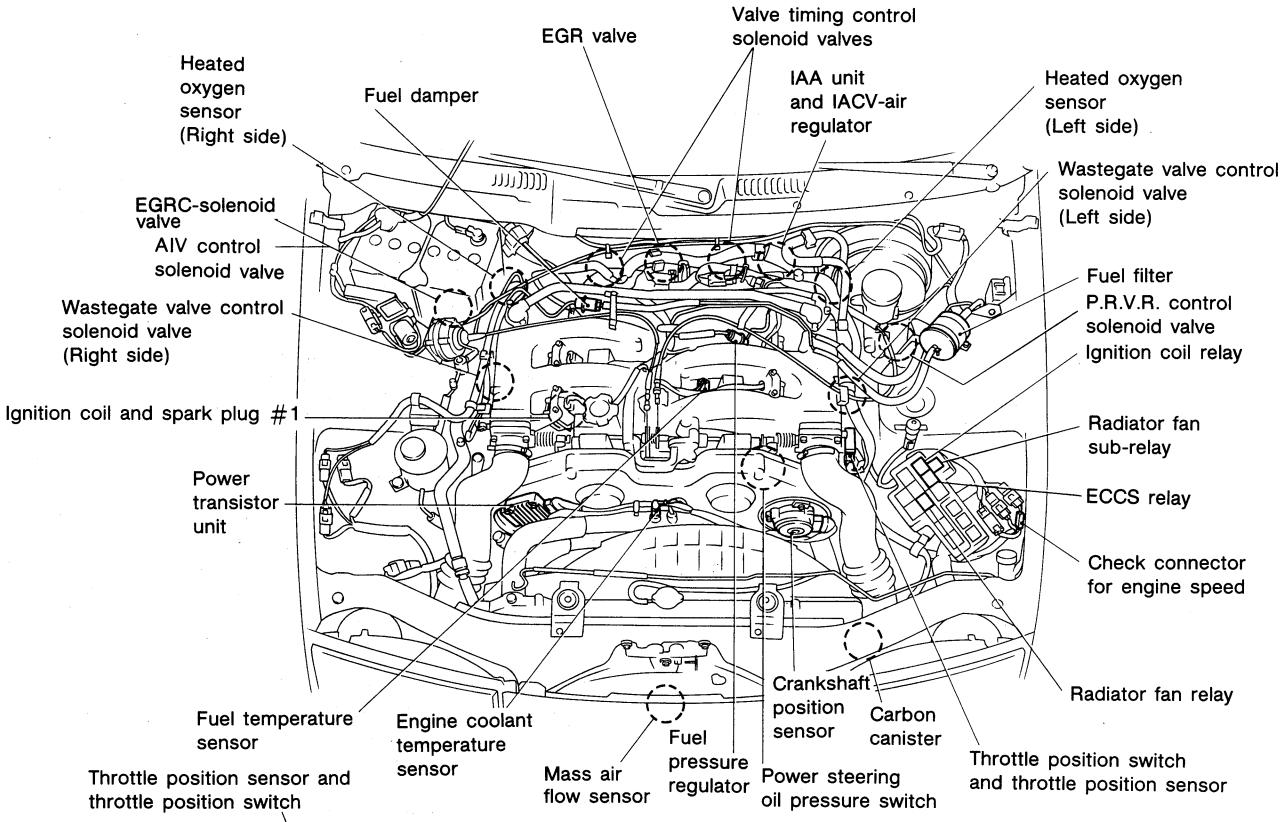


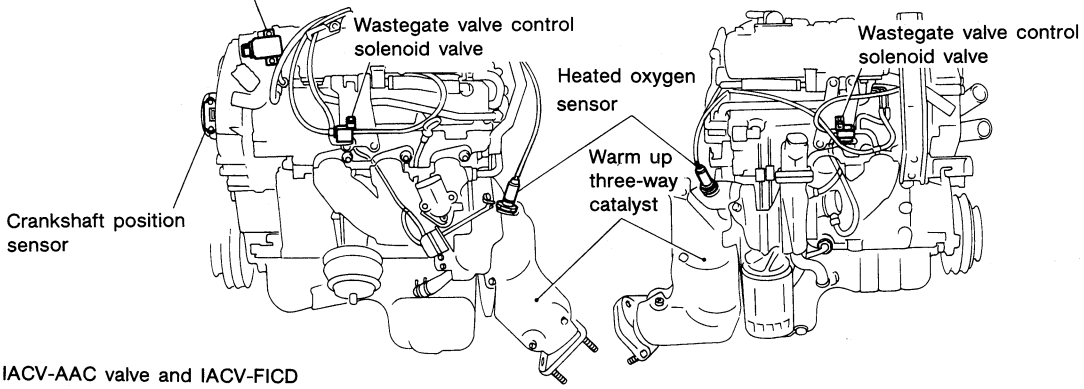


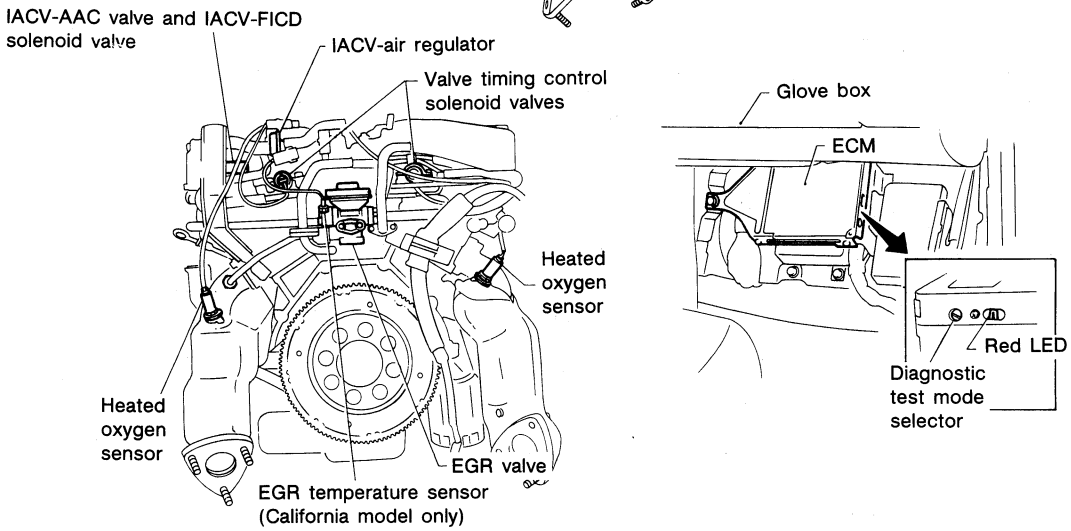
SEF723M

ECCS Component Parts Location (Cont'd)

TURBOCHARGER MODEL



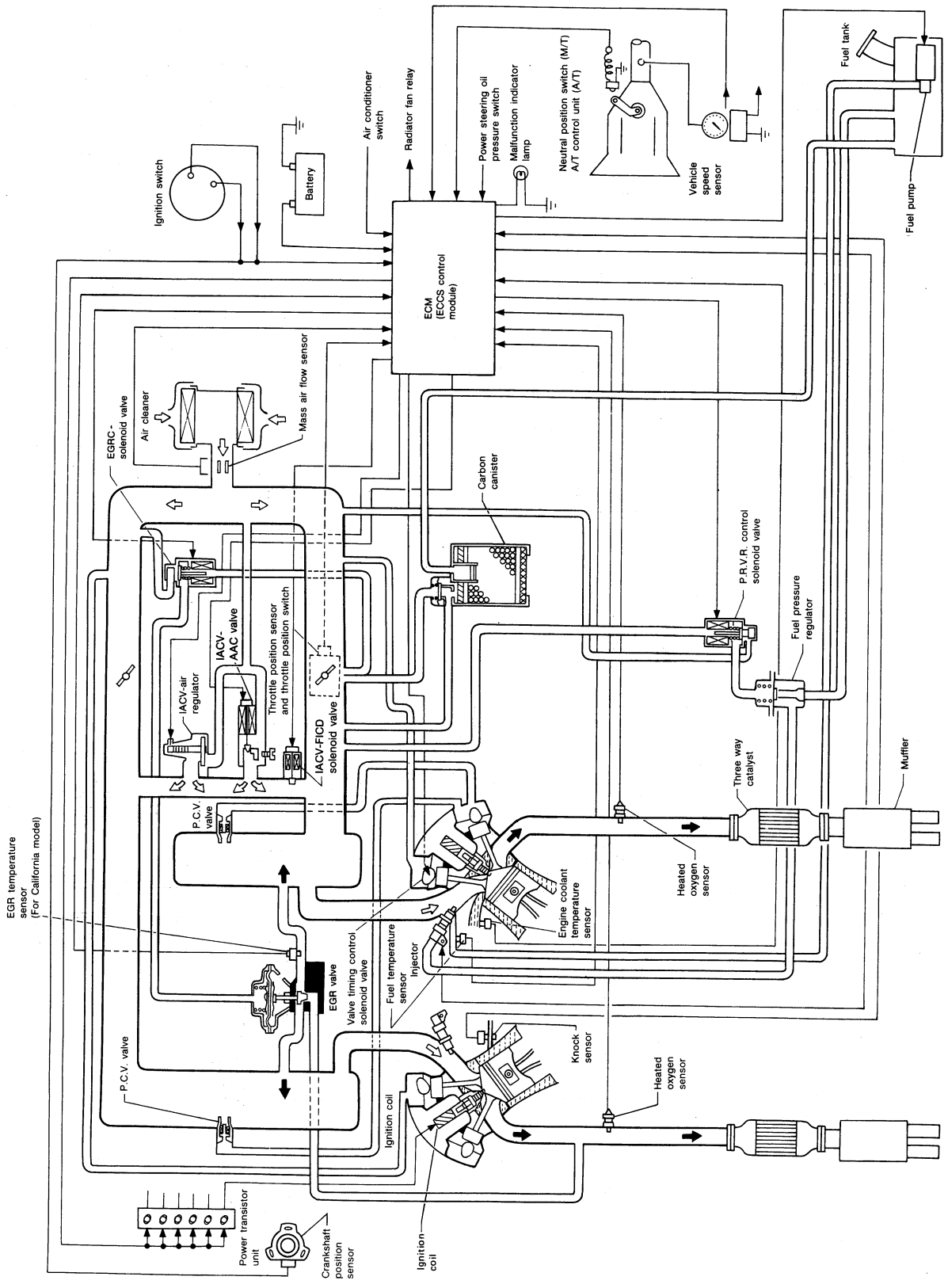




SEF724M

System Diagram

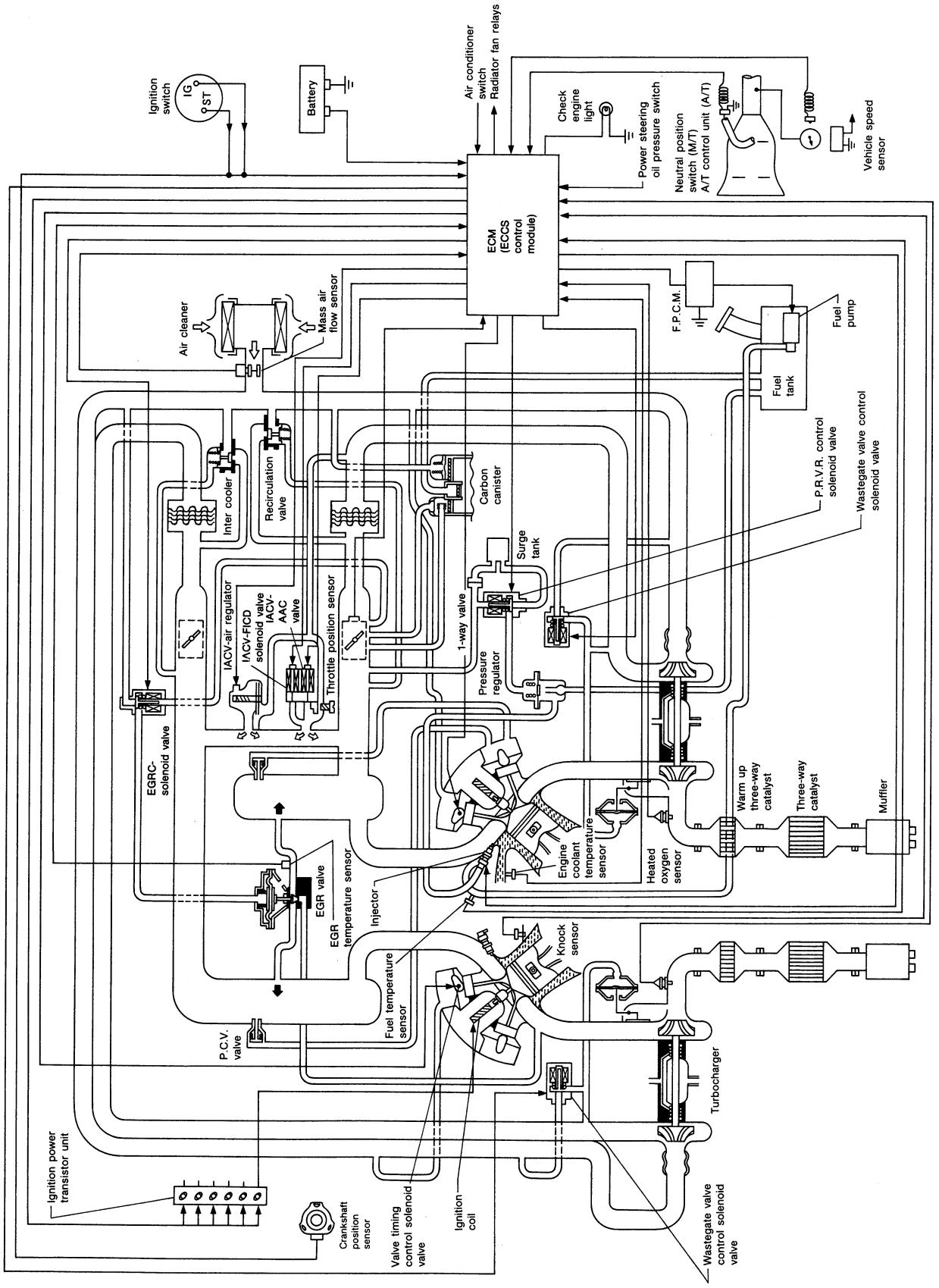
NON-TURBOCHARGER MODEL



SEF738M

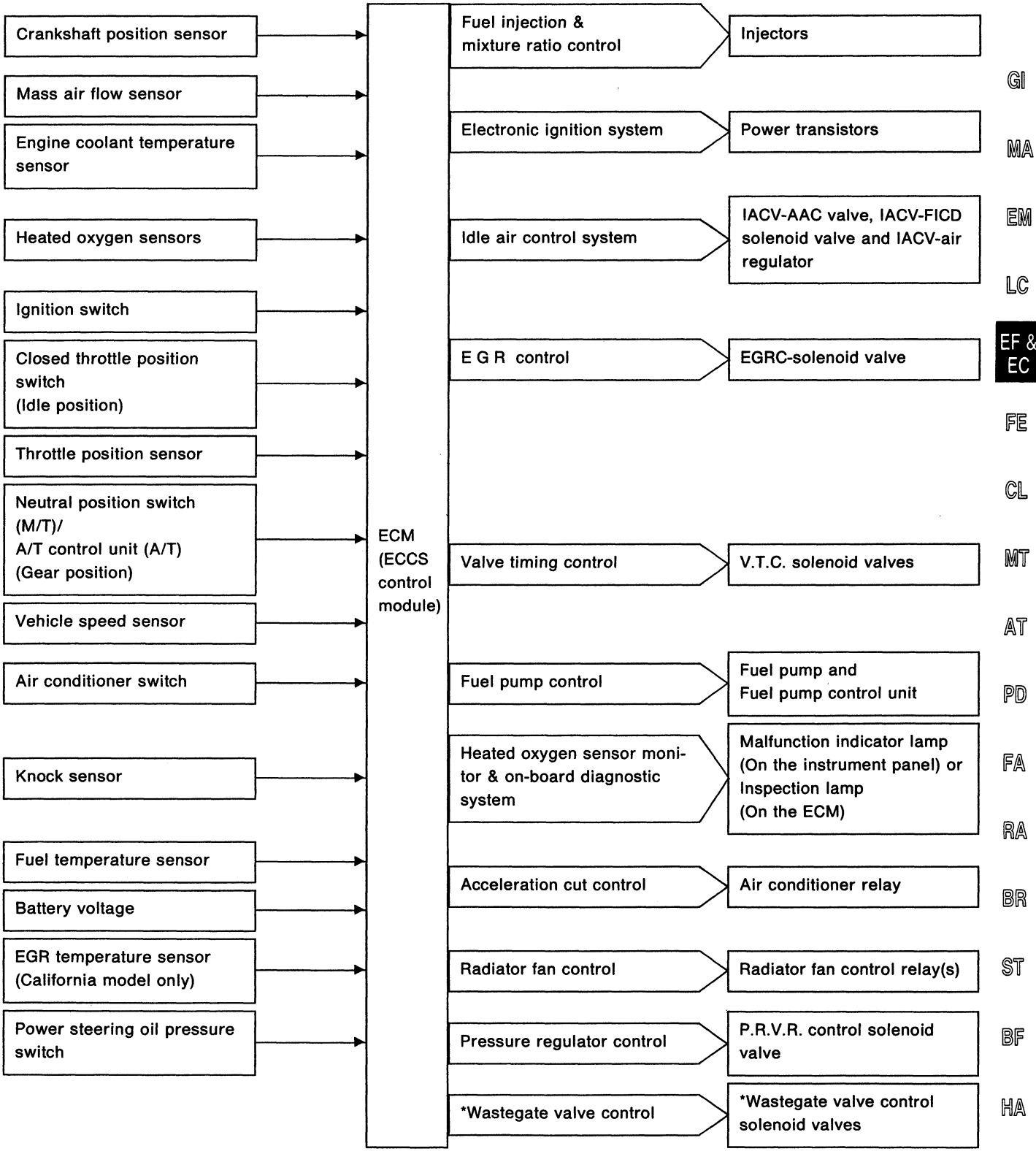
System Diagram (Cont'd)

TURBOCHARGER MODEL



SEF725M

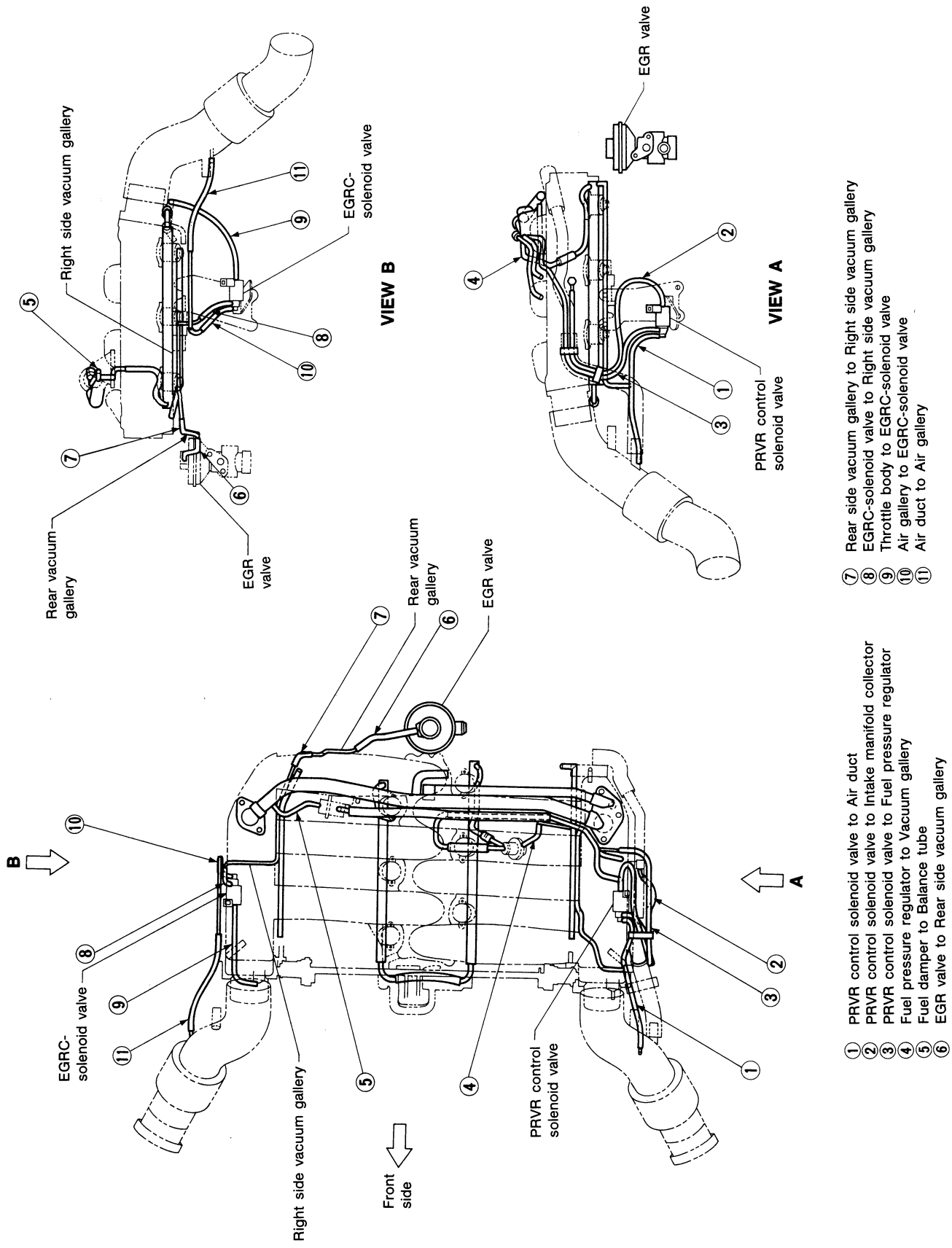
System Chart



* Turbocharger model only

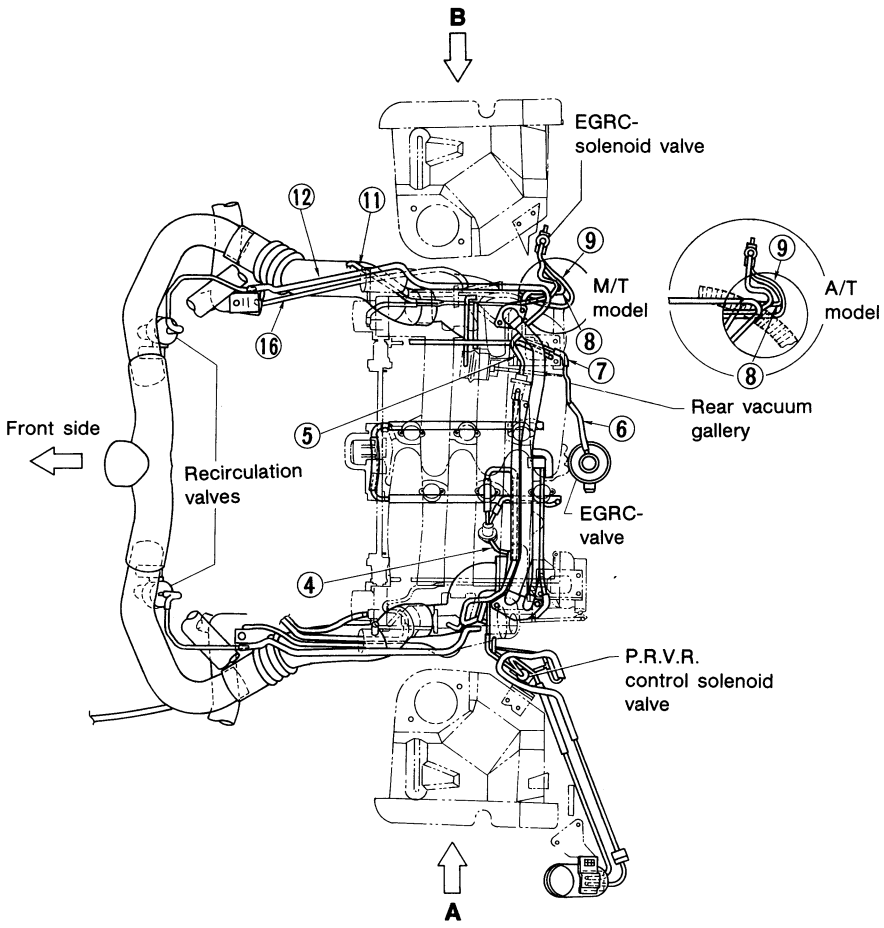
Vacuum Hose Drawing

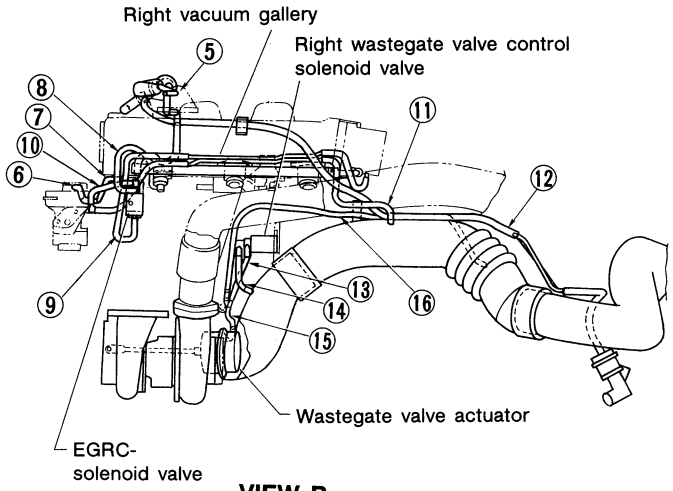
NON-TURBOCHARGER MODEL

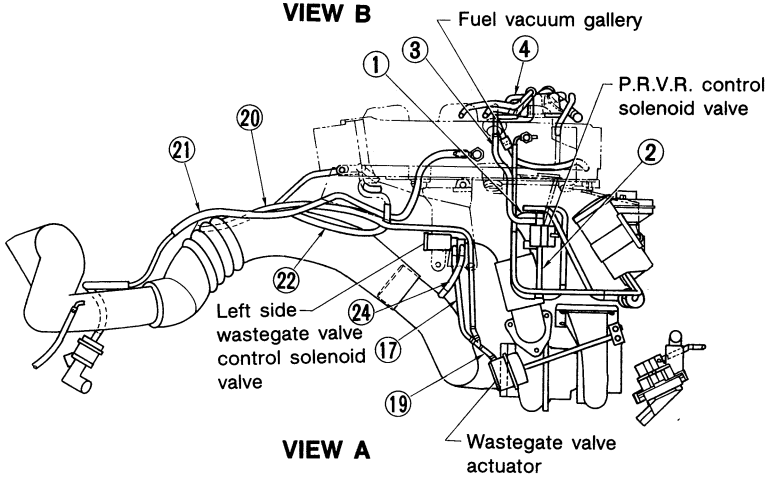


① PRVR control solenoid valve to Air duct
② PRVR control solenoid valve to Intake manifold collector
③ PRVR control solenoid valve to Fuel pressure regulator
④ Fuel pressure regulator to Vacuum gallery
⑤ Fuel damper to Balance tube
⑥ EGR valve to Rear side vacuum gallery
⑦ Rear side vacuum gallery to Right side vacuum gallery
⑧ EGRC-solenoid valve to Right side vacuum gallery
⑨ Throttle body to EGRC-solenoid valve
⑩ Air gallery to EGRC-solenoid valve
⑪ Air duct to Air gallery

SEF739M



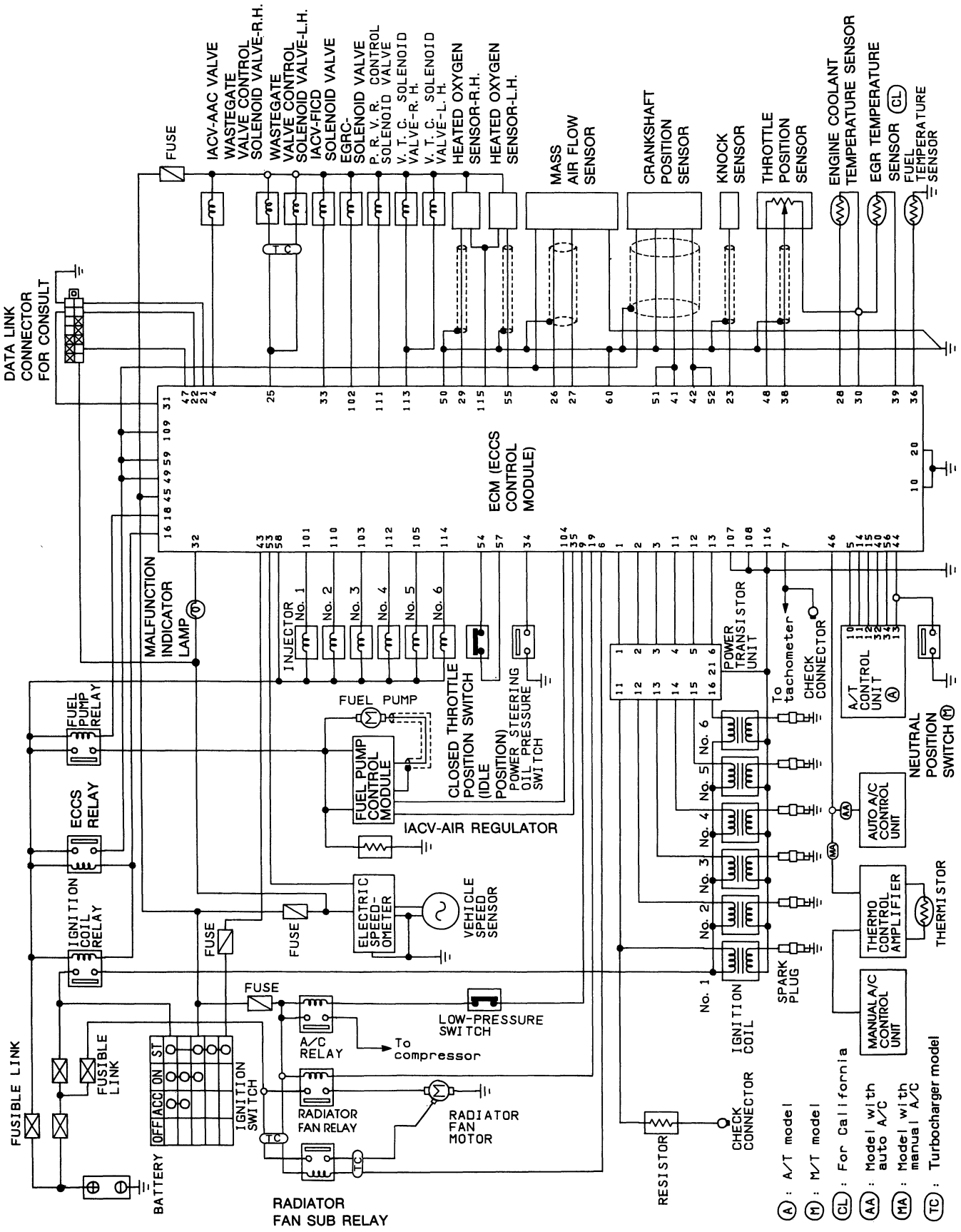




① P.R.V.R. control solenoid valve to Vacuum tank
② P.R.V.R. control solenoid valve to Intake manifold collector
③ P.R.V.R. control solenoid valve to Fuel vacuum gallery
④ Fuel pressure regulator to Fuel vacuum gallery
⑤ Fuel damper to Balance tube
⑥ EGRC-solenoid valve to Rear side vacuum gallery
⑦ Rear side vacuum gallery to Right side vacuum gallery
⑧ EGRC-solenoid valve to Right side vacuum gallery
⑨ Throttle body to EGRC-solenoid valve
⑩ EGRC-solenoid valve to Right side air gallery through 3-way connector
⑪ Air duct to Right side air gallery
⑫ Right side recirculation valve to Intake manifold collector
⑬ Right side wastegate valve control solenoid valve to Air pipe through 3-way connector
⑭ Right side wastegate valve control solenoid valve to Suction pipe
⑮ Right side wastegate valve actuator to Air pipe through 3-way connector
⑯ Air pipe to 3-way connector (For right side wastegate valve control)
⑰ Left side wastegate valve control solenoid valve to Air pipe through 3-way connector
⑱ Left side wastegate valve control solenoid valve to Suction pipe
⑲ Left side wastegate valve actuator to Air pipe through 3-way connector
⑳ Air pipe to 3-way connector (For left side wastegate valve control)
㉑ Left side recirculation valve to Intake manifold collector
㉒ Canister purge line

SEF726M

Circuit Diagram



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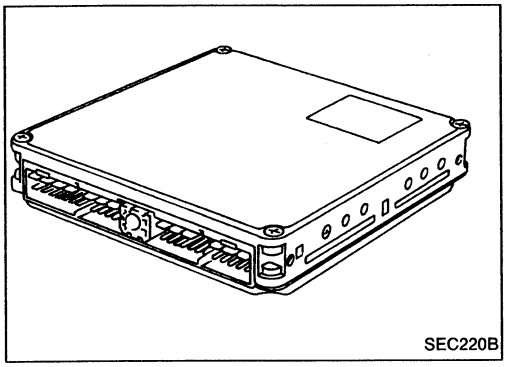
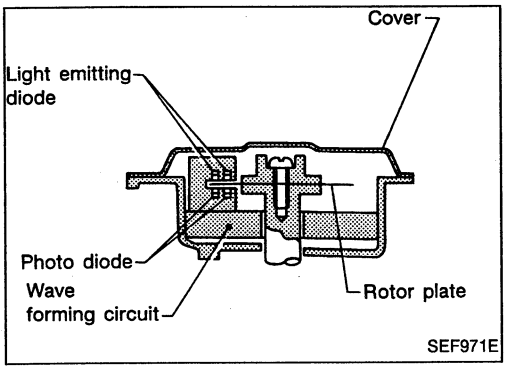

SEC220B

Engine Control Module (ECM)-ECCS Control Module

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

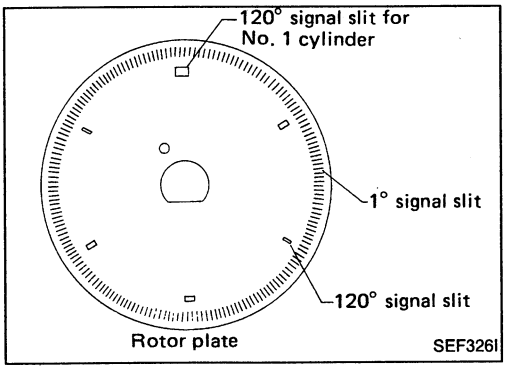


SEF971E

Crankshaft Position Sensor (CKPS)

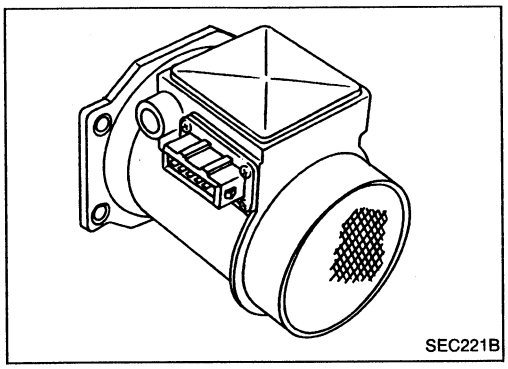
The crankshaft position sensor is a basic component of the ECCS. It monitors engine speed and piston position, and sends signals to the ECM to control fuel injection, ignition timing and other functions.

The crankshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 6 slits for 120° signal. Light Emitting Diodes (L.E.D.) and photo diodes are built in the wave-forming circuit.



SEF326I

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.

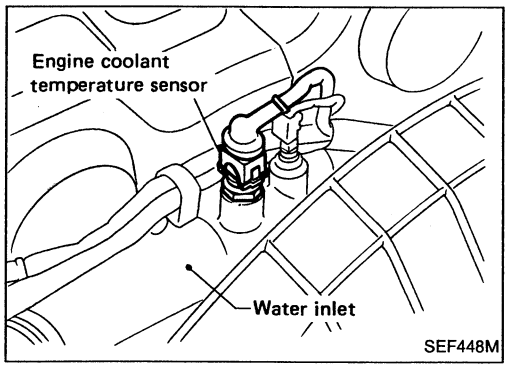

SEC221B

Mass Air Flow Sensor (MAFS)

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

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

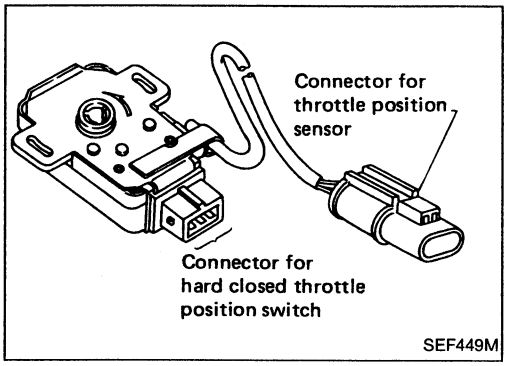
Therefore, it is necessary to supply the hot film with more electric current in order to maintain the temperature of the hot film. The ECM detects the air flow by means of this current change.



Engine Coolant Temperature Sensor (ECTS)

The engine coolant temperature sensor, located on the top of water inlet housing, detects engine coolant temperature and transmits a signal to the ECM.

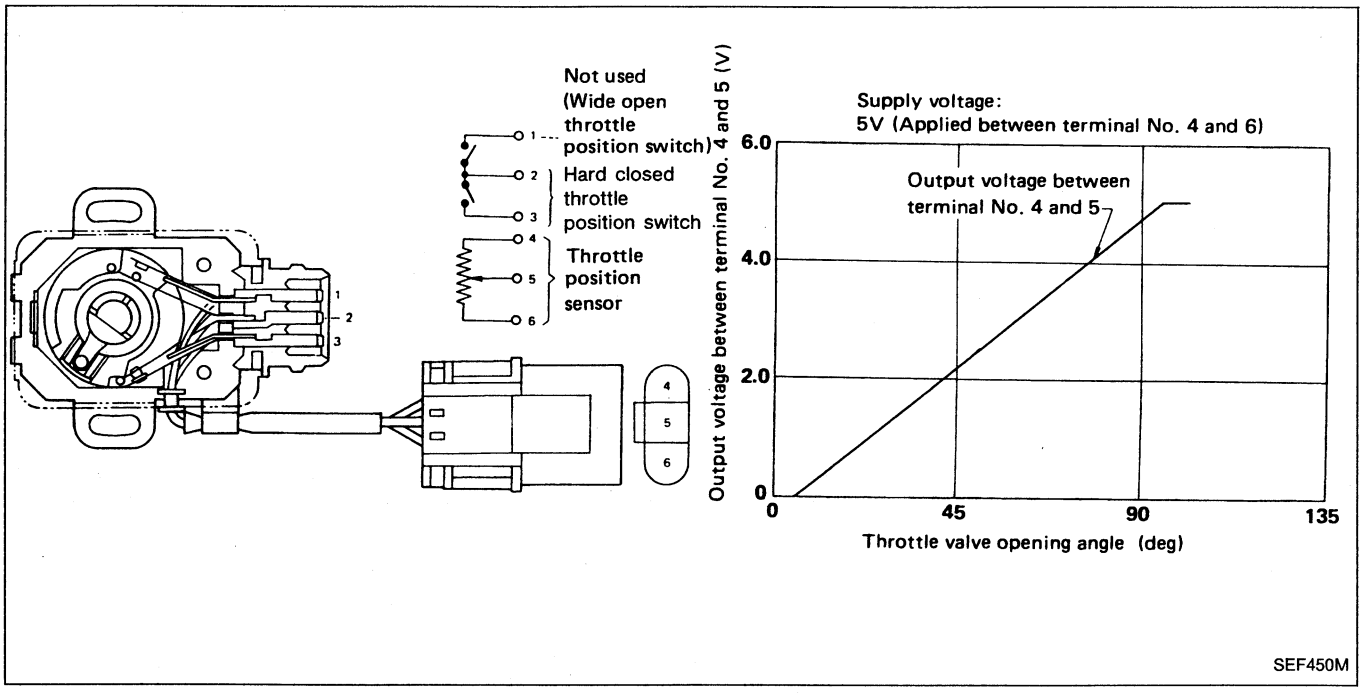
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

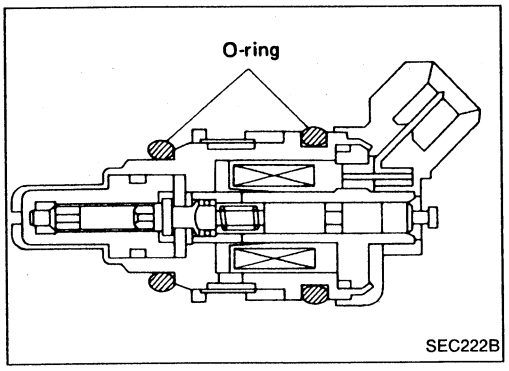


Throttle Position Sensor (TP) & Soft/Hard Closed Throttle Position (CTP) Switch

The throttle position sensor responds to 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.

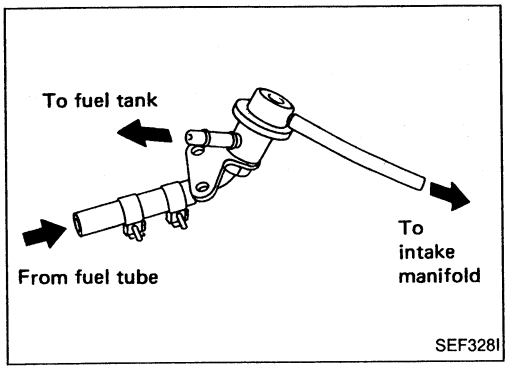
Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This system is called "soft closed throttle position switch". It controls engine operation such as fuel cut. On the other hand, "hard closed throttle position switch", which is built in the throttle position sensor unit, is used for engine control when soft closed throttle position switch is malfunctioning.





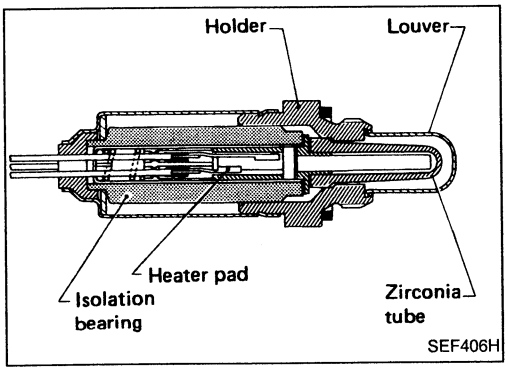
Fuel Injector

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.



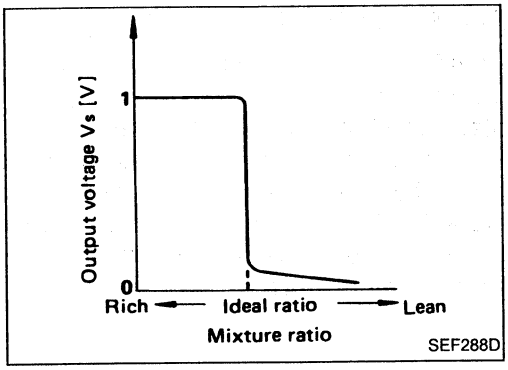
Pressure Regulator

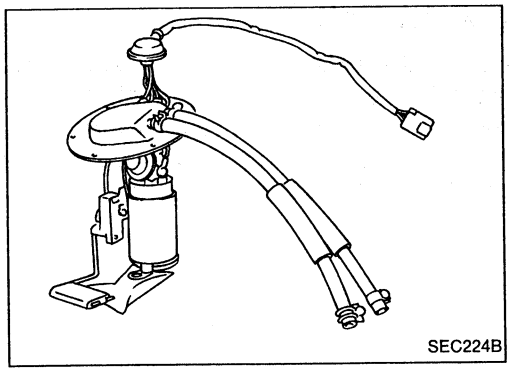
The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



Heated Oxygen Sensor (HO2S)

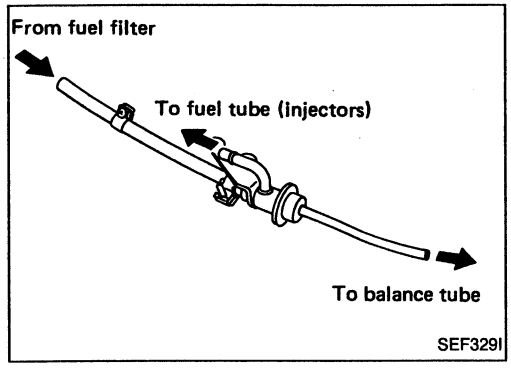
The heated oxygen sensor, which is placed into the exhaust outlet, monitors the amount of oxygen in the exhaust gas.
The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares 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.





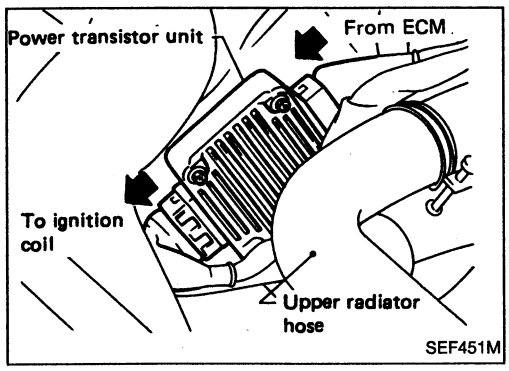
Fuel Pump

The fuel pump is an in-tank type with a fuel damper. Both the pump and damper are located in the fuel tank.



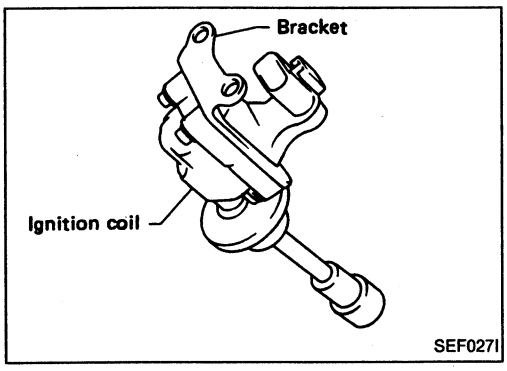
Fuel Damper

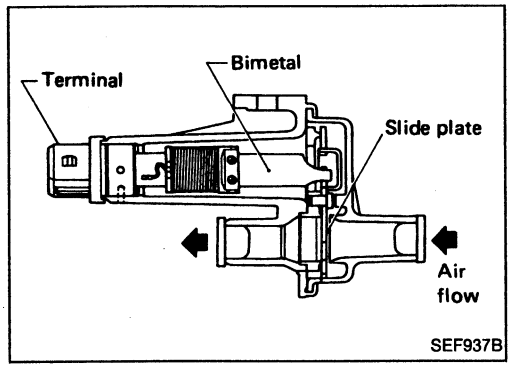
The fuel damper, which consists of a diagram, reduces fuel pressure pulsation in the fuel feed line between the fuel filter and injectors.



Power Transistor Unit & Ignition Coil

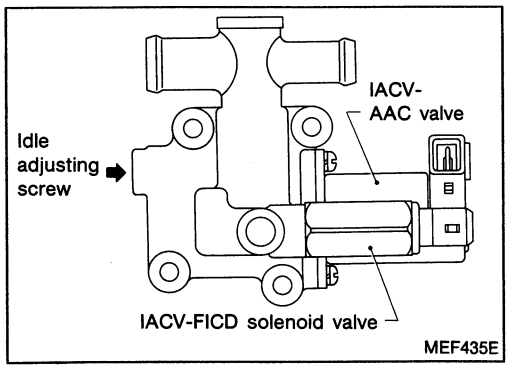
The ignition signal from the ECM is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.





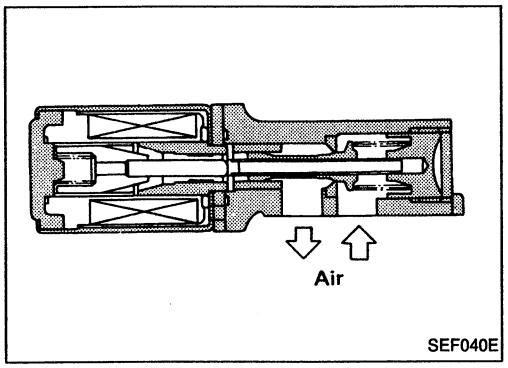
Idle Air Control Valve (IACV)-Air Regulator

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.



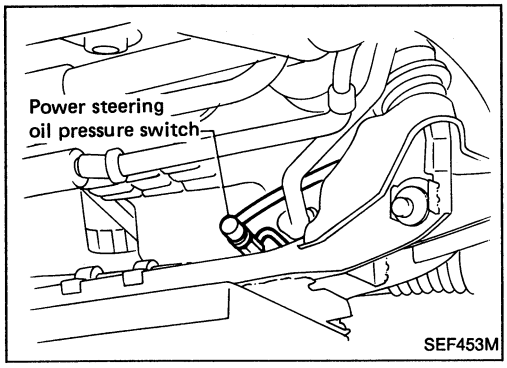
Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the IACV-AAC valve, IACV-FICD solenoid valve and idle adjust screw. It receives the signal from the ECM and controls the idle speed at the preset value.
The IACV-FICD solenoid valve compensates for changes in idle speed caused by the operation of the air compressor.



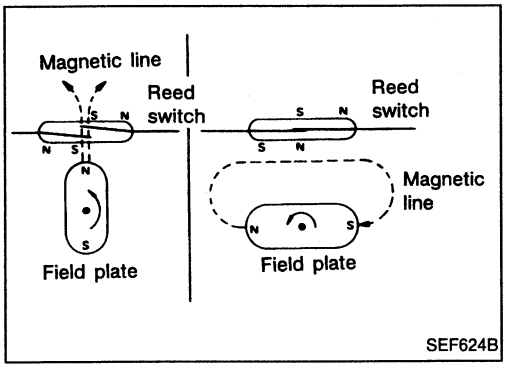
Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve

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.



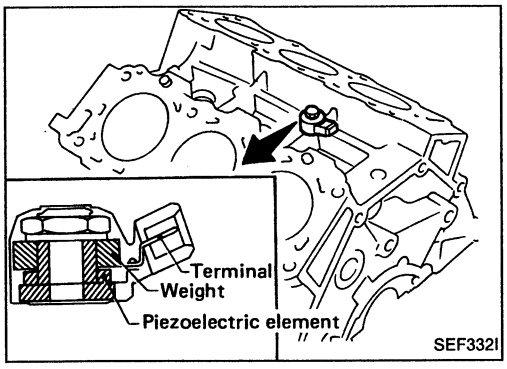
Power Steering Oil Pressure Switch

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.



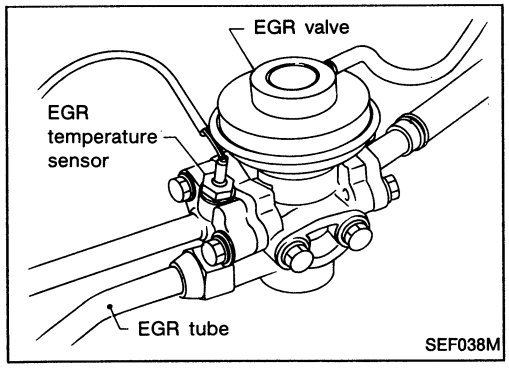
Vehicle Speed Sensor (VSS)

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.



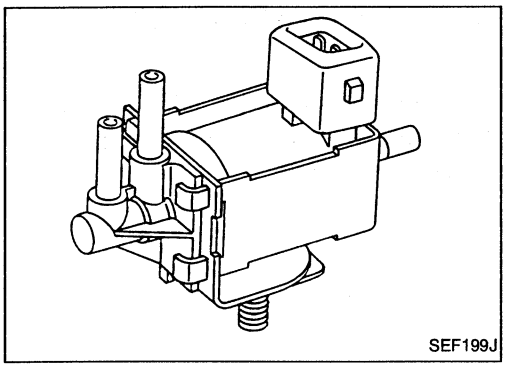
Knock Sensor (KS)

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 sent to the ECM.



Exhaust Gas Recirculation (EGR) Valve

The EGR valve controls the quantity of exhaust gas to be diverted to the intake manifold through vertical movement of a taper valve connected to the diaphragm. Vacuum is applied to the diaphragm in response to the opening of the throttle valve.

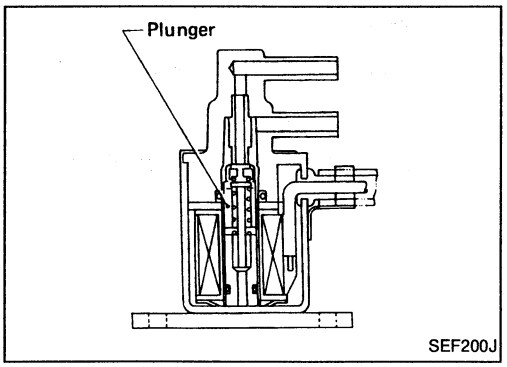

SEF199J

EGR Control (EGRC)-Solenoid Valve

The solenoid valve responds to the ON/OFF signal from the ECM. When it is off, a vacuum signal from the throttle body is fed into the EGR valve. When the ECM sends an ON signal, the coil pulls the plunger downward and cuts the vacuum signal.

Pressure Regulator Vacuum Relief (P.R.V.R.) Control Solenoid Valve

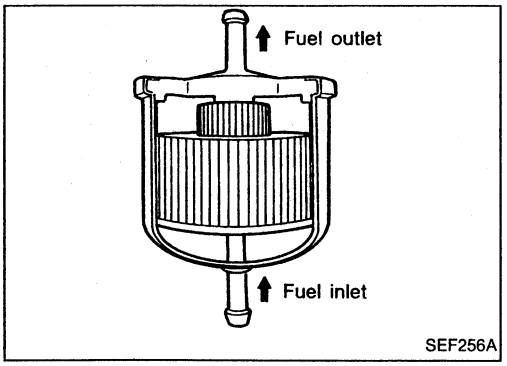
The solenoid valve responds to the ON/OFF signal from the ECM. When it is off, a vacuum signal from the intake manifold is fed into the pressure regulator. When the ECM sends an ON signal, the coil pulls the plunger downward and cuts the vacuum signal.



SEF200J

Wastegate Valve Control Solenoid Valve

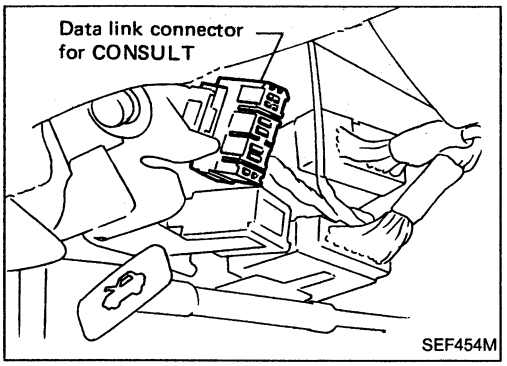
The solenoid valve responds to the ON/OFF signal from the ECM. When it is ON, a vacuum signal from the suction pipe or compressor outlet is fed into the wastegate valve actuator. The actuator is hard to open at this time. When the control module sends an OFF signal, the coil pulls the plunger upward and cuts the route to the suction pipe.



SEF256A

Fuel Filter

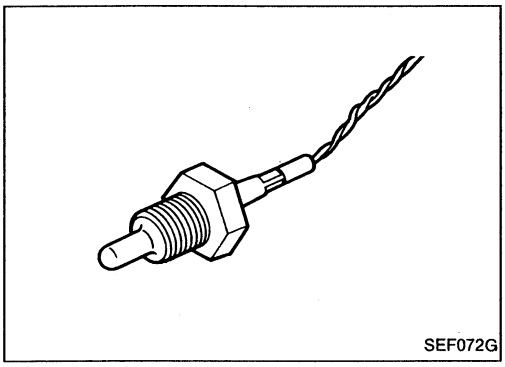
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



SEF454M

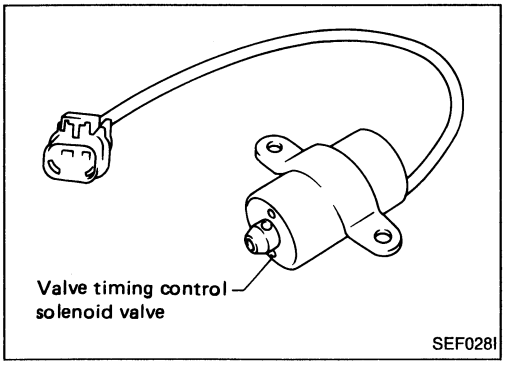
Data Link Connector for CONSULT

The data link connector for CONSULT is located above the hood release handle.


SEF072G

EGR Temperature Sensor

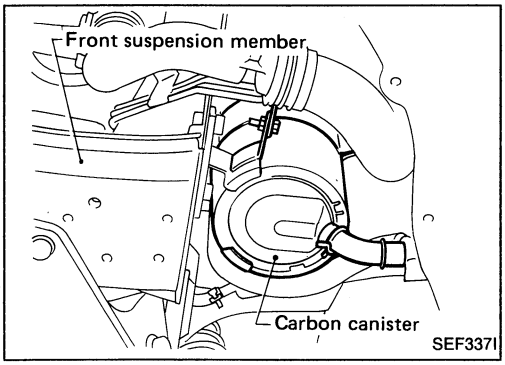
The EGR temperature sensor monitors the exhaust gas temperature and transmits a signal to the ECM. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.



SEF028I

Valve Timing Control Solenoid Valve

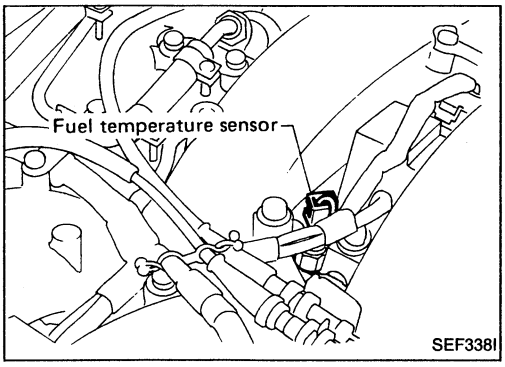
The valve timing control solenoids are installed at the rear end of the intake camshafts, and control oil pressure which regulates the position of the intake camshafts.



SEF337I

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.



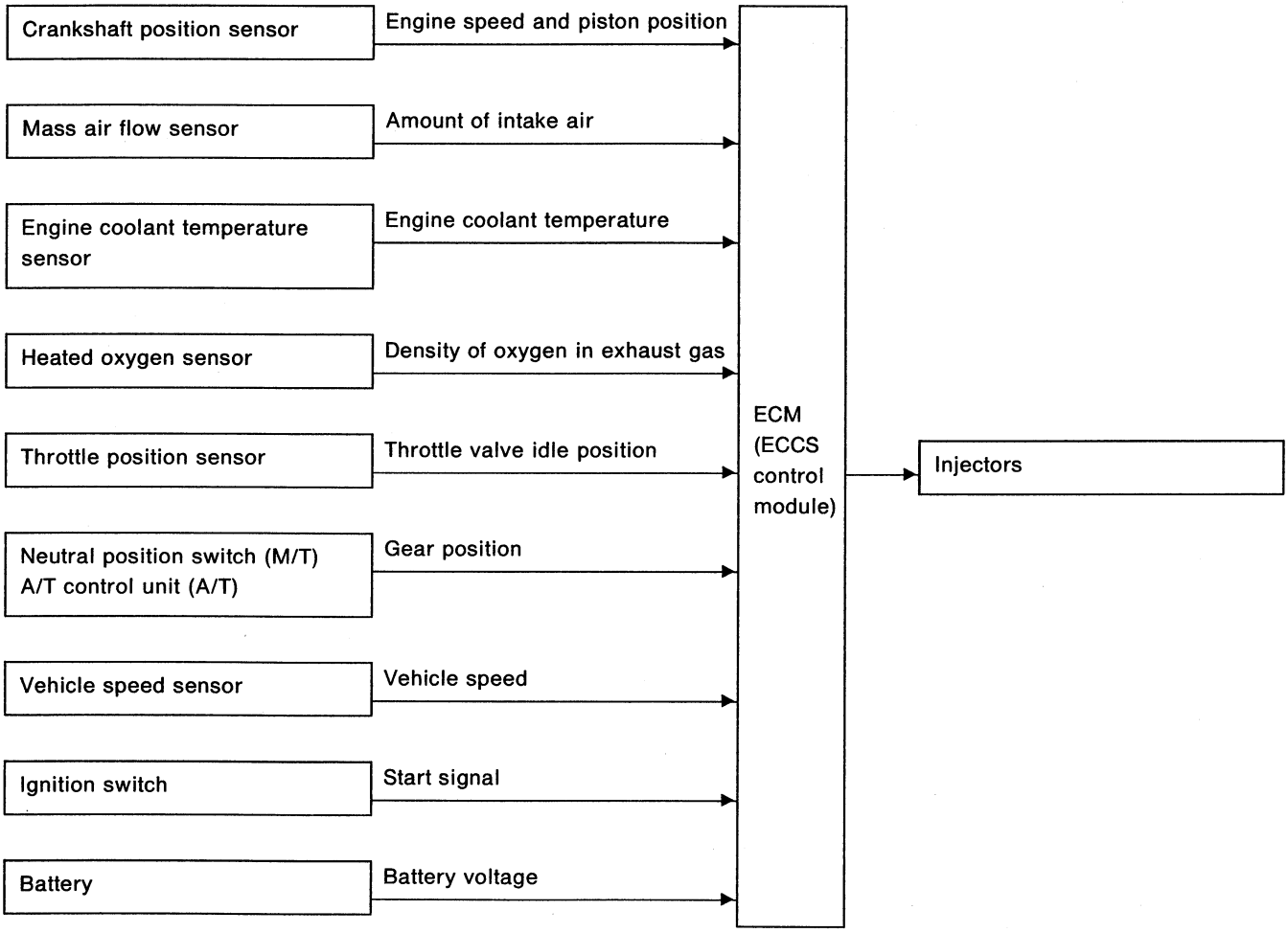
SEF338I

Fuel Temperature Sensor

The fuel temperature sensor, built into the fuel tube, senses fuel temperature. When the fuel temperature is higher than specified, the ECM (ECCS control module) turns the P.R.V.R. control solenoid valve ON and raises fuel pressure.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPORT 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.

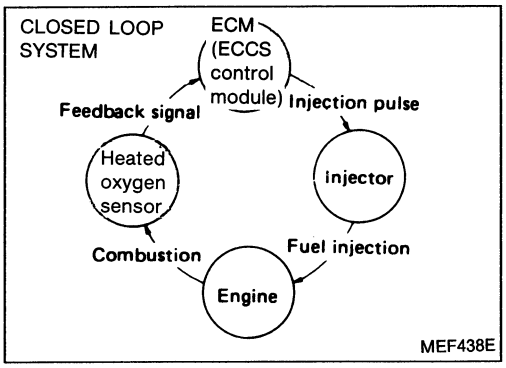
<Fuel increase>

1) During warm-up
2) When starting the engine
3) During acceleration
4) Hot-engine operation

<Fuel decrease>

1) During deceleration

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



MIXTURE RATIO FEEDBACK CONTROL

The mixture ratio feedback system is used for precise control of 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.

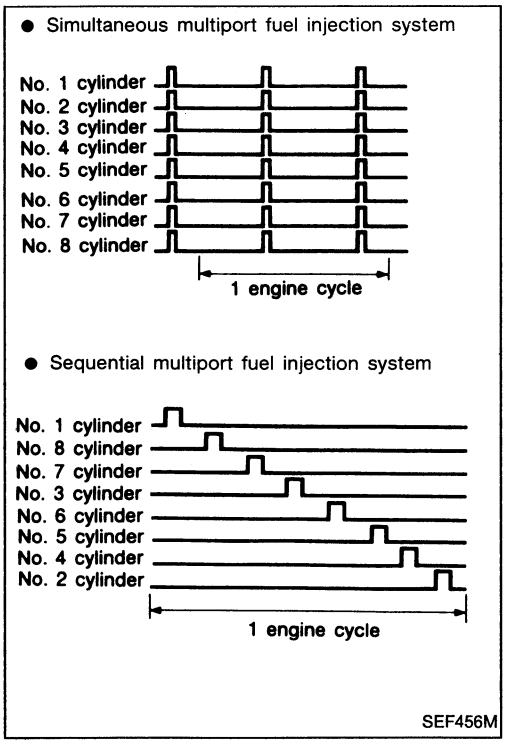
This stage refers to the closed loop control condition. The open loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

1) Deceleration
2) High-load, high-speed 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) Heated oxygen sensor high output voltage

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 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 six cylinders simultaneously twice each engine cycle.

In other words, pulse signals of the same width are simultaneously transmitted from the ECM to the six 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.

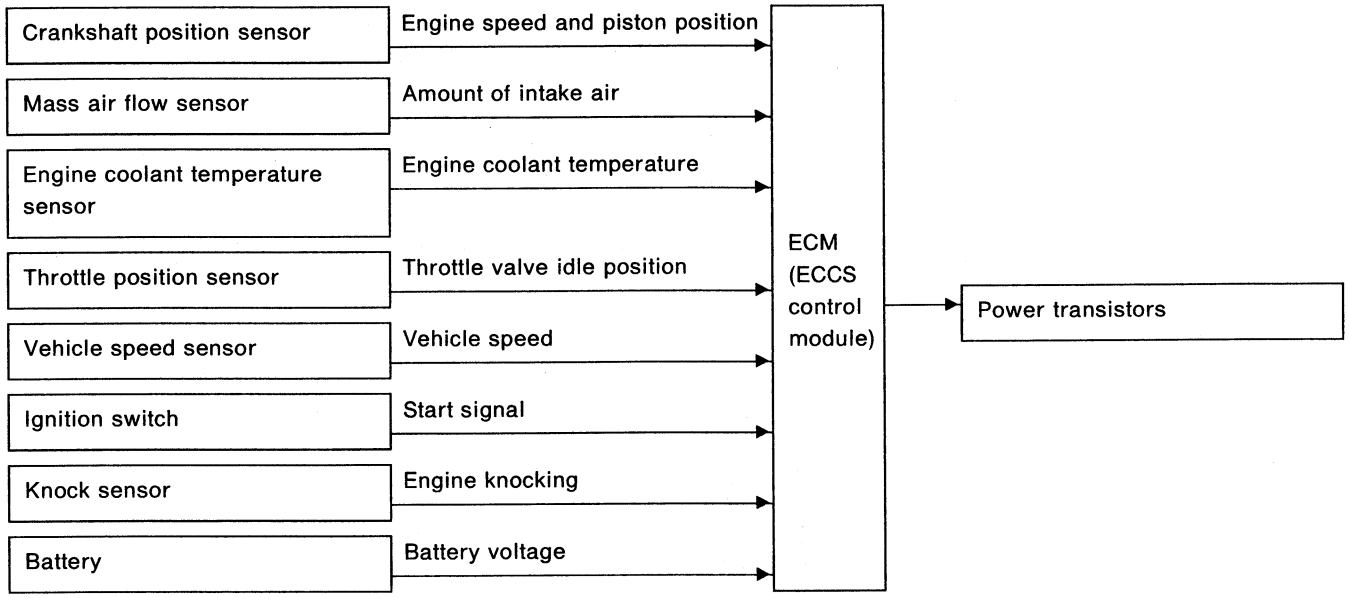
When engine is starting, fuel is injected into all six cylinders simultaneously twice per cycle.

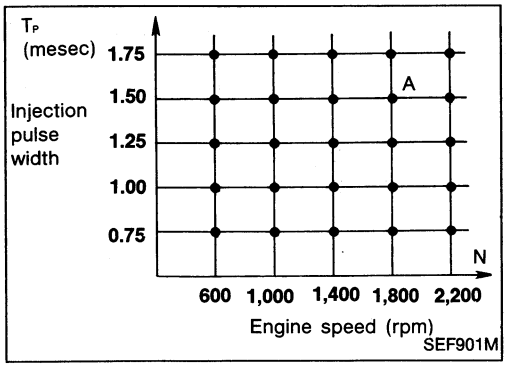
FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or high-speed operation.

Electronic Ignition (EI) 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. This data forms the map shown below.

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 low battery voltage

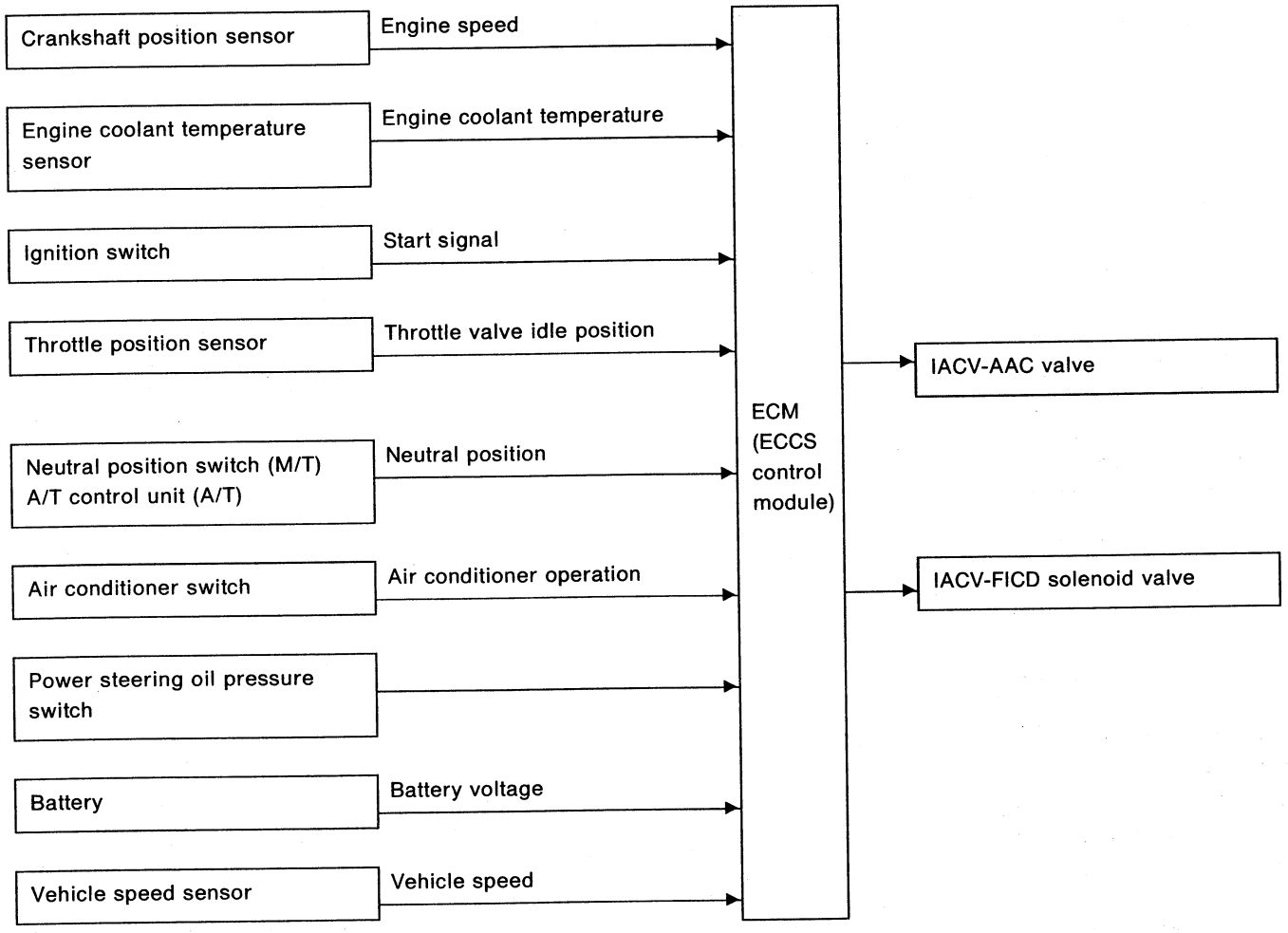
the ignition timing is revised by the ECM according to the other data stored in the ECM.

The retard system, actuated by the 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 eliminate the knocking condition.

Idle Air Control (IACV) System

INPUT/OUTPUT SIGNAL LINE

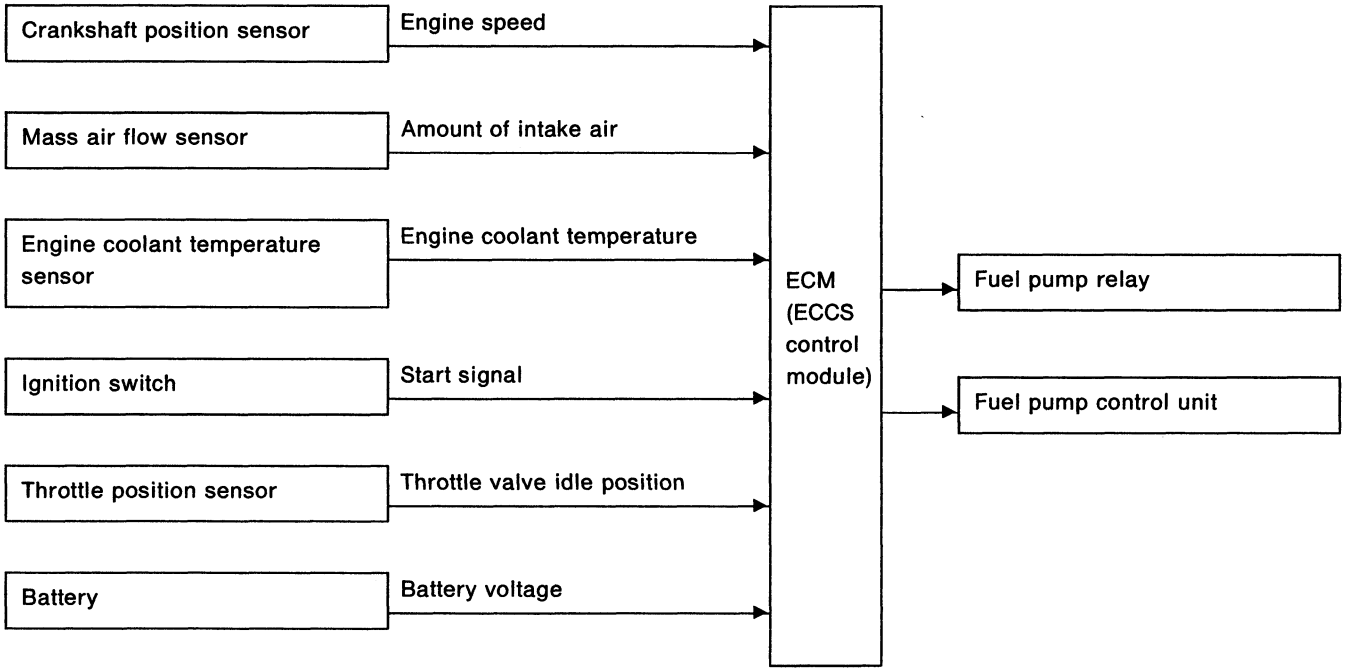


SYSTEM DESCRIPTION

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 noise and vibration transmitted to the vehicle interior, fuel consumption, and engine load.

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

Fuel pump and IACV-air regulator ON-OFF control

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine start-up. If the ECM receives a 1° signal from the crankshaft position sensor, it knows that the engine is rotating, and causes the pump to activate. If the 1° 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 1 second
Engine running and cranking	Operates
When engine is stopped	Stops in 1.5 seconds
Except as shown above	Stops

Fuel pump voltage control

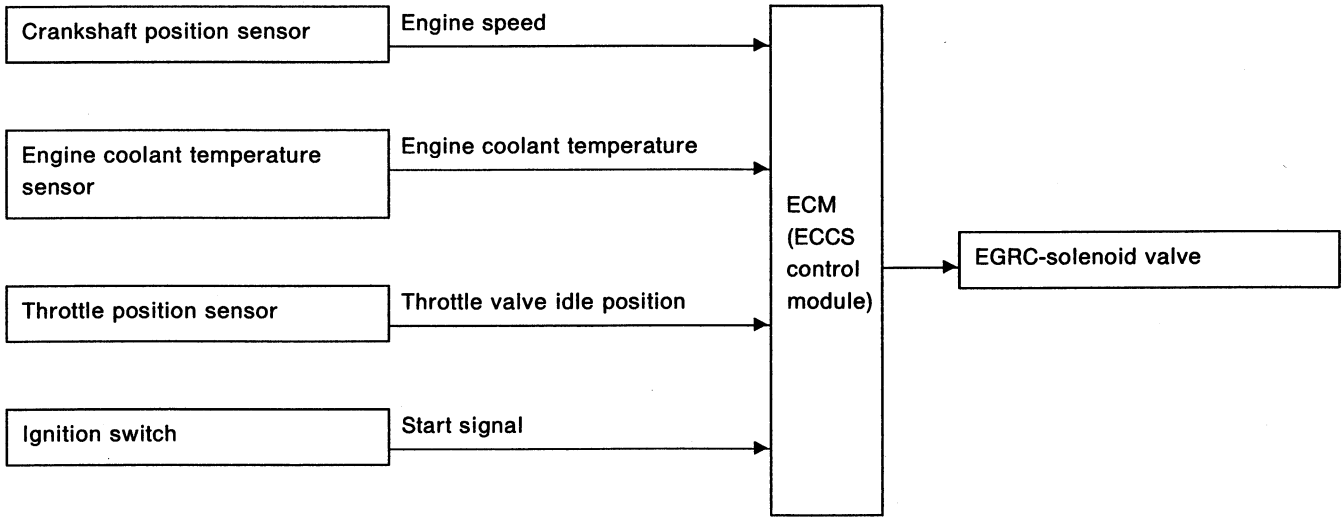
The fuel pump is controlled by the fuel pump control unit adjusting the voltage supplied to the fuel pump.

Conditions	Supplied voltage	
	Turbocharger model	Non-turbocharger model
• 1 second after ignition switch is turned ON • Engine cranking • 30 (*NA)/5 (**TC) seconds after engine start [above 50°C (122°F)] • Engine coolant temperature below 0°C (32°F) • Engine is running under heavy load conditions	Battery voltage	Battery voltage
• Engine is running under middle load conditions	Approx. 7V	Battery voltage
• Except the above	Approx. 6V	Approx. 8V

*NA: Non-turbocharger model **TC: Turbocharger model

Exhaust Gas Recirculation (EGR) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

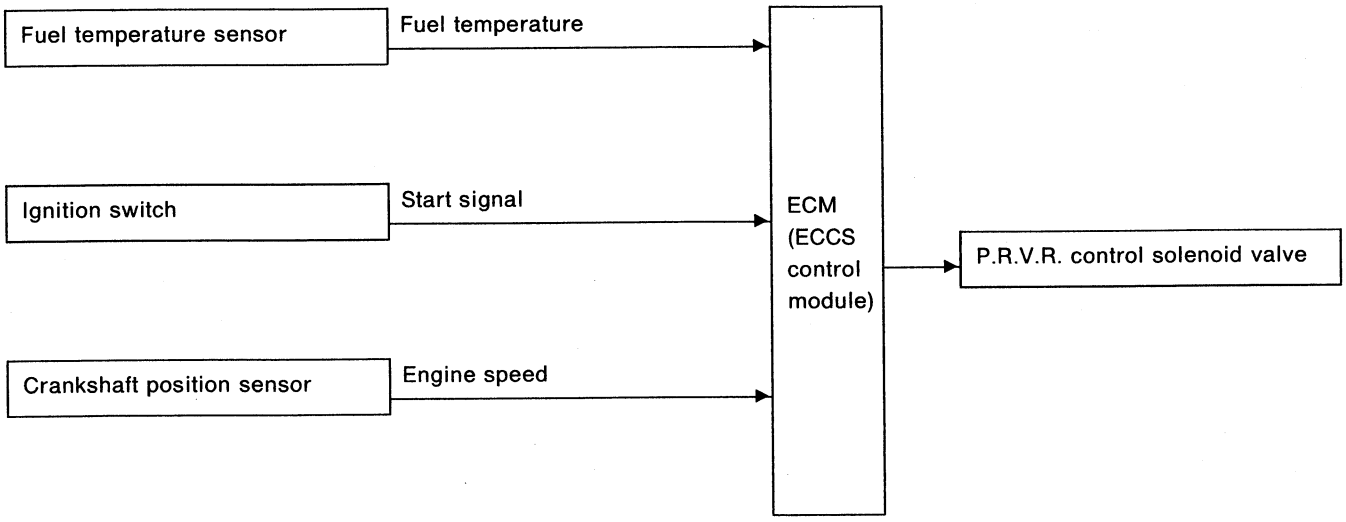
In addition, a system is provided which precisely cuts and controls port vacuum applied to the EGR valve to suit engine operating conditions.
This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve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

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

1) Low engine coolant temperature
2) Engine starting
3) High-speed engine operation
4) Engine idling
5) Excessively high engine coolant temperature

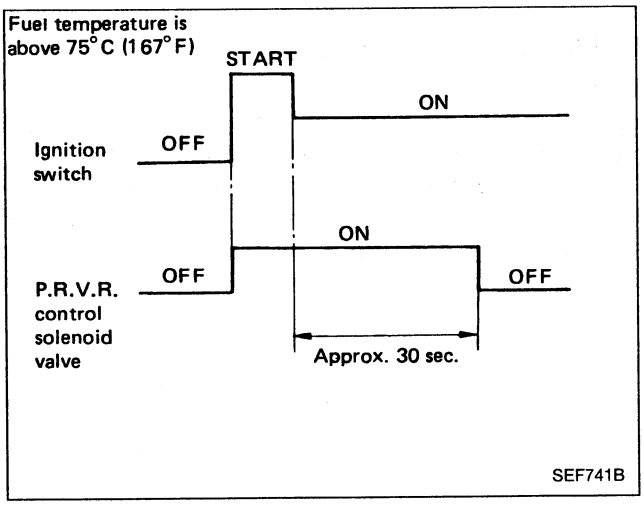
Fuel Pressure Regulator Control

INPUT/OUTPUT SIGNAL LINE



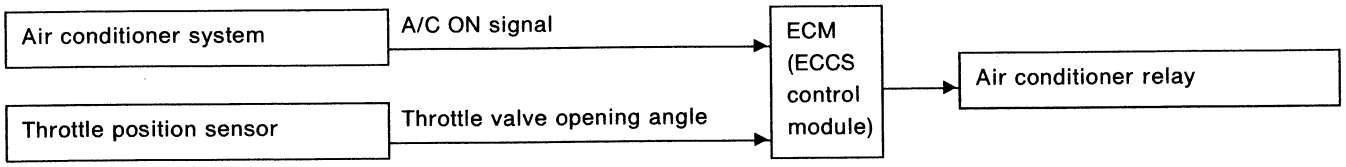
SYSTEM DESCRIPTION

The fuel "pressure-up" control system briefly increases fuel pressure for improved starting performance of a hot engine. Under normal operating conditions, manifold vacuum is applied to the fuel pressure regulator. When starting the engine, however, the ECM allows current to flow through the ON/OFF solenoid valve in the control vacuum line, opening this line to the atmosphere. As a result, atmospheric pressure is applied, restricting the fuel return line so as to increase fuel pressure.



Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



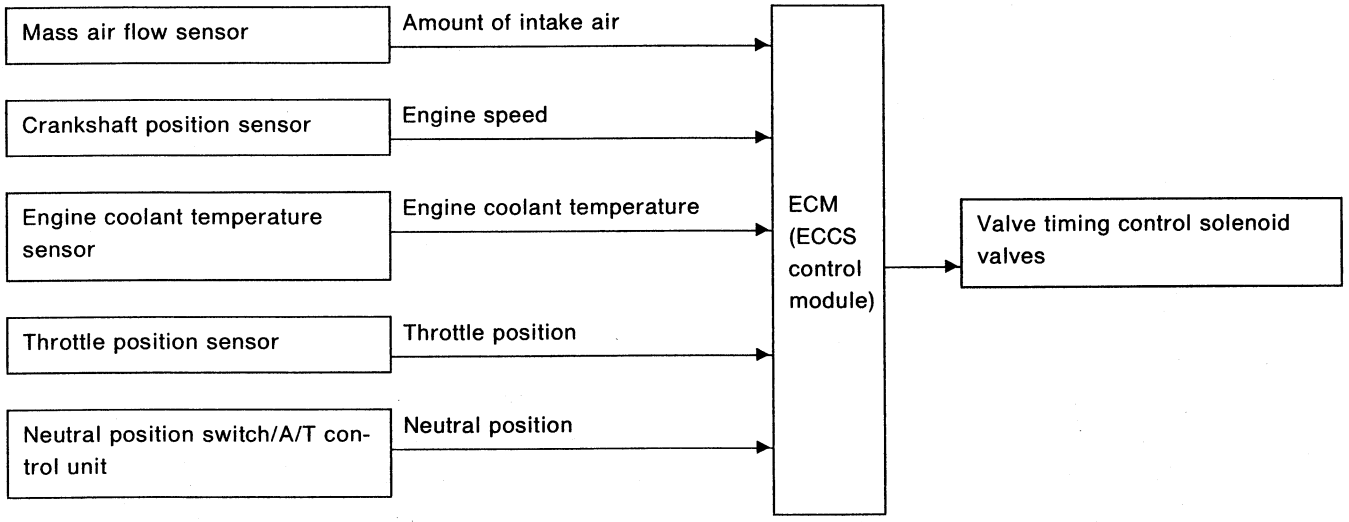
SYSTEM DESCRIPTION

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.

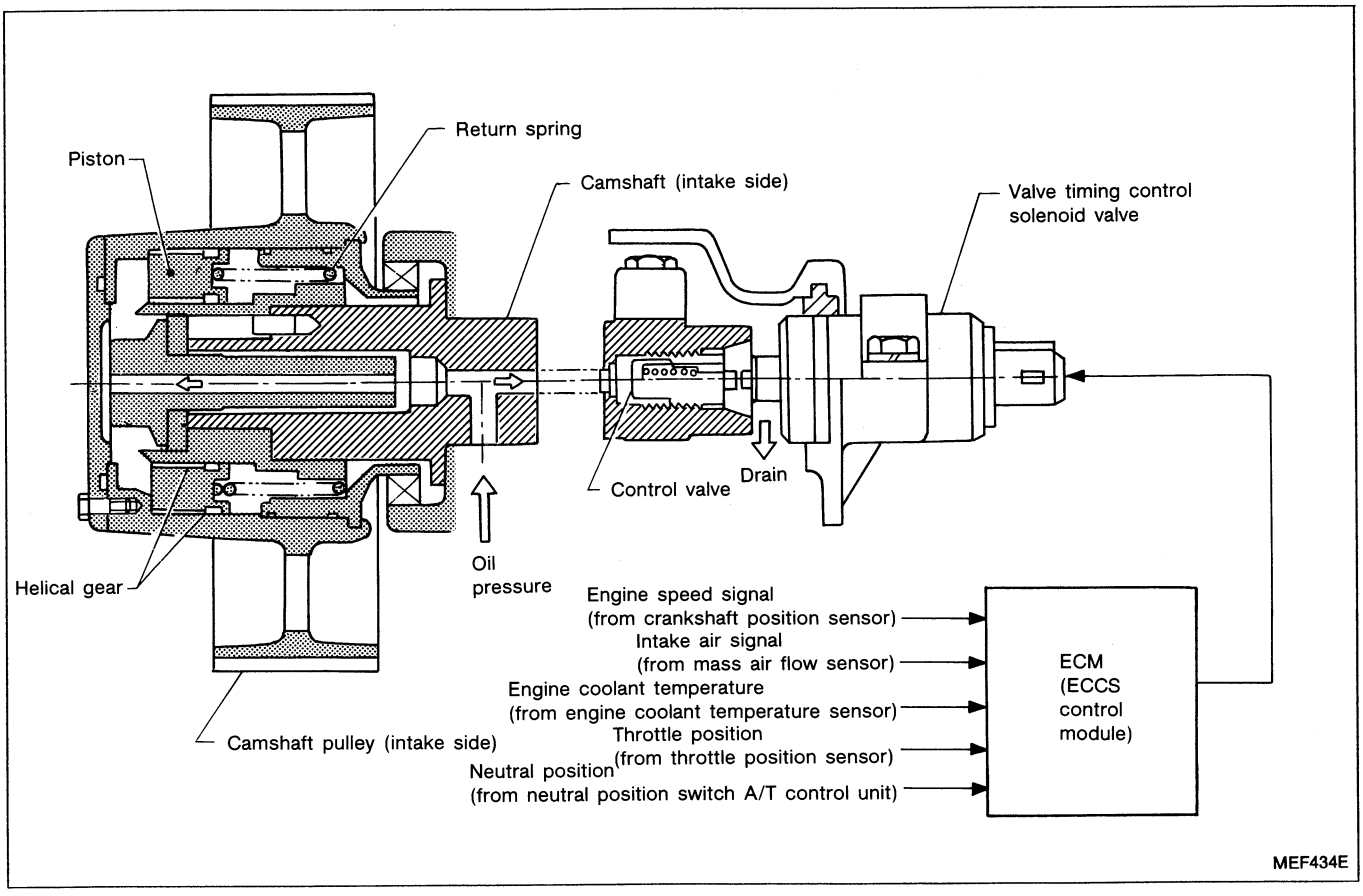
Valve Timing Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The valve timing control system is utilized to increase engine performance. Intake valve opening and closing time is controlled, according to the engine operating conditions, by the ECM.
Engine coolant temperature signals, engine speed, amount of intake air, throttle position and gear position are used to determine intake valve timing.
The intake camshaft pulley position is regulated by oil pressure, which is controlled by the valve timing control solenoid valve.

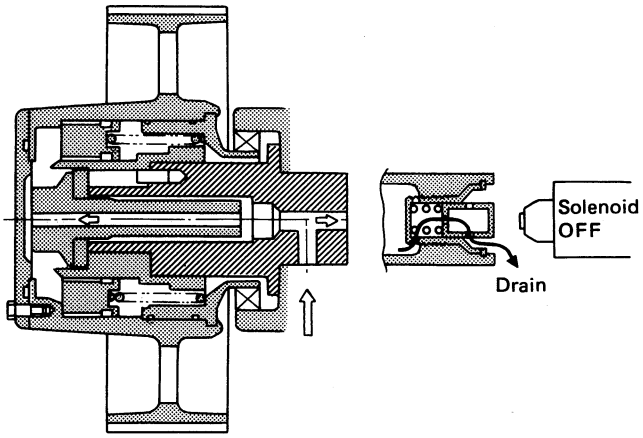


Valve Timing Control (Cont'd)

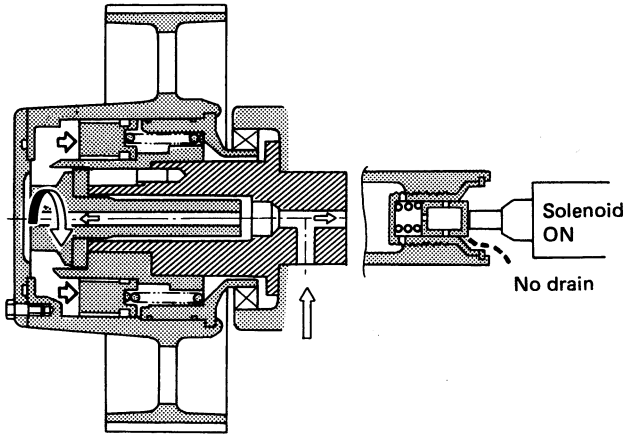
OPERATION

Engine operating condition	Valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap	Engine torque curve
Idling, high speed	OFF	Retard	Decreased	Ⅰ
Low to medium speed	ON	Advance	Increased	Ⅱ

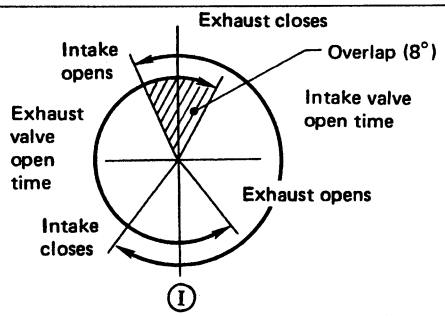
Ⅰ Valve timing control solenoid valve is OFF.

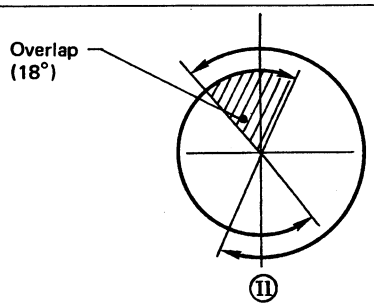


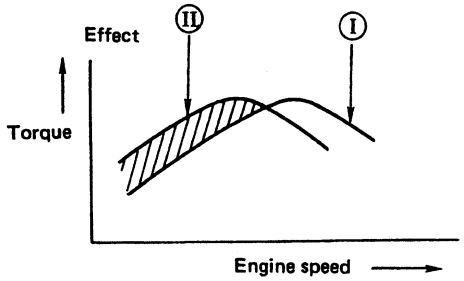
Ⅱ Valve timing control solenoid valve is ON.



SEF009I



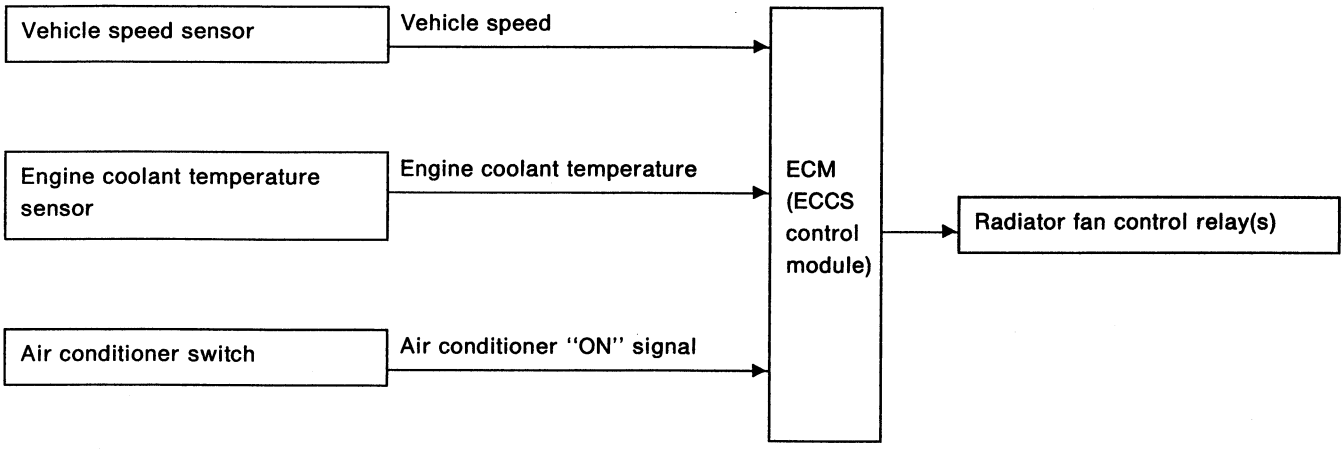




SEF010I

Radiator Fan Control

INPUT/OUTPUT SIGNAL LINE



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

OPERATION

[Non-turbocharger model]

Air conditioner switch is "OFF"

Engine coolant temperature °C (°F)	Radiator fan
Below 104 (219)	OFF
Above 105 (221)	ON

Air conditioner switch is "ON"

Vehicle speed km/h (MPH)	Engine coolant temperature °C (°F)	Radiator fan
Below 39 (24)	Below 94 (201)	OFF
	Above 95 (203)	ON (HIGH)
Above 40 (25)	Below 104 (219)	OFF
	Above 105 (221)	ON (HIGH)

[Turbocharger model]

Air conditioner switch is "OFF"

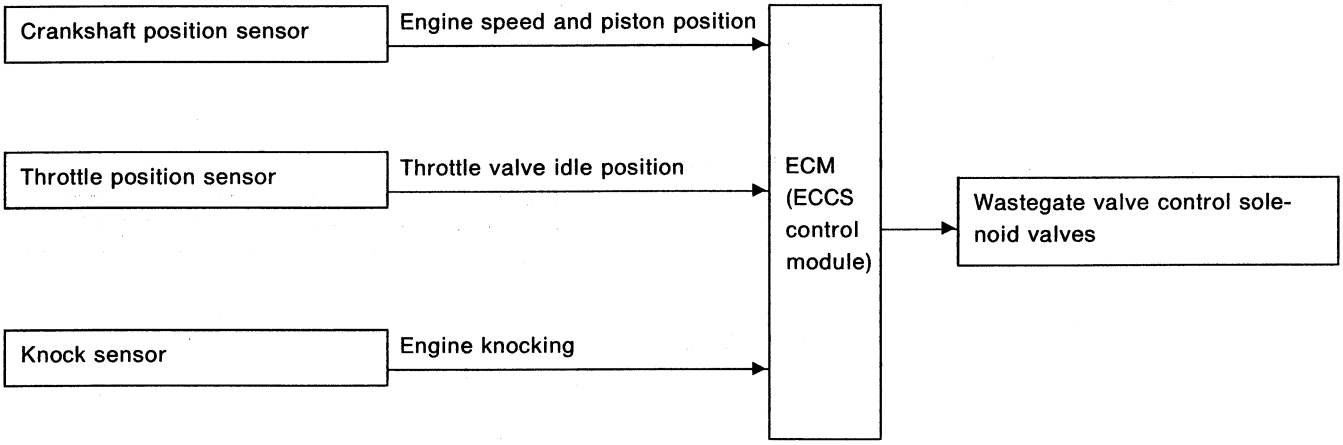
Engine coolant temperature °C (°F)	Radiator fan
Below 104 (219)	OFF
Above 105 (221)	ON

Air conditioner switch is "ON"

Vehicle speed km/h (MPH)	Engine coolant temperature °C (°F)	Radiator fan
Below 39 (24)	Below 89 (192)	OFF
	Between 90 (194) and 99 (210)	LOW
	Above 100 (212)	HIGH
Above 40 (25)	Below 104 (219)	OFF
	Above 105 (221)	HIGH

Wastegate Valve Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The wastegate valve control solenoid valve changes the source vacuum which activates the actuator. This results in a suitable turbocharger-pressure.
When knock signs are detected, which means a low octane fuel is being used, the solenoid valve turns OFF, and turbocharger pressure becomes low.

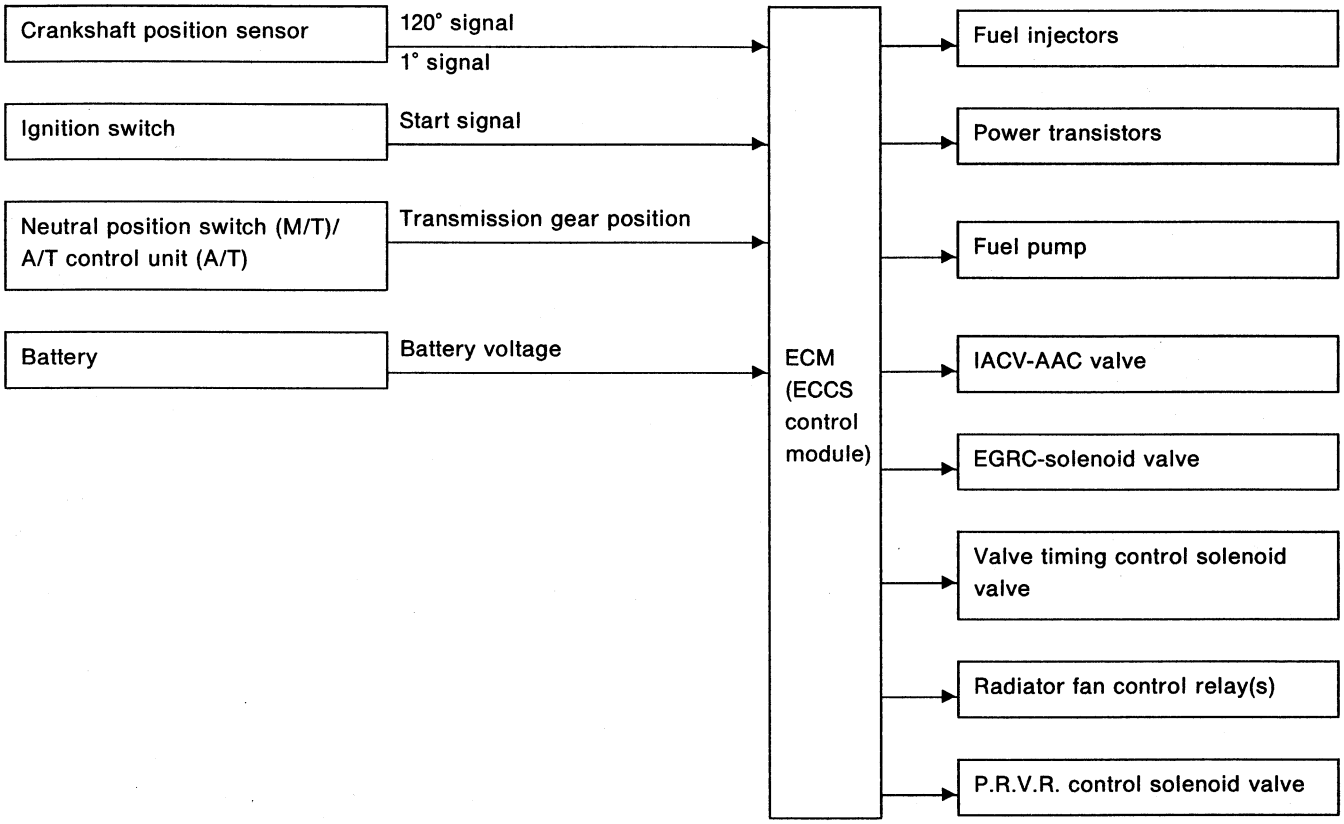
OPERATION

Engine conditions	Wastegate valve control solenoid valves	Wastegate valve actuators	Turbocharger pressure
• Engine running or cranking • Throttle position sensor output voltage: more than 0.1V • Judged fuel quality: hi octane (Detecting no sign of knock)	ON	Lead to suction pipe or turbocharger compressor outlet	HIGH
• Except the above	OFF	Lead to turbocharger compressor outlet	LOW

Fail-safe System

C.P.U. MALFUNCTION OF ECM

Input/output signal line



Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the ECM's C.P.U. circuit.

In general, engine starting was difficult under the previously mentioned conditions. But with the provisions in this fail-safe system, it is possible to start the engine.

Fail-safe System (Cont'd)

Fail-safe system activating condition when ECM is malfunctioning

The fail-safe mode operation starts when the computing function of the ECM is judged to be malfunctioning.
When the fail-safe system activates, i.e. if a malfunction condition is detected in the C.P.U. of the 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, engine idle speed, EGR operation, and so on are controlled under certain limitations.

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 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.
Although the mass air flow sensor is malfunctioning, it is possible to start the engine and drive the vehicle. 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

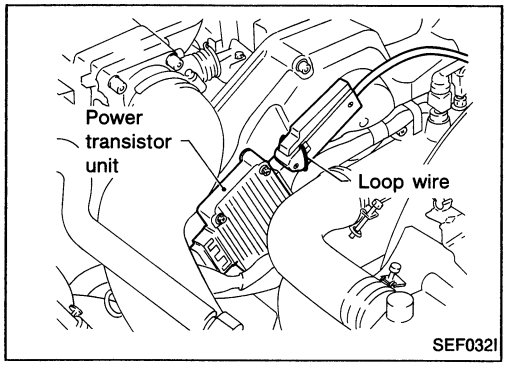
When engine coolant temperature sensor output voltage is below or above the specified value, engine coolant temperature signal is fixed at the preset value as follows:

Engine condition	Engine coolant temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)

FUEL TEMPERATURE SENSOR MALFUNCTION

When fuel temperature sensor output voltage is below or above the specified value, fuel temperature signal is fixed at the preset value as follows:

Engine condition	Fuel temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)



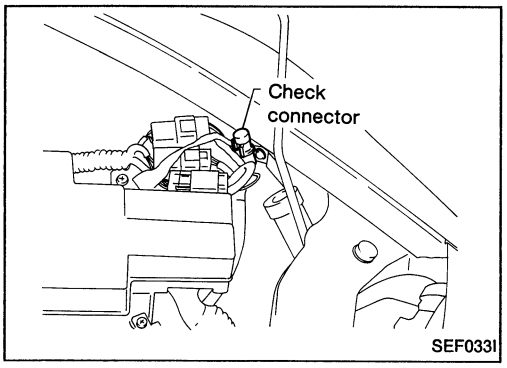
Direct Ignition System

CHECKING IDLE SPEED AND IGNITION TIMING

Idle speed

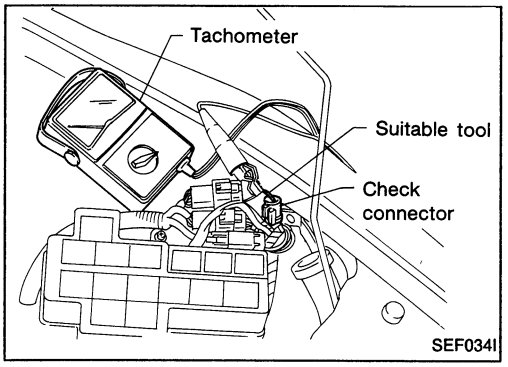
- **Method A (With pulse type tachometer)**

Clamp loop wire as shown.



- **Method B (With voltage type tachometer)**

1. Disconnect check connector (Harness color: Y/R) for tachometer.

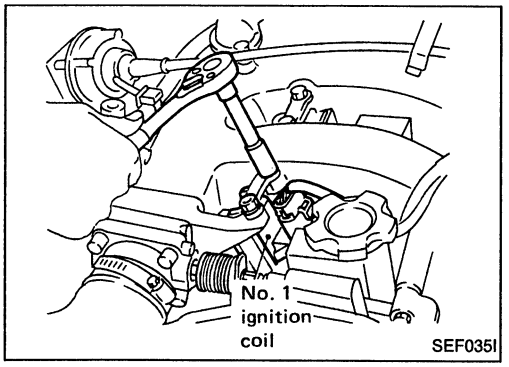


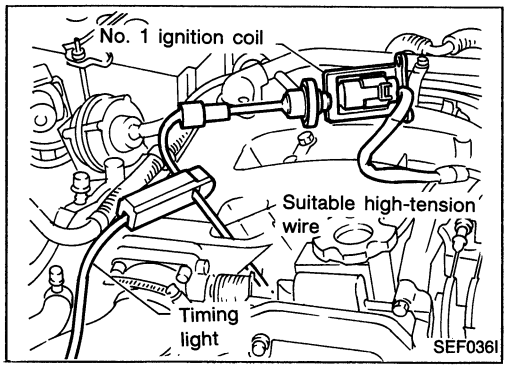
2. Connect tachometer using suitable tool.

Ignition timing

- **Method A (Without S.S.T.)**

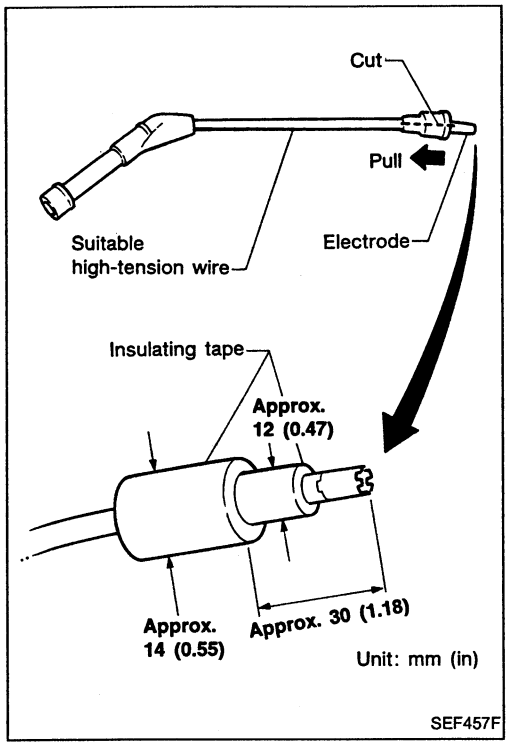
1. Remove No. 1 ignition coil.



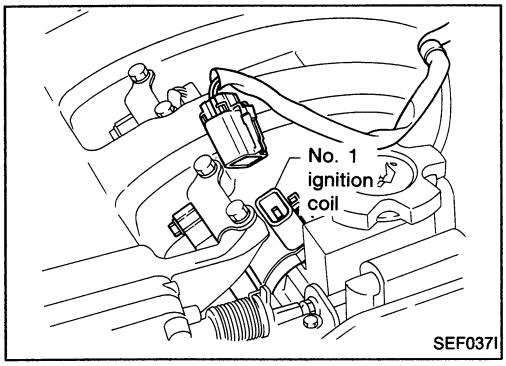


2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.
3. Check ignition timing.

Direct Ignition System (Cont'd)

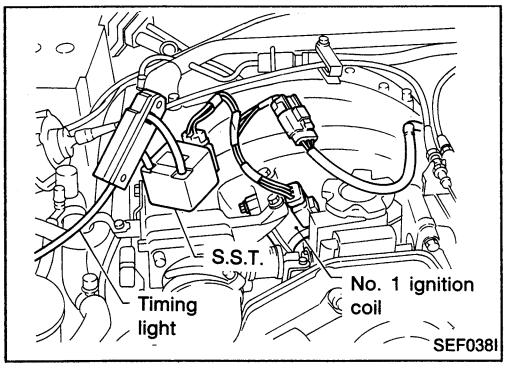


4. For above procedures, enlarge suitable high-tension wire end with insulating tape as shown.

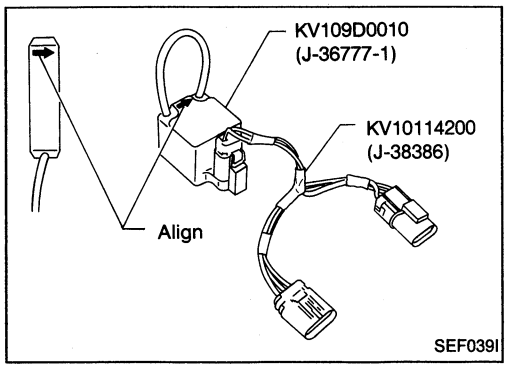


- **Method B (With S.S.T.)**

1. Disconnect connector of No. 1 ignition coil.



2. Connect S.S.T. and clamp wire with timing light as shown.
3. Check ignition timing.



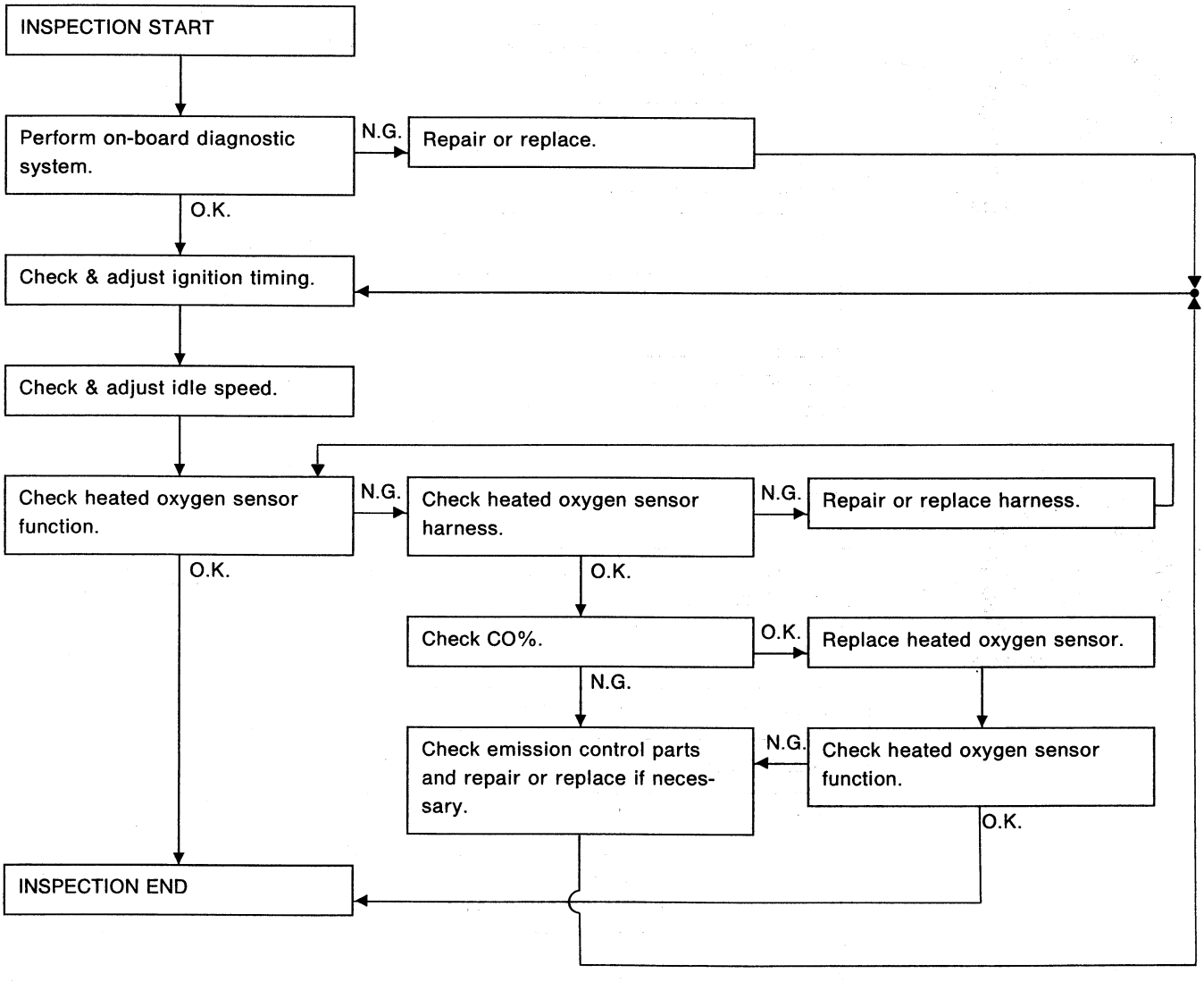
Align direction marks on S.S.T. and timing light clamp if aligning mark is punched.

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
- EGR valve operation
- Throttle valve

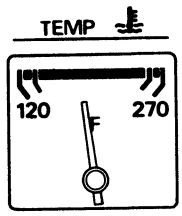
2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
4. When measuring "CO" percentage, 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



START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- EGR valve operation
- Electrical connectors
- Gasket

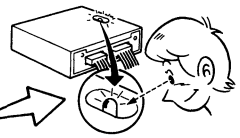


SEF246F

Start engine and warm it up until water temperature indicator points to the middle of gauge.

SEF247F

Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.


SEF362I

Perform ECCS on-board diagnostic system.

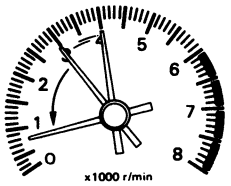
O.K. | N.G.

Repair or replace components as necessary.

Does engine run smoothly?

O.K. | N.G.

Clean injectors.



SEF248F

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

Ⓗ

Check ignition timing with a timing light.

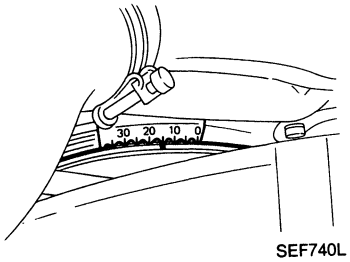
15° ± 2° B.T.D.C.

O.K. | N.G.

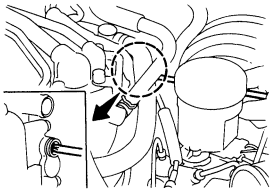
Adjust ignition timing by turning crankshaft position sensor after loosening securing bolts.

Ⓑ

Ⓐ

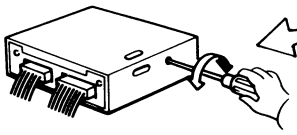


SEF740L

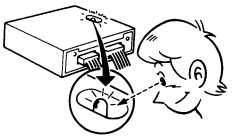


SEF364I

SEF247F



SEF957D



SEF362I

Ⓐ

Check idle speed.

A/T: 770 ± 50 rpm (in "N" position) [Non-turbocharger]
750 ± 50 rpm (in "N" position) [Turbocharger]
M/T: 700 ± 50 rpm

O.K.

N.G.

Non-turbocharger
- Disconnect throttle position sensor harness connector.

Turbocharger
- Disconnect IACV-AAC valve harness connector.

Adjust idle speed by turning idle speed adjusting screw.

A/T: 720 rpm (in "N" position) [Non-turbocharger]
700 rpm (in "N" position) [Turbocharger]
M/T: 650 rpm

Non-turbocharger
- Connect throttle position sensor harness connector.

Turbocharger
- Connect IACV-AAC valve harness connector.

Ⓑ

Run engine at about 2,000 rpm for about 2 minutes under no-load.

Set the diagnosis mode of ECM to Diagnostic Test Mode II.

Ⓘ

Check left side heated oxygen sensor signal.
Make sure that inspection lamp goes on and off more than 5 times during 10 seconds (at 2,000 rpm).

Inspection lamp does not blink.

O.K.

Less than 5 times

Replace left side heated oxygen sensor.

Ⓙ

O.K.

Check left side heated oxygen sensor signal.
Make sure that inspection lamp goes on and off more than 5 times during 10 seconds (at 2,000 rpm).

N.G.

Ⓚ

Inspection lamp does not blink.

Check right side heated oxygen sensor signal.
Make sure that inspection lamp goes on and off more than 5 times during 10 seconds (at 2,000 rpm).

O.K.

Less than 5 times

END

Replace right side heated oxygen sensor.

Ⓒ Ⓓ Ⓔ Ⓕ

Ⓒ

Ⓓ

Ⓕ

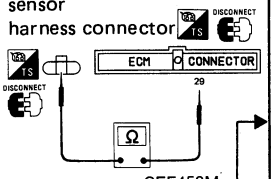
Check right side heated oxygen sensor signal. Make sure that inspection lamp goes on and off more than 5 times during 10 seconds (at 2,000 rpm).

N.G. → Ⓔ

O.K.

END

Heated oxygen sensor harness connector



SEF458M

Check right side heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect 76-pin connector from ECM.
3) Disconnect right side heated oxygen sensor harness connector.
4) Check for continuity between terminal No. 29 of 76-pin connector and harness connector for heated oxygen sensor.

Continuity exists ..... **O.K.**
Continuity does not exist ..... **N.G.**

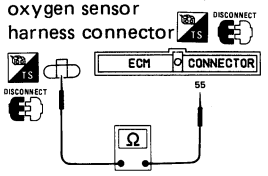
O.K.

N.G.

Repair or replace harness. → Ⓘ

Connect 76-pin connector to ECM.

Heated oxygen sensor harness connector



SEF459M

Check left side heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect 76-pin connector from ECM.
3) Disconnect left side heated oxygen sensor harness connector.
4) Check for continuity between terminal No. 55 of 76-pin connector and harness connector for heated oxygen sensor.

Continuity exists ..... **O.K.**
Continuity does not exist ..... **N.G.**

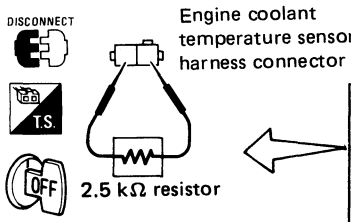
O.K.

N.G.

Repair or replace harness. → Ⓘ

Connect 76-pin connector to ECM.

Ⓖ

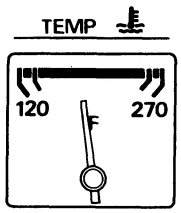


SEF460M

Ⓖ

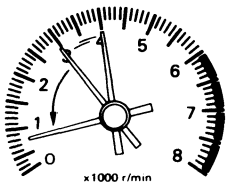
1) Disconnect engine coolant temperature sensor harness connector.
2) Connect a resistor (2.5 kΩ) between terminals of engine coolant temperature sensor harness connector.

Start engine and warm it up until water temperature indicator points to the middle of gauge.



SEF246F

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



SEF248F

Check "CO" %.

Idle CO: 0.2 - 8%

O.K. → Ⓙ

After checking CO%,
1) Disconnect the resistor from terminals of engine coolant temperature sensor.
2) Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

N.G.

Connect heated oxygen sensor harness connector to heated oxygen sensor.

Check fuel pressure regulator. → Ⓚ

Check mass air flow sensor.

Check injector.
Clean or replace if necessary.

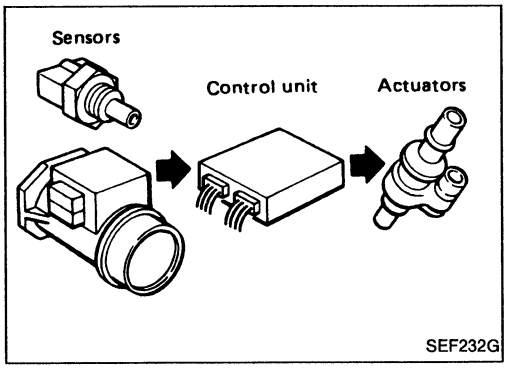
Check engine coolant temperature sensor.

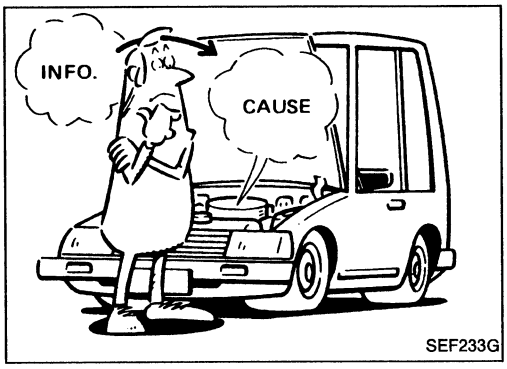
Check ECM function* by substituting another known good ECM. → Ⓗ

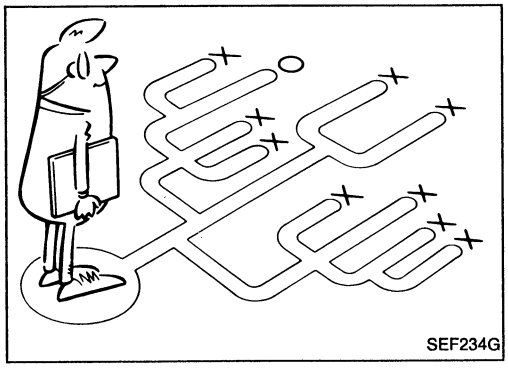
*: ECM may be the cause of a problem, but this is rarely the case.

Contents

Contents (Cont'd)







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.

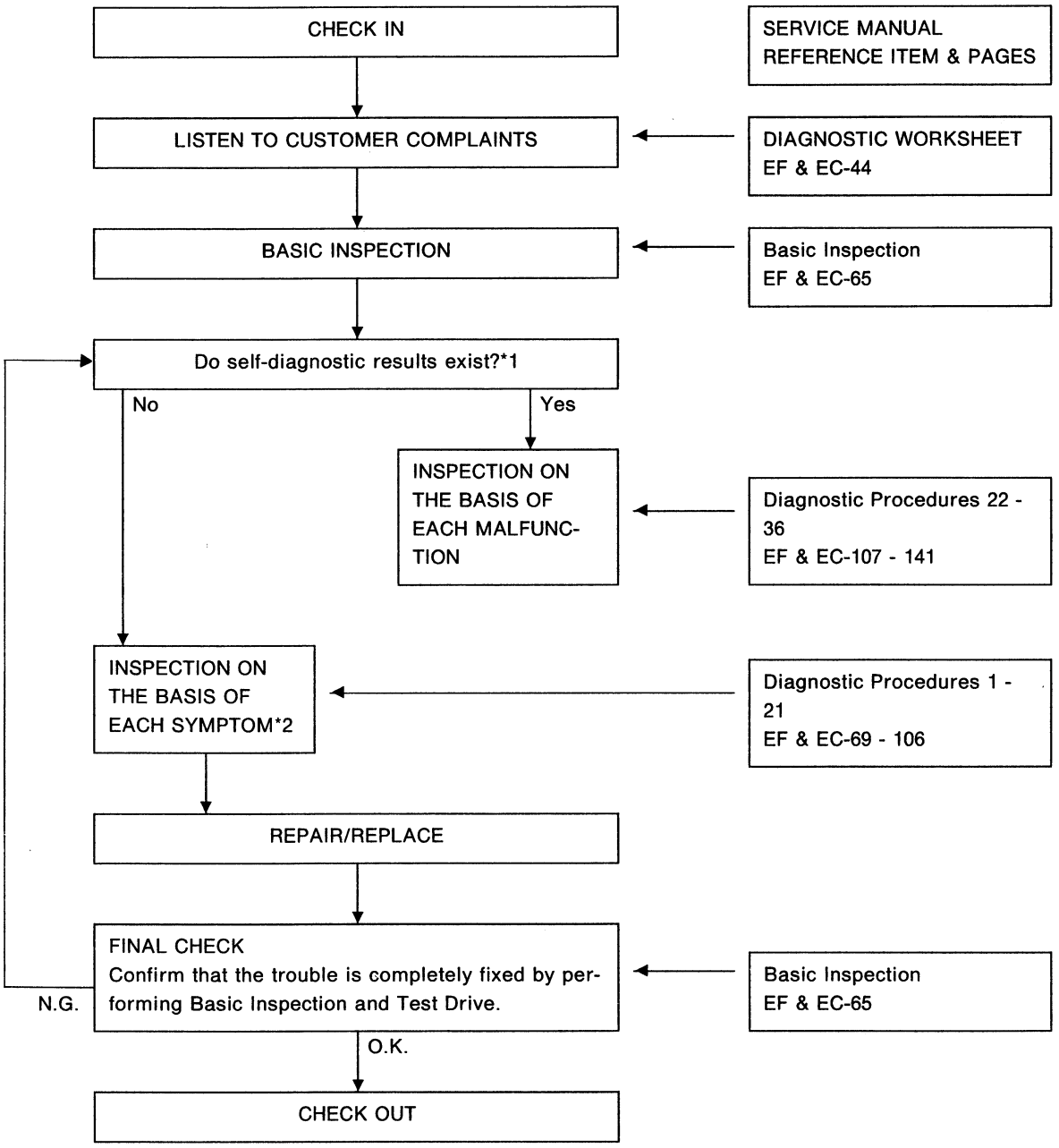
A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

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.

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 22.)**

***2: If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EF & EC-45).**

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

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

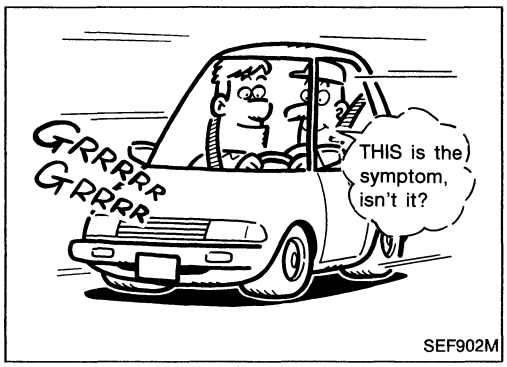
SEF907L

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 trouble-shooting.

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	



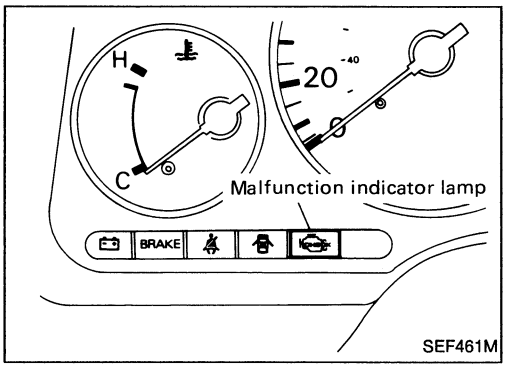
SEF902M

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.

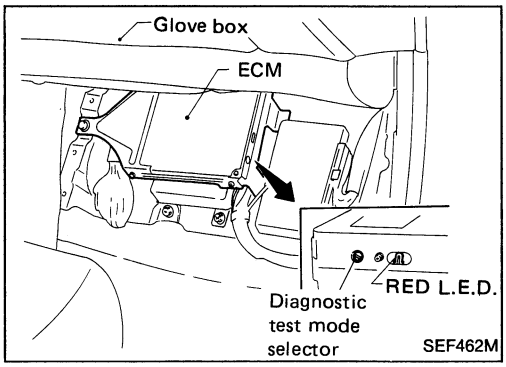
	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Crankshaft position sensor	Advanced	Rotate distributor counterclockwise.
			Retarded	Rotate distributor clockwise.
3	Mixture ratio feedback control	Heated oxygen sensor	Suspended	Disconnect heated oxygen sensor harness connector.
		ECM	Operation check	Perform on-board diagnostic system (Diagnostic Test Mode II) 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 position	Timing light	Spark power check	Try to flash timing light for each cylinder using ignition coil adapter (S.S.T.).



On-board Diagnostic System

MALFUNCTION INDICATOR LAMP

A malfunction indicator lamp has been adopted on the California, Federal and Canada models. This light blinks simultaneously with the RED L.E.D. on the ECM.



ECM L.E.D.

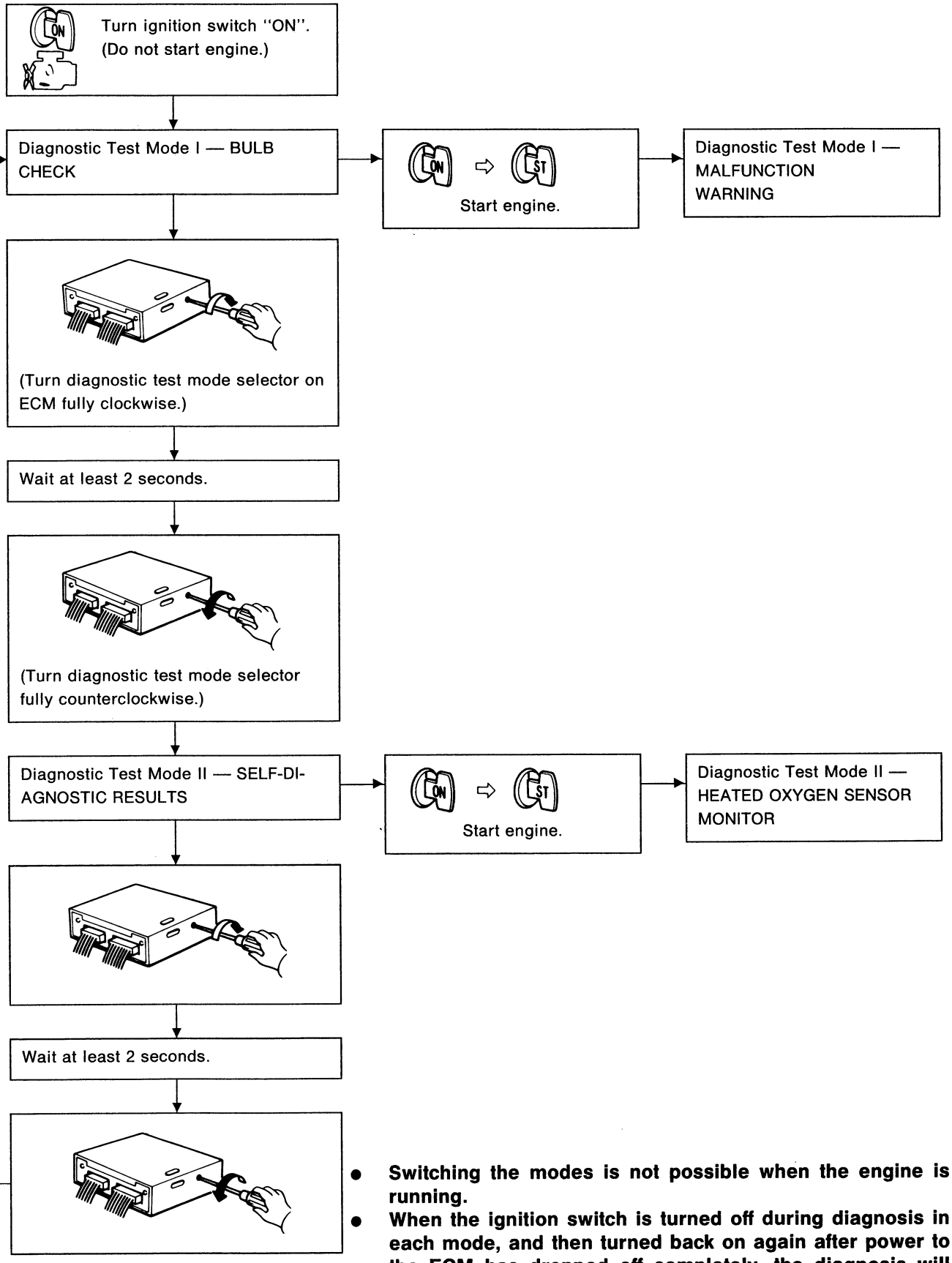
In the ECM, the Green and Red L.E.D.'s have now been permanently changed to one RED L.E.D.

ON-BOARD DIAGNOSTIC SYSTEM FUNCTION

Condition		Diagnostic Test Mode	
		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

On-board Diagnostic System (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



- **Switching the modes is not possible when the engine is running.**
- **When the ignition switch is turned off during diagnosis in each mode, and then turned back on again after power to the ECM has dropped off completely, the diagnosis will automatically return to Diagnostic Test Mode I.**

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 MODEL

MALFUNCTION INDICATOR LAMP and RED L.E.D.	Condition
ON	When the following malfunction (malfunction indicator lamp item) is 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 (Left side)
35	EGR temperature sensor circuit
43	Throttle position sensor circuit
45	Injector leak
51	Injector circuit
53	Heated oxygen sensor circuit (Right side)

- **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.**

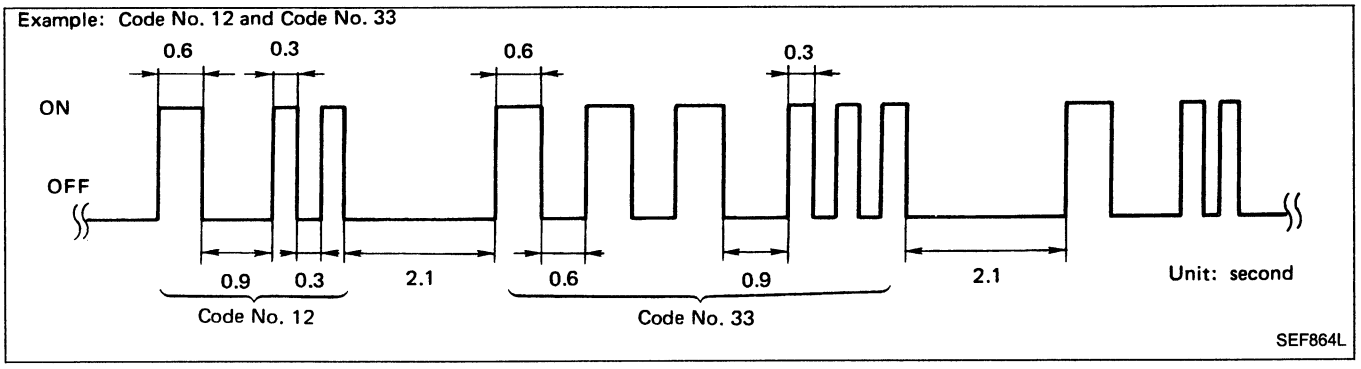
FOR NON-CALIFORNIA MODEL

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

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 model	Non-California model
11		Crankshaft position sensor circuit	X	X
12	CHECK	Mass air flow sensor circuit	X	X
13	CHECK	Engine coolant temperature sensor circuit	X	X
14	CHECK	Vehicle speed sensor circuit	X	X
21		Ignition signal circuit	X	X
31	CHECK	ECM	X	X
32	CHECK	EGR function	X	—
33	CHECK	Heated oxygen sensor circuit (Left side)	X	X
34		Knock sensor circuit	X	X
35	CHECK	EGR temperature sensor circuit	X	—
42		Fuel temperature sensor circuit	X	X
43	CHECK	Throttle position sensor circuit	X	X
45	CHECK	Injector leak	X	—
51	CHECK	Injector circuit	X	—
53	CHECK	Heated oxygen sensor circuit (Right side)	X	X
54		Signal circuit from A/T control unit to ECM (A/T only)	X	X
55		No malfunction in the above circuits	X	X

X: Available

—: Not available

CHECK : Malfunction indicator lamp item

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 120° signal is not entered for the first few seconds during engine cranking. • Either 1° or 120° 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 • EGRC-solenoid valve
33	Heated oxygen sensor circuit (Left side)	• 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
53	Heated oxygen sensor circuit (Right side)		
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
42	Fuel temperature sensor circuit	• The fuel temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Fuel 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

*: 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.

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)
45	Injector leak	• Fuel leaks from injector.	• Injector
51	Injector circuit	• The injector circuit is open.	• Harness and connector • Injector
54	Signal circuit from A/T control unit to ECM (A/T only)	• The A/T communication line is open or shorted.	• Harness and connector

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 DIAGNOSTIC TEST 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.**

On-board Diagnostic System — Diagnostic Test Mode II (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

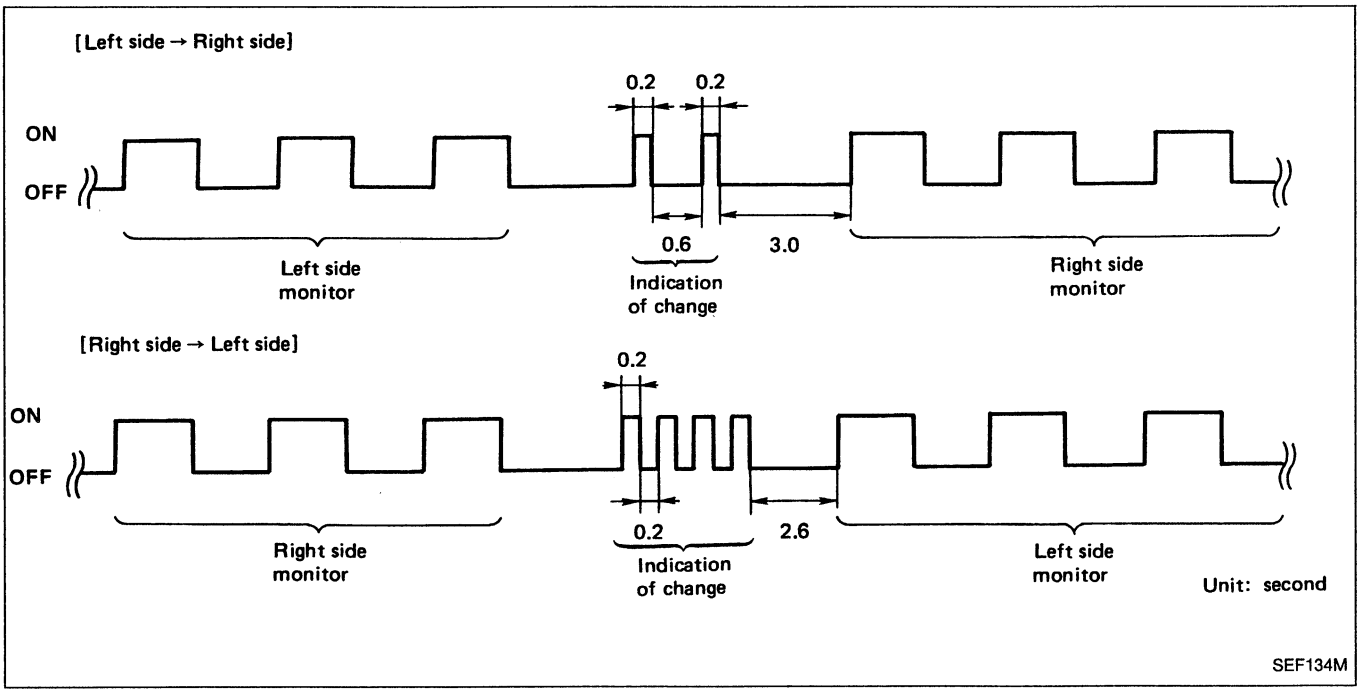
*: Maintains conditions just before switching to open loop.

If two heated oxygen sensors (right side and left side) are fitted on the engine, the left side heated oxygen sensor monitor operates first, when selecting this mode.

HOW TO CHANGE MONITOR FROM LEFT SIDE (Right side) TO RIGHT SIDE (Left side)

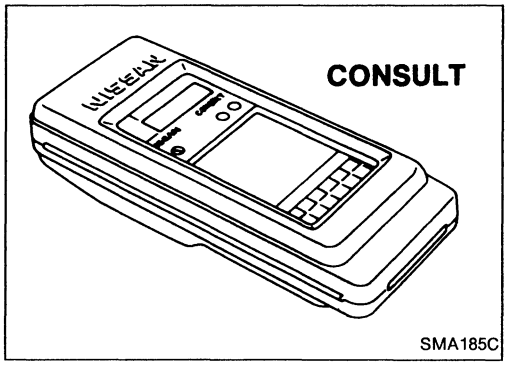
1. Turn diagnostic test mode selector on ECM fully clockwise.
2. Wait at least 2 seconds.
3. Turn diagnostic test mode selector on ECM fully counterclockwise.

- These procedures should be carried out when the engine is running.



HOW TO CHECK HEATED OXYGEN SENSOR

1. Set Diagnostic Test Mode II. (Refer to "HOW TO SWITCH DIAGNOSTIC TEST 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.

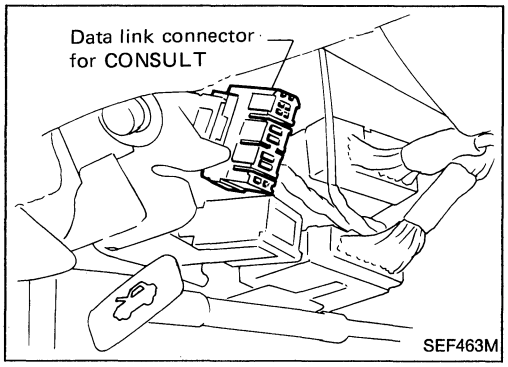


SMA185C

Consult

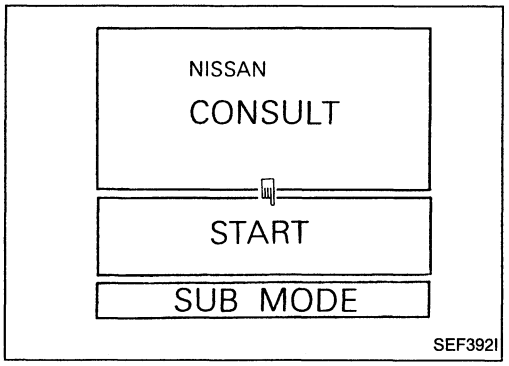
CONSULT INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located in left dash side panel.)



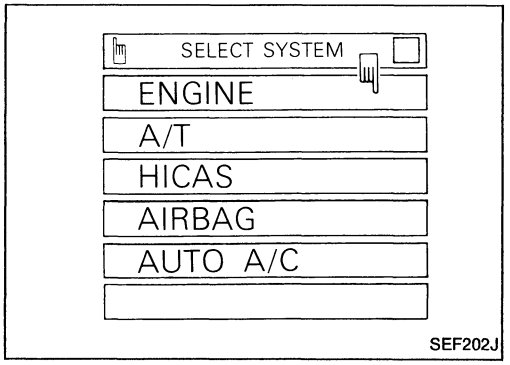
SEF463M

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



SEF392I

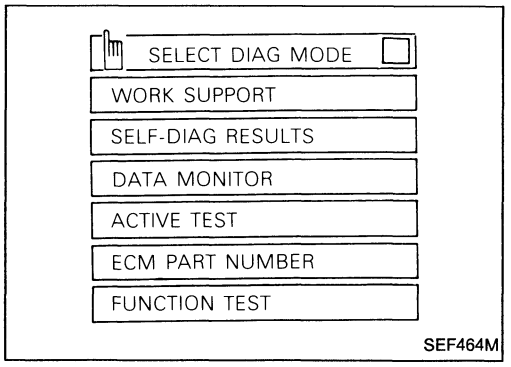
5. Touch "ENGINE".



SEF202J

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

For further information, see the CONSULT Operation Manual.



SEF464M

Consult (Cont'd)

ECCS COMPONENT PARTS APPLICATION

	ECCS COMPONENT PARTS	DIAGNOSTIC TEST MODE				
		WORK SUPPORT	SELF-DIAGNOSTIC 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 sensor		X	X		X
	Throttle position sensor	X	X	X		X
	Fuel temperature sensor		X	X		
	EGR temperature sensor*		X	X		
	Knock sensor		X			
	Ignition switch (start signal)			X		X
	Air conditioner switch			X		
	Neutral position switch			X		
	Power steering oil pressure switch			X		X
	Battery			X		
	A/T signal		X			
OUTPUT	Injectors		X	X	X	X
	Power transistors (ignition timing)		X (Ignition signal)	X	X	X
	IACV-AAC valve	X		X	X	X
	IACV-FICD solenoid valve			X	X	X
	Valve timing control solenoid valve			X	X	X
	P.R.V.R. control solenoid valve			X	X	X
	EGRC-solenoid valve			X	X	X
	Wastegate valve control solenoid valve			X		
	Air conditioner relay			X		
	Fuel pump relay	X		X	X	X
	Radiator fan			X	X	X

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

X: Applicable

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 number	ECM part number 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 ADJUSTMENT*	● 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/V 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.

*: The ignition timing feedback control is not adopted on model 300ZX, so it is not necessary to perform IGNITION TIMING ADJUSTMENT.

Consult (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN ...	CHECK ITEM (REMEDY)
CRANK POSITION SEN*	• Either 1° or 120° signal is not entered for the first few seconds during engine cranking. • Either 1° or 120° 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).]
EGR SYSTEM**	• EGR valve does not operate. (EGR valve spring does not lift.)	• EGR valve • EGRC-solenoid valve
OXYGEN SEN OXYGEN SEN-R	• 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
FUEL TEMP SENSOR	• The fuel temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Fuel 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 FUEL LEAK**	• Fuel leaks from injector.	• Injector
INJECTOR OPEN**	• The injector circuit is open.	• Injector
A/T COMM LINE	• The A/T communication line is open or shorted.	• Harness and connector

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

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

DATA MONITOR MODE

Remarks: • The monitor item marked "*" is applicable to vehicles for California only.
• Specification data are reference values.
• Specification data are out-put/in-put values which are detected or supplied by ECM at the connector.
*: Specification data may not be directly related to their components signals/values/operations.
ie. 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 being not adjusted to the specification data. This IGN TIMING monitors the calculated data by ECM according to the input signals from crankshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CKPS·RPM (POS)	• 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
CKPS·RPM (REF)				
MAS AIR/FL SE	• Engine: After warming up, idle the engine • A/C switch "OFF" • Shift lever "N" • No-load	Idle	0.8 - 1.5V	• Harness and connector • Mass air flow sensor
		2,000 rpm	1.4 - 1.8V	
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 ↔ 0.6 - 1.0V	• Harness and connector • Heated oxygen sensor • Intake air leaks • Injectors
O2 SEN-R				
M/R F/C MNT			LEAN ↔ RICH Changes more than 5 times during 10 seconds.	
M/R F/C MNT-R				
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	0.4 - 0.5V	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment
		Throttle valve fully opened	Approx. 4.0V	
FUEL TEMP SEN	• Engine: After warming up		20 - 60°C (68 - 140°F)	• Harness and connector • Fuel temp. sensor
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 • Start 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	

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	
INJ PULSE	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load		Idle	2.0 - 3.0 msec.	• Harness and connector • Injector • Mass air flow sensor • Intake air system
INJ PULSE-R			2,000 rpm	2.0 - 3.0 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	15 - 40%	• Harness and connector • IACV-AAC valve
			2,000 rpm	—	

Consult (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION TEST	• Engine: Return to the original trouble condition • Change the amount of fuel injection with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Fuel injectors • Heated oxygen sensor
IACV-AAC/V OPENING TEST	• Engine: After warming up, idle the engine. • Change the IACV-AAC valve opening percent with the CONSULT.	Engine speed changes according to the opening percent.	• Harness and connector • IACV-AAC valve
ENG COOLANT TEMP TEST	• Engine: Return to the original trouble condition • Change the engine coolant temperature with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Engine coolant temperature sensor • Fuel injectors
IGN TIMING TEST	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Adjust initial ignition timing
POWER BALANCE TEST	• Engine: After warming up, idle the engine. • A/C switch "OFF" • Shift lever "N" • Cut off each injector signal one at a time with the CONSULT.	Engine runs rough or dies.	• Harness and connector • Compression • Injectors • Power transistor • Spark plugs • Ignition coils
RADIATOR FAN TEST	• Ignition switch: ON • Turn the radiator fan "ON" and "OFF" with the CONSULT.	Radiator fan moves and stops.	• Harness and connector • Radiator fan motor
FICD SOL/V TEST	• Engine: After warming up, idle the engine. • A/C switch "OFF" • Shift lever "N" • Turn the IACV-FICD solenoid valve "ON" with the CONSULT.	Engine speed will increase momentarily by approx. 200 rpm.	• Harness and connector • IACV-FICD solenoid valve
FUEL PUMP RLY TEST	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay "ON" and "OFF" with the CONSULT and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connector • Fuel pump relay
EGRC SOLENOID VALVE TEST PRVR CONT SOL/V TEST VALVE TIM SOL TEST	• 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
SELF-LEARN CONT TEST	• In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen.		

Consult (Cont'd)

FUNCTION TEST MODE

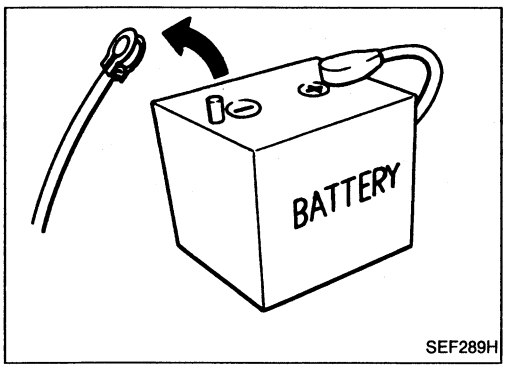
TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	• Ignition switch: ON (Engine stopped) • Displays the results of on-board diagnostic system.	—		Objective system
CLOSED THROTTLE POSI (CLOSED THROTTLE POSITION SWITCH CIRCUIT)	• Ignition switch: ON (Engine stopped) • Closed throttle position switch circuit is tested when throttle is opened and closed fully. ("CLOSED THROTTLE POSI" 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.
		Throttle valve: closed	ON	
THROTTLE POSI SEN CKT	• 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.
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
		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
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
PRVR CONT S/V CIRCUIT	• Ignition switch: ON (Engine stopped) • PRVR CONT S/V circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		• Harness and connector • PRVR control solenoid valve
VALVE TIMING S/V CKT	• Ignition switch: ON (Engine stopped) • Valve timing S/V circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		• Harness and connector • Valve timing solenoid valve
RADIATOR FAN CIRCUIT	• Ignition switch: ON (Engine stopped) • Radiator fan circuit is tested by checking radiator fan operation.	The radiator fan rotates and stops every 3 seconds.		• Harness and connector • Radiator fan motor • Radiator fan relay

Consult (Cont'd)

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 O_2 sensor output at 2,000 rpm under non-loaded state.	• O_2 SEN COUNT: More than 5 times during 10 seconds (O_2 SEN-R 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) • O_2 sensor circuit • O_2 sensor operation • Fuel pressure high or low • Mass air flow sensor
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
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

Consult (Cont'd)

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
IACV-FICD S/V SYSTEM	• After warming up, idle the engine. A/C switch: OFF Light switch: OFF • FICD system is tested by detecting change in engine speed when IACV-FICD solenoid valve is ON and OFF.	Difference in engine speed is greater than 50 rpm between IACV-FICD solenoid valve "ON" and "OFF".	• Harness and connector • IACV-FICD solenoid valve • Air passage

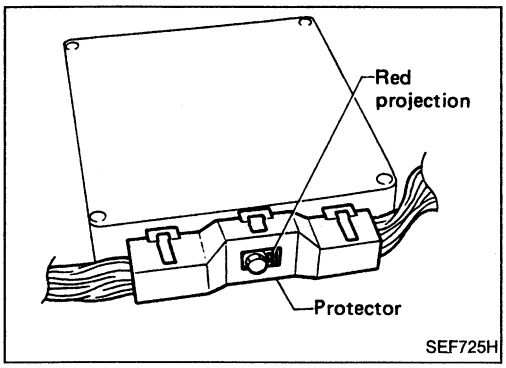


SEF289H

Diagnostic Procedure

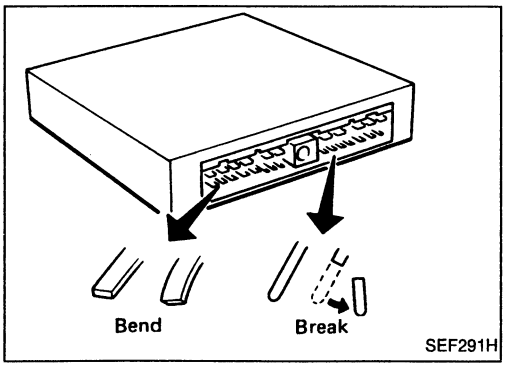
CAUTION:

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.**



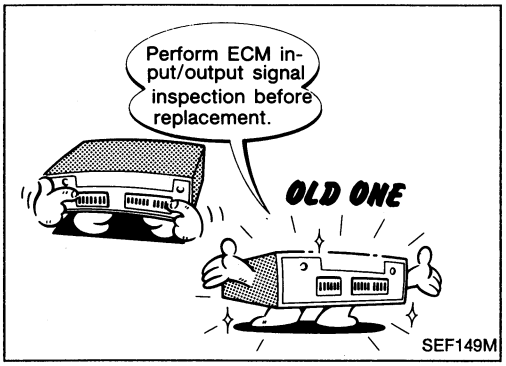
SEF725H

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



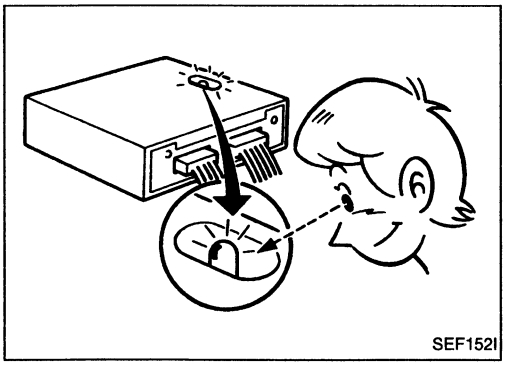
SEF291H

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.**



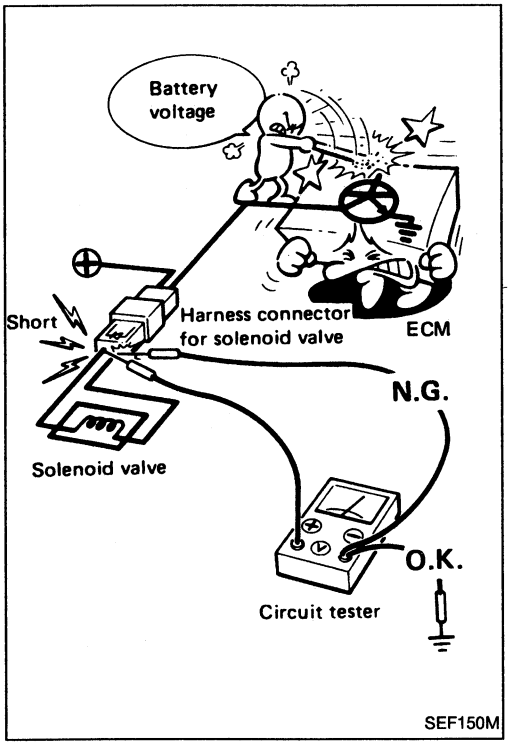
SEF149M

5. **Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EF & EC-169.)**


SEF152I

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

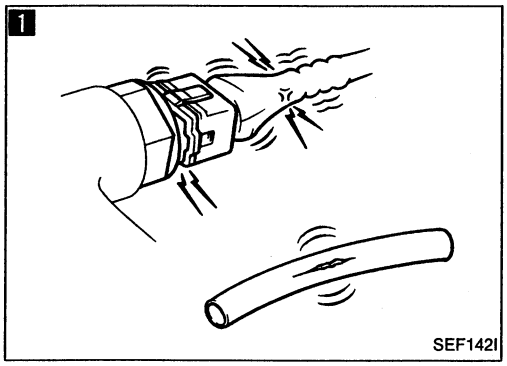
Diagnostic Procedure (Cont'd)



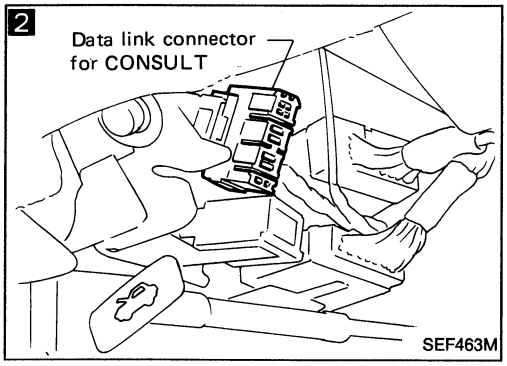
7. **When measuring ECM controlled components supply voltage with a circuit tester, separate one tester probe from the other.**
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the ECM power transistor.

Basic Inspection

1

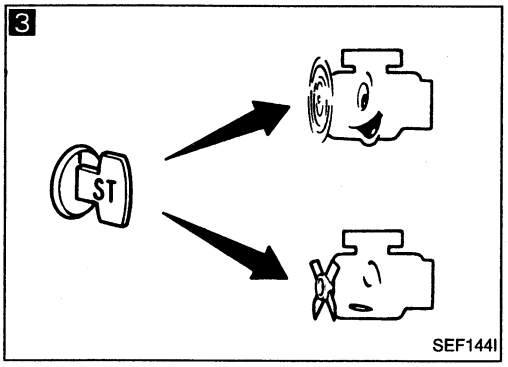

SEF142I

2



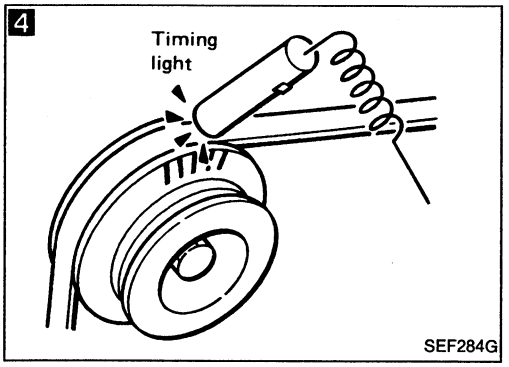
SEF463M

3



SEF144I

4



SEF284G

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-53.)

↓

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-35.)
Ignition timing: 15° ± 2° B.T.D.C.

N.G. → Adjust ignition timing by turning crankshaft position sensor.

O.K. ↓

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

5 Non-turbocharger

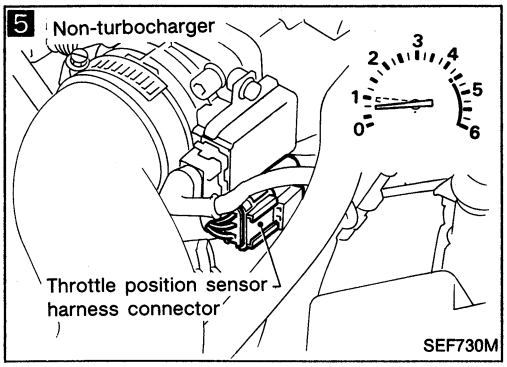
■ IGN TIMING ADJ ■ □

IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START.
AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANK ANGLE SENSOR.

START

SEF729M

5 Non-turbocharger



SEF730M

5 Turbocharger

■ IACV-AAC/V ADJ ■

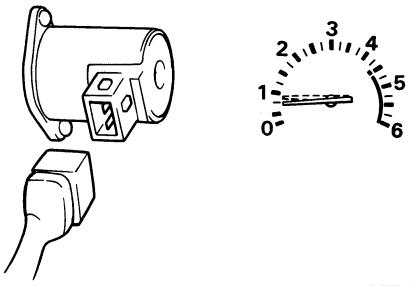
SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITION

- ENG WARMED UP
- NO LOAD

START

SEF727M

5 Turbocharger



SEF728M

Ⓐ

5

CHECK IDLE ADJ. SCREW INITIAL SET RPM.

Non-turbocharger

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine speed fall to;
   M/T: 650±50 rpm
   A/T: 720±50 rpm
   [in "N" position]?

No → Adjust engine speed by turning idle adjusting screw.

OR

When disconnecting throttle position sensor harness connector, does engine speed fall to:
M/T: 650±50 rpm
A/T: 720±50 rpm
[in "N" position]?

OR

Turbocharger

1. Select "IACV-AAC/V ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine speed fall to;
   M/T: 650±50 rpm
   A/T: 700±50 rpm
   [in "N" position]?

OR

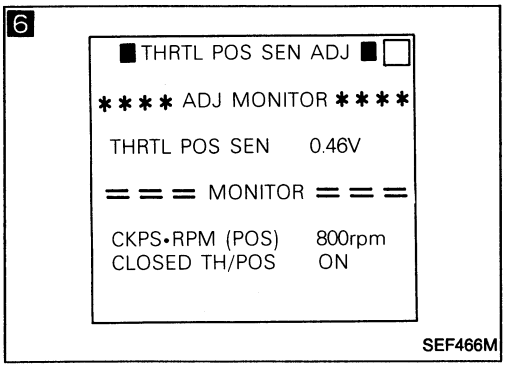
When disconnecting IACV-AAC valve harness connector, does engine speed fall to;
M/T: 650±50 rpm
A/T: 700±50 rpm
[in "N" position]?

Yes

(Go to Ⓑ on next page.)

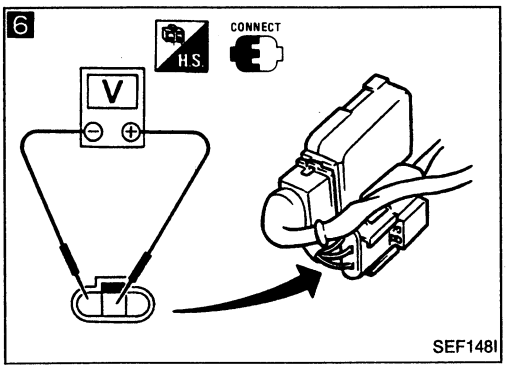
Basic Inspection (Cont'd)

6



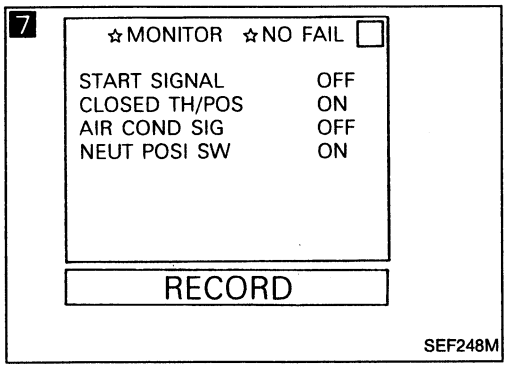
SEF466M

6



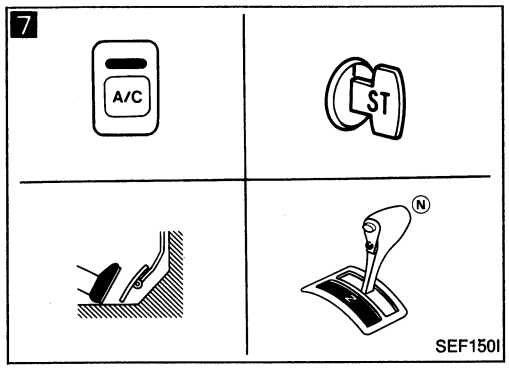
SEF148I

7



SEF248M

7



SEF150I

Ⓑ

6

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

1. Perform "THRTL POS SEN. ADJ." in "WORK SUPPORT" mode.
2. Check that output voltage of throttle position sensor is 0.4 to 0.5V. (Throttle valve fully closes.) and "CLOSED TH/POS" stays "ON".

OR

Measure output voltage of throttle position sensor using voltmeter, and check that it is 0.4 to 0.5V. (Throttle valve fully closed.)

N.G. →

1. Adjust output voltage by rotating throttle position sensor body.
2. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "CLOSED TH/POS" stays "ON".

O.K. ↓

7

CHECK SWITCH INPUT SIGNAL.

Select the following switches in "DATA MONITOR" mode,
a) Start signal,
b) Idle position,
c) Air conditioner signal,
d) Neutral position (Parking) switch,
and check the switches' ON-OFF operation.

OR

Remove ECM from front floor panel and check the above switches' ON-OFF operation using voltmeter at each ECM terminal.

N.G. → Repair or replace the malfunctioning switch or its circuit.

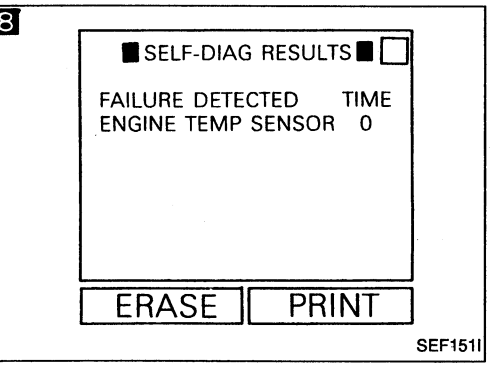
Switch	Condition	Voltage (V)
Start signal	IGN ON → IGN START	0 → Battery voltage
Idle position	—	—
A/C signal	A/C OFF → A/C ON (Engine running)	Battery voltage → 0.5 - 0.7
Neutral position (Parking) switch	Shift lever is "N" or "P" position → Except "N" and "P"	0 → 8.0 - 9.0

O.K. ↓

(Go to Ⓒ on next page.)

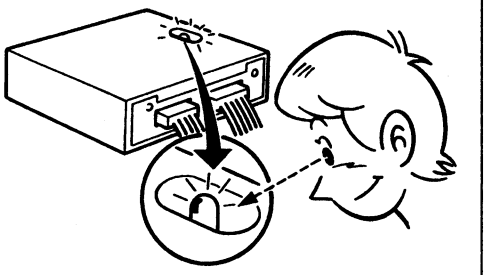
Basic Inspection (Cont'd)

8



SEF151I

8



SEF152I

Ⓒ

8

READ SELF-DIAGNOSTIC RESULTS.

1. Perform "SELF-DIAG RESULTS" mode.
2. Read out self-diagnostic results.
3. Is a failure detected?

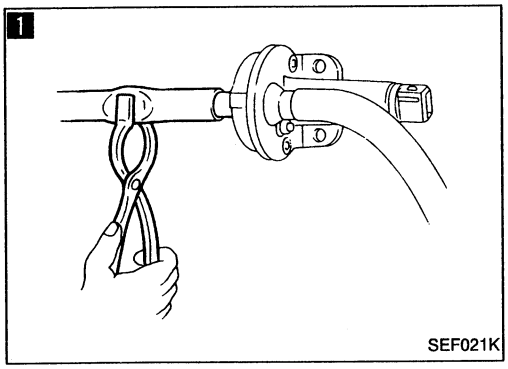
Yes → Go to the relevant inspection procedure.

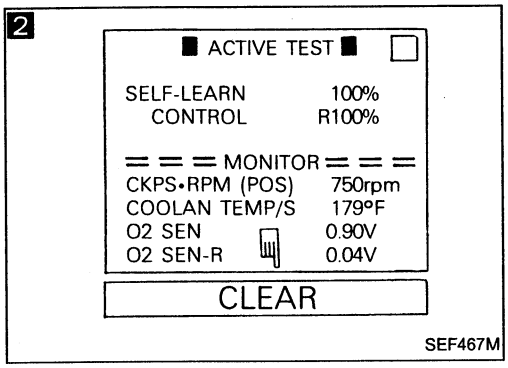
OR

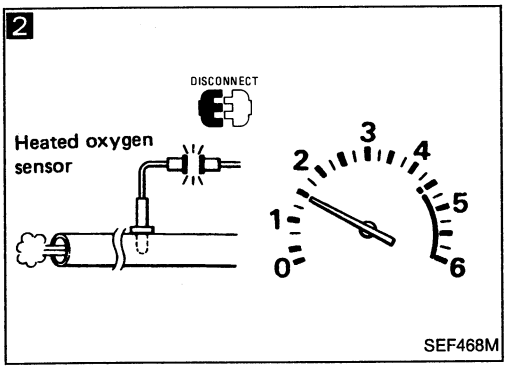
1. Set "Self-diagnostic results mode" in Diagnostic Test Mode II. (Refer to page EF & EC-49.)
2. Count the number of RED L.E.D. flashes and read out the diagnostic trouble codes.
3. Are the diagnostic trouble codes being output?

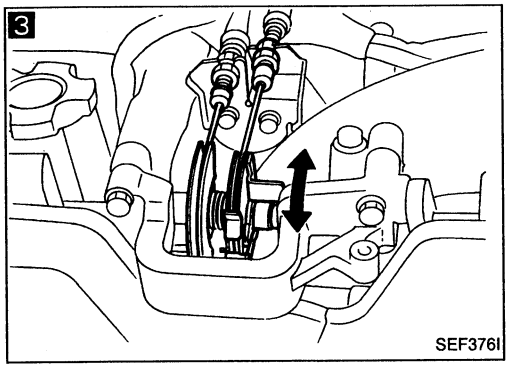
No → INSPECTION END

Diagnostic Procedure 1 — High Idling after Warm-up









1

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

Yes → Check IACV-air regulator and circuit.

No ↓

2

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 connectors.
2. After racing engine at 1,500 rpm under no load for about 30 seconds, does the engine speed drop?

No ↓

3

CHECK THROTTLE LINKAGE.

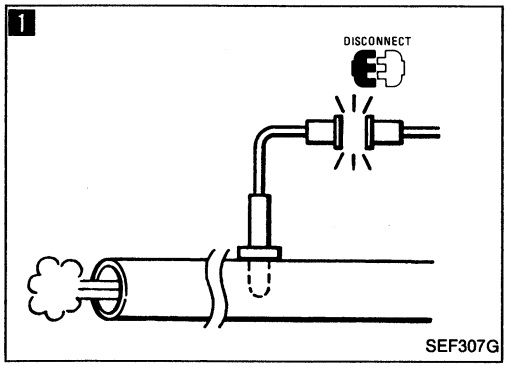
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

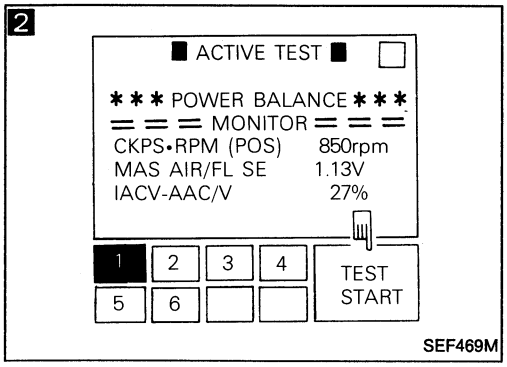
N.G. → Repair throttle linkage or sticking of throttle valve.

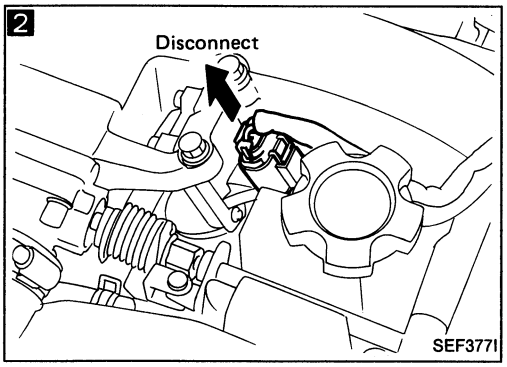
O.K. ↓

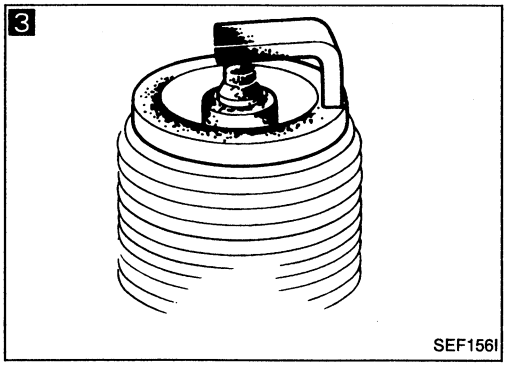
INSPECTION END

Diagnostic Procedure 2 — Hunting









1

CHECK HEATED OXYGEN SENSORS.
When disconnecting heated oxygen sensor harness connectors, is the hunting fixed?

Yes → Check heated oxygen sensor(s). (See page EF & EC-126.)

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?

OR

When disconnecting each ignition coil harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **4** .

Yes ↓

3

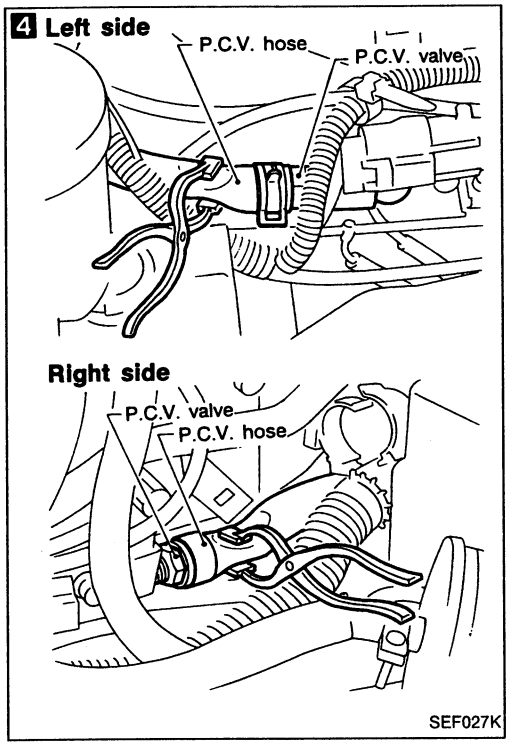
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

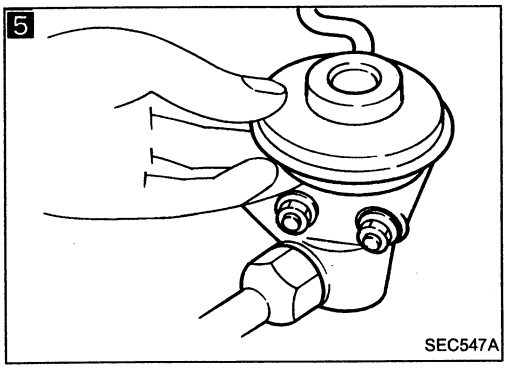
N.G. → Repair or replace spark plug(s).

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 2 — 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

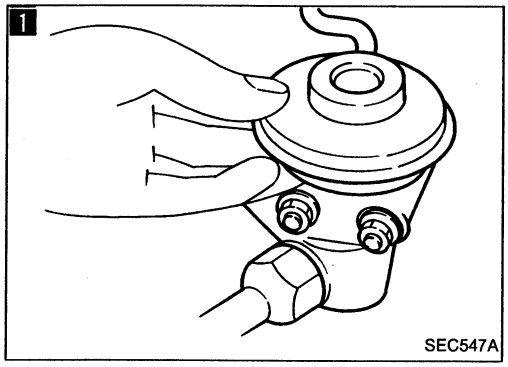
CHECK EGR VALVE.
Check EGR valve for sticking.

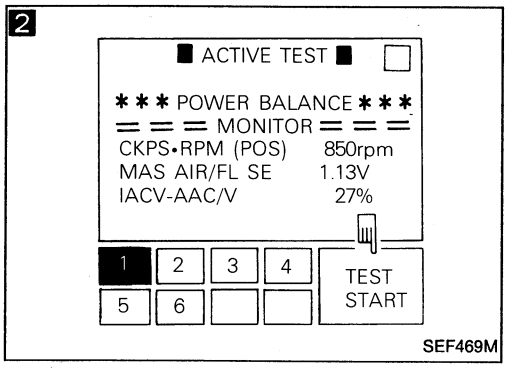
N.G. → Repair or replace.

O.K.

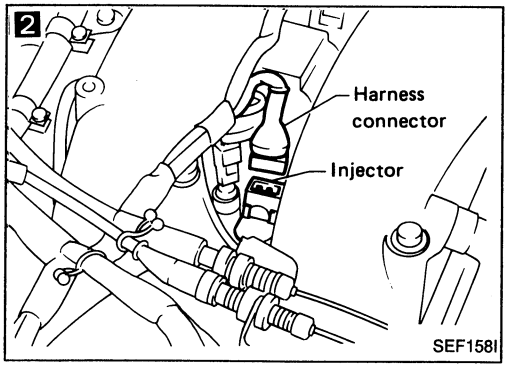
INSPECTION END

Diagnostic Procedure 3 — Unstable Idle

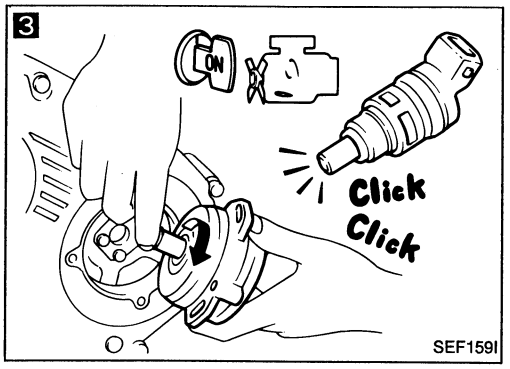

SEC547A



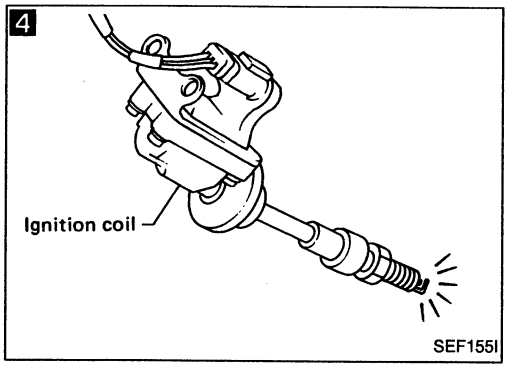
SEF469M



SEF158I



SEF159I



SEF155I

1

CHECK EGR VALVE.
Check EGR valve for sticking.

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?

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 6 .

Yes ↓

3

CHECK INJECTOR.

1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

CHECK IGNITION SPARK.

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

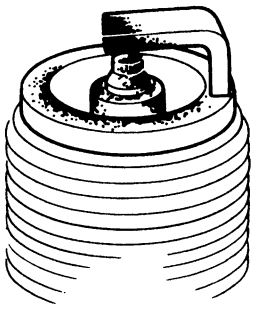
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-119.)

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 3 — Unstable Idle (Cont'd)

5



SEF156I

6

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START

SEF204J

Ⓐ

5

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

6

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)

N.G. → Check fuel pump and circuit.

OR

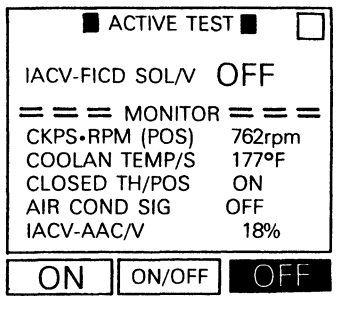
1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

(Go to Ⓑ on next page.)

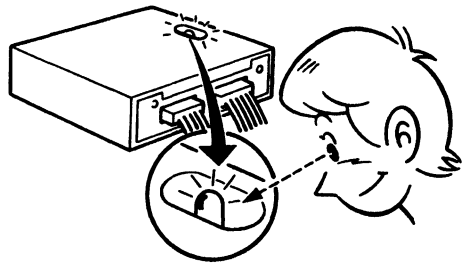
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

7



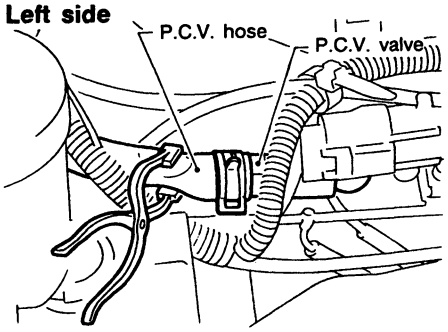
SEF470M

7

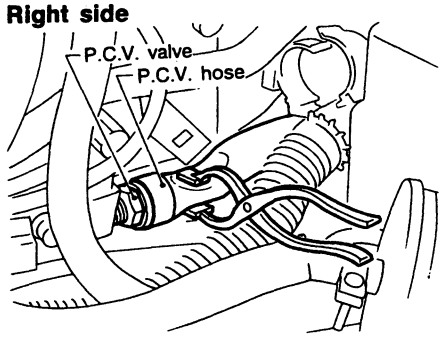


SEF152I

8 Left side



Right side



SEF027K

Ⓑ

7

CHECK HEATED OXYGEN SENSOR.

1. See "M/R F/C MNT (right and left sides)" 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→LEAN→RICH.....
   (1 time; 2 times)

N.G. → Replace heated oxygen sensor(s).

OR

1. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EF & EC-52.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

O.K.

8

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

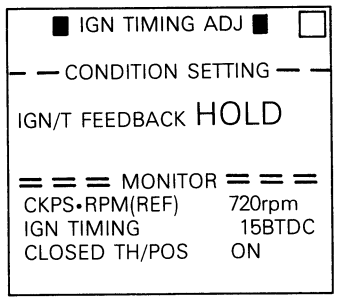
Yes → Discover air leak location and repair.

No

(Go to Ⓒ on next page.)

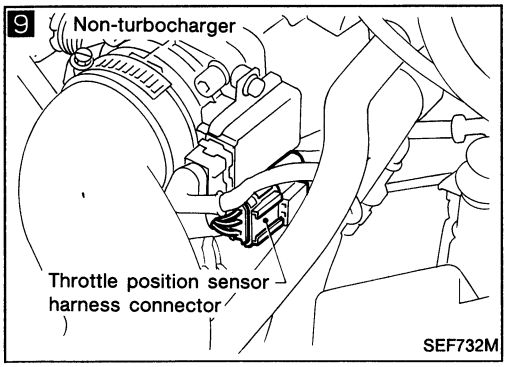
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

9 Non-turbocharger



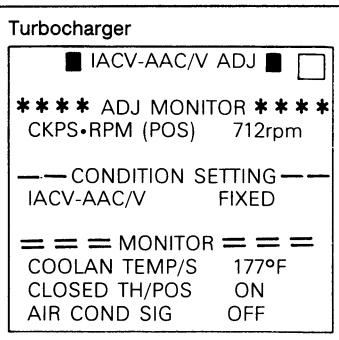
SEF731M

9 Non-turbocharger



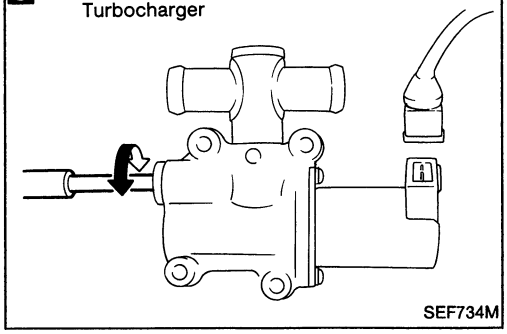
SEF732M

9 Turbocharger



SEF733M

9 Turbocharger



SEF734M

10

COMPRESSION PRESSURE

SEF309G

Ⓒ

9 **CHECK IDLE ADJ. SCREW CLOGGING.** No → Check for IAS clogging or throttle valve clogging.

Non-turbocharger
1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine speed as follows by turning idle adjusting screw?
   M/T: 650±50 rpm
   A/T: 720±50 rpm
   [in "N" position]

— OR —

1. Disconnect throttle position sensor harness connector.
2. Can you set engine speed as follows by turning idle speed adjusting screw?
   M/T: 650±50 rpm
   A/T: 720±50 rpm
   [in "N" position]

— OR —

Turbocharger
1. Perform "IACV-AAC/V ADJ" in "WORK SUPPORT" mode.
2. Can you set engine speed as follows by turning idle adjusting screw?
   M/T: 650±50 rpm
   A/T: 700±50 rpm
   [in "N" position]

— OR —

1. Disconnect IACV-AAC valve harness connector.
2. Can you set engine speed as follows by turning idle adjusting screw?
   M/T: 650±50 rpm
   A/T: 700±50 rpm
   [in "N" position]

Yes

10 **CHECK COMPRESSION PRESSURE.** N.G. → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

- Check compression pressure.
  Standard: kPa (kg/cm², psi)/300 rpm
  1,285 (13.1, 186)
  Minimum: kPa (kg/cm², psi)/300 rpm
  981 (10.0, 142)
  Difference between each cylinder: kPa (kg/cm², psi)/300 rpm
  98 (1.0, 14)

O.K.

11 **CHECK ECM HARNESS CONNECTOR.** N.G. → Repair or replace.

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

O.K.

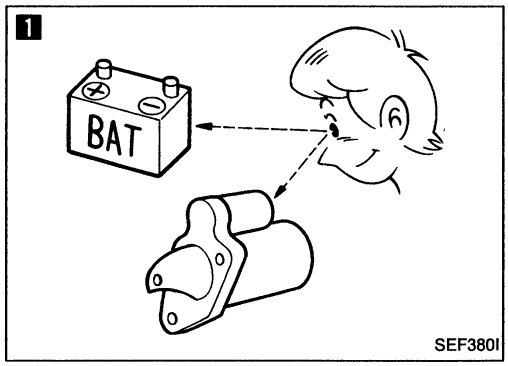
12 **TRY A KNOWN GOOD ECM*.**

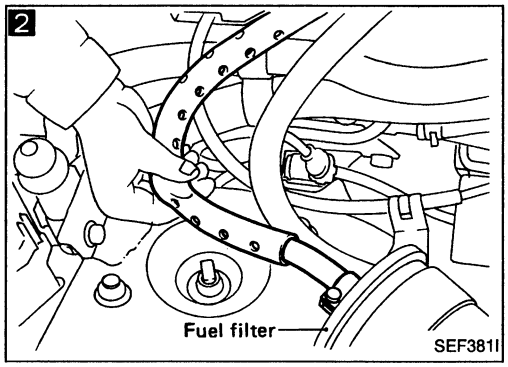
O.K.

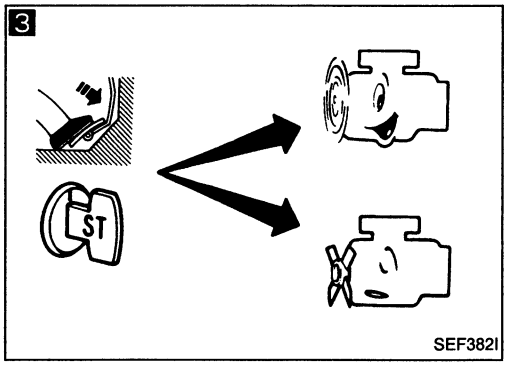
INSPECTION END

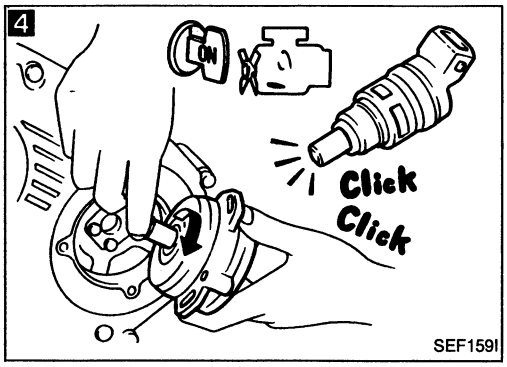
*: ECM may be the cause of a problem, but this is rarely the case.

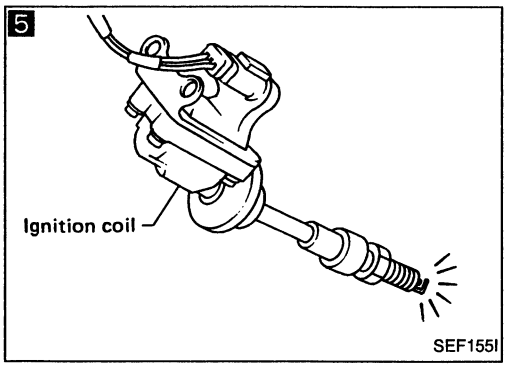
Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold











1

CHECK BATTERY AND STARTER.
Check battery and starter condition.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

2

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-150.)

Yes ↓

3

CHECK IACV-AIR REGULATOR AND IACV-AAC VALVE.
When pressing accelerator pedal fully, can you start the engine?

Yes → Check IACV-AAC valve, IACV-air regulator and circuits. (See pages EF & EC-153 - 156.)

No ↓

4

CHECK INJECTOR.
1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

5

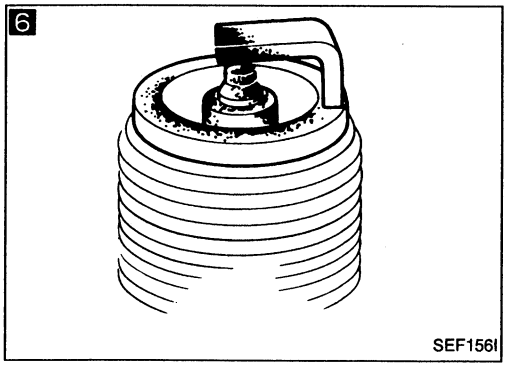
CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-119.)

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)



Ⓐ

6

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

7

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.

8

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-107.

N.G. → Repair or replace.

O.K.

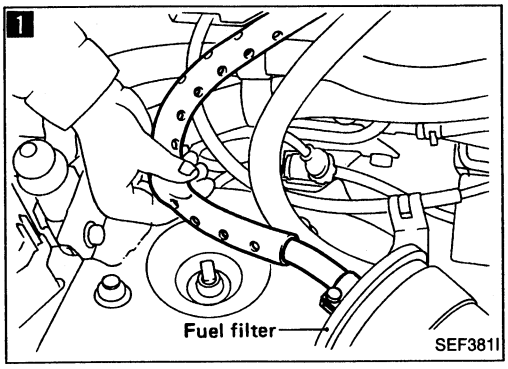
9

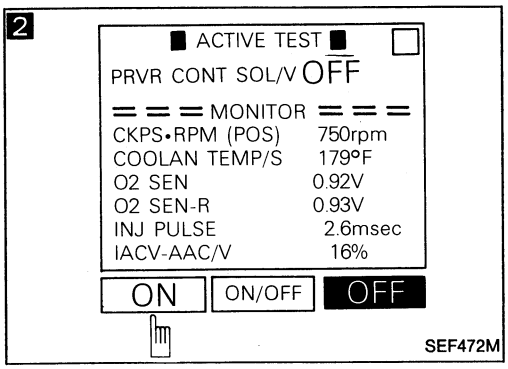
TRY A KNOWN GOOD ECM*.

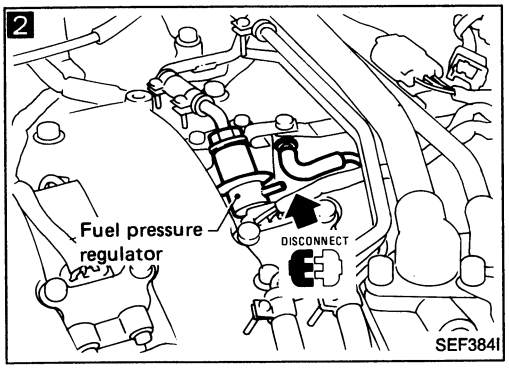
INSPECTION END

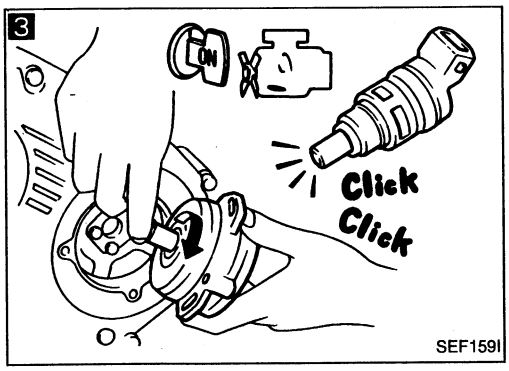
*: ECM may be the cause of a problem, but this is rarely the case.

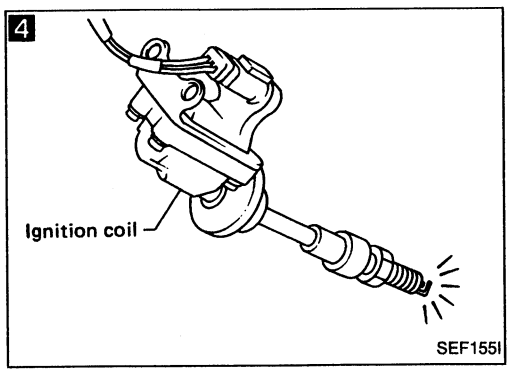
Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot











1

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-150.)

Yes ↓

2

CHECK FUEL VAPOR.
1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", can you start the engine?

Yes → Check fuel properties.

OR

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

No ↓

3

CHECK INJECTOR.
1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

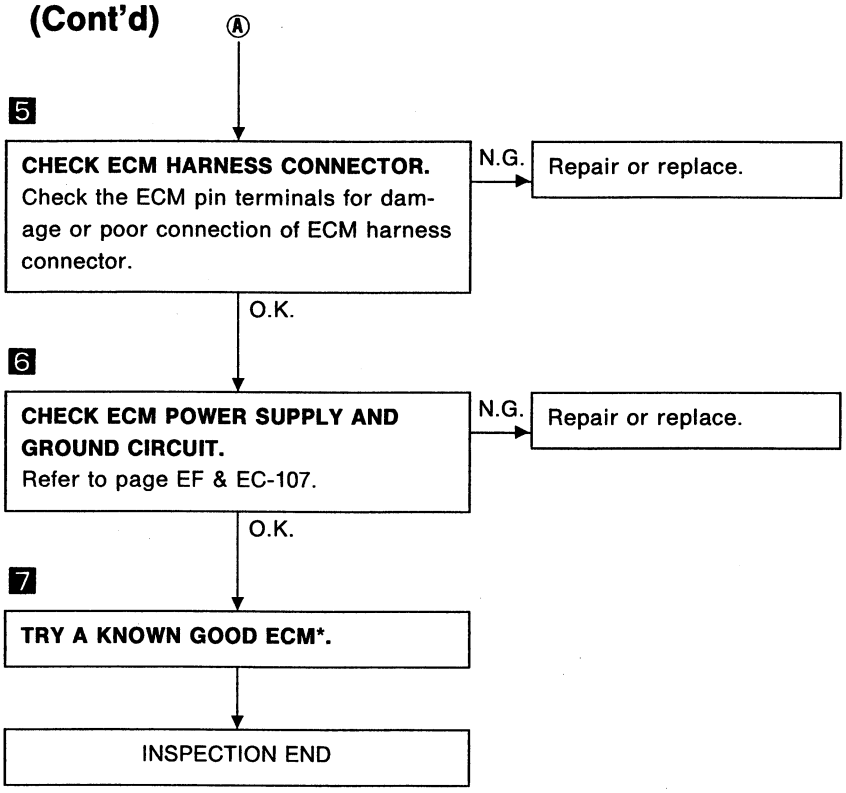
CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

O.K. ↓

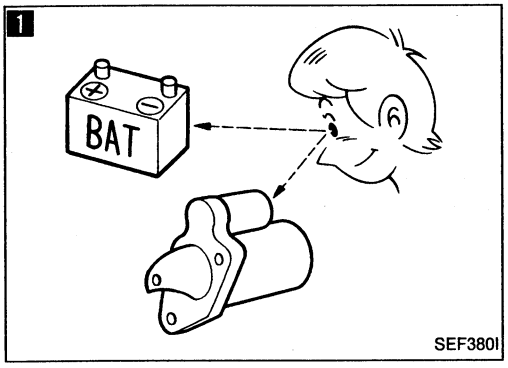
(Go to Ⓐ on next page.)

Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)



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

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions

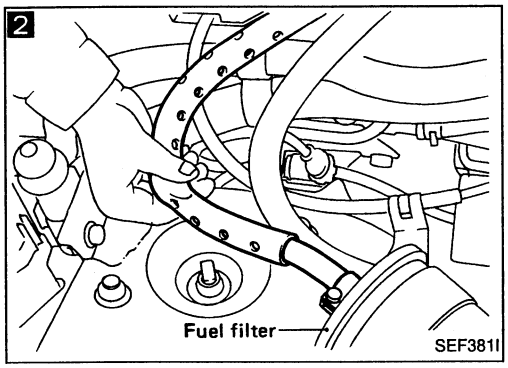


1

CHECK BATTERY AND STARTER.
Check battery and starter operation.
(Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓

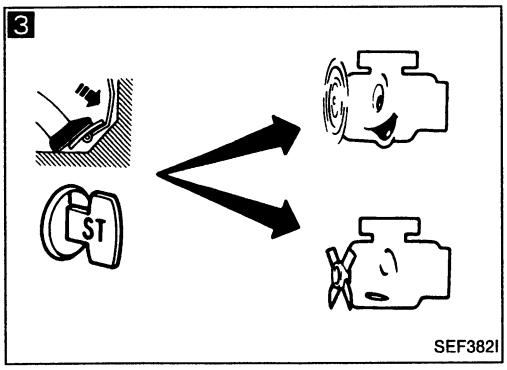


2

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-150.)

Yes ↓

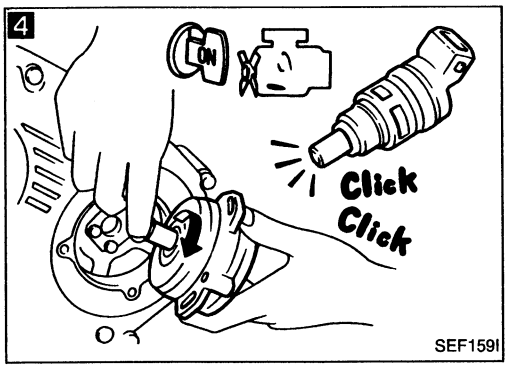


3

CHECK INJECTOR FOR LEAKAGE.
When pressing accelerator pedal fully, can you start the engine?

Yes → Check injector(s) for leakage.

No ↓

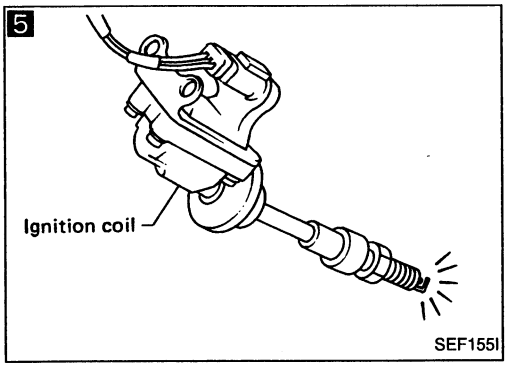


4

CHECK INJECTOR.
1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injectors and circuits.

Yes ↓



5

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

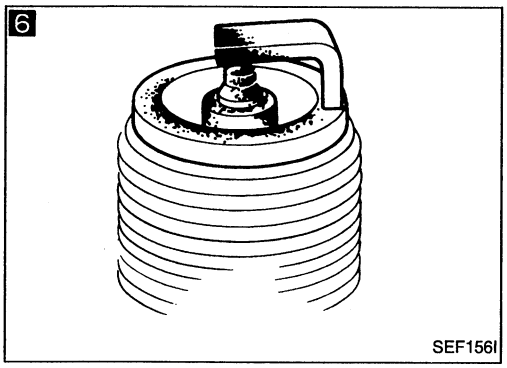
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

6



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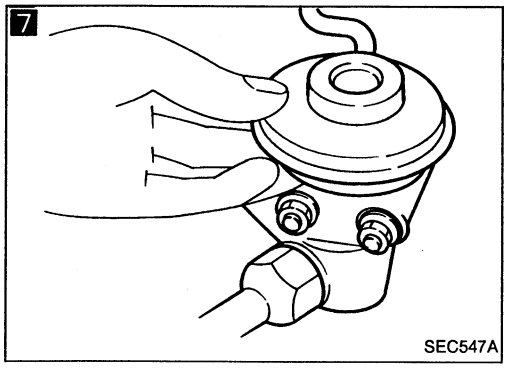
7



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6

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

7

CHECK EGR VALVE.
Check EGR valve for sticking.

N.G. → Repair or replace.

O.K.

8

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.

9

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-107.

N.G. → Repair or replace.

O.K.

10

TRY A KNOWN GOOD ECM*.

Trouble is fixed. → Replace ECM.

Trouble is not fixed.

11

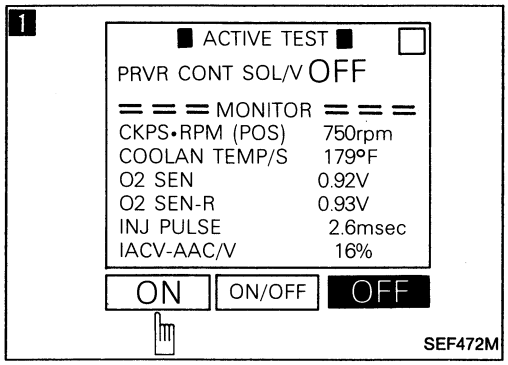
CHECK TIMING BELT FOR PROPER INSTALLATION.

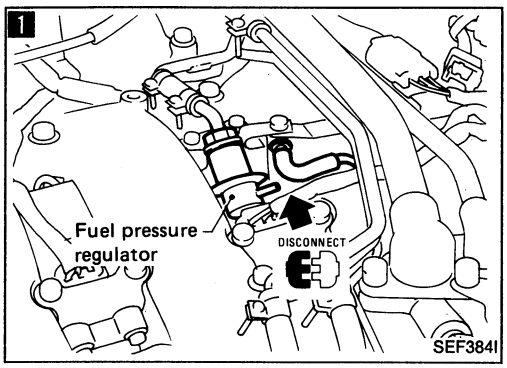
N.G. → Replace timing belt.

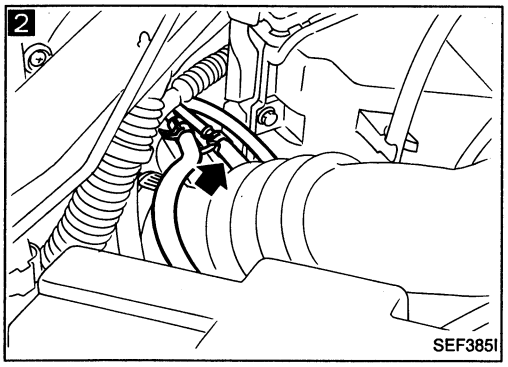
O.K.

INSPECTION END

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







Diagnostic Procedure 7 — Hesitation when the Engine is Hot

1

CHECK FUEL VAPOR.

1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", perform cruise test.
3. Does the hesitation disappear?

Yes → Check fuel properties.

OR

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

No ↓

2

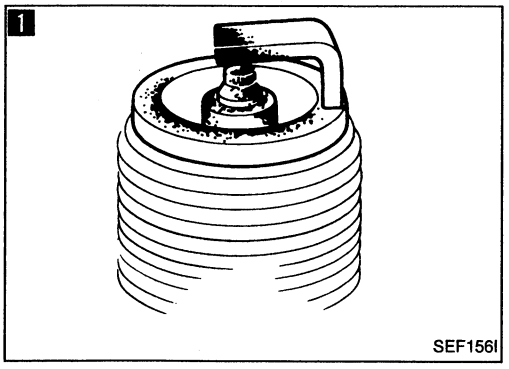
CHECK CANISTER PURGE.

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

Yes → Check purge and vacuum lines.

No ↓

INSPECTION END



Diagnostic Procedure 8 — Hesitation when the Engine is Cold

1

CHECK SPARK PLUGS.

Remove spark plugs and check for fouling, etc.

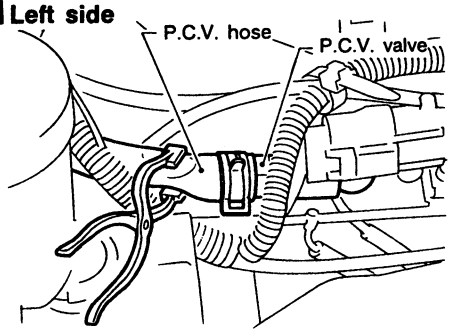
N.G. → Repair or replace spark plug(s).

O.K. ↓

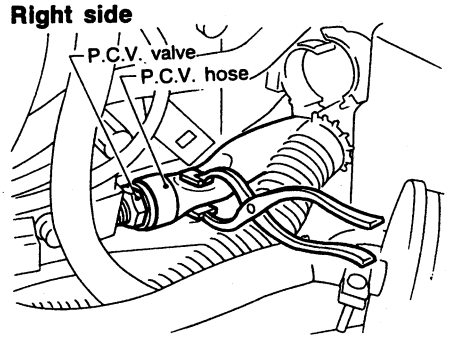
Ⓐ

Diagnostic Procedure 8 — Hesitation when the Engine is Cold (Cont'd)

2 Left side



Right side



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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.

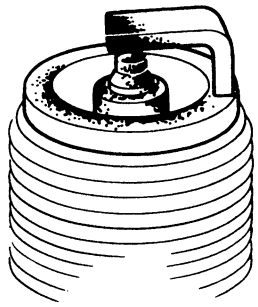
Trouble is not fixed.

4

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

INSPECTION END

1



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Diagnostic Procedure 9 — Hesitation under Normal Conditions

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

2

CHECK HEATED OXYGEN SENSOR.

1. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
2. 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→ LEAN→RICH.....
   (1 time, 2 times)

Yes → Replace heated oxygen sensor(s).

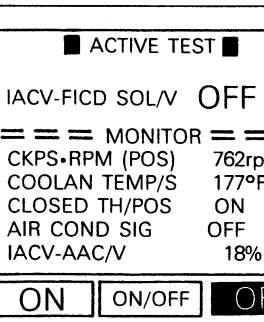
OR

1. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EF & EC-52.)
2. Maintaining engine at 2,000 rpm under no load, check that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

No

(Go to Ⓐ on next page.)

2



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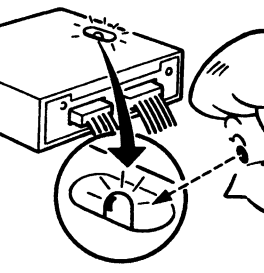
2



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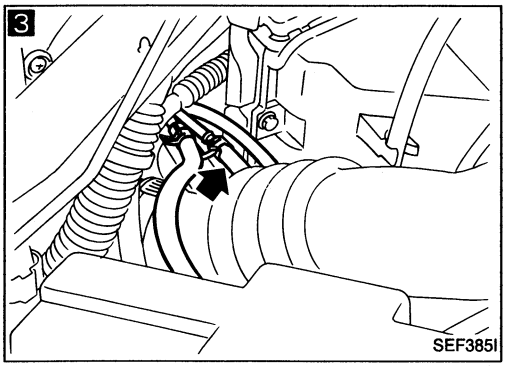
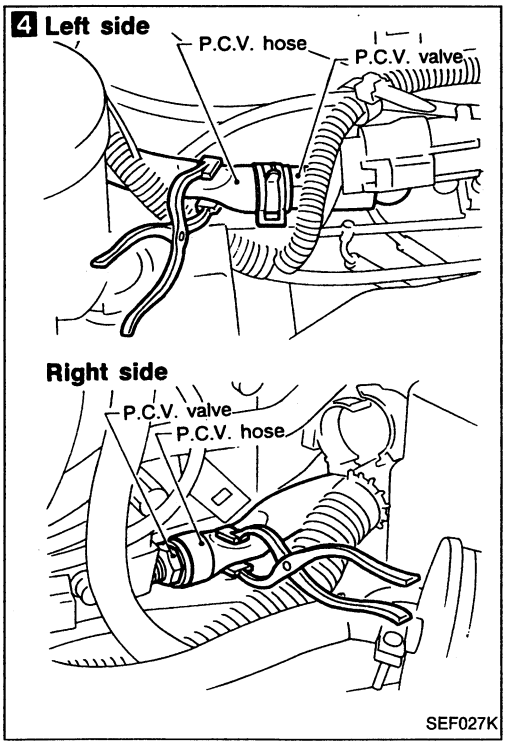
Diagnostic Procedure 9 — Hesitation under Normal Conditions (Cont'd)





Ⓐ

3

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 lines.

No

4

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

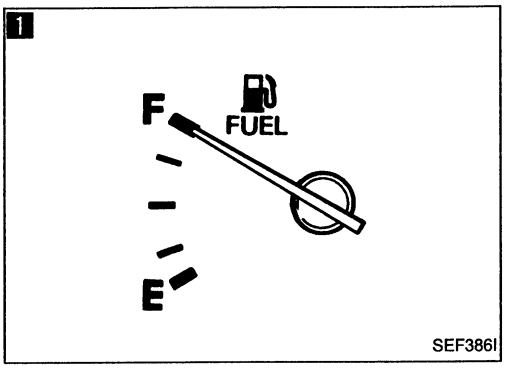
Yes → Discover air leak location and repair.

No

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning

1



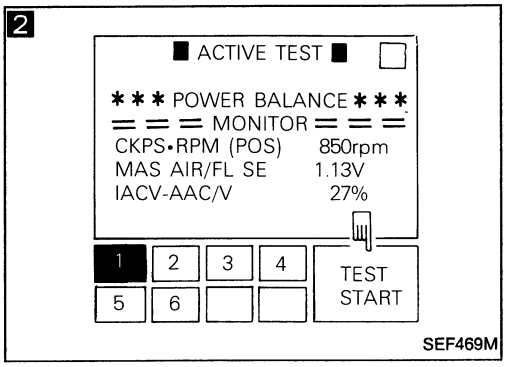
SEF386I

CHECK FUEL LEVEL.
Check to see that there is enough fuel in tank.

N.G. → Fill fuel tank with fuel.

O.K. ↓

2



SEF469M

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?

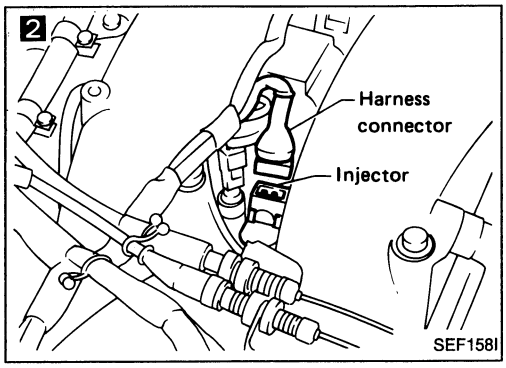
No → Go to 5 .

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 ↓

2



SEF158I

3

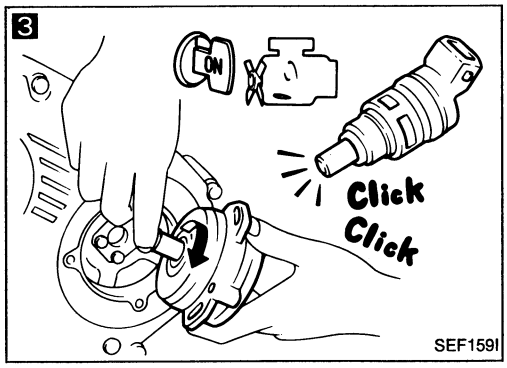
CHECK INJECTOR.

1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3



SEF159I

4

CHECK IGNITION SPARK.

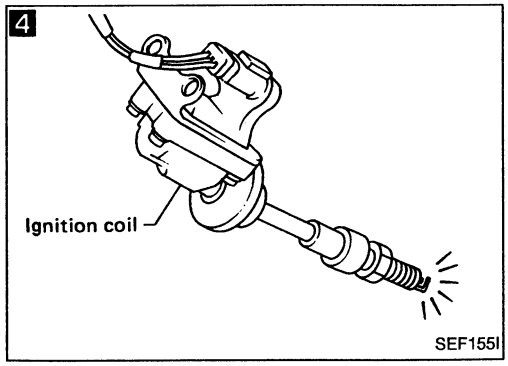
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

O.K. ↓

(Go to Ⓐ on next page.)

4



SEF155I

Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)

5

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START

SEF204J

Ⓐ

5

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

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-107.

N.G. → Repair or replace.

O.K.

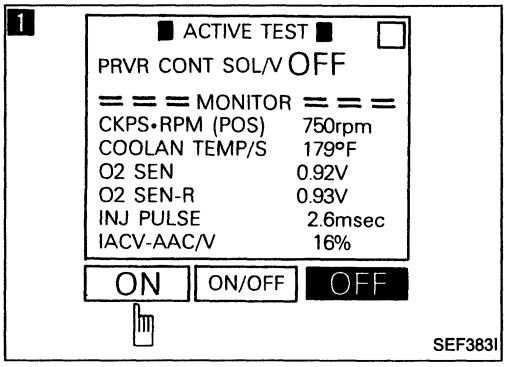
8

TRY A KNOWN GOOD ECM*.

INSPECTION END

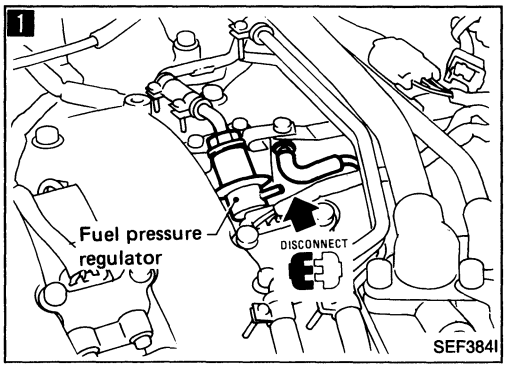
*: ECM may be the cause of a problem, but this is rarely the case.

1



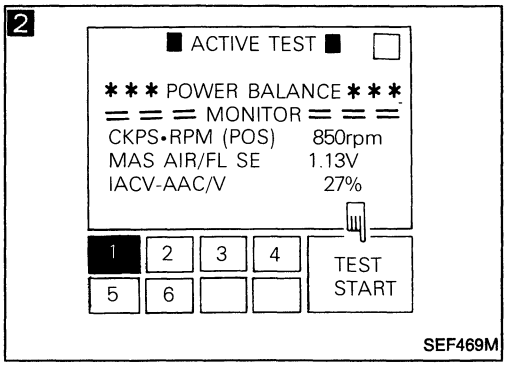
SEF383I

1



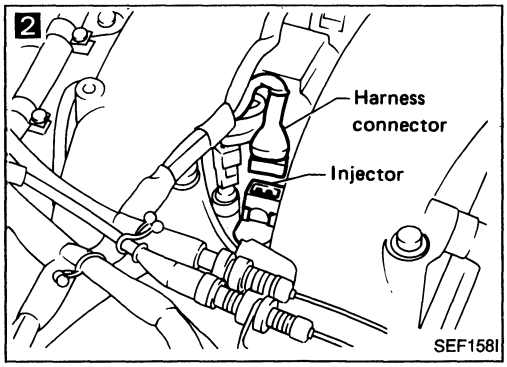
SEF384I

2



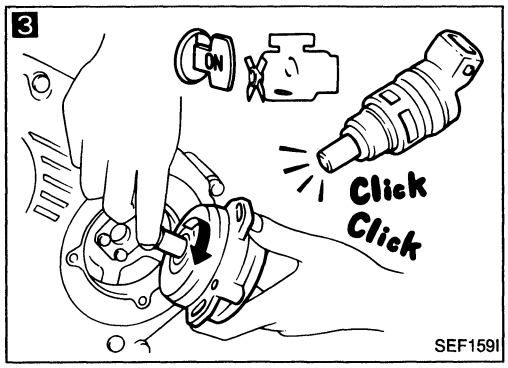
SEF469M

2



SEF158I

3



SEF159I

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

1

CHECK FUEL VAPOR.

1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", perform cruise test.
3. Does the engine stall disappear?

Yes → Check fuel properties.

OR

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

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.

1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

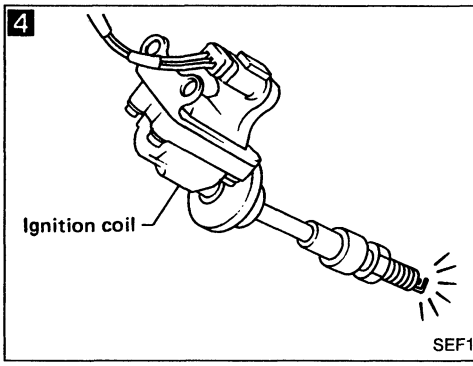
No → Check injector(s) and circuit(s).

Yes

(Go to Ⓐ on next page.)

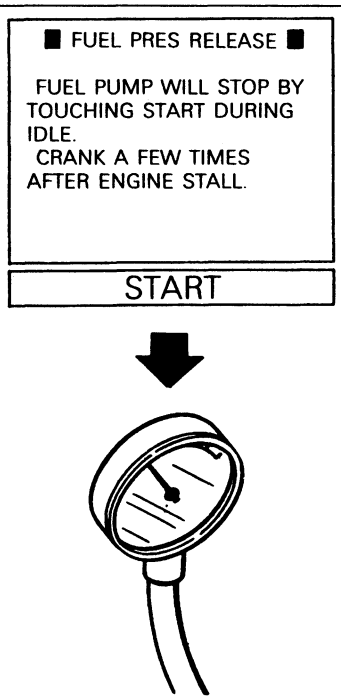
Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)

4



SEF155I

5



SEF204J

Ⓐ

4

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-119.)

O.K.

5

CHECK FUEL PRESSURE.
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

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-107.

N.G. → Repair or replace.

O.K.

8

TRY A KNOWN GOOD ECM*.

Trouble is fixed. → Replace ECM.

Trouble is not fixed.

9

CHECK TIMING BELT FOR PROPER INSTALLATION.

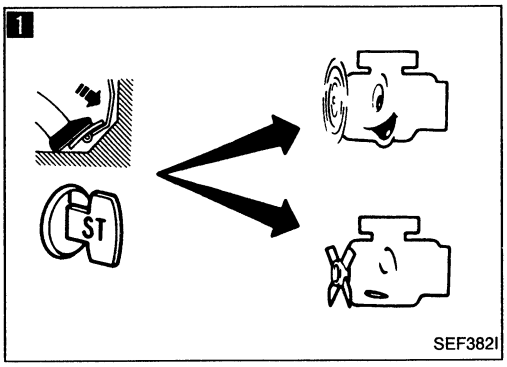
N.G. → Replace timing belt.

O.K.

INSPECTION END

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

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

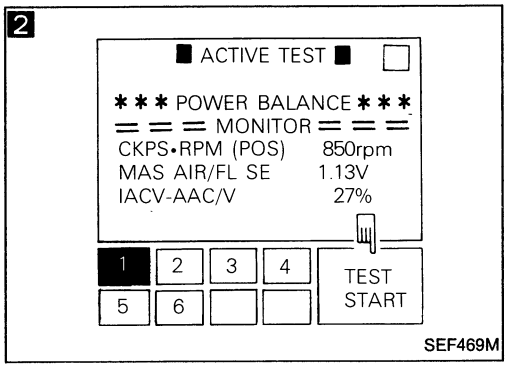


1

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-153 - 156.)

O.K. ↓



2

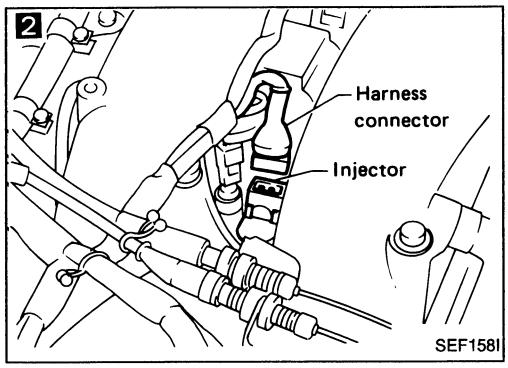
PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

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. ↓

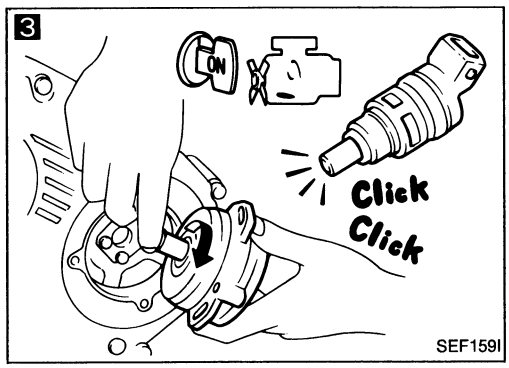


3

CHECK INJECTOR.
1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

N.G. → Check injector(s) and circuit(s).

O.K. ↓

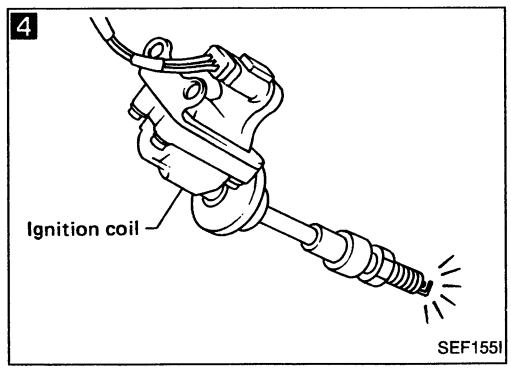


4

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

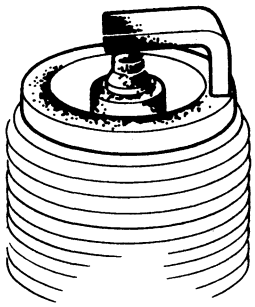
O.K. ↓



(Go to Ⓐ on next page.)

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)

5



SEF156I

6

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START

SEF204J

Ⓐ

5

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K.

6

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

7

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.

8

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-107.

N.G. → Repair or replace.

O.K.

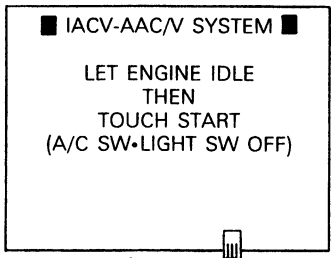
9

TRY A KNOWN GOOD ECM*.

INSPECTION END

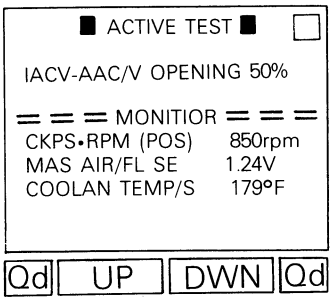
*: ECM may be the cause of a problem, but this is rarely the case.

1



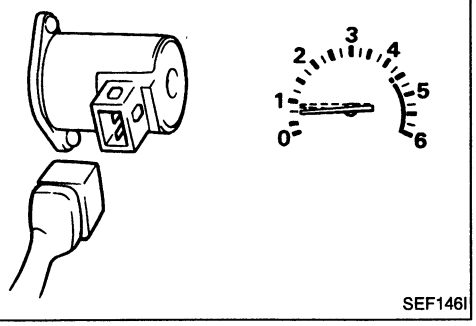
SEF249M

1



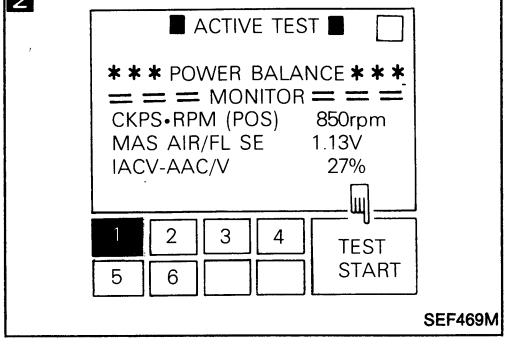
SEF473M

1



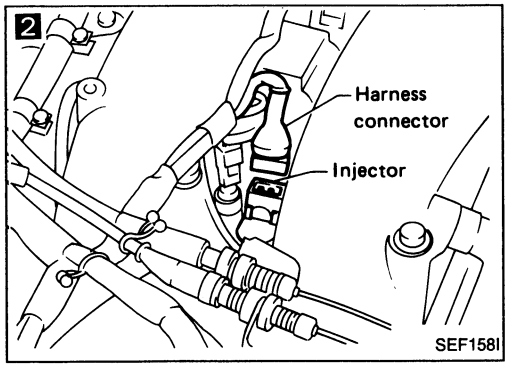
SEF146I

2



SEF469M

2



SEF158I

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently.
2. Check idle speed.
   A/T: 770 ± 50 rpm (Non-turbocharger)
   750 ± 50 rpm (Turbocharger)
   [in "N" position]
   M/T: 700 ± 50 rpm
3. Perform "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

No → Check IACV-AAC valve and circuit. (See page EF & EC-156.)

OR

1. Select "IACV-A.A.C./V 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?

Yes

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

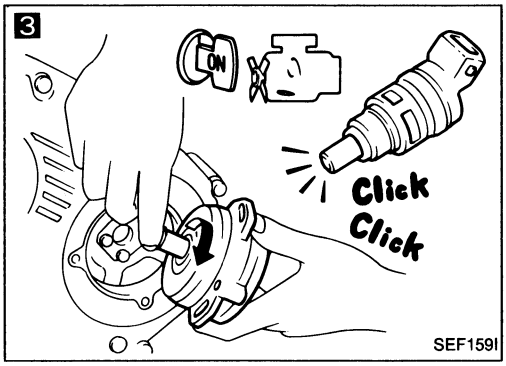
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

(Go to Ⓐ on next page.)

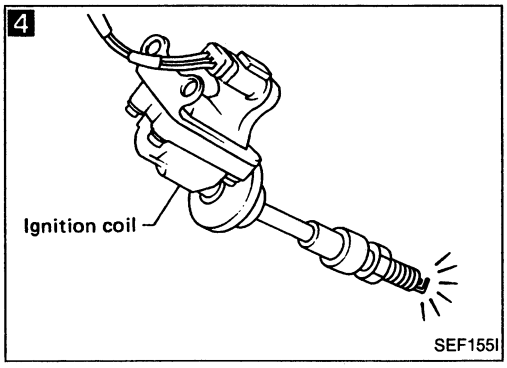
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)

3



SEF159I

4



SEF155I

5

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START

SEF204J

Ⓐ

3

CHECK INJECTOR.

1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and their circuit(s).

Yes

4

CHECK IGNITION SPARK.

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

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-119.)

O.K.

5

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

N.G. → Check fuel pressure regulator diaphragm.

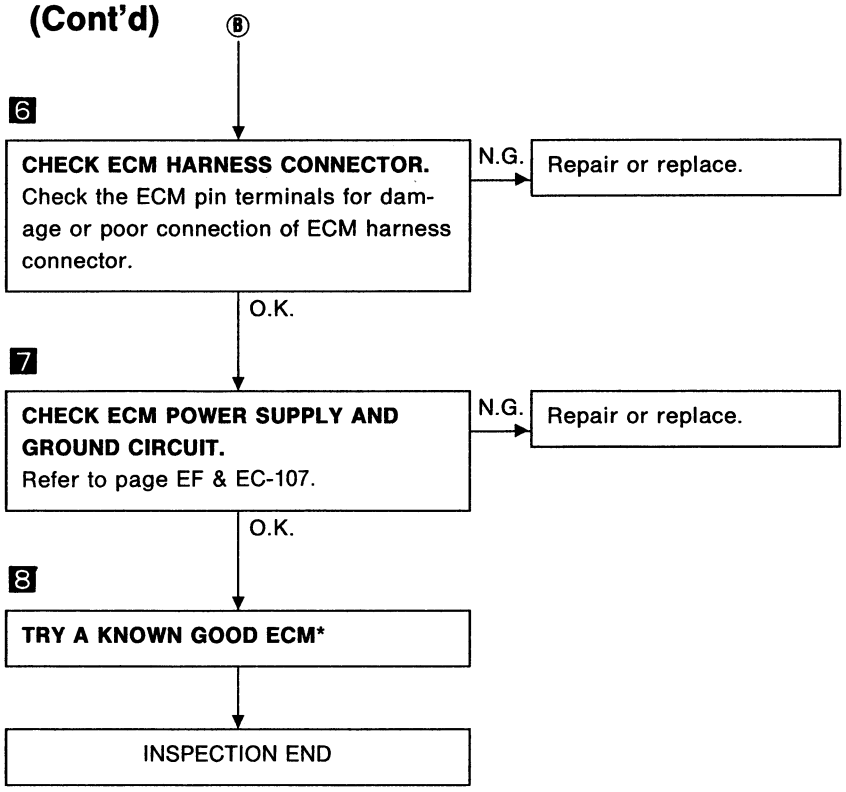
OR

1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

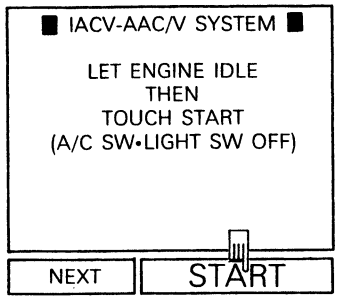
(Go to Ⓑ on next page.)

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)



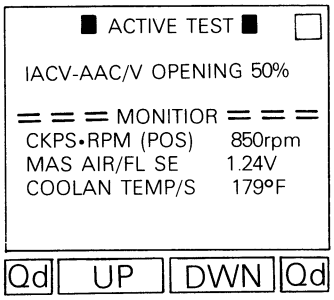
*: ECM may be the cause of a problem, but this is rarely the case.

1



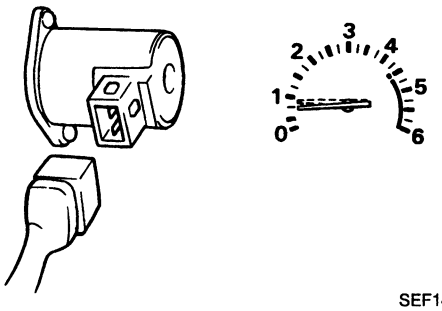
SEF474M

1



SEF473M

1



SEF146I

Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently.
2. Check idle speed.
   A/T: 770 ± 50 rpm (Non-turbocharger)
   750 ± 50 rpm (Turbocharger)
   [In "N" position]
   M/T: 700 ± 50 rpm
3. Perform "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

No → Check IACV-AAC valve and circuit. (See page EF & EC-156.)

OR

1. Select "IACV-AAC/V 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

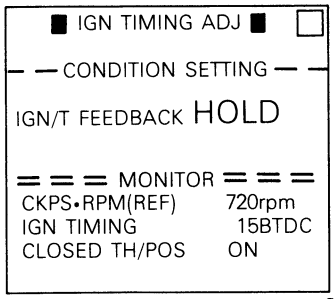
When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

Yes

(Go to Ⓐ on next page.)

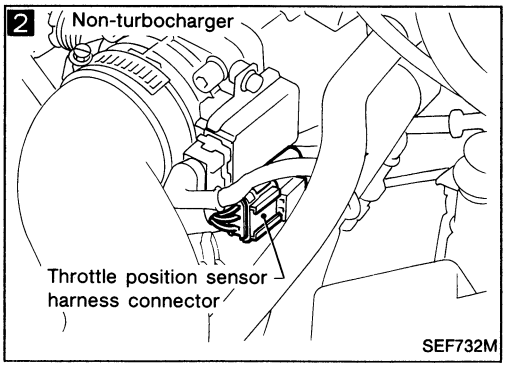
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

2 Non-turbocharger



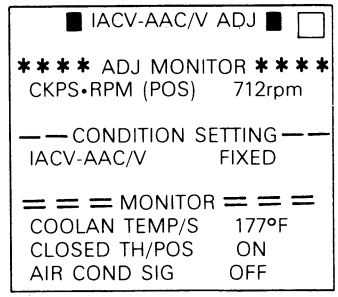
SEF731M

2 Non-turbocharger



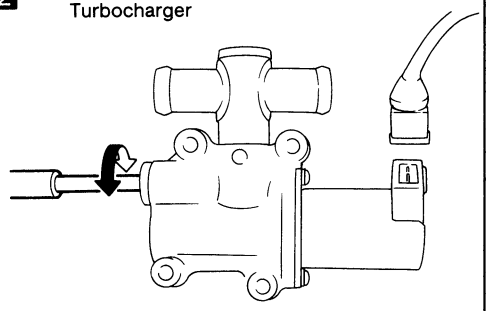
SEF732M

2 Turbocharger



SEF733M

2 Turbocharger



SEF734M

Ⓐ

2

CHECK IDLE ADJ. SCREW CLOGGING.

Non-turbocharger

1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine speed as follows by turning idle adjusting screw?
   M/T: 650±50 rpm
   A/T: 720±50 rpm
   [in "N" position]

No → Check for IAS clogging or throttle body clogging.

OR

1. Disconnect throttle position sensor harness connector.
2. Can you set engine speed as follows by turning idle speed adjusting screw?
   M/T: 650±50 rpm
   A/T: 720±50 rpm
   [in "N" position]

OR

Turbocharger

1. Perform "IACV-AAC/V ADJ" in "WORK SUPPORT" mode.
2. Can you set engine speed as follows by turning idle adjusting screw?
   M/T: 650±50 rpm
   A/T: 700±50 rpm
   [in "N" position]

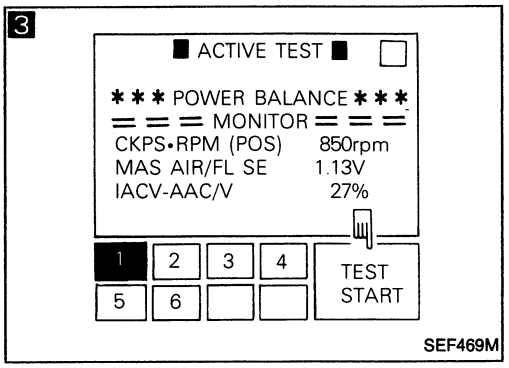
OR

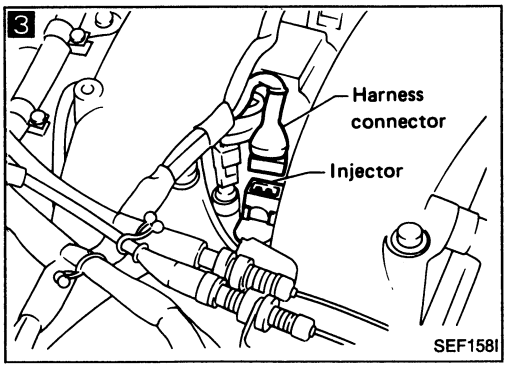
1. Disconnect IACV-AAC valve harness connector.
2. Can you set engine speed as follows by turning idle adjusting screw?
   M/T: 650±50 rpm
   A/T: 700±50 rpm
   [in "N" position]

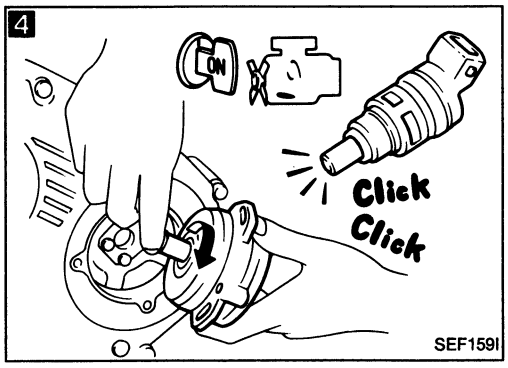
Yes

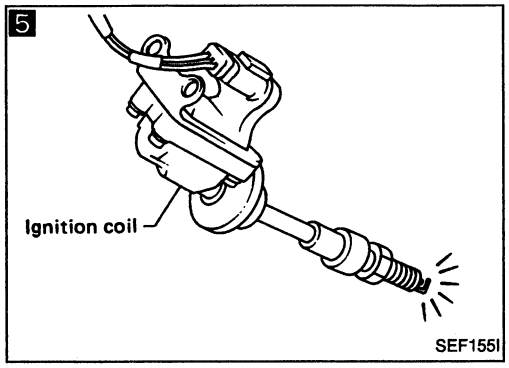
(Go to Ⓑ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)









Ⓑ

3

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 **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?

Yes ↓

4

CHECK INJECTOR.

1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

5

CHECK IGNITION SPARK.

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

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

O.K. ↓

(Go to Ⓒ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

6

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START

SEF204J

7

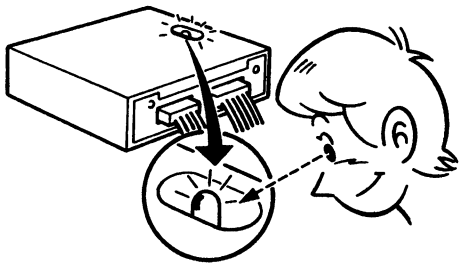
☆MONITOR ☆NO FAIL ☐

CKPS•RPM (POS)	2087rpm
M/R F/C MNT	LEAN
M/R F/C MNT-R	RICH

RECORD

SEF470M

7



SEF152I

Ⓒ

6

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

7

CHECK HEATED OXYGEN SENSOR.

1. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
2. 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.....

N.G. → Replace heated oxygen sensor(s).

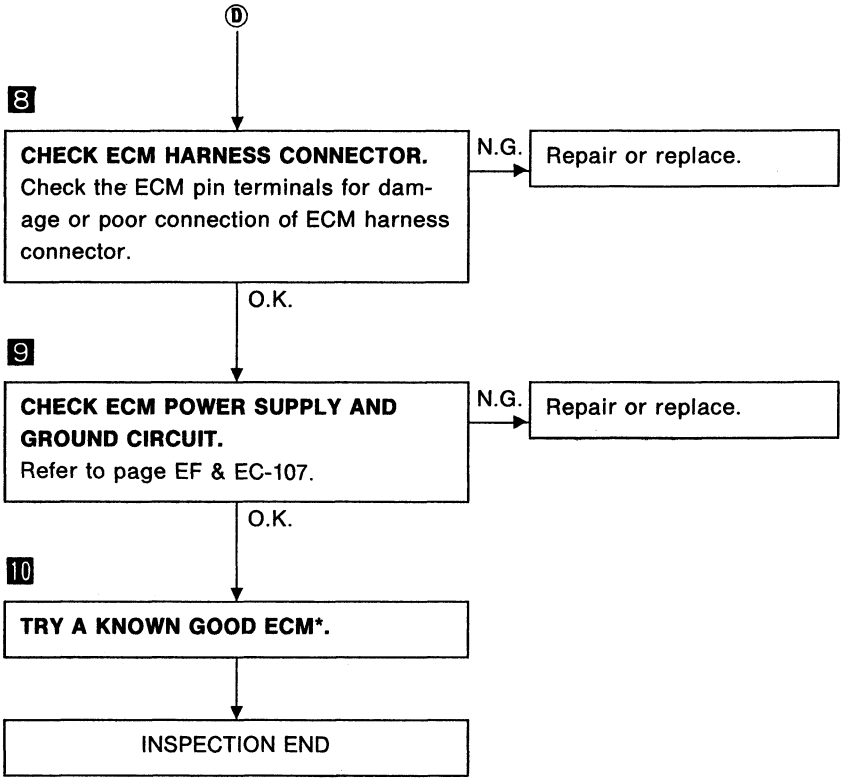
OR

1. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EF & EC-52.)
2. Maintaining engine at 2,000 rpm under no load, check that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

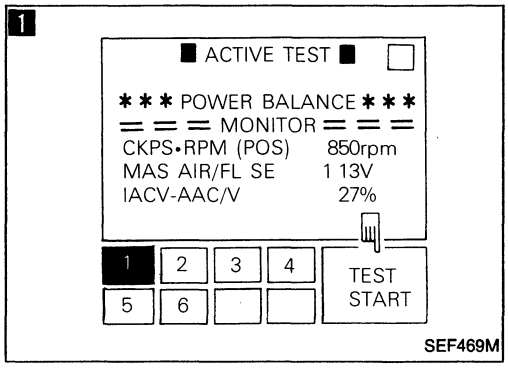
O.K.

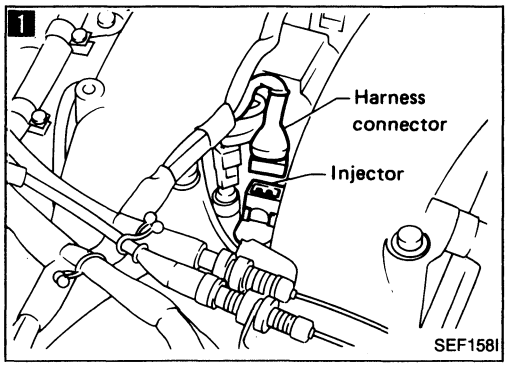
(Go to Ⓓ on next page.)

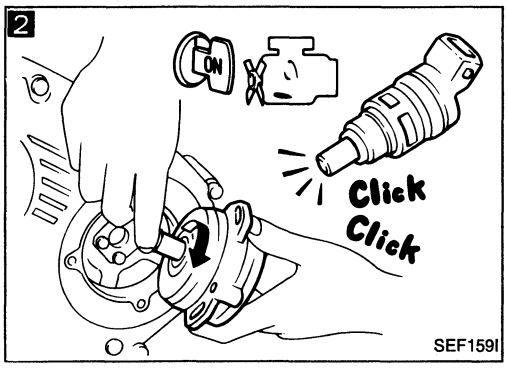
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

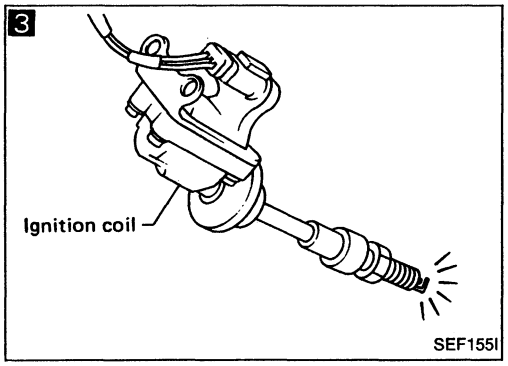


*: ECM may be the cause of a problem, but this is rarely the case.









Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising

1

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 **4** .

— 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 ↓

2

CHECK INJECTOR.

1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3

CHECK IGNITION SPARK.

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

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising (Cont'd)

4

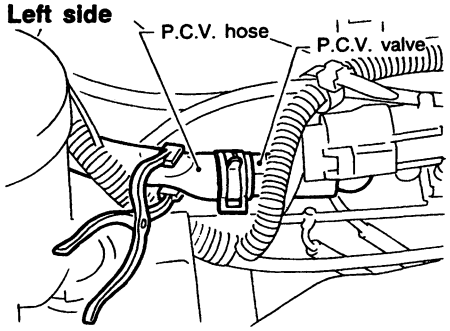
■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

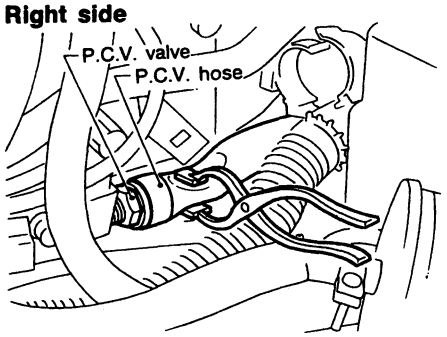
START

SEF204J

5 **Left side**



Right side



SEF027K

Ⓐ

4 **CHECK FUEL PRESSURE.**

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

N.G. → Check fuel pump, circuit and fuel pressure regulator.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

5 **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

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-107.

Yes → Repair or replace.

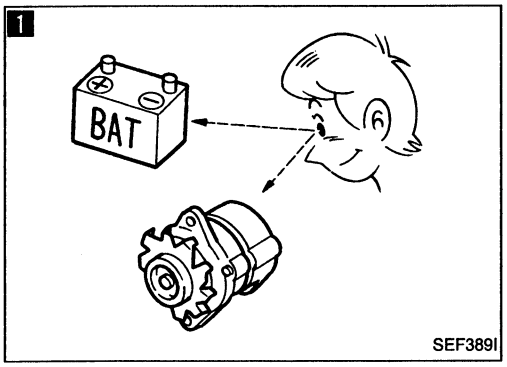
No

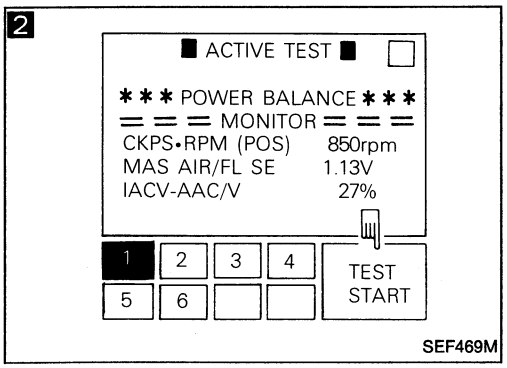
8 **TRY A KNOWN GOOD ECM*.**

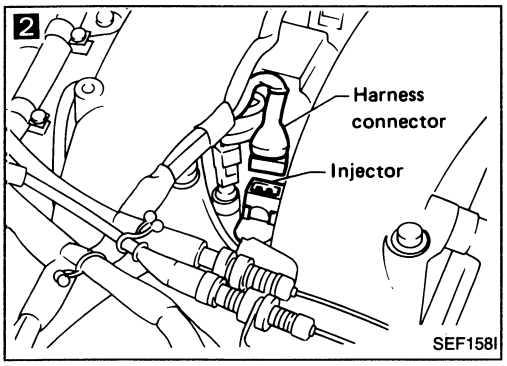
INSPECTION END

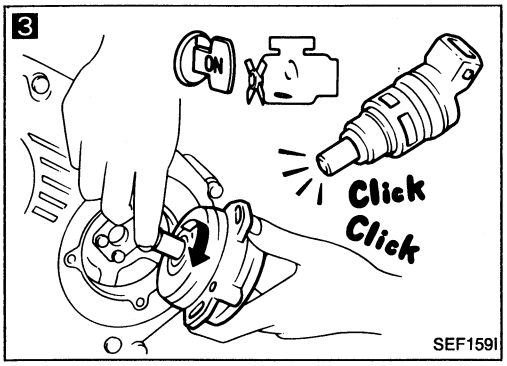
*: ECM may be the cause of a problem, but this is rarely the case.

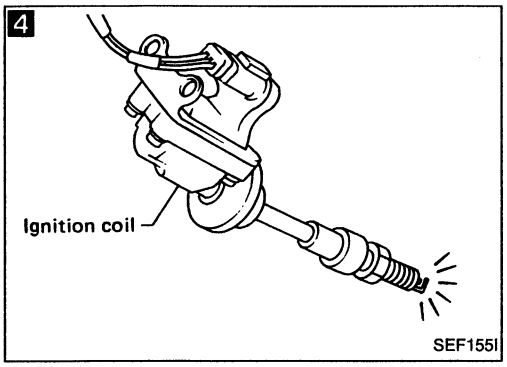
Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy











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.

1. Remove crankshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crankshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

CHECK IGNITION SPARK.

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

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)

5

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START

SEF204J

Ⓐ

5

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

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-107.

N.G. → Repair or replace.

O.K.

8

TRY A KNOWN GOOD ECM*.

INSPECTION END

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

1

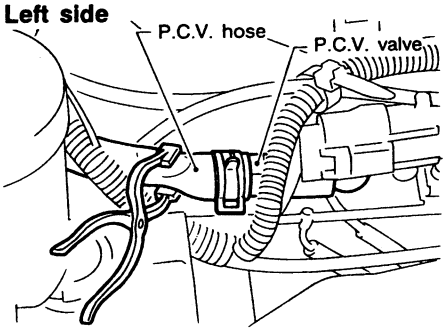
■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

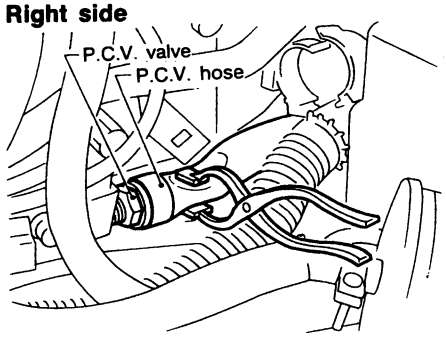
START

SEF204J

2 Left side



Right side



SEF027K

Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-181.)
2. Install fuel pressure gauge and check fuel pressure.

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

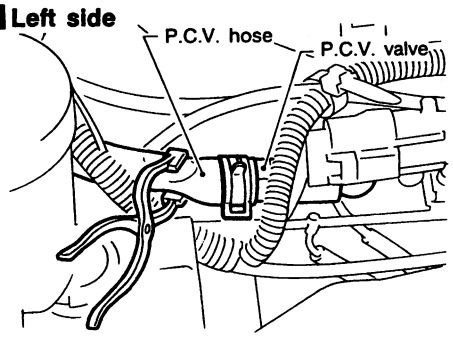
CHECK TIMING BELT FOR PROPER INSTALLATION.

N.G. → Replace timing belt.

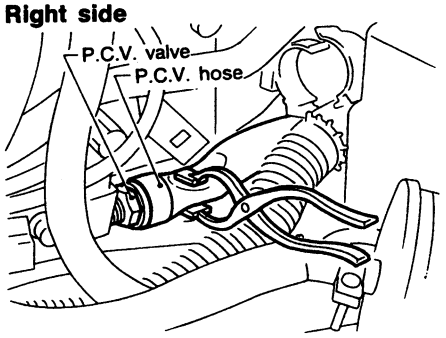
O.K.

INSPECTION END

1 Left side



Right side



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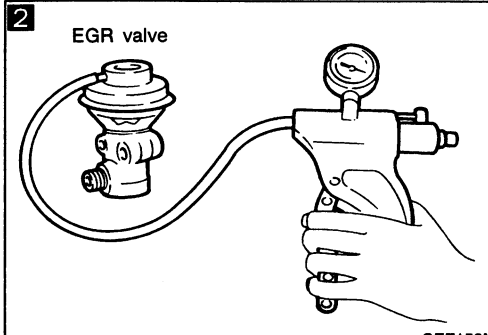
2



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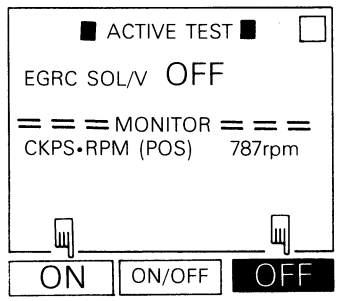
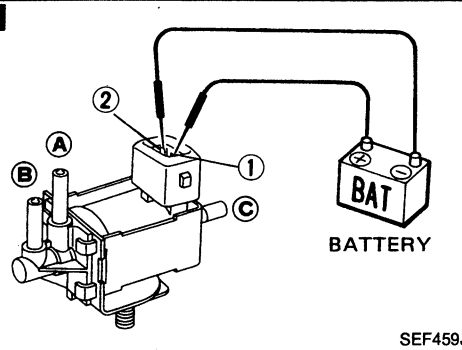
3



SEF475M

3



SEF459J

Diagnostic Procedure 18 — 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 EGRC-SOLENOID VALVE.
1. Select "EGRC. SOL/V" in "ACTIVE TEST" mode.
2. Turn EGRC-solenoid valve ON and OFF.
3. Check operating sound.

OR

1. Disconnect EGRC-solenoid valve harness connector.
2. Supply EGRC-solenoid valve terminals with battery current and check operating sound.

N.G. → Check solenoid valve and circuit.

O.K. ↓

4

CHECK VACUUM HOSES.
Check the following vacuum hoses for clogging, cracks and poor connection.
a) Vacuum hose between EGR valve and EGRC-solenoid valve.
b) Vacuum hose between EGRC-solenoid valve and throttle body port.
c) Vacuum hose between EGRC-solenoid valve and air duct.

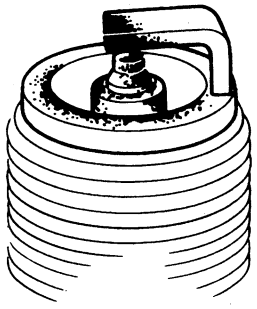
N.G. → Repair or replace.

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 18 — Knock (Cont'd)

5



SEF156I

Ⓐ

5

CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

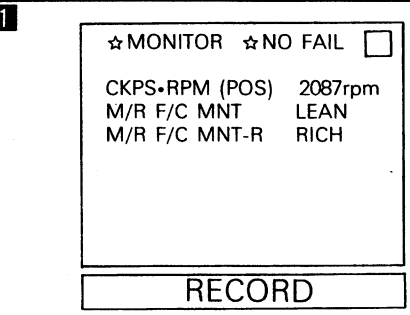
Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No ↓

INSPECTION END

Diagnostic Procedure 19 — Surge

1



SEF160I

1

CHECK HEATED OXYGEN SENSOR.

1. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
2. 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.

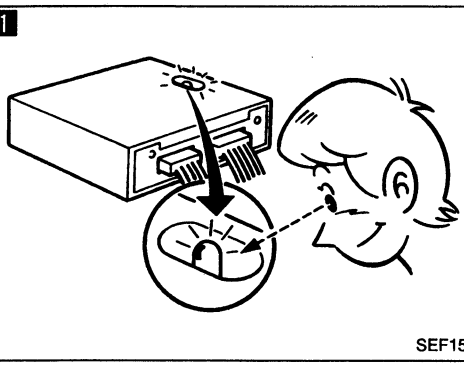
RICH→LEAN→RICH→ (1 time, 2 times)
LEAN→RICH.....

N.G. → Replace heated oxygen sensor(s).

OR

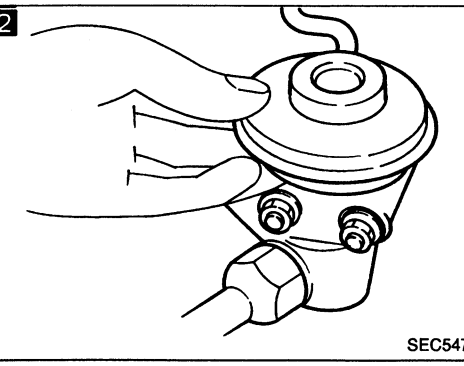
1. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EF & EC-52.)
2. Maintaining engine at 2,000 rpm under no load, check that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

O.K. ↓



SEF152I

2



SEC547A

2

CHECK EGR VALVE.
Check EGR valve for sticking.

N.G. → Repair or replace.

O.K. ↓

3

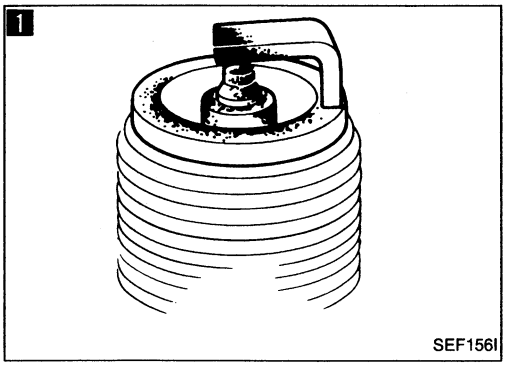
TRY A KNOWN GOOD ECM*.

O.K. ↓

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 PD FA RA BR ST BF HA EL



Diagnostic Procedure 20 — Backfire through the Intake

1

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

O.K. ↓

2

CHECK 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.

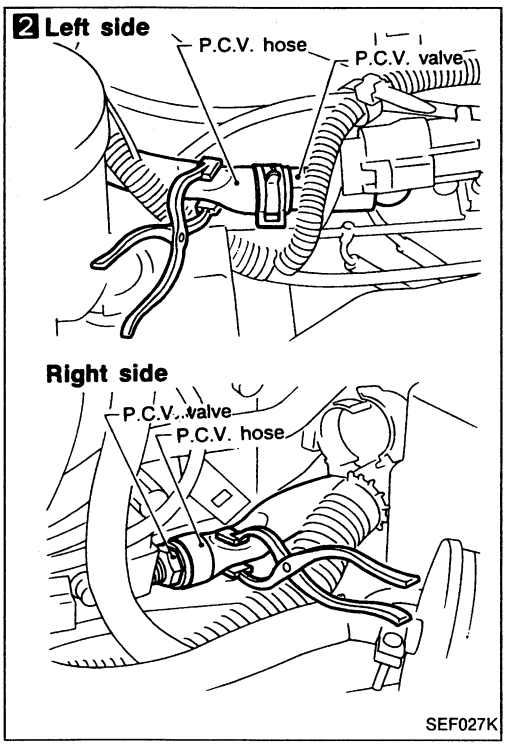
No ↓

3

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

INSPECTION END



Diagnostic Procedure 21 — Backfire through the Exhaust

CHECK ENGINE COOLANT TEMPERATURE SENSOR.
Check engine coolant temperature sensor and its circuit. (See page EF & EC-115.)

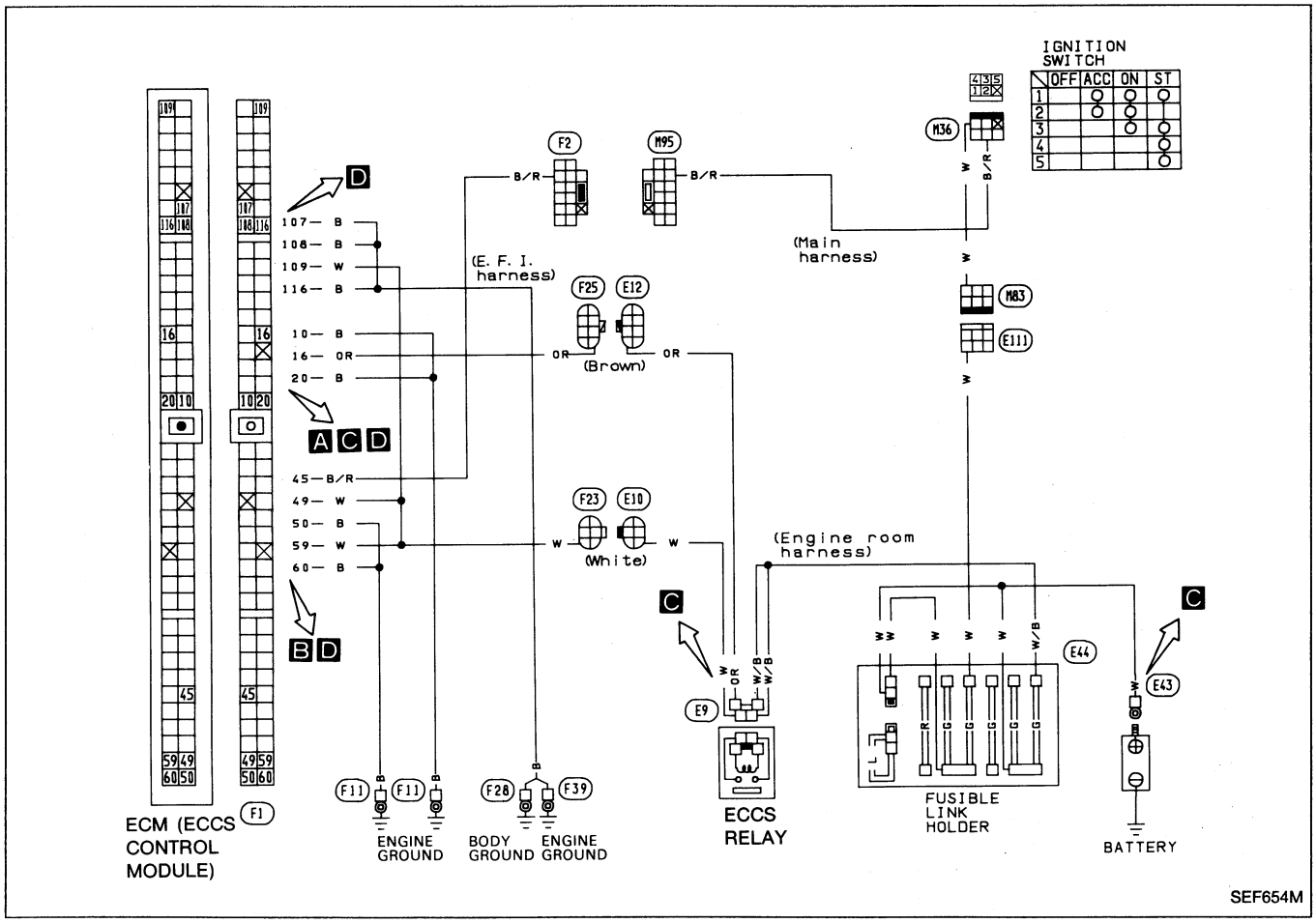
N.G. → Replace or repair.

O.K. ↓

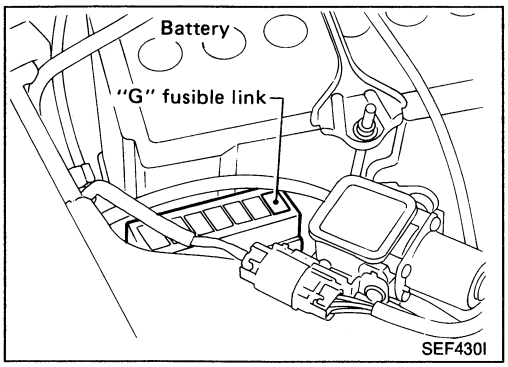
INSPECTION END

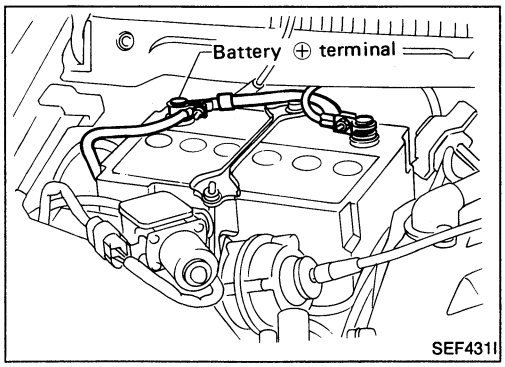
Diagnostic Procedure 22

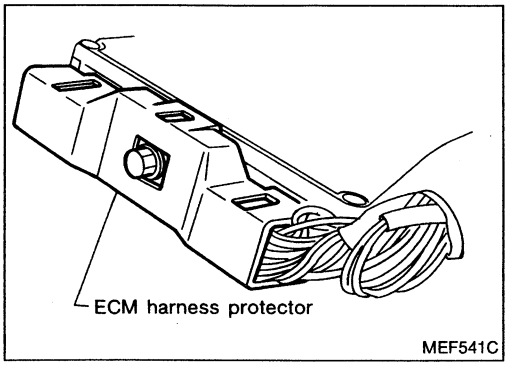
MAIN POWER SUPPLY AND GROUND CIRCUIT



Harness layout

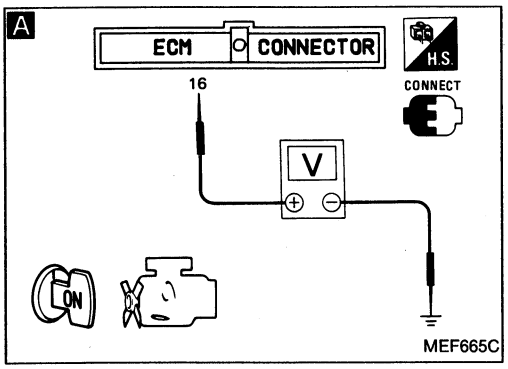




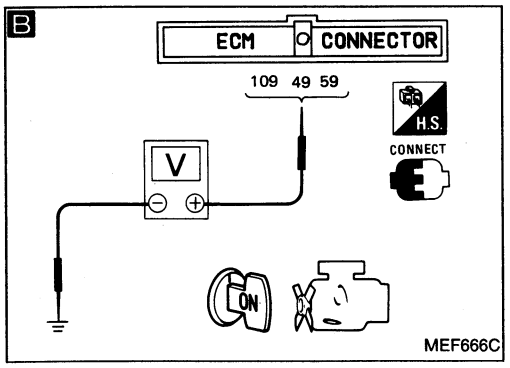


Diagnostic Procedure 22 (Cont'd)

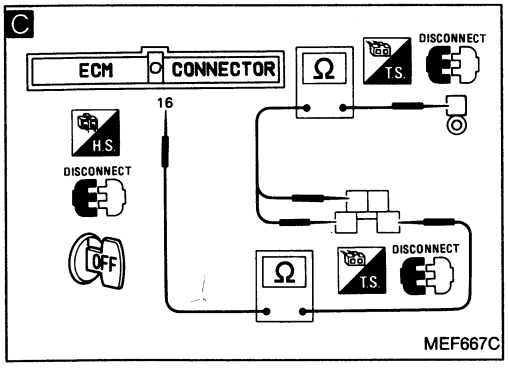
A



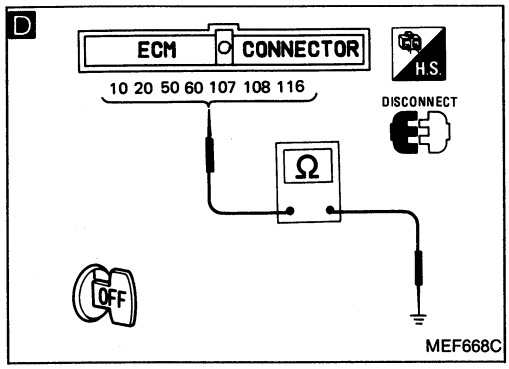
B



C



D



INSPECTION START

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
A 2) Check voltage between ECM pin terminal ⑯ and ground.
Voltage:
Approximately 0.8 - 1.0V
B 3) Check voltage between ECM pin terminals ㊾, ㊾, ⑩⑨ and ground.
Voltage: Battery voltage

N.G. → C

C

Check the following items.
1) ECCS relay
Refer to "Electrical Components Inspection".
(See page EF & EC-180.)
2) "G" fusible link
3) Harness continuity between ECCS relay and battery ⊕ terminal
Continuity should exist.
4) Harness continuity between ECCS relay and ECM pin terminal ⑯
Continuity should exist.

O.K.

D

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM pin terminals ⑩, ⑳, ㊿, ⑥⓪, ⑩⑦, ⑩⑧, ⑪⑥ and ground.
Continuity should exist.

N.G. →

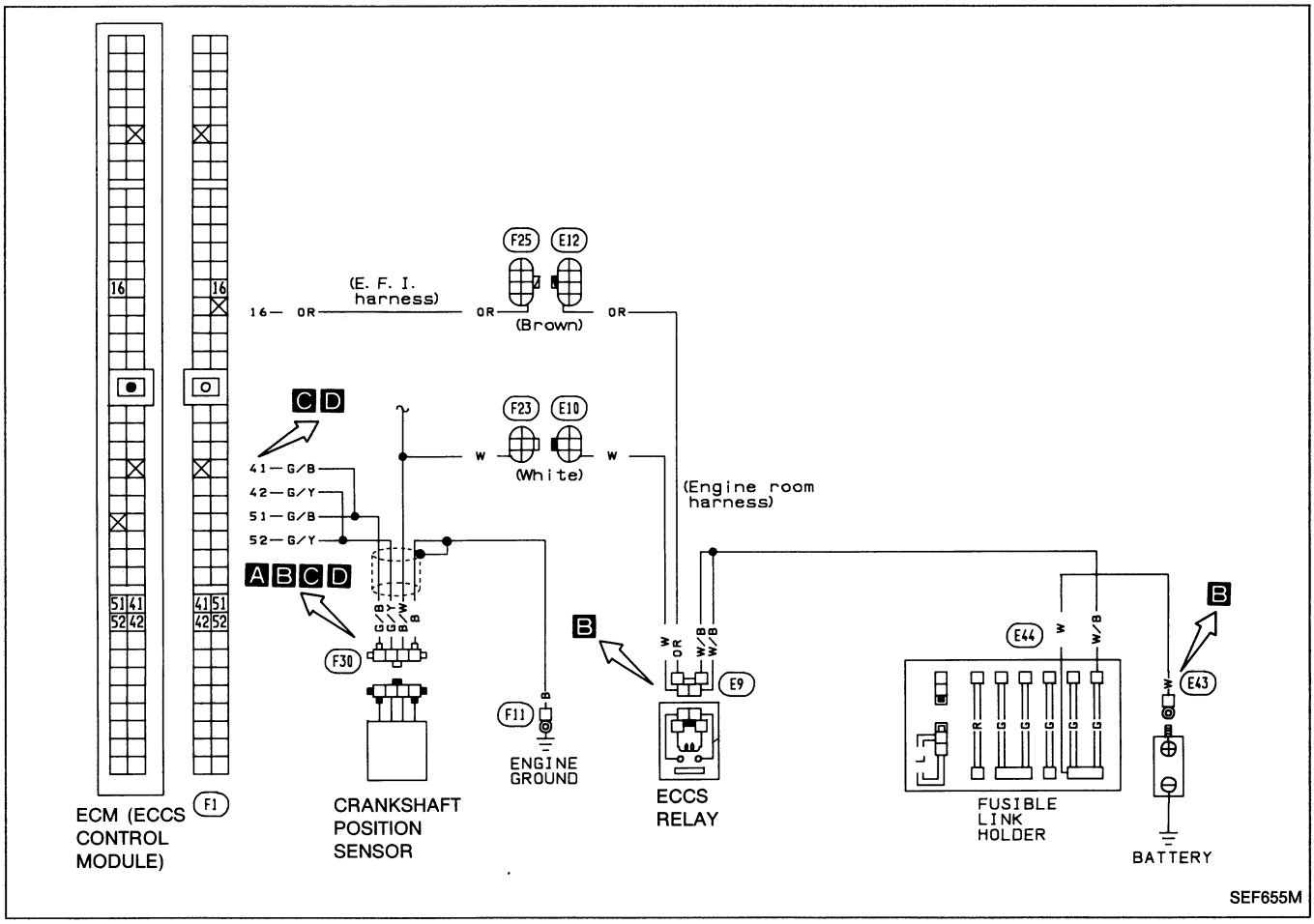
1) Check if engine ground terminal connectors ⓕ㉘, ⓕ⑪ and ⓕ㊴ make contact with engine body properly.
2) Repair harness or connectors.

O.K.

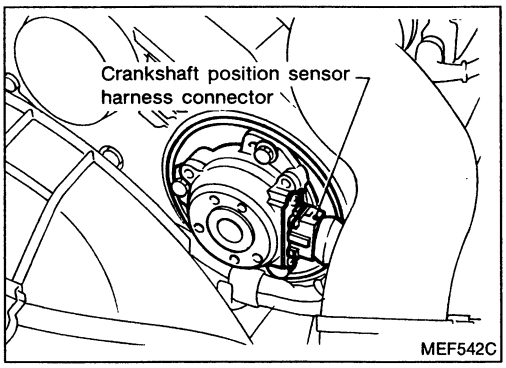
INSPECTION END

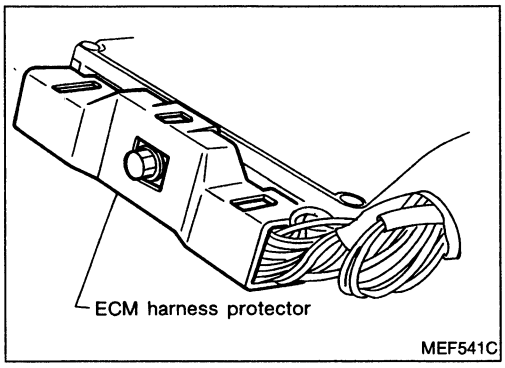
Diagnostic Procedure 23

CRANKSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)

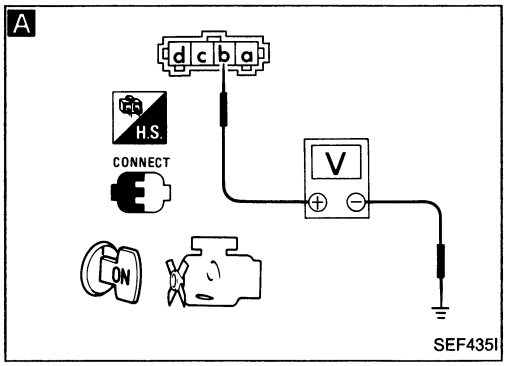


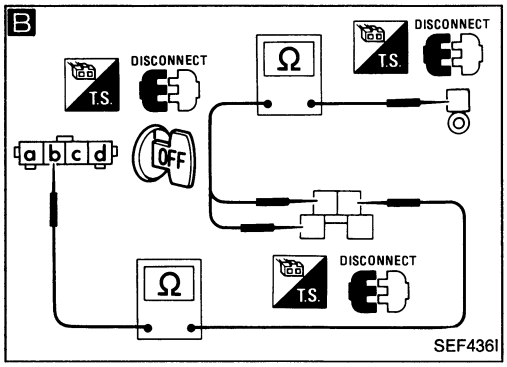
Harness layout

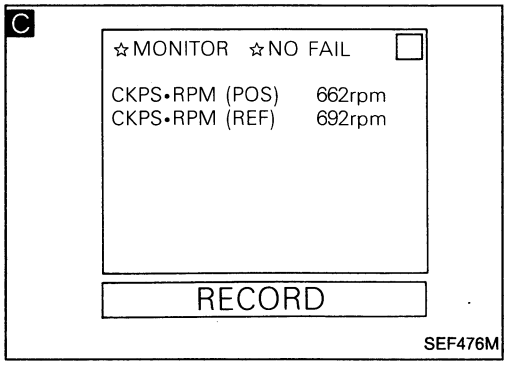


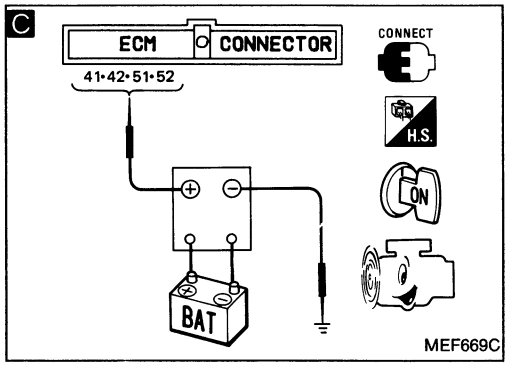


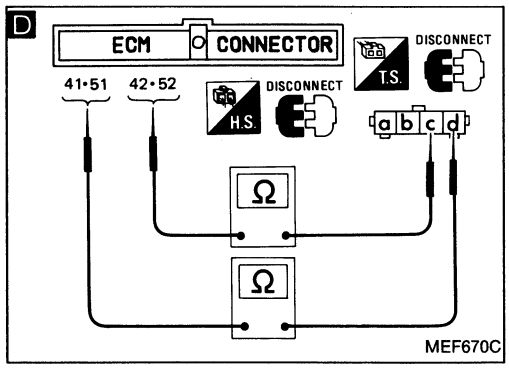
Diagnostic Procedure 23 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → **B**

Check the following items.
1) ECCS relay
Refer to "Electrical Components Inspection". (See page EF & EC-180.)
2) "G" fusible link
3) Harness continuity between ECCS relay and battery ⊕ terminal
Continuity should exist.
4) Harness continuity between ECCS relay and crankshaft position sensor terminal ⓑ
Continuity should exist.

O.K. ↓

C

CHECK INPUT SIGNAL.
1) Start engine.
2) Read crankshaft position sensor signals in "DATA MONITOR" mode with CONSULT.
rpm: M/T 700 ± 50
A/T 770 ± 50 (Non-turbocharger)
750 ± 50 (Turbocharger)

OR

2) Check that pulse signals exist in ECM terminals ㊶, ㊶ and ㊷, ㊷ with logic probe.
Pulse signal should exist.
㊶, ㊶: 120° signal
㊷, ㊷: 1° signal

N.G. → **D**

CHECK HARNESS CONTINUITY BETWEEN ECM AND CRANKSHAFT POSITION SENSOR.
1) Stop engine.
2) Disconnect crankshaft position sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminals ㊶, ㊶ and terminal ⓓ, ECM terminals ㊷, ㊷ and terminal ⓒ.
Continuity should exist.
If N.G., repair harness or connectors.

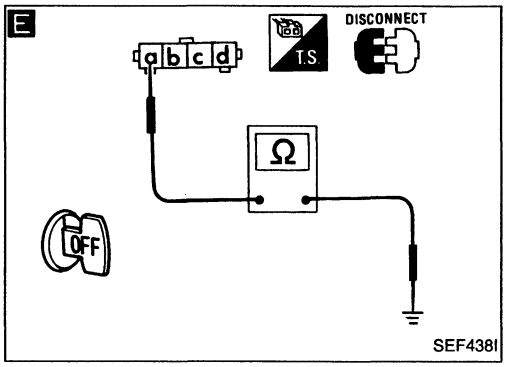
O.K. ↓

CHECK COMPONENT (Crankshaft position sensor).
Refer to "Electrical Components Inspection". (See page EF & EC-174.)

O.K. ↓

Ⓐ

Diagnostic Procedure 23 (Cont'd)



Ⓐ

E

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect crankshaft position sensor harness connector.
3) Check harness continuity between terminal ⓐ and ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Reinstall any part removed.

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

Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

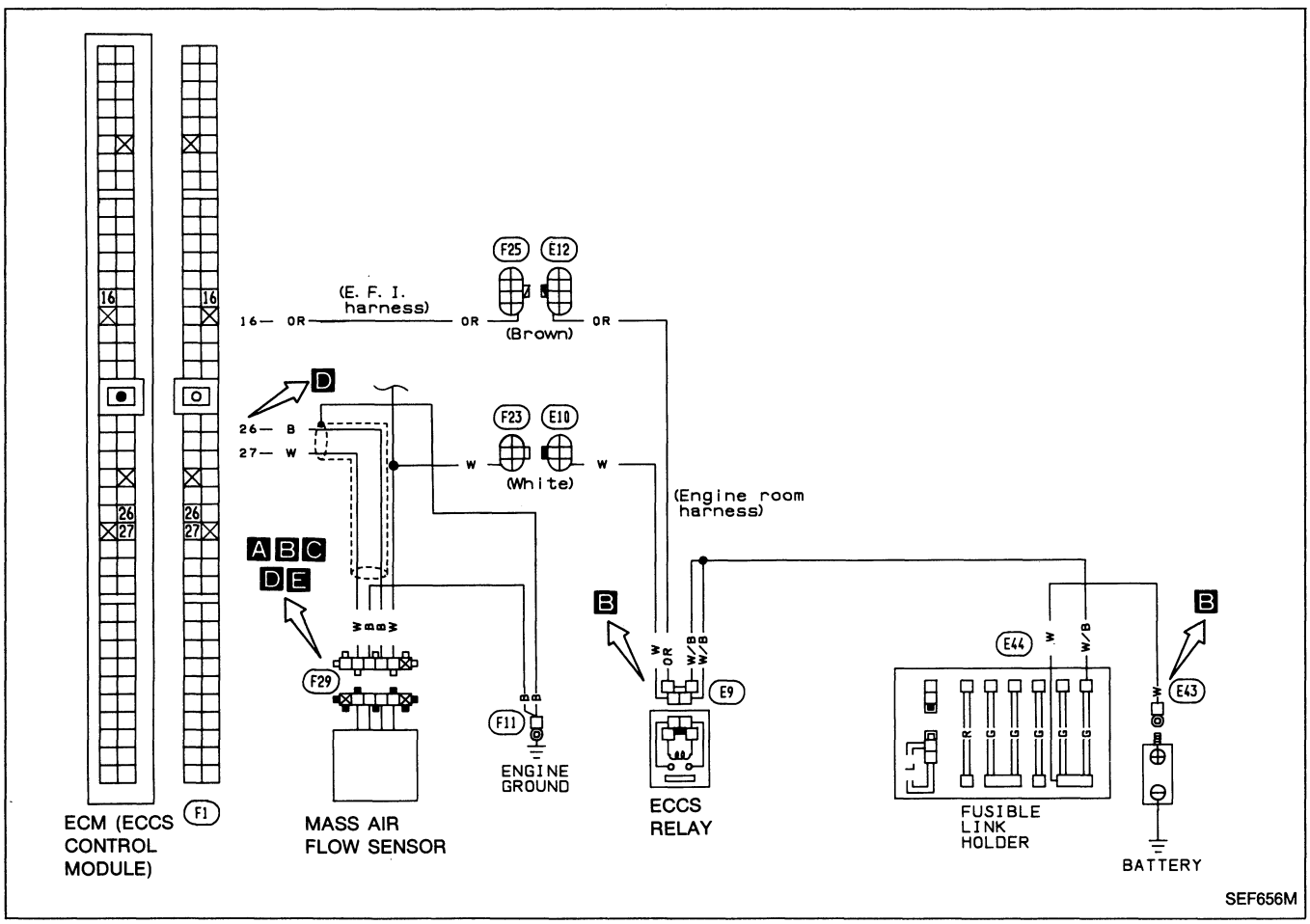
N.G. → 1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage.
Check the connection at the ECM harness connector.

O.K.

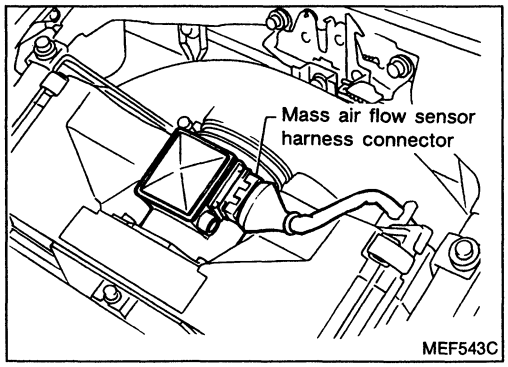
INSPECTION END

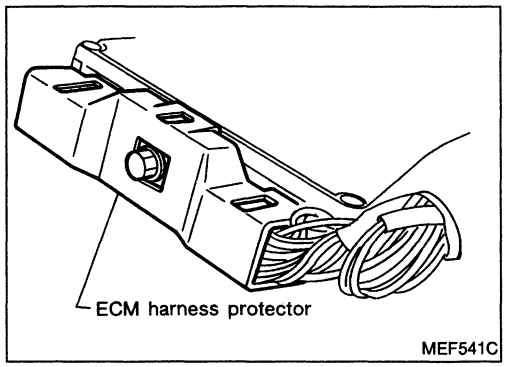
Diagnostic Procedure 24

MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12) (MALFUNCTION INDICATOR LAMP ITEM)

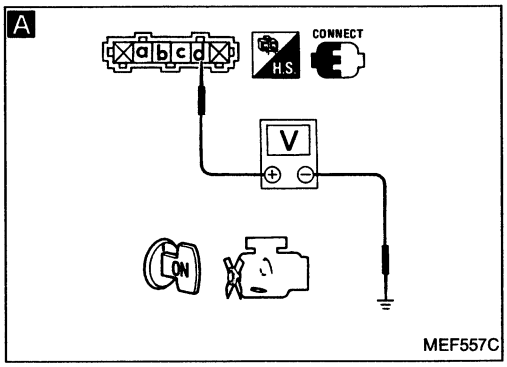


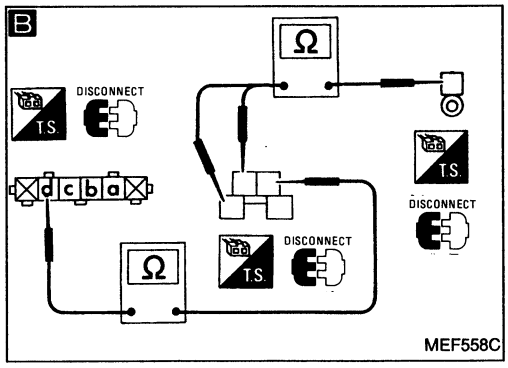
Harness layout

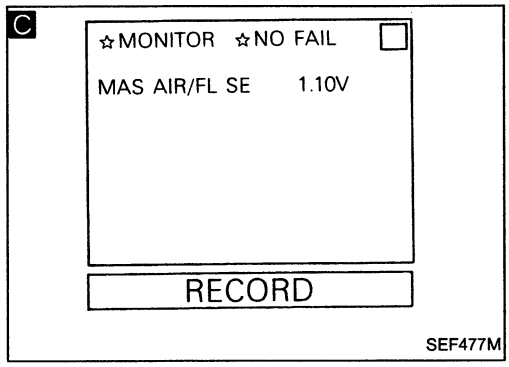


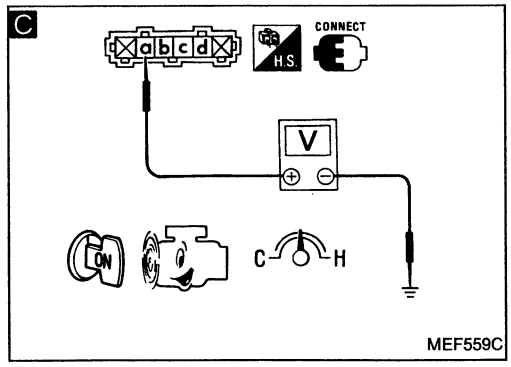


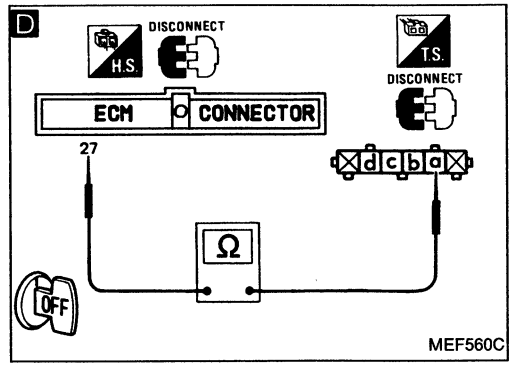
Diagnostic Procedure 24 (Cont'd)











INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓓ and ground.
Voltage: Battery voltage

N.G. →

B

Check the following items.
1) ECCS relay
Refer to "Electrical Components Inspection".
(See page EF & EC-180.)
2) "G" fusible link
3) Harness continuity between ECCS relay and battery ⊕ terminal
Continuity should exist.
4) Harness continuity between ECCS relay and mass air flow sensor terminal ⓓ.
Continuity should exist.

O.K. ↓

C

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Read mass air flow sensor signal in "DATA MONITOR" mode with CONSULT.
Voltage: 0.8 - 1.5V

OR

2) Check voltage between terminal ⓐ and ground at idle under no-load.
Voltage: 0.8 - 1.5V

N.G. →

D

CHECK HARNESS CONTINUITY BETWEEN MASS AIR FLOW SENSOR AND ECM.
1) Stop engine.
2) Disconnect mass air flow sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㉗ and terminal ⓐ.
Continuity should exist.
If N.G., repair harness or connectors.

O.K. ↓

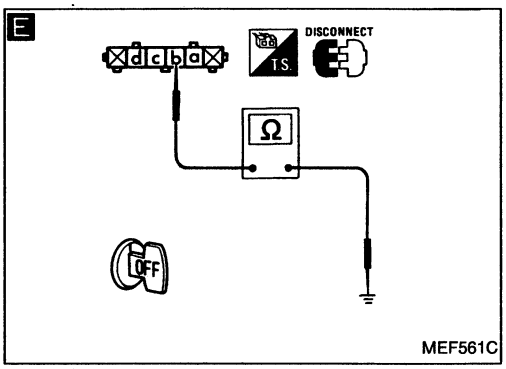
CHECK COMPONENT (Mass air flow sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-174.)

O.K. ↓

Ⓐ

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

Diagnostic Procedure 24 (Cont'd)



Ⓐ

E

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect mass air flow sensor harness connector.
3) Check harness continuity between terminal ⓑ and ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Reinstall any part removed.

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

Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

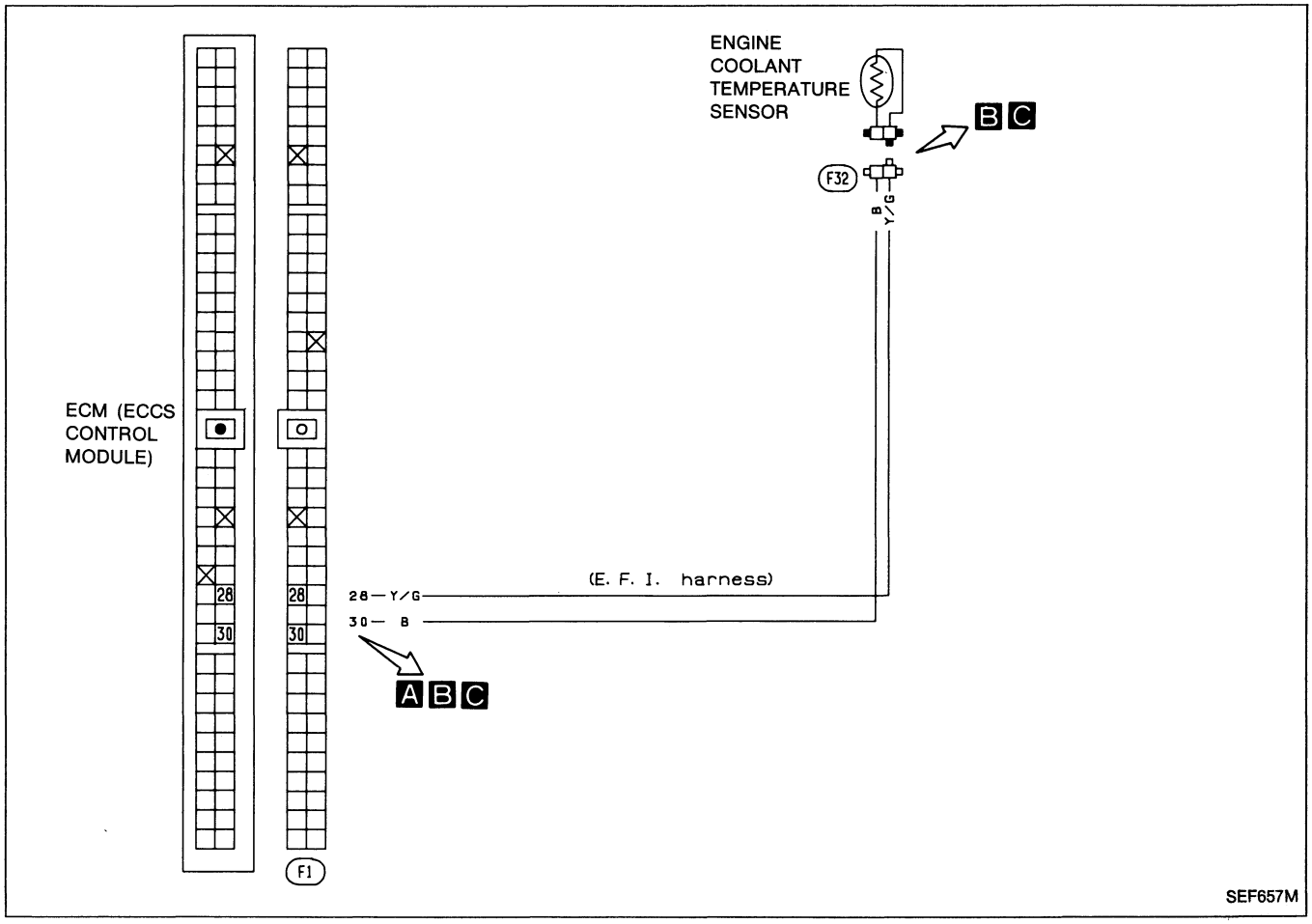
N.G. → 1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage.
Check the connection at the ECM harness connector.

O.K.

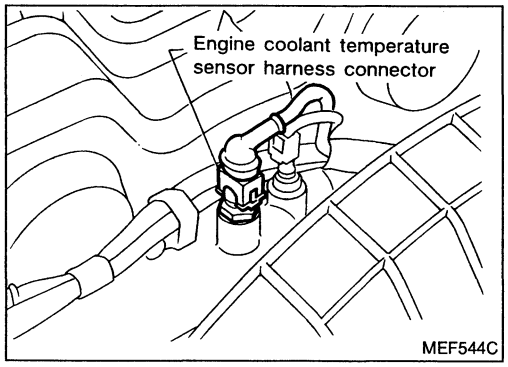
INSPECTION END

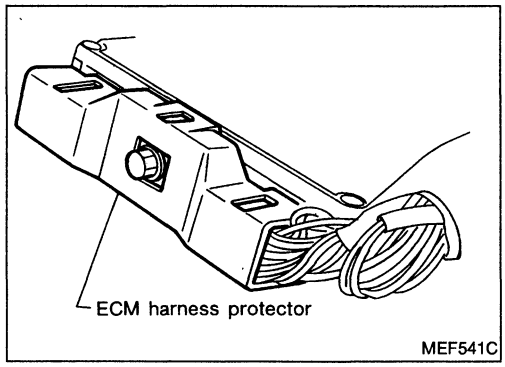
Diagnostic Procedure 25

ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13)
(MALFUNCTION INDICATOR LAMP ITEM)

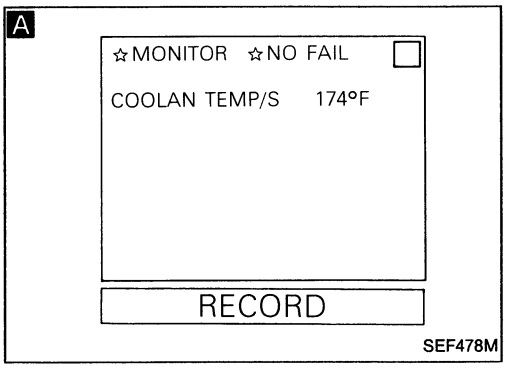


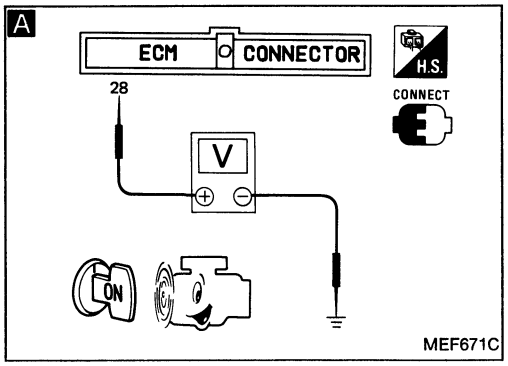
Harness layout

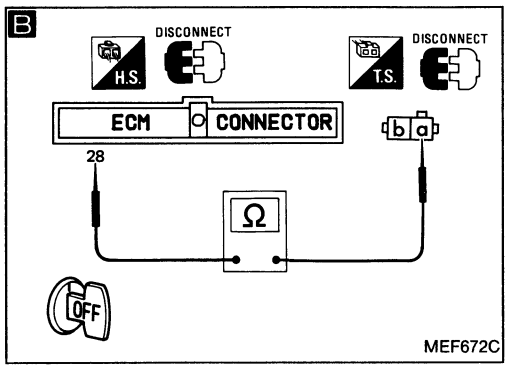


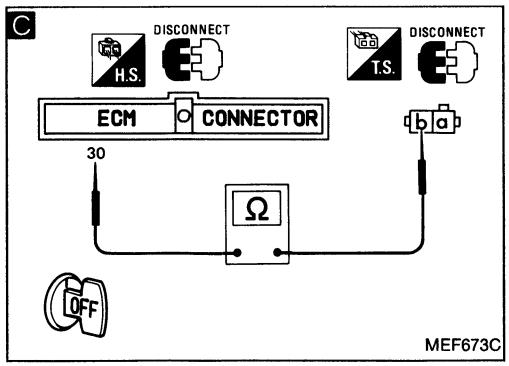


Diagnostic Procedure 25 (Cont'd)









INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine.
2) Read engine coolant temperature sensor signal in "DATA MONITOR" mode with CONSULT.
Engine coolant temperature should gradually rise and reach more than 70°C (158°F) after engine warm-up.

OR

2) Make sure that voltage between ECM terminal ㉘ and ground changes during engine warm-up.
Cold → Hot:
Approximately 5 - 0V

N.G. → **B**

B

CHECK HARNESS CONTINUITY BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM.
1) Stop engine.
2) Disconnect engine coolant temperature sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㉘ and terminal ⓐ.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT (Engine coolant temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-174.)

O.K.

C

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect engine coolant temperature sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㉚ and terminal ⓑ.

N.G. → Repair harness or connectors.

O.K.

Reinstall any part removed.

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

Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

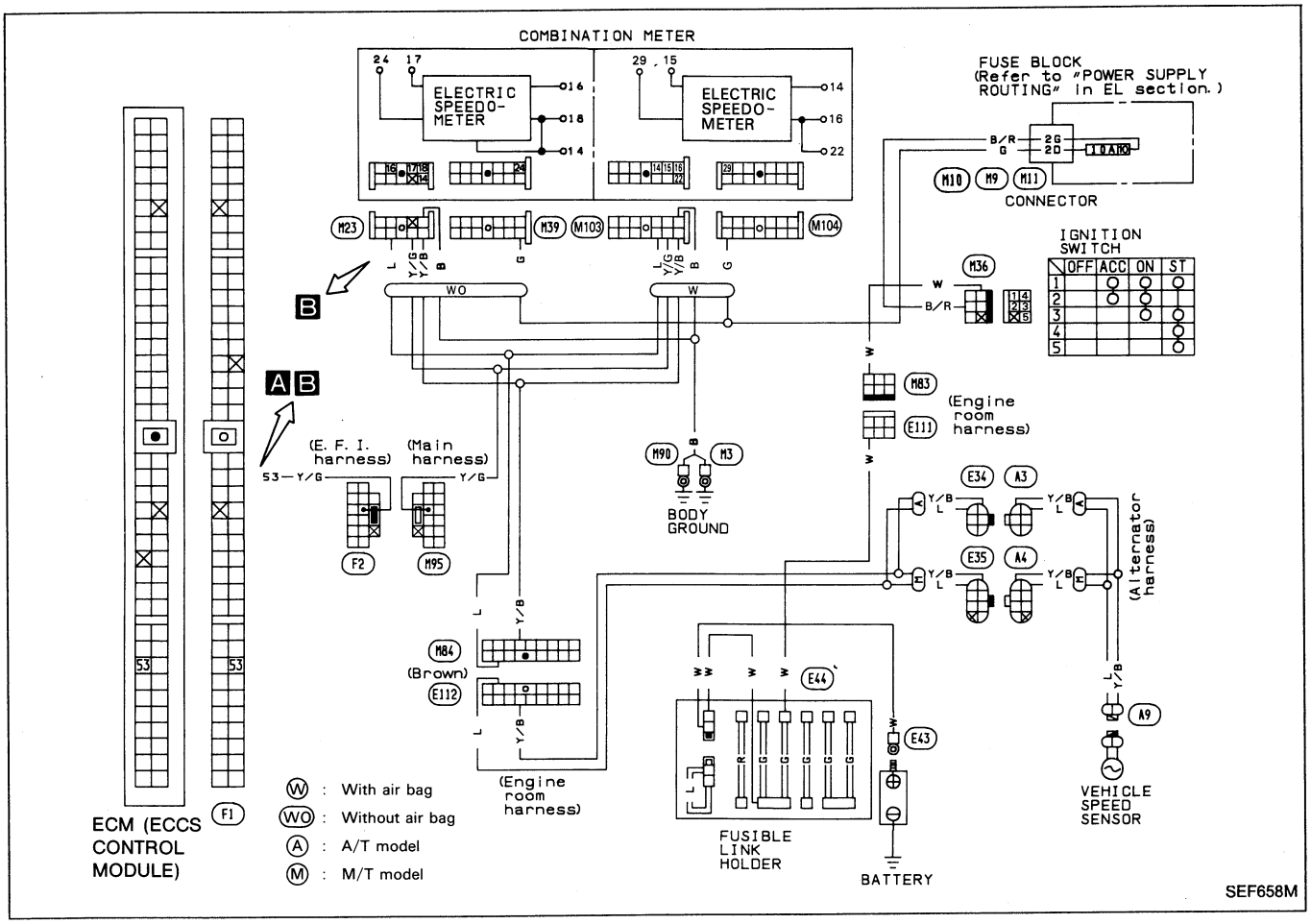
N.G. →
1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage.
Check the connection at the ECM harness connector.

O.K.

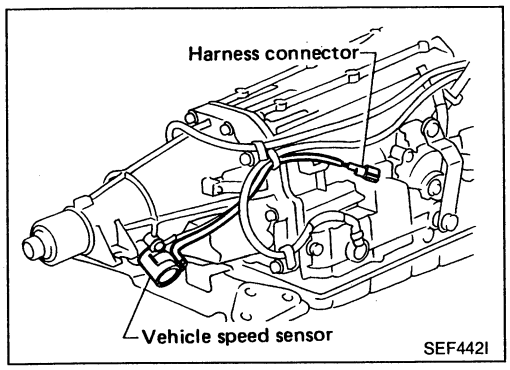
INSPECTION END

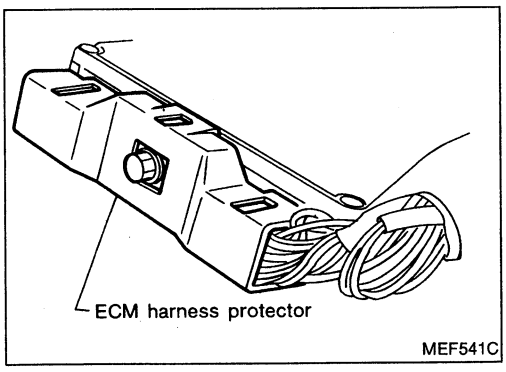
Diagnostic Procedure 26

VEHICLE SPEED SENSOR (Diagnostic trouble code No. 14) CHECK (MALFUNCTION INDICATOR LAMP ITEM)

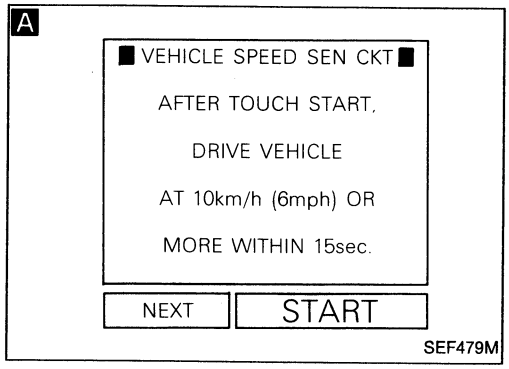


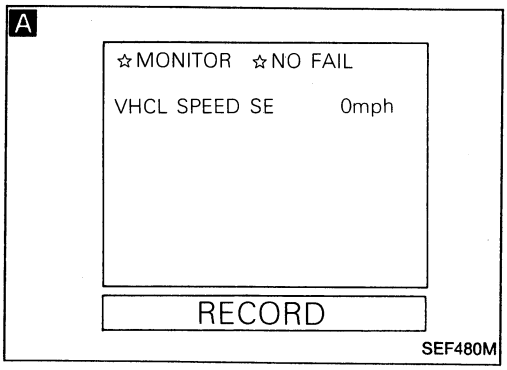
Harness layout

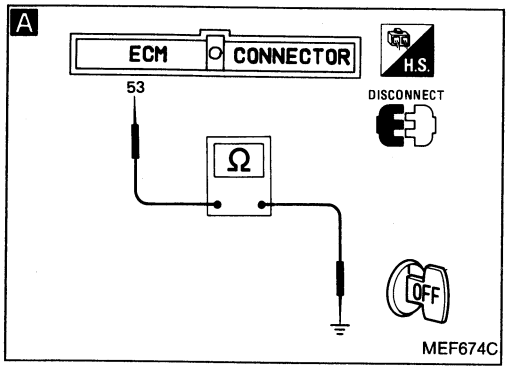


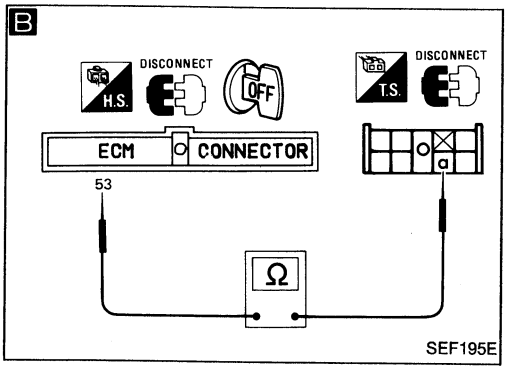


Diagnostic Procedure 26 (Cont'd)









INSPECTION START

Make sure that speedometer in combination meter operates properly.

N.G. → Check power supply and ground circuit for instrument panel. (See EL section.) If N.G., repair harness or connectors.

O.K.

A

CHECK INPUT SIGNAL CIRCUIT.

Perform "VEHICLE SPEED SEN CKT" in "FUNCTION-TEST" mode with CONSULT.

— OR —

1) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.

CONSULT value should be the same as the speedometer indication.

— OR —

1) Jack up rear wheels.
2) Disconnect ECM harness connector.
3) Check resistance between ECM terminal (53) and ground. With transmission in neutral position, turn both rear wheels.
Continuity should be intermittent.

N.G. → B

CHECK COMPONENT (Vehicle speed sensor). Refer to "Electrical Components Inspection". (See page EF & EC-175.)

B

CHECK HARNESS CONTINUITY BETWEEN COMBINATION METER AND ECM.

1) Remove combination meter from instrument panel.
2) Disconnect combination meter harness connector (M23).
3) Check harness continuity between ECM terminal (53) and terminal (a).
Continuity should exist.

O.K.

Reinstall any part removed.

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

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

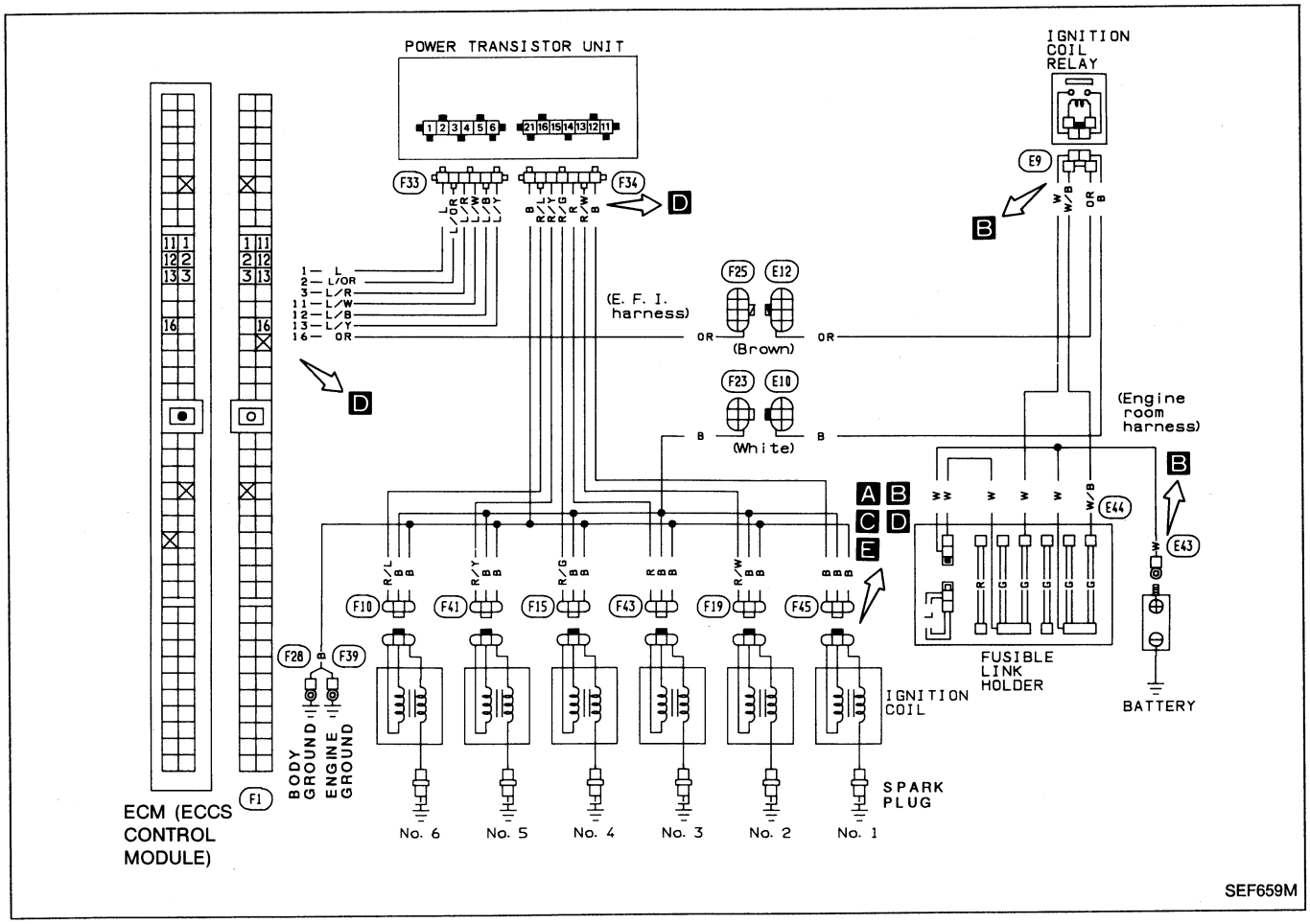
N.G. → 1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage. Check the connection at the ECM harness connector.

O.K.

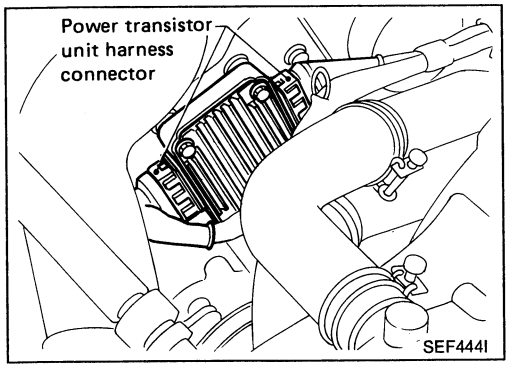
INSPECTION END

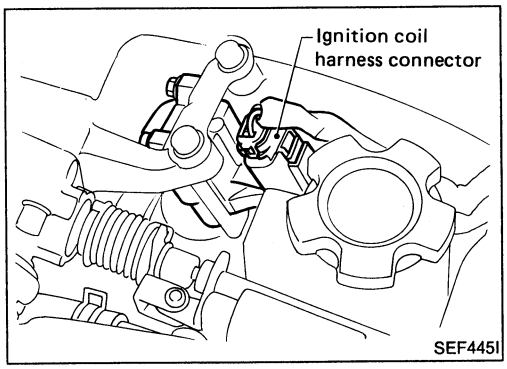
Diagnostic Procedure 27

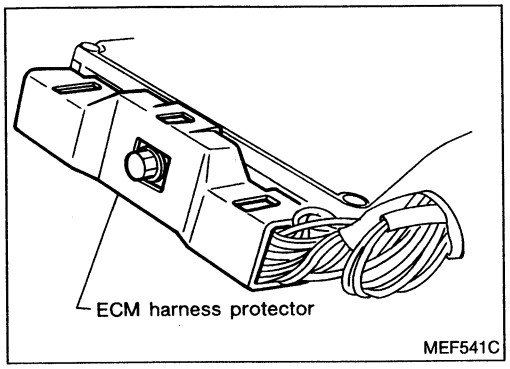
IGNITION SIGNAL (Diagnostic trouble code No. 21)



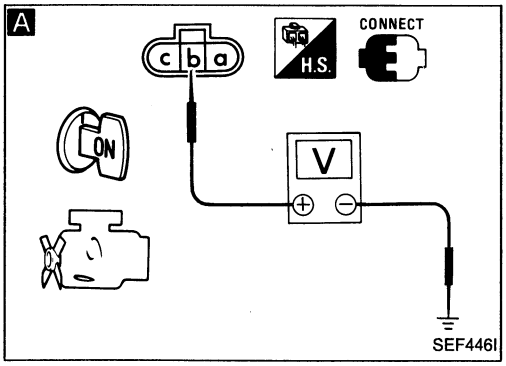
Harness layout

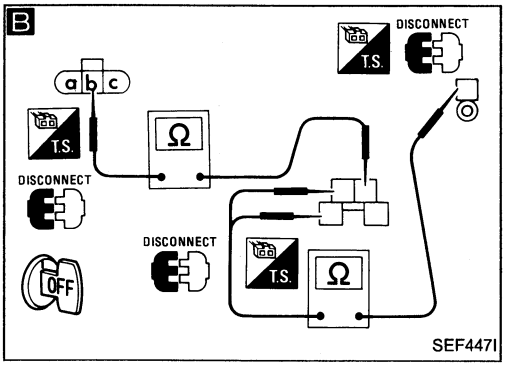


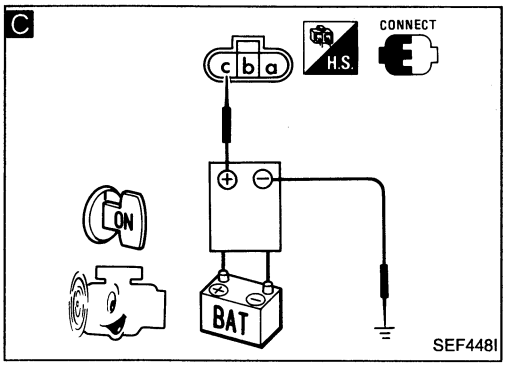


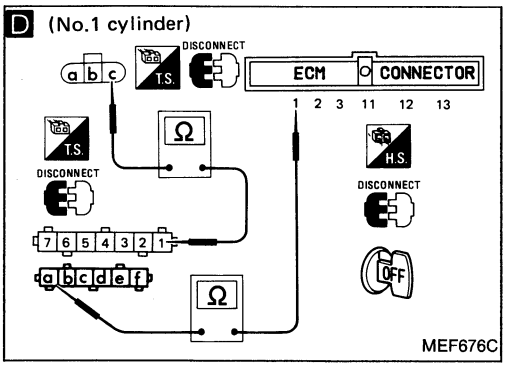


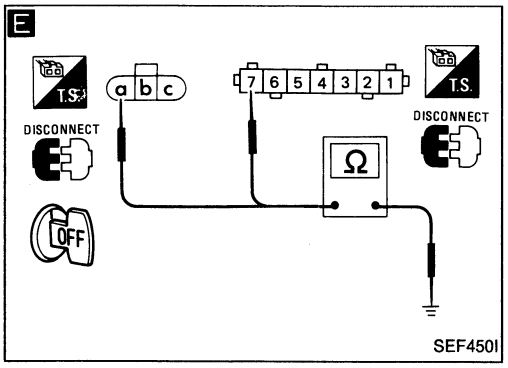
Diagnostic Procedure 27 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage:
Approx. battery voltage

N.G. → **B**

Check the following items.
1) Ignition coil relay
Refer to "Electrical Components Inspection". (See page EF & EC-180.)
2) "G" fusible link
3) Harness continuity between ignition coil relay and ignition coils.
Continuity should exist.
4) Harness continuity between ignition coil relay and battery ⊕ terminal.
Continuity should exist.

O.K. ↓

C

CHECK OUTPUT SIGNAL.
1) Start engine.
2) With logic probe make sure that pulse signal exists between terminal ⓒ and ground.
Pulse signal should exist.

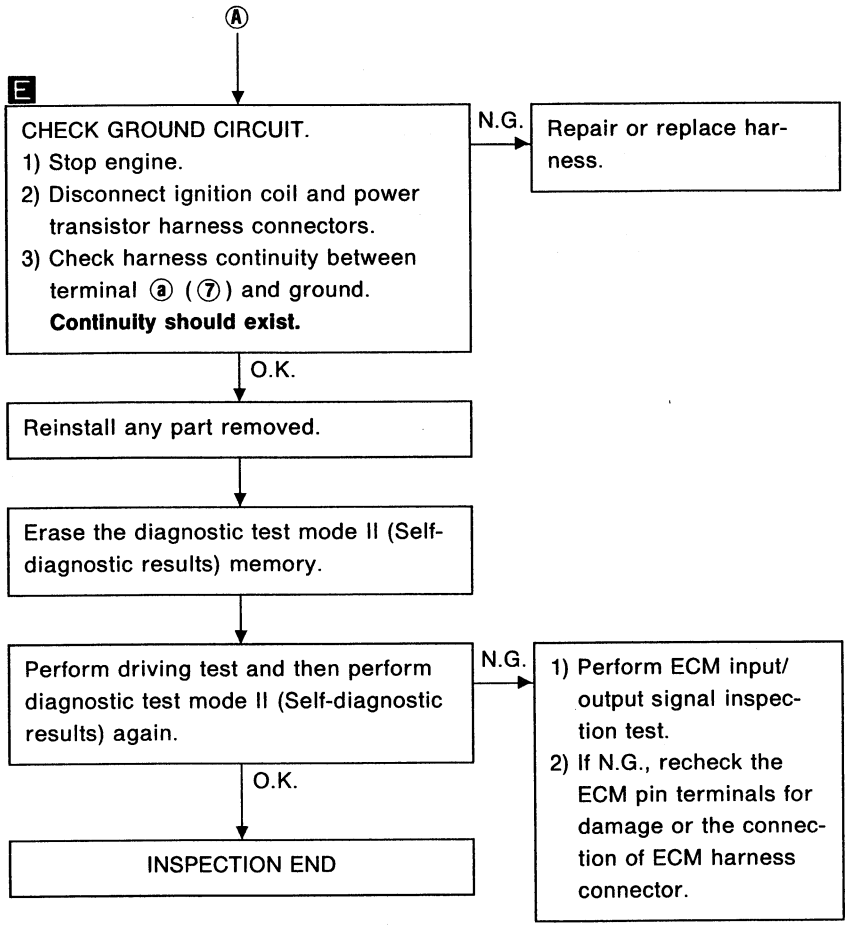
N.G. → **D**

Check the following items.
1) Power transistor unit
Refer to "Electrical Components Inspection". (See page EF & EC-175.)
2) Harness continuity between terminal ⓒ and power transistor terminals ① (No. 1 cylinder), ② (No. 2 cylinder), ... ⑥ (No. 6 cylinder).
Continuity should exist.
3) Harness continuity between power transistor terminals and ECM terminals.
① - ⓐ ⑪ - ⓓ
② - ⓑ ⑫ - ⓔ
③ - ⓒ ⑬ - ⓕ
Continuity should exist.

O.K. ↓

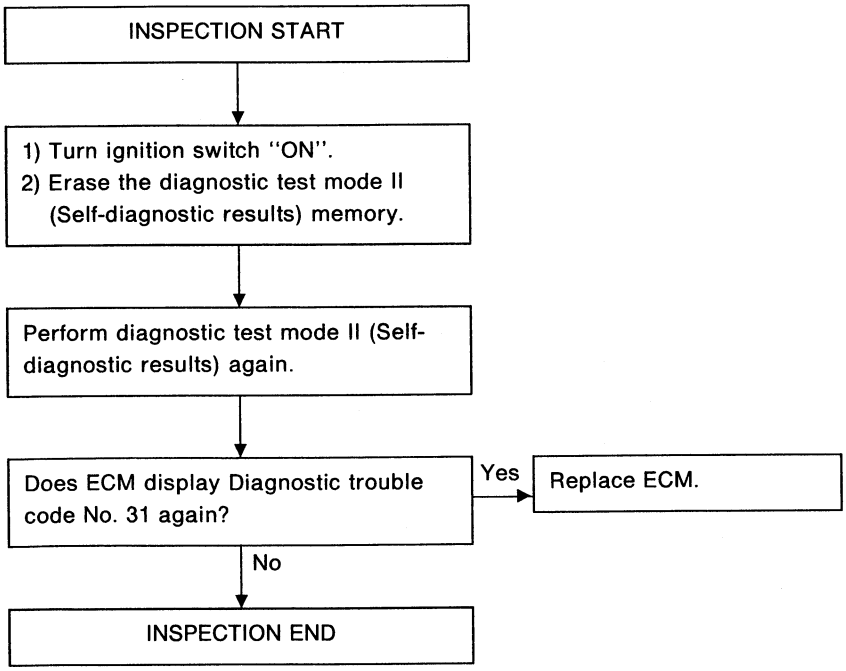
Ⓐ

Diagnostic Procedure 27 (Cont'd)



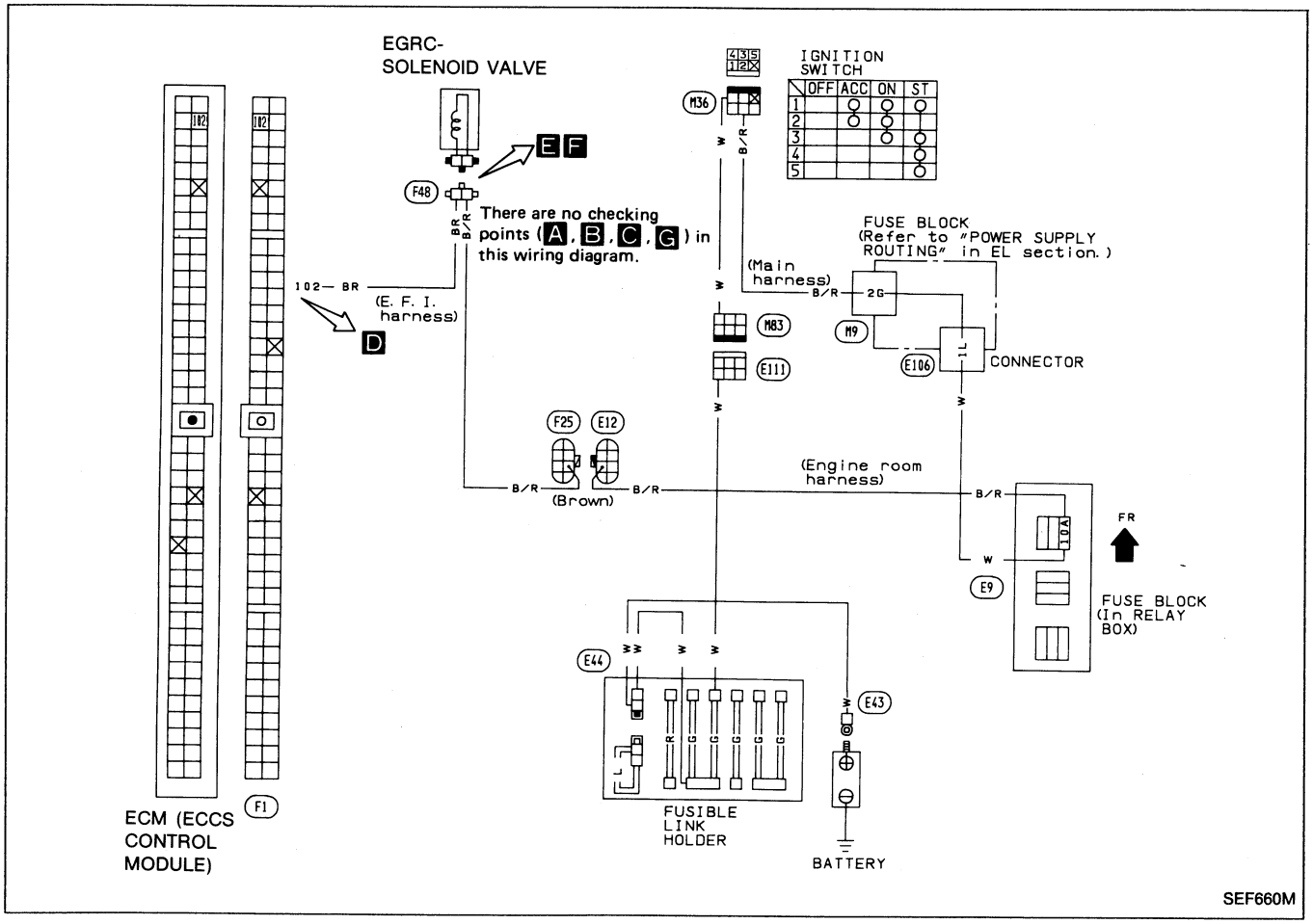
Diagnostic Procedure 28

ENGINE CONTROL UNIT (Diagnostic trouble code No. 31) (MALFUNCTION INDICATOR LAMP ITEM)

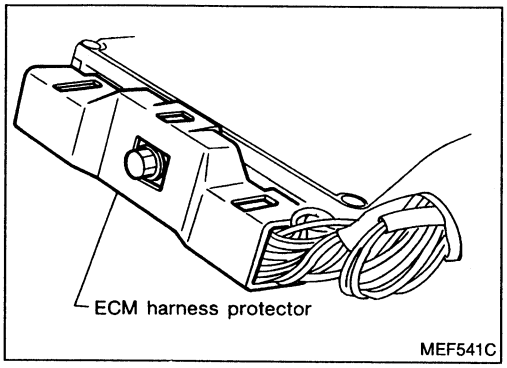


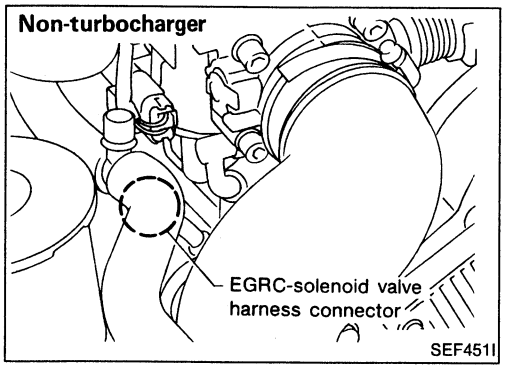
Diagnostic Procedure 29

EGR FUNCTION (Diagnostic trouble code No. 32) CHECK (MALFUNCTION INDICATOR LAMP ITEM): For California model
(Not self-diagnostic item): For Non-California model



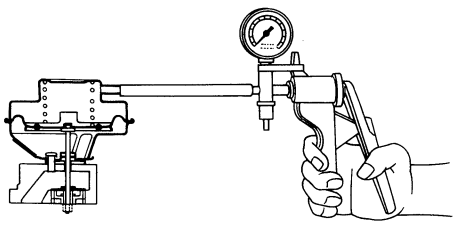
Harness layout





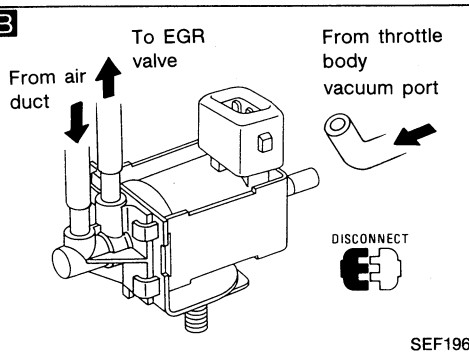
Diagnostic Procedure 29 (Cont'd)

A



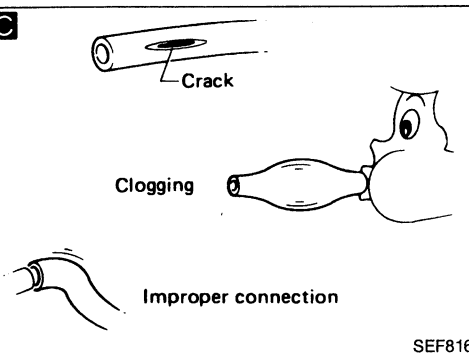
SEC327

B



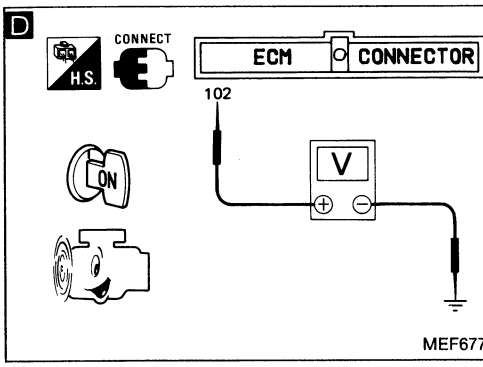
SEF196E

C



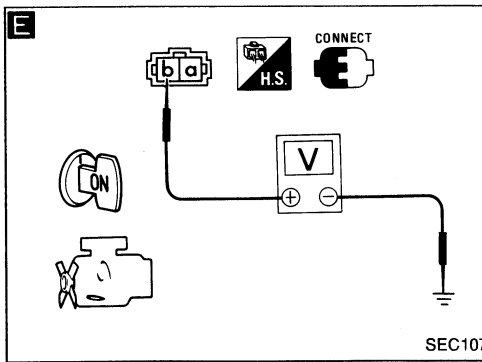
SEF816F

D



MEF677C

E



SEC107B

INSPECTION START

A

CHECK EGR VALVE OPERATION.
Make sure that EGR valve lifts up when applying vacuum.

N.G. → Replace or repair EGR valve.

O.K.

B

CHECK VACUUM SOURCE TO EGR VALVE.
1) Disconnect vacuum hose connected to EGRC-solenoid valve.
2) Make sure vacuum exists when racing engine.

N.G. → CHECK THROTTLE BODY VACUUM PORT FOR CLOGGING.

O.K.

C

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connections.

N.G. → If necessary, replace vacuum hose or reconnect vacuum hose firmly.

O.K.

D

CHECK ECM OUTPUT SIGNAL.
1) Check voltage between ECM terminal (102) and ground under the following conditions:

Engine condition	Voltage
Idle	0.7 - 0.8V
Racing (Less than approx. 3,000 rpm)	Battery voltage

N.G. →

E CHECK POWER SOURCE TO EGRC-SOLENOID VALVE.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal (b) and ground.
Voltage: Battery voltage

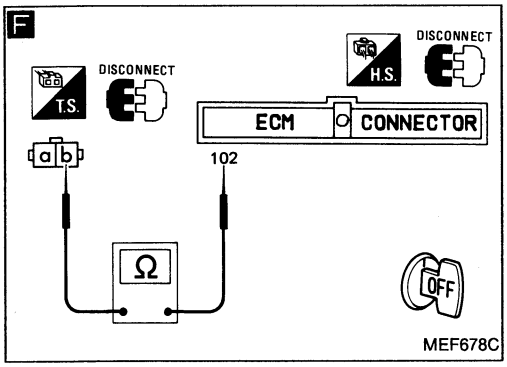
F CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect EGRC-solenoid valve harness connector.
4) Check resistance between ECM terminal (102) and terminal (b).
Resistance: Approximately 0Ω
If N.G., repair or replace harness.

O.K. → (A)

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

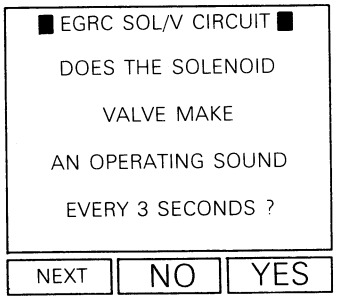
Diagnostic Procedure 29 (Cont'd)

F



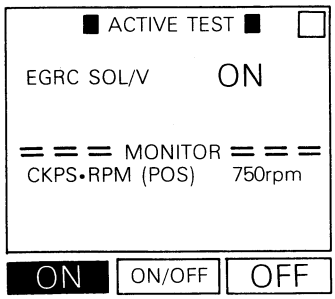
MEF678C

G



SEF481M

G



SEF482M

Ⓐ

G

CHECK COMPONENT (EGRC-solenoid valve).

1) Turn ignition switch "ON".
2) Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Turn ignition switch "ON".
2) Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-176.)

N.G. → Replace EGRC-solenoid valve.

O.K. ↓

Check resistance of EGR temperature sensor. (See page EF & EC-177.)

↓

Reinstall any part removed.

↓

Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure Diagnostic trouble code No. 55 is displayed in Diagnostic Test Mode II.

↓

Ⓑ

Diagnostic Procedure 29 (Cont'd)

H ROAD TEST

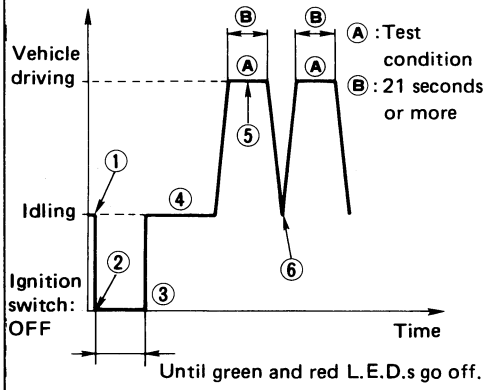
Test condition

Drive vehicle under the following conditions with a suitable shift position.

(1) **Engine speed:**
2,200±200 rpm

(2) **Intake manifold vacuum:**
−30.0±10.0 kPa
(−225±75 mmHg, −8.86±2.95 inHg)

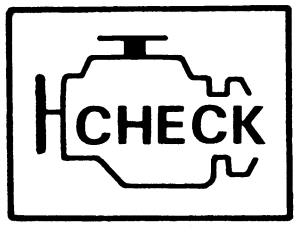
Driving mode



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 driving test.
④ Keep engine running for at least 3 minutes.
⑤ Shift to suitable gear position and drive in "Test condition" for at least 21 seconds.
⑥ Decrease engine revolutions to less than 2,000 rpm.
⑦ Repeat steps ⑤ through ⑥ at lest 1 more time.

SEF302H

I



MALFUNCTION INDICATOR LAMP

MEF706C

Ⓑ

H

Perform driving test under the following conditions:
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure **H** .

I

Make sure malfunction indicator lamp does not come "ON" during driving test.

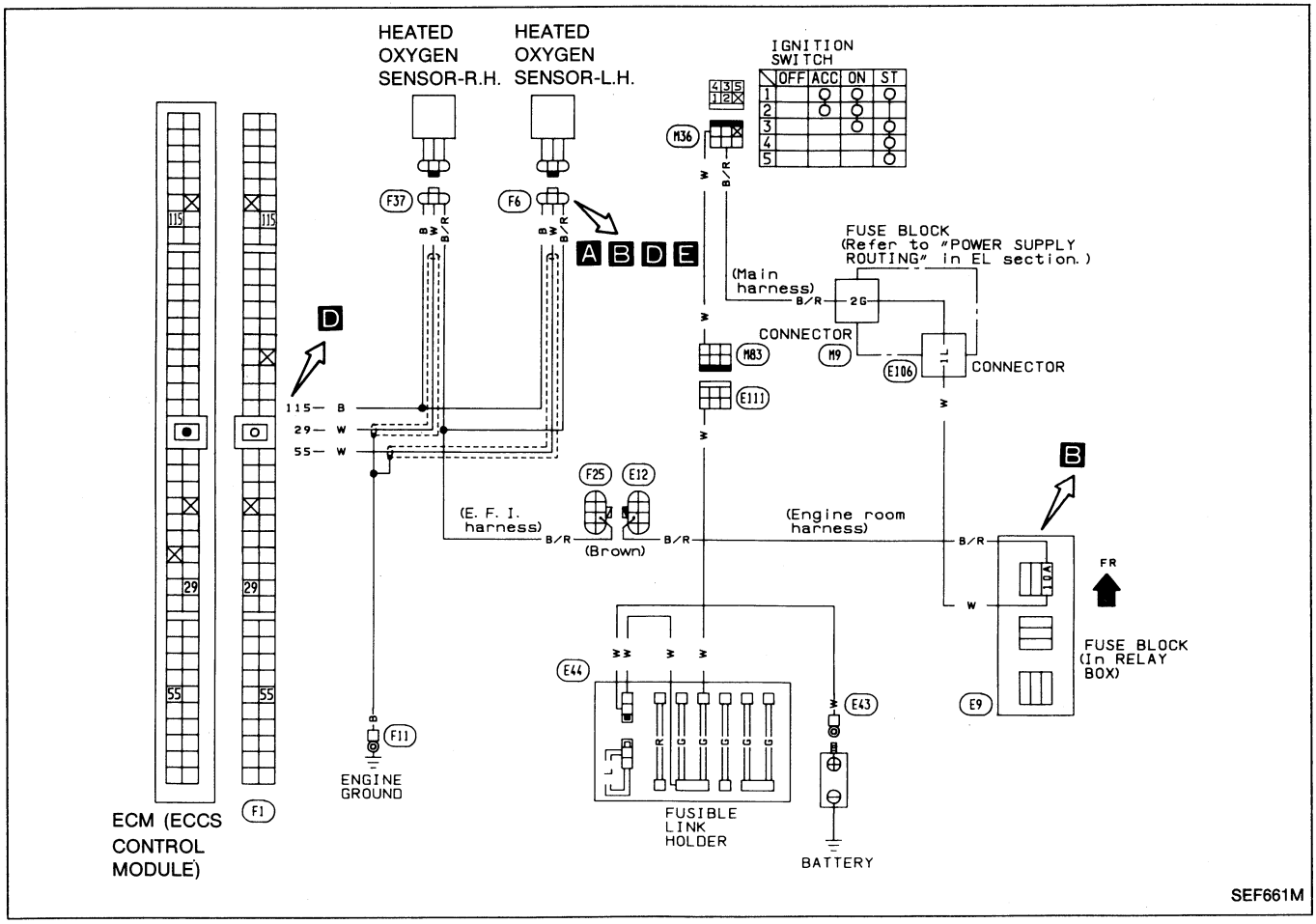
Comes "ON" → Perform diagnostic test mode II (Self-diagnostic results) and find diagnostic trouble code. According to displayed Diagnostic trouble code No., perform electronic control system inspection.

Does not come "ON"

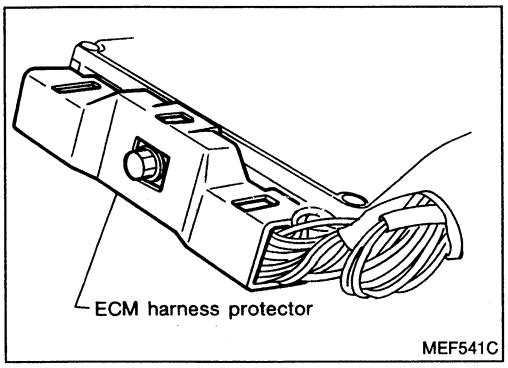
INSPECTION END

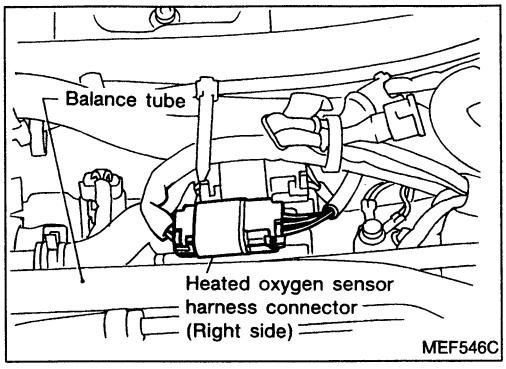
Diagnostic Procedure 30

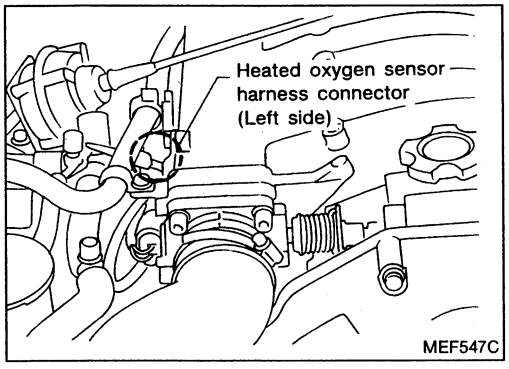
HEATED OXYGEN SENSOR (Diagnostic trouble code No. 33 and 53) CHECK (MALFUNCTION INDICATOR LAMP ITEM)



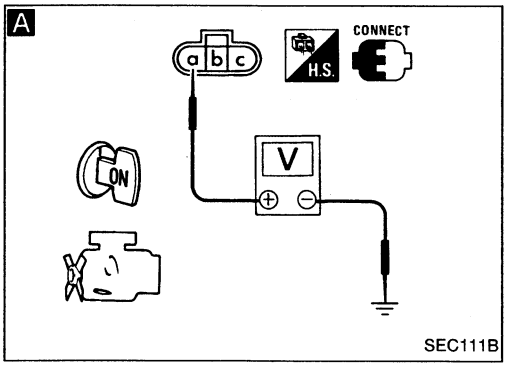
Harness layout

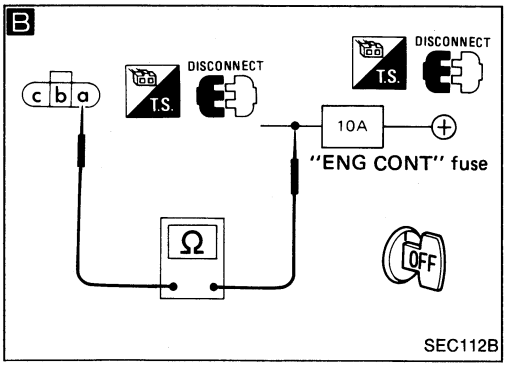


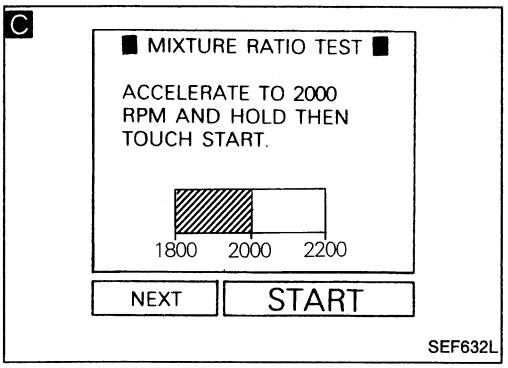


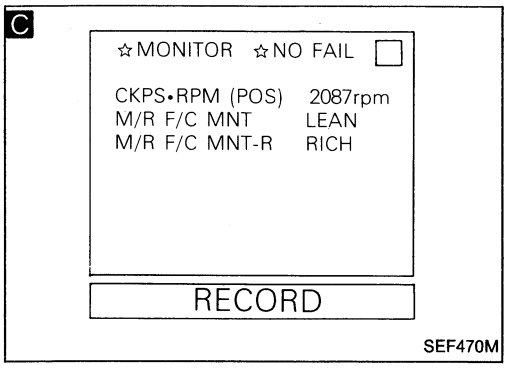


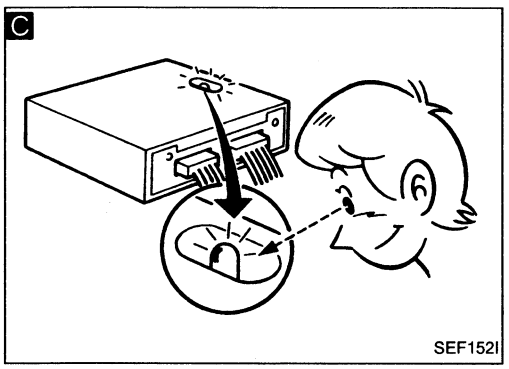
Diagnostic Procedure 30 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → **B**

CHECK HARNESS CONTINUITY BETWEEN HEATED OXYGEN SENSOR AND FUSE.
1) Turn ignition switch "OFF".
2) Disconnect heated oxygen sensor harness connector.
3) Disconnect "ENG CONT" fuse.
4) Check harness continuity between terminal ⓐ and the fuse.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

C

CHECK OVERALL FUNCTION.
Perform "MIXTURE RATIO TEST" in "FUNCTION-TEST" mode with CONSULT.

OR

1) Start engine and warm it up sufficiently.
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 red L.E.D. on ECM goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm in on-board diagnostic system (Diagnostic Test Mode II).

N.G. → **D**

CHECK HARNESS CONTINUITY BETWEEN HEATED OXYGEN SENSOR AND ECM.
1) Stop engine.
2) Disconnect heated oxygen sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminals and heated oxygen sensor terminals.
Right side: ㉙ - ⓑ
Left side: ㊺ - ⓑ
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

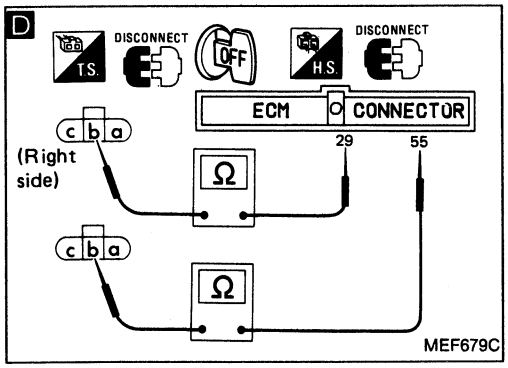
Replace heated oxygen sensor.

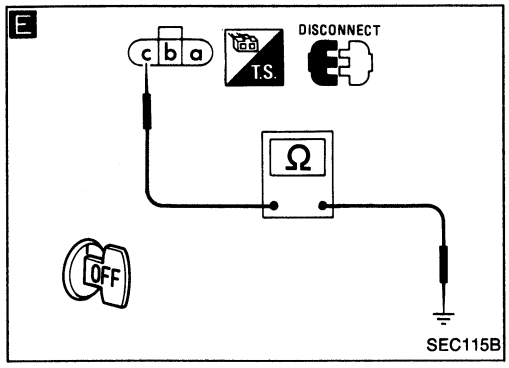
O.K.

Ⓐ

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

Diagnostic Procedure 30 (Cont'd)





Ⓐ

E

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect heated oxygen sensor harness connector.
3) Check harness continuity between terminal Ⓒ and ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Reinstall any part removed.

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

Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

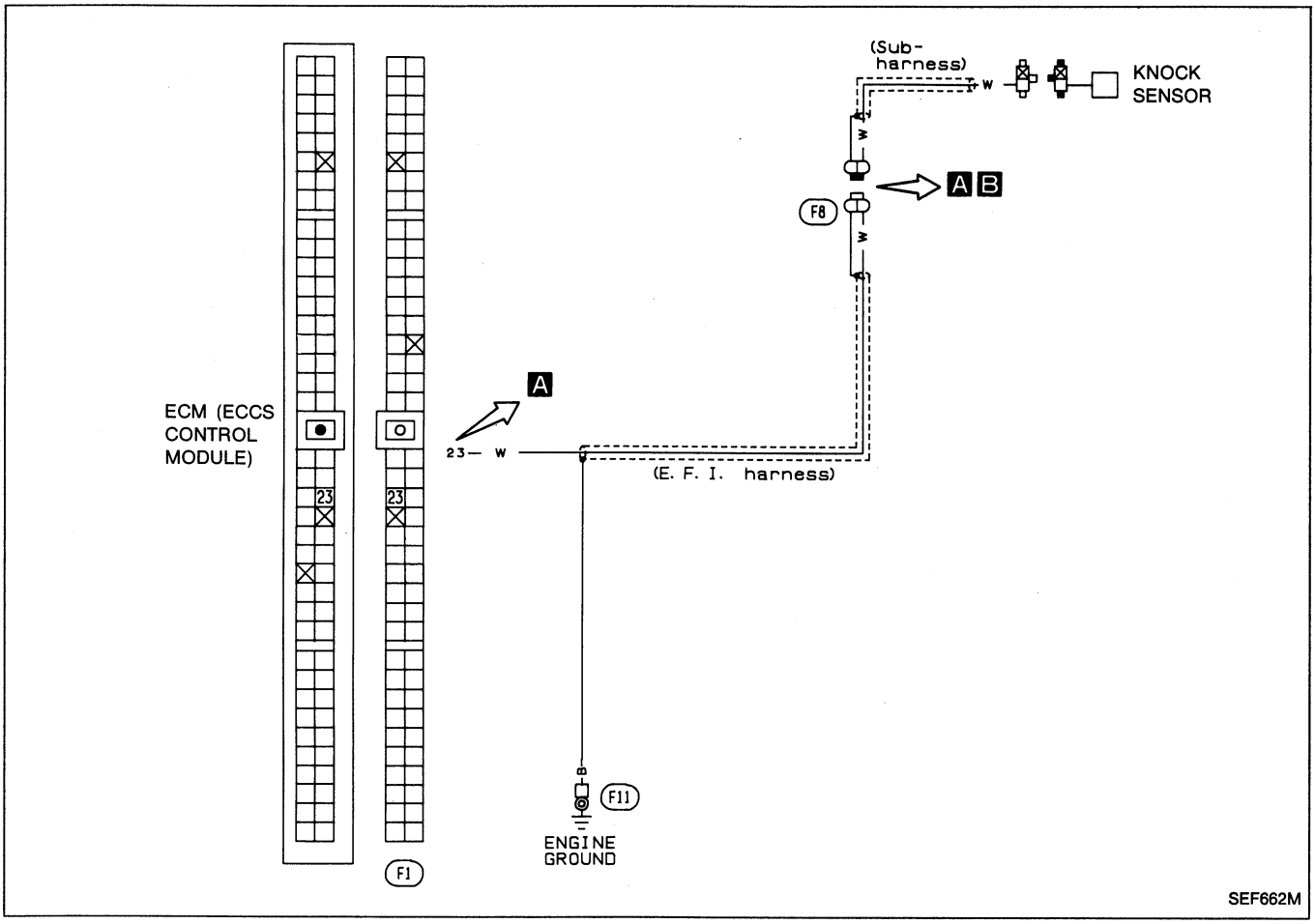
N.G. →
1) Perform ECM input/output signal inspection test.
2) If N.G., recheck ECM pin terminals for damage or the connection of ECM harness connector.

O.K.

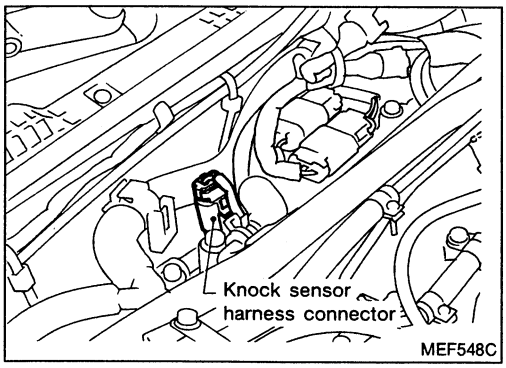
INSPECTION END

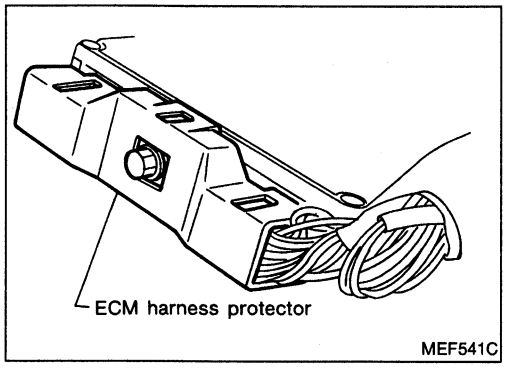
Diagnostic Procedure 31

KNOCK SENSOR (Diagnostic trouble code No. 34)

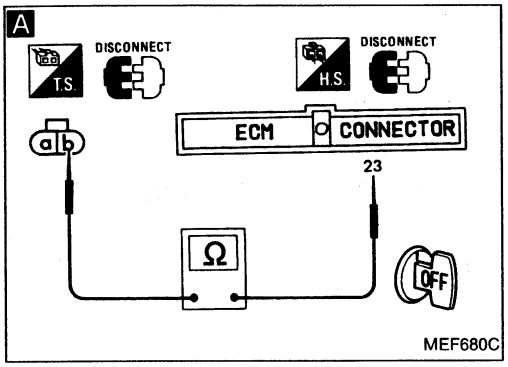


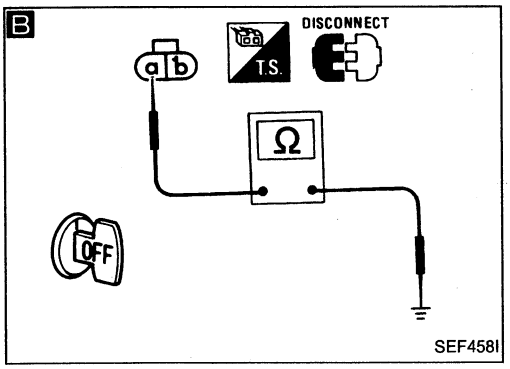
Harness layout





Diagnostic Procedure 31 (Cont'd)





INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Make sure that ignition switch is in "OFF" position.
2) Disconnect knock sensor sub-harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㉓ and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.
1) Check harness continuity between terminal ⓐ and ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

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

O.K.

Reinstall any part removed.

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

Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

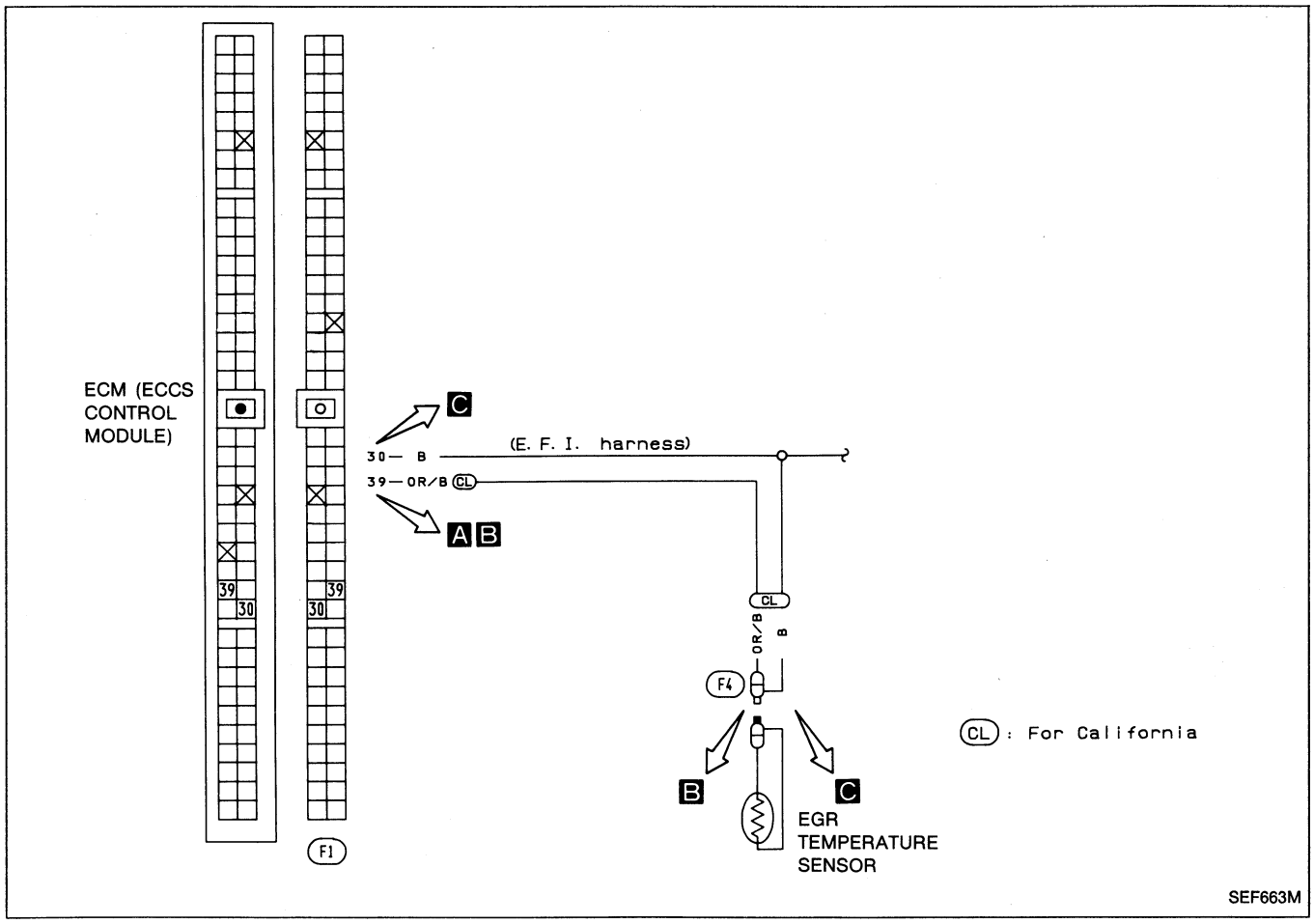
N.G. →
1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage or the connection of ECM harness connector.

O.K.

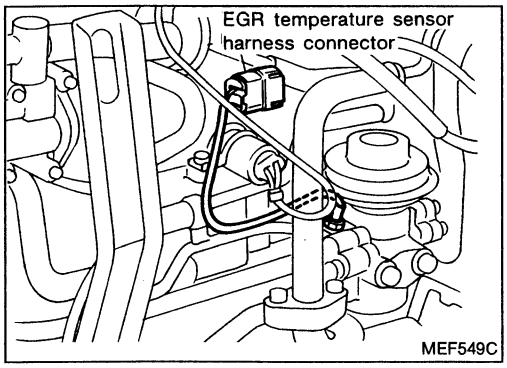
INSPECTION END

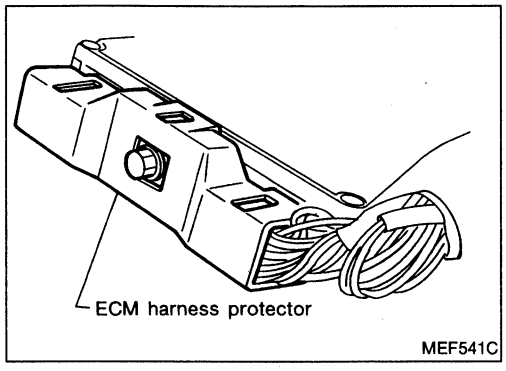
Diagnostic Procedure 32

EGR TEMPERATURE SENSOR (Diagnostic trouble code No. 35) CHECK (MALFUNCTION INDICATOR LAMP ITEM); CALIFORNIA MODEL ONLY

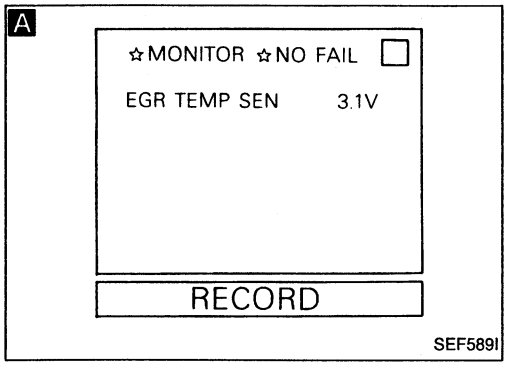


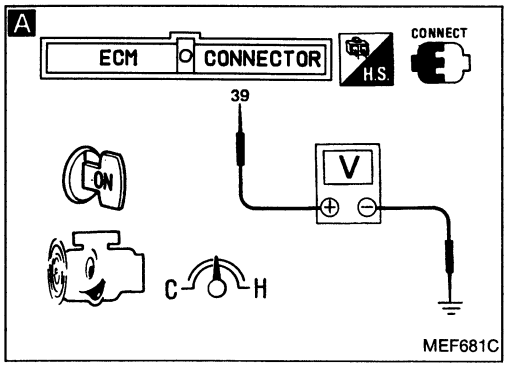
Harness layout

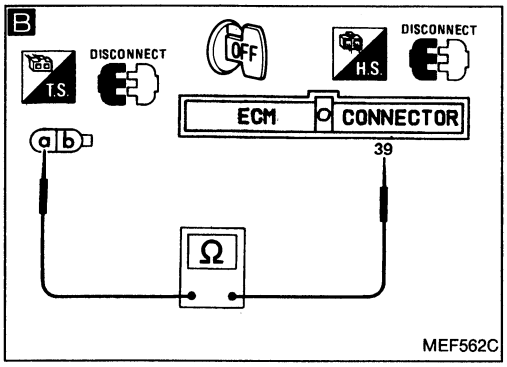


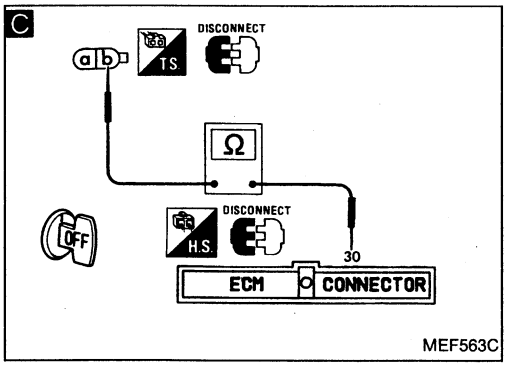


Diagnostic Procedure 32 (Cont'd)









INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Read EGR temperature sensor signal in "DATA MONITOR" mode with CONSULT.
Voltage:
Less than 4.5V

OR

2) Check voltage between ECM terminal ㊴ and ground.
Voltage:
Less than 4.5V

N.G. →

B

CHECK HARNESS CONTINUITY BETWEEN ECM AND EGR TEMPERATURE SENSOR.
1) Stop engine.
2) Disconnect ECM harness connector.
3) Disconnect EGR temperature sensor harness connector.
4) Check continuity between ECM terminal ㊴ and terminal ⓐ.
Continuity should exist.

O.K. ↓

CHECK COMPONENT (EGR temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-177.)

O.K. ↓

C

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect ECM harness connector.
3) Disconnect EGR temperature sensor harness connector.
4) Check harness continuity between ECM terminal ㉚ and terminal ⓑ.

N.G. → Repair harness or connectors.

O.K. ↓

Reinstall any part removed.

↓

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

↓

Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

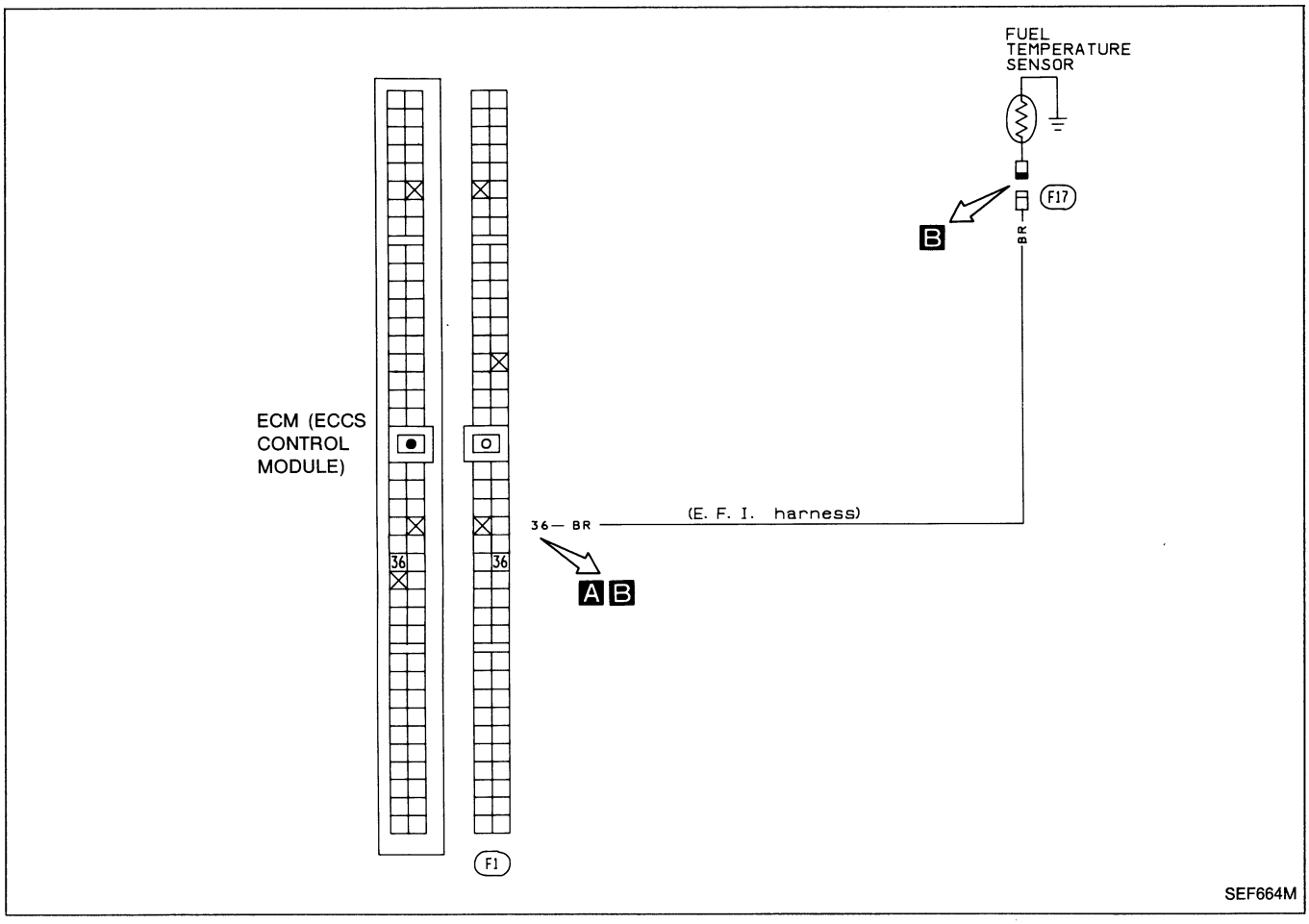
N.G. →
1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage or the connection of ECM harness connector.

O.K. ↓

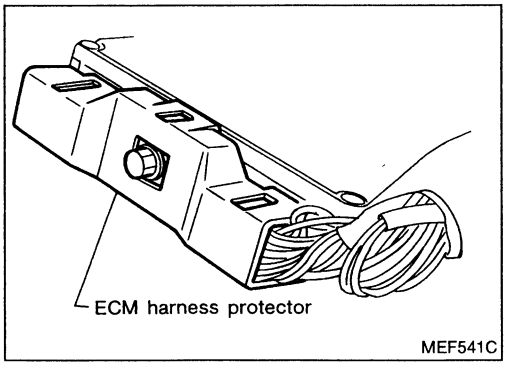
INSPECTION END

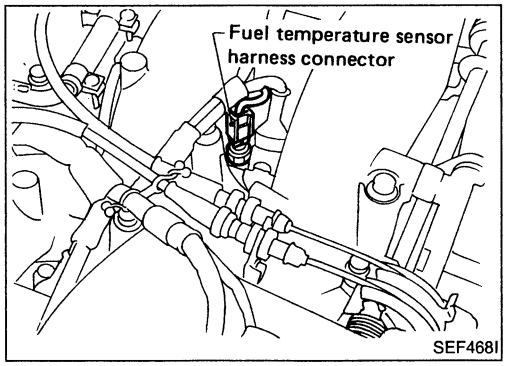
Diagnostic Procedure 33

FUEL TEMPERATURE SENSOR (Diagnostic trouble code No. 42)

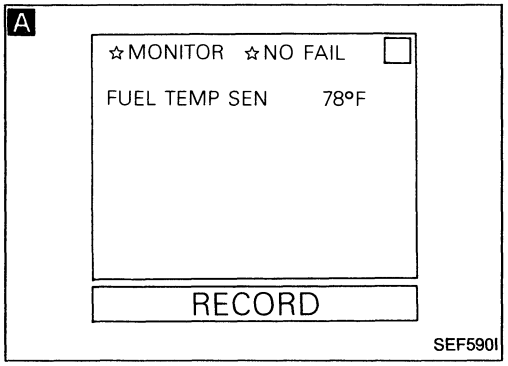


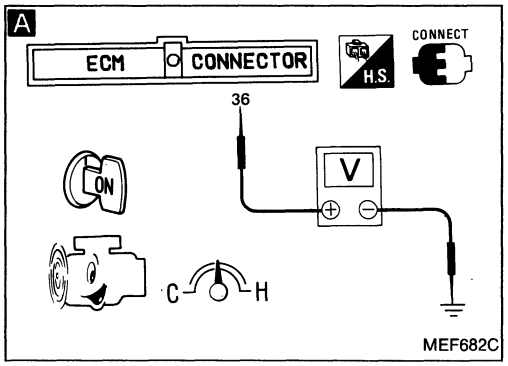
Harness layout

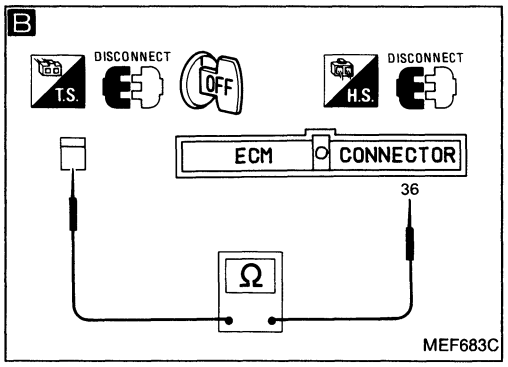




Diagnostic Procedure 33 (Cont'd)







INSPECTION START

A

CHECK INPUT SIGNAL.

Read fuel temperature sensor signal in "DATA MONITOR" mode with CONSULT after engine warm-up.

Fuel temperature:
20 - 60°C (68 - 140°F)

OR

Check voltage between ECM terminal ㊱ and ground after engine warm-up.

Voltage: 0 - 5.0V

N.G.

B

CHECK HARNESS CONTINUITY BETWEEN ECM AND FUEL TEMPERATURE SENSOR.

1) Stop engine.
2) Disconnect ECM harness connector.
3) Disconnect EGR temperature sensor harness connector.
4) Check continuity between ECM terminal ㊱ and fuel temperature terminal.

Continuity should exist.

O.K.

CHECK COMPONENT (Fuel temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-180.)

O.K.

Reinstall any part removed.

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

Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

N.G.

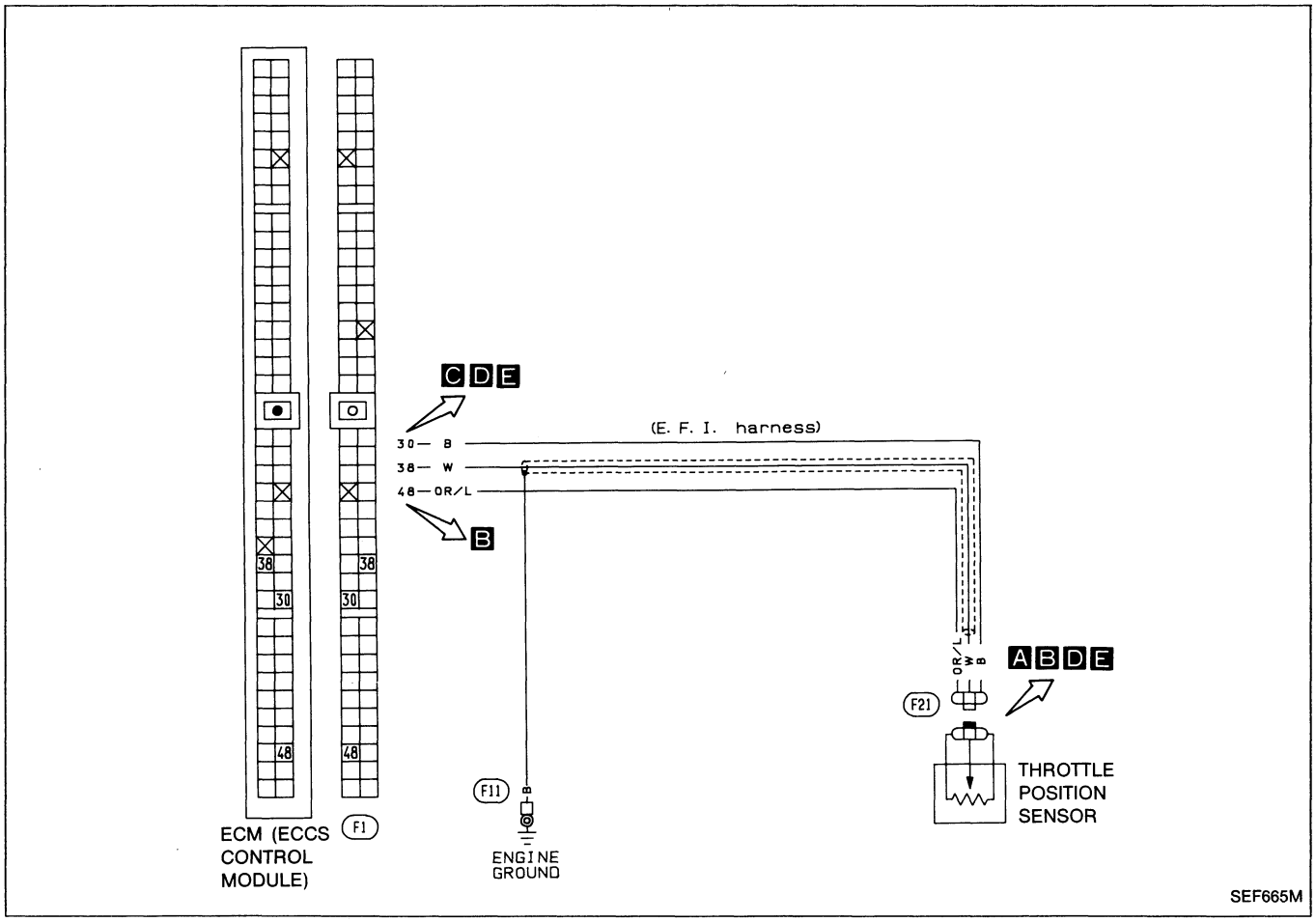
1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage or the connection of ECM harness connector.

O.K.

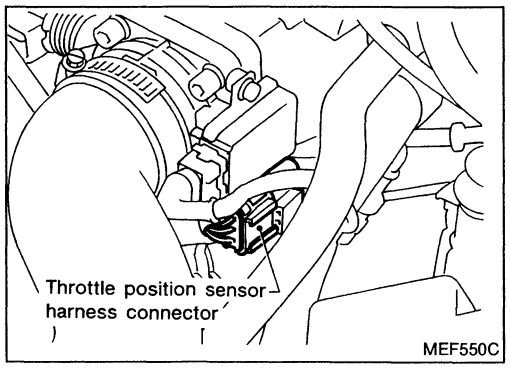
INSPECTION END

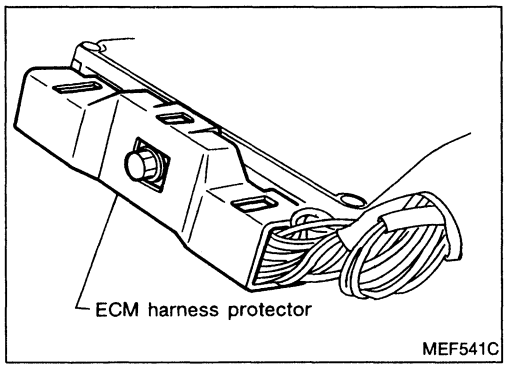
Diagnostic Procedure 34

THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43) CHECK (MALFUNCTION INDICATOR LAMP ITEM)

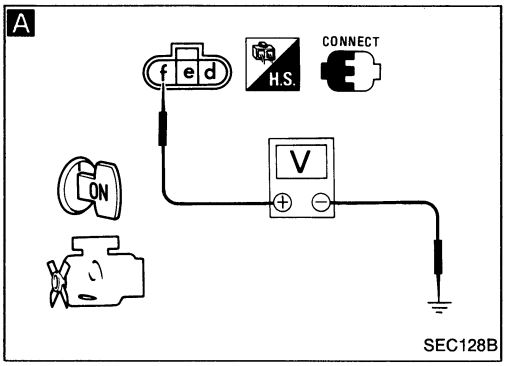


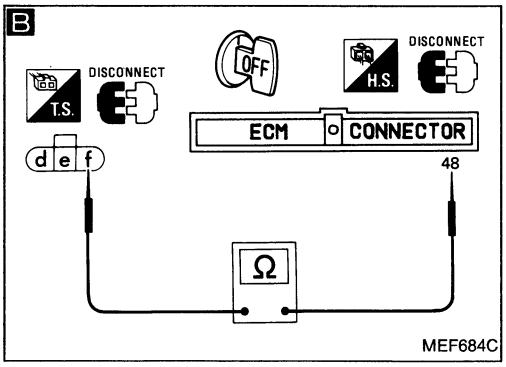
Harness layout

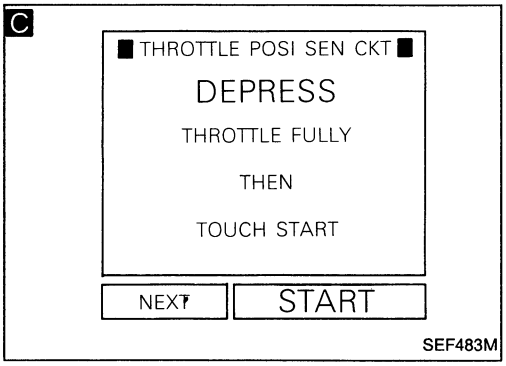


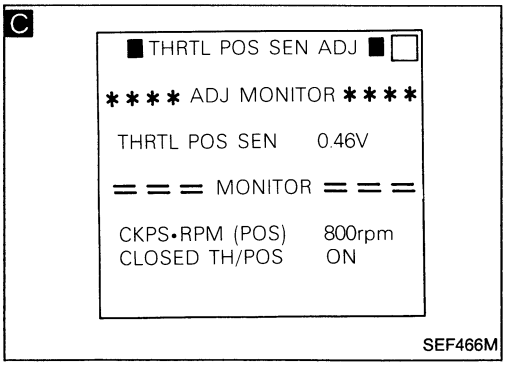


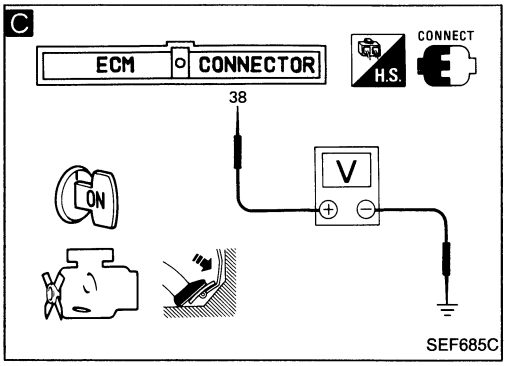
Diagnostic Procedure 34 (Cont'd)











INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓕ and ground.
Voltage:
Approximately 5.0V

N.G. → **B**

CHECK HARNESS CONTINUITY BETWEEN THROTTLE POSITION SENSOR AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect throttle position sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㊽ and terminal ⓕ.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL.
Perform "THROTTLE POSI SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

Read throttle position sensor output voltage in "WORK SUPPORT" mode with CONSULT.
Throttle valve fully closed:
0.4 - 0.5V
Throttle valve fully open:
Approx. 4.0V

OR

Make sure that voltage between ECM terminal ㊳ and ground changes when accelerator pedal is depressed.
Voltage:
Throttle valve fully closed:
0.4 - 0.5V
Throttle valve fully open:
Approx. 4.0V

N.G. → ADJUST THROTTLE POSITION SENSOR INITIAL POSITION.
(See page EF & EC-177.)

D

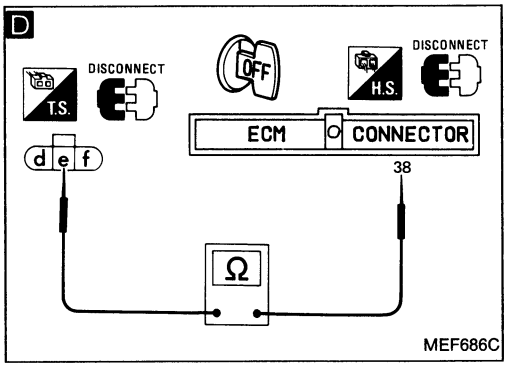
CHECK HARNESS CONTINUITY BETWEEN THROTTLE POSITION SENSOR AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect throttle position sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㊳ and terminal ⓔ.
Continuity should exist.
If N.G., repair harness or connectors.

O.K. → Ⓑ

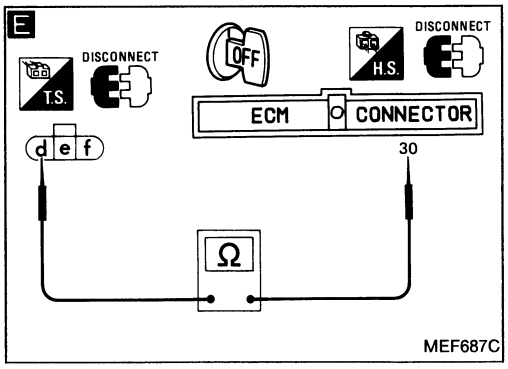
O.K. → Ⓐ

Diagnostic Procedure 34 (Cont'd)

D



E



Ⓐ

Ⓑ

CHECK COMPONENT (Throttle position sensor). Refer to "Electrical Components Inspection". (See page EF & EC-177.)

E

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect throttle position sensor harness connector.
4) Check resistance between ECM terminal ㉚ and terminal ⓓ.
Continuity should exist.

N.G. → 1) Check harness continuity between throttle position sensor and ground.
2) ECM ground circuit.

O.K. ↓

Reinstall any part removed.

↓

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

↓

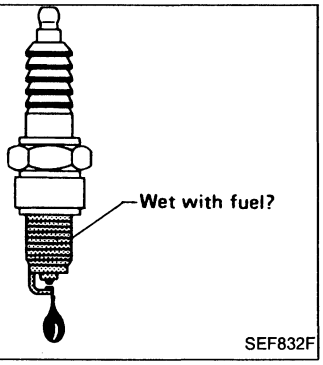
Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

N.G. → 1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage or the connection of ECM harness connector.

O.K. ↓

INSPECTION END

A



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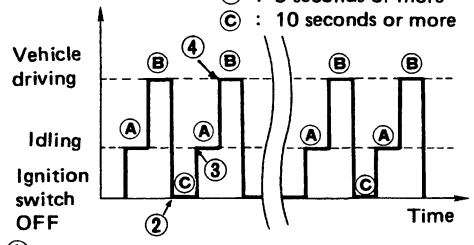
B **ROAD TEST**

Test condition
Drive vehicle under the following conditions with a suitable shift position.
(1) Engine speed: 2,200±200rpm
(2) Intake manifold vacuum:
−38.7±9.3 kPa
(−290±70 mmHg, −11.42±2.76 inHg)

Driving mode

Ⓐ : 40 seconds or more
Ⓑ : 5 seconds or more
Ⓒ : 10 seconds or more



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 40 seconds.
④ Shift to a suitable gear position and drive in "Test condition" for at least 5 seconds.
⑤ Repeat steps ② through ④ at least 5 times.

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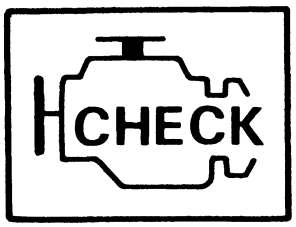
C



MALFUNCTION INDICATOR LAMP

MEF706C

Diagnostic Procedure 35

INJECTOR LEAK (Diagnostic trouble code No. 45) CHECK (MALFUNCTION INDICATOR LAMP ITEM); CALIFORNIA MODEL ONLY

INSPECTION START

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warm-up.

Runs smoothly

Does not run smoothly

Set the diagnosis mode selector of ECM to Diagnostic Test Mode II.

These inspections should be performed on both heated oxygen sensors by changing monitor from left side to right side.
(Refer to EF & EC-52.)
Check if the red L.E.D. on ECM stays off during 10 seconds at 1,000 rpm under no-load.

Stays off

Does not stay off

Check mixture ratio feedback system.
(See page EF & EC-35.)

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

These inspections should be performed on both heated oxygen sensors by changing monitor from left side to right side.
(Refer to EF & EC-52.)
Set diagnosis to Diagnostic Test Mode II and check that red L.E.D. on ECM blinks at 2,000 rpm under no-load.

Does not blink

Blinks

Check idle CO%.
(See page EF & EC-35.)

INSPECTION END

Ⓐ

Remove all spark plugs from intake manifold. Are plugs wet with fuel?

Yes

Replace the injector in which cylinder spark plug is wet with fuel.

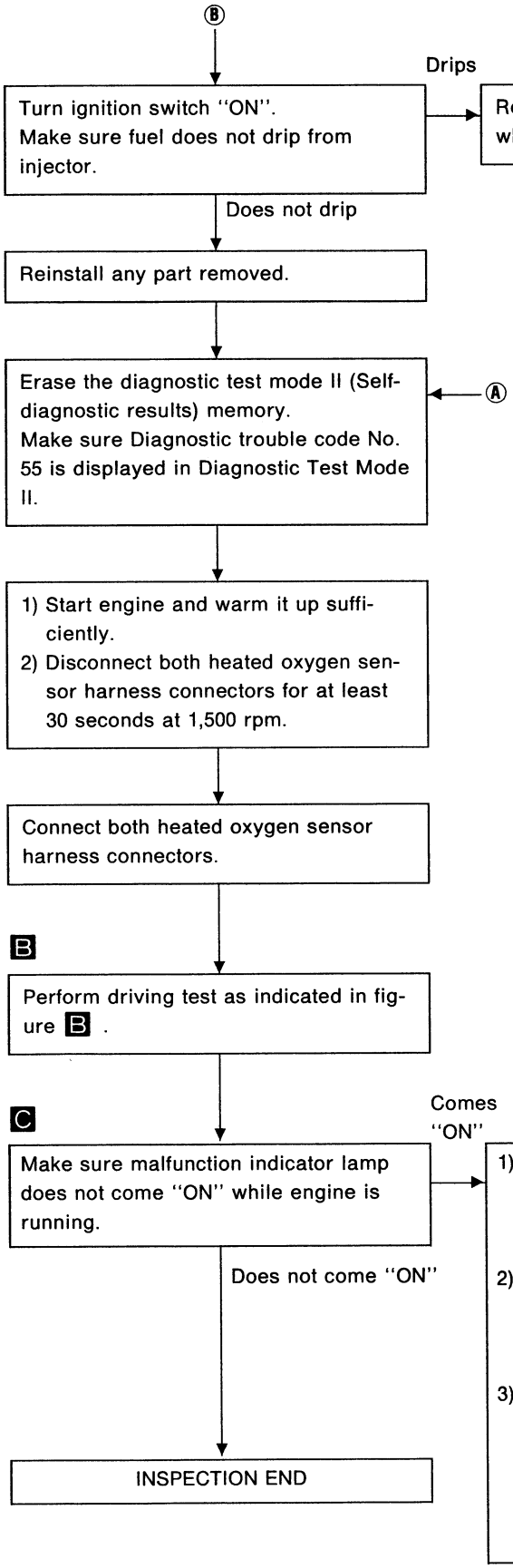
(Go to Ⓐ on next page.)

No

Remove injector assembly.
(See page EF & EC-182.)
Keep fuel hose and all injectors connected to injector gallery.

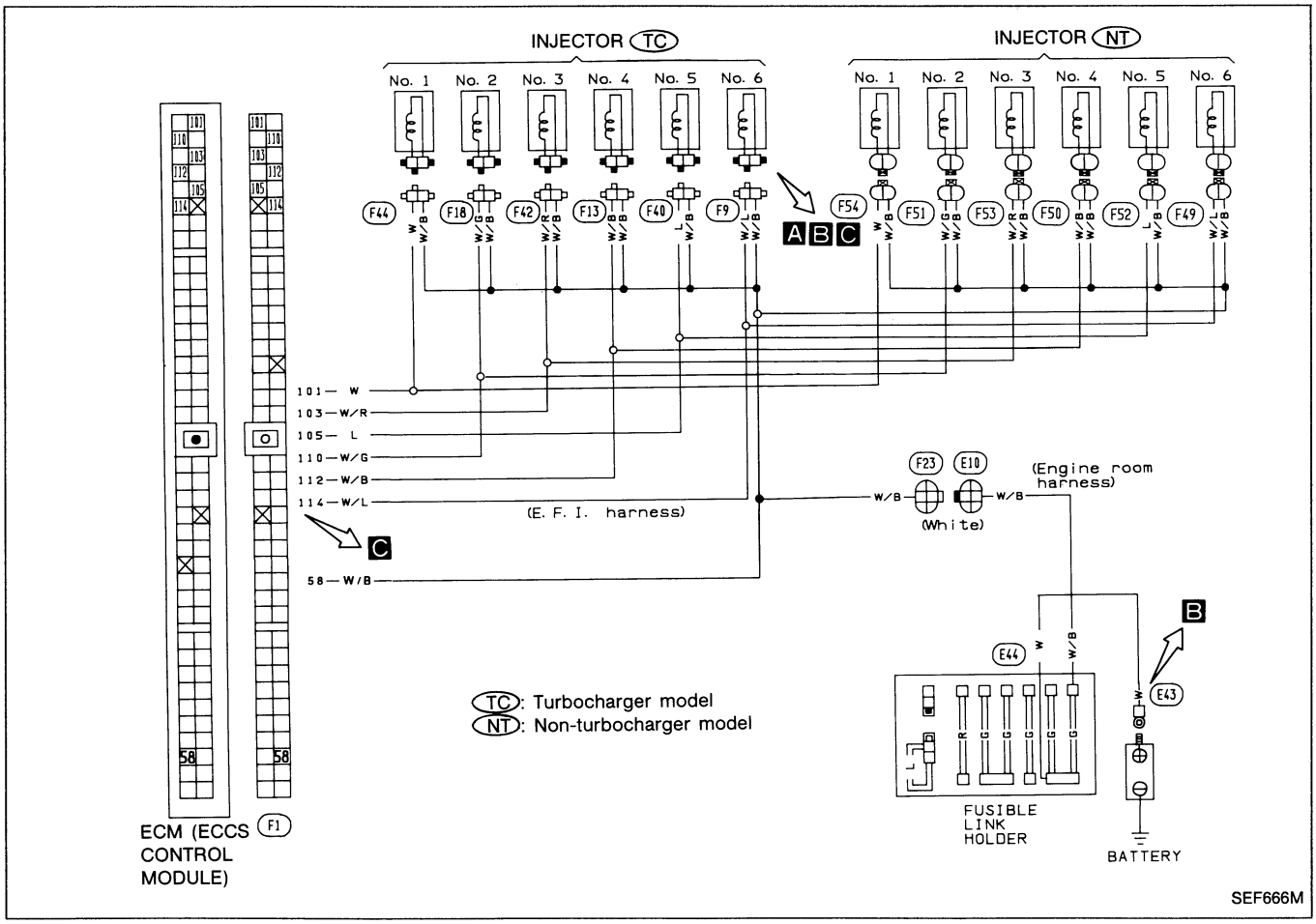
Ⓑ

Diagnostic Procedure 35 (Cont'd)

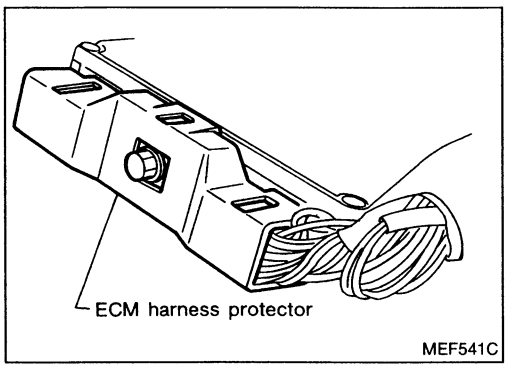


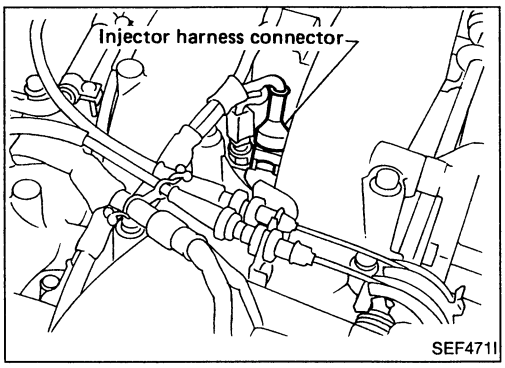
Diagnostic Procedure 36

INJECTOR CIRCUIT (Diagnostic trouble code No. 51) CHECK (MALFUNCTION INDICATOR LAMP ITEM): For California model
(Not self-diagnostic item): For Non-California model

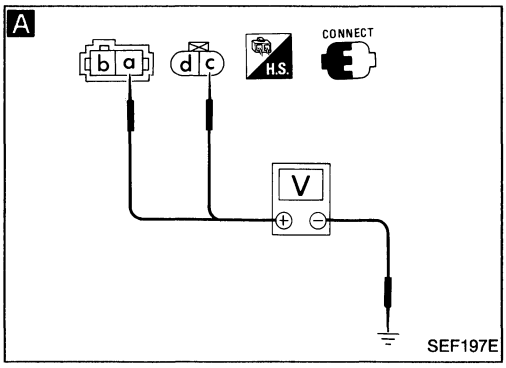


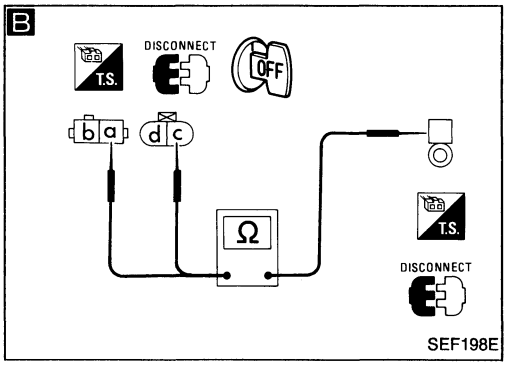
Harness layout

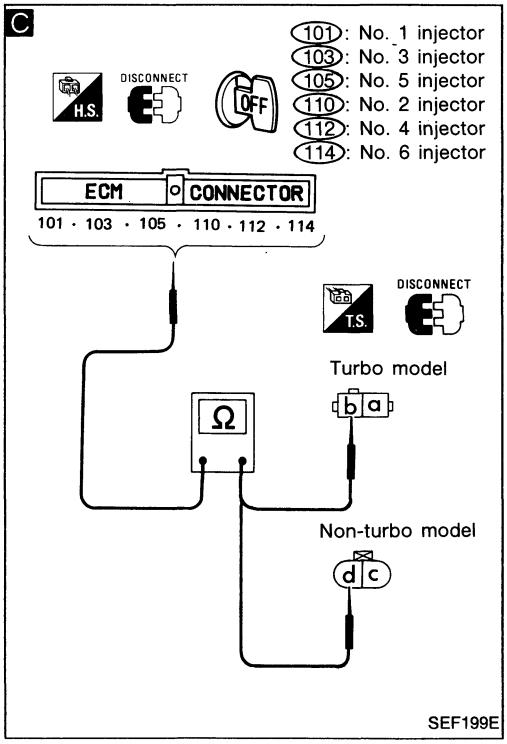




Diagnostic Procedure 36 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
Check voltage between terminal ⓐ (Turbocharger), ⓒ (Non-turbocharger) and ground.
Voltage: Battery voltage

N.G. → **B**

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND BATTERY.
1) Turn ignition switch "OFF".
2) Disconnect injector harness connector.
3) Disconnect battery ⊕ terminal.
4) Check harness continuity between terminal ⓐ (Turbocharger), ⓒ (Non-turbocharger) and battery ⊕ terminal.
Continuity should exist.
5) Check "G" fusible link. If N.G., replace harness, connector or fusible link.

O.K.

C

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND ECM.
1) Disconnect battery ⊕ terminal.
2) Disconnect injector harness connectors and ECM harness connector.
3) Check harness continuity between terminals ⓑ (Non-turbocharger) or ⓓ (Turbocharger) and ECM terminals (101), (103), (105), (110), (112), (114).
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

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

N.G. → Repair or replace injector.

O.K.

Reinstall any part removed.

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

Perform driving test and then perform diagnostic test mode II (Self-diagnostic results) again.

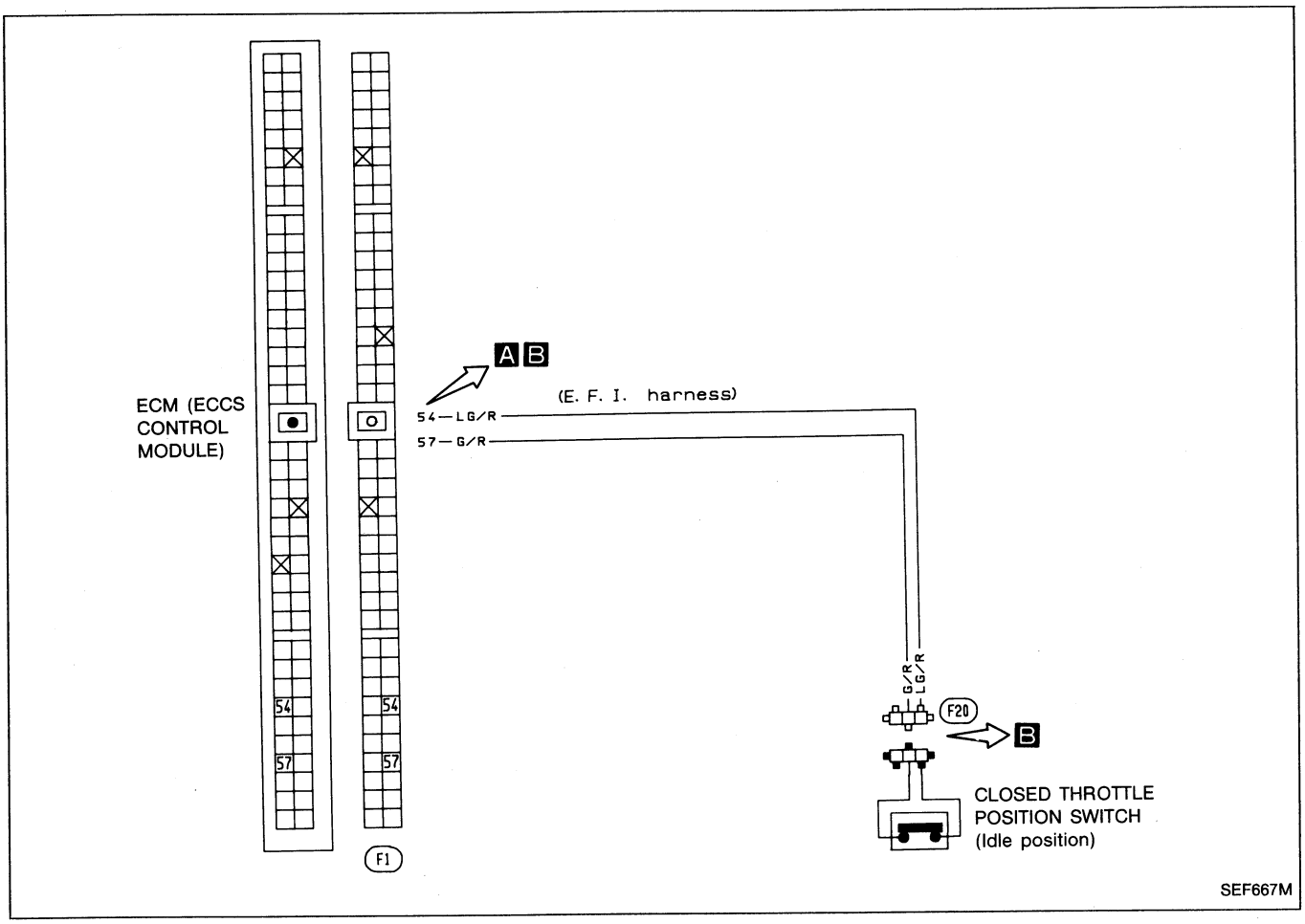
N.G. →
1) Perform ECM input/output signal inspection test.
2) If N.G., recheck the ECM pin terminals for damage or the connection of ECM harness connector.

O.K.

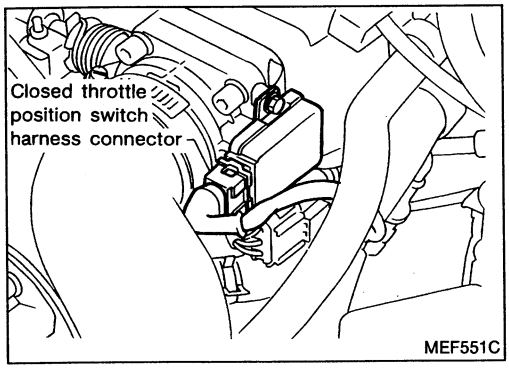
INSPECTION END

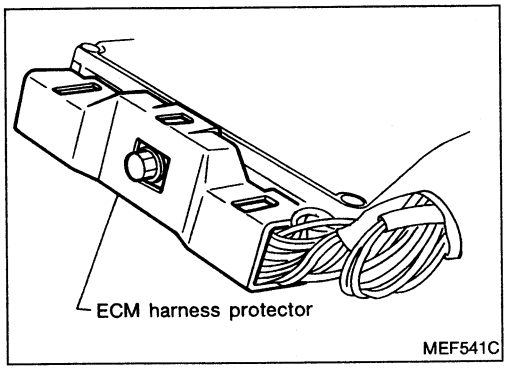
Diagnostic Procedure 37

CLOSED THROTTLE POSITION SWITCH (Idle position) (Not self-diagnostic item)

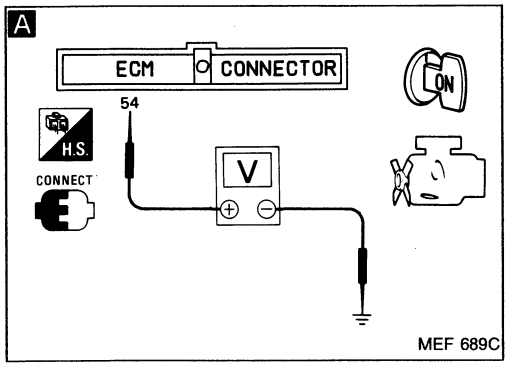


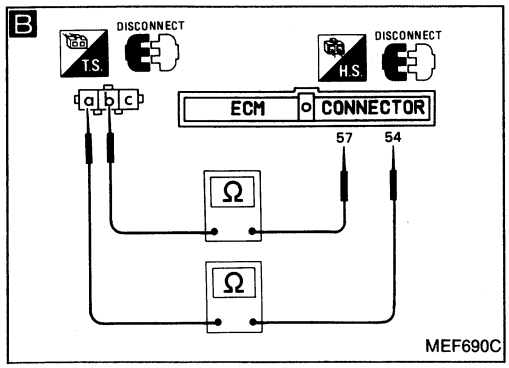
Harness layout





Diagnostic Procedure 37 (Cont'd)





INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminal ⑭ and ground.
Voltage:
Throttle valve fully closed:
9.0 - 10.0V
Throttle valve fully open:
0V

N.G.

O.K.

INSPECTION END

B

CHECK HARNESS CONTINUITY BETWEEN ECM AND CLOSED THROTTLE POSITION SWITCH.
1) Turn ignition switch "OFF".
2) Disconnect closed throttle position switch harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminals ⑭, ⑰ and terminals ⓐ, ⓑ.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

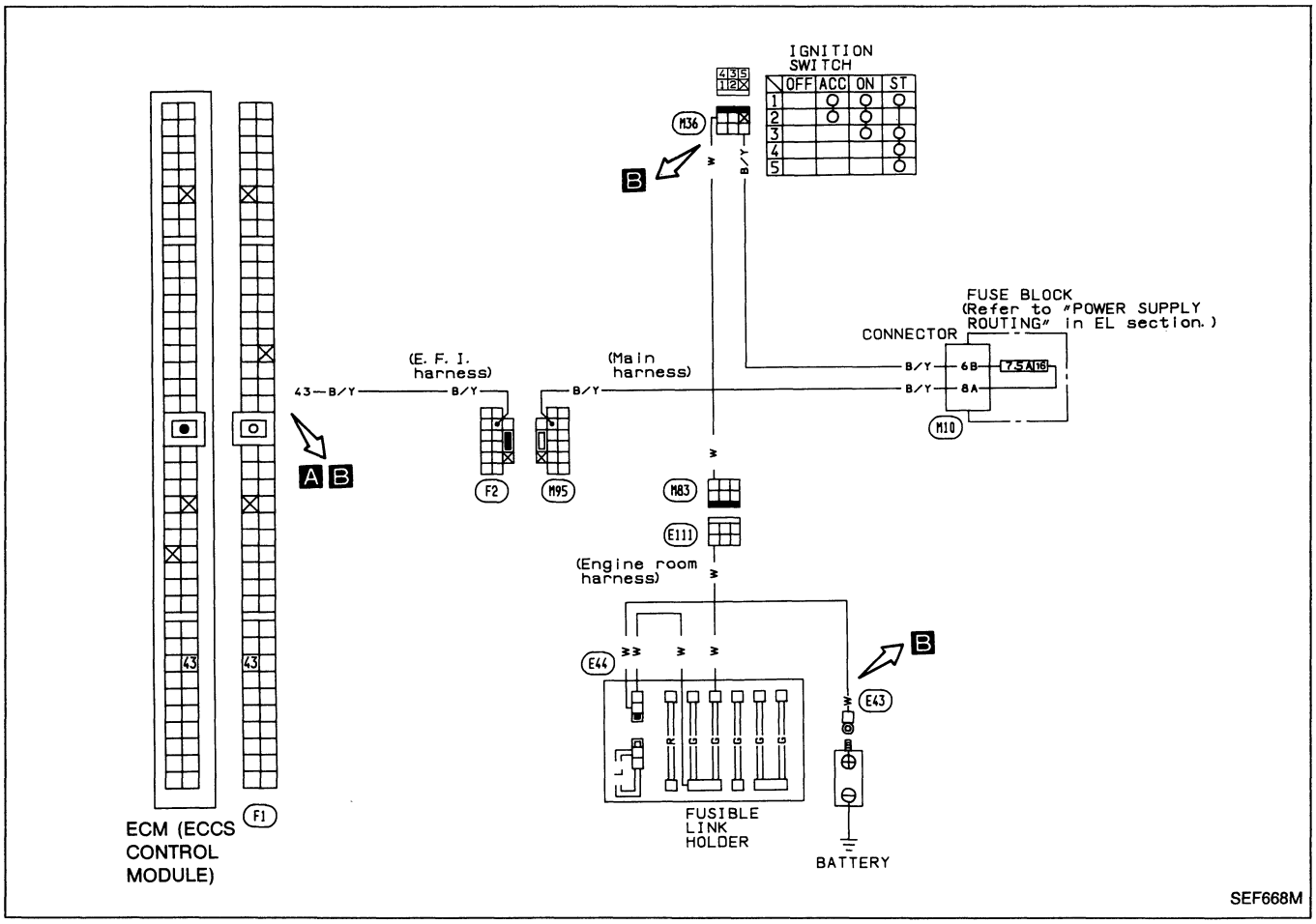
Check if closed throttle position switch (throttle position sensor body) is installed in proper position.
(See page EF & EC-177.)

O.K.

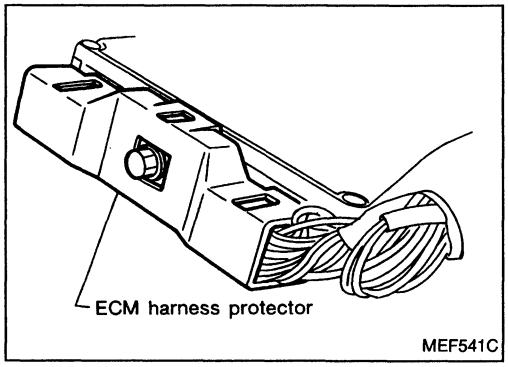
CHECK COMPONENT (closed throttle position switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-177.)

Diagnostic Procedure 38

START SIGNAL (Not self-diagnostic item)



Harness layout



Diagnostic Procedure 38 (Cont'd)

A

■ START SIGNAL CKT ■

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

NEXT | START

SEF191L

A

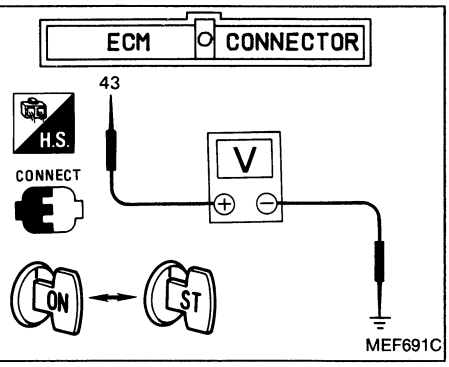
☆MONITOR ☆NO FAIL

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

RECORD

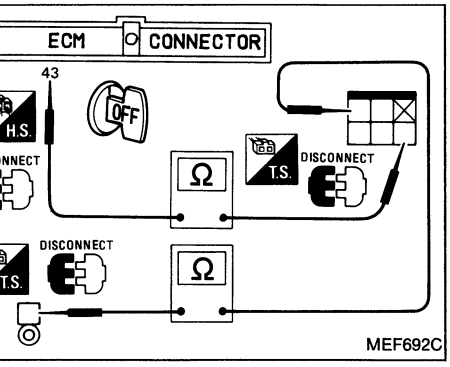
SEF485M

A



MEF691C

B



MEF692C

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

1) Turn ignition switch "ON".
2) Check start signal in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

2) Check voltage between ECM terminal ㊸ and ground.
When cranking:
Battery voltage
Except above:
0V

N.G. →

B

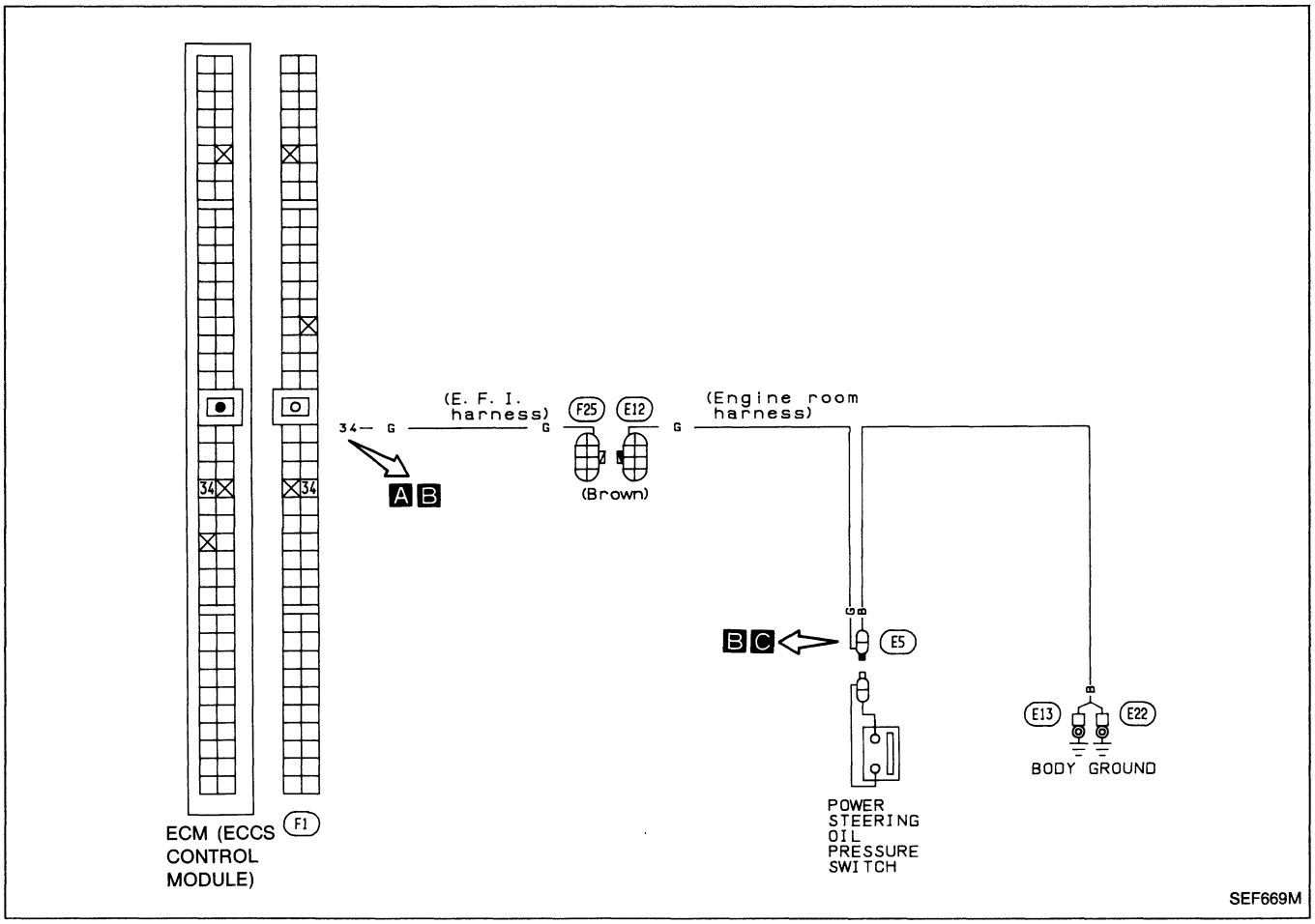
Check the following items.
1) "G" fusible link
2) "7.5A" fuse
3) Ignition switch
4) Harness continuity between ECM and ignition switch
Continuity should exist.
5) Harness continuity between battery ⊕ terminal and ignition switch
Continuity should exist.

O.K. ↓

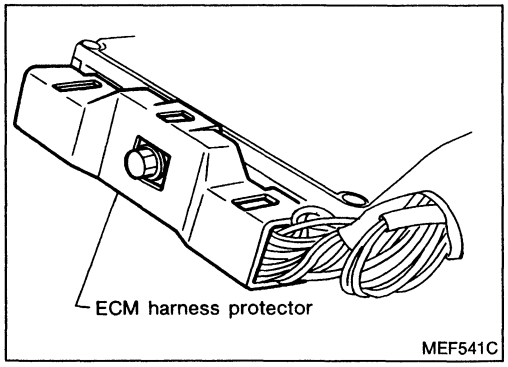
INSPECTION END

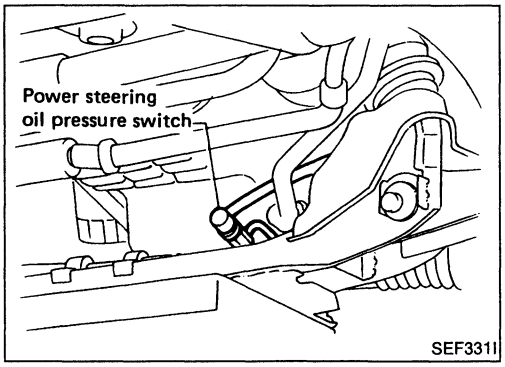
Diagnostic Procedure 39

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

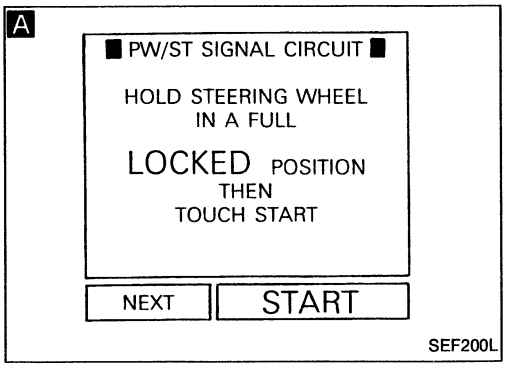


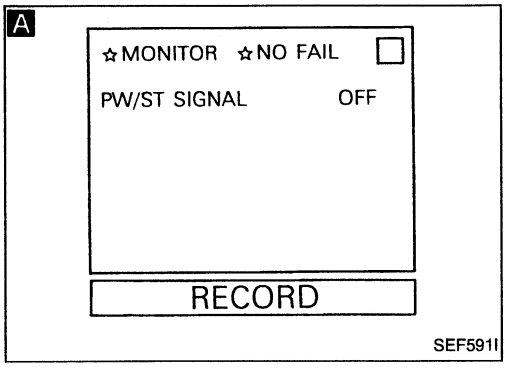
Harness layout

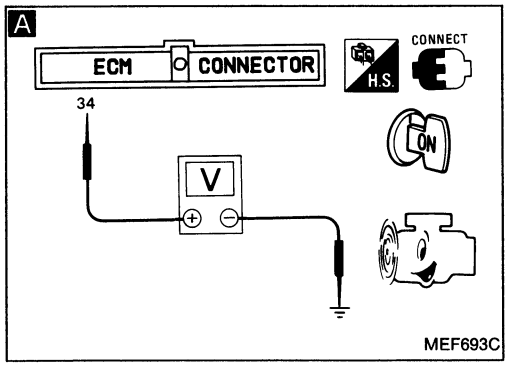


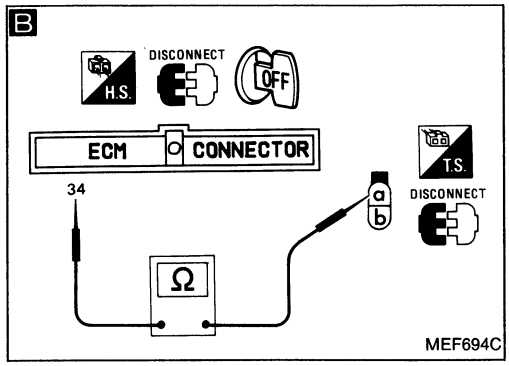


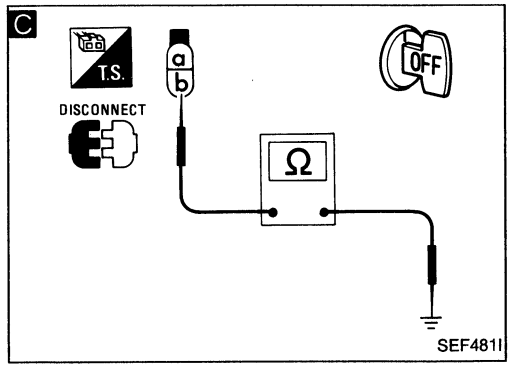
Diagnostic Procedure 39 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Start engine.
2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.

Steering is neutral position: OFF
Steering is turned: ON

OR

1) Start engine.
2) Check voltage between ECM terminal ㉞ and ground with tester.

Voltage:
Steering is neutral position:
Approx. 8 - 9V
Steering is turned:
Approx. 0V

O.K. → INSPECTION END

N.G.

B

CHECK HARNESS CONTINUITY BETWEEN POWER STEERING OIL PRESSURE SWITCH AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and power steering oil pressure switch harness connector.
3) Check harness continuity between ECM terminal ㉞ and ⓐ.

Continuity should exist.

N.G. → Repair or replace harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.
Check harness continuity between terminal ⓑ and ground.

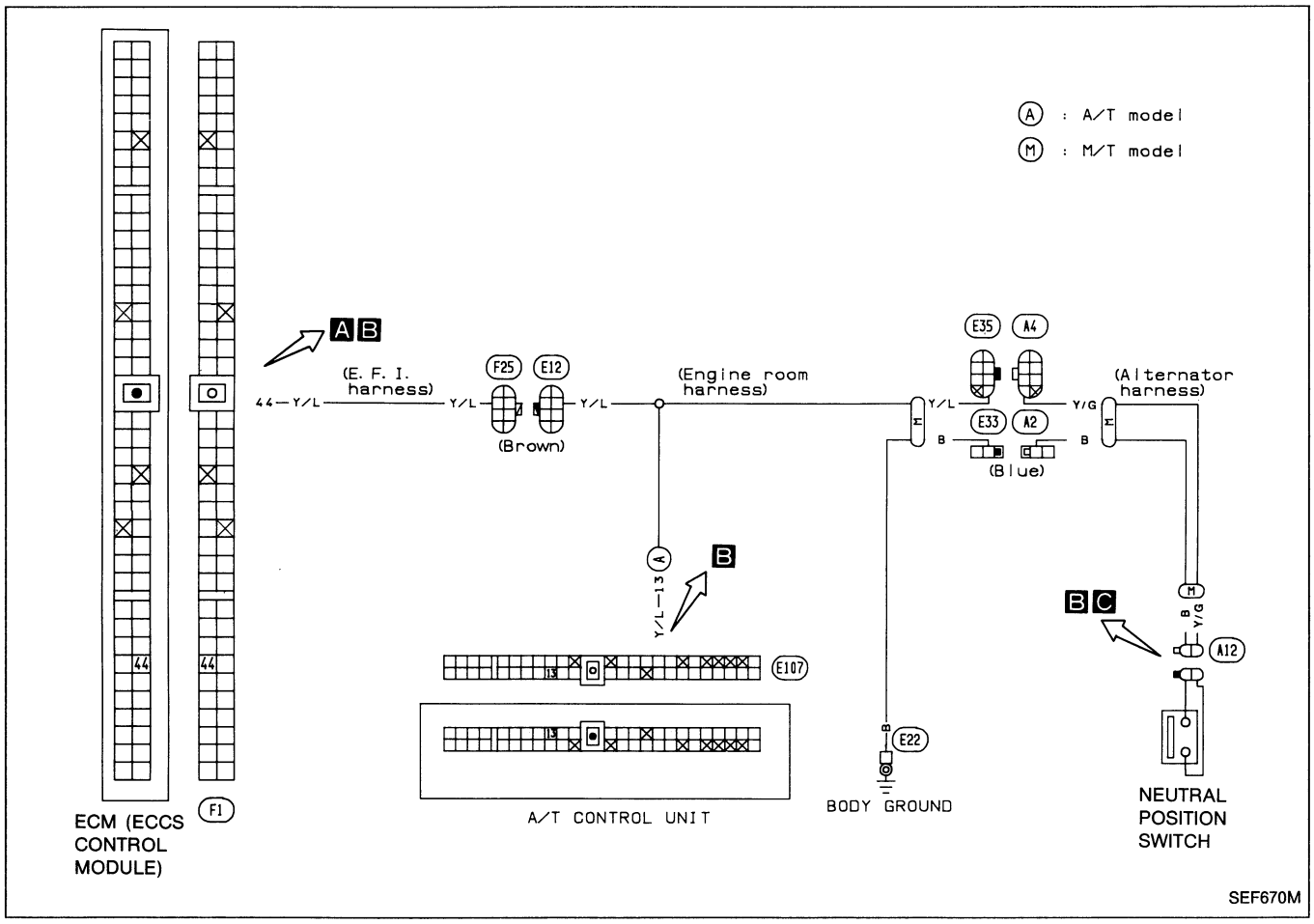
Continuity should exist.

N.G.

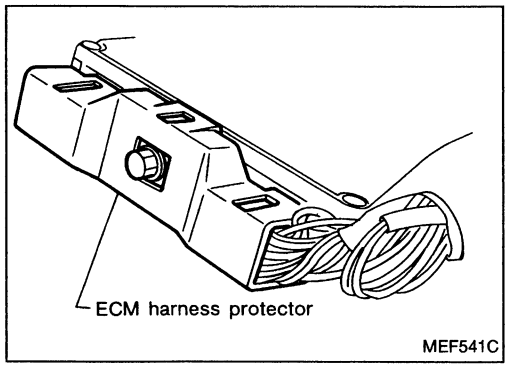
O.K. → CHECK COMPONENT. (Power steering oil pressure switch)
Refer to "Electrical Components Inspection".
(See page EF & EC-180.)

Diagnostic Procedure 40

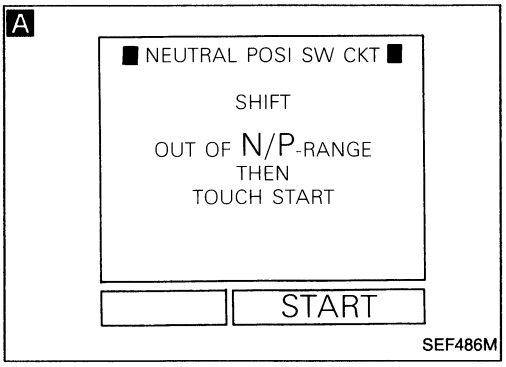
NEUTRAL POSITION SWITCH & A/T CONTROL UNIT (NEUTRAL POSITION SIGNAL) CIRCUIT (Not self-diagnostic item)

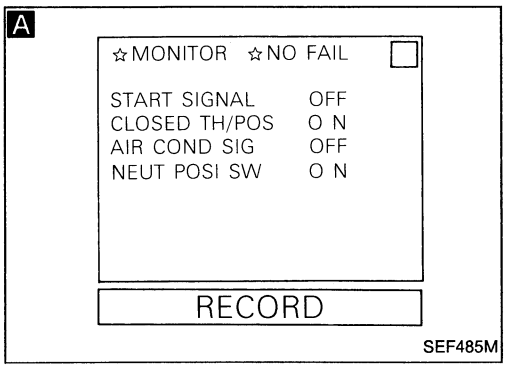


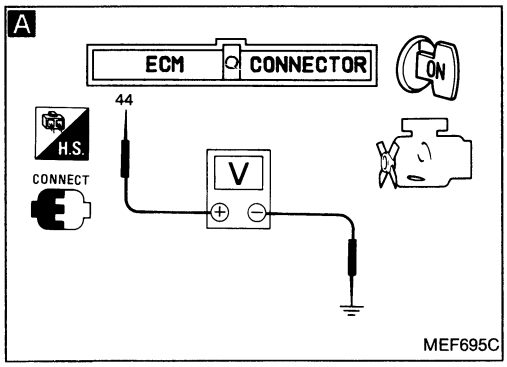
Harness layout

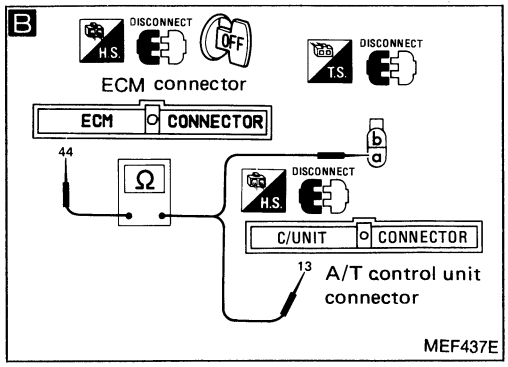


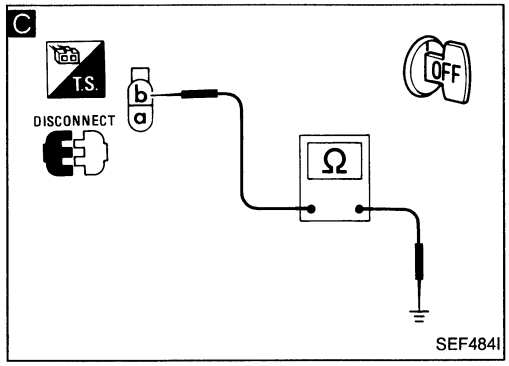
Diagnostic Procedure 40 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.

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

— OR —

1) Turn ignition switch "ON".
2) Perform "NEUT POSI SW" in "DATA MONITOR" mode with CONSULT.
"N" or "P": ON
Except above: OFF

— OR —

2) Check voltage between ECM terminal ㊹ and ground.
"N" or "P": Approx. 0V
Except above: 8 - 9V

O.K. → INSPECTION END

N.G.

B

CHECK HARNESS CONTINUITY BETWEEN ECM AND NEUTRAL POSITION SWITCH (A/T CONTROL UNIT)
1) Turn the ignition switch "OFF".
2) Disconnect ECM harness connector and neutral position switch harness connector (A/T control unit harness connector.)
3) Check harness continuity between ECM terminal ㊹ and ⓐ (⑬).
Continuity should exist.

N.G. → Repair or replace harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT
(M/T only).
Check harness continuity between terminal ⓑ and ground.
Continuity should exist.

N.G.

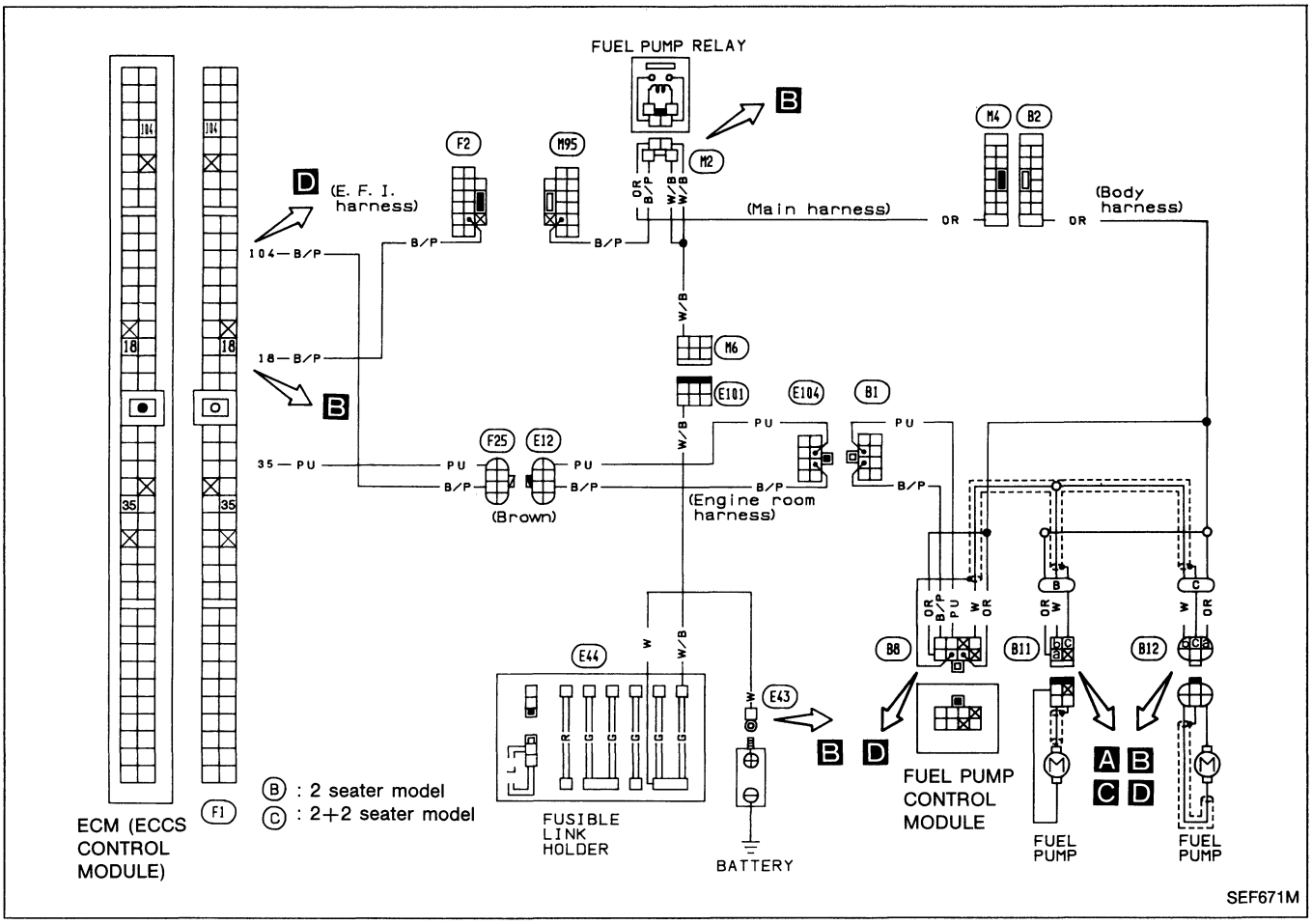
CHECK COMPONENT.
- (Neutral position switch)
  Refer to "Electrical Components Inspection". (See page EF & EC-179.)
- (A/T control unit)
  See A/T section.
- (Inhibitor switch)

Refer to "Electrical Components Inspection". (See page EF & EC-180.)

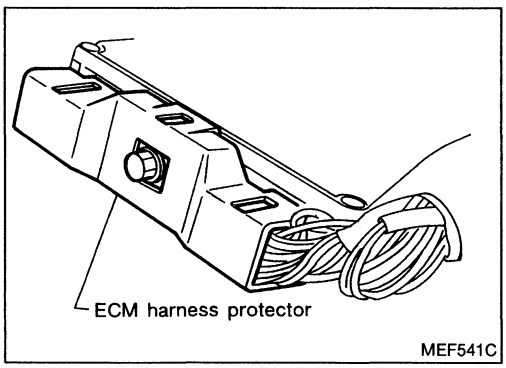
O.K.

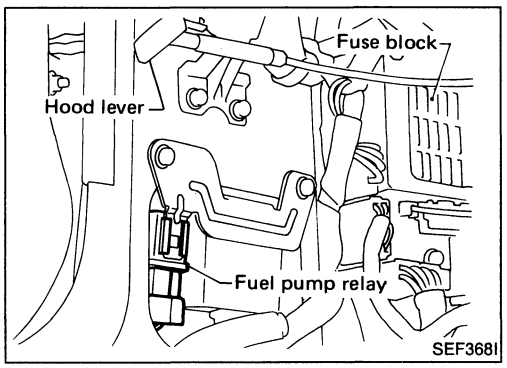
Diagnostic Procedure 41

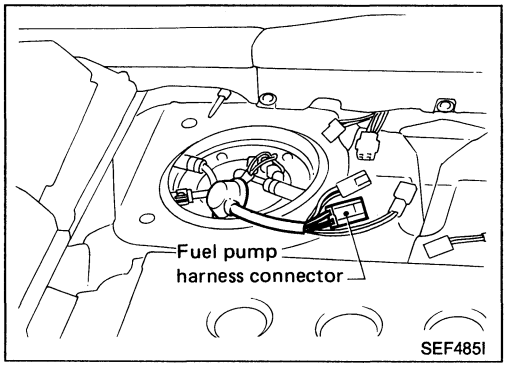
FUEL PUMP (Not self-diagnostic item)

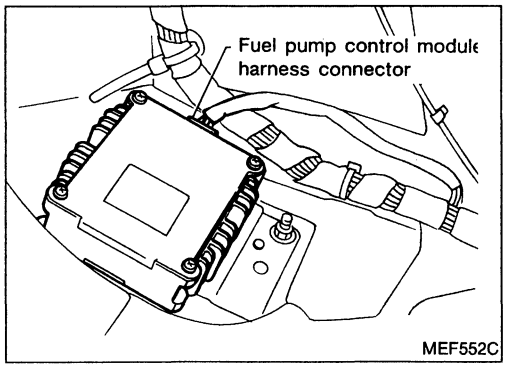


Harness layout



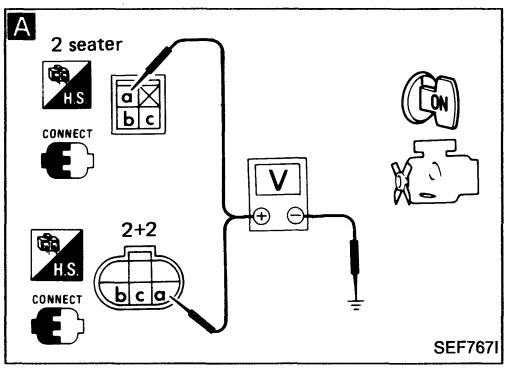




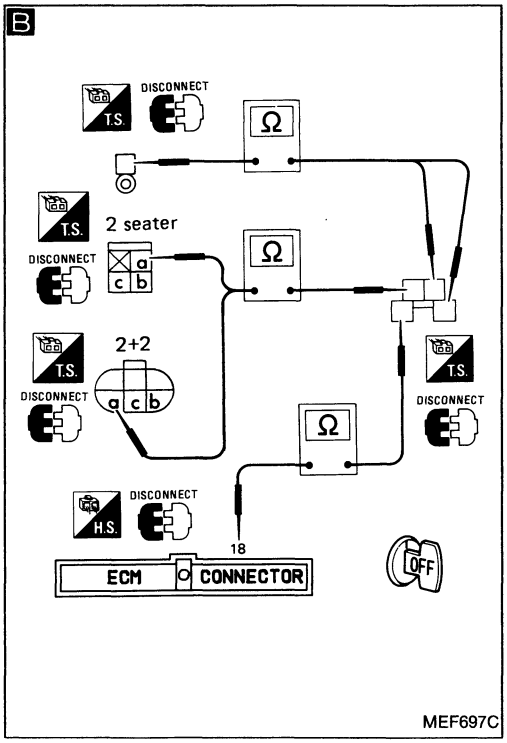


Diagnostic Procedure 41 (Cont'd)

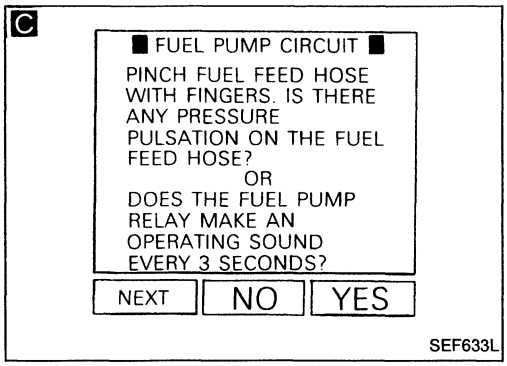
A



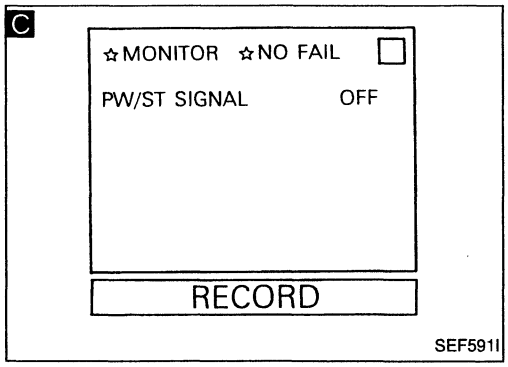
B



C



C



INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between fuel pump connector terminal ⓐ and ground.
Battery voltage indication should appear for 1 second after turning ignition switch "ON".

N.G.

B

Check the following items.
1) "G" fusible link
2) Harness continuity between
- battery ⊕ terminal and fuel pump relay
- fuel pump relay and fuel pump
- fuel pump relay and ECM terminal ⑱

Continuity should exist.

O.K.

C

CHECK COMPONENT (Fuel pump relay).

Perform "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

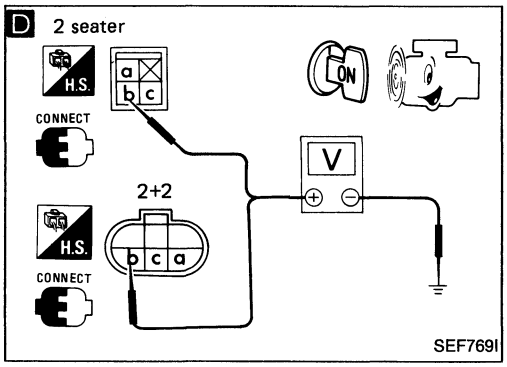
Perform "FUEL PUMP RELAY TEST" in "ACTIVE TEST" mode with CONSULT.

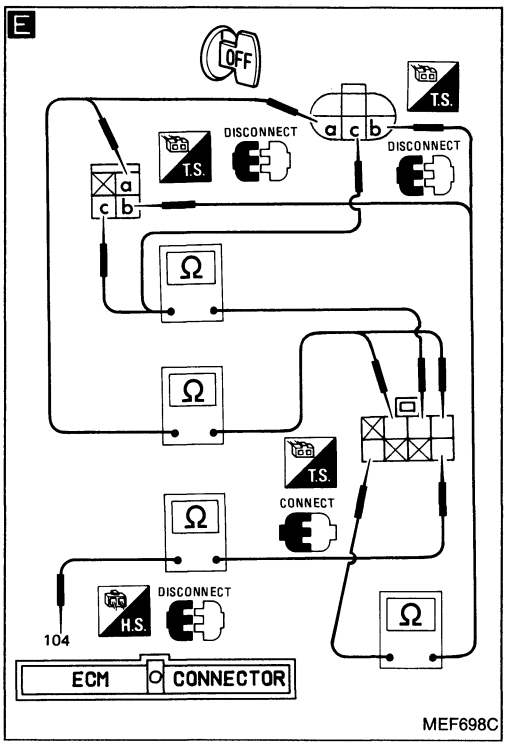
OR

Refer to "Electrical Components Inspection". (See page EF & EC-180.)

Ⓐ

Diagnostic Procedure 41 (Cont'd)





Ⓐ

D

CHECK GROUND CIRCUIT.
Check voltage between fuel pump terminal ⓑ and ground under the following conditions.

Idling	Approx. 3 - 6V
For 30 seconds after starting engine	Battery voltage

N.G. →

E

Check the following items.
Harness continuity between
- fuel pump and fuel pump control unit
- fuel pump control unit and ECM terminal (104)

Continuity should exist.

O.K. ↓

CHECK COMPONENT (Fuel pump).
Refer to "Electrical Components Inspection".
(See page EF & EC-175.)

N.G. ↓

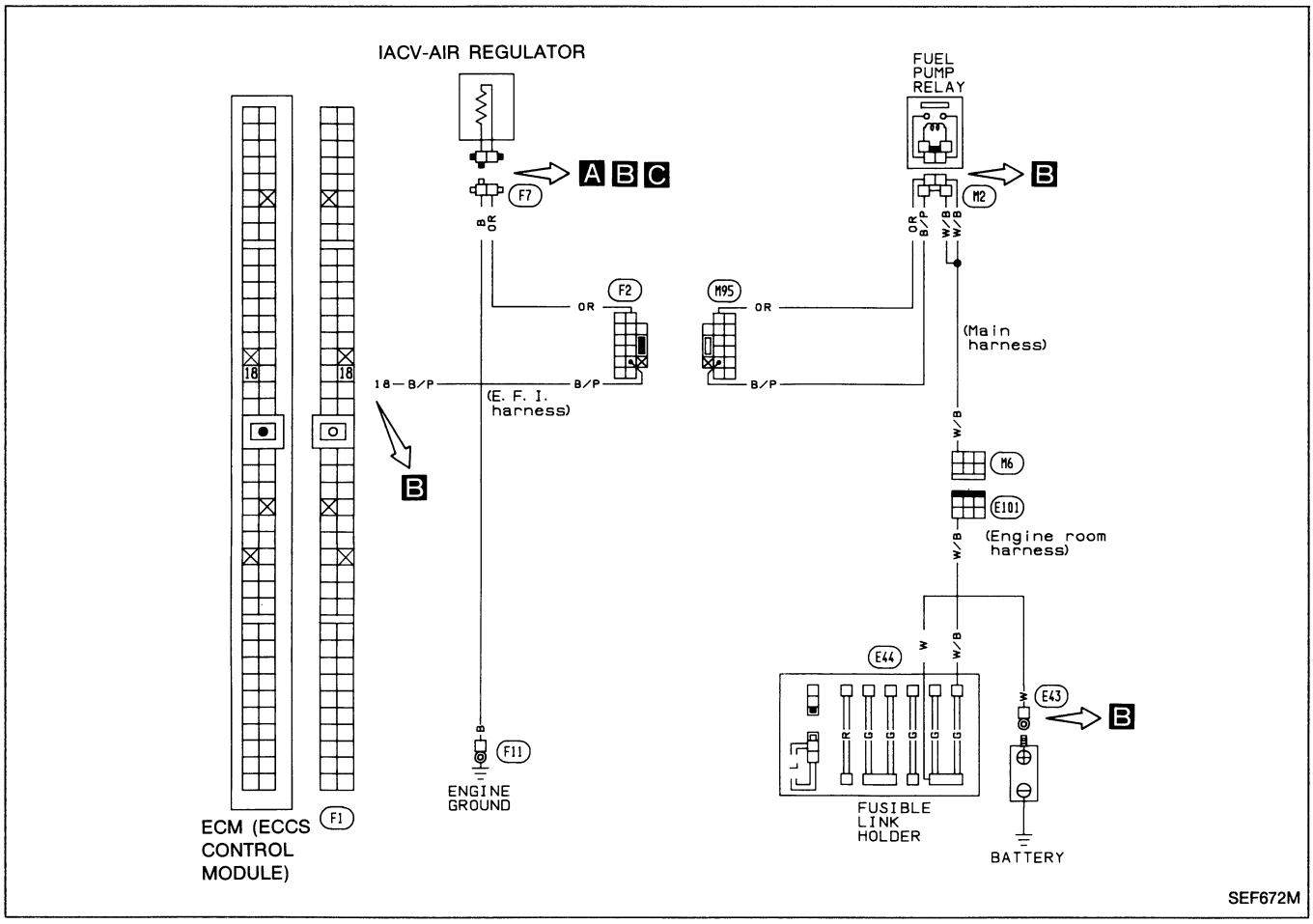
Replace fuel pump control unit.

O.K. ↓

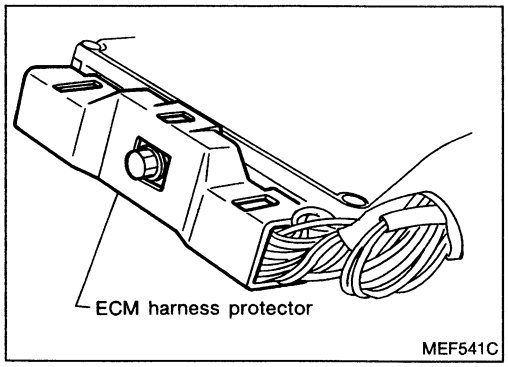
INSPECTION END

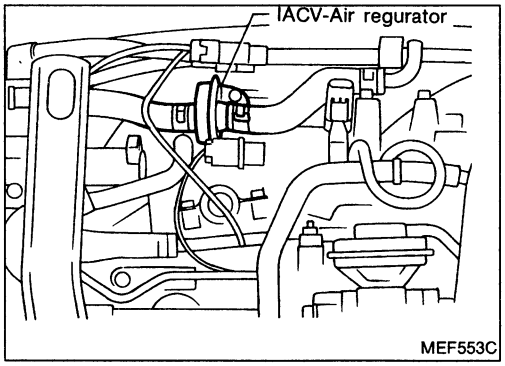
Diagnostic Procedure 42

IACV-AIR REGULATOR (Not self-diagnostic item)

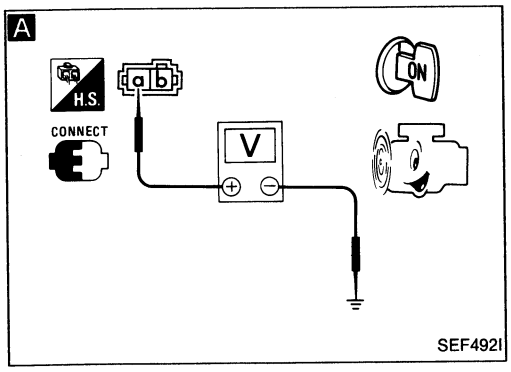


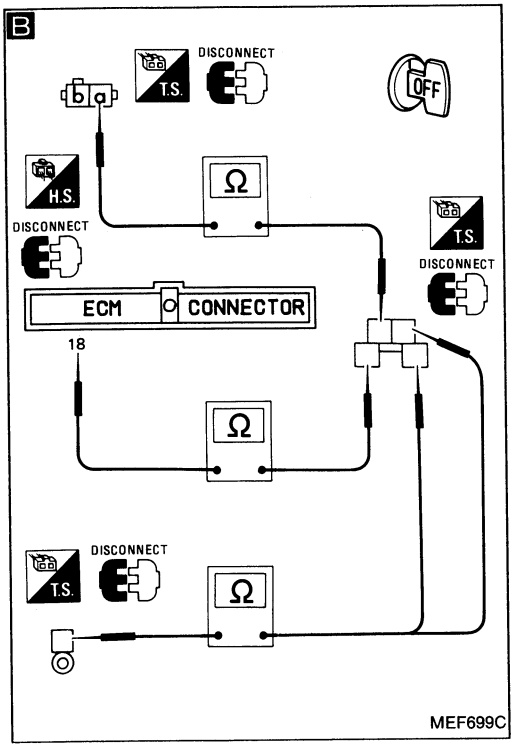
Harness layout

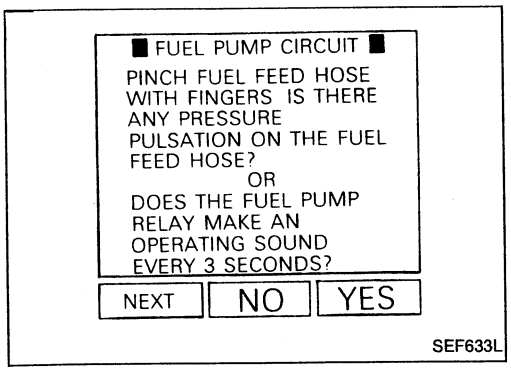


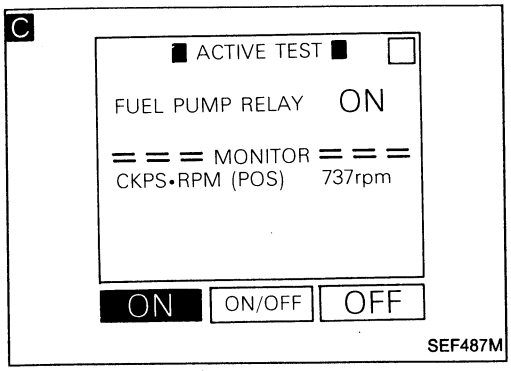


Diagnostic Procedure 42 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Start engine.
2) Check voltage between IACV-air regulator terminal ⓐ and ground.
Voltage: Battery voltage

N.G.

B

Check the following items.
1) Harness continuity between
- IACV-air regulator and fuel pump relay
- fuel pump relay and battery ⊕ terminal
- fuel pump relay and ECM terminal ⑱

Continuity should exist.
2) "G" fusible link

O.K.

C

CHECK COMPONENT.
Perform "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

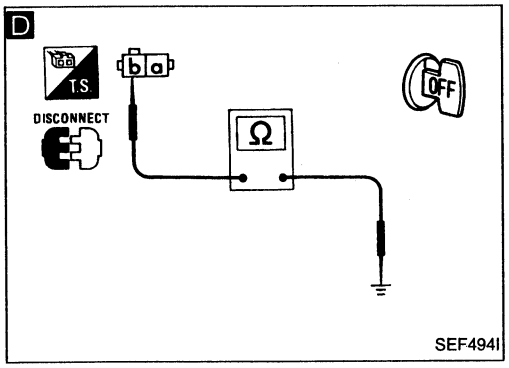
(Fuel pump relay).
Perform "FUEL PUMP RELAY TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-180.)

Ⓐ

Diagnostic Procedure 42 (Cont'd)



Ⓐ

D

CHECK GROUND CIRCUIT.
Check harness continuity between IACV-air regulator terminal ⓑ and ground.
Continuity should exist.

N.G. → Repair or replace harness or connectors.

O.K.

CHECK COMPONENT (IACV-air regulator).
Refer to "Electrical Components Inspection".
(See page EF & EC-179.)

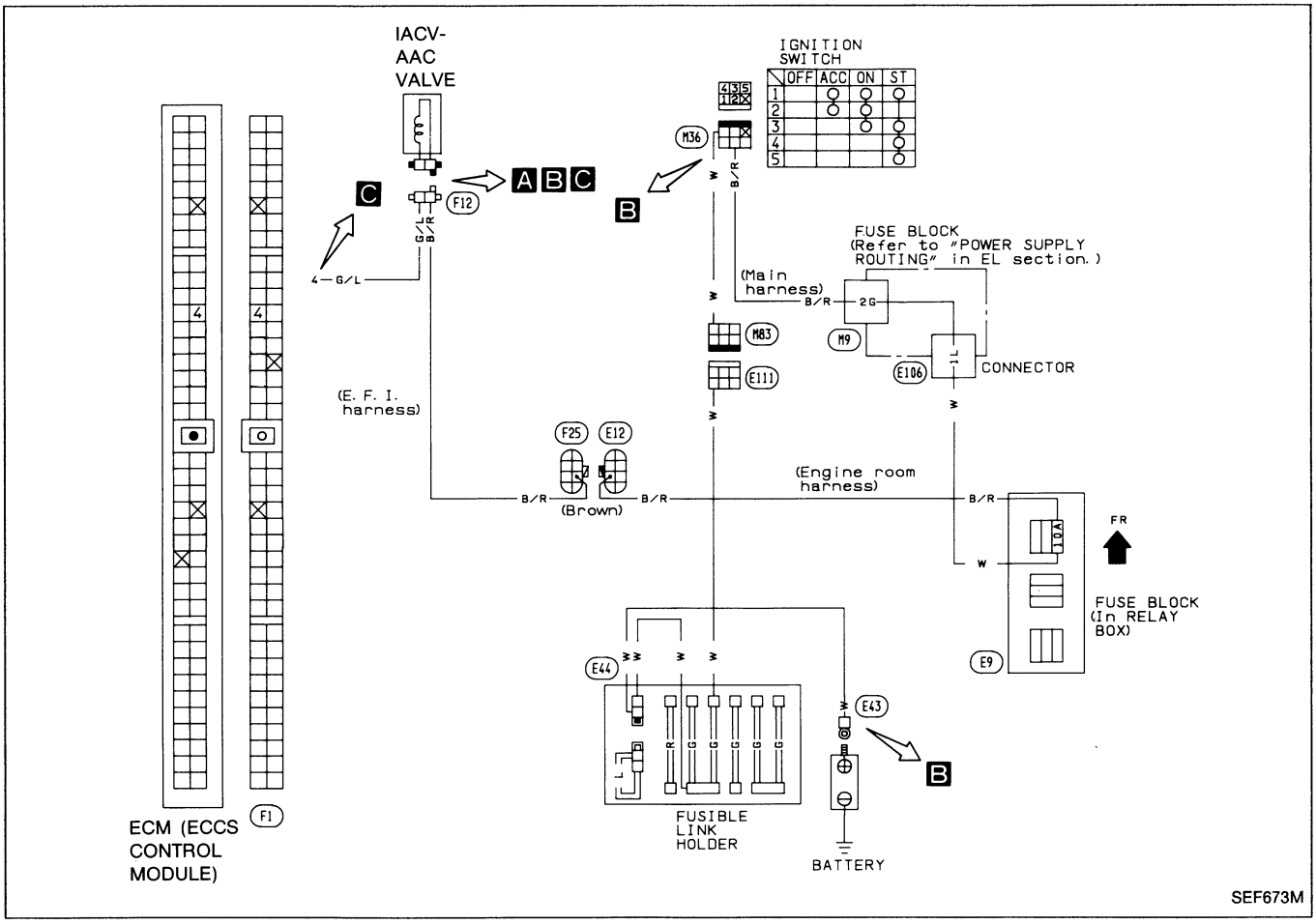
N.G. → Repair or replace IACV-air regulator.

O.K.

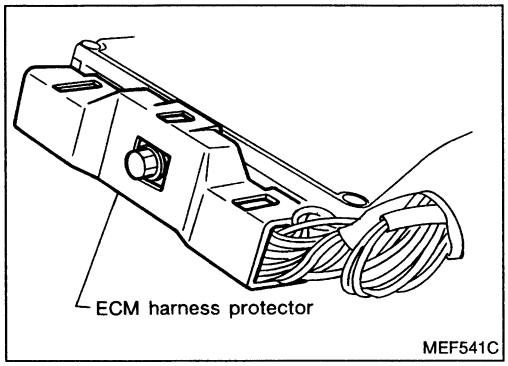
INSPECTION END

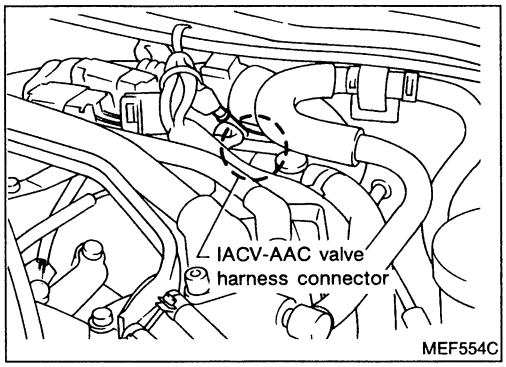
Diagnostic Procedure 43

IACV-AAC VALVE (Not self-diagnostic item)

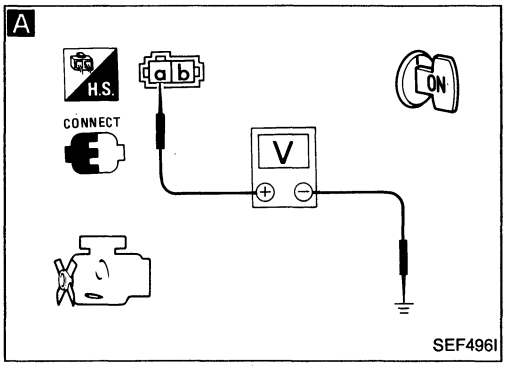


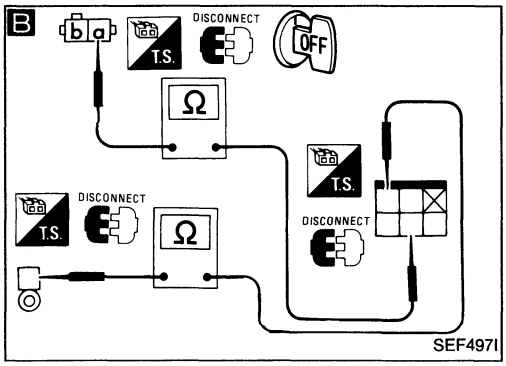
Harness layout

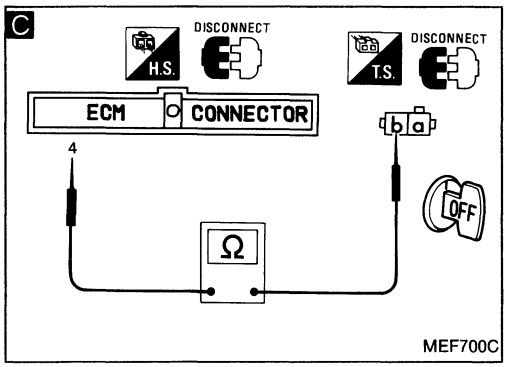


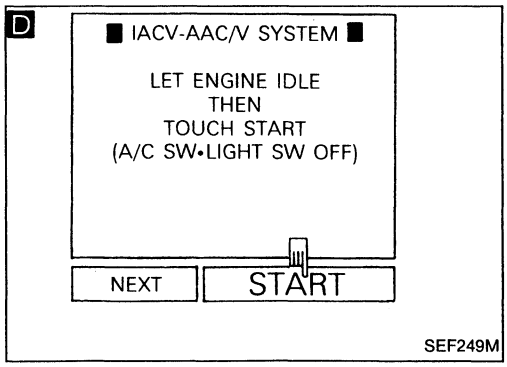


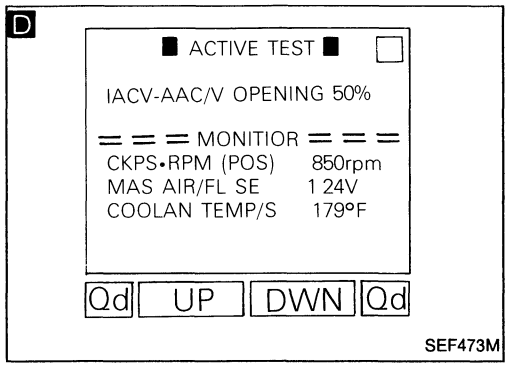
Diagnostic Procedure 43 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between IACV-AAC valve terminal ⓐ and ground.
Voltage: Battery voltage.

N.G. → **B**

Check the following items.
1) "G" fusible link
2) Ignition switch
3) "10A" fuses
4) Harness continuity between terminals:
- IACV-AAC valve and ignition switch
- Ignition switch and battery ⊕ terminal.

O.K.

C

CHECK HARNESS CONTINUITY BETWEEN IACV-AAC VALVE AND ECM.
Check harness continuity between IACV-AAC valve terminal ⓑ and ECM terminal ④.
Continuity should exist.

N.G. → Repair or replace harness or connectors.

O.K.

D

CHECK COMPONENT.

1) Perform "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

— 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.

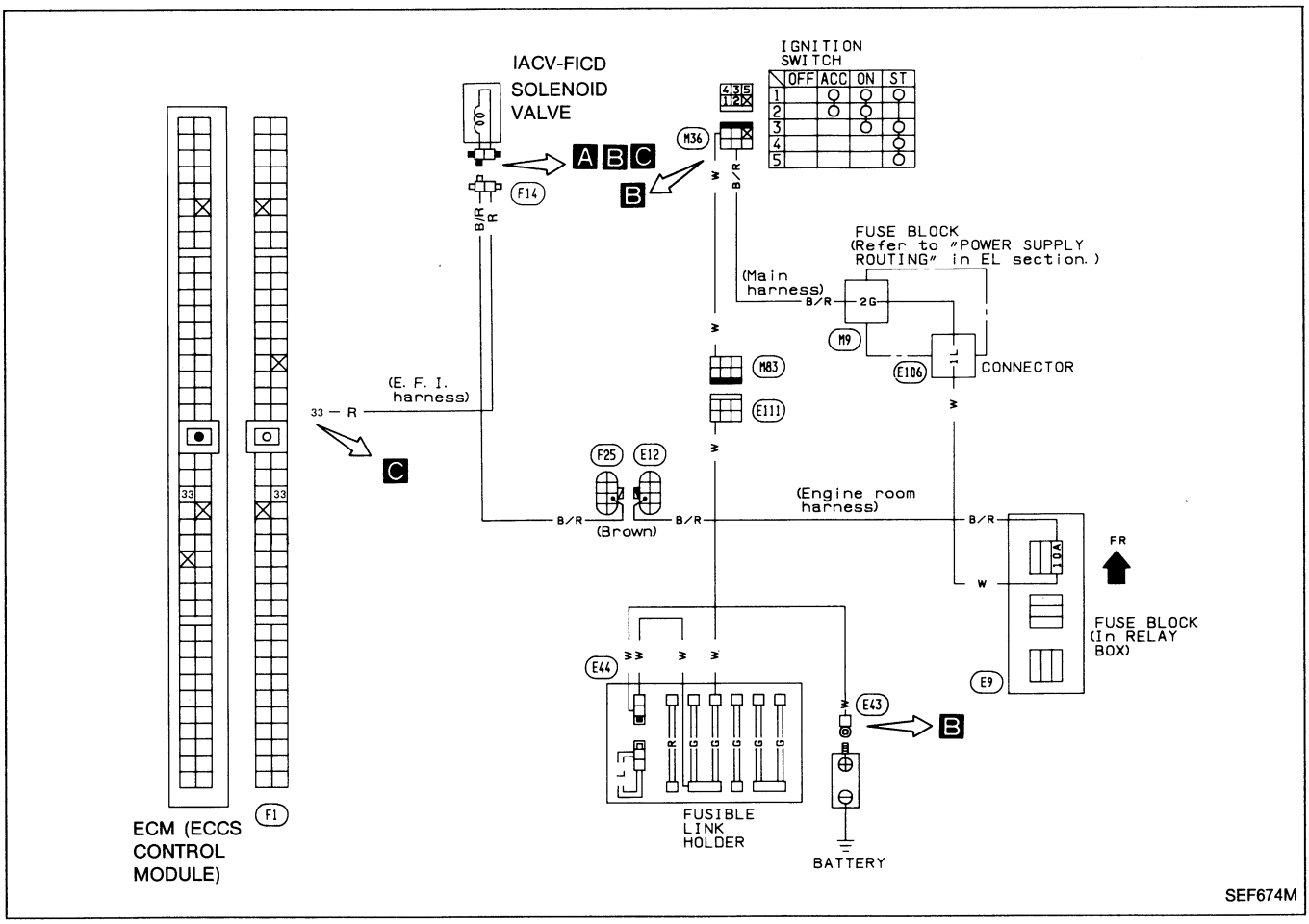
N.G. → Repair or replace IACV-AAC valve.

O.K.

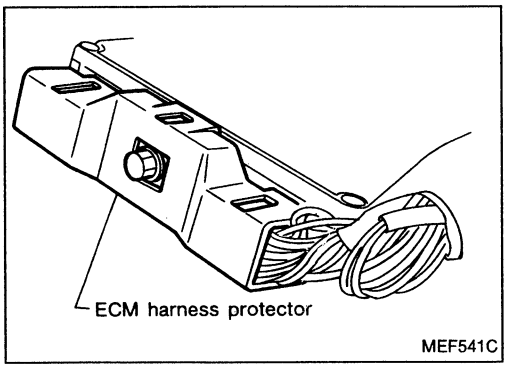
INSPECTION END

Diagnostic Procedure 44

IACV-FICD SOLENOID VALVE

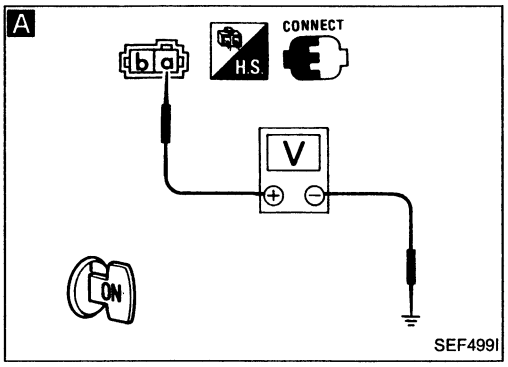


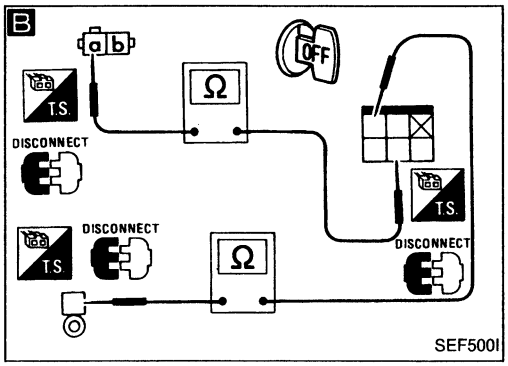
Harness layout

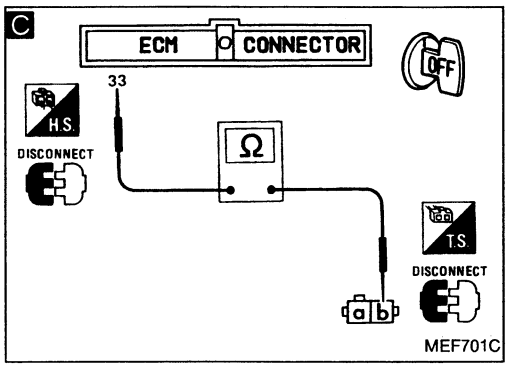


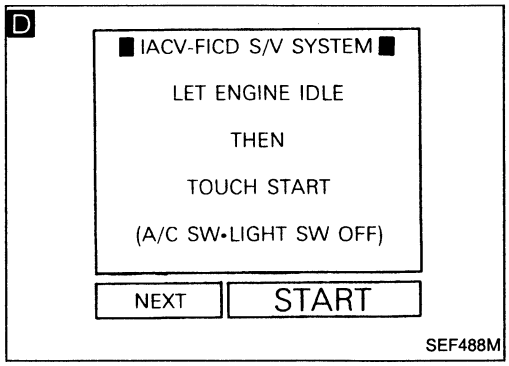
IACV-FICD solenoid valve harness connector is located near IACV-AAC valve harness connector.

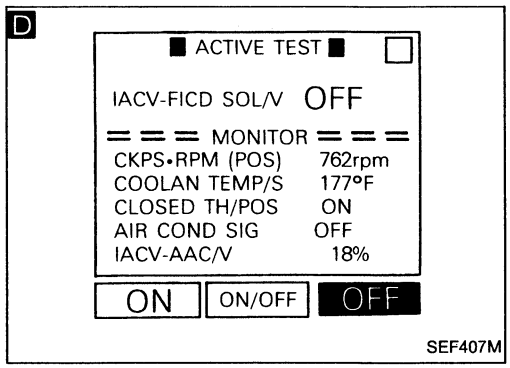
Diagnostic Procedure 44 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between IACV-FICD solenoid valve terminal ⓐ and ground.
Voltage: Battery voltage.

N.G. → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- IACV-FICD solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

Continuity should exist.

O.K. ↓

C

CHECK HARNESS CONTINUITY BETWEEN IACV-FICD SOLENOID VALVE AND ECM.
Check harness continuity between IACV-FICD solenoid valve terminal ⓑ and ECM terminal ㉝.
Continuity should exist.

N.G. → Repair or replace harness or connectors.

O.K. ↓

D

CHECK COMPONENT (IACV-FICD solenoid valve).

Perform "IACV-FICD S/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

— OR —

Perform "IACV-FICD SOL/V TEST" in "ACTIVE TEST" mode with CONSULT.

— OR —

Refer to "Electrical Components Inspection".
(See page EF & EC-178.)

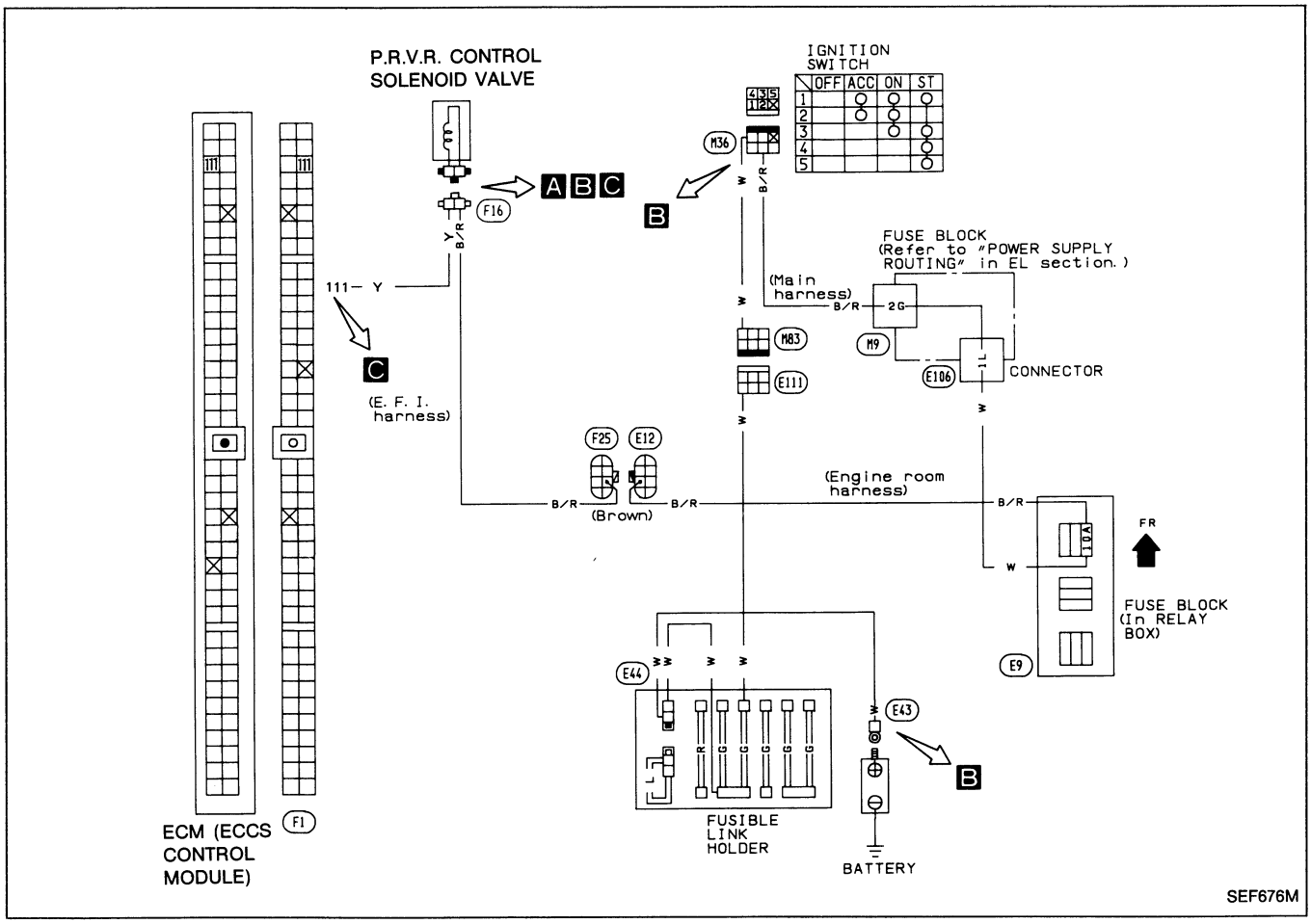
N.G. → Repair or replace IACV-FICD solenoid valve.

O.K. ↓

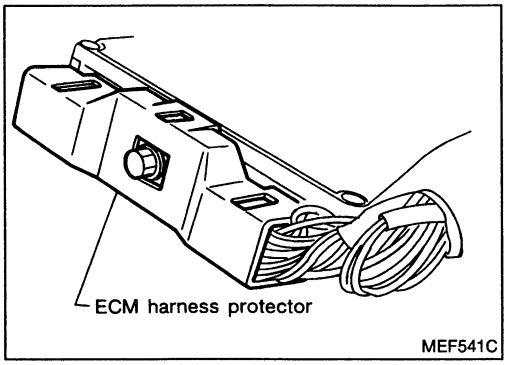
INSPECTION END

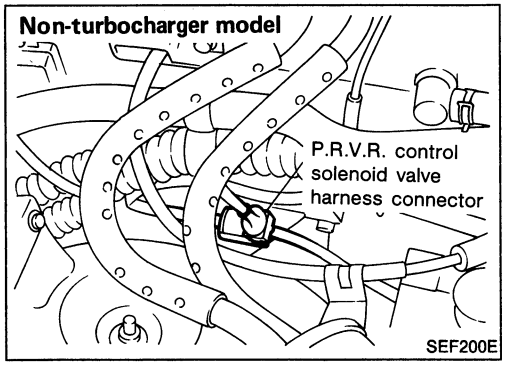
Diagnostic Procedure 45

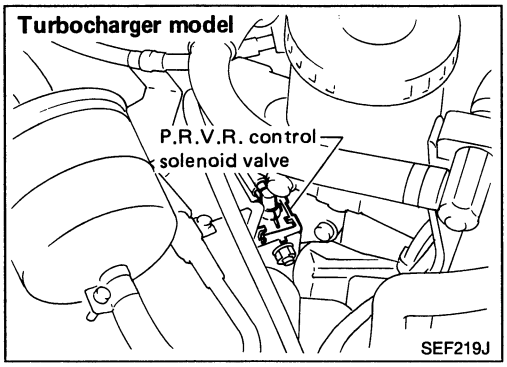
P.R.V.R. CONTROL SOLENOID VALVE (Not self-diagnostic item)



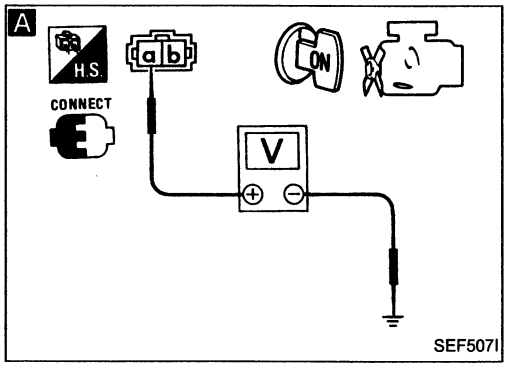
Harness layout

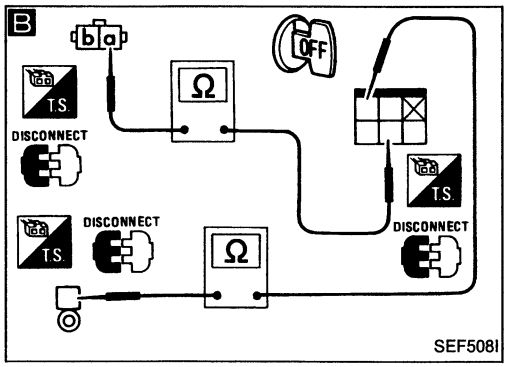


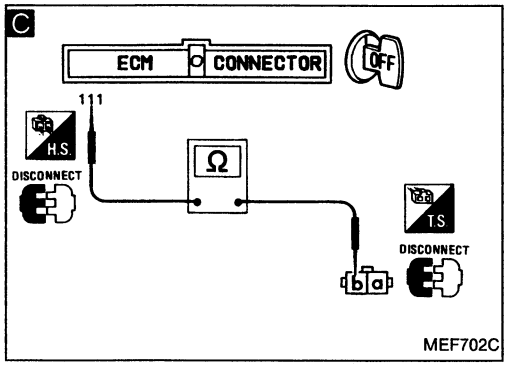


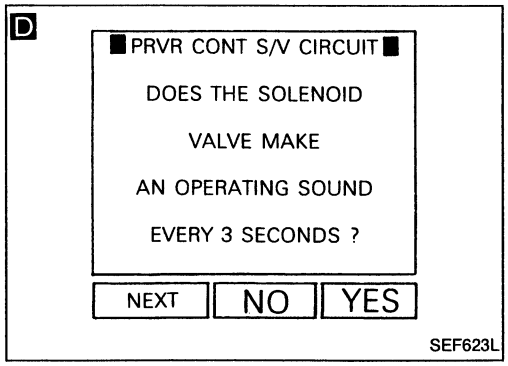


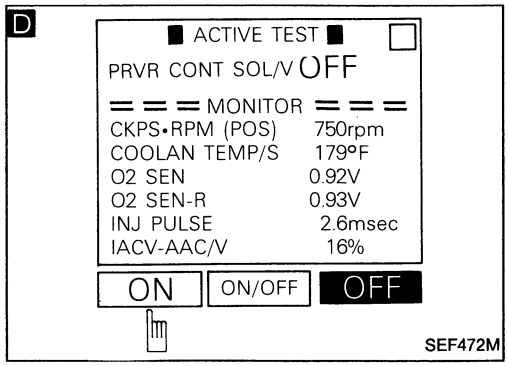
Diagnostic Procedure 45 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between P.R.V.R. control solenoid valve terminal ⓐ and ground.
Voltage: Battery voltage.

N.G. → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- P.R.V.R. control solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

Continuity should exist.

O.K.

C

CHECK HARNESS CONTINUITY BETWEEN P.R.V.R. CONTROL SOLENOID VALVE AND ECM.
Check harness continuity between P.R.V.R. control solenoid valve terminal ⓑ and ECM terminal (111).
Continuity should exist.

N.G. → Repair or replace harness or connectors.

O.K.

D

CHECK COMPONENT (P.R.V.R. control solenoid valve).

Perform "PRVR CONT S/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

Perform "P.R.V.R. CONTROL SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-176.)

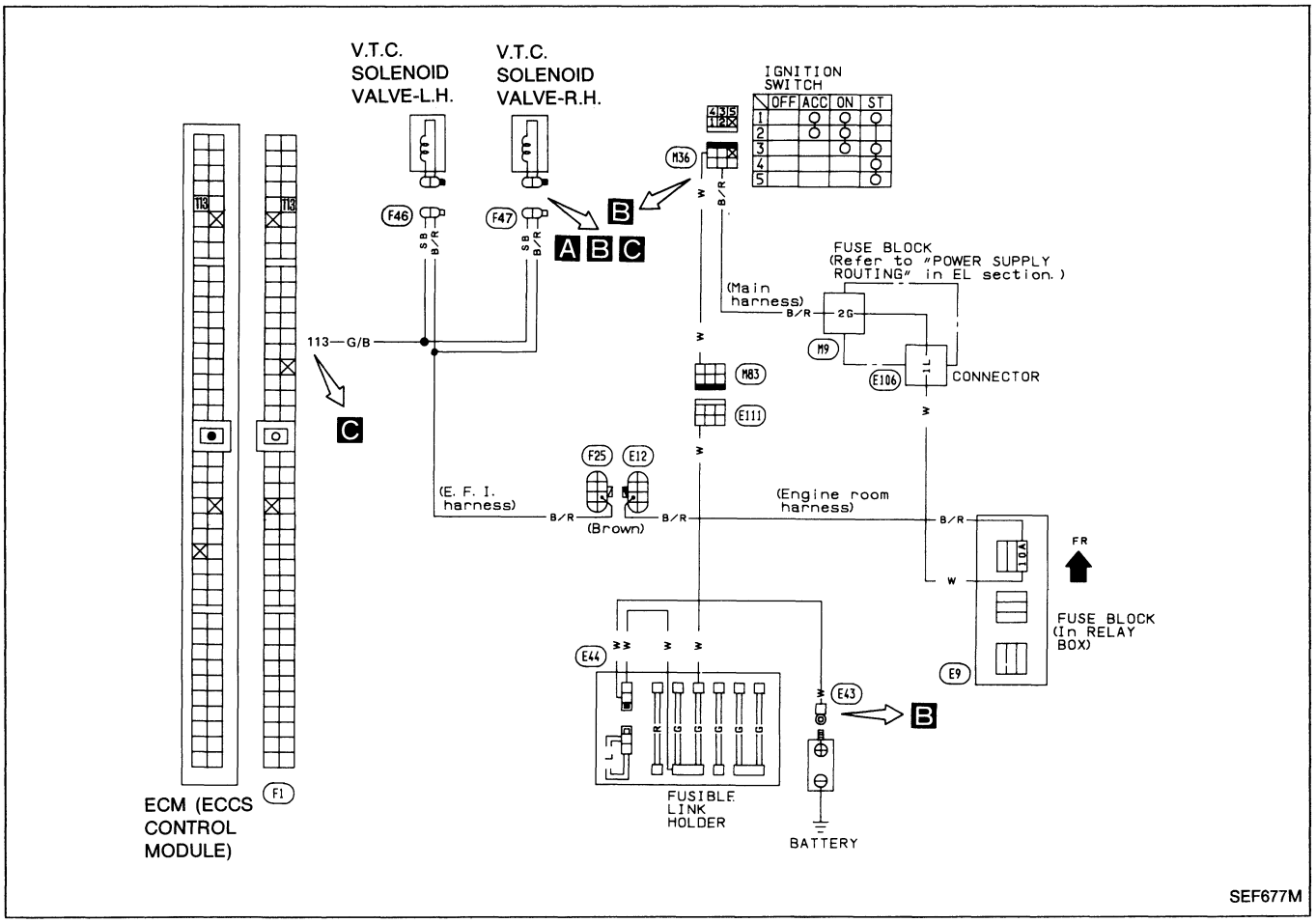
N.G. → Repair or replace P.R.V.R. control solenoid valve.

O.K.

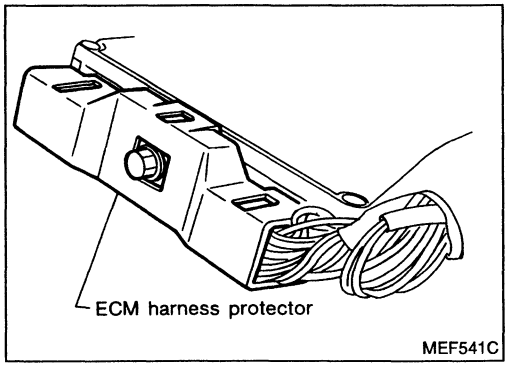
INSPECTION END

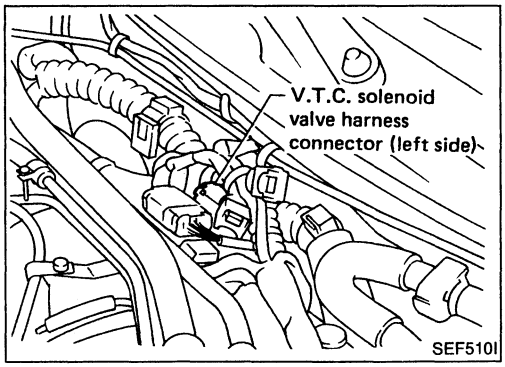
Diagnostic Procedure 46

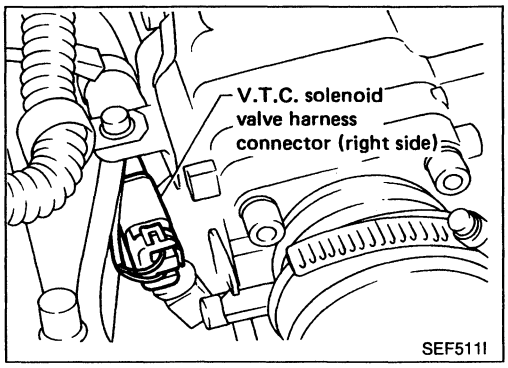
V.T.C. SOLENOID VALVE (Not self-diagnostic item)



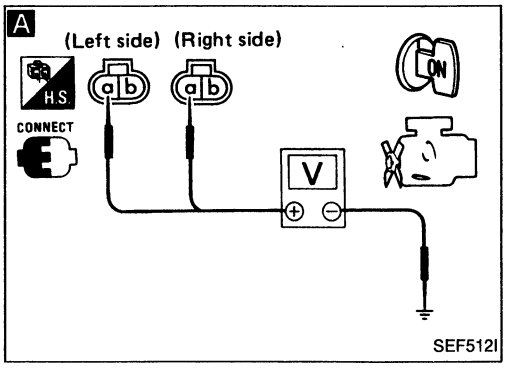
Harness layout

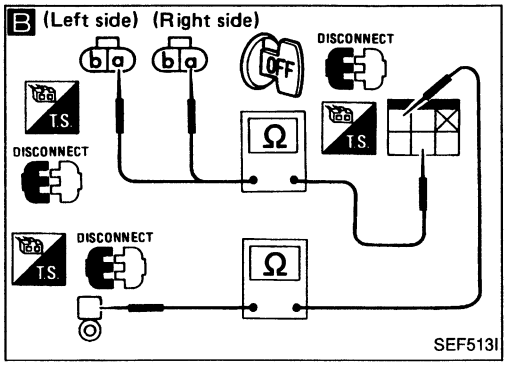


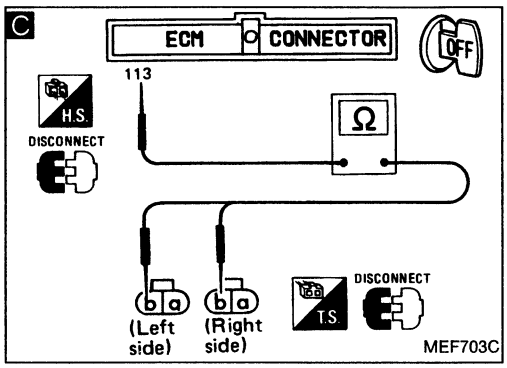


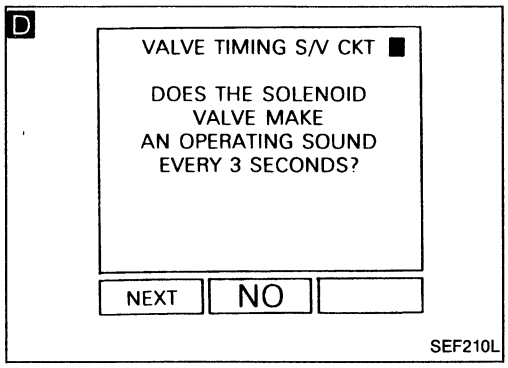


Diagnostic Procedure 46 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between V.T.C. solenoid valve terminal ⓐ and ground.
Voltage: Battery voltage.

N.G. → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- V.T.C. solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

Continuity should exist.

O.K.

C

CHECK HARNESS CONTINUITY BETWEEN V.T.C. SOLENOID VALVE AND ECM.
Check harness continuity between V.T.C. solenoid valve terminal ⓑ and ECM terminal (113).
Continuity should exist.

N.G. → Repair or replace harness or connectors.

O.K.

D

CHECK COMPONENT (V.T.C. solenoid valve).

Perform "VALVE TIMING S/V CKT" in "FUNCTION TEST" mode with CONSULT.

— OR —

Refer to "Electrical Components Inspection".
(See page EF & EC-179.)

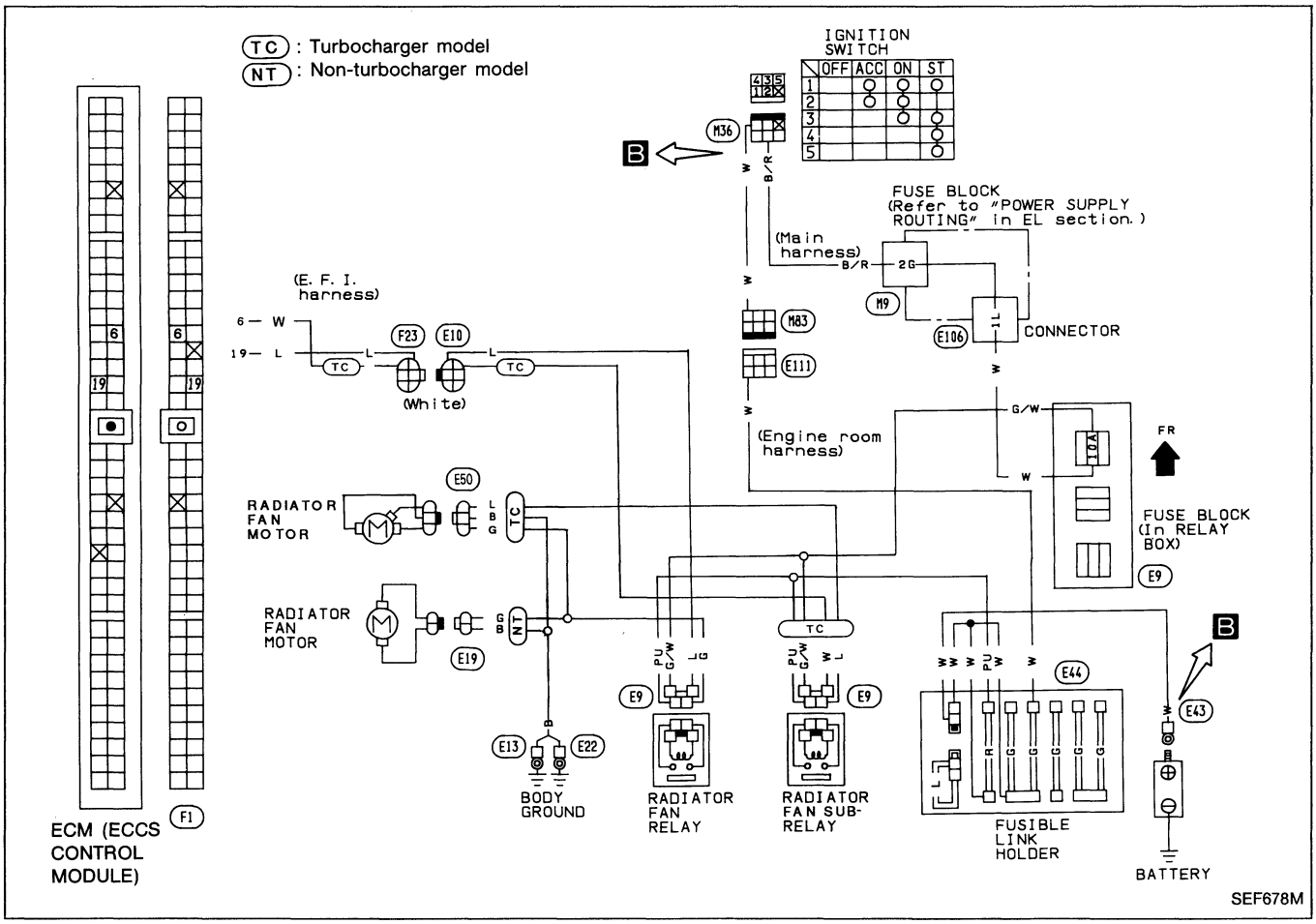
N.G. → Repair or replace V.T.C. solenoid valve.

O.K.

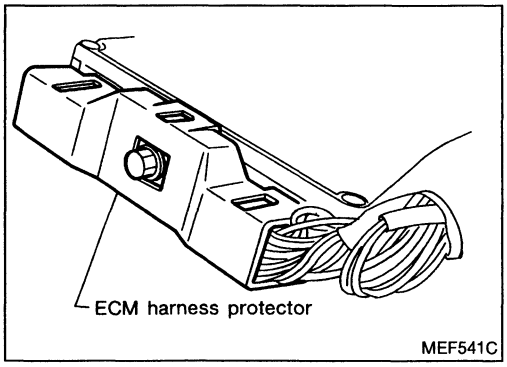
INSPECTION END

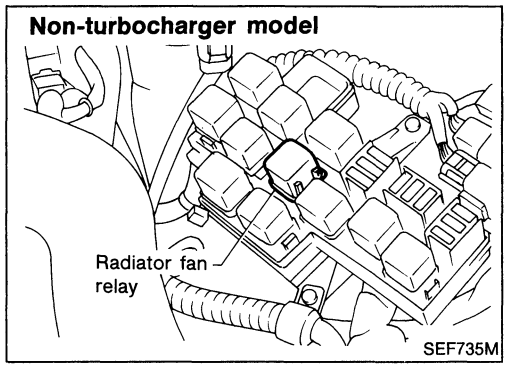
Diagnostic Procedure 47

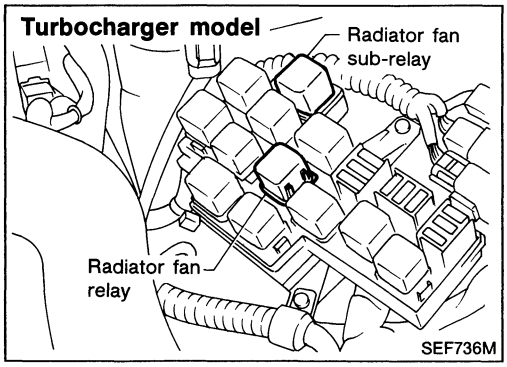
RADIATOR FAN CONTROL (Not self-diagnostic item)



Harness layout

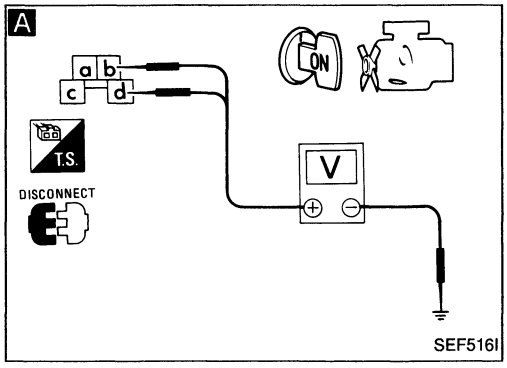


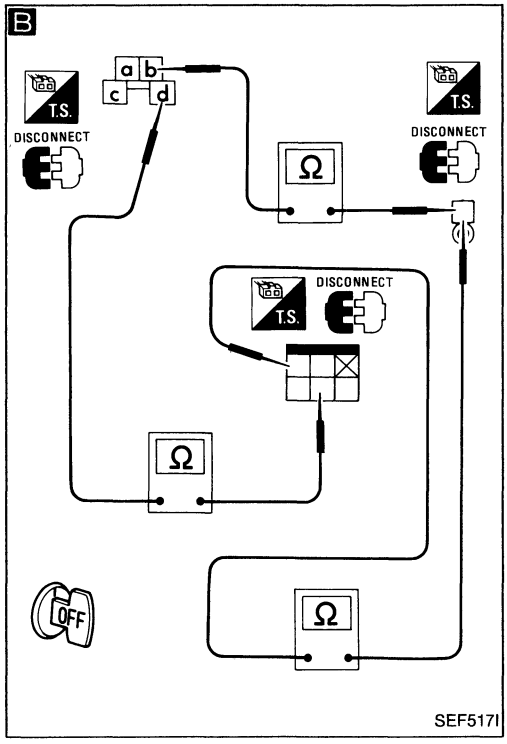


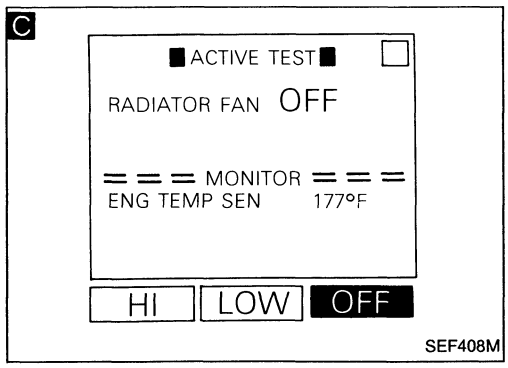


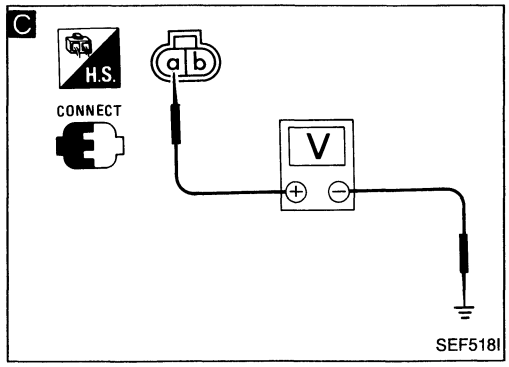
For radiator fan motor harness connector, see "HARNESS LAYOUT" in EL section.

Diagnostic Procedure 47 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY (1).
1) Turn ignition switch "ON".
2) Check voltage between radiator fan relay terminals ⓑ, ⓓ and ground.
Voltage: Battery voltage.

N.G. → **B**

B

Check the following items.
1) "G", "R" and "L" fusible links.
2) "10A" fuses
3) Ignition switch
4) Harness continuity between
- radiator fan relay terminal ⓑ and battery ⊕ terminal
- radiator fan relay terminal ⓓ and ignition switch
- ignition switch and battery ⊕ terminal

Continuity should exist.

O.K.

C

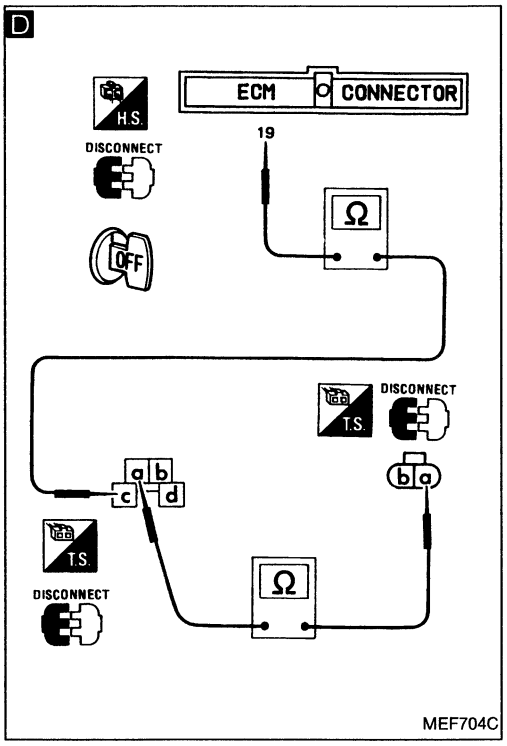
CHECK POWER SUPPLY (2).
1) Turn radiator fan relay "ON" in "ACTIVE TEST" mode with CONSULT.
2) Check voltage between radiator fan motor terminal ⓐ and ground.
Voltage: Battery voltage.

N.G. → Ⓑ

O.K. → Ⓐ

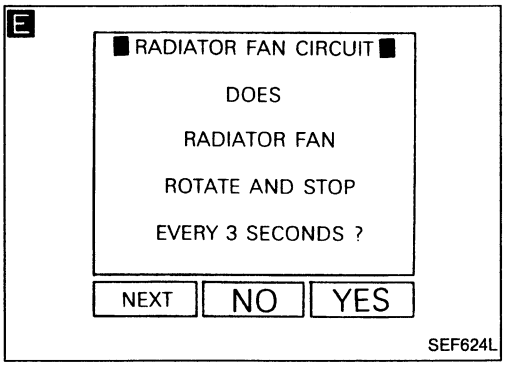
Diagnostic Procedure 47 (Cont'd)

D



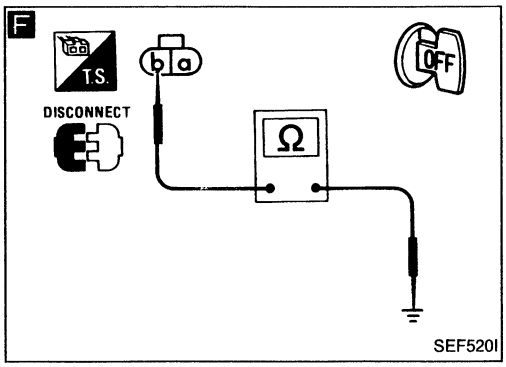
MEF704C

E



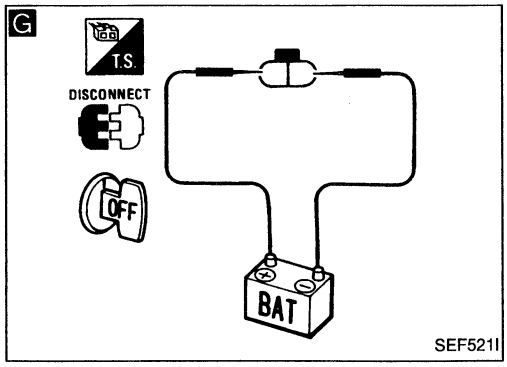
SEF624L

F



SEF520I

G



SEF521I

Ⓐ

F

CHECK GROUND CIRCUIT.
Check harness continuity between radiator fan motor terminal ⓑ and ground.
Continuity should exist.

N.G. → Ⓑ D

O.K.

G

CHECK RADIATOR FAN MOTOR.
Supply radiator fan motor terminals with battery voltage and check operation.
Radiator fan motor should operate.

N.G. → Repair or replace radiator fan motor.

O.K.

INSPECTION END

Ⓑ

D

Check the following items.
Harness continuity between
- radiator fan motor and radiator fan relay
- radiator fan relay and ECM terminal ⑲

N.G. → Repair or replace harness or connectors.

O.K.

E

CHECK COMPONENT (Radiator fan relay).

Perform "RADIATOR FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

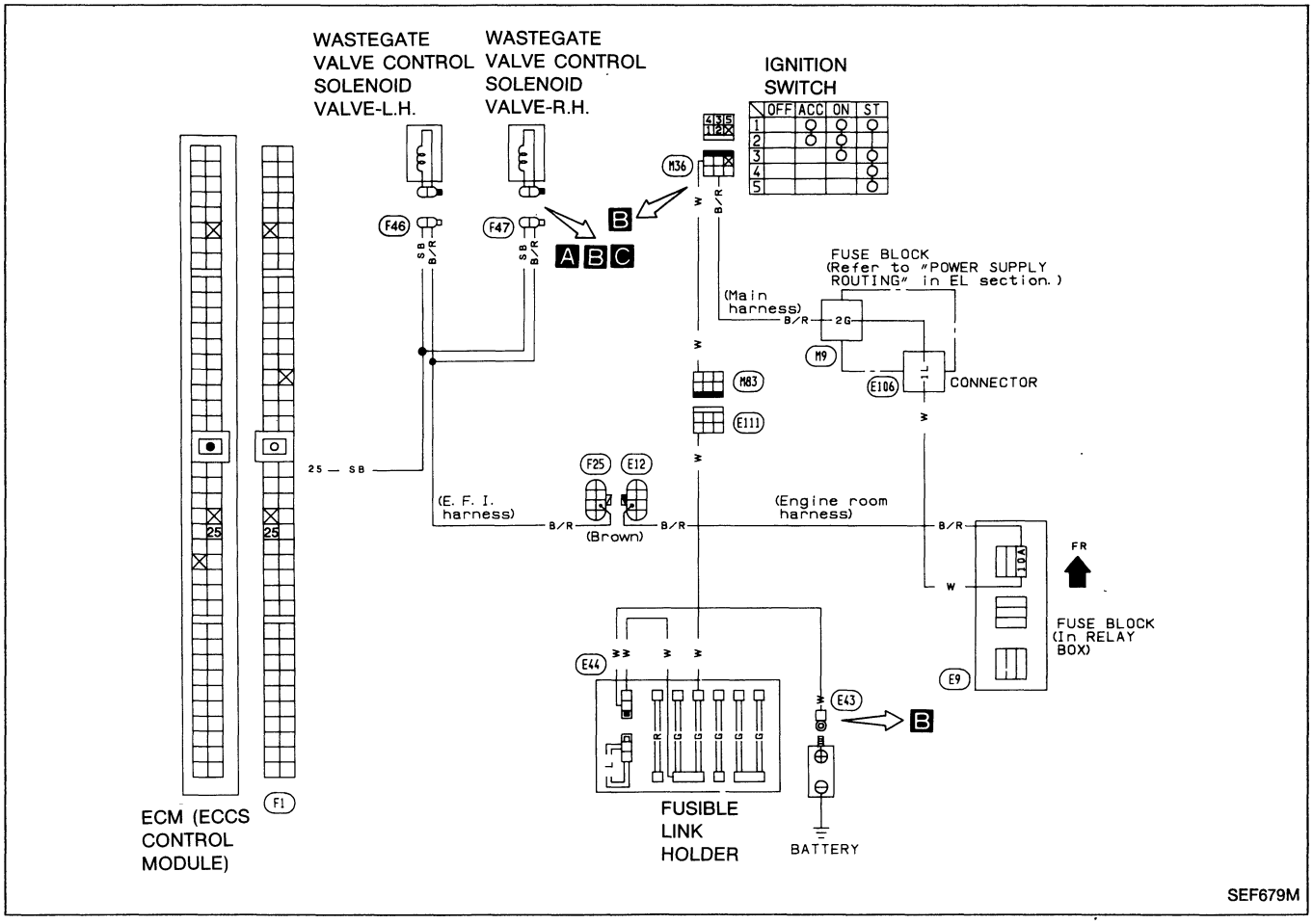
Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.

OR

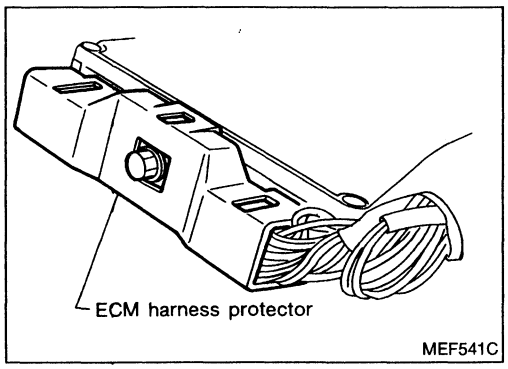
Refer to "Electrical Components Inspection". (See page EF & EC-180.)

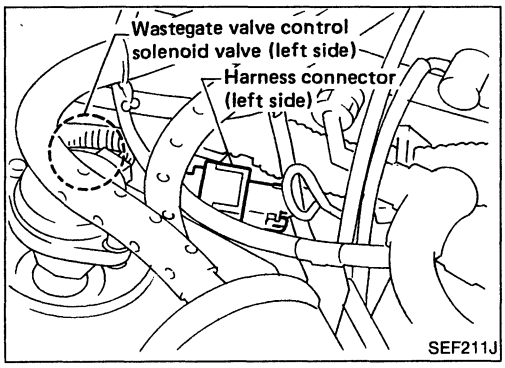
Diagnostic Procedure 48

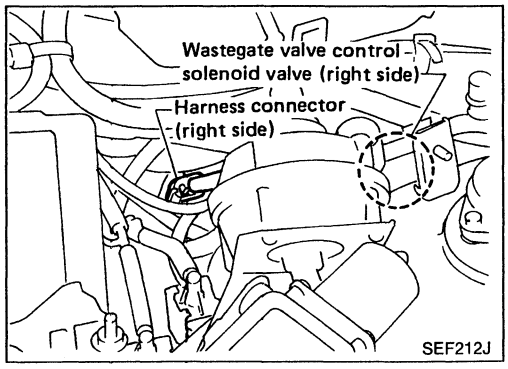
WASTEGATE VALVE CONTROL SOLENOID VALVE (Not self-diagnostic item): Turbocharger model only



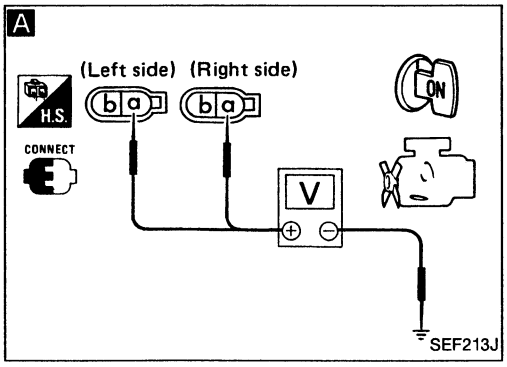
Harness layout

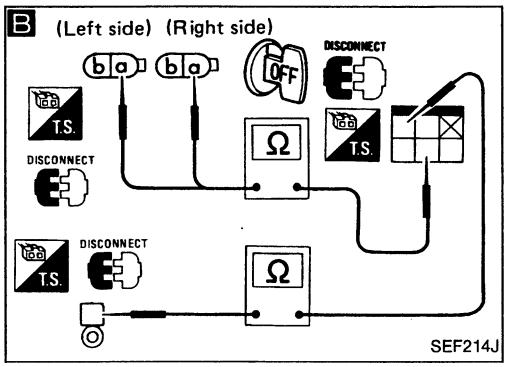


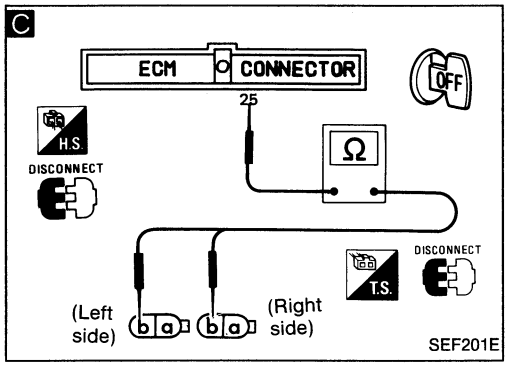




Diagnostic Procedure 48 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between wastegate valve control solenoid valve terminal ⓐ and ground.
Voltage: Battery voltage.

N.G. →

B

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- Wastegate valve control solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

Continuity should exist.

O.K. ↓

C

CHECK HARNESS CONTINUITY BETWEEN WASTEGATE VALVE CONTROL SOLENOID VALVE AND ECM.
Check harness continuity between wastegate valve control solenoid valve terminal ⓑ and ECM terminal ㉕.
Continuity should exist.

N.G. → Repair or replace harness or connectors.

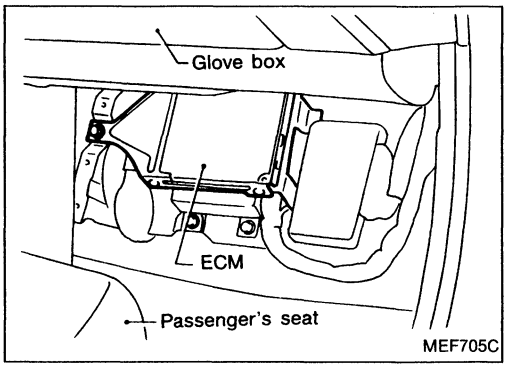
O.K. ↓

CHECK COMPONENT
(Wastegate valve control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-176.)

N.G. → Repair or replace wastegate valve control solenoid valve.

O.K. ↓

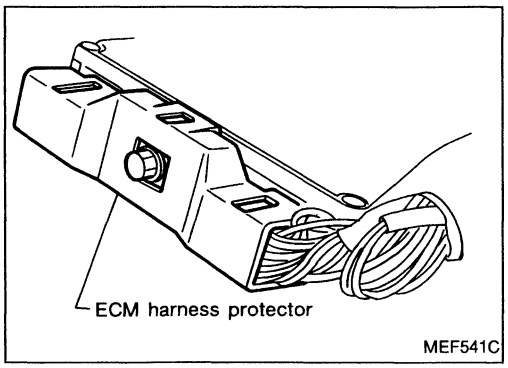
INSPECTION END



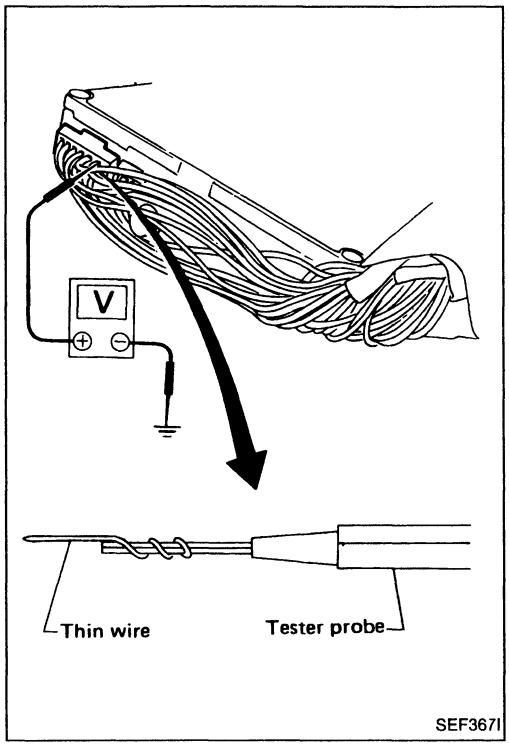
Electrical Components Inspection

ECM INPUT/OUTPUT SIGNAL INSPECTION

1. ECM is located behind front passenger side floor board. For this inspection, remove the front passenger side floor board.



2. Remove ECM harness protector.



3. Perform all voltage measurements with the connectors connected.
   Extend tester probe as shown to perform tests easily.

Electrical Components Inspection (Cont'd)

ECM inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
1 2 3 11 12 13	Ignition signal	Engine is running. └ Idle speed	Approx. 0.1V
		Engine is running. └ Engine speed is 2,000 rpm.	Approx. 0.14V
4	IACV-AAC valve	Engine is running. └ Racing condition	Voltage briefly decreases from battery voltage (11 - 14V).
6	Radiator fan sub-relay (Turbocharger model)	Engine is running. └ Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Radiator fan is operating.	0.1 - 0.3V
7	Tachometer	Engine is running. └ Idle speed	Approx. 0.7V
		Engine is running. └ Engine speed is 2,000 rpm	Approx. 1.2V
9	Air conditioner relay	Engine is running. └ Air conditioner switch "OFF"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Air conditioner switch "ON"	Approx. 0V
16	ECM power source (Self-shutoff)	Engine is running. └ Idle speed	0.8 - 1.0V
		Engine is not running. └ For a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
18	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └ In 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
19	Radiator fan relay	Engine is running. └ Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Radiator fan is operating.	0.1 - 0.3V
23	Knock sensor	Engine is running. └ Idle speed	Approx. 2.5V

Electrical Components Inspection (Cont'd)

***Data are reference values.**

TERMINAL NO.	ITEM	CONDITION	*DATA
25	Wastegate valve control solenoid valves (Turbocharger model)	Ignition switch "ON" Engine is running.	BATTERY VOLTAGE (11 - 14V)
		Engine is racing. └ Engine speed is up to 2,000 rpm	Approx. 0.2V
27	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	0.8 - 1.5V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.0 - 1.6V
28	Engine coolant temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine coolant temperature.
29 55	Right side heated oxygen sensor Left side heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 ↔ Approx. 1.0V
33	IACV-FICD solenoid valve	Engine is running. └ A/C compressor is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ A/C compressor is operating.	0.7 - 0.8V
34	Power steering oil pressure switch	Engine is running. └ Steering wheel is in the "straight ahead" position.	8.0 - 9.0V
		Engine is running. └ Steering wheel is turned.	Approx. 0V
36	Fuel temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with fuel temperature.
38	Throttle position sensor	Ignition switch "ON"	0.4 - 4.0V Output voltage varies with throttle valve opening angle.
39	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
		Engine is running. (Warm-up condition) └ EGR system is operating.	0 - 1.0V
41 51	Crankshaft position sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	1.2 - 1.4V Output voltage varies slightly with engine speed.
42 52	Crankshaft position sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.5 - 2.7V Output voltage varies slightly with engine speed.

Electrical Components Inspection (Cont'd)

***Data are reference values.**

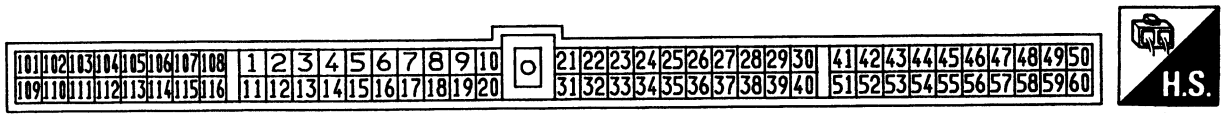
TERMINAL NO.	ITEM	CONDITION	*DATA
43	Start signal	Ignition switch "ON"	Approx. 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
44	Neutral position switch (M/T model) A/T control unit (A/T model)	Ignition switch "ON" └ Gear position is "Neutral position" (M/T model). └ Gear position is "N" or "P" (A/T model).	Approx. 0V
		Ignition switch "ON" └ Except the above conditions	8.0 - 9.0V
45	Ignition switch	Ignition switch "ON" └ Engine stopped	BATTERY VOLTAGE (11 - 14V)
46	Air conditioner switch	Engine is running. └ Air conditioner switch "OFF"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Air conditioner switch "ON"	0.5 - 0.7V
48	Power source for sensors	Ignition switch "ON" └ Engine stopped	Approximately 5.0V
49	Battery source	Ignition switch "ON" └ Engine stopped	BATTERY VOLTAGE (11 - 14V)
54	Closed throttle position switch (Idle position)	Ignition switch "ON" └ Accelerator pedal is fully released (engine running).	9.0 - 10.0V
		Ignition switch "ON" └ Accelerator pedal is depressed (engine running).	0V
57	Power source for closed throttle position switch	Ignition switch "ON" └ Engine running	BATTERY VOLTAGE (11 - 14V)
59	Power supply	Ignition switch "ON" └ Engine running	BATTERY VOLTAGE (11 - 14V)
101 103 105 110 112 114	Injectors	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

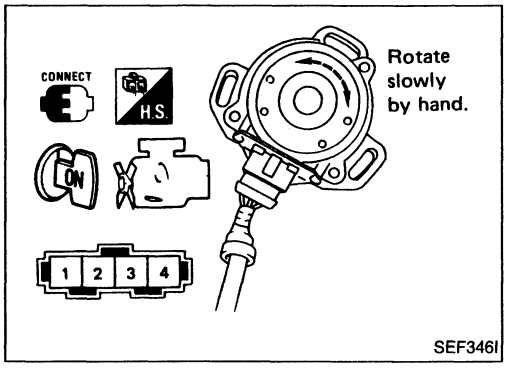
***Data are reference values.**

TERMINAL NO.	ITEM	CONDITION	*DATA
102	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Idle speed	0.7 - 0.8V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
35 104	Fuel pump voltage control (35: Turbocharger model)	Ignition switch "ON" └ Engine stopped	BATTERY VOLTAGE (11 - 14V)
		Engine is running. (Warm-up condition) └ Idle speed	Approx. 0V
111	P.R.V.R. control solenoid valve	Stop and restart engine after warming it up. └ Fuel temperature is above 75°C (167°F)	0 - 1.0V (for 30 seconds after ignition switch is turned off.)
			BATTERY VOLTAGE (After 30 seconds)
		Stop and restart engine after warming it up. └ Fuel temperature is below 75°C (167°F)	BATTERY VOLTAGE (11 - 14V)
113	Valve timing control solenoid valves	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Engine speed is 3,000 rpm.	0.2 - 0.5V

ECM HARNESS CONNECTOR TERMINAL LAYOUT



SEC250B



Electrical Components Inspection

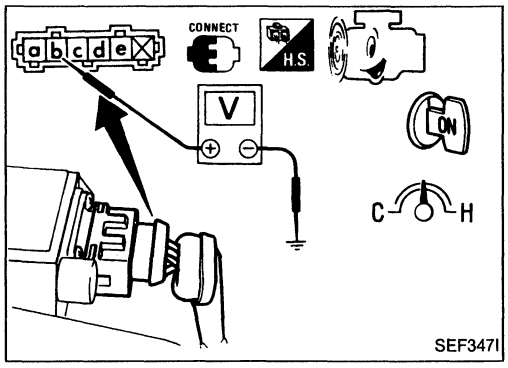
CRANKSHAFT POSITION SENSOR

1. Remove crankshaft position sensor from engine. (Crankshaft position sensor harness connector should remain connected.)
2. Turn ignition switch "ON".
3. Rotate crankshaft position sensor shaft slowly by hand and check voltage between terminals ①, ② and ground.

Terminal	Voltage
② (120° signal)	Voltage fluctuates between 5V and 0V.
① (1° signal)	

If N.G., replace crankshaft position sensor.

After this inspection, diagnostic trouble code No. 11 might be displayed though the crankshaft position sensor is functioning properly. In this case erase the stored memory.

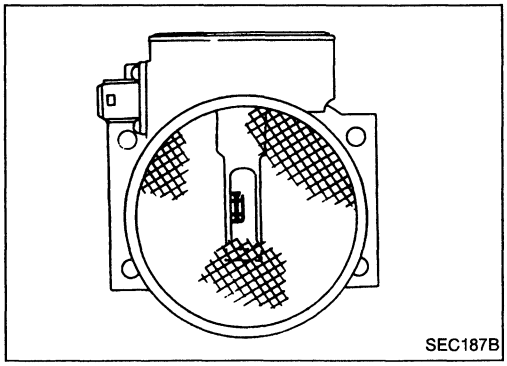


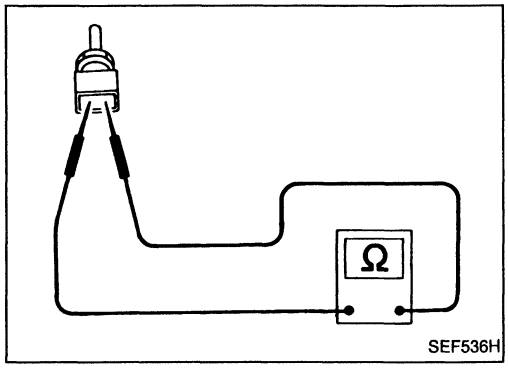
MASS AIR FLOW SENSOR

1. Fold back 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 ⓑ and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Approximately 0.8
Idle (Engine is warm-up sufficiently.)	Approximately 0.8 - 1.5

5. If N.G., remove mass air flow sensor from air duct. Check hot wire for damage or dust.





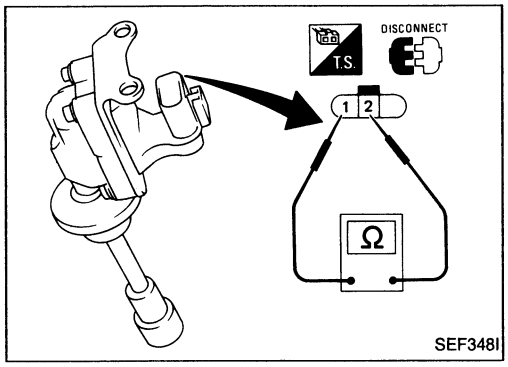
ENGINE COOLANT TEMPERATURE SENSOR

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 - 1.00
80 (176)	0.30 - 0.33

If N.G., replace engine coolant temperature sensor.

Electrical Components Inspection (Cont'd)

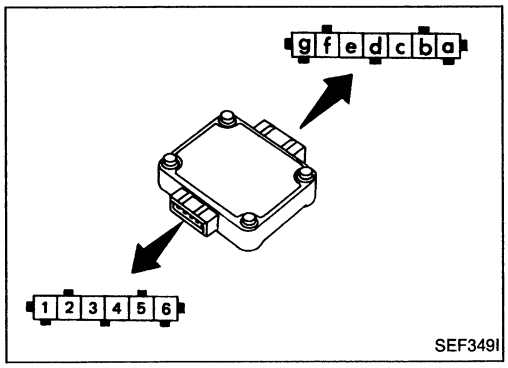


IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 0.7Ω

If N.G., replace ignition coil.

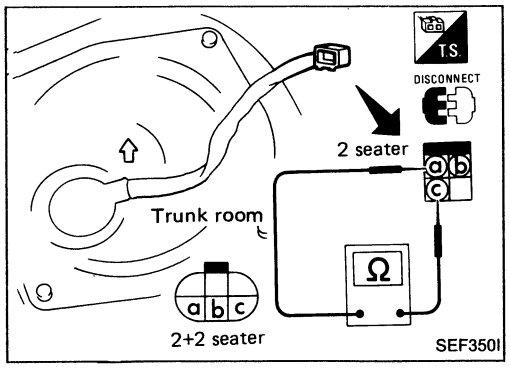


POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals as shown in the figure.

Terminal combination						Tester polarity	Continuity	Tester polarity	Continuity
g a	g b	g c	g d	g e	g f	⊕ ⊖	No	⊖ ⊕	Yes
g 1	g 2	g 3	g 4	g 5	g 6	⊕ ⊖	Yes	⊖ ⊕	Yes
a 1	b 2	c 3	d 4	e 5	f 6	⊕ ⊖	Yes	⊖ ⊕	No

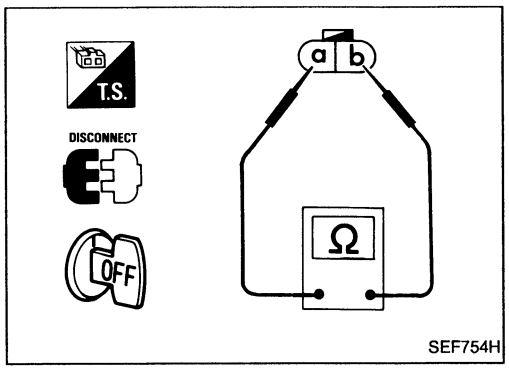
If N.G., replace power transistor.



FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓐ and ⓒ.
   Resistance: Approximately 0.5Ω

If N.G., replace fuel pump.



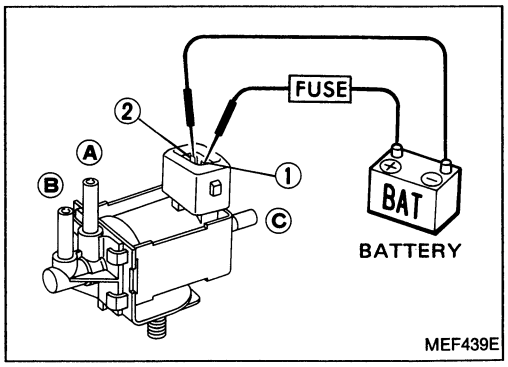
VEHICLE SPEED SENSOR

1. Jack up rear wheels. Use stands to support vehicle.
2. Disconnect vehicle speed sensor harness connector.
3. Check continuity between terminals ⓐ and ⓑ while rotating rear wheel by hand.

Continuity should come and go.

If N.G. replace vehicle speed sensor.

Electrical Components Inspection (Cont'd)



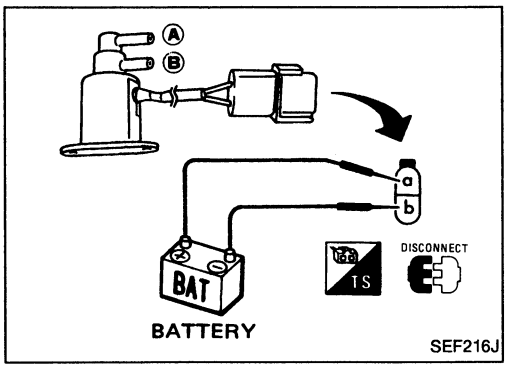
EGRC-SOLENOID VALVE

P.R.V.R. CONTROL SOLENOID VALVE

Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If N.G., replace solenoid valve.

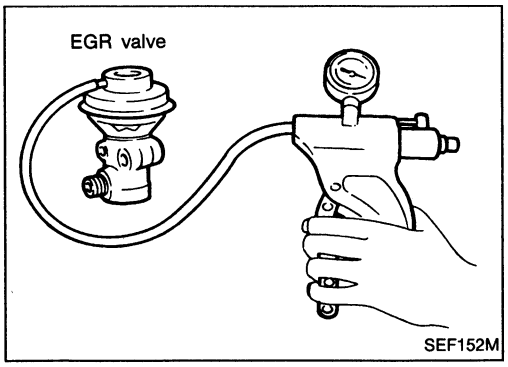


WASTEGATE VALVE CONTROL SOLENOID VALVE

Check air passage continuity.

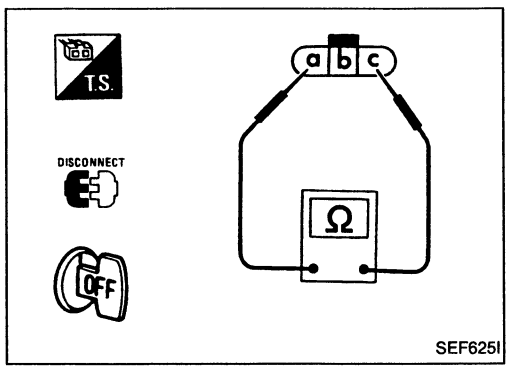
Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ⓐ and ⓑ	Yes
No supply	No

If N.G., replace 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.



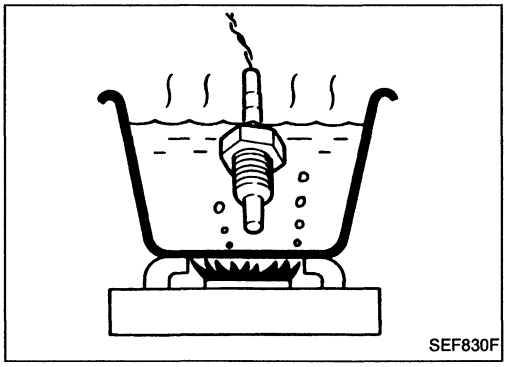
HEATED OXYGEN SENSOR

Refer to "Diagnostic Procedure 30".
(See page EF & EC-126.)

HEATED OXYGEN SENSOR HEATER

Check resistance between terminals ⓐ and ⓒ.
Resistance: 3 - 1,000Ω
If N.G., replace heated oxygen sensor.

Electrical Components Inspection (Cont'd)


SEF830F

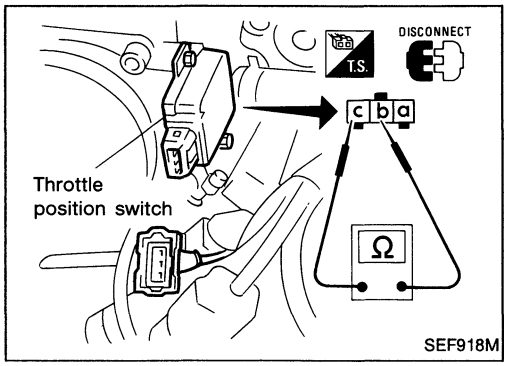
EGR TEMPERATURE SENSOR

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.



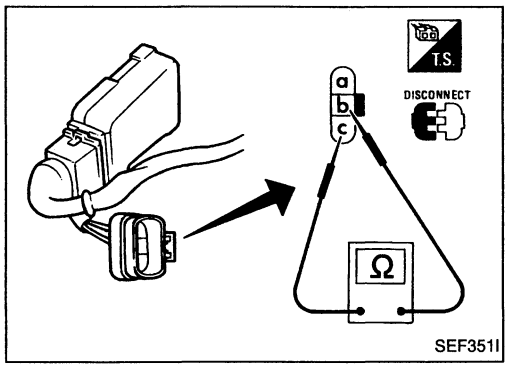
SEF918M

WIDE OPEN THROTTLE POSITION SWITCH

1. Disconnect throttle position switch harness connector.
2. Check continuity between terminals ⓒ and ⓑ.

Accelerator pedal condition	Continuity
Released	No
Depressed	Yes

If N.G., replace throttle position switch.



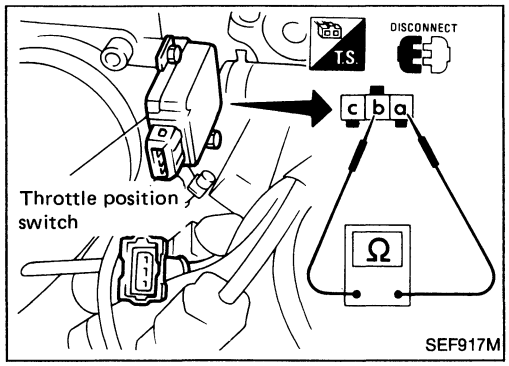
SEF351I

THROTTLE POSITION SENSOR

1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between terminals ⓑ and Ⓒ changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

If N.G., replace throttle position sensor.



SEF917M

CLOSED THROTTLE POSITION SWITCH (Idle position)

1. Disconnect closed throttle position switch harness connector.
2. Check continuity between terminals ⓐ and ⓑ.

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

If N.G., replace closed throttle position switch.

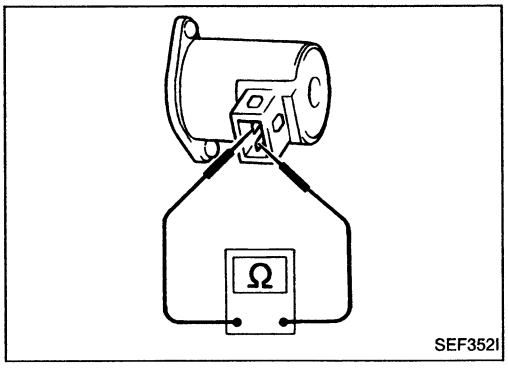
Adjustment

If throttle position sensor or throttle position switch is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:

1. Install throttle position sensor body in throttle body. Do not tighten bolts.
2. Connect throttle position sensor and throttle position switch harness connector.
3. Start engine and warm it up sufficiently.
4. Disconnect throttle position switch harness connector.
5. Check closed throttle position switch OFF → ON speed with circuit tester, closing throttle valve manually.

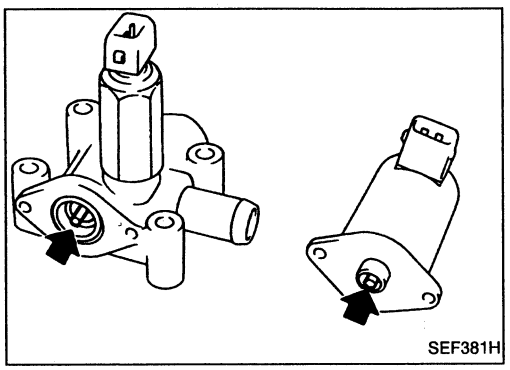
Electrical Components Inspection (Cont'd)

Closed throttle position switch OFF → ON speed:
M/T: 900 ± 150 rpm
A/T: Engine speed in "N" position
970 ± 150 rpm (Non-turbocharger)
950 ± 150 rpm (Turbocharger)

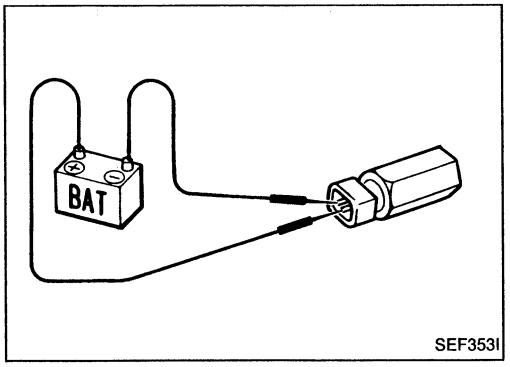


IACV-AAC VALVE

- Check IACV-AAC valve resistance.
  Resistance:
  Approximately 10Ω

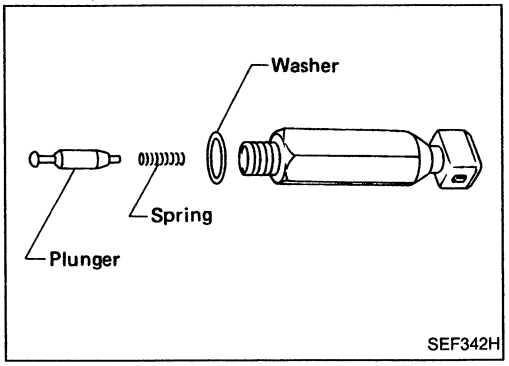


- Check plunger for seizing or sticking.
- Check for broken spring.



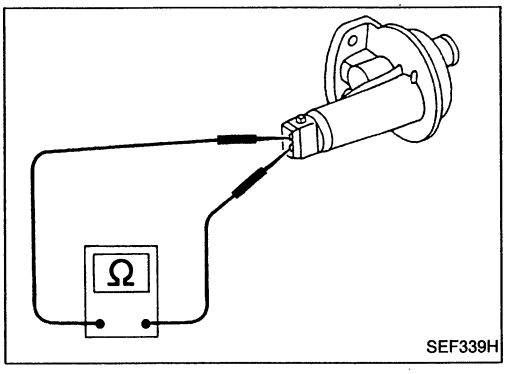
IACV-FICD SOLENOID VALVE

- Check for clicking sound when applying 12V direct current to terminals.



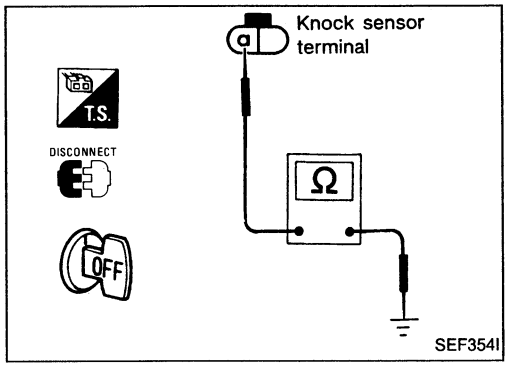
- Check plunger for seizing or sticking.
- Check for broken spring.

Electrical Components Inspection (Cont'd)



IACV-AIR REGULATOR

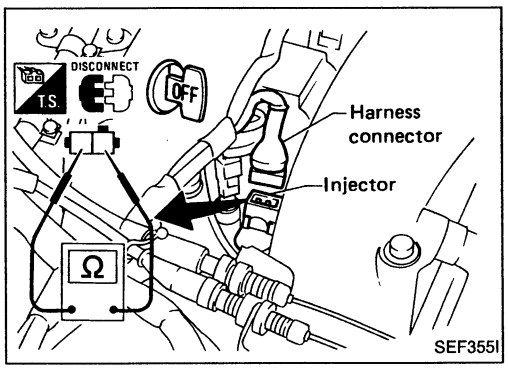
- Check IACV-air regulator resistance.
  Resistance:
  Approximately 70 - 80Ω
- Check IACV-air regulator for clogging.



KNOCK SENSOR

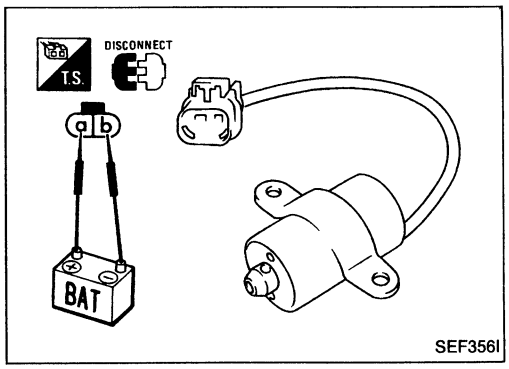
1. Disconnect knock sensor sub-harness connector.
2. Check continuity between terminal (a) and ground.

Continuity should exist.



INJECTOR

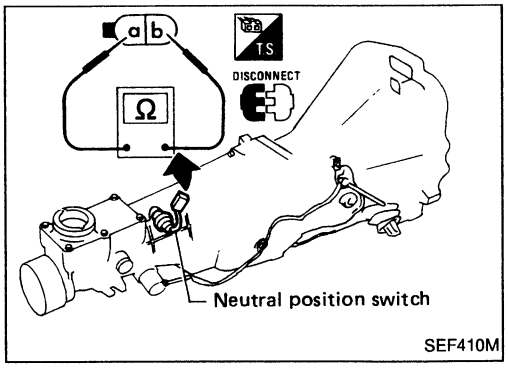
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω
   If N.G., replace injector.



VALVE TIMING CONTROL SOLENOID VALVE

Check valve timing control solenoid valve for normal operation by supplying it with battery voltage between terminals ⓐ and ⓑ.

If N.G., replace solenoid valve.



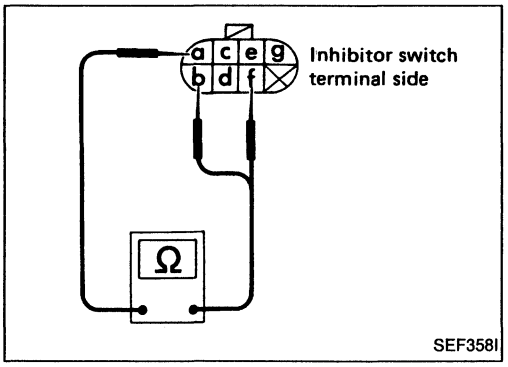
NEUTRAL POSITION SWITCH

Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Shift to Neutral position	Yes
Shift to other position	No

If N.G., replace neutral position switch.

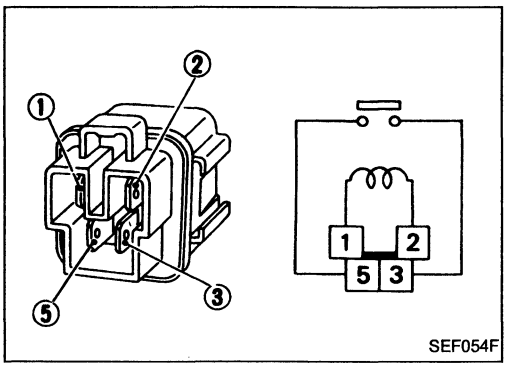
Electrical Components Inspection (Cont'd)



INHIBITOR SWITCH

Check continuity between terminals ⓐ and ⓑ, ⓕ.

Conditions	Continuity between terminals ⓐ and ⓑ	Continuity between terminals ⓐ and ⓕ
Shift to "P" position	Yes	No
Shift to "N" position	No	Yes
Shift to positions other than "P" and "N"	No	No



ECCS RELAY, FUEL PUMP RELAY, RADIATOR FAN RELAY AND IGNITION COIL RELAY

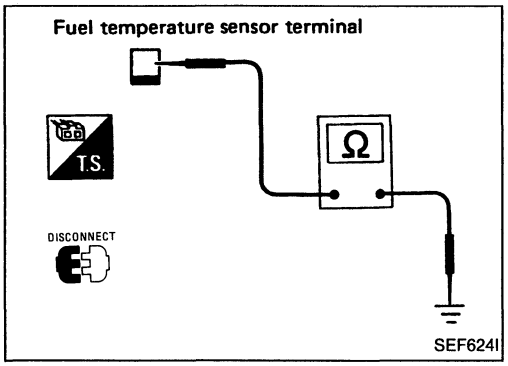
Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If N.G., replace relay.

POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check resistance between terminals.
   Resistance: Approximately 2 - 3Ω

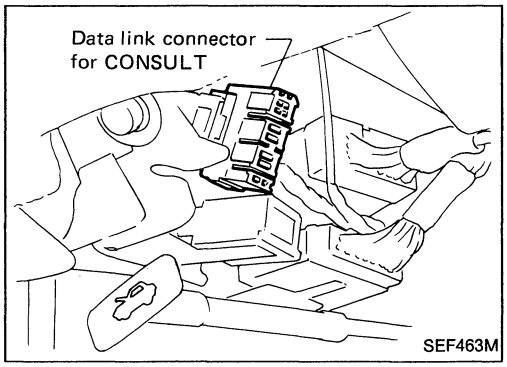


FUEL TEMPERATURE SENSOR

1. Disconnect fuel temperature sensor harness connector.
2. Check resistance between terminal and ground as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
80 (176)	0.30 - 0.33

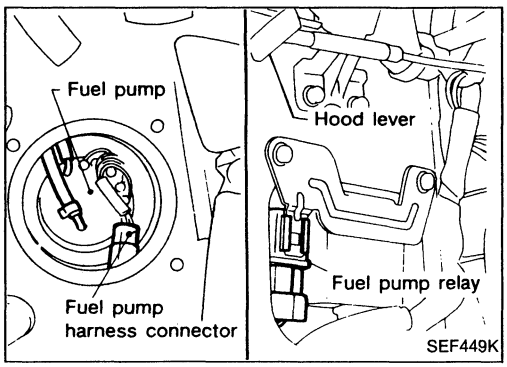
If N.G., replace fuel inhibitor switch.



Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.

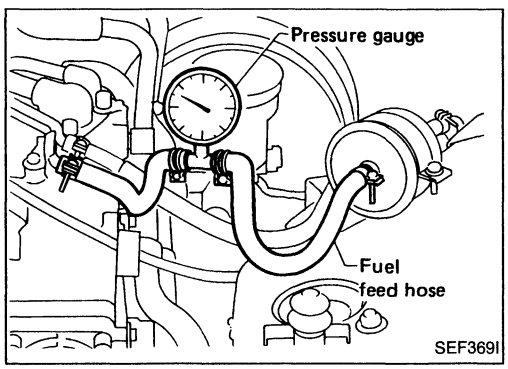


1. Remove fuel pump relay or disconnect fuel pump connector.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay or fuel pump connector.

Fuel Pressure Check

a. When reconnecting fuel line, always use new clamps.
b. Make sure that clamp screw does not contact adjacent parts.
c. Use a torque driver to tighten clamps.
d. Use Pressure Gauge to check fuel pressure.
e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.

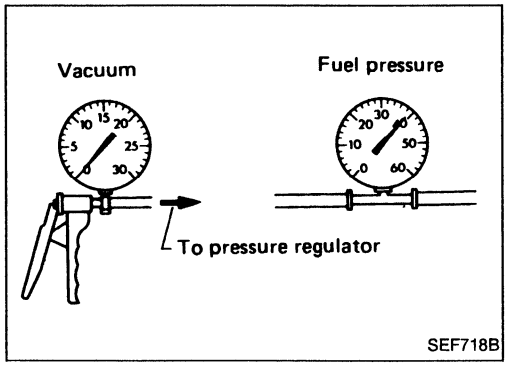
1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.



5. Read the indication of fuel pressure gauge.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   Approximately 250.1 kPa (2.55 kg/cm^2, 36.3 psi)
   When fuel pressure regulator valve vacuum hose is disconnected.
   Approximately 299.1 kPa (3.05 kg/cm^2, 43.4 psi)

Fuel Pressure Check (Cont'd)

6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.



9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.

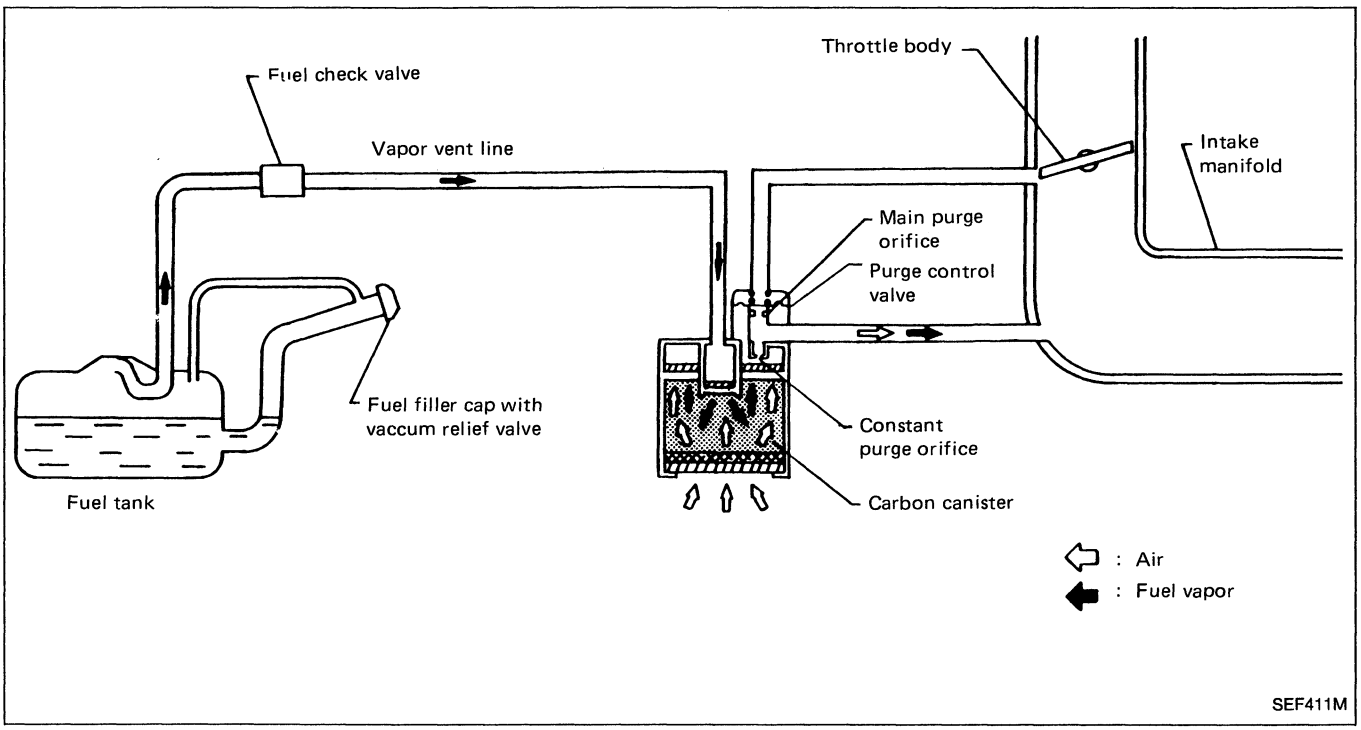
Injector Removal and Installation

1. Release fuel pressure to zero.
2. Drain coolant from radiator drain cock.
3. Remove or disconnect the following:
- Related harnesses, wires and tubes
- Intake manifold collector
  For details, refer to EM section.
4. Remove injectors with fuel tube assembly.
5. Remove injectors from fuel tube assembly.
6. Install injectors as follows:
1) Clean exterior of injector tail piece.
2) Use new O-rings.

CAUTION:
After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.

7. Assemble injectors with fuel tube assembly to intake manifold.

Description

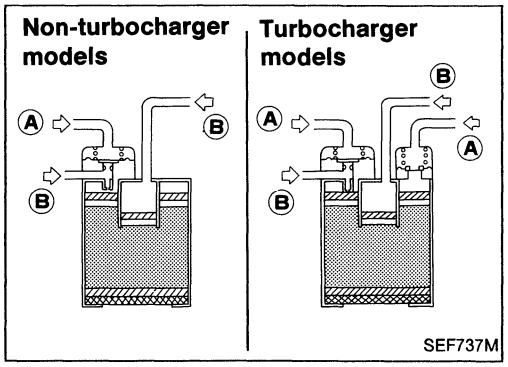


The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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

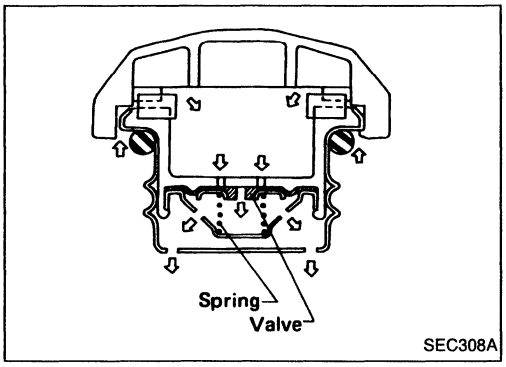
CARBON CANISTER

Check carbon canister as follows:

Ⓐ : Blow air and ensure that there is no leakage.

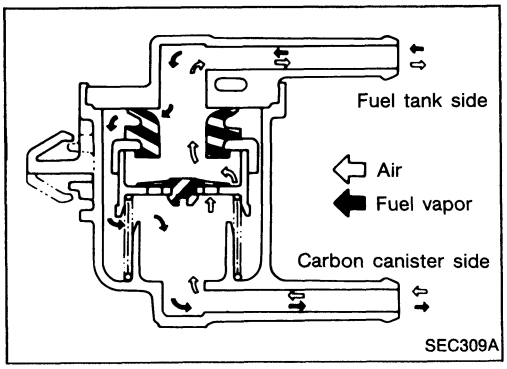
Ⓑ : Blow air and ensure that there is leakage.

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.



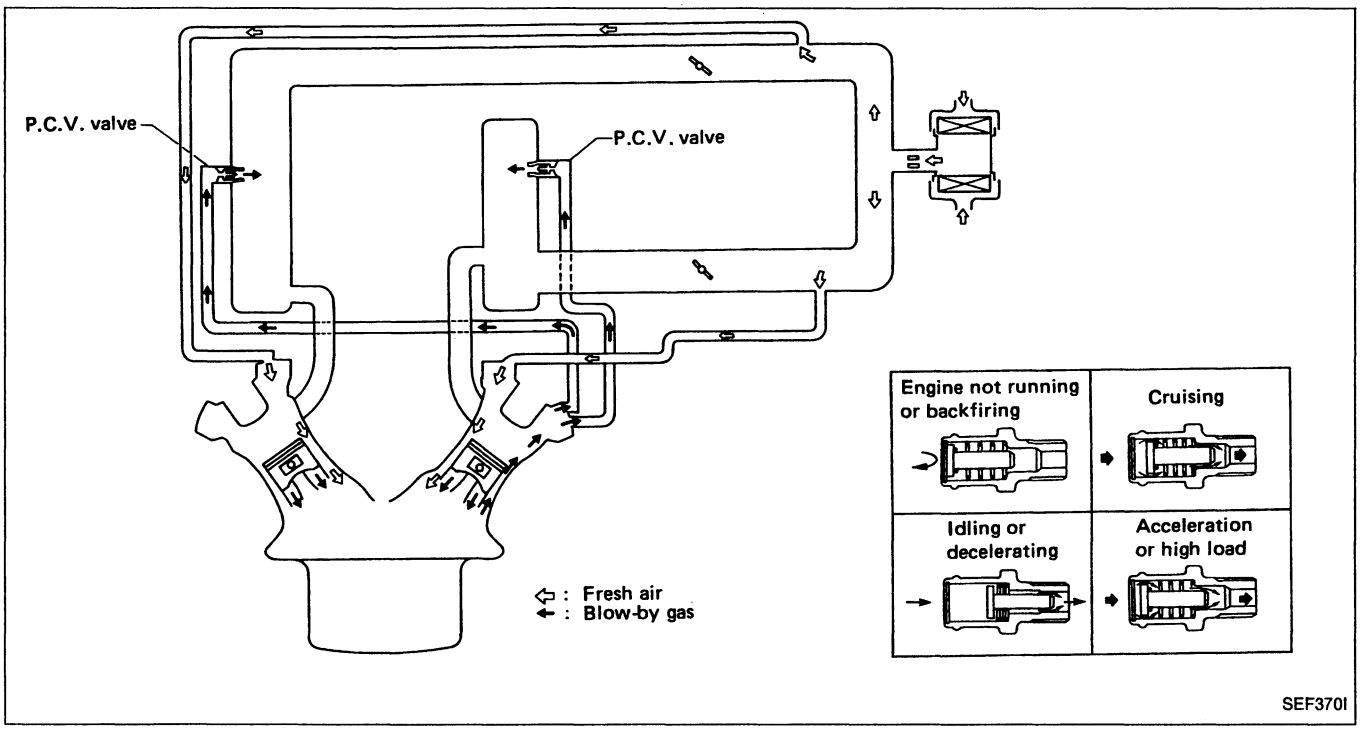
FUEL CHECK VALVE

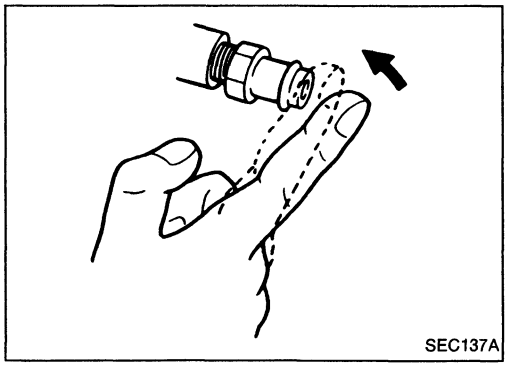
1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the canister.
2. Blow air through connector on canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected 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.

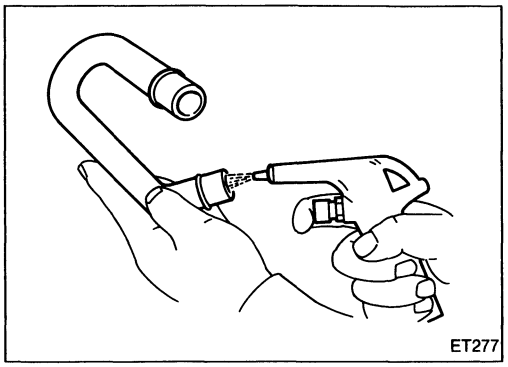




Inspection

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.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

General Specifications

PRESSURE REGULATOR	
Regulated pressure kPa (kg/cm^2, psi)	299.1 (3.05, 43.4)

Inspection and Adjustment

Idle speed*1	rpm	
No-load*2		
M/T		700 ± 50
A/T (in "N" position)		770 ± 50 (Non-turbo-charger) 750 ± 50 (Turbo-charger)
Air conditioner: ON		800 ± 50 (Non-turbo-charger) 850 ± 50 (Turbo-charger)
Ignition timing	degree	15 ± 2 B.T.D.C.
Throttle position sensor idle position	V	0.4 - 0.5

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Steering wheel: Kept straight
- Electric load: OFF (Lights, heater, fan & rear defogger)
- Radiator fan: OFF

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 0.7
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 8

ENGINE COOLANT TEMPERATURE SENSOR AND FUEL 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

FUEL PUMP

Resistance	Ω	Approximately 0.5

EGR TEMPERATURE SENSOR

Resistance [at 100°C (212°F)]	kΩ	85.3 ± 8.53

HEATED OXYGEN SENSOR HEATER

Resistance	Ω	3 - 1,000

IACV-AAC VALVE

Resistance	Ω	Approximately 10

INJECTOR

Resistance	Ω	10 - 14

THROTTLE POSITION SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

IACV-AIR REGULATOR

Resistance	Ω	70 - 80

POWER STEERING OIL PRESSURE SWITCH

Resistance	Ω	Approximately 2 - 3

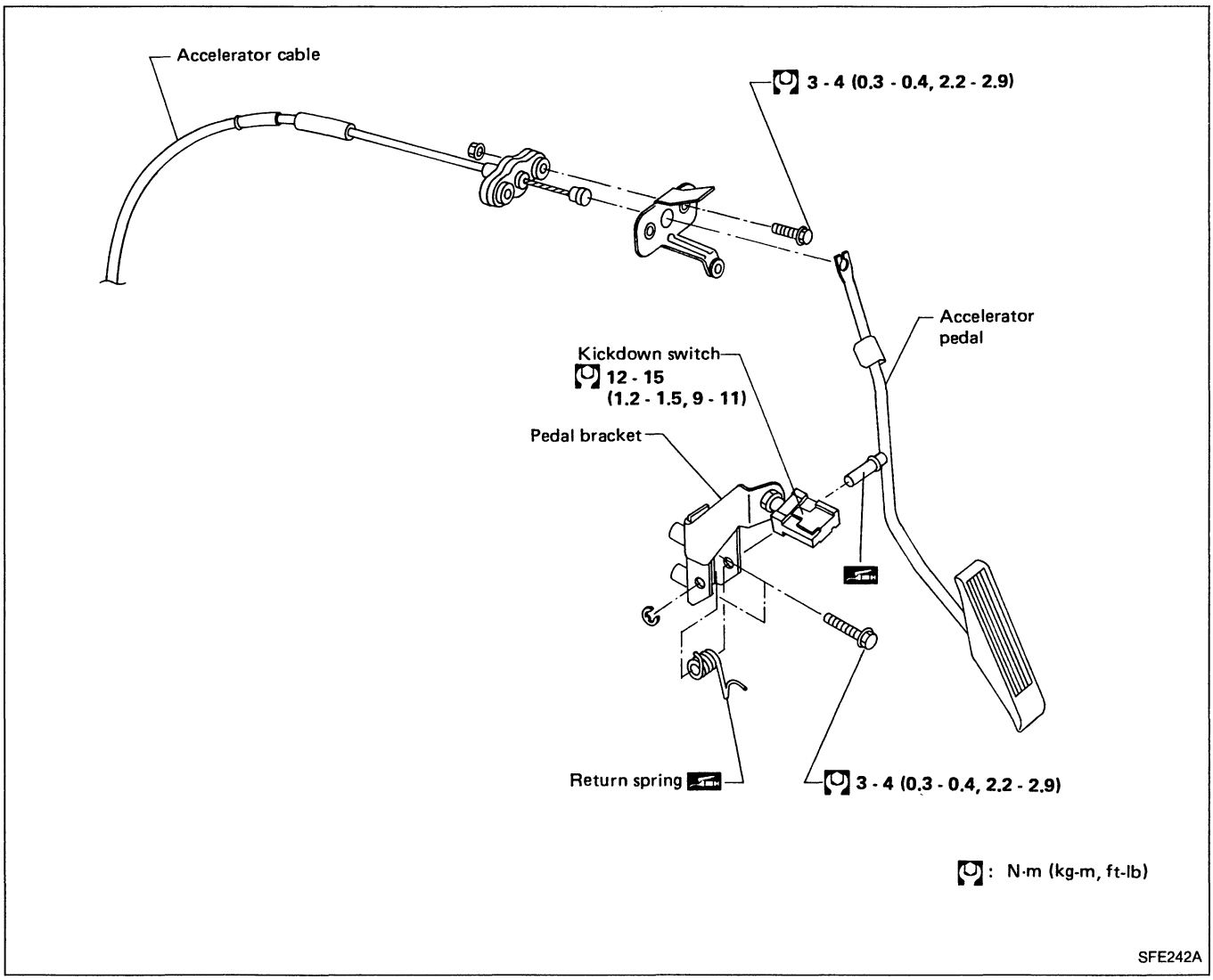
ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

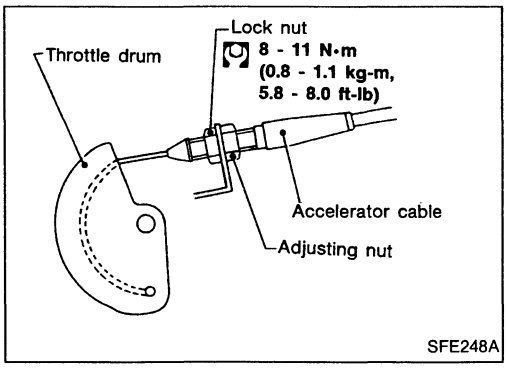
SECTION FE

CONTENTS

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.**
- **Refer to EL section for A.S.C.D. cable adjustment.**
- **For Kickdown switch adjustment, refer to "ON-VEHICLE SERVICE" in AT section.**





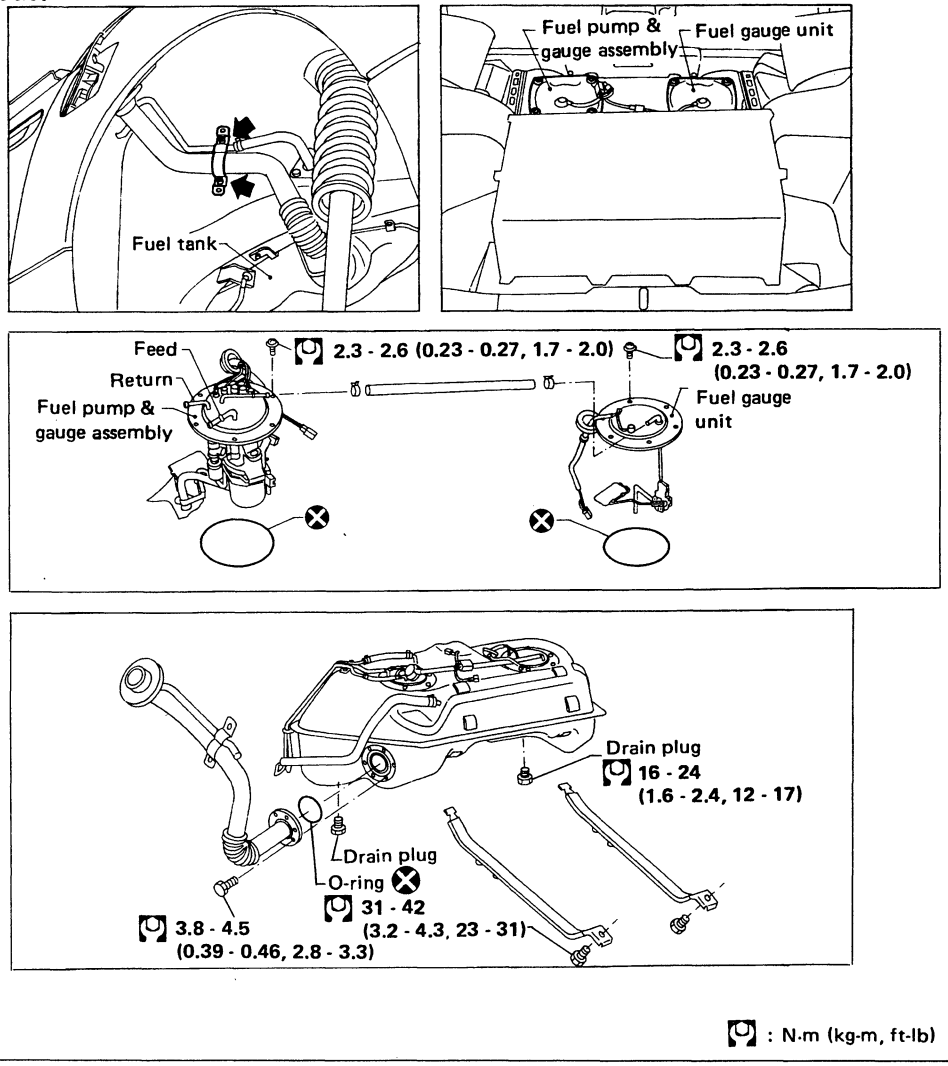
Adjusting Accelerator Cable

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.

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 CO_2 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.**

CAUTION:
- **Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.**
- **Do not disconnect any fuel line unless absolutely necessary.**
- **Plug hose and pipe openings to prevent entry of dust or dirt.**
- **Always replace O-ring and clamps with new ones.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose clamps excessively to avoid damaging hoses.**
- **When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)**
- **Tighten bolts to specified torque.**
- **After installation, run engine and check for fuel leaks at connections.**

2 seater model



: N·m (kg-m, ft-lb)

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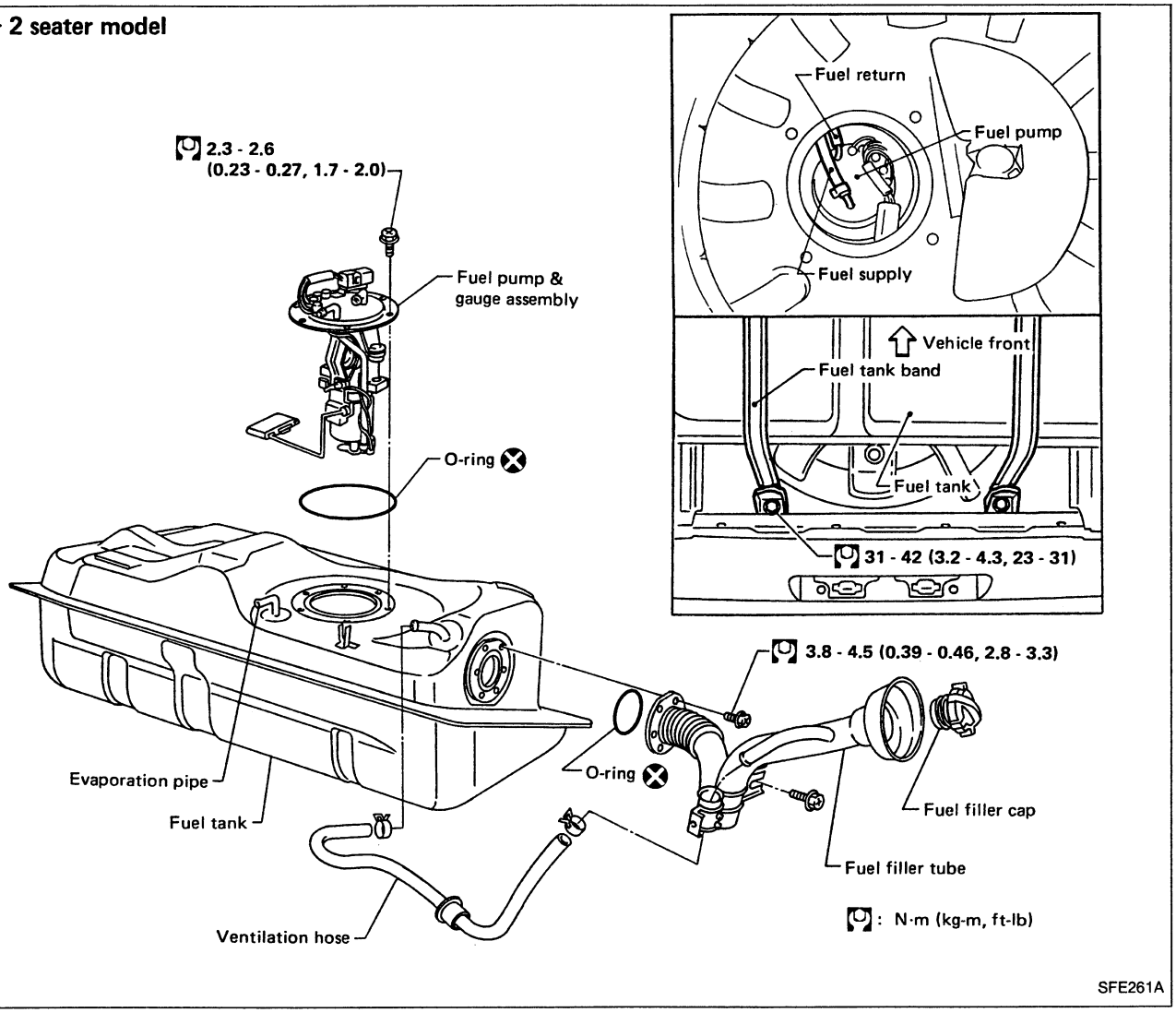
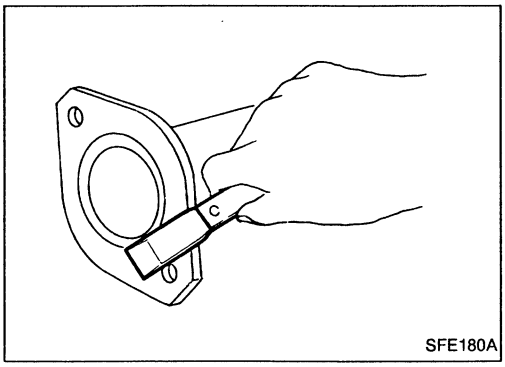
2 + 2 seater model

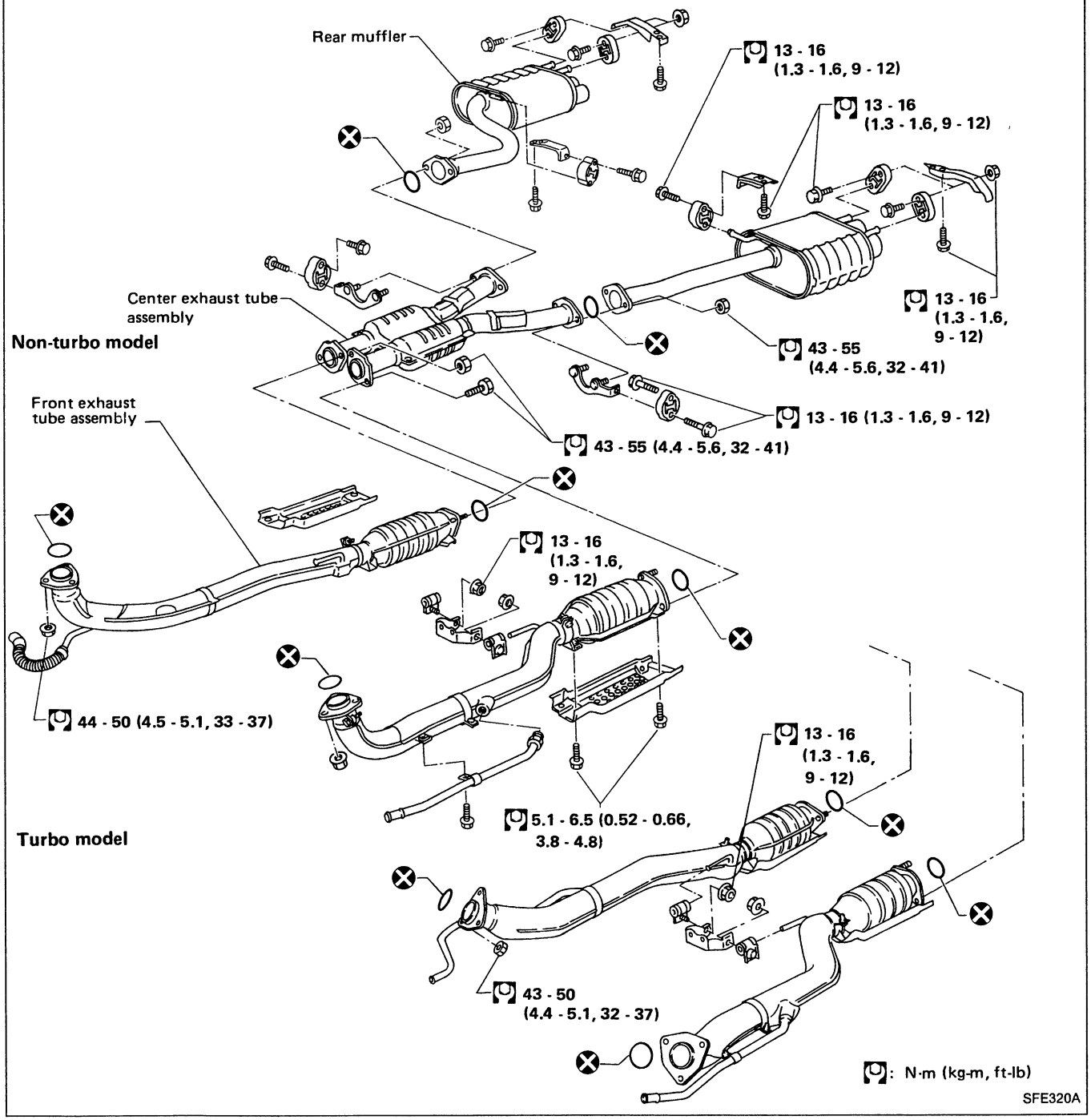




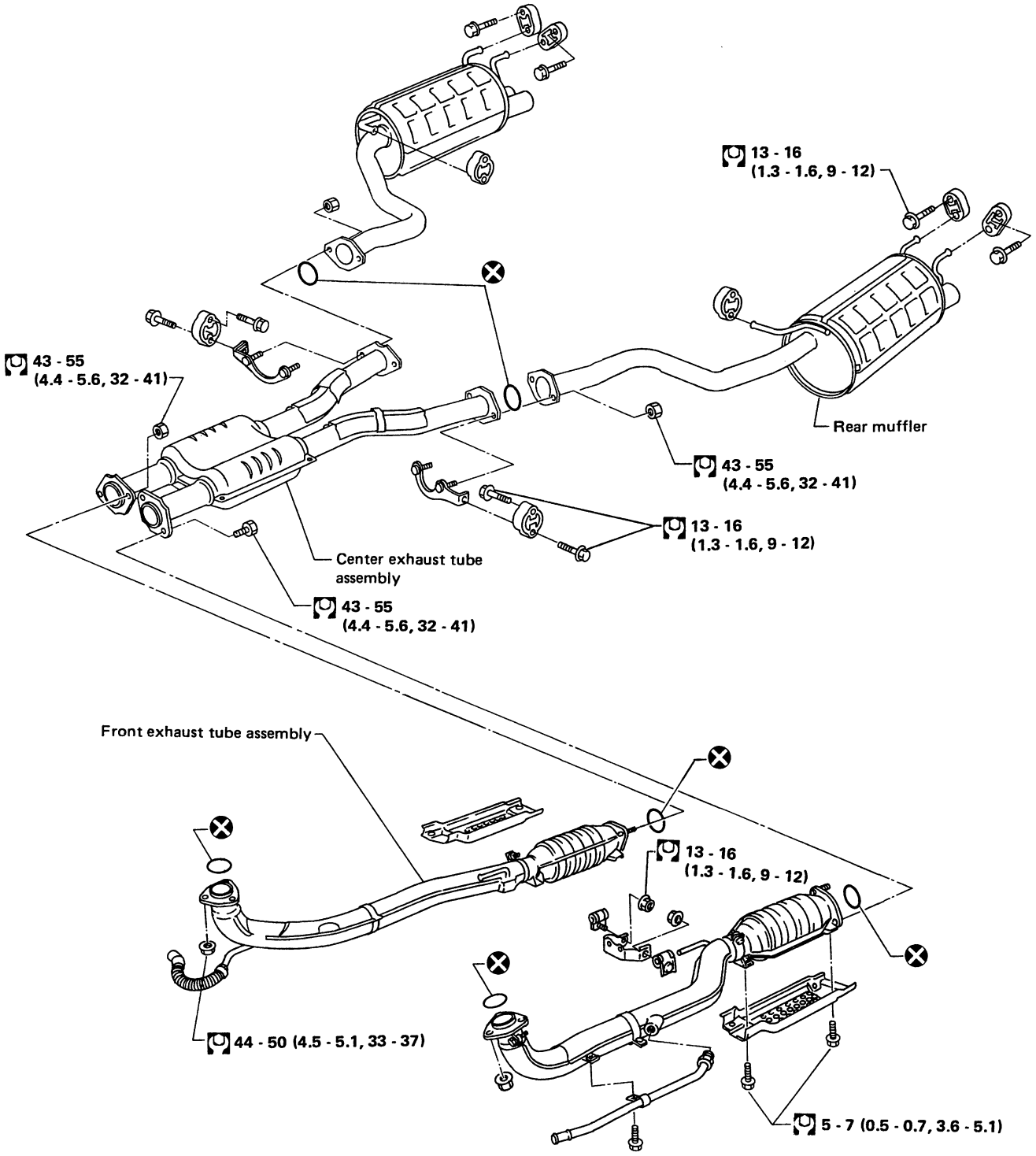
CAUTION:

- **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.**

2 seater model



2 + 2 seater model

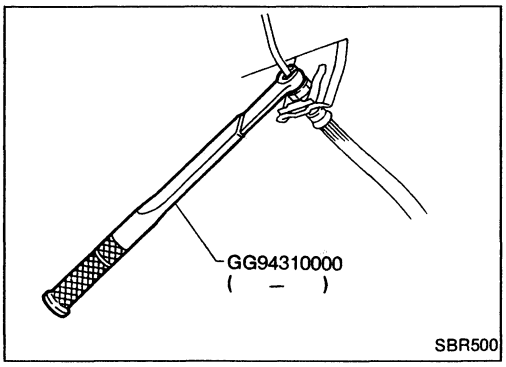


: N·m (kg-m, ft-lb)

SFE321A

SECTION CL

CONTENTS

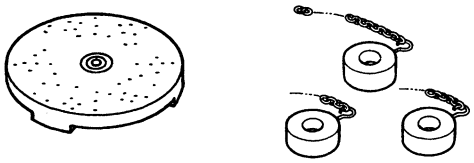
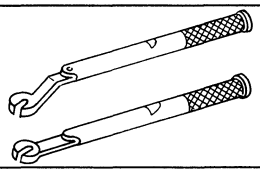
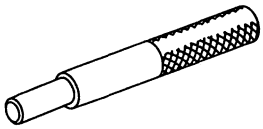


Precautions

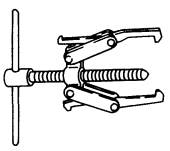
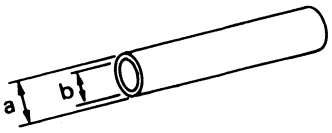
- **Recommended fluid is brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **When removing and installing clutch piping, use Tool.**
- **Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.**
- **Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.**

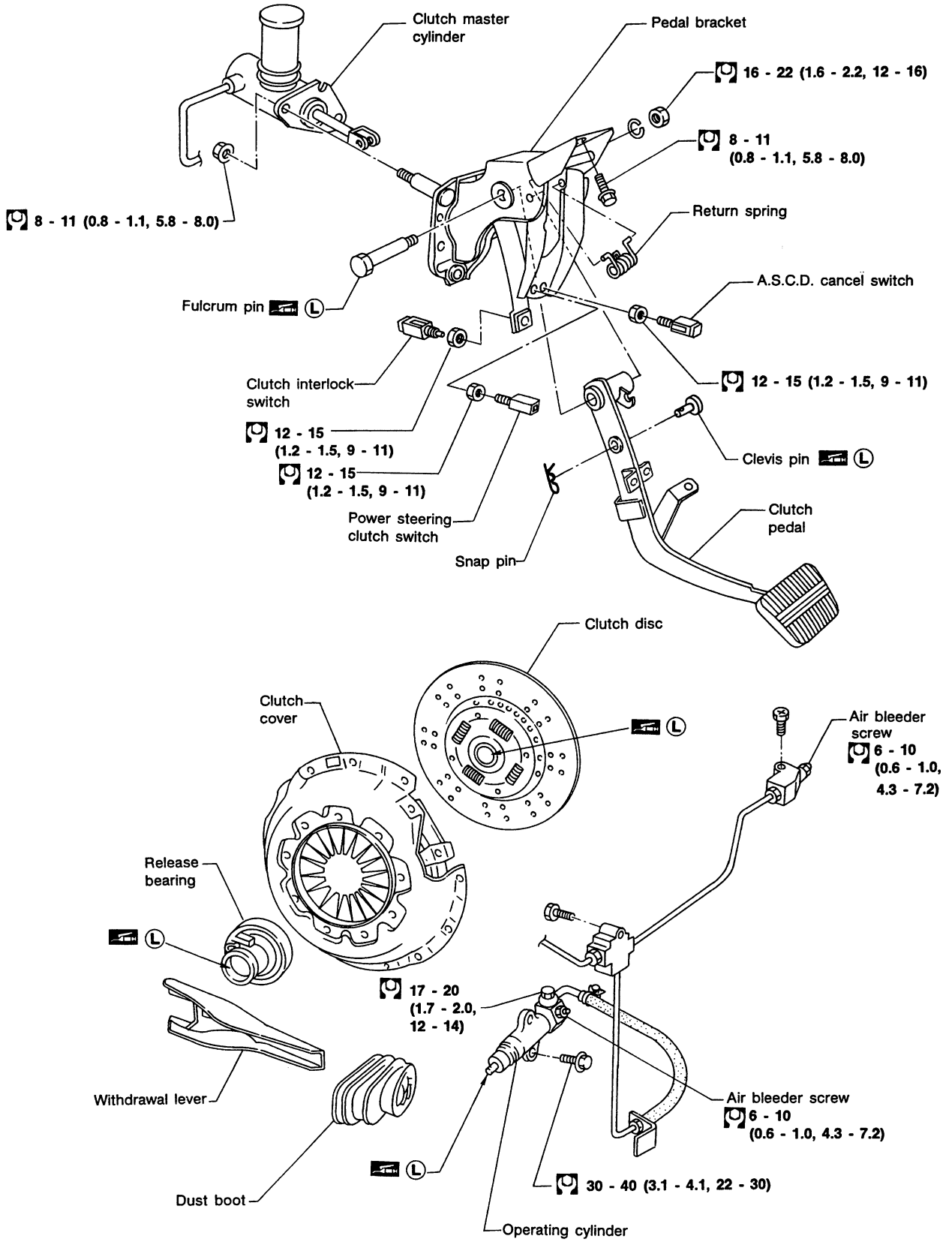
WARNING:
After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
ST20050010 (—) Base plate ST20050100 (—) Distance piece		Inspecting diaphragm spring of clutch cover
GG94310000 (—) Flare nut torque wrench		Removing and installing each clutch piping
ST20600000 (J26366) Clutch aligning bar		Installing clutch cover and clutch disc
ST20050240 (—) Diaphragm spring adjusting wrench		Adjusting unevenness of diaphragm spring of clutch cover

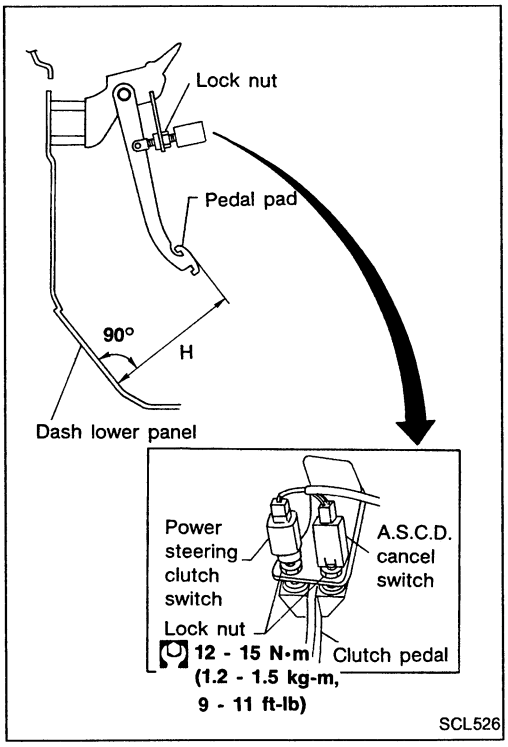
Commercial Service Tools

Tool name	Description	
Bearing puller		Removing release bearing
Bearing drift		Installing release bearing **a: 50 mm (1.97 in) dia.** **b: 45 mm (1.77 in) dia.**



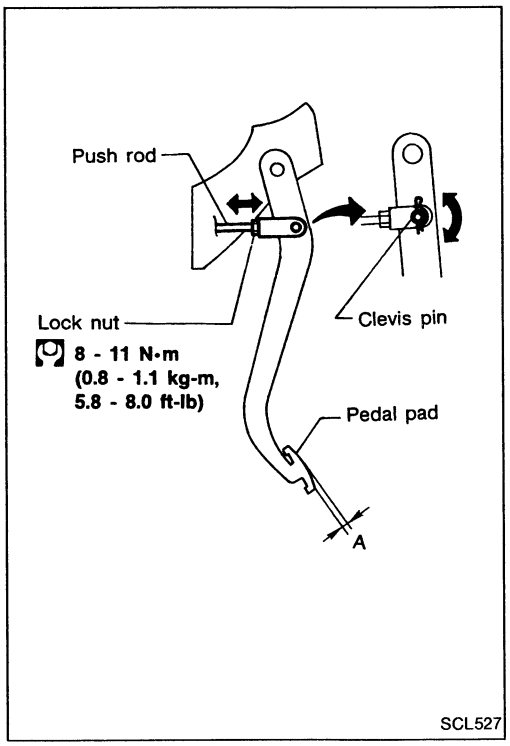
: N•m (kg-m, ft-lb)
: Apply lithium-based grease including molybdenum disulphide.

SCL436



Adjusting Clutch Pedal

1. Adjust pedal height with A.S.C.D. cancel switch and HICAS clutch switch or power steering clutch switch.
   Pedal height "H":
   197 - 207 mm (7.76 - 8.15 in)



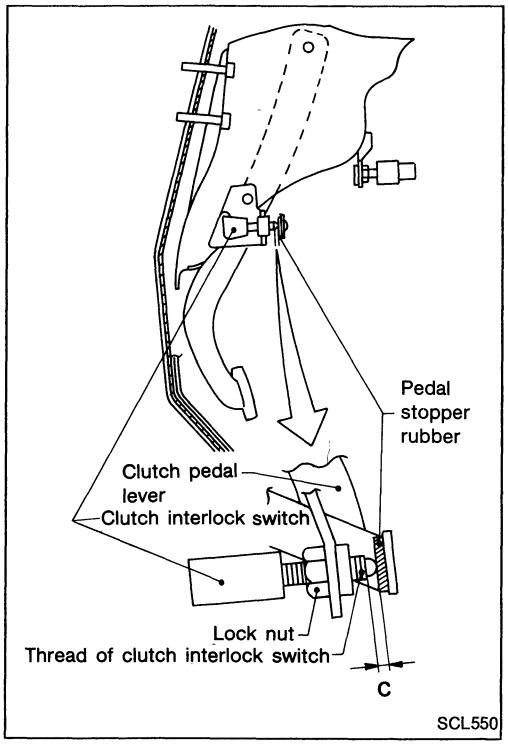
2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.
   Pedal free play "A":
   1.0 - 3.0 mm (0.039 - 0.118 in)

Pedal free play means the following measured at position of pedal pad:

- **Play due to clevis pin and clevis pin hole in clutch pedal.**

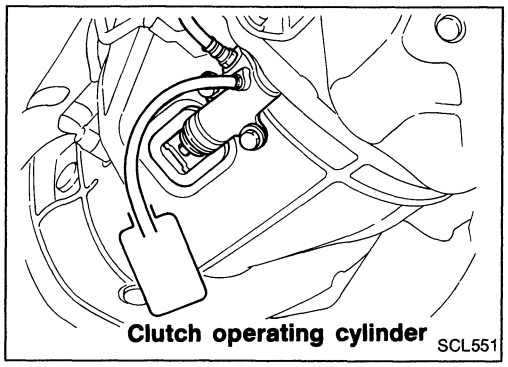
3. Make sure that clevis pin can be rotated smoothly.
   If not, readjust pedal free play with master cylinder push rod.

Adjusting Clutch Pedal (Cont'd)



— U.S.A. model only —

4. Adjust clearance "C" between pedal stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.
   Clearance C:
   1.0 - 2.0 mm (0.039 - 0.079 in)



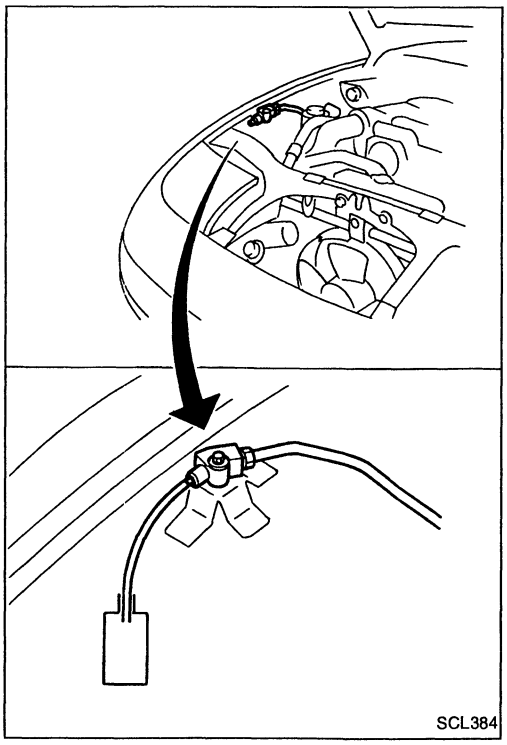
Bleeding Procedure

1. Bleed air from clutch operating cylinder according to the following procedure.

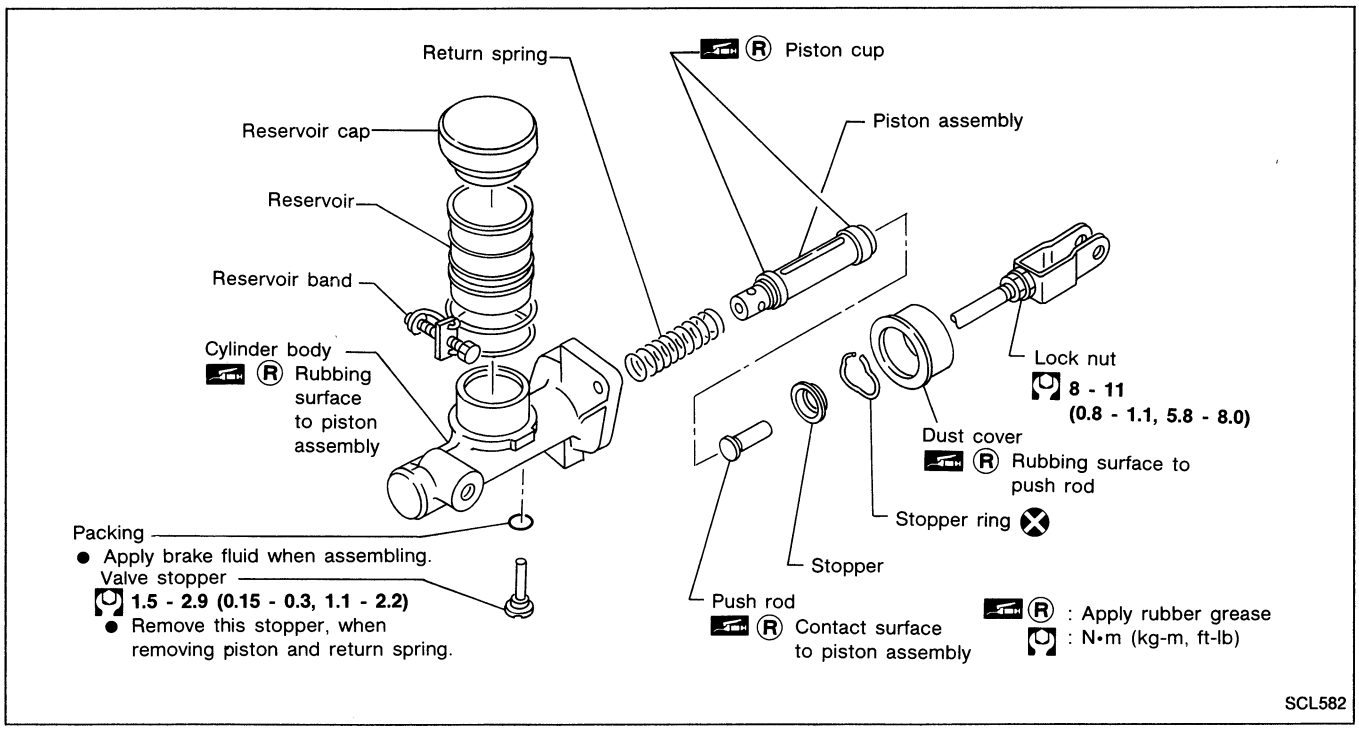
Carefully monitor fluid level at master cylinder during bleeding operation.

a. Top up reservoir with recommended brake fluid.
b. Connect a transparent vinyl tube to air bleeder valve.
c. Fully depress clutch pedal several times.
d. With clutch pedal depressed, open bleeder valve to release air.
e. Close bleeder valve.
f. Repeat steps c through e above until brake fluid flows from air bleeder valve without air bubbles.

2. Bleed air from clutch piping connector according to the above same procedure.
3. Repeat the above bleeding procedures 1 and 2 several times.

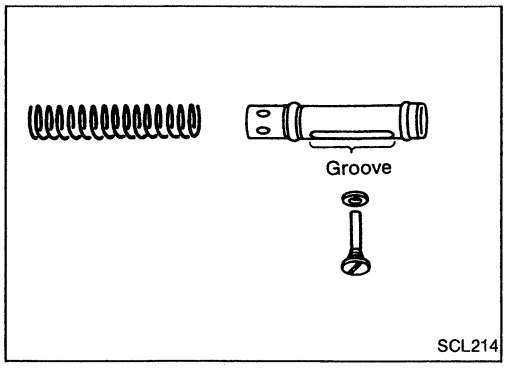


Clutch Master Cylinder



DISASSEMBLY AND ASSEMBLY

- Push piston into cylinder body with screwdriver when removing and installing valve stopper.

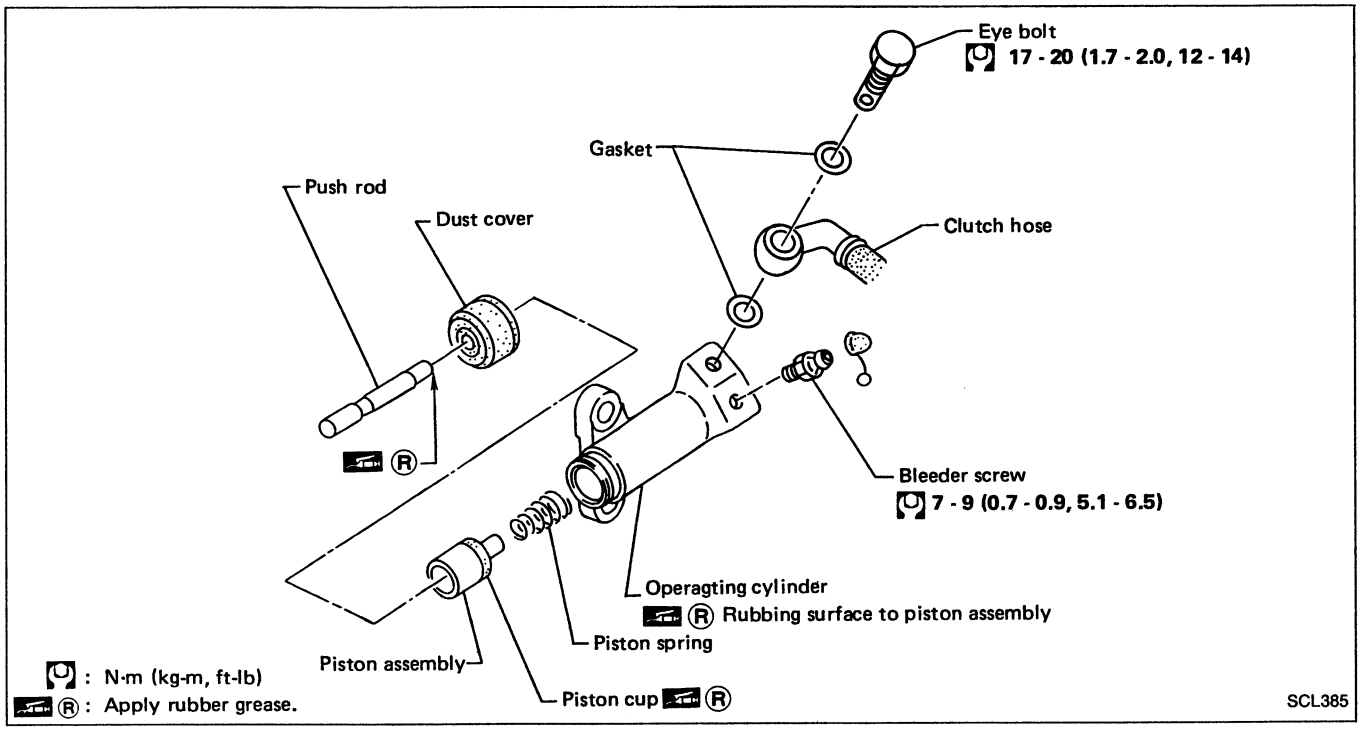


- Align groove of piston assembly and valve stopper when installing valve stopper.
- Check direction of piston cups.

INSPECTION

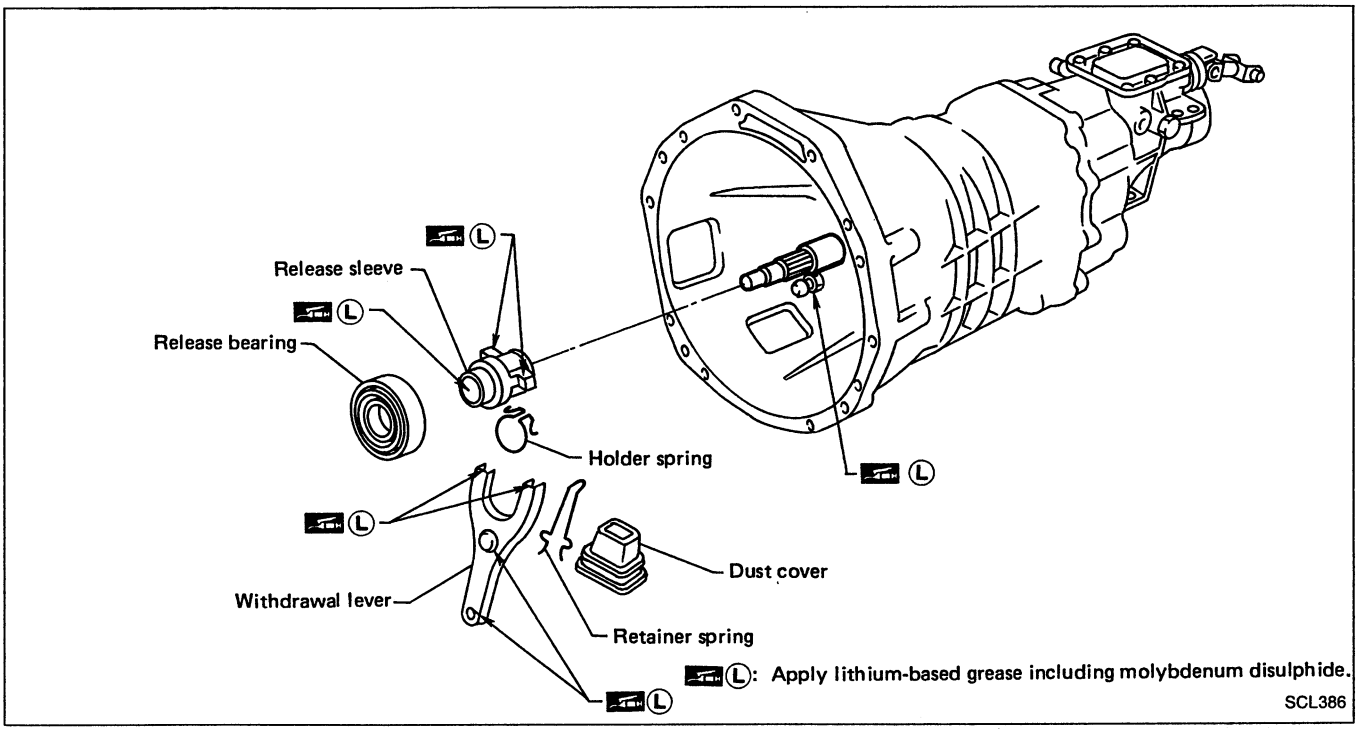
- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

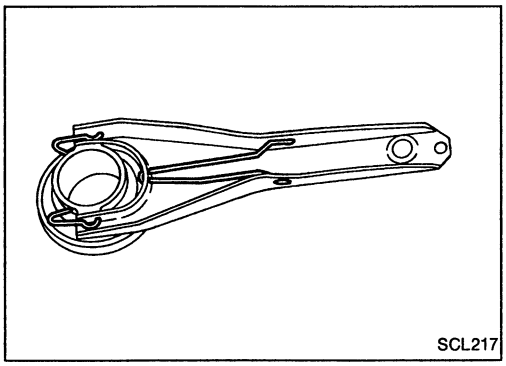
Operating Cylinder



INSPECTION

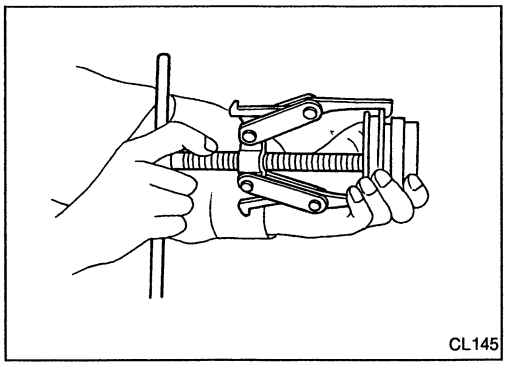
- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check piston spring for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.



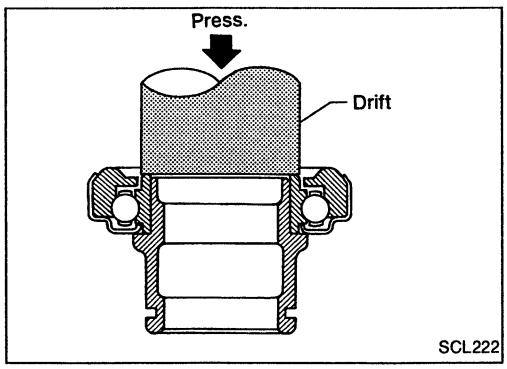


REMOVAL AND INSTALLATION

- Install retainer spring and holder spring.



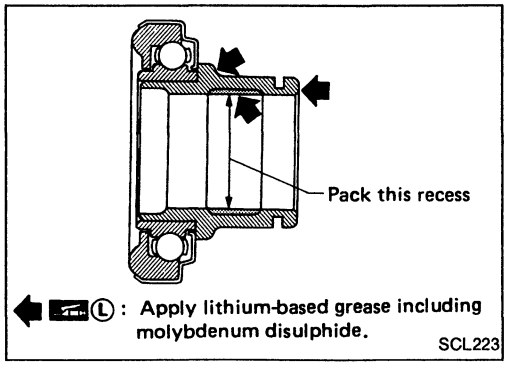
- Remove release bearing.



- Install release bearing with suitable drift.

INSPECTION

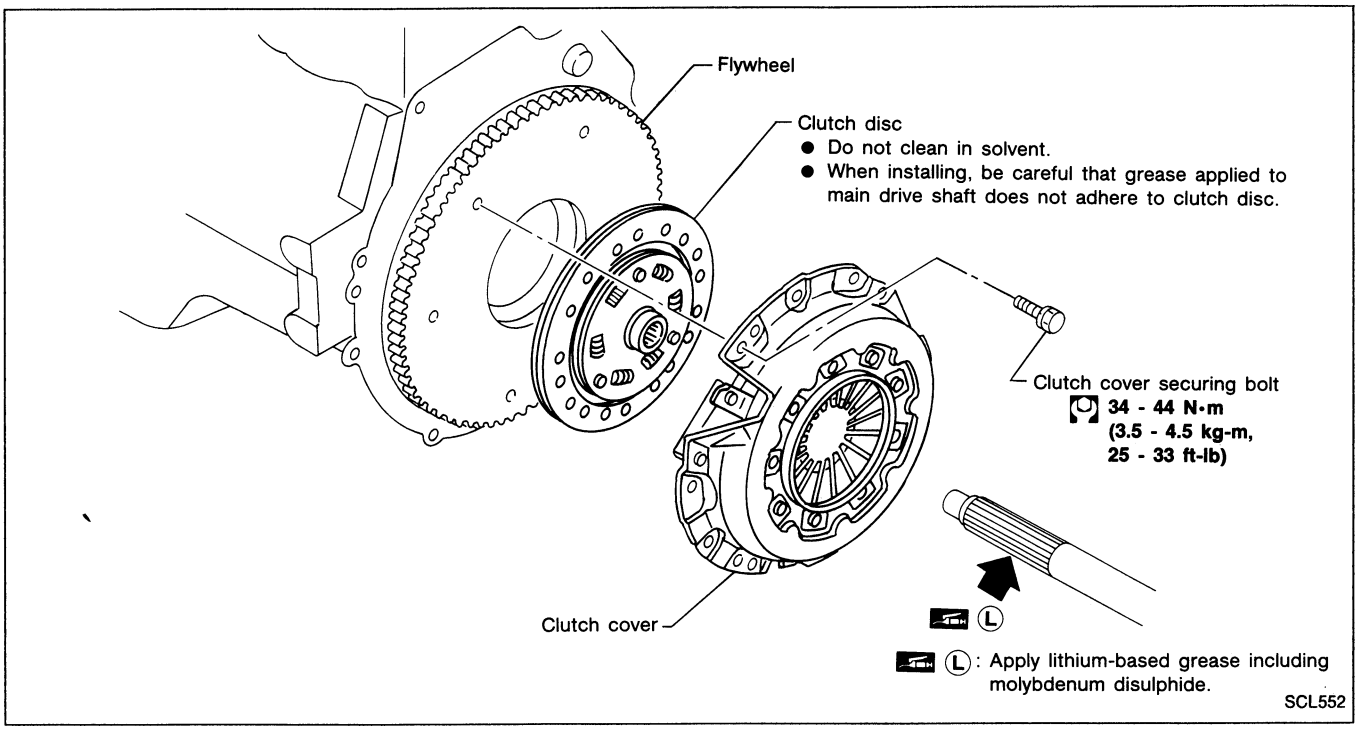
- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.

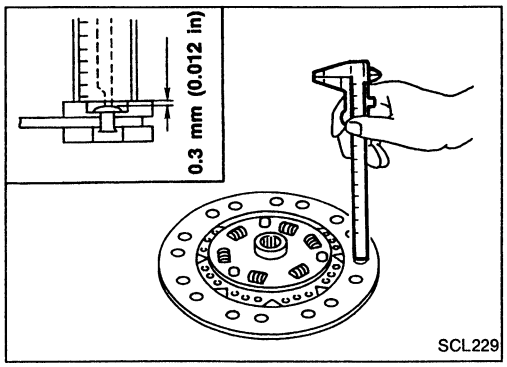


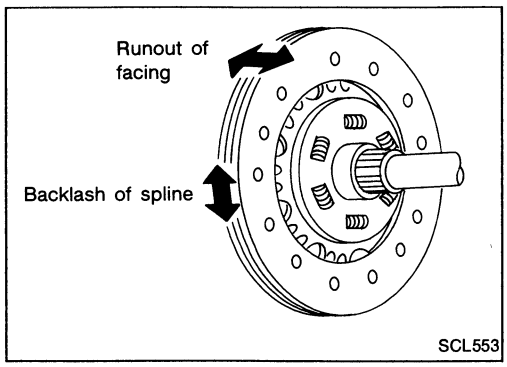
LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

Too much lubricant might damage clutch disc facing.







Clutch Disc

INSPECTION

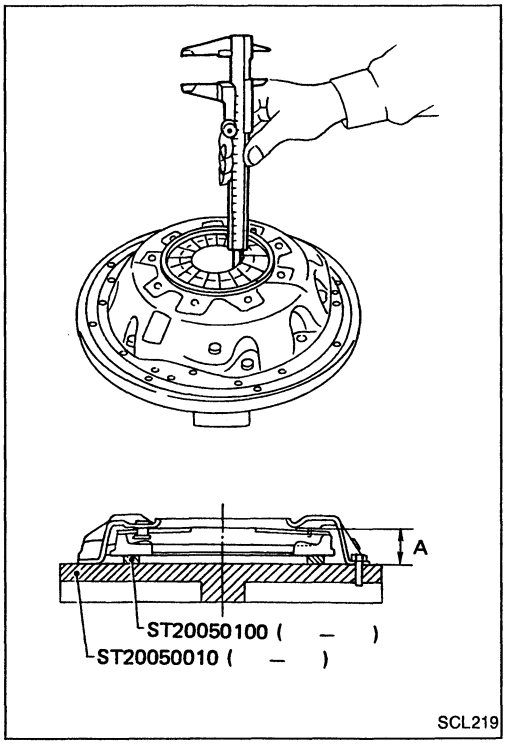
- Check clutch disc for wear of facing.
  Wear limit of facing surface to rivet head:
  0.3 mm (0.012 in)

- Check clutch disc for backlash of spline and runout of facing.
  Maximum backlash of spline (at outer edge of disc):
  1.0 mm (0.039 in)
  Runout limit:
  1.0 mm (0.039 in)
  Distance of runout check point (from hub center):
  115 mm (4.53 in)
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.

INSTALLATION

- Apply recommended grease to contact surface of spring portion.

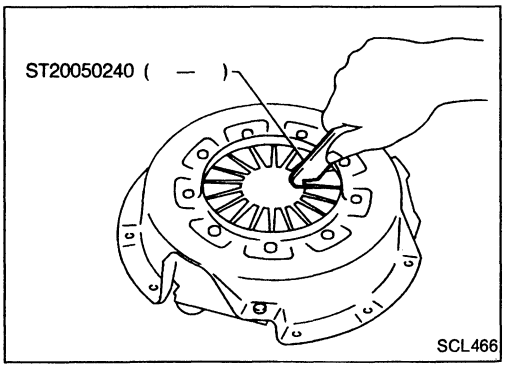
Too much lubricant might damage clutch disc facing.



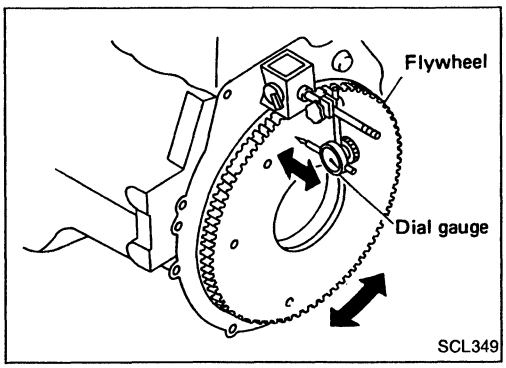
Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.
  Diaphragm spring height "A":
  37.5 - 39.5 mm (1.476 - 1.555 in)
- **Set 0.5 mm (0.020 in) feeler gauges on distance pieces (ST20050100) when checking diaphragm spring height.**
- 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.

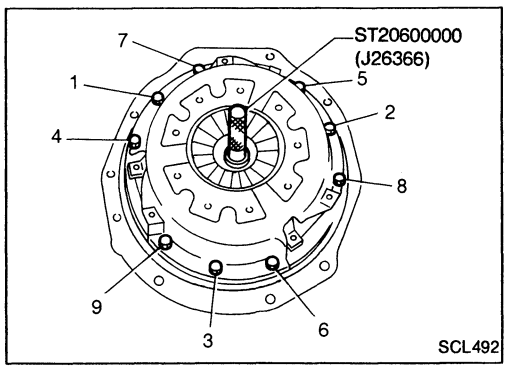


- Adjust unevenness of diaphragm spring with Tool.
  Uneven limit:
  0.5 mm (0.020 in)



FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.
  Runout (Total indicator reading):
  Less than 0.15 mm (0.0059 in)



INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.
- Tighten bolts in numerical order.
- Be careful not to allow grease to contaminate clutch facing.

General Specifications

CLUTCH CONTROL SYSTEM

Type of clutch control	Hydraulic

CLUTCH MASTER CYLINDER

Inner diameter mm (in)	15.87 (5/8)

CLUTCH OPERATING CYLINDER

Inner diameter mm (in)	19.05 (3/4)

CLUTCH DISC

Model	240TBL
Engine	VG30DE
Facing size (Outer dia. x inner dia. x thickness) mm (in)	240 x 160 x 3.5 (9.45 x 6.30 x 0.138)
Thickness of disc assembly With load mm (in)	8.1 - 8.5 (0.319 - 0.335) with 4,904 N (500 kg, 1,103 lb)

CLUTCH COVER

Model	C240S
Engine	VG30DE
Full load N (kg, lb)	5,688 (580, 1,279)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Engine	VG30DE
Pedal height "H*"	197 - 207 (7.76 - 8.15)
Pedal free play (Backlash at clevis)	1.0 - 3.0 (0.039 - 0.118)
Clearance between pedal stopper rubber and threaded end of clutch interlock switch	1.0 - 2.0 (0.039 - 0.079)

*: Measured from surface of dash lower panel to pedal pad

CLUTCH DISC

Unit: mm (in)

Model	240TBL
Wear limit of facing surface to rivet head	0.3 (0.012)
Runout limit of facing	1.0 (0.039)
Distance of runout check point (from the hub center)	115 (4.53)
Maximum backlash of spline (at outer edge of disc)	1.0 (0.039)

CLUTCH COVER

Unit: mm (in)

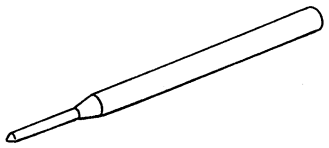
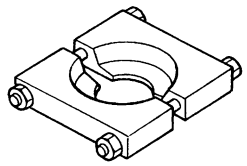
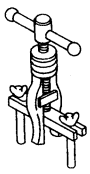
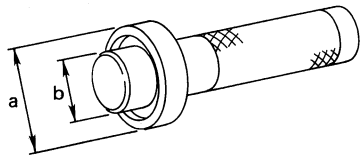
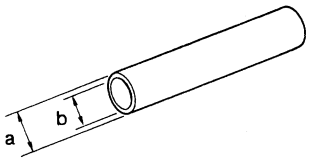
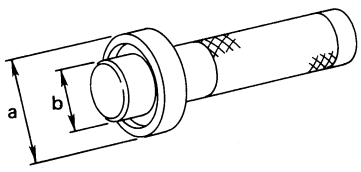
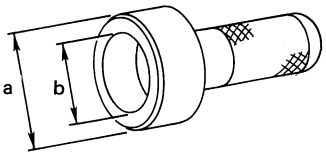
Model	C240S
Diaphragm spring height	37.5 - 39.5 (1.476 - 1.555)
Uneven limit of diaphragm spring toe height	0.5 (0.020)

MANUAL TRANSMISSION

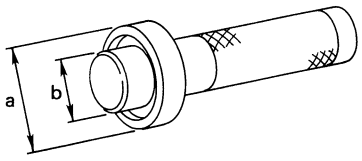
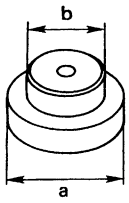
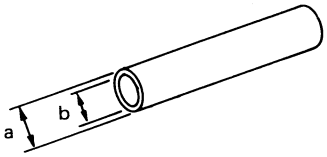
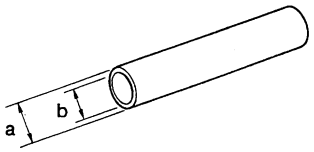
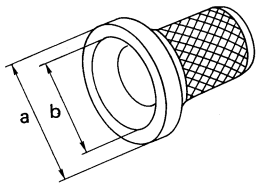
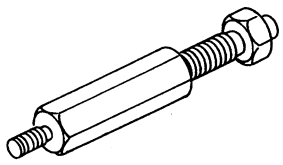
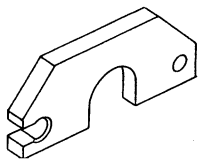
SECTION MT

CONTENTS

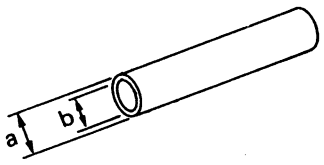
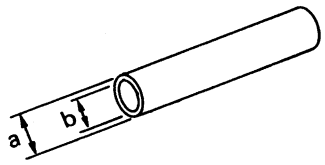
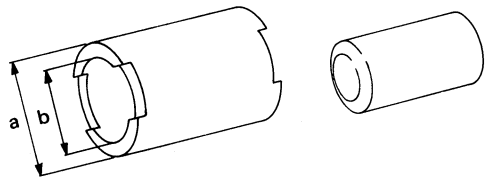
Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
ST23540000 (J25689-A) Pin punch		Removing and installing retaining pin
ST30031000 (J22912-01) Puller		Removing 1st & 2nd synchronizer assembly Removing counter gear rear thrust bearing Removing main drive bearing Measuring 2nd & 3rd inner baulk ring
ST33290001 (J25810-A) Puller		Removing rear oil seal
ST33230000 (—) Drift	 **a: 51 mm (2.01 in) dia.** **b: 28.5 mm (1.122 in) dia.**	Removing mainshaft and counter gear
ST22350000 (J25678-01) Drift	 **a: 34 mm (1.34 in) dia.** **b: 28 mm (1.10 in) dia.**	Removing counter gear front bearing (Use with KV38100300)
KV38100300 (J25523) Drift	 **a: 54 mm (2.13 in) dia.** **b: 32 mm (1.26 in) dia.**	Removing counter gear front bearing (Use with ST22350000) Installing counter gear rear bearing
ST30720000 ① (J34286) ② (J34331) Drift	 **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**	① Removing mainshaft front bearing ② Installing mainshaft front bearing

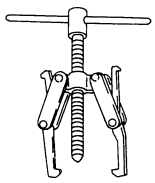
Special Service Tools (Cont'd)

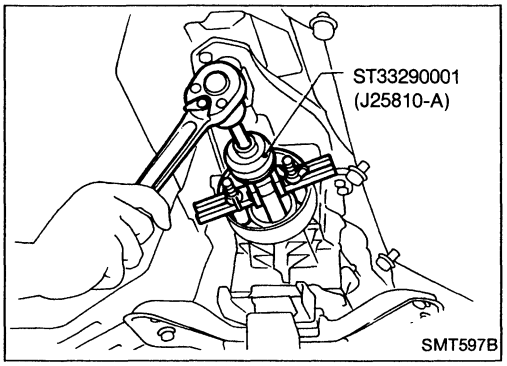
Tool number (Kent-Moore No.) Tool name	Description	
ST33210000 ① (J25523) ② (J25803-01) Drift	 **a: 44 mm (1.73 in) dia.** **b: 24.5 mm (0.965 in) dia.**	① Installing counter gear front bearing ② Installing front cover oil seal
ST30613000 (J25742-3) Drift	 **a: 72 mm (2.83 in) dia.** **b: 48 mm (1.89 in) dia.**	Installing main drive gear bearing
ST37750000 ① (J34286) ② (J34332) ③ (J34334) ④ (J25679-01) Drift	 **a: 40 mm (1.57 in) dia.** **b: 31 mm (1.22 in) dia.**	① Removing counter gear rear bearing ② Installing O.D. gear bushing ② Installing reverse cone ③ Installing reverse counter gear ④ Installing counter gear rear end bearing
ST22452000 (J34337) Drift	 **a: 45 mm (1.77 in) dia.** **b: 36 mm (1.42 in) dia.**	Installing reverse hub Installing mainshaft rear bearing
ST33400001 (J26082) Drift	 **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**	Installing rear oil seal
(J26349-3) Puller leg		Installing mainshaft and counter gear (Use with J34328)
(J34328) Puller		Installing mainshaft and counter gear (Use with J26349-3)

Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
(J26092) Drift	 **a: 44.5 mm (1.752 in) dia.** **b: 38.5 mm (1.516 in) dia.**	Installing sub-gear snap ring
(J34342) Drift	 **a: 44.5 mm (1.752 in) dia.** **b: 40.5 mm (1.594 in) dia.**	Installing O.D. main gear Installing reverse gear bushing
ST36730000 (—) Drift	 **a: 50 mm (1.97 in) dia.** **b: 39 mm (1.54 in) dia.**	Installing sub-gear on reverse idler gear

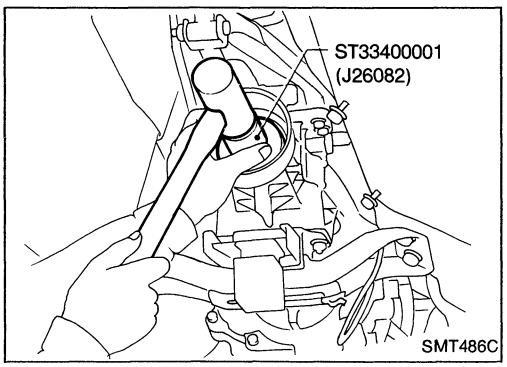
Commercial Service Tool

Tool name	Description	
Puller		Removing counter gear rear end bearing Removing mainshaft rear bearing Removing reverse synchronizer hub Removing reverse counter gear

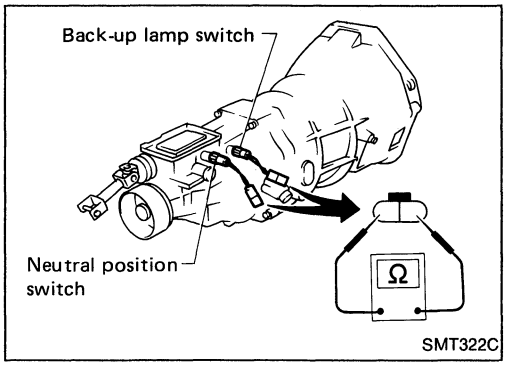


Replacing Rear Oil Seal

REMOVAL



INSTALLATION



Position Switch Check

BACK-UP LAMP SWITCH

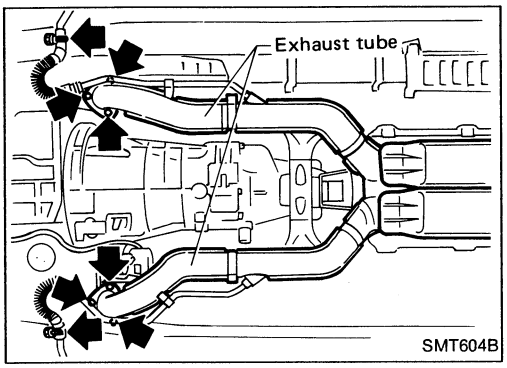
- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No

NEUTRAL POSITION SWITCH

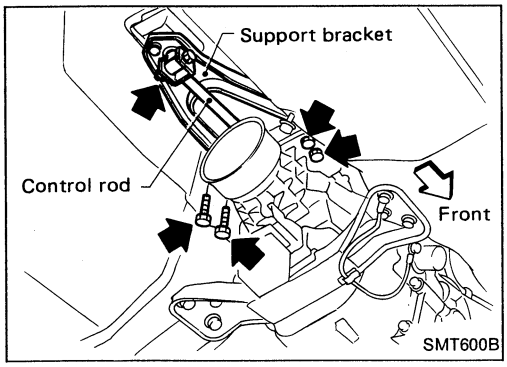
- Check continuity.

Gear position	Continuity
Neutral	Yes
Except neutral	No

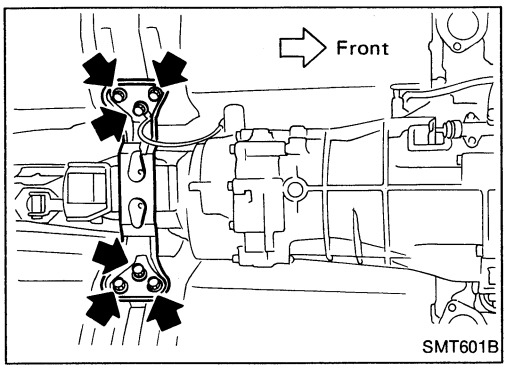


Removal

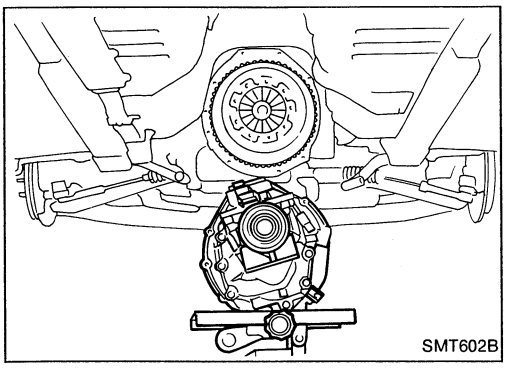
- Remove exhaust tube.



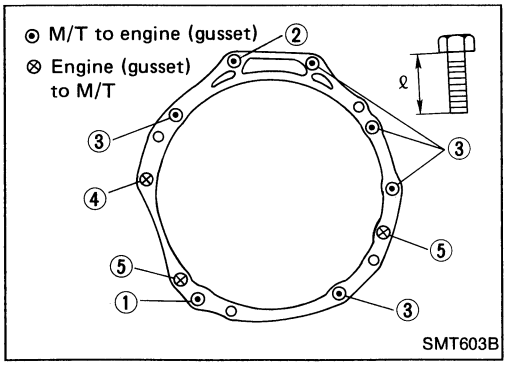
- Remove support bracket from M/T assembly.
- Remove control rod from shift lever.



- Remove propeller shaft — Refer to section PD.
- **Insert plug into rear oil seal after removing propeller shaft.**
- **Be careful not to damage spline, sleeve yoke and rear oil seal when removing propeller shaft.**
- Disconnect back-up lamp switch and neutral switch harness connectors.
- Support manual transmission with a jack.
- Remove rear mounting.



- Lower manual transmission.

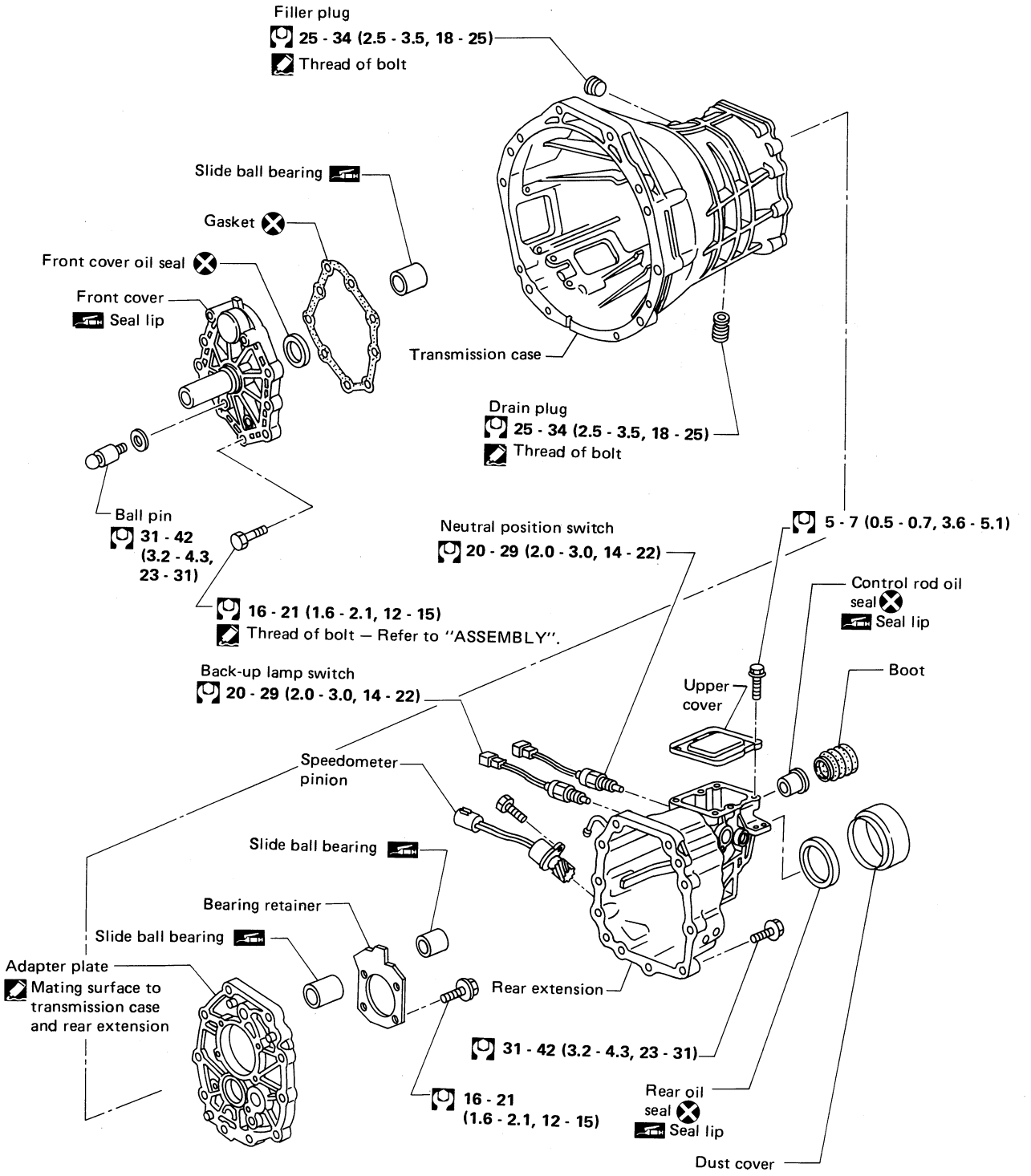


Installation

- Tighten all transmission bolts.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
①	39 - 49 (4.0 - 5.0, 29 - 36)	100 (3.94)
②	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
③	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
④	29 - 39 (3.0 - 4.0, 22 - 29)	55 (2.17)
⑤	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)

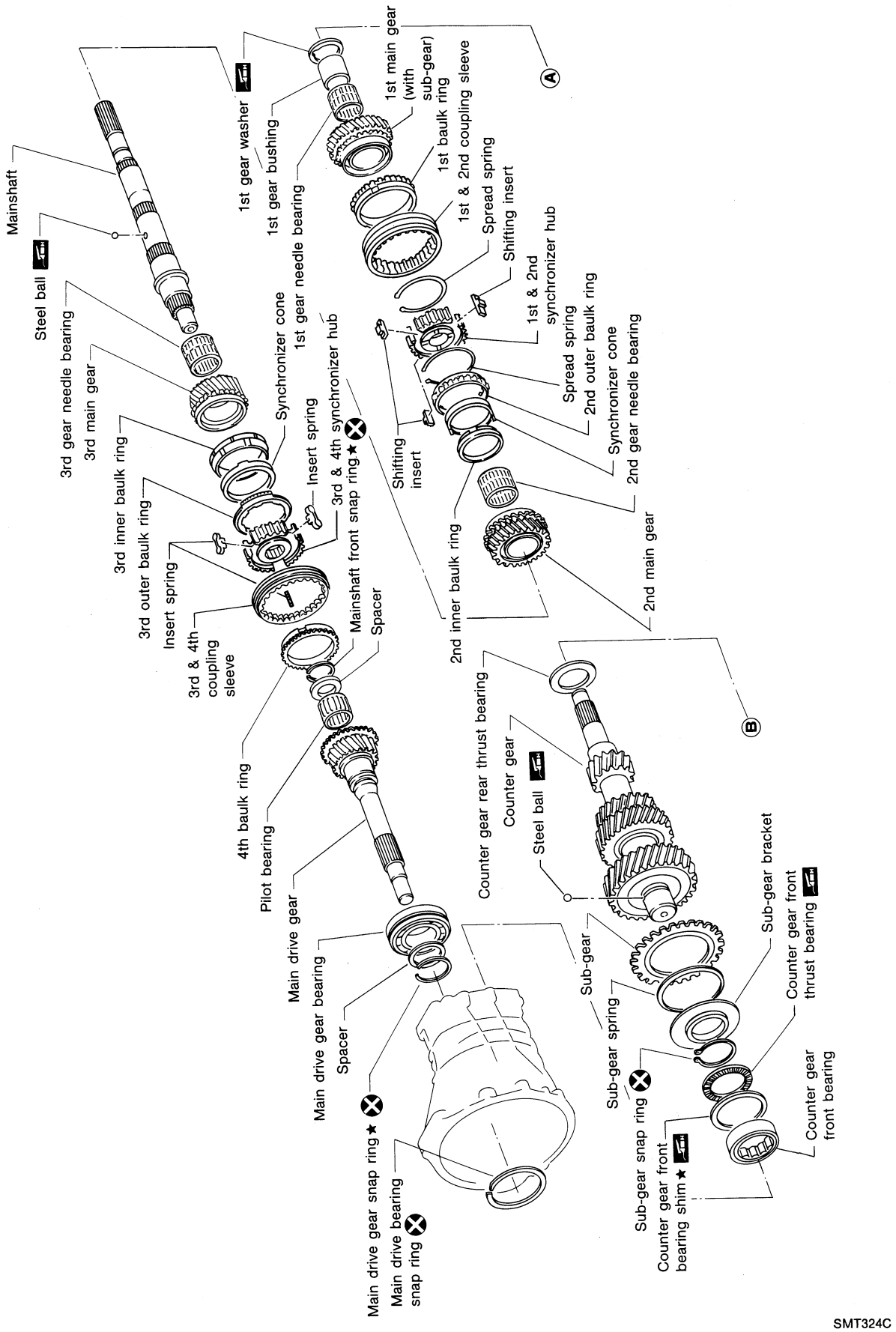
Case Components



: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine Part: KP610-00250) or equivalent.

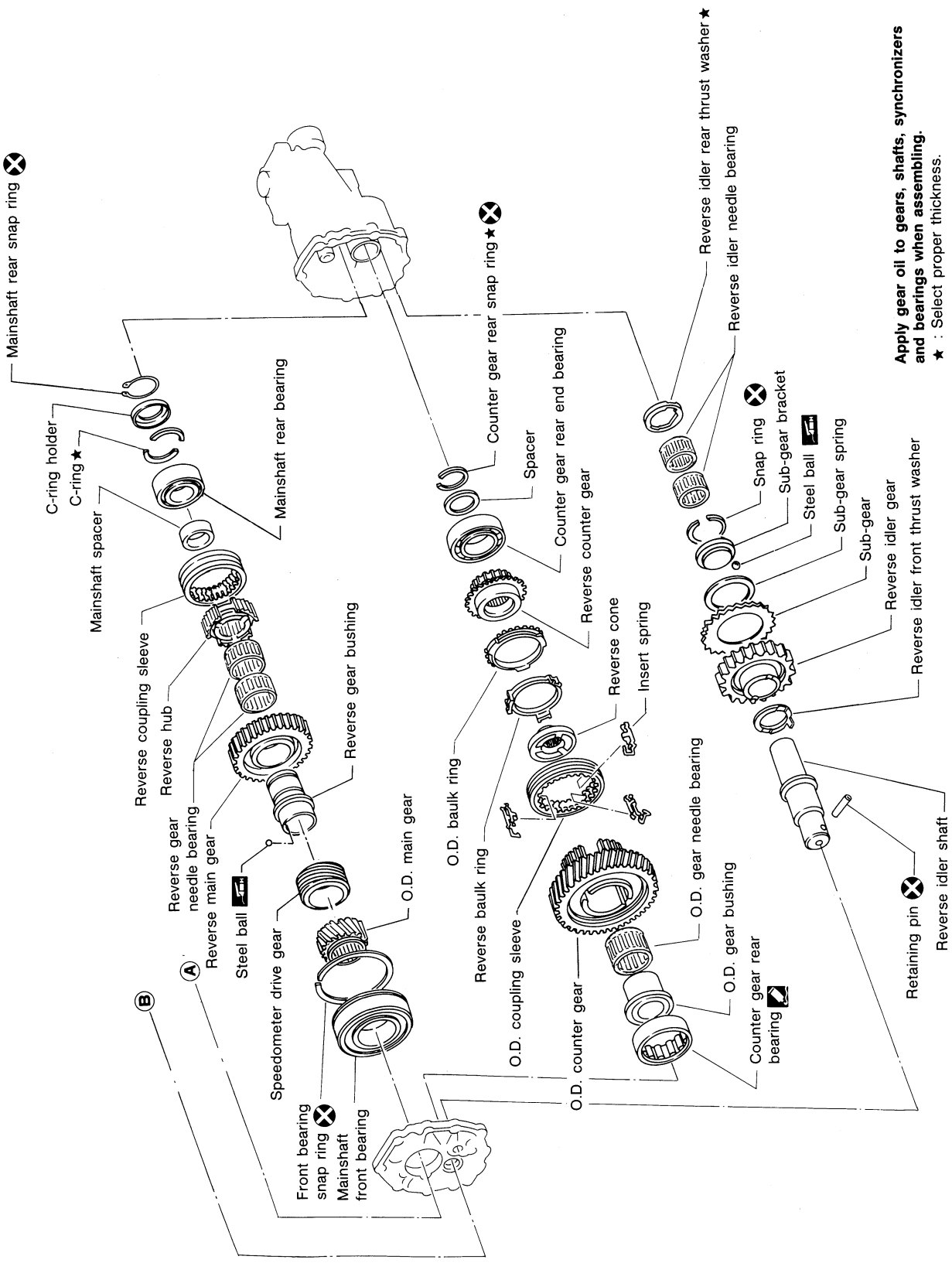
SMT323C

Gear Components



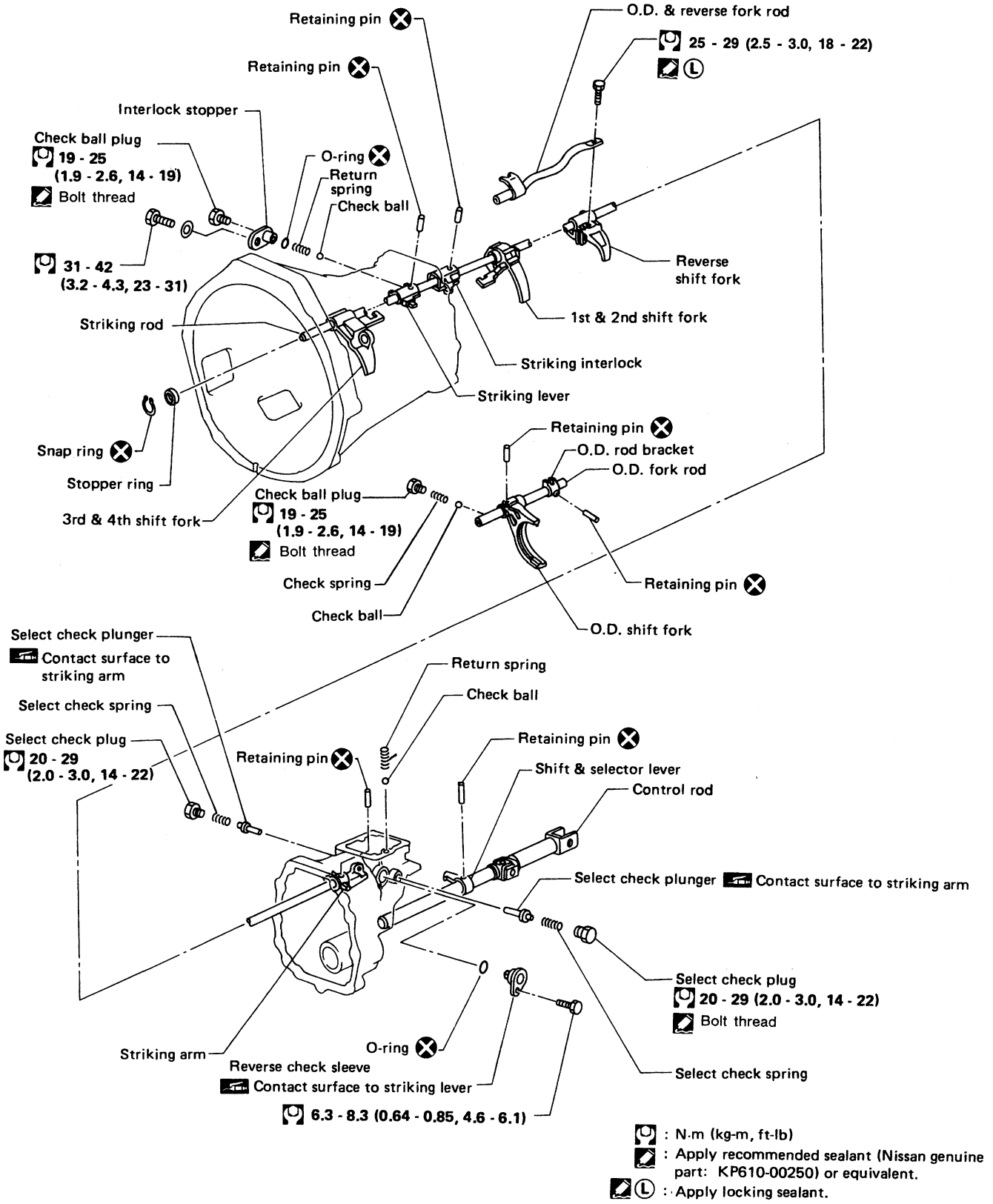
SMT324C

Gear Components (Cont'd)



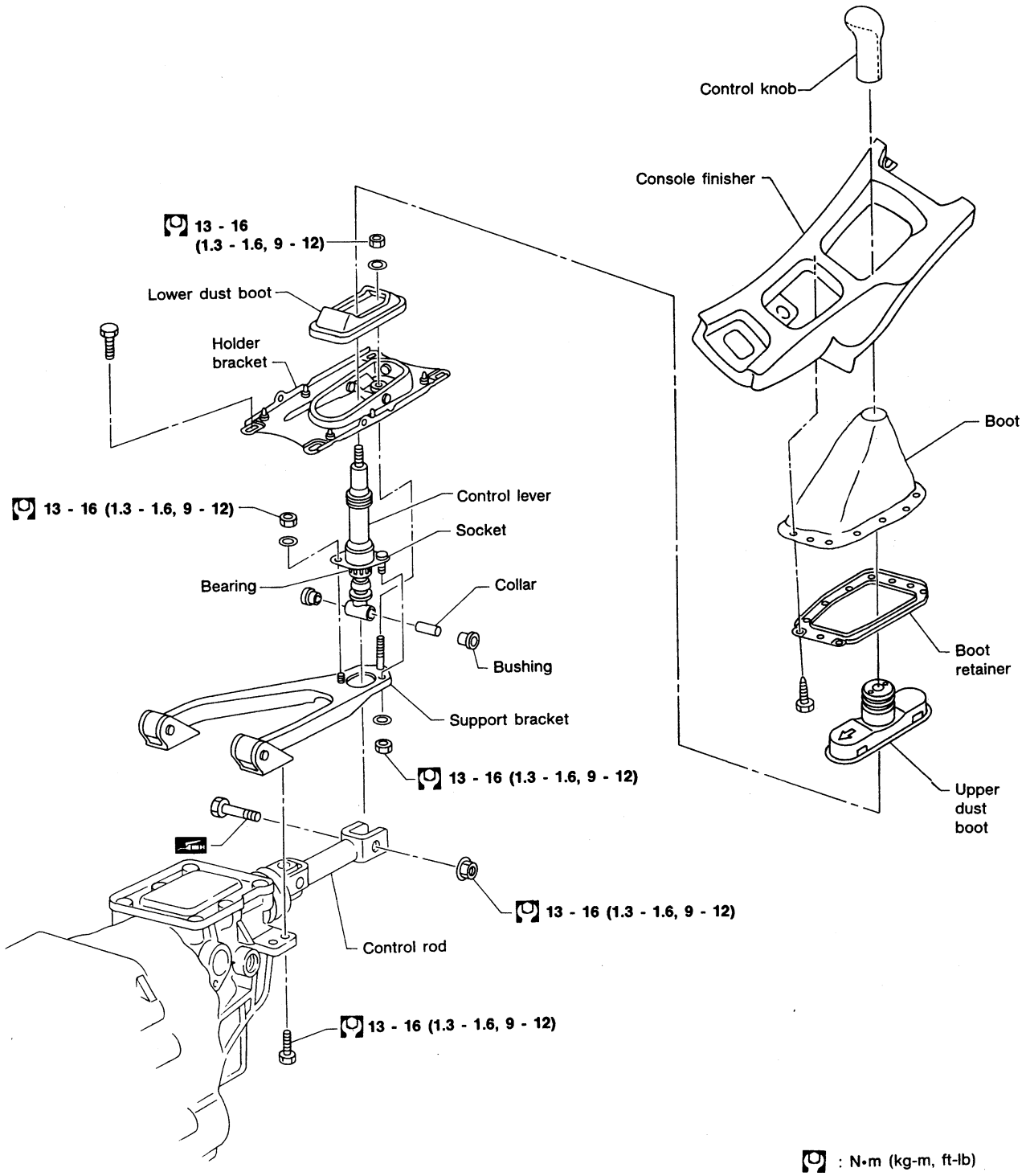
SMT501C

Shift Control Components

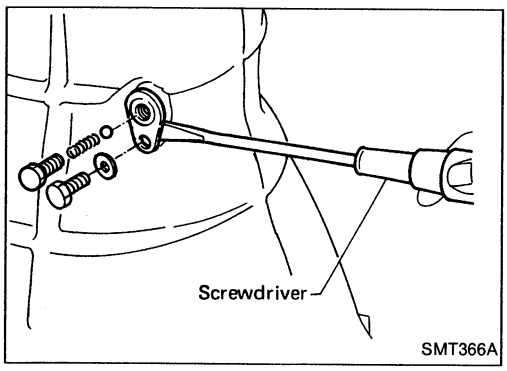


SMT607B

Shift Control Components (Cont'd)

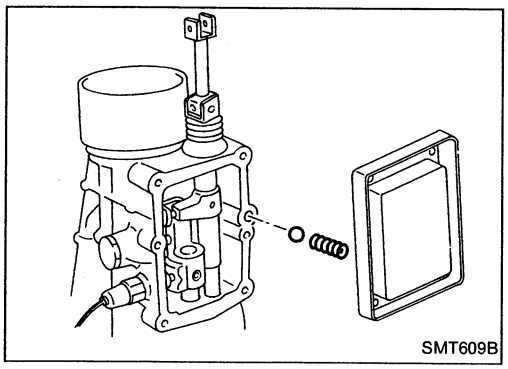


SMT651B

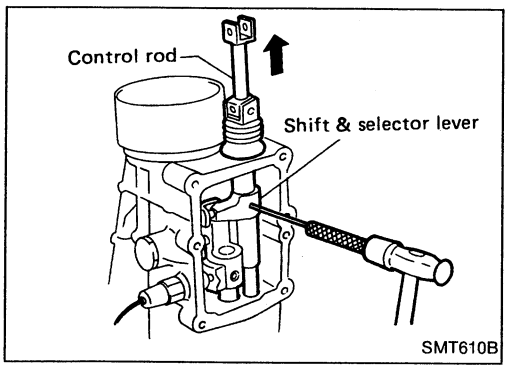


Case Components

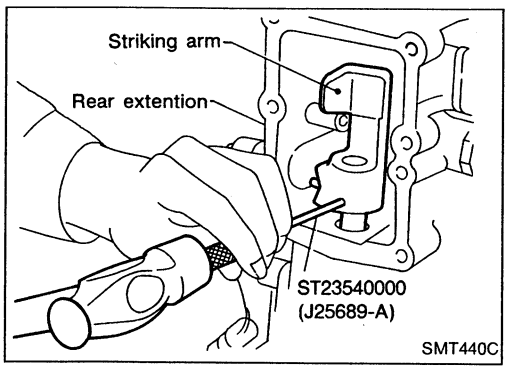
1. Remove check ball plug, check spring and check ball. Then remove interlock stopper.
   If interlock assembly is removed as a unit, the check ball can fall into transmission case.



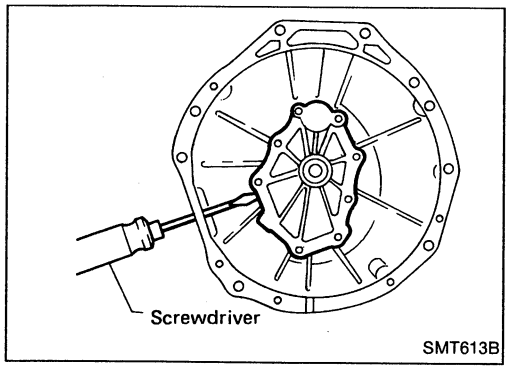
2. Remove upper cover, return spring and check ball.



3. Drive out retaining pin from shift & selector lever.
4. Remove control rod from M/T assembly.
   Be careful not to damage control rod oil seal and dust cover.

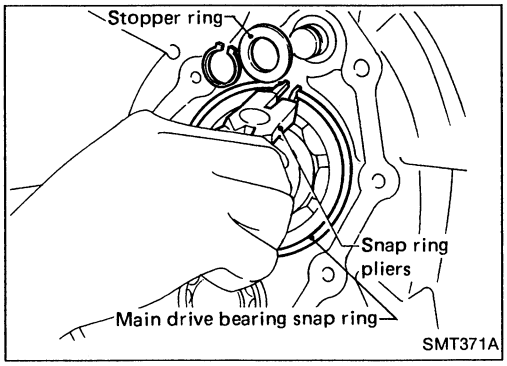


5. Drive out retaining pin from striking arm.
6. Remove rear extension together with striking arm by tapping lightly.

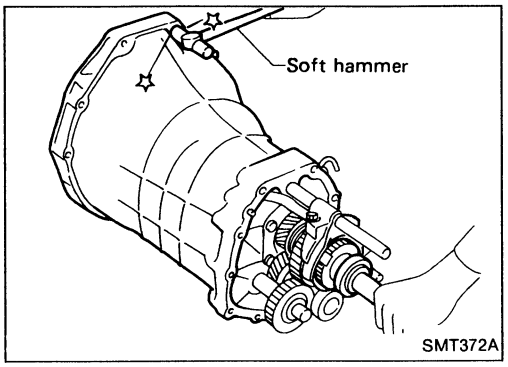


7. Remove front cover and gasket.

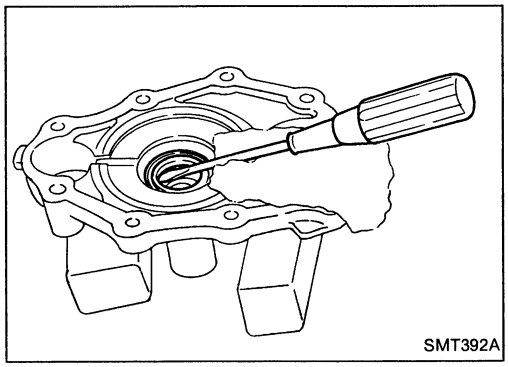
Case Components (Cont'd)



8. Remove stopper ring and main drive bearing snap ring.

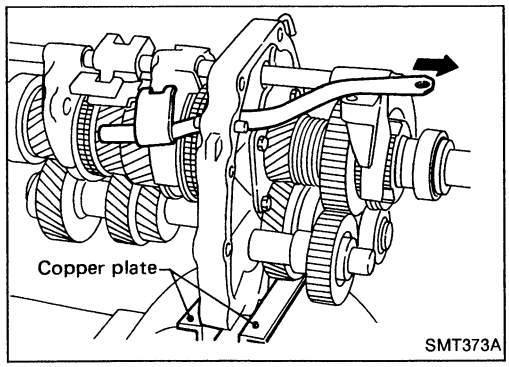


9. Remove transmission case by tapping lightly.

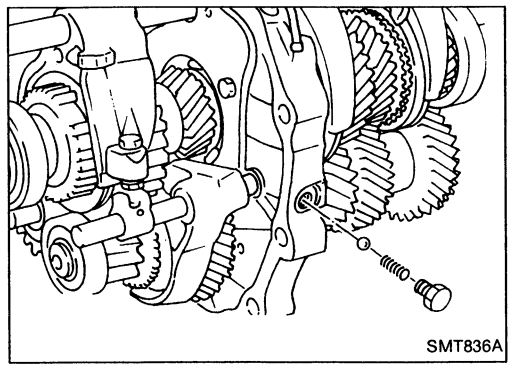


10. Remove front cover oil seal.

Shift Control Components

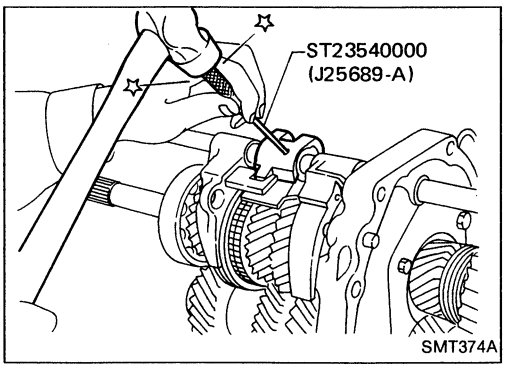


1. Mount adapter plate on vise.
2. Remove O.D. & reverse fork rod.

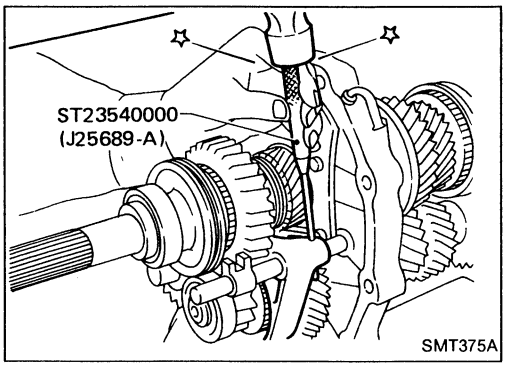


3. Remove check ball plug, check ball and return spring.

Shift Control Components (Cont'd)

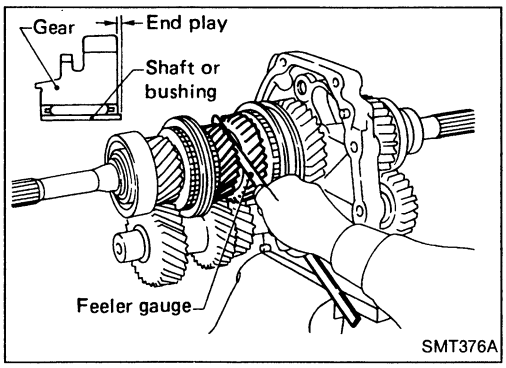


4. Drive out retaining pin from striking lever.
5. While pulling out striking rod, remove striking lever and striking interlock. Then remove 1st & 2nd, 3rd & 4th and reverse shift forks.



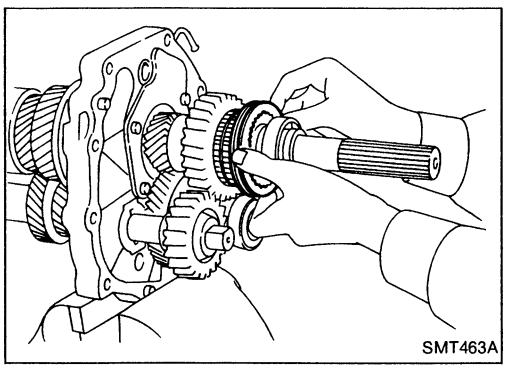
6. Drive out retaining pin from O.D. shift fork.
7. Pull out O.D. fork rod and then remove O.D. shift fork.

Gear Components



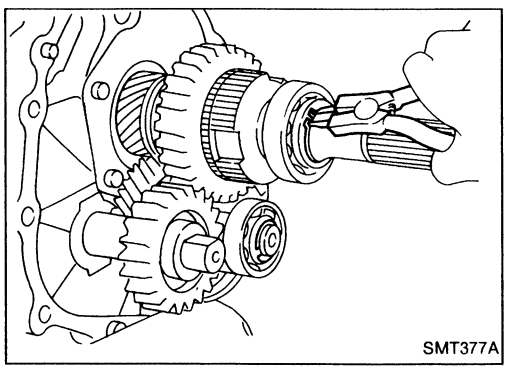
1. Before removing gears and shafts, measure each gear end play.
   Gear end play:
   Refer to S.D.S.

- If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.



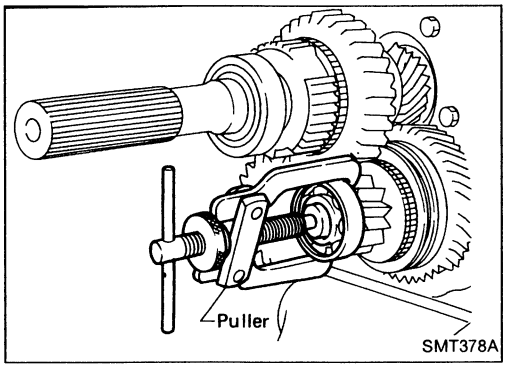
2. Remove rear side components on mainshaft and counter gear.

a. Remove snap ring, speedometer drive gear and steel ball.
b. Remove reverse coupling sleeve.

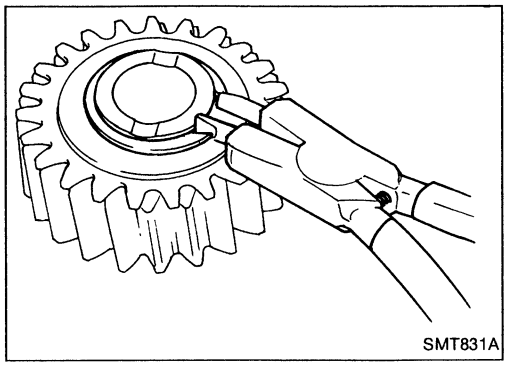


c. Remove mainshaft rear snap ring and counter gear rear snap ring.
d. Remove C-ring holder and mainshaft C-rings from mainshaft. Use punch and hammer to remove C-rings.

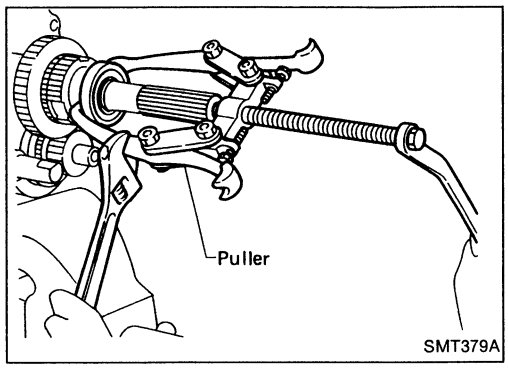
Gear Components (Cont'd)



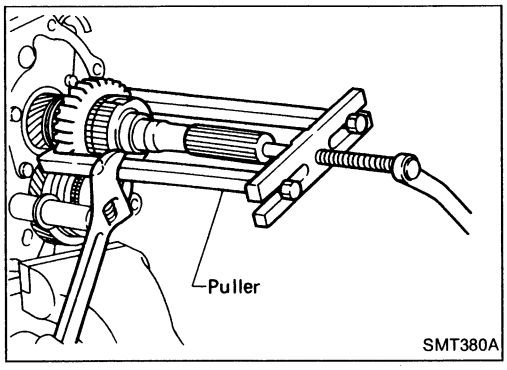
e. Pull out counter gear rear end bearing.
f. Remove reverse idler gear and reverse idler thrust washers.



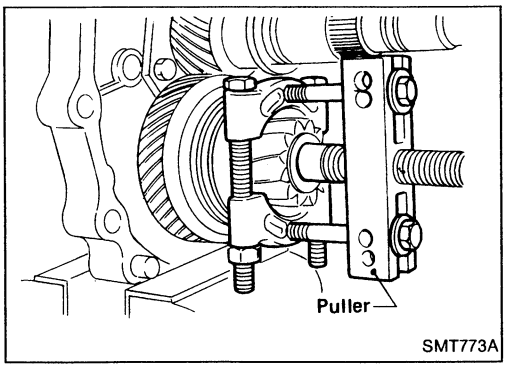
g. Remove sub-gear from reverse idler gear.



h. Pull out mainshaft rear bearing.

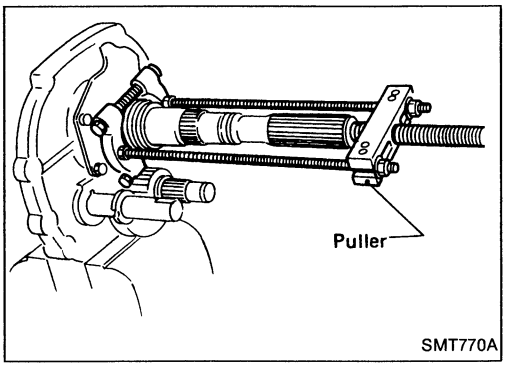


i. Pull out reverse main gear together with mainshaft spacer and reverse synchronizer hub. Then remove reverse gear needle bearings.

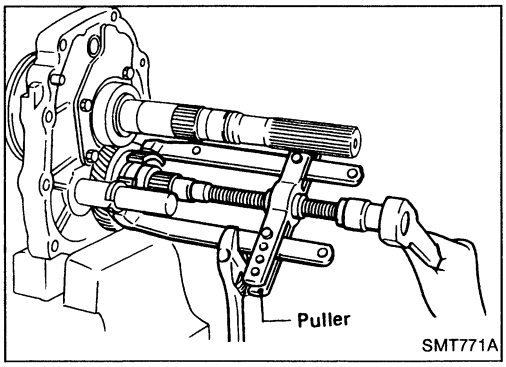


j. Pull out reverse counter gear.
k. Remove O.D. coupling sleeve together with O.D. baulk ring, reverse baulk ring and spring inserts.

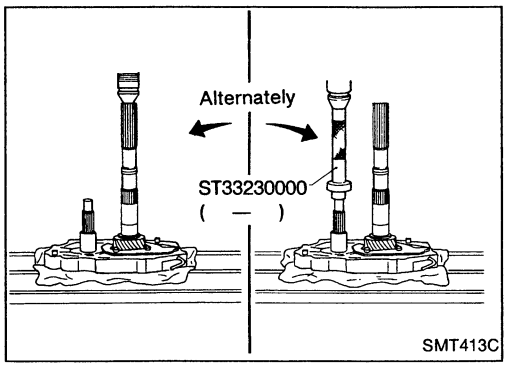
Gear Components (Cont'd)



l. Pull out reverse gear bushing.

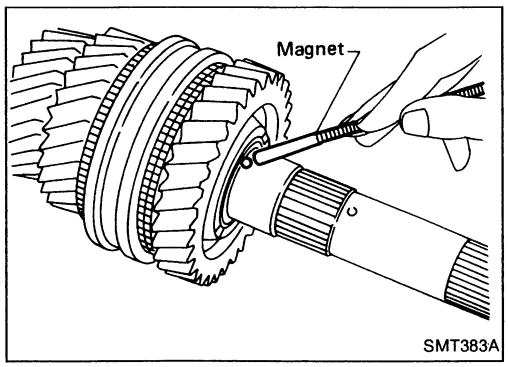


m. Pull out O.D. counter gear together with reverse cone.

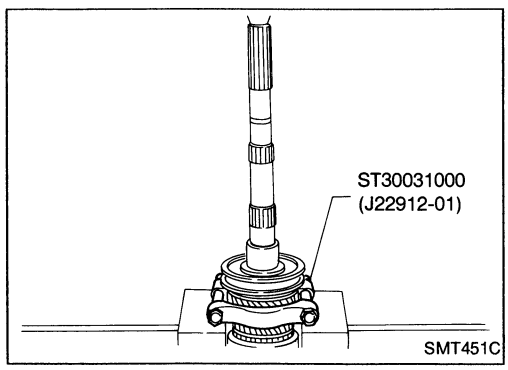


3. Press out mainshaft and counter gear alternately.

- **Be sure to press mainshaft and counter gear alternately so as not to allow the front surface of one to contact the rear surface of the other.**

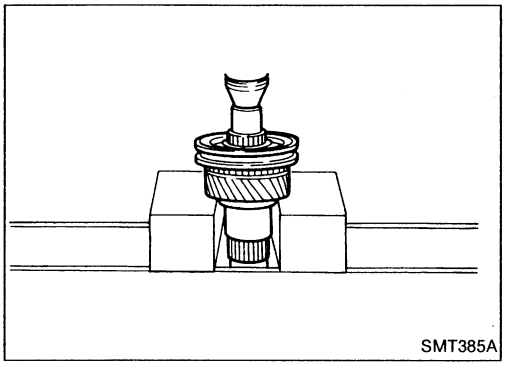


4. Remove front side components on mainshaft.
a. Remove 1st gear washer and steel ball.
b. Remove 1st main gear and 1st gear needle bearing.

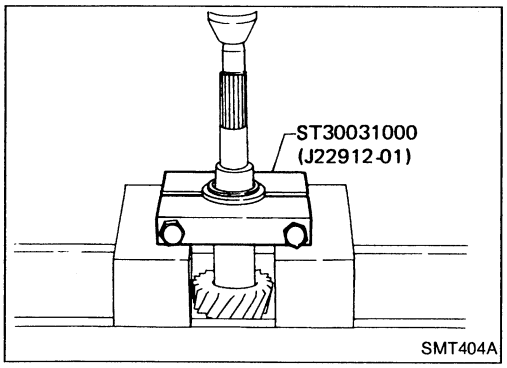


c. Press out 2nd main gear together with 1st gear bushing and 1st & 2nd synchronizer assembly.
d. Remove mainshaft front snap ring.

Gear Components (Cont'd)

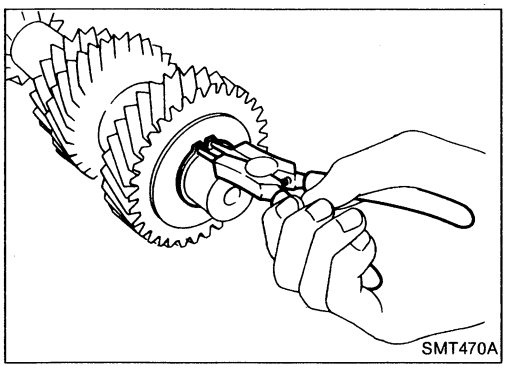

SMT385A

e. Press out 3rd main gear together with 3rd & 4th synchronizer assembly and 3rd gear needle bearing.

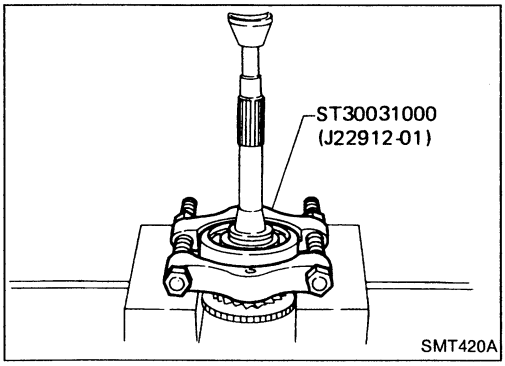


SMT404A

5. Remove front side components on counter gear.
a. Remove counter gear rear thrust bearing.


SMT470A

b. Remove sub-gear components.

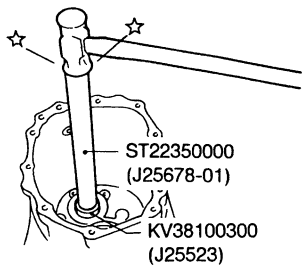


SMT420A

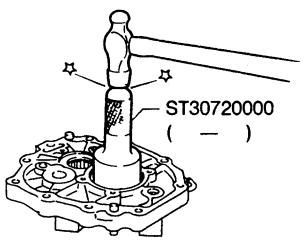
6. Remove main drive gear bearing.
a. Remove main drive gear snap ring and spacer.
b. Press out main drive gear bearing.

7. Remove bearings from case components.

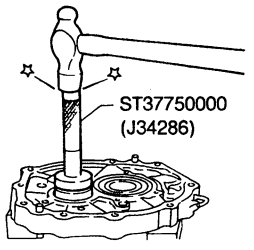
Counter gear front bearing in transmission case



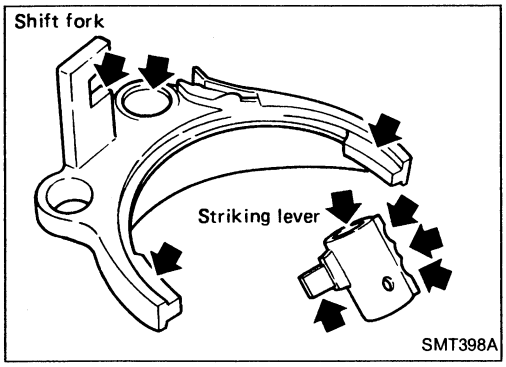
Mainshaft front bearing in adapter plate



Counter gear rear bearing in adapter plate

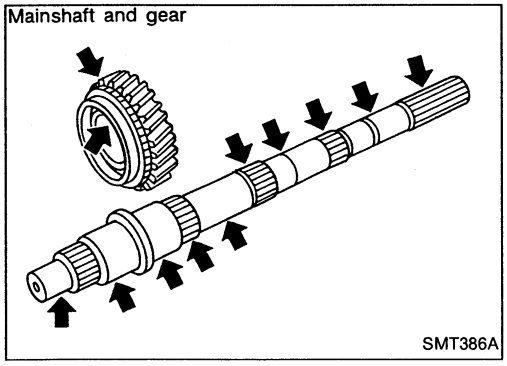


SMT136C



Shift Control Components

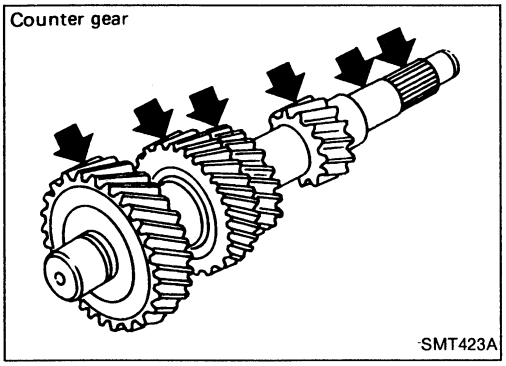
- Check contact surface and sliding surface for wear, scratches, projections or other damage.

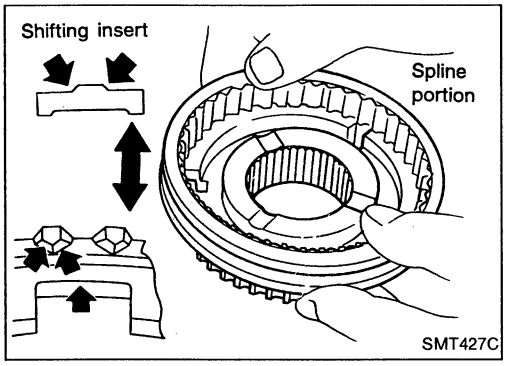


Gear Components

GEARS AND SHAFTS

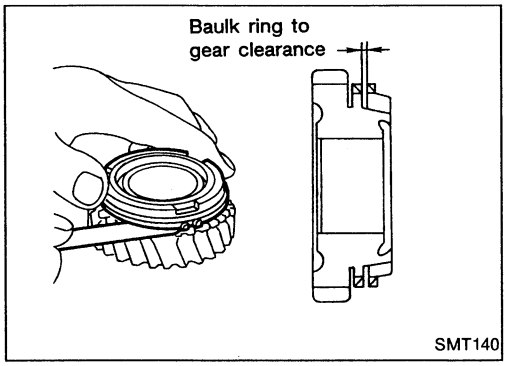
- Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.





SYNCHRONIZERS

- Check spline portion of coupling sleeves, hubs, and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.
- Check insert springs for deformation.



Clearance between baulk ring and gear

- Measure wear of main drive, 1st and O.D. baulk rings.

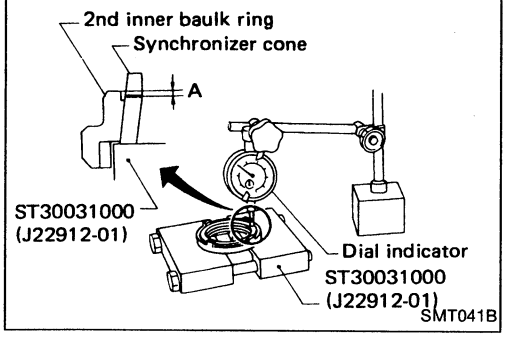
Unit: mm (in)

	Standard	Wear limit
1st	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
Main drive	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
O.D.	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)

If the clearance is smaller than the wear limit, replace baulk ring.

Gear Components (Cont'd)

Inner baulk ring



- Measure wear of 2nd and 3rd baulk rings.

a. Place baulk rings in position on synchronizer cone.

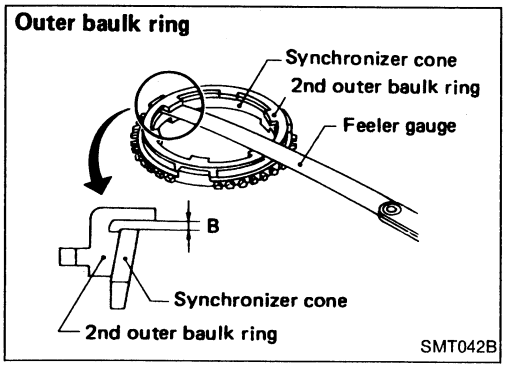
b. While holding baulk rings against synchronizer cone as far as it will go, measure dimensions "A" and "B".

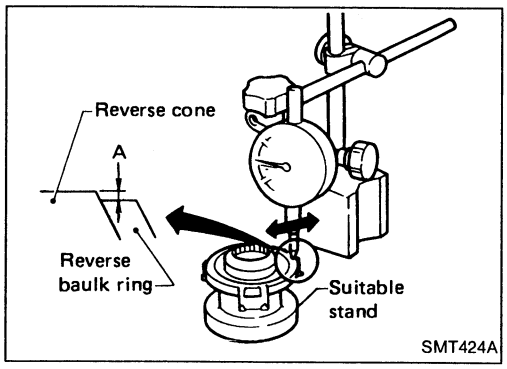
Unit: mm (in)

Dimension	Standard	Wear limit
A	0.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)
B	0.7 - 0.9 (0.028 - 0.035)	

c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.

Outer baulk ring





- Measure wear of reverse baulk ring.

a. Place baulk ring in position on reverse cone.

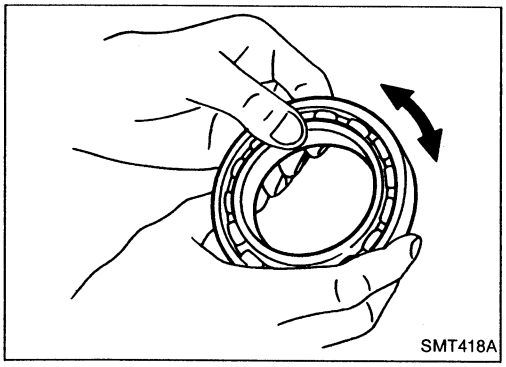
b. While holding baulk ring against reverse cone as far as it will go, measure dimension "A" with dial indicator.

Dimension "A":

Standard –0.1 to 0.35 mm (–0.0039 to 0.0138 in)

Wear limit 0.7 mm (0.028 in)

c. If dimension "A" is larger than the wear limit, replace baulk ring.

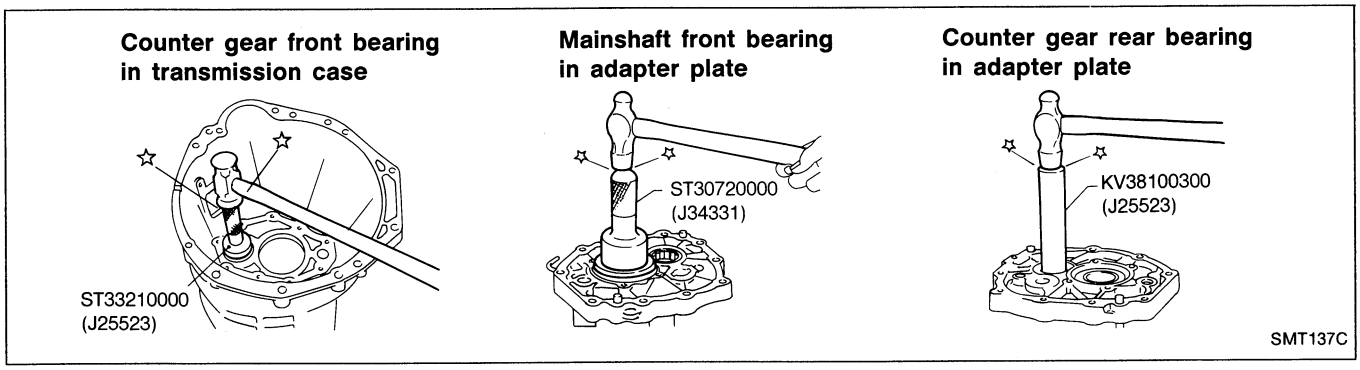


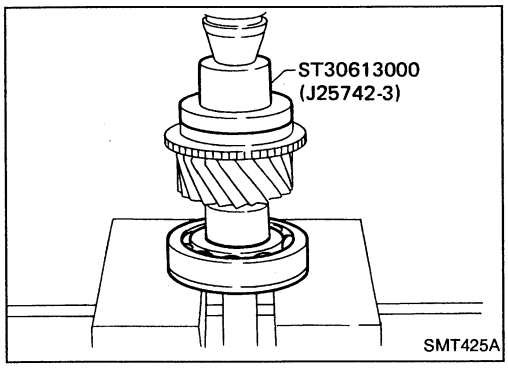
BEARINGS

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

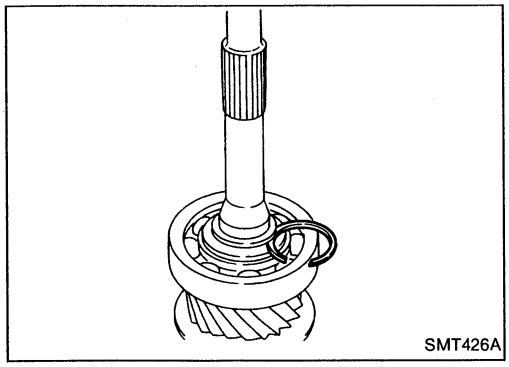
Gear Components

1. Install bearings into case components.

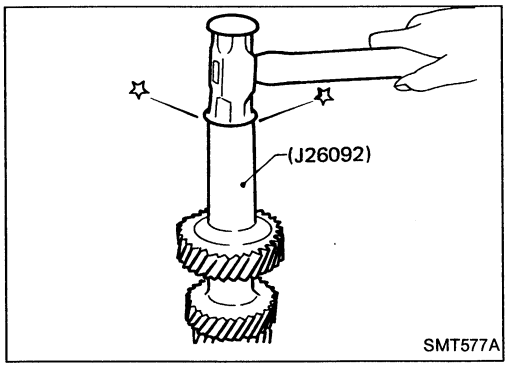




2. Install main drive gear bearing.
a. Press main drive gear bearing.
b. Install main drive gear spacer.

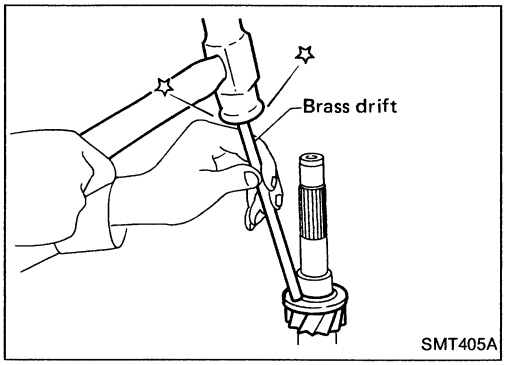


c. Select proper main drive gear snap ring to minimize clearance of groove.
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)
Main drive gear snap ring:
Refer to S.D.S.
d. Install selected snap ring on main drive gear.

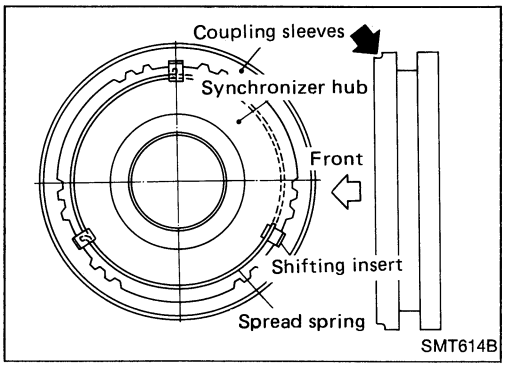


3. Install components on counter gear.
a. Install sub-gear components.
When installing sub-gear snap ring, tap sub-gear snap ring into position on counter gear.

Gear Components (Cont'd)

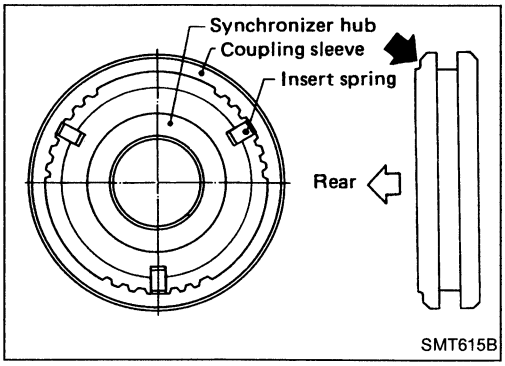


b. Install counter gear rear thrust bearing.

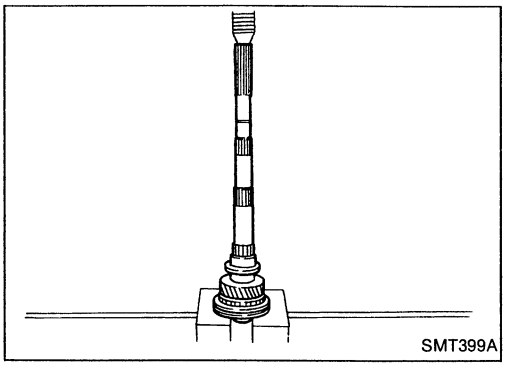


4. Install front side components on mainshaft.

a. Assemble 1st & 2nd synchronizer.

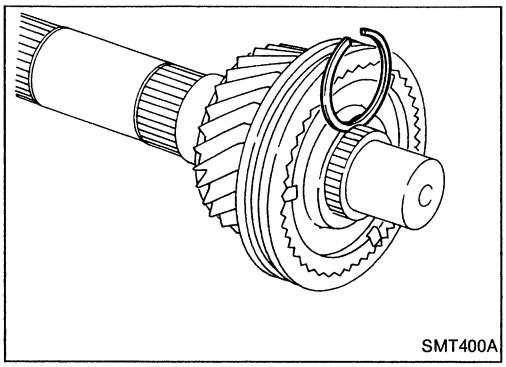


b. Assemble 3rd & 4th synchronizer.



c. Press on 3rd & 4th synchronizer assembly together with 3rd main gear and 3rd gear needle bearing.

Pay attention to direction of synchronizer assembly.

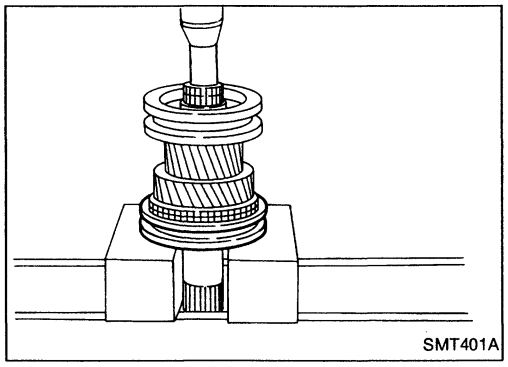


d. Select proper snap ring to minimize clearance of groove.

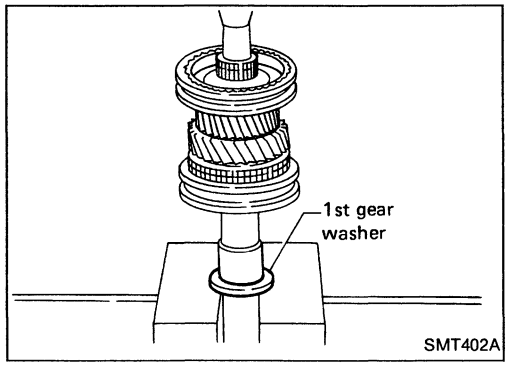
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)
Mainshaft front snap ring:
Refer to S.D.S.

e. Install selected snap ring on mainshaft.

Gear Components (Cont'd)

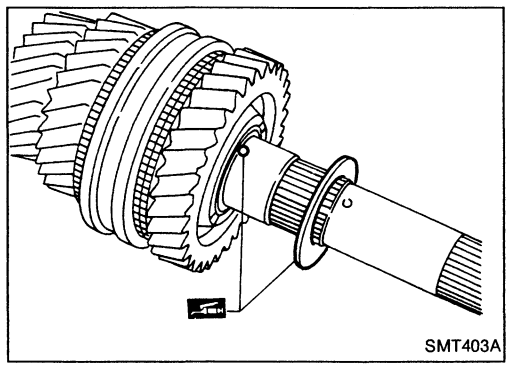

SMT401A

f. Press on 1st & 2nd synchronizer assembly together with 2nd main gear and 2nd gear needle bearing.

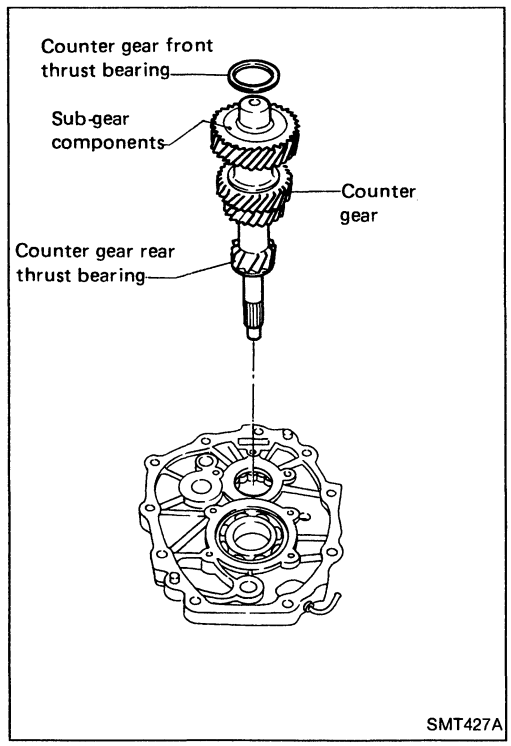


SMT402A

g. Press on 1st gear bushing using 1st gear washer.
h. Install 1st main gear and needle bearing.


SMT403A

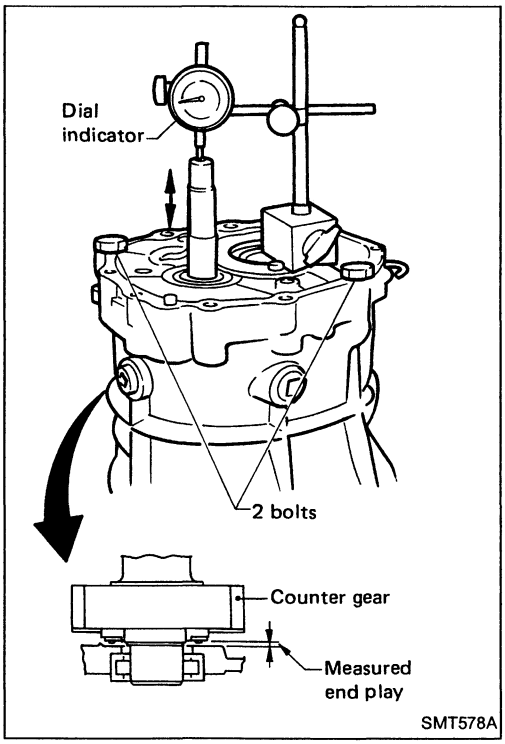
i. Install steel ball and 1st gear washer.
Apply multi-purpose grease to steel ball and 1st gear washer before installing.



SMT427A

5. Select proper counter gear front bearing shim when replacing transmission case, counter gear, counter gear thrust bearing or sub-gear components.
a. Install counter gear with sub-gear components, counter gear front and rear thrust bearing on adapter plate.
b. Remove counter gear front bearing shim from transmission case.
c. Place adapter plate and counter gear assembly in transmission case (case inverted).

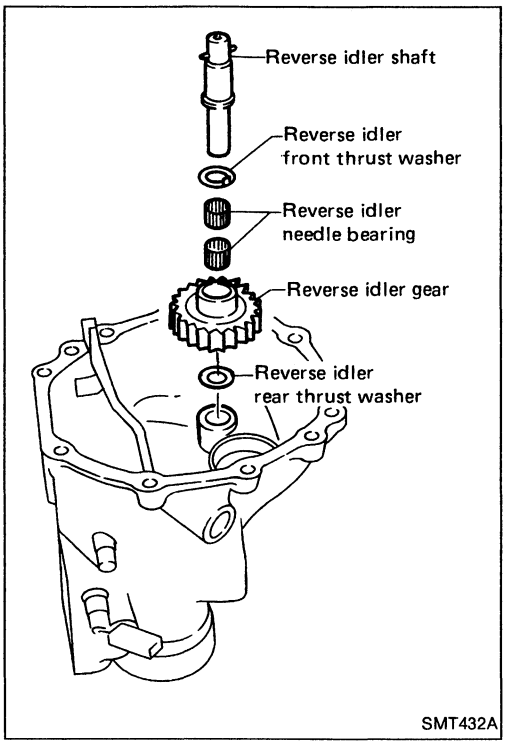
Gear Components (Cont'd)



d. Tighten adapter plate to transmission case using 2 bolts.
e. Place dial indicator on rear end of counter gear.
f. Move counter gear up and down and measure dial indicator deflection.
g. Select proper shim using table in S.D.S. as a guide.

Counter gear end play:
0.10 - 0.25 mm (0.0039 - 0.0098 in)

Table for selecting proper counter gear front bearing shim:
Refer to S.D.S.



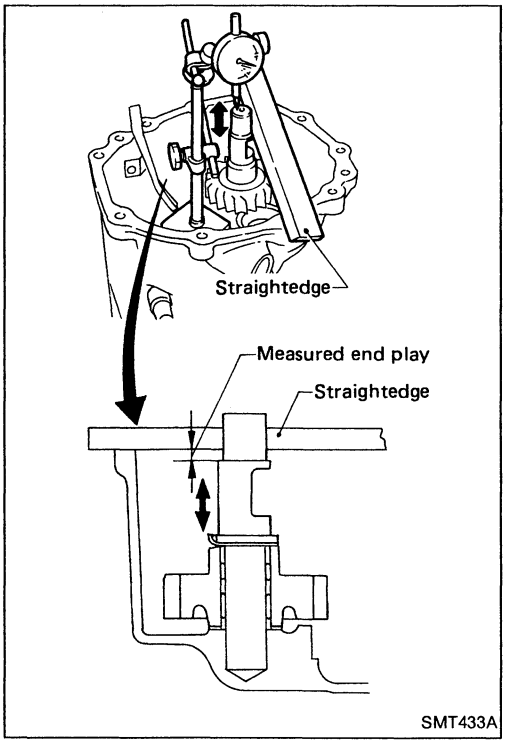
6. Select proper reverse idler rear thrust washer when replacing rear extension, reverse idler gear, reverse idler shaft or reverse idler thrust washer.
a. Install reverse idler gear, reverse idler needle bearings, reverse idler thrust washers and reverse idler shaft into rear extension.

When replacing reverse idler rear washer, install either A or B.

Reverse idler rear thrust washer

	Thickness mm (in)	Part number
A	1.97 (0.0776)	32284-01G10
B	2.07 (0.0815)	32284-01G11

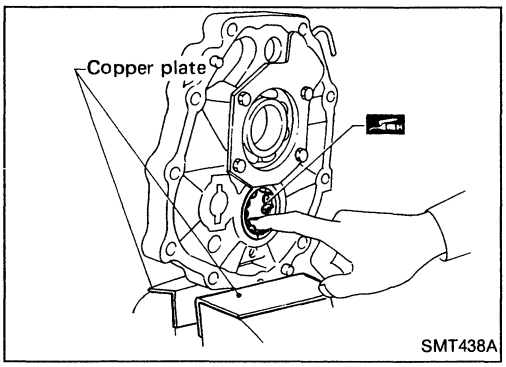
Gear Components (Cont'd)



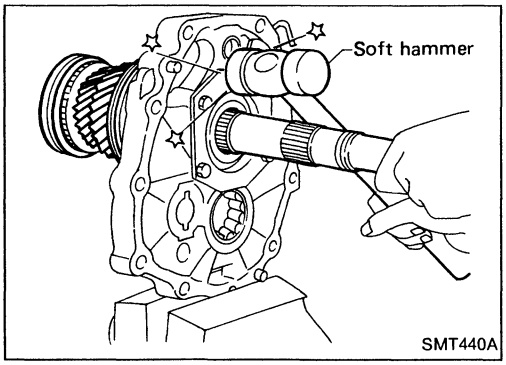
b. Place dial indicator on front end of reverse idler shaft.
c. Put straightedge on front surface of rear extension as a stopper of reverse idler shaft.
d. Move reverse idler shaft up and down and measure reverse idler gear end play.

Reverse idler gear end play:
0.30 - 0.53 mm (0.0118 - 0.0209 in)

e. If not within specification, replace reverse idler rear thrust washer with the other (A or B) and check again.

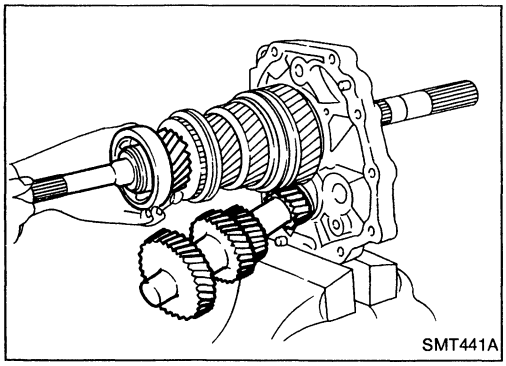


7. Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft.
a. Mount adapter plate on vise and apply multi-purpose grease to counter gear rear bearing.



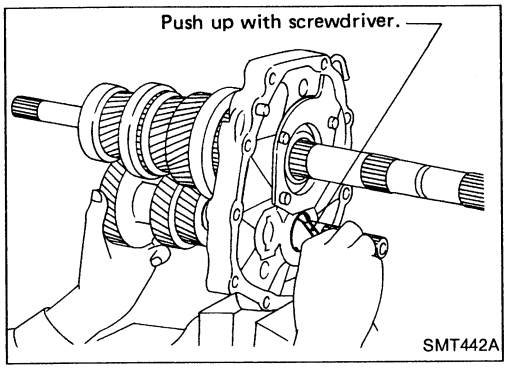
b. Install mainshaft a little on mainshaft front bearing.

To allow for installation of counter gear, do not install mainshaft completely.

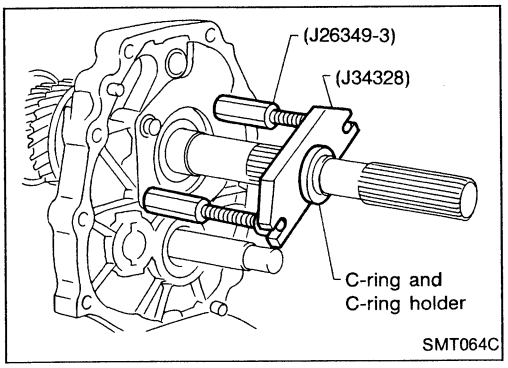


c. Install counter gear on counter gear rear bearing and install main drive gear, pilot bearing and spacer on mainshaft.

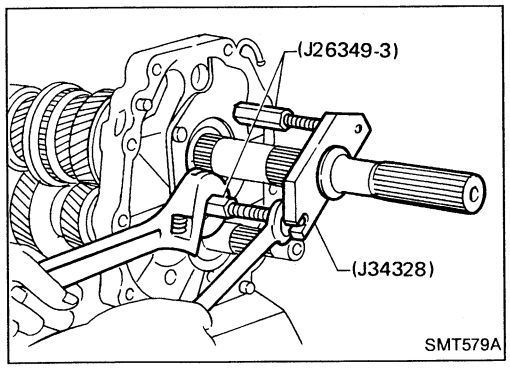
Gear Components (Cont'd)



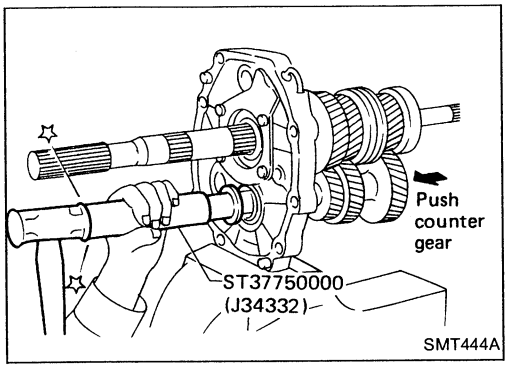
When installing counter gear into counter gear rear bearing, push up on upper roller of counter gear rear bearing with screwdriver.



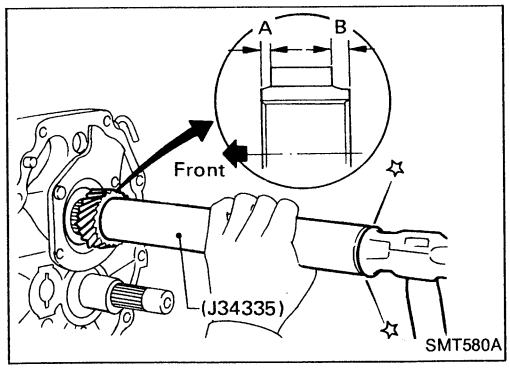
d. Install Tools (J26349-3) onto adapter plate and C-ring and C-ring holder on mainshaft.
e. Install Tool (J34328) on mainshaft.



f. Install mainshaft and counter gear completely by extending length of J26349-3.

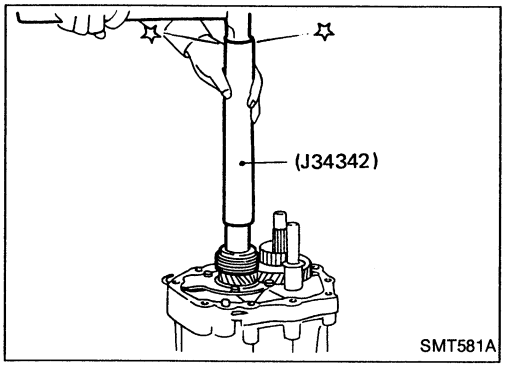


8. Install rear side components on mainshaft and counter gear.
a. Install O.D. gear bushing while pushing on the front of counter gear.

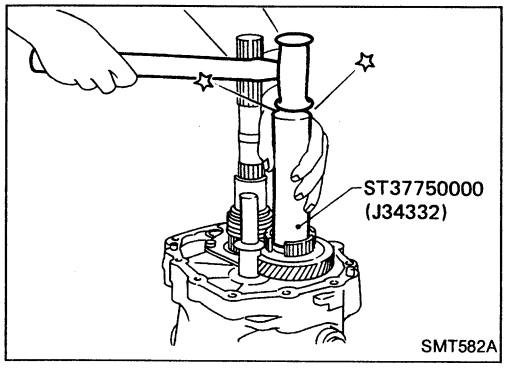


b. Install O.D. main gear.
Pay attention to direction of O.D. main gear. (B is wider than A as shown at left.)
c. Install adapter plate with gear assembly onto transmission case.
d. Install O.D. gear needle bearing and then install O.D. counter gear and reverse idler shaft.

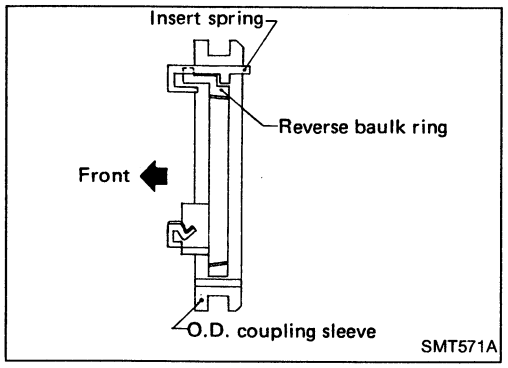
Gear Components (Cont'd)



e. Install reverse gear bushing.

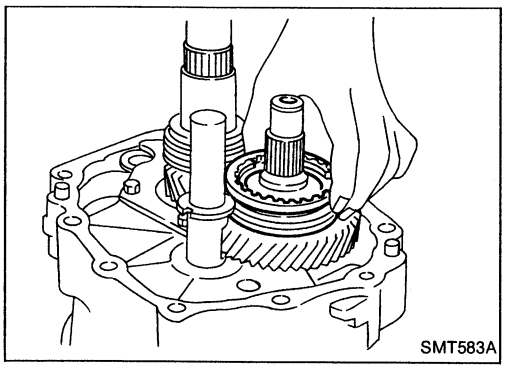


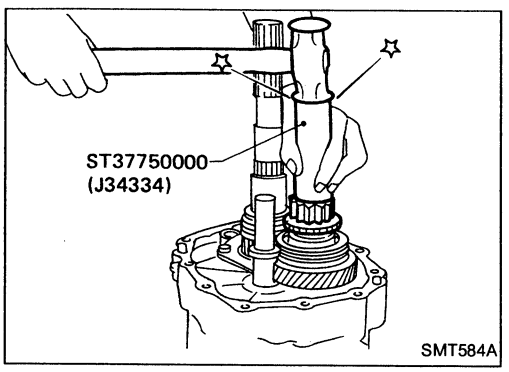
f. Install reverse cone.



g. Install insert springs and reverse baulk ring on O.D. coupling sleeve. Then install them and O.D. baulk ring on O.D. counter gear.

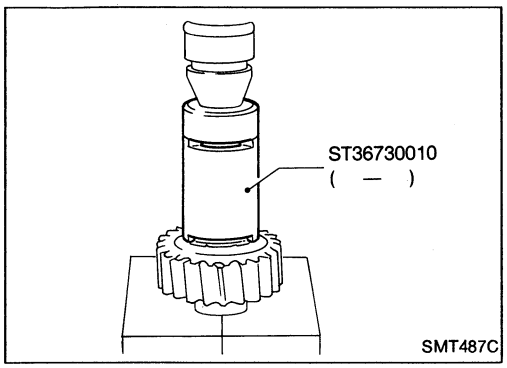
Pay attention to direction of O.D. coupling sleeve.



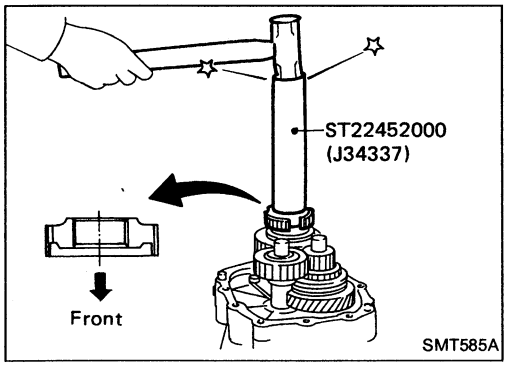


h. Install reverse counter gear.

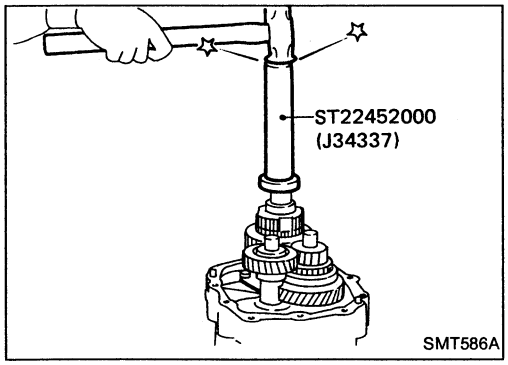
Gear Components (Cont'd)



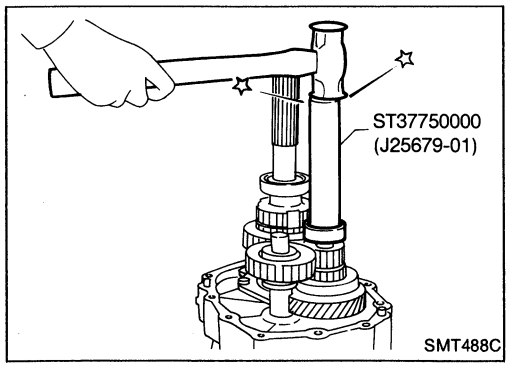
i. Install sub-gear on reverse idler gear.
j. Install reverse gear needle bearing and then install reverse main gear, reverse idler gear and reverse idler thrust washers.



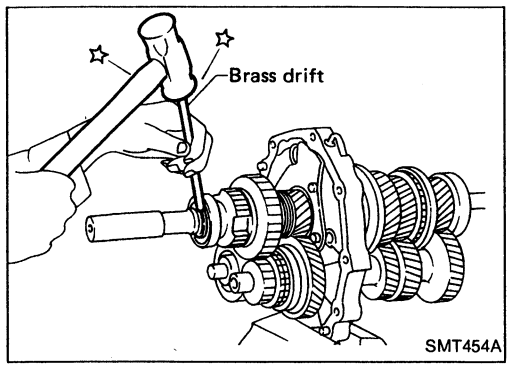
k. Install reverse hub.
Pay attention to its direction.



l. Install mainshaft spacer and mainshaft rear bearing.
m. Install speedometer drive gear.

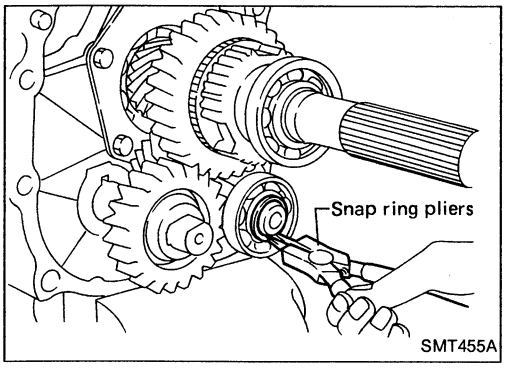


n. Install counter gear rear end bearing.
o. Separate adapter plate from transmission case and Mount adapter plate on vise again.



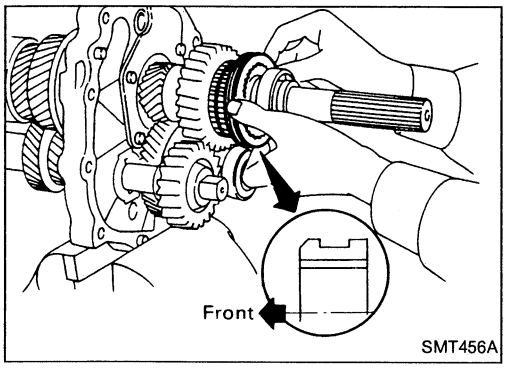
p. Select proper mainshaft C-ring to minimize clearance of groove.
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)
Mainshaft C-ring:
Refer to S.D.S.
q. Install selected C-ring, C-ring holder and mainshaft rear snap ring.

Gear Components (Cont'd)



r. Install spacer and then select proper counter gear rear snap ring to minimize clearance of groove.
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)
Counter gear rear snap ring:
Refer to S.D.S.

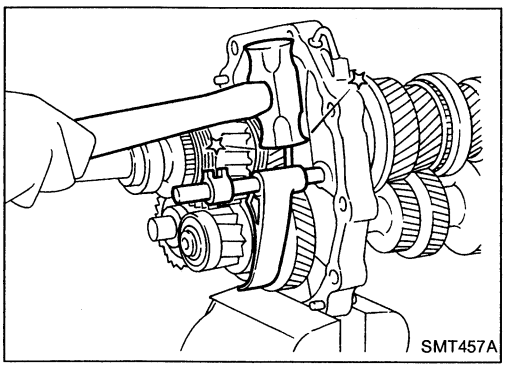
s. Install selected counter gear rear snap ring.



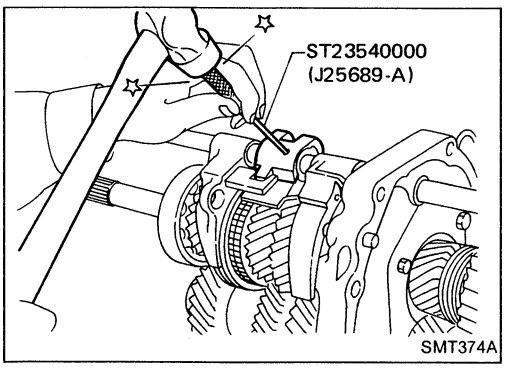
t. Install reverse coupling sleeve.
Pay attention to its direction.

u. Measure each gear end play as a final check — Refer to "DISASSEMBLY".

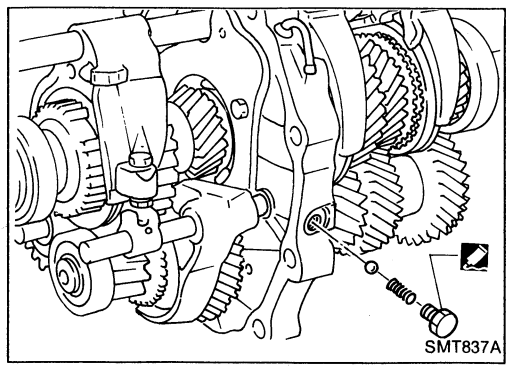
Shift Control Components



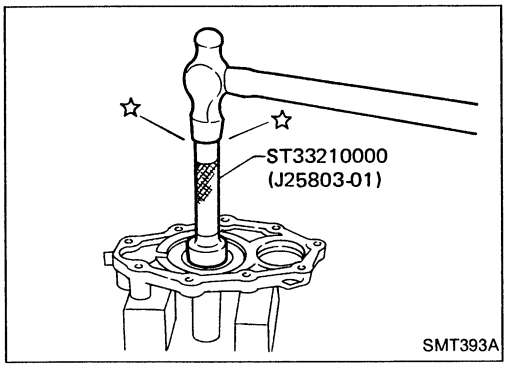
1. Install O.D. fork rod and O.D. shift fork. Then install retaining pin into O.D. shift fork.
2. Install 1st & 2nd, 3rd & 4th and reverse shift forks onto coupling sleeve.



3. Install striking rod into hole of shift forks, striking lever and interlock and then install retaining pin into striking lever.
Make sure that striking rod moves smoothly.

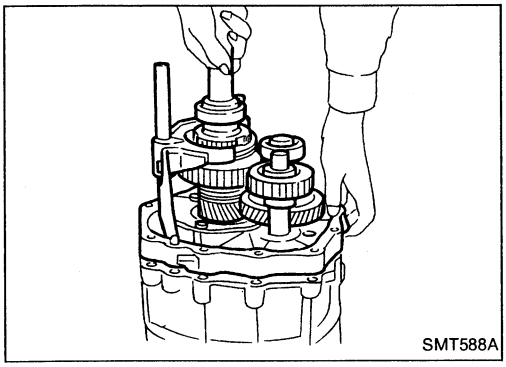


4. Install check ball, return spring and check ball plug.
Apply sealant to thread of check ball plug.

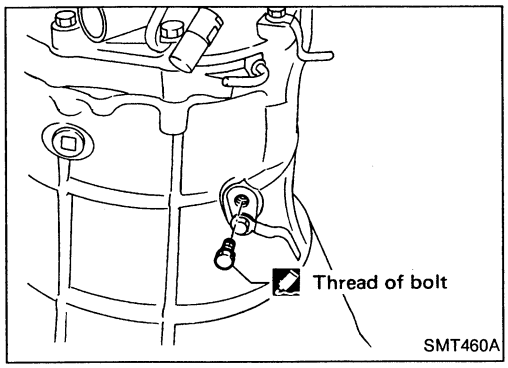


Case Components

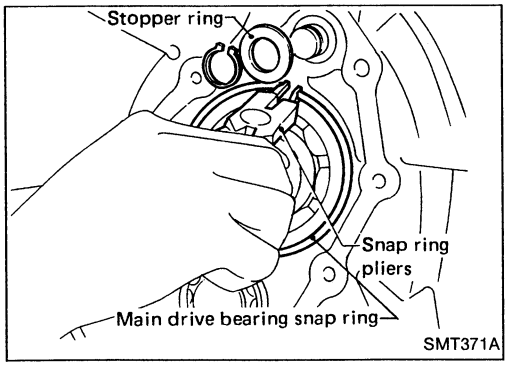
1. Install front cover oil seal.
   Apply multi-purpose grease to seal lip.
2. Install selected counter gear front bearing shim onto transmission case.
   Apply multi-purpose grease.
3. Apply sealant to mating surface of transmission case.



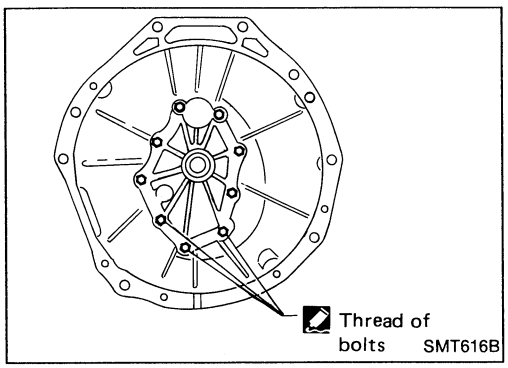
4. Install gear assembly onto transmission case.
5. Install check spring and check ball into interlock stopper.
   Apply multi-purpose grease to check ball.



6. Install interlock stopper assembly and then tighten check ball plug.
   Apply sealant to thread of check ball plug.

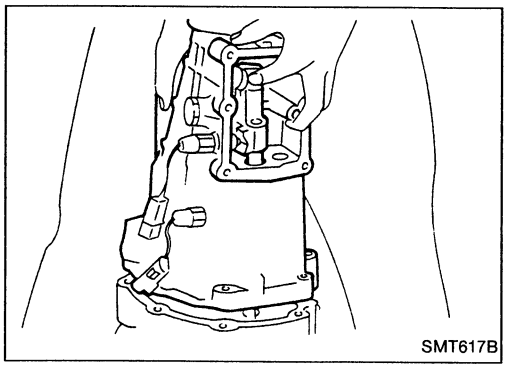


7. Install stopper ring and main drive bearing snap ring.

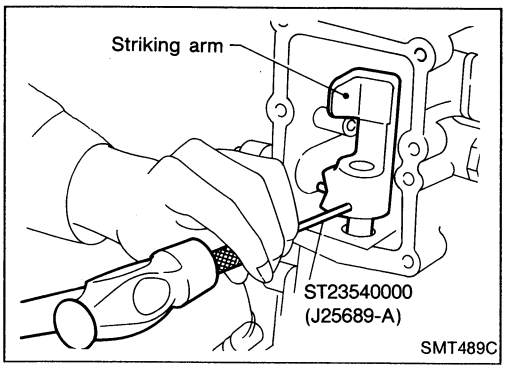


8. Install front cover and gasket.
   Apply sealant to thread of 3 bolts shown left.
9. Apply sealant to mating surface of adapter plate.

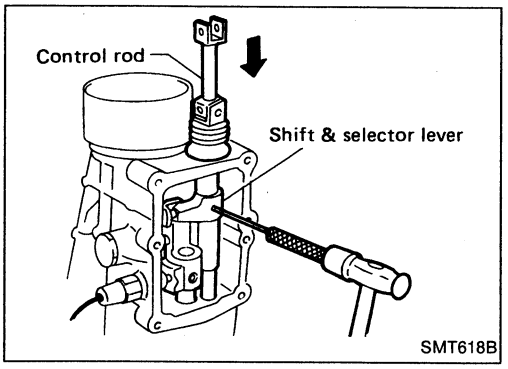
Case Components (Cont'd)



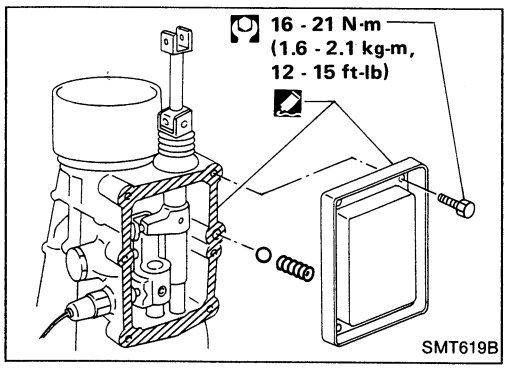
10. Install rear extension together with striking arm.



11. Install retaining pin into striking arm.

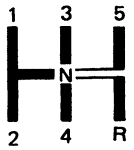


12. Install control rod.
    Be careful not to damage control rod oil seal and dust cover.
13. Install retaining pin into shift & selector lever.



14. Install return spring and check ball and then install control housing.
    Apply sealant to mating surface of rear extension.
15. Tighten control housing bolts.

General Specifications

Engine	VG30DE, VG30DETT
Transmission model	RS5R30A
Shift pattern	
Synchromesh type	Warner

Gear ratio	
1st	3.214
2nd	1.925
3rd	1.302
4th	1.000
O.D.	0.752
Reverse	3.369

Number of teeth	
Main drive gear	23
Main gear	
1st	31
2nd	30
3rd	29
O.D.	24
Reverse	30
Counter drive gear	31
Counter gear	
1st	13
2nd	21
3rd	30
O.D.	43
Reverse	12
Reverse idler gear	22
Oil capacity liter (US pt, Imp pt)	2.8 (5-7/8, 4-7/8)

Inspection and Adjustment

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.23 - 0.33 (0.0091 - 0.0130)
2nd main gear	0.23 - 0.33 (0.0091 - 0.0130)
3rd main gear	0.23 - 0.33 (0.0091 - 0.0130)
O.D. counter gear	0.23 - 0.33 (0.0091 - 0.0130)
Reverse main gear	0.33 - 0.43 (0.0130 - 0.0169)
Counter gear	0.10 - 0.25 (0.0039 - 0.0098)
Reverse idler gear	0.30 - 0.53 (0.0118 - 0.0209)

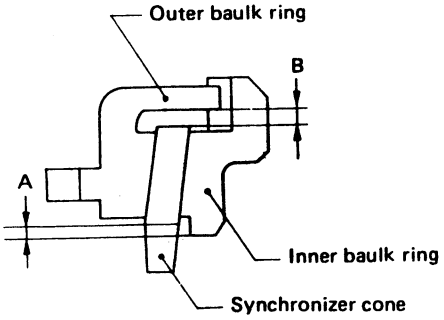
CLEARANCE BETWEEN BAULK RING AND GEAR

1st, main drive and O.D. baulk ring

Unit: mm (in)

	Standard	Wear limit
1st	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
Main drive	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
O.D.	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)

2nd and 3rd baulk ring



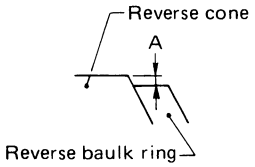
SMT044B

Unit: mm (in)

Dimension	Standard	Wear limit
A	0.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)
B	0.7 - 0.9 (0.028 - 0.035)	0.2 (0.008)

Inspection and Adjustment (Cont'd)

DISTANCE BETWEEN REAR SURFACE OF REVERSE CONE AND REVERSE BAULK RING



Unit: mm (in)

	Standard	Wear limit
Dimension "A"	–0.1 to 0.35 (–0.0039 to 0.0138)	0.7 (0.028)

AVAILABLE SNAP RING

Main drive gear snap ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.89 (0.0744)	32204-01G00
1.98 (0.0780)	32204-01G01
2.05 (0.0807)	32204-01G02
2.12 (0.0835)	32204-01G03
2.19 (0.0862)	32204-01G04

Mainshaft front snap ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.89 (0.0744)	32204-01G00
1.98 (0.0780)	32204-01G01
2.05 (0.0807)	32204-01G02
2.12 (0.0835)	32204-01G03
2.19 (0.0862)	32204-01G04

Counter gear rear snap ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.26 (0.0496)	32236-01G08
1.32 (0.0520)	32236-01G00
1.38 (0.0543)	32236-01G01
1.44 (0.0567)	32236-01G02
1.50 (0.0591)	32236-01G03
1.56 (0.0614)	32236-01G04
1.62 (0.0638)	32236-01G05
1.68 (0.0661)	32236-01G06
1.74 (0.0685)	32236-01G07

AVAILABLE C-RING

Mainshaft C-ring

Allowable clearance		0 - 0.1 mm (0 - 0.004 in)	
Thickness mm (in)	Part number	Thickness mm (in)	Part number
2.63 (0.1035)	32348-01G15	3.19 (0.1256)	32348-01G07
2.70 (0.1063)	32348-01G00	3.26 (0.1283)	32348-01G08
2.77 (0.1091)	32348-01G01	3.33 (0.1311)	32348-01G09
2.84 (0.1118)	32348-01G02	3.40 (0.1339)	32348-01G10
2.91 (0.1146)	32348-01G03	3.47 (0.1366)	32348-01G11
2.98 (0.1173)	32348-01G04	3.54 (0.1394)	32348-01G12
3.05 (0.1201)	32348-01G05	3.61 (0.1421)	32348-01G13
3.12 (0.1228)	32348-01G06	3.68 (0.1449)	32348-01G14

AVAILABLE SHIM AND WASHER

Table for selecting proper counter gear front bearing shim

Dial indication deflection mm (in)	Thickness of proper washer mm (in)	Part number
0.93 - 1.02 (0.0366 - 0.0402)	0.8 (0.031)	32218-01G00
1.03 - 1.12 (0.0406 - 0.0441)	0.9 (0.035)	32218-01G01
1.13 - 1.22 (0.0445 - 0.0480)	1.0 (0.039)	32218-01G02
1.23 - 1.32 (0.0484 - 0.0520)	1.1 (0.043)	32218-01G03
1.33 - 1.42 (0.0524 - 0.0559)	1.2 (0.047)	32218-01G04
1.43 - 1.52 (0.0563 - 0.0598)	1.3 (0.051)	32218-01G05
1.53 - 1.62 (0.0602 - 0.0638)	1.4 (0.055)	32218-01G06

Reverse idler rear thrust washer

Thickness mm (in)	Part number
1.97 (0.0776)	32284-01G10
2.07 (0.0815)	32284-01G11

AUTOMATIC TRANSMISSION

SECTION AT

CONTENTS

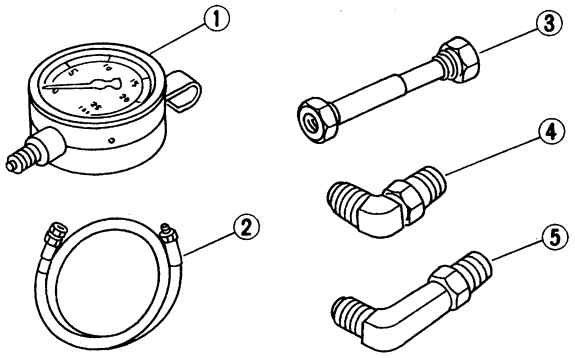
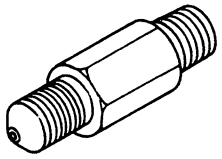
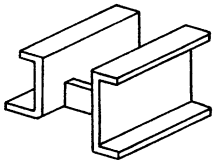
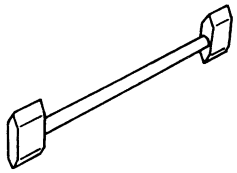
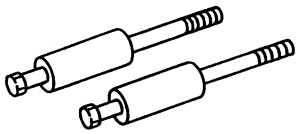
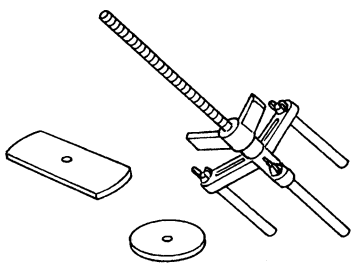
CONTENTS (Cont'd.)

When you read wiring diagrams:

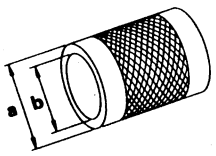
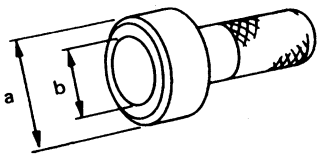
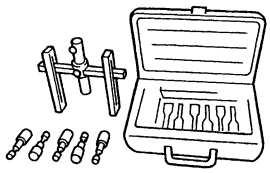
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

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

Special Service Tools

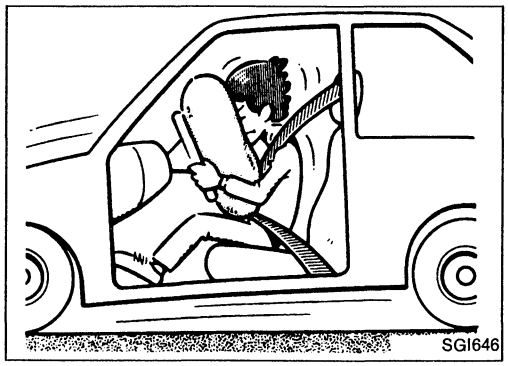
Tool number (Kent-Moore No.) Tool name	Description
ST2505S001 (J25695-A) Oil pressure gauge set ① ST25051001 (—) Oil pressure gauge ② ST25052000 (—) Hose ③ ST25053000 (—) Joint pipe ④ ST25054000 (—) Adapter ⑤ ST25055000 (—) Adapter	Measuring line pressure 
KV31101201 (—) Oil pressure gauge adapter	Measuring line pressure 
ST07870000 (J37068) Transmission case stand	Disassembling and assembling A/T 
KV31102100 (J37065) Torque converter one-way clutch check tool	Checking one-way clutch in torque converter 
ST25850000 (J25721-A) Sliding hammer	Removing oil pump assembly 
KV31102400 (J34285 and J34285-87) Clutch spring compressor	Removing and installing clutch return springs 

Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
ST33200000 (J26082) Drift	 **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**	Installing oil pump housing oil seal Installing rear oil seal
ST30720000 (J34331) Drift	 **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**	Installing rear oil seal
(J34291) Shim setting gauge set		Selecting oil pump cover bearing race and oil pump thrust washer

Precautions

- Before proceeding with disassembly, thoroughly clean the outside of the transmission. 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 transmission.
- 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 transmission 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 transmission with new A.T.F.


SGI646

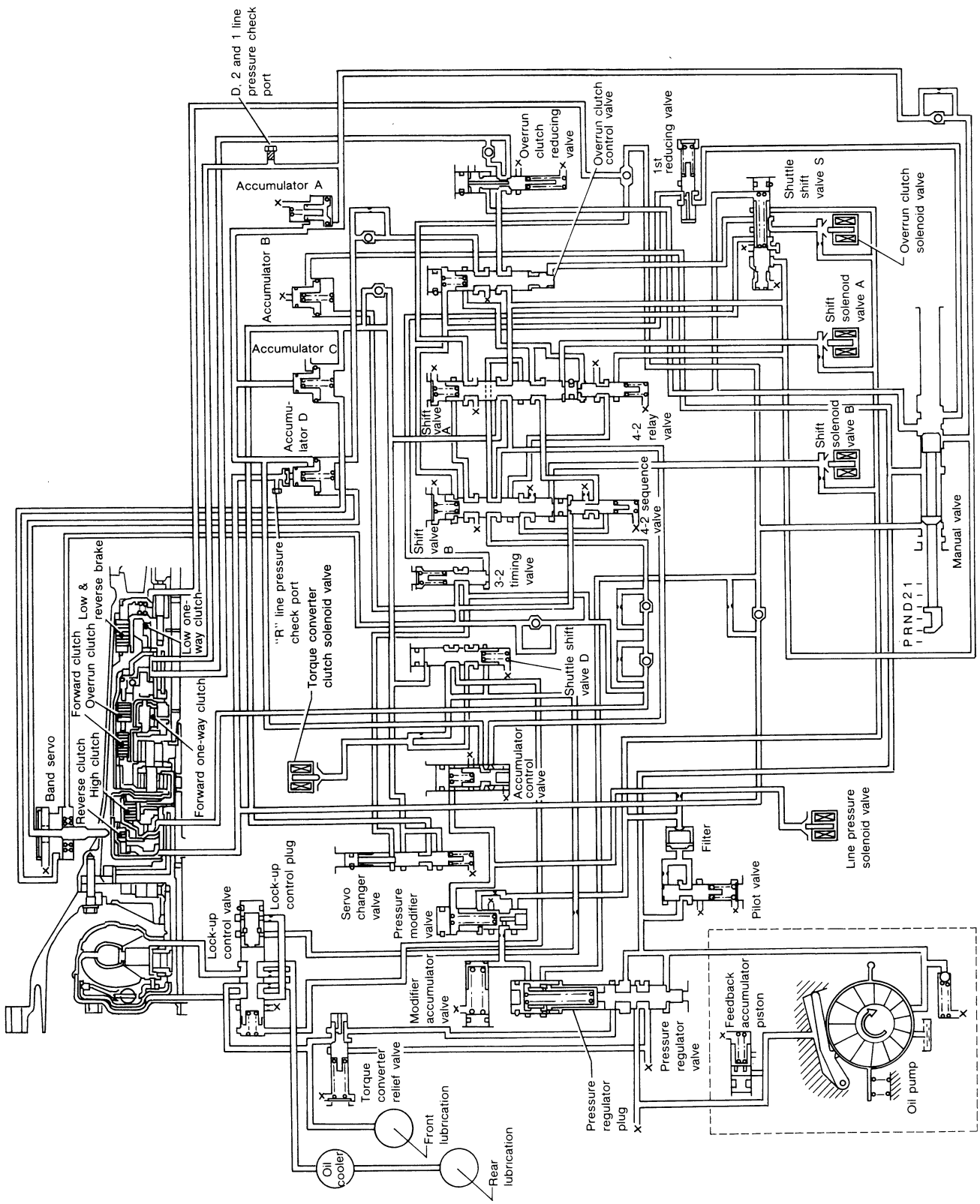
Precautions for Supplemental Restraint System "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safety is included in **section BF** of this Service Manual.

WARNING:

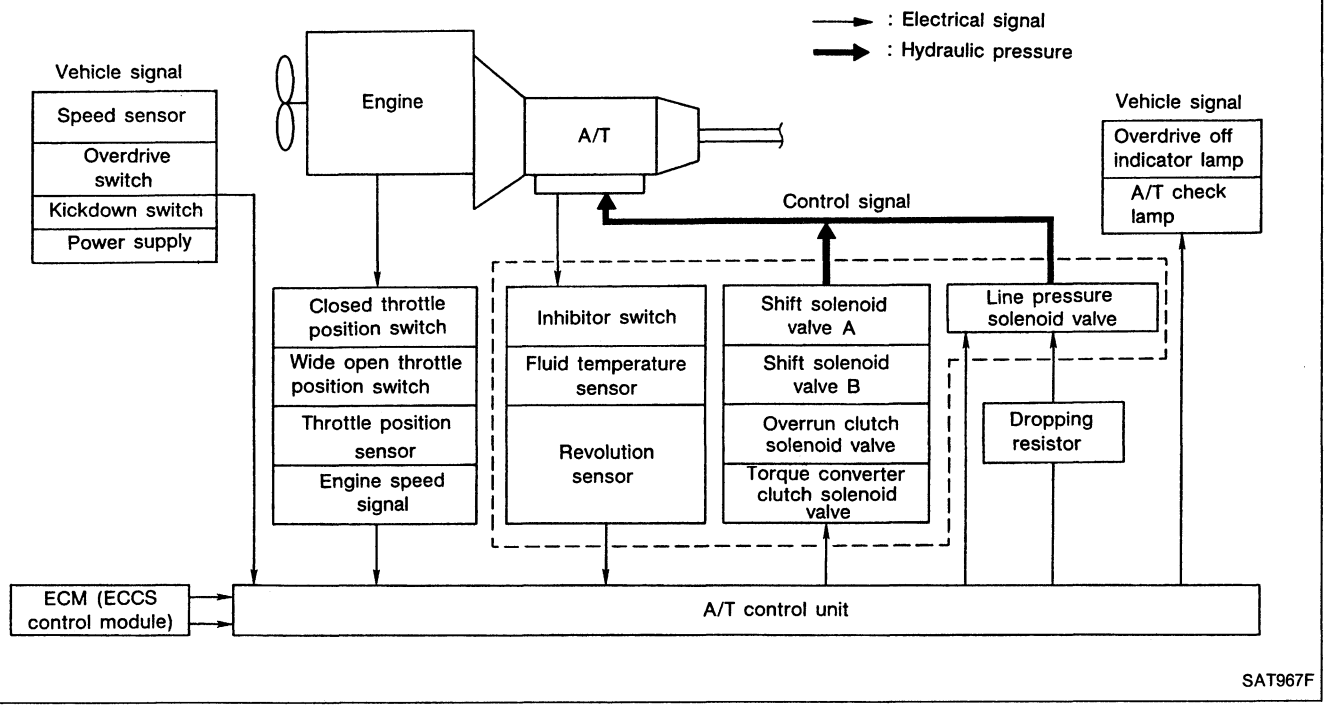
- **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**

Hydraulic Control Circuits



SAT624G

Electrical Control Chart

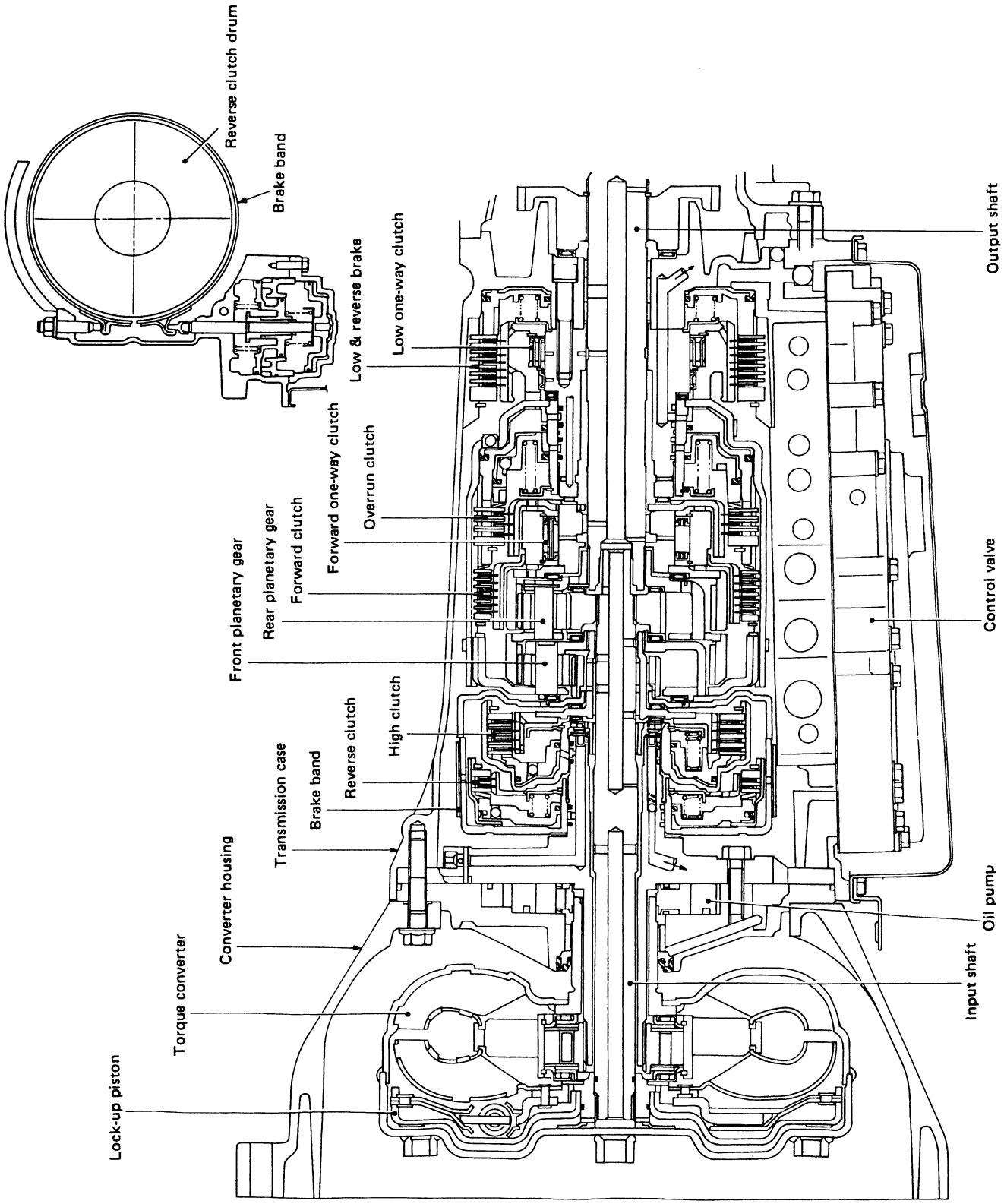


Mechanical Operation

Shift position		Reverse clutch	High clutch	Forward clutch	Overrun clutch	Band servo 2nd apply	Band servo 3rd release	Band servo 4th apply	Forward one-way clutch	Low one-way clutch	Low & reverse brake	Lock-up	Remarks
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 set to "OFF".
*2. Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, because oil pressure area on the "release" side is greater than that on the "apply" side, brake band does not contract.
*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 to "OFF" position.
○ : Operates
◎ : Operates when throttle opening is less than 1/16. Engine brake activates.
● : Operates during "progressive" acceleration.
⊗ : Operates but does not affect power transmission.
⊗ : Operates when throttle opening is less than 1/16 but does not affect engine brake.

Cross-Sectional View



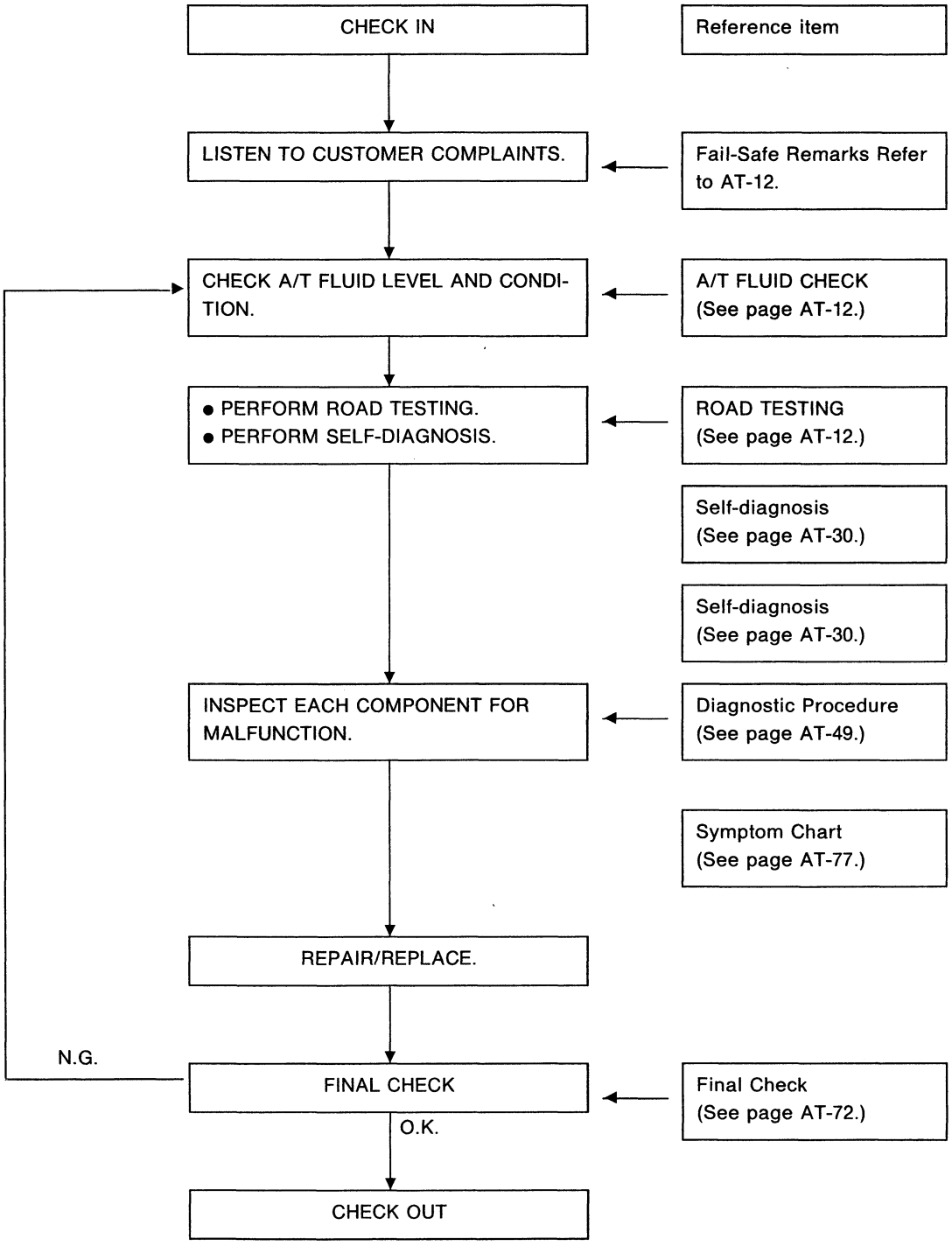
SAT125B

Contents

Contents (Cont'd)

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



Fail-Safe Remarks

The A/T control unit has an electronic Fail-Safe (limp home mode) to allow the vehicle to be driven even in the event of damage of a major electrical input or output device circuit.
In this condition, the vehicle runs in third gear in positions 1, 2 or D and will not upshift. Customer may say "Sluggish, poor acceleration".
When Fail-safe operation occurs the next time the key is turned to the ON position, the OD OFF lamp will blink for about 8 seconds. (For diagnosis, refer to AT-13.)

Remarks

If the vehicle is driven under extreme conditions such as excessive wheel spinning and emergency braking suddenly after, Fail-Safe may be activated even if all electrical circuits are undamaged.
In this case, normal shift pattern can be returned by turning the ignition key OFF for 3 seconds and then back ON.
The blinking of the O.D. OFF lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions by chance.
Always follow the "WORK FLOW" (see the previous page).
The SELF-DIAGNOSIS results will be as follows:

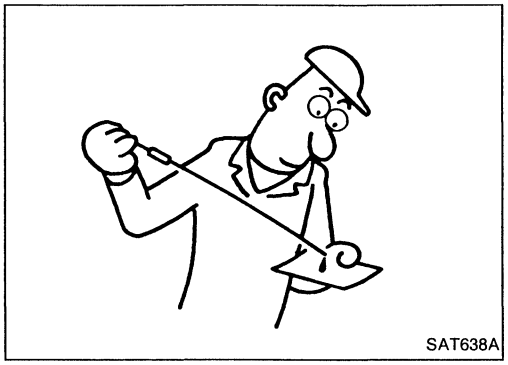
The first SELF-DIAGNOSIS will indicate the damage of the vehicle speed sensor or the revolution sensor.
During the next SELF-DIAGNOSIS performed after checking the sensor, no damages will be indicated.

Preliminary Check

A/T FLUID CHECK

Fluid leakage check

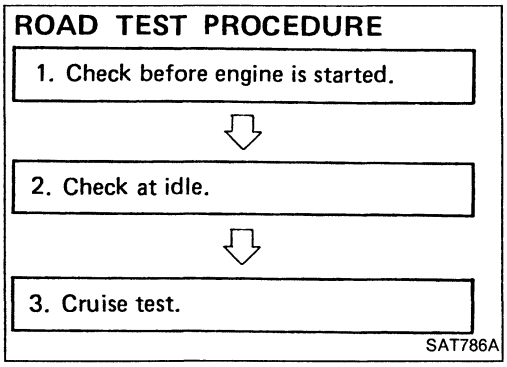
1. Clean area suspected of leaking, — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in "D" position and wait a few minutes.
3. Stop engine.
4. Check for fresh leakage.


SAT638A

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.



SAT786A

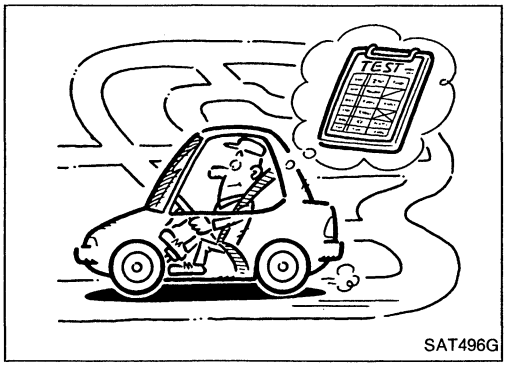
ROAD TESTING

Description

- The purpose of this road test is to determine overall performance of automatic transmission and analyze causes of problems.
- The road test consists of the following three parts:

1. Check before engine is started
2. Check at idle
3. Cruise test

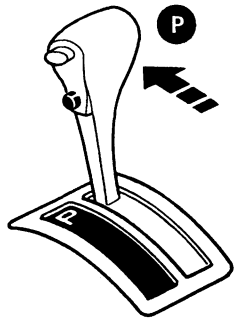
Preliminary Check (Cont'd)



SAT496G

- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis System" and "Diagnostic Procedure".

1



SAT768B

1. Check before engine is started

1 2

1. Park vehicle on flat surface.
2. Turn ignition switch to "OFF" position.
3. Move selector lever to "P" position.
4. Turn ignition switch to "ON" position. (Do not start engine.)
5. Does A/T check lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

Yes ↓

3

Does A/T check lamp flicker for about 8 seconds?

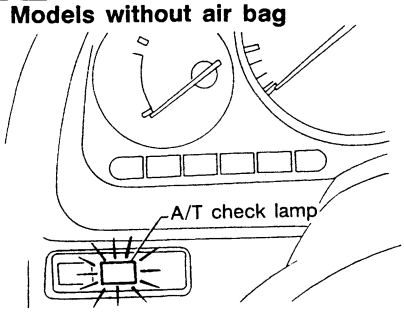
Yes → Perform self-diagnosis system.
— Refer to SELF-DIAGNOSTIC PROCEDURE.

No ↓

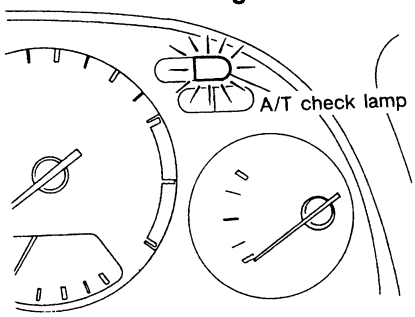
1. Turn ignition switch to "OFF" position.
2. Perform self-diagnosis system.
   — Refer to SELF-DIAGNOSTIC PROCEDURE and note N.G. items.
3. Go to "ROAD TESTING — 2. Check at idle".

2 3

Models without air bag



Models with air bag



SAT025E

Preliminary Check (Cont'd)

2. Check at idle

1. Park vehicle on flat surface.
2. Turn ignition switch to "OFF" position.
3. Move selector lever to "P" or "N" position.
4. Turn ignition switch start position.
5. Is engine started?

No → Go to Diagnostic Procedure 2.

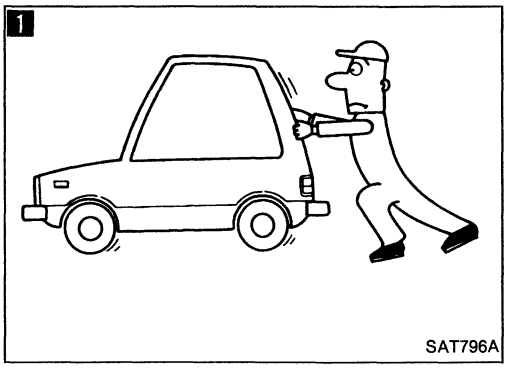
Yes ↓

1. Turn ignition switch to "OFF" position.
2. Move selector lever to "D", "1", "2" or "R" position.
3. Turn ignition switch to start position.
4. Is engine started?

Yes → Go to Diagnostic Procedure 2.

No ↓

1



SAT796A

1. Turn ignition switch to "OFF" position.
2. Move selector lever to "P" position.
3. Release parking brake.
4. Push vehicle forward or backward.
5. Does vehicle move when it is pushed forward or backward?

Yes → Go to Diagnostic Procedure 3.

No ↓

1. Apply parking brake.
2. Move selector lever to "N" position.
3. Turn ignition switch to START position and start engine.
4. Release parking brake.
5. Does vehicle move forward or backward?

Yes → Go to Diagnostic Procedure 4.

No ↓

2

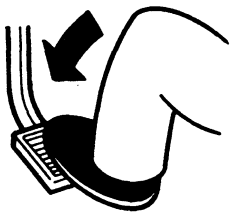
1. Apply foot brake.
2. Move selector lever to "R" position.
3. Is there large shock when changing from "N" to "R" position?

Yes → Go to Diagnostic Procedure 5.

No ↓

2

Brake pedal



SAT797A

1. Release foot brake for several seconds.
2. Does vehicle creep backward when foot brake is released?

No → Go to Diagnostic Procedure 6.

Yes ↓

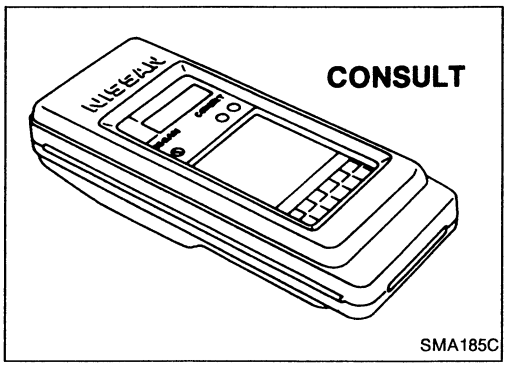
1. Move selector lever to "D", "1" and "2" positions and check if vehicle creeps forward.
2. Does vehicle creep forward in all three position?

Yes → Go to Cruise test.

No ↓

Go to Diagnostic Procedure 7.

Preliminary Check (Cont'd)



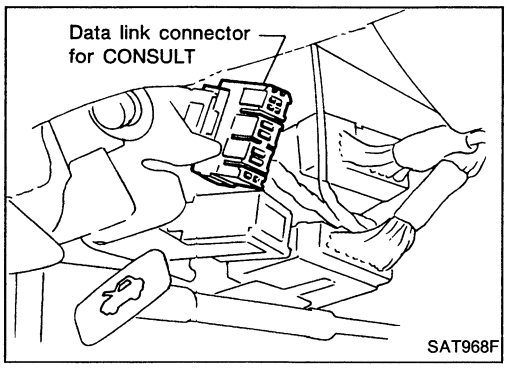
3. Cruise test

With CONSULT

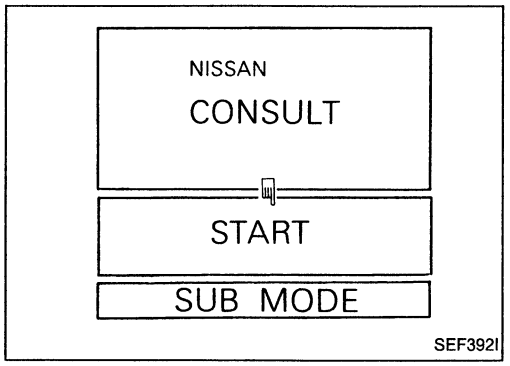
- Using CONSULT, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule."
- Check all items listed in Parts 1 through 3.

CONSULT setting procedure

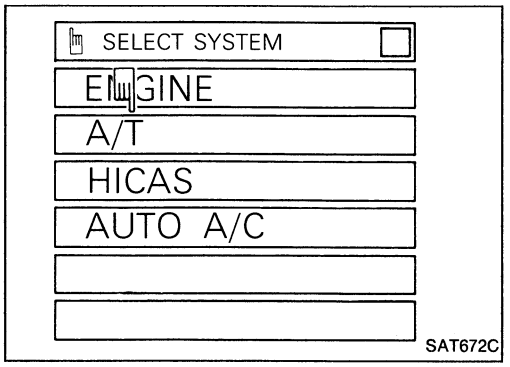
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located in left dash side panel.)



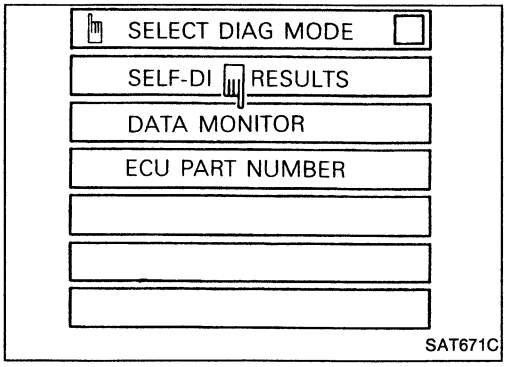
3. Turn on ignition switch.
4. Touch "START".



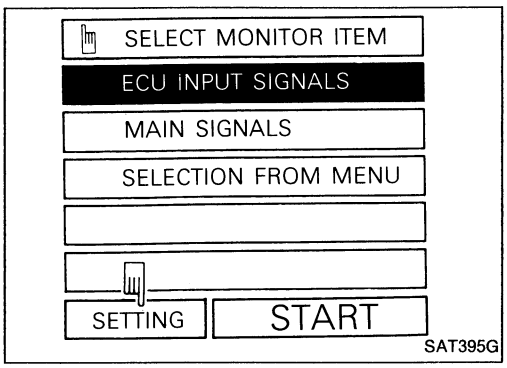
5. Touch "A/T".



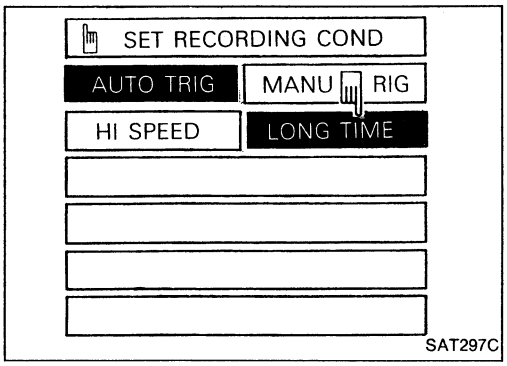
6. Touch "DATA MONITOR".



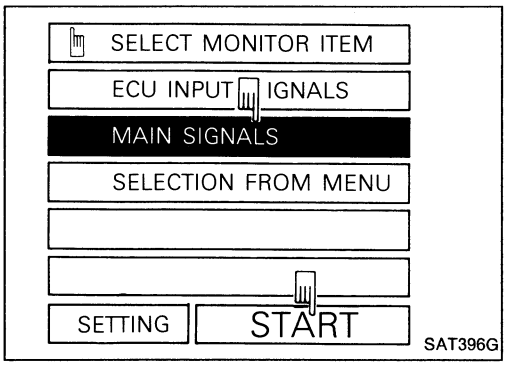
Preliminary Check (Cont'd)



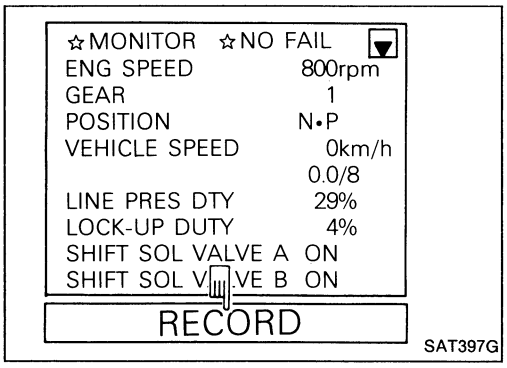
7. Touch "SETTING" to set recording condition.



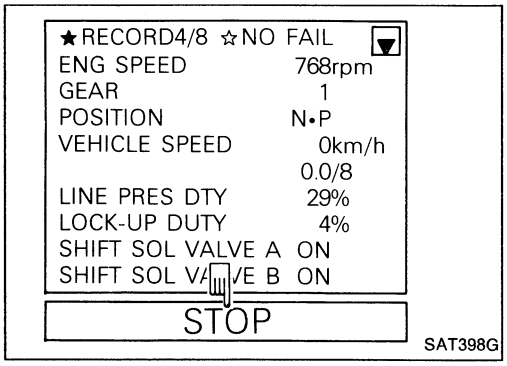
8. Touch "LONG TIME" and "ENTER" key.



9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".
10. Touch "START".

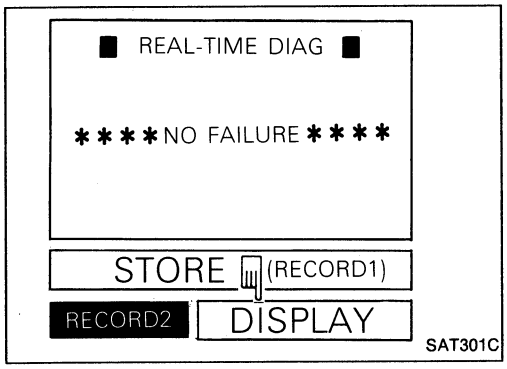


11. When performing cruise test, touch "RECORD".

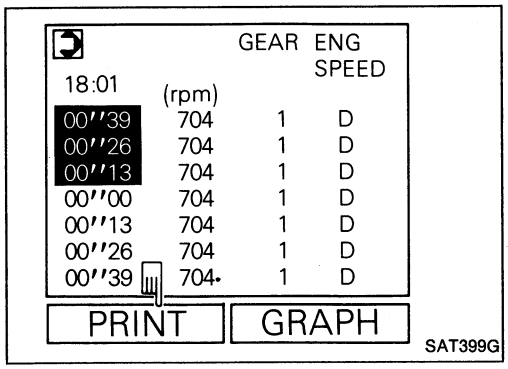


12. After finishing cruise test part 1, touch "STOP".

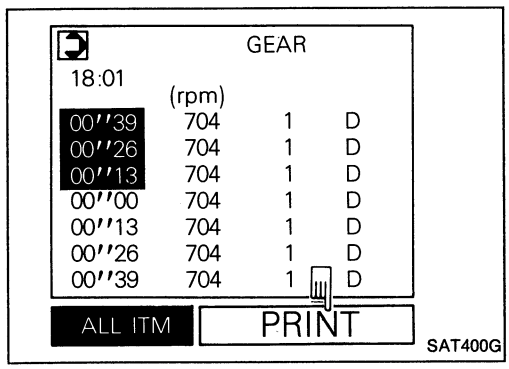
Preliminary Check (Cont'd)



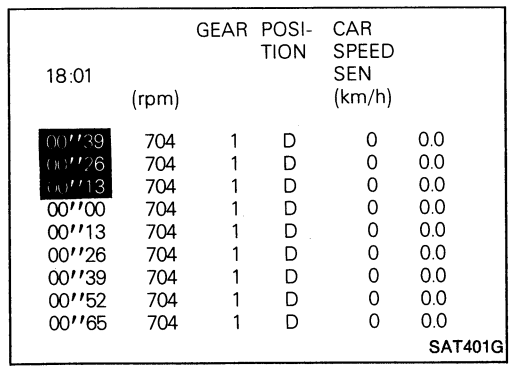
13. Touch "DISPLAY".



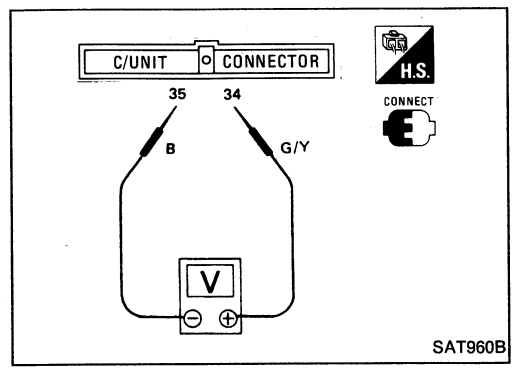
14. Touch "PRINT".



15. Touch "PRINT" again.



16. Check the monitor data printed out.
17. Continue cruise test part 2 and 3.

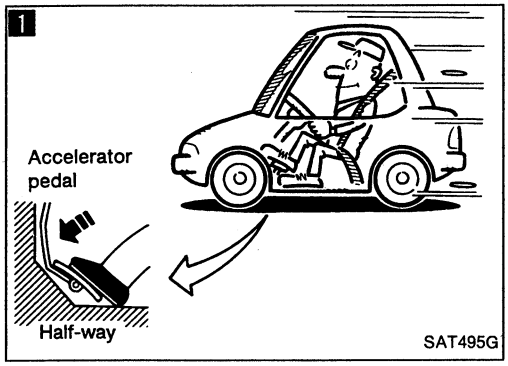


Without CONSULT

- Throttle position can be controlled by voltage across terminals ㉞ and ㉟ of A/T control unit.

Preliminary Check (Cont'd)

Cruise test — Part 1



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)

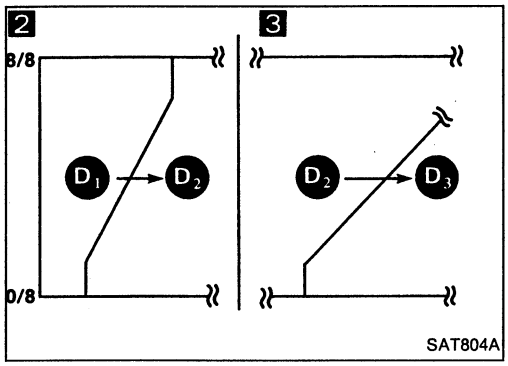
1

1. Park vehicle on flat surface.
2. Set overdrive switch in "ON" position.
3. Move selector lever to "P" position.
4. Turn ignition switch to "ON" position and start engine.
5. Move selector lever to "D" position.
6. Accelerate vehicle at half throttle.
7. Does vehicle start from D_1?

Read gear position.

No → Go to Diagnostic Procedure 8.

Yes



2

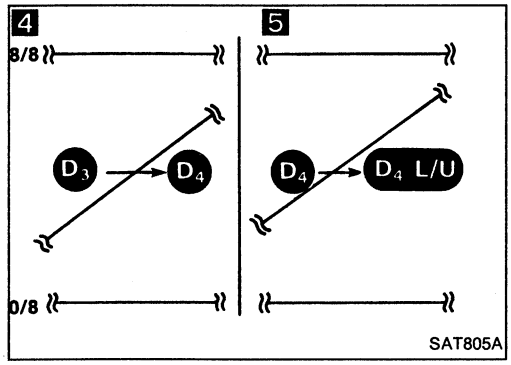
Does A/T shift from D_1 to D_2 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_1 to D_2:
Refer to Shift schedule.

No → Go to Diagnostic Procedure 9.

Yes



3

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle opening and vehicle speed.

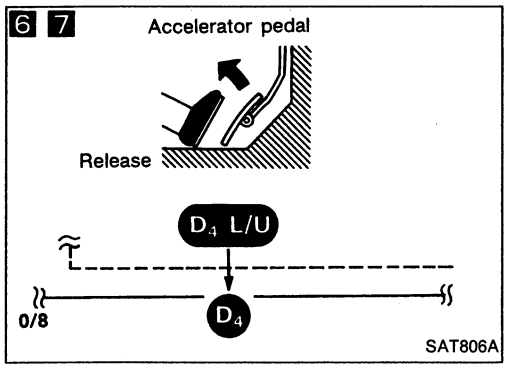
Specified speed when shifting from D_2 to D_3:
Refer to Shift schedule.

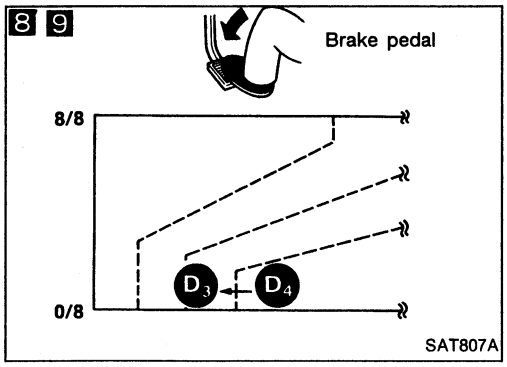
No → Go to Diagnostic Procedure 10.

Yes

Ⓐ

Preliminary Check (Cont'd)





Ⓐ

4

Does A/T shift from D_3 to D_4 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_3 to D_4:

Refer to Shift schedule.

No → Go to Diagnostic Procedure 11.

Yes

5

Does A/T perform lock-up at the specified speed?

Read vehicle speed, throttle opening when lock-up duty becomes 94%.

Specified speed when lock-up occurs:

Refer to Shift schedule.

No → Go to Diagnostic Procedure 12.

Yes

Does A/T hold lock-up condition for more than 30 seconds?

No → Go to Diagnostic Procedure 13.

Yes

6 7

1. Release accelerator pedal.
2. Is lock-up released when accelerator pedal is released?

No → Go to Diagnostic Procedure 14.

Yes

8 9

1. Decelerate vehicle by applying foot brake lightly.
2. Does engine speed return to idle smoothly when A/T is shifted from D_4 to D_3?

Read gear position and engine speed.

No → Go to Diagnostic Procedure 15.

Yes

1. Stop vehicle.
2. Go to "Cruise test — Part 2".

Preliminary Check (Cont'd)

Cruise test — Part 2

1. Confirm overdrive switch is in "ON" position.
2. Confirm selector lever is in "D" position.
3. Accelerate vehicle at half throttle again.

↓

Does vehicle start from D_1?
Read gear position.

No → Go to Diagnostic Procedure 16.

Yes ↓

1 2 3

1. Accelerate vehicle to A km/h as shown in illustration.
2. Release accelerator pedal and then quickly depress it fully.
3. Does A/T shift from D_4 to D_2 as soon as accelerator pedal is depressed fully?

Read gear position and throttle opening.

No → Go to Diagnostic Procedure 9.

Yes ↓

4

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle opening and vehicle speed.
Specified speed when shifting from D_2 to D_3

No → Go to Diagnostic Procedure 10.

Yes ↓

5 6

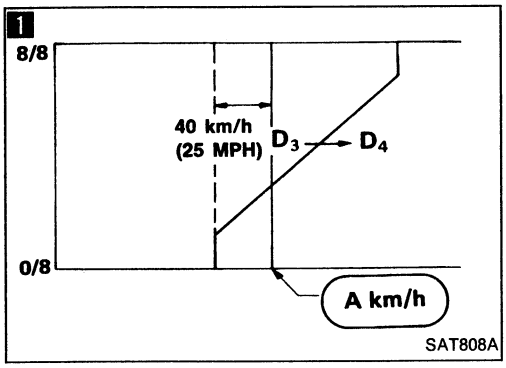
1. Release accelerator pedal after shifting from D_2 to D_3.
2. Does A/T shift from D_3 to D_4 and does vehicle decelerate by engine brake?

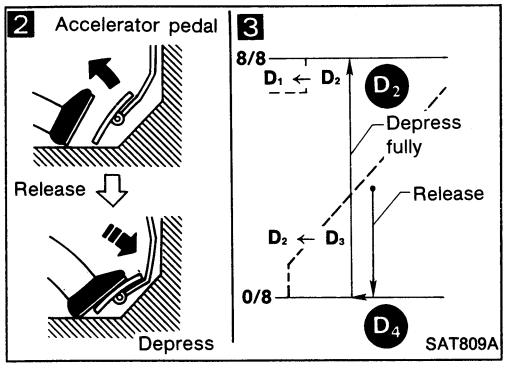
Read gear position, throttle opening and vehicle speed.

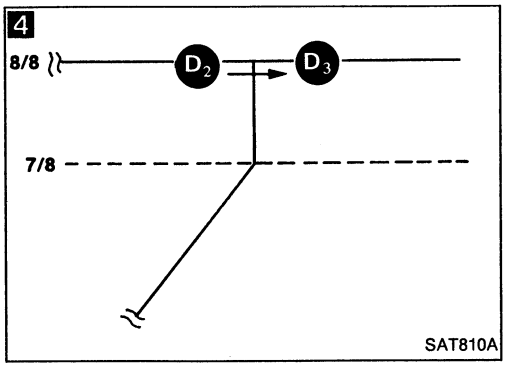
No → Go to Diagnostic Procedure 11.

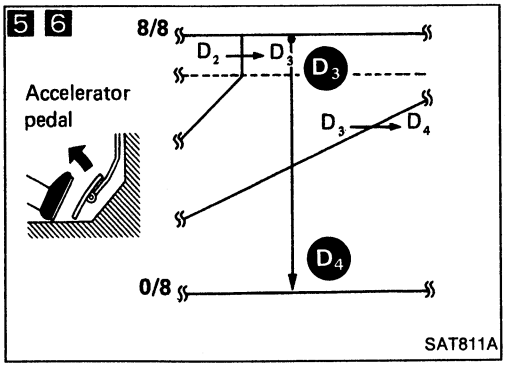
Yes ↓

1. Stop vehicle.
2. Go to "Cruise test — Part 3".



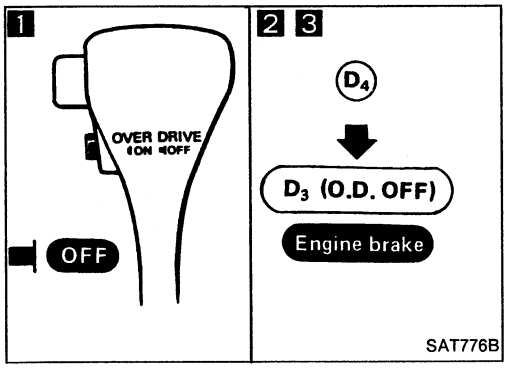


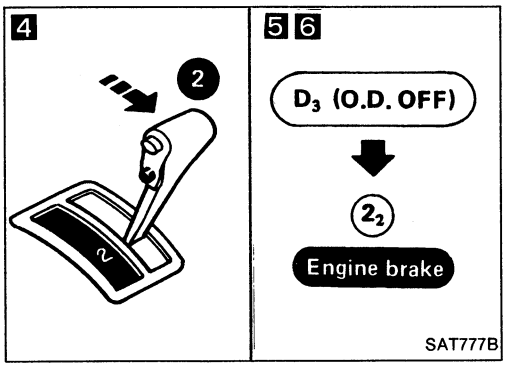


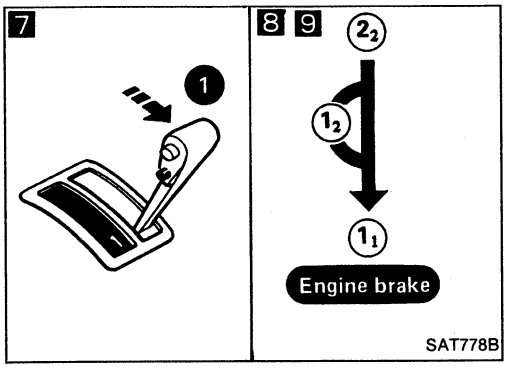


Preliminary Check (Cont'd)

Cruise test — Part 3







1 2

1. Confirm overdrive switch is in "ON" position.
2. Confirm selector lever is in "D" position.
3. Accelerate vehicle, using half-throttle, to D_4.
4. Release accelerator pedal.
5. Set overdrive switch in "OFF" position while driving in D_4 position.
6. Does A/T shift from D_4 to D_3?

Read gear position and vehicle speed.

No → Go to Diagnostic Procedure 17.

Yes ↓

3

Does vehicle decelerate by engine brake?

No → Go to Diagnostic Procedure 15.

Yes ↓

4 5

1. Move selector lever from "D" to "2" position while driving in D_3.
2. Does A/T shift from D_3 to 2_2?

Read gear position.

No → Go to Diagnostic Procedure 18.

Yes ↓

6

Does vehicle decelerate by engine brake?

No → Go to Diagnostic Procedure 15.

Yes ↓

7 8

1. Move selector lever from "2" to "1" position while driving in 2_2.
2. Does A/T shift from 2_2 to 1_1 position?

Read gear position.

No → Go to Diagnostic Procedure 19.

Yes ↓

9

Does vehicle decelerate by engine brake?

No → Go to Diagnostic Procedure 20.

Yes ↓

1. Stop vehicle.
2. Perform self-diagnosis system. — Refer to SELF-DIAGNOSTIC PROCEDURE.

Preliminary Check (Cont'd)

Vehicle speed when shifting gears

RE4R01A

Throttle position	Vehicle speed km/h (MPH)					
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$
Full throttle	60 - 64 (37 - 40)	107 - 115 (66 - 71)	166 - 176 (103 - 109)	161 - 169 (100 - 105)	96 - 104 (60 - 65)	44 - 48 (27 - 30)
Half throttle	45 - 49 (28 - 30)	83 - 89 (52 - 55)	119 - 127 (74 - 79)	80 - 88 (50 - 55)	33 - 39 (21 - 24)	10 - 14 (6 - 9)

RE4R03A

Throttle position	Vehicle speed km/h (MPH)					
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$
Full throttle	68 - 72 (42 - 45)	120 - 128 (75 - 80)	183 - 193 (114 - 120)	177 - 187 (110 - 116)	109 - 117 (68 - 73)	33 - 37 (21 - 23)
Half throttle	47 - 51 (29 - 32)	89 - 95 (55 - 59)	136 - 144 (85 - 89)	78 - 86 (48 - 53)	28 - 34 (17 - 21)	10 - 14 (6 - 9)

Vehicle speed when performing and releasing lock-up

RE4R01A

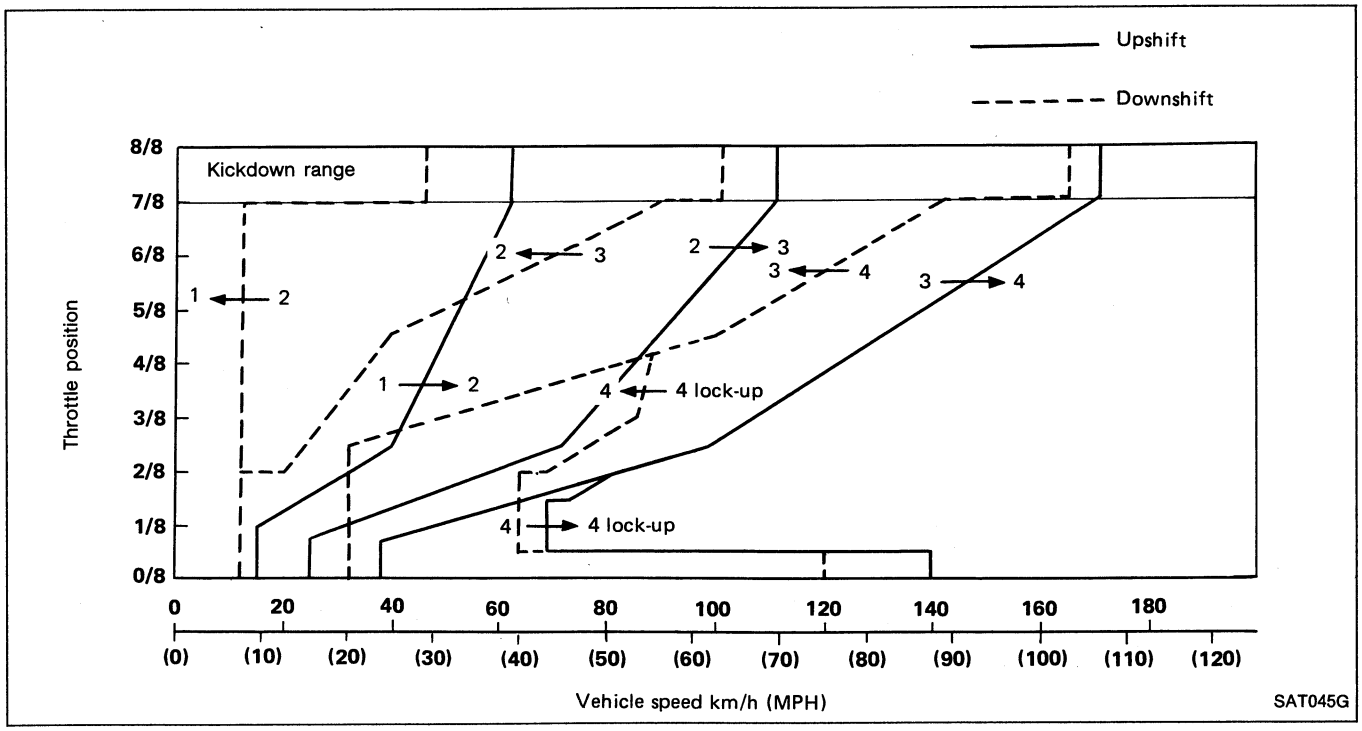
Throttle position	O.D. switch [Shift position]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D_4]	167 - 175 (104 - 109)	161 - 169 (100 - 105)
	OFF [D_3]	107 - 115 (66 - 71)	96 - 104 (60 - 65)
Half throttle	ON [D_4]	120 - 128 (75 - 80)	84 - 92 (52 - 57)
	OFF [D_3]	91 - 99 (57 - 62)	86 - 94 (53 - 58)

RE4R03A

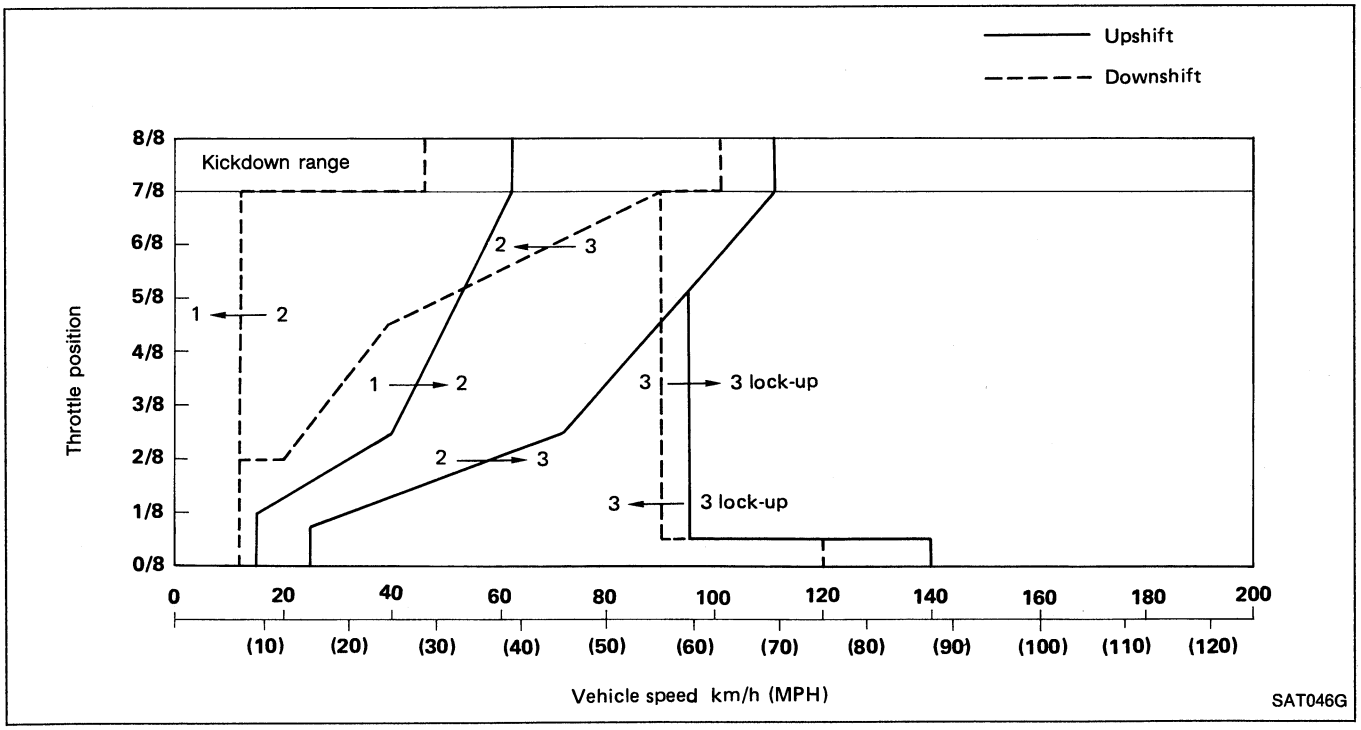
Throttle position	O.D. switch [Shift position]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D_4]	184 - 192 (114 - 119)	178 - 186 (111 - 116)
	OFF [D_3]	120 - 128 (75 - 80)	109 - 117 (68 - 73)
Half throttle	ON [D_4]	184 - 192 (114 - 119)	117 - 125 (73 - 78)
	OFF [D_3]	88 - 96 (55 - 60)	74 - 82 (46 - 51)

Preliminary Check (Cont'd)

Shift schedule (Overdrive ON) — RE4R01A

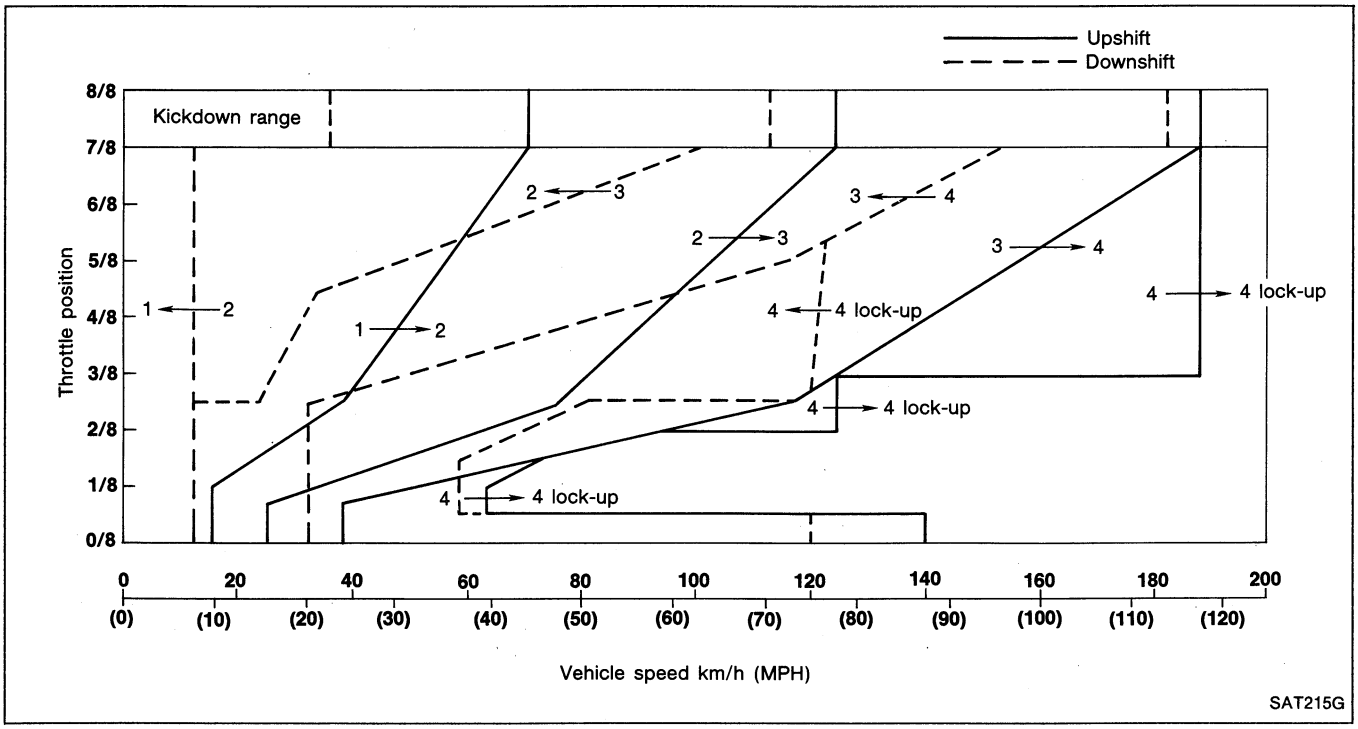


Shift schedule (Overdrive OFF) — RE4R01A

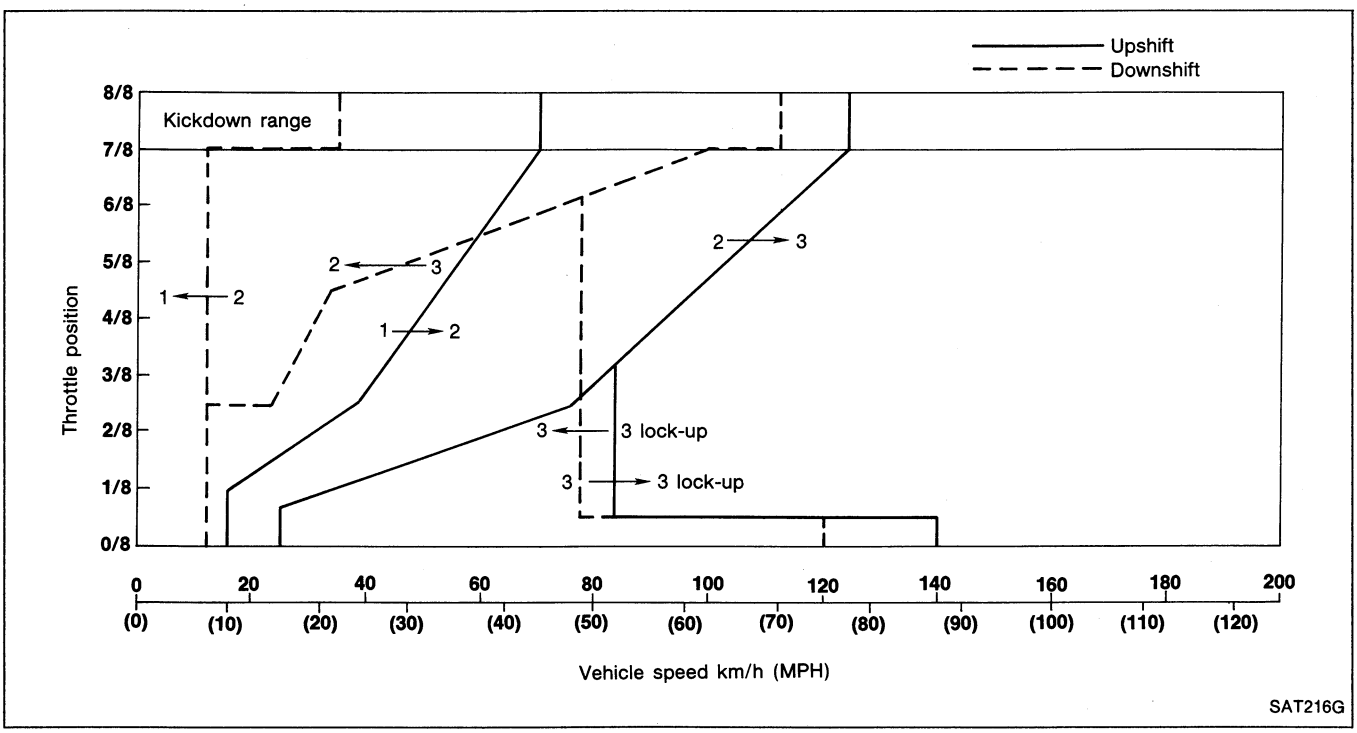


Preliminary Check (Cont'd)

Shift schedule (Overdrive ON) — RE4R03A



Shift schedule (Overdrive OFF) — RE4R03A



Diagnosis by CONSULT

NOTICE

1. The CONSULT electrically displays shift timing and lock-up timing (that is, operation timing of each solenoid).
   When a noticeable time difference occurs between shift timing which is manifested by shift shock and the CONSULT display, mechanical parts (except solenoids, sensors, etc.) are considered to be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
2. Shift schedule (which implies gear position) displayed on CONSULT and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:
   - Actual shift schedule has more or less tolerance or allowance,
   - Shift schedule indicated in Service Manual refers to the point where shifts starts, and
   - Gear position displayed on CONSULT indicates the point where shifts are completed.
3. Shift solenoid valve "A" or "B" is displayed on CONSULT at the start of shifting while gear position is displayed upon completion of shifting (which is computed by A/T control unit).

DATA MONITOR APPLICATION

Item	Application
Vehicle speed sensor 1 (A/T)	X
Vehicle speed sensor 2 (meter)	X
Throttle position sensor	X
Fluid temperature sensor	X
Battery voltage	X
Engine speed	X
Selector lever switch (O.D. switch)	X
A.S.C.D. — cruise signal	X
A.S.C.D. — O.D. cut signal	X
Kickdown switch	X
Power shift switch	—
Closed throttle position switch	X
Wide open throttle position switch	X
Shift solenoid valve A	X
Shift solenoid valve B	X
Overrun clutch solenoid valve	X
*Shift solenoid valve A (feedback)	X
*Shift solenoid valve B (feedback)	X
*Overrun clutch solenoid valve (feedback)	X
Hold mode switch	—
1 position switch	X
2 position switch	X
D position switch	X
N position switch	X
R position switch	X
Gear position	X
Range position	X
Vehicle speed	X
Throttle opening	X
Line-pressure solenoid valve	X
Torque converter clutch solenoid valve	X

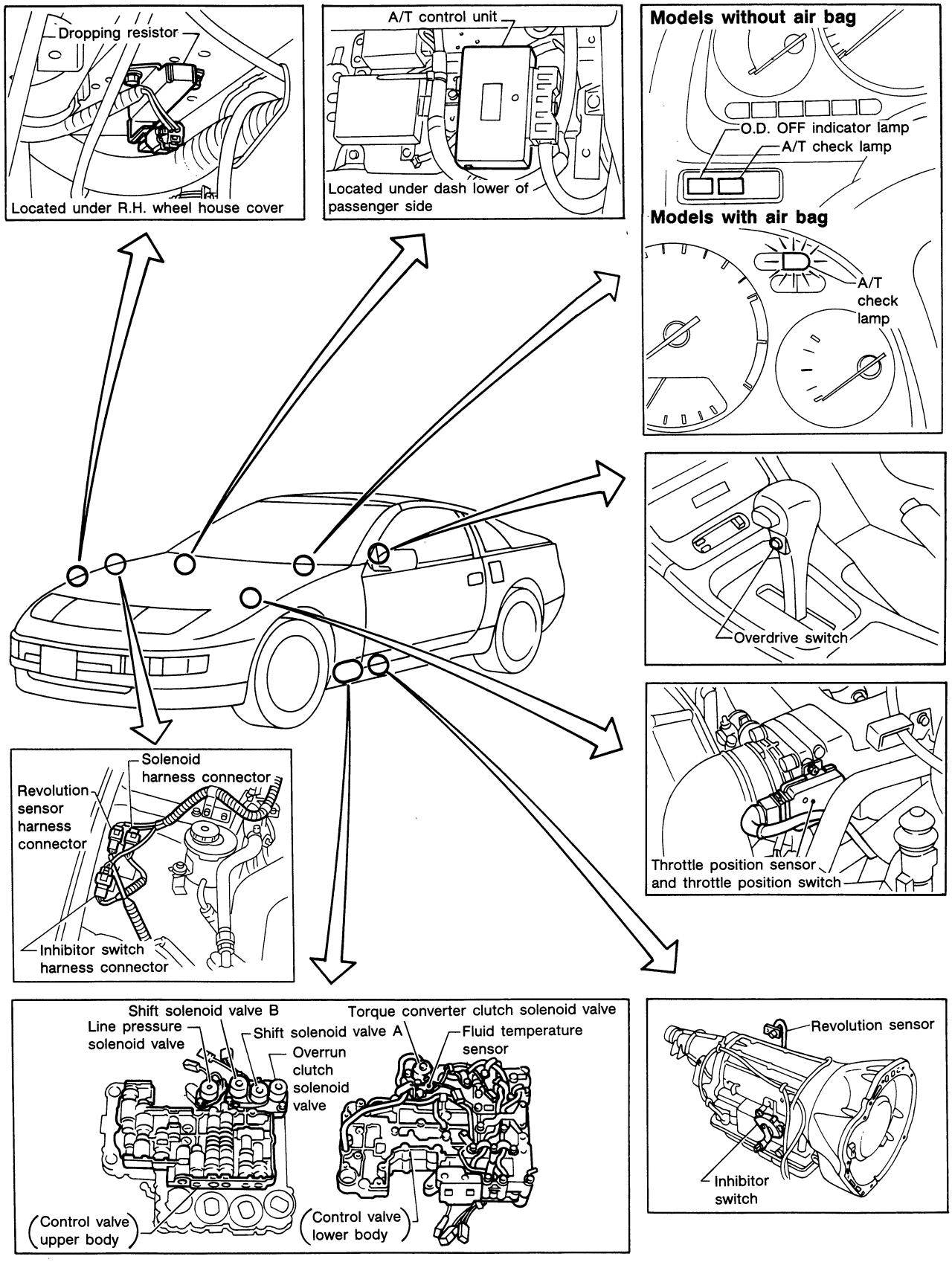
X: Applicable —: Not applicable

DATA ANALYSIS

Item	Display	Condition
Lock-up duty	Approximately 4% ↓ Approximately 94%	Lock-up "OFF" ↓ Lock-up "ON"
Line pressure duty	Approximately 29% ↓ Approximately 94%	Low line-pressure (Small throttle opening) ↓ High line-pressure (Large throttle opening)
Throttle position sensor	Approximately 0.5V	Fully-closed throttle
	Approximately 4V	Fully-open throttle
Fluid temperature sensor	Approximately 1.5V↓ Approximately 0.5V	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]

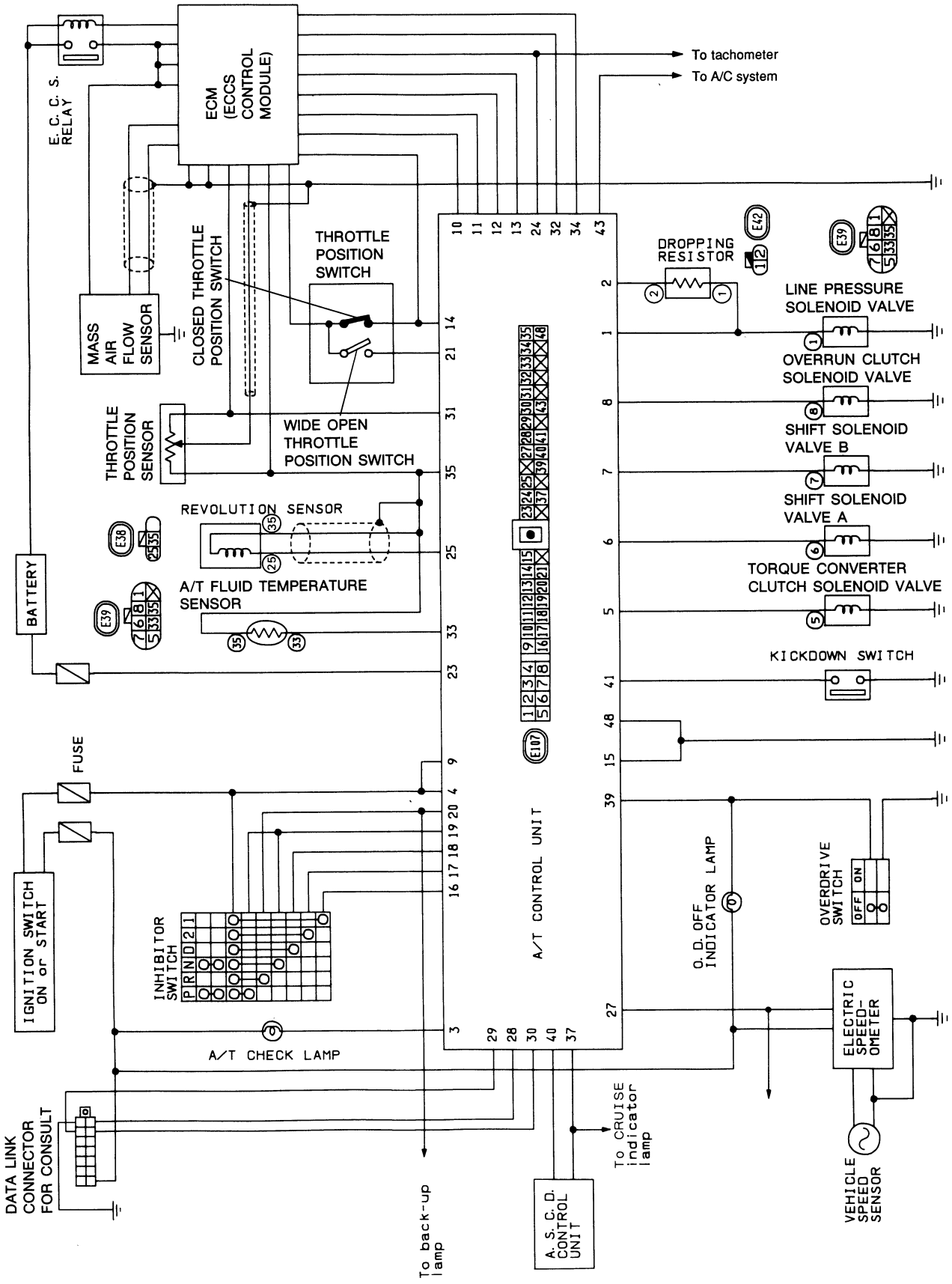
Gear position	1	2	3	4
Shift solenoid valve A	ON	OFF	OFF	ON
Shift solenoid valve B	ON	ON	OFF	OFF

A/T Electrical Parts Location



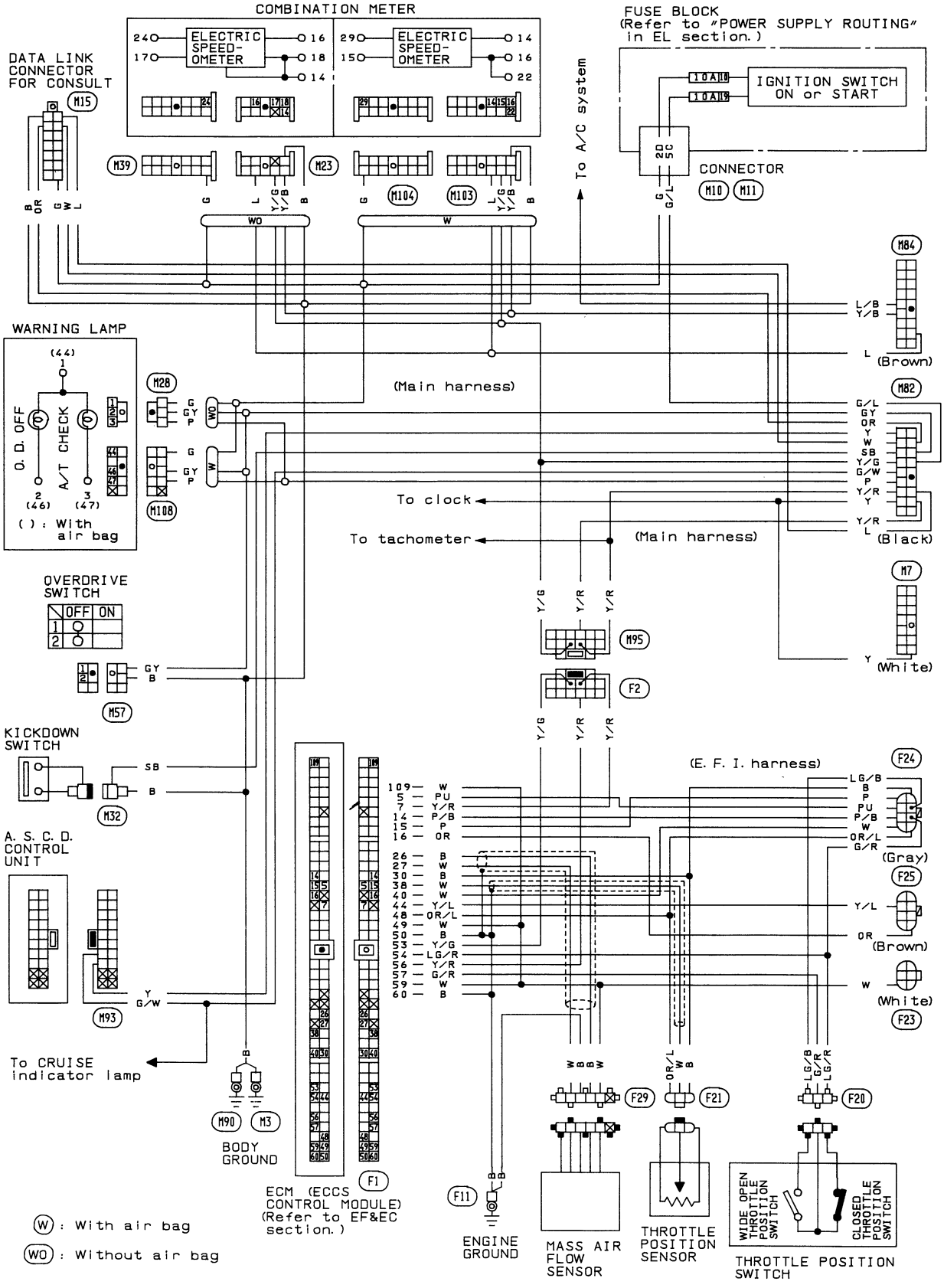
SAT974F

Circuit Diagram for Quick Pinpoint Check

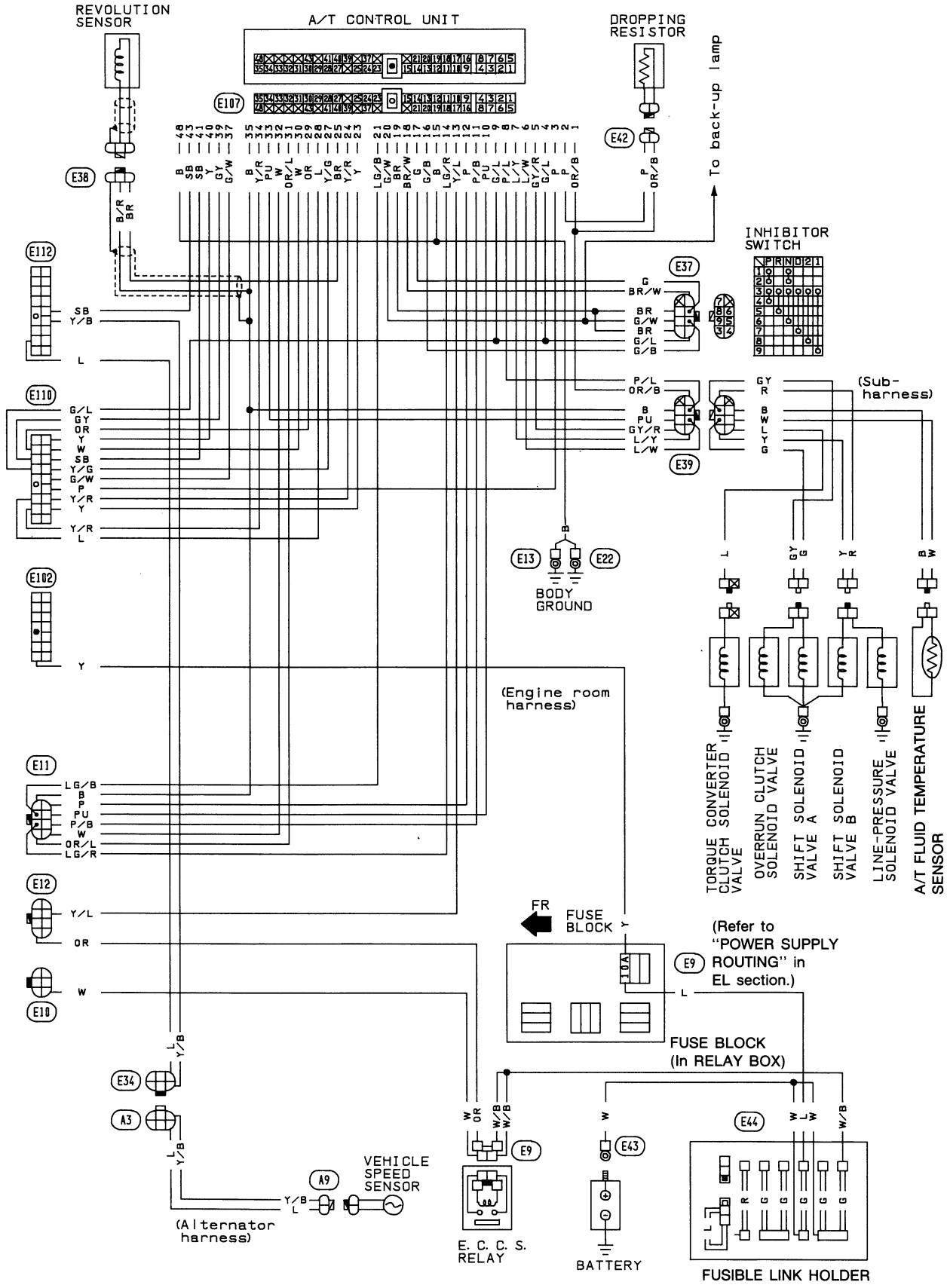


SAT217G

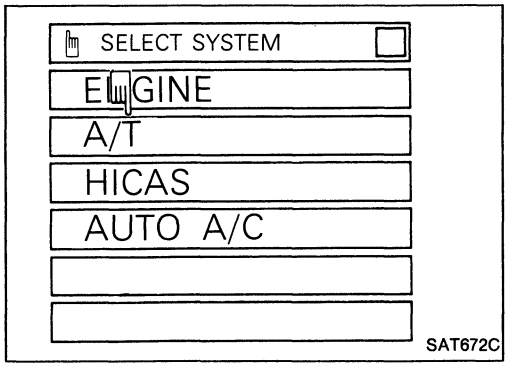
Wiring Diagram



Wiring Diagram (Cont'd)



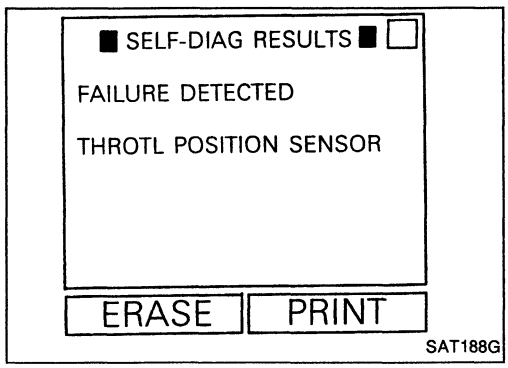
SAT218G



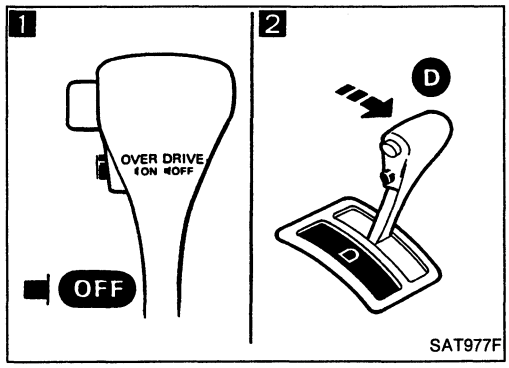
Self-diagnosis System

SELF-DIAGNOSTIC PROCEDURE (With CONSULT)

1. Turn on CONSULT.
2. Touch "A/T".



3. Touch "SELF-DIAGNOSIS SYSTEM".
   CONSULT performs REAL-TIME SELF-DIAGNOSIS SYSTEM.



SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)

DIAGNOSIS START

1. Start engine and warm it up to normal engine operating temperature.
2. Turn ignition switch to "OFF" position.
3. Turn ignition switch from "OFF" to "ACC" position.

1

4. Set overdrive switch in "OFF" position.

2

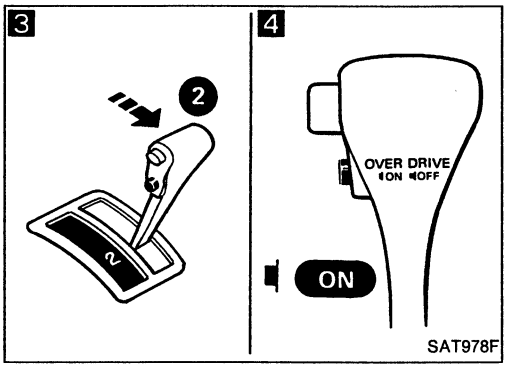
5. Move selector lever to "D" position.
6. Turn ignition switch to "ON" position. (Do not start engine.)
7. Does A/T check lamp come on for about 2 seconds?

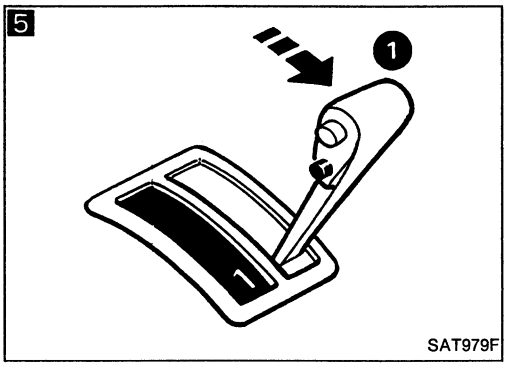
No → Go to Diagnostic Procedure 1.

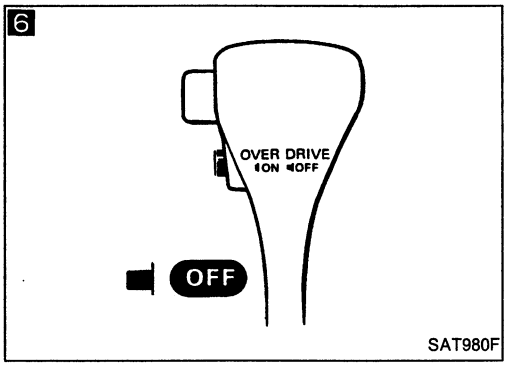
Yes

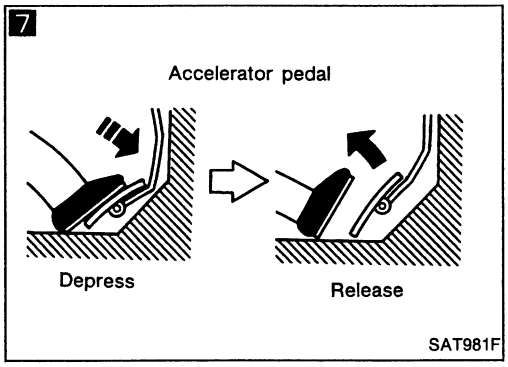
Ⓐ

Self-diagnosis System (Cont'd)









Ⓐ

3
8. Move selector lever to "2" position.
4
9. Set overdrive switch in "ON" position.
5
10. Move selector lever to "1" position.
6
11. Set overdrive switch in "OFF" position.
7
12. Depress accelerator pedal fully and release it.
13. Check A/T check lamp.
Refer to JUDGEMENT OF SELF-DIAGNOSIS SYSTEM CODE on next page.

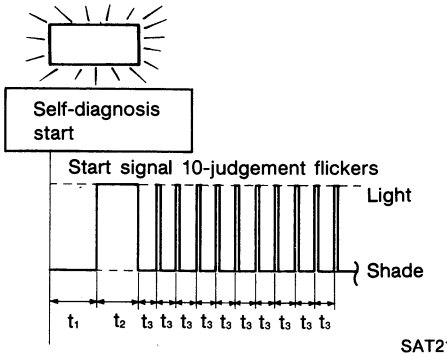
DIAGNOSIS END

Self-diagnosis System (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE

Flickers of O.D. OFF indicator lamp: Damaged circuit

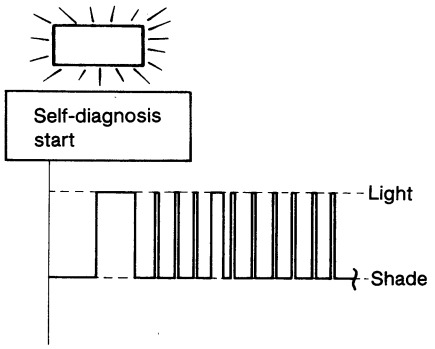
All judgement flickers are same.



SAT219G

All circuits that can be confirmed by self-diagnosis are O.K.

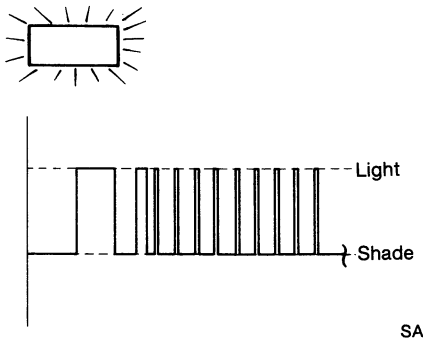
4th judgement flicker is longer than others.



SAT220G

Shift solenoid valve A circuit is short-circuited or disconnected.
→ **Go to shift solenoid valve A circuit check.**

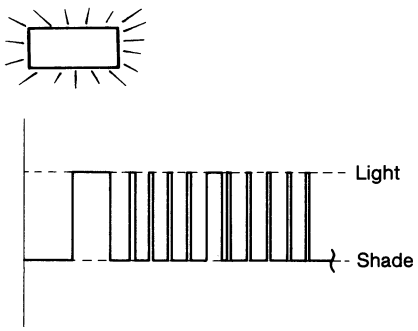
1st judgement flicker is longer than others.



SAT227G

Revolution sensor circuit is short-circuited or disconnected.
→ **Go to revolution sensor circuit check.**

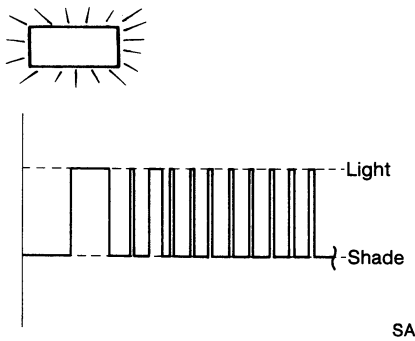
5th judgement flicker is longer than others.



SAT291G

Shift solenoid valve B circuit is short-circuited or disconnected.
→ **Go to shift solenoid valve B circuit check.**

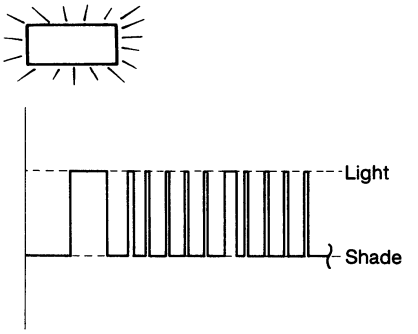
2nd judgement flicker is longer than others.



SAT289G

Speed sensor circuit is short-circuited or disconnected.
→ **Go to speed sensor circuit check.**

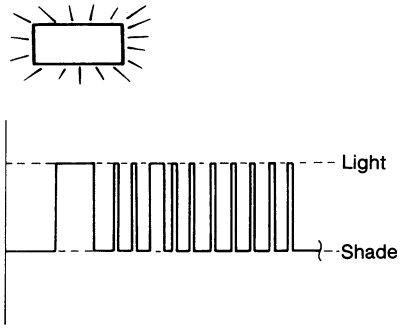
6th judgement flicker is longer than others.



SAT292G

Overrun clutch solenoid valve circuit is short-circuited or disconnected.
→ **Go to overrun clutch solenoid valve circuit check.**

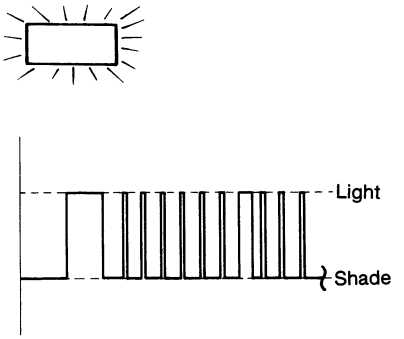
3rd judgement flicker is longer than others.



SAT290G

Throttle position sensor circuit is short-circuited or disconnected.
→ **Go to throttle position sensor circuit check.**

7th judgement flicker is longer than others.



SAT293G

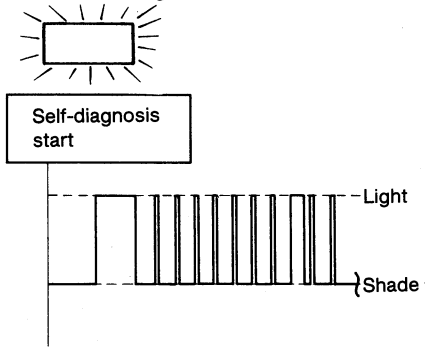
Torque converter clutch solenoid valve circuit is short-circuited or disconnected.
→ **Go to torque converter clutch solenoid valve circuit check.**

t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second

Self-diagnosis System (Cont'd)

Flickers of O.D. OFF indicator lamp: Damaged circuit

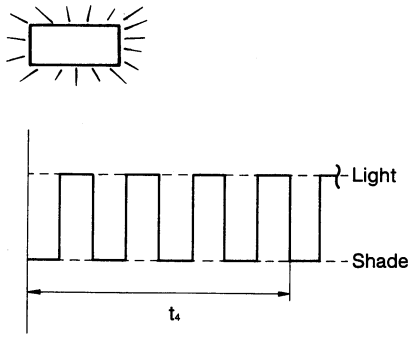
8th judgement flicker is longer than others.



SAT221G

Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.
→ **Go to fluid temperature sensor and A/T control unit power source circuit check.**

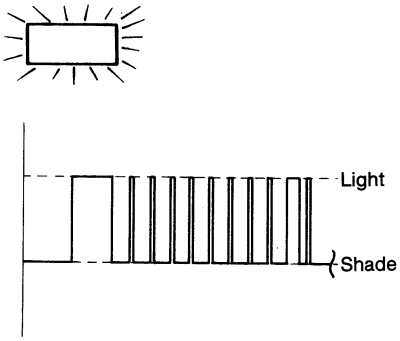
Flickers as shown below.



SAT294G

Battery power is low.
Battery has been disconnected for a long time.
Battery is connected conversely.
(When reconnecting A/T control unit connectors. — This is not a problem.)

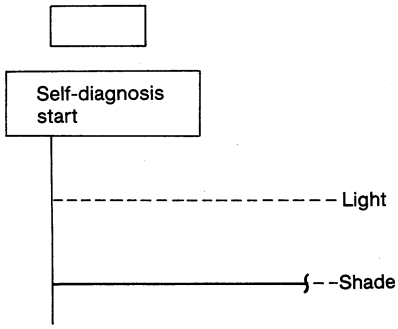
9th judgement flicker is longer than others.



SAT222G

Engine speed signal circuit is short-circuited or disconnected.
→ **Go to engine speed signal circuit check.**

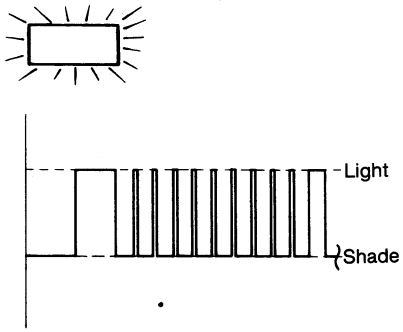
Does not come on.



SAT226G

Inhibitor switch, overdrive switch, kickdown switch or closed throttle position switch circuit is disconnected or A/T control unit is damaged.
→ **Go to inhibitor, overdrive, kickdown and closed throttle position switch circuit checks.**

10th judgement flicker is longer than others.



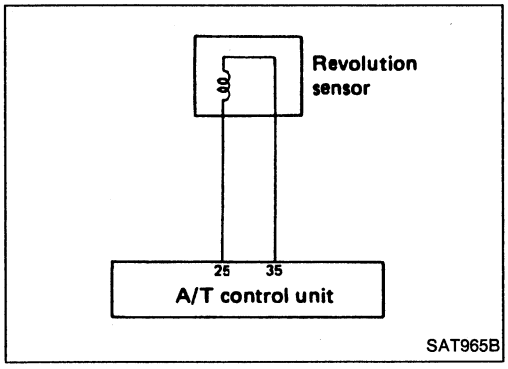
SAT224G

Line pressure solenoid valve circuit is short-circuited or disconnected.
→ **Go to line pressure solenoid valve circuit check.**

t_4 = 1.0 second

Self-diagnosis System (Cont'd)

REVOLUTION SENSOR CIRCUIT CHECK



CHECK REVOLUTION SENSOR. — Refer to "Electrical Components Inspection".

N.G. → Repair or replace revolution sensor.

O.K. ↓

A

CHECK INPUT SIGNAL.

1. Turn ignition switch to "start" position and start engine.
2. ● Select "ECU INPUT SIGNALS".
   ● Read out the value of "VHCL/S SE·A/T" while driving.
   ● Check the value changes according to driving speed.

N.G. → Check harness continuity between A/T control unit and revolution sensor.

OR

Check voltage between A/T control unit terminal ㉕ and ground while driving.
(Measure with A.C. position.)
Voltage:
At 0 km/h (0 MPH):
0V
At 30 km/h (19 MPH):
1V or more
(Voltage rises gradually in response to vehicle speed.)

O.K. ↓

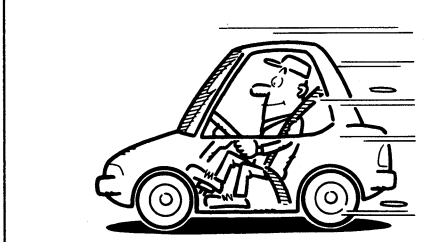
Perform self-diagnosis again after driving for a while.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

A

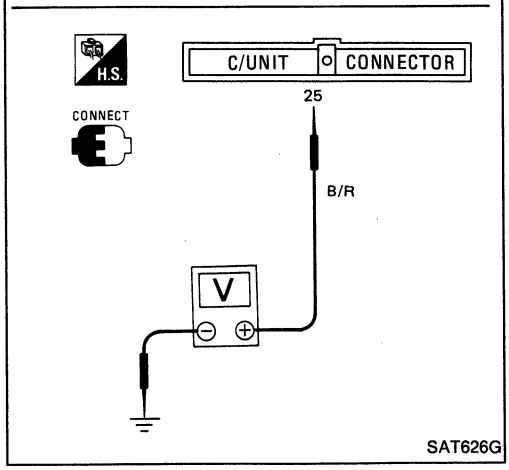


☆MONITOR	☆NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

RECORD

SAT416G

A



SAT626G

Self-diagnosis System (Cont'd)

SPEED SENSOR CIRCUIT CHECK

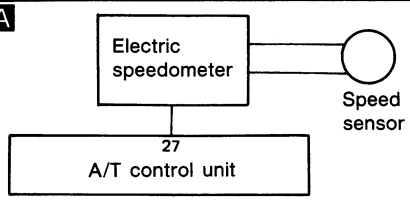
A

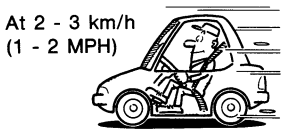
☆MONITOR	☆NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

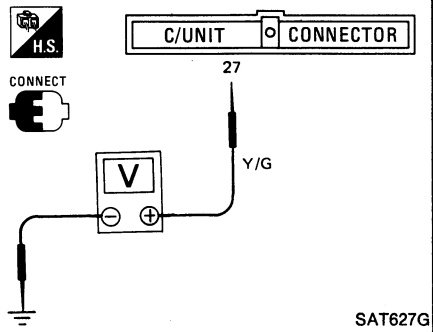
RECORD

SAT416G

A







SAT627G

A

CHECK INPUT SIGNAL.

1. Turn ignition switch to "start" position and start engine.
2.
   - Select "ECU INPUT SIGNALS".
   - Read out the value of "VHCL/S SE·MTR" while driving.
   - Check the value changes according to driving speed.

N.G. → Check the following items.
- Speed sensor and ground circuit for speed sensor — Refer to section EL.
- Harness continuity between A/T control unit and speed sensor

OR

Check voltage between A/T control unit terminal ㉗ and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.
Voltage:
Varies from 0V to 5V

O.K. ↓

Perform self-diagnosis again after driving for a while.

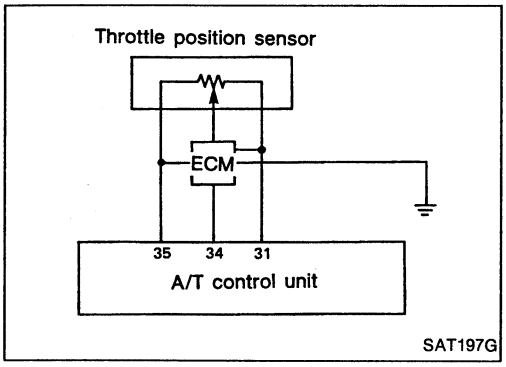
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

Self-diagnosis System (Cont'd)

THROTTLE POSITION SENSOR CIRCUIT CHECK



SAT197G

Perform self-diagnosis (Mode III) for engine control.

N.G. → Check throttle position sensor circuit for engine control. — Refer to section EF & EC.

O.K.

A

CHECK INPUT SIGNAL.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. ● Select "ECU INPUT SIGNALS".
   ● Read out the value of "THRTL POS SEN".

Voltage:
Fully-closed throttle:
Approximately 0.5V
Fully-open throttle:
Approximately 4V

N.G. → Check harness continuity between ECM and A/T control unit regarding throttle position sensor circuit.

OR

● Check voltage between A/T control unit terminals ㉞ and ㉟ while accelerator pedal is depressed slowly.

Voltage:
Fully-closed throttle:
Approximately 0.5V
Fully-open throttle:
Approximately 4V
(Voltage rises gradually in response to throttle valve opening.)

O.K.

Perform self-diagnosis again after driving for a while.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

INSPECTION END

A

Depress slowly.

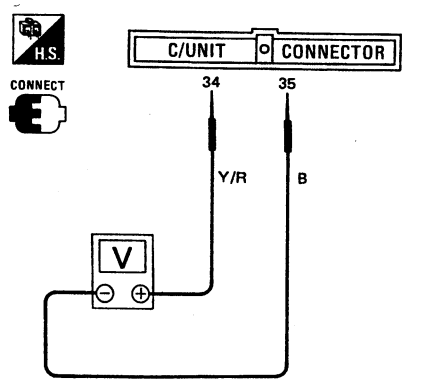
MONITOR	NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

RECORD

SAT417G

A

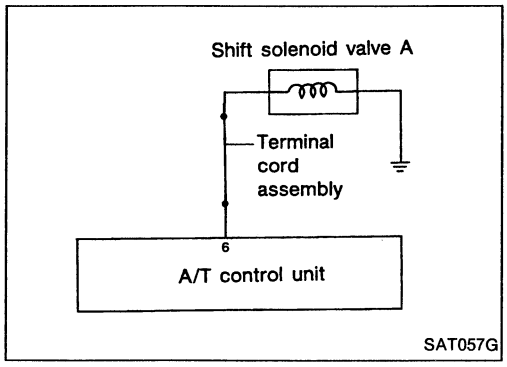
Depress slowly.

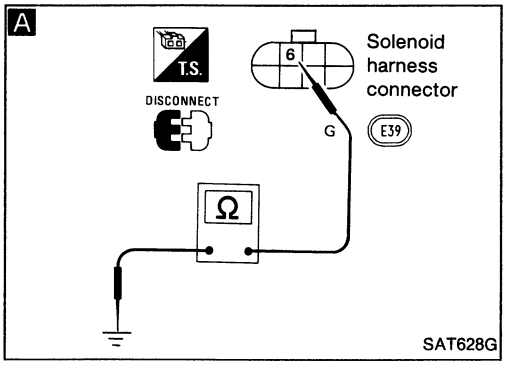


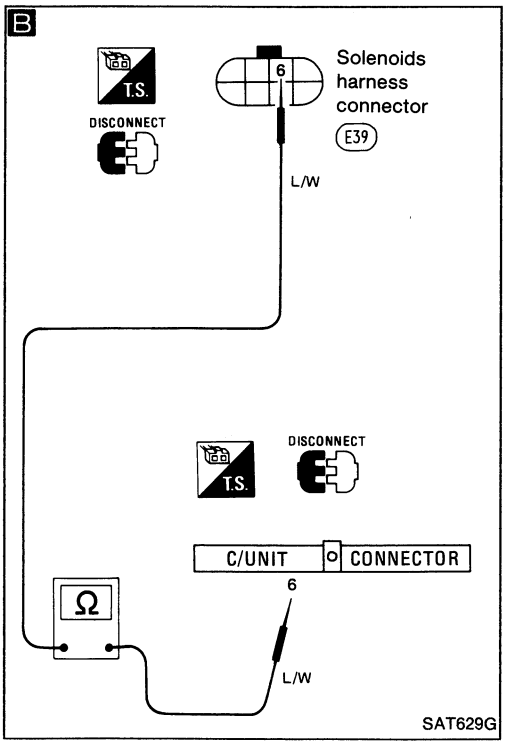
SAT978B

Self-diagnosis System (Cont'd)

SHIFT SOLENOID VALVE A CIRCUIT CHECK







A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑥ and ground.
   Resistance: 20 - 40Ω

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Shift solenoid valve A — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑥ and A/T control unit terminal ⑥.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

N.G. → Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

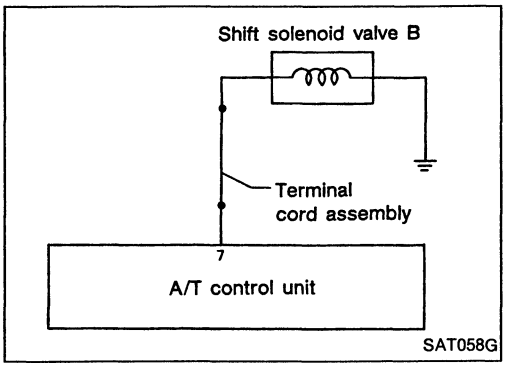
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

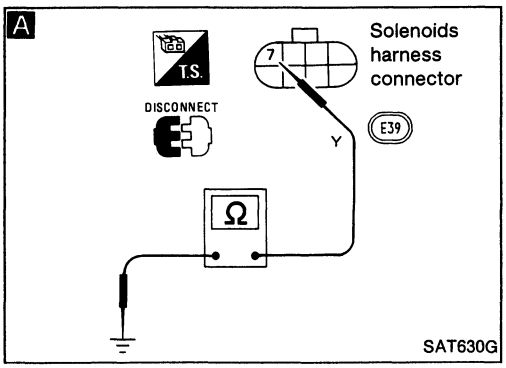
O.K. ↓

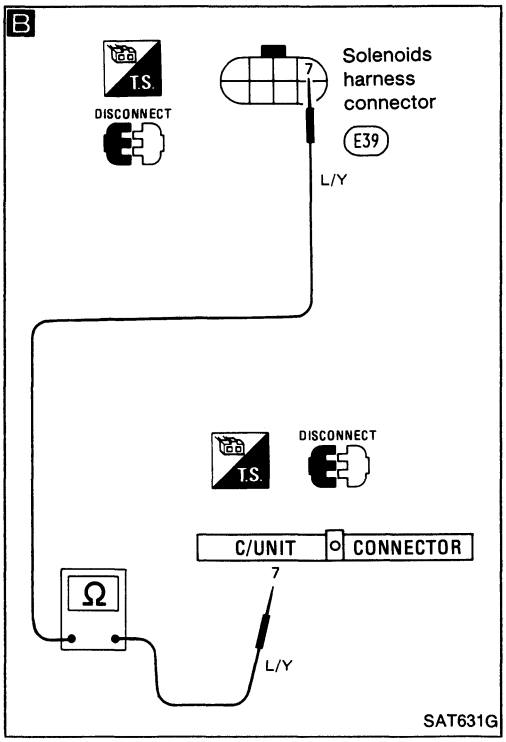
INSPECTION END

Self-diagnosis System (Cont'd)

SHIFT SOLENOID VALVE B CIRCUIT CHECK







A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑦ and ground.
   Resistance: 20 - 40Ω

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Shift solenoid valve B — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑦ and A/T control unit terminal ⑦.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

N.G. → Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

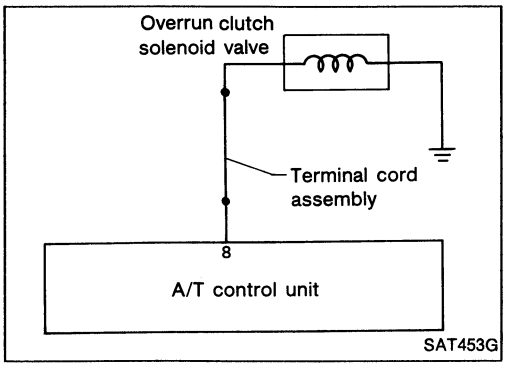
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

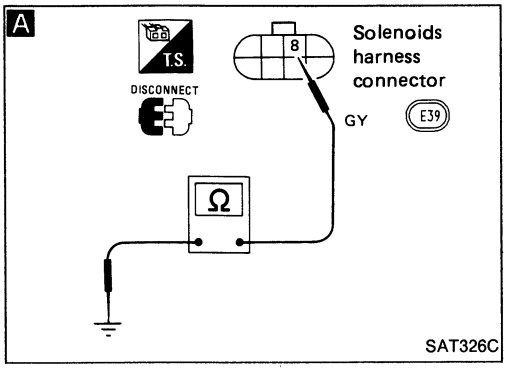
O.K. ↓

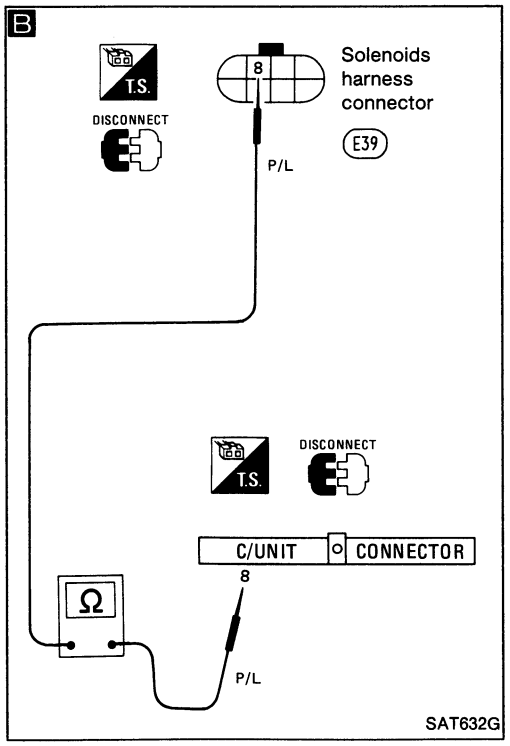
INSPECTION END

Self-diagnosis System (Cont'd)

OVERRUN CLUTCH SOLENOID VALVE CIRCUIT CHECK







A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑧ and ground.
   Resistance: 20 - 40Ω

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Overrun clutch solenoid valve. — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑧ and A/T control unit terminal ⑧.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

N.G. → Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

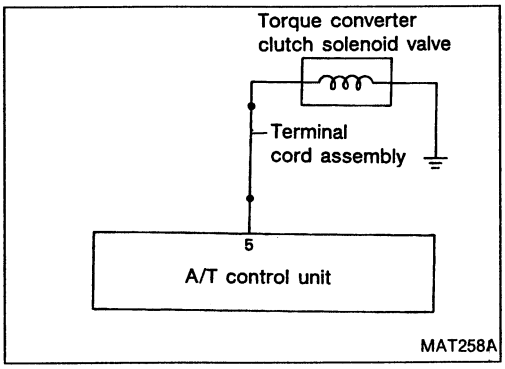
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

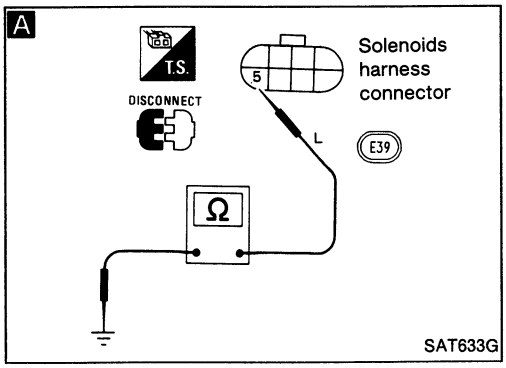
O.K. ↓

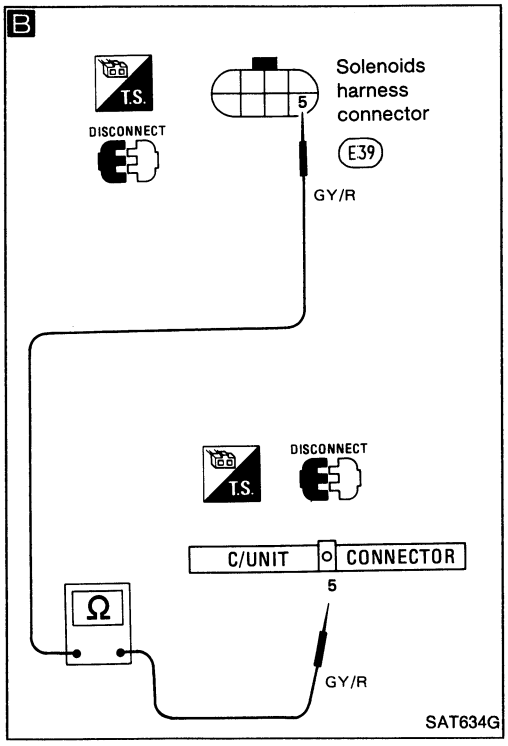
INSPECTION END

Self-diagnosis System (Cont'd)

TORQUE CONVERTER CLUTCH SOLENOID VALVE CIRCUIT CHECK







A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑤ and ground.
   Resistance: 10 - 20Ω

N.G. →
1. Remove oil pan. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Torque converter clutch solenoid valve. — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑤ and A/T control unit terminal ⑤.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

N.G. → Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

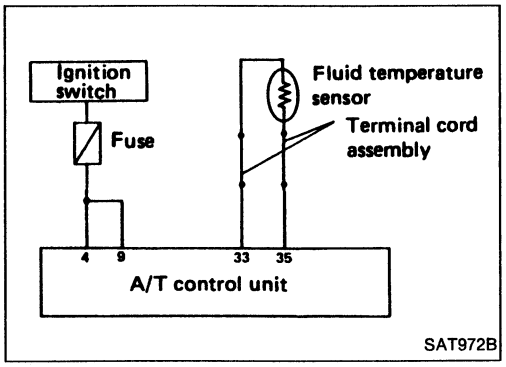
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

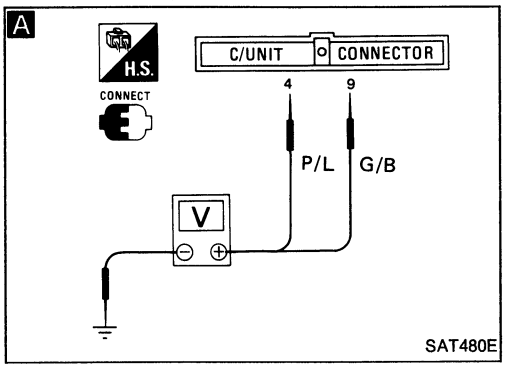
O.K. ↓

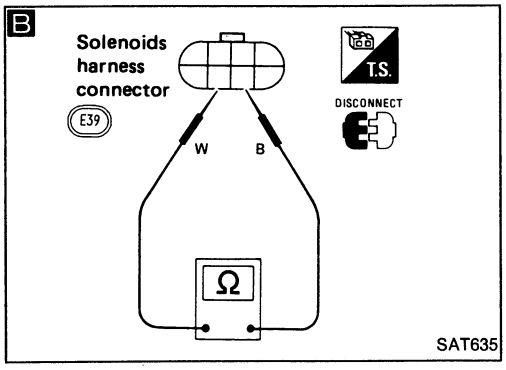
INSPECTION END

Self-diagnosis System (Cont'd)

FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS







A

CHECK A/T CONTROL UNIT POWER SOURCE.

1. Turn ignition switch to "ON" position (Do not start engine.)
2. Check voltage between A/T control unit terminals ④, ⑨ and ground.
   Battery voltage should exist.

N.G. → Check the following items.
- Harness continuity between ignition switch and A/T control unit
- Ignition switch and fuse — Refer to section EL.

O.K. ↓

B

CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals ㉝ and ㉟ when A/T is cold.
   Resistance:
   Cold [20°C (68°F)]
   Approximately 2.5 kΩ
4. Reinstall any part removed.

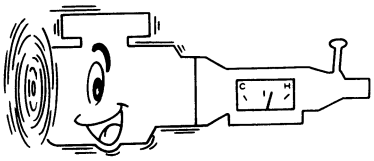
N.G. → 1. Remove control valve cover.
2. Check the following items.
- Fluid temperature sensor — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

Ⓐ

Self-diagnosis System (Cont'd)

C

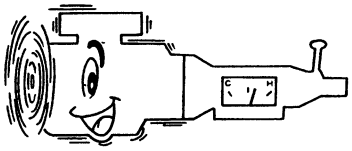


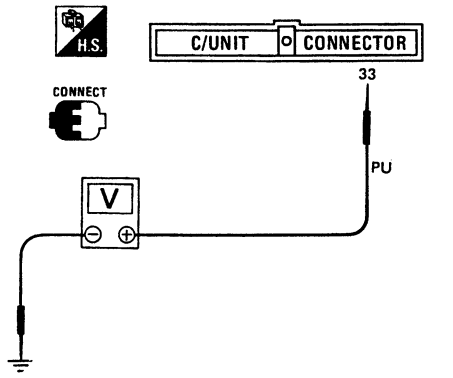
☆MONITOR	☆NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

RECORD

SAT418G

C





SAT990B

Ⓐ

C

CHECK INPUT SIGNAL OF FLUID TEMPERATURE SENSOR.

1. Turn ignition switch to "ON" position and start engine.
2. ● Select "ECU INPUT SIGNALS".
   ● Read out the value of "FLUID TEMPERATURE SENSOR".
   Voltage:
   Cold [20°C (68°F)] →
   Hot [80°C (176°F)]:
   Approximately
   1.5V → 0.5V

N.G. → Check harness continuity between A/T control unit and terminal cord assembly.

OR

● Check voltage between A/T control unit terminal ㉝ and ground while warming up A/T.
Voltage:
Cold [20°C (68°F)] →
Hot [80°C (176°F)]:
Approximately
1.5V → 0.5V

O.K.

Perform self-diagnosis after driving for a while.

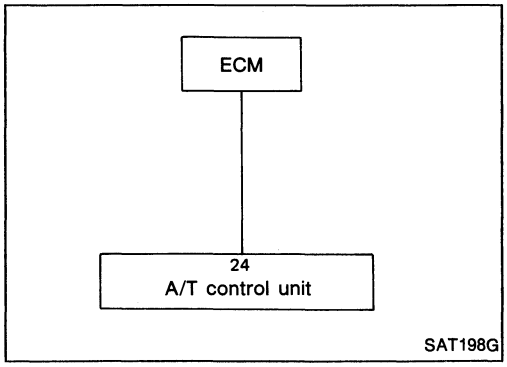
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

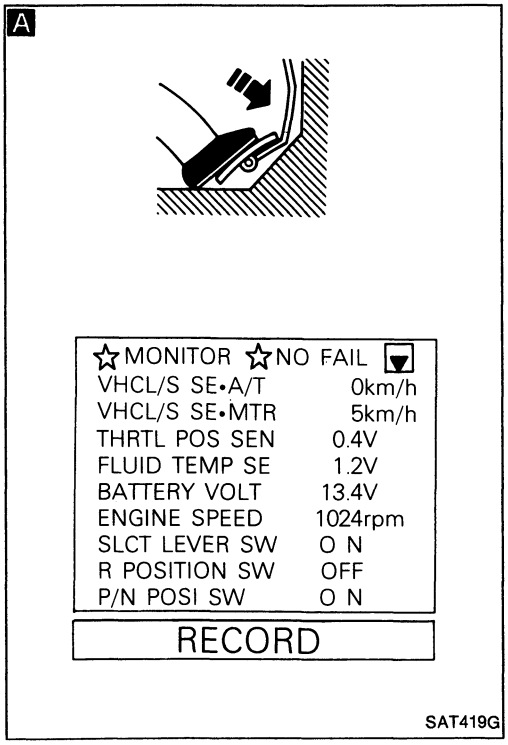
O.K.

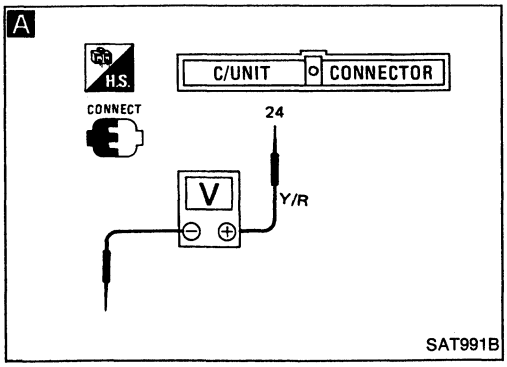
INSPECTION END

Self-diagnosis System (Cont'd)

ENGINE SPEED SIGNAL CIRCUIT CHECK







Check ignition circuit condition for engine.
- N.G. → Repair or replace. — Refer to section EF & EC.
- O.K. ↓

A

CHECK INPUT SIGNAL.

1. Turn ignition switch to "ON" position and start engine.
2.
   - Select "ECU INPUT SIGNALS".
   - Read out the value of "ENGINE SPEED".
   - Check engine speed changes according to throttle opening.

N.G. → Check harness continuity between A/T control unit and ECM (ECCS control module).

OR

- Check voltage between A/T control unit terminal ㉔ and ground.
  Voltage: 0.9 - 4.5V

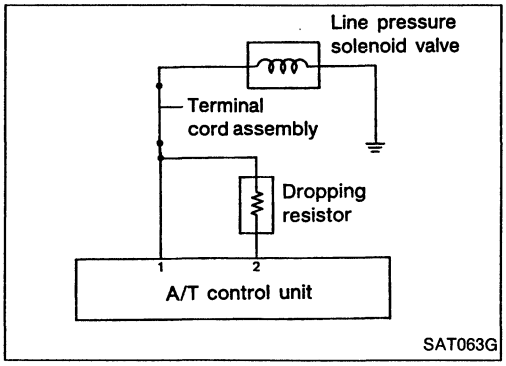
O.K. ↓

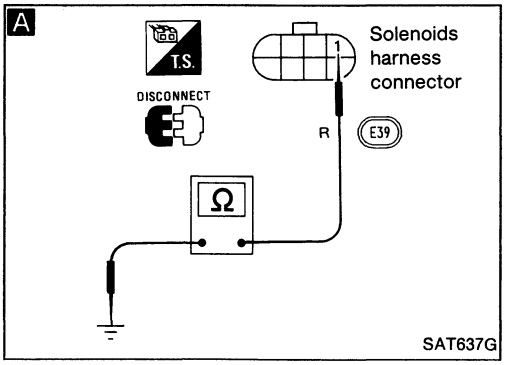
Perform self-diagnosis again after driving for a while.
- N.G. → 1. Perform A/T control unit input/output signal inspection.
  2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

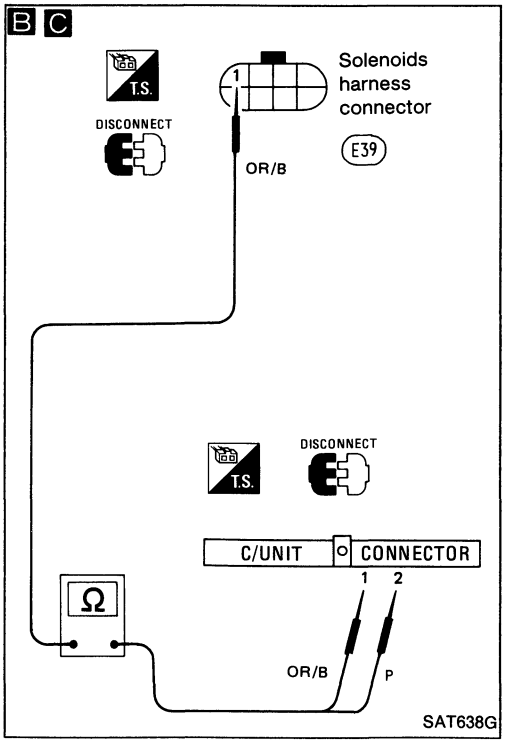
INSPECTION END

Self-diagnosis System (Cont'd)

LINE PRESSURE SOLENOID VALVE CIRCUIT CHECK







A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ① and ground.
   Resistance: 2.5 - 5Ω

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Line pressure solenoid valve — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ① and A/T control unit terminal ②.
   Resistance: 11.2 - 12.8Ω

N.G. →
Check the following items.
- Dropping resistor — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit ② and terminal cord assembly

O.K. ↓

C

CHECK POWER SOURCE CIRCUIT
1. Turn ignition switch to "OFF" position.
2. Check resistance between terminal ① and A/T control unit terminal ①.
   Resistance:
   Approximately 0Ω
3. Reinstall any part removed.

N.G. →
Repair or replace harness between A/T control unit ① and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

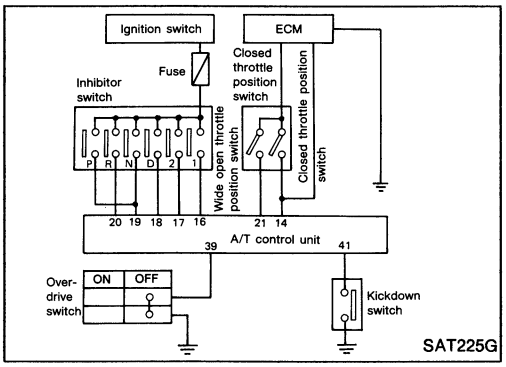
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

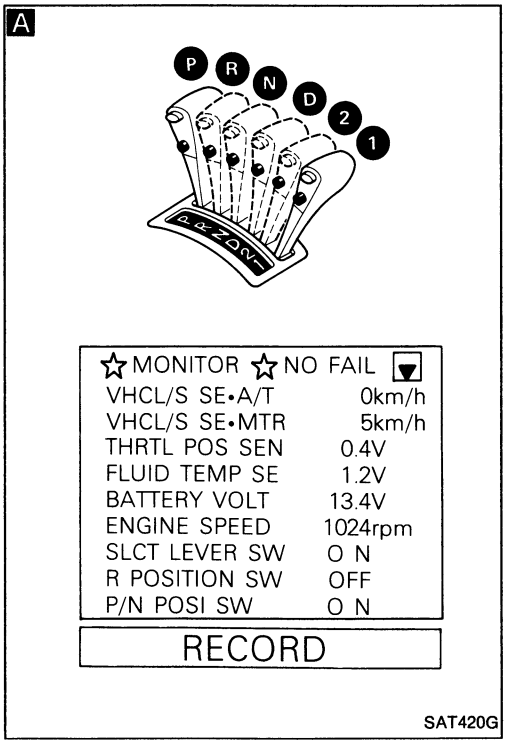
INSPECTION END

Self-diagnosis System (Cont'd)

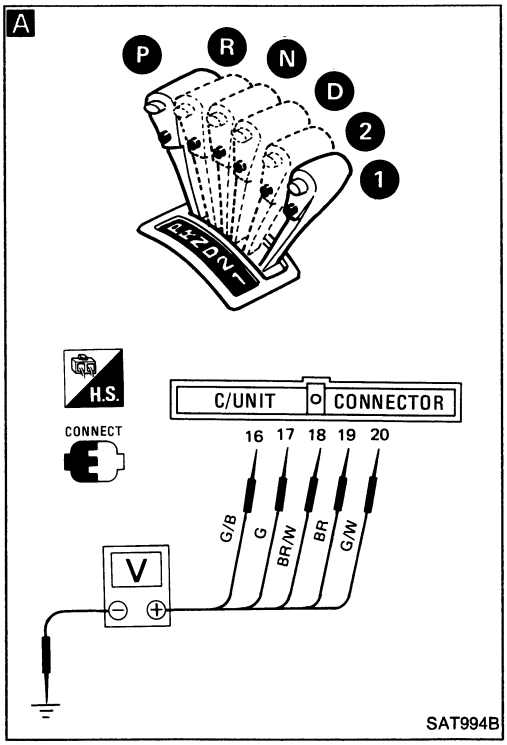
INHIBITOR, OVERDRIVE, KICKDOWN AND CLOSED THROTTLE POSITION SWITCH CIRCUIT CHECKS



A



A



A

CHECK INHIBITOR SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2.
   - Select "ECU INPUT SIGNALS".
   - Read out "R, N, D, 1 and 2 position switches" moving selector lever to each position.
   - Check the selector lever position is indicated properly.

OR

- Check voltage between A/T control unit terminal ⑯, ⑰, ⑱, ⑲, ⑳ and ground while moving selector lever through each position.

Voltage:
B: Battery voltage
0: 0V

Lever position	Terminal No. ⑲	⑳	⑱	⑰	⑯
P, N	**B**	0	0	0	0
R	0	**B**	0	0	0
D	0	0	**B**	0	0
2	0	0	0	**B**	0
1	0	0	0	0	**B**

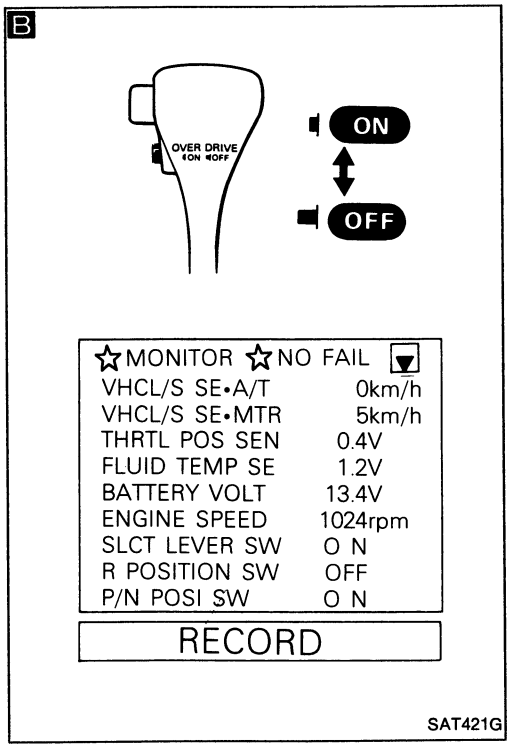
N.G. →

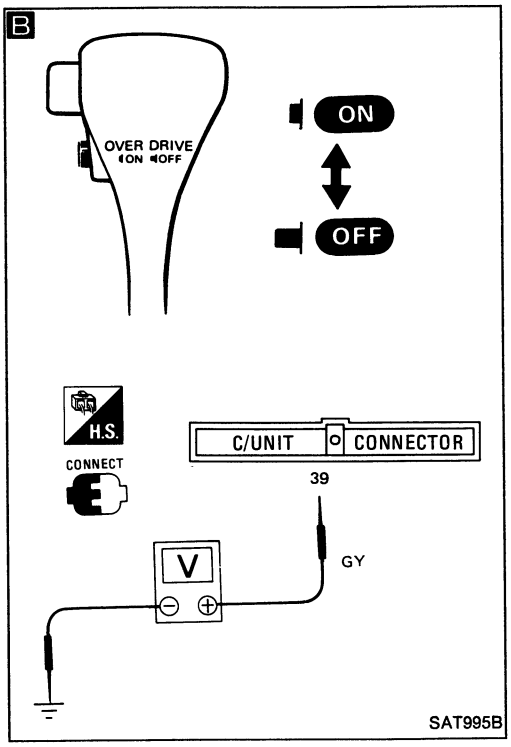
Check the following items.
- Inhibitor switch — Refer to "Electrical Components Inspection".
- Harness continuity between ignition switch and inhibitor switch
- Harness continuity between inhibitor switch and A/T control unit

O.K. ↓

Ⓐ

Self-diagnosis System (Cont'd)





Ⓐ

B

CHECK OVERDRIVE SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2.
   - Select "ECU INPUT SIGNALS".
   - Read out "SELECTOR LEVER SWITCH (Overdrive switch)".
   - Check the selector lever switch position is indicated properly. (Selector lever switch "ON" displayed on CONSULT means overdrive "OFF".)

N.G. → Check the following items.
- Overdrive switch — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit and overdrive switch
- Harness continuity of ground circuit for overdrive switch

OR

- Check voltage between A/T control unit terminal ㊴ and ground when overdrive switch is in "ON" position and in "OFF" position.

Switch position	Voltage
ON	Battery voltage
OFF	1V or less

O.K. → Ⓑ

Self-diagnosis System (Cont'd)

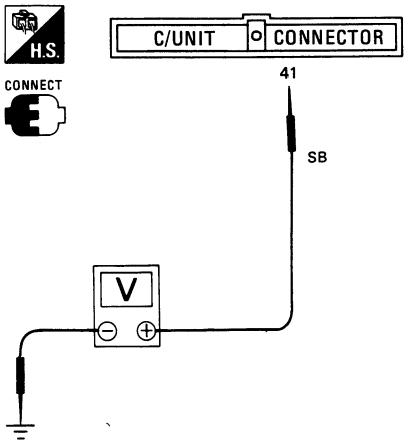
C

☆MONITOR	☆NO FAIL
D POSITION SW	OFF
1 POSITION SW	OFF
2 POSITION SW	OFF
ASCD•CRUISE	OFF
ASCD•OD OUT	OFF
KICKDOWN SW	OFF
POWERSHIFT SW	OFF
CLOSED THL/SW	O N
W/O THRL/P-SW	OFF

RECORD

SAT422G

C



SAT337C

Ⓑ

C

CHECK KICKDOWN SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. ● Select "ECU INPUT SIGNALS".
   ● Read out "KICKDOWN SWITCH" depressing accelerator pedal fully.
   ● Check kickdown switch position is indicated properly.

OR

● Check voltage between A/T control unit terminal ㊶ and ground while depressing accelerator pedal slowly. (after warming up engine)
Voltage:
When releasing accelerator pedal: 3 - 8V
When depressing accelerator pedal fully: 1V or less

N.G. → Check the following items.
- Kickdown switch
- Harness continuity between A/T control unit and kickdown switch
- Harness continuity of ground circuit for kickdown switch
- Adjust kickdown switch — Refer to "ON-VEHICLE SERVICE".

O.K.

Ⓒ

Self-diagnosis System (Cont'd)

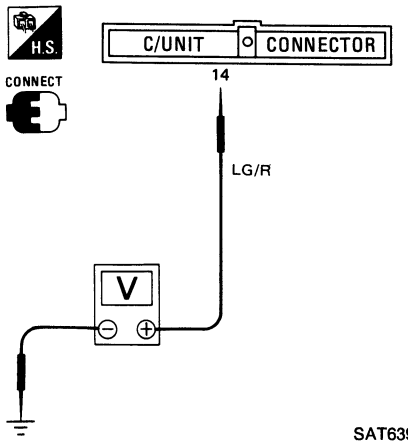
D

☆MONITOR	☆NO FAIL
D POSITION SW	OFF
1 POSITION SW	OFF
2 POSITION SW	OFF
ASCD•CRUISE	OFF
ASCD•OD OUT	OFF
KICKDOWN SW	OFF
POWERSHIFT SW	OFF
CLOSED THL/SW	O N
W/O THRL/P-SW	OFF

RECORD

SAT423G

D



SAT639G

Ⓒ

D

CHECK CLOSED THROTTLE POSITION SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. ● Select "ECU INPUT SIGNALS".
   ● Read out "CLOSED THROTTLE POSITION SWITCH" depressing and releasing accelerator pedal.
   ● Check closed throttle position switch changes ON or OFF.

N.G. → Perform self-diagnosis (Mode IV) for engine control. Check closed throttle position switch circuit.

O.K. → Check harness continuity between A/T control unit and closed throttle position switch.

N.G. → Check closed throttle position switch circuit for engine control. — Refer to section EF & EC.

OR

● Check voltage between A/T control unit terminal ⑭ and ground while depressing accelerator pedal slowly. (after warming up engine)

Voltage:

When releasing accelerator pedal:
8 - 15V

When depressing accelerator pedal fully:
1V or less

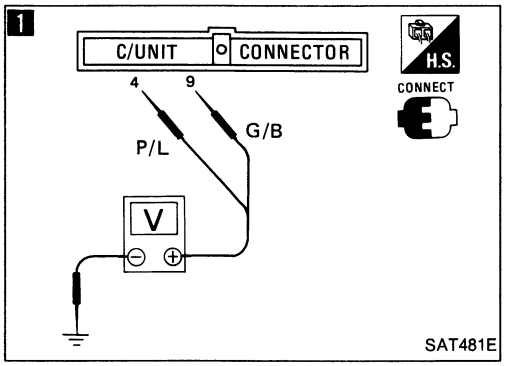
O.K.

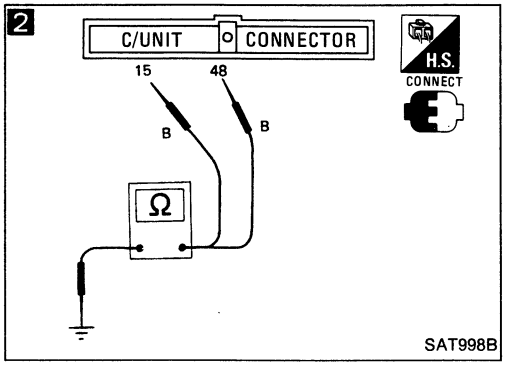
Perform self-diagnosis again after driving for a while.

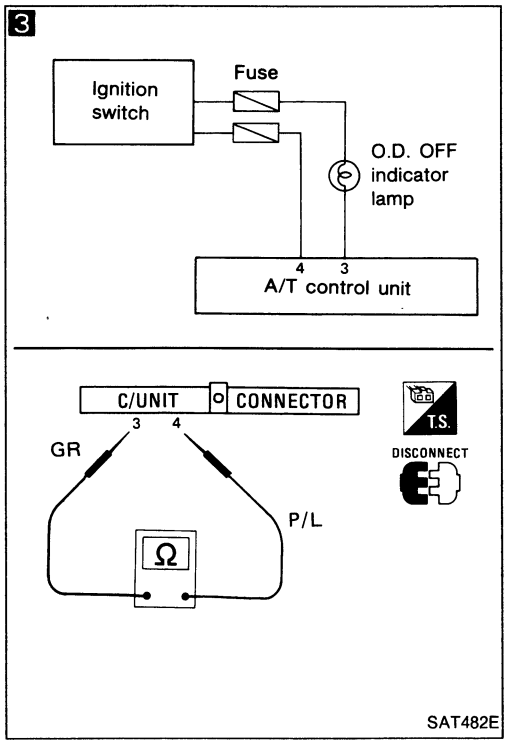
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

INSPECTION END







Diagnostic Procedure 1

SYMPTOM: A/T CHECK lamp does not come on for about 2 seconds when turning ignition switch to "ON".

1

CHECK A/T CONTROL UNIT POWER SOURCE.
1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit terminals ④, ⑨ and ground.
Battery voltage should exist.

N.G. → Check the following items.
- Harness continuity between ignition switch and A/T control unit.
- Ignition switch and fuse — Refer to section EL.

O.K. ↓

2

CHECK A/T CONTROL UNIT GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between A/T control unit terminals ⑮, ㊽ and ground.
Resistance:
Approximately 0Ω

N.G. → Check harness continuity between A/T control unit and ground.

O.K. ↓

3

CHECK LAMP CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between A/T control unit terminals ③ and ④.
Resistance: 50 - 100Ω
4. Reinstall any part removed.

N.G. → Check the following items.
- A/T check lamp
- Harness continuity between ignition switch and A/T check lamp
- Harness continuity between A/T check lamp and A/T control unit

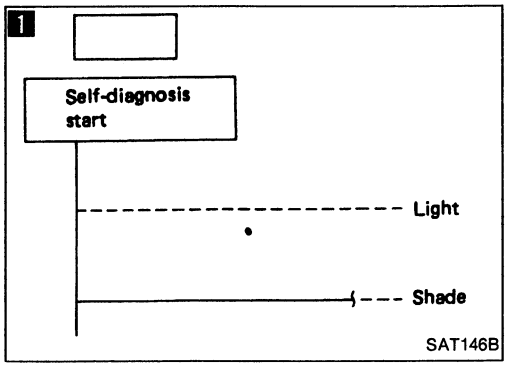
O.K. ↓

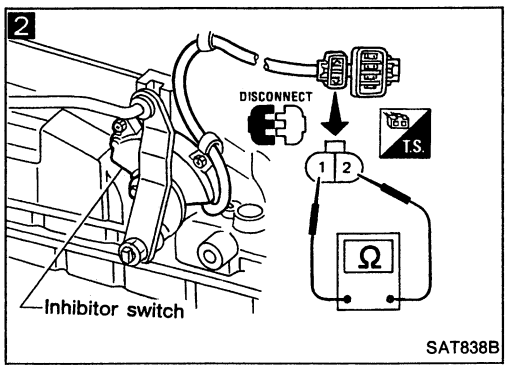
Check again.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END





Diagnostic Procedure 2

SYMPTOM: Engine cannot be started with selector lever in "P" or "N" position or engine can be started with selector lever in "D", "2", "1" or "R" position.

Does "ECU INPUT SIGNALS" show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

OR

1 Does self-diagnosis show damage to inhibitor switch circuit?

No

2 Check continuity of inhibitor switch 2-pin connector. — Refer to "Electrical Components Inspection". — N.G. → Repair or replace inhibitor switch.

O.K.

Check starting system. — Refer to section EL. — N.G. → Repair or replace damaged parts.

O.K.

INSPECTION END

Diagnostic Procedure 3

SYMPTOM: Vehicle moves when it is pushed forward or backward with selector lever in "P" position.

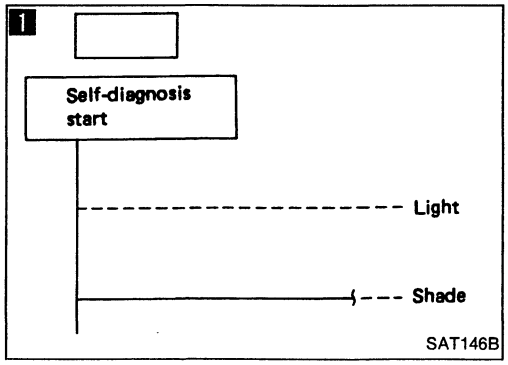
Check parking components. — Refer to "ON-VEHICLE SERVICE". — N.G. → Repair or replace damaged parts.

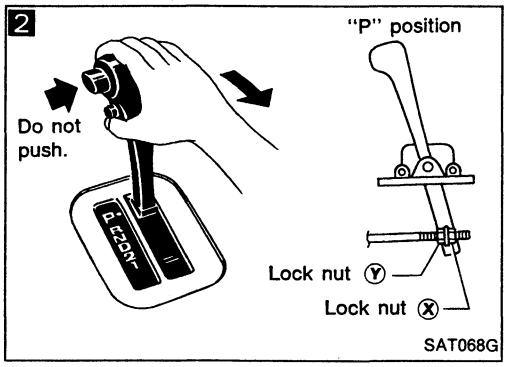
O.K.

INSPECTION END

Diagnostic Procedure 4

SYMPTOM: Vehicle moves forward or backward when selecting "N" position.





Does "ECU INPUT SIGNALS" show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

OR

1 Does self-diagnosis show damage to inhibitor switch circuit?

No ↓

Check manual control linkage. — Refer to "ON-VEHICLE SERVICE". — N.G. → 2 Adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".

O.K. ↓

3 Check A/T fluid level again. — N.G. → Refill A.T.F.

O.K. ↓

4 1. Remove oil pan.
2. Check A/T fluid condition. — N.G. →
1. Disassemble A/T.
2. Check the following items.
- Forward clutch assembly
- Overrun clutch assembly
- Reverse clutch assembly
- Accumulator piston D

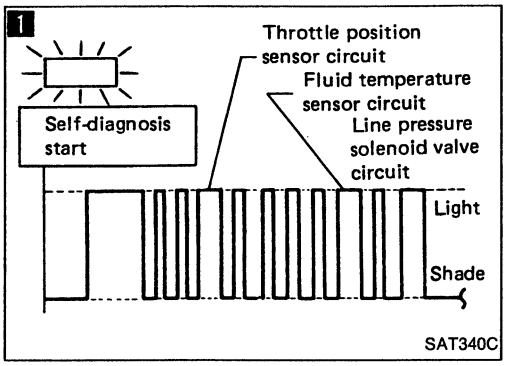
O.K. ↓

Check again. — N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

1



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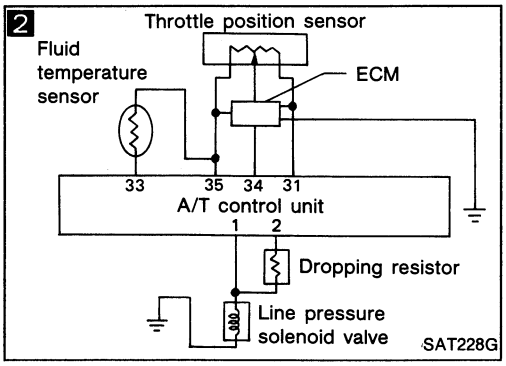

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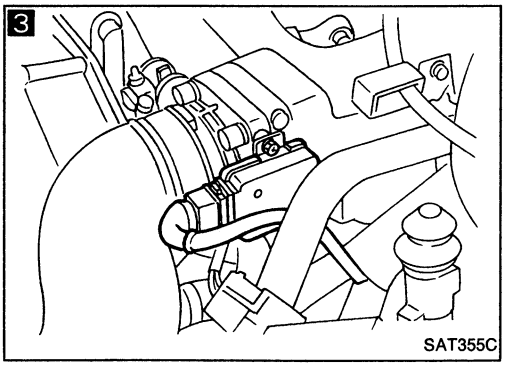


Diagnostic Procedure 5

SYMPTOM: There is large shock when changing from "N" to "R" position.

1

Does self-diagnosis show damage to throttle position sensor, line pressure solenoid valve or fluid temperature sensor circuit?

Yes → **2** Check damaged circuit. — Refer to "Self-diagnosis".

No ↓

3

Check throttle position sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle position sensor.

O.K. ↓

Check line pressure at closed throttle position switch selector lever in "D" position. — Refer to "PRESSURE TESTING".

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Valves to control line pressure (Pressure regulator valve, modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

O.K. ↓

Check again.

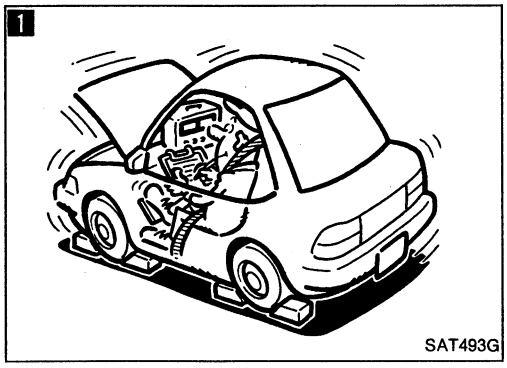
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

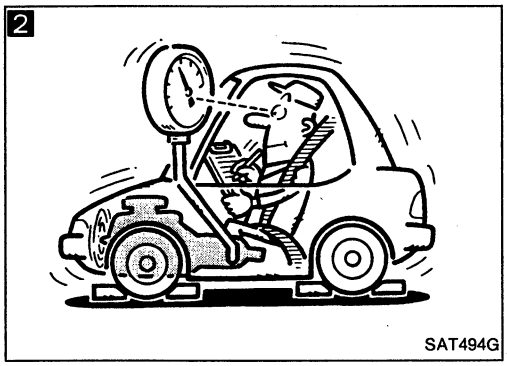
O.K. ↓

INSPECTION END

Diagnostic Procedure 6

SYMPTOM: Vehicle does not creep backward when selecting "R" position.





Check A/T fluid level again.
N.G. → Refill A.T.F.
O.K.

N.G. in both "1" and "R" position

1
Check stall revolution with selector lever in "1" and "R" position.
O.K.

O.K. in "1" position
N.G. in "R" position

2
Check line pressure at idle with selector lever in "R" position. — Refer to "PRESSURE TESTING".
N.G.
O.K.

1. Remove oil pan.
2. Check fluid condition.
N.G.
O.K.

Check again.
N.G.
O.K.

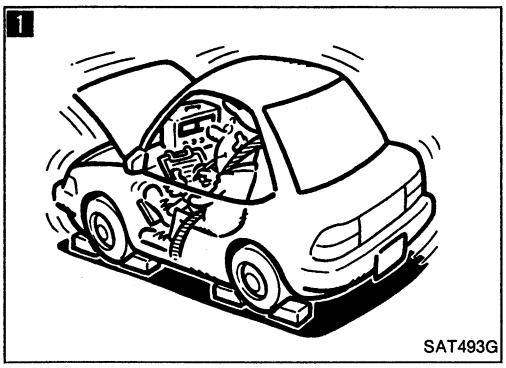
INSPECTION END

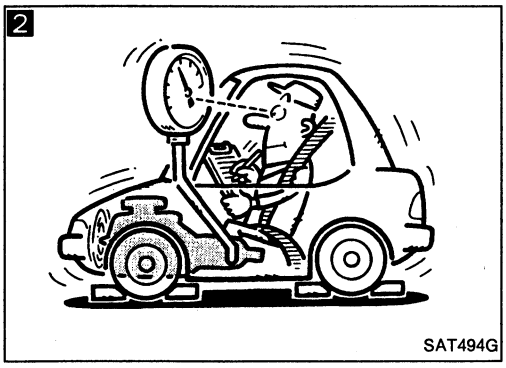
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Valves to control line pressure (Pressure regulator valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items.
- Oil pump assembly
- Torque converter
- Reverse clutch assembly
- High clutch assembly
- Low & reverse brake assembly
- Low one-way clutch

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

Diagnostic Procedure 7

SYMPTOM: Vehicle does not creep forward when selecting "D", "2" or "1" position.





Check A/T fluid level again.
- N.G. → Refill A.T.F.
- O.K. ↓

1

Check stall revolution with selector lever in "D" position. — Refer to "STALL TESTING".
- N.G. → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE". 2. Check the following items.
  - Valves to control line pressure (Pressure regulator valve, modifier valve, pilot valve and pilot filter)
  - Line pressure solenoid valve
  3. Disassemble A/T. 4. Check the following items.
  - Oil pump assembly
  - Forward clutch assembly
  - Forward one-way clutch
  - Low one-way clutch
  - Low & reverse brake assembly
  - Torque converter
- O.K. ↓

2

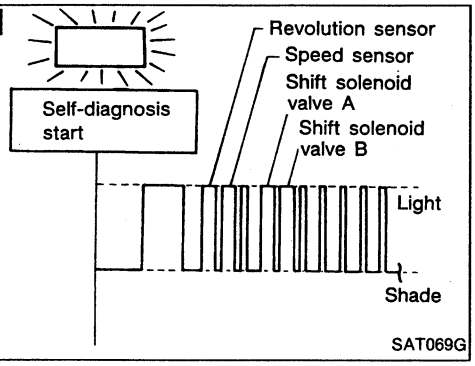
Check line pressure at closed throttle position switch selector lever in "D" position. — Refer to "PRESSURE TESTING".
- N.G. → (1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE". 2. Check the following items. • Valves to control line pressure (Pressure regulator valve, modifier valve, pilot valve and pilot filter) • Line pressure solenoid valve 3. Disassemble A/T. 4. Check the following items. • Oil pump assembly • Forward clutch assembly • Forward one-way clutch • Low one-way clutch • Low & reverse brake assembly • Torque converter)
- O.K. ↓

1. Remove oil pan.
2. Check A/T fluid condition.
- N.G. → (1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE". 2. Check the following items. • Valves to control line pressure (Pressure regulator valve, modifier valve, pilot valve and pilot filter) • Line pressure solenoid valve 3. Disassemble A/T. 4. Check the following items. • Oil pump assembly • Forward clutch assembly • Forward one-way clutch • Low one-way clutch • Low & reverse brake assembly • Torque converter)
- O.K. ↓

Check again.
- N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

INSPECTION END

1



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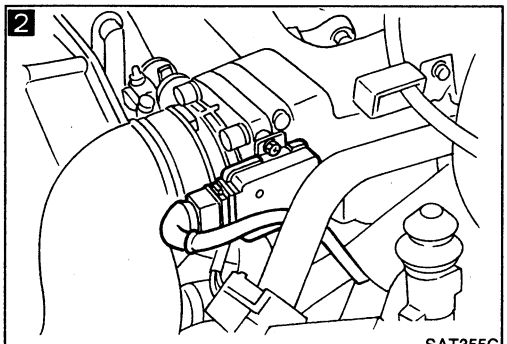

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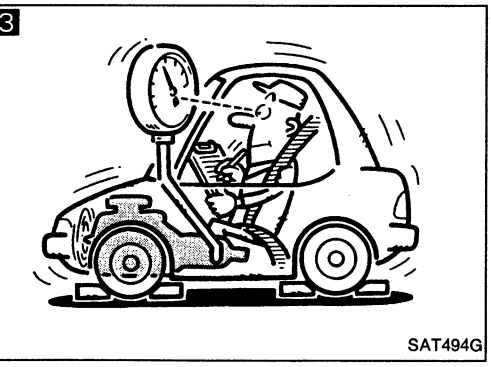


Diagnostic Procedure 8

SYMPTOM: Vehicle cannot be started from D_1 on Cruise test — Part 1.

Is Diagnostic Procedure 7 O.K.? — No → Go to Diagnostic Procedure 7.

Yes ↓

1

Does self-diagnosis show damage to revolution sensor, speed sensor, shift solenoid valve A or B after cruise test? — Yes → Check damaged circuit. — Refer to "Self-diagnosis".

No ↓

2

Check throttle position sensor. — Refer to section EF & EC. — N.G. → Repair or replace throttle position sensor.

O.K. ↓

3

Check line pressure at stall point with selector lever in "D" position. — Refer to "PRESSURE TESTING". — N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Shift valve A
   - Shift valve B
   - Shift solenoid valve A
   - Shift solenoid valve B
   - Pilot valve
   - Pilot filter

O.K. ↓

1. Remove oil pan.
2. Check A/T fluid condition. — O.K. →

N.G. ↓

O.K. →

3. Disassemble A/T.
4. Check the following items.
   - Forward clutch assembly
   - Forward one-way clutch
   - Low one-way clutch
   - High clutch assembly
   - Torque converter
   - Oil pump assembly

Check again. — N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

Diagnostic Procedure 9

SYMPTOM: A/T does not shift from D_1 to D_2 at the specified speed.
A/T does not shift from D_4 to D_2 when depressing accelerator pedal fully at the specified speed.

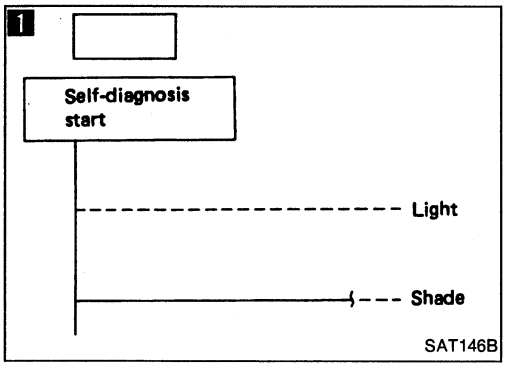
Are Diagnostic Procedures 7 and 8 O.K.?
- No → Go to Diagnostic Procedure 7 or 8.
- Yes ↓

Does "ECU INPUT SIGNALS" show damage to inhibitor switch circuit?
- Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

OR

1 Does self-diagnosis show damage to inhibitor switch circuit?
- No ↓

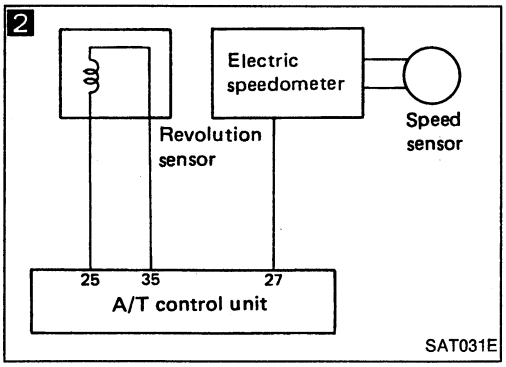
1



SAT146B

2 Check revolution sensor and speed sensor circuit. — Refer to "Self-diagnosis".
- N.G. → Repair or replace revolution sensor and speed sensor circuits.
- O.K. ↓

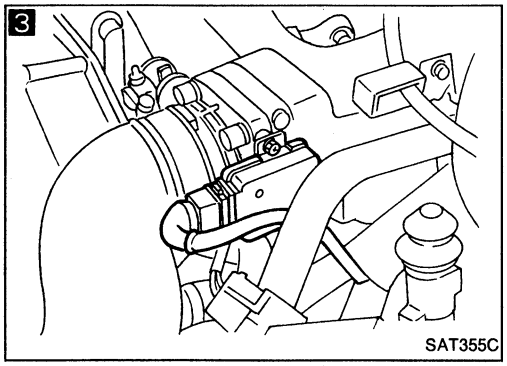
2



SAT031E

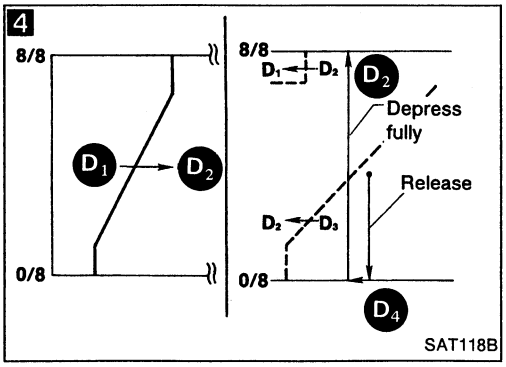
3 Check throttle position sensor. — Refer to section EF & EC.
- N.G. → Repair or replace throttle position sensor.
- O.K. ↓

3


SAT355C

1. Remove oil pan.
2. Check A/T fluid condition.
- N.G. →
  1. Remove control valve. — Refer to "ON-VEHICLE SERVICE".
  2. Check the following items.
     - Shift valve A
     - Shift solenoid valve A
     - Pilot valve
     - Pilot filter
- O.K. ↓

4



SAT118B

Check again.
- N.G. →
  1. Perform A/T control unit input/output signal inspection.
  2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

INSPECTION END

Diagnostic Procedure 10

SYMPTOM: A/T does not shift from D_2 to D_3 at the specified speed.

Are Diagnostic Procedures 7 and 8 O.K.?

No → Go to Diagnostic Procedure 7 or 8.

Yes ↓

Does "ECU INPUT SIGNALS" show damage to inhibitor switch circuit?

Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

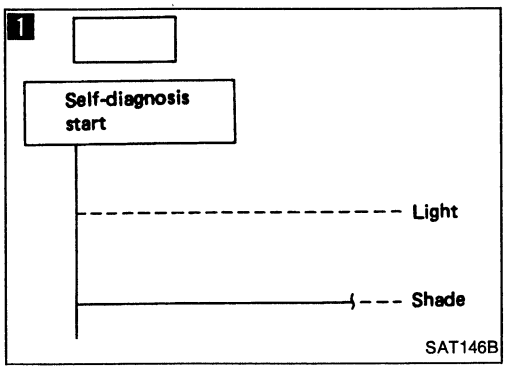
OR

1

Does self-diagnosis show damage to inhibitor switch circuit?

No ↓

1

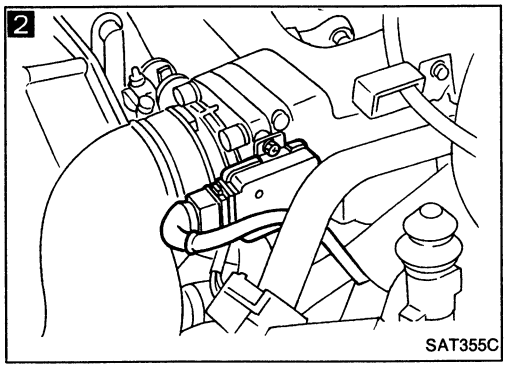


2

Check throttle position sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle position sensor.

O.K. ↓



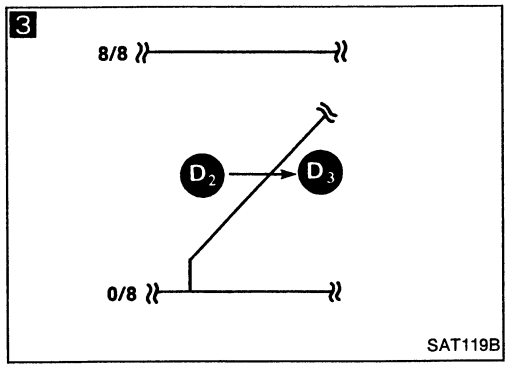
1. Remove oil pan.
2. Check A/T fluid condition.

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Shift valve B
   - Shift solenoid valve B
   - Pilot valve
   - Pilot filter
3. Disassemble A/T.
4. Check the following items.
   - Servo piston assembly
   - High clutch assembly
   - Oil pump assembly

O.K. ↓

O.K. ←

O.K. ←



3

Check again.

N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

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

Diagnostic Procedure 11

SYMPTOM: A/T does not shift from D_3 to D_4 at the specified speed.

Are Diagnostic Procedures 7 and 8 O.K.?

No → Go to Diagnostic Procedure 7 or 8.

Yes ↓

1

Does self-diagnosis show damage to inhibitor switch, overdrive switch, shift solenoid valve A, B, revolution sensor, speed sensor or fluid temperature sensor circuit after cruise test?

Yes → Check damaged circuit. — Refer to "Self-diagnosis".

No ↓

2

Check throttle position sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle position sensor.

O.K. ↓

1. Remove oil pan.
2. Check A/T fluid condition.

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Shift valve B
   - Overrun clutch control valve
   - Shift solenoid valve B
   - Pilot valve
   - Pilot filter
3. Disassemble A/T.
4. Check the following items.
   - Servo piston assembly
   - Brake band
   - Torque converter
   - Oil pump assembly

O.K. ↓

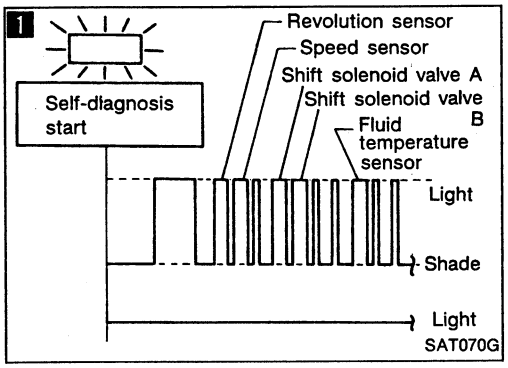
3

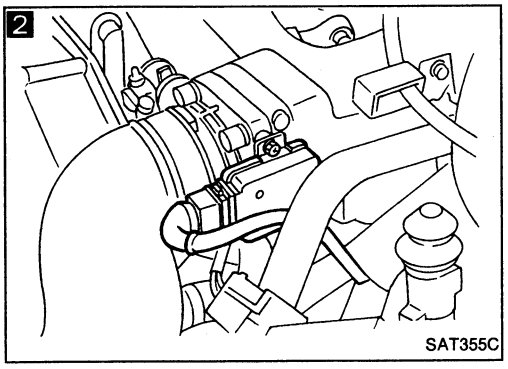
Check again.

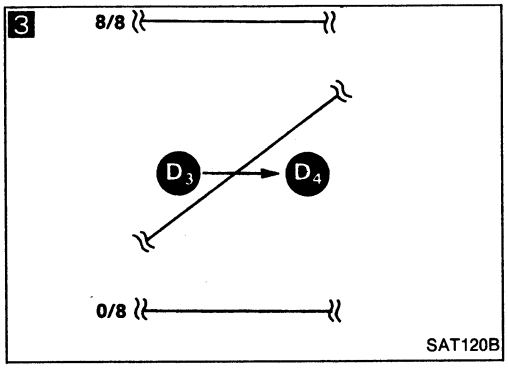
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

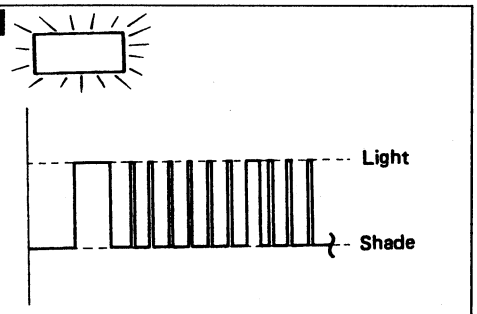
INSPECTION END







1



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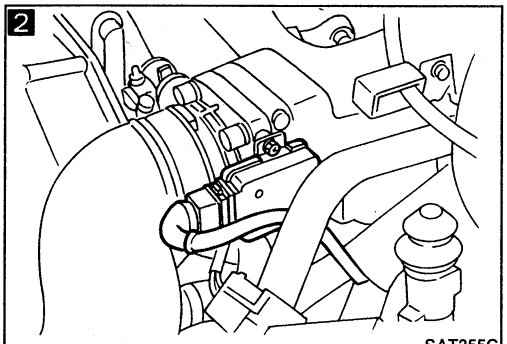
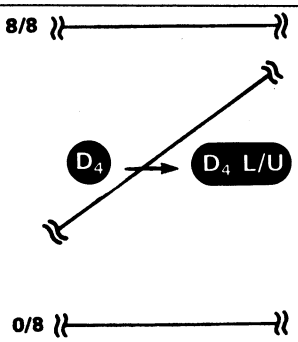
2



SAT355C

3



SAT121B

Diagnostic Procedure 12

SYMPTOM: A/T does not perform lock-up at the specified speed.

1

Does self-diagnosis show damage to torque converter clutch solenoid valve circuit after cruise test?

Yes → Check torque converter clutch solenoid valve circuit. — Refer to "Self-diagnosis".

No ↓

2

Check throttle position sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle position sensor.

O.K. ↓

1. Remove control valve. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Lock-up control valve
- Shuttle shift valve D
- Torque converter relief valve
- Torque converter clutch solenoid valve
- Pilot valve
- Pilot filter

N.G. → Repair or replace damaged parts.

O.K. ↓

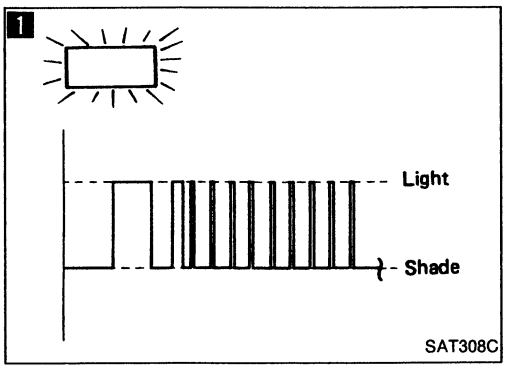
3

Check again.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END



Diagnostic Procedure 13

SYMPTOM: A/T does not hold lock-up condition for more than 30 seconds.

1

Does self-diagnosis show damage to engine speed signal circuit after cruise test?

Yes → Check engine speed signal circuit. — Refer to "Self-diagnosis".

No ↓

1. Remove oil pan.
2. Check A/T fluid condition.

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Lock-up control valve
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check torque converter and oil pump assembly.

O.K. ↓

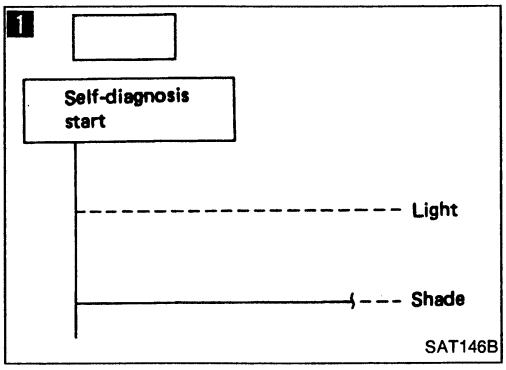
O.K. ←

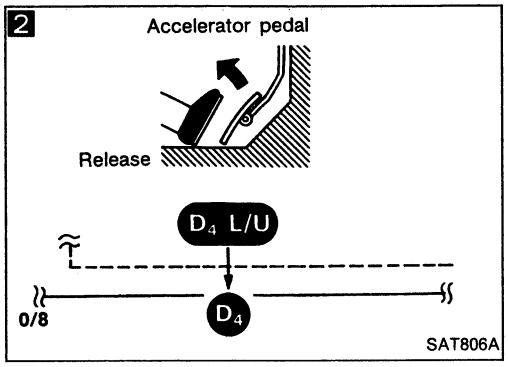
Check again.

N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END





Diagnostic Procedure 14

SYMPTOM: Lock-up is not released when accelerator pedal is released.

Does "ECU INPUT SIGNALS" show damage to closed throttle position switch circuit? — Yes → Check closed throttle position switch circuit. — Refer to "Self-diagnosis".

OR

1

Does self-diagnosis show damage to closed throttle position switch circuit?

No

2

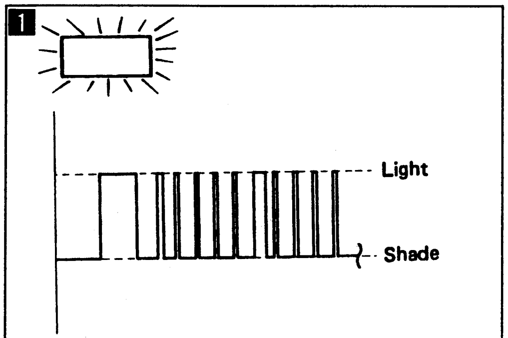
Check again. — N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

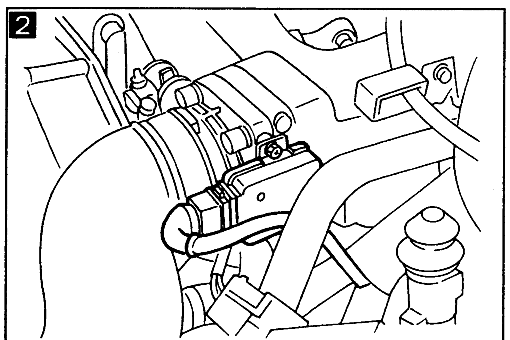
INSPECTION END

Diagnostic Procedure 15

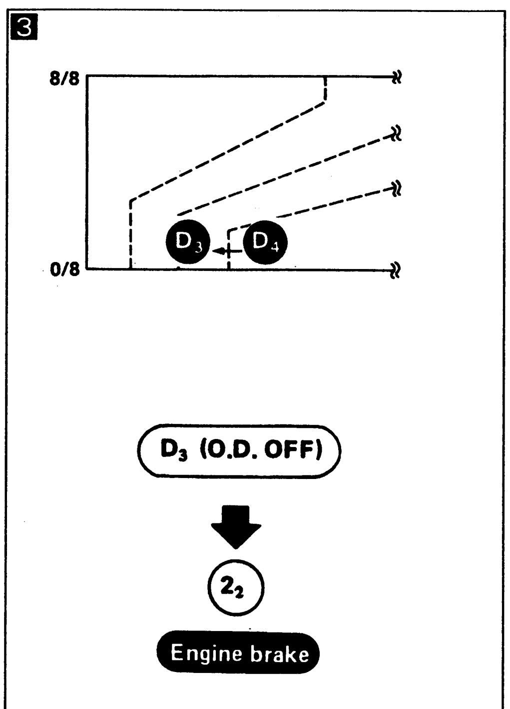
SYMPTOM: Engine speed does not return to idle smoothly when A/T is shifted from D_4 to D_3 with accelerator pedal released.
Vehicle does not decelerate by engine brake when changing overdrive switch to "OFF" position with accelerator pedal released.
Vehicle does not decelerate by engine brake when changing selector lever from "D" to "2" position with accelerator pedal released.



SAT313C



SAT355C



SAT765B

1

Does self-diagnosis show damage to overrun clutch solenoid valve circuit after cruise test?

- Yes → Check overrun clutch solenoid valve circuit. — Refer to "Self-diagnosis".
- No ↓

2

Check throttle position sensor. — Refer to section EF & EC.

- N.G. → Repair or replace throttle position sensor.
- O.K. ↓

1. Remove oil pan.
2. Check A/T fluid condition.

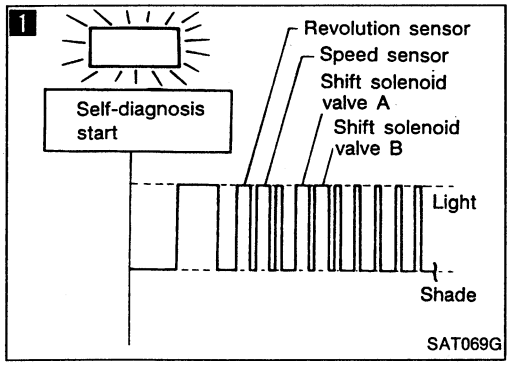
- N.G. / O.K. →
  1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
  2. Check the following items.
     - Overrun clutch control valve
     - Overrun clutch reducing valve
     - Overrun clutch solenoid valve
  3. Disassemble A/T.
  4. Check the following items.
     - Overrun clutch assembly
     - Oil pump assembly
- O.K. ↓

3

Check again.

- N.G. →
  1. Perform A/T control unit input/output signal inspection.
  2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

INSPECTION END



Diagnostic Procedure 16

SYMPTOM: Vehicle does not start from D_1 on Cruise test — Part 2.

1

Does self-diagnosis show damage to revolution sensor, speed sensor, shift solenoid valve A or B after cruise test?

Yes → Check damaged circuit. — Refer to "Self-diagnosis".

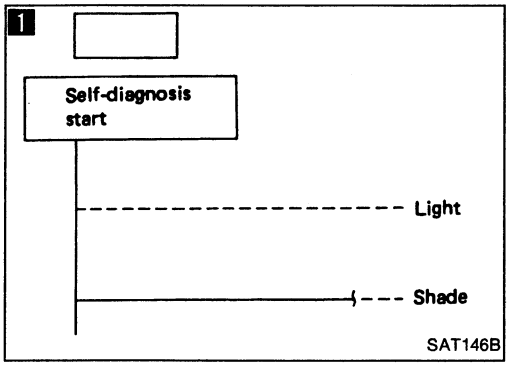
No ↓

Check again.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

Go to Diagnostic Procedure 8.



Diagnostic Procedure 17

SYMPTOM: A/T does not shift from D_4 to D_3 when changing overdrive switch to "OFF" position.

Does "ECU INPUT SIGNALS" show damage to overdrive switch circuit?

Yes → Check overdrive switch circuit. — Refer to "Self-diagnosis".

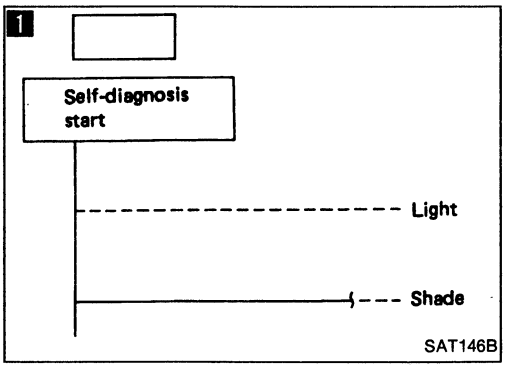
OR

1

Does self-diagnosis show damage to overdrive switch circuit?

No ↓

Go to Diagnostic Procedure 10.



Diagnostic Procedure 18

SYMPTOM: A/T does not shift from D_3 to 2_2 when changing selector lever from "D" to "2" position.

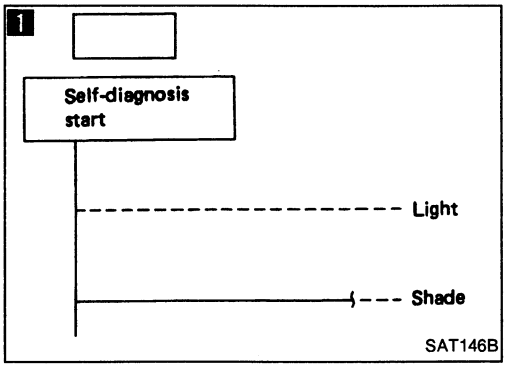
Does "ECU INPUT SIGNALS" show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

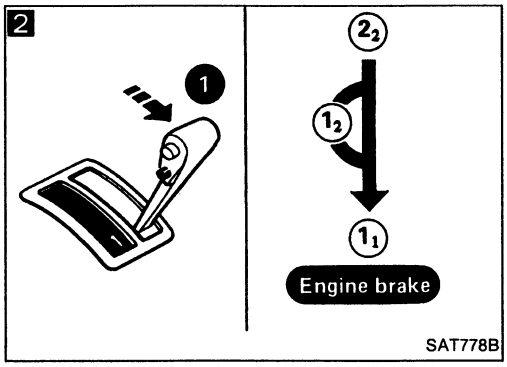
OR

1

Does self-diagnosis show damage to inhibitor switch circuit?

No → Go to Diagnostic Procedure 9.





Diagnostic Procedure 19

SYMPTOM: A/T does not shift from 2_2 to 1_1 when changing selector lever from "2" to "1" position.

Does "ECU INPUT SIGNALS" show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

OR

1

Does self-diagnosis show damage to inhibitor switch circuit?

No

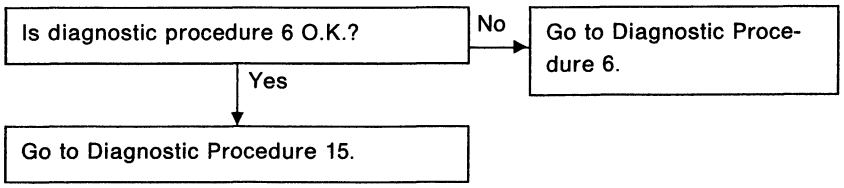
2

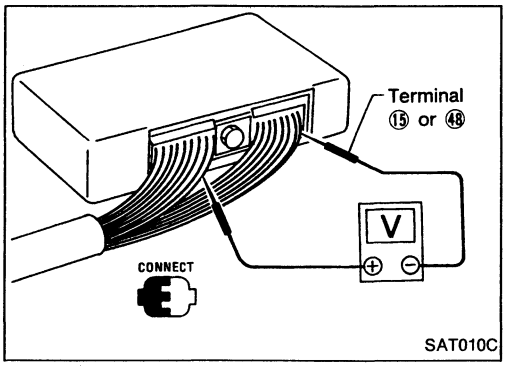
Check again. — N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. → **INSPECTION END**

Diagnostic Procedure 20

SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 2_2 (1_2) to 1_1.



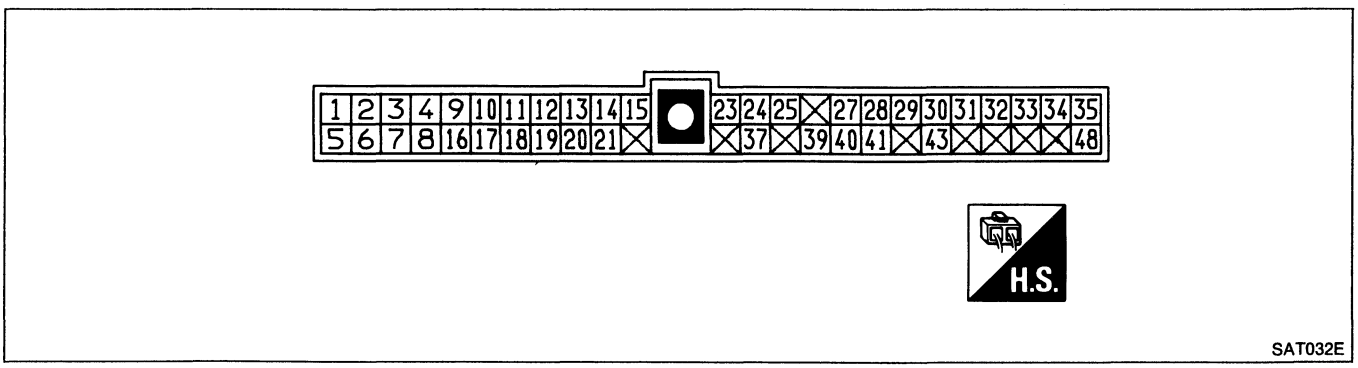


Electrical Components Inspection

INSPECTION OF A/T CONTROL UNIT

- Measure voltage between each terminal and terminal ⑮ or ㊽ by following "A/T CONTROL UNIT INSPECTION TABLE".

- Pin connector terminal layout.



A/T CONTROL UNIT INSPECTION TABLE
(Data are reference values.)

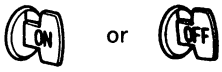
Terminal No.	Item	Condition		Judgement standard
1	Line pressure solenoid valve		When accelerator pedal is released after warming up engine.	1.5 - 2.5V
			When accelerator pedal is depressed fully after warming up engine.	0.5V or less
2	Line pressure solenoid valve (with dropping resistor)		When accelerator pedal is released after warming up engine.	5 - 14V
			When accelerator pedal is depressed fully after warming up engine.	0.5V or less
3	A/T check lamp		When A/T check lamp is on.	1V or less
			When A/T check lamp is not on.	Battery voltage
4	Power source		When ignition switch is turned to "ON".	Battery voltage
			When ignition switch is turned to "OFF".	1V or less
5	Torque converter clutch solenoid valve		When A/T is performing lock-up.	8 - 15V
			When A/T is not performing lock-up.	1V or less
6	Shift solenoid valve A		When shift solenoid valve A is operating. (When driving in "D_1" or "D_4".)	Battery voltage
			When shift solenoid valve A is not operating. (When driving in "D_2" or "D_3".)	1V or less
7	Shift solenoid valve B		When shift solenoid valve B is operating. (When driving in "D_1" or "D_2".)	Battery voltage
			When shift solenoid valve B is not operating. (When driving in "D_3" or "D_4".)	1V or less
8	Overrun clutch solenoid valve		When timing solenoid is operating. (When driving in "D_1" or "D_4".)	Battery voltage
			When timing solenoid is not operating. (When driving in "D_2" or "D_3".)	1V or less

Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition		Judgement standard
9	Power source		Same as No. 4	
10*	—		—	—
11	—		—	—
12	—		—	—
13	—		—	—
14	Closed throttle position switch (in throttle position switch)		When accelerator pedal is released after warming up engine.	8 - 15V
			When accelerator pedal is depressed after warming up engine.	1V or less
15	Ground		—	—
16	Inhibitor "1" position switch		When selector lever is set to "1" position.	Battery voltage
			When selector lever is set to other positions.	1V or less
17	Inhibitor "2" position switch		When selector lever is set to "2" position.	Battery voltage
			When selector lever is set to other positions.	1V or less
18	Inhibitor "D" position switch		When selector lever is set to "D" position.	Battery voltage
			When selector lever is set to other positions.	1V or less
19	Inhibitor "N" or "P" position switch		When selector lever is set to "N" position.	Battery voltage
			When selector lever is set to other positions.	1V or less
20	Inhibitor "R" position switch		When selector lever is set to "R" position.	Battery voltage
			When selector lever is set to other positions.	1V or less
21	Wide open throttle position switch (in throttle position switch)		When accelerator pedal is depressed more than half-way after warming up engine.	8 - 15V
			When accelerator pedal is released after warming up engine.	1V or less
22	—		—	—

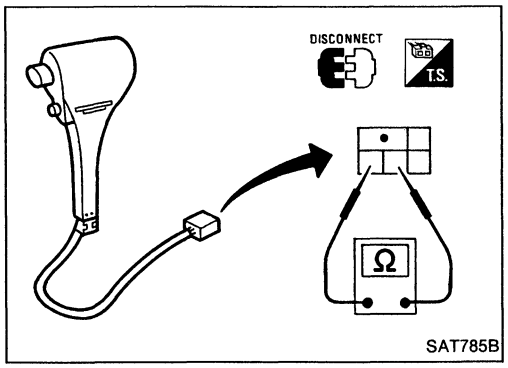
*: This terminal is connected to terminal No. 36 of ECM (ECCS control module).
When code No. 54 appears during engine self-diagnosis, check line between above terminals for proper continuity.

Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition		Judgement standard
23	Power source (Back-up)		When ignition switch is turned to "OFF".	Battery voltage
			When ignition switch is turned to "ON".	Battery voltage
24	Engine speed signal		When engine is running at idle speed.	0.9V
			When engine is running at 3,000 rpm.	Approximately 3.7V
25	Revolution sensor (Measure in AC position)		When vehicle is cruising at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle is parked.	0V
26	—		—	—
27	Speed sensor		When vehicle is moving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.	Vary from 0 to 5V
28	—		—	—
29	—		—	—
30	—		—	—
31	Throttle position sensor (Power source)		—	4.5 - 5.5V
32	—		—	—
33	Fluid temperature sensor		When A.T.F. temperature is 20°C (68°F).	Approximately 1.5V
			When A.T.F. temperature is 80°C (176°F).	Approximately 0.5V
34	Throttle position sensor		When accelerator pedal is depressed slowly after warming up engine. Voltage rises gradually in response to throttle opening angle.	Fully-closed throttle: Approximately 0.5V Fully-open throttle: Approximately 4V
35	Throttle position sensor (Ground)		—	—
36	—		—	—
37	A.S.C.D. cruise signal		When A.S.C.D. cruise is being performed. ("CRUISE" light comes on.)	Battery voltage
			When A.S.C.D. cruise is not being performed. ("CRUISE" light does not comes on.)	1V or less

Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition		Judgement standard
38	—		—	—
39	Overdrive switch		When overdrive switch is set in "ON" position.	Battery voltage
			When overdrive switch is set in "OFF" position.	1V or less
40	A.S.C.D. O.D. cut signal		When "ACCEL" set switch on A.S.C.D. cruise is released.	5 - 8V
			When "ACCEL" set switch on A.S.C.D. cruise is applied.	1V or less
41	Kickdown switch		When accelerator pedal is released after warming up engine.	3 - 8V
			When accelerator pedal is depressed fully after warming up engine.	1V or less
42	—		—	—
43	A/C switch (Turbo model)		When A/C switch is set in "ON" position.	8 - 16V
			When A/C switch is set in "OFF" position.	2V or less
44	—		—	—
45	—		—	—
46	—		—	—
47	—		—	—
48	Ground		—	—



OVERDRIVE SWITCH

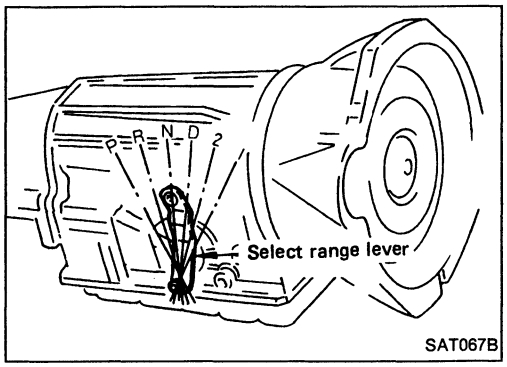
- Check continuity between two terminals.

O.D. switch position	Continuity
ON	No
OFF	Yes

THROTTLE POSITION SWITCH (Idle position)

Refer to Electrical Components Inspection (Cont'd) in EF & EC section.

Electrical Components Inspection (Cont'd)

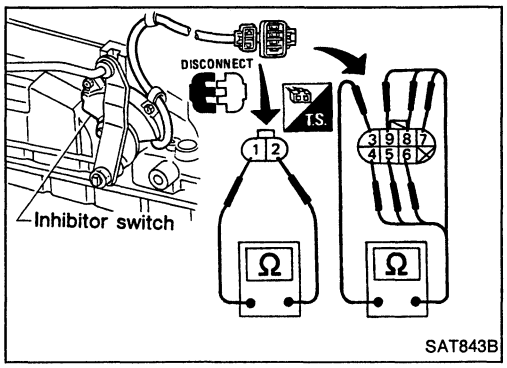


SAT067B

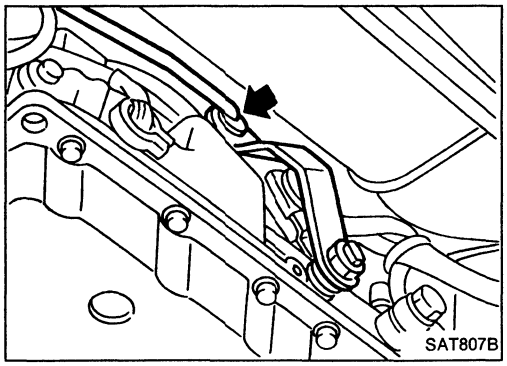
INHIBITOR SWITCH

1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each position.

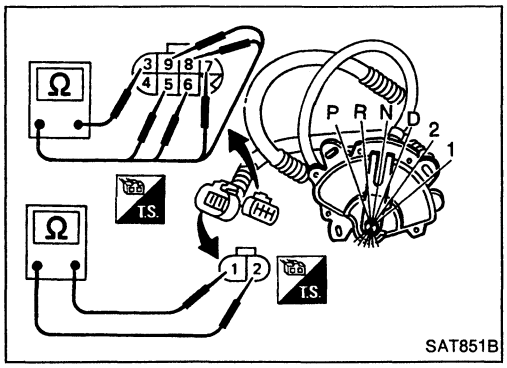
Lever position	Terminal No.								
	①	②	③	④	⑤	⑥	⑦	⑧	⑨
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
2			○					○	
1			○						○



SAT843B

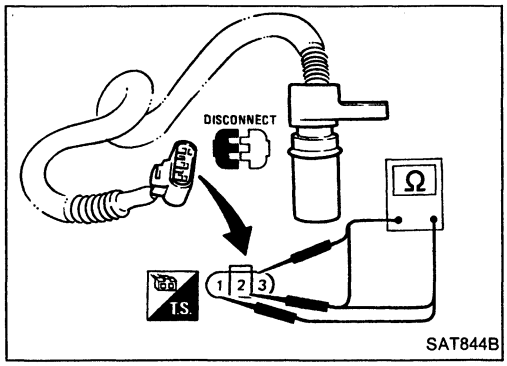

SAT807B

2. If N.G., check again with manual control linkage disconnected from manual shaft of A/T assembly. — Refer to step 1.
3. If O.K. on step 2, adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".



SAT851B

4. If N.G. on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminal. — Refer to step 1.
5. If O.K. on step 4, adjust inhibitor switch. — Refer to "ON-VEHICLE SERVICE".
6. If N.G. on step 4, replace inhibitor switch.



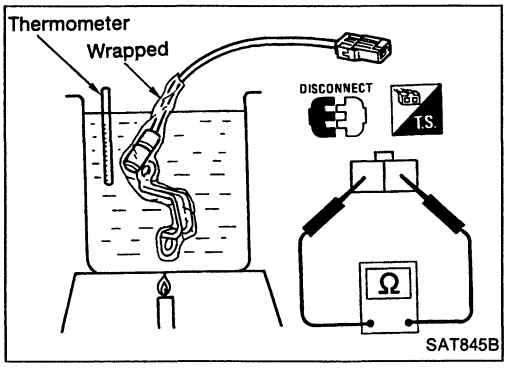
SAT844B

REVOLUTION SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals ①, ② and ③.

Terminal No.		Resistance
①	②	500 - 650Ω
②	③	No continuity
①	③	No continuity

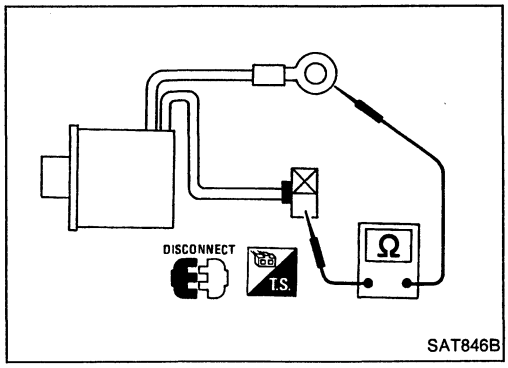
Electrical Components Inspection (Cont'd)



FLUID TEMPERATURE SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals while changing temperature as shown at left.

Temperature °C (°F)	Resistance
20 (68)	Approximately 2.5 kΩ
80 (176)	Approximately 0.3 kΩ

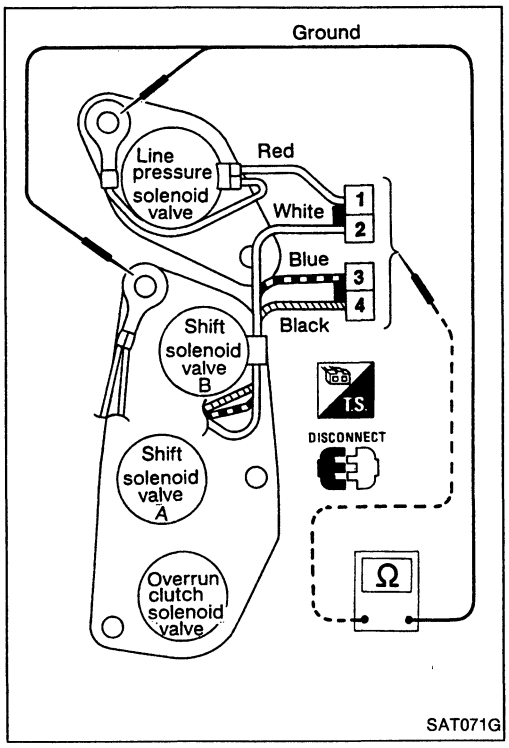


TORQUE CONVERTER CLUTCH SOLENOID VALVE

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

  Resistance:

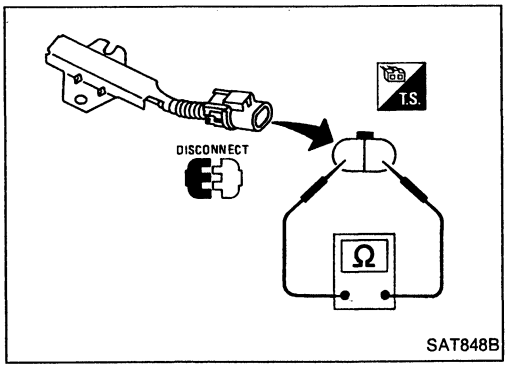
  Torque converter clutch solenoid valve 10 - 20Ω



3-UNIT SOLENOID ASSEMBLY (Shift solenoid valves A, B and overrun clutch solenoid valve) AND LINE PRESSURE SOLENOID VALVE

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.

Solenoid	Terminal No.		Resistance
Shift solenoid valve A	③	Ground terminal	20 - 40Ω
Shift solenoid valve B	②		
Overrun clutch solenoid valve	④		
Line pressure solenoid valve	①		2.5 - 5Ω



DROPPING RESISTOR

- Check resistance between two terminals.

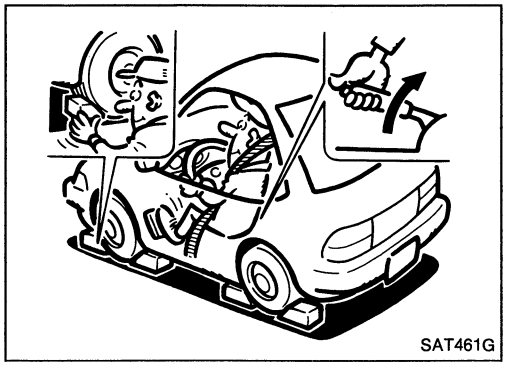
  Resistance: 11.2 - 12.8Ω

Final Check

STALL TESTING

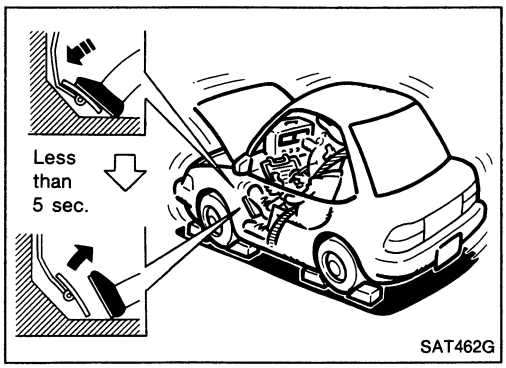
Stall test procedure

1. Check A/T and engine fluid levels. If necessary, add.
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.


SAT461G

- **It is good practice to put a mark on 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.



SAT462G

- **During test, never hold throttle wide-open for more than 5 seconds.**
  Stall revolution:
  2,450 - 2,650 rpm (RE4R01A)
  2,950 - 3,200 rpm (RE4R03A)

8. Shift selector lever to "N".
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", respectively.

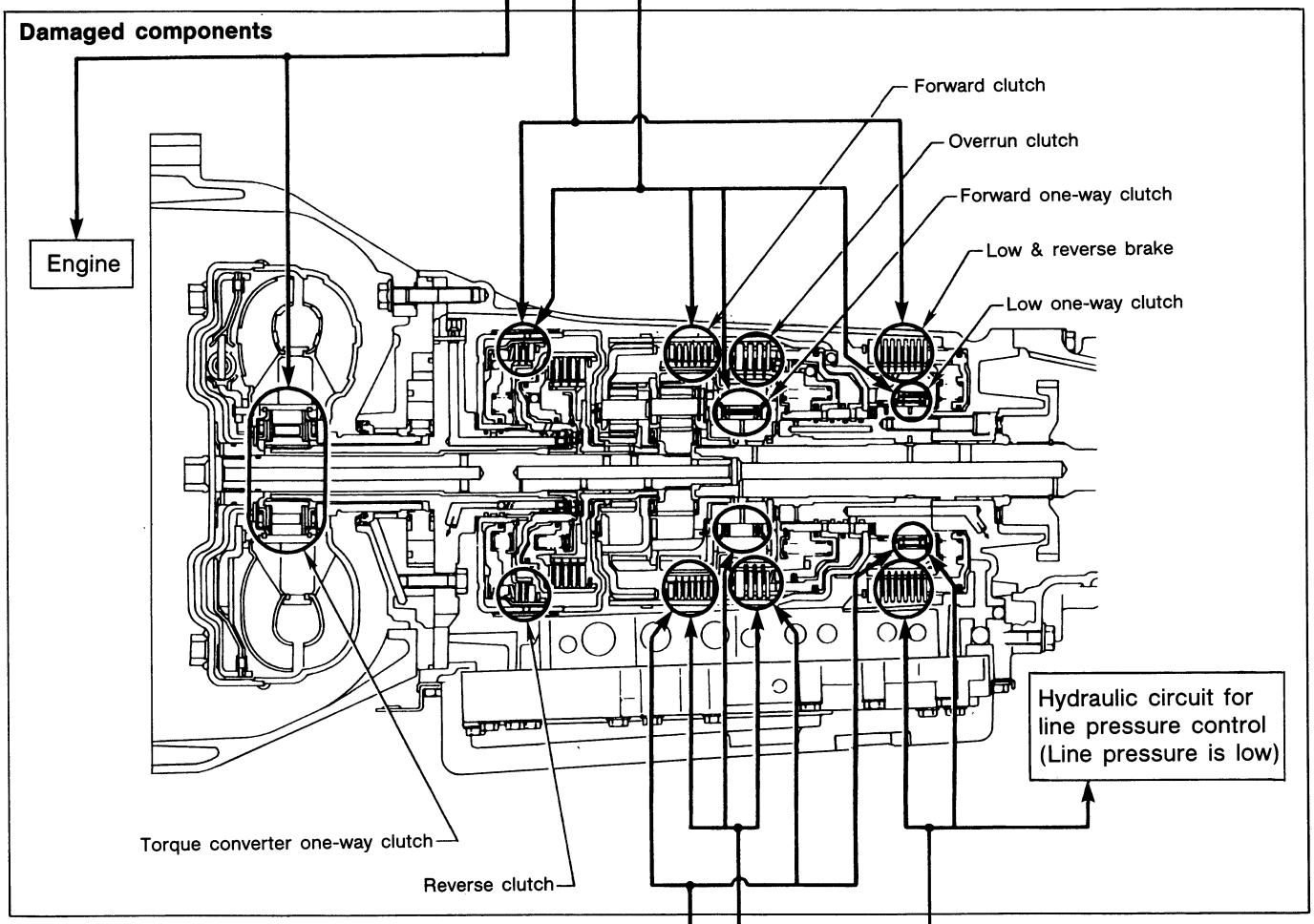
Final Check (Cont'd)

Judgement of stall test

Selector lever position	Judgement		
D	L	O	H
2	L	O	H
1	L	O	O
R	L	H	H

O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.

Damaged components



Clutches and brakes except high clutch and brake band are O.K. (Condition of high clutch and brake band cannot be confirmed by stall test.

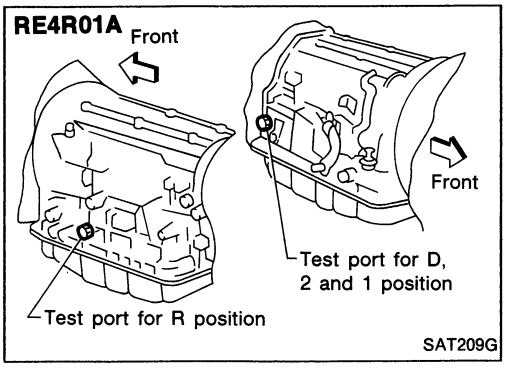
D	H	H	H	O
2	H	H	H	O
1	O	H	H	O
R	O	O	H	O
Selector lever position	Judgement			

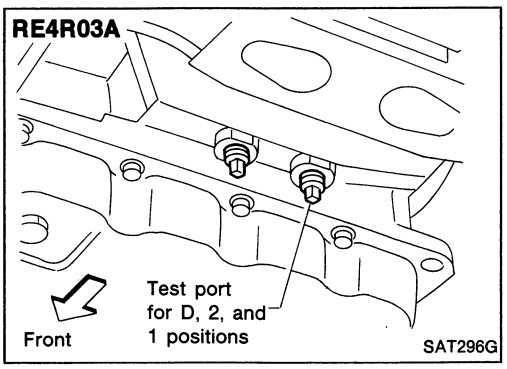
SAT640G

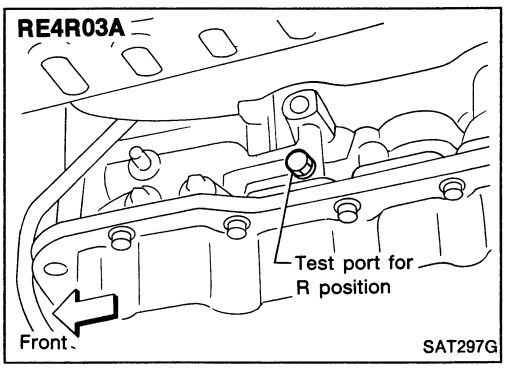
Final Check (Cont'd)

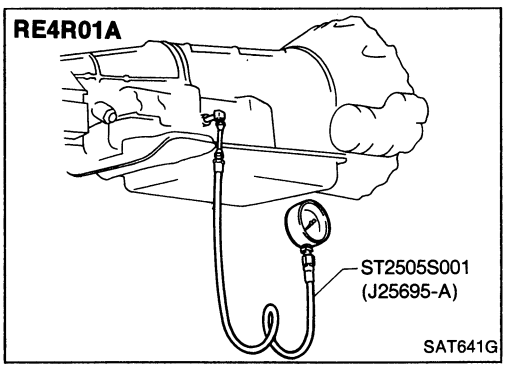
PRESSURE TESTING

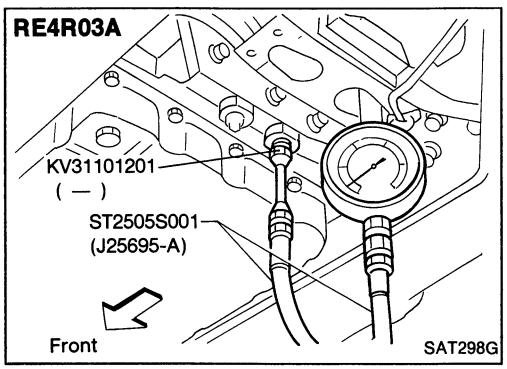
- Location of line pressure test port
- **Line pressure plugs are hexagon headed bolts.**
- **Always replace line pressure plugs as they are self-sealing bolts.**











Line pressure test procedure

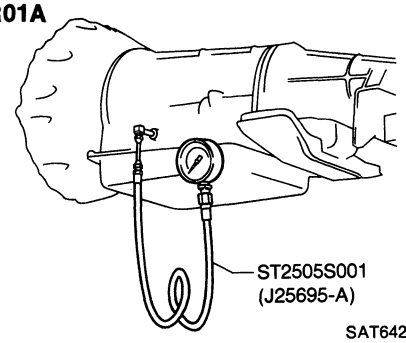
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.
   A.T.F. operating temperature:
   50 - 80°C (122 - 176°F)
3. Install pressure gauge to line pressure port.

— D, 2 and 1 positions —

Final Check (Cont'd)

— R position —

RE4R01A



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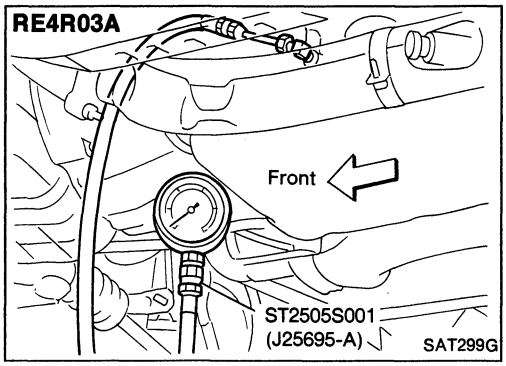
RE4R03A



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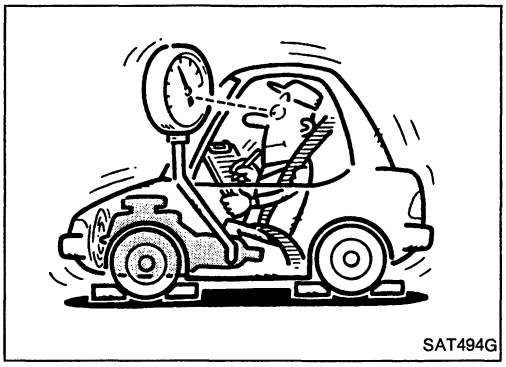


SAT494G

4. Set parking brake and block wheels.
- **Continue to depress brake pedal fully while line pressure test at stall speed is performed.**

5. Start engine and measure line pressure at idle and stall speed.
- **When measuring line pressure at stall speed, follow the stall test procedure.**

Line pressure:

Engine speed rpm	Line pressure kPa (kg/cm^2, psi)	
	D, 2 and 1 positions	R position
Idle	422 - 461 (4.3 - 4.7, 61 - 67)	667 - 706 (6.8 - 7.2, 97 - 102)
Stall	1,020 - 1,098 (10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.5 - 15.3, 206 - 218)

Final Check (Cont'd)

JUDGEMENT OF LINE PRESSURE TEST

	Judgement	Suspected parts
At idle	Line pressure is low in all position.	• Oil pump wear • Control piston damage • Pressure regulator valve or plug sticking • Spring for pressure regulator valve damaged • Fluid pressure leakage between oil strainer and pressure regulator valve
	Line pressure is low in particular position.	• Fluid pressure leakage between manual valve and particular clutch. • For example; If line pressure is low in "R" and "1" positions but is normal in "D" and "2" positions, fluid leakage exists at or around low & reverse brake circuit.
	Line pressure is high.	• Mal-adjustment of throttle position sensor • Fluid temperature sensor damaged • Line pressure solenoid valve sticking • Short circuit of line pressure solenoid valve circuit • Pressure modifier valve sticking • Pressure regulator valve or plug sticking
At stall speed	Line pressure is low.	• Mal-adjustment of throttle position sensor • Control piston damaged • Line pressure solenoid valve sticking • Short circuit of line pressure solenoid valve circuit • Pressure regulator valve or plug sticking • Pressure modifier valve sticking • Pilot valve sticking

Symptom Chart

Reference page (AT-)		ON vehicle										OFF vehicle					
	Reference (AT-)	12, 91	70	70	74	71, 117	71	71	98, 71	98, 99	98, 99	102, 113	130, 134	136, 150	136, 147	140	157
	Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level / Control linkage	Inhibitor switch / Throttle position sensor (Adjustment)	Revolution sensor and speed sensor / Engine speed signal	Engine idling rpm / Line pressure	Control valve assembly / Shift solenoid valve A	Shift solenoid valve B / Line pressure solenoid valve	Torque converter clutch solenoid valve / Overrun clutch solenoid valve	Fluid temperature sensor / Accumulator N-D	Accumulator 1-2 / Accumulator 2-3	Accumulator 3-4 (N-R) / Ignition switch and starter	Torque converter / Oil pump	Reverse clutch / High clutch	Forward clutch / Forward one-way clutch	Overrun clutch / Low one-way clutch	Low & reverse brake / Brake band	Parking components
50	Engine does not start in "N", "P" positions.	2	3								1						
50	Engine starts in position other than "N" and "P".	1	2														
—	Transmission noise in "P" and "N" positions.	1	3	4 5	2							⑦ ⑥					
50	Vehicle moves when changing into "P" position or parking gear does not disengage when shifted out of "P" position.	1															②
51	Vehicle runs in "N" position.	1									4		③	②	⑤		
53	Vehicle will not run in "R" position (but runs in "D", "2" and "1" positions). Clutch slips. Very poor acceleration.	1			2	4	3						⑤ ⑥	⑦	⑧	⑨	
—	Vehicle braked when shifting into "R" position.	1 2			3	5	4						⑥	⑧	⑨	⑦	
—	Sharp shock in shifting from "N" to "D" position.		2	5	1 3	7	6		4 8					⑨			
—	Vehicle will not run in "D" and "2" positions (but runs in "1" and "R" positions).	1													②		
54	Vehicle will not run in "D", "1", "2" positions (but runs in "R" position). Clutch slips. Very poor acceleration.	1			2	4	3		5				⑥ ⑦	⑧ ⑨	⑩		
—	Clutches or brakes slip somewhat in starting.	1 2	3		4	6	5		7		8	⑬ ⑫	⑩	⑨		⑪	
—	Excessive creep.				1												
53, 54	No creep at all.	1			2	3						⑥ ⑤		④			
—	Failure to change gear from "D_1" to "D_2".	2	1 5			4 3										⑥	
—	Failure to change gear from "D_2" to "D_3".	2	1 5			4	3						⑥			⑦	
—	Failure to change gear from "D_3" to "D_4".	2	1 4			3			5							⑥	
56, 57, 58	Too high a gear change point from "D_1" to "D_2", from "D_2" to "D_3", from "D_3" to "D_4".		1	2		3	4										
—	Gear change directly from "D_1" to "D_3" occurs.	1								2						③	
—	Engine stops when shifting lever into "R", "D", "2" and "1".				1	3		2				④					
—	Too sharp a shock in change from "D_1" to "D_2".		1		2	4			5	3						⑥	
—	Too sharp a shock in change from "D_2" to "D_3".		1		2	4				3			⑤			⑥	

Symptom Chart (Cont'd)

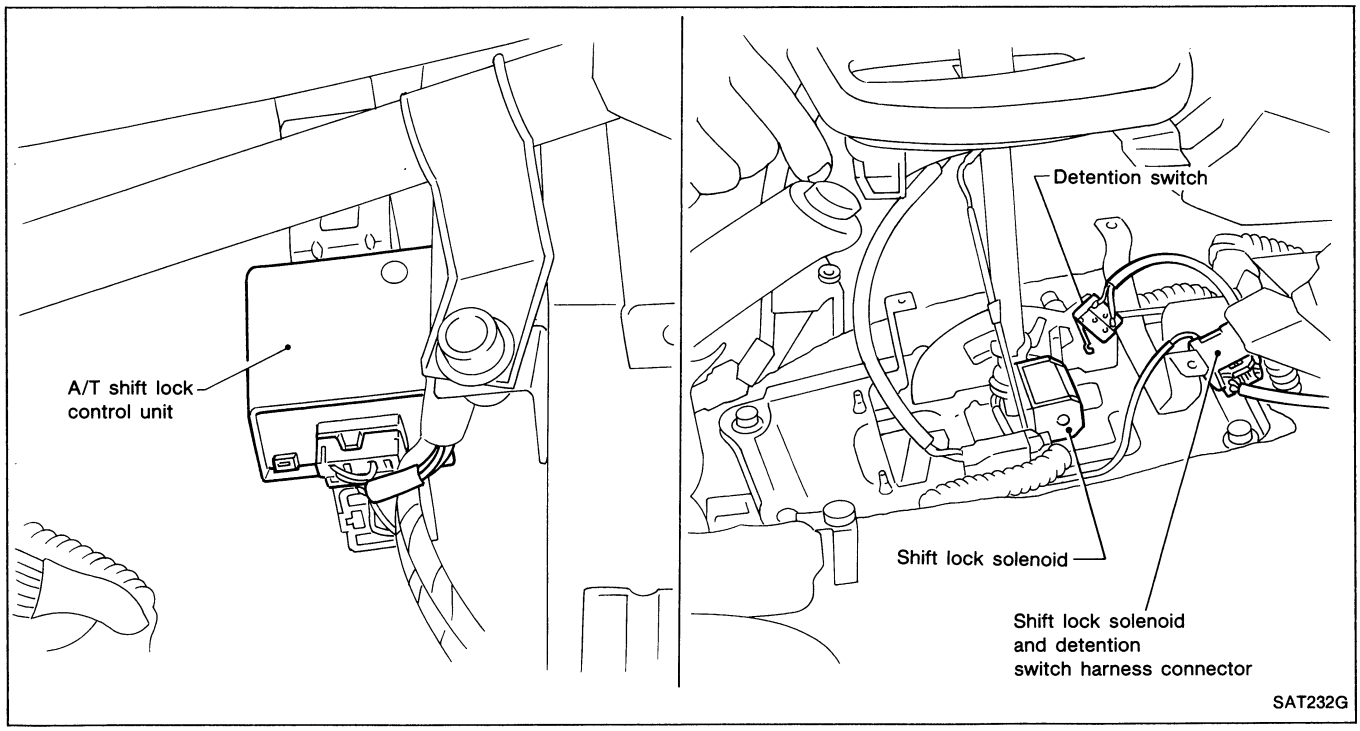
		ON vehicle									OFF vehicle					
Reference (AT-)		12, 91	70	70	74	71, 117	71	71	71, 98	99	99	102, 113	130, 134	136, 150	136, 147	140	158
Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level Control linkage	Inhibitor switch Throttle position sensor (Adjustment)	Revolution sensor and speed sensor Engine speed signal	Engine idling rpm Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	Fluid temperature sensor Accumulator N-D	Accumulator 1-2 Accumulator 2-3	Accumulator 3-4 (N-R) Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking components
—	Too sharp a shock in change from "D_3" to "D_4".	. .	. 1	. .	. 2	4 .	. .	. .	. .	. .	3 .	. .	. .	. .	⑥ .	. ⑤	.
—	Almost no shock or clutches slipping in change from "D_1" to "D_2".	1 .	. 2	. .	. 3	5 .	. .	. .	. .	4 .	. .	. .	. .	. .	. .	. ⑥	.
—	Almost no shock or slipping in change from "D_2" to "D_3".	1 .	. 2	. .	. 3	5 .	. .	. .	. .	. 4	. .	. .	. ⑥	. .	. .	. ⑦	.
—	Almost no shock or slipping in change from "D_3" to "D_4".	1 .	. 2	. .	. 3	5 .	. .	. .	. .	. .	4 .	. .	. ⑥	. .	. .	. ⑦	.
—	Vehicle braked by gear change from "D_1" to "D_2".	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	② ④	. .	. ⑤	③ .	.
—	Vehicle braked by gear change from "D_2" to "D_3".	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. ②	.
—	Vehicle braked by gear change from "D_3" to "D_4".	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	④ .	. ③	② .	. .	.
—	Maximum speed not attained. Acceleration poor.	1 .	2 .	. .	. .	5 3	4 .	. .	. .	. .	. .	⑪ ⑩	⑥ ⑦	. .	. .	⑨ ⑧	.
—	Failure to change gear from "D_4" to "D_3".	1 .	. 2	. .	. .	6 4	. 5	. 3	. .	. .	. .	. .	. .	. .	⑧ .	⑦ .	.
—	Failure to change gear from "D_3" to "D_2" or from "D_4" to "D_2".	1 .	. 2	. .	. .	5 3	4 .	. .	. .	. .	. .	. .	. ⑥	. .	. .	. ⑦	.
—	Failure to change gear from "D_2" to "D_1" or from "D_3" to "D_1".	1 .	. 2	. .	. .	5 3	4 .	. .	. .	. .	. .	. .	. ⑦	. .	. ⑥	. ⑧	.
—	Gear change shock felt during deceleration by releasing accelerator pedal.	. .	. 1	. .	. 2	4 .	. .	. 3	. .	. .	. .	. .	. .	. .	. .	. .	.
—	Too high a change point from "D_4" to "D_3", from "D_3" to "D_2", from "D_2" to "D_1".	. .	. 1	2 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
—	Kickdown does not operate when depressing pedal in "D_4" within kickdown vehicle speed.	. .	. 1	2 .	. .	. 3	4 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
—	Kickdown operates or engine overruns when depressing pedal in "D_4" beyond kickdown vehicle speed limit.	. .	. 2	1 .	. .	. 3	4 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
—	Races extremely fast or slips in changing from "D_4" to "D_3" when depressing pedal.	1 .	. 2	. .	. 3	5 .	. 4	. .	. .	. .	. .	. .	. ⑥	⑦ .	. .	. .	.
—	Races extremely fast or slips in changing from "D_4" to "D_2" when depressing pedal.	1 .	. 2	. .	. 3	6 5	. 4	. .	. .	. .	. .	. .	. .	⑧ .	. .	. ⑦	.
—	Races extremely fast or slips in changing from "D_3" to "D_2" when depressing pedal.	1 .	. 2	. .	. 3	5 .	. 4	. .	8 .	. 10	. .	. .	. ⑨	⑦ .	. .	. ⑥	.
	Races extremely fast or slips in changing from "D_4" or "D_3" to "D_1" when depressing pedal.	1 .	. 2	. .	. 3	5 .	. 4	. .	. .	. .	. .	. .	. .	⑥ ⑦	. ⑧	. .	.
—	Vehicle will not run in any position.	1 2	. .	. .	. 3	. .	. 4	. .	. .	. .	. .	⑨ ⑤	. ⑥	. .	. .	⑧ ⑦	⑩
—	Transmission noise in "D", "2", "1" and "R" positions.	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	② .	. .	. .	. .	. .	.

Symptom Chart (Cont'd)

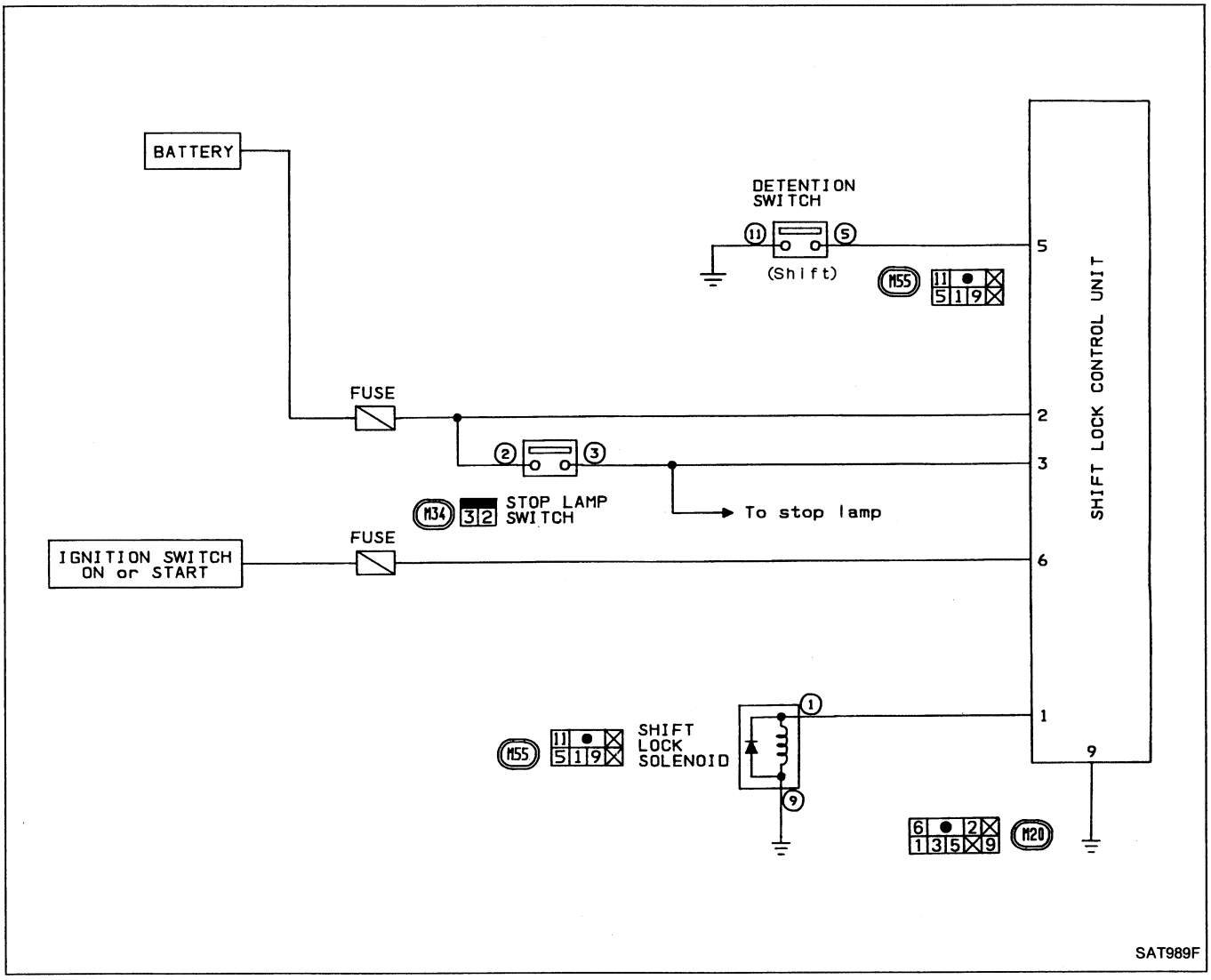
Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.	ON vehicle										OFF vehicle					
Reference (AT-)		12, 91	70	70	74	71, 117	71	71	71, 98	99	99	102, 113	130, 134	136, 150	136, 147	140	158
		Fluid level / Control linkage	Inhibitor switch / Throttle position sensor (Adjustment)	Revolution sensor and speed sensor / Engine speed signal	Engine idling rpm / Line pressure	Control valve assembly / Shift solenoid valve A	Shift solenoid valve B / Line pressure solenoid valve	Torque converter clutch solenoid valve / Overrun clutch solenoid valve	Fluid temperature sensor / Accumulator N-D	Accumulator 1-2 / Accumulator 2-3	Accumulator 3-4 (N-R) / Ignition switch and starter	Torque converter / Oil pump	Reverse clutch / High clutch	Forward clutch / Forward one-way clutch	Overrun clutch / Low one-way clutch	Low & reverse brake / Brake band	Parking components
64	Failure to change from "D_3" to "2_2" when changing lever into "2" position.	. 7	1 2	. .	. .	6 5	4 .	. 3	. .	. .	. .	. .	. .	. .	⑨ .	. ⑧	.
—	Gear change from "2_2" to "2_3" in "2" position.	. .	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
65	Engine brake does not operate in "1" position.	. 2	1 3	4 .	. .	6 5	. .	. 7	. .	. .	. .	. .	. .	. .	⑧ .	⑨ .	.
—	Gear change from "1_1" to "1_2" in "1" position.	. 2	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
—	Does not change from "1_2" to "1_1" in "1" position.	. .	1 .	2 .	. .	4 3	. .	. 5	. .	. .	. .	. .	. .	. .	⑥ .	⑦ .	.
—	Large shock changing from "1_2" to "1_1" in "1" position.	. .	. .	. .	. .	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	② .	.
	Transmission overheats.	1 .	. 3	. .	2 4	6 .	. 5	. .	. .	. .	. .	⑭ ⑦	⑧ ⑨	⑪ .	⑫ .	⑬ ⑩	.
—	A.T.F. shoots out during operation. White smoke emitted from exhaust pipe during operation.	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	② ③	⑤ .	⑥ .	⑦ ④	.
—	Offensive smell at fluid charging pipe.	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	② ③	④ ⑤	⑦ .	⑧ .	⑨ ⑥	.
—	Torque converter is not locked up.	. .	3 1	2 4	. 6	8 .	. .	7 .	5 .	. .	. .	⑨ .	. .	. .	. .	. .	.
—	Lock-up piston slip	1 .	. 2	. .	. 3	6 .	. 5	4 .	. .	. .	. .	⑦ .	. .	. .	. .	. .	.
61	Lock-up point is extremely high or low.	. .	. 1	2 .	. .	4 .	. .	3 .	. .	. .	. .	. .	. .	. .	. .	. .	.
—	A/T does not shift to "D_4" when driving with overdrive switch "ON".	. .	2 1	3 .	. 8	6 4	. .	. 5	7 .	. .	. .	. .	. .	. .	⑩ .	. ⑨	.
—	Engine is stopped at "R", "D", "2" and "1" positions.	1 .	. .	. .	. .	5 4	3 .	2 .	. .	. .	. .	. .	. .	. .	. .	. .	.

Contents

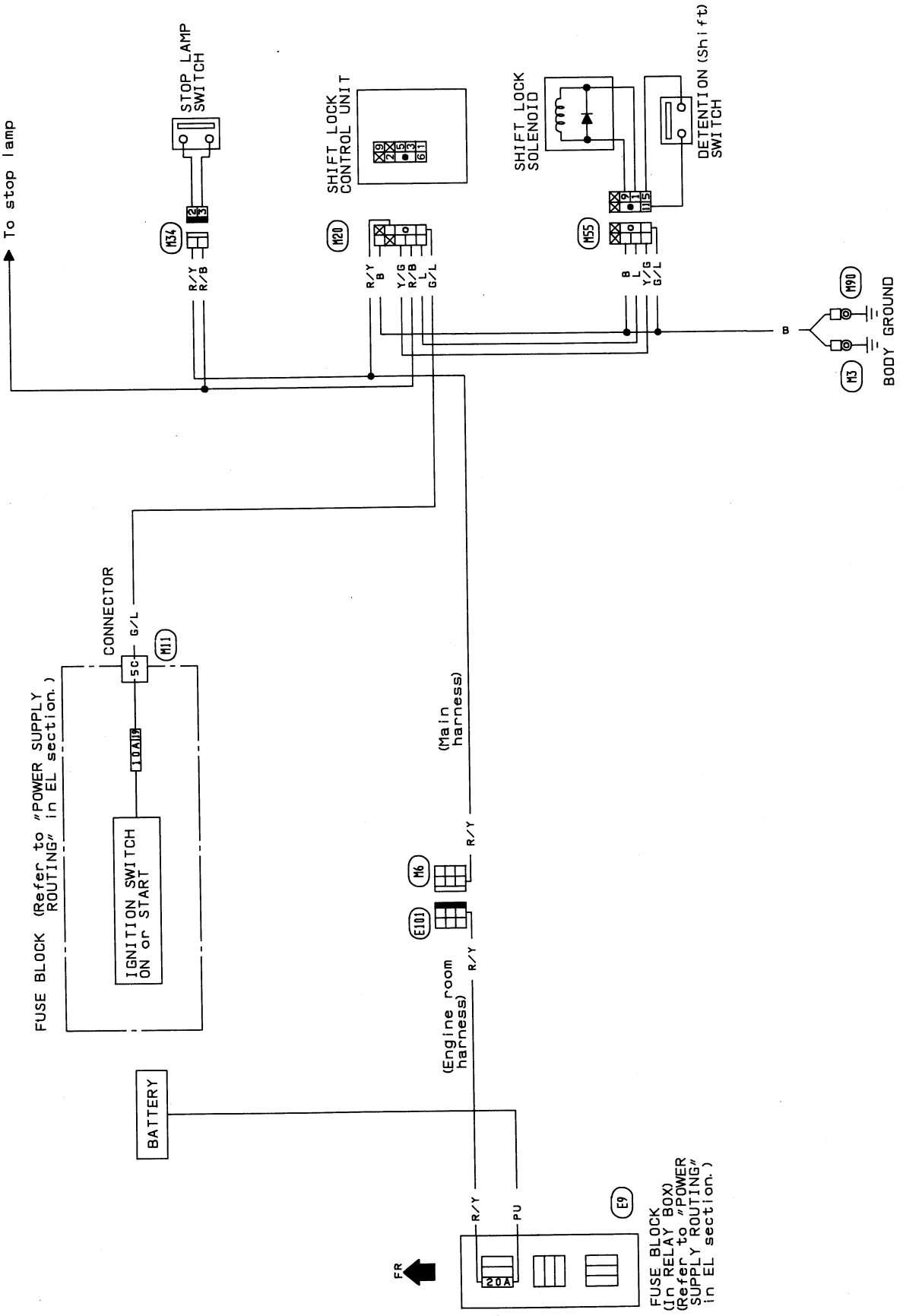
Shift Lock Electrical Parts Location



Circuit Diagram for Quick Pinpoint Check



Wiring Diagram



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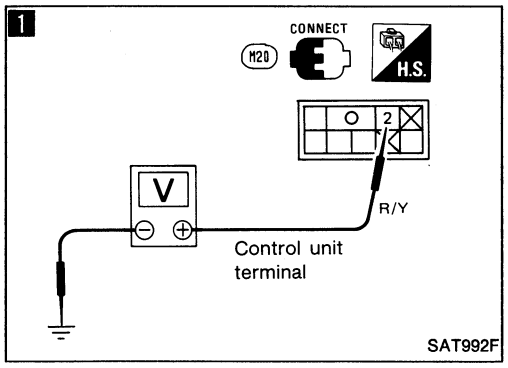
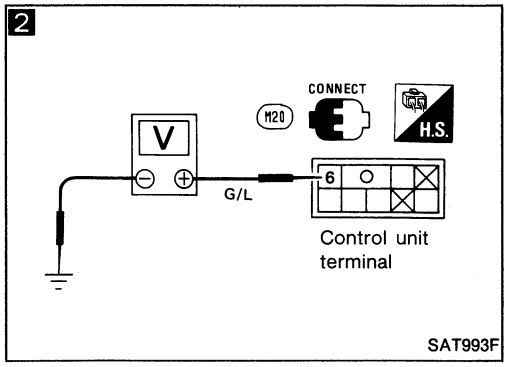
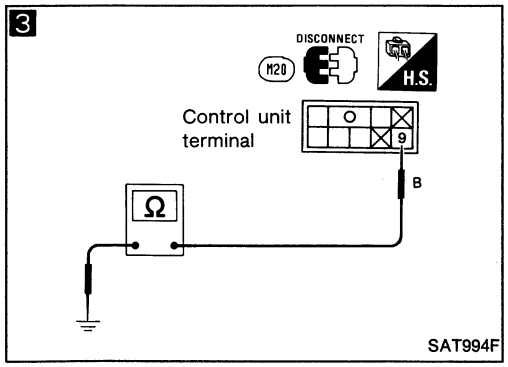






Diagnostic Procedure

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".

Check key interlock cable for damage.
- N.G. → Repair key interlock cable. Refer to "Key Interlock Cable".
- O.K. ↓

1 **CHECK POWER SOURCE.**
1. Turn ignition switch to "OFF" position.
2. Check voltage between control unit harness terminal ② and ground.
Battery voltage should exist.

- N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminal ②
2. Fuse
- O.K. ↓

2 **CHECK IGNITION SIGNAL.**
1. Turn ignition switch to "OFF" position.
2. Check voltage between control unit harness terminal ⑥ and ground.
0V
3. Turn ignition switch from "OFF"' to "ON" position.
(Don't start engine.)
4. Check voltage between control unit harness terminal ⑥ and ground.
Battery voltage should exist.

- N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminal ⑥
2. Fuse
3. Ignition switch
- O.K. ↓

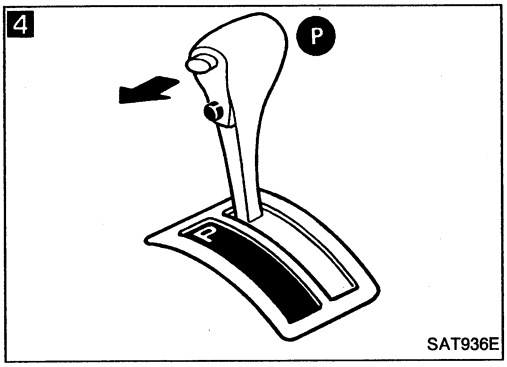
3 **CHECK GROUND CIRCUIT FOR CONTROL UNIT.**
1. Turn ignition switch from "ON" to "OFF" position.
2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
Continuity should exist.

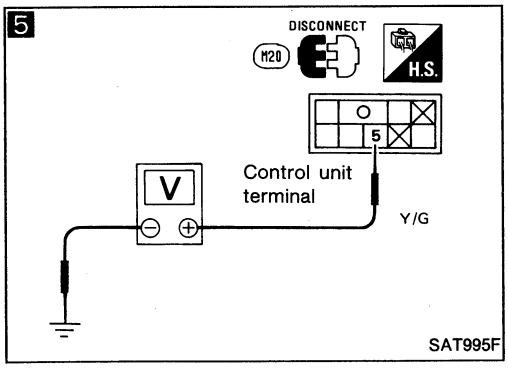
- N.G. → Repair harness or connector.
- O.K. ↓

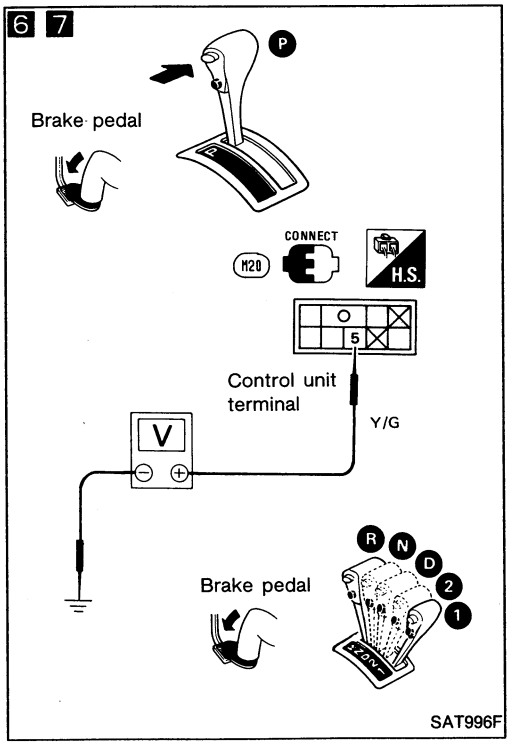
Ⓐ

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

Diagnostic Procedure (Cont'd)







Ⓐ

CHECK INPUT SIGNAL (DETENTION SWITCH).

1. Reconnect control unit harness connector.
2. Turn ignition switch from "OFF" to "ON" position.
4. 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.
5. 4. Disconnect control unit harness connector.
   5. Check continuity between control unit harness terminal ⑤ 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 from "ON" to "OFF" position. (Do not start engine.)
6. 2. Check continuity between control unit harness terminal ⑤ and ground with brake pedal depressed and selector lever button pushed.
   Continuity should exist.
7. 3. Check continuity between control unit harness terminal ⑤ 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 ⑤ and detention switch harness terminal ⑤
2. Harness continuity between detention switch harness terminal and ground
3. Detention switch (Refer to "COMPONENT CHECK".)

O.K. ↓

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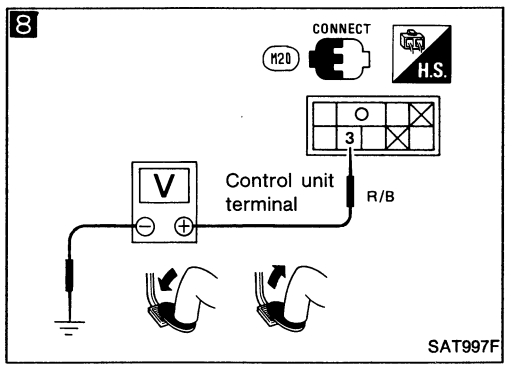
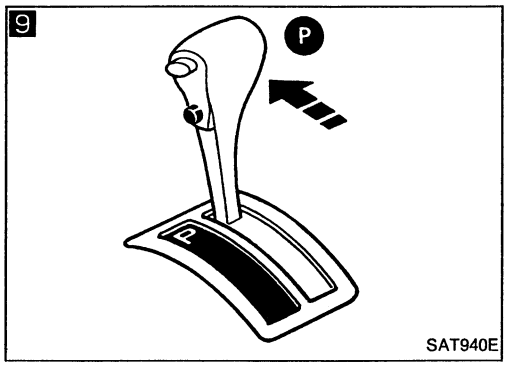
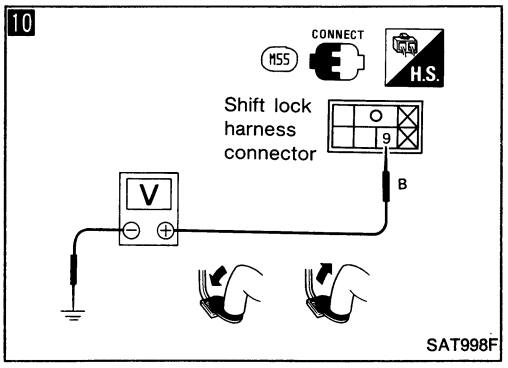
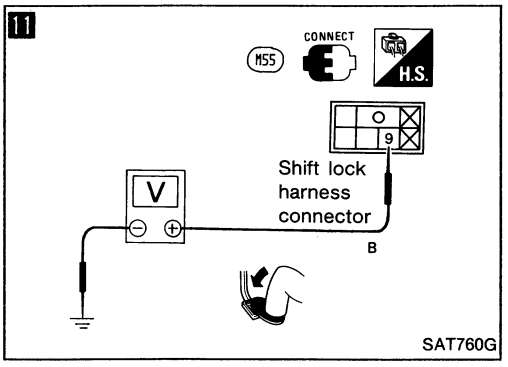
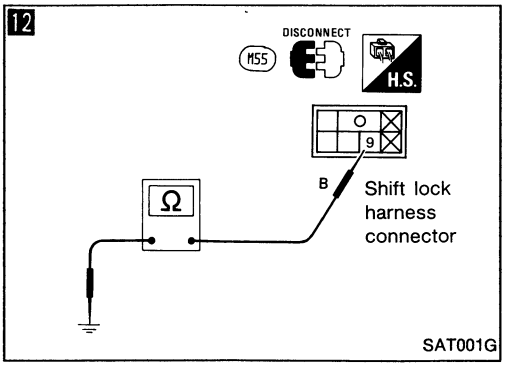
Diagnostic Procedure (Cont'd)











Ⓑ

8 **CHECK INPUT SIGNAL (STOP LAMP SWITCH).**

- Turn ignition switch to "ON" position. (Do not start engine.)
- Check voltage between control unit harness terminal ③ and ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ③ and stop lamp switch harness terminal ②
2. Harness continuity between stop lamp switch harness terminal ② and fuse
3. Stop lamp switch (Refer to "COMPONENT CHECK".)

O.K. ↓

9
1. Set selector lever in "P" position.

CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).

2. Turn ignition switch to "ON" position. (Do not start egnine.)
3. Check voltage between shift lock harness connector terminal ⑨ and body ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

4. Turn ignition switch from "ON" to "OFF" position.

11 5. Check voltage between shift lock harness connector terminal ⑨ and ground with brake pedal depressed.
0V

N.G. → Check harness continuity between control unit harness terminal ② and shift lock solenoid harness terminal ⑨.

O.K. ↓

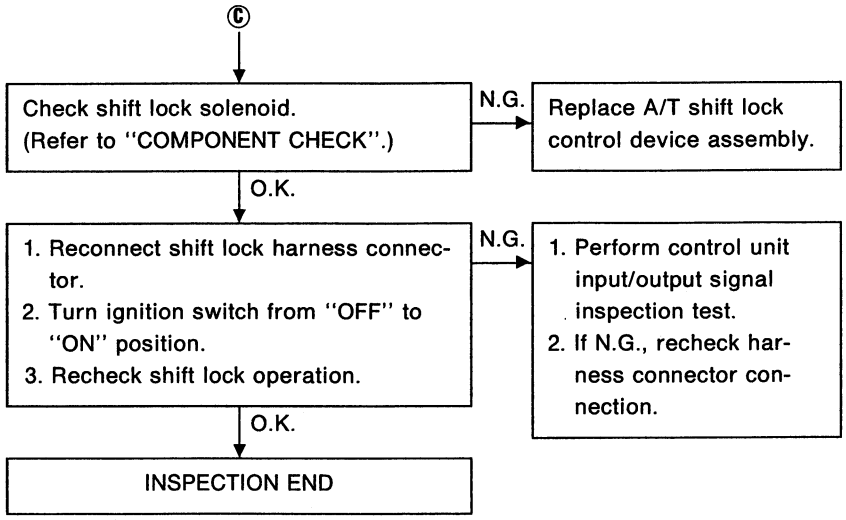
12 **CHECK GROUND CIRCUIT FOR SHIFT LOCK SOLENOID.**
1. Disconnect shift lock harness connector.
2. Check continuity between shift lock harness terminal ⑨ and ground.
Continuity should exist.

N.G. → Repair harness or connector.

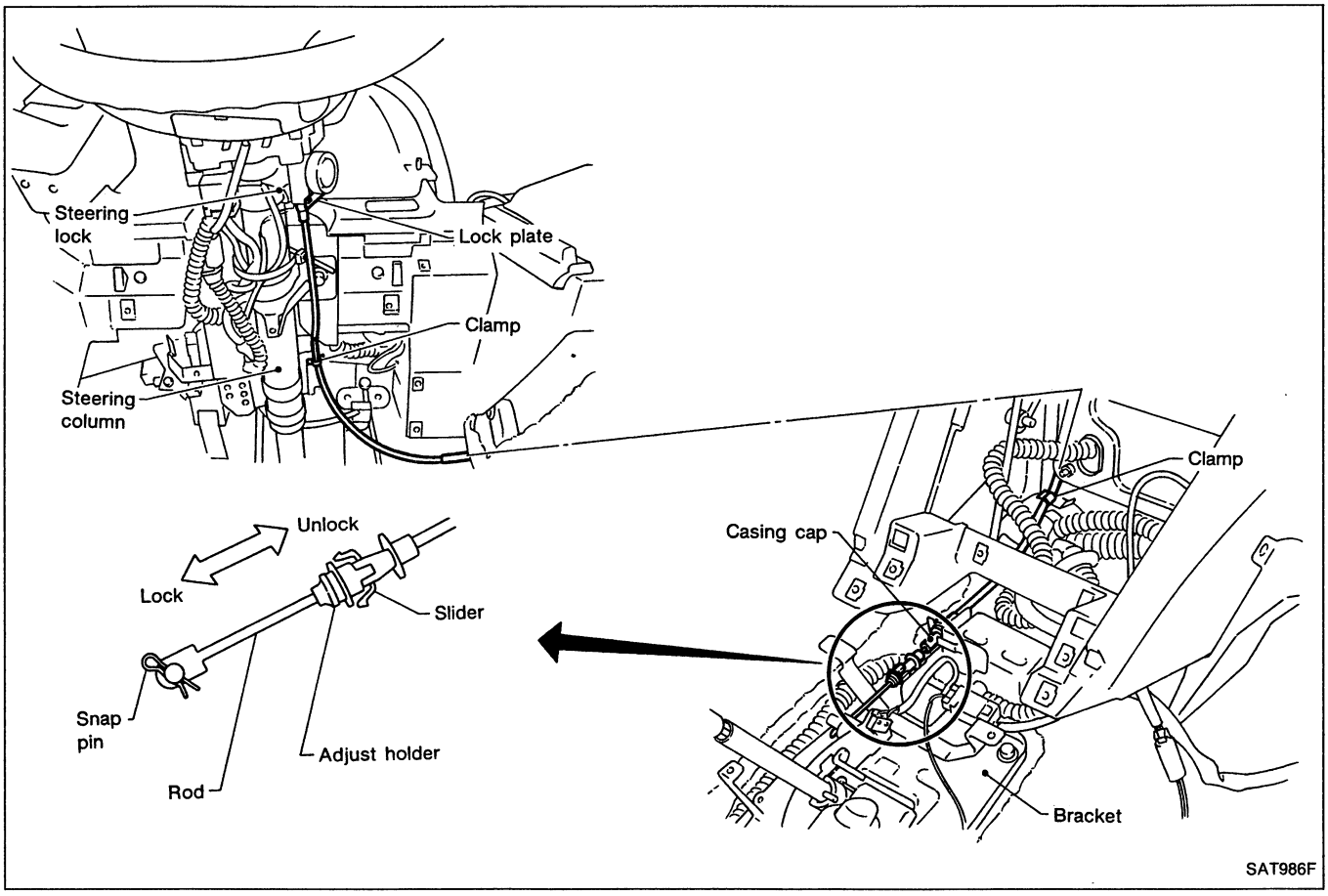
O.K. ↓

Ⓒ

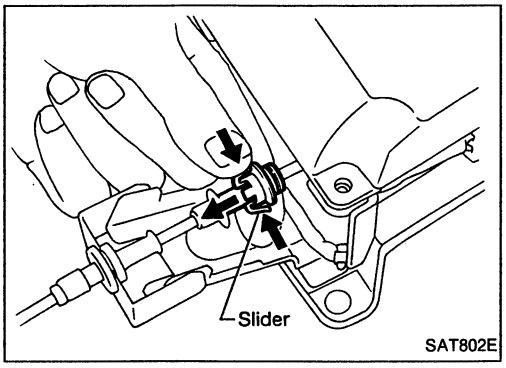
Diagnostic Procedure (Cont'd)



Key Interlock Cable

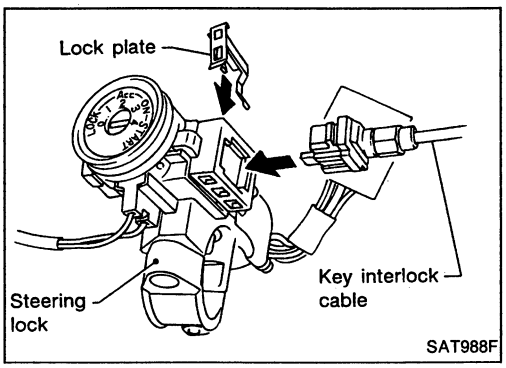


Key Interlock Cable (Cont'd)



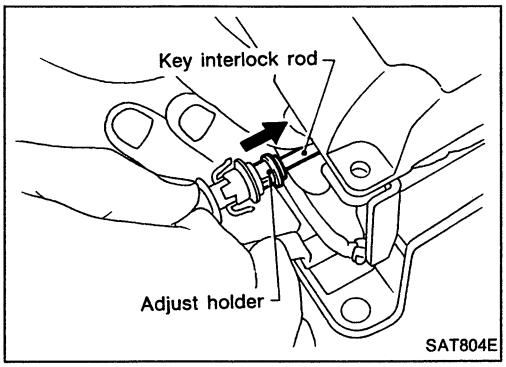
REMOVAL

Unlock slider from adjuster holder and remove rod from cable.

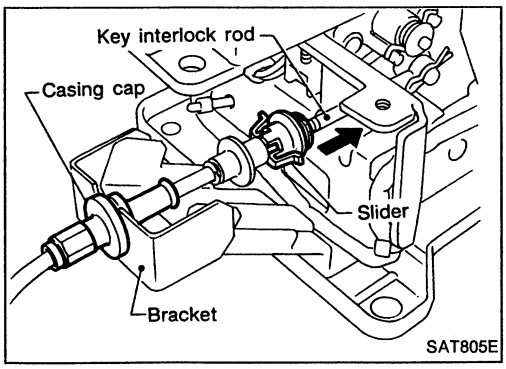


INSTALLATION

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 position.

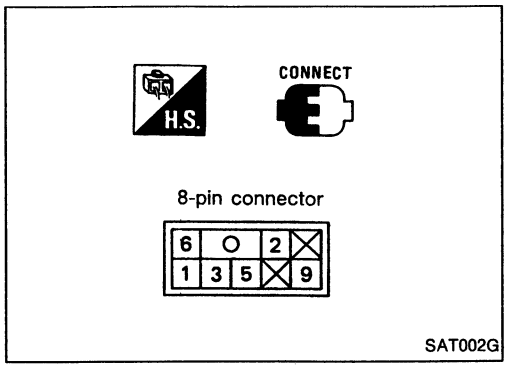


4. Insert interlock rod into adjuster holder.



5. Install casing cap to bracket.
6. Move slider in order to fix adjuster holder to interlock rod.

Shift Lock Control Unit Inspection

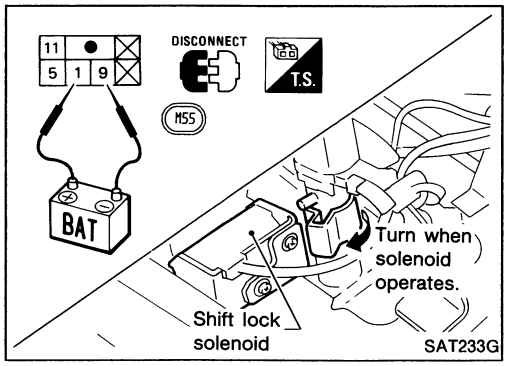


- Measure voltage between each terminal and terminal ⑨ by following "Shift Lock Control Unit Inspection Table".
- Pin connector terminal layout.

Shift Lock Control Unit Inspection Table

(Data are reference values.)

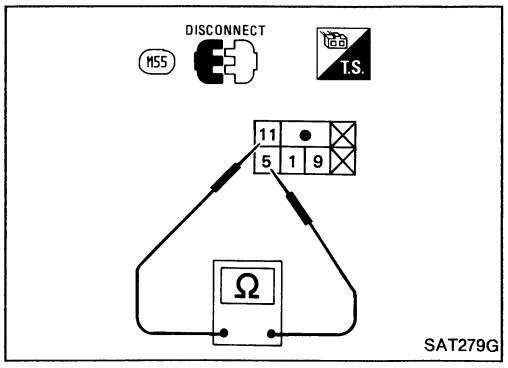
Terminal No. ⊕	Terminal No. ⊖	Item	Condition	Judgment standard
1	9	Shift lock signal	When selector lever is set in "P" position and brake pedal is depressed.	Battery voltage
			Except above	0V
2		Power source	Any condition	Battery voltage
3		Stop lamp switch	When brake pedal is depressed.	Battery voltage
			When brake pedal is released.	0V
5		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
6		Ignition signal		Battery voltage
			Except above	0V
9	—	Ground	—	—



Component Check

SHIFT LOCK SOLENOID

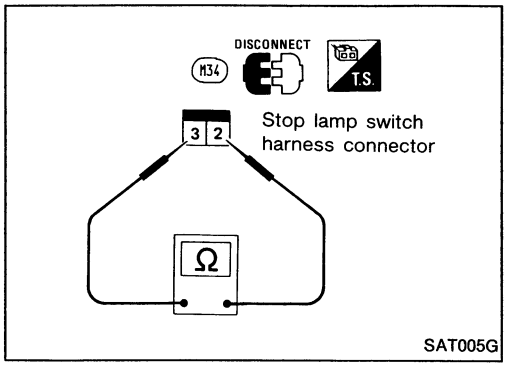
- Check operation by applying battery voltage to shift lock harness connector.



DETENTION SWITCH

- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.

Condition	Continuity
When selector lever is set in "P" position and selector lever button is released	No
Except above	Yes

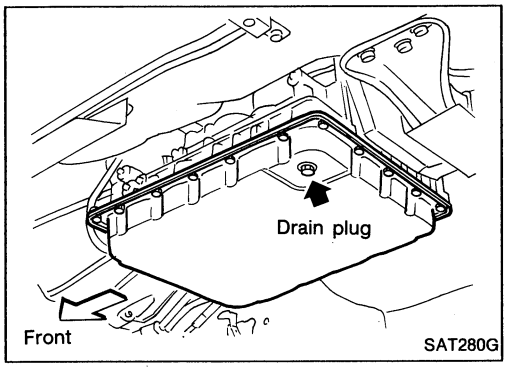


STOP LAMP SWITCH

- Check continuity between terminals ② and ③ of stop lamp switch harness connector.

Condition	Continuity
When brake pedal is depressed	Yes
When brake pedal is released	No

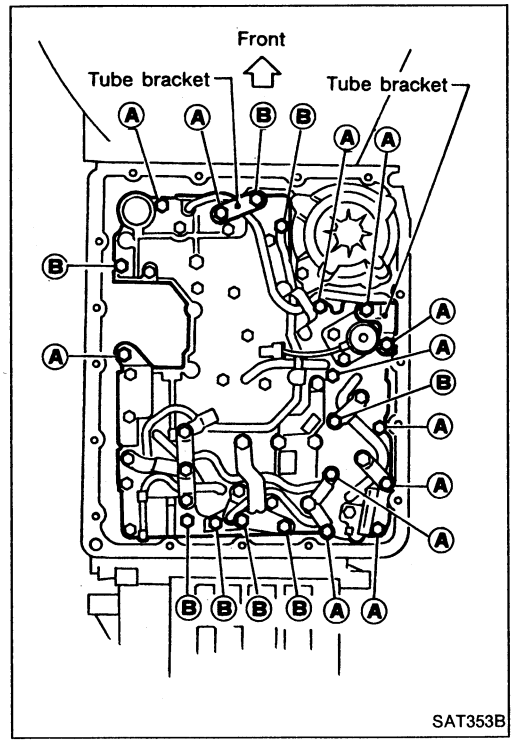
Check stop lamp switch after adjusting brake pedal — refer to section BR.



Control Valve Assembly and Accumulators Inspection

1. Drain fluid by removing drain plug.
2. Remove oil pan and gasket.

3. Remove oil strainer.

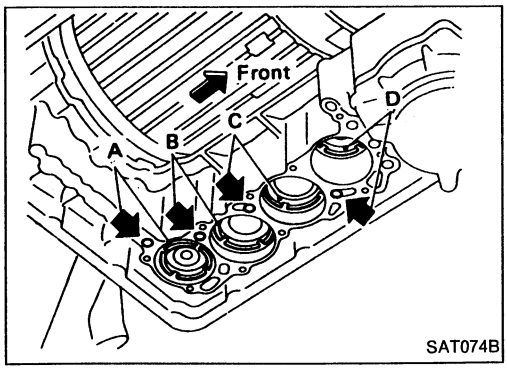


4. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

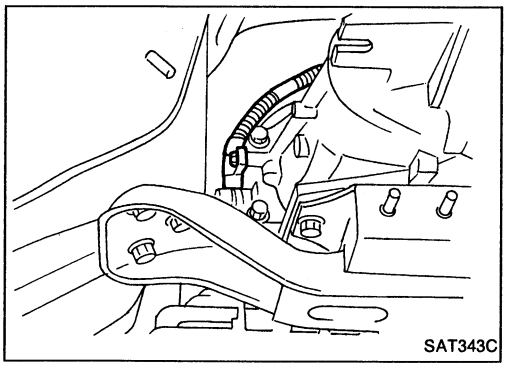
Bolt length and location

Bolt symbol	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

5. Remove solenoids and valves from valve body if necessary.
6. Remove terminal cord assembly if necessary.



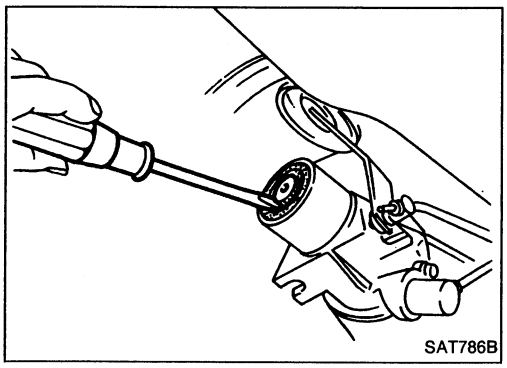
7. Remove accumulators A, B, C and D by applying compressed air if necessary.
- **Hold each piston with rag.**
8. Reinstall any part removed.
- **Always use new sealing parts.**



Revolution Sensor Replacement

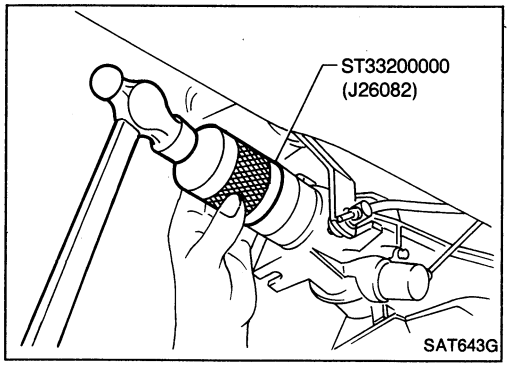
1. Remove exhaust tube.
2. Remove revolution sensor from A/T assembly.
3. Reinstall any part removed.

- **Always use new sealing parts.**



Rear Oil Seal Replacement

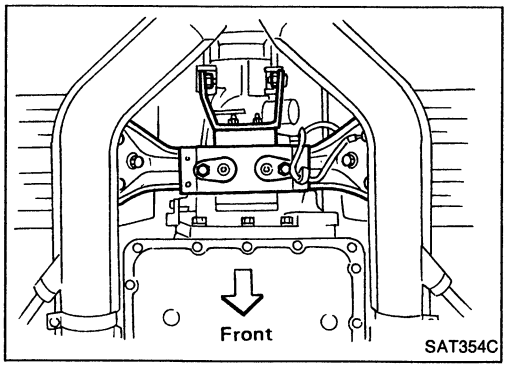
1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear oil seal.



3. Install rear oil seal.

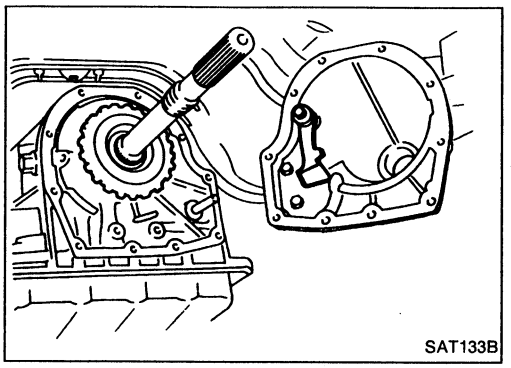
- **Apply A.T.F. before installing.**

4. Reinstall any part removed.



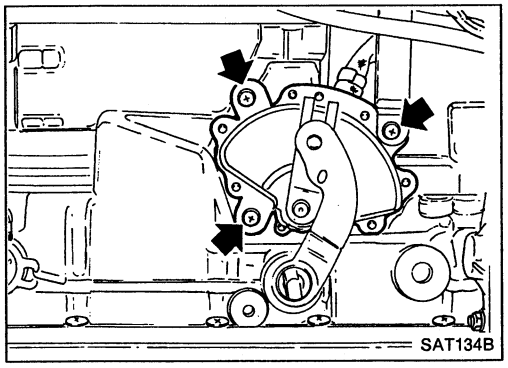
Parking Components Inspection

1. Remove exhaust tube.
2. Remove propeller shaft from vehicle. — Refer to section PD.
3. Remove rear engine mounting member from A/T assembly while supporting A/T with jack.



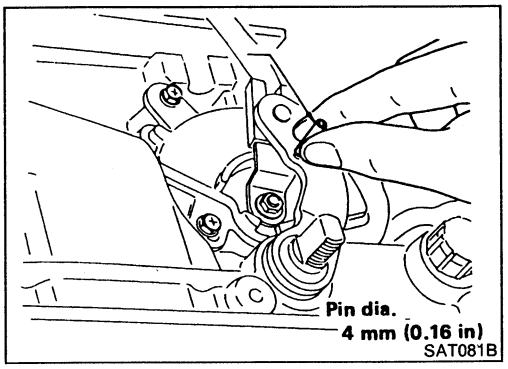
4. Remove rear extension from transmission case.
5. Replace parking components if necessary.
6. Reinstall any part removed.

- **Always use new sealing parts.**


SAT134B

Inhibitor Switch Adjustment

1. Remove manual control linkage from manual shaft of A/T assembly.
2. Set manual shaft of A/T assembly in "N" position.
3. Loosen inhibitor switch fixing bolts.



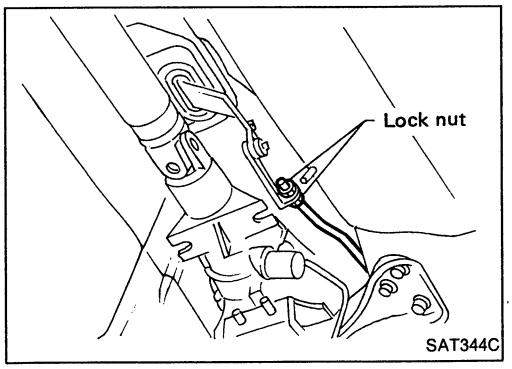
SAT081B

4. Insert pin into adjustment holes in both inhibitor switch and manual shaft of A/T assembly as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".

Manual Control Linkage Adjustment

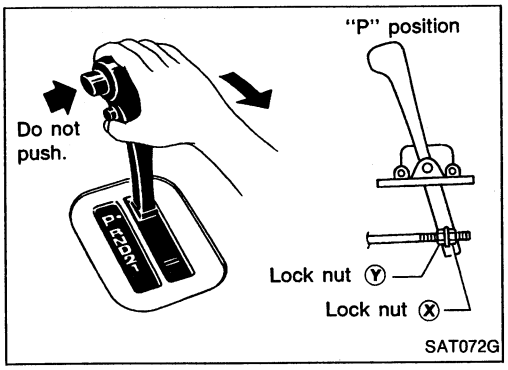
Move selector lever from "P" position to "1" position. You should be able to feel the detents in each position.
If the detents cannot be felt or the pointer indicating the position is improperly aligned, the linkage needs adjustment.

1. Place selector lever in "P" position.
2. Loosen lock nuts.



SAT344C

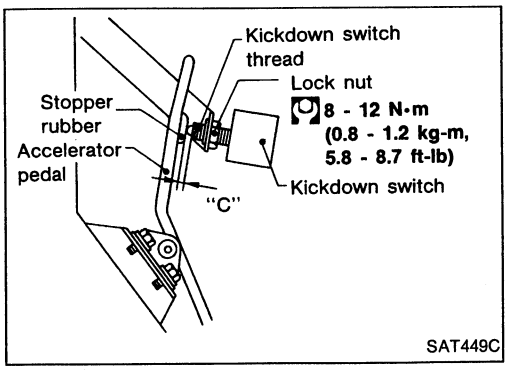
3. Tighten lock nut Ⓧ until it touches trunnion pulling selector lever toward "R" position side without pushing button.
4. Back off lock nut Ⓧ 1 turn and tighten lock nut Ⓨ to the specified torque.
   Lock nut:
   : 29 - 39N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
5. Move selector lever from "P" position to "1" position. Make sure that selector lever can move smoothly.



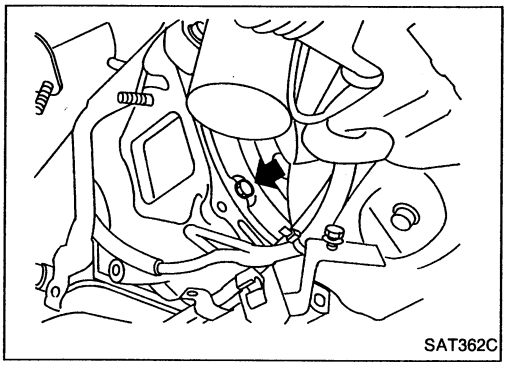
SAT072G

Kickdown Switch Adjustment

1. Adjust accelerator cable — Refer to section FE.
2. Adjust clearance "C" between stopper rubber and end of kickdown switch thread while depressing accelerator pedal fully.
   Clearance "C": 0.3 - 1.0 mm (0.012 - 0.039 in)

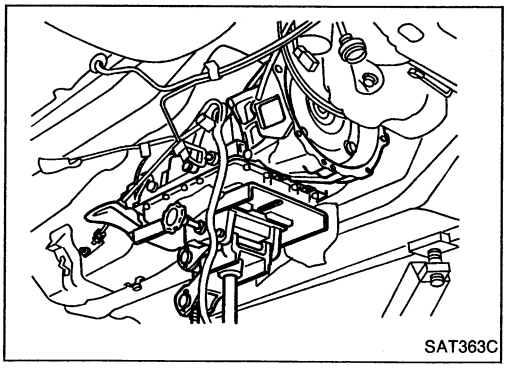


SAT449C

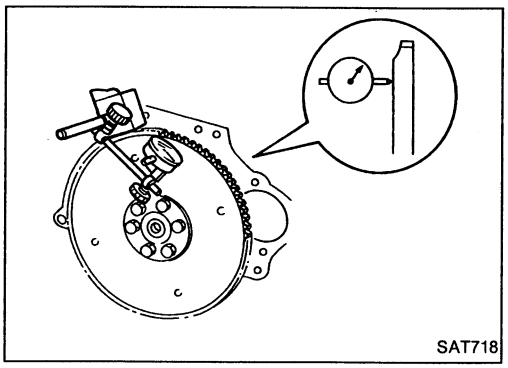

SAT362C

Removal

- Remove exhaust tube.
- Remove fluid charging pipe from A/T assembly.
- Remove oil cooler pipe from A/T assembly.
- Remove control linkage from selector lever.
- Disconnect inhibitor switch and solenoid harness connectors.
- Remove speedometer cable from A/T assembly.
- Plug up openings such as the oil charging pipe hole, etc.
- Remove propeller shaft. — Refer to section PD.
- **Insert plug into rear oil seal after removing propeller shaft.**
- **Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.**

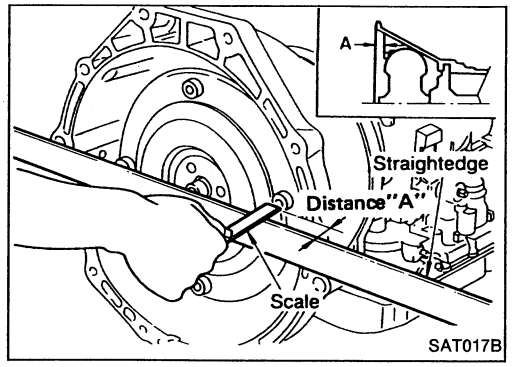

SAT363C

- Remove starter motor.
- Remove gusset securing engine to A/T assembly.
- Remove bolts securing torque converter to drive plate.
- **Remove the bolts by turning crankshaft.**
- Support engine by placing a jack under oil pan.
- **Do not place jack under oil pan drain plug.**
- Remove transmission from engine.
- **Support automatic transmission, while removing it.**


SAT718

Installation

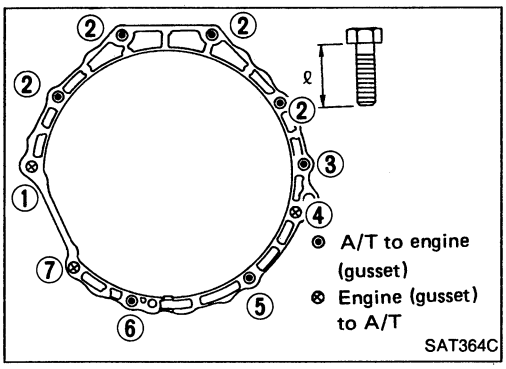
- Drive plate runout
  Maximum allowable runout:
  0.5 mm (0.020 in)
  If this runout is out of allowance, replace drive plate with ring gear.



SAT017B

- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.
  Distance "A":
  RE4R01A
  26.0 mm (1.024 in) or more
  RE4R03A
  25.0 mm (0.984 in) or more
- Install converter to drive plate.
- Reinstall any part removed.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.**

Installation (Cont'd)



- Tighten bolts securing transmission.

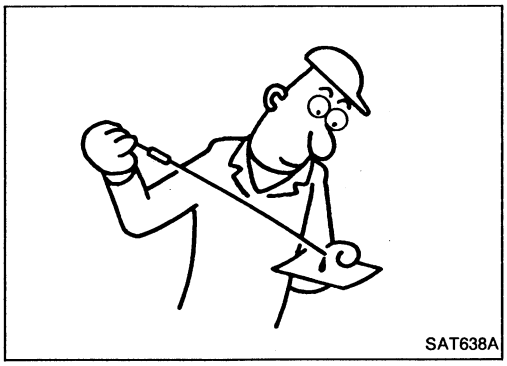
RE4R01A

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
2	39 - 49 (4.0 - 5.0, 29 - 36)	50 (1.97)
3	39 - 49 (4.0 - 5.0, 29 - 36)	45 (1.77)
4	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
5	29 - 39 (3.0 - 4.0, 22 - 29)	60 (2.36)
6	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
7	39 - 49 (4.0 - 5.0, 29 - 36)	25 (0.98)
Gusset to engine	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.98)

RE4R03A

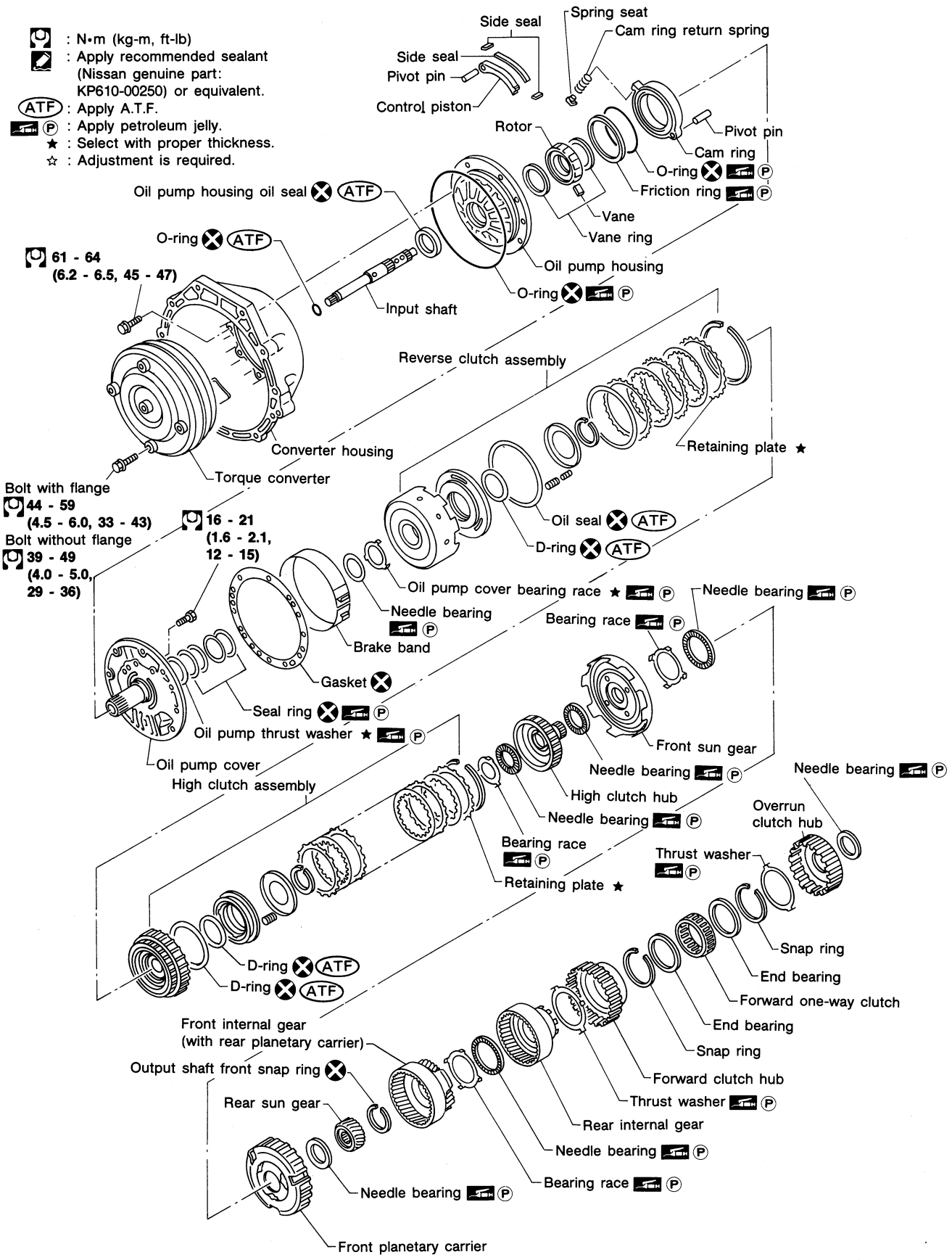
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
2	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
3	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
4	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
5	29 - 39 (3.0 - 4.0, 22 - 29)	60 (2.36)
6	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
7	39 - 49 (4.0 - 5.0, 29 - 36)	25 (0.98)
Gusset to engine	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.98)

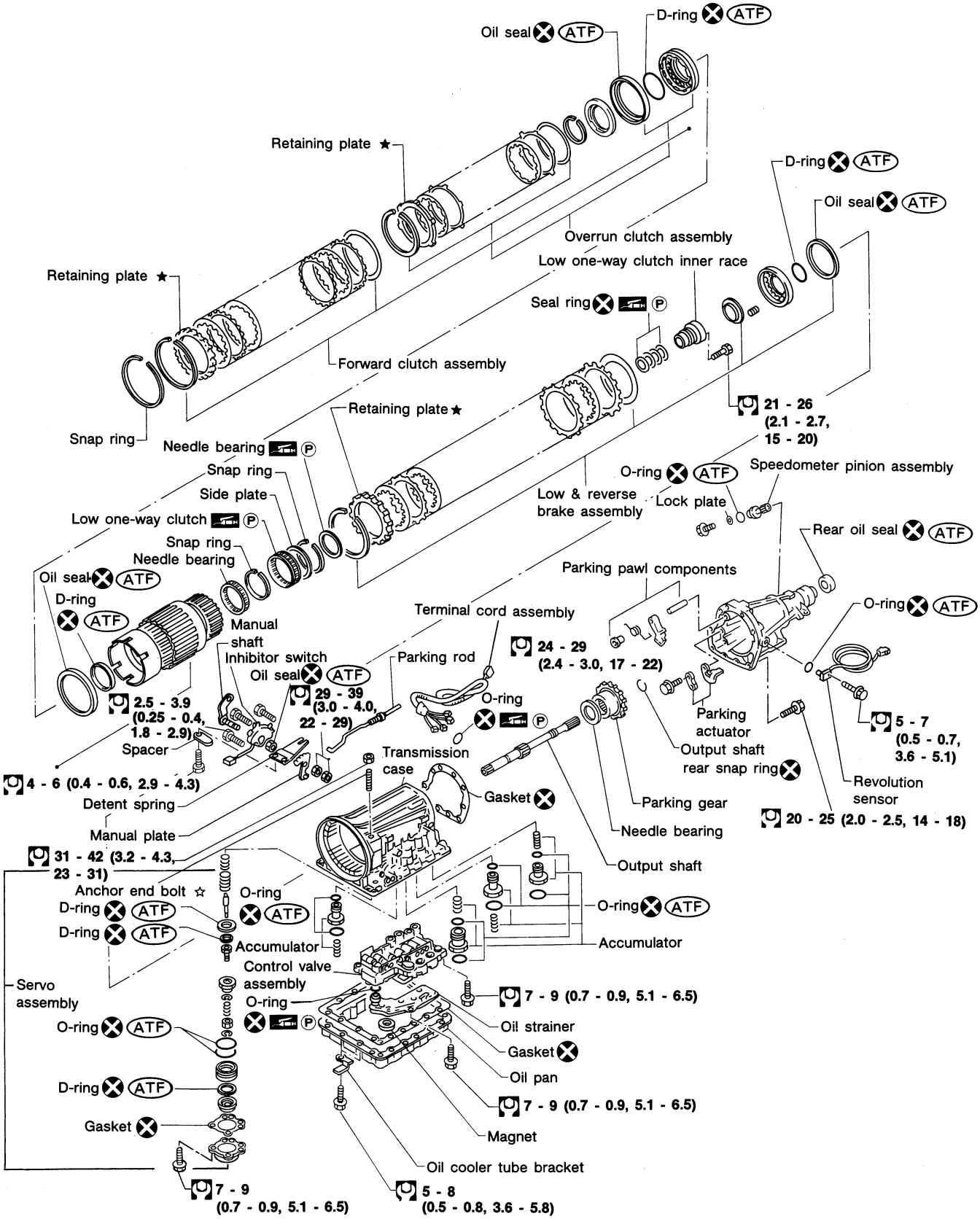
- Reinstall any part removed.



- Check fluid level in transmission.
- Move selector lever through all positions to be sure that transmission operates correctly.
  With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. — Refer to "ROAD TESTING".

RE4R01A

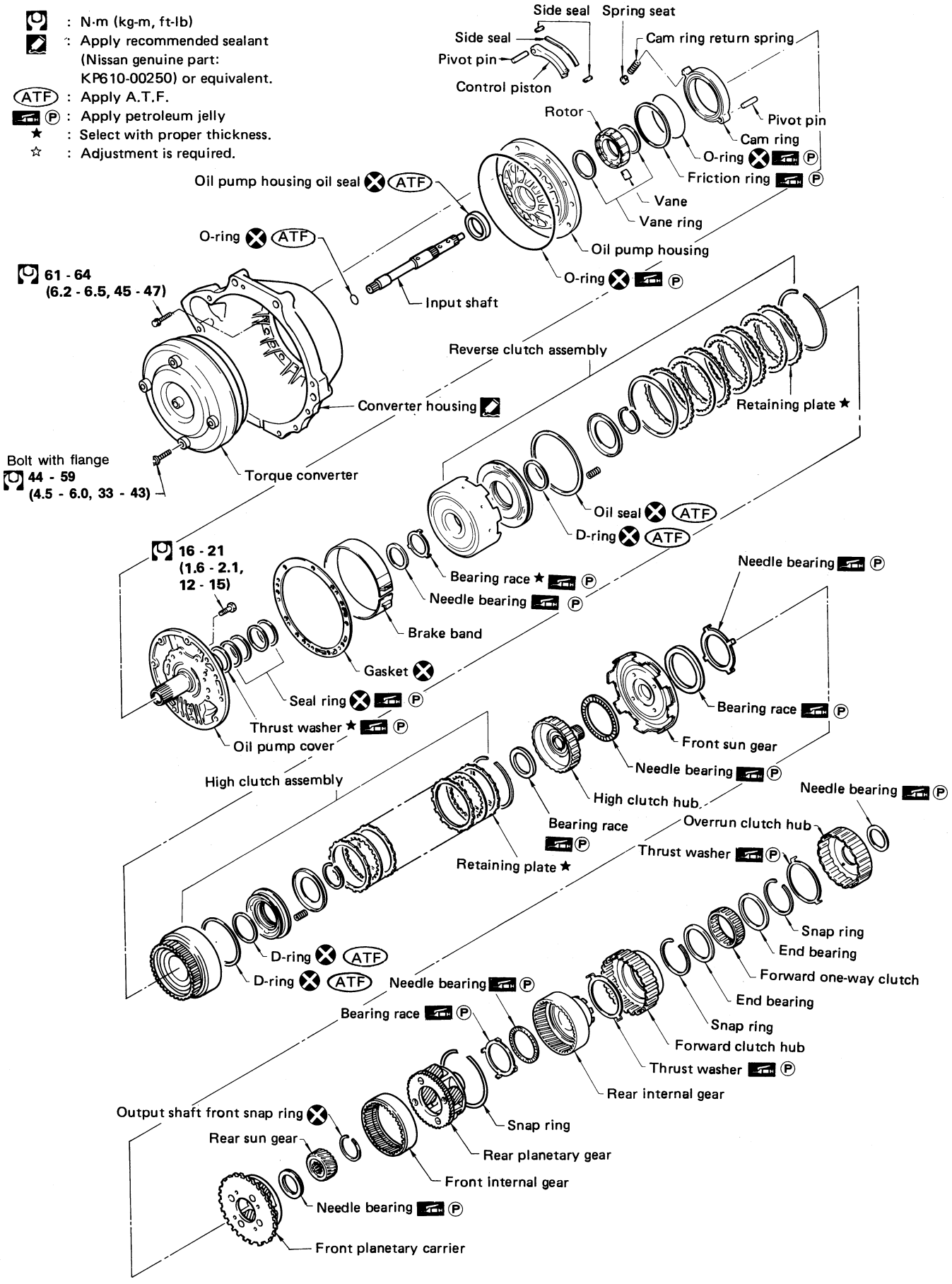

: N•m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.
ATF : Apply A.T.F.
P : Apply petroleum jelly.
★ : Select with proper thickness.
☆ : Adjustment is required.
Side seal
Spring seat
Cam ring return spring
Side seal
Pivot pin
Control piston
Rotor
Pivot pin
Cam ring
O-ring ATF P
Friction ring P
Vane
Vane ring
Oil pump housing oil seal ATF
O-ring ATF
61 - 64 (6.2 - 6.5, 45 - 47)
Oil pump housing
O-ring P
Input shaft
Reverse clutch assembly
Converter housing
Retaining plate ★
Torque converter
Bolt with flange 44 - 59 (4.5 - 6.0, 33 - 43)
Bolt without flange 39 - 49 (4.0 - 5.0, 29 - 36)
16 - 21 (1.6 - 2.1, 12 - 15)
Oil seal ATF
D-ring ATF
Oil pump cover bearing race ★ P
Needle bearing P
Needle bearing P
Bearing race P
Brake band
Gasket
Seal ring P
Oil pump thrust washer ★ P
Oil pump cover
High clutch assembly
Front sun gear
Needle bearing P
High clutch hub
Needle bearing P
Needle bearing P
Overrun clutch hub
Bearing race P
Thrust washer P
Retaining plate ★
D-ring ATF
D-ring ATF
Snap ring
End bearing
Forward one-way clutch
End bearing
Front internal gear (with rear planetary carrier)
Output shaft front snap ring
Snap ring
Forward clutch hub
Thrust washer P
Rear sun gear
Rear internal gear
Needle bearing P
Bearing race P
Needle bearing P
Front planetary carrier

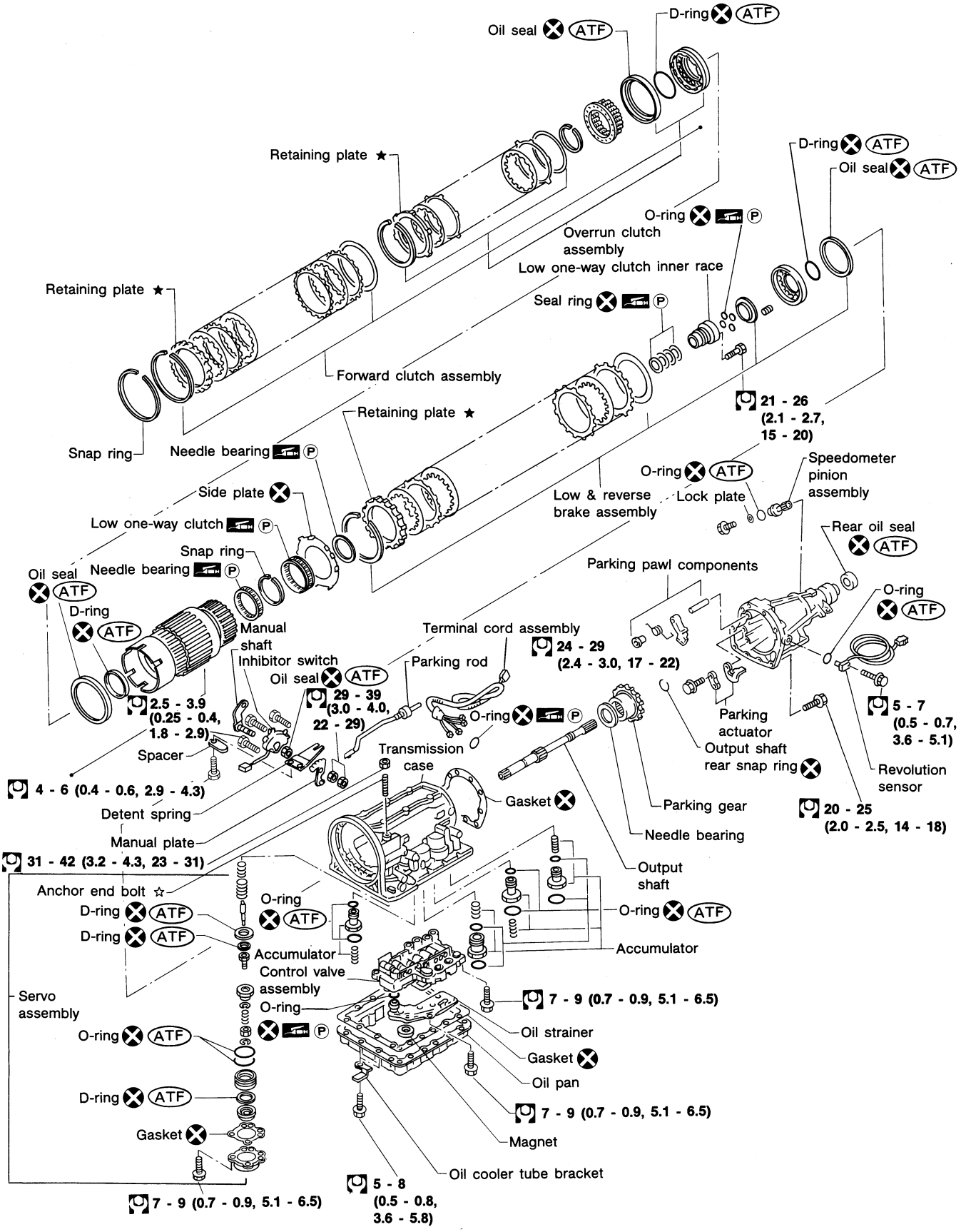

Oil seal ATF
D-ring ATF
Retaining plate ★
D-ring ATF
Oil seal ATF
Overrun clutch assembly
Low one-way clutch inner race
Retaining plate ★
Seal ring P
Forward clutch assembly
21 - 26 (2.1 - 2.7, 15 - 20)
Snap ring
Needle bearing P
Retaining plate ★
Snap ring
Side plate
Low one-way clutch P
Snap ring
Needle bearing
Oil seal ATF
D-ring ATF
Manual shaft
Inhibitor switch
Oil seal ATF
2.5 - 3.9 (0.25 - 0.4, 1.8 - 2.9)
29 - 39 (3.0 - 4.0, 22 - 29)
Spacer
4 - 6 (0.4 - 0.6, 2.9 - 4.3)
Detent spring
Manual plate
31 - 42 (3.2 - 4.3, 23 - 31)
Anchor end bolt ☆
D-ring ATF
D-ring ATF
O-ring ATF
Accumulator
Servo assembly
Control valve assembly
O-ring
O-ring ATF
O-ring P
D-ring ATF
Gasket
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Transmission case
Gasket
Parking rod
Terminal cord assembly
24 - 29 (2.4 - 3.0, 17 - 22)
O-ring P
Low & reverse brake assembly
O-ring ATF
Lock plate
Speedometer pinion assembly
Parking pawl components
Rear oil seal ATF
O-ring ATF
Parking actuator
Output shaft rear snap ring
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Revolution sensor
20 - 25 (2.0 - 2.5, 14 - 18)
Parking gear
Needle bearing
Output shaft
O-ring ATF
Accumulator
Oil strainer
Gasket
Oil pan
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Magnet
Oil cooler tube bracket
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
5 - 8 (0.5 - 0.8, 3.6 - 5.8)

SAT483E

RE4R03A

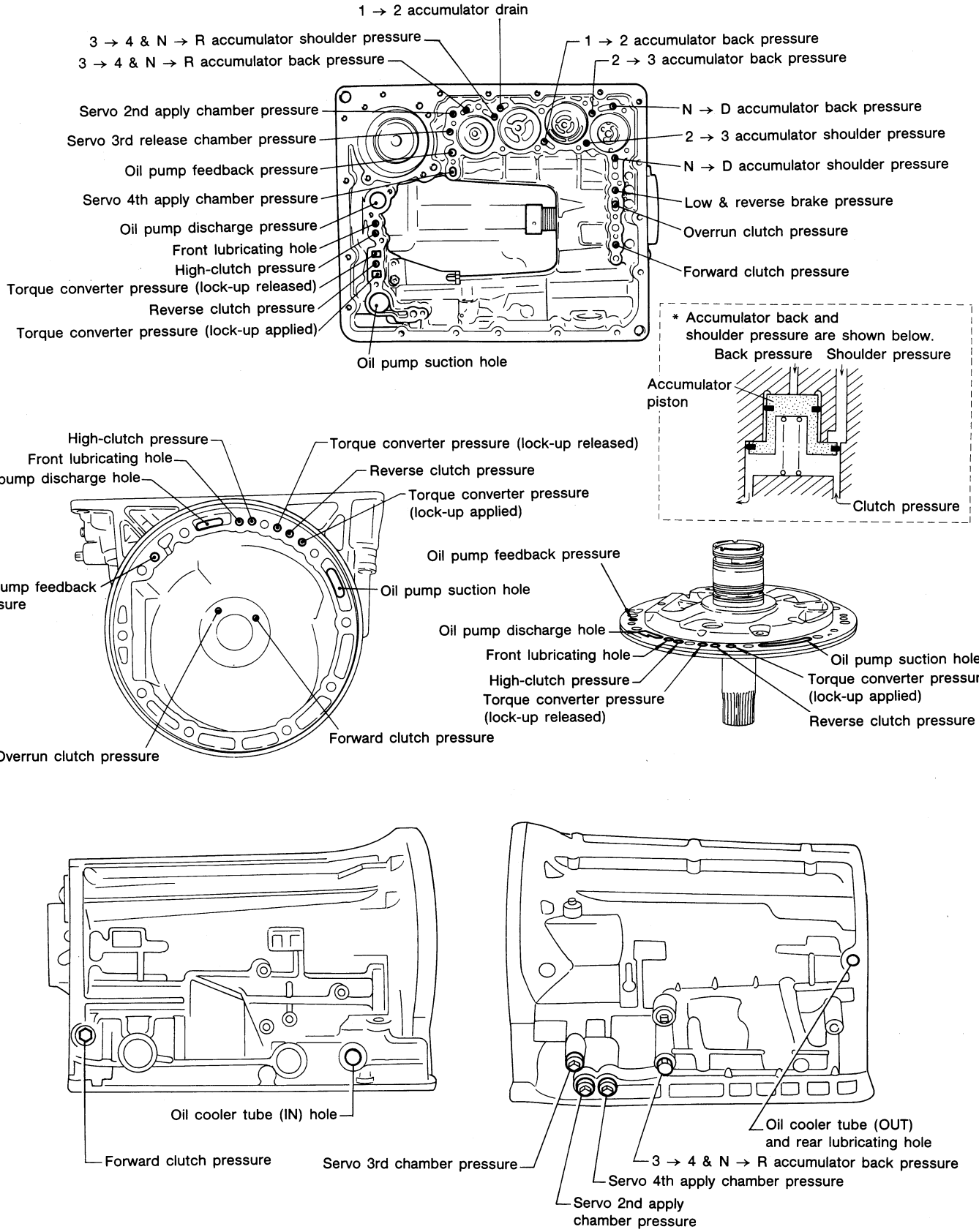
: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.
ATF : Apply A.T.F.
P : Apply petroleum jelly
★ : Select with proper thickness.
☆ : Adjustment is required.




Oil seal ATF
D-ring ATF
Retaining plate ★
D-ring ATF
Oil seal ATF
O-ring P
Overrun clutch assembly
Low one-way clutch inner race
Retaining plate ★
Seal ring P
Forward clutch assembly
21 - 26 (2.1 - 2.7, 15 - 20)
Snap ring
Needle bearing P
Retaining plate ★
O-ring ATF
Speedometer pinion assembly
Side plate
Low & reverse brake assembly
Lock plate
Low one-way clutch P
Rear oil seal ATF
Snap ring
Parking pawl components
Oil seal ATF
Needle bearing P
O-ring ATF
D-ring ATF
Manual shaft
Terminal cord assembly
24 - 29 (2.4 - 3.0, 17 - 22)
Inhibitor switch
Parking rod
Oil seal ATF
29 - 39 (3.0 - 4.0, 22 - 29)
2.5 - 3.9 (0.25 - 0.4, 1.8 - 2.9)
O-ring P
Parking actuator
Output shaft rear snap ring
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Spacer
Transmission case
Revolution sensor
4 - 6 (0.4 - 0.6, 2.9 - 4.3)
Gasket
20 - 25 (2.0 - 2.5, 14 - 18)
Detent spring
Parking gear
Manual plate
Needle bearing
31 - 42 (3.2 - 4.3, 23 - 31)
Output shaft
Anchor end bolt ☆
O-ring ATF
D-ring ATF
O-ring ATF
D-ring ATF
Accumulator
Accumulator
Control valve assembly
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Servo assembly
O-ring
Oil strainer
O-ring ATF
O-ring P
Gasket
Oil pan
D-ring ATF
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Gasket
Magnet
Oil cooler tube bracket
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
5 - 8 (0.5 - 0.8, 3.6 - 5.8)

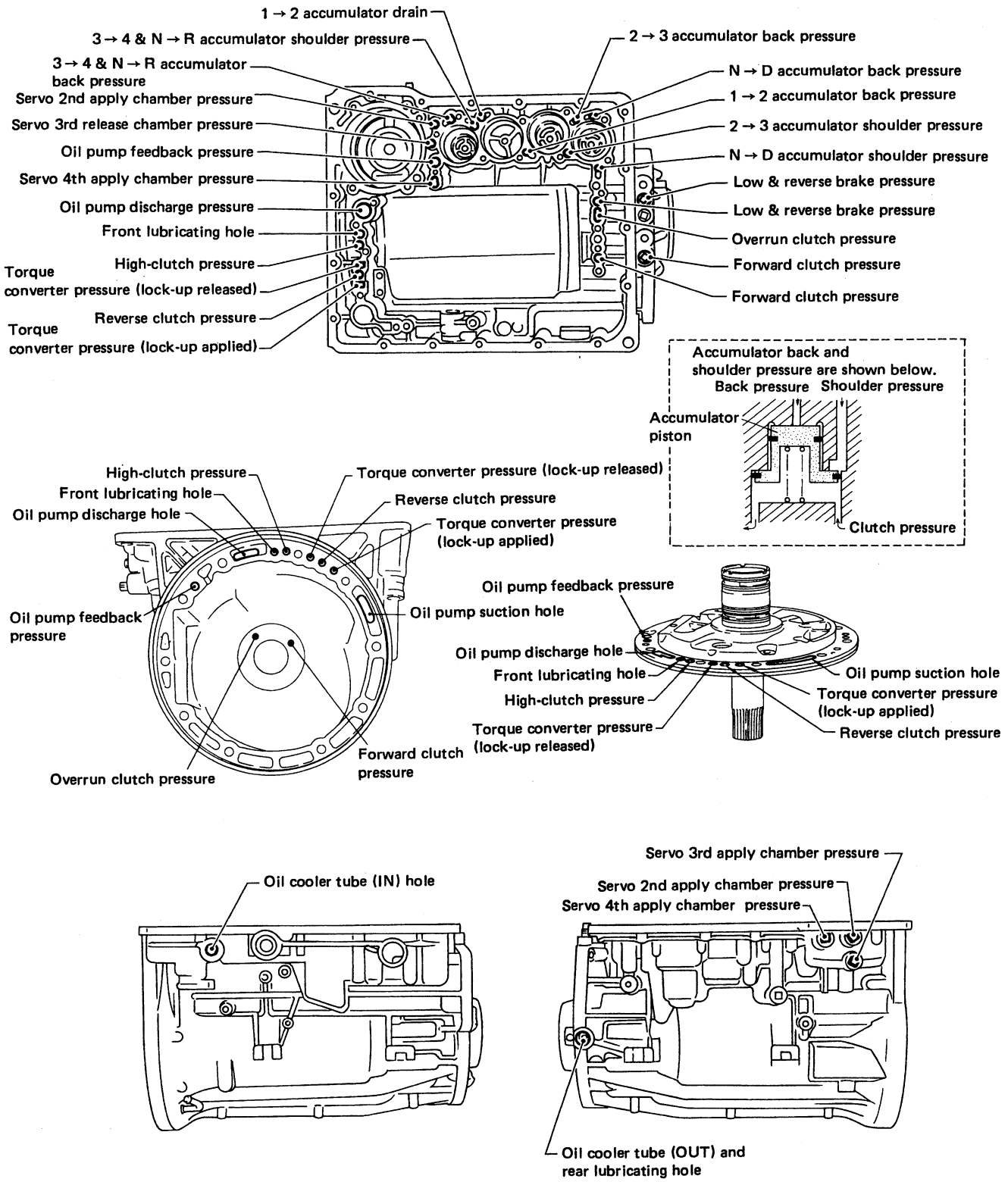
SAT484E

Oil Channel — RE4R01A



SAT185B

Oil Channel — RE4R03A



SAT611B

Locations of Needle Bearings, Thrust Washers and Snap Rings — RE4R01A

Outer diameter of snap rings

Item number	Outer diameter mm (in)
②	161.0 (6.34)
③	140.1 (5.52)
④	156.4 (6.16)
⑥	142.0 (5.59)
⑦	159.2 (6.27)

Thrust washers

Item number	Color
①	Black
⑤	White

Outer diameter of needle bearings

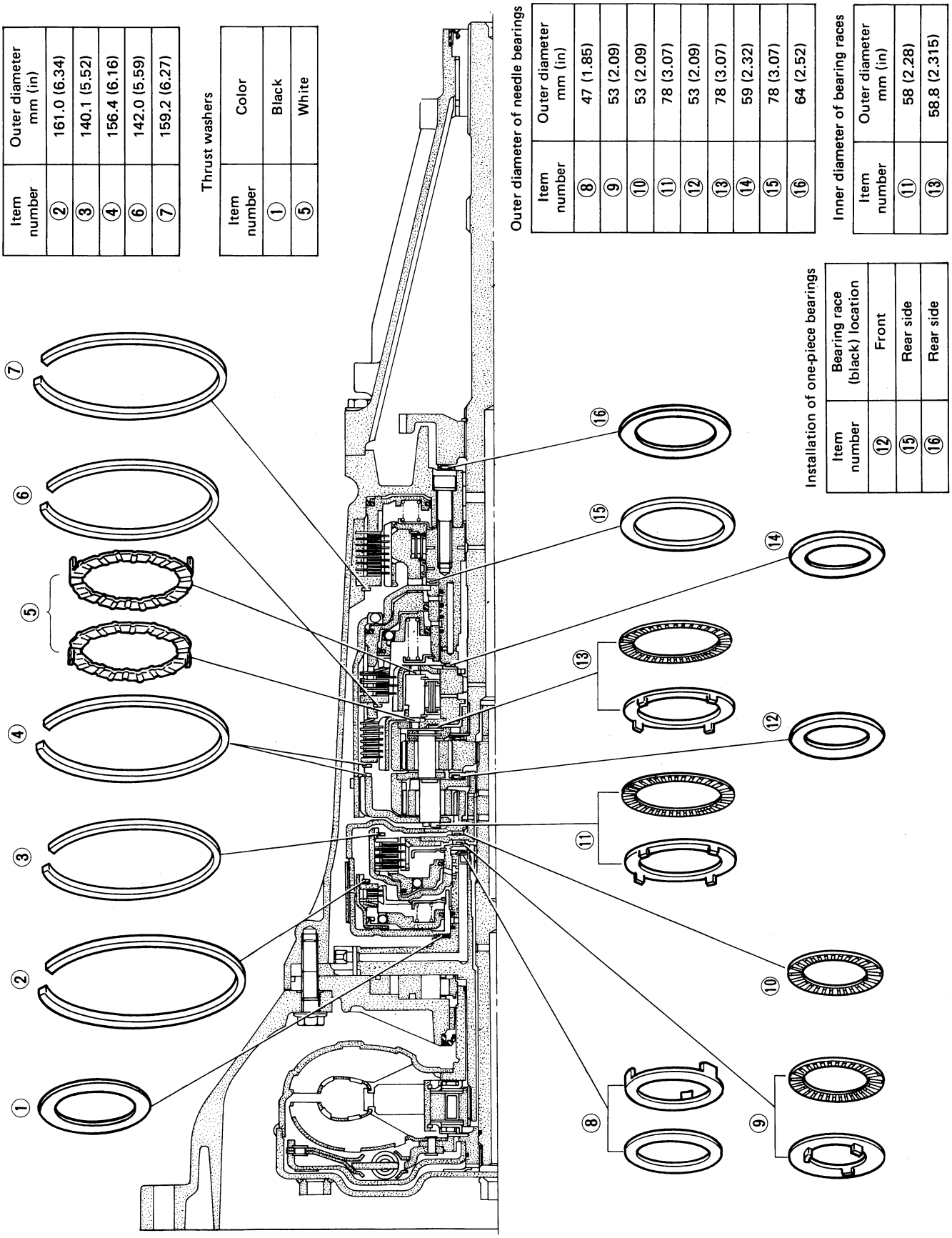
Item number	Outer diameter mm (in)
⑧	47 (1.85)
⑨	53 (2.09)
⑩	53 (2.09)
⑪	78 (3.07)
⑫	53 (2.09)
⑬	78 (3.07)
⑭	59 (2.32)
⑮	78 (3.07)
⑯	64 (2.52)

Inner diameter of bearing races

Item number	Outer diameter mm (in)
⑪	58 (2.28)
⑬	58.8 (2.315)

Installation of one-piece bearings

Item number	Bearing race (black) location
⑫	Front
⑮	Rear side
⑯	Rear side



SAT647A

Locations of Needle Bearings, Thrust Washers and Snap Rings — RE4R03A

Outer diameter of snap rings

Item number	Outer diameter mm (in)
②, ⑤	164.0 (6.46)
③	176.0 (6.93)
⑥	172.0 (6.77)

Thrust washers

Item number	Color
①	Black
④	White

Outer diameter of bearing races

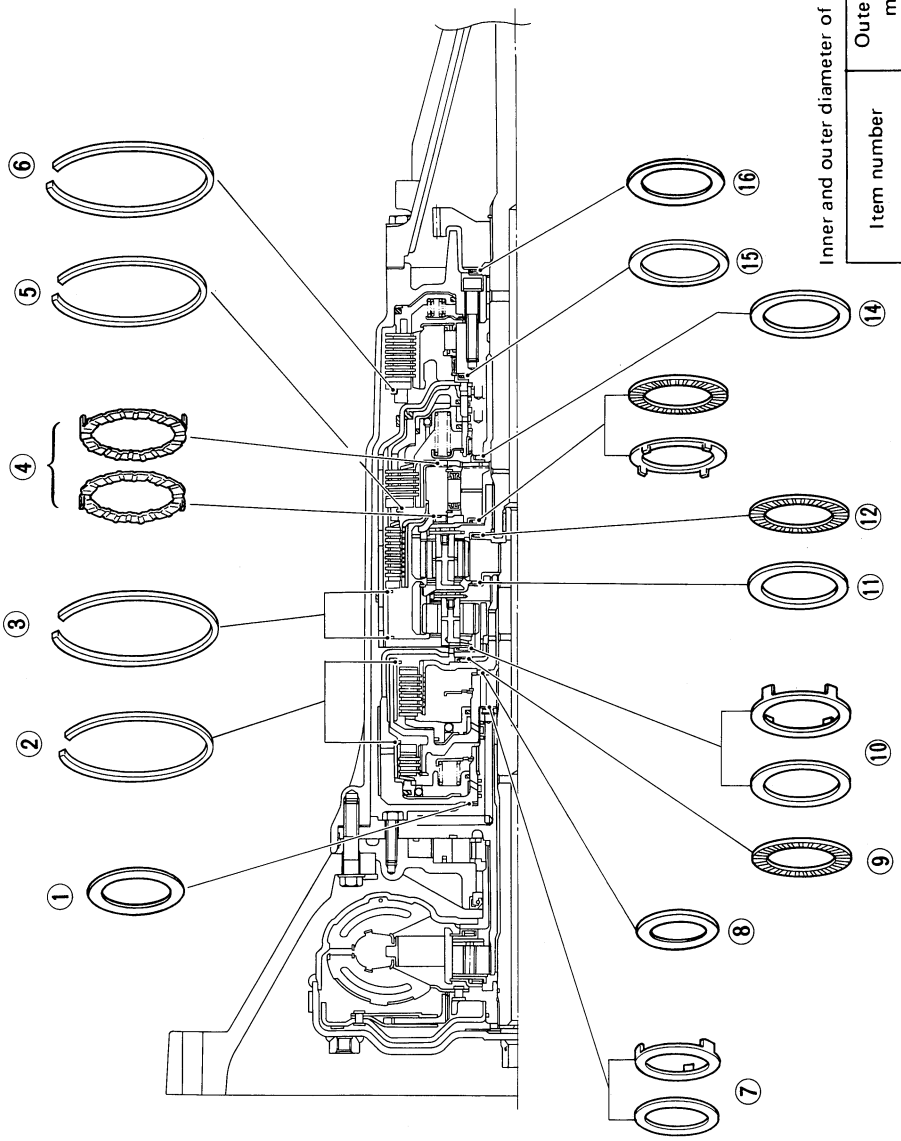
Item number	Outer diameter mm (in)
⑦	43.5 (1.713)
⑩	82.0 (3.228)
⑬	63.2 (2.488)

Installation of one-piece bearings

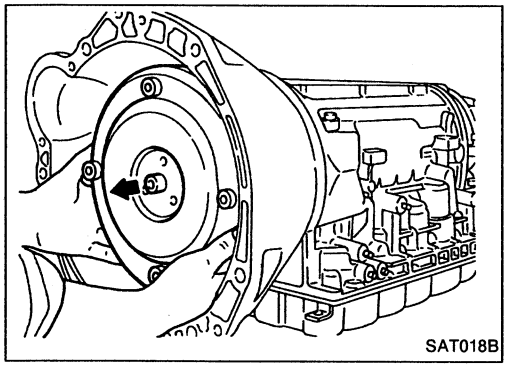
Item number	Bearing race (black) location
⑮	Rear side
⑯	Rear side

Inner and outer diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)	Number of needles
⑦	47.0 (1.850)	30.0 (1.181)	–
⑧	53.0 (2.087)	35.1 (1.382)	–
⑨, ⑩	85.0 (3.346)	62.7 (2.468)	–
⑪, ⑫	64.0 (2.520)	45.0 (1.772)	52
⑬	64.0 (2.520)	45.0 (1.772)	50
⑭	64.0 (2.520)	44.0 (1.732)	34
⑮	78.1 (3.075)	–	–
⑯	64.0 (2.520)	–	–

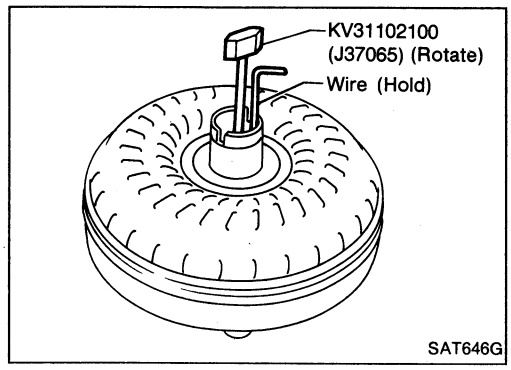


SAT636C


SAT018B

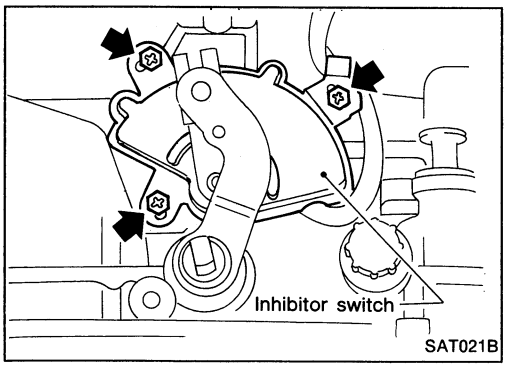
Disassembly

1. Remove torque converter by holding it firmly and turning while pulling straight out.



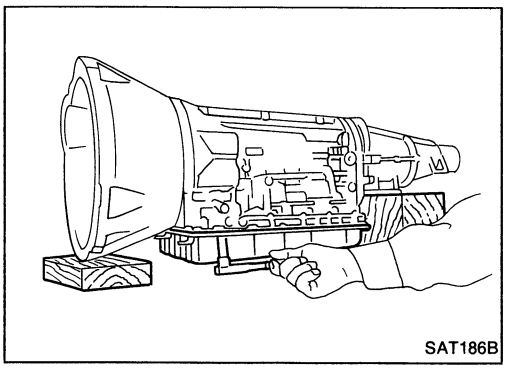
SAT646G

2. Check torque converter one-way clutch.
a. Insert Tool into spline of one-way clutch inner race.
b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.



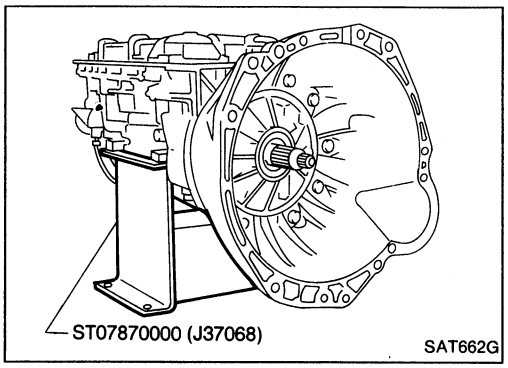
SAT021B

3. Remove inhibitor switch from transmission case.


SAT186B

4. Remove oil pan.
a. Drain A.T.F. from rear extension.
b. Raise oil pan by placing wooden blocks under converter housing and rear extension.
c. Separate the oil pan and transmission case.

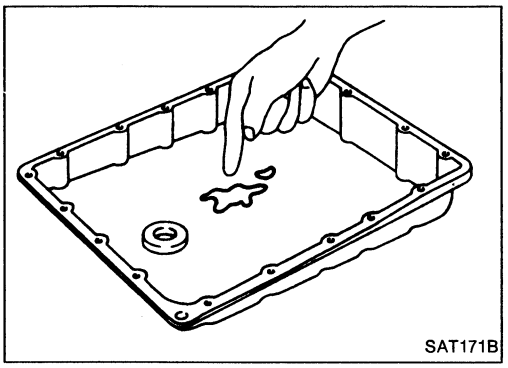
- **Always place oil pan straight down so that foreign particles inside will not move.**



SAT662G

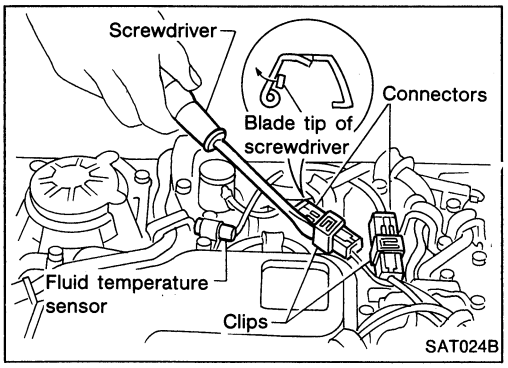
5. Place transmission into Tool with the control valve facing up.

Disassembly (Cont'd)


SAT171B

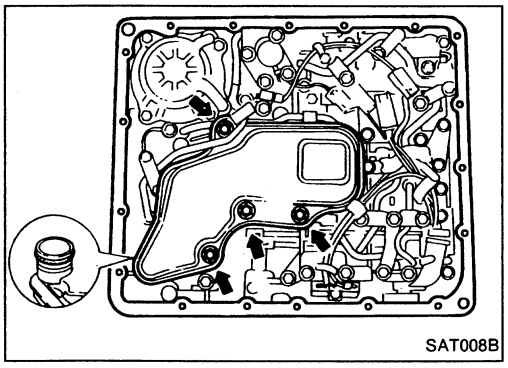
6. Check oil pan and oil strainer for accumulation of foreign particles.
- If materials of clutch facing are found, clutch plates may be worn.
- If metal filings are found, clutch plates, brake bands, etc. may be worn.
- If aluminum filings are found, bushings or aluminum cast parts may be worn.

In above cases, replace torque converter and check unit for cause of particle accumulation.



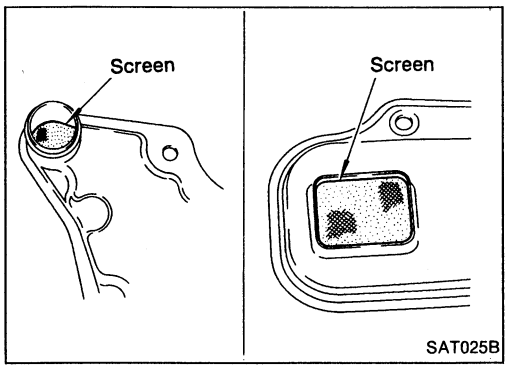
SAT024B

7. Remove torque converter clutch solenoid valve and fluid temperature sensor connectors.
- **Be careful not to damage connector.**


SAT008B

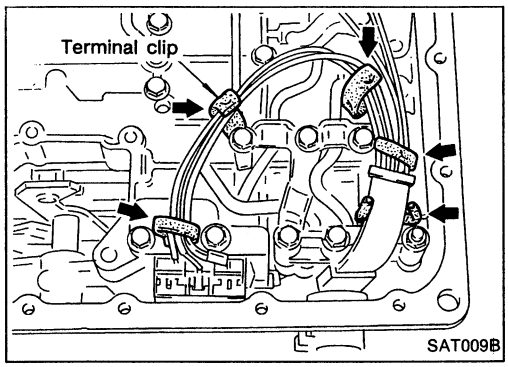
8. Remove oil strainer.

a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.



SAT025B

b. Check oil strainer screen for damage.

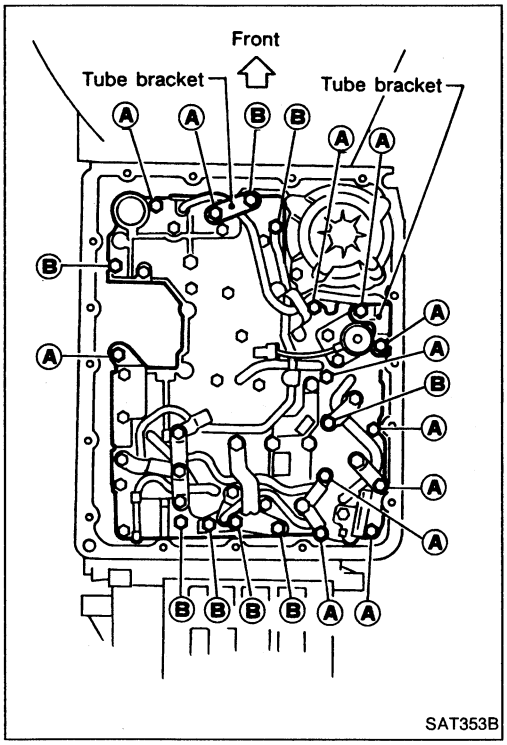


SAT009B

9. Remove control valve assembly.

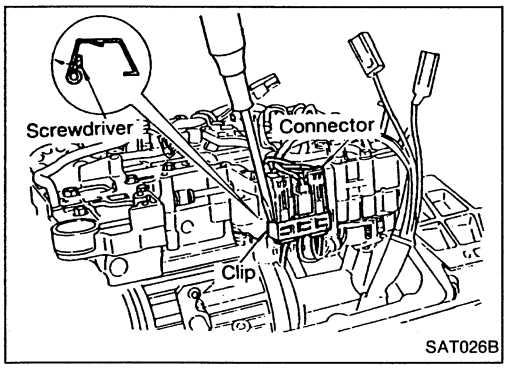
a. Straighten terminal clips to free terminal cords then remove terminal clips.

Disassembly (Cont'd)



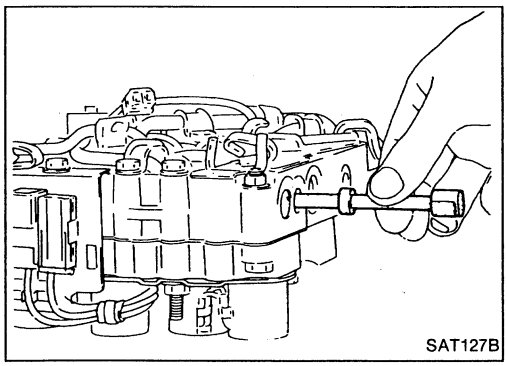
b. Remove bolts Ⓐ and Ⓑ, and remove control valve assembly from transmission.

Bolt symbol	ℓ mm (in) ℓ
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

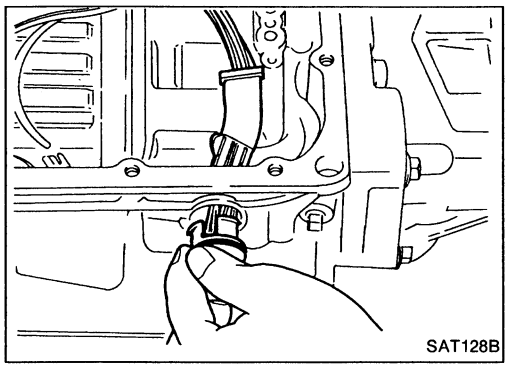


c. Remove solenoid connector.

- **Be careful not to damage connector.**



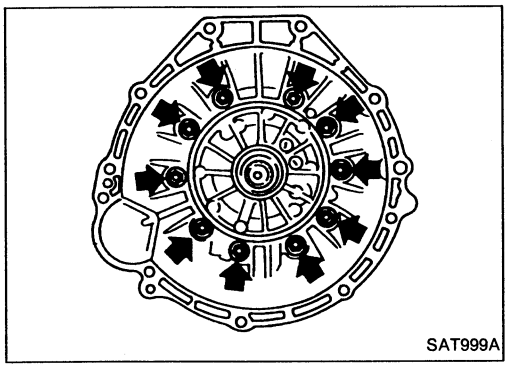
d. Remove manual valve from control valve assembly.



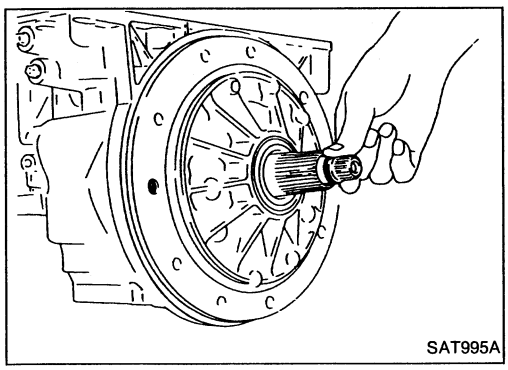
10. Remove terminal cord assembly from transmission case while pushing on stopper.

- **Be careful not to damage cord.**
- **Do not remove terminal cord assembly unless it is damaged.**

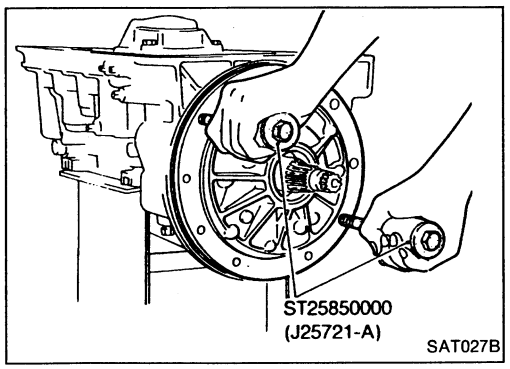
Disassembly (Cont'd)


SAT999A

11. Remove converter housing from transmission case.

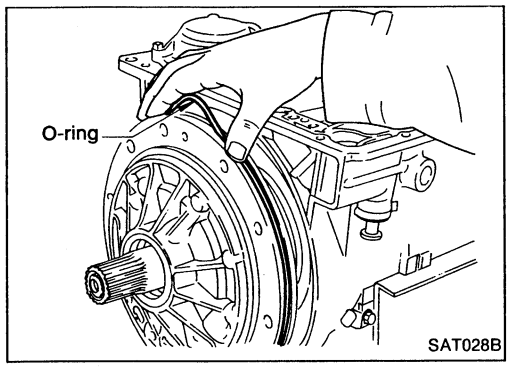

SAT995A

12. Remove O-ring from input shaft.



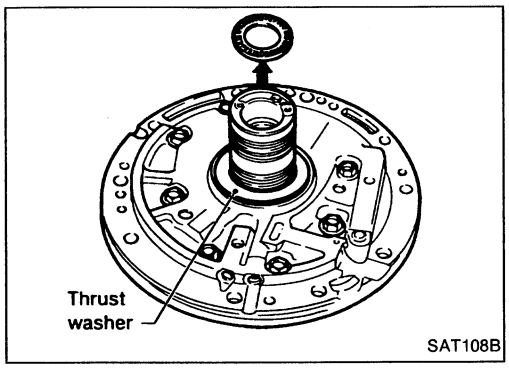
SAT027B

13. Remove oil pump assembly.
a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



SAT028B

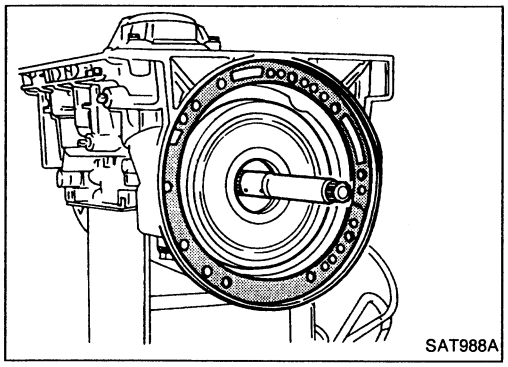
b. Remove O-ring from oil pump assembly.
c. Remove traces of sealant from oil pump housing.
- **Be careful not to scratch pump housing.**



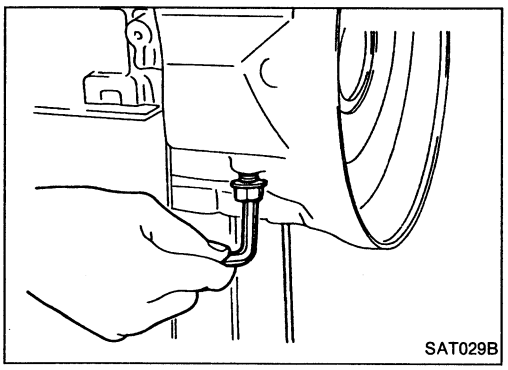
SAT108B

d. Remove needle bearing and thrust washer from oil pump assembly.

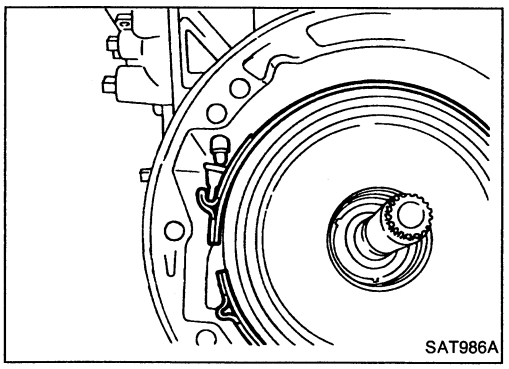
Disassembly (Cont'd)


SAT988A

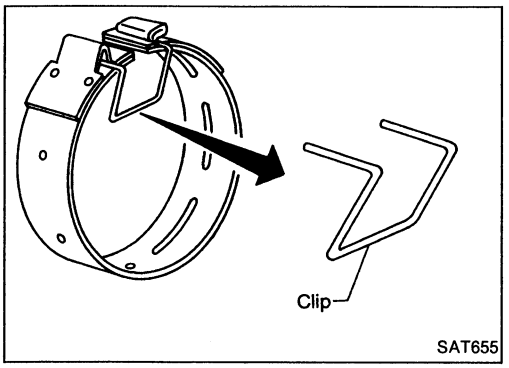
14. Remove input shaft and oil pump gasket.


SAT029B

15. Remove brake band and band strut.
a. Loosen lock nut and remove band servo anchor end pin from transmission case.

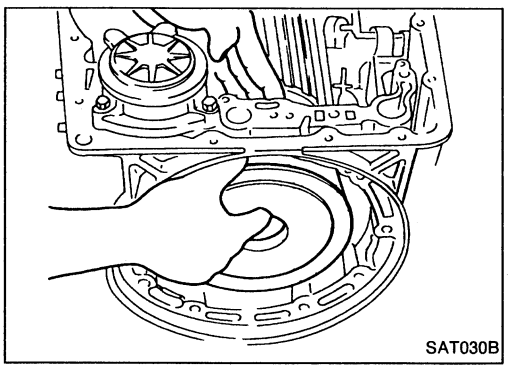

SAT986A

b. Remove brake band and band strut from transmission case.



SAT655

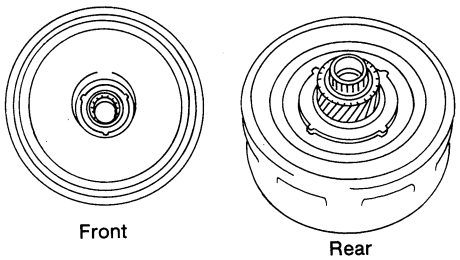
c. Hold brake band in a circular shape with clip.


SAT030B

16. Remove front side clutch and gear components.
a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

Disassembly (Cont'd)

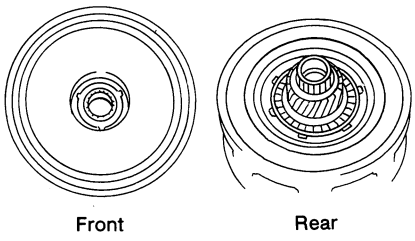
RE4R01A



SAT647G

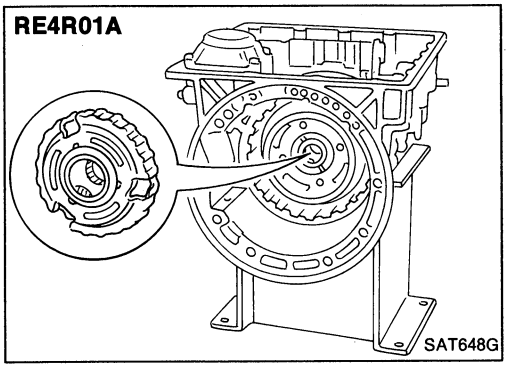
b. Remove front bearing race from clutch pack.
c. Remove rear bearing race or front needle bearing from clutch pack.

RE4R03A



SAT637C

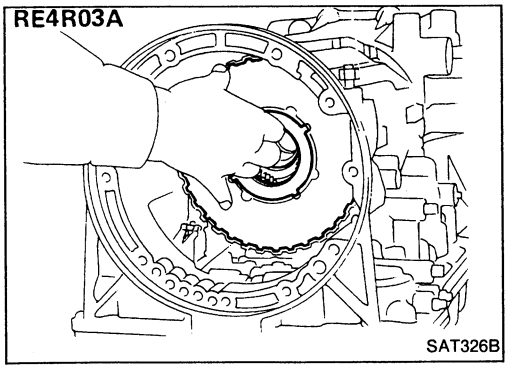
RE4R01A



SAT648G

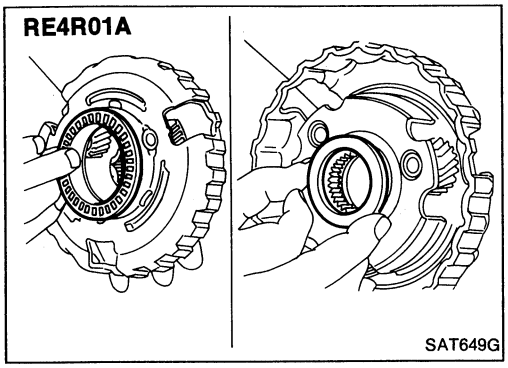
d. Remove front planetary carrier from transmission case.

RE4R03A



SAT326B

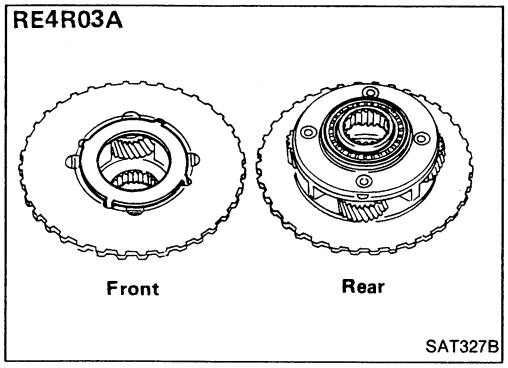
RE4R01A

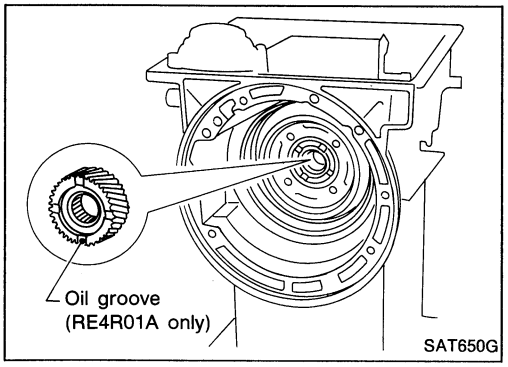


SAT649G

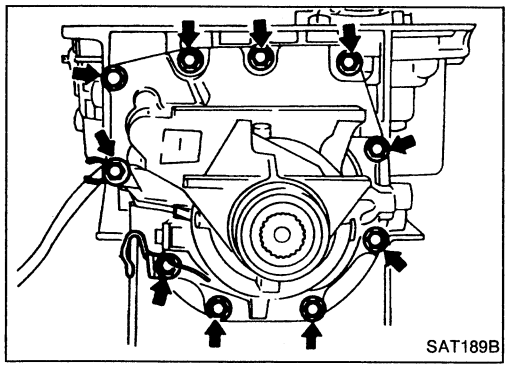
e. Remove front needle bearing or front bearing race from front planetary carrier.
f. Remove rear needle bearing from front planetary carrier.

Disassembly (Cont'd)

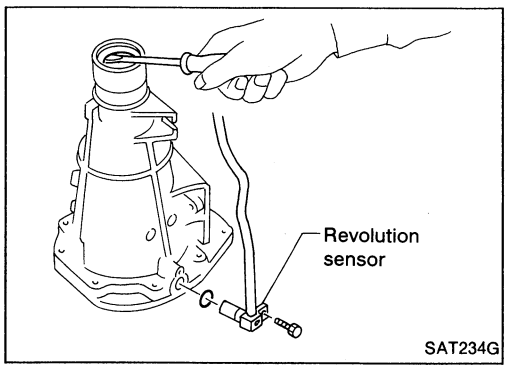




g. Remove rear sun gear from transmission case.

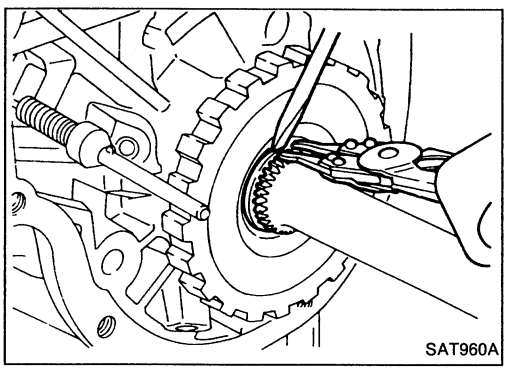


17. Remove rear extension.
a. Remove rear extension from transmission case.
b. Remove rear extension gasket from transmission case.



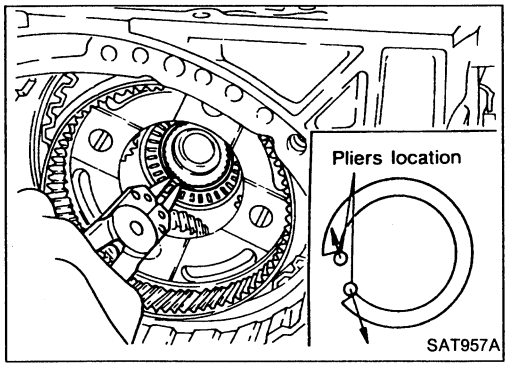
c. Remove oil seal from rear extension.
- **Do not remove oil seal unless it is to be replaced.**

d. Remove revolution sensor from rear extension.
e. Remove O-ring from revolution sensor.



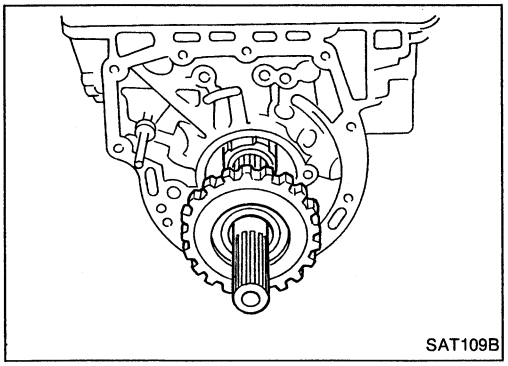
18. Remove output shaft and parking gear.
a. Remove rear snap ring from output shaft.

Disassembly (Cont'd)

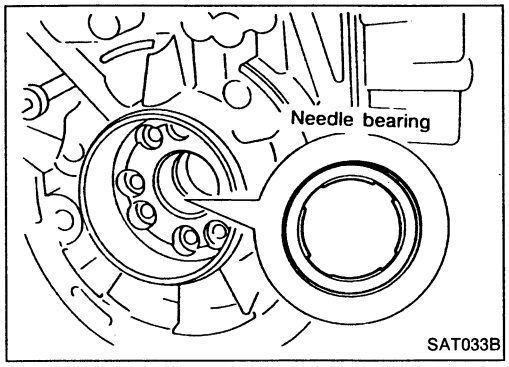


b. Slowly push output shaft all the way forward.
- **Do not use excessive force.**

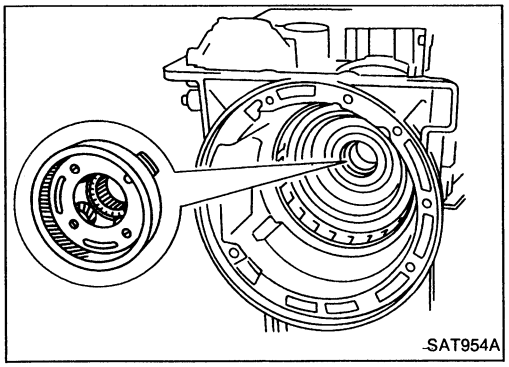
c. Remove snap ring from output shaft.



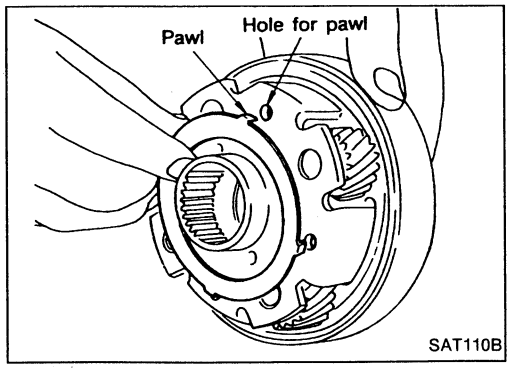
d. Remove output shaft and parking gear as a unit from transmission case.
e. Remove parking gear from output shaft.



f. Remove needle bearing from transmission case.

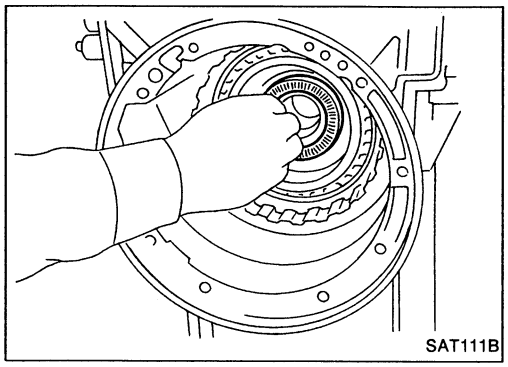


19. Remove rear side clutch and gear components.
a. Remove front internal gear.

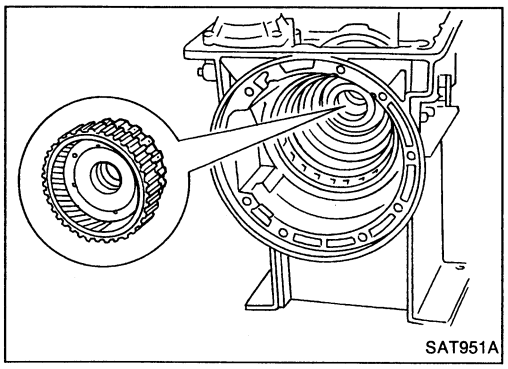


b. Remove bearing race from front internal gear.

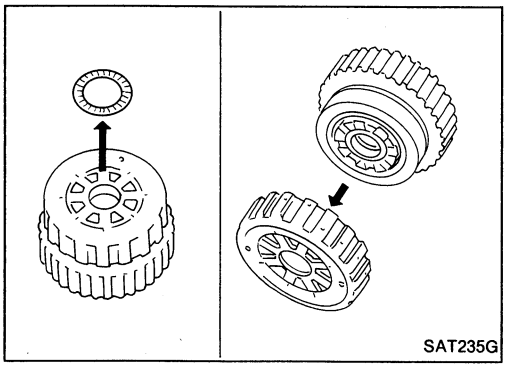
Disassembly (Cont'd)


SAT111B

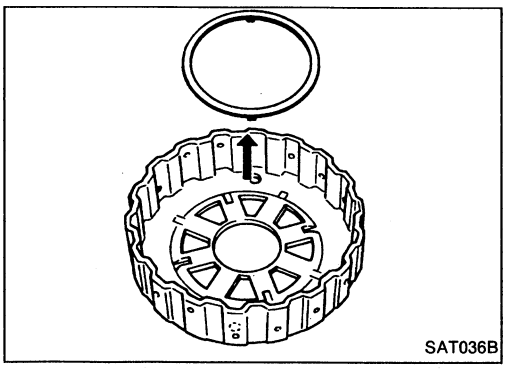
c. Remove needle bearing from rear internal gear.


SAT951A

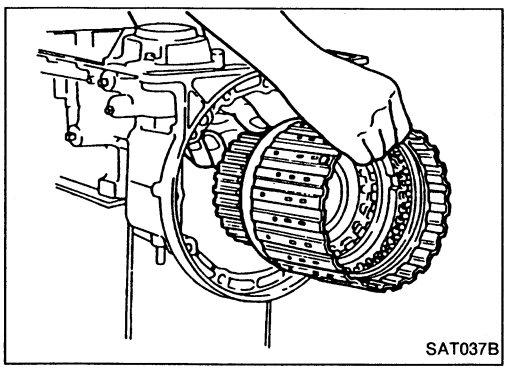
d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.


SAT235G

e. Remove needle bearing from overrun clutch hub.
f. Remove overrun clutch hub from rear internal gear and forward clutch hub.

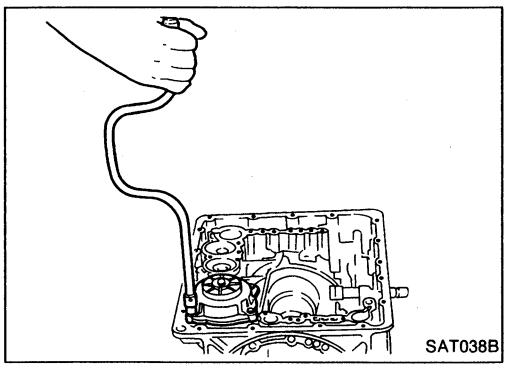

SAT036B

g. Remove thrust washer from overrun clutch hub.

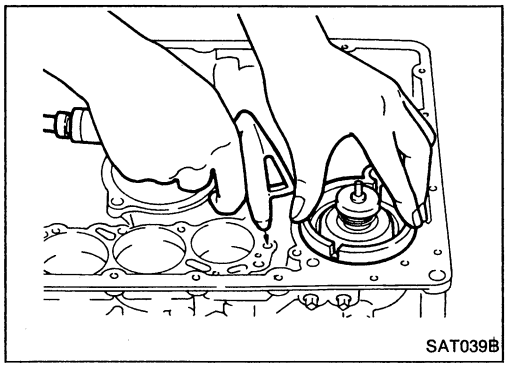

SAT037B

h. Remove forward clutch assembly from transmission case.

Disassembly (Cont'd)

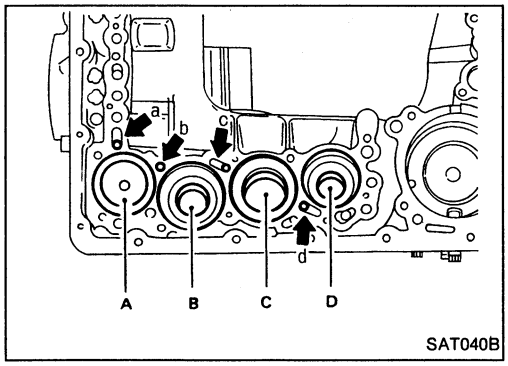


20. Remove band servo and accumulator components.
a. Remove band servo retainer from transmission case.



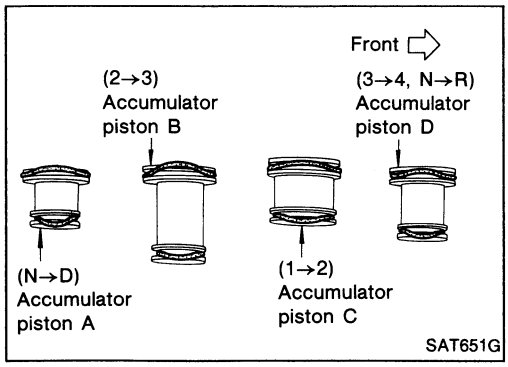
b. Apply compressed air to oil hole until band servo piston comes out of transmission case.
- **Hold piston with a rag and gradually direct air to oil hole.**

c. Remove return springs.

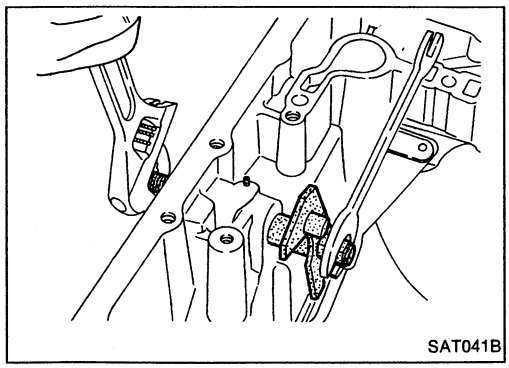


d. Remove springs from accumulator pistons B, C and D.
e. Apply compressed air to each oil hole until piston comes out.
- **Hold piston with a rag and gradually direct air to oil hole.**

Identification of accumulator pistons	A	B	C	D
Identification of oil holes	a	b	c	d

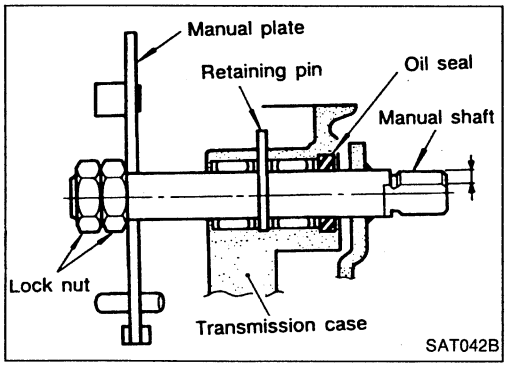


f. Remove O-ring from each piston.

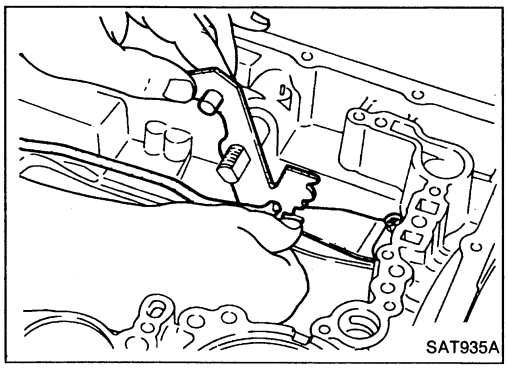


21. Remove manual shaft components, if necessary.
a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.

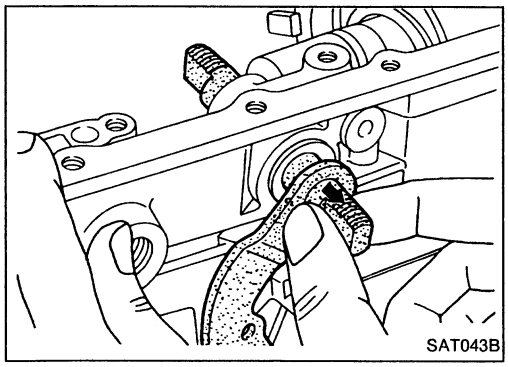
Disassembly (Cont'd)



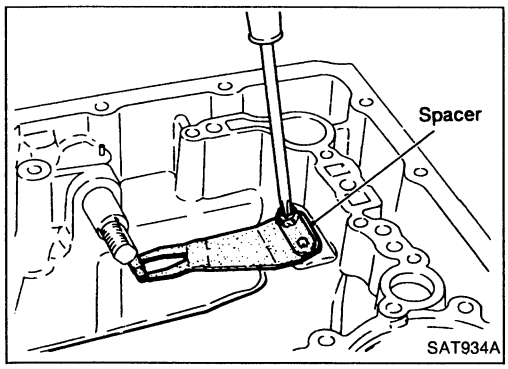
b. Remove retaining pin from transmission case.



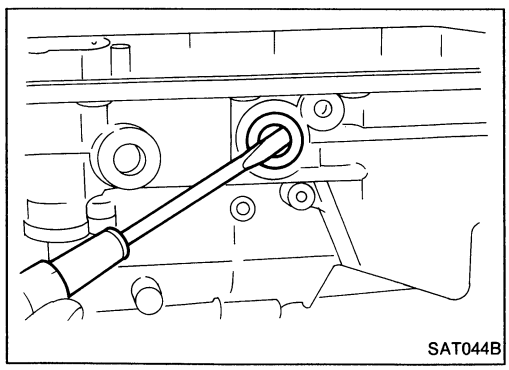
c. While pushing detent spring down, remove manual plate and parking rod from transmission case.



d. Remove manual shaft from transmission case.

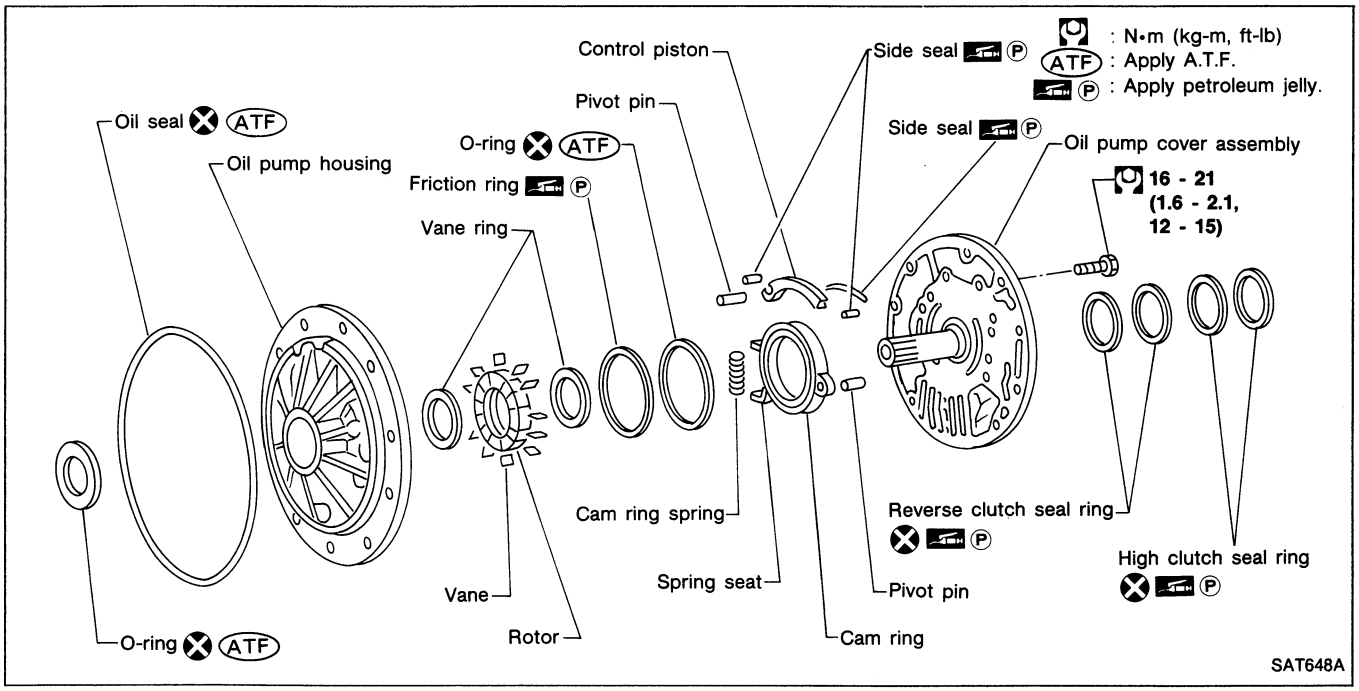


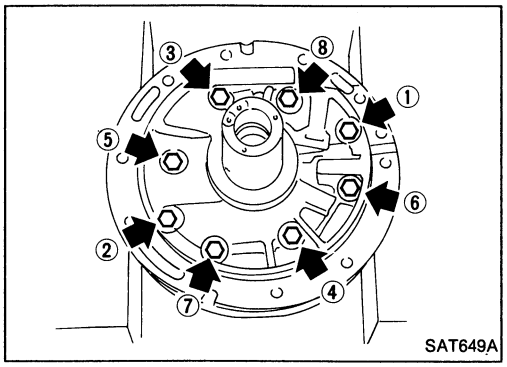
e. Remove spacer and detent spring from transmission case.



f. Remove oil seal from transmission case.

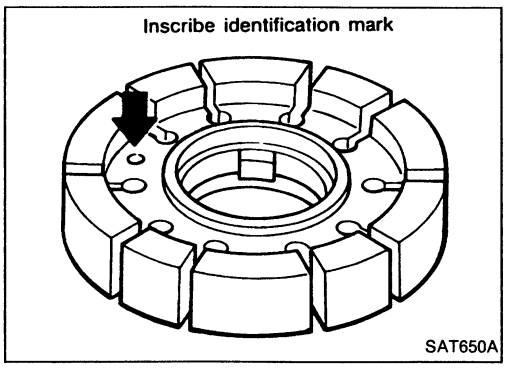
Oil Pump



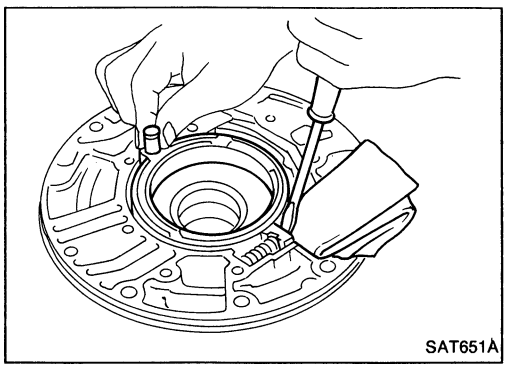


DISASSEMBLY

1. Loosen bolts in numerical order and remove oil pump cover.

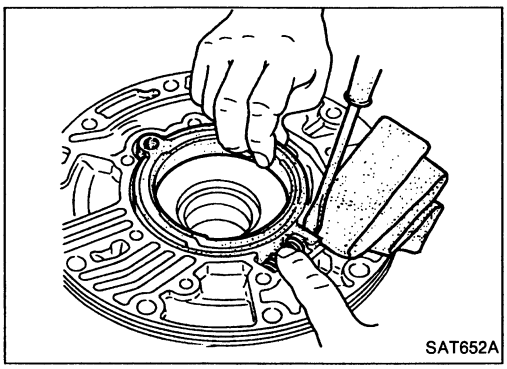


2. Remove rotor, vane rings and vanes.
- **Inscribe a mark on back of rotor for identification of fore-aft direction when reassembling rotor. Then remove rotor.**

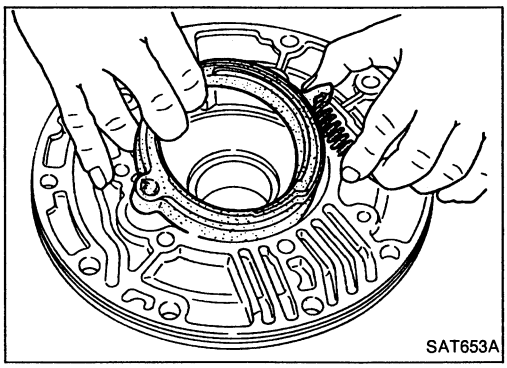


3. While pushing on cam ring remove pivot pin.
- **Be careful not to scratch oil pump housing.**

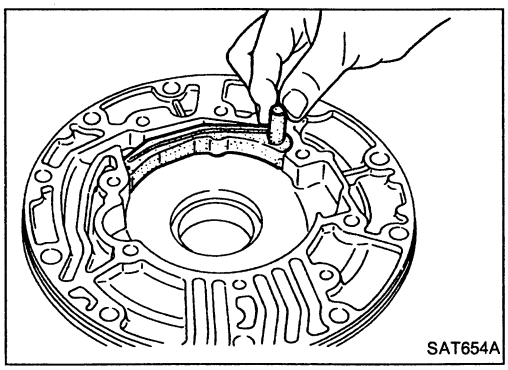
Oil Pump (Cont'd)


SAT652A

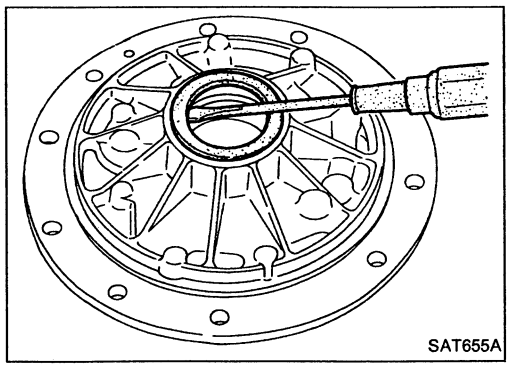
4. While holding cam ring and spring lift out cam ring spring.
- **Be careful not to damage oil pump housing.**
- **Hold cam ring spring to prevent it from jumping.**


SAT653A

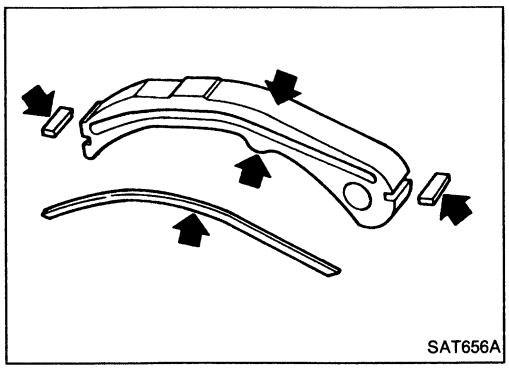
5. Remove cam ring and cam ring spring from oil pump housing.


SAT654A

6. Remove pivot pin from control piston and remove control piston assembly.


SAT655A

7. Remove oil seal from oil pump housing.
- **Be careful not to scratch oil pump housing.**

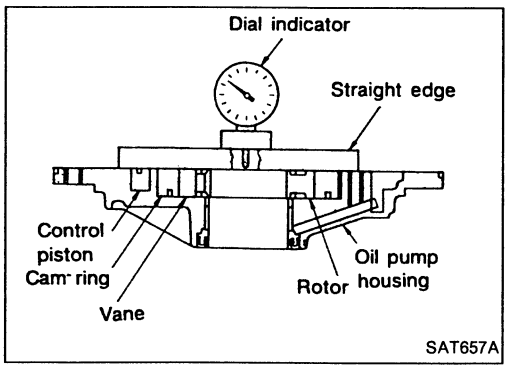

SAT656A

INSPECTION

Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring

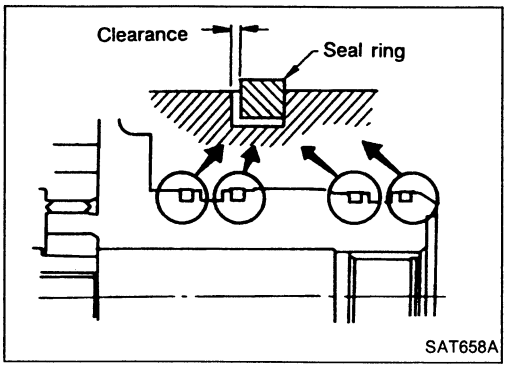
- Check for wear or damage.

Oil Pump (Cont'd)



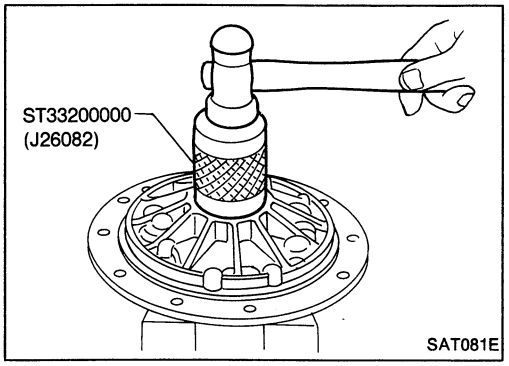
Side clearances

- Measure side clearances between end of oil pump housing and cam ring, rotor, vanes and control piston in at least four places along their circumferences. Maximum measured values should be within specified position.
- **Before measuring side clearance, check that friction rings, O-ring, control piston side seals and cam ring spring are removed.**
  Standard clearance (Cam ring, rotor, vanes and control piston):
  Refer to S.D.S.
- If not within standard clearance, replace oil pump assembly except oil pump cover assembly.



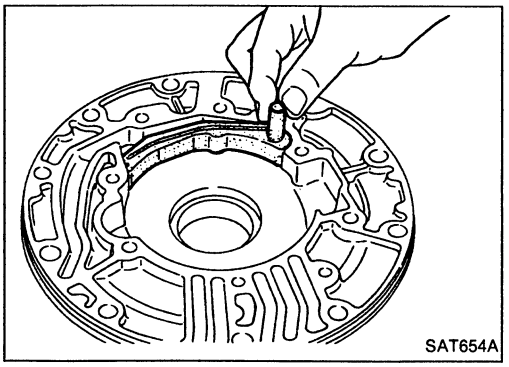
Seal ring clearance

- Measure clearance between seal ring and ring groove.
  Standard clearance:
  0.10 - 0.25 mm (0.0039 - 0.0098 in)
  Wear limit:
  0.25 mm (0.0098 in)
- If not within wear limit, replace oil pump cover assembly.



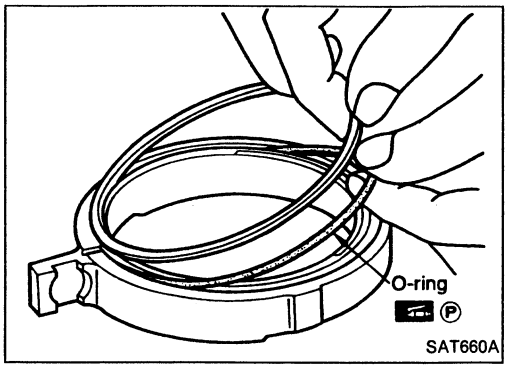
ASSEMBLY

1. Drive oil seal into oil pump housing.
- **Apply A.T.F. to outer periphery and lip surface.**



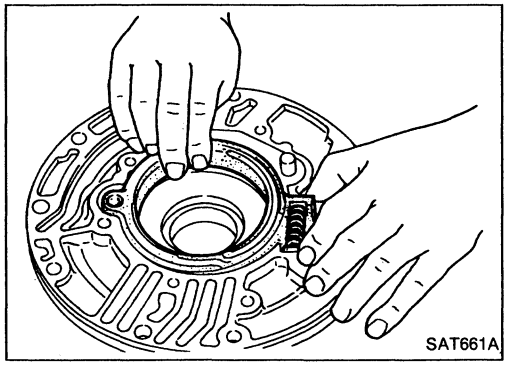
2. Install cam ring in oil pump housing by the following steps.
a. Install side seal on control piston.
- **Pay attention to its direction — Black surface goes toward control piston.**
- **Apply petroleum jelly to side seal.**

b. Install control piston on oil pump.

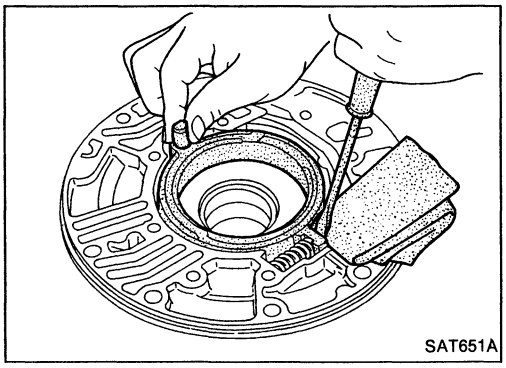


c. Install O-ring and friction ring on cam ring.
- **Apply petroleum jelly to O-ring.**

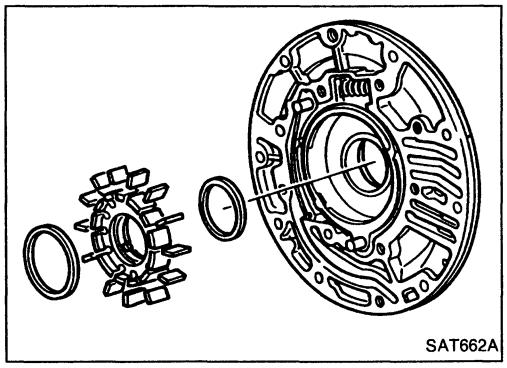
Oil Pump (Cont'd)



d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.

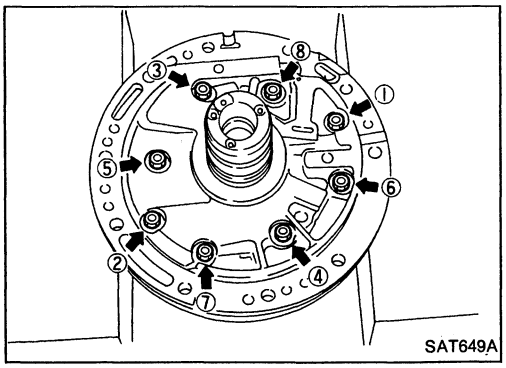


e. While pushing on cam ring install pivot pin.



3. Install rotor, vanes and vane rings.

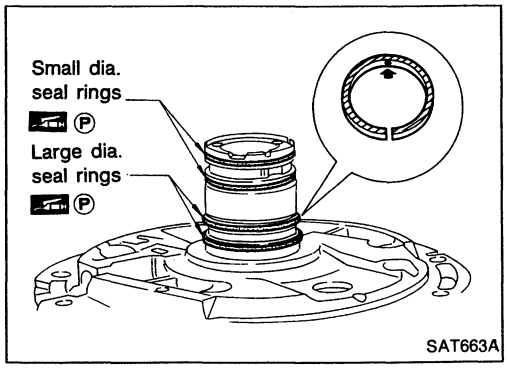
- **Pay attention to direction of rotor.**



4. Install oil pump housing and oil pump cover.

a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.

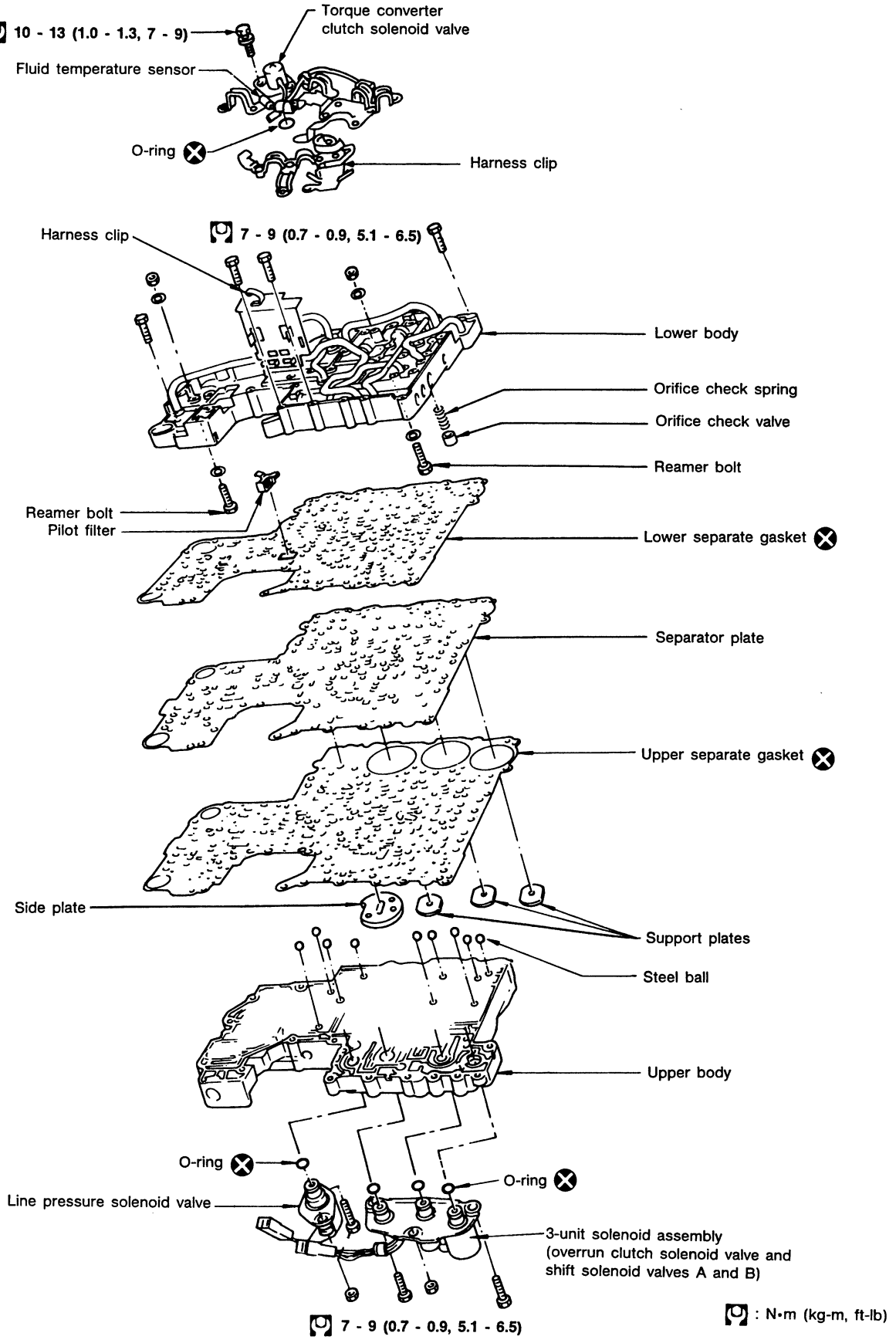
b. Tighten bolts in a criss-cross pattern.



5. Install seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.

- **Seal rings come in two different diameters. Check fit carefully in each groove.**
  Small dia. seal ring:
  No mark
  Large dia. seal ring:
  Yellow mark in area shown by arrow
- **Do not spread gap of seal ring excessively while installing. It may deform ring.**

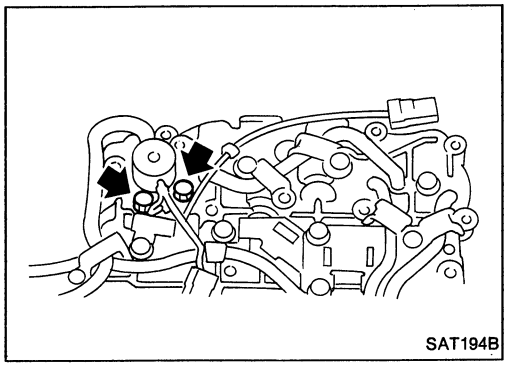
Control Valve Assembly



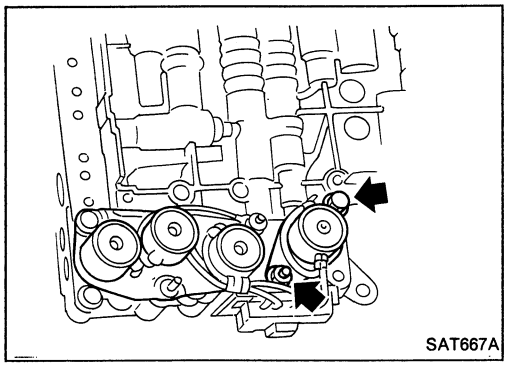
SAT963F

Control Valve Assembly (Cont'd)

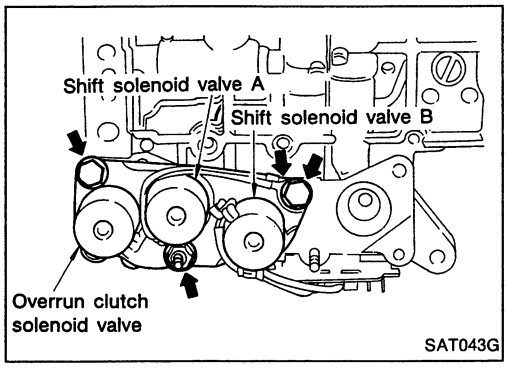
DISASSEMBLY


SAT194B

1. Remove solenoids.
a. Remove torque converter clutch solenoid valve and side plate from lower body.
b. Remove O-ring from solenoid.

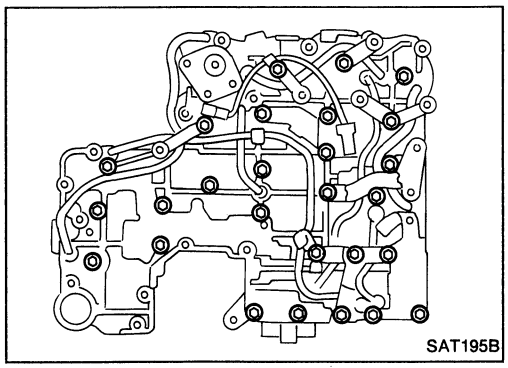

SAT667A

c. Remove line pressure solenoid valve from upper body.
d. Remove O-ring from solenoid.



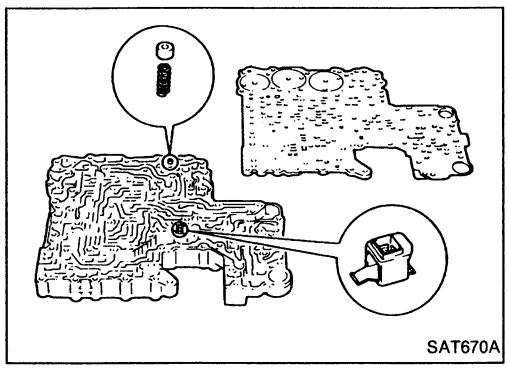
SAT043G

e. Remove 3-unit solenoid assembly from upper body.
f. Remove O-rings from solenoids.


SAT195B

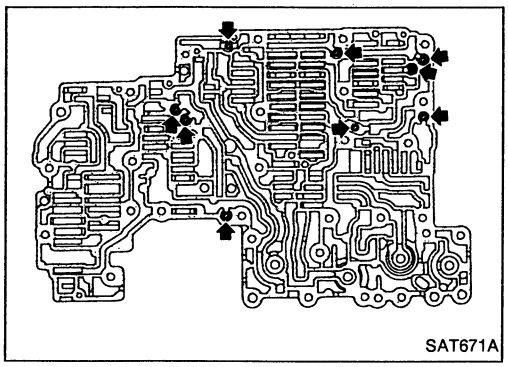
2. Disassemble upper and lower bodies.
a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
b. Remove lower body, separator plate and separate gasket as a unit from upper body.

- **Be careful not to drop pilot filter, orifice check valve, spring and steel balls.**


SAT670A

c. Place lower body facedown, and remove separate gasket and separator plate.
d. Remove pilot filter, orifice check valve and orifice check spring.

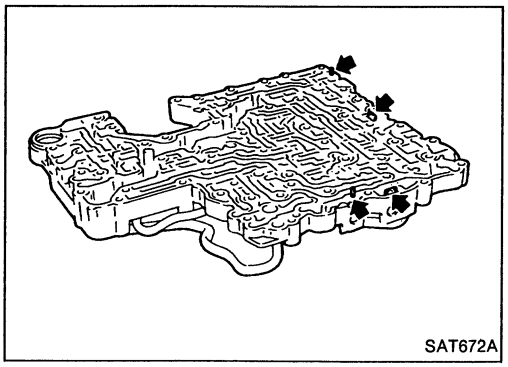
Control Valve Assembly (Cont'd)


SAT671A

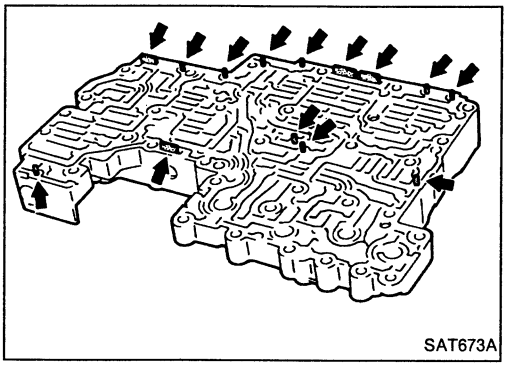
e. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.

INSPECTION

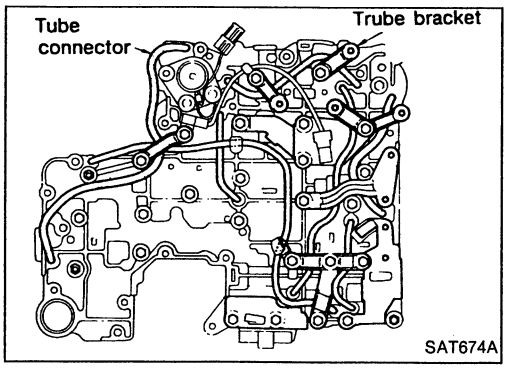
Lower and upper bodies


SAT672A

- Check to see that there are pins and retainer plates in lower body.

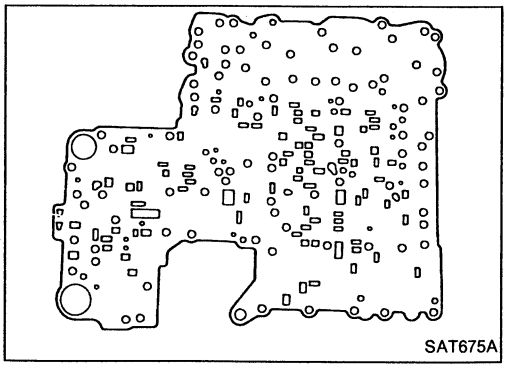

SAT673A

- Check to see that there are pins and retainer plates in upper body.
- **Be careful not to lose these parts.**



SAT674A

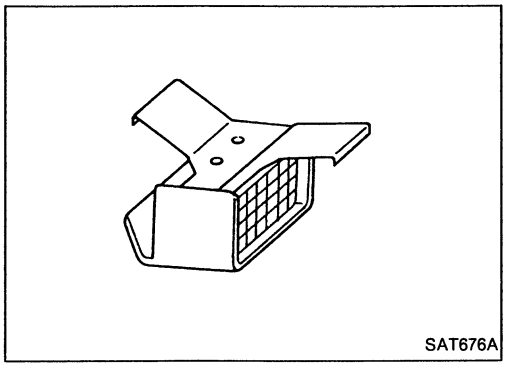
- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.


SAT675A

Separator plates

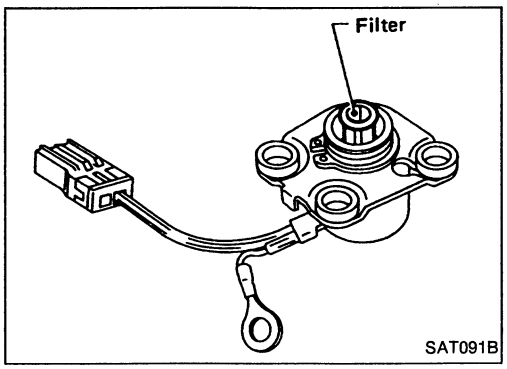
- Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.

Control Valve Assembly (Cont'd)


SAT676A

Pilot filter

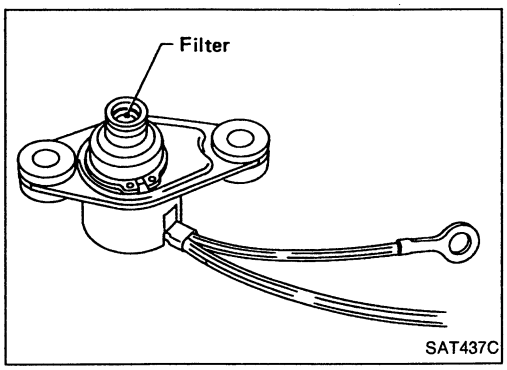
- Check to make sure that filter is not clogged or damaged.



SAT091B

Torque converter clutch solenoid valve

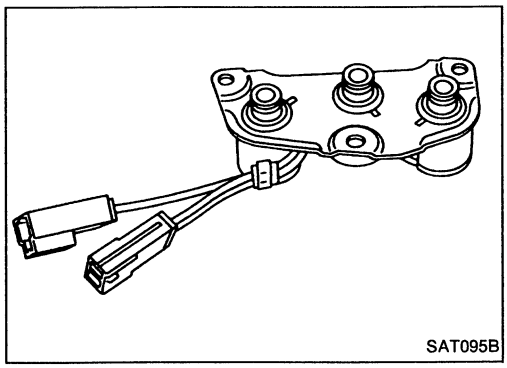
- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



SAT437C

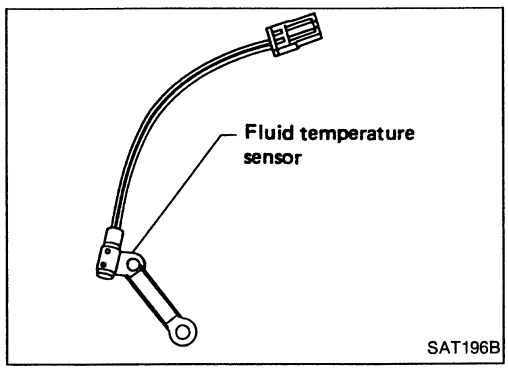
Line pressure solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".


SAT095B

3-unit solenoid assembly (Overrun clutch solenoid valve and shift solenoid valves A and B)

- Measure resistance of each solenoid. — Refer to "Electrical Components Inspection".



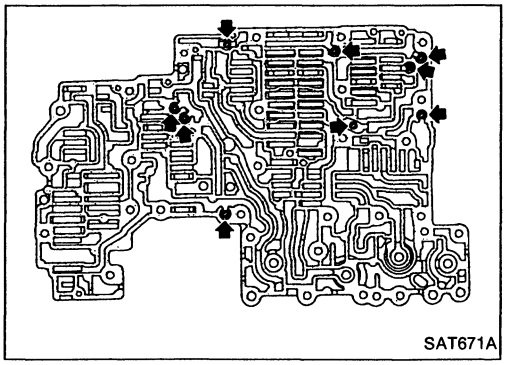
SAT196B

Fluid temperature sensor

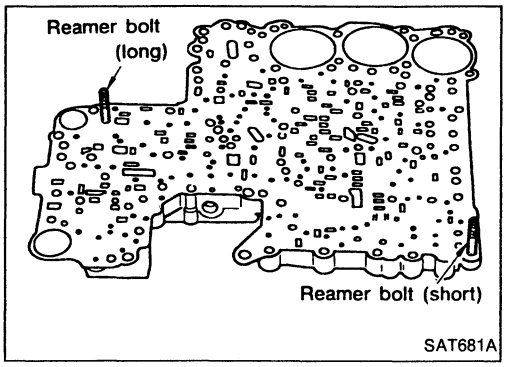
- Measure resistance. — Refer to "Electrical Components Inspection".

Control Valve Assembly (Cont'd)

ASSEMBLY

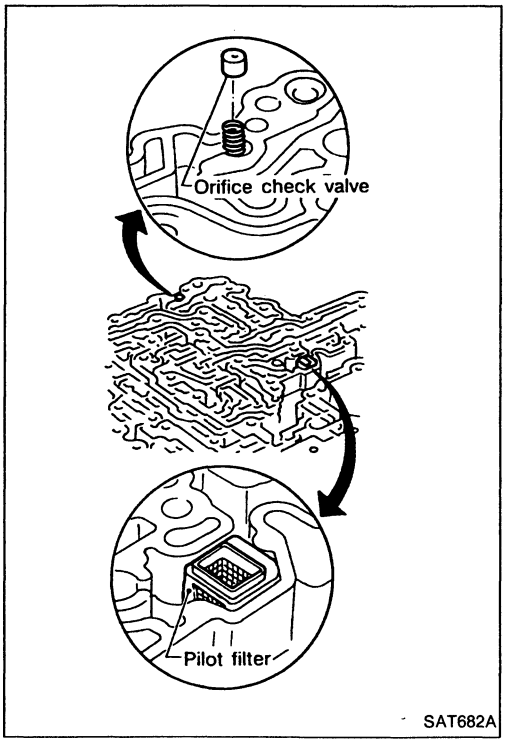

SAT671A

1. Install upper and lower bodies.
a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



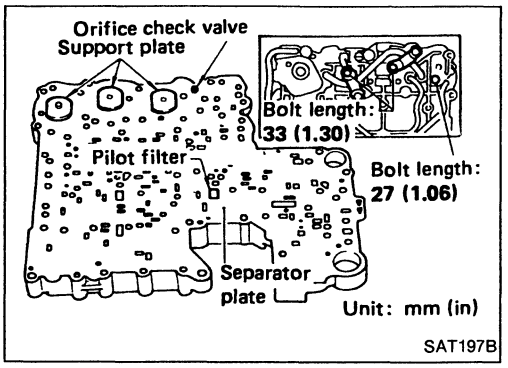
SAT681A

b. Install reamer bolts from bottom of upper body and install separate gaskets.



SAT682A

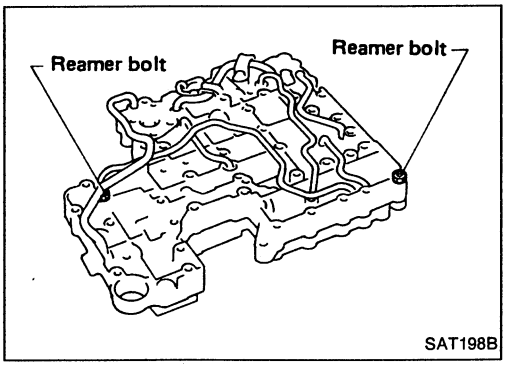
c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.



SAT197B

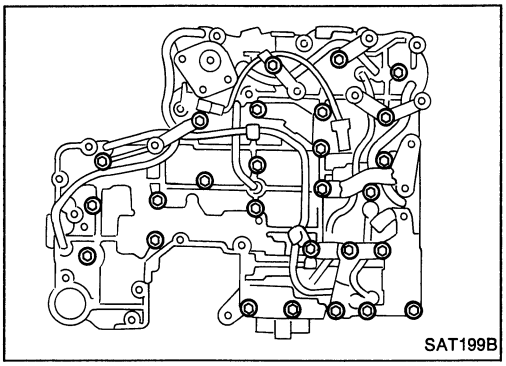
d. Install lower separate gaskets and separator plates on lower body.
e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.

Control Valve Assembly (Cont'd)



f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

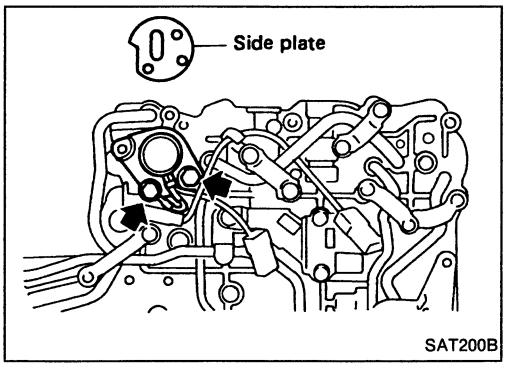
- **Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.**



g. Install and temporarily tighten bolts and tube brackets in their proper locations.

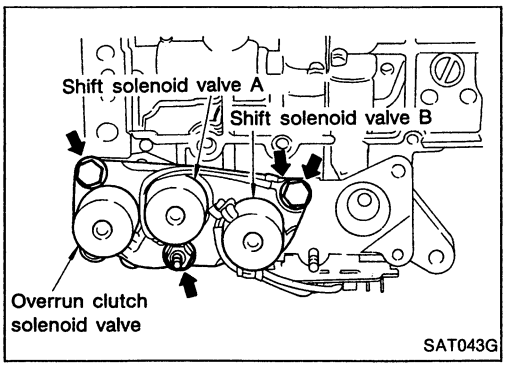
Bolt length and location:

Bolt symbol		a	b	c	d
Bolt length	mm (in)	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)

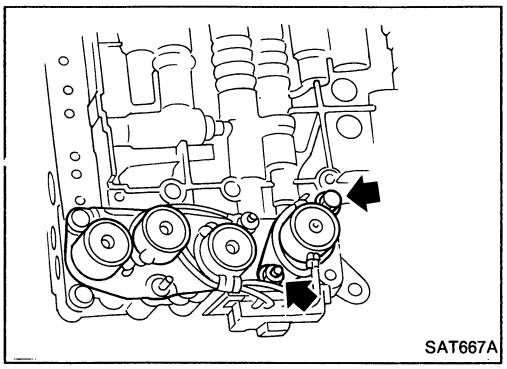


2. Install solenoids.

a. Attach O-ring and install torque converter clutch solenoid valve and side plates onto lower body.



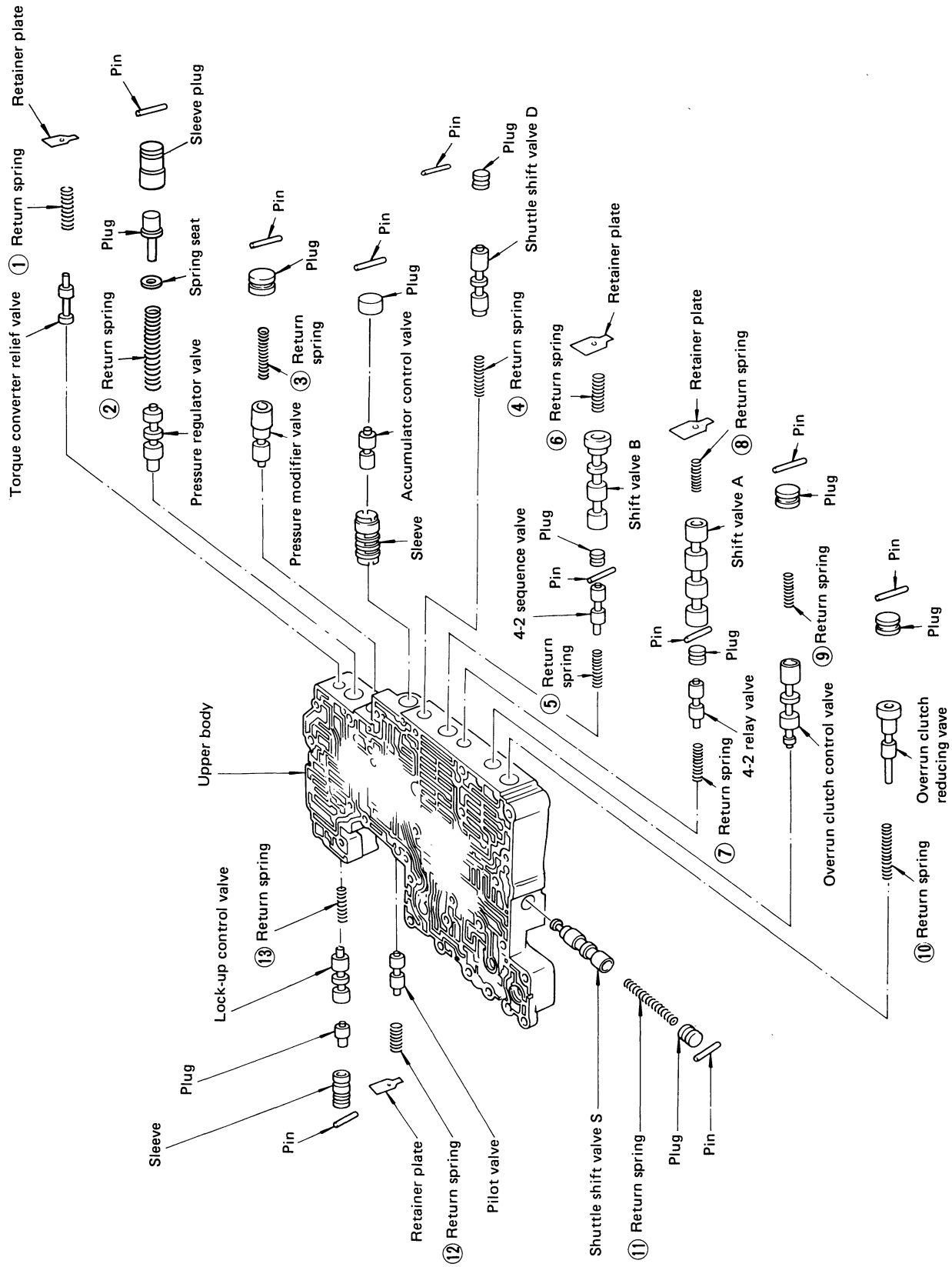
b. Attach O-rings and install 3-unit solenoids assembly onto upper body.



c. Attach O-ring and install line pressure solenoid valve onto upper body.

3. Tighten all bolts.

Control Valve Upper Body



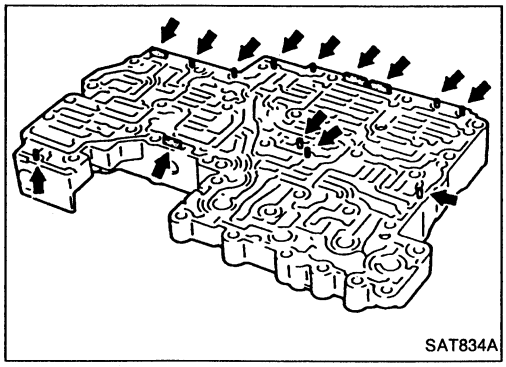
Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-127.

Apply A.T.F. to all components before their installation.

SAT639C

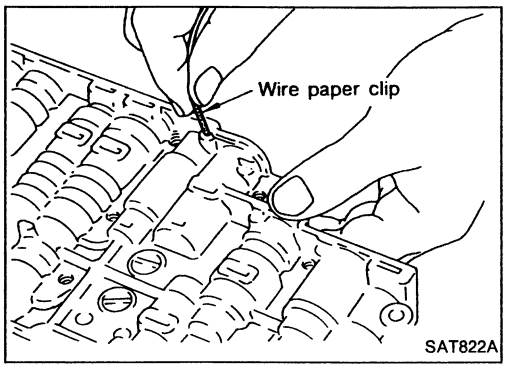
Control Valve Upper Body (Cont'd)

DISASSEMBLY


SAT834A

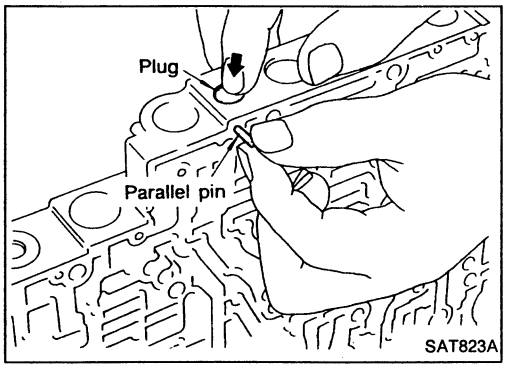
1. Remove valves at parallel pins.

- **Do not use a magnetic hand.**



SAT822A

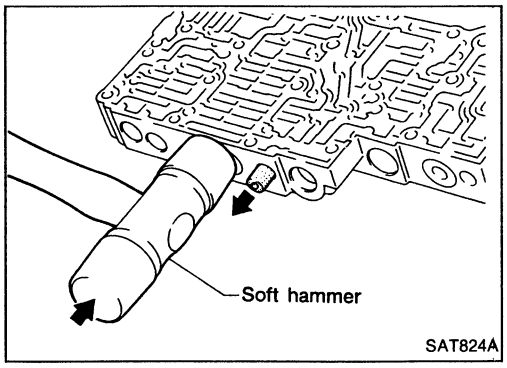
a. Use a wire paper clip to push out parallel pins.



SAT823A

b. Remove parallel pins while pressing their corresponding plugs and sleeves.

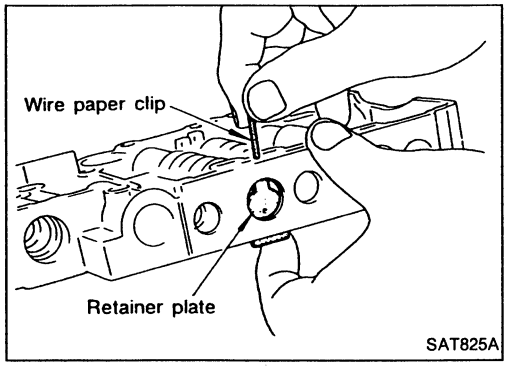
- **Remove plug slowly to prevent internal parts from jumping out.**



SAT824A

c. Place mating surface of valve facedown, and remove internal parts.

- **If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**

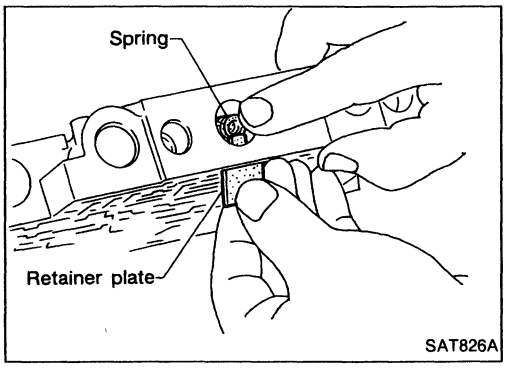


SAT825A

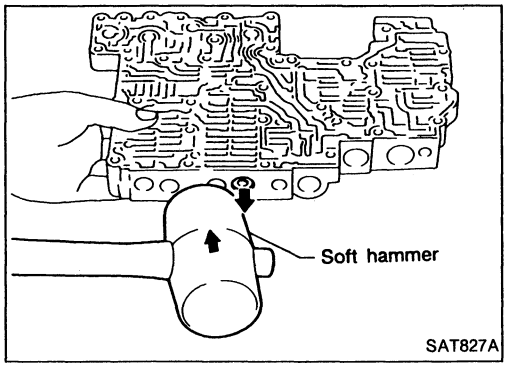
2. Remove valves at retainer plates.

a. Pry out retainer plate with wire paper clip.

Control Valve Upper Body (Cont'd)

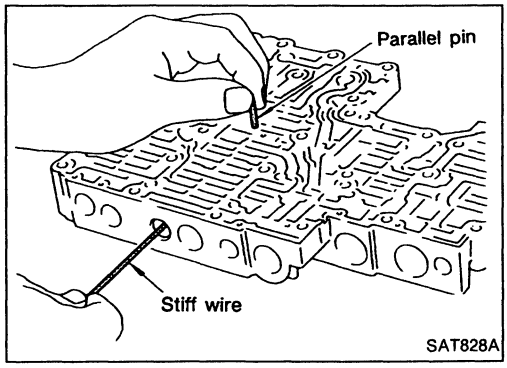


b. Remove retainer plates while holding spring.

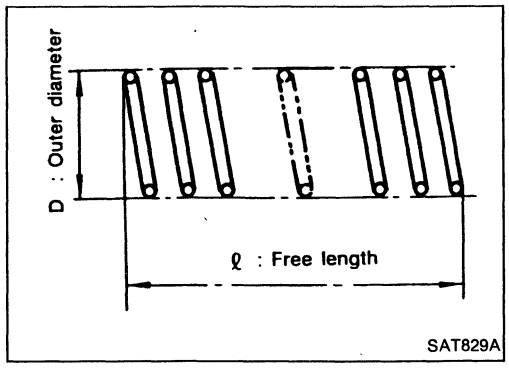


c. Place mating surface of valve facedown, and remove internal parts.

- **If a valve is hard to remove, lightly tap valve body with a soft hammer.**
- **Be careful not to drop or damage valves, sleeves, etc.**



- 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.
- **Be careful not to scratch sliding surface of valve with wire.**



INSPECTION

Valve springs

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-132.

Control Valve Upper Body (Cont'd)

Inspection standard

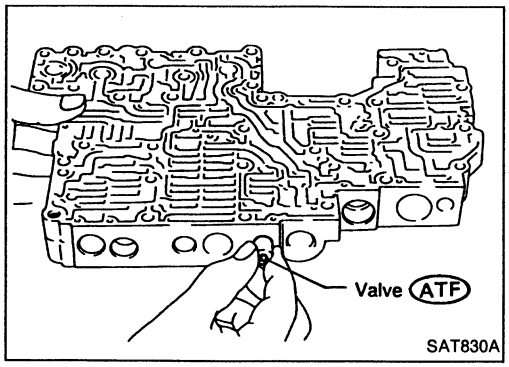
Unit: mm (in)

	Parts	Part No.	ℓ	D
①	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)
②	Pressure regulator valve spring	31742-41X24	44.02 (1.7331)	14.0 (0.551)
③	Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
④	Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
⑤	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑥	Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑦	4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑧	Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑨	Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
⑩	Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)
⑪	Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
⑫	Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
⑬	Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)

- Replace valve springs if deformed or fatigued.

Control valves

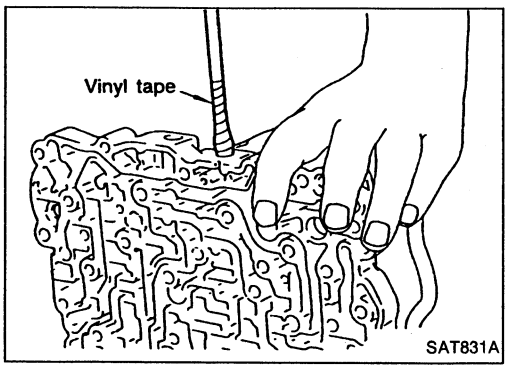
- Check sliding surfaces of valves, sleeves and plugs.



ASSEMBLY

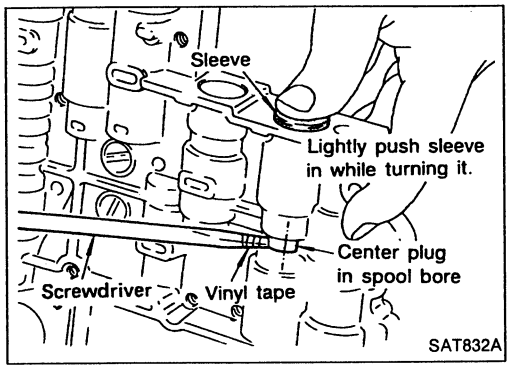
1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

- **Be careful not to scratch or damage valve body.**



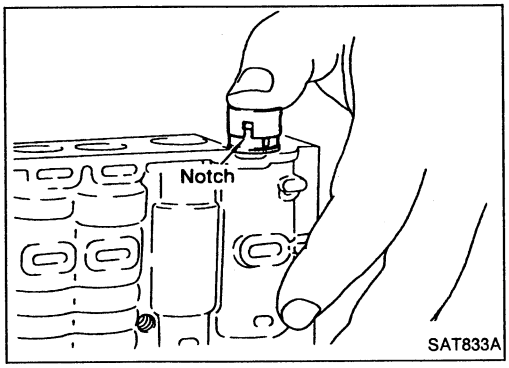
- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.

Control Valve Upper Body (Cont'd)



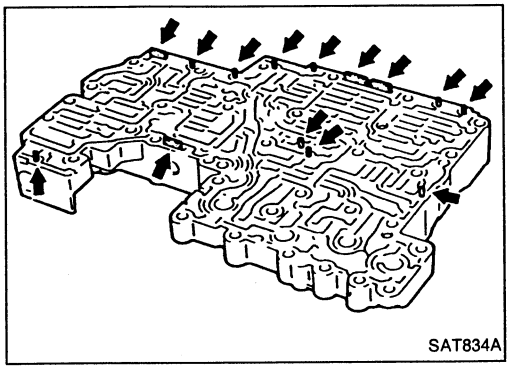
Pressure regulator valve

- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body.
  If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.

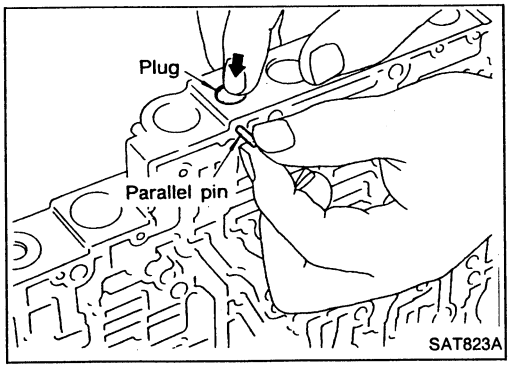


Accumulator control plug

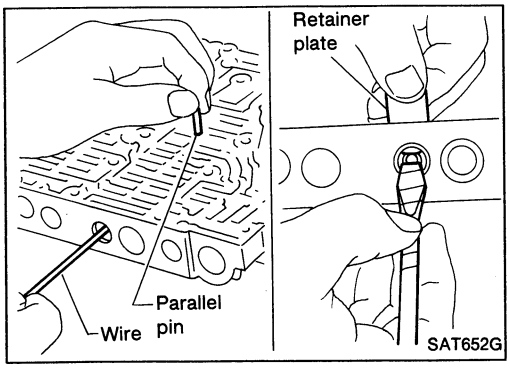
- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



2. Install parallel pins and retainer plates.



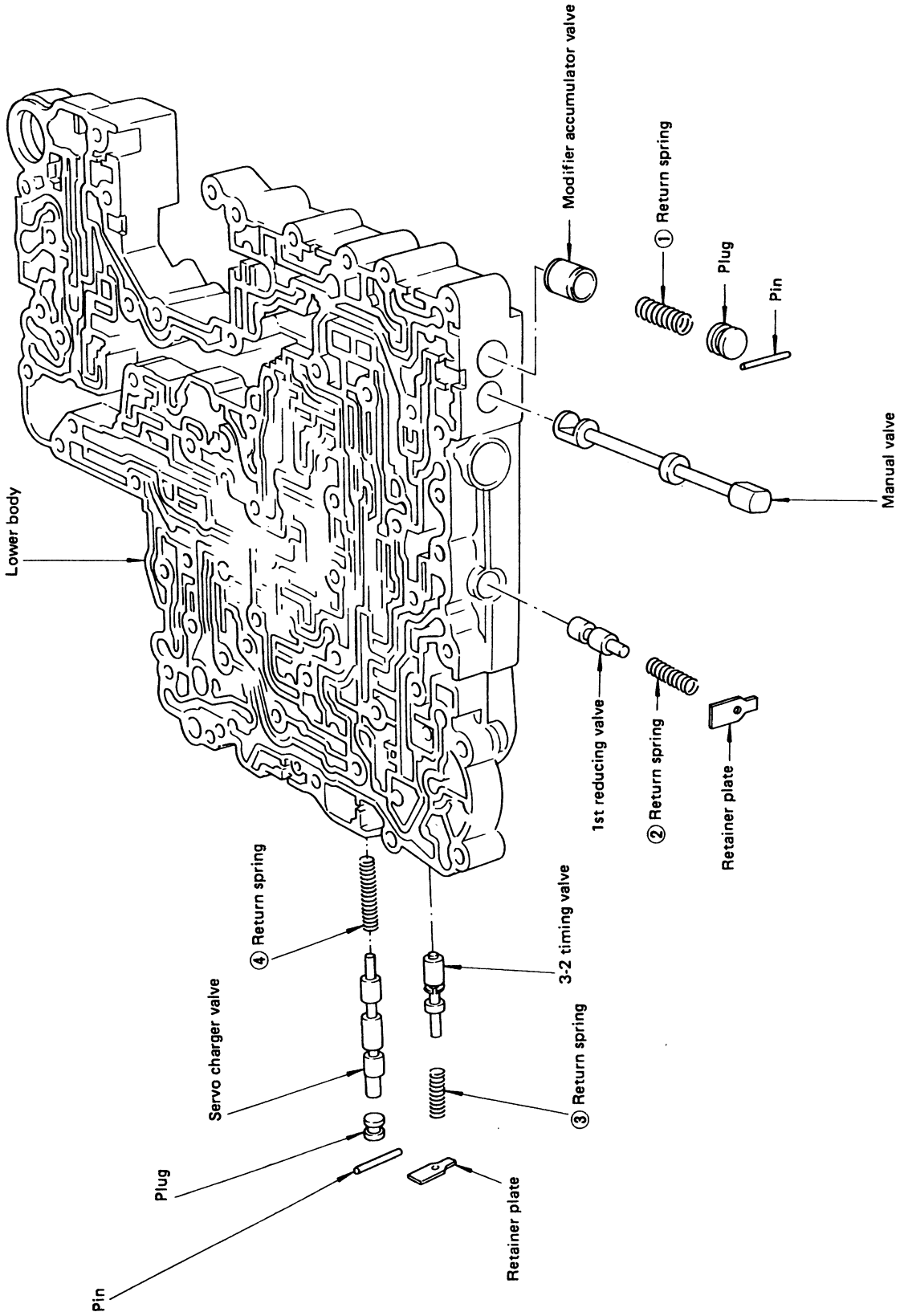
- **While pushing plug, install parallel pin.**



4-2 sequence valve and relay valve

- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.
- Insert retainer plate while pushing spring.

Control Valve Lower Body

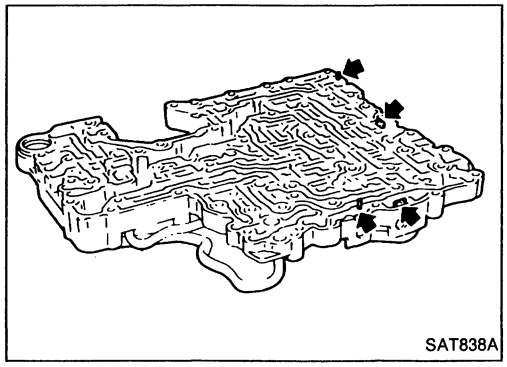


Numbers preceding valve springs correspond with those shown in Spring Chart on the next page.

Apply A.T.F. to all components before their installation.

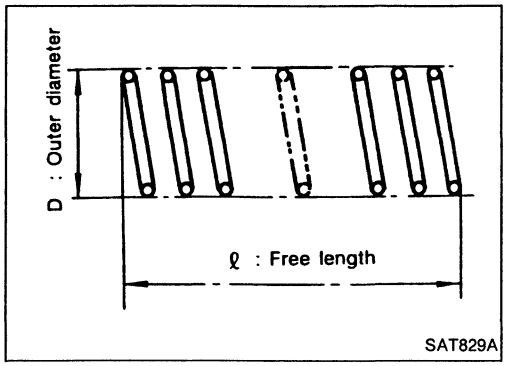
SAT640C

Control Valve Lower Body (Cont'd)


SAT838A

DISASSEMBLY

1. Remove valves at parallel pins.
2. Remove valves at retainer plates.
   For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



SAT829A

INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-138.

Inspection standard:

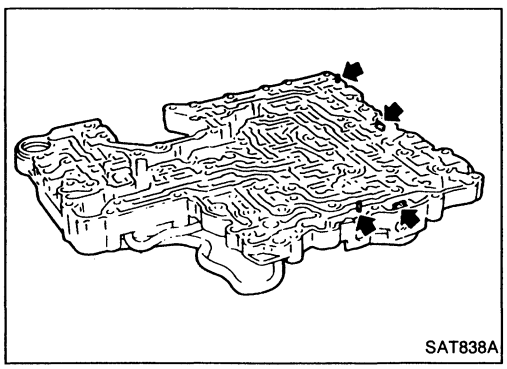
Unit: mm (in)

	Parts	Part No.	ℓ	D
①	Modifier accumulator piston spring	31742-27X70	31.4 (1.236)	9.8 (0.386)
②	1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
③	3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
④	Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)

- Replace valve springs if deformed or fatigued.

Control valves

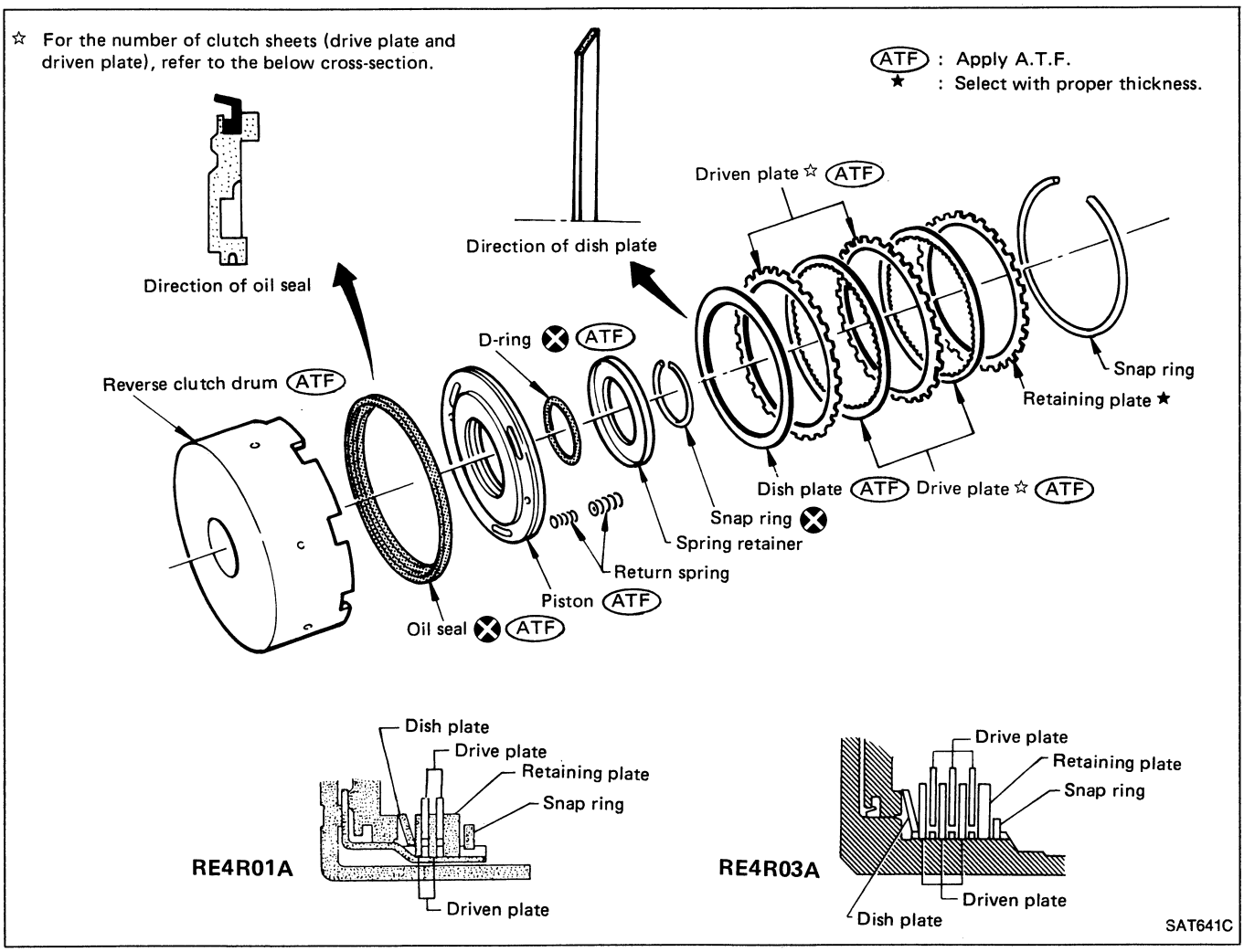
- Check sliding surfaces of control valves, sleeves and plugs for damage.

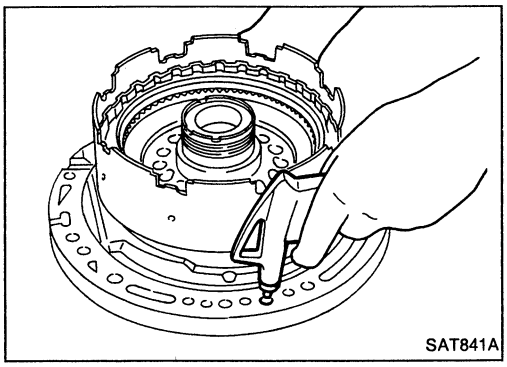

SAT838A

ASSEMBLY

- Install control valves.
  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.

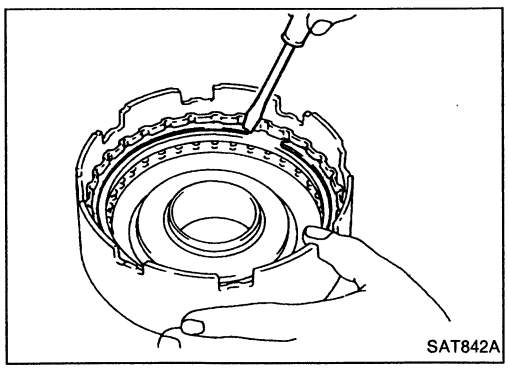
Reverse Clutch





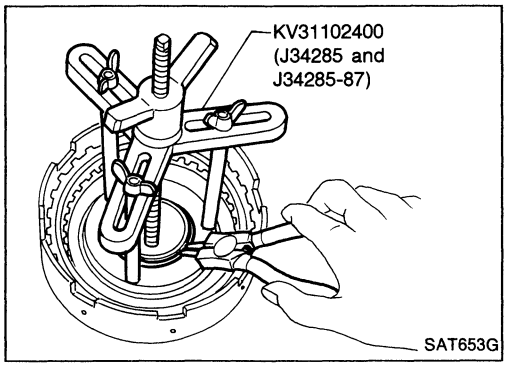
DISASSEMBLY

1. Check operation of reverse clutch.
   a. Install seal ring onto oil pump cover and install reverse clutch. 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.

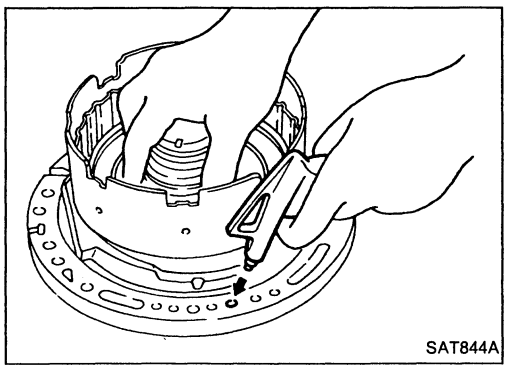


2. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.

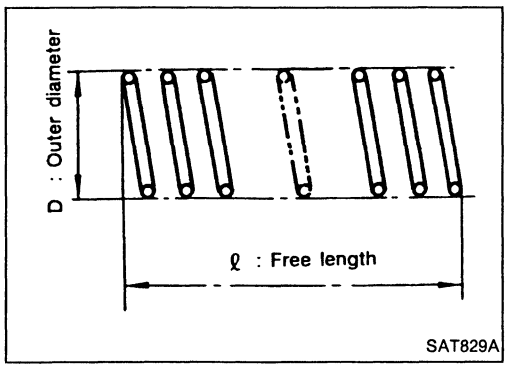
Reverse Clutch (Cont'd)



3. Remove snap ring from clutch drum while compressing clutch springs.
- **Do not expand snap ring excessively.**
4. Remove spring retainer and return spring.



5. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
- **Do not apply compressed air abruptly.**
6. Remove D-ring and oil seal from piston.



INSPECTION

Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.

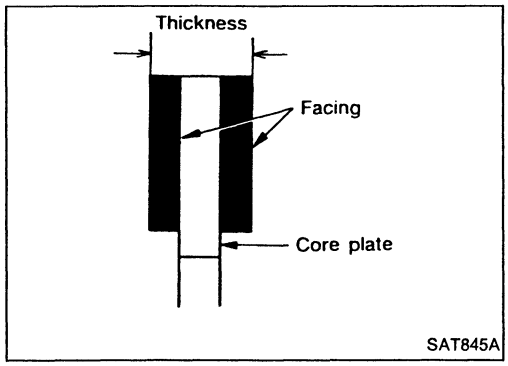
Reverse clutch return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

Model	Part No.	ℓ	D
RE4R01A	31505-41X02	19.69 (0.7752)	11.6 (0.457)
RE4R03A	31505-51X00	37.8 (1.488)	14.8 (0.583)

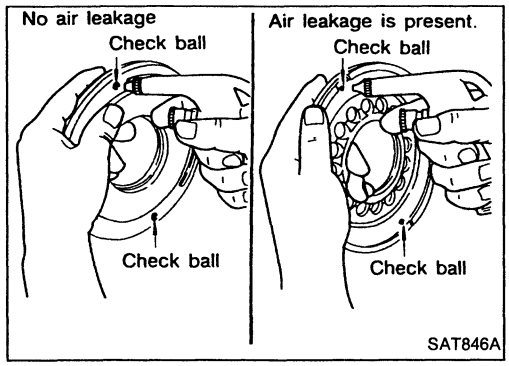


Reverse clutch drive plates

- 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.

Reverse clutch dish plate

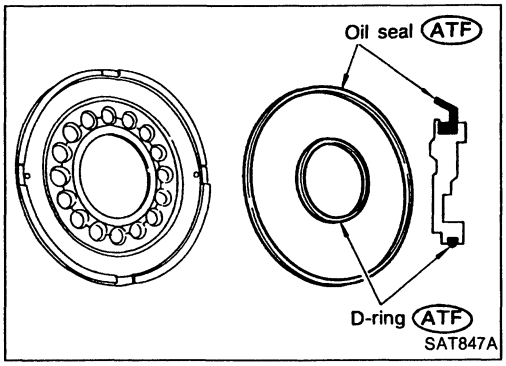
- Check for deformation or damage.



Reverse clutch piston

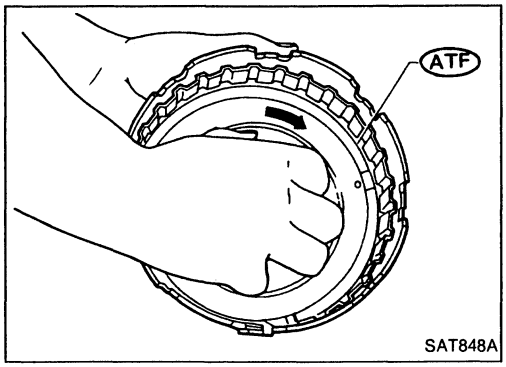
- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring to assure that there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

Reverse Clutch (Cont'd)

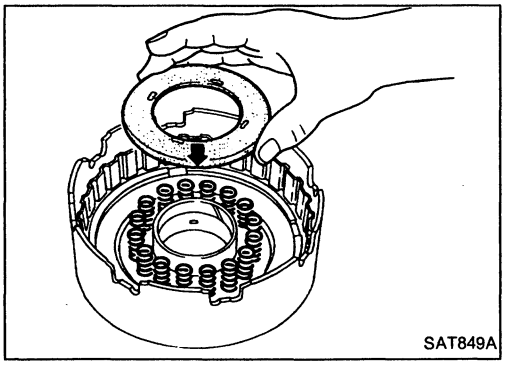


ASSEMBLY

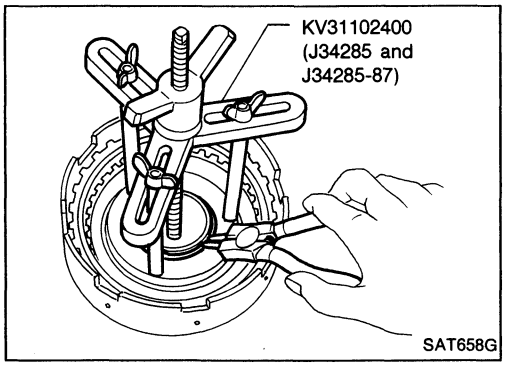
1. Install D-ring and oil seal on piston.
- **Apply A.T.F. to both parts.**



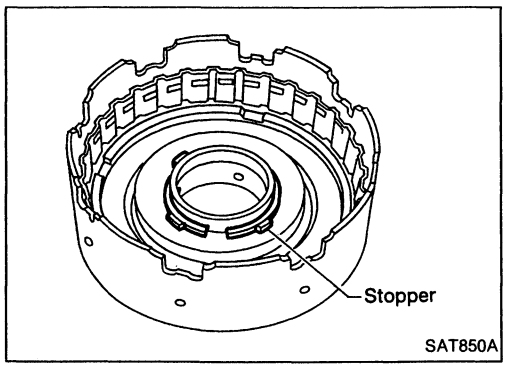
2. Install piston assembly by turning it slowly and evenly.
- **Apply A.T.F. to inner surface of drum.**



3. Install return springs and spring retainer.

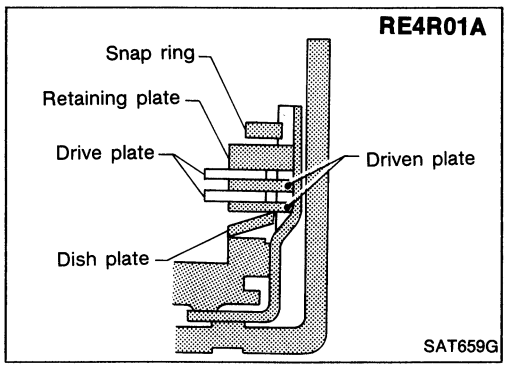


4. Install snap ring while compressing clutch springs.

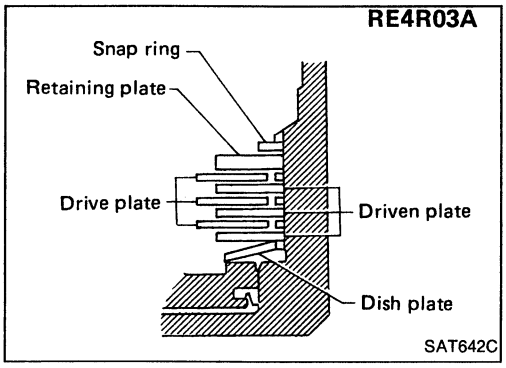


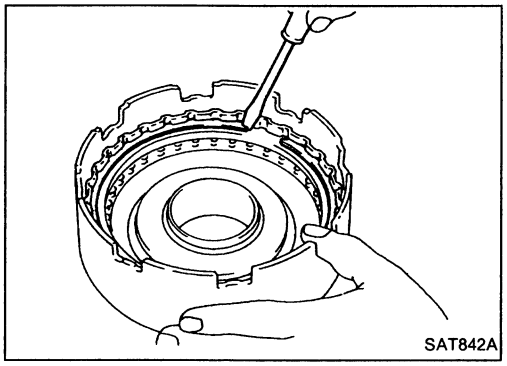
- **Do not align snap ring gap with spring retainer stopper.**

Reverse Clutch (Cont'd)

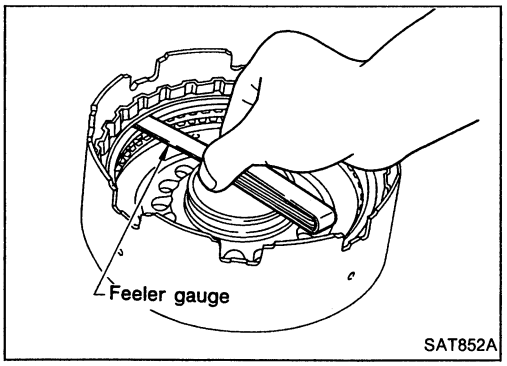


5. Install drive plates, driven plates, retaining plate and dish plate.

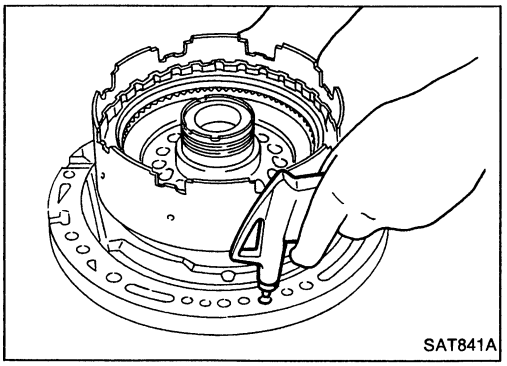




6. Install snap ring.



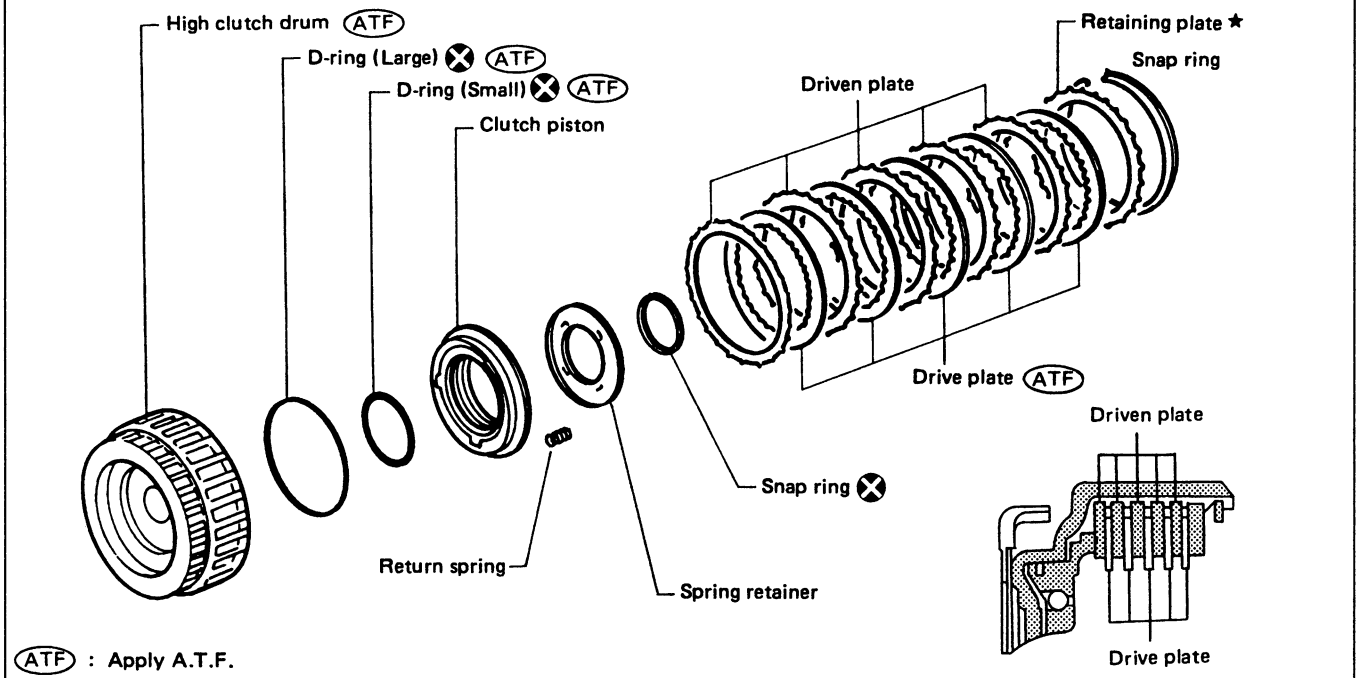
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard
   0.5 - 0.8 mm (0.020 - 0.031 in)
   Allowable limit
   1.2 mm (0.047 in) (RE4R01A)
   1.4 mm (0.055 in) (RE4R03A)
   Retaining plate:
   Refer to S.D.S.



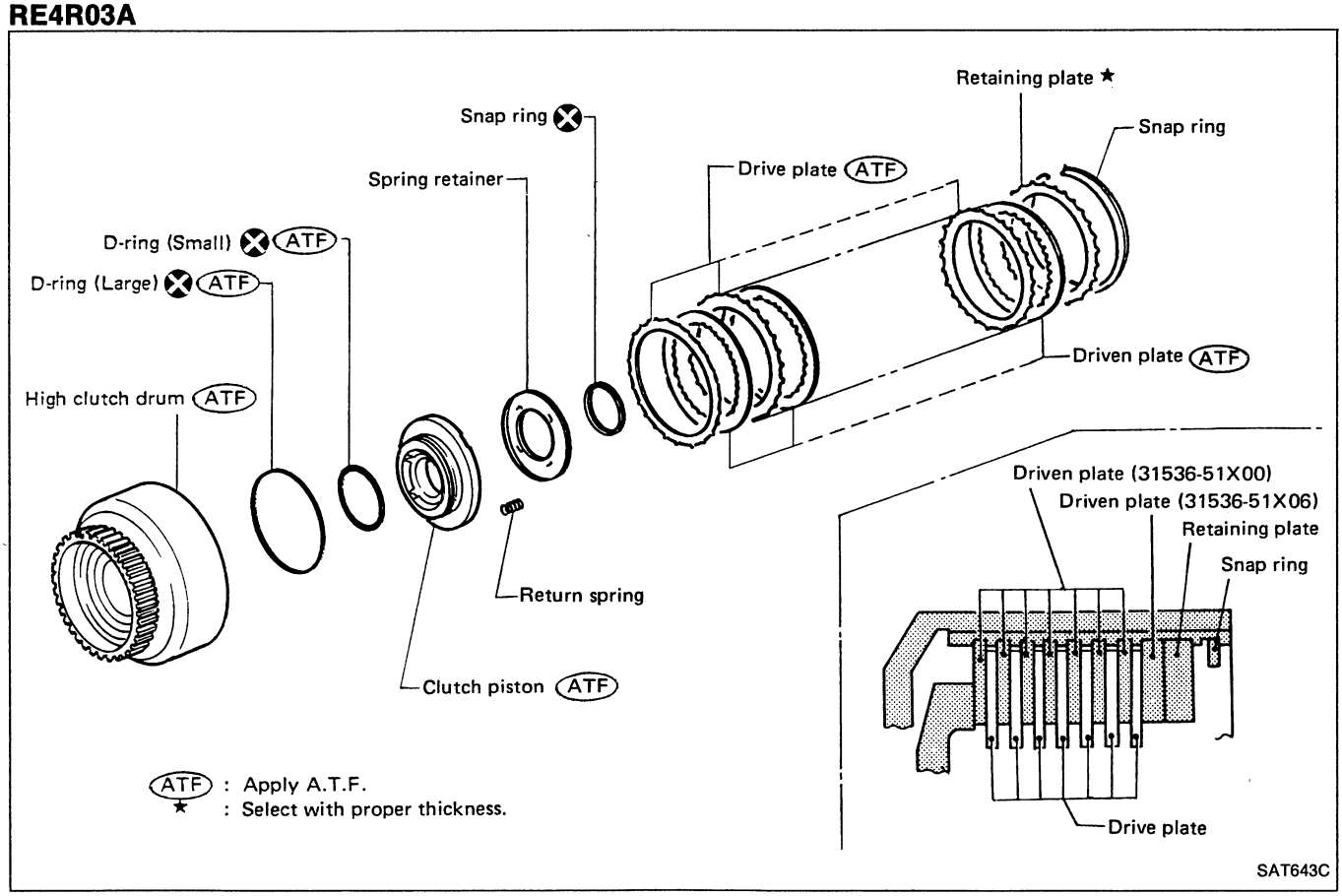
8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch.

High Clutch

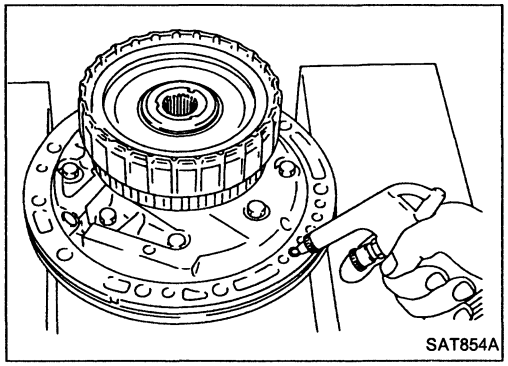
RE4R01A



RE4R03A

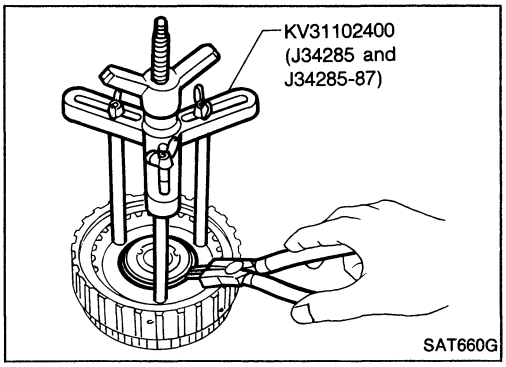


High Clutch (Cont'd)


SAT854A

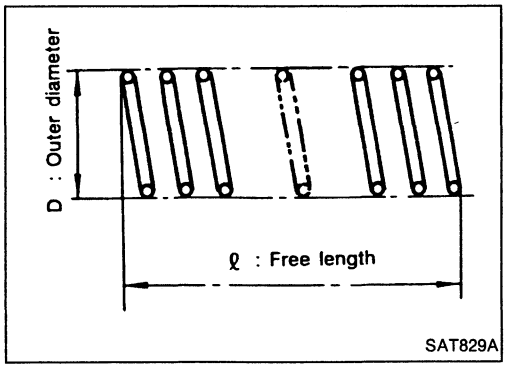
Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

- Check of high clutch operation



SAT660G

- Removal and installation of return spring



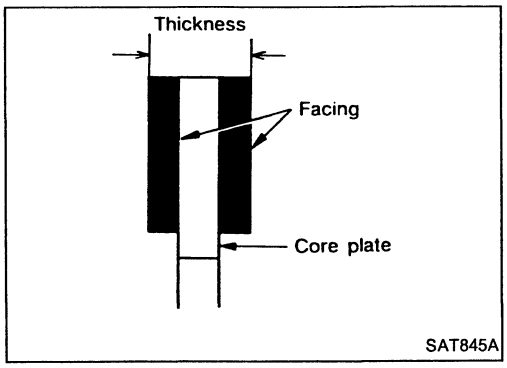
SAT829A

- Inspection of high clutch return springs

Inspection standard:

Unit: mm (in)

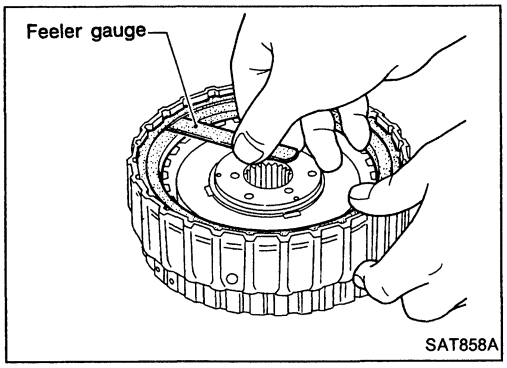
Part No.	ℓ	D
31505-21X03	22.06 (0.8685)	11.6 (0.457)



SAT845A

- Inspection of high clutch drive plate

Thickness of drive plate:
Standard
1.6 mm (0.063 in)
Wear limit
1.4 mm (0.055 in)



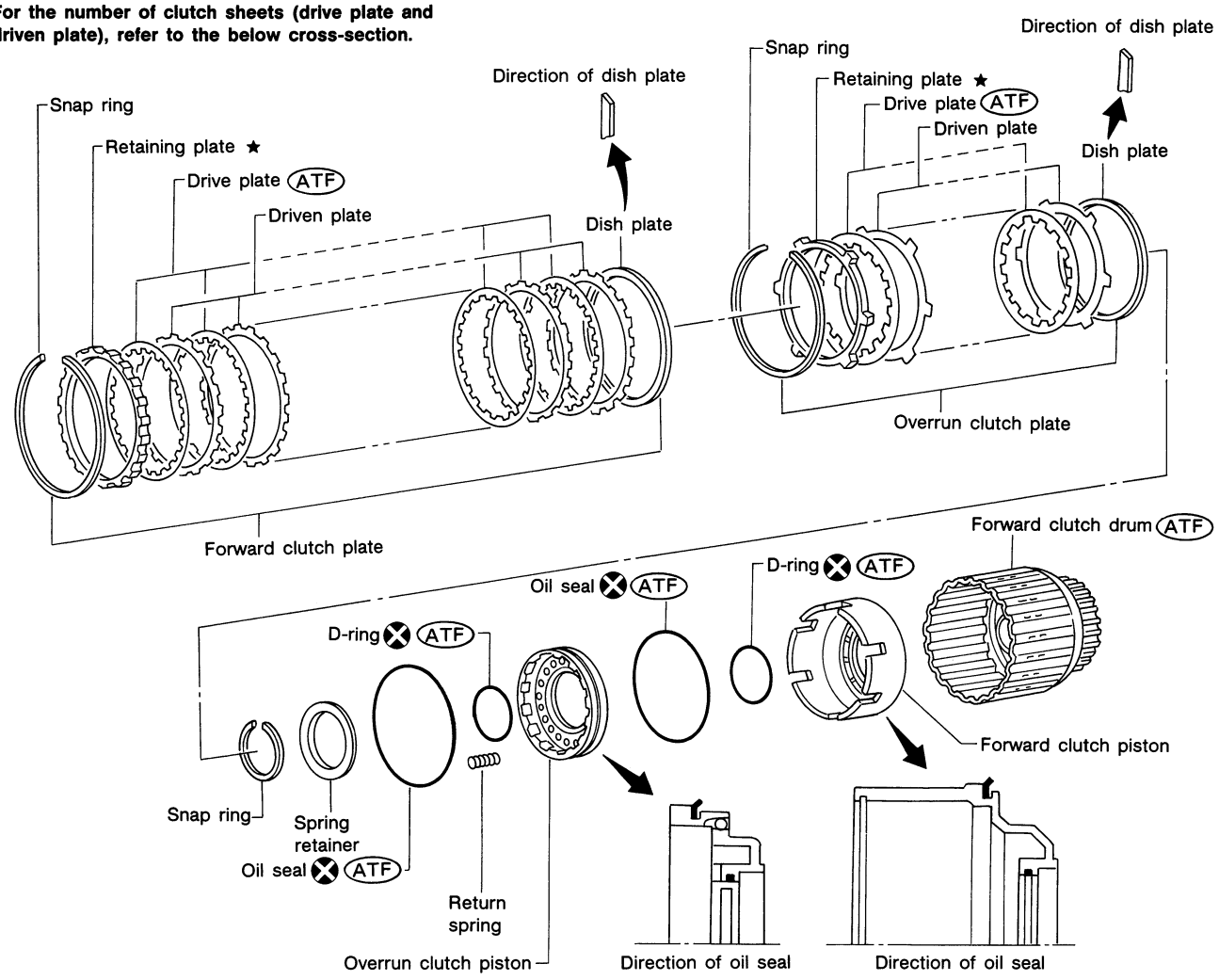
SAT858A

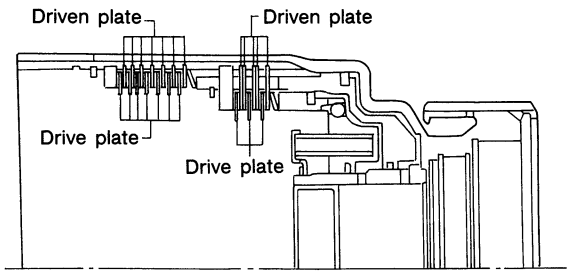
- Measurement of clearance between retaining plate and snap ring

Specified clearance:
Standard
1.8 - 2.2 mm (0.071 - 0.087 in)
Allowable limit
3.2 mm (0.126 in) (RE4R01A)
3.0 mm (0.118 in) (RE4R03A)
Retaining plate:
Refer to S.D.S.

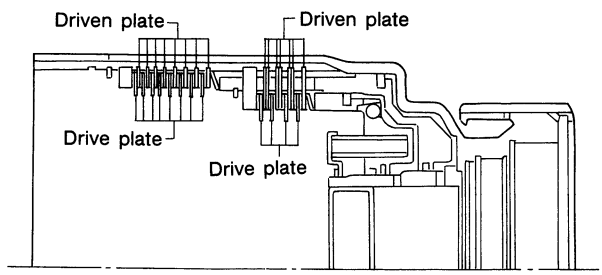
Forward and Overrun Clutches

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.





RE4R01A

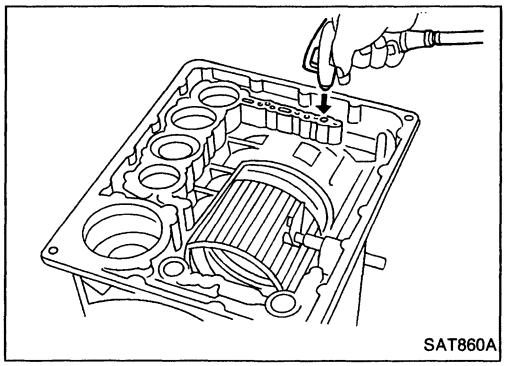


RE4R03A

(ATF): Apply A.T.F.
★ : Select with proper thickness.

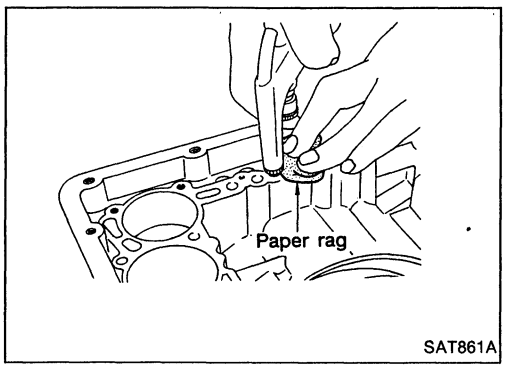
SAT644C

Forward and Overrun Clutches (Cont'd)


SAT860A

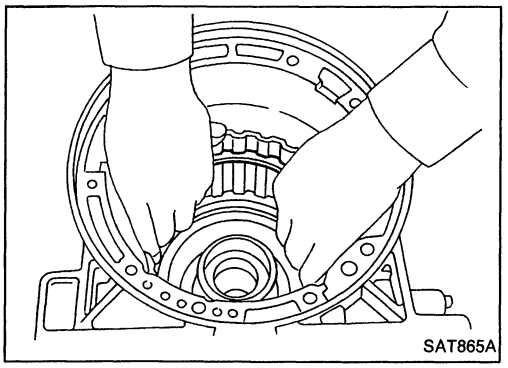
Service procedures for forward and overrun clutches are essentially the same as those for reverse clutch, with the following exception:

- Check of forward clutch operation.



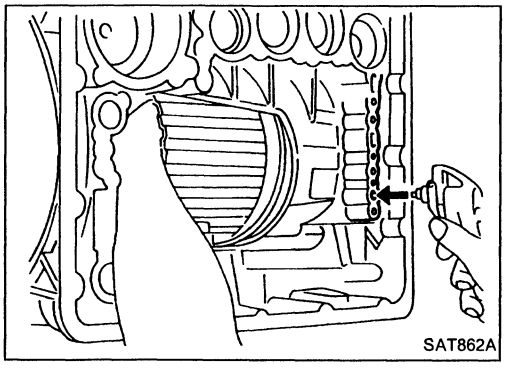
SAT861A

- Check of overrun clutch operation.


SAT865A

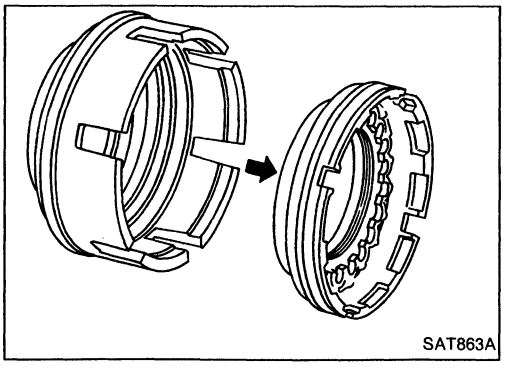
- Removal of forward clutch drum

  Remove forward clutch drum from transmission case by holding snap ring.


SAT862A

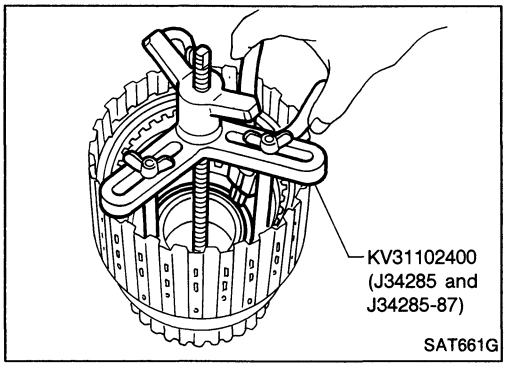
- Removal of forward clutch and overrun clutch pistons

1. While holding overrun clutch piston, gradually apply compressed air to oil hole.

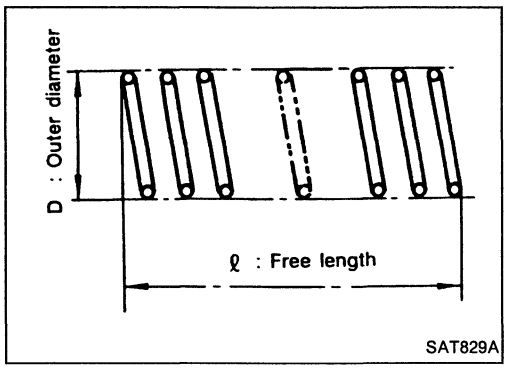

SAT863A

2. Remove overrun clutch from forward clutch.

Forward and Overrun Clutches (Cont'd)



- Removal and installation of return springs

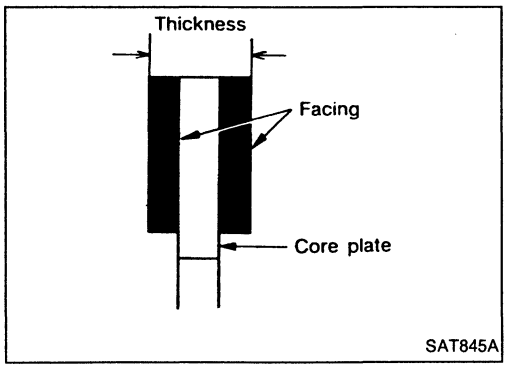


- Inspection of forward clutch and overrun clutch return springs

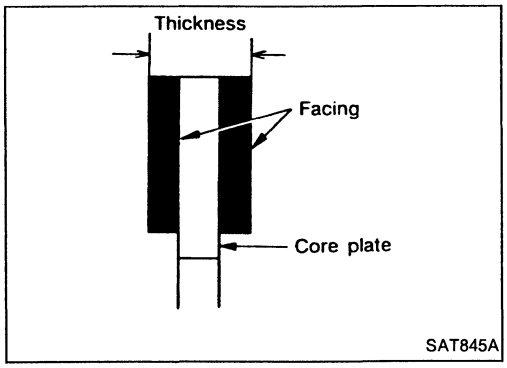
Inspection standard:

Unit: mm (in)

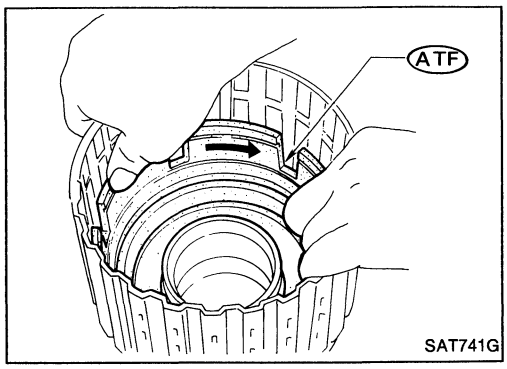
Model	Part No.	ℓ	D
RE4R01A	31505-41X01	35.77 (1.4083)	9.7 (0.382)
RE4R03A	31505-51X04	36.8 (1.449)	9.8 (0.386)



- Inspection of forward clutch drive plates
  - **Thickness of drive plate:**
    - **Standard**
      - **1.6 mm (0.063 in) (RE4R01A)**
      - **2.0 mm (0.079 in) (RE4R03A)**
    - **Wear limit**
      - **1.4 mm (0.055 in) (RE4R01A)**
      - **1.8 mm (0.071 in) (RE4R03A)**



- Inspection of overrun clutch drive plates
  - **Thickness of drive plate:**
    - **Standard**
      - **2.0 mm (0.079 in) (RE4R01A)**
      - **1.6 mm (0.063 in) (RE4R03A)**
    - **Wear limit**
      - **1.8 mm (0.071 in) (RE4R01A)**
      - **1.4 mm (0.055 in) (RE4R03A)**

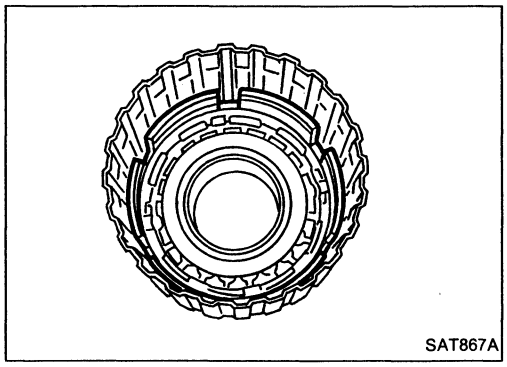


- Installation of forward clutch piston and overrun clutch piston

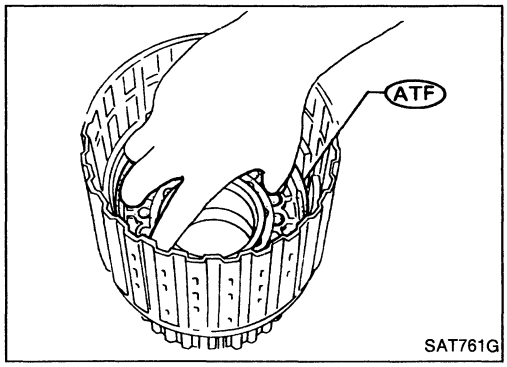
1. Install forward clutch piston by turning it slowly and evenly.

- **Apply A.T.F. to inner surface of clutch drum.**

Forward and Overrun Clutches (Cont'd)

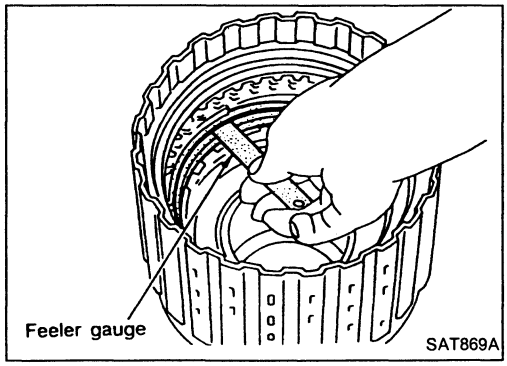

SAT867A

- **Align notch in forward clutch piston with groove in forward clutch drum.**



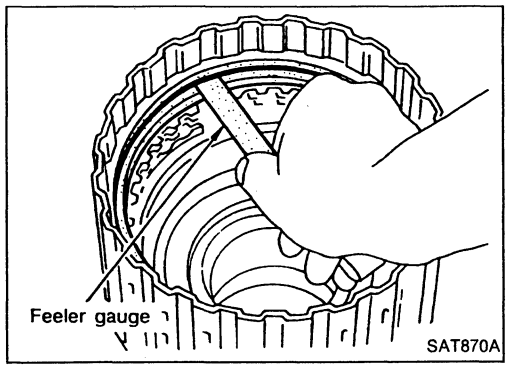
SAT761G

2. Install overrun clutch by turning it slowly and evenly.
- **Apply A.T.F. to inner surface of forward clutch piston.**



SAT869A

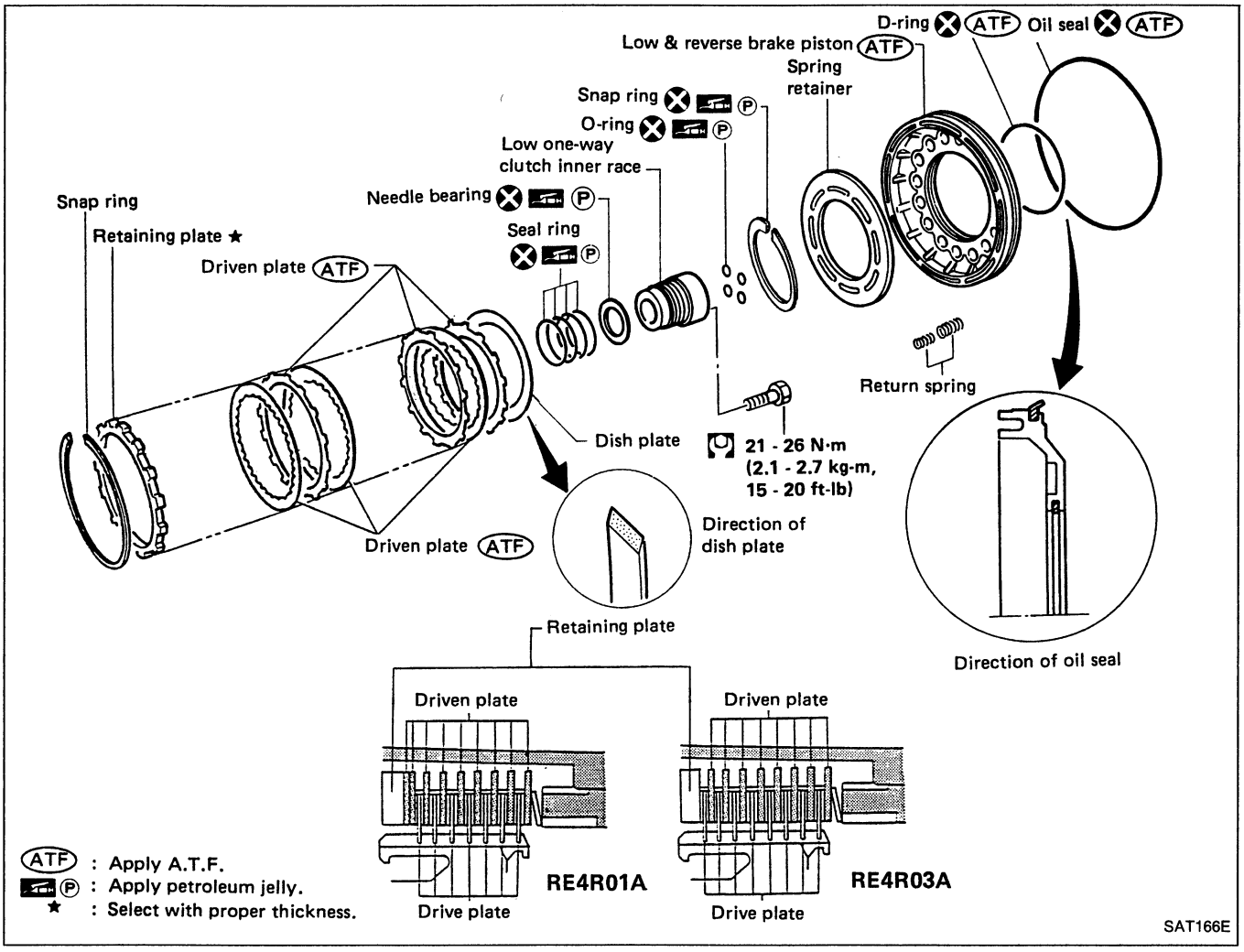
- Measurement of clearance between retaining plate and snap ring of overrun clutch
  - **Specified clearance:**
    - **Standard**
      - **1.0 - 1.4 mm (0.039 - 0.055 in)**
    - **Allowable limit**
      - **2.0 mm (0.079 in) (RE4R01A)**
      - **2.2 mm (0.087 in) (RE4R03A)**
  - **Retaining plate:**
    - **Refer to S.D.S.**

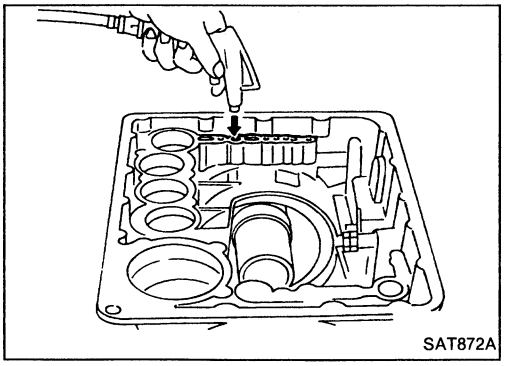


SAT870A

- Measurement of clearance between retaining plate and snap ring of forward clutch
  - **Specified clearance:**
    - **Standard**
      - **0.45 - 0.85 mm (0.0177 - 0.0335 in)**
    - **Allowable limit**
      - **2.25 mm (0.0886 in) (RE4R01A)**
      - **2.45 mm (0.0965 in) (RE4R03A)**
  - **Retaining plate:**
    - **Refer to S.D.S.**

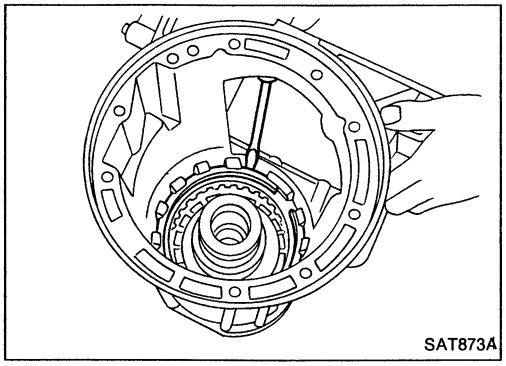
Low & Reverse Brake





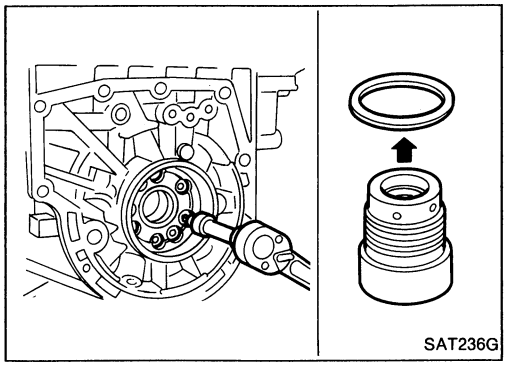
DISASSEMBLY

1. Check operation of low and reverse brake.
a. Install seal ring onto oil pump cover and install reverse clutch. 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.

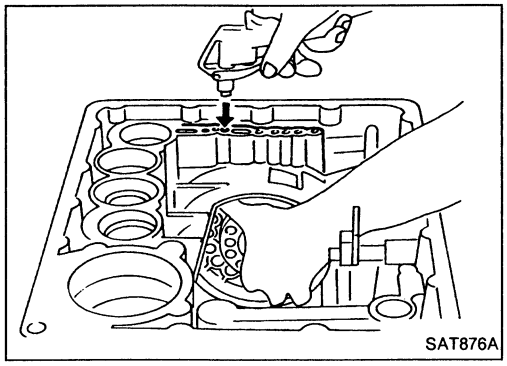


2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

Low & Reverse Brake (Cont'd)


SAT236G

3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.
4. Remove seal rings from low one-way clutch inner race.
5. Remove needle bearing from low one-way clutch inner race.

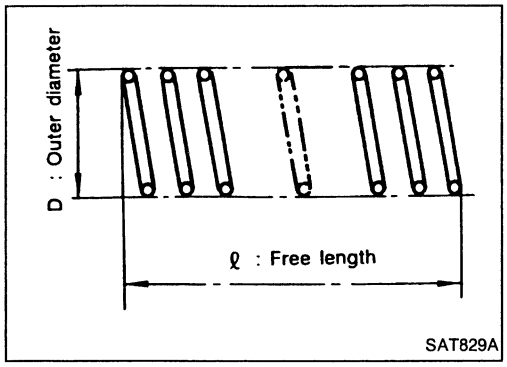

SAT876A

6. Remove low and reverse brake piston using compressed air.
7. Remove oil seal and D-ring from piston.

INSPECTION

Low and reverse brake snap ring and spring retainer

- Check for deformation, or damage.



SAT829A

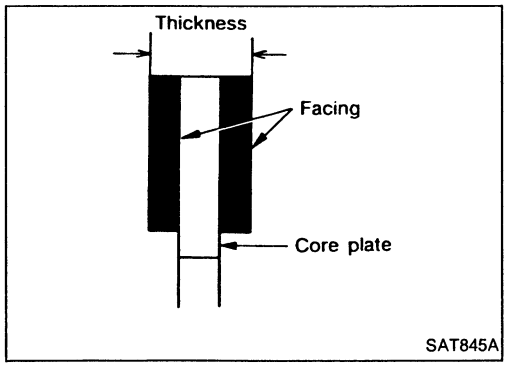
Low and reverse brake return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

Model	Part No.	ℓ	D
RE4R01A	31521-21X00	23.7 (0.933)	11.6 (0.457)
RE4R03A	(Inner) 31505-51X06	20.43 (0.8043)	10.3 (0.406)
	(Outer) 31505-51X05	20.35 (0.8012)	13.0 (0.512)



SAT845A

Low and reverse brake 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) (RE4R01A)

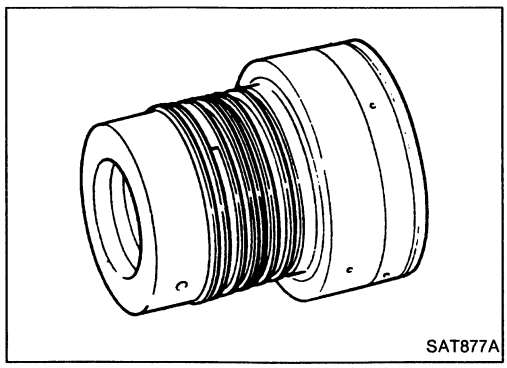
1.6 mm (0.063 in) (RE4R03A)

Wear limit

1.8 mm (0.071 in) (RE4R01A)

1.4 mm (0.055 in) (RE4R03A)

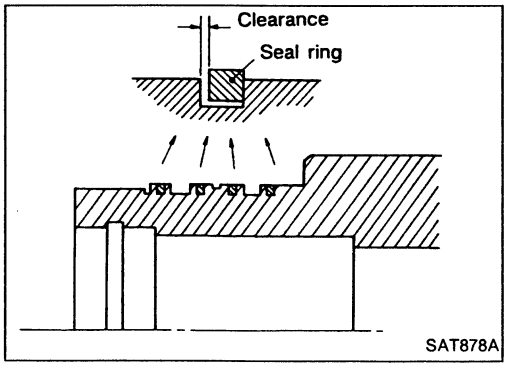
- If not within wear limit, replace.


SAT877A

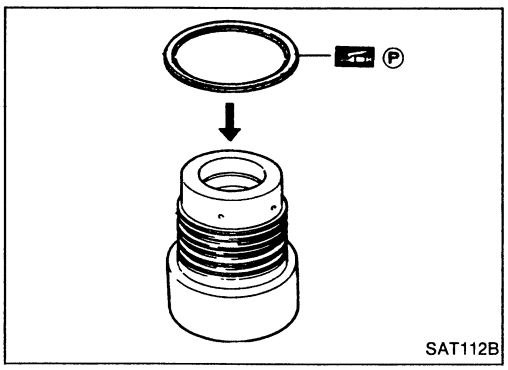
Low one-way clutch inner race

- Check frictional surface of inner race for wear or damage.

Low & Reverse Brake (Cont'd)

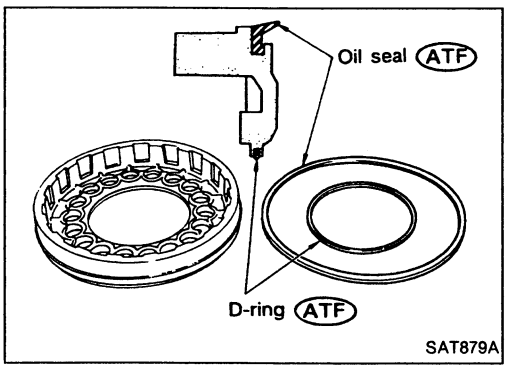


- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.
  Inspection standard:
  Standard value: 0.10 - 0.25 mm (0.0039 - 0.0098 in)
  Allowable limit: 0.25 mm (0.0098 in)
- If not within allowable limit, replace low one-way clutch inner race.

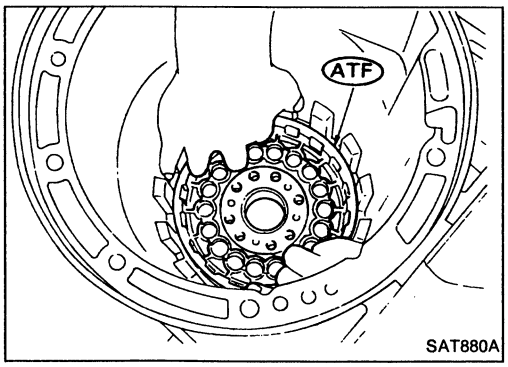


ASSEMBLY

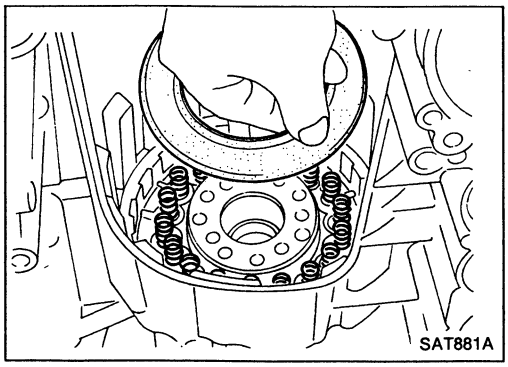
1. Install bearing onto one-way clutch inner race.
- **Pay attention to its direction — Black surface goes to rear side.**
- **Apply petroleum jelly to needle bearing.**



2. Install oil seal and D-ring onto piston.
- **Apply A.T.F. to oil seal and D-ring.**

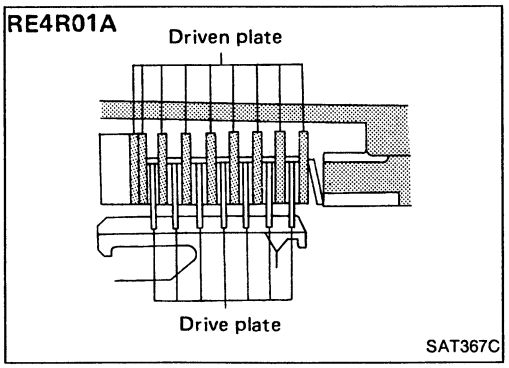


3. Install piston by rotating it slowly and evenly.
- **Apply A.T.F. to inner surface of transmission case.**



4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.

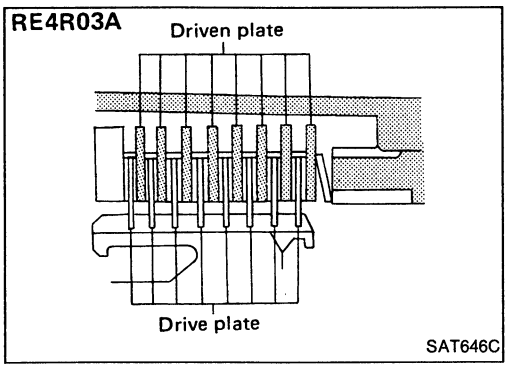
Low & Reverse Brake (Cont'd)

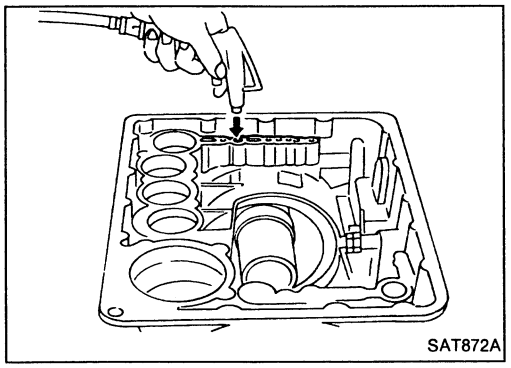


5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.

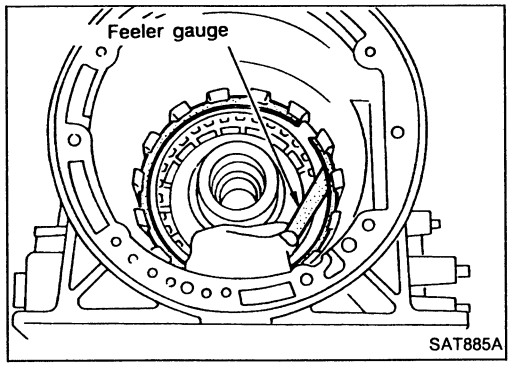
- **Two types of drive plates are used on the RE4R03A transmission. One type uses a "waving" design and the other type uses a "flat" design. Either one can be installed first since they are interchangeable.**

6. Install snap ring on transmission case.



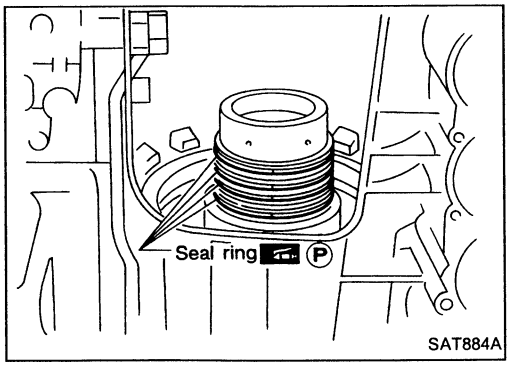


7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY".



8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

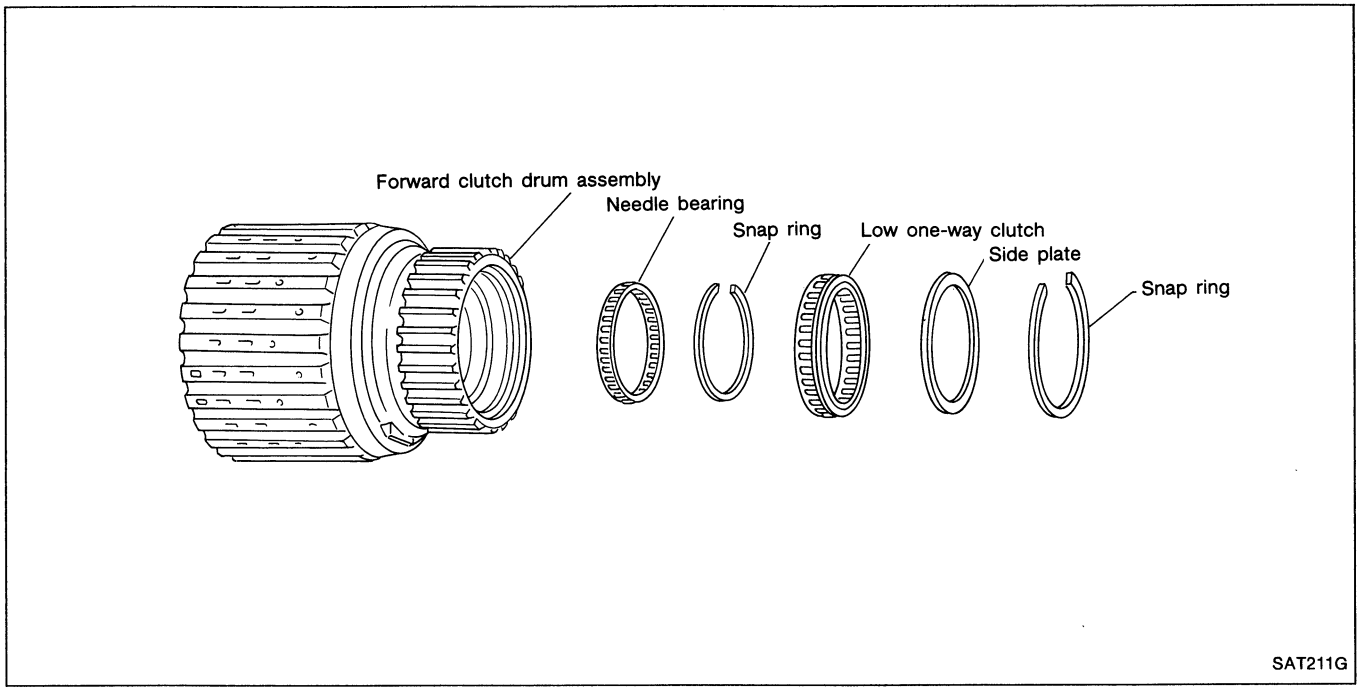
Specified clearance:
Standard
1.1 - 1.5 mm (0.043 - 0.059 in)
Allowable limit
2.9 mm (0.114 in) (RE4R01A)
3.1 mm (0.122 in) (RE4R03A)
Retaining plate:
Refer to S.D.S.

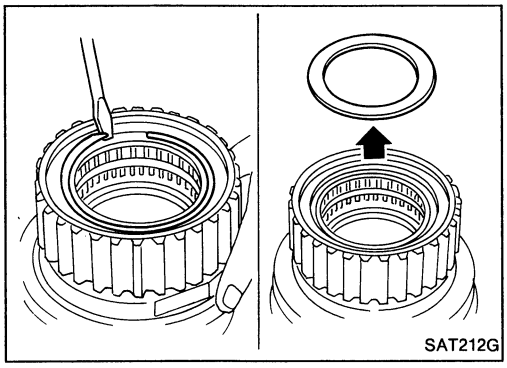


9. Install low one-way clutch inner race seal ring.

- **Apply petroleum jelly to seal ring.**
- **Make sure seal rings are pressed firmly into place and held by petroleum jelly.**

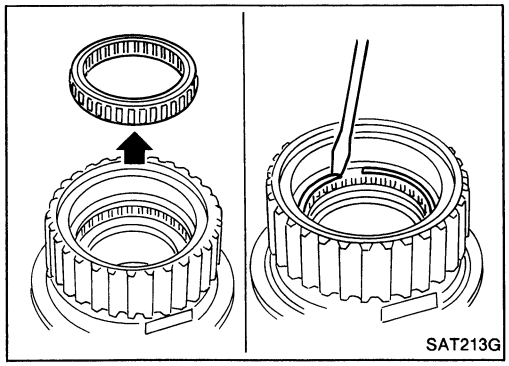
Forward Clutch Drum Assembly — RE4R01A



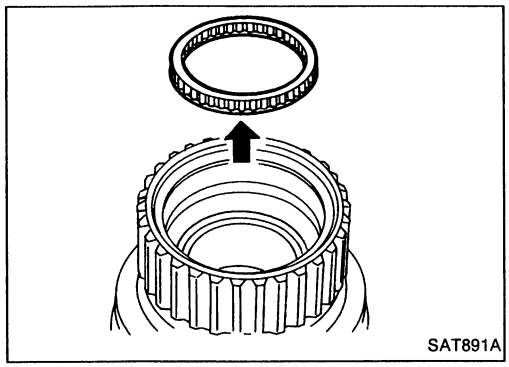


DISASSEMBLY

1. Remove snap ring from forward clutch drum.
2. Remove side plate from forward clutch drum.

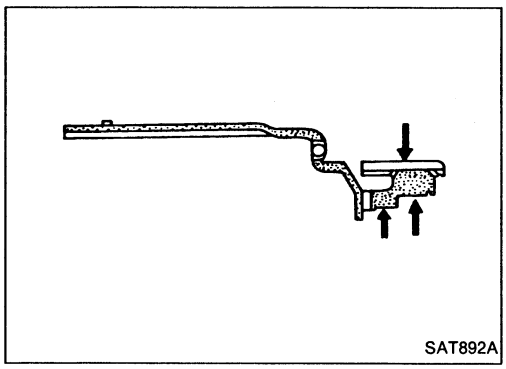


3. Remove low one-way clutch from forward clutch drum.
4. Remove snap ring from forward clutch drum.



5. Remove needle bearing from forward clutch drum.

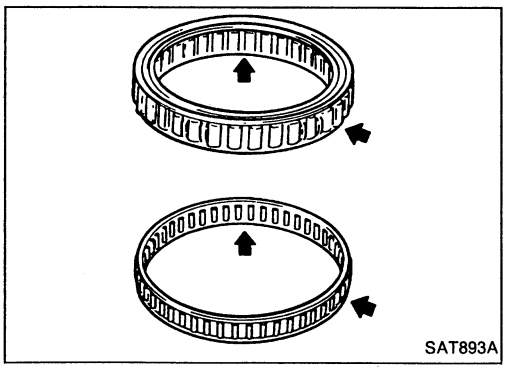
Forward Clutch Drum Assembly — RE4R01A (Cont'd)


SAT892A

INSPECTION

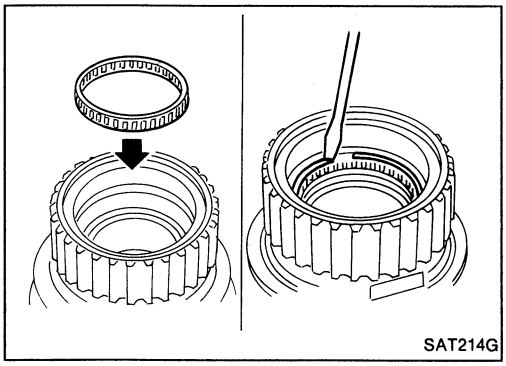
Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.


SAT893A

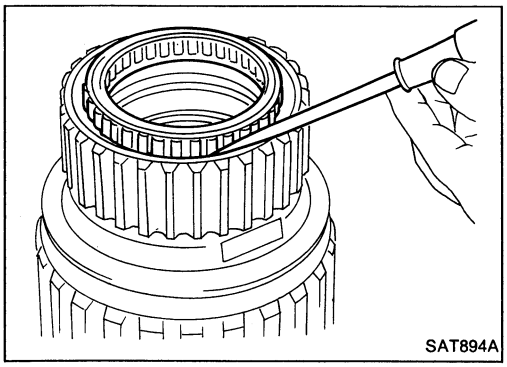
Needle bearing and low one-way clutch

- Check frictional surface for wear or damage.

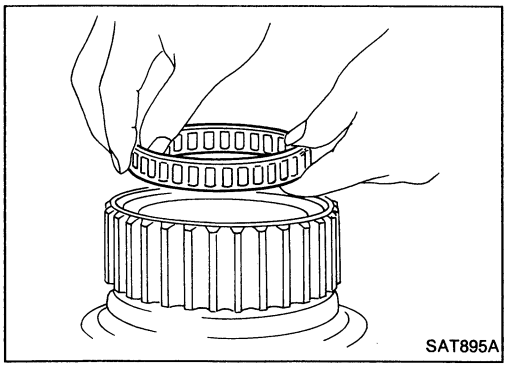

SAT214G

ASSEMBLY

1. Install needle bearing in forward clutch drum.
2. Install snap ring onto forward clutch drum.

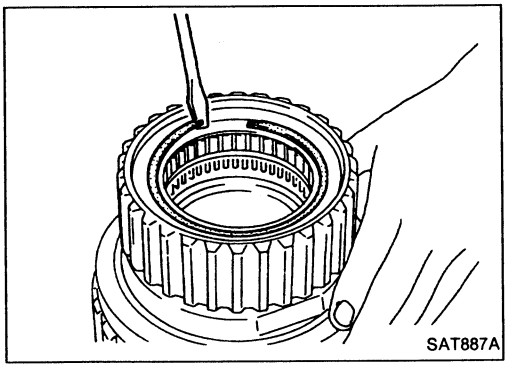

SAT894A

3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.


SAT895A

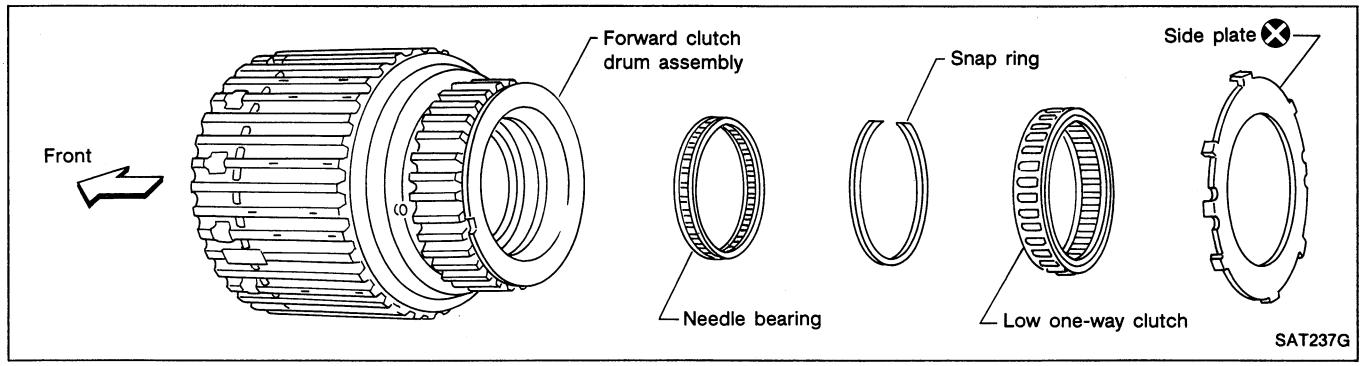
- **Install low one-way clutch with flange facing rearward.**

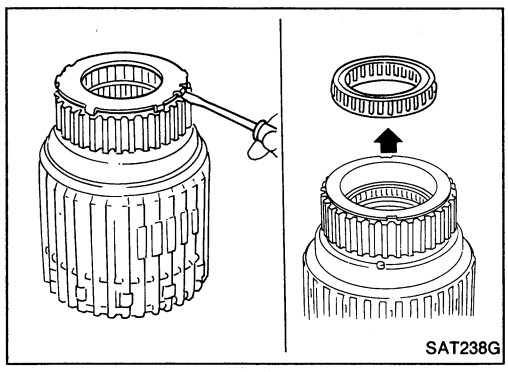
Forward Clutch Drum Assembly — RE4R01A (Cont'd)



4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

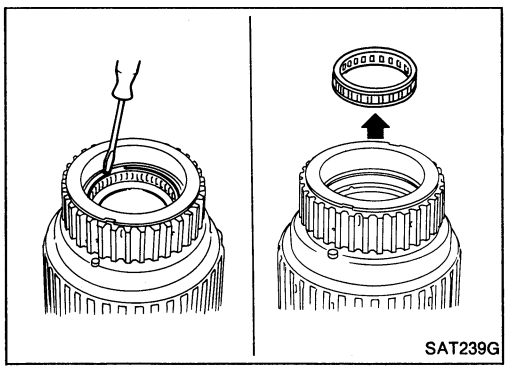
Forward Clutch Drum Assembly — RE4R03A



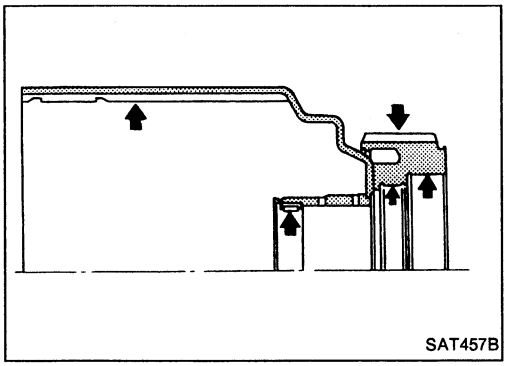


DISASSEMBLY

1. Remove side plate from forward clutch drum.
2. Remove low one-way clutch from forward clutch drum.



3. Remove snap ring from forward clutch drum.
4. Remove needle bearing from forward clutch drum.

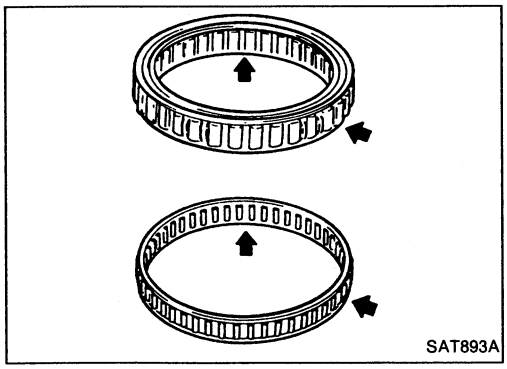


INSPECTION

Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.

Forward Clutch Drum Assembly — RE4R03A (Cont'd)

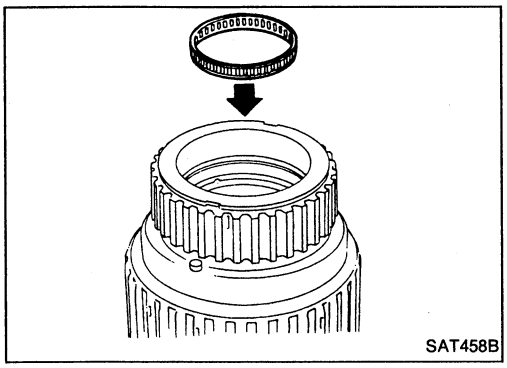

SAT893A

Needle bearing and low one-way clutch

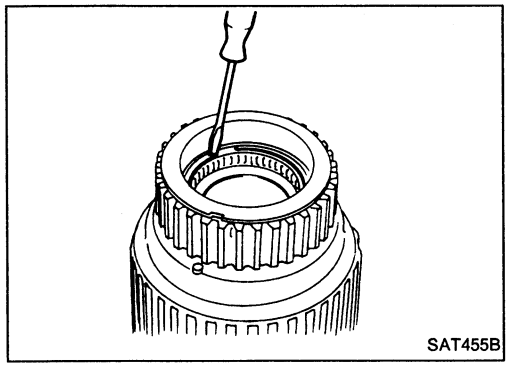
- Check frictional surface for wear or damage.

ASSEMBLY

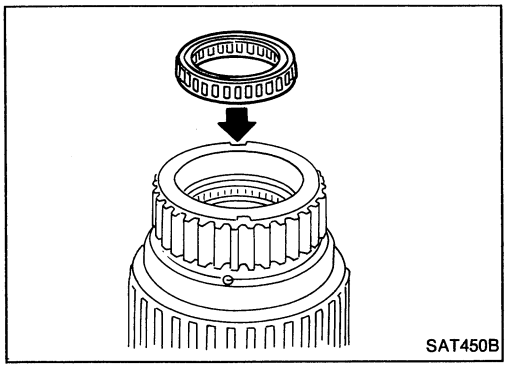
1. Install needle bearing in forward clutch drum.


SAT458B

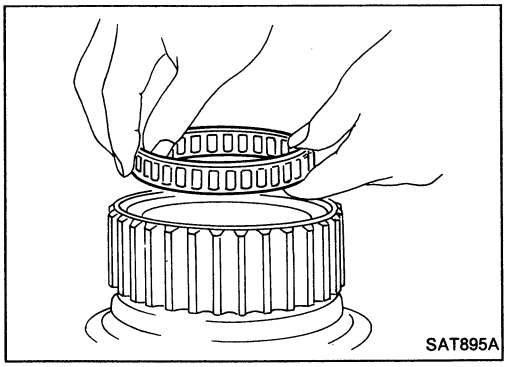
2. Install snap ring onto forward clutch drum.


SAT455B

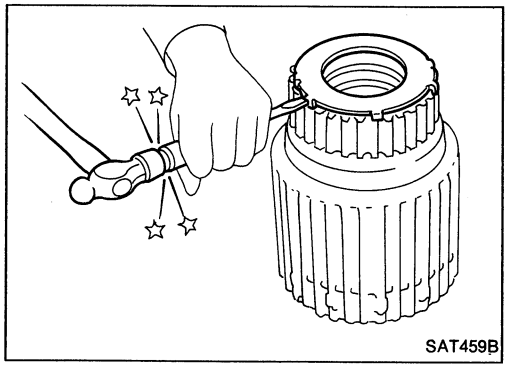
3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.


SAT450B

- **Install low one-way clutch with flange facing rearward.**

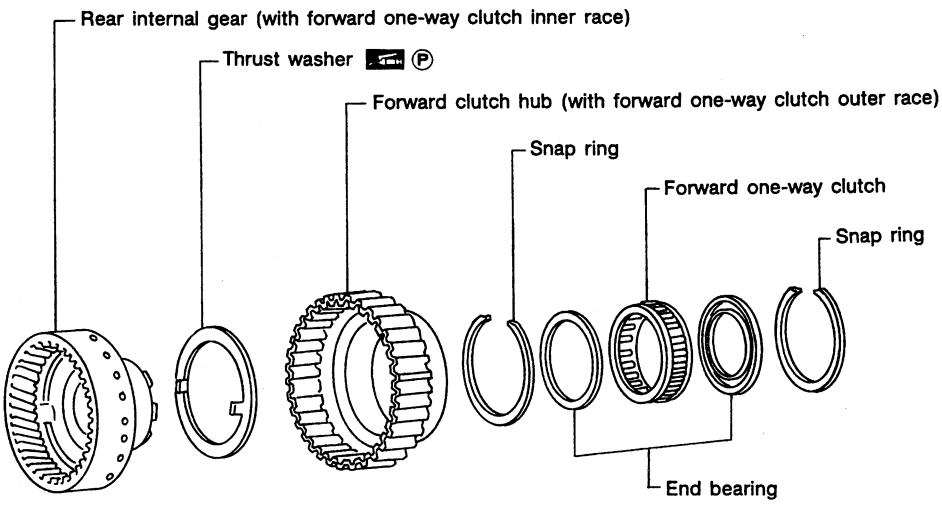

SAT895A

Forward Clutch Drum Assembly — RE4R03A (Cont'd)


SAT459B

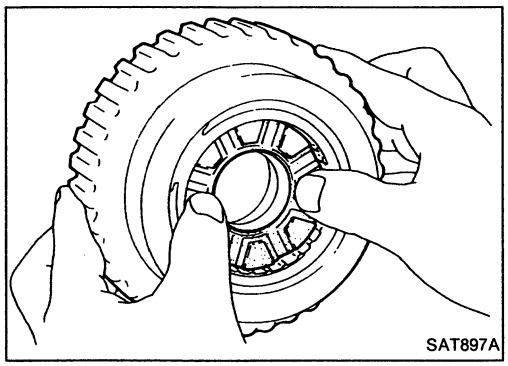
4. Install side plate onto forward clutch drum.

Rear Internal Gear and Forward Clutch Hub



: Apply petroleum jelly.

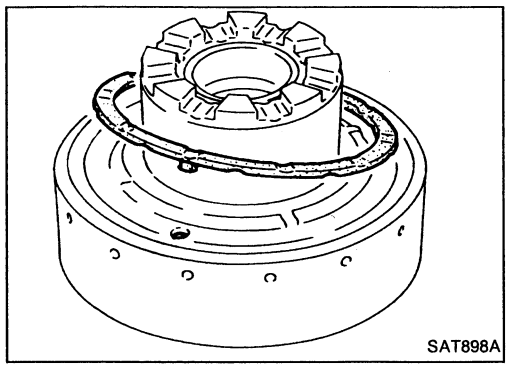
SAT896A



SAT897A

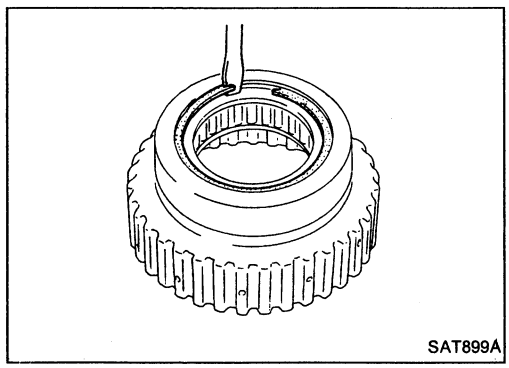
DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.



SAT898A

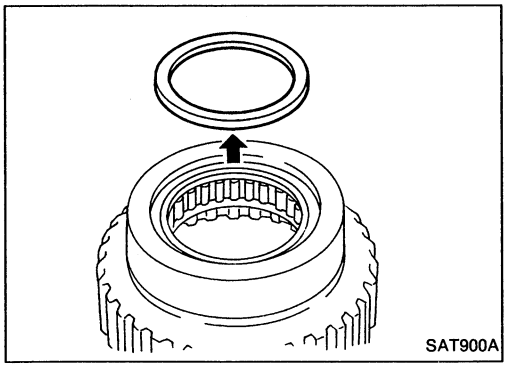
2. Remove thrust washer from rear internal gear.



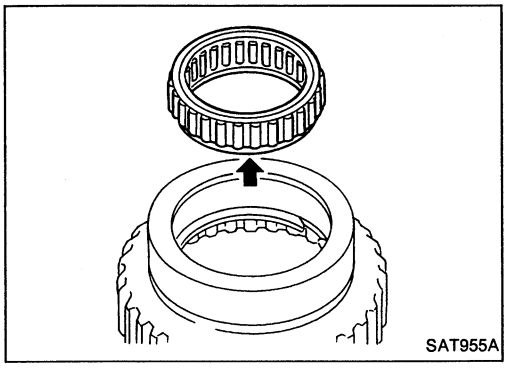
SAT899A

3. Remove snap ring from forward clutch hub.

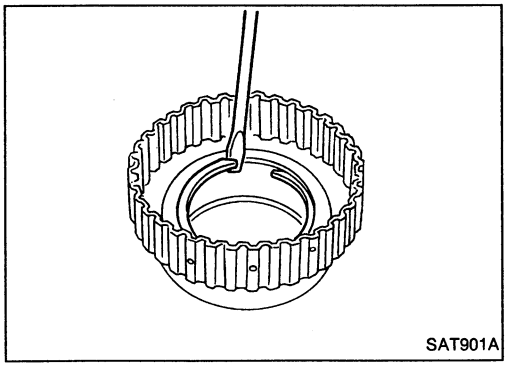
Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT900A

4. Remove end bearing.


SAT955A

5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.

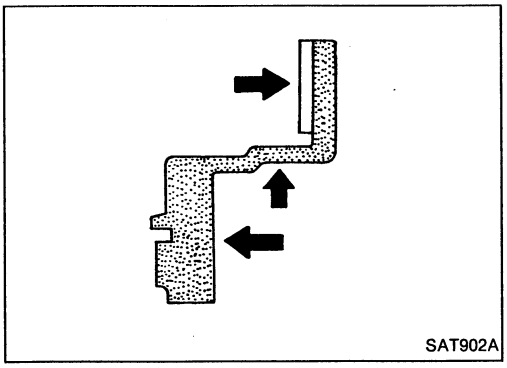

SAT901A

6. Remove snap ring from forward clutch hub.

INSPECTION

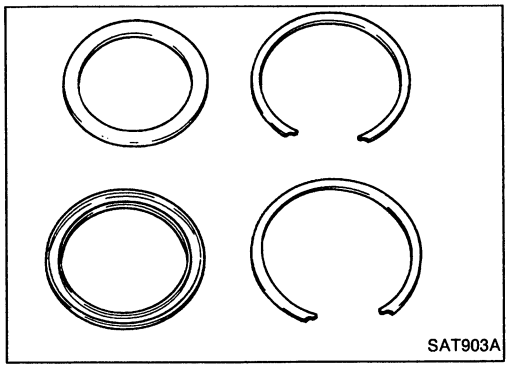
Rear internal gear and forward clutch hub

- Check gear for excessive wear, chips or cracks.
- Check frictional surfaces of forward one-way clutch and thrust washer for wear or damage.
- Check spline for wear or damage.


SAT902A

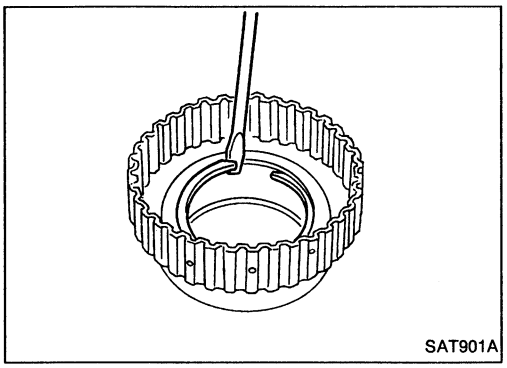
Snap ring and end bearing

- Check for deformation or damage.

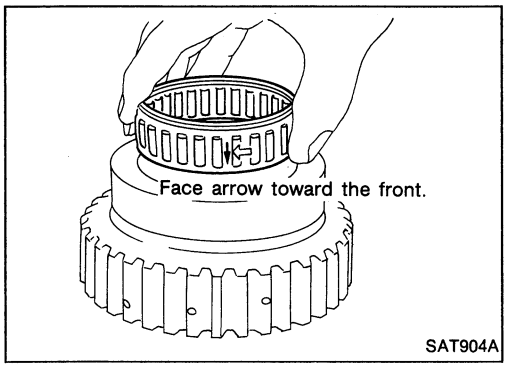

SAT903A

Rear Internal Gear and Forward Clutch Hub (Cont'd)

ASSEMBLY

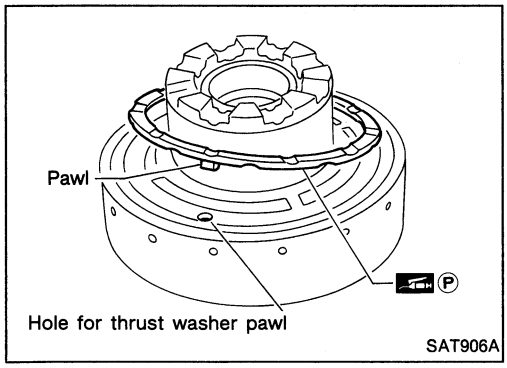

SAT901A

1. Install snap ring onto forward clutch hub.
2. Install end bearing.



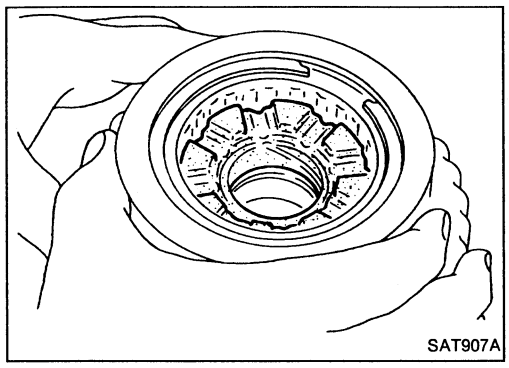
SAT904A

3. Install forward one-way clutch onto clutch hub.
- **Install forward one-way clutch with flange facing rearward.**
4. Install end bearing.
5. Install snap ring onto forward clutch hub.

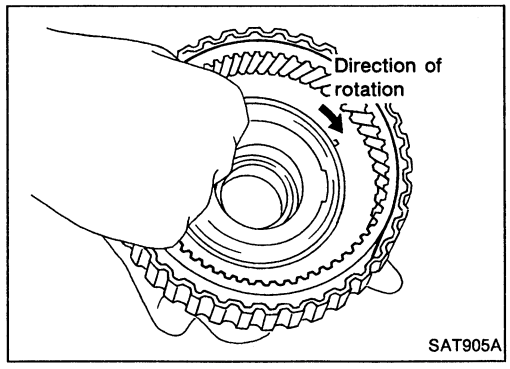


SAT906A

6. Install thrust washer onto rear internal gear.
- **Apply petroleum jelly to thrust washer.**
- **Securely insert pawls of thrust washer into holes in rear internal gear.**


SAT907A

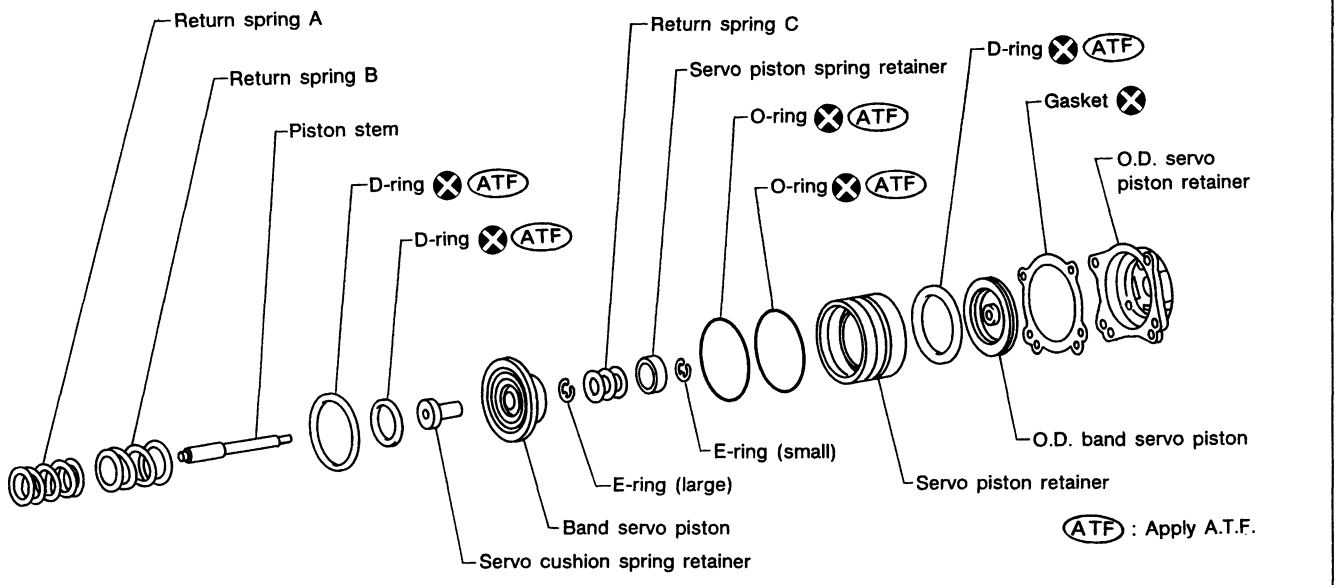
7. Position forward clutch hub in rear internal gear.

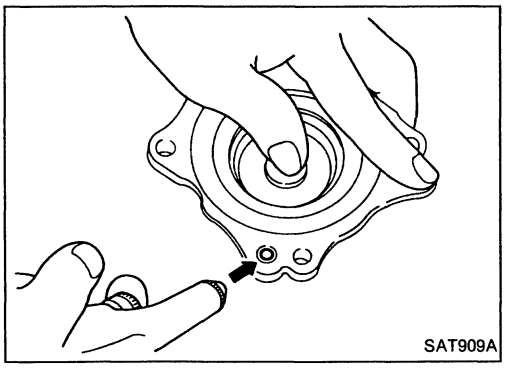


SAT905A

8. After installing, check to assure that forward clutch hub rotates clockwise.

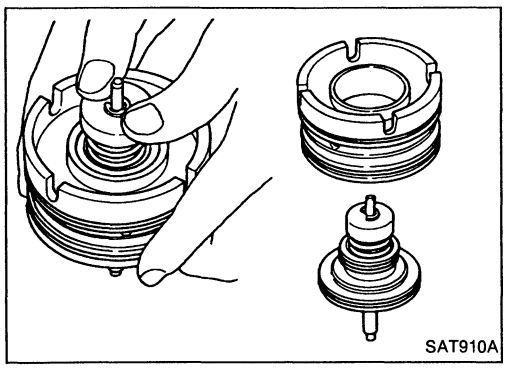
Band Servo Piston Assembly



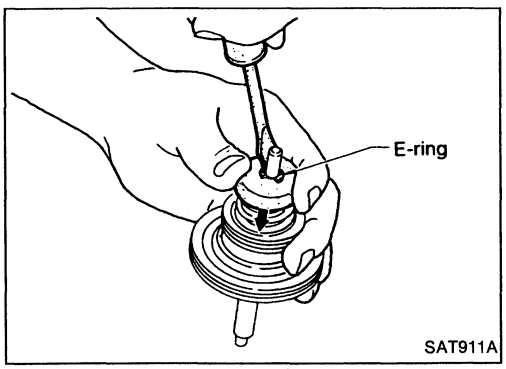


DISASSEMBLY

1. Block one oil hole in O.D. servo piston retainer and the center hole in O.D. band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove O.D. band servo piston from retainer.
3. Remove D-ring from O.D. band servo piston.

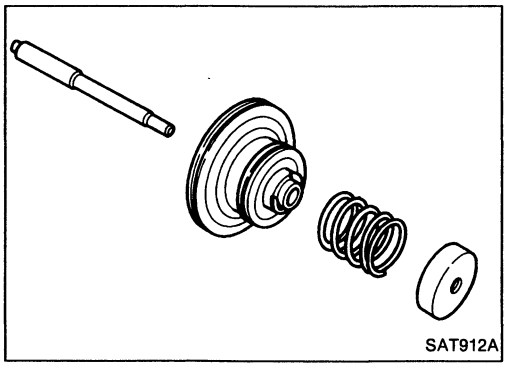


4. Remove band servo piston assembly from servo piston retainer by pushing it forward.

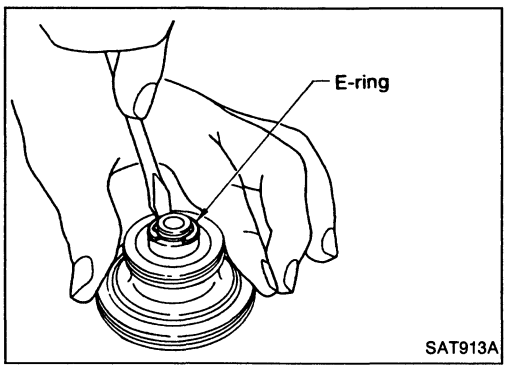


5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

Band Servo Piston Assembly (Cont'd)

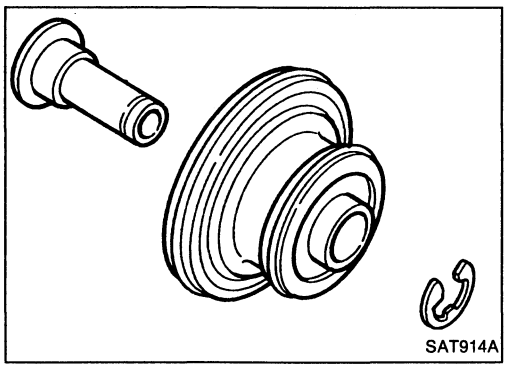

SAT912A

6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.

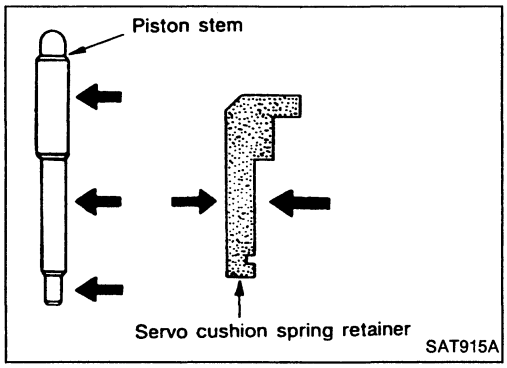


SAT913A

7. Remove E-ring from band servo piston.


SAT914A

8. Remove servo cushion spring retainer from band servo piston.
9. Remove D-rings from band servo piston.
10. Remove O-rings from servo piston retainer.

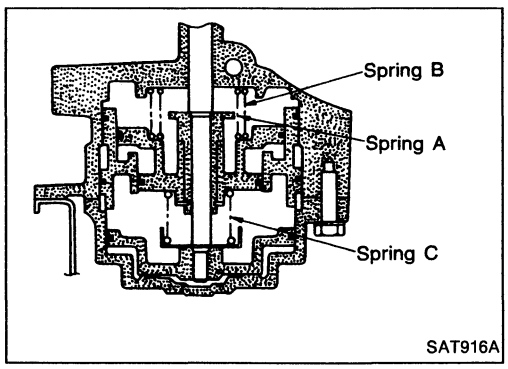


SAT915A

INSPECTION

Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



SAT916A

Return springs

- Check for deformation or damage. Measure free length and outer diameter.

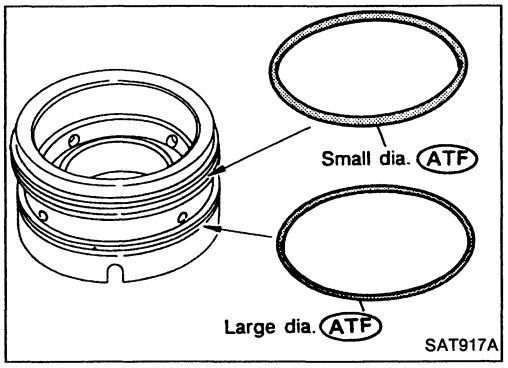
Inspection standard:

Unit: mm (in)

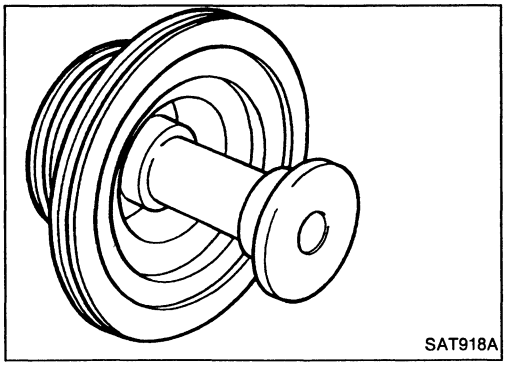
Parts	Free length	Outer diameter
Spring A	45.6 (1.795)	34.3 (1.350)
Spring B	53.8 (2.118)	40.3 (1.587)
Spring C	29.7 (1.169)	27.6 (1.087)

Band Servo Piston Assembly (Cont'd)

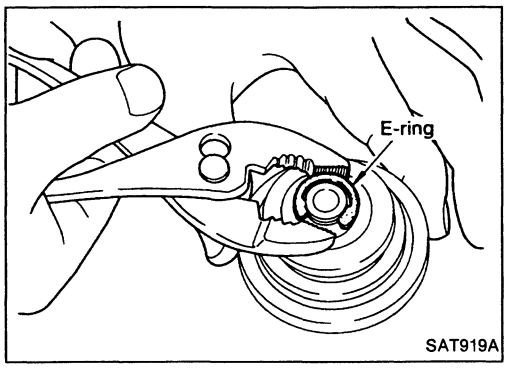
ASSEMBLY



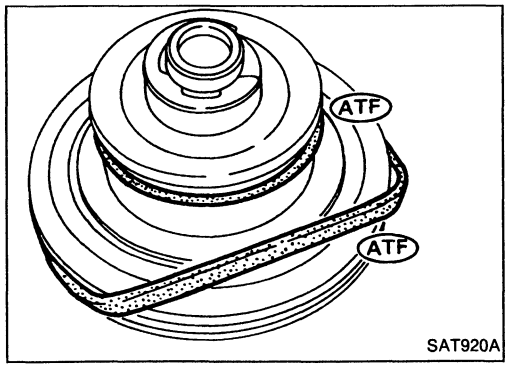
1. Install O-rings onto servo piston retainer.
   - **Apply A.T.F. to O-rings.**
   - **Pay attention to position of each O-ring.**



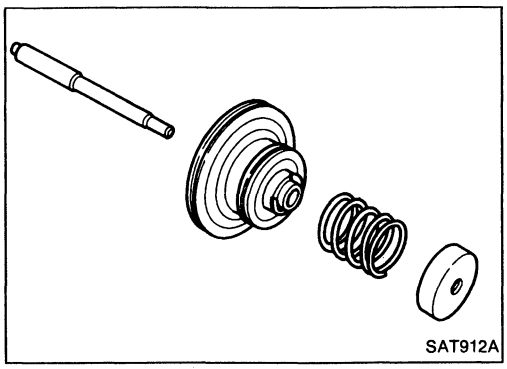
2. Install servo cushion spring retainer onto band servo piston.



3. Install E-ring onto servo cushion spring retainer.

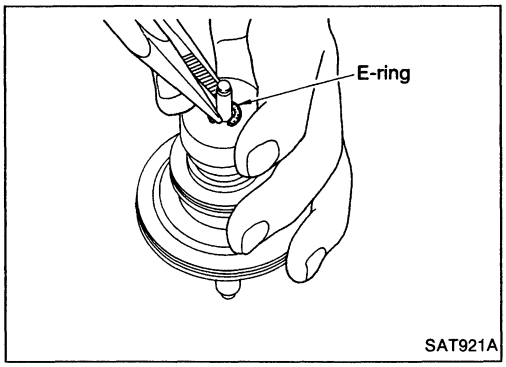


4. Install D-rings onto band servo piston.
   - **Apply A.T.F. to D-rings.**

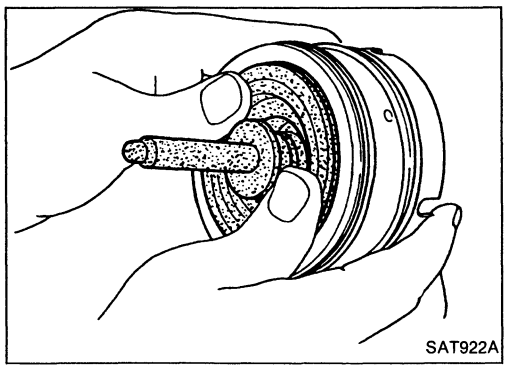


5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.

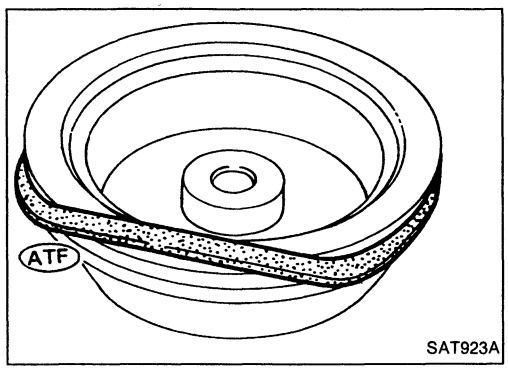
Band Servo Piston Assembly (Cont'd)



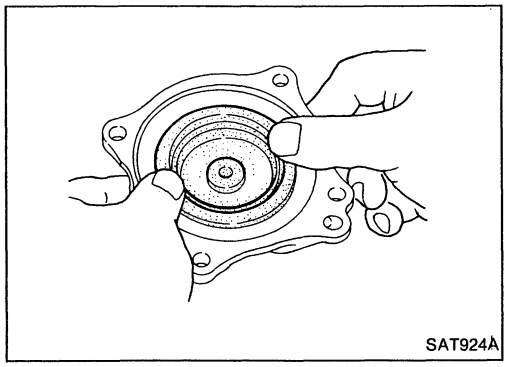
6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



7. Install band servo piston assembly onto servo piston retainer by pushing it inward.

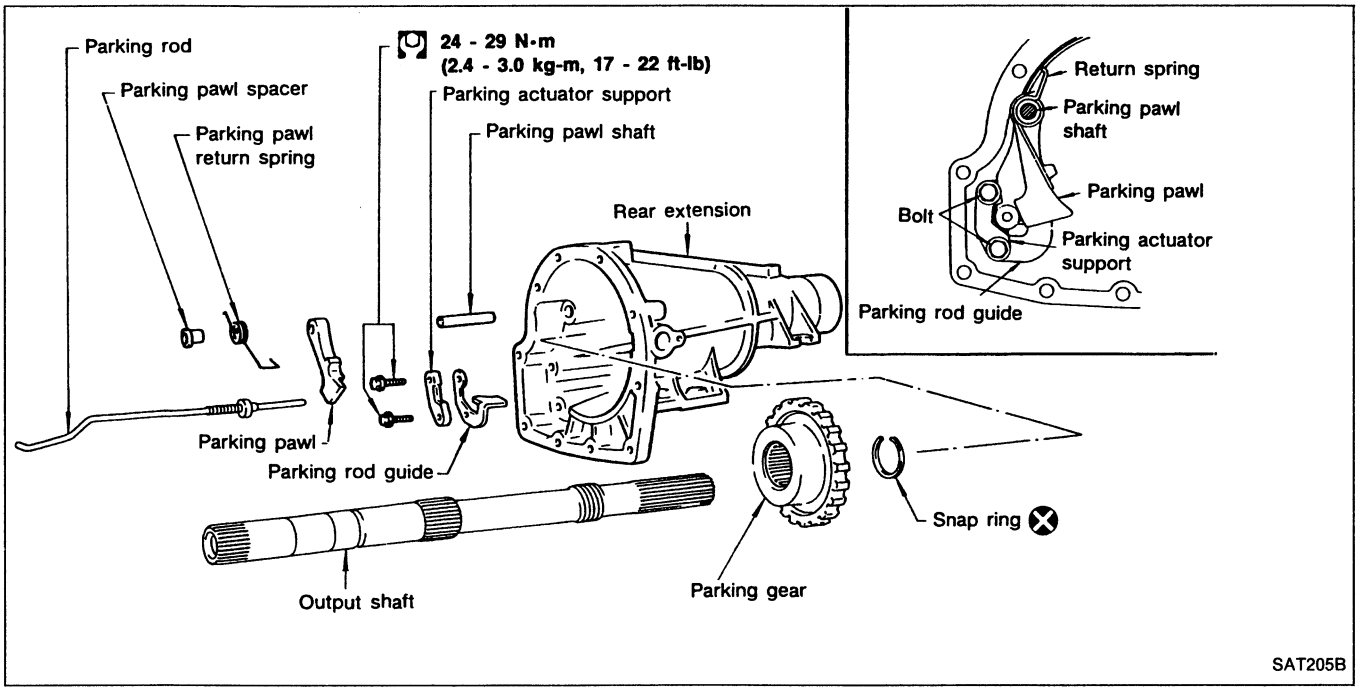


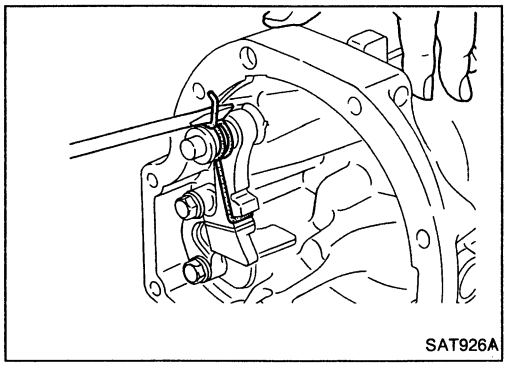
8. Install D-ring on O.D. band servo piston.
- **Apply A.T.F. to D-ring.**



9. Install O.D. band servo piston onto servo piston retainer by pushing it inward.

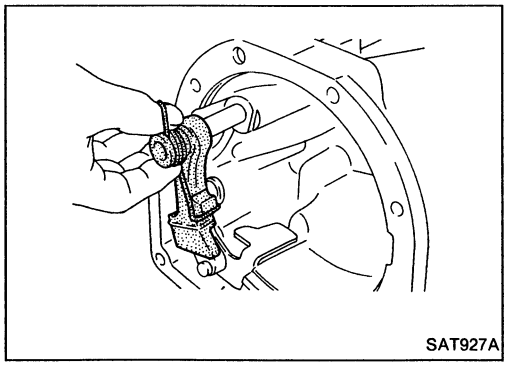
Parking Pawl Components



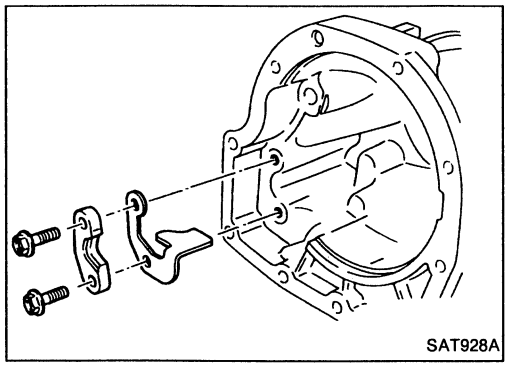


DISASSEMBLY

1. Slide return spring to the front of rear extension flange.

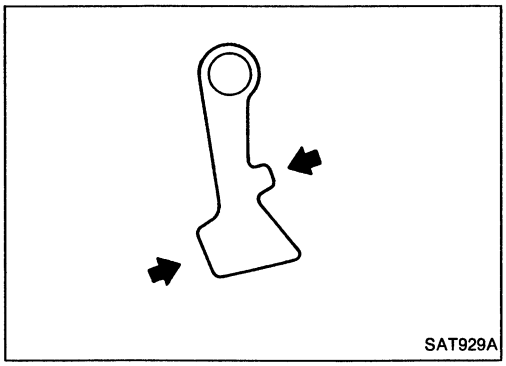


2. Remove return spring, pawl spacer and parking pawl from rear extension.
3. Remove parking pawl shaft from rear extension.



4. Remove parking actuator support and rod guide from rear extension.

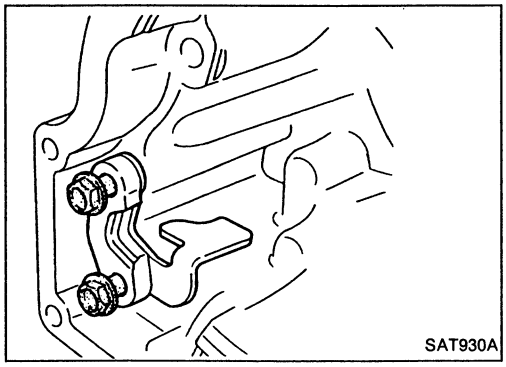
Parking Pawl Components (Cont'd)


SAT929A

INSPECTION

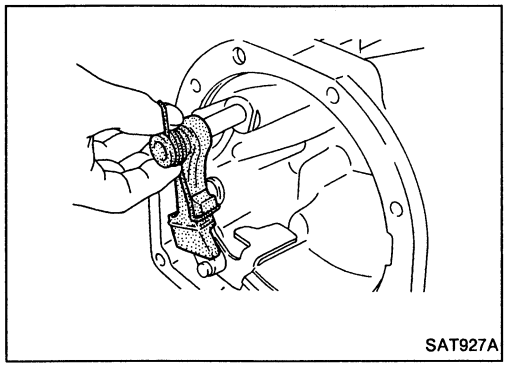
Parking pawl and parking actuator support

- Check contact surface of parking rod for wear.

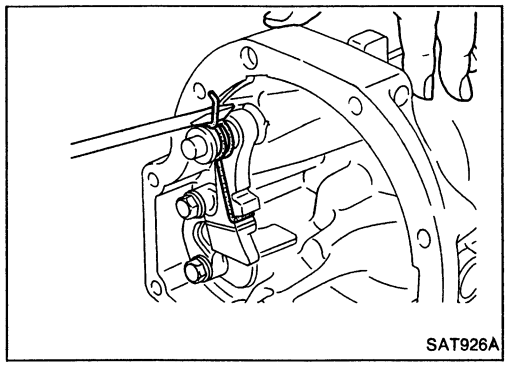

SAT930A

ASSEMBLY

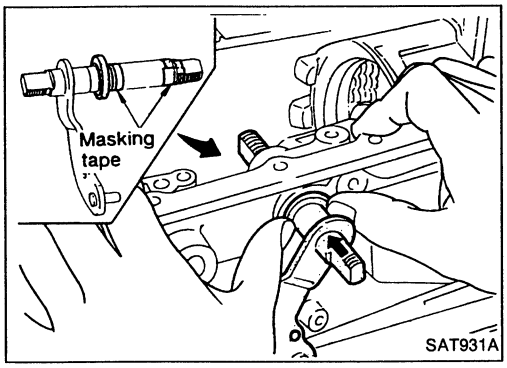
1. Install rod guide and parking actuator support onto rear extension.
2. Insert parking pawl shaft into rear extension.


SAT927A

3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.


SAT926A

4. Bend return spring upward and install it onto rear extension.



Assembly (1)

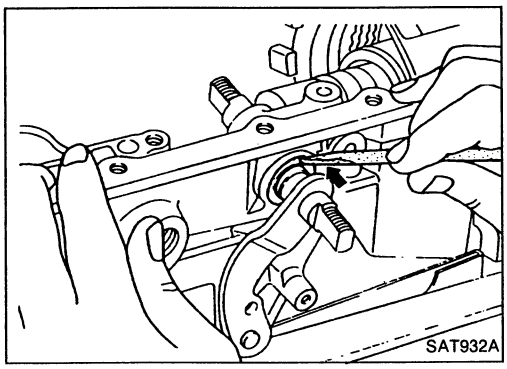
1. Install manual shaft components.

a. Install oil seal onto manual shaft.

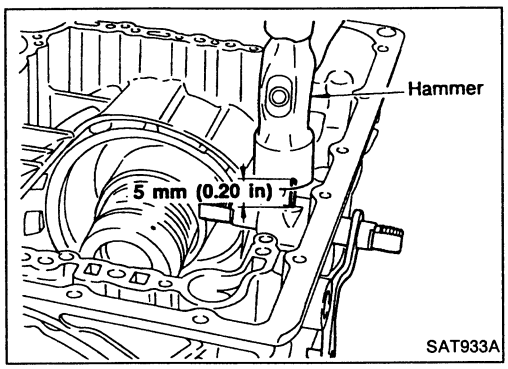
- **Apply A.T.F. to oil seal.**
- **Wrap threads of manual shaft with masking tape.**

b. Insert manual shaft and oil seal as a unit into transmission case.

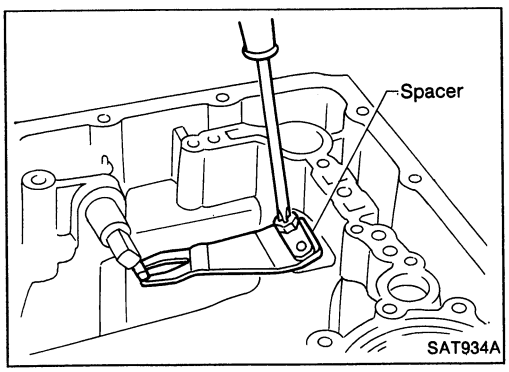
c. Remove masking tape.



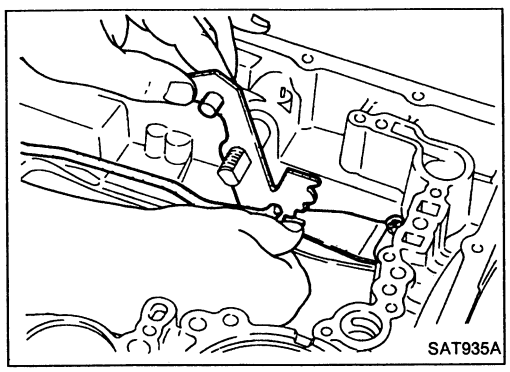
d. Push oil seal evenly and install it onto transmission case.



e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.

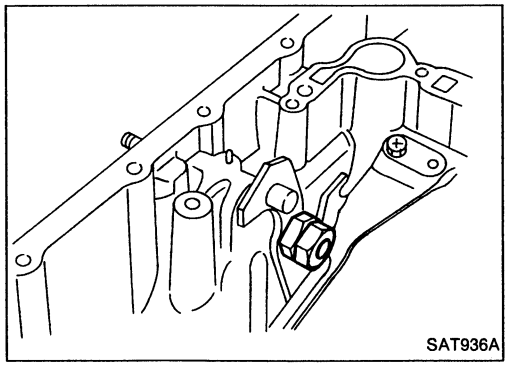


f. Install detent spring and spacer.

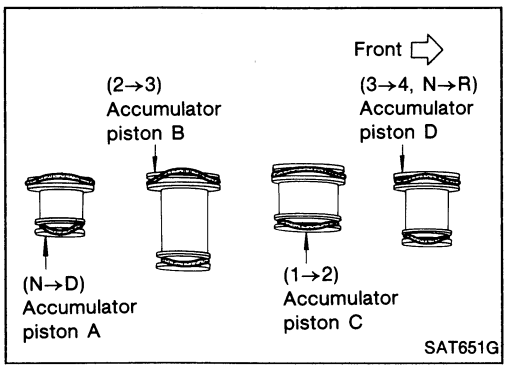


g. While pushing detent spring down, install manual plate onto manual shaft.

Assembly (1) (Cont'd)



h. Install lock nuts onto manual shaft.



2. Install accumulator piston.

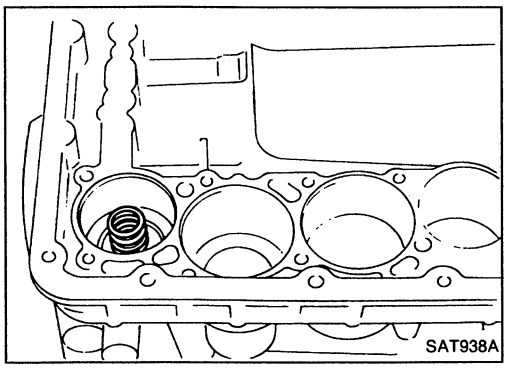
a. Install O-rings onto accumulator piston.

- **Apply A.T.F. to O-rings.**

Accumulator piston O-rings:

Unit: mm (in)

Accumulator	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

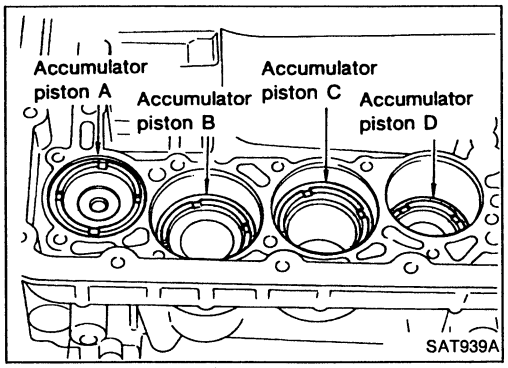


b. Install return spring for accumulator A onto transmission case.

Free length of return spring

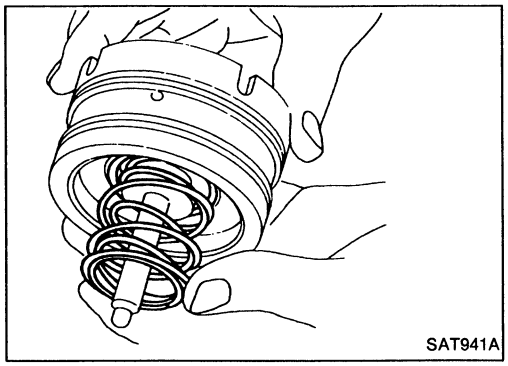
Unit: mm (in)

Accumulator	A
Free length	43 (1.69)



c. Install accumulator pistons A, B, C and D.

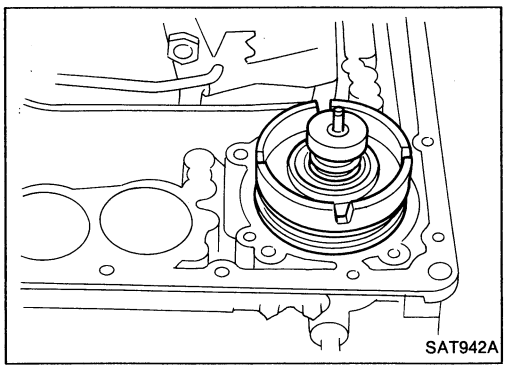
- **Apply A.T.F. to transmission case.**



3. Install band servo piston.

a. Install return springs onto servo piston.

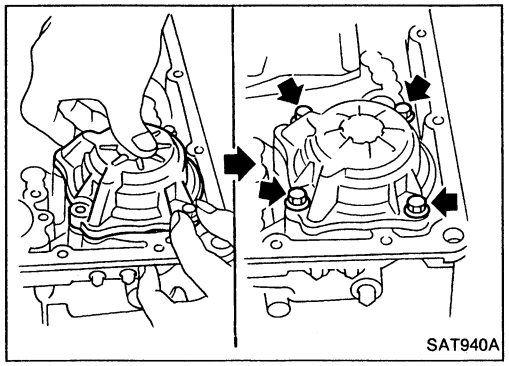
Assembly (1) (Cont'd)



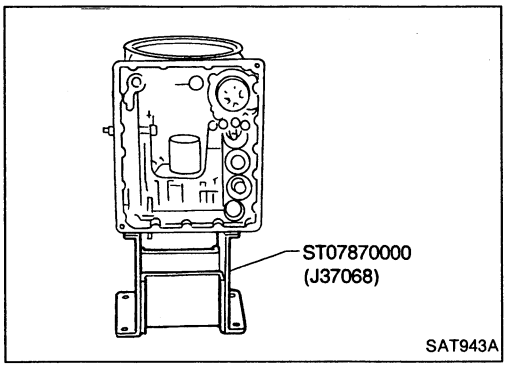
b. Install band servo piston onto transmission case.

- **Apply A.T.F. to O-ring of band servo piston and transmission case.**

c. Install gasket for band servo onto transmission case.

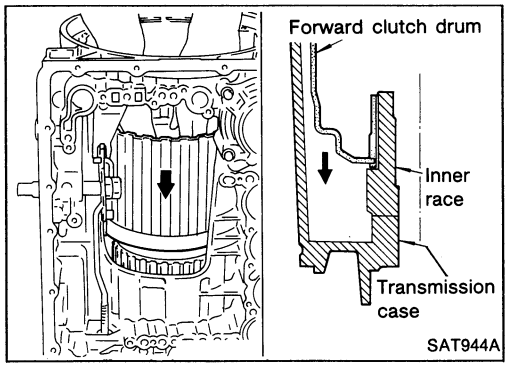


d. Install band servo retainer onto transmission case.

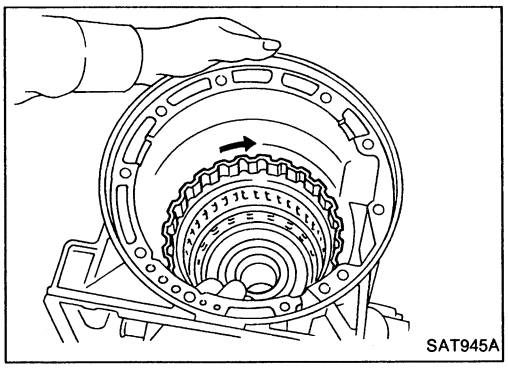


4. Install rear side clutch and gear components.

a. Place transmission case in vertical position.

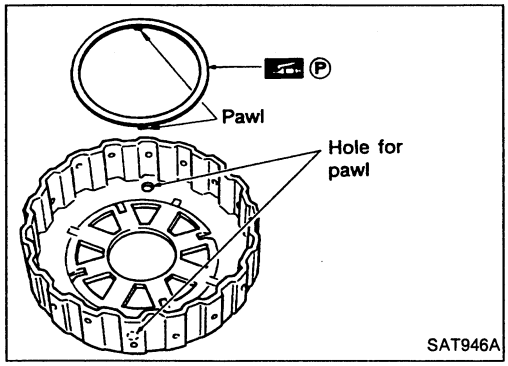


b. Slightly lift forward clutch drum assembly and slowly rotate it clockwise until its hub passes fully over the clutch inner race inside transmission case.



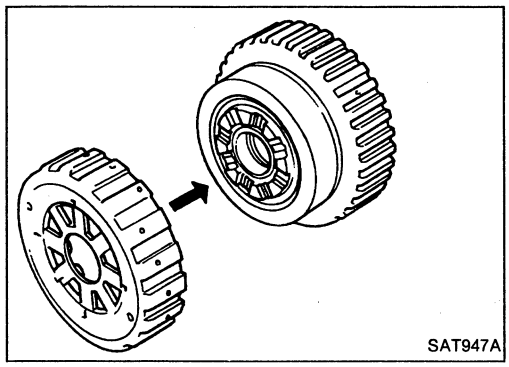
c. Check to be sure that rotation direction of forward clutch assembly is correct.

Assembly (1) (Cont'd)

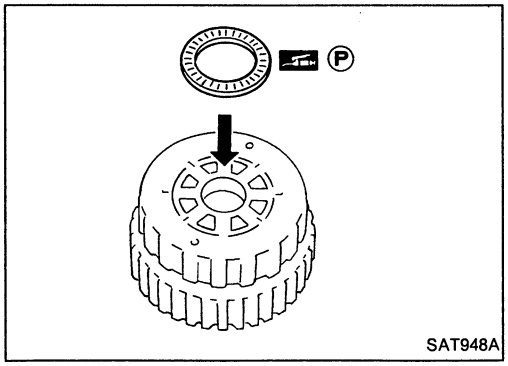


d. Install thrust washer onto front of overrun clutch hub.

- **Apply petroleum jelly to the thrust washer.**
- **Insert pawls of thrust washer securely into holes in overrun clutch hub.**

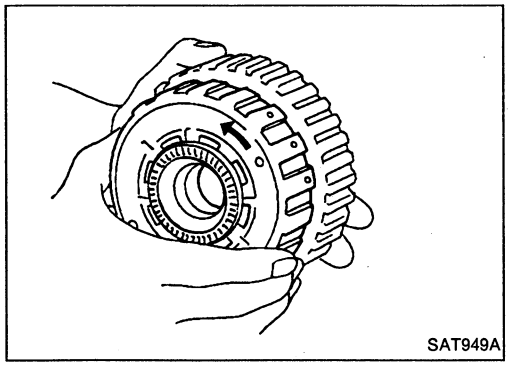


e. Install overrun clutch hub onto rear internal gear assembly.

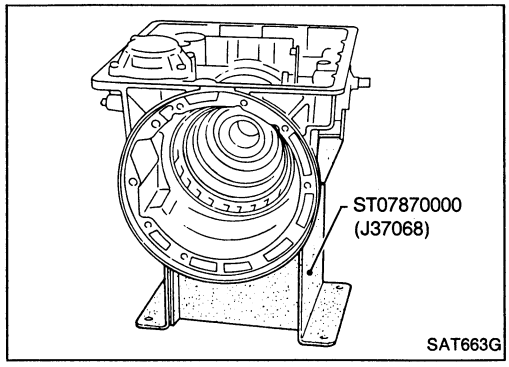


f. Install needle bearing onto rear of overrun clutch hub.

- **Apply petroleum jelly to needle bearing.**

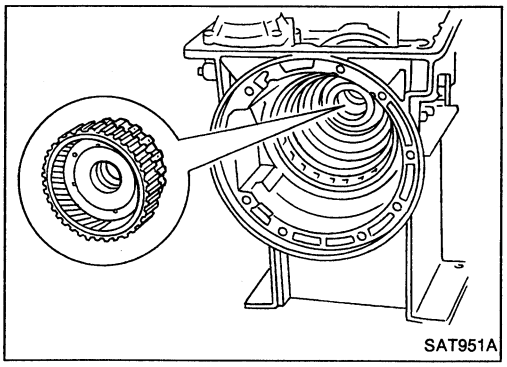


g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.

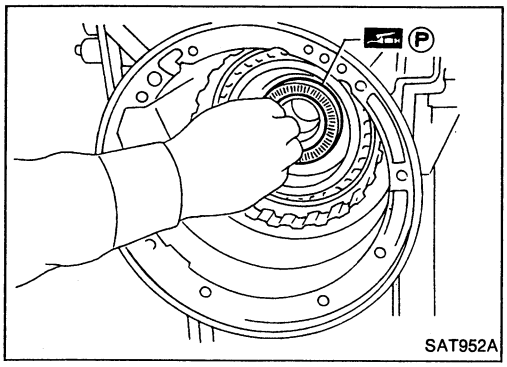


h. Place transmission case into horizontal position.

Assembly (1) (Cont'd)


SAT951A

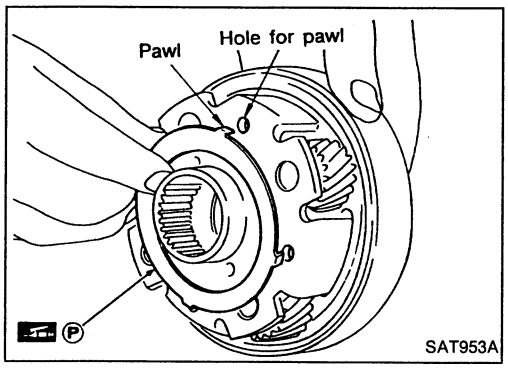
i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.



SAT952A

j. Install needle bearing onto rear internal gear.

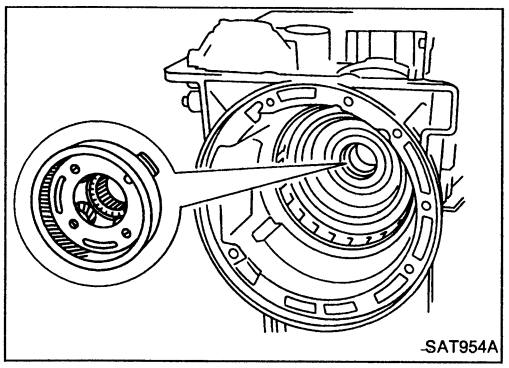
- **Apply petroleum jelly to needle bearing.**



SAT953A

k. Install bearing race onto rear of front internal gear.

- **Apply petroleum jelly to bearing race.**
- **Securely engage pawls of bearing race with holes in front internal gear.**


SAT954A

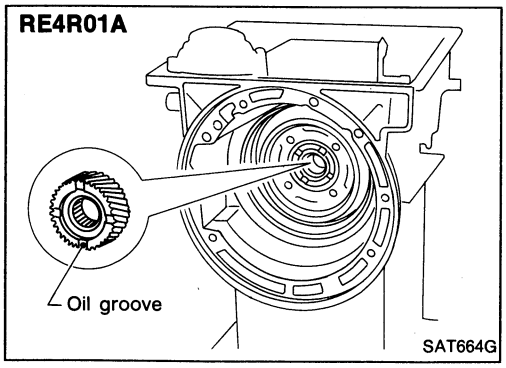
l. Install front internal gear on transmission case.

Adjustment

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	●	●
Low one-way clutch inner race	●	●
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	—	●

RE4R01A

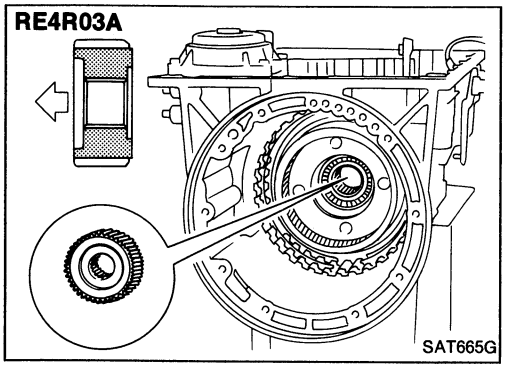


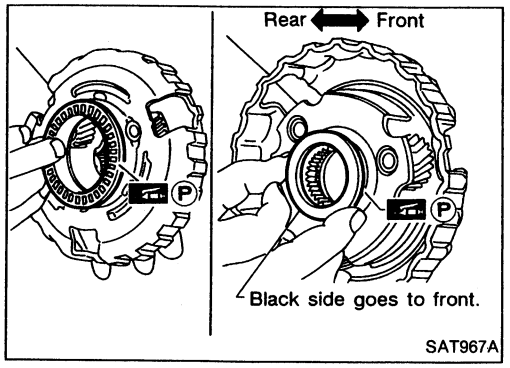
1. Install front side clutch and gear components.

a. Install rear sun gear on transmission case.

- **Pay attention to its direction.**

RE4R03A





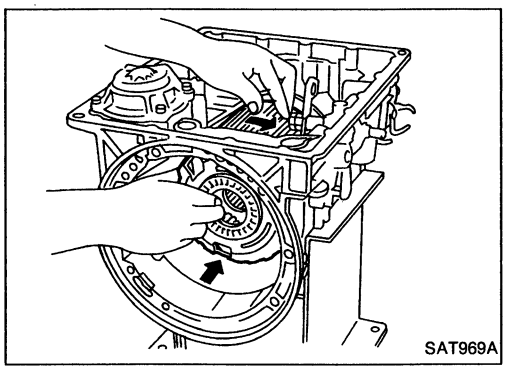
b. Install needle bearing on front of front planetary carrier.

- **Apply petroleum jelly to needle bearing.**

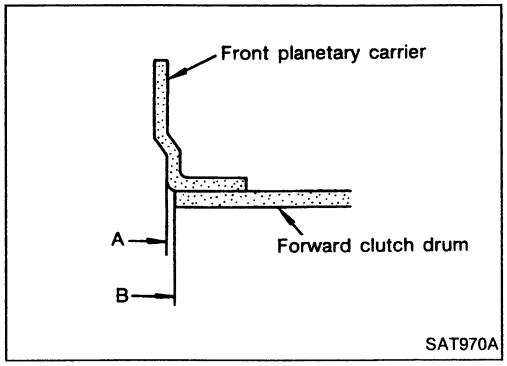
c. Install needle bearing on rear of front planetary carrier.

- **Apply petroleum jelly to bearing.**
- **Pay attention to its direction — Black side goes to front.**

Adjustment (Cont'd)

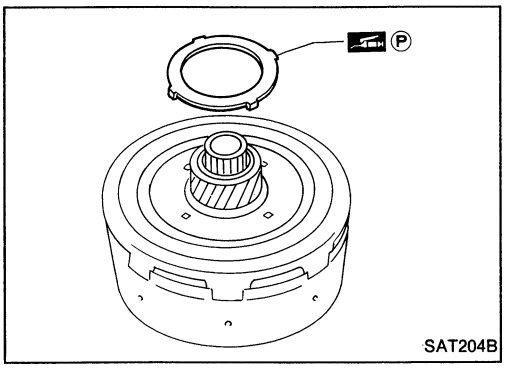

SAT969A

d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.

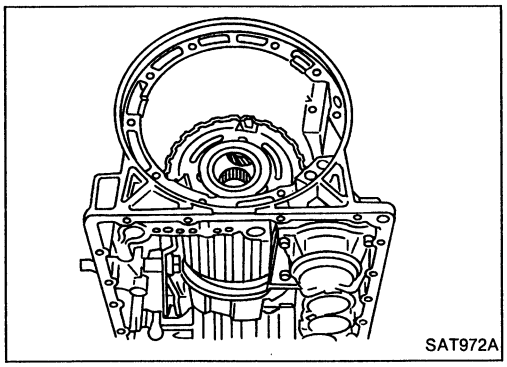


SAT970A

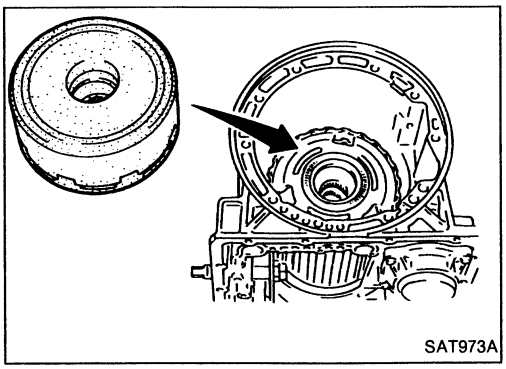
- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly. (RE4R01A only)**


SAT204B

e. Install bearing race (RE4R01A) or needle bearing (RE4R03A) on rear of clutch pack.
- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing race with hole in clutch pack.**

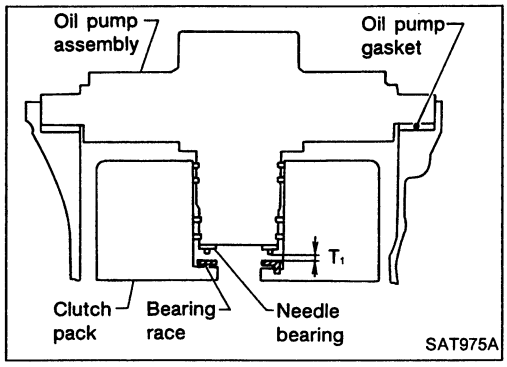

SAT972A

f. Place transmission case in vertical position.

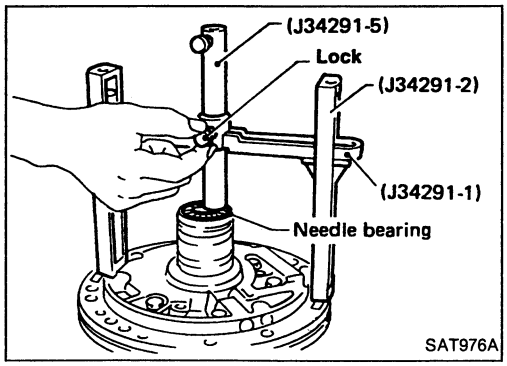

SAT973A

g. Install clutch pack into transmission case.

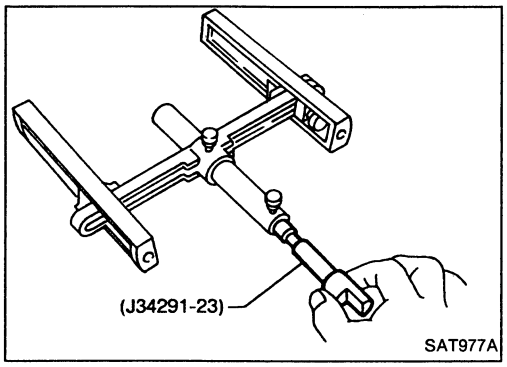
Adjustment (Cont'd)



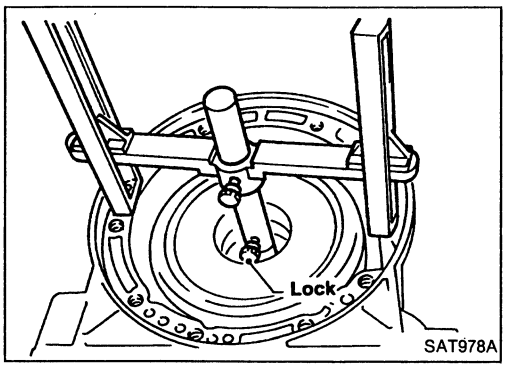
2. Adjust total end play.
   Total end play "T_1":
   0.25 - 0.55 mm (0.0098 - 0.0217 in)



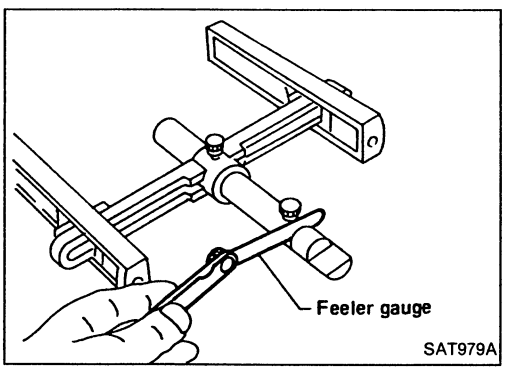
a. With needle bearing installed, place J34291-1 (bridge), J34291-2 (legs) and the J34291-5 (gauging cylinder) onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly and gauging cylinder should rest on top of the needle bearing. Lock gauging cylinder in place with set screw.



b. Install J34291-23 (gauging plunger) into gauging cylinder.



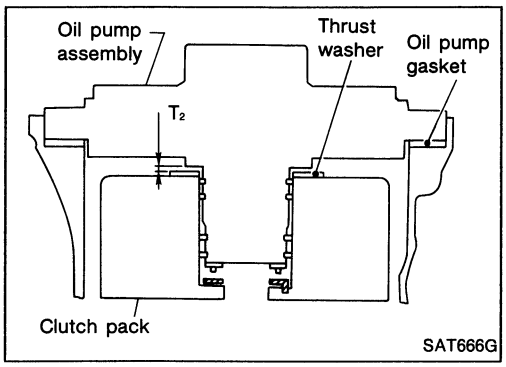
c. With original bearing race installed inside reverse clutch drum, place shim selecting gauge with its legs on machined surface of transmission case (no gasket) and allow gauging plunger to rest on bearing race. Lock gauging plunger in place with set screw.



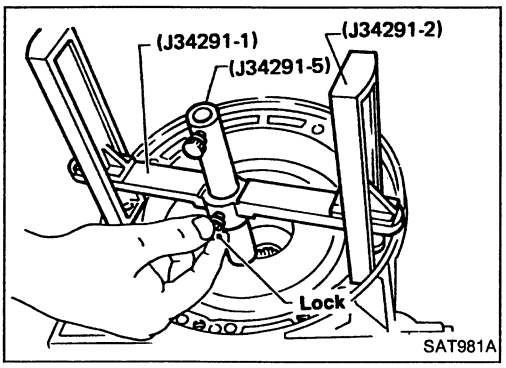
d. Remove Tool and use feeler gauge to measure gap between gauging cylinder and gauging plunger. This measurement should give exact total end play.
   Total end play "T_1":
   0.25 - 0.55 mm (0.0098 - 0.0217 in)

- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.
  Available oil pump cover bearing race:
  Refer to S.D.S.

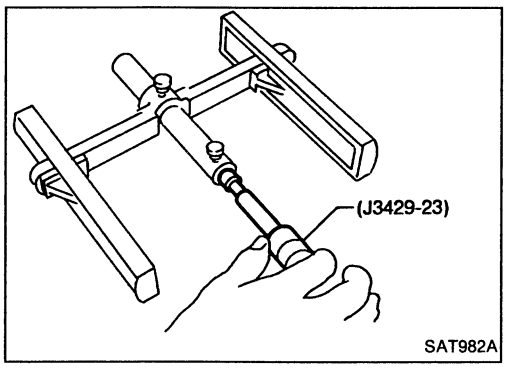
Adjustment (Cont'd)



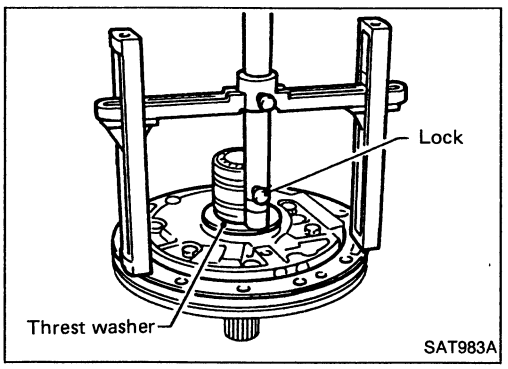
3. Adjust reverse clutch drum end play.
   Reverse clutch drum end play "T_2":
   0.55 - 0.90 mm (0.0217 - 0.0354 in)



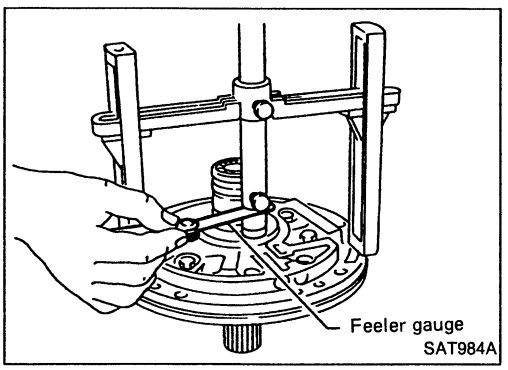
a. Place J34291-1 (bridge), J34291-2 (legs) and J34291-5 (gauging cylinder) on machined surface of transmission case (no gasket) and allow gauging cylinder to rest on front thrust surface of reverse clutch drum. Lock cylinder in place with set screw.



b. Install J34291-23 (gauging plunger) into gauging cylinder.

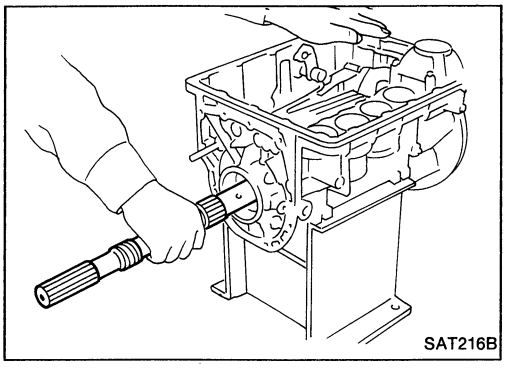


c. With original thrust washer installed on oil pump, place shim setting gauge legs onto machined surface of oil pump assembly and allow gauging plunger to rest on thrust washer. Lock plunger in place with set screw.



d. Use feeler gauge to measure gap between gauging plunger and gauging cylinder. This measurement should give you exact reverse clutch drum and play.
   Reverse clutch drum end play "T_2":
   0.55 - 0.90 mm (0.0217 - 0.0354 in)

- If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.
  Available oil pump thrust washer:
  Refer to S.D.S.

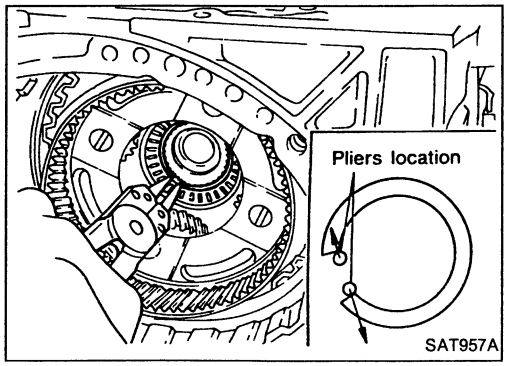

SAT216B

Assembly (2)

1. Install output shaft and parking gear.

a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.

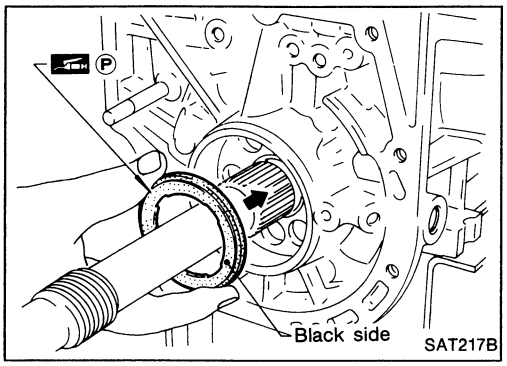
- **Do not force output shaft against front of transmission case.**



SAT957A

b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.

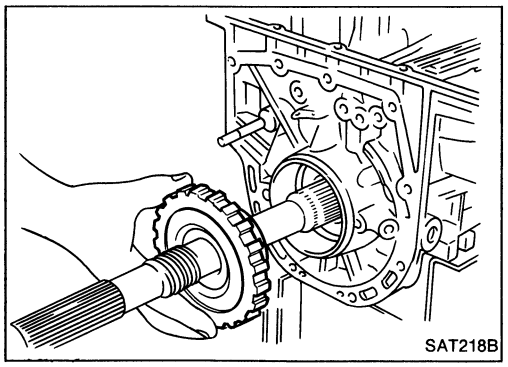
- **Check to be sure output shaft cannot be removed in rear direction.**



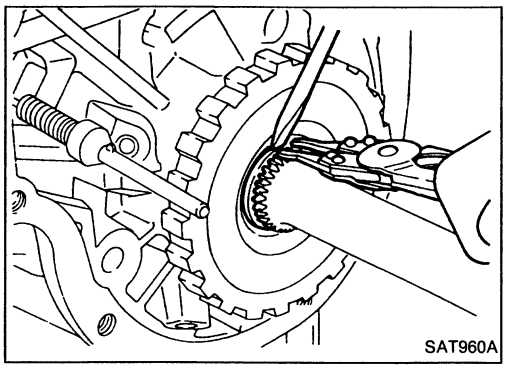
SAT217B

c. Install needle bearing on transmission case.

- **Pay attention to its direction — Black side goes to rear.**
- **Apply petroleum jelly to needle bearing.**


SAT218B

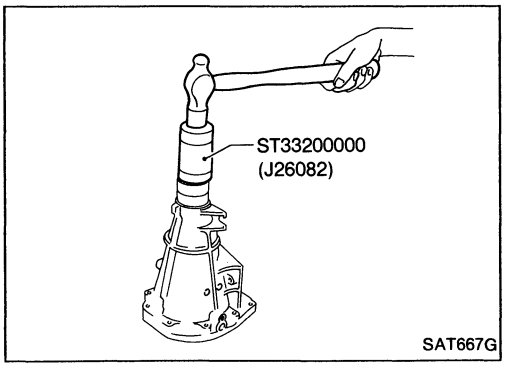
d. Install parking gear on transmission case.


SAT960A

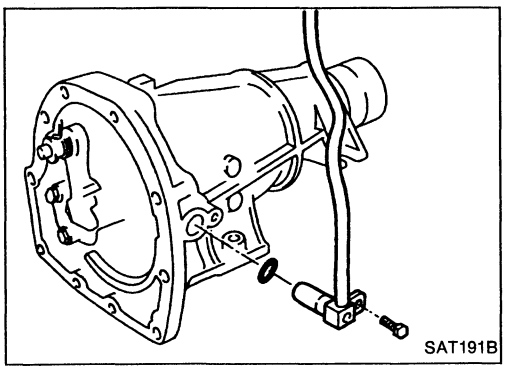
e. Install snap ring on rear of output shaft.

- **Check to be sure output shaft cannot be removed in forward direction.**

Assembly (2) (Cont'd)

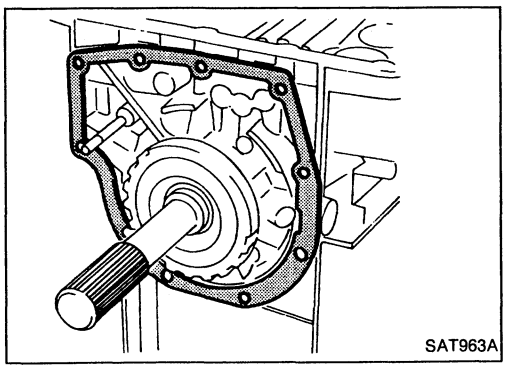


2. Install rear extension.
a. Install oil seal on rear extension.
- **Apply A.T.F. to oil seal.**

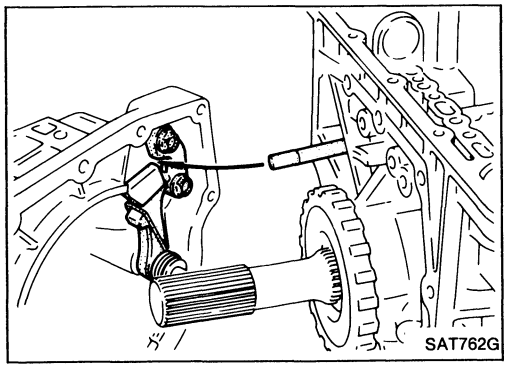


b. Install O-ring on revolution sensor.
- **Apply A.T.F. to O-ring.**

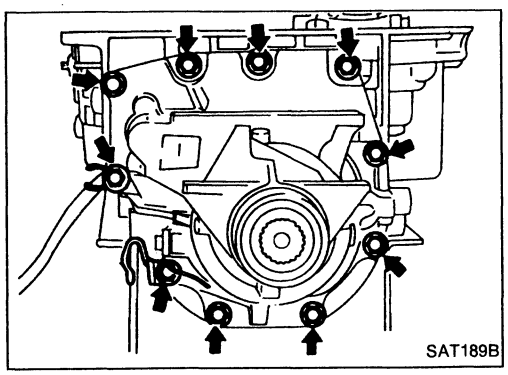
c. Install revolution sensor on rear extension.



d. Install rear extension gasket on transmission case.

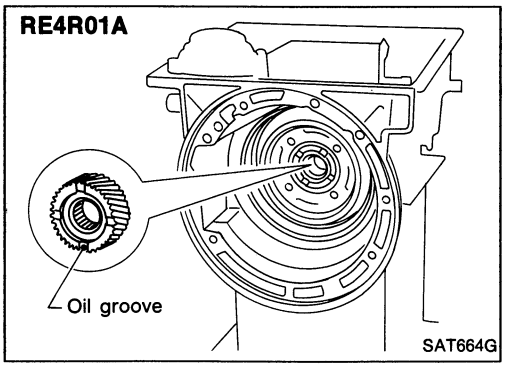


e. Install parking rod on transmission case.



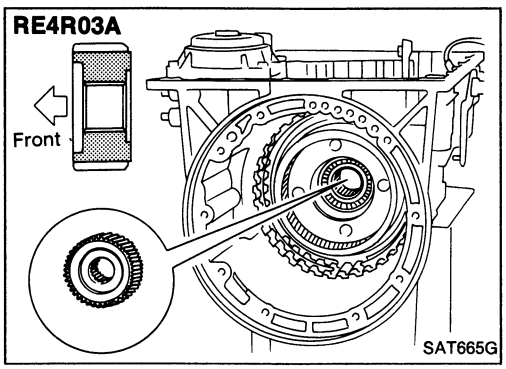
f. Install rear extension on transmission case.

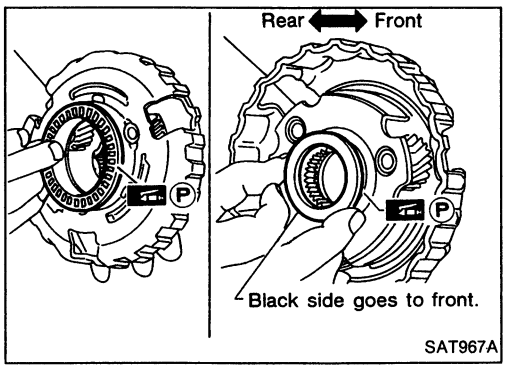
Assembly (2) (Cont'd)



3. Install front side clutch and gear components.
a. Install rear sun gear on transmission case.

- **Pay attention to its direction.**



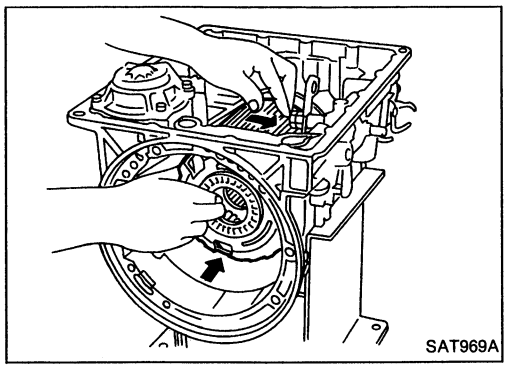


b. Make sure needle bearing is on front of front planetary carrier.

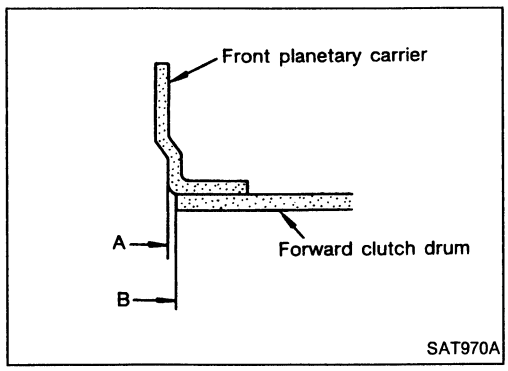
- **Apply petroleum jelly to needle bearing.**

c. Make sure needle bearing is on rear of front planetary carrier.

- **Apply petroleum jelly to bearing.**
- **Pay attention to its direction — Black side goes to front.**

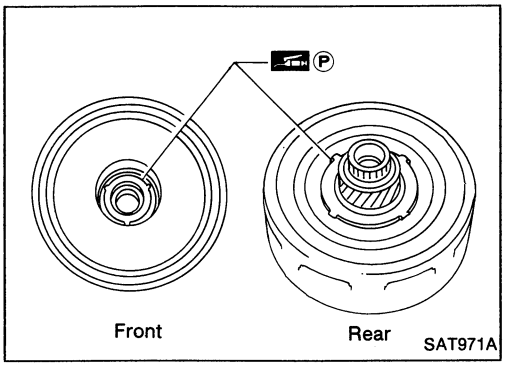


d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



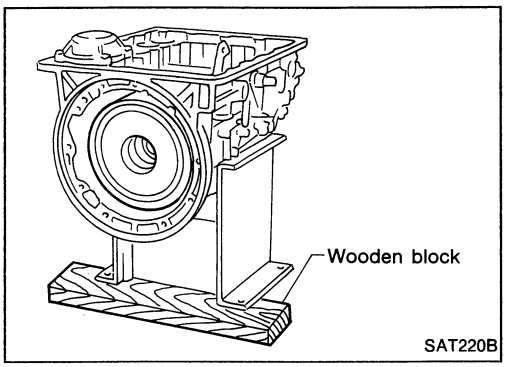
- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly. (RE4R01A only)**

Assembly (2) (Cont'd)

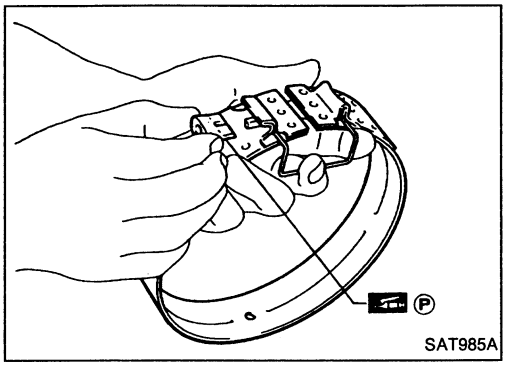


e. Make sure bearing race (RE4R01A) or needle bearing (RE4R03A) are on front and rear of clutch pack.

- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing races with holes in clutch pack.**



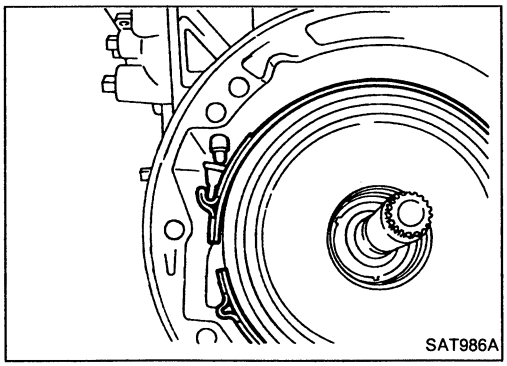
f. Install clutch pack into transmission case.



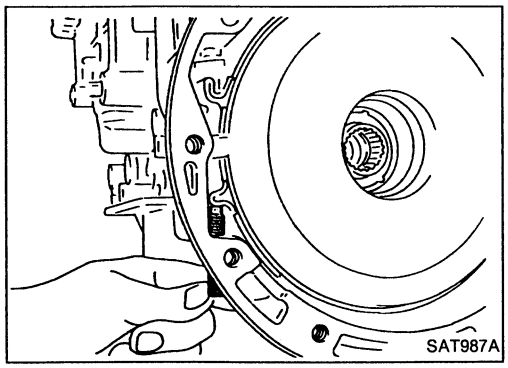
4. Install brake band and band strut.

a. Install band strut on brake band.

- **Apply petroleum jelly to band strut.**

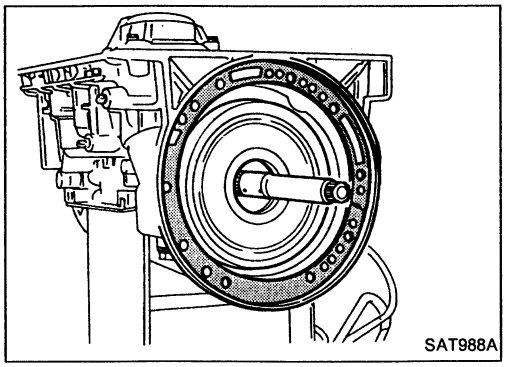


b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.

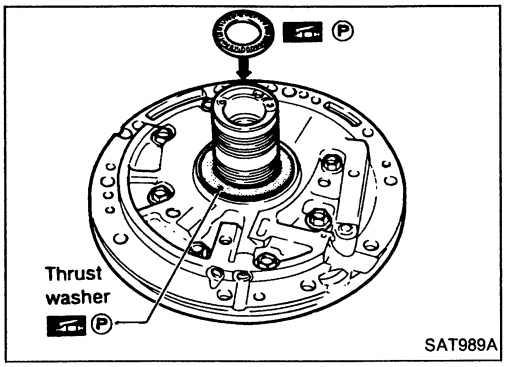


c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.

Assembly (2) (Cont'd)

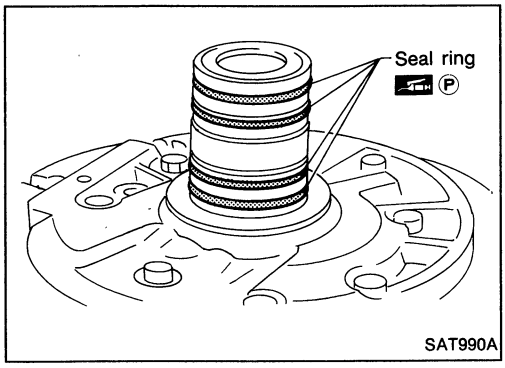

SAT988A

5. Install input shaft on transmission case.
- **Pay attention to its direction — O-ring groove side is front.**
6. Install gasket on transmission case.



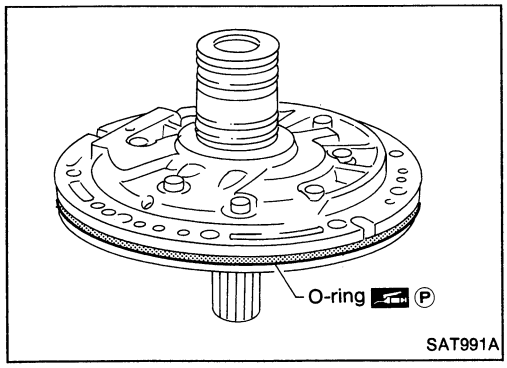
SAT989A

7. Install oil pump assembly.
a. Install needle bearing on oil pump assembly.
- **Apply petroleum jelly to the needle bearing.**
b. Install selected thrust washer on oil pump assembly.
- **Apply petroleum jelly to thrust washer.**



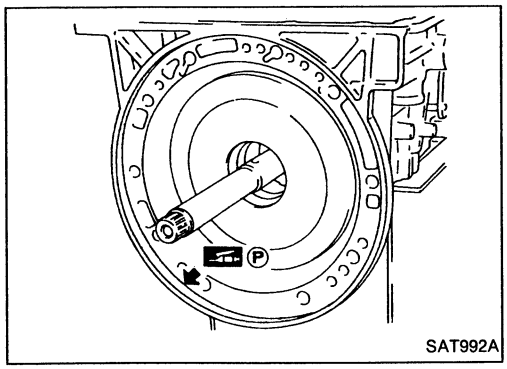
SAT990A

c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.



SAT991A

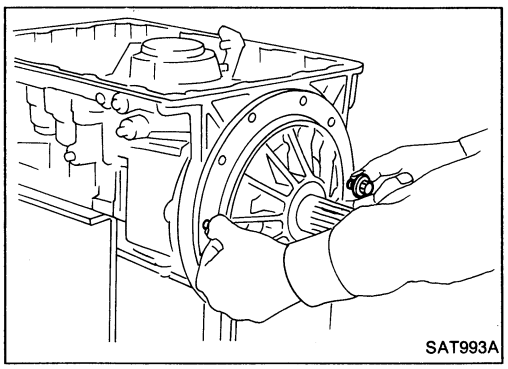
d. Install O-ring on oil pump assembly.
- **Apply petroleum jelly to O-ring.**



SAT992A

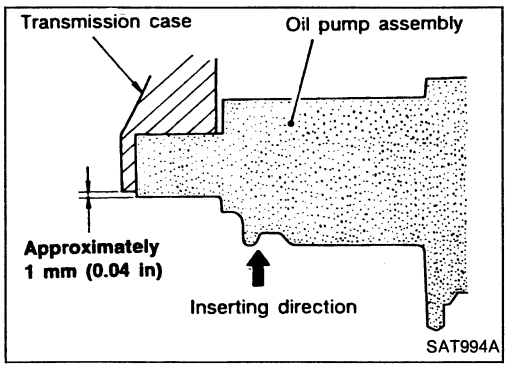
e. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.

Assembly (2) (Cont'd)

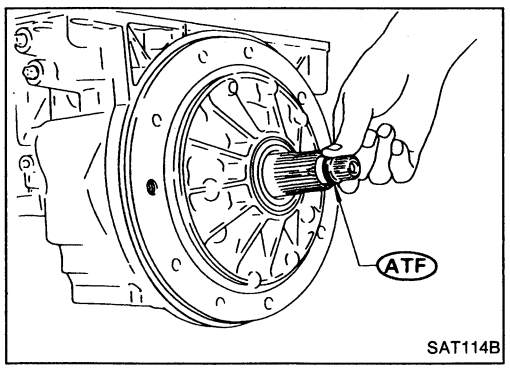


f. Install oil pump assembly.

- **Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.**

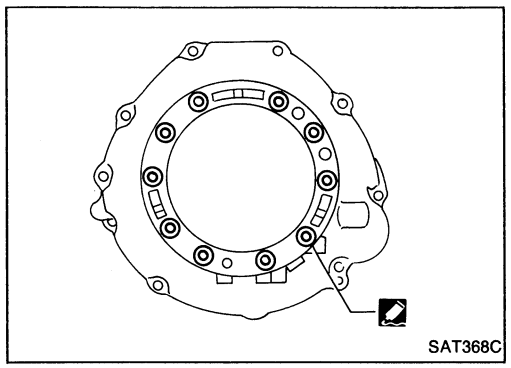


- **Insert oil pump assembly to the specified position in transmission, as shown at left.**



8. Install O-ring on input shaft.

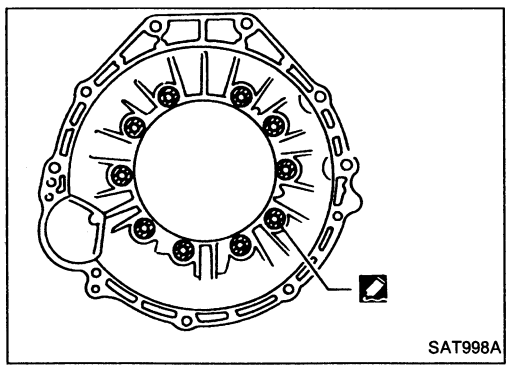
- **Apply A.T.F. to O-rings.**



9. Install converter housing.

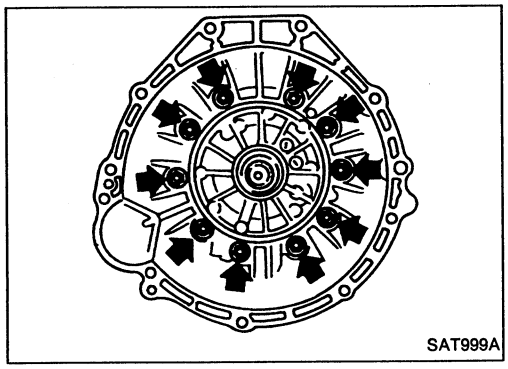
a. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.

- **Do not apply too much sealant.**

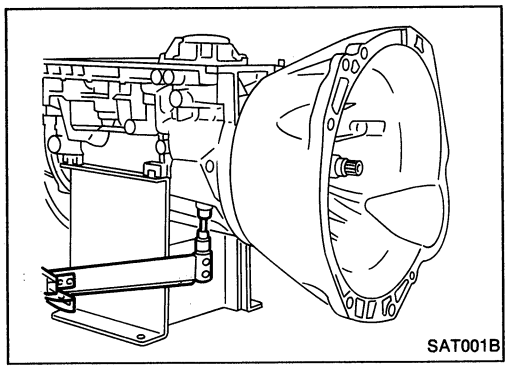


b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.

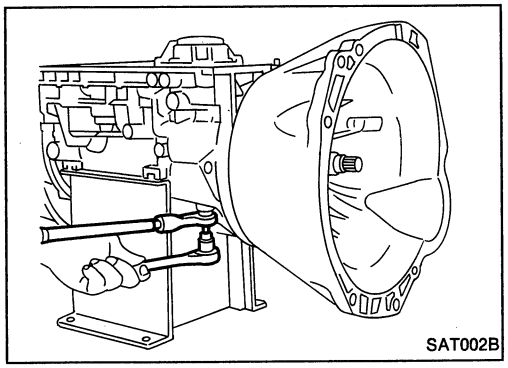
Assembly (2) (Cont'd)


SAT999A

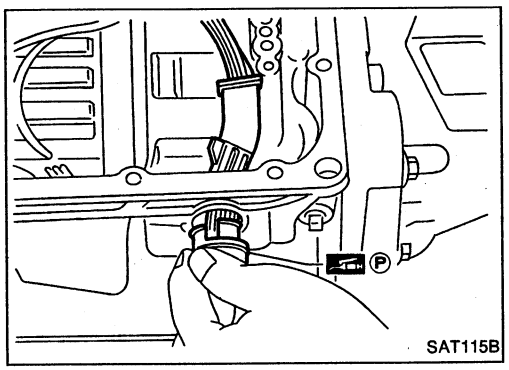
c. Install converter housing on transmission case.


SAT001B

10. Adjust brake band.
a. Tighten anchor end bolt to specified torque.
Anchor end bolt:
(O): 4 - 6 N·m
(0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)
b. Back off anchor end bolt two and a half turns.

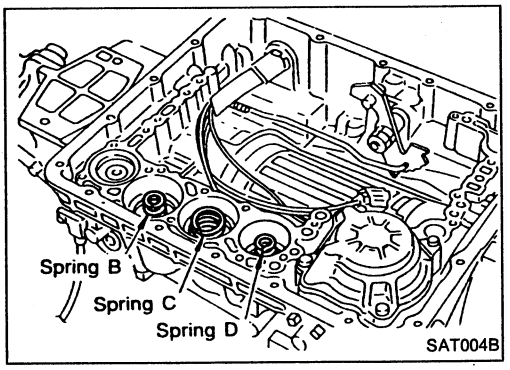

SAT002B

c. While holding anchor end pin, tighten lock nut.


SAT115B

11. Install terminal cord assembly.
a. Install O-ring on terminal cord assembly.
- **Apply petroleum jelly to O-ring.**

b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.



SAT004B

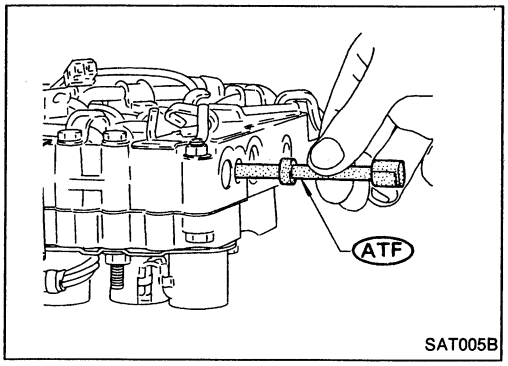
12. Install control valve assembly.
a. Install accumulator piston return springs B, C and D.

Free length of return springs:

Unit: mm (in)

Accumulator	B	C	D
Free length	66 (2.60)	45 (1.77)	58.4 (2.299)

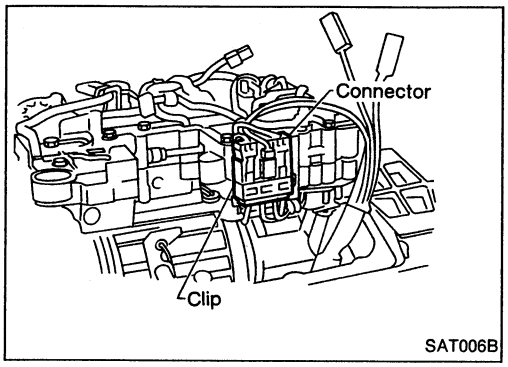
Assembly (2) (Cont'd)



SAT005B

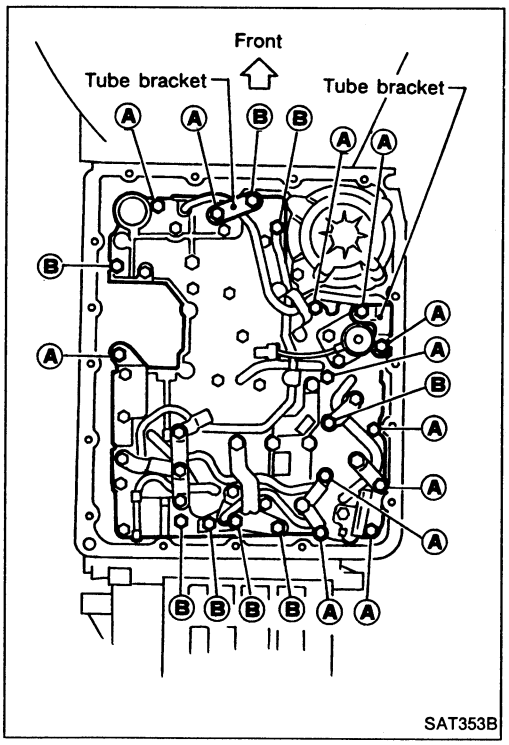
b. Install manual valve on control valve.

- **Apply A.T.F. to manual valve.**



SAT006B

c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
d. Install connector clip.

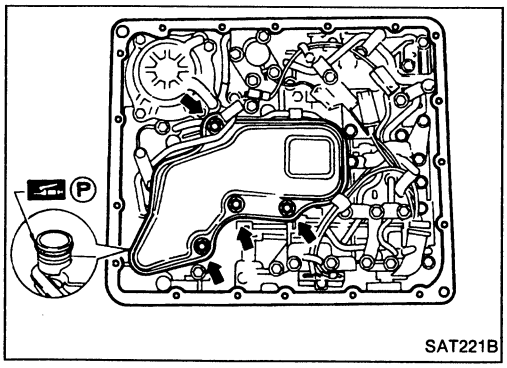


SAT353B

e. Install control valve assembly on transmission case.
f. Install connector tube brackets and tighten bolts Ⓐ and Ⓑ.

- **Check that terminal assembly harness does not catch.**

Bolt symbol	ℓ mm (in) ℓ
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)



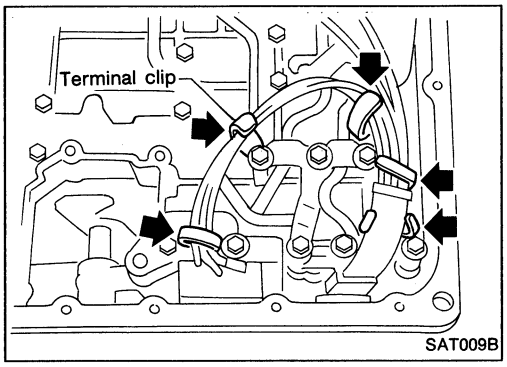
SAT221B

g. Install O-ring on oil strainer.

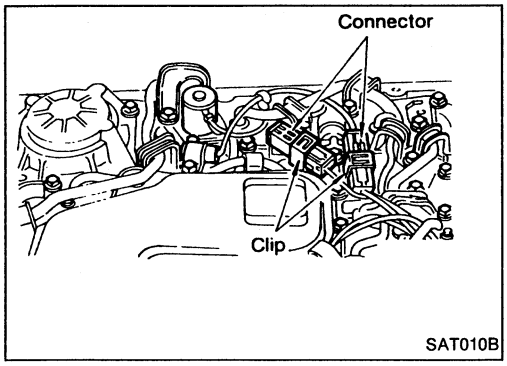
- **Apply petroleum jelly to O-ring.**

h. Install oil strainer on control valve.

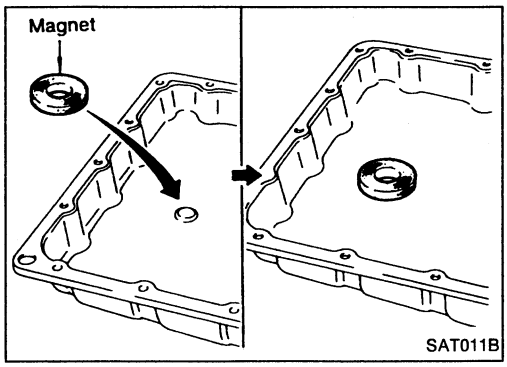
Assembly (2) (Cont'd)



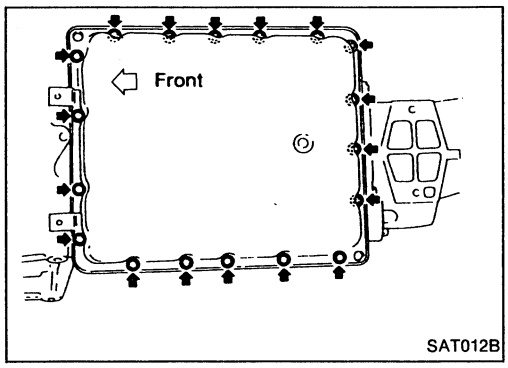
i. Securely fasten terminal harness with clips.



j. Install torque converter clutch solenoid valve and fluid temperature sensor connectors.

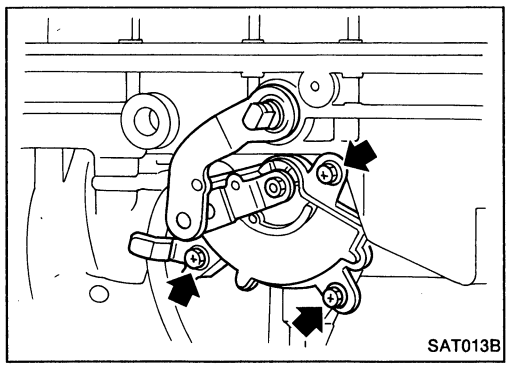


13. Install oil pan.
a. Attach a magnet to oil pan.



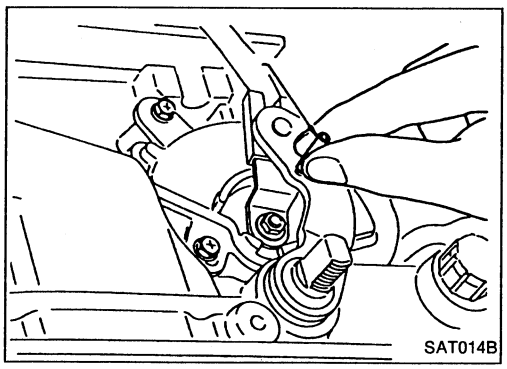
b. Install oil pan gasket on transmission case.
c. Install oil pan and bracket on transmission case.

- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

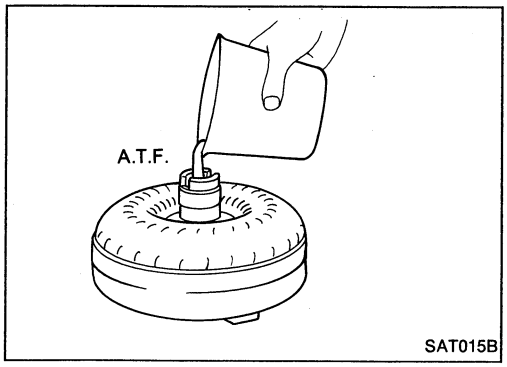


14. Install inhibitor switch.
a. Check that manual shaft is in "1" position.
b. Temporarily install inhibitor switch on manual shaft.
c. Move manual shaft to "N".

Assembly (2) (Cont'd)



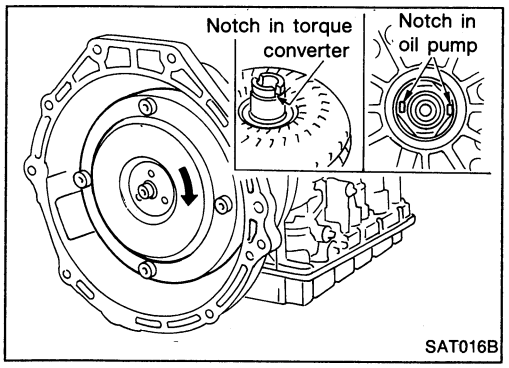
d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.



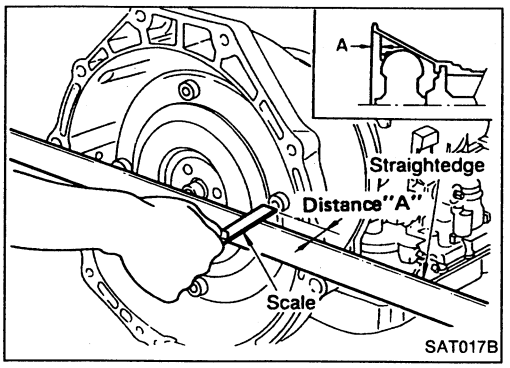
15. Install torque converter.

a. Pour A.T.F. into torque converter.

- **Approximately 2 liters (2-1/8 US qt, 1-3/4 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 and oil pump.



c. Measure distance A to check that torque converter is in proper position.

Distance "A":

RE4R01A

26.0 mm (1.024 in) or more

RE4R03A

25.0 mm (0.984 in) or more

General Specifications

Engine	VG30DE	VG30DETT
Automatic transmission model	RE4R01A	RE4R03A
Transmission model code number	45 x 65	51 x 08
Stall torque ratio	2.0 : 1	
Transmission gear ratio		
1st	2.785	2.784
2nd	1.545	1.544
Top	1.000	1.000
O.D.	0.694	0.694
Reverse	2.272	2.275
Recommended oil	Genuine Nissan ATF or equivalent Type DEXRON™II	
Oil capacity ℓ (US qt, Imp qt)	8.3 (8-3/4, 7-1/4)	8.2 (8-5/8, 7-1/4)

Specifications and Adjustment — RE4R01A

VEHICLE SPEED WHEN SHIFTING GEARS

Throttle position	Vehicle speed km/h (MPH)					
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$
Full throttle	60 - 64 (37 - 40)	107 - 115 (66 - 71)	166 - 176 (103 - 109)	161 - 169 (100 - 105)	96 - 104 (60 - 65)	44 - 48 (27 - 30)
Half throttle	45 - 49 (28 - 30)	83 - 89 (52 - 55)	119 - 127 (74 - 79)	80 - 88 (50 - 55)	33 - 39 (21 - 24)	10 - 14 (6 - 9)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Throttle position	O.D. switch [Shift position]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D_4]	167 - 175 (104 - 109)	161 - 169 (100 - 105)
	OFF [D_3]	107 - 115 (66 - 71)	96 - 104 (60 - 65)
Half throttle	ON [D_4]	120 - 128 (75 - 80)	84 - 92 (52 - 57)
	OFF [D_3]	91 - 99 (57 - 62)	86 - 94 (53 - 58)

STALL REVOLUTION

Stall revolution rpm
2,450 - 2,650

LINE PRESSURE

Engine speed rpm	Line pressure kPa (kg/cm², psi)	
	D, 2 and 1 positions	R position
Idle	422 - 461 (4.3 - 4.7, 61 - 67)	667 - 706 (6.8 - 7.2, 97 - 102)
Stall	1,020 - 1,098 (10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.5 - 15.3, 206 - 218)

Specifications and Adjustment — RE4R01A (Cont'd)

RETURN SPRINGS

Unit: mm (in)

Parts			Part No.	Free length	Outer diameter
Control valve	Upper body	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)
		Pressure regulator valve spring	31742-41X24	44.02 (1.7331)	14.0 (0.551)
		Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
		Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
		4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
		4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
		Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
		Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)
		Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
		Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
		Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)
	Lower body	Modifier accumulator piston spring	31742-27X70	31.4 (1.236)	9.8 (0.386)
		1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
		3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
		Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)
Reverse clutch		16 pcs	31505-41X02	19.69 (0.7752)	11.6 (0.457)
High clutch		16 pcs	31505-21X03	22.06 (0.8685)	11.6 (0.457)
Forward clutch (Overrun clutch)		20 pcs	31505-41X01	35.77 (1.4083)	9.7 (0.382)
Low & reverse brake		18 pcs	31521-21X00	23.7 (0.933)	11.6 (0.457)
Band servo		Spring A	31605-41X05	45.6 (1.795)	34.3 (1.350)
		Spring B	31605-41X00	53.8 (2.118)	40.3 (1.587)
		Spring C	31605-41X01	29.7 (1.169)	27.6 (1.087)
Accumulator		Accumulator A	31605-41X02	43.0 (1.693)	—
		Accumulator B	31605-41X10	66.0 (2.598)	—
		Accumulator C	31605-41X09	45.0 (1.772)	—
		Accumulator D	31605-41X06	58.4 (2.299)	—

Specifications and Adjustment — RE4R01A (Cont'd)

ACCUMULATOR O-RINGS

Accumulator	Diameter mm (in)			
	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

CLUTCHES AND BRAKES

Reverse clutch

Number of drive plates	2
Number of driven plates	2
Thickness of drive plate 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
	4.6 (0.181)	31537-21X00
	4.8 (0.189)	31537-21X01
	5.0 (0.197)	31537-21X02
	5.2 (0.205)	31537-21X03
	5.4 (0.213)	31537-21X04
	5.6 (0.220)	31567-21X13
	5.8 (0.228)	31567-21X14

High clutch

Number of drive plates	5
Number of driven plates	5
Thickness of drive plate mm (in)	
Standard	1.6 (0.063)
Wear limit	1.4 (0.055)
Clearance mm (in)	
Standard	1.8 - 2.2 (0.071 - 0.087)
Allowable limit	3.2 (0.126)

Thickness of retaining plate	Thickness mm (in)	Part number
	3.4 (0.134)	31537-41X71
	3.6 (0.142)	31537-41X61
	3.8 (0.150)	31537-41X62
	4.0 (0.157)	31537-41X63
	4.2 (0.165)	31537-41X64
	4.4 (0.173)	31537-41X65
	4.6 (0.181)	31537-41X66
	4.8 (0.189)	31537-41X67

Forward clutch

Number of drive plates	7
Number of driven plates	7
Thickness of drive plate mm (in)	
Standard	1.6 (0.063)
Wear limit	1.4 (0.055)
Clearance mm (in)	
Standard	0.45 - 0.85 (0.0177 - 0.0335)
Allowable limit	2.25 (0.0886)

Thickness of retaining plate	Thickness mm (in)	Part number
	4.0 (0.157)	31537-41X07
	4.2 (0.165)	31537-41X08
	4.4 (0.173)	31537-41X09
	4.6 (0.181)	31537-41X10
	4.8 (0.189)	31537-41X11
	5.0 (0.197)	31567-41X12
	5.2 (0.205)	31567-41X13

Overrun clutch

Number of drive plates	3
Number of driven plates	5
Thickness of drive plate mm (in)	
Standard	2.0 (0.079)
Wear limit	1.8 (0.071)
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
	4.0 (0.157)	31537-41X79
	4.2 (0.165)	31537-41X80
	4.4 (0.173)	31537-41X81
	4.6 (0.181)	31537-41X82
	4.8 (0.189)	31537-41X83
	5.0 (0.197)	31537-41X84
	5.2 (0.205)	31537-41X20

Specifications and Adjustment — RE4R01A (Cont'd)

Low & reverse brake		
Number of drive plates	7	
Number of driven plates	9	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	0.7 - 1.1 (0.028 - 0.043)	
Allowable limit	2.9 (0.114)	
Thickness of retaining plate	Thickness mm (in)	Part number
	7.2 (0.283)	31667-41X13
	7.4 (0.291)	31667-41X14
	7.6 (0.299)	31667-41X07
	7.8 (0.307)	31667-41X08
	8.0 (0.315)	31667-41X00
	8.2 (0.323)	31667-41X01
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	

OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in)	
Cam ring — oil pump housing	
Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing	
Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

TOTAL END PLAY

Total end play "T_1"	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
Thickness of oil pump cover bearing race	Thickness mm (in)	Part number
	0.8 (0.031)	31429-21X00
	1.0 (0.039)	31429-21X01
	1.2 (0.047)	31429-21X02
	1.4 (0.055)	31429-21X03
	1.6 (0.063)	31429-21X04
	1.8 (0.071)	31429-21X05
	2.0 (0.079)	31429-21X06

REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T_2"	0.55 - 0.90 mm (0.0217 - 0.0354 in)	
Thickness of oil pump thrust washer	Thickness mm (in)	Part number
	0.7 (0.028)	31528-21X00
	0.9 (0.035)	31528-21X01
	1.1 (0.043)	31528-21X02
	1.3 (0.051)	31528-21X03
	1.5 (0.059)	31528-21X04
	1.7 (0.067)	31528-21X05
	1.9 (0.075)	31528-21X06

REMOVAL AND INSTALLATION

Manual control linkage	
Number of returning revolutions for lock nut	1
Lock nut tightening torque	29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
Distance between end of converter housing and torque converter	26.0 mm (1.024 in) or more
Drive plate runout limit	0.5 mm (0.020 in)

Specifications and Adjustment — RE4R03A

VEHICLE SPEED WHEN SHIFTING GEARS

Throttle position	Vehicle speed km/h (MPH)					
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$
Full throttle	68 - 72 (42 - 45)	120 - 128 (75 - 80)	183 - 193 (114 - 120)	177 - 187 (110 - 116)	109 - 117 (68 - 73)	33 - 37 (21 - 23)
Half throttle	47 - 51 (29 - 32)	89 - 95 (55 - 59)	136 - 144 (85 - 89)	78 - 86 (48 - 53)	28 - 34 (17 - 21)	10 - 14 (6 - 9)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Throttle position	O.D. switch [Shift position]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D_4]	184 - 192 (114 - 119)	178 - 186 (111 - 116)
	OFF [D_3]	120 - 128 (75 - 80)	109 - 117 (68 - 73)
Half throttle	ON [D_4]	184 - 192 (114 - 119)	117 - 125 (73 - 78)
	OFF [D_3]	88 - 96 (55 - 60)	74 - 82 (46 - 51)

STALL REVOLUTION

Stall revolution rpm
2,950 - 3,200

LINE PRESSURE

Engine speed rpm	Line pressure kPa (kg/cm^2, psi)	
	D, 2 and 1 positions	R position
Idle	422 - 461 (4.3 - 4.7, 61 - 67)	667 - 706 (6.8 - 7.2, 97 - 102)
Stall	1,020 - 1,098 (10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.5 - 15.3, 206 - 218)

Specifications and Adjustment — RE4R03A (Cont'd)

RETURN SPRINGS

Unit: mm (in)

Parts			Part No.	Free length	Outer diameter
Control valve	Upper body	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)
		Pressure regulator valve spring	31742-41X24	44.02 (1.7331)	14.0 (0.551)
		Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
		Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
		4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
		4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
		Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
		Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)
		Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
		Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
		Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)
	Lower body	Modifier accumulator piston spring	31742-27X70	31.4 (1.236)	9.8 (0.386)
		1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
		3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
		Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)
Reverse clutch		16 pcs	31505-51X00	37.8 (1.488)	14.8 (0.583)
High clutch		16 pcs	31505-21X03	22.06 (0.8685)	11.6 (0.457)
Forward clutch (Overrun clutch)		20 pcs	31505-51X04	36.8 (1.449)	9.8 (0.386)
Low & reverse brake		Inner 16 pcs	31505-51X06	20.43 (0.8043)	10.3 (0.406)
		Outer 16 pcs	31505-51X05	20.35 (0.8012)	13.0 (0.512)
Band servo		Spring A	31605-41X05	45.6 (1.795)	34.3 (1.350)
		Spring B	31605-41X00	53.8 (2.118)	40.3 (1.587)
		Spring C	31605-41X01	29.7 (1.169)	27.6 (1.087)
Accumulator		Accumulator A	31605-41X02	43.0 (1.693)	—
		Accumulator B	31605-41X10	66.0 (2.598)	—
		Accumulator C	31605-41X09	45.0 (1.772)	—
		Accumulator D	31605-41X06	58.4 (2.299)	—

Specifications and Adjustment — RE4R03A (Cont'd)

ACCUMULATOR O-RINGS

Accumulator	Diameter mm (in)			
	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

CLUTCHES AND BRAKES

Reverse clutch

Number of drive plates	3
Number of driven plates	3
Thickness of drive plate 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	1.4 (0.055)

Thickness of retaining plate	Thickness mm (in)	Part number
	4.4 (0.173)	31537-51X61
	4.6 (0.181)	31537-51X00
	4.8 (0.189)	31537-51X01
	5.0 (0.197)	31537-51X02

High clutch

Number of drive plates	7
Number of driven plates	7 + 1
Thickness of drive plate mm (in)	
Standard	1.6 (0.063)
Wear limit	1.4 (0.055)
Clearance mm (in)	
Standard	1.8 - 2.2 (0.071 - 0.087)
Allowable limit	3.0 (0.118)

Thickness of retaining plate	Thickness mm (in)	Part number
	4.0 (0.157)	31537-51X19
	4.2 (0.165)	31537-51X60
	4.4 (0.173)	31537-51X61
	4.6 (0.181)	31537-51X00
	4.8 (0.189)	31537-51X01
	5.0 (0.197)	31537-51X02

Forward clutch

Number of drive plates	8
Number of driven plates	8
Thickness of drive plate mm (in)	
Standard	2.0 (0.079)
Wear limit	1.8 (0.071)
Clearance mm (in)	
Standard	0.45 - 0.85 (0.0177 - 0.0335)
Allowable limit	2.45 (0.0965)

Thickness of retaining plate	Thickness mm (in)	Part number
	4.2 (0.165)	31537-51X67
	4.4 (0.173)	31537-51X05
	4.6 (0.181)	31537-51X06
	4.8 (0.189)	31537-51X07
	5.0 (0.197)	31537-51X08
	5.2 (0.205)	31537-51X09

Overrun clutch

Number of drive plates	4
Number of driven plates	7
Thickness of drive plate 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	2.2 (0.087)

Thickness of retaining plate	Thickness mm (in)	Part number
	3.8 (0.150)	31537-51X11
	4.0 (0.157)	31537-51X12
	4.2 (0.165)	31537-51X13
	4.4 (0.173)	31537-51X14
	4.6 (0.181)	31537-51X15
	4.8 (0.189)	31537-51X64

Specifications and Adjustment — RE4R03A (Cont'd)

Low & reverse brake		
Number of drive plates	2 + 6	
Number of driven plates	8	
Thickness of drive plate mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	0.9 - 1.2 (0.035 - 0.047)	
Allowable limit	3.1 (0.122)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.2 (0.165)	31667-51X10
	4.4 (0.173)	31667-51X00
	4.6 (0.181)	31667-51X01
	4.8 (0.189)	31667-51X02
	5.0 (0.197)	31667-51X03
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	

OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in)	
Cam ring — oil pump housing	
Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing	
Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

TOTAL END PLAY

Total end play "T_1"	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
Thickness of oil pump cover bearing race	Thickness mm (in)	Part number
	0.8 (0.031)	31429-21X00
	1.0 (0.039)	31429-21X01
	1.2 (0.047)	31429-21X02
	1.4 (0.055)	31429-21X03
	1.6 (0.063)	31429-21X04
	1.8 (0.071)	31429-21X05
	2.0 (0.079)	31429-21X06

REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T_2"	0.55 - 0.90 mm (0.0217 - 0.0354 in)	
Thickness of oil pump thrust washer	Thickness mm (in)	Part number
	0.7 (0.028)	31528-21X00
	0.9 (0.035)	31528-21X01
	1.1 (0.043)	31528-21X02
	1.3 (0.051)	31528-21X03
	1.5 (0.059)	31528-21X04
	1.7 (0.067)	31528-21X05
	1.9 (0.075)	31528-21X06

REMOVAL AND INSTALLATION

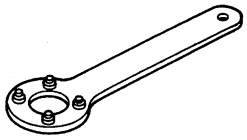
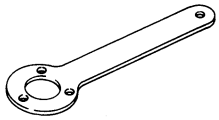
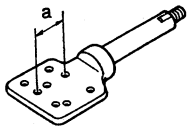
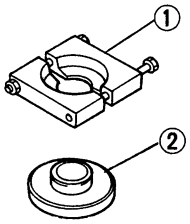
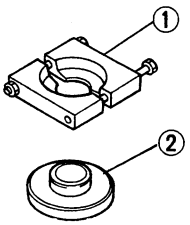
Manual control linkage	
Number of returning revolutions for lock nut	1
Lock nut tightening torque	29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
Distance between end of converter housing and torque converter	25.0 mm (0.984 in) or more
Drive plate runout limit	0.5 mm (0.020 in)

PROPELLER SHAFT & DIFFERENTIAL CARRIER

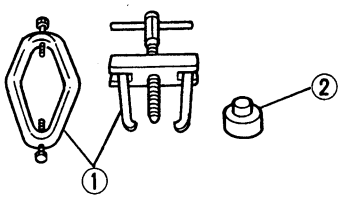
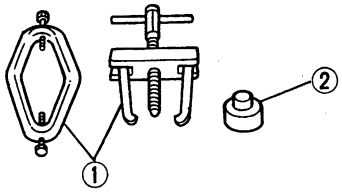
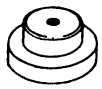
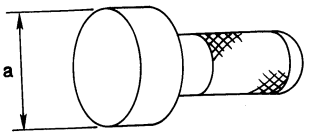
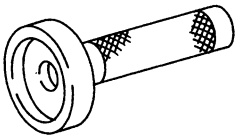
SECTION PD

CONTENTS

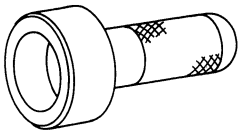
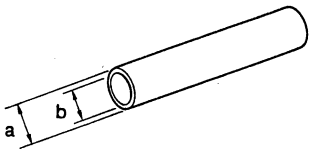
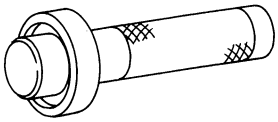
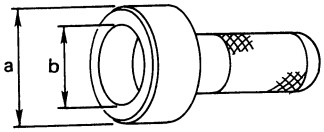
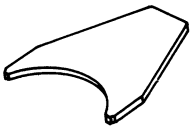
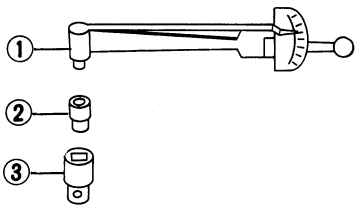
Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description		Unit application	
			R200V	R230V
ST38060002 (J34311) Drive pinion flange wrench		Removing and installing propeller shaft lock nut, and drive pinion lock nut. **Use two holes and propeller shaft connecting bolt to hold companion flange**	X	—
(—) Drive pinion flange wrench		Removing and installing propeller shaft lock nut, and drive pinion lock nut	—	X
KV38100800 (—) Equivalent tool (J25604-01) Differential attachment		Mounting final drive (To use, make a new hole.) **a: 156 mm (6.14 in) — R200V** **178 mm (7.01 in) — R230V**	X	X
ST3090S000 (—) Drive pinion rear inner race puller set ① ST30031000 (J22912-01) Puller ② ST30901000 (—) Equivalent tool (J26010-01) Base		Removing and installing drive pinion rear cone	X	—
ST3002S000 (—) Drive pinion rear inner race puller set ① ST30021000 (—) Puller ② ST30022000 (—) Base		Removing and installing drive pinion rear cone	—	X

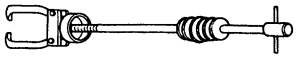
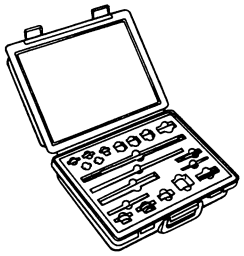
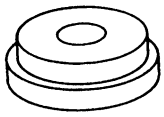
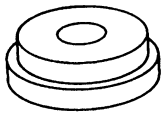
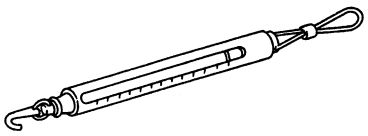
Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	Unit application R200V	Unit application R230V
ST3306S001 (—) Differential side bearing puller set ① ST33051001 (—) Equivalent tool (J22888) Body ② ST33061000 (J8107-2) Equivalent tool (J26010-01) Adapter	Removing and installing differential side bearing inner cone 	X	—
ST3306S001 (—) Differential side bearing puller set ① ST33051001 (—) Equivalent tool (J22888) Body ② (—) Adapter	Removing and installing differential side bearing inner cone 	—	X
ST30611000 (J25742-1) Drift	Installing pinion rear bearing outer race 	X	X
ST30613000 (J25742-3) Drift	Installing pinion front bearing outer race 	X	—
(—) Drift	Installing pinion front bearing outer race  a: 79 mm (3.11 in) dia.	—	X
KV38100200 (J26233) Oil seal drift	Installing side oil seal 	X	—

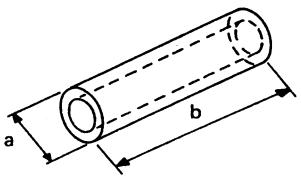
Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	Unit application R200V	Unit application R230V
KV38102510 (—) Oil seal drift	 Installing side oil seal	—	X
KV38100500 (—) Oil seal drift	 Installing front oil seal	X	—
(—) Oil seal drift	 Installing front oil seal **a: 85 mm (3.35 in) dia.** **b: 69 mm (2.72 in) dia.**	—	X
KV38100300 (J25523) Drift	 Installing side bearing inner cone	X	—
(—) Drift	 Installing side bearing inner cone **a: 64 mm (2.52 in) dia.** **b: 55.5 mm (2.185 in) dia.**	—	X
KV38100600 (J25267) Side bearing spacer drift	 Installing side bearing spacer	X	—
(—) Side bearing spacer drift	 Installing side bearing spacer	—	X
ST3127S000 (See J5765-A) Preload gauge ① GG91030000 (J25765) Torque wrench ② HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter	 Measuring pinion bearing preload and total preload	X	X

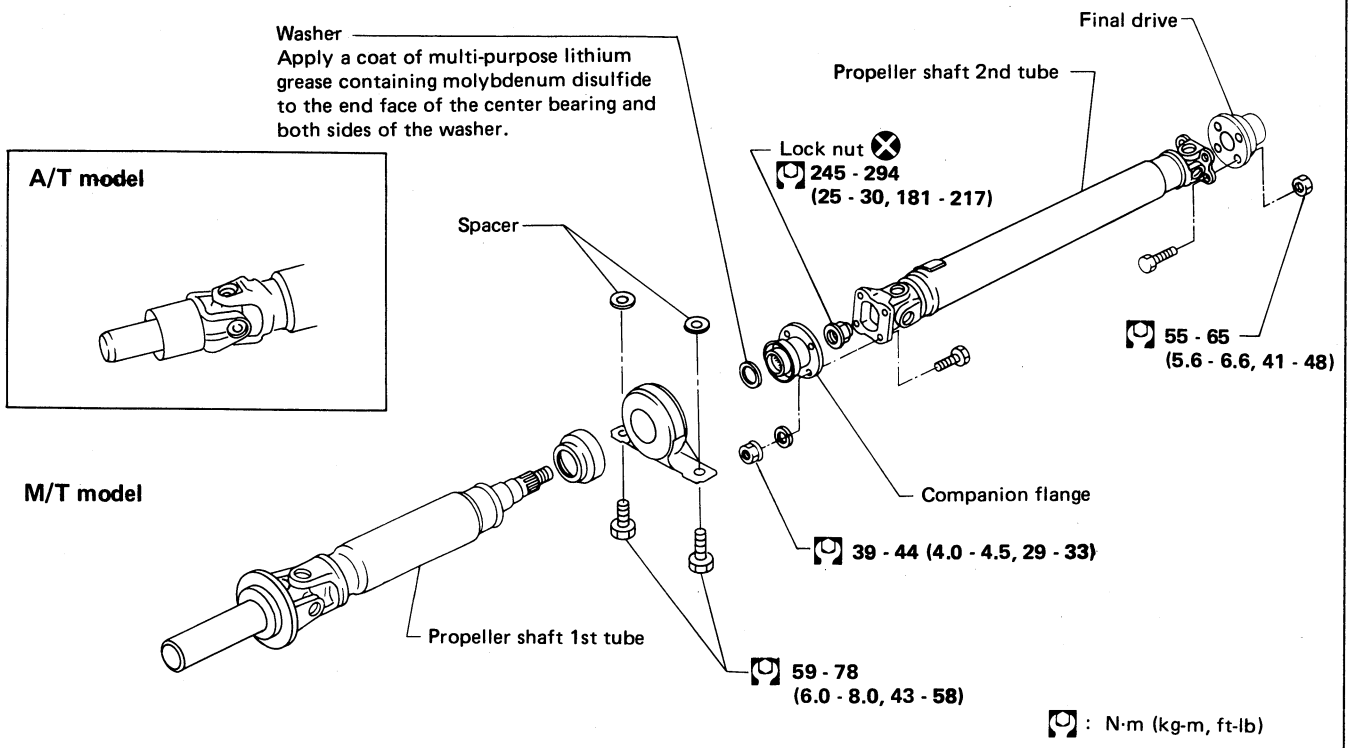
Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	Unit application R200V	Unit application R230V
HT72400000 (—) Slide hammer	 Removing differential case assembly	X	X
(J34309) Differential shim selector	 Adjusting bearing preload and gear height	X	—
(—) Differential shim selector	 Adjusting bearing preload and gear height	—	X
(J25269-4) Side bearing discs (2 Req'd)	 Selecting pinion height adjusting washer	X	—
(—) Side bearing discs (2 Req'd)	 Selecting pinion height adjusting washer	—	X
(J8129) Spring gauge	 Measuring carrier turning torque	X	X

Commercial Service Tool

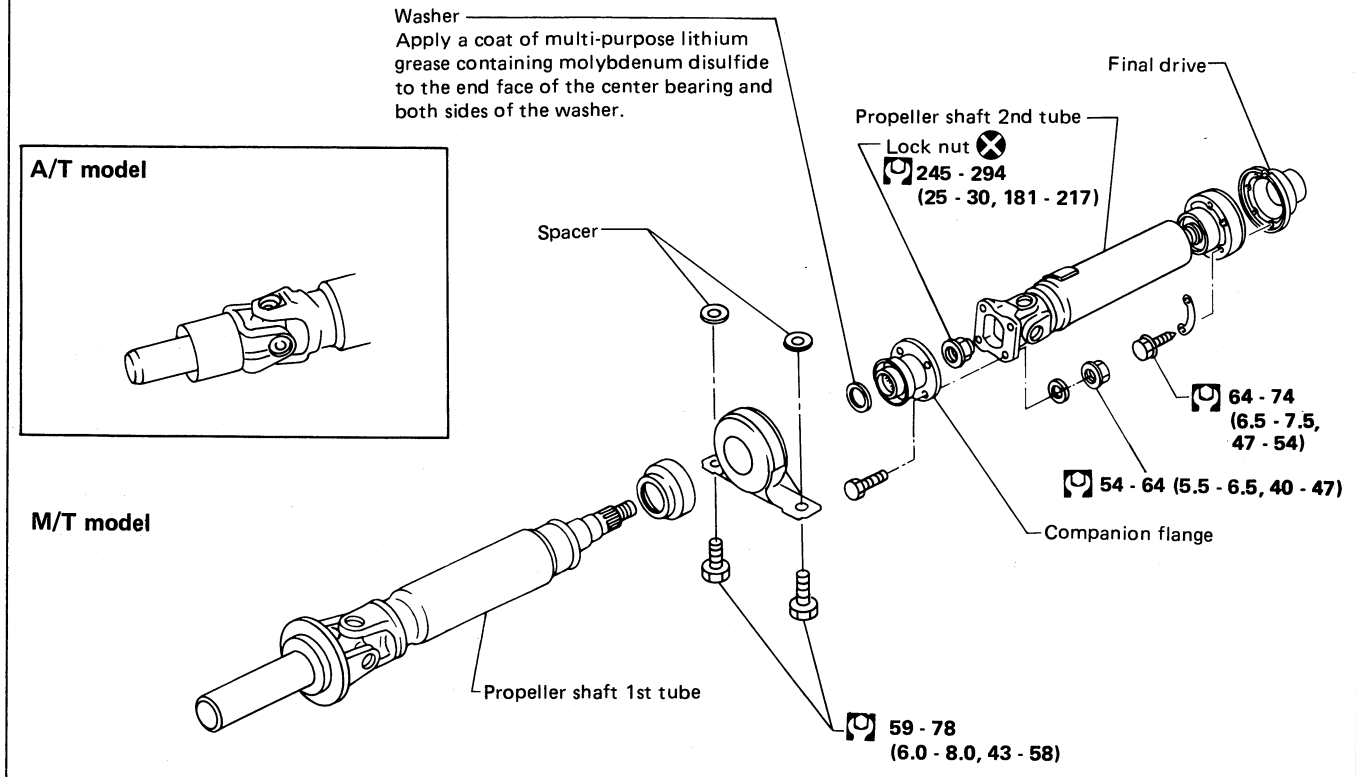
Tool name	Description	Unit application R200V	Unit application R230V
Drift	 Installing pinion rear bearing outer race **a: 89 mm (3.50 in) dia. — R200V** **99 mm (3.90 in) dia. — R230V** **b: 200 mm (7.87 in)**	X	X

3S71A

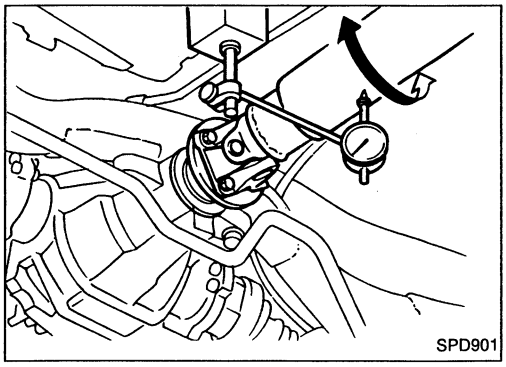


SPD107A

3S80A-VL107



SPD109A

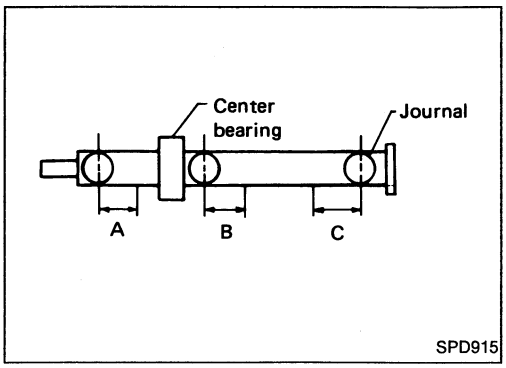

SPD901

On-vehicle Service

PROPELLER SHAFT VIBRATION

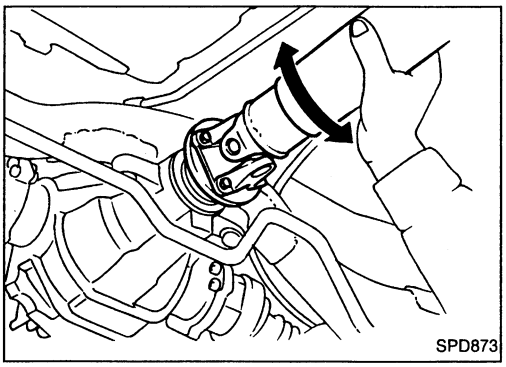
If vibration is present at high speed, inspect propeller shaft runout first.

1. Raise rear wheels.
2. Measure propeller shaft runout at indicated points by rotating final drive companion flange with hands.
   Runout limit: 0.6 mm (0.024 in)



SPD915

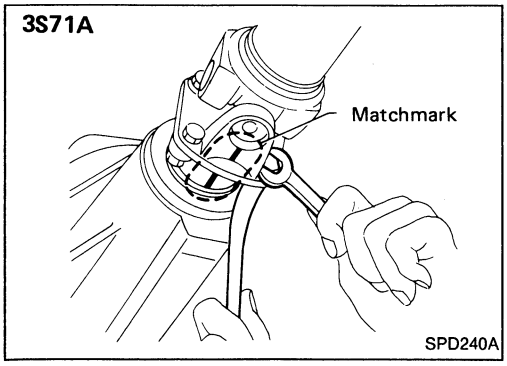
Propeller shaft runout measuring points:
Distance "A":
162 mm (6.38 in)
Distance "B":
3S71A : 172 mm (6.77 in)
3S80A-VL107: 200 mm (7.87 in)
Distance "C":
3S71A : 192 mm (7.56 in)
3S80A-VL107: 200 mm (7.87 in)


SPD873

3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange. Rotate companion flange 90° (3S71A) or 60° (3S80A-VL107), and reconnect propeller shaft and check runout.
   Repeat above operation when companion flange is rotated 180° (3S71A) or 120° (3S80A-VL107) and 270° (3S71A) or 180° (3S80A-VL107), respectively. Also, for 3S80A-VL107, the operation should be repeated at 240° and 300°. Securely connect propeller shaft at the point where the smallest runout of the three measurements occurs.
   Runout limit: 0.6 mm (0.024 in)
4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.

APPEARANCE CHECKING

- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.

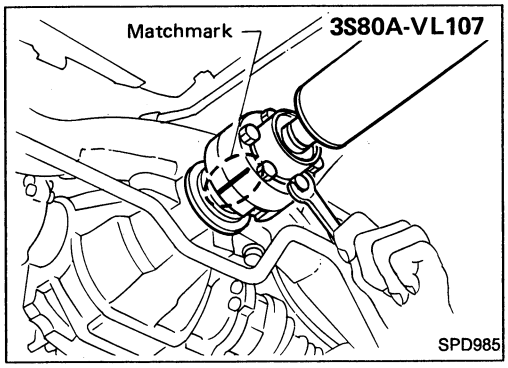


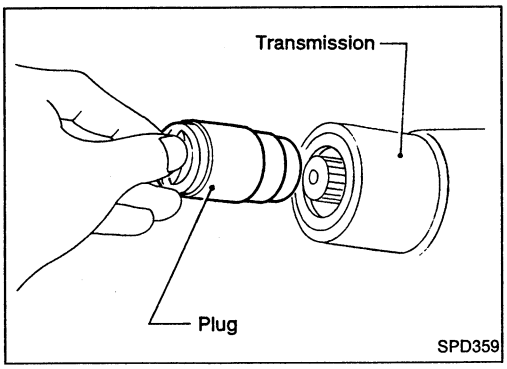
SPD240A

Removal

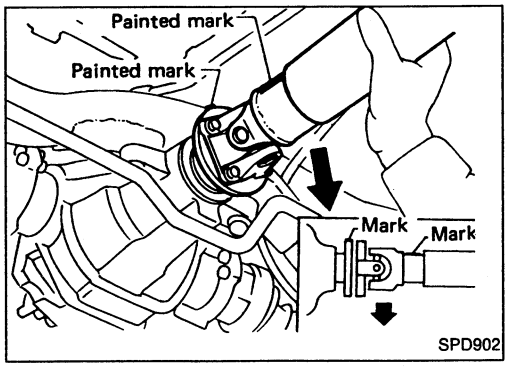
- Put matchmarks on flanges and separate propeller shaft from final drive.

Removal (Cont'd)



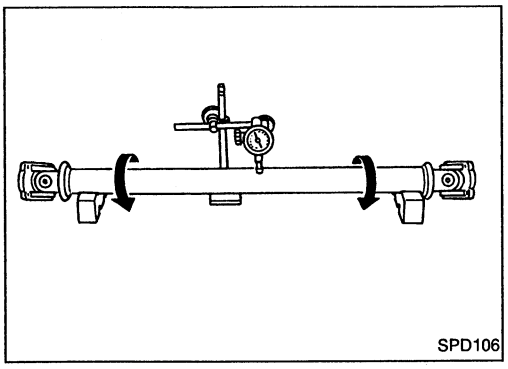


- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.



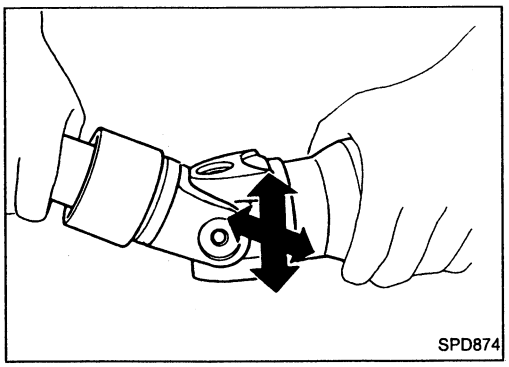
Installation

- Temporarily install differential companion flange and flange yoke so that their alignment marks are located as close to each other as possible.
- Turn propeller shaft until alignment marks face straight upward. Securely fasten propeller shaft so that lower side wall of concave flange yoke will touch lower side wall of convex companion flange.

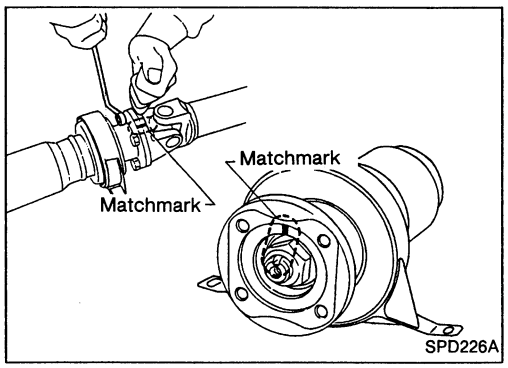


Inspection

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.
  Runout limit: 0.6 mm (0.024 in)



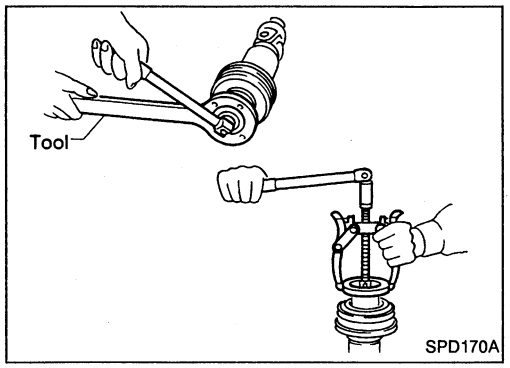
- Inspect journal axial play.
  If the play exceeds specifications, replace propeller shaft assembly.
  Journal axial play:
  0 mm (0 in)



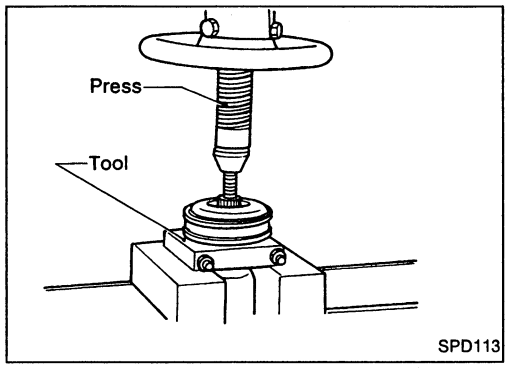
Disassembly

CENTER BEARING

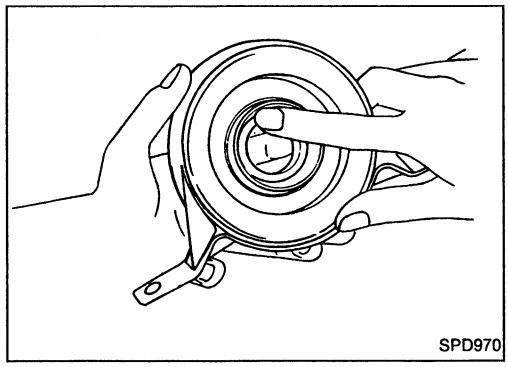
1. Put matchmarks on flanges, and separate 2nd tube from 1st tube.
2. Put matchmarks on the flange and shaft.



3. Remove locking nut with Tool.
   Tool number: ST38060002 (J34311)
4. Remove companion flange with puller.



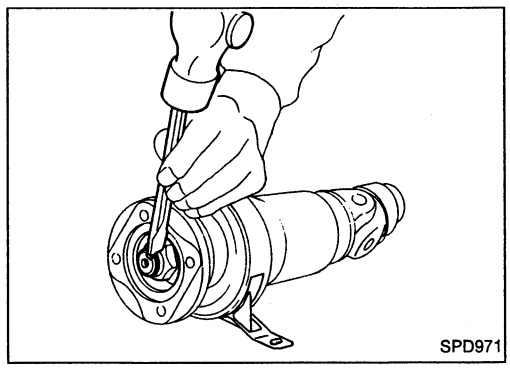
5. Remove center bearing with Tool and press.
   Tool number: ST30031000 (J22912-01)



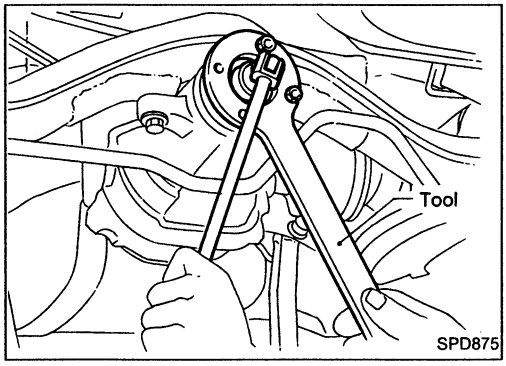
Assembly

CENTER BEARING

- Install center bearing with insulator's protrusion side facing front of vehicle.
- **Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.**



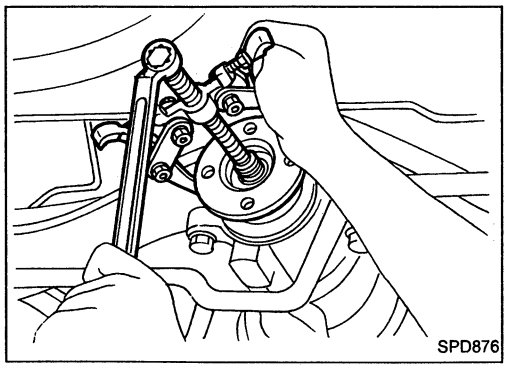
- Stake the nut. Always use new one.
- Align matchmarks when assembling tubes.



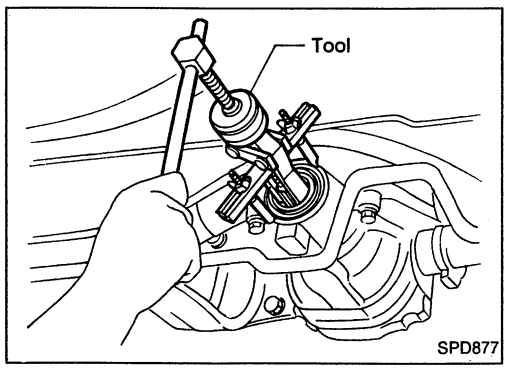
Front Oil Seal Replacement (R200V)

CAUTION:
For final drive models using collapsible spacer (R230V), bearing preload must be adjusted whenever companion flange is removed. In order to do this adjustment correctly, final drive overhaul is required.

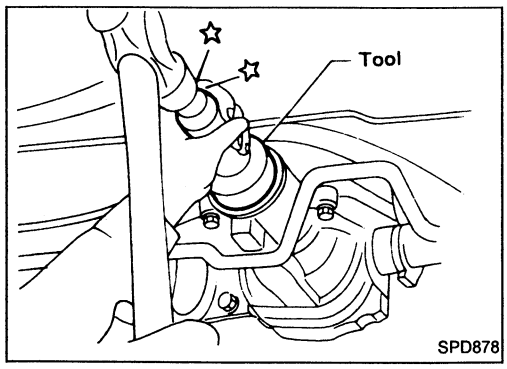
1. Remove propeller shaft.
2. Loosen drive pinion nut with Tool.
   Tool number: ST38060002 (J34311)



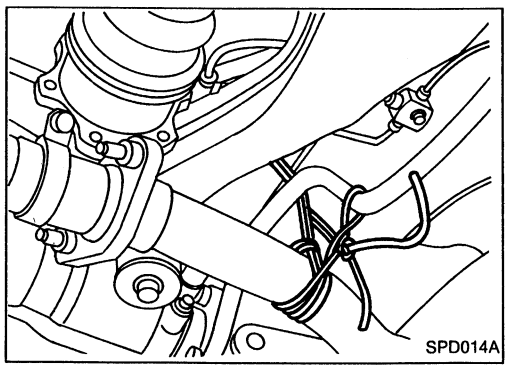
3. Remove companion flange.



4. Remove front oil seal.



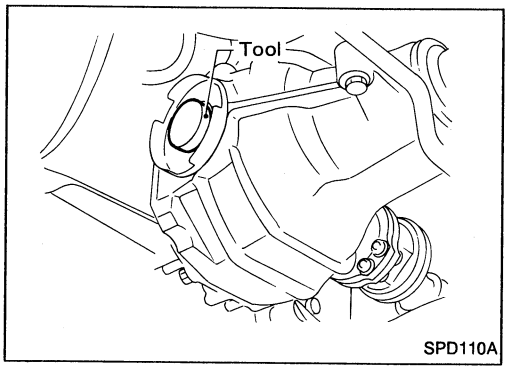
5. Apply multi-purpose grease to sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.



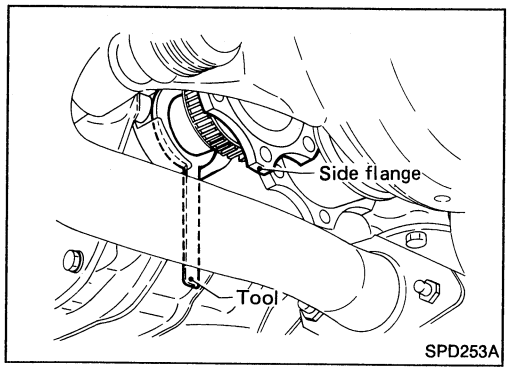
Side Oil Seal Replacement

1. For L.H. side, remove drive shaft. For details, refer to section RA. For R.H. side, disconnect final drive side flange and drive shaft flange, and suspend drive shaft flange with wire.
2. Remove final drive side flange.
3. Remove oil seal.

Side Oil Seal Replacement (Cont'd)



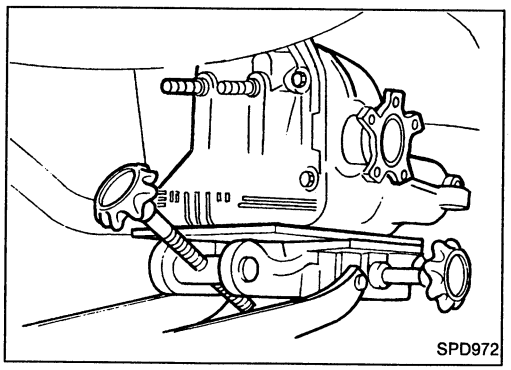
4. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.
   Tool number:
   KV38100200 (J26233) — R200V —
   (—) — R230V —



5. Install final drive side flange.

Use Tool to prevent side oil seal from being damaged by spline portion of side flange.
   Tool number:
   KV38107900 (J39352) — R200V —
   KV38108000 (J39351) — R230V —

6. Install drive shaft.



Removal

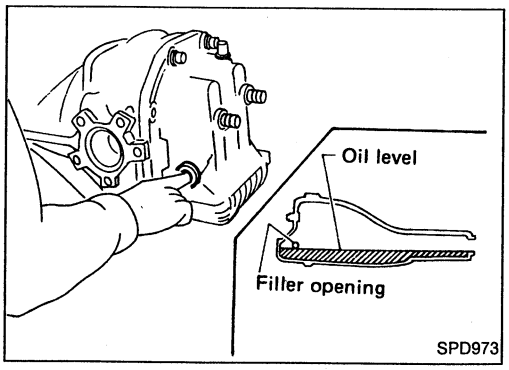
- Remove exhaust tube.
- Remove propeller shaft.

Plug up rear end of transmission rear extension housing.

- Remove drive shafts.
  Refer to RA section.
- Remove nuts securing final drive rear cove to suspension member.
- Support weight of final drive using jack.
- Remove final drive mounting member from front of final drive.
- Move final drive forward together with jack. Remove rear cover stud bolts from suspension member.
- Lower final drive using jack. Remove jack from rear of vehicle.

CAUTION:

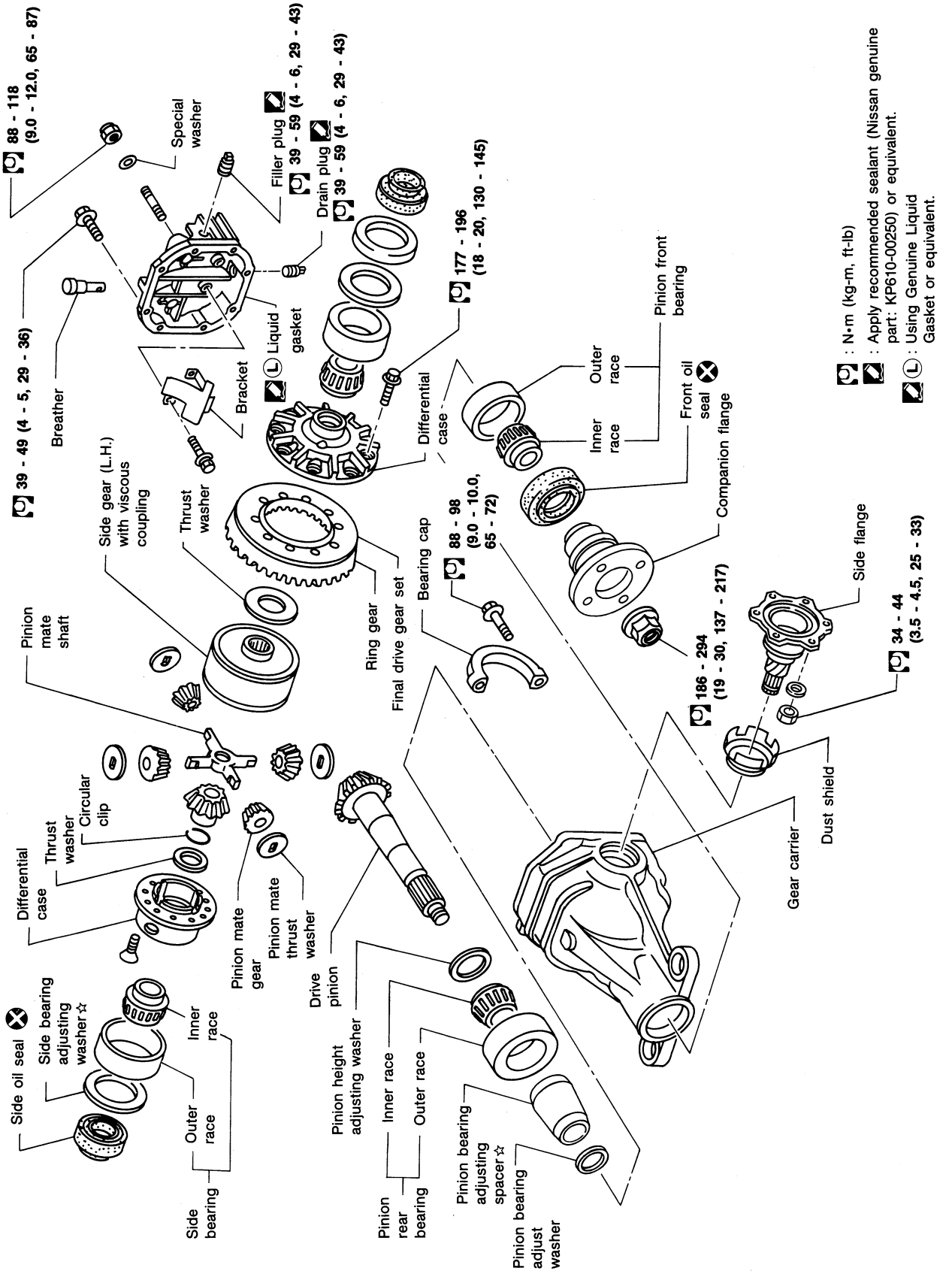
- **Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.**
- **After final drive is removed, support suspension member on a stand to prevent its insulators from being twisted or damaged.**



Installation

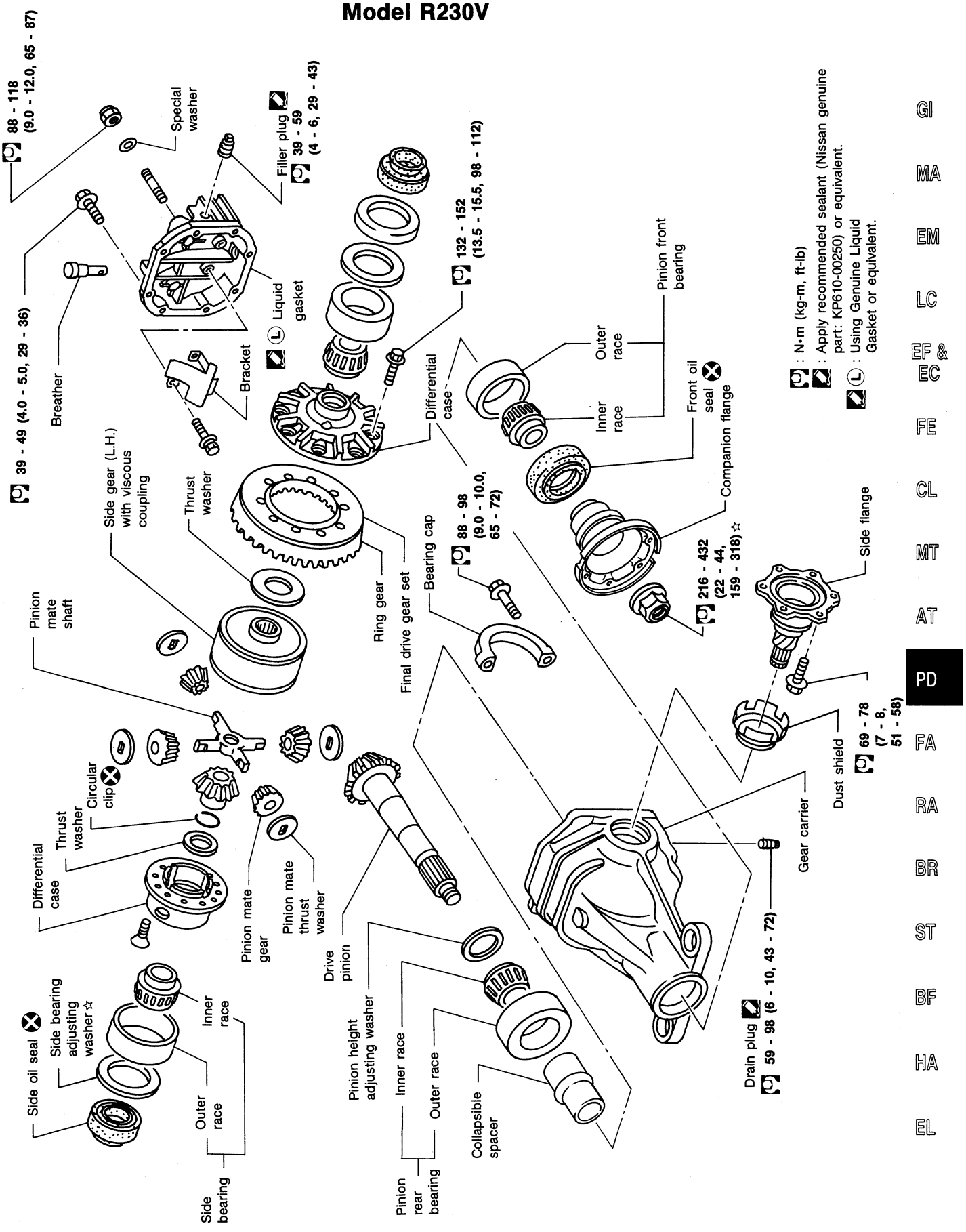
- Fill final drive with recommended gear oil.

Model R200V

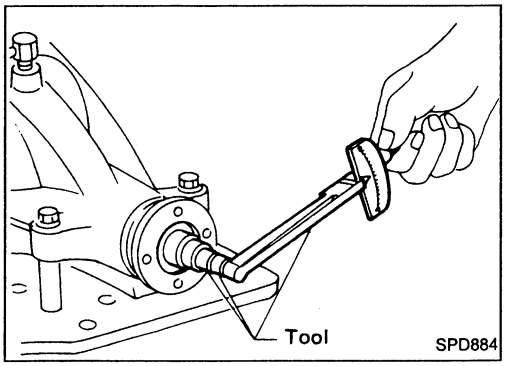


SPD243A

Model R230V



SPD244A

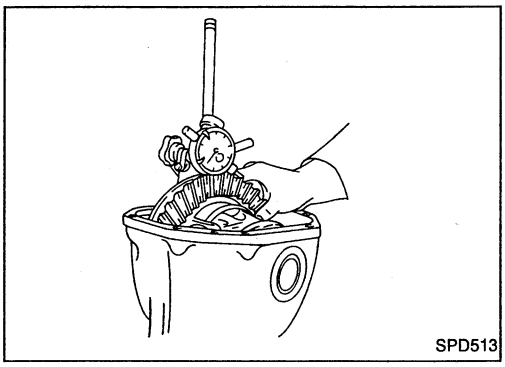


Pre-inspection

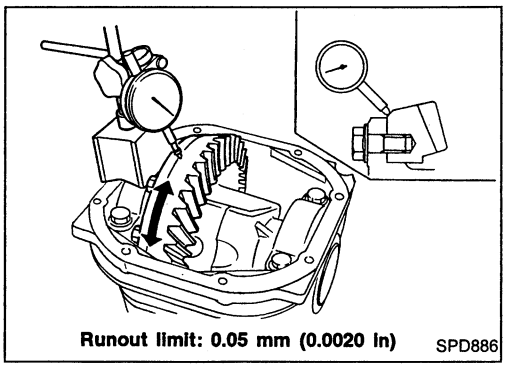
Before disassembling final drive, perform the following inspection.

- Total preload

1) Turn drive pinion in both directions several times to set bearing rollers.
2) Check total preload with Tool.
   Tool number: ST3127S000 (J25765-A)
   Total preload:
   R200V 1.4 - 1.7 N·m (14 - 17 kg-cm, 12 - 15 in-lb)
   R230V 2.1 - 2.9 N·m (21 - 30 kg-cm, 18 - 26 in-lb)



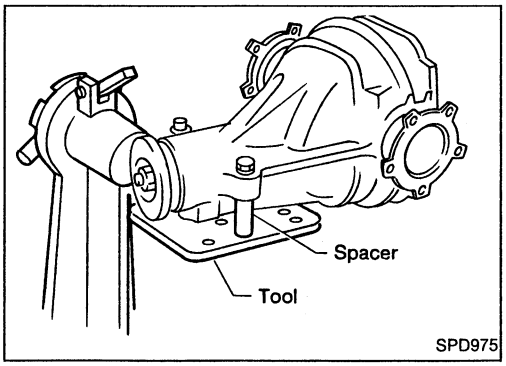
- Ring gear to drive pinion backlash
  Check ring gear to drive pinion backlash with a dial indicator at several points.
  Ring gear to drive pinion backlash:
  R200V 0.10 - 0.15 mm (0.0039 - 0.0059 in)
  R230V 0.13 - 0.18 mm (0.0051 - 0.0071 in)

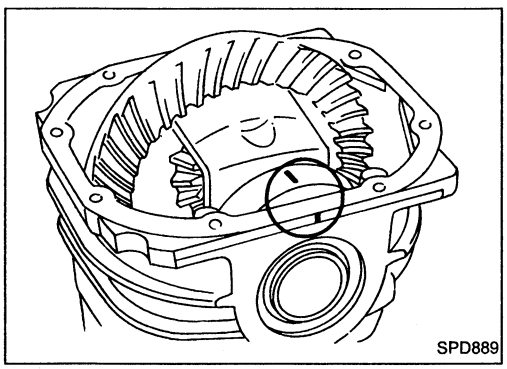


- Ring gear runout
  Check runout of ring gear with a dial indicator.
  Runout limit: 0.05 mm (0.0020 in)
- Tooth contact
  Check tooth contact. (Refer to Adjustment.)

Differential Carrier

1. Using two 45 mm (1.77 in) spacers, mount carrier on Tool.
   Tool number: KV38100800 (—)

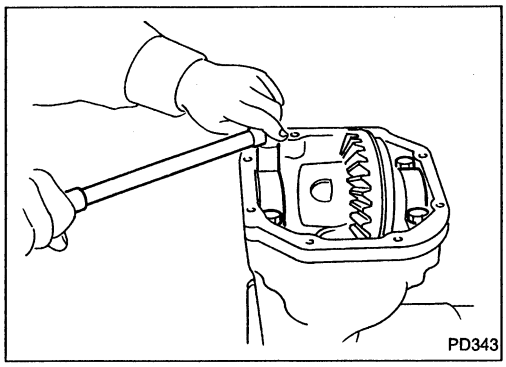




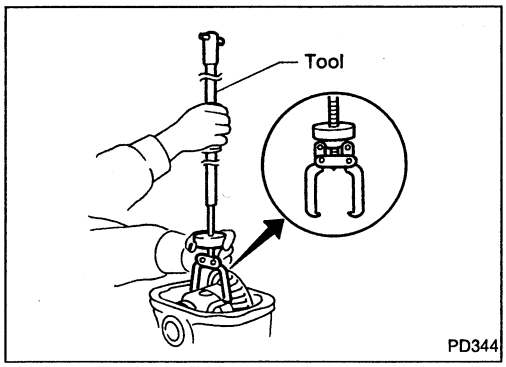
2. Paint or punch matchmarks on one side of the side bearing cap so it can be properly reinstalled.

Bearing caps are line-board during manufacture. Replace them in their proper positions.

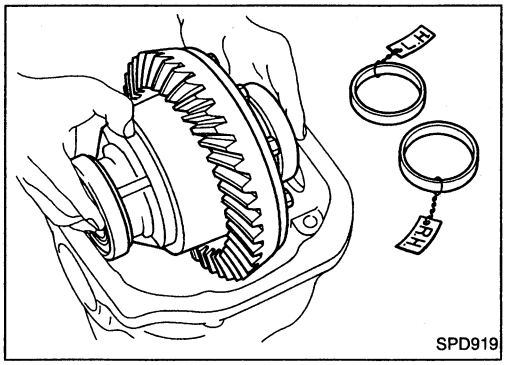
Differential Carrier (Cont'd)



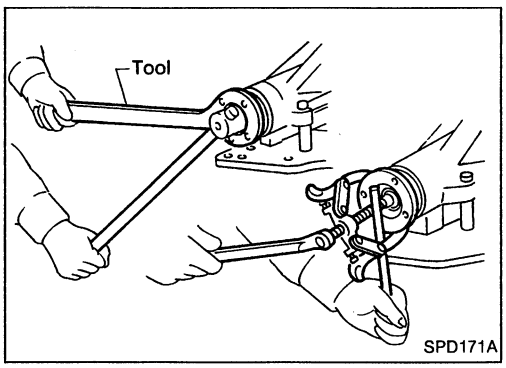
3. Remove side bearing caps.



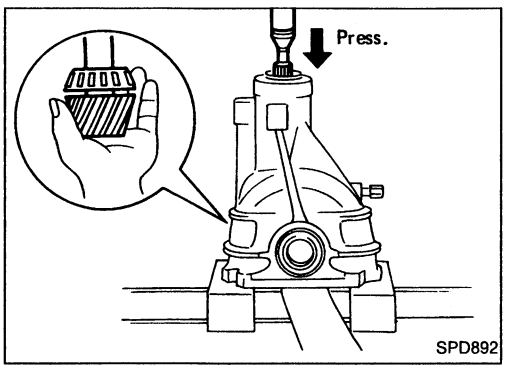
4. Lift differential case assembly out with Tool.
   Tool number: HT72400000 (—)



Keep the side bearing outer races together with inner cone — do not mix them up.
Also, keep side bearing spacer and adjusting shims together with bearings.

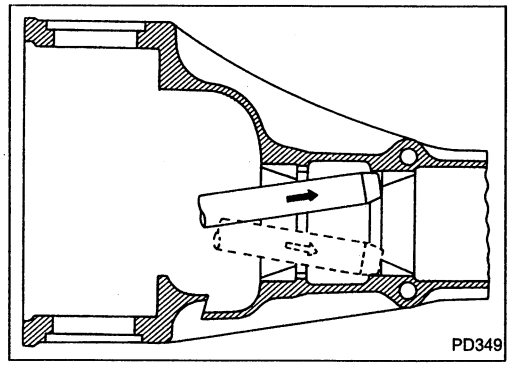


5. Loosen drive pinion nut and pull off companion flange.
   Tool number:
   ST38060002 (J34311) — R200V —
   (—) — R230V —

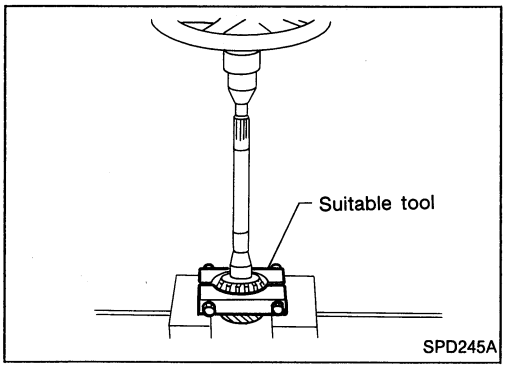


6. Take out drive pinion (together with rear bearing inner race, bearing spacer and adjusting washer).
7. Remove oil seal.
8. Remove front bearing inner race.
9. Remove side oil seal.

Differential Carrier (Cont'd)

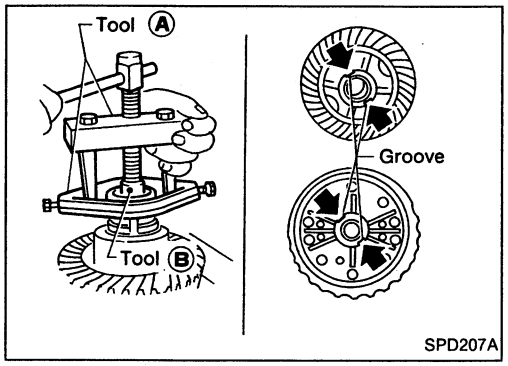


10. Remove pinion bearing outer races with a brass drift.



11. Remove pinion rear bearing inner race and drive pinion height adjusting washer with suitable tool.

Differential Case



1. Remove side bearing inner cones.

To prevent damage to bearing, engage puller jaws in groove.

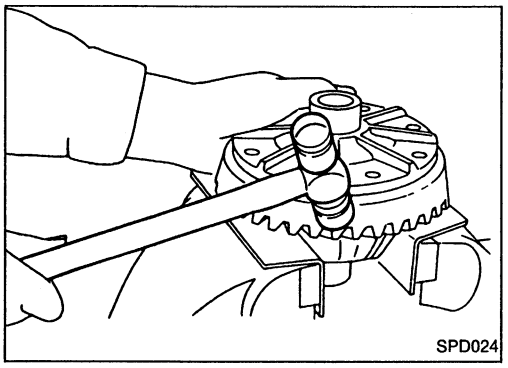
Tool number:

Ⓐ ST33051001 (—)

Ⓑ ST33061000 (J8107-2) — R200V —

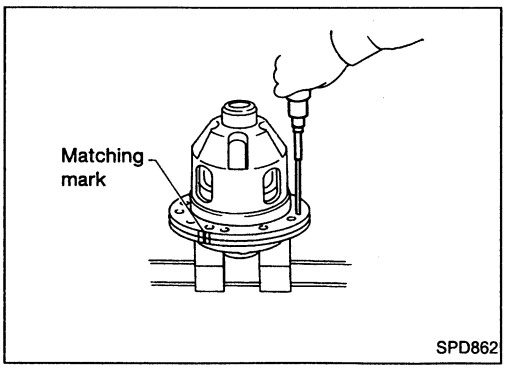
(—) — R230V —

Be careful not to mix up the left and right bearings.



2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off the differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



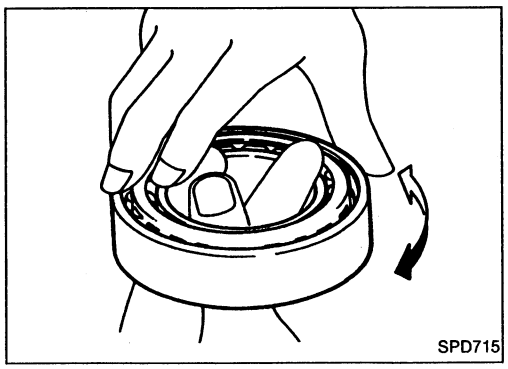
4. Loosen screws on differential cases A and B.
5. Separate differential cases A and B.

CAUTION:

Assemble differential case firmly.

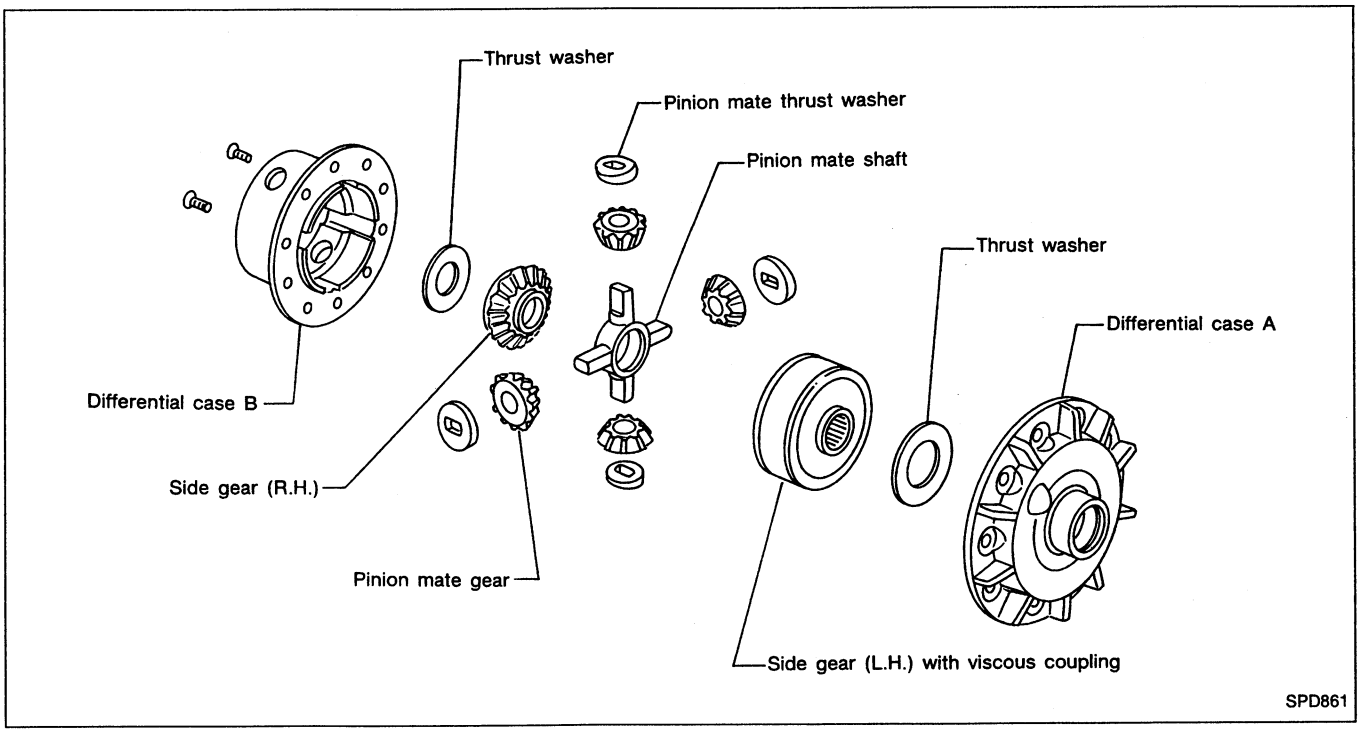
Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping.
If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).


SPD715

Bearing

1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking. Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.



Differential Case Assembly

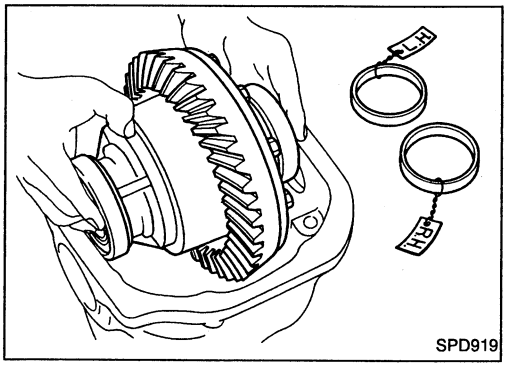
Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft and thrust washers.

For quiet and reliable final drive operation, the following five adjustments must be made correctly.

1. Side bearing preload
2. Pinion gear height
3. Pinion bearing preload
4. Ring gear to pinion backlash (Refer to ASSEMBLY.)
5. Ring and pinion gear tooth contact pattern

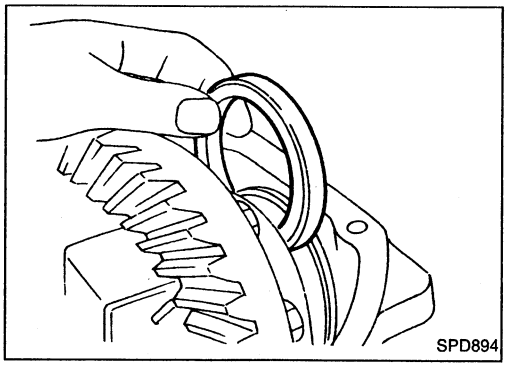
Side Bearing Preload

A selection of carrier side bearing preload shims is required for successful completion of this procedure.

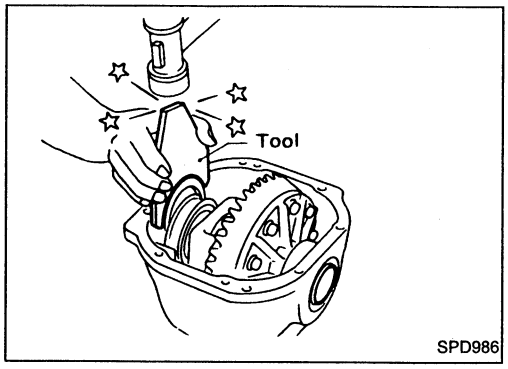


SPD919

1. Make sure all parts are clean and that the bearings are well lubricated with light oil or DEXRON™II type automatic transmission fluid.
2. Place the differential carrier, with side bearings and bearing races installed, into the final drive housing.


SPD894

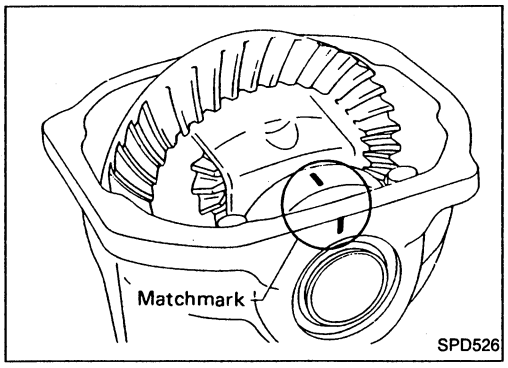
3. Put the side bearing spacer in place on the ring gear end of the carrier.



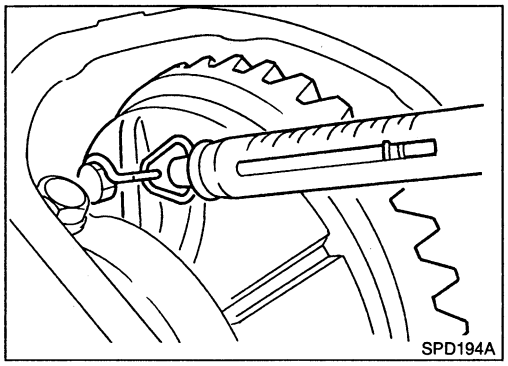
SPD986

4. Using the J25267 side bearing spacer drift, place both of the original carrier side bearing preload shims on the carrier end, opposite the ring gear.

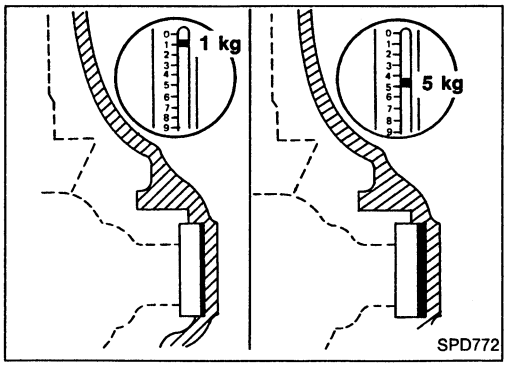
Side Bearing Preload (Cont'd)



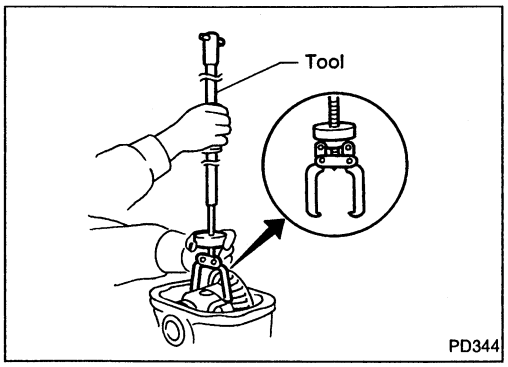
5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.
   Specification:
   88 - 98 N·m
   (9 - 10 kg-m, 65 - 72 ft-lb)
6. Turn the carrier several times to seat the bearings.



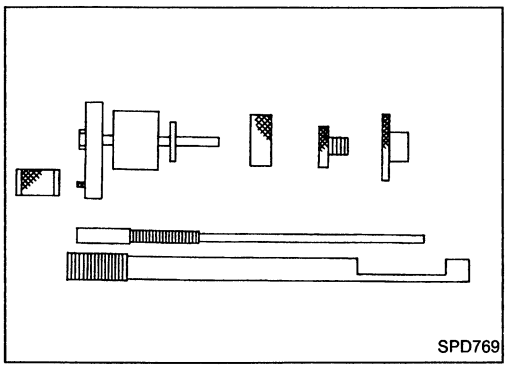
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J8129.
   Specification:
   34.3 - 39.2 N
   (3.5 - 4 kg, 7.7 - 8.8 lb)
   of pulling force at the ring gear bolt



8. If the carrier turning torque is not within the specification range, increase or decrease the total thickness of the side bearing adjusting washers until the turning torque is correct. If the turning torque is less than the specified range, install washers of greater thickness; if the turning torque is greater than the specification, install thinner washers. See the S.D.S. section for washer dimensions and part numbers.
9. Record the total amount of washer thickness required for the correct carrier side bearing preload.



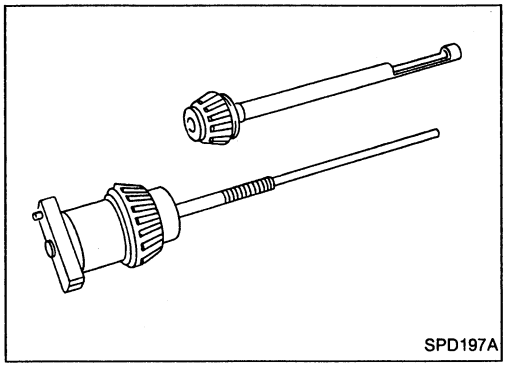
10. Remove the carrier from the final drive housing, saving the selected preload washers for later use during the assembly of the final drive unit.



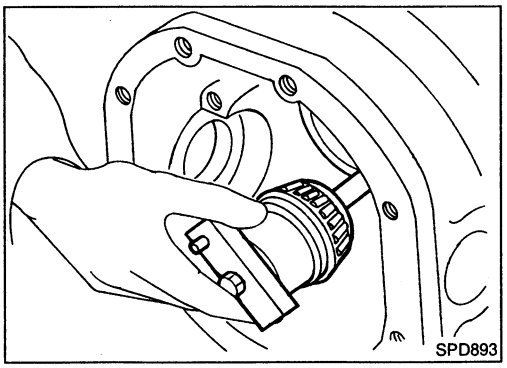
Pinion Gear Height and Pinion Bearing Preload

1. Make sure all parts are clean and that the bearings are well lubricated.
2. Assemble the pinion gear bearings into the pinion preload shim selector Tool, J34309.

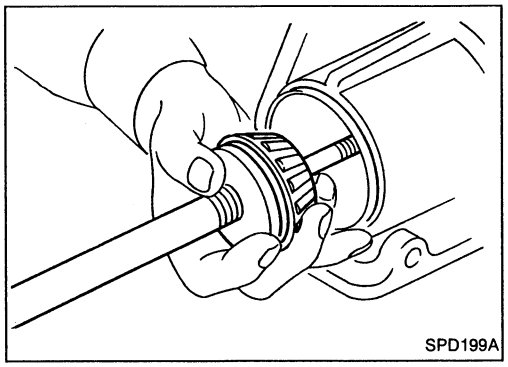
Pinion Gear Height and Pinion Bearing Preload (Cont'd)


SPD197A

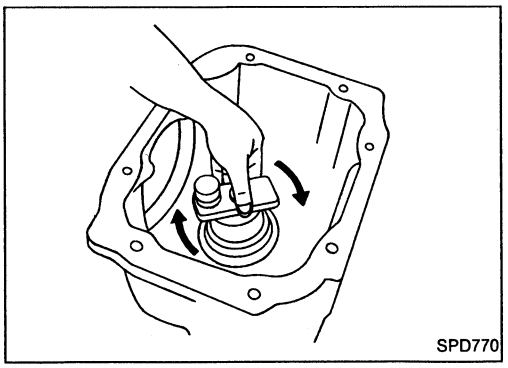
- **Front pinion bearing** — make sure the J34309-3 front pinion bearing seat is secured tightly against the J34309-2 gauge anvil. Then turn the front pinion bearing pilot, J34309-5, to secure the bearing in its proper position.
- **Rear pinion bearing** — the rear pinion bearing pilot, J34309-8, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J34309-4, is used to lock the bearing to the assembly.
- **Installation of J34309-9 and J34309-16** — place a suitable 2.5 mm (0.098 in) thick plain washer between J34309-9 and J34309-16. Both surfaces of J34309-9 and J34309-16 must be parallel with a clearance of 2.5 mm (0.098 in).


SPD893

3. Place the pinion preload shim selector Tool, J34309-1, gauge screw assembly with the pinion rear bearing inner cone installed into the final drive housing.

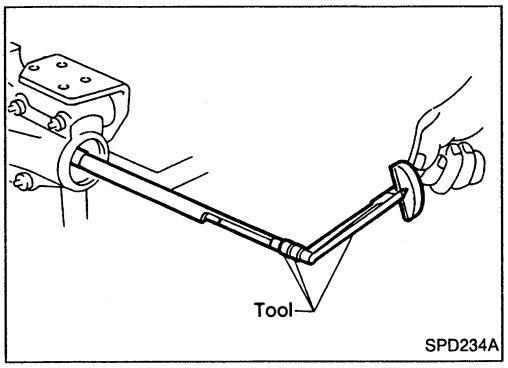

SPD199A

4. Assemble the front pinion bearing inner cone and the J34309-2 gauge anvil together with the J34309-1 gauge screw in the final drive housing. Make sure that the pinion height gauge plate, J34309-16, will turn a full 360 degrees, and tighten the two sections together by hand.

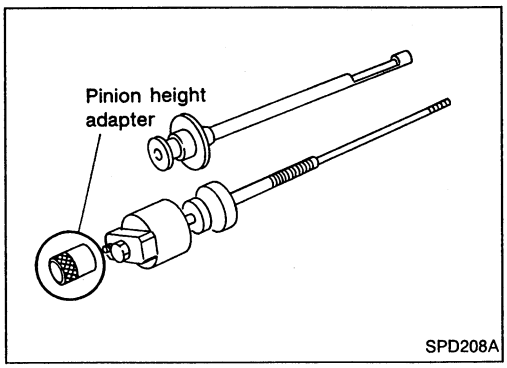

SPD770

5. Turn the assembly several times to seat the bearings.

Pinion Gear Height and Pinion Bearing Preload (Cont'd)



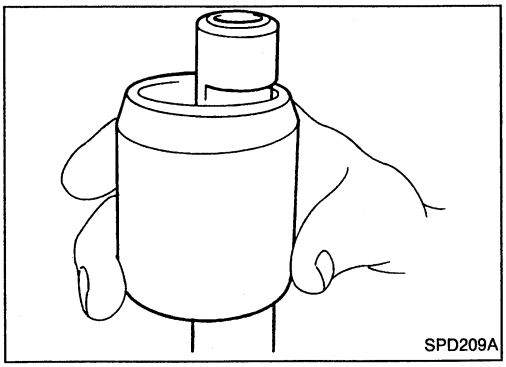
6. Measure the turning torque at the end of the J34309-2 gauge anvil using torque wrench J25765A.
   Turning torque specification:
   1.0 - 1.3 N·m
   (10 - 13 kg-cm, 8.7 - 11.3 in-lb)



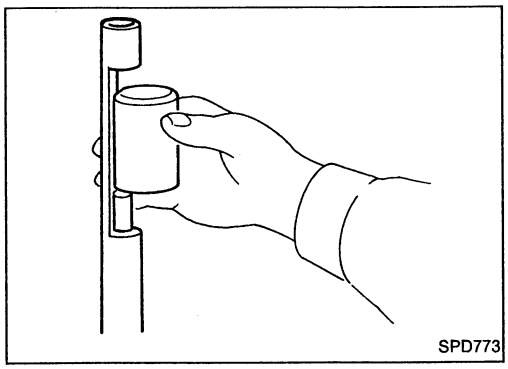
7. Place the J34309-11 "R200A" pinion height adapter onto the gauge plate and tighten it by hand.

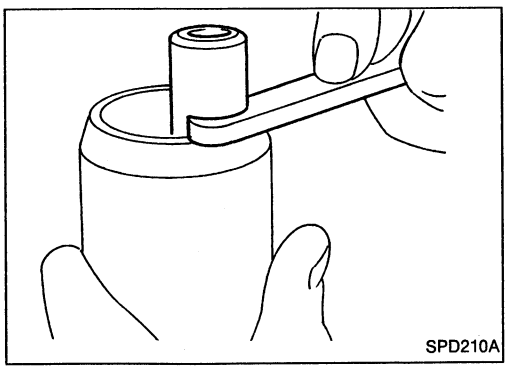
CAUTION:
Make sure all machined surfaces are clean.

— PINION BEARING PRELOAD WASHER SELECTION —



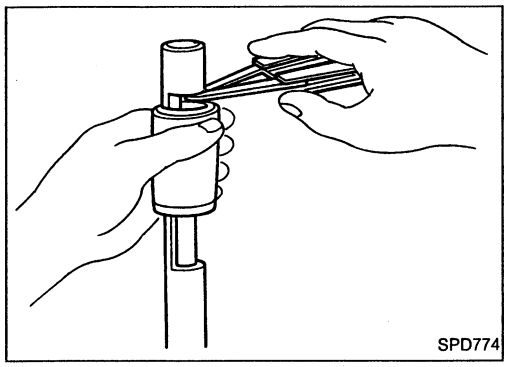
8. Place the solid pinion bearing spacer, small end first, over the J34309-2 gauge anvil and seat the small end squarely against the tip of the J34309-1 gauge screw in the tool recessed portion.





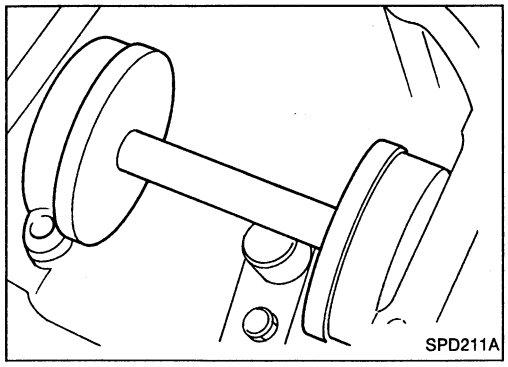
9. Select the correct thickness of pinion bearing preload adjusting washer using a standard gauge of 3.5 mm (0.138 in) and your J34309-101 feeler gauge. The exact measurement you get with your gauges is the thickness of the adjusting washer required. Select the correct washer.
   Drive pinion bearing preload adjusting washer:
   Refer to S.D.S.

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

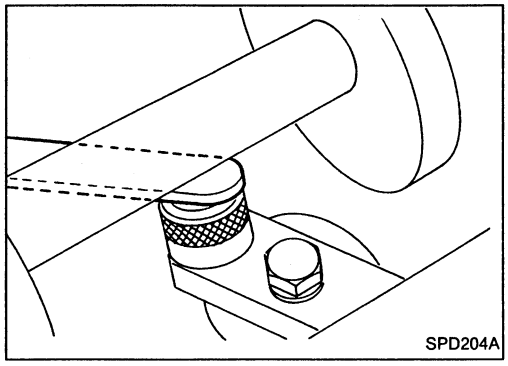

SPD774

10. Set your selected, correct pinion bearing preload adjusting washer aside for use when assembling the pinion gear and bearings into the final drive.

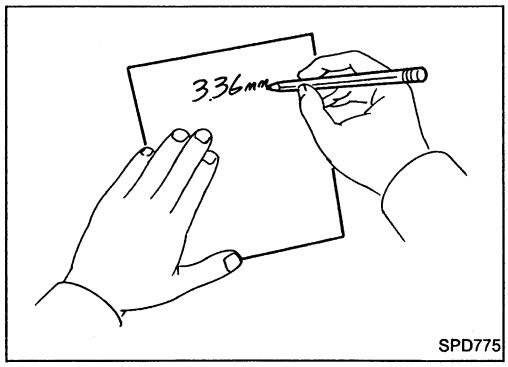
— PINION HEIGHT ADJUSTING WASHER SELECTION —


SPD211A

11. Now, position the side bearing discs, J25269-4, and arbor firmly into the side bearing bores.
    Install the side bearing caps and tighten the cap bolts to proper torque.

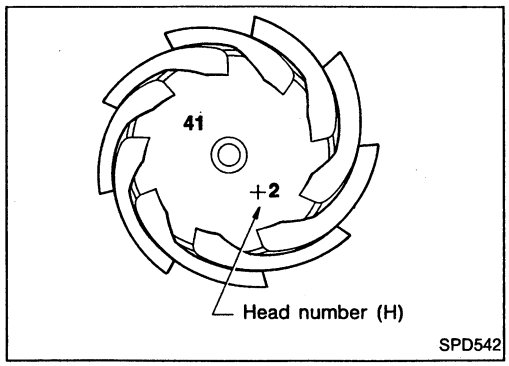

SPD204A

12. Select the correct standard pinion height adjusting washer thickness using a standard gauge of 3 mm (0.12 in) and your J34309-101 feeler gauge. Measure the distance between the J34309-11 pinion height adapter including the standard gauge and the arbor.



SPD775

13. Write down your exact measurement (the value of feeler gauge).



SPD542

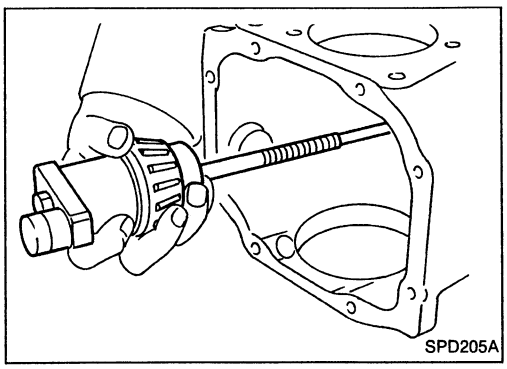
14. Correct the pinion height washer size by referring to the "pinion head number."

There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number", and it refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

Pinion head height number	Add or remove from the standard pinion height washer thickness measurement
–6	Add 0.06 mm (0.0024 in)
–5	Add 0.05 mm (0.0020 in)
–4	Add 0.04 mm (0.0016 in)
–3	Add 0.03 mm (0.0012 in)
–2	Add 0.02 mm (0.0008 in)
–1	Add 0.01 mm (0.0004 in)
0	Use the selected washer thickness
+1	Subtract 0.01 mm (0.0004 in)
+2	Subtract 0.02 mm (0.0008 in)
+3	Subtract 0.03 mm (0.0012 in)
+4	Subtract 0.04 mm (0.0016 in)
+5	Subtract 0.05 mm (0.0020 in)
+6	Subtract 0.06 mm (0.0024 in)

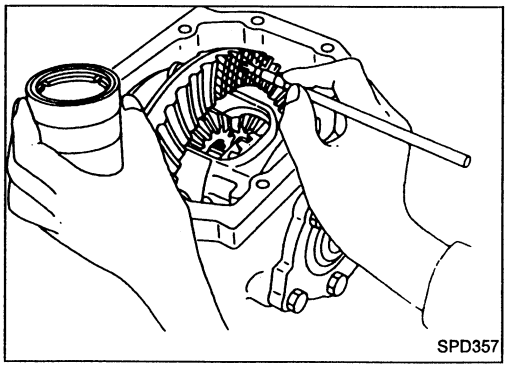
15. Select the correct pinion height washer from the following chart.
    Drive pinion height adjusting washer:
    Refer to S.D.S.


SPD205A

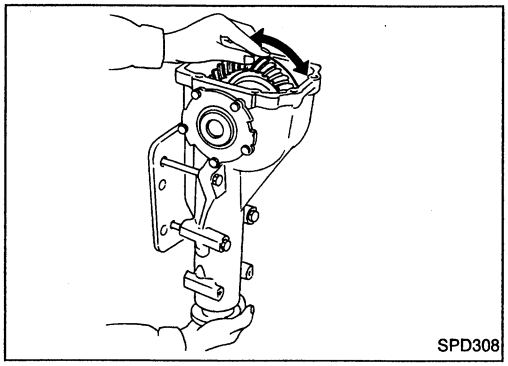
16. Remove the J34309 pinion preload shim selector Tool from the final drive housing and disassemble to retrieve the pinion bearings.

Tooth Contact

Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gears which are not positioned properly in relation to one another may be noisy, or have short life or both. With the checking of gear tooth contact pattern, the most desirable contact for low noise level and long life can be assured.

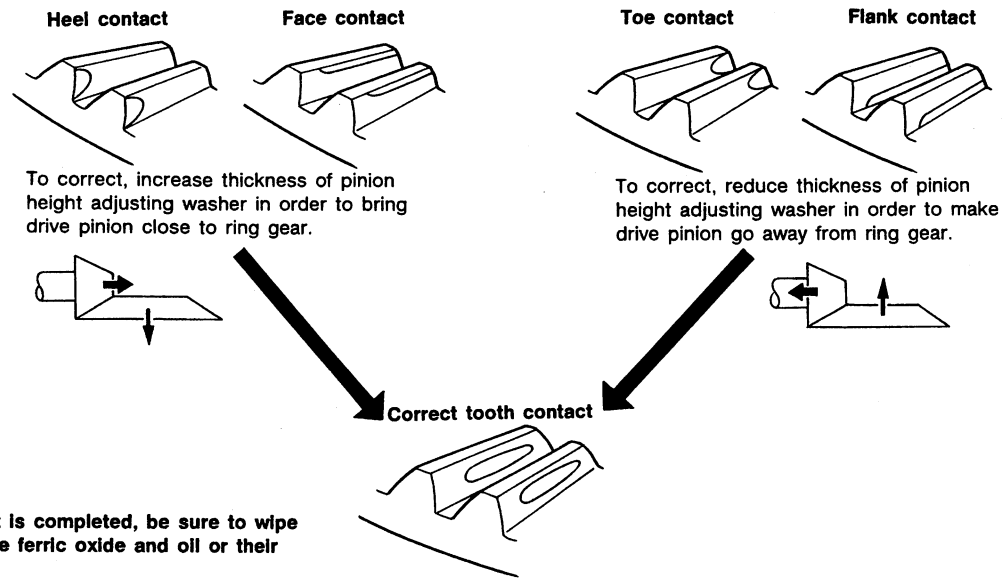

SPD357

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered titanium oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.


SPD308

3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.
However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern.
The tooth pattern is the best indication of how well a differential has been set up.



When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

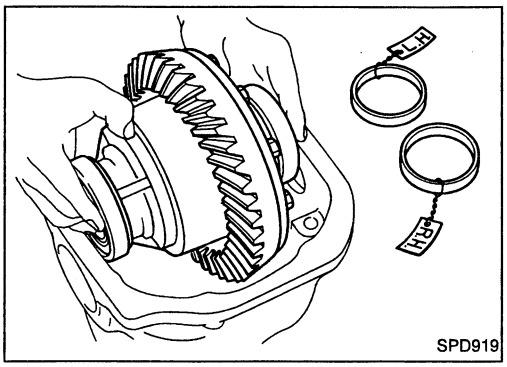
SPD007

For quiet and reliable final drive operation, the following five adjustments must be made correctly.

1. Side bearing preload
2. Pinion gear height
3. Ring gear to pinion backlash (Refer to ASSEMBLY.)
4. Ring and pinion gear tooth contact pattern

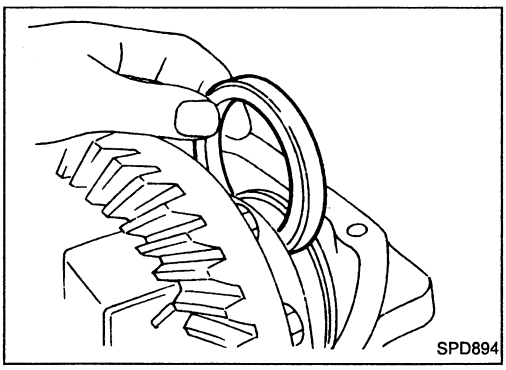
Side Bearing Preload

A selection of carrier side bearing preload shims is required for successful completion of this procedure.

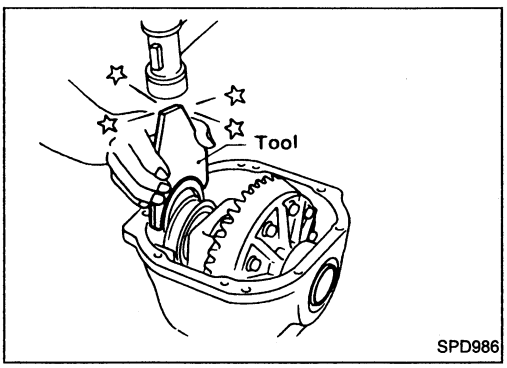


SPD919

1. Make sure all parts are clean and that the bearings are well lubricated with light oil or DEXRON™II type automatic transmission fluid.
2. Place the differential carrier, with side bearings and bearing races installed, into the final drive housing.


SPD894

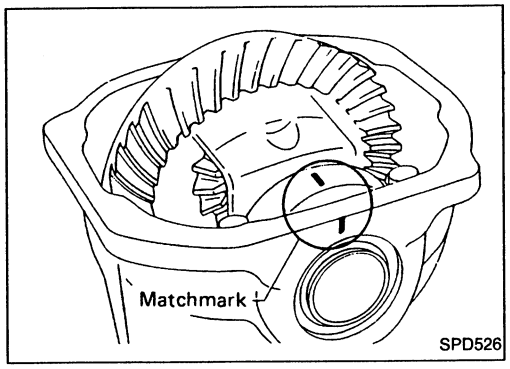
3. Put the side bearing spacer in place on the ring gear end of the carrier.



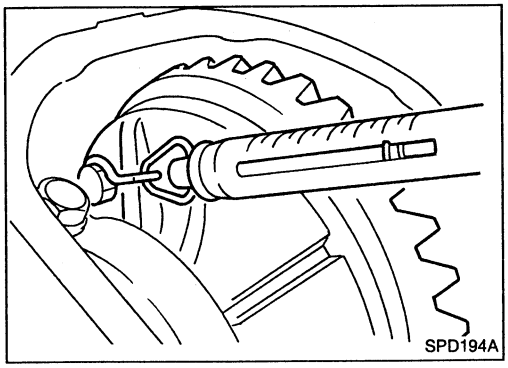
SPD986

4. Using the (—) side bearing spacer drift, place both of the original carrier side bearing preload shims on the carrier end, opposite the ring gear.

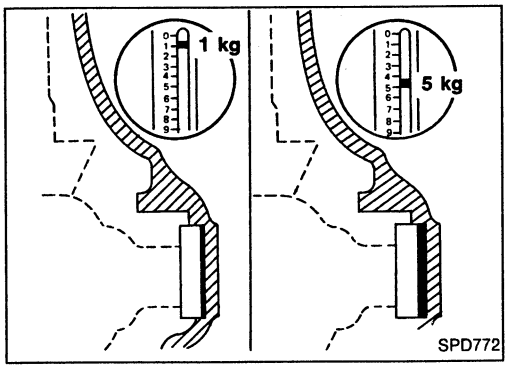
Side Bearing Preload (Cont'd)



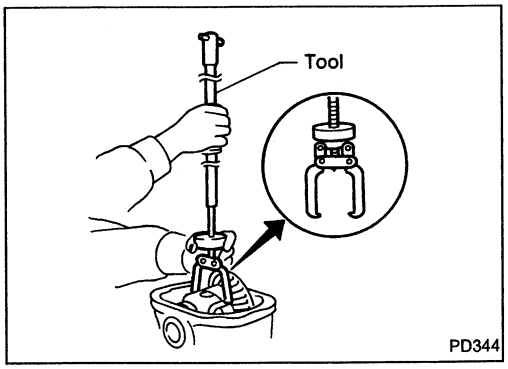
5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.
   Specification:
   88 - 98 N·m
   (9 - 10 kg-m, 65 - 72 ft-lb)
6. Turn the carrier several times to seat the bearings.



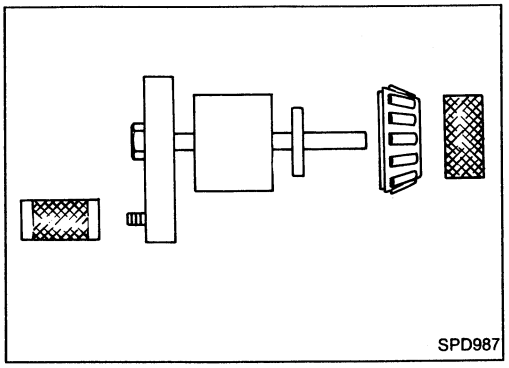
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J8129.
   Specification:
   34.3 - 39.2 N
   (3.5 - 4 kg, 7.7 - 8.8 lb)
   of pulling force at the ring gear bolt



8. If the carrier turning torque is not within the specification range, increase or decrease the total thickness of the side bearing adjusting washers until the turning torque is correct. If the turning torque is less than the specified range, install washers of greater thickness; if the turning torque is greater than the specification, install thinner washers. See the S.D.S. section for washer dimensions and part numbers.
9. Record the total amount of washer thickness required for the correct carrier side bearing preload.



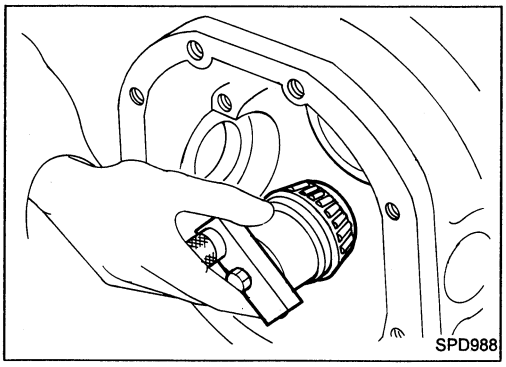
10. Remove the carrier from the final drive housing, saving the selected preload washers for later use during the assembly of the final drive unit.



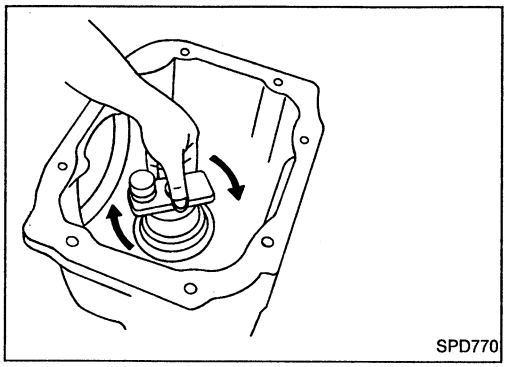
Pinion Gear Height

1. Make sure all parts are clean and that the bearings are well lubricated.
2. Assemble the pinion gear bearings into the pinion preload shim selector Tool, (—).

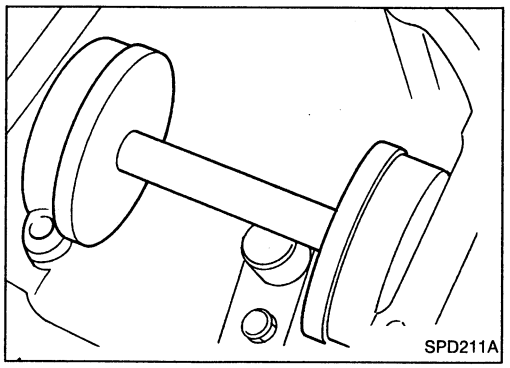
Pinion Gear Height (Cont'd)



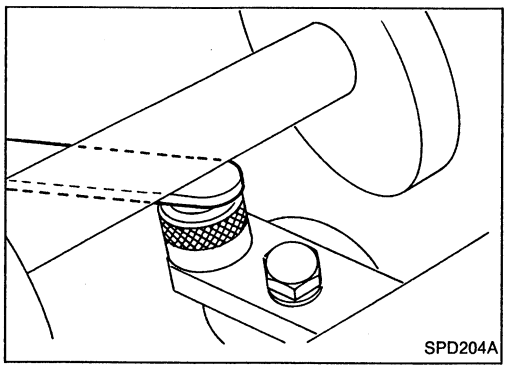
3. Place the pinion preload shim selector Tool, (—), gauge screw assembly with the pinion rear bearing inner cone installed into the final drive housing.



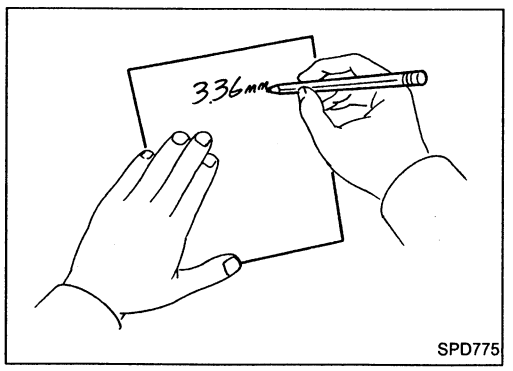
4. Turn the assembly several times to seat the bearings.



5. Now, position the side bearing discs, (—), and arbor firmly into the side bearing bores.
   Install the side bearing caps and tighten the cap bolts to proper torque.

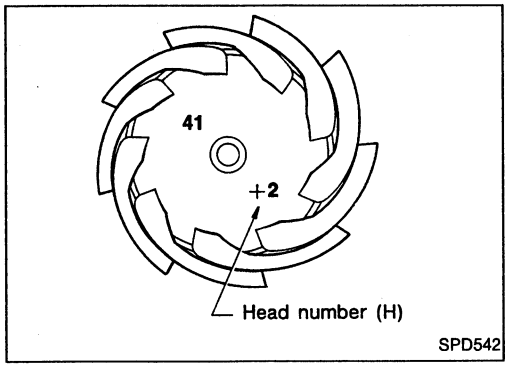


6. Select the correct standard pinion height adjusting washer thickness using a standard gauge of 3 mm (0.12 in) and your (—) feeler gauge. Measure the distance between the (—) pinion height adapter including the standard gauge and the arbor.



7. Write down your exact measurement (the value of feeler gauge).

Pinion Gear Height (Cont'd)



8. Correct the pinion height washer size by referring to the "pinion head number."

There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number", and it refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.

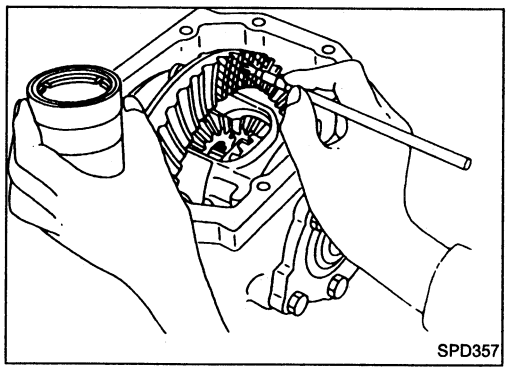
Pinion head height number	Add or remove from the standard pinion height washer thickness measurement
–6	Add 0.06 mm (0.0024 in)
–5	Add 0.05 mm (0.0020 in)
–4	Add 0.04 mm (0.0016 in)
–3	Add 0.03 mm (0.0012 in)
–2	Add 0.02 mm (0.0008 in)
–1	Add 0.01 mm (0.0004 in)
0	Use the selected washer thickness
+1	Subtract 0.01 mm (0.0004 in)
+2	Subtract 0.02 mm (0.0008 in)
+3	Subtract 0.03 mm (0.0012 in)
+4	Subtract 0.04 mm (0.0016 in)
+5	Subtract 0.05 mm (0.0020 in)
+6	Subtract 0.06 mm (0.0024 in)

9. Select the correct pinion height washer from the following chart.

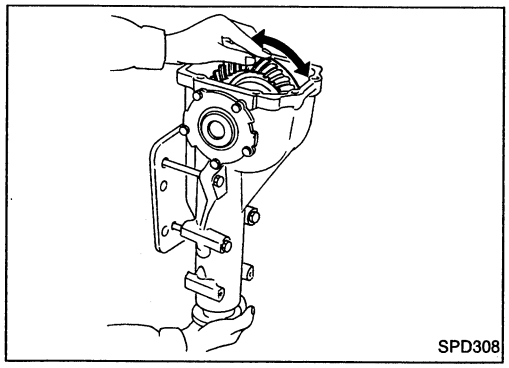
Drive pinion height adjusting washer:
Refer to S.D.S.

Tooth Contact

Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gears which are not positioned properly in relation to one another may be noisy, or have short life or both. With the checking of gear tooth contact pattern, the most desirable contact for low noise level and long life can be assured.

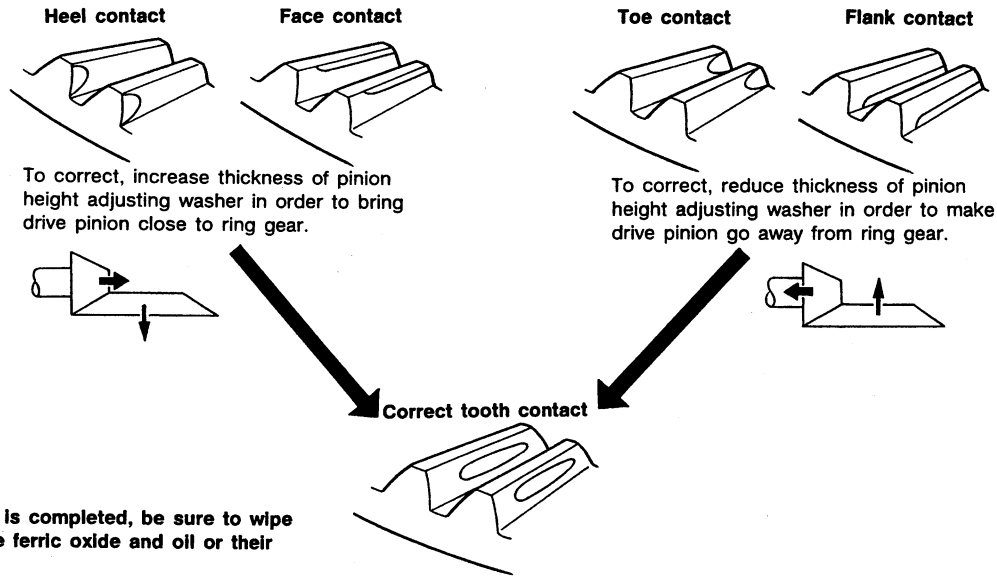

SPD357

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered titanium oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.


SPD308

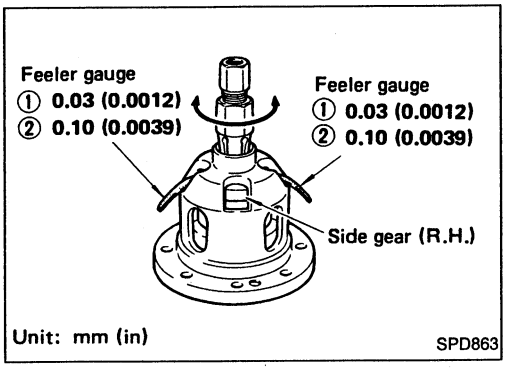
3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.
However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern.
The tooth pattern is the best indication of how well a differential has been set up.



When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

SPD007



Differential Case

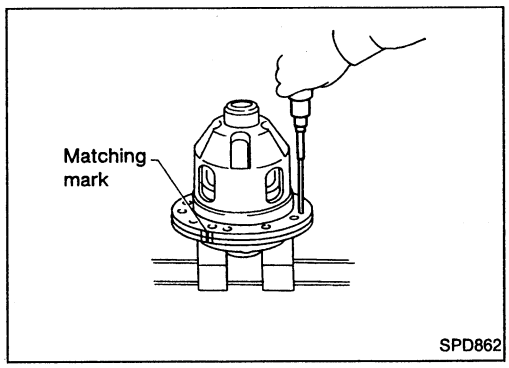
Whenever side gears or pinion mate gears are replaced, selection of thrust washers should be carried out.
Before selecting thrust washers, make sure all parts are clean and well lubricated with hypoid gear oil.

THRUST WASHER SELECTION

1. Install the previously removed thrust washer on right side gear. On left side gear, install a suitable thrust washer. Temporarily tighten differential cases using two screws.
2. Position differential assembly so that right side gear is on the upper side. Place two feeler gauges with thickness of 0.03 mm (0.0012 in) between right side gear and thrust washer as shown at left.

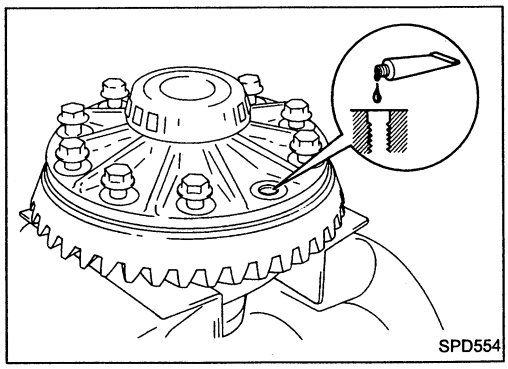
Do not insert feeler gauge in oil groove portion of differential case.

3. Rotate right side gear with a suitable tool attached to splines.
   If right side gear cannot be rotated, replace thrust washer used on left side gear with a thinner one.
4. Replace both 0.03 mm (0.0012 in) feeler gauges with 0.10 mm (0.0039 in) gauges. At this point, make sure right side gear does not rotate. If it does, replace thrust washer on left side gear with a thicker one so that right side gear does not rotate.



ASSEMBLY

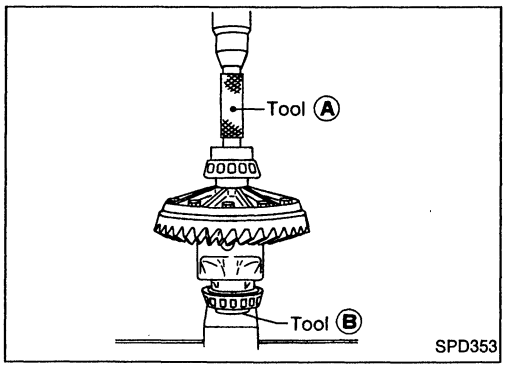
1. Install differential case A and B.



2. Place differential case on ring gear.
3. Apply locking sealant to ring gear bolts, and install them.

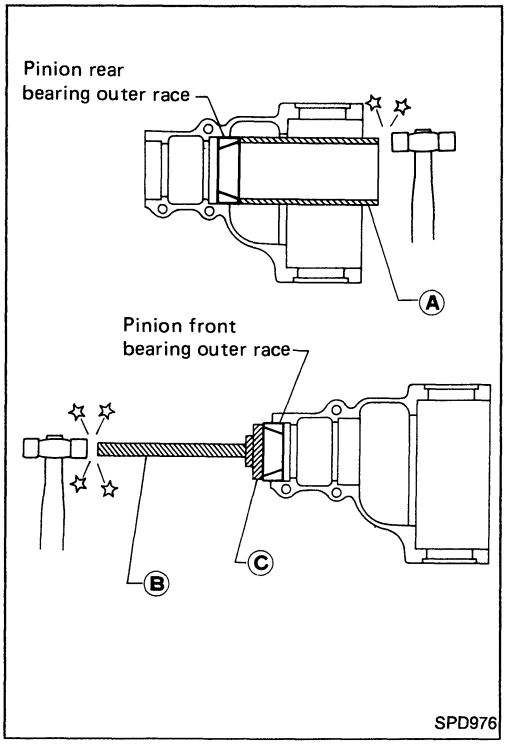
Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.

Differential Case (Cont'd)

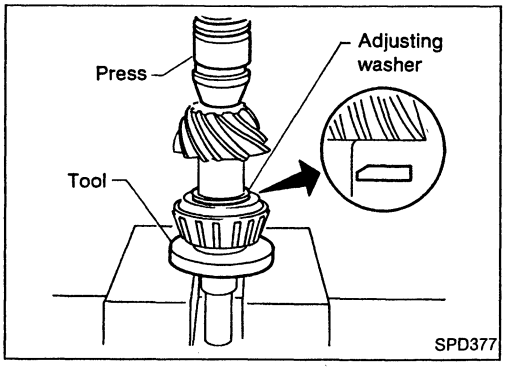


4. Press-fit side bearing inner cones on differential case with Tool.
   Tool number:
   Ⓐ KV38100300 (J25523) — R200V —
   (—) — R230V —
   Ⓑ ST33061000 (J8107-2) — R200V —
   (—) — R230V —

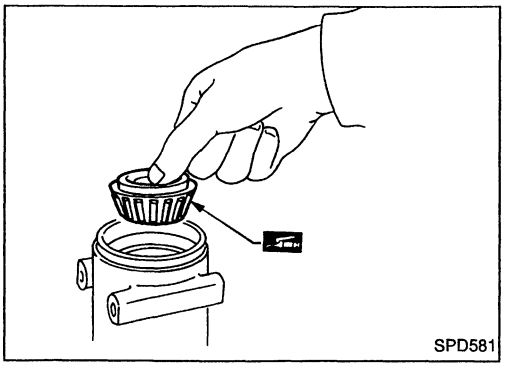
Differential Carrier



1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   Ⓐ Suitable tool
   Ⓑ ST30611000 (J25742-1)
   Ⓒ ST30613000 (J25742-3) — R200V —
   (—) — R230V —
2. Select pinion bearing adjusting washer and drive pinion bearing spacer. Refer to ADJUSTMENT.

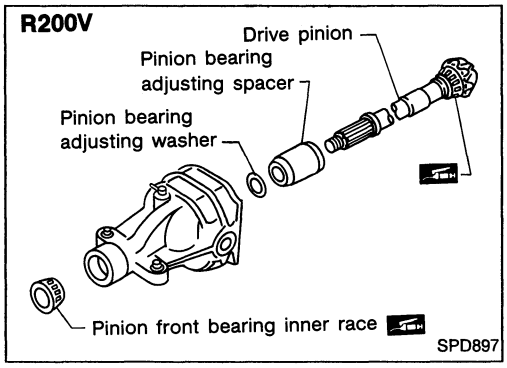


3. Install selected drive pinion height adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, using press and Tool.
   Tool number:
   ST30901000 (—) — R200V —
   ST30022000 (—) — R230V —



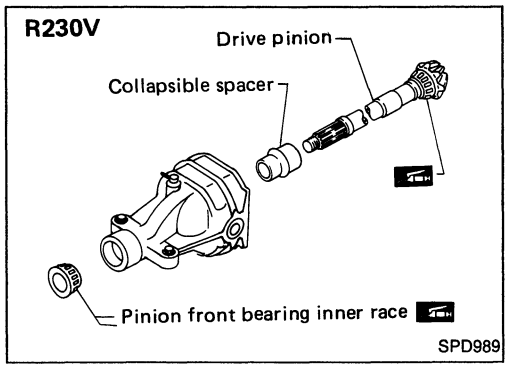
4. Place pinion front bearing inner cone in final drive housing.

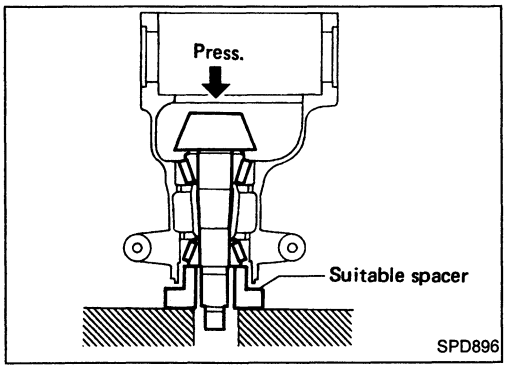
Differential Carrier (Cont'd)

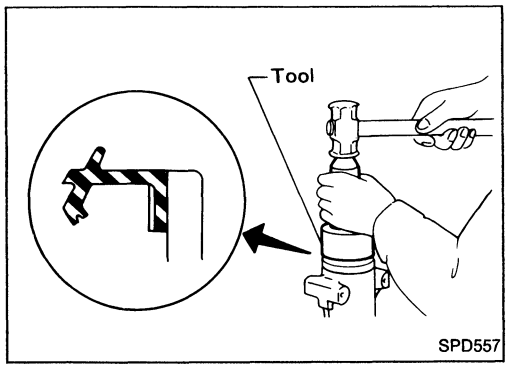


5. Set drive pinion assembly (as shown in figure at left) in differential carrier and install drive pinion, with press and suitable tool.

Stop when drive pinion touches bearing.
Apply multi-purpose grease to pinion rear bearing inner race, pinion front bearing inner race and front pilot bearing.

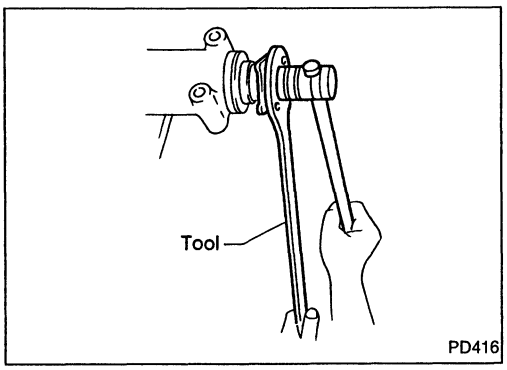






6. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal with Tool.

Tool number:
KV38100500 (—) — R200V —
(—) — R230V —



7. Install companion flange.

— R200V —

Tighten pinion nut to specified torque with Tool.

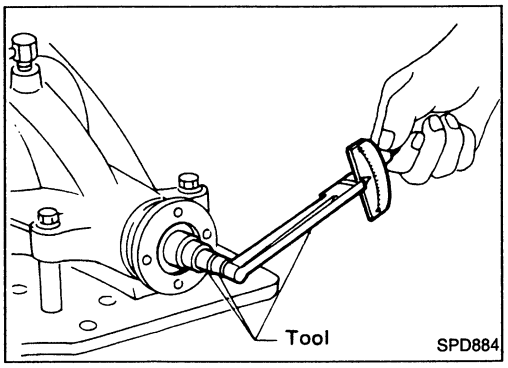
— R230V —

Tighten pinion nut to 127 N·m (13 kg-m, 94 ft-lb)

Make sure that threaded portion of drive pinion and pinion nut are free from oil or grease.

Tool number:
ST38060002 (J34311) — R200V —
(—) — R230V —

Differential Carrier (Cont'd)



8. —R200V —
   Turn drive pinion in both directions several times, and measure pinion bearing preload.
   Pinion bearing preload:
   1.1 - 1.4 N·m
   (11 - 14 kg-cm, 9.5 - 12.2 in-lb)

When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

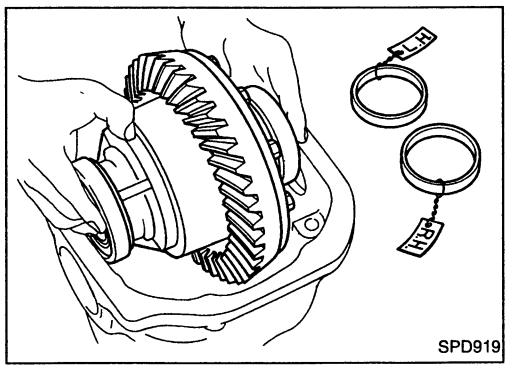
— R230V —

Tighten the pinion nut by very small degrees until the specified preload is achieved. When checking the preload, turn the drive pinion in both directions several times to set the bearing rollers.

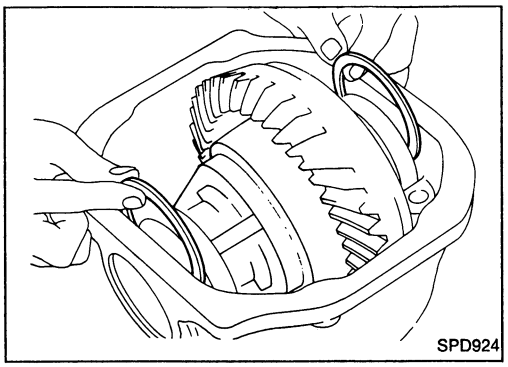
Pinion bearing preload:
1.8 - 2.6 N·m
(18 - 27 kg-cm, 16 - 23 in-lb)

This procedure will have to be repeated if:

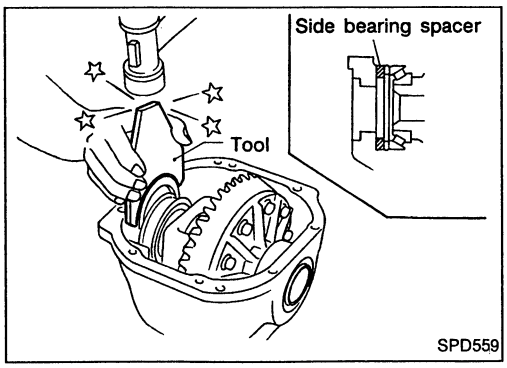
- **Maximum preload is achieved before the minimum pinion nut torque is reached.**
- **Minimum preload is not achieved before maximum pinion nut torque is reached.**



9. Install differential case assembly with side bearing outer races into gear carrier.

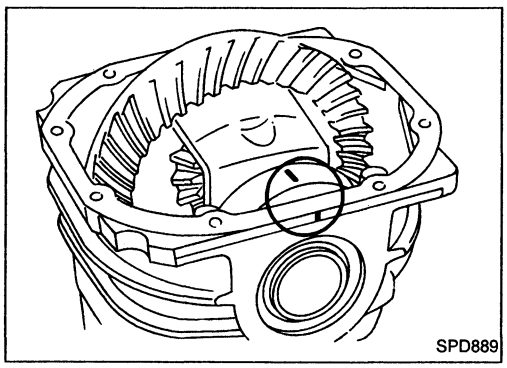


10. Insert left and right side bearing adjusting washers in place between side bearings and carrier.

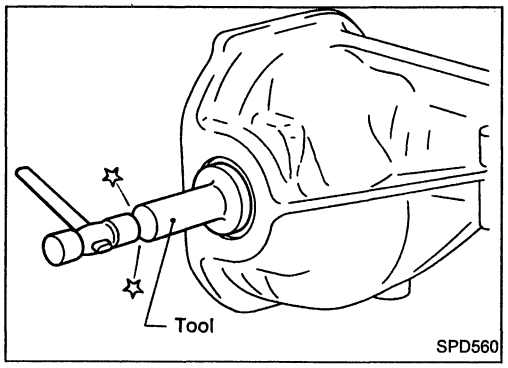


11. Drive in side bearing spacer with Tool.
    Tool number:
    KV38100600 (J25267) — R200V —
    (—) — R230V —

Differential Carrier (Cont'd)

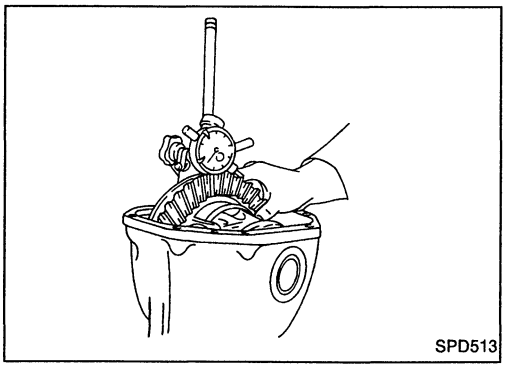

SPD889

12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.



SPD560

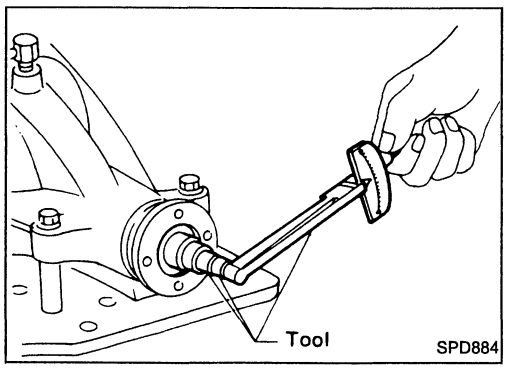
13. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.
    Tool number:
    KV38100200 (J26233) — R200V —
    KV38102510 (—) — R230V


SPD513

14. Measure ring gear to drive pinion backlash with a dial indicator.
    Ring gear to drive pinion backlash:
    R200V 0.10 - 0.15 mm (0.0039 - 0.0059 in)
    R230V 0.13 - 0.18 mm (0.0051 - 0.0071 in)

- If backlash is too small, decrease thickness of left shim and increase thickness of right shim by the same amount.
  If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.



SPD884

15. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.

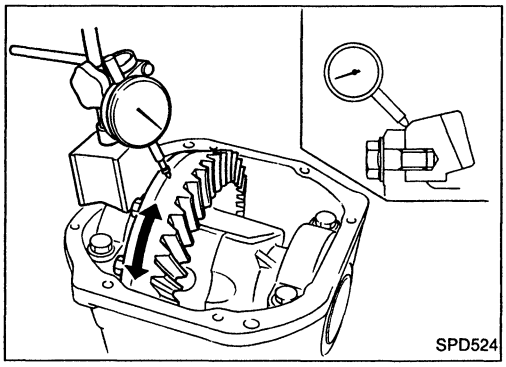
Total preload:
Value more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on measured value of drive pinion preload

- If preload is too great, remove the same amount of shim from each side.
- If preload is too small, add the same amount of shim to each side.

Never add or remove a different number of shims for each side as it will change ring gear to drive pinion backlash.

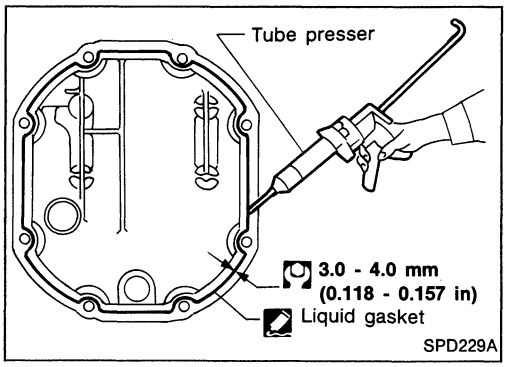
16. Recheck ring gear to drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear to pinion backlash.

Differential Carrier (Cont'd)


SPD524

17. Check runout of ring gear with a dial indicator.
    Runout limit:
    0.05 mm (0.0020 in)
- If backlash varies excessively in different places, foreign matter may be caught between the ring gear and the differential case.
- If the backlash varies greatly when the ring gear runout is within a specified range, replace the hypoid gear set or differential case.

18. Check tooth contact.
    Refer to ADJUSTMENT.



SPD229A

19. Install rear cover

a. Remove all traces of liquid gasket from mating surface of rear cover and gear carrier using a scraper.

b. Apply a continuous bead of liquid gasket only to mating surface of rear cover.

- **Use Genuine Liquid Gasket or equivalent.**
- **Attaching should be done within 5 minutes after coating.**
- **Wait at least 1 hour before refilling gear oil.**
- **For the first 12 hours avoid abrupt acceleration or deceleration.**

Propeller Shaft

GENERAL SPECIFICATIONS

Vehicle model	2 seater				2+2 seater	
Engine	VG30DETT		VG30DE			
Transmission	M/T	A/T	M/T	A/T	M/T	A/T
Propeller shaft model	3S80A-VL107		3S71A			
Number of joints	3					
Coupling method with transmission	Sleeve type					
Types of journal bearings	Shell type (non-disassembly type) x 2, CVJ* x 1		Shell type (non-disassembly type)			
Distance between yokes mm (in)	80.0 (3.150)		71.0 (2.795)			
Shaft length mm (in) (Spider to spider)						
1st	606 (23.86)	489 (19.25)	606 (23.86)	510 (20.08)	606 (23.86)	510 (20.08)
2nd	388 (15.28)		419 (16.50)		539 (21.22)	
Shaft outer diameter mm (in)						
1st	82.6 (3.252)		75 (2.95)			
2nd	75.2 (2.961)		75 (2.95)			

*: Constant velocity joint

INSPECTION AND ADJUSTMENT

Unit: mm (in)

Propeller shaft model	3S71A	3S80A-VL107
Journal axial play	0 (0)	
Propeller shaft runout limit	0.6 (0.024)	

Final Drive

GENERAL SPECIFICATIONS

Final drive model	R200V	R230V
Ring gear pitch diameter mm (in)	205 (8.07)	230 (9.06)
Gear ratio	4.083	3.692
Number of teeth (Ring gear/Drive pinion)	49/12	48/13
Oil capacity (approx.) ℓ (US pt, Imp pt)	1.5 (3-1/8, 2-5/8)	1.8 (3-7/8, 3-1/8)

INSPECTION AND ADJUSTMENT (R200V)

Ring gear runout

Ring gear runout limit mm (in)	0.05 (0.0020)

Side gear adjustment

Side gear backlash (Clearance between side gear and differential case) mm (in)	0.03 - 0.09 (0.0012 - 0.0035)

Available side gear thrust washers

Thickness mm (in)	Part number
0.80 (0.0315)	38424-40F60
0.83 (0.0327)	38424-40F61
0.86 (0.0339)	38424-40F62
0.89 (0.0350)	38424-40F63
0.92 (0.0362)	38424-40F64
0.95 (0.0374)	38424-40F65
0.98 (0.0386)	38424-40F66
1.01 (0.0398)	38424-40F67
1.04 (0.0409)	38424-40F68
1.07 (0.0421)	38424-40F69
1.10 (0.0433)	38424-40F70
1.13 (0.0445)	38424-40F71
1.16 (0.0457)	38424-40F72
1.19 (0.0469)	38424-40F73
1.22 (0.0480)	38424-40F74
1.25 (0.0492)	38424-40F75
1.28 (0.0504)	38424-40F76
1.31 (0.0516)	38424-40F77
1.34 (0.0528)	38424-40F78
1.37 (0.0539)	38424-40F79
1.40 (0.0551)	38424-40F80
1.43 (0.0563)	38424-40F81
1.46 (0.0575)	38424-40F82
1.49 (0.0587)	38424-40F83

Final Drive (Cont'd)

Side bearing adjustment

Side bearing preload measured at ring gear retaining bolt N (kg, lb)	34.3 - 39.2 (3.5 - 4.0, 7.7 - 8.8)

Available side bearing adjusting washers

Thickness mm (in)	Part number
2.00 (0.0787)	38453-N3100
2.05 (0.0807)	38453-N3101
2.10 (0.0827)	38453-N3102
2.15 (0.0846)	38453-N3103
2.20 (0.0866)	38453-N3104
2.25 (0.0886)	38453-N3105
2.30 (0.0906)	38453-N3106
2.35 (0.0925)	38453-N3107
2.40 (0.0945)	38453-N3108
2.45 (0.0965)	38453-N3109
2.50 (0.0984)	38453-N3110
2.55 (0.1004)	38453-N3111
2.60 (0.1024)	38453-N3112
2.65 (0.1043)	38453-N3133

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
3.09 (0.1217)	38154-P6017
3.12 (0.1228)	38154-P6018
3.15 (0.1240)	38154-P6019
3.18 (0.1252)	38154-P6020
3.21 (0.1264)	38154-P6021
3.24 (0.1276)	38154-P6022
3.27 (0.1287)	38154-P6023
3.30 (0.1299)	38154-P6024
3.33 (0.1311)	38154-P6025
3.36 (0.1323)	38154-P6026
3.39 (0.1335)	38154-P6027
3.42 (0.1346)	38154-P6028
3.45 (0.1358)	38154-P6029
3.48 (0.1370)	38154-P6030
3.51 (0.1382)	38154-P6031
3.54 (0.1394)	38154-P6032
3.57 (0.1406)	38154-P6033
3.60 (0.1417)	38154-P6034
3.63 (0.1429)	38154-P6035
3.66 (0.1441)	38154-P6036

Drive pinion preload adjustment

Drive pinion preload with front oil seal N·m (kg-cm, in-lb)	1.1 - 1.4 (11 - 14, 9.5 - 12.2)

Available drive pinion bearing preload adjusting washers

Thickness mm (in)	Part number
3.80 - 3.82 (0.1496 - 0.1504)	38125-61001
3.82 - 3.84 (0.1504 - 0.1512)	38126-61001
3.84 - 3.86 (0.1512 - 0.1520)	38127-61001
3.86 - 3.88 (0.1520 - 0.1528)	38128-61001
3.88 - 3.90 (0.1528 - 0.1535)	38129-61001
3.90 - 3.92 (0.1535 - 0.1543)	38130-61001
3.92 - 3.94 (0.1543 - 0.1551)	38131-61001
3.94 - 3.96 (0.1551 - 0.1559)	38132-61001
3.96 - 3.98 (0.1559 - 0.1567)	38133-61001
3.98 - 4.00 (0.1567 - 0.1575)	38134-61001
4.00 - 4.02 (0.1575 - 0.1583)	38135-61001
4.02 - 4.04 (0.1583 - 0.1591)	38136-61001
4.04 - 4.06 (0.1591 - 0.1598)	38137-61001
4.06 - 4.08 (0.1598 - 0.1606)	38138-61001
4.08 - 4.10 (0.1606 - 0.1614)	38139-61001

Available drive pinion bearing preload adjusting spacers

Length mm (in)	Part number
45.60 (1.7953)	38165-10V05
45.90 (1.8071)	38165-10V06
46.20 (1.8189)	38165-10V07
46.50 (1.8307)	38165-10V00
46.80 (1.8425)	38165-10V01

Total preload

Total preload	Value of more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on to measured value of drive pinion preload
Ring gear backlash mm (in)	0.10 - 0.15 (0.0039 - 0.0059)

Final Drive (Cont'd)

INSPECTION AND ADJUSTMENT (R230V)

Ring gear runout

Ring gear runout limit mm (in)	0.05 (0.0020)

Side gear adjustment

Side gear backlash (Clearance between side gear and differential case) mm (in)	0.03 - 0.09 (0.0012 - 0.0035)

Available side gear thrust washers

Thickness mm (in)	Part number
0.85 (0.0335)	38424-40F08
0.90 (0.0354)	38424-40F01
0.95 (0.0374)	38424-40F09
1.00 (0.0394)	38424-40F02
1.05 (0.0413)	38424-40F10
1.10 (0.0433)	38424-40F03
1.15 (0.0453)	38424-40F11
1.20 (0.0472)	38424-40F04
1.25 (0.0492)	38424-40F12
1.30 (0.0512)	38424-40F05
1.35 (0.0531)	38424-40F13
1.40 (0.0551)	38424-40F06
1.45 (0.0571)	38424-40F14
1.50 (0.0591)	38424-40F07

Side bearing adjustment

Side bearing preload measured at ring gear retaining bolt N (kg, lb)	34.3 - 39.2 (3.5 - 4.0, 7.7 - 8.8)

Available side bearing adjusting washers

Thickness mm (in)	Part number
2.00 (0.0787)	38453-40P00
2.05 (0.0807)	38453-40P01
2.10 (0.0827)	38453-40P02
2.15 (0.0846)	38453-40P03
2.20 (0.0866)	38453-40P04
2.25 (0.0886)	38453-40P05
2.30 (0.0906)	38453-40P06
2.35 (0.0925)	38453-40P07
2.40 (0.0945)	38453-40P08
2.45 (0.0965)	38453-40P09
2.50 (0.0984)	38453-40P10
2.55 (0.1004)	38453-40P11
2.60 (0.1024)	38453-40P12

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
2.59 (0.1020)	38154-40P00
2.61 (0.1028)	38154-40P01
2.63 (0.1035)	38154-40P02
2.65 (0.1043)	38154-40P03
2.67 (0.1051)	38154-40P04
2.69 (0.1059)	38154-40P05
2.71 (0.1067)	38154-40P06
2.73 (0.1075)	38154-40P07
2.75 (0.1083)	38154-40P08
2.77 (0.1091)	38154-40P09
2.79 (0.1098)	38154-40P10
2.81 (0.1106)	38154-40P11
2.83 (0.1114)	38154-40P12
2.85 (0.1122)	38154-40P13
2.87 (0.1130)	38154-40P14
2.89 (0.1138)	38154-40P15
2.91 (0.1146)	38154-40P16
2.93 (0.1154)	38154-40P17
2.95 (0.1161)	38154-40P18
2.97 (0.1169)	38154-40P19

Drive pinion preload adjustment

Drive pinion preload with front oil seal N·m (kg-cm, in-lb)	1.8 - 2.6 (18 - 27, 16 - 23)

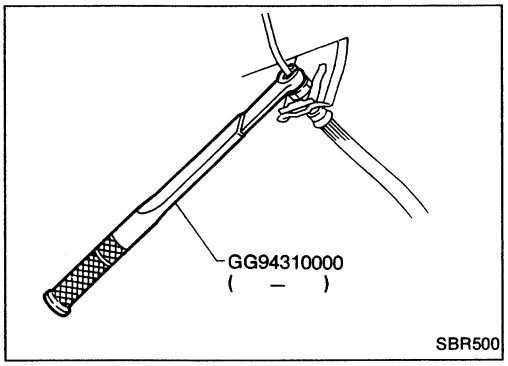
Total preload adjustments

Total preload	Value of more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on to measured value of drive pinion preload
Ring gear backlash mm (in)	0.13 - 0.18 (0.0051 - 0.0071)

FRONT AXLE & FRONT SUSPENSION

SECTION FA

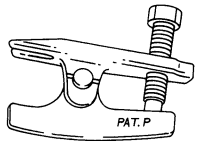
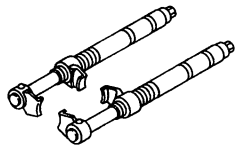
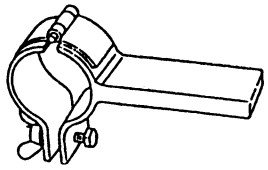
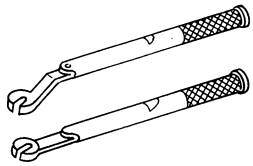
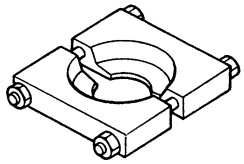
CONTENTS



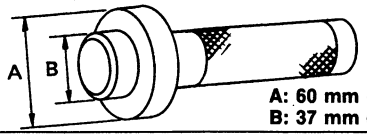
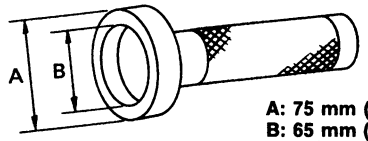
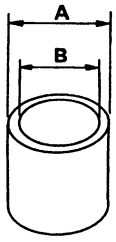
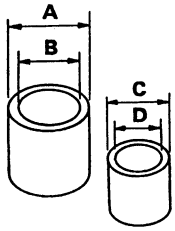
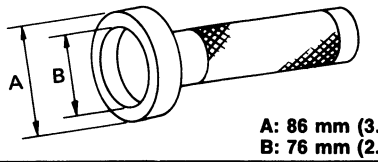
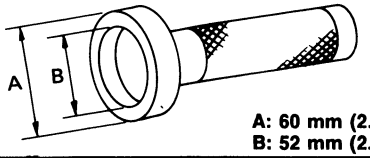
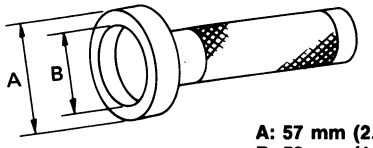
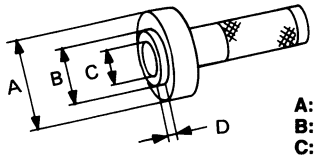
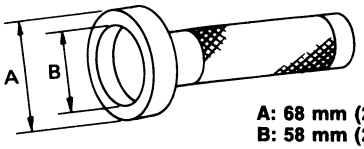
Precautions

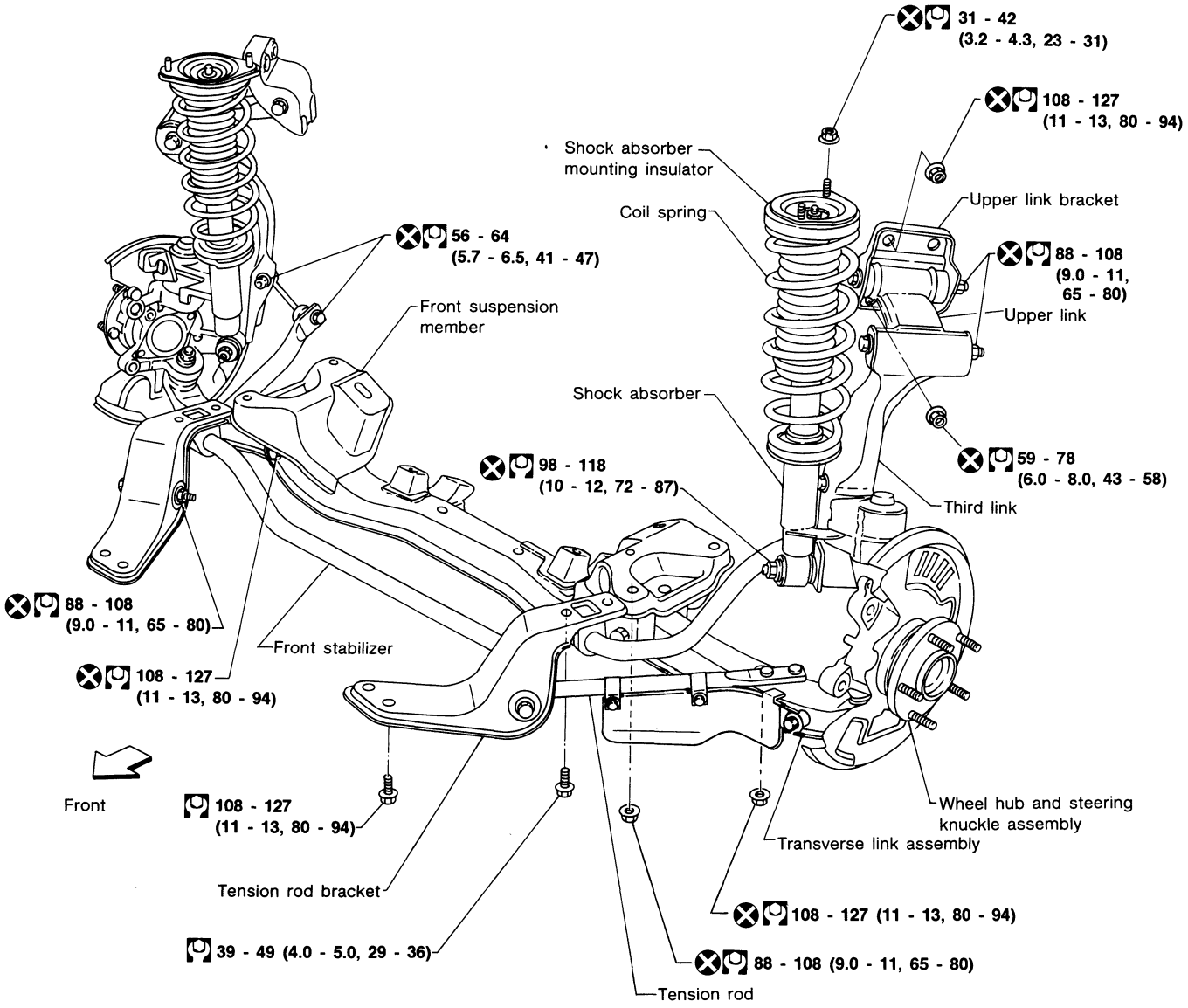
- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  *** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Use Tool when removing or installing brake lines.**

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
HT72750000 (J24319-01) Ball joint remover		Removing tie-rod outer end and lower ball joint
HT71780000 (—) Spring compressor		Removing and installing coil spring
ST35652000 (—) Shock absorber attachment		Fixing shock absorber
GG94310000 (—) Flare nut torque wrench		Removing and installing brake piping
ST30031000 (J22912-01) Bearing inner race puller		Removing bearing inner race

Commercial Service Tools

Tool name	Description	
Wheel bearing drift	 A: 60 mm (2.36 in) dia. B: 37 mm (1.46 in) dia.	Removing wheel bearing
Wheel bearing drift	 A: 75 mm (2.95 in) dia. B: 65 mm (2.56 in) dia.	Installing wheel bearing
Baffle plate drift	 A: 125 mm (4.92 in) dia. B: 106 mm (4.17 in) dia.	Installing baffle plate
Tension rod bushing drift	 A: 78 mm (3.07 in) dia. B: 66 mm (2.60 in) dia. C: 62 mm (2.44 in) dia. D: 25 - 55 mm (0.98 - 2.17 in) dia.	Removing and installing tension rod bushing
Grease seal drift	 A: 86 mm (3.39 in) dia. B: 76 mm (2.99 in) dia.	Installing wheel hub grease seal
Cap drift	 A: 60 mm (2.36 in) dia. B: 52 mm (2.05 in) dia.	Installing king pin cap
Bearing drift	 A: 57 mm (2.24 in) dia. B: 50 mm (1.97 in) dia.	Installing king pin lower bearing
Bearing drift	 A: 57 mm (2.24 in) dia. B: 46 mm (1.81 in) dia. C: 40 mm (1.57 in) dia. D: 2.5 mm (0.098 in)	Installing king pin upper bearing
Grease seal drift	 A: 68 mm (2.68 in) dia. B: 58 mm (2.28 in) dia.	Installing king pin grease seal



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.**

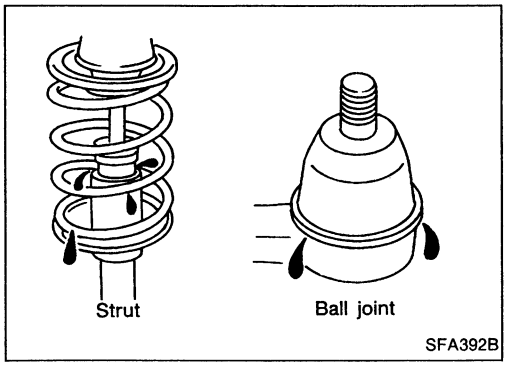
: N•m (kg-m, ft-lb)

SFA250B

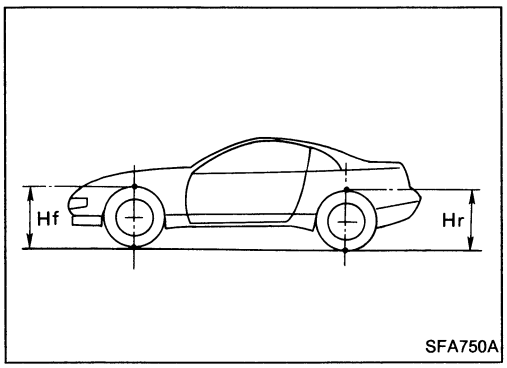
Front Axle and Front Suspension Parts

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

- Retighten all nuts and bolts to the specified torque.
  Tightening torque: Refer to FRONT SUSPENSION.
- Make sure that cotter pin is inserted.



- Check suspension lower ball joint and tie-rod ball joint for grease leakage, and dust cover for cracks or other damage.
- Check shock absorber for oil leakage or other damage.

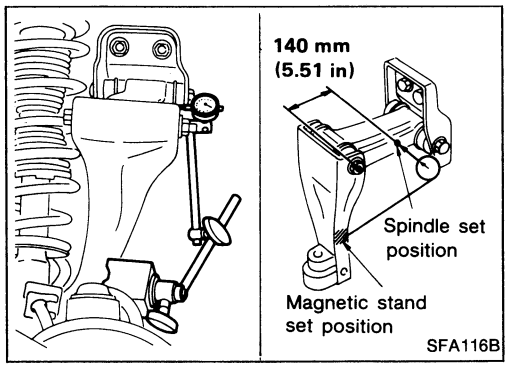


- Check spring height from top of wheelarch to ground.

(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 vehicle up and down several times before measuring.
  Standard height: Refer to S.D.S.

(3) Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.

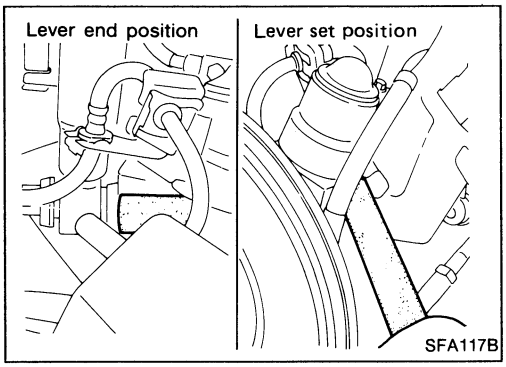


- Check upper link free play.

(1) Jack up front of vehicle and set stands.
(2) Set steering wheel in the straight-forward direction and lock it using key lock.
(3) Remove front wheels.

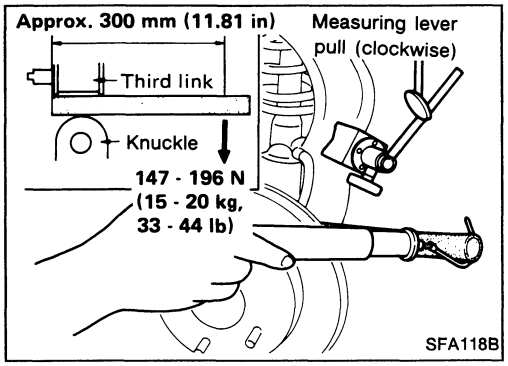
On axle side

(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.)
(5) Install lever.
Insert lever [30 mm (1.18 in) outside dia., 350 mm (13.78 in) long, approx.] between lower end of third link and kingpin location.



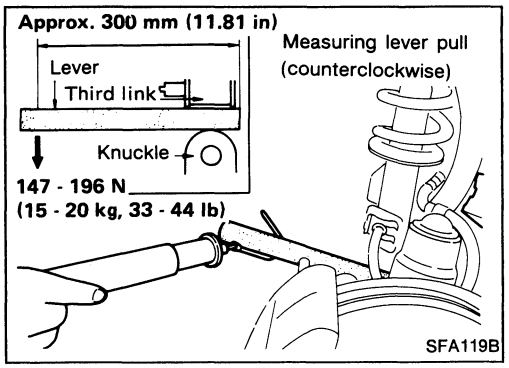
Make sure lever does not interfere with splash guard, brake hoses, etc., when set in position.

Front Axle and Front Suspension Parts (Cont'd)



— Free play in direction "A" —

Attach spring scale to lever tip. Pull spring scale with a force of 147 to 196 N (15 to 20 kg, 33 to 44 lb) and then read dial gauge indication.

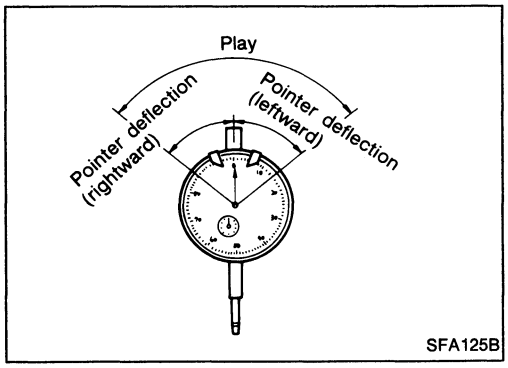


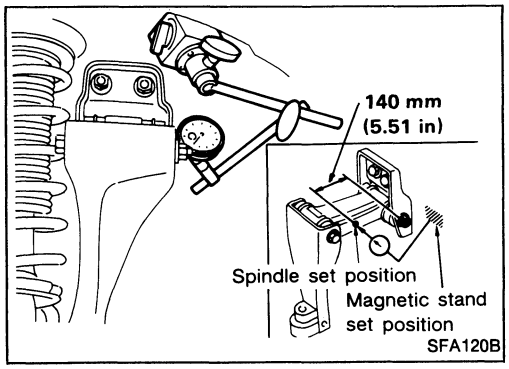
— Free play in direction "B" —

With dial gauge held in position, invert lever. Attach spring scale to lever tip. Pull spring scale with a force of 147 to 196 N (15 to 20 kg, 33 to 44 lb) and then read dial gauge indication.

Free play = (Gauge pointer deflection in direction "A") + (Gauge pointer deflection in direction "B")

Allowable free play range:
5.0 mm (0.197 in), max.

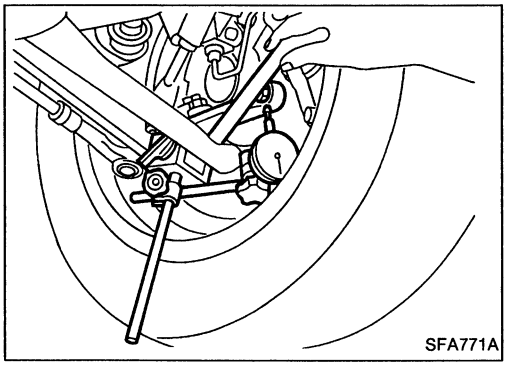




On body side

(6) Install dial gauge.
a. Install magnet stand on hoodledge wheelhouse side.
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 the retaining bolt on bracket side. (Reset dial gauge.)
(7) Follow the same procedures for setting lever and measuring the free play as those outlined under "On axle side" above.
Allowable free play range: 5.0 mm (0.197 in), max.
(8) If free play exceeds specifications, replace upper link assembly.

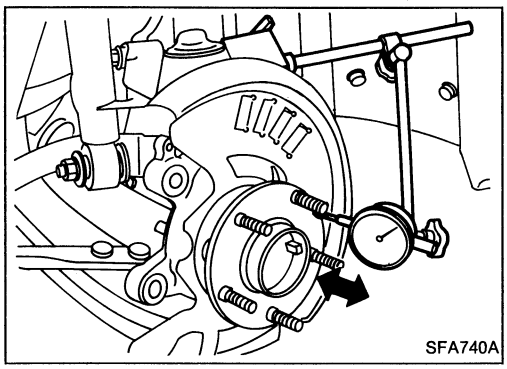
Front Axle and Front Suspension Parts (Cont'd)


SFA771A

- 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 pushing and releasing pry bar, observe maximum dial indicator value.

Vertical end play: 0 mm (0 in)


SFA740A

Front Wheel Bearing

- Check tightening torque of wheel bearing lock nut.

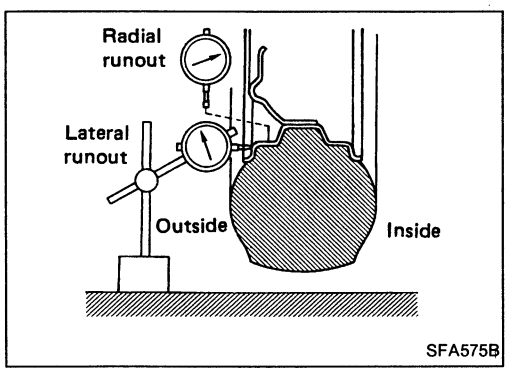
: 206 - 284 N·m
(21 - 29 kg-m, 152 - 210 ft-lb)

- Check wheel bearings for smooth operation.
- 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.



SFA575B

Front Wheel Alignment

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

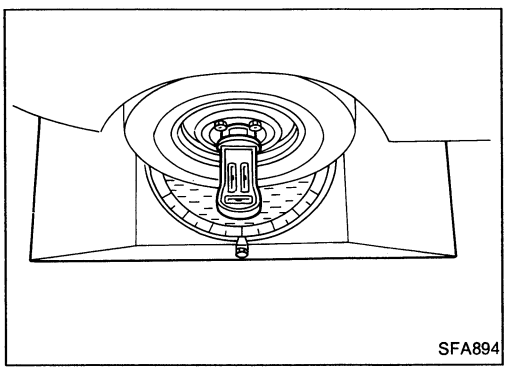
PRELIMINARY INSPECTION

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

- Check tires for wear and improper inflation.
- Check front wheel bearings for looseness.
- Check wheel runout.

Refer to S.D.S.

- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen).
  ("Unladen": Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.)


SFA894

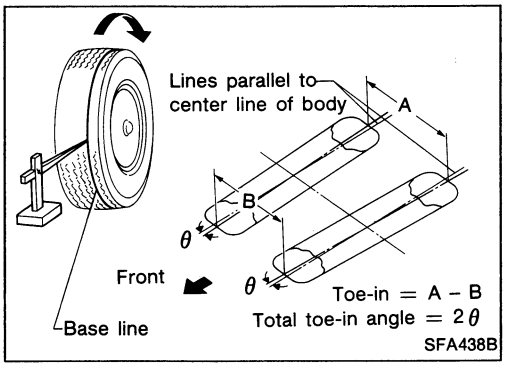
CAMBER, CASTER AND KINGPIN INCLINATION

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.

Front Wheel Alignment (Cont'd)



TOE-IN

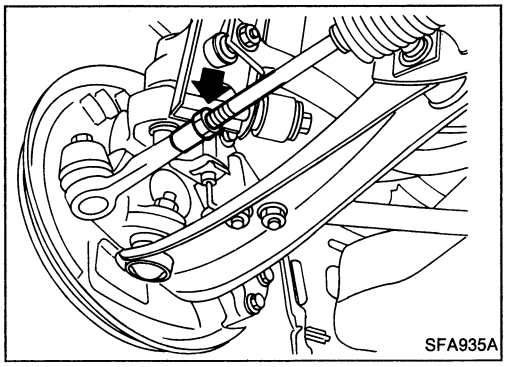
1. Draw a base line on tread surface of tires.

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

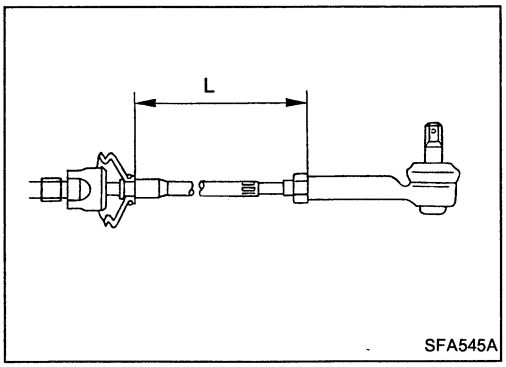
2. Measure toe-in.

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

Toe-in:
Refer to S.D.S.

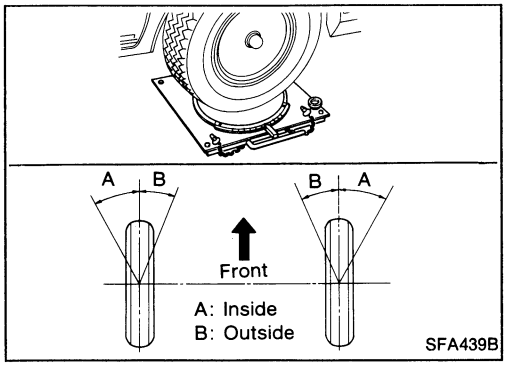


3. Adjust toe-in by varying length of steering tie-rods.
(1) Loosen lock nuts.
(2) Adjust toe-in by turning tie-rod forward or backward.



Make sure both tie-rods are the same length.
Standard length "L":
155 mm (6.10 in)

(3) Tighten lock nuts to the specified torque.
: 78 - 98 N·m
(8.0 - 10.0 kg-m, 58 - 72 ft-lb)

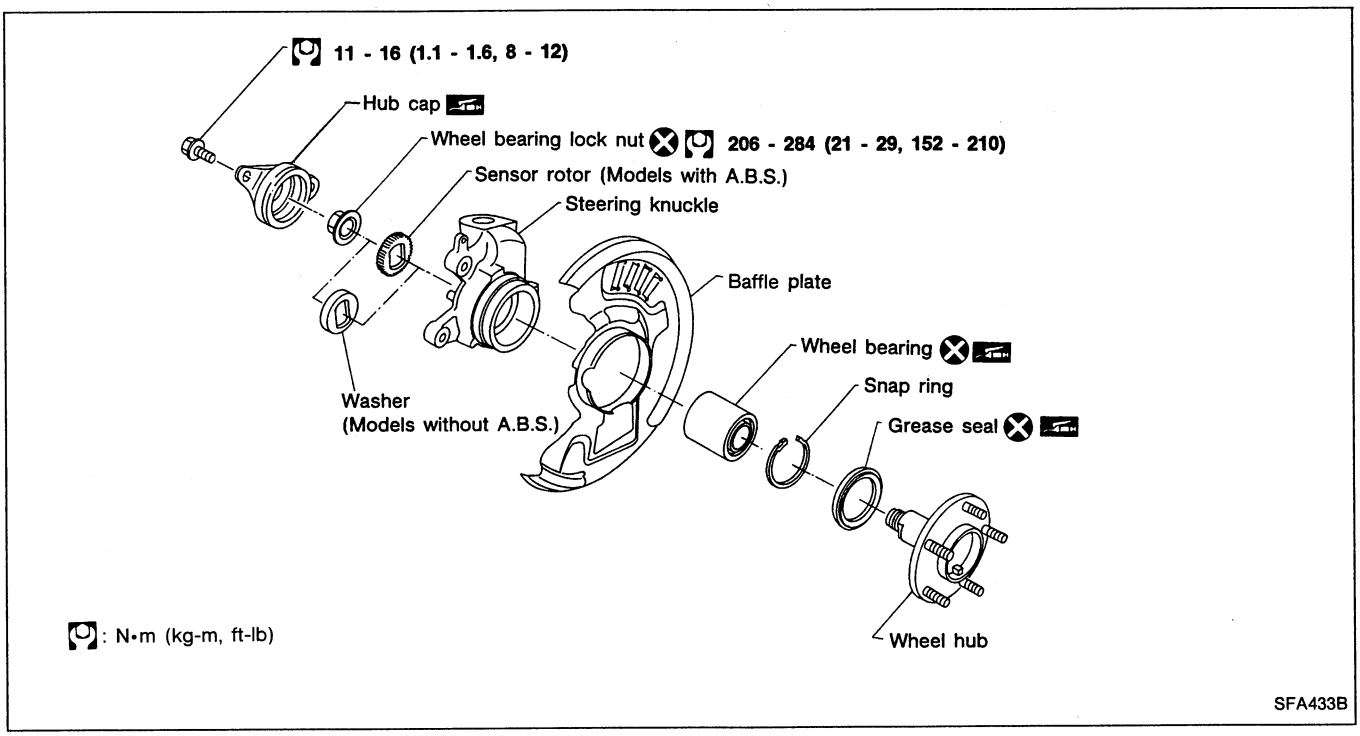


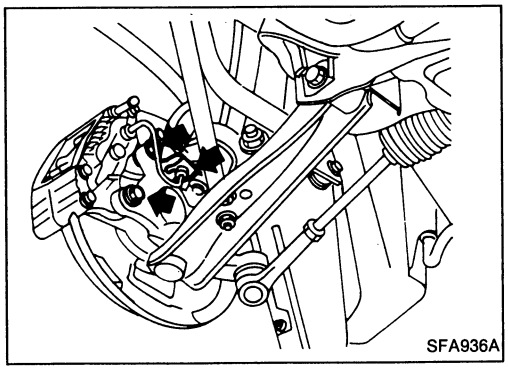
FRONT WHEEL TURNING ANGLE

1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.
2. Rotate steering wheel fully to the right or left; measure turning angle.

Wheel turning angle:

Full turn	Inside wheel: A	32°30′ - 36°30′
	Outside wheel: B	26°30′ - 30°30′





Wheel Hub and Steering Knuckle

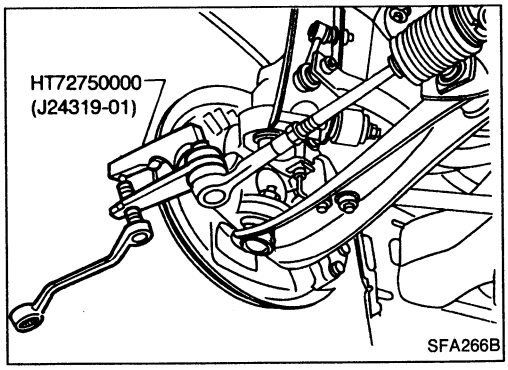
REMOVAL

CAUTION:

Wheel bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly.

- **Growling noise is emitted from wheel bearing during operation.**
- **Wheel bearing drags or turns roughly when hub is turned by hand.**
- Remove brake caliper assembly and rotor.

Brake line need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake line is not twisted.



- Remove tie-rod ball joint and lower ball joint with Tool.

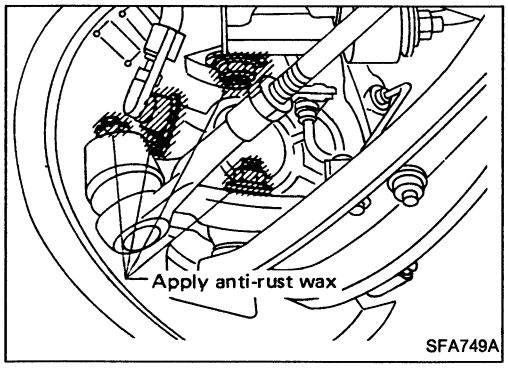
CAUTION:

Steering knuckle is made from aluminum alloy.

Be careful not to hit steering knuckle.

- Remove kingpin lower nut then remove steering knuckle assembly.

Wheel Hub and Steering Knuckle (Cont'd)



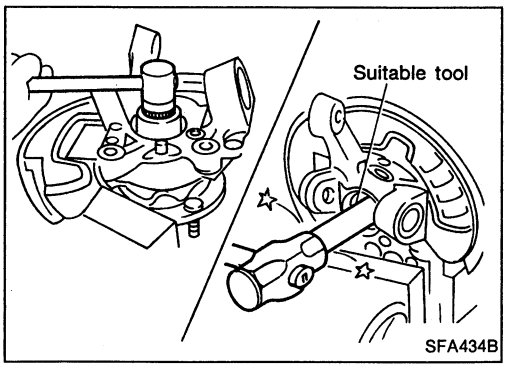
INSTALLATION

- Install steering knuckle assembly.
- Apply anti-rust wax as follows:
  - Portions around lower ball joint connections
  - Portions around tie-rod ball joint connections
  - Portions around kingpin lower nut location
  - Portions around ABS sensor connection

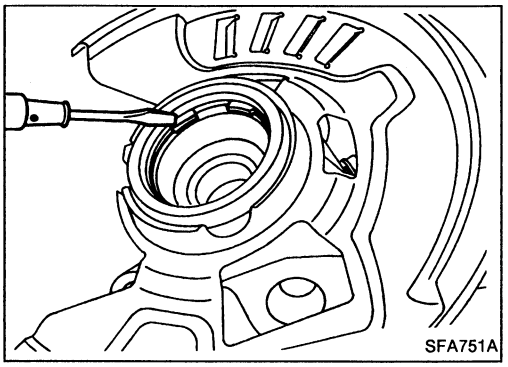
DISASSEMBLY

CAUTION:

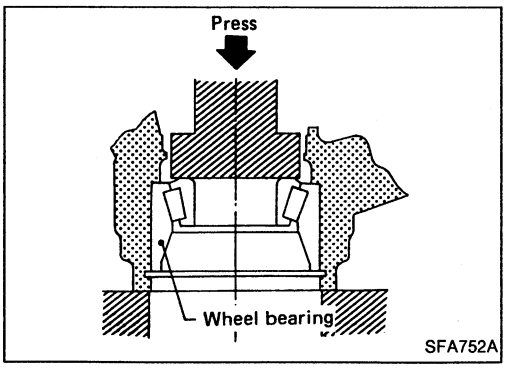
When removing wheel bearing from steering knuckle, replace wheel bearing assembly (outer race, inner races and grease seal) with a new one.



- Remove hub cap and wheel bearing lock nut.
- Remove wheel hub with a suitable tool.

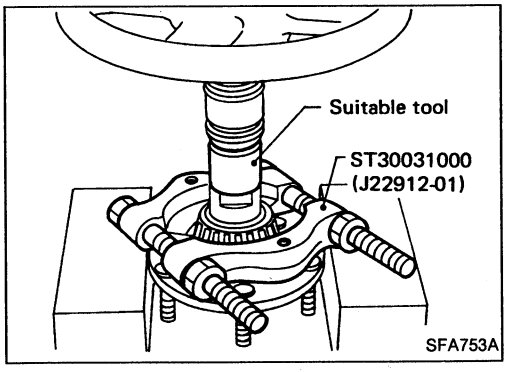


- Remove circular clip with a suitable tool.



- Press out wheel bearing assembly from steering knuckle.

Wheel Hub and Steering Knuckle (Cont'd)



- Drive out wheel bearing inner race (to outside) from wheel hub, then remove grease seal.

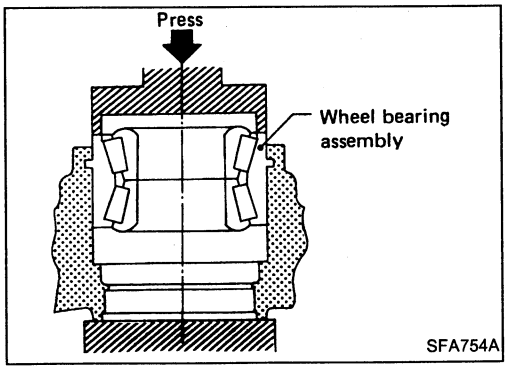
INSPECTION

Wheel hub and steering knuckle

- Check wheel hub and steering knuckle for any cracks.

Circular clip

- Check circular clip for wear or cracks.
  Replace if necessary.

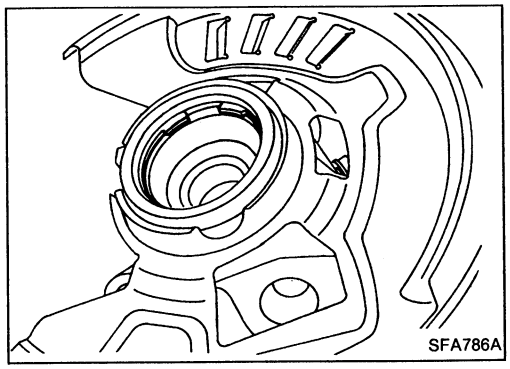


ASSEMBLY

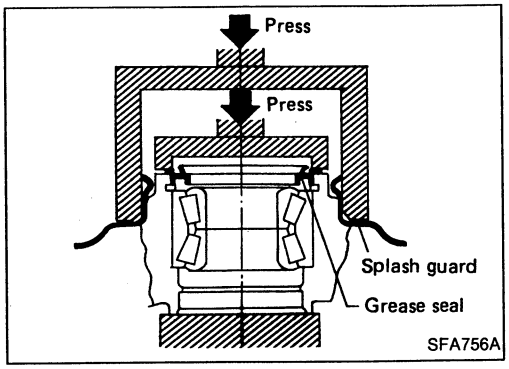
1. Press new wheel bearing assembly into steering knuckle from outside of steering knuckle.
   Maximum load P:
   34.3 kN (3.5 ton, 3.9 US ton, 3.44 Imp ton)

CAUTION:

- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and wheel hub.**

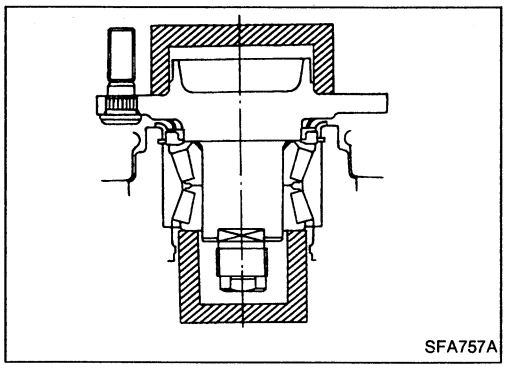


2. Install circular clip into groove of steering knuckle.

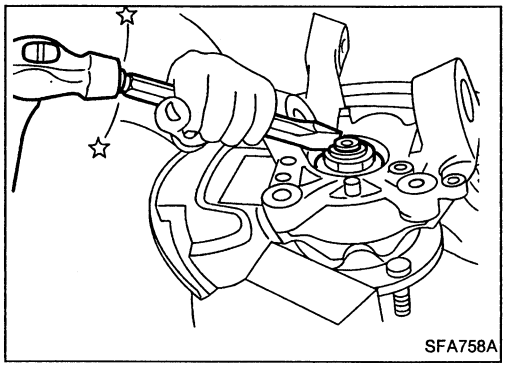


3. Apply multi-purpose grease to sealing lip.
4. Install grease seal.
   Maximum load P:
   10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)
5. Install splash guard.

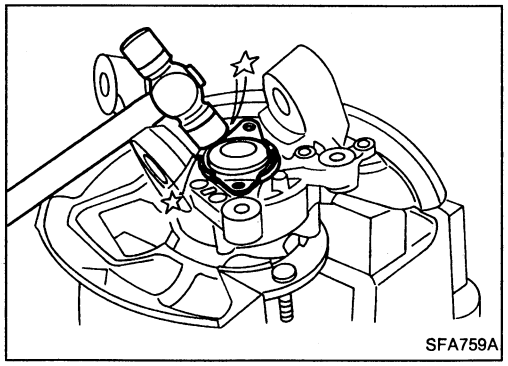
Wheel Hub and Steering Knuckle (Cont'd)


SFA757A

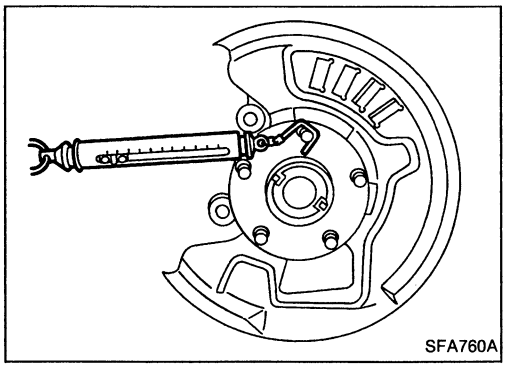
6. Press wheel hub into steering knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)
7. Tighten wheel bearing lock nut to the specified torque.
   [O]: 206 - 284 N·m (21 - 29 kg-m, 152 - 210 ft-lb)


SFA758A

8. Stake wheel bearing lock nut.


SFA759A

9. Install hub cap.
   Apply multi-purpose grease to packing surface of hub cap. Drive hub cap onto steering knuckle by lightly tapping with a plastic hammer. After hub cap is in close contact with steering knuckle, tighten bolts.


SFA760A

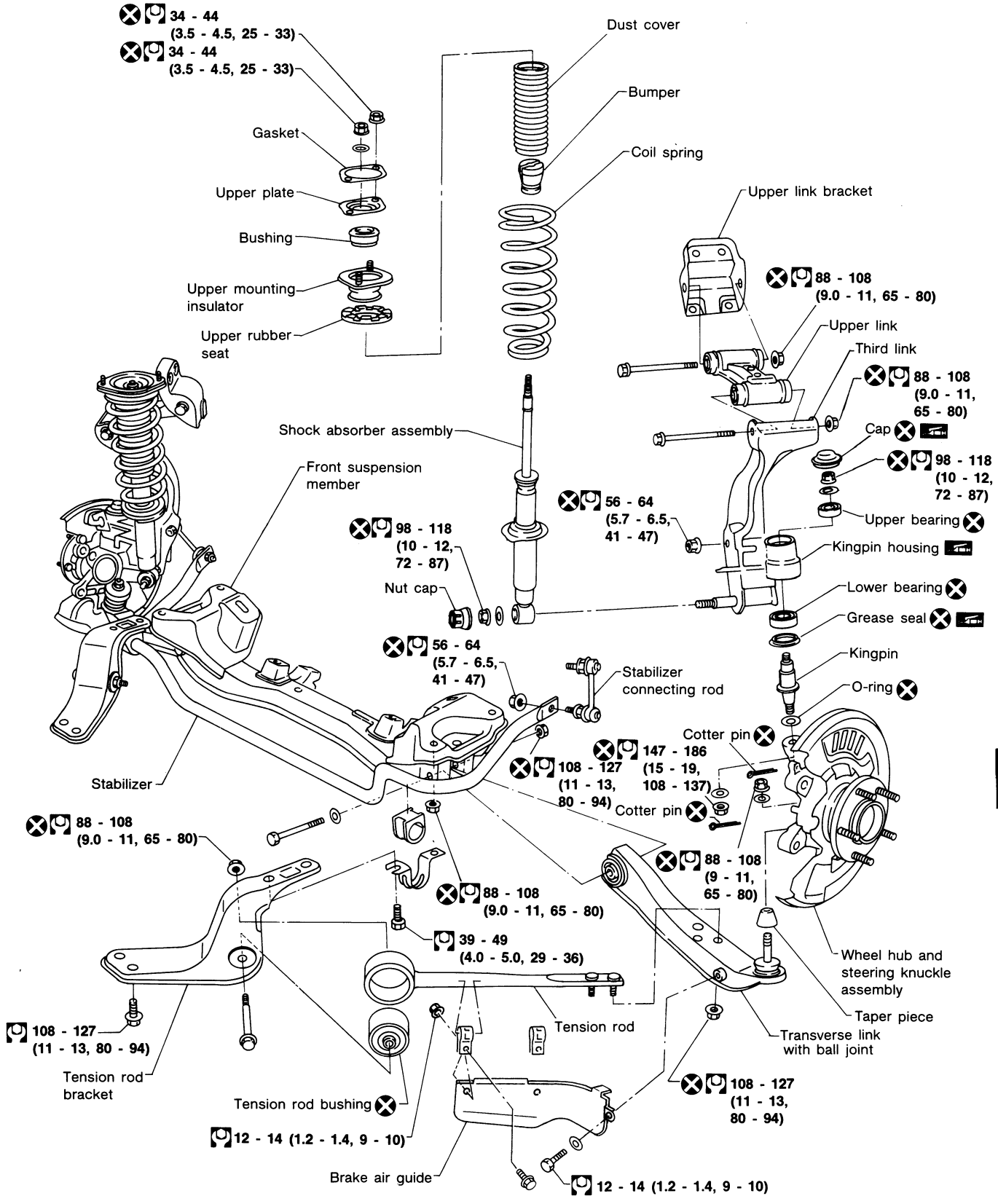
10. Check wheel bearing preload and axial end play.

Before checking, spin wheel hub at least 10 revolutions in both directions.

Turning torque:
0.34 - 2.16 N·m (3.5 - 22.0 kg-cm, 3.0 - 19.1 in-lb)
(NSK bearing)
0.44 - 3.33 N·m (4.5 - 34.0 kg-cm, 3.9 - 29.5 in-lb)
(NTN bearing)

As measured at wheel hub bolt:
5.9 - 37.3 N (0.6 - 3.8 kg, 1.3 - 8.4 lb)
(NSK bearing)
7.8 - 57.9 N (0.8 - 5.9 kg, 1.8 - 13.0 lb)
(NTN bearing)

Axial end play:
0.05 mm (0.0020 in) or less

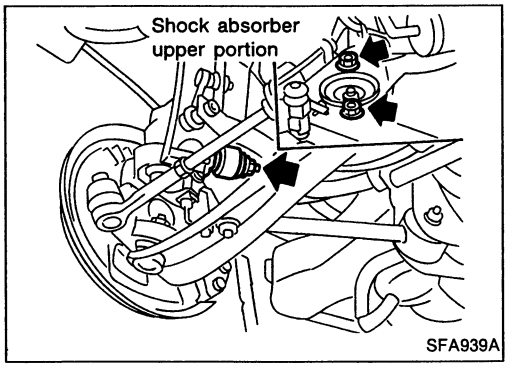


When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

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

: N•m (kg-m, ft-lb)

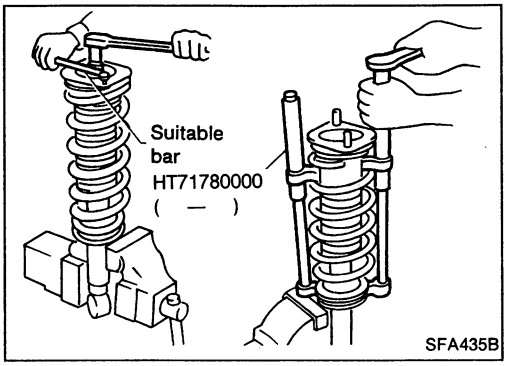
SFA251B



Coil Spring and Shock Absorber

REMOVAL

- Remove shock absorber fixing bolt and nut (to hoodledge).
- **Do not remove piston rod lock nut.**



DISASSEMBLY

1. Set shock absorber on vise with Tool, then loosen piston rod lock nut.
- **Do not remove piston rod lock nut.**
2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.
3. Remove piston rod lock nut.

INSPECTION

Shock absorber assembly

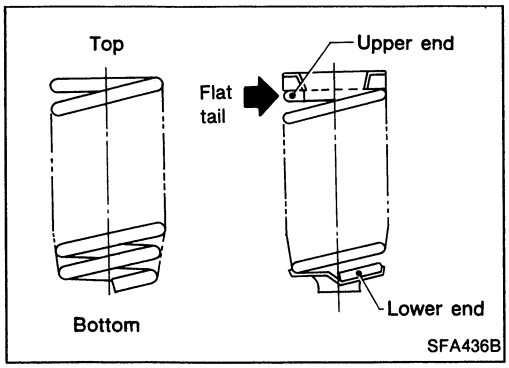
- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

Mounting insulator and rubber parts

- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration. Replace if necessary.

Coil spring

- Check for cracks, deformation or other damage. Replace if necessary.



ASSEMBLY

- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)
- When installing coil spring on shock absorber, it must be positioned as shown in figure at left.

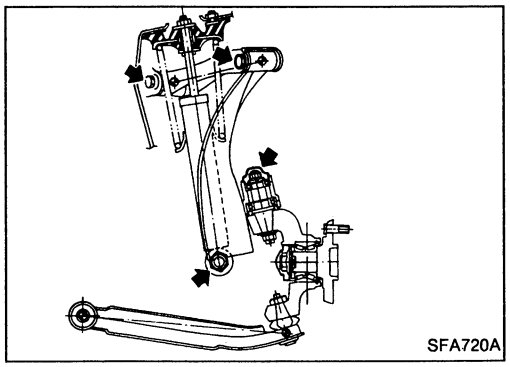
Third Link and Upper Link

REMOVAL

CAUTION:

Kingpin bearing usually does not require maintenance. If any of the following symptoms are noted, replace kingpin bearing assembly.

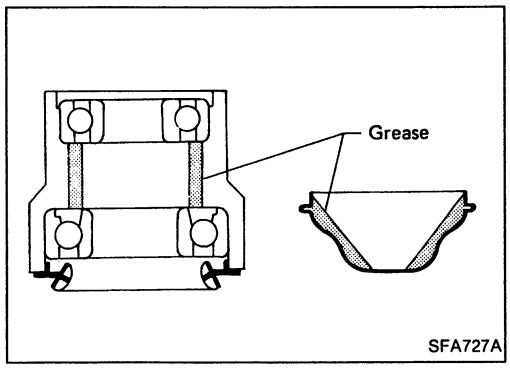
- **Growling noise is emitted from kingpin bearing during operation.**
- **Kingpin bearing drags or turns roughly when steering knuckle is turned by hand.**


SFA720A

1. Remove cap and kingpin upper nut.
- **Do not remove kingpin lower nut.**
2. Remove shock absorber fixing nut and upper link fixing bolts.
3. Remove third link and upper link.

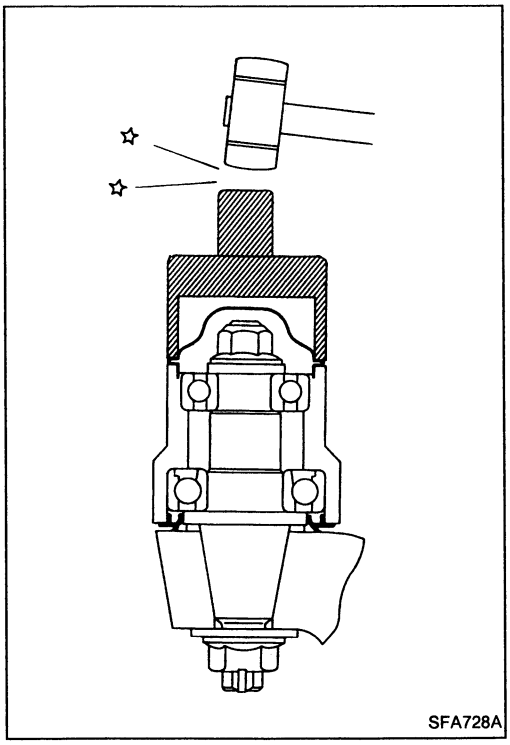
INSTALLATION

Third link



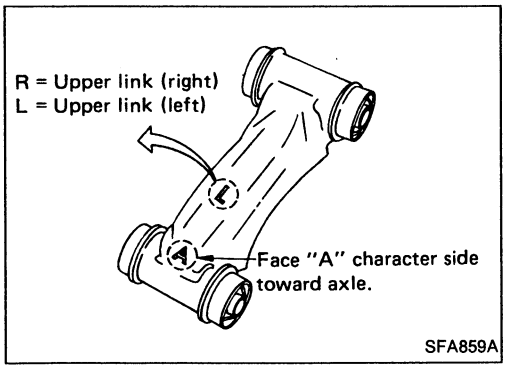
SFA727A

- Pack kingpin housing and cap with multi-purpose grease.
  Grease capacity:
  Kingpin housing 10 g (0.35 oz)
  Cap 5 g (0.18 oz)


SFA728A

- Install third link and cap.

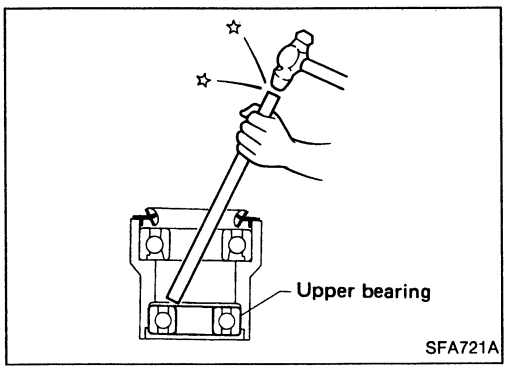
Third Link and Upper Link (Cont'd)



Upper link

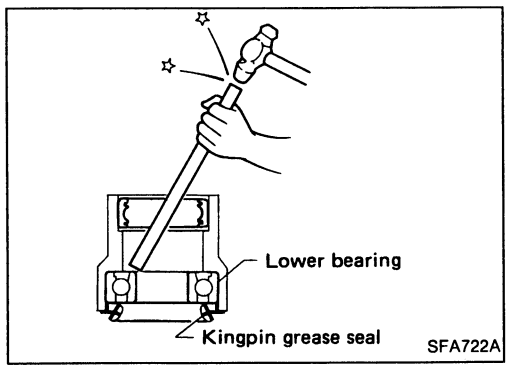
- Upper link has characters "A" and "L" (or "R") on it as shown. Always install upper link with "A" side facing axle and side without a character facing vehicle body.

Upper link bushings cannot be disassembled.

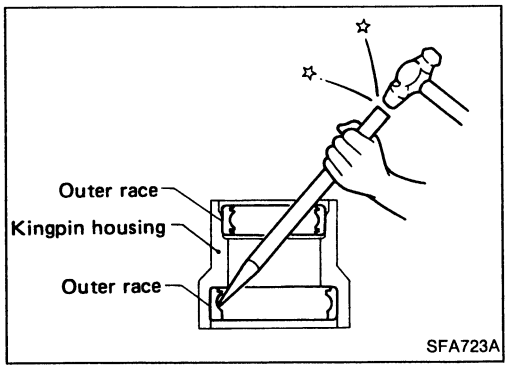


DISASSEMBLY

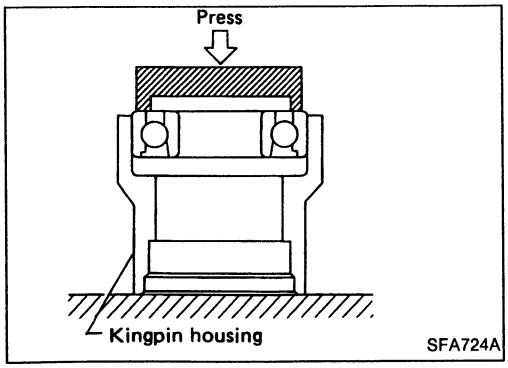
- Remove upper bearing (inner race and ball).



- Remove kingpin grease seal.
- Remove lower bearing (inner race and ball).



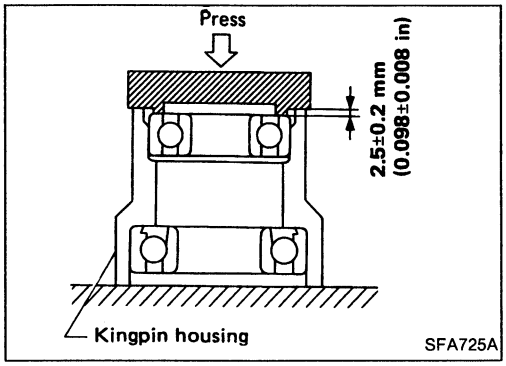
- Remove upper and lower outer race.
- **Be careful not to damage kingpin housing.**



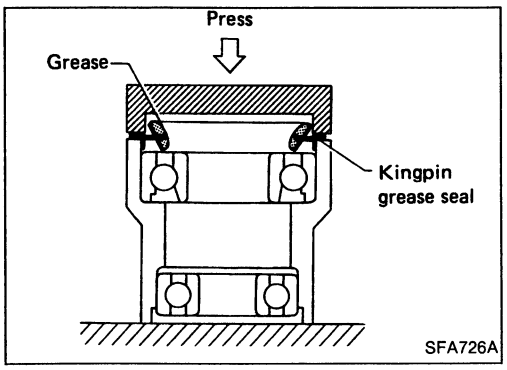
ASSEMBLY

- Install lower bearing.

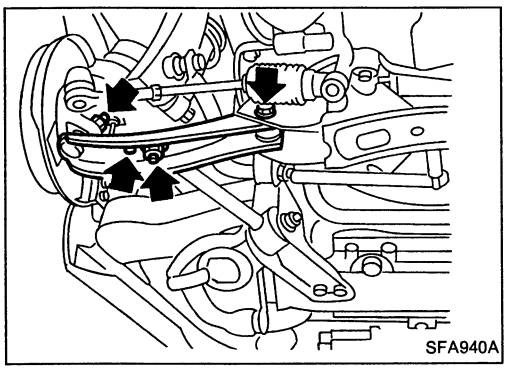
Third Link and Upper Link (Cont'd)



- Install upper bearing.



- Install lower oil seal.
- Apply multi-purpose grease to oil seal lip.



Transverse Link and Lower Ball Joint

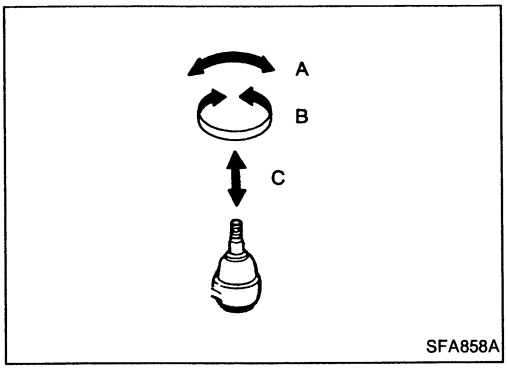
REMOVAL AND INSTALLATION

- 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 and rubber bushing for damage, cracks or deformation.
  Replace if necessary.



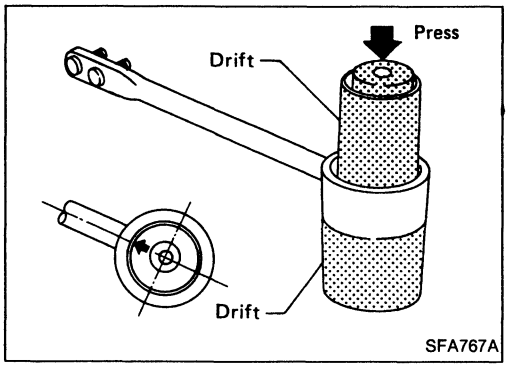
Lower ball joint

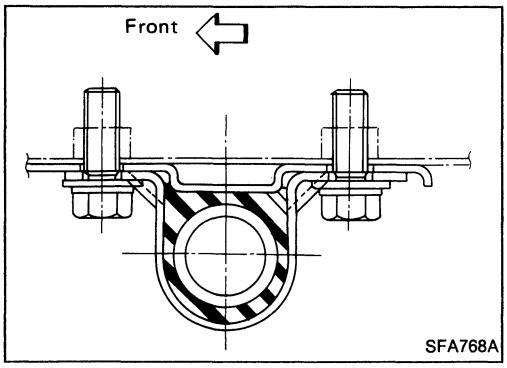
If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link assembly.

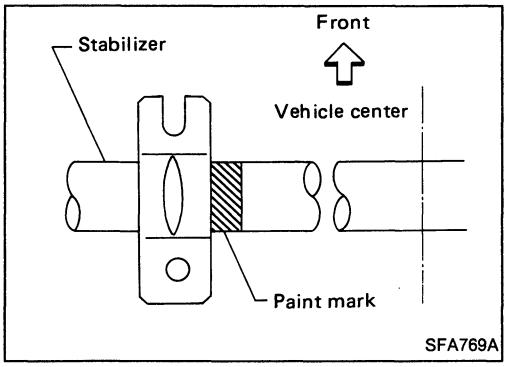
Swing force, turning torque and vertical end play

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

Swing force "A": 7.8 - 53.0 N (0.8 - 5.4 kg, 1.8 - 11.9 lb)
(measuring point: cotter pin hole of ball stud)
Turning torque "B":
0.49 - 3.43 N·m (5.0 - 35 kg-cm, 4.3 - 30.4 in-lb)
Vertical end play limit "C": 0 mm (0 in)



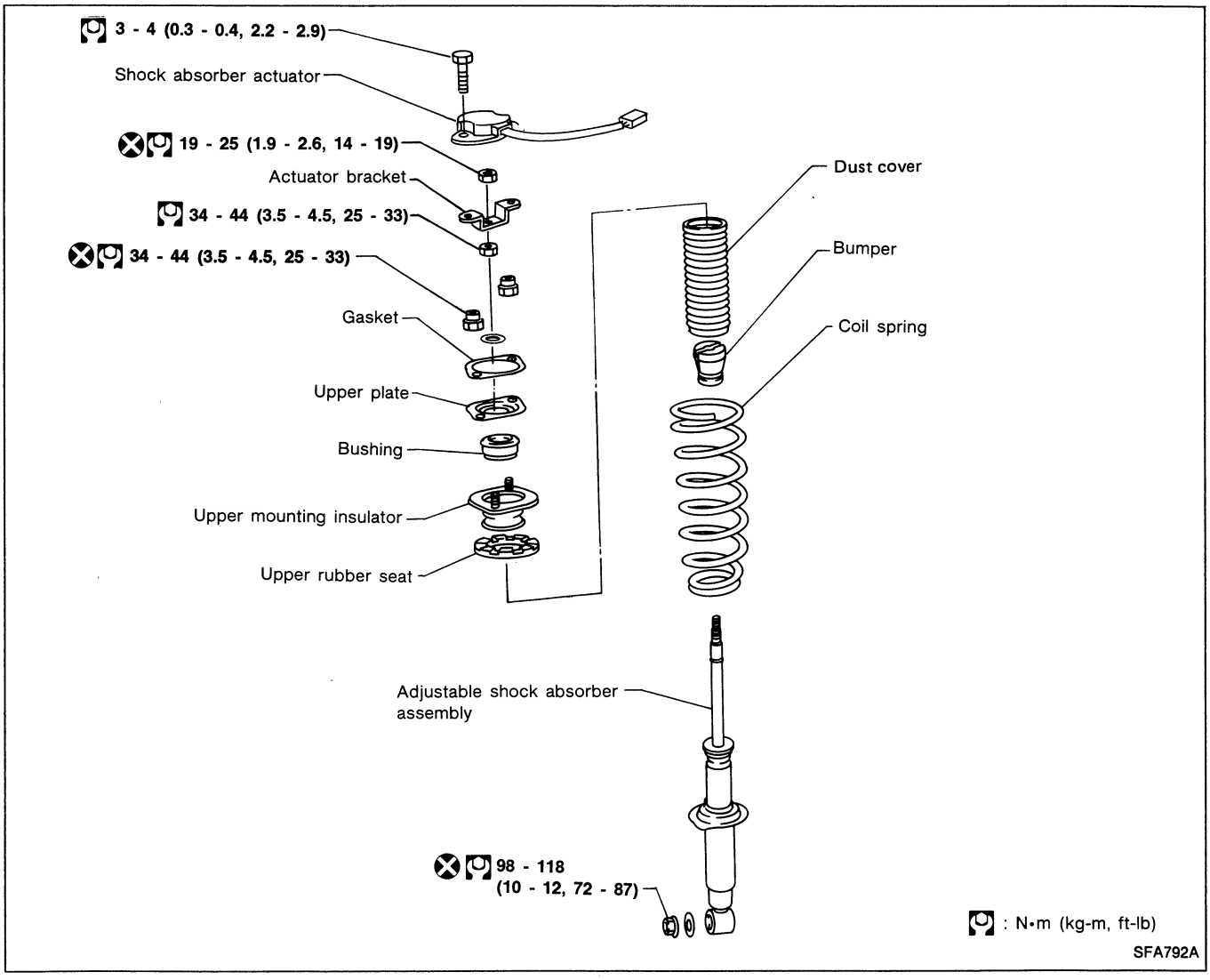


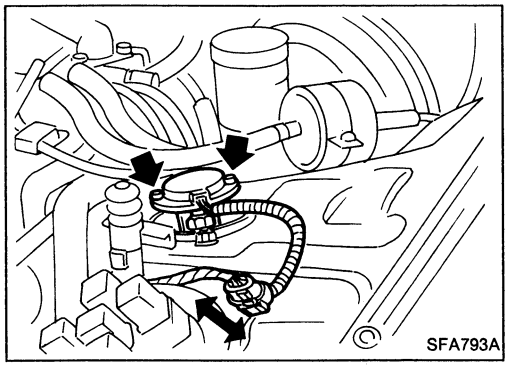


Tension Rod and Stabilizer Bar

REMOVAL AND INSTALLATION

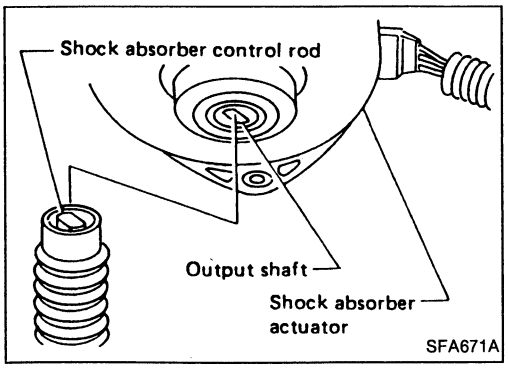
- Remove tension rod and stabilizer bar.
- When removing tension rod bushing, place one drift on lower side of bushing and the other on upper side, and press bushing out.
- Place arrow mark on bushing facing tension rod before installing bushing.
- When installing stabilizer, make sure that paint mark and clamp face in the correct direction.





REMOVAL AND INSTALLATION

- Disconnect sub-harness connector.
- Remove shock absorber actuator fixing bolts.



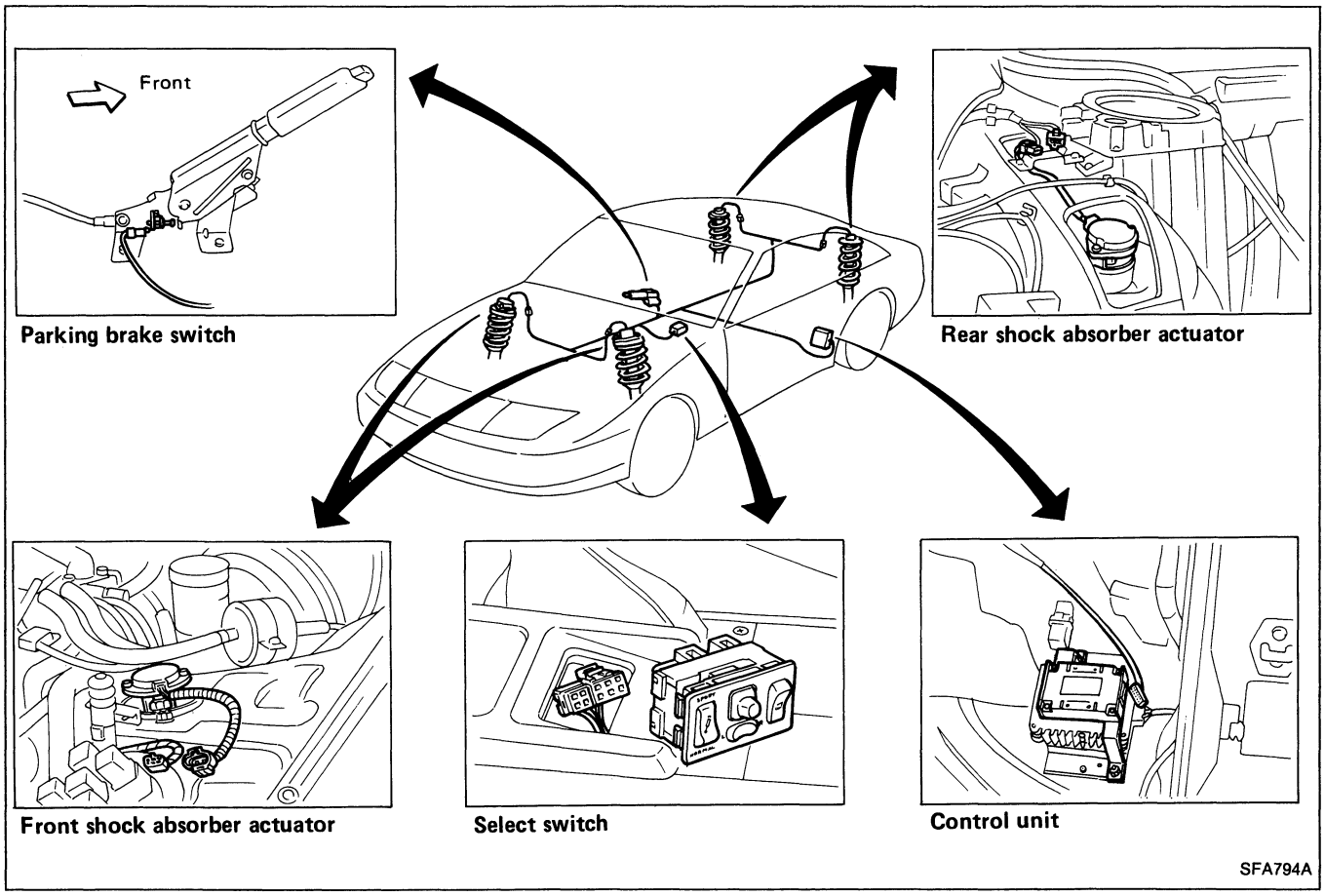
- **Before installing actuator, ensure shock absorber control rod is aligned with actuator output shaft. Otherwise, actuator may be damaged.**
- Refer to FRONT SUSPENSION for other procedures.

INSPECTION

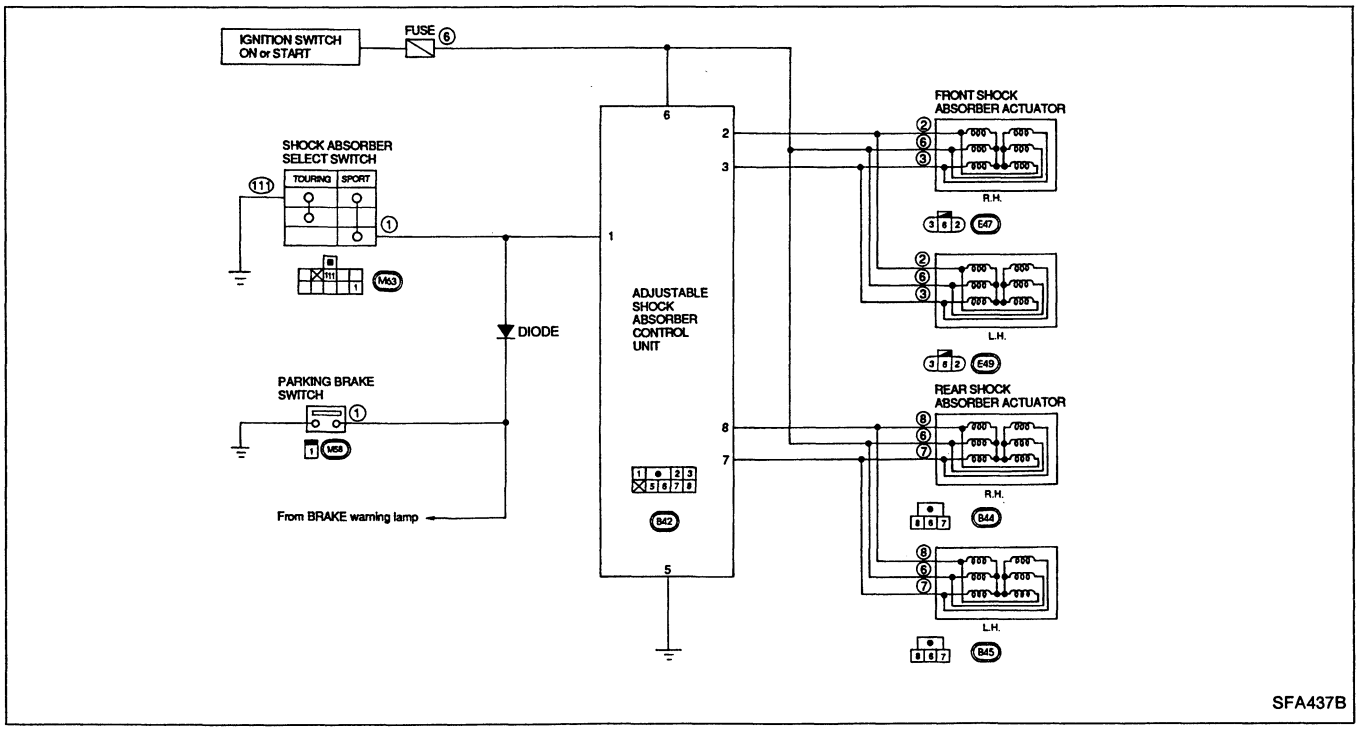
- Replace shock absorber assembly if it is damaged. Refer to FRONT SUSPENSION — Coil Spring and Shock Absorber.

Trouble Diagnoses

COMPONENT PARTS AND HARNESS CONNECTOR LOCATION

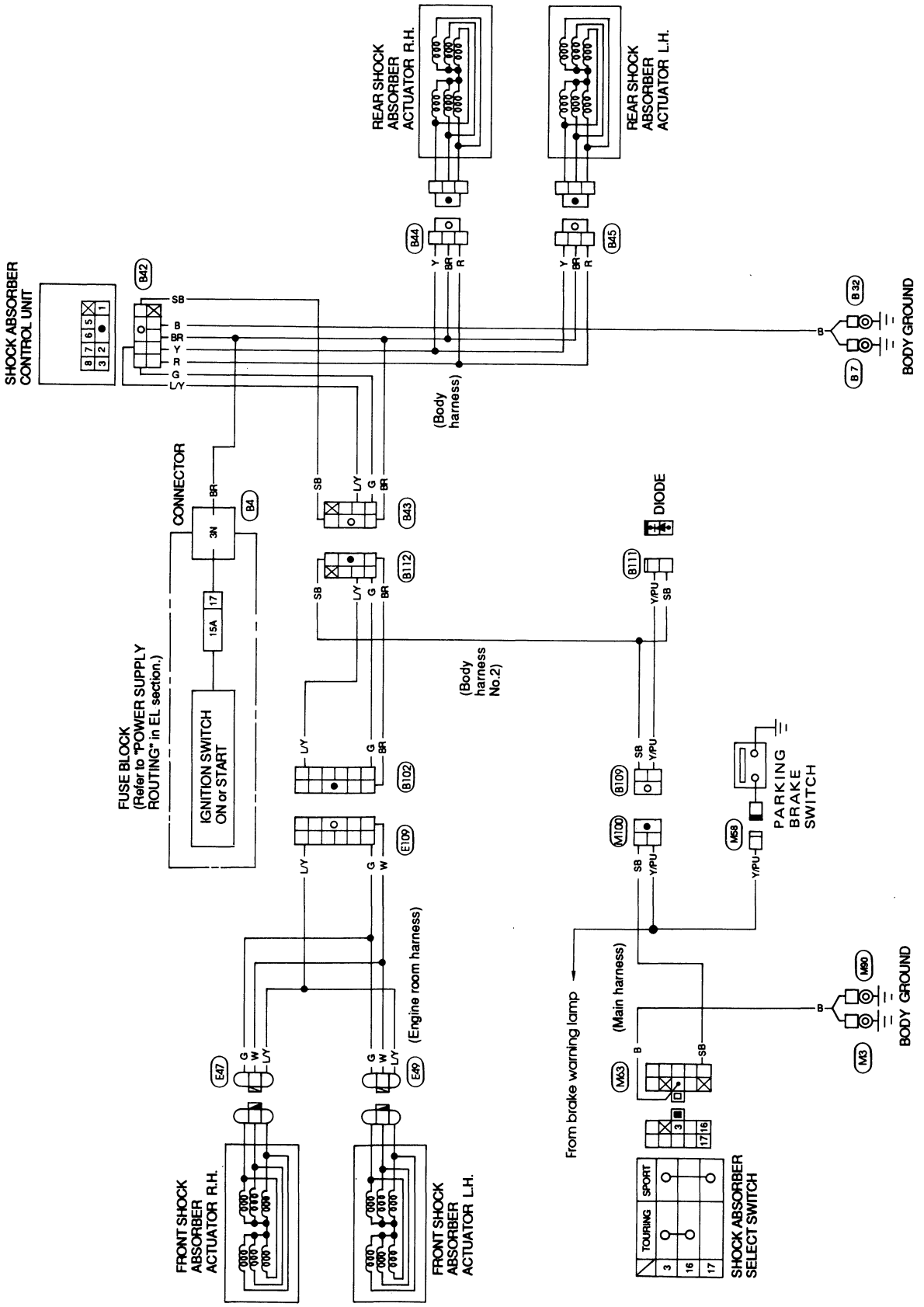


CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



Trouble Diagnoses (Cont'd)

WIRING DIAGRAM

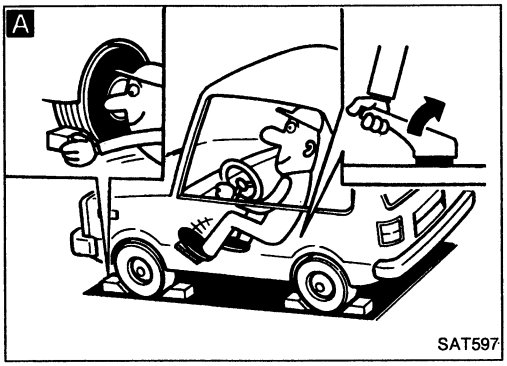


SFA461B

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE

A



SAT597

START

A

Engage parking brake and chock all four wheels.

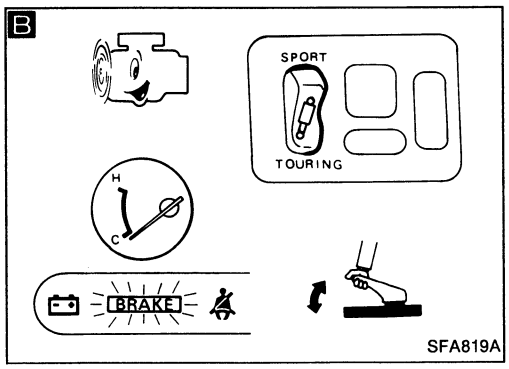
B

CHECK PARKING BRAKE WARNING LAMP.
1) Set shift lever to "P" (A/T model) or "N" (M/T model).
2) Set select switch to "TOURING".
3) Start engine.
4) Check that parking brake warning lamp comes on when engine starts.

No → Repair or replace parking brake switch, warning lamp or harness.

Yes

B



SFA819A

C

CHECK SWITCHING OF SHOCK ABSORBER ACTUATOR.
- Release and engage parking brake.
- Push down on body above each wheel with your hand to check damping force of shock absorber.
- Release parking brake. Push down on body above each wheel to check if damping force of shock absorber changes.

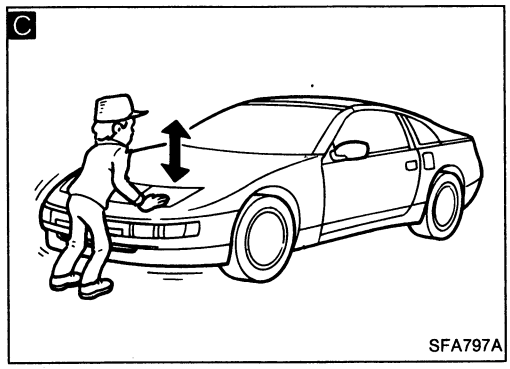
Damping force of all shock absorber does not change.

D

CHECK CONNECTOR CONTINUITY.
Disconnect control unit and select switch connectors and reconnect them firmly.

Ⓐ

C



SFA797A

Damping force of one or more shock absorbers changes.

E

CHECK SWITCHING OF SHOCK ABSORBER ACTUATOR.
- Release parking brake.
- Move select switch from "TOURING" to "SPORT".
- Push down on body above each wheel with your hand to see if damping force of each shock absorber changes.

→ Ⓑ

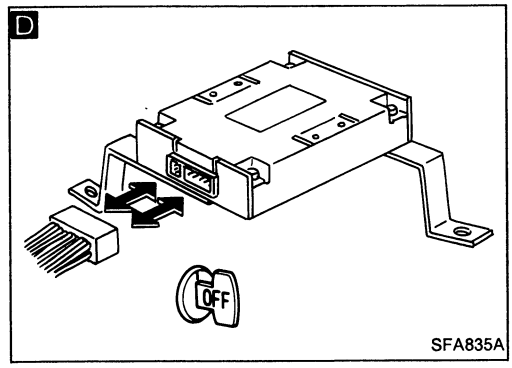
Damping force of all shock absorbers does not change.

→ Ⓒ

Damping force of some shock absorbers does not change.

Damping force of all shock absorbers changes.

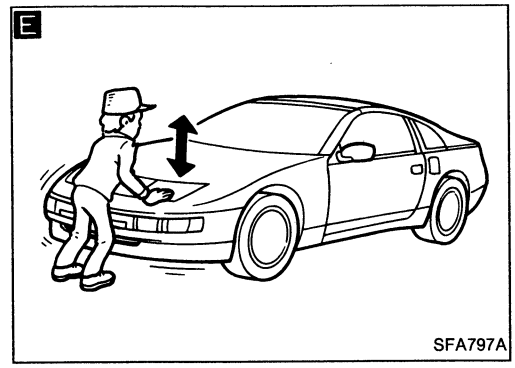
D



SFA835A

END

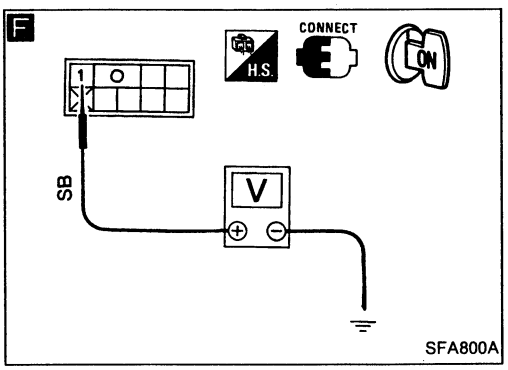
E



SFA797A

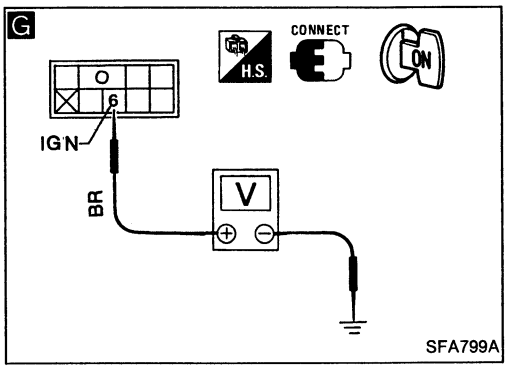
Trouble Diagnoses (Cont'd)

F



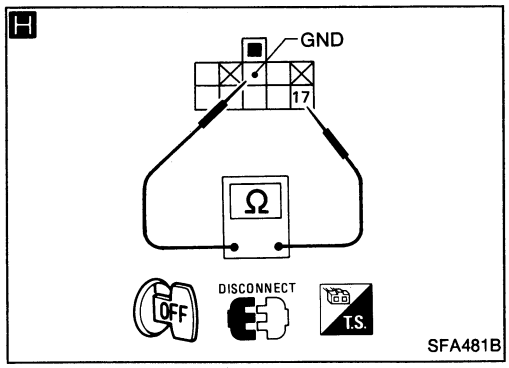
SFA800A

G



SFA799A

H



SFA481B

Ⓐ

F

CHECK CONTROL UNIT INPUT SIGNAL.
Check control unit input signal at terminal ①.
- Set select switch to "TOURING".
- Parking brake lever:
  Released ...
  Approx. 12V O.K.
  Engaged ... 0V

12V are indicated regardless of parking brake lever position.

→ Repair or replace harness between control unit and parking brake switch.

0V are indicated regardless of parking lever position.

O.K.

G

CHECK CONTROL UNIT POWER SUPPLY.
1) Turn ignition switch "ON".
2) Measure voltage across control unit terminals IGN and ground.
Voltage:
Approximately 12V
... O.K.

O.K. → Replace control unit.

N.G. → Check and repair fuse and power supply harness.

H

CHECK SELECT SWITCH CONTINUITY.
1) Disconnect select switch connector.
2) Check continuity between select switch terminal ⑯ and GND.
Continuity should exist.

O.K. → Repair or replace harness between control unit and parking brake switch.

N.G. → Replace select switch.

Ⓑ

H

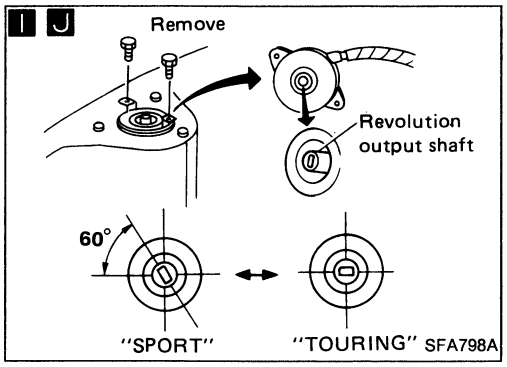
CHECK SELECT SWITCH CONTINUITY.
1) Disconnect select switch connector.
2) Check continuity between select switch terminal ⑯ and GND.
Continuity should exist.

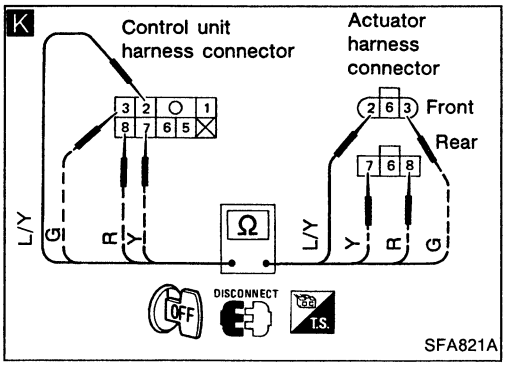
N.G. → Replace select switch.

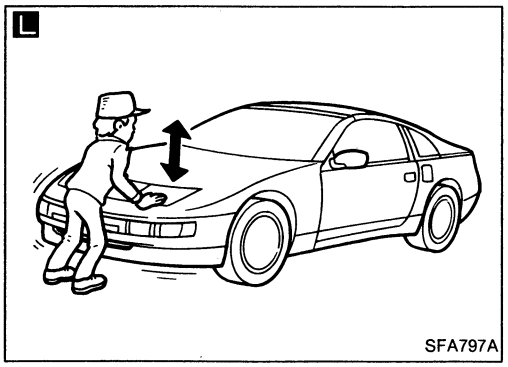
O.K.

Repair or replace harness between control unit and select switch.

Trouble Diagnoses (Cont'd)







Ⓒ

Rubbing noise is emitted from actuator.

I CHECK ACTUATOR.
Remove actuator from shock absorber (for those shock absorbers in which damping force does not change).
Switch select switch to check if actuator output shaft rotates.

→ Replace actuator.

Output shaft rotates. → Ⓓ

Output shaft does not rotate.

J Interchange left and right actuators and check that output shafts rotate.

Yes → Old actuator malfunctions.
Replace.

No

K CHECK HARNESS CONTINUITY BETWEEN CONTROL UNIT AND ACTUATOR.
1) Disconnect control unit connector and actuator connector.
2) Check continuity between control unit harness connector terminals and corresponding terminals of actuator harness connector.
Continuity should exist.

N.G. → Repair or replace harness between control unit and actuator.

O.K.

Replace control unit.

Ⓓ

Visually check bracket for deformities.

N.G. → Replace bracket.

O.K.

L CHECK SWITCHING OF SHOCK ABSORBER ACTUATOR.
After checking that output shafts rotate with left and right actuators interchanged, install actuator on shock absorber for which damping force does not change, and check that damping force changes properly.

N.G. → Replace shock absorber.

O.K.

Old actuator malfunctions.
Replace.

Trouble Diagnoses (Cont'd)

Control and operation of shock absorber damping force

	Select switch	
	TOURING	SPORT
Parking brake lever released	Soft	Firm
Parking brake lever engaged	Firm	Firm

Control unit inspection table

Terminal No.	Connected to	Standard value
①	Select switch and parking brake switch	0V ("SPORT"); 12V ("TOURING") *1 0V (parking brake lever released); *2 12V (parking brake lever engaged)
②	Front actuator "Firm"	When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V. *1
③	Front actuator "Soft"	When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V. *1
⑤	GND	0V
⑥	IGN	Approx. 12V
⑦	Rear actuator "Firm"	When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V. *1
⑧	Rear actuator "Soft"	When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V. *1

*1: Measure with parking brake released.
*2: Measure with select switch set to "TOURING".

General Specifications

COIL SPRING

Model	2 seater (Non-turbo)	2+2 seater (Non-turbo)	Turbo
Wire diameter mm (in)	12.1 (0.476)	11.9 (0.469)	12.1 (0.476)
Coil diameter mm (in)	100.1 (3.94)	99.9 (3.933)	100.1 (3.94)
Free length mm (in)	360 (14.17)	370 (14.57)	
Identification color	Light blue x 1, Pink x 1	Light blue x 2	Light blue x 1, Orange 1

SHOCK ABSORBER

Model	Non-turbo	Turbo
Shock absorber type	Double acting gas type	
Piston rod diameter mm (in)	12.5 (0.492)	14.0 (0.551)
Inner cylinder bore diameter mm (in)	25.0 (0.984)	30.0 (1.181)

FRONT STABILIZER BAR

Applied model	2 seater	2+2 seater
Stabilizer diameter mm (in)	27.2 (1.071)	28.6 (1.126)
Identification color	White	Purple

TENSION ROD

Rod diameter mm (in)	20.0 (0.787)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Camber	degree	−1°35′ to −0°05′
Caster	degree	8°55′ - 10°25′
Toe-in		
A — B	mm (in)	0 - 2 (0 - 0.08)
Total angle 2θ	degree	0′ - 11′
Kingpin inclination	degree	12°10′ - 13°40′
Front wheel turning angle		
Full turn*2 inside/outside	degree	32°30′ - 36°30′/26°30′ - 30°30′

*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 mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut	
Tightening torque N·m (kg-m, ft-lb)	206 - 284 (21 - 29, 152 - 210)
Wheel bearing turning resistance N·m (kg-cm, in-lb)	
NSK bearing	0.34 - 2.16 (3.5 - 22.0, 3.0 - 19.1)
NTN bearing	0.44 - 3.33 (4.5 - 34.0, 3.9 - 29.5)
At wheel hub bolt N (kg, lb)	
NSK bearing	5.9 - 37.3 (0.6 - 3.8, 1.3 - 8.4)
NTN bearing	7.8 - 57.9 (0.8 - 5.9, 1.8 - 13.0)

LOWER BALL JOINT

Swing force (Measuring point: cotter pin hole of ball stud) N (kg, lb)	7.8 - 53.0 (0.8 - 5.4, 1.8 - 11.9)
Turning torque N·m (kg-cm, in-lb)	0.49 - 3.43 (5.0 - 35, 4.3 - 30.4)
Vertical end play mm (in)	0 (0)

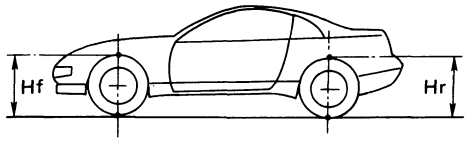
WHEEL RUNOUT (Radial and lateral)

Aluminum wheel	0.3 mm (0.012 in) or less

WHEELARCH HEIGHT

Unit: mm (in)

	Non-turbo		Turbo
	2 seater	2+2 seater	2 seater
Front (Hf)	675 (26.57)	677 (26.65)	675 (26.57)
Rear (Hr)	676 (26.61)	675 (26.57)	675 (26.57)

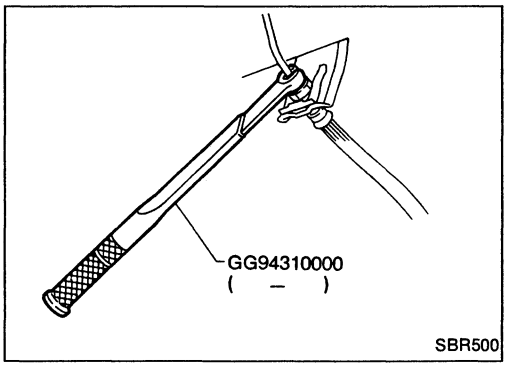


SFA750A

REAR AXLE & REAR SUSPENSION

SECTION RA

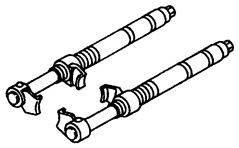
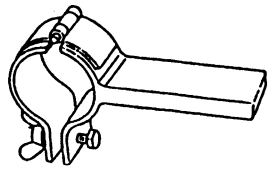
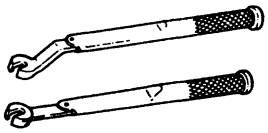
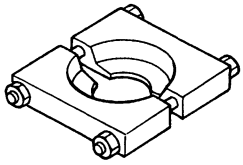
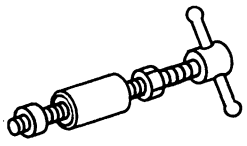
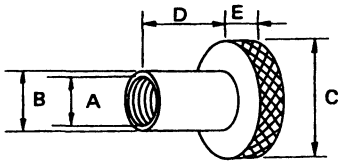
CONTENTS



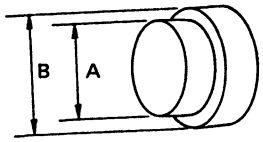
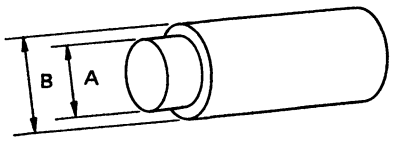
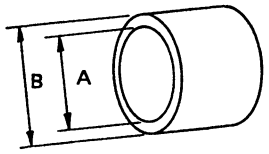
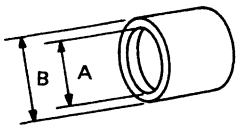
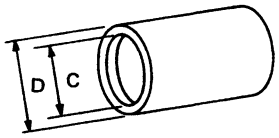
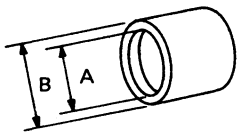
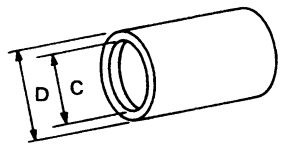
Precautions

- **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 lines.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Do not jack up at the lower arm.**

Special Service Tools

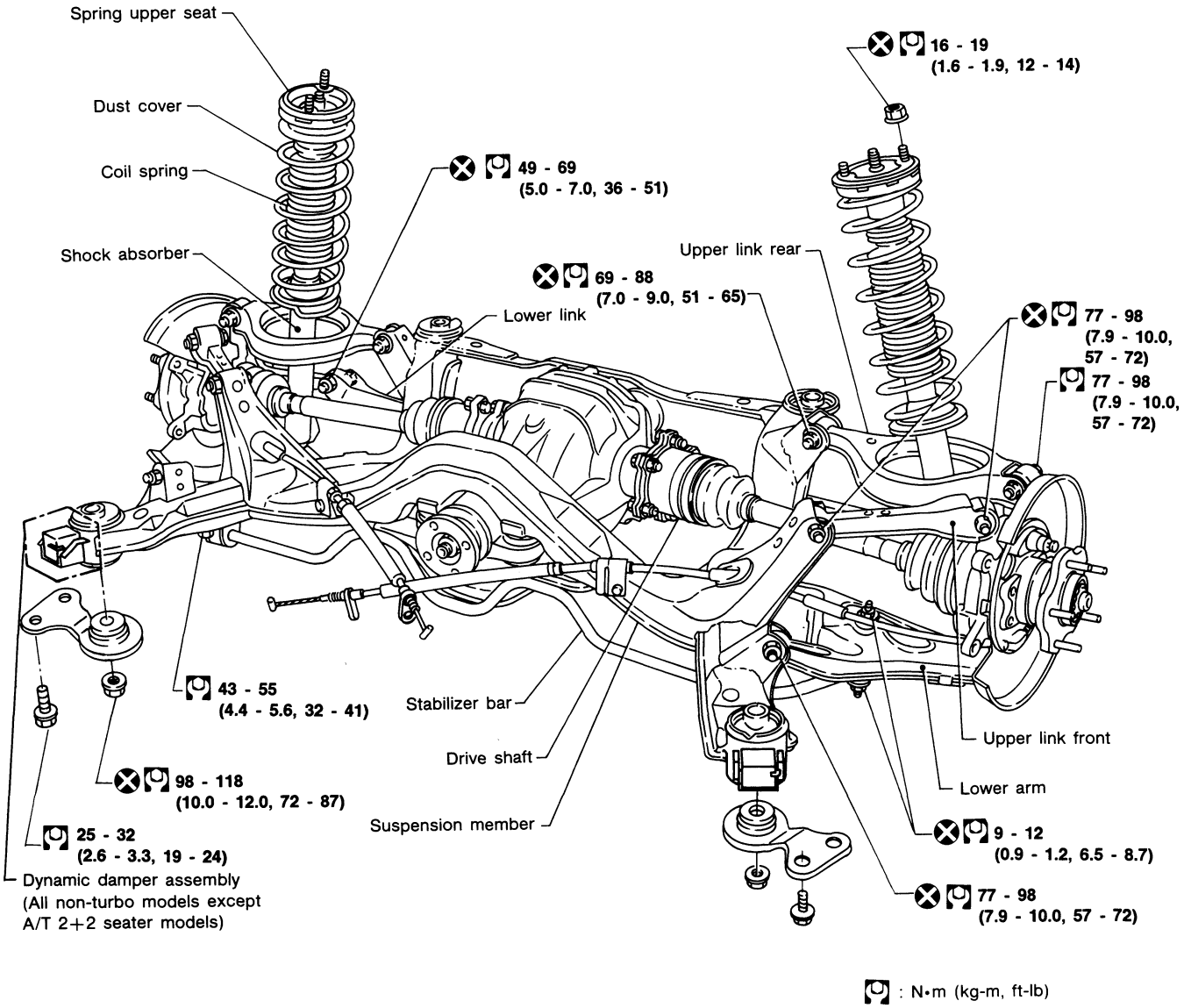
Tool number (Kent-Moore No.) Tool name	Description	
HT71780000 (—) Spring compressor		Removing and installing coil spring
ST35652000 (—) Shock absorber attachment		Fixing strut assembly
GG94310000 (—) Flare nut torque wrench		Removing and installing brake piping
ST30031000 (J22912-01) Bearing puller		Removing inner race of wheel bearing
ST38280000 (—) Arm bushing remover		Removing and installing bushing of rear axle housing
IM23600800 (—) Attachment Wheel alignment		Measure rear 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)

Commercial Service Tools

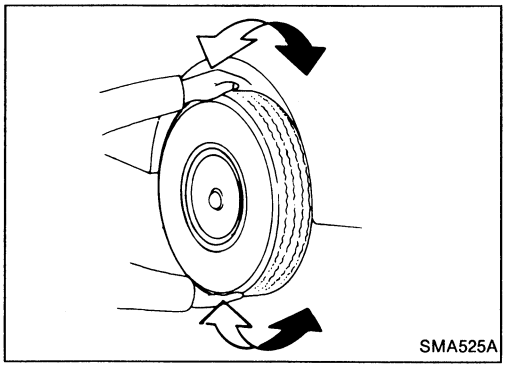
Tool name	Description	
Rear wheel hub drift		Installing bearing **A: 41 mm (1.61 in) dia.** **B: 49 mm (1.93 in) dia.**
Wheel bearing drift		Removing rear wheel hub **A: 26 mm (1.02 in) dia.** **B: 40 mm (1.57 in) dia.**
Rear drive shaft plug seal drift		Installing rear drive shaft plug seal **A: 67 mm (2.64 in) dia.** **B: 85 mm (3.35 in) dia.**
Rear axle housing ball joint drift	 	Removing ball joint **A: 20 (0.79) dia.** **B: 28 (1.10) dia.** **C: 40 (1.57) dia.** **D: 43 (1.69) dia.** Unit: mm (in)
Rear axle housing ball joint drift	 	Installing ball joint **A: 33 (1.30) dia.** **B: 43 (1.69) dia.** **C: 30 (1.18) dia.** **D: 40 (1.57) dia.** Unit: mm (in)

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.**



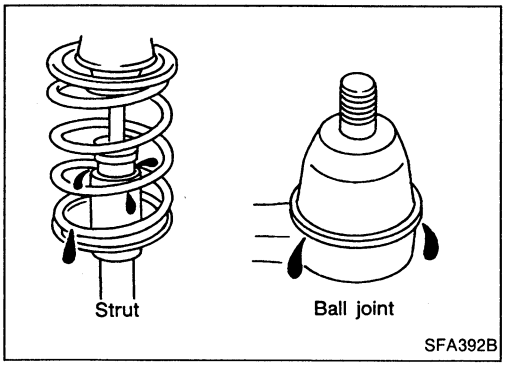
SRA220A


SMA525A

Rear Axle and Rear Suspension Parts

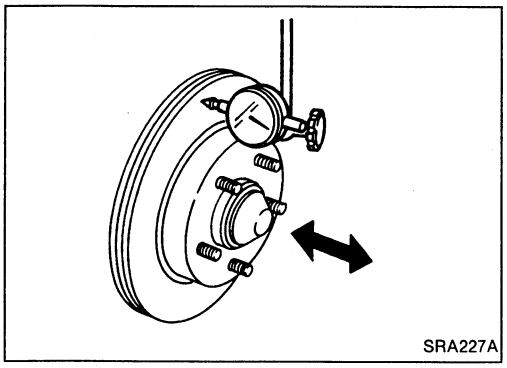
Check axle and suspension parts for looseness, wear or damage.

- Shake each rear wheel to check for excessive play.
- Retighten all nuts and bolts to the specified torque.
  Tightening torque:
  Refer to REAR SUSPENSION.
- Make sure that cotter pin is inserted.
- Check rear axle and rear suspension parts for wear, cracks or other damage.



SFA392B

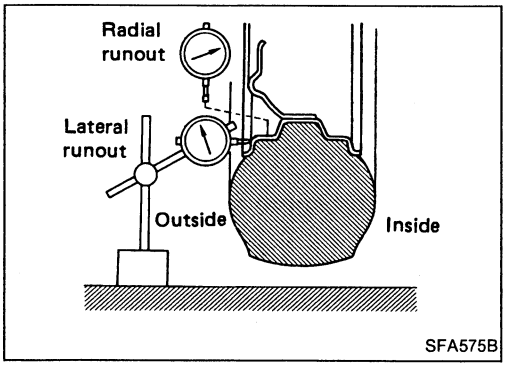
- Check shock absorber for oil leakage or other damage.
- Check wheelarch height. Refer to section FA.
- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.


SRA227A

Rear Wheel Bearing

- Check tightening torque of wheel bearing lock nut.
  [O]: 206 - 275 N·m
  (21 - 28 kg-m, 152 - 203 ft-lb)
- Check wheel bearings for smooth operation.
- 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 REAR AXLE — Wheel Hub and Axle Housing.



SFA575B

Rear Wheel Alignment

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

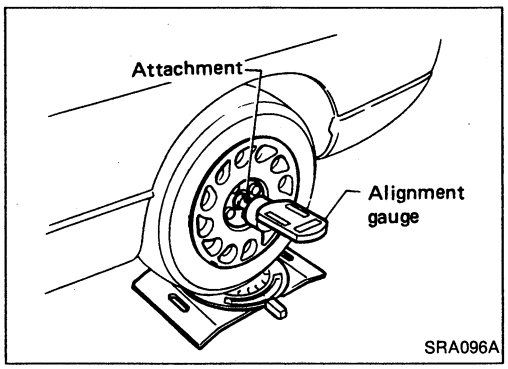
PRELIMINARY INSPECTION

Make the 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.
  Refer to S.D.S.
- Check that rear shock absorber works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen).

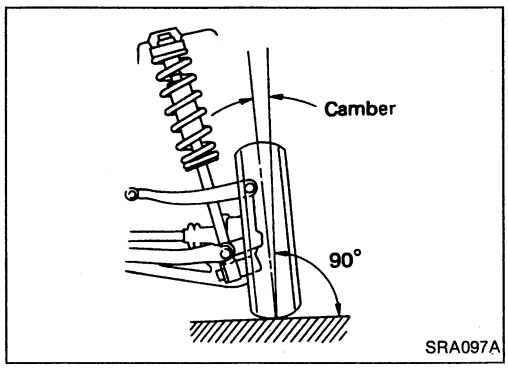
("Unladen": Fuel tank, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.)

Rear Wheel Alignment (Cont'd)

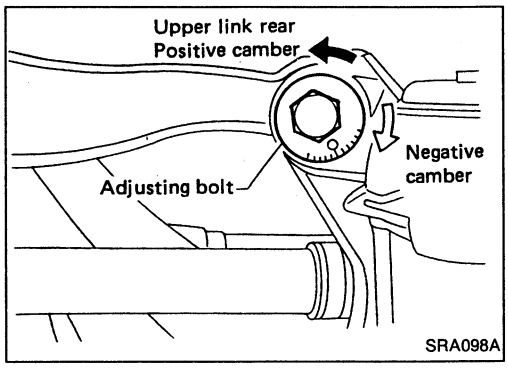


CAMBER

- **Measure camber of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.**



Camber:
Refer to S.D.S.



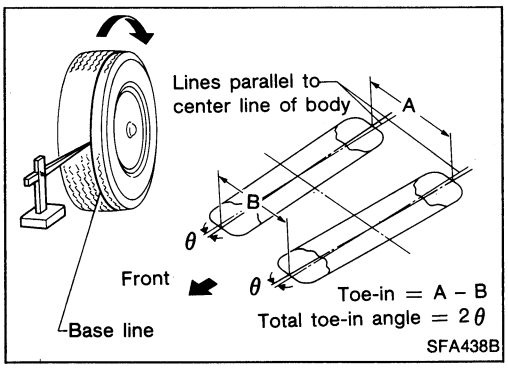
If camber is not within specification, adjust by turning the adjusting bolt.

(1) Turn the adjusting bolt to adjust.

Camber changes about 5′ with each graduation of the adjusting bolt.

(2) Tighten to the specified torque.

: 69 - 88 N·m
(7.0 - 9.0 kg-m, 51 - 65 ft-lb)



TOE-IN

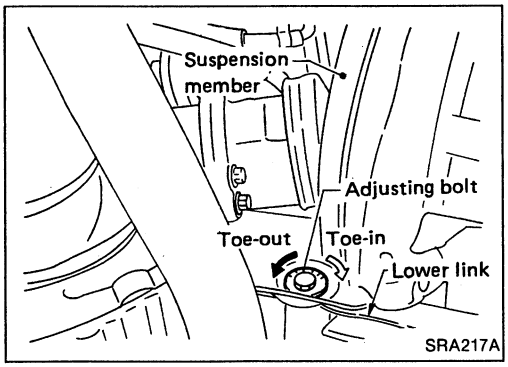
1. Draw a base line across the tread.

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.

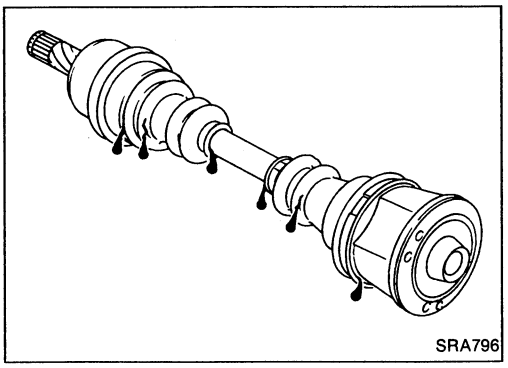


3. Adjust toe-in by turning adjusting bolts.

Toe changes about 1.5 mm (0.059 in) [One side] with each graduation of the adjusting bolt.

4. Tighten to the specified torque.

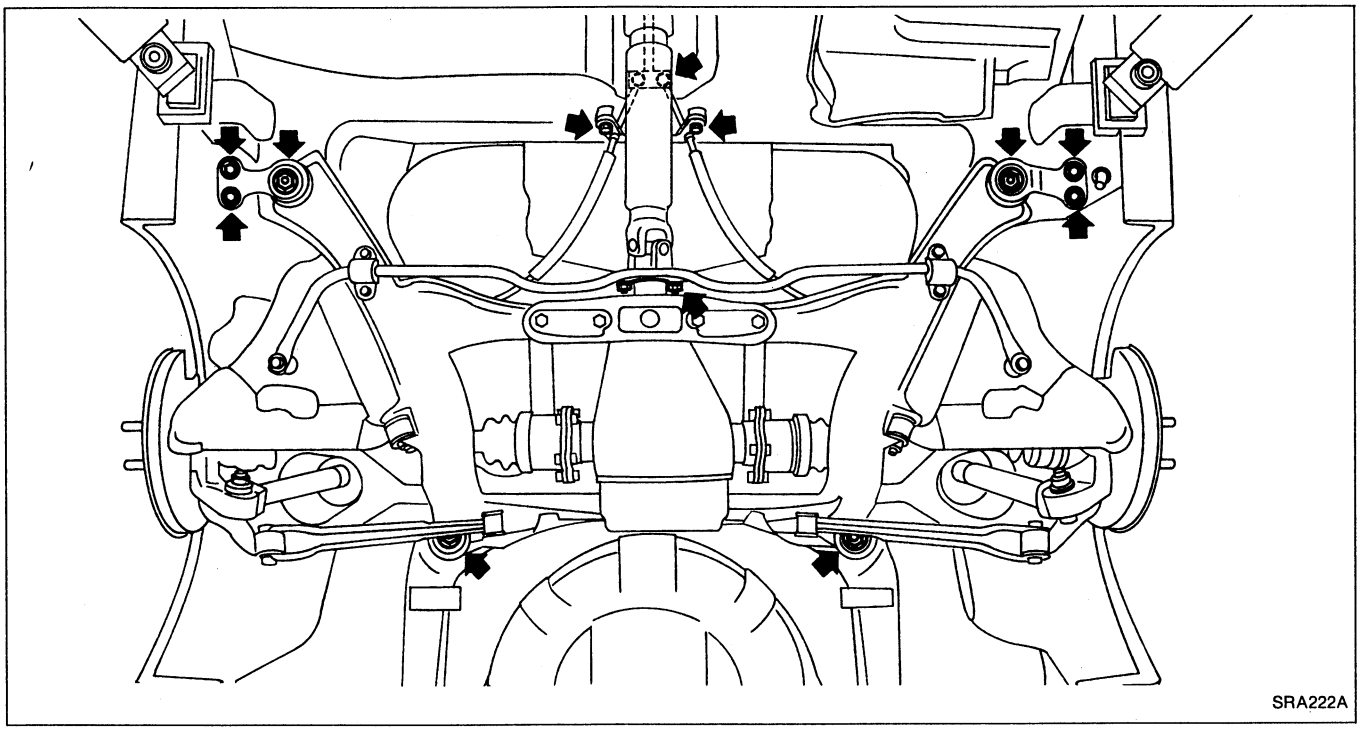
: 69 - 88 N·m
(7.0 - 9.0 kg-m, 51 - 65 ft-lb)


SRA796

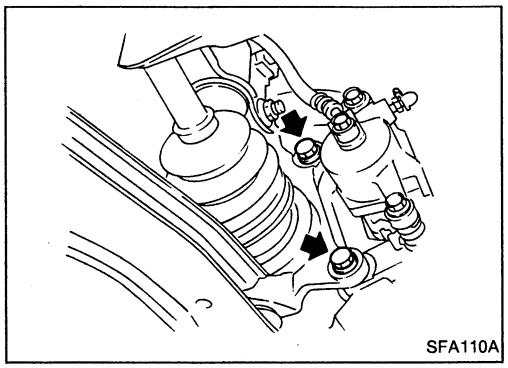
Drive Shaft

Check boot and drive shaft for cracks, wear, damage or grease leakage.

Removal and Installation

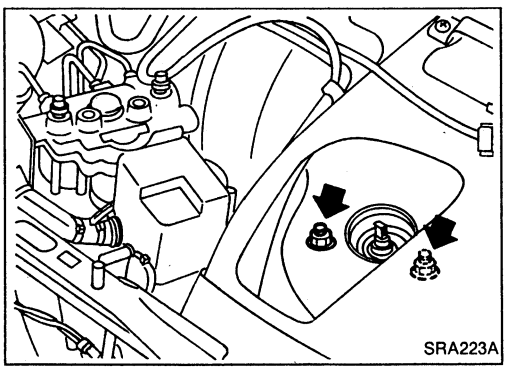

SRA222A

- Remove exhaust tube.
- Disconnect propeller shaft rear end.
- Disconnect hand brake wire front end.


SFA110A

- Remove brake caliper assembly.

Brake line need not be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out-
Make sure brake line is not twisted.

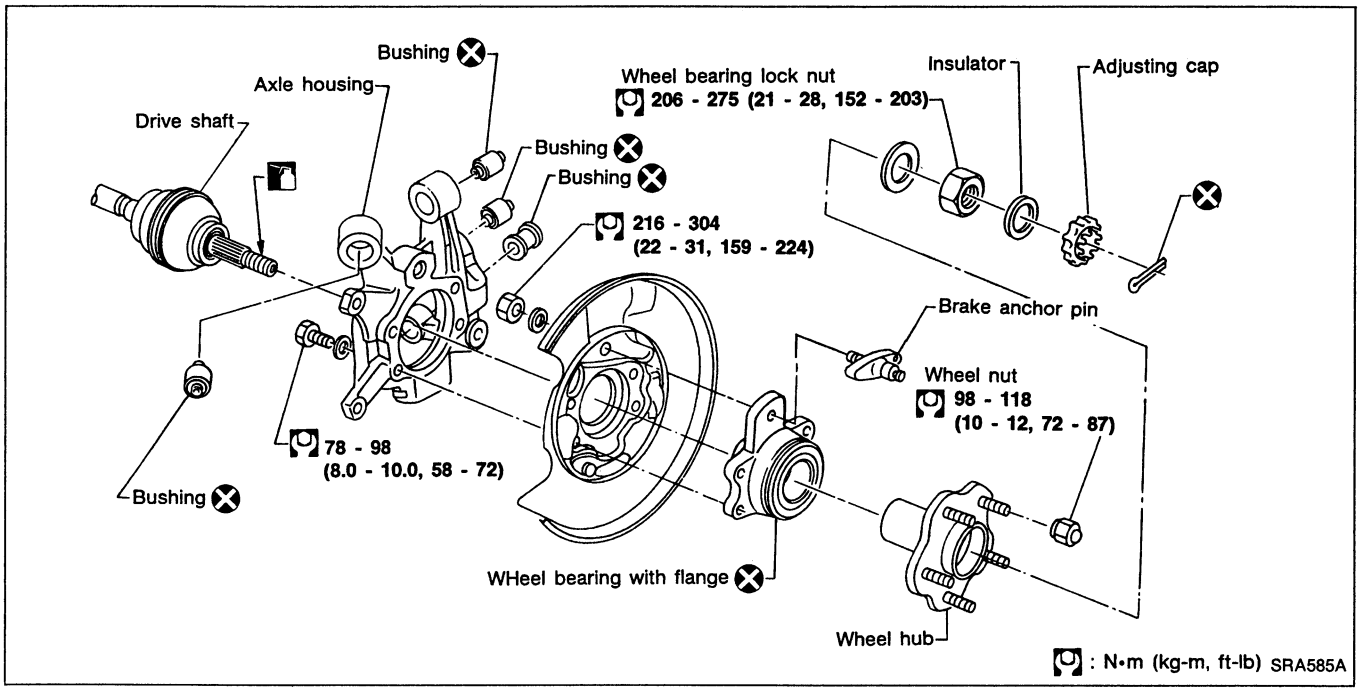

SRA223A

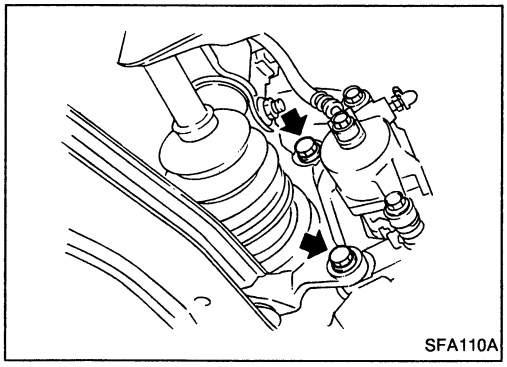
- Remove upper end nuts of shock absorber.

Do not remove piston rod lock nut.

- Remove suspension member fixing nuts. Then draw out rear axle and rear suspension assembly.

Wheel Hub and Axle Housing

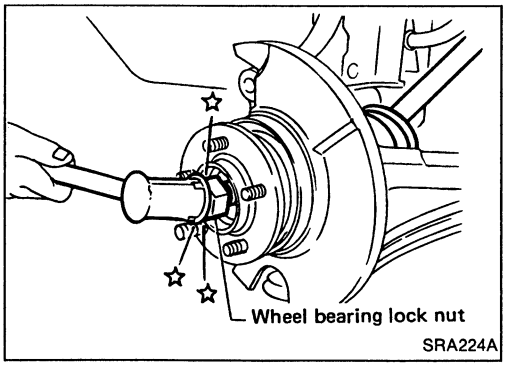




REMOVAL

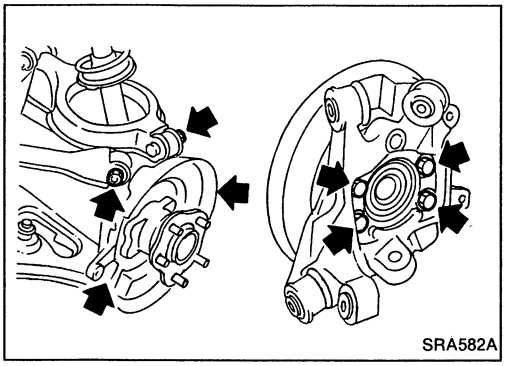
- Remove wheel bearing lock nut.
- Remove brake caliper assembly and rotor.

Brake line need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake line is not twisted.



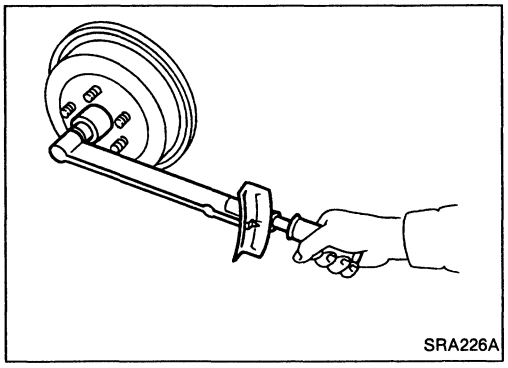
- Separate drive shaft from axle housing by slightly tapping it.

When removing drive shaft, cover boots with shop towel to prevent them from being damaged.



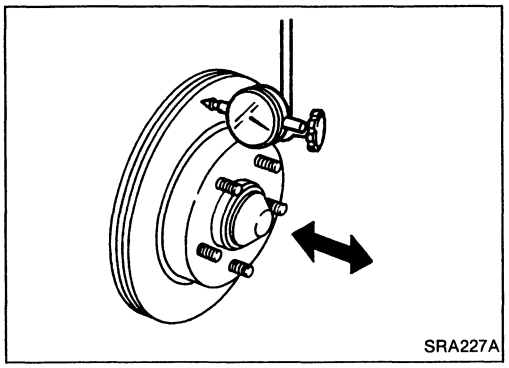
- Remove axle housing.
- Remove wheel bearing with flange, and wheel hub from axle housing.

Wheel Hub and Axle Housing (Cont'd)

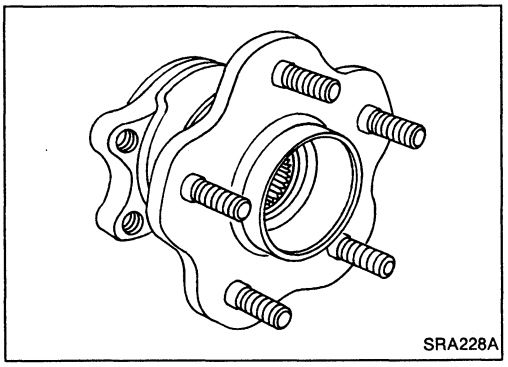


INSTALLATION

- Install axle housing with wheel hub.
- Tighten wheel bearing lock nut.
  : 206 - 275 N·m
  (21 - 28 kg-m, 152 - 203 ft-lb)



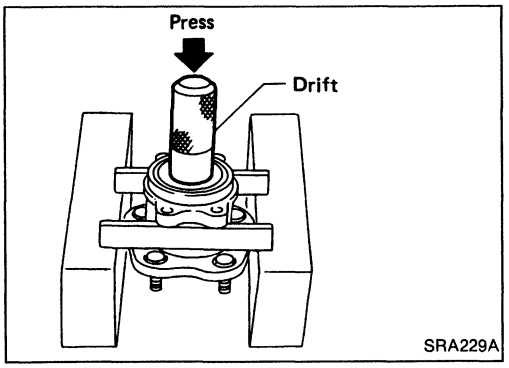
- Check wheel bearing axial end play.
  Axial end play: 0.05 mm (0.0020 in) or less



DISASSEMBLY

CAUTION:
Wheel bearing with flange usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly (including flange, and inner and outer seals).

- **Growling noise is emitted from wheel bearing during operation.**
- **Wheel bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.**
- **After wheel bearing is removed from hub.**

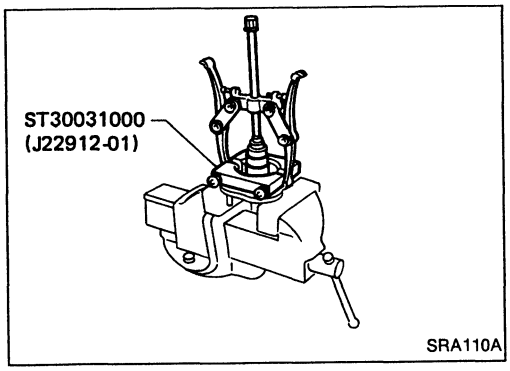


Wheel hub

- Remove wheel bearing (with flange) and wheel hub as one unit from axle housing before disassembling.

Wheel bearing

- Using a press and drift as shown in figure at left, press wheel bearing out.
- Discard old wheel bearing assembly. Replace with a new wheel assembly.



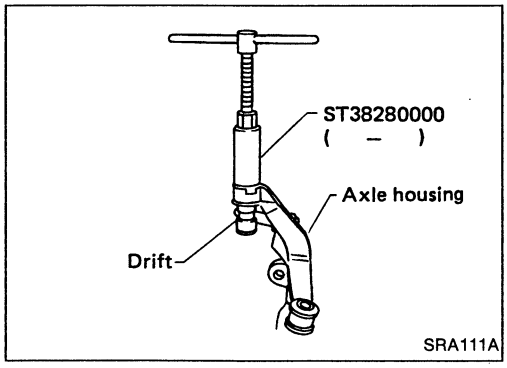
- Remove inner race from hub using a bearing replacer/puller.

CAUTION:

a. Do not reuse old inner race although it is of the same brand as the bearing assembly.

b. Do not replace grease seals as single parts.

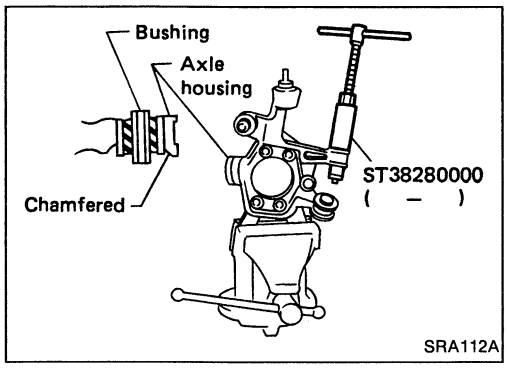
Wheel Hub and Axle Housing (Cont'd)



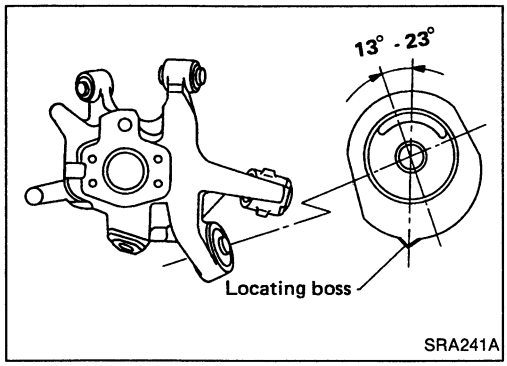
Axle housing

- Attach a drift on outer shell of bushing as shown in figure at left, remove bushing using arm bushing remover.

When placing axle housing in a vise, use wooden blocks or copper plates as pads.



- Ensure axle housing bore is free from scratches or deformities before pressing bushing into it.
- Attach bushing to chamfered bore end of axle housing and press it until it is flush with end face of axle housing.



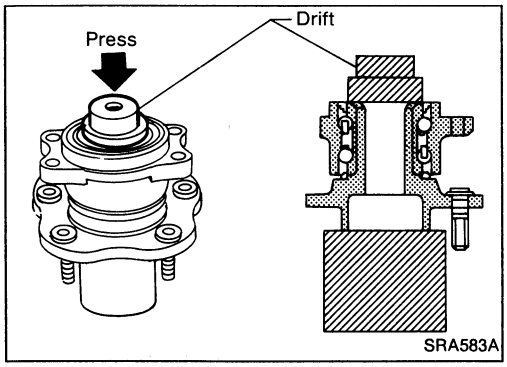
- When installing shock absorber bushing, make sure that it is positioned as shown.

INSPECTION

Wheel hub and axle housing

- Check wheel hub and axle housing for cracks by using a magnetic exploration or dyeing test.
- Check wheel bearing for damage, seizure, rust or rough operation.
- Check rubber bushing for wear or other damage.

Replace if necessary.

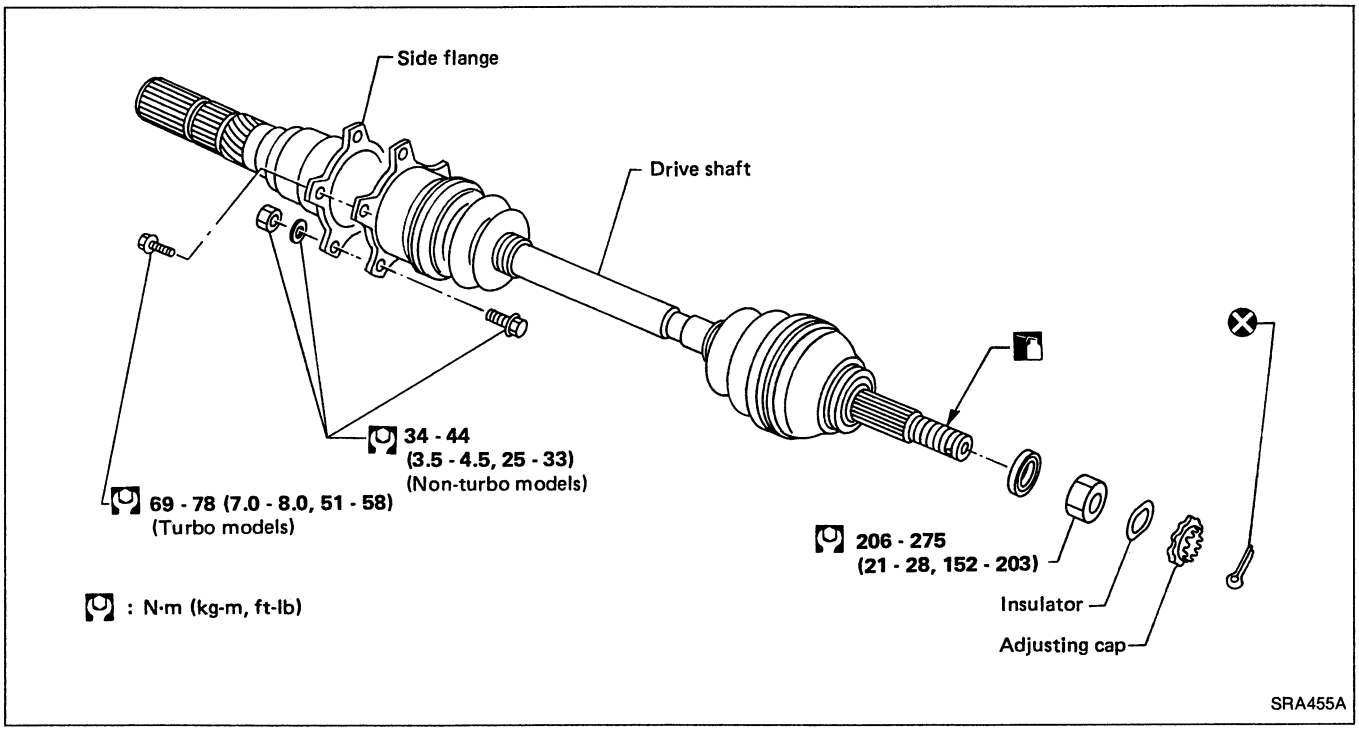


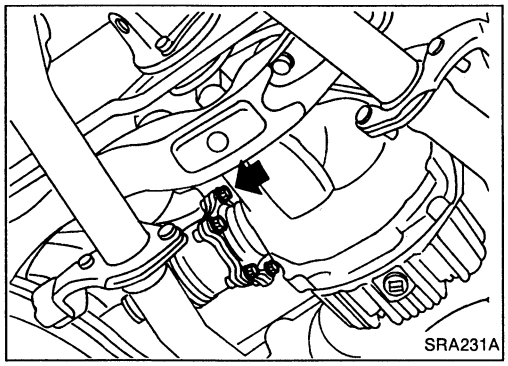
ASSEMBLY

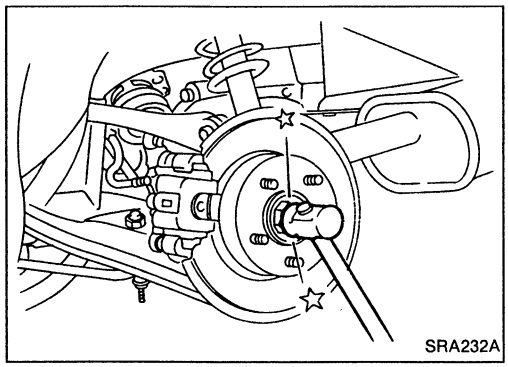
- Place hub on a block. Attach a drift to inner race of wheel bearing and press it into hub as shown in figure at left.

Be careful not to damage grease seal.

Drive Shaft







REMOVAL

When removing drive shaft, cover boots with shop towel to prevent damage to them.

Final drive side

- Remove side flange mounting bolt and separate shaft.

Wheel side

- Remove drive shaft by lightly tapping it with a copper hammer.

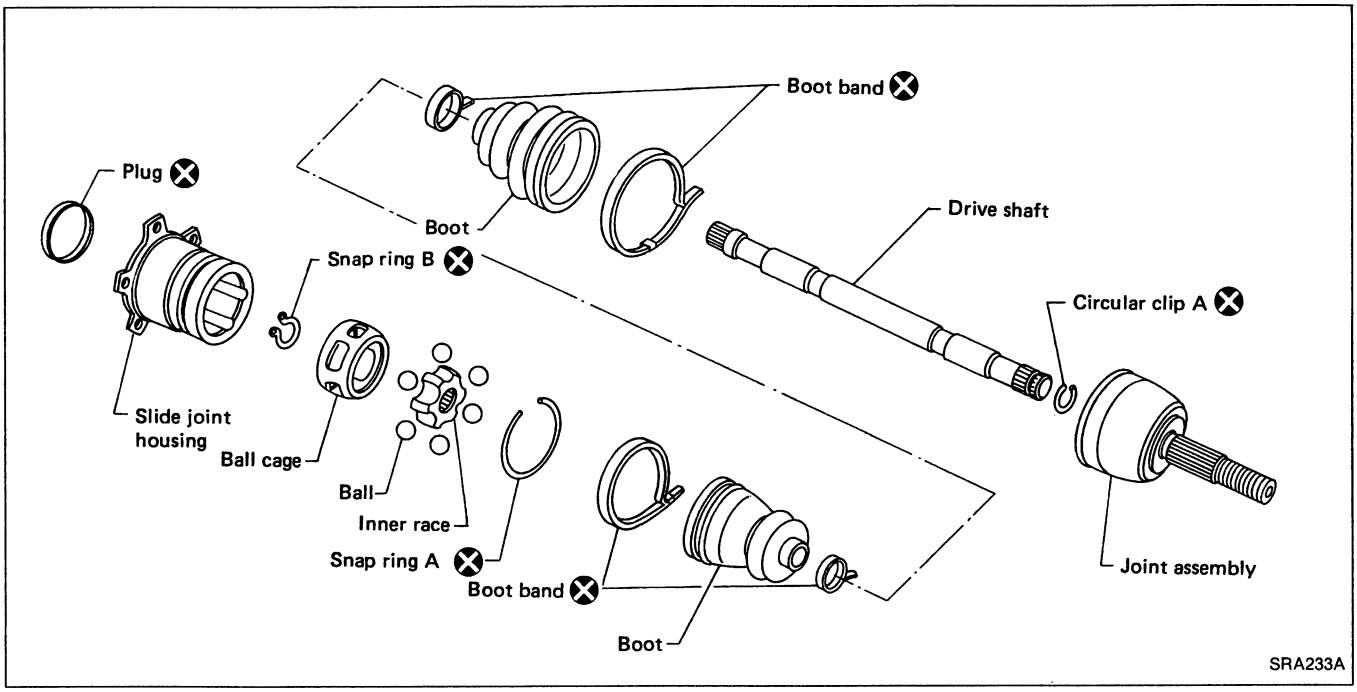
To avoid damaging threads of drive shaft, install a nut while removing drive shaft.

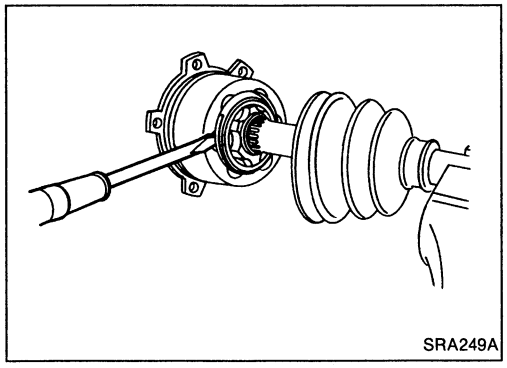
INSTALLATION

- Insert drive shaft from wheel hub and temporarily tighten wheel bearing lock nut.
- Tighten side flange mounting bolts to specified torque.
- Tighten wheel bearing lock nut to specified torque.

Drive Shaft (Cont'd)

COMPONENTS

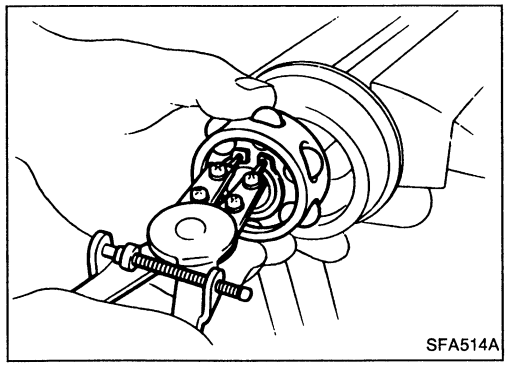




DISASSEMBLY

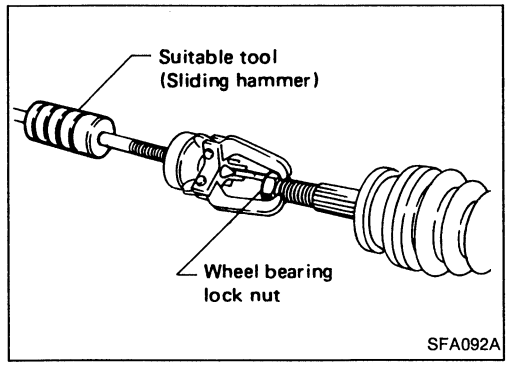
Final drive side

1. Remove boot bands.
2. Put matchmarks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



4. Put matchmarks on inner race and drive shaft.
5. Pry off snap ring "B", then remove ball cage, inner race and balls as a unit.
6. Draw out boot.

Cover drive shaft serration with tape so as not to damage the boot.



Wheel side

CAUTION:

The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matchmarks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

Be careful not to damage threads on drive shaft.

- Remove boot bands.

Drive Shaft (Cont'd)

INSPECTION

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

Drive shaft

Replace drive shaft if it is twisted or cracked.

Boot

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

Joint assembly (Final drive side)

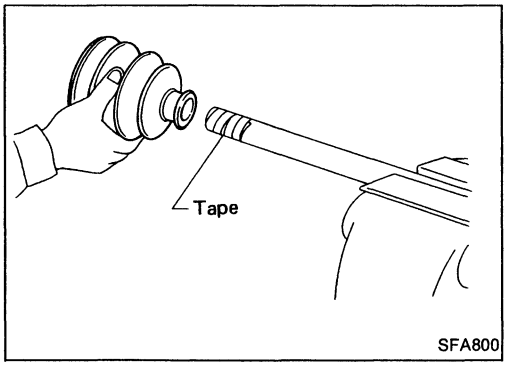
- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

Joint assembly (Wheel side)

Replace joint assembly if it is deformed or damaged.

ASSEMBLY

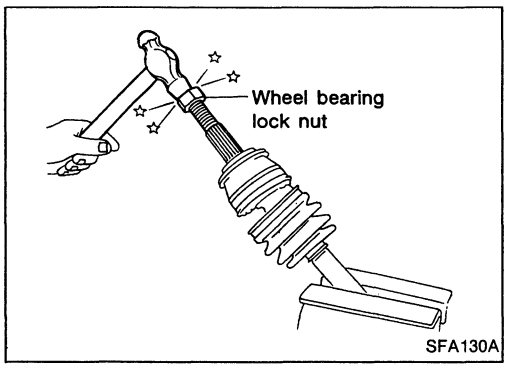
- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use NISSAN GENUINE GREASE or equivalent after every overhaul.**



Wheel side

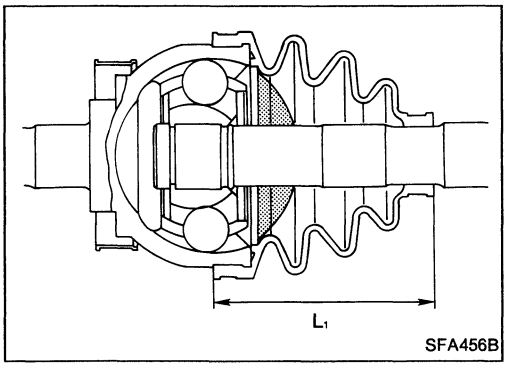
1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.



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.

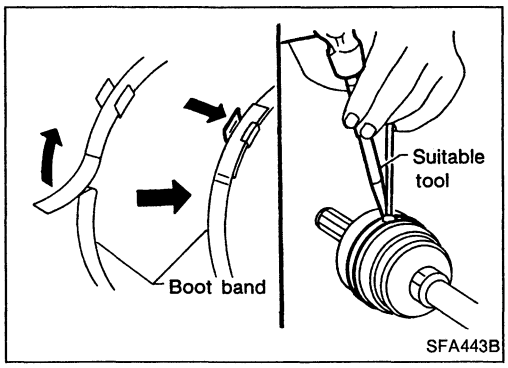
Drive Shaft (Cont'd)



3. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   Without turbo 165 - 175 g (5.82 - 6.17 oz)
   With turbo 170 - 190 g (6.00 - 6.70 oz)
4. Set boot so that it does not swell and deform when its length is "L_1".

Make sure that boot is properly installed on the drive shaft groove.

Length "L_1":
Without turbo 96 - 98 mm (3.78 - 3.86 in)
With turbo 101 - 103 mm (3.98 - 4.06 in)

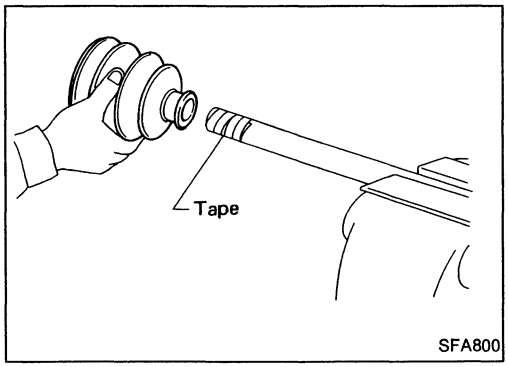


5. Lock new larger and smaller boot bands securely with a suitable tool.

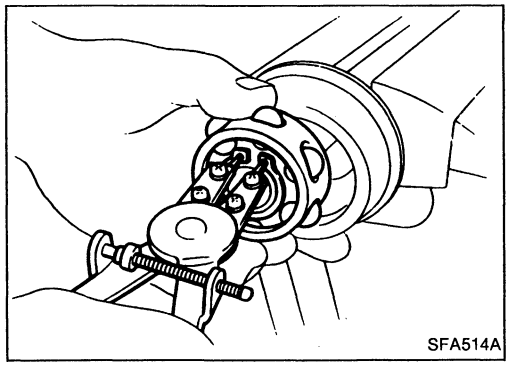
Final drive side

1. Install boot and new small boot band on drive shaft.

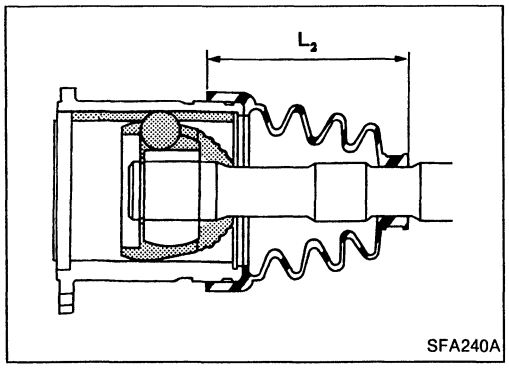
Cover drive shaft serration with tape so as not to damage boot during installation.



2. Securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "B".



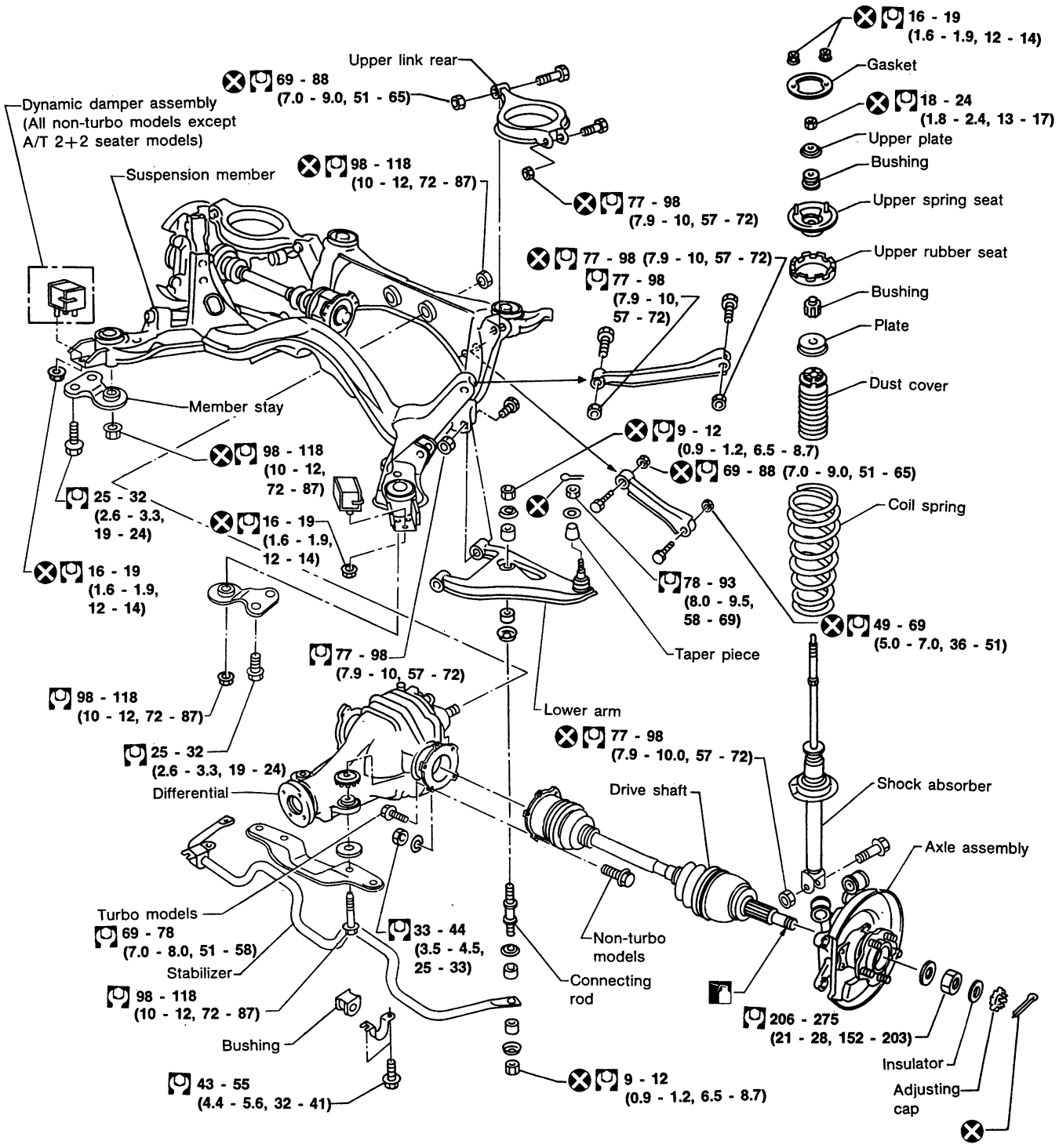
4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   Without turbo 165 - 175 g (5.82 - 6.17 oz)
   With turbo 180 - 200 g (6.35 - 7.05 oz)
5. Install slide joint housing, then install new snap ring "A".
6. Set boot so that it does not swell and deform when its length is "L_2".



Make sure that boot is properly installed on the drive shaft groove.

Length "L_2":
Without turbo 93 - 95 mm (3.66 - 3.74 in)
With turbo 102.5 - 104.5 mm (4.04 - 4.11 in)

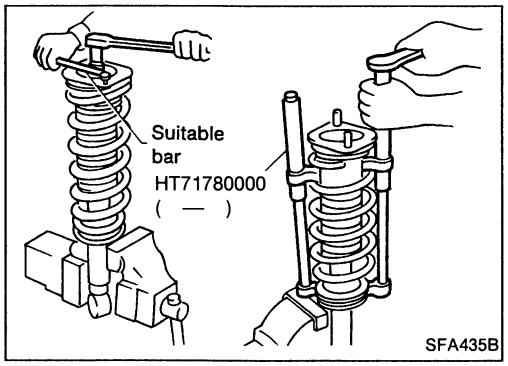
7. Lock new larger and smaller boot bands securely with a suitable tool.



CAUTION:
Do not jack up lower arm.
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.**

: N•m (kg-m, ft-lb)

SRA456A



Coil Spring and Shock Absorber

REMOVAL

- Remove shock absorber upper and lower fixing nuts.
- **Do not remove piston rod lock nut on vehicle.**

DISASSEMBLY

1. Set shock absorber on 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 upper spring seat can be turned by hand.
3. Remove piston rod lock nut.

INSPECTION

Shock absorber assembly

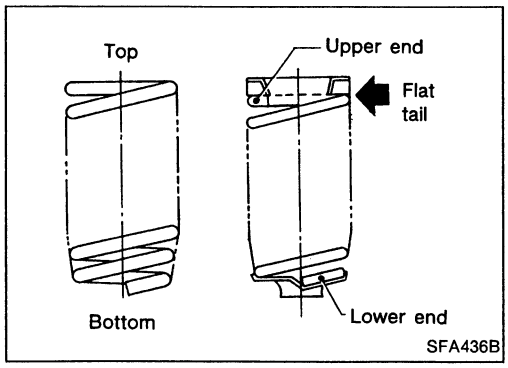
- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage.Replace if necessary.

Upper rubber seat and bushing

- Check rubber parts for deterioration or cracks. Replace if necessary.

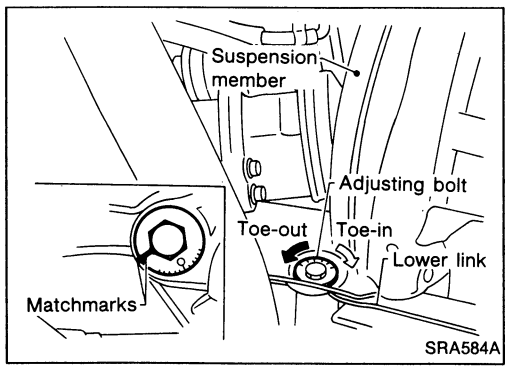
Coil spring

- Check for cracks, deformation or other damage. Replace if necessary.



ASSEMBLY

- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)
- When installing coil spring on strut, it must be positioned as shown in figure at left.



Multi-link and Lower Ball Joint

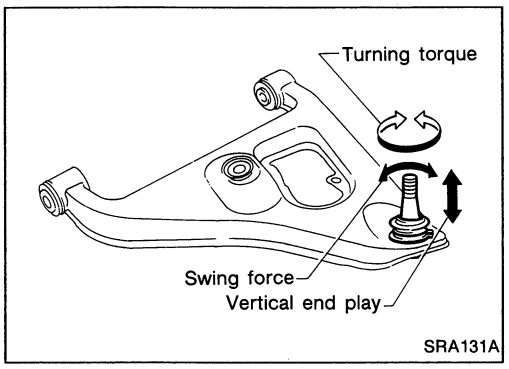
REMOVAL AND INSTALLATION

- Refer to "Removal and Installation" of REAR AXLE AND REAR SUSPENSION ASSEMBLY.

Before removing, put matchmarks on adjusting bolt.

- When installing, final tightening must be done at curb weight with tires on ground.
- After installation, check wheel alignment. Refer to "Rear Wheel Alignment" of ON-VEHICLE SERVICE.

Multi-link and Lower Ball Joint (Cont'd)



INSPECTION

Rear suspension member

- Replace suspension member assembly if cracked or deformed or if any part (insulator, for example) is damaged.

Upper and lower links

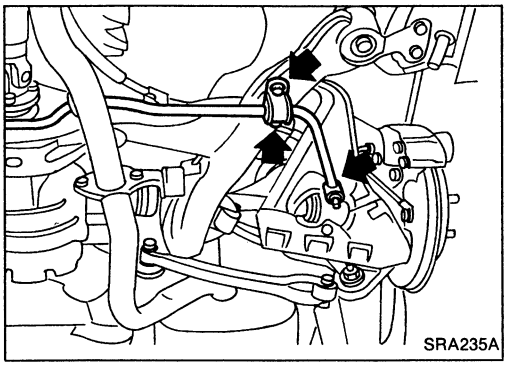
- Replace upper or lower link as required if cracked or deformed or if bushing is damaged.

Suspension lower ball joint

- Measure swing force, turning torque and vertical end play in axial direction. (Use same measurement procedures as that of FA section.)
- If ball stud is worn, play in axial direction is excessive, or joint is hard to swing, replace lower arm.

Ball joint specifications	Swing force	7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb)
	Turning torque	0.5 - 3.4 N·m (5 - 35 kg-cm, 4.3 - 30.4 in-lb)
	Vertical end play	0 mm (0 in)

Stabilizer Bar

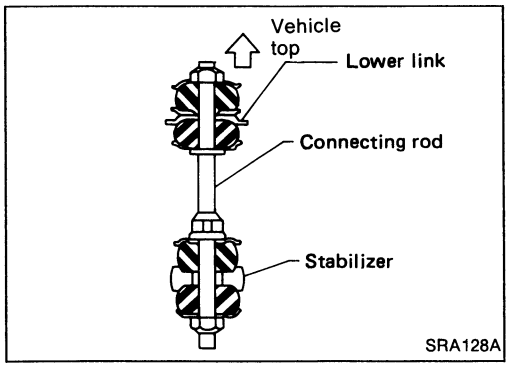


REMOVAL

- Remove connecting rod and clamp

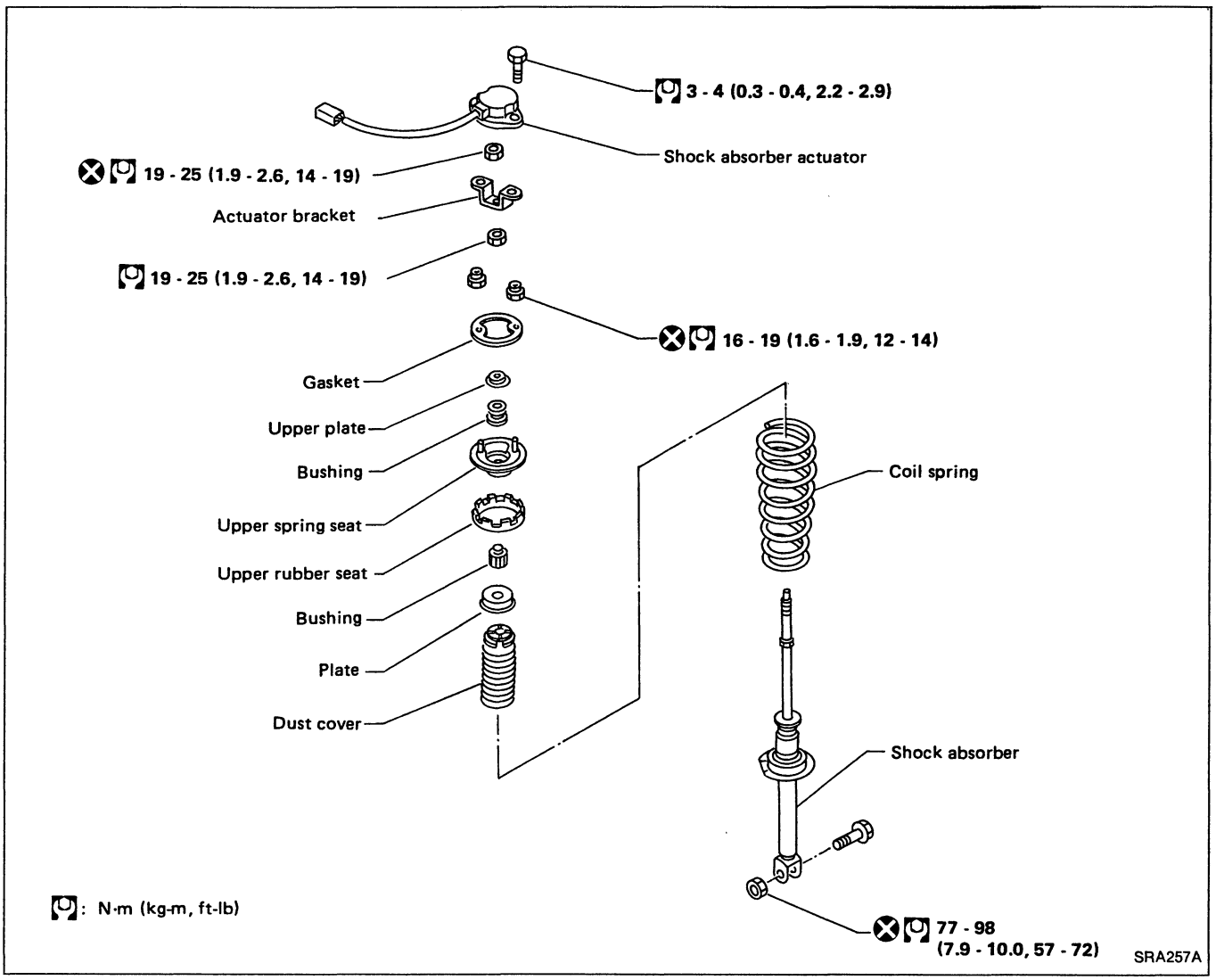
INSPECTION

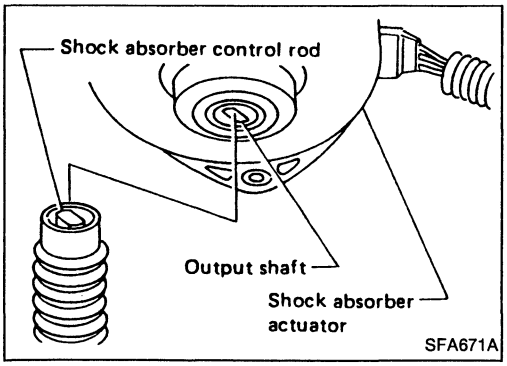
- Check stabilizer bar for deformation or cracks. Replace if necessary.
- Check rubber bushings for deterioration or cracks. Replace if necessary.



INSTALLATION

- When installing connecting rod,make sure direction is correct (as shown at left)





Removal and Installation

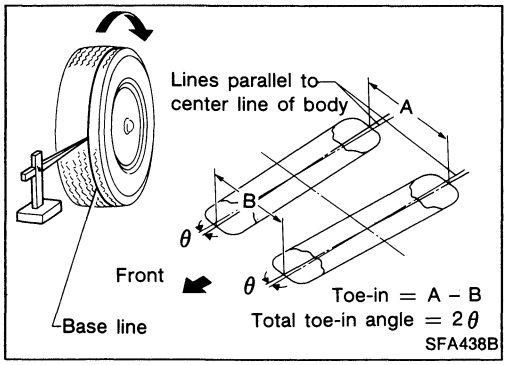
- Remove room trim. Refer to section BF.
- Disconnect sub-harness connector.
- Remove shock absorber actuator fixing bolts.
- **Before installing actuator, ensure angle of shock absorber control rod is aligned with that of actuator output shaft. Otherwise, actuator may be damaged.**
- Refer to REAR SUSPENSION for other procedures.

Inspection

- Replace shock absorber assembly if it is damaged. Refer to REAR SUSPENSION — Coil Spring and Shock Absorber.

Trouble Diagnosis

Refer to ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses in section FA.



Rear Wheel Alignment

TOE-IN

1. Draw a base line across the tread.

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

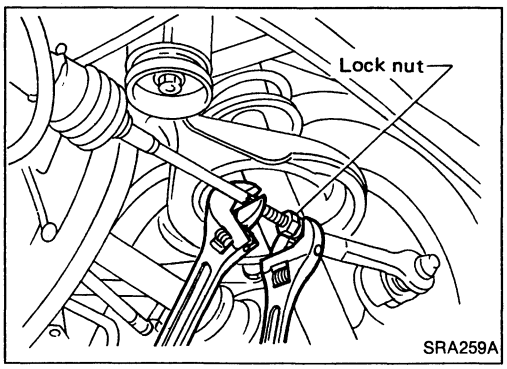
2. Measure toe-in.

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

Toe-in:
Refer to S.D.S.

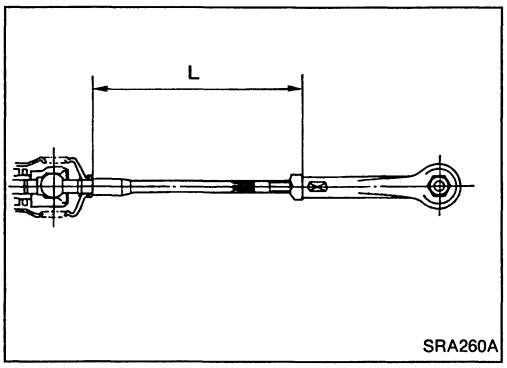
3. Adjust toe-in by varying length of power cylinder lower links.

(1) Loosen lock nuts.
(2) Adjust toe-in by turning lower links forward or backward.



Make sure both lower links are the same length.
Standard length "L":
185.5 mm (7.30 in)

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

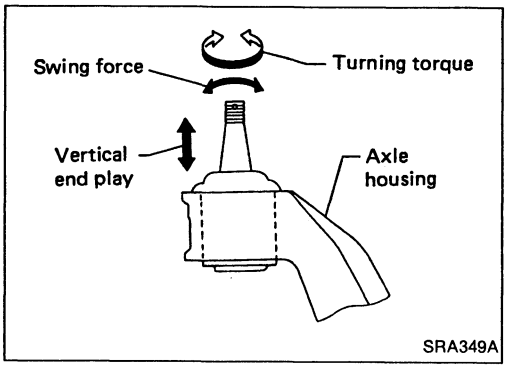


- Refer to ON-VEHICLE SERVICE for other procedures.

Rear Axle Housing Ball Joint

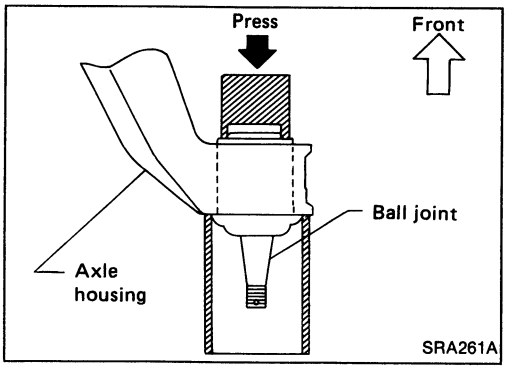
INSPECTION

- Measure swing force, turning torque and vertical end play in axial direction.
- If ball joint is worn, play in axial direction is excessive, or joint is hard to swing, replace ball joint.



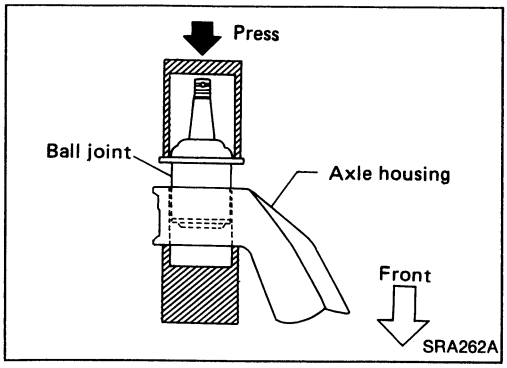
Ball joint specifications	Swing force	6.9 - 68.6 N (0.7 - 7.0 kg, 1.5 - 15.4 lb)
	Turning torque	0.3 - 2.9 N·m (3 - 30 kg-cm, 2.6 - 26.0 in-lb)
	Vertical end play	0 mm (0 in)

Rear Axle Housing Ball Joint (Cont'd)



REMOVAL

- Remove ball joint snap ring.
- Press out ball joint from axle housing.



ASSEMBLY

- Press new ball joint assembly into axle housing.
- Install snap ring into groove of ball joint.
- Refer to REAR AXLE — Wheel Hub and Axle Housing for other procedures.
- Refer to ST section for power cylinder and SUPER HICAS — Trouble Diagnoses.

General Specifications

COIL SPRING

Item	Engine		
	VG30DE		VG30DETT
	2 seater	2+2 seater	2 seater
Wire diameter mm (in)	11.4 (0.449)		11.2 (0.441)
Coil diameter mm (in)	99.9 (3.933)		99.2 (3.906)
Free length mm (in)	371.5 (14.63)	380 (14.96)	370 (14.57)
Spring constant N/mm (kg/mm, lb/in)	21.6 (2.2, 123)		23.5 (2.4, 134)
Identification color	White x 1, Yellow x 1	Purple x 1, Pink x 1	Purple x 1, Light green x 1

SHOCK ABSORBER

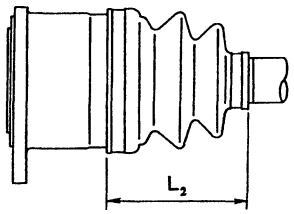
Item	Engine	
	VG30DE	VG30DETT
Piston rod diameter mm (in)	12.5 (0.492)	14.0 (0.551)

DRIVE SHAFT

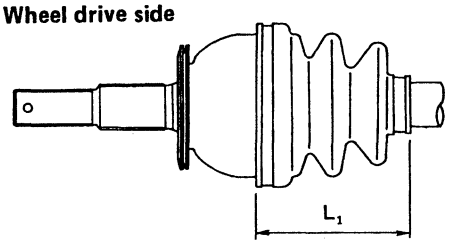
Item	Engine	
	VG30DE	VG30DETT
Joint type		
Final drive side	DS90	DS100
Wheel side	ZF100	BF100
Diameter mm (in)		
Wheel side D_1	30 (1.18)	33 (1.30)
Grease	Nissan genuine grease or equivalent	
Specified amount of grease g (oz)		
Final drive side	165 - 175 (5.82 - 6.17)	180 - 200 (6.35 - 7.05)
Wheel side	165 - 175 (5.82 - 6.17)	170 - 190 (6.00 - 6.70)
Boot length mm (in)		
Final drive side (L_2)	93 - 95 (3.66 - 3.74)	102.5 - 104.5 (4.04 - 4.11)
Wheel side (L_1)	96 - 98 (3.78 - 3.86)	101 - 103 (3.98 - 4.06)

Final drive side

Final drive side



Wheel drive side



SRA236A

REAR STABILIZER BAR

Item	Engine		
	VG30DE		VG30DETT
	2 seater	2+2 seater	
Stabilizer diameter mm (in)			
Outer	15.9 (0.626)	21.0 (0.827)	25.4 (1.000)
Inner	12.3 (0.484)	15.8 (0.622)	19.4 (0.764)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Camber	degree	–1°36′ to –0°36′
Toe-in		
A — B	mm (in)	0.4 - 4.4 (0.016 - 0.173)
Total angle 2θ	degree	1′ - 24′

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

WHEEL BEARING

Wheel bearing axial end play mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut	
Tightening torque N·m (kg-m, ft-lb)	206 - 275 (21-28, 152 - 203)

WHEEL RONOUT (Radial and lateral)

Wheel type	Radial runout	Lateral runout
Aluminum wheel mm (in)	0.3 (0.012) or less	

LOWER BALL JOINT

Swing force (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 N·m (kg-cm, in-lb)	0.5 - 3.4 (5 - 35, 4.3 - 30.4)
Vertical end play mm (in)	0 (0)

LOWER LINK BALL JOINT (SUPER HICAS)

Swing force (at cotter pin hole) N (kg, lb)	6.9 - 68.6 (0.7 - 7.0, 1.5 - 15.4)
Turning torque N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Vertical end play mm (in)	0 (0)

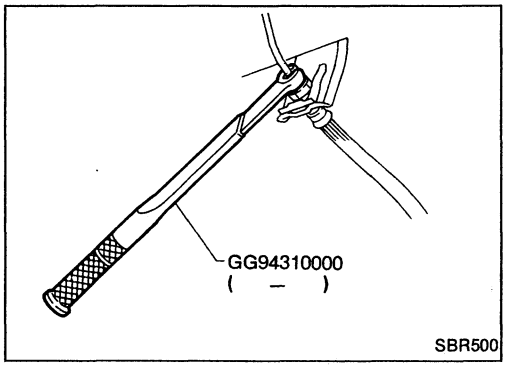
BRAKE SYSTEM

SECTION BR

CONTENTS

Precautions

- **Recommended fluid is brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.**
- **Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.**

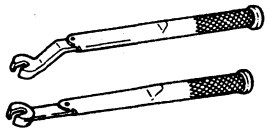
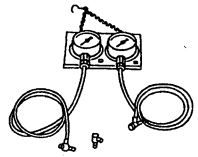
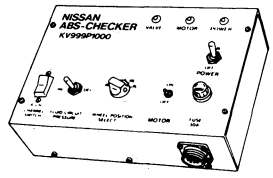
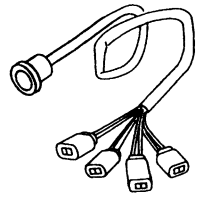


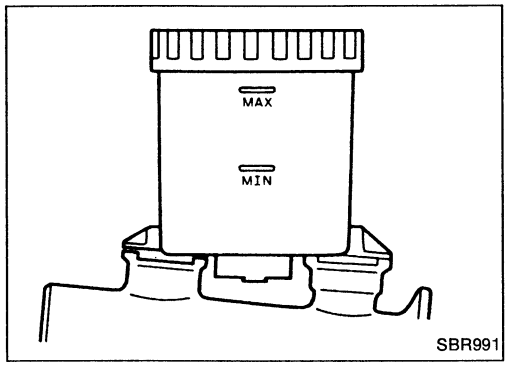
- **Use Tool when removing and installing brake tube.**

WARNING:

- **Clean brake pads and shoes with a waste cloth, then collect dust with a dust collector.**

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 brake fluid pressure of ABS actuator
KV999P1020 (—) ABS checker adapter harness		Checking brake fluid pressure of ABS actuator



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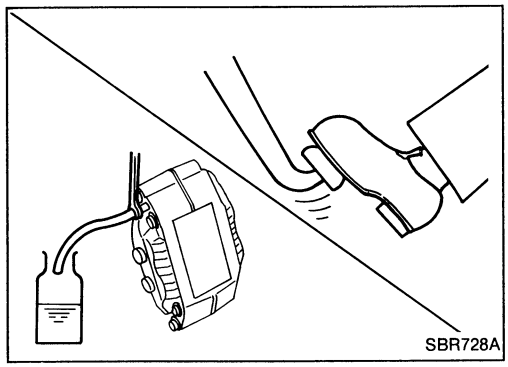
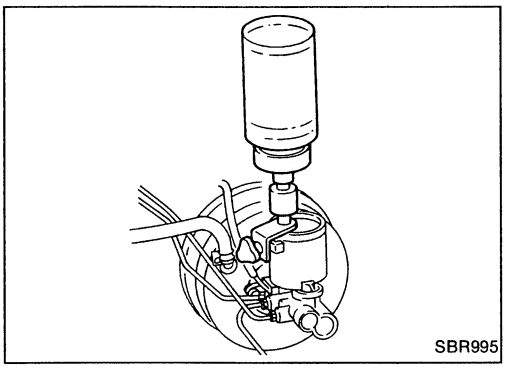
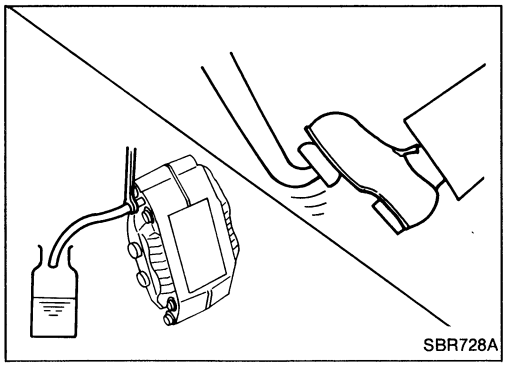

SBR728A


SBR995


SBR728A

Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.

Checking Brake System

- Check brake lines (lines and flexible hoses) for cracks, deterioration or other damage. Replace any damaged parts.
  If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Check for oil leakage by fully depressing brake pedal.

Changing Brake Fluid

1. Drain brake fluid in each air bleeder valve.
2. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to "Bleeding Brake System".

- **Refill with recommended brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**

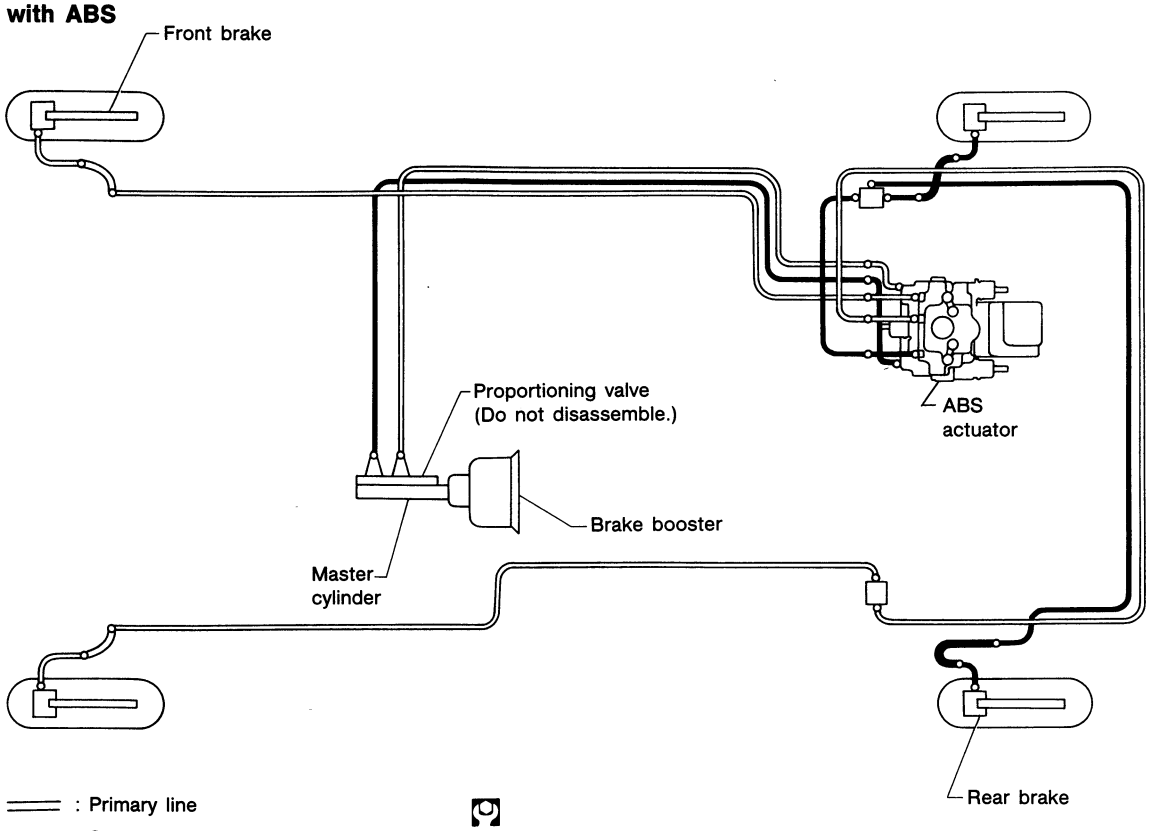
Bleeding Brake System

CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with recommended brake fluid. Make sure it is full at all times while bleeding air out of system.**
- **Place a container beneath master cylinder to avoid spillage of brake fluid.**
- Bleed air according to the following procedure.
  Left rear caliper
  ↓
  Right rear caliper
  ↓
  Left front caliper
  ↓
  Right front caliper
  ↓
  Front side air bleeder on ABS actuator (Models with ABS)
  ↓
  Rear side air bleeder on ABS actuator (Models with ABS)
- **To bleed air out of lines, wheel cylinders and calipers, use the following procedure.**

1) Connect a transparent vinyl tube to air bleeder valve.
2) Fully depress brake pedal several times.
3) With brake pedal depressed, open air bleeder valve to release air.
4) Close air bleeder valve.
5) Release brake pedal slowly.
6) Repeat steps 2) through 5) until clear brake fluid comes out of air bleeder valve.

Models with ABS



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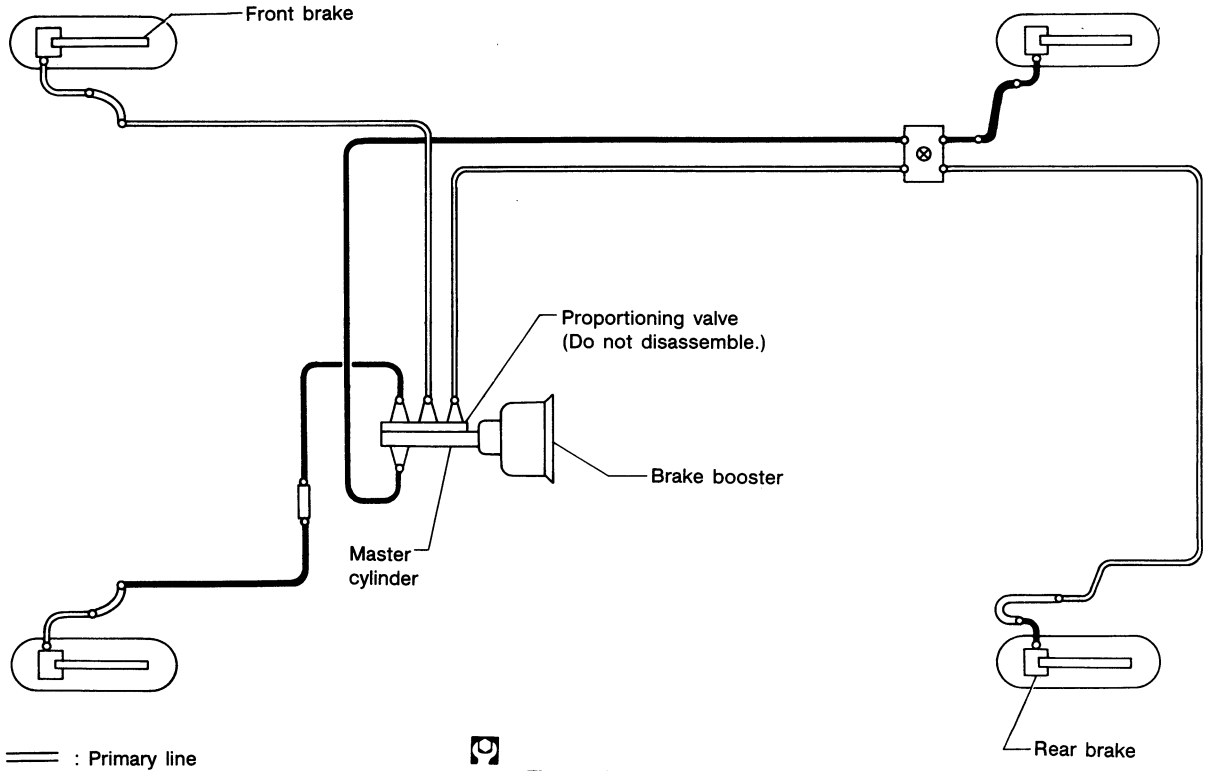
Models without ABS



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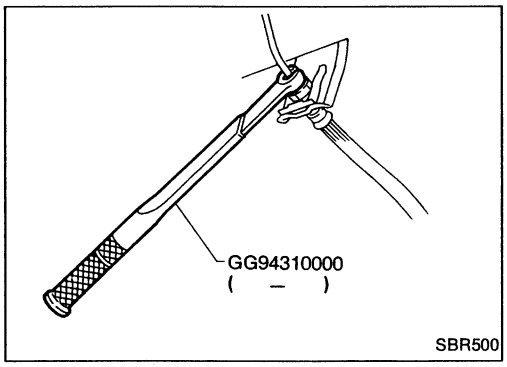


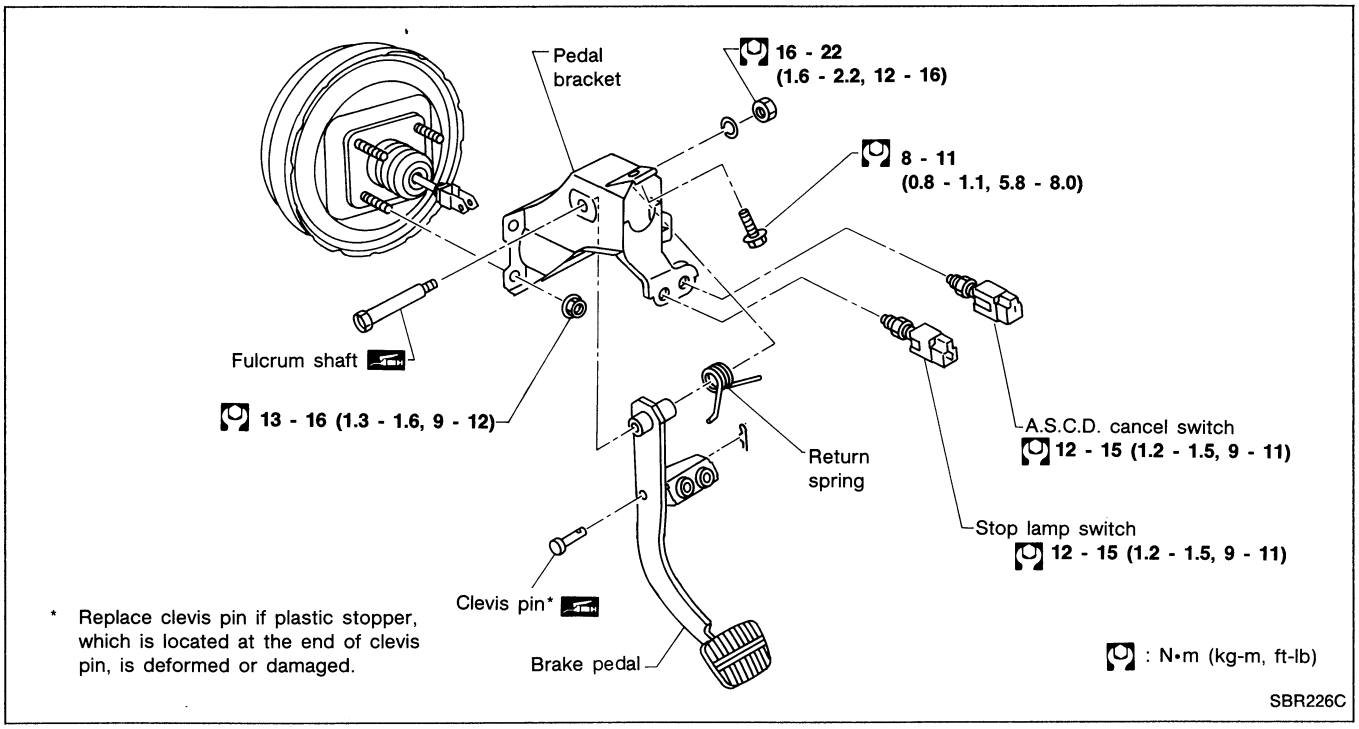
Removal and Installation

1. To remove brake flexible hose, first remove flare nut securing brake line to hose, then withdraw lock spring.
2. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.
3. All hoses must be free from excessive bending, twisting and pulling.
4. After installing brake lines, check for oil leakage by fully depressing brake pedal.

Inspection

Check brake lines (lines and flexible hoses) for cracks, deterioration or other damage. Replace any damaged parts.
If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

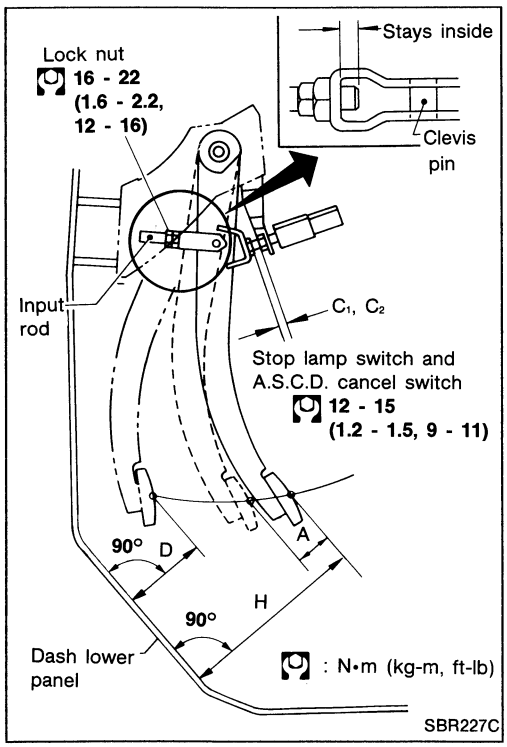
Removal and Installation



Inspection

Check brake pedal for 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

C_1: Clearance between pedal stopper and threaded end of stop lamp switch
0.3 - 1.0 mm (0.012 - 0.039 in)

C_2: Clearance between pedal stopper and threaded end of 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)

Adjustment (Cont'd)

1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

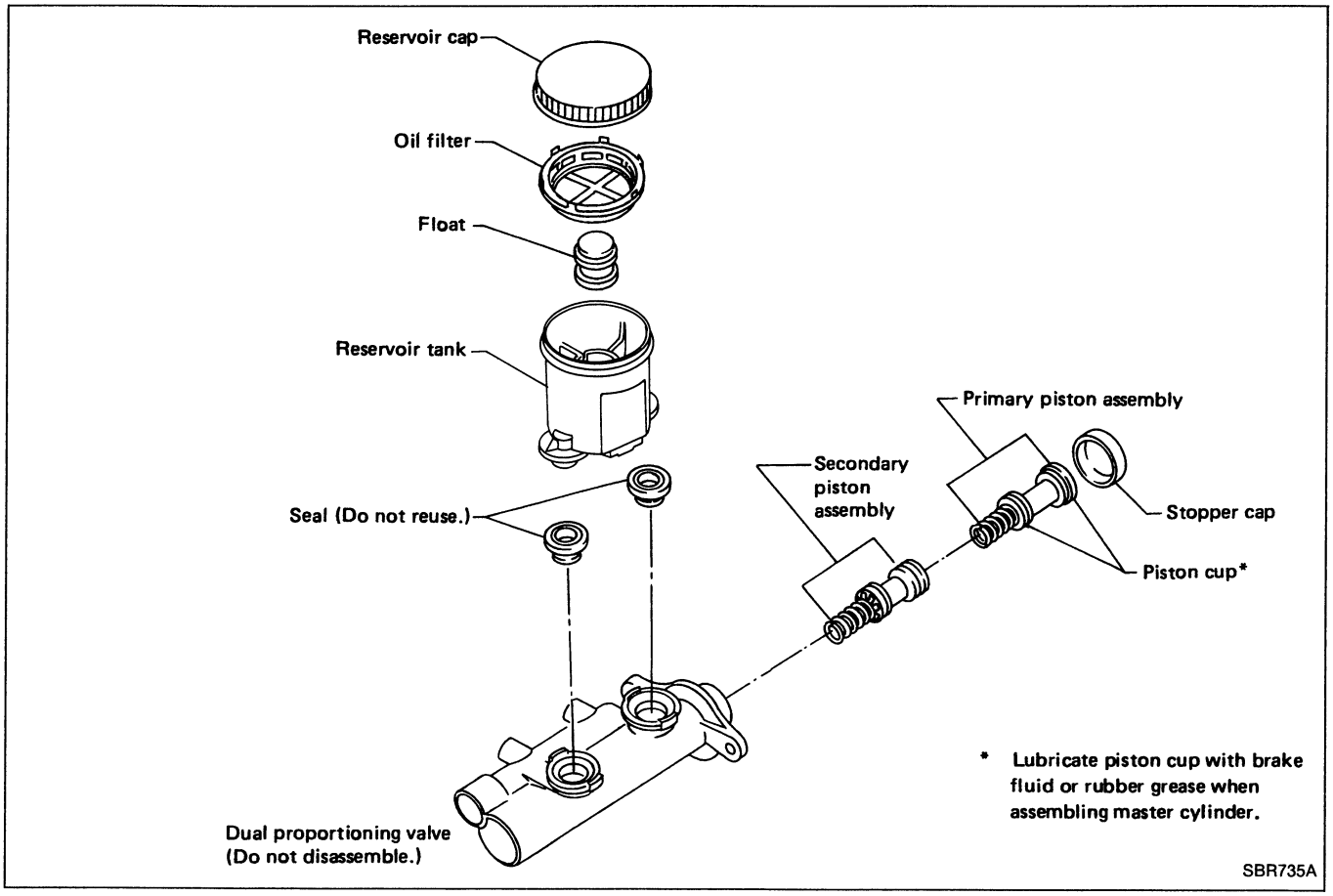
Make sure that tip of input rod stays inside.

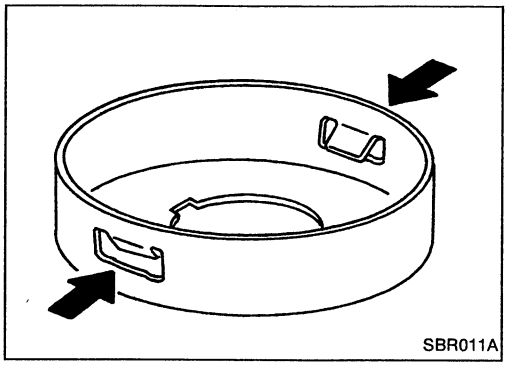
2. Adjust clearance "C_1" and "C_2" with stop lamp switch and A.S.C.D. switch respectively. Then tighten lock nuts.
3. Check pedal free play.

Make sure that stop lamp is off when pedal is released.

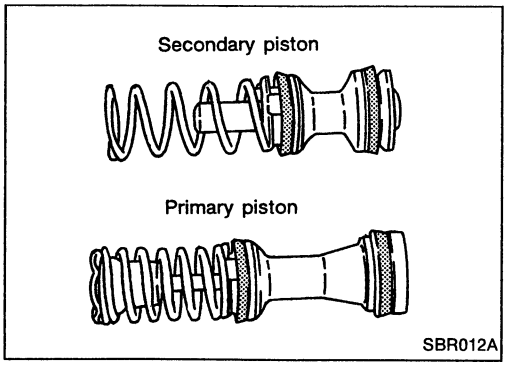
4. Check brake pedal's depressed height while engine is running.
   If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.

Removal and Installation



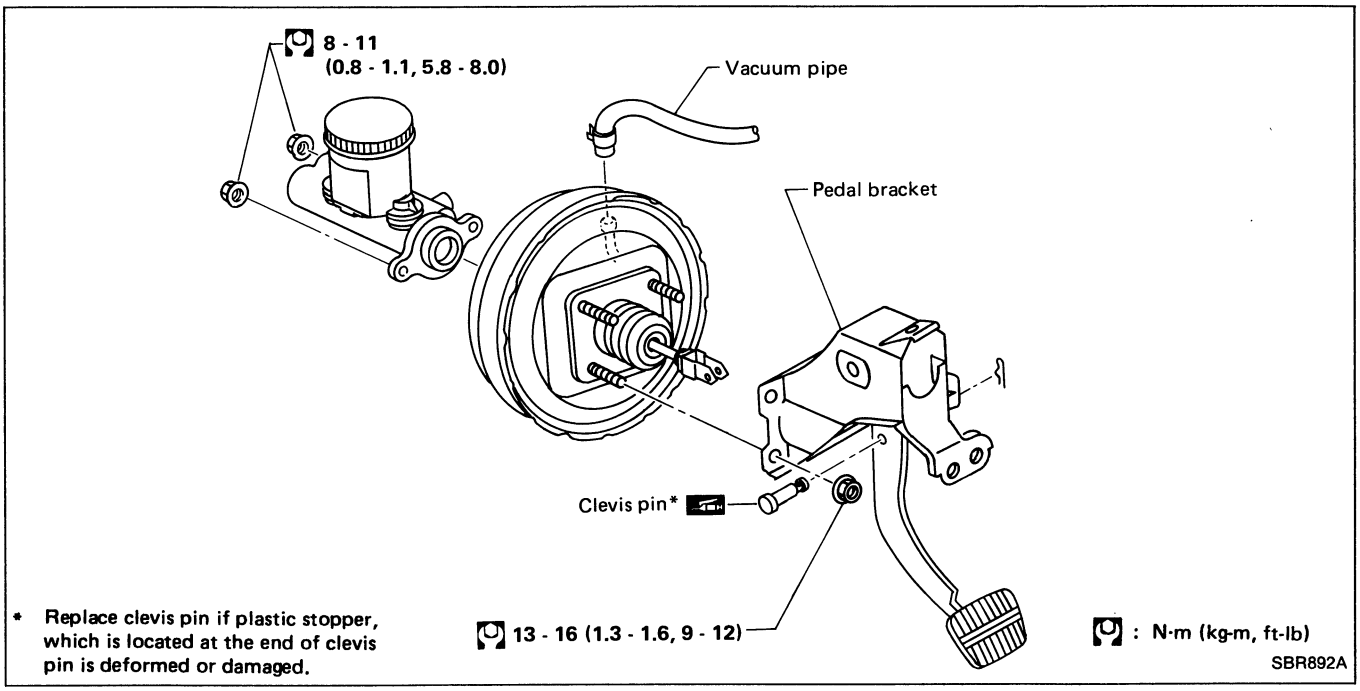


- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.

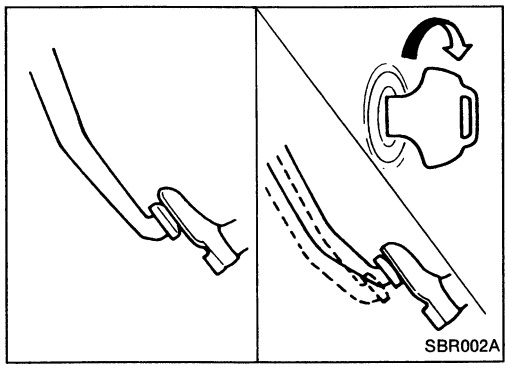


- Check parts for wear or damage. Replace if necessary.

Removal and Installation



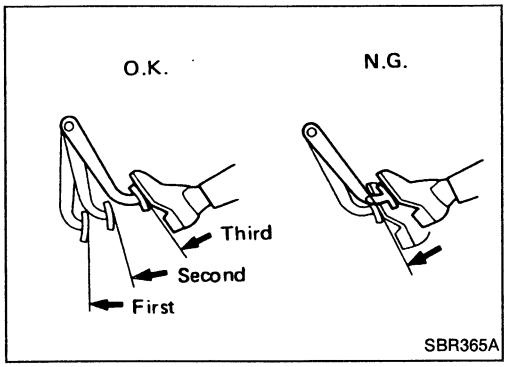
* Replace clevis pin if plastic stopper, which is located at the end of clevis pin is deformed or damaged.



Inspection

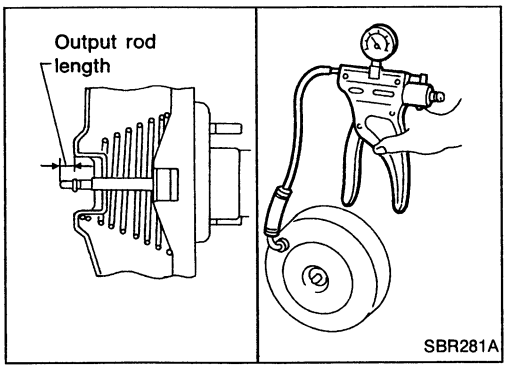
OPERATING CHECK

- 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.



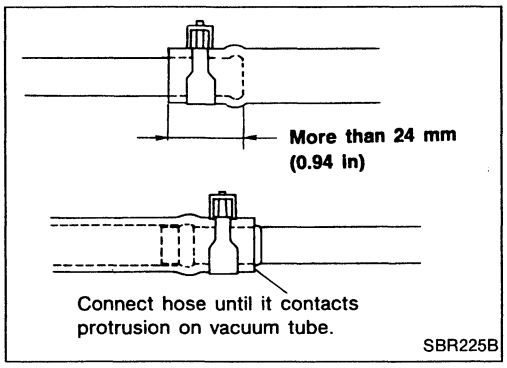
AIRTIGHT CHECK

- 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.



OUTPUT ROD LENGTH CHECK

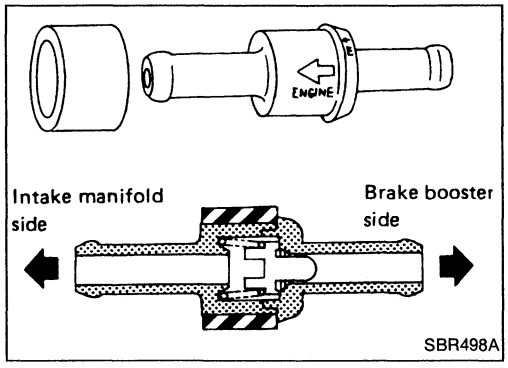
1. Apply vacuum of –66.7 kPa (–500 mmHg, –19.69 inHg) to brake booster with a handy vacuum pump.
2. Check output rod length.
   Specified length:
   10.275 - 10.525 mm (0.4045 - 0.4144 in)
3. Adjust rod length if necessary.
4. If rod length is without specification, replace brake booster.



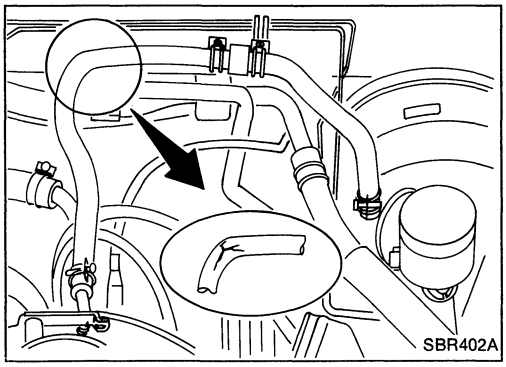
Removal and Installation

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 hoses as shown.**



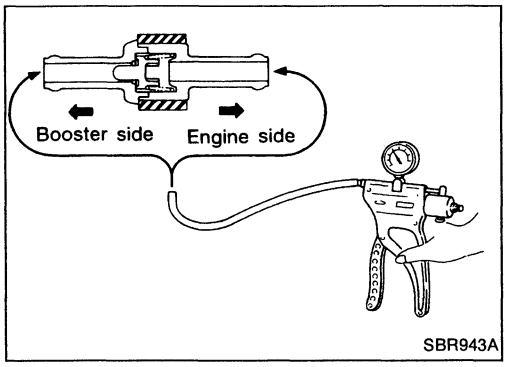
- Install check valve, paying attention to its direction.



Inspection

HOSES AND CONNECTORS

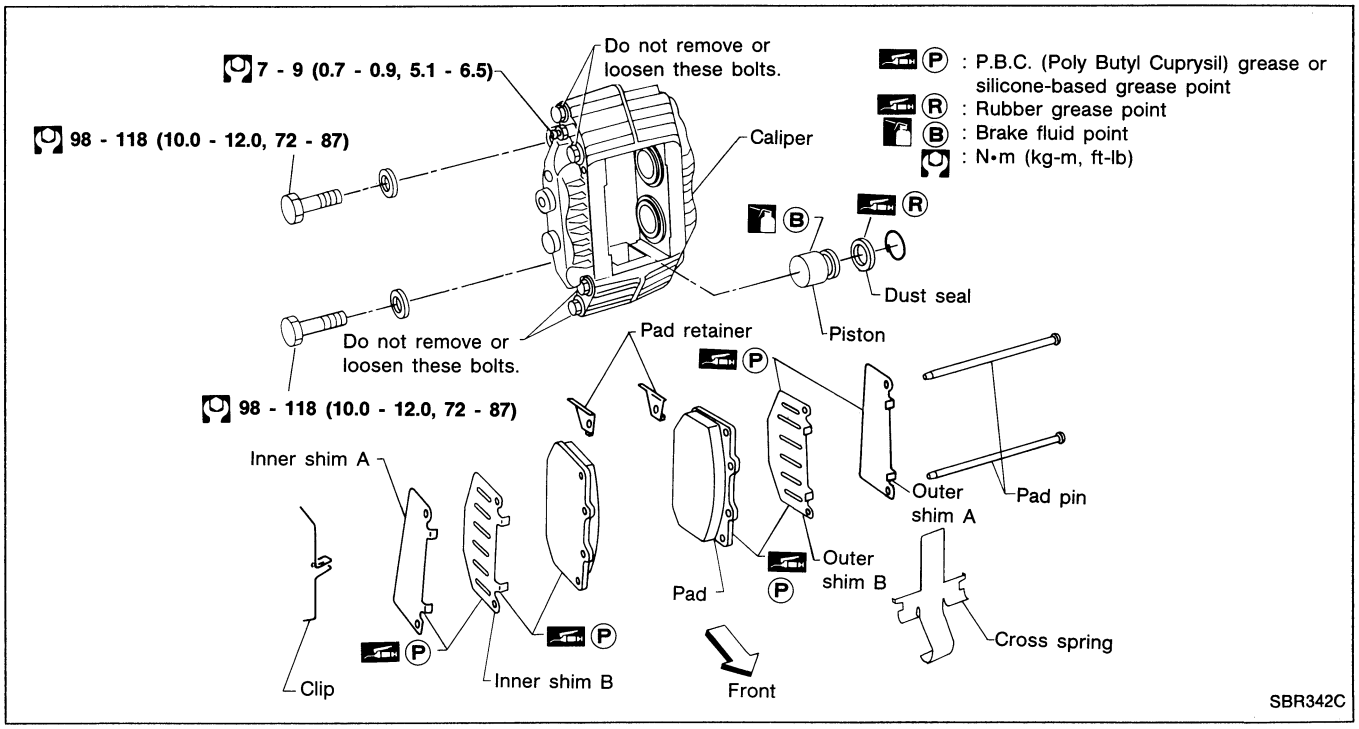
- Check vacuum lines, connections and check valve for airtightness, improper attachment chafing and deterioration.

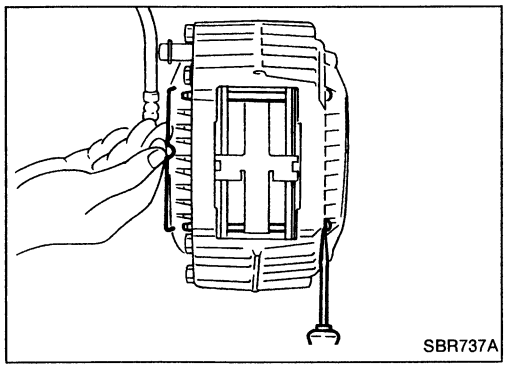


CHECK VALVE

Check vacuum with a vacuum pump.

Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.



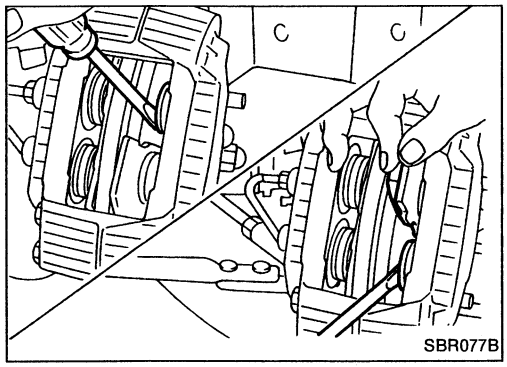


Pad Replacement

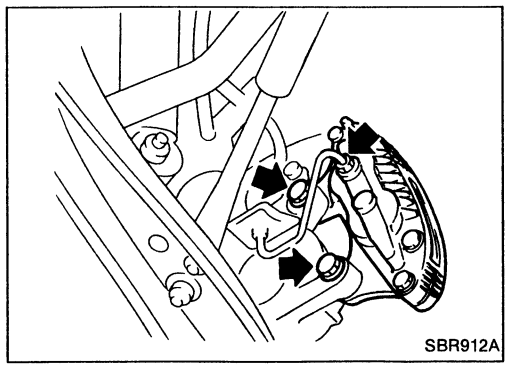
CAUTION:

- **When pads are removed, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.**

1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.

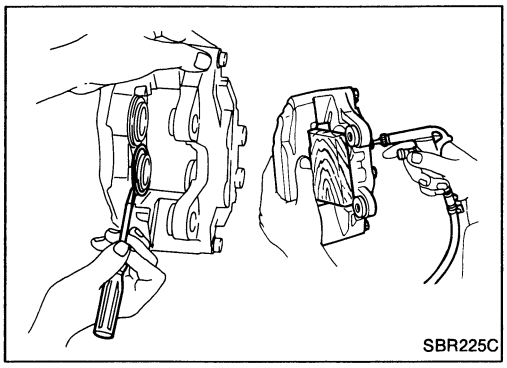


3. Pull out outer pad and insert it temporarily between lower piston and rotor as shown.
4. Push back upper piston with a suitable tool and insert new pad so it contacts upper piston as shown.
5. Pull out old pad.
6. Push back lower piston with a suitable tool.
7. Pull out new pad and reinstall it in the proper position.
8. Repeat step 3 to 7 for inner pad.
9. Install cross spring, pad pin and clip.



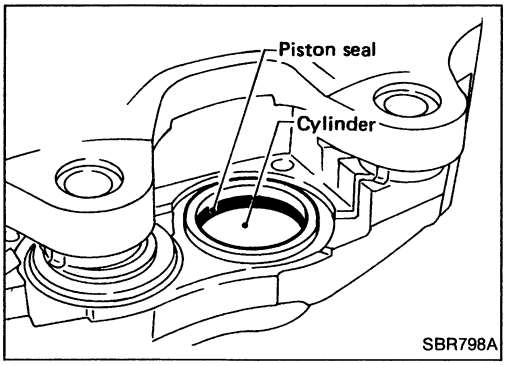
Removal and Installation

1. Disconnect brake tube.
2. Remove brake pad.
3. Remove brake caliper mounting bolts.


SBR225C

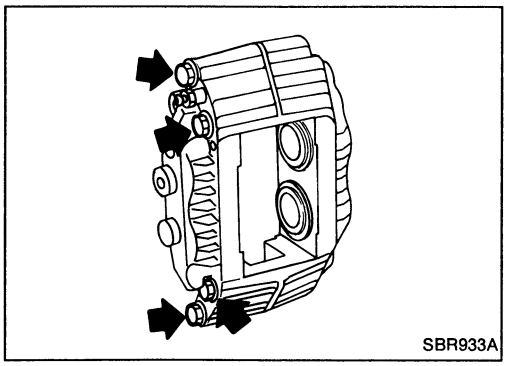
Disassembly

1. Remove retaining ring.
2. Push out piston with dust seal using compressed air.



SBR798A

3. Remove piston seal.


SBR933A

CAUTION:
Be careful not to loosen or remove bolts joining both sides of caliper.
If there is any fluid leakage, replace caliper assembly.

Inspection

CALIPER

- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for scoring, rust, wear, damage or foreign materials. Replace if any such condition exists.
- Eliminate minor damage from rust or foreign materials by polishing surface with fine emery paper.

CAUTION:
Use brake fluid to clean.

PISTON

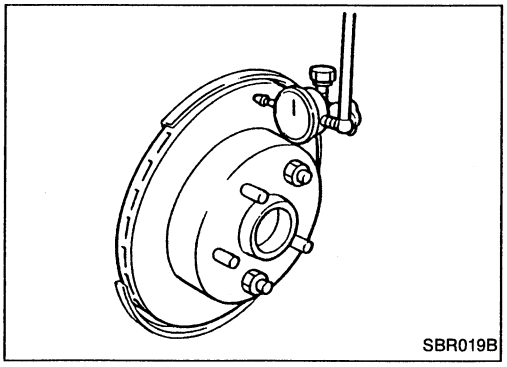
Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

PAD PIN AND CLIPS

Check for wear, cracks deformation, deterioration, rust or other damage. Replace if any such condition exists.

Inspection (Cont'd)


SBR019B

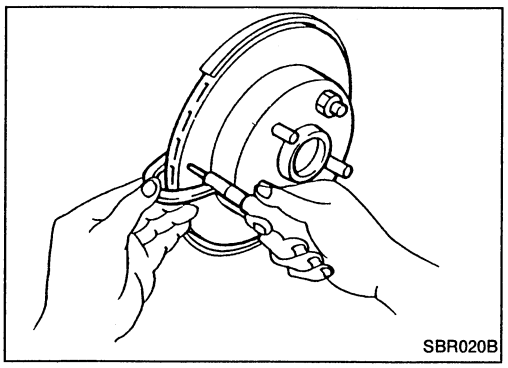
RUNOUT

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:
0.05 mm (0.0020 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).

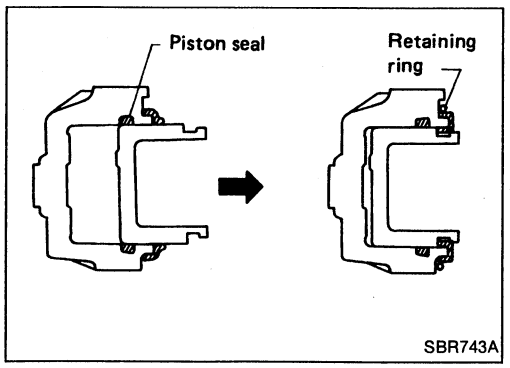

SBR020B

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.

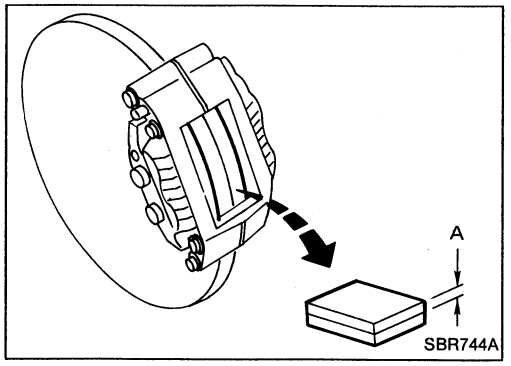
Rotor repair limit:
28.0 mm (1.102 in)



SBR743A

Assembly

1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.



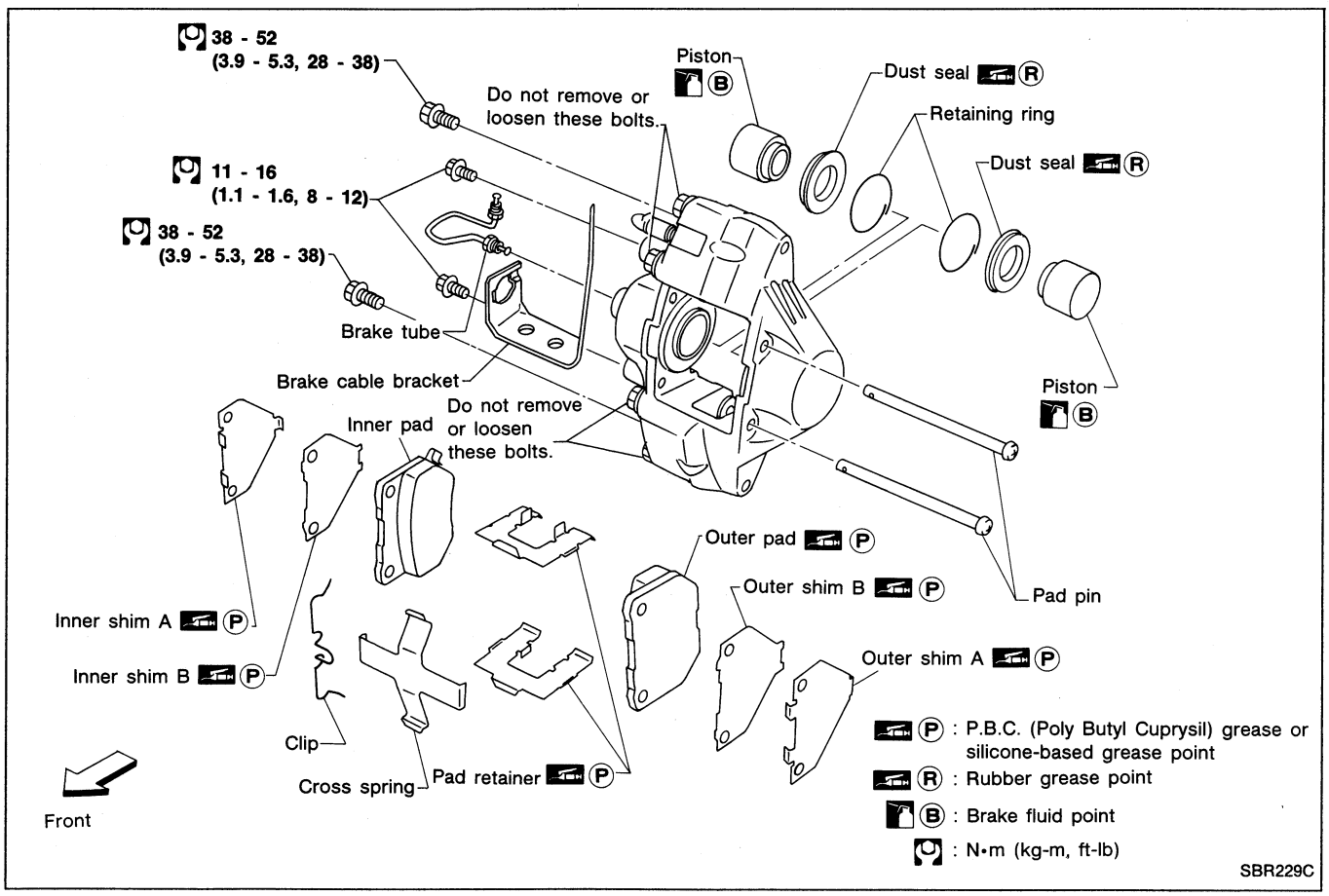
SBR744A

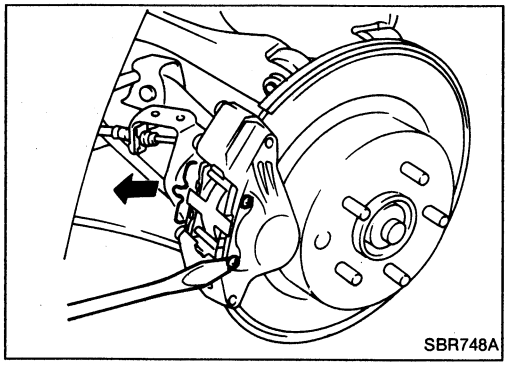
Inspection (On-vehicle)

DISC PAD

- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.

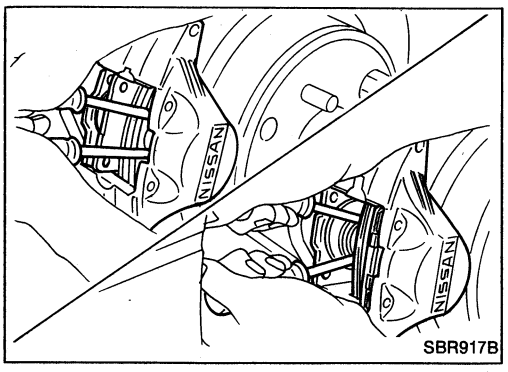
Pad standard thickness (A):
10.0 mm (0.394 in)
Pad wear limit (A):
2.0 mm (0.079 in)



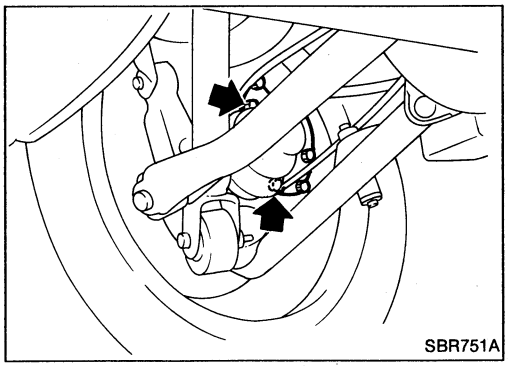


Pad Replacement

1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.
   Standard pad thickness:
   11.5 mm (0.453 in)
   Pad wear limit:
   2.0 mm (0.079 in)

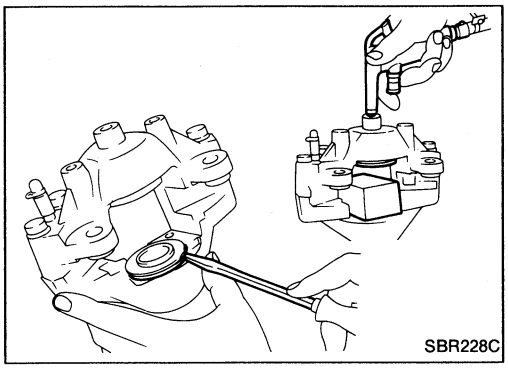


3. Pull out outer pad.
4. Push back outer piston with a suitable tool and install new pad.
5. Pull out inner pad.
6. Push back inner piston with a suitable tool and install new pad.
7. Install cross spring, pad pin and clip.


SBR751A

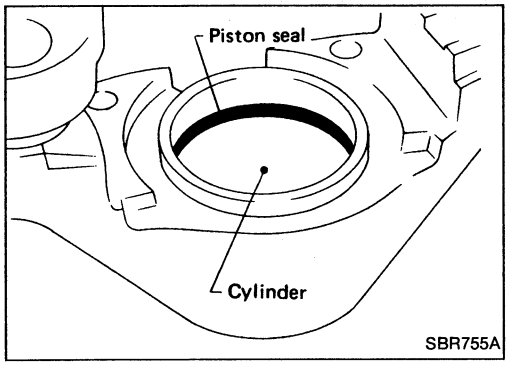
Removal and Installation

1. Disconnect brake tube.
2. Remove brake pad.
3. Remove brake cable and bracket.
4. Remove axle housing fixing bolts.


SBR228C

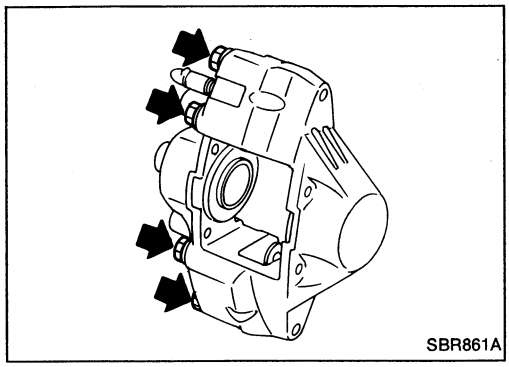
Disassembly

1. Remove retaining ring.
2. Push out piston with dust seal using compressed air.



SBR755A

3. Remove piston seal.


SBR861A

CAUTION:
Be careful not to loosen or remove bolts joining both sides of caliper.
If there is any fluid leakage, replace caliper assembly.

Inspection

CALIPER

- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for score, rust, wear or other damage.
- Minor damage from rust of foreign materials may be eliminated by polishing surface with a fine emery paper. Replace if necessary.

CAUTION:
Use brake fluid to clean.

Inspection (Cont'd)

PISTON

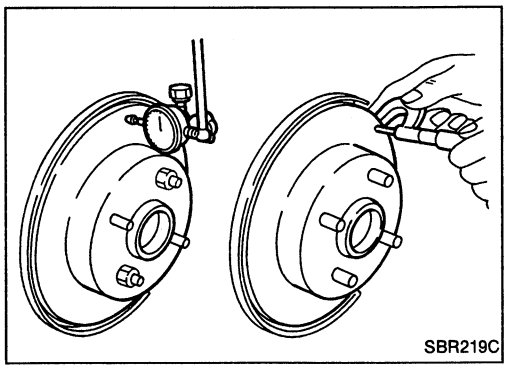
Check piston for score, rust, wear or other damage. Replace if necessary.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

PAD PIN AND CLIP

Check for wear, cracks deformation, deterioration, rust or other damage. Replace if necessary.


SBR219C

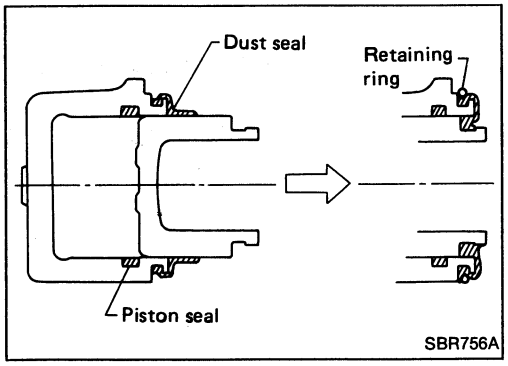
RUNOUT

- Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
- Make sure that axial end play is within the specifications before measuring. Refer to section RA.

Rotor repair limit: 0.07 mm (0.0028 in)
Maximum runout
(Total indicator reading at center of rotor pad contact surface)

THICKNESS

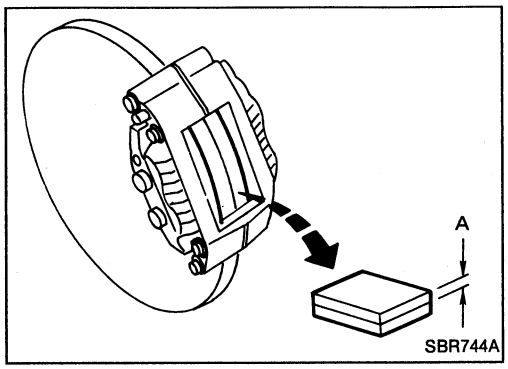
Standard thickness: 18.0 mm (0.709 in)
Minimum thickness: 16.0 mm (0.630 in)



SBR756A

Assembly

1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.



SBR744A

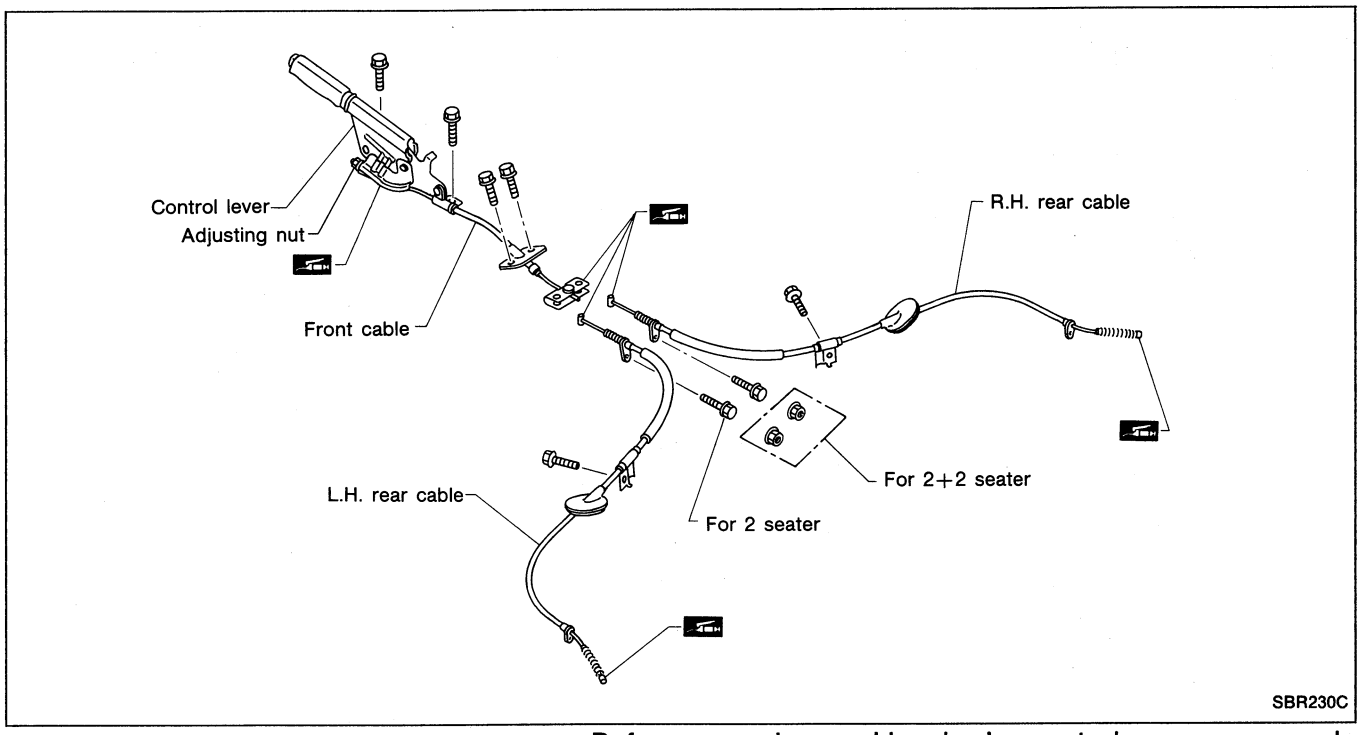
Inspection (On-vehicle)

DISC PAD

- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.

Standard thickness (A):
11.5 mm (0.453 in)
Pad wear limit (A):
2.0 mm (0.079 in)

Removal and Installation



- Before removing parking brake control, remove console box.
- Loosen cable using control lever adjuster, and separate front and rear cables.

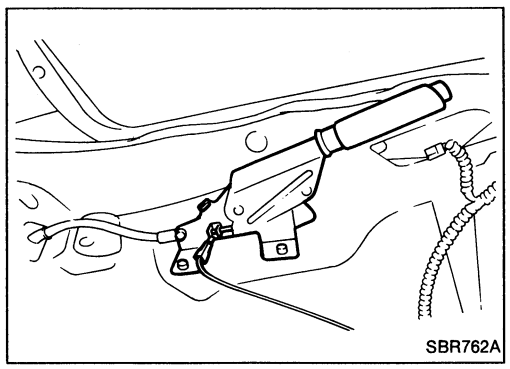
Apply multi-purpose grease to areas between control lever drum and cables.
Be careful not to damage boot and inner cable.

Inspection

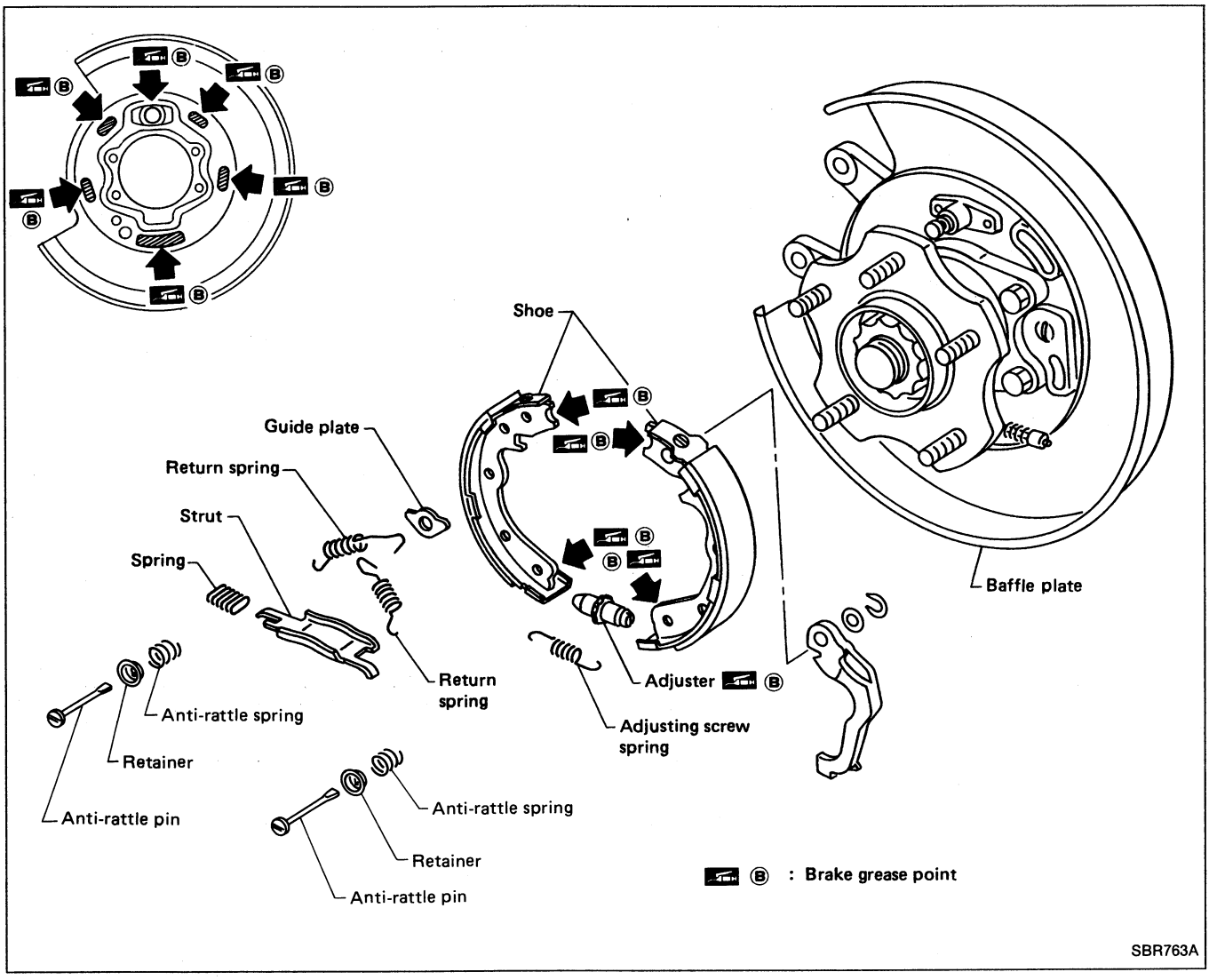
1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables, lamp and switch. Replace if necessary.
3. Check parts at each connecting portion for deformation or damage. If found, replace.

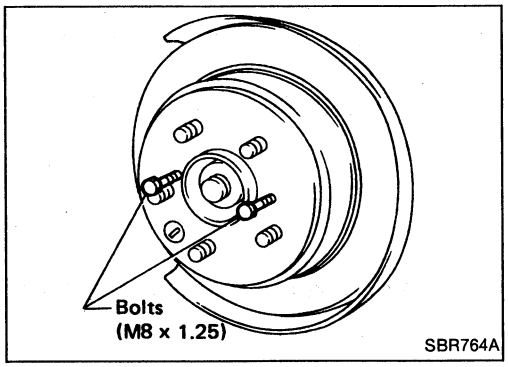
Adjustment

Perform shoe clearance adjustment before adjusting control lever stroke.



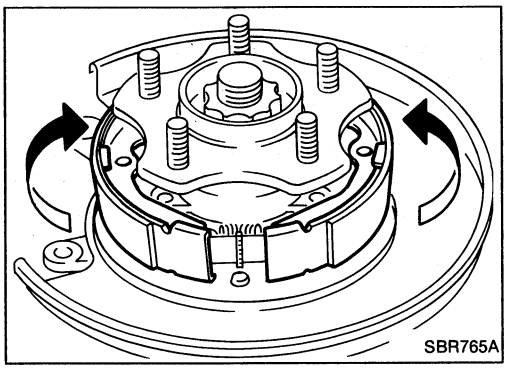
1. Turn adjusting nut.
2. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches at 196 N (20 kg, 44 lb): 6 - 7
3. Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.
   Number of notches "A": 1





Shoe Replacement

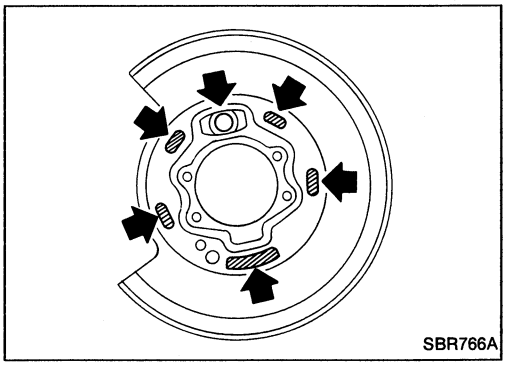
1. Remove disc rotor (With parking drum brake).
   Tighten two bolts gradually if disc rotor is hard to remove.



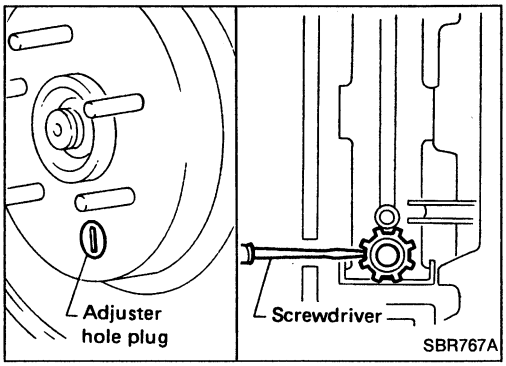
2. After removing anti-rattle pin, remove spring by rotating shoes.

Be careful not to damage parking brake cable when separating it.

Shoe Replacement (Cont'd)


SBR766A

3. Apply brake grease to the contact areas shown at left.



SBR767A

Shoe Clearance Adjustment

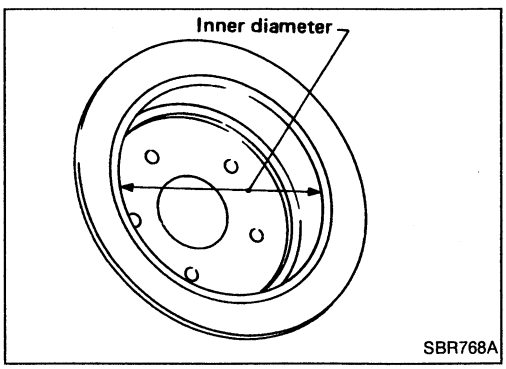
1. Remove adjuster hole plug, and turn adjuster wheel with a screwdriver until shoe touches brake drum.

Make sure that parking control lever is released completely.

2. Return adjuster wheel 5 to 6 latches.
3. Install adjuster hole plug, and make sure that there is no drag between shoes and brake drum when rotating disc rotor.

Breaking in Drum and Lining

1. Using either low or 2nd transmission speed, drive the unloaded vehicle on a safe, level and dry road.
2. Depress the release button of parking brake lever, then pull the lever with a force of 98 N (10 kg, 22 lb).
3. While holding the lever, continue to drive the vehicle forward 100 m (328 ft) at approximately 35 km/h (22 MPH).
4. While holding the lever, drive the vehicle in reverse 10 m (33 ft) at approximately 10 km/h (6 MPH).
5. Repeat steps 1 through three times and then repeat only step 4 one more time.

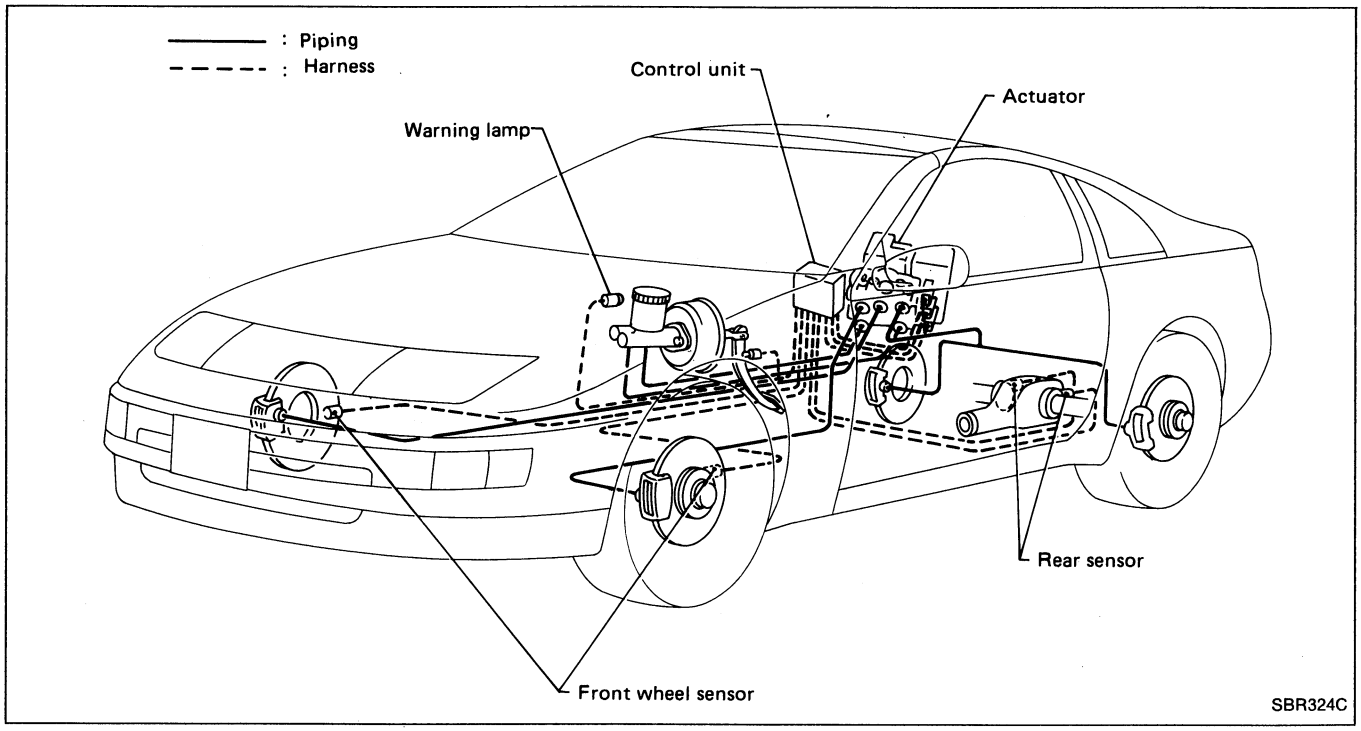


SBR768A

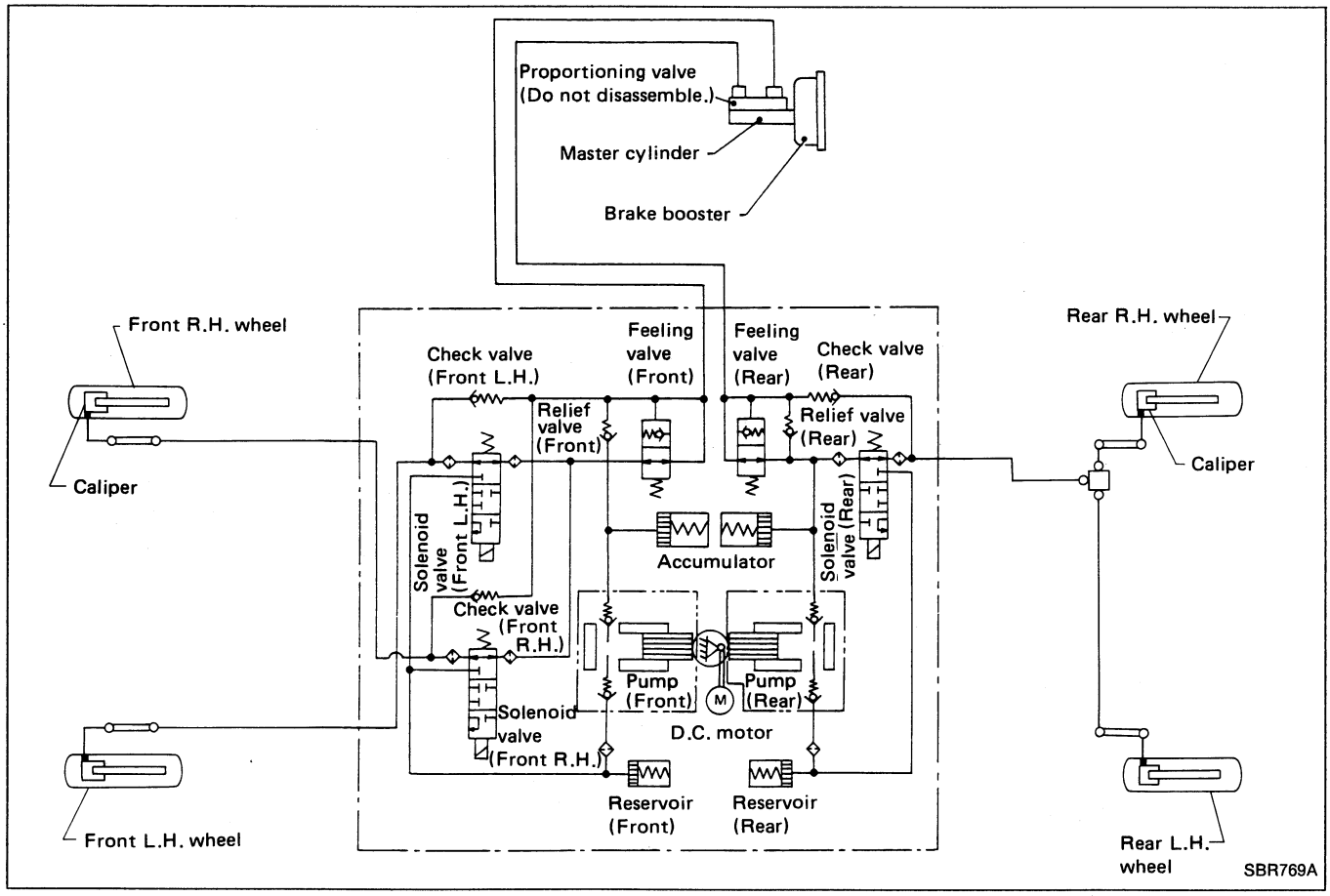
Drum Inspection

Standard inner diameter:
172.0 mm (6.77 in)
Maximum inner diameter:
173.0 mm (6.81 in)

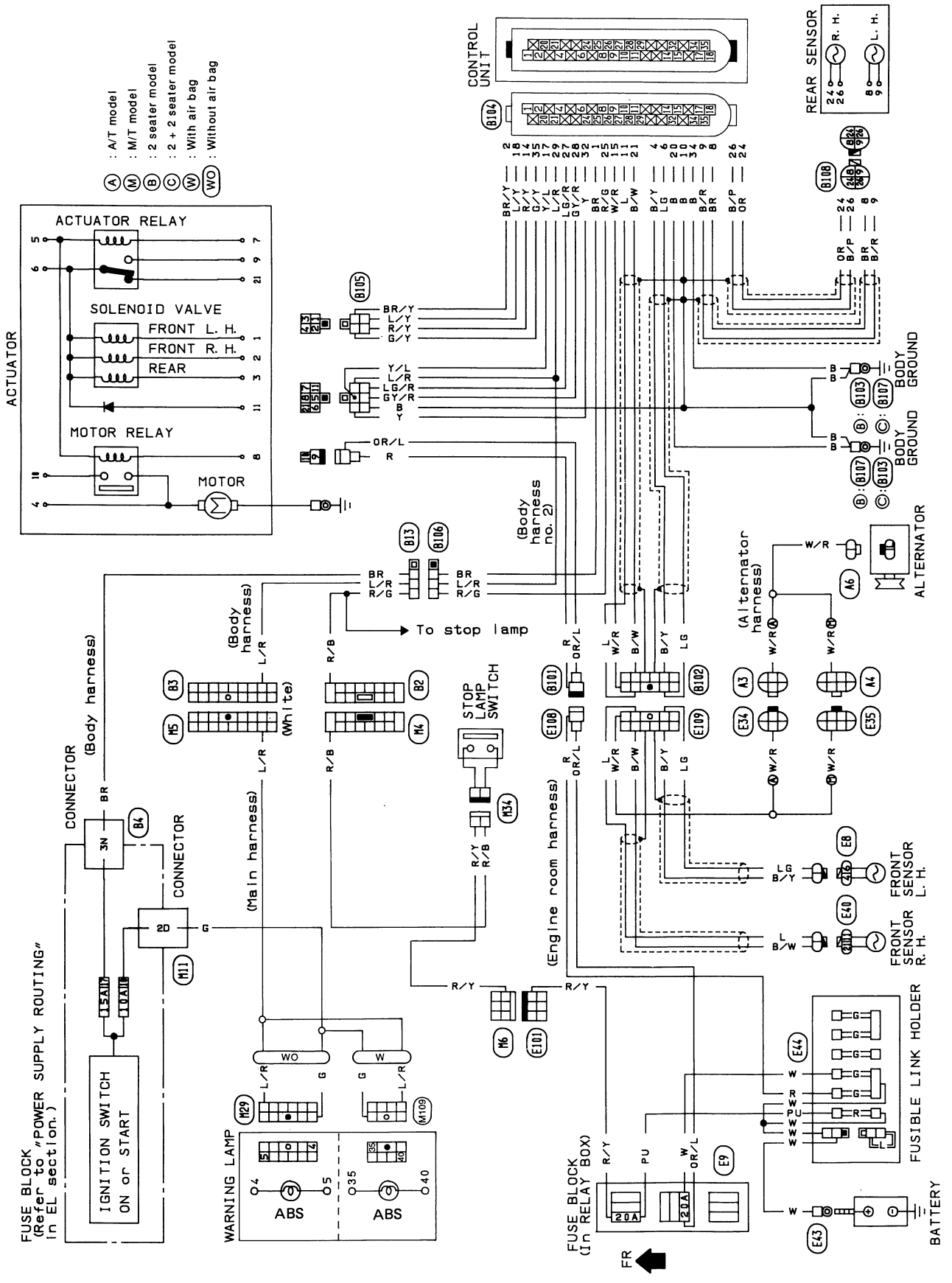
System Components



Hydraulic Circuit



Wiring Diagram

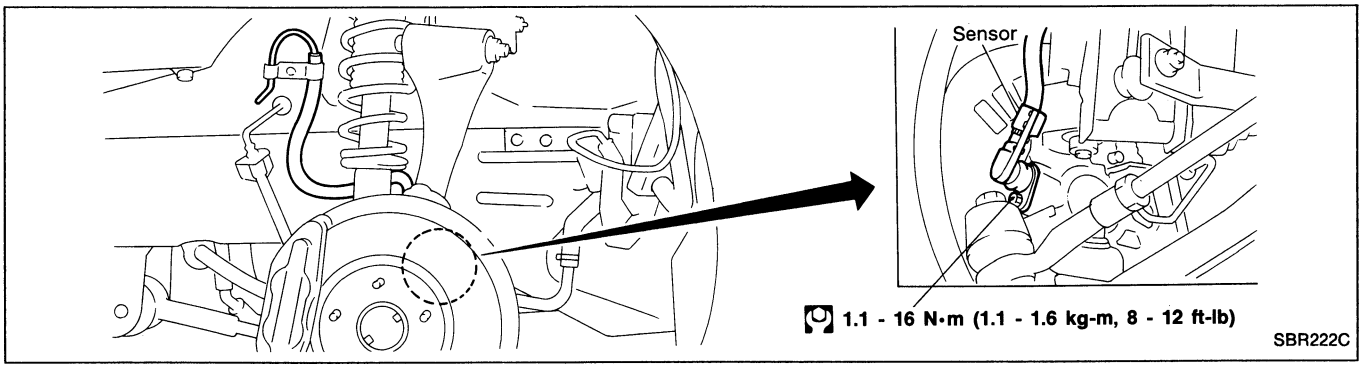


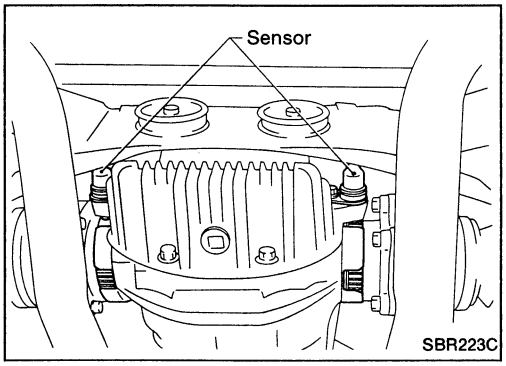
SBR921B

Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR

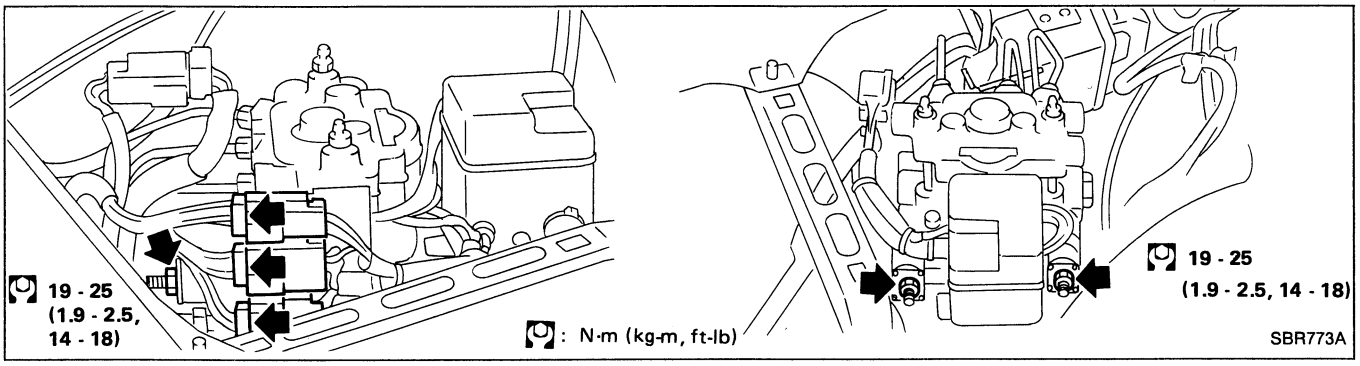




REAR SENSOR

- Remove rear sensor rotor with differential side flange after drive shaft removal.
  Refer to RA section.

ACTUATOR

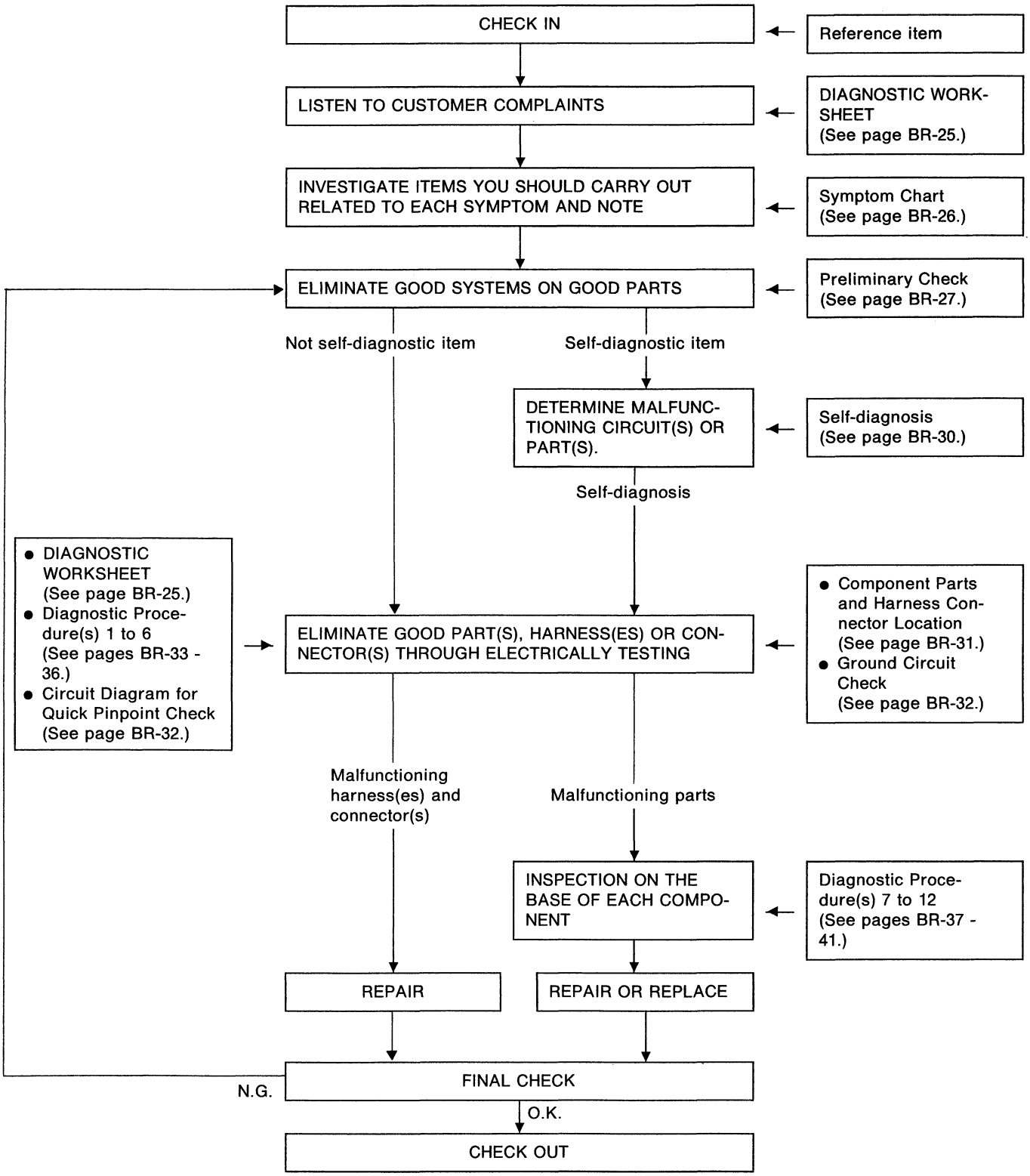


- Disconnect 3 connectors and brake tubes.
- Remove 3 nuts fixing actuator to bracket.

Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



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

SBR339B

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	☐ Unexpected pedal action	☐ ABS does not 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					

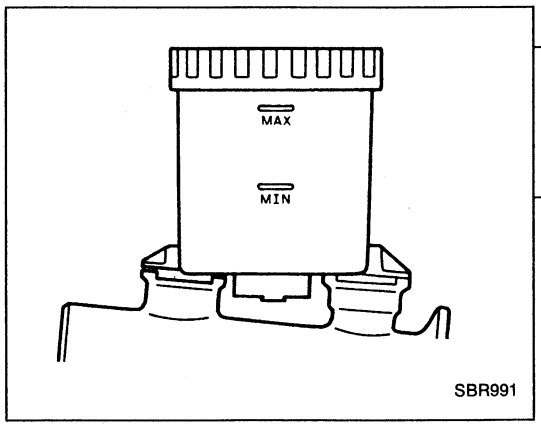
Symptom Chart

PROCEDURE											
REFERENCE PAGE											
SYMPTOM											
Pedal vibration & noise	○	○	○	○	○	○	○	○	○	○	○
Warning activates	○	○		○	○	○	○	○	○	○	○
Long stopping distance	○		○			○	○	○	○	○	○
Unexpected pedal action	○			○			○	○	○	○	○
ABS does not work	○	○									
ABS works but warning activates	○	○									
ABS works frequently	○	○									

Preliminary Check	BR-27	Preliminary Check 1
	BR-28	Preliminary Check 2
	BR-29	Preliminary Check 3
	BR-29	Preliminary Check 4
Diagnostic Procedure	BR-33	Diagnostic Procedure 1
	BR-34	Diagnostic Procedure 2
	BR-35	Diagnostic Procedure 3
	BR-35	Diagnostic Procedure 4
	BR-36	Diagnostic Procedure 5
	BR-36	Diagnostic Procedure 6
Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	BR-37	L.E.D. flashing 1 - 4
	BR-38	L.E.D. flashing 5 - 8
	BR-39	L.E.D. flashing 9
	BR-40	L.E.D. flashing 10
	BR-41	L.E.D. flashing 16
	BR-41	L.E.D. comes off
Ground Circuit Check	BR-32	Motor ground
Electrical Components Inspection	BR-42	Actuator inspection

Preliminary Check 1

CHECK

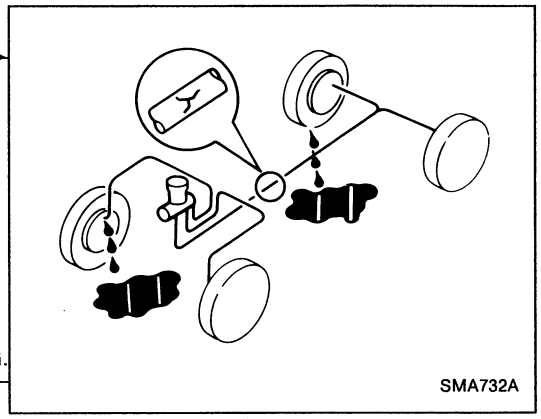


Check brake fluid level in reservoir tank

N.G. → Fill up brake fluid

O.K. →

CHECK

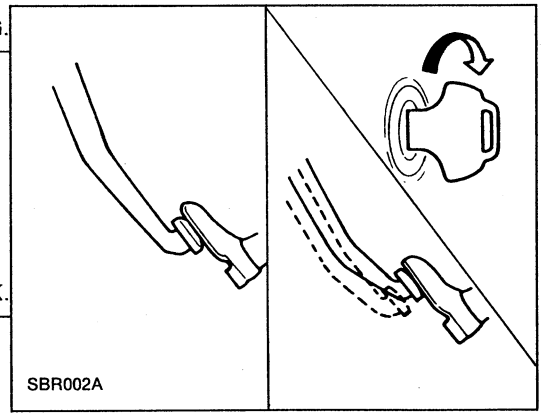


Check brake system.
Refer to CHECK AND ADJUSTMENT.

N.G. ← Repair brake system.

O.K. ↓

CHECK

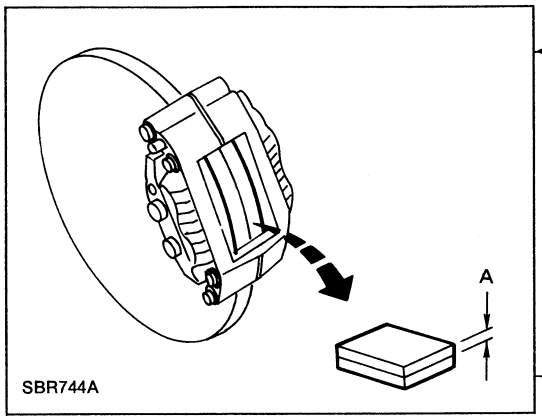


Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

N.G. ← Repair or replace booster system.

O.K. ←

CHECK

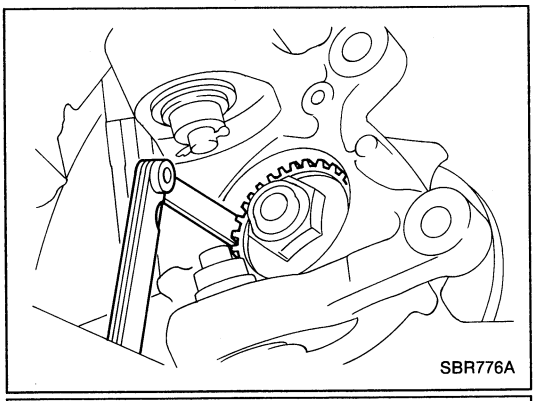


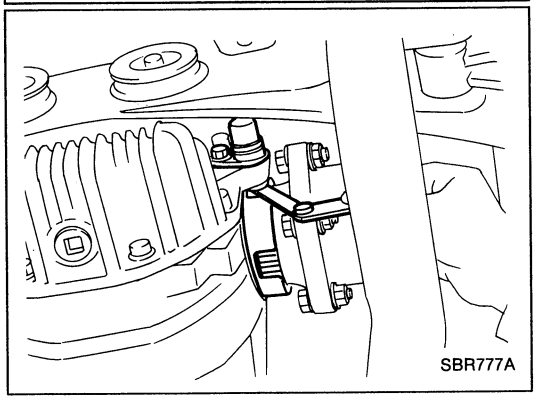
Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

N.G. → Replace malfunctioning parts.

Preliminary Check 2

CHECK


SBR776A


SBR777A

Check sensor clearance.

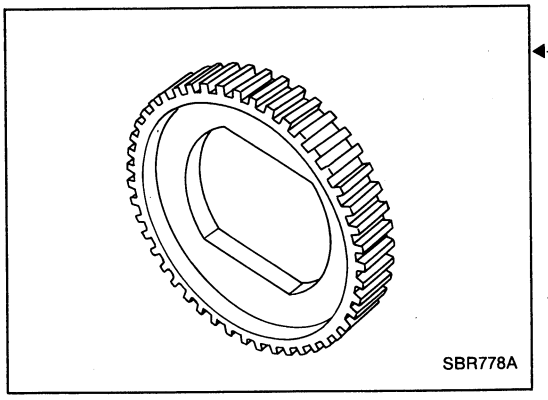
	Clearance mm (in)
Front wheel sensor	0.22 - 0.71 (0.0087 - 0.0280)
Rear sensor	0.06 - 0.93 (0.0024 - 0.0366)

N.G. → Check sensor for the following items:
- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K. → N.G. → Repair or replace malfunctioning sensor.

O.K.

CHECK


SBR778A

Check sensor rotor for teeth damage.

N.G. → Replace sensor rotor.

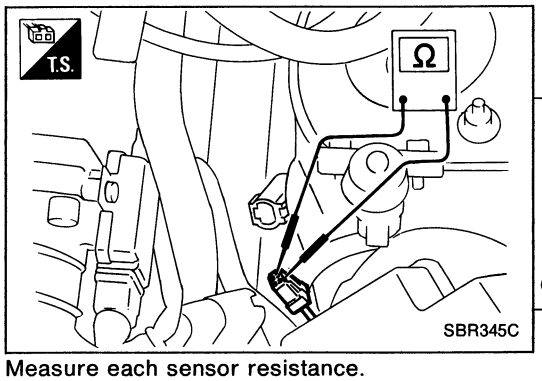
Number of teeth:

Front: 46

Rear: 46

Preliminary Check 3, 4

Preliminary Check 3
CHECK

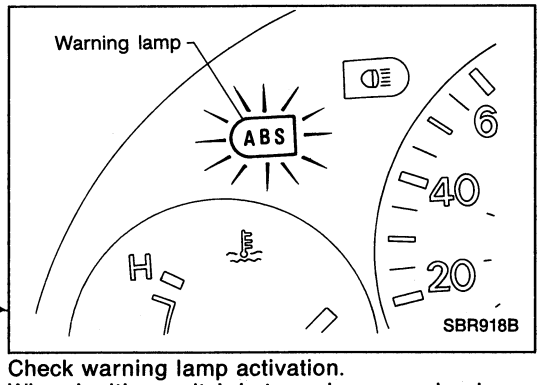


Measure each sensor resistance.
0.8 - 12 kΩ

N.G. → Replace.

O.K.

Preliminary Check 4
CHECK

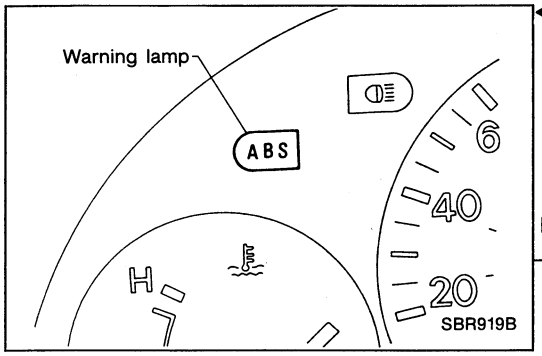


Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K. ↓

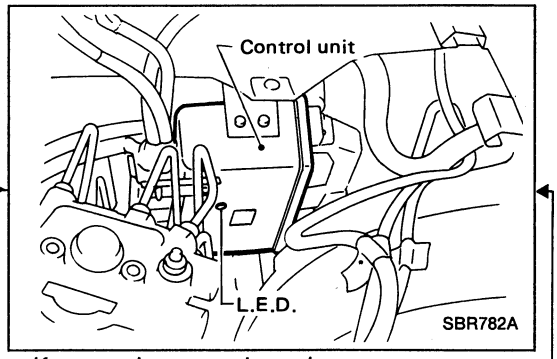
N.G. ↓
Check fuse.
Check bulb condition and remedy.

CHECK



Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

N.G. →



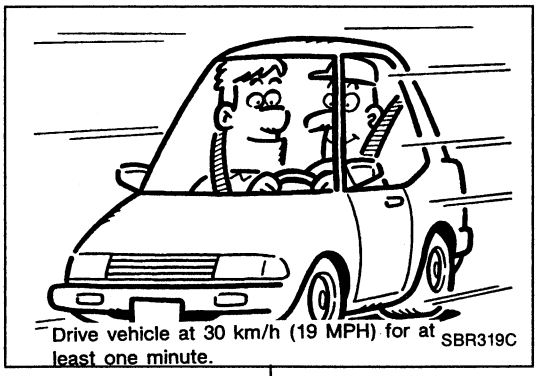
- Keep engine on and running.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

↓

Go to Self-diagnosis.
(See next page)

↓ O.K.

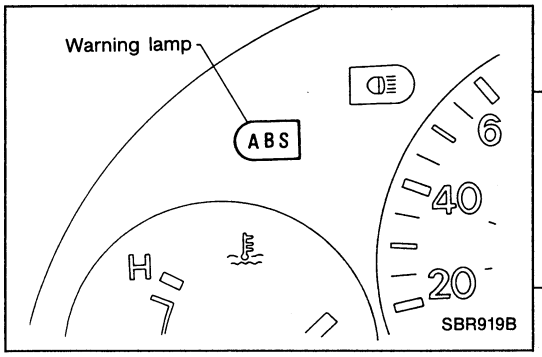
DRIVE



Drive vehicle at 30 km/h (19 MPH) for at least one minute.

↓

CHECK



Ensure warning lamp remains off while driving.

N.G. → (to Control unit)

O.K. → If Preliminary Check 2 is not performed and there is abnormal ABS operation, perform Preliminary Check 2.

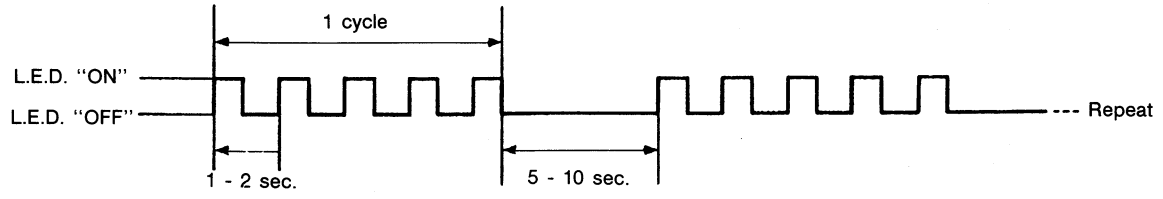
Self-diagnosis

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 or 4	Rear actuator solenoid circuit
5	Left front rotor sensor circuit
6	Right front rotor sensor circuit
7	Right rear rotor sensor circuit
8	Left rear wheel sensor circuit
9	Actuator motor, motor relay circuit
10	Actuator solenoid valve relay
16	Control unit
Warning activates and L.E.D. "OFF"	Power supply or ground circuit for control unit

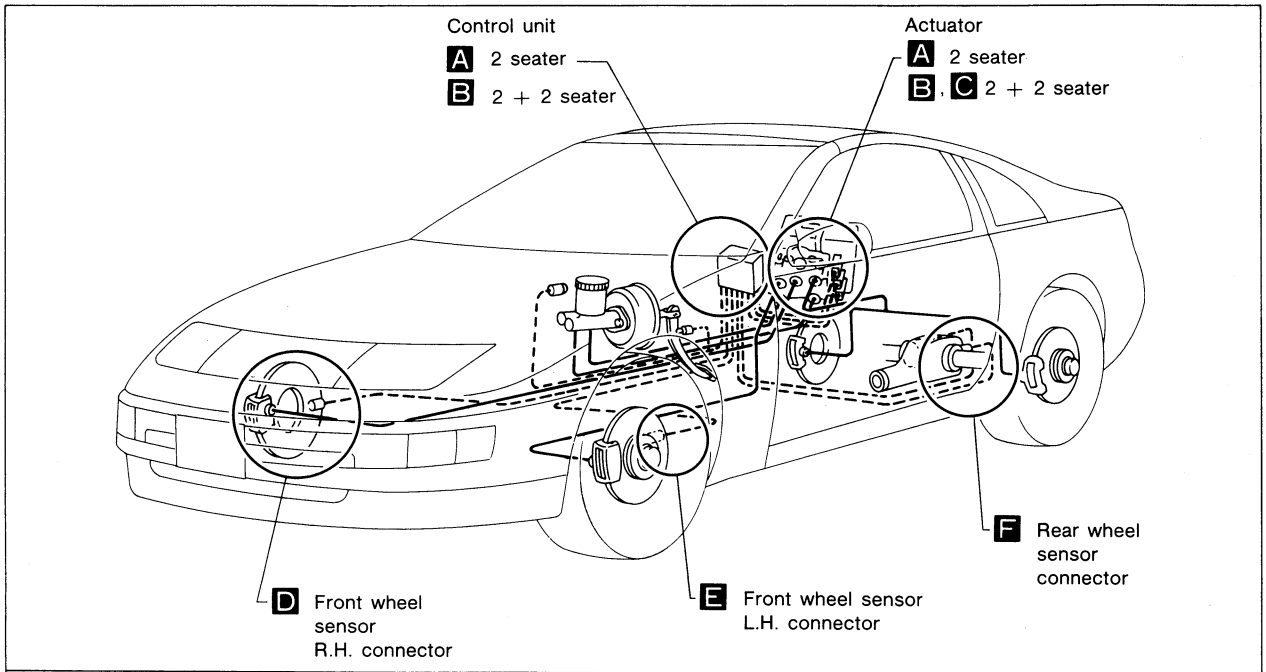
Example
Improper operation of left front rotor sensor circuit

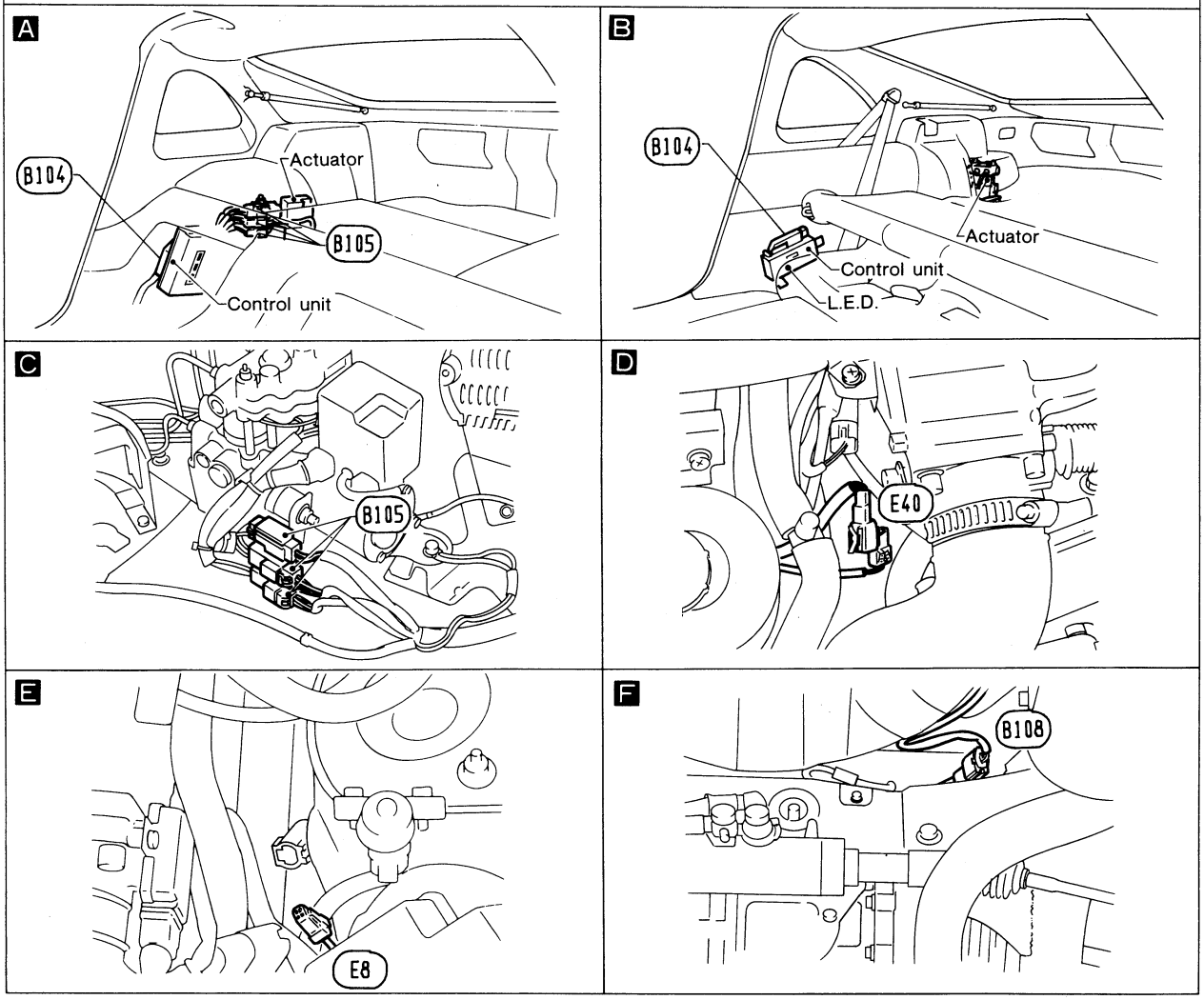


SBR531A

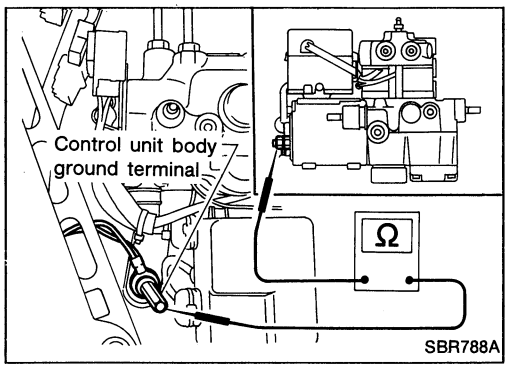
Go to Diagnostic Procedure from 7 to 10, where malfunction portion is concerned.

Component Parts and Harness Connector Location





SBR323C



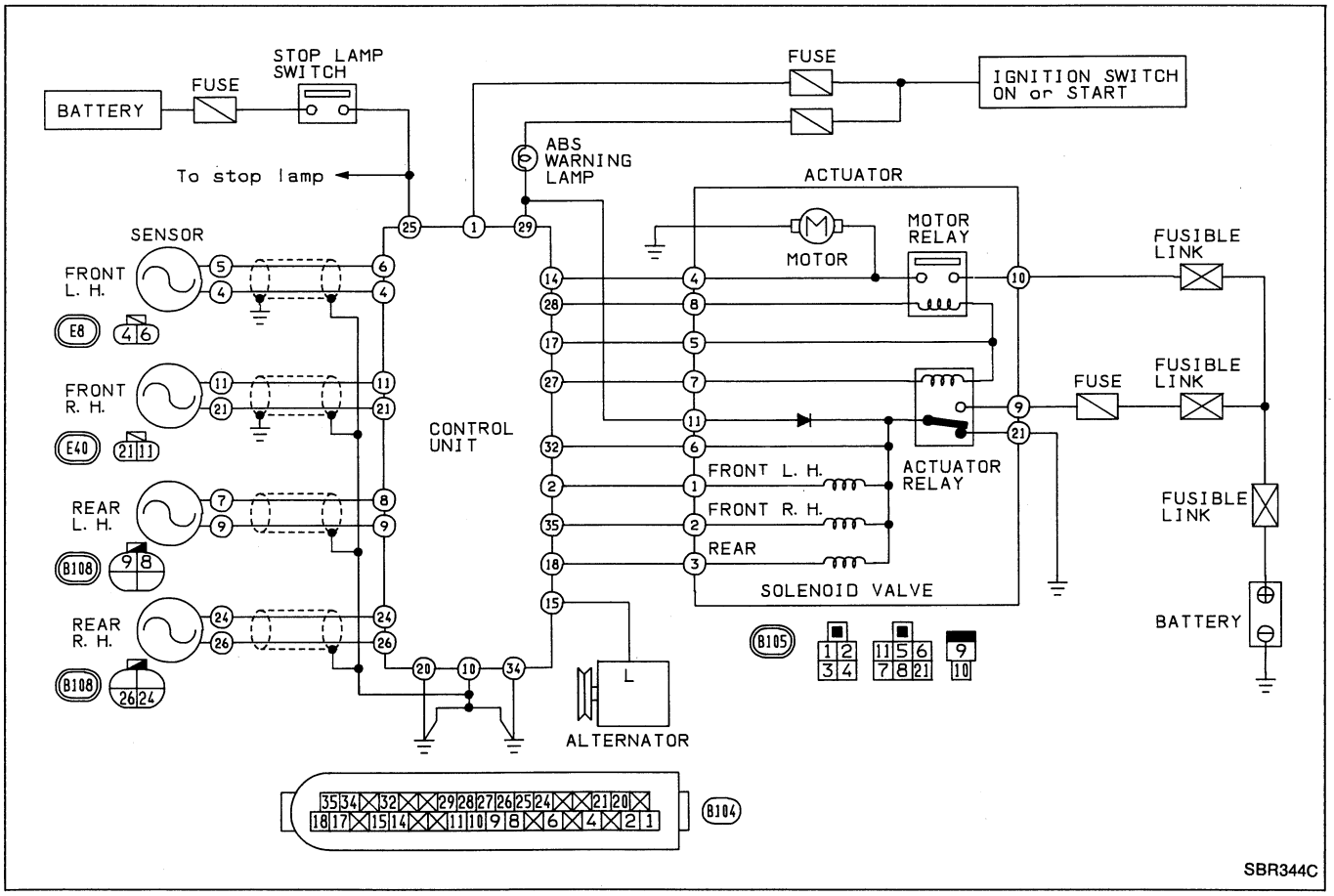
Ground Circuit Check

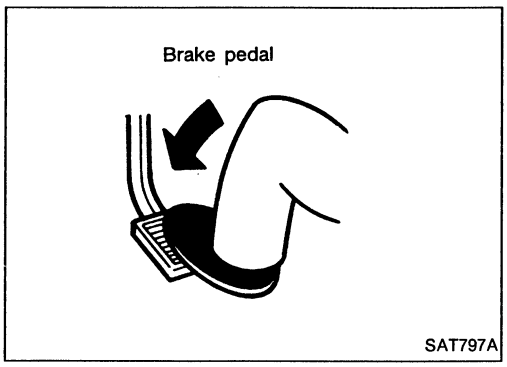
ACTUATOR MOTOR GROUND

- Check resistance between both terminals.
  Resistance: approx. 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-31.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".





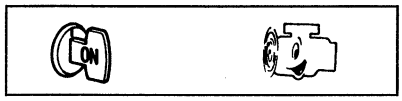
Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

Refer to worksheet results.

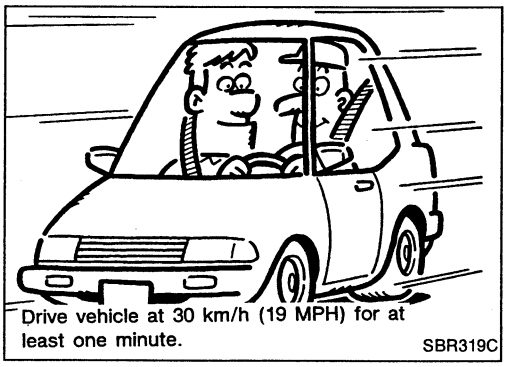
Check whether the symptom appears only when brake is applied suddenly.
- Yes → When brake is applied suddenly, ABS works and produces pedal vibration or noise.
- No ↓

Check whether the symptom appears only when engine is started.

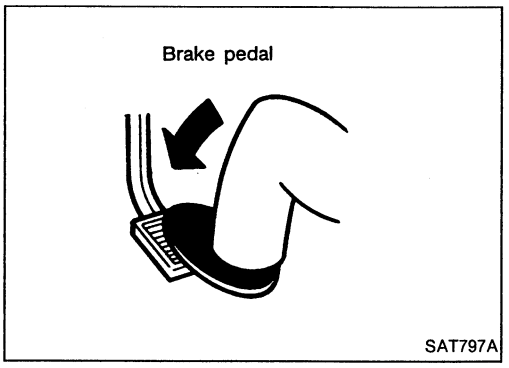


- Yes → Refer to Preliminary Check 4 result.
- No ↓

Check whether the symptom appears only when the vehicle speed is within 10 km/h (6 MPH) after starting engine.
- Yes → Check whether the symptom disappears within 5 seconds.
  - No → Ⓐ
  - Yes → Control unit activates ABS actuator to carry out self-diagnosis.
- No ↓


Drive vehicle at 30 km/h (19 MPH) for at least one minute.
SBR319C

Check whether the symptom appears while the vehicle is being driven.
- No → Ⓐ
- Yes ↓

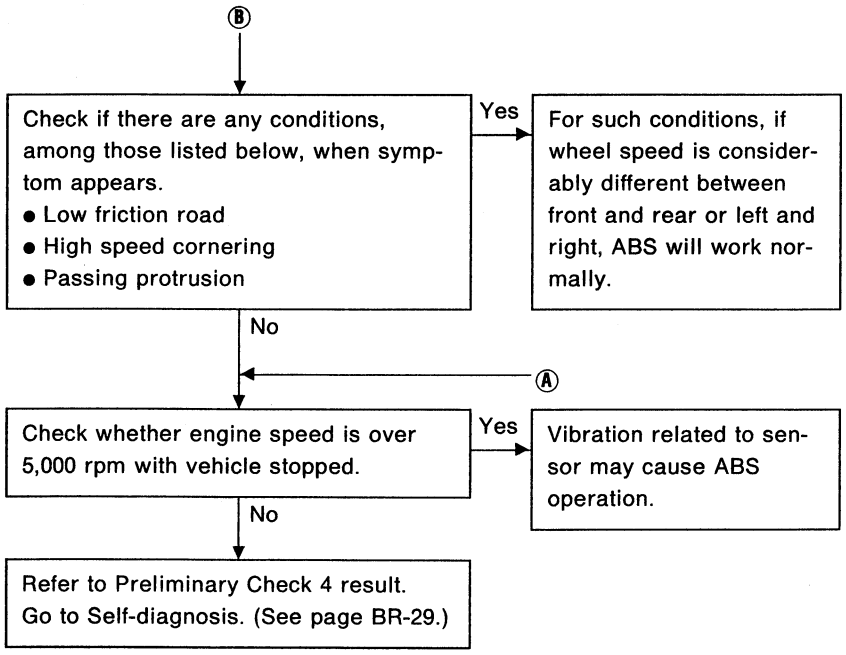


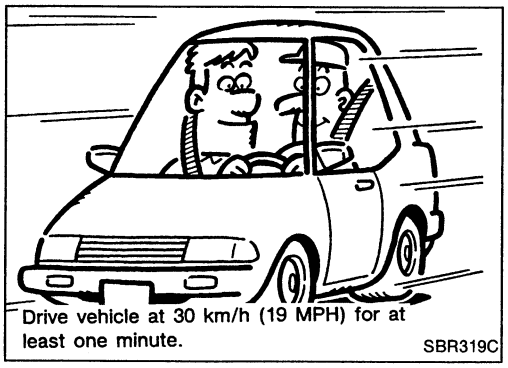
Check whether the symptom appears when brake is applied gradually.
- No (Appears when brake is not applied.) → Check if there are any conditions, among those listed below, when symptom appears.
  - ● Shifting
  - ● Operating clutch
  - ● Passing protrusion
  - No → Ⓑ
  - Yes → Under these conditions individual wheel speed can change suddenly. This may sometimes cause the ABS to operate.
- Yes ↓

Ⓑ

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

Diagnostic Procedure 1 (Cont'd)

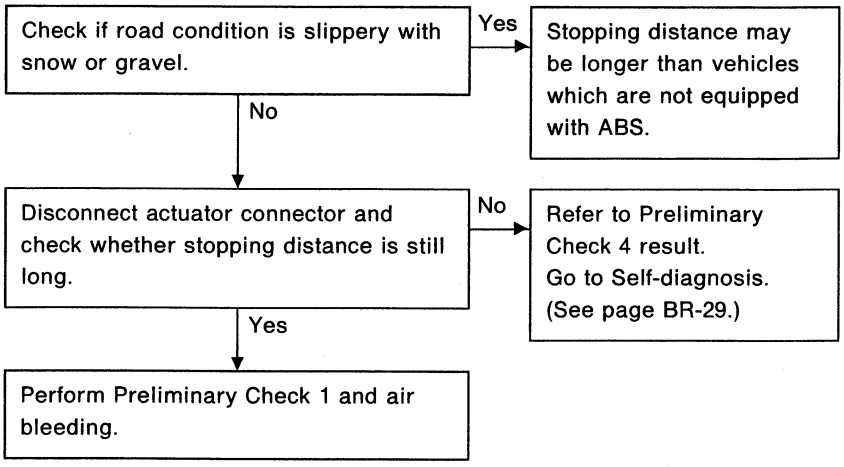


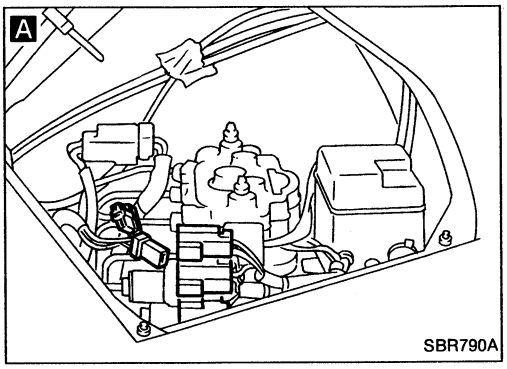


Diagnostic Procedure 2

SYMPTOM: Long stopping distance

Refer to worksheet results.





Diagnostic Procedure 3

SYMPTOM: Unexpected pedal action

Refer to worksheet results.

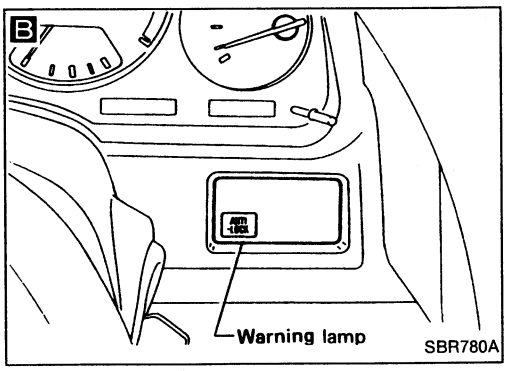
Check whether brake pedal stroke is large.
- Yes → Vehicle equipped with ABS may have a tendency for large pedal strokes.
- No ↓

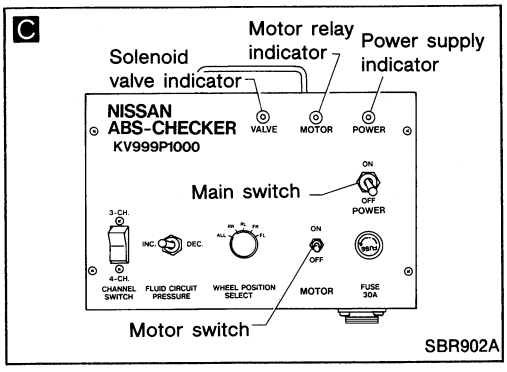
Check that brake pedal force is firm but brake is effective.
- Yes → Normal condition.
- No ↓

A

Disconnect actuator connector and check whether brake is effective.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-29.)
- No ↓

Perform Preliminary Check 1.





Diagnostic Procedure 4

SYMPTOM: ABS does not work.

Refer to worksheet results.

B

Check whether warning activates.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-29.)
- No ↓

Check whether vehicle speed is under 10 km/h (6 MPH).
- Yes → ABS doesn't work in this condition.
- No ↓

Refer to Preliminary Check 2 result.

O.K. but ABS still does not work. ↓

C

Check actuator by referring to Electrical Components Inspection — ACTUATOR. (See page BR-42.)

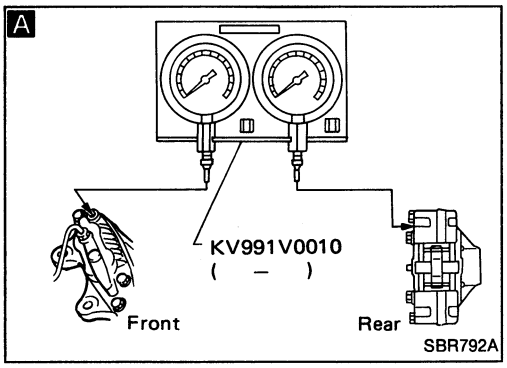
Diagnostic Procedure 5

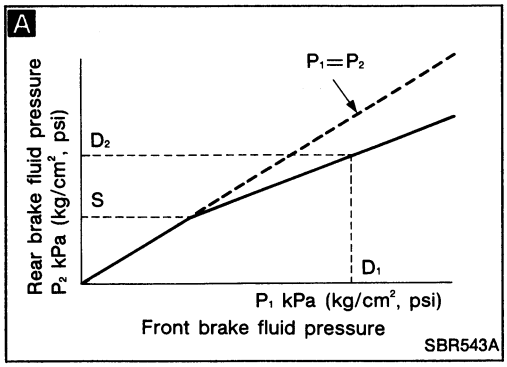
SYMPTOM: ABS works but warning activates.

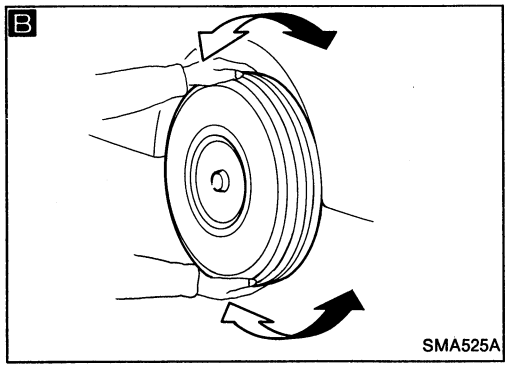
Check whether alternator produces proper output.
Refer to EL section.
→ No → Remedy.
↓ Yes

Check whether battery has enough voltage.
Refer to EL section.
→ No → Remedy.
↓ Yes

Refer to Preliminary Check 4 result.
Go to Self-diagnosis. (See page BR-29.)







Diagnostic Procedure 6

SYMPTOM: ABS works frequently.

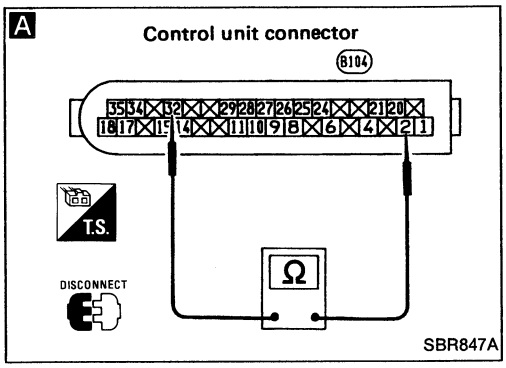
A

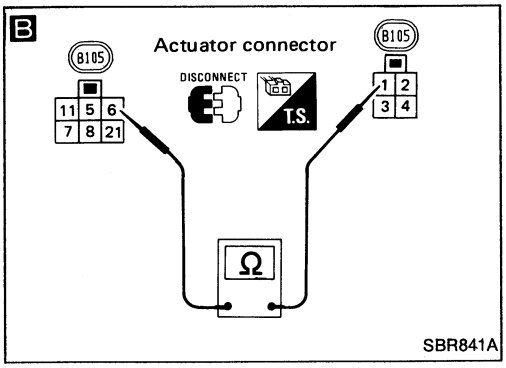
CHECK BRAKE FLUID PRESSURE.
Check whether brake fluid pressure distribution is normal.
D_2/D_1:
4,609 - 5,002 kPa
(47 - 51 kg/cm², 668 - 725 psi)/
6,865 kPa (70 kg/cm², 995 psi)
→ N.G. → Perform Preliminary Check 1.
↓ O.K.

B

Check whether front axles have excessive looseness.
→ Yes → Remedy.
↓ No

Perform Preliminary Check 2 and Ground Circuit Check.





Diagnostic Procedure 7

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK SOLENOID VALVE RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 1:
Terminals ㉜ and ②
Flashing number 2:
Terminals ㉜ and ㉟
Flashing number 3 or 4:
Terminals ㉜ and ⑱
Resistance: 0.7 - 1.6Ω

O.K. → Replace control unit.

N.G.

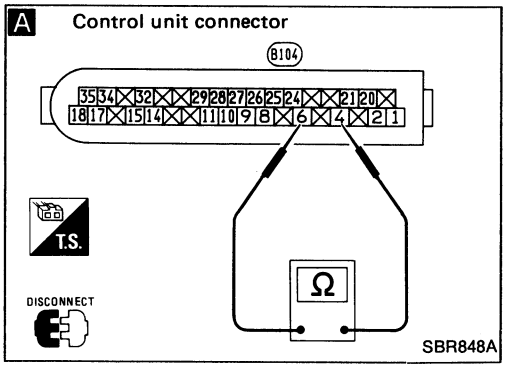
B

Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals.
Flashing number 1:
Terminals ⑥ and ①
Flashing number 2:
Terminals ⑥ and ②
Flashing number 3 or 4:
Terminals ⑥ and ③
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
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 5 (Fr, L.H.):
Terminals ④ and ⑥
Flashing number 6 (Fr, R.H.):
Terminals ⑪ and ㉑
Flashing number 7 (Rr, R.H.):
Terminals ㉔ and ㉖
Flashing number 8 (Rr, L.H.):
Terminals ⑧ and ⑨
Resistance: 0.8 - 1.2 kΩ

N.G. → Replace control unit.

O.K. ↓

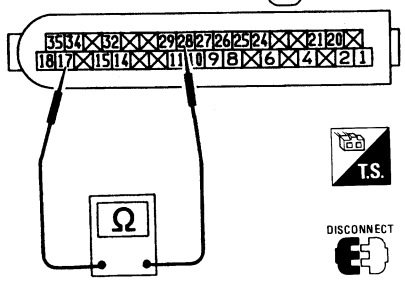
Refer to Preliminary Check 3 result.
Check whether sensor has 0.8 - 1.2 kΩ resistance.

N.G. → Replace sensor.

O.K. ↓

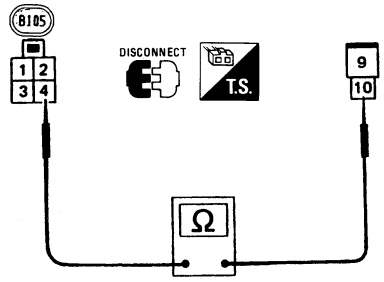
Repair harness between sensor connector and control unit connector.

A Control unit connector B104



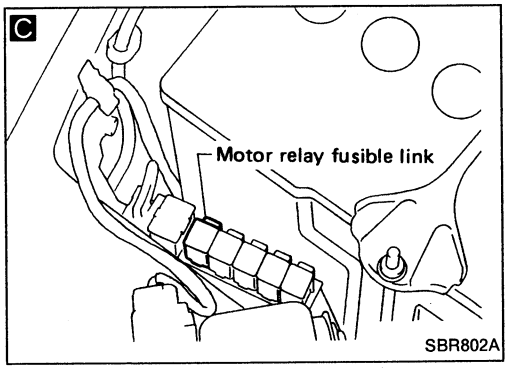
SBR849A

B Actuator connector



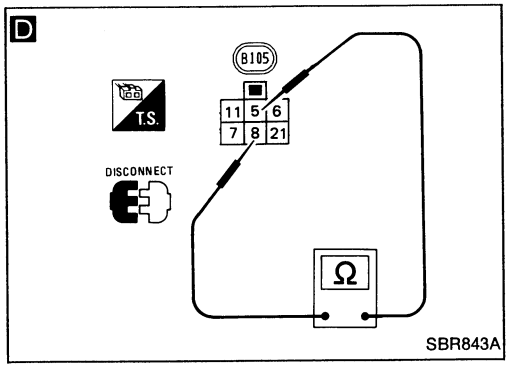
SBR791A

C



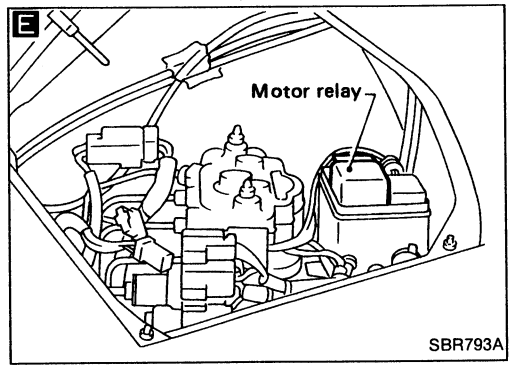
SBR802A

D



SBR843A

E



SBR793A

Diagnostic Procedure 9

ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)

INSPECTION START
Remove battery negative terminal connector.

A
CHECK MOTOR RELAY SOLENOID RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals ⑰ and ㉘.
Resistance: 45 - 55Ω

N.G. → **D**
Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals ⑧ and ⑤.
Resistance: 45 - 55Ω

D: O.K. → Repair harness between actuator and control unit.
D: N.G. → **E** Replace motor relay.

A: O.K. →

B
CHECK MOTOR RELAY DEACTIVATION.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals ④ and ⑩.

Yes → **E** Replace motor relay.

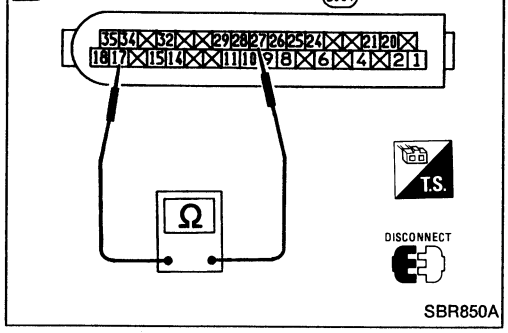
No →

C
Check visually if motor's fusible link is blown.
Resistance:
Approximately 0Ω

No → Perform Electrical Components Inspection — ACTUATOR. (See page BR-42.)
Perform Electrical Components Inspection: O.K. → Replace control unit.
Perform Electrical Components Inspection: N.G. → Replace actuator.

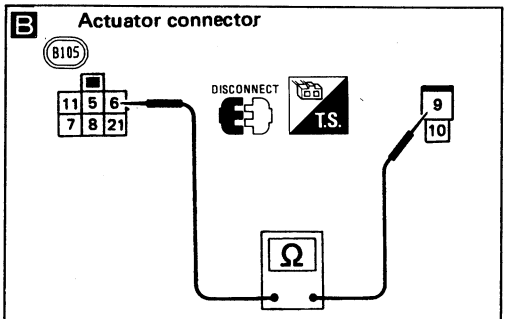
C: Yes → Replace fusible link.

A Control unit connector (B104)



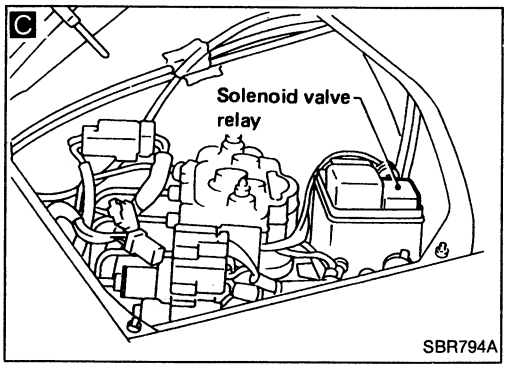
SBR850A

B Actuator connector (B105)



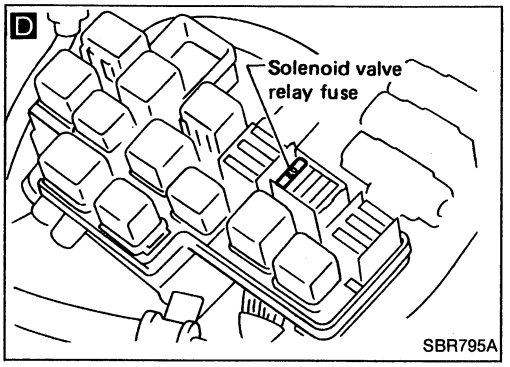
SBR757A

C



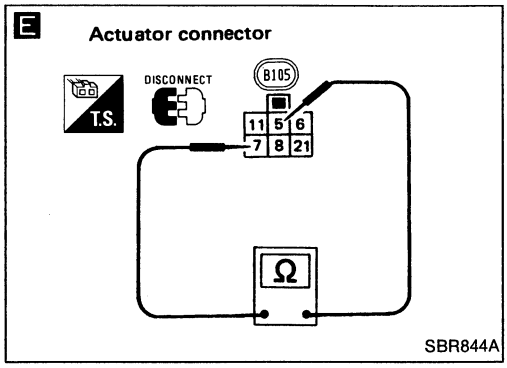
SBR794A

D



SBR795A

E Actuator connector



SBR844A

Diagnostic Procedure 10

ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK SOLENOID VALVE RELAY RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals ㉗ and ⑰.
Resistance: 80 - 90Ω

N.G. → **E**

Check resistance between actuator connector (actuator side) terminals ⑦ and ⑤.
Resistance: 80 - 90Ω

O.K. → Repair harness between actuator and control unit.

N.G. → **C** Replace solenoid valve relay.

O.K.

B

CHECK SOLENOID VALVE RELAY MOVEMENT.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals ⑥ and ⑨.

Yes → **C** Replace solenoid valve relay.

No

D

Check visually if solenoid valve relay fuse is blown.

No → Perform Electrical Components Inspection — ACTUATOR.
(See page BR-42.)

Yes → Replace fuse.

N.G. → Replace actuator.

O.K. → Replace control unit.

Diagnostic Procedure 11

CONTROL UNIT (L.E.D. flashing number 16)

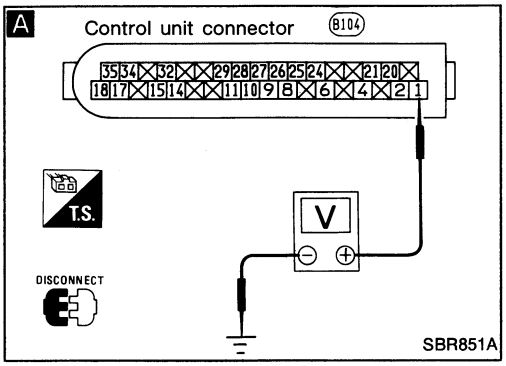
INSPECTION START

↓

Control unit malfunction.

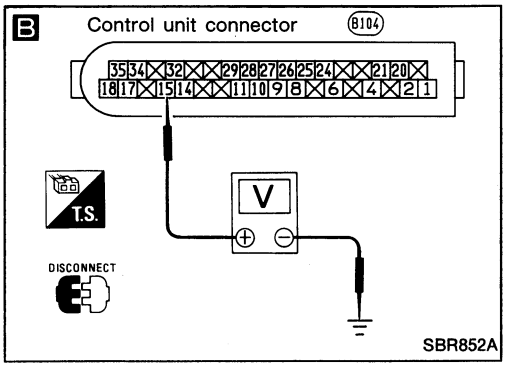
↓

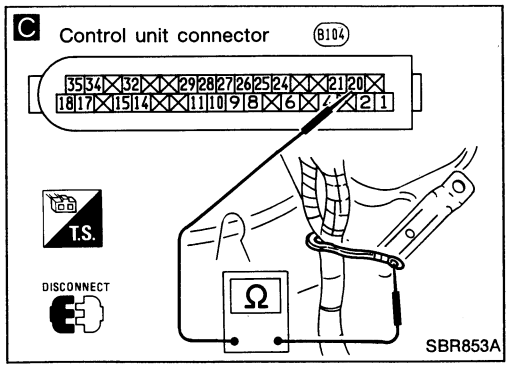
Replace control unit.



Diagnostic Procedure 12

CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)





INSPECTION START

↓

A

CHECK CONTROL UNIT POWER SUPPLY.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal ① and body ground with ignition switch turned on.

N.G. → Check if control unit "10A" fuse is blown.
- Yes → Replace fuse.
- No → Repair power supply harness.

O.K. ↓

B

CHECK ALTERNATOR L TERMINAL VOLTAGE.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal ⑮ and body ground after engine starting.
Voltage: 6V or more

N.G. → Check if other warnings activate.
- Yes → Repair harness between alternator and control unit.
- No → Malfunctioning alternator.

O.K. ↓

C

Check continuity between control unit connector (vehicle side) terminal ⑳ and body ground with ignition switch "OFF".

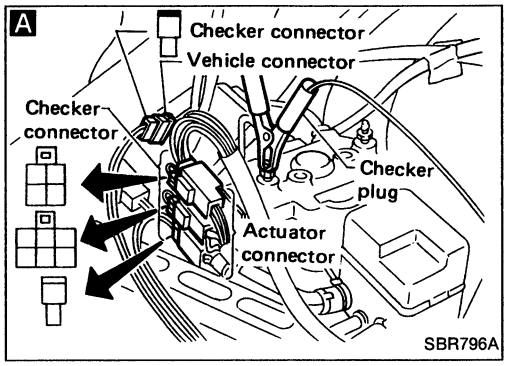
N.G. → Repair ground harness.

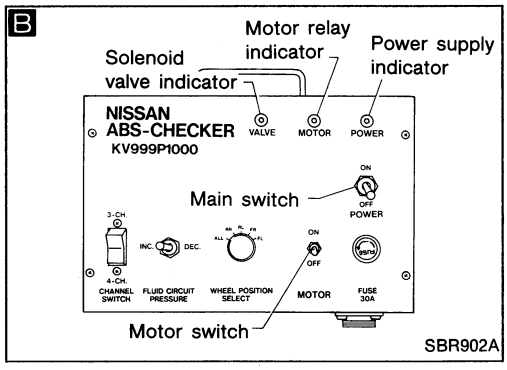
O.K. ↓

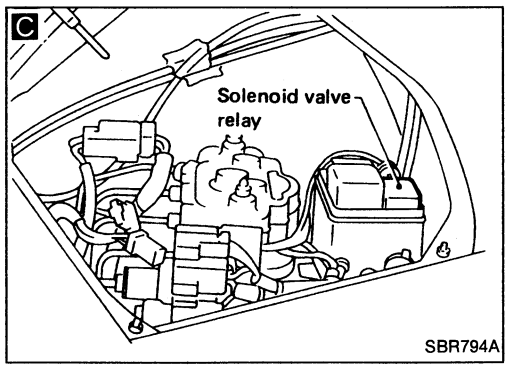
Replace control unit.

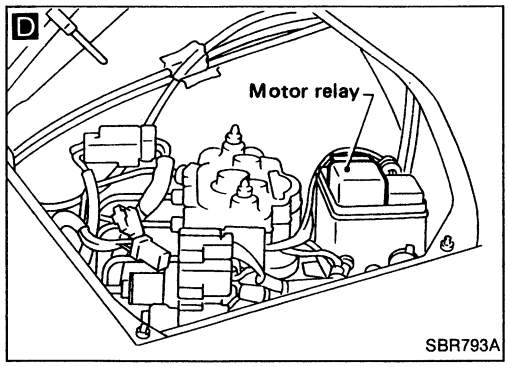
Electrical Components Inspection

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 3 channel.
Set channel select switch to 3 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.

Yes

B

Check checker valve relay indicator for coming on.

No → C Replace solenoid valve relay, if checker connection is correct.

Yes

B step Ⓐ

Select one valve — FL, FR 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.

B

Check motor relay indicator for coming on while motor switch is turned on.

No → D Replace motor relay, if checker connection is correct.

Yes

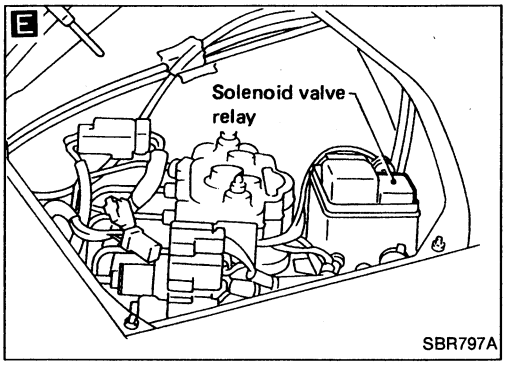
Check motor for operational sound beside the actuator in a quiet place.

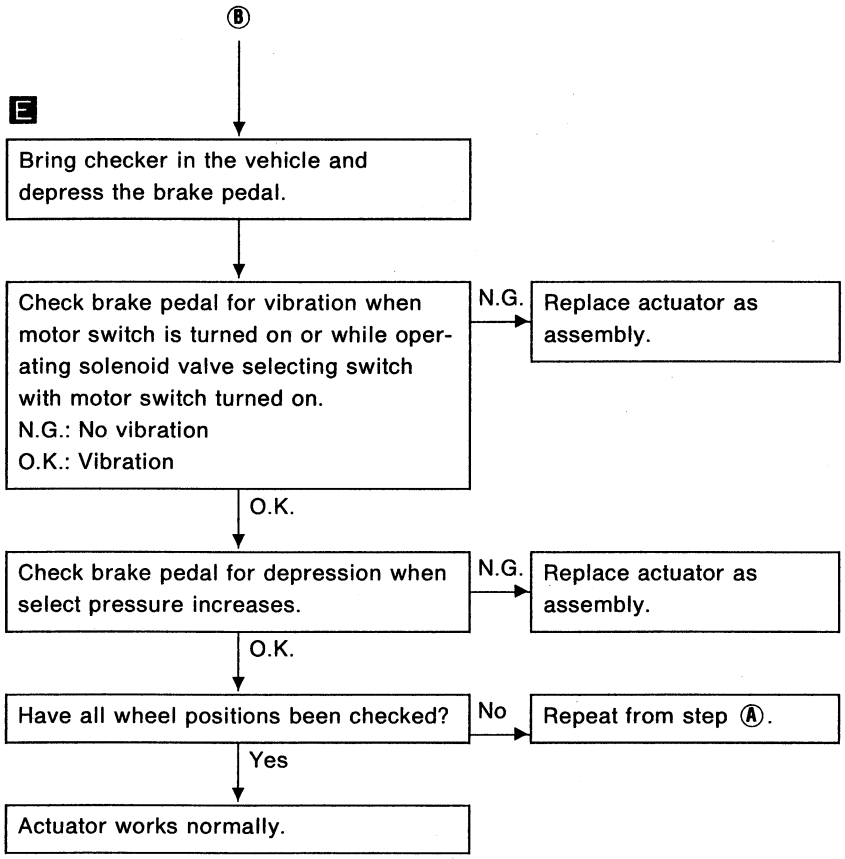
No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.

Yes

Ⓑ

Electrical Components Inspection (Cont'd)





CAUTION:
Do not set checker at pressure decrease position for more than 5 seconds at a time. Actuator solenoid valve may be damaged.

General Specifications

Applied model	VG30DE		VG30DETT
	Without ABS	With ABS	—
Front brake			
Brake model	OPZ25VA		
Cylinder bore diameter mm (in)	40.45 (1.5925) x 4		
Pad length x width x thickness mm (in)	116 x 50 x 10 (4.57 x 1.97 x 0.39)		
Rotor outer diameter x thickness mm (in)	280 x 30 (11.02 x 1.18)		
Rear brake			
Brake model	OPZ11VB		
Cylinder bore diameter mm (in)	38.1 (1.500) x 2		
Pad length x width x thickness mm (in)	71.8 x 36.5 x 11.5 (2.827 x 1.437 x 0.453)		
Rotor outer diameter x thickness mm (in)	297 x 18 (11.69 x 0.71)		
Master cylinder			
Cylinder bore diameter mm (in)	23.81 (15/16)	25.40 (1)	

Applied model	VG30DE		VG30DETT
	Without ABS	With ABS	—
Control valve			
Valve model	Proportioning valve (within master cylinder)		
Split point x reducing ratio kPa (kg/cm^2, psi)	3,432 (35, 498) x 0.4	2,452 (25, 356) x 0.4	
Brake booster			
Booster model	M215T		
Diaphragm diameter mm (in)	Primary: 230 (9.06) Secondary: 205 (8.07)		
Brake fluid			
Recommended brake fluid	DOT 3		
Parking drum brake			
Brake model	DS17HD		
Lining Length x width x thickness mm (in)	154.1 x 25.0 x 3.0 (6.07 x 0.984 x 0.118)		
Drum inner diameter mm (in)	172.0 (6.77)		

Inspection and Adjustment

DISC BRAKE

Unit: mm (in)

	Front	Rear
Pad wear limit		
Minimum thickness	2.0 (0.079)	
Rotor repair limit		
Minimum thickness	28.0 (1.102)	16.0 (0.630)

PARKING DRUM BRAKE

Unit: mm (in)

Lining replacement limit	
Minimum thickness	1.5 (0.059)
Drum repair limit	
Maximum inner diameter	173.0 (6.81)

BRAKE PEDAL

Unit: mm (in)

Applied model	M/T	A/T
Free height	186 - 196 (7.32 - 7.72)	195 - 205 (7.68 - 8.07)
Depressed height [under force of 490 N (50 kg, 110 lb) with engine running]		
With ABS	100 (3.94)	105 (4.13)
Without ABS	95 (3.74)	105 (4.13)
Clearance between pedal stopper and threaded end of switches	0.3 - 1.0 (0.012 - 0.039)	
Pedal free play clevis	1 - 3 (0.04 - 0.12)	

PARKING BRAKE

Number of notches [under force of 196 N (20 kg, 44 lb)]	6 - 7
Number of notches (when warning switch comes on)	1

STEERING SYSTEM

SECTION ST

CONTENTS

Precautions

SUPPLEMENTAL RESTRAINT SYSTEM "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), five sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF section** of this Service Manual.

WARNING:

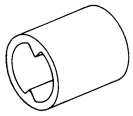
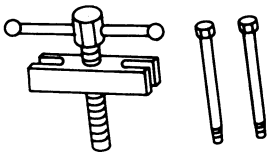
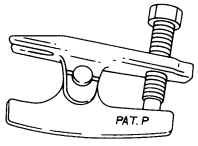
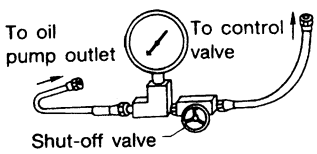
- **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**

STEERING SYSTEM

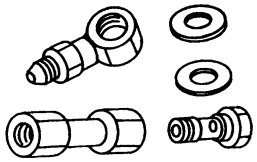
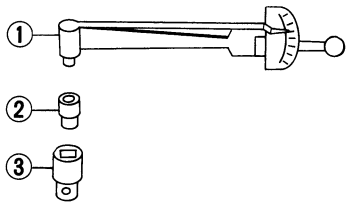
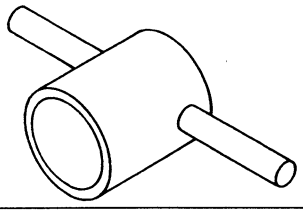
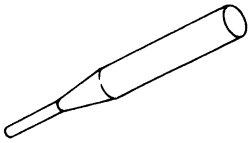
- **Before disassembly, thoroughly clean the outside of the unit.**
- **Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.**
- **When disassembling parts, be sure to place them in order in a parts 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**

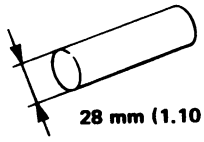
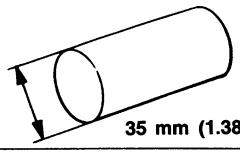
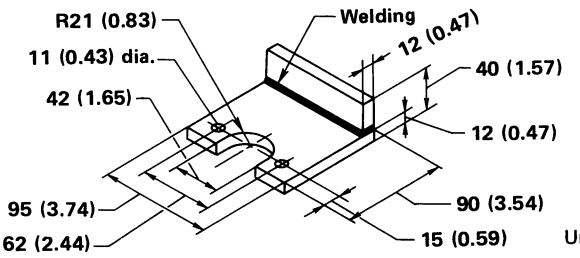
Special Service Tools

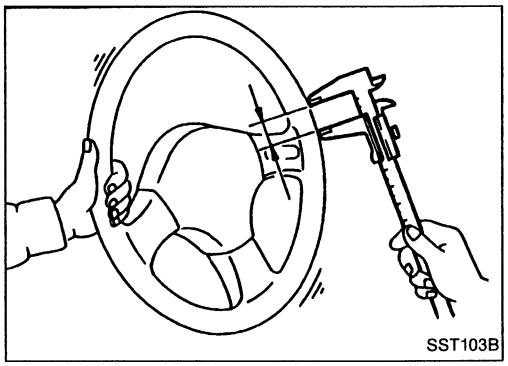
Tool number (Kent-Moore No.) Tool name	Description	
KV48100700 (J26364) Torque adapter		Measuring pinion rotating torque
ST27180001 (J25726-A) Steering wheel puller		Removing steering wheel
HT72750000 (J24319-01) Ball joint remover		Removing ball joint
ST27091000 (J26357) Pressure gauge		Measuring oil pressure

Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
KV48102500 (—) Pressure gauge adapter		Measuring oil pressure
ST3127S000 (See J25765-A) ① GG91030000 (J25765-A) Torque wrench ② HT6294000 (—) Socket adapter ③ HT62900000 (—) Socket adapter		Measuring turning torque
KV48104400 (—) Rack seal ring reformer		Reforming teflon ring
KV32101100 (—) Pin punch		Removing and installing tube seat

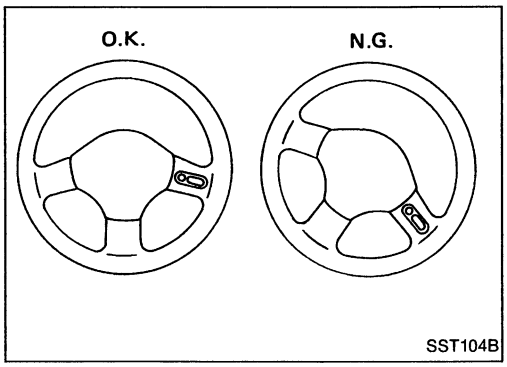
Commercial Service Tools

Tool name	Description	
Rear oil seal drift		Installing rear oil seal
Pinion oil seal drift		Installing pinion oil seal
Oil pump attachment	 Unit: mm (in)	Disassembling and assembling oil pump


SST103B

Checking Steering Wheel Play

- With wheels in a straight-ahead position, check steering wheel play.
  Steering wheel play:
  35 mm (1.38 in) or less
- If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.



SST104B

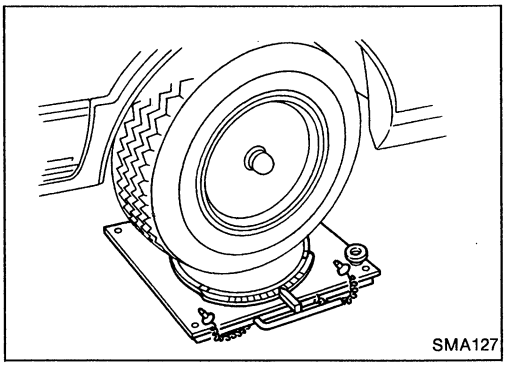
Checking Neutral Position on Steering Wheel

Pre-checking

- 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.

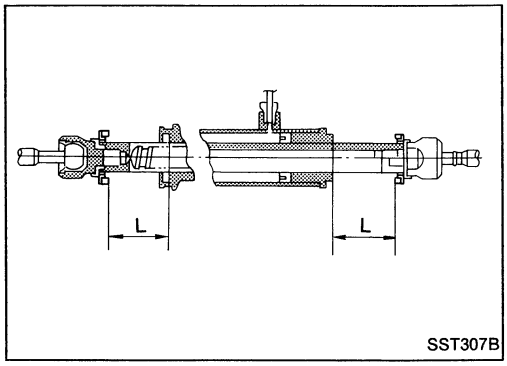
Checking

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.


SMA127

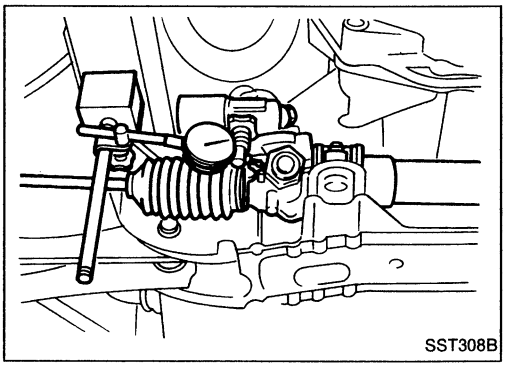
Front Wheel Turning Angle

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.



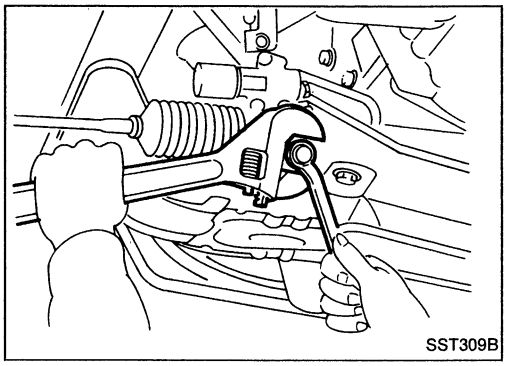
SST307B

2. If it is not within specification, check rack stroke.
   Rack stroke "L":
   Refer to S.D.S.


SST308B

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.

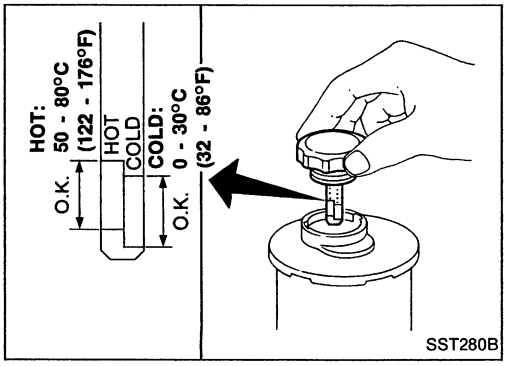

SST309B

Adjusting Rack Retainer

- Perform this driving test on a flat road.
1. Check whether vehicle moves in a straight line when steering wheel is released.
2. Check whether steering wheel returns to neutral position when steering wheel is released from a slightly turned (approx. 20°) position.
- If any abnormality is found, correct it by resetting adjusting screw.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.

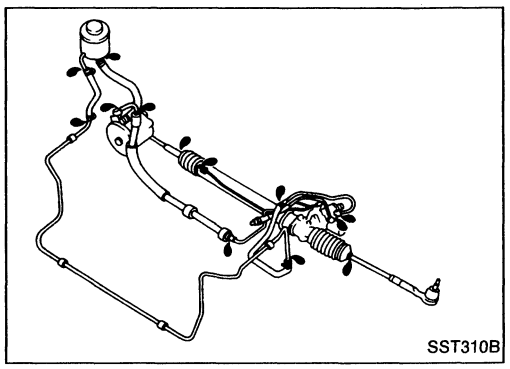


SST280B

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 "DEXRON™ II" type or equivalent.**


SST310B

Checking Fluid Leakage

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

1. Run engine at idle speed or 1,000 rpm.

   Make sure temperature of fluid in reservoir 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.

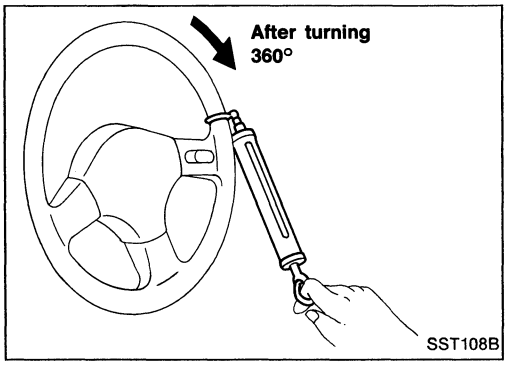
Bleeding Hydraulic System

1. Raise front end of vehicle until wheels clear 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 turning 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.



SST108B

Checking Steering Wheel Turning Force

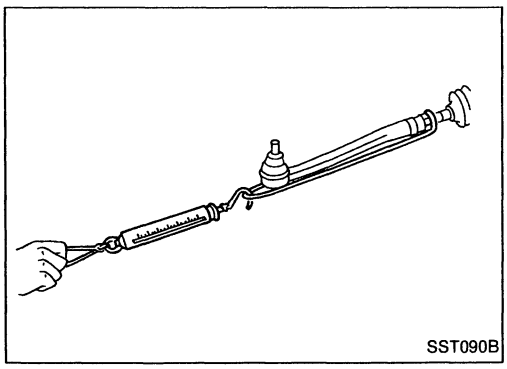
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

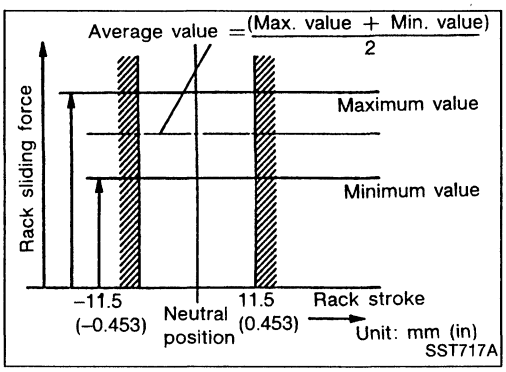
4. Check steering wheel turning force when steering wheel has been turned 360° from the neutral position.

   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 in the ±11.5 mm (±0.453 in) range from the neutral position, make sure rack sliding force is within specification.


SST090B

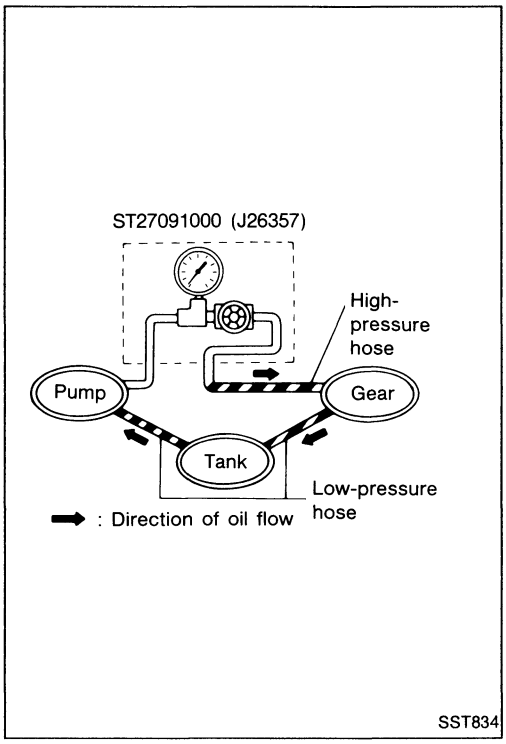
Checking Steering Wheel Turning Force (Cont'd)



Average rack sliding force:
Without HICAS
206 - 265 N (21 - 27 kg, 46 - 60 lb)
With HICAS
201.0 - 250.1 N (20.5 - 25.5 kg, 45.2 - 56.2 lb)

d. Check sliding force outside above range.
Maximum rack sliding force:
Not more than 39 N (4 kg, 9 lb) beyond above value

6. If rack sliding force is not within specification, overhaul 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/cm^2, 1,109 - 1,194 psi)

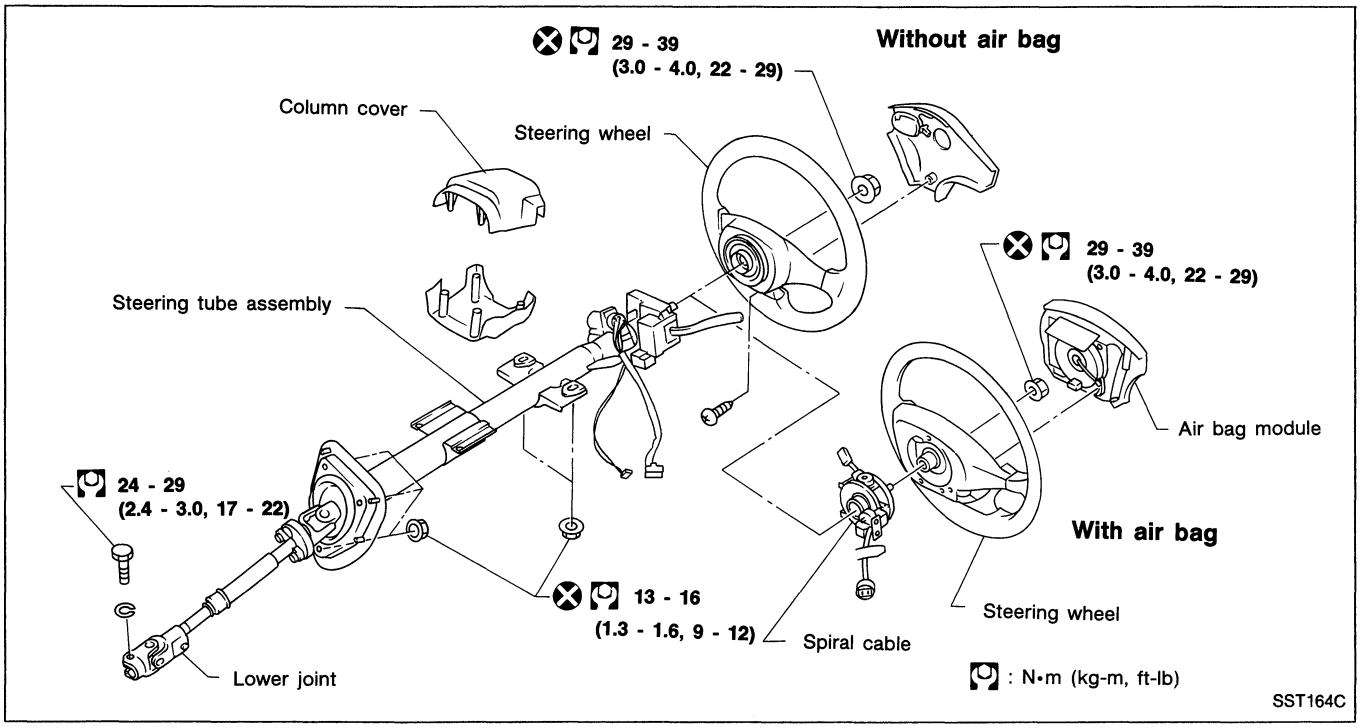
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.

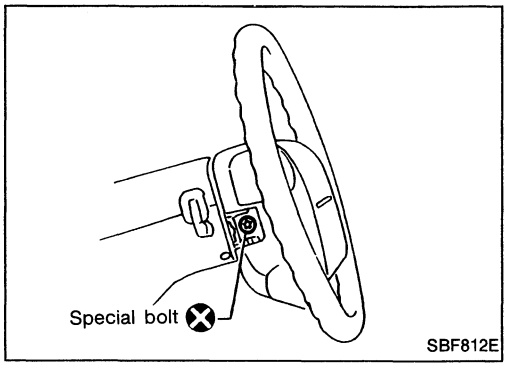
- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

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.

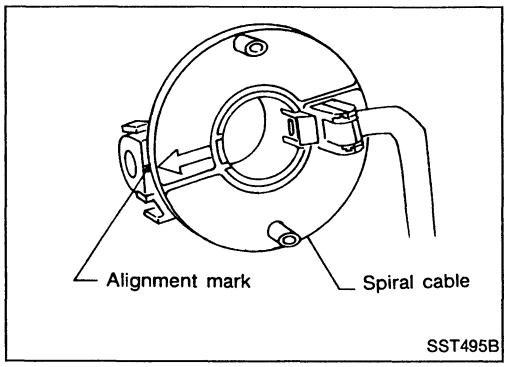




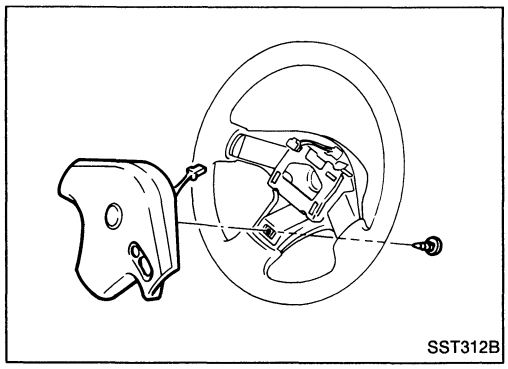
Removal

STEERING WHEEL (With air bag)

- Remove screws from both sides of steering wheel and pull out horn pad. Refer to section BF for Air Bag Module and Spiral Cable Removal.



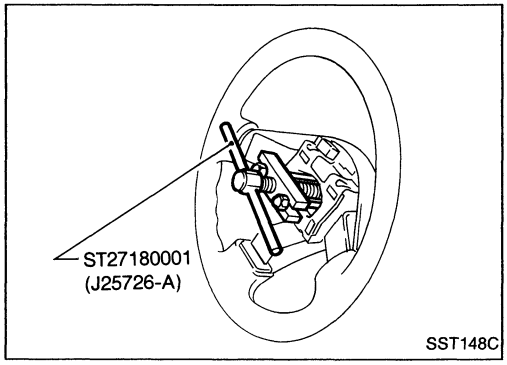
- Align spiral cable correctly when installing steering wheel.



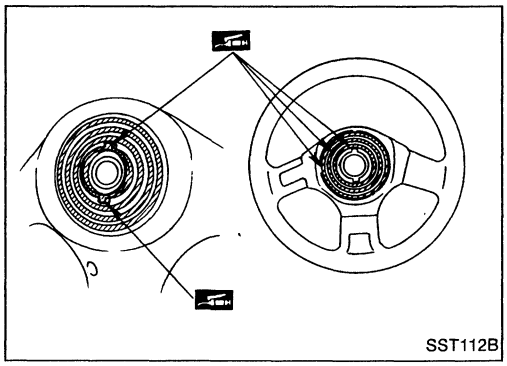
STEERING WHEEL (Without air bag)

- Remove screw from rear of steering wheel and pull out horn pad.

Removal (Cont'd)



- Remove steering wheel with Tool.



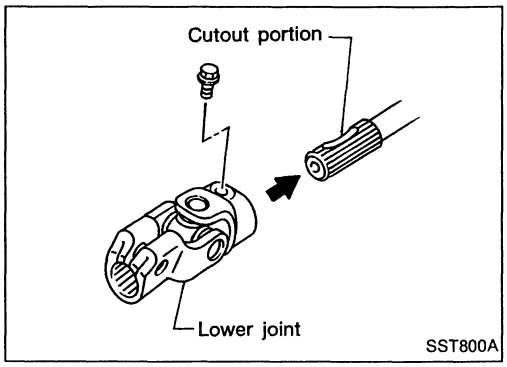
Installation

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.

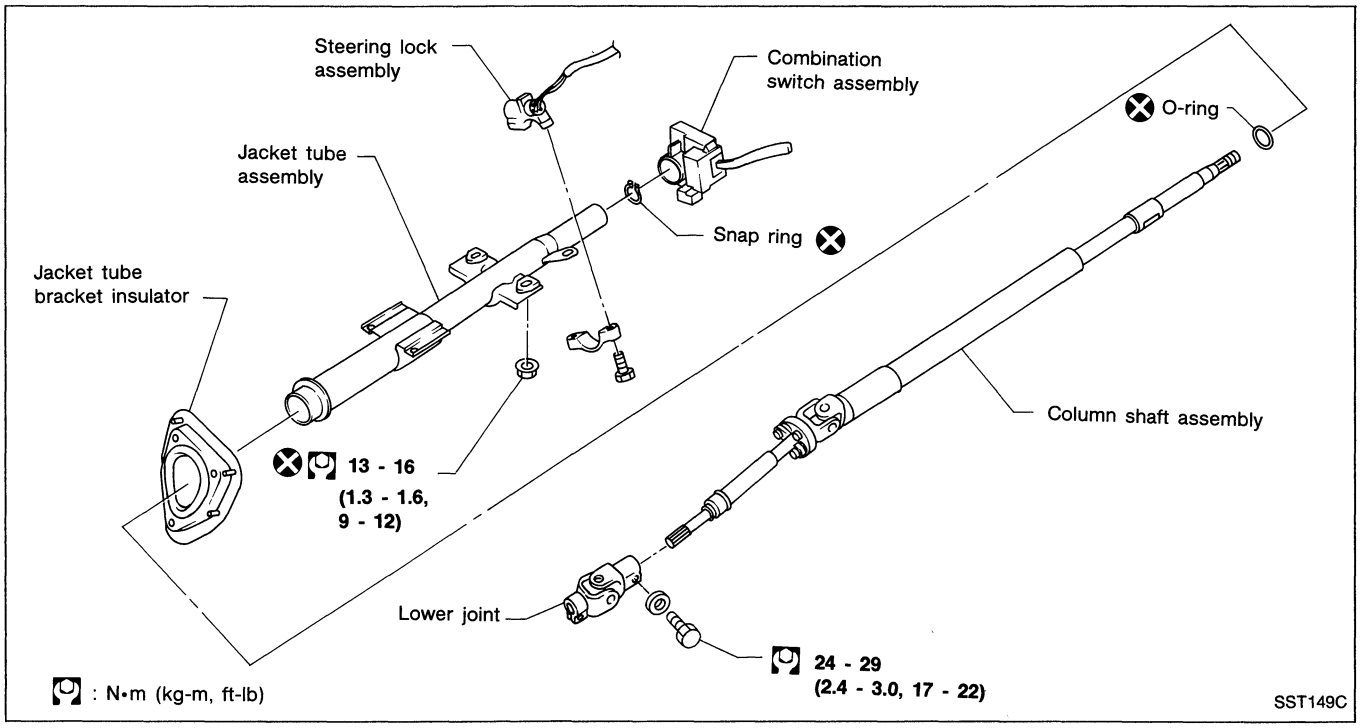
STEERING COLUMN

- 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 coupling joint, be sure tightening bolt faces cutout portion.

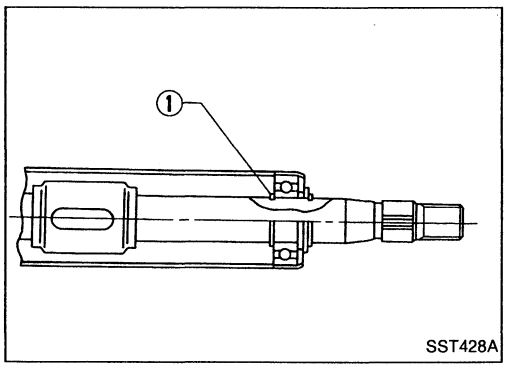


CAUTION:
After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.
Be sure that the steering wheel is in a neutral position when driving straight ahead.

Disassembly and Assembly

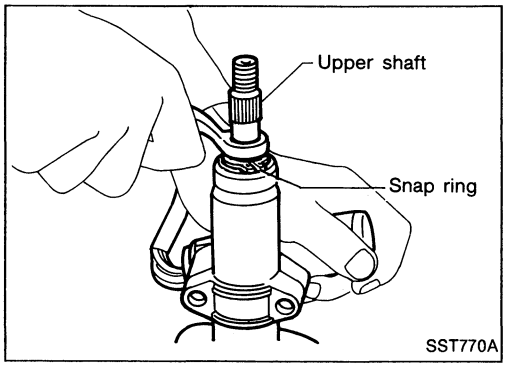


Disassembly and Assembly (Cont'd)



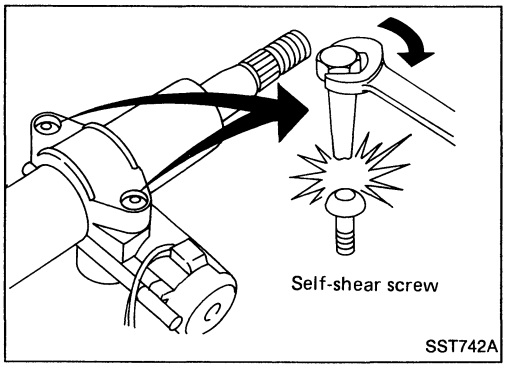
SST428A

- When disassembling and assembling, unlock steering lock with key.
- Install O-ring ① before inserting shaft into jacket tube. Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.



SST770A

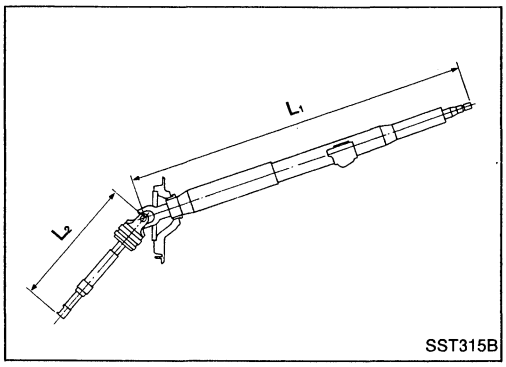
- Install snap ring on upper shaft with box wrench.



SST742A

- 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.



SST315B

Inspection

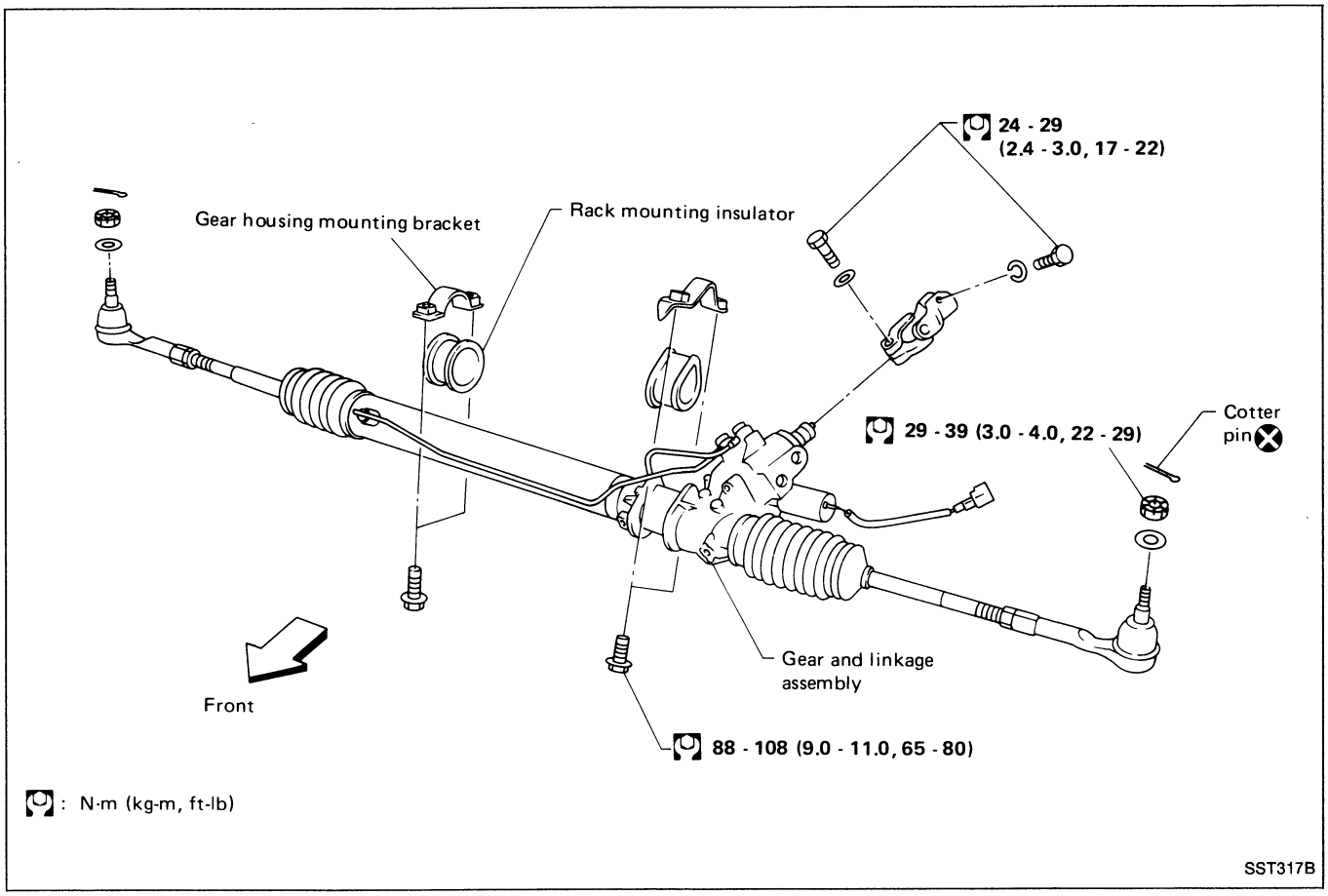
- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

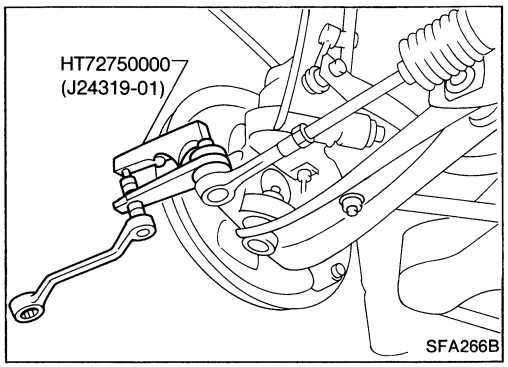
a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
b. Check steering column lower shaft for deformation or breakage. Replace if necessary.

- When the vehicle is involved in a light collision, check steering column length "L_1" and steering column lower shaft length "L_2". If it is not within specifications, replace steering column as an assembly.

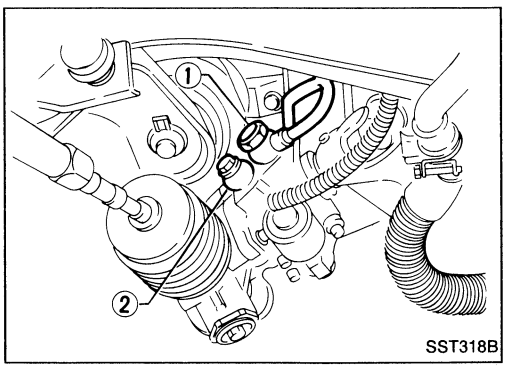
Steering column length "L_1":
Without air bag
745.9 - 747.5 mm (29.37 - 29.43 in)
With air bag
749.4 - 751.0 mm (29.50 - 29.57 in)
Steering column lower shaft length "L_2":
280.6 - 282.2 mm (11.05 - 11.11 in)

Removal and Installation





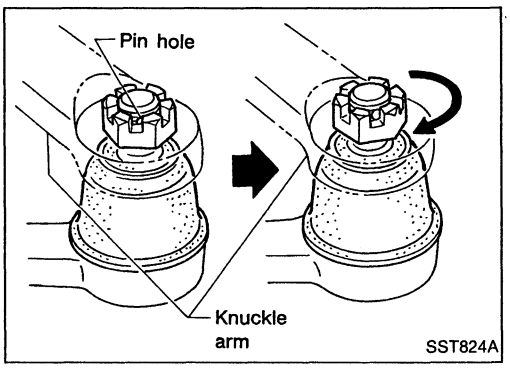
- Detach tie-rod outer sockets from knuckle arms with Tool.



- Install pipe connector.
  - ① Low-pressure side
    : 36 - 40 N·m (3.7 - 4.1 kg-m, 27 - 30 ft-lb)
  - ② High-pressure side
    : 30 - 35 N·m (3.1 - 3.6 kg-m, 22 - 26 ft-lb)

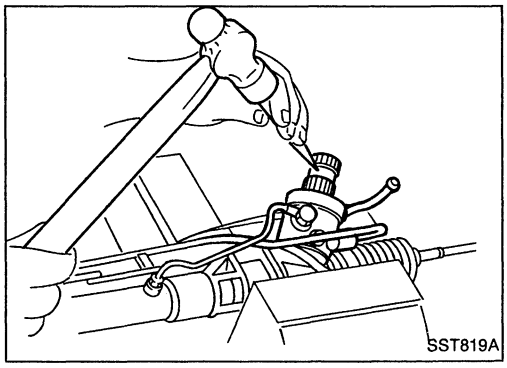
Removal and Installation (Cont'd)

- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.



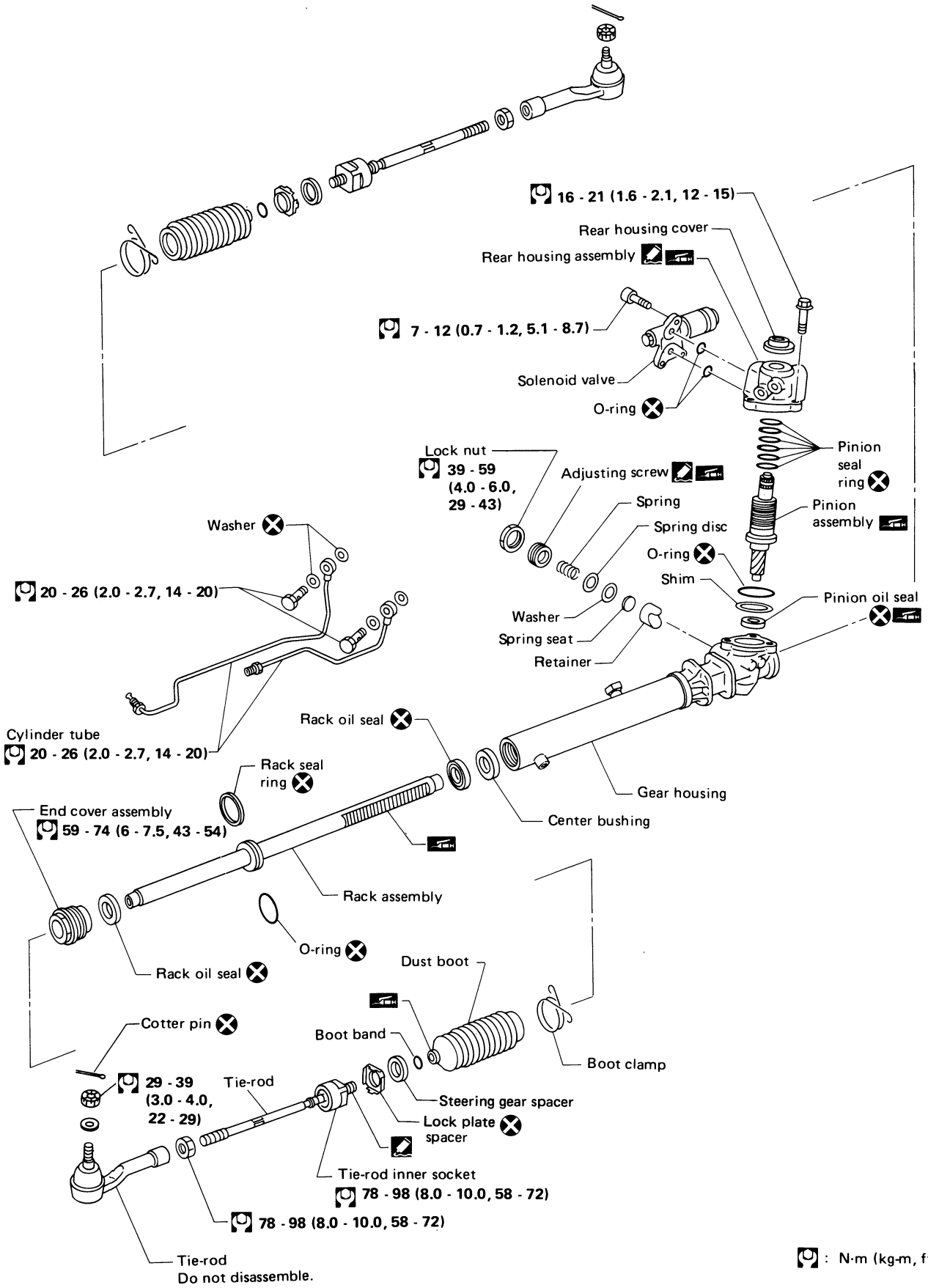
- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



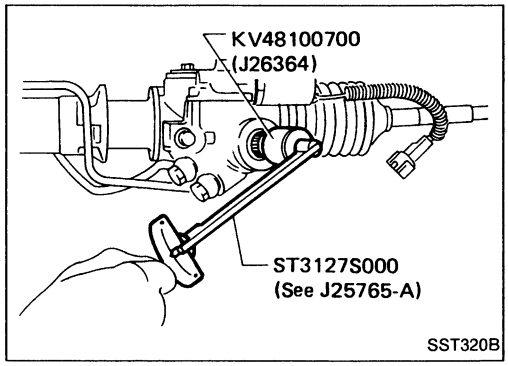
- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matchmarks on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matchmarks of pinion shaft and pinion housing.

POWER STEERING GEAR AND LINKAGE (Model PR26SE)



: N·m (kg-m, ft-lb)

SST319B



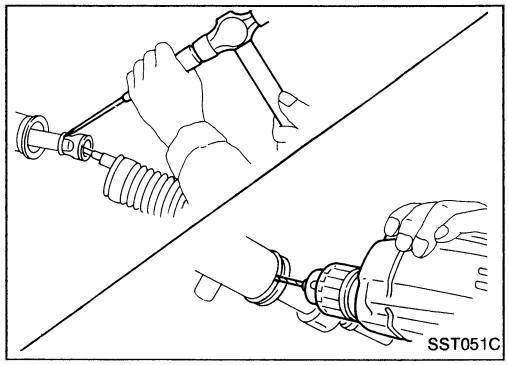
Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

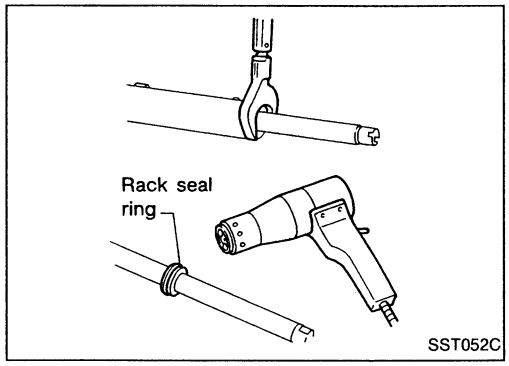
- **Before measuring, disconnect cylinder tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.**

2. Remove pinion gear.

- **Be careful not to damage pinion gear when removing pinion seal ring.**



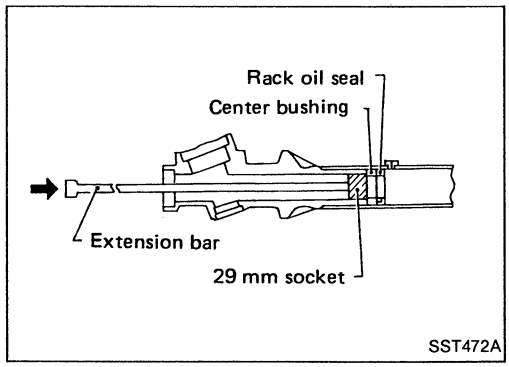
3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.
7. Drill staked portion of cylinder end cover with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.



8. Remove gear housing end cover assembly with 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.
- Replace rack seal ring and O-ring with new ones.

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 "DEXRON™II" type or equivalent, and blow dry with compressed air, if available.

BOOT

Check condition of boot. If cracked excessively, replace it.

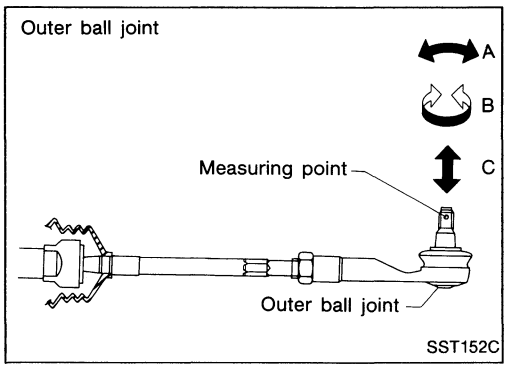
RACK

Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

Inspection (Cont'd)

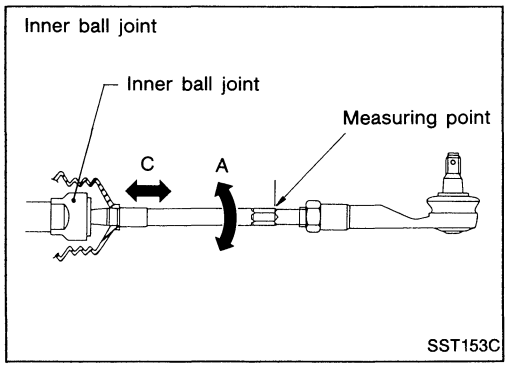
PINION ASSEMBLY

- 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.



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.

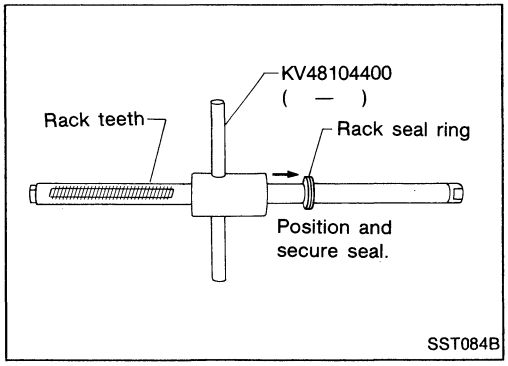


CYLINDER TUBES

Check cylinder tubes for scratches or other damage. Replace if necessary.

Assembly

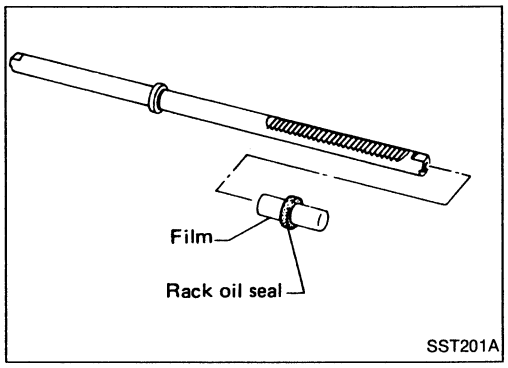
1. Using a heat gun, heat rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.



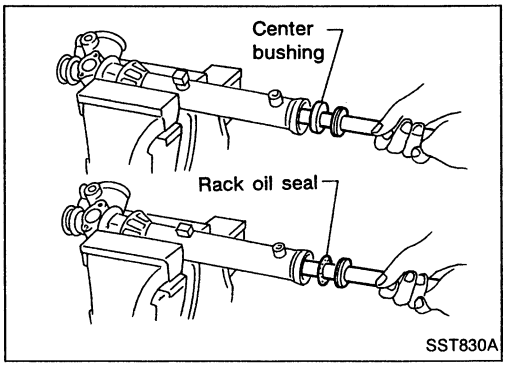
- Using Tool, compress periphery of rack seal ring (made of Teflon) to position and secure it on rack.

Always insert the tool from the rack gear side.

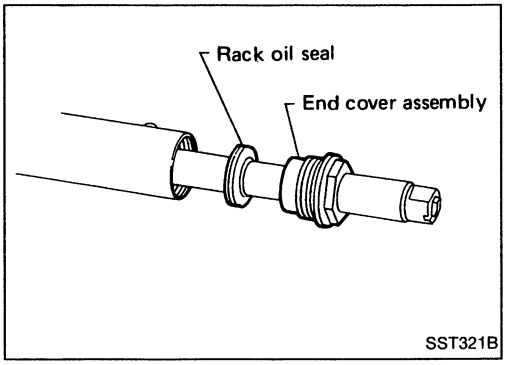
Assembly (Cont'd)



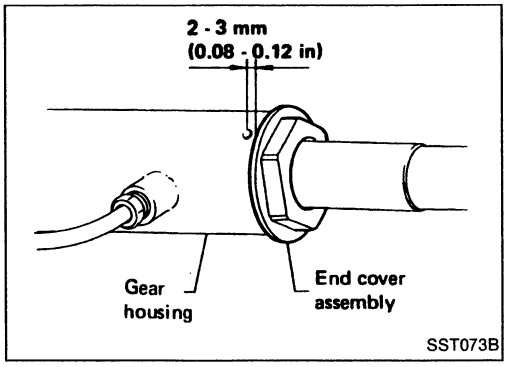
2. Insert rack oil seal.
- **Place plastic film into rack oil seal to prevent damage by rack teeth.**
- **Always remove plastic film after rack oil seal is positioned properly.**
- **Make sure lips of rack oil seal face each other.**



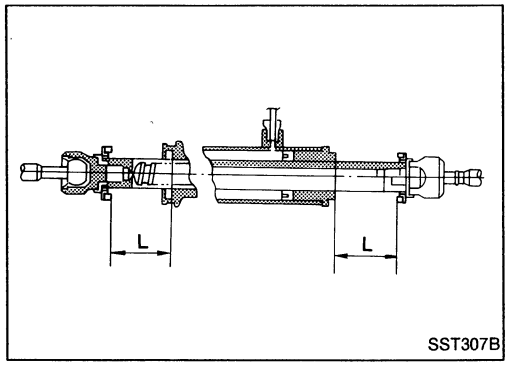
3. Install center bushing and rack oil seal with rack assembly.



4. Insert rack oil seal and end cover assembly to rack then tighten end cover assembly.

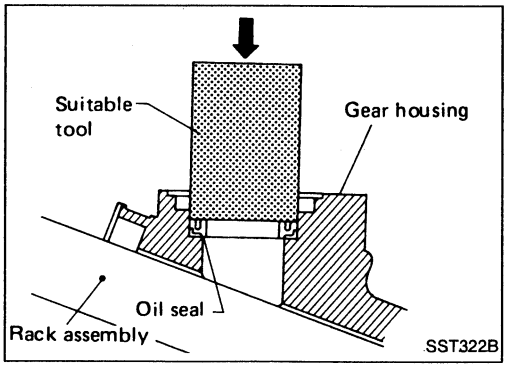


5. Fasten cylinder end cover assembly to gear housing by staking.

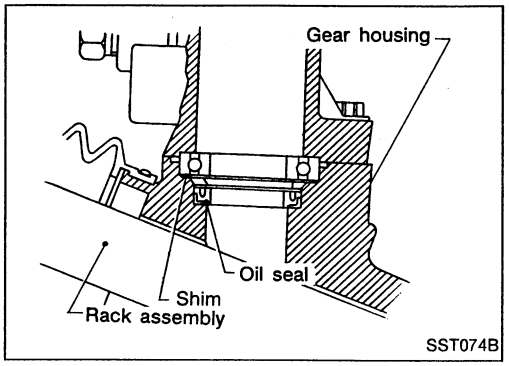


6. Set rack gear in neutral position.
   Rack stroke "L":
   Refer to S.D.S.

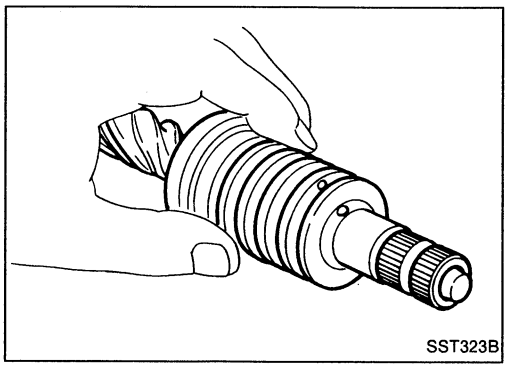
Assembly (Cont'd)



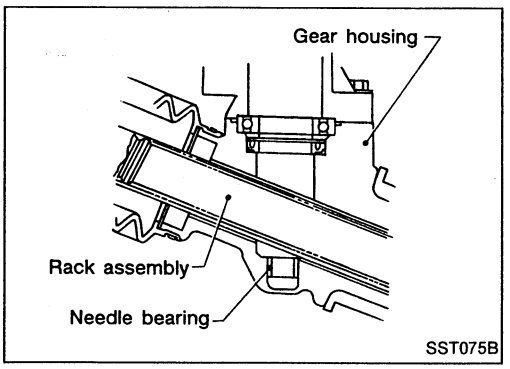
7. Coat seal lip of oil seal with multi-purpose grease and install new pinion oil seal to pinion housing with a suitable tool.
- Make sure lip of oil seal faces up when installed.



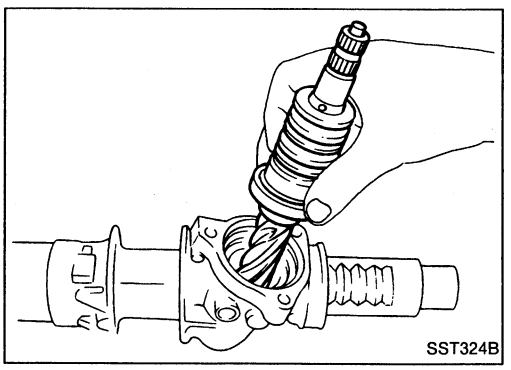
8. Install pinion bearing adjusting shim(s).
- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



9. Install pinion seal ring 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.



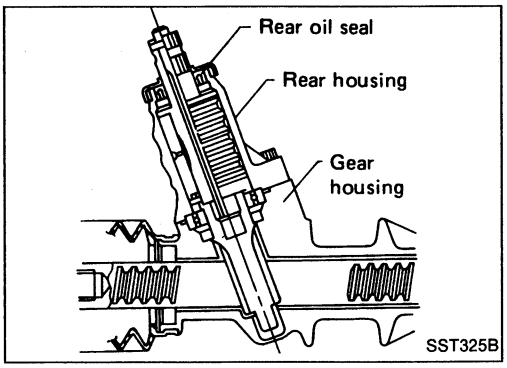
10. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



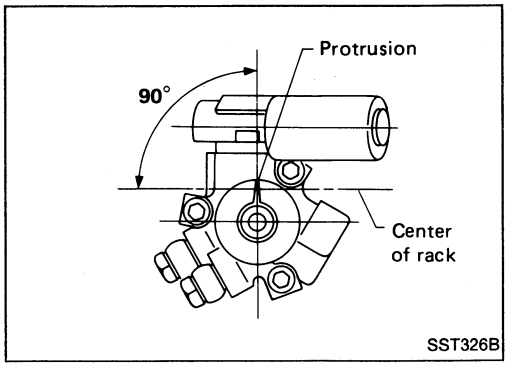
11. Install pinion assembly to pinion housing.

Be careful not to damage pinion oil seal.

Assembly (Cont'd)

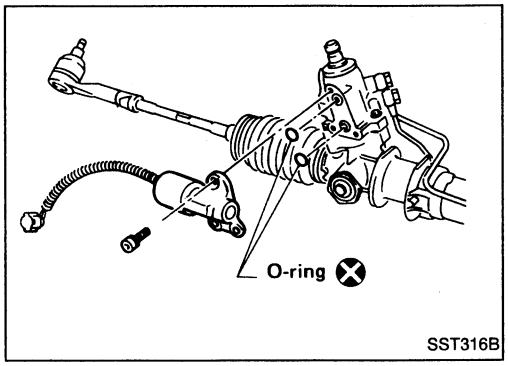


12. Apply a coat of multi-purpose grease to rear oil seal lip before installing rear housing.

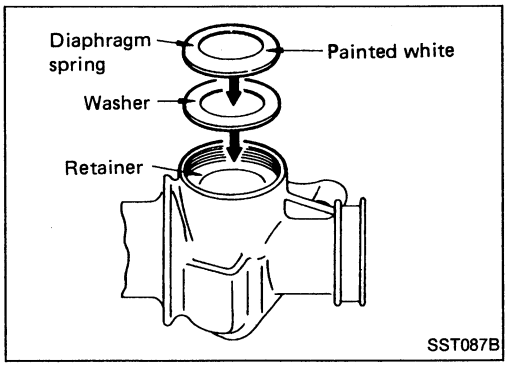


13. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left.

Be careful not to damage worm ring and oil seal.

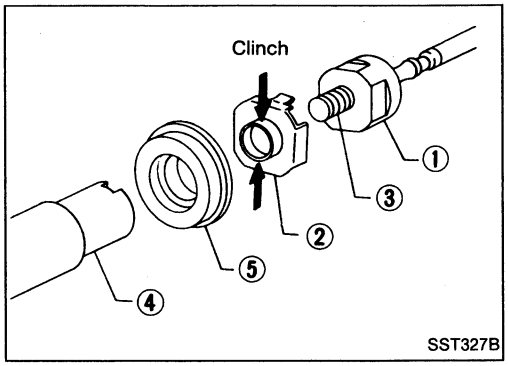


14. Install solenoid valve.



15. Install diaphragm spring at retainer.
- Always install retainer, spring washer and diaphragm spring in that order.
- Make sure convex end (painted white) of diaphragm spring faces outward when installing.

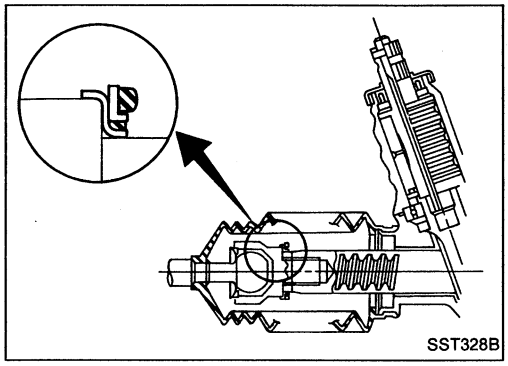
16. Install retainer spring and adjusting screw temporarily.



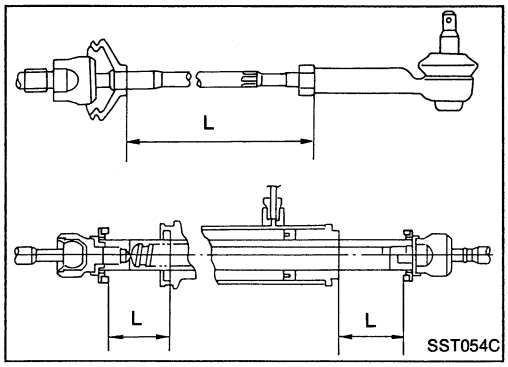
CAUTION:
Ensure steering gear spacer is installed with rubber side facing rack.

- Attach lock plate ② to side rod inner socket ①.
- Insert steering gear spacer ⑤ to rack ④.
- Apply locking sealant to inner socket threads ③.Screw inner socket into rack ④ and tighten to specified torque.
- Clinch lock plate at two places.

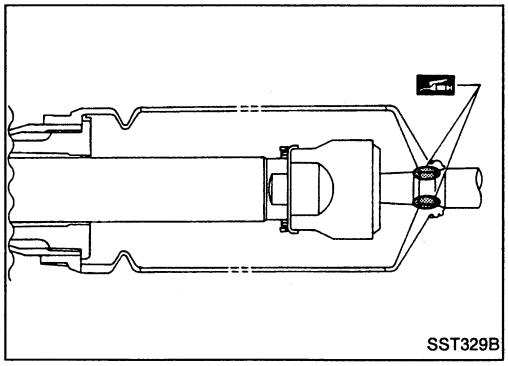
Assembly (Cont'd)



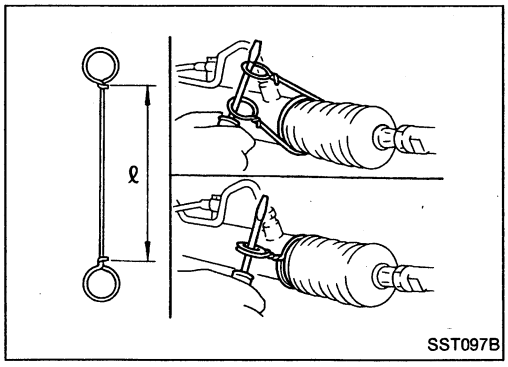
17. Install steering gear spacer ⑤ to lock plate ②.



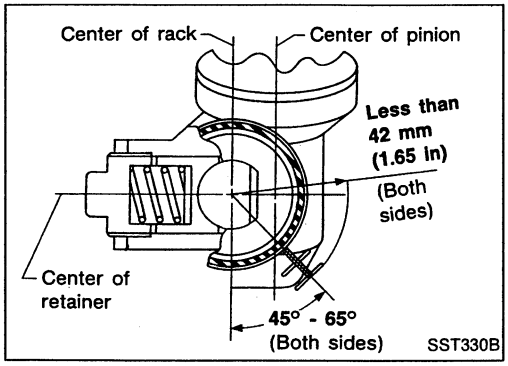
18. Tighten outer socket lock nut.
    Tie-rod length "L":
    Refer to S.D.S.
19. Measure rack stroke.
    Rack stroke "L":
    Refer to S.D.S.



20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

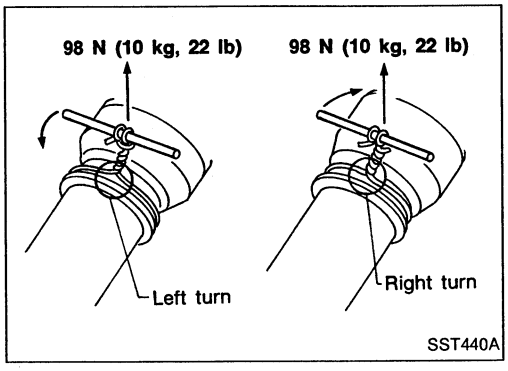


21. Install boot clamps.
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).

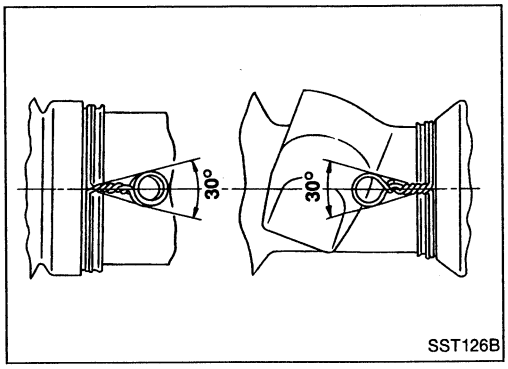


- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will prevent interference with other parts.)

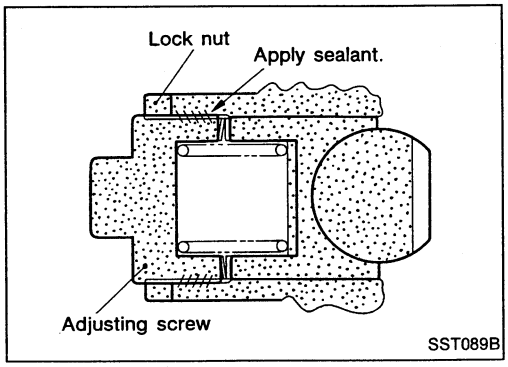
Assembly (Cont'd)



- Twist boot clamp in the direction shown in figure at left.



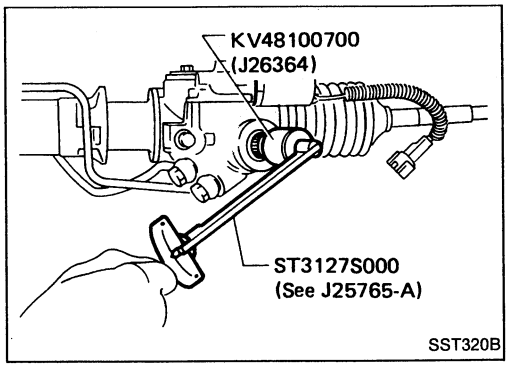
- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.

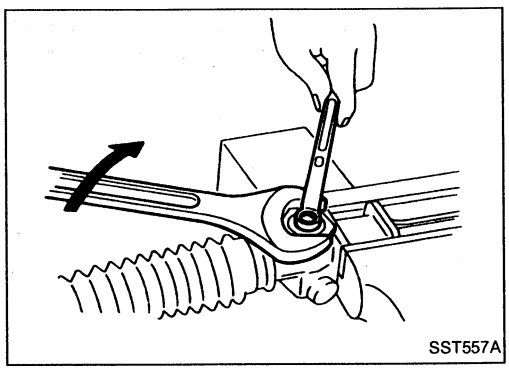


Adjustment

Adjust pinion rotating torque as follows:

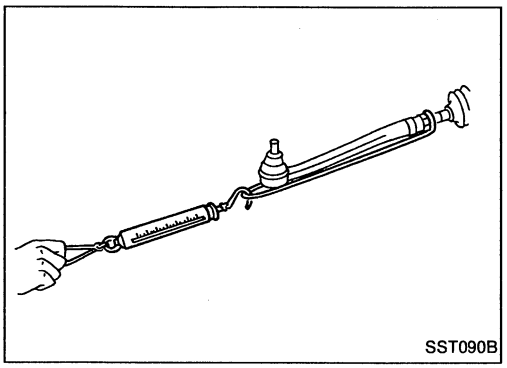
1. Set gears to Neutral without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.05 to 0.20 N·m (0.5 to 2 kg-cm, 0.43 to 1.74 in-lb).
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 60° to 100°.



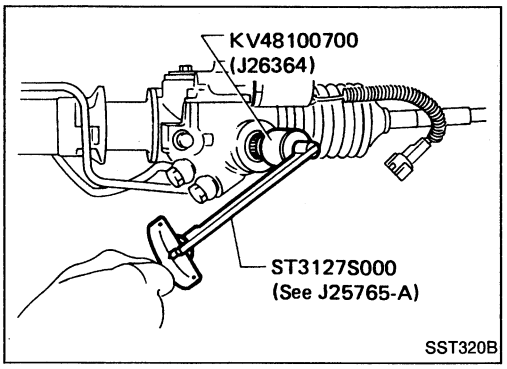


10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

Adjustment (Cont'd)

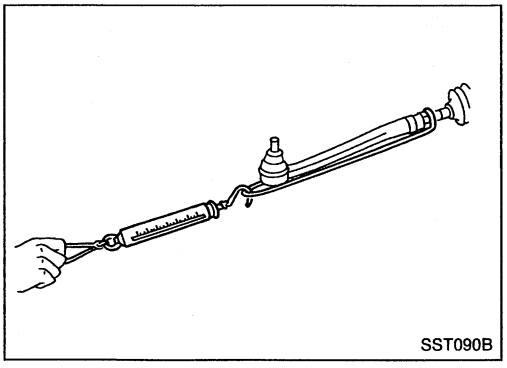

SST090B

11. Check steering gear for rack sliding frictional force.
    Around neutral point of rack stroke
    ±5.5 mm (±0.217 in):
    122.6 - 166.7 N (12.5 - 17 kg, 27.6 - 37.5 lb)
    Except for neutral point:
    122.6 - 186.3 N (12.5 - 19 kg, 27.6 - 41.9 lb)
- If sliding frictional force is out of specification, repeat the adjustment procedure, starting from No. 4.
- After the readjustment, if sliding force is still out of specification, steering gear is damaged.

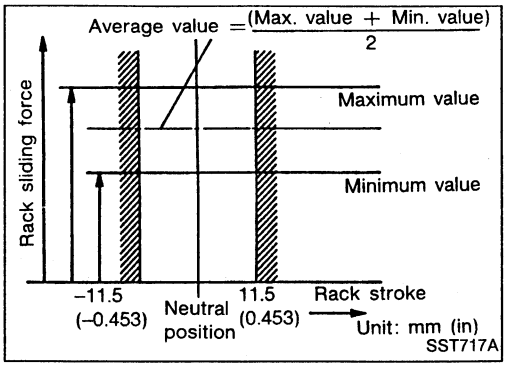


SST320B

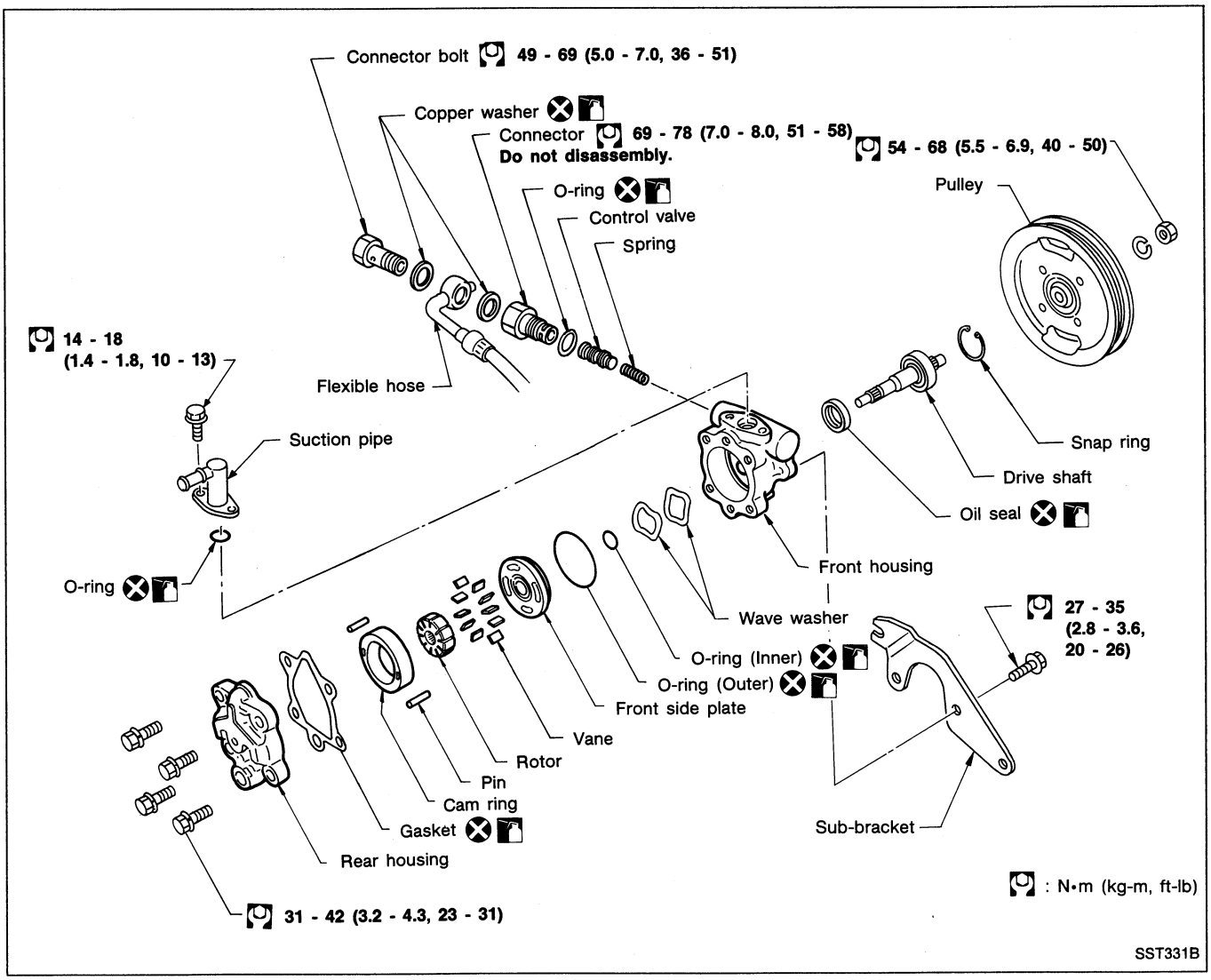
12. Measure pinion rotating torque within the range of ±100° from the neutral point.
    Average rotating torque
    [(Max. measured value + Min. measured value) x 0.5]:
    0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)
    Maximum torque increment:
    Less than 0.4 N·m (4 kg-cm, 3.5 in-lb)
    Except for above mentioned measuring range:
    Maximum rotating torque
    1.9 N·m (19 kg-cm, 16 in-lb)
    Maximum torque increment
    Less than 0.6 N·m (6 kg-cm, 5.2 in-lb)
- If pinion rotating torque is not within specification, readjust it.
- After the readjustment, if pinion rotating torque is still out of specification, steering gear is damaged.

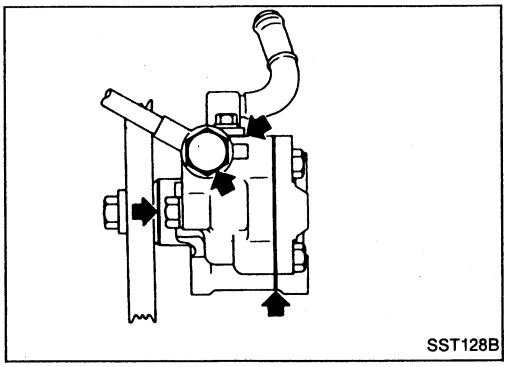

SST090B

13. 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:
    Without HICAS
    206 - 265 N (21 - 27 kg, 46 - 60 lb)
    With HICAS
    201.0 - 250.1 N (20.5 - 25.5 kg, 45.2 - 56.2 lb)
g. Check sliding force outside above range.
    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.



SST717A





Pre-disassembly Inspection

Disassemble the power steering oil pump only if the following items are found.

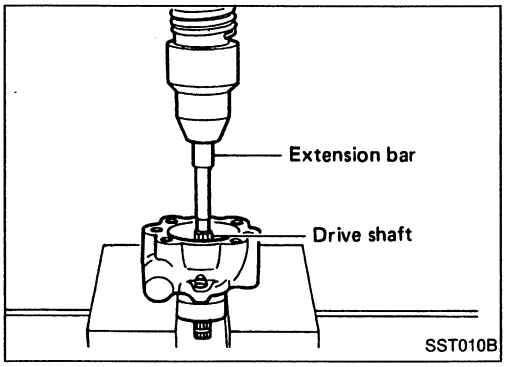
- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance

Disassembly

CAUTION:

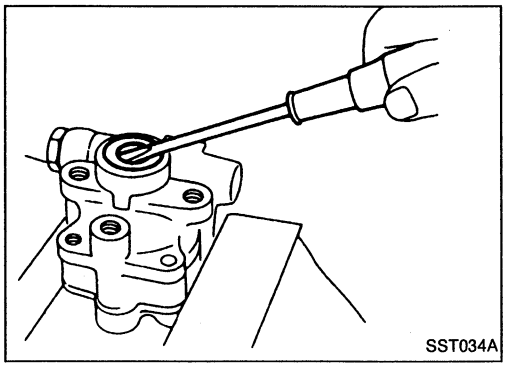
- **Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.**
- **Disassemble in as clean a place as possible.**
- **Clean your hands before disassembly.**
- **Do not use rags; use nylon cloths or paper towels.**
- **Follow the procedures and cautions in the Service Manual.**
- **When disassembling and reassembling, do not let foreign matter enter or contact the parts.**

Disassembly (Cont'd)



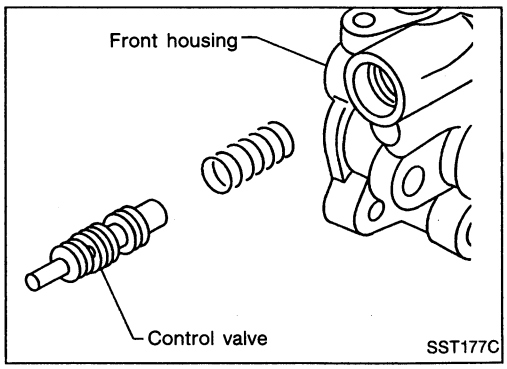
- Remove snap ring, then draw drive shaft out.

Be careful not to drop drive shaft.



- Remove oil seal.

Be careful not to damage front housing.

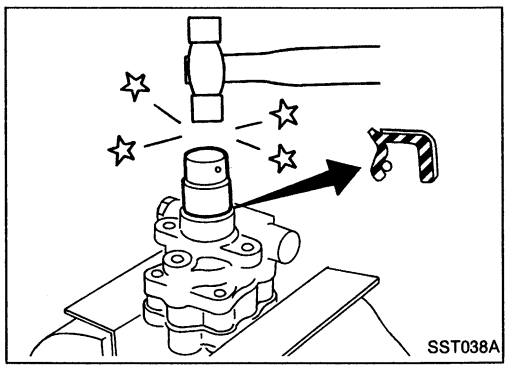


- Remove connector.

Be careful not to drop control valve.

Inspection

Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.

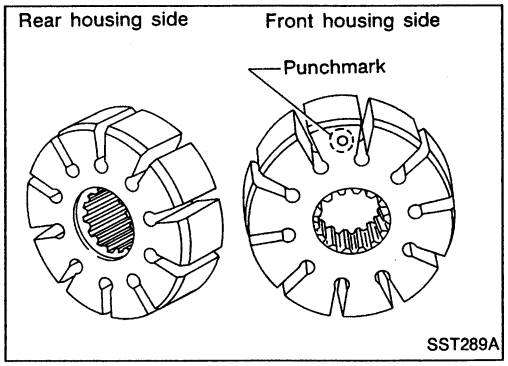


Assembly

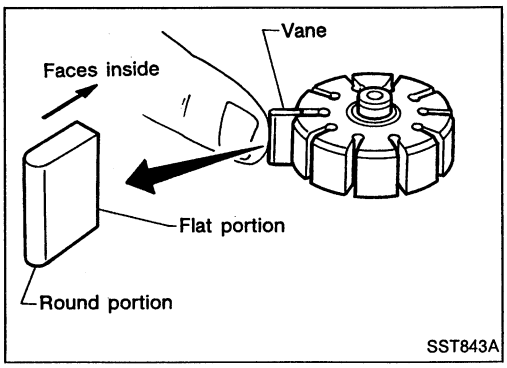
Assemble oil pump, noting the following instructions.

- 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.

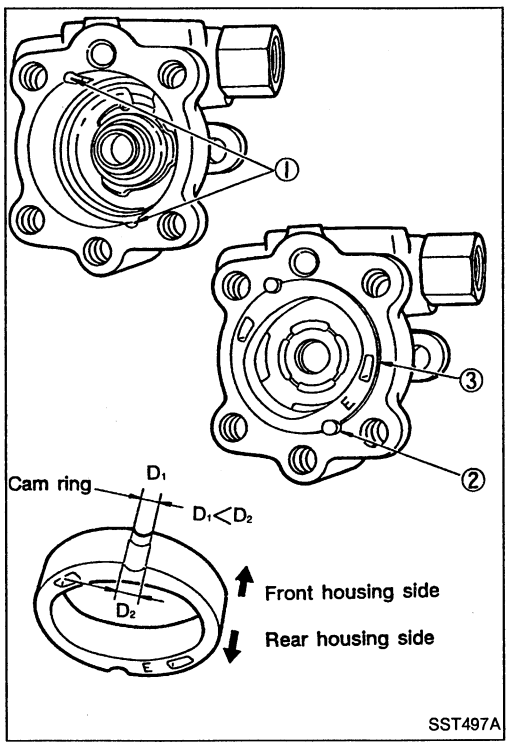
Assembly (Cont'd)



- Pay attention to rotor direction.

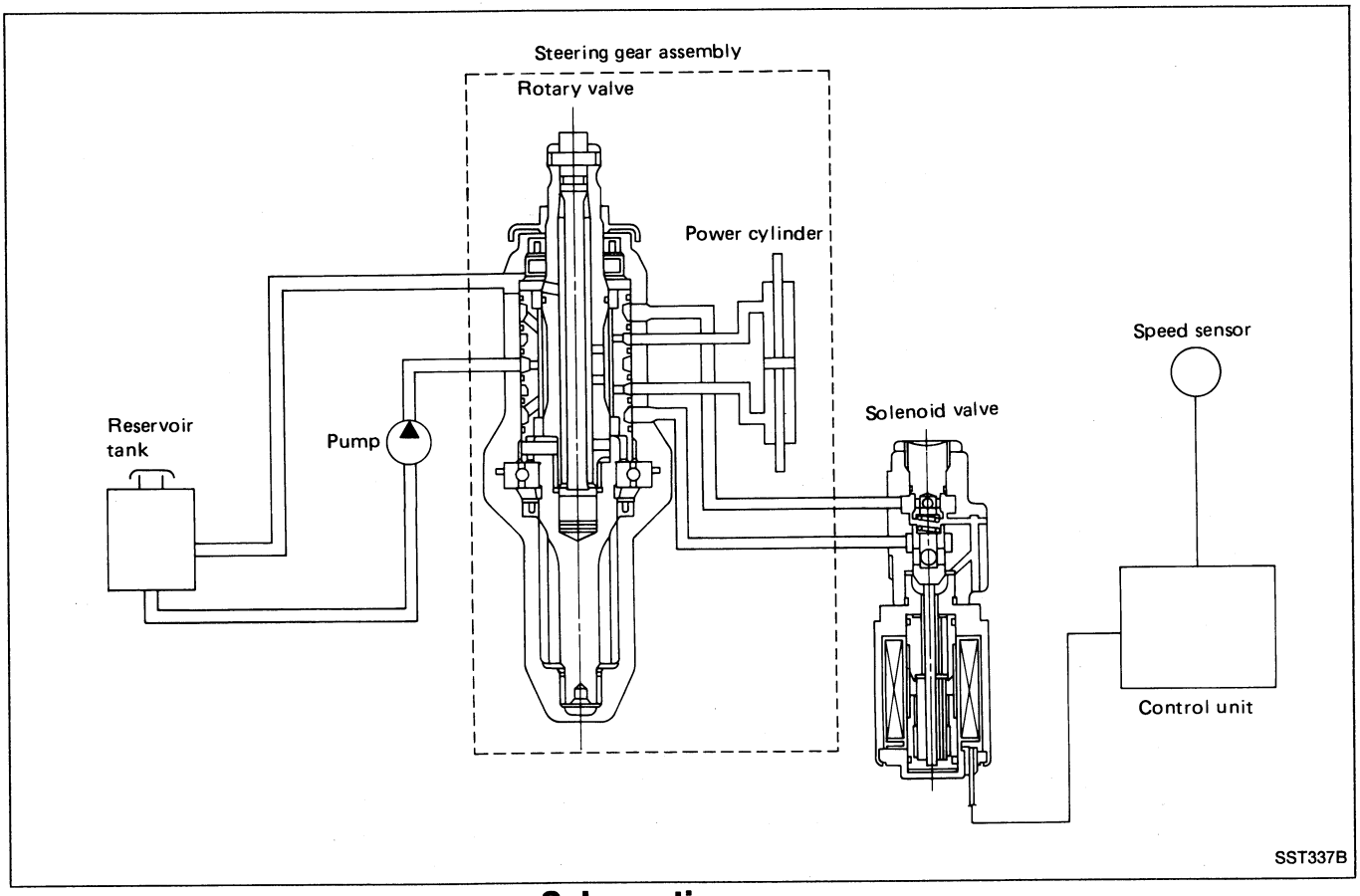


- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.

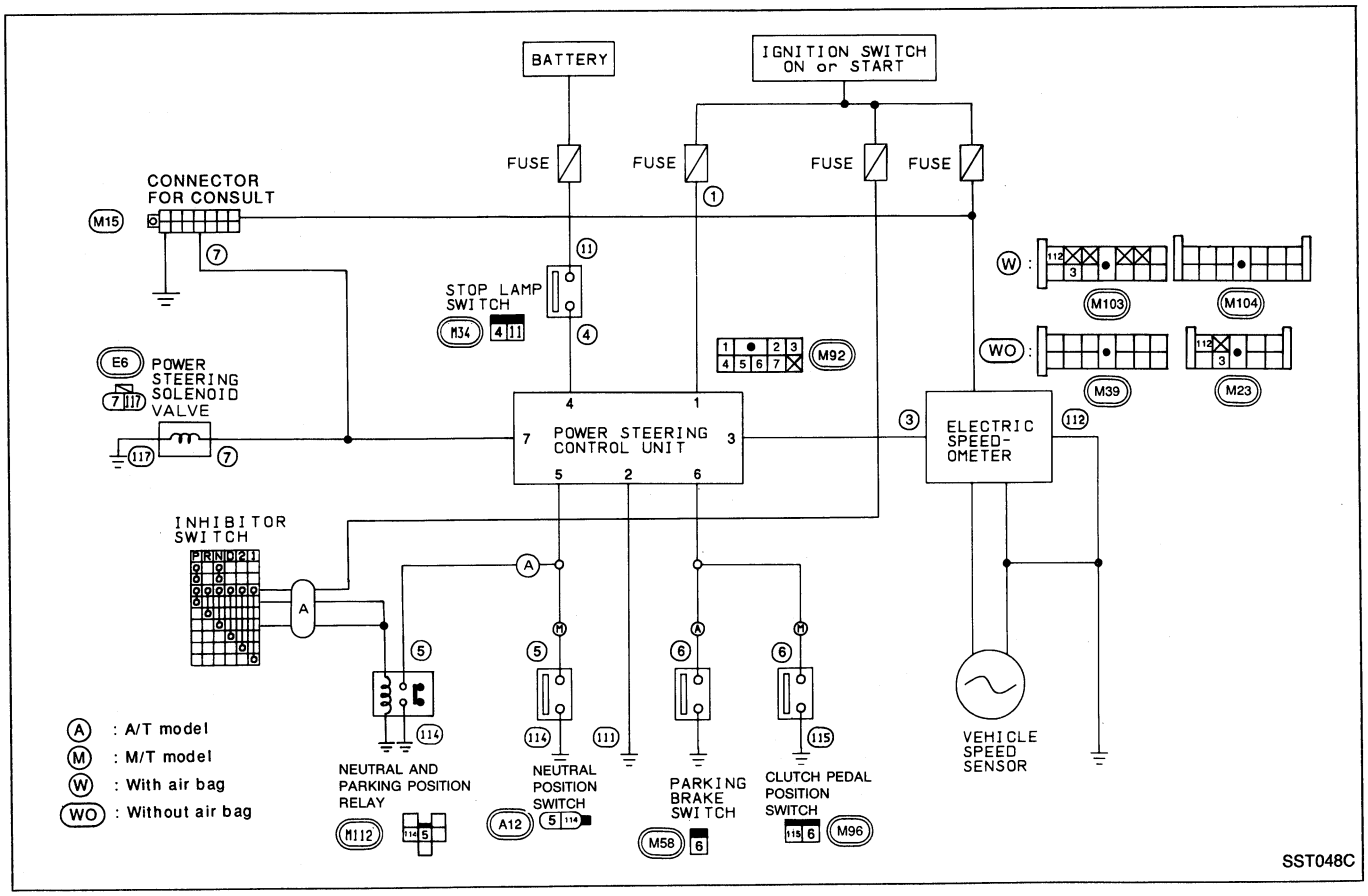


- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

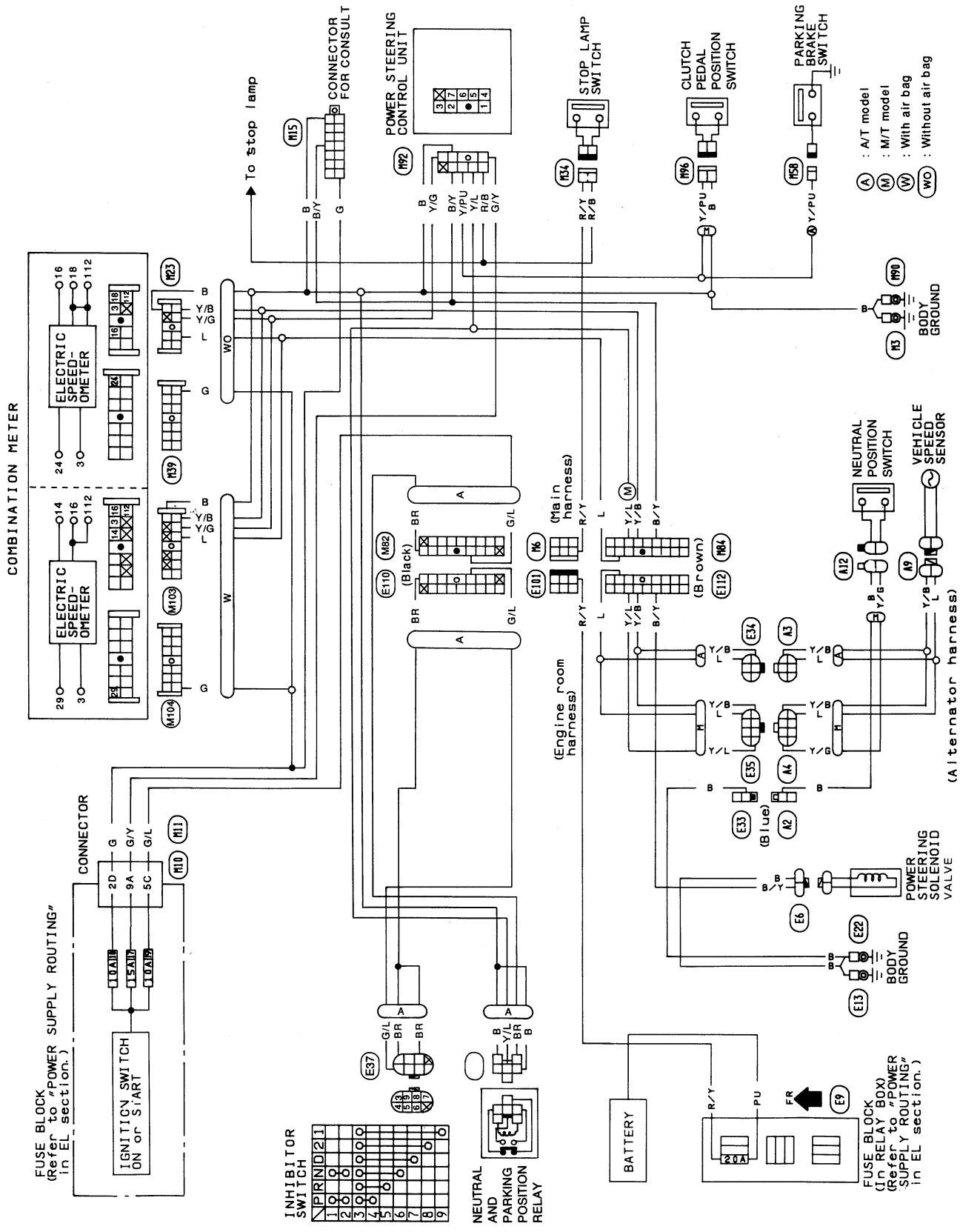
Hydraulic Circuit



Schematic



Wiring Diagram



SST047C

Trouble Diagnoses

PRECAUTIONS

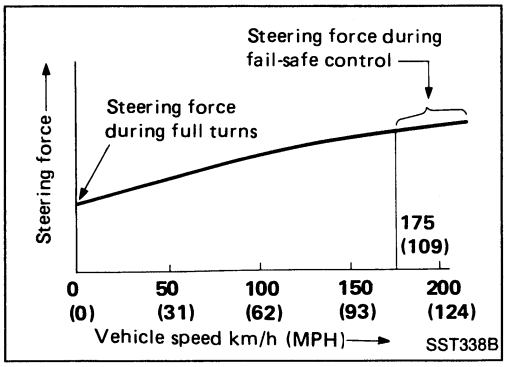
Before diagnosing the power steering system, ensure that:

Vehicle stopped

a. **Power steering components (gears, oil pump, pipes, etc.) are free from leakage, and that oil level is correct.**
b. **Tires are inflated to specified pressure and are of specified size, and that steering wheel is a genuine Nissan part.**
c. **Wheel alignment is adjusted properly.**
d. **Suspension utilizes the original design, and is free of modifications which increase vehicle weight.**

Vehicle in operation

a. **Understand the trouble symptoms.**
b. **Engine is operating properly.**



Preliminary knowledge helpful in conducting diagnoses

The power steering system is a twin orifice type, which uses a vehicle-speed sensing, electronic control design. Valve sensitivity is controlled in response to vehicle speed to achieve optimum steering effort. When a vehicle-speed signal is not entered into the power steering control unit for approximately 10 seconds during normal operation (see NOTE below), a fail-safe system activates to maintain the steering effort at a level similar to that experienced during high-speed operation.
More precisely, if a foot-brake signal, parking-brake signal and/or transmission position signal (N or P-range signal on automatic transmission models and a neutral or clutch signal on manual transmission models) are not entered, the power steering system is held in a "fail-safe" control state. When this happens, a symptom referred to as "heavy steering during stationary turns" sometimes occurs.

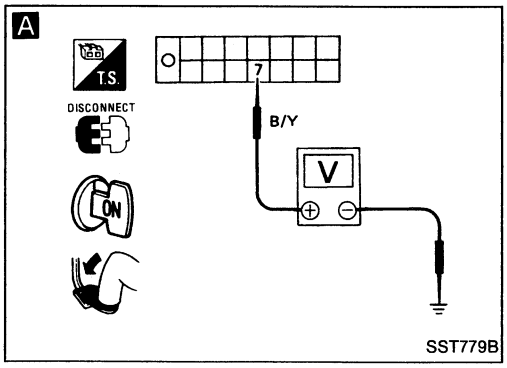
NOTE:
Normal operation refers to a driving condition in which the foot brake pedal and parking brake lever are released, the shift lever is in any position other than "P" or "N" (automatic transmission models), the shift lever set in any position except "N" (manual transmission models) and the clutch pedal is not depressed.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

SYMPTOM:

Heavy steering operation during stationary turns

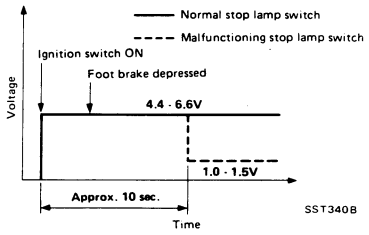


START

1) CHECK STOP LAMP SIGNAL.
Turn ignition switch "ON" (with engine OFF), release foot brake pedal and parking brake lever.
Set shift lever to any position except "P" and "N" on automatic transmission models or set shift lever to any position except "N" on manual transmission models, and ensure clutch pedal is released.

A

Depress brake pedal and check voltage between solenoid valve terminals of data link connector for CONSULT.



Voltage:
4.4 - 6.6V (constant)

Yes → Go to 2) on page ST-30.

No

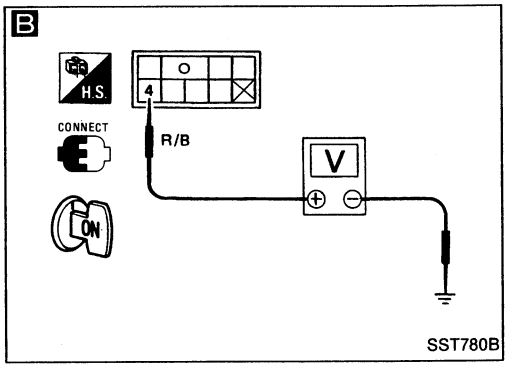
Does terminal voltage drop to 1 - 1.5V range approx. 10 seconds after ignition switch is turned ON?

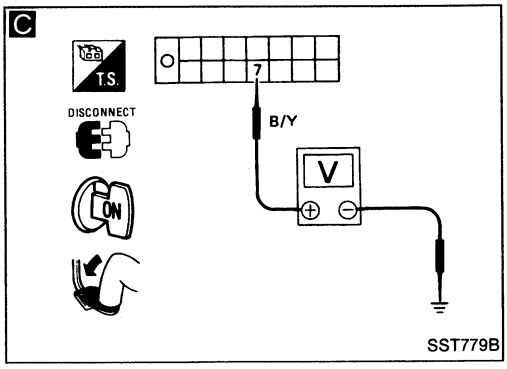
No → Go to 5) on page ST-32.

Yes

Ⓐ

Trouble Diagnoses (Cont'd)





Ⓐ

B

Check if stop lamp switch signal is present at power steering control unit.
Voltage: 12V
(Brake pedal depressed.)

No → Malfunctioning stop lamp switch system

Yes

Ensure that power steering control unit connector is connected properly.

C

After ignition switch is turned "ON", depress brake pedal and check voltage between solenoid valve terminals of data link connector for CONSULT.
4.4 - 6.6V (constant)

No → Malfunctioning power steering control unit.

Yes

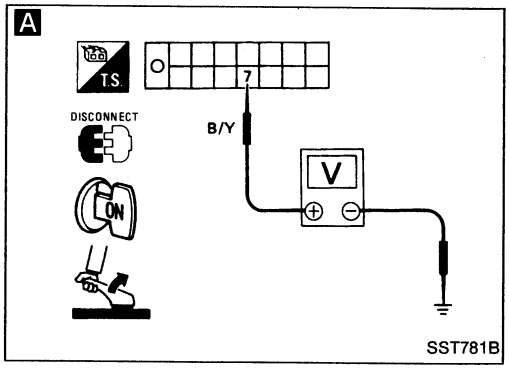
Check if heavy steering operation occurs during stationary turns.

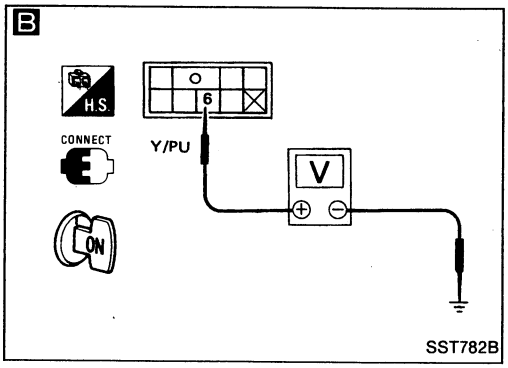
Yes → Go to 4) on page ST-32.

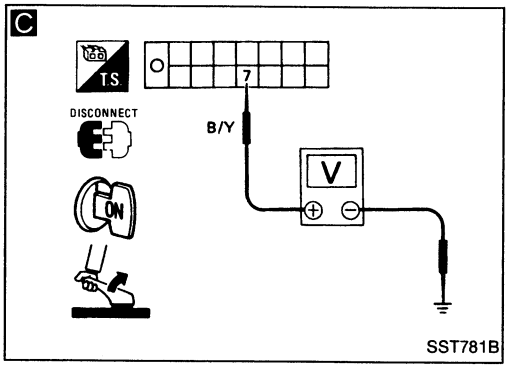
No

END

Trouble Diagnoses (Cont'd)

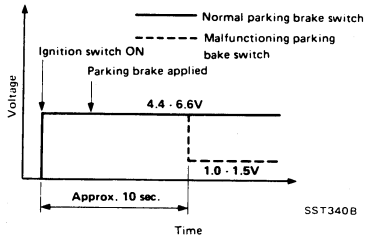






A

2) CHECK PARKING BRAKE SIGNAL.
Release foot brake pedal and apply parking brake lever.
Check voltage between solenoid valve terminals of data link connector for CONSULT.



Voltage:
4.4 - 6.6V (constant)

Yes → Go to 3) on page ST-31.

No

Does terminal voltage drop to 1.0 - 1.5V range approx. 10 seconds after ignition switch is turned ON?

No → Go to 5) on page ST-32.

Yes

B

Check if parking brake switch signal is present at power steering control unit.
Voltage: 0V
(Parking brake applied)

No → Malfunctioning parking brake system

Yes

Ensure that power steering control unit connector is connected properly.

C

Turn ignition switch ON and apply parking brake lever.
Check voltage between solenoid valve terminals of data link connector for CONSULT.
Voltage:
4.4 - 6.6V (constant)

No → Malfunctioning power steering control unit

Yes

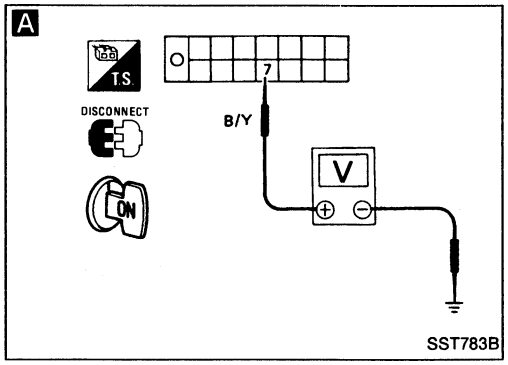
Check if heavy steering operation occurs during stationary turns.

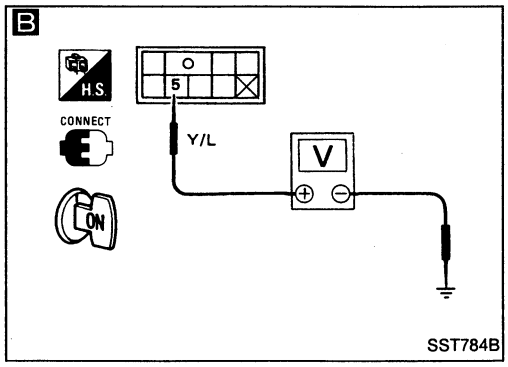
Yes → Go to 4) on page ST-32.

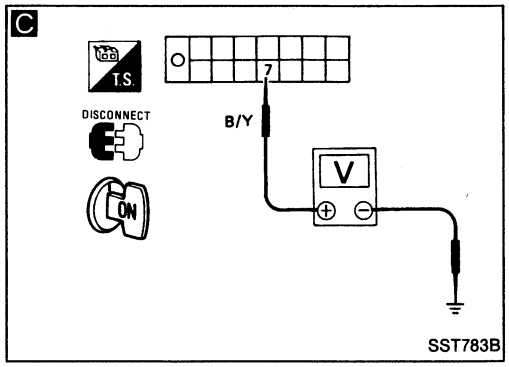
No

END

Trouble Diagnoses (Cont'd)

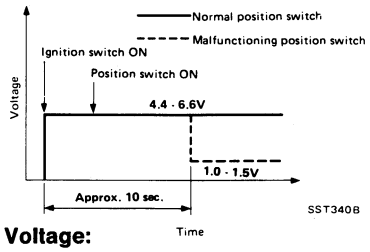






A

3) CHECK NEUTRAL POSITION SIGNAL.
Release parking brake lever.
Move shift lever to Neutral position (A/T and M/T models). Check voltage between solenoid valve terminals of data link connector for CONSULT.



Voltage:
4.4 - 6.6V (constant)

Yes → Depress clutch pedal (M/T model) and move shift lever to "P" (A/T model).
Check voltage between solenoid valve terminals at data link connector for CONSULT.
Voltage:
4.4 - 6.6V (constant)

Yes → Go to 4) on page ST-32.

No

Check if terminal voltage drops to 1.0 - 1.5V range approx. 10 seconds after ignition switch is turned ON.

No → Go to 5) on page ST-32.

Yes

B

Check if position switch signal is present at power steering control unit.
Voltage: 0V
(Position switch is ON)

No → Malfunctioning position switch system

Yes

Ensure that power steering control unit connector is connected properly.

C

Turn ignition switch ON, depress clutch pedal (M/T model) or move shift lever to "P" (A/T model).
Check voltage between solenoid valve terminals of data link connector for CONSULT.
Voltage:
4.4 - 6. 6V (constant)

No → Malfunctioning power steering control unit

Yes

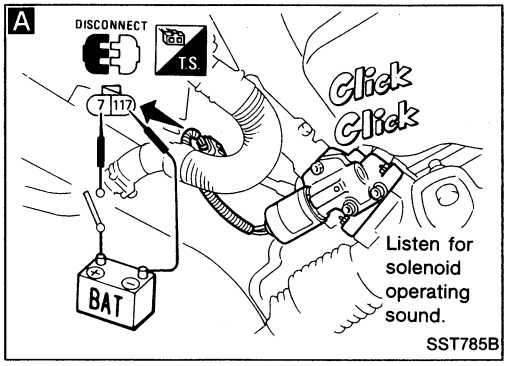
Check if heavy steering operation occurs during stationary turns.

Yes → Go to 1) on page ST-28.

No

END

Trouble Diagnoses (Cont'd)



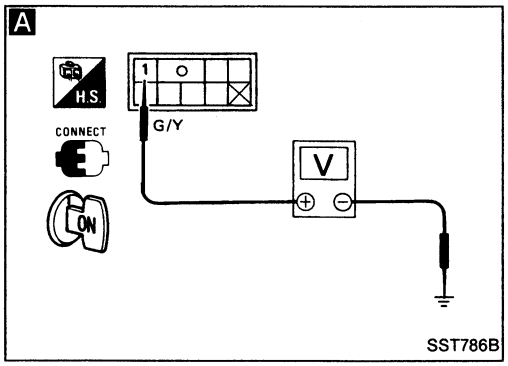
A

4) CHECK POWER STEERING SOLENOID VALVE FOR PROPER OPERATION.
Disconnect solenoid valve connector.
Does plunger click when voltage is applied between connector terminals (on solenoid valve side)?

No → Malfunctioning power steering solenoid valve

Yes ↓

- Malfunctioning steering gear assembly
- Malfunctioning oil pump



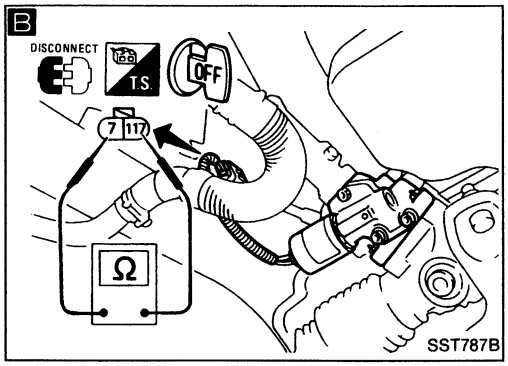
A

5) CHECK POWER STEERING CONTROL UNIT FOR PROPER OPERATION.
Check if power voltage is present at power steering control unit.
Voltage: 12V

No → Malfunctioning ignition power circuit

Yes ↓

B



Measure solenoid valve resistance.
Disconnect solenoid valve connector, and check resistance between connector terminals (on solenoid valve side.)
Resistance:
4 - 6 ohms

No → Malfunctioning solenoid valve system

Yes ↓

Ensure that power steering control unit connector is connected properly.

↓

Check if heavy steering operation occurs during stationary turns.

Yes → Malfunctioning power steering control unit

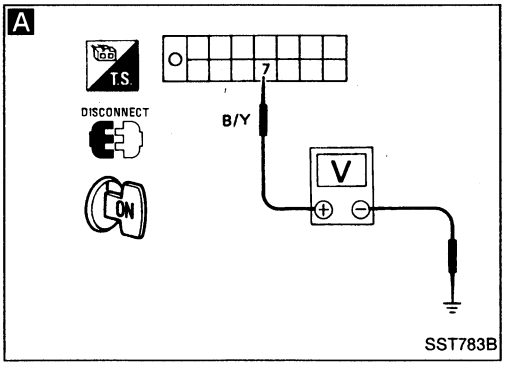
No ↓

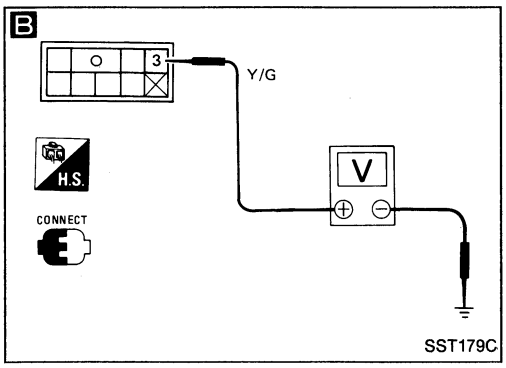
END

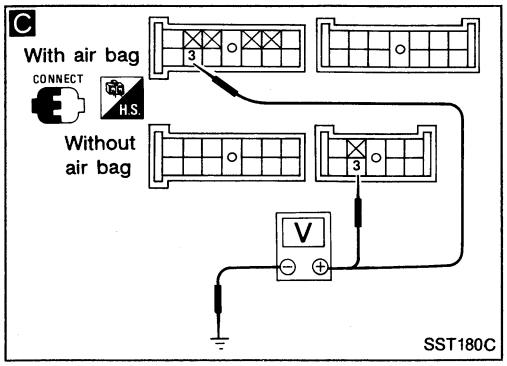
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

SYMPTOM:
Light steering operation during high-speed driving







Raise rear wheels off ground and start engine.

A

Check voltage between solenoid valve terminals of data link connector for CONSULT while driving vehicle from 0 to 100 km/h (0 to 62 MPH).
Voltage:
0 km/h (0 MPH):
4.4 - 6.6V
100 km/h (62 MPH):
1.8 - 2.8V

Yes → Ⓒ

No

Check speedometer for proper operation.

N.G. → Malfunctioning vehicle speed sensor or speedometer

O.K.

Check A.S.C.D. and vehicle speed-sensing door lock for proper operation.

N.G. → C

Check if vehicle speed signal is present at speedometer.
Disconnect speedometer from vehicle to facilitate work. Reconnect wiring.
Measure voltage between speedometer terminals while driving vehicle at very slow speeds.
1V (Min.) and 5V (Max.) are alternately repeated

Yes → Improper connection between speedometer and power steering control unit

No → Malfunctioning speedometer

O.K.

B

Check if vehicle speed signal is present at power steering control unit.
While driving at very slow speeds, connect power steering unit connector. Measure terminal voltage.
1V (Min.) and 5V (Max.) are alternately repeated

No → Improper connection between speedometer and power steering control unit

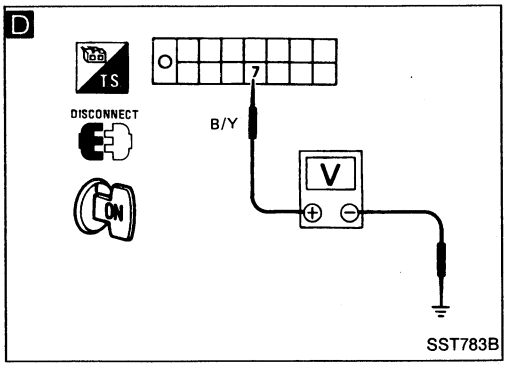
Yes

Ensure that power steering control unit connector is connected properly.

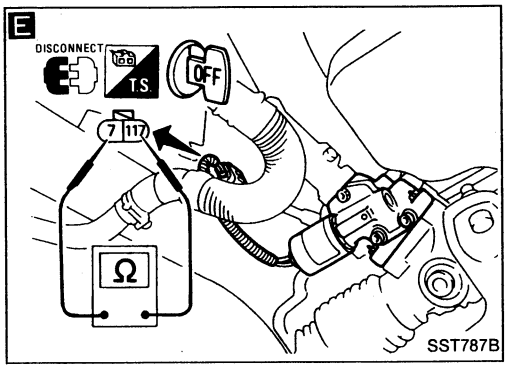
Ⓐ

Trouble Diagnoses (Cont'd)

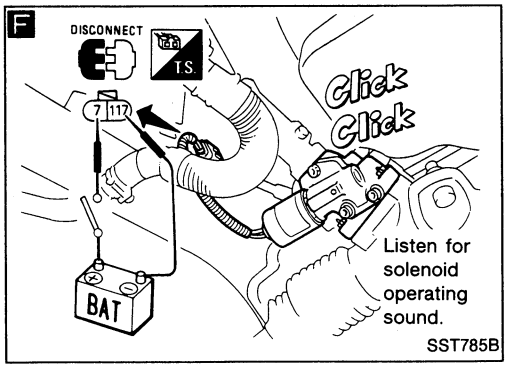
D



E



F



Ⓐ

D

Measure voltage between solenoid valve connector terminals of data link connector for CONSULT while driving vehicle from 0 to 100 km/h (0 to 62 MPH).

Voltage:

0 km/h (0 MPH):
4.4 - 6.6V

100 km/h (62 MPH):
1.8 - 2.8V

O.K. → Check if steering operation is heavy during high-speed driving.

No → Ⓒ

Yes → END

N.G. ↓

E

Measure solenoid valve resistance.
Disconnect solenoid valve connector, and check resistance between connector terminals (on solenoid valve side).

Resistance:
4 - 6 ohms

No → F

Yes → Malfunctioning power steering control unit

F

Disconnect solenoid valve connector.
Apply voltage between connector terminals (on solenoid valve side) and check if solenoid valve clicks (which indicate operation).

No → Malfunctioning solenoid valve

Yes →

- Malfunctioning steering gear assembly
- Malfunctioning oil pump

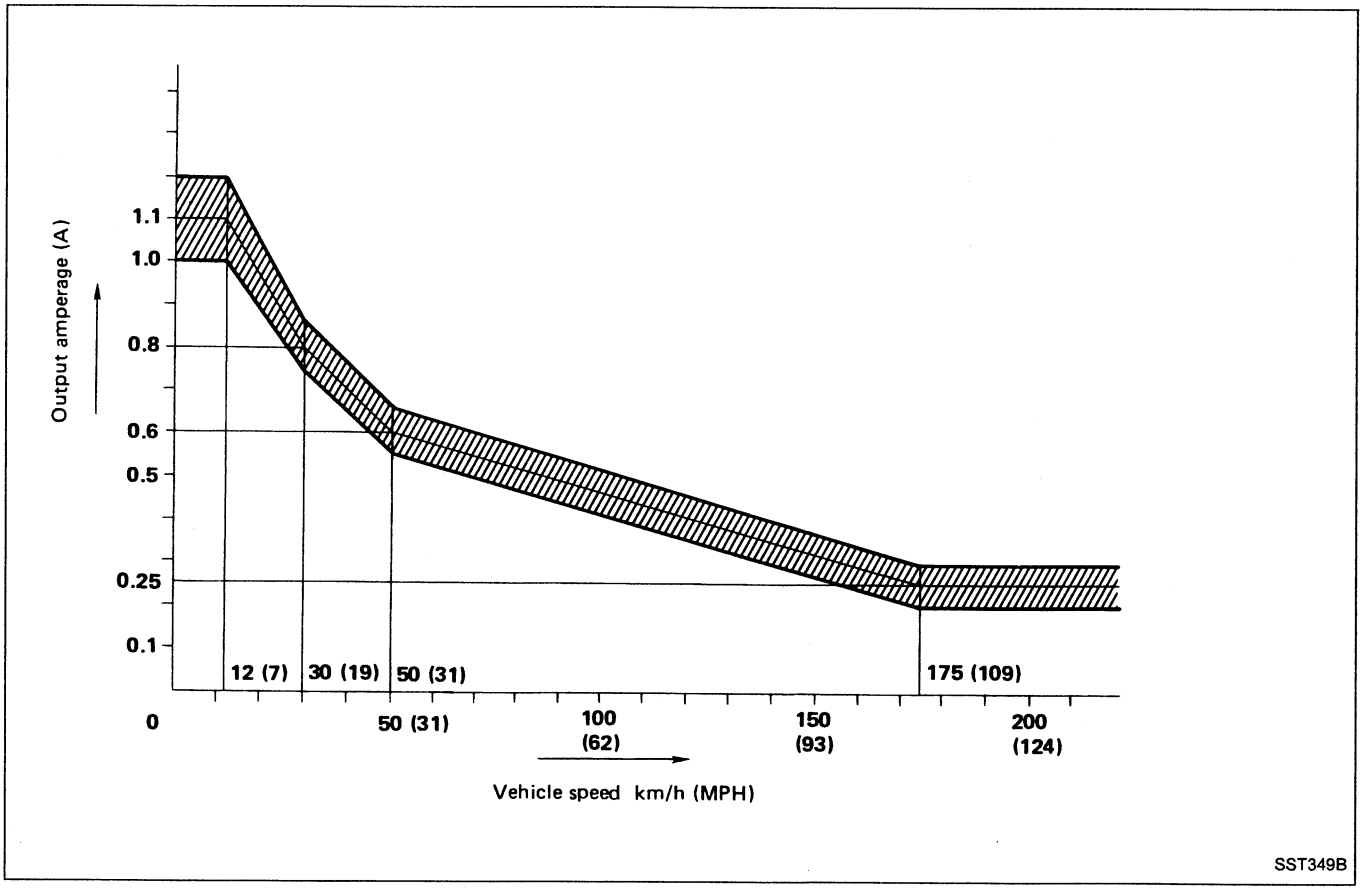
Trouble Diagnoses (Cont'd)

CONTROL UNIT INSPECTION TABLE

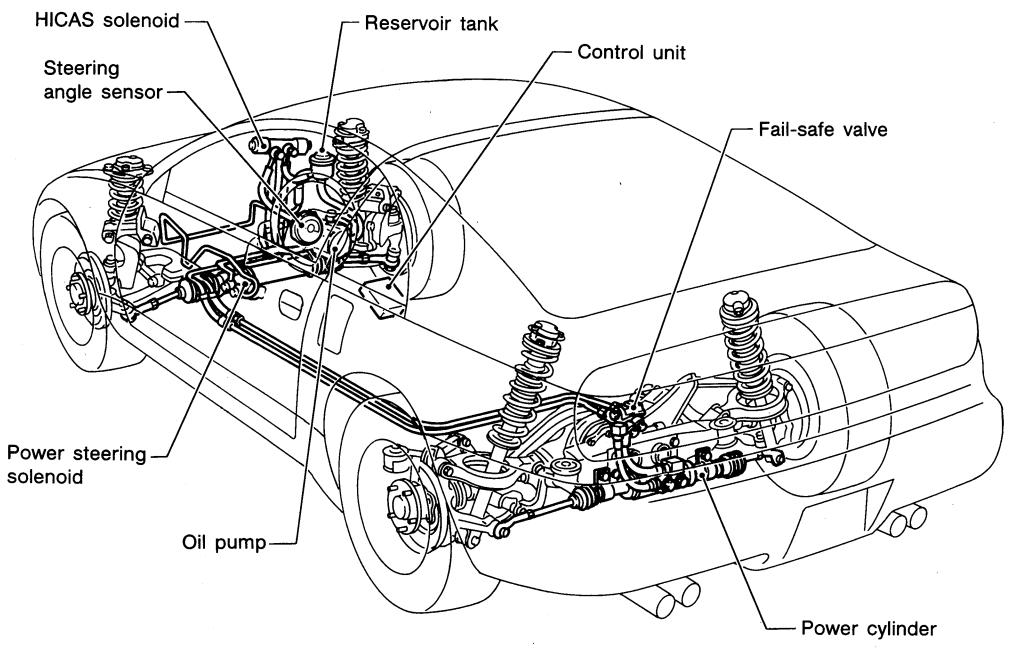
The standard values (voltage), measured with an analog tester in contact with the control unit terminal, are shown below:

Terminal No.	Application	Standard value
1	Power	Approx. 12V
2	Ground	0V
3	Vehicle speed sensor input	1 volt (min.) and 5 volts (max.) are alternately repeated when vehicle is driven at very slow speeds.
4	Stop lamp switch input	Pressed: Approx. 12V Released: 0V
5	Neutral switch input	0V (clutch engaged and shift lever in "N") ... M/T models 0V (selector lever in "N" or "P") ... A/T models 4 - 5V (except for the above)
6	Parking brake switch input	Applied: 0V Released: Approx. 12V
7	Power steering solenoid valve output	0 km/h (0 MPH) 4.4 - 6.6V 100 km/h (62 MPH) 1.8 - 2.8V Fail-safe 1.0 - 1.5V

PERFORMANCE OF CONTROLLER

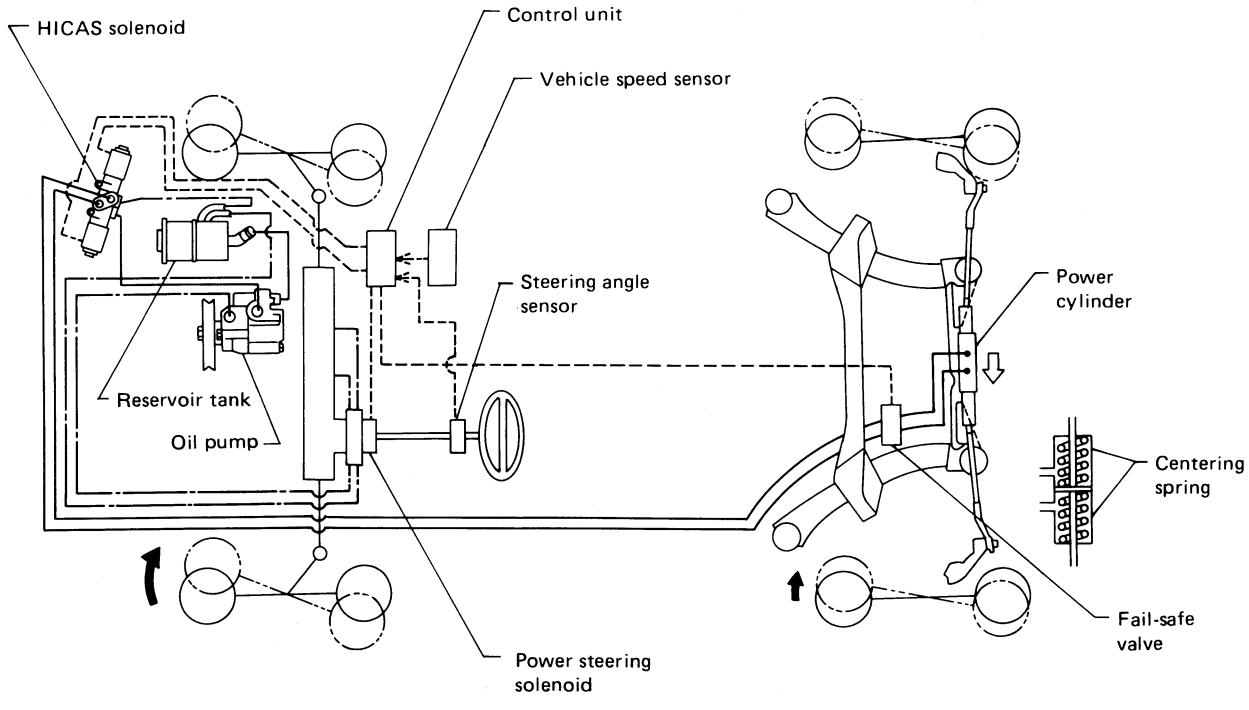


HICAS Component Parts Location

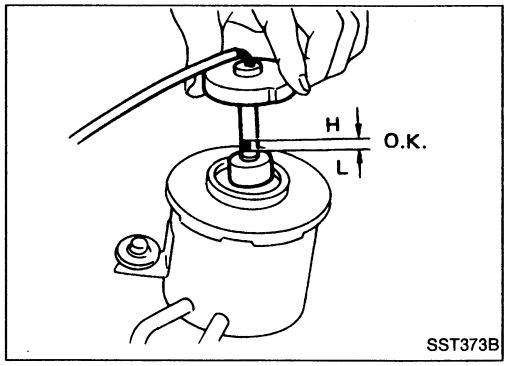


SST372B

System Diagram



SST451B



On-vehicle Service

CHECKING FLUID LEVEL

Maintain the fluid level so that the lower surface of the float is maintained between the "L" and "H" marks on the gauge rod. The fluid level should be checked when the engine is stopped and the fluid temperature is about 30°C (86°F).

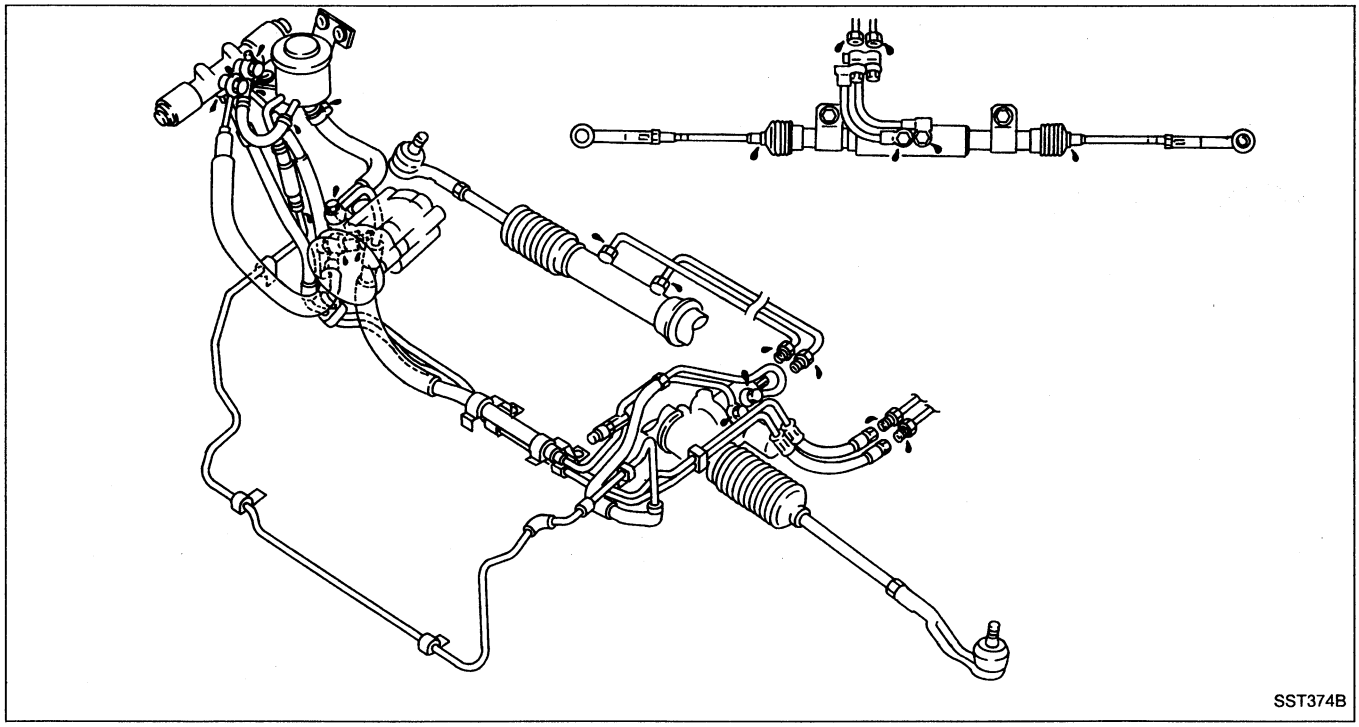
CAUTION:

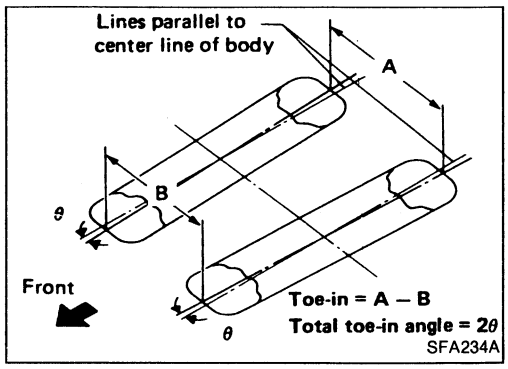
- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "Dexron™ II" type or equivalent.**
- **Note that fluid level will vary with fluid temperature by approx. 1 mm/5°C (0.04 in/9°F) due to changes in fluid volume.**

CHECKING FLUID LEAKAGE

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

Fluid leakage should be checked for when the oil temperature is normal with the engine idling.





MEASURING REAR TOE-IN

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

Toe-in:

Refer to S.D.S. in RA section.

On-vehicle Service (Cont'd)

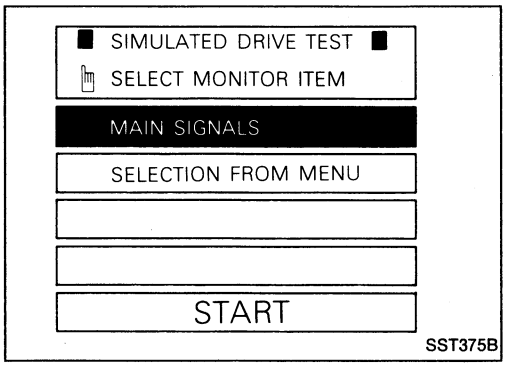
INSPECTION OF HICAS SYSTEM OPERATION

CAUTION:

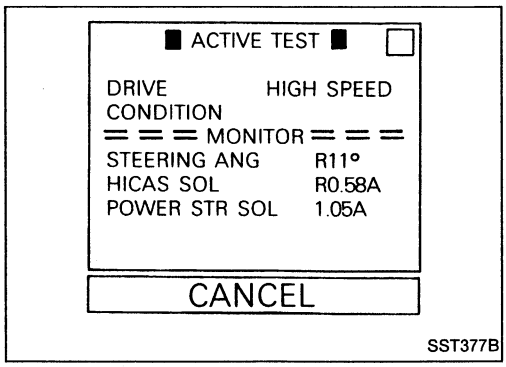
Ensure that shift lever is set to "P" (A/T model) or "Neutral" (M/T model) before checking HICAS system operation.

When CONSULT is used:

1. Have a helper sit in the driver's compartment and raise vehicle.
   (Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Connect CONSULT unit to diagnostic connector and start engine.
3. Touch "START" on CONSULT display.
4. Touch "HICAS", "ACTIVE TEST" and "SIMULATED DRIVE" in that order.

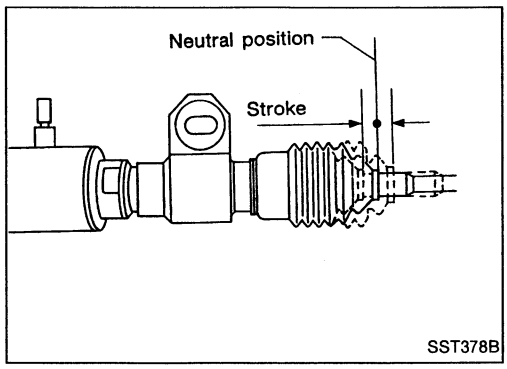


5. Touch "START" when MAIN SIGNALS display is reversed.



6. Touch "START."

After simulated drive condition has continued for 5 minutes, it will automatically cancel and CONSULT unit will then show "TEST IS INTERRUPTED TO AVOID OIL TEMP. RISE" display. To cancel this mode during self-diagnosis, simply touch "CANCEL".



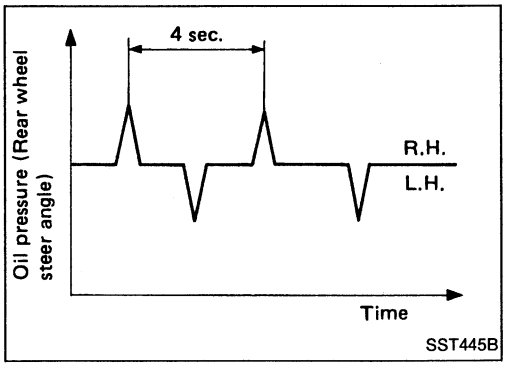
7. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° in one direction from the neutral position. Measure extension value of one power cylinder rod and retraction value of the other. Then, turn steering wheel 180° in the other direction from the neutral position, and measure extension value of one cylinder rod and retraction value of the other. Determine strokes of respective power cylinders by adding (measured) extension and retraction values.

On-vehicle Service (Cont'd)

Measure rod strokes in as short a period of time as possible.

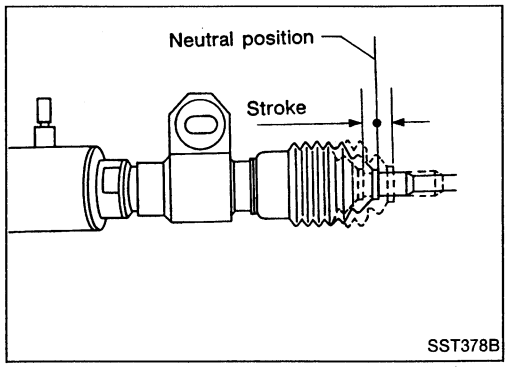
Specifications:

When turned to the right
3 mm (0.12 in)
When turned to the left
3 mm (0.12 in)
Total stroke
6 mm (0.24 in)



When CONSULT is not used:

1. Have a helper sit in the driver's compartment and raise vehicle.
   (Use a 2-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Set HICAS system in self-diagnosis mode.
(1) Turn ignition switch "OFF".
(2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
(3) Turn ignition switch "ON".
(4) Immediately start engine.
(5) Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
3. Set steering wheel to a point approximately 10° from the neutral position and check to ensure that rear wheels turn to the left and right alternately.



4. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° in one direction from the neutral position. Measure extension value of one power cylinder rod and retraction value of the other. Then, turn steering wheel 180° in the other direction from the neutral position, and measure extension value of one cylinder rod and retraction value of the other. Determine strokes of respective power cylinder rods by adding (measured) extension and retraction values.

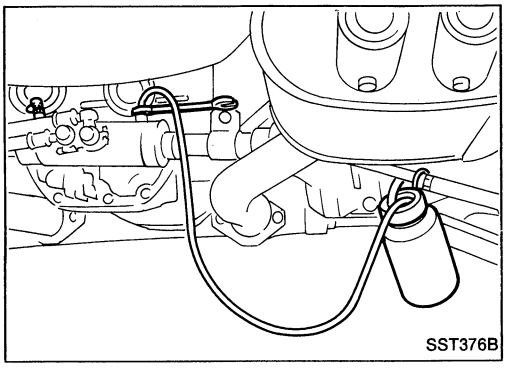
Measure rod strokes in as short a period of time as possible.

Specifications:

When turned to the right
3 mm (0.12 in)
When turned to the left
3 mm (0.12 in)
Total stroke
6 mm (0.24 in)

Do not depress foot brake pedal during operation check, otherwise the operation will be stopped.

On-vehicle Service (Cont'd)

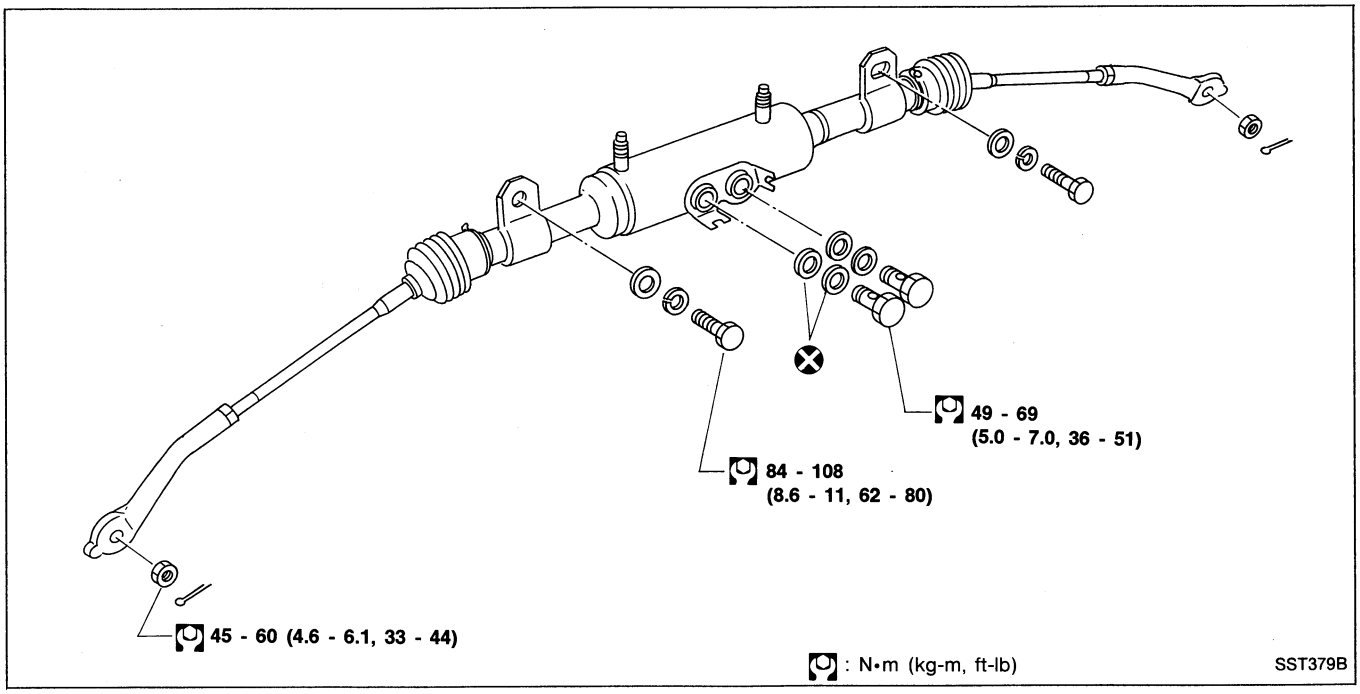

SST376B

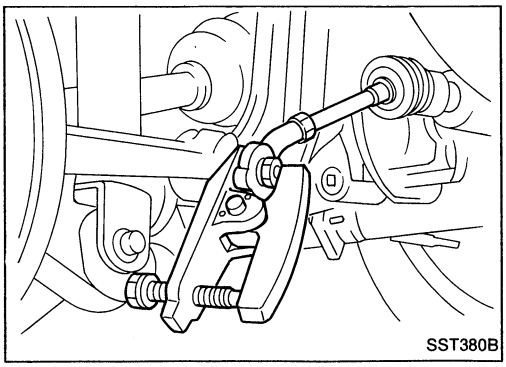
BLEEDING HYDRAULIC SYSTEM

Before bleeding air from the HICAS system, be sure to bleed air from the power steering system.
Refer to "SUPER HICAS SYSTEM — Repair of Component Parts".

Repair of Component Parts

POWER CYLINDER

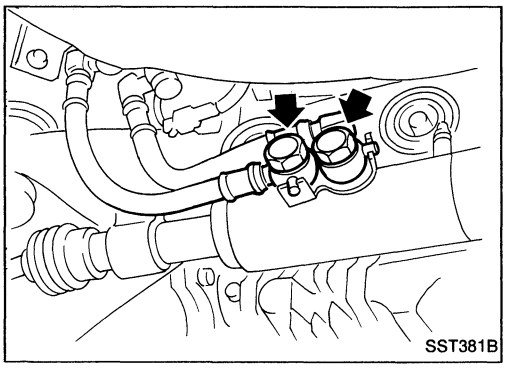



SST380B

Removal

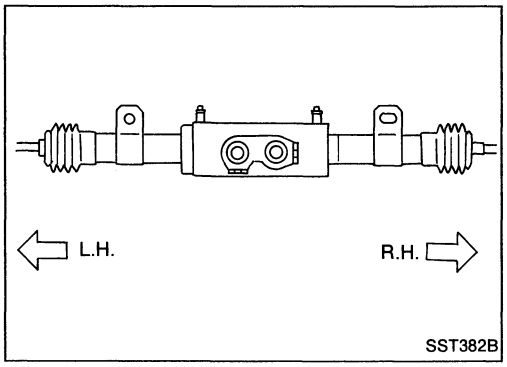
- Detach power cylinder lower links from axle housing sockets with Tool.

Repair of Component Parts (Cont'd)


SST381B

- Disconnect oil pipes from power cylinders and remove power cylinders.

CAUTION:
Plug openings of oil pipes and power cylinders to prevent entry of foreign particles after removal.



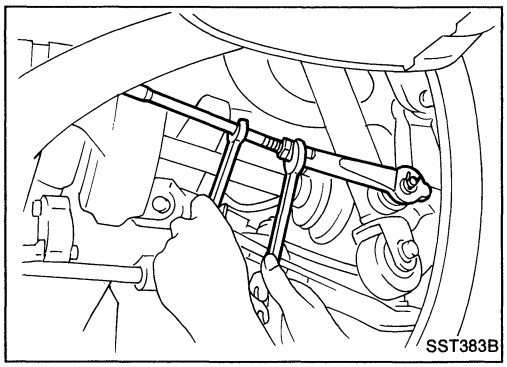
SST382B

Installation

1. Before installing power cylinder on suspension member, wipe power cylinder bracket and mating surface of suspension member. Using the left side of the bracket as a reference point, locate the right side (oblong hole side) and install power cylinder.

CAUTION:
a. To prevent entry of foreign particles, clean oil pipes and connectors using dry compressed air.
b. Ensure that your hands are clean and free from foreign particles when connecting oil pipes.

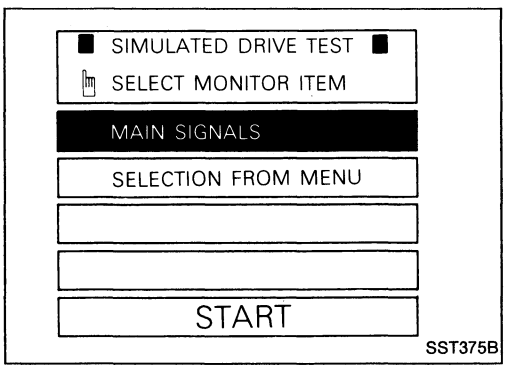
2. Install power cylinders and oil pipes.
3. After installing lower link assemblies, check toe-in to ensure that it is within specifications. If it is not within specifications, perform proper adjustments.
   Refer to "SUPER HICAS" in section RA.


SST383B

Bleeding hydraulic system

Before bleeding air from the HICAS system, be sure to bleed air from the power steering system.

CAUTION:
Ensure that shift lever is set to "P" (A/T model) or "Neutral" (M/T model) position.



SST375B

When CONSULT is used:

1. Connect CONSULT unit to diagnosis connector on body side.
2. Have a helper sit in the driver's compartment and raise vehicle.

Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.

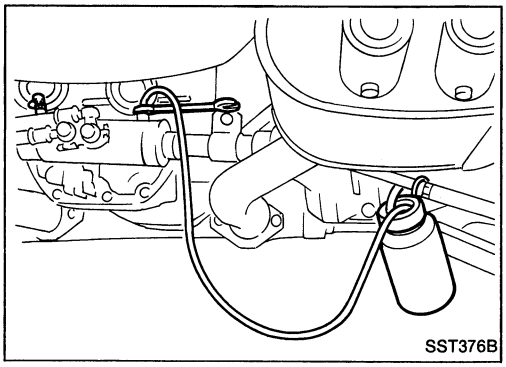
3. Start engine.
4. Touch "START" on CONSULT display. (Display will then change.)

Repair of Component Parts (Cont'd)

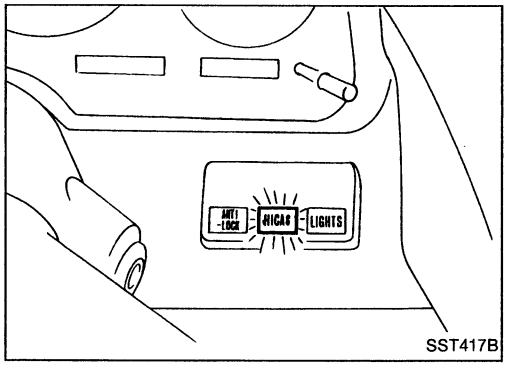
5. Touch "HICAS", "ACTIVE TEST", "SIMULATED DRIVE" and "START" in that order.

Before touching "START", ensure that MAIN SIGNALS display is reversed.

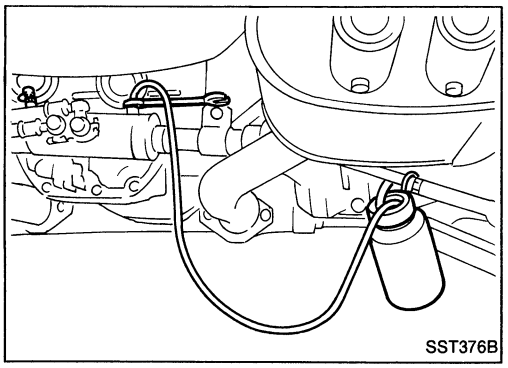
6. Touch "START".


SST376B

7. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° to the right from the neutral position. Loosen right power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
8. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° to the left from the neutral position. Loosen left power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
9. Repeat steps 7. and 8. until there are no air bubbles in fluid. While bleeding air from power cylinders, never allow fluid level to drop below inlet port of reservoir tank (by adding fluid as required).
10. Touch "CANCEL" on CONSULT display and turn ignition switch OFF.



SST417B


SST376B

When CONSULT is not used:

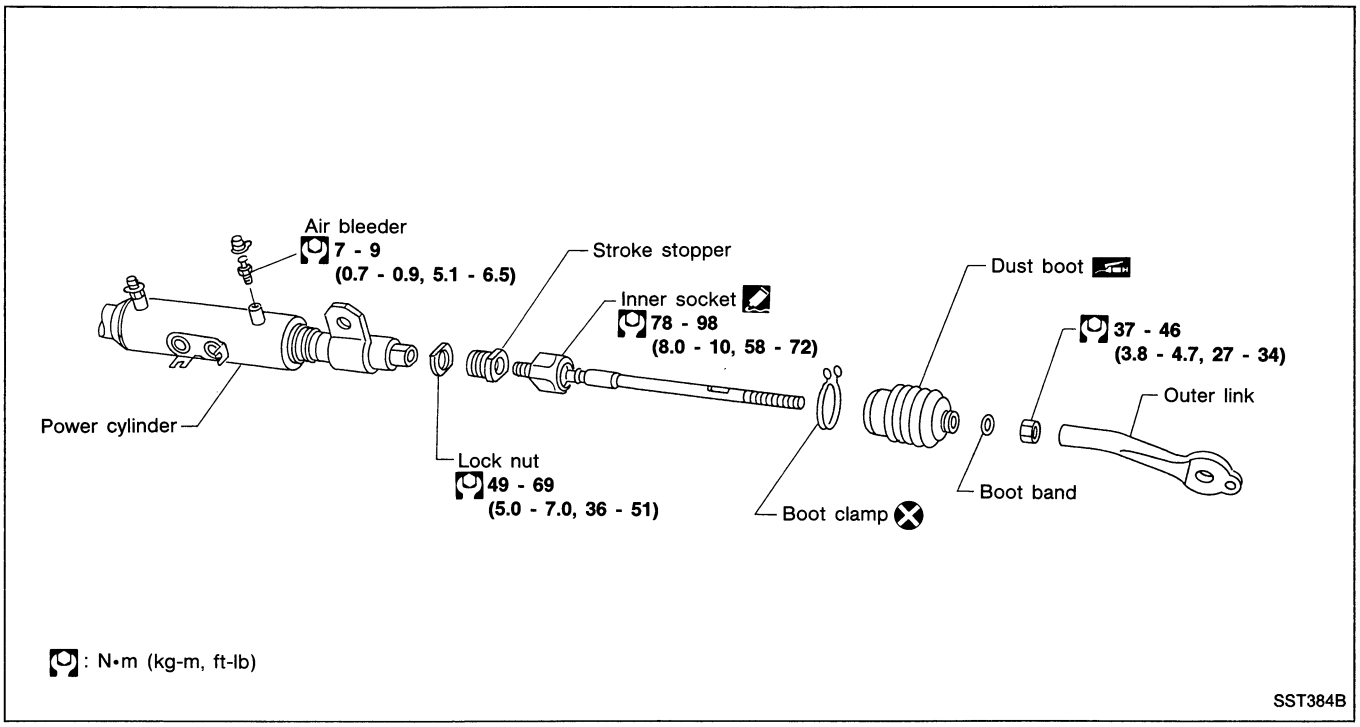
1. Have a helper sit in the driver's compartment, and raise vehicle.

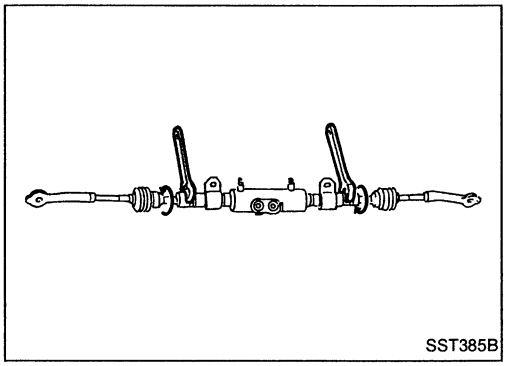
Use a two-pole lift or center pole lift so that the four wheels are free to rotate.

2. Set HICAS system in self-diagnosis mode.
(1) Turn ignition switch "OFF".
(2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
(3) Turn ignition switch "ON".
(4) Immediately start engine.
(5) Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
3. Set steering wheel within 10° from the neutral position. Ensure that rear wheels turn to the left and right alternately.
4. Operate engine at idling speed, and turn steering wheel 180° to the right from the neutral position. Loosen right power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.

Repair of Component Parts (Cont'd)

5. Operate engine at idling speed, and turn steering wheel 180° to the left from the neutral position. Loosen left power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
6. Repeat steps 4. and 5. above until there are no air bubbles in fluid. While bleeding air from power cylinders, never allow fluid level to drop below inlet port of reservoir tank (by adding fluid as required).
7. Turn ignition switch OFF to complete self-diagnosis operation.

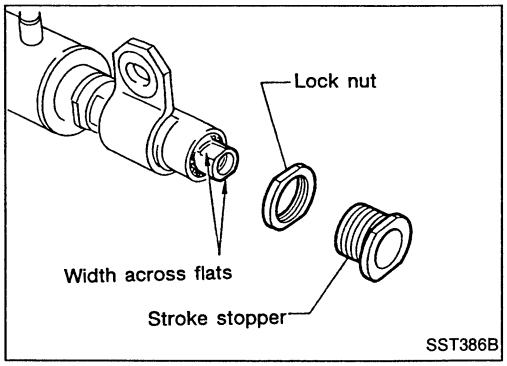




Power cylinder assembly cannot be disassembled. When it is malfunctioning, replace power cylinder as an assembly.

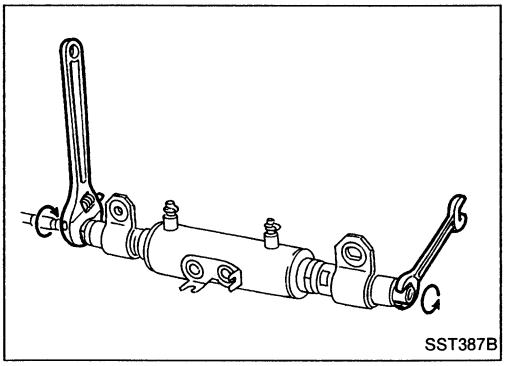
Disassembly

1. Remove clamps from left and right dust boots, and move dust boots toward outer links.
2. Attach wrenches to left and right ball joint sockets, and turn in directions that loosen lower links. Remove one of loosened lower link assemblies.

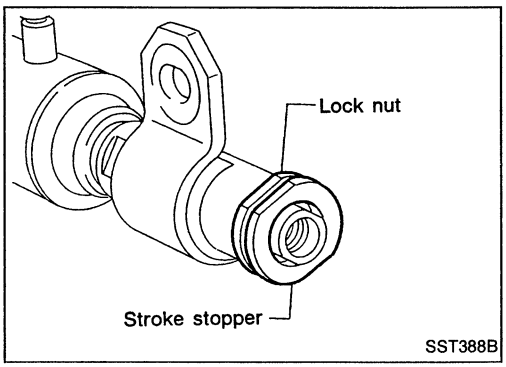


3. Loosen stroke stopper lock nut from which lower link assembly was removed, and remove stroke stopper.

Repair of Component Parts (Cont'd)


SST387B

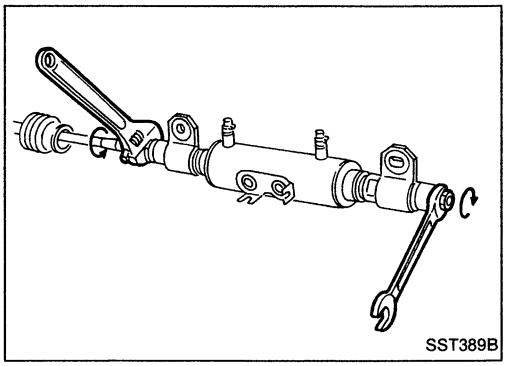
- While attaching a wrench to "width across flats" section of rod end from which stroke stopper was removed, remove the other lower link assembly.



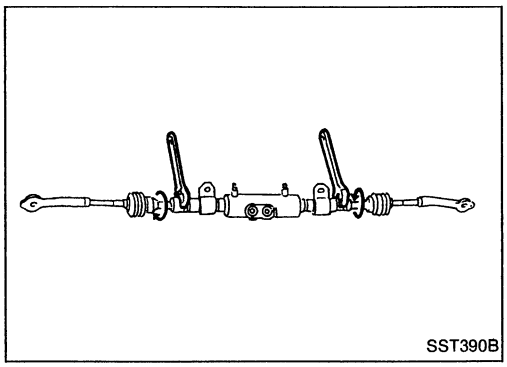
SST388B

Assembly

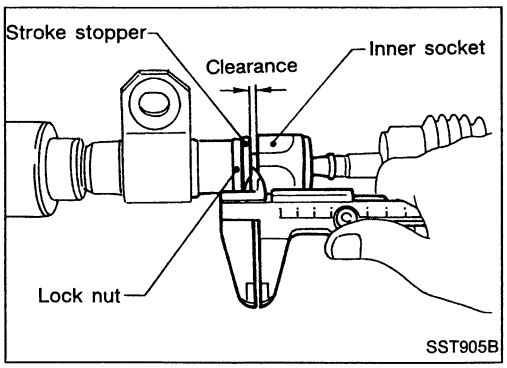
1. Install stroke stopper and lock nut on the lower link assembly to be assembled.


SST389B

2. Apply Locktite to inner ball joint thread. Attach a wrench to "width across flats" section of piston rod (located on the other side) to prevent rod from turning. Install lower link assembly.


SST390B

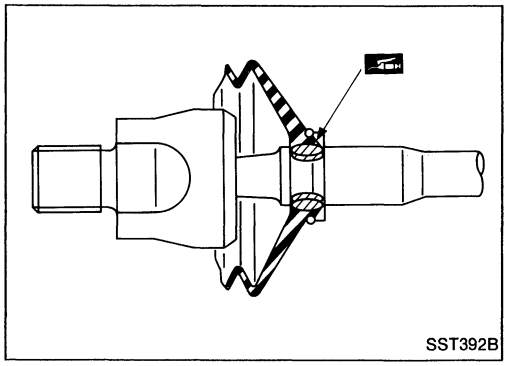
3. After installing stroke stopper and lock nut on the other lower link assembly, install lower link assembly. Attach a wrench to inner ball joint (to prevent it from turning), tighten inner socket to specified torque.
   Inner socket:
   [O]: 78 - 98 N·m (8 - 10 kg-m, 58 - 72 ft-lb)



SST905B

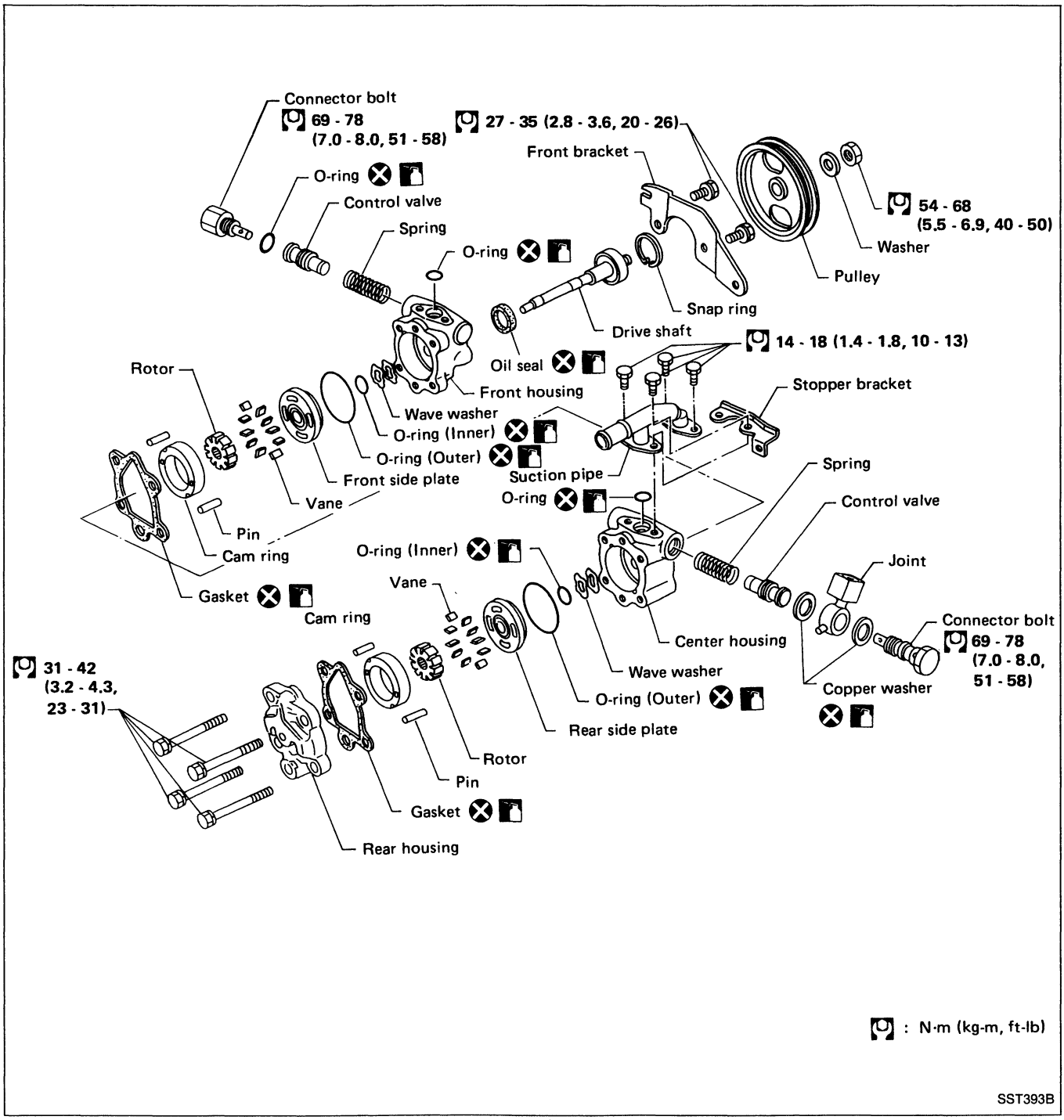
4. Adjust clearance between inner socket and stroke stopper by turning stroke stopper, then tighten lock nuts to the specified torque.
   Clearance:
   2.9 - 3.1 mm (0.114 - 0.122 in)

Repair of Component Parts (Cont'd)

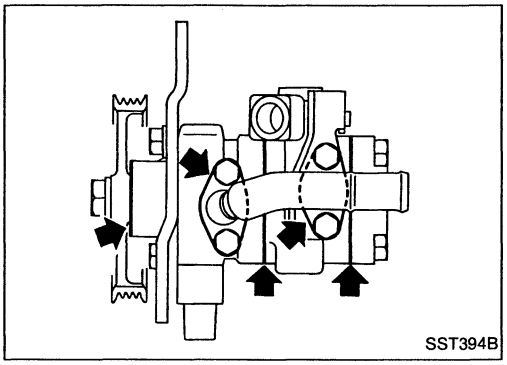


5. Install dust boot using new boot band and clamp.
- **Apply a coat of grease to grooves at boot location.**

OIL PUMP



Repair of Component Parts (Cont'd)


SST394B

Pre-disassembly inspection

Disassemble the power steering oil pump only if the following items are found.

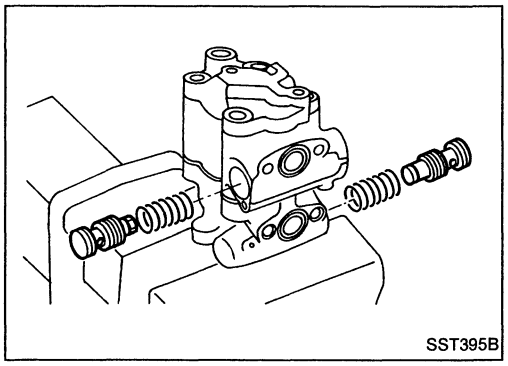
- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.

Procedures for disassembly and assembly are the same as those for the power steering oil pump.

DISASSEMBLY

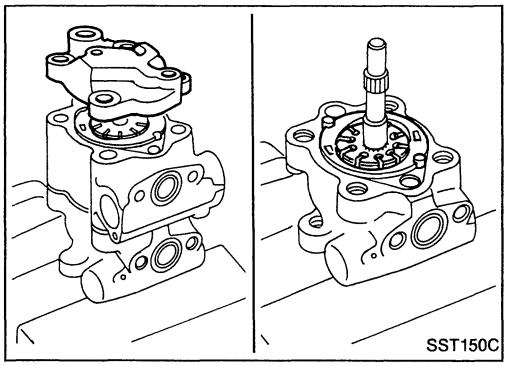
CAUTION:

- **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.**


SST395B

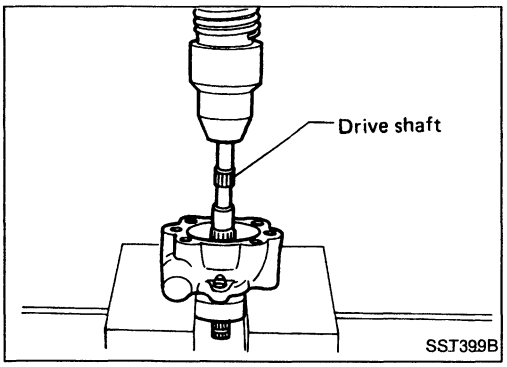
1. Remove connector.

Be careful not to drop control valve.
Be careful not to confuse main side with sub side.


SST150C

2. Remove rear housing.
3. Remove center housing.
4. Remove cam ring, rotor and other parts from center housing (sub side).
5. Remove cam ring, rotor and other parts from front housing (main side).

Be careful not to confuse main side with sub side.

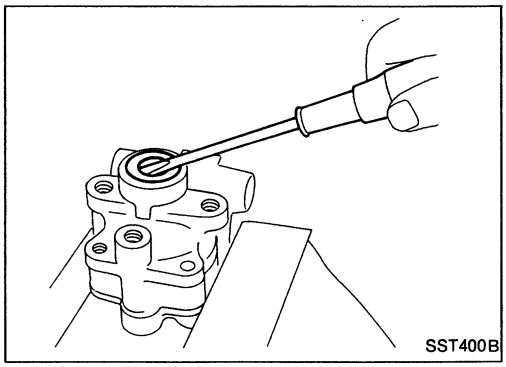


SST399B

6. Remove snap ring, then draw drive shaft out.

Be careful not to drop drive shaft.

Repair of Component Parts (Cont'd)



7. Remove oil seal.

Be careful not to damage front housing.

INSPECTION

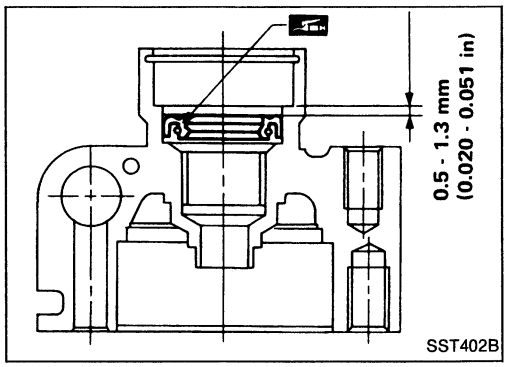
If any of the following parts are scratched or damaged, replace oil pump assembly.

- Mating surfaces of front housing and cam center housing
- Mating surfaces of rear housing and cam center housing
- Front housing bushing (at drive shaft support location)
- Flow control valve
- Drive shaft
- Rotor

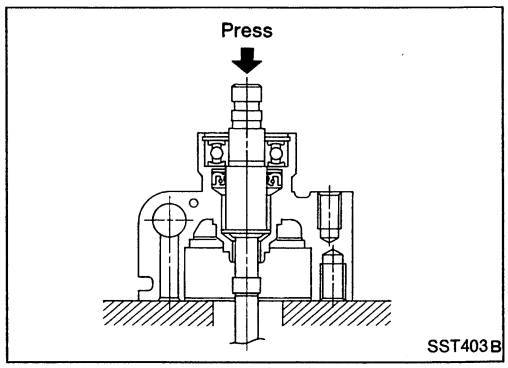
ASSEMBLY

Assemble oil pump in the reverse order of disassembly, noting the following instructions.

- Before installation, coat the O-rings and oil seal with A.T.F.
- Make sure O-rings and oil seal are properly installed.
- When assembling vanes to rotor, rounded surfaces of vanes must face cam case side.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.

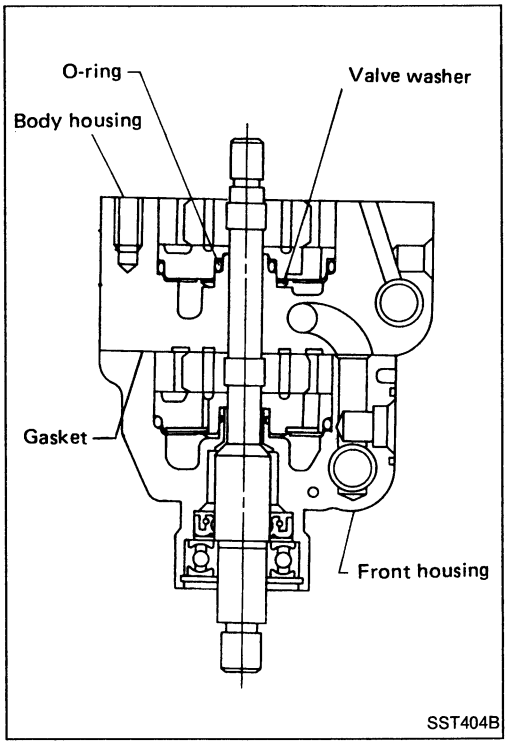


1. Press oil seal into front housing and apply grease to sealing lips.



2. Press shaft assembly into front housing and install snap ring.

Repair of Component Parts (Cont'd)



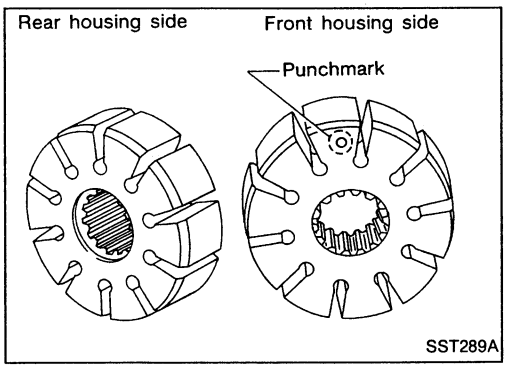
3. Install component parts on front housing in the order indicated below:

1) O-ring x 2
2) Wave washer
3) Side plate
4) Rotor [thickness: 16.25 mm (0.6398 in) (main side); 13 mm (0.51 in) (sub side)]
5) Vane
6) Pin
7) Cam ring [thickness: 16.25 mm (0.6398 in) (main side); 13 mm (0.51 in) (sub side)]

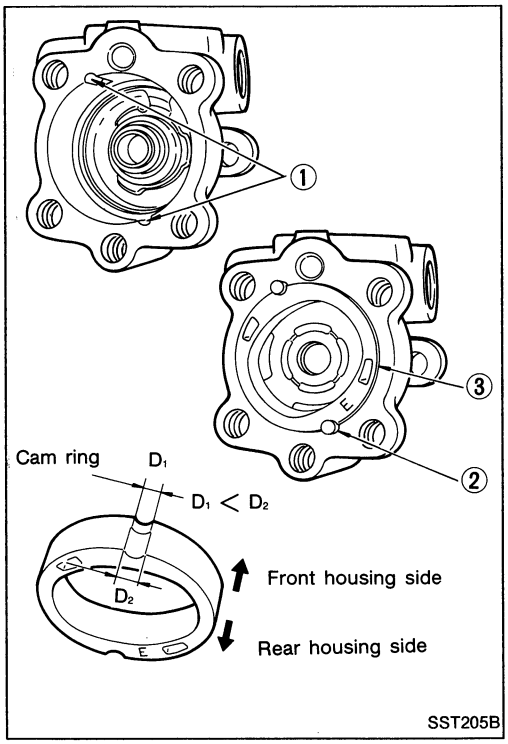
4. Place packing on front housing and position center housing on the packing. In the manner similar to step 3. above, install component parts on front housing (sub side).

CAUTION:

- **Ensure that O-rings are positioned properly.**
- **Ensure that vane is installed with curved side facing cam ring.**
- **Use cam, rotor vane as original single unit.**
- **Ensure that control valve moves smoothly.**



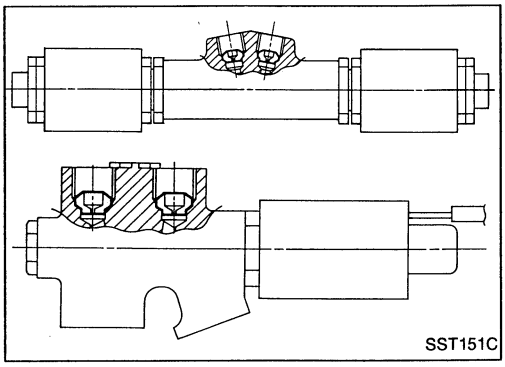
- Pay attention to rotor direction.



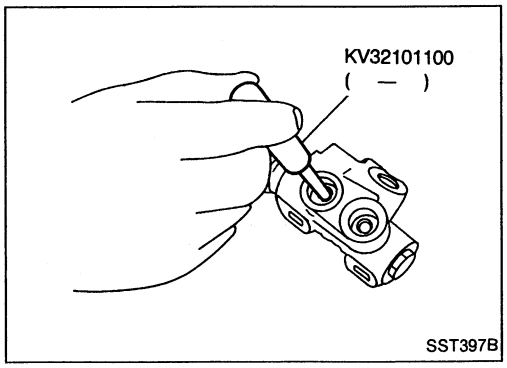
- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

Repair of Component Parts (Cont'd)

HICAS SOLENOID AND FAIL-SAFE VALVE

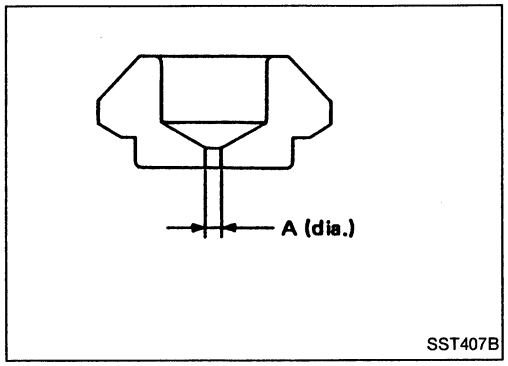

SST151C

- Do not loosen lock nut which secures solenoid since HICAS solenoid fail-safe valves are of types that should not be disassembled.
- If any part is found to be malfunctioning, always replace as a valve assembly.



SST397B

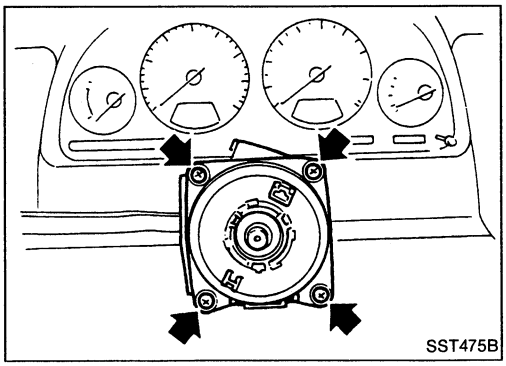
- Whenever tubes are disconnected, check tube seat for scratches or damage. A scratched or cracked tube seat may cause oil leakage. Replace it using pin punch.



SST407B

		Control valve	Cut-off valve
Part No.		49528-31P10	49528-52L10
A (dia.)	mm (in)	1.5 (0.059)	6.5 (0.256)

STEERING ANGLE SENSOR


SST475B

- Ensure that steering angle sensor bolts are secure and tight.
- If any part of steering angle sensor is malfunctioning, replace steering angle sensor assembly.

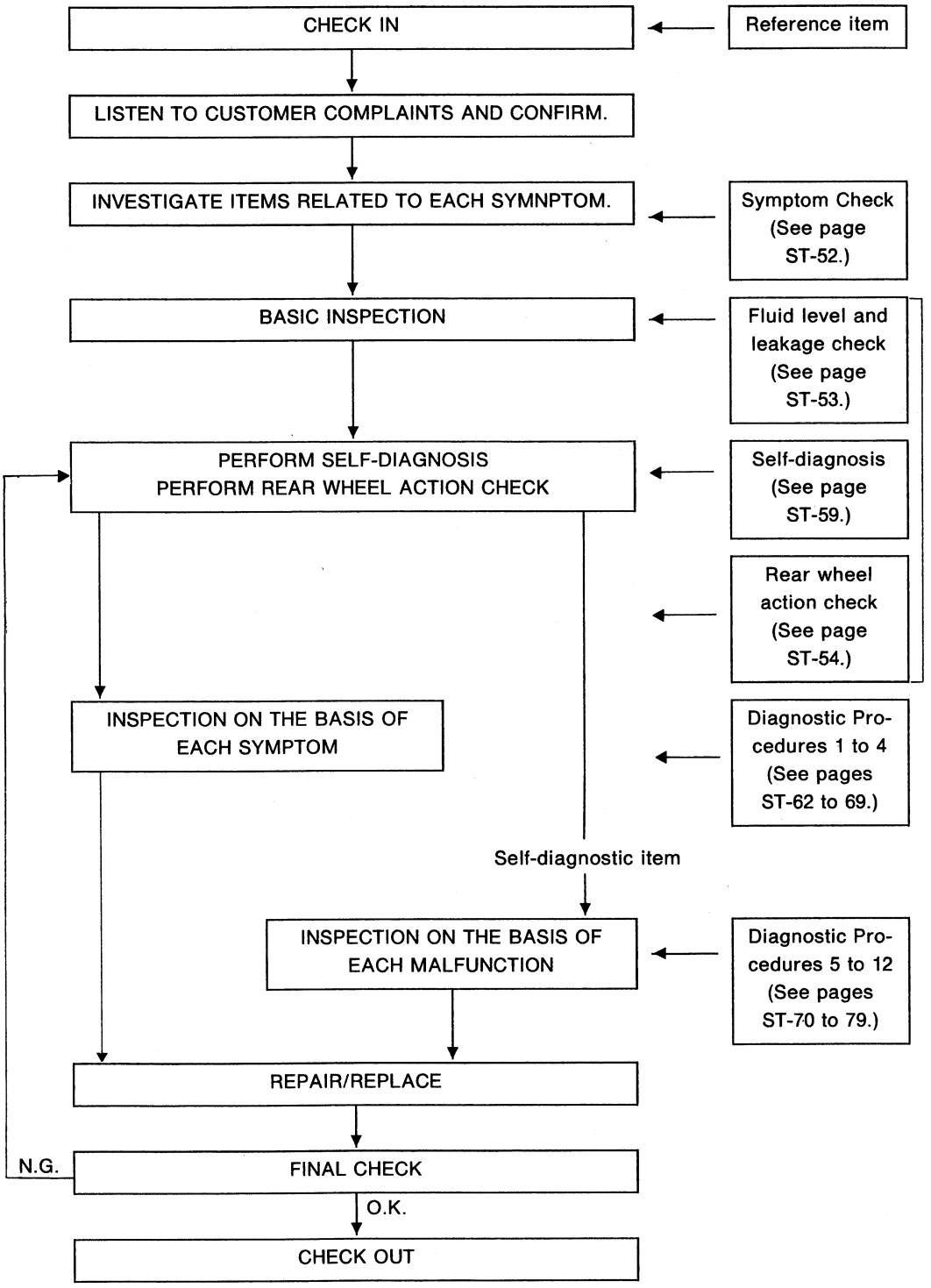
Trouble Diagnoses

CONTENTS

Trouble Diagnoses (Cont'd)

HOW TO PERFORM TROUBLE DIAGNOSES FOR QUICK AND ACCURATE REPAIR

Work flow



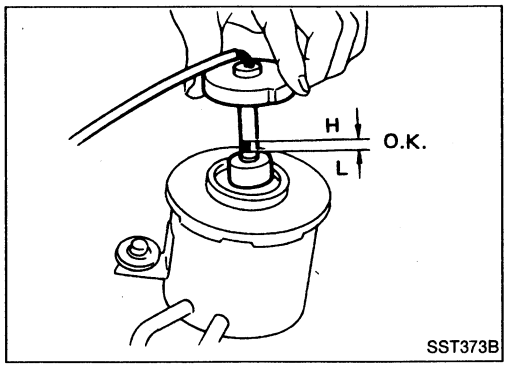
Trouble Diagnoses (Cont'd)

SYMPTOM CHART

Diagnostic table

PROCEDURE				Preliminary Check			Diagnostic Procedure											
REFERENCE PAGE (ST-)				53	53	54	62	62	64	65	70	72	73	74	75	76	78	79
SYMPTOM				Preliminary check 1	Preliminary check 2	Preliminary check 3	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	Diagnostic procedure 6	Diagnostic procedure 7	Diagnostic procedure 8	Diagnostic procedure 9	Diagnostic procedure 10	Diagnostic procedure 11	Diagnostic procedure 12
No warning lamp comes on when ignition switch is turned "ON"				○			○											
Warning lamp comes on when engine is running				○	○	○		○		○	○	○	○	○	○	○	○	○
Abnormal noise is emitted.				○	○	○			○									
Vehicle behavior is unusual (due to malfunctioning HICAS system.)				○	○	○				○	○	○	○	○	○	○	○	○
Self-diagnostic results	System is not set in self-diagnosis mode.										○							
	Self-diagnosis code No.	Diagnosed part	CONSULT indication															
	1	HICAS solenoid (RH) output is not present.	HICAS SOLENOID-R [ABNORMAL SIGNAL]									○						
	2	HICAS solenoid (LH) output is not present.	HICAS SOLENOID-L [ABNORMAL SIGNAL]									○						
	3	Fail-safe valve output is not present.	FAIL-SAFE VALVE [ABNORMAL SIGNAL]										○					
	4	Power steering solenoid output is not present.	POWER STEERING SOL [ABNORMAL SIGNAL]											○				
	5	Vehicle speed signal is not present.	VEHICLE SPEED SENSOR [NO SIGNAL] (·a) CAR SPEED SENSOR [SIG-SUDDEN TURN] (-b)												○			
	6	Steering angle sensor input is not present.	STEERING ANGLE SEN [NO ANG SIGNAL] (·a) STEERING ANGLE SEN [NO NEUT SIGNAL] (·b) STEERING ANGLE SEN [NEUT SIG-360° OFF] (·c) STEERING ANGLE SEN [NEUT SIG-30° ON] (·d)													○		
	7																	
	8	Parking brake (AT) or clutch switch (MT) input is not present.	—														○	
	9	Inhibitor switch (AT) or neutral switch (MT) input is not present.	—															○

Trouble Diagnoses (Cont'd)

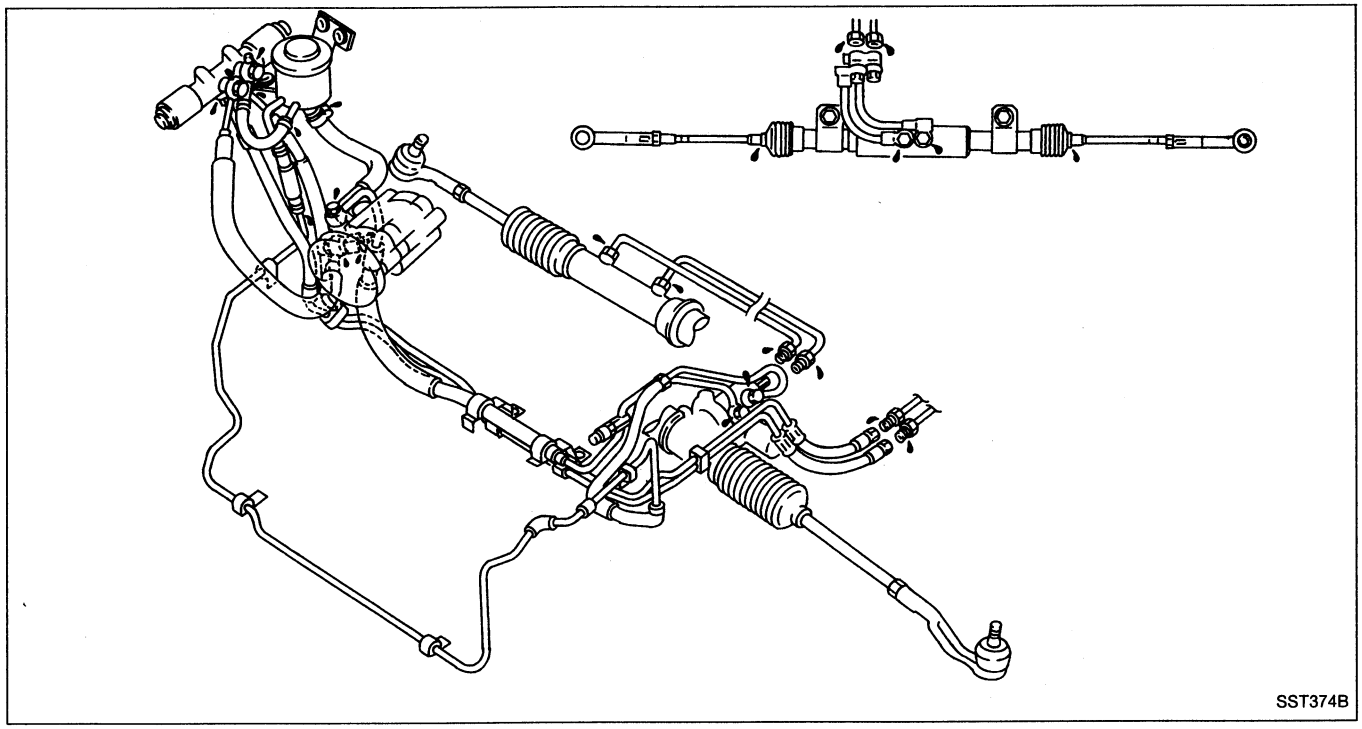


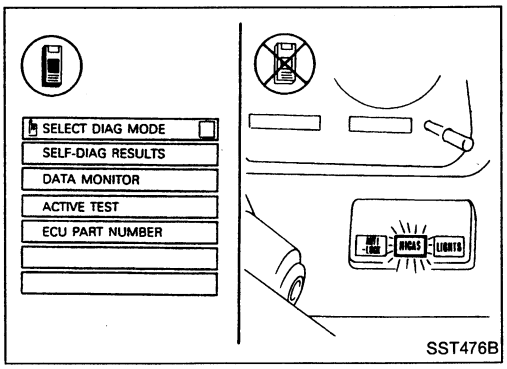
PRELIMINARY CHECK

Check 1

Checking fluid level and fluid leakage

Refer to "SUPER HICAS SYSTEM — On-vehicle Service" on page ST-37.



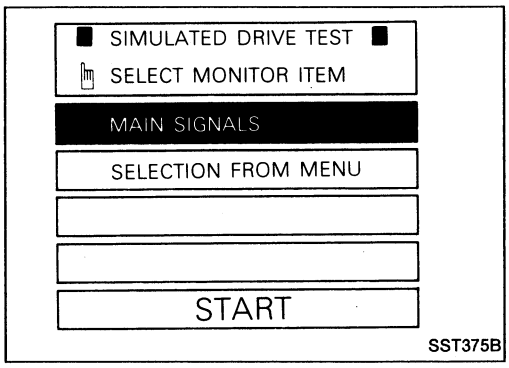


Check 2

Perform self-diagnosis.

Refer to "Self-diagnosis" on page ST-59.

Trouble Diagnoses (Cont'd)

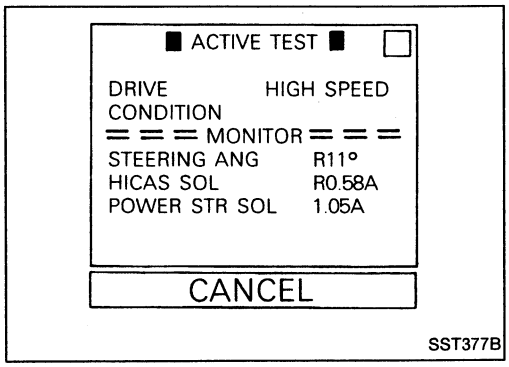


Check 3

Perform rear wheel action check.

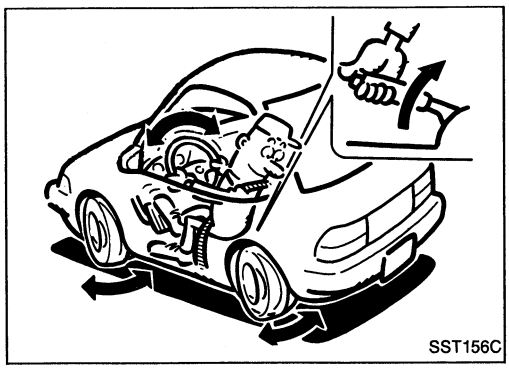
When CONSULT is used:

1. Have a helper sit in the driver's compartment, and raise vehicle.
   (Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Connect CONSULT unit to diagnosis connector and start engine.
3. Touch "START" on CONSULT display.
4. Touch "HICAS", "ACTIVE TEST" and "SIMULATED DRIVE" in that order.
5. Touch "START" when "MAIN SIGNALS" display is reversed.



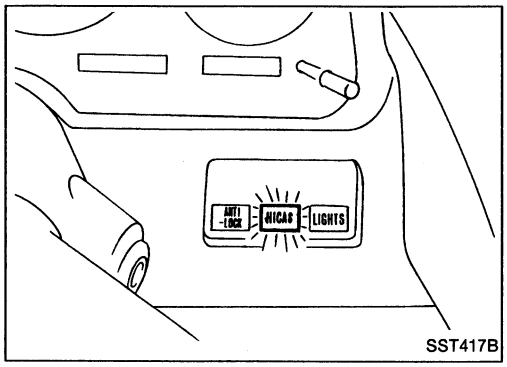
6. Touch "START."

After simulated drive condition has continued for 5 minutes, it will automatically cancel and CONSULT unit will then show "TEST IS INTERRUPTED TO AVOID OIL TEMP RISE" display. To cancel this mode during self-diagnosis, simply touch "CANCEL".

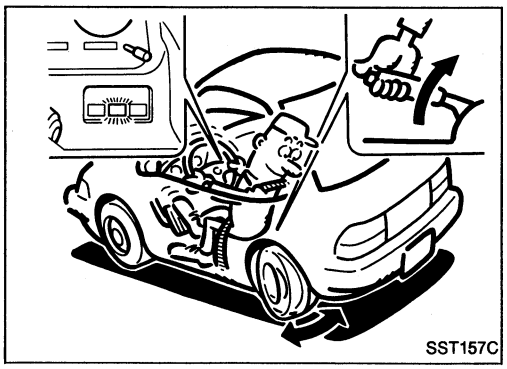


7. While running engine at speeds greater than 2,000 rpm, turn steering wheel 180° to the left and right from the neutral position. Ensure that rear wheels steer in response to rotation of steering wheel.

Trouble Diagnoses (Cont'd)



SST417B

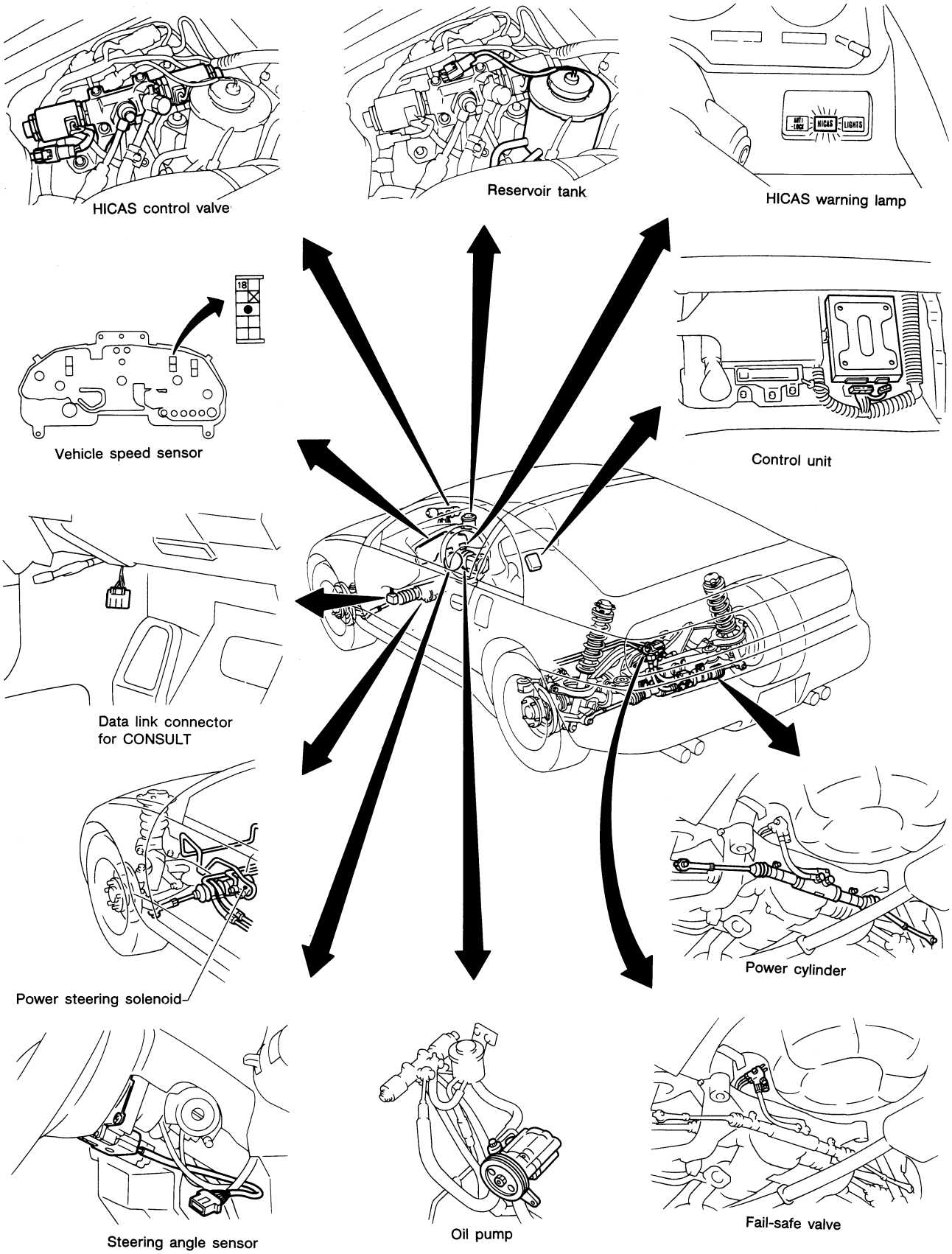

SST157C

When CONSULT is not used:

1. Turn key switch "OFF".
2. Set HICAS system in self-diagnosis mode.
(1) Turn ignition switch "OFF".
(2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
(3) Turn ignition switch "ON".
(4) Immediately start engine.
(5) Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
3. Set steering wheel to a point approximately 10° from the neutral position and check to ensure that rear wheels turn to the left and right alternately.

Trouble Diagnoses (Cont'd)

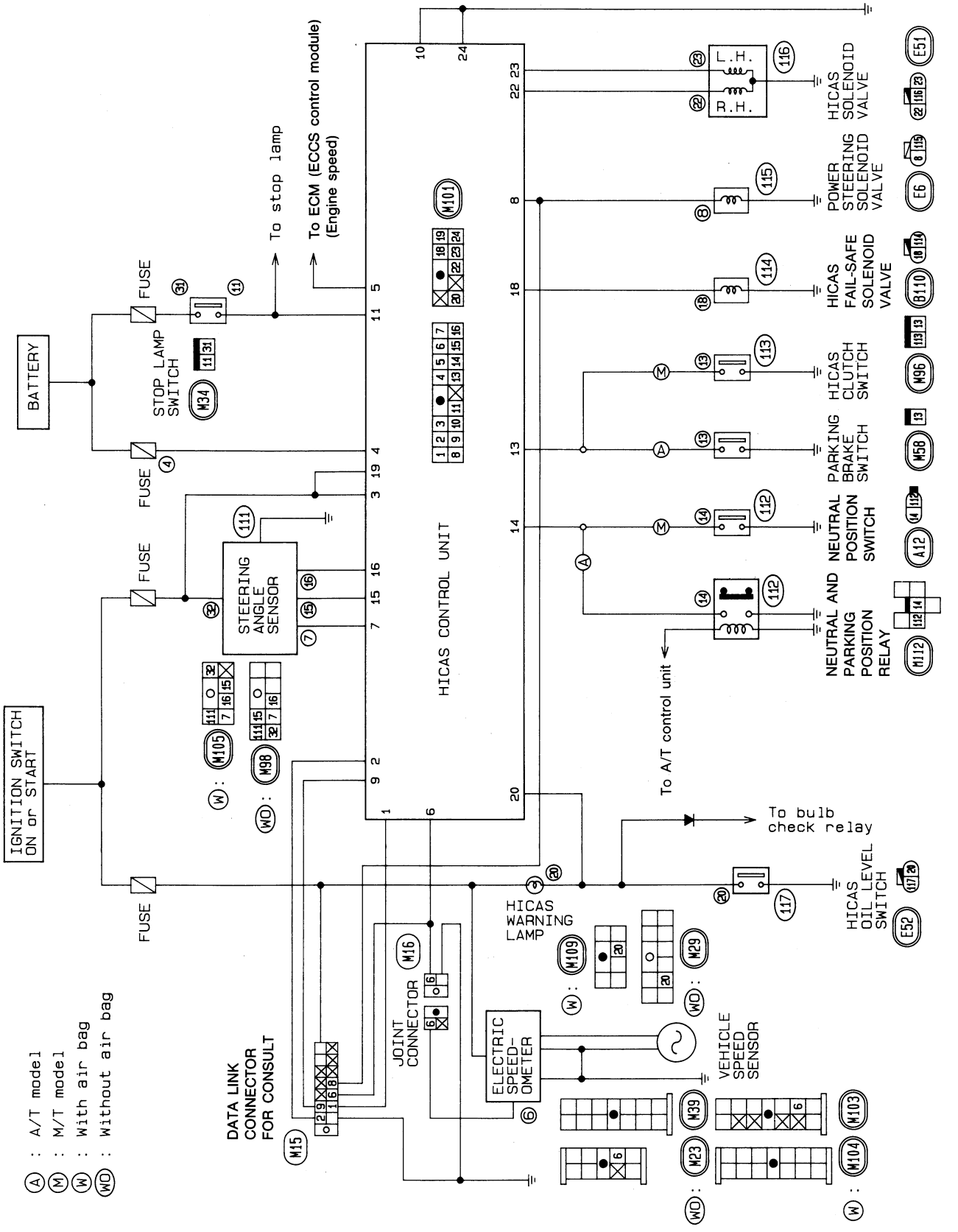
COMPONENT PARTS AND HARNESS CONNECTOR LOCATIONS



SST409B

Trouble Diagnoses (Cont'd)

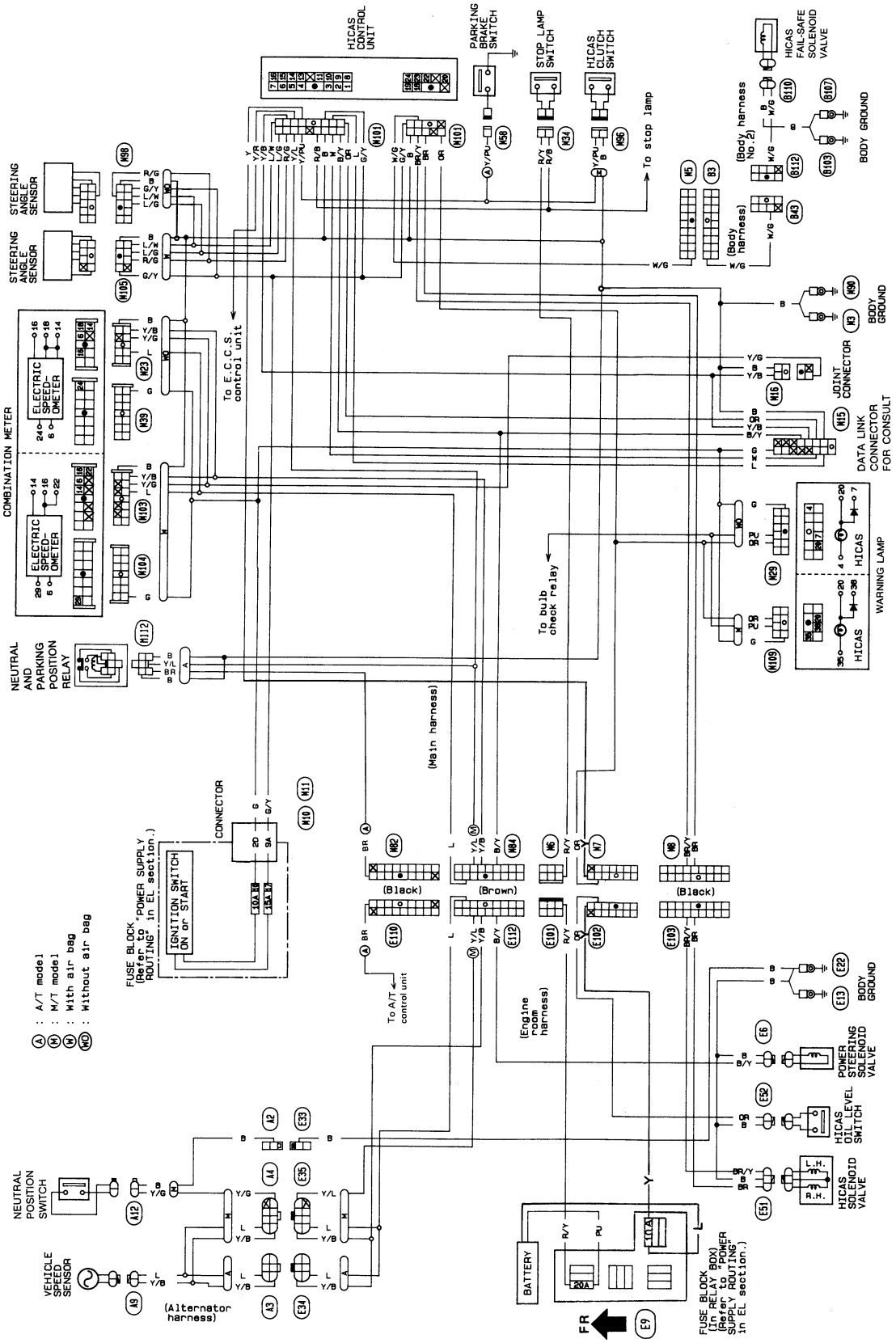
CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



SST050C

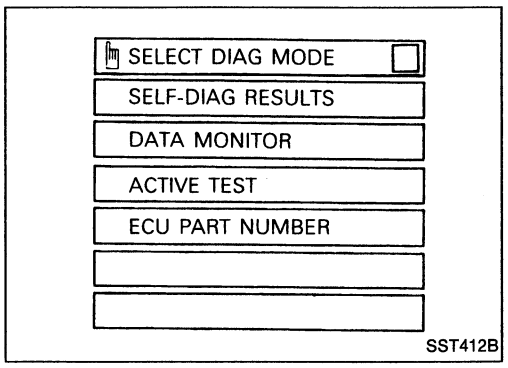
Trouble Diagnoses (Cont'd)

WIRING DIAGRAM



SST049C

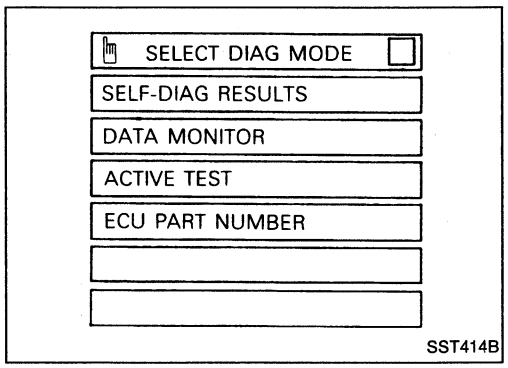
Trouble Diagnoses (Cont'd)



SELF-DIAGNOSIS (When CONSULT is used)

- Start engine.
- Touch START (on CONSULT display).
- Touch HICAS.
- Touch SELF-DIAG RESULTS.

Refer to CONSULT operation manual "HICAS" for details.



For reference:

Recording input/output signals using data monitor function

- Start engine.
- Touch START (on CONSULT display).
- Touch HICAS.
- Touch DATA MONITOR.

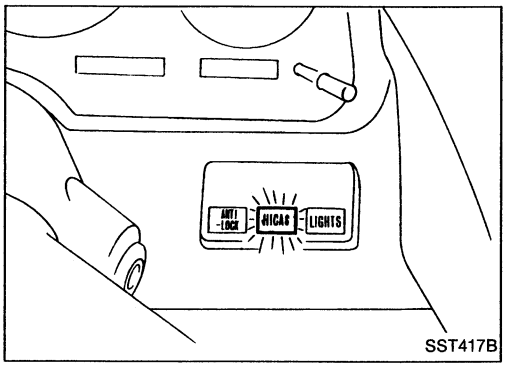
Refer to CONSULT operation manual "HICAS" for details.

SELF-DIAGNOSIS (When CONSULT is not used)

Self-diagnosis procedures

1. Input starting conditions for self-diagnosis.
(1) Turn ignition switch "OFF".
(2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
(3) Turn ignition switch "ON".
(4) Immediately start engine.
(5) Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
2. Input self-diagnosis item.
(1) Depress and release foot brake pedal.
(2) Turn steering wheel from left to right (at least 20°) from the neutral position.
(3) (M/T model)
Depress clutch pedal and move gear shift lever to any position other than Neutral land return to Neutral. Release clutch pedal.
(A/T model)
Disengage and engage parking brake lever. Move shift lever to any position other than Neutral or Parking and return to Parking.
(4) Move car at least 3 meters (10 ft) forward and proceed at an indicated speed of at least 2 km/h (1 MPH) in self-diagnosis mode.

Trouble Diagnoses (Cont'd)



3. The self-diagnosis mode will then appear in the "HICAS" warning lamp.

When all systems are normal:

HICAS warning lamp flashes at 0.25-second intervals.

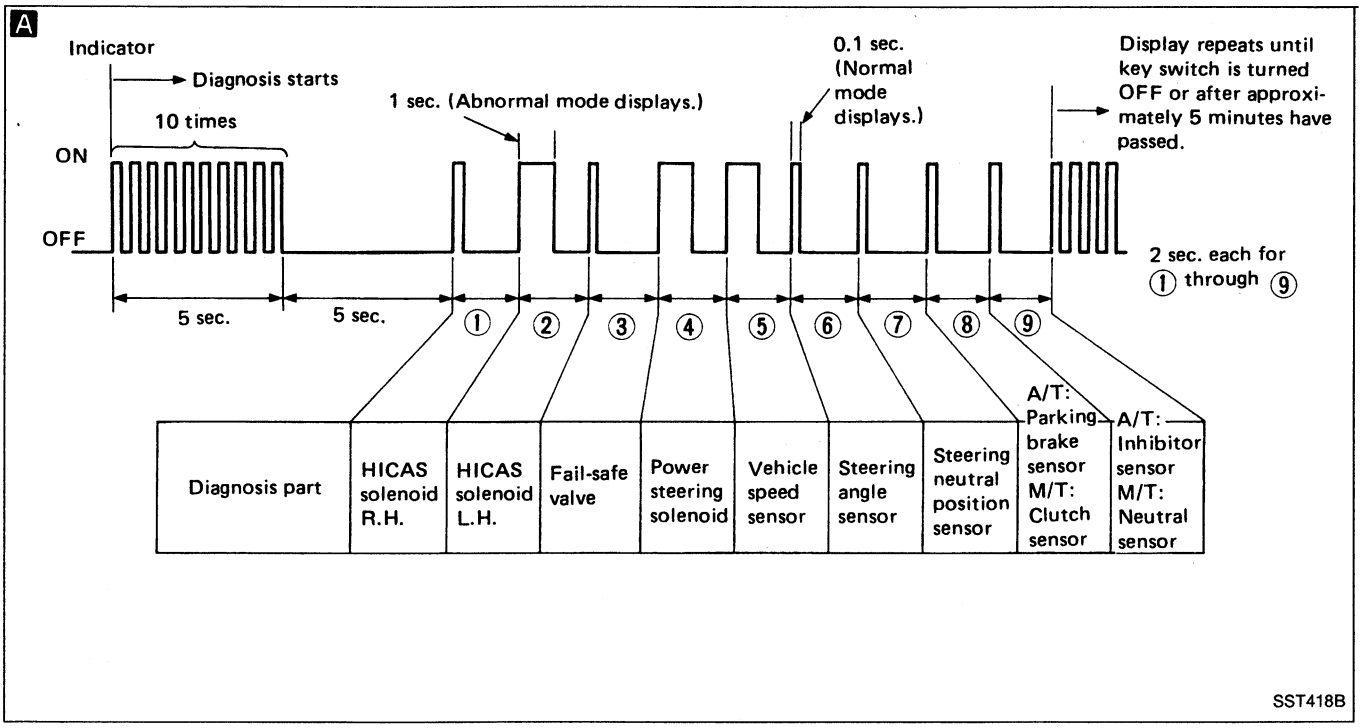
When there is a system malfunction:

Example: When ② HICAS solenoid LH, ④ power steering solenoid and ⑤ vehicle speed sensor have experienced a malfunction.

The warning lamp displays abnormal mode (1 sec. ON).

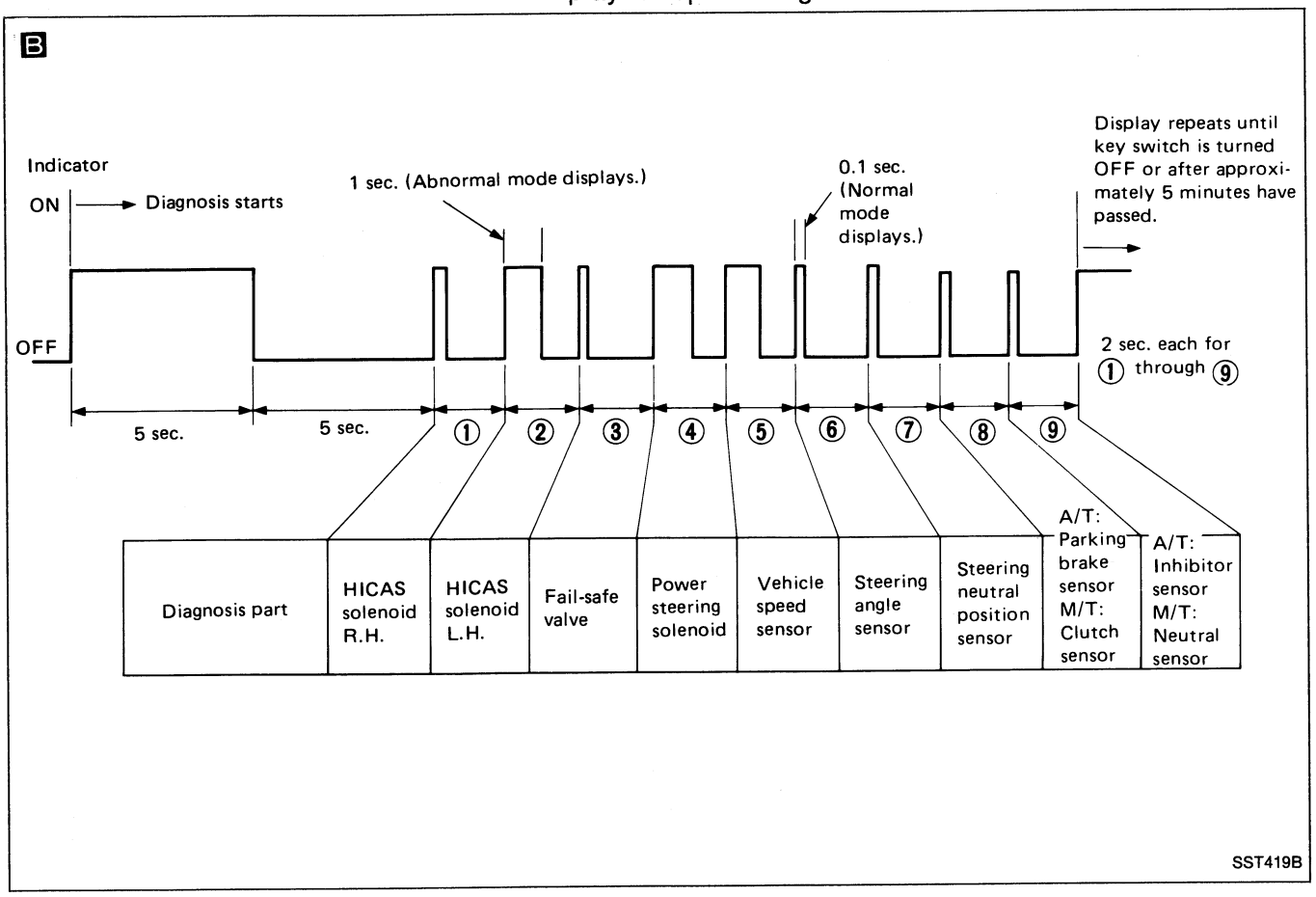
A If fail-safe system was operated (fail-safe valve is operating) when ignition switch was turned OFF for the last time, fail-safe items will be displayed in numerical order in modes indicated. After all items are displayed, display is repeated again.

- **To change the display mode to A , turn OFF ignition switch after mode B is displayed.**
- **When battery charge is insufficient, mode B is displayed.**



Trouble Diagnoses (Cont'd)

B If fail-safe system was not operated when ignition switch was turned OFF for the last time, display will show self-diagnosis results in numerical sequence in modes indicated below. After all self-diagnosis results are shown, display is repeated again.

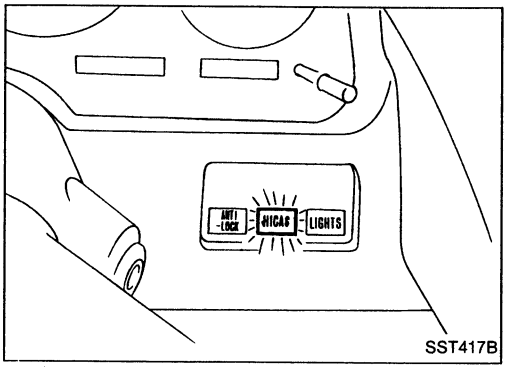


Canceling the self-diagnosis function

There are three methods for canceling the self-diagnosis function, as described below:

- The self-diagnosis system is canceled by the turning ignition switch "OFF".
- After self-diagnosing has been operated for approximately 5 minutes, the self-diagnosis system will be automatically canceled.
- The self-diagnosis system is canceled by a vehicle speed of 30 km/h (19 MPH) or over.

Trouble Diagnoses (Cont'd)

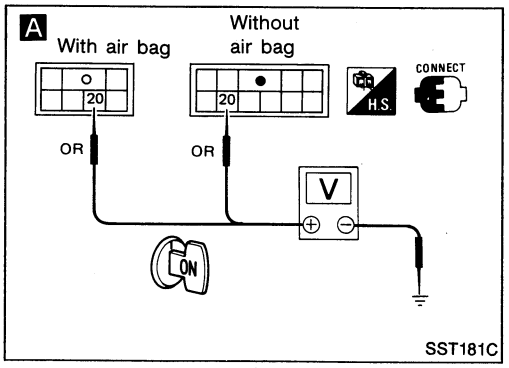


SST417B

DIAGNOSTIC PROCEDURE 1

SYMPTOM:

No warning lamp comes on when ignition switch is turned "ON".



SST181C

START

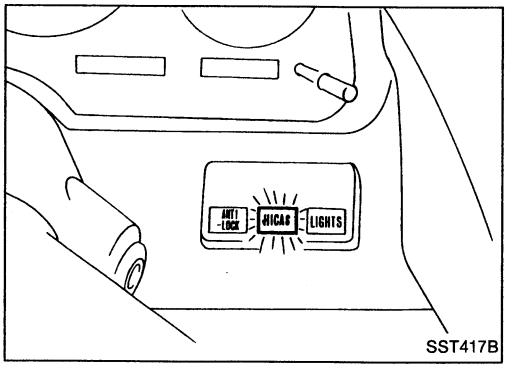
A

CHECK WARNING LAMP POWER SUPPLY.
1) Turn ignition switch "ON".
2) Measure voltage across warning lamp connector terminal ⑳ and ground.
Voltage:
Approximately 12V

N.G. → Check and repair wiring.

O.K.

Replace warning lamp.

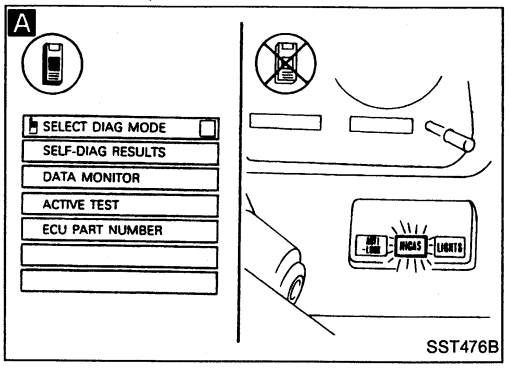


SST417B

DIAGNOSTIC PROCEDURE 2

SYMPTOM (A):

Warning lamp comes on during operation.



SST476B

START

A

Check in self-diagnosis mode.
Refer to page ST-59.

Repair malfunctioning part detected by self-diagnosis.
Refer to Diagnostic Procedures 5 to 12.

O.K. → END

N.G.

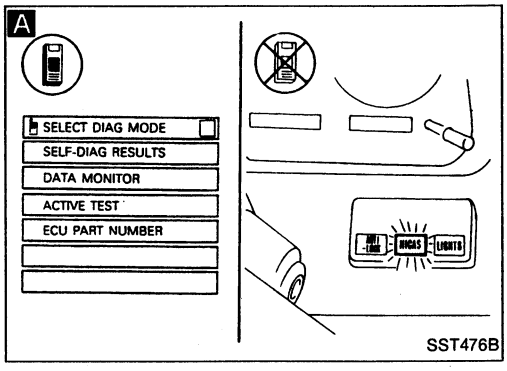
Check connectors for improper contact.

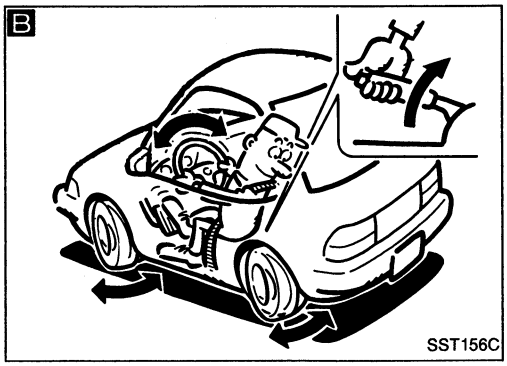
O.K. → END

N.G.

Check steering neutral position.
Refer to page ST-4.

Trouble Diagnoses (Cont'd)





SYMPTOM (B):
Warning lamp stays on after engine starts.

START

A

Check in self-diagnosis mode.
Refer to page ST-59.

O.K. → No engine rpm signal is entered. → Ⓐ

Warning lamp remains ON

N.G. → Repair malfunctioning part detected by self-diagnosis.
Refer to Diagnostic Procedures 5 to 12. → Ⓐ

B

Check rear wheel action.
Left and right rear wheels are turned in response to rotation of steering wheel.
Refer to page ST-54.

No → No power is supplied to control unit.

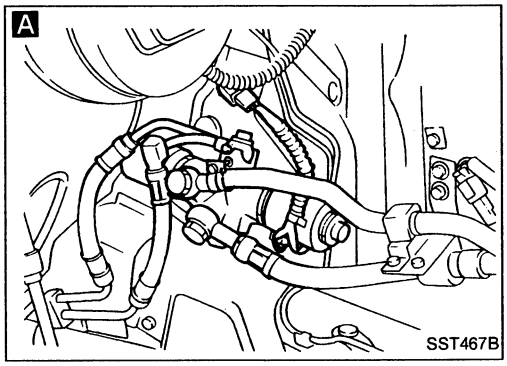
Yes → Insufficient oil quantity.

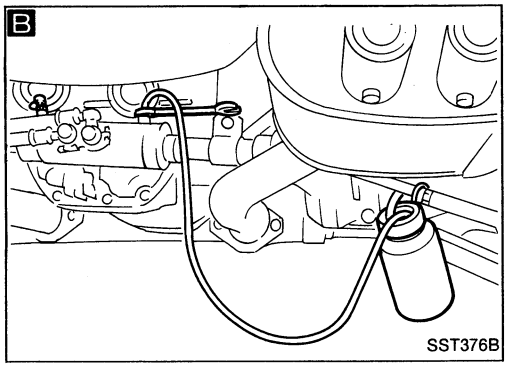
Replace fluid level sensor (on reservoir tank) if warning lamp remains on during engine operation. ← Ⓐ

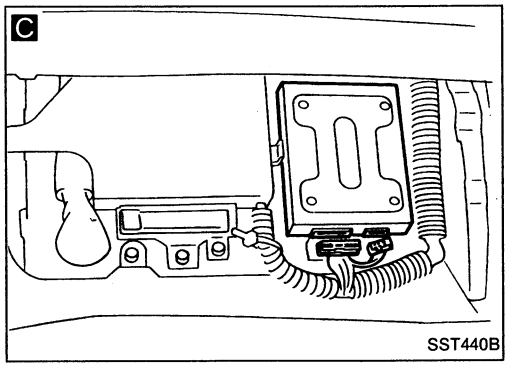
Trouble Diagnoses (Cont'd)

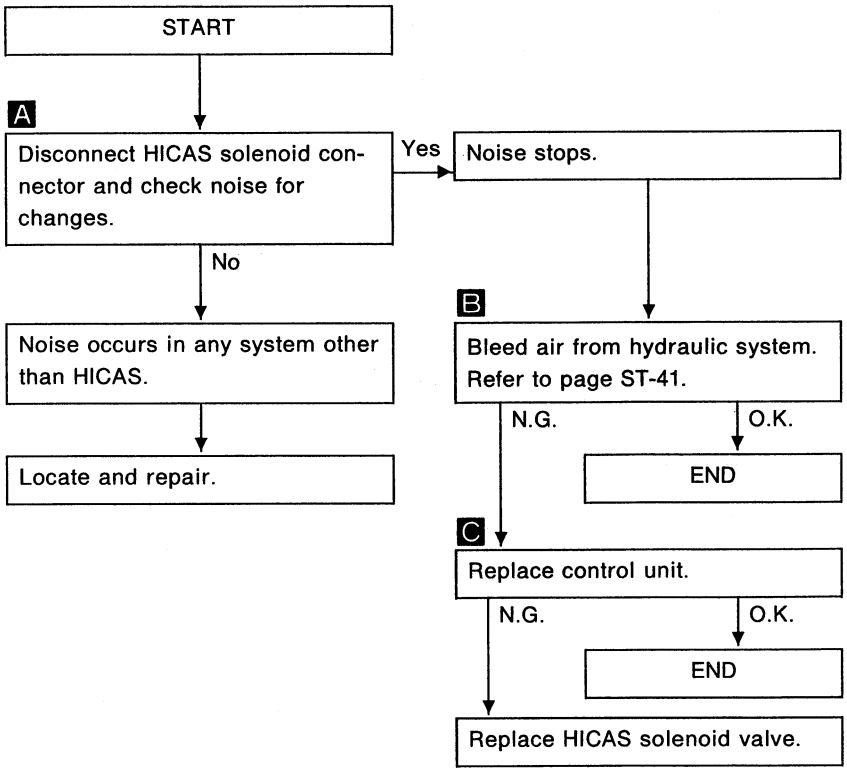
DIAGNOSTIC PROCEDURE 3

SYMPTOM:
Abnormal noise occurs.







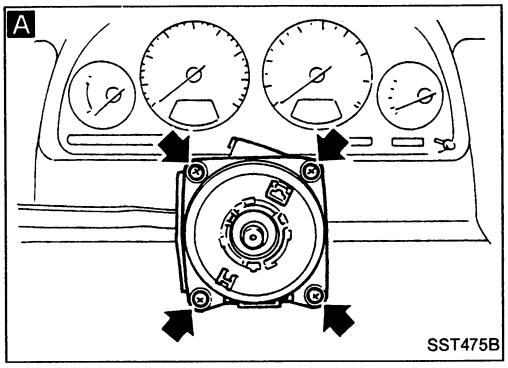


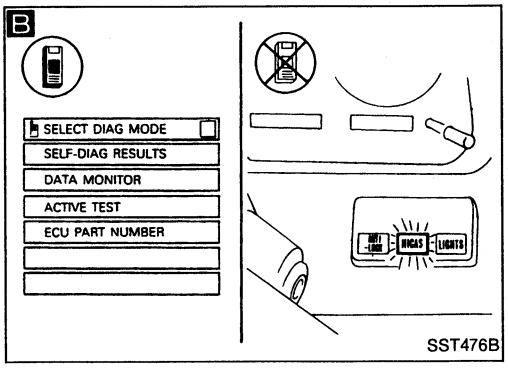
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM:

Vehicle behavior is abnormal. (Vehicle sways or jerks.)





START

A

Check steering wheel neutral position for misalignment and steering angle sensors for looseness.
Refer to page ST-4.

O.K. → END

N.G.

B

Check in self-diagnosis mode.
Refer to page ST-66.

N.G. → Repair malfunctioning system detected by self-diagnosis.
Refer to Diagnostic Procedures 5 to 12.

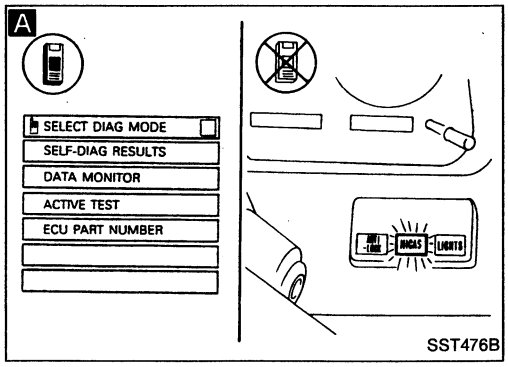
O.K.

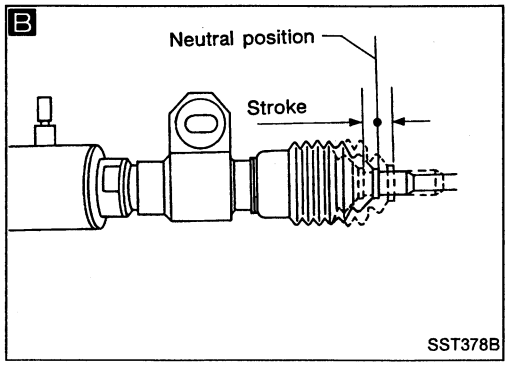
Check static HICAS characteristic performance.
Refer to flow chart A on page ST-66.

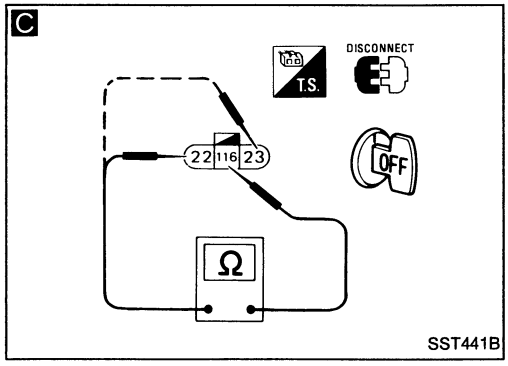
Check dynamic HICAS characteristic performance.
Refer to flow chart B on page ST-68.

Trouble Diagnoses (Cont'd)

A. Static HICAS characteristic performance check







START

A

Set CONSULT in ACTIVE TEST mode.

OR

Set self-diagnosis mode.

Refer to page ST-59.

B

- Run engine at a speed or less than 2,000 rpm.
- Turn steering wheel approximately 180° to the left or right.

CHECK POWER CYLINDER STROKES.

Each stroke from neutral position:

2.9 - 3.1 mm

(0.114 - 0.122 in)

Refer to page ST-44.

O.K. → END

N.G.

C

CHECK RESISTANCE OF HICAS SOLENOID VALVE.

Stop engine and disconnect HICAS solenoid valve.

Measure resistance between HICAS solenoid connector terminals (22) and (23), and (116).

Resistance:

4 - 6Ω

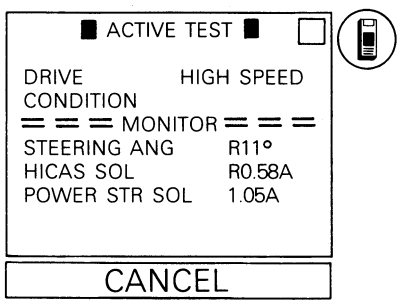
N.G. → Replace HICAS solenoid valve. → (B)

O.K.

(A)

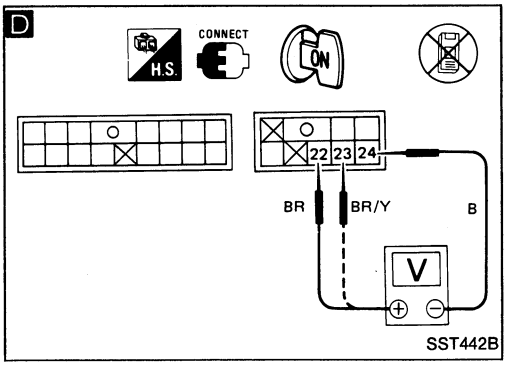
Trouble Diagnoses (Cont'd)

D



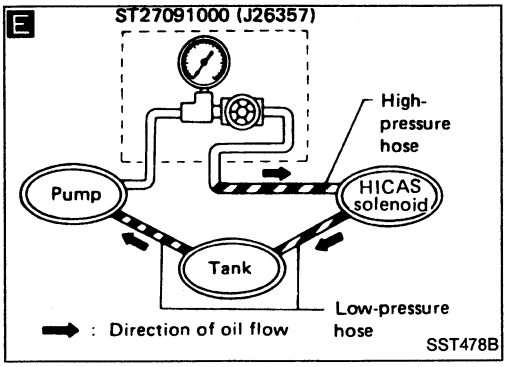
SST377B

D



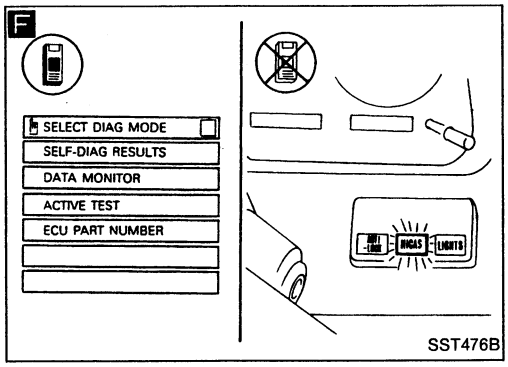
SST442B

E



SST478B

F



SST476B

Ⓐ

D

CHECK CONTROL UNIT OUTPUT VOLTAGE.

Set CONSULT in ACTIVE TEST mode.

HICAS solenoid valve output amperes:
1.1 - 1.2A

OR

Set self-diagnosis mode.

- Run engine at a speed of more than 2,000 rpm.
- Turn steering wheel approximately 180°.
- Measure voltage across control unit connector terminals (22) and (23), and (24).

Output voltage:
More than 4.4V

N.G. → Replace control unit. → Ⓑ

O.K.

E

CHECK HICAS OIL PUMP RELIEF PRESSURE.

- Cancel self-diagnosis mode.
- Check HICAS oil pump relief pressure with engine running at a speed of more than 2,000 rpm.

Relief pressure:
More than 5,884 kPa
(60 kg/cm², 853 psi)

N.G. → Replace oil pump. → Ⓑ

O.K.

F

CHECK OIL PRESSURE AT FAIL-SAFE VALVE.

Set CONSULT in ACTIVE TEST mode.

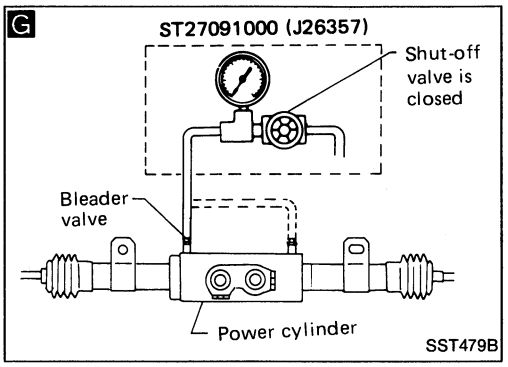
OR

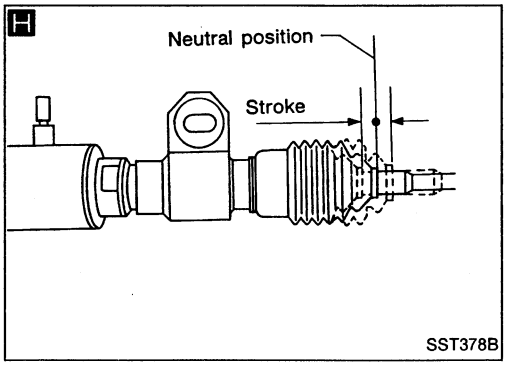
Set self-diagnosis mode.

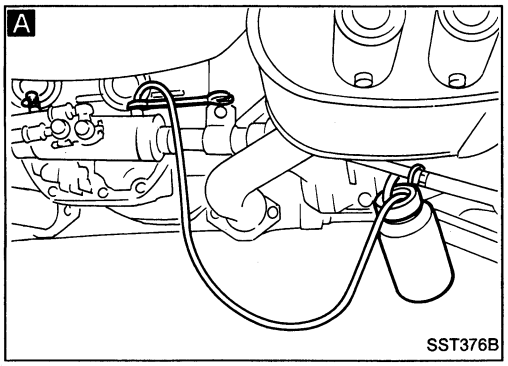
Ⓒ

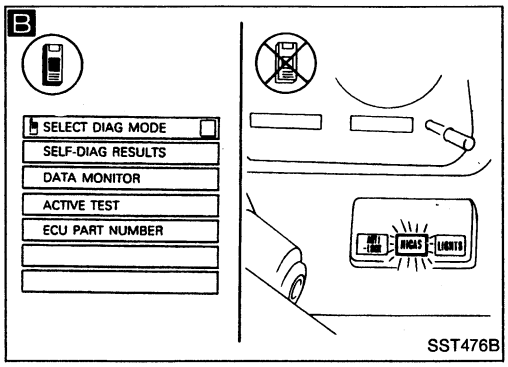
GI MA EM LC EF & EC FE CL MT AT PD FA RA BR ST BF HA EL

Trouble Diagnoses (Cont'd)









Ⓒ

G

- Run engine at a speed of more than 2,000 rpm and turn steering wheel approximately 180° to the left and right.
- Check oil pressure at bleeder valve of power cylinder.

Oil pressure:
More than 5,394 kPa
(55 kg/cm², 782 psi)

N.G. → Replace HICAS solenoid valve.

O.K. ↓

Replace power cylinder.

H

CHECK POWER CYLINDER STROKE.
Each stroke from neutral position:
2.9 - 3.1 mm
(0.114 - 0.122 in)
Refer to page ST-44.

N.G. → Replace fail-safe valve.

O.K. → (Go to Ⓑ on page ST-66.)

B. Dynamic HICAS characteristic performance check

START

A

CHECK PIPING AND CONNECTIONS. ALSO BLEED AIR FROM HYDRAULIC SYSTEM.
- Replace piping or connectors which are found to be damaged.
- Bleed air from hydraulic system. Refer to page ST-41.

B

Set CONSULT in ACTIVE TEST mode.

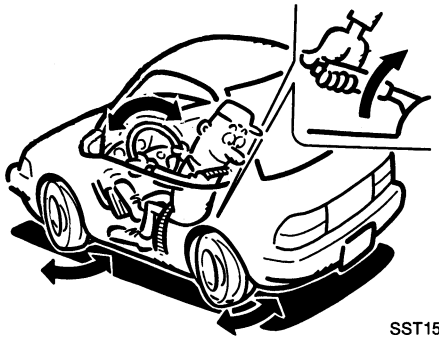
OR

Set in self-diagnosis mode. Refer to page ST-59.

Ⓐ

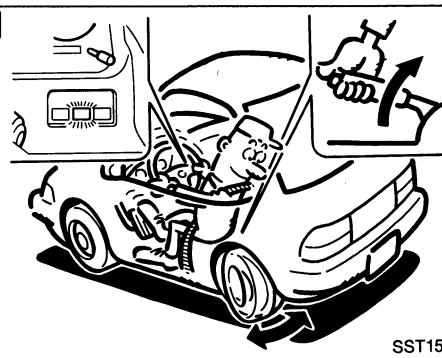
Trouble Diagnoses (Cont'd)

C



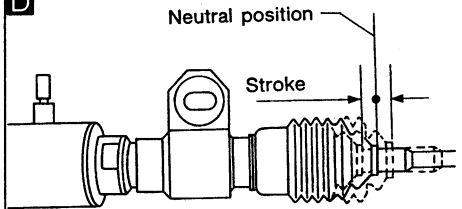
SST156C

C



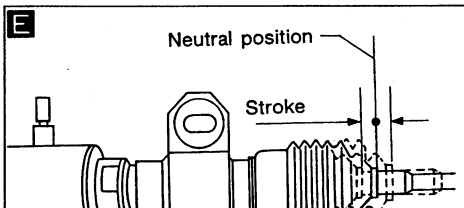
SST157C

D



SST378B

E



SST378B

Ⓐ

Run engine at a speed of more than 2,000 rpm.

C

CHECK REAR WHEELS FOR PROPER MOVEMENT.

Ensure that rear wheel turns to the left or right when steering wheel is turned to the left or right.

OR

Ensure that rear wheels intermittently turn to the left and right when steering wheel is set to the neutral position.

D

CHECK POWER CYLINDER STROKES.
Each stroke from neutral position:
More than 2.0 mm
(0.079 in)

O.K. → END

N.G.

Replace HICAS solenoid valve.

E

CHECK POWER CYLINDER STROKE.
- After replacing HICAS solenoid valve, check power cylinder stroke.
  Each stroke from neutral position:
  More than 2.0 mm
  (0.079 in)

O.K. → END

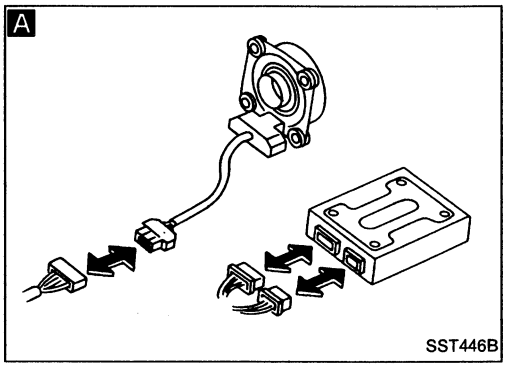
N.G.

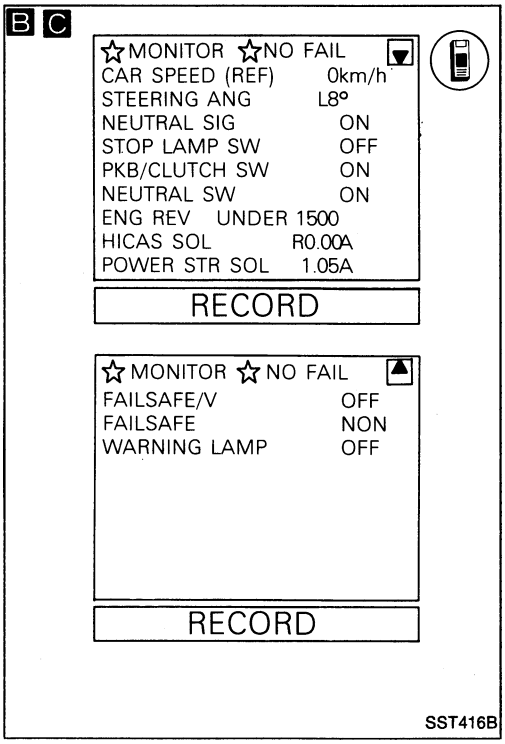
Replace power cylinder.

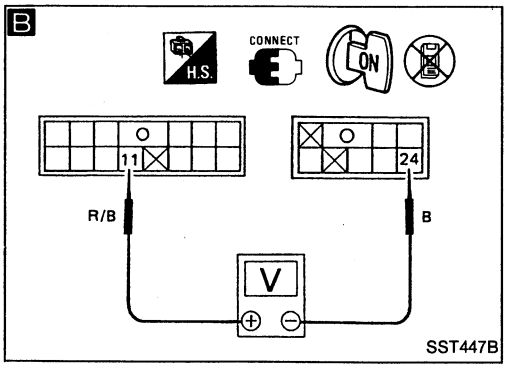
Trouble Diagnoses (Cont'd)

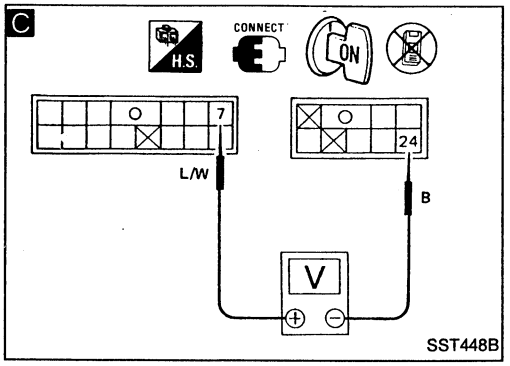
DIAGNOSTIC PROCEDURE 5

SYMPTOM:
System is not set in self-diagnosis mode.









START

A

CHECK CONNECTOR CONTINUITY.
Disconnect steering angle sensor connector and control unit connector, and reconnect them firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK STOP LAMP INPUT SIGNAL.

Set CONSULT in DATA MONITOR mode.
Check "STOP LAMP SW" ON-OFF display while operating brake pedal.

OR

Check that stop lamp input is present at control unit.
Brake ON:
Approximately 12V
Brake OFF:
0V

N.G. → Malfunctioning stop lamp switch system

O.K.

C

CHECK STEERING NEUTRAL POSITION SENSOR INPUT SIGNAL.

Set CONSULT in DATA MONITOR mode.
Check "NEUTRAL SIG" ON-OFF display while turning steering wheel to the right and left at least 20° from the neutral position.

OR

Check that steering neutral input is present at control unit when steering wheel is turned to the left and right at least 20° from the neutral position.
Neutral position:
Approximately 5V
When turned at least 20°:
0V

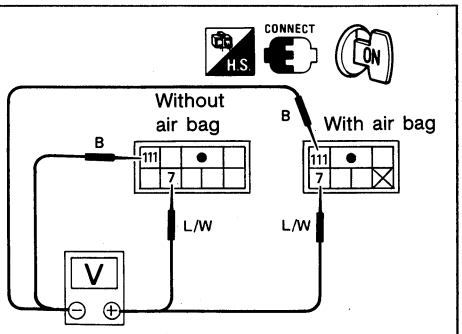
O.K. → Replace control unit.

N.G.

Ⓐ

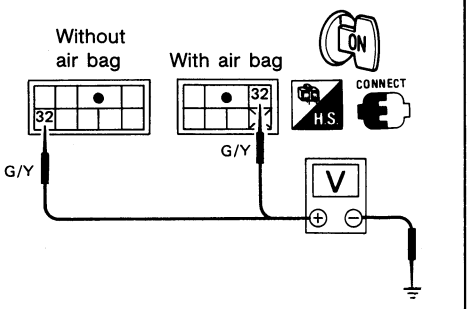
Trouble Diagnoses (Cont'd)

D



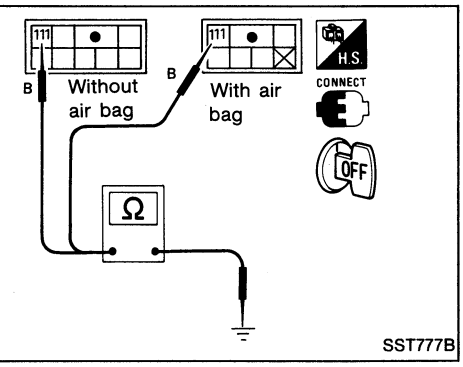
SST775B

E



SST776B

F



SST777B

Ⓐ

D

CHECK STEERING ANGLE SENSOR OUTPUT SIGNAL.
Check that steering neutral output is present when steering wheel is turned to the left and right at least 20° from the neutral position.
Neutral position:
Approximately 5V
When turned at least 20°:
0V

O.K. → Repair or replace harness between control unit and steering angle sensor.

N.G. ↓

E CHECK STEERING ANGLE SENSOR POWER SUPPLY.
1) Turn ignition switch "ON".
2) Measure voltage across steering angle sensor connector terminal IGN and ground.
Voltage:
Approximately 12V

O.K. → Replace steering angle sensor.

F CHECK STEERING ANGLE SENSOR GROUND CIRCUIT.
Check continuity between steering angle sensor terminal GND and body ground.
Continuity should exist.

N.G. ↓

Check and repair power supply harness or ground harness.

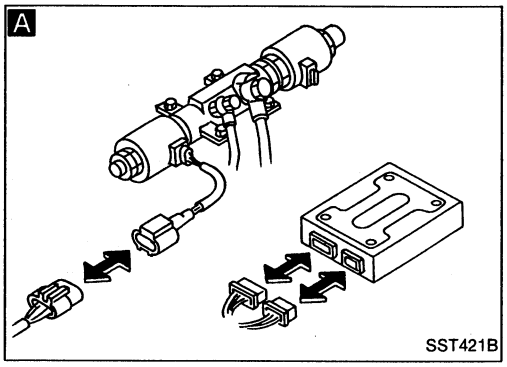
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

SYMPTOM:

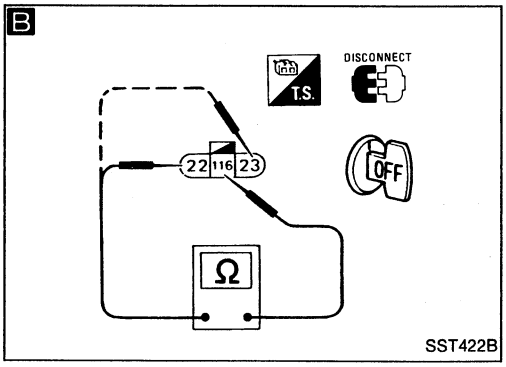
HICAS solenoid (left and right) output is not present.

A



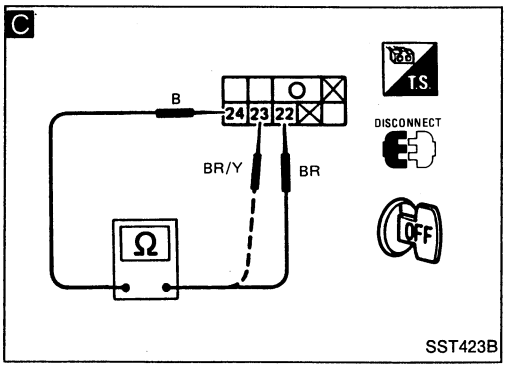
SST421B

B



SST422B

C



SST423B

START

A

CHECK CONNECTOR CONTINUITY. Disconnect HICAS solenoid connector and control unit connector, and reconnect them firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK RESISTANCE OF LEFT AND RIGHT HICAS SOLENOIDS (on solenoid side).

1) Disconnect HICAS solenoid connector.
2) Measure resistance between HICAS solenoid connector terminals ㉒ and ㉓, and (116).

Resistance:

4 - 6Ω

N.G. → Replace HICAS solenoid

O.K.

C

CHECK RESISTANCE OF LEFT AND RIGHT HICAS SOLENOIDS (on control unit side).

1) Disconnect control unit connector.
2) Measure resistance between body connector terminals ㉒ and ㉓, and ㉔.

Resistance:

4 - 6Ω

O.K. → Replace control unit.

N.G.

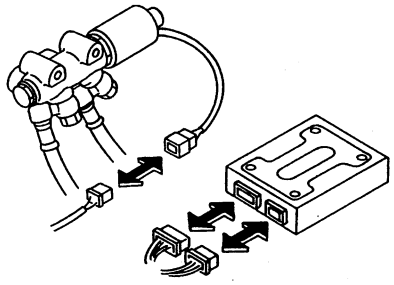
Repair or replace harness between control unit and HICAS solenoid.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7

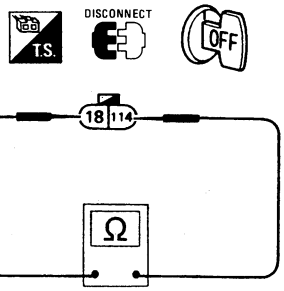
SYMPTOM:
Fail-safe valve output is not present.

A



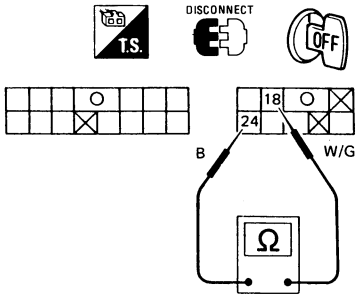
SST424B

B



SST425B

C



SST471B

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect fail-safe valve connector and control unit connector, and reconnect them firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK RESISTANCE OF FAIL- SAFE VALVE (on fail-safe valve side).
1) Disconnect fail-safe valve connector.
2) Measure resistance between connector terminals ⑱ and ⑭.
Resistance:
13 - 17Ω

N.G. → Replace fail-safe valve.

O.K.

C

CHECK RESISTANCE OF FAIL- SAFE VALVE (on control unit side).
1) Disconnect control unit connector.
2) Measure resistance between body connector terminals ⑱ and ㉔.
Resistance:
13 - 17Ω

O.K. → Replace control unit.

N.G.

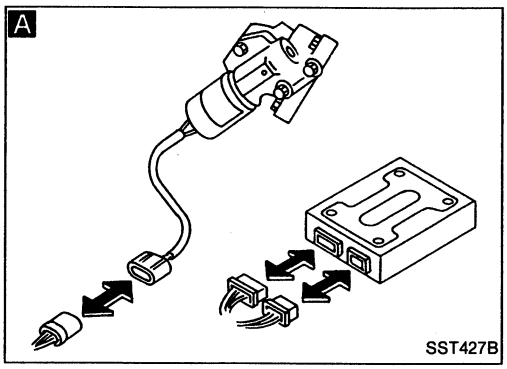
Repair or replace harness between control unit and fail-safe valve.

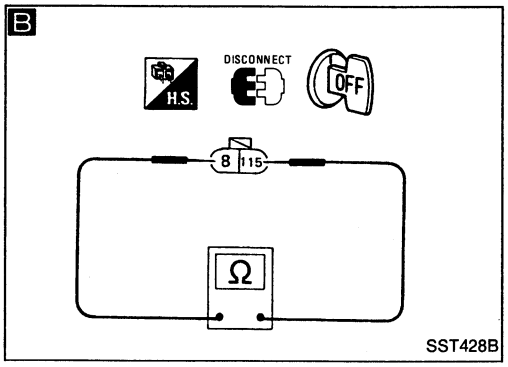
Trouble Diagnoses (Cont'd)

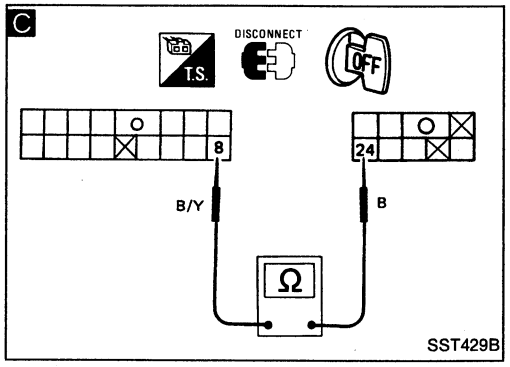
DIAGNOSTIC PROCEDURE 8

SYMPTOM:

Power steering solenoid output is not present.







START

A

CHECK CONNECTOR CONTINUITY.
Disconnect power steering solenoid connector and control unit connector, and reconnect them firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK RESISTANCE OF POWER STEERING SOLENOID (on solenoid side).
1) Disconnect power steering solenoid connector.
2) Measure resistance between solenoid connector terminals ⑧ and ⑮.
Resistance:
4 - 6Ω

N.G. → Replace power steering solenoid.

O.K.

C

CHECK RESISTANCE OF POWER STEERING SOLENOID (on control unit side).
1) Disconnect control unit connector.
2) Measure resistance between body connector terminals ⑧ and ㉔.
Resistance:
4 - 6Ω

O.K. → Replace control unit.

N.G.

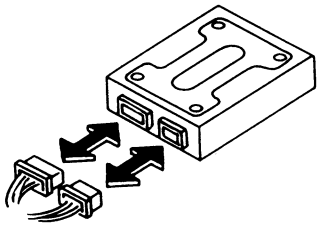
Repair or replace harness between control unit and power steering solenoid.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 9

SYMPTOM:
Vehicle speed signal is not present.

A



SST430B

B

☆MONITOR ☆NO FAIL	
CAR SPEED (REF)	0km/h
STEERING ANG	L8°
NEUTRAL SIG	ON
STOP LAMP SW	OFF
PKB/CLUTCH SW	ON
NEUTRAL SW	ON
ENG REV	UNDER 1500
HICAS SOL	R0.00A
POWER STR SOL	1.05A

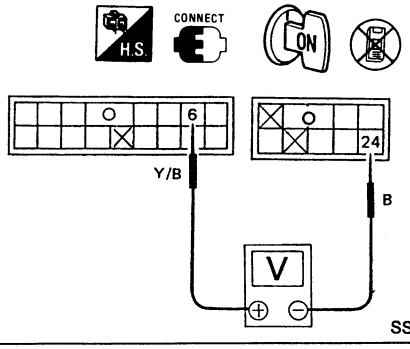
RECORD

☆MONITOR ☆NO FAIL	
FAILSAFE/V	OFF
FAILSAFE	NON
WARNING LAMP	OFF

RECORD

SST416B

B



SST182C

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.
1) Raise rear end of vehicle so that rear wheels rotate freely.
2) Set CONSULT in DATA MONITOR mode.
Check "CAR SPEED (REF)" display while rotating rear wheels by hand.
OR
Measure voltage variations between control unit connector terminals ⑥ and ㉔ while slowly rotating rear wheels by hand.
Voltage must change between 0 and 5V.

O.K. → Replace control unit.

N.G.

Repair or replace harness between speed sensor or control unit and speedometer.

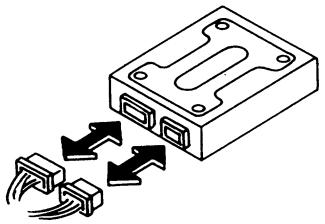
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 10

SYMPTOM:

Steering angle sensor input is not present.

A



SST430B

B

☆MONITOR ☆NO FAIL	
CAR SPEED (REF)	0km/h
STEERING ANG	L8°
NEUTRAL SIG	ON
STOP LAMP SW	OFF
PKB/CLUTCH SW	ON
NEUTRAL SW	ON
ENG REV	UNDER 1500
HICAS SOL	R0.00A
POWER STR SOL	1.05A

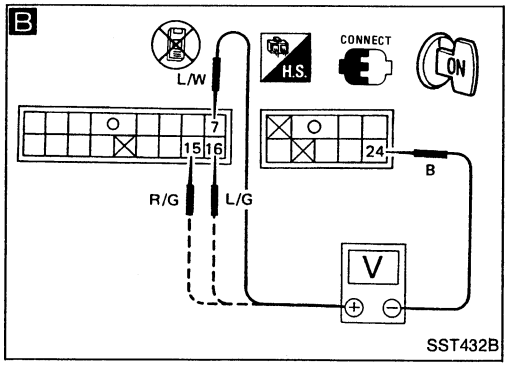
RECORD

☆MONITOR ☆NO FAIL	
FAILSAFE/V	OFF
FAILSAFE	NON
WARNING LAMP	OFF

RECORD

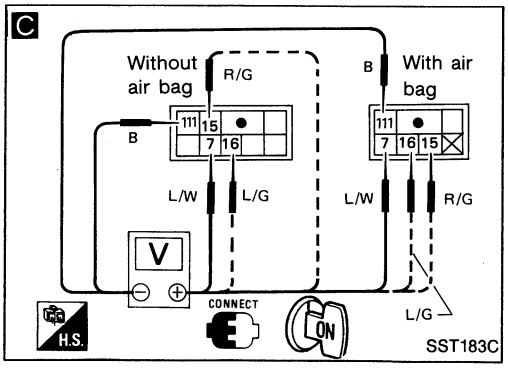
SST416B

B



SST432B

C



SST183C

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Set CONSULT in DATA MONITOR mode.
Check "STEERING ANG" and "NEUTRAL SIG" display while turning steering wheel to the right and left at least 20° from the neutral position.

OR

Measure voltage variations between control unit terminals ⑦, ⑮ and ⑯, and ㉔ when steering wheel is slowly turned to the left and right at least 20° from the neutral position.
Do not turn steering wheel quickly.
Voltage must change from 0 to at least 5V.

O.K. → Replace control unit.

N.G.

C

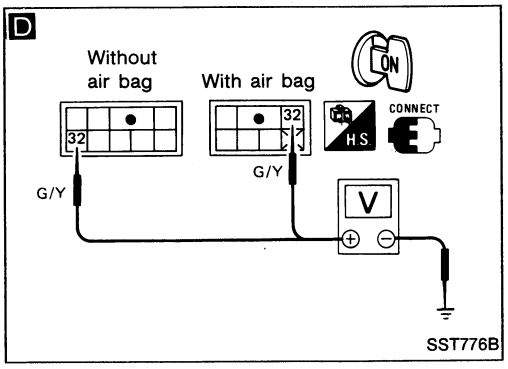
CHECK STEERING ANGLE SENSOR OUTPUT SIGNAL.
1) Turn signal switch "ON".
2) Measure voltage variations between steering angle sensor connector terminals ⑦, ⑮ and ⑯, and ㉛.
Voltage must change from 0 to at least 5V.

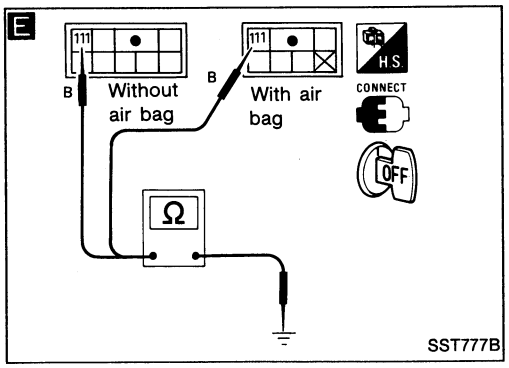
O.K. → Repair or replace harness between control unit and steering angle sensor.

N.G.

Ⓐ

Trouble Diagnoses (Cont'd)





Ⓐ

D CHECK STEERING ANGLE SENSOR POWER SUPPLY.

1) Turn ignition switch "ON".
2) Measure voltage across steering angle sensor connector terminal (32) and ground.

Voltage:
Approximately 12V

O.K. → Replace steering angle sensor.

E CHECK STEERING ANGLE SENSOR GROUND CIRCUIT.

Check continuity between steering angle sensor terminal (111) and body metal (ground).

Continuity should exist.

N.G. → Repair or replace power supply harness or ground harness.

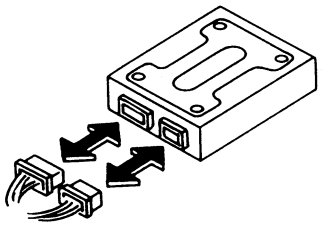
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 11

SYMPTOM:

Parking brake (A/T) or clutch switch (M/T) input is not present.

A



SST430B

B

☆MONITOR ☆NO FAIL	
CAR SPEED (REF)	0km/h
STEERING ANG	L8°
NEUTRAL SIG	ON
STOP LAMP SW	OFF
PKB/CLUTCH SW	ON
NEUTRAL SW	ON
ENG REV	UNDER 1500
HICAS SOL	R0.00A
POWER STR SOL	1.05A

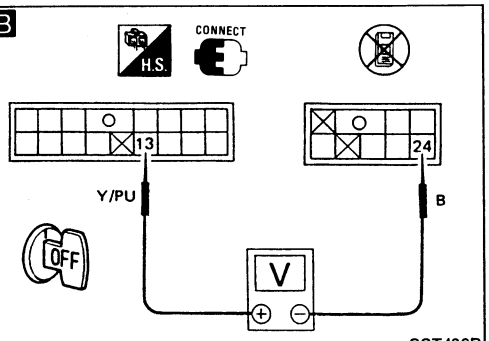
RECORD

☆MONITOR ☆NO FAIL	
FAILSAFE/V	OFF
FAILSAFE	NON
WARNING LAMP	OFF

RECORD

SST416B

B



SST436B

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.

Set CONSULT in DATA MONITOR mode.
Check "PKB/CLUTCH SW" ON-OFF display while pulling parking brake (A/T) or depressing clutch pedal (M/T).

OR

Measure voltage variations between control unit terminals ⑬ and ㉔ when parking brake is pulled (A/T) or clutch is depressed (M/T).

Voltage:
0V → Approximately 12V

O.K. → Replace control unit.

N.G.

Check parking brake switch or clutch switch and harness.

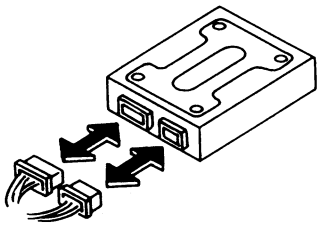
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 12

SYMPTOM:

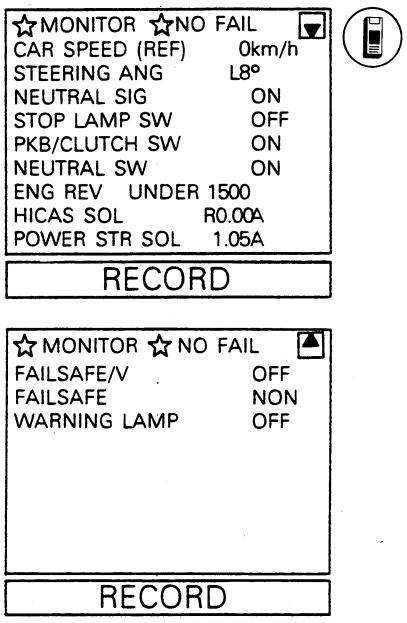
Inhibitor switch (A/T) or neutral switch (M/T) input is not present.

A



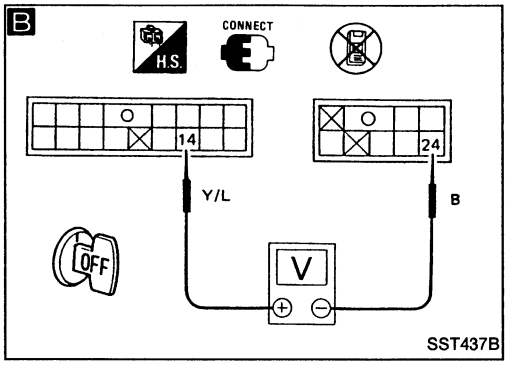
SST430B

B



SST416B

B



SST437B

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.

Set CONSULT in DATA MONITOR mode.
Check "NEUTRAL SW" ON-OFF display while moving selector lever from P or N to any other position (A/T) or moving shift lever from neutral position to any other position (M/T).

OR

Measure voltage variations between control unit terminals ⑭ and ㉔ when shift lever is moved from P to any other position (A/T) or shift lever is moved from neutral to any other position (M/T).

Voltage:
0V → Approximately 12V

O.K. → Replace control unit.

N.G.

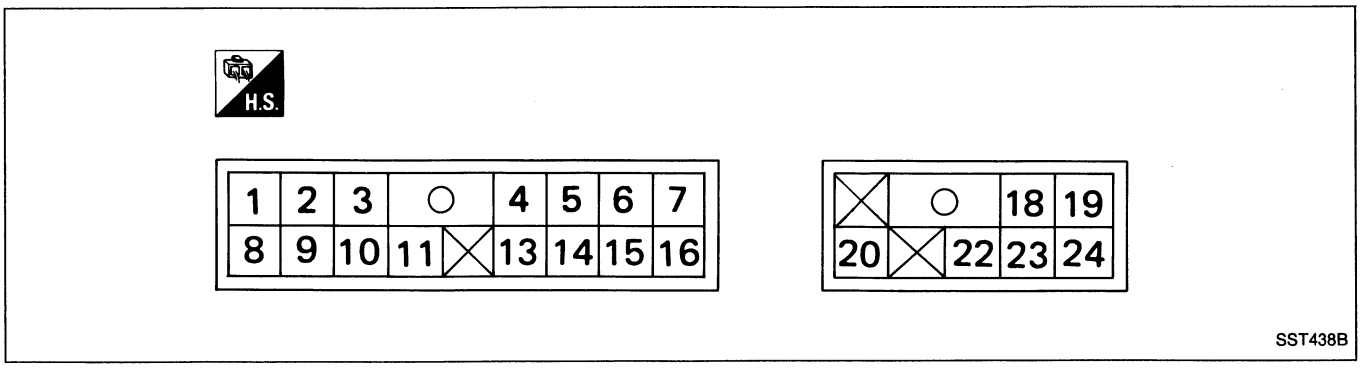
Check inhibitor switch or neutral switch and harness.

Trouble Diagnoses (Cont'd)

CONTROL UNIT INSPECTION TABLE

The standard values (voltage) measured with an analog tester, in contact with the control unit terminal, are shown below:

Terminal No.	Application	Standard value
1	Service support CLK input	Pulse wave (153.6 kHz Approximately 7V)
2	Service support RX output (Reception from CONSULT)	(Not specified serial pulse data)
3	IGN power supply	Key switch ON: Approximately 12V Key switch in other position: 0V
4	Battery	Approximately 12V
5	ECCS revolution signal	Refer to "Electrical Components Inspection" in "TROUBLE DIAGNOSES" section of EF & EC.
6	Vehicle speed signal	Rear wheel rotating 0V ←→ greater than 5V (approx.), intermittent
7	Steering neutral position sensor	Approximately 5V (Neutral position)
8	Resistance of power steering solenoid	4 - 6Ω
9	Service support TX output (Transmission for CONSULT)	(Not specified serial pulse data)
10	Ground	0V
11	Stop lamp switch signal	Brake ON: Approximately 12V Brake OFF: 0V
13	Parking brake signal (A/T), Clutch signal (M/T)	Parking brake engaged (A/T)/ clutch disengaged (M/T): Approximately 12V
14	Inhibitor signal (A/T), Neutral signal (M/T)	Shift lever in any position other than Parking (A/T) or neutral (M/T): Approximately 12V
15	Steering angle sensor-1 signal	Steering wheel turned 0 ←→ Approximately 5V, intermittent
16	Steering angle sensor-2 signal	Steering wheel turned 0 ←→ Approximately 5V, intermittent
18	Resistance of fail-safe valve	13 - 17Ω
19	IGN power supply	Ignition switch ON: Approximately 12V Ignition switch in other position: 0V
20	HICAS warning lamp	Lamp ON: 0V Lamp OFF: Approximately 12V
22	Resistance of HICAS solenoid (R.H.)	4 - 6Ω (Voltage varies with steering operation.)
23	Resistance of HICAS solenoid (L.H.)	4 - 6Ω (Voltage varies with steering operation.)
24	Ground	0V



General Specifications

	Without SUPER HICAS	With SUPER HICAS
Steering model	Power steering	
Steering gear type	PR26SE	
Steering overall gear ratio	16.9	14.8
Turn of steering wheel (Lock to lock)	2.7	2.4
Steering column type	Collapsible	

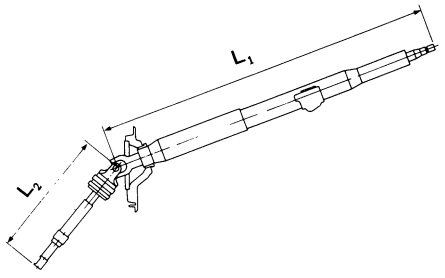
Inspection and Adjustment

STEERING WHEEL

Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	0 - 35 (0 - 1.38)

STEERING COLUMN

	Without air bag	With air bag
Steering column length "L_1" mm (in)	745.9 - 747.5 (29.37 - 29.43)	749.4 - 751.0 (29.50 - 29.57)
Steering column lower shaft length "L_2" mm (in)	280.6 - 282.2 (11.05 - 11.11)	

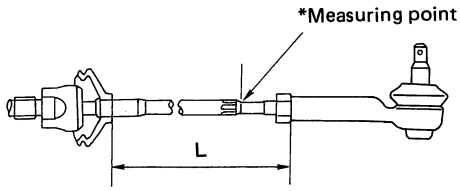


SST315B

STEERING GEAR AND LINKAGE

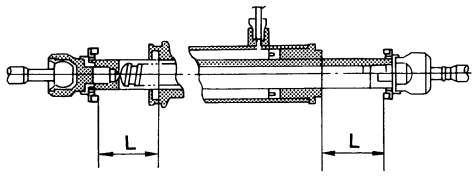
Steering gear type	PR26SE
Tie-rod outer ball joint	
Swinging force "A" (at cotter pin hole) N (kg, lb)	4.61 - 46.09 (0.47 - 4.7, 1.04 - 10.36)
Rotating torque "B" N·m (kg-cm, in-lb)	0.29 - 2.94 (3.0 - 30.0, 2.6 - 26.0)
Axial end play "C" mm (in)	0 (0)
Tie-rod inner ball joint	
Swinging force* "A" N (kg, lb)	8.8 - 78.5 (0.9 - 8.0, 2.0 - 17.6)
Axial end play "C" mm (in)	0 (0)
Tie-rod standard length "L" mm (in)	155 (6.10)

*: Measuring point



SST161C

Rack stroke "L" mm (in)	59.5 (2.343)



SST307B

Inspection and Adjustment (Cont'd)

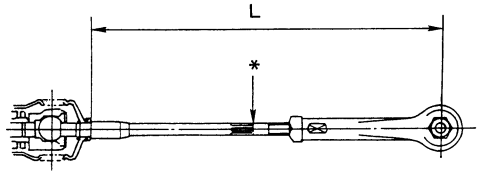
POWER STEERING

	Without SUPER HICAS	With SUPER HICAS
Rack sliding force N (kg, lb)		
Under normal operating oil pressure		
Range within ±11.5 mm (±0.453 in) from the neutral position	206 - 265 (21 - 27, 46 - 60)	201.0 - 250.1 (20.5 - 25.5, 45.2 - 56.2)
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	60° - 100°	
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)	1.3 (1-3/8, 1-1/8)	2.0 (2-1/8, 1-3/4)
Oil pump maximum pressure kPa (kg/cm^2, psi)	7,649 - 8,238 (78 - 84, 1,109 - 1,194)	Main: 7,649 - 8,238 (78 - 84, 1,109 - 1,194) Sub: 6,375 - 6,865 (65 - 70, 924 - 995)

POWER CYLINDER LOWER LINK (SUPER HICAS)

Power cylinder lower link ball joint		
Swinging force*	N (kg, lb)	2.9 - 41.2 (0.3 - 4.2, 0.7 - 9.3)
Axial end play	mm (in)	0 (0)
Power cylinder lower link standard length "L"	mm (in)	309.5 (12.19)
Stroke	mm (in)	3.0 (0.118)

*: Measuring point



SST486B

SECTION BF

CONTENTS

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

★ For conventional seat belt, refer to MA section.

Precautions

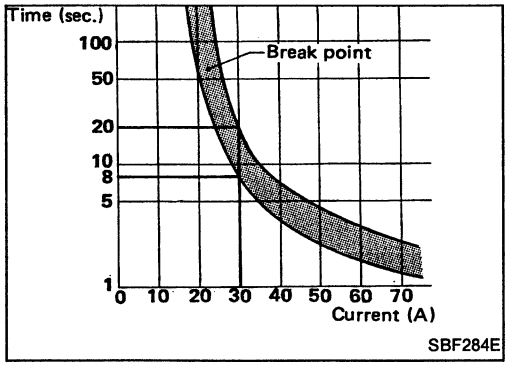
- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing 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.

Supplemental Restraint System "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**



Circuit Breaker Inspection

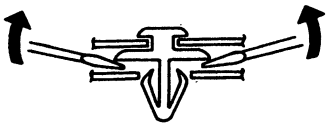
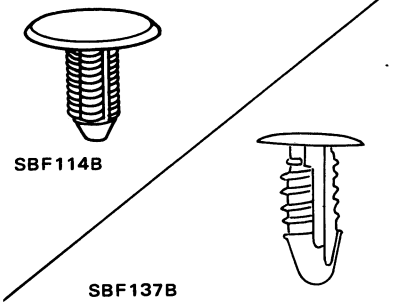
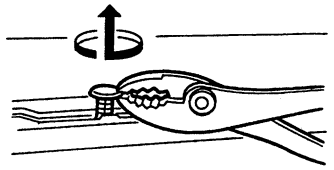
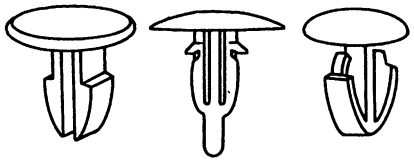
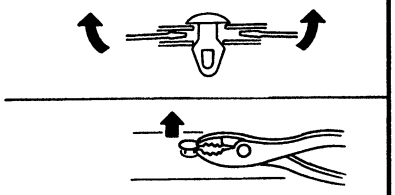
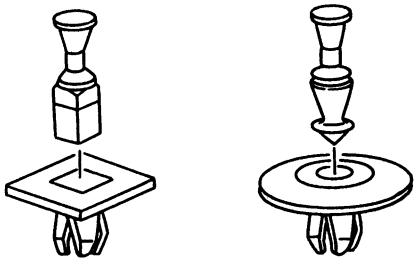
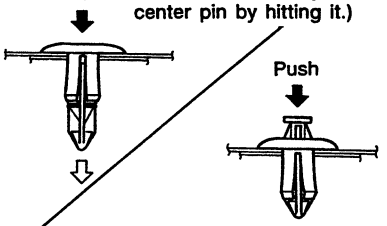
For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

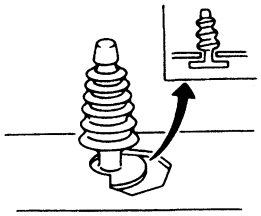
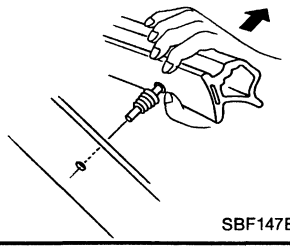
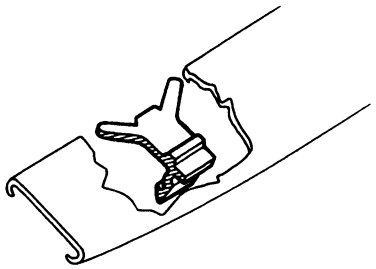
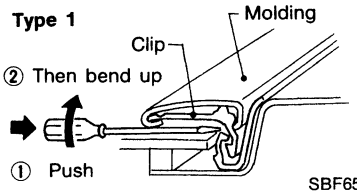
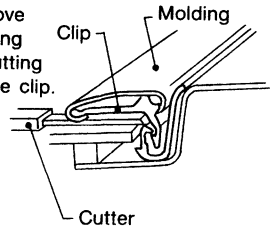
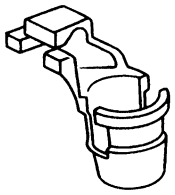
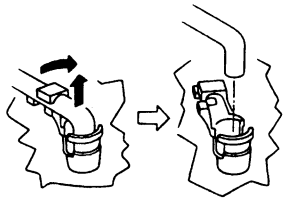
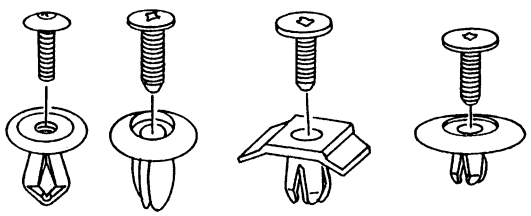
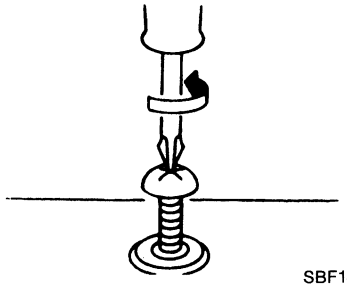
- Power window & power door lock
- Power seat

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.

Symbol No.	Shapes	Removal & Installation
C101	 SBF256G	**Removal:** Remove by bending up with flat-bladed screwdrivers.  SBF367B
C102	 SBF114B SBF137B	 **Removal:** Pull up by rotating. SBF115B
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.)  **Installation:** SBF708E

Clip and Fastener (Cont'd)

Symbol No.	Shapes	Removal & Installation
CE103 	 SBF104B	**Removal:**  SBF147B
CE106	 SBF653B	**Removal:** **Type 1** Molding Clip ② Then bend up ① Push  SBF654B **Type 2** Remove molding by cutting off the clip. Molding Clip Cutter  SBF914B
CR103	 SBF768B	**Removal:** Holder portion of clip must be spread out to remove rod.  SBF770B
CS101 	 SBF260G	**Removal:** Screw out with a Phillips screwdriver.  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.

Bumper shock absorber inspection

1. Check shock absorber for oil leakage, cracks or deformation.
2. Function of shock absorber;

(1) Place vehicle in front of a wall.
Apply parking brake and place tire stoppers securely.
(2) Place a jack between bumper and wall, jack is positioned squarely with bumper, directly in line with shock absorber to be checked.
(3) Apply pressure to compress shock absorber at least 10.0 mm (0.394 in).

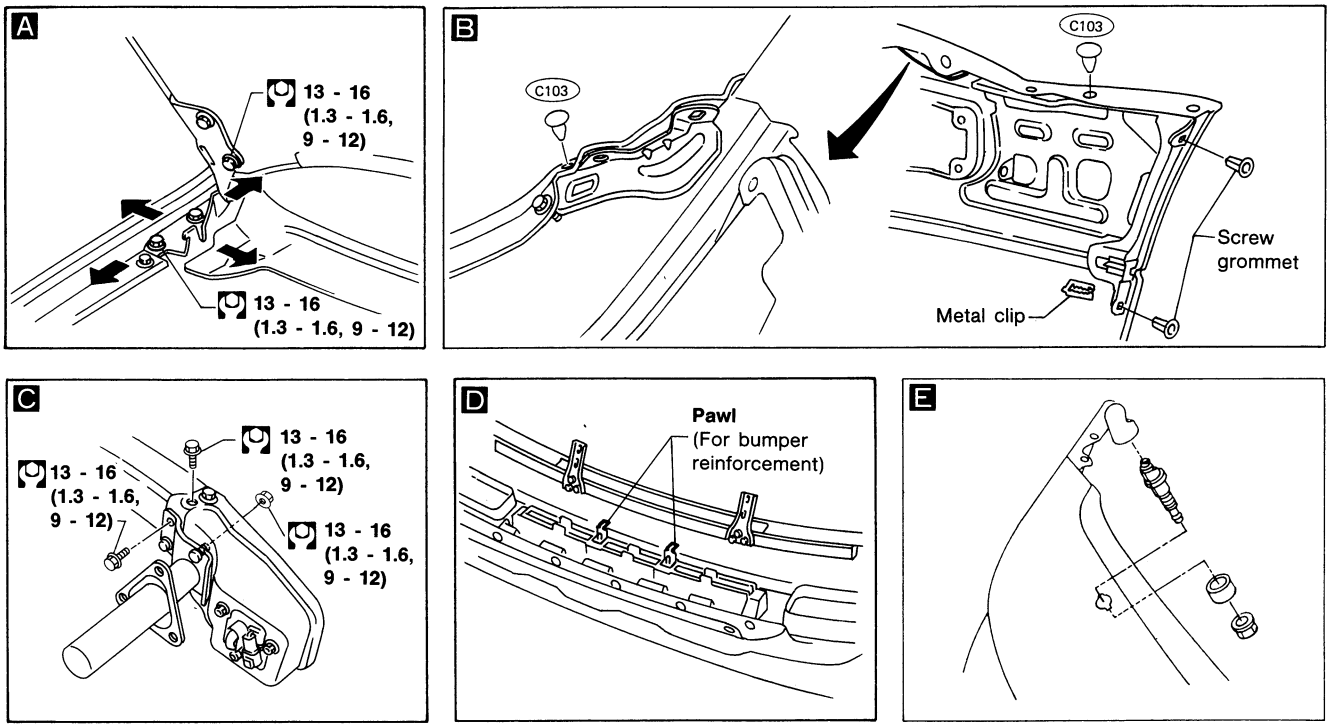
Use a jack with capacity of more than 600 kg (1,323 lb).

(4) Make sure bumper returns to its original position when jack is retracted. Replace if necessary.

CAUTION:

It is not recommended to confirm proper installation by driving into walls or other barriers as this could cause personal injury or damage to the vehicle.

When replacing shock absorbers, make sure they are of the same type and rating, and manufactured by the same maker.



Service Notice

- Be sure to enlarge hood hinge holes (hinge to hood side) less than 10 mm (0.39 in) dia. for easy hood adjustment at hood-hinge portion.
- Be sure to take rust prevention measures after enlargement of holes.

Body Front End (Cont'd)

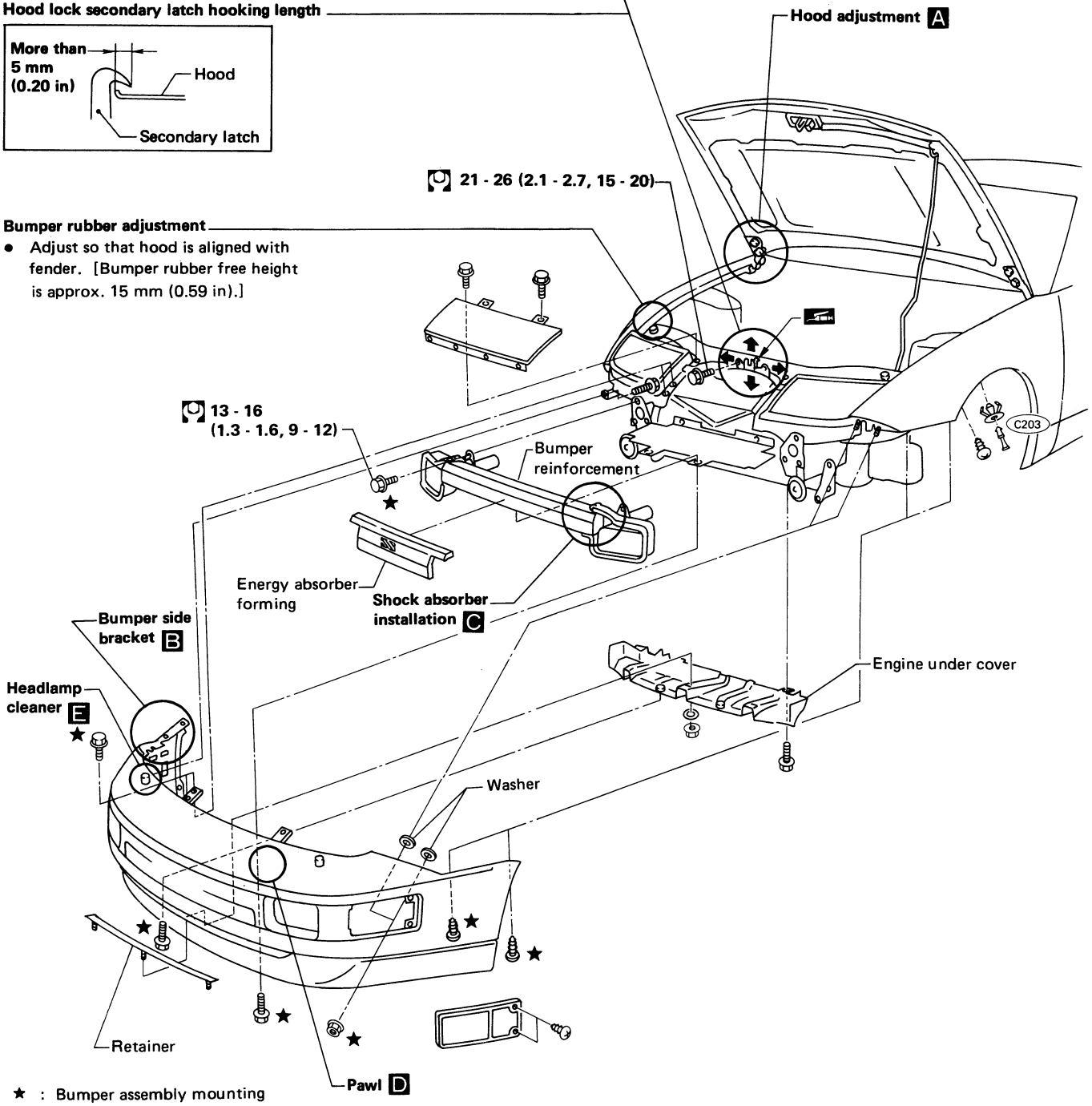
Hood lock adjustment

- Adjust lock so that hood primary lock meshes at a position where hood is 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. [Bumper rubber free height is approx. 15 mm (0.59 in).]



★ : Bumper assembly mounting bolts, nuts and screws

: N·m (kg-m, ft-lb)

: Double-faced adhesive tape

MBF760A

Body Rear End and Opener

BACK DOOR TYPE

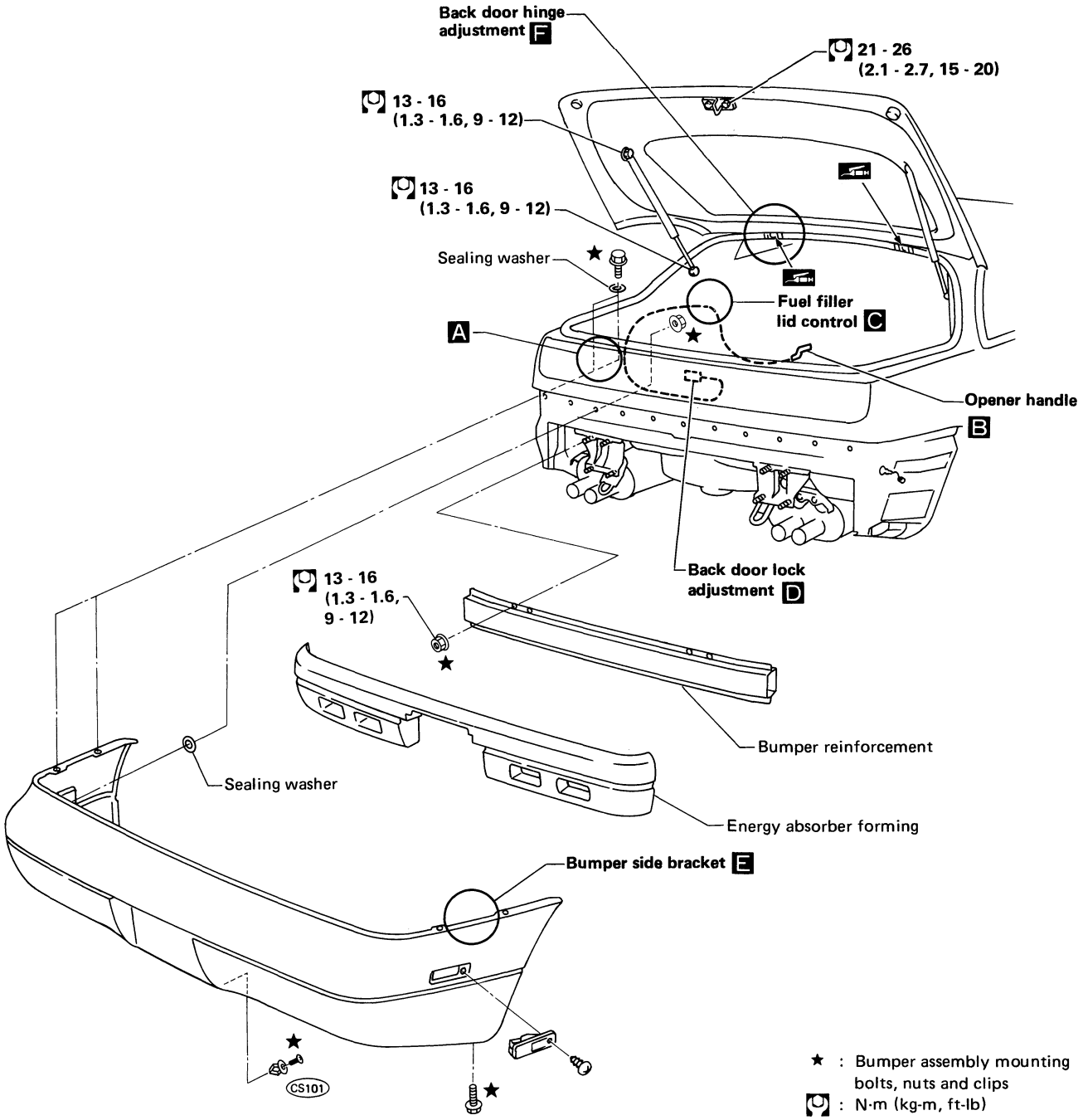
- Back door adjustment: Adjust at hinge-body portion for proper back door fit.
- Back door lock system adjustment: Adjust lock & striker so that they are in the center. After adjustment, check back door lock operation.

WARNING:

a. Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.

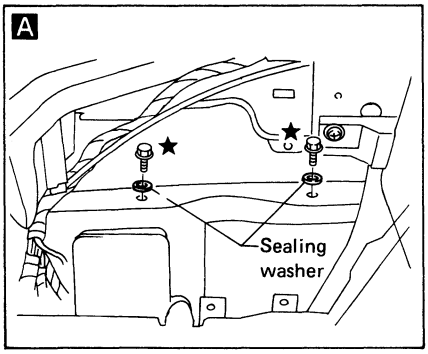
b. The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.

- 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.
- Remove washer tank (located at left of luggage compartment) before removing or installing bumper.



Body Rear End and Opener (Cont'd)

A



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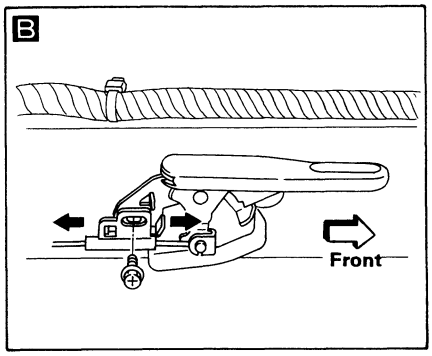

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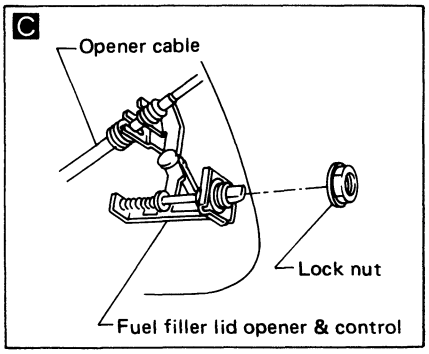

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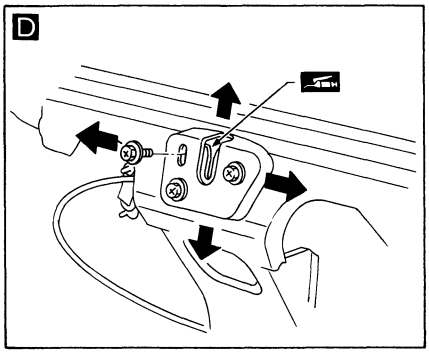

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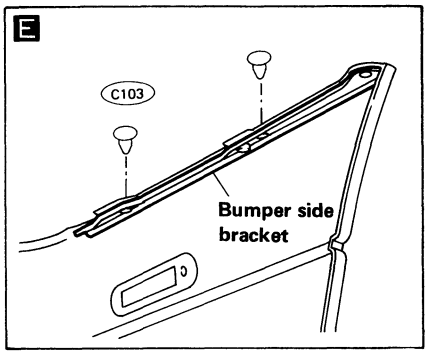

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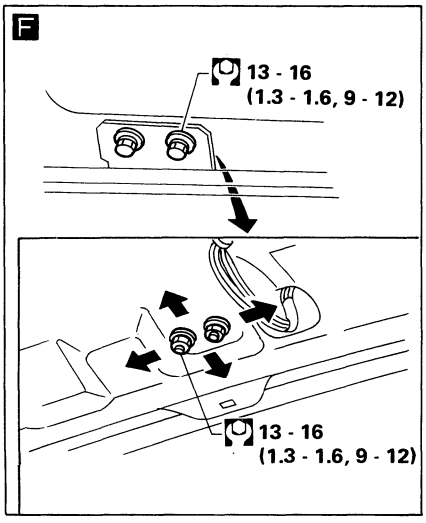
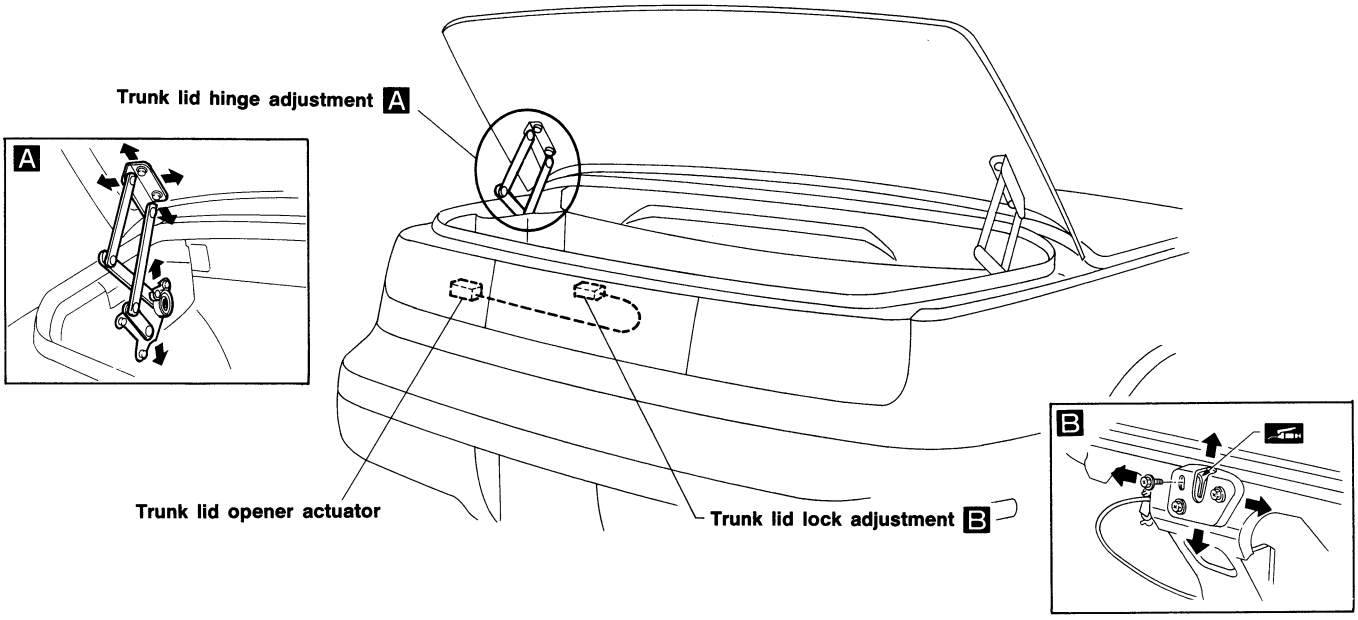


MBF513A

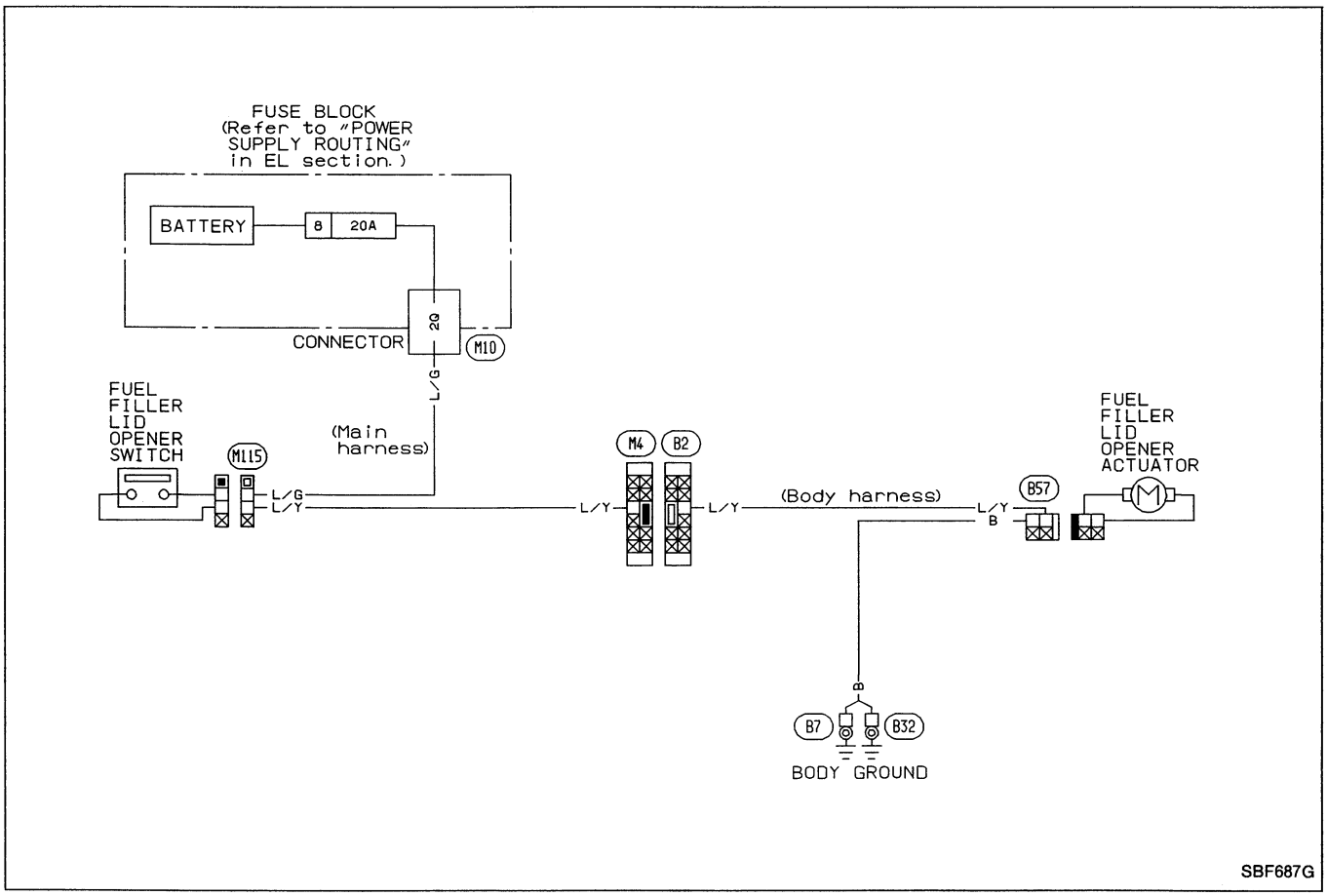
TRUNK LID TYPE

- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- After installing/adjusting opener, make sure that trunk lid and fuel filler lid open smoothly.



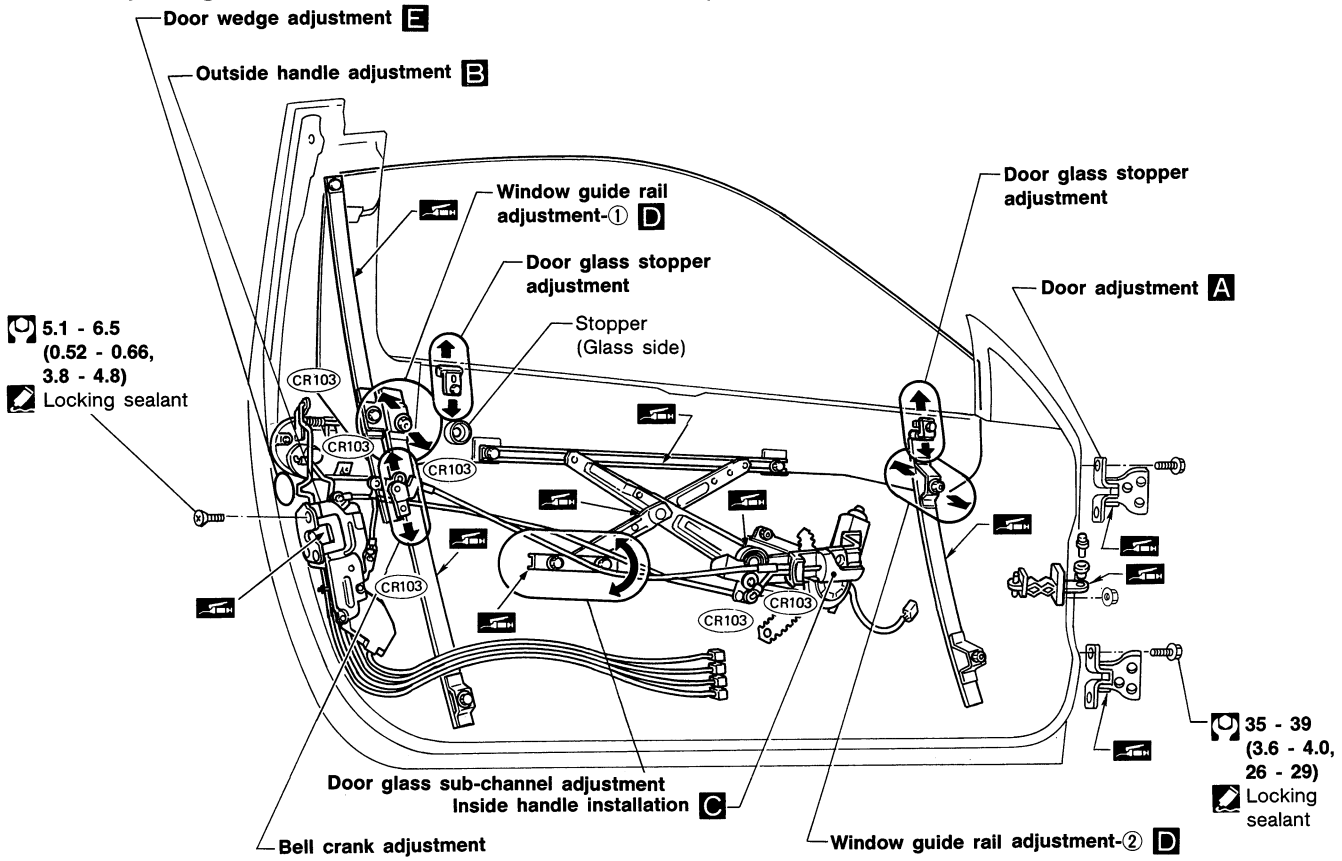
MBF696A

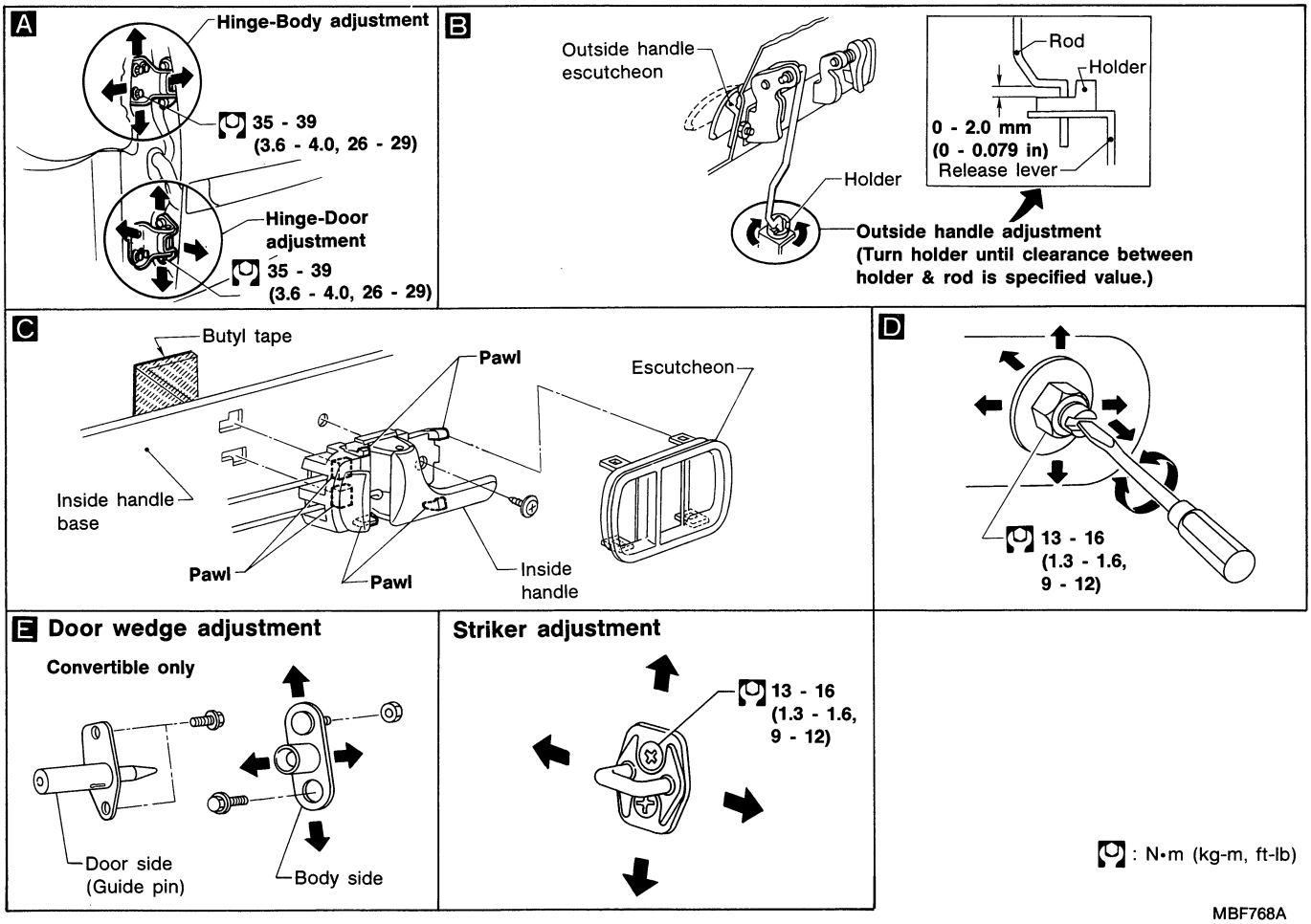
FUEL FILLER LID OPENER SYSTEM — WIRING DIAGRAM



SBF687G

- After adjusting door or door lock, check door lock operation.



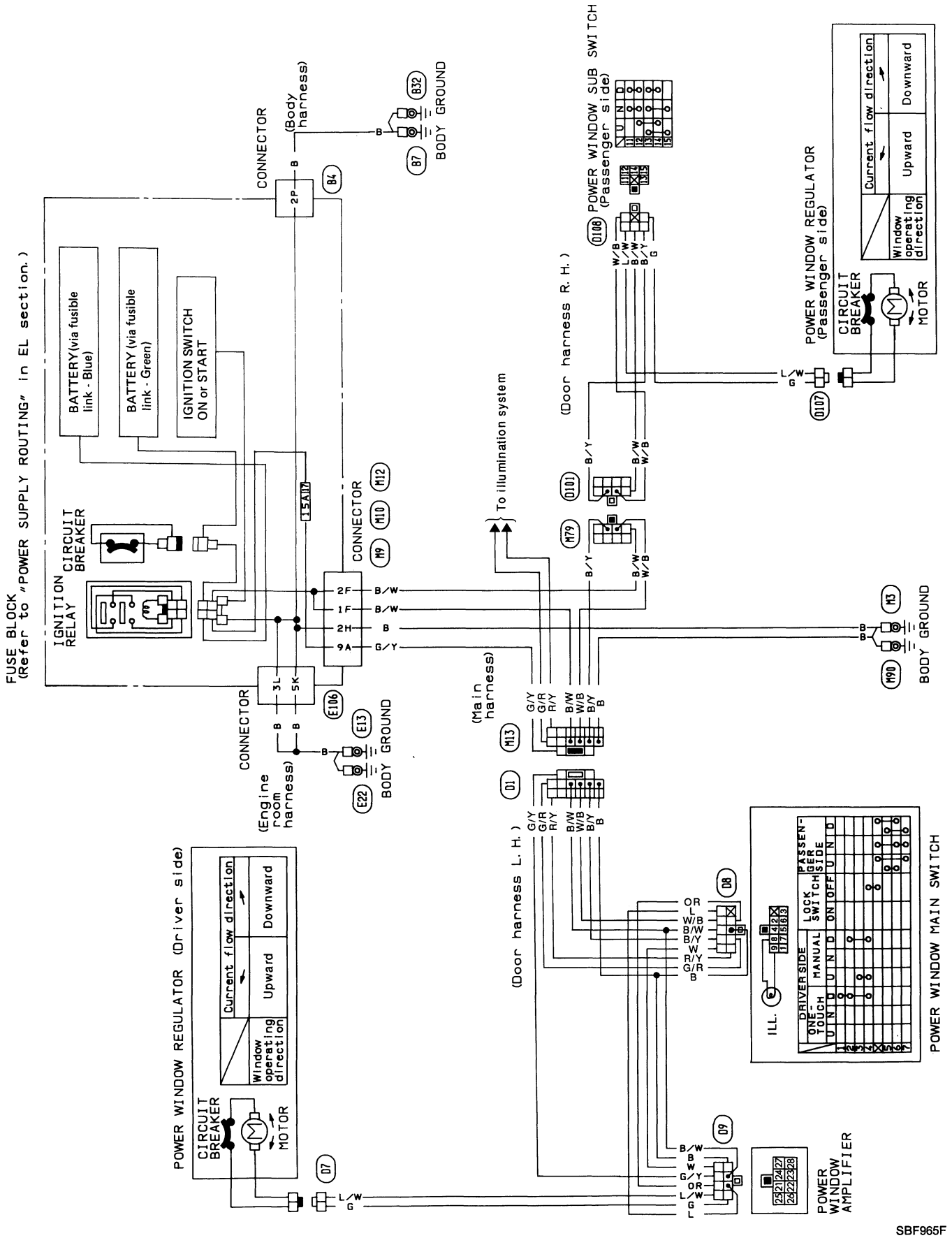


: N•m (kg-m, ft-lb)

MBF768A

Power Window

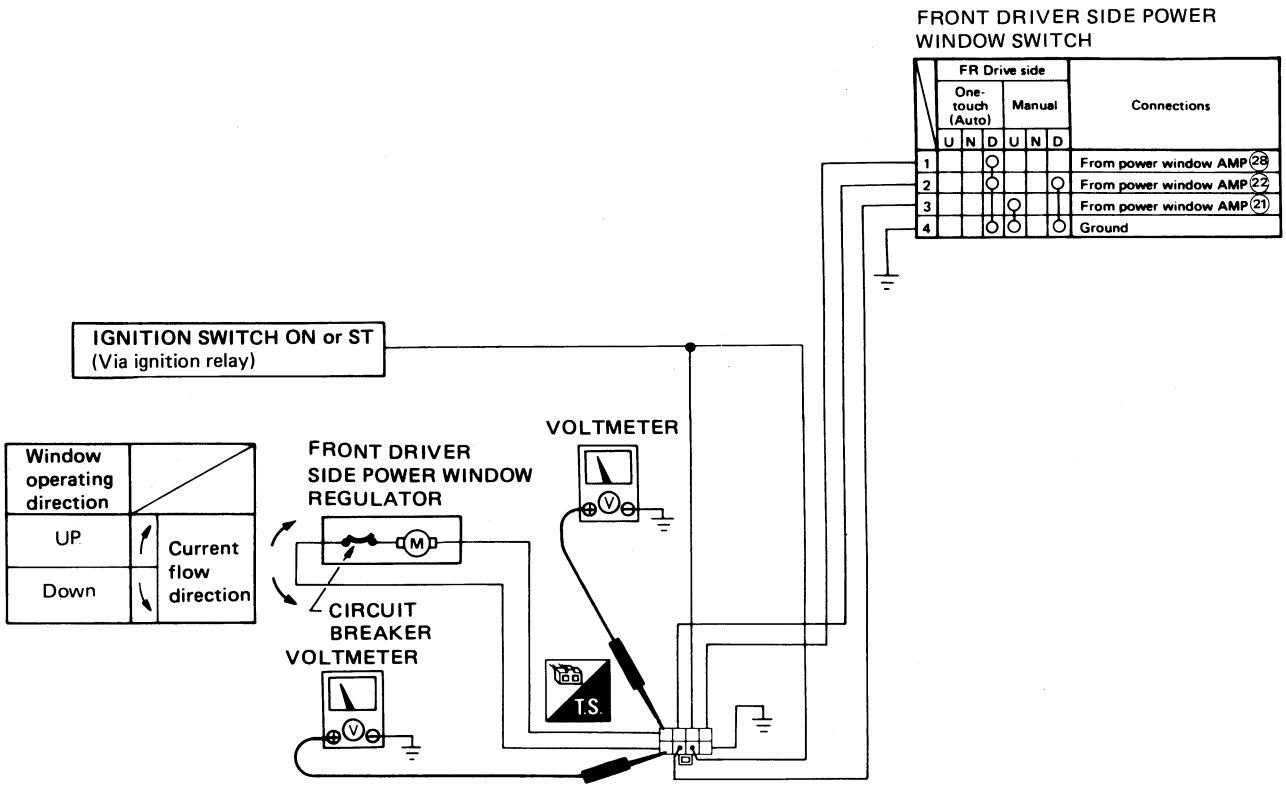
WIRING DIAGRAM



SBF965F

Power Window (Cont'd)

POWER WINDOW AMP. INSPECTION



25 21 24 29
26 22 23 28

AMP. OPERATION

	Connections		Operations					
			Manual operation			One-touch (Auto) Operation		
24	Power source (IGN)		12V	12V	12V	12V	12V	12V
27	Ground		Ground	Ground	Ground	Ground	Ground	Ground
23	Input signal	From ignition SW (ON or ST)	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST
28	Input signal	To FR driver side power window SW (AUTO) ①	OFF	OFF	OFF	OFF	ON	OFF
21	Input signal	To FR driver side power window SW (UP) ③	OFF	ON	OFF	OFF	OFF	OFF
22	Input signal	To FR driver side power window SW (DOWN) ②	OFF	OFF	ON	OFF	ON	OFF
25	Output signal	FR driver side regulator ("Up" power source)	Approx. 0V	Approx. over 9V	Approx. 0V	Approx. 0V	Approx. 0V	Approx. 0V
26	Output signal	FR driver side regulator ("Down" power source)	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. 0V	Aprrox. over 9V	Approx. over 9V

Regulator Operating Condition	Stop	Upward operation	Downward operation	Stop	Starting	Keeps operating until fully open, then stops automatically.
					Downward operation	

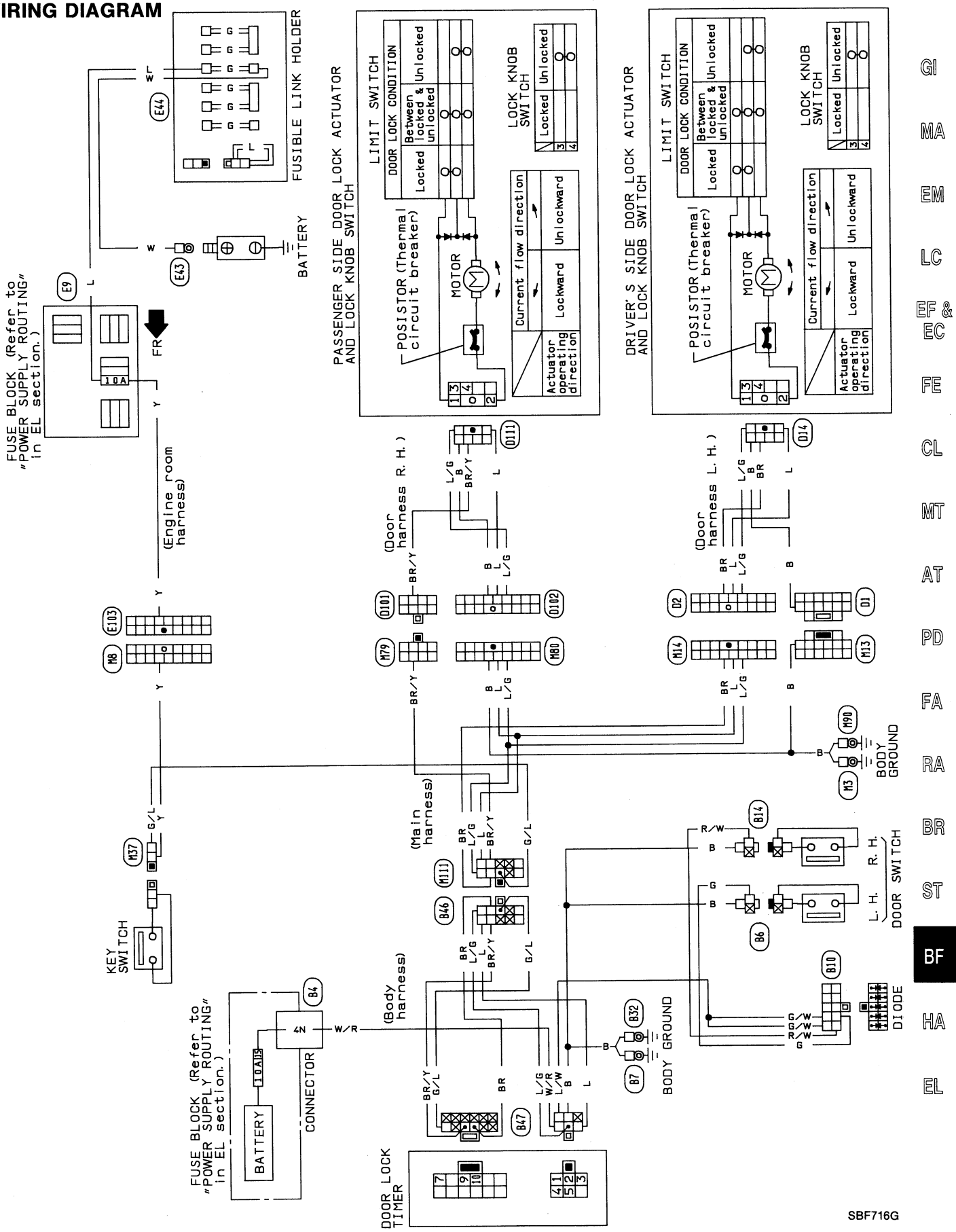
Carry out this operation check in this chart from left to right

POWER WINDOW AMP. – Front driver side door (Behind door trim)

SBF219F

Power Door Lock

WIRING DIAGRAM



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., go to ELECTRICAL COMPONENTS INSPECTION.
(3) Check output signals.
If the input signal is O.K. and the output signal is N.G., replace the door lock timer.
If the input signal and output signal are O.K., check door lock actuator in ELECTRICAL COMPONENTS INSPECTION.

Lock & unlock operation by lock knob or main switch

(The voltages are approximate values.)

	Connections		Operations			
			Lock knob switch L.H.		Lock knob switch R.H.	
			Unlock → Lock	Lock → Unlock	Unlock → Lock	Lock → Unlock
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	Input signals	Door switch L.H.				
10	Input signals	Lock knob switch L.H.	ON (Ground) → OFF (Open)	OFF (Open) → ON (Ground)	—	—
9	Input signals	Lock knob switch R.H.	—	—	ON (Ground) → OFF (Open)	OFF (Open) → ON (Ground)
2	Output signals	Door lock actuator (Lock power source)	0V → 12V → 0V (Approx. 1.0 sec.)	0V	0V → 12V → 0V (Approx. 1.0 sec.)	0V
3	Output signals	Door lock actuator (Unlock power source)	0V	0V → 12V → 0V (Approx. 1.0 sec.)	0V	0V → 12V → 0V (Approx. 1.0 sec.)

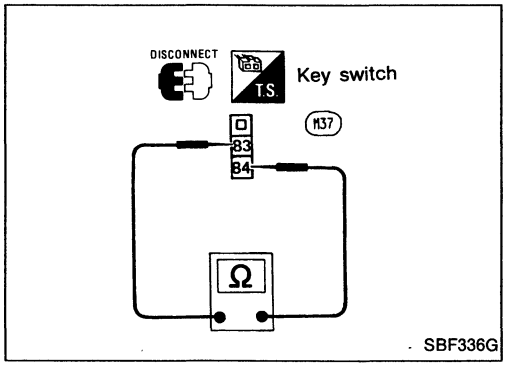
Key reminder operation

(The voltages are approximate values.)

	Connections		Operations	
			Lock knob switch L.H.	Lock knob switch R.H.
			Unlock → Lock → Automatically unlocked	Unlock → Lock → Automatically unlocked
1	Power source		12V	12V
5	Ground		0V	0V
7	Input signals	Key switch	ON (12V) — Key is in the ignition.	
4	Input signals	Door switch	ON (Ground) — Either door is open.	
10	Input signals	Lock knob switch L.H.	ON (Ground) → OFF (Open) → ON (Ground)	—
9	Input signals	Lock knob switch R.H.	—	ON (Ground) → OFF (Open) → ON (Ground)
2	Output signals	Door lock actuator (Lock power source)	0V → 12V → 0V (Approx. 0.3 sec.)	0V → 12V → 0V (Approx. 0.3 sec.)
3	Output signals	Door lock actuator (Unlock power source)	0V → 12V → 0V (Approx. 1.4 sec.)	0V → 12V → 0V (Approx. 1.4 sec.)

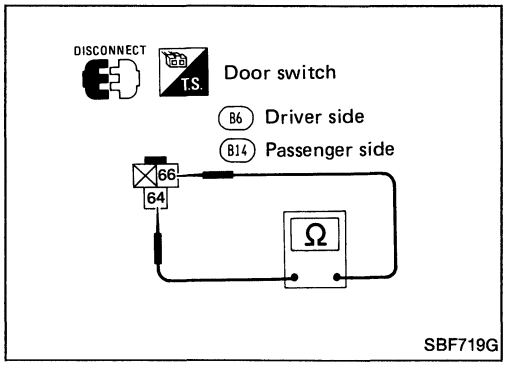
Power Door Lock (Cont'd)

ELECTRICAL COMPONENTS INSPECTION



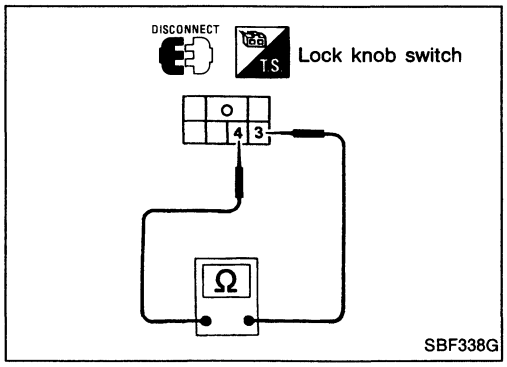
Key switch

Terminals	Condition	Continuity
⑧③ - ⑧④	Key is in the ignition.	Yes
	Key is not in the ignition.	No



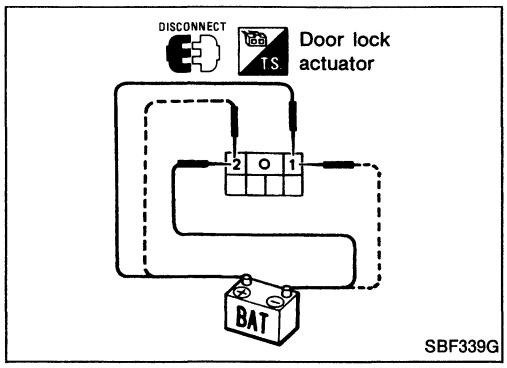
Door switch

Terminals	Condition	Continuity
⑥④ - ⑥⑥	Door is closed.	No
	Door is open.	Yes



Lock knob switch (Built-in front door lock actuator)

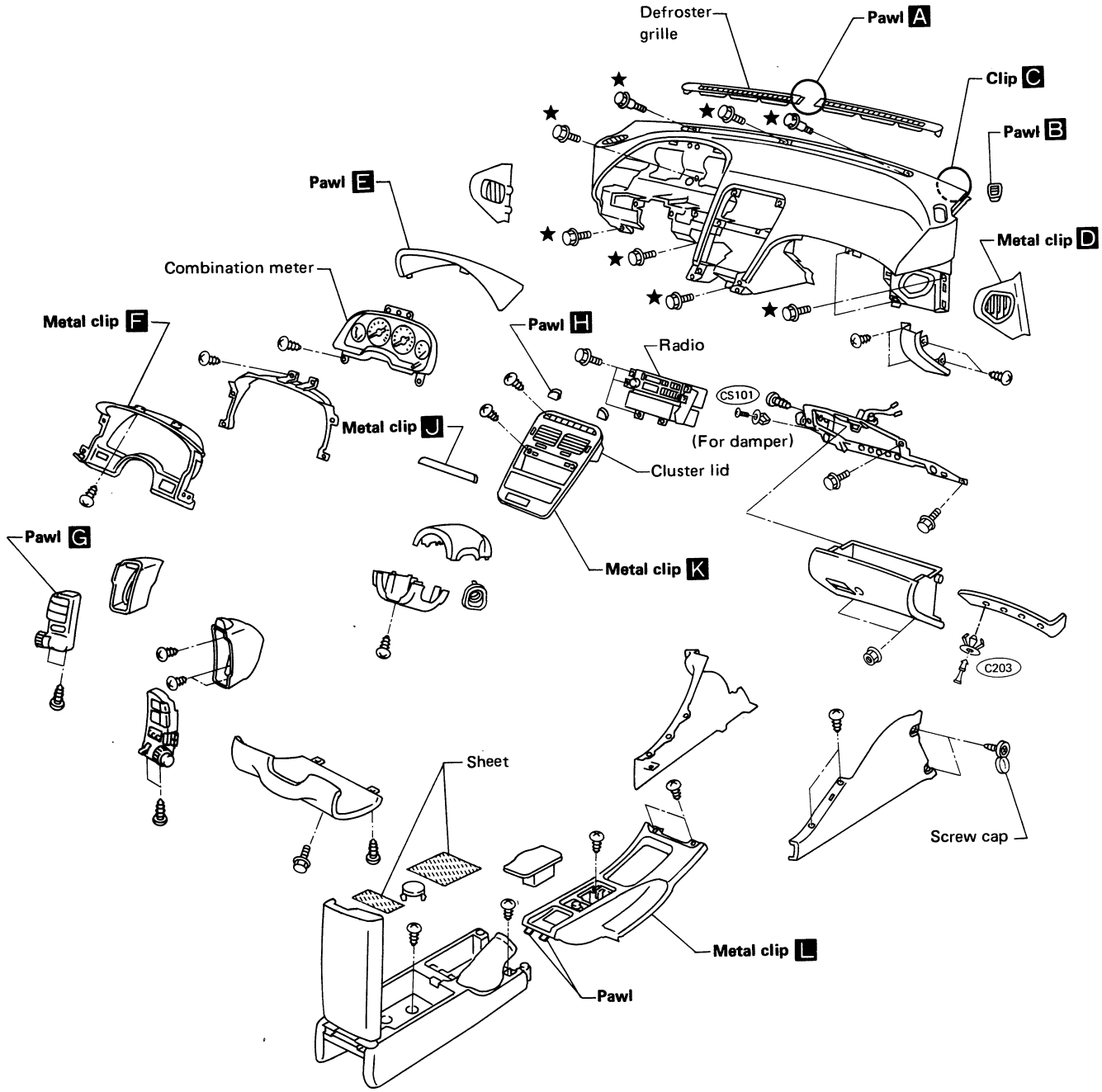
Terminals	Condition	Continuity
③ - ④	Lock	No
	Unlock	Yes



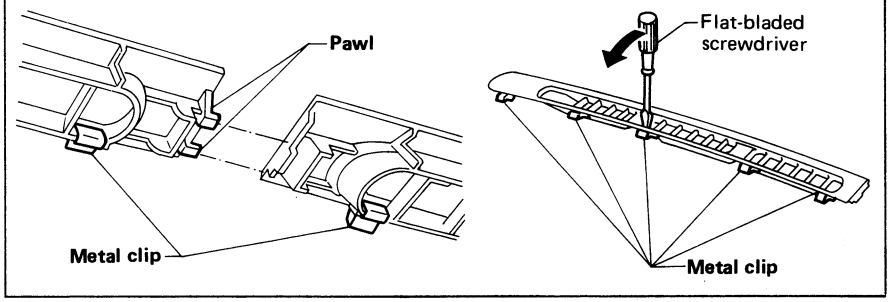
Door lock actuator

Terminals		Operation
⊕	⊖	
①	②	Lock
②	①	Unlock

- When removing instrument panel assembly, remove defroster grille, combination meter, cluster lid and radio first.



A



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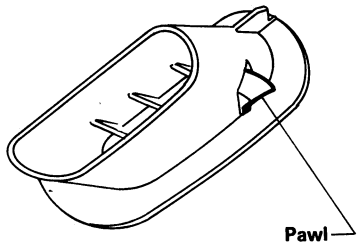
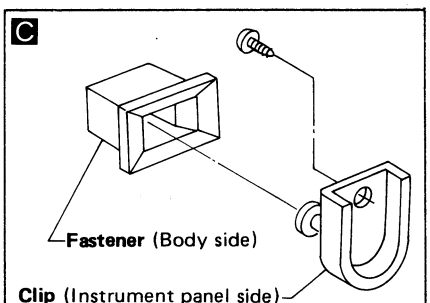


C



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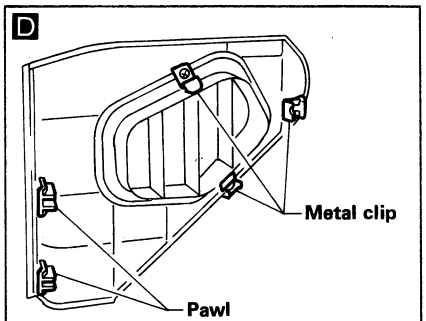

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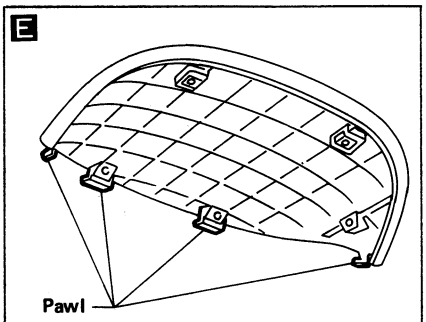

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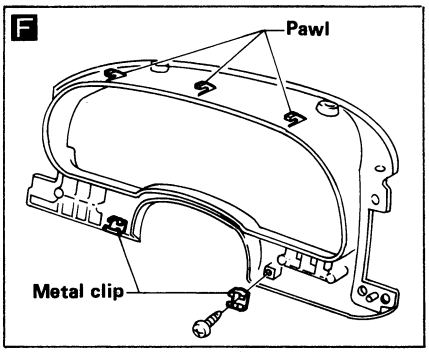

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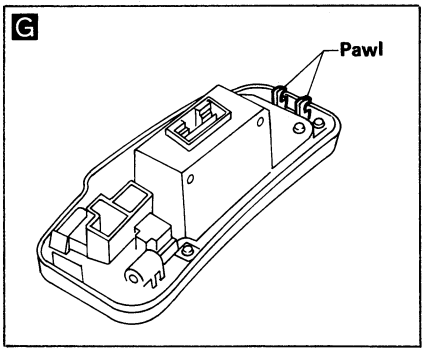

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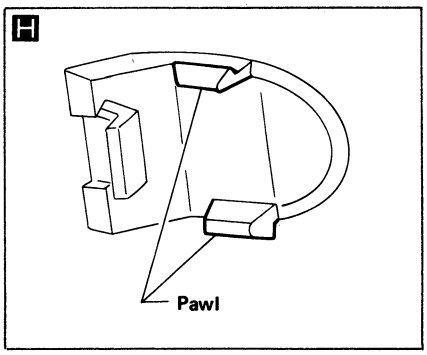

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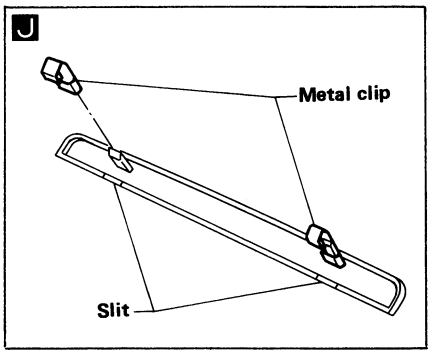

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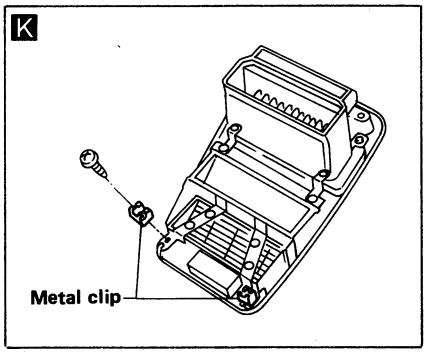

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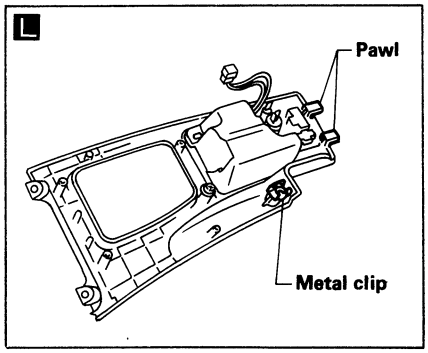
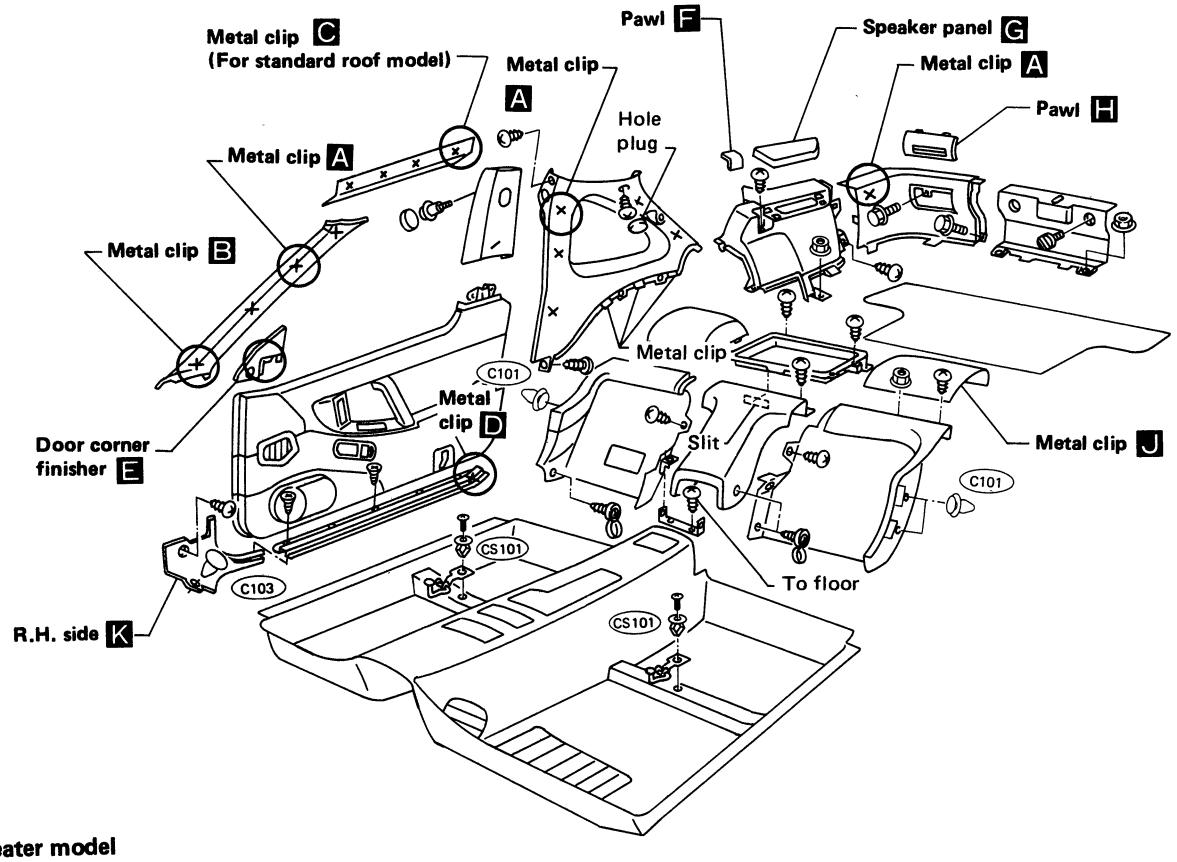


MBF514A

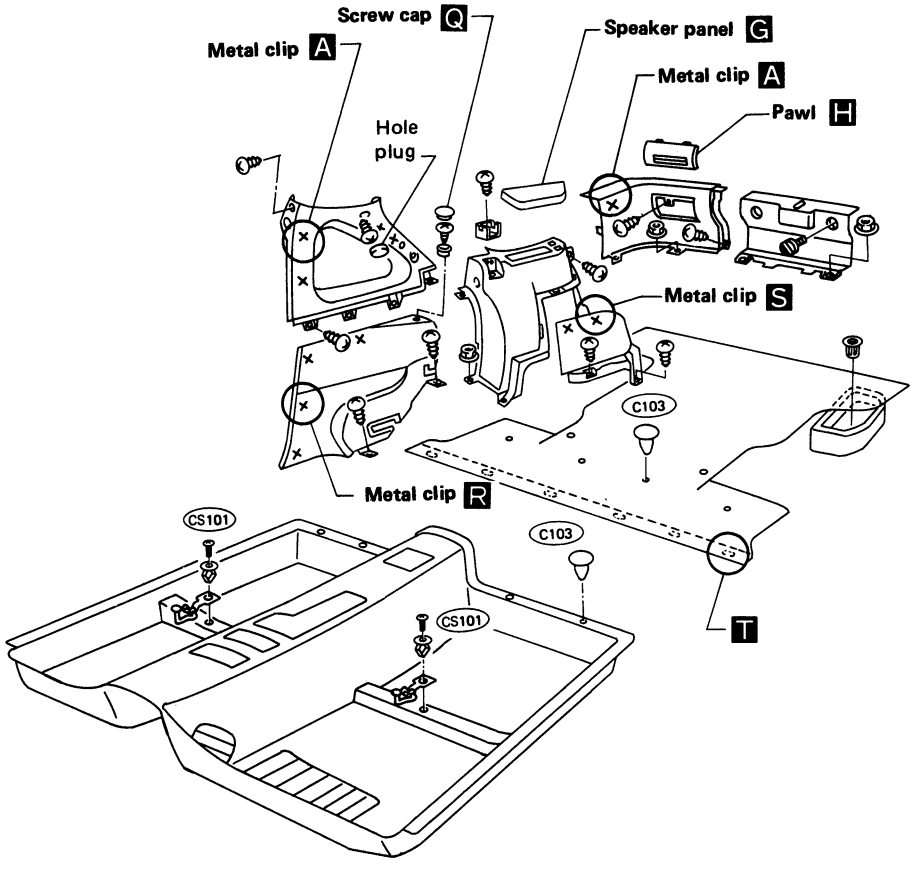
Interior

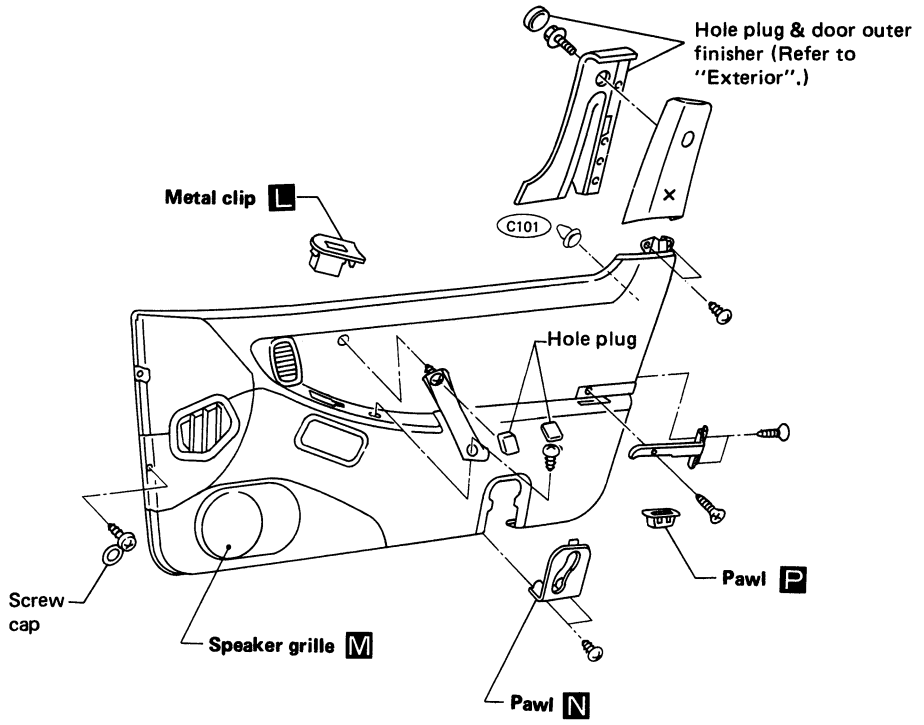
SIDE, LUGGAGE AND FLOOR TRIM

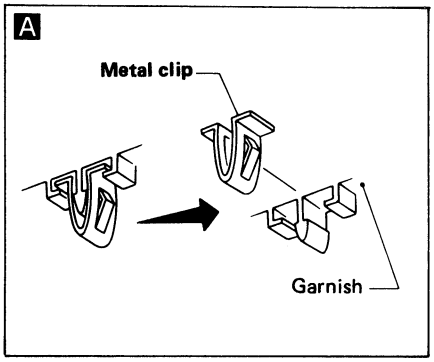
2 seater model

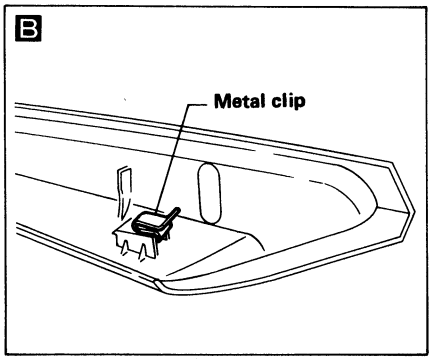


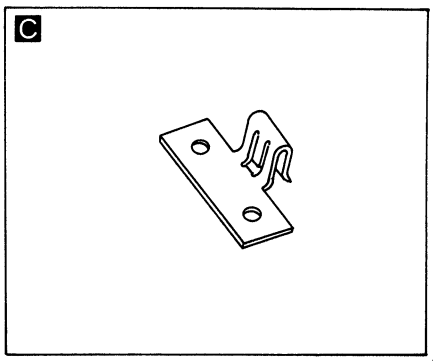
2+2 seater model




Hole plug & door outer finisher (Refer to "Exterior".)
Metal clip L
C101
Hole plug
Screw cap
Speaker grille M
Pawl P
Pawl N


A
Metal clip
Garnish


B
Metal clip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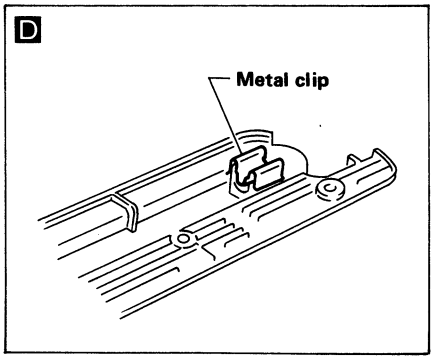
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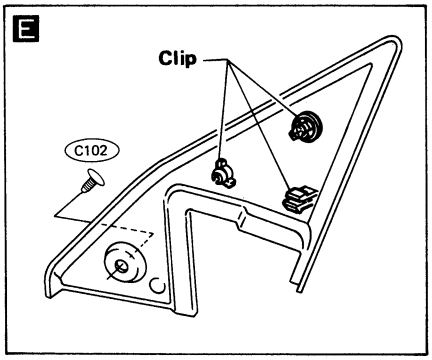
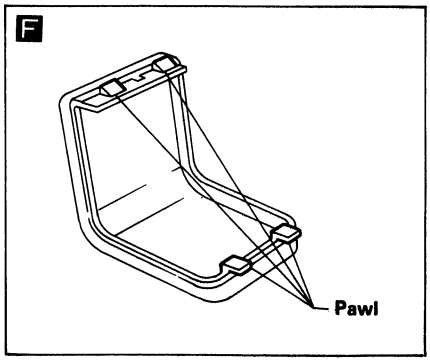
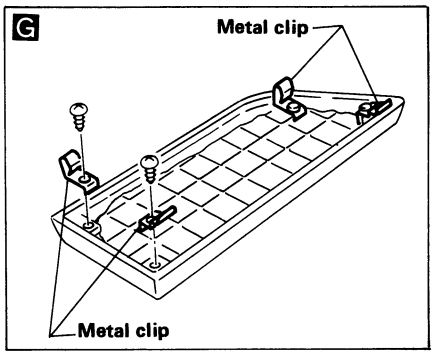
Metal clip


E
Clip
C102

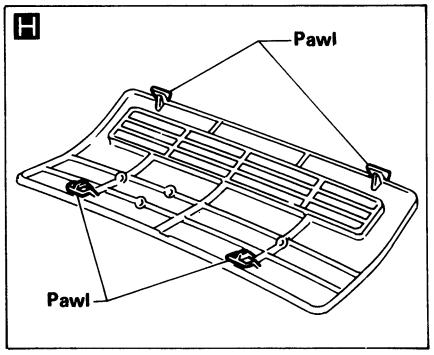

F
Pawl

Interior (Cont'd)

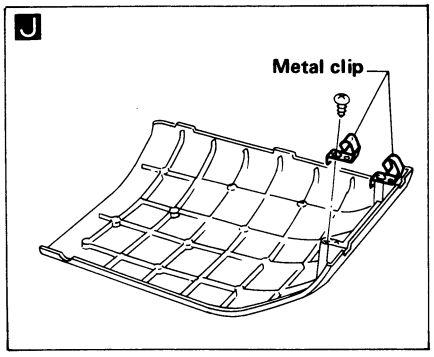
G



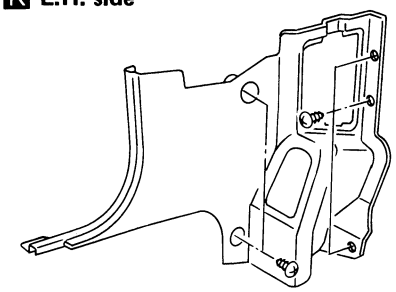
H



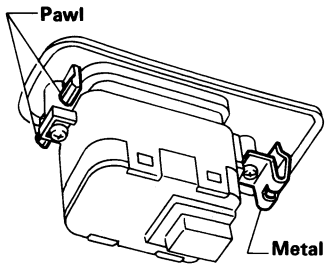
J



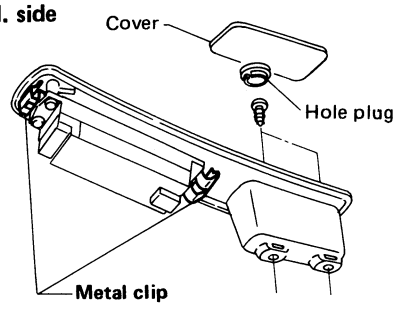
K L.H. side



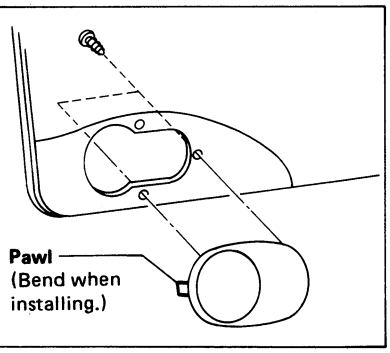
L R.H. side



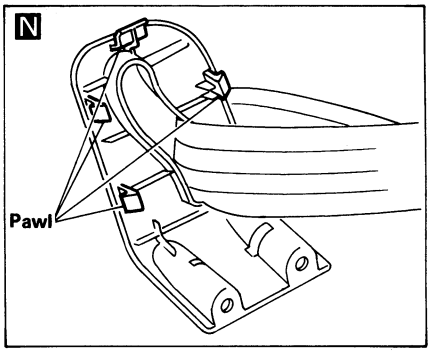
L.H. side



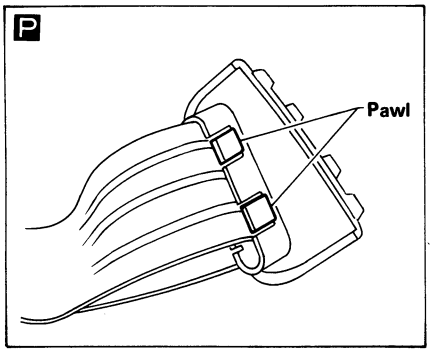
M



N



P



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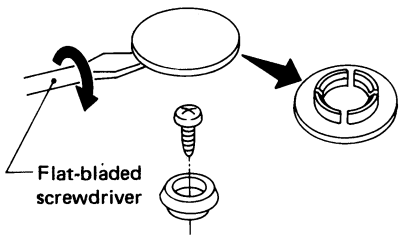

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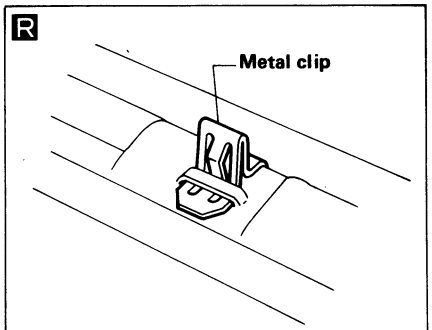

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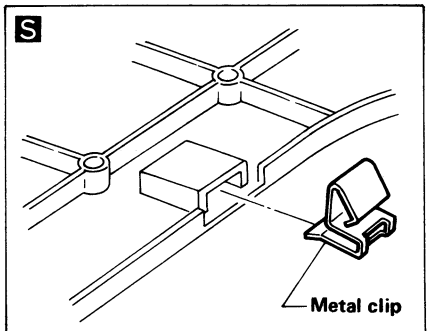
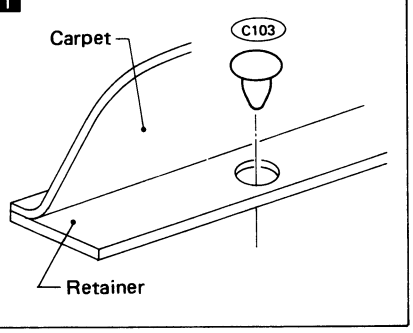


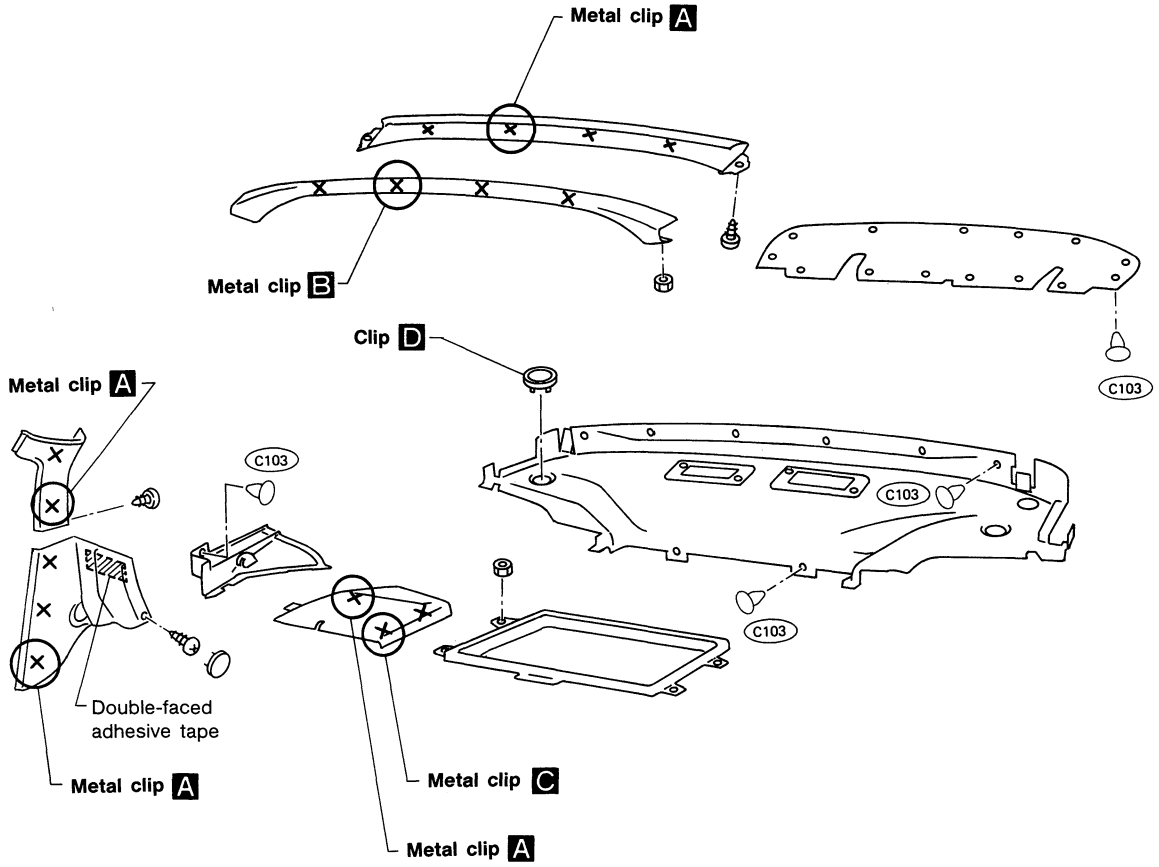
T

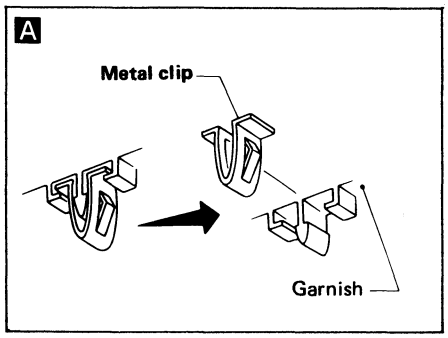


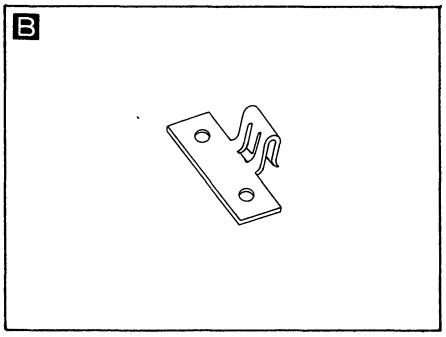
MBF515A

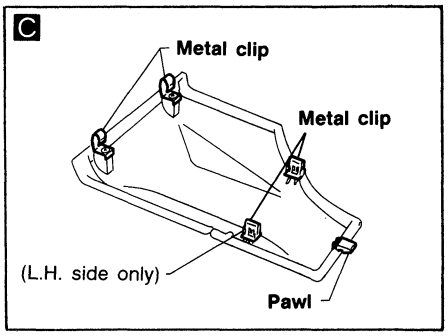
Interior (Cont'd)

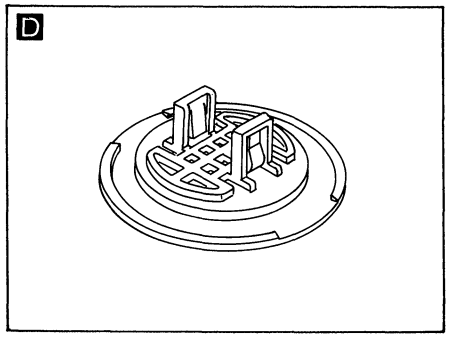
Convertible model







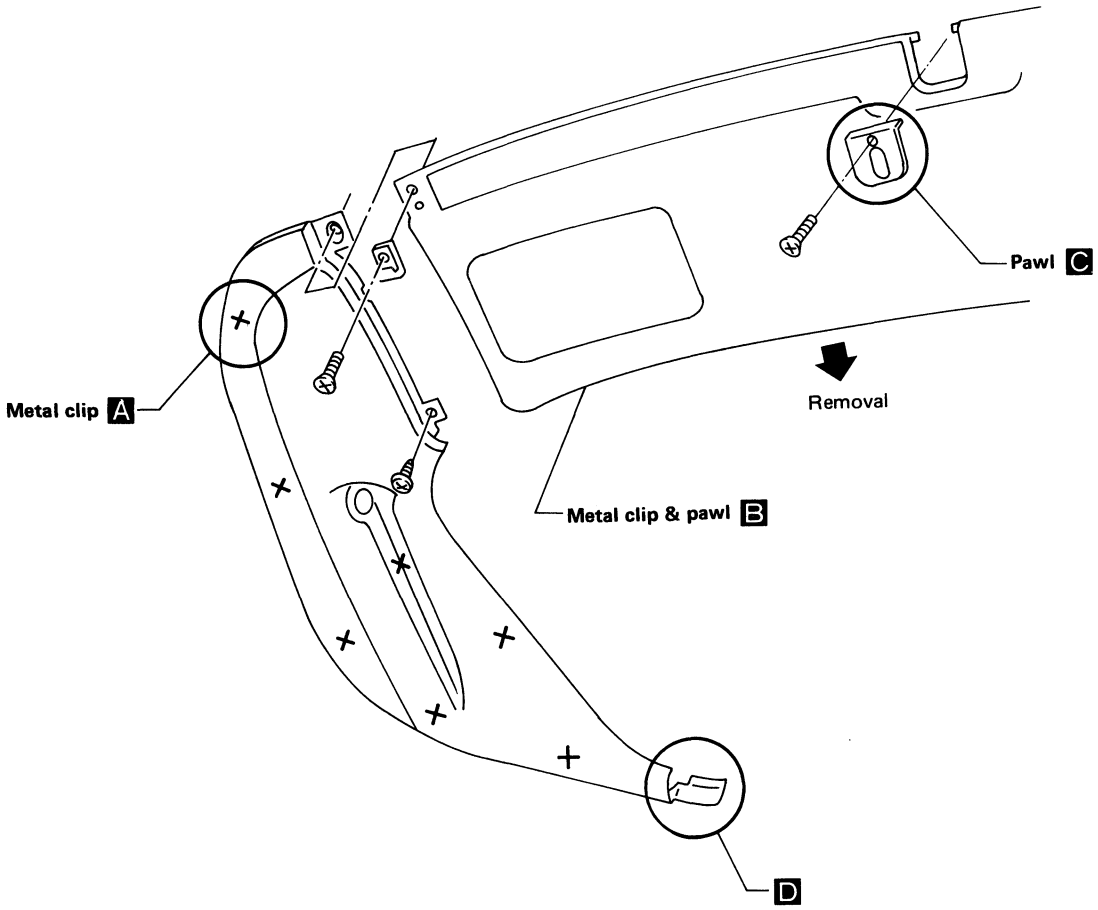


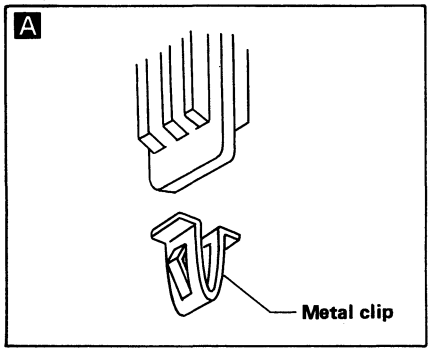


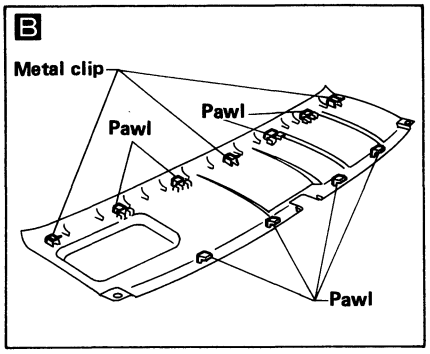
MBF697A

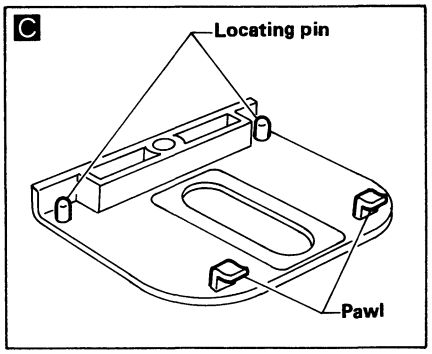
Interior (Cont'd)

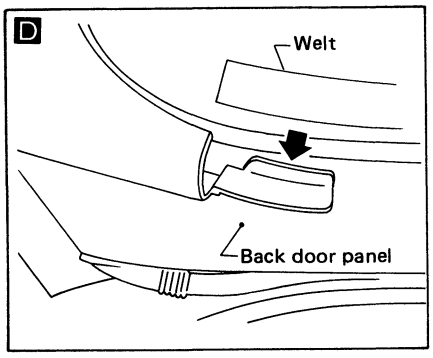
BACK DOOR TRIM — Standard model







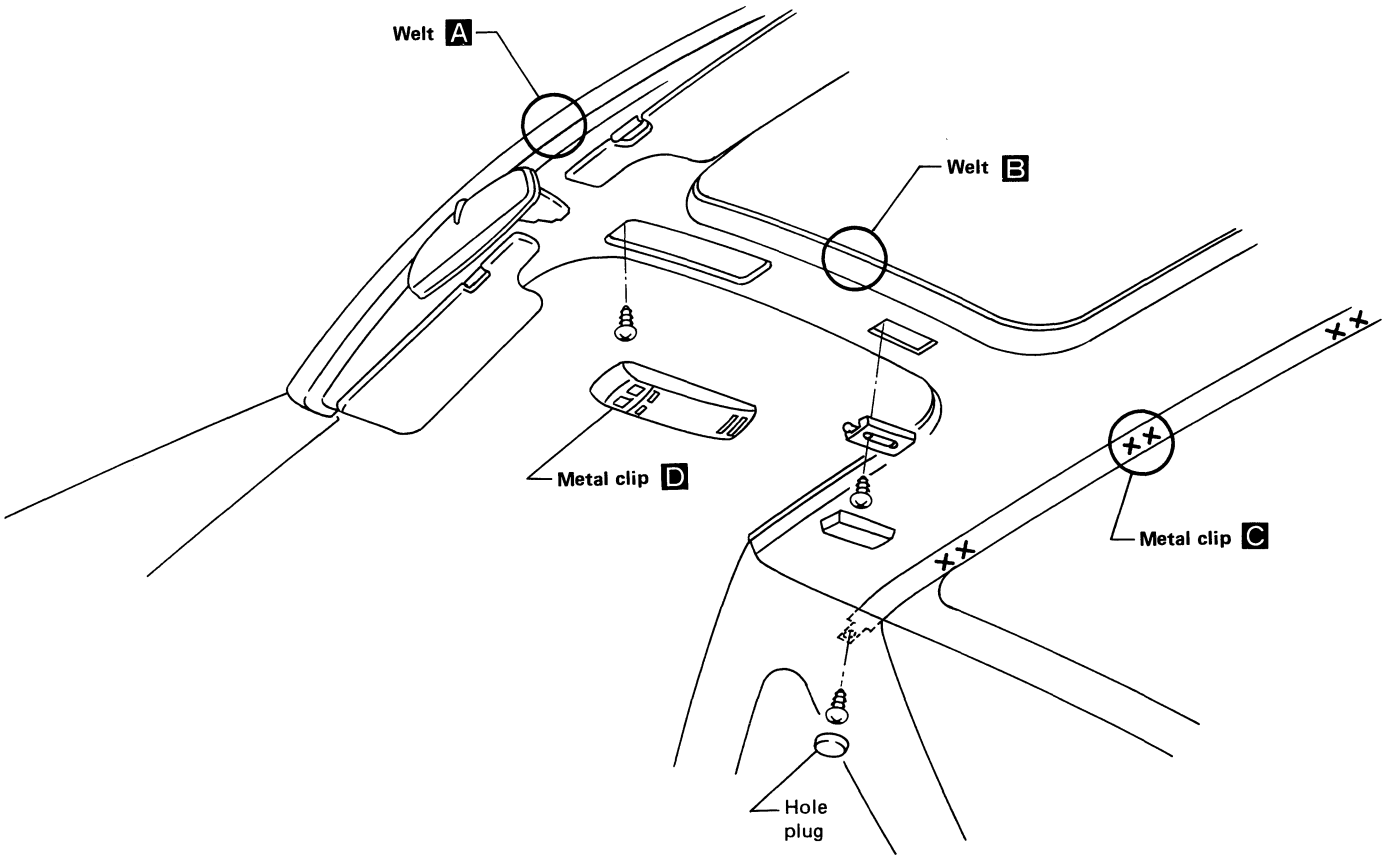


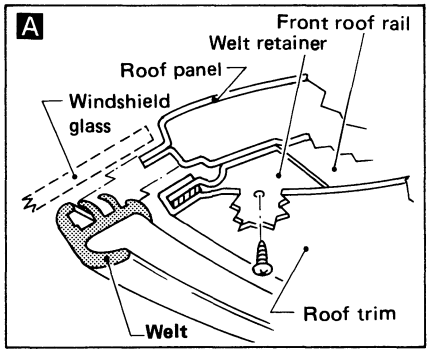


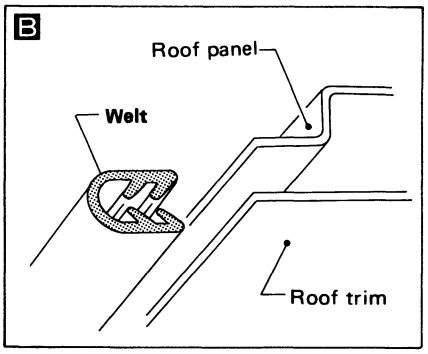
SBF861E

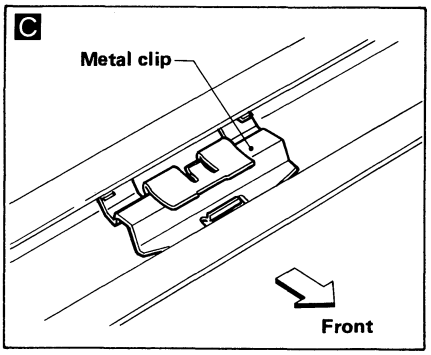
Interior (Cont'd)

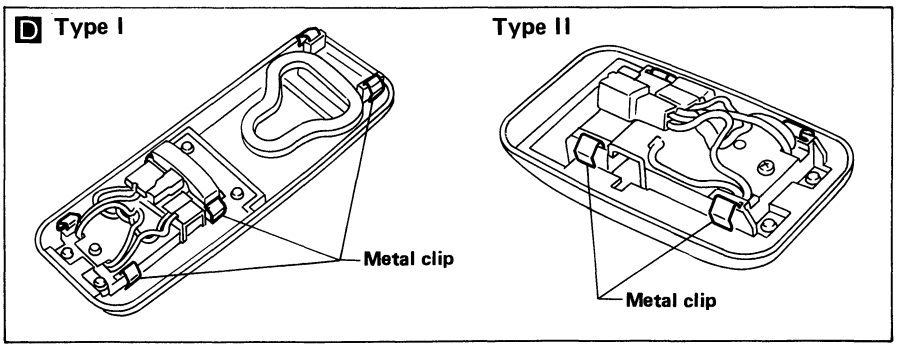
ROOF TRIM — T-bar roof model







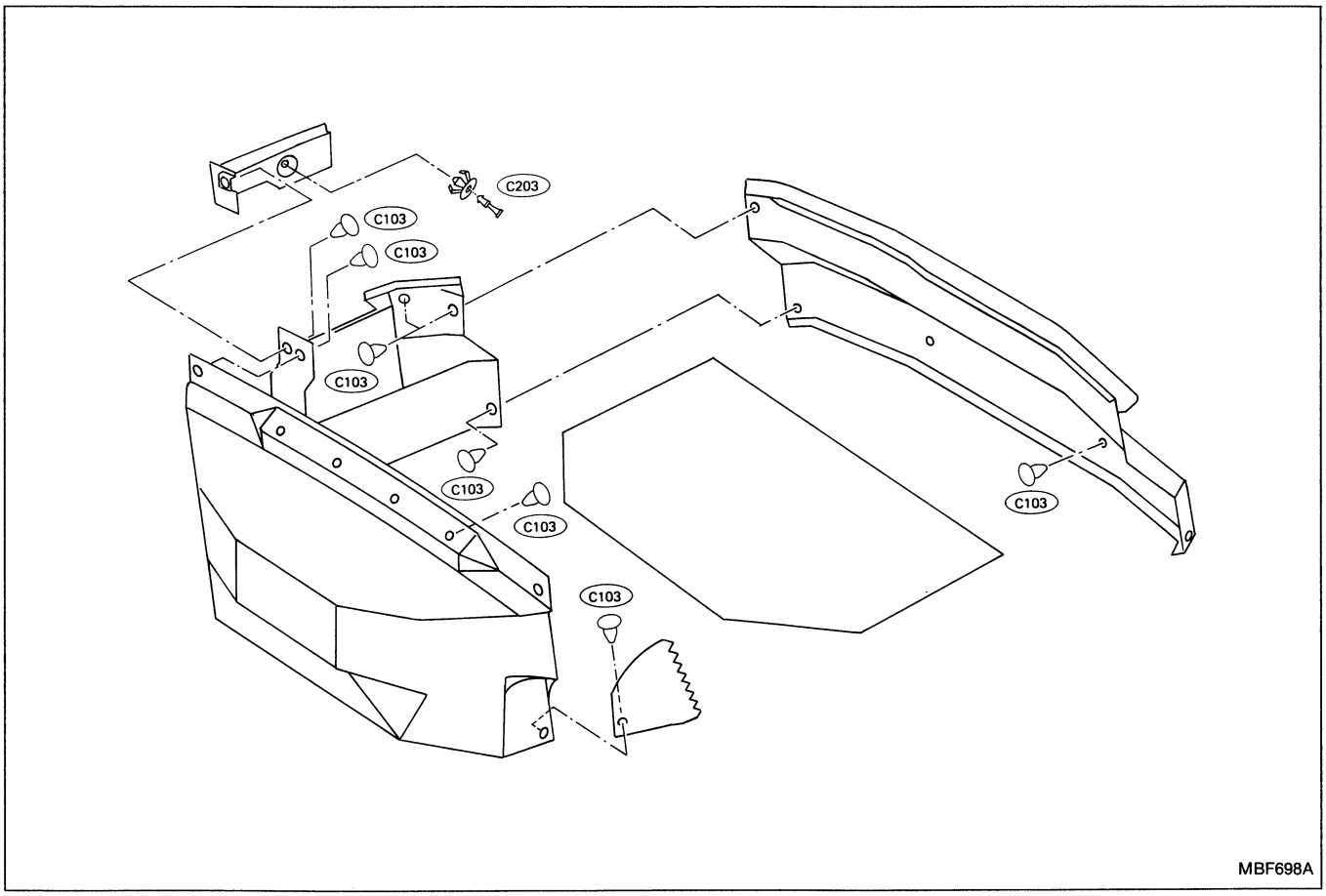




SBF862E

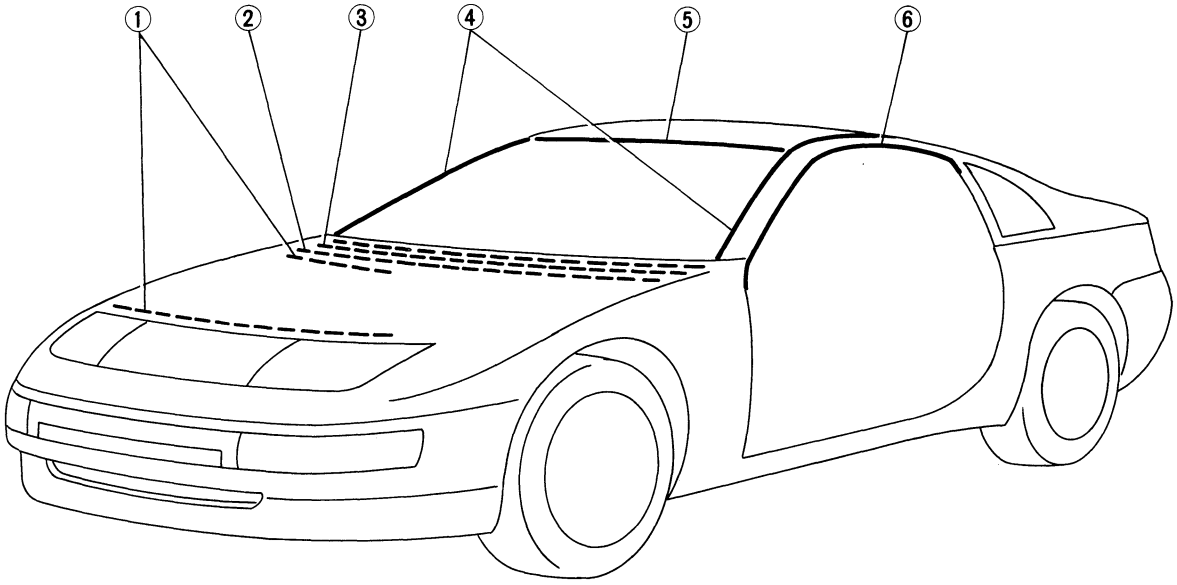
Interior (Cont'd)

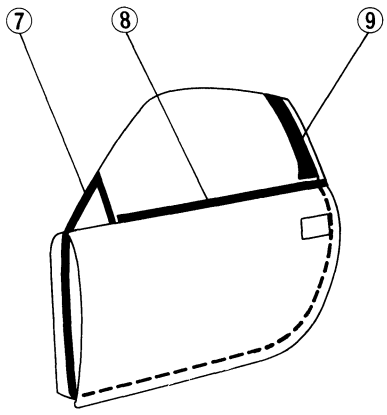
TRUNK ROOM TRIM — Convertible model

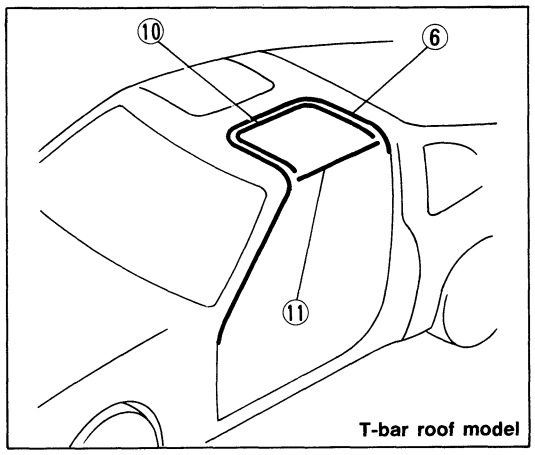


Exterior

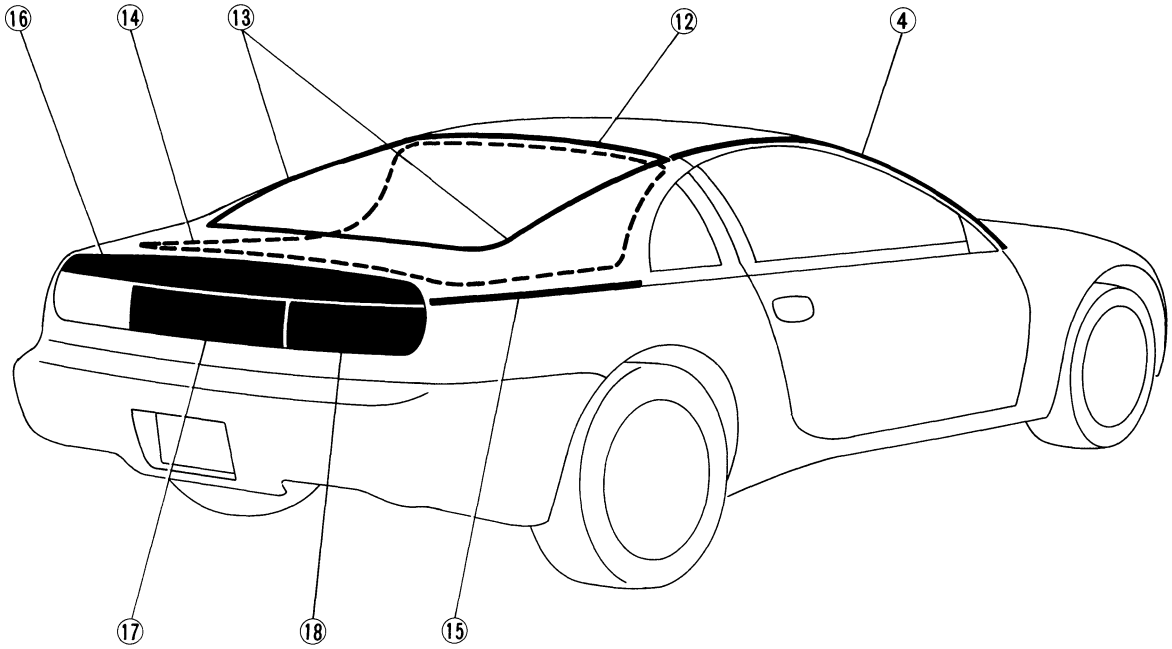
Standard model







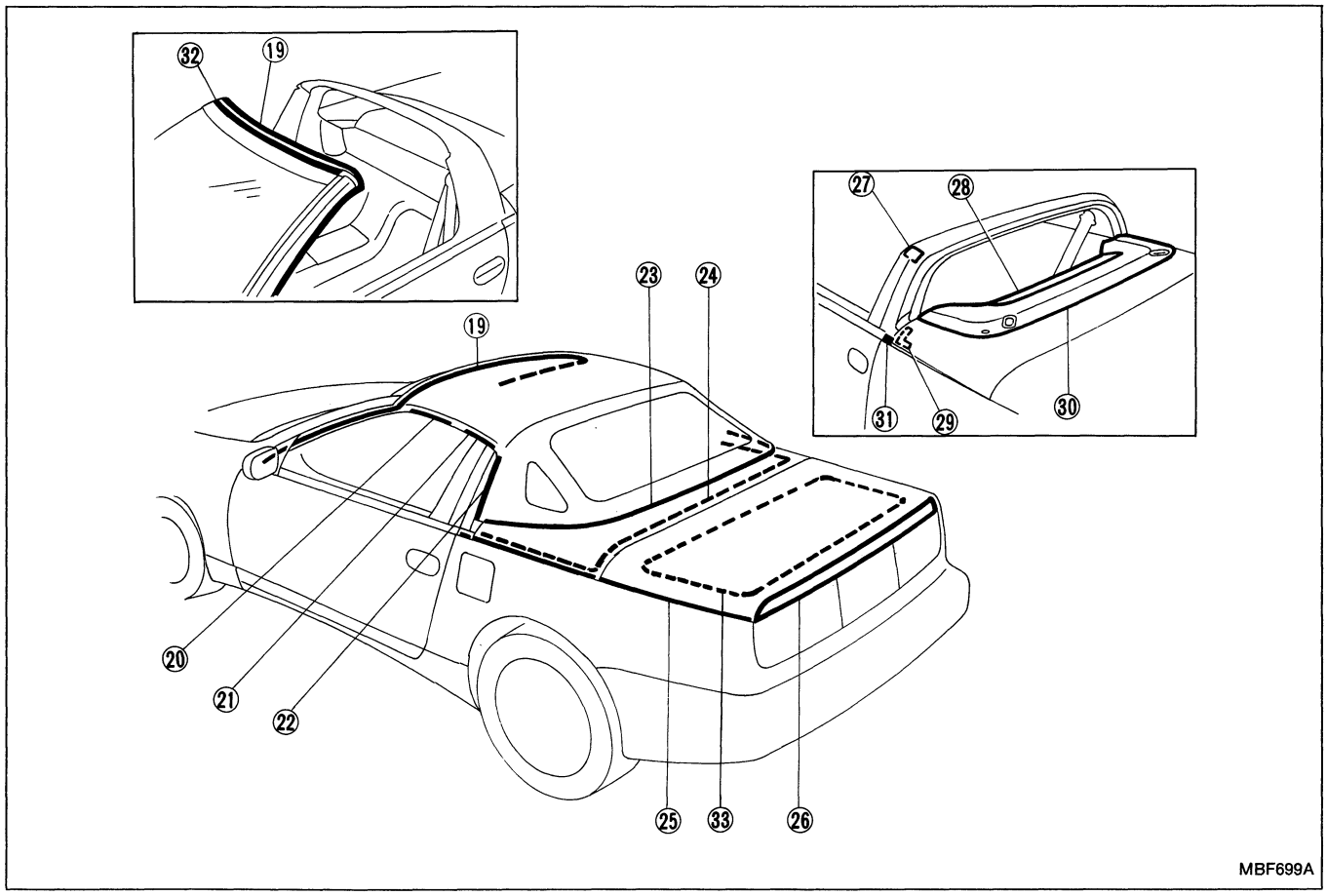
T-bar roof model



MBF761A

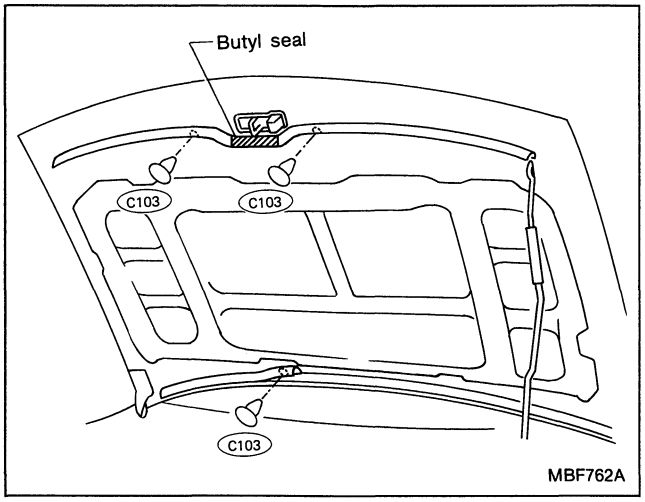
Exterior (Cont'd)

Convertible model

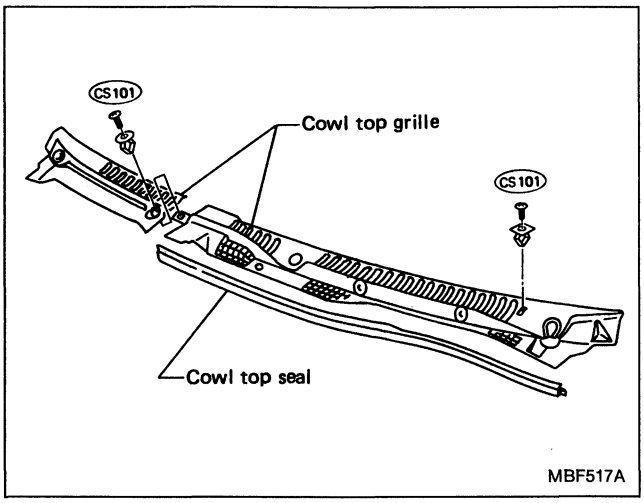


Exterior (Cont'd)

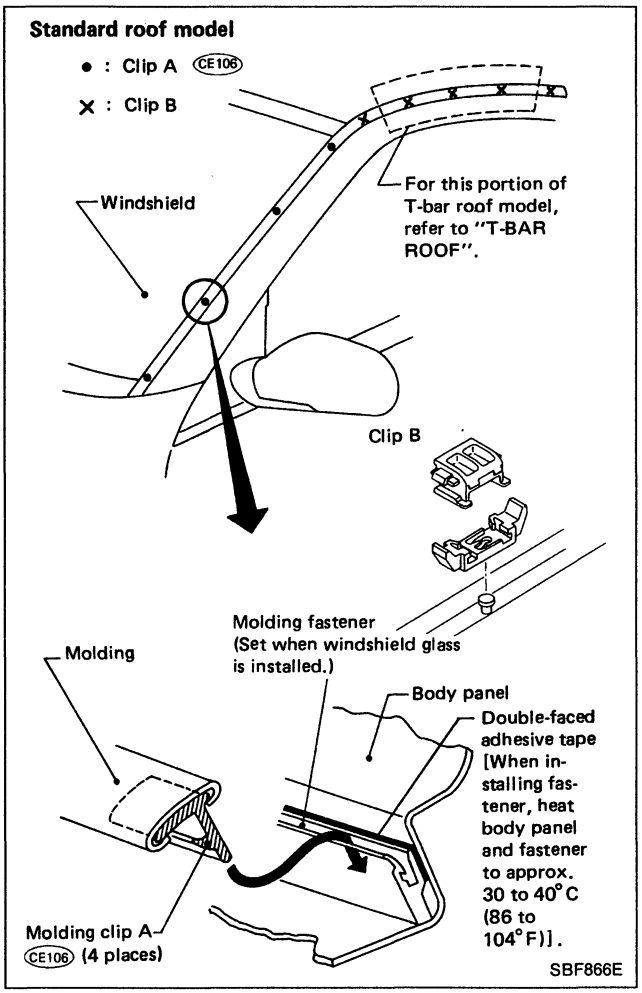
① Hood front and rear seal



② ③ Cowl top seal and cowl top grille



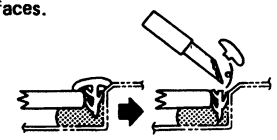
④ Windshield side molding



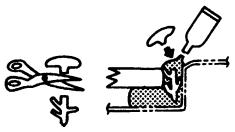
⑤ Windshield upper molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.

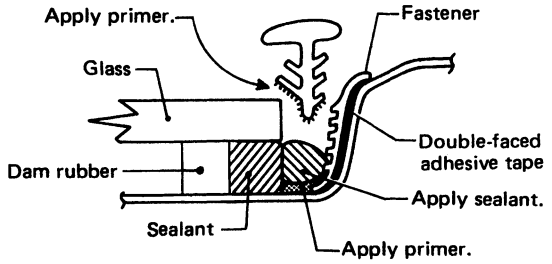


Cut off lower portion of new molding

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 & primer to body panel, and apply primer to molding.



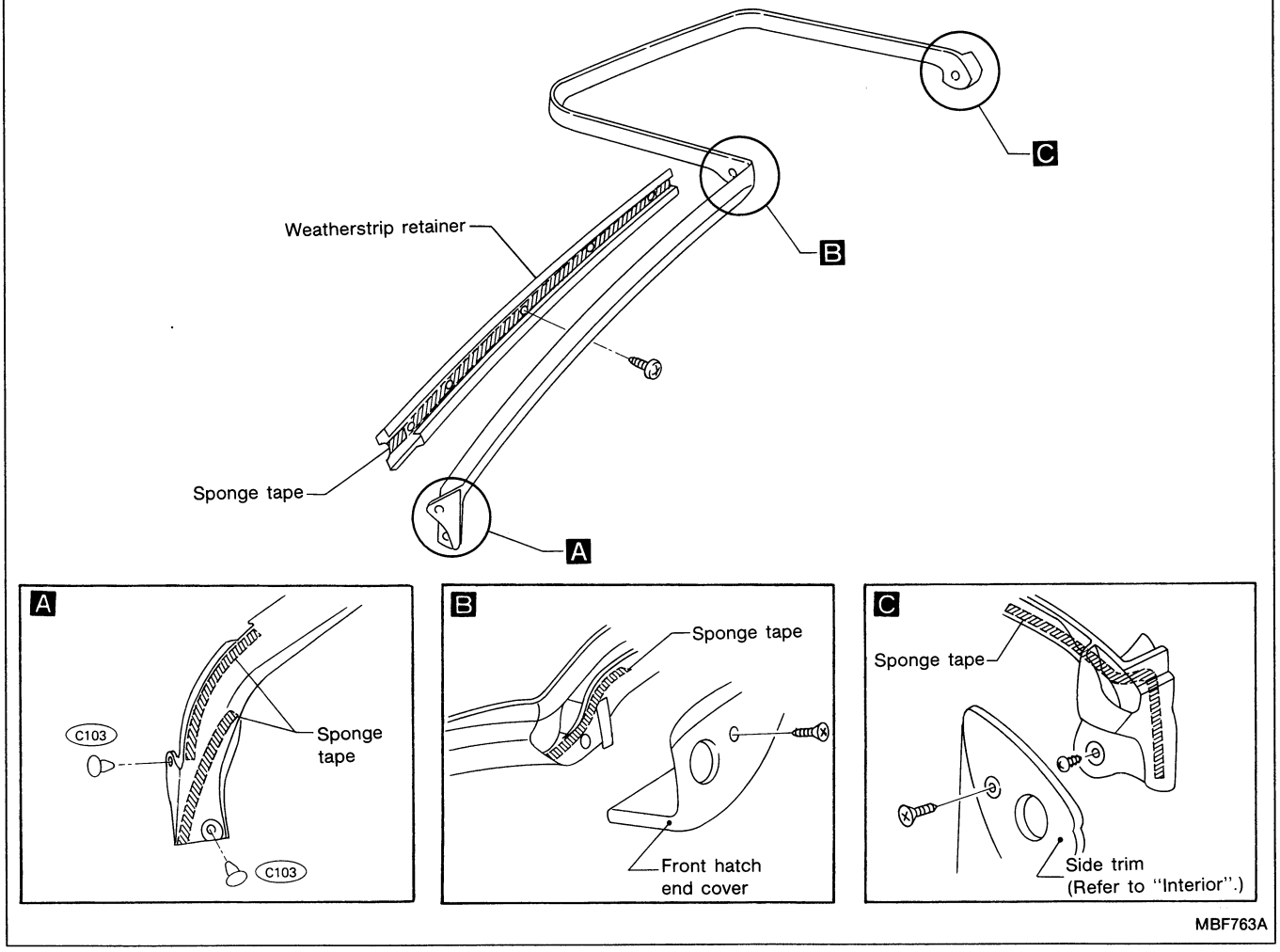
4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

MBF690A

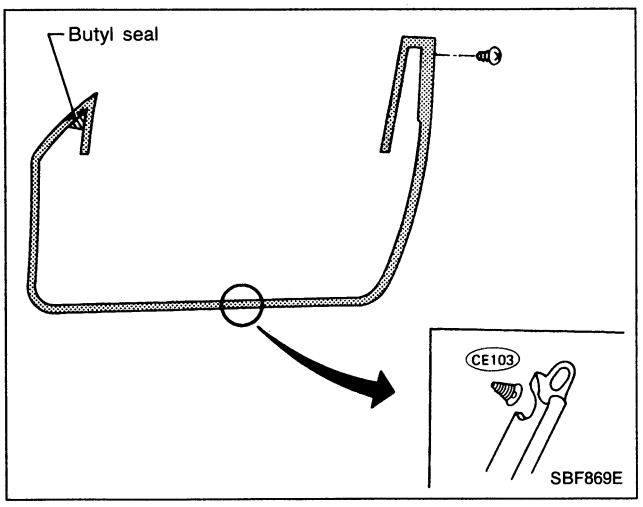
Exterior (Cont'd)

⑥ Body side weatherstrip

T-bar roof model
Basically the same as the standard roof model

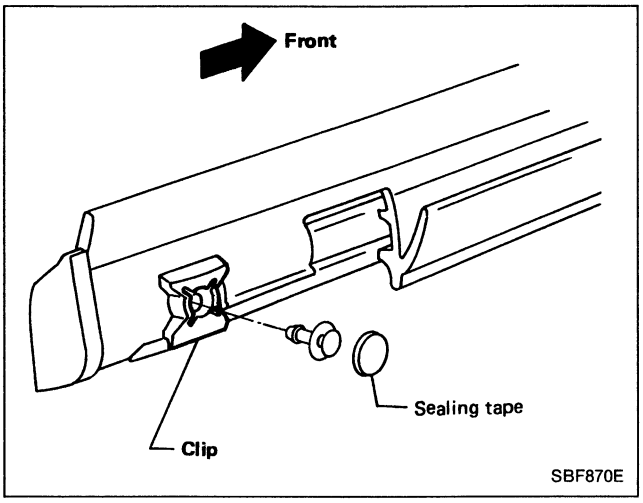


⑦ Door weatherstrip

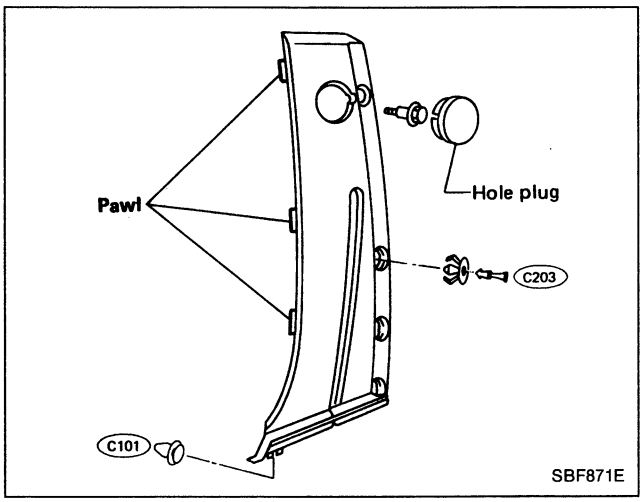


Exterior (Cont'd)

⑧ Door out side molding



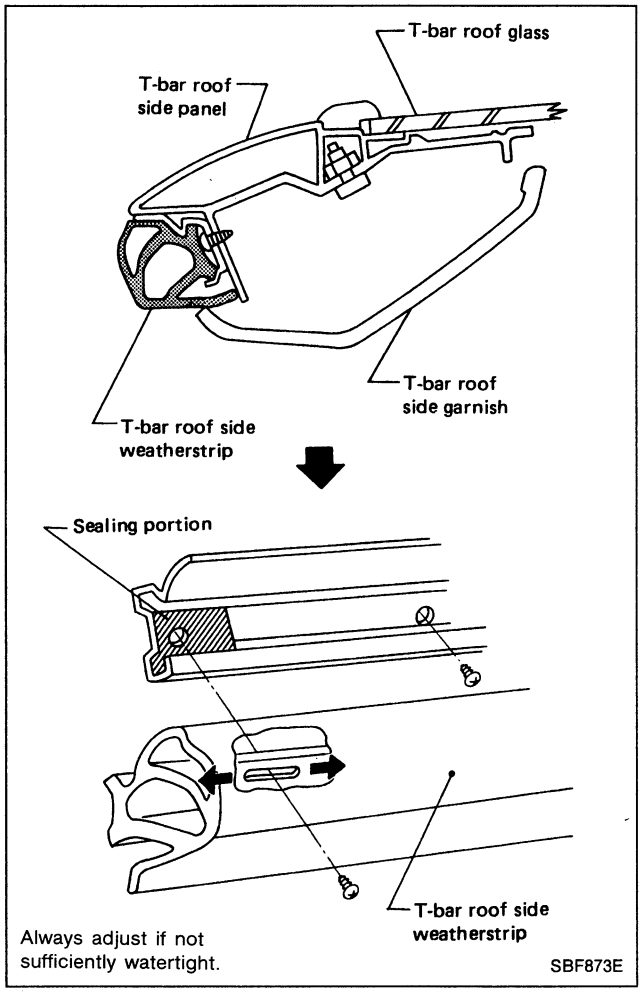
⑨ Door outer finisher



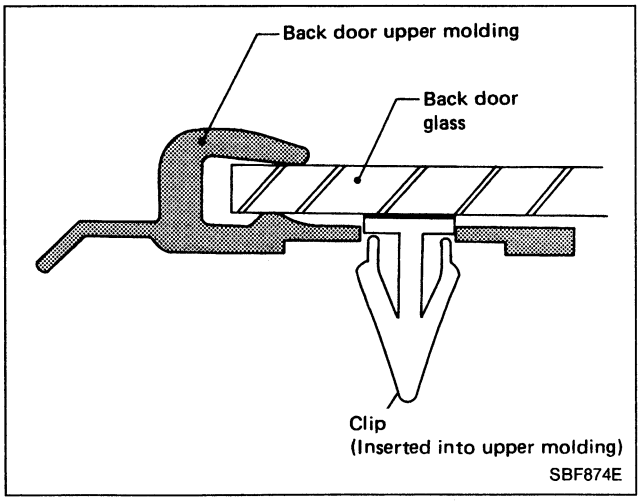
⑩ T-bar roof sash and T-bar roof weatherstrip

These are part of the T-bar roof glass and cannot be removed. (Refer to "T-BAR ROOF".)
If they are damaged, replace entire T-bar roof glass assembly.

⑪ T-bar roof side weatherstrip

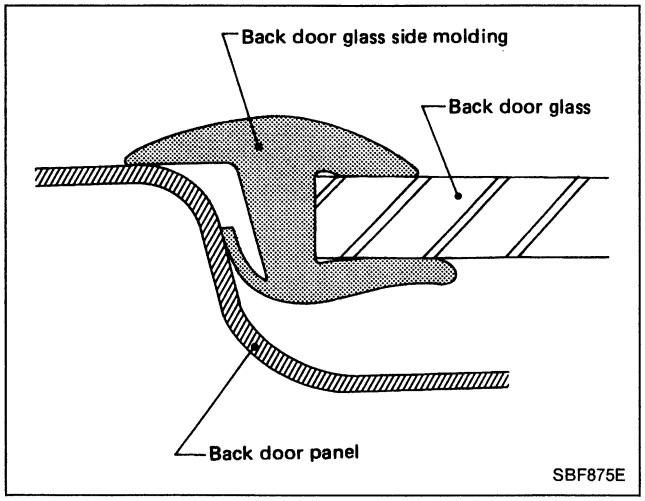


⑫ Back door glass upper molding

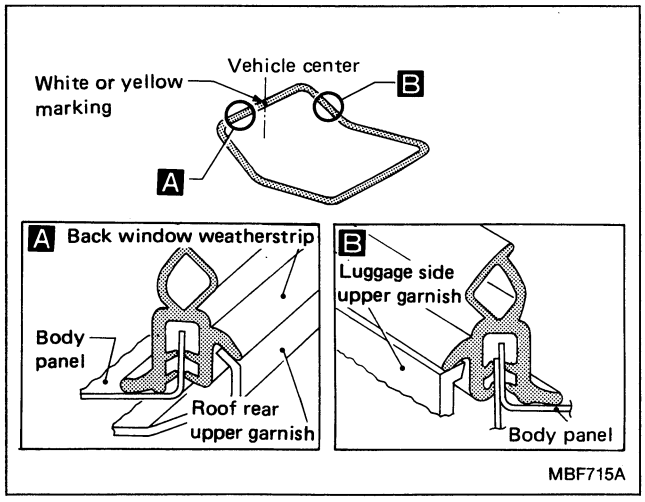


Exterior (Cont'd)

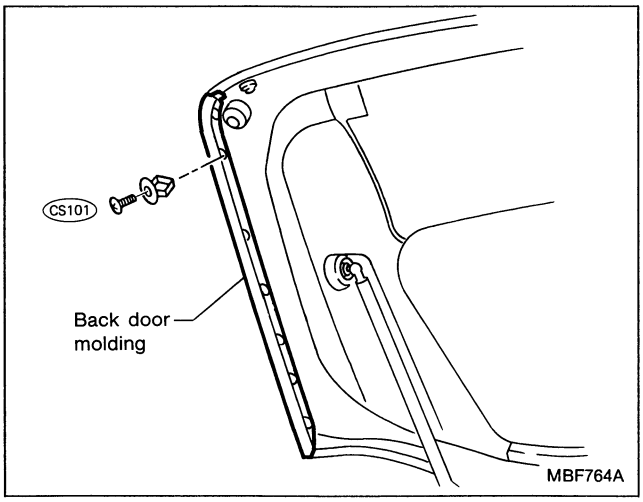
⑬ Back door glass side molding



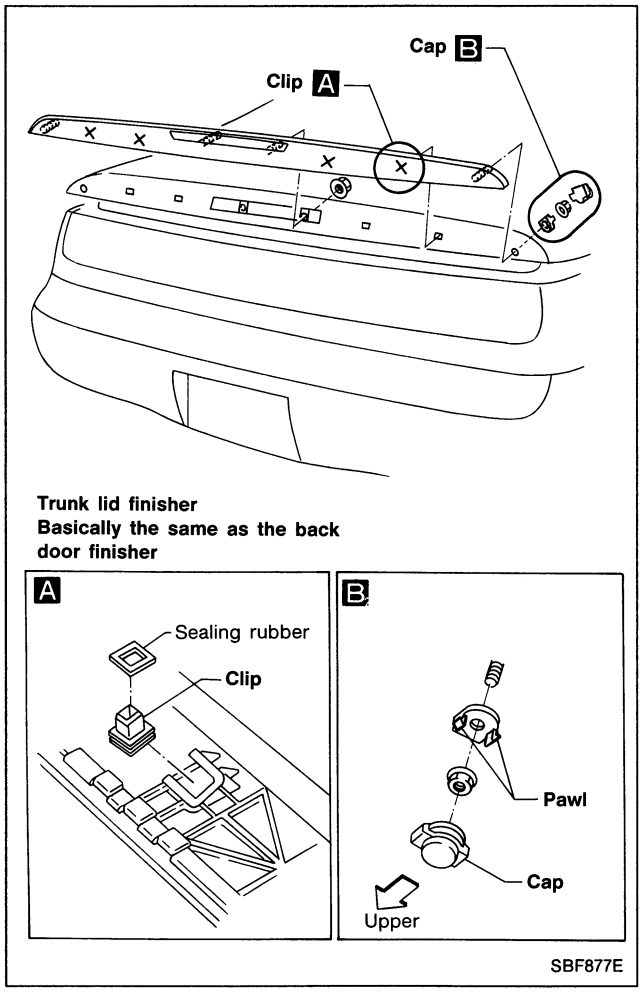
⑭ Back door weatherstrip



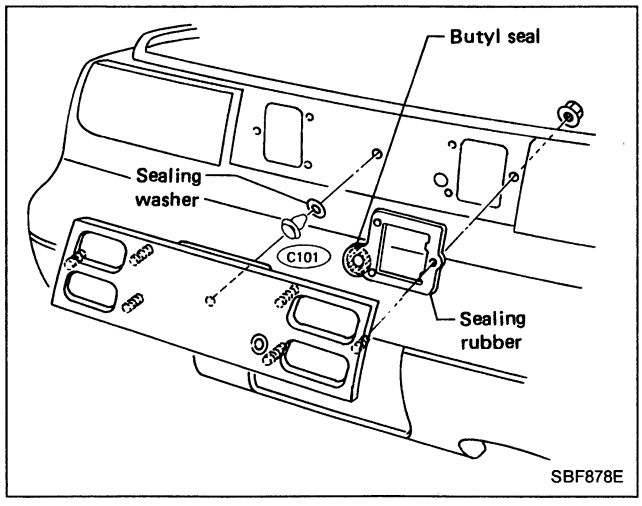
⑮ Back door molding



⑯ ㉖ Back door finisher and trunk lid finisher

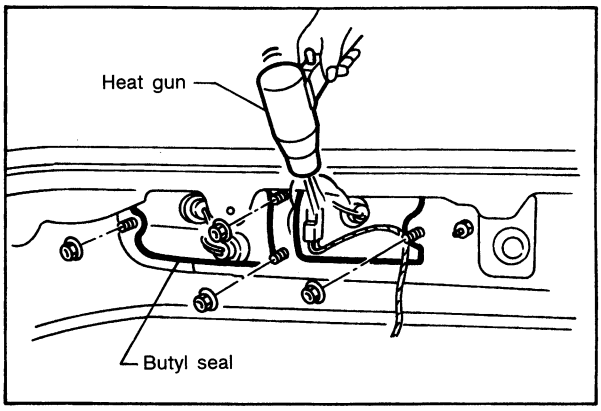


⑰ Rear panel finisher

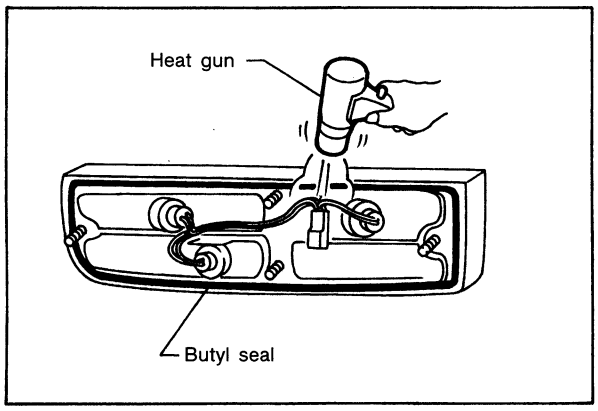


Exterior (Cont'd)

⑱ Rear combination lamp



- **Warm up lamp assembly area to a temperature a little below 60°C (140°F).**

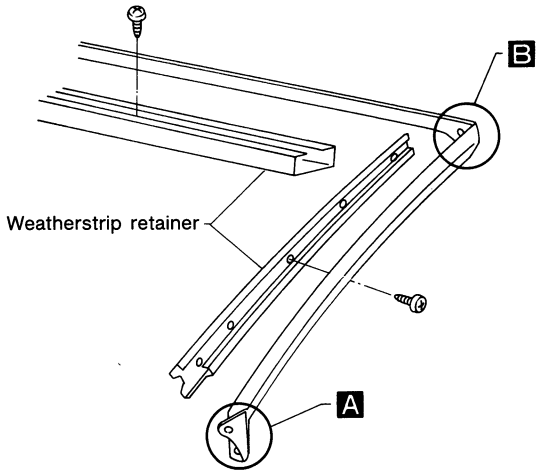


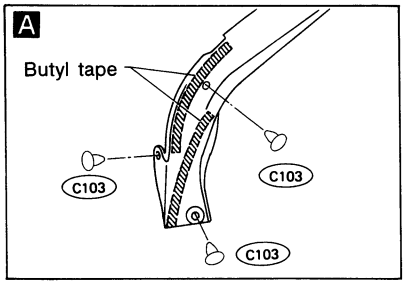
- **Apply butyl seal evenly as it tends to become thin in the corners.**
- **Warm up lamp assembly area to a temperature a little below 60°C (140°F).**

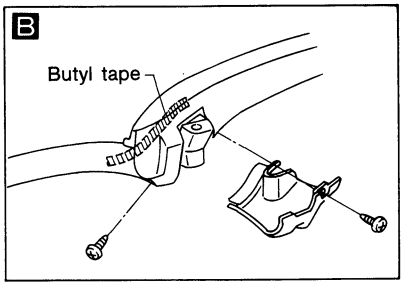
SBF886E

⑲ Body side weatherstrip

Convertible model



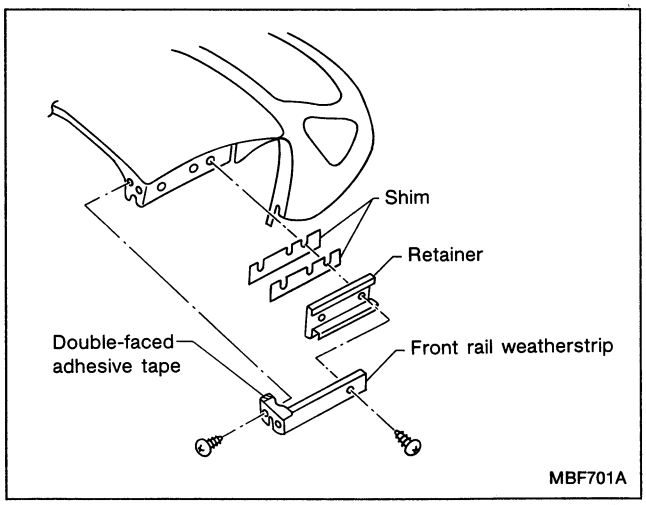




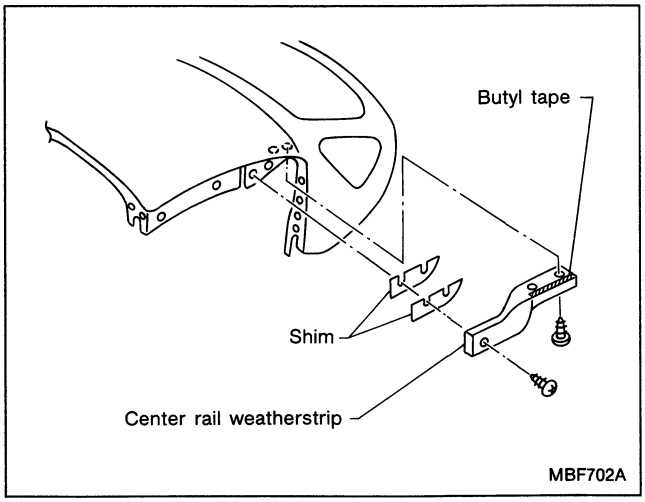
MBF700A

Exterior (Cont'd)

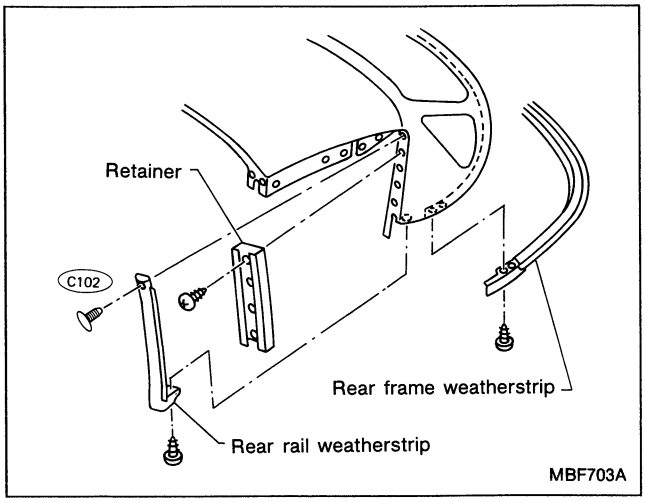
⑳ Front rail weatherstrip



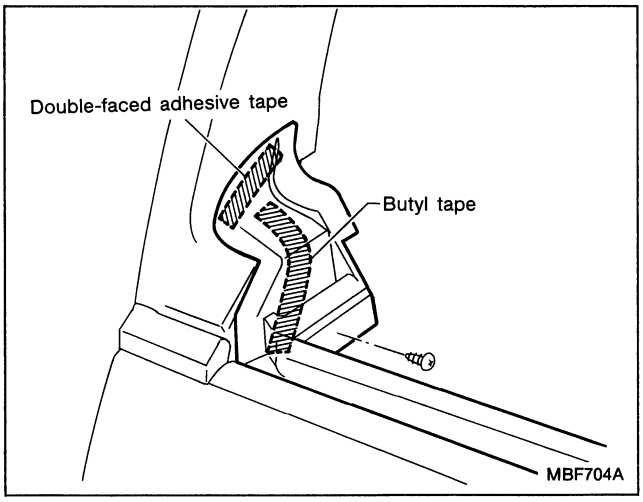
㉑ Center rail weatherstrip



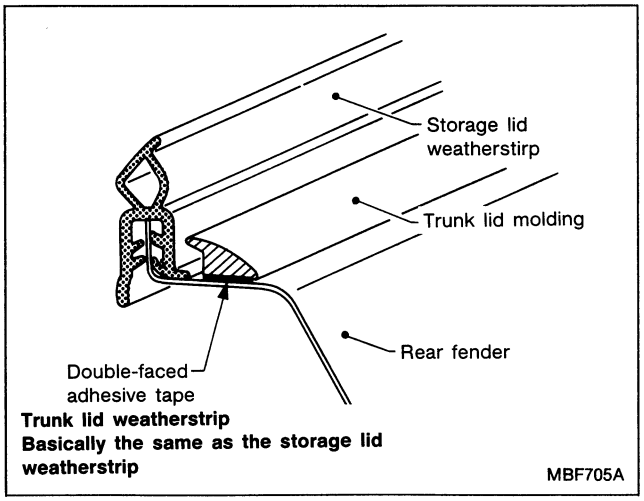
㉒ ㉓ Rear rail weatherstrip and rear frame weatherstrip



㉔ Storage lid weatherstrip

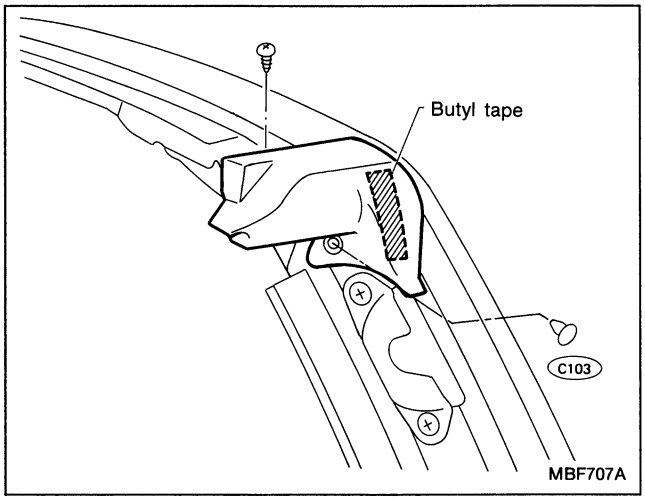


㉕ ㉝ Trunk lid molding and Trunk lid weatherstrip

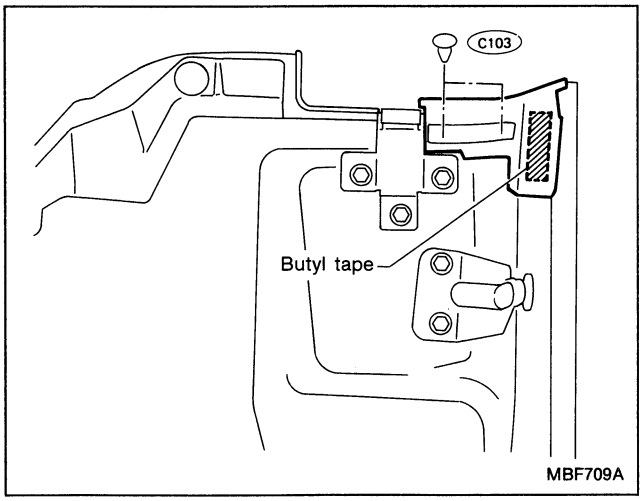


Exterior (Cont'd)

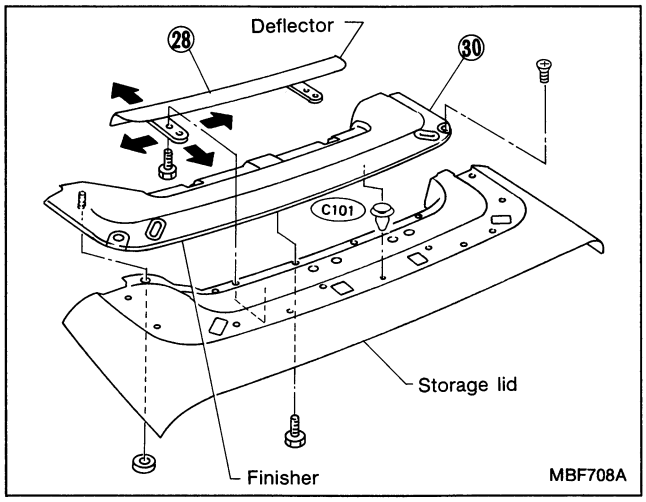
㉗ Body side rear weatherstrip



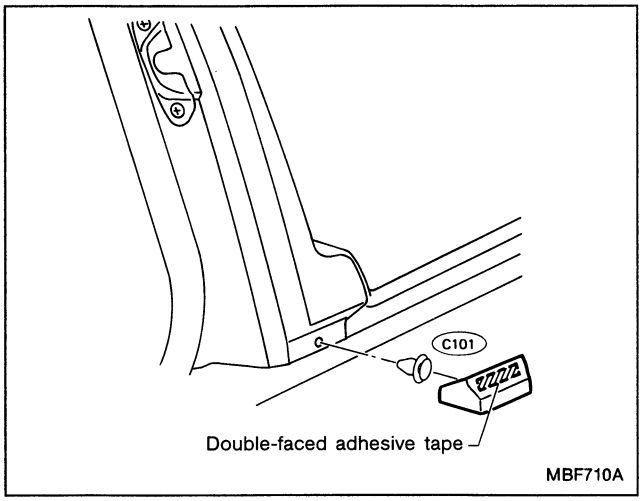
㉙ Storage lid corner seal



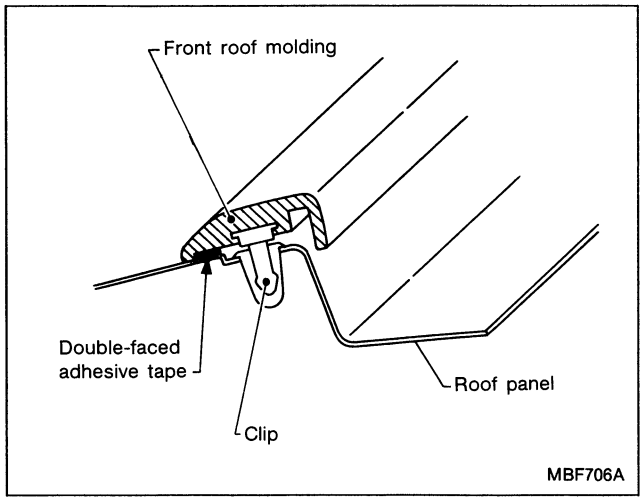
㉘ ㉚ Storage lid deflector and finisher



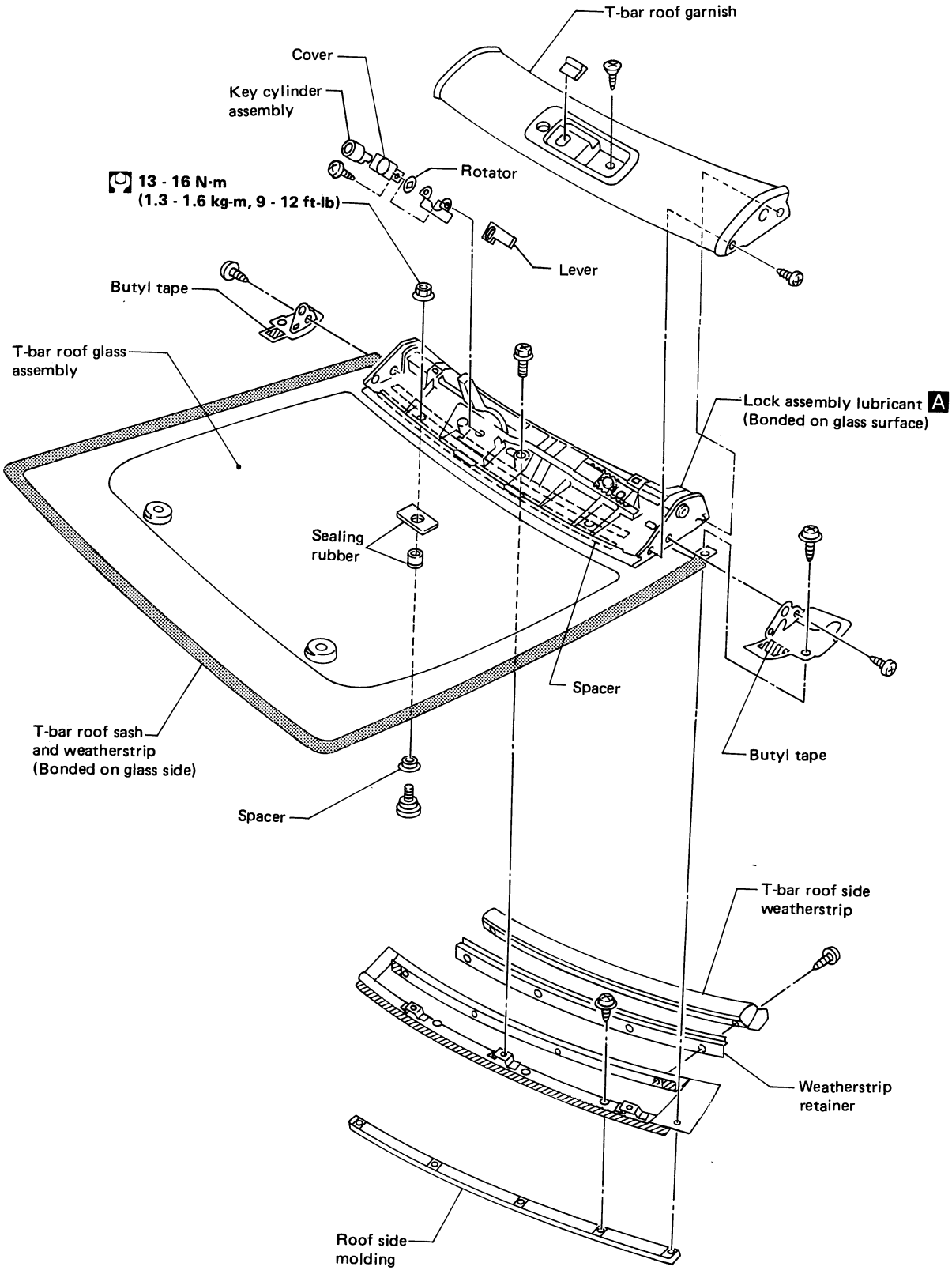
㉛ Center pillar molding

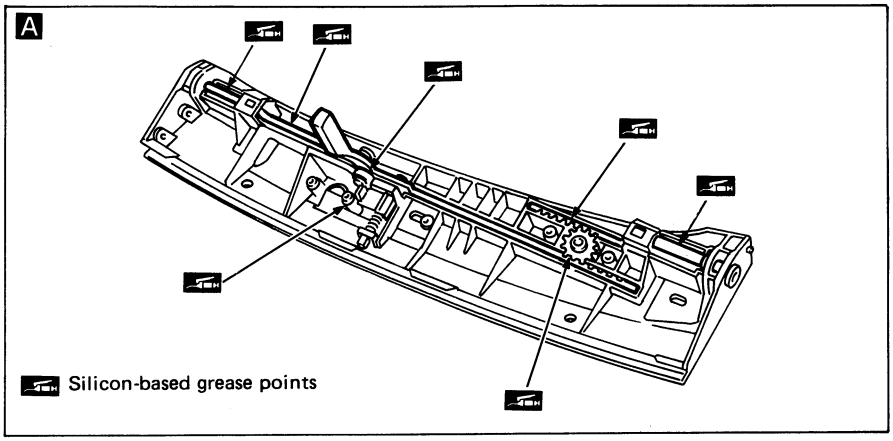


㉜ Front roof molding

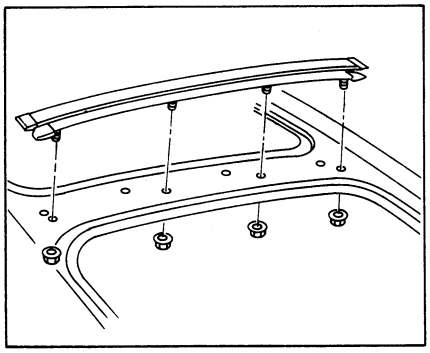


- Handle T-bar roof glass with care so not to damage it.
- Apply sealant to portions susceptible to water leakage if necessary.
- Side molding, sash, lock basement and glass of T-bar roof constitute one unit and cannot be disassembled.

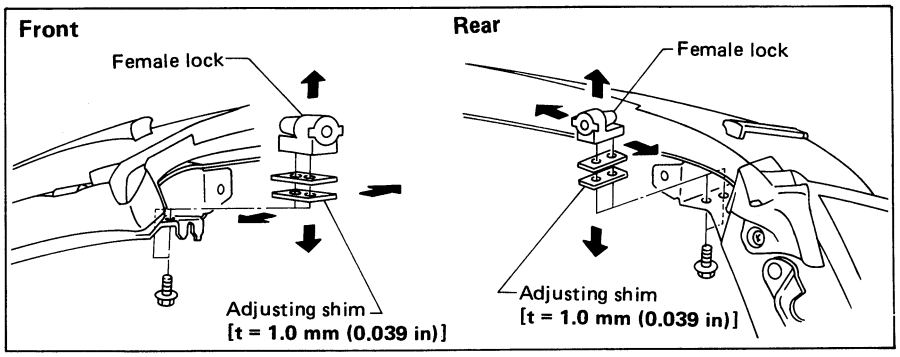




T-bar roof hook



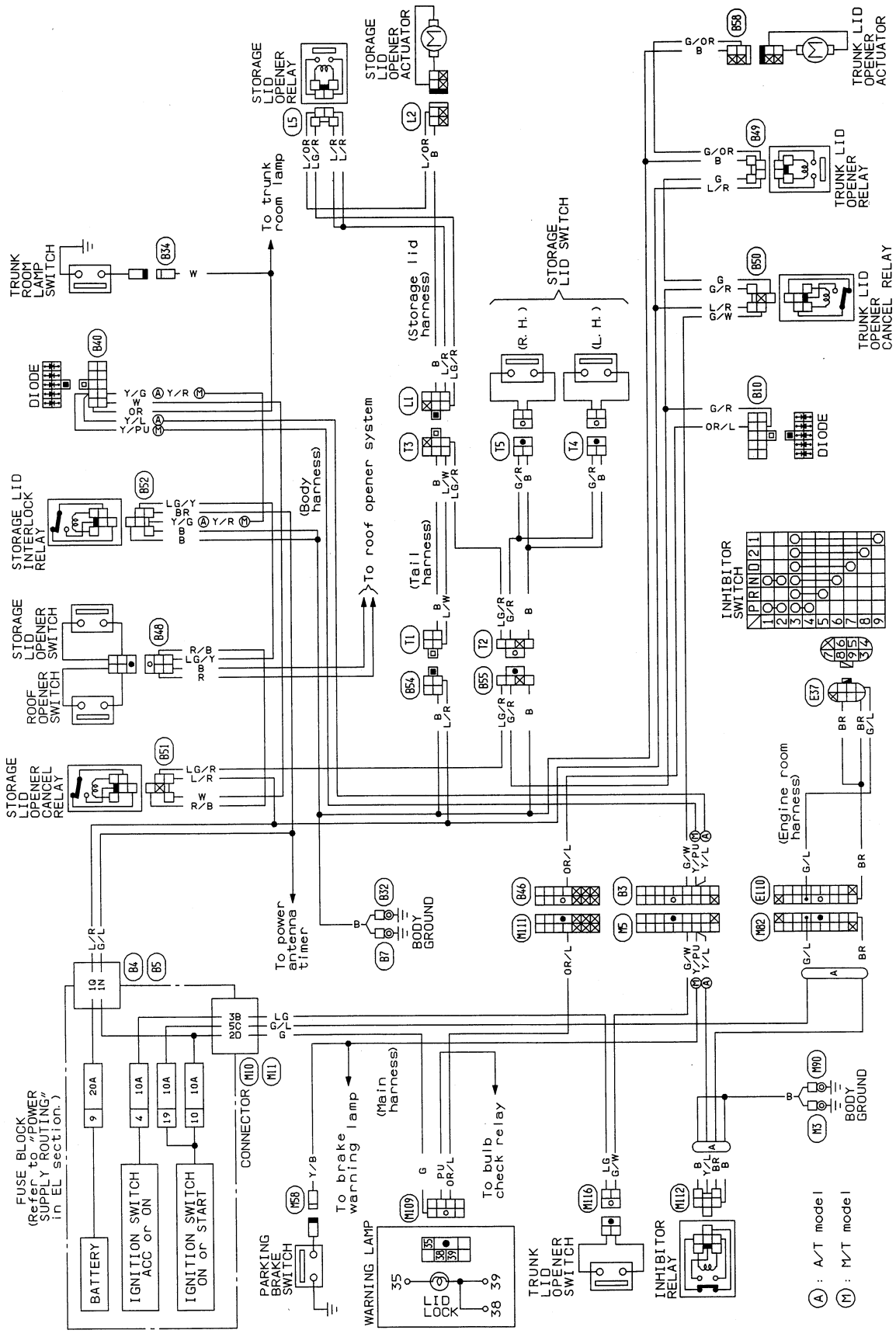
T-bar roof female lock adjustment



MBF717A

Wiring Diagram

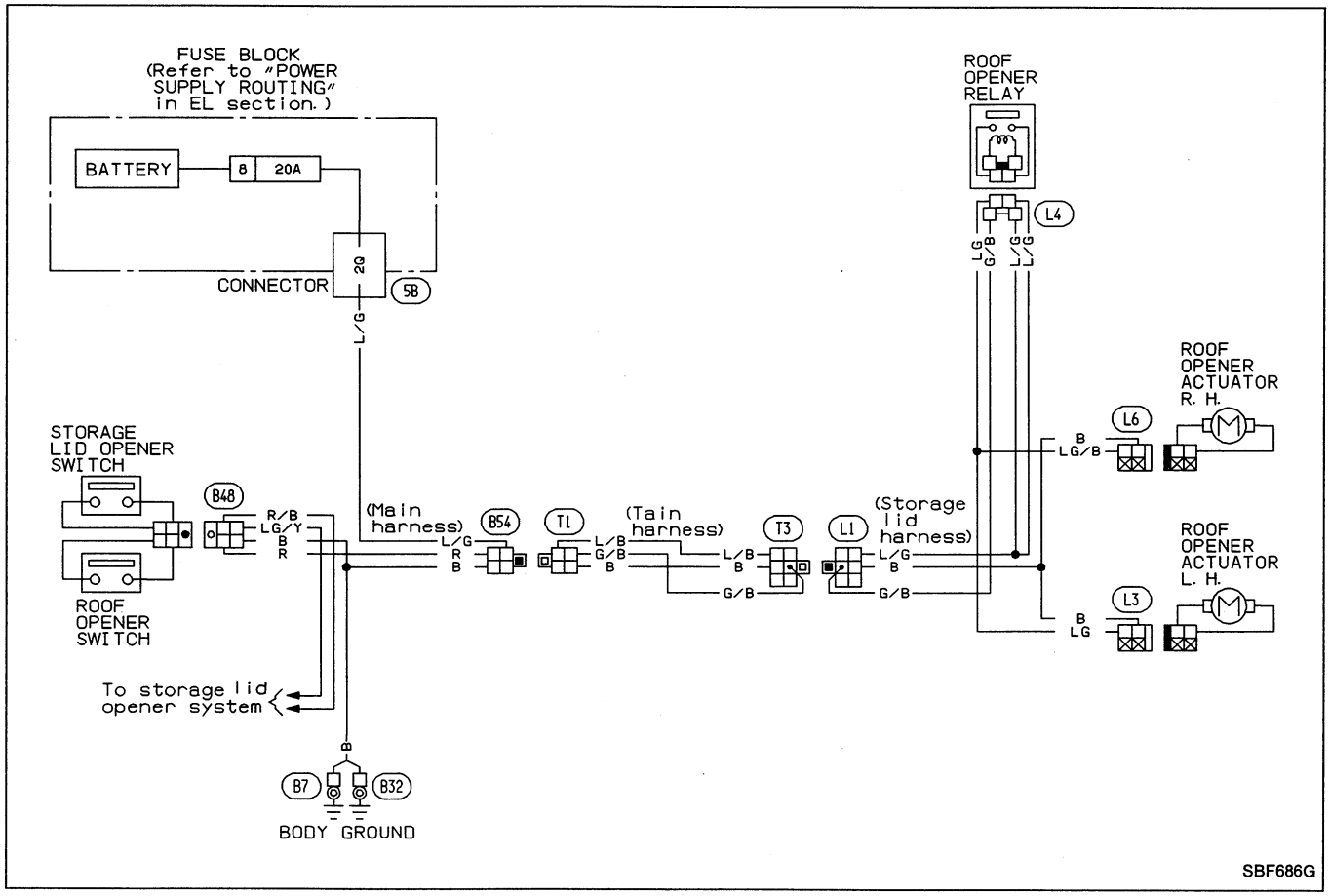
STORAGE LID AND TRUNK LID OPENER SYSTEM



SBF685G

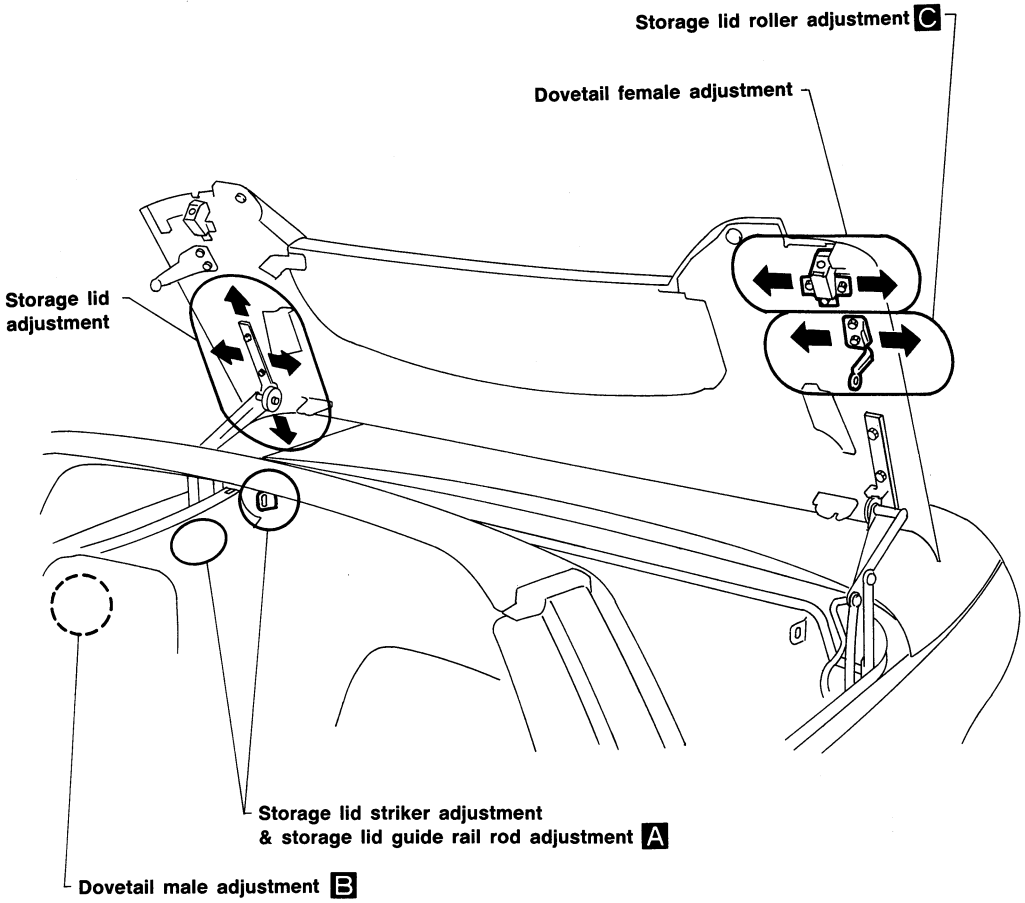
Wiring Diagram (Cont'd)

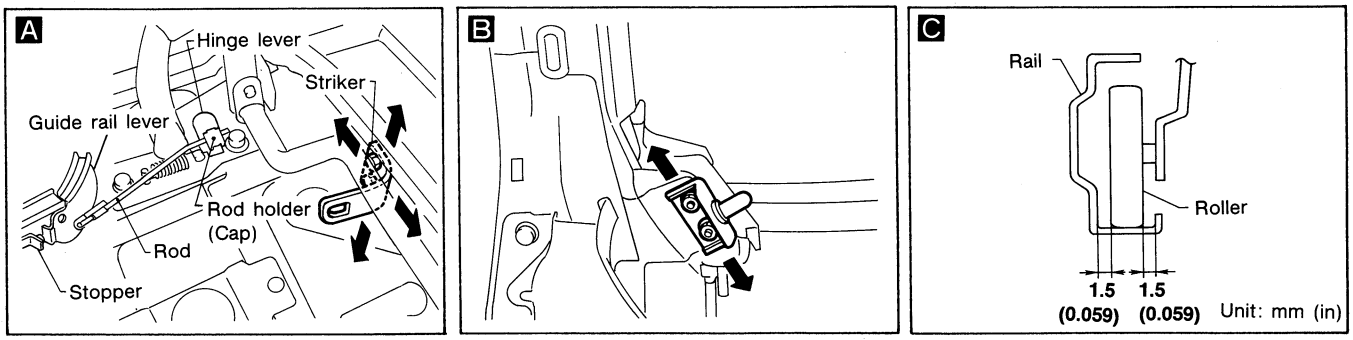
ROOF OPENER SYSTEM



Storage Lid

- Storage lid adjustment: Adjust at hinge-storage lid portion for proper storage lid.
- Storage lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check storage lid lock operation.





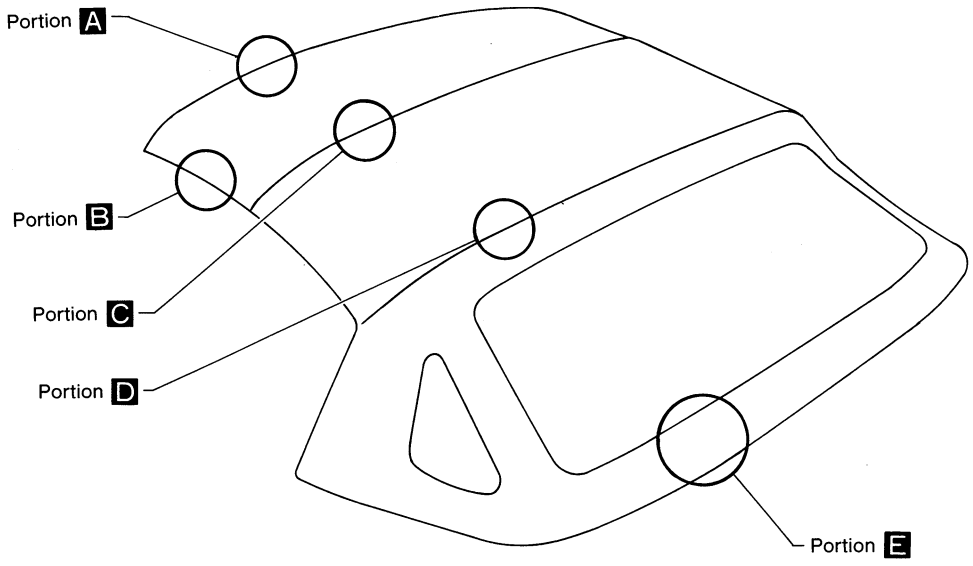
Rod length adjustment procedure

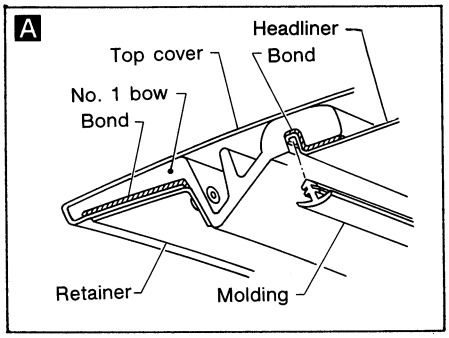
(1) Ensure cap and rod are freed.
(2) Lightly push rod toward front of vehicle until guide rail lever comes into contact with stopper.
(3) Push lever (on hinge side) toward front of vehicle until it comes into contact with catch.
(4) Push rod into rod holder and then put cap over the rod.

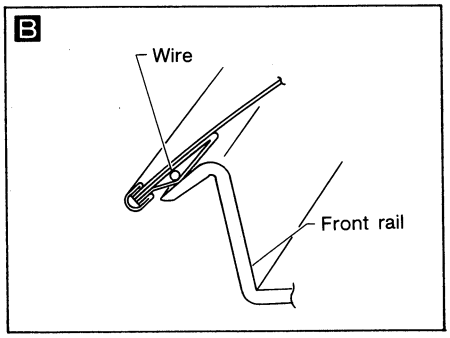
MBF711A

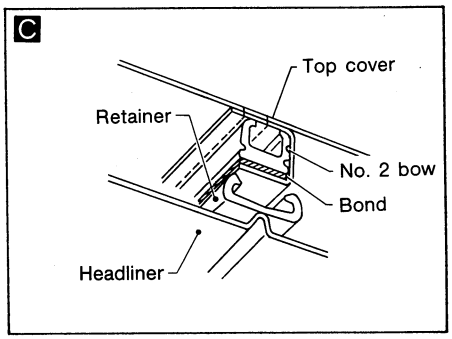
Top Cover and Headliner

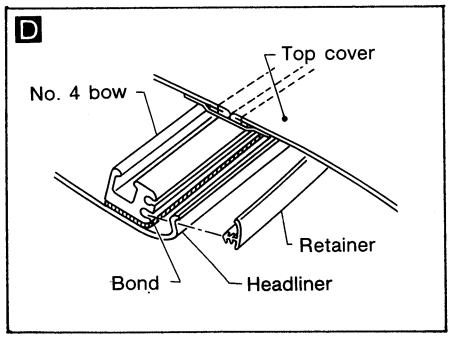
- Protect vehicle interior and exterior when applying adhesive.
- Take care not to apply an excessive amount of adhesive.

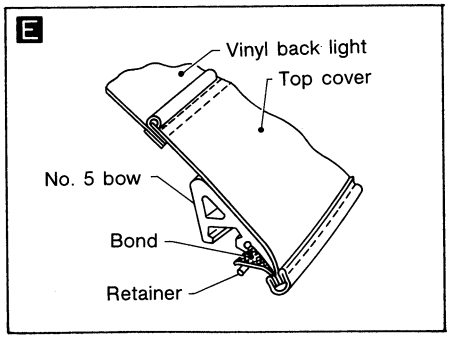












BOND ... 3M Super Weatherstrip Adhesive or equivalent

MBF712A

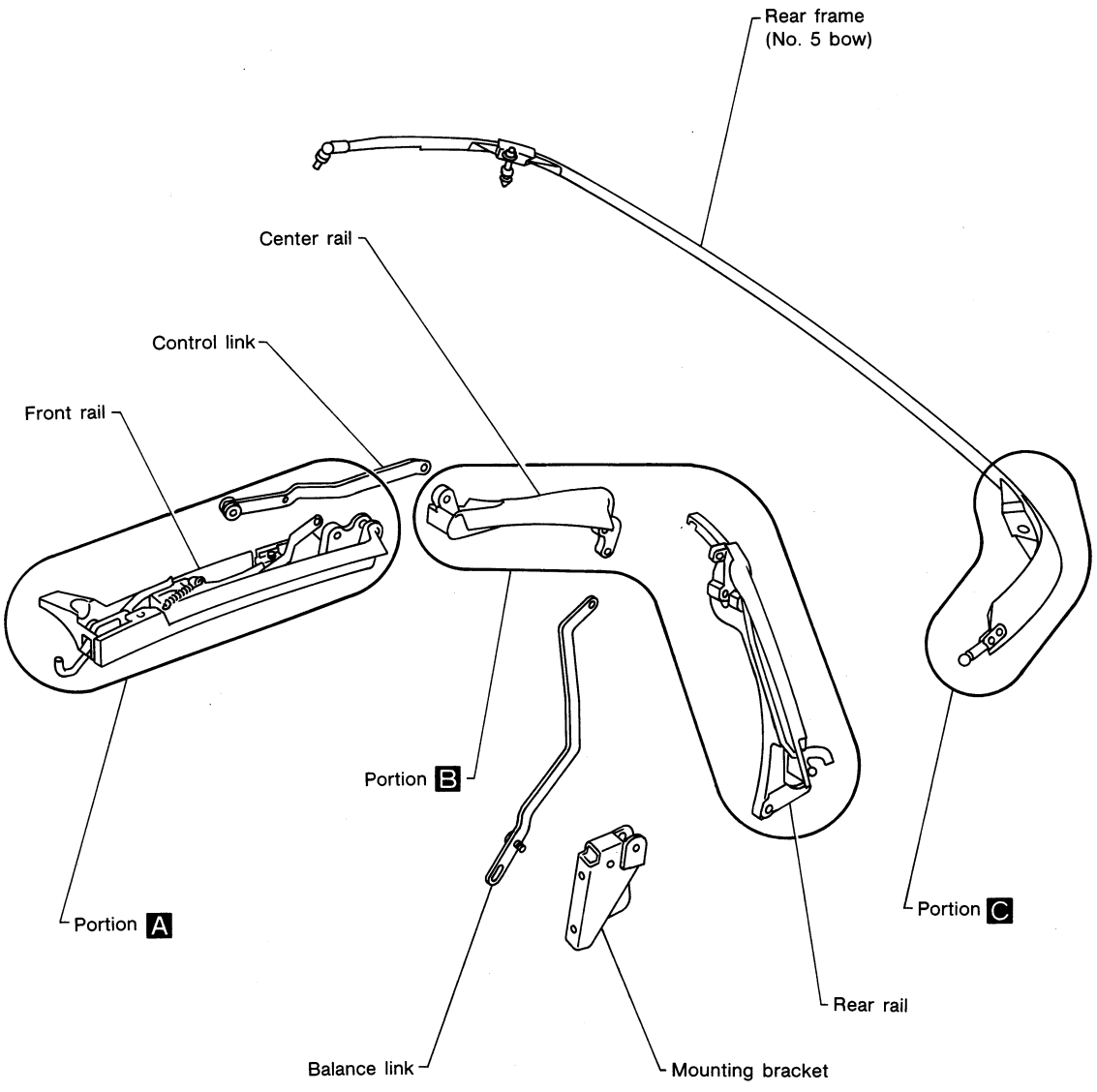
Linkage

Make sure of the following:

- Front and rear locks operate smoothly and securely.
- When stored, top cover is locked securely to hook and storage lid operates smoothly.
- No abnormal sound is heard during operation.
- The bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.

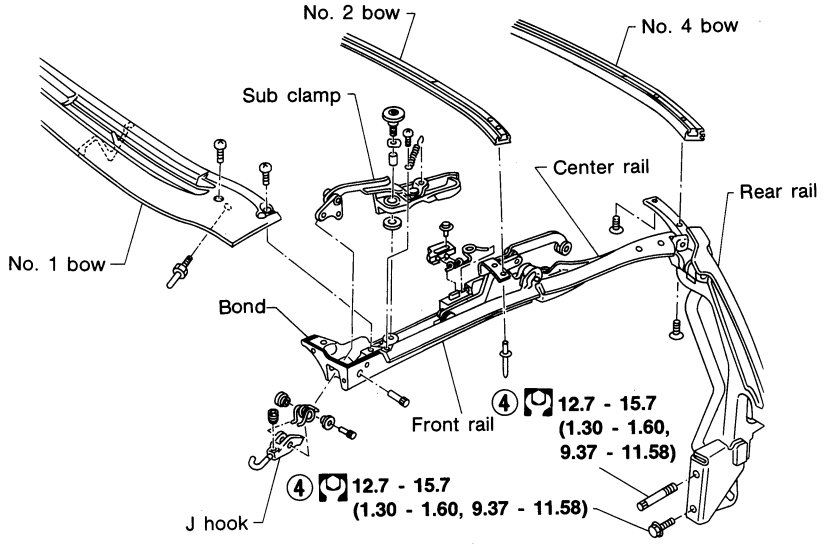
REMOVAL — Top stack roof assembly

① Fully open top stack roof.
② Unlock the rear lock at rear frame.
③ Remove balance spring.
④ Remove bolt.

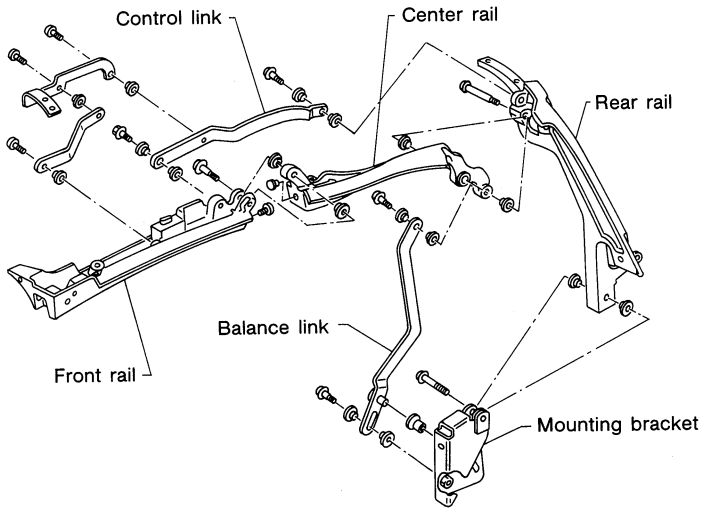


Linkage (Cont'd)

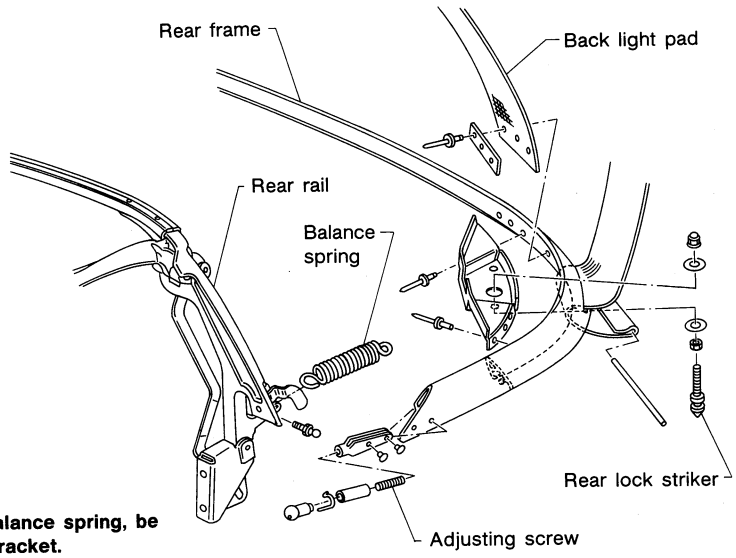
A



B



C

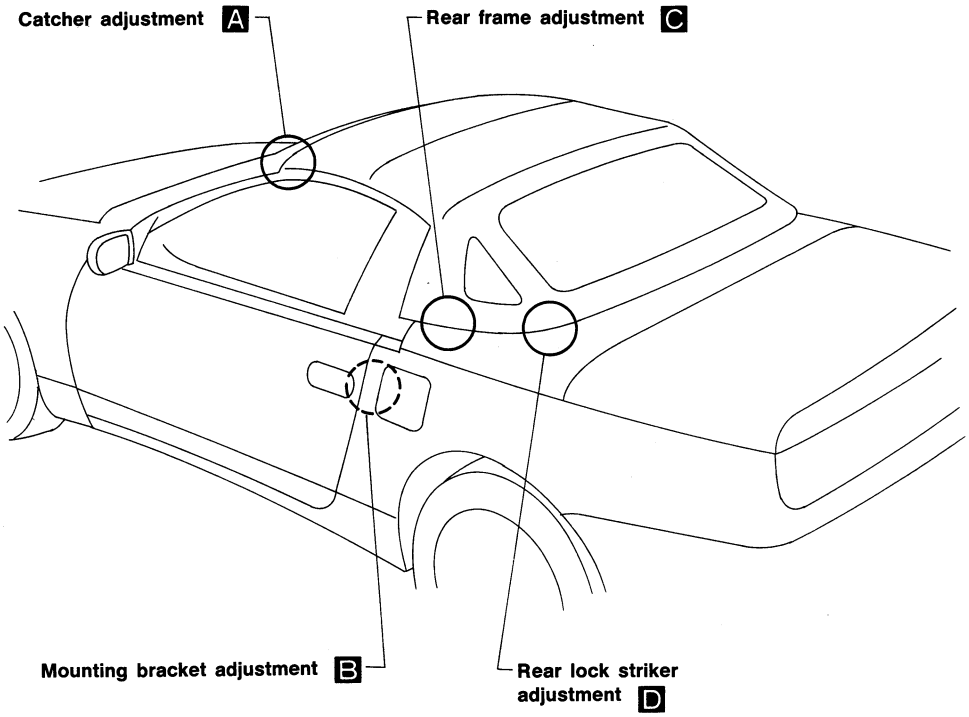


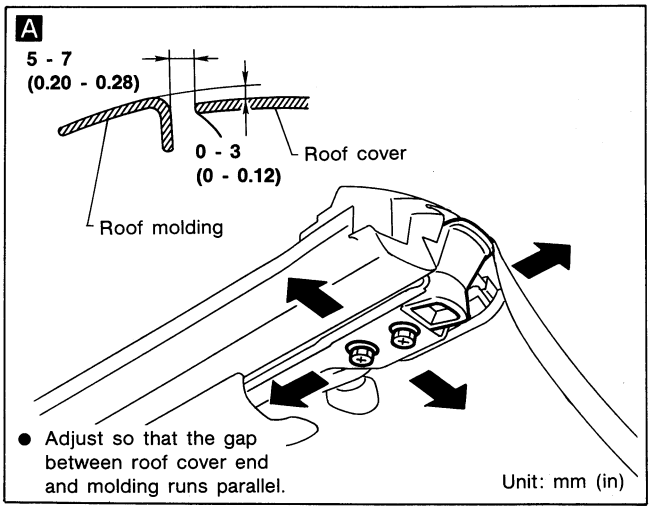
CAUTION:
While removing or installing balance spring, be careful not to deform spring bracket.

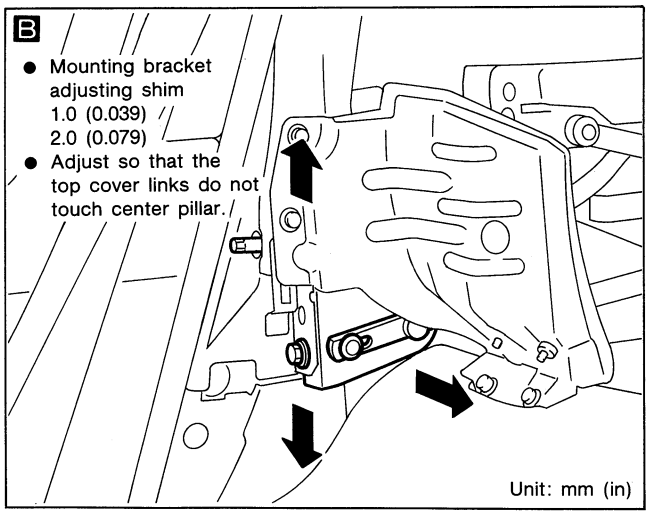
MBF713A

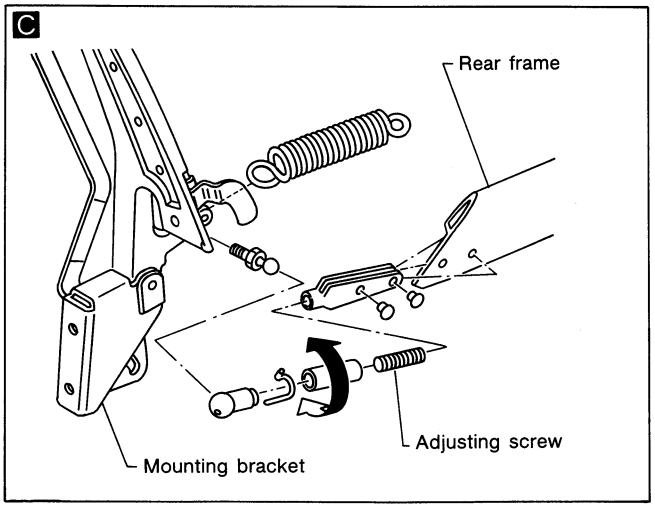
Adjustment

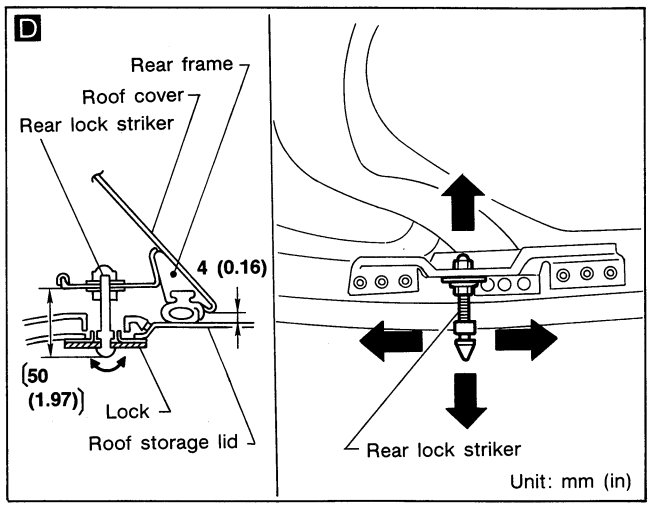
- After any adjustment, check top stack roof operation and roof alignment.









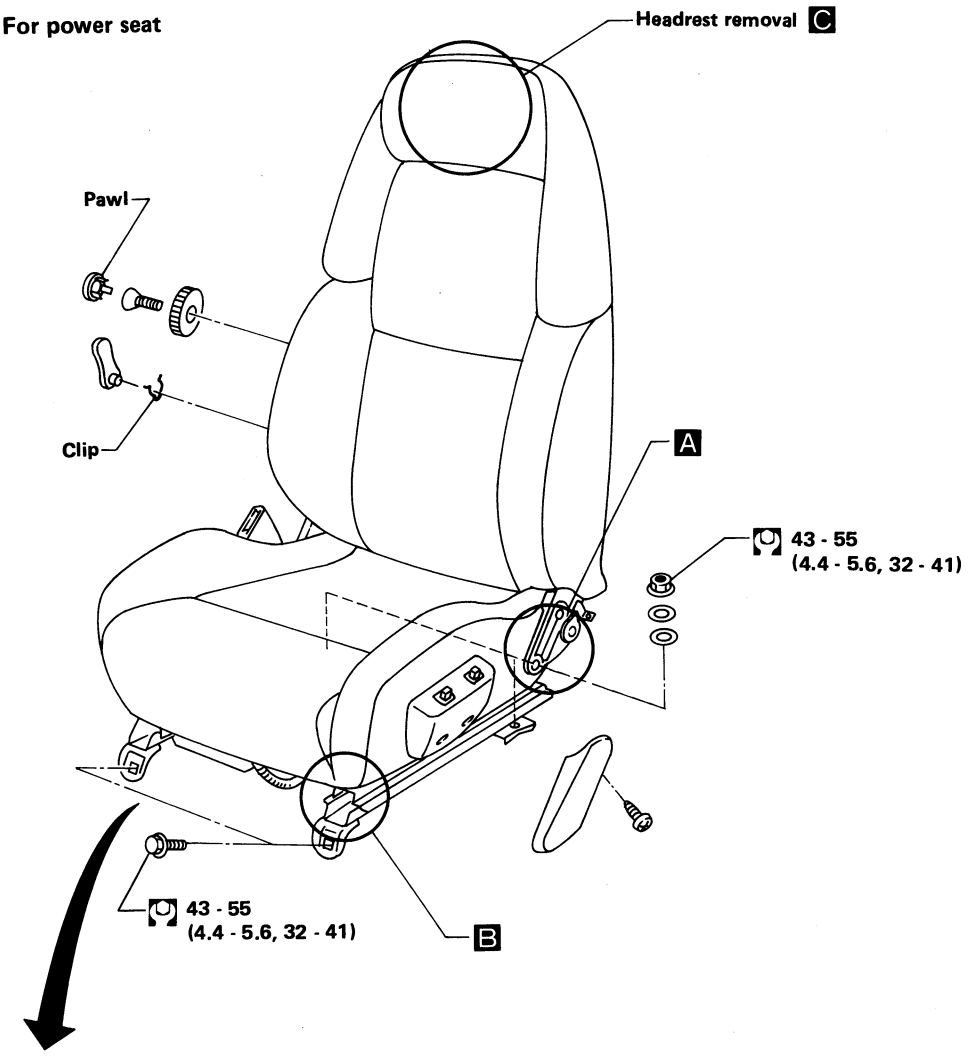


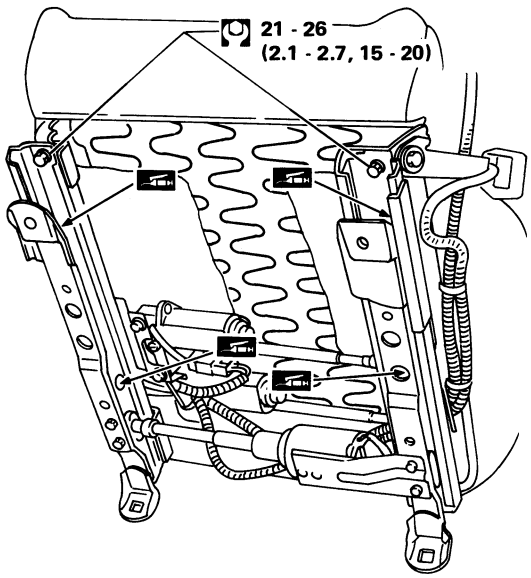
MBF714A

- When removing or installing the seat trim, handle it carefully to keep it from becoming dirty and to avoid damage.

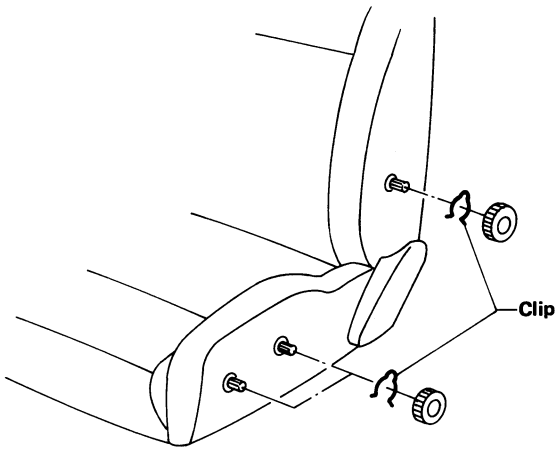
FRONT SEAT

For power seat



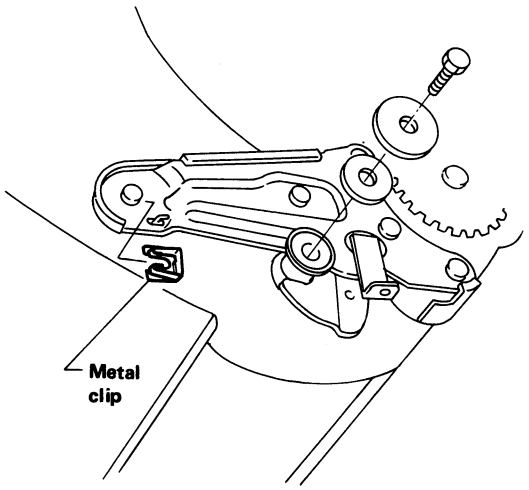


For manual seat



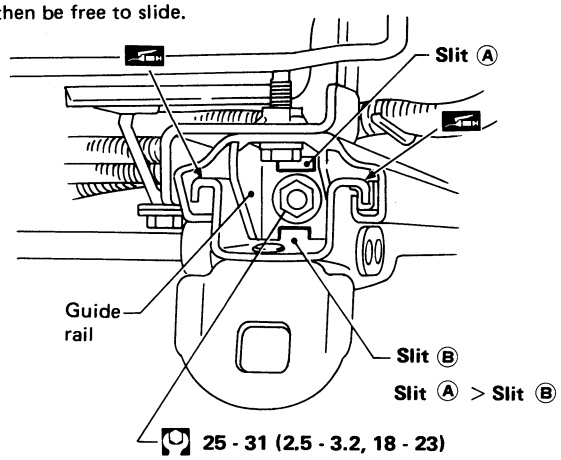
: N·m (kg-m, ft-lb)

A

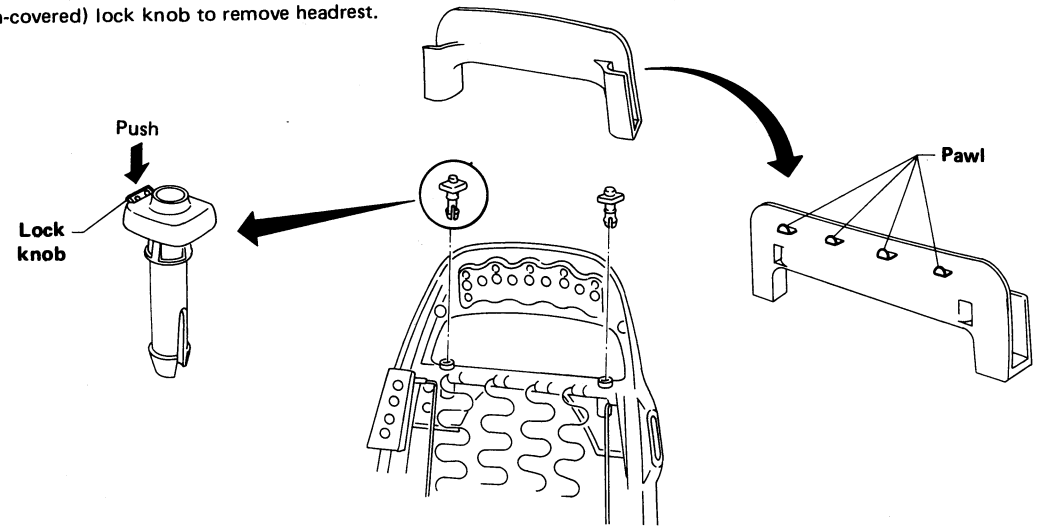


B **For power seat**

Remove nuts from left and right guide rails. Seat will then be free to slide.

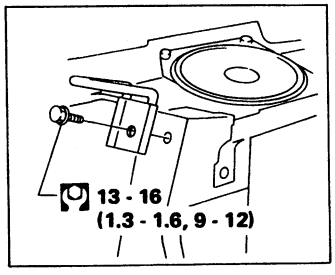


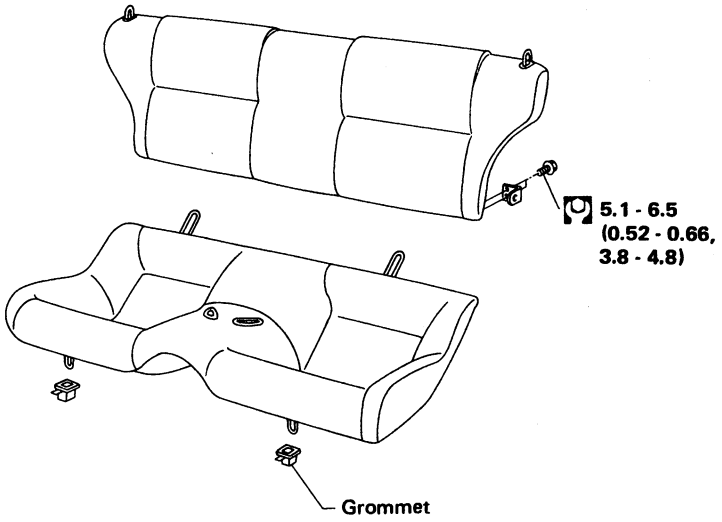
C Push (trim-covered) lock knob to remove headrest.



SBF879E

REAR SEAT

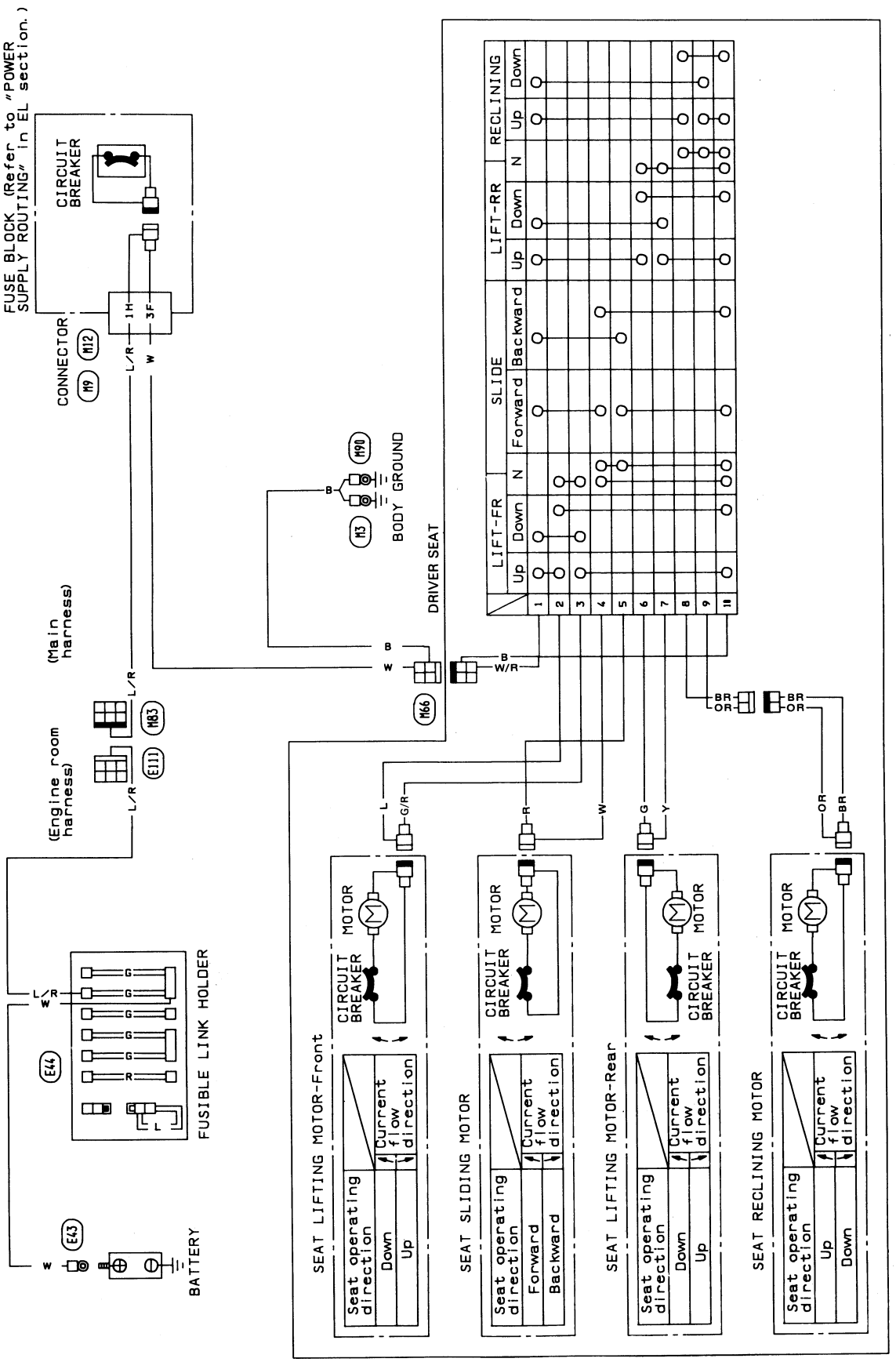




: N·m (kg-m, ft-lb)

SBF954E

POWER SEAT/WIRING DIAGRAM



SBF680G

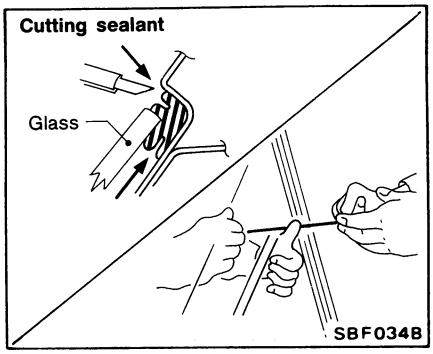
Windshield

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.

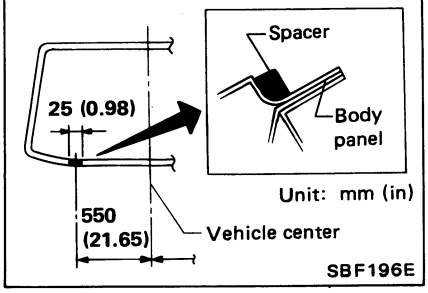
CAUTION:

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.**

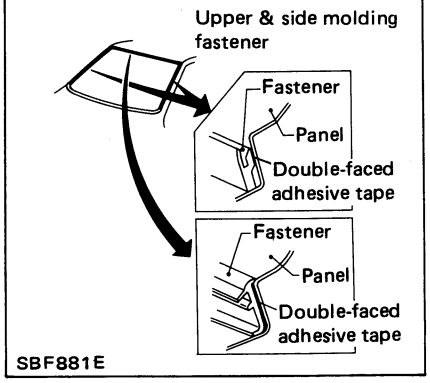
Body side

Install spacers to panel with double-faced adhesive tape.



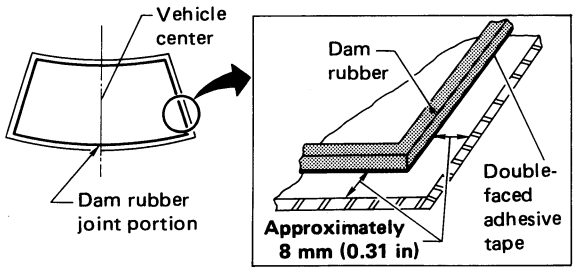
Install molding fastener.

When installing, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F).

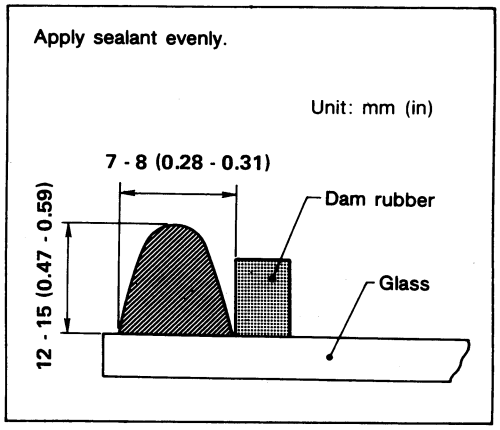


Glass side

Install dam rubber & spacers with double-faced adhesive tape.



Apply sealant evenly.



REPAIRING WATER LEAKS FOR WINDSHIELD

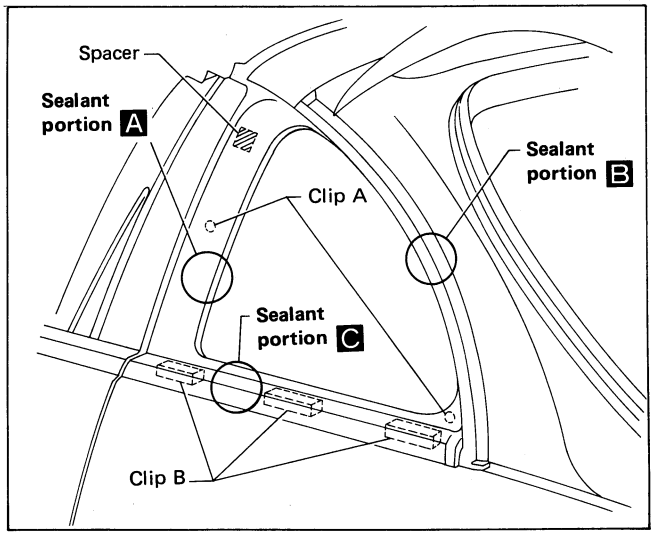
Leaks can be repaired without removing and reinstalling glass.

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.

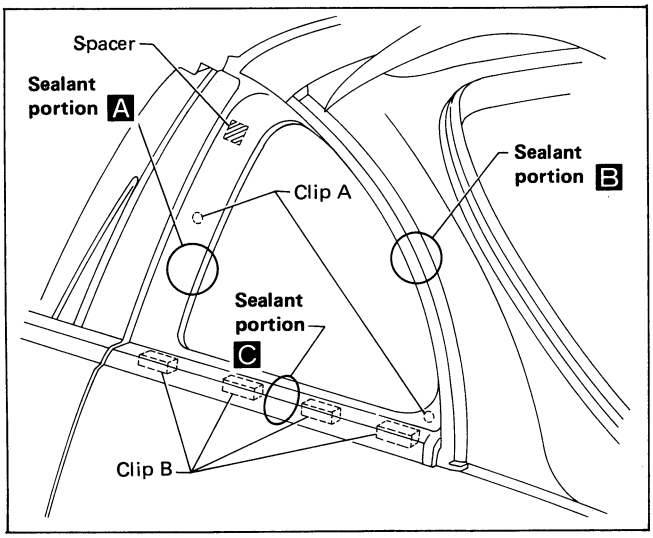
To stop the leak, apply primer (if necessary) and then sealant to the leak point.

Side Window

2 seater model



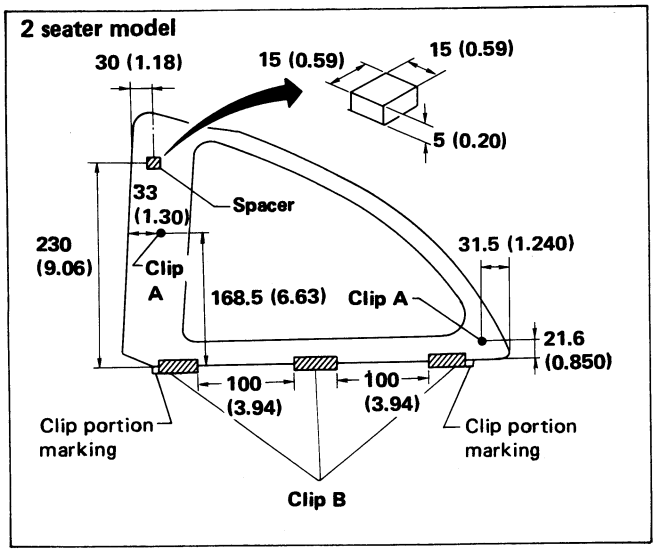
2+2 seater model



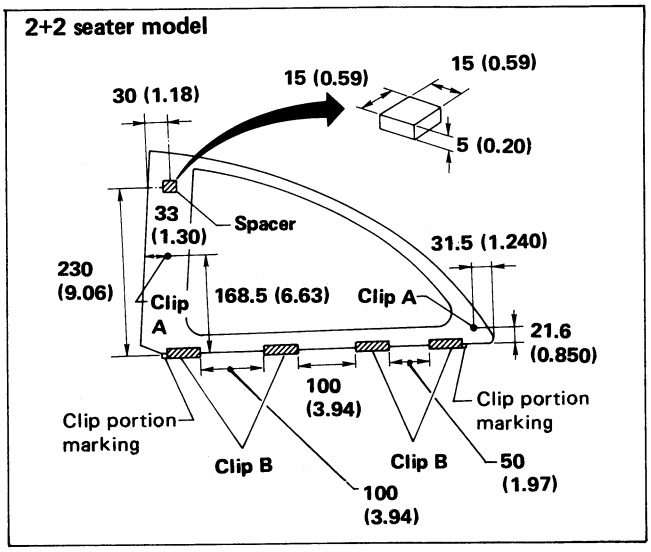
Spacer and clip portion

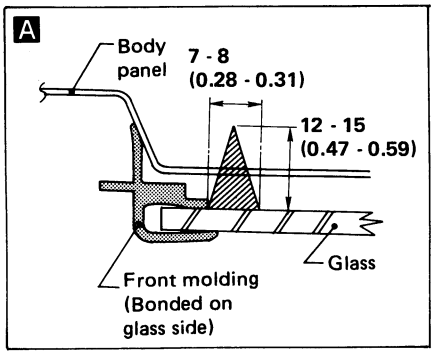
Unit: mm (in)

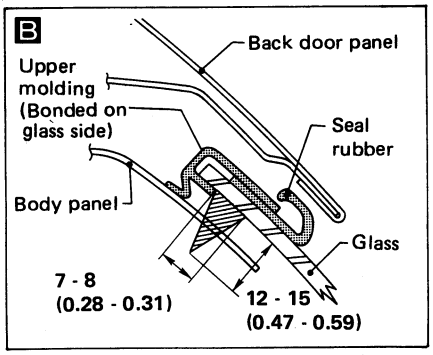
2 seater model

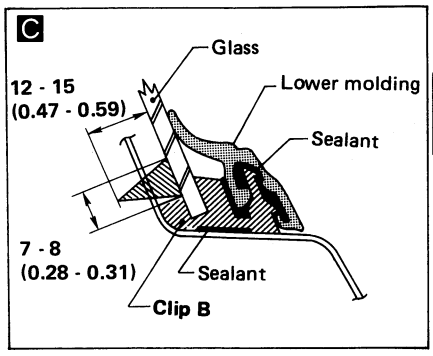


2+2 seater model





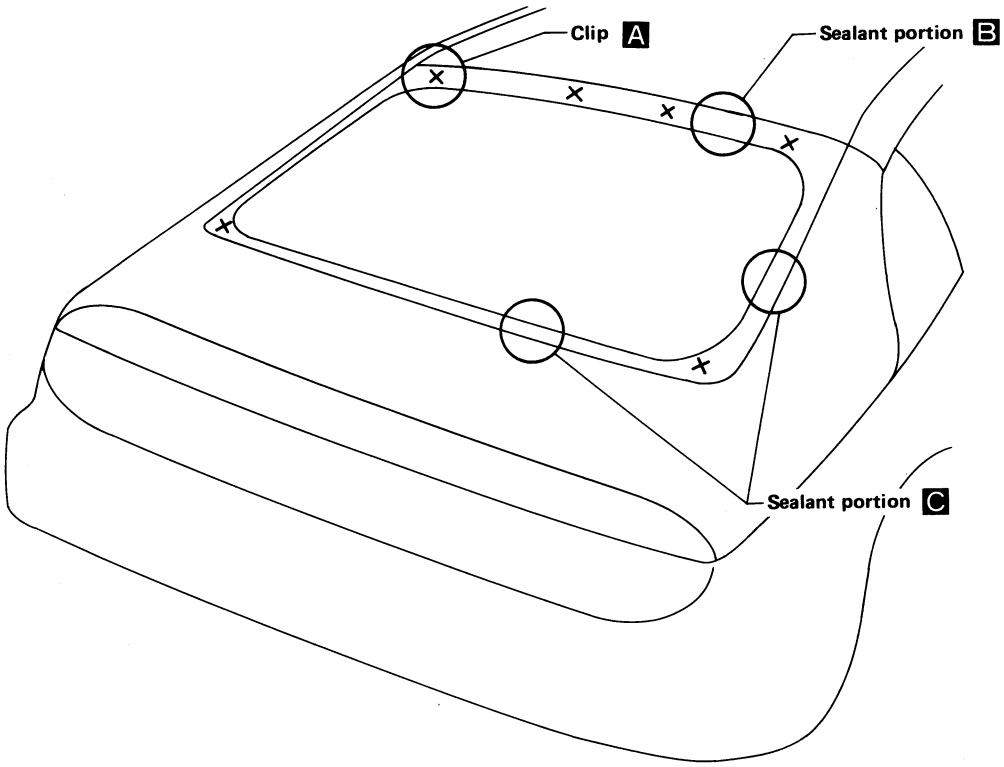


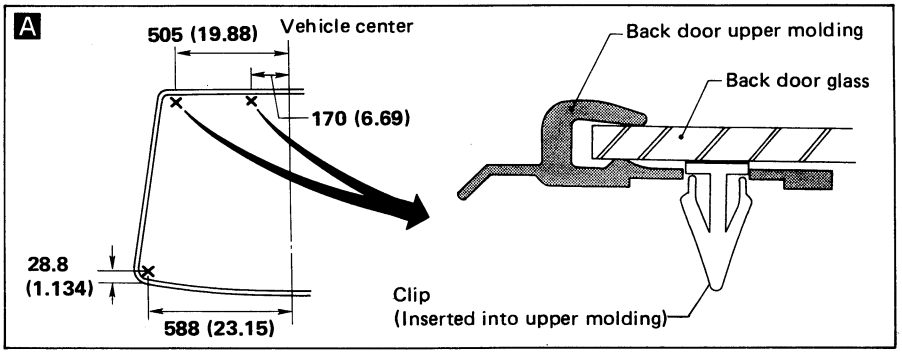


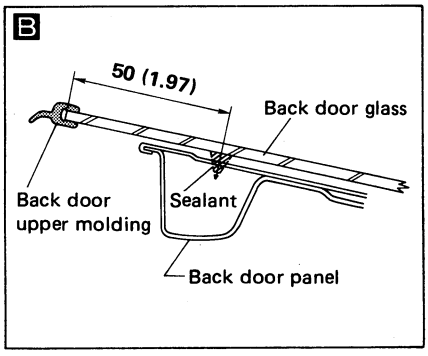
SBF010F

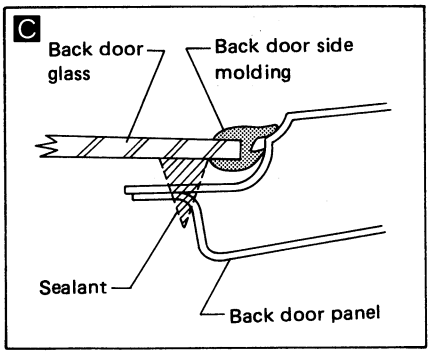
Back Door Window

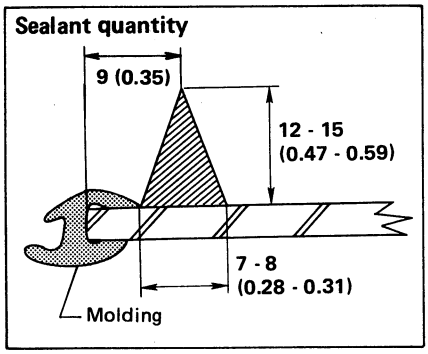
- Construction and removal/reinstallation method of back door window are basically the same as those of windshield.
- For sealant drying time, refer to "Drying Time for Sealant".
- For details of moldings, refer to "Exterior".







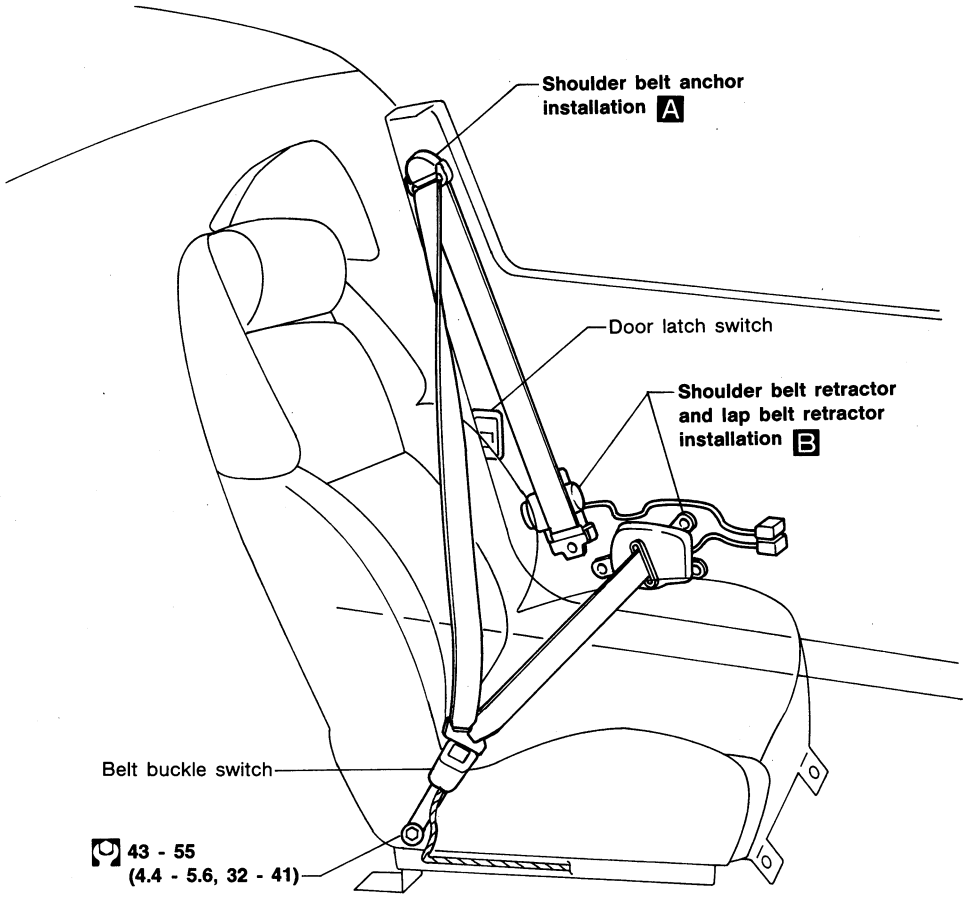




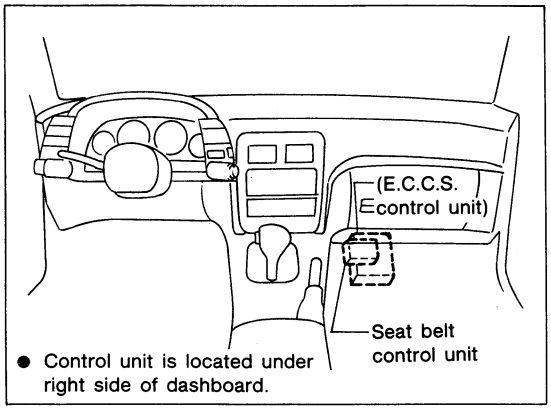
Unit: mm (in)

SBF884E

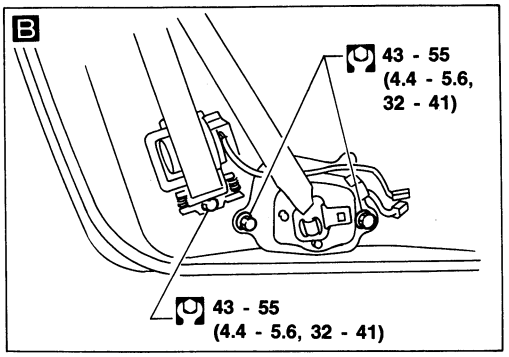
Unit Location

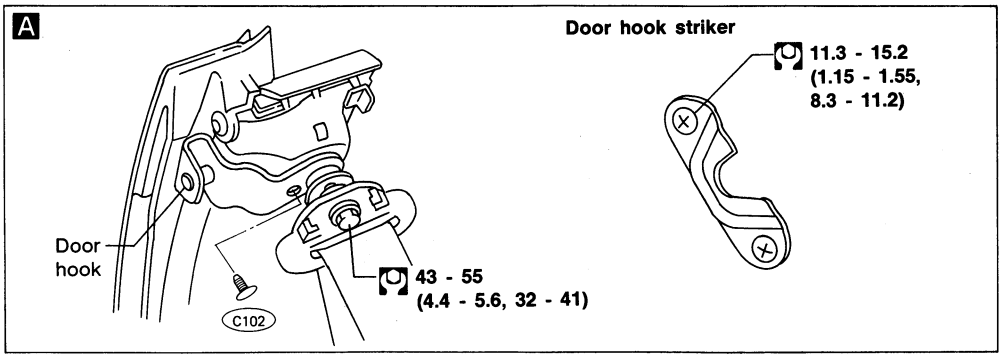


Control unit



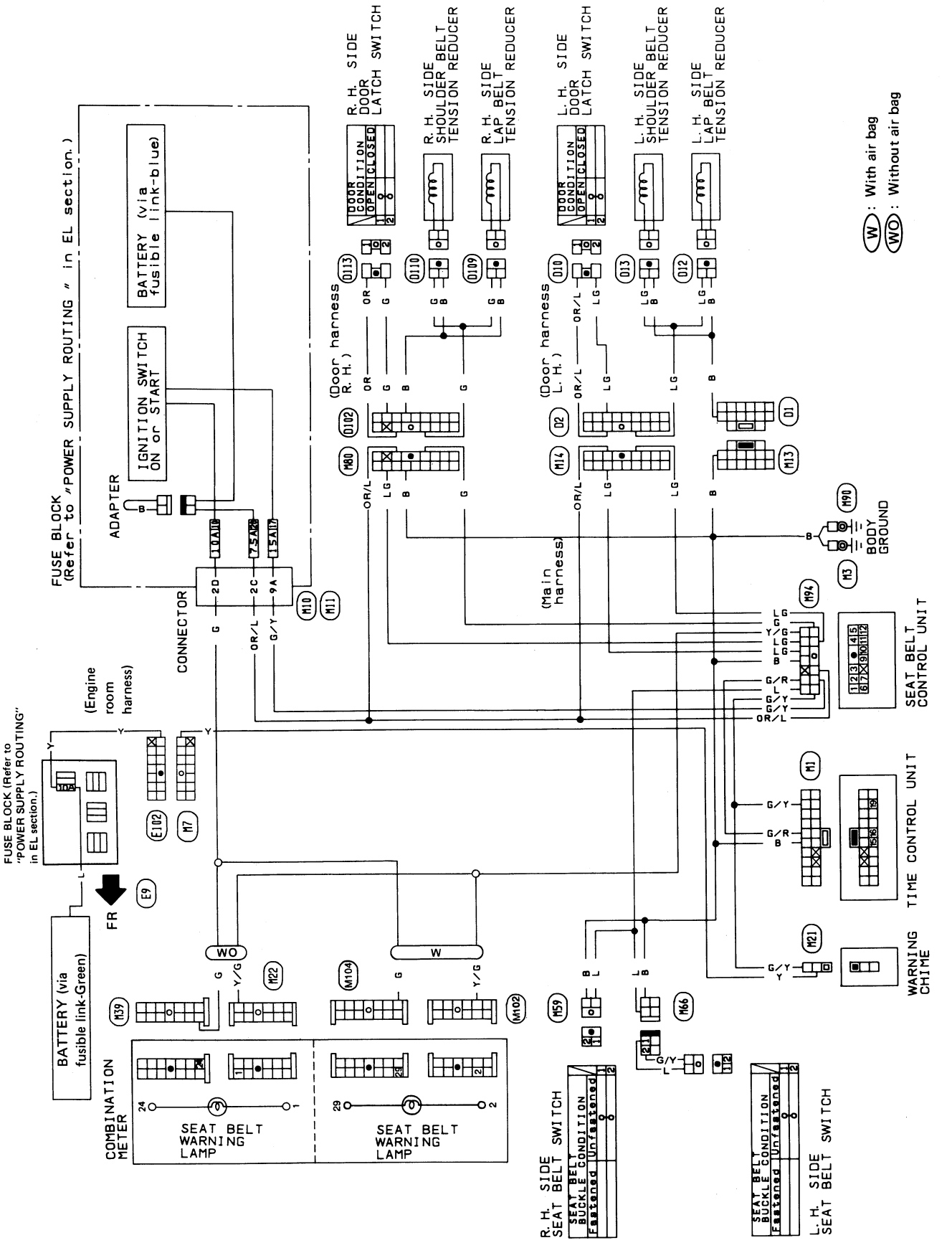
: N•m (kg-m, ft-lb)





MBF765A

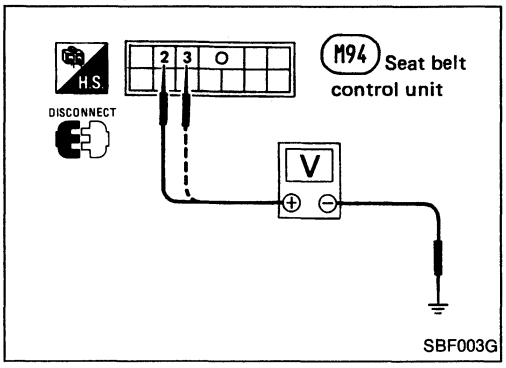
Wiring Diagram



SBF717G

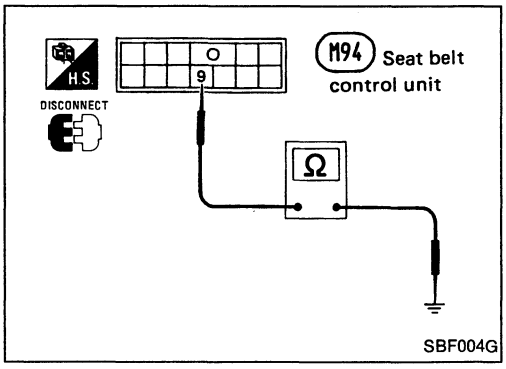
Preparation for Trouble Diagnoses

1. Remove floor board located in front of passenger leg space.
2. Disconnect harness connector.



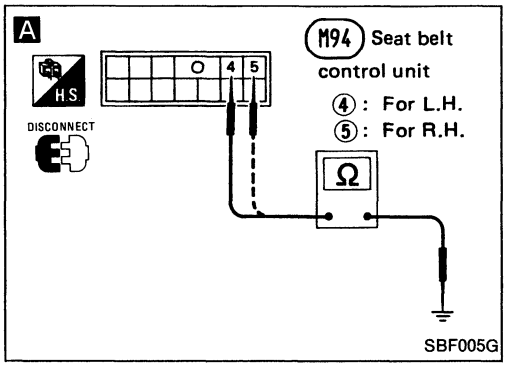
POWER SUPPLY CIRCUIT CHECK

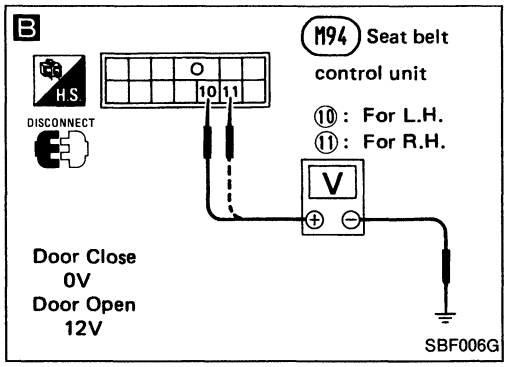
Terminals		Ignition switch	
⊕	⊖	OFF or ACC	ON
②	Ground	0V	12V
③	Ground	12V	12V



GROUND CIRCUIT CHECK

Terminals	Continuity
⑨ -Ground	Yes





Trouble Diagnoses

SYMPTOM:

Warning lamp flashes continuously.

A

Does continuity exist between terminal ④ and ground or terminal ⑤ and ground?

Yes → B

No → Repair harness.

B

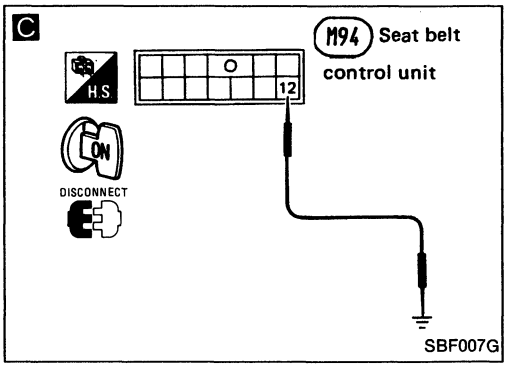
Does door latch switch signal (battery voltage) exist between terminal ⑩ and ground or terminal ⑪ and ground?

Yes → Replace control unit.

No → Replace door lock assembly.

Trouble Diagnoses (Cont'd)

C



SYMPTOM:

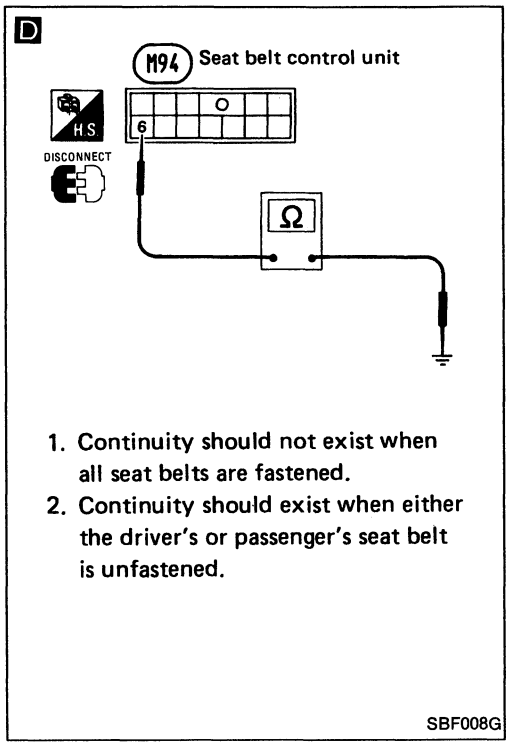
Warning lamp does not flash when ignition switch is "ON".

C

Does warning lamp flash if terminal ⑫ is grounded?

- Yes → Replace control unit.
- No →
  - Check harness.
  - Check bulb.

D



1. Continuity should not exist when all seat belts are fastened.
2. Continuity should exist when either the driver's or passenger's seat belt is unfastened.

SYMPTOM:

Warning chime does not operate for 6 seconds after ignition switch is "ON", when releasing belt from buckle.

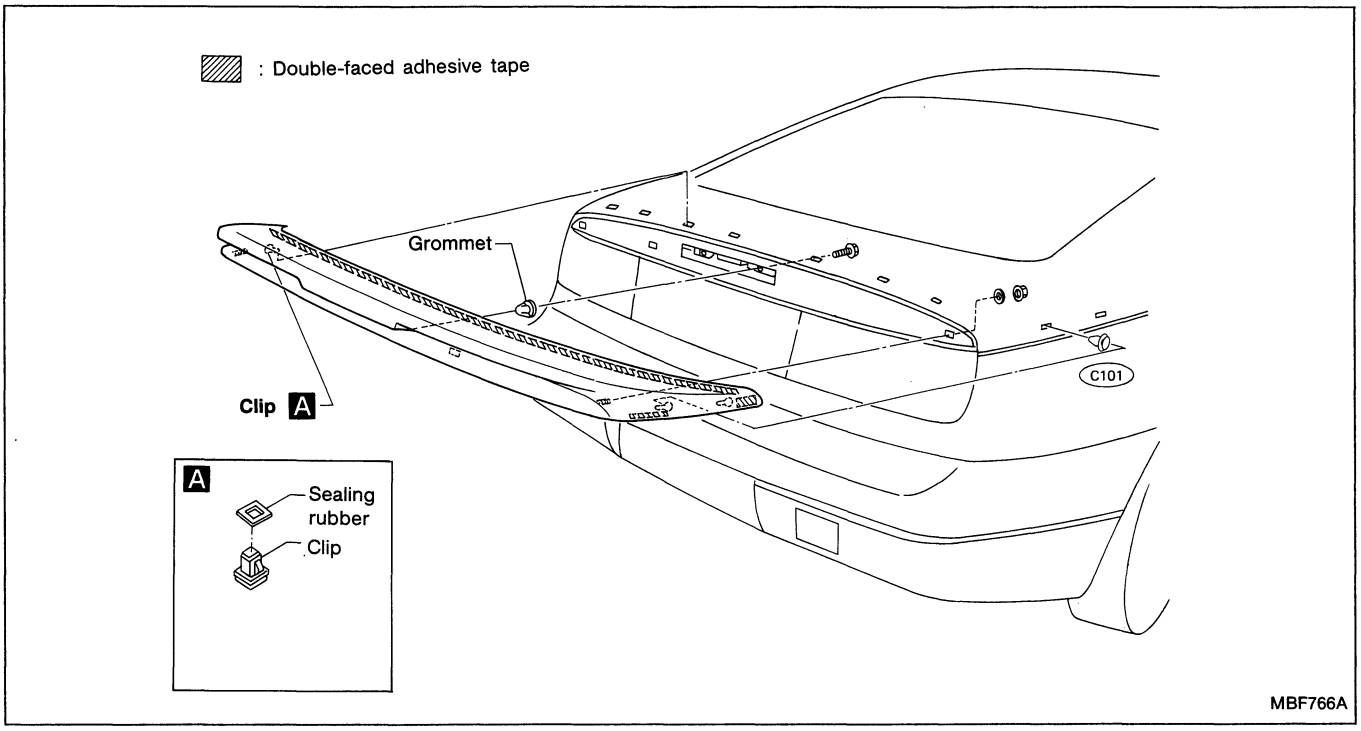
D

Check continuity between terminal ⑥ and ground.

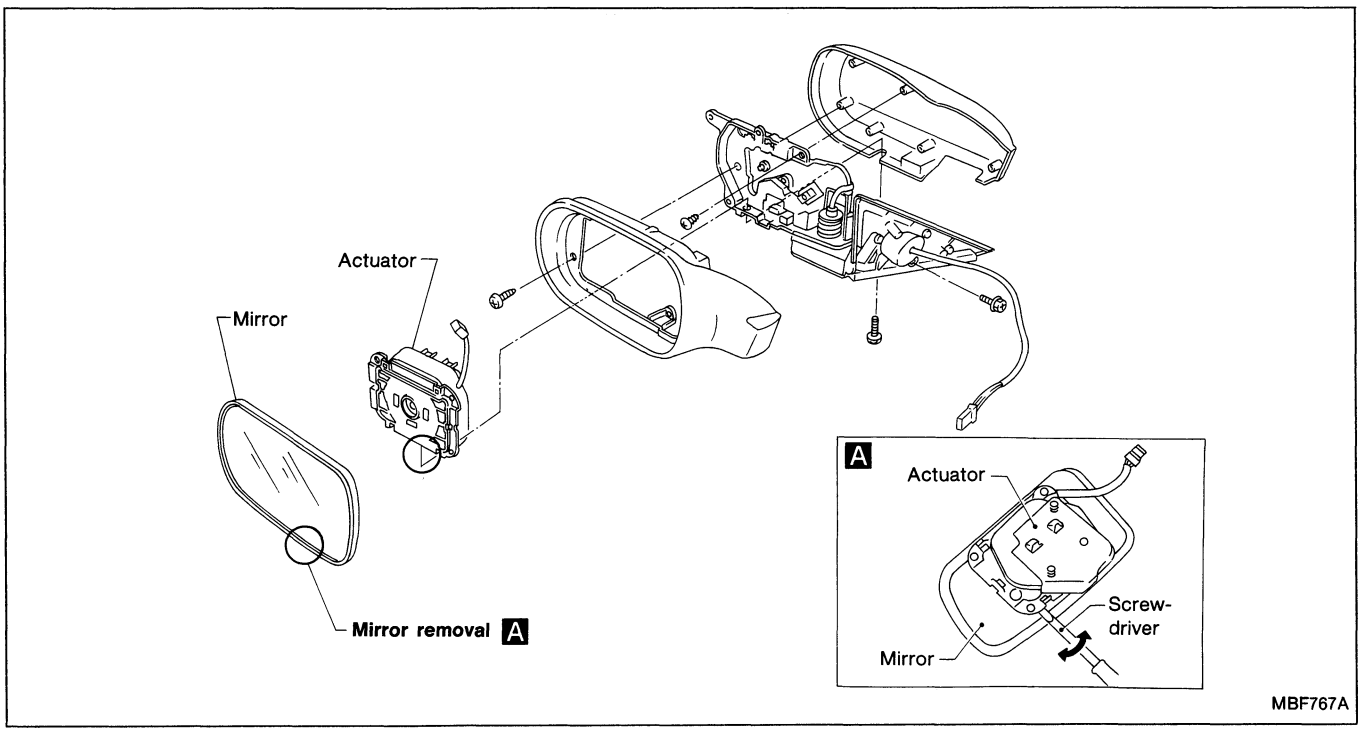
- O.K. →
  Do other warning chimes such as light warning chime operate?
  - Yes → Check harness between terminal ① and chime.
  - No →
    - Go to "TIME CONTROL SYSTEM" in EL section.
- N.G. →
  - Check harness.
  - Check shoulder belt buckle.

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.



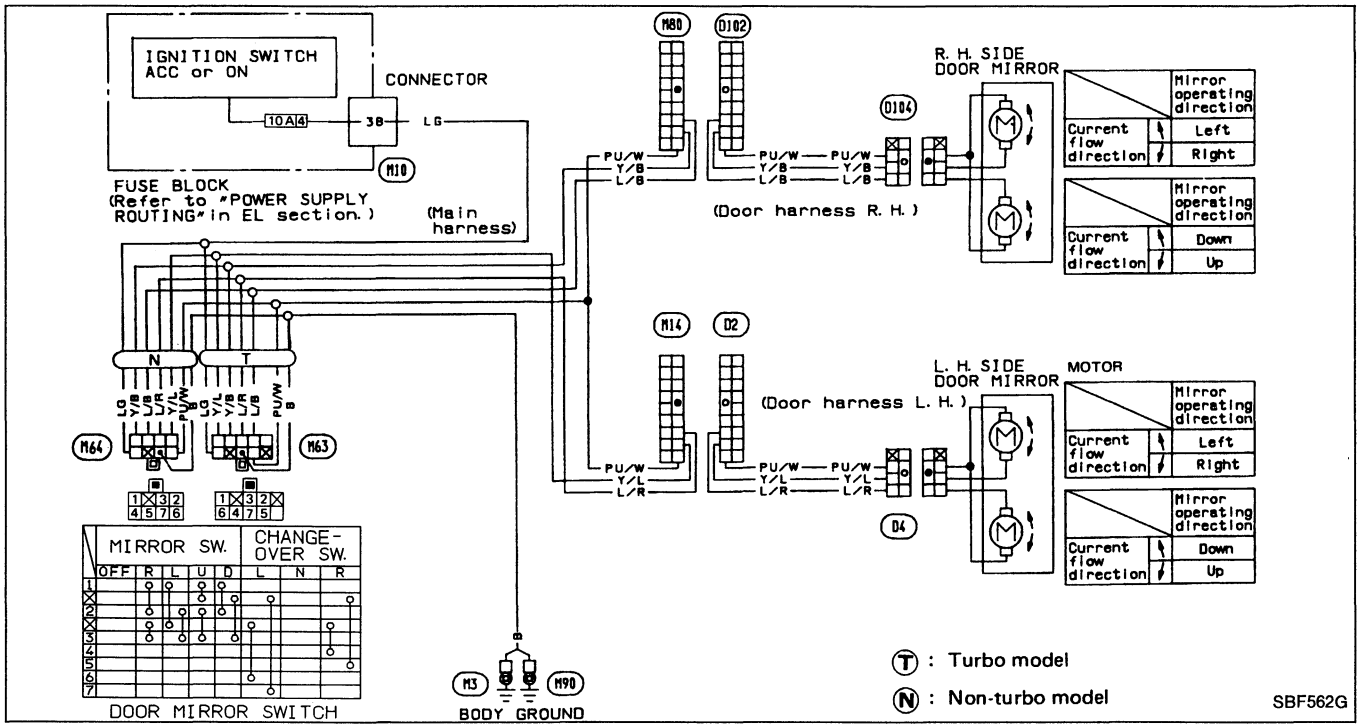
Door Mirror



Door Mirror (Cont'd)

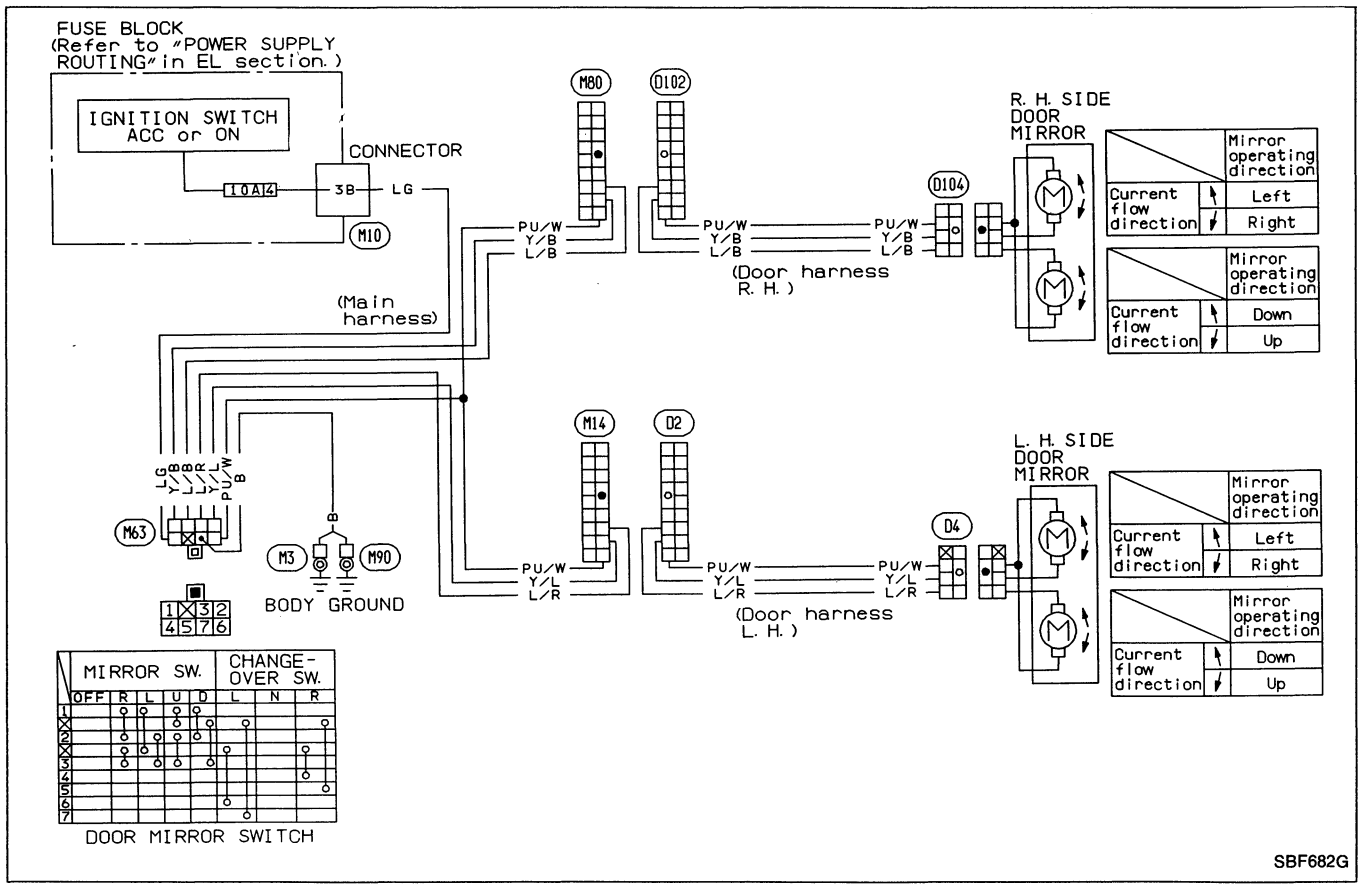
WIRING DIAGRAM

Except convertible roof type

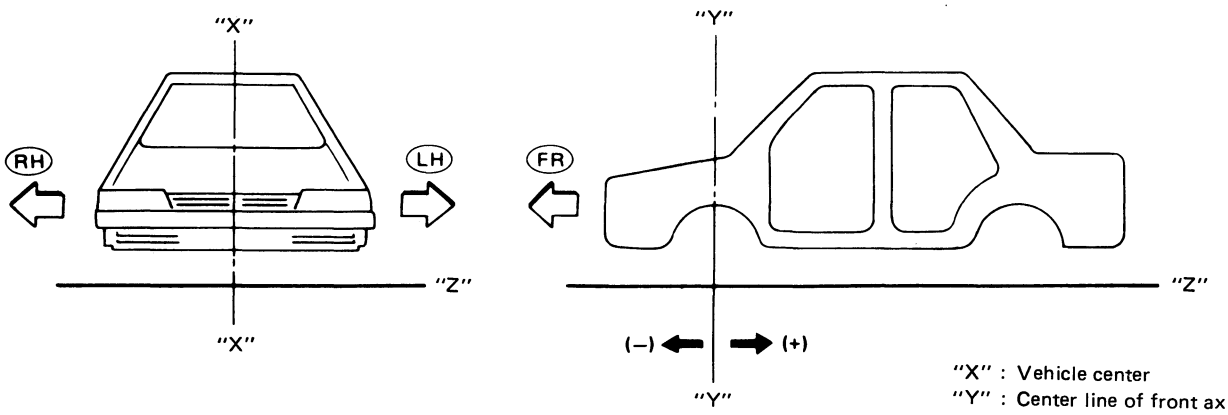


For door mirror defogger, refer to "REAR WINDOW DEFOGGER & HEATER MIRROR" in **EL** section.

Convertible roof type



- 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".

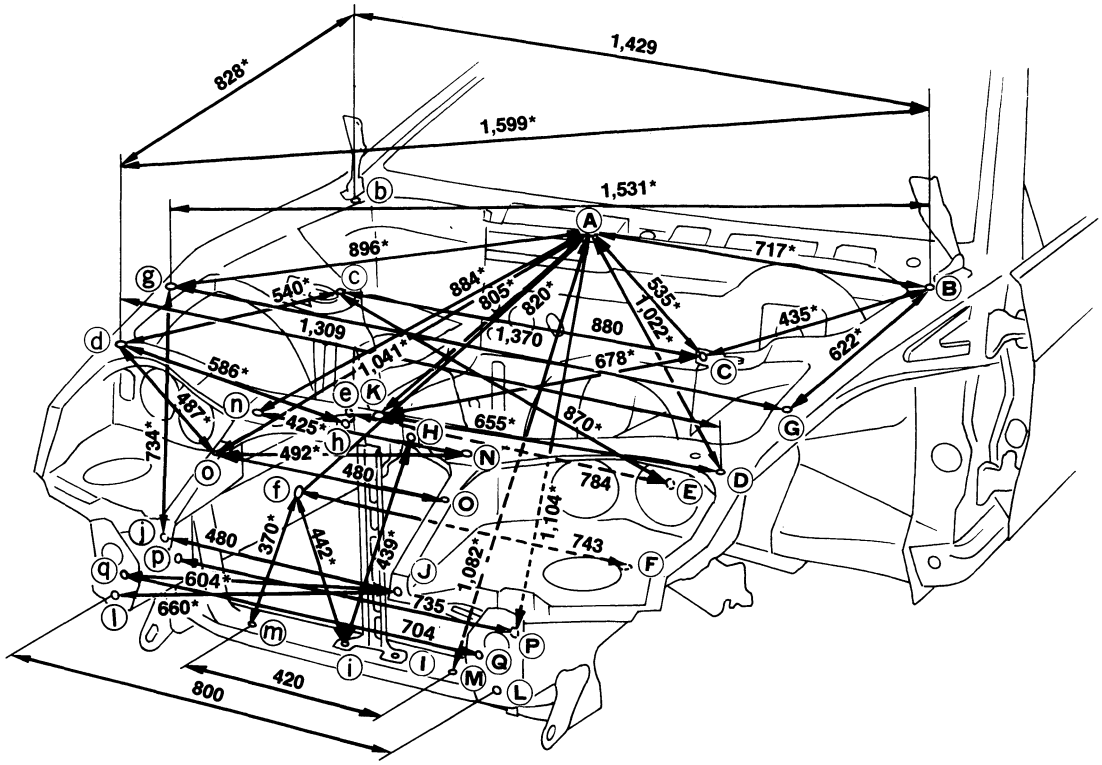


(LH) : L.H. side
(RH) : R.H. side

"X" : Vehicle center
"Y" : Center line of front axle
"Z" : Imaginary base line
[200 mm below datum line ("OZ" at design plan)]

Engine Compartment

MEASUREMENT



Unit: mm

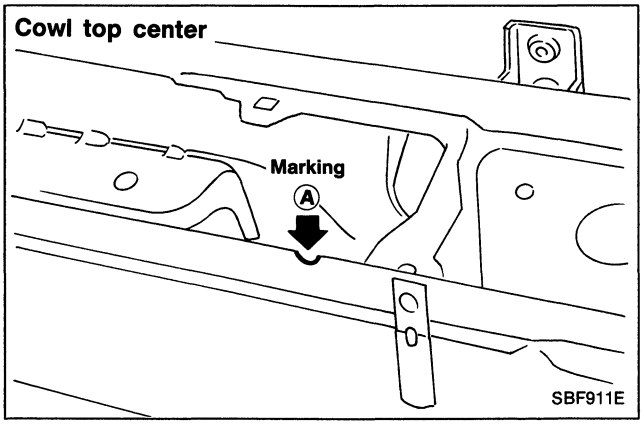
SBF002G

Engine Compartment (Cont'd)

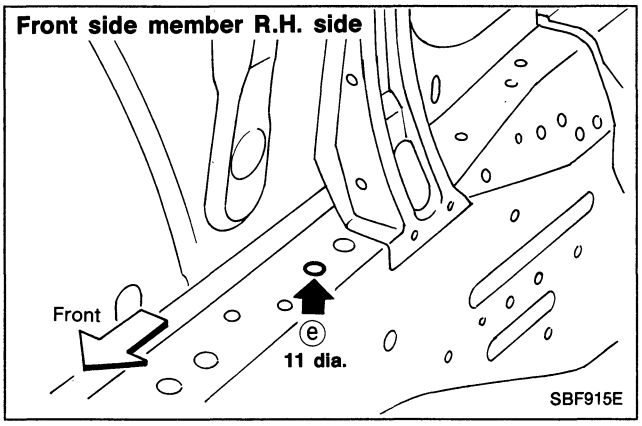
MEASUREMENT POINTS

Unit: mm

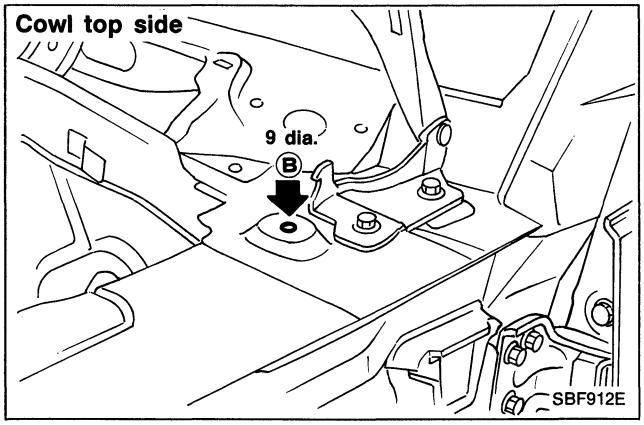
Cowl top center



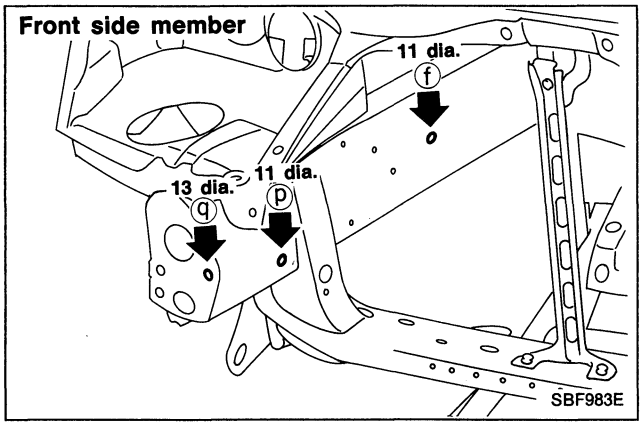
Front side member R.H. side



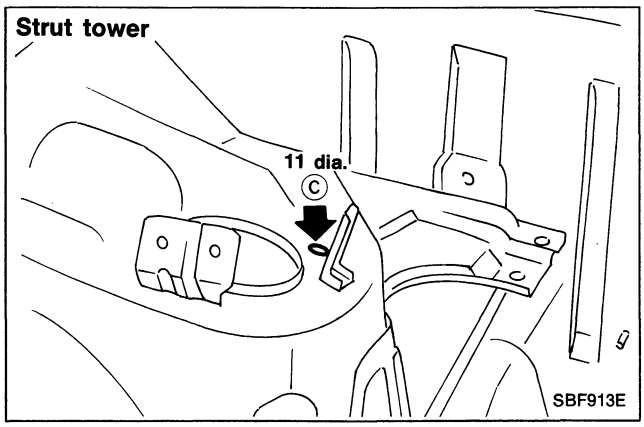
Cowl top side



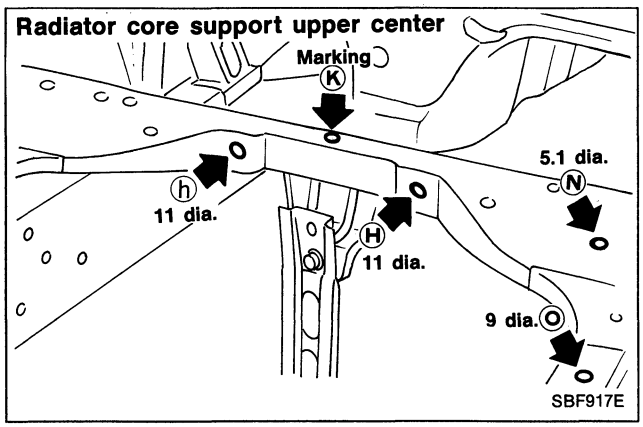
Front side member



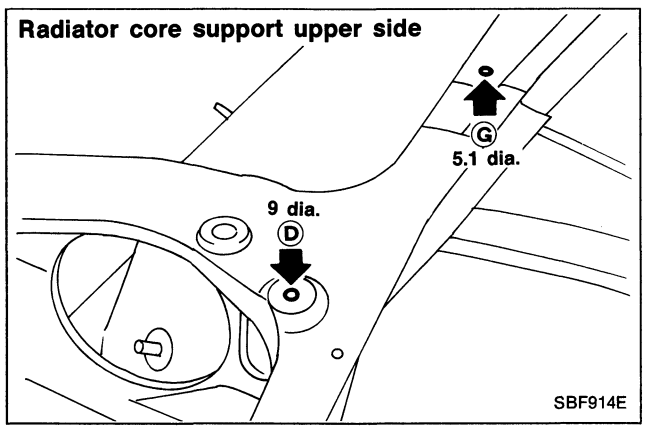
Strut tower



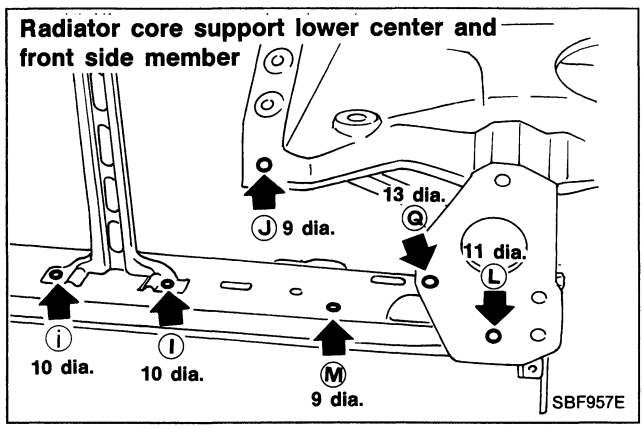
Radiator core support upper center



Radiator core support upper side



Radiator core support lower center and front side member

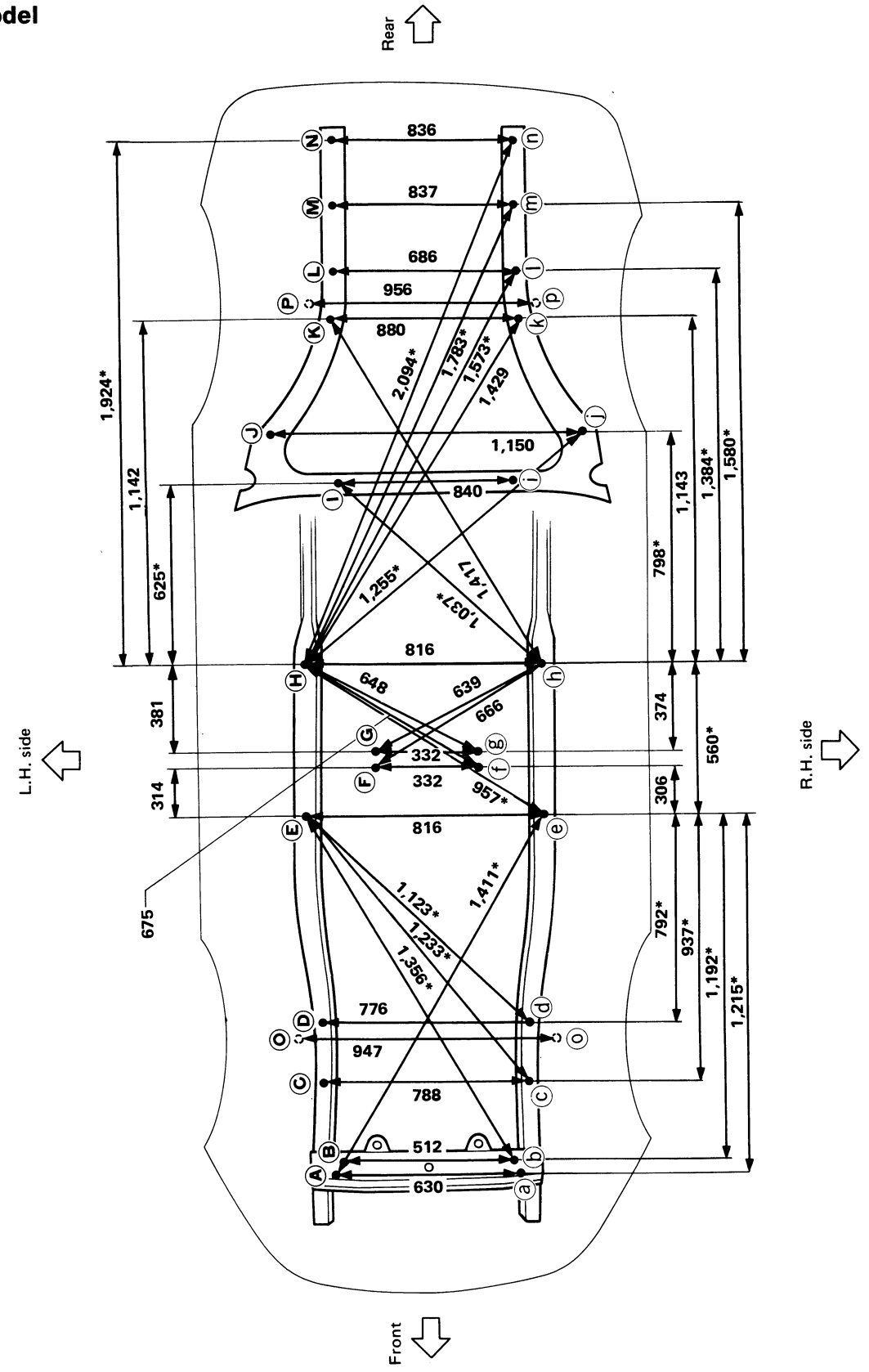


Underbody

MEASUREMENT

2 seater model

Unit: mm



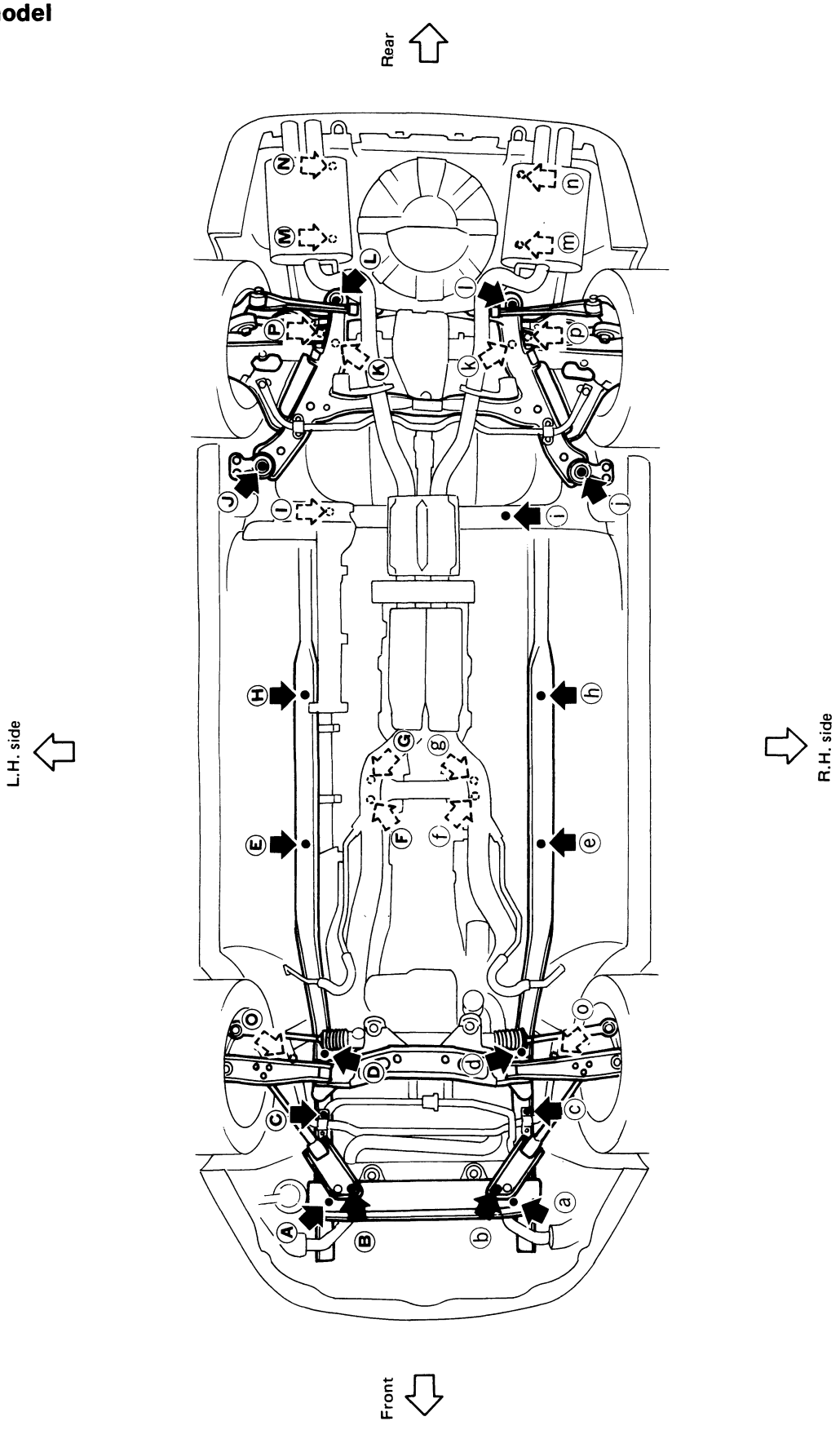
All dimensions indicated in this figure are actual ones.
(There are no projected dimensions.)

SBF958E

Underbody (Cont'd)

MEASUREMENT POINTS

2 seater model



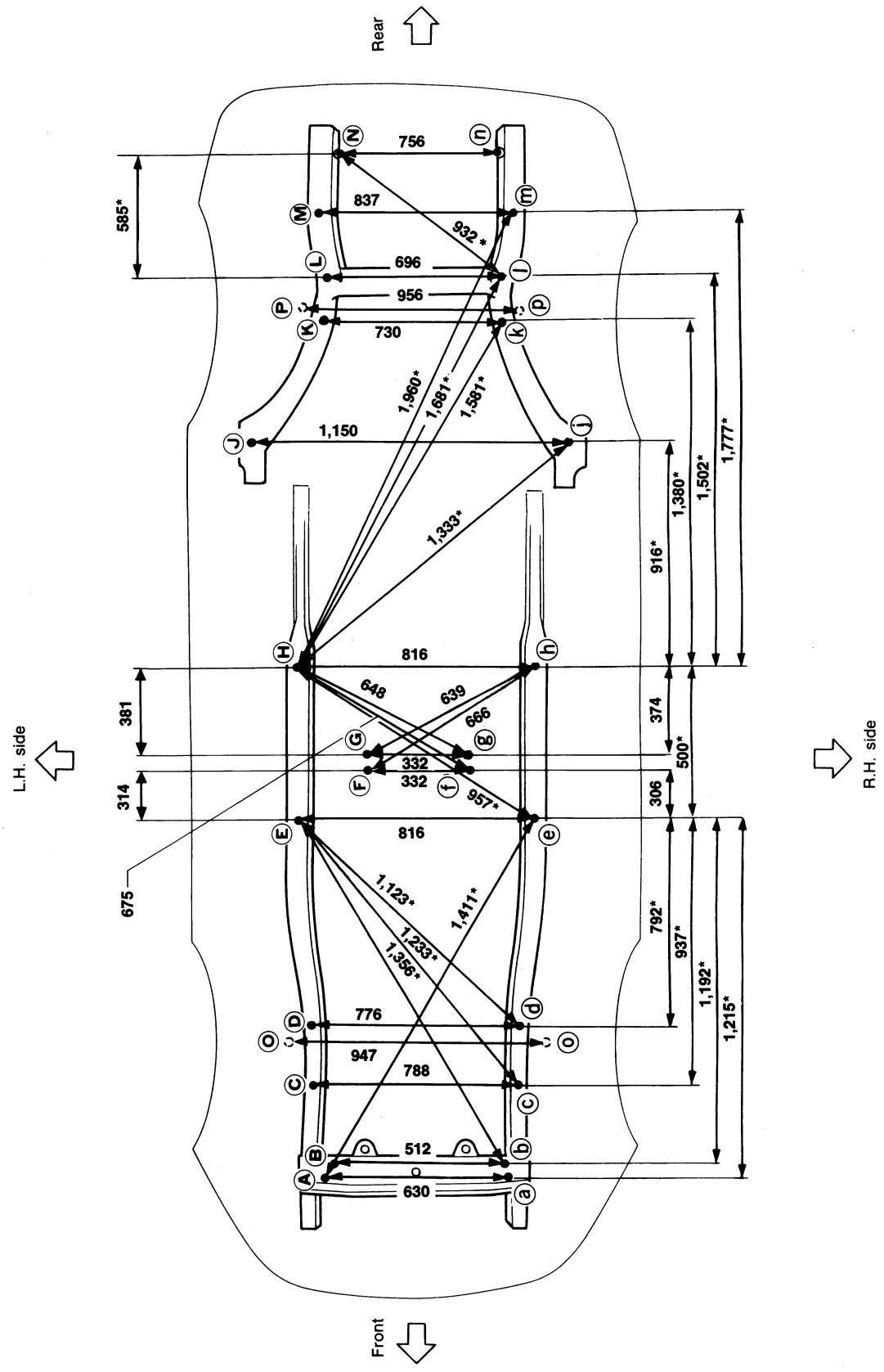
SBF959E

Underbody (Cont'd)

MEASUREMENT

2 + 2 seater model

Unit: mm

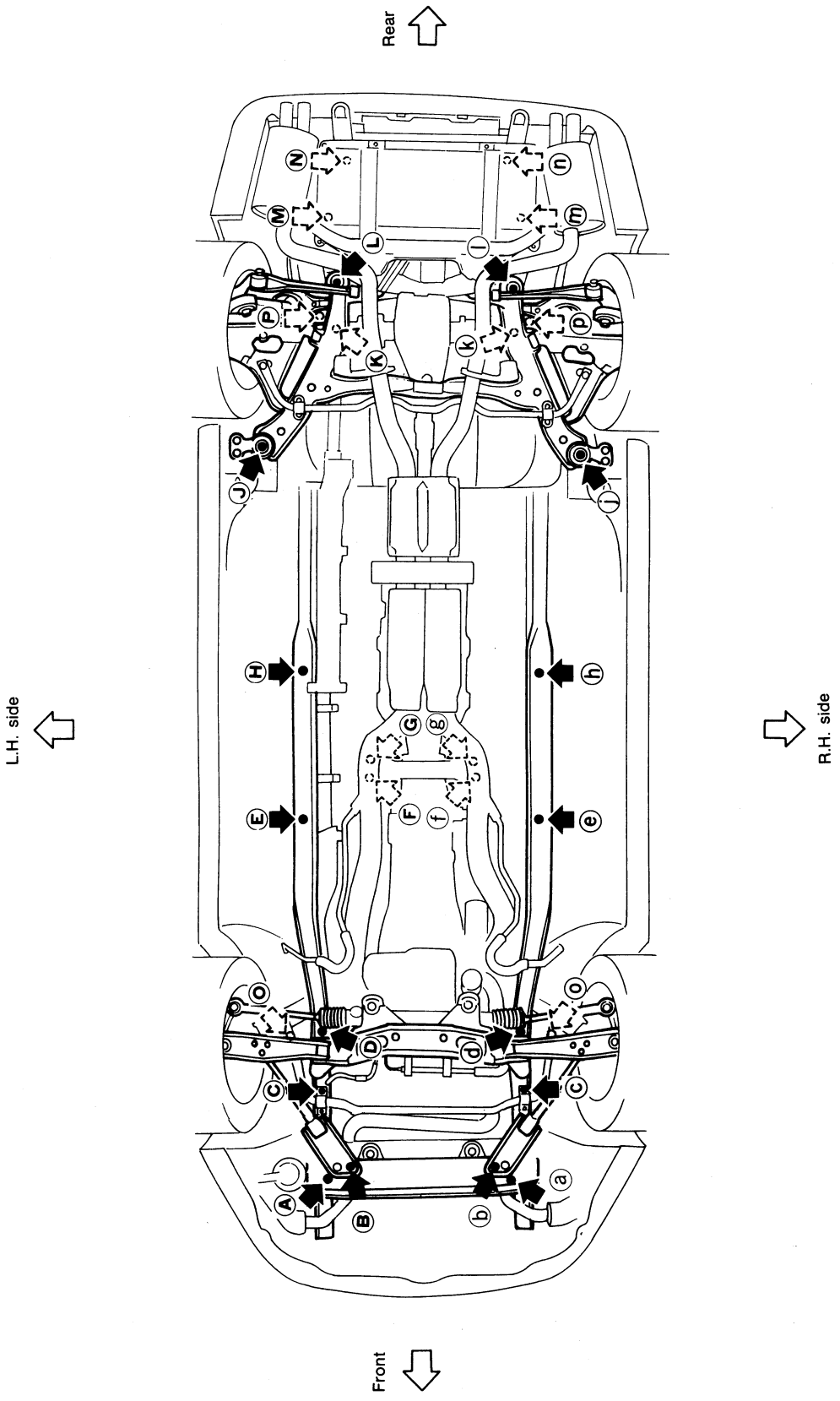


All dimensions indicated in this figure are actual ones.
(There are no projected dimensions.)

SBF563F

MEASUREMENT POINTS

2 + 2 seater model



SBF564F

Underbody (Cont'd)

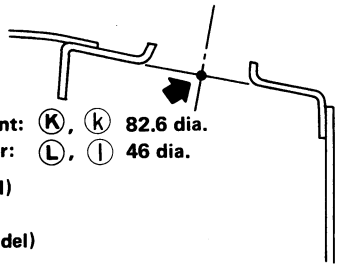
Unit: mm

Front and rear strut tower centers

Coordinates:

Ⓚ, ⓚ
X: 473.4
Y: 52.3
Z: 727.2

Ⓛ, ⓛ
X: 477.9
Y: 2,489.3
(2 seater model)
2,609.3
(2+2 seater model)
Z: 727.8



MBF052A

Front side member and front extension

Coordinates:

Ⓐ, ⓐ
X: 315
Y: –460
Z: 205.1

Ⓑ, ⓑ
X: 255.8
Y: –431
Z: 205.1

Ⓒ, ⓒ
X: 394
Y: –170
Z: 330

Ⓓ, ⓓ
X: 388
Y: –22
Z: 330

Ⓔ, ⓔ
X: 408.2
Y: 750
Z: 152.6

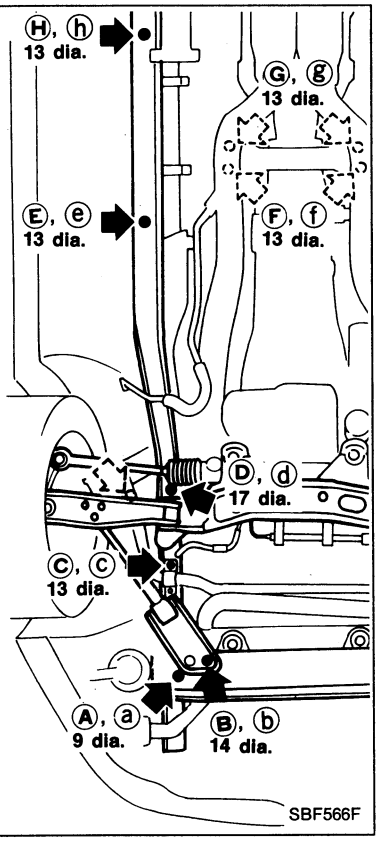
Ⓕ
Y: 161
Y: 917
Z: 249

ⓕ
X: 171
Y: 917
Z: 249

Ⓖ
X: 161
Y: 977
Z: 249

ⓖ
X: 171
Y: 977
Z: 249

Ⓗ, ⓗ
X: 408.2
Y: 1,250
Z: 152.6



SBF566F

Rear side member and rear extension (2 seater model)

Coordinates:

Ⓘ, ⓘ
X: 420
Y: 1,860
Z: 286.1

Ⓙ, ⓙ
X: 575
Y: 2,030
Z: 179.1

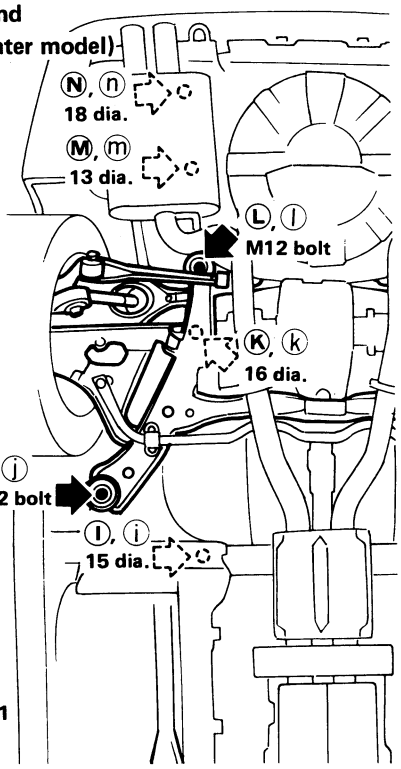
Ⓚ
X: 430
Y: 2,350
Z: 459.6

ⓚ
X: 450
Y: 2,350
Z: 459.6

Ⓜ, ⓜ
X: 418.5
Y: 2,800
Z: 460

Ⓛ, ⓛ
X: 343
Y: 2,620
Z: 334.3

Ⓝ, ⓝ
X: 418
Y: 3,153.1
Z: 434.1



SBF963E

Rear side member and rear extension (2+2 seater model)

Coordinates:

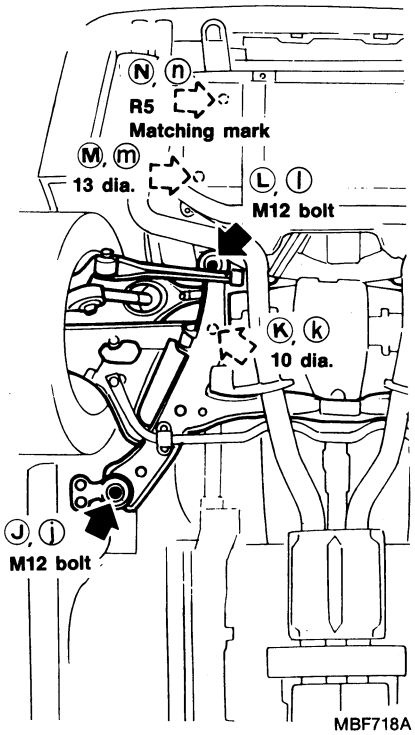
Ⓙ, ⓙ
X: 575
Y: 2,150
Z: 180.7

Ⓚ, ⓚ
X: 365
Y: 2,625
Z: 259.6

Ⓛ, ⓛ
X: 348
Y: 2,740
Z: 334.3

Ⓜ, ⓜ
X: 418.5
Y: 3,000
Z: 459.8

Ⓝ, ⓝ
X: 378
Y: 3,290
Z: 530

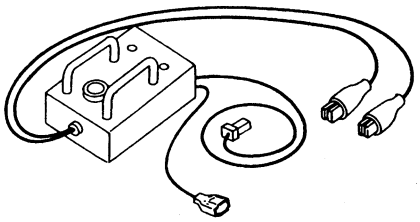


MBF718A

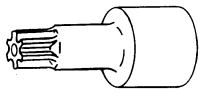
Precautions for SRS "Air Bag" Service

- Do not use a circuit tester to check SRS circuits.
- Before servicing the SRS, turn ignition switch "OFF", disconnect battery ground cable and wait for at least 10 minutes.
  For approximately ten minutes after the cables are removed, it is still possible for the air bag to inflate. Therefore, do not work on any air bag system connectors or wires until at least ten minutes have passed.
- SRS sensors must always be installed with their arrow marks " ⇦ " facing the front of the vehicle for proper operation. Also check sensors for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place it with the pad side facing upward.
- After removing any SRS parts, discard old bolts and replace with new ones. Conduct self-diagnosis to check entire SRS for proper function.
- If front of vehicle is damaged in a collision, always check the crash zone sensor and the wiring harness.

Special Service Tool

Tool number Tool name	Description	
KV999R0011 (J38381) Deployment tool		Disposing of air bag module

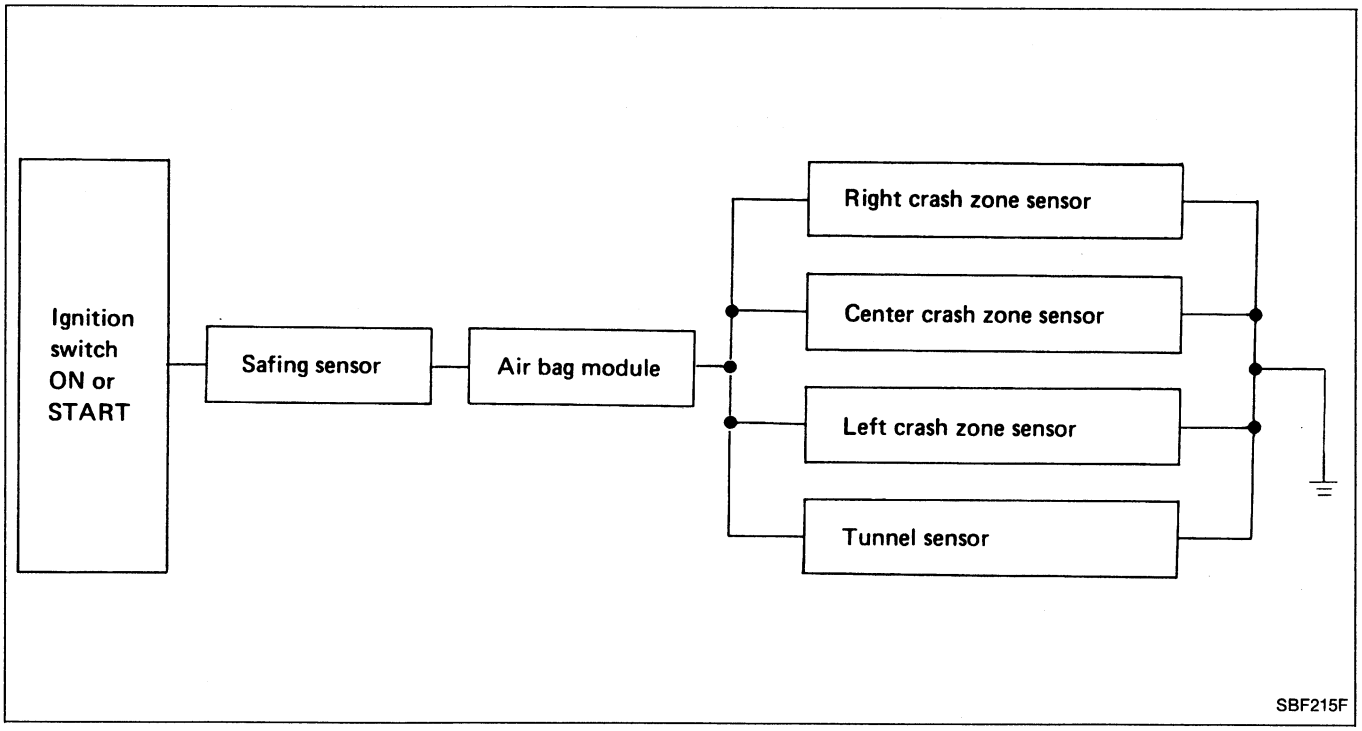
Commercial Service Tools

Tool name	Description	
Special torx bit		Use for special bolts (tamper resistant screw)
Spiral cable stopper		Avoiding unexpected spiral cable rotation

Description

The air bag deploys when any of the four sensors (right crash zone sensor, center crash zone censor, left crash zone sensor or tunnel sensor) and the safing sensor simultaneously activate while the ignition switch is "ON".

Ignition	Crash zone sensor			Tunnel sensor	Safing sensor	Air bag signal
	Right	Center	Left			
ON	ON				ON	ON
ON		ON			ON	ON
ON			ON		ON	ON
ON				ON	ON	ON

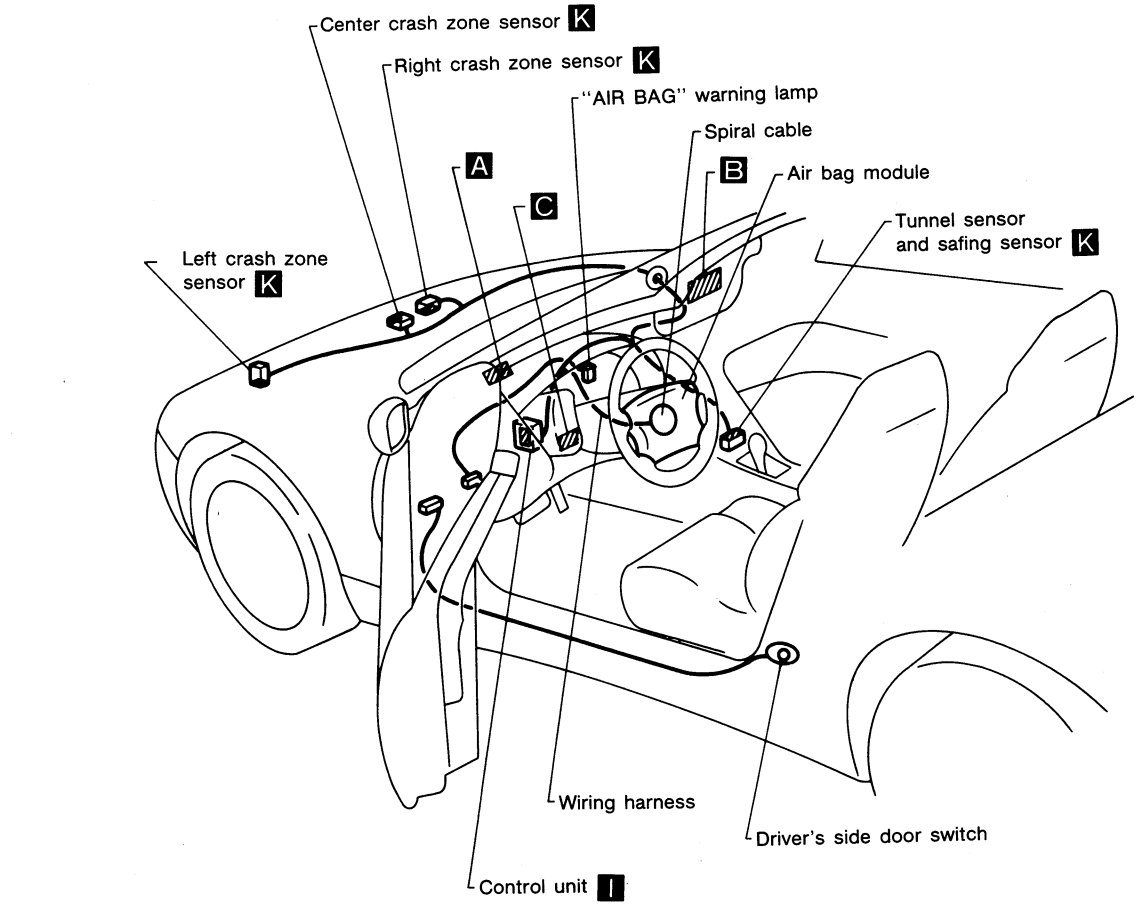


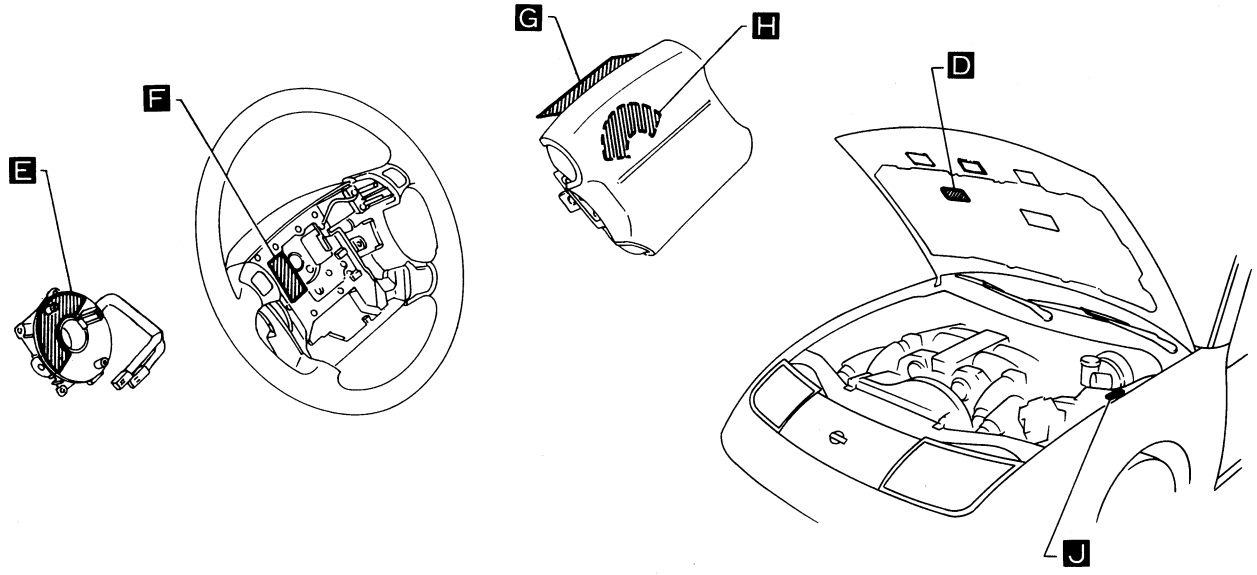
Self-diagnosis

The control unit (diagnostic unit) diagnoses the SRS circuit. When the ignition key is in the "ON" or "START" position, the "AIR BAG" warning lamp will illuminate for about 7 seconds and then turn off. This means that the system is operational.

Caution Labels and SRS Component Parts Location

The CAUTION LABELS are important when servicing air bags in the field. If they are dirty or damaged, replace them with new ones.





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Caution Labels and SRS Component Parts Location (Cont'd)

A

DRIVER-AIRBAG

B

INFORMATION SRS AIRBAG

- THIS CAR IS EQUIPPED WITH A DRIVER AIR BAG AS A SUPPLEMENTAL RESTRAINT SYSTEM (S.R.S.) TO REDUCE INJURY TO THE DRIVER IN A FRONTAL COLLISION.
- THE SYSTEM IS DESIGNED TO SUPPLEMENT THE ACCIDENT PROTECTION PROVIDED BY THE DRIVER'S SEAT BELT. BUT IT IS NOT A SUBSTITUTE FOR THE BELT SYSTEM.
- ALWAYS WEAR YOUR SEAT BELT WHEN THE CAR IS IN USE.
- THE SYSTEM MUST BE INSPECTED 10 YEARS AFTER DATE OF MANUFACTURE, AS NOTED ON THE CERTIFICATION LABEL LOCATED ON THE LEFT FRONT DOOR.
- THE "AIRBAG" LAMP WILL LIGHT MOMENTARILY WHEN THE IGNITION KEY IS TURNED TO THE "ON" OR "START" POSITION. THIS MEANS THE SYSTEM IS OPERATIONAL.
- HOWEVER, IF ANY OF THE FOLLOWING CONDITIONS OCCUR, THE SYSTEM MUST BE SERVICED:
  1. THE "AIR BAG" LAMP DOES NOT GO ON AS DESCRIBED ABOVE.
  2. THE "AIRBAG" LAMP FLASHES INTERMITTENTLY OR REMAINS ON.
  3. ANY PORTION OF THE FRONT END OF THE CAR IS DAMAGED.
  4. THE AIR BAG HAS DEPLOYED.
- SEE YOUR OWNER'S MANUAL FOR DETAILS ABOUT THE FUNCTIONING, SERVICE, AND DISPOSAL PROCEDURES FOR THE SYSTEM.

C

NOTICE SRS AIRBAG

- THIS CAR IS EQUIPPED WITH A DRIVER AIR BAG AS A SUPPLEMENTAL RESTRAINT SYSTEM (S.R.S.)
- IT IS DESIGNED TO SUPPLEMENT THE SEAT BELT.
- ALWAYS WEAR YOUR SEAT BELT.

D

WARNING SRS AIRBAG

- THIS CAR IS EQUIPPED WITH A DRIVER AIR BAG AS A SUPPLEMENTAL RESTRAINT SYSTEM (S.R.S.)
- ALL S.R.S. ELECTRICAL WIRING AND CONNECTORS ARE COLORED YELLOW.
- DO NOT USE ELECTRICAL TEST EQUIPMENT ON THESE CIRCUITS.
- TAMPERING WITH OR DISCONNECTING THE S.R.S. WIRING AND CONNECTORS COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIR BAG OR MAKE THE SYSTEM INOPERATIVE, WHICH MAY RESULT IN SERIOUS INJURY.

E

CAUTION SRS AIRBAG

- BEFORE ASSEMBLY;
  - — LINE UP THE FRONT WHEELS STRAIGHT AHEAD.
  - — ALIGN THE ARROW WITH THE YELLOW MARK ON THE SIDE GEAR.
  - — READ SERVICE MANUAL.
- NO SERVICEABLE PARTS INSIDE.
- DO NOT DISASSEMBLE OR TAMPER.

F

WARNING SRS AIRBAG

BEFORE MOUNTING STEERING WHEEL;

- MAKE SURE THAT THE FRONT WHEELS ARE IN STRAIGHT-AHEAD POSITION.
- ALIGN THE ARROW WITH THE YELLOW MARK ON THE SIDE GEAR. (SPIRAL CABLE)
- READ SERVICE MANUAL.

I

CAUTION SRS AIRBAG

- NO SERVICEABLE PARTS INSIDE.
- DO NOT DISASSEMBLE OR TAMPER.
- DO NOT DROP; KEEP DRY.
- WHILE REMOVED, STORE IN A CLEAN AND DRY AREA.
- IF WET CONDITION OCCURS,THIS UNIT MUST BE SERVICED.

Caution Labels and SRS Component Parts Location (Cont'd)

G

WARNING SRS AIRBAG

- THIS AIRBAG MODULE CANNOT BE REPAIRED.
- USE DIAGNOSTIC INSTRUCTIONS TO DETERMINE IF THE UNIT IS OPERATIONAL.
- IF NOT OPERATIONAL, REPLACE AND DISPOSE OF THE ENTIRE UNIT AS DIRECTED IN THE INSTRUCTIONS.
- UNDER NO CIRCUMSTANCES SHOULD A DIAGNOSIS BE PERFORMED USING ELECTRICALLY POWERED TEST EQUIPMENT OR PROBING DEVICES.
- TAMPERING OR MISHANDLING CAN RESULT IN PERSONAL INJURY.
- STORE THE REMOVED AIRBAG MODULE WITH THE PAD SURFACE UP.
- FOR SPECIAL HANDLING OR STORAGE REFER TO SERVICE MANUAL.

J

CAUTION SRS AIRBAG

- TO AVOID DAMAGING THE S.R.S. SPIRAL CABLE, WHICH COULD MAKE THE SYSTEM INOPERATIVE, REMOVE THE STEERING WHEEL BEFORE REMOVING THE STEERING LOWER JOINT.

H

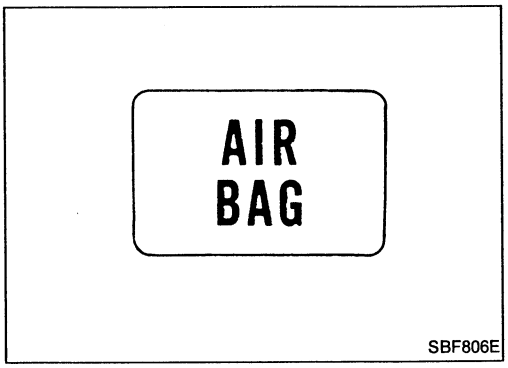
DANGER POISON

- KEEP OUT OF THE REACH OF CHILDREN.
- CONTAINS SODIUM AZIDE AND POTASSIUM NITRATE.
- CONTENTS ARE POISONOUS AND EXTREMELY FLAMMABLE.
- CONTACT WITH ACID, WATER OR HEAVY METALS MAY PRODUCE HARMFUL AND IRRITATING GASES OR EXPLOSIVE COMPOUNDS.
- DO NOT DISMANTLE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY OR STORE AT TEMPERATURES EXCEEDING 200°F.
- FIRST AID: IF CONTENTS ARE SWALLOWED, INDUCE VOMITING;
  - — FOR EYE CONTACT, FLUSH EYES WITH WATER FOR 15 MINUTES
  - — IF GASES FROM ACID OR WATER CONTACT ARE INHALED, SEEK FRESH AIR
  - — IN EVERY CASE, GET PROMPT MEDICAL ATTENTION
- FOR ADDITIONAL INFORMATION, SEE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT.

K

WARNING SRS AIRBAG

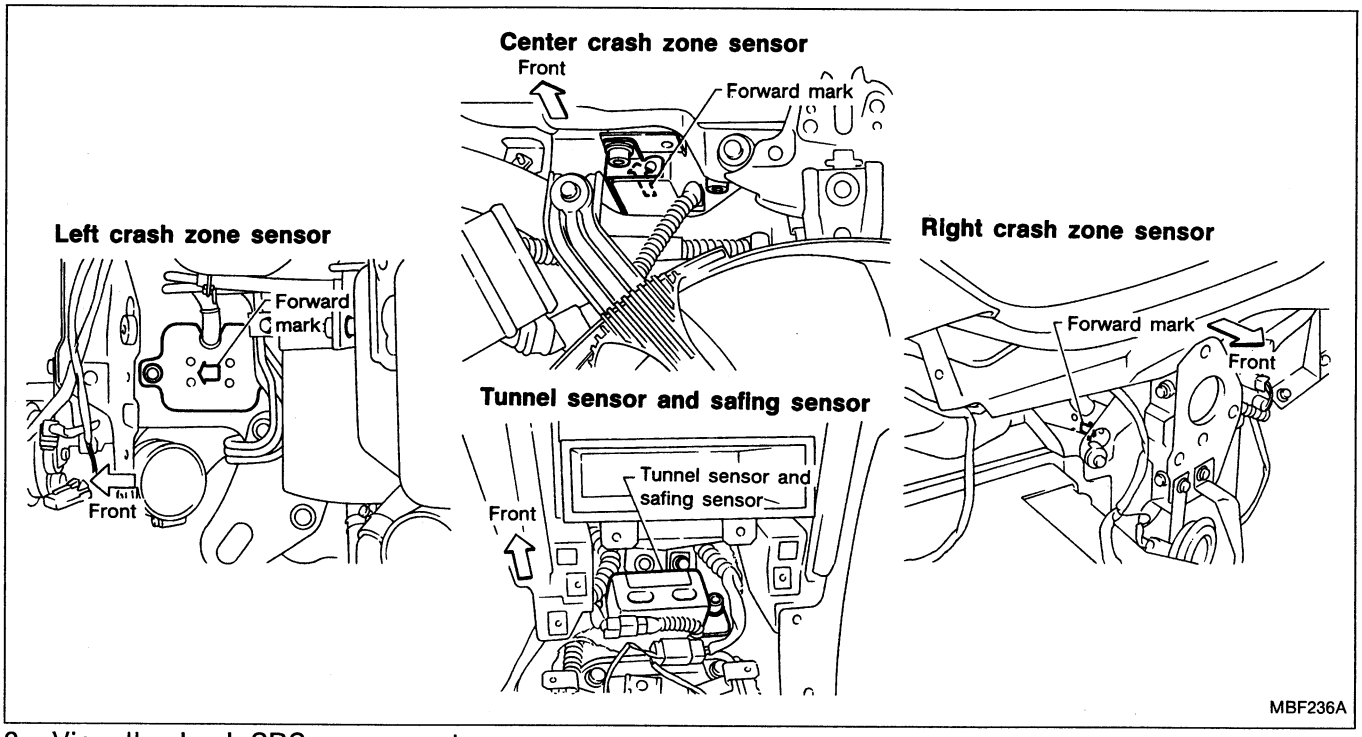
- DO NOT DISASSEMBLE OR TAMPER.
- DISMANTLING AND INSTALLATION SHOULD ONLY BE PERFORMED BY TRAINED PERSONNEL.



Maintenance Items

1. Check "AIR BAG" warning lamp
   When the ignition key is in the "ON" or "START" position, the "AIR BAG" warning lamp will illuminate for about 7 seconds and then turn off. This means that the system is operational.

Maintenance Items (Cont'd)



2. Visually check SRS components

(1) Sensors
- Check sensors to ensure the arrow marks face the front of the vehicle.
- Check body and sensor brackets for deformities or rust.
- Check sensor case for dents, cracks, deformities or rust.
- Check sensor harness for binds, connector for damage, and terminals for deformities.

(2) Control unit — Airbag
- Check connectors for damage, and terminals for for deformities.

(3) Main harness and instrument harness
- Check connectors for poor connections.
- Check harnesses for binds, connectors for damage, and terminals for deformities.

(4) Spiral cable
- Visually check lock (engagement) pins and combination switch for damage.
- Check connectors, flat cable and protective tape for damage.
- Check steering wheel for noise, binds or difficult operation.

(5) Steering wheel
- Check harness (built into steering wheel) and connectors for damage, and terminals for deformities.
- Install air bag module to check fit or alignment with steering wheel.
- Check steering wheel for excessive free play.

(6) Air bag module
- Remove air bag module from steering wheel.
  Check harness cover and connectors for damage, terminals for deformities, and harness for binds.
- Install air bag module to steering wheel to check fit or alignment with the wheel.

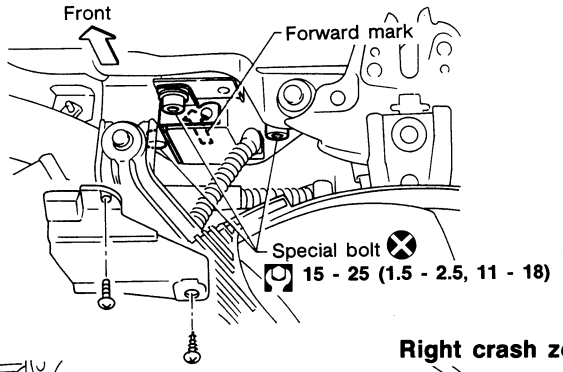
CAUTION:
Replace previously used screws with new ones.

Removal and Installation — Control Unit and Sensors

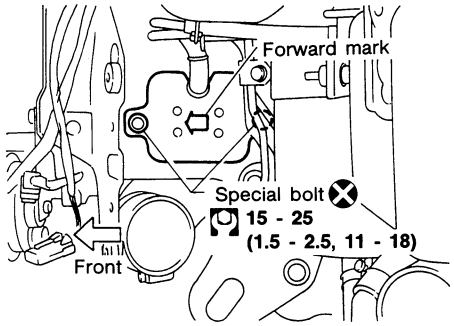
CAUTION:

- **Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes.**
- **The special bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.**
- Check all sensors for proper installation.
- Check all sensors to ensure they are free of deformities, dents, cracks or rust. If they show any visible signs of damage, replace them with new ones.
- Check sensor brackets to ensure they are free of deformities or rust.

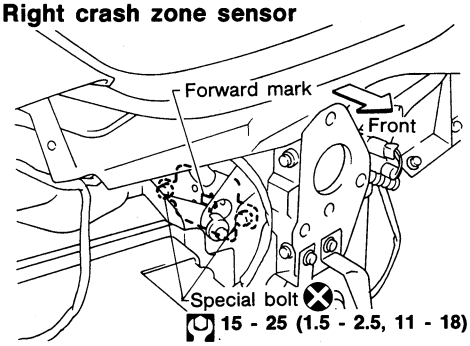
Center crash zone sensor



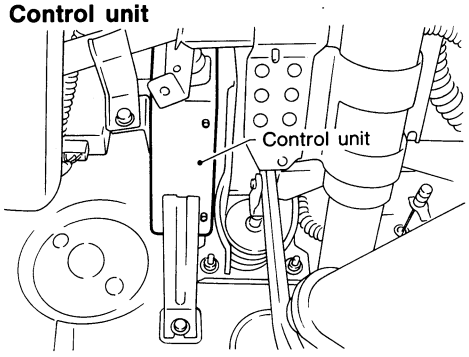
Left crash zone sensor



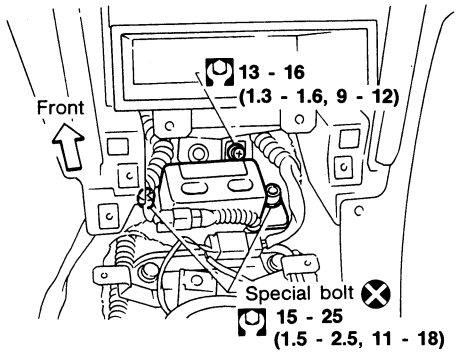
Right crash zone sensor



Control unit



Tunnel sensor and safing sensor



: N•m (kg-m, ft-lb)

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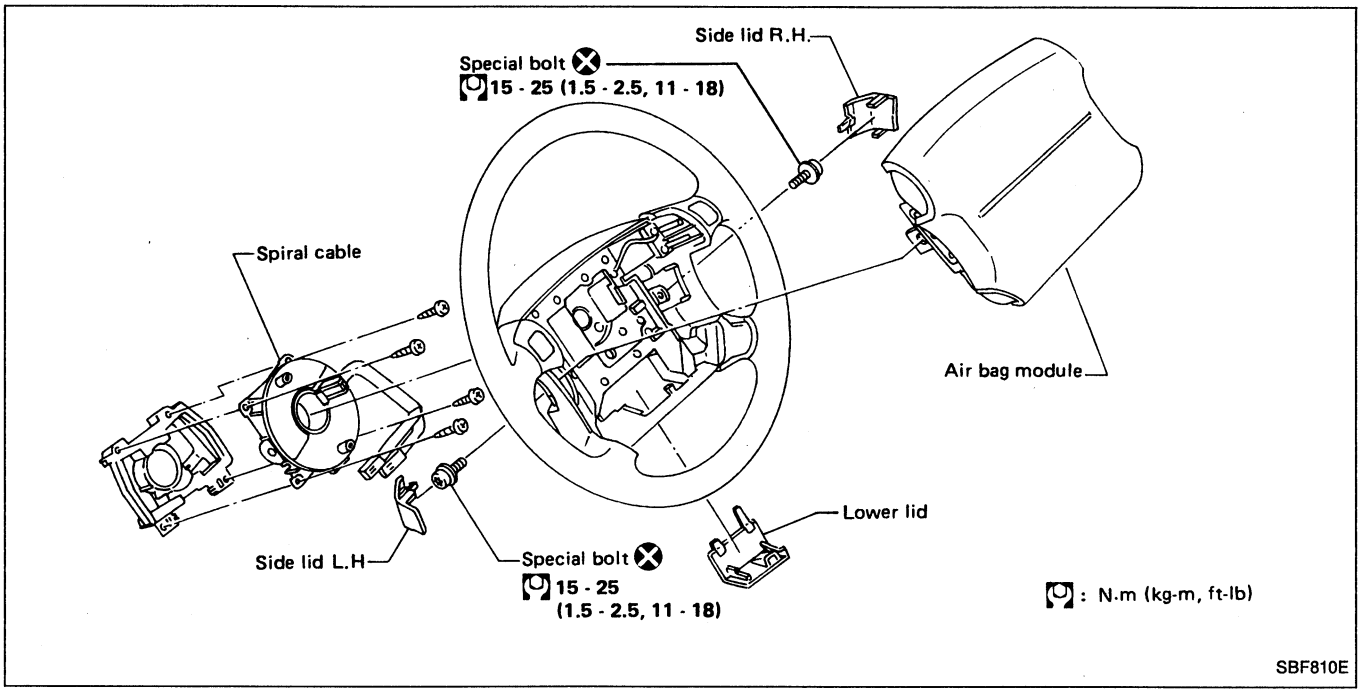
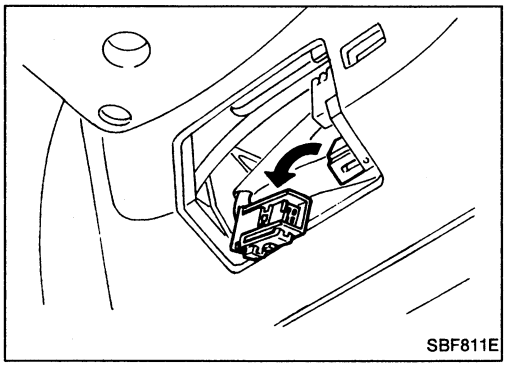
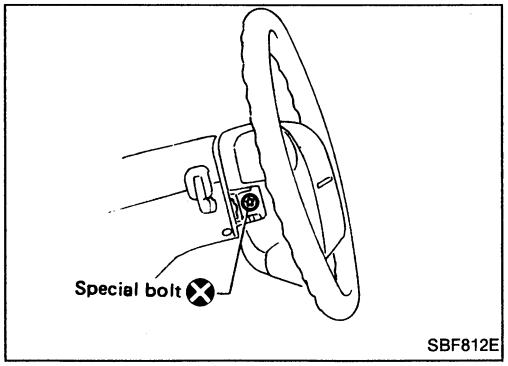
Removal — Air Bag Module and Spiral Cable



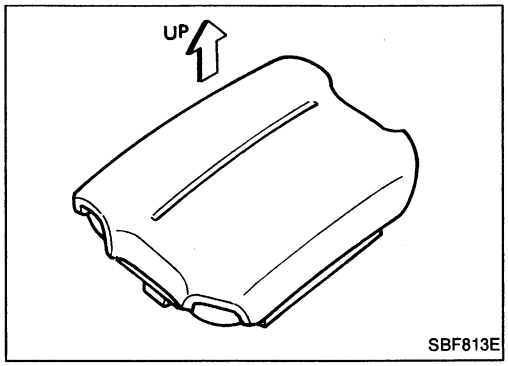


CAUTION:
Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes.

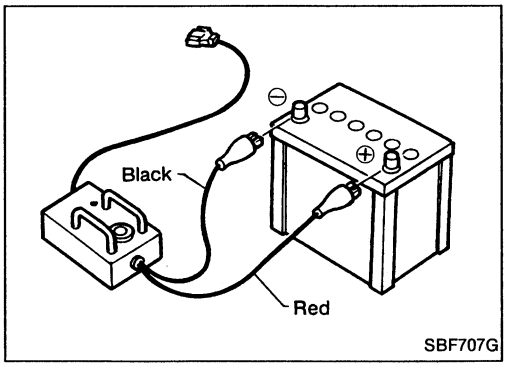
1. Remove lower lid from steering wheel, and disconnect air bag module connector.



2. Remove side lid. Using the T50H torx bit, remove left and right special bolts. Air bag module can then be removed.



CAUTION:
- **Always place air bag module with pad side facing upward.**
- **Do not attempt to disassemble air bag module.**
- **The special bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.**



Scrapping the Air Bag

Before scrapping an air bag module or a vehicle equipped with an SRS air bag, be sure to deploy air bag.

CONNECTING TO BATTERY

- Place the vehicle outdoors in such a way that it is surrounded on all sides by at least 6 m (20 ft) of open space.
- Use a voltmeter to make sure the vehicle battery is fully charged.

CAUTION:

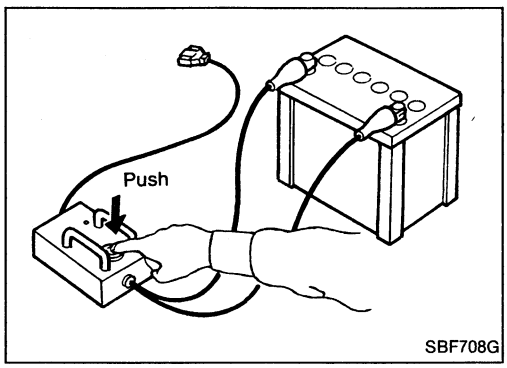
The battery must show voltage of 9.6V or more.

Remove the battery from the vehicle and place it on dry wood blocks approximately 5 m (16 ft) away from the vehicle.

- Wait 10 to 12 minutes after the vehicle battery is disconnected before proceeding.
- Connect deployment tool to the battery.

CAUTION:

Make sure the polarity is correct. The right side lamp in the tool, marked "deployment tool power", should glow with a green light. If the right side lamp glows red, reverse the connections to the battery.



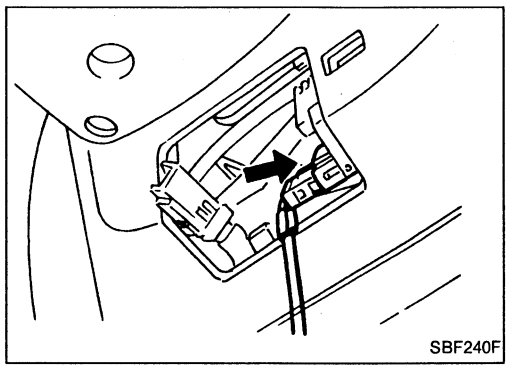
DEPLOYMENT TOOL CHECK

Press the deployment tool switch to the "ON" position. The left side lamp in the tool, marked "air bag connector voltage" should illuminate. If it does not illuminate, replace the tool.

AIR BAG DEPLOYMENT TOOL LAMP ILLUMINATION CHART (Battery connected)

Switch operation	Left side lamp,green* "AIR BAG CONNECTOR VOLTAGE"	Right side lamp, green* "DEPLOYMENT TOOL POWER"
OFF	OFF	ON
ON	ON	ON

*: If this lamp glows red, the tool is connected to the battery incorrectly. Reverse the connections and make sure the lamp glows green.



CONNECTING TO AIR BAG

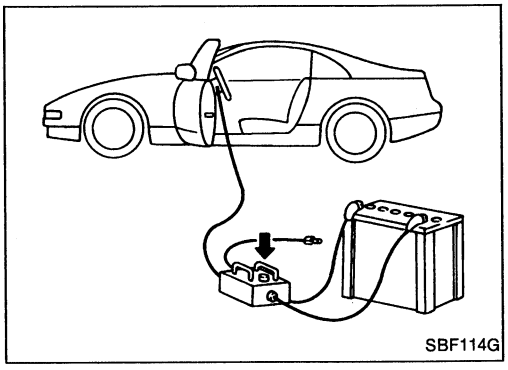
- Remove lower lid from steering wheel and disconnect air bag module connector.
- Connect deployment tool connector.

CAUTION:

Make sure the deployment tool is disconnected from the battery before you make this connection.

- Reconnect the battery cable to the prepared battery.
- The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.

Scrapping the Air Bag (Cont'd)


SBF114G

DEPLOYMENT

Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the air bag will deploy.

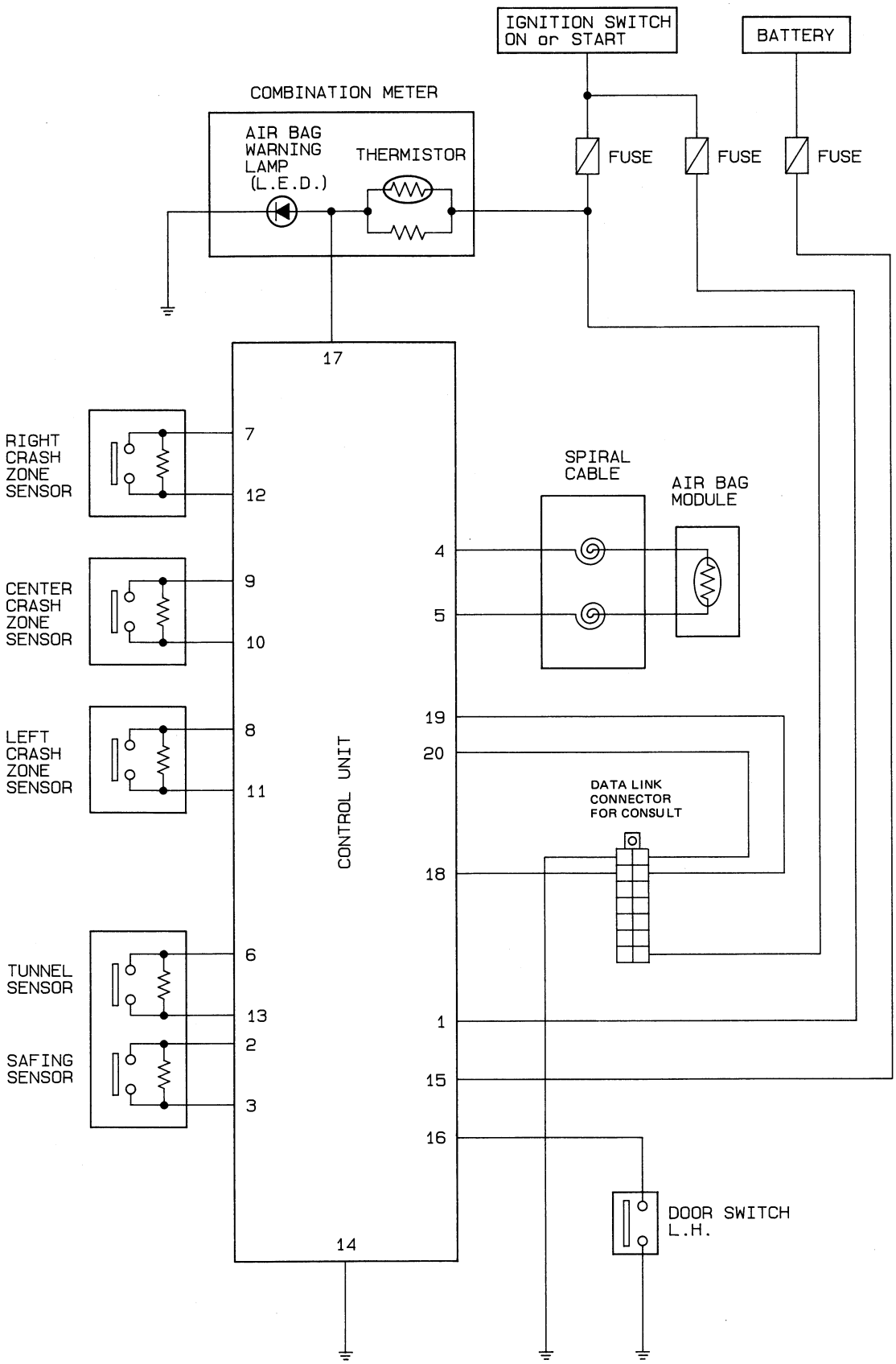
DISPOSAL

- Remove steering wheel side lids. Use the special "torx"bit to remove the air bag module from the steering wheel. Place it into a sealed vinyl bag for disposal.

CAUTION:

- **When deploying air bag, ensure vehicle is empty.**
- **No poisonous gas is produced upon air bag deployment. However, be careful not to inhale gas since it irritates throat and can cause choking.**
- **Due to heat, leave air bag module unattended for more than 30 minutes after air bag deployment.**
- **Do not attempt to disassemble air bag module.**
- **Air bag module can not be re-used.**
- **Never apply water to a deployed air bag module.**
- **Be sure to wear gloves when handling a deployed air bag module.**

Schematic

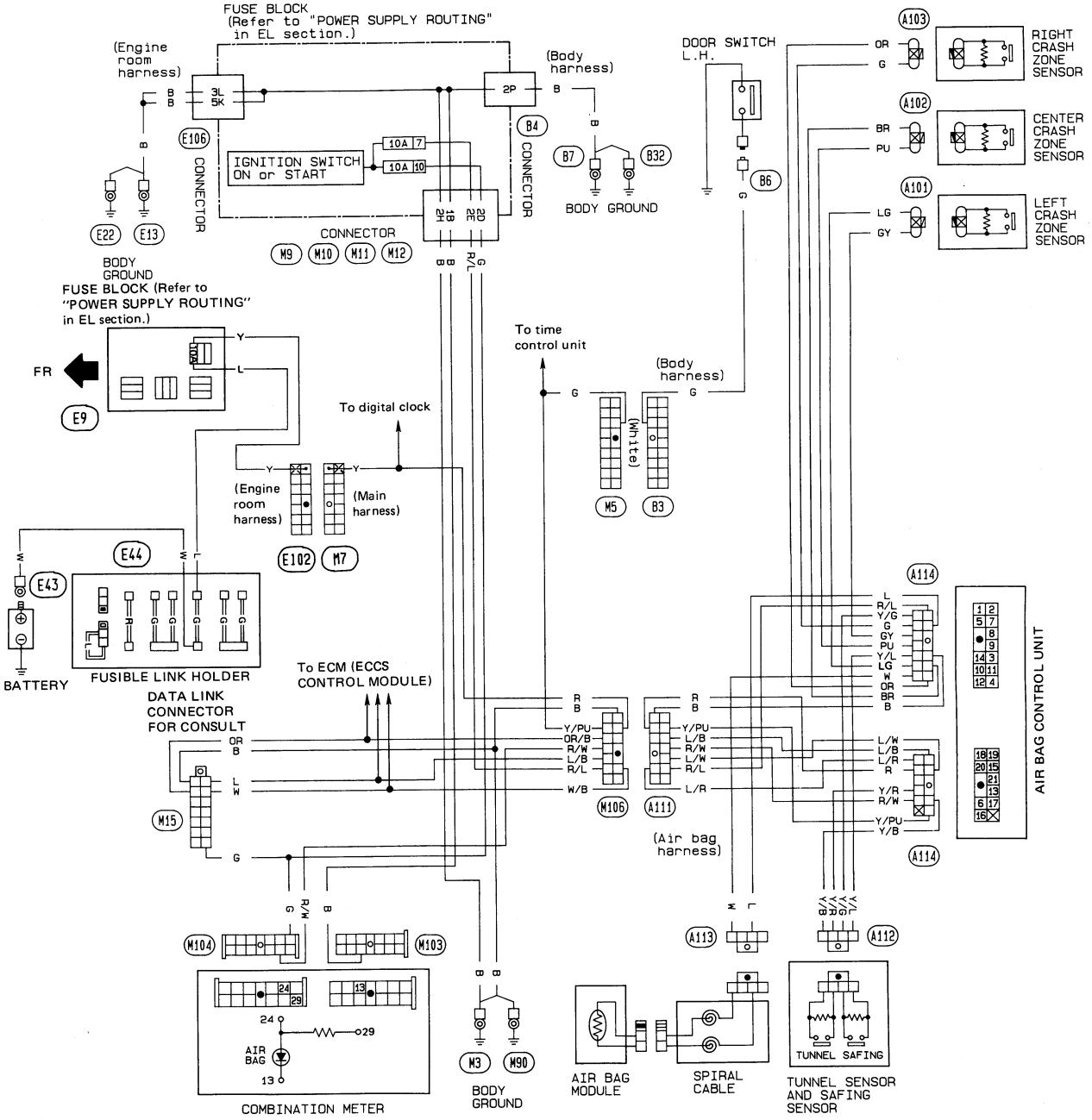


SBF683G

Wiring Diagram

CAUTION:

- **Do not use a circuit tester to check SRS "Air Bag" harness connectors. The wiring harness and connectors have yellow outer insulation for easy identification.**
- **Do not attempt to repair, splice or modify the SRS "Air Bag" wiring harness. If the harness is damaged, replace it with a new one.**
- **Keep ground portion clean.**



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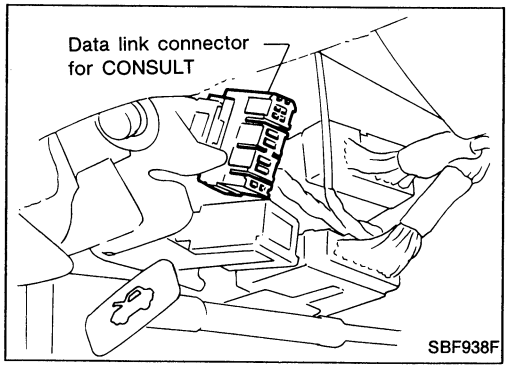


Self-diagnosis

USING CONSULT

The self-diagnosis results can be read by CONSULT, as follows:

1. Connect "CONSULT" to vehicle harness connector.

2. Turn ignition switch to "ON". (When CONSULT is connected, the "AIR BAG" warning lamp will be turned to present diagnosis mode.)

3. Touch "START" to operate "CONSULT".

4. Touch "AIR BAG" to choose air bag system.

5. Touch "SELF DIAG RESULTS" to read self-diagnosis results.

6. Problem codes are displayed on "SELF DIAG RESULT 1" (first page — present mode). The problem code last indicated is displayed on "SELF DIAG RESULT 2" (second page — initial mode).

7. When "PRINT" is pressed, information displayed on "SELF DIAG RESULTS 1 and 2" is printed out.

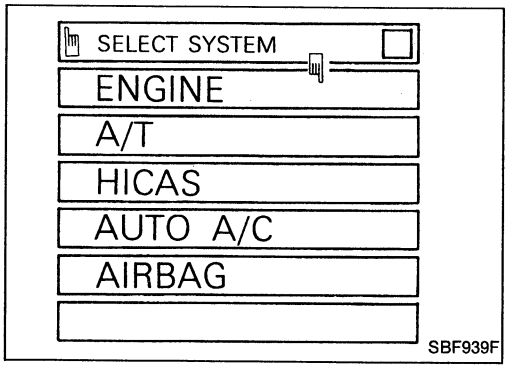
8. After repairing malfunctioning parts, press "ERASE" to clear self-diagnosis results.

- **After repairing malfunctioning parts, attempt to clear self-diagnosis results from memory.**
- **If malfunctioning parts are not completely repaired, self-diagnosis results remain stored in memory.**

9. Push Back Key of CONSULT until SELECT SYSTEM mode appears to make "SELF-DIAGNOSIS" user mode.

10. Push the power off switch.

11. Turn off ignition switch.

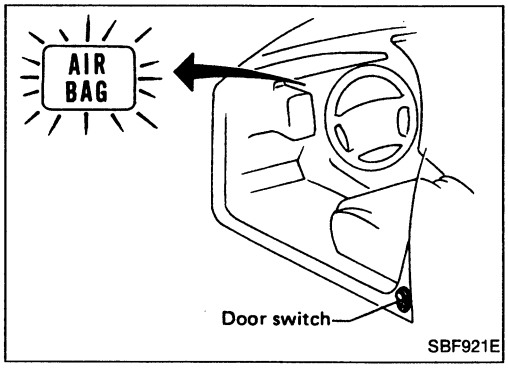


Self-diagnosis (Cont'd)

Self-diagnosis results

Failure parts group [Present] and [Initial]	Explanation	Repair order * Recheck SRS at each replacement.
**** NO SELF DIAGNOSTIC FAILURE ****	Normal. The SRS "Air Bag" is in good order.	—
SAFING SENSOR [OPEN/LWR-GND-SHORT]	The circuit for the safing sensor is open or the wire from the safing sensor to the control unit (terminal No. 3) is shorted.	1. Visually check the wiring harness connections. 2. Replace the safing sensor. (safing sensor and tunnel sensor unit) 3. Replace the control unit. 4. Replace the main harness.
SAFING SENSOR [SHORT/LWR-VB-SHORT]	Both the wires for the safing sensor are shorted or the wire from the safing sensor to the control unit (terminal No. 3) is shorted to some power supply circuit.	
AIRBAG MODULE [OPEN]	The circuit for the air bag module is open. (including the spiral cable)	1. Visually check the wiring harness connections. 2. Replace the spiral cable. 3. Replace the air bag module. (Before disposing of it, it must be deployed.) 4. Replace the control unit. 5. Replace the main harness.
AIRBAG MODULE [VB-SHORT]	The circuit for the air bag module is shorted to some power supply circuit. (including the spiral cable)	
AIRBAG MODULE [GND-SHORT]	The circuit for the air bag module is shorted. (including the spiral cable)	
TUNNEL SENSOR [OPEN/UPR-VB-SHORT]	The circuit for the tunnel sensor is open or the wire from the control unit (terminal No. 6) to the tunnel sensor is shorted to some power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the tunnel sensor. (safing sensor and tunnel sensor unit) 3. Replace the control unit. 4. Replace the main harness.
TUNNEL SENSOR [SHORT]	The circuits for the tunnel sensor are shorted to each other.	
CRASH ZONE SEN-RH [OPEN/UPR-VB-SHORT]	The circuit for the crash zone sensor is open or the wire from the control unit (terminal for the crash zone sensor RH: No. 7, LH: No. 8, CTR: No. 9) to the crash zone sensor is shorted to some power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the crash zone sensor. 3. Replace the control unit. 4. Replace the main harness.
CRASH ZONE SEN-LH [OPEN/UPR-VB-SHORT]		
CRASH ZONE SEN-CTR [OPEN/UPR-VB-SHORT]		
CRASH ZONE SEN-RH [SHORT]	The circuits for the crash zone sensor are shorted to each other.	
CRASH ZONE SEN-LH [SHORT]		
CRASH ZONE SEN-CTR [SHORT]		
CONTROL UNIT	The control unit (diagnostic unit) is out of order.	1. Visually check the wiring harness connections. 2. Replace the control unit. 3. Replace the main harness.
INDEFINITE FAILURES	A problem which cannot be specified occurs because more than two parts are out of order.	1. See the SELF-DIAGNOSIS RESULT 2 failure parts group [Initial], then repair as necessary. 2. Visually check the wiring harness connections. 3. Replace the control unit. 4. Replace all sensors, spiral cable and air bag module. 5. Replace the main harness.

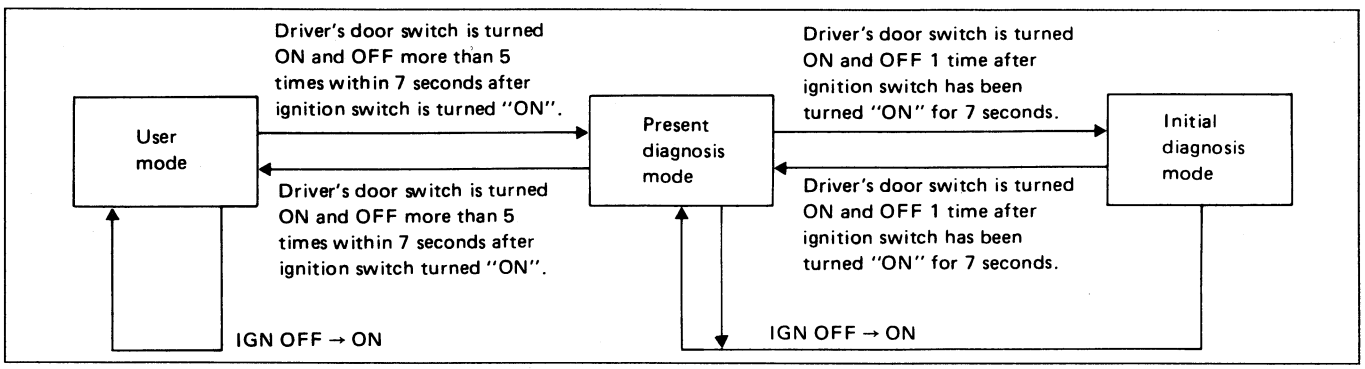
Self-diagnosis (Cont'd)



USING THE WARNING LAMP

Self-diagnosis results can be also read by using the "AIR BAG" warning lamp.
The "Air bag" warning lamp operates as shown below:

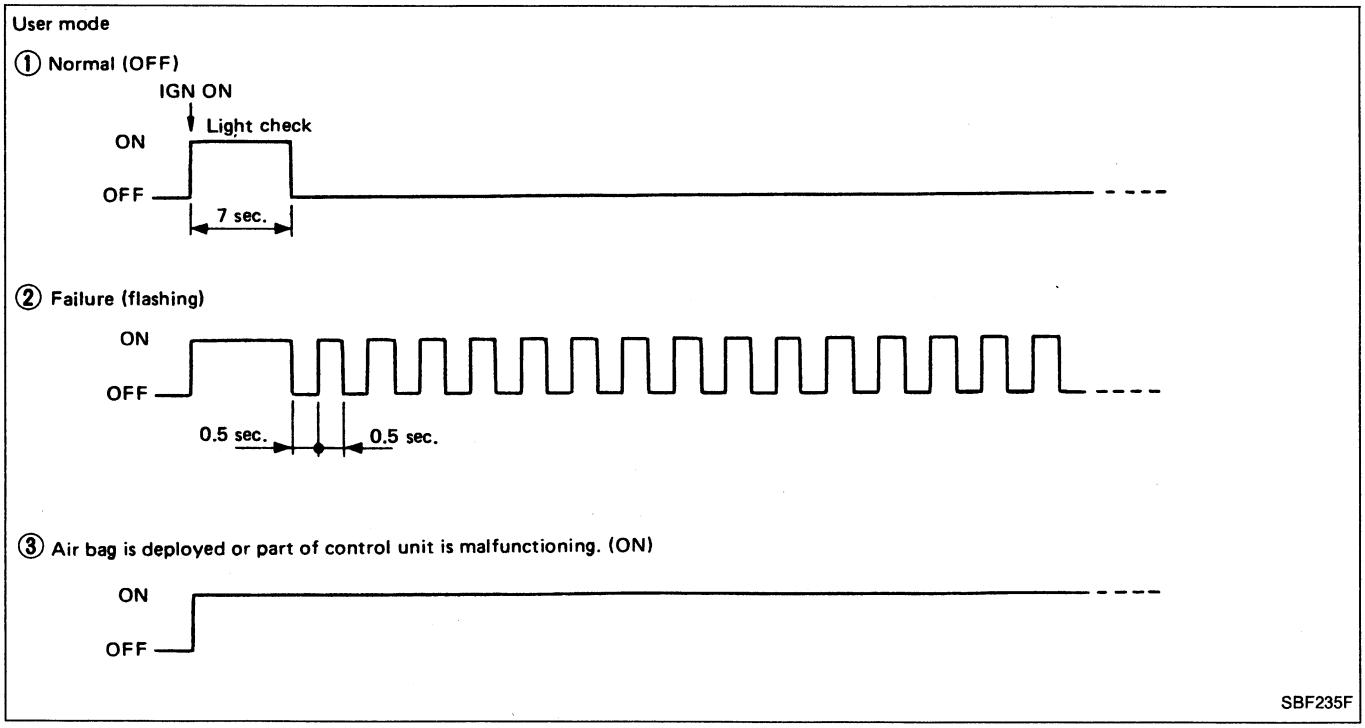
How to alternate self-diagnosis



Problem codes are displayed in present diagnosis mode (self-diagnosis result 1). The problem code last indicated is displayed in initial diagnosis mode (self-diagnosis result 2).

After the malfunctioning parts have been repaired and the system is returned to the user mode, the present diagnosis mode information, displayed as self-diagnosis results, is automatically cleared from memory.

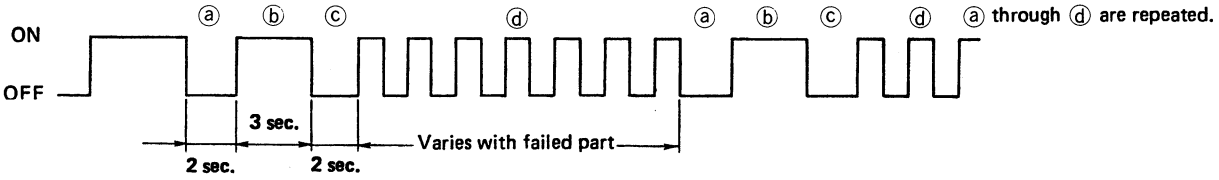
- **After repairing malfunctioning part, attempt to clear self-diagnosis results from memory.**
- **If a malfunctioning part is not completely repaired, information stored in memory will not be cleared.**



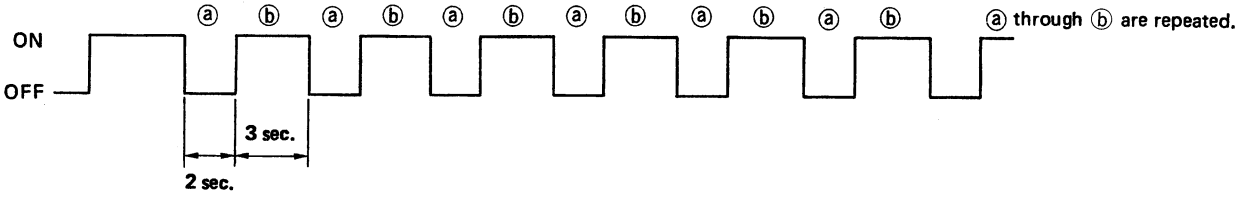
Self-diagnosis (Cont'd)

Present diagnosis mode (self-diagnosis result 1)

ⓑ Start signal; Start signal identifies display modes.



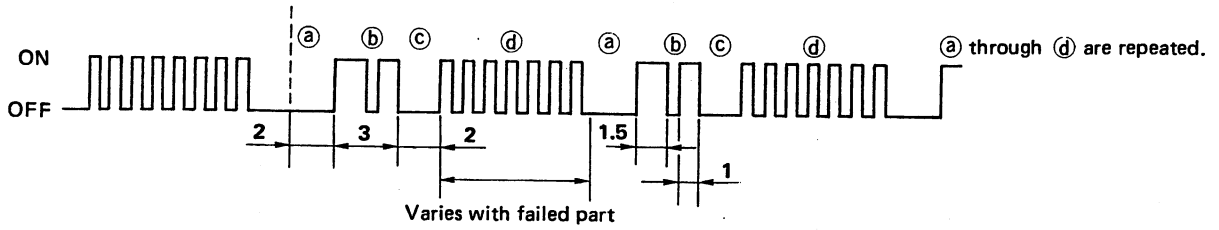
- No failure (or intermittent failure/repair completion)



SBF236F

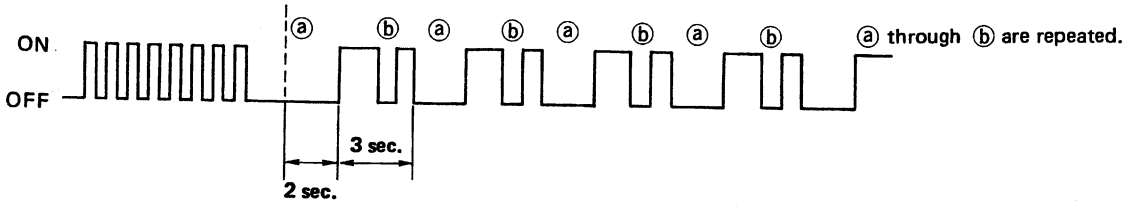
Initial diagnosis mode (self-diagnosis result 2)

ⓑ Start signal; Start signal identifies display modes.



- No failure

Unit: sec.



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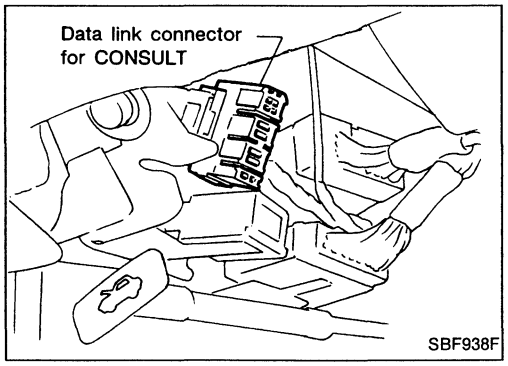
Self-diagnosis results in present- and initial-diagnosis modes can be identified by number of flashes (d). Refer to Table on next page for failed parts.

Self-diagnosis (Cont'd)

Warning lamp flashing times and repair

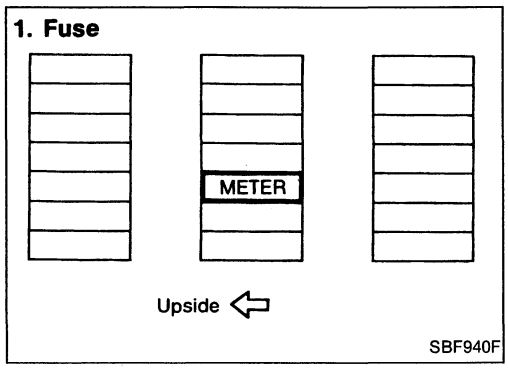
Flash code ⓓ (# of flashes)	Explanation	Repair order * Recheck SRS at each replacement.
0	Normal. The SRS "Air Bag" is in good order.	—
1	The circuit for the safing sensor is out of order.	1. Visually check the wiring harness connections. 2. Replace the safing sensor. (safing sensor and tunnel sensor unit) 3. Replace the control unit. 4. Replace the main harness.
2	The circuit for the air bag module is out of order.	1. Visually check the wiring harness connections. 2. Replace the spiral cable. 3. Replace the air bag module. (Before disposing of it, it must be deployed.) 4. Replace the control unit. 5. Replace the main harness.
3	The circuit for the tunnel sensor is out of order.	1. Visually check the wiring harness connections. 2. Replace the tunnel sensor. (safing sensor and tunnel sensor unit) 3. Replace the control unit. 4. Replace the main harness.
4	The circuit for the right crash zone sensor is out of order.	1. Visually check the wiring harness connections. 2. Replace the right crash sensor. 3. Replace the control unit. 4. Replace the main harness.
5	The circuit for the left crash zone sensor is out of order.	1. Visually check the wiring harness connections. 2. Replace the left crash zone sensor. 3. Replace the control unit. 4. Replace the main harness.
6	The circuit for the center crash zone sensor is out of order.	1. Visually check the wiring harness connections. 2. Replace the center crash zone sensor. 3. Replace the control unit. 4. Replace the main harness.
7	The control unit (diagnostic unit) is out of order.	1. Visually check the wiring harness connections. 2. Replace the control unit. 3. Replace the main harness.
8	More than two parts groups are out of order.	1. See the SELF-DIAGNOSIS RESULT 2 failure parts group [Initial], then repair it. 2. Visually check the wiring harness connections. 3. Replace the control unit. 4. Replace all sensors, spiral cable and air bag module. 5. Replace the main harness.

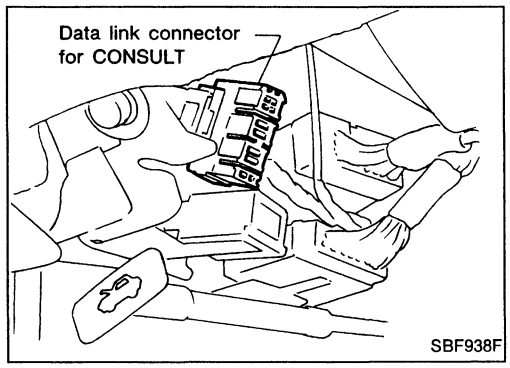


Diagnostic Procedure 1

SYMPTOM: Warning lamp flashes.

Connect the CONSULT and operate it. Read the SELF-DIAGNOSIS RESULTS 1 and 2.	→ Refer to SELF-DIAGNOSIS RESULTS and repair.
OR	
Refer to warning lamp self-diagnosis.	→ Refer to the number of warning lamp flashes. Repair as necessary.



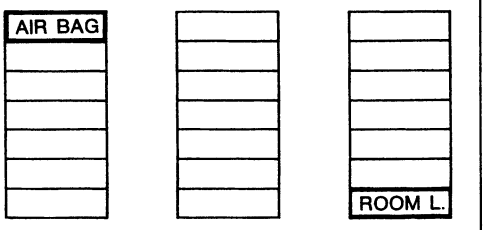


Diagnostic Procedure 2

SYMPTOM: Warning lamp does not come on.

1. Check the warning lamp fuse. — N.G. → Replace the fuse.
   O.K. ↓
2. Connect the CONSULT unit and begin diagnosis.
   • Is "AIR BAG" displayed on the CONSULT screen? — N.G. → Replace the control unit.
   O.K. ↓
3. Read the SELF-DIAGNOSIS RESULTS 1 and 2. — N.G. → Refer to SELF-DIAGNOSIS RESULTS and repair.
   O.K. ↓
4. Check the warning lamp bulb. — N.G. → Replace the warning lamp bulb.
   O.K. ↓
5. Check the warning lamp harness connection. — N.G. → Replace the harness.
   O.K. ↓
6. Replace the control unit.

2. Fuse



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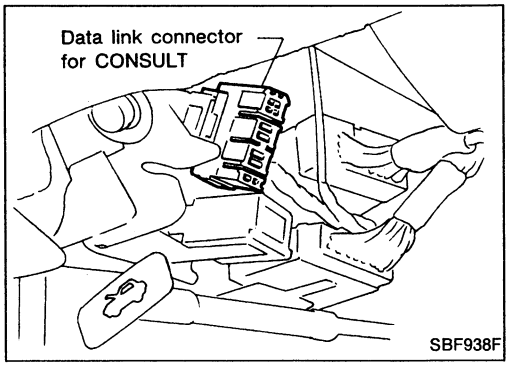

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Diagnostic Procedure 3

SYMPTOM: Warning lamp does not go off.

1. Is the air bag module deployed?
   - Yes → Replace the air bag module.
   - No ↓
2. Check the fuses used for the SRS "Air Bag" and "Room Lamp".
   - N.G. → Replace the fuse.
   - O.K. ↓
3. Connect the CONSULT unit and operate it.
   - ● Is "AIR BAG" displayed on the CONSULT?
   - N.G. → Replace the control unit.
   - O.K. ↓
4. Read the SELF-DIAGNOSIS RESULTS 1 and 2.*
   - N.G. → Refer to SELF-DIAGNOSIS RESULTS and repair.

   OR

   Refer to the warning lamp self-diagnosis.*
   - N.G. → Refer to the warning lamp flashing times and repair as necessary.
   - O.K. ↓
5. Check the harness connection between the warning lamp and the control unit.
   - N.G. → Replace the harness.
   - O.K. ↓
6. Replace the control unit.

* Recheck SRS after each replacement.

Collision Diagnosis

To repair the SRS "AIR BAG", perform the following steps.

① Check the control unit (diagnostic unit).
- Connect CONSULT and then erase the memory. (However, the memory may not be cleared.)

OR

- Check "AIR BAG" warning lamp and perform the following twice: turn driver's door switch ON and OFF 5 times within 7 seconds after ignition switch turned "ON".

↓ If "AIR BAG" warning lamp comes on continuously.

Replace the control unit.

② Remove the deployed air bag module.

③ Check the SRS components using the table shown below:
- If the SRS components are showing any visible damage such as dents, cracks, or deformation, replace them with new ones.

④ Conduct self-diagnosis using CONSULT or "AIR BAG" warning lamp to ensure entire SRS operates properly except open circuit of air bag module.

⑤ Install new air bag module.

	Inspection (when air bag deploys in collision)	Inspection (when air bag does not deploy in low-speed collision)
Steering wheel	(1) Check harness (built into steering wheel) and connectors for damage, and terminals for deformities. (2) Install air bag module to check fit or alignment with steering wheel. (3) Check steering wheel for excessive free play.	
In-compartment sensor All sensors (except those affected by collision)	(1) Check body and sensor brackets for deformities or rust. (2) Check sensor case for dents, cracks, deformities or rust. (3) Check sensor harness for binds, connector for damage, and terminals for deformities.	
Air bag module	Replace air bag module.	(1) Remove air bag module from steering wheel. Check harness cover and connectors for damage, terminals for deformities, and harness for binds. (2) Install air bag module to steering wheel to check fit or alignment with the wheel. (3) Replace screws with new ones.
Harness connector (Main and Instrument harness)	(1) Check connectors for poor connections. (2) Check harness for binding, connectors for damage, and terminals for deformities.	
Spiral cable	(1) Visually check lock (engagement) pins and combination switch for damage. (2) Check connectors, flat cable and protective tape for damage. (3) Check steering wheel for noise, binds or heavy operation.	
Control unit	Replace control unit (diagnostic unit).	(1) Check case and bracket for dents, cracks or deformities. (2) Check connectors for damage, and terminals for deformities.

HEATER & AIR CONDITIONER

SECTION HA

CONTENTS

CONTENTS (Cont'd.)

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

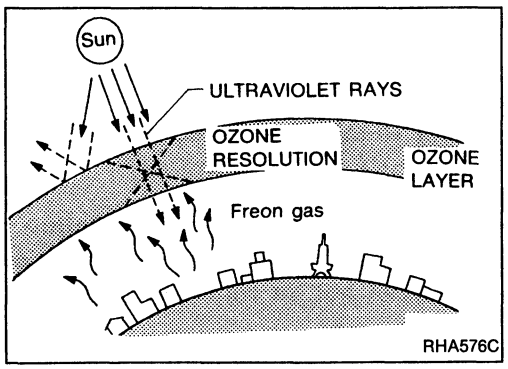
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

Supplemental Restraint System "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF section** of this Service Manual.

WARNING:

a. **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.**
b. **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
c. **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**

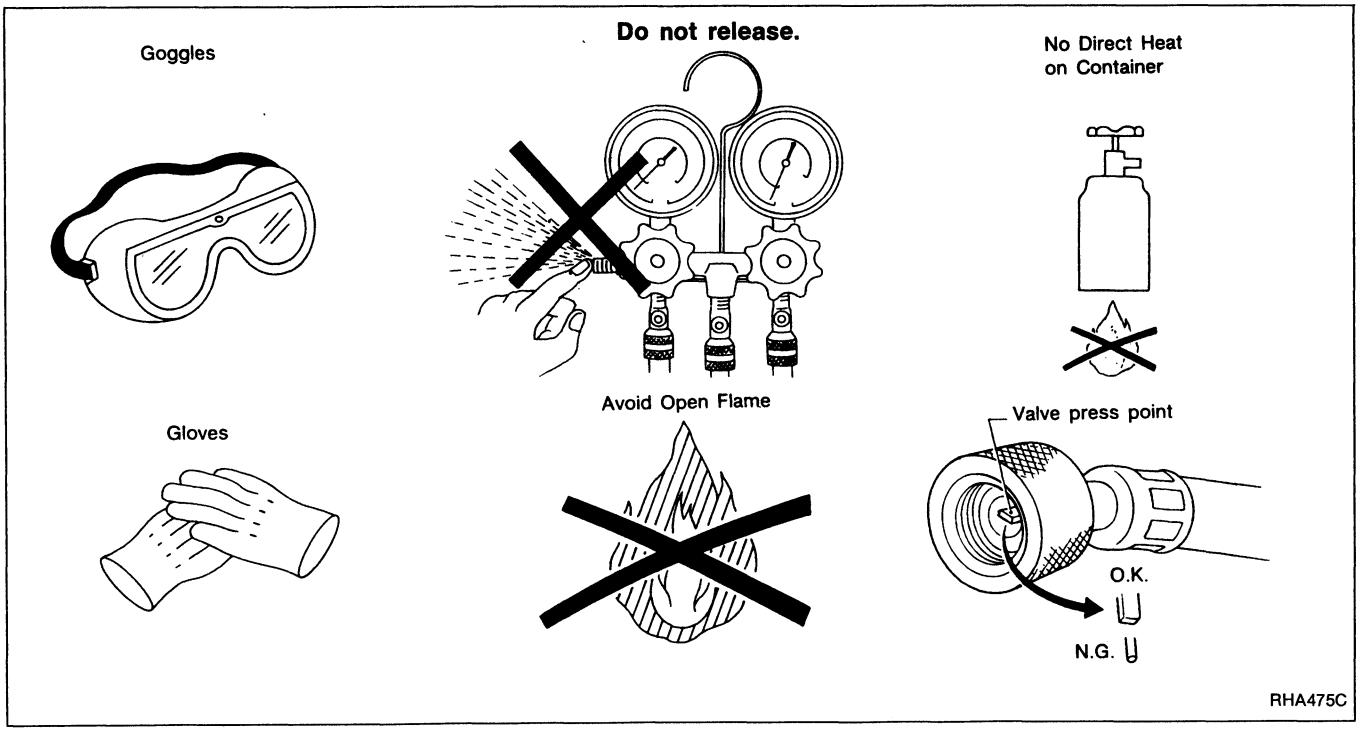


Precautions for the Handling of Refrigerant

WARNING:

- **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.



Precautions for the Handling of Refrigerant (Cont'd)

- 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 for Refrigerant Connection

WARNING:

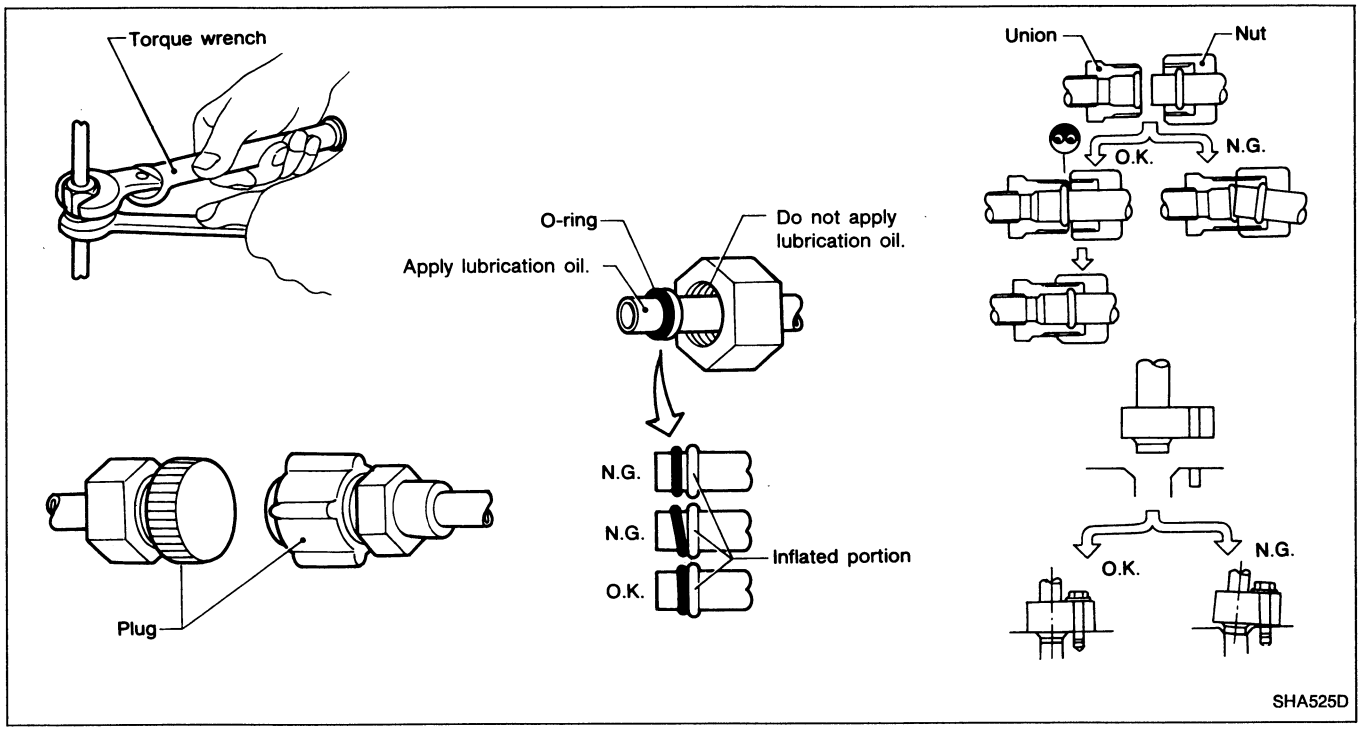
Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric. Then gradually loosen the discharge side hose fitting and remove it.

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.
- 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 for Refrigerant Connection (Cont'd)



Precautions for Servicing Compressor

- **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 LUBRICATION 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.**
- **Replace shaft seal, seal seat, oil seal and O-ring as a set.**
- **When installing shaft seal, Seal seat, oil seal, O-ring and gaskets, apply compressor oil sparingly to the contact surface. Do not reuse them.**
- **After replacement or repairs, conduct a Leak Test.**

Features — Auto Air Conditioner

OUTLET AIR TEMPERATURE CONTROL (Air mix door control)

When the desired temperature is set on the control panel, the automatic temperature control system determines both the head and foot target temperatures, as well as target upper (VENT and DEF) and lower (FOOT) outlet air temperatures. This computation is accomplished in relation to the desired temperature, and outside conditions (ambient temperature and sunload). The automatic temperature control system then controls the air mix door position so that the outlet air temperatures meet target* outlet air temperatures.

A summary of the automatic temperature control system is as follows:

1. The upper and lower air temperatures are independently controlled to provide a comfortable ride.
2. Optimum outlet air temperatures can be set to the passenger's preference.
3. Outlet air temperature feedback control through duct sensors permits a "potentiometerless" air mix door design. It requires no adjustment, increases service life and improves performance reliability.

FAN SPEED CONTROL

The A.T.C. system continuously regulates fan speed according to the difference between the target temperature and the temperatures detected at the upper and lower in-vehicle sensors. The greater the difference between the temperatures the higher the blower speed. If the cabin sunload or ambient temperature is high, fan speed will be increased.

INTAKE DOOR CONTROL

The A.T.C. system adjusts the intake door position once every thirty seconds. The system is programmed to take in outside air as much as possible.

OUTLET DOOR CONTROL

The A.T.C. system controls distribution of air through the VENT, DEF and FOOT outlets based on the cabin sunload, ambient temperature and the set temperature.

COMPRESSOR MAGNET CLUTCH CONTROL

The A.T.C. system automatically shuts off the compressor at temperatures lower than 0°C (32°F).

SELF-DIAGNOSTIC SYSTEM

The A.T.C. system contains an on-board diagnostic system which can be used to check the A.T.C. system sensors and motors and any trouble data stored in the memory.

Pushing the "AUTO" and "OFF" switches at the same time for more than 5 seconds will give the self-diagnostic mode. There are 4 kinds of self-diagnostic systems (STEP 1 to STEP 4). Each step can be accessed by pushing the "AUTO" switch. The functions of each step are as follows:

- STEP 1 — Monitor diagnosis
- STEP 2 — Actuator test
- STEP 3 — Change of difference between upper and lower target temperature
- STEP 4 — Readout of trouble data memory

***: Target temperature**

When a temperature for the cabin is set using the TEMP. SET switch, the A.T.C. system calculates an initial target temperature based on information from the various A.T.C. system sensors. This target temperature is continuously updated to bring the cabin temperature to the set temperature in the most comfortable way possible for the occupants. (The program for this was made after careful study of comfort levels related to car interiors).

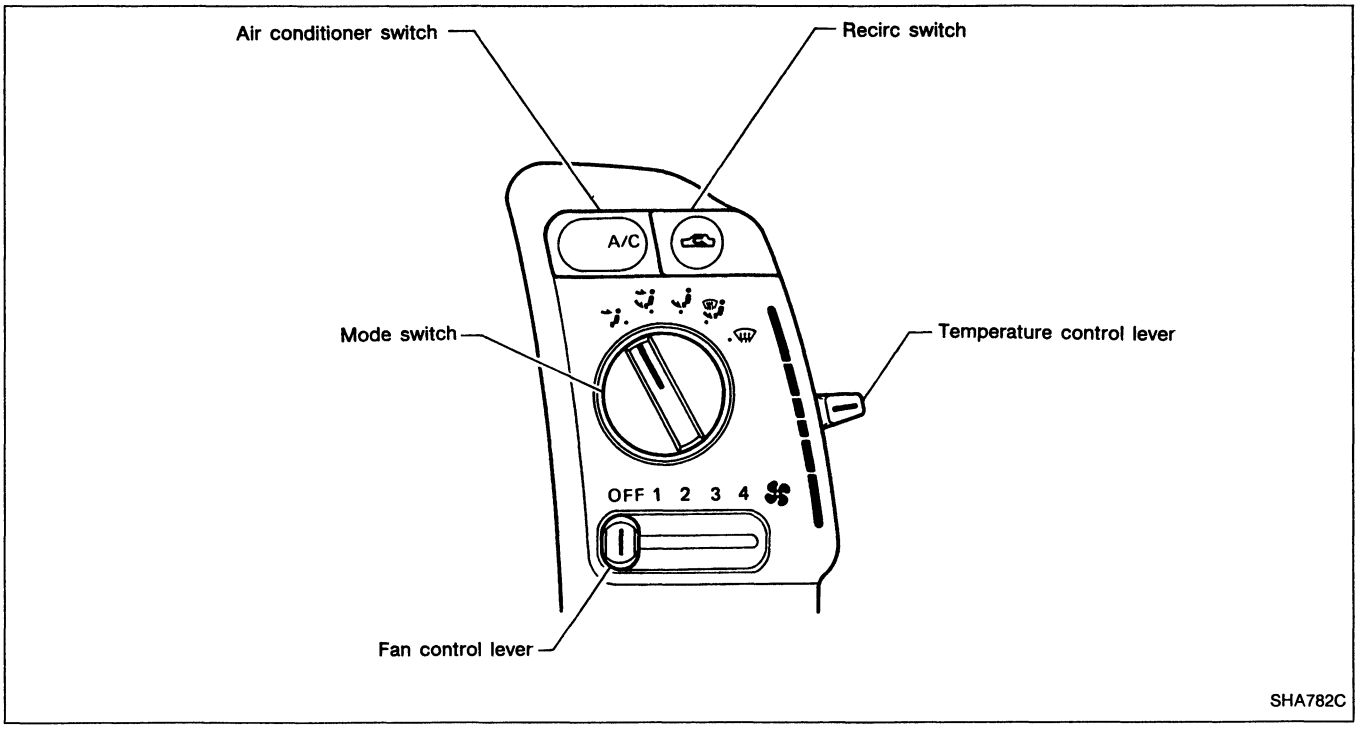
Acceleration Cut System

This system is controlled by ECM (ECCS control module).
When the engine is heavily overloaded, the compressor is turned off for several seconds to reduce overloading.

Water Cock Control System

The water cock is connected to the air mix doors with a cable. When the air mix doors are at the full-cold position, the water cock is fully closed, and when the air mix doors are at the full-hot position, the water cock is fully opened.

Control Operation — Manual Air Conditioner



FAN CONTROL LEVER

This lever turns the fan ON and OFF, and controls fan speed.

MODE SWITCH

This switch allows you to select the outlet air flow.
In the "DEF" mode, the intake door is set to "FRE". The compressor turns on in "DEF" or "F/D" mode.

TEMPERATURE CONTROL LEVER

This lever allows you to adjust the temperature of the outlet air.

RECIRC SWITCH

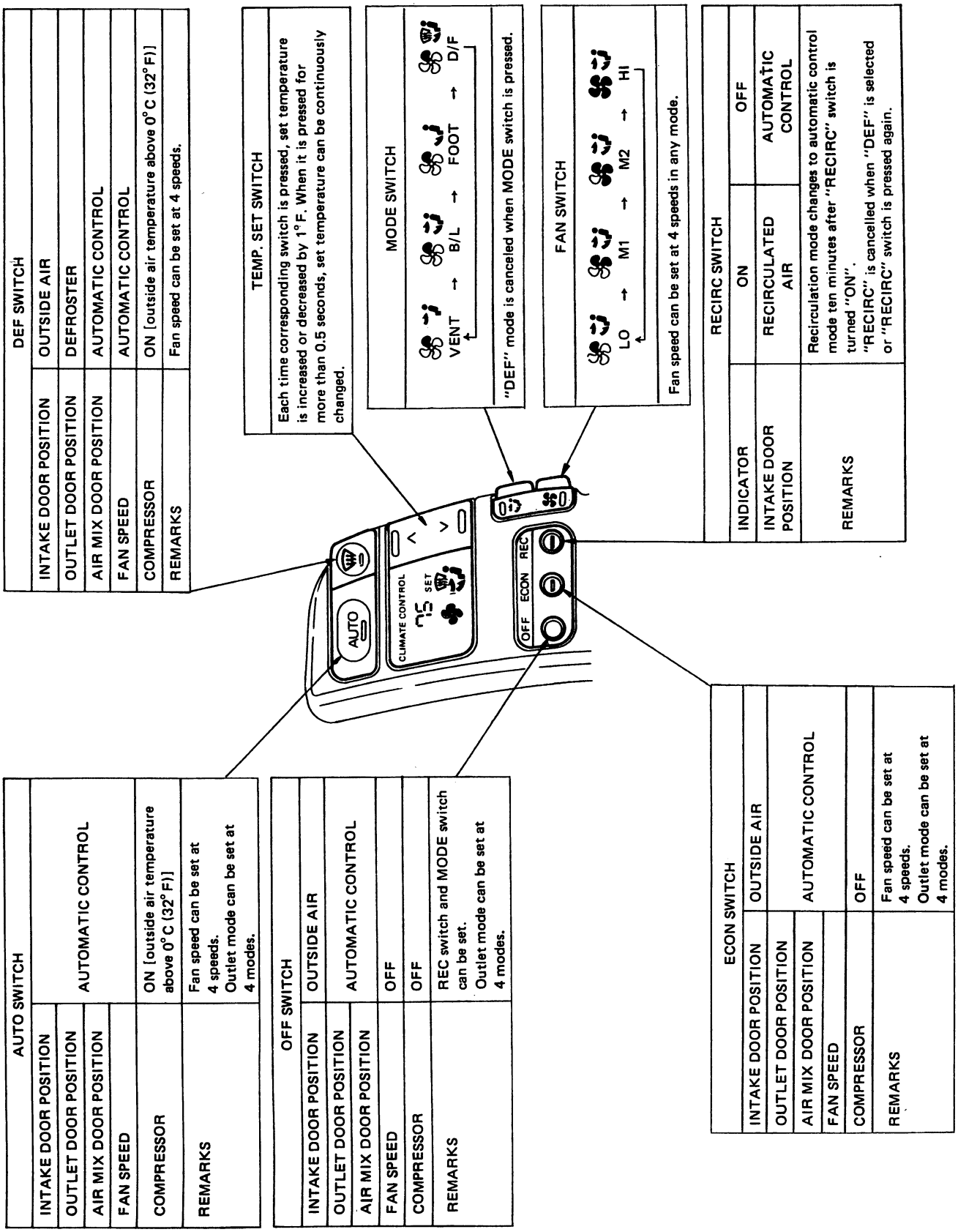
OFF position:
Outside air is drawn into the passenger compartment when this switch is OFF.
ON position:
Interior air is recirculated inside the vehicle.
"RECIRC" is cancelled when "DEF" is selected.

AIR CONDITIONER SWITCH

Start the engine, move the fan control lever 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.

Control Operation — Auto Air Conditioner



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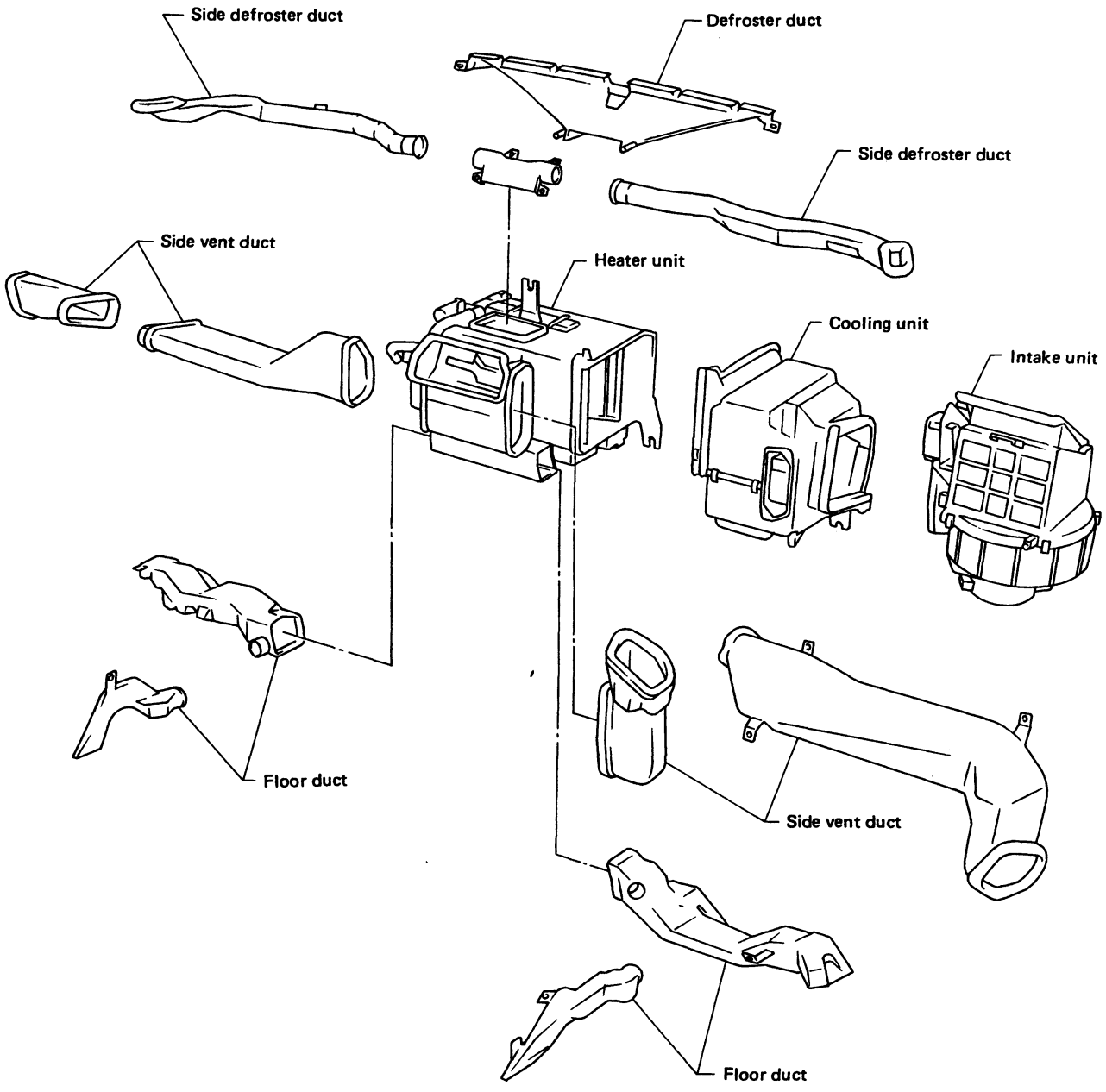
Component Layout



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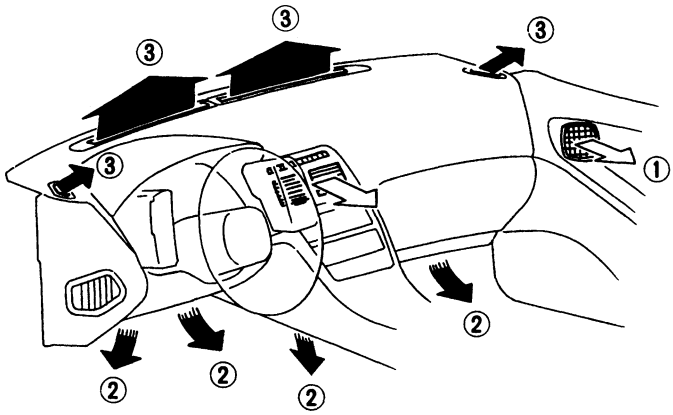
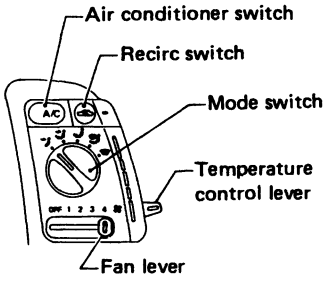
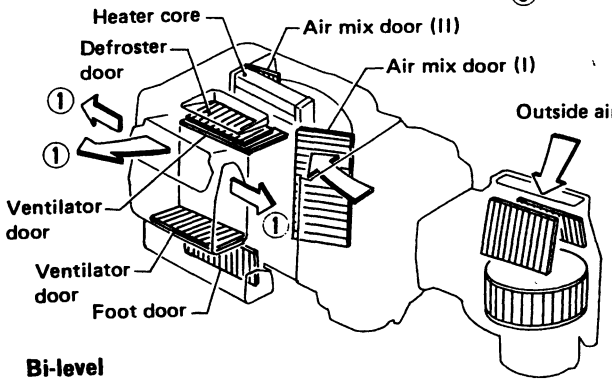
Air Flow



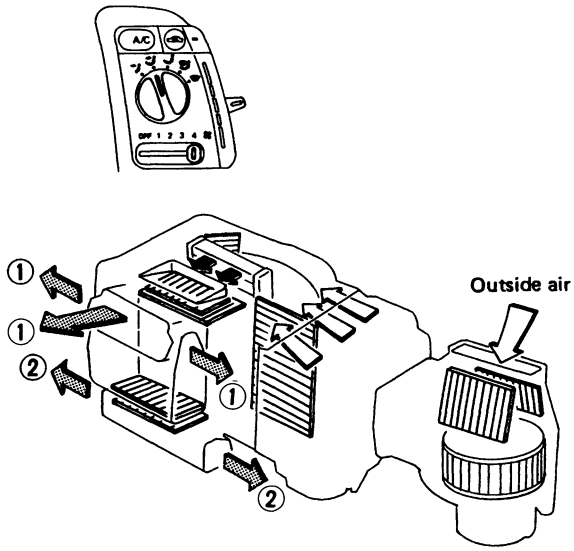
Ventilation



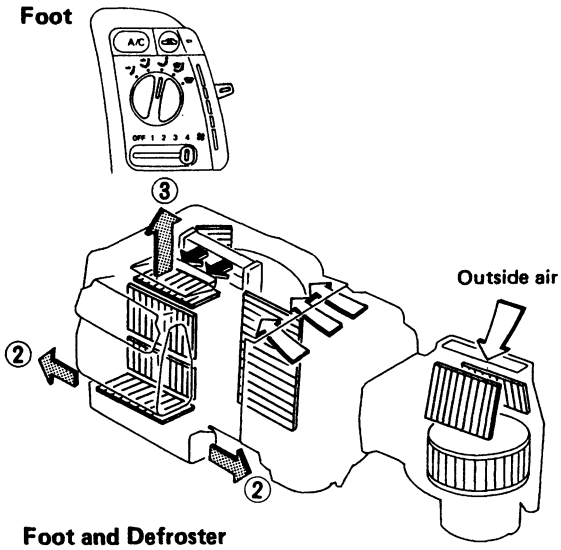
① ... To ventilator
② ... To floor
③ ... To defroster



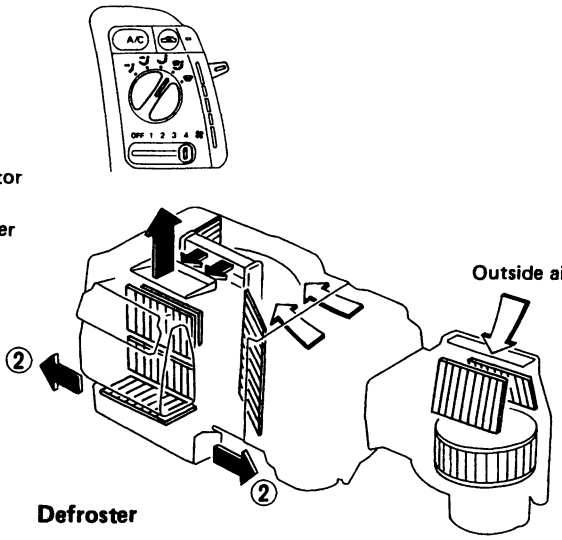
Bi-level



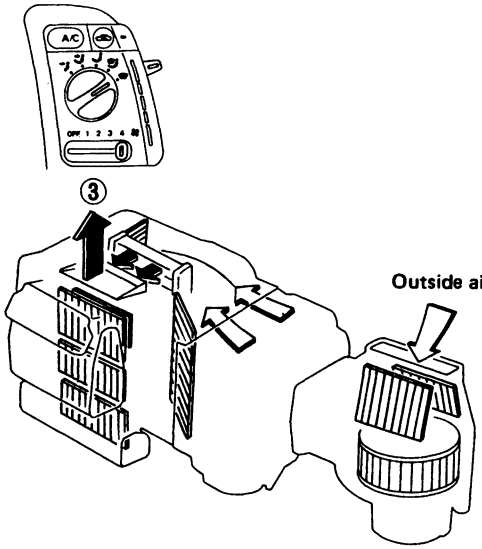
Foot



Foot and Defroster



Defroster



: Air passed through heater core

: Mixed air

: Air not passed through heater core

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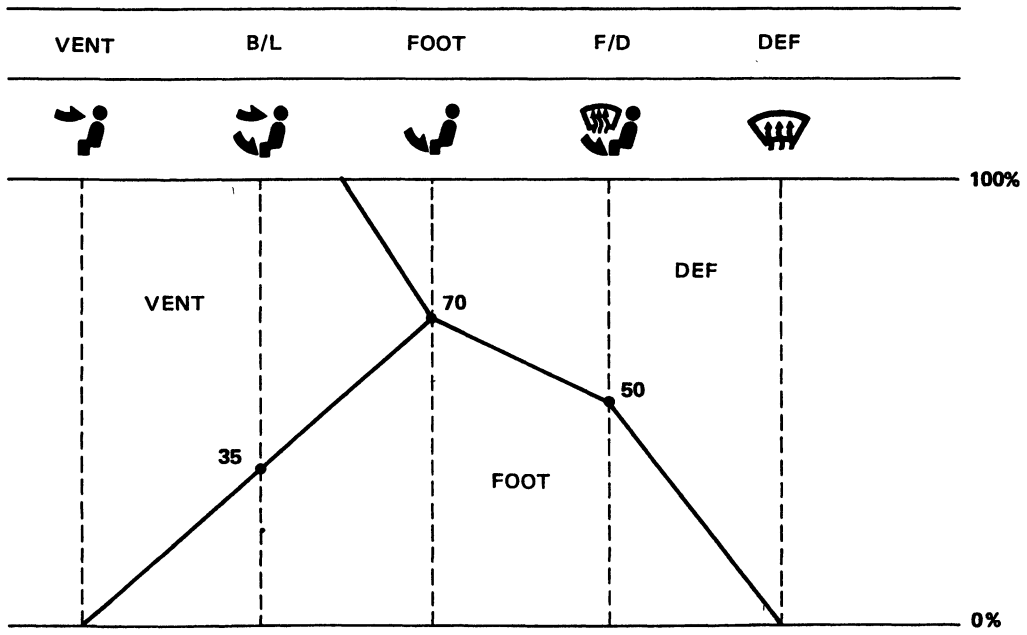
Air Flow (Cont'd)

AIR DISTRIBUTION RATIOS



SHA266C

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.
Refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION (For manual air conditioner)

If evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts compressor operation. When evaporator coil temperature rises above the specification, compressor operation will resume. This condition (compressor cycling) indicates a malfunction in the system.

FREEZE PROTECTION (For auto air conditioner)

When the A/C is switched on, the compressor runs continuously, and the evaporator pressure, and therefore the temperature, is controlled by a suction throttle valve (S.T.V.) to prevent freeze up.

REFRIGERANT SYSTEM PROTECTION

Low-pressure switch

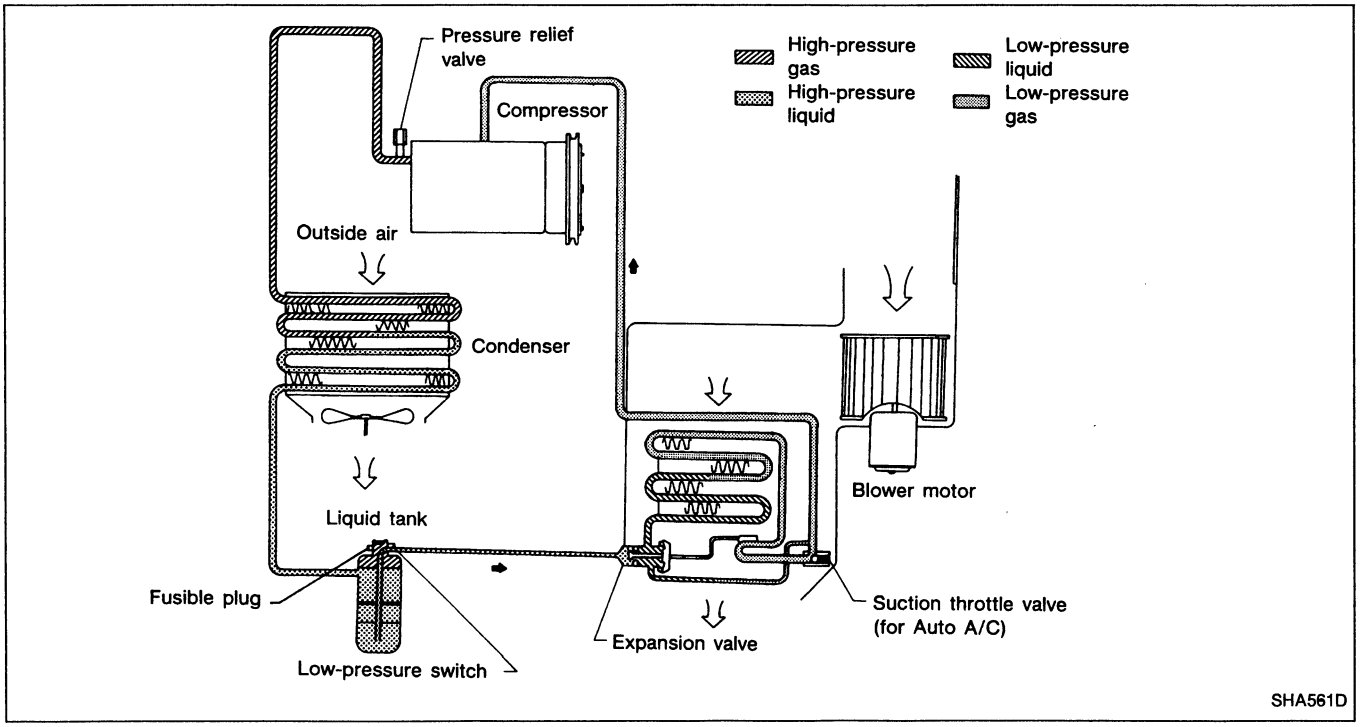
The refrigerant system is protected against excessively low pressures by the low-pressure switch, located on the liquid tank. If the system pressure falls below the specifications, the low-pressure switch opens to interrupt compressor operation.

Fusible plug

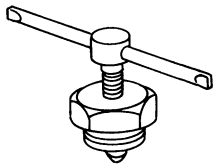
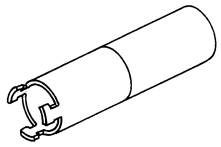
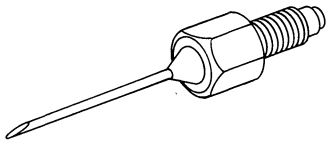
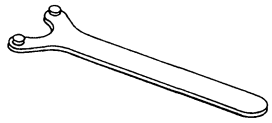
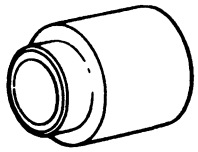
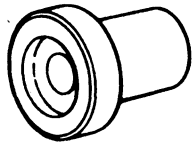
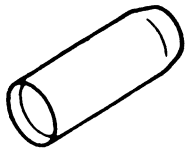
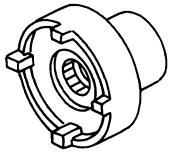
Opens at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace the liquid tank.

Pressure relief valve

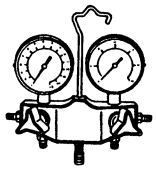
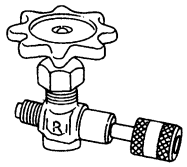
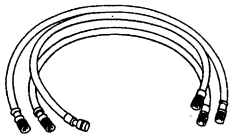
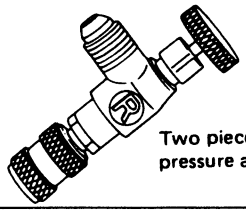
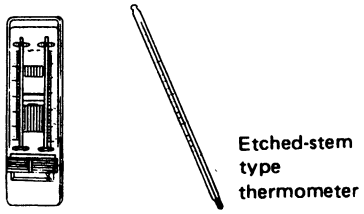
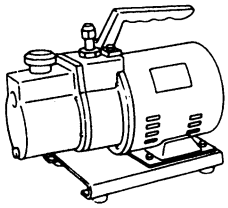
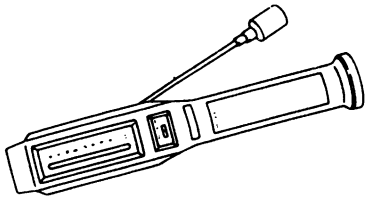
The refrigerant system is also protected by a pressure relief valve, located on the end of the high pressure flexible hose near the compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm^2, 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



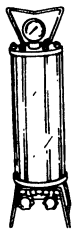
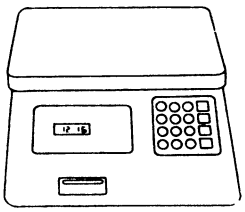
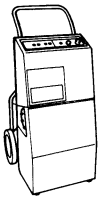
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
KV99232022 (J26571-A) Clutch disc puller		Removing clutch disc
KV99235140 (J37876) Shaft seal remover and installer		Removing and installing shaft seal
KV994C1552 (J37880) Charge nozzle		Charging refrigerant
KV99231010 (J37877) Clutch disc wrench		Removing shaft nut and clutch disc
KV99233040 (J26720-A) Puller pilot		Removing pulley
KV99234160 (J37879) Pulley installer		Installing pulley
KV99267420 (J37878) Shaft seal guide		Installing shaft seal
KV99235160 (J37882) Nut wrench		Removing lock nut

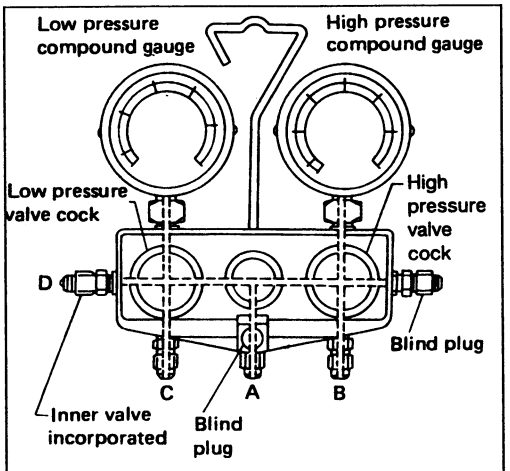
Service Tools

Tool name	Description	
Manifold gauge	 SHA899C	Discharging, evacuating and charging refrigerant
Additional valve	 SHA898C	Discharging, evacuating and charging refrigerant
Charging hose	 SHA897C	Discharging, evacuating and charging refrigerant
Adapter valve	 Two pieces on each high pressure and low pressure line RHA573B	Discharging, evacuating and charging refrigerant
Thermometer and hygrometer	 Etched-stem type thermometer SHA900C	Checking temperature and humidity
Vacuum pump	 RHA575B	Evacuating
Gas leak detector	 RHA577B	Checking refrigerant leaks

Service Tools (Cont'd)

Tool name	Description
Charging cylinder	 RHA578B — Checking amount of refrigerant and charging refrigerant
Weight scale	 RHA579B — Checking amount of refrigerant
Refrigerant recycling equipment	 SHA813D — Capturing and recycling refrigerant

For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.



Center joint (A):
Use for evacuating.
High pressure side joint (B):
Connect to high pressure side service valve of refrigerating system.
Low pressure side joint (C):
Connect to low pressure side service valve of refrigerating system.
Refrigerant joint (D):
Use for charging refrigerant.
SHA044D

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 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 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.)**

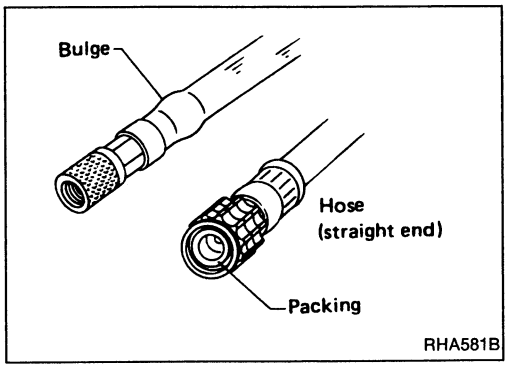
Service Tools (Cont'd)

Charging hose

1. Completely tighten the high pressure valve, low pressure valve and vacuum pump valve cocks of the gauge manifold.
2. Connect the charging hoses to the high and low pressure lines.
3. Connect the charging hose fitted with a valve core to the charging cylinder.
4. Connect the vacuum pump hose to the vacuum pump.

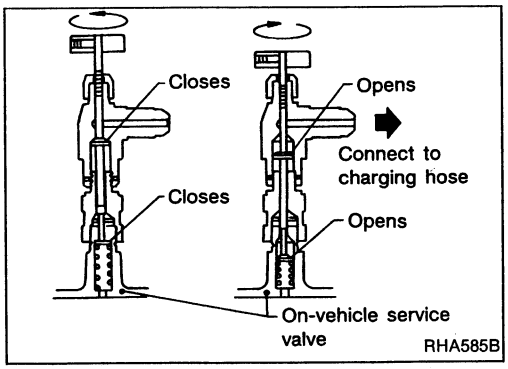
The high and low pressure hoses are color coded to prevent wrong connection.

High pressure line hose	Red
Low pressure line hose	Yellow
Charging hose	Blue or green (with valve core)
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.**



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.

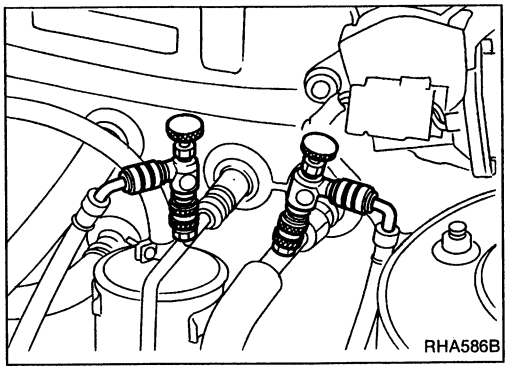
1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

CAUTION:

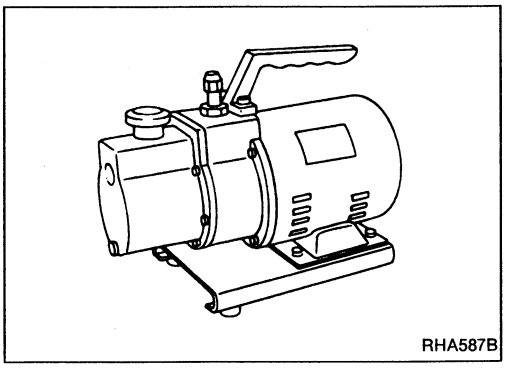
Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace the packing with new.

2. Connect the high and low pressure hoses to the adapter valves.

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.



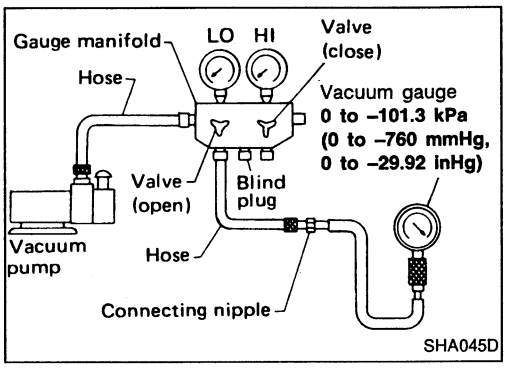
Service Tools (Cont'd)


RHA587B

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.

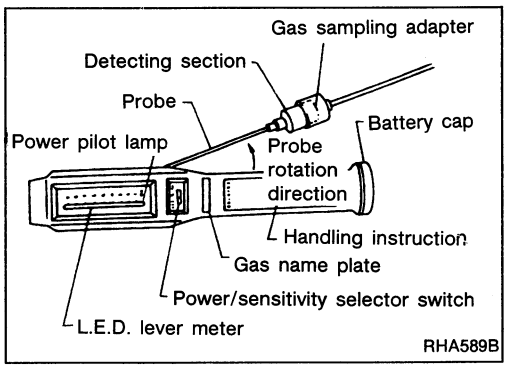
Check the vacuum pump to see that the vacuum pump capacity is greater than –100.0 kPa (–750 mmHg, –29.53 inHg).



SHA045D

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.



RHA589B

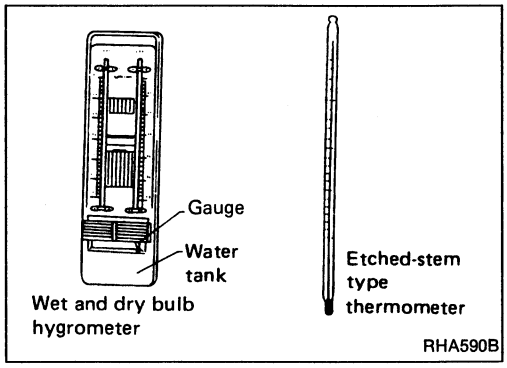
Gas leak detector

The gas leak detector is used to check whether the refrigeration system is leaking. The detector is an electrical type. The features of this gas leak detector are listed below.

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 tow 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: Changing 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.

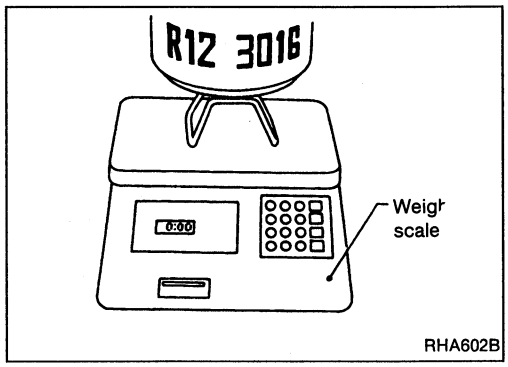
- **Leakage inspection of a refrigeration system needs a sensitivity greater than 20 g (0.71 oz)/year.**
- **The actual amount of leak is estimated at 5 to 10 times the detected amount.**
- **Insufficient cooling may be felt if leakage exceeds 150 to 200 g (5.29 to 7.05 oz).**

Service Tools (Cont'd)



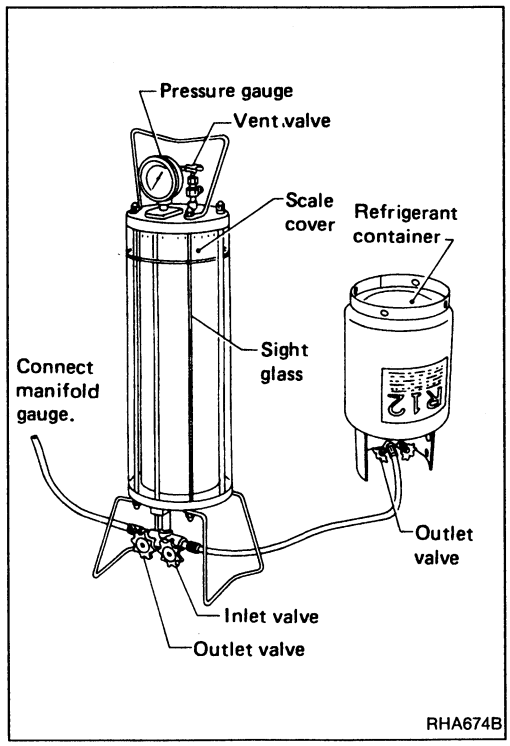
Temperature gauge

Use to check the air conditioner performance. An etched stem type thermometer may be used. A hydrometer 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.



Charging cylinder

The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

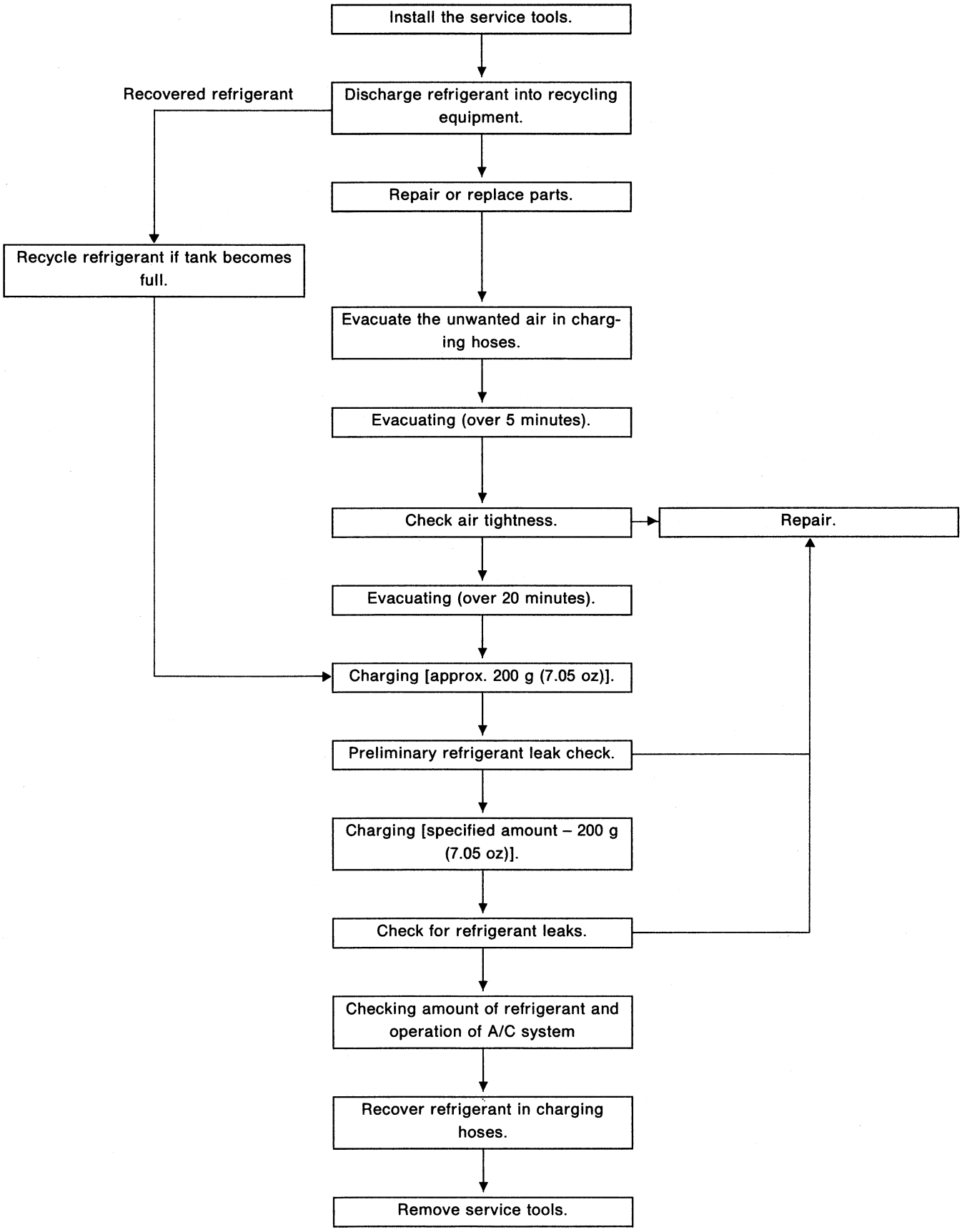
Features

- 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.

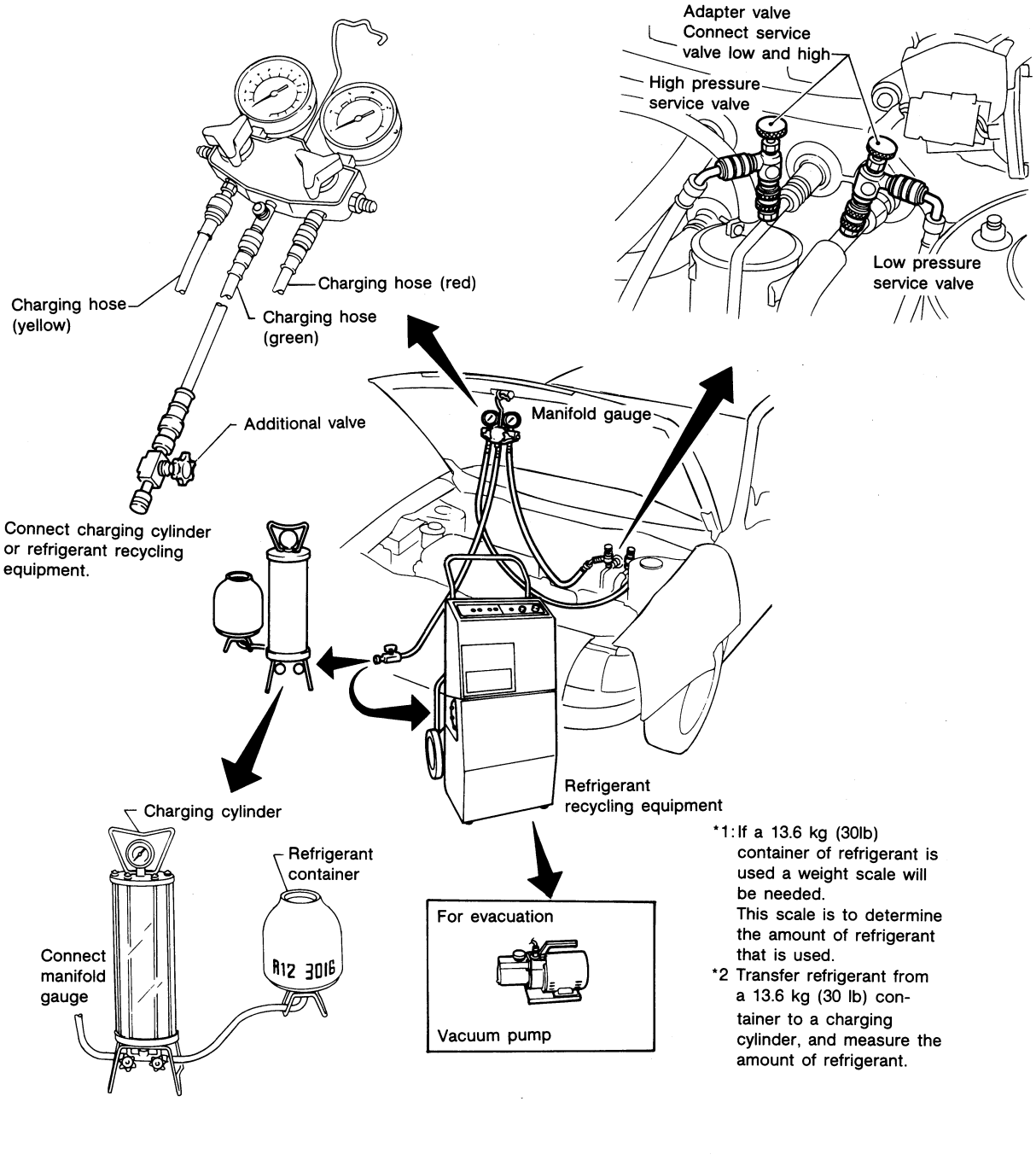
CAUTION:

- **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.**

Work Procedure

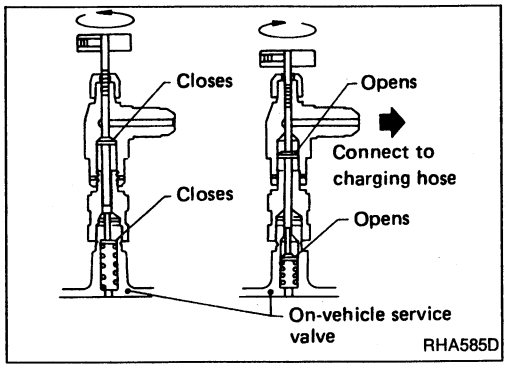


Setting of Service Tools



WARNING:
Discharge only into your recycling equipment. Do not release refrigerant into the air.

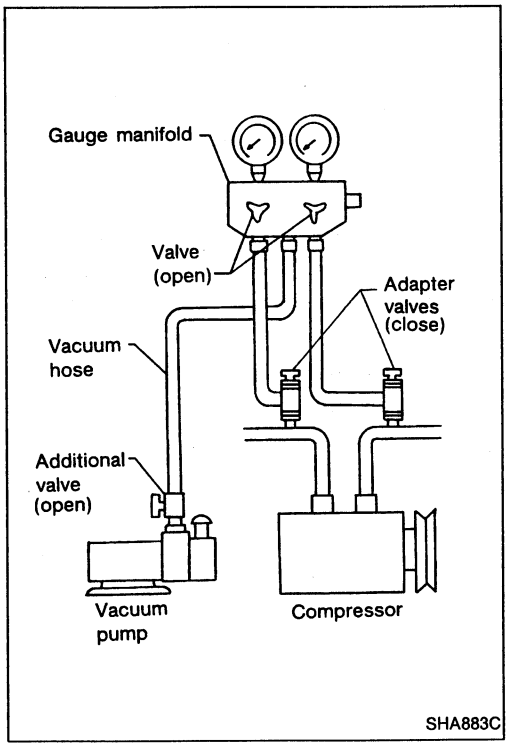
Setting of Service Tools (Cont'd)

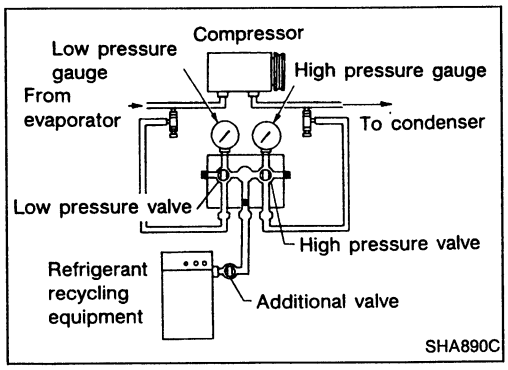


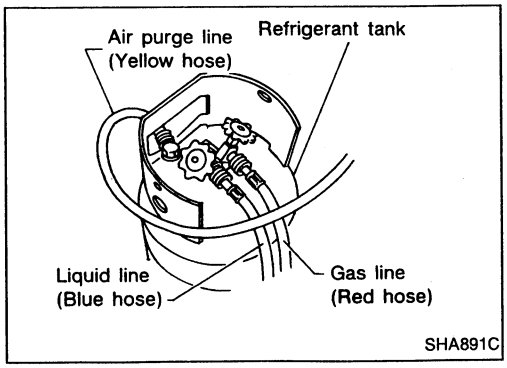
1. Install adapter valve to each of high pressure and low pressure service valves.

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.

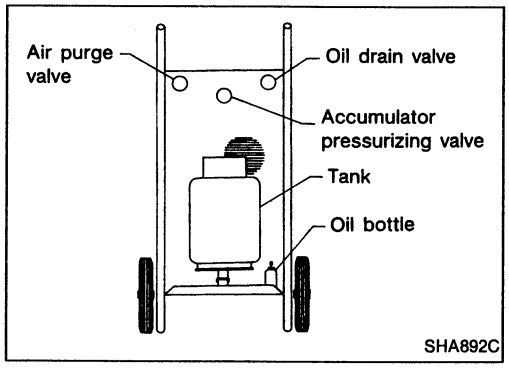
Use only authorized refillable refrigerant tanks for your recycling equipment.

Use of other tanks could cause personal injury.

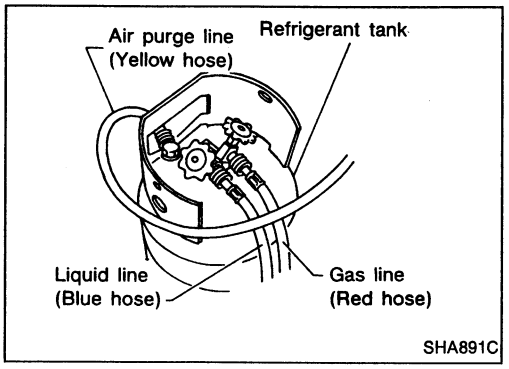
REFRIGERANT RECOVERY

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/cm^2, 0 psi) within two minutes. If this occurs, repeat this step.

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.

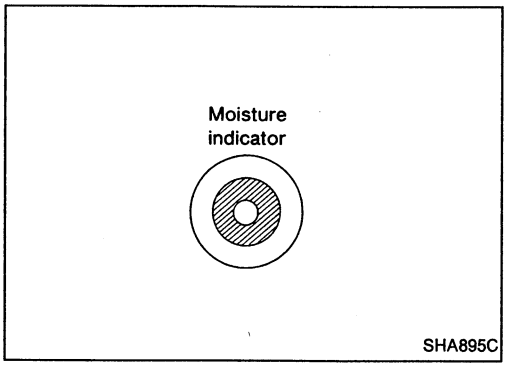


REFRIGERANT RECYCLING

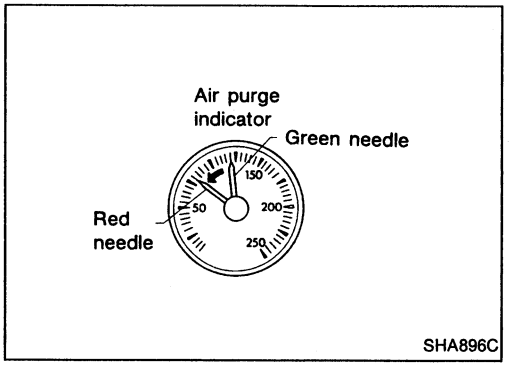
The recycling of reclaimed refrigerant is essential in order to assure that the refrigerant which meets the standards is re-used.

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.



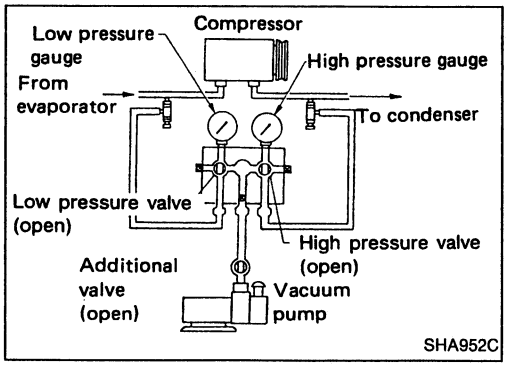
1. Make certain both valves on recovery tank are open.
2. Turn on "Recycling" switch. Recycling solenoid will be energized.
3. Depress start switch. Compressor will start, and "Recycling On" light will come. Refrigerant will be seen going through moisture indicator at start up. The sightglass will not 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.



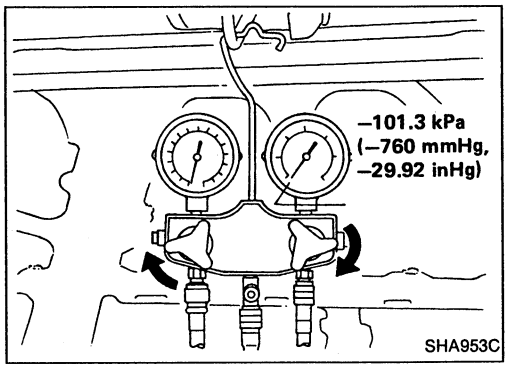
Evacuation

EVACUATION PROCEDURE

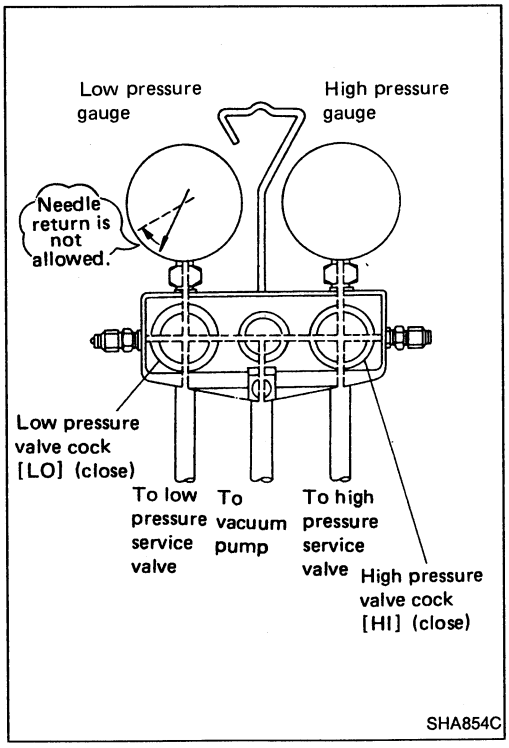
1. Connect vacuum hose to vacuum pump.
2. Open high and low pressure valves of manifold gauge set and additional valve.
3. Run vacuum pump.



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).

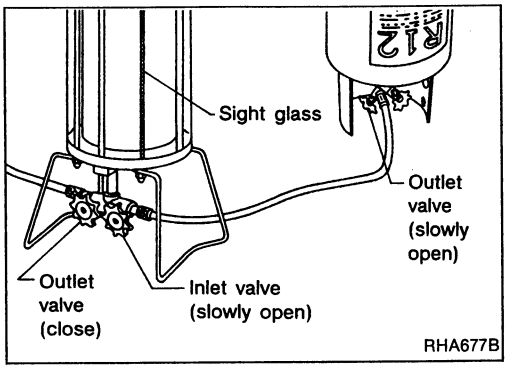
If any reverse movement is noted, it indicates poor system airtightness. Service the system until airtightness is complete. If pressure changes approx. 13.3 kPa (100 mmHg, 3.94 inHg) in 10 minutes, the refrigerant in the system will be exhausted in about one month.

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.

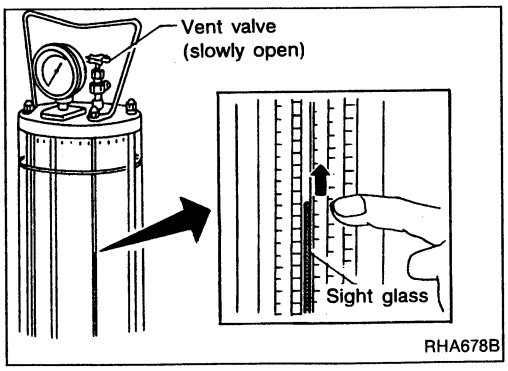
Charging Refrigerant



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.

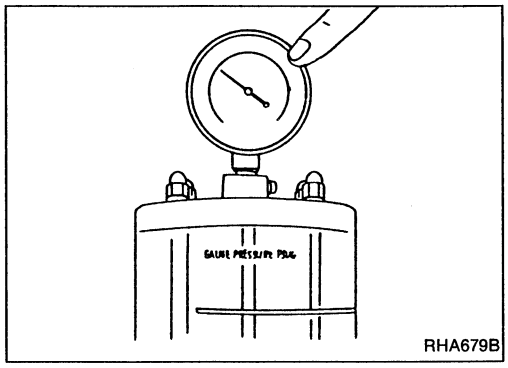


4. Slowly open upper vent valve to release pressure from charging cylinder. While doing so, continue charging until required amount of refrigerant is reached.

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).

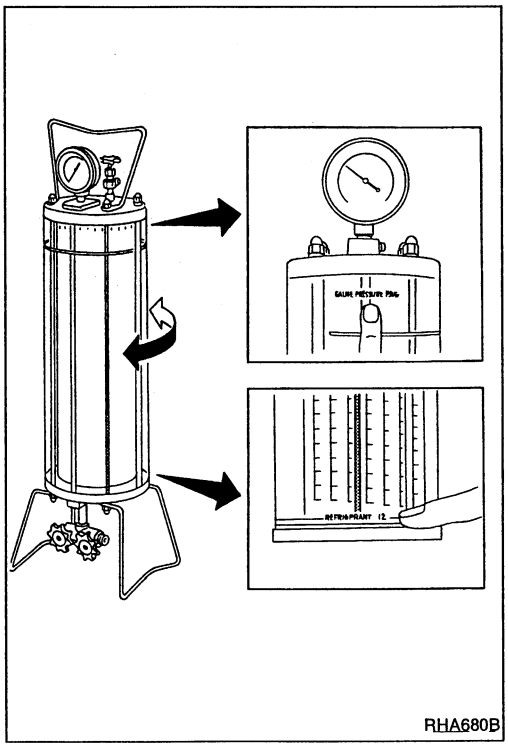
5. Close inlet valve and upper vent valve of charging cylinder.

Charging Refrigerant (Cont'd)


RHA679B

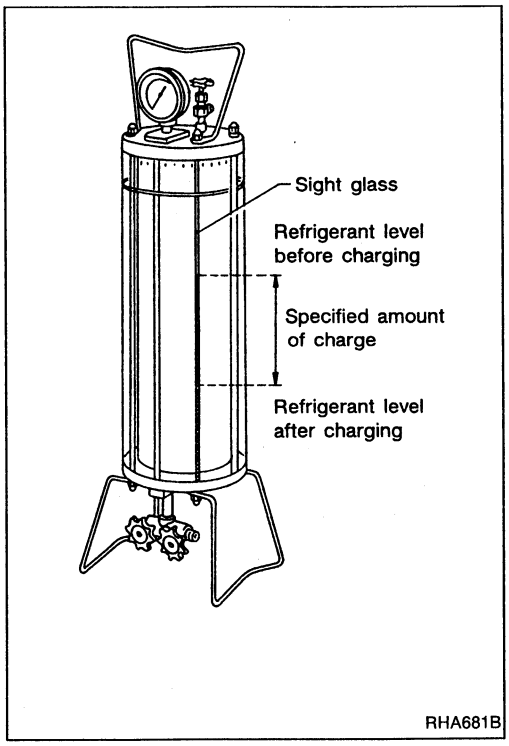
6. Turn on heater switch (charging cylinder is provided with a heater.)

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/cm^2, 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.


RHA680B

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.



RHA681B

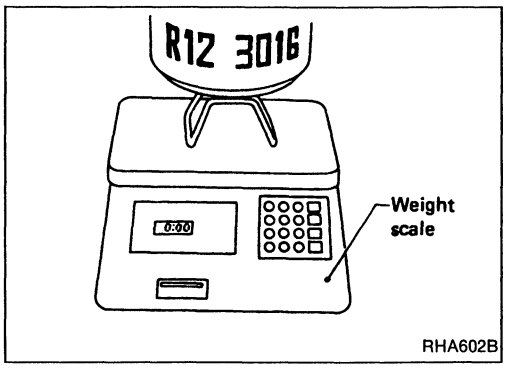
CALCULATING CHARGING AMOUNT OF REFRIGERANT

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.

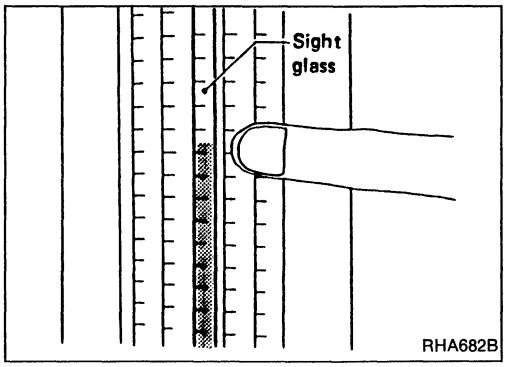
Example:

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.

Charging Refrigerant (Cont'd)



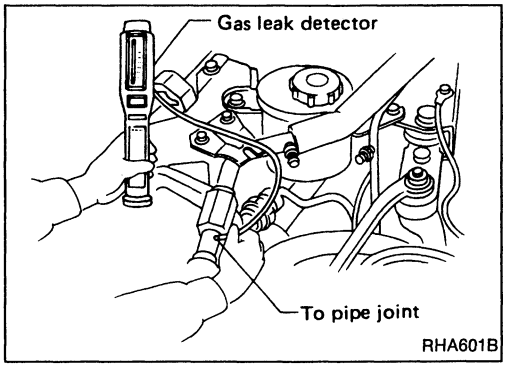
If a flow meter is not available, the amount of charged refrigerant also can be determined by subtracting the weight of the container measured after charging from its weight measured before charging.



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).

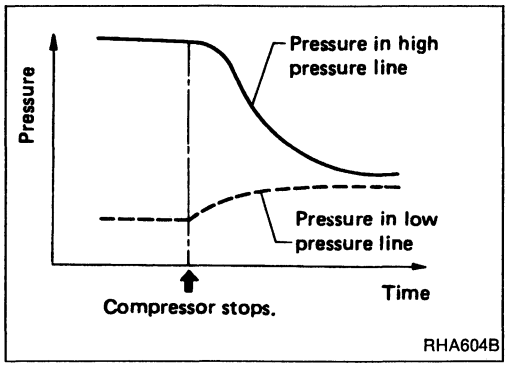
Inspection for Refrigerant Leaks

WORK PROCEDURE

To facilitate inspection for refrigerant leaks, establish the following conditions:

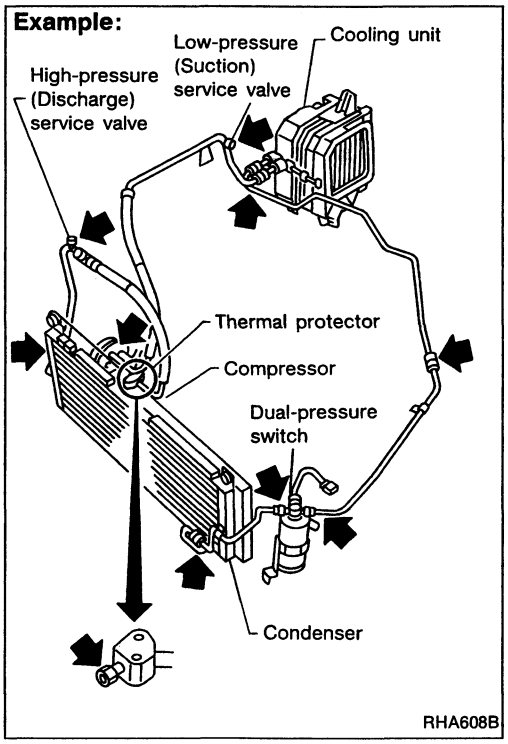
- Start engine.
- Run air conditioner.
- Set blower fan control to MAX.
- Set temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate refrigerant through the system).

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

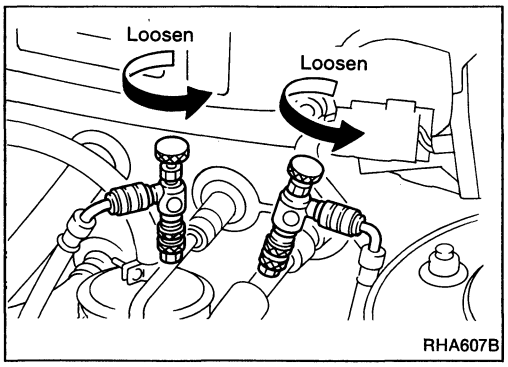
Check pressure valve, safety valve and fusible plug mounts.

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.

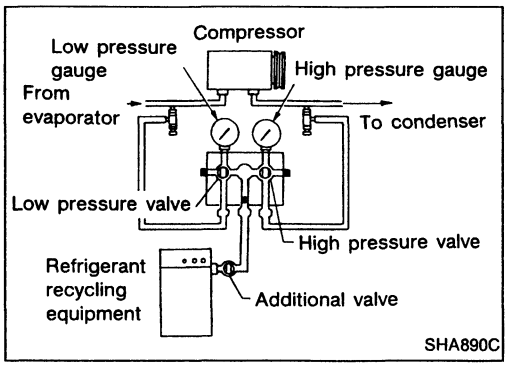
Inside of cooling unit

To check, insert leak tester probe into drain hose immediately after stopping engine. (Keep probe inserted for more than 10 seconds.)



Removal of 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.



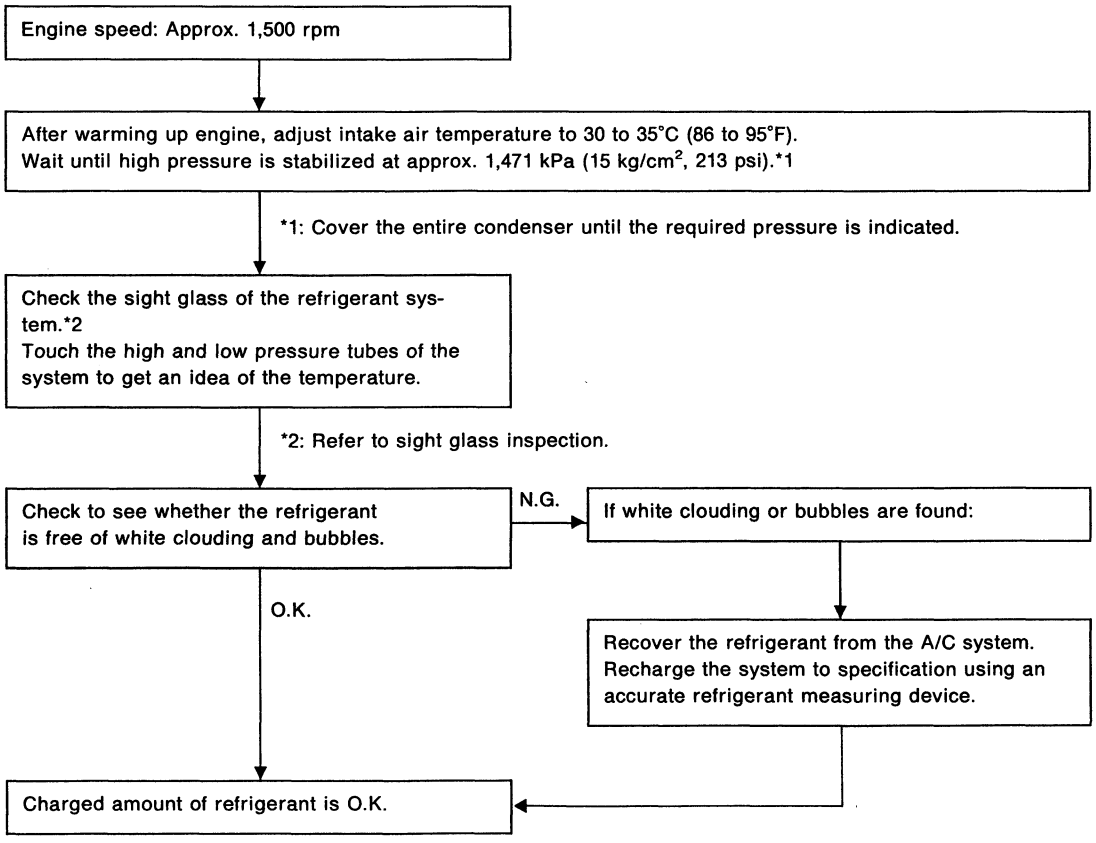
Confirmation of Amount of Charged Refrigerant

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:

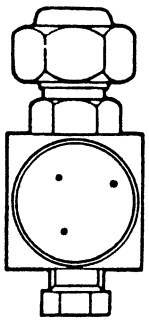
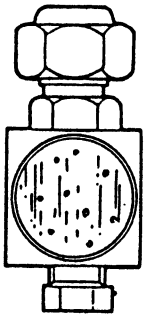
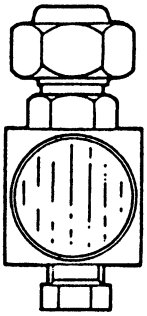
CONDITIONS

- 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).
- AUTO switch:
  ON
- Engine speed:
  Approx. 1,500 rpm

WORK PROCEDURE



Confirmation of Amount of Charged Refrigerant (Cont'd)

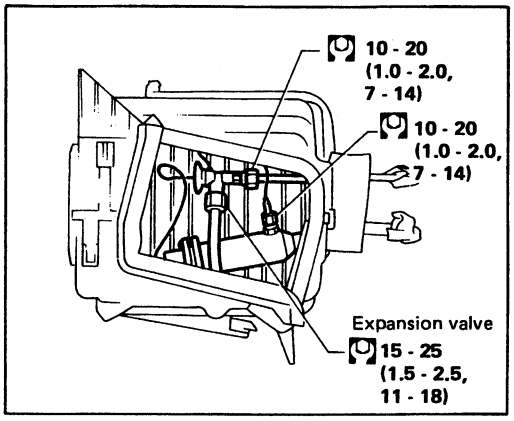
Amount of charge / Check item	Appropriate	Refrigerant is insufficient	Almost no refrigerant	Overcharged, or air in system
Temperature of high and low pressure pipes	High pressure side is hot while low pressure side is cold.	High pressure side is warm and low pressure side is somewhat cold.	No difference is felt between high and low presser 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/cm^2, 199 - 256 psi) Normal low pressure: 147 - 294 kPa (1.5 - 3 kg/cm^2, 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.

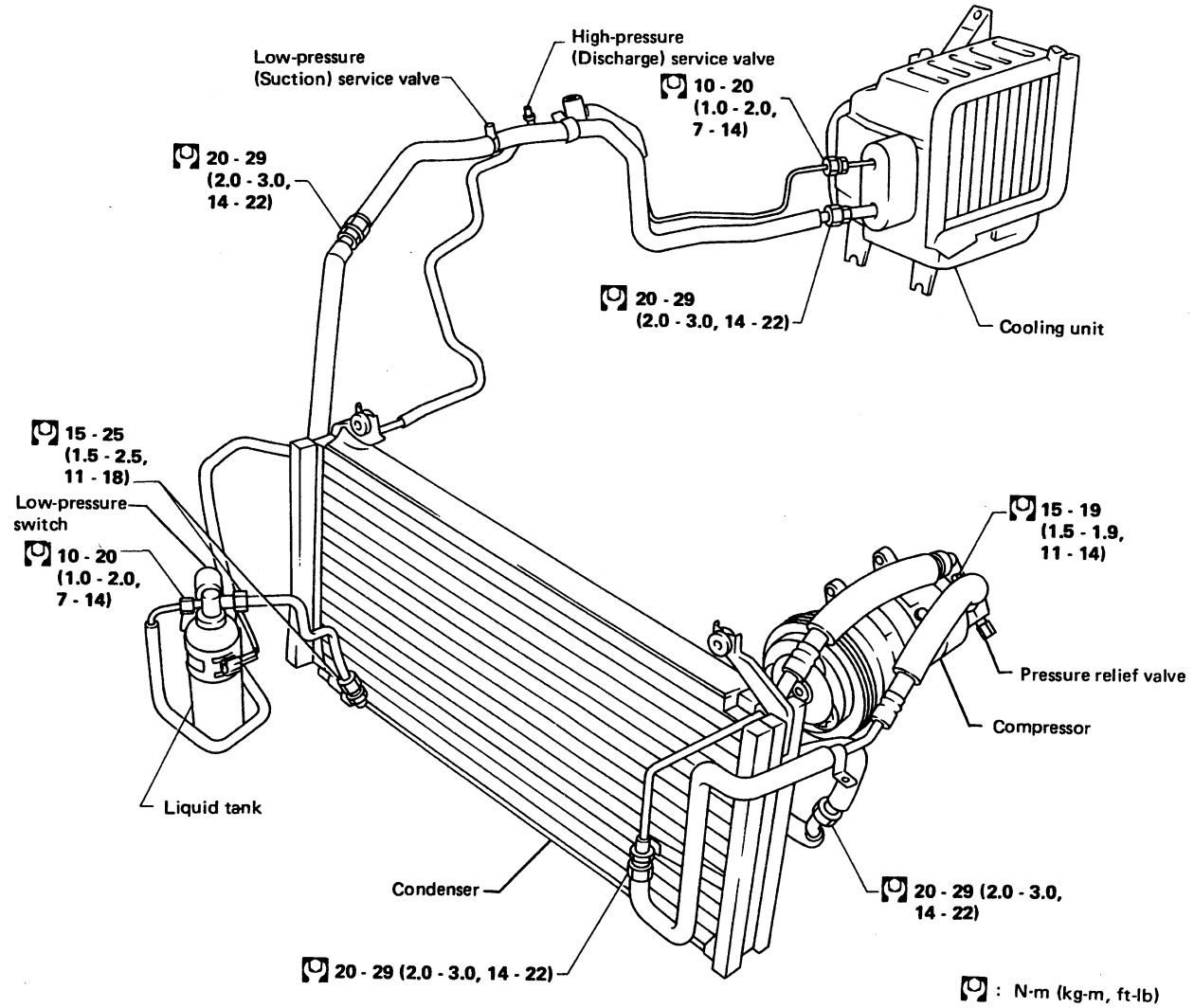
CAUTION:
The condition of bubbles seen through the sight glass as well as the intake and discharge pressures are influenced by the ambient temperature, wind velocity, weather, and by the air temperature in front of the condenser, etc.

Refrigerant Lines

Refer to "Precautions for Refrigerant Connection" on page HA-4.

VG30DE ENGINE MODEL



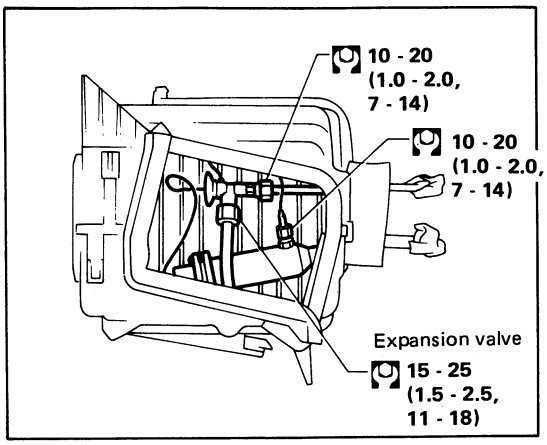


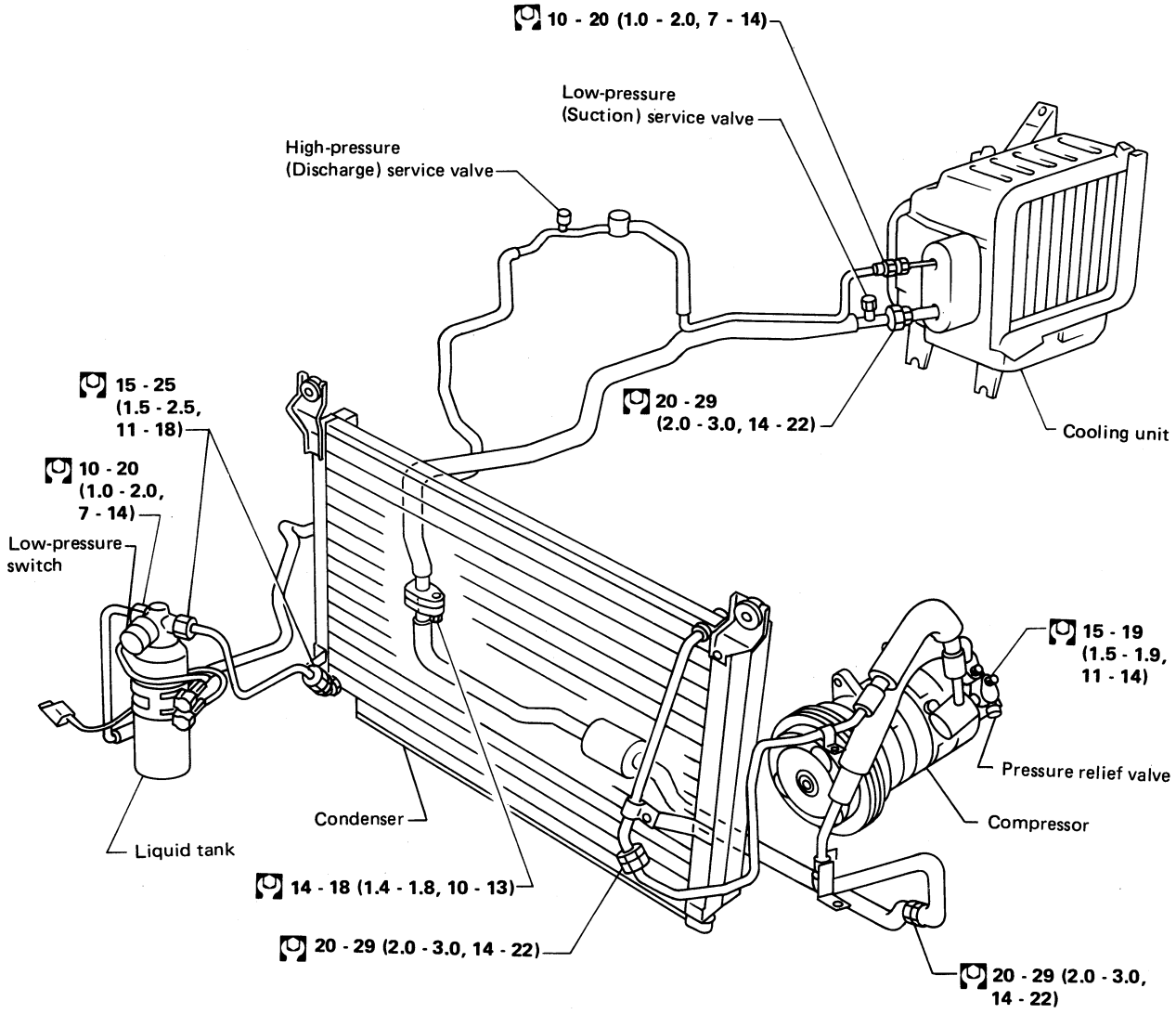
SHA499D

Refrigerant Lines (Cont'd)

Refer to "Precautions for Refrigerant Connection" on page HA-4.

VG30DETT ENGINE MODEL

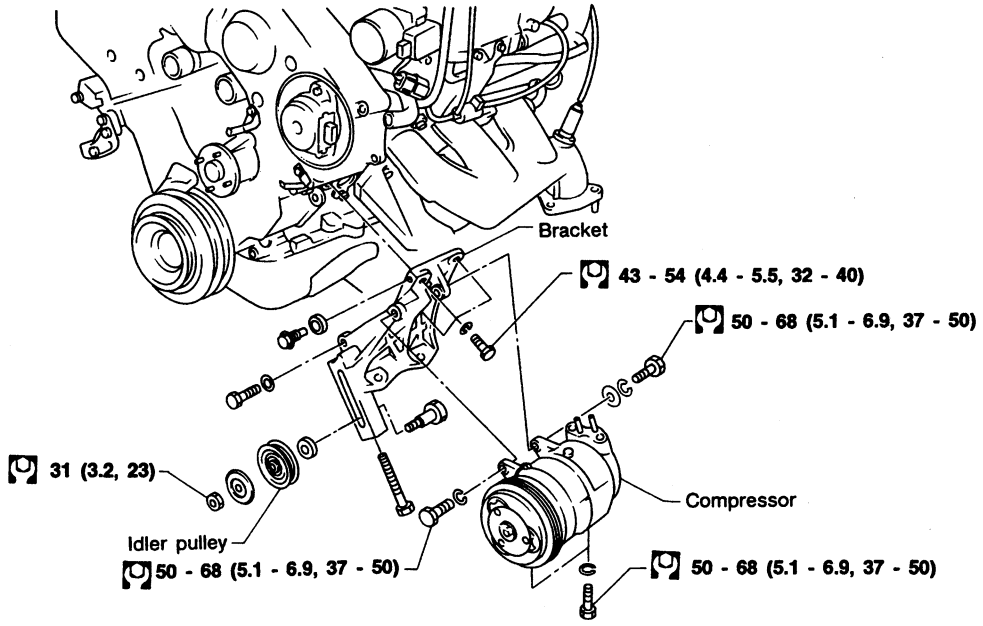




: N·m (kg-m, ft-lb)

SHA500D

Compressor Mounting



Belt Tension

- Refer to section MA.

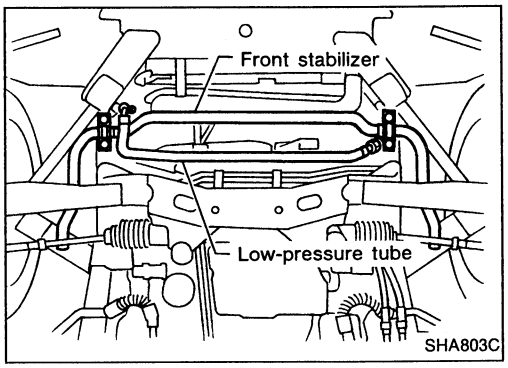
Fast Idle Control Device (F.I.C.D.)

- Refer to section EF & EC.

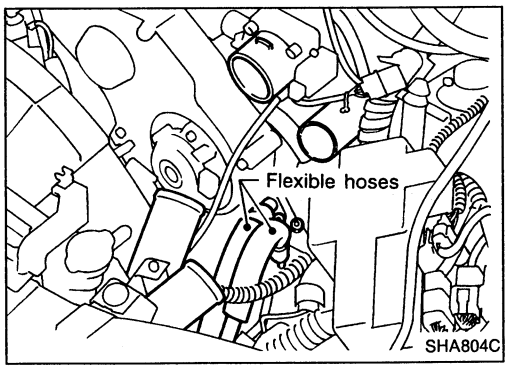
Removal and Installation — Compressor

REMOVAL

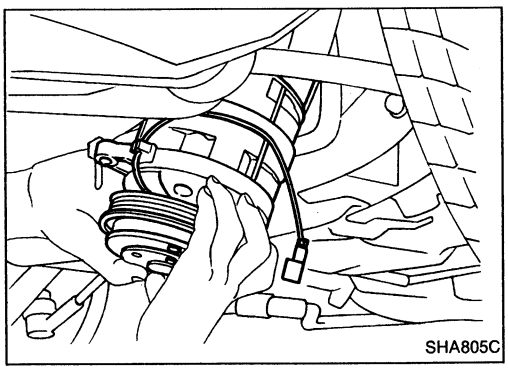
1. Disconnect battery cable.
2. Discharge refrigerant into your refrigerant recycling equipment.
3. Remove under cover.



4. Remove low pressure tube, front stabilizer bar and its clamps.
5. Loosen idler pulley nut and adjusting bolt.
   Remove idler pulley.



6. Remove air pipes and hoses to make room.
7. Remove two nuts to separate high and low pressure flexible hoses from compressor.
8. Disconnect compressor harness connector.
9. Remove two compressor fixing bolts (upper).



10. Remove two compressor fixing bolts (lower).
11. Remove the compressor as shown in the left-hand figure.

INSTALLATION

Installation is the reverse order of removal. Tightening torque related to front stabilizer: refer to FA section.

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.

START

Can oil return operation be performed?
- A/C system works properly.
- There is no evidence of a large amount of oil leakage.

Yes → Perform oil return operation, proceeding as follows:

1. Start engine, and set the following conditions:
   - **Test condition**
     Engine speed: Idling to 1,200 rpm
     A/C or AUTO switch: ON
     Blower speed: Max. position
     Temp. control: Optional [Set so that intake air temperature is 25 to 30°C (77 to 86°F).]
2. **Next item is for V-5 or V-6 compressor. Connect the manifold gauge, and check that the high pressure side pressure is 588 kPa (6 kg/cm², 85 psi) or higher.**
   If less than the reference level, attach a cover to the front face of the condenser to raise the pressure.
3. Perform oil return operating for about 10 minutes.
4. Stop engine

CAUTION:
If excessive oil leakage is noted, do not perform the oil return operation.

No

Should the compressor be replaced?

No → Is there any part to be replaced? (Evaporator, condenser, liquid tank or in case there is evidence of a large amount of oil leakage.)

Yes → Ⓐ (Go to next page.)

Yes → After replacing any of the following major components of the system, be sure to add the correct amount of oil to the system.
Amount of oil to be added

Part replaced	Oil to be added to system		Remarks
	Amount of oil mℓ (US fl oz, Imp fl oz)	Ratio (%)	
Evaporator	45 - 75 (1.5 - 2.5, 1.6 - 2.6)	30	—
Condenser	30 - 50 (1.0 - 1.7, 1.1 - 1.8)	20	—
Liquid tank	15 - 25 (0.5 - 0.8, 0.5 - 0.9)	10	Add if compressor is not replaced.*1
In case of refrigerant leak	30 - 50 (1.0 - 1.7, 1.1 - 1.8)	—	Large leak
	—	—	Small leak*2

*1: If compressor is replaced, addition of oil is included in the flow chart.
*2: If refrigerant leak is small, no addition of oil is needed. "Ratio" in this table indicated the ratio of added oil to the overall amount of oil needed in the system.

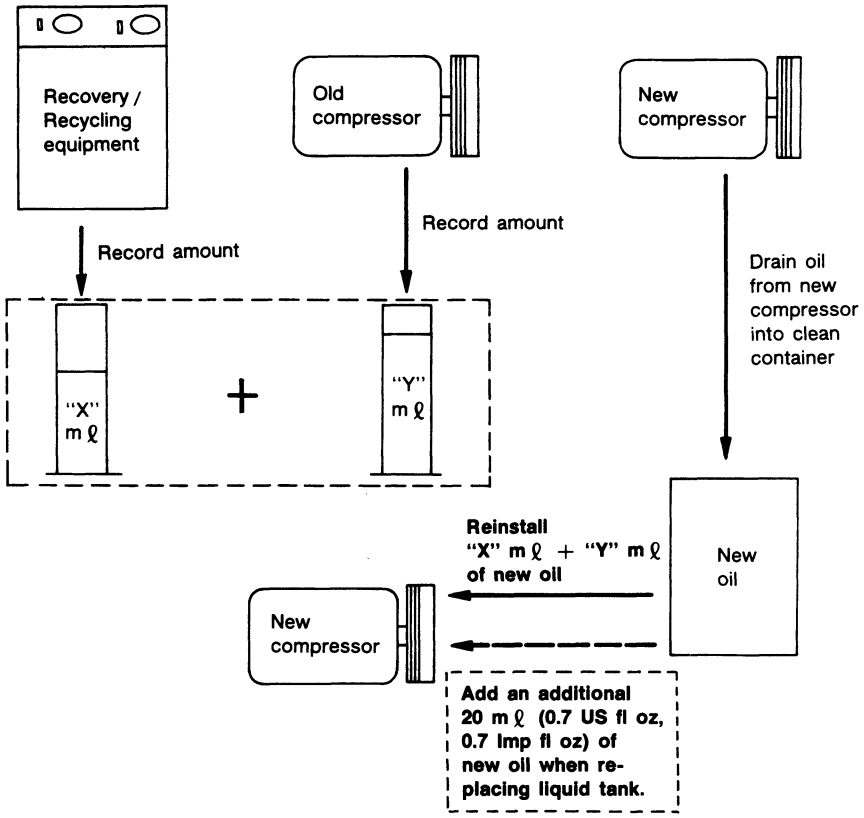
No

Carry out the A/C performance test.

Checking and Adjusting (Cont'd)

Ⓐ

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.



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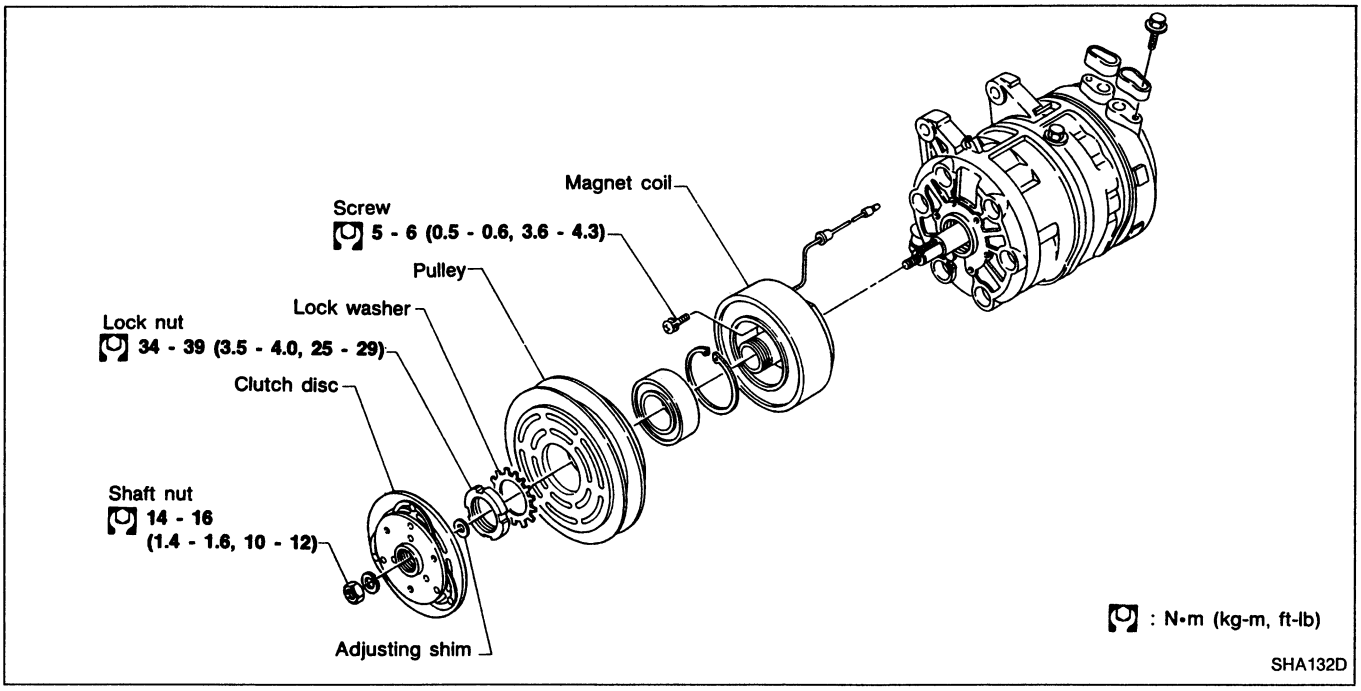
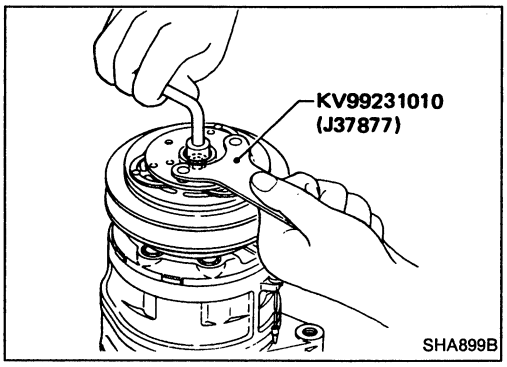
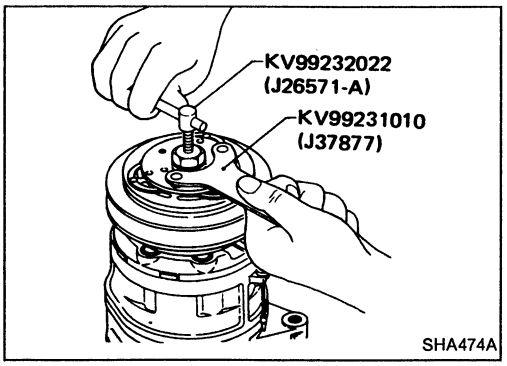
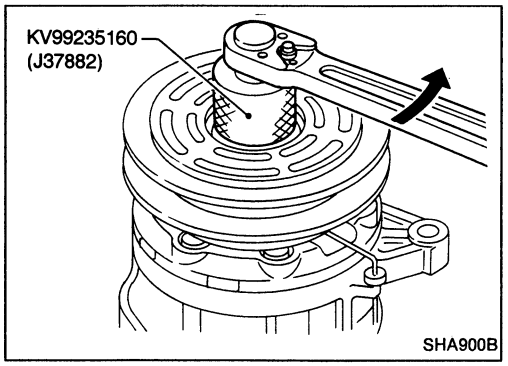






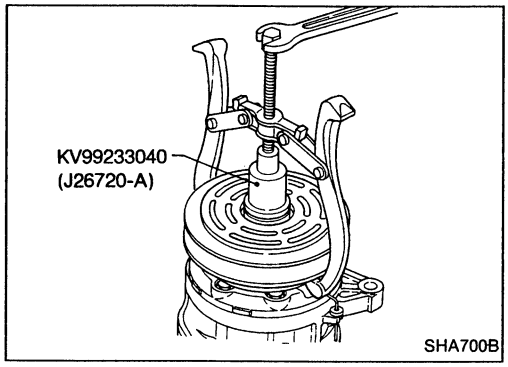


Compressor Clutch

REMOVAL

- When removing shaft nut, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed easily.
- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

Compressor Clutch (Cont'd)



- Remove the pulley by hand. If difficult, use puller pilot.

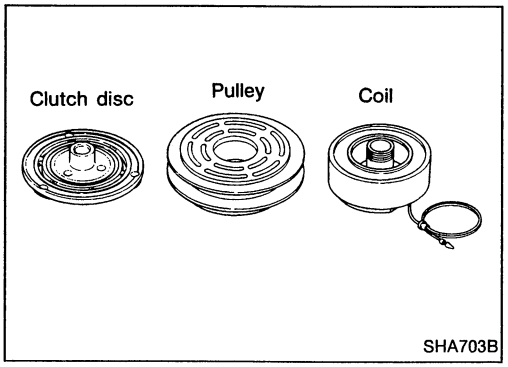
INSPECTION

Clutch disc

If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

Pulley

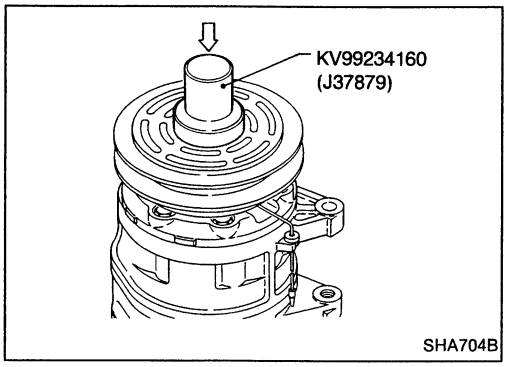
Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.



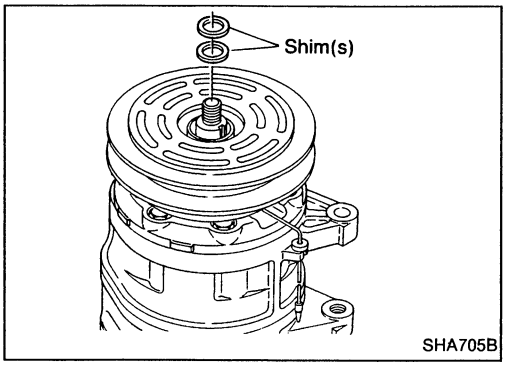
Coil

Check coil for loose connection or cracked insulation.

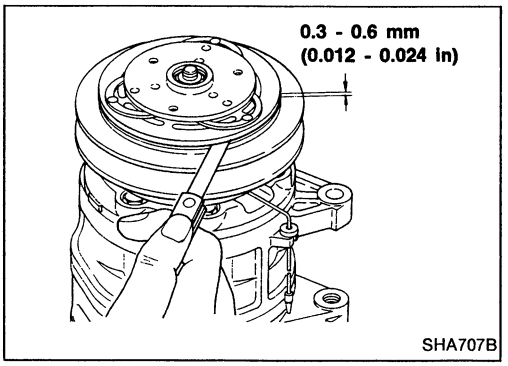
INSTALLATION



- Install the key in the keyway on the compressor drive shaft.
- Install the coil to compressor (lead wire up) and tighten the mounting screws.
- Install the lead wire into the holder correctly.



- Install lock washer and nut with nut wrench.
- Bend one pawl of the lock washer up against the nut to prevent the nut from loosening.



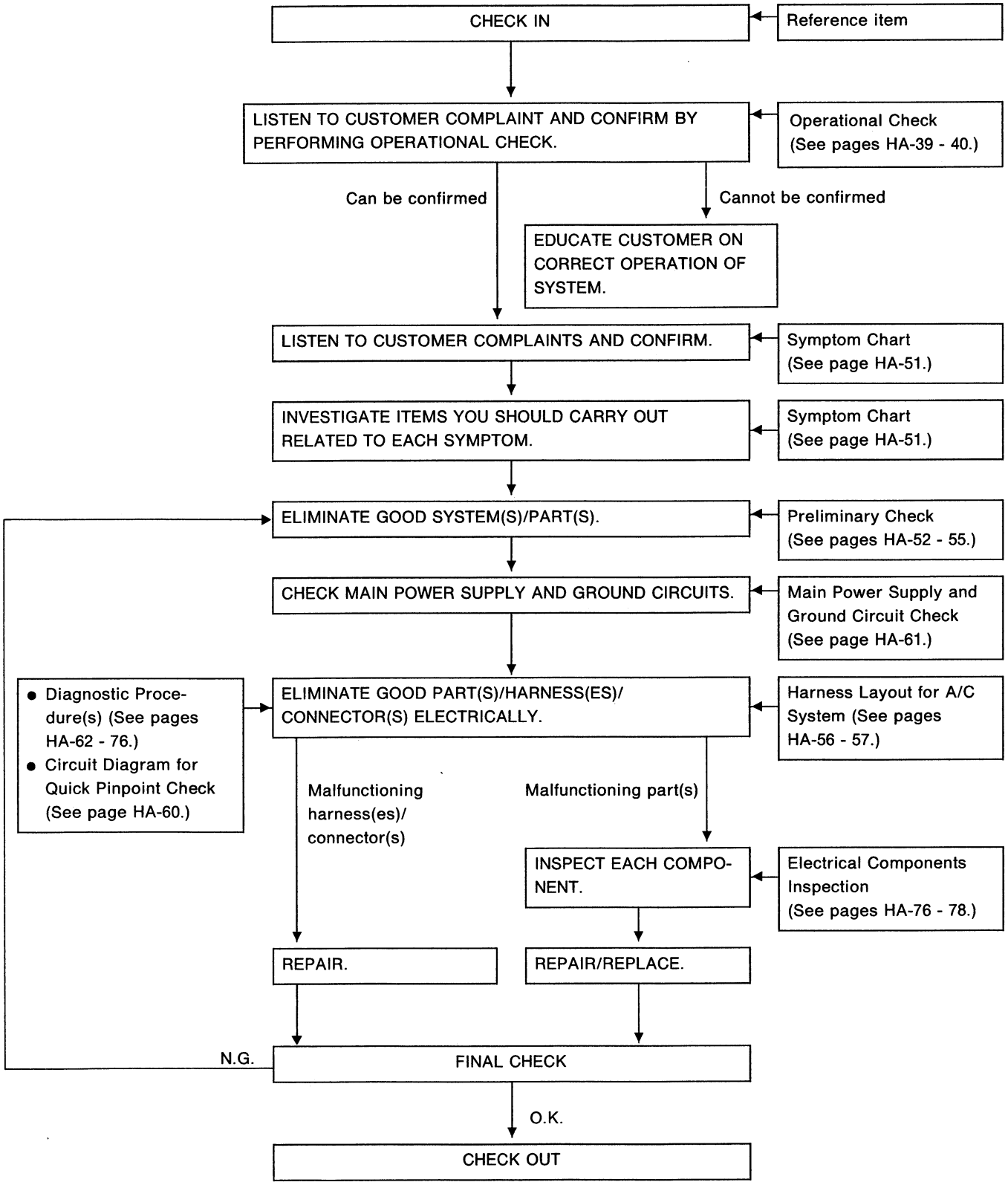
- Check to ensure that the clutch clearance is between 0.3 to 0.6 mm (0.012 to 0.024 in). Adjust the clearance using shim(s) as necessary.

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.

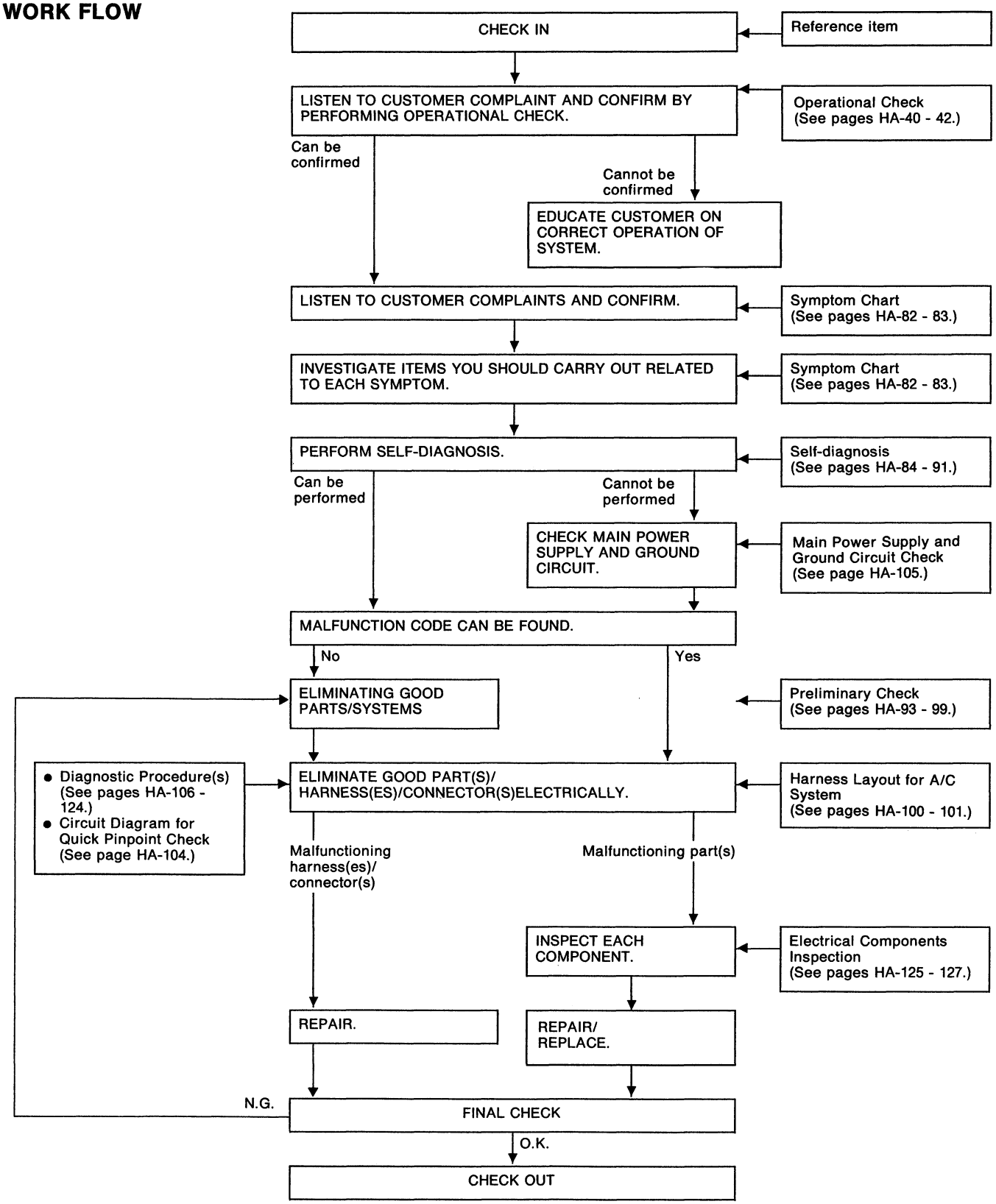
How to Perform Trouble Diagnoses for Quick and Accurate Repair — Manual Air Conditioner

WORK FLOW



How to Perform Trouble Diagnoses for Quick and Accurate Repair — Auto Air Conditioner

WORK FLOW

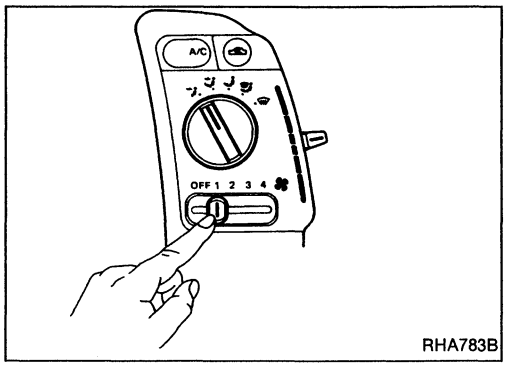


Operational Check — Manual Air Conditioner

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.

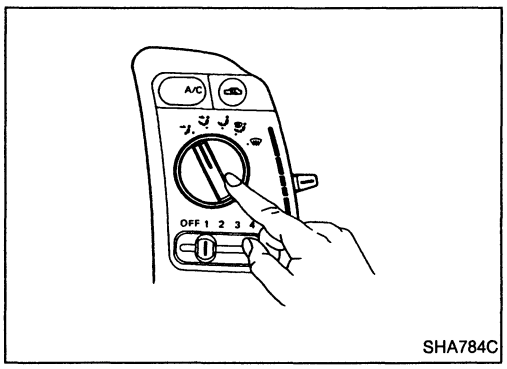


RHA783B

PROCEDURE:

1. Check blower

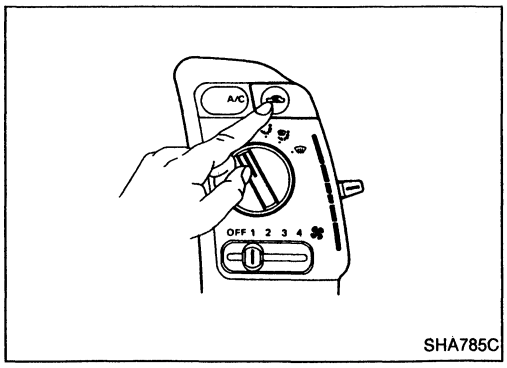
1) Slide fan lever to 1-speed.
   Blower should operate on 1-speed.
2) Then slide fan lever to 2-speed.
3) Continue checking blower speed until all four speeds are checked.
4) Leave blower on 4-speed.



SHA784C

2. Check discharge air

1) Set mode switch at VENT position.
2) Confirm that all discharge air comes out of face vents.
3) Set mode switch at B/L position.
4) Confirm that discharge air comes out of face vents and foot vents.
5) Set mode switch at FOOT position.
6) Confirm that discharge air comes out of foot vents, with some air from defroster vents.
7) Set mode switch at F/D position.
8) Confirm that discharge air comes out of foot vents and defroster vents, and that compressor turns ON.
9) Set mode switch at DEF position.
10) The discharge air should be coming only from defroster vents. At the same time intake door position should be at FRE.

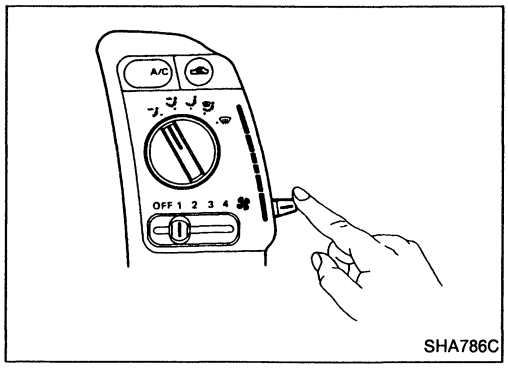


SHA785C

3. Check recirc

1) Press RECIRC switch.
   RECIRC indicator should light.
2) Listen for intake door position change (you should hear blower sound change slightly).

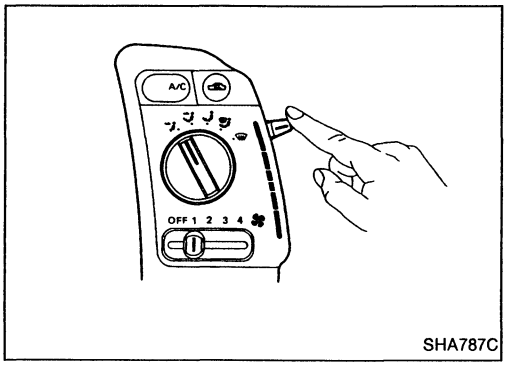
Operational Check — Manual Air Conditioner (Cont'd)



SHA786C

4. Check temperature decrease

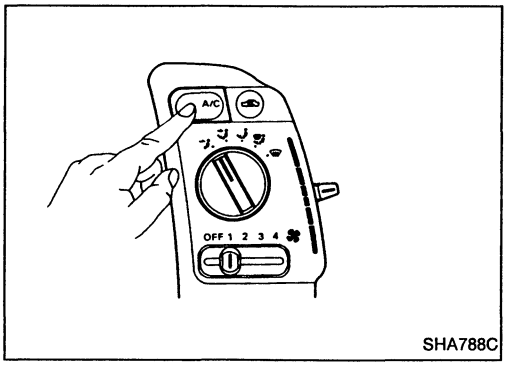
1) Slide temperature control lever to full cold.
2) Check for cold air at discharge air outlets.



SHA787C

5. Check temperature increase

1) Slide temperature control lever to full hot.
2) Check for hot air at discharge air outlets.



SHA788C

6. Check air conditioner switch

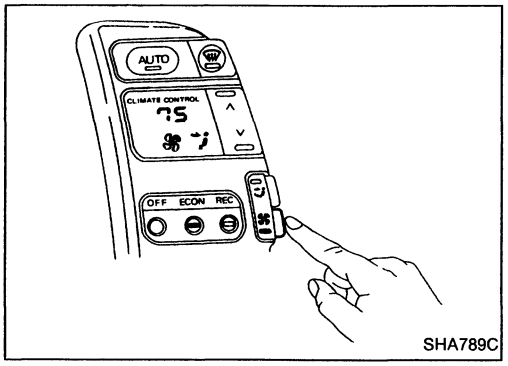
Move fan control lever to the desired (1 to 4-speed) position and push the air conditioner switch to turn ON the air conditioner.
The indicator light should come on when air conditioner is ON.

Operational Check — Auto Air Conditioner

The purpose of the operational check is to confirm that the system operates as it should. The systems which will be checked are the blower, mode (discharge air), ambient display, intake air, defrost, econ, auto, temperature decrease, temperature increase, and the memory function.

CONDITIONS:

Engine running at normal operating temperature.



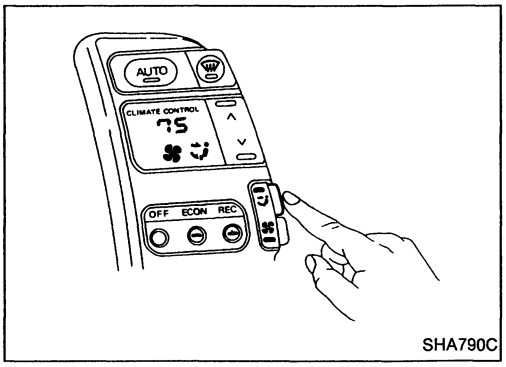
SHA789C

PROCEDURE:

1. Check blower

1) Press fan switch one time.
   ECON indicator should light.
   Blower should operate on low speed, and the fan symbol should have one blade lit ( ).
2) Press fan switch one more time.
3) Continue checking blower speed and fan symbol until all four speeds have been checked.
4) Leave blower on high speed.

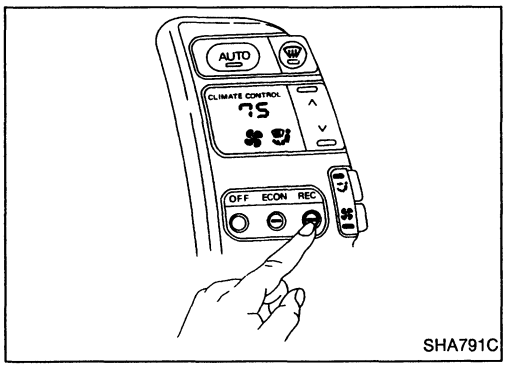
Operational Check — Auto Air Conditioner (Cont'd)



SHA790C

2. Check discharge air

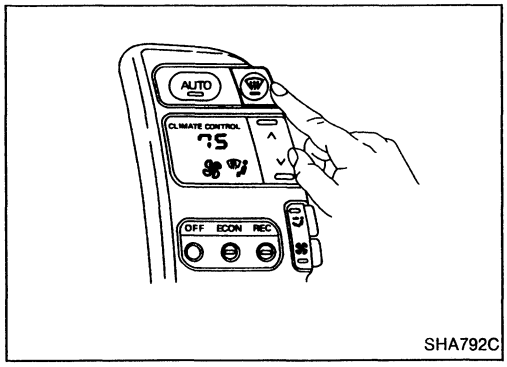
1) Press mode switch one time.
   Display should show air to face ( ).
2) Confirm that all discharge air comes out of face vents.
3) Press mode switch one more time.
   Display should show air to face and foot (bi-level) ( )
4) Confirm that discharge air comes out of face and foot vents.
5) Press mode switch one more time.
   Display should show air to foot ( ).
6) Confirm that discharge air comes mostly from foot outlets, with some air from defroster outlets.
7) Press mode switch one more time.
   Display should show air to foot and defroster ( ).
8) Confirm that discharge air comes out of foot vents and defroster vents.
9) Leave system in F/D mode.



SHA791C

3. Check recirc

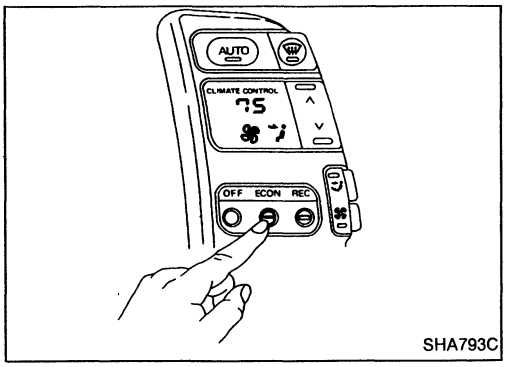
1) Press RECIRC switch.
   RECIRC indicator should light.
2) Listen for intake door position change (you should hear blower sound change slightly).



SHA792C

4. Check defrost

1) Press DEF switch.
2) Check that RECIRC, ECON, MODE and Fan are canceled.
   The discharge air should be coming only from defrost vents.
3) Confirm that compressor clutch is engaged (visual inspection).
   Display should show air to defroster ( ).

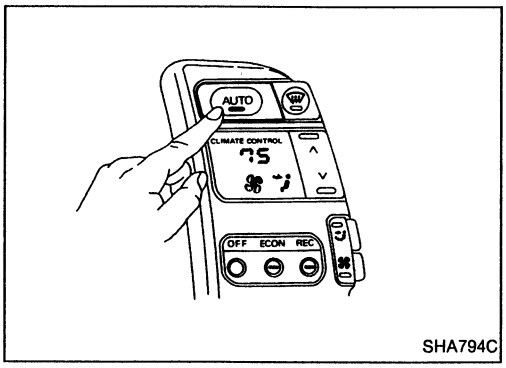


SHA793C

5. Check ECON mode

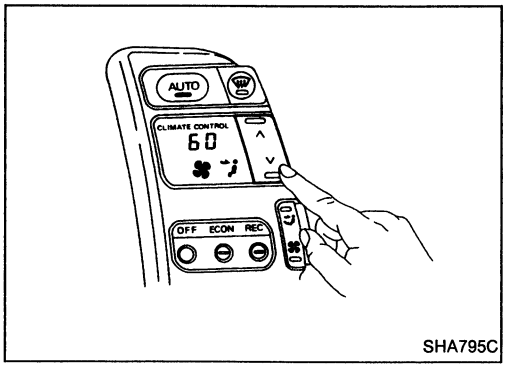
1) Press ECON switch.
   Defrost should be canceled.
   Discharge air outlet will depend on ambient, in-vehicle, and set temperatures.
2) Confirm that the compressor clutch is not engaged (visual inspection).

Operational Check — Auto Air Conditioner (Cont'd)



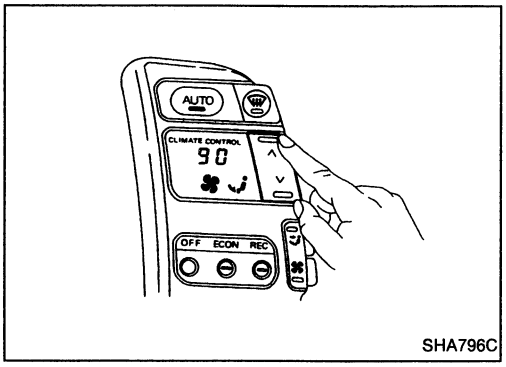
6. Check AUTO mode

1) Press AUTO switch.
2) Confirm that compressor clutch engages (audio or visual inspection).
   Discharge air will depend on ambient, in-vehicle, and set temperatures.



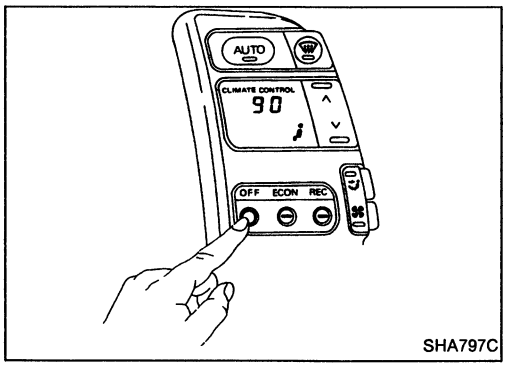
7. Check temperature decrease

1) Press temperature set switch until 10°C (60°F) is displayed.
2) Listen for changes in blower speed as set temperature changes.
3) Check for cold air at discharge air outlets.



8. Check temperature increase

1) Press temperature set switch until 40°C (90°F) is displayed.
2) Listen for changes in blower speed as set temperature changes.
3) Check for hot air at discharge air outlets.



9. Check memory function

1) Press off button.
2) Turn ignition off.
3) Wait 15 seconds.
4) Turn ignition on.
5) Press AUTO button.
6) Confirm that the set temperature remained at 40°C (90°F).

Performance Chart

TEST CONDITION — For Manual Air Conditioner

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)
Doors: Closed
Door windows: Open
Hood: Open
TEMP. lever position: Max. COLD
Mode switch: (Ventilation) set
REC switch: (Recirculation) set
FAN level position: Max. position
Engine speed: 1,500 rpm
Time required before starting testing after air conditioner starts operating: More than 10 minutes

TEST CONDITION — For Auto Air Conditioner

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)
Doors: Closed
Door windows: Open
Hood: Open

Set up ACTIVE-TEST with CONSULT and set each component as follows:
Mode door: VENT
Intake door: REC
Air mix door: Full-cold
Compressor: ON
Blower motor: 12V

Set up self-diagnosis STEP 2 and set code .

Performance Chart (Cont'd)

TEST READING

Recirculating-to-discharge air temperature table

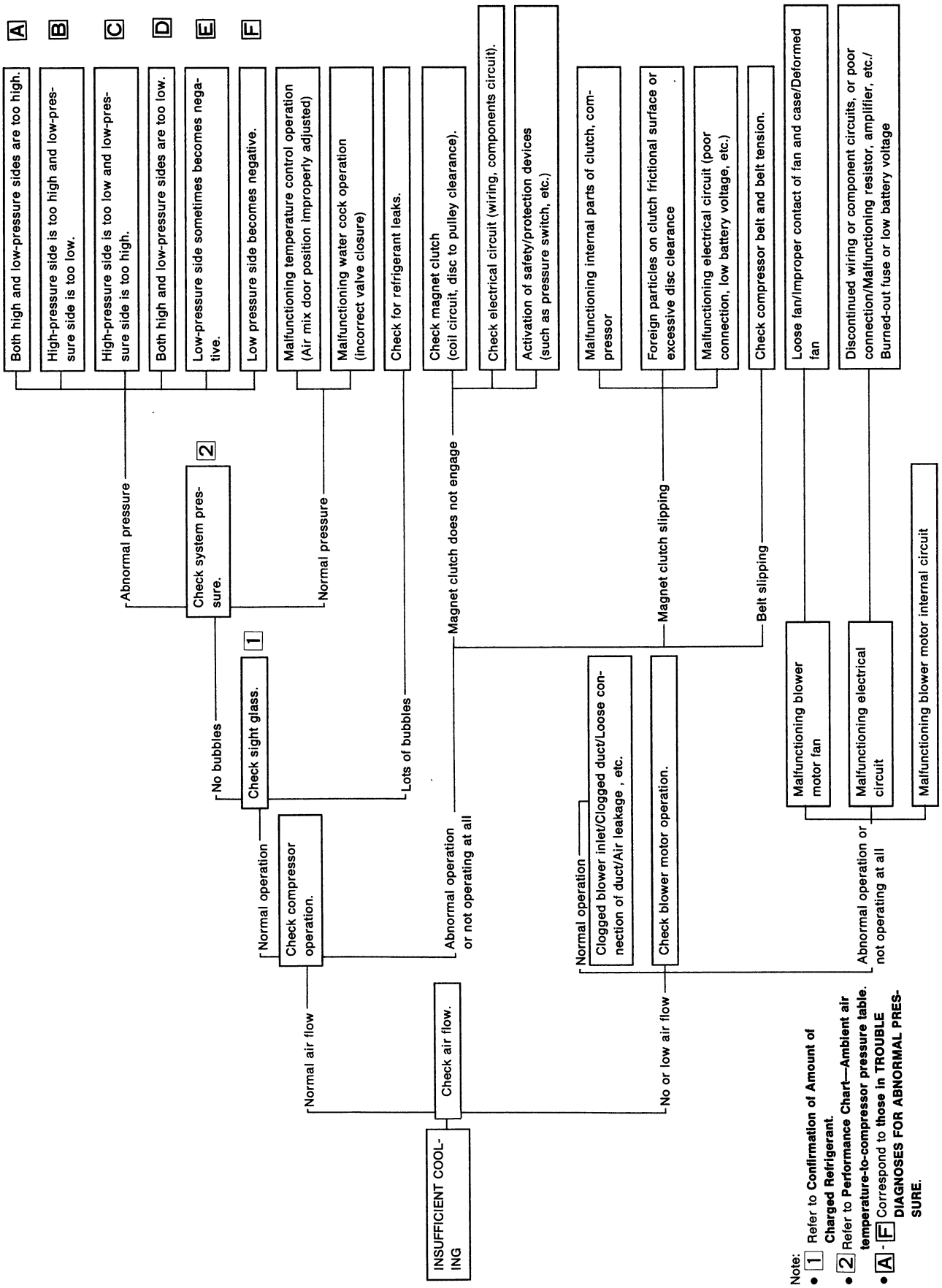
Inside air(Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	5.9 - 7.8 (43 - 46)
	25 (77)	8.0 - 10.7 (46 - 51)
	30 (86)	11.0 - 14.4 (52 - 58)
	35 (95)	14.8 - 19.4 (59 - 67)
60 - 70	20 (68)	7.8 - 9.9 (46 - 50)
	25 (77)	10.7 - 13.6 (51 - 56)
	30 (86)	14.4 - 18.2 (58 - 65)
	35 (95)	19.4 - 24.8 (67 - 77)

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)		
50 - 70	20 (68)	608 - 912 (6.2 - 9.3, 88 - 132)	177 - 245 (1.8 - 2.5, 26 - 36)
	25 (77)	814 - 1,147 (8.3 - 11.7, 118 - 166)	186 - 255 (1.9 - 2.6, 27 - 37)
	30 (86)	1,020 - 1,402 (10.4 - 14.3, 148 - 203)	196 - 265 (2.0 - 2.7, 28 - 38)
	35 (95)	1,236 - 1,638 (12.6 - 16.7, 179 - 237)	226 - 314 (2.3 - 3.2, 33 - 46)

Performance Test Diagnoses

INSUFFICIENT COOLING

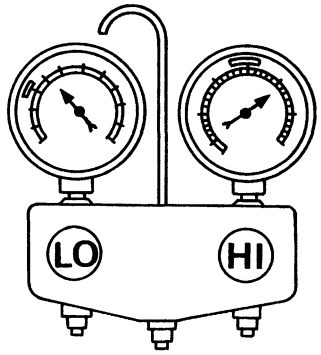


Note:
- 1 Refer to **Confirmation of Amount of Charged Refrigerant.**
- 2 Refer to **Performance Chart—Ambient air temperature-to-compressor pressure table.**
- A - F Correspond to **those in TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE.**

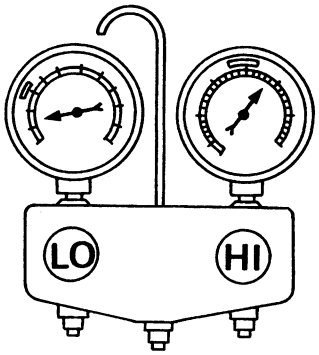
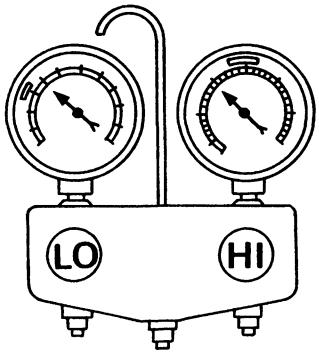
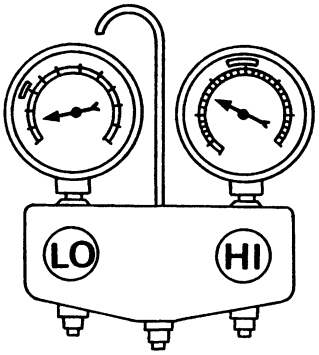
Performance Test Diagnoses (Cont'd)

TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE

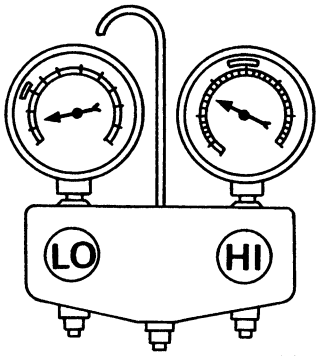
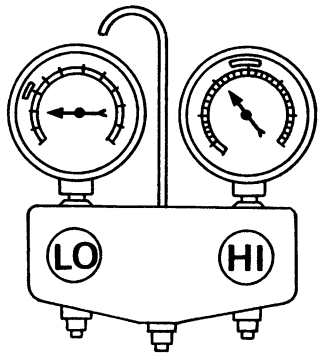
Whenever abnormal pressure of high and/or low sides of the system is noted, diagnosis must be conducted by using a manifold gauge. The large-line zone on the gauge scale (see illustrations.) shown in the following table refers to the standard (normal) pressure range for the corresponding pressure side (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 fan 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/cm^2, 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.

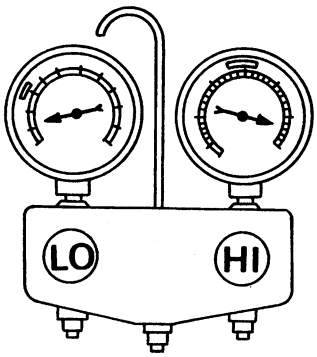
Performance Test Diagnoses (Cont'd)

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.
	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.	Liquid tank inside is clogged a little.	• Replace liquid tank • Check compressor oil for contamination.
	• 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	High-pressure pipe located between liquid tank and expansion valve is clogged.	• Check and repair malfunctioning parts. • Check compressor oil for contamination.

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.
	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.
	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.
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.

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.

Contents

Symptom Chart

DIAGNOSTIC TABLE

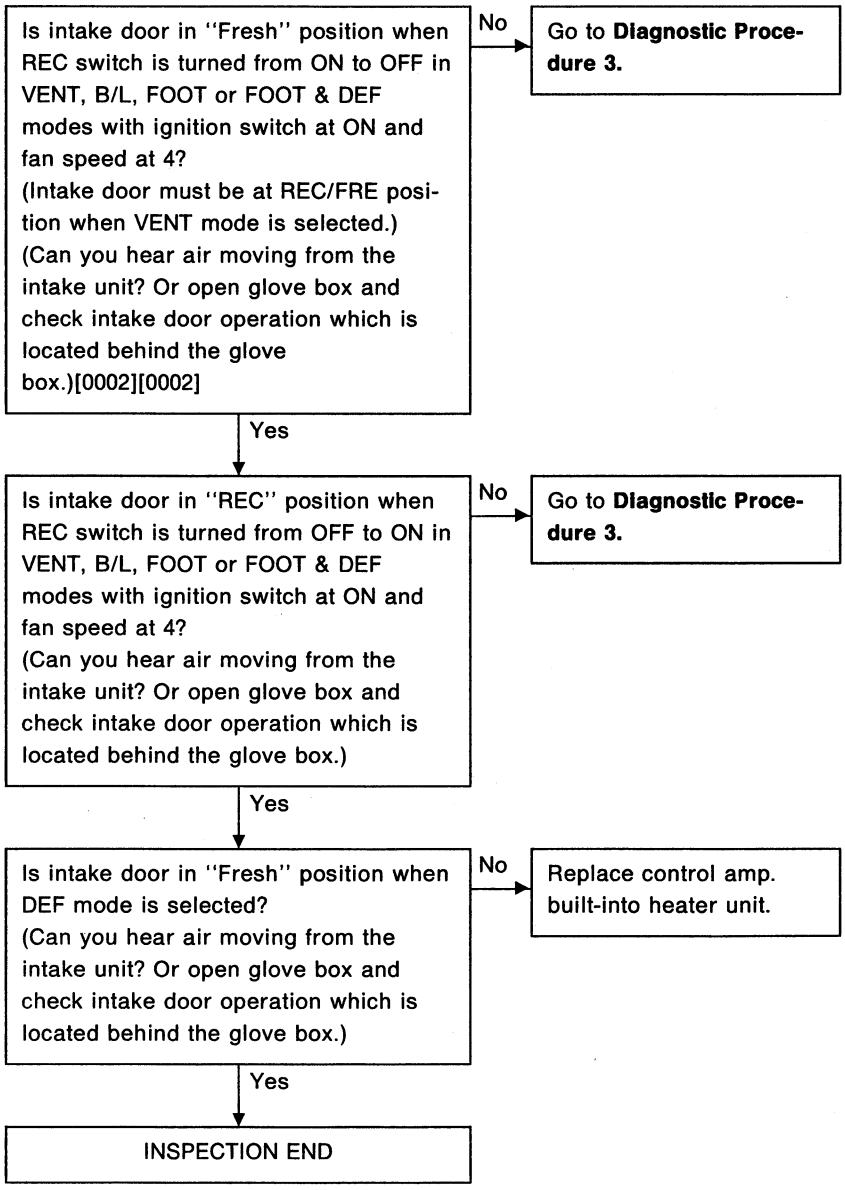
PROCEDURE	Preliminary check						Diagnostic Procedure						Main power supply and Ground circuit check		Electrical components inspection											
REFERENCE PAGE	HA-52	HA-53	HA-54	HA-54	HA-55	HA-55	HA-62 - 63	HA-64 - 65	HA-66	HA-67 - 70	HA-71 - 74	HA-75 - 76	HA-61	HA-61	HA-76	HA-76	HA-76	HA-77	HA-77	HA-77	HA-78	HA-78	—	—	—	—	—
SYMPTOM	Preliminary check 1	Preliminary check 2	Preliminary check 3	Preliminary check 4	Preliminary check 5	Preliminary check 6	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	Diagnostic procedure 6	Control amp.	Fuses	Fan switch	Blower motor	Blower resistor	A/C switch	Low pressure switch	RELAYS	MODE switch	THERMO CONTROL AMP.	Air mix door motor	Mode door motor	Intake door motor	Compressor	Harness
A/C does not blow cold air.		❶					○			○		○	○	○		○	○		○	○						○	○
Insufficient heating						❶	○					○	○			○	○						○				○
Blower motor does not rotate.		❶					❷						○	○		○	○										
Air outlet does not change.				❶				❷					○	○							○			○			○
Intake door does not change in VENT, B/L or FOOT modes.									❶				○	○											○		○
Intake door is not set at "FRESH" in DEF mode.	❶								○				○	○											○		○
Magnet clutch does not engage when A/C switch and fan switch are ON.		❶								❷									○	○		○				○	
Magnet clutch does not engage in FOOT & DEF or DEF mode.		❶	❷							○				○	○			○	○	○						○	○
Illumination or indicators on switch panel do not come on.											❶			○													○
Noise					❶																						

❶, ❷: The number means checking order.
○: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Preliminary Check

PRELIMINARY CHECK 1

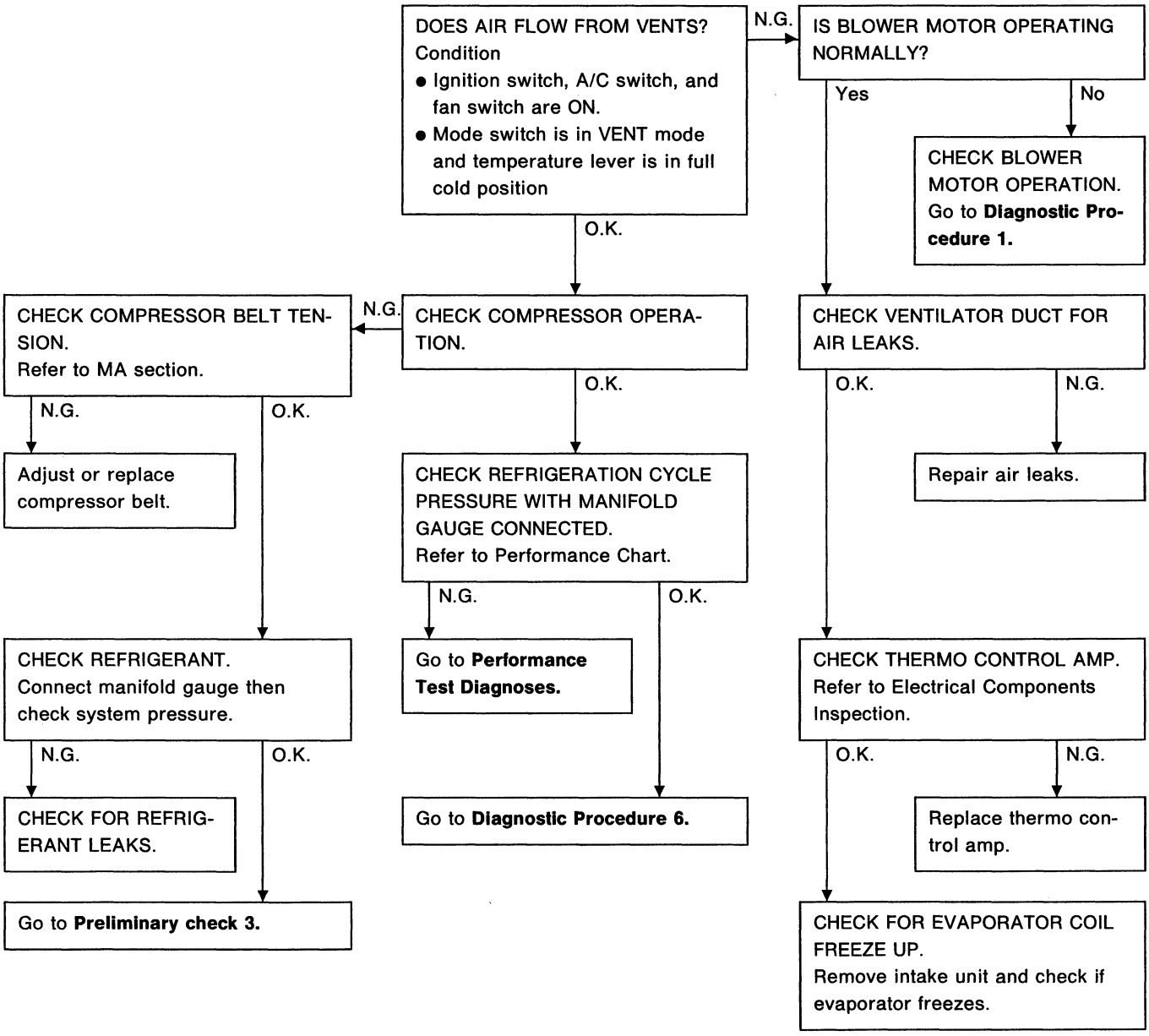
Intake door is not set at "FRESH" in DEF mode.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.

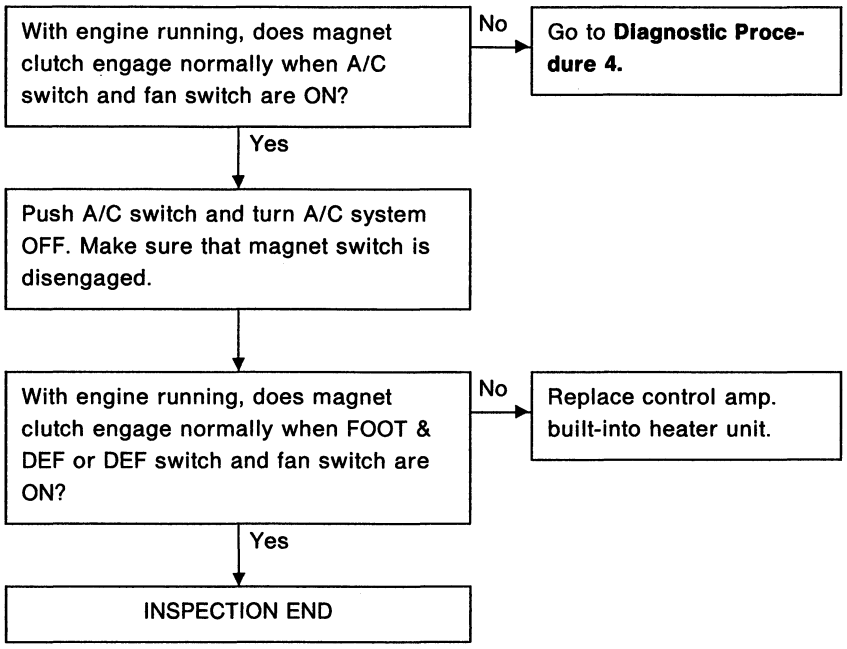


Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

Magnet clutch does not engage in FOOT & DEF or DEF modes.

- **Perform PRELIMINARY CHECK 2 and 4 before referring to the following flow chart.**



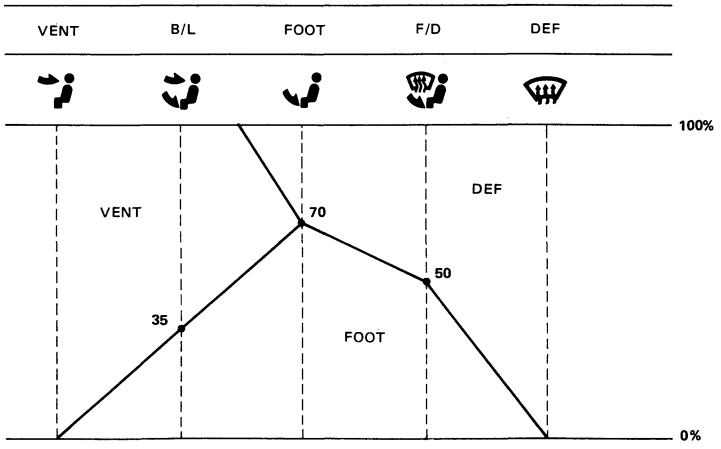
PRELIMINARY CHECK 4

Air outlet does not change.

DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS SELECTED WITH IGNITION SWITCH AT ON?

Switch		Air outlet
Mode		VENT
		FOOT & VENT
		FOOT & DEF
		FOOT & DEF
		DEF

AIR DISTRIBUTION RATIOS



Yes

INSPECTION END

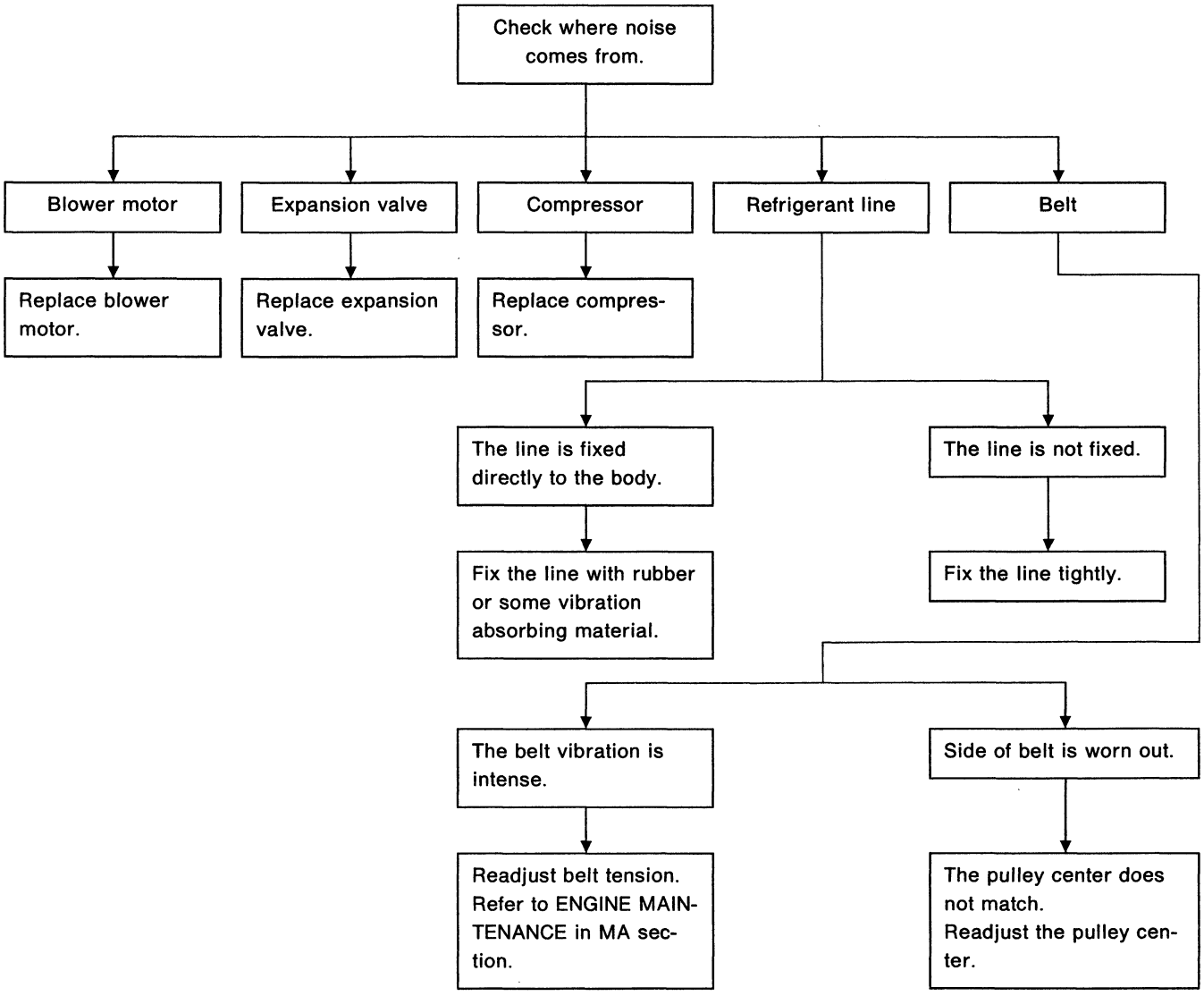
No

Go to **Diagnostic Procedure 2.**

Preliminary Check (Cont'd)

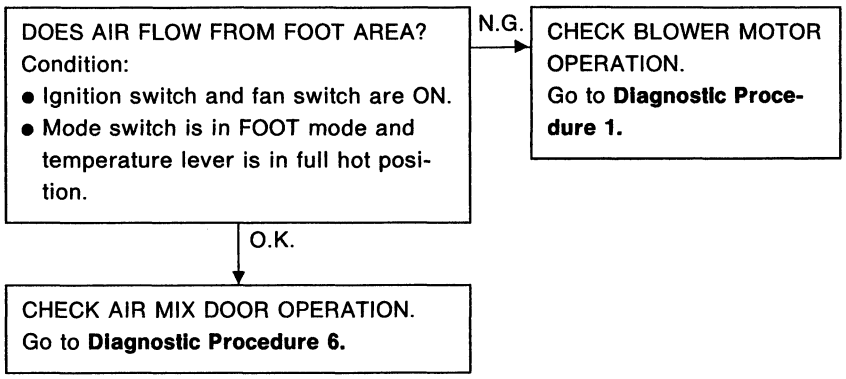
PRELIMINARY CHECK 5

Noise



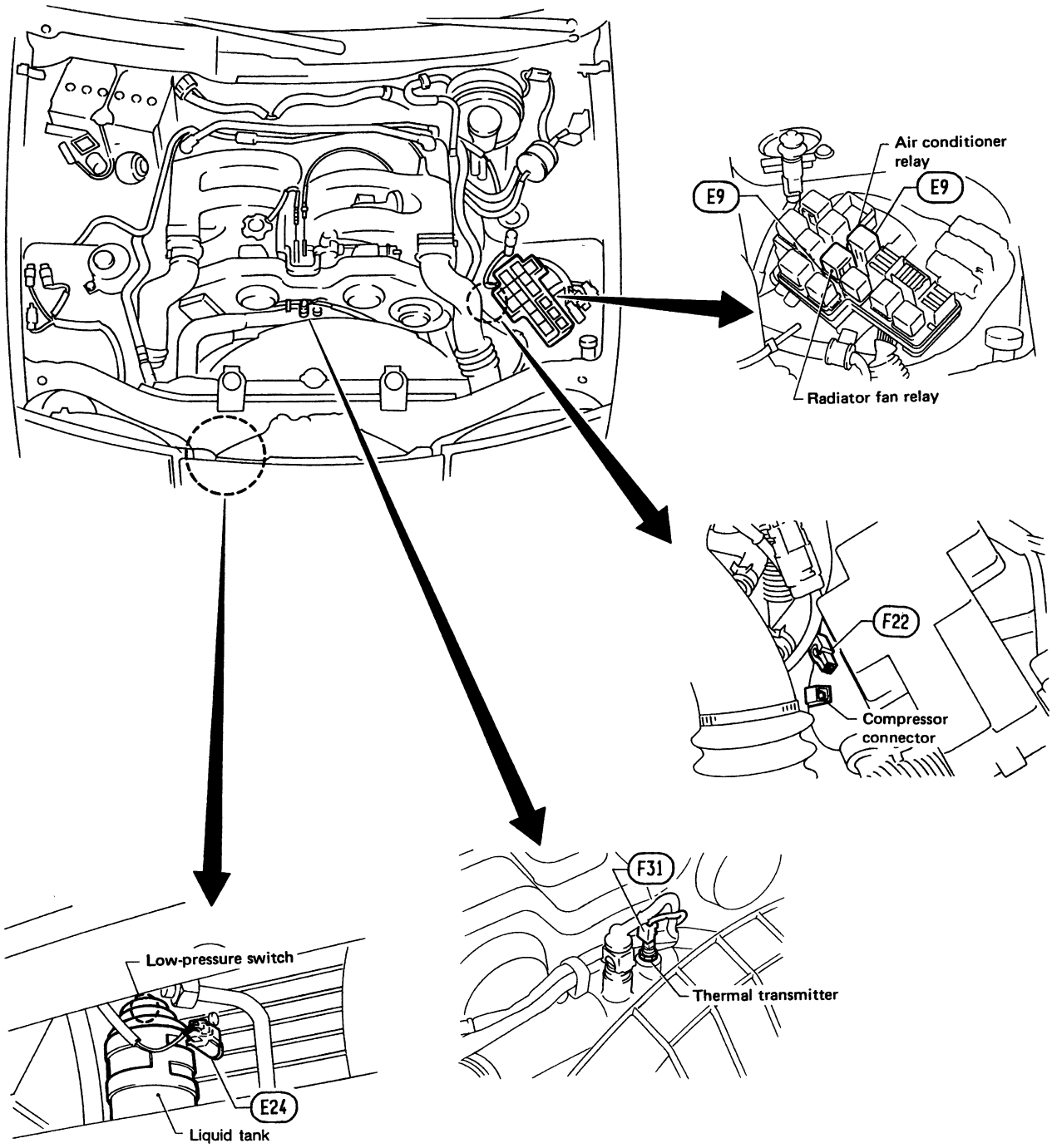
PRELIMINARY CHECK 6

Insufficient heating



Harness Layout for A/C System

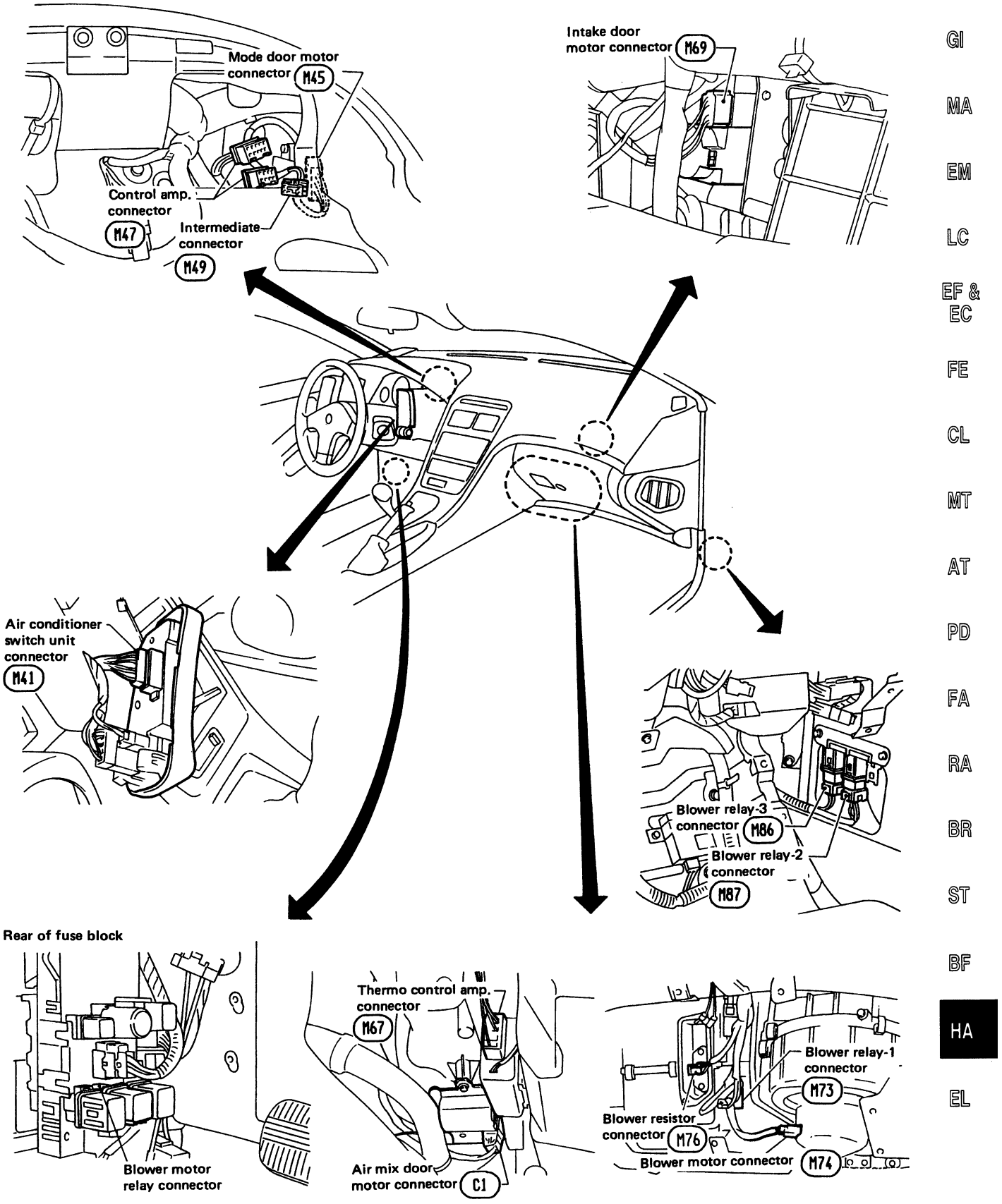
ENGINE COMPARTMENT



SHA523D

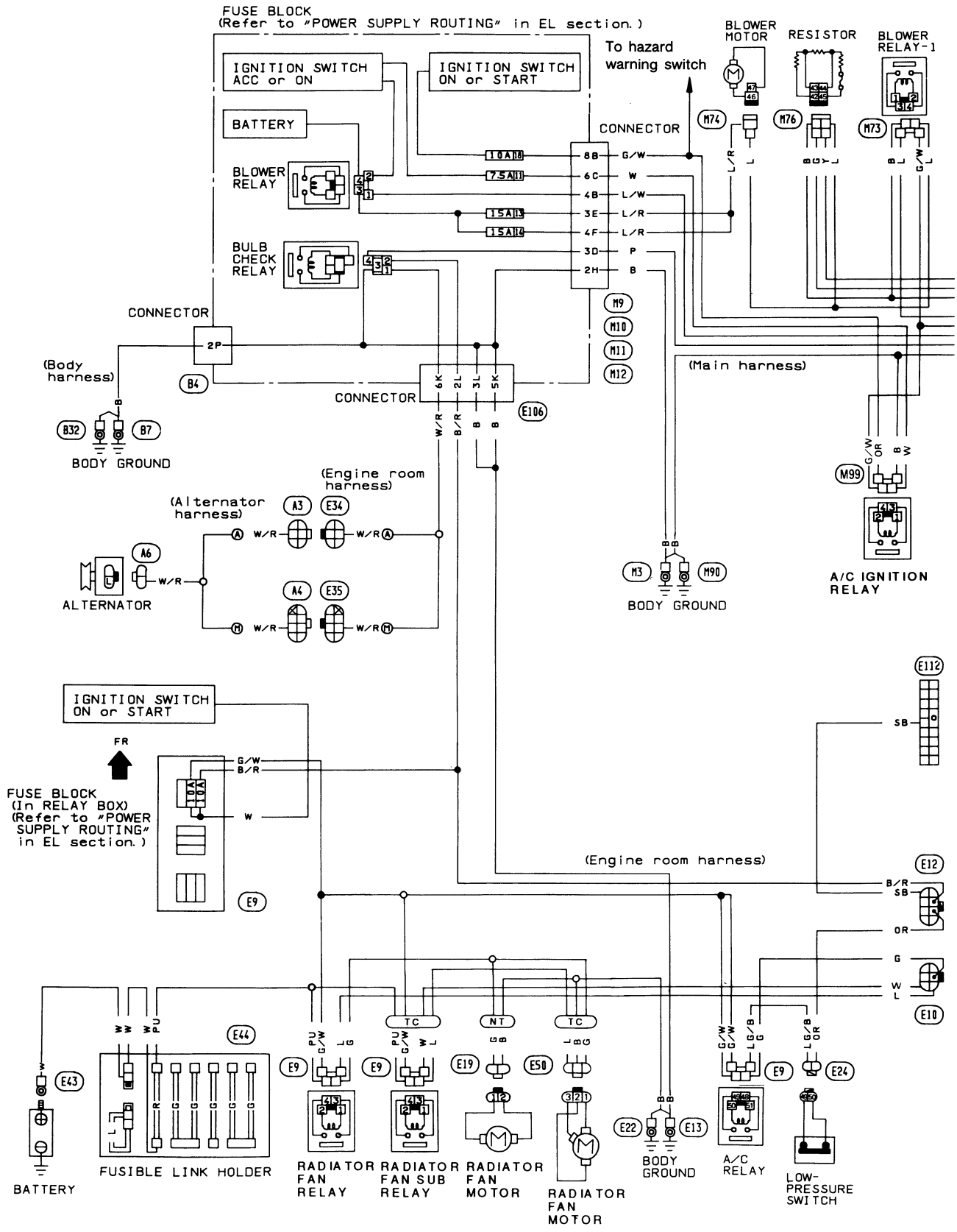
Harness Layout for A/C System (Cont'd)

PASSENGER COMPARTMENT

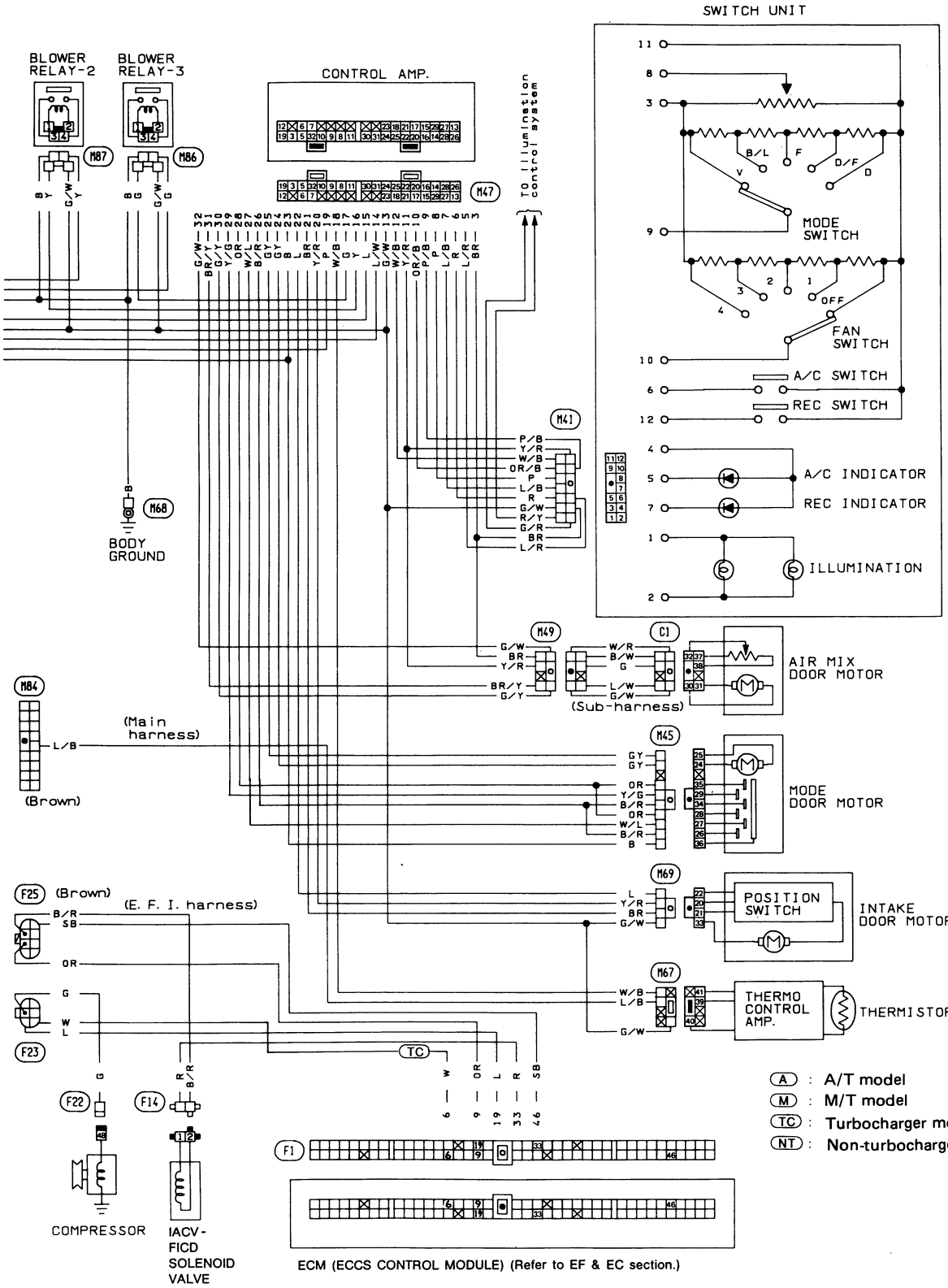


SHA462C

Wiring Diagram

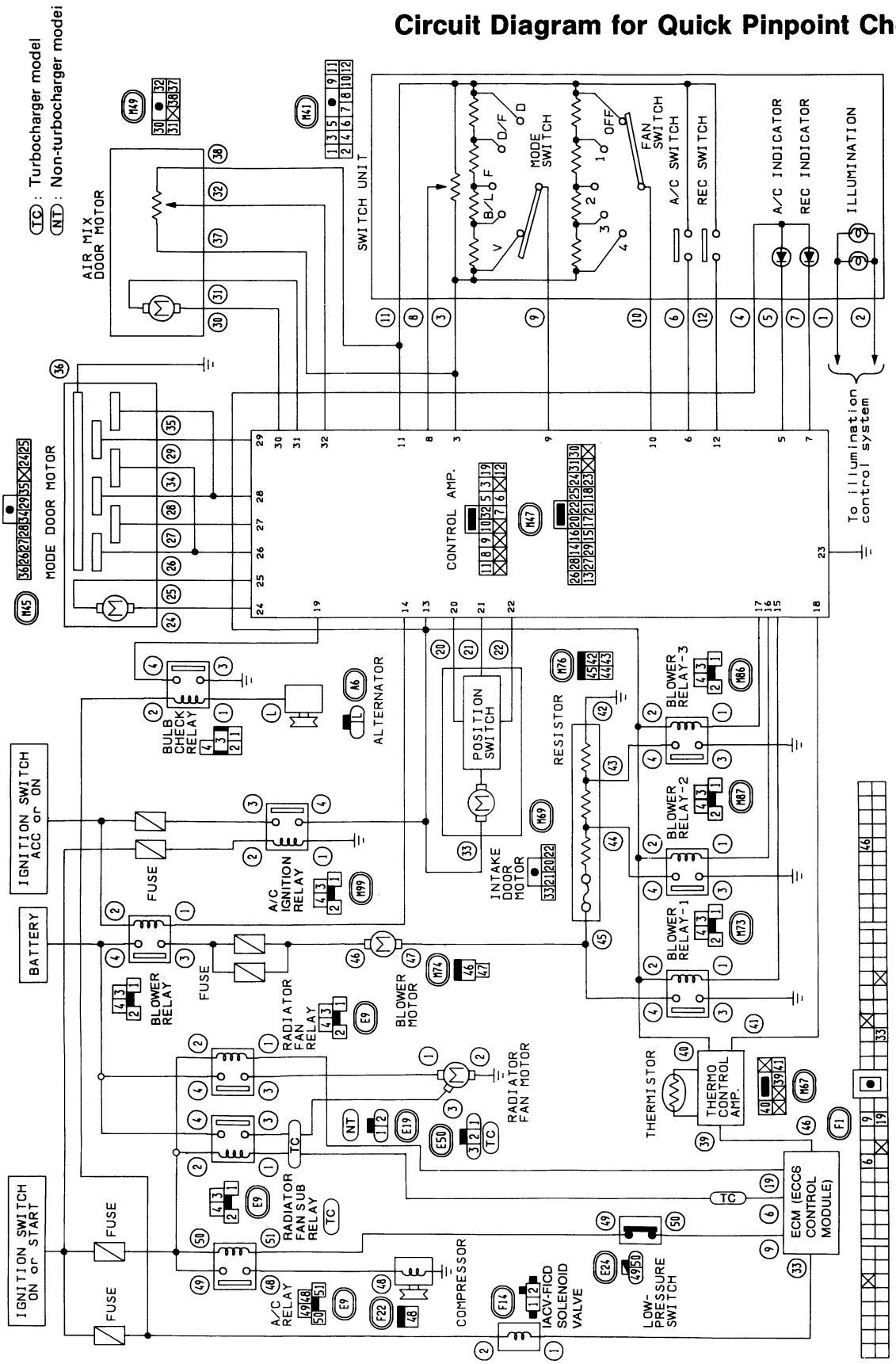


Wiring Diagram (Cont'd)



SHA638D

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-56, HA-57.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

SHA639D

Main Power Supply and Ground Circuit Check

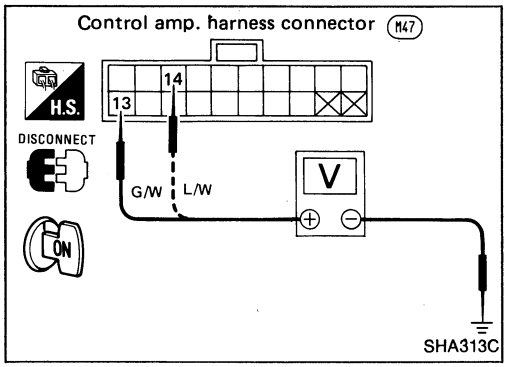
POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

Refer to "POWER SUPPLY ROUTING" in section EL and Wiring Diagram.

CONTROL AMP. REMOVAL

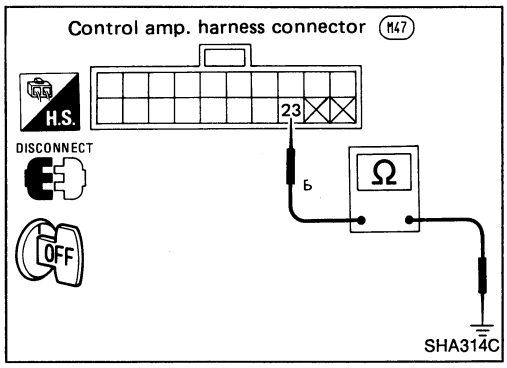
1. Remove driver side instrument lower lid.
2. Remove vent duct.
3. Remove control amp. with harness connected.



CONTROL AMP. CHECK

1. Disconnect control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑬ or No. ⑭ and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
⑬	Body ground	Approximately 12V
⑭		



Check body ground circuit for control amp. with ignition switch OFF.

1. Disconnect control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check continuity between terminal No. ㉓ and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
㉓	Body ground	Yes

	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.

5 → Ⓔ
4 → Ⓓ
3 → Ⓒ
2 → Ⓑ

(Go to next page.)

A 1

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
Do approx. 12 volts exist between blower motor harness terminal No. 46 and body ground?

N.G. → Check fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K.

B

Check circuit continuity between blower motor harness terminal No. 47 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. 45 and body ground?

N.G. → Disconnect blower motor and resistor harness connectors.

D

Note: Check circuit continuity between blower motor harness terminal No. 47 and resistor harness terminal No. 45.

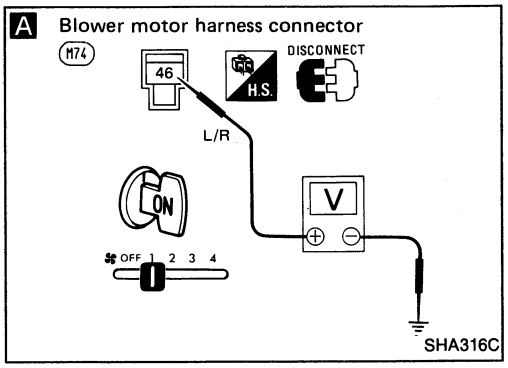
O.K.

Ⓐ

(Go to next page.)

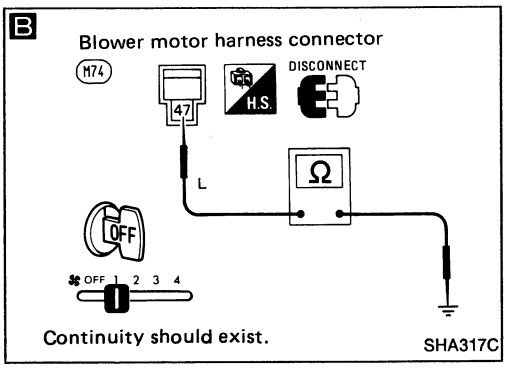
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A Blower motor harness connector (M74)



SHA316C

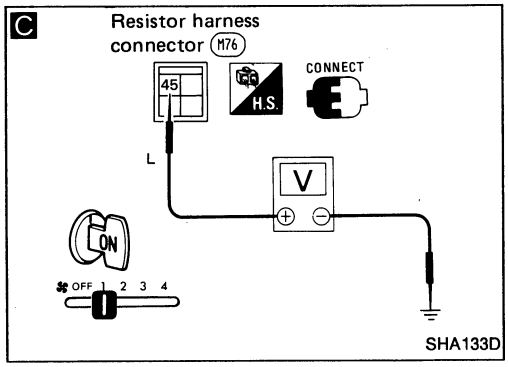
B Blower motor harness connector (M74)



Continuity should exist.

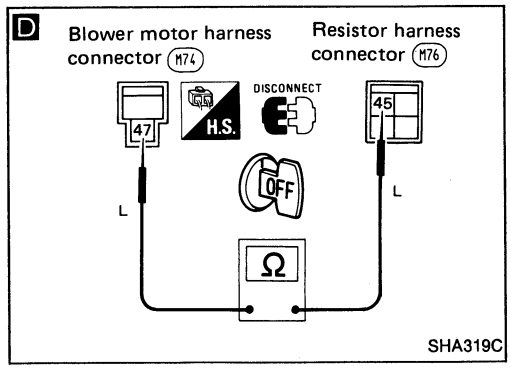
SHA317C

C Resistor harness connector (M76)



SHA133D

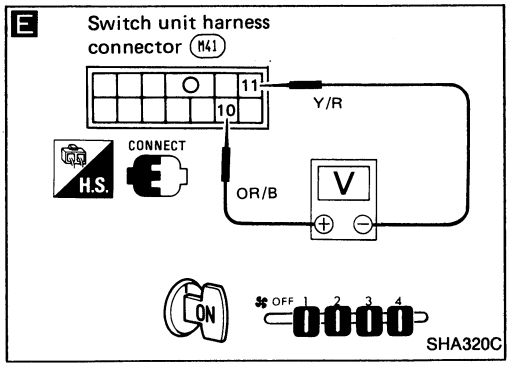
D Blower motor harness connector (M74) — Resistor harness connector (M76)



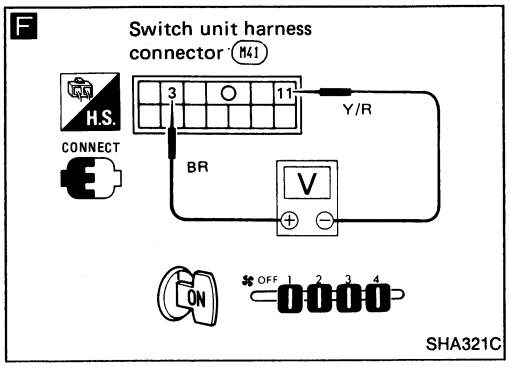
SHA319C

Diagnostic Procedure 1 (Cont'd)

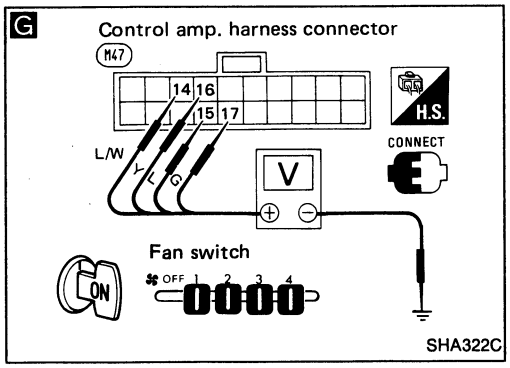
E



F



G



Ⓐ 1 Ⓑ 2 Ⓒ 3 4 Ⓓ 5 Ⓔ

CHECK RESISTOR AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

O.K. → Reconnect resistor harness connector.

N.G. → Replace resistor.

2 3 4 5

E

CHECK FAN SWITCH CIRCUIT.
Do normal volts exist between switch unit harness connector terminals?

Flow chart No. (Fan SW position)	Terminal No. ⊕	Terminal No. ⊖	Normal voltage (Approx.)
2 (1)	⑩	⑪	2V
3 (2)			3V
4 (3)			4V
5 (4)			5V

N.G. → **F**

Do approx. 5 volts exist between control panel terminal No. ③ and No. ⑪?

O.K. → Replace fan switch.

O.K. →

G

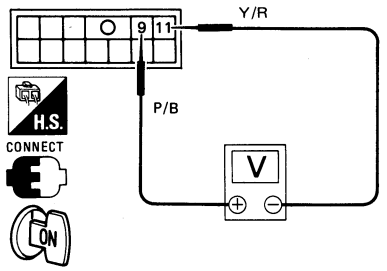
CHECK CONTROL AMP. HARNESS TERMINAL VOLTAGE.
Do approx. 12 volts or 0 volts exist between control amp. harness terminal No. ⑭, ⑮, ⑯ or ⑰ and body ground?

N.G. → Replace control amp.

Flow chart No.	Terminal No.	Fan SW operation ON	Fan SW operation OFF
2	⑭	0V	Approx. 12V
3	⑰	0V	Approx. 12V
4	⑯	0V	Approx. 12V
5	⑮	0V	Approx. 12V

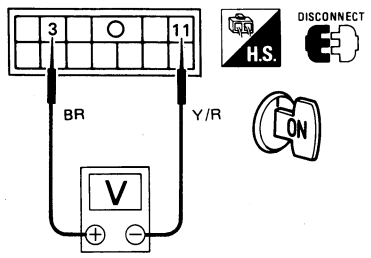
O.K. → Replace blower motor.

A Switch unit harness connector (M41)



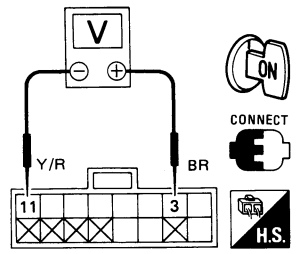
SHA323C

B Switch unit harness connector (M41)



SHA324C

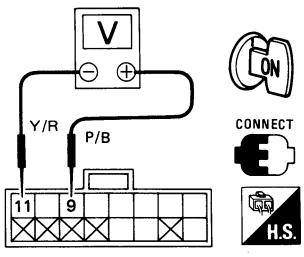
C



Control amp. harness connector (M47)

SHA325C

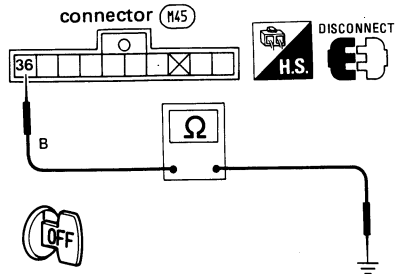
D



Control amp. harness connector (M47)

SHA326C

E Mode door motor harness connector (M45)



SHA327C

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.
Measure voltage between switch unit harness connector terminal No. ⑨ and ⑪.

Mode switch	Terminal No. ⊕	Terminal No. ⊖	Voltage (Approx.)
VENT	⑨	⑪	5V
B/L			4V
FOOT			3V
F/D			2V
DEF			0V

N.G. → Disconnect switch unit harness connector.

B

Do approx. 5 volts exist between switch unit harness connector terminal No. ③ and ⑪.

N.G. → C

O.K. → Replace switch unit.

C

Do approx. 5 volts exist between control amp. harness connector No. ③ and ⑪.

N.G. → Replace control amp.

O.K. → Repair harness or connector.

O.K. ↓

D

Measure voltage between control amp. harness connector terminal No. ⑨ and ⑪.

Mode switch	Terminal No. ⊕	Terminal No. ⊖	Voltage (Approx.)
VENT	⑨	⑪	5V
B/L			4V
FOOT			3V
F/D			2V
DEF			0V

N.G. → Repair harness or connector.

O.K. ↓

E

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness connector terminal No. ㊱ and body ground?

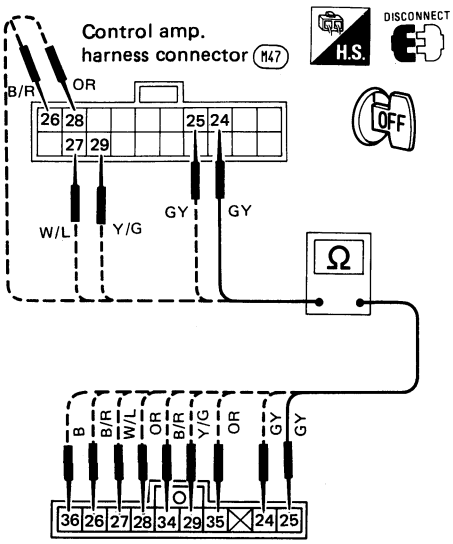
N.G. → Repair harness or connector.

O.K. ↓

Ⓐ

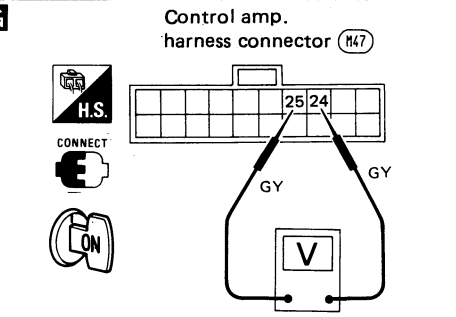
Diagnostic Procedure 2 (Cont'd)

F



SHA328C

G



SHA329C

Ⓐ

F

Check circuit continuity between each terminal on control amp. and mode door motor.

N.G. → Repair harness or connector.

Terminal No.		Continuity
Control amp.	Mode door motor	
㉔	㉔	Yes
㉕	㉕	
㉖	㉖ and ㉞	
㉗	㉗	
㉘	㉘ and ㉟	
㉙	㉙	

O.K.

G

CHECK FOR OUTPUT OF CONTROL AMP.

Do approx. 12 volts exist between control amp. harness terminal No. ㉔ and ㉕ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

N.G. → Replace control amp.

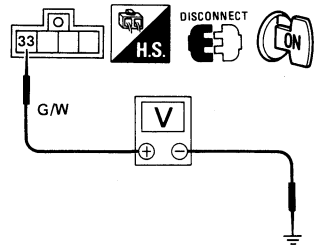
Terminal No.		Mode door motor	
㉔	㉕	Mode door operation	Direction of linkage rotation
⊖	⊕	VENT → DEF	Clockwise
⊕	⊖	DEF → VENT	Counterclockwise

O.K.

Replace mode door motor.

A

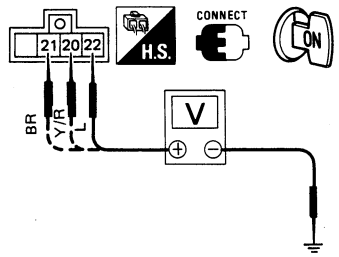
Intake door motor harness connector (M69)



SHA330C

B

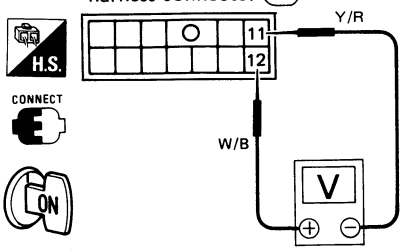
Intake door motor harness connector (M69)



SHA331C

C

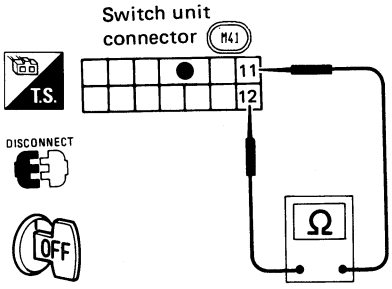
Switch unit harness connector (M41)



SHA332C

D

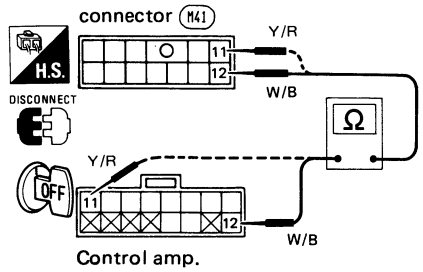
Switch unit connector (M41)



SHA333C

E

Switch unit harness connector (M41)



SHA334C

Diagnostic Procedure 3

SYMPTOM: Intake door does not change in VENT, B/L, or FOOT mode.

- **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. (33) and body ground?

N.G. → Check intake door motor power supply circuit continuity.

O.K. ↓

B

Select VENT mode and check the voltage between intake door motor harness terminal No. (20), (21), (22) and body ground.

A/C switch	REC switch	Mode	Terminal voltage (Approx.)		
			(20)	(21)	(22)
ON	ON	REC	12V	12V	0V
ON	OFF	REC/FRE	12V	0V	12V
OFF	OFF	FRE	0V	12V	12V

N.G. → C

O.K. ↓

Replace intake door motor.

C

Check the voltage between control panel harness connector terminal No. (12) and (11).

A/C switch	Terminal No.		Voltage (Approx.)
	(12)	(11)	
Switch pressed	⊕	⊖	0V
Switch free			5V

N.G. → Disconnect control panel connector.

O.K. → Replace control amp.

D

Check circuit continuity between control panel terminal No. (12) and (11).

REC switch	Continuity between terminal No. (12) and (11)
Switch pressed	Yes
Switch free	No

N.G. → Replace control panel.

O.K. ↓

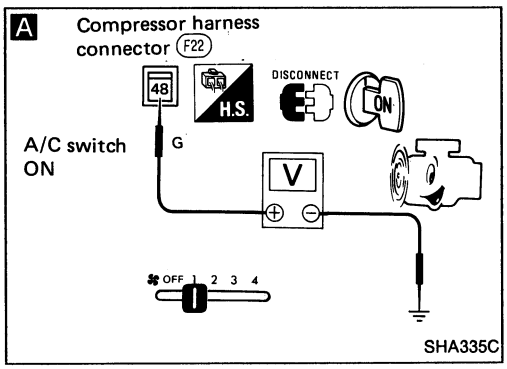
E

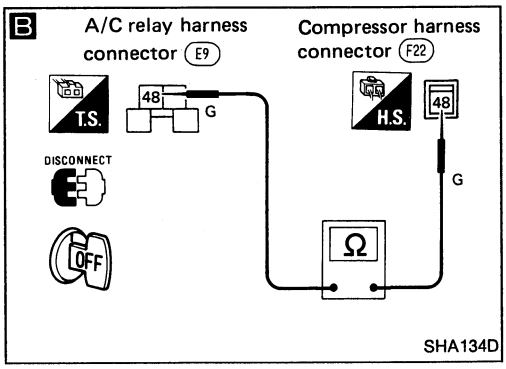
Check circuit continuity between control panel harness terminal No. (12) ((11)) and control amp. harness terminal No. (12) ((11)).

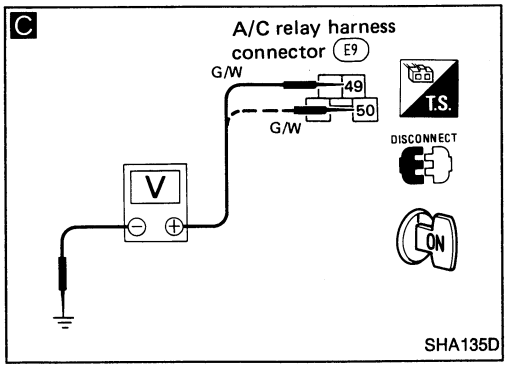
N.G. → Repair harness or connector.

O.K. ↓

Replace control amp.







Diagnostic Procedure 4

SYMPTOM: Magnet clutch does not engage with A/C switch and fan switch ON.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
Do approx. 12 volts exist between compressor harness connector terminal No. ㊽ and body ground?

O.K. → Check magnet clutch coil.

N.G. → Replace magnet clutch. Refer to COMPRESSOR — Model DKS-16H (ZEXEL make).

N.G. → Disconnect A/C relay harness connector.

B

Check circuit continuity between A/C relay harness connector terminal No. ㊽ and compressor harness connector terminal No. ㊽.

Note O.K. → C

C

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminal No. ㊾, ㊿ and body ground?

O.K. → CHECK A/C RELAY AFTER DISCONNECTING IT. (Refer to Electrical Components Inspection.)

N.G. → CHECK POWER SUPPLY CIRCUIT AND 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.

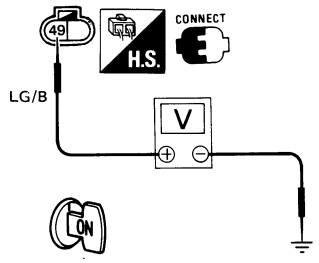
Reconnect A/C relay. → Ⓐ

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)

D

Low-pressure switch harness connector (E24)

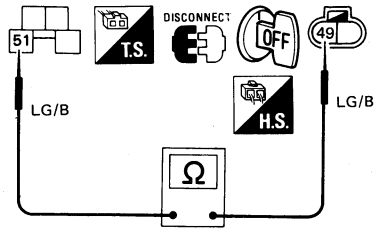


SHA136D

E

A/C relay harness connector (E9)

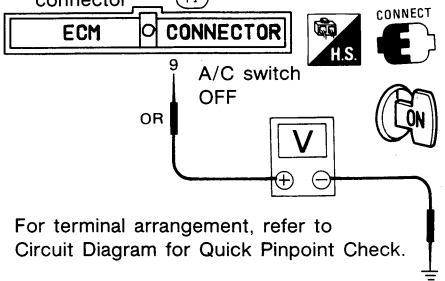
Low-pressure switch harness connector (E24)



SHA137D

F

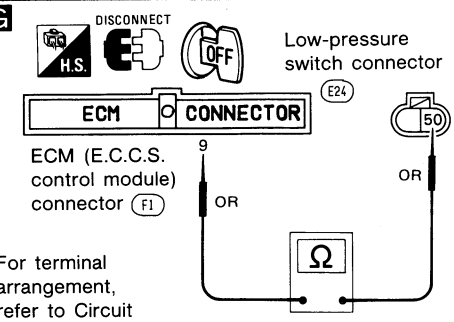
ECM (E.C.C.S. control module) connector (F1)



For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.

SHA541D

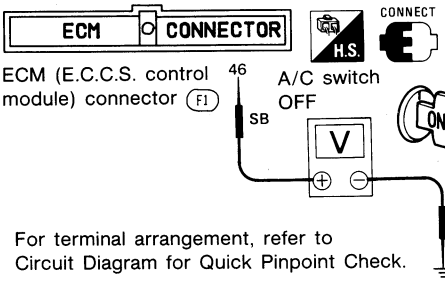
G



For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.

SHA542D

H



For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.

SHA543D

Ⓐ

D CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between low-pressure switch harness connector terminal No. ㊾ and body ground?

N.G. → **E** Check circuit continuity between A/C relay harness connector terminal No. ㊶ and low-pressure switch harness connector terminal No. ㊾.

O.K.

F Do approximately 12 volts exist between ECM (ECCS control module) harness terminal No. ⑨ and body ground?

N.G. → **G** Check circuit continuity between low-pressure switch harness connector terminal No. ㊿ and ECM (ECCS control module) harness connector terminal No. ⑨.

Note

O.K.

Note

CHECK LOW-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

N.G.

Replace low-pressure switch.

O.K.

H Do more than 8 volts exist between ECM (ECCS control module) harness connector terminal No. ㊻ and body ground?

N.G. → CHECK ECM (ECCS control module).
(Refer to EF & EC section.)

O.K.

Disconnect thermo. amp. harness connector.

O.K.

Ⓑ

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)

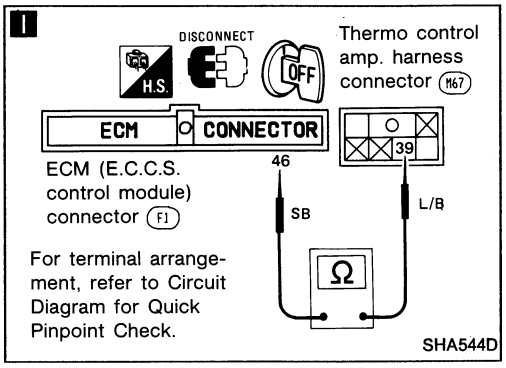
Ⓑ

I Note

Check circuit continuity between thermo. control amp. harness connector terminal No. ㊴ and ECM (ECCS control module) harness connector terminal No. ㊻.

O.K.

I



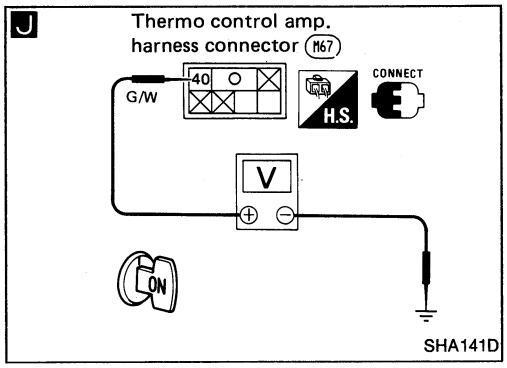
J

CHECK POWER SUPPLY FOR THERMO. AMP.
Do approx. 12 volts exist between thermo. amp. harness connector terminal No. ㊵ and body ground?

N.G. → CHECK POWER SUPPLY CIRCUIT AND FUSE AT FUSE BLOCK. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K.

J



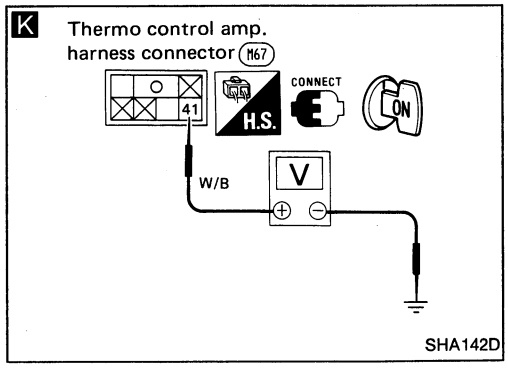
K

Is the voltage between thermo. amp. harness connector terminal No. ㊶ and body ground less than 1V?

N.G. → Replace thermo. control amp.

O.K.

K

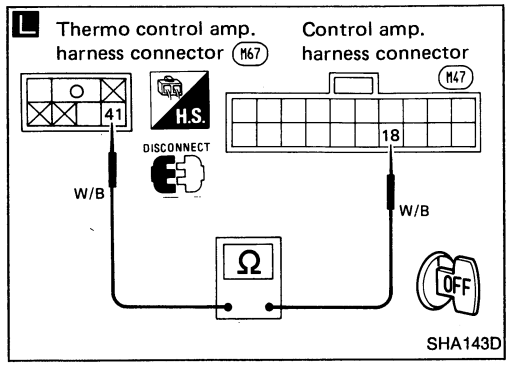


L Note

Check continuity between thermo. control amp. harness connector terminal No. ㊶ and control amp. harness connector terminal No. ⑱.

O.K.

L



M

CHECK A/C SWITCH OF SWITCH UNIT.
Check the voltage between switch unit harness connector terminal No. ⑥ and ⑪.

N.G. → Disconnect switch unit connector.

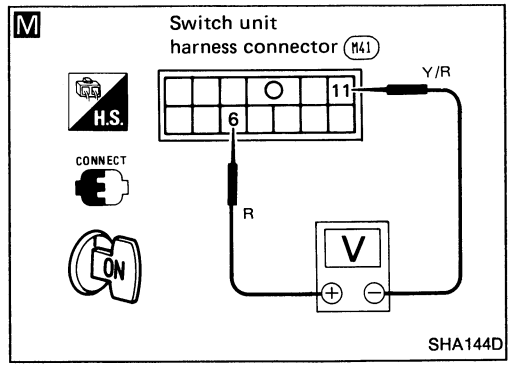
REC switch	Terminal No. ⑥	Terminal No. ⑪	Voltage (Approx.)
Switch pressed	⊕	⊖	0V
Switch free	⊕	⊖	5V

O.K.

Replace control amp.

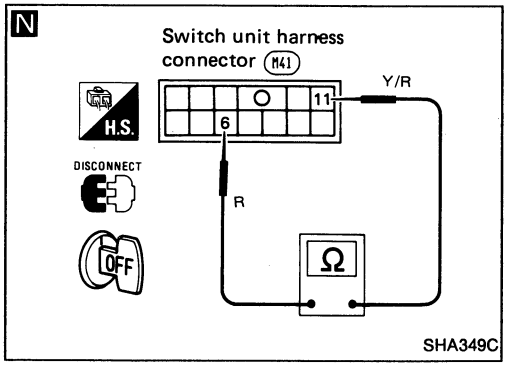
Ⓒ

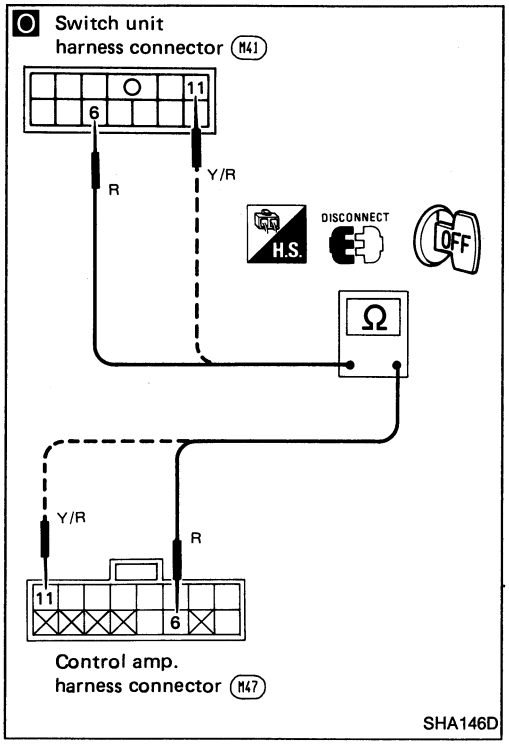
M



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)





Ⓒ

N

Check circuit continuity between switch unit harness connector terminal No. ⑥ and ⑪.

N.G. → Replace switch unit.

A/C switch	Continuity between terminal No. ⑥ and ⑪
Switch pressed	Yes
Switch free	No

O.K.

O Note

Check circuit continuity between switch unit harness connector terminal No. ⑥ (⑪) and control amp. harness connector terminal No. ⑥ (⑪).

O.K.

Replace control amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5

SYMPTOM: Illumination or control panel indicators do not come on.

- **Perform Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

Turn ignition switch and lighting switch ON.

↓

CHECK ILLUMINATION AND INDICATORS.
- Turn A/C, REC and fan ON.
- Rotary VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown.

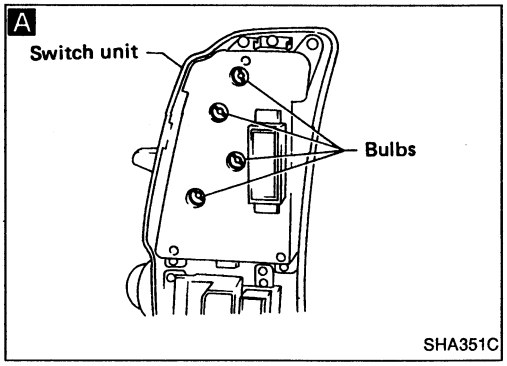
INCIDENT			How to repair
ILL Control panel	A/C	REC	
×	○	○	Go to DIAGNOSTIC PROCEDURE 5-1.
○	×	○	Go to DIAGNOSTIC PROCEDURE 5-2.
○	○	×	Go to DIAGNOSTIC PROCEDURE 5-3.
○	×	×	Go to DIAGNOSTIC PROCEDURE 5-4.

○: Illumination or indicator comes on.
×: Illumination or indicator does not come on.

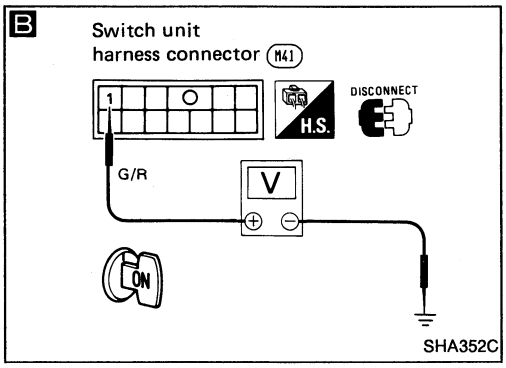
Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-1

A



B



CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illuminations 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.

A

CHECK ILLUMINATION BULB.
Remove switch unit and disconnect harness connectors.
Remove illumination bulb(s) and check them.

N.G. → Replace illumination bulb(s).

O.K. ↓

B

CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.
Do approx. 12 volts exist between switch unit connector harness terminal No. ① and body ground?

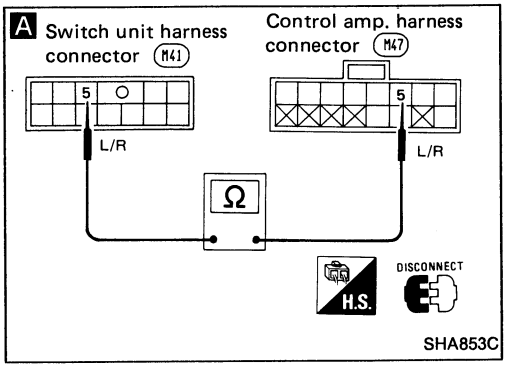
N.G. → CHECK POWER SUPPLY FOR ILLUMINATION SYSTEM.
Refer to Illumination/ Wiring Diagram in EL section.

O.K. ↓

CHECK TIME CONTROL SYSTEM.
Refer to TIME CONTROL SYSTEM in EL section.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-2



CHECK MAGNET CLUTCH OPERATION.
Does magnet clutch operate normally when engine is ON and A/C switch, fan switch are ON?

N.G. → Go to **Diagnostic Procedure 4.**

O.K. ↓

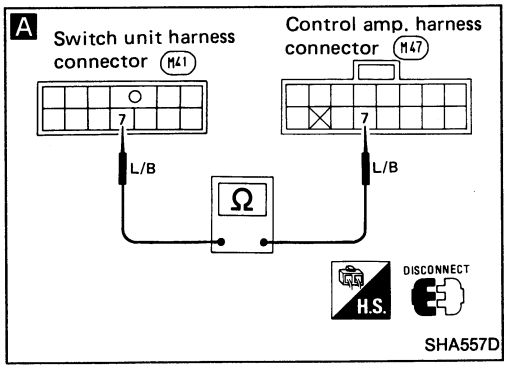
A

Check continuity between switch unit harness connector terminal No. ⑤ and control amp. harness connector terminal No. ⑤.

N.G. ↓

Replace switch unit.

DIAGNOSTIC PROCEDURE 5-3



CHECK INTAKE DOOR OPERATION.
Does intake door operate normally when engine is ON and A/C switch, fan switch are ON?

N.G. → Go to **Diagnostic Procedure 3.**

O.K. ↓

A

Check continuity between switch unit harness connector terminal No. ⑦ and control amp. harness connector terminal No. ⑦.

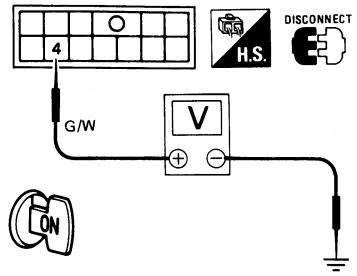
N.G. ↓

Replace switch unit.

Diagnostic Procedure 5 (Cont'd)

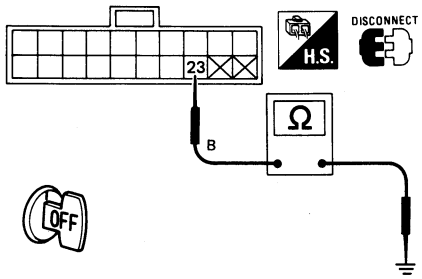
DIAGNOSTIC PROCEDURE 5-4

A Switch unit harness connector (M41)



SHA356C

B Control amp. harness connector (M47)



SHA357C

Turn ignition switch and lighting switch OFF.

↓

Disconnect switch unit harness connector.

↓

A

CHECK POWER SUPPLY FOR SWITCH UNIT.
Do approx. 12 volts exist between switch unit harness connector terminal No. ④ and body ground?

N.G. → Check harness of switch unit power supply circuit. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K.

↓

B

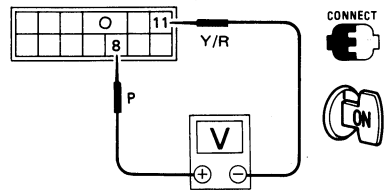
CHECK BODY GROUND CIRCUIT FOR CONTROL AMP.
Does continuity exist between control amp. harness connector terminal No. ㉓ and body ground?

O.K.

↓

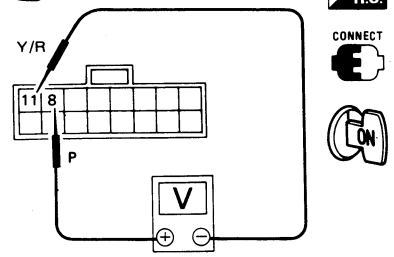
Replace control amp.

A Switch unit harness connector (M41)



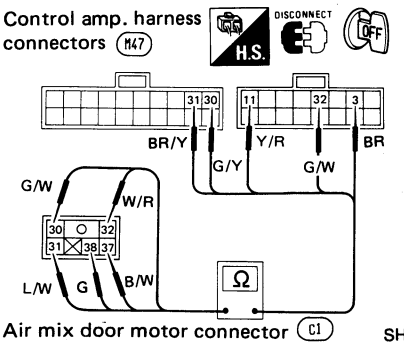
SHA521C

B Control amp. harness connector (M47)



SHA522C

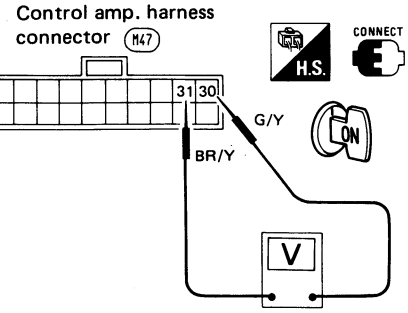
C Control amp. harness connectors (M47)



Air mix door motor connector (C1)

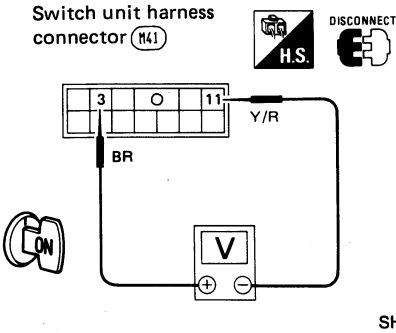
SHA523C

D Control amp. harness connector (M47)



SHA524C

E Switch unit harness connector (M41)



SHA525C

Diagnostic Procedure 6

SYMPTOM: Temperature of air outlet does not change.

A

CHECK TEMPERATURE CONTROL LEVER.
Measure voltage between control panel harness connector terminals No. ⑧ and ⑪.

Temp. control lever	Terminal No. ⊕	Terminal No. ⊖	Voltage (approx.)
Full hot	⑧	⑪	5V
Full cold	⑧	⑪	0V

N.G. → Disconnect control amp. harness connector.

E

Check if approx. 5 volts exist between control panel harness connector terminals No. ③ and ⑪.

N.G. → Replace control amp.

O.K. → Ⓐ (Go to next page.)

O.K.

B

Measure voltage between control amp. harness connector terminals No. ⑧ and ⑪.

Temp. control lever	Terminal No. ⊕	Terminal No. ⊖	Voltage (approx.)
Full hot	⑧	⑪	5V
Full cold	⑧	⑪	0V

O.K.

C

Check continuity between each terminal of control amp. and air mix door motor.

Terminal No. Control amp.	Terminal No. Air mix door motor	Continuity
㉚	㉚	Yes
㉛	㉛	
③	㊲	
㉜	㉜	
⑪	㊳	

N.G. → Repair harness or connector.

O.K.

D

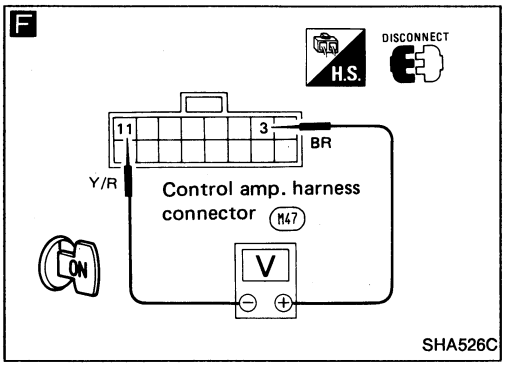
CHECK FOR CONTROL AMP. OUTPUT.
Check if 12 volts exist between control amp. harness connector terminals No. ㉚ and ㉛ when temp. control lever is moved.

Terminal No.		Air mix door motor	Direction of linkage rotation
㉚	㉛	Air mix door operation	
⊖	⊕	Cold→Hot	Clockwise
⊕	⊖	Hot→Cold	Counterclockwise

N.G. → Replace control amp.

O.K. → Replace air mix door motor.

Diagnostic Procedure 6 (Cont'd)



Ⓐ

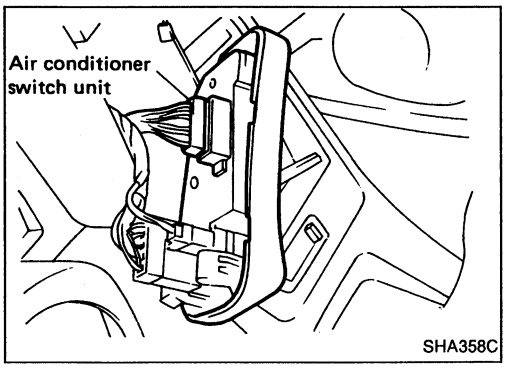
F

Check if approx. 5 volts exist between control amp. harness connector terminals No. ③ and ⑪.

N.G. → Replace control amp.

O.K. ↓

Repair harness or connector.

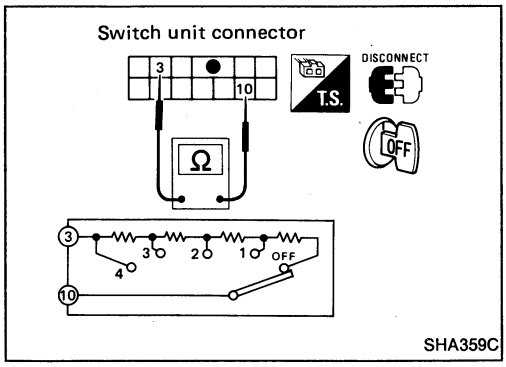


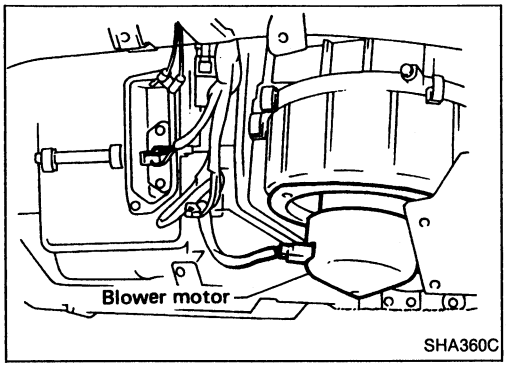
Electrical Components Inspection

FAN SWITCH

Check resistance between terminals at each switch position.

Switch position	Resistance between terminals No. ③ and ⑩ (Approx. Ω)
OFF	710
1	1,140
2	460
3	270
4	0

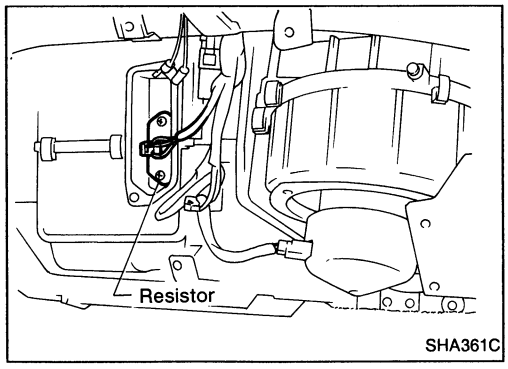




BLOWER MOTOR

Confirm smooth rotation of the blower motor.

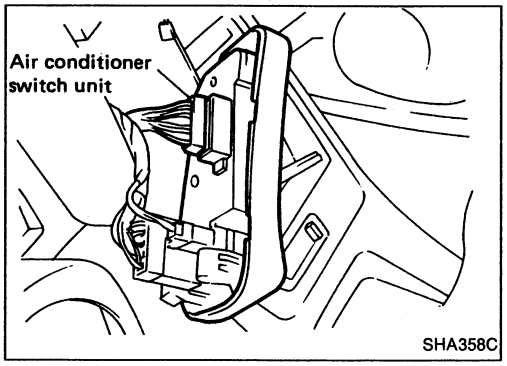
- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.

Electrical Components Inspection (Cont'd)

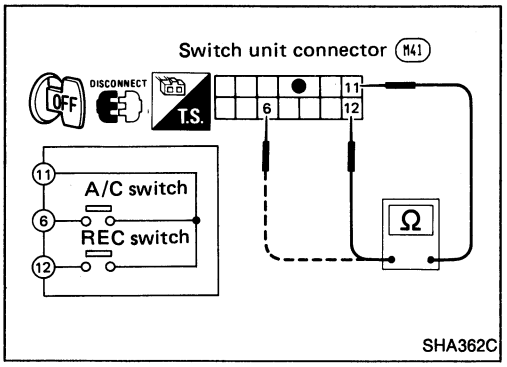


SHA358C

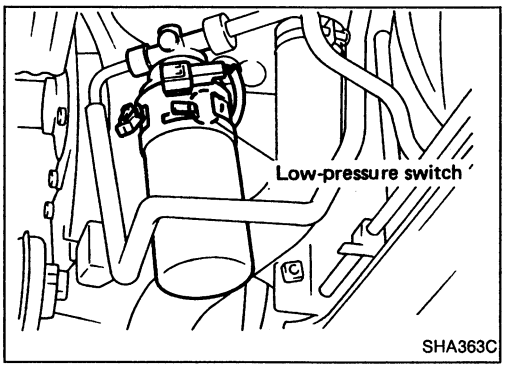
A/C SWITCH

Check continuity between terminals at each switch position.

Switch condition	Terminal No.		Continuity
While A/C switch is pushed	⑥	⑪	Yes
While REC switch is pushed	⑫	⑪	Yes



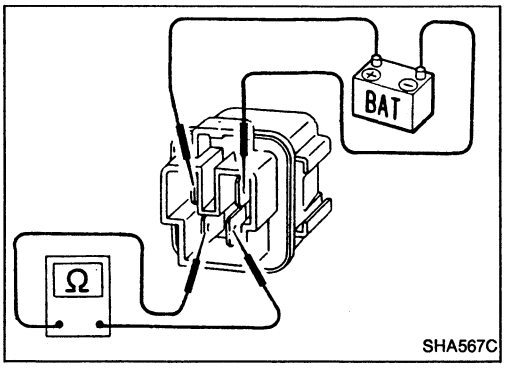
SHA362C



SHA363C

LOW-PRESSURE SWITCH

High-pressure side line pressure kPa (kg/cm², psi)	Operation	Continuity
196 (2.0, 28)	Turn OFF	Does not exist
206 (2.1, 30)	Turn ON	Exist

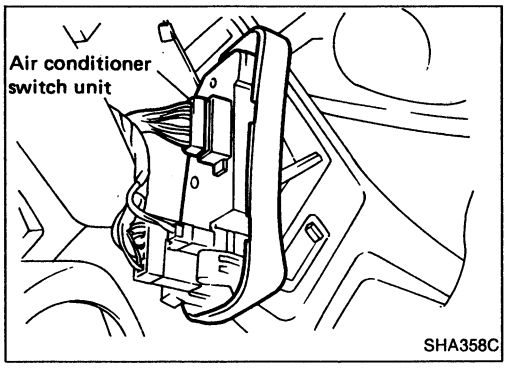


SHA567C

RELAYS

Check circuit continuity between terminals by supplying 12 volts to coil side terminal of relay.

Electrical Components Inspection (Cont'd)

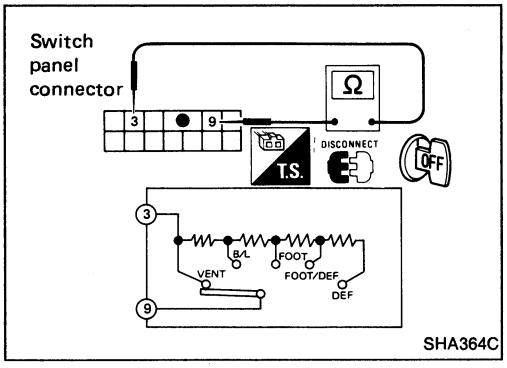


SHA358C

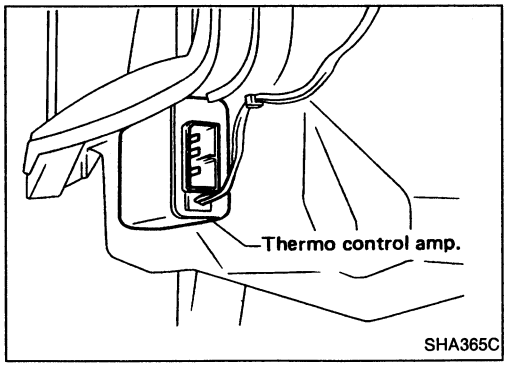
MODE SWITCH

Check resistance between terminals at each switch position.

Switch position	Resistance between terminals No. ⑨ and No. ③ (Ω)
VENT	0
B/L	270
FOOT	460
FOOT/DEF	1,140
DEF	710



SHA364C



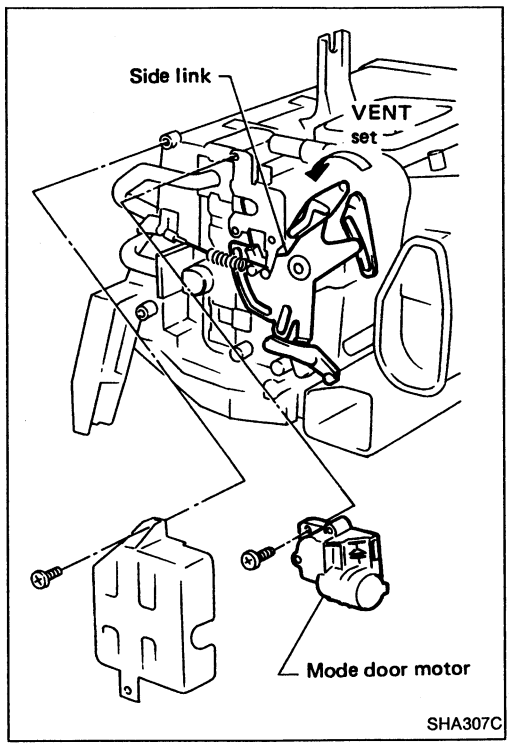
SHA365C

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	Voltage (Approx.)
Decreasing to 3.0 (37)	Turn OFF	12V
Increasing to 4.5 (40)	Turn ON	0V

Control Linkage Adjustment

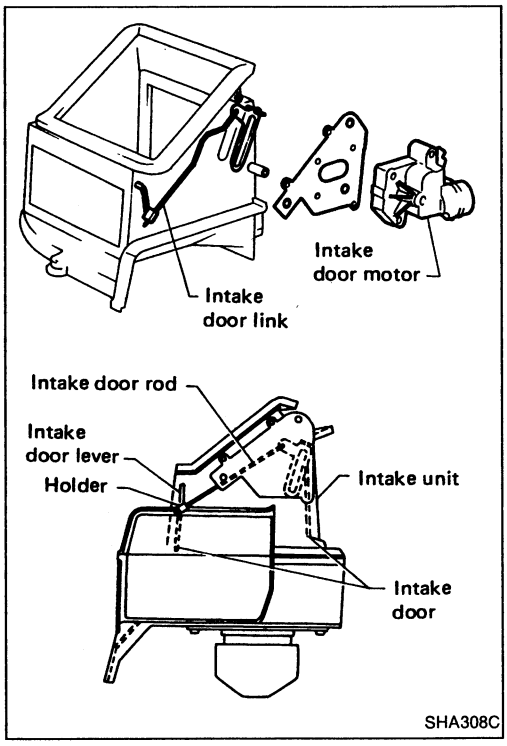


SHA307C

MODE DOOR

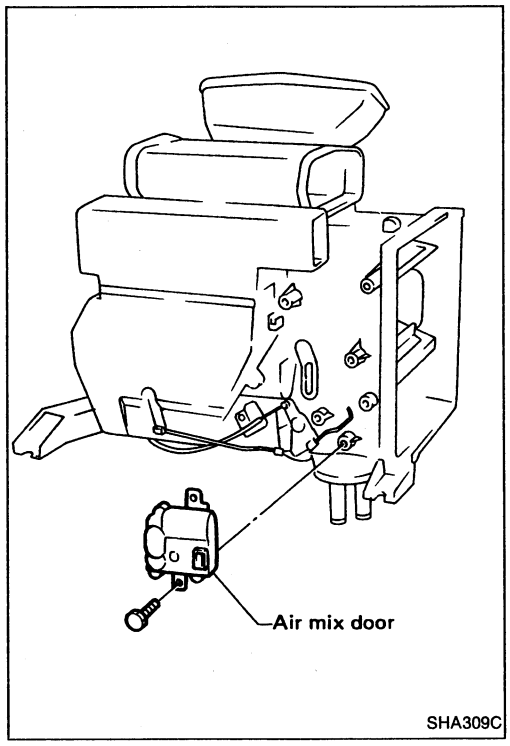
1. Move side link by hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to harness.
3. Turn ignition switch to ON.
4. Turn VENT switch ON.
5. Attach mode door rod to side link rod holder.
6. Check that when DEF position is selected, only DEF door is at full-open position, and when VENT position is selected, only VENT door is at full-open position.

Control Linkage Adjustment (Cont'd)



INTAKE DOOR

1. Install intake door motor on intake unit.
2. Connect intake door motor harness connector.
3. Turn ignition switch to ON.
4. Turn REC switch ON.
5. Install intake door lever.
6. Set intake door rod in REC position and fasten intake door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.



AIR MIX DOOR

1. Connect harness to air mix door motor and set temperature control lever at full-cold position.
2. Set air mix doors I and II at full-cold position and fasten door rod.
3. Check that when temperature control lever is at full-cold, both doors are at full-cold position, and when temperature control lever is at full-hot, both doors are at full-hot position.

WATER COCK CONTROL CABLE

Clamp cable at full-close position when air mix doors I and II are at full-cold position, and full-open position when air mix doors I and II are at full-hot position.

Contents

Contents (Cont'd)

Symptom Chart

DIAGNOSTIC TABLE

Symptom	Possible cause	Diagnostic procedure
Air outlet does not change	• Mode door motor not operating correctly • Inaccurate sensor input • No output to mode door motor from auto amplifier	Proceed to Preliminary check 1, then to Diagnostic procedures 17 and 18 if air mix door is malfunctioning.
Intake door does not change	• Intake door motor or mechanism malfunctioning • Inaccurate sensor input • No output to intake door motor from auto amplifier	Proceed to Preliminary check 2. If intake door is at fault, go to Diagnostic procedure 16.
Insufficient cooling	• Compressor clutch not engaged • Air mix door motors not working properly • Condenser fan inoperative • Low freon level	Proceed to Preliminary check 3. If air mix doors do not operate properly, go to Diagnostic procedure 15. Check compressor clutch operation and freon level of system.
Discharged air temperature does not change	• Air mix doors do not operate correctly • Incorrect sensor input	Proceed to Preliminary check 7.
Noise	• Compressor belt tension • Compressor component malfunction • Blower motor interference • Radiator cooling fan interference	Proceed to Preliminary check 8.
Air conditioner control switch panel illumination does not come on	• Blown fuse • Loose or open in harness • Blown bulb	Proceed to Diagnostic procedure 20.
Insufficient heating	• Coolant temperature is low • Air mix doors not in correct position • Incorrect sensor circuit	Proceed to Preliminary check 4. If air mix doors do not operate correctly, go to Diagnostic procedure 15.
Blower motor operation is malfunctioning	• Blower motor is not receiving power • Vents may be obstructed • Motor does not spin freely • Air intake obstructed • Blown fuse • Malfunctioning blower relay	Proceed to Preliminary check 5. If blower motor is malfunctioning, go to Diagnostic procedure 25.
Magnet clutch does not engage.	• Blown fuse • A/C relay inoperative • Open in wiring • Open ambient sensor circuit • Low freon level • Malfunctioning clutch assembly	Proceed to Preliminary check 6, then Diagnostic procedure 19 if clutch is at fault.
No display on A/C switch panel	• Blown fuse • Malfunctioning bulb	Proceed to Diagnostic procedure 20.
Set temperature and mode indication do not appear on display window	• Malfunctioning switch unit • Open in circuit • Malfunctioning auto amplifier	Proceed to Diagnostic procedure 21.
When air conditioner switch is operated, if does not beep	• Malfunctioning A/C switch • Open in harness or connector • Malfunctioning auto amplifier	Proceed to Diagnostic procedure 22.

Symptom Chart (Cont'd)

Symptom	Possible cause	Diagnostic procedure
Set temperature and mode indication do not appear in display and indicator lamp (L.E.D.) does not come on	• Open in harness • Malfunctioning switch panel • Malfunctioning auto amplifier	Proceed to Diagnostic procedure 23.
Switches do not work	• Malfunctioning switch panel • Open in harness • Malfunctioning auto amplifier	Proceed to Diagnostic procedure 24.

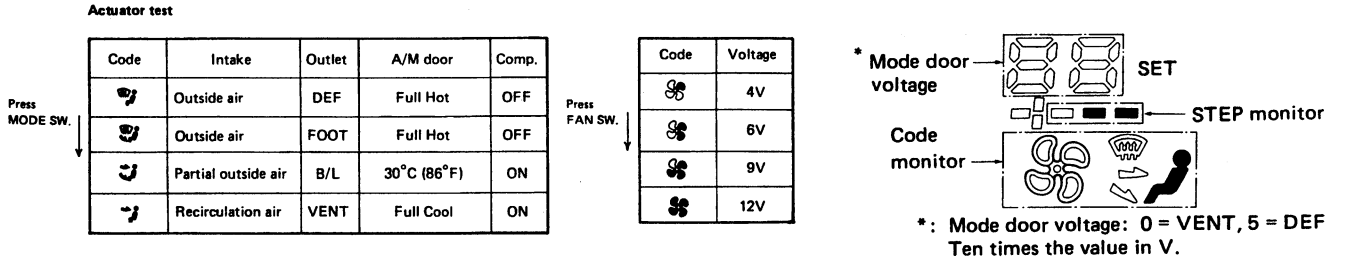
Self-diagnosis

CONSULT AND ONBOARD SELF-DIAGNOSTIC SYSTEM

Function of CONSULT and ONBOARD SELF-DIAGNOSTIC SYSTEM are as follows:

ITEM	MONITOR		CHANGE PARAMETER		READOUT OF TROUBLE DATA STORED IN MEMORY	
	CONSULT	ONBOARD	CONSULT	ONBOARD	CONSULT	ONBOARD
Ambient temp.	○	○			○	○
In-vehicle temp. (Upper)	○	○			○	○
In-vehicle temp. (Lower)	○	○			○	○
Duct temp. (Defroster)	○	○			○	○
Duct temp. (Ventilator)	○	○			○	○
Duct temp. (Floor)	○	○			○	○
Sunload	○	○			○	○
Water temp.	○	○				
Mode door P.B.R.	○	○				
In-vehicle target temp. (Upper)	○					
In-vehicle target temp. (Lower)	○					
Outlet air target temp. (Upper)	○		○	*○		
Outlet air target temp. (Lower)	○		○	*○		
Mode door target position	○		○	*○		
Intake door target position	○		○	*○		
Blower motor target voltage	○		○	*○		
Difference between upper and lower target temp.	○		○	*○		
Output signal to compressor	○		○	*○		
Set temp.	○					
Selected mode	○					
Operated switches status	○					
Manual select status	○					

*: These can be set by self-diagnosis step II; their combinations are as follows:

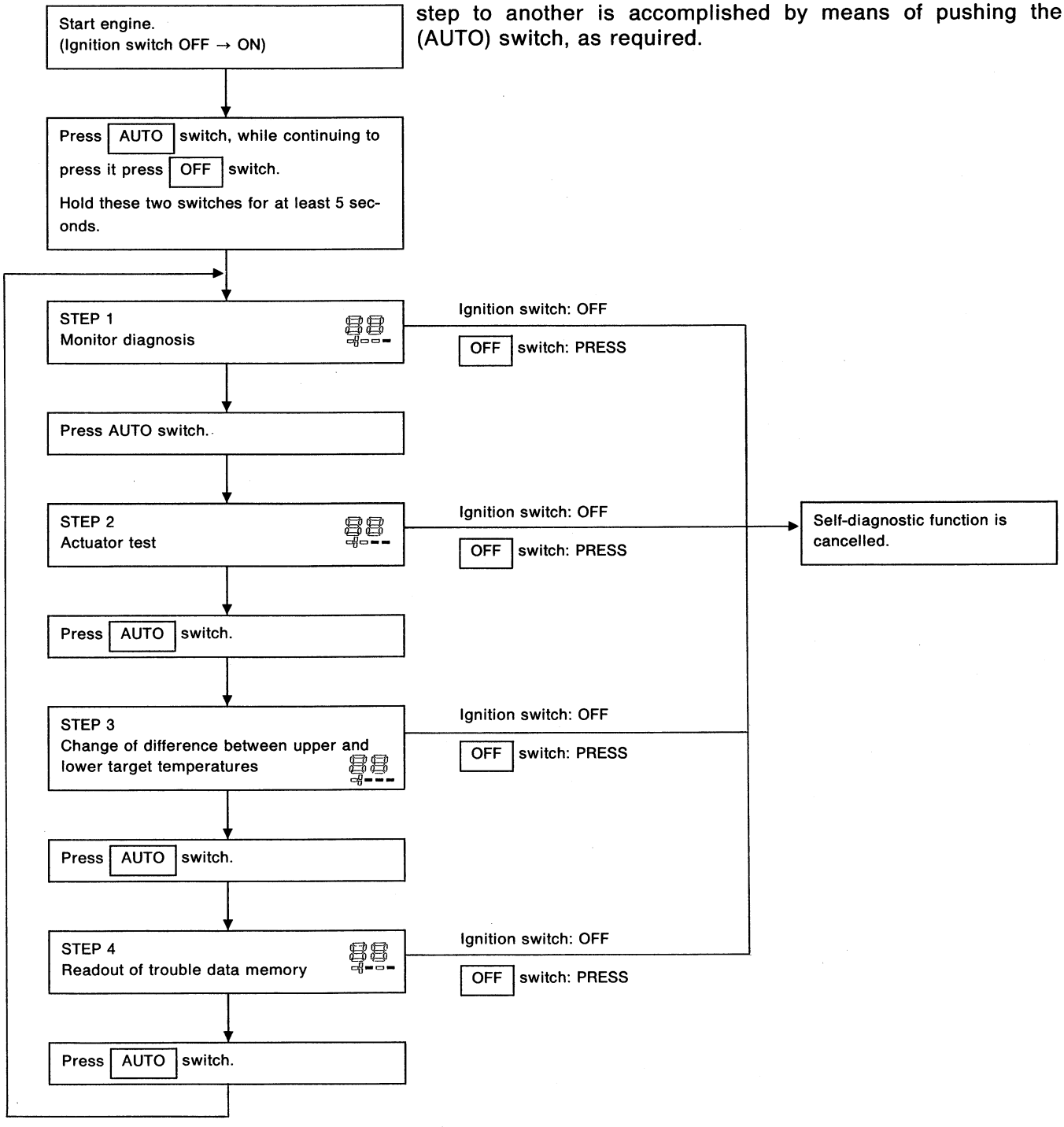


SHA755C

Self-diagnosis (Cont'd)

The self-diagnostic system diagnoses the sensors, door motors, blower motor, etc. by system line. Refer to applicable sections (items) for details. Shifting from normal control to the self-diagnostic system is accomplished by starting the engine (turning ignition switch from "OFF" to "ON"), and pressing both the (AUTO) and (OFF) switch for at least 5 seconds.

This system will be cancelled by either pressing the (OFF) switch or turning the ignition switch "OFF". Shifting from one step to another is accomplished by means of pushing the (AUTO) switch, as required.



Self-diagnosis (Cont'd)

CHECKING PROCEDURE

Start engine.

↓

Check if SET and Mode data VFD display) illuminate. — No → Faulty wiring or VFD

↓ Yes

Set in self-diagnostic mode.
(Press AUTO switch, while continuing to press it press OFF switch. Hold these two switches for at least 5 seconds.)

↓ yes

Check if air conditioner operates and appears. — No → Faulty "AUTO" or "OFF" switch

↓ Yes

STEP 1
SENSOR MONITOR

↓

Identification data of each sensor is shown.

↓

Press MODE switch or FAN switch.

↓

Press AUTO switch.

↓

STEP 2
ACTUATOR TEST

↓

Code No. of actuators test pattern is indicated on display.

↓

Press MODE switch or FAN switch.

↓

Ⓐ

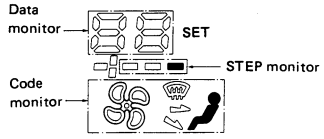
Note:
1. Without engine running, STEP 1 and 2 are not useful for some case because compressor not operate.

Sensor monitor

Code	Item	Unit	Code	Item	Unit
	Ambient temperature	°C (°F)		Internal data	–
	Upper compartment temperature				–
	Lower compartment temperature				–
	DEF outlet air temperature				–
	VENT outlet air temperature				–
	FOOT outlet air temperature				–
	Sunload	*1		Difference between upper and lower target temperatures	°C (°F)
	Water temperature *3	°C (°F)		Internal data	–
	Mode door voltage*4	*2			

Press FAN SW.
Press MODE SW.

*1: One tenth of the value in kcal/h·m² unit
*2: Ten times of the value in V
*3: When coolant temperature is below 40°C (104°F), indicates 20°C (68°F)
When coolant temperature is avove 40°C (104°F), indicates 80°C (176°F)
*4: Mode door voltage: 0 = VENT, 5 = DEF



SHA754C

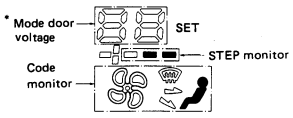
Actuator test

Code	Intake	Outlet	A/M door	Comp.
	Outside air	DEF	Full Hot	OFF
	Outside air	FOOT	Full Hot	OFF
	Partial outside air	B/L	30°C (86°F)	ON
	Recirculation air	VENT	Full Cool	ON

Press MODE SW.

Code	Voltage
	4V
	6V
	9V
	12V

Press FAN SW.



*: Mode door voltage: 0 = VENT, 5 = DEF
Ten times the value in V.

SHA755C

Self-diagnosis (Cont'd)

Ⓐ

Press AUTO switch.

STEP 3 ..... STEP 3 should not be used for diagnostic purposes.

Press AUTO switch.

STEP 4
READOUT OF TROUBLE DATA STORED IN MEMORY

[No. of engine starts/stops occurring since last problem was detected for each sensor]

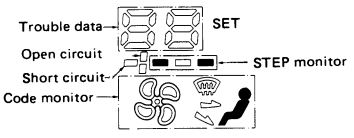
Press MODE switch or FAN switch.

Press OFF switch.

END

Readout of trouble data stored in memory

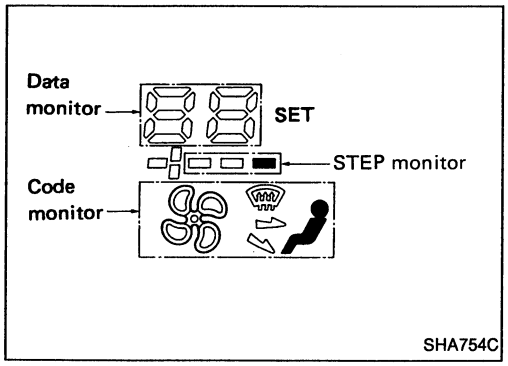
Code	Item	Trouble diagnosis criteria	Remarks
	Ambient sensor trouble data	Less than −70°C (−94°F) Greater than 141°C (286°F)	
	Upper in-vehicle sensor trouble data	Less than −38°C (−36°F) Greater than 141°C (286°F)	
	Lower in-vehicle sensor trouble data		
Press FAN SW.	DEF Duct sensor trouble data		
	VENT Duct sensor trouble data		
Press MODE SW.	FOOT Duct sensor trouble data		
	Sunload sensor trouble data	–	Detects only short circuit



Trouble data
No. of IGN ON/OFF operations since last trouble was detected.
50: No problem
49 - 01: Problem existed
0: Problem exists

SHA756C

Self-diagnosis (Cont'd)



STEP 1: MONITOR DIAGNOSIS

By setting in self-diagnostic mode, VFD display shows that Step 1 mode has begun.
In this mode, each time the FAN or MODE SW is pressed, the code monitor changes in turn, and data corresponding with each code appears in the data monitor.

If the temperature shown on the display greatly differs from the actual temperature, check the sensor circuit first, then inspect the sensor itself according to the procedures described in Electrical Components Inspection.

* For cross-reference of code and corresponding data, refer to "Sensor monitor" in "Checking procedure".

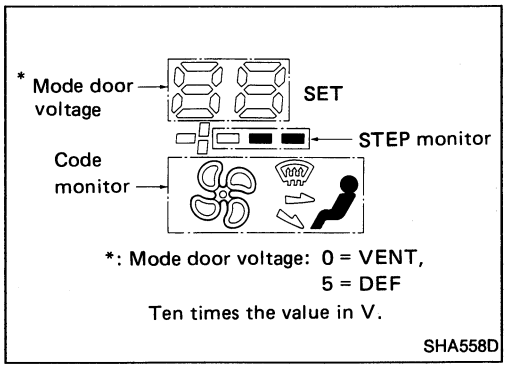
Press FAN SW. ↑

Press MODE SW. ↓

Code	Item	Unit	Code	Item	Unit
	Ambient temperature	°C (°F)		Internal data	—
	Upper compartment temperature				—
	Lower compartment temperature				—
	DEF outlet air temperature				—
	VENT outlet air temperature				—
	FOOT outlet air temperature				—
	Sunload	*1		Difference between upper and lower target temperatures	°C (°F)
	Water temperature*3	°C (°F)		Internal data	—
	Mode door voltage*4	*2			

*1: One tenth of the value in kcal/h·m^2 unit
*2: Ten times of the value in V
*3: When coolant temperature is below 40°C (104°F), indicates 20°C (68°F)
When coolant temperature is above 40°C (104°F), indicates 80°C (176°F)
*4: Mode door voltage: 0 = VENT, 5 = DEF

Self-diagnosis (Cont'd)



STEP 2: ACTUATOR TEST

By pushing the AUTO SW once, self-diagnosis is changed from step 1 to step 2.

During inspection in STEP 2 mode, the auto amplifier will forcefully transmit an output to the affected actuators in response to the code shown on the display, as indicated in the table below. Each operating condition can be set in turn by pressing FAN or MODE SW.
Checks must be made for improper operation visually, by listening to any noise, or by touching air outlets with your hand, etc.

Press MODE SW. →

Display / Actuator				
Mode door	DEF	D/FOOT	B/L	VENT
Intake door	FRE	FRE	50% FRE	REC
Air mix door	Full Hot	Full Hot	30°C (86°F)	Full Cold
Compressor	OFF	OFF	ON	ON

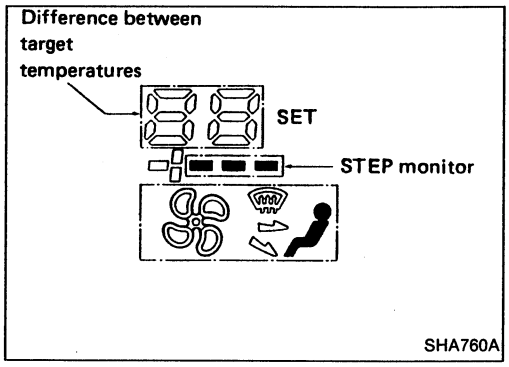
Operating condition of each actuator cannot be checked by indicators.

Press FAN SW. →

Display / Blower motor				
Voltage	4V	6V	9V	12V

* 1) Mode and fan speed can be set independently.
2) When appears, air mix door activates.
A stabilized outlet temperature 30°C (86°F) is reached after air mix door has been operating for approximately one minute.

Self-diagnosis (Cont'd)



STEP 3: AUXILIARY MECHANISM

Changes of difference between upper and lower target temperatures.

* Figures in parentheses "( )" refer to values for "°F" specifications.

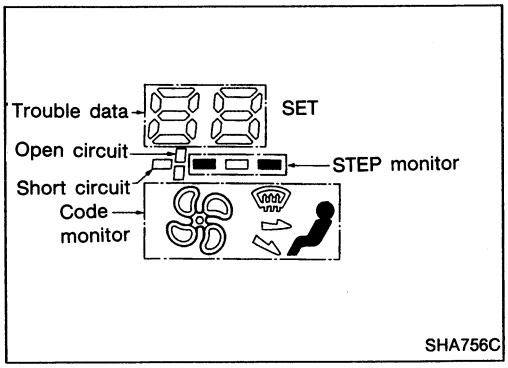
Each time the "MODE" switch is pressed, the number in the SET section advances. This number will increase up to 20 for °C specifications and 36 for °F specifications. Each time the "FAN" switch is pressed, the number decreases. This number decreases to –20 for °C specifications and –36 for °F specifications.

For °C specifications, pressing the "MODE" or "FAN" switch each time increases or decreases the data number by "1" degree (and by "1" through "3" degrees for °F specifications).

		← Press FAN SW.					Press MODE SW. →	
°C specifications	Data	–20	.....	–1	0	1	.....	20
	Difference between upper and lower target temperatures	–2.0°C	.....	–0.1°C	0°C	0.1°C	.....	2.0°C
°F specifications	Data	–36	.....	–2	0	2	.....	36
	Difference between upper and lower target temperatures	–3.6°F	.....	–0.2°F	0°F	0.2°F	.....	3.6°F

Difference between upper and lower target temperatures changed in the preceding procedure is kept until the next change is done or the battery cable is removed.

Self-diagnosis (Cont'd)



STEP 4: READOUT OF TROUBLE DATA STORED IN MEMORY

By pushing the AUTO SW once in step 3, self-diagnosis is changed to step 4.

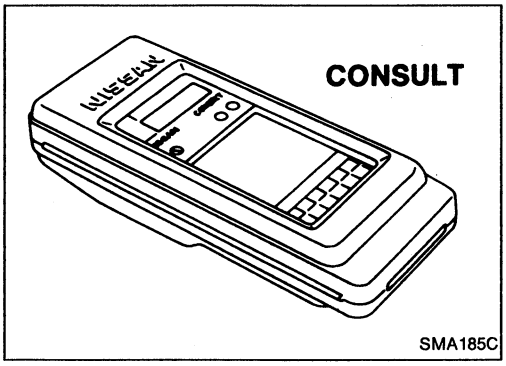
In this mode, each time the FAN or MODE SW is pressed, the code monitor changes in turn, and data or status of each sensor appears in the data monitor.

When the sensor becomes inoperative, the number of IGN ON/OFF operations occurring since the last trouble was detected appears in the SET section.

Open circuit or short circuit is indicated by "▯" or "▭".

Conditions for open or short circuit

Code	Sensor	Open circuit	Short circuit
	Ambient sensor	Less than –70°C (–94°F)	Greater than 141°C (286°F)
	Room upper sensor	Less than –38°C (–36°F)	Greater than 141°C (286°F)
	Room lower sensor	Less than –38°C (–36°F)	Greater than 141°C (286°F)
	DEF duct sensor	Less than –38°C (–36°F)	Greater than 141°C (286°F)
	VENT duct sensor	Less than –38°C (–36°F)	Greater than 141°C (286°F)
	Foot duct sensor	Less than –38°C (–36°F)	Greater than 141°C (286°F)
	Sunloaded sensor	Open circuit can not be detected by self-diagnosis.	Greater than 1.784 kW (1,534 kcal/h, 6,087 BTU/h) /m^2 [0.1657 kW (142.51 kcal/h, 565.5 BTU/h)/sq ft]

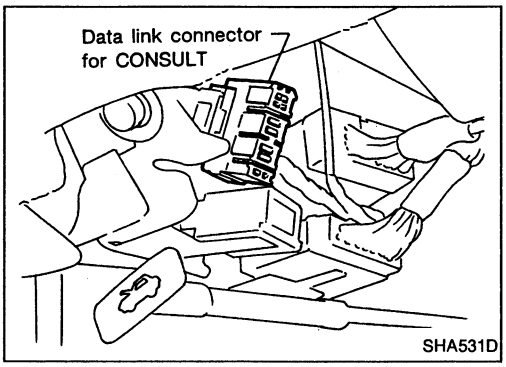


SMA185C

Consult

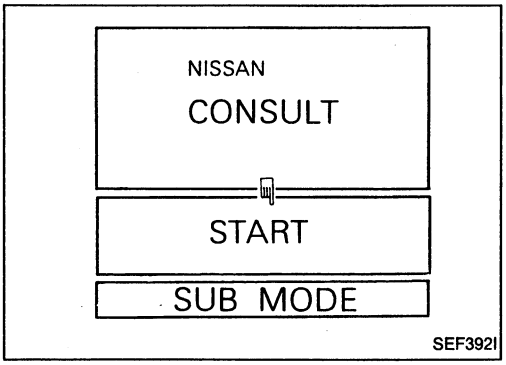
CONSULT INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located in left dash side panel.)



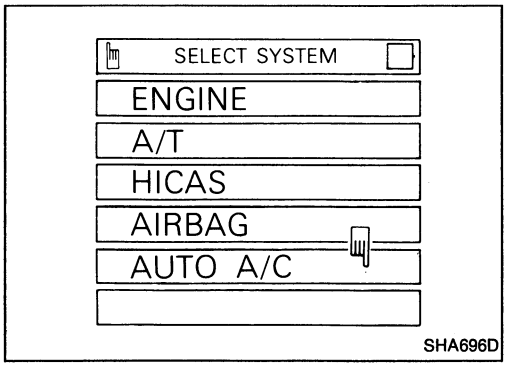
SHA531D

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



SEF392I

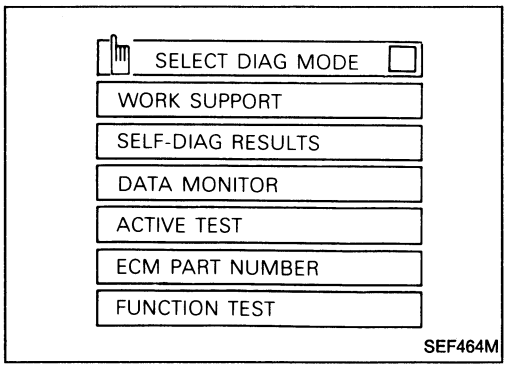
5. Touch "AUTO A/C".



SHA696D

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

For further information, read the CONSULT Operation Manual.



SEF464M

Preliminary Check

PRELIMINARY CHECK 1

Air outlet does not change.

Does this incident occur only in Manual Select Mode?

Yes → **Go to Diagnostic Procedure 24.**

No ↓

CHECK SENSOR CIRCUIT.

Read out trouble data with CONSULT.

or

Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

CONSULT indication	Self-diagnosis code No.	Self-diagnosis data	How to repair
Ambient sensor circuit is open		0	Go to Diagnostic procedure 2.
Ambient sensor circuit is shorted.		—	Go to Diagnostic procedure 3.
Upper in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 4.
Upper in-vehicle sensor circuit is shorted.		—	Go to Diagnostic procedure 5.
Lower in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 6.
Lower in-vehicle sensor circuit is shorted.		—	Go to Diagnostic procedure 7.
Defroster (duct) sensor circuit is open.		0	Go to Diagnostic procedure 8.
Defroster (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 9.
Vent (duct) sensor circuit is open.		0	Go to Diagnostic procedure 10.
Vent (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 11.
Foot (duct) sensor circuit is open.		0	Go to Diagnostic procedure 12.
Foot (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 13.
Sunload sensor circuit is shorted.		0	Go to Diagnostic procedure 14.

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

CHECK MODE DOOR OPERATION.

Set up "ACTIVE TEST" mode with CONSULT.

or

Set up self-diagnosis STEP 2.

Does air outlet change according to each mode?

Set mode	DEF	HEAT	B/L	VENT
Code No.				
Air outlet	DEF	FOOT/ DEF	FOOT/ VENT	VENT

Refer to **AIR DISTRIBUTION.**

O.K. ↓

Air outlet control system is normal.
Refer to **Specifications.**

N.G. →

CHECK SIDE LINK MECHANISM.
Refer to **Control Linkage Adjustment.**

N.G. → Repair or adjust.

O.K. ↓

Go to **Diagnostic Procedure 17 or 18.**

Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

Intake door does not change.

CHECK SENSOR CIRCUIT.
Read out trouble data with CONSULT.
or
Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

CONSULT indication	Self-diagnosis code No.	Self-diagnosis data	How to repair
Ambient sensor circuit is open		0	Go to Diagnostic procedure 2.
Ambient sensor circuit is shorted.		5	Go to Diagnostic procedure 3.
Upper in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 4.
Upper in-vehicle sensor circuit is shorted.		5	Go to Diagnostic procedure 5.
Lower in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 6.
Lower in-vehicle sensor circuit is shorted.		5	Go to Diagnostic procedure 7.
Defroster (duct) sensor circuit is open.		0	Go to Diagnostic procedure 8.
Defroster (duct) sensor circuit is shorted.		5	Go to Diagnostic procedure 9.
Vent (duct) sensor circuit is open.		0	Go to Diagnostic procedure 10.
Vent (duct) sensor circuit is shorted.		5	Go to Diagnostic procedure 11.
Foot (duct) sensor circuit is open.		0	Go to Diagnostic procedure 12.
Foot (duct) sensor circuit is shorted.		5	Go to Diagnostic procedure 13.
Sunload sensor circuit is shorted.		0	Go to Diagnostic procedure 14.

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K.

CHECK MODE DOOR OPERATION.
Set up "ACTIVE TEST" mode with CONSULT.
or
Set up self-diagnosis STEP 2.
Does intake air change according to each ordered position?

Set mode	FRE		FRE/REC	REC
Code No.				
Air intake	FRE		FRE/REC	REC

O.K. ↓

Intake door control system is normal.
Refer to **Specifications.**

N.G. →

CHECK INTAKE DOOR ROD or LEVER MECHANISM.
Refer to **Control Linkage Adjustment.**

N.G. → Repair or adjust.

O.K. ↓

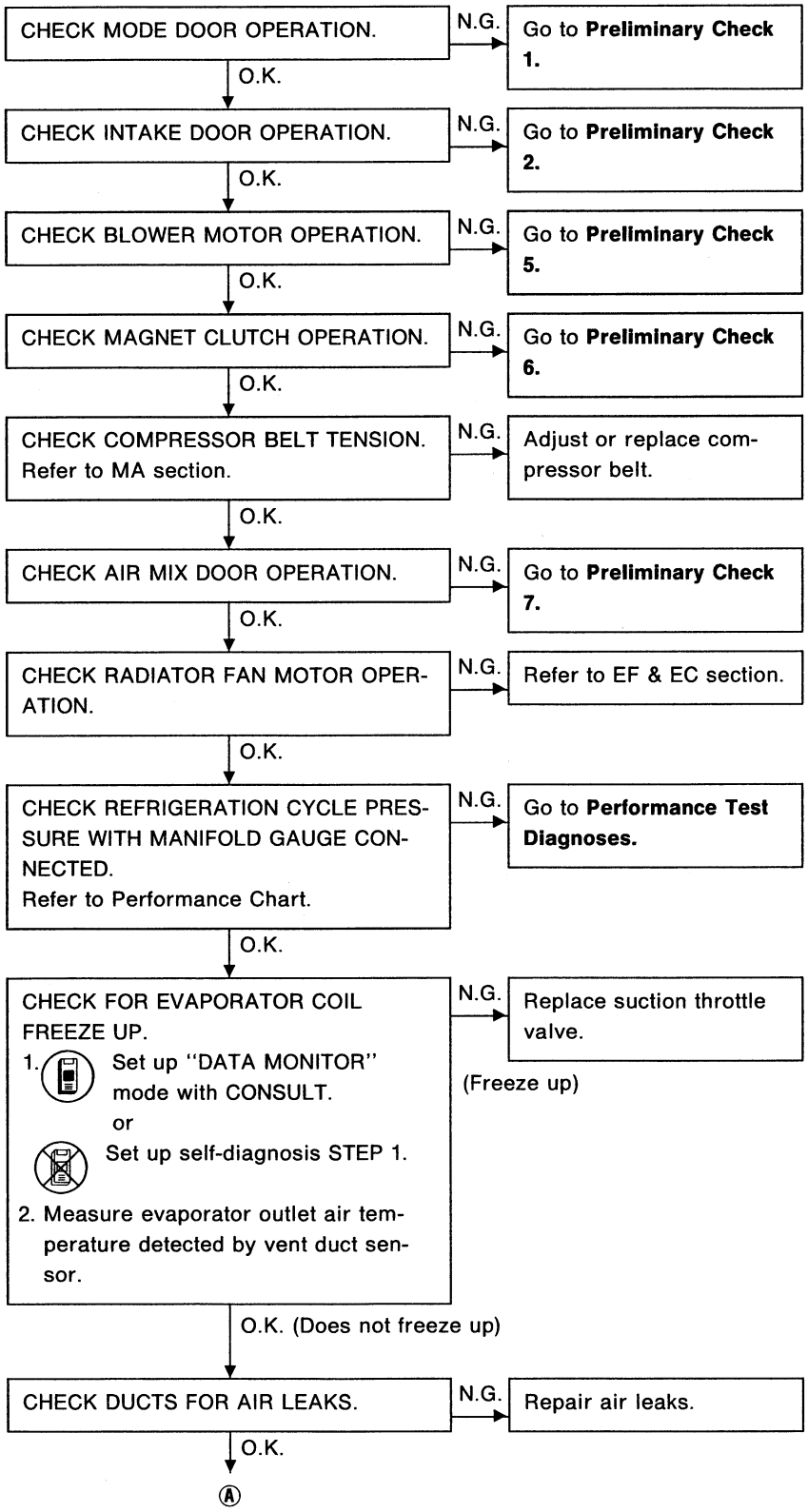
Go to **Diagnostic Procedure 16.**

Preliminary Check (Cont'd)

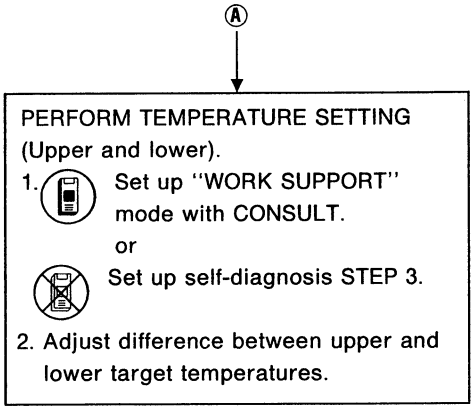
PRELIMINARY CHECK 3

Insufficient cooling

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



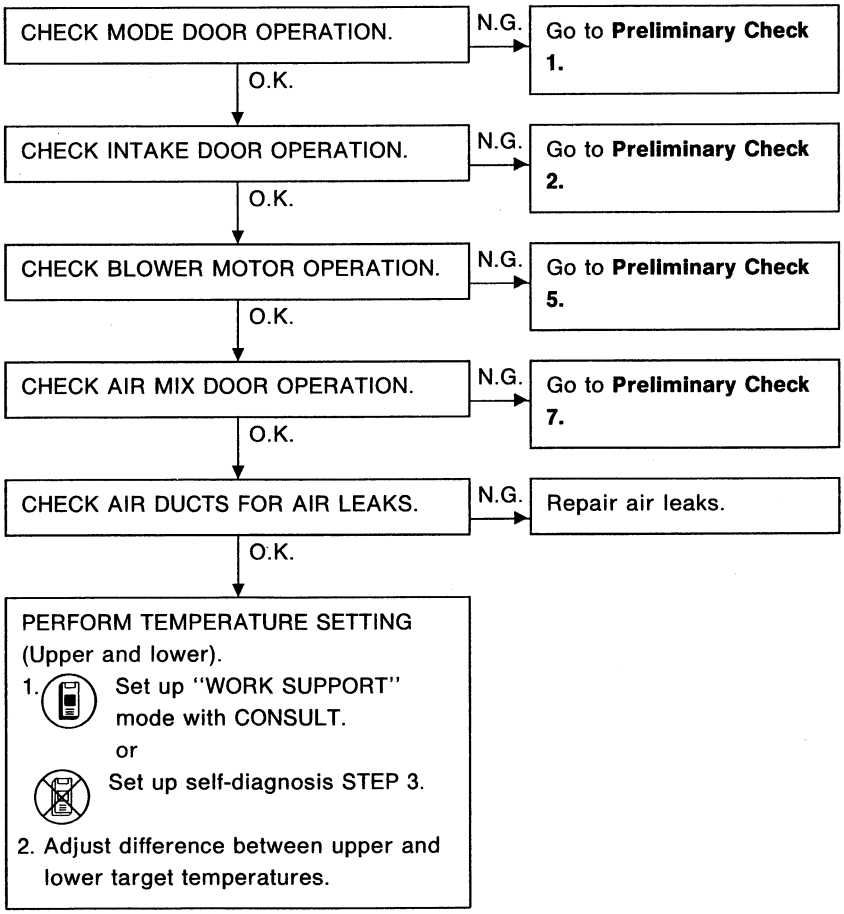
Preliminary Check (Cont'd)



PRELIMINARY CHECK 4

Insufficient heating

- Check coolant level, engine coolant temperature and heater hoses and read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

Blower motor operation is malfunctioning.

Does this incident occur only in Manual Select Mode?

Yes → **Go to Diagnostic Procedure 24.**

No ↓

CHECK SENSOR CIRCUIT.

Read out trouble data with CONSULT.

or

Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

CONSULT indication	Self-diagnosis code No.	Self-diagnosis data	How to repair
Ambient sensor circuit is open		0	Go to Diagnostic procedure 2.
Ambient sensor circuit is shorted.		—	Go to Diagnostic procedure 3.
Upper in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 4.
Upper in-vehicle sensor circuit is shorted.		—	Go to Diagnostic procedure 5.
Lower in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 6.
Lower in-vehicle sensor circuit is shorted.		—	Go to Diagnostic procedure 7.
Defroster (duct) sensor circuit is open.		0	Go to Diagnostic procedure 8.
Defroster (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 9.
Vent (duct) sensor circuit is open.		0	Go to Diagnostic procedure 10.
Vent (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 11.
Foot (duct) sensor circuit is open		0	Go to Diagnostic procedure 12.
Foot (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 13.
Sunload sensor circuit is shorted.		0	Go to Diagnostic procedure 14.

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK BLOWER MOTOR OPERATION.

Set up "ACTIVE TEST" mode with CONSULT.

or

Set up self-diagnosis STEP 2.

Does blower motor speed change according to each ordered fan speed?

Set fan speed	4V	6V	9V	12V
Code No.				
Fan speed				

N.G. → Go to **Diagnostic Procedure 25.**

Is engine coolant temperature below 40°C (104°F) and foot duct temperature below 30°C (86°F)?

N.G. → Blower motor operation is normal. Refer to **Fan speed control specification.**

O.K. ↓

IS BLOWER MOTOR CONTROLLED UNDER FAN STARTING SPEED CONTROL?
Refer to **Starting fan speed control specification.**

No → Check engine coolant temperature sensor control circuit. Refer to EF & EC section.

Yes ↓

Blower motor operation is normal.

Preliminary Check (Cont'd)

PRELIMINARY CHECK 6

Magnet clutch does not engage.

CHECK SENSOR CIRCUIT.

Read out trouble data with CONSULT.

or

Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

CONSULT indication	Self-diagnosis code No.	Self-diagnosis data	How to repair
Ambient sensor circuit is open		0	Go to Diagnostic procedure 2.
Ambient sensor circuit is shorted.		∞	Go to Diagnostic procedure 3.
Upper in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 4.
Upper in-vehicle sensor circuit is shorted.		∞	Go to Diagnostic procedure 5.
Lower in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 6.
Lower in-vehicle sensor circuit is shorted.		∞	Go to Diagnostic procedure 7.
Defroster (duct) sensor circuit is open.		0	Go to Diagnostic procedure 8.
Defroster (duct) sensor circuit is shorted.		∞	Go to Diagnostic procedure 9.
Vent (duct) sensor circuit is open.		0	Go to Diagnostic procedure 10.
Vent (duct) sensor circuit is shorted.		∞	Go to Diagnostic procedure 11.
Foot (duct) sensor circuit is open.		0	Go to Diagnostic procedure 12.
Foot (duct) sensor circuit is shorted.		∞	Go to Diagnostic procedure 13.
Sunload sensor circuit is shorted.		0	Go to Diagnostic procedure 14.

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK MAGNET CLUTCH OPERATION.

Set up "ACTIVE TEST" mode with CONSULT.

or

Set up self-diagnosis STEP 2.

Check if magnet clutch engages according to order from CONSULT or each code No.

Set fan speed	4V	6V	9V	12V
Code No.				
Fan speed				

O.K. ↓

Magnet clutch control system is normal.
Refer to **MAGNET CLUTCH CONTROL.**

N.G. →

CHECK REFRIGERANT.
Connect manifold gauge then check system pressure.

N.G. → Check for refrigerant leaks.

O.K. ↓

Go to **Diagnostic Procedure 19.**

Preliminary Check (Cont'd)

PRELIMINARY CHECK 7

Discharged air temperature does not change.

CHECK SENSOR CIRCUIT.

Read out trouble data with CONSULT.

or

Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. → CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

CONSULT indication	Self-diagnosis code No.	Self-diagnosis data	How to repair
Ambient sensor circuit is open		0	Go to Diagnostic procedure 2.
Ambient sensor circuit is shorted.		—	Go to Diagnostic procedure 3.
Upper in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 4.
Upper in-vehicle sensor circuit is shorted.		—	Go to Diagnostic procedure 5.
Lower in-vehicle sensor circuit is open.		0	Go to Diagnostic procedure 6.
Lower in-vehicle sensor circuit is shorted.		—	Go to Diagnostic procedure 7.
Defroster (duct) sensor circuit is open.		0	Go to Diagnostic procedure 8.
Defroster (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 9.
Vent (duct) sensor circuit is open.		0	Go to Diagnostic procedure 10.
Vent (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 11.
Foot (duct) sensor circuit is open.		0	Go to Diagnostic procedure 12.
Foot (duct) sensor circuit is shorted.		—	Go to Diagnostic procedure 13.
Sunload sensor circuit is shorted.		0	Go to Diagnostic procedure 14.

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K.

CHECK AIR MIX DOOR OPERATION.

Set up "ACTIVE TEST" mode with CONSULT.

or

Set up self-diagnosis STEP 2.

Check if discharge air temperature changes as in following chart.

Set magnet clutch operation	OFF		ON	
Code No.				
Magnet clutch operation	OFF		ON	

O.K. → Air mix door control system is normal. Refer to **Specification of air mix door control.**

N.G. → CHECK AIR MIX DOOR MECHANISM. Refer to **Control Linkage Adjustment.**

N.G. → Repair or adjust.

O.K. → Go to **Diagnostic Procedure 15.**

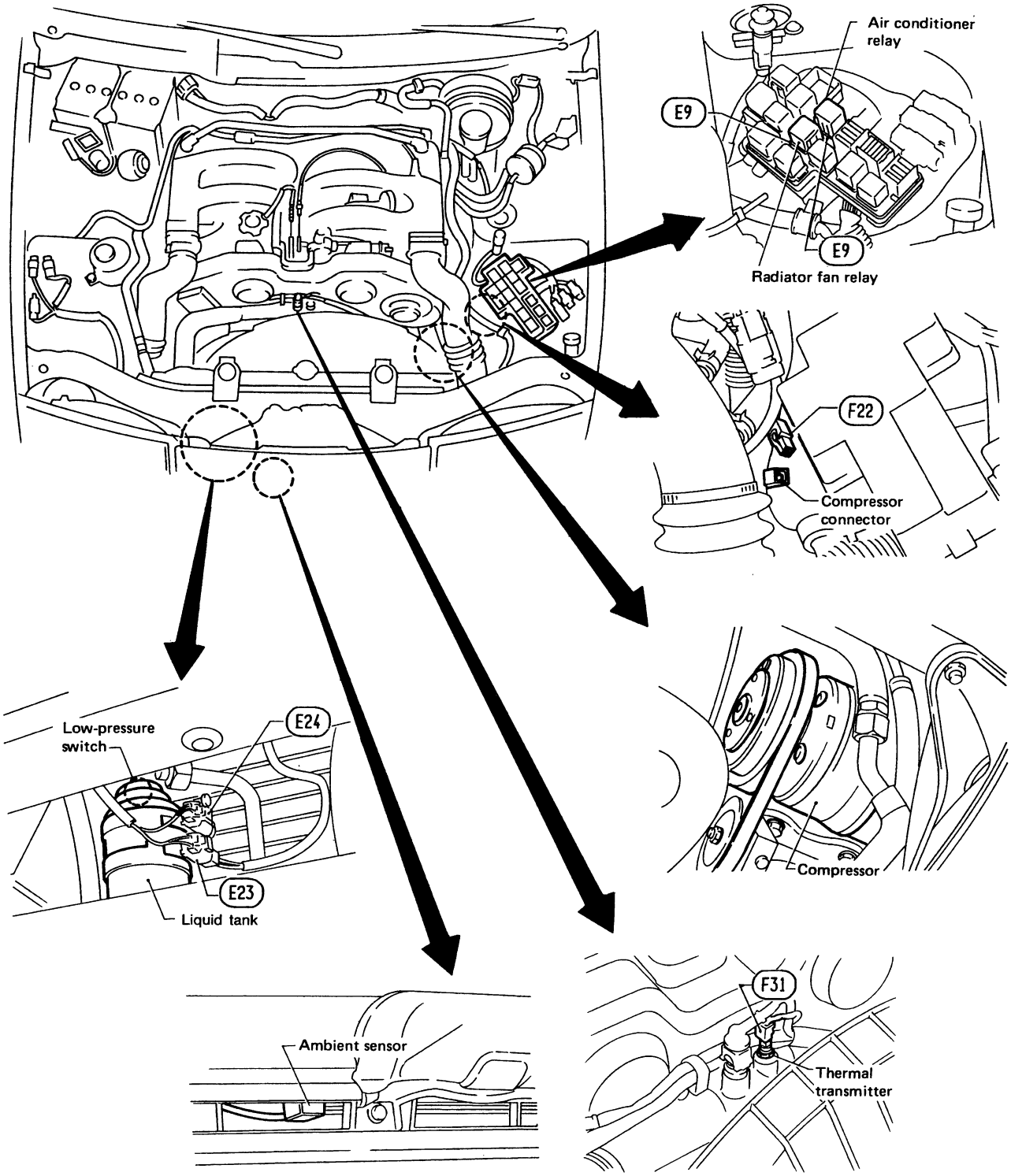
PRELIMINARY CHECK 8

Noise

Refer to page HA-55.

Harness Layout for A/C System

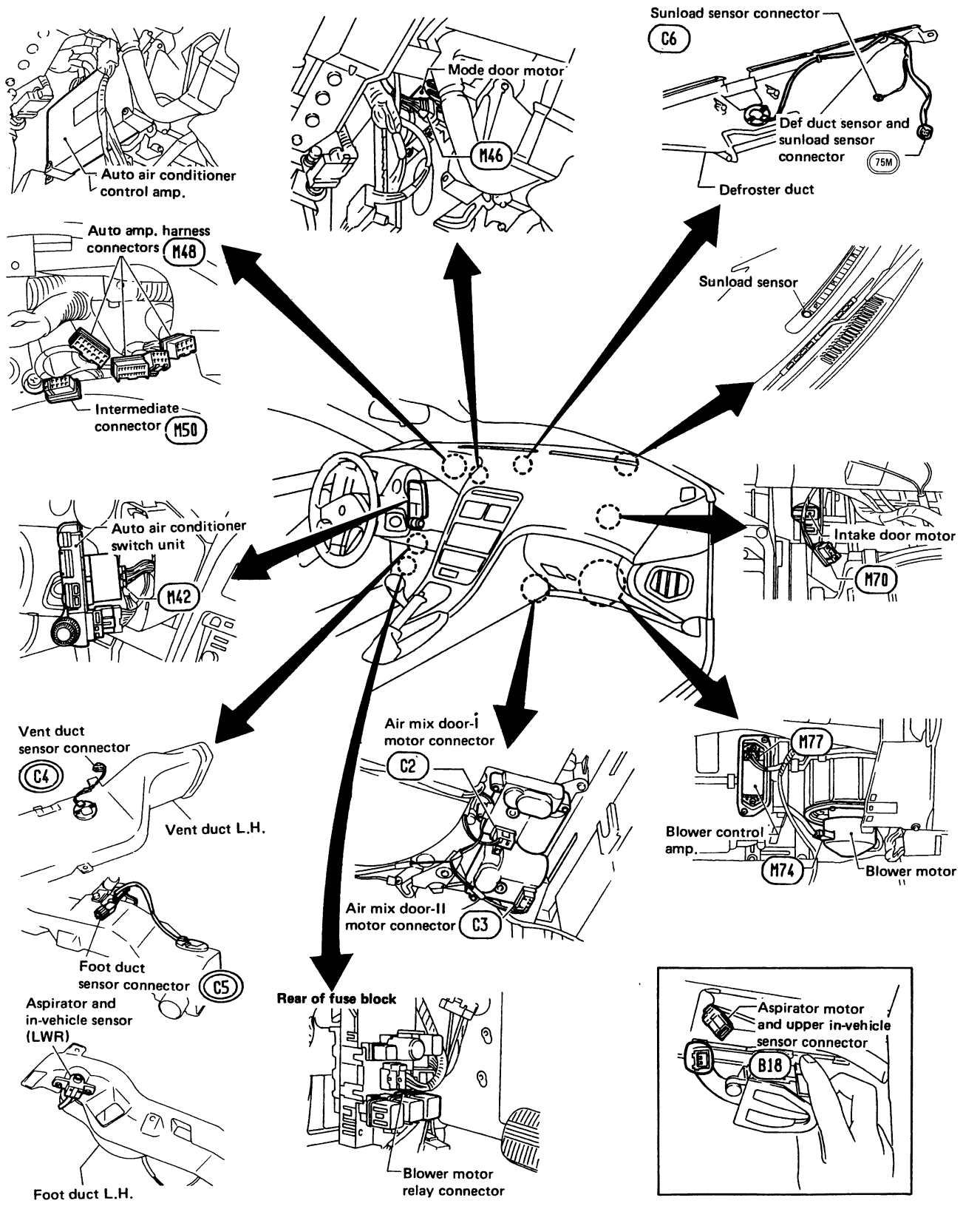
Engine compartment



SHA524D

Harness Layout for A/C System (Cont'd)

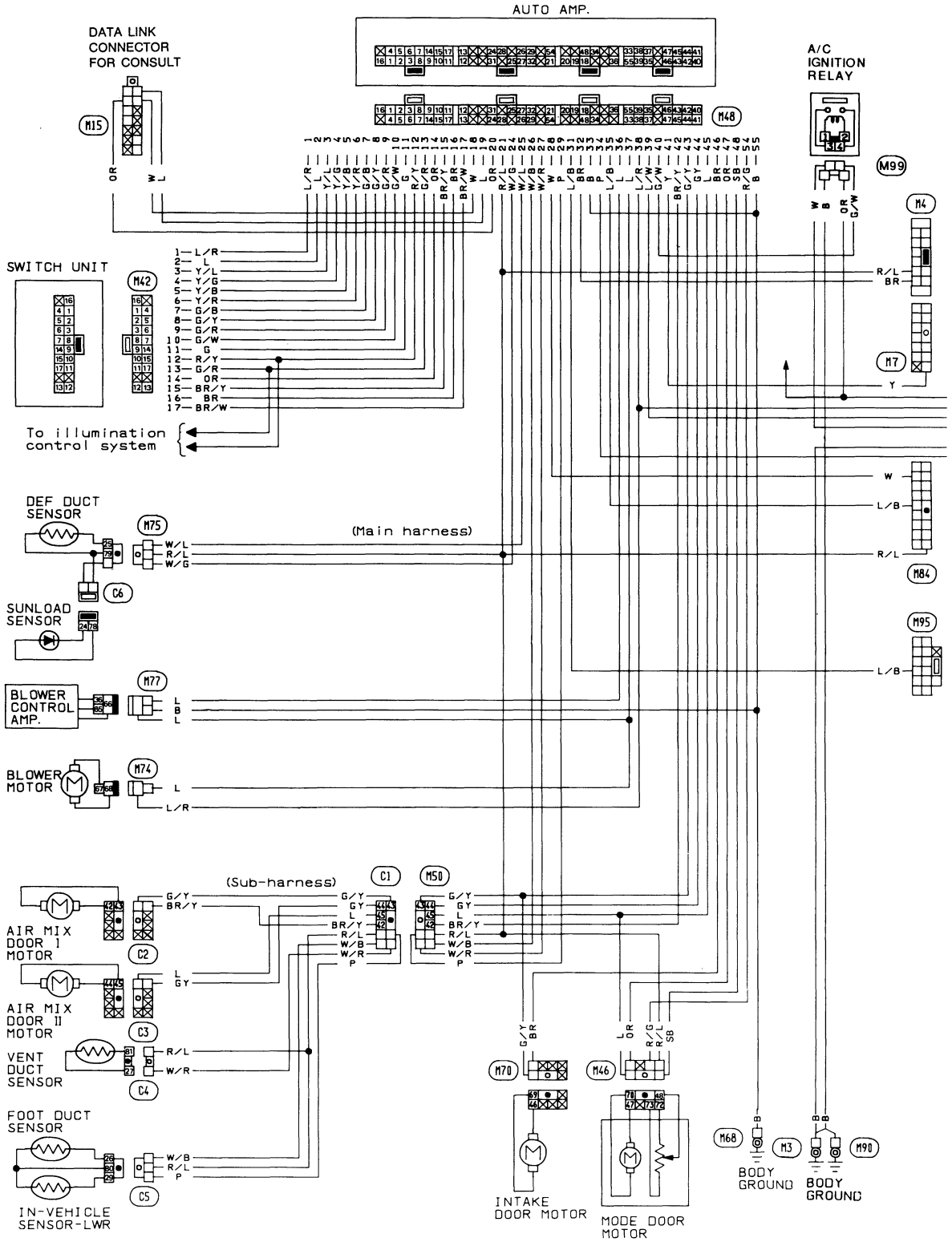
Passenger compartment



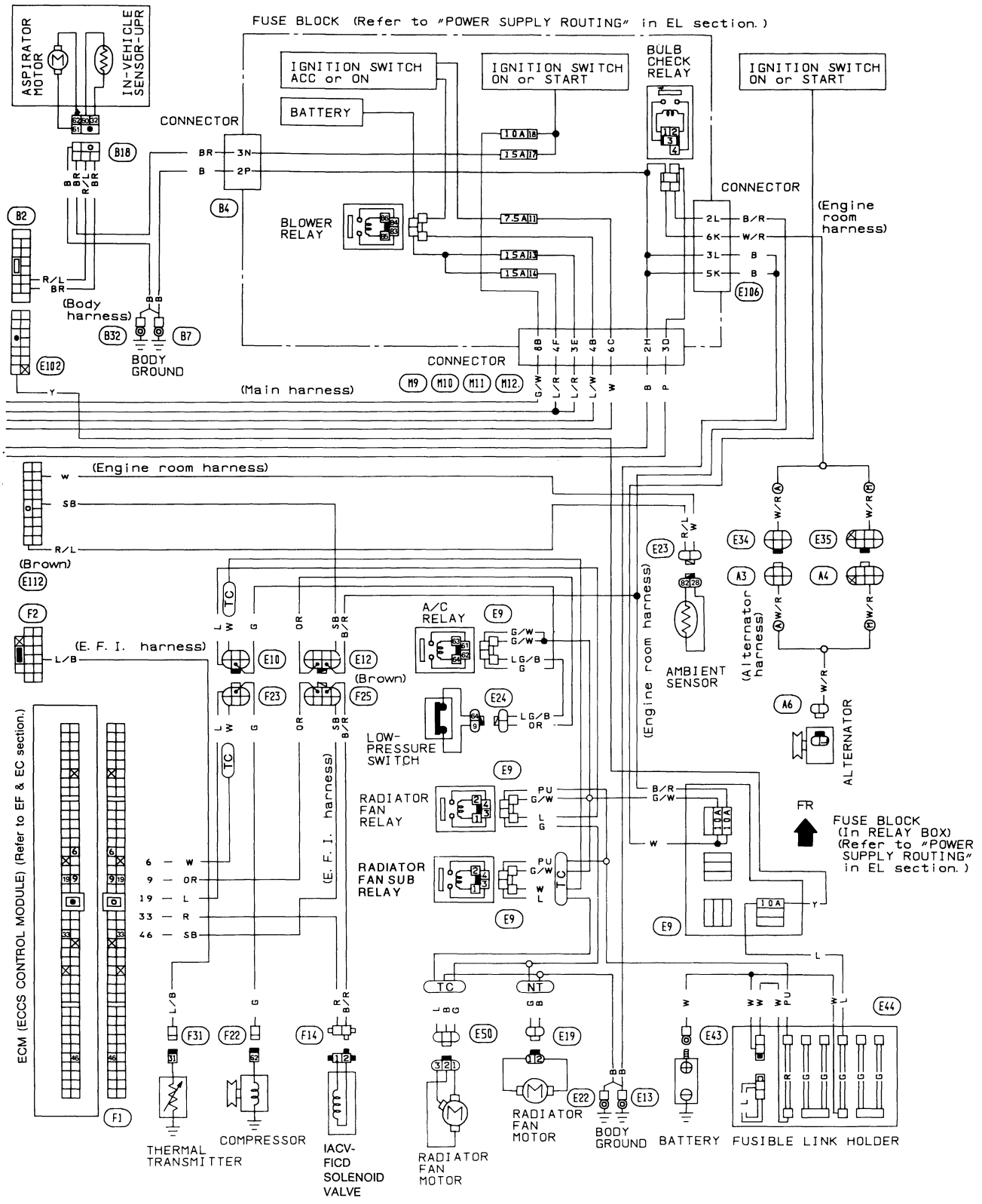
SHA543C

Wiring Diagram

(TC): Turbocharger model
(NT): Non-turbocharger model

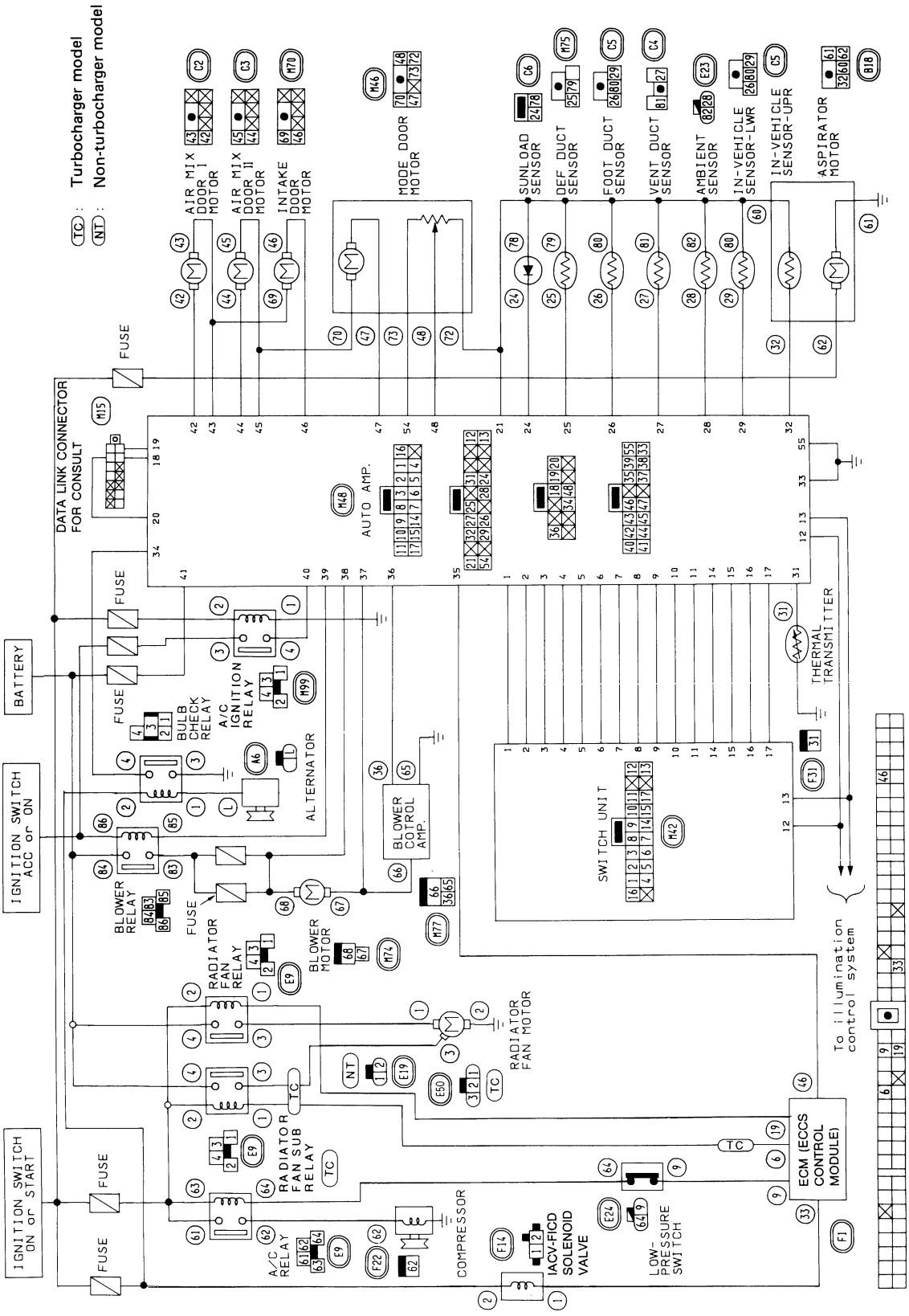


Wiring Diagram (Cont'd)



SHA640D

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-100, HA-101.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

SHA641D

Main Power Supply and Ground Circuit Check

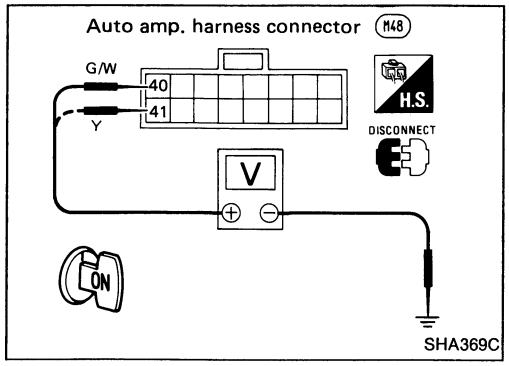
POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

Refer to "POWER SUPPLY ROUTING" in section EL and Wiring Diagram — Auto Air Conditioner.

AUTO AMP. REMOVAL

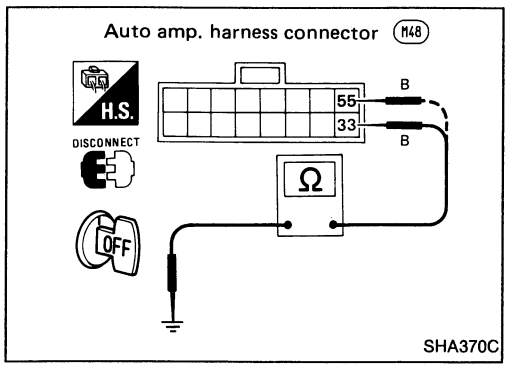
1. Remove driver side instrument lower lid.
2. Remove vent duct.
3. Remove auto amp. with harness connected.



AUTO AMP. CHECK

1. Disconnect auto amp. harness connectors.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ㊵ or No. ㊶ and body ground.

Voltmeter terminal		Voltage (Approx.)
⊕	⊖	
㊵	Body ground	12V
㊶		



Check body ground circuit for control unit with ignition switch OFF.

1. Disconnect auto amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check continuity between terminal No. ㉝ or ㊺ and body ground.

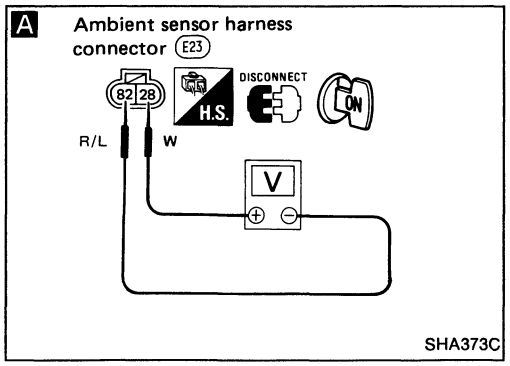
Ohmmeter terminal		Continuity
⊕	⊖	
㉝	Body ground	Yes
㊺		

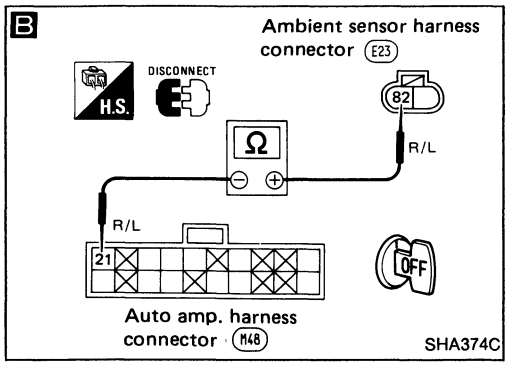
Diagnostic Procedure 1

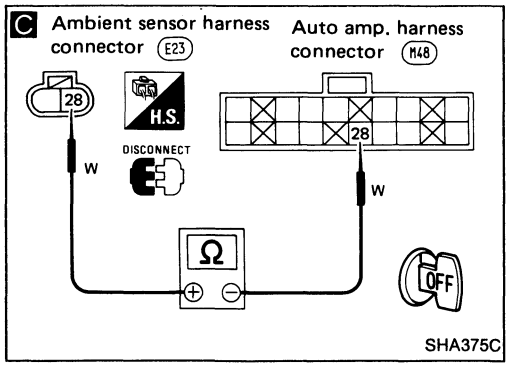
SYMPTOM: Self-diagnosis detects intermittent short or open circuit in each sensor circuit.

Check each connector connection as shown in the following table, and check each line's condition.

Malfunctioning circuit	Connector No. to be checked			
	Main harness	Engine room harness	Body harness	A/C sub-harness
Ambient sensor	M48	E23 E112		
Upper in-vehicle sensor	M4 M48		B2 B18	
Lower in-vehicle sensor	M48 M50			C5 C1
DEF duct sensor	M48 M75			
VENT duct sensor	M48 M50			C1 C4
Floor duct sensor	M48 M50			C5 C1
Sunload sensor	M48 M75			C6







Diagnostic Procedure 2

SYMPTOM: Ambient sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK AMBIENT SENSOR CIRCUIT BETWEEN AMBIENT SENSOR AND AUTO AMP.
Disconnect ambient sensor harness connector.
Do approx. 5 volts exist between ambient sensor harness connector terminal No. 28 and 82?

N.G. → Disconnect auto amp. harness connector.

O.K. ↓

CHECK AMBIENT SENSOR.
(Refer to Electrical Components Inspection.)

O.K. → Replace auto amp.

N.G. → Replace ambient sensor.

B

Disconnect auto amp. harness connector. ↓

Check circuit continuity between ambient sensor harness connector terminal No. 82 and auto amp. harness connector terminal No. 21.

Note

O.K. ↓

C

Check circuit continuity between ambient sensor harness connector terminal No. 28 and auto amp. harness connector terminal No. 28.

Note

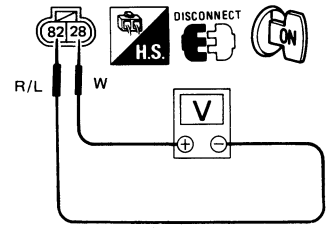
O.K. ↓

Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A

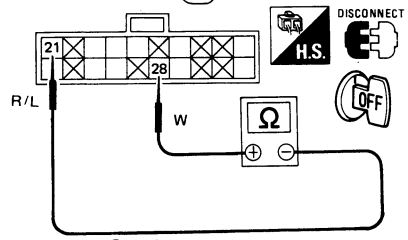
Ambient sensor harness connector (E23)



SHA376C

B

Auto amp. harness connector (M48)



Continuity should not exist

SHA377C

Diagnostic Procedure 3

SYMPTOM: Ambient sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK AMBIENT SENSOR CIRCUIT BETWEEN AMBIENT SENSOR AND AUTO AMP.
Disconnect ambient sensor harness connector.
Do approx. 5 volts exist between ambient sensor harness connector terminal No. (28) and (82)?

N.G. → Disconnect auto amp. harness connector.

B

Note

Check the circuit between auto amp. harness connector terminal No. (28) and (21) is not shorted.

O.K. → Replace auto amp.

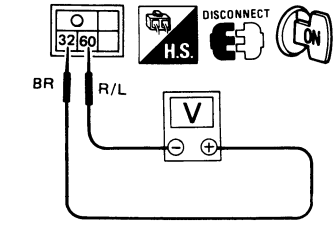
O.K. → CHECK AMBIENT SENSOR. (Refer to Electrical Components Inspection.)

O.K. → Replace auto amp.

N.G. → Replace ambient sensor.

A

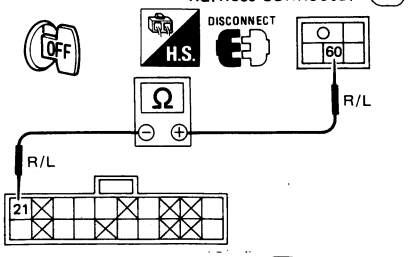
In-vehicle upper sensor harness connector (B18)



SHA378C

B

In-vehicle upper sensor harness connector (B18)

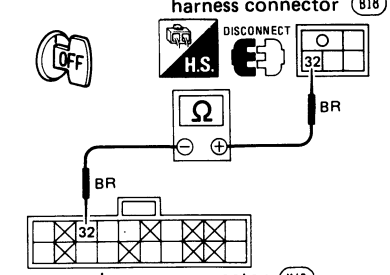


Auto amp. harness connector (M48)

SHA148D

C

In-vehicle upper sensor harness connector (B18)



Auto amp. harness connector (M48)

SHA380C

Diagnostic Procedure 4

SYMPTOM: In-vehicle upper sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK IN-VEHICLE UPPER SENSOR CIRCUIT BETWEEN IN-VEHICLE UPPER SENSOR AND AUTO AMP.
Disconnect in-vehicle upper sensor harness connector.
Do approx. 5 volts exist between in-vehicle upper sensor harness connector terminal No. (32) and (60)?

N.G. → Disconnect auto amp. harness connector.

B

Note

Check circuit continuity between in-vehicle upper sensor harness connector terminal No. (60) and auto amp. harness connector terminal No. (21).

O.K. → C

Note

Check circuit continuity between in-vehicle upper sensor harness connector terminal No. (32) and auto amp. harness connector terminal No. (32).

O.K. → Replace auto amp.

O.K. → CHECK IN-VEHICLE UPPER SENSOR. (Refer to Electrical Components Inspection.)

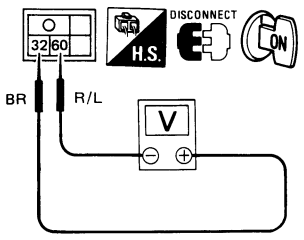
O.K. → Replace auto amp.

N.G. → Replace in-vehicle upper sensor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

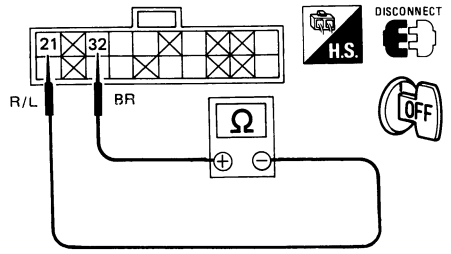
A

In-vehicle upper sensor harness connector (B18)



SHA381C

B Auto amp. harness connector (M48)



Continuity should not exist.

SHA382C

Diagnostic Procedure 5

SYMPTOM: In-vehicle upper sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK IN-VEHICLE UPPER SENSOR BETWEEN IN-VEHICLE UPPER SENSOR AND AUTO AMP.
Disconnect in-vehicle upper sensor harness connector.
Do approx. 5 volts exist between in-vehicle upper sensor harness connector terminal No. (32) and (60)?

N.G. → Disconnect auto amp. harness connector.

B

Check the circuit between auto amp. harness connector terminal No. (32) and (21) is not shorted.

Note

O.K. → Replace auto amp.

O.K. →

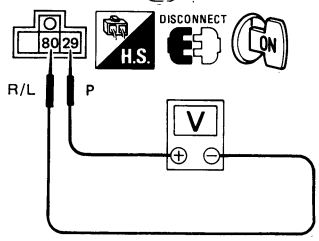
CHECK IN-VEHICLE UPPER SENSOR. (Refer to Electrical Components Inspection.)

O.K. → Replace auto amp.

N.G. → Replace in-vehicle upper sensor.

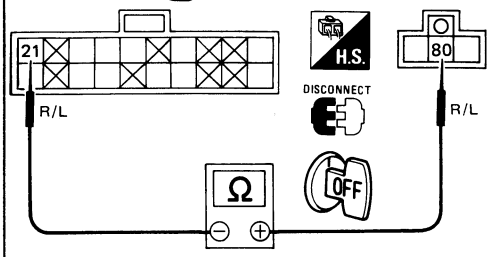
A

In-vehicle lower sensor harness connector (C5)



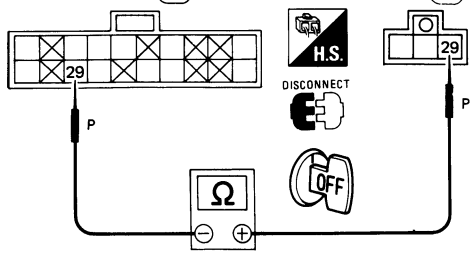
SHA383C

B Auto amp. harness connector (M48) In-vehicle lower sensor harness connector (C5)



SHA384C

C Auto amp. harness connector (M48) In-vehicle lower sensor harness connector (C5)



SHA385C

Diagnostic Procedure 6

SYMPTOM: In-vehicle lower sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK IN-VEHICLE LOWER SENSOR CIRCUIT BETWEEN IN-VEHICLE LOWER SENSOR AND AUTO AMP.
Disconnect in-vehicle lower sensor harness connector.
Do approx. 5 volts exist between in-vehicle lower sensor harness connector terminal No. (29) and (80)?

N.G. → Disconnect auto amp. harness connector.

B

Check circuit continuity between in-vehicle lower sensor harness connector terminal No. (80) and auto amp. harness connector terminal No. (21).

Note

O.K. →

C

Check circuit continuity between in-vehicle lower sensor harness connector terminal No. (29) and auto amp. harness connector terminal No. (29).

Note

O.K. → Replace auto amp.

O.K. →

CHECK IN-VEHICLE LOWER SENSOR. (Refer to Electrical Components Inspection.)

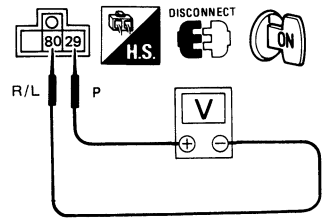
O.K. → Replace auto amp.

N.G. → Replace in-vehicle lower sensor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A

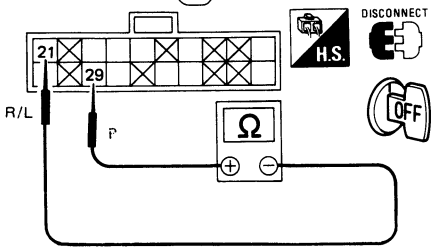
In-vehicle lower sensor harness connector (C5)



SHA386C

B

Auto amp. harness connector (M48)



Continuity should not exist.

SHA387C

Diagnostic Procedure 7

SYMPTOM: In-vehicle lower sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK IN-VEHICLE LOWER SENSOR CIRCUIT BETWEEN IN-VEHICLE LOWER SENSOR AND AUTO AMP.
Disconnect in-vehicle lower sensor harness connector.
Do approx. 5 volts exist between in-vehicle lower sensor harness connector terminal No. (29) and (80)?

N.G. → Disconnect auto amp. harness connector.

B Note

Check the circuit continuity between auto amp. harness connector terminal No. (29) and (21) is not shorted.

O.K. → Replace auto amp.

O.K.

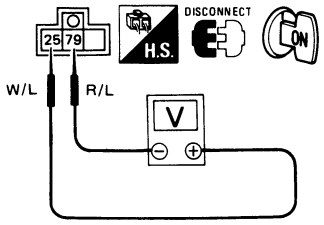
CHECK IN-VEHICLE LOWER SENSOR. (Refer to Electrical Components Inspection.)

O.K. → Replace auto amp.

N.G. → Replace in-vehicle lower sensor.

A

Def. duct sensor harness connector (M75)

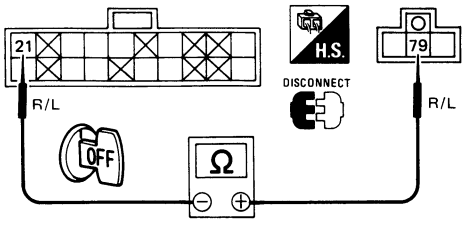


SHA388C

B

Auto amp. harness connector (M48)

Def. duct sensor harness connector (M75)

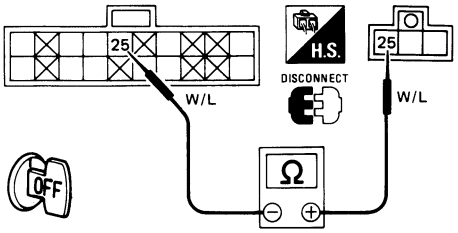


SHA389C

C

Auto amp. harness connector (M48)

Def. duct sensor harness connector (M75)



SHA390C

Diagnostic Procedure 8

SYMPTOM: Def. duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK DEF. DUCT SENSOR CIRCUIT BETWEEN DEF. DUCT SENSOR AND AUTO AMP.
Disconnect def. duct sensor harness connector.
Do approx. 5 volts exist between def. duct sensor harness connector terminal No. (25) and (79)?

N.G. → Disconnect auto amp. harness connector.

B Note

Check circuit continuity between def. duct sensor harness connector terminal No. (79) and auto amp. harness connector terminal No. (21).

O.K. → C Note

Check circuit continuity between def. duct sensor harness connector terminal No. (25) and auto amp. harness terminal No. (25).

O.K. → Replace auto amp.

O.K.

CHECK DEF. DUCT SENSOR. (Refer to Electrical Components Inspection.)

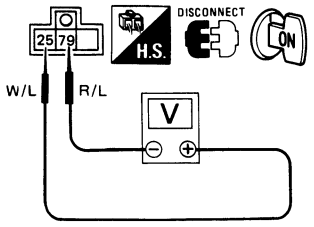
O.K. → Replace auto amp.

N.G. → Replace def. duct sensor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A

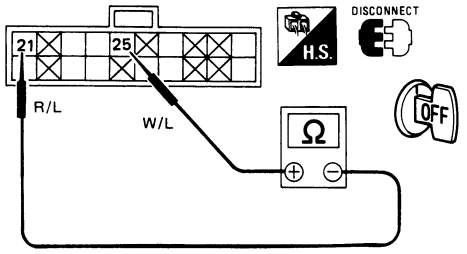
Def. duct sensor harness connector (M75)



SHA391C

B

Auto amp. harness connector (M48)



Continuity should not exist.

SHA392C

Diagnostic Procedure 9

SYMPTOM: Def. duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK DEF. DUCT SENSOR BETWEEN DEF. DUCT SENSOR AND AUTO AMP.
Disconnect def. duct sensor harness connector.
Do approx. 5 volts exist between def. duct sensor harness connector terminal No. (25) and (79)?

N.G. → Disconnect auto amp. harness connector.

B

Check the circuit between auto amp. harness connector terminal No. (25) and (21) is not shorted.

Note

O.K. → Replace auto amp.

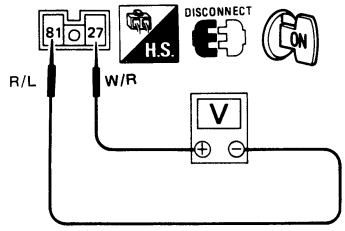
O.K. → CHECK DEF. DUCT SENSOR. (Refer to Electrical Components Inspection.)

O.K. → Replace auto amp.

N.G. → Replace def. duct sensor.

A

Vent duct sensor harness connector (C4)

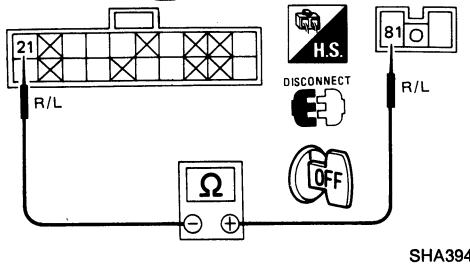


SHA393C

B

Auto amp. harness connector (M48)

Vent duct sensor harness connector (C4)

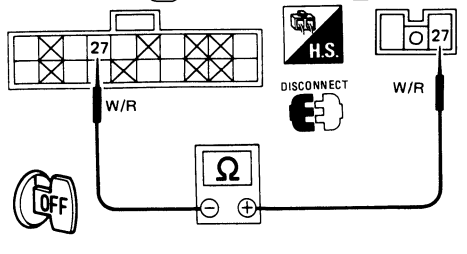


SHA394C

C

Auto amp. harness connector (M48)

Vent duct sensor harness connector (C4)



SHA395C

Diagnostic Procedure 10

SYMPTOM: Vent duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK VENT DUCT SENSOR CIRCUIT BETWEEN VENT DUCT SENSOR AND AUTO AMP.
Disconnect vent duct sensor harness connector.
Do approx. 5 volts exist between vent duct sensor harness connector terminal No. (27) and (81)?

N.G. → Disconnect auto amp. harness connector.

B

Check circuit continuity between vent duct sensor harness connector terminal No. (81) and auto amp. harness connector terminal No. (21).

Note

O.K. → C

Check circuit continuity between vent duct sensor harness connector terminal No. (27) and auto amp. harness connector terminal No. (27).

Note

O.K. → Replace auto amp.

O.K. → CHECK VENT DUCT SENSOR. (Refer to Electrical Components Inspection.)

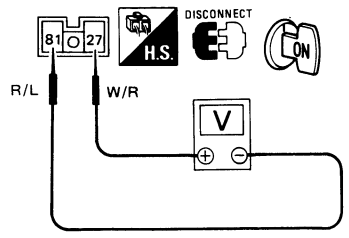
O.K. → Replace auto amp.

N.G. → Replace vent duct sensor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A

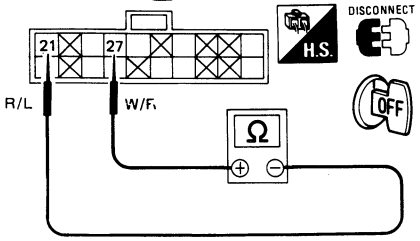
Vent duct sensor harness connector (C4)



SHA396C

B

Auto amp. harness connector (M48)



Continuity should not exist.

SHA397C

Diagnostic Procedure 11

SYMPTOM: Vent duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK VENT DUCT SENSOR BETWEEN VENT DUCT SENSOR AND AUTO AMP.
Disconnect vent duct sensor harness connector.
Do approx. 5 volts exist between vent duct sensor harness connector terminal No. (27) and (81)?

N.G. → Disconnect auto amp. harness connector.

B

Note: Check the circuit between auto amp. harness connector terminal No. (27) and (21) is not shorted.

O.K. → Replace auto amp.

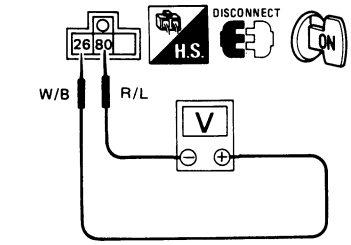
O.K. → CHECK VENT DUCT SENSOR. (Refer to Electrical Components Inspection.)

O.K. → Replace auto amp.

N.G. → Replace vent duct sensor.

A

Foot duct sensor harness connector (C5)

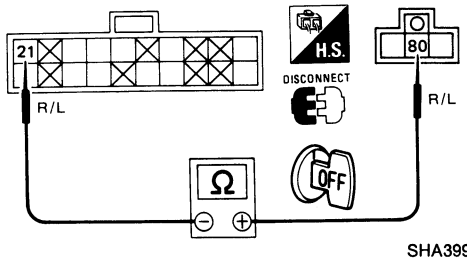


SHA398C

B

Auto amp. harness connector (M48)

Foot duct sensor harness connector (C5)

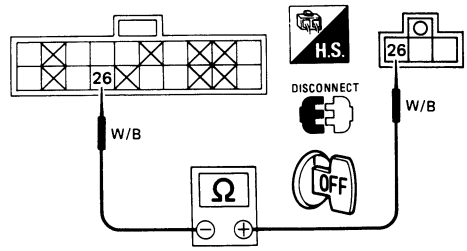


SHA399C

C

Auto amp. harness connector (M48)

Foot duct sensor harness connector (C5)



SHA400C

Diagnostic Procedure 12

SYMPTOM: Foot duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK FOOT DUCT SENSOR CIRCUIT BETWEEN FOOT DUCT SENSOR AND AUTO AMP.
Disconnect foot duct sensor harness connector.
Do approx. 5 volts exist between foot duct sensor harness connector terminal No. (26) and (80)?

N.G. → Disconnect auto amp. harness connector.

B

Note: Check circuit continuity between foot duct sensor harness connector terminal No. (80) and auto amp. harness connector terminal No. (21).

O.K. → C

Note: Check circuit continuity between foot duct sensor harness connector terminal No. (26) and auto amp. harness connector terminal No. (26).

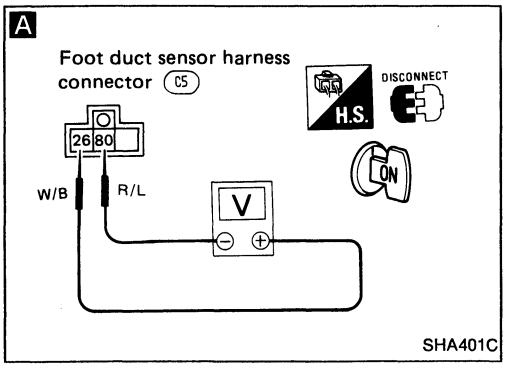
O.K. → Replace auto amp.

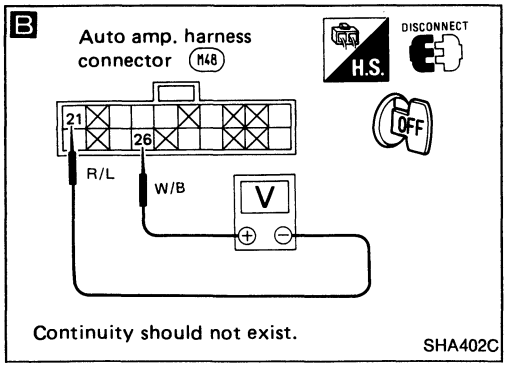
O.K. → CHECK FOOT DUCT SENSOR. (Refer to Electrical Components Inspection.)

O.K. → Replace auto amp.

N.G. → Replace foot duct sensor.

Note:
If the result is N.G. after checking insulation of each terminal, repair harness or connector.





Diagnostic Procedure 13

SYMPTOM: Foot duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK FOOT DUCT SENSOR BETWEEN FOOT DUCT SENSOR AND AUTO AMP.
Disconnect foot duct sensor harness connector.
Do approx. 5 volts exist between foot duct sensor harness connector terminal No. 26 and 80?

N.G. → Disconnect auto amp. harness connector.

B

Note

Check the circuit between auto amp. harness connector terminal No. 26 and 21 is not shorted.

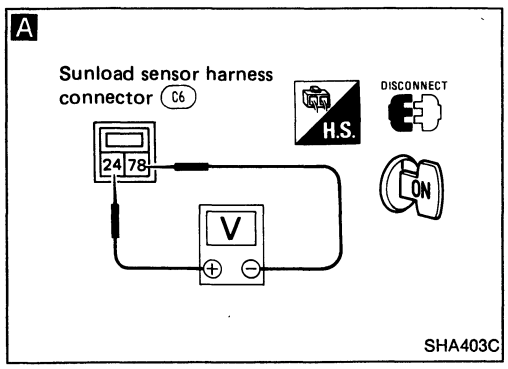
O.K. → Replace auto amp.

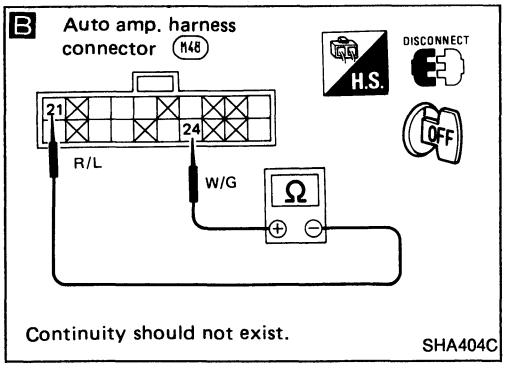
O.K. →

CHECK FOOT DUCT SENSOR.
(Refer to Electrical Components Inspection.)

O.K. → Replace auto amp.

N.G. → Replace foot duct sensor.





Diagnostic Procedure 14

SYMPTOM: Sunload sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

A

CHECK SUNLOAD SENSOR BETWEEN SUNLOAD SENSOR AND AUTO AMP.
Disconnect sunload sensor harness connector.
Do approx. 5 volts exist between sunload sensor harness connector terminal No. 24 and 78?

N.G. → Disconnect auto amp. harness connector.

B

Note

Check the circuit between auto amp. harness connector terminal No. 24 and 21 is not shorted.

O.K. → Replace auto amp.

O.K. →

CHECK SUNLOAD SENSOR.
(Refer to Electrical Components Inspection.)

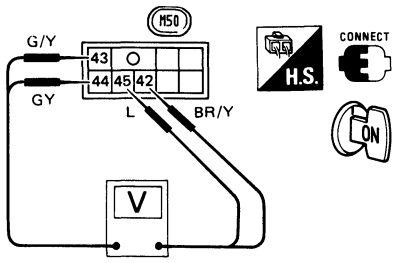
N.G. → Replace sunload sensor.

O.K. → Replace auto amp.

Note:
If the result is N.G. after checking insulation of each terminal, repair harness or connector.

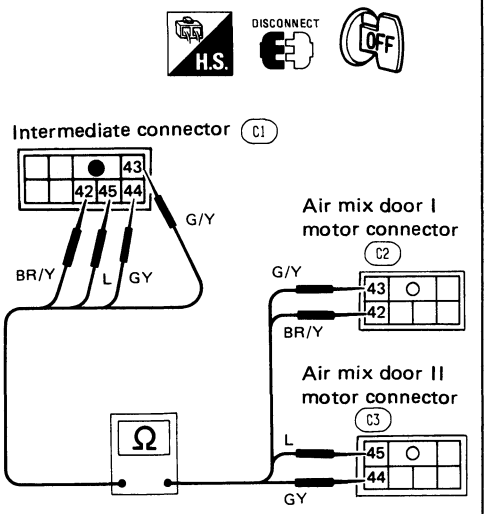
A

Intermediate connector between auto amp. harness and air mix door motor harness.



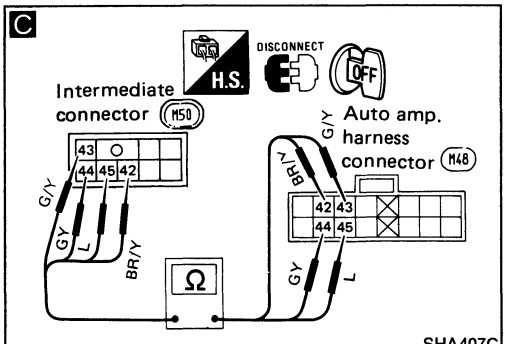
SHA405C

B



SHA933D

C



SHA407C

Diagnostic Procedure 15

SYMPTOM: Air mix door does not operate normally.

- **Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.**
- **Remove combination meter assembly to make working space and reconnect air conditioner switch connector.**

A

CHECK FOR SIGNALS TO AIR MIX DOOR MOTOR.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set air mix door position as shown in the following chart.

Check if approx. 10V exists for 3 seconds every 10 seconds between each terminal.*

Air mix door position	Code No.	Terminal No. Air mix door I ⊕	Air mix door I ⊖	Air mix door II ⊕	Air mix door II ⊖
Full-Hot		43	42	45	44
Full-Cool		42	43	44	45

N.G. →

C

Check circuit continuity between auto amp. harness connector terminals and intermediate connector terminals.

Intermediate connector	Auto amp. connector	Continuity
42	42	Yes
43	43	Yes
44	44	Yes
45	45	Yes

O.K. → Replace auto amp.

N.G. → Repair harness or connector.

O.K. ↓

*: After two minutes power supply is automatically cut off.

Remove heater unit assembly. ↓

B

Check continuity between intermediate connector terminal and each air mix door motor harness connector terminal.

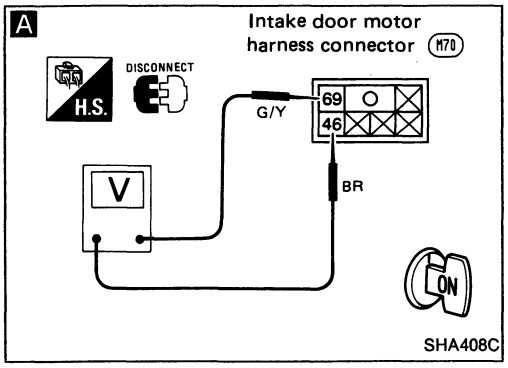
N.G. → Repair harness or connector.

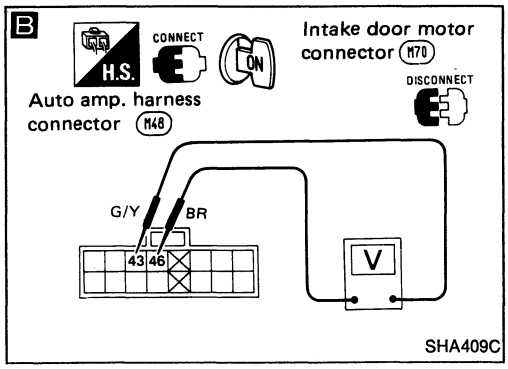
Intermediate connector	Air mix door I motor connector	Continuity
42	42	Yes
43	43	Yes

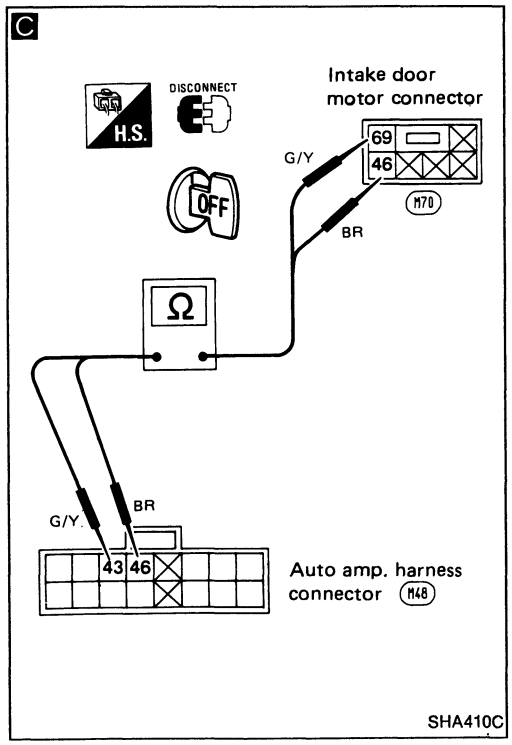
Intermediate connector	Air mix door I motor connector	Continuity
44	44	Yes
45	45	Yes

O.K. ↓

Replace air mix door motor.







Diagnostic Procedure 16

SYMPTOM: Intake door does not operate normally.

- **Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.**

A

CHECK FOR SIGNALS TO INTAKE DOOR MOTOR.

Disconnect intake door motor harness connector.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set intake door position as shown in the following chart.

Check if approx. 10V exists for 2.5 seconds between each terminal.

Intake door position	Code No.	Terminal No. ⊕	Terminal No. ⊖
FRE/REC → REC	→	46	69
REC → FRE	→	69	46

N.G.

B

CHECK OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set intake door position as shown in the following chart.

Check if approx. 10V exists for 2.5 seconds between each terminal.

Intake door position	Code No.	Terminal No. ⊕	Terminal No. ⊖
FRE/REC → REC	→	46	43
REC → FRE	→	43	46

O.K.

N.G.

Replace auto amp.

O.K.

Replace intake door motor.

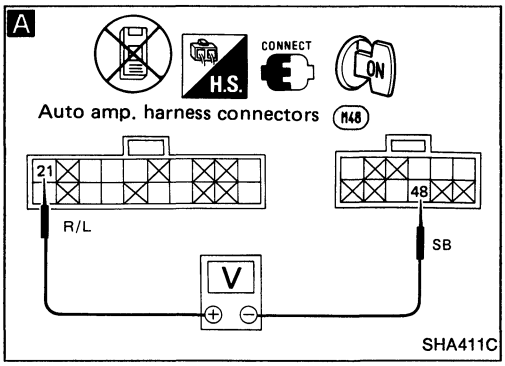
C

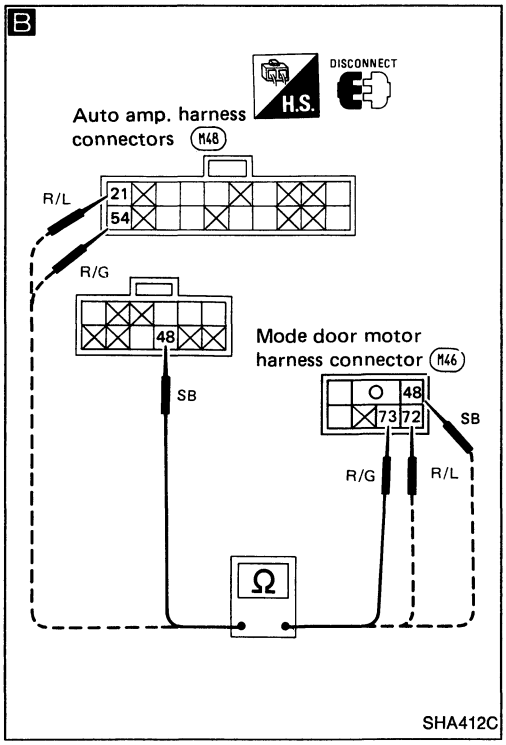
Check continuity between auto amp. harness connector terminal No. 46 and intake door motor harness connector terminal No. 46

Check auto amp. harness connector terminal No. 43 and intake door motor harness connector terminal No. 69.

N.G.

Repair harness or connector.





Diagnostic Procedure 17

SYMPTOM: Mode door does not operate normally.

- **Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.**

A

CHECK P.B.R. CIRCUIT.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set mode door motor as shown in the following chart.

Check P.B.R. voltage with data monitor function in "ACTIVE TEST" mode.

Mode door position	P.B.R. voltage (approx.)
DEF	4.8V
FOOT/DEF	2.5V
B/L	1.1V
VENT	0V

Check if voltage between auto amp. harness connector terminals ㊽ and ㉑ varies from approx. 5V to approx. 0V according to mode door position varies.

Code No.	Voltage ㊽ ⊖	Voltage ㉑ ⊕
	4.8V	
	2.5V	
	1.1V	
	0V	

N.G. → CHECK MODE DOOR MOTOR. Refer to Electrical Components Inspection.

O.K. → B

N.G. → Replace mode door motor.

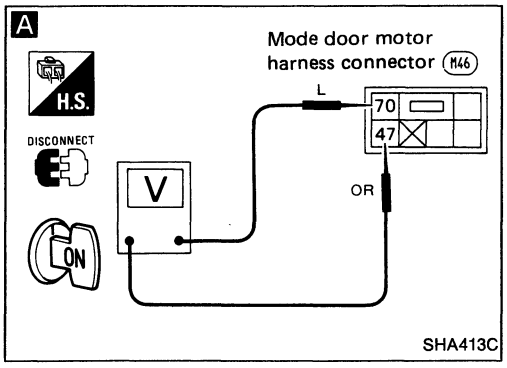
B

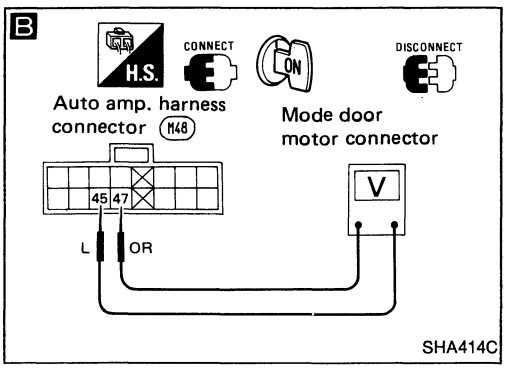
CHECK HARNESS BETWEEN AUTO AMP. AND MODE DOOR MOTOR.

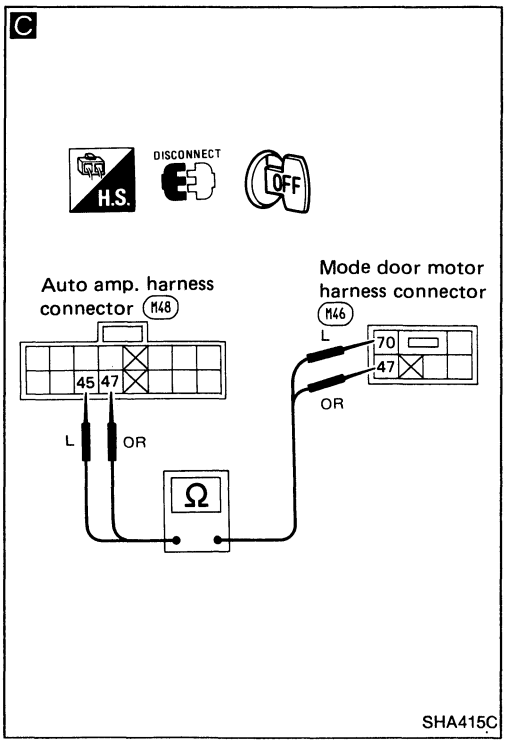
Auto amp. harness connector terminal	Mode door motor harness connector terminal	Continuity
㉑	㊽	No
	㉒	Yes
	㉓	No
㊽	㊽	Yes
	㉒	No
	㉓	No
㊿	㊽	No
	㉒	No
	㉓	Yes

O.K. → Go to diagnostic procedure 18.

N.G. → Repair harness or connector.







Diagnostic Procedure 18

SYMPTOM: Mode door does not move at all.

- **Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.**

A

CHECK FOR SIGNALS TO MODE DOOR MOTOR.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set mode door position as shown in the following chart.

Check if approx. 10V exists between mode door motor harness connector terminals ㊼ and ㊿ for approx. 1.3 second every 10 seconds.

Mode door position	Code No.	Terminal No. ⊕	Terminal No. ⊖
DEF		㊿	㊼
VENT		㊼	㊿

N.G. →

B

CHECK OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set mode door position as shown in the following chart.

Check if approx. 10V exists between mode door motor harness connector terminals ㊼ and ㊺ for approx. 1.3 second every 10 seconds.

Mode door position	Code No.	Terminal No. ⊕	Terminal No. ⊖
DEF		㊺	㊼
VENT		㊼	㊺

O.K. ↓

Replace mode door motor.

O.K. ↓

N.G. →

Replace auto amp.

C

Check continuity between auto amp. harness connector terminal No. ㊼, ㊺ and mode door motor harness connector terminal No. ㊼, ㊿ respectively.

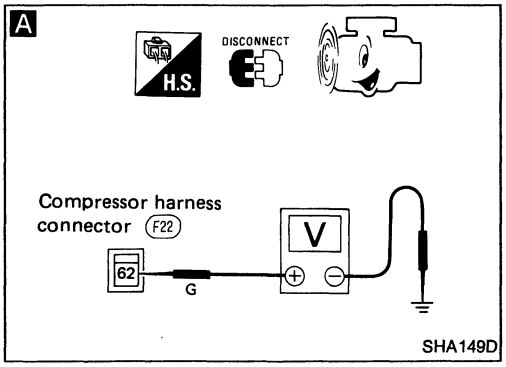
O.K. ↓

N.G. →

Repair harness or connector.

INSPECTION END

A



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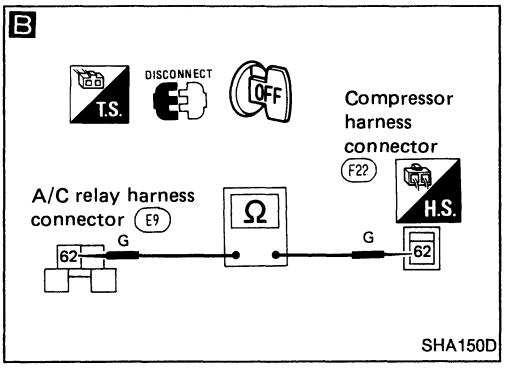

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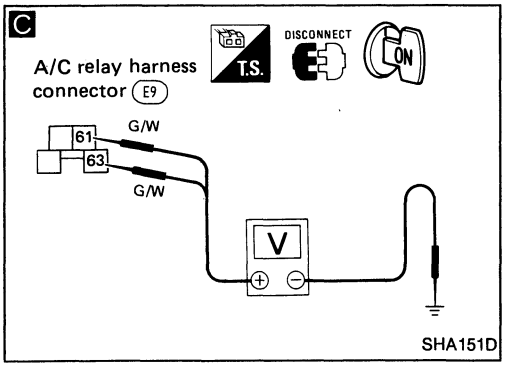

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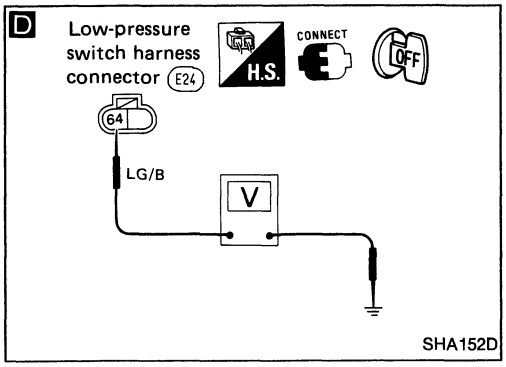


Diagnostic Procedure 19

SYMPTOM: Magnet clutch does not engage.

- **Perform Preliminary check 6 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
Set up "ACTIVE TEST" mode with CONSULT.
Set up self-diagnosis STEP 2.
Set compressor as shown in the following chart.
Check if approx. 12V exists between compressor harness connector terminal and body ground.

Compressor	Code No.	Terminal No.	
ON		62	Body ground

N.G. → Disconnect A/C relay harness connector.

B Note

Check circuit continuity between A/C relay harness connector terminal No. 62 and compressor harness connector terminal No. 62.

O.K. →

O.K. ↓

Check magnet clutch.

N.G. ↓

Replace magnet clutch.
Refer to COMPRESSOR — Model DKS-16H (ZEXEL make).

C

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness connector terminal No. 61, 63 and body ground respectively?

N.G. → CHECK POWER SUPPLY CIRCUIT.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓

CHECK A/C RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C relay.

O.K. ↓

Reconnect A/C relay.

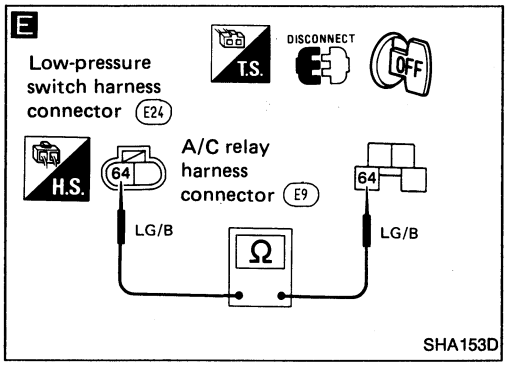
Ⓐ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

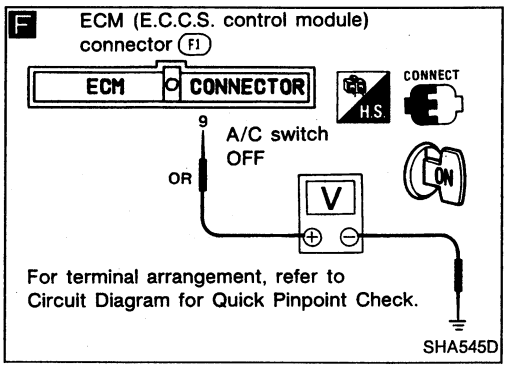
Diagnostic Procedure 19 (Cont'd)

E



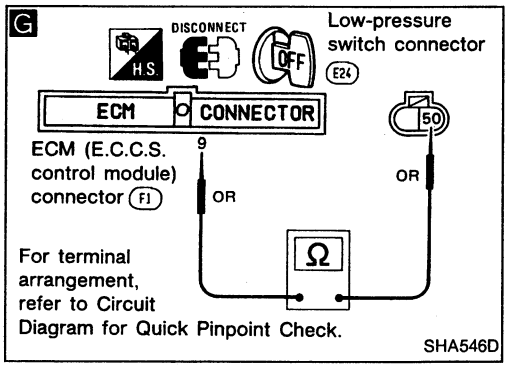
SHA153D

F



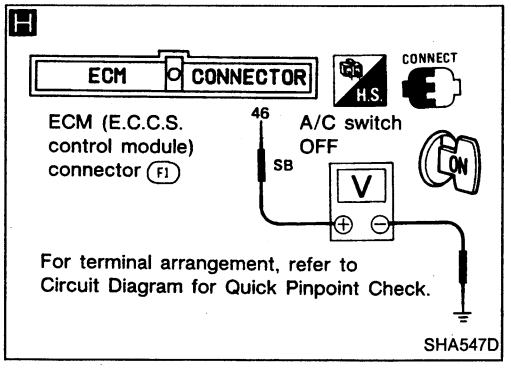
SHA545D

G



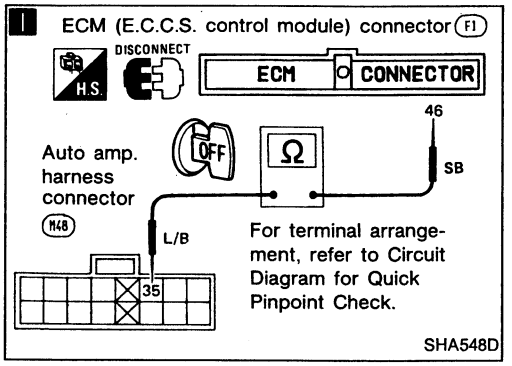
SHA546D

H



SHA547D

I



SHA548D

Ⓐ

Turn ignition switch ON and press OFF switch.

D

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between low-pressure switch harness connector terminal No. ⑭ and body ground?

N.G. →

E Note

Check circuit continuity between A/C relay harness connector terminal No. ⑭ and low-pressure harness connector terminal No. ⑭.

O.K.

F

Do approx. 12 volts exist between ECM (ECCS control module) harness connector terminal No. ⑨ and body ground?

N.G. →

G Note

Check circuit continuity between low-pressure switch harness connector terminal No. ㊿ and ECM (ECCS control module) harness connector terminal No. ⑨.

O.K.

CHECK LOW-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

N.G.

Replace low-pressure switch.

O.K.

H

Do more than 8 volts exist between ECM (ECCS control module) harness connector terminal No. ㊻ and body ground?

N.G. →

CHECK ECM (ECCS control module).
(Refer to EF & EC section.)

O.K.

Disconnect auto amp. harness connector.

O.K.

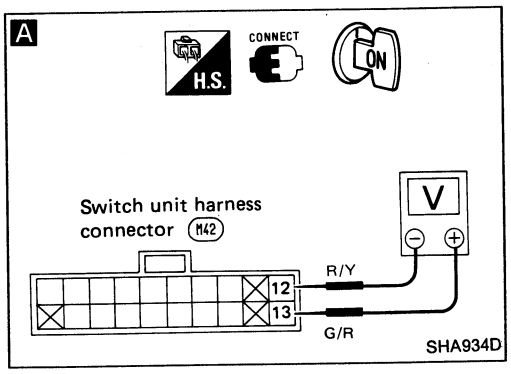
I

Check circuit continuity between auto amp. harness connector terminal No. ㉟ and ECM (ECCS control module) harness connector terminal No. ㊻.

O.K.

Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 20

SYMPTOM: Air conditioner control switch panel illumination does not come on.

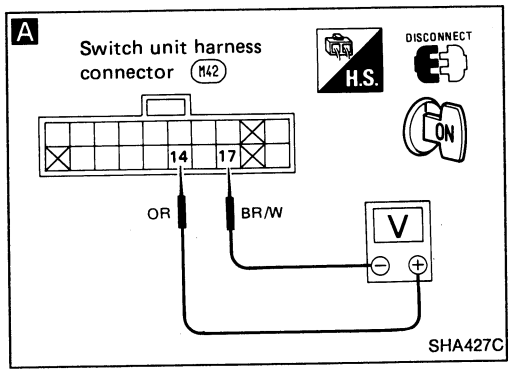
A

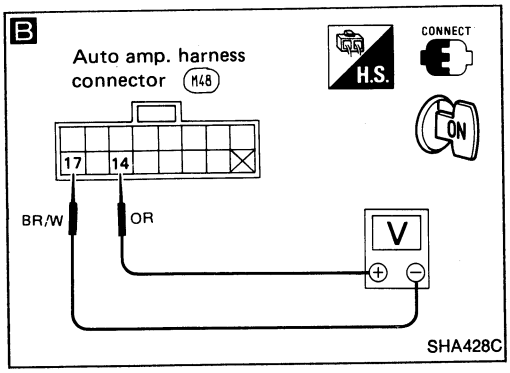
Turn on light switch.
Set illumination control switch at brightest position.
Check if approx. 12V exists between switch panel harness connector terminal No. ⑫ and ⑬.

N.G. → Check illumination control system. Refer to section EL.

O.K. ↓

Replace bulb.





Diagnostic Procedure 21

SYMPTOM: Set temperature and mode display do not appear on display window.

A

Check if approx. 0.5 to 2V exist between switch unit harness connector terminals No. ⑭ and ⑰.

N.G. → B

Check if approx. 0.5 to 2V exist between auto amp. harness connector terminals ⑭ and ⑰.

O.K. ↓

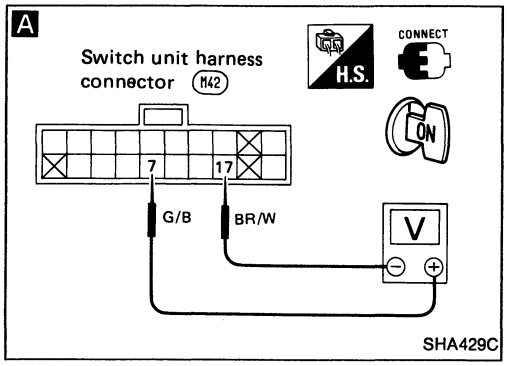
Replace switch unit.

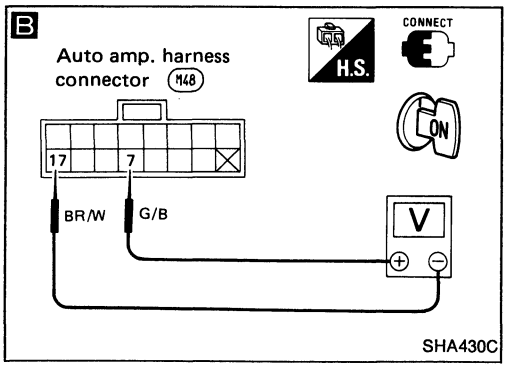
O.K. ↓

Repair harness or connector (terminal No. ⑭, ⑰).

N.G. →

Replace auto amp.





Diagnostic Procedure 22

SYMPTOM: When air conditioner switch is operated, it does not beep.

A

Do approx. 12 volts exist between air conditioner switch unit harness connector terminal No. ⑦ and ⑰?

N.G. → Replace air conditioner switch.

O.K. ↓

B

Do approx. 12 volts exist between auto amp. harness connector terminal No. ⑦ and ⑰?

N.G. → Repair harness or connector (terminal No. ⑰).

O.K. ↓

Check switch panel.
Refer to Electrical Components Inspection.

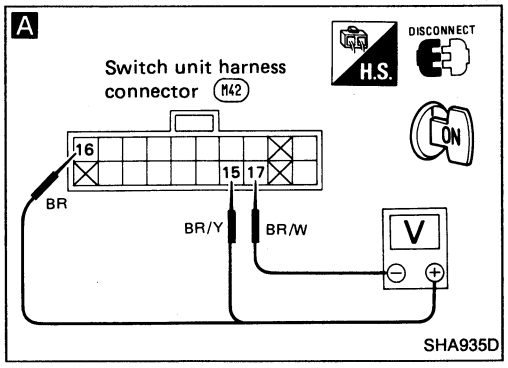
N.G. → Replace auto amp.

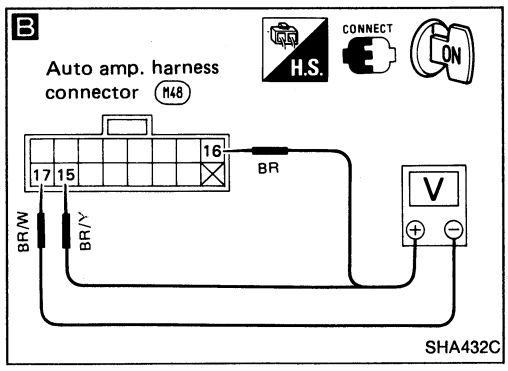
O.K. ↓

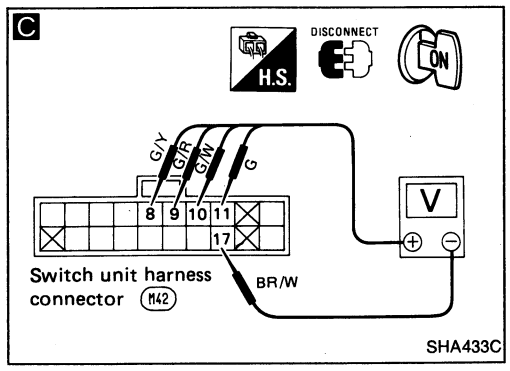
Replace switch panel.

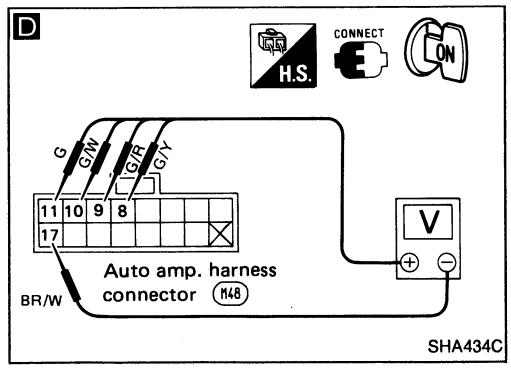
Diagnostic Procedure 23

SYMPTOM: Figures of set temperature do not appear on the display window and indicator lamp (L.E.D.) does not come on.









A

Do approx. 12 volts exist between switch unit harness connector terminal No. ⑮, ⑯ and ⑰?

N.G. → B

B

Do approx. 12 volts exist between auto amp. harness connector terminal No. ⑮, ⑯ and ⑰?

O.K. → Repair harness or connector (Terminal No. ⑮, ⑯ and ⑰).

N.G. → Replace auto amp.

O.K. → C

C

Check switch unit.
Refer to Electrical Components Inspection.

N.G. → D

O.K. → Replace switch panel.

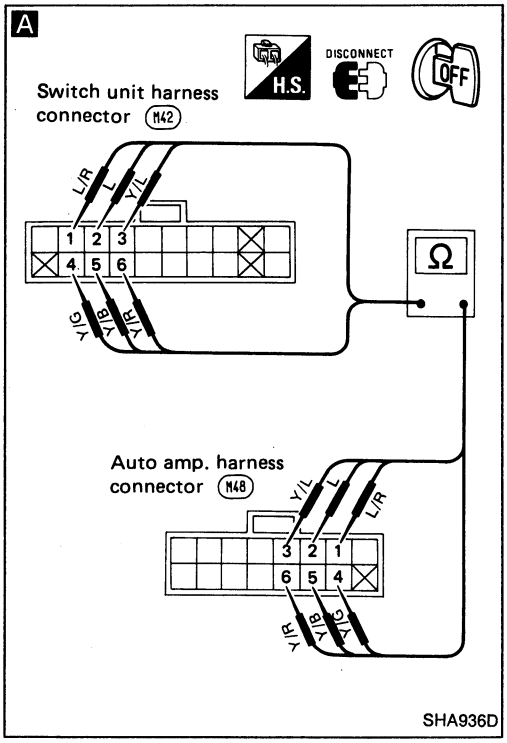
D

Measure voltage between auto amp. harness connector terminal No. ⑧, ⑨, ⑩, ⑪ and ⑰.

Terminal No.		Voltage (approx.)
⊕	⊖	
⑧	⑰	1.0V
⑨	⑰	0.65V
⑩	⑰	0.8V
⑪	⑰	0V (Light OFF) 12V (Light ON)

O.K. → Repair harness or connector (Terminal No. ⑧, ⑨, ⑩, ⑪ and ⑰).

N.G. → Replace auto amp.



SHA936D

Diagnostic Procedure 24

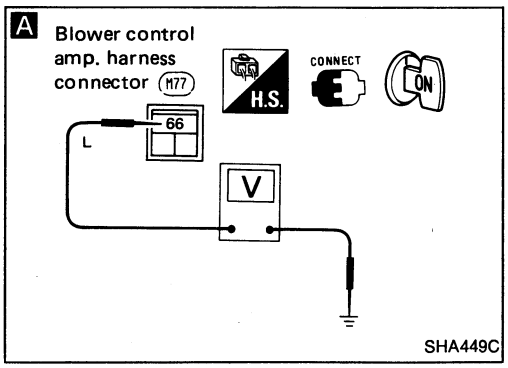
SYMPTOM: Switches do not work.

Check switch panel.
Refer to Electrical Components Inspection.
N.G. → Replace switch panel.
O.K. ↓

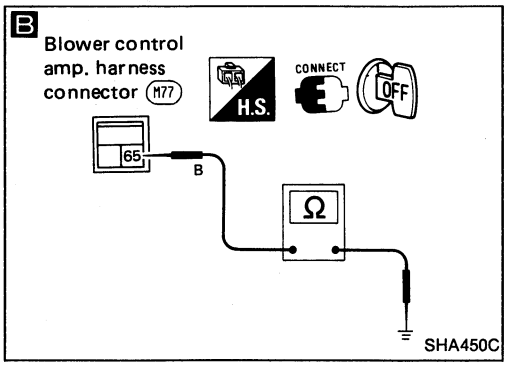
A

Check continuity between auto amp. harness connector terminal No. ① - ⑥ and switch panel harness terminal No. ① - ⑥ respectively.
N.G. → Repair harness or connector.
O.K. ↓

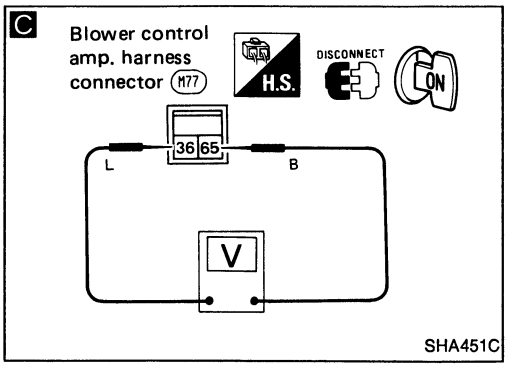
Replace auto amp.



SHA449C



SHA450C



SHA451C

Diagnostic Procedure 25

SYMPTOM: Blower motor operation is malfunctioning.

- **Perform Preliminary check 5 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR FAN CONTROL AMP.
Do approx. 12 volts exist between fan control amp. harness connector terminal No. ⑯ and body ground?
N.G. → D
O.K. ↓

B — Note

CHECK BODY GROUND CIRCUIT FOR FAN CONTROL AMP.
Does continuity exist between fan control amp. harness connector terminal No. ⑮ and body ground?
O.K. ↓

Ⓐ

D

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Do approx. 12 volts exist between blower motor harness connector terminal No. ⑱ and body ground?
O.K. → E
N.G. → Ⓑ

E — Note

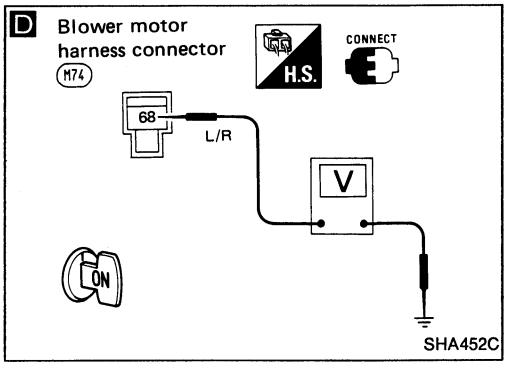
Check circuit continuity between blower motor harness connector terminal No. ⑰ and fan control amp. harness connector terminal No. ⑯.
O.K. ↓

CHECK BLOWER MOTOR (Refer to Electrical Components Inspection.)

Replace blower motor.

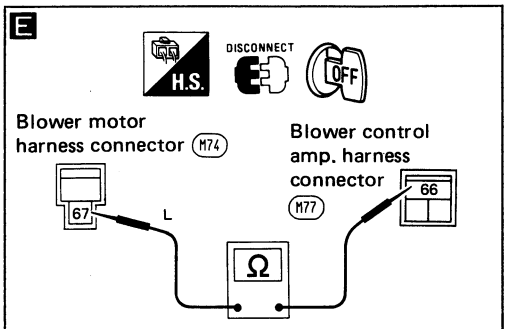
Diagnostic Procedure 25 (Cont'd)

D Blower motor harness connector (M74)



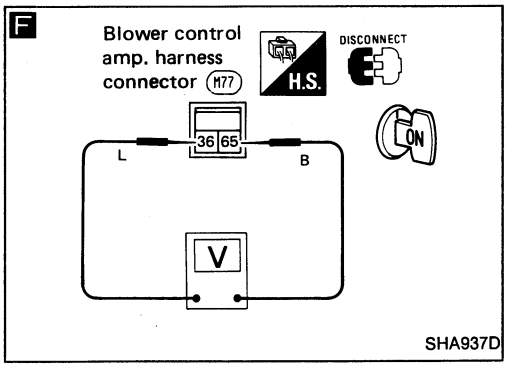
SHA452C

E



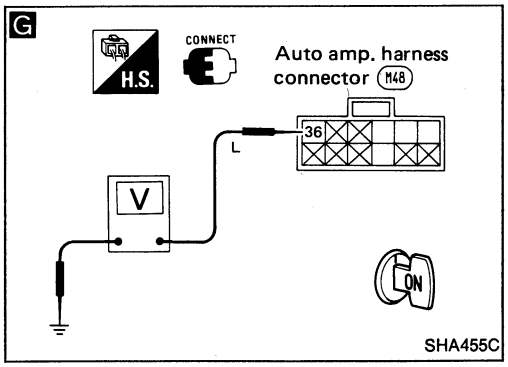
SHA453C

F Blower control amp. harness connector (M77)



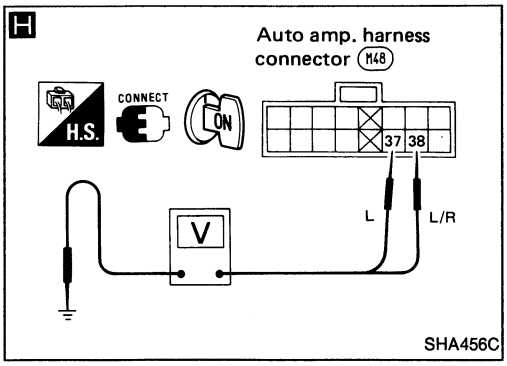
SHA937D

G



SHA455C

H



SHA456C

Ⓐ

C CHECK OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Measure voltage across fan control amp. harness connector terminals No. (36) and (65).

Blower motor voltage (V)	Code No.	Terminal No. ⊕	Terminal No. ⊖	Voltage (Approx.) (V)
4		(36)	(65)	1.2
6		(36)	(65)	1.3
9		(36)	(65)	1.4
12		(36)	(65)	1.6

N.G.

O.K.

Replace fan control amp.

F Set up "ACTIVE TEST" mode with CONSULT.

Set blower motor voltage at 9 volts.

Set up self-diagnosis STEP 2.

Set code No. in .

Do approx. 12 volts exist between fan control amp. harness connector terminal No. (36) and (65)?

N.G.

O.K.

Replace fan control amp.

G CHECK FOR OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT.

Set blower motor voltage at 9 volts.

Set up self-diagnosis STEP 2. Set code No. in .

Do approx. 12 volts exist between auto amp. harness connector terminal No. (36) and body ground?

N.G.

O.K.

Repair harness or connector.

H CHECK FOR FEEDBACK SIGNAL TO AUTO AMP.

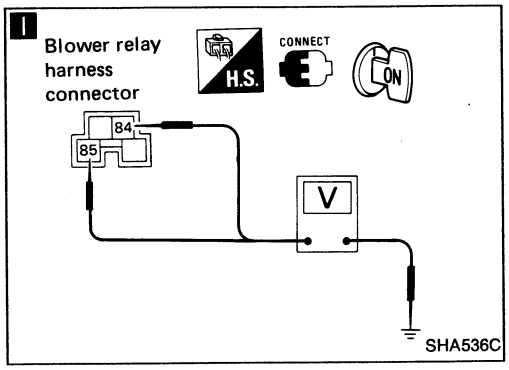
Disconnect fan control amp. connector only.

Do approx. 12 volts exist between auto amp. harness connector terminal No. (37), (38) and body ground?

N.G. → Repair harness or connector.

O.K. → Replace auto amp.

Diagnostic Procedure 25 (Cont'd)



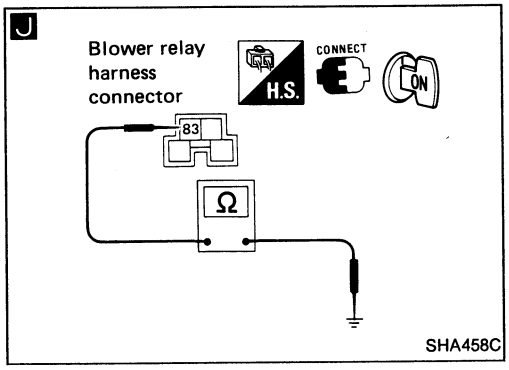
Ⓑ

I

CHECK POWER SUPPLY FOR BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness connector terminal No. ⑭, ⑮ and body ground?

N.G. → Check power supply circuit. (Refer to "POWER SUPPLY ROUTING" in EL section.)

O.K. ↓



J

Do approx. 12 volts exist between blower relay harness connector terminal No. ⑬ and body ground?

N.G. → K

K

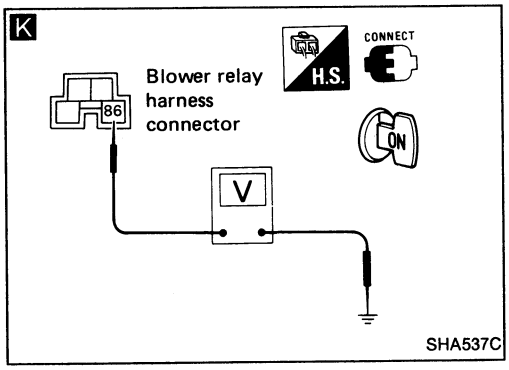
Check voltage between blower relay harness connector terminal No. ⑯ and body ground is less than 1.5 volt.

O.K. → Replace blower relay.

N.G. → L

O.K. ↓

Check 12A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)



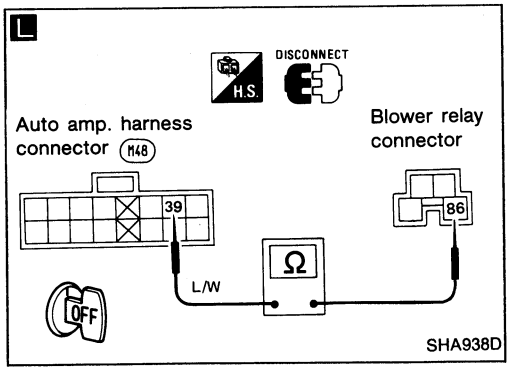
L

Note

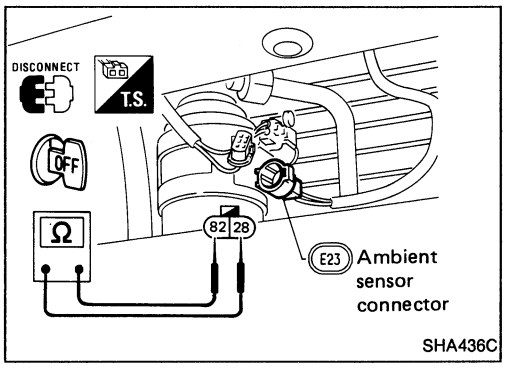
Does continuity exist between blower relay harness connector terminal No. ⑯ and auto amp. harness connector terminal No. ㊴.

O.K. ↓

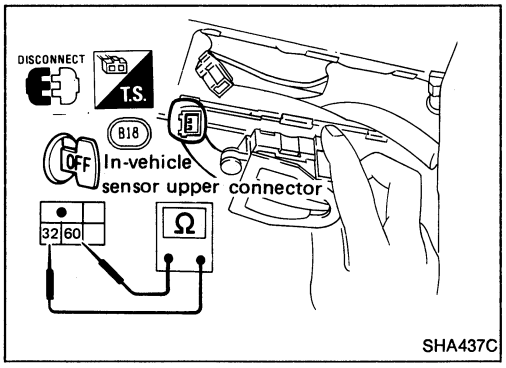
Replace auto amp.



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

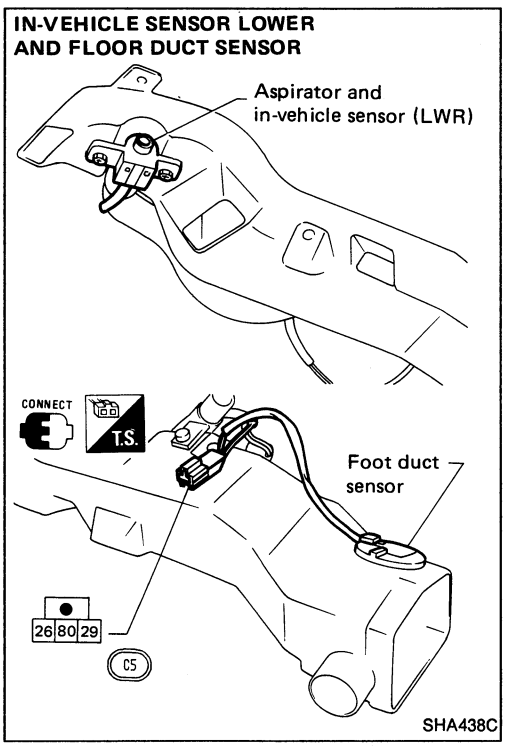


SHA436C



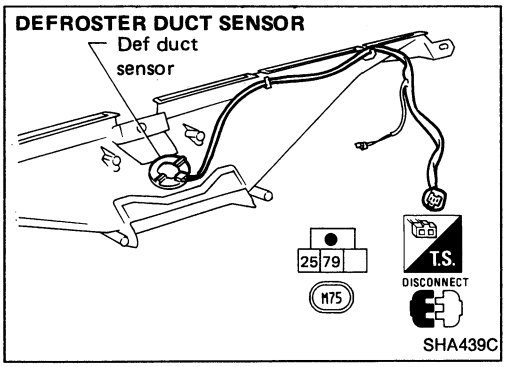
SHA437C

IN-VEHICLE SENSOR LOWER AND FLOOR DUCT SENSOR



SHA438C

DEFROSTER DUCT SENSOR



SHA439C

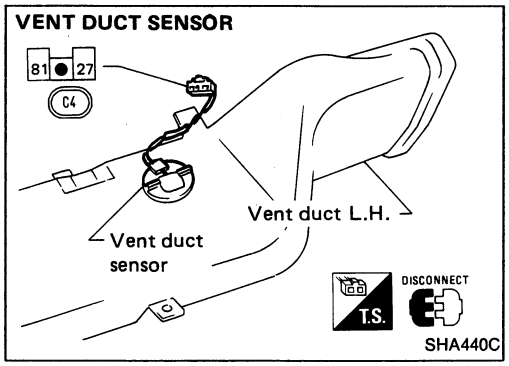
Electrical Components Inspection

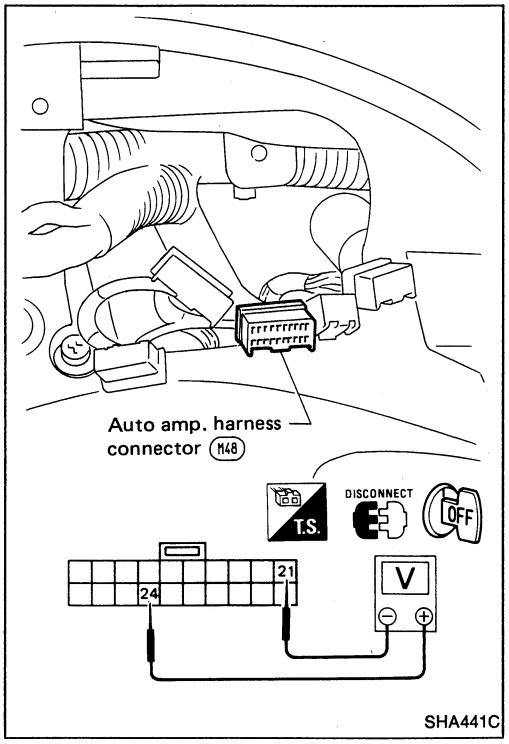
TEMPERATURE SENSORS

After disconnecting temperature sensors harness connector measure resistance between terminals of each sensor, using the table below.

Temperature °C (°F)	Resistance kΩ
–40 (–40)	210.55
–35 (–31)	146.86
–30 (–22)	103.97
–25 (–13)	74.63
–20 (–4)	54.28
–15 (5)	39.97
–10 (14)	29.77
–5 (23)	22.43
0 (32)	17.07
5 (41)	13.11
10 (50)	10.18
15 (59)	7.96
20 (68)	6.29
25 (77)	5.00
30 (86)	4.01
35 (95)	3.24
40 (104)	2.63
45 (113)	2.15
50 (122)	1.77
55 (131)	1.47
60 (140)	1.22
65 (149)	1.02
70 (158)	0.86
75 (167)	0.73
80 (176)	0.62

Electrical Components Inspection (Cont'd)





SUNLOAD SENSOR

Measure voltage between terminals ㉑ and ㉔ at vehicle harness side using the table below.

Input current mA	Output voltage (V)
0	5
0.1	4
0.2	3
0.3	2
0.4	1
0.5	0

- When checking sunload sensor, select a place where sun shines on it directly.

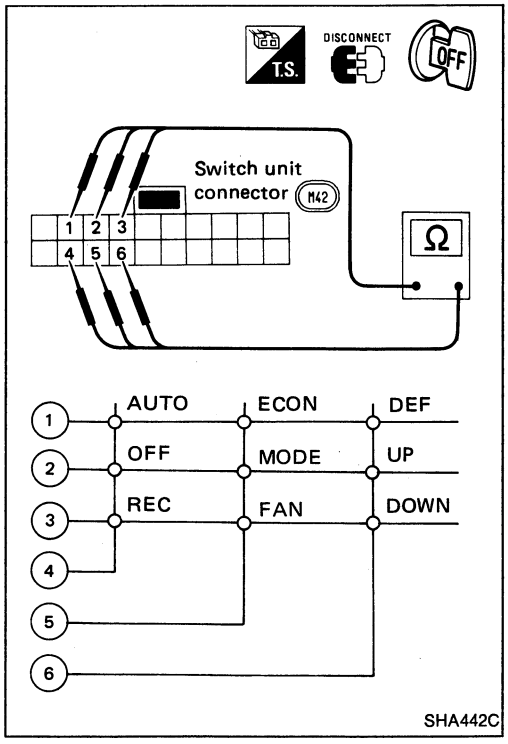
MODE DOOR MOTOR

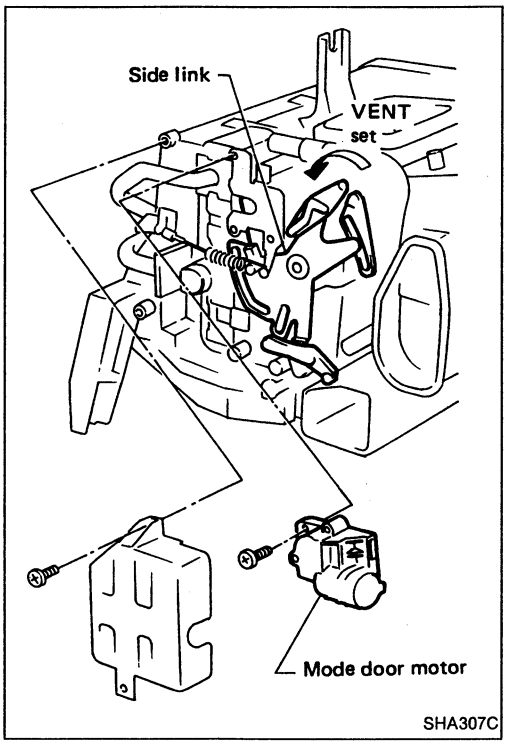
Check to see if motor rotates when 12V is applied across mode door motor connector terminals No. ㊼ and No. ㊿.

Terminal No.		Mode door operation
㊼	㊿	
⊖	⊕	VENT → DEF
⊕	⊖	DEF → VENT

Check to see if mode door P.B.R. resistance is varied according to mode door position, as shown in the following table.

Mode door position	Resistance between terminal No. ㊽ and ㉒
DEF	3 kΩ
FOOT/DEF	1.6 kΩ
B/L	0.7 kΩ
VENT	0Ω





Electrical Components Inspection (Cont'd)

AIR CONDITIONER SWITCH UNIT

Check the resistance between switch unit connector terminals as follows:

Switch condition	Resistance
Press	Less than 500Ω
Free	∞

Example:
When Auto switch is pressed, the resistance between terminal No. ① and ④ is less than 500Ω.

BLOWER MOTOR

- Refer to page HA-76.

RELAY

- Refer to page HA-77.

LOW-PRESSURE SWITCH

- Refer to page HA-77.

Control Linkage Adjustment

MODE DOOR

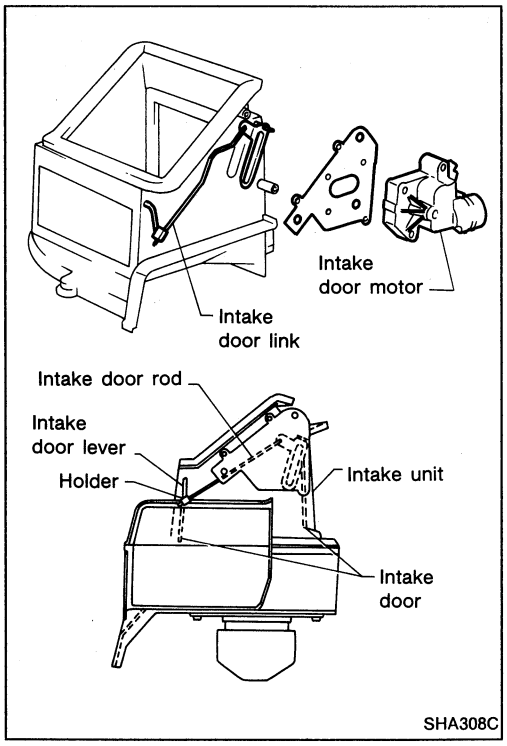
1. Move side link by hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to harness.
3. Turn ignition switch to ON.
4. Set up "ACTIVE TEST" mode with CONSULT or set up self-diagnosis STEP 2.
5. Set MODE DOOR position as in the following table.

MODE DOOR POSITION	Code No.
VENT	

6. Attach mode door rod to side link rod holder.
7. Check mode door operates when position is changed with CONSULT or when code No. is changed to others.

Code No.				
Mode door position	DEF	HEAT	B/L	VENT

Control Linkage Adjustment (Cont'd)



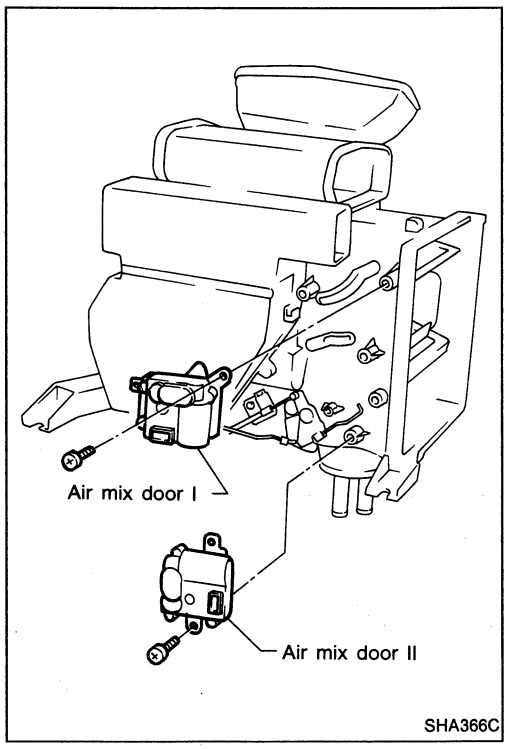
INTAKE DOOR

1. Install intake door motor on intake unit.
2. Connect intake door motor to harness.
3. Turn ignition switch to ON.
4. Set up "ACTIVE TEST" mode with CONSULT or set up self-diagnosis STEP 2.
5. Set INTAKE DOOR position as in the following table.

INTAKE DOOR POSITION	Code No.
REC	

6. Install intake door lever.
7. Set intake door rod in REC position and fasten intake door rod to holder intake door lever.
8. Check intake door operates properly when position is changed with CONSULT or when code No. is changed to others.

Code No.				
Intake door position	Outside air		Partial out-side air	Recircula-tion



AIR MIX DOOR

1. Connect harness to air mix door motors I and II and set temperature control lever at full-cold position.
2. Set air mix doors I and II at full-cold position and fasten door rod.
3. Check that when temperature control lever is at full-cold, both doors are at full-cold position, and when temperature control lever is at full-hot, both doors are at full-hot position.

WATER COCK CONTROL CABLE

Clamp cable at full-close position when air mix door II is at full-cold position, and full-open position when air mix door II is at full-hot position.

Control Switches

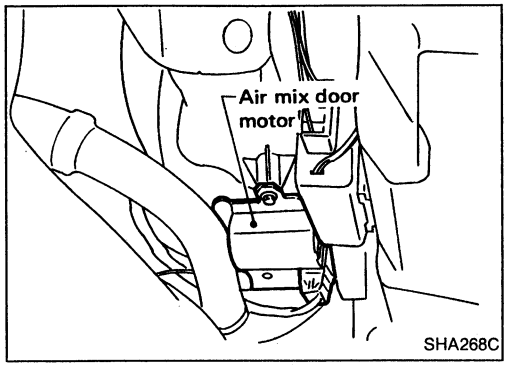
SWITCHES AND THEIR CONTROL FUNCTIONS

Switch		Indicator illuminates: A/C	Indicator illuminates: ⇦	Air outlet	Intake air	Compressor
A/C		○				ON*1
Mode	⇨			VENT	*3	*1*4
	⇨			B/L	*5	*1*4
	⇨			FOOT	*5	*1*4
	⇨			F/D	*5	ON*1
	⇨			DEF	FRE	ON*1
⇦			○		REC*2	ON*1

*1: Compressor is operated by thermo control amp. and ECM (ECCS control module).
*2: Depending on mode switch position.
*3: When vent mode is selected, REC switch function is as in the following chart:
*4: Depending on A/C switch position.
*5: Depending on REC switch position.

A/C SW	REC: ON	REC: OFF
ON	REC	REC/FRE
OFF	REC	FRE

SHA711D



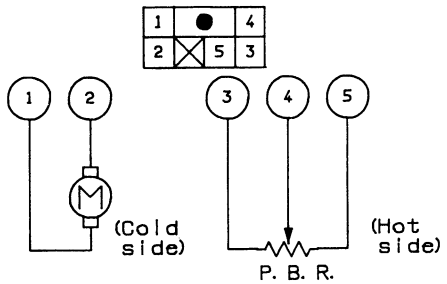
SHA268C

Specifications

AIR MIX DOOR MOTOR

The air mix door motor is attached to the heater unit. It rotates, opening the air mix door to the position set by the temperature control lever.
Motor rotation is conveyed through shafts and linkages. The air mix door position is fed back to the control amplifier by the Potentio Balance Resistor (P.B.R.) built into the air mix door motor.

Air mix door motor operation

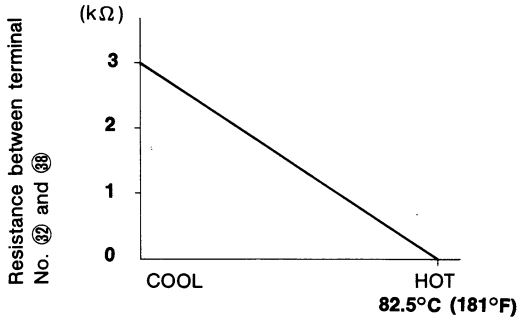


1	2	Air mix door operation	Direction of lever movement
⊕	⊖	COLD → HOT	Clockwise (Toward passenger compartment)
–	–	STOP	STOP
⊖	⊕	HOT → COLD	Counterclockwise (Toward engine compartment)

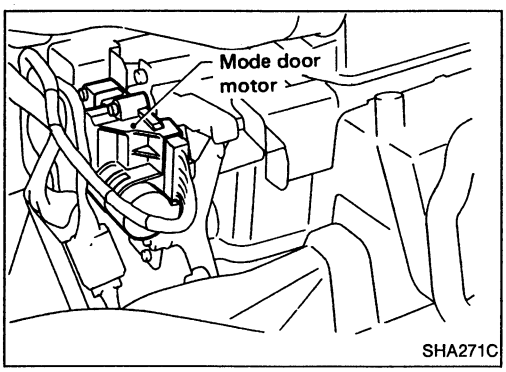
SHA939D

Specifications (Cont'd)

Characteristics of P.B.R.



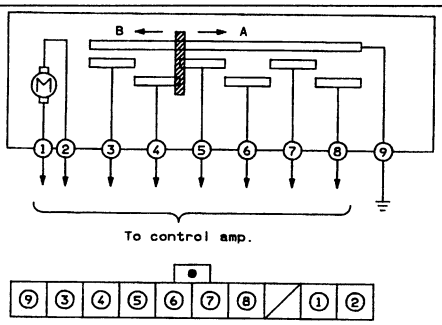
SHA713D



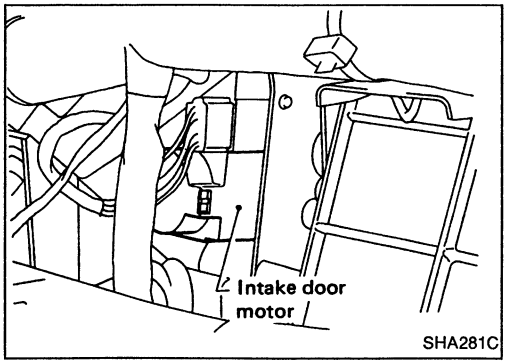
SHA271C

MODE DOOR MOTOR

When a mode switch is selected, the position switch built into it reads the corresponding mode to determine the direction of motor rotation. As soon as the desired mode is set, the position switch stops the motor.



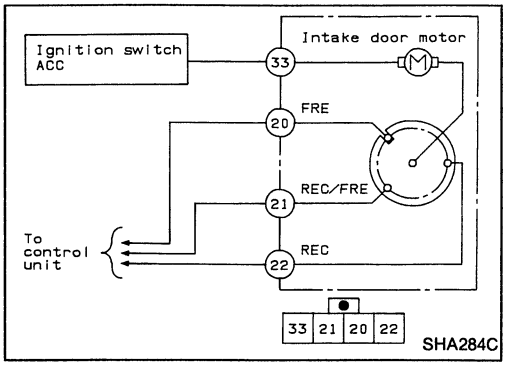
SHA158D



SHA281C

INTAKE DOOR MOTOR

The intake door motor is installed on the side portion of the intake unit. Using a rod and link it opens and closes the intake door. When the REC switch is ON (OFF), the ground line of the intake door motor is switched from terminal 20 to 22 (22 to 20). This causes the motor to start because the position switch contacts built into it are now 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. (FRE→REC→REC/FRE)

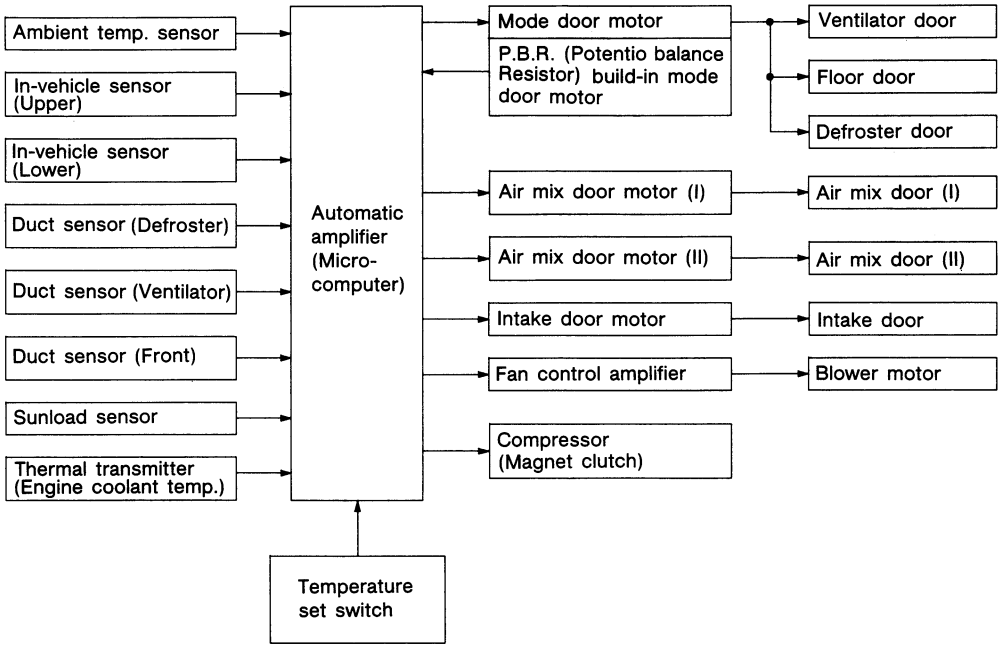


SHA284C

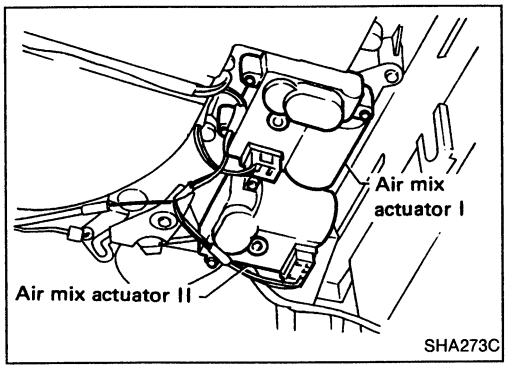
Specifications

AUTO AMPLIFIER

The auto amplifier has a built-in microcomputer which processes information from the A.T.C. system sensors. Signals are sent from the auto amplifier to activate the A.T.C. system depending upon the information sent by these sensors and the set temperature selected on the switch panel.
The A.T.C. system's self-diagnostic capabilities are built into the auto amplifier.



SHA715D



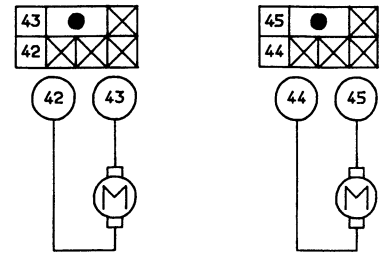
SHA273C

AIR MIX DOOR I and II MOTORS

Component and related parts

- Auto amplifier
- Air mix door motors
- In-vehicle sensors (upper and lower)
- Duct sensors (vent, foot, defroster)
- Ambient sensor
- Sunload sensor

Operation of air mix door I and II motors



㊷ ㊹	㊸ ㊺	Air mix door I and II operation	Direction of lever movement
⊖	⊕	COLD → HOT	*Clockwise
–	–	STOP	STOP
⊕	⊖	HOT → COLD	*Counterclockwise

*: P → Heater unit → Motor. "Direction of lever movement" is as viewed from arrow P.

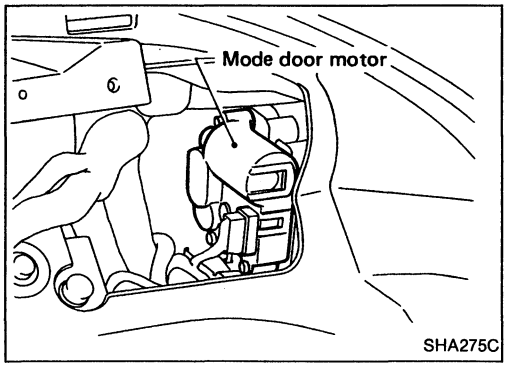
SHA940D

Specifications (Cont'd)

System operation

The air mix door motors are attached to the bottom of the heater unit. The motors rotate, moving a lever system which varies the air mix door position to heat or cool the inlet air. Outlet air temperature is measured by the duct sensors, signals from which are sent to the auto amplifier which uses them to modify the air mix door position to achieve the current target temperature.

- **It takes about 1 minute to stabilize duct air temperature.**
- **When ambient temperature is below 5°C (41°F) or above 60°C (140°F), air mix door position is fixed.**

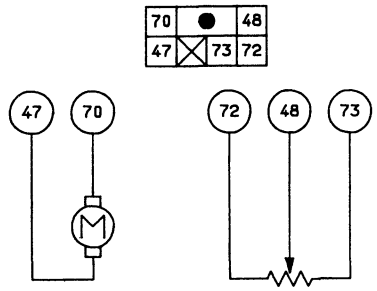


MODE DOOR MOTOR

Component and related parts

- Auto amplifier
- Mode door motor with potential ballast resistor (P.B.R.)
- Lower in-vehicle sensor
- Ambient sensor
- Sunload sensor

Mode door motor operation

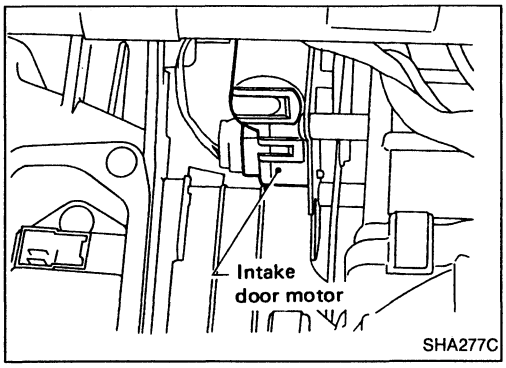


⑰	⑳	Mode door operation	Direction of side link rotation
⊖	⊕	VENT → DEF	Clockwise
–	–	STOP	STOP
⊕	⊖	DEF → VENT	Counterclockwise

SHA941D

System operation

The mode door motor is attached to the heater unit. The motor operates a cam assembly which moves the air outlet doors. The auto amplifier controls air distribution to the VENT, DEF and FOOT outlets. Outlet door position is conveyed to the auto amplifier by the P.B.R. built into the mode door motor.
The auto amplifier computes air outlet conditions according to ambient temperature, set temperature and sunload. When thermal loads are great, the air outlet computation is additionally influenced by the foot area temperature. The air outlet positions are smoothly adjusted in response to changes in ambient temperatures.
When the set temperature is decreased or when the sunload is increased, the air flow volume from the vent outlets is increased.



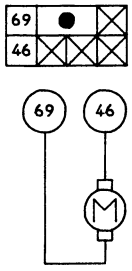
INTAKE DOOR MOTOR

Component and related parts

- Auto amplifier
- Intake door motor
- Upper in-vehicle sensor
- Vent duct sensor
- Ambient sensor
- Sunload sensor

Specifications (Cont'd)

Intake door operation



㊻	㊾	Intake door operation	Direction of lever rotation
⊖	⊕	REC → FRE	Counterclockwise
–	–	STOP	STOP
⊕	⊖	FRE → REC	Clockwise

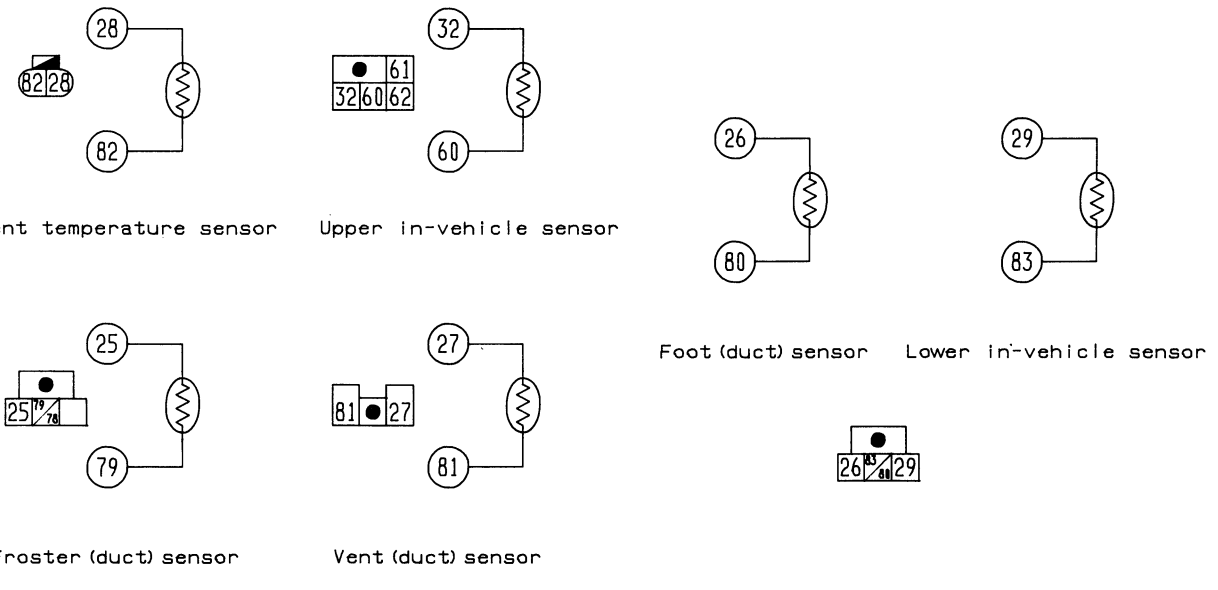
SHA942D

System operation

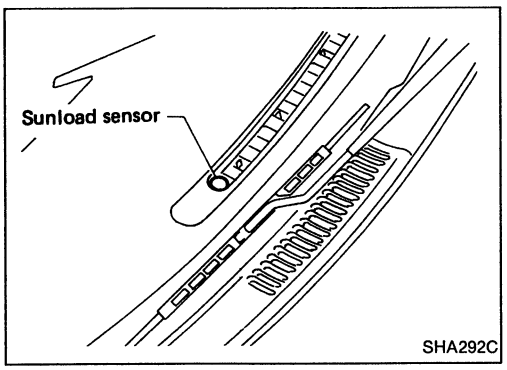
The intake door motor is attached to the air intake unit. Intake door position is controlled approximately once every thirty seconds, according to the difference between target and actual vent air temperatures. When the actual outlet air temperature is higher than the target vent air temperature, the intake door will gradually shift toward the recirculation-air side. When the outlet air temperature reaches the target outlet air temperature, the intake door will gradually shift toward the fresh air side. However, when the ambient temperature is lower than 20°C (68°F), 100% fresh air is taken regardless of outlet air temperatures.

When the compressor is "OFF" the auto amplifier sets the intake door at the "FRESH" position except when the "RECIRC" switch is "ON".

TEMPERATURE SENSORS



SHA562D



SHA292C

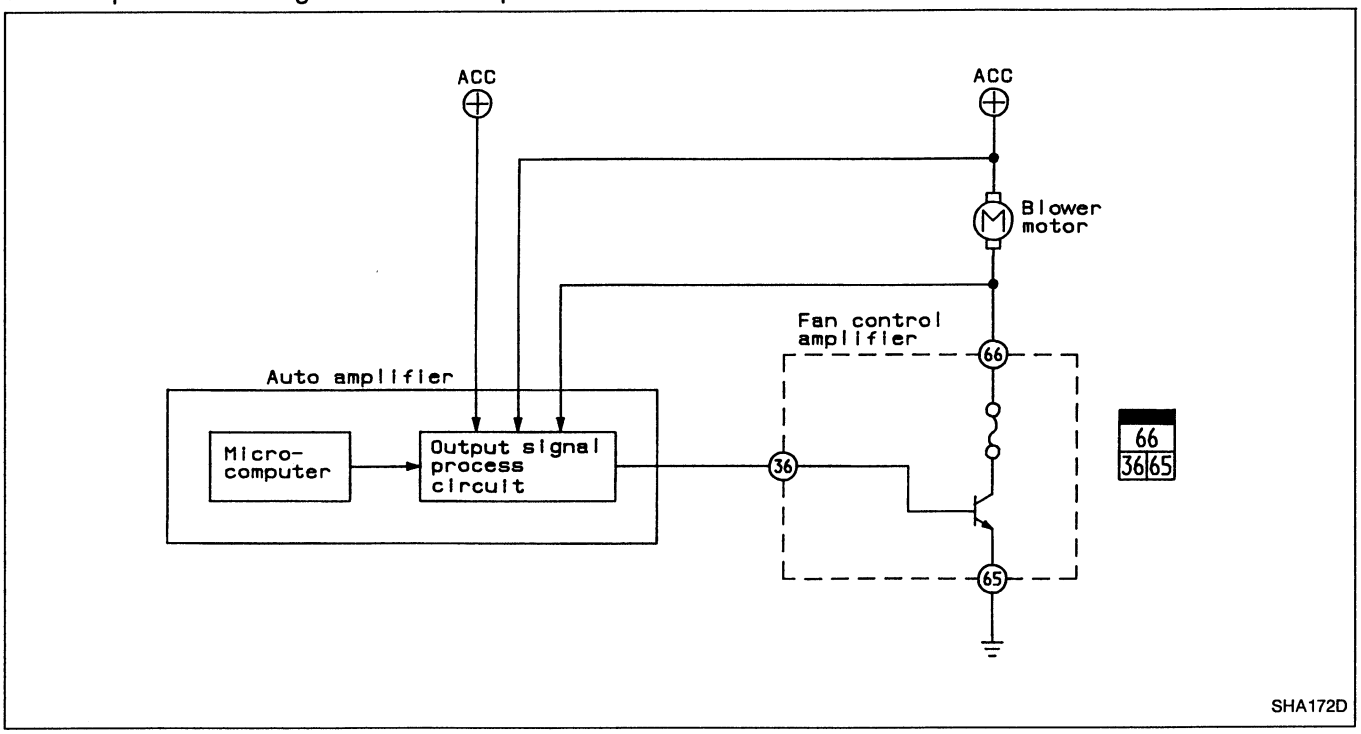
SUNLOAD SENSOR

The sunload sensor is located on the right defroster grille. It detects sunload entering through the windshield by means of a photo diode and converts it into a current value which is then input into the auto amplifier.

Specifications (Cont'd)

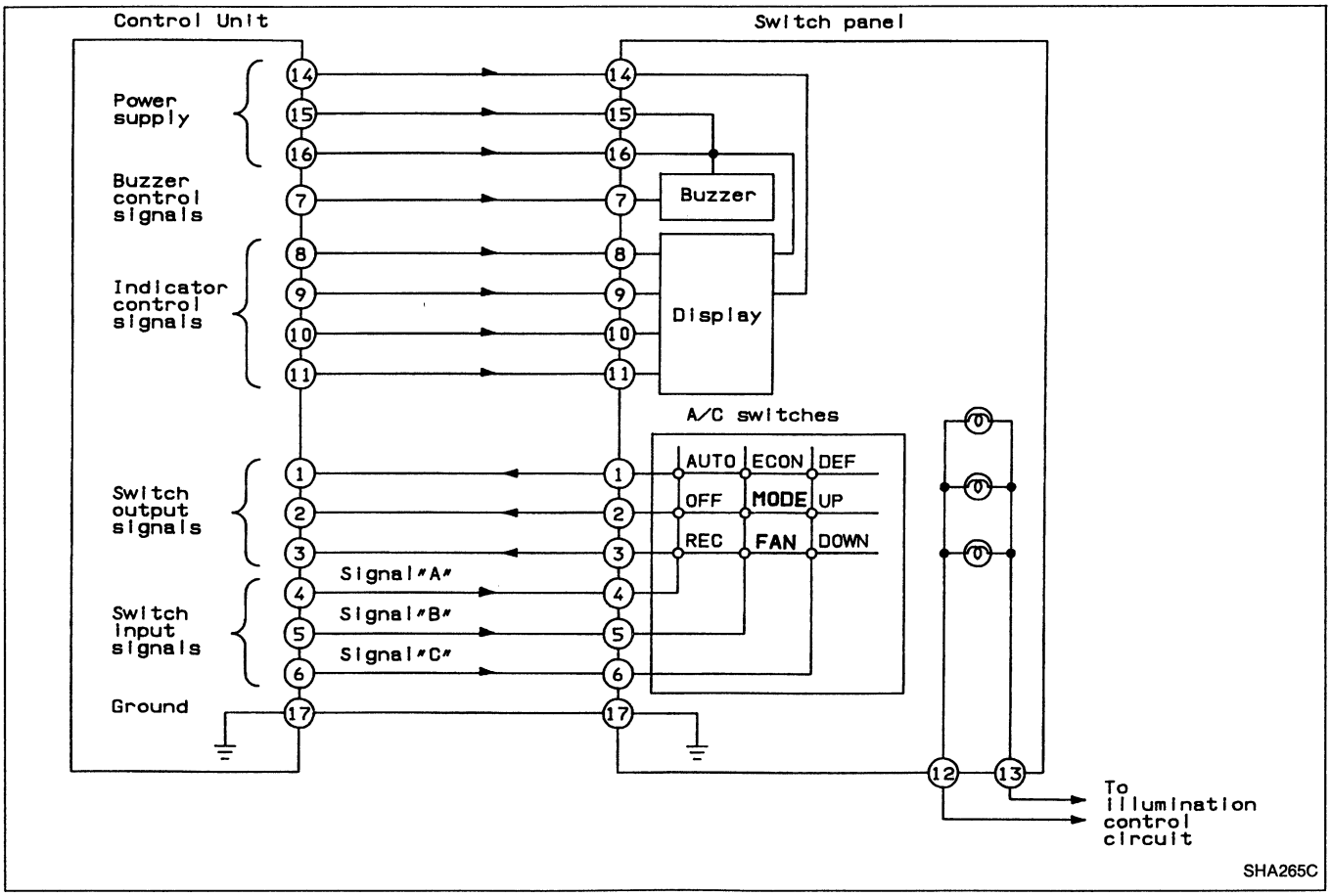
FAN CONTROL AMPLIFIER

The fan control amplifier is located on the cooling unit. It amplifies the base current flowing from the auto amplifier to change the blower speed.



System Operation

SWITCH PANEL



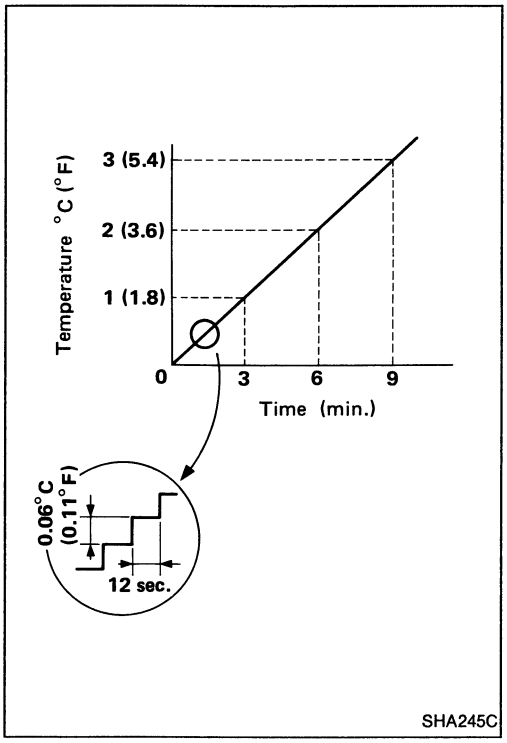
System Operation (Cont'd)

System operation

Except for illumination lamp terminals ⑫ and ⑬, the switch panel is operated by signals emitted from the control unit. There are three categories of signals.

1) Power and ground signals
2) Indicators (VFD and LED) and buzzer control signals
3) Switch input and output signals

The control unit always sends three different signals to the switch panel on three lines ④, ⑤, and ⑥. For example, when the "Auto" switch is pushed, signal "A" returns to the control unit on line No. ①. And when the "Econ" switch is pushed, signal "B" returns to the control unit on line No. ①.
Similarly for the other switches; the control unit recognizes which signal returns on which line, and then identifies which switch is pushed.



SHA245C

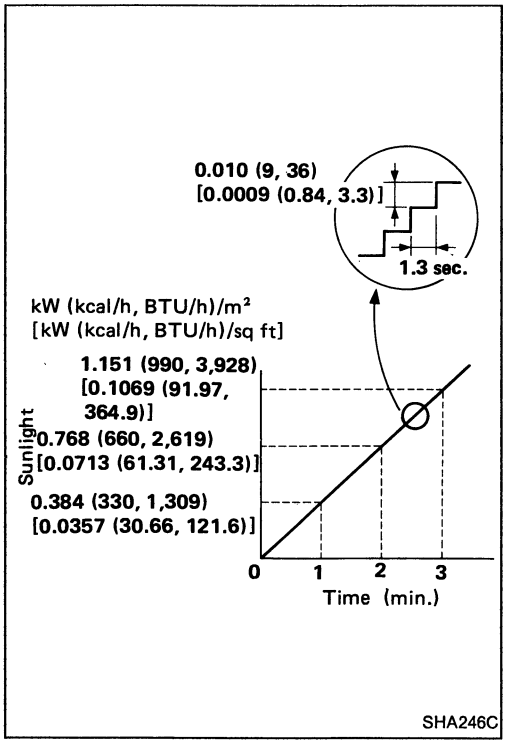
AMBIENT TEMPERATURE INPUT PROCESS

For A.T.C. system operation an accurate ambient sensor signal is necessary. The auto amplifier contains a circuit to ensure accurate measurement of increases in ambient temperature. Sudden increase in temperature of 16°C (61°F) or more, which may be detected after encountering heavy traffic after a period of high speed cruising, are processed through a delay circuit. The delay circuit processes any temperature increase in increments of 0.06°C (0.11°F) every 12 seconds and, in this way, the A.T.C. system is protected from any sudden changes in ambient sensor signal due to low air flow around the sensor.

Temperature decreases are not processed through the time delay circuit.

Example:

In the case of a signal stop after high-speed cruising, the ambient temperature will rise suddenly.
The ambient temperature input process functions at this time to prevent unpleasant air conditioning system changes.



SHA246C

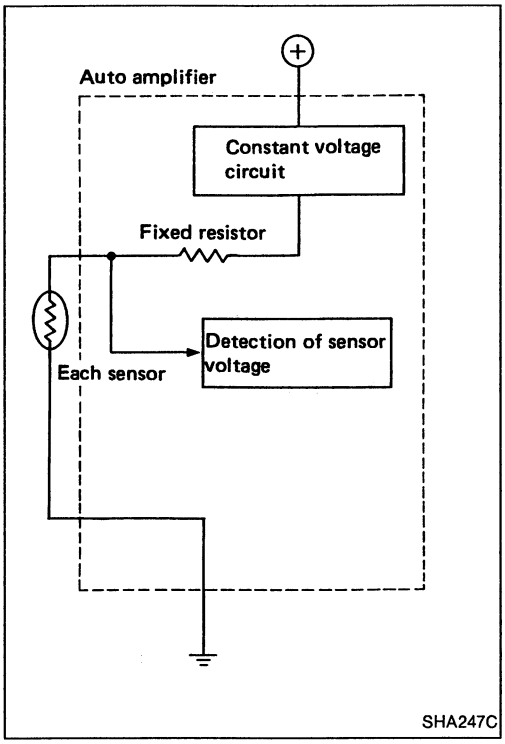
SUNLOAD INPUT PROCESS

The sunload input circuit in the auto amplifier also features a time delay to prevent abrupt A.T.C. system changes. This feature operates under rapid increases and decreases in sunload.

Example:

When entering a tunnel the sunload will change suddenly. The sunload input process system functions at this time to prevent unpleasant air conditioning system changes.

System Operation (Cont'd)



SENSOR INPUT PROCESS

A fixed resistor is built into the auto amplifier. 12V DC is converted to 5V DC by the constant voltage circuit where it is then applied to the ground line of the auto amplifier by the fixed resistor and sensors. The auto amplifier monitors the voltage between each sensor and the fixed resistor. The resistance of each sensor varies according to temperature.
Accordingly, the voltage at each sensor varies according to the temperature. The voltage signal is processed by the auto amplifier for A.T.C. system operation.

STARTING FAN SPEED AND OUTLET DOOR CONTROL

Component parts

Starting fan speed and outlet door control components are:

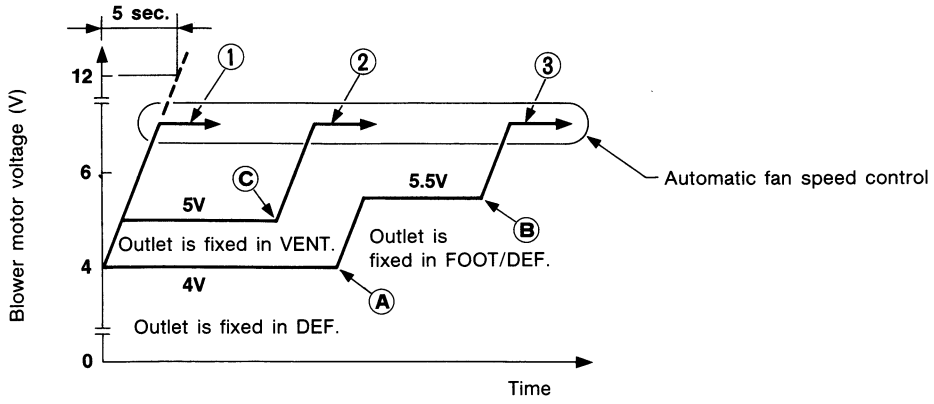
- Auto amplifier
- Fan control amplifier
- In-vehicle sensors (Upper and Lower)
- Duct sensor (Defroster, Ventilator and Floor)
- Ambient sensor
- Sunload sensor
- Thermal transmitter (Engine coolant temperature sensor)

System operation

- Fan speed control
  At a set temperature of 25°C (77°F), when the upper compartment temperature is below 21°C (70°F) and the outlet duct temperature is lower than 35°C (95°F), the fan starts at minimum flow rate. As the discharge air temperature increases, the air flow rate increases to bring the compartment temperature to the target level as quickly as possible.
  When the ambient temperature is above 40°C (104°F), fan air flow rate is at full volume.
  As interior temperature begins to reach the target temperature, fan speed decreases.
  Under heavy sunload conditions, fan speed is increased to maintain uniform interior temperature.
  Fan speed also increases if the set temperature is decreased.
- Outlet door control
  At a set temperature of 25°C (77°F), when the upper in-vehicle temperature is lower than 21°C (70°F) and all of the outlet air temperatures are lower than 24°C (75°F), the system starts with the minimum airflow rate in the defroster mode. When defroster duct temperature rises above 24°C (75°F), the air outlet mode changes from the defroster mode to the DEF/FOOT mode. When foot duct temperature exceeds 39°C (102°F), the starting fan speed control and outlet door control mode is replaced by the normal automatic control mode. When the upper in-vehicle temperature is far greater than the lower in-vehicle temperature because of a large sunload, the system starts with the ventilator mode, which is replaced by the automatic control mode as the coolant temperature and outlet air temperature increase.

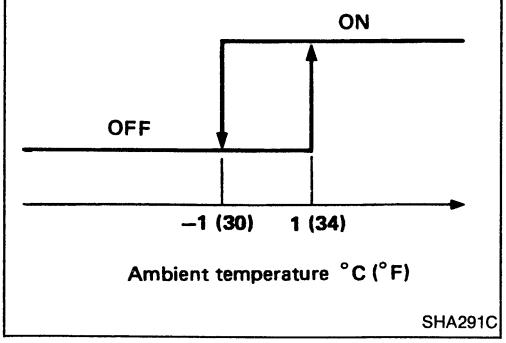
System Operation (Cont'd)

Starting fan speed and outlet door control specifications



① : When both upper and lower in-vehicle temperatures are much higher than set temperature.
② : When upper in-vehicle temperature is higher than set temperature.
③ : When upper in-vehicle temperature is lower than set temperature.
Ⓐ : When DEF duct temperature rises above 24°C (75°F)
(Exact temperature depends on ambient temperature.)
Ⓑ : When FOOT duct temperature rises above 39°C (102°F)
(Exact temperature depends on ambient temperature.)
Ⓒ : When engine coolant temperature rises above 40°C (104°F) and difference between outlet air temperature and target temperature is lower than 5°C (9°F).

SHA550D



SHA291C

MAGNET CLUTCH CONTROL

The auto amplifier controls compressor operation by the ambient temperature and signals from the ECM (ECCS control module).

The auto amplifier will turn the compressor "ON" or "OFF" as determined by a signal detected by the ambient temperature sensor.

General Specifications

COMPRESSOR

Model	ZEXEL make DKS-16H
Type	Swash plate
Displacement cm^3 (cu in)/Rev.	167 (10.19)
Cylinder bore x stroke mm (in)	37.0 x 25.8 (1.457 x 1.016)
Direction of rotation	Clockwise (viewed from drive end)
Drive belt	Poly V

LUBRICATION OIL

Model	ZEXEL make DKS-16H
Type	SUNISO 5GS
Capacity mℓ (US fl oz, Imp fl oz)	
Total in system	200 (6.8, 7.0)
Compressor (Service parts) charging amount	200 (6.8, 7.0)

REFRIGERANT

Type	R12
Capacity kg (lb)	0.75 - 0.85 (1.65 - 1.87)

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	DKS-16H
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

CONTENTS (Cont'd.)

WIRING DIAGRAM REFERENCE CHART

Precautions

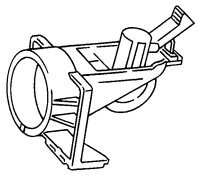
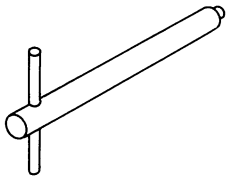
SUPPLEMENTAL RESTRAINT SYSTEM "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a control unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF section** of this Service Manual.

WARNING:

a. **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.**
b. **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
c. **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
26081 30P00 (right) 26086 30P00 (left) Headlamp aimer adapter		Attaching headlamp aimer
(J36126) Washer nozzle adjusting tool		Adjusting washer nozzle

Description

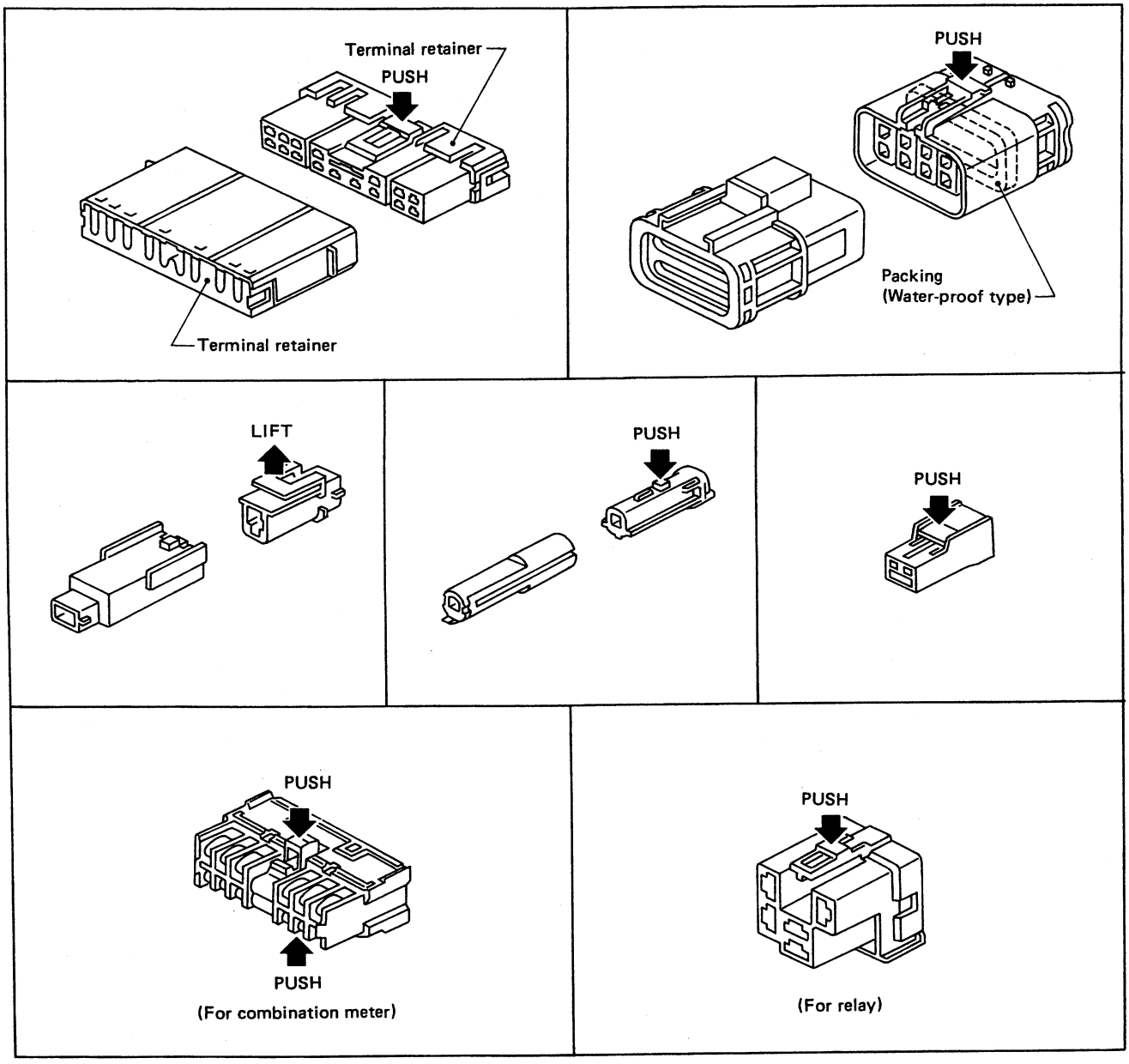
HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental looseness or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

CAUTION:

Do not pull the harness when disconnecting the connector.

[Example]

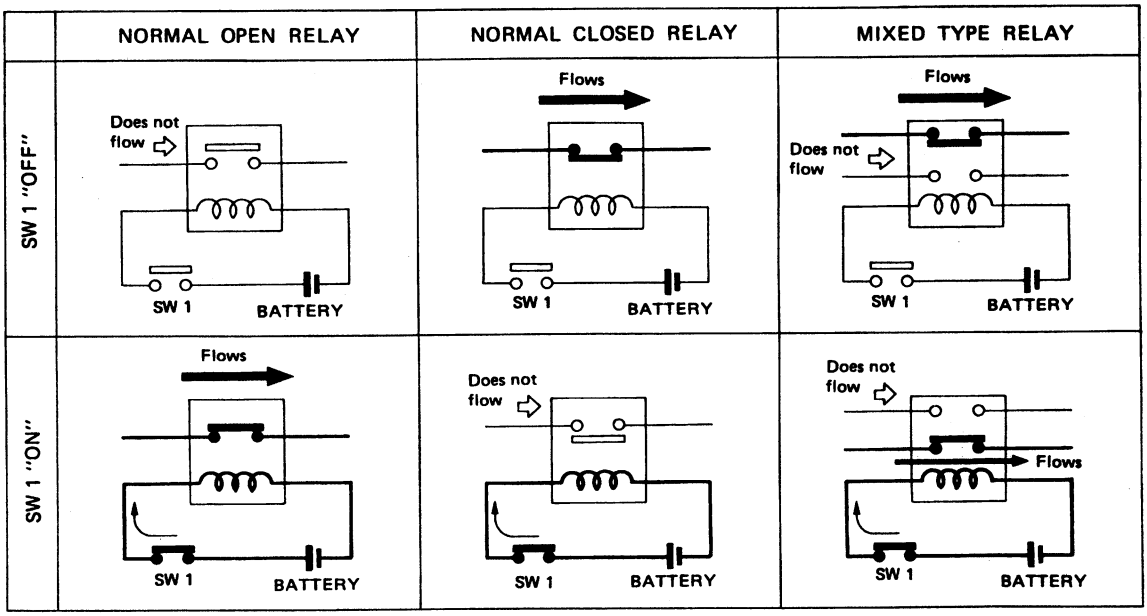


SEL769D

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

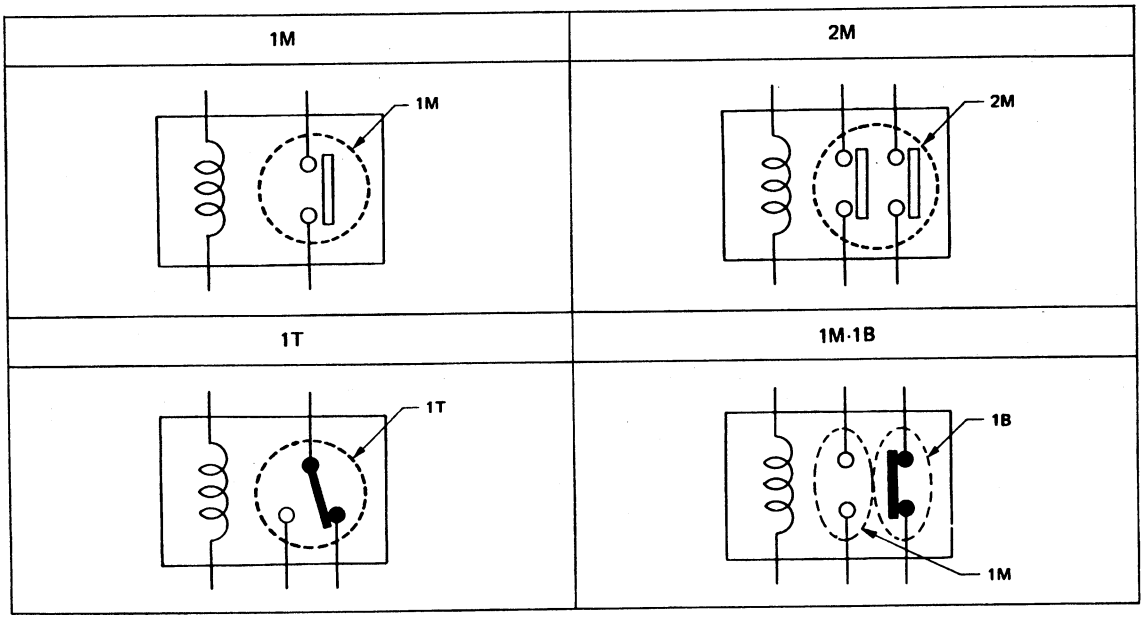
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

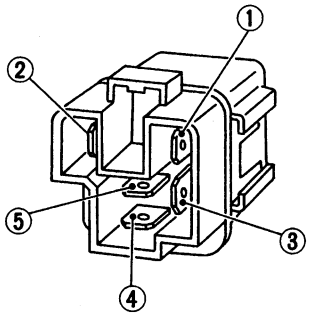
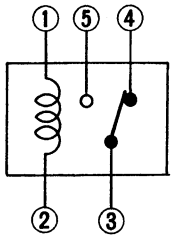
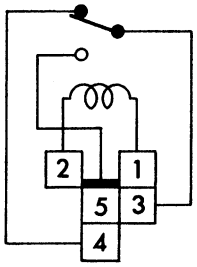
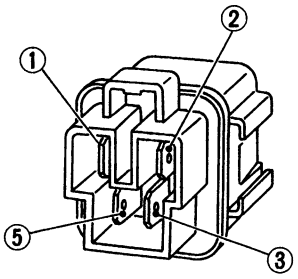
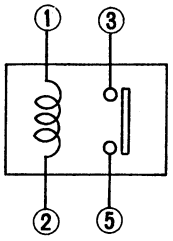
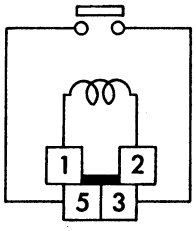
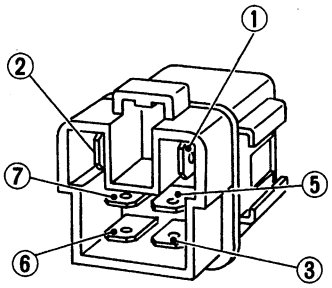
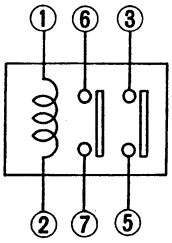
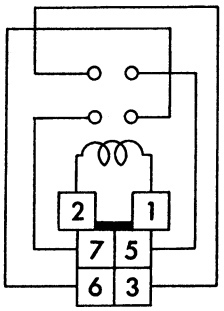
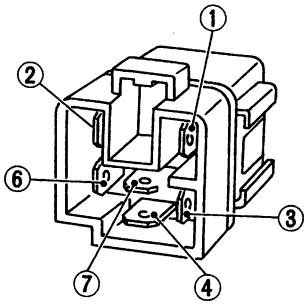
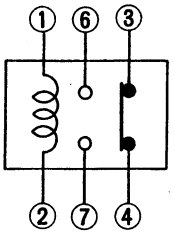
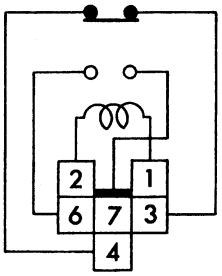
TYPE OF STANDARDIZED RELAYS

1M ..... 1 Make
2M ..... 2 Make
1T ..... 1 Transfer
1M·1B ..... 1 Make, 1 Break



SEL882H

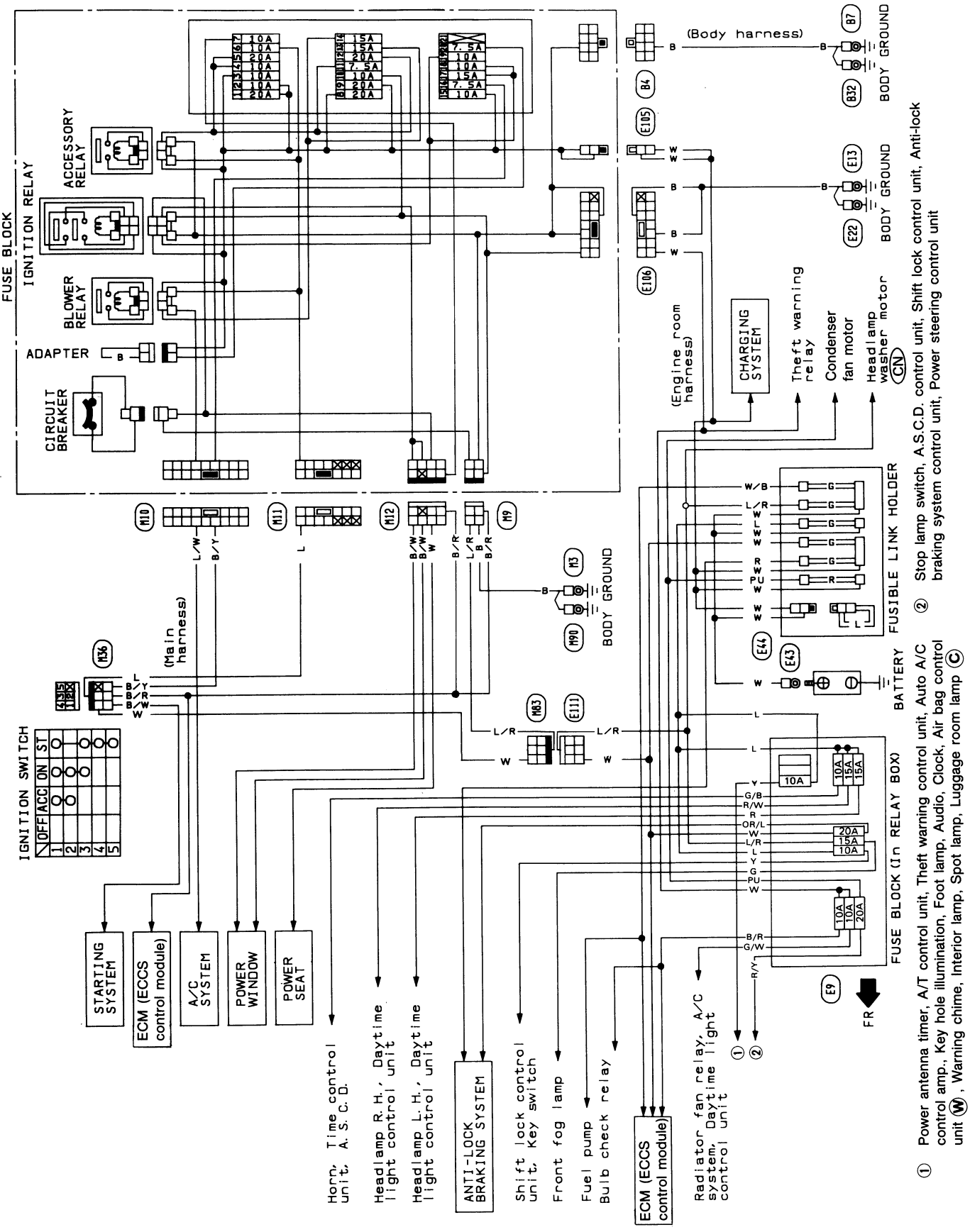
Description (Cont'd)

Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE or GREEN
2M				BROWN
1M·1B				GRAY

SEL883H

NOTE

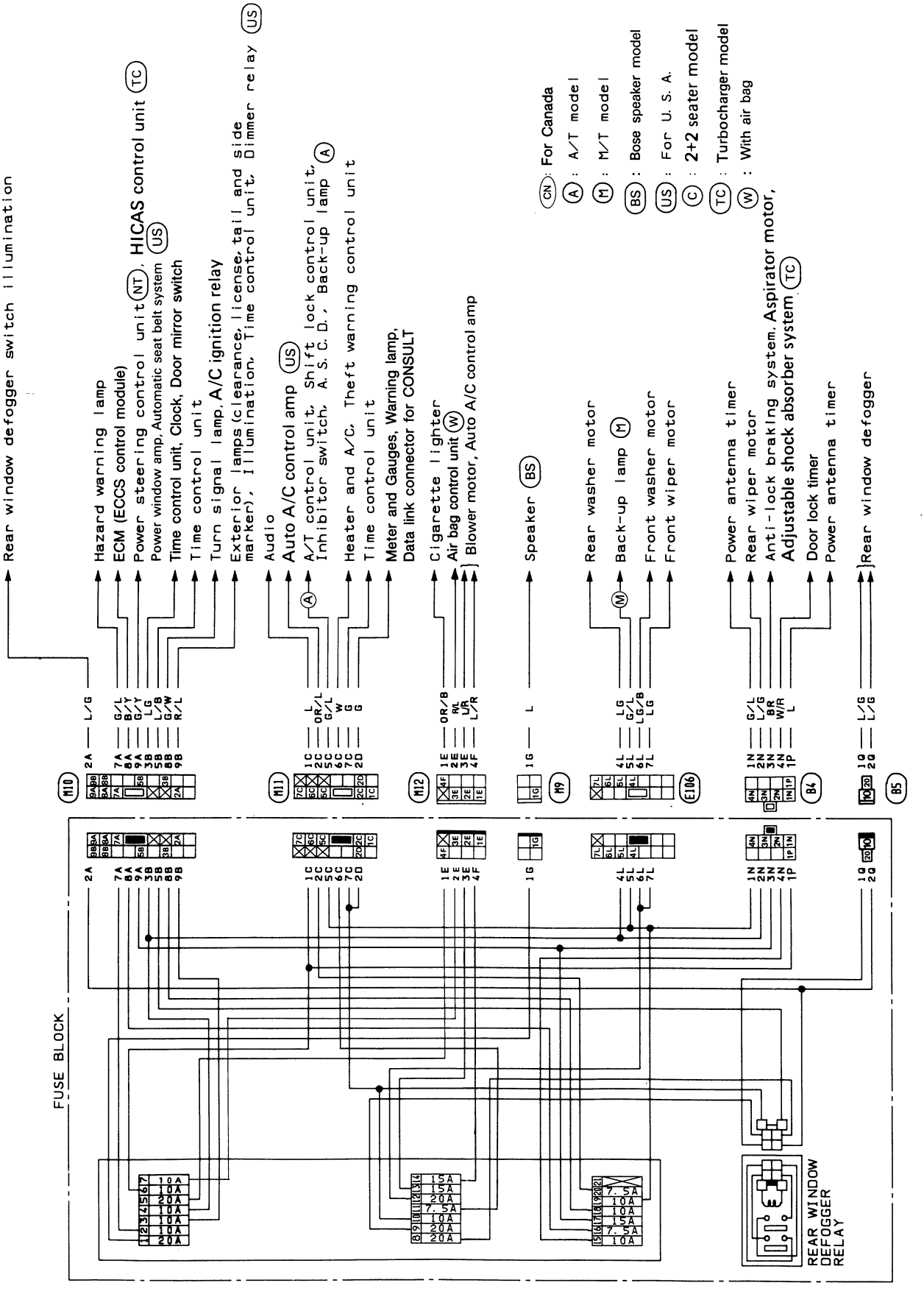
Wiring Diagram



① Power antenna timer, A/T control unit, Theft warning control unit, Auto A/C control amp., Key hole illumination, Foot lamp, Audio, Clock, Air bag control unit (W), Warning chime, Interior lamp, Spot lamp, Luggage room lamp (C)

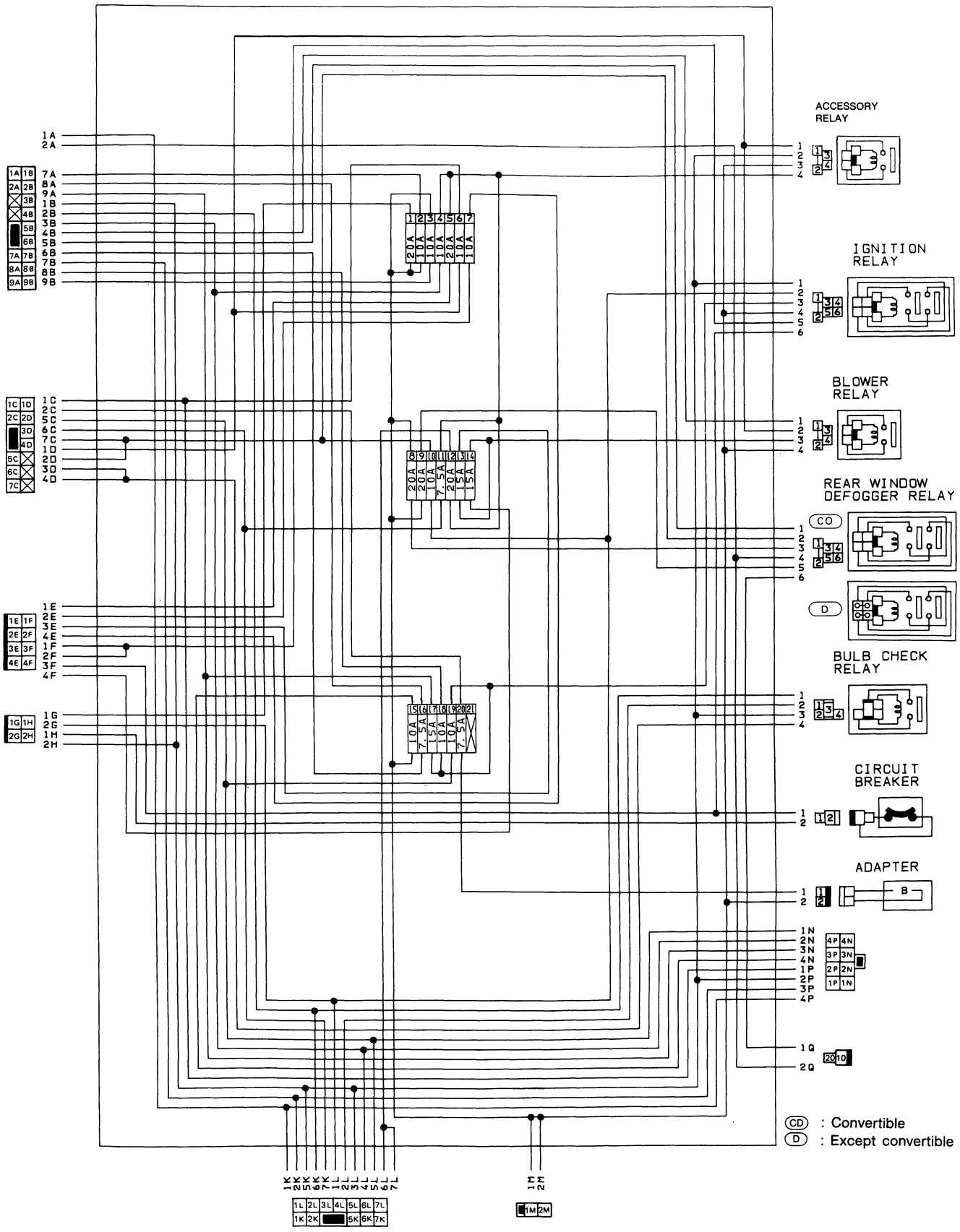
② Stop lamp switch, A.S.C.D. control unit, Shift lock control unit, Anti-lock braking system control unit, Power steering control unit

Wiring Diagram (Cont'd)

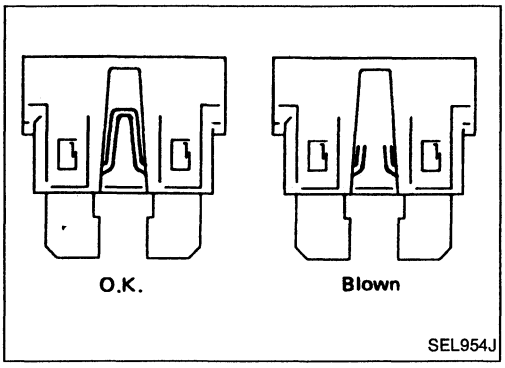


SEL681R

Fuse Block Internal Circuit

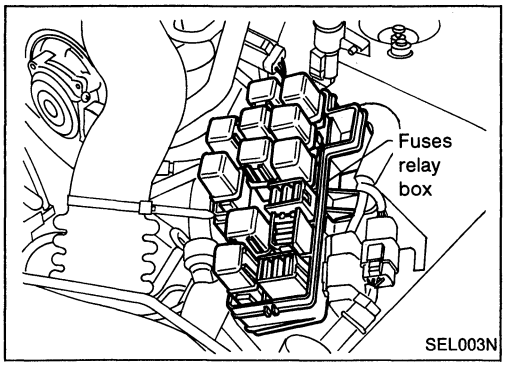


SEL682R



Fuse

a. **If fuse is blown, be sure to eliminate cause of problem before installing new fuse.**
b. **Use fuse of specified rating. Never use fuse of more than specified rating.**
c. **Do not install fuse in oblique direction; always insert it into fuse holder properly.**
d. **Remove fuse for clock if vehicle is not used for a long period of time.**

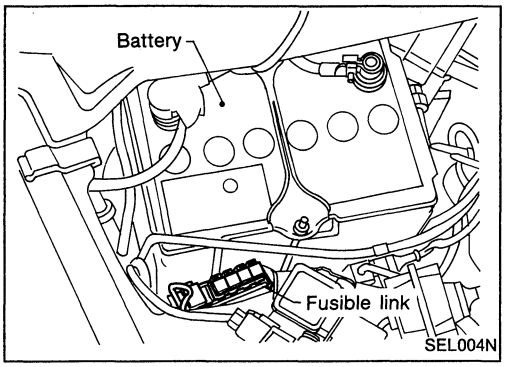


Fusible Link

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

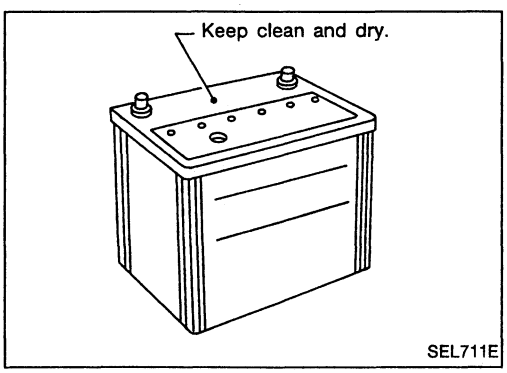
CAUTION:

a. **If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.**
b. **Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.**



CAUTION:

a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
c. Never add distilled water through the hole used to check specific gravity.

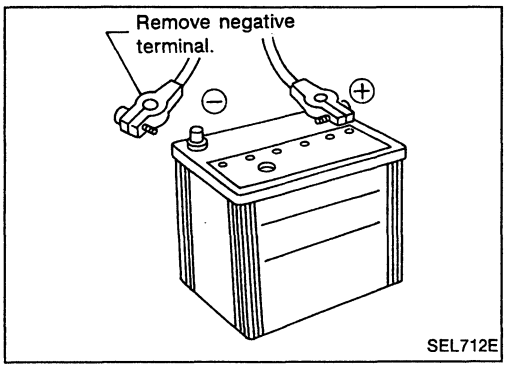


How to Handle Battery

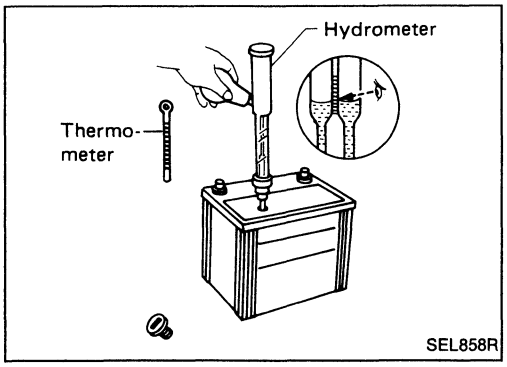
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level.



- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)



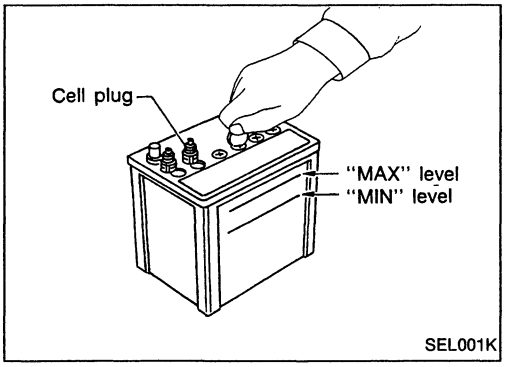
- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

CHECKING ELECTROLYTE LEVEL

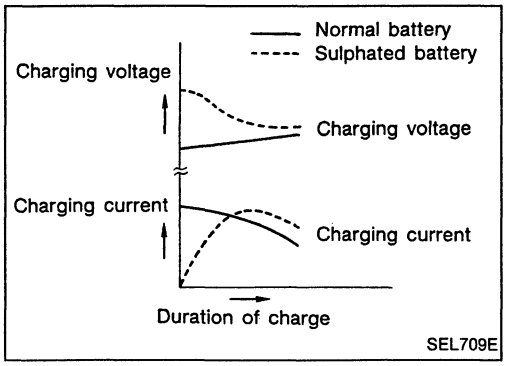
WARNING:

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.

How to Handle Battery (Cont'd)

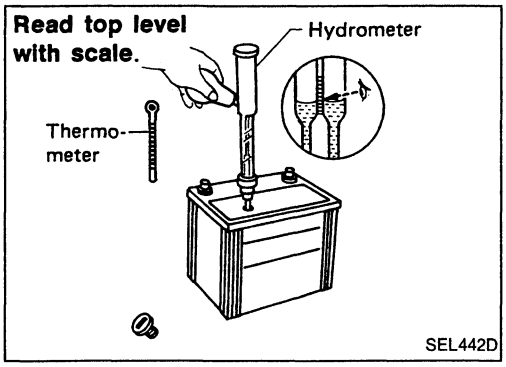


- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



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.

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
66 (150)	0.028
60 (140)	0.024
54 (129)	0.020
49 (120)	0.016
43 (110)	0.012
38 (100)	0.008
32 (90)	0.004
27 (80)	0
21 (70)	–0.004
16 (60)	–0.008
10 (50)	–0.012
4 (39)	–0.016
–1 (30)	–0.020
–7 (20)	–0.024
–12 (10)	–0.028
–18 (0)	–0.032

Corrected specific gravity	Approximate charge condition
1.260 - 1.280	Fully charged
1.230 - 1.250	3/4 charged
1.200 - 1.220	1/2 charged
1.170 - 1.190	1/4 charged
1.140 - 1.160	Almost discharged
1.110 - 1.130	Completely discharged

CHARGING THE BATTERY

CAUTION:

a. Do not "quick charge" a fully discharged battery.

b. Keep the battery away from open flame while it is being charged.

c. 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.

d. 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:

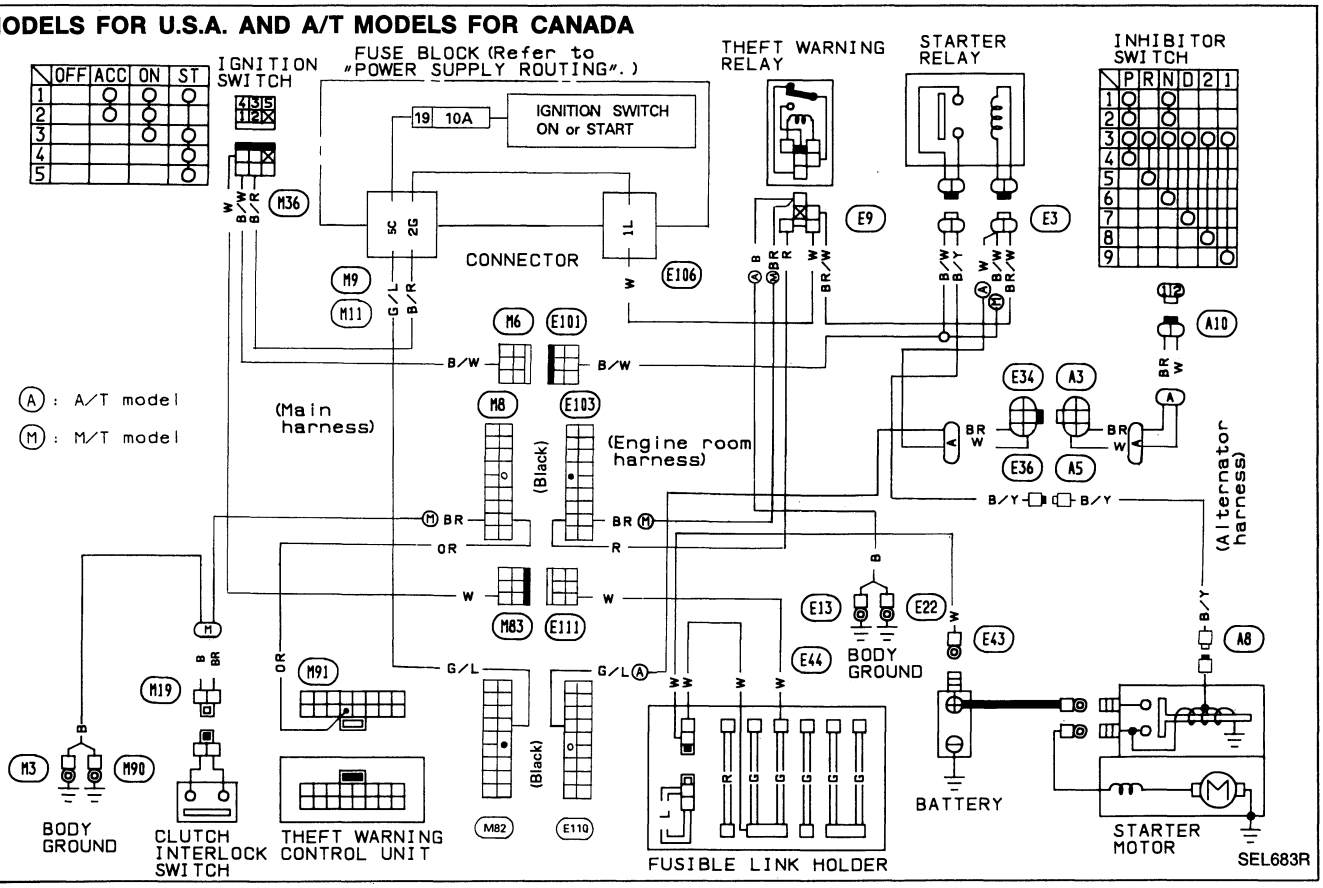
Amps	Time
50	1 hour
25	2 hours
10	5 hours
5	10 hours

Service Data and Specifications (S.D.S.)

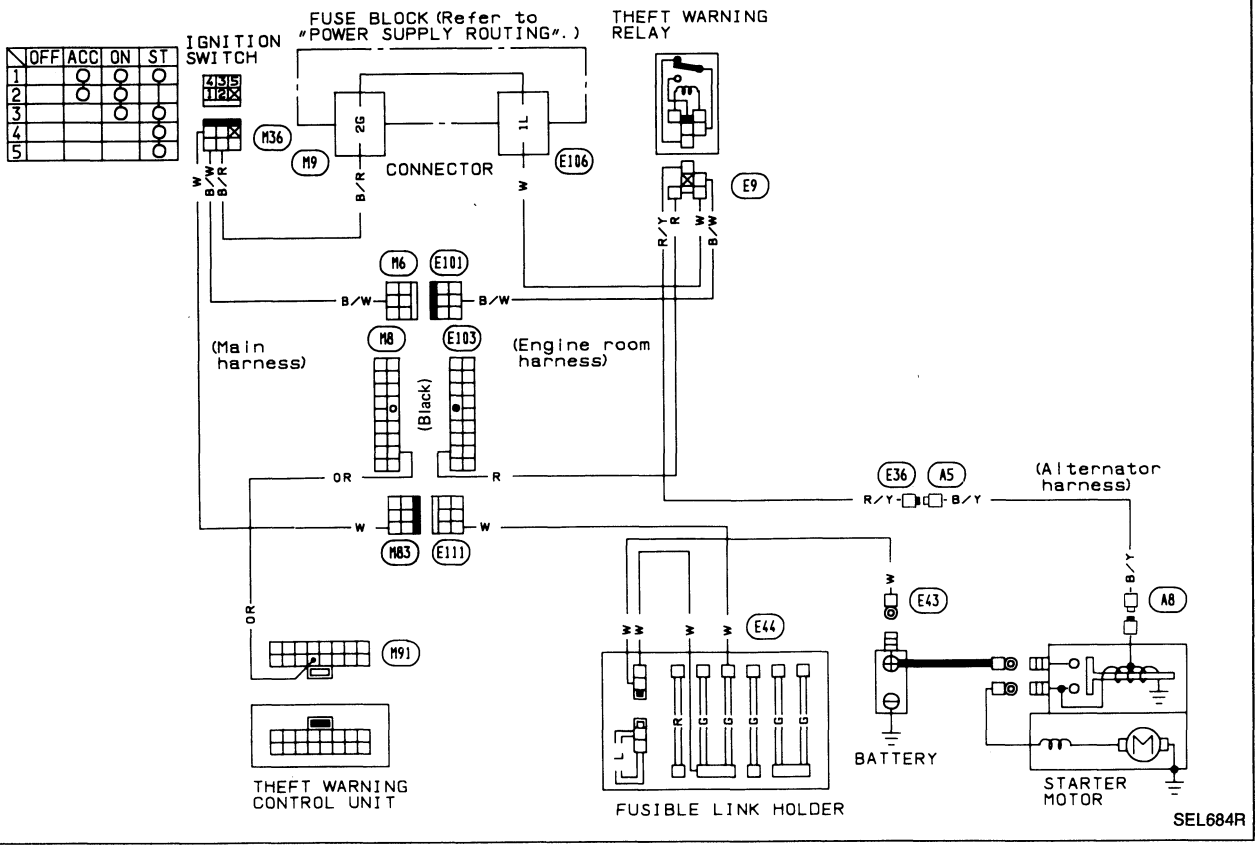
Applied model	M/T	A/T
Type	65D26L	80D26L
Capacity V-AH	12-65	
Cold cranking current (For reference value) A	413	582

Wiring Diagram

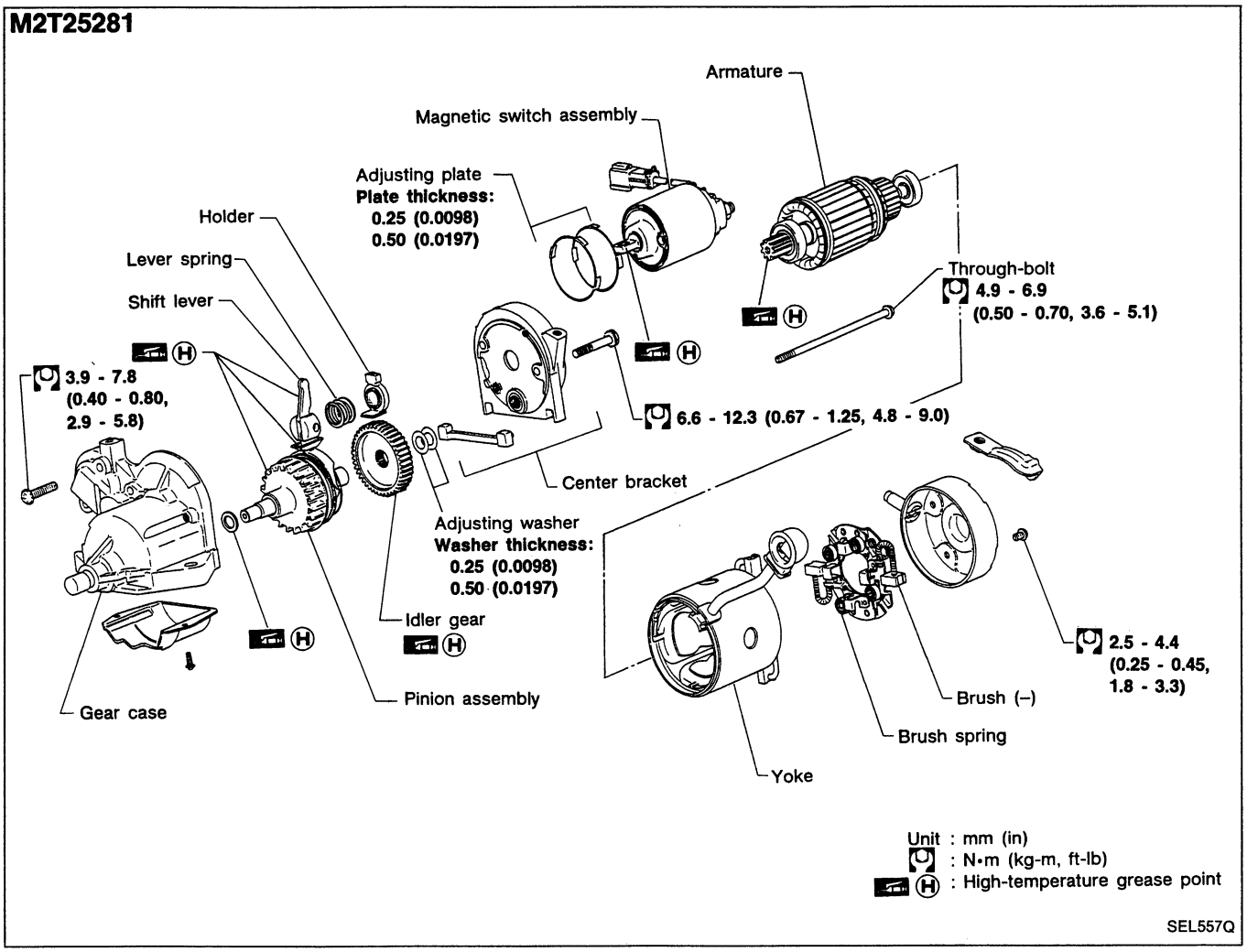
MODELS FOR U.S.A. AND A/T MODELS FOR CANADA

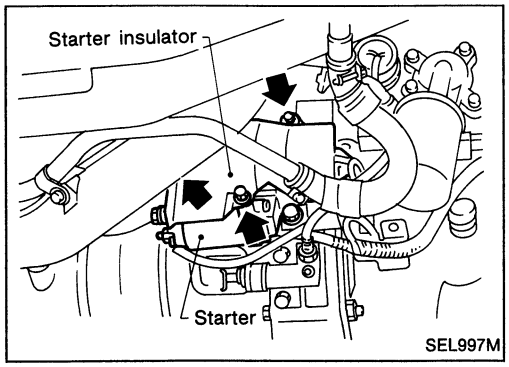


M/T MODELS FOR CANADA



Construction





Removal and Installation

REMOVAL

1. Remove starter insulator.
2. Remove starter harness connector and cable.
3. Remove starter fixing bolt and nut and remove starter.

INSTALLATION

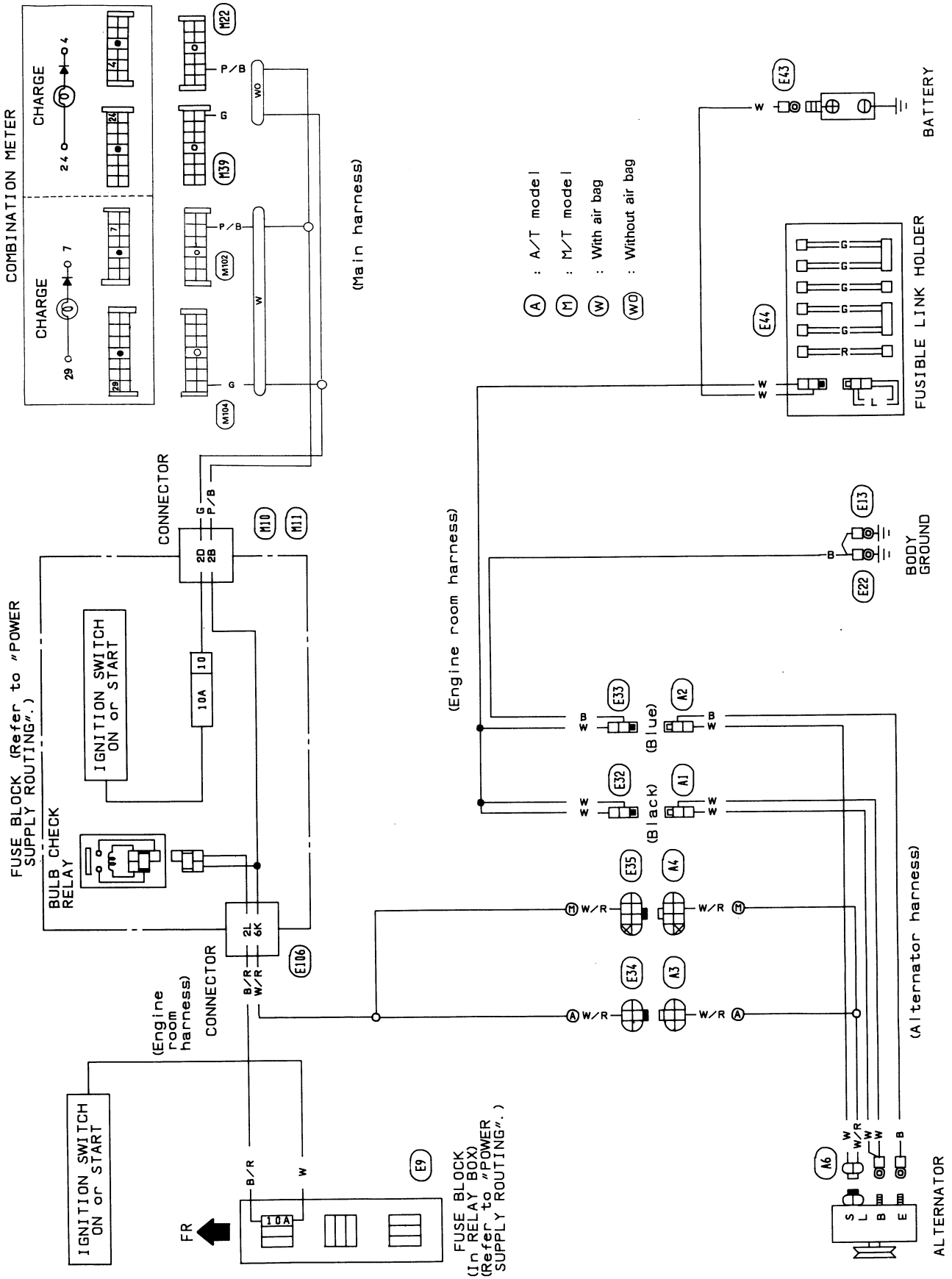
- Installation procedure is in reverse order of removal.

Service Data and Specifications (S.D.S.)

STARTER

Type			M2T25281
			Reduction gear
System voltage		V	12
No-load	Terminal voltage	V	11.0
	Current	A	70
	Revolution	rpm	More than 2,000
Minimum length of brush		mm (in)	11.5 (0.453)
Brush spring tension (With new brush)		N (kg, lb)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)
Minimum diameter of commutator		mm (in)	31.4 (1.236)
Difference in height of pinion assembly		mm (in)	0.3 - 2.0 (0.012 - 0.079)

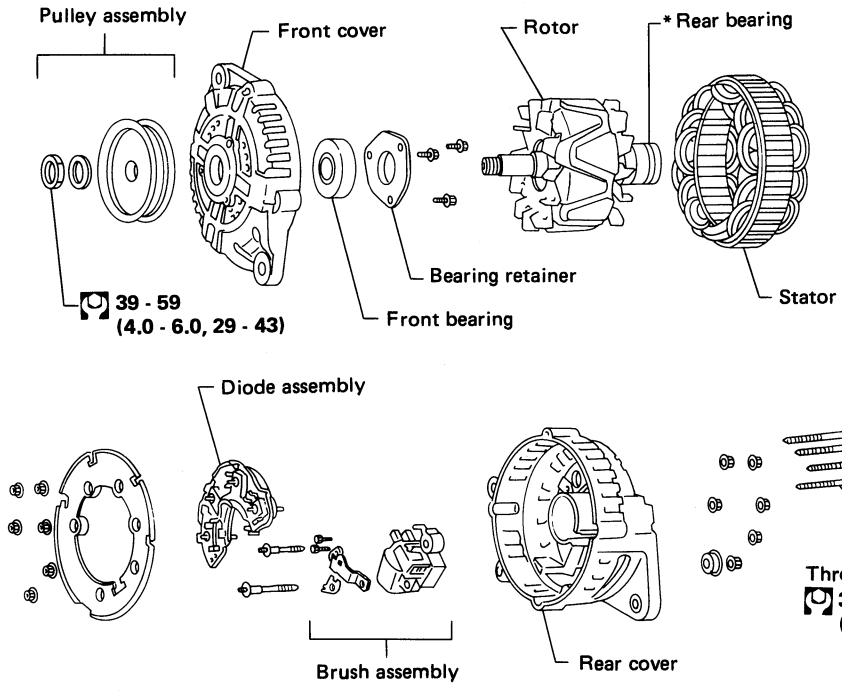
Wiring Diagram



SEL685R

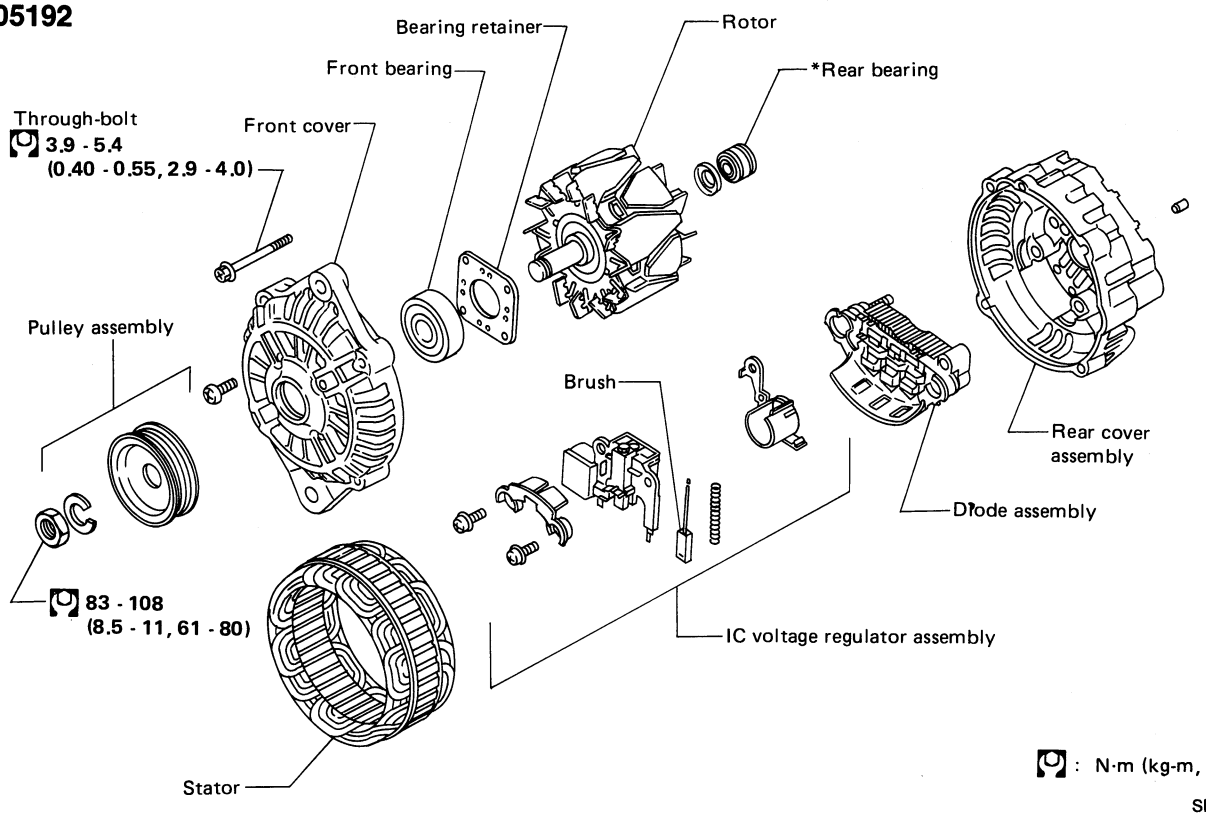
Construction

LR180-724



SEL686N

A3T05192



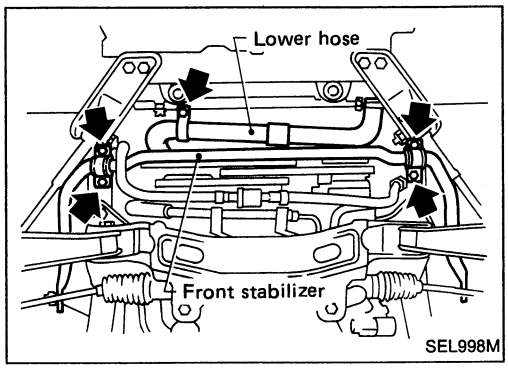
SEL687N

***Rear bearing**
CAUTION:
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.

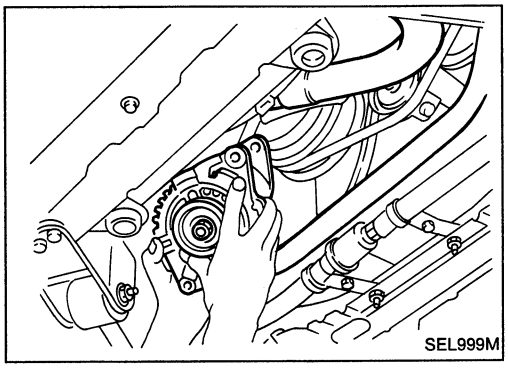
Removal and Installation

REMOVAL

1. Loosen alternator belt.
2. Remove alternator adjusting bar.
3. Remove harness connector and cable from alternator.



4. Remove stabilizer bracket fixing bolts.
5. Remove radiator lower hose bracket and push lower hose upward to make room.



6. Remove alternator fixing bolt and take out alternator as shown in the figure.

INSTALLATION

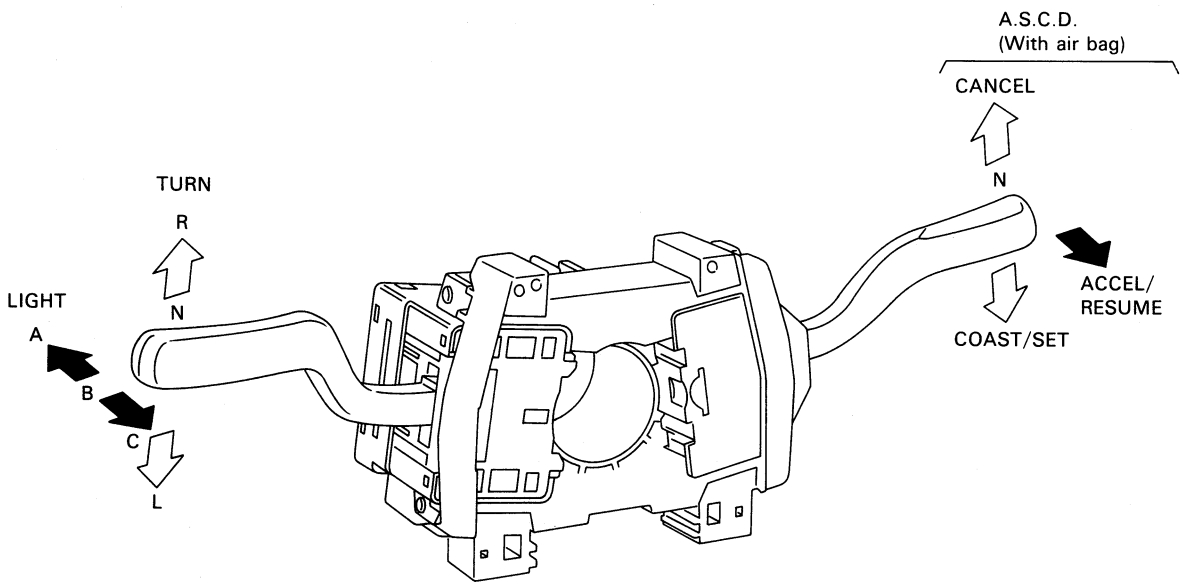
- Installation procedure is in reverse order of removal.

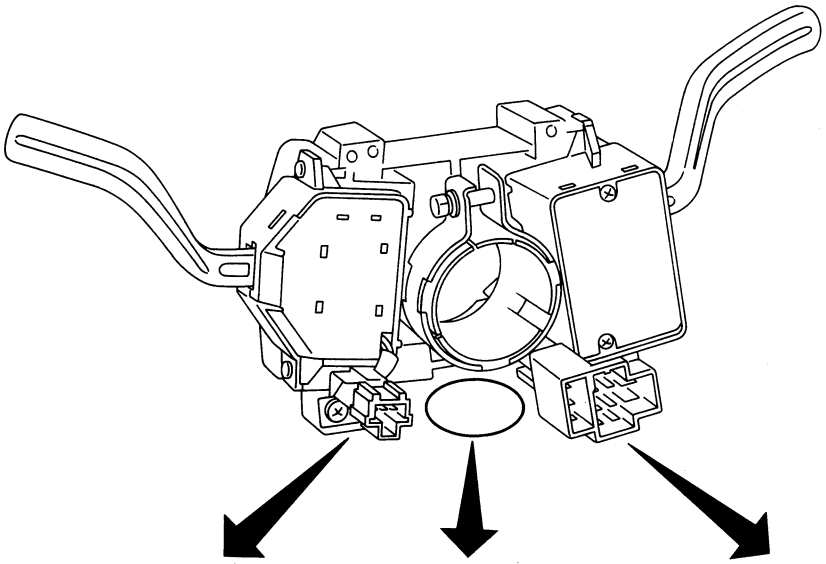
Service Data and Specifications (S.D.S.)

ALTERNATOR

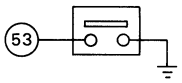
Type		LR180-724	A3T05192
		HITACHI make	MITSUBISHI make
Applied engine		VG30DE	VG30DETT
Nominal rating	V-A	12-80	12-90
Ground polarity		Negative	
Minimum revolution under no-load (when 13.5 volts is applied)	rpm	Less than 950	Less than 1,300
Hot output current	A/rpm	More than 65/2,500 More than 80/5,000	More than 65/2,500 More than 90/5,000
Regulated output voltage	V	14.1 - 14.7	
Minimum length of brush	mm (in)	More than 7.0 (0.276)	More than 8.0 (0.315)
Brush spring pressure	N (g, oz)	1.863 - 3.040 (190 - 310, 6.70 - 10.93)	3.040 - 4.217 (310 - 430, 10.93 - 15.17)
Slip ring minimum outer diameter	mm (in)	More than 30.6 (1.205)	More than 22.1 (0.870)

Combination Switch/Check





HORN SWITCH



A.S.C.D. SWITCH

	RESUME ACCEL	N	SET COAST	OFF	CANCEL
13 or 53	○		○		○
12 or 52			○		○
11 or 51	○				○

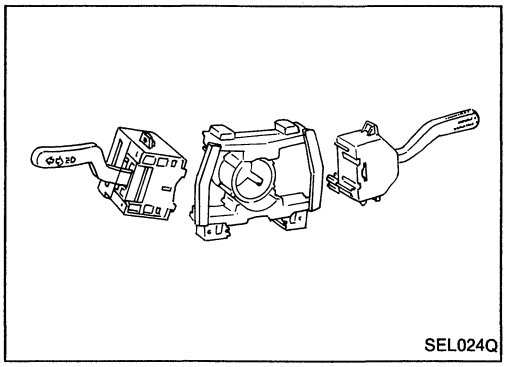
DIMMER SWITCH

	A	B	C
5			○
6			○
8			○
9			○
43		○	
44		○	

TURN SIGNAL SWITCH

	R	N	L
1	○		○
2	○		
3			○

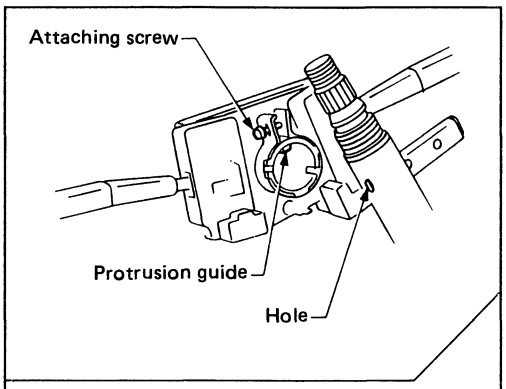
SEL015S


SEL024Q

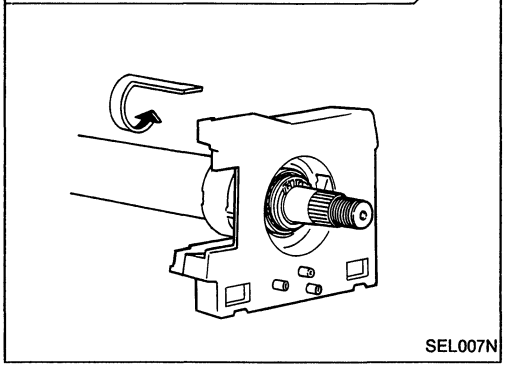
Combination Switch/Replacement

For removing/installing air bag module and spiral cable, refer to BF section.

- Each switch can be replaced without removing combination switch base.

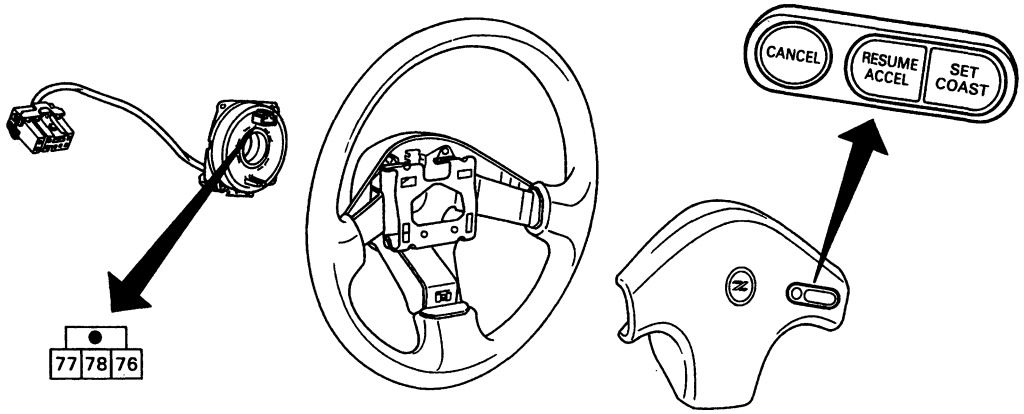


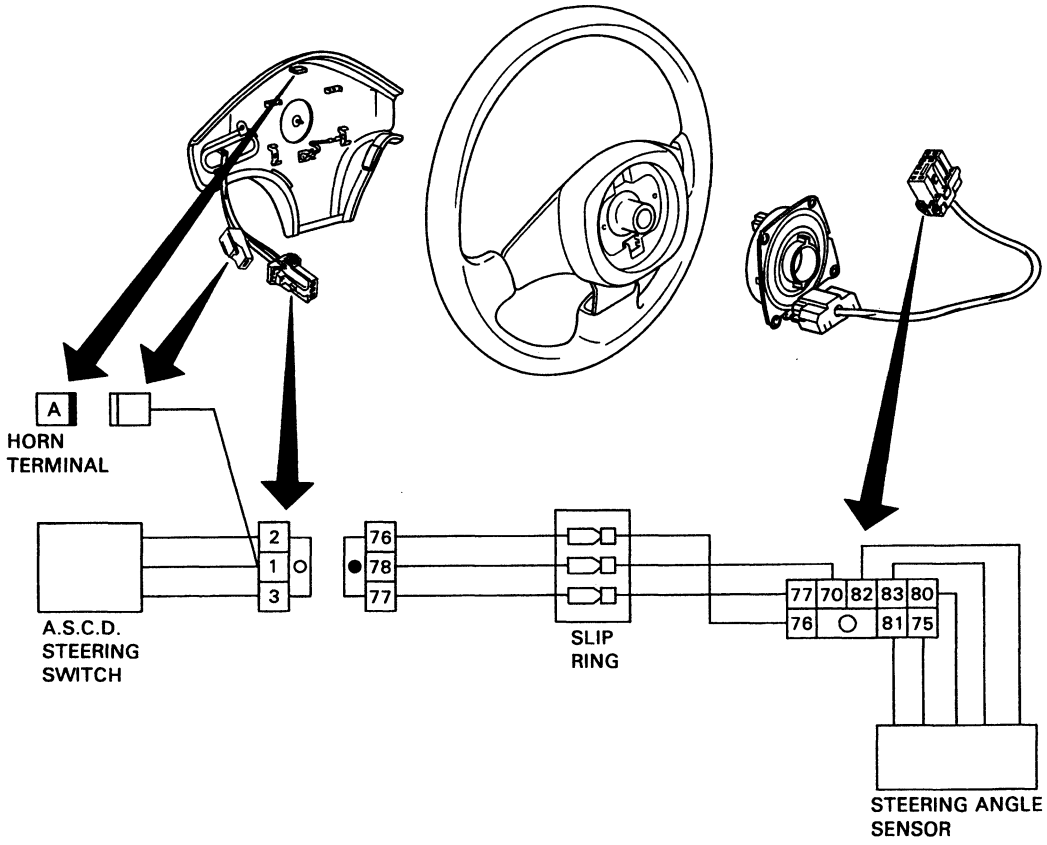
- To remove combination switch base, remove base attaching screw and turn after pushing on it.


SEL007N

Steering Switch/Check

TURBOCHARGER MODELS WITHOUT AIR BAG





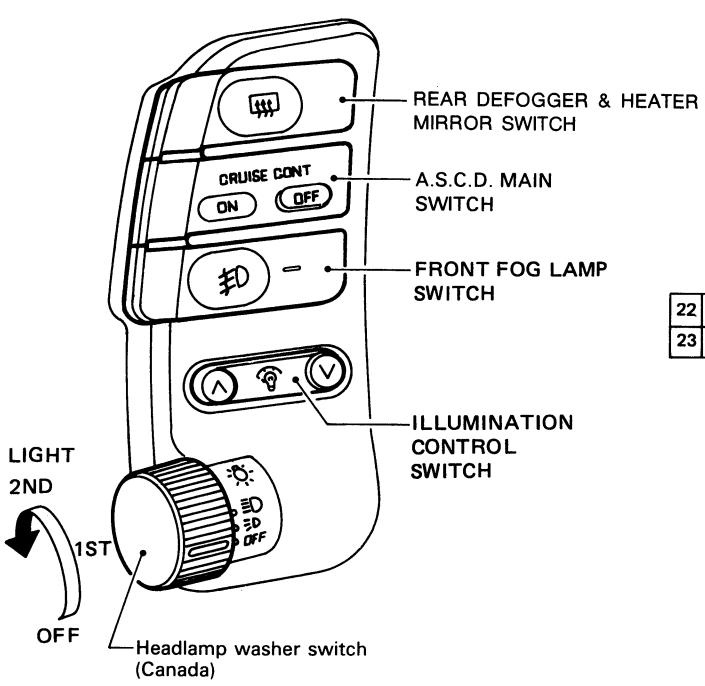
A.S.C.D. STEERING SWITCH

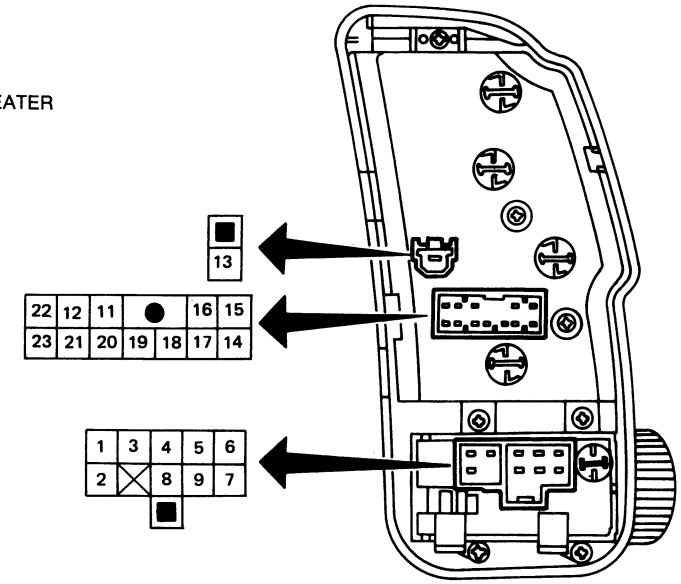
	RESUME ACCEL	N	SET COAST	OFF	CANCEL
1	○		○		○
2			○		○
3	○				○

HORN SWITCH

SEL528N

Check





LIGHTING SWITCH

	OFF	1ST	2ND
1			○
2			○
3			○
4			○
5		○	○
6		○	○
⊠		○	
⊠		Ⓔ	
7		○	

REAR DEFOGGER & HEATER MIRROR SWITCH

	OFF	ON
11		○
12		○
⊠		Ⓔ
13		○

A.S.C.D. MAIN SWITCH

	OFF	N	ON
14			○
15		○	○
16		○	○

FRONT FOG LAMP SWITCH

	OFF	ON
17		○
18		○
⊠		Ⓔ
19		○

HEADLAMP WASHER SWITCH

	OFF	ON
8		○
9		○

ILLUMINATION CONTROL SWITCH

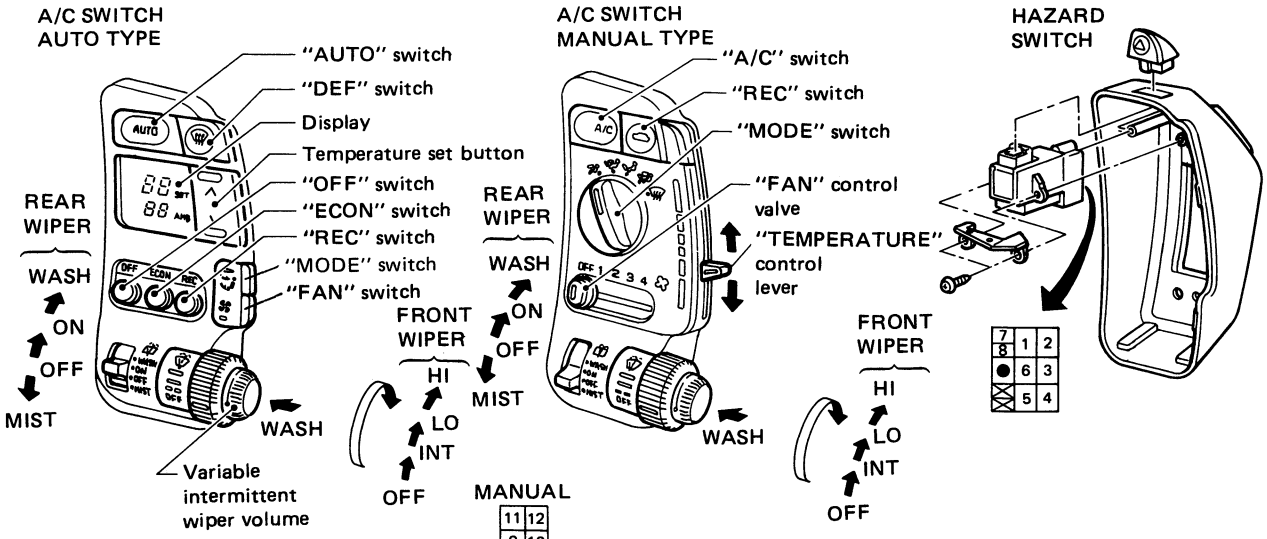
	V	N	∧
20			○
21	○		
12	○		○

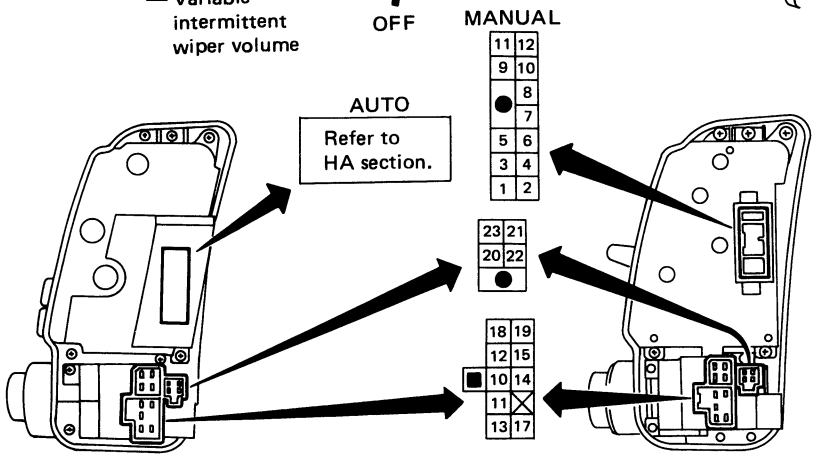
CLUSTER ILLUMINATION

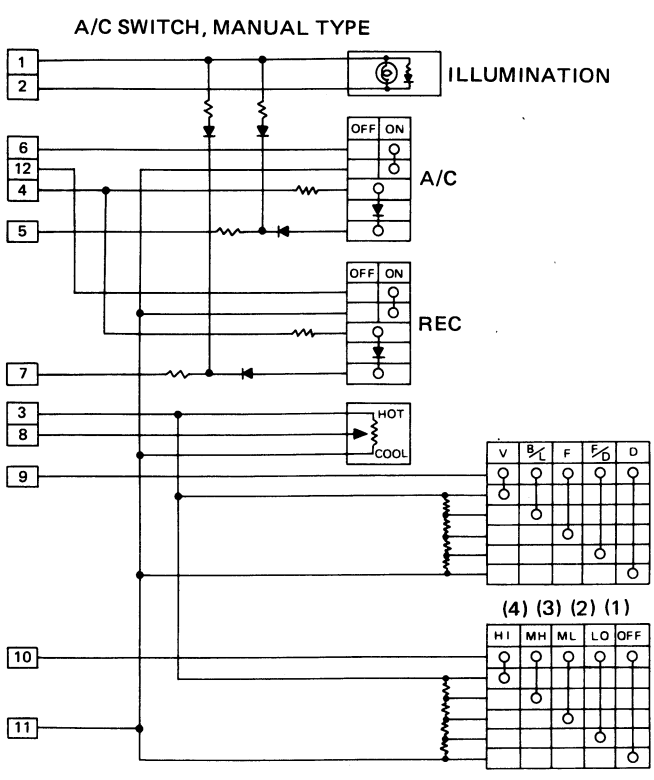
22	○
⊠	Ⓔ
23	○

SEL785Q

Check (Cont'd)







FRONT WIPER SWITCH

	WIPER					WASH	
	OFF	INT	LO	HI	⅟	OFF	ON
10	○	○					
11	○	○	○				
12		○	○	○			
13							
14		○	○	○	○		○
15					○		
17							
18				○			
⊠				Ⓔ			
19				○			

REAR WIPER SWITCH

	MIST	OFF	ON	WASH
20	○	○	○	○
21		○		
22			○	○
23	○		○	○

HAZARD SWITCH

	OFF	ON
1	○	○
2	○	
3		○
4		○
5		○
6		○
7	○	
	Ⓔ	
8	○	

SEL529N

Operation (Daytime light system equipped model)

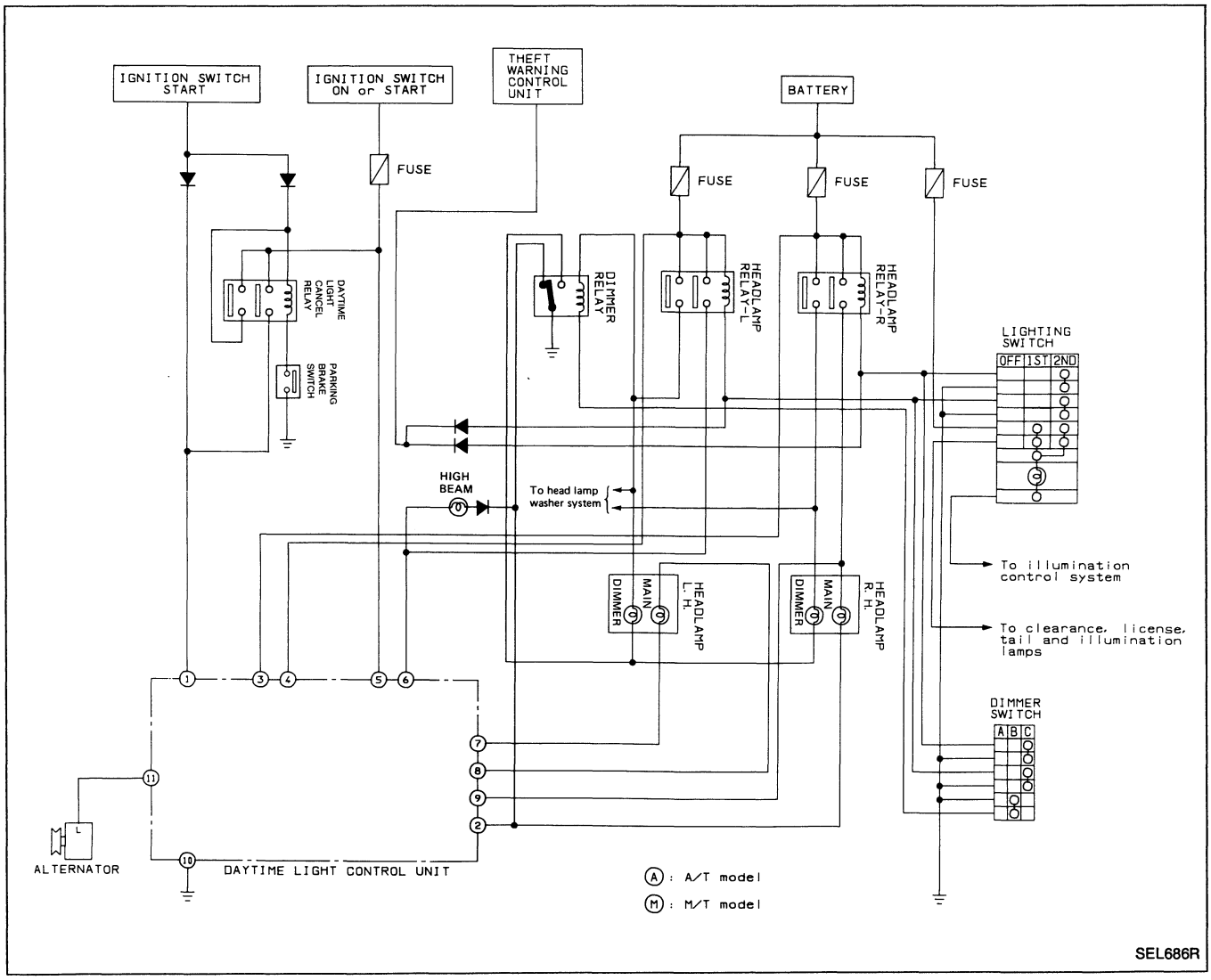
After starting the engine with the lighting switch in the "OFF" position, the headlamp high beam automatically turns on. Lighting switch operations other than the above are the same as conventional light systems.

Engine		With engine stopped									With engine running								
Lighting switch		OFF			1ST			2ND			OFF			1ST			2ND		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	×	×	○	×	×	○	○	×	○	△*	△*	○	△	△	○	○	×	○
	Low beam	×	×	×	×	×	×	×	○	×	×	×	×	×	×	×	×	○	×
Clearance and tail lamp		×	×	×	○	○	○	○	○	○	×	×	×	○	○	○	○	○	○
License and instrument illumination lamp		×	×	×	○	○	○	○	○	○	×	×	×	○	○	○	○	○	○

○: Lamp "ON"
×: Lamp "OFF"
△: Lamp dims.
□: Added functions
* : When starting the engine with the parking brake released, the daytime light system will come ON.
When starting the engine with the parking brake pulled, the daytime light system will not come ON.

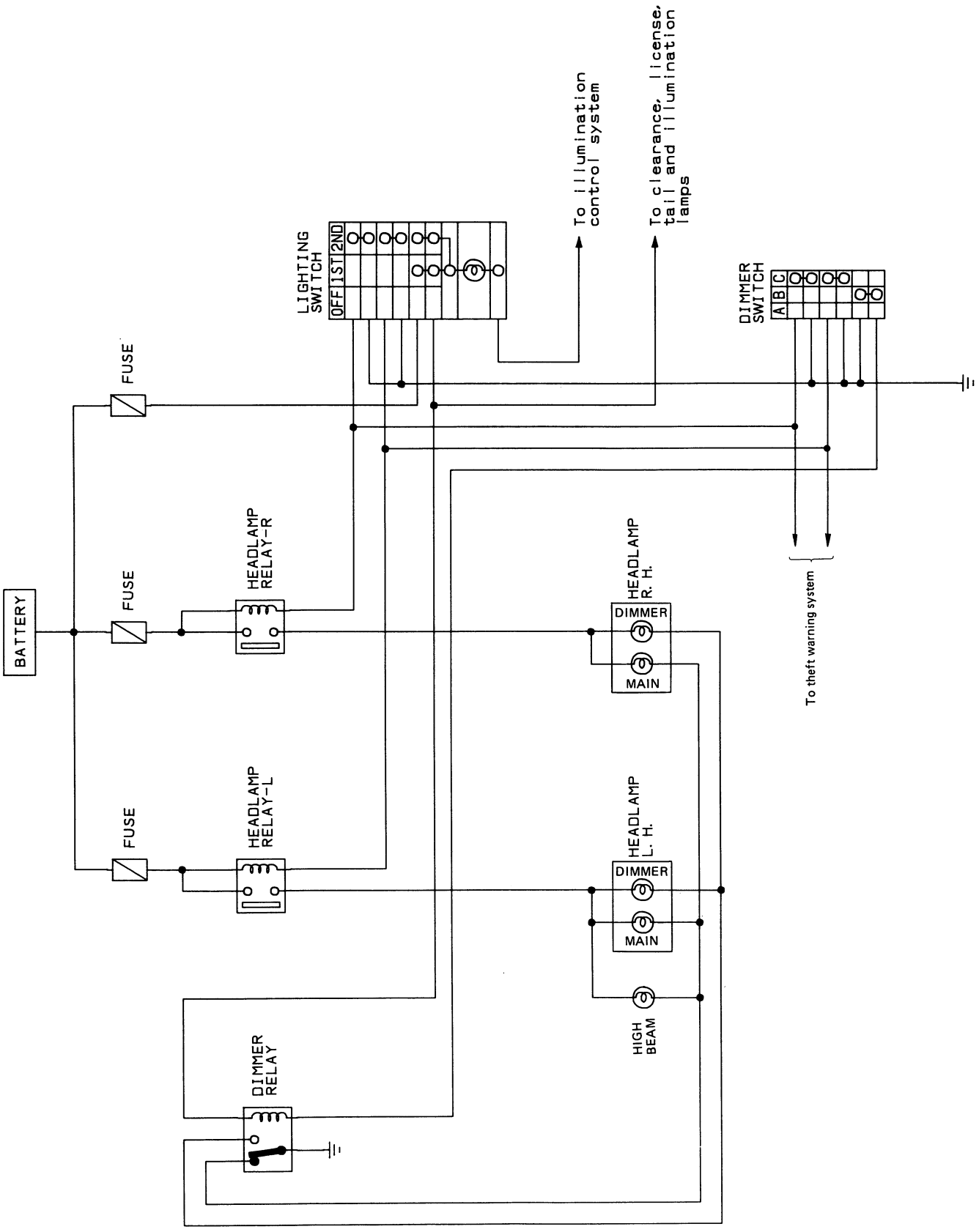
Schematic

FOR CANADA



Schematic (Cont'd)

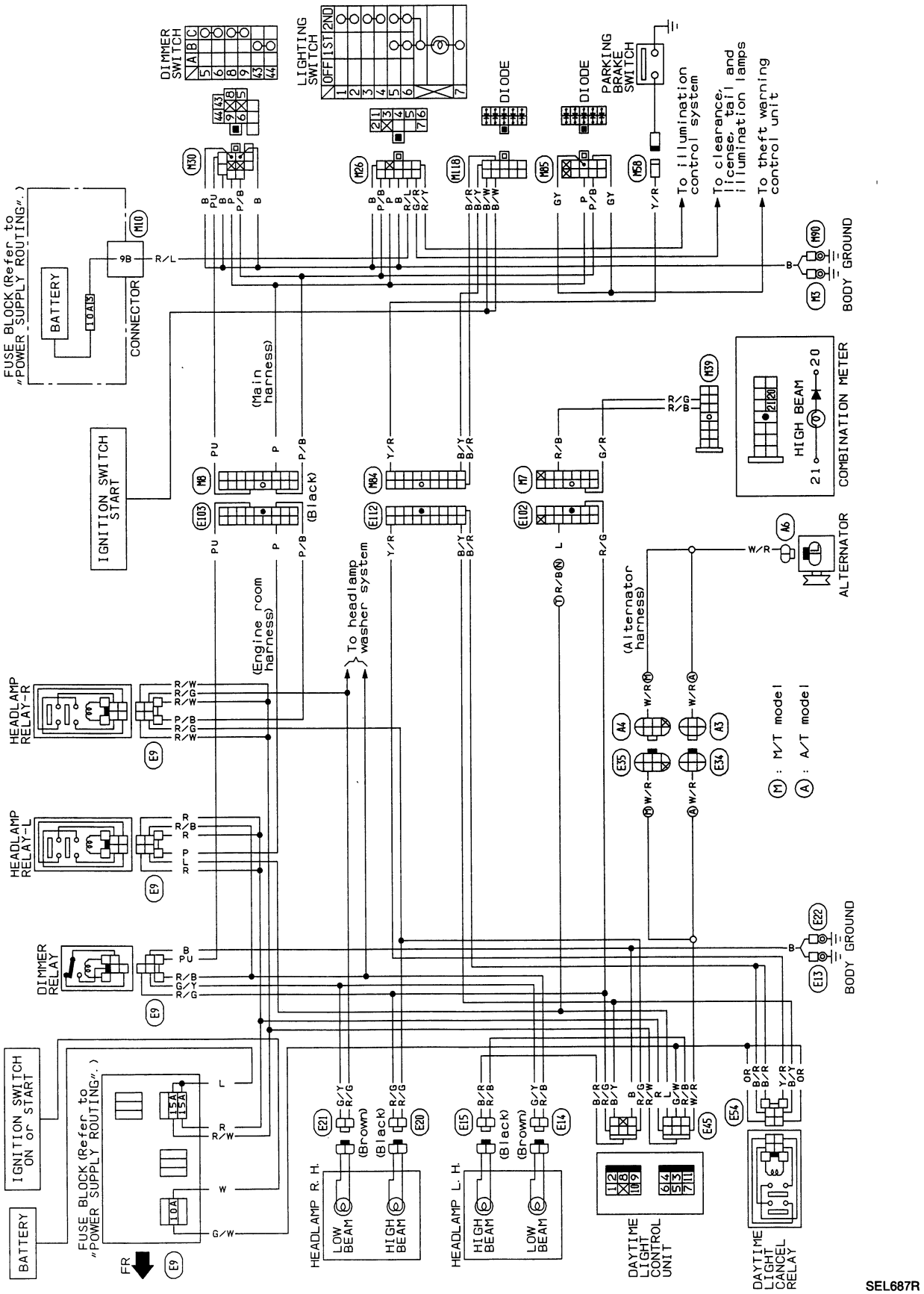
FOR U.S.A.



SEL530N

Wiring Diagram

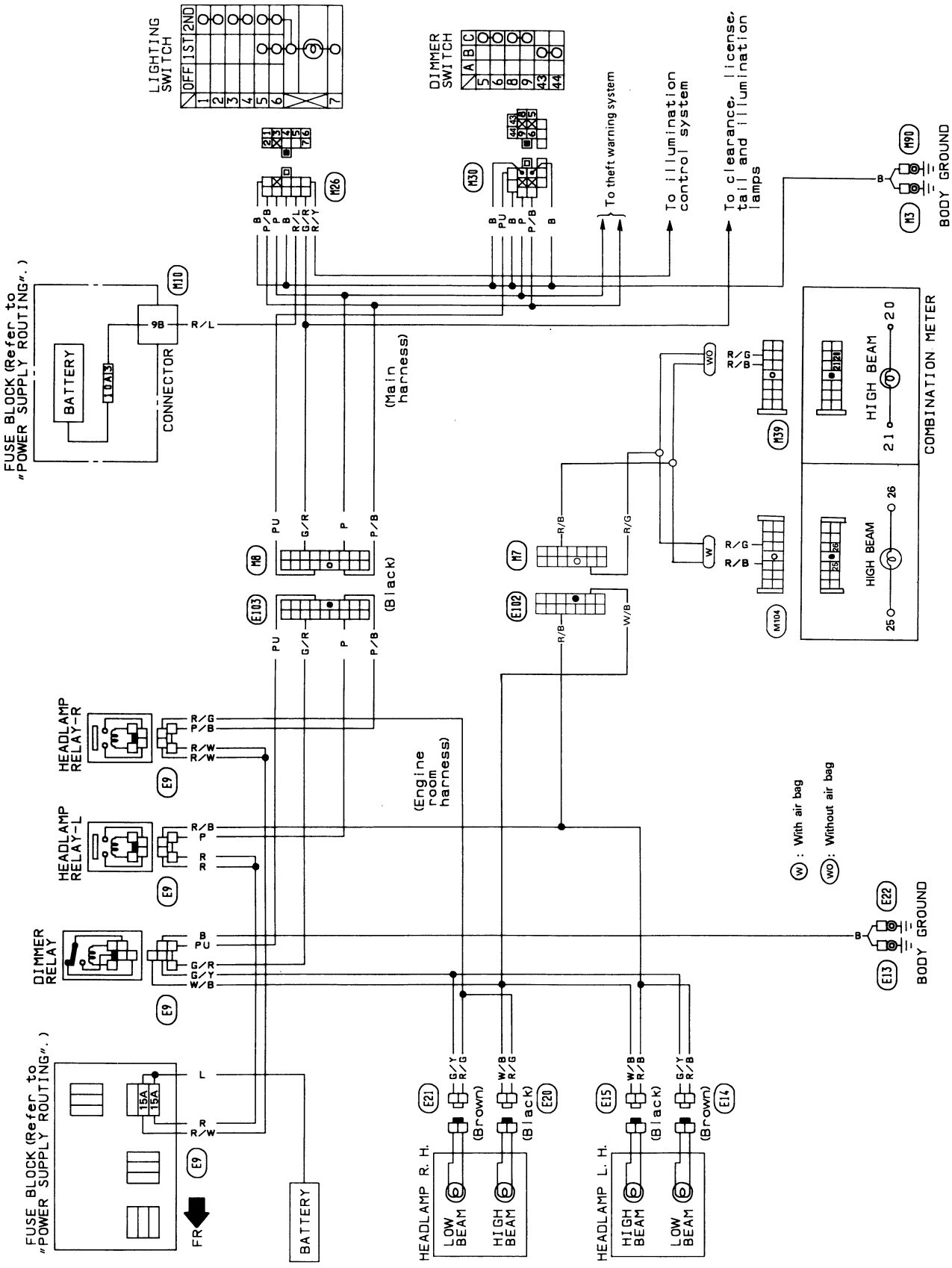
FOR CANADA



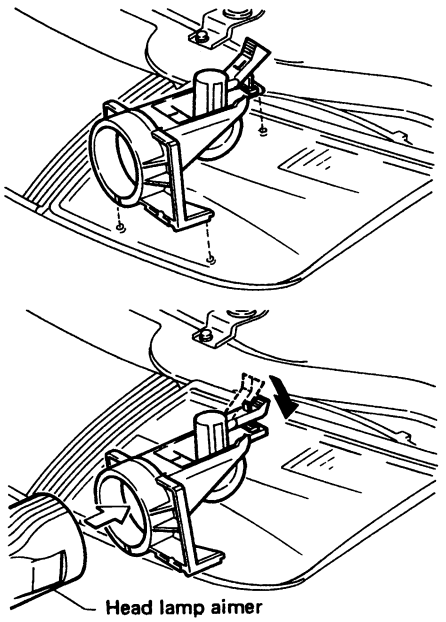
SEL687R

Wiring Diagram (Cont'd)

FOR U.S.A.



SEL680Q



SEL895M

Aiming Adjustment

When performing headlamp aiming adjustment, use an aiming machine, aiming wall, screen or headlamp tester. When operating any aimer, it should be in good repair, calibrated and used according to the operation manual supplied with the unit.

HEADLAMP AIMER ADAPTER

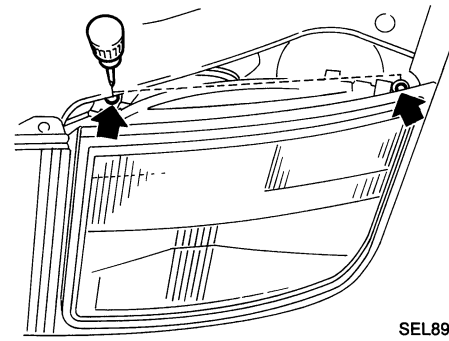
Attach the headlamp aimer using Tool (aimer adapter). Place the aimer adapter on the 3 points of the headlamp, then push the lever down to secure it.

If no aimer is available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

CAUTION:

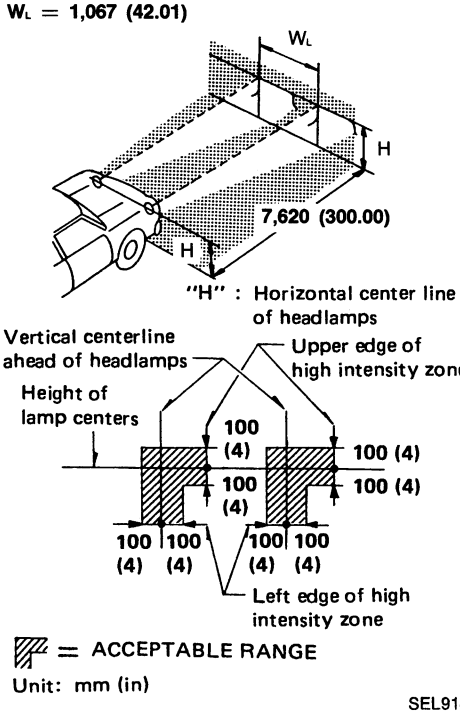
a. **Make sure tires are inflated to correct pressures.**
b. **Place vehicle and tester on the same flat surface.**
c. **See that there is no load in the vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).**



SEL896M

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.**

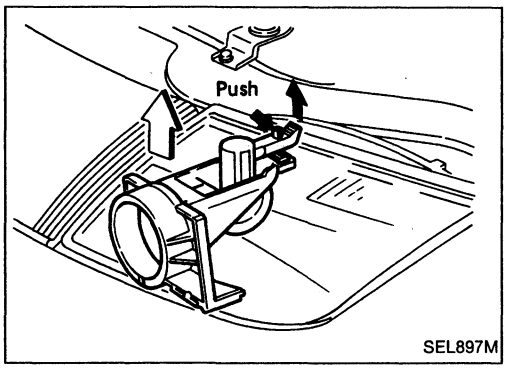


SEL914D

- **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.**

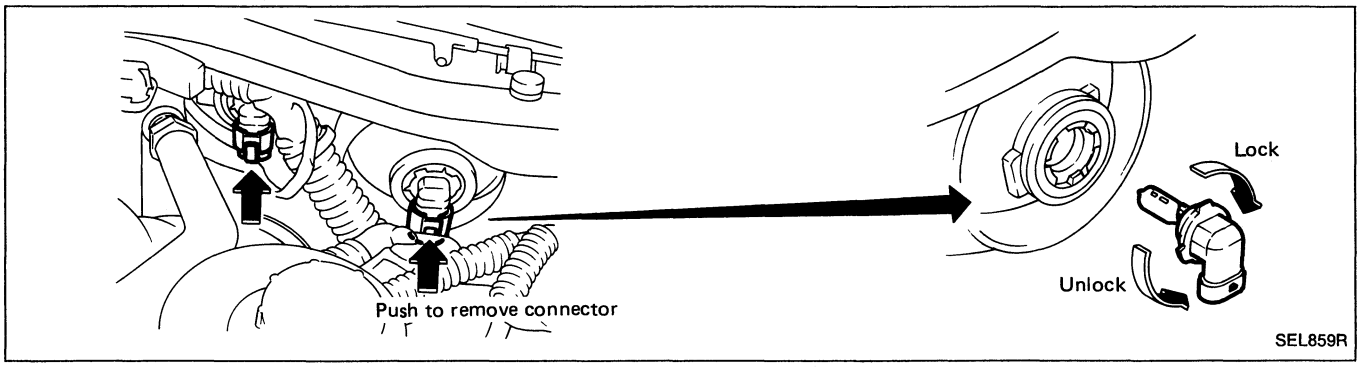
"H": Horizontal center line of headlamps
"W_L": Distance between each headlamp center

Aiming Adjustment (Cont'd)



Push the tongue and pull the lever up to remove the adapter.

Bulb Replacement



The Headlamp is a semi-sealed beam type which uses a replaceable Headlamp (halogen) bulb. A bulb can be replaced from inside the engine compartment without removing the Headlamp assembly.

CAUTION:

High pressure halogen gas is sealed inside the halogen bulb. The bulb may break if the glass envelope is scratched or the bulb is dropped.

Hold the plastic base when handling the bulb. Never touch the glass envelope.

REMOVING HEADLAMP BULB

1. Disconnect battery negative cable.
2. Disconnect electrical connector from rear end of bulb.
3. Turn plastic base counterclockwise until it is free from headlamp reflector, then remove it.
4. Remove headlamp bulb. Do not shake or rotate bulb when removing it.

REPLACING HEADLAMP BULB

1. Insert bulb into headlamp reflector with plastic base facing downward and turn it clockwise until it stops.
2. Push electrical connector into bulb plastic base until it snaps and stops.

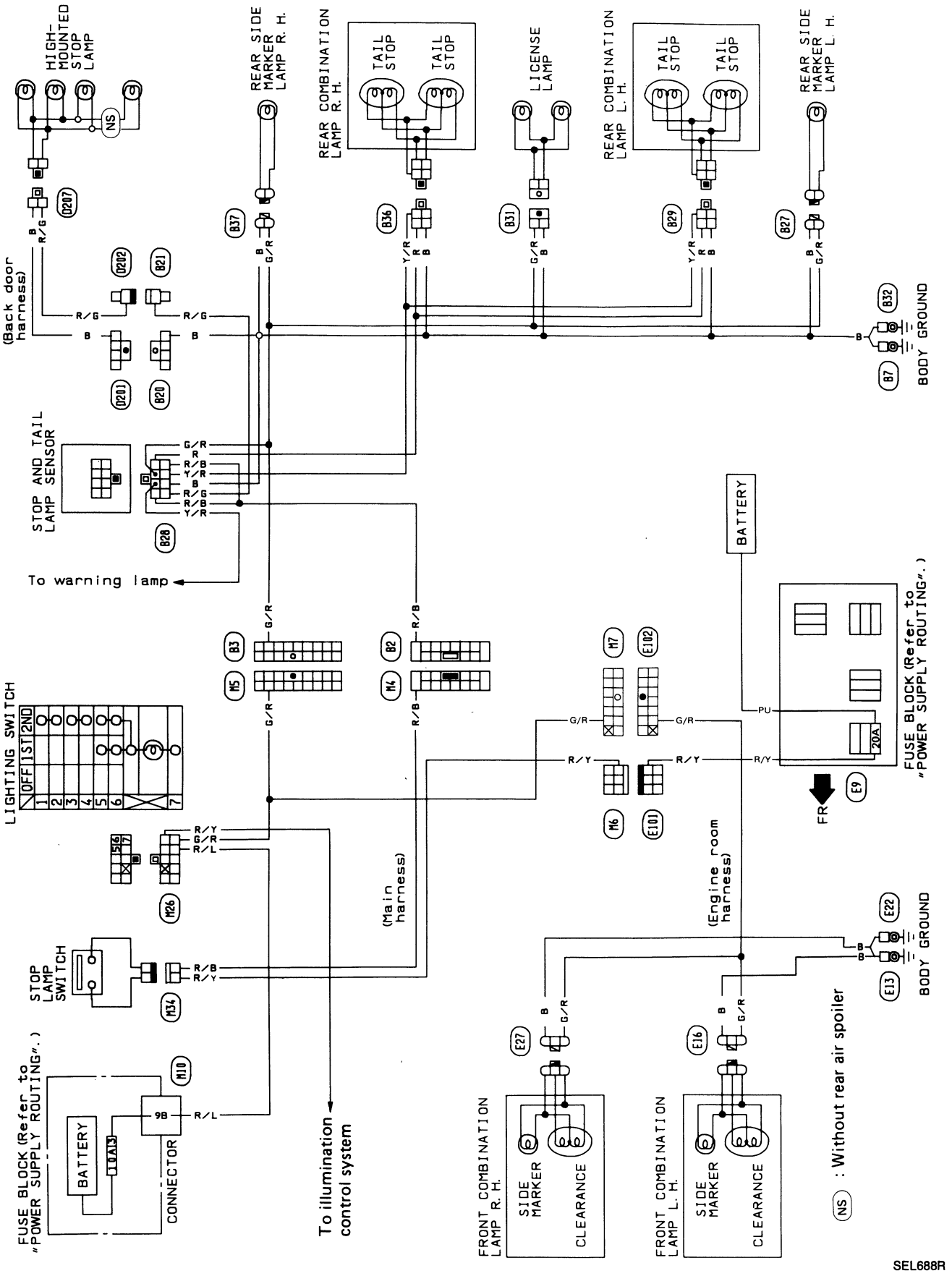
CAUTION:

Do not touch the bulb.

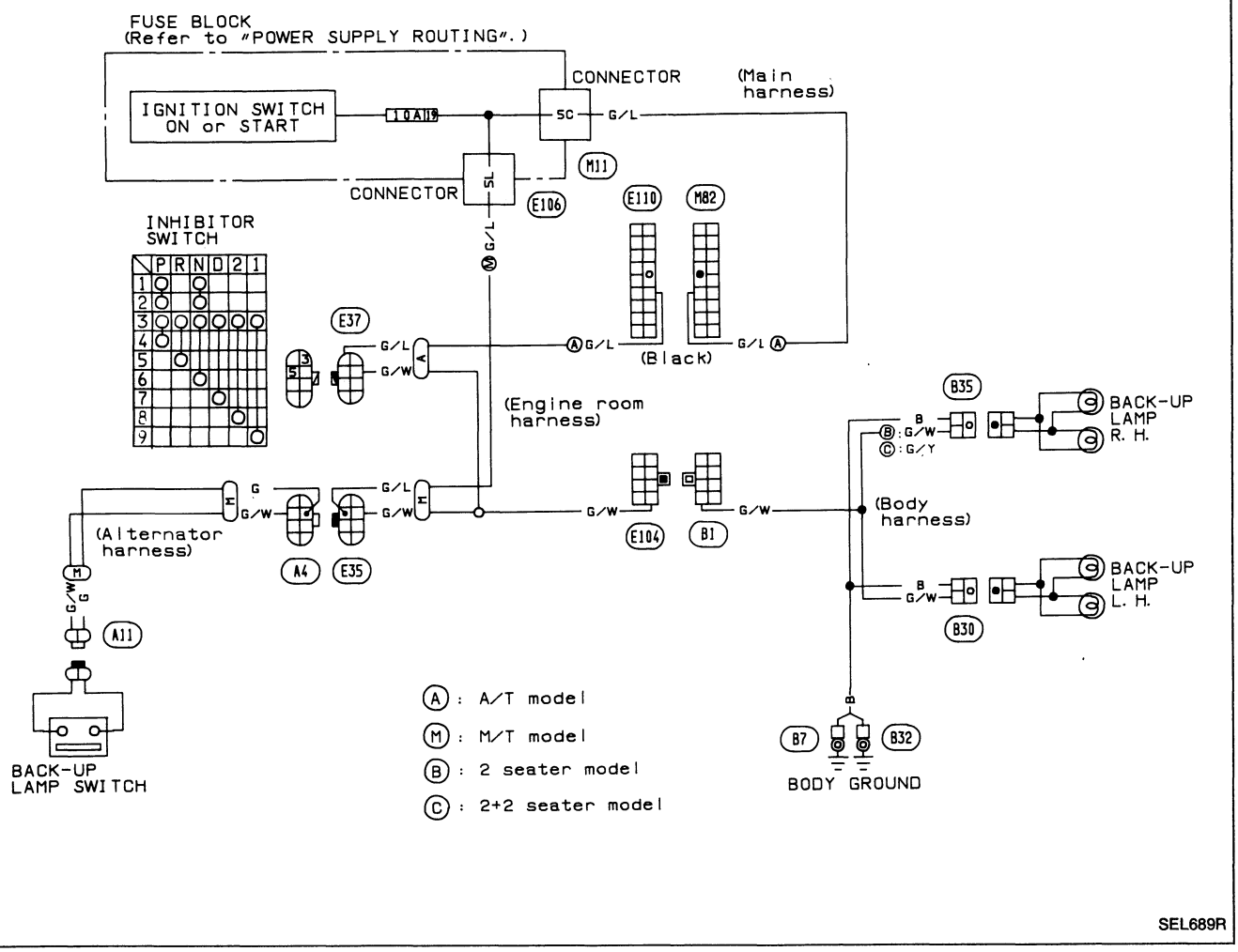
- **Use the same number and wattage as originally installed:**

	Inside (High beam)	Outside (Low beam)
Wattage (W)	65	55
Bulb no.	9005	9006

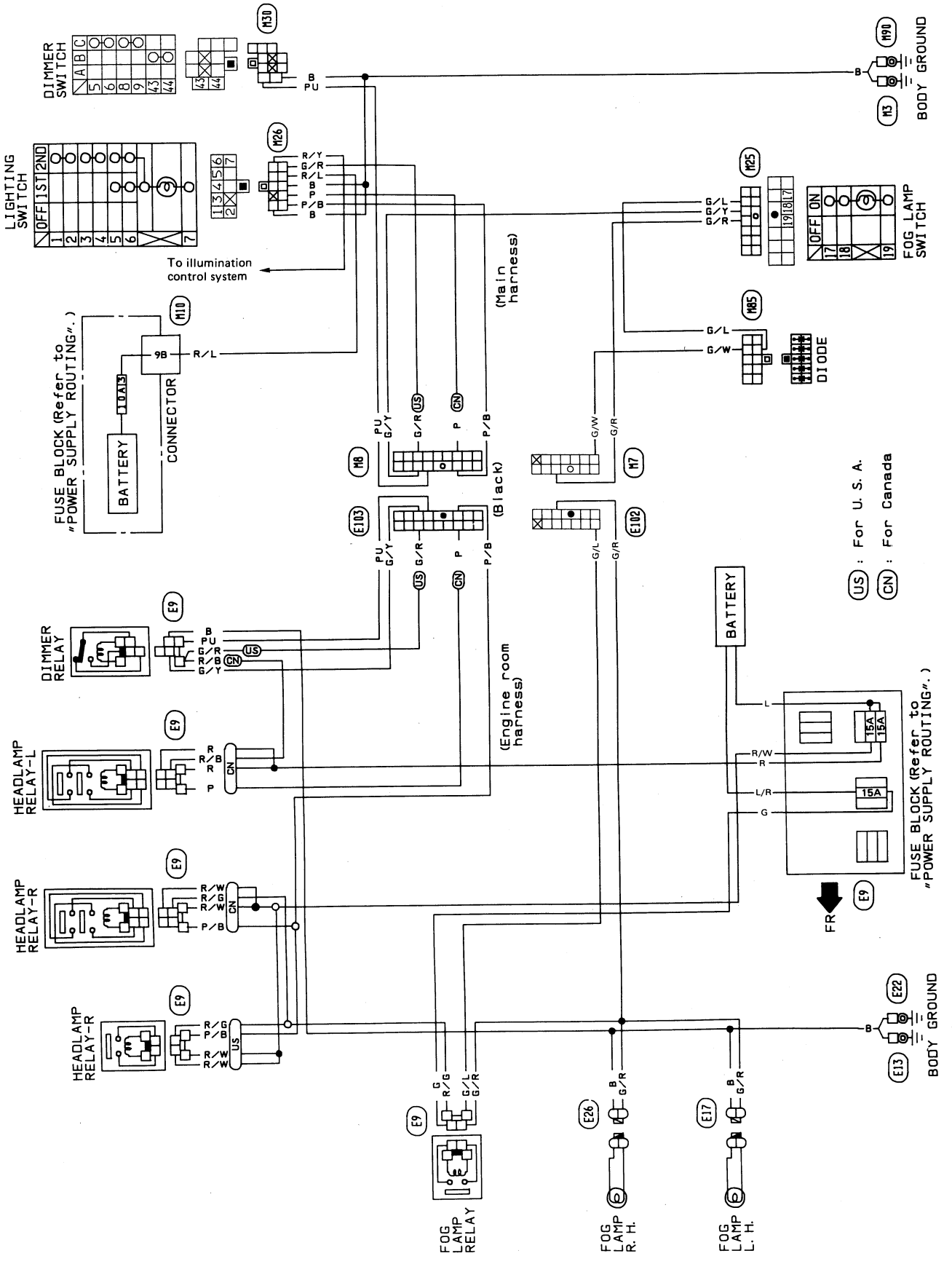
Clearance, License, Tail and Stop Lamps/Wiring Diagram



Back-up Lamp/Wiring Diagram

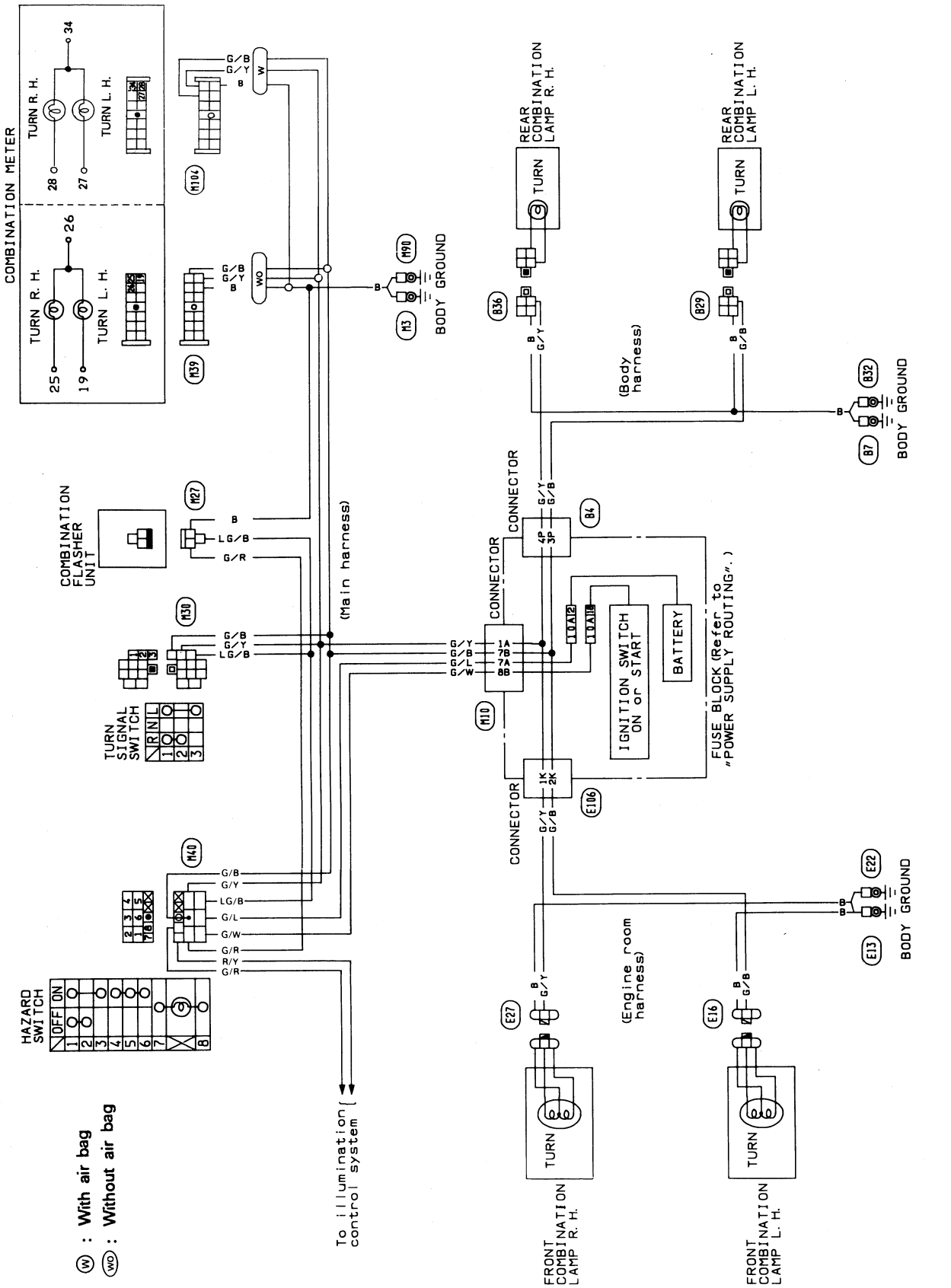


Front Fog Lamp/Wiring Diagram

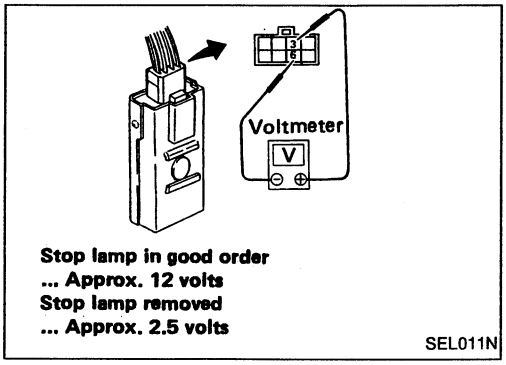


SEL411R

Turn Signal and Hazard Warning Lamps/Wiring Diagram



SEL690R



Stop lamp in good order
... Approx. 12 volts
Stop lamp removed
... Approx. 2.5 volts

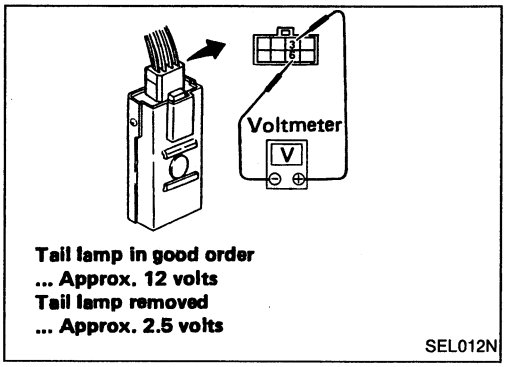
SEL011N

Stop and Tail Lamp Sensor Check

- Before checking, ensure that bulbs meet specifications.

STOP LAMP

1. Start engine.
2. Stop lamp switch on.

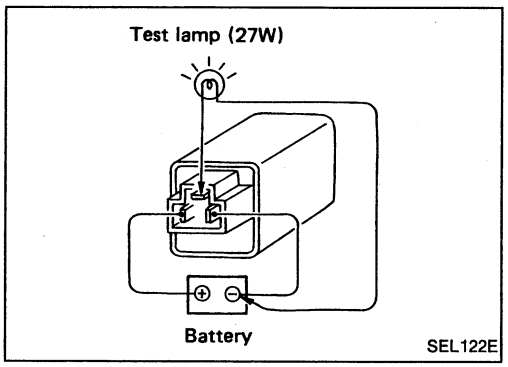


Tail lamp in good order
... Approx. 12 volts
Tail lamp removed
... Approx. 2.5 volts

SEL012N

Tail Lamp

1. Start engine.
2. Lighting switch on.



SEL122E

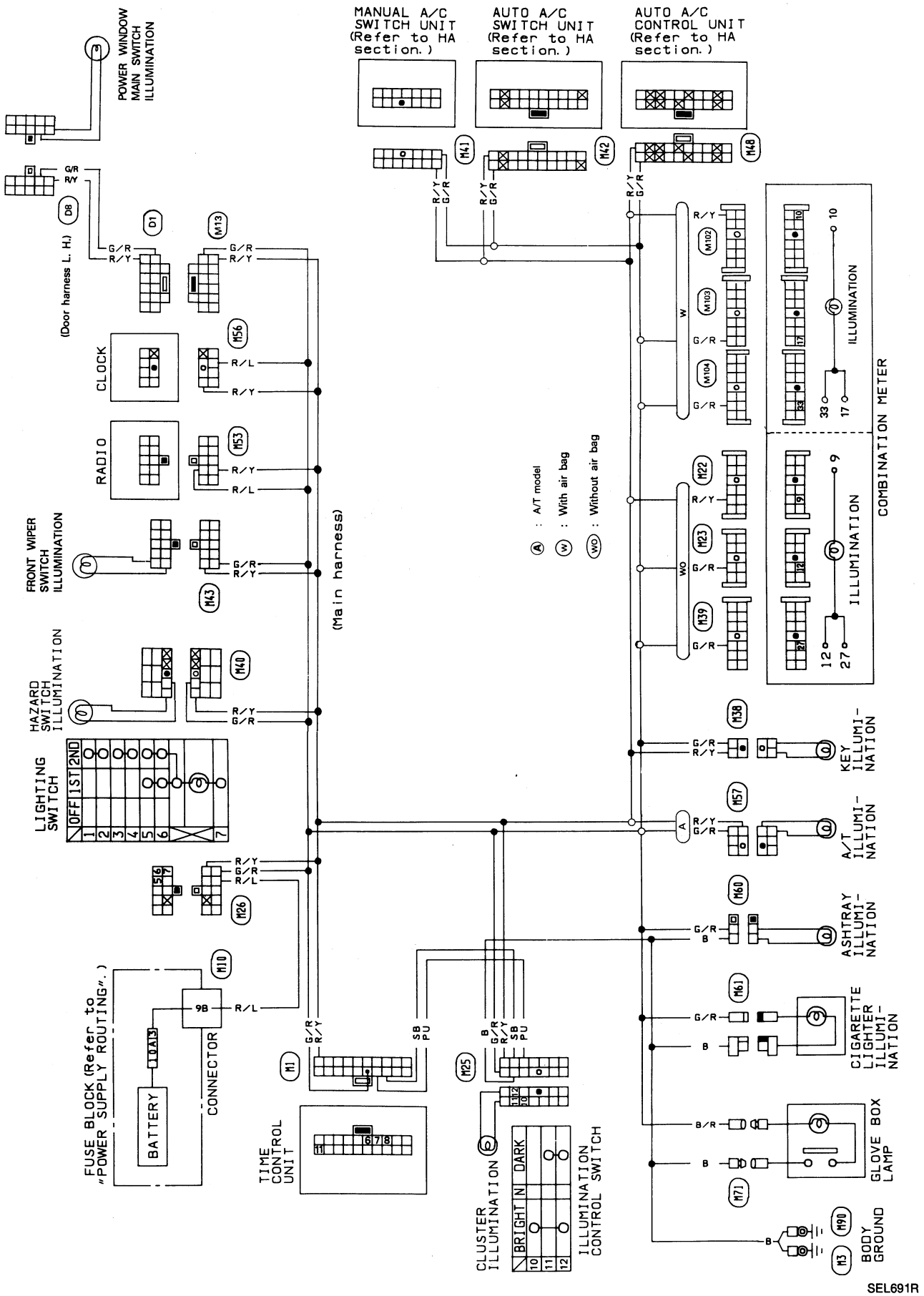
Combination Flasher Unit Check

- 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.

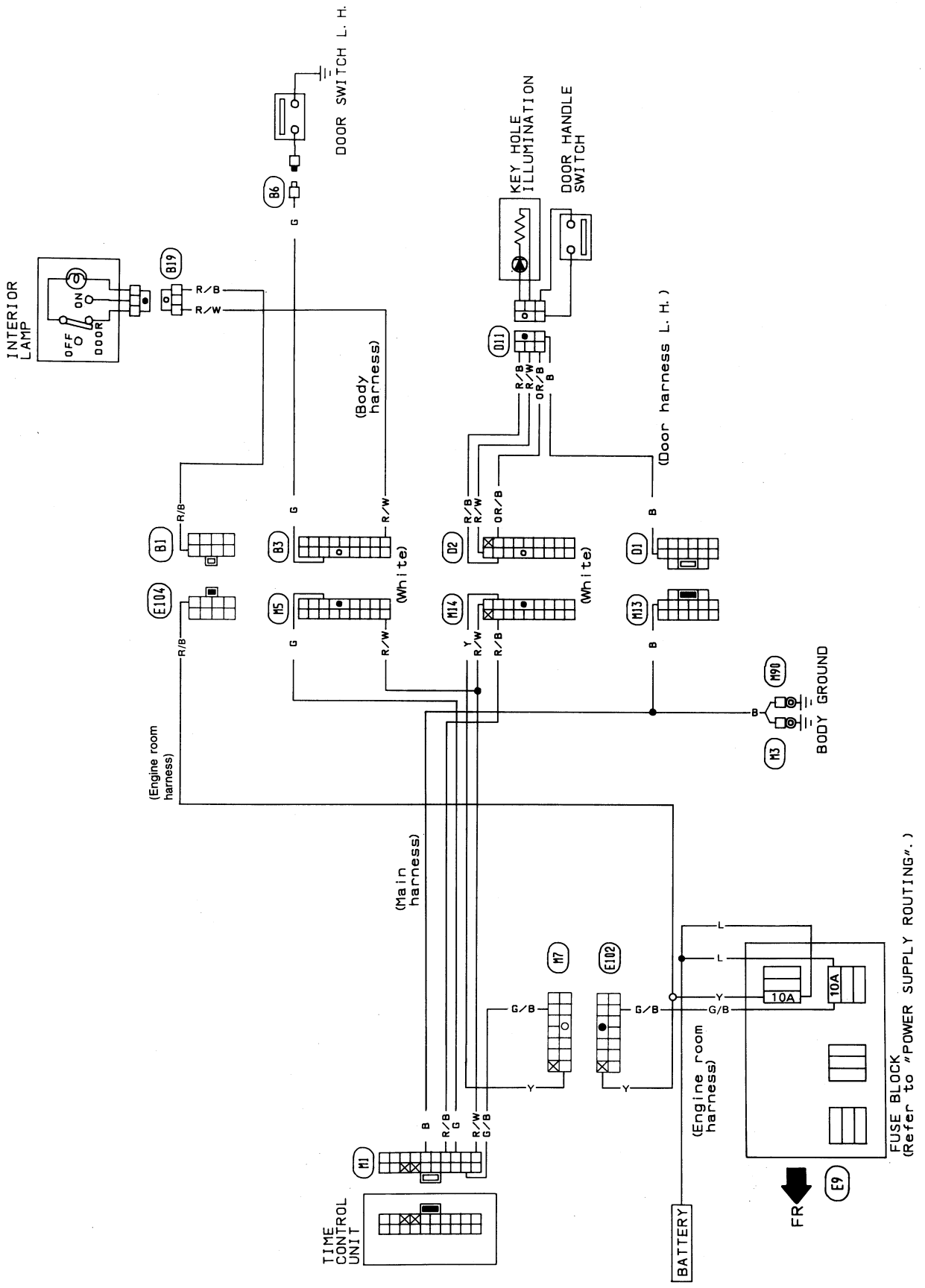
Bulb Specifications

	Wattage (W)	Bulb No.
Front combination lamp		
Turn signal/Clearance	27/8	1157
Front side marker	3.8	194
Rear combination lamp		
Turn signal	27	1156
Stop/Tail	27/8	1157
Back-up lamp	27	1156
Rear side marker lamp	3.8	194
License plate lamp	3.8	194
Front fog lamp	35	
High-mounted stop lamp	13	
Interior lamp	10	
Spot lamp	3.6	
Luggage room lamp	3.4	
Foot lamp	2	

Illumination/Wiring Diagram

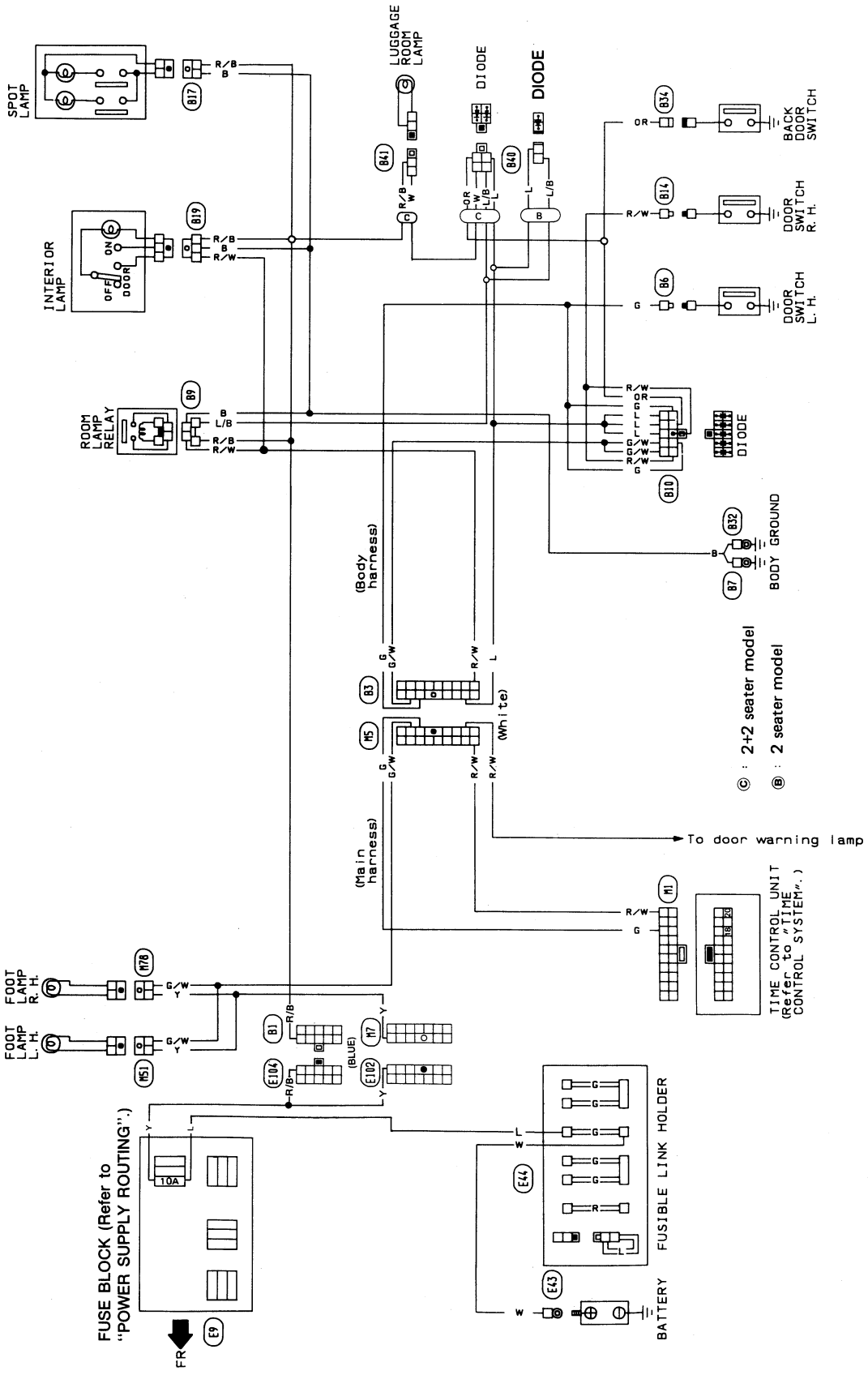


Illuminated Entry System/Wiring Diagram



SEL692R

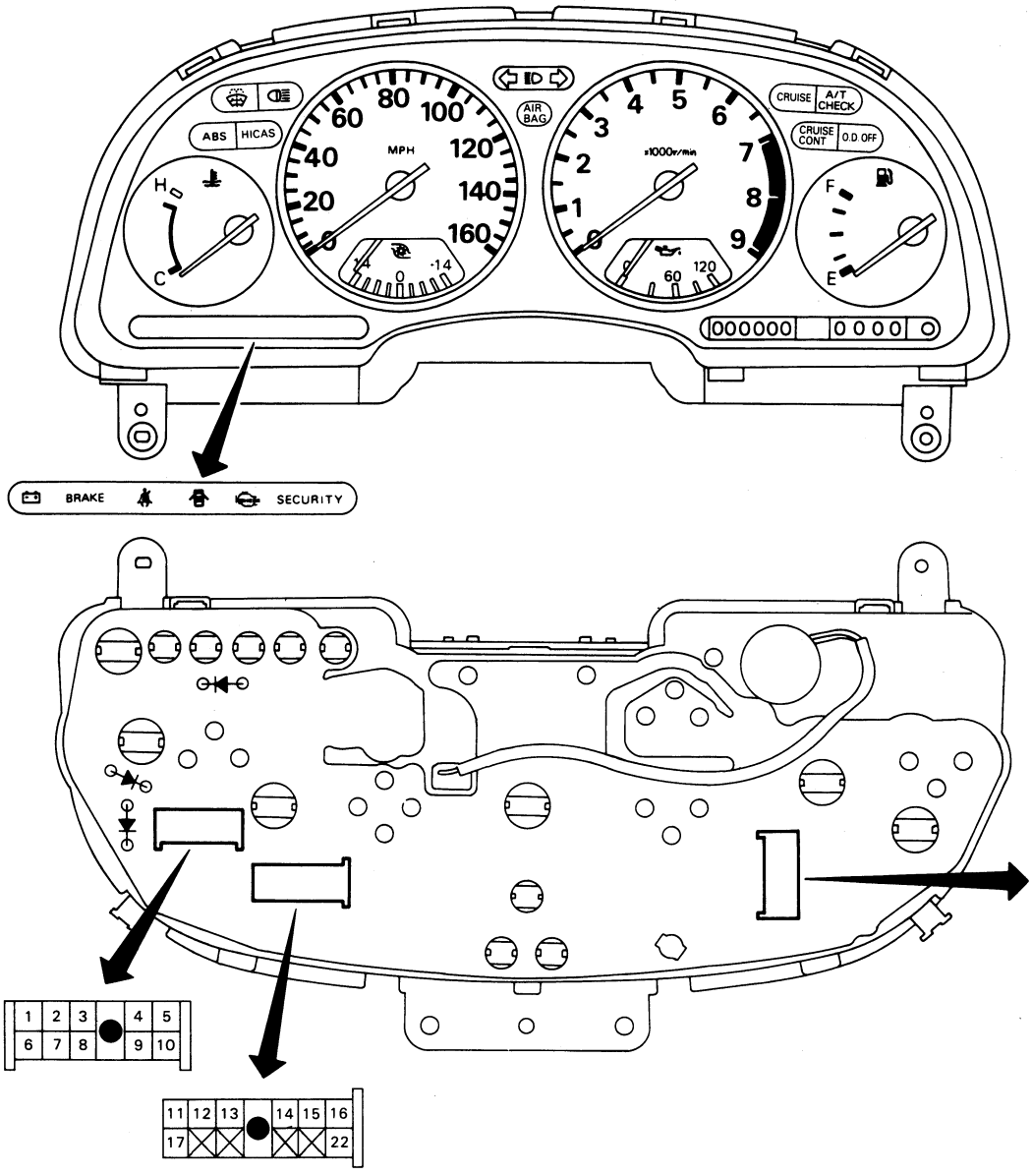
Interior, Spot, Foot and Luggage Room Lamps/ Wiring Diagram

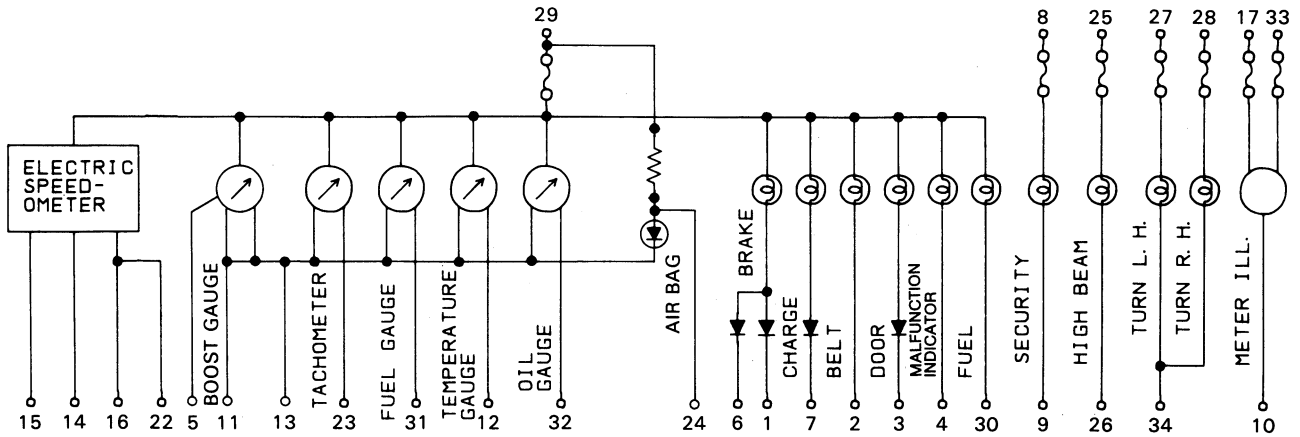


SEL693R

Combination Meter

TYPE A

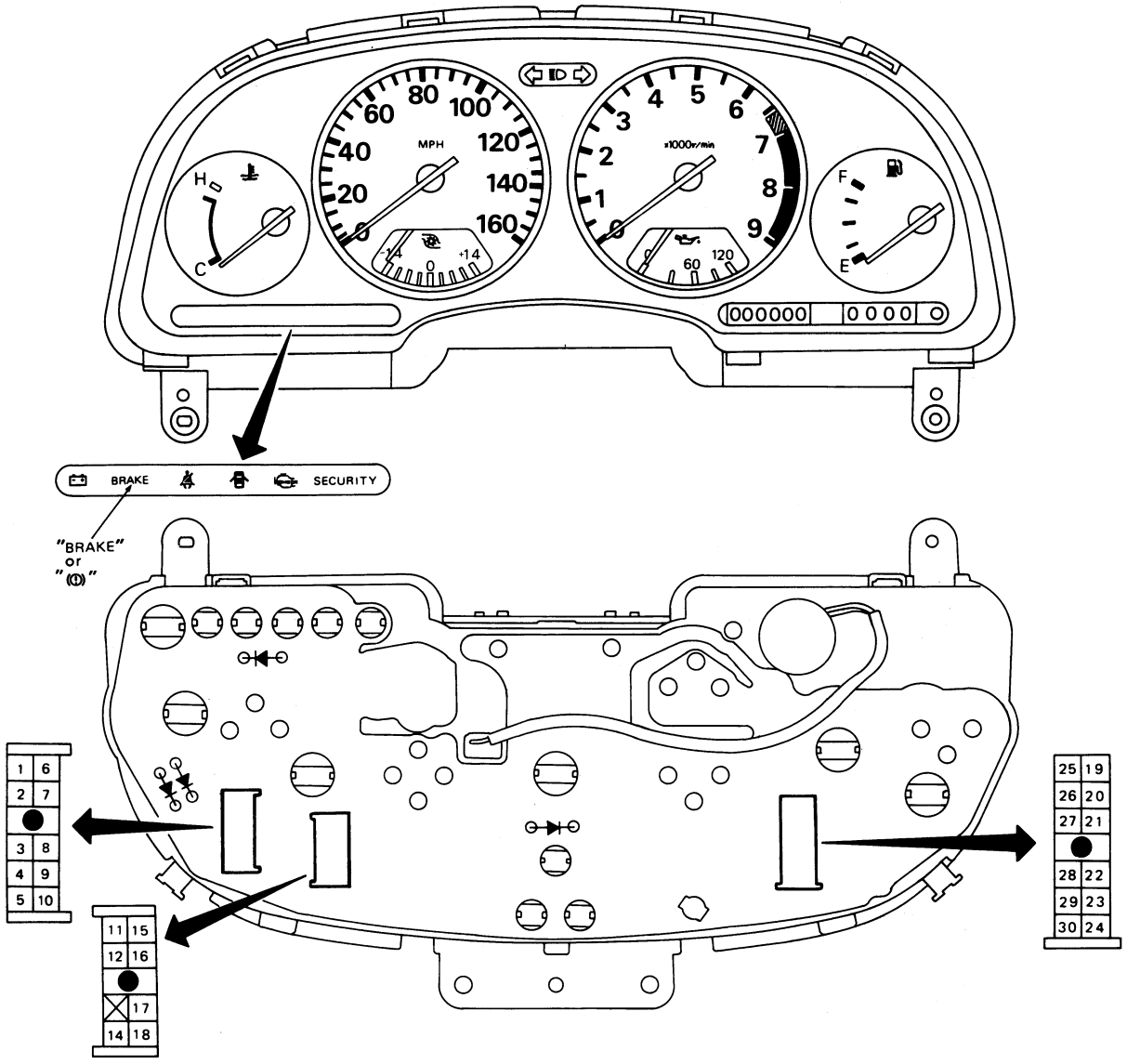


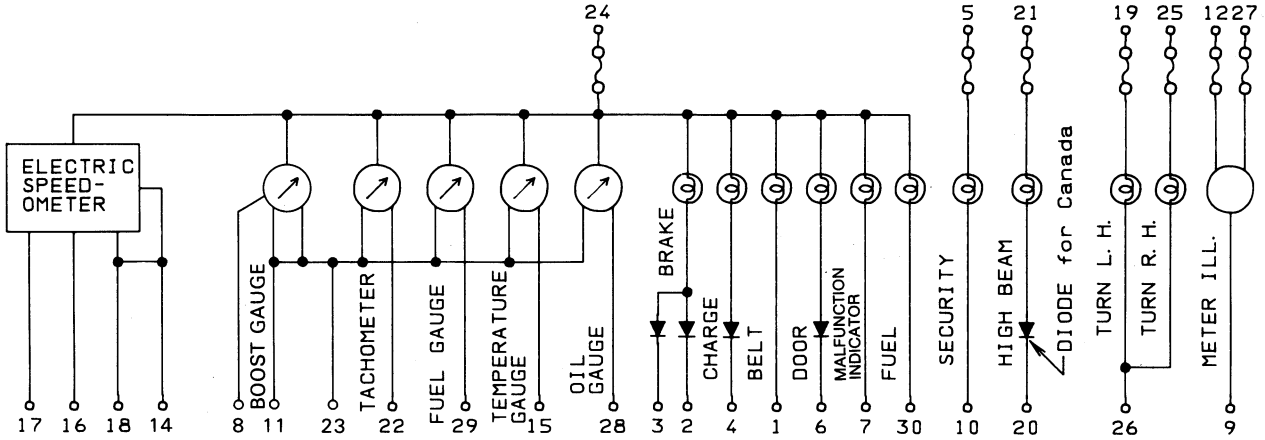


SEL694R

Combination Meter (Cont'd)

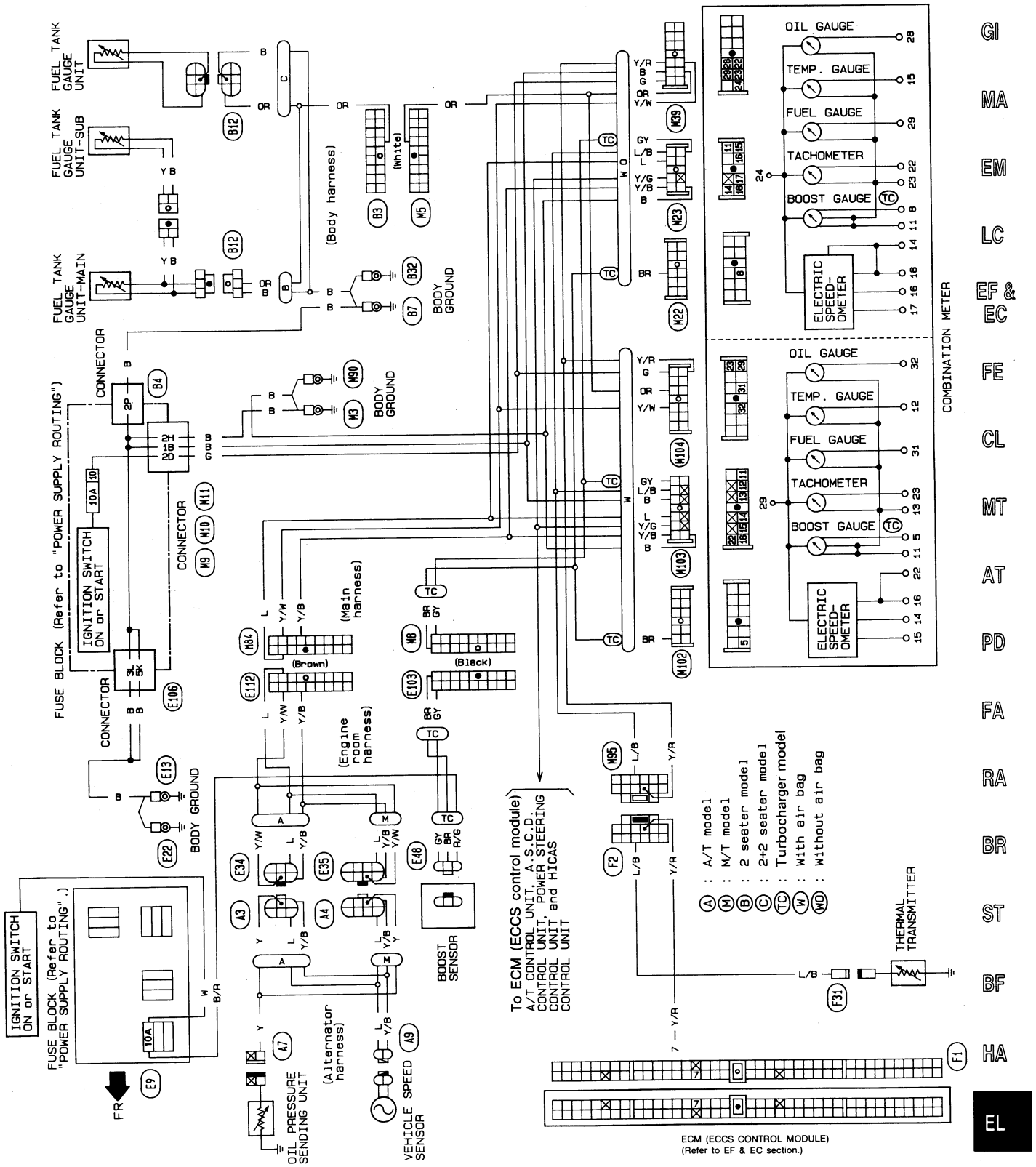
TYPE B



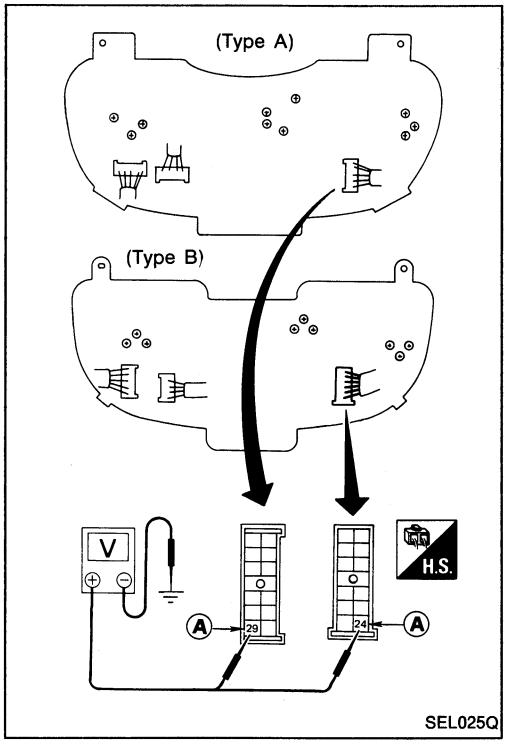


SEL695R

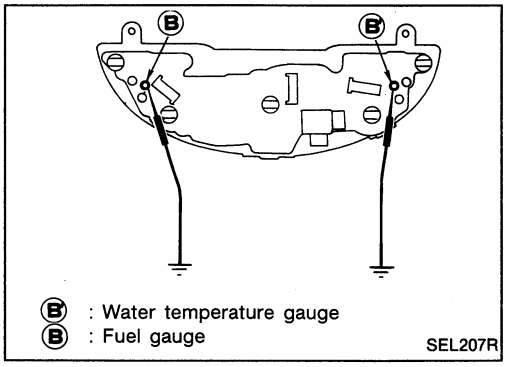
Speedometer, Tachometer, Temp., Oil, Fuel and Boost Gauges/Wiring Diagram



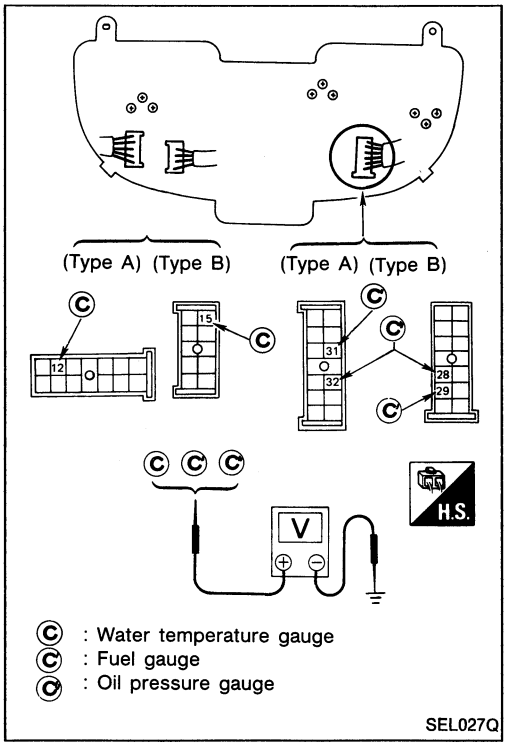
SEL696R



SEL025Q



Ⓑ : Water temperature gauge
Ⓑ : Fuel gauge
SEL207R



Ⓒ : Water temperature gauge
Ⓒ : Fuel gauge
Ⓒ : Oil pressure gauge
SEL027Q

Inspection/Fuel Gauge and Water Temperature Gauge

INSPECTION START

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal Ⓐ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and fuse
4) Ignition switch

O.K.

CHECK GAUGE OPERATION
1) Turn ignition switch "ON".
2) Connect terminals Ⓑ, Ⓑ and ground with wire **for less than 10 seconds.**
3) Check operation of gauge.
Gauge should move smoothly to full scale.

N.G. → Repair or replace gauge.

O.K.

Check harness continuity between component and combination meter Ⓒ, Ⓒ and Ⓒ .

N.G. → Repair or replace.

O.K.

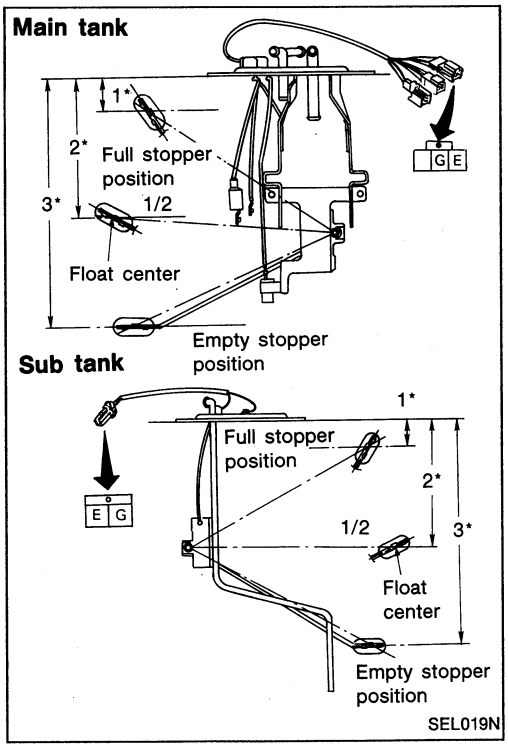
CHECK COMPONENT
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check", "Thermal Transmitter Check" and "Oil Pressure Sending Unit Check".

N.G. → Repair or replace.
Refer to FE section. (Fuel tank gauge unit)

O.K.

Reinstall any part removed.

INSPECTION END



Fuel Tank Gauge Unit Check

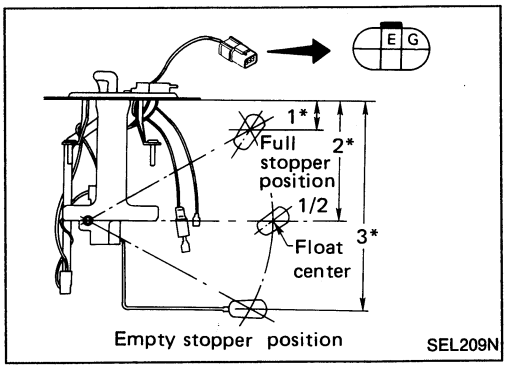
- For removal, refer to FE section.

Check the resistance between terminals Ⓖ and Ⓔ.

2 seater model:

Ohm-meter (+)	Ohm-meter (−)				Float position mm (in)	Resistance value (Ω)
G	E	1*	Full	Main	41.0 (1.614)	8.6 - 11.6
				Sub	40.0 (1.575)	
		2*	1/2	Main	137.0 (5.39)	55.4 - 68.6
				Sub	139.5 (5.49)	
		3*	Empty	Main	232.0 (9.13)	157.6 - 170.6
				Sub	261.0 (10.28)	

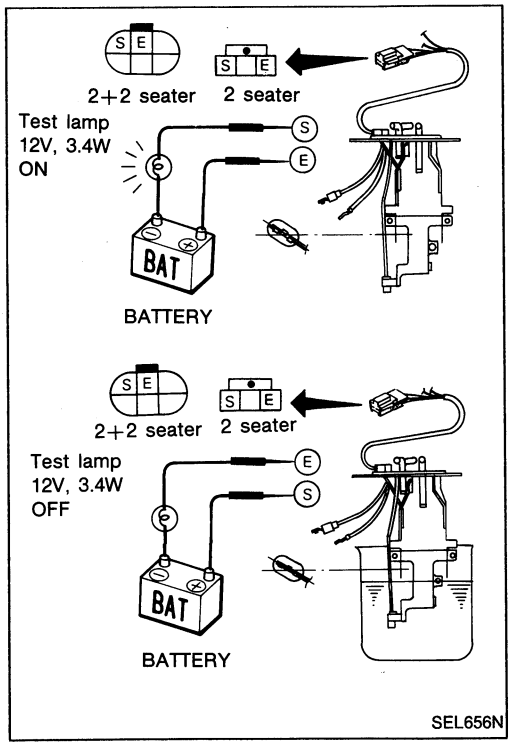
1* and 3*: When float rod is in contact with stopper.



2+2 seater model:

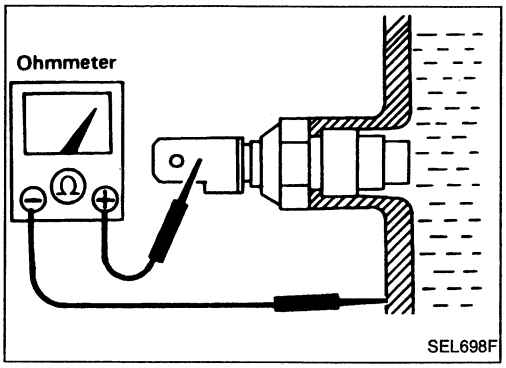
Ohm-meter (+)	Ohm-meter (−)			Float position mm (in)	Resistance value (Ω)
G	E	1*	Full	21.0 (0.827)	4.3 - 5.8
		2*	1/2	115.0 (4.53)	27.7 - 34.3
		3*	Empty	207.0 (8.15)	78.3 - 84.8

1* and 3*: When float rod is in contact with stopper.



Fuel Warning Lamp Sensor Check

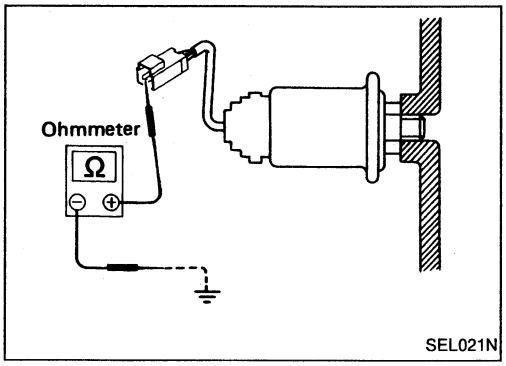
- It will take a short time for the bulb to light.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

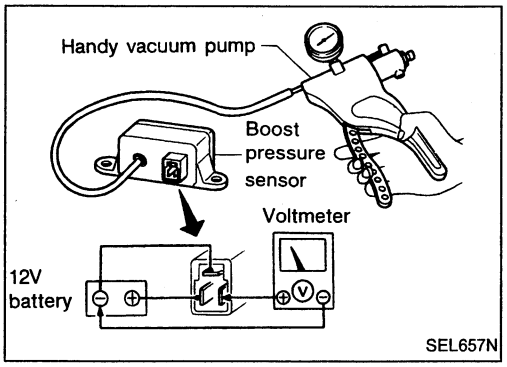
Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 21 - 24Ω



Oil Pressure Sending Unit Check

Check the resistance between the terminals of oil pressure sending unit and body ground.

Oil pressure kPa (kg/cm^2 psi)	Resistance (Ω)
0 (0, 0) (Engine is stopped)	More than 83
392 (4, 57)	Approx. 26 - 37
588 (6, 85)	Approx. 18 - 26



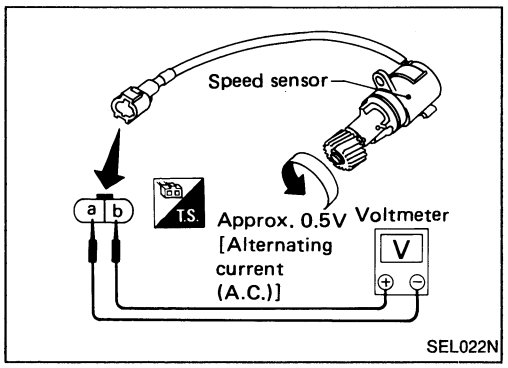
Boost Sensor Check

1. Connect vacuum pump gauge to boost sensor vacuum hose.
2. Disconnect harness connector from boost sensor and connect battery and voltmeter as shown.
3. Apply vacuum pressure to boost sensor by vacuum pump gauge and measure voltages.

   Voltage:

   Approx. 2.2V at 0 kPa (0 kg/cm^2, 0 psi) (Atmospheric pressure)

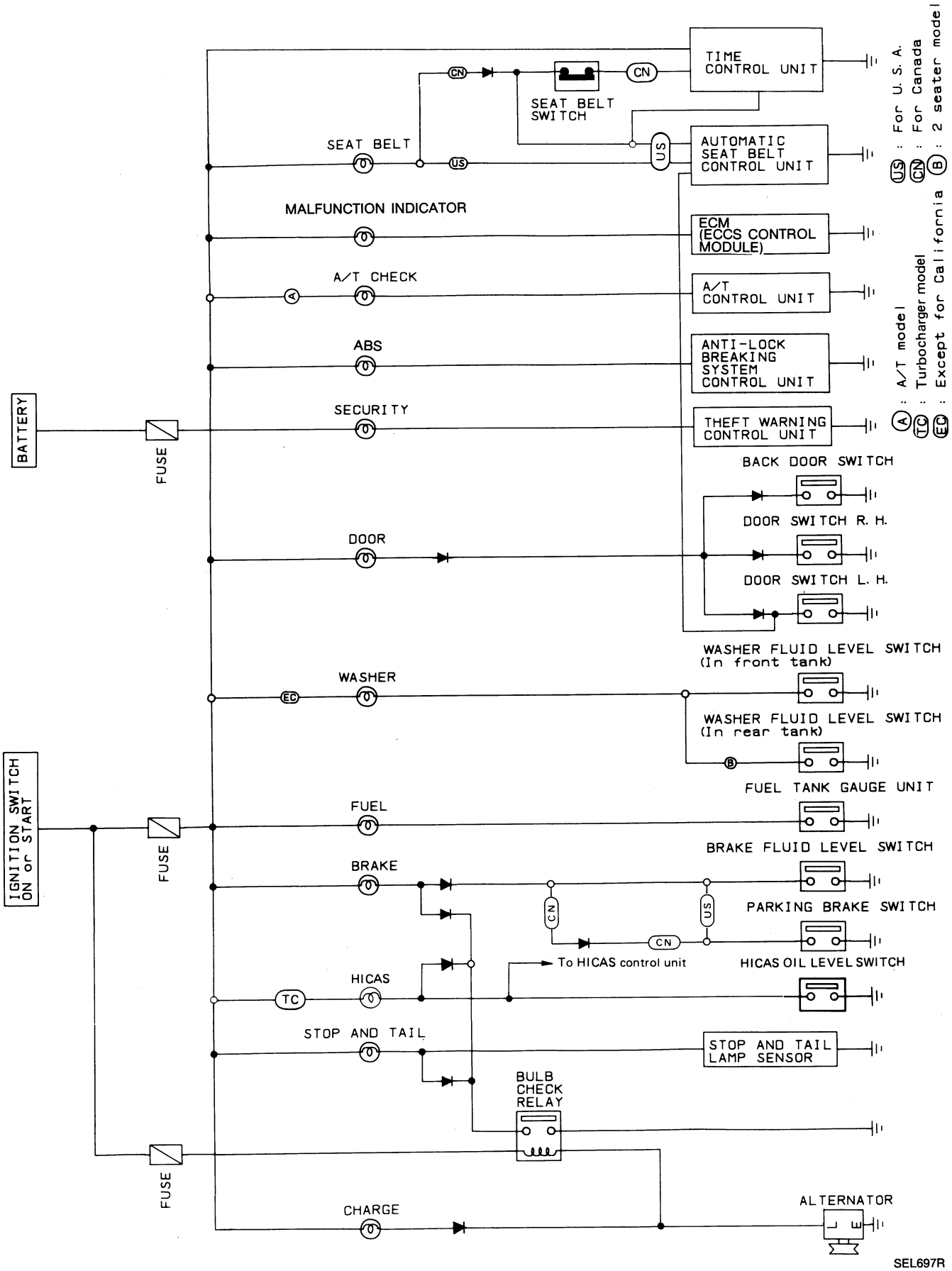
   Approx. 1.3V at –55 kPa (–0.56 kg/cm^2, –8 psi)



Speed Sensor Signal Check

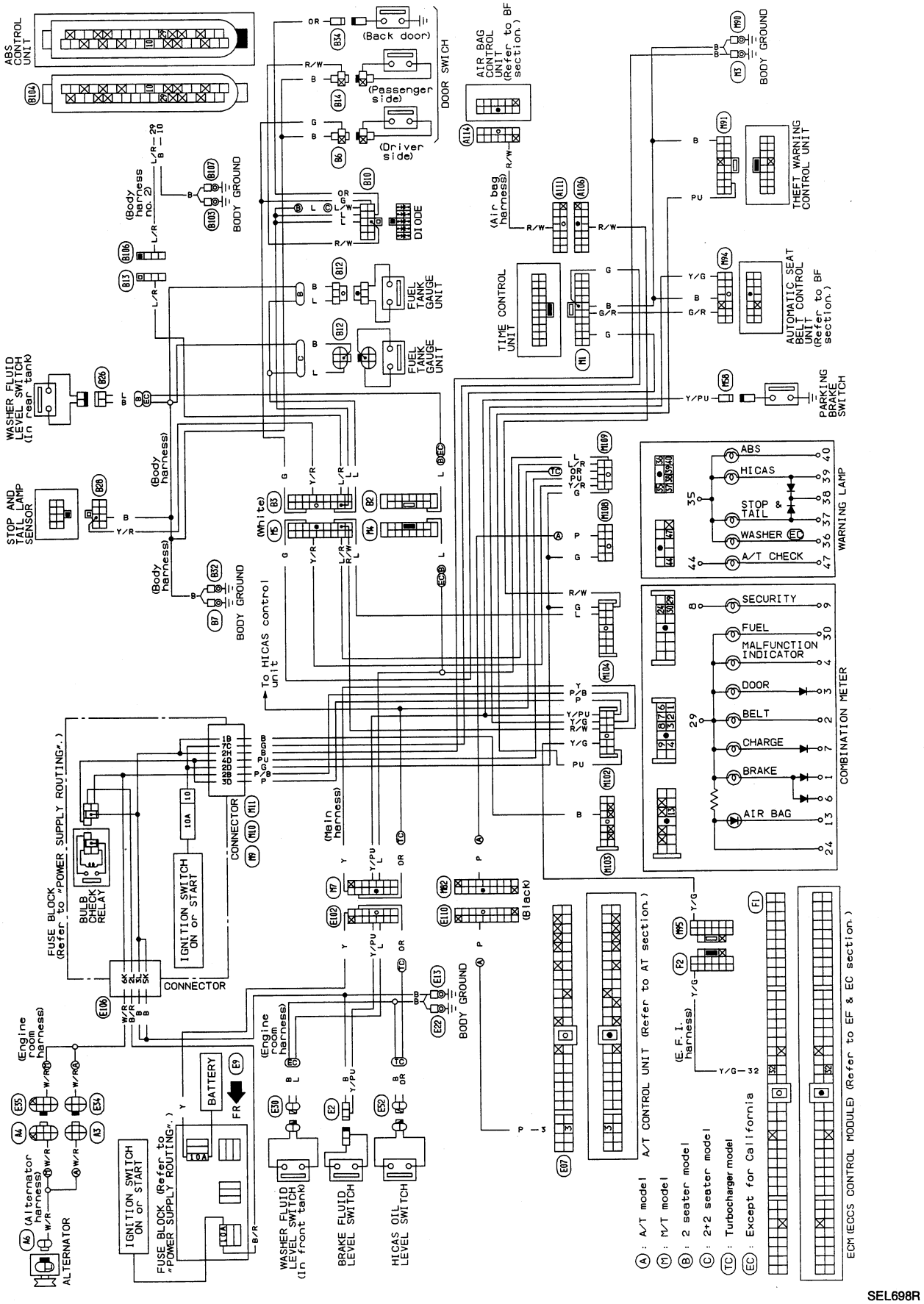
1. Remove speed sensor from transmission.
   Location: Refer to "LOCATION OF ELECTRICAL UNITS" in Service Manual.
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

Warning Lamps/Schematic



Warning Lamps/Wiring Diagram

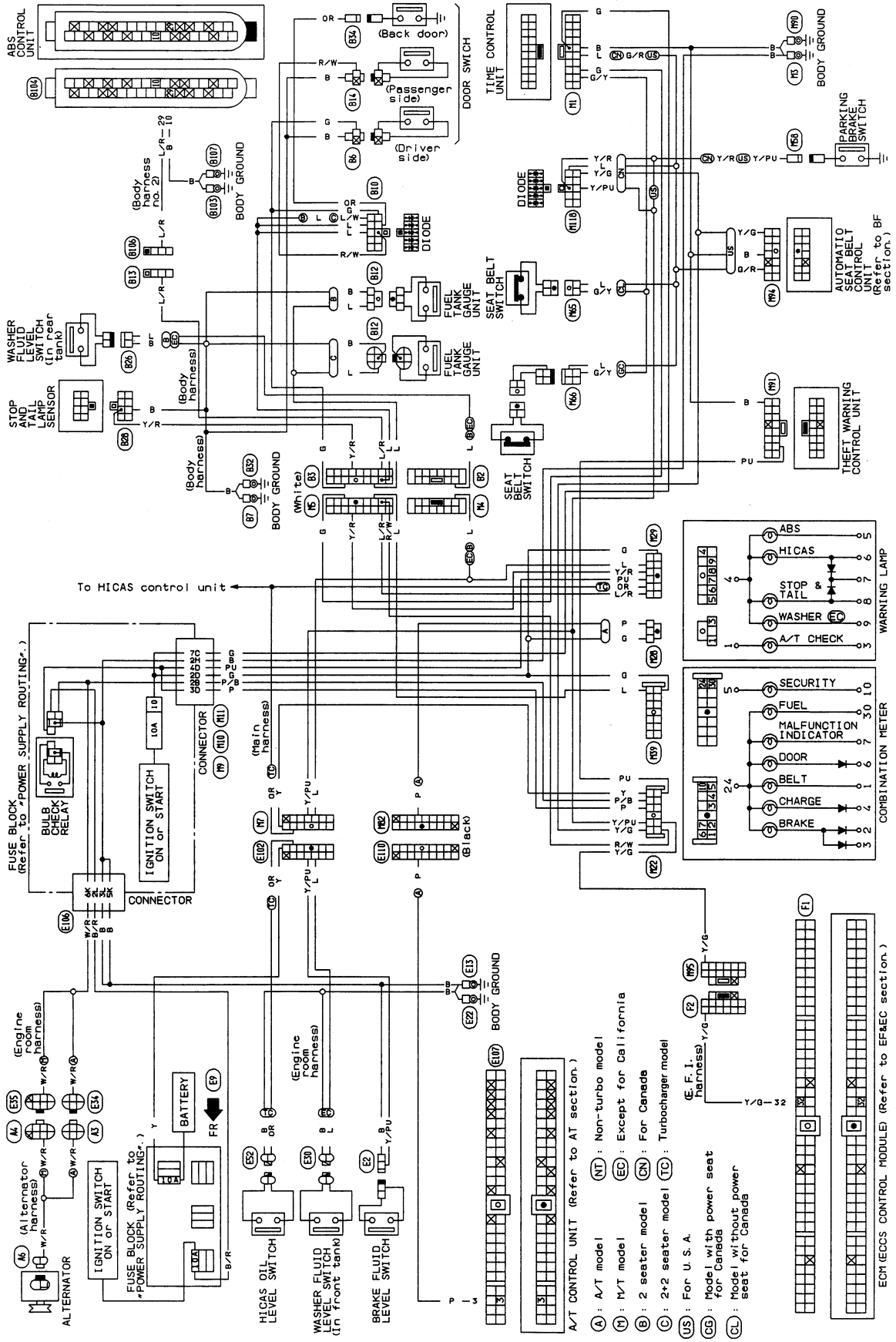
WITH AIR BAG



SEL698R

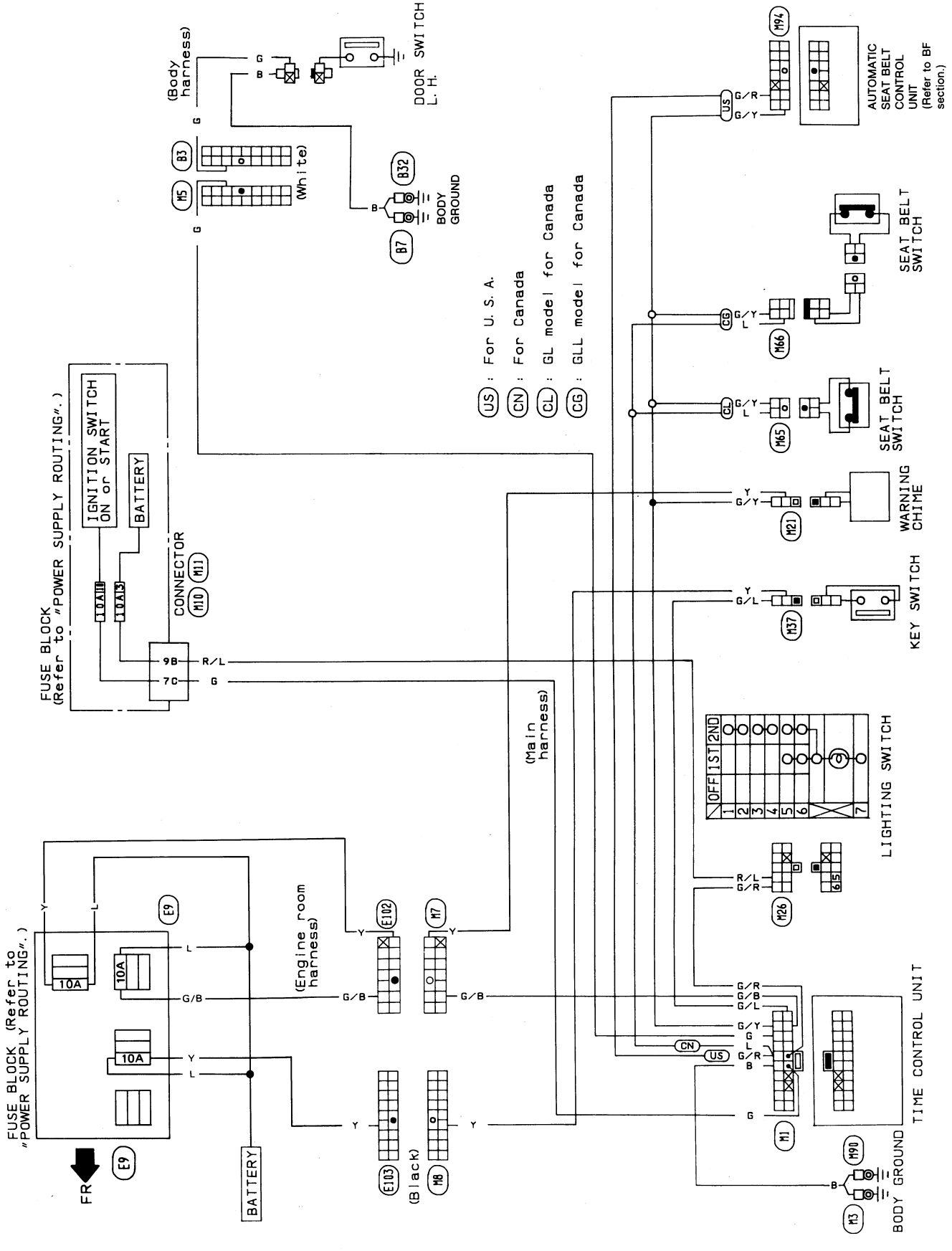
Warning Lamps/Wiring Diagram (Cont'd)

WITHOUT AIR BAG

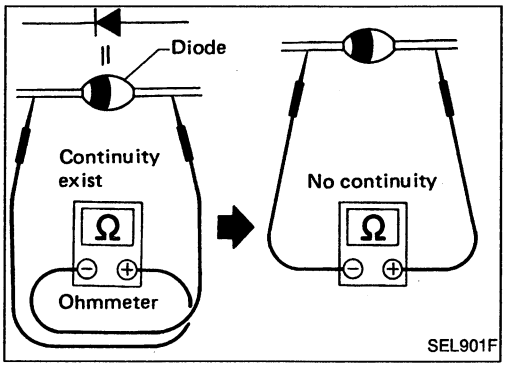


SEL699R

Warning Chime/Wiring Diagram

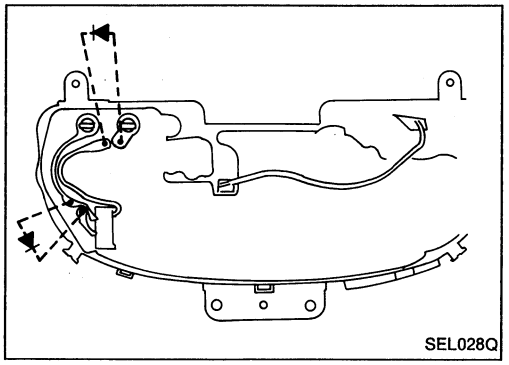


SEL700R

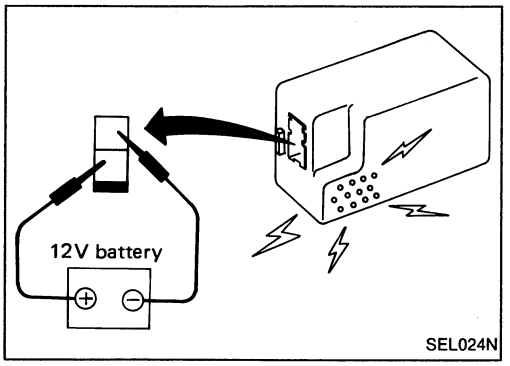


Diode Check

- 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

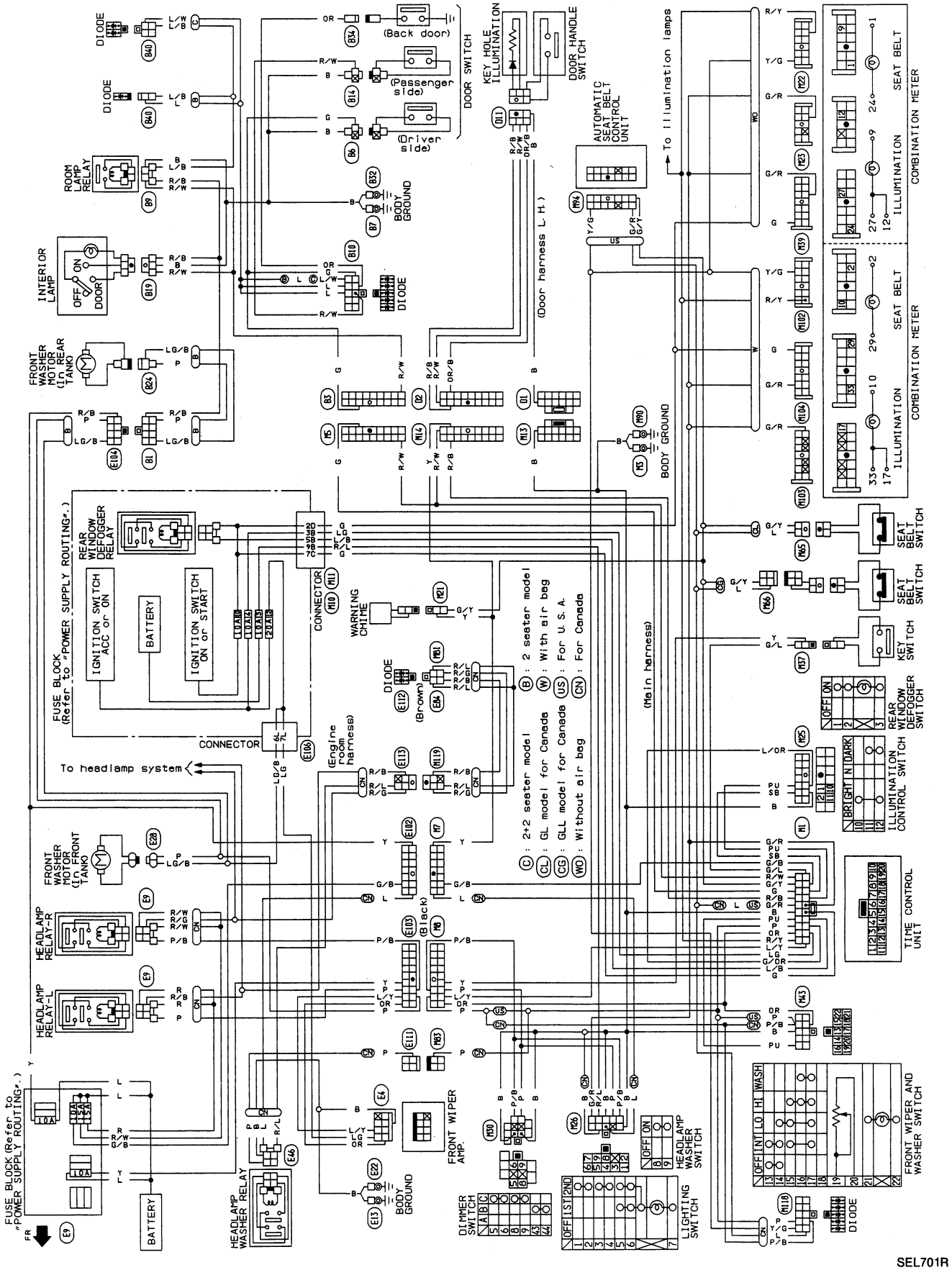
Description

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.
9	Interior lamp timer	Fades out interior lamp when driver's side door is opened and closed.
10	Door key hole illumination	Illuminates for about 7 seconds when door outside handle is pulled.
11	Illumination control	The brightness of the instrument panel light can be adjusted.

Wiring Diagram



SEL701R

Trouble Diagnoses

SYMPTOM CHART

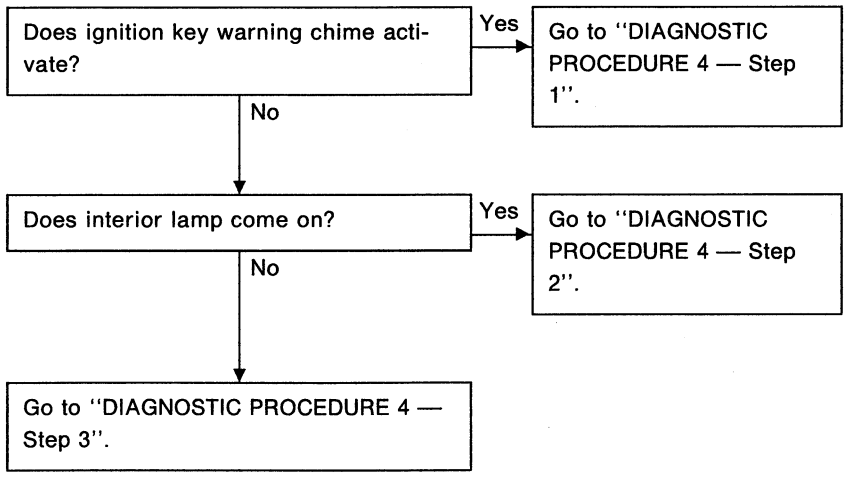
PROCEDURE		Preliminary Check			Main Power Supply and Ground Circuit Check	Diagnostic Procedure										
REFERENCE PAGE		EL-55	EL-55	EL-55	EL-57	EL-57	EL-58	EL-58	EL-59	EL-60	EL-61	EL-62	EL-62	EL-63	EL-64	EL-65
SYMPTOM		Preliminary check 1	Preliminary check 2	Preliminary check 3	Main power supply and 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	Diagnostic Procedure 9	Diagnostic Procedure 10	Diagnostic Procedure 11
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.				○								○			
Illumination	Interior lamp does not fade out after driver's door is closed.				○									○		
	Door key hole illumination does not come on even if door handle is pulled.				○										○	
	Illumination control does not actuate.															○

Trouble Diagnoses (Cont'd)

PRELIMINARY CHECK

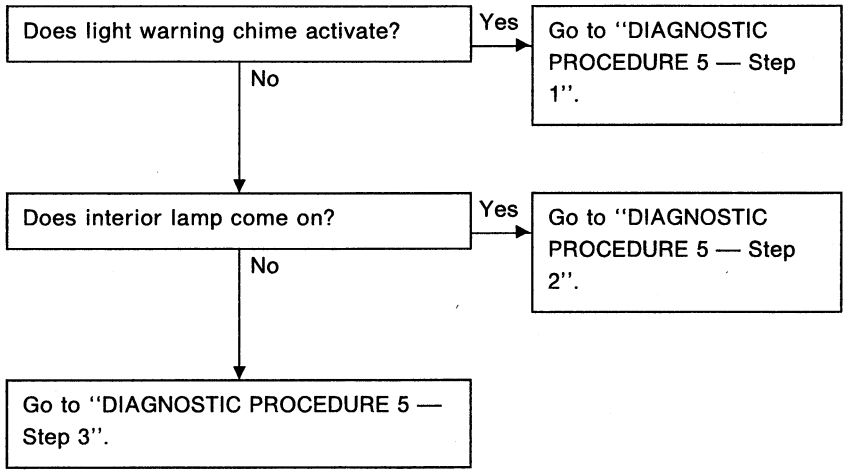
Preliminary check 1

- **Light warning chime does not activate.**



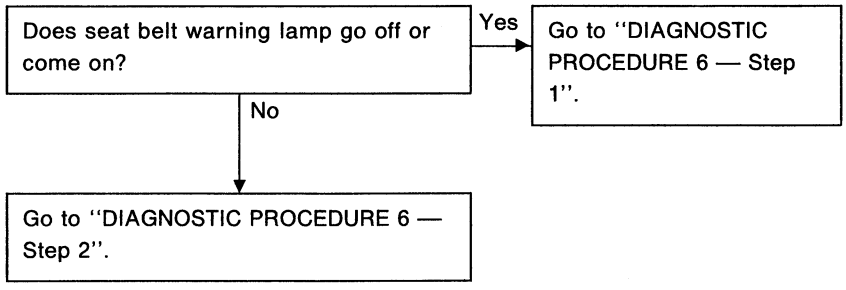
Preliminary check 2

- **Ignition key warning chime does not activate.**



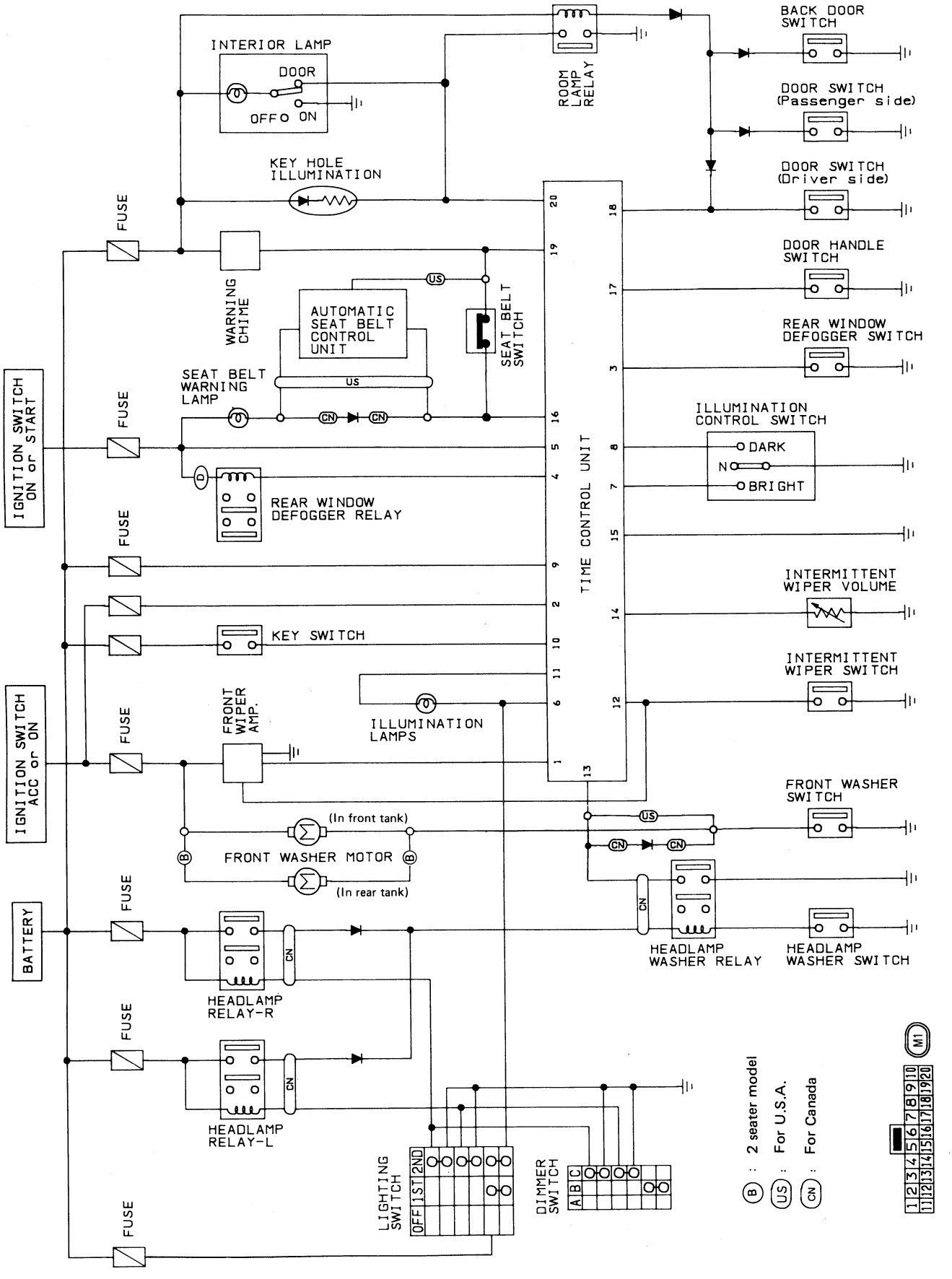
Preliminary check 3

- **Seat belt warning chime does not activate.**



Trouble Diagnoses (Cont'd)

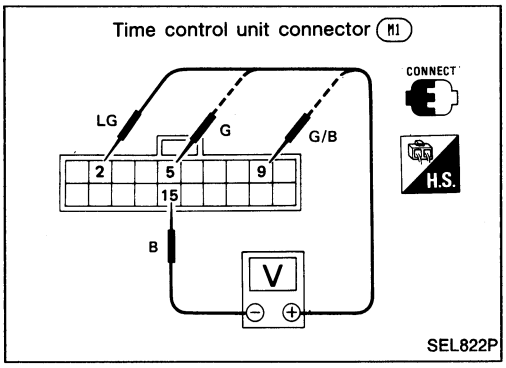
CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



SEL702R

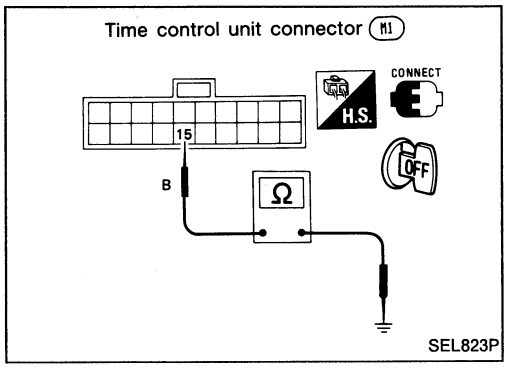
Trouble Diagnoses (Cont'd)

MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK



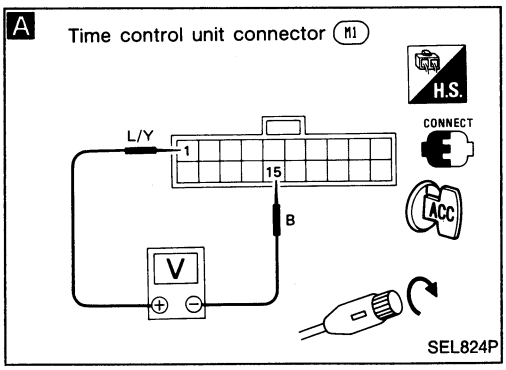
Main power supply

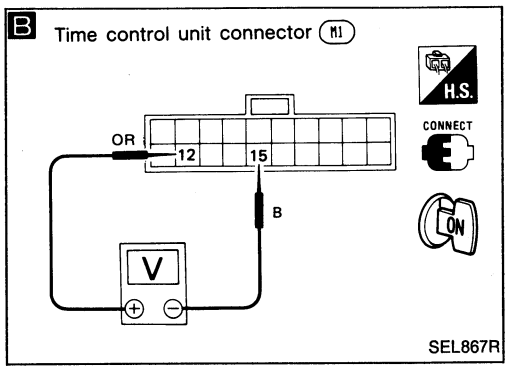
Terminals	Battery voltage existence condition		
	Ignition switch position		
	OFF	ACC	ON
⑨ - ⑮	Yes	Yes	Yes
⑤ - ⑮	No	No	Yes
② - ⑮	No	Yes	Yes



Ground circuit

Terminals	Continuity
⑮ - Ground	Yes





DIAGNOSTIC PROCEDURE 1

SYMPTOM: Intermittent wiper does not operate.

A

WIPER RELAY OUTPUT SIGNAL CHECK
1) Turn ignition switch to "ACC".
2) Turn wiper switch to "INT" or "OFF".
3) Measure voltage between control unit harness terminals ① and ⑮.

Condition of wiper switch	Voltage [V]
OFF	Approx. 12
INT	Pointer swings from 0 to 12 every 3 to 23 seconds

O.K. → Check wiper amp. Refer to "WIPER AND WASHER".
- O.K. → Check wiper amp. circuit.
- N.G. → Replace wiper amp.

N.G. →

B

INTERMITTENT SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑫ and ⑮.

Condition of wiper switch	Voltage [V]
OFF	Approx. 12
INT	0

N.G. → Check wiper switch. Check harness continuity between T.C.U. and wiper switch.

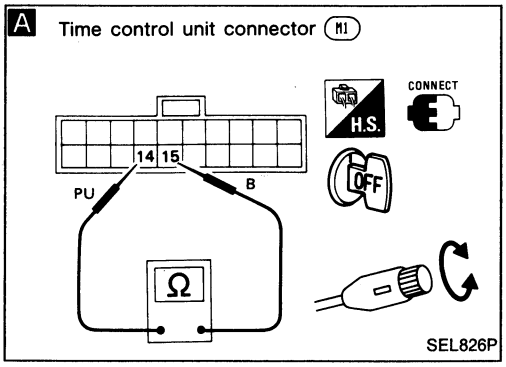
O.K. →

Replace control unit.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

SYMPTOM: Intermittent time of wiper cannot be adjusted.



A

INTERMITTENT WIPER VOLUME INPUT SIGNAL CHECK

Measure resistance between control unit harness terminals ⑭ and ⑮ while turning intermittent wiper volume.

Position of wiper knob	Resistance [Ω]
S	0
L	Approx. 1 k

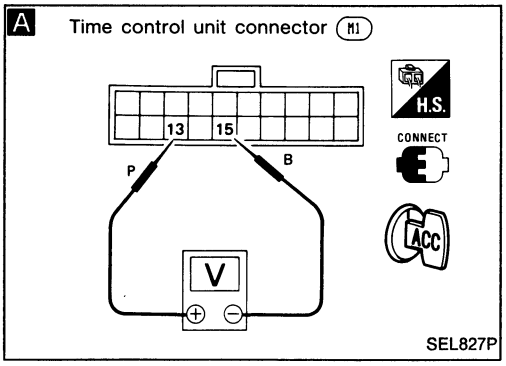
O.K. → Replace control unit.

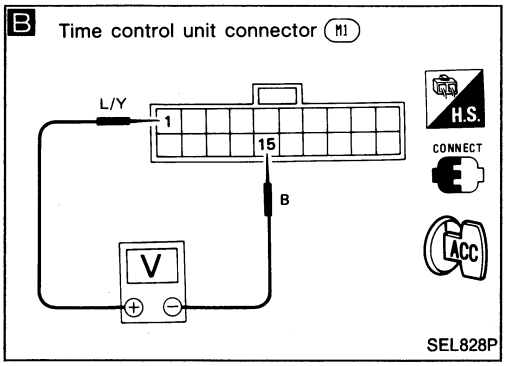
N.G. →

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.





A

WASHER SWITCH INPUT SIGNAL CHECK

1) Turn ignition switch to "ACC".
2) Measure voltage between control unit harness terminals ⑬ and ⑮.

Condition of washer switch	Voltage [V]
OFF	Approx. 12
ON	0

N.G. → Check harness continuity between T.C.U. and washer switch.

O.K. ↓

B

WIPER AMP. OUTPUT SIGNAL CHECK

Measure voltage between control unit harness terminals ① and ⑮ after operating washer switch.

0V for approx. 3 seconds after washer has operated.

N.G. → Replace control unit.

O.K. ↓

Replace wiper amp.

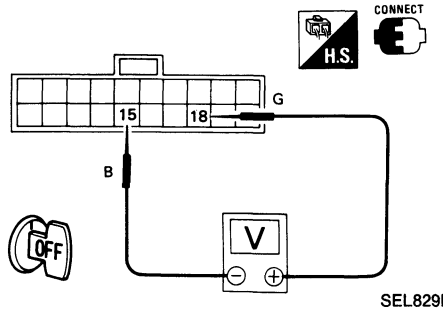
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Light warning chime does not activate.

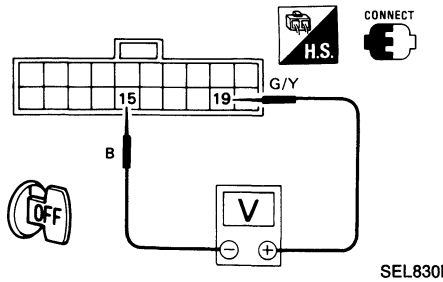
- Perform "PRELIMINARY CHECK — Procedure 1" before referring to the following flow chart.

A Time control unit connector (M1)



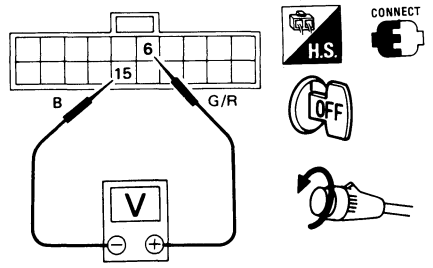
SEL829P

B Time control unit connector (M1)



SEL830P

C Time control unit connector (M1)



SEL831P

A

Step 3

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑱ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	0

N.G. → Check door switch. Check harness continuity between T.C.U. and door switch.

O.K. ↓

B

Step 2

CHIME OUTPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑲ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	Pointer deflects intermittently

O.K. → Check chime. Check harness continuity between T.C.U. and chime.

N.G. ↓

C

Step 1

LIGHT SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑥ and ⑮.

Condition	Voltage [V]
Light switch is ON	Approx. 12
Light switch is OFF	0

N.G. → Check light switch. Check harness continuity between T.C.U. and light switch.

O.K. ↓

Replace control unit.

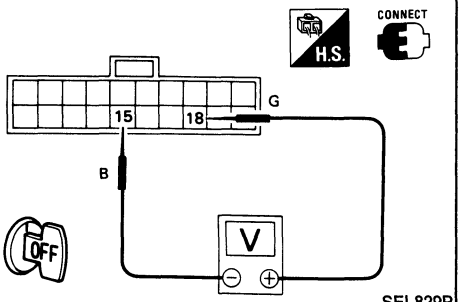
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

SYMPTOM: Ignition key warning chime does not activate.

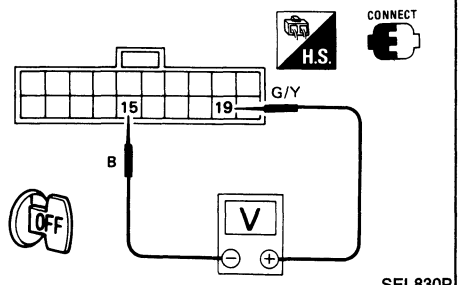
- Perform "PRELIMINARY CHECK — Procedure 2" before referring to the following flow chart.

A Time control unit connector (M1)



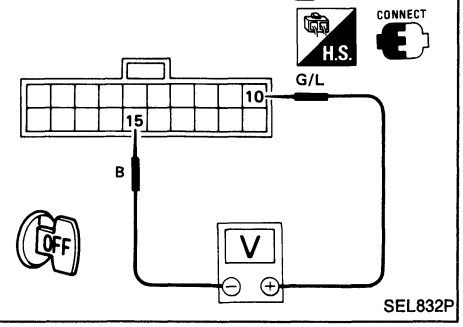
SEL829P

B Time control unit connector (M1)



SEL830P

C Time control unit connector (M1)



SEL832P

A

Step 3

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑱ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	0

N.G. → Check door switch.
Check harness continuity between T.C.U. and door switch.

O.K. ↓

B

Step 2

CHIME OUTPUT SIGNAL CHECK
Measure voltage between control unit harness between ⑲ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	Pointer deflects intermittently

N.G. → Check chime.
Check harness continuity between T.C.U. and chime.

N.G. ↓

C

Step 1

IGNITION KEY SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑩ and ⑮.

Condition	Voltage [V]
Key is inserted	Approx. 12
Key is pulled	0

N.G. → Check ignition key switch.
Check harness continuity between T.C.U. and ignition key switch.

O.K. ↓

Replace control unit.

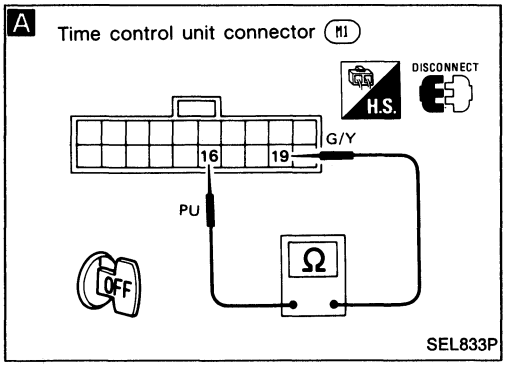
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

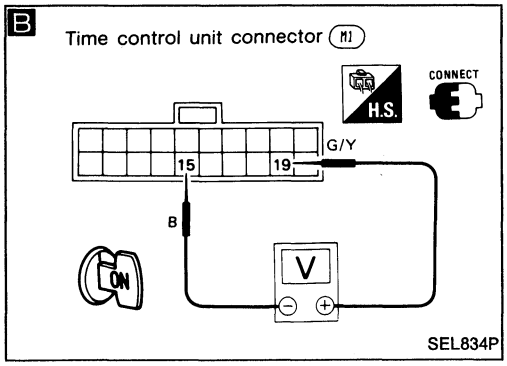
SYMPTOM: Seat belt warning chime does not activate.

- Perform "PRELIMINARY CHECK — Procedure 3" before referring to the following flow chart.

A



B



A — Step 2

SEAT BELT SWITCH INPUT SIGNAL CHECK

Check continuity between control unit harness terminals ⑯ and ⑲.

Condition	Continuity
Unfastened	Yes
Fastened	No

N.G. → Check seat belt switch. Check harness continuity between T.C.U. and seat belt switch.

O.K. ↓

B — Step 1

CHIME OUTPUT SIGNAL CHECK

1) Connect T.C.U. harness connector.
2) Turn ignition switch "ON".
3) Measure voltage between control unit harness terminals ⑲ and ⑮.

Condition of seat belt	Voltage [V]
Unfastened	Pointer deflects intermittently
Fastened	Approx. 12

O.K. → Check chime. Check harness continuity between T.C.U. and chime.

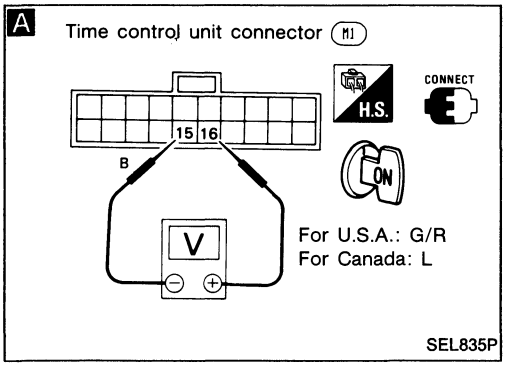
N.G. ↓

Replace control unit.

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"?

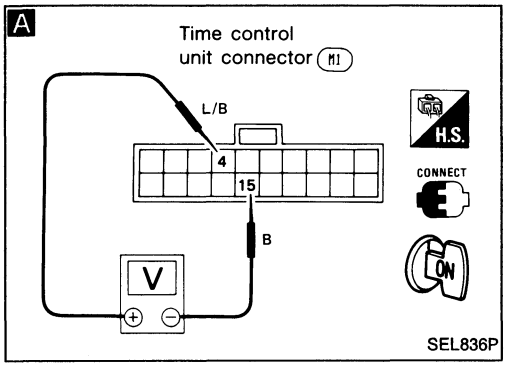
Yes → Check warning lamp. Check harness continuity between T.C.U. and warning lamp.

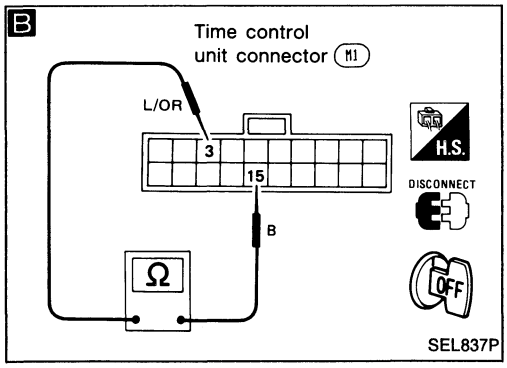
No ↓

Replace control unit.

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.

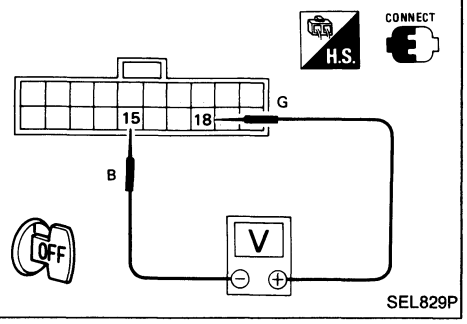
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 9

SYMPTOM: Interior lamp does not fade out after driver's door is closed.

A

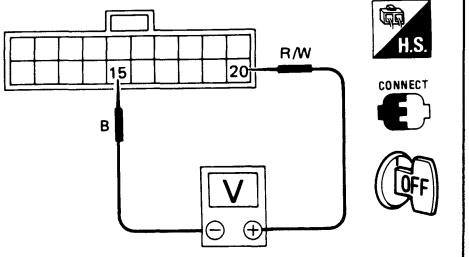
Time control unit connector (M1)



SEL829P

B

Time control unit connector (M1)



SEL838P

A

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑱ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	Approx. 12
Door is open	0

N.G. → Check door switch. Check harness continuity between T.C.U. and door switch.

O.K. ↓

B

INTERIOR LAMP SIGNAL CHECK
Measure voltage between control unit harness terminals ⑳ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	0 → Approx. 12
Door is open	0

O.K. → Check interior lamp and harness between T.C.U. and interior lamp.

N.G. ↓

Replace T.C.U.

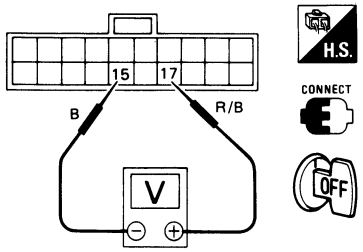
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 10

SYMPTOM: Door key hole illumination does not come on even if door handle is pulled.

A

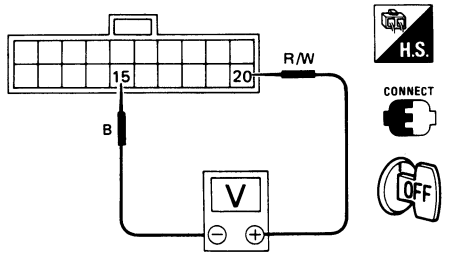
Time control unit connector (M1)



SEL839P

B

Time control unit connector (M1)



SEL838P

A

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑰ and ⑮.

Condition of driver's handle	Voltage [V]
Handle is pulled	0
Handle is released	Approx. 12

N.G. → Check door handle switch.
Check harness continuity between T.C.U. and door handle switch.

O.K. ↓

B

KEY HOLE ILLUMINATION SIGNAL CHECK
Measure voltage between control unit harness terminals ⑳ and ⑮.

Condition of driver's door	Voltage [V]
Door is closed	0 → Approx. 12
Door is open	0

O.K. → Check key hole illumination and harness between T.C.U. and key hole illumination.

N.G. ↓

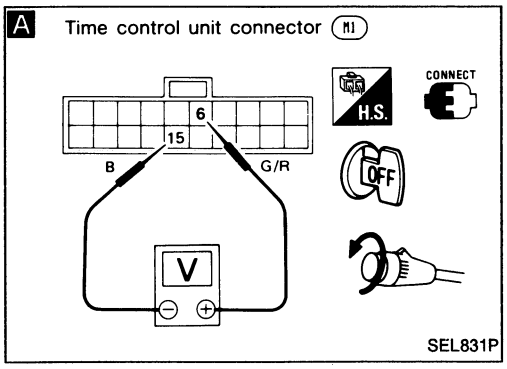
Replace T.C.U.

Trouble Diagnoses (Cont'd)

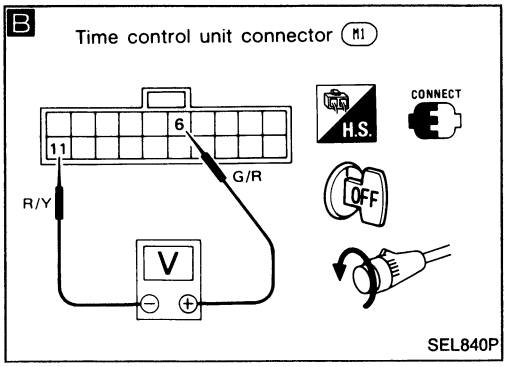
DIAGNOSTIC PROCEDURE 11

SYMPTOM: Illumination control does not actuate.

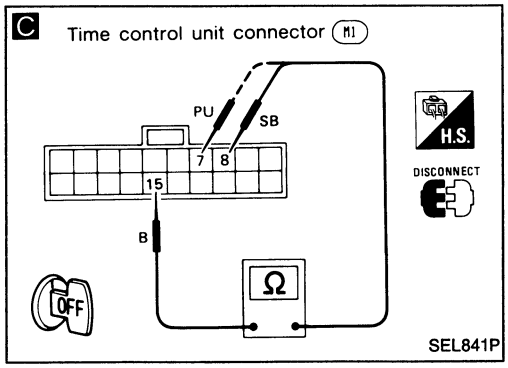
A



B



C



A

LIGHT SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑥ and ⑮.

Condition	Voltage [V]
Light switch is on	Approx. 12
Light switch is off	0

N.G. → Check light switch. Check harness continuity between T.C.U. and light switch.

O.K. ↓

B

ILLUMINATION CIRCUIT CHECK
Measure voltage between control unit harness terminals ⑥ and ⑪.

Condition	Voltage [V]
Light switch is on	Approx. 12
Light switch is off	0

N.G. → Check meter illumination. Check harness continuity of illumination circuit.

O.K. ↓

C

ILLUMINATION CIRCUIT CHECK
Measure resistance between control unit harness terminals ⑦ or ⑧ and ⑮.

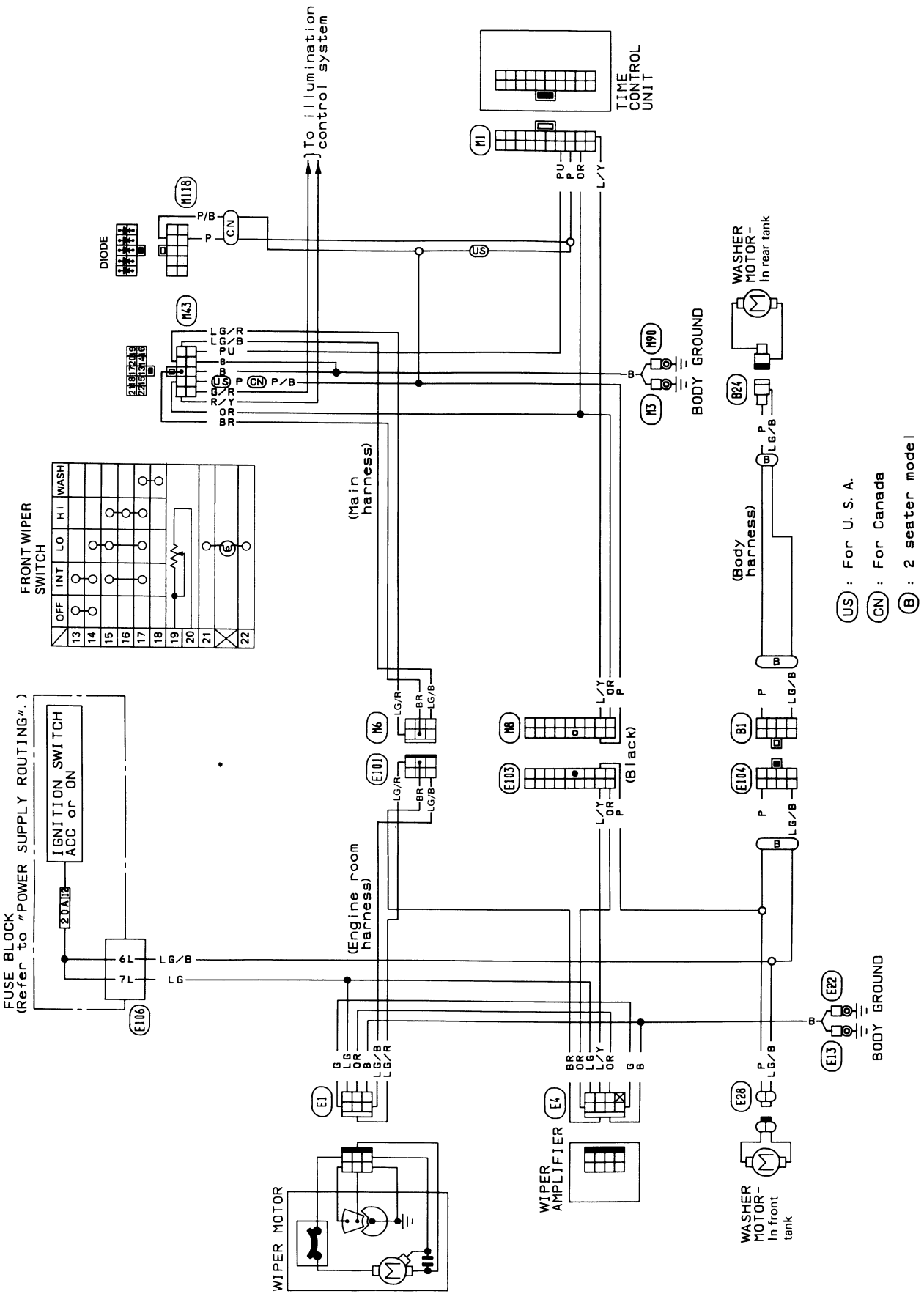
Terminals		Illumination control switch condition	Resistance [Ω]
⑧	⑮	DARK	0
		BRIGHT	Except 0
⑦	⑮	DARK	Except 0
		BRIGHT	0

N.G. → Check illumination control switch. Check harness continuity between T.C.U. and illumination switch.

O.K. ↓

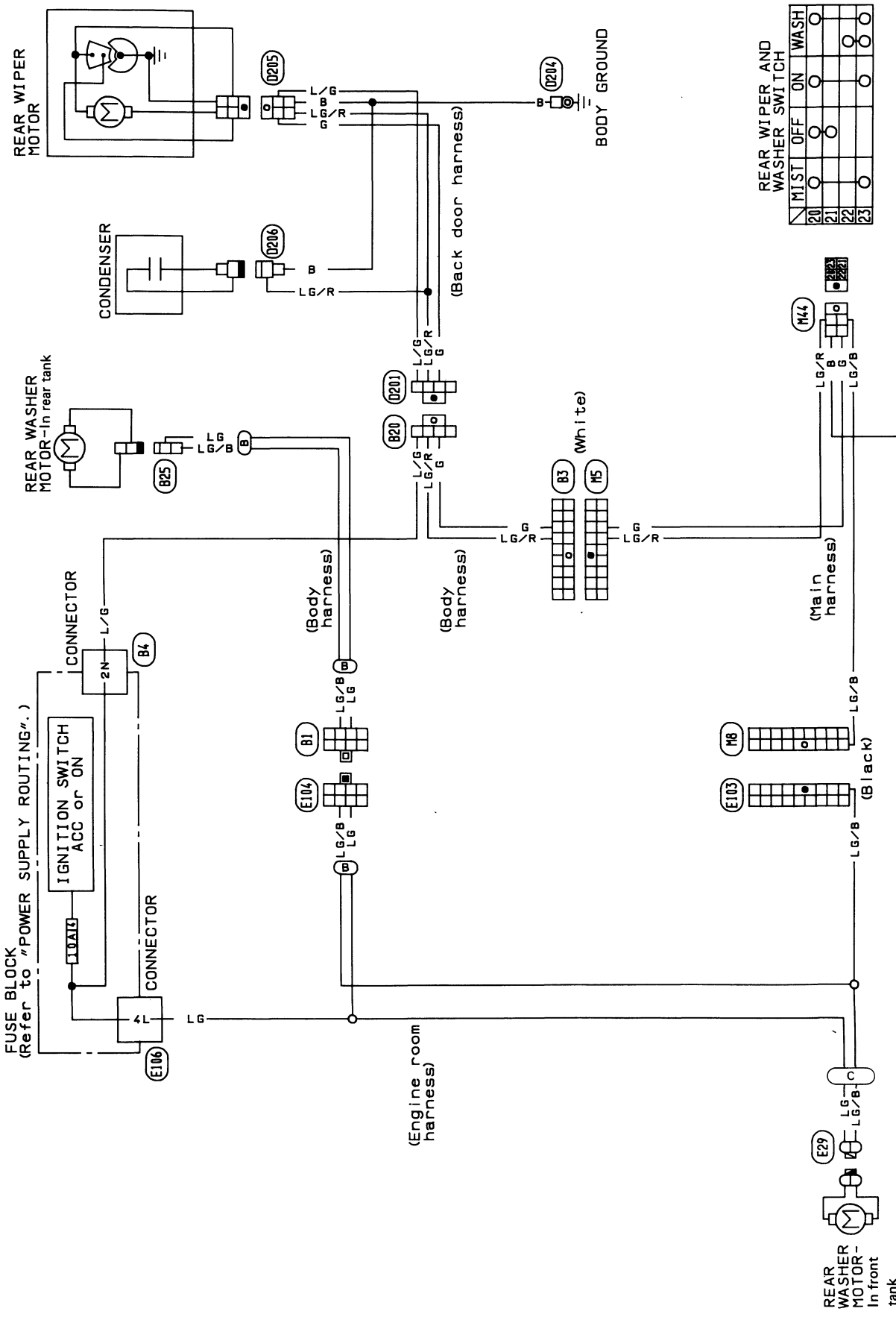
Replace T.C.U.

Front Wiper and Washer/Wiring Diagram



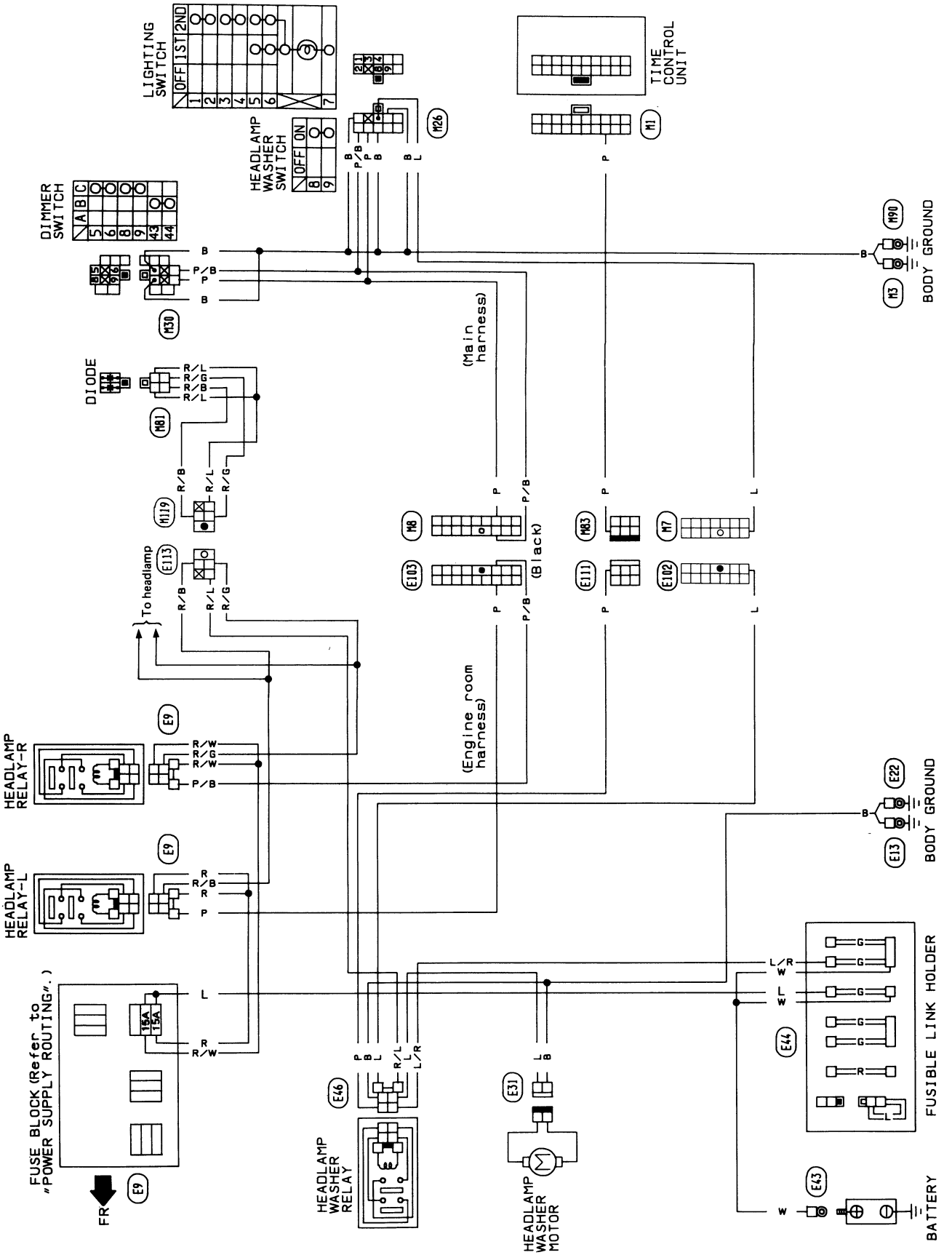
SEL703R

Rear Wiper and Washer/Wiring Diagram



SEL427R

Headlamp Washer/Wiring Diagram



SEL704R

Installation

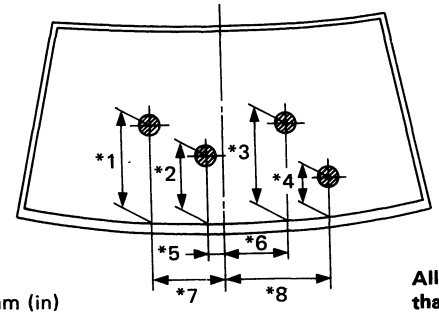
1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance "C" or "D" immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "C" or "D".

Clearance "C": 0 - 10 mm (0 - 0.39 in)
Clearance "D": 73 - 88 mm (2.87 - 3.46 in)

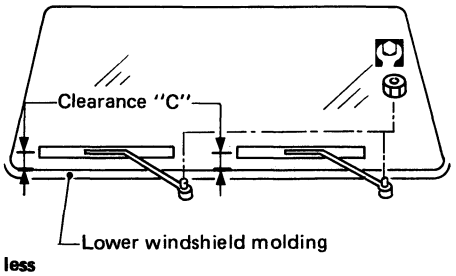
- Tighten windshield wiper arm nuts to specified torque.

Front wiper:
: 26 - 32 N·m (2.7 - 3.3 kg-m, 20 - 24 ft-lb)
Rear wiper:
: 13 - 18 N·m (1.3 - 1.8 kg-m, 9 - 13 ft-lb)

Front wiper and washer



*1: 364 (14.33)
*2: 200 (7.87)
*3: 411 (16.18)
*4: 255 (10.04)
*5: 173 (6.81)
*6: 198 (7.80)
*7: 370 (14.57)
*8: 416 (16.38)

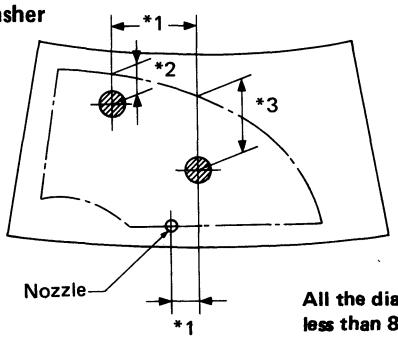


Unit: mm (in)

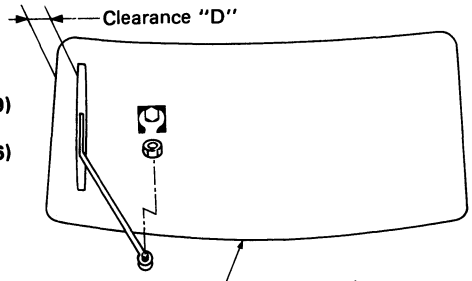
All the diameters of these circles are less than 80 (3.15).

SEL025N

Rear wiper and washer



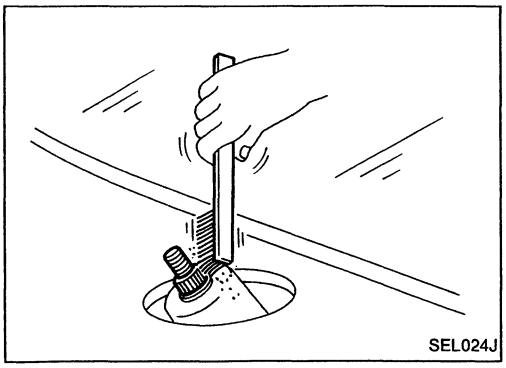
*1: 170 (6.69)
*2: 50 (1.97)
*3: 220 (8.66)



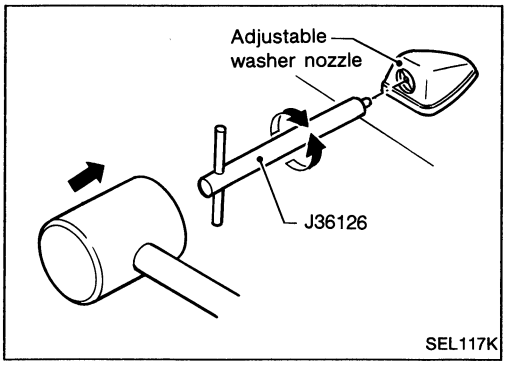
Unit: mm (in)

All the diameters of these circles are less than 80 (3.15).

SEL026N



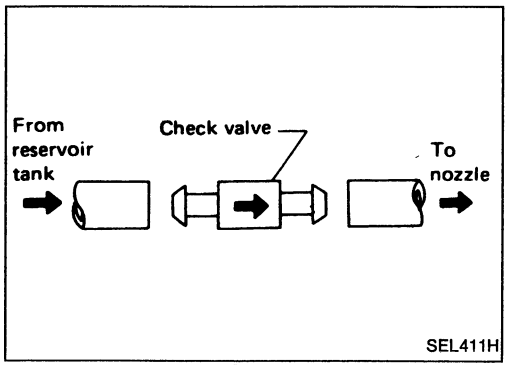
- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**



Washer Nozzle Adjustment

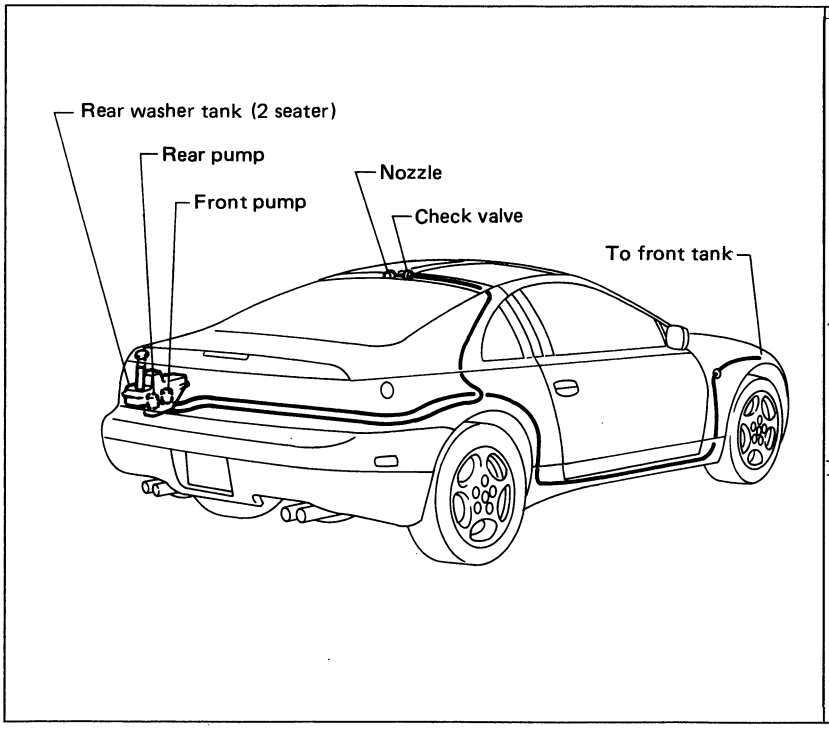
- Adjust washer nozzle with J36126 as shown in the figure at left.

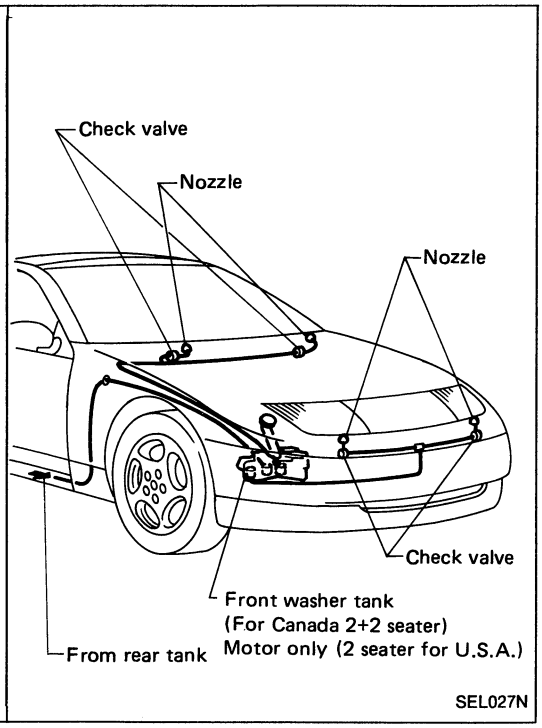
Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle. This will prevent "rounding out" the small female square in the center of the nozzle.

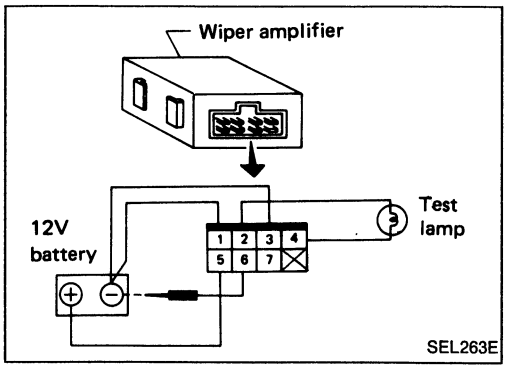


Check Valve

- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.



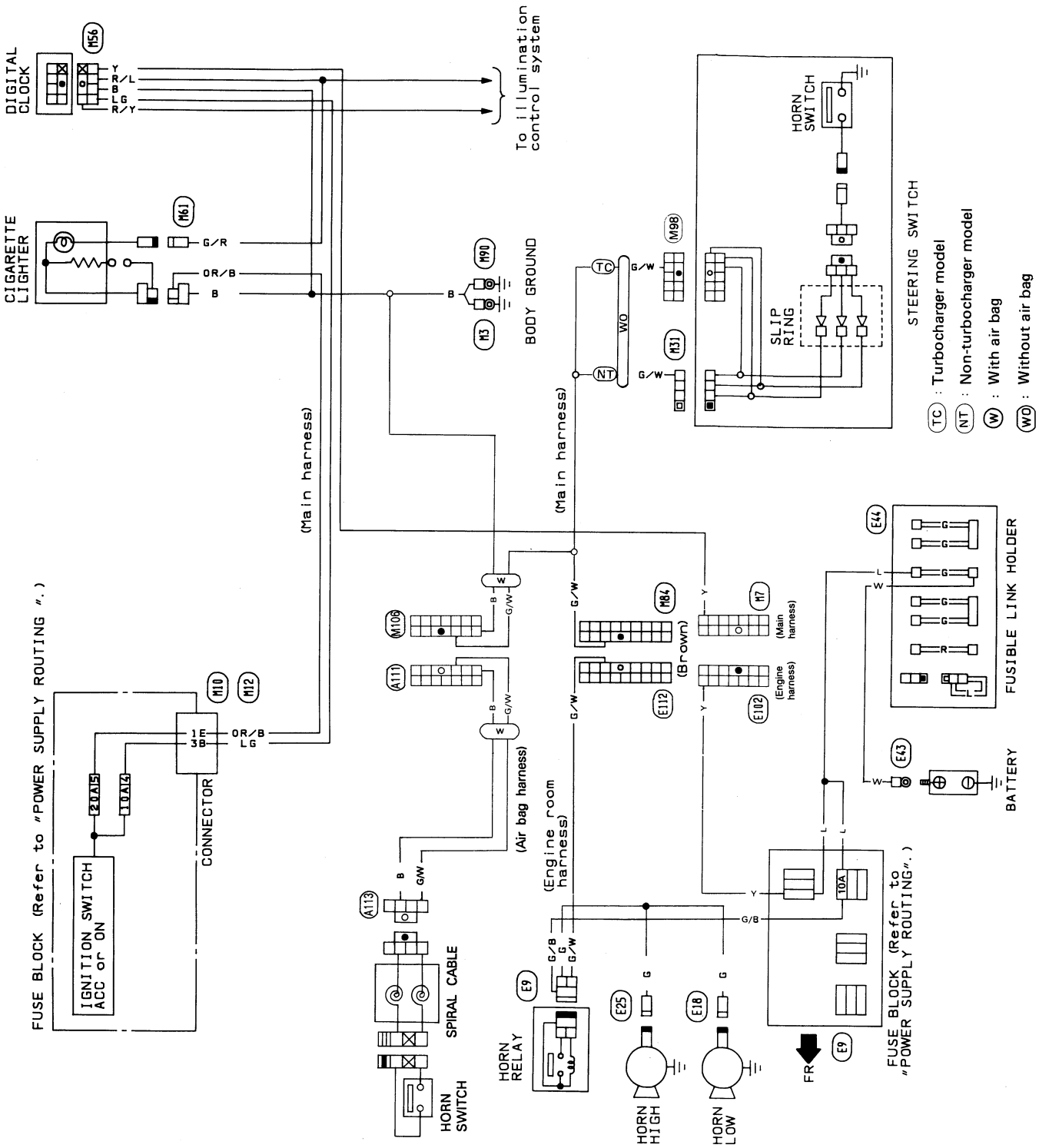




Wiper Amplifier Check

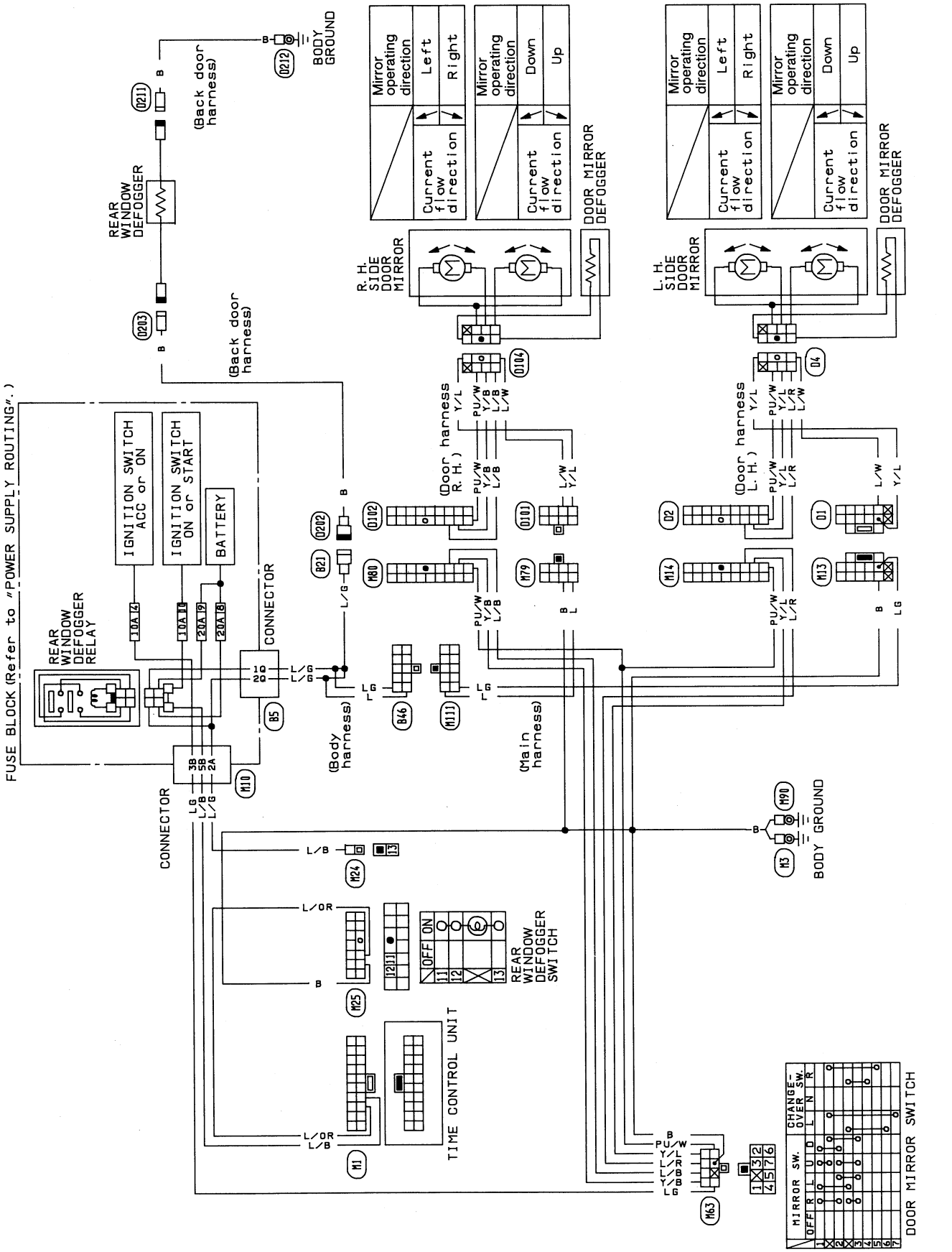
1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ⑥ and battery ground, wiper amplifier is normal.

Wiring Diagram

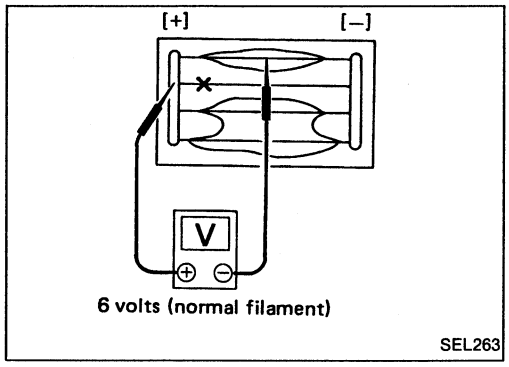


SEL705R

Wiring Diagram

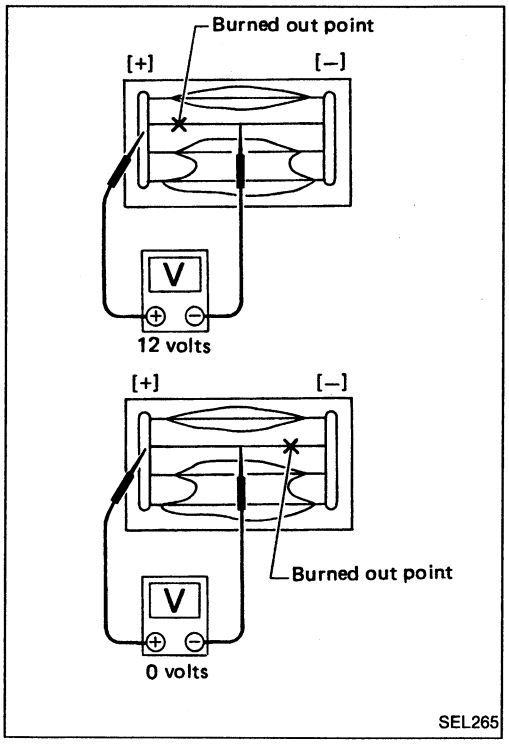


SEL429R

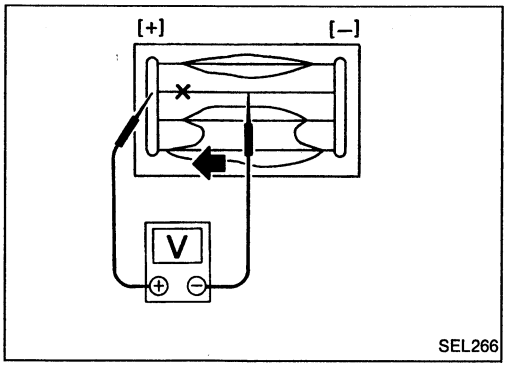


Filament Check

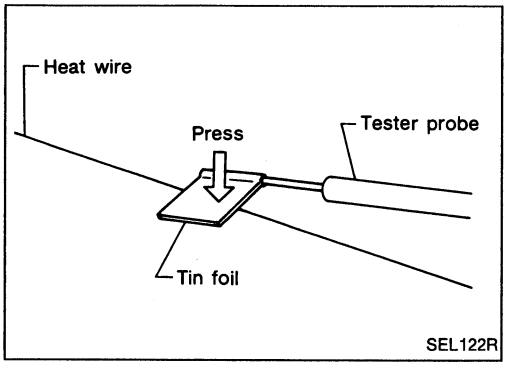
1. Attach probe circuit tester (in volt range) to middle portion of each filament.



2. If a filament is burned out, circuit tester registers 0 or 12 volts.



3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

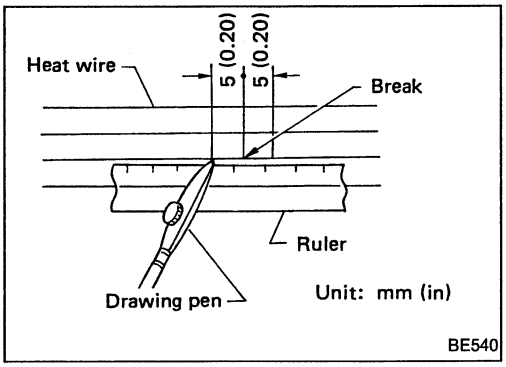


- **When measuring voltage, wind a piece of tin foil around the top of the negative probe and press the foil against the wire with your finger as shown.**

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



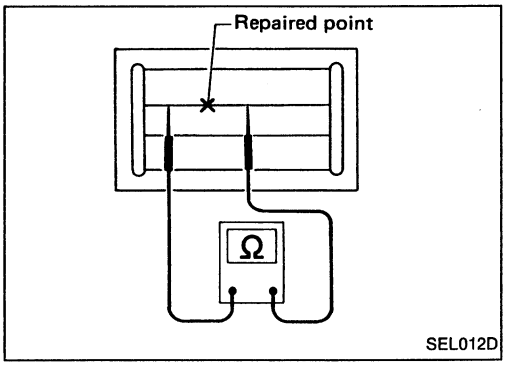
REPAIRING PROCEDURE

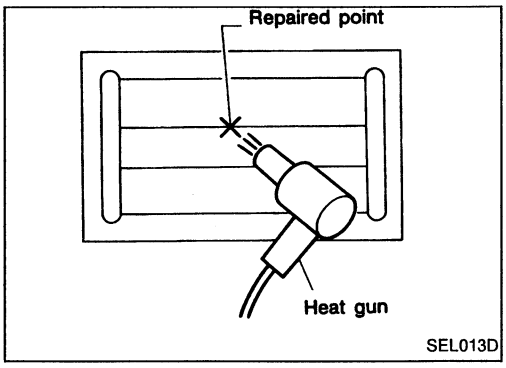
1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

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.

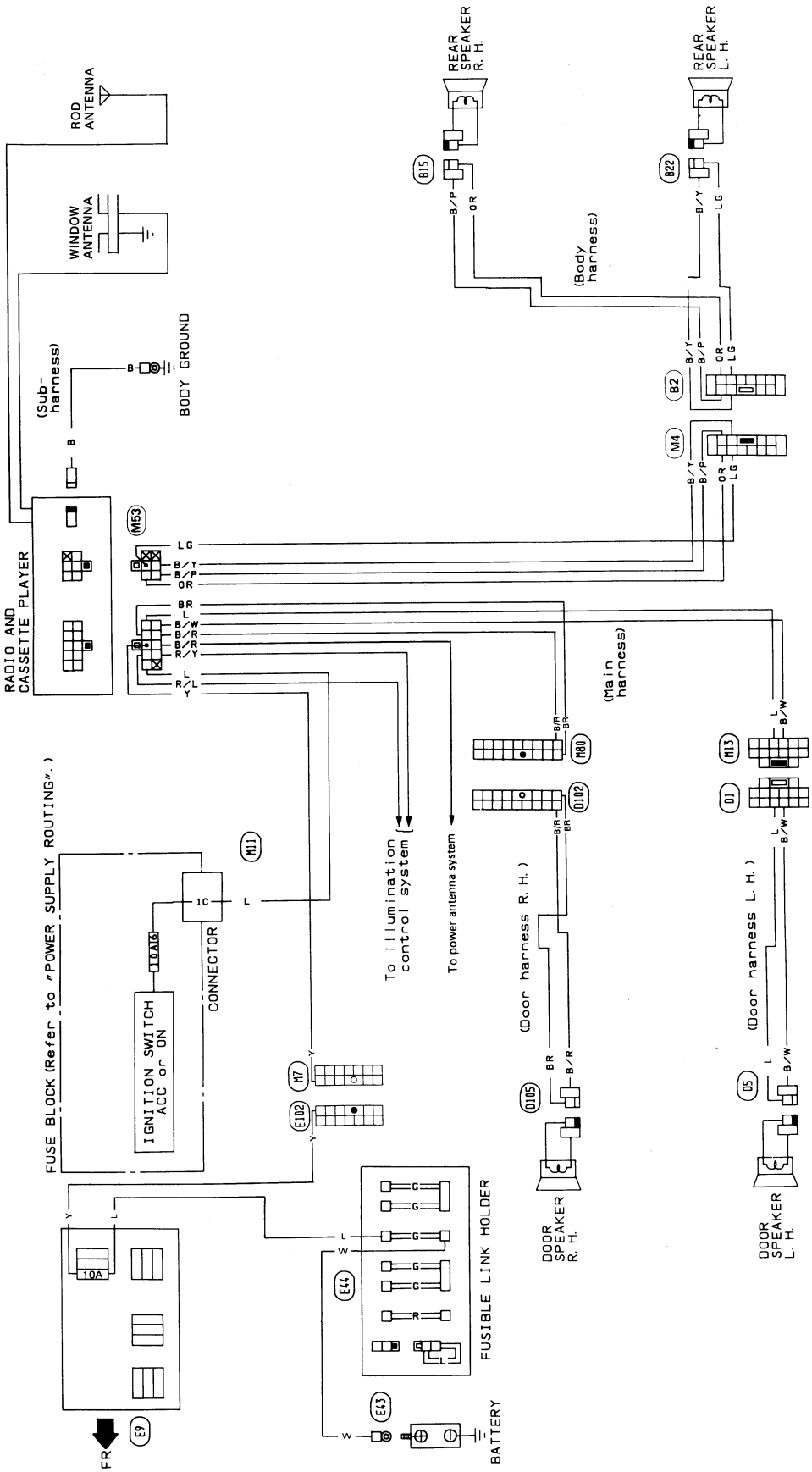




5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

Audio/Wiring Diagram

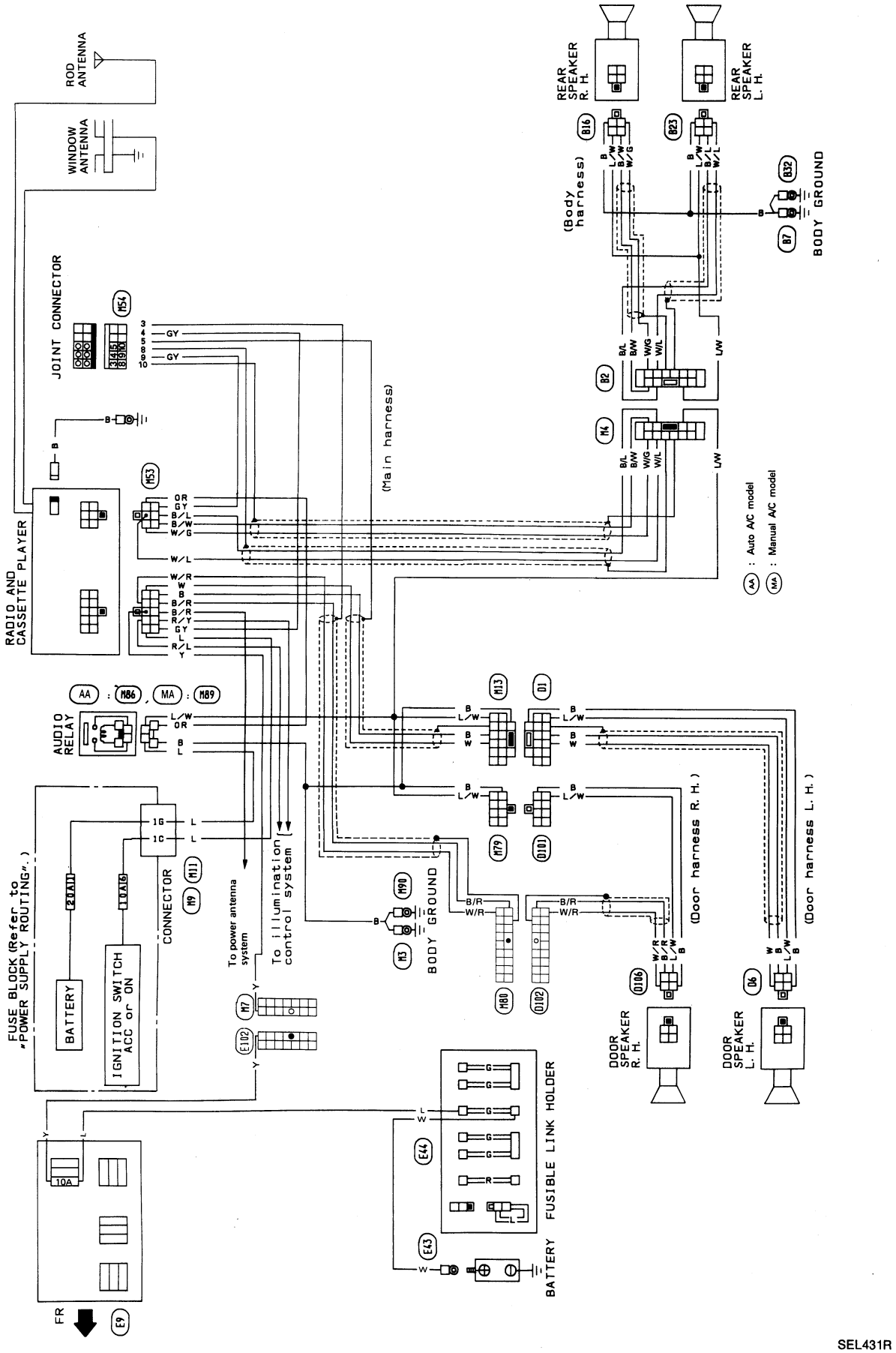
EXCEPT BOSE SYSTEM



SEL706R

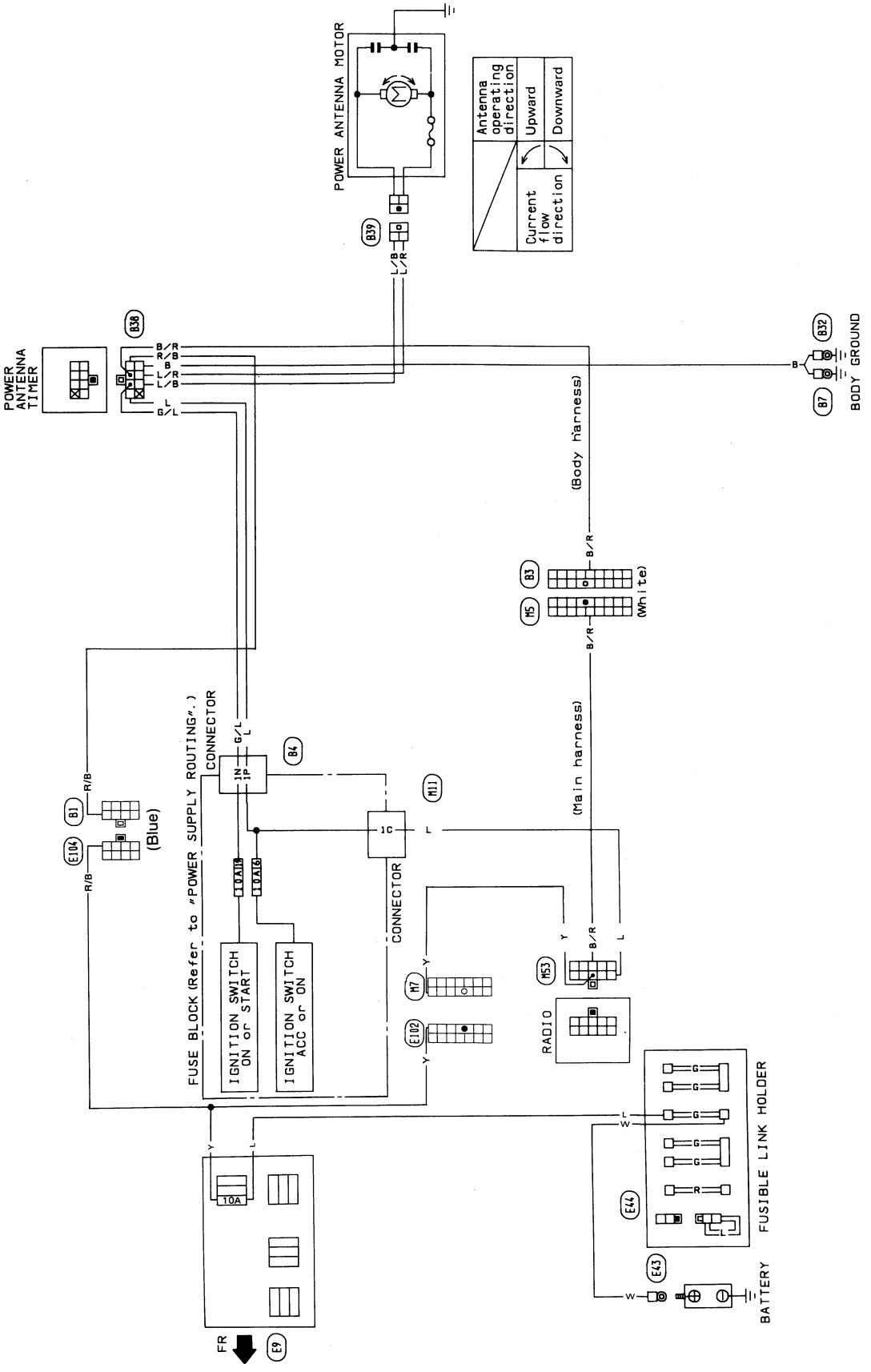
Audio/Wiring Diagram (Cont'd)

BOSE SYSTEM



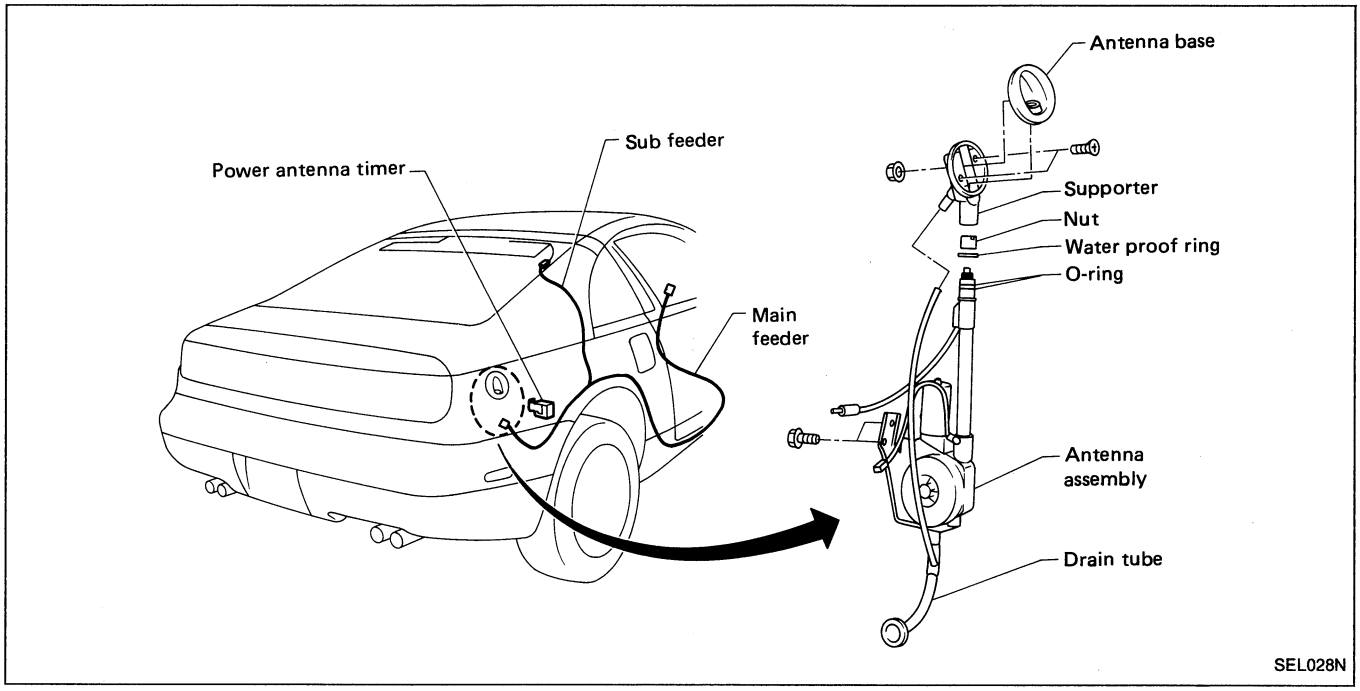
SEL431R

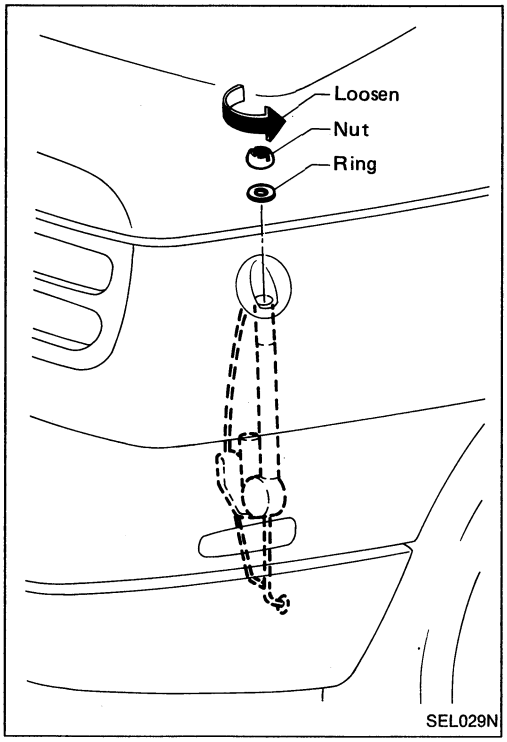
Power Antenna/Wiring Diagram



SEL432R

Location of Antenna

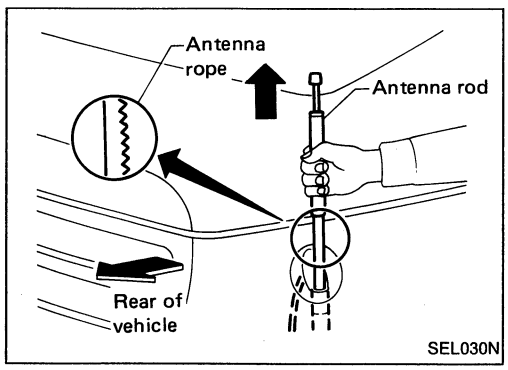




Antenna Rod Replacement

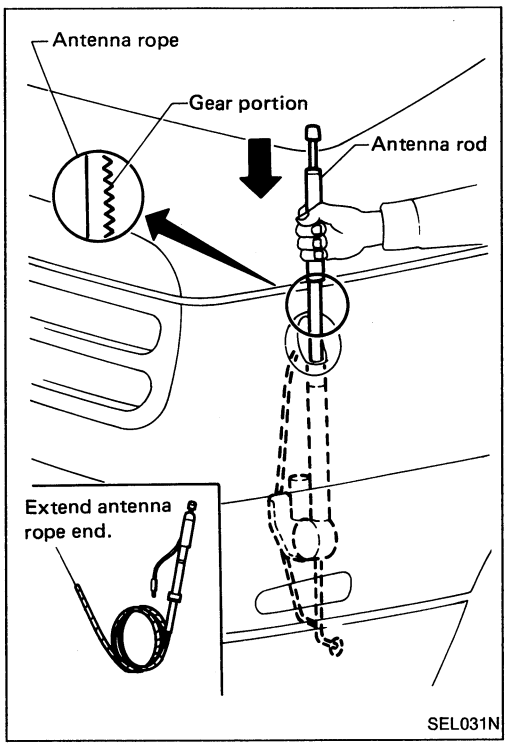
REMOVAL

1. Remove antenna nut and antenna base.



2. Withdraw antenna rod while raising it by operating antenna motor.

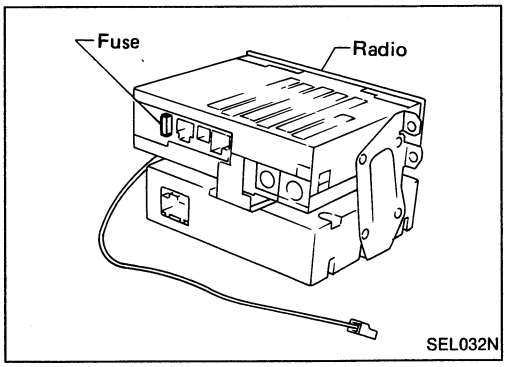
Antenna Rod Replacement (Cont'd)



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.

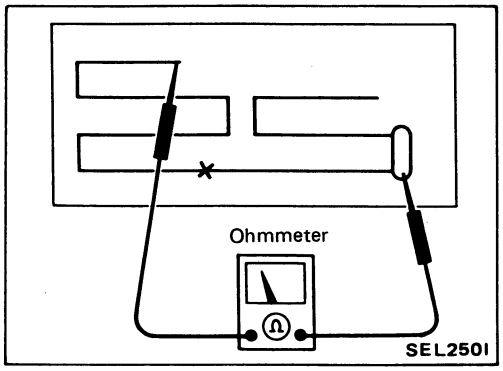
Radio Fuse Check



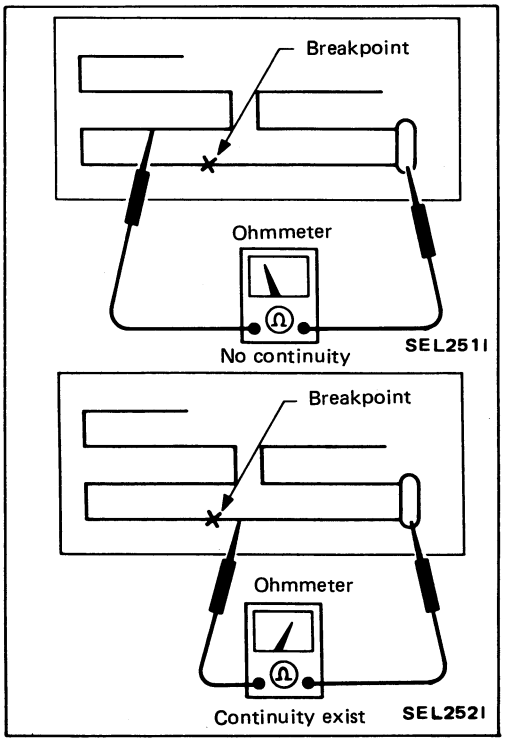
Window Antenna Repair

ELEMENT CHECK

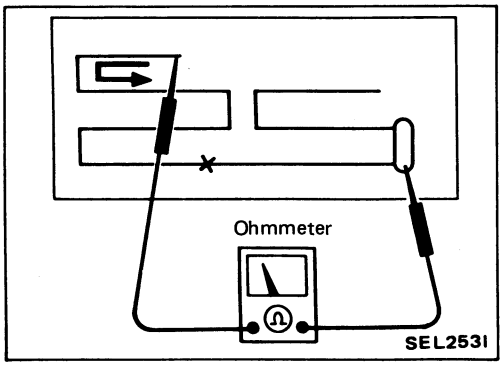
1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



2. If an element is broken, no continuity will exist.



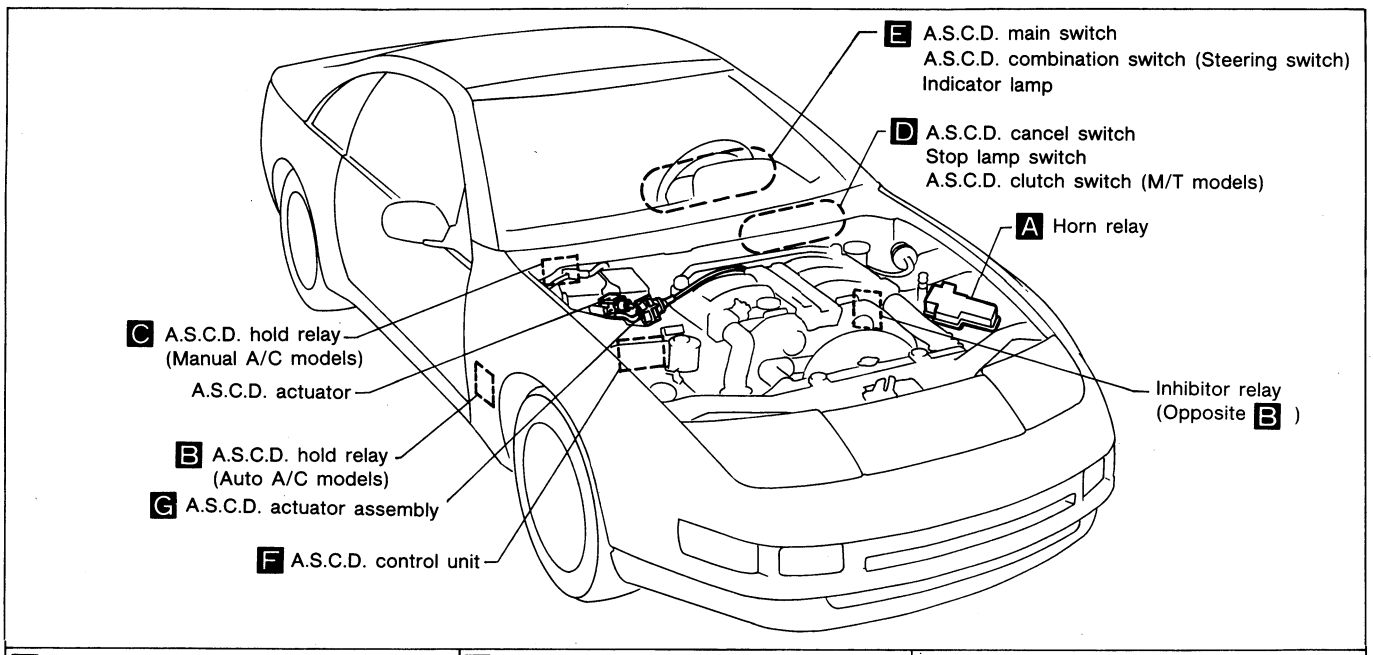
3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

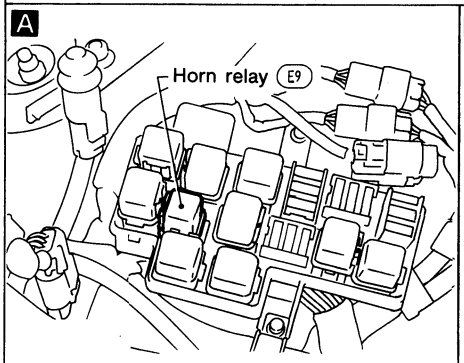


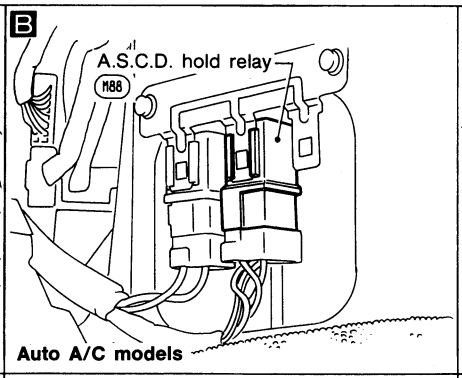
ELEMENT REPAIR

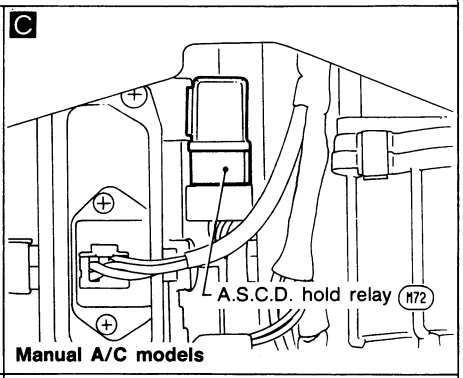
Refer to REAR WINDOW DEFOGGER "Filament Repair".

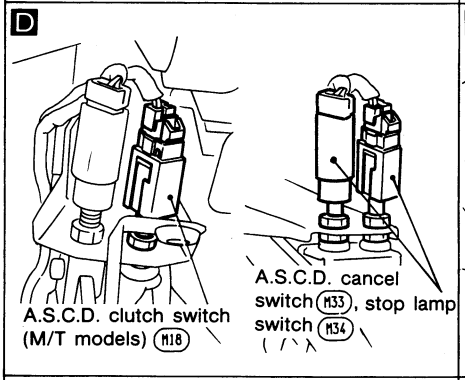
Component Parts and Harness Connector Location

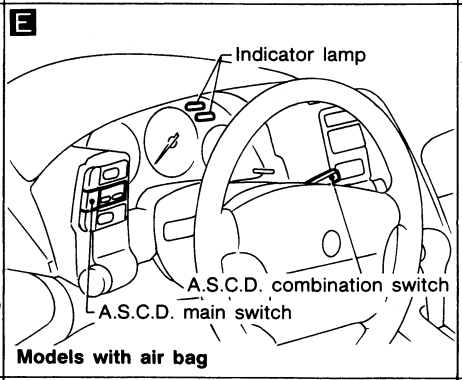


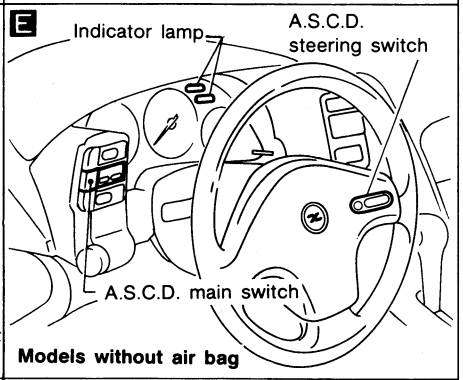


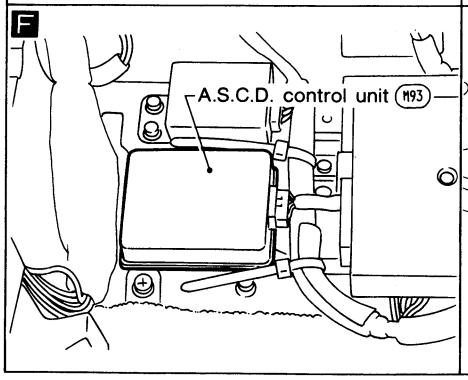


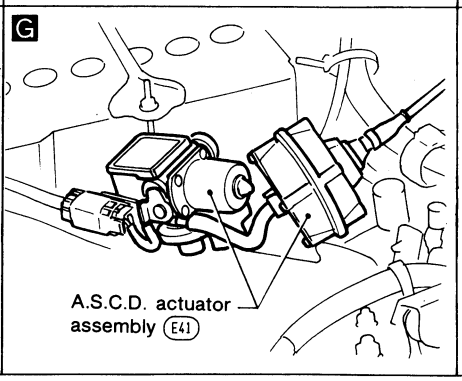






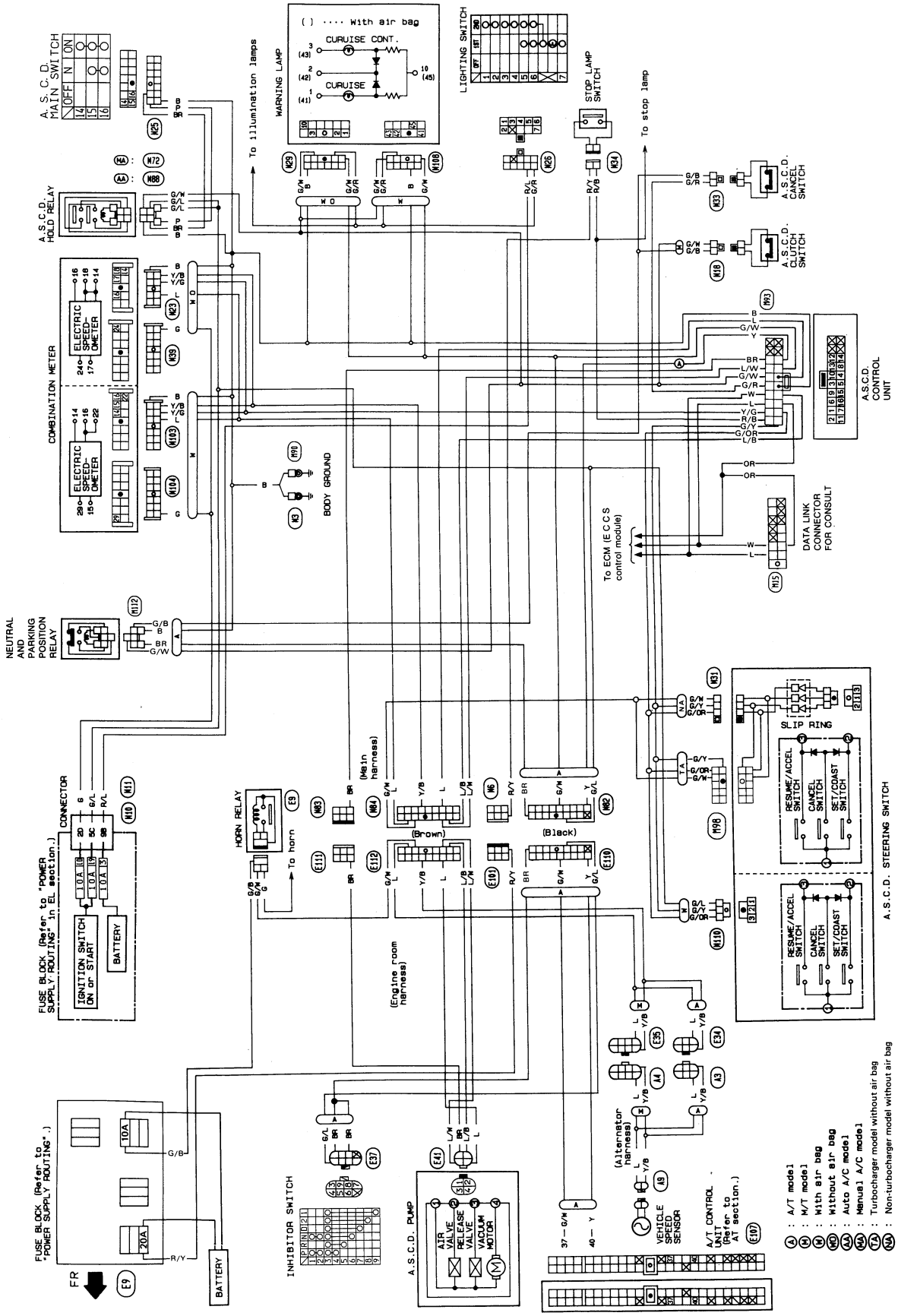




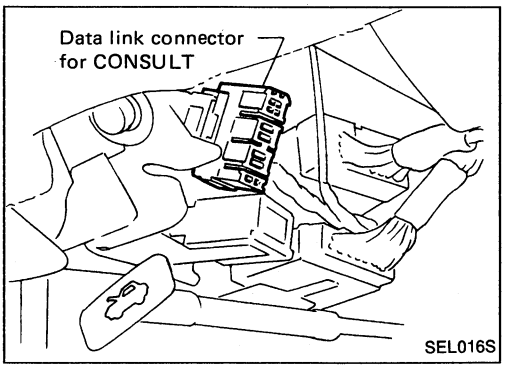


SEL714Q

Wiring Diagram



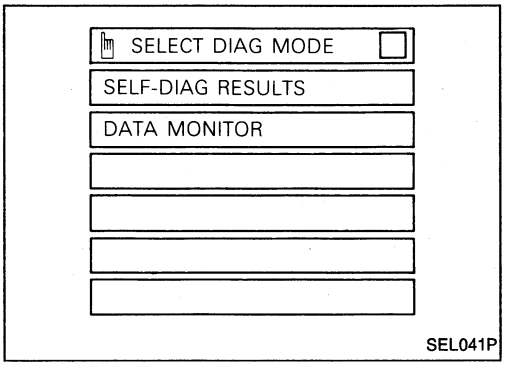
SEL707R



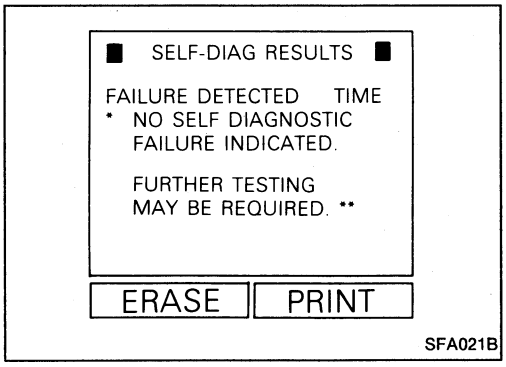
Trouble Diagnoses

CONSULT

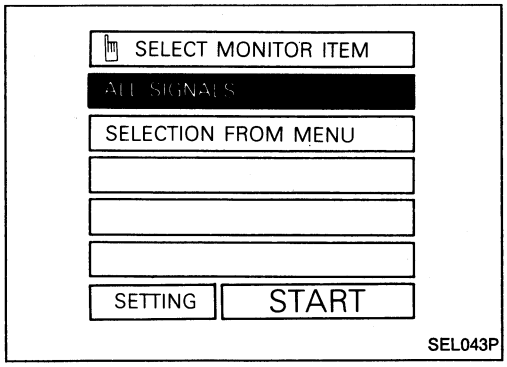
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector.



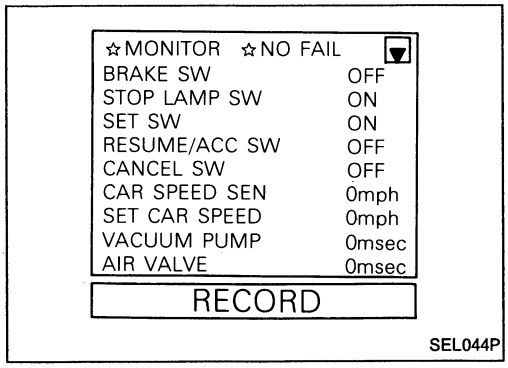
3. Turn on ignition switch.
4. Turn on A.S.C.D. main switch
5. Touch START (on CONSULT display).
6. Touch A.S.C.D.
7. Touch SELF-DIAG RESULTS.



- Self-diagnostic results are shown on display. Refer to table on the next page.



8. Touch DATA MONITOR.



- Touch START.
- Data monitor results are shown on display. Refer to table on the next page.

For further information, read the CONSULT Operation Manual.

Trouble Diagnoses (Cont'd)

Self-diagnostic results

Diagnostic item	Description
* NO SELF DIAGNOSTIC FAILURE INDICATED. FURTHER TESTING MAY BE REQUIRED.**	• Even if no self diagnostic failure is indicated, further testing may be required as far as the customer complains.
POWER SUPPLY-VALVE	• The power supply circuit for the valves is open. (An abnormally high voltage is entered.)
VACUUM PUMP	• The vacuum pump circuit is open or shorted. (An abnormally high or low voltage is entered.
AIR VALVE	• The air valve circuit is open or shorted. (An abnormally high or low voltage is entered.)
CAR/S SEN/FAILSAFE	• The vehicle speed sensor or the fail-safe circuit is malfunctioning.
CONTROL UNIT	• The A.S.C.D. control unit is malfunctioning.
RELEASE VALVE	• The release valve circuit is open or shorted. (An abnormally high or low voltage is entered.)
BRAKE SW/STOP/L SW	• The brake switch or stop lamp switch is malfunctioning.

Data monitor

Monitored item	Description
BRAKE SW	• Indicates [ON/OFF] condition of the brake switch circuit.
STOP LAMP SW	• Indicates [ON/OFF] condition of the stop lamp switch circuit.
SET SW	• Indicates [ON/OFF] condition of the set switch circuit.
RESUME/ACC SW	• Indicates [ON/OFF] condition of the resume/accelerate switch circuit.
CANCEL SW	• Indicates [ON/OFF] condition of the cancel circuit.
CAR SPEED SEN	• The present vehicle speed computed from the vehicle speed sensor signal is displayed.
SET CAR SPEED	• The preset vehicle speed is displayed.
VACUUM PUMP	• The operation time of the vacuum pump is displayed.
AIR VALVE	• The operation time of the air valve is displayed.
PW SUP-VALVE	• Indicates [ON/OFF] condition of the circuit for the air valve and the release valve.
CRUISE LAMP	• Indicates [ON/OFF] condition of the cruise lamp circuit.
A/T OD CANCEL	• Indicates [ON/OFF] condition of the OD cancel circuit.
FAIL SAFE·LOW	• The fail-safe (LOW) circuit function is displayed.
FAIL SAFE·SPD	• The fail-safe (SPEED) circuit function is displayed.

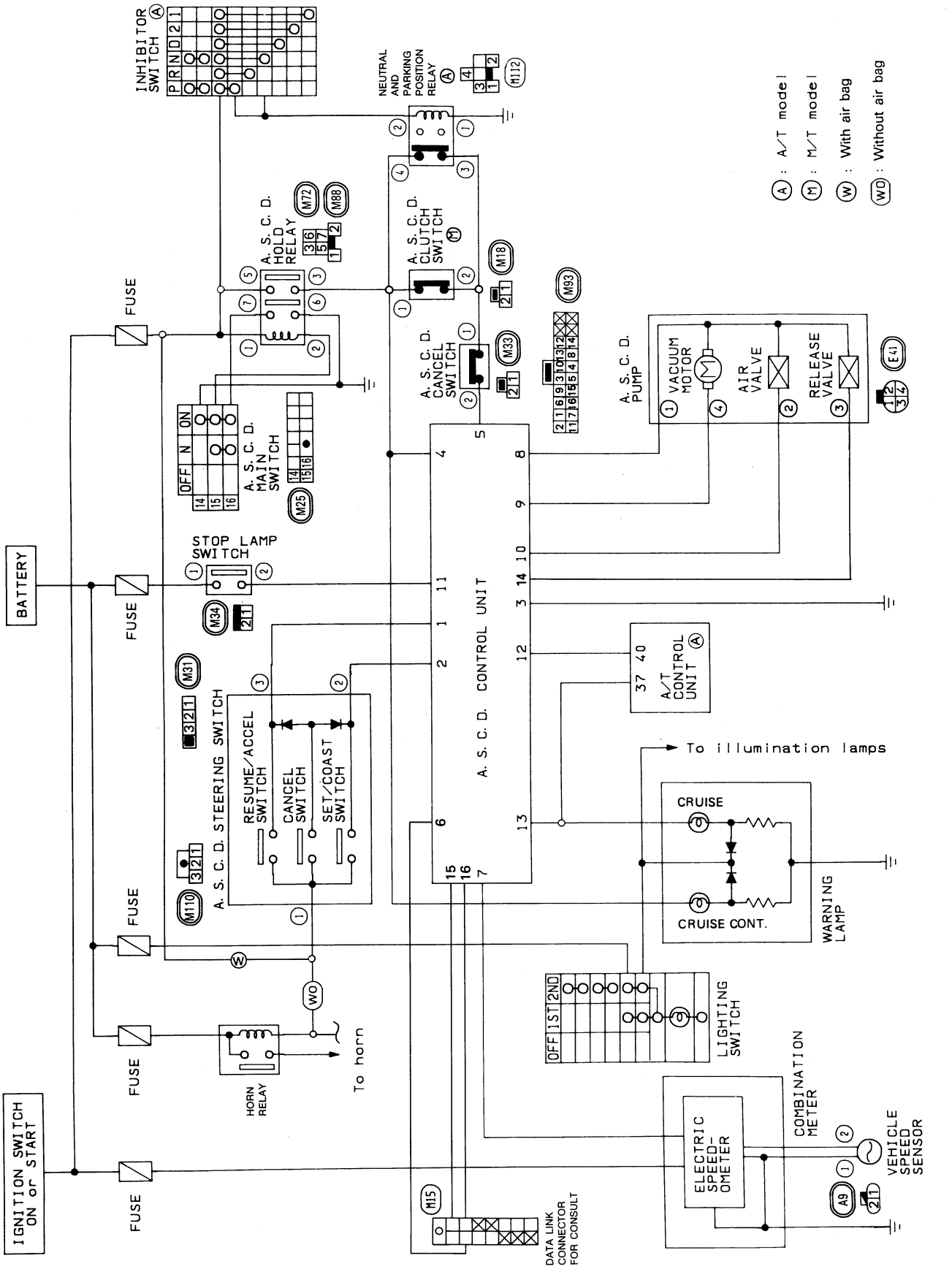
Trouble Diagnoses (Cont'd)

SYMPTOM CHART

PROCEDURE	Diagnostic Procedure								Electrical Components Inspection						
REFERENCE PAGE	EL-87	EL-90	EL-90	EL-91	EL-91	EL-93	EL-94	EL-96	EL-97	EL-98	EL-99	EL-99	EL-99	EL-100	EL-100
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	Inhibitor switch	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 canceled.					○				○	○			○		
"CRUISE" indicator lamp blinks.								○		○		○	○		

Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



SEL708R

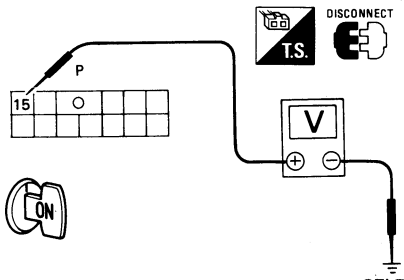
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

SYMPTOM: A.S.C.D. control cannot be set.

A

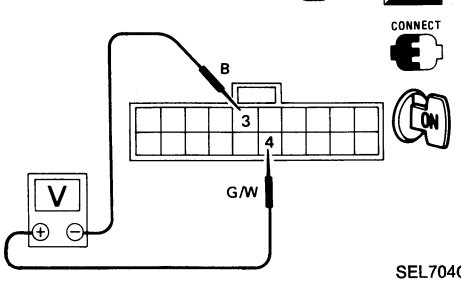
A.S.C.D. main switch connector (M25)



SEL757P

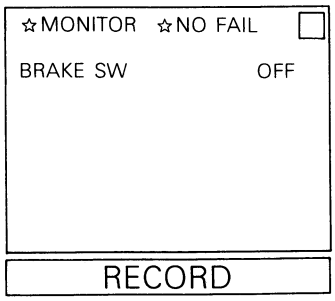
B

A.S.C.D. control unit connector (M93)



SEL704Q

C

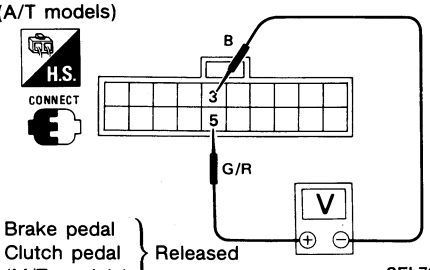


SEL948P

C

A.S.C.D. control unit connector (M93)

A/T shift lever → Except "N" and "P" (A/T models)



Brake pedal
Clutch pedal (M/T models) } Released

SEL705Q

Turn A.S.C.D. main switch "OFF" and "ON" to make sure indicator illuminates.

N.G. → A

O.K.

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 ⑮ and body ground?

No → Check fuse and harness.

Yes → 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 terminals ④ and ③.
   Battery voltage should exist.

N.G. → Check continuity between control unit harness terminal ④ and A.S.C.D. hold relay.

O.K.

C

CHECK CUT-OFF CIRCUIT FOR A.S.C.D. CONTROL UNIT.

See "BRAKE SW" in "Data monitor" mode.
BRAKE SWITCH
When switch is depressed: OFF
When switch is released: ON

OR

Check voltage between control unit harness terminals ⑤ and ③.
Battery voltage should exist.

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).

O.K.

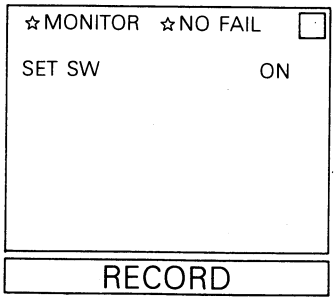
Ⓐ

(Next page)

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

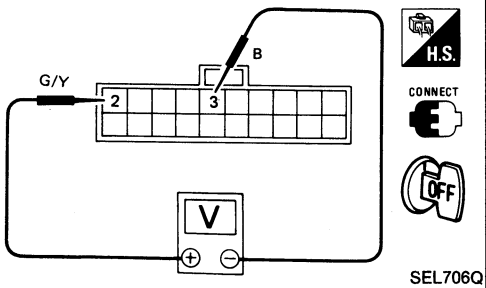
Trouble Diagnoses (Cont'd)

D



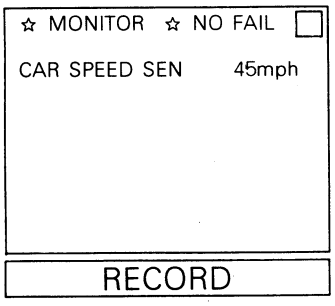
SEL950P

D A.S.C.D. control unit connector M93



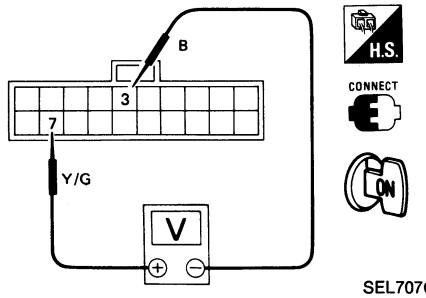
SEL706Q

E



SEL952P

E A.S.C.D. control unit connector M93



SEL707Q

Ⓐ

D

CHECK SET/COAST SWITCH CIRCUIT FOR A.S.C.D. CONTROL UNIT.

See "SET SW" in "Data monitor" mode.

SET SW
When switch is pressed: ON
When switch is released: OFF

N.G. → Does horn work?

No → Check fuse and horn relay.

Yes → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

OR

1. Turn and keep on SET/COAST switch of A.S.C.D. combination (steering) switch.
2. Check voltage between control unit harness terminals ② and ③.

Battery voltage should exist.

O.K.

E

CHECK SPEED SENSOR CIRCUIT.

See "CAR SPEED SEN" in "Data monitor" mode while driving.

N.G. → CHECK SPEED SENSOR. Refer to "Electrical Components Inspection".

OR

1. Apply wheel chocks and jack up rear of vehicle.
2. Connect voltmeter between control unit harness terminals ⑦ and ③.
3. Slowly turn rear wheel.
4. Check deflection of voltmeter pointer.

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 assembly.

O.K.

Ⓑ

(Next page)

Trouble Diagnoses (Cont'd)

F

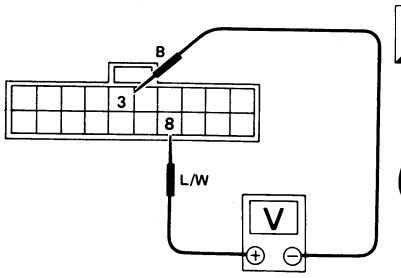
☆ MONITOR ☆ NO FAIL ☐

PW SUP-VALVE ON

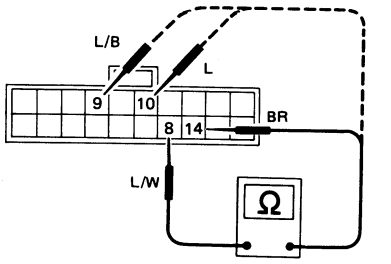
RECORD

SEL860R

F A.S.C.D. control unit connector (M93)



A.S.C.D. control unit connector (M93)



SEL708Q

Ⓑ

F

CHECK OUTPUT FOR A.S.C.D. ACTUATOR/A.S.C.D. PUMP.

1. Read out "PW SUP-VALVE" in "Data monitor" mode while driving.
   PW SUP-VALVE:
   ON (When A.S.C.D. is operating.)
   OFF (When A.S.C.D. is not operating.)

OR

1. Check voltage between control unit harness terminals Ⓑ and ③.
   Voltage is 0V.

N.G. → Repair A.S.C.D. control unit.

O.K.

F

1. Disconnect A.S.C.D. control unit connector.
2. Measure resistance between control unit harness terminals Ⓑ and ⑨, ⑩, ⑭.

Terminals		Resistance [Ω]
Ⓑ	⑨	Approx. 8 - 45
	⑩	Approx. 65
	⑭	Approx. 65

O.K. → (to Repair A.S.C.D. control unit.)

N.G.

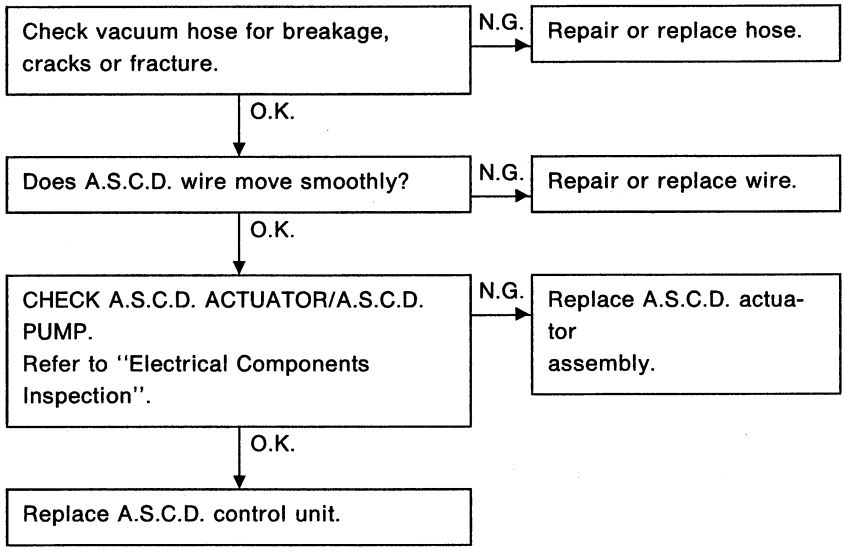
Repair short or open circuit in A.S.C.D. actuator assembly.

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

Trouble Diagnoses (Cont'd)

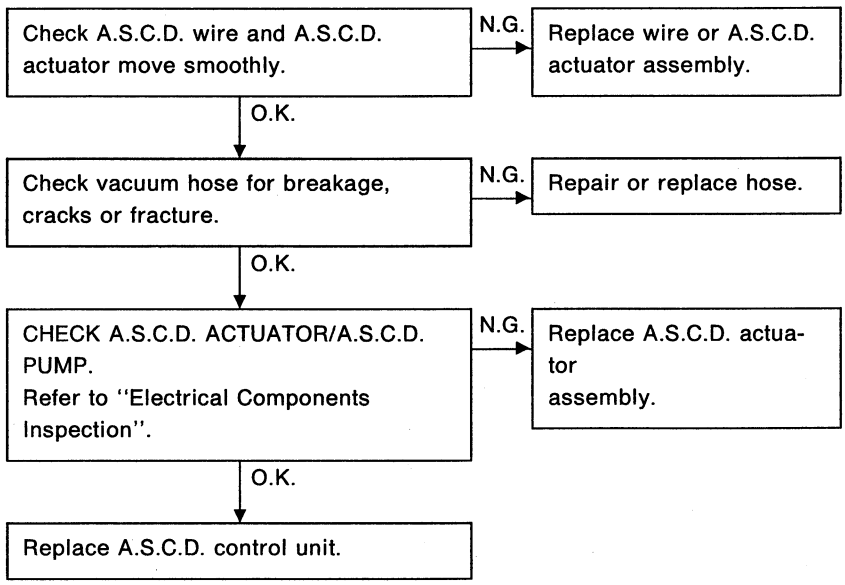
DIAGNOSTIC PROCEDURE 2

SYMPTOM: Engine hunts.



DIAGNOSTIC PROCEDURE 3

SYMPTOM: Large difference between set vehicle speed and actual speed.



Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

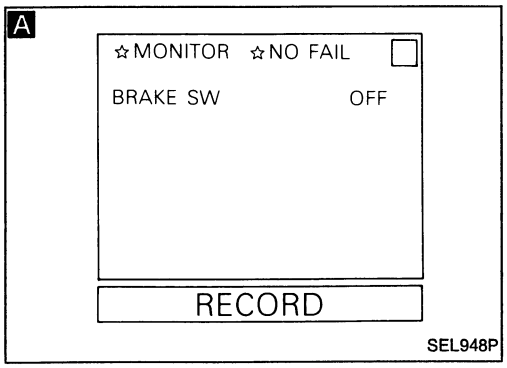
SYMPTOM: Deceleration is greatest immediately after A.S.C.D. has been set.

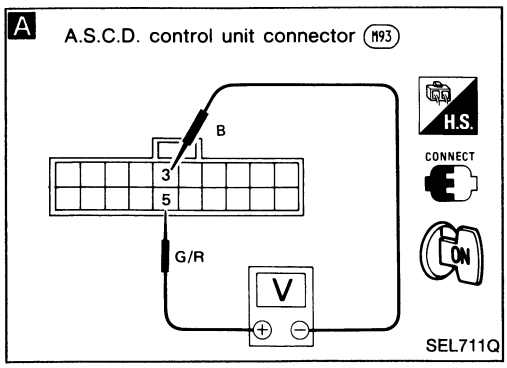
Check tension of A.S.C.D. wire and that A.S.C.D. wire moves smoothly.
- N.G. → ADJUST OR REPLACE A.S.C.D. WIRE. Refer to "A.S.C.D. Wire Adjustment".
- O.K. ↓

Check vacuum hose for breakage, cracks or fracture.
- N.G. → Repair or replace hose.
- 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 assembly.
- O.K. ↓

Replace A.S.C.D. control unit.





DIAGNOSTIC PROCEDURE 5

SYMPTOM: Set speed cannot be cancelled.

A

CHECK A.S.C.D. BRAKE AND INHIBITOR SWITCH CIRCUIT.
1. Turn A.S.C.D. main switch "ON".
2. See "BRAKE SW" in "Data monitor" mode.
   BRAKE SW
   When brake pedal is released: ON
   When brake pedal is depressed: OFF

- N.G. → CHECK A.S.C.D. CANCEL, CLUTCH, and INHIBITOR SWITCH. Refer to "Electrical Components Inspection".

OR

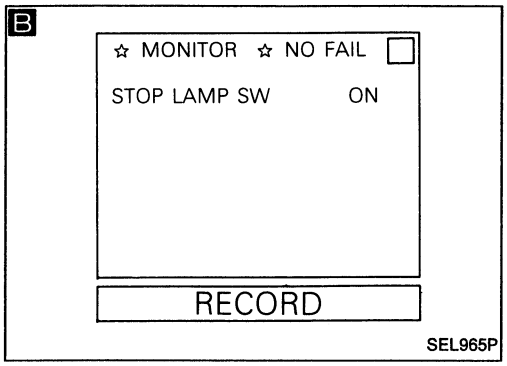
2. Check voltage between control unit harness terminals ⑤ and ③.

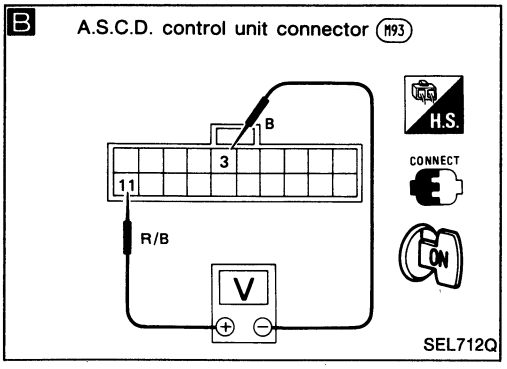
Conditions			Voltage [V]
M/T	A.S.C.D. cancel switch	De-pressed	0
		Released	Approx. 12
	A.S.C.D. clutch switch	De-pressed	0
		Released	Approx. 12
A/T	A/T shift lever position is at any position except N or P.		Approx. 12
	A/T shift lever position is at N or P.		0

O.K. ↓

Ⓒ
(Next page)

Trouble Diagnoses (Cont'd)





Ⓒ

B

CHECK STOP LAMP SWITCH CIRCUIT.

See "STOP LAMP SW" in "Data monitor" mode.

STOP LAMP SW

When brake pedal is released: OFF

When brake pedal is depressed: ON

N.G. → CHECK STOP LAMP SWITCH. Refer to "Electrical Components Inspection.

OR

Check voltage between control unit harness terminals ⑪ and ③.

Condition		Voltage [V]
Stop lamp switch	Depressed	Approx. 12
	Released	0

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 assembly.

O.K.

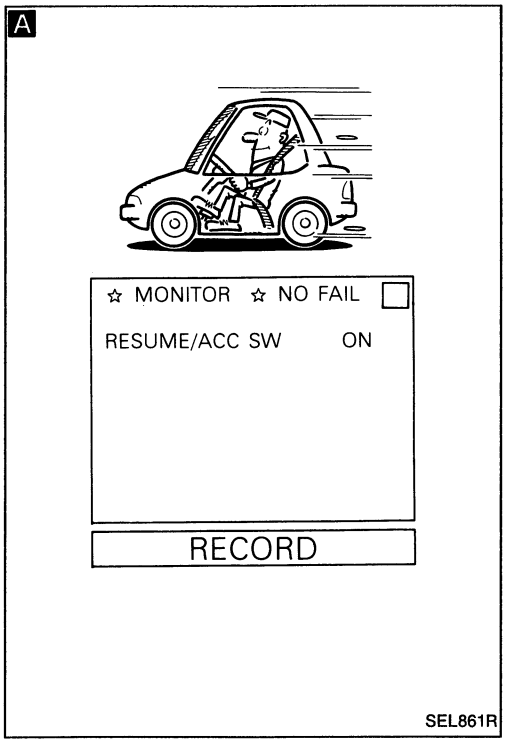
↓

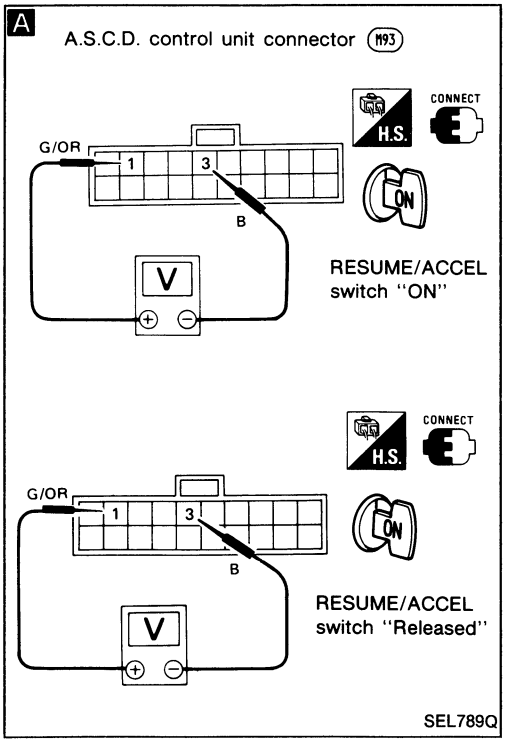
Replace A.S.C.D. control unit.

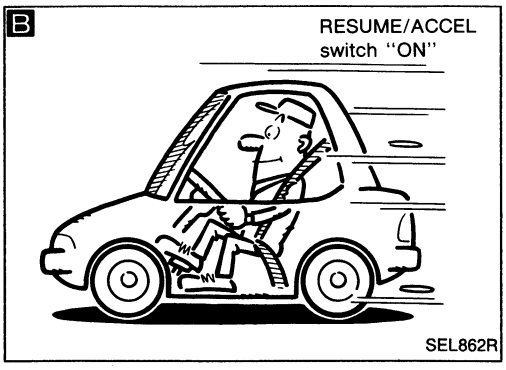
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

SYMPTOM: ACCEL switch will not operate.







Check constant-speed function for operating using SET/COAST switch.
N.G. → Go to "DIAGNOSTIC PROCEDURE 1".
O.K. ↓

A

CHECK RESUME/ACCEL SWITCH CIRCUIT.

See "RESUME/ACC SW" in "Data monitor" mode.
RESUME/ACC SW
When switch is pressed: ON
When switch is released: OFF

N.G. → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

OR

Check voltage between control unit harness terminals ① and ③ after turning on and holding RESUME/ACCEL switch.
Battery voltage should exist.
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. COMBINATION (STEERING) SWITCH.

O.K. ↓

B

Does vehicle accelerate when RESUME/ACCEL switch is turned on?
No → Replace control unit.
Yes ↓

C

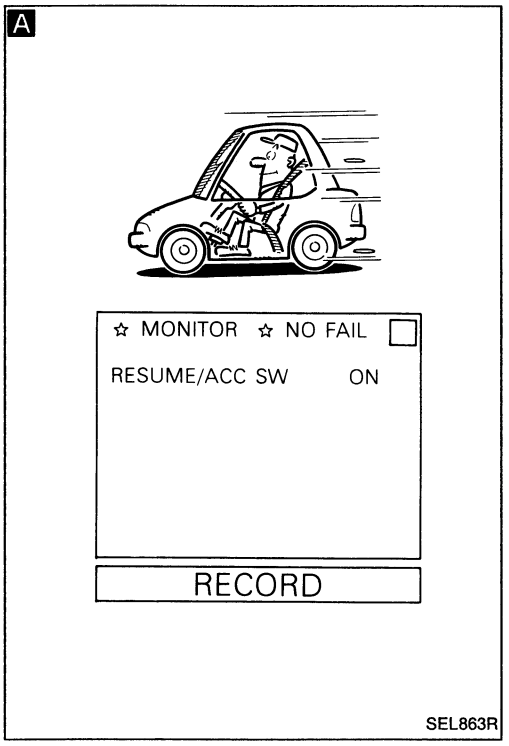
Does vehicle maintain the new (faster) speed when RESUME/ACCEL switch is released?
No → Replace control unit.
Yes ↓

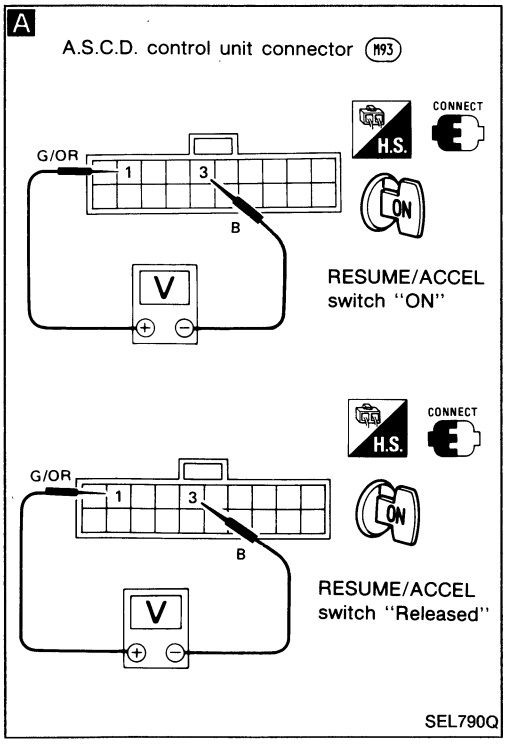
System is O.K.

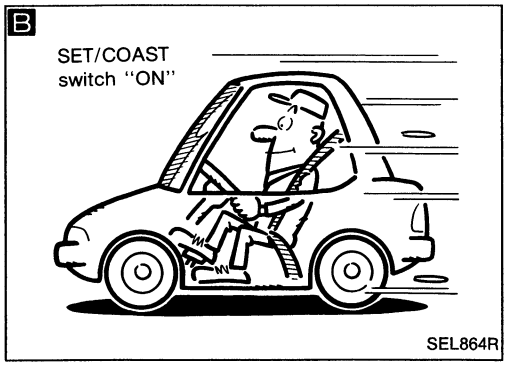
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7

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 RESUME/ACCEL SWITCH CIRCUIT.

N.G. → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

See "RESUME/ACC SW" in "Data monitor" mode.

RESUME/ACC SW

When switch is pressed: ON

When switch is released: OFF

OR

Check voltage between control unit harness terminals ① and ③.

- After turning on and holding RESUME/ACC switch.
  Battery voltage should exist.
- After releasing RESUME/ACC switch.
  Voltage is 0V.

O.K.

B

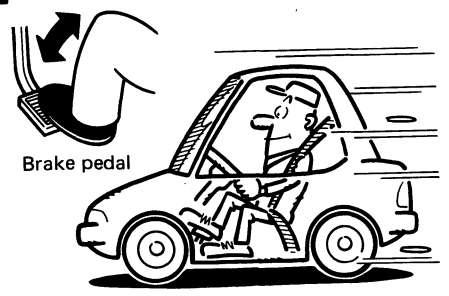
Set vehicle speed at 80 km/h (50 MPH) by turning on SET/COAST switch.

O.K.

Ⓓ
(Next page)

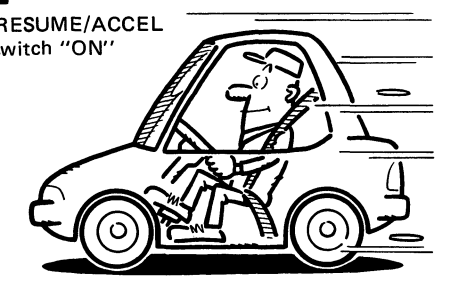
Trouble Diagnoses (Cont'd)

C



SEL865R

D



SEL866R

Ⓓ

C

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

D

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.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 8

SYMPTOM: "CRUISE" indicator lamp blinks.

Does indicator lamp blink when A.S.C.D. main switch is turned to "ON" again?

Yes → Does indicator lamp blink when brake pedal is depressed slowly?

No → CHECK A.S.C.D. ACTUATOR/ A.S.C.D. PUMP. Refer to "Electrical Components Inspection".

Does indicator lamp blink when brake pedal is depressed slowly?

No → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

Yes → Adjust installation of stop lamp switch and A.S.C.D. cancel switch. Refer to BR section.

CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. combination (steering) switch.

O.K. → Replace control unit.

CHECK A.S.C.D. ACTUATOR/ A.S.C.D. PUMP. Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. actuator assembly.

O.K. →

CHECK A.S.C.D. ACTUATOR/ A.S.C.D. PUMP CIRCUIT.

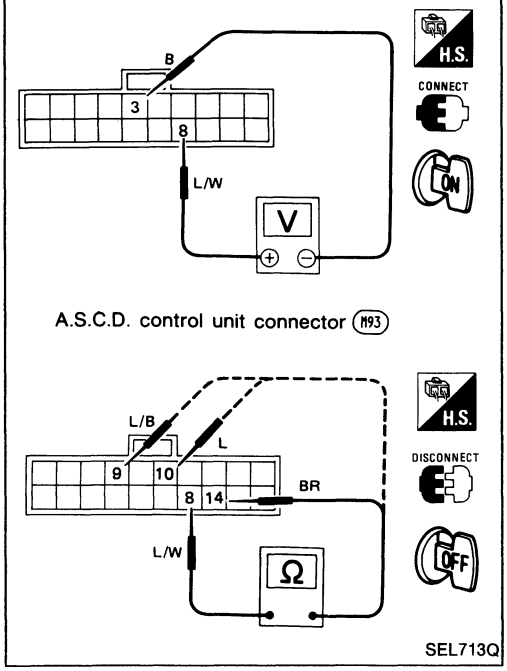
1. Check voltage between control unit harness terminals ⑧ and ③.
   Voltage is 0V.
2. Disconnect A.S.C.D. control unit connector.
3. Measure resistance between control unit harness terminals ⑧ and ⑨, ⑩, ⑭.

N.G. → Repair short or open circuit in A.S.C.D. actuator/ A.S.C.D. pump harness.

Terminals		Resistance [Ω]
⑧	⑨	Approx. 8 - 45
	⑩	Approx. 65
	⑭	Approx. 65

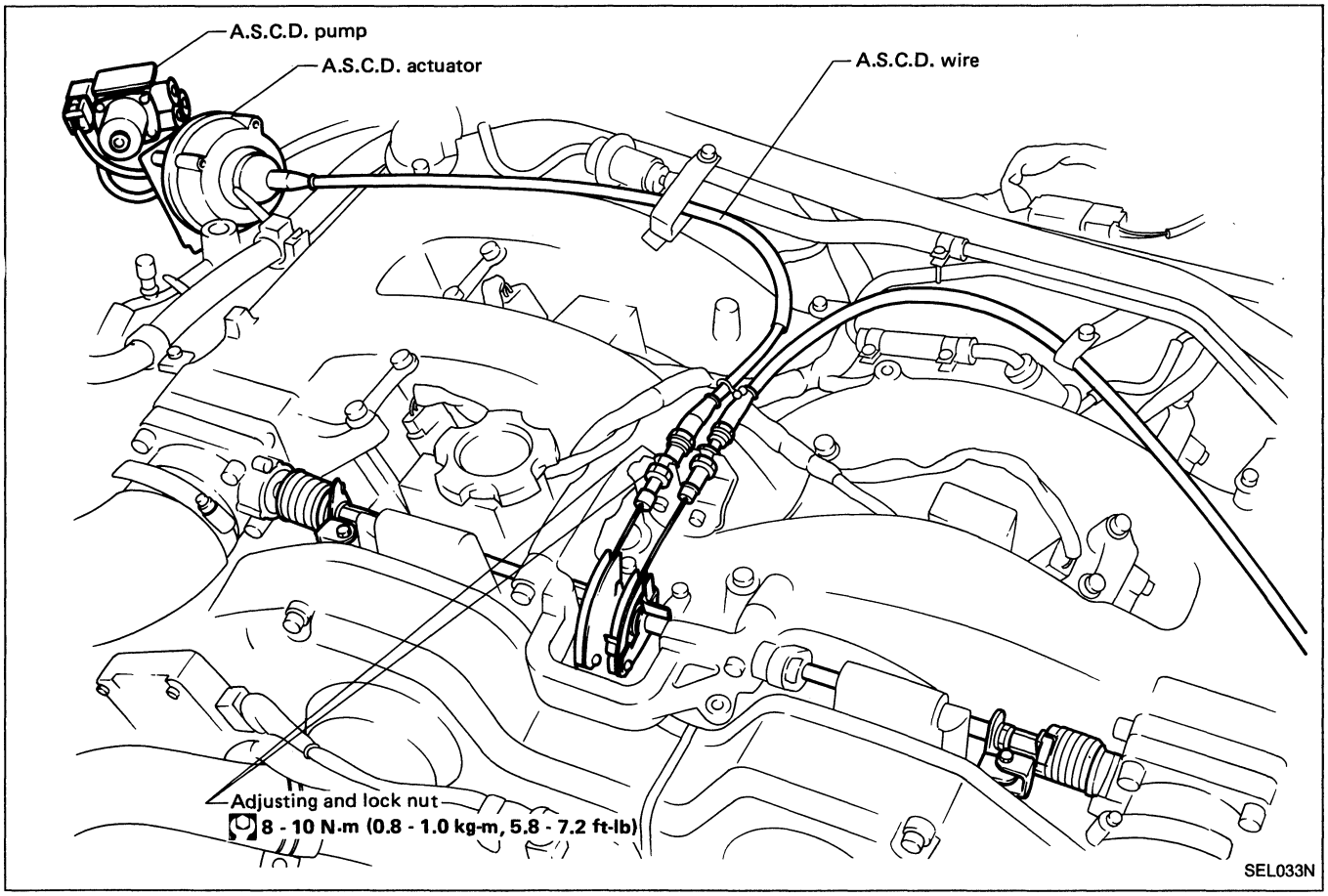
O.K. → Replace A.S.C.D. control unit.

A.S.C.D. control unit connector (M93)



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.

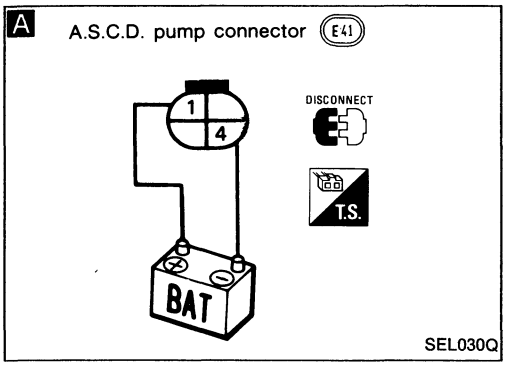
Trouble Diagnoses (Cont'd)

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

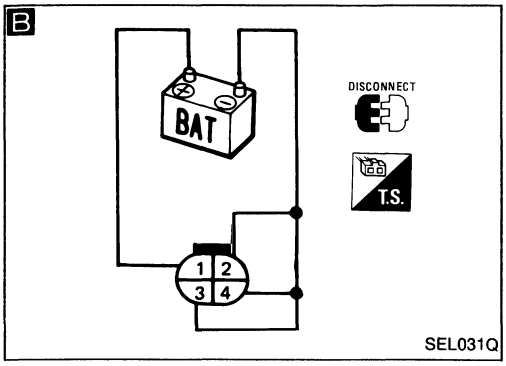


Check to see if motor starts when 12V D.C. is applied across ① and ④.

N.G. → Replace A.S.C.D. actuator assembly.

O.K.

B

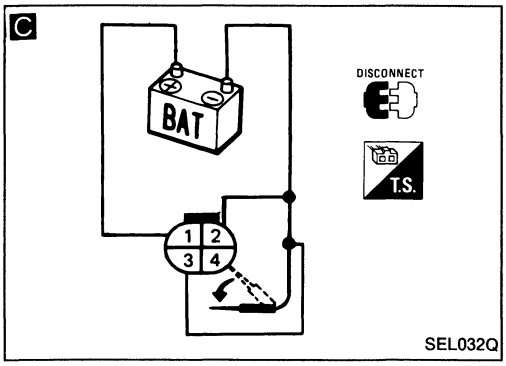


Check to see if A.S.C.D. wire is pulled when 12V D.C. is applied across ①, ②, ③ and ④.

N.G.

O.K. (Wire is pulled.)

C

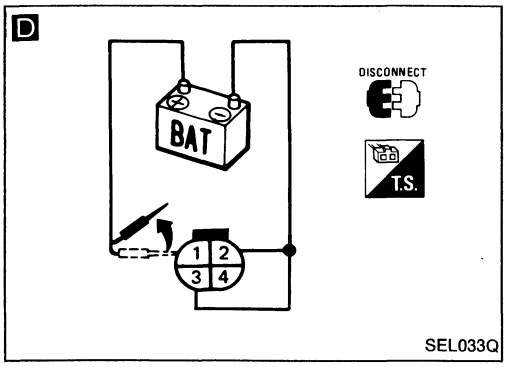


Check to see if A.S.C.D. wire returns to original position 50 to 60 seconds after disconnecting lead from ④.

N.G. → Replace A.S.C.D. actuator assembly.

O.K. (Wire does not return.)

D



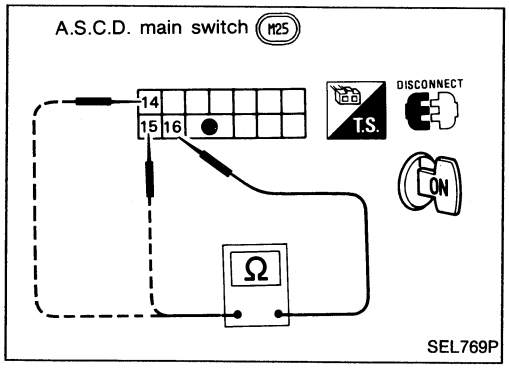
Disconnect lead from ① to see if A.S.C.D. wire returns immediately.

N.G. → Replace A.S.C.D. actuator assembly.

O.K. (Wire returns.)

A.S.C.D. actuator/A.S.C.D. pump are O.K.

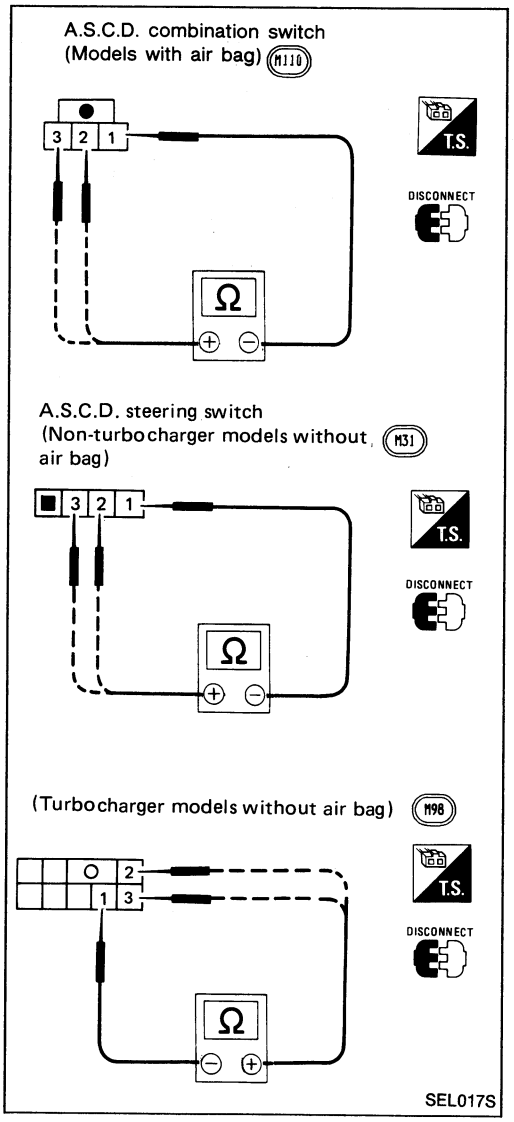
Trouble Diagnoses (Cont'd)



A.S.C.D. main switch

Check continuity between terminals by pushing switch to each position.

Switch position	Terminals		
	14	15	16
ON	○	○	○
N		○	○
OFF			



A.S.C.D. combination switch

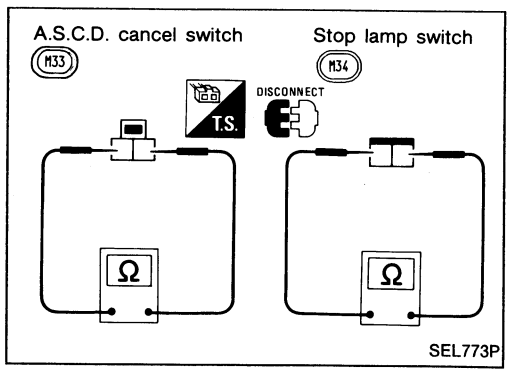
Check continuity between terminals by turning lever.

Lever	Terminals		
	1	2	3
SET/COAST	○	○	
RESUME/ACCEL	○		○
CANCEL	○	▶○	
	○	▶	○

A.S.C.D. steering switch

Check continuity between terminals by pushing each button.

Button	Terminals		
	1	2	3
SET/COAST	○	○	
RESUME/ACCEL	○		○
CANCEL	○	▶○	
	○	▶	○

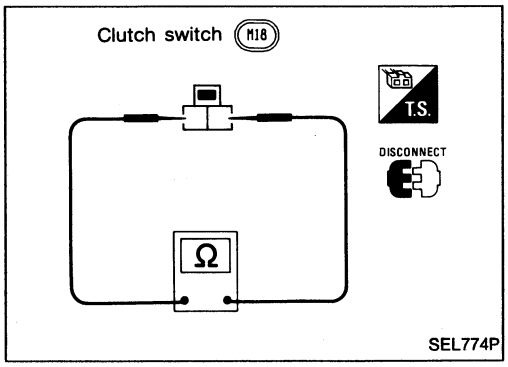


A.S.C.D. cancel switch and stop lamp switch

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.

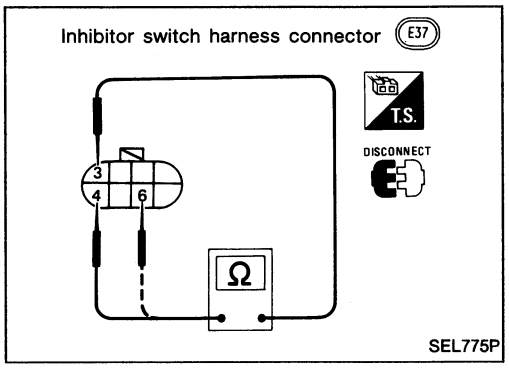
Trouble Diagnoses (Cont'd)



Clutch switch (For M/T models)

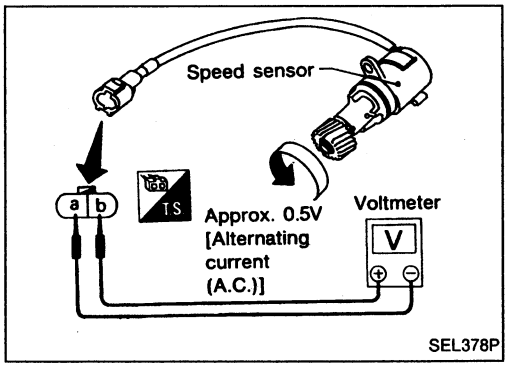
Condition	Continuity
When clutch pedal is depressed	No
When clutch pedal is released	Yes

Check switch after adjusting clutch pedal—refer to CL section.



Inhibitor switch (For A/T models)

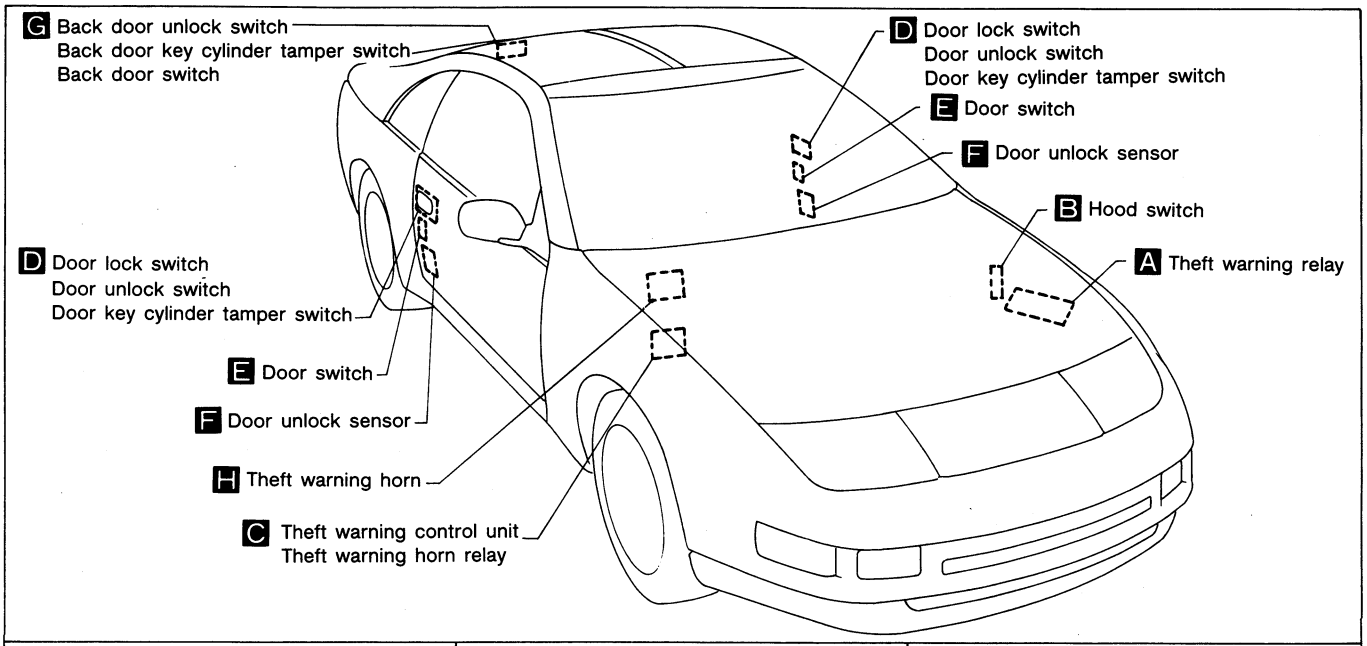
Shift lever position	Terminals		
	3	4	6
"P"	○	○	
"N"	○		○
Except "N" or "P"			

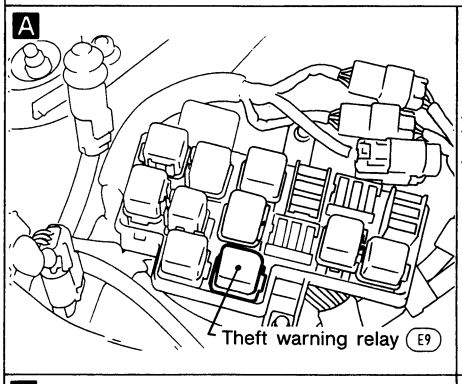


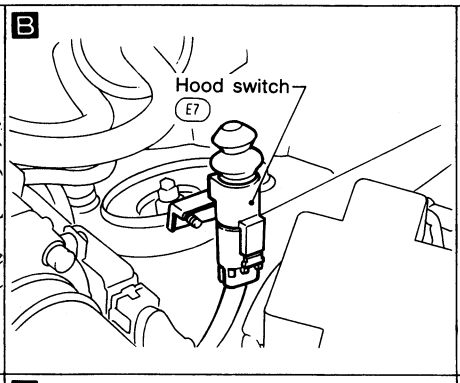
Speed sensor

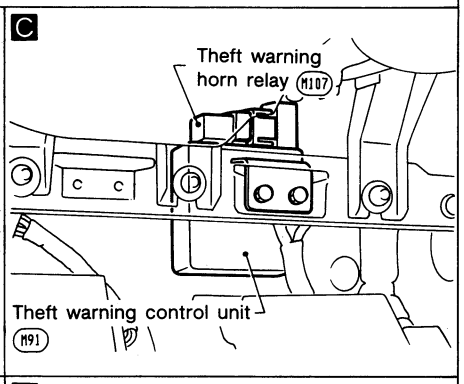
1. Remove speed sensor from transaxle.
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

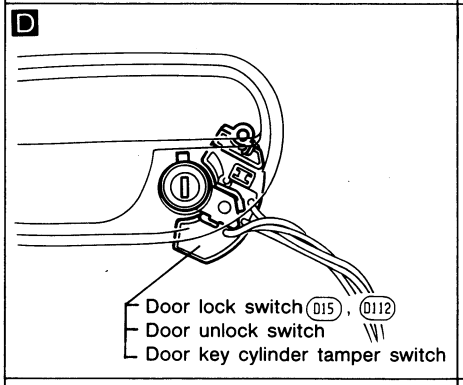
Component Parts and Harness Connector Location

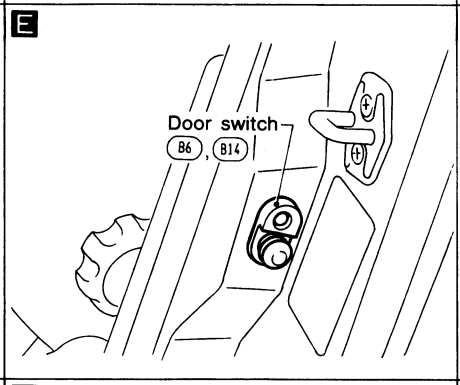


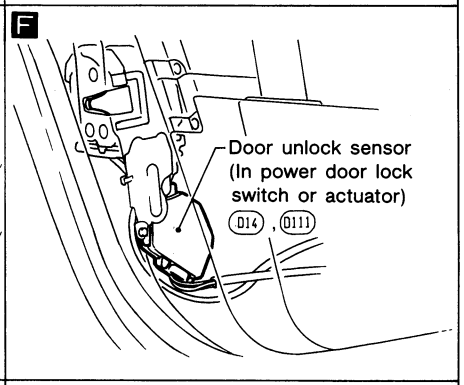


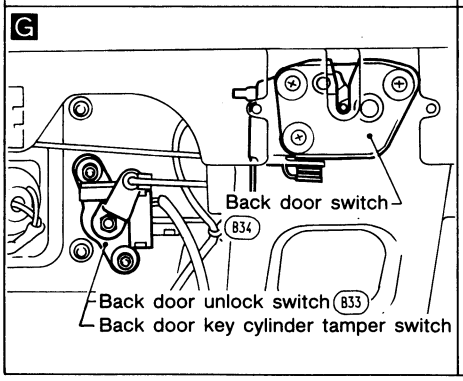


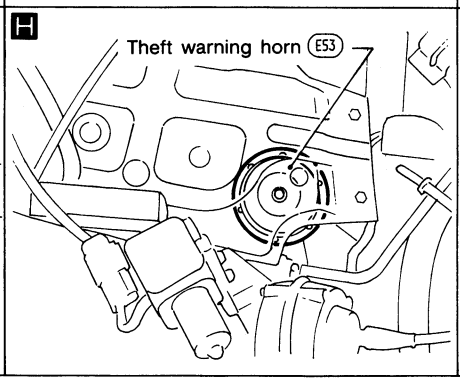












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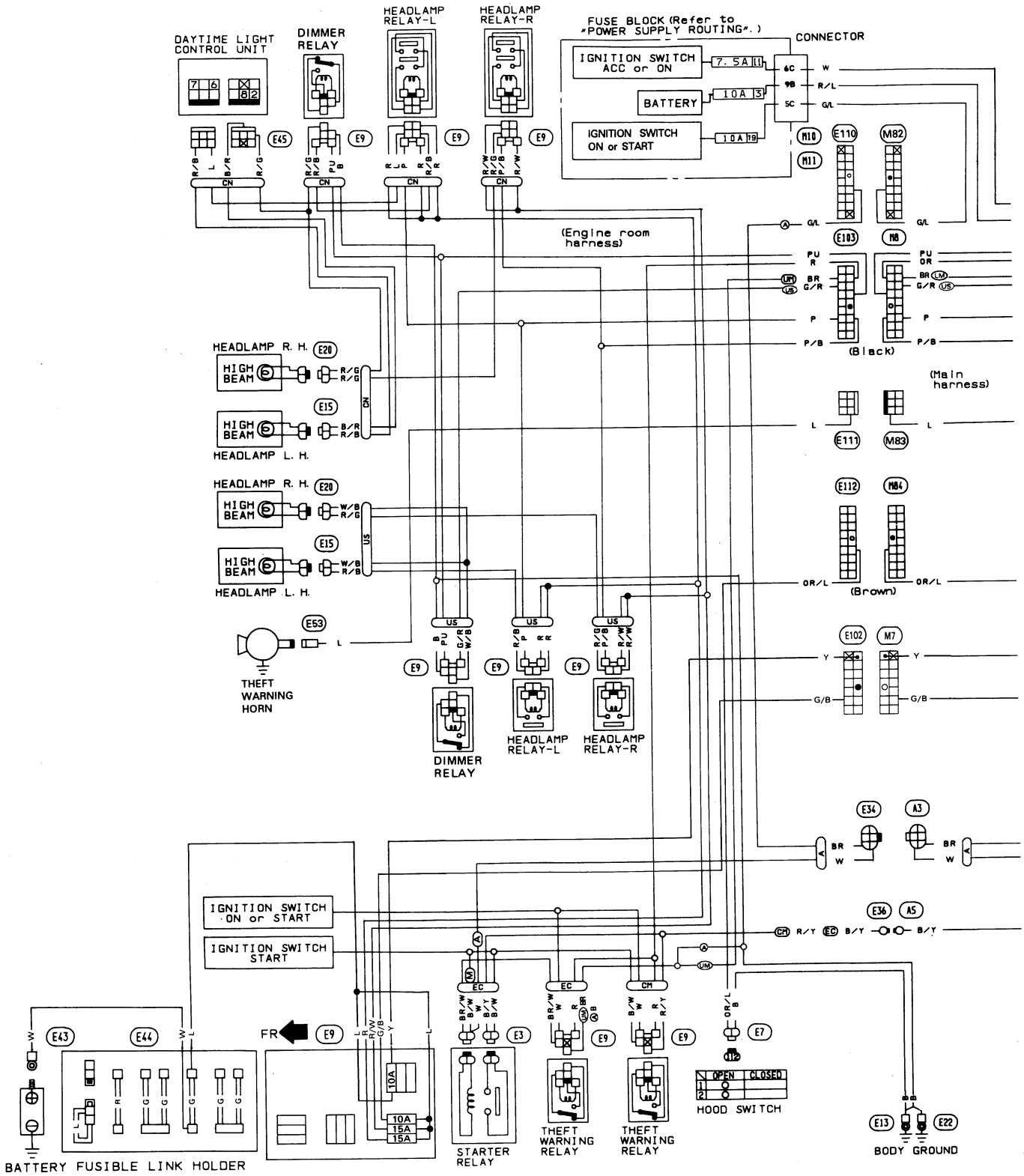
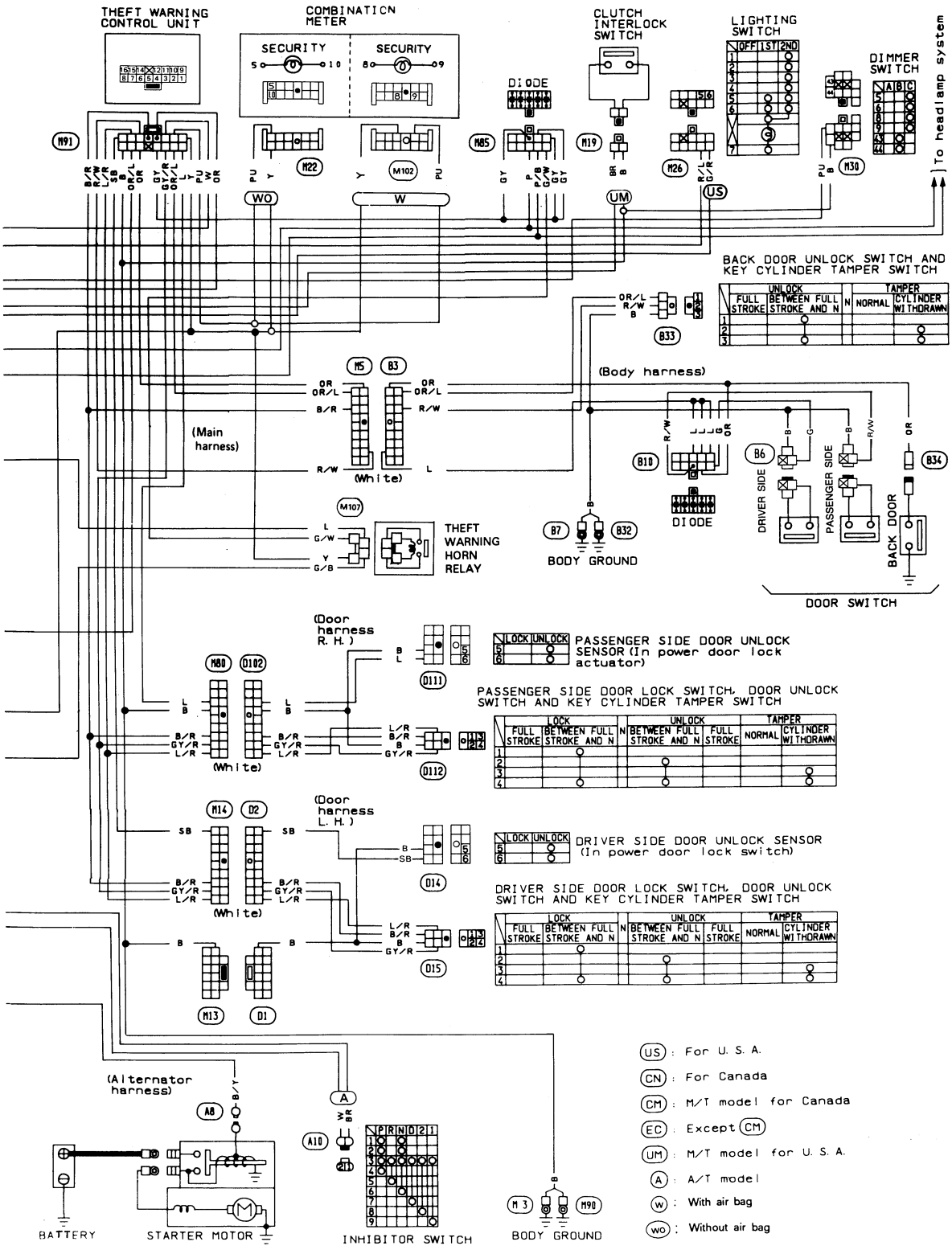
Wiring Diagram



Wiring Diagram (Cont'd)

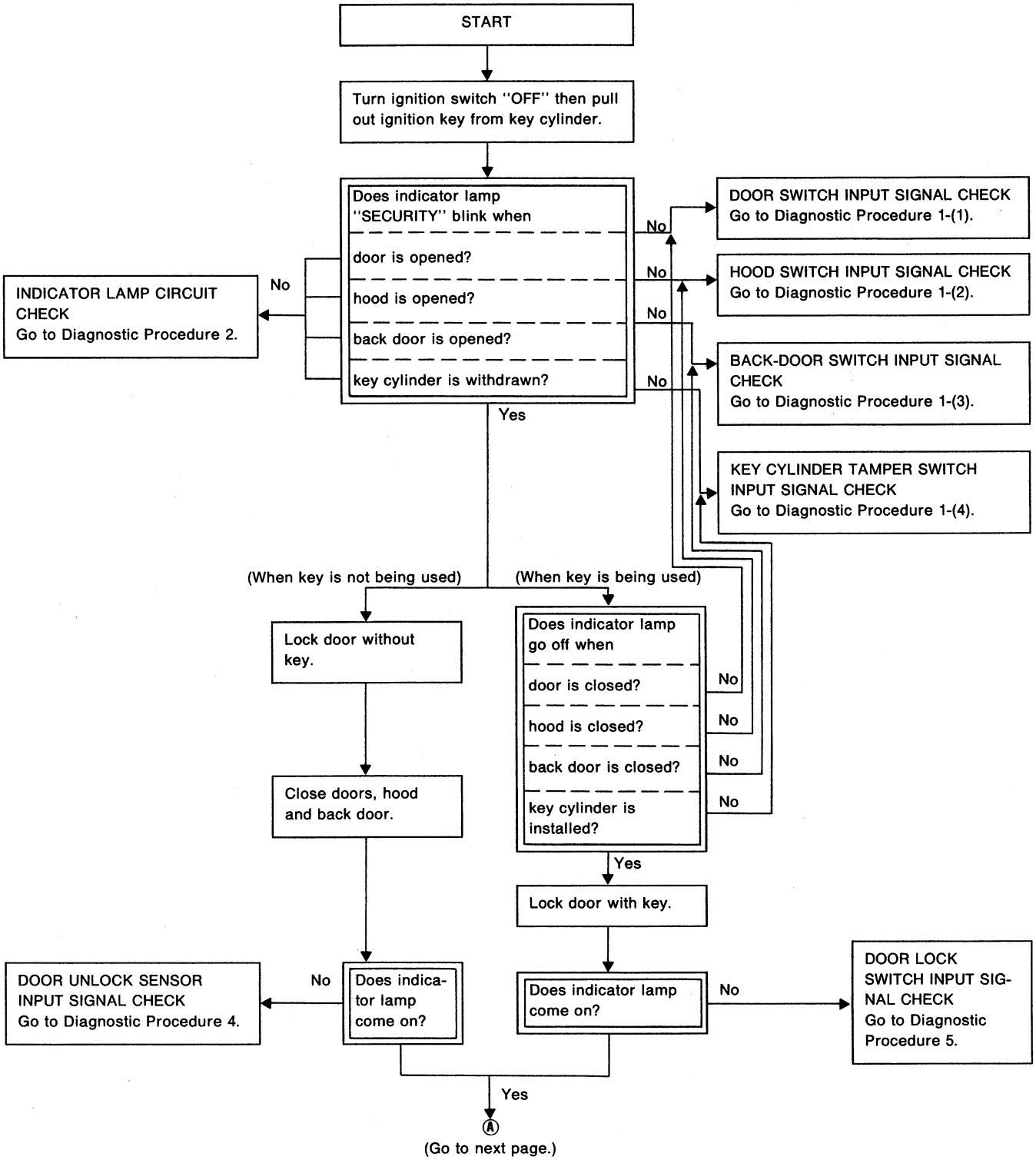


SEL709R

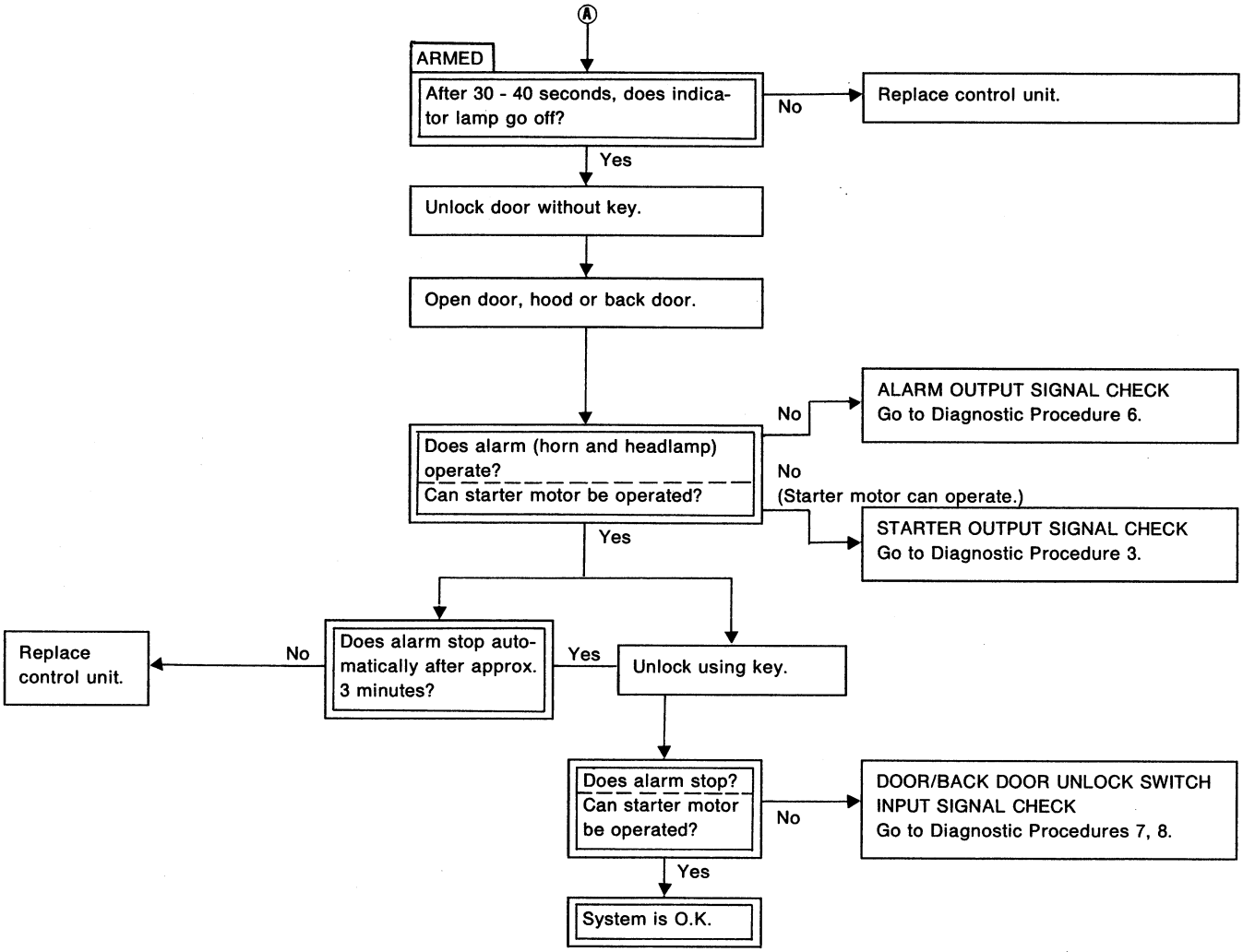
Trouble Diagnoses

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.

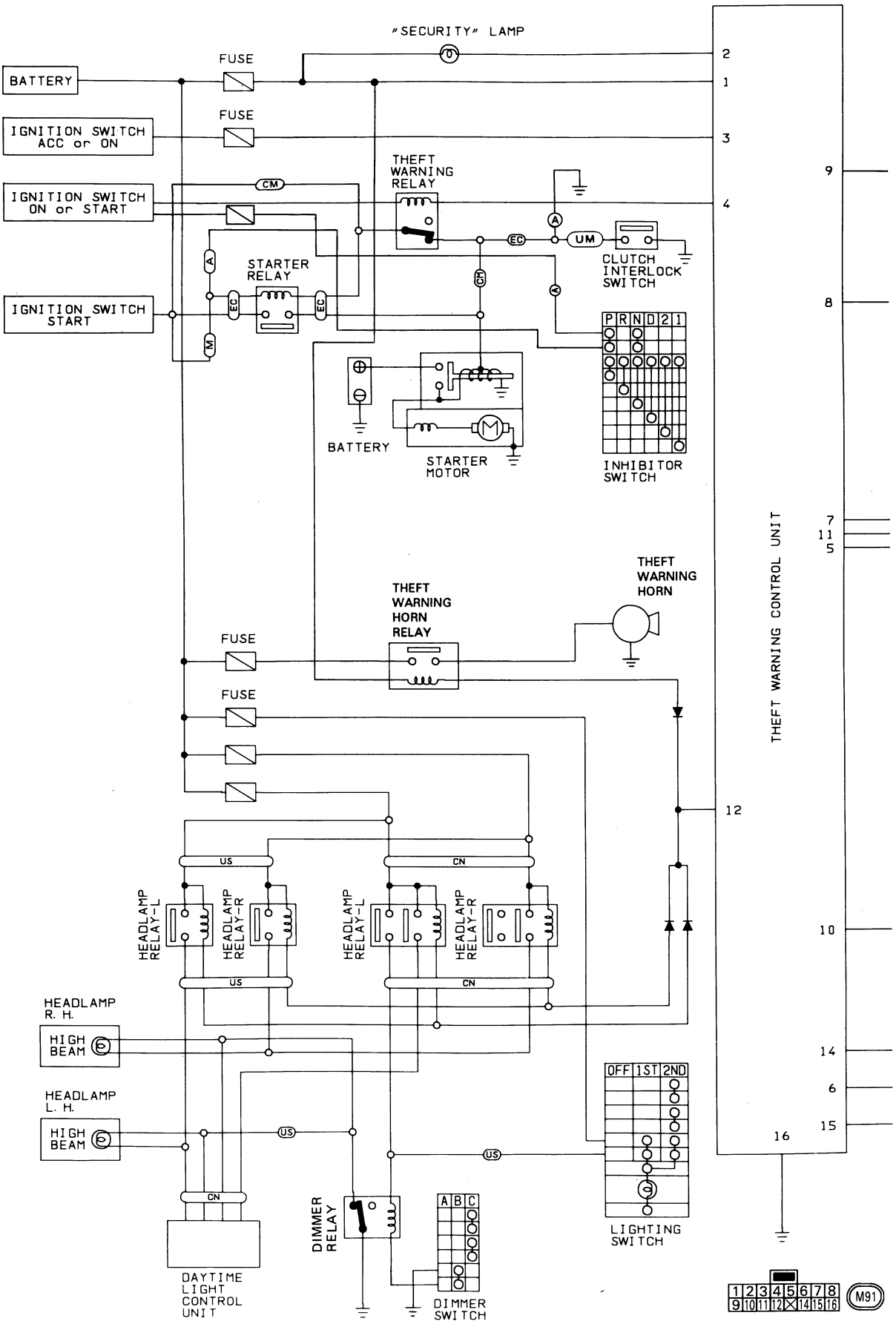


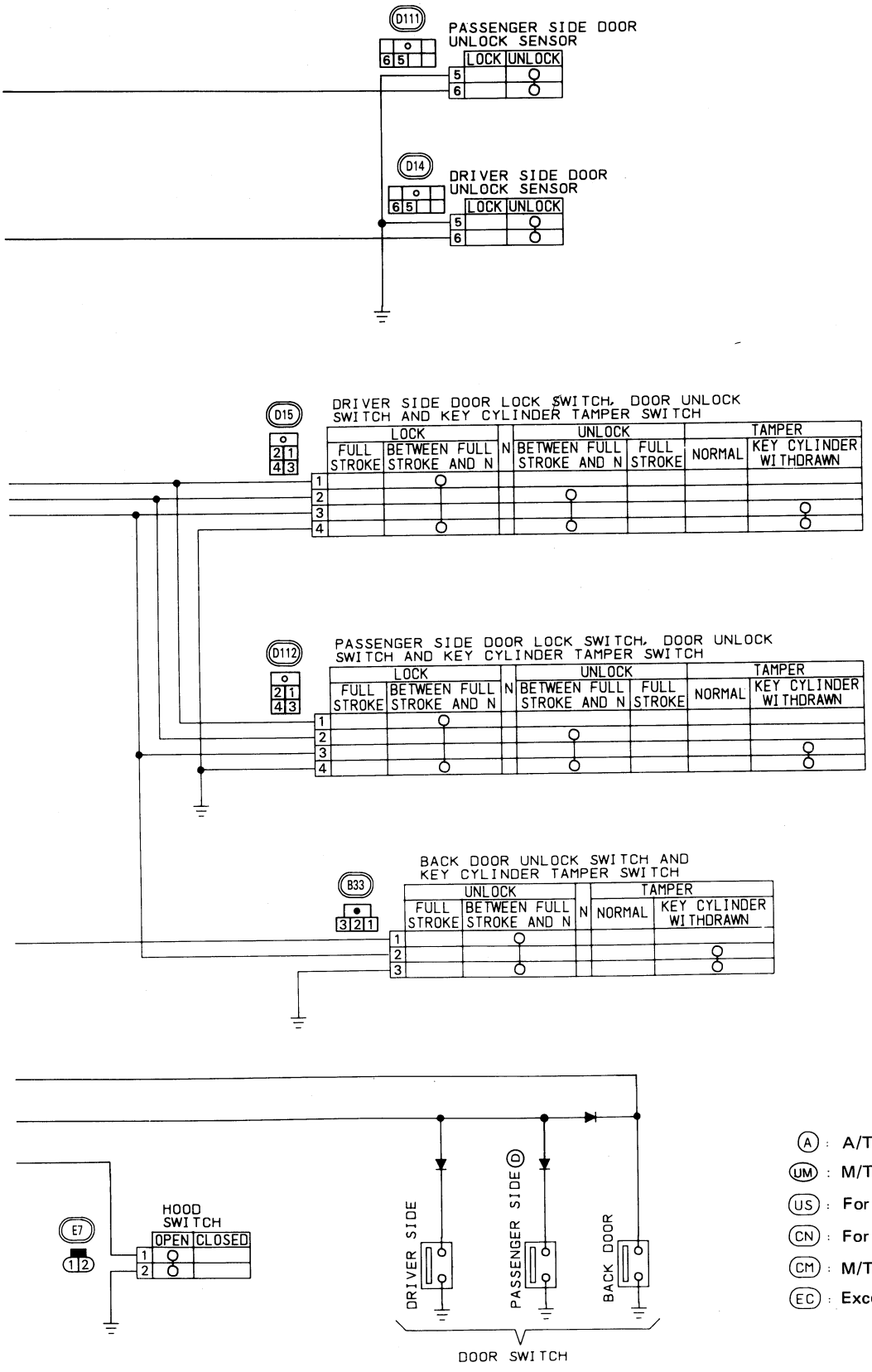
Trouble Diagnoses (Cont'd)



Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK

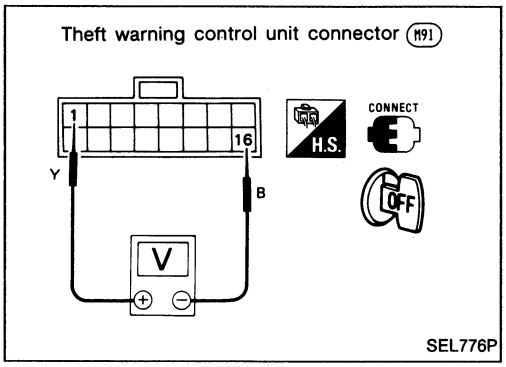



D111
PASSENGER SIDE DOOR UNLOCK SENSOR
LOCK UNLOCK
D14
DRIVER SIDE DOOR UNLOCK SENSOR
LOCK UNLOCK
D15
DRIVER SIDE DOOR LOCK SWITCH, DOOR UNLOCK SWITCH AND KEY CYLINDER TAMPER SWITCH
LOCK
UNLOCK
TAMPER
FULL STROKE
BETWEEN FULL STROKE AND N
N
BETWEEN FULL STROKE AND N
FULL STROKE
NORMAL
KEY CYLINDER WITHDRAWN
D112
PASSENGER SIDE DOOR LOCK SWITCH, DOOR UNLOCK SWITCH AND KEY CYLINDER TAMPER SWITCH
B33
BACK DOOR UNLOCK SWITCH AND KEY CYLINDER TAMPER SWITCH
E7
HOOD SWITCH
OPEN CLOSED
DRIVER SIDE
PASSENGER SIDE Ⓓ
BACK DOOR
DOOR SWITCH
Ⓐ : A/T model
Ⓤⓜ : M/T model for U.S.A.
Ⓤⓢ : For U.S.A.
Ⓒⓝ : For Canada
Ⓒⓜ : M/T model for Canada
Ⓔⓒ : Except Ⓒⓜ

SEL710R

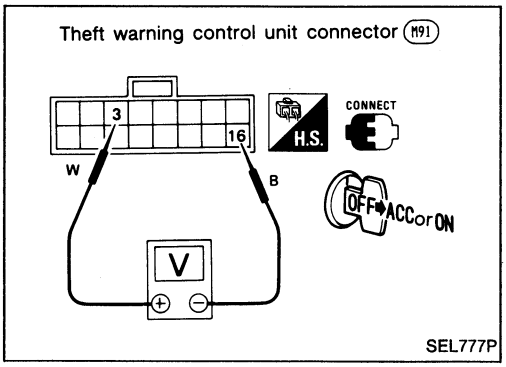
Trouble Diagnoses (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT CHECK



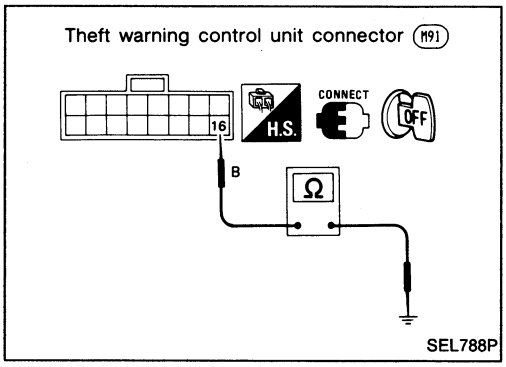
Main power supply circuit check

Terminals	Ignition switch position		
	OFF	ACC	ON
① - ⑯	Battery voltage	Battery voltage	Battery voltage



Power supply circuit check for system cancel

Terminals	Ignition switch position		
	OFF	ACC	ON
③ - ⑯	0V	Battery voltage	Battery voltage



Ground circuit check

Terminals	Continuity
⑯ - Ground	Yes

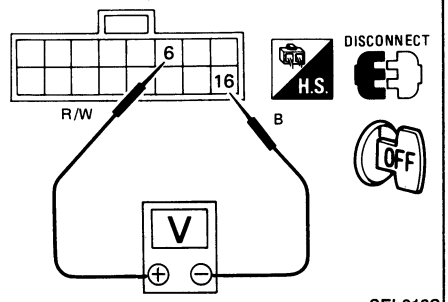
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

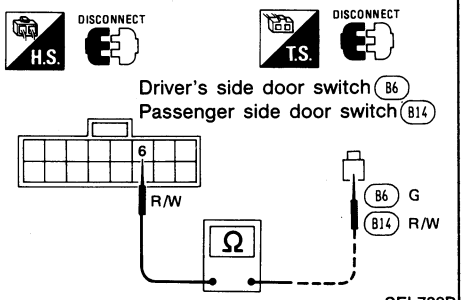
SYMPTOM:
- **Indicator lamp does not blink.**
- **Indicator lamp remains blinking.**

Diagnostic procedure 1-(1)

A Theft warning control unit connector (M91)



B Theft warning control unit connector (M91)



A

DOOR SWITCH INPUT SIGNAL CHECK
Check voltage between control unit harness terminals ⑥ and ⑯.

Condition	Voltage
All doors are closed	Battery voltage
At least one door is open	0V

O.K. → Go to Diagnostic Procedure 2.

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 ⑥ and door switch harness terminal.
Continuity should exist.

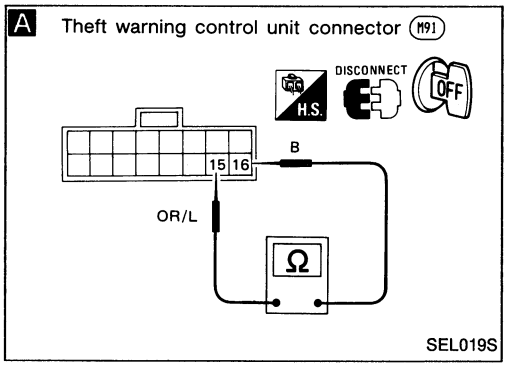
N.G. → Repair harness or connectors.

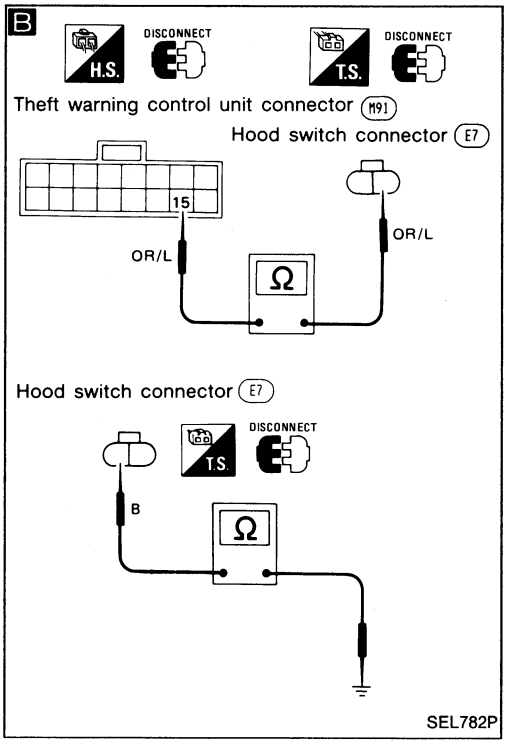
O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

Diagnostic procedure 1-(2)





A

HOOD SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑮ and ⑯.

Condition	Continuity
Hood is open	Yes
Hood is closed	No

O.K. → Go to Diagnostic Procedure 2.

N.G.

Check hood switch and hood fitting condition.

N.G. → Adjust installation of hood switch or hood.

O.K.

HOOD SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace hood switch.

O.K.

B

HOOD SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑮ and hood switch harness terminal.
- Check harness continuity between hood switch terminal and body ground.

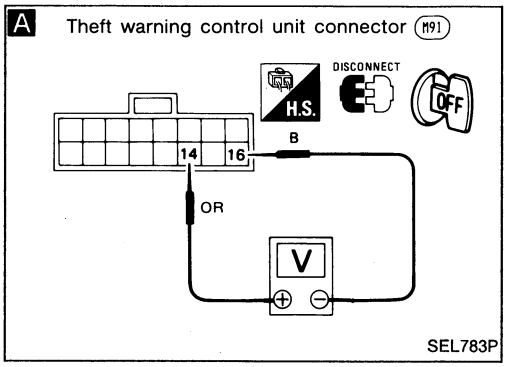
Continuity should exist.

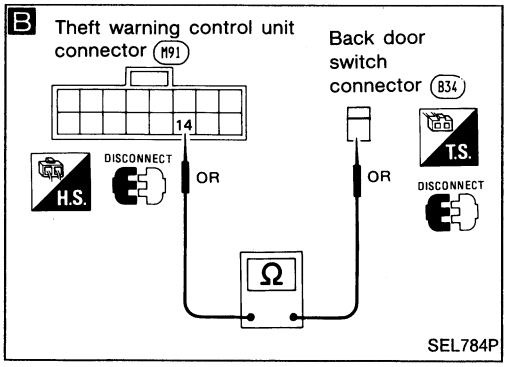
N.G. → Repair harness or connectors.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

Diagnostic procedure 1-(3)





A

BACK DOOR SWITCH INPUT SIGNAL CHECK
Check voltage between control unit harness terminals ⑭ and ⑯.

Condition	Voltage
Back door is open	Approx. 0V
Back door is closed	Approx. 12V

O.K. → Go to Diagnostic Procedure 2.

N.G.

Does room lamp come on?

Yes → B

No

BACK DOOR SWITCH CIRCUIT CHECK
Refer to "Electrical Components Inspection".

O.K. → B

N.G.

Replace back door switch.

B

BACK DOOR SWITCH CIRCUIT CHECK
Check harness continuity between control unit harness terminal ⑭ and back door switch harness terminal.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

Diagnostic procedure 1-(4)

A

KEY CYLINDER TAMPER SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑤ and ⑯.

Condition	Continuity
Tamper switch is	
Normal	No
Removed	Yes

O.K. → Go to Diagnostic Procedure 2.

N.G. ↓

KEY CYLINDER TAMPER SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder tamper switch.

O.K. ↓

B

KEY CYLINDER TAMPER SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑥ and tamper switch harness terminal.
- Check harness continuity between tamper switch terminal and body ground.

Continuity should exist.

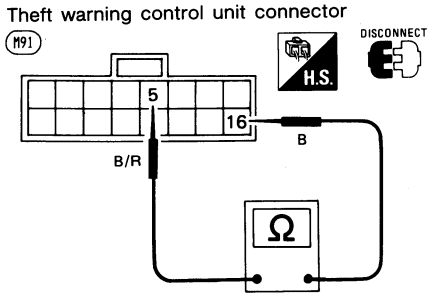
N.G. → Repair harness and connectors.

O.K. ↓

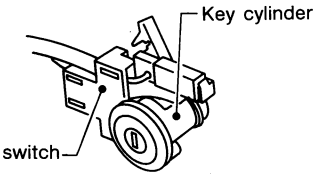
CHECK THE CONNECTIONS AT EACH CONNECTOR.

A

Theft warning control unit connector (M91)

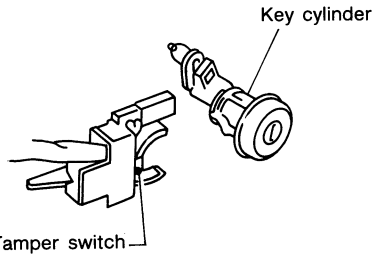


[Example]



No continuity ... O.K.

[Example]

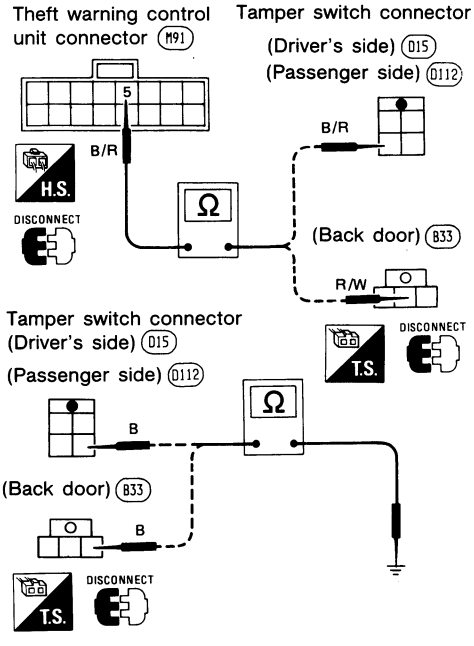


Reed switch turns on when key cylinder is removed.

Continuity exists ... O.K.

SEL785P

B

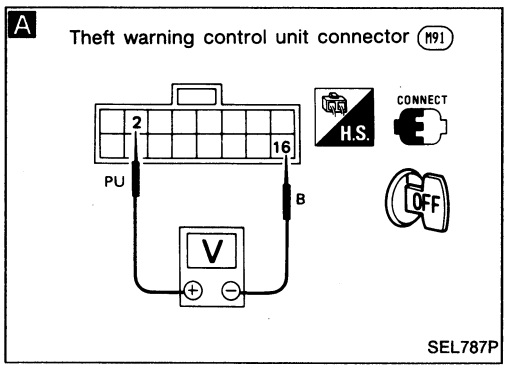


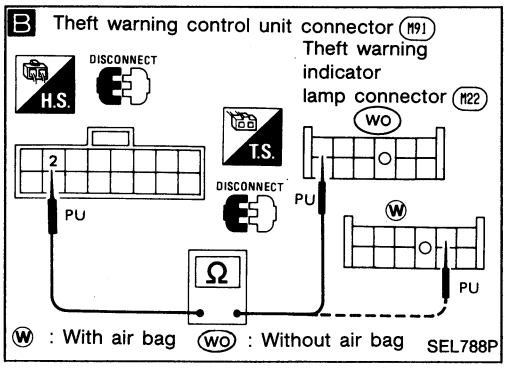
SEL786P

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

SYMPTOM: Indicator lamp does not blink.





A

INDICATOR LAMP OUTPUT SIGNAL CHECK
Check voltage between control unit harness terminals ② and ⑯.
Pointer of voltmeter should deflect intermittently.

N.G. → Replace control unit.

O.K. ↓

INDICATOR LAMP CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace indicator lamp.

O.K. ↓

B

INDICATOR LAMP CIRCUIT CHECK
Check harness continuity between control unit harness terminal ② and indicator lamp harness terminal.
Continuity should exist.

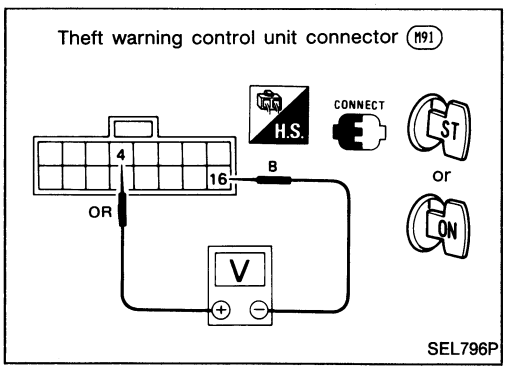
N.G. → Repair harness or connectors.

O.K. ↓

CHECK THE CONNECTIONS AT EACH CONNECTOR.

DIAGNOSTIC PROCEDURE 3

SYMPTOM: STARTER MOTOR can be operated. (Starter killed phase)



Approx. 12V

STARTER MOTOR KILL OUTPUT SIGNAL CHECK
Check voltage between control unit harness terminals ④ and ⑯ when ignition switch is turned to ON or "START".

→ Replace control unit.

Approx. 0 volt ↓

Check theft warning relay.

N.G. → Replace theft warning relay.

O.K. ↓

Repair harness between control unit and theft warning relay.

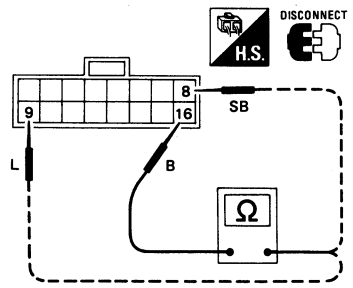
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Indicator lamp does not come on.

A

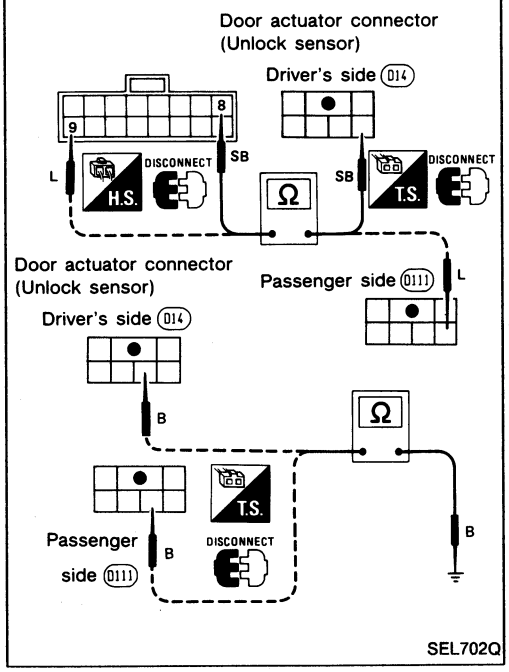
Theft warning control unit connector (M91)



SEL789P

B

Theft warning control unit connector (M19)



SEL702Q

A

DOOR UNLOCK SENSOR INPUT SIGNAL CHECK

Check continuity between control unit harness terminals ⑧ (Driver's side) or ⑨ (Passenger side) and ⑯.

Condition	Continuity
Locked	No
Unlocked	Yes

O.K. → Go to Diagnostic Procedure 5.

O.K. → Replace control unit.

N.G. ↓

DOOR UNLOCK SENSOR CHECK

Refer to "Electrical Components Inspection".

N.G. → Replace door lock actuator.

O.K. ↓

B

DOOR UNLOCK SENSOR CIRCUIT CHECK

- Check harness continuity between control unit harness terminal ⑧ (Driver's side) or ⑨ (Passenger side) and door actuator terminal.
- Check harness continuity between door actuator terminal and body ground.

Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

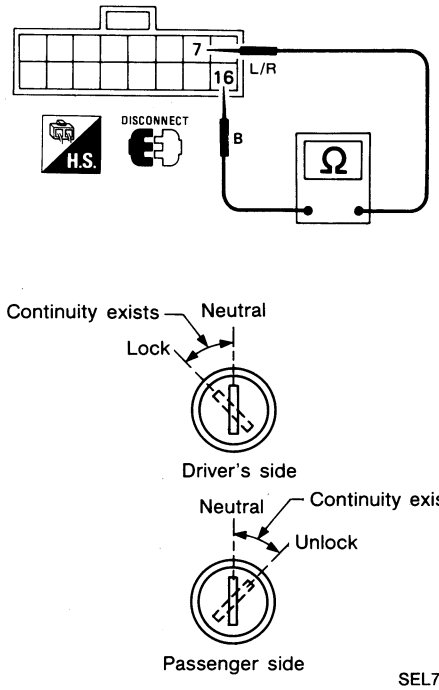
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

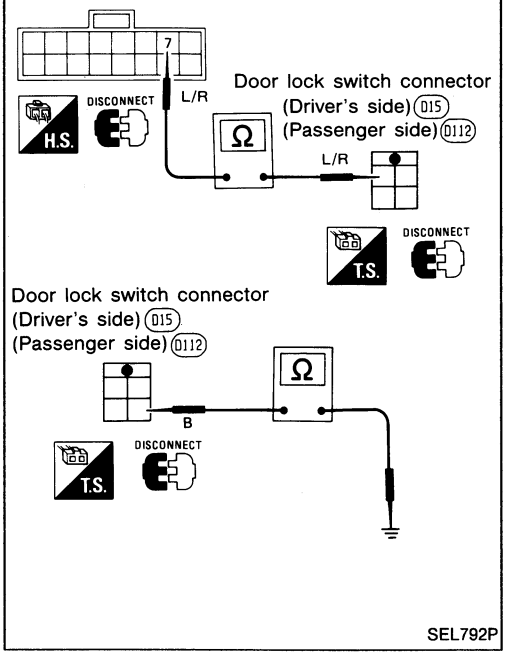
SYMPTOM: Indicator lamp does not come on.

A Theft warning control unit connector (M91)



SEL791P

B Theft warning control unit connector (M91)



SEL792P

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

O.K. → Go to Diagnostic Procedure 4.

O.K. → Replace control unit.

N.G.

DOOR LOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder switch.

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.

N.G. → Repair harness or connectors.

O.K.

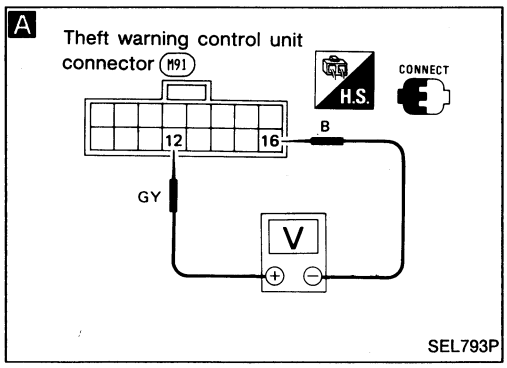
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

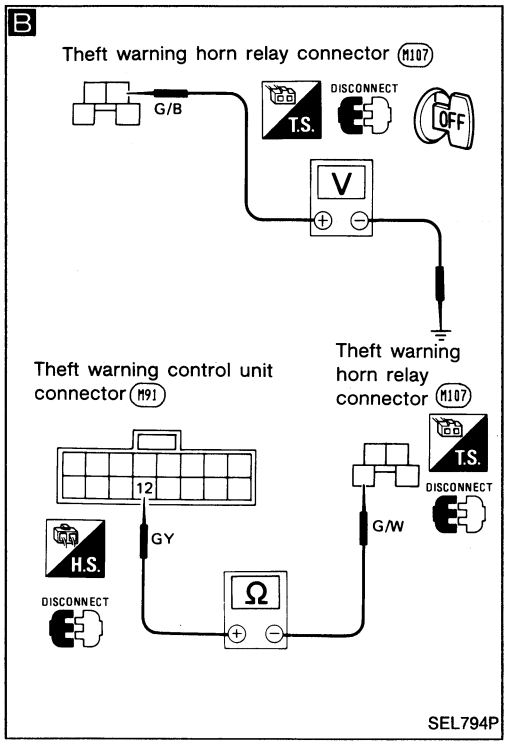
DIAGNOSTIC PROCEDURE 6

SYMPTOM: Alarm does not operate.

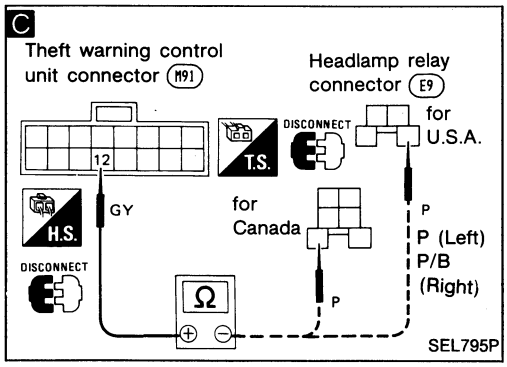
A



B



C



A

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. ↓

B

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. ↓

C

THEFT WARNING HEADLAMP CIRCUIT CHECK
Check continuity between headlamp relay terminal and control unit harness terminal ⑫.

N.G. → Repair harness and connectors.

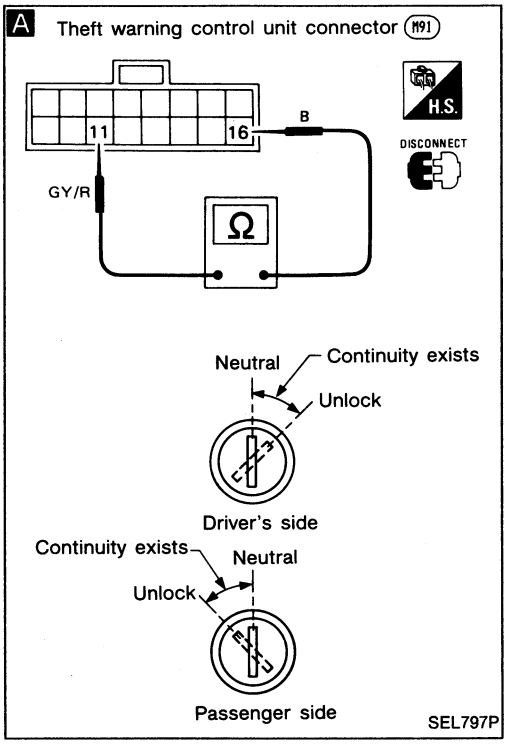
O.K. ↓

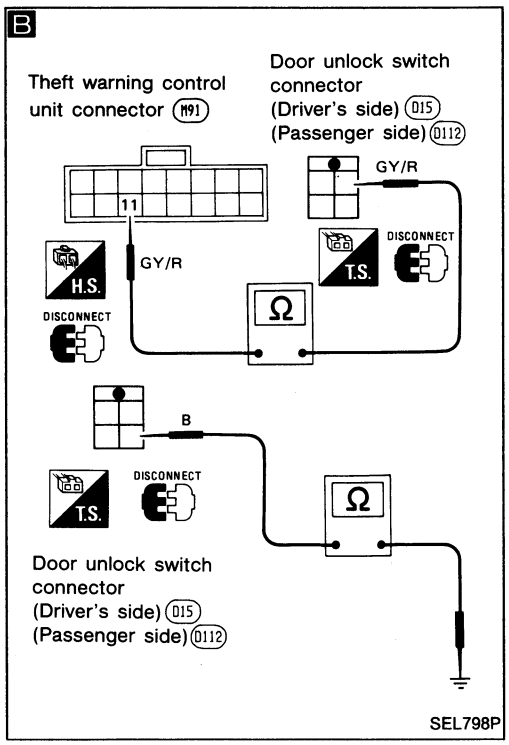
Check headlamp system. Refer to "HEADLAMP".

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7

SYMPTOM: Alarm does not stop even if stop signal is given.





A

DOOR UNLOCK SWITCH INPUT SIGNAL CHECK (UNLOCK SIGNAL)
Check continuity between control unit harness terminals ⑪ and ⑯.

Key position	Continuity
Neutral/Unlock	No
Between neutral and unlock	Yes

O.K. → Replace control unit.

N.G.

DOOR UNLOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder switch.

O.K.

B

DOOR UNLOCK SWITCH CIRCUIT CHECK

- Check harness continuity between control unit harness terminal ⑪ and door unlock switch terminal.
- Check harness continuity between door unlock switch terminal and body ground.

Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

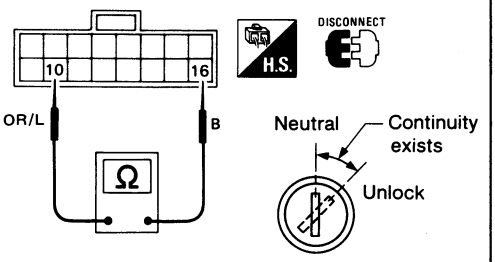
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 8

SYMPTOM: Alarm does not stop even if stop signal is given.

A

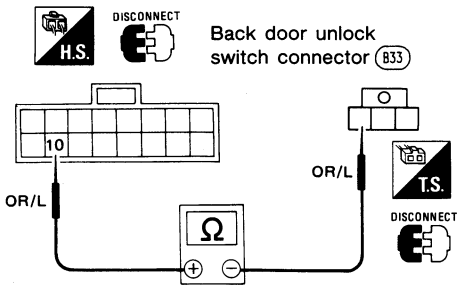
Theft warning control unit connector (M91)



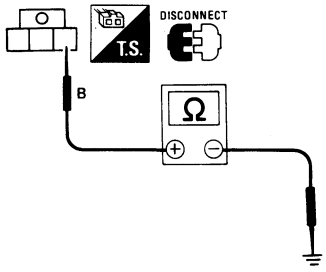
SEL799P

B

Theft warning control unit connector (M91)



Back door unlock switch connector (B33)



SEL800P

A

BACK DOOR 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.

BACK DOOR UNLOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder switch.

O.K.

B

BACK DOOR UNLOCK SWITCH CIRCUIT CHECK

- Check harness continuity between control unit harness terminal ⑩ and back door unlock switch terminal.
- Check harness continuity between back door unlock switch terminal and body ground.

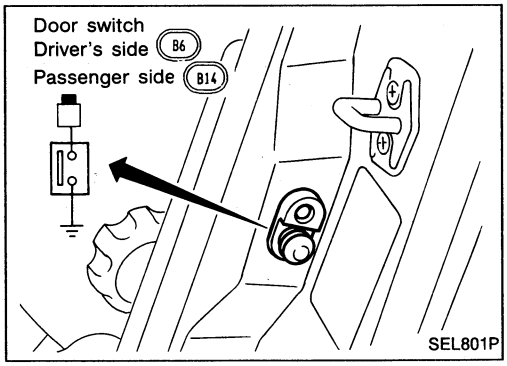
N.G. → Repair harness or connectors.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

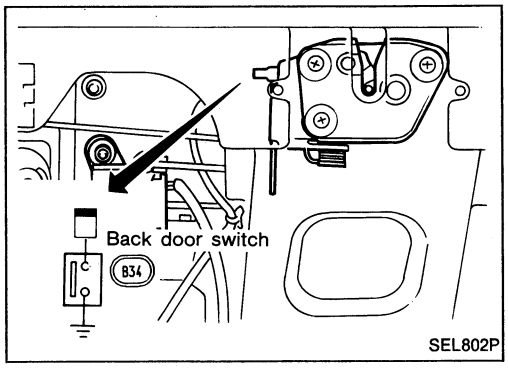
Trouble Diagnoses (Cont'd)

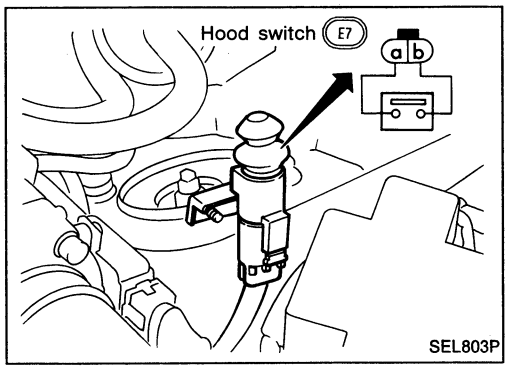
ELECTRICAL COMPONENTS INSPECTION



Door switches

Check continuity between terminal and switch body.

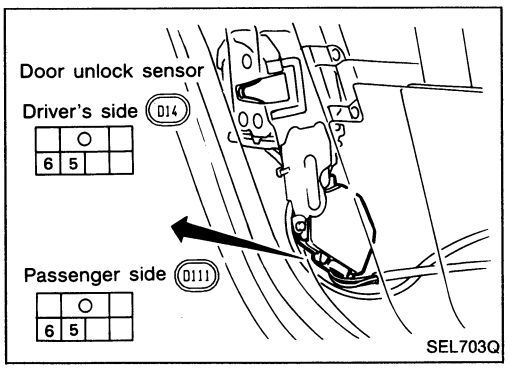




Hood switch

Check continuity between terminals when hood switch is pushed and released.

Terminal	Pushed	Released
a		○
b		○

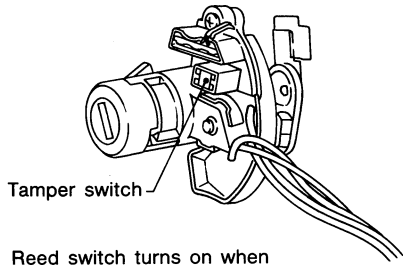


Door unlock sensor

	LOCK	UNLOCK
5		○
6		○

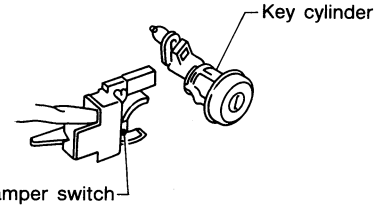
Trouble Diagnoses (Cont'd)

Tamper switch for door

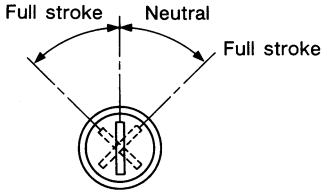


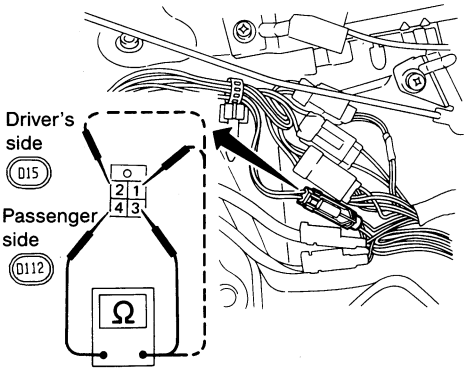
Reed switch turns on when tamper switch is removed from door.

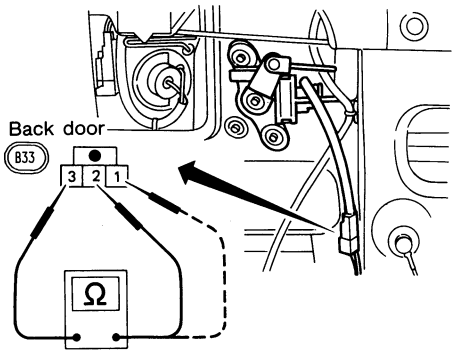
Tamper switch for back door



Reed switch turns on when key cylinder is removed.







SEL805P

Key cylinder tamper switch, door lock switch and door unlock switch

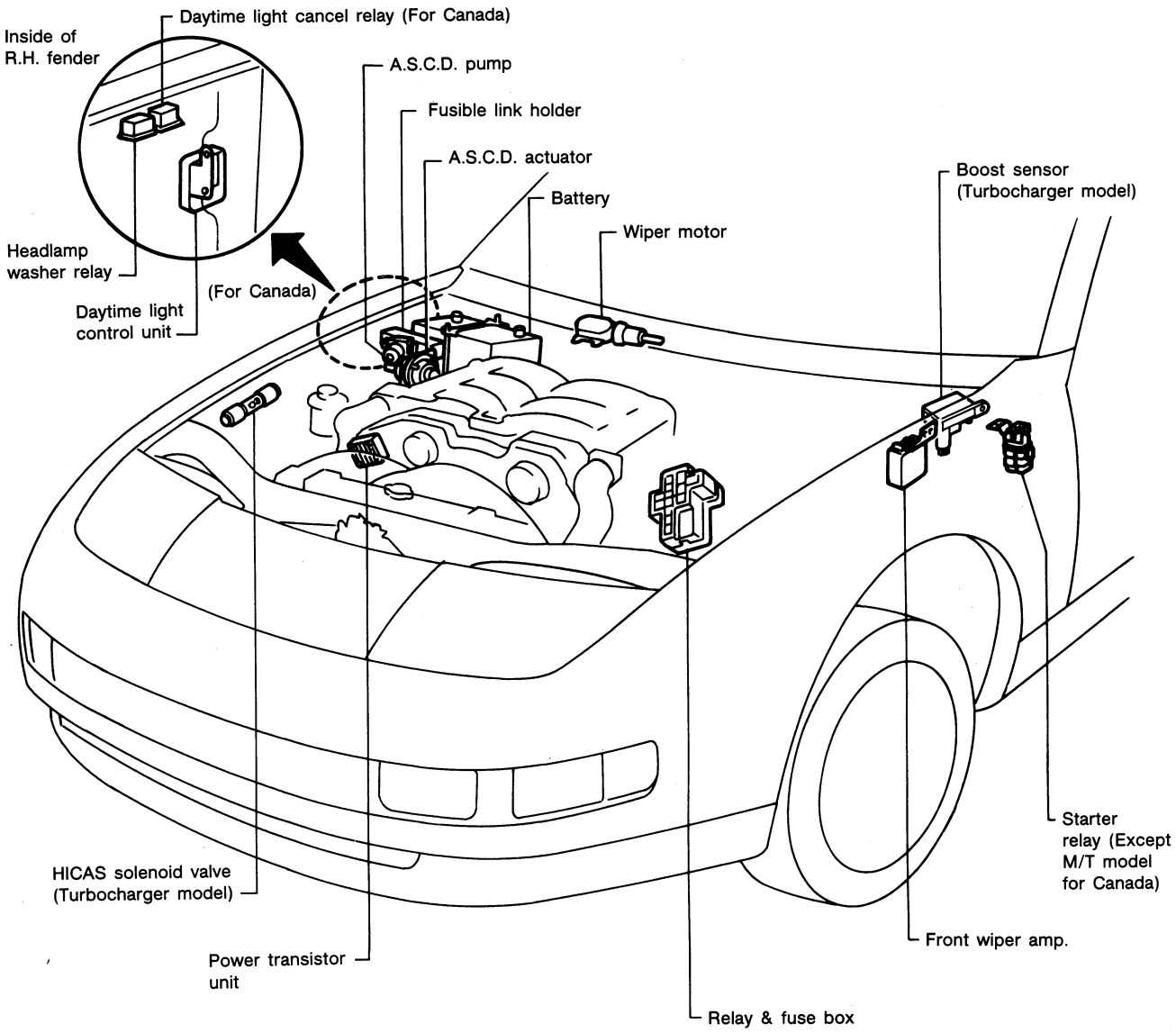
- **Door**

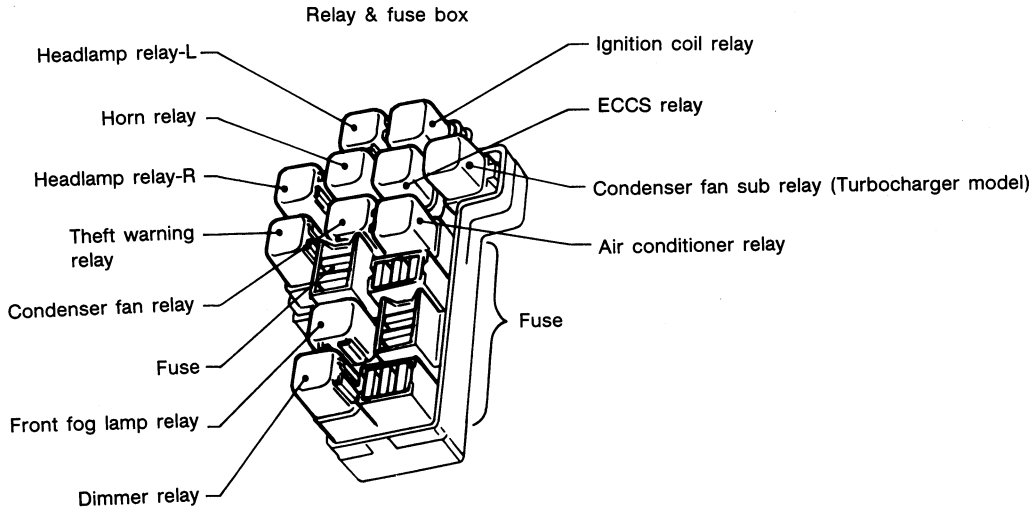
	TAMPER SWITCH		DOOR LOCK SWITCH			DOOR UNLOCK SWITCH	
	Key cylinder is installed	Key cylinder is removed	Full stroke	Between full stroke and neutral	Neutral	Between full stroke and neutral	Full stroke
1				○			
2				|		○	
3		○		|		|	
4		|		○		○	

- **Back door**

	TAMPER SWITCH		Back door unlock switch		
	Key cylinder is installed	Key cylinder is removed	Full stroke	Between full stroke and neutral	Neutral
1				○	
2		○		|	
3		|		○	

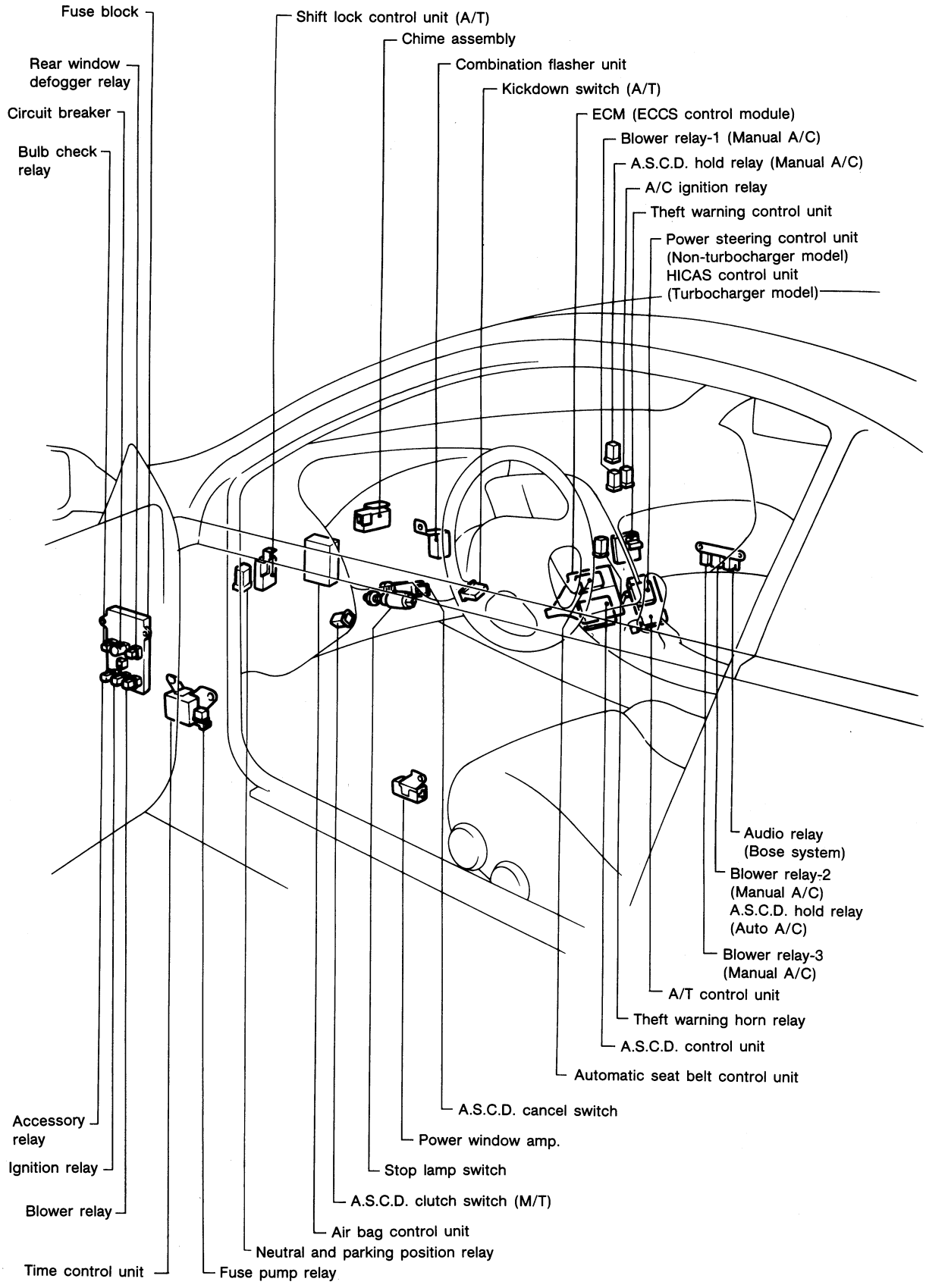
Engine Compartment





SEL722R

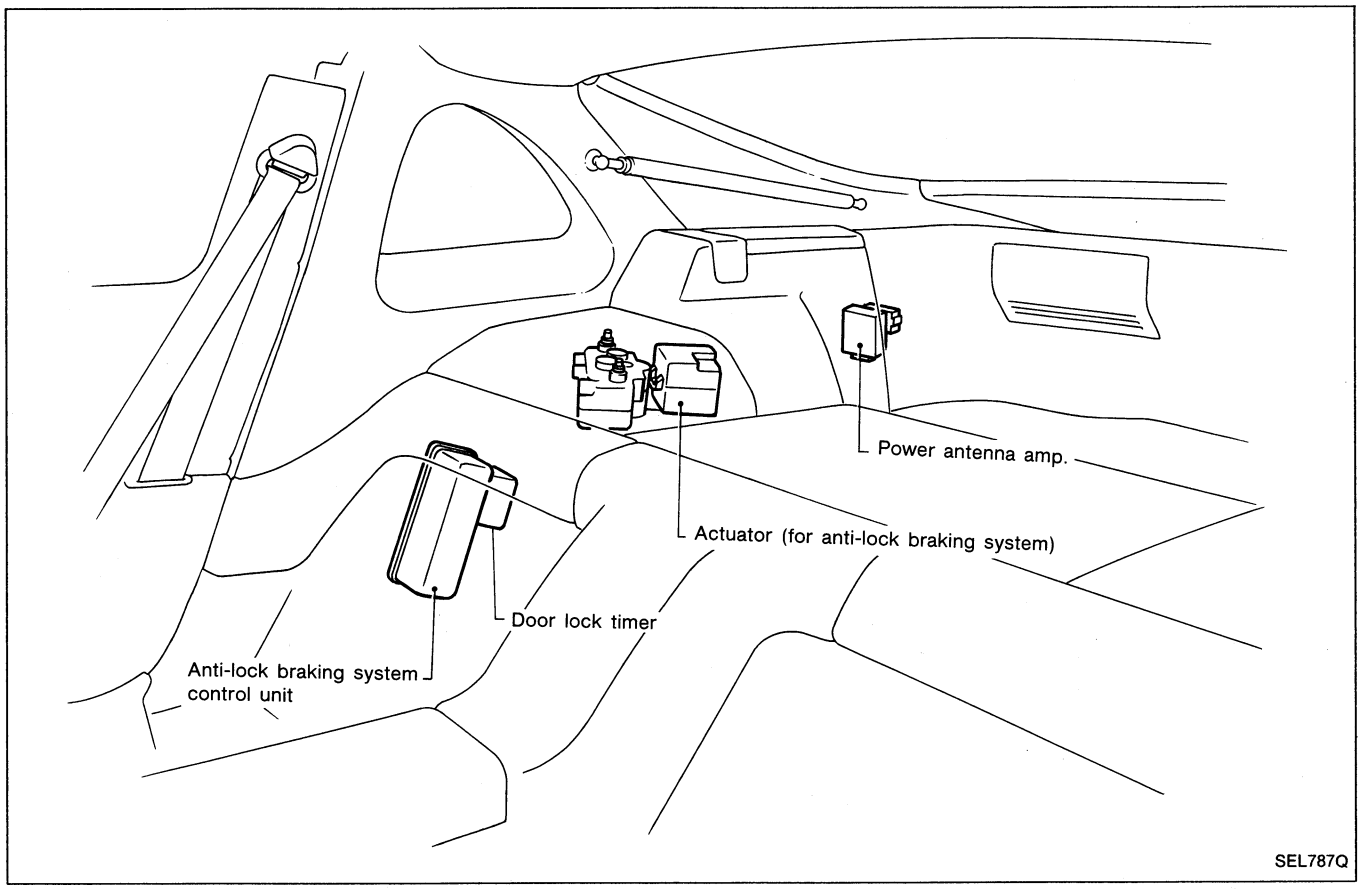
Passenger Compartment

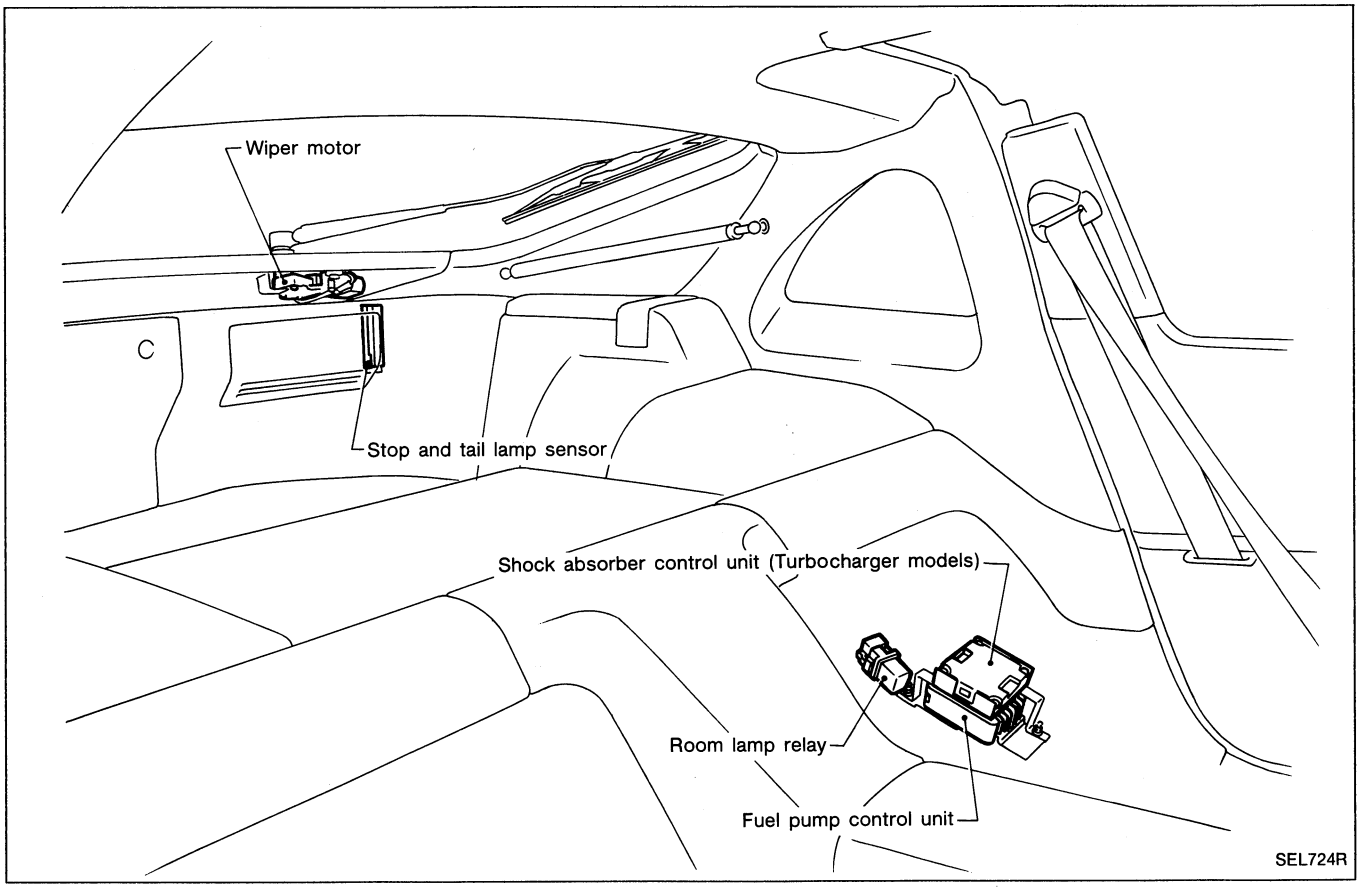


SEL723R

Luggage Compartment

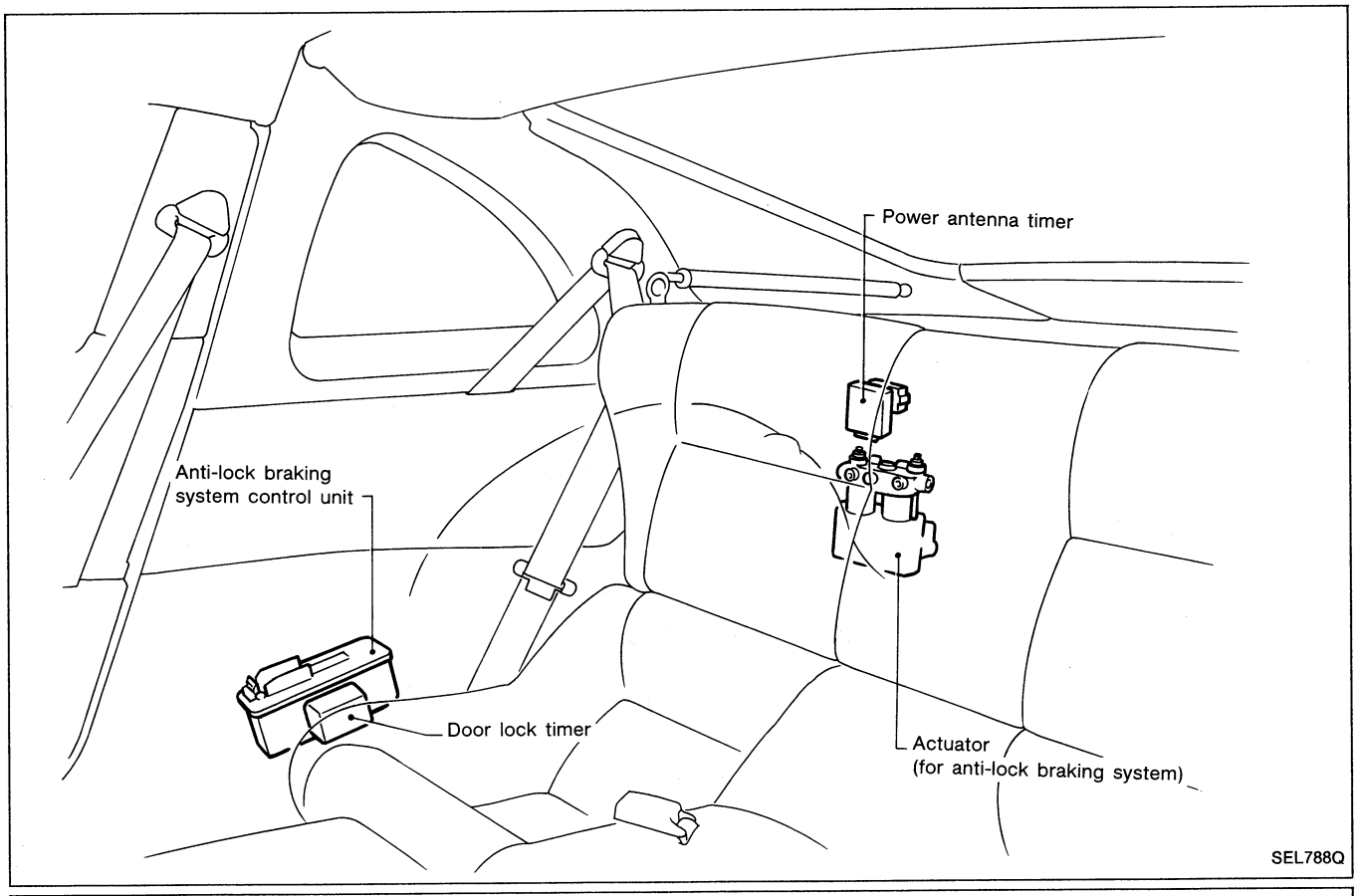
2 SEATER

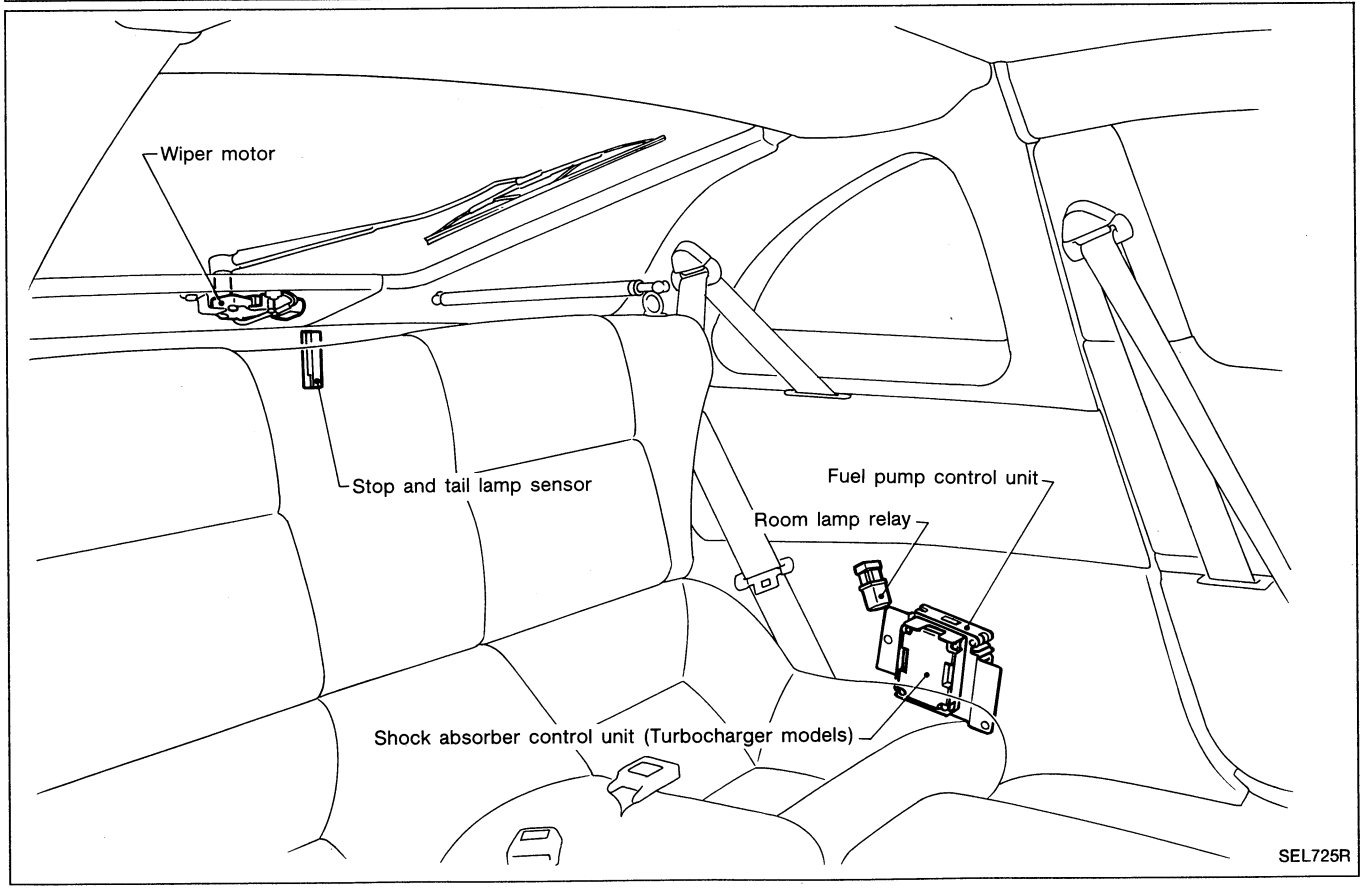




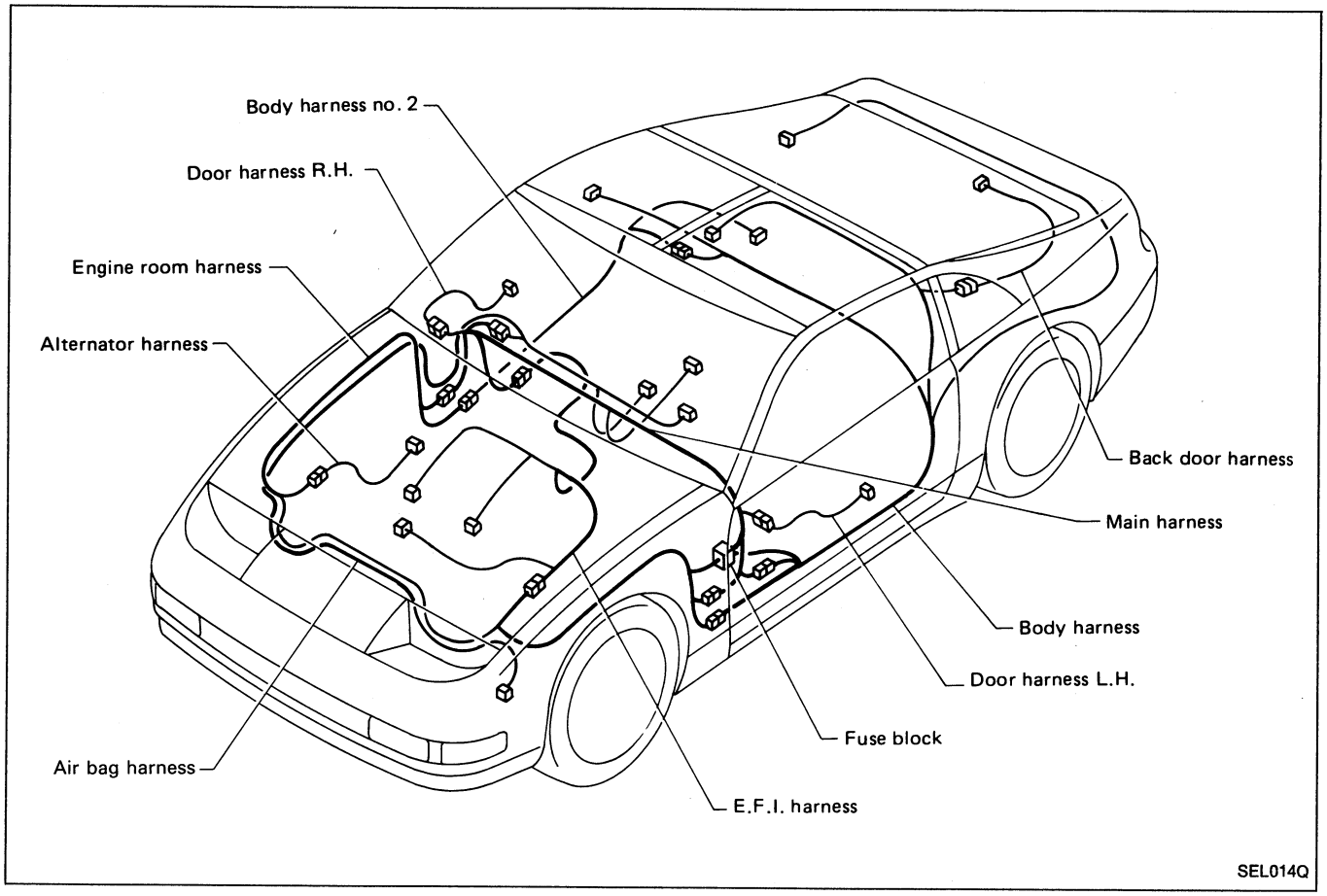
Luggage Compartment (Cont'd)

2+2 SEATER

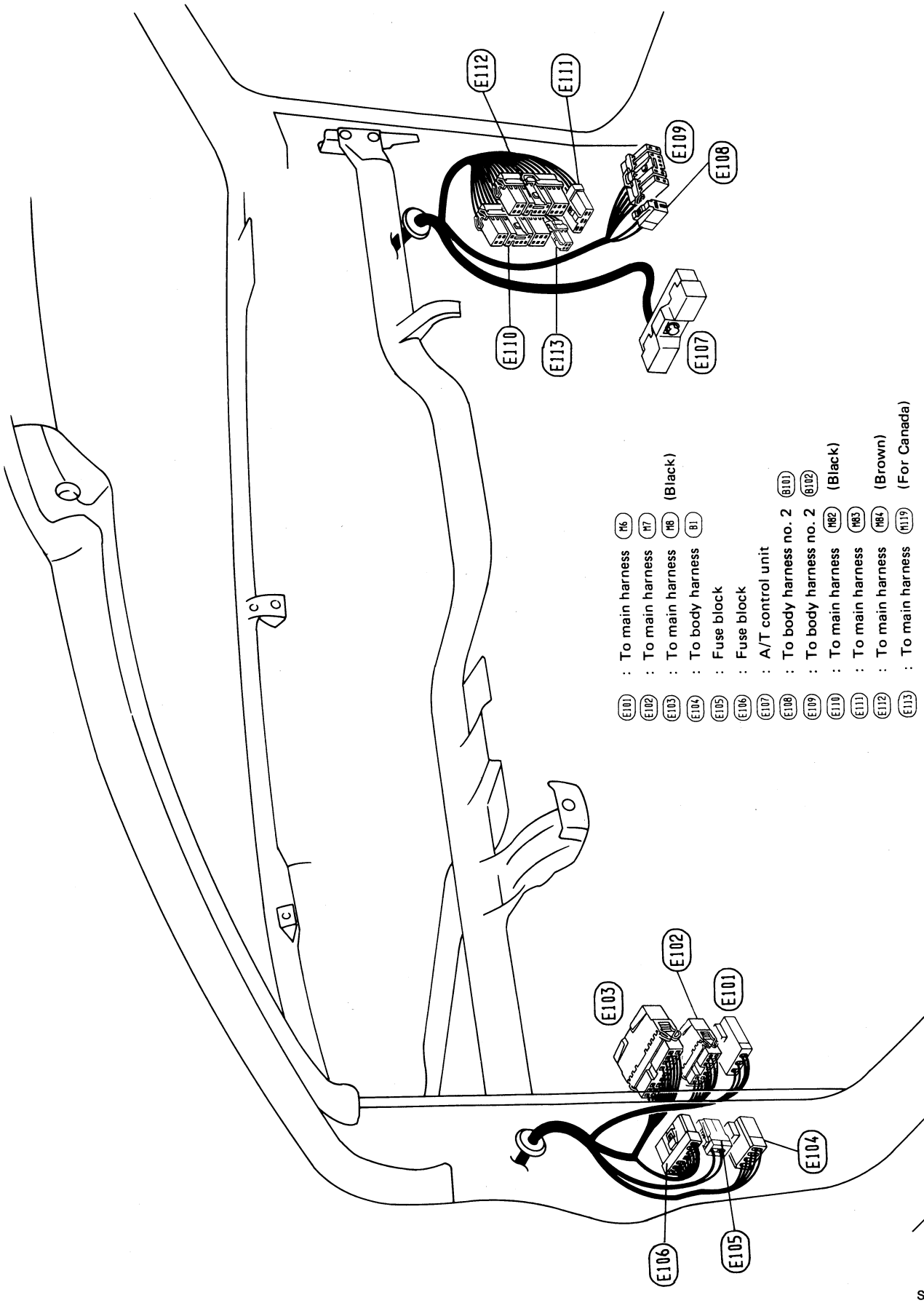




Outline

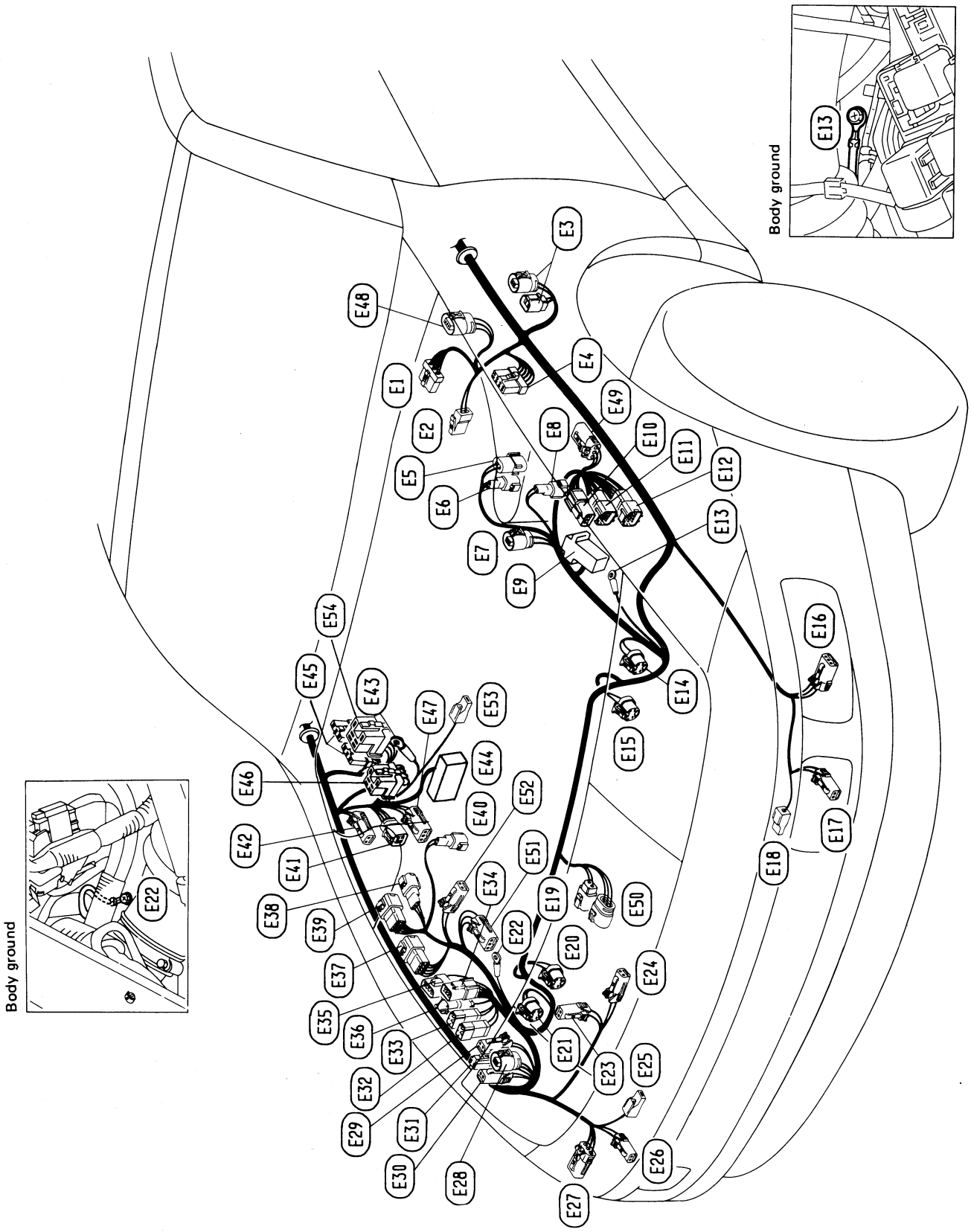

Body harness no. 2
Door harness R.H.
Engine room harness
Alternator harness
Air bag harness
E.F.I. harness
Fuse block
Door harness L.H.
Body harness
Main harness
Back door harness
SEL014Q

Engine Room Harness



SEL715R

Engine Room Harness (Cont'd)

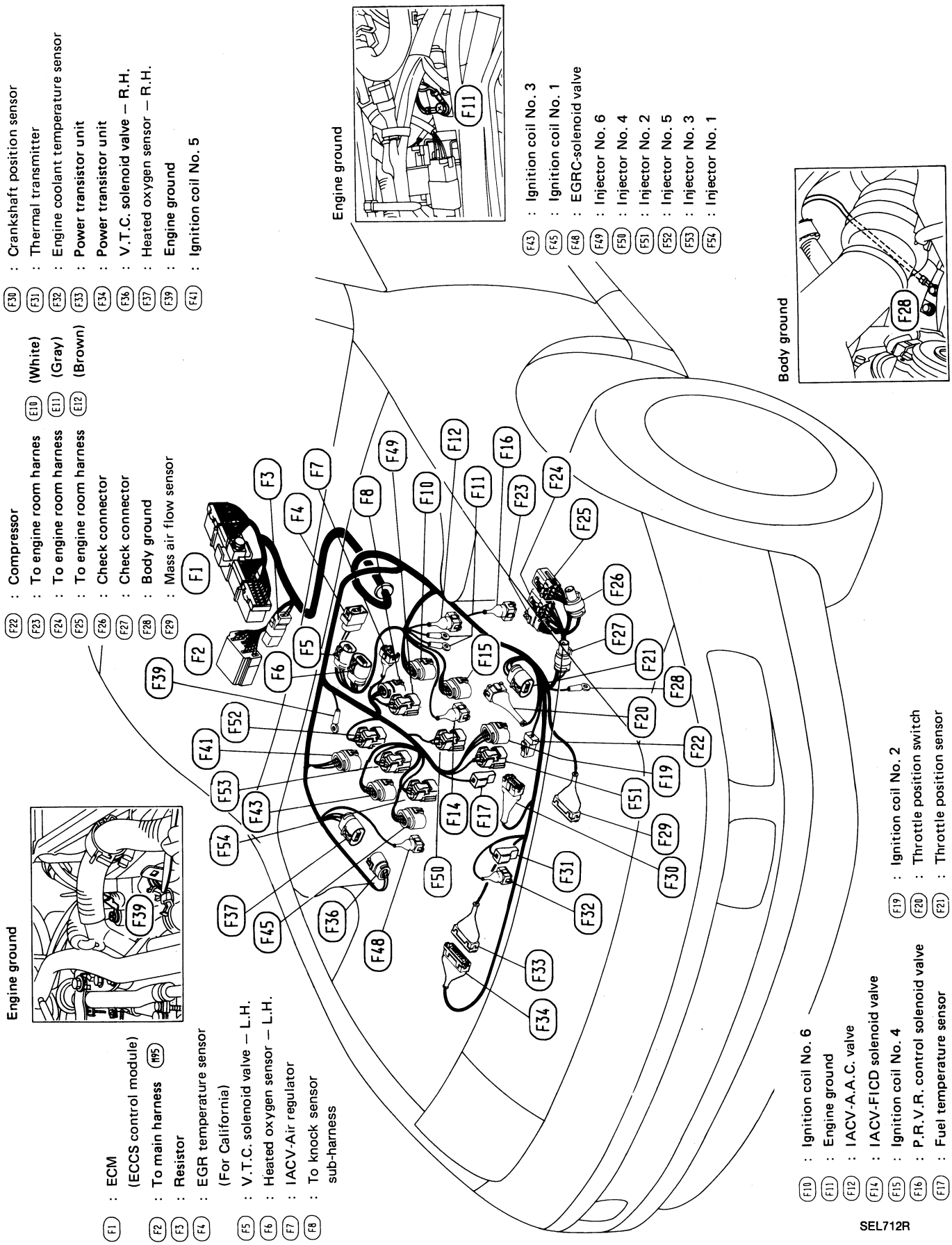


(E1) : Front wiper motor
(E2) : Brake fluid level switch
(E3) : Starter relay (Except M/T model for Canada)
(E4) : Front wiper amplifier
(E5) : Power steering oil pressure switch (Black)
(E6) : Power steering solenoid (Gray)
(E7) : Hood switch
(E8) : Front sensor L.H. (For anti-lock braking system)
(E9) : Relay box (Refer to page EL-120.)
(E10) : To E.F.I. harness (F23) (White)
(E11) : To E.F.I. harness (F24) (Gray)
(E12) : To E.F.I. harness (F25) (Brown)
(E13) : Body ground
(E14) : Headlamp L.H. (Low beam) (Brown)
(E15) : Headlamp L.H. (High beam) (Black)
(E16) : Front combination lamp L.H.
(E17) : Front fog lamp L.H.
(E18) : Horn-low
(E19) : Radiator fan motor (Non-turbocharger model)
(E20) : Headlamp R.H. (High beam) (Black)
(E21) : Headlamp R.H. (Low beam) (Brown)
(E22) : Body ground
(E23) : Ambient sensor (Auto A/C model)
(E24) : Low-pressure switch
(E25) : Horn-high
(E26) : Front fog lamp R.H.
(E27) : Front combination lamp R.H.
(E28) : Front washer motor (White)
(E29) : Rear washer motor (Gray)
(E30) : Washer fluid level switch (Brown) (Except for california)
(E31) : Headlamp washer motor (Black) (For Canada)
(E32) : To alternator harness (A1) (Black)
(E33) : To alternator harness (A2) (Blue)
(E34) : To alternator harness (A3) (A/Tmodel)
(E35) : To alternator harness (A4) (M/T model)
(E36) : To alternator harness (A5)
(E37) : Inhibitor switch (A/T model)
(E38) : Revolution sensor (A/T model)
(E39) : To A/T solenoid harness (A/T model)
(E40) : Front sensor R.H. (For anti-lock braking system)
(E41) : A.S.C.D. pump
(E42) : Dropping resistor (A/T model)
(E43) : Battery
(E44) : Fusible link holder
(E45) : Daytime light control unit (For Canada)
(E46) : Headlamp washer relay (For Canada)
(E47) : Front shock absorber actuator R.H. (Turbocharger model)
(E48) : Boost sensor (Turbocharger model)
(E49) : Front shock absorber actuator L.H. (Turbocharger model)
(E50) : Radiator fan motor (Turbocharger model)
(E51) : HICAS solenoid valve (Turbocharger model)
(E52) : HICAS oil level switch (Turbocharger model)
(E53) : Theft warning horn
(E54) : Daytime light cancel relay (For Canada)

SEL714R

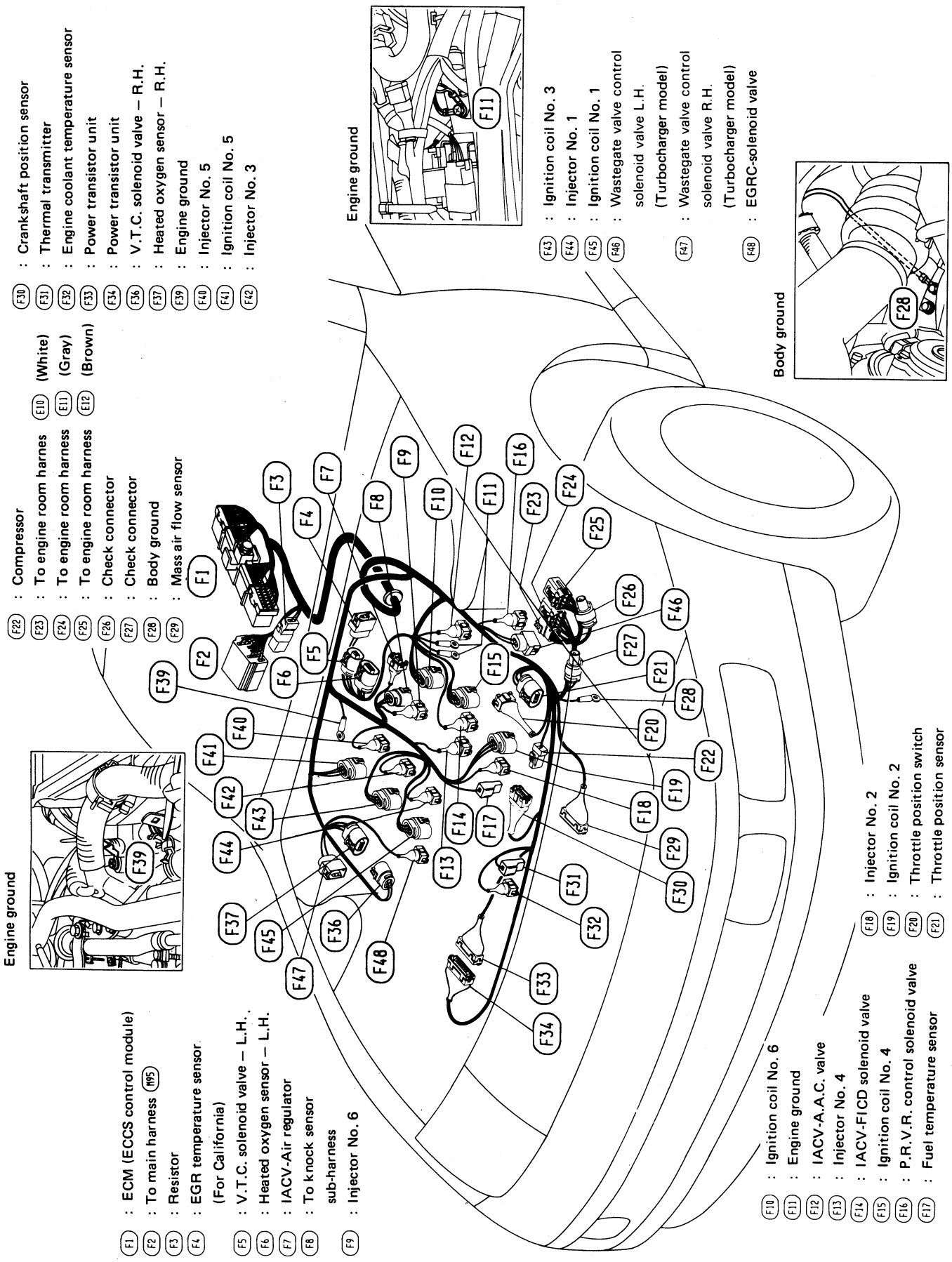
E.F.I. Harness

NON-TURBOCHARGER MODEL

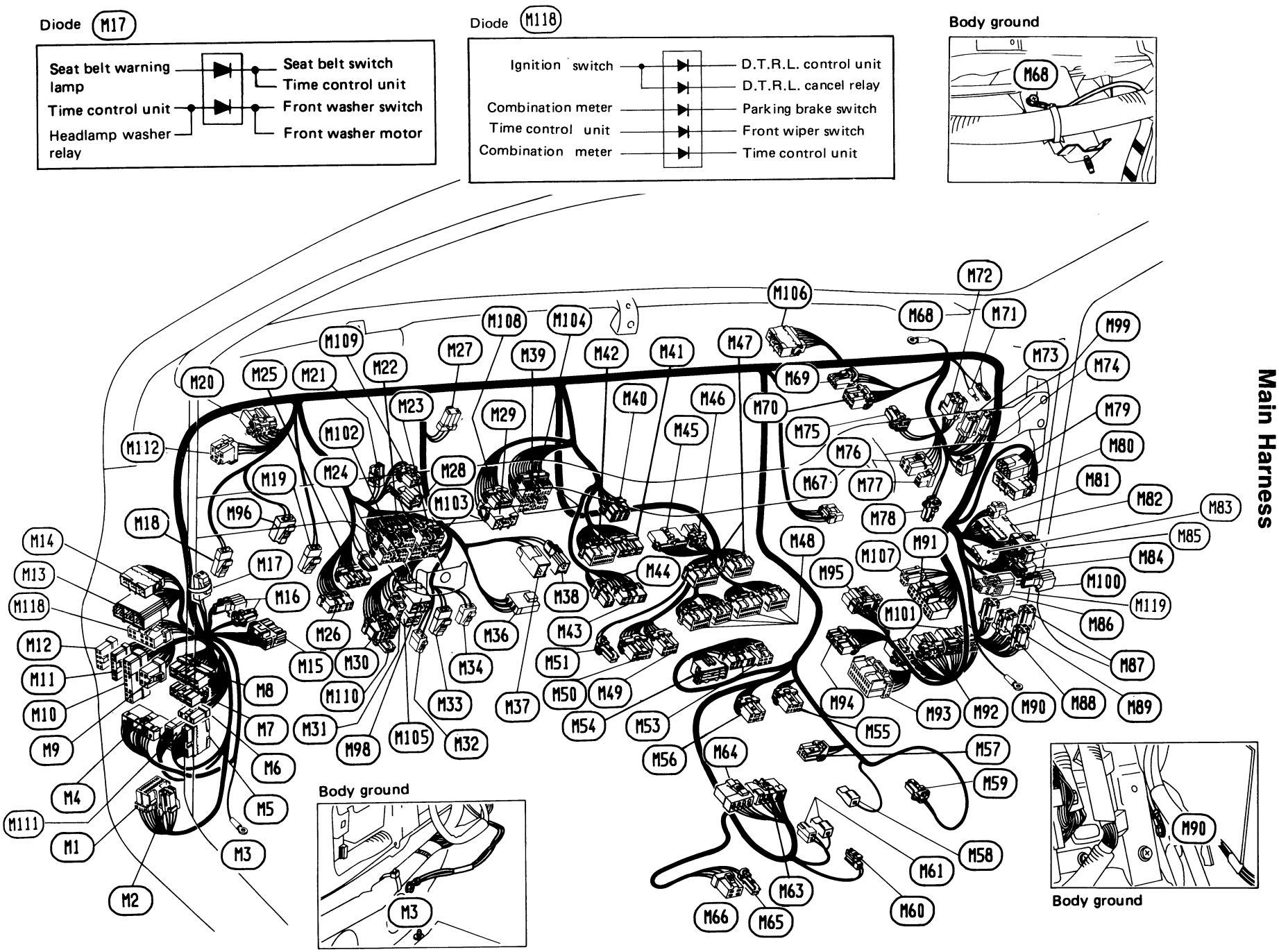


E.F.I. Harness (Cont'd)

TURBOCHARGER MODEL



SEL713R


Diode M17
Seat belt warning lamp
Time control unit
Headlamp washer relay
Seat belt switch
Time control unit
Front washer switch
Front washer motor
Diode M118
Ignition switch
Combination meter
Time control unit
Combination meter
D.T.R.L. control unit
D.T.R.L. cancel relay
Parking brake switch
Front wiper switch
Time control unit
Body ground
M68
Body ground
M3
Body ground
M90
M1
M2
M3
M4
M5
M6
M7
M8
M9
M10
M11
M12
M13
M14
M15
M16
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M101
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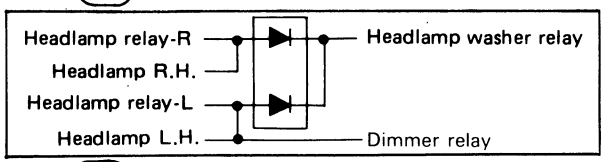
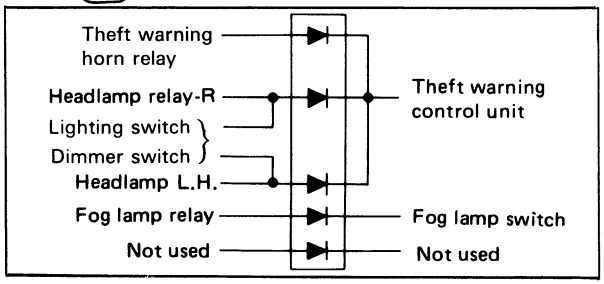
M103
M104
M105
M106
M107
M108
M109
M110
M111
M112
M118
M119

(M1) : Time control unit
(M2) : Fuel pump relay
(M3) : Body ground
(M4) : To body harness (B2)
(M5) : To body harness (B3)
(M6) : To engine room harness (E101)
(M7) : To engine room harness (E102)
(M8) : To engine room harness (E103) (Black)
(M9) : Fuse block
(M10) : Fuse block
(M11) : Fuse block
(M12) : Fuse block
(M13) : To door harness L.H. (D1)
(M14) : To door harness L.H. (D2)
(M15) : Data link connector for CONSULT
(M16) : Joint connector (Turbocharger)
(M17) : Diode
(M18) : A.S.C.D. clutch switch (Blue) (M/T model)
(M19) : Clutch interlock switch (Blue) (M/T model for U.S.A.)
(M20) : Shift lock control unit (A/T model)
(M21) : Warning chime
(M22) : Combination meter (Black)(Without air bag)
(M23) : Combination meter (White)(Without air bag)
(M24) : Cluster switch
(M25) : Cluster switch
(M26) : Lighting switch·Headlamp washer switch
(M27) : Combination flasher unit
(M28) : Warning lamp (A/T model)(Without air bag)
(M29) : Warning lamp (Without air bag)
(M30) : Dimmer switch
(M31) : Steering switch (Non-turbocharger model without air bag)
(M32) : Kickdown switch (White) (A/T model)
(M33) : A.S.C.D. cancel switch (Blue)
(M34) : Stop lamp switch (Black)
(M36) : Ignition switch
(M37) : Key switch
(M38) : Key hole illumination
(M39) : Combination meter (Without air bag)
(M40) : Hazard warning switch
(M41) : A/C switch unit (Manual A/C model)
(M42) : A/C switch unit (Auto A/C model)
(M43) : Front wiper and washer switch
(M44) : Rear wiper and washer switch
(M45) : Mode door motor (Manual A/C model)
(M46) : Mode door motor (Auto A/C model)
(M47) : A/C control unit (Manual A/C model)
(M48) : A/C control unit (Auto A/C model)
(M49) : Air mix actuator (Manual A/C model)
(M50) : To A/C sub-harness (Auto A/C model)
(M51) : Foot lamp L.H.
(M53) : Radio and cassette player
(M54) : Joint connector (Bose system model)
(M55) : Shift lock solenoid·Detention switch (A/T model)
(M56) : Digital clock
(M57) : O.D. control switch and A/T illumination (A/T model)
(M58) : Parking brake switch
(M59) : Seat belt switch R.H.
(M60) : Ashtray illumination
(M61) : Cigarette lighter
(M63) : Door mirror control switch·Shock absorber select switch (Turbocharger model)
(M64) : Door mirror control switch (Non-turbocharger model)
(M65) : Seat belt switch L.H. (Without power seat)
(M66) : To seat sub-harness (With power seat)
(M67) : Thermo control amplifier (Manual A/C model)
(M68) : Body ground
(M69) : Intake door motor (Manual A/C model)
(M70) : Intake door motor (Auto A/C model)
(M71) : Glove box lamp
(M72) : A.S.C.D. hold relay (Manual A/C model)
(M73) : Blower relay-1 (Manual A/C model)
(M74) : Blower motor
(M75) : A/C sensor (Auto A/C model)
(M76) : Heater resistor (Manual A/C model)
(M77) : Blower control amplifier (Auto A/C model)
(M78) : Foot lamp R.H.
(M79) : To door harness R.H. (D101)
(M80) : To door harness R.H. (D102)
(M81) : Diode (For Canada)
(M82) : To engine room harness (E110) (Black)
(M83) : To engine room harness (E111)
(M84) : To engine room harness (E112) (Brown)
(M85) : Diode
(M86) : Blower relay-3 (Manual A/C model)
Audio relay (Auto A/C model with Bose system)
(M87) : Blower relay-2 (Manual A/C model)
(M88) : A.S.C.D. hold relay (Auto A/C model)
(M89) : Audio relay (Manual A/C model with Bose system)
(M90) : Body ground
(M91) : Theft warning control unit
(M92) : Power steering control unit (Non-turbocharger model)
(M93) : A.S.C.D. control unit
(M94) : Automatic seat belt control unit (For U.S.A.)
(M95) : To E.F.I. harness (F2)
(M96) : Clutch pedal position switch (Black) (M/T)
(M98) : Steering angle sensor·Steering switch (Turbocharger model without air bag)
(M99) : A/C ignition relay
(M100) : To body harness no.2 (B109) (Turbocharger model)
(M101) : HICAS control unit (Turbocharger model)
(M102) : Combination meter (With air bag)
(M103) : Combination meter (With air bag)
(M104) : Combination meter (With air bag)
(M105) : Steering angle sensor (Turbocharger model with air bag)
(M106) : To air bag harness (A111)
(M107) : Theft warning horn relay
(M108) : Warning lamp (With air bag)
(M109) : Warning lamp (With air bag)
(M110) : Steering switch (With air bag)
(M111) : To (B46)
(M112) : Inhibitor relay
(M118) : Diode (For Canada)
(M119) : To engine room harness (E113) (For Canada)

Diode (M81)

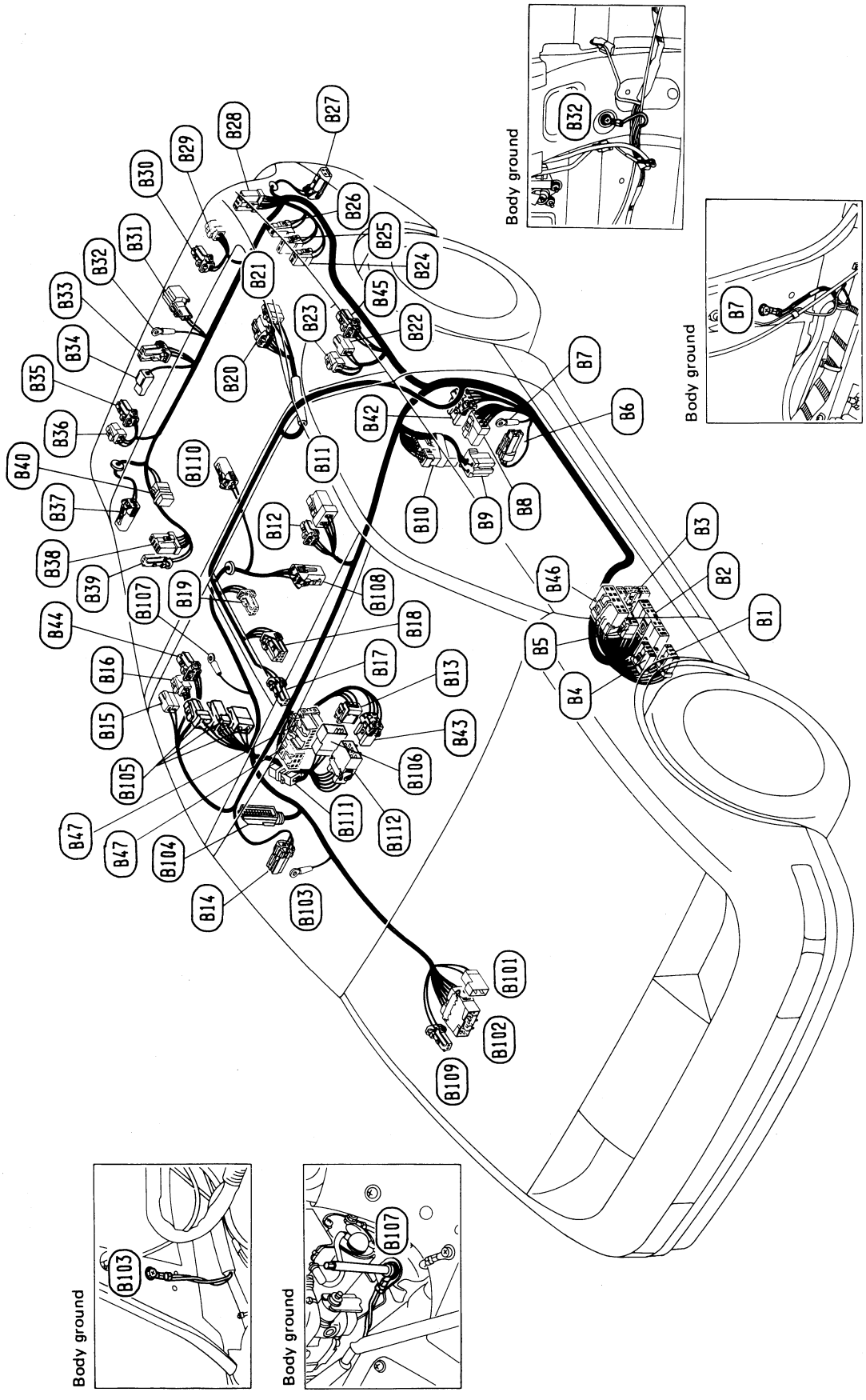


Diode (M85)



Body Harness

2 SEATER



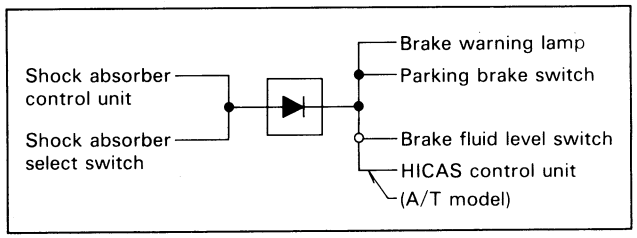
Body harness

(B1) : To engine room harness (E104)
(B2) : To main harness (M4)
(B3) : To main harness (M5)
(B4) : Fuse block
(B5) : Fuse block
(B6) : Door switch L.H.
(B7) : Body ground
(B8) : Fuel pump control unit
(B9) : Room lamp relay
(B10) : Diode
(B11) : Fuel pump
(B12) : Fuel tank gauge unit
(B13) : To body harness no. 2 (B106)
(B14) : Door switch R.H.
(B15) : Rear speaker R.H. (Except Bose system)
(B16) : Rear speaker R.H. (Bose system)
(B17) : Spot lamp
(B18) : In-vehicle sensor upper·Aspirator motor (Auto A/C model)
(B19) : Interior lamp
(B20) : To back door harness (D201)
(B21) : To back door harness (D202)
(B22) : Rear speaker L.H. (Except Bose system)
(B23) : Rear speaker L.H. (Bose system)
(B24) : Front washer motor (White)
(B25) : Rear washer motor (Green)
(B26) : Washer fluid level switch (Black) (Except for California)
(B27) : Rear side marker lamp L.H.
(B28) : Stop and tail lamp sensor
(B29) : Rear combination lamp L.H.
(B30) : Back-up lamp L.H.
(B31) : License lamp
(B32) : Body ground
(B33) : Back door key switch
(B34) : Back door switch
(B35) : Back-up lamp R.H.
(B36) : Rear combination lamp R.H.
(B37) : Rear side marker lamp R.H.
(B38) : Power antenna timer
(B39) : Power antenna motor
(B40) : Diode
(B42) : Shock absorber control unit (Turbocharger model)
(B43) : To body harness no.2 (B112) (Turbocharger model)
(B44) : Rear shock absorber actuator R.H. (Turbocharger model)
(B45) : Rear shock absorber actuator L.H. (Turbocharger model)
(B46) : To main harness (M111)
(B47) : Door lock timer

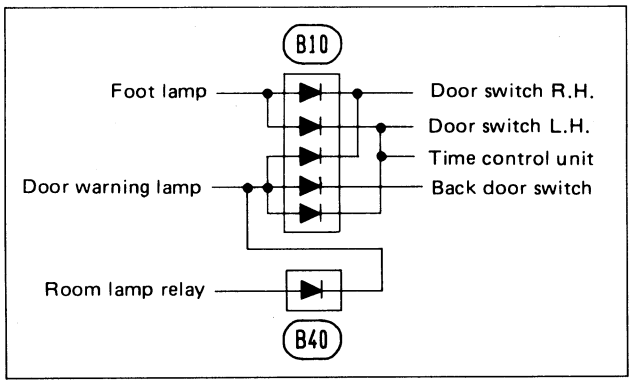
Body harness no. 2

(B101) : To engine room harness (E108)
(B102) : To engine room harness (E109)
(B103) : Body ground
(B104) : ABS control unit
(B105) : Actuator (For ABS)
(B106) : To body harness (B13)
(B107) : Body ground
(B108) : Rear sensor (For ABS)
(B109) : To main harness (M100) (Turbocharger model)
(B110) : HICAS fail-safe solenoid valve (Turbocharger model)
(B111) : Diode (Turbocharger model)
(B112) : To body harness (B43) (Turbocharger model)

Diode (B111)



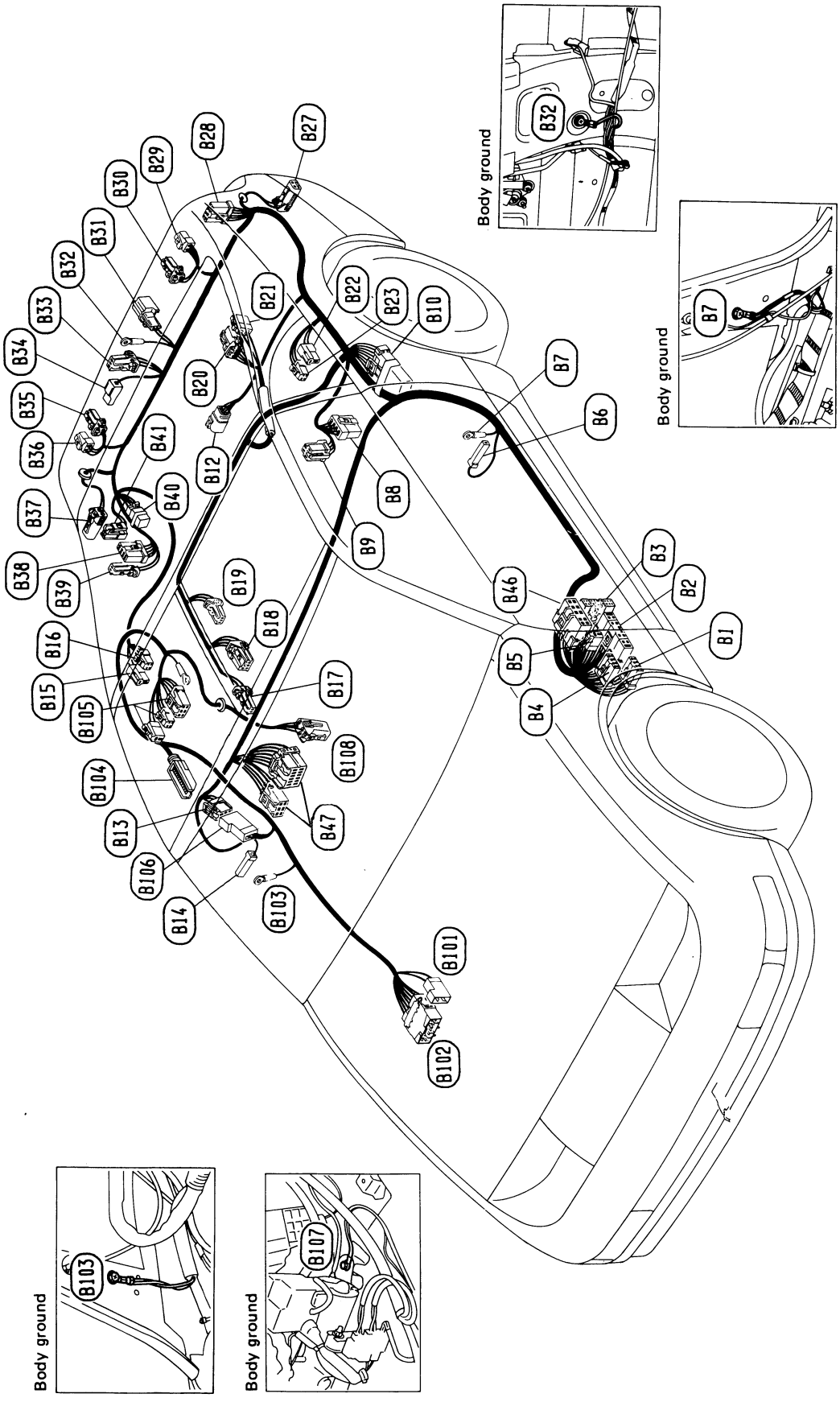
Diode (B10) (B40)



SEL717R

Body Harness (Cont'd)

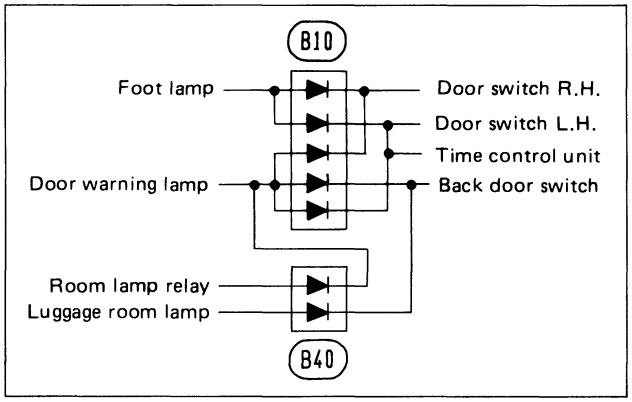
2 + 2 SEATER



Body harness

(B1) : To engine room harness (E104)
(B2) : To main harness (M4)
(B3) : To main harness (M5)
(B4) : Fuse block
(B5) : Fuse block
(B6) : Door switch L.H.
(B7) : Body ground
(B8) : Fuel pump control unit
(B9) : Room lamp relay
(B10) : Diode
(B12) : Fuel tank gauge unit
(B13) : To body harness no. 2 (B106)
(B14) : Door switch R.H.
(B15) : Rear speaker R.H. (Except Bose system)
(B16) : Rear speaker R.H.(Bose system)
(B17) : Spot lamp
(B18) : In-vehicle sensor upper·Aspirator motor (Auto A/C model)
(B19) : Interior lamp
(B20) : To back door harness (D201)
(B21) : To back door harness (D202)
(B22) : Rear speaker L.H. (Except Bose system)
(B23) : Rear speaker L.H. (Bose system)
(B27) : Rear side marker lamp L.H.
(B28) : Stop and tail lamp sensor
(B29) : Rear combination lamp L.H.
(B30) : Back-up lamp L.H.
(B31) : License lamp
(B32) : Body ground
(B33) : Back door key switch
(B34) : Back door switch
(B35) : Back-up lamp R.H.
(B36) : Rear combination lamp R.H.
(B37) : Rear side marker lamp R.H.
(B38) : Power antenna timer
(B39) : Power antenna motor
(B40) : Diode
(B41) : Luggage room lamp
(B46) : To main harness (M111)
(B47) : Door lock timer

Diode (B10) (B40)

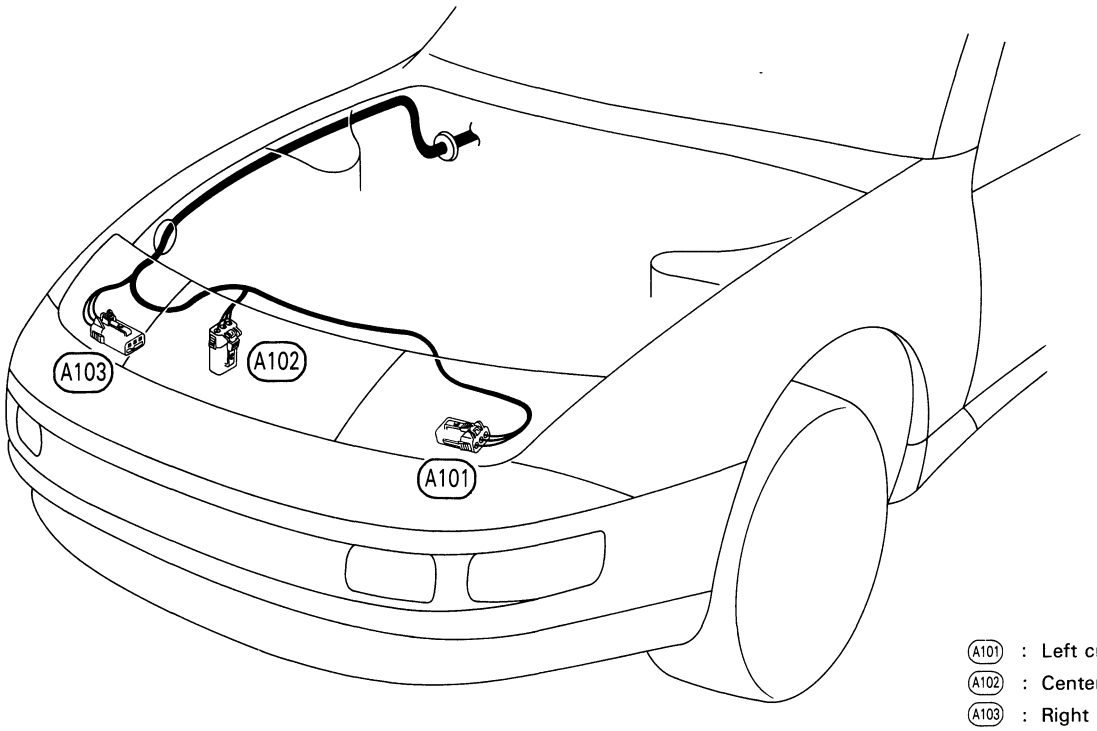


Body harness no. 2

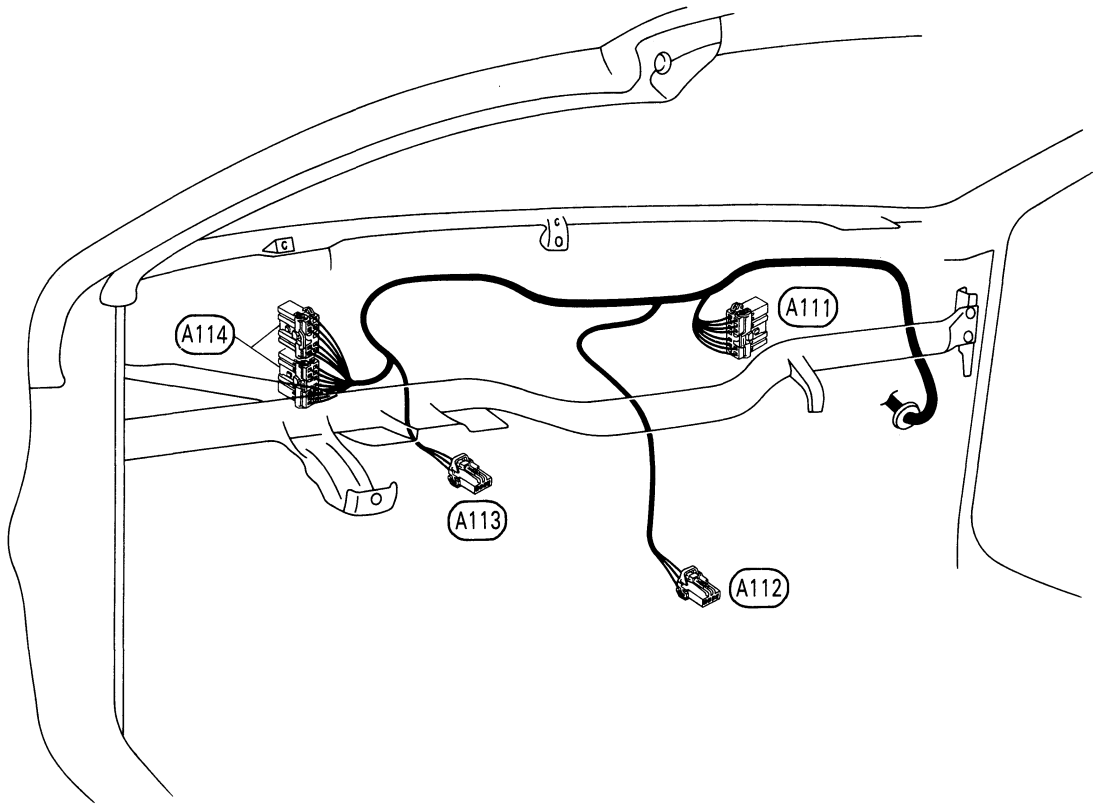
(B101) : To engine room harness (E108)
(B102) : To engine room harness (E109)
(B103) : Body ground
(B104) : ABS control unit
(B105) : Actuator (For ABS)
(B106) : To body harness (B13)
(B107) : Body ground
(B108) : Rear sensor (For ABS)

SEL718R

Air Bag Harness

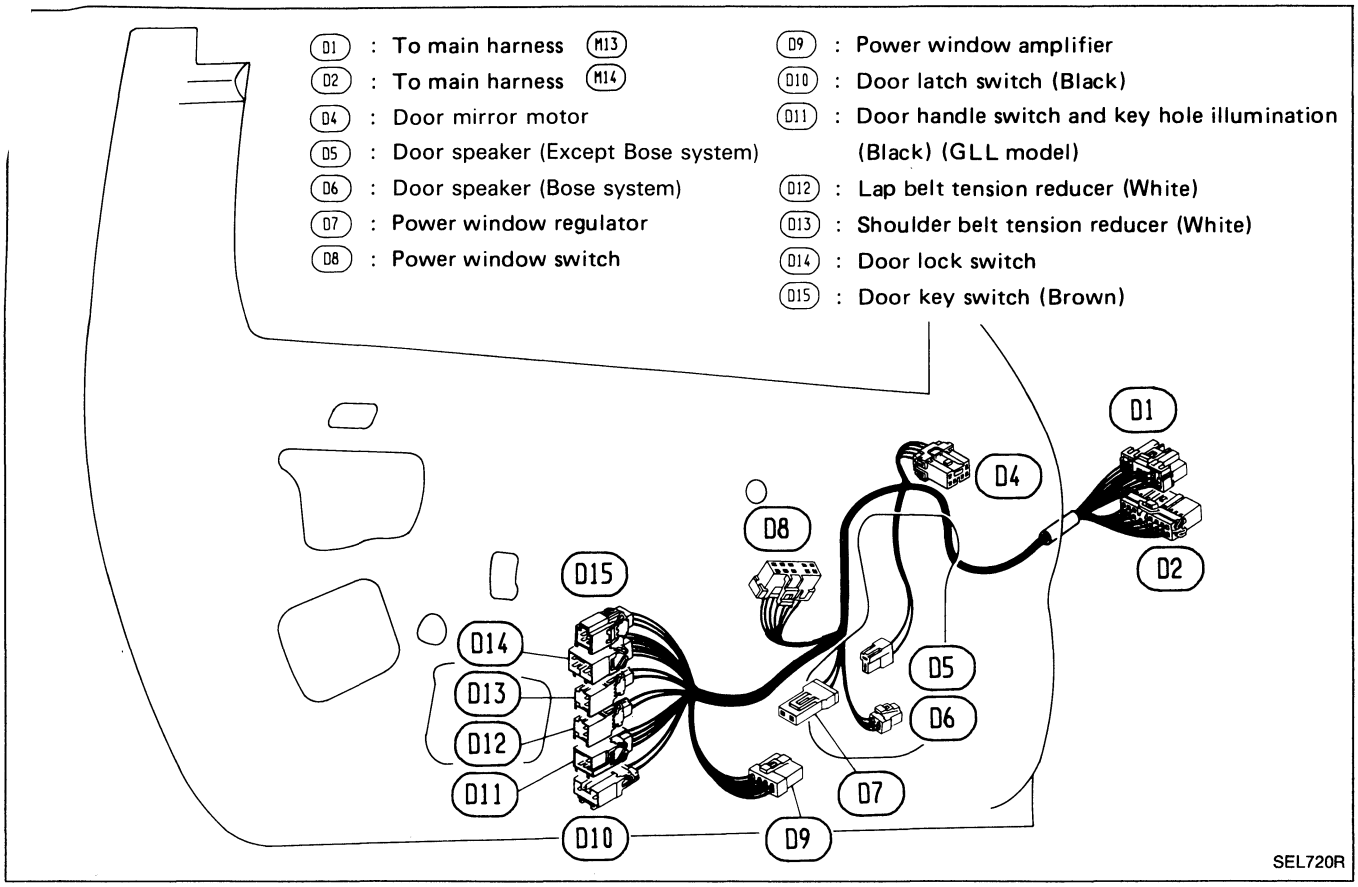


(A101) : Left crash zone sensor
(A102) : Center crash zone sensor
(A103) : Right crash zone sensor
(A111) : To main harness (M106)
(A112) : Tunnel and safing sensor
(A113) : Air bag module
(A114) : Air bag control unit

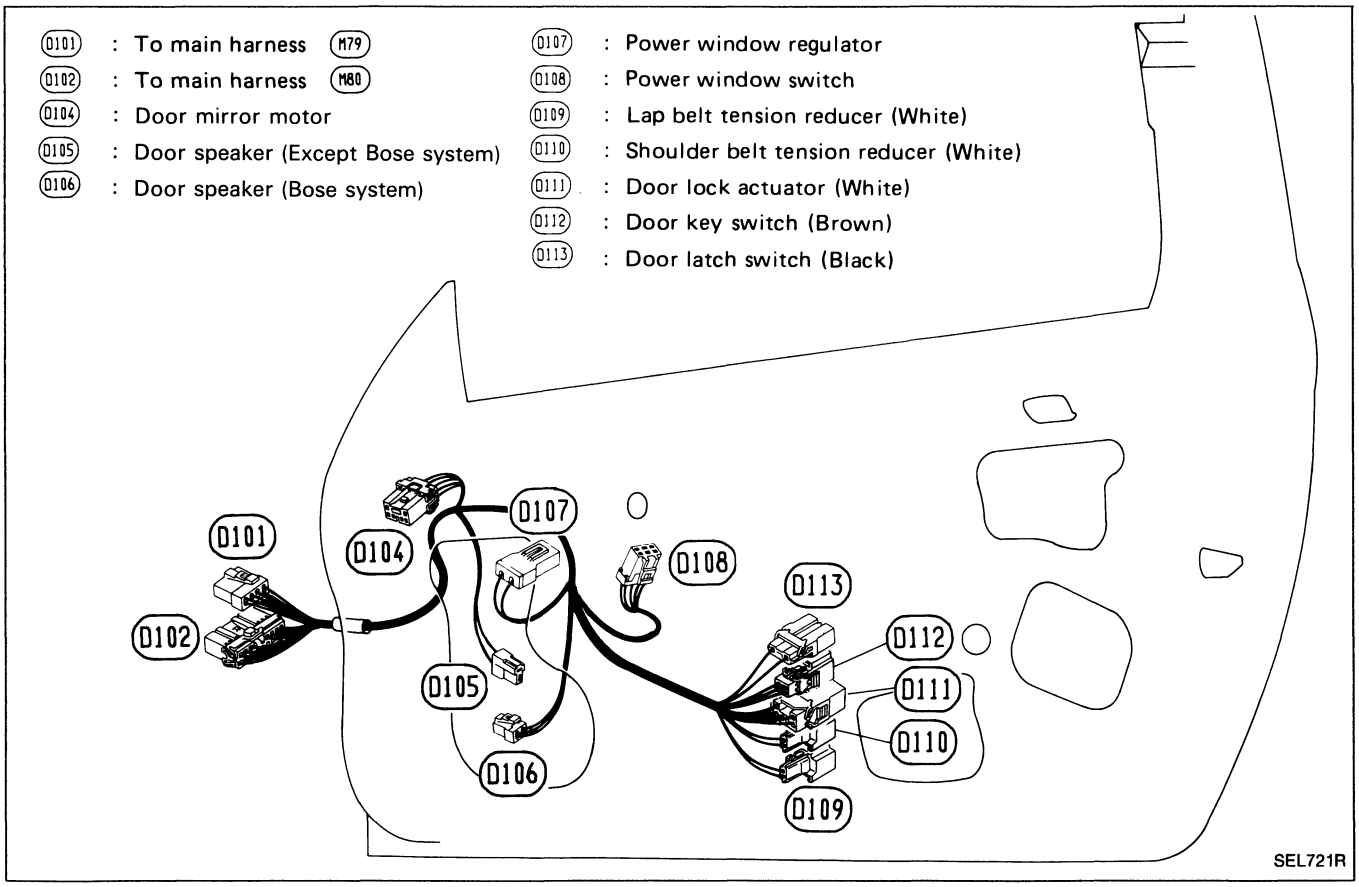


SEL719R

Door Harness L.H.

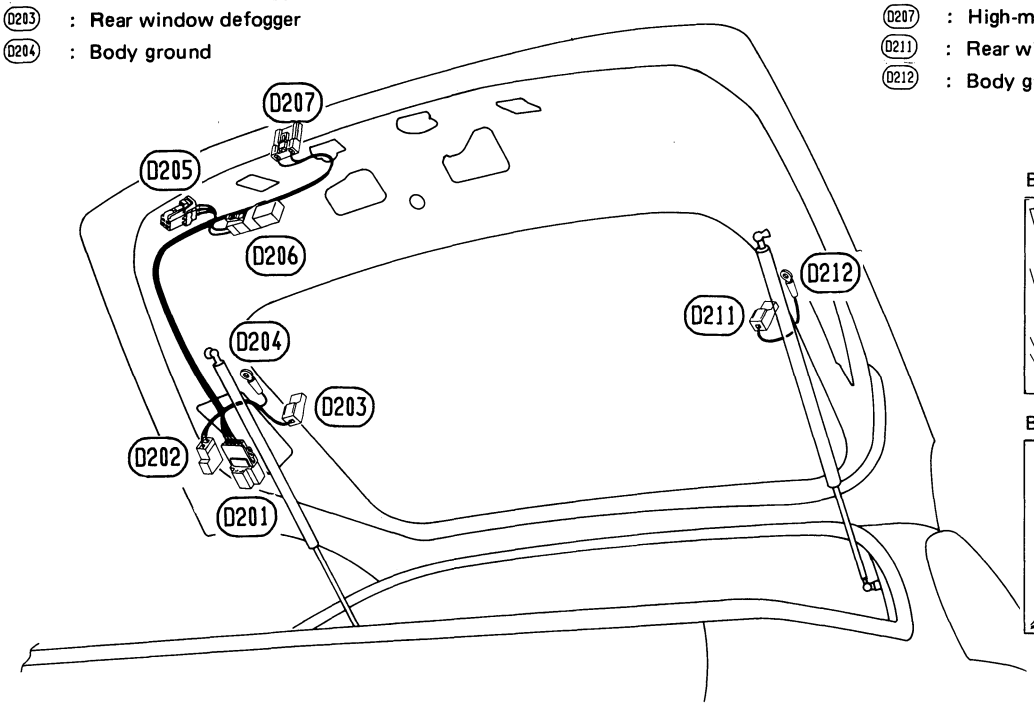


Door Harness R.H.

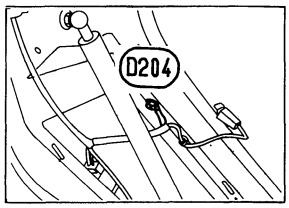


Back Dcor Harness

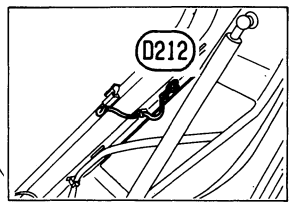
(D201) : To body harness (B20)
(D202) : To body harness (B21)
(D203) : Rear window defogger
(D204) : Body ground
(D205) : Rear wiper motor
(D206) : Condenser
(D207) : High-mounted stop lamp
(D211) : Rear window defogger
(D212) : Body ground



Body ground



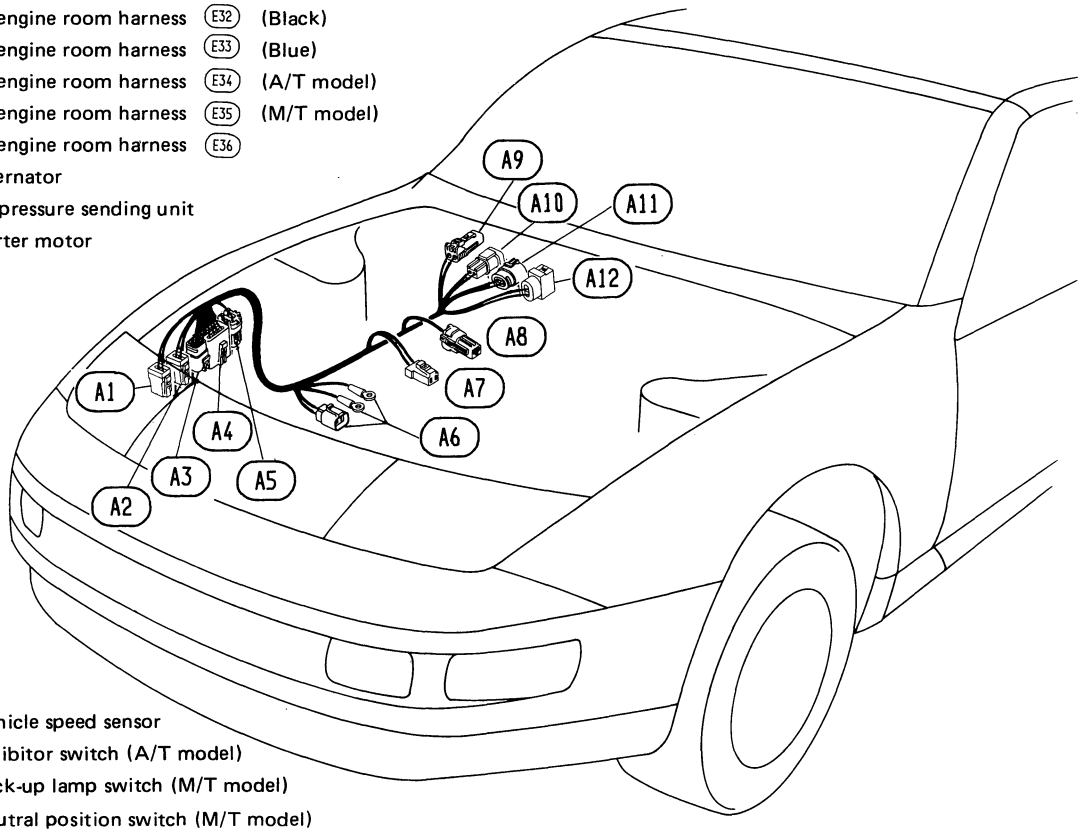
Body ground



SEL711R

Alternator Harness

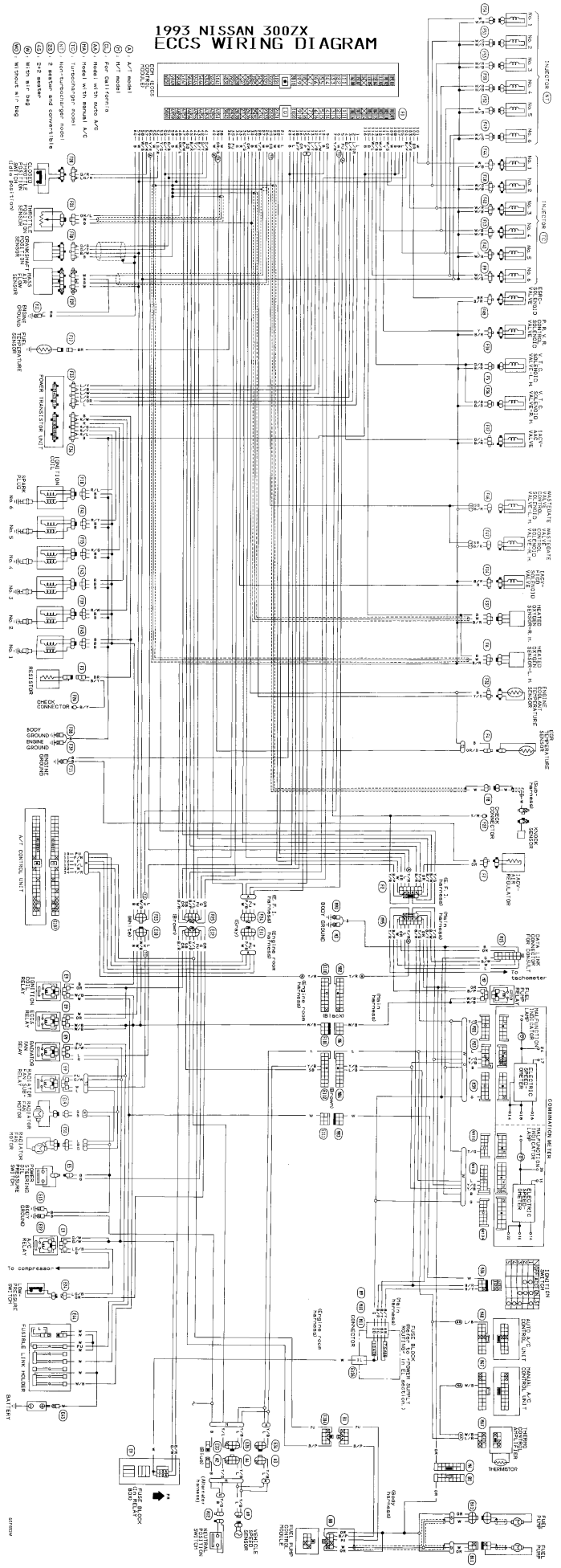
(A1) : To engine room harness (E32) (Black)
(A2) : To engine room harness (E33) (Blue)
(A3) : To engine room harness (E34) (A/T model)
(A4) : To engine room harness (E35) (M/T model)
(A5) : To engine room harness (E36)
(A6) : Alternator
(A7) : Oil pressure sending unit
(A8) : Starter motor



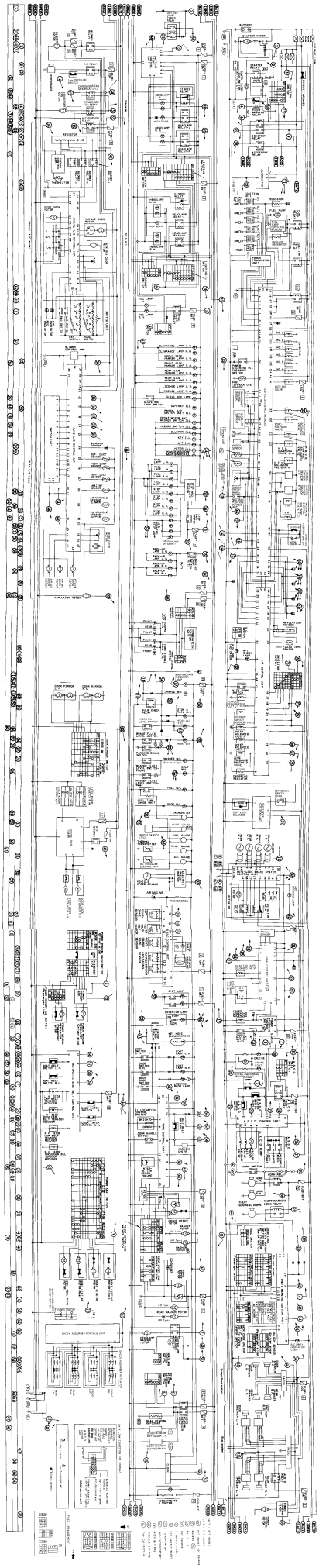
(A9) : Vehicle speed sensor
(A10) : Inhibitor switch (A/T model)
(A11) : Back-up lamp switch (M/T model)
(A12) : Neutral position switch (M/T model)

SEL996M

1993 NISSAN 300ZX
ECCS WIRING DIAGRAM



1993 NISSAN 300ZX
CIRCUIT DIAGRAM



INCH TO METRIC CONVERSION TABLE

(Rounded-off for automotive use)

inches	mm	inches	mm
.100	2.54	.610	15.49
.110	2.79	.620	15.75
.120	3.05	.630	16.00
.130	3.30	.640	16.26
.140	3.56	.650	16.51
.150	3.81	.660	16.76
.160	4.06	.670	17.02
.170	4.32	.680	17.27
.180	4.57	.690	17.53
.190	4.83	.700	17.78
.200	5.08	.710	18.03
.210	5.33	.720	18.29
.220	5.59	.730	18.54
.230	5.84	.740	18.80
.240	6.10	.750	19.05
.250	6.35	.760	19.30
.260	6.60	.770	19.56
.270	6.86	.780	19.81
.280	7.11	.790	20.07
.290	7.37	.800	20.32
.300	7.62	.810	20.57
.310	7.87	.820	20.83
.320	8.13	.830	21.08
.330	8.38	.840	21.34
.340	8.64	.850	21.59
.350	8.89	.860	21.84
.360	9.14	.870	22.10
.370	9.40	.880	22.35
.380	9.65	.890	22.61
.390	9.91	.900	22.86
.400	10.16	.910	23.11
.410	10.41	.920	23.37
.420	10.67	.930	23.62
.430	10.92	.940	23.88
.440	11.18	.950	24.11
.450	11.43	.960	24.38
.460	11.68	.970	24.64
.470	11.94	.980	24.89
.480	12.19	.990	25.15
.490	12.45	1.000	25.40
.500	12.70	2.000	50.80
.510	12.95	3.000	76.20
.520	13.21	4.000	101.60
.530	13.46	5.000	127.00
.540	13.72	6.000	152.40
.550	13.97	7.000	177.80
.560	14.22	8.000	203.20
.570	14.48	9.000	228.60
.580	14.73	10.000	254.00
.590	14.99	20.000	508.00
.600	15.24		

METRIC TO INCH CONVERSION TABLE

(Rounded-off for automotive use)

mm	inches	mm	inches
1	.0394	51	2.008
2	.079	52	2.047
3	.118	53	2.087
4	.157	54	2.126
5	.197	55	2.165
6	.236	56	2.205
7	.276	57	2.244
8	.315	58	2.283
9	.354	59	2.323
10	.394	60	2.362
11	.433	61	2.402
12	.472	62	2.441
13	.512	63	2.480
14	.551	64	2.520
15	.591	65	2.559
16	.630	66	2.598
17	.669	67	2.638
18	.709	68	2.677
19	.748	69	2.717
20	.787	70	2.756
21	.827	71	2.795
22	.866	72	2.835
23	.906	73	2.874
24	.945	74	2.913
25	.984	75	2.953
26	1.024	76	2.992
27	1.063	77	3.031
28	1.102	78	3.071
29	1.142	79	3.110
30	1.181	80	3.150
31	1.220	81	3.189
32	1.260	82	3.228
33	1.299	83	3.268
34	1.339	84	3.307
35	1.378	85	3.346
36	1.417	86	3.386
37	1.457	87	3.425
38	1.496	88	3.465
39	1.535	89	3.504
40	1.575	90	3.543
41	1.614	91	3.583
42	1.654	92	3.622
43	1.693	93	3.661
44	1.732	94	3.701
45	1.772	95	3.740
46	1.811	96	3.780
47	1.850	97	3.819
48	1.890	98	3.858
49	1.929	99	3.898
50	1.969	100	3.937

QUICK REFERENCE CHART : 300ZX Revised 1993

ENGINE TUNE-UP DATA

Engine model		VG30DE	VG30DETT
Firing order		1-2-3-4-5-6	
Idle speed rpm	M/T	700±50	
	A/T (in "N" position)	770±50	750±50
Ignition timing (degree 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	Used belt deflection: Deflection after adjustment	Deflection of new belt
Alternator		11.5 (0.453)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Air conditioner compressor		12.5 (0.492)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump		19 (0.75)	12 - 13.5 (0.472 - 0.531)	10.5 - 11.5 (0.413 - 0.453)
Applied pressed 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 kPa (kg/cm^2, psi)/rpm	Standard	1,285 (13.1, 186)/300	1,177 (12.0, 171)	
	Minimum	981 (10.0, 142)/300	883 (9.0, 128)	
Spark plug	Type (Standard)	PFR6B-11	PFR5B-11B	
	Gap mm (in)	1.0 - 1.1 (0.039 - 0.043)		

CLUTCH PEDAL

Unit: mm (in)

Engine	VG30DE	VG30DETT
Pedal height	197 - 207 (7.76 - 8.15)	183 - 193 (7.20 - 7.60)
Pedal free play	1 - 3 (0.04 - 0.12)	

FRONT WHEEL ALIGNMENT (Unladen*)

Camber	degree	−1°35′ to −0°05′
Caster	degree	8°55′ - 10°25′
Toe-in A − B	mm (in)	0 - 2 (0 - 0.08)
Total angle 2θ	degree	0′ - 11′
Wheel turning angle (Full turn) Inside	degree	32°30′ - 36°30′
Outside		26°30′ - 30°30′

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

REAR WHEEL ALIGNMENT (Unladen*)

Camber	degree	−1°36′ to −0°36′
Toe-in A − B	mm (in)	0.4 - 4.4 (0.016 - 0.173)
Total angle 2θ	degree	1′ - 24′

*: 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			28.0 (1.102)
Rear brake Pad wear limit			2.0 (0.079)
Rotor repair limit			16.0 (0.630)
Pedal free height	M/T model		186 - 196 (7.32 - 7.72)
	A/T model		195 - 205 (7.68 - 8.07)
Pedal depressed height*1	M/T model	With A.B.S.	100 (3.94) or more
		Without A.B.S.	95 (3.74) or more
	A/T model	With A.B.S.	105 (4.13) or more
		Without A.B.S.	105 (4.13) or more
Parking brake Number of notches*2			6 - 7

*1 Under force of 490 N (50 kg, 110 lb) with engine running
*2 At pulling force: 196 N (20 kg, 44 lb)

REFILL CAPACITIES

Unit			Liter	US measure
Fuel tank			72	19 gal
Coolant			9	9-1/2 qt
Engine	With oil filter		3.4	3-5/8 qt
	Without oil filter		3.0	3-1/8 qt
Transmission	M/T		2.8	5-7/8 pt
	A/T	Non-turbocharger	8.3	8-3/4 qt
		Turbocharger	8.2	8-5/8 qt
Differential carrier	Non-turbocharger		1.5	3-1/8 pt
	Turbocharger		1.8	3-7/8 pt
Power steering system	Without SUPER HICAS		1.3	1-3/8 qt
	With SUPER HICAS		2.0	2-1/8 qt
Air conditioning system	Compressor oil		0.20	6.8 fl oz
	Refrigerant		0.75 - 0.85 kg	1.65 - 1.87 lb

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