I N F I N I T I ®

M30

MODEL F31 SERIES

QUICK REFERENCE INDEX

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FOREWORD

This manual contains maintenance and repair procedures for the 1992 INFINITI M30.

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

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

IMPORTANT SAFETY NOTICE

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

I N F I N I T I ®

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

SECTION GI

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

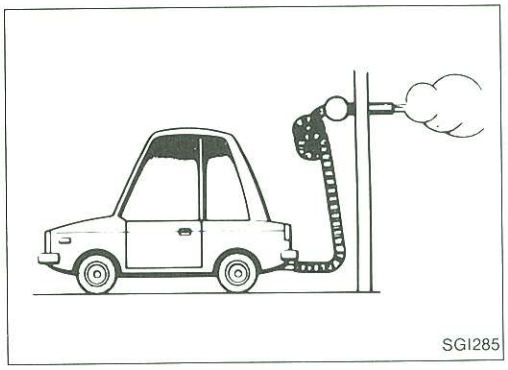
SGI646

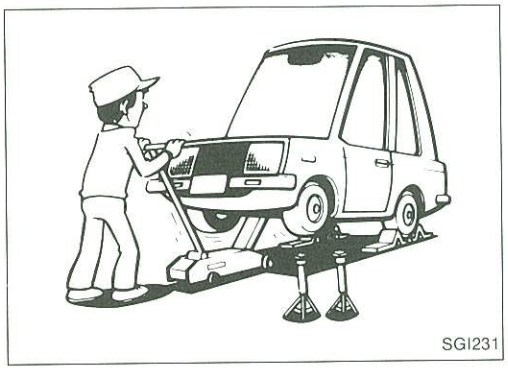
Precautions for Supplemental Restraint System "AIR BAG"

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:

- **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 INFINITI 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".**

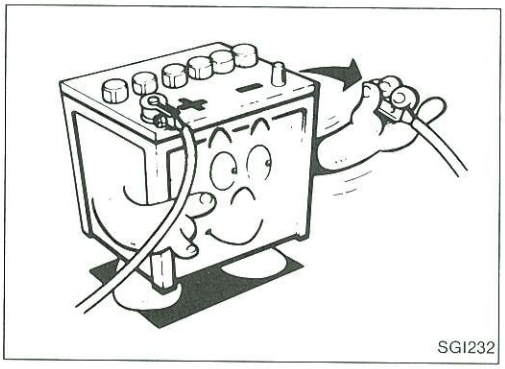

SGI285


SGI231

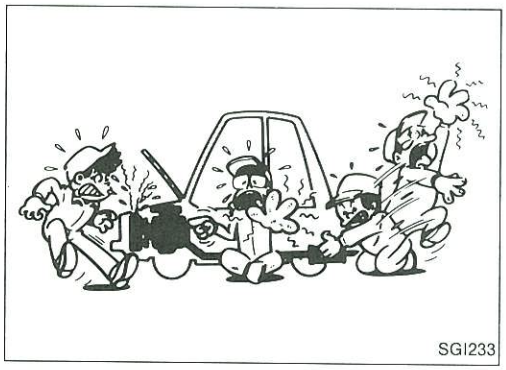
General Precautions

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.

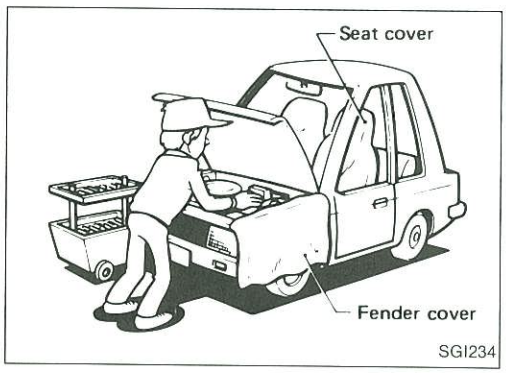
General Precautions (Cont'd)


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 electronic control units).
    Static electricity may damage internal electronic components.
12. After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
13. Use only the lubricants specified in MA section.
14. Use approved bonding agent, sealants or their equivalents when required.
15. Use tools and recommended special tools where specified for safe and efficient service repairs.
16. When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.
17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.

Precautions for E.F.I. or E.C.C.S. Engine

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

Precautions for Catalyst

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

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

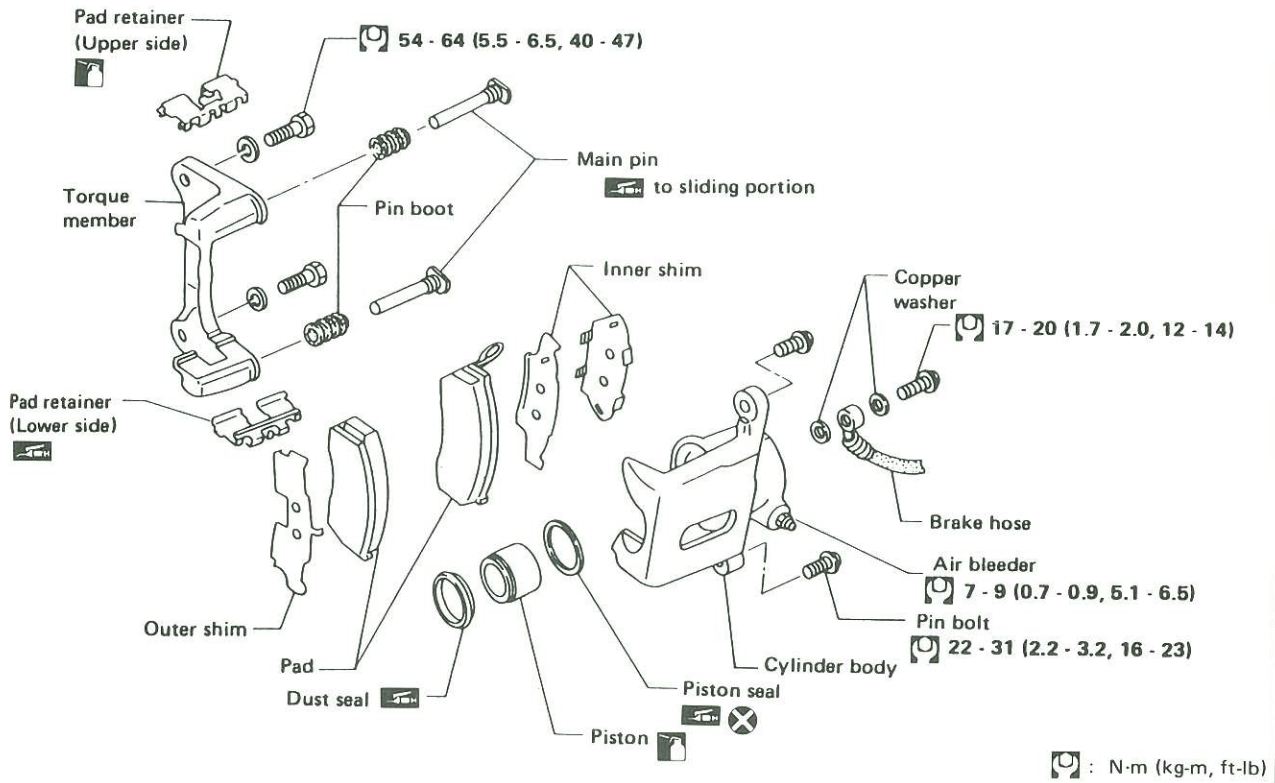
Precautions for Fuel

Use unleaded gasoline with an octane rating of at least 87 AKI (Anti-Knock Index) number (research octane number 91).
For improved vehicle performance, the use of unleaded gasoline with an octane rating of at least 91 AKI number (RON 96) is recommended.

CAUTION:
Do not use leaded gasoline. Using leaded gasoline will damage the catalytic converter.

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**.

Example



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

	:	Tightening torque
	:	Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.
	:	Should be lubricated with oil.
	:	Sealing point
	:	Checking point
	:	Always replace after every disassembly.
(P)	:	Apply petroleum jelly.
ATF	:	Apply A.T.F.
★	:	Select with proper thickness.
☆	:	Adjustment is required.

S.D.S.	:	Service Data and Specifications
L.H.	:	Left-Hand
A/T	:	Automatic Transaxle/Transmission
Tool	:	Special Service Tools
A.T.F.	:	Automatic Transmission Fluid
D_1	:	Drive range 1st gear
D_2	:	Drive range 2nd gear
D_3	:	Drive range 3rd gear
D_4	:	Drive range 4th gear
O.D.	:	Overdrive

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:

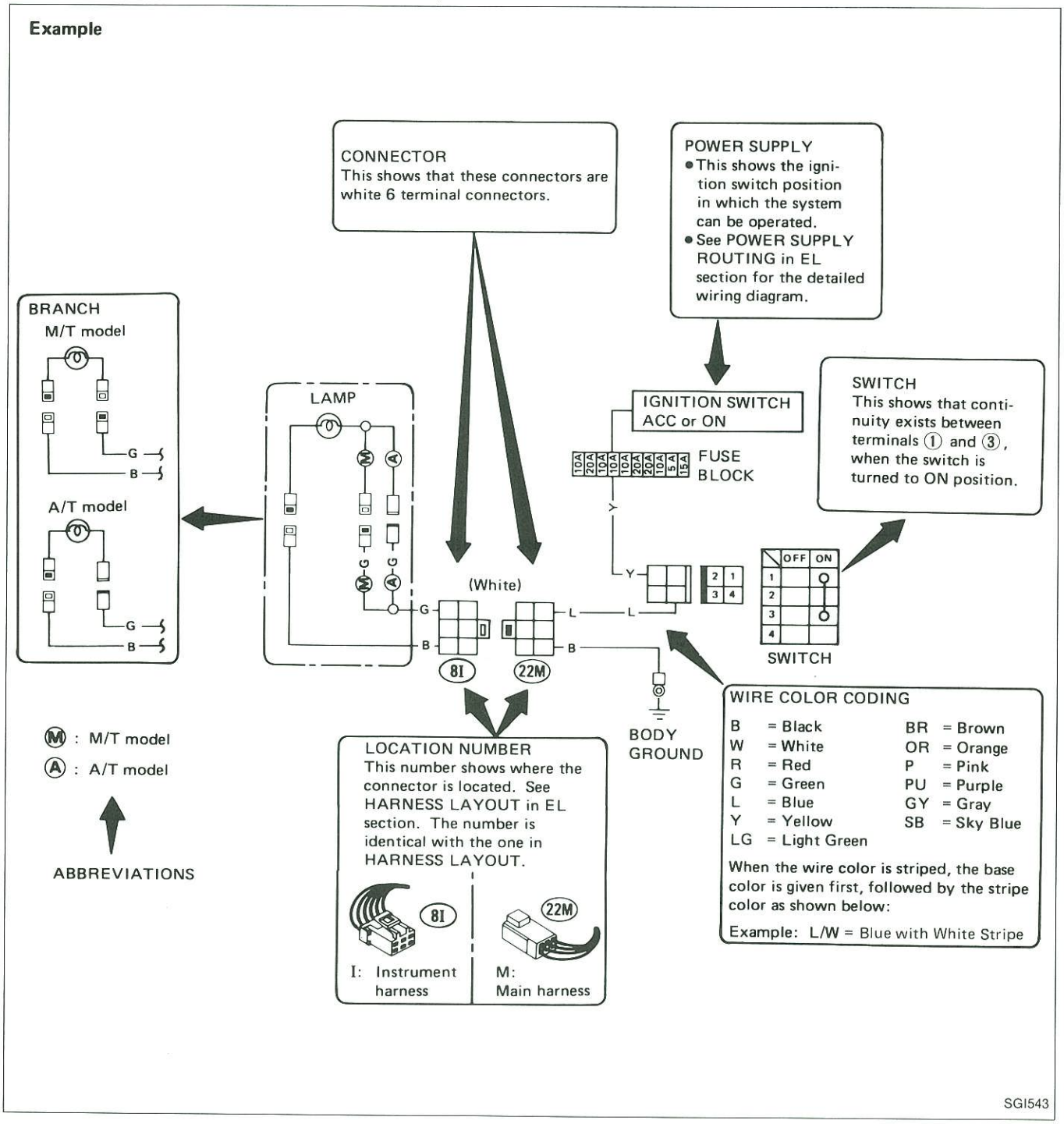
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

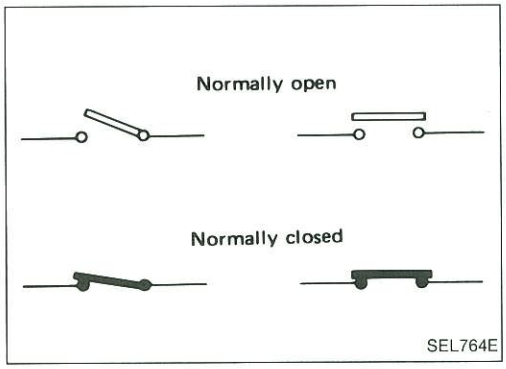
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal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

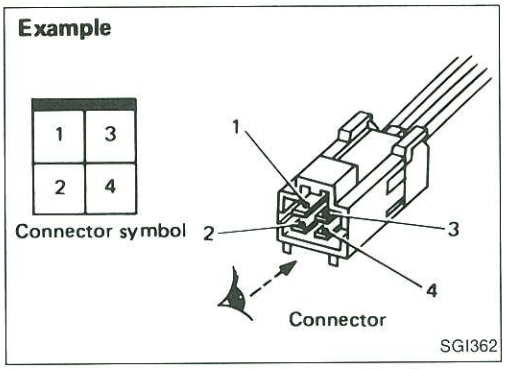




SWITCH POSITIONS

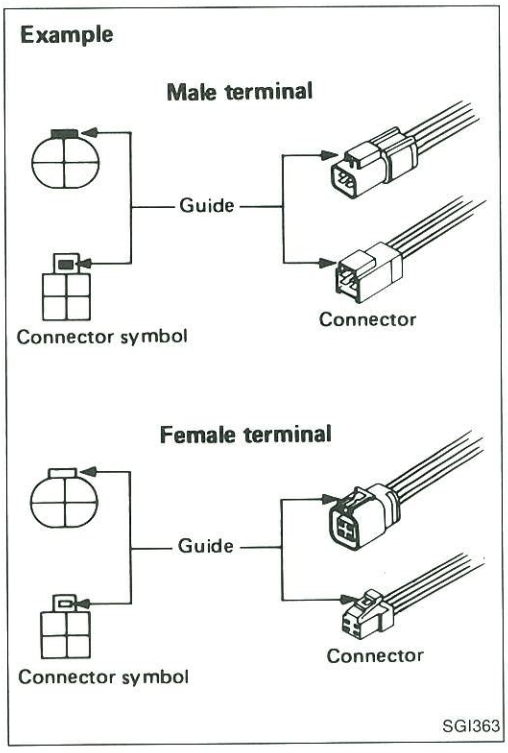
Wiring diagram switches are shown with the vehicle in the following condition.

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



CONNECTOR SYMBOLS

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

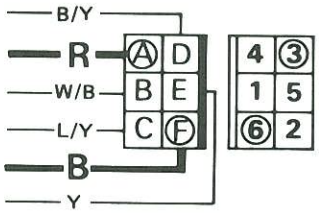


- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

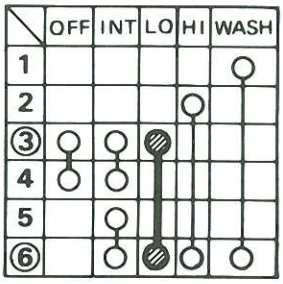
MULTIPLE SWITCH

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

Example



WIPER SWITCH



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

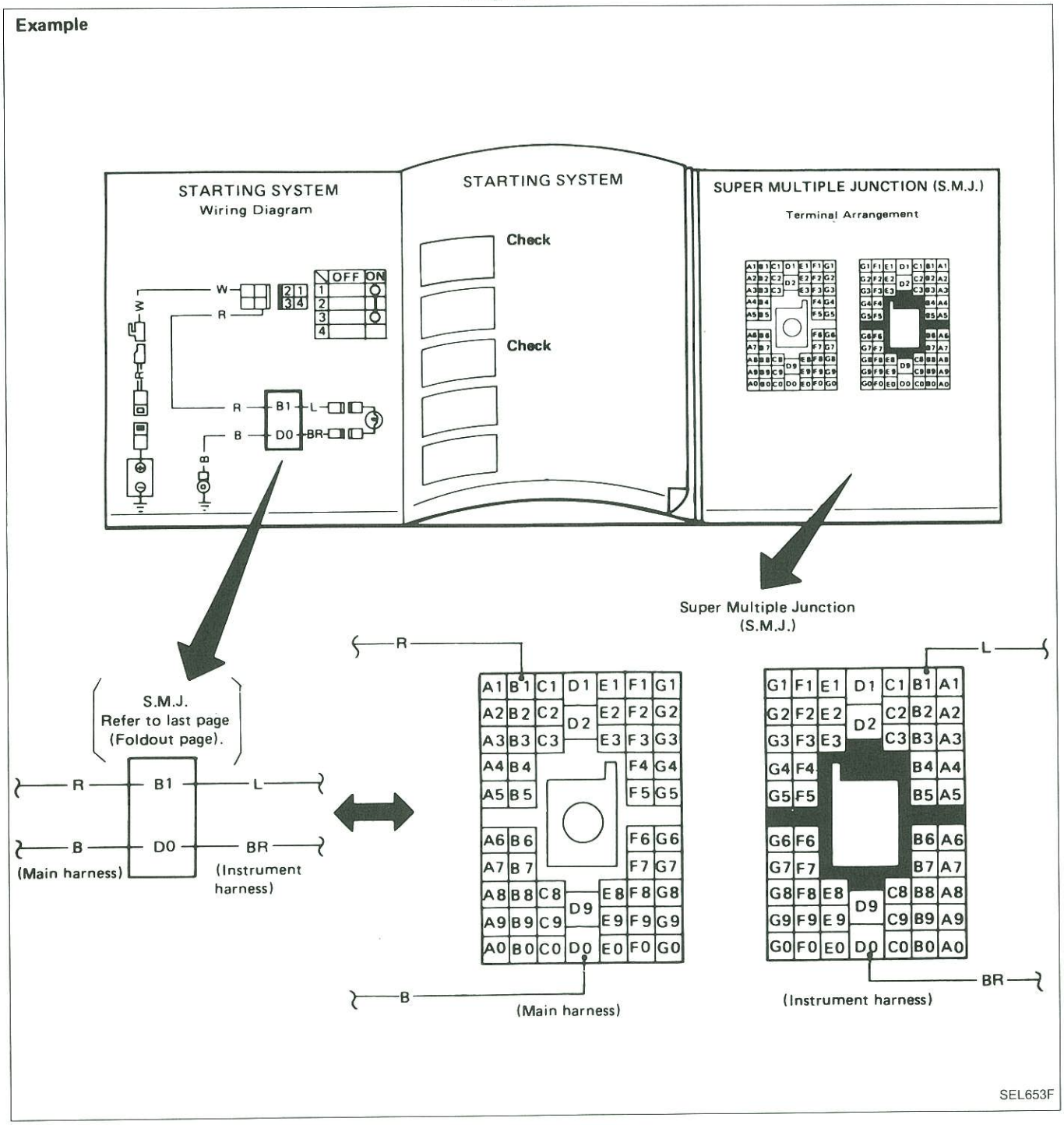
Example: Wiper switch in LO position
Continuity circuit: Red wire – Ⓐ terminal – ③ terminal – Wiper switch (● – ● : LO) – ⑥ terminal – Ⓕ terminal – Black wire

SGI365

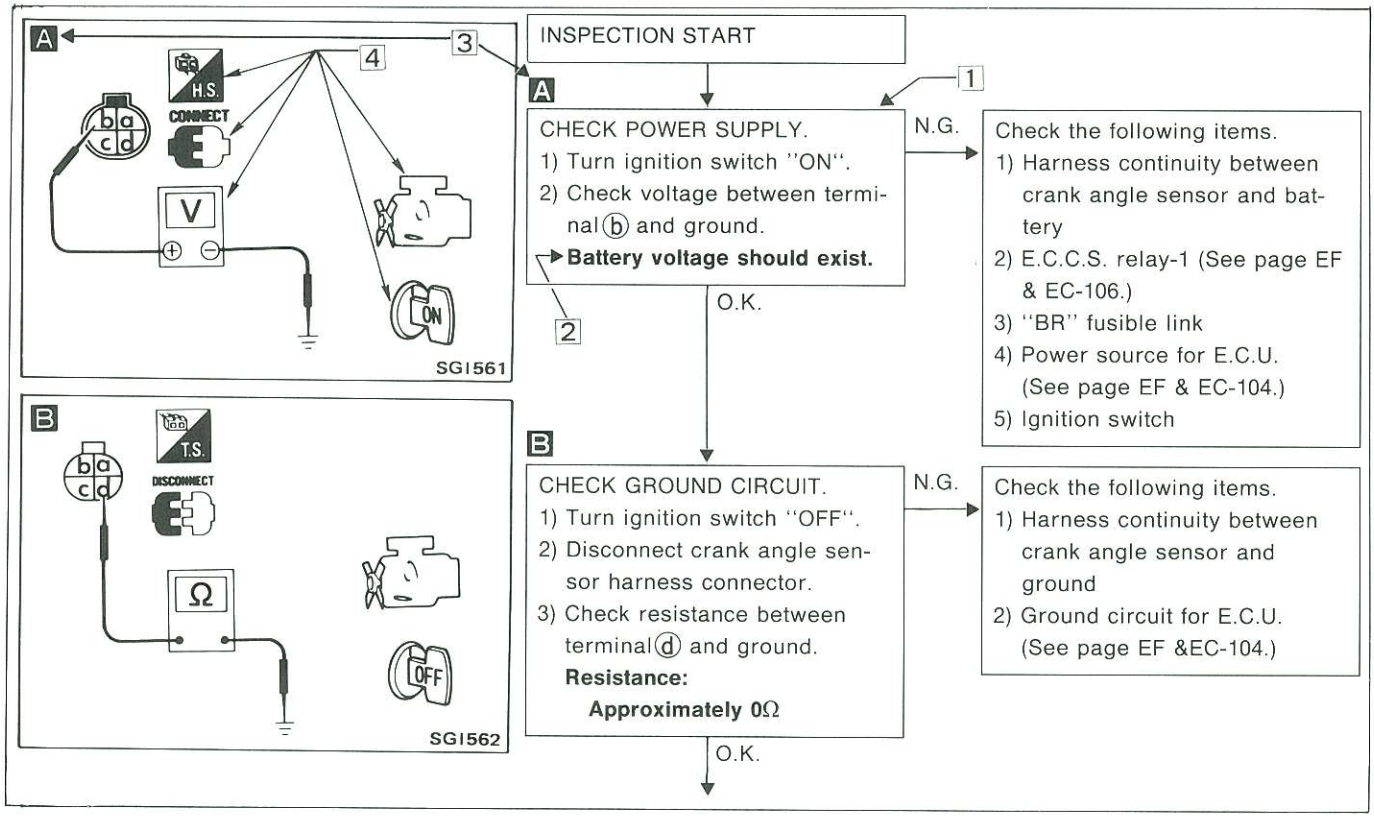
SUPER MULTIPLE JUNCTION (S.M.J.)

- 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

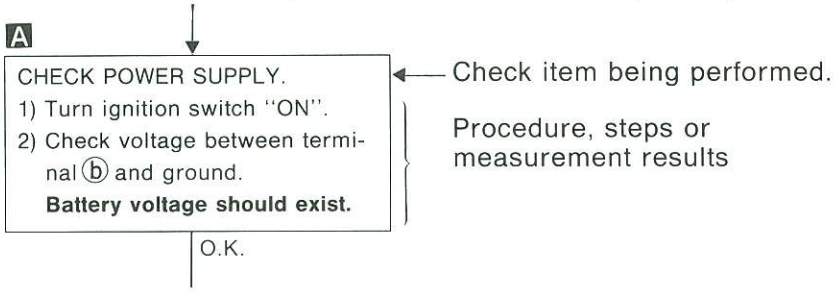
The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

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:

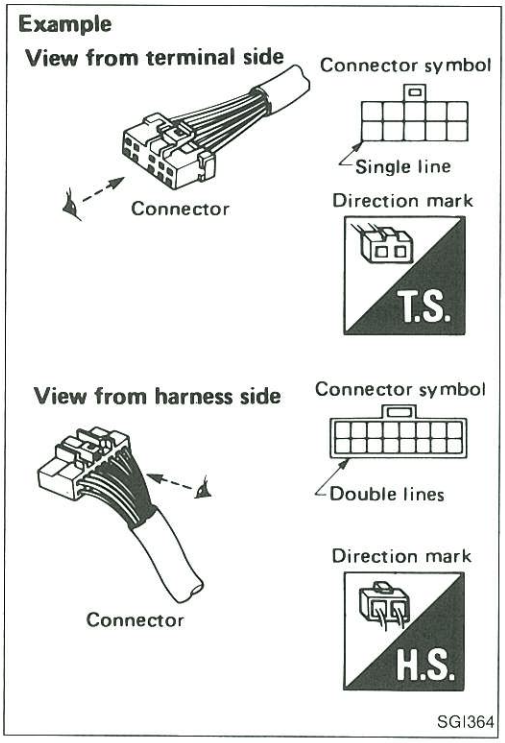
Battery voltage → 11 - 14V or approximately 12V
Voltage: Approximately 0V → Less than 1V

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 flow chart for easy identification. More precisely, the procedure under the "CHECK POWER SUPPLY" outlined previously is indicated by an illustration A.

4 Symbols used in illustrations

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



Direction mark

A direction mark is shown to clarify the side of connector (terminal side or harness side).
Direction marks are mainly used in the illustrations indicating terminal inspection.

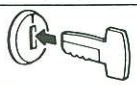
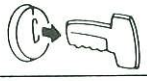
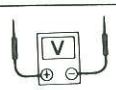
: **View from terminal side ... T.S.**

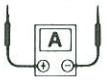
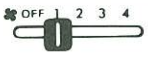
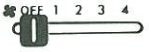
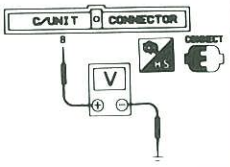
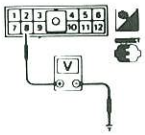
- **All connector symbols shown from the terminal side are enclosed by a single line.**

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

- **All connector symbols shown from the harness side are enclosed by a double line.**

Key to symbols signifying measurements or procedures

Symbol	Symbol explanation
	Check after disconnecting the connector to be measured.
	Check after connecting the connector to be measured.
	Insert key into ignition switch.
	Remove key from ignition switch.
	Turn ignition switch to "OFF" position.
	Turn ignition switch to "ON" position.
	Turn ignition switch to "START" position.
	Turn ignition switch from "OFF" to "ACC" position.
	Turn ignition switch from "ACC" to "OFF" position.
	Turn ignition switch from "OFF" to "ON" position.
	Turn ignition switch from "ON" to "OFF" position.
	Do not start engine, or check with engine stopped.
	Start engine, or check with engine running.
	Apply parking brake.
	Release parking brake.
	Check after engine is warmed up sufficiently.
	Voltage should be measured with a voltmeter.
	Circuit resistance should be measured with an ohmmeter.

Symbol	Symbol explanation
	Current should be measured with an ammeter.
	Procedure with CONSULT
	Procedure without CONSULT
	A/C switch is "OFF".
	A/C switch is "ON".
	Fan switch is "ON". (At any position except for "OFF" position)
	Fan switch is "OFF".
	Apply battery voltage directly to components.
	Drive vehicle.
	Disconnect battery negative cable.
	Depress brake pedal.
	Release brake pedal.
	Depress accelerator pedal.
	Release accelerator pedal.
	Pin terminal check for S.M.J. type E.C.U. and A/T control unit connectors. **For details regarding the terminal arrangement, refer to the foldout page.** 

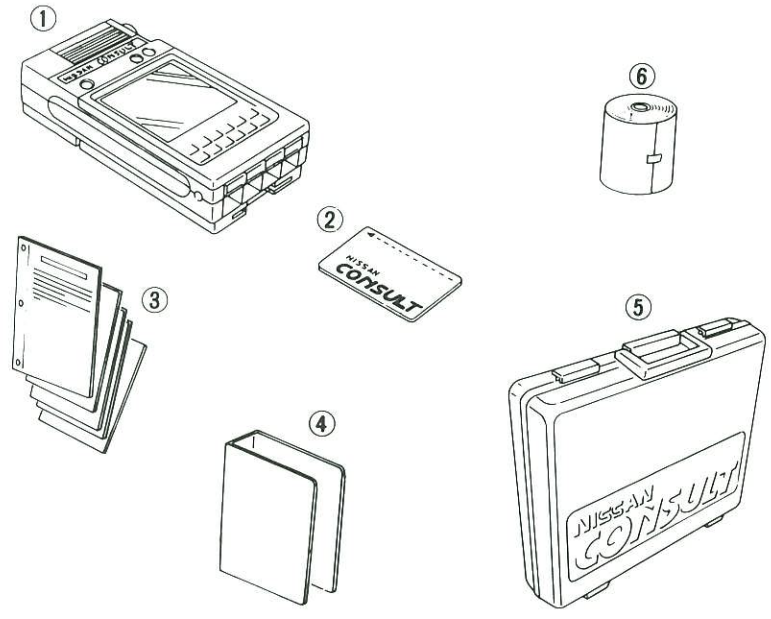
System Application and Function

Diagnostic mode	Function	E.C.C.S.	A/T	Air bag
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT.	X	—	—
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	X	X	X
Data monitor	Input/Output data in the control unit can be read.	X	X	—
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.	X	—	—
E.C.U. part number	E.C.U. part number can be read.	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

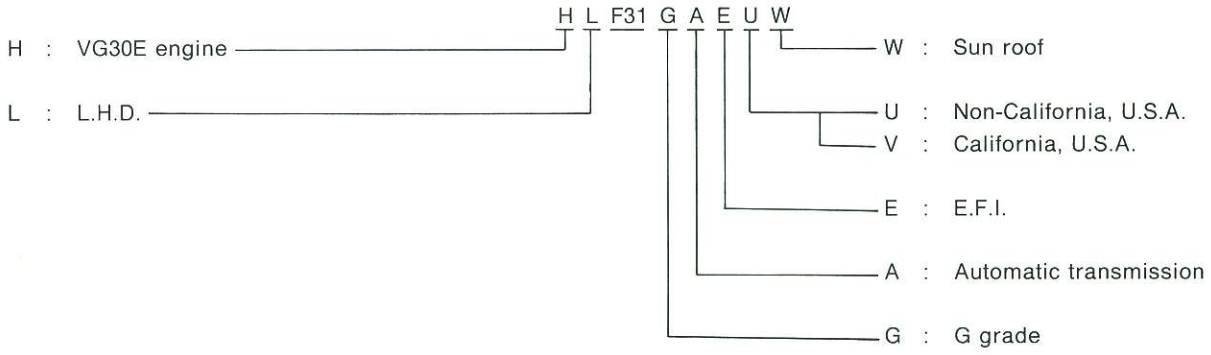
When ordering the below equipment, contact your INFINITI distributor.

Tool name	Description
NISSAN CONSULT kit ① CONSULT unit and accessories ② Program card (UE 900) ③ Operation manuals ④ Binder ⑤ Carrying case ⑥ Thermal paper (Rolls)	

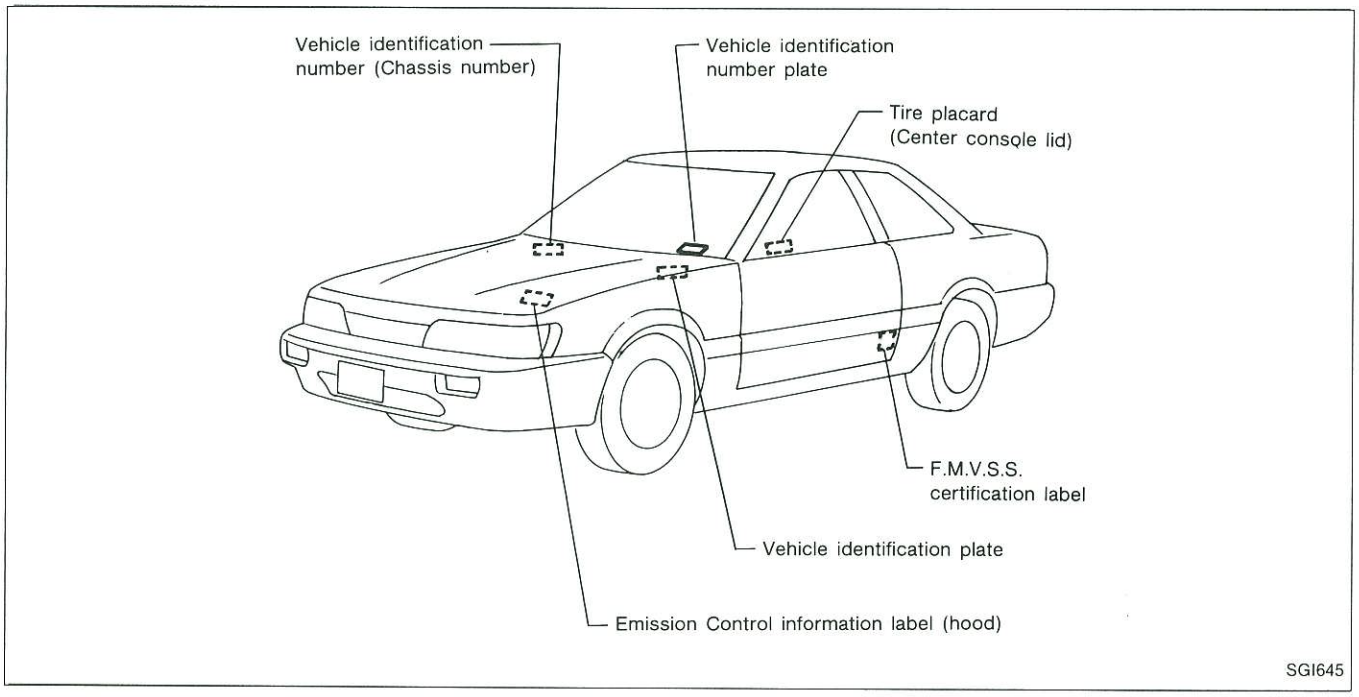
Model Variation

Body	Destination	Grade	Model	Engine	Transmission	Differential carrier	Road wheel size ... offset mm (in)	Tire size
Coupe	Non-California	Base	HL-GAEU	VG30E	RE4R01A	R200	6-1/2JJ x 15 ... 25 (0.98)	P215/60R15 93H
		STD	HL-GAEUW					
	California	Base	HL-GAEV					
		STD	HL-GAEVW					

Prefix and suffix designations:



Identification Number



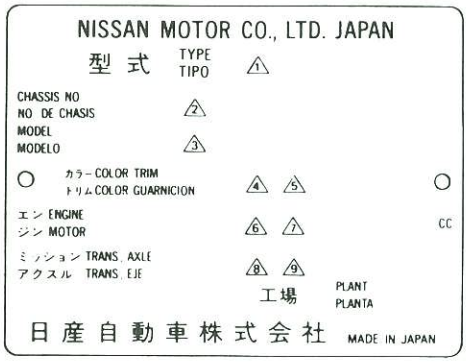
VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JNK H F 1 4 C X N T 000001

- Manufacturer
  - JNK : Nissan, Passenger vehicle
- Engine type
  - H : VG30E
- Vehicle line
  - F : INFINITI M30
- Model change
- Body type
  - 4 : 2-door Coupe
- Restraint system
  - C : Air bag + 3-point belt
- Check digit (0 to 9 or X)
  - The code for the check digit is determined by mathematical computation.
- Model year
  - N : 1992 year model
- Manufacturing plant
  - T : Oppama
- Vehicle serial number (Chassis number)

Identification Number (Cont'd)

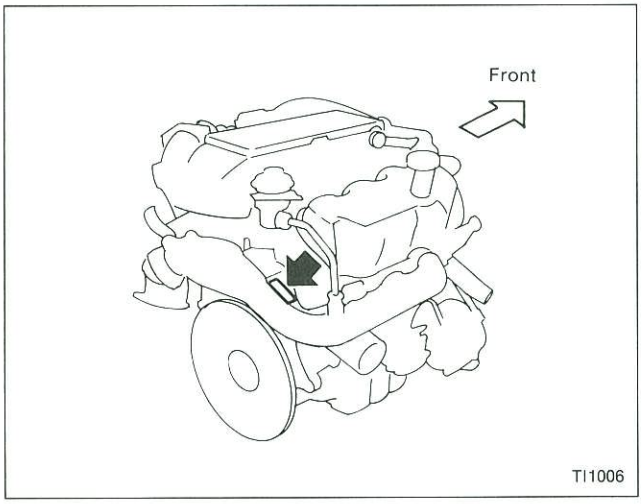
IDENTIFICATION PLATE



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

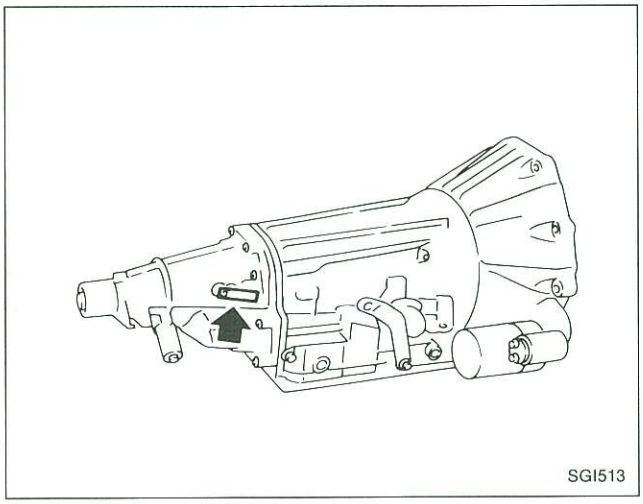
SGI315

ENGINE SERIAL NUMBER



TI1006

AUTOMATIC TRANSMISSION NUMBER



SGI513

Dimensions

Unit: mm (in)

Item \ Model		Coupe
Overall length		4,796 (188.8)
Overall width		1,689 (66.5)
Overall height		1,379 (54.3)
Wheel base		2,616 (103.0)
Tread	Front	1,435 (56.5)
	Rear	1,435 (56.5)

Wheels and Tires

Road wheel	Aluminum	6-1/2 JJ x 15
	Offset mm (in)	25 (0.98)
Tire size	Conventional	P215/60R15
	Spare	T135/70D15

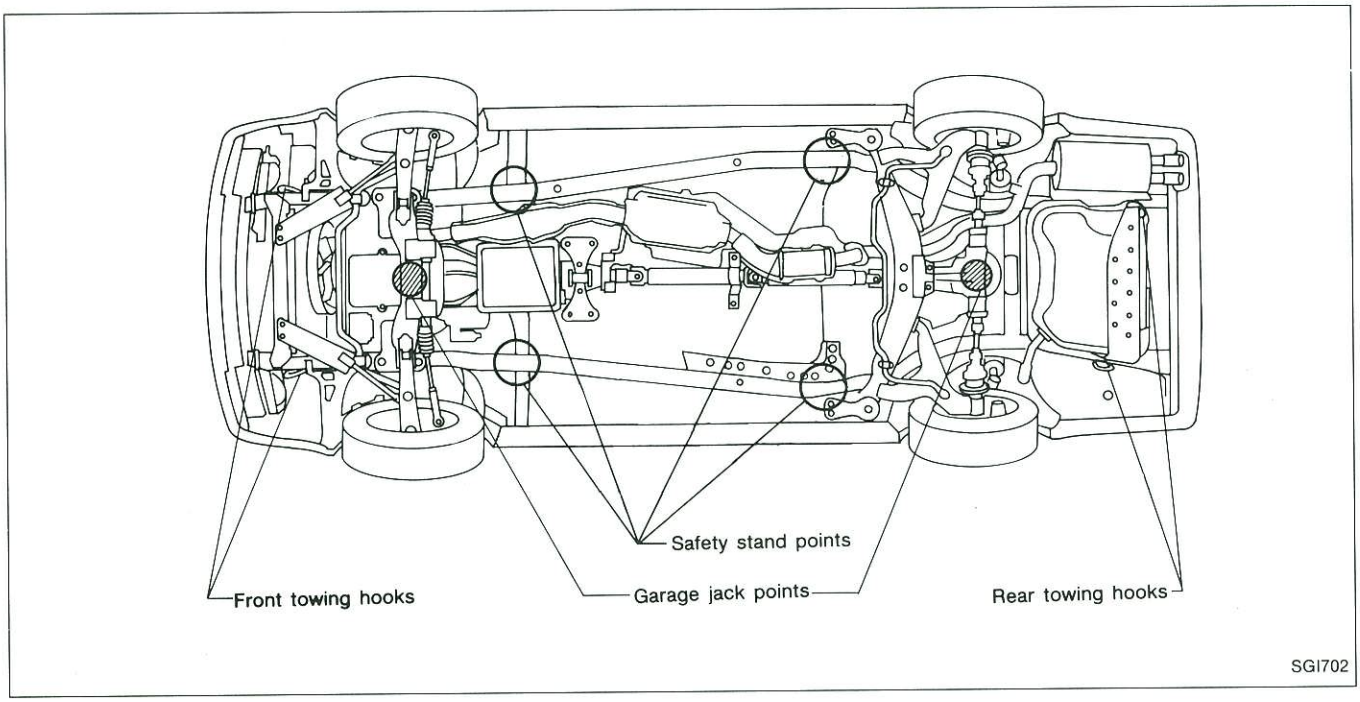
Garage Jack and Safety Stand

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.

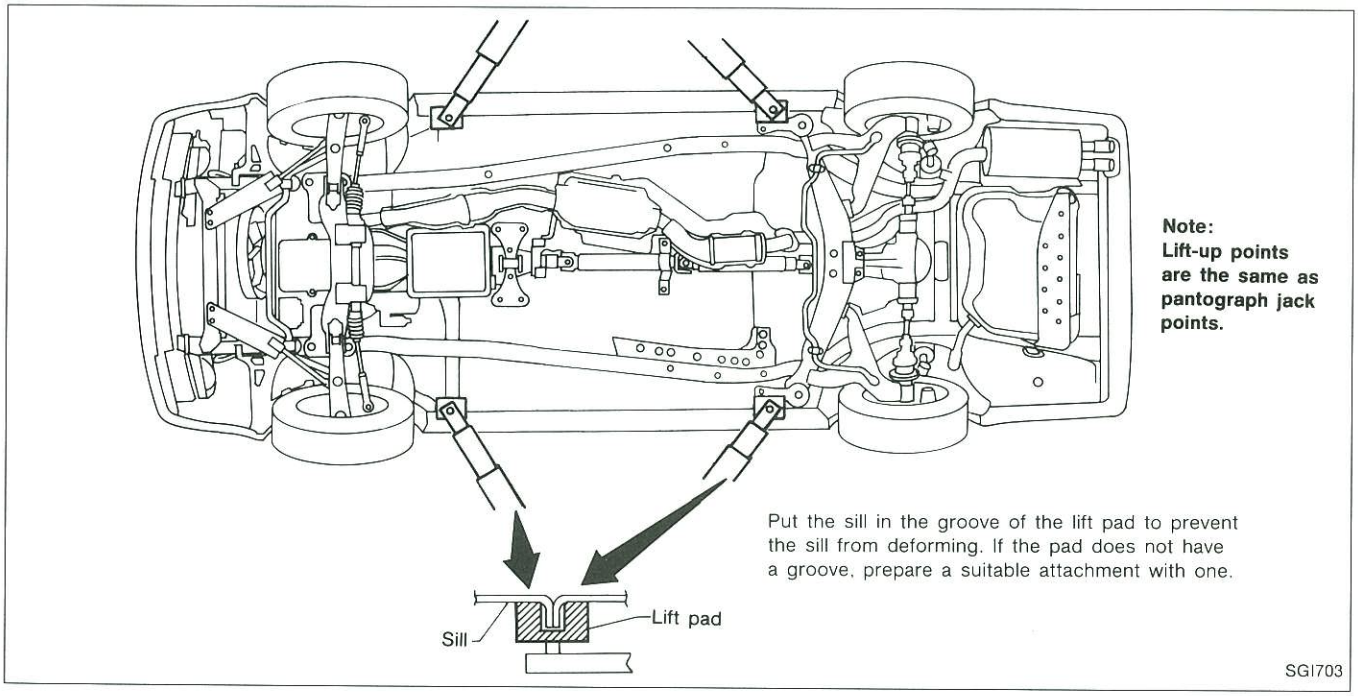


2-pole Lift

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.

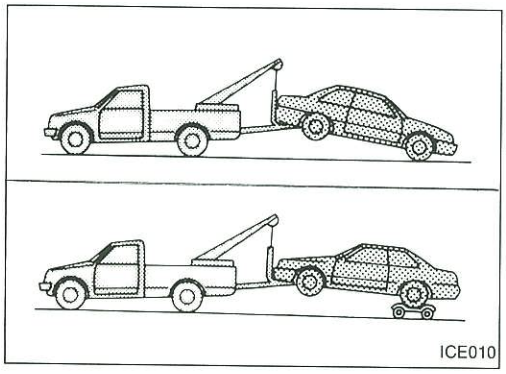
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



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 shift lever to neutral ("N" position).**
- **Never tow the vehicle from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transmission.**



INFINITI 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.

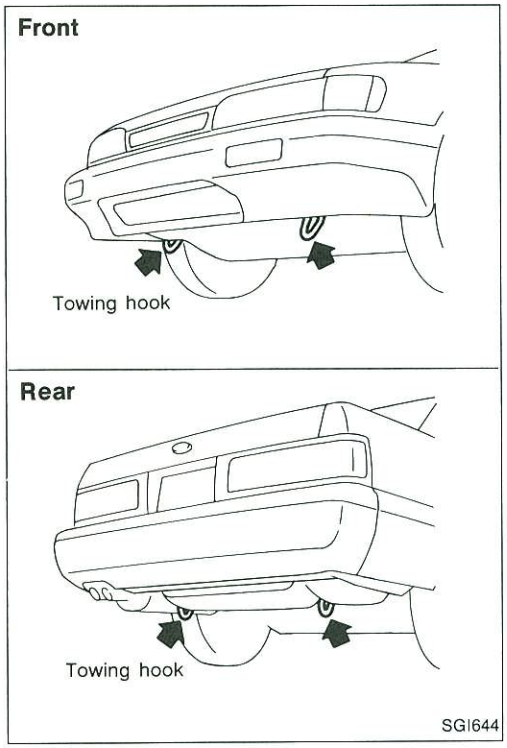
Speed:

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

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

TIGHTENING TORQUE OF STANDARD BOLTS

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

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

Grade	Mark
4T	4
7T	7
9T	9

* : Nominal diameter

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

MAINTENANCE

SECTION MA

CONTENTS

PRECAUTIONS ..... MA- 2
GENERAL MAINTENANCE ..... MA- 3
PERIODIC MAINTENANCE ..... MA- 5
RECOMMENDED FLUIDS AND LUBRICANTS ..... MA- 8
ENGINE MAINTENANCE ..... MA- 9
CHASSIS AND BODY MAINTENANCE MA-16
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MA-21

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 INFINITI 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 INFINITI dealers do them.

Item	Reference page
OUTSIDE THE VEHICLE The maintenance items listed here should be performed from time to time, unless otherwise specified.	
Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	—
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).	MA-18
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-18 FA-8
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. 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-20
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 adjuster, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restraints move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks.	—
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-20
Brakes Check that the brake does not pull the vehicle to one side when applied.	—
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 floor mats away from the pedal.	BR-9 BR-12

Item	Reference page
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied.	BR-27
Automatic transmission "Park" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes.	—
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 fluid level Make sure that the brake fluid level is between the "MAX" and "MIN" lines on the reservoir.	MA-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 belts 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-19
Automatic transmission fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	MA-16
Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a small of exhaust fumes, immediately locate the trouble and correct it.	MA-19
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 as necessary.

[ ]: Perform service at the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL																
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	3.75	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)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	(78)	(84)	(90)	(96)	
	Months	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	
EMISSION CONTROL SYSTEM MAINTENANCE																		
Service "A"																		
Engine oil		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-13
Engine oil filter (Use Nissan PREMIUM type or equivalent)		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-13
Service "E"																		
Air cleaner filter	See NOTE (1)								[R]								[R]	MA-13
Service "F"																		
Vapor lines									I*								I*	MA-15
Fuel lines									I*								I*	MA-12
Fuel filter	See NOTE (2)*																	MA-12
Service "G"																		
Drive belts	See NOTE (3)																I*	MA-9
Service "J"																		
Engine coolant	See NOTE (4)																R*	MA-10
Service "H"																		
Spark plugs (PLATINUM-TIPPED type)																	[R]	MA-14
Timing belt																	[R]	EM-13
CHASSIS AND BODY MAINTENANCE																		
Service "B"																		
Brake pads & discs			I		I		I		I		I		I		I		I	MA-18
Steering gear & linkage, axle & suspension parts			I		I		I		I		I		I		I		I	MA-19, FA-5, RA-5
Steering linkage ball joints & front suspension ball joints			I		I		I		I		I		I		I		I	MA-19, FA-6
Exhaust system			I		I		I		I		I		I		I		I	MA-19
Service "D"																		
Brake lines & cables					I				I				I				I	MA-17
Automatic transmission oil & differential gear oil	See NOTE (5)				I				I				I				I	MA-16, 17
Air bag system	See NOTE (6)																	BF-49

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

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

[ ]: Perform service at the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	7.5	15	22.5	30	37.5	45	52.5	60	Reference page
	(km x 1,000)	(12)	(24)	(36)	(48)	(60)	(72)	(84)	(96)	
	Months	6	12	18	24	30	36	42	48	
EMISSION CONTROL SYSTEM MAINTENANCE										
Service "A"										
Engine oil		R	R	R	R	R	R	R	R	MA-13
Service "C"										
Engine oil filter (Use Nissan PREMIUM type or equivalent)		R		R		R		R		MA-13
Service "E"										
Air cleaner filter					[R]				[R]	MA-13
Service "F"										
Vapor lines					I*				I*	MA-15
Fuel lines					I*				I*	MA-12
Fuel filter	See NOTE (1)*									MA-12
Service "G"										
Drive belts	See NOTE (2)								I*	MA-9
Service "J"										
Engine coolant	See NOTE (3)								R*	MA-10
Service "H"										
Spark plugs (PLATINUM-TIPPED Type)									[R]	MA-14
Timing belt									[R]	EM-13
CHASSIS AND BODY MAINTENANCE										
Service "D"										
Brake lines & cables			I		I		I		I	MA-17
Brake pads & discs			I		I		I		I	MA-18
Automatic transmission oil & differential gear oil			I		I		I		I	MA-16, 17
Exhaust system			I		I		I		I	MA-19
Service "F"										
Steering gear linkage axle & suspension parts					I				I	MA-19, FA-5, RA-5
Air bag system	See NOTE (4)									BF-49

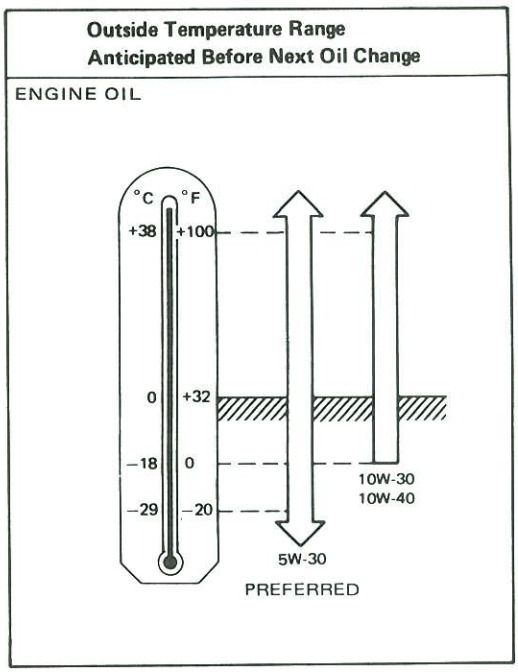
NOTE:
(1) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.
(2) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000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

Fluids and Lubricants

	Capacity (Approximate)			Recommended fluids and lubricants
	US measure	Imp measure	Liter	
Engine oil (Refill)				
With oil filter	4-5/8 qt	3-7/8 qt	4.4	Energy Conserving Oils of API SG*2, *3
Without oil filter	4-1/4 qt	3-1/2 qt	4.0	
Cooling system (With reservoir)	9-5/8 qt	8 qt	9.15	Anti-freeze coolant (Ethylene glycol base)
Differential gear oil	2-3/4 pt	2-1/4 pt	1.3	API GL-5*2
Automatic transmission fluid	8-3/4 qt	7-1/4 qt	8.3	Genuine ATF*1 or equivalent Type DEXRON™
Power steering fluid	—	—	—	Type DEXRON™
Brake fluid	—	—	—	Genuine Brake Fluid*1 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose grease	—	—	—	NLGI No. 2 (Lithium soap base)

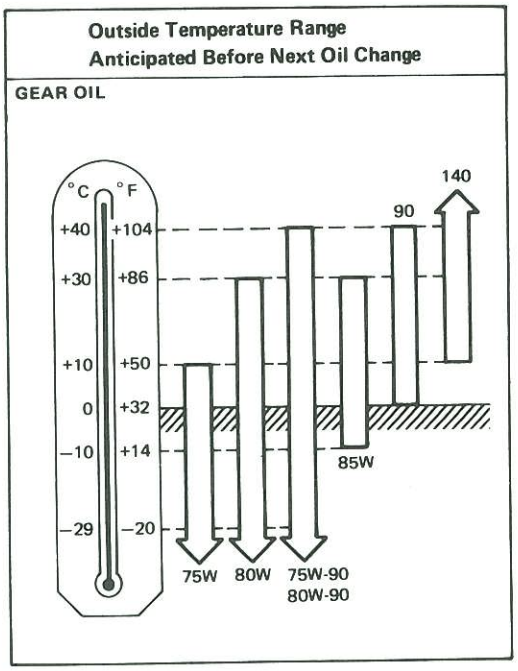
*1: Available in mainland U.S.A. through your INFINITI dealer.
*2: For further details, see "Recommended SAE viscosity number".
*3: Energy conserving oils
These oils can be identified by such labels as EC-I, EC-II, energy conserving, energy saving, improved fuel economy, etc.

SAE Viscosity Number



TI0008

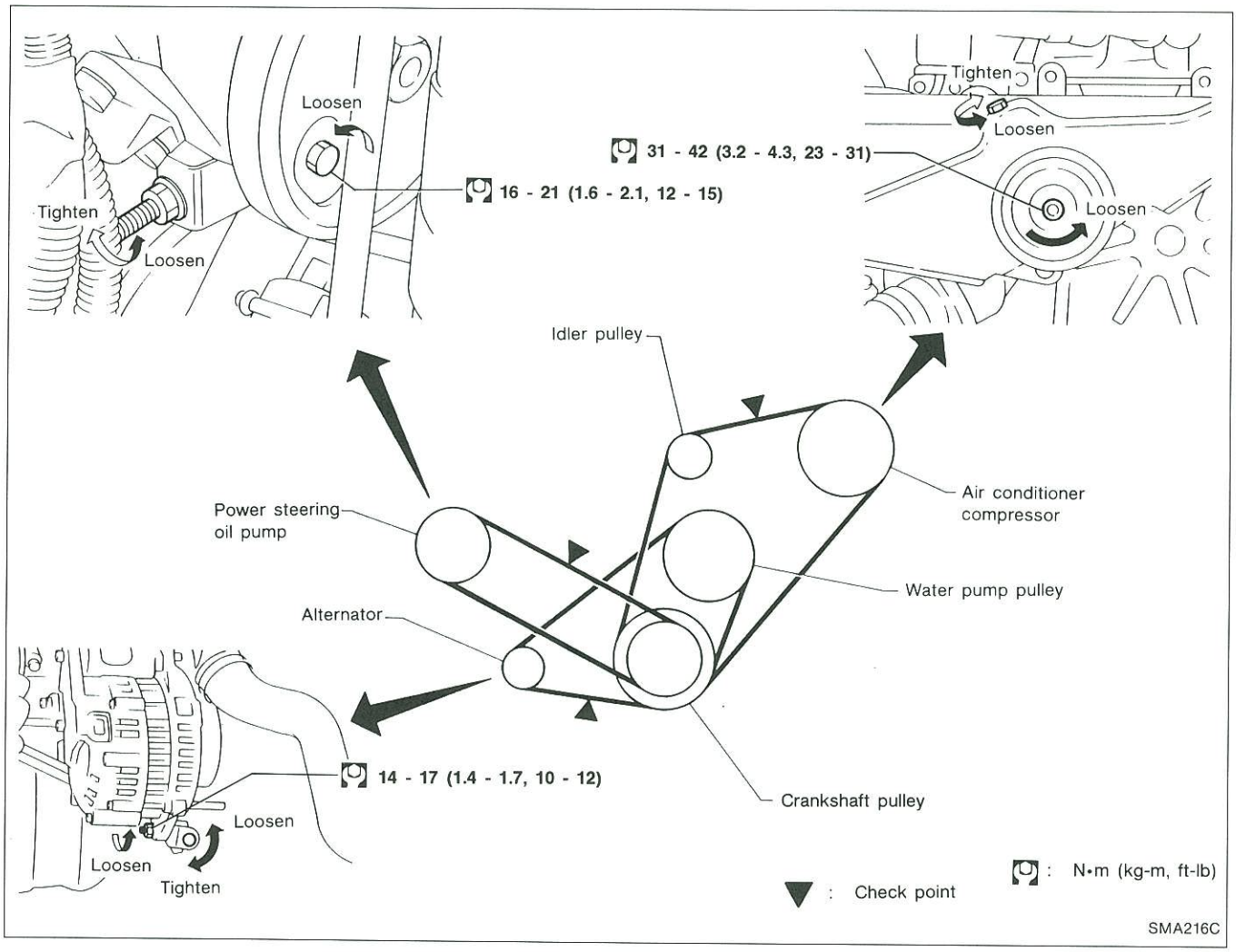
5W-30 is preferable for all ambient temperature . 20W-40 and 20W-50 are usable for ambient temperatures above 10°C (50°F) for all seasons.



TI0003

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

Checking Drive Belts



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

Adjust if belt deflection exceed the limit.

Belt deflection:

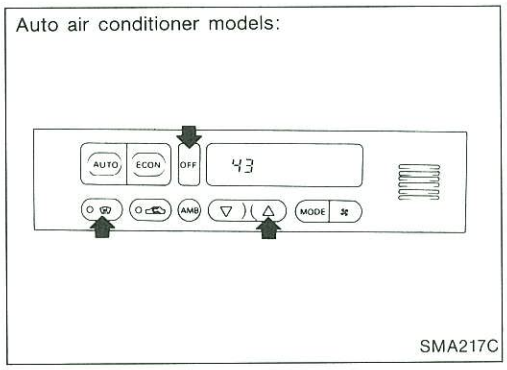
Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	12 (0.47)	7.5 - 8.5 (0.295 - 0.335)	6.5 - 7.5 (0.256 - 0.295)
Air conditioner compressor	14 (0.55)	9 - 10 (0.35 - 0.39)	8 - 9 (0.31 - 0.35)
Power steering oil pump	20 (0.79)	14 - 16 (0.55 - 0.63)	12 - 14 (0.47 - 0.55)
Applied pushing force	98 N (10 kg, 22 lb)		

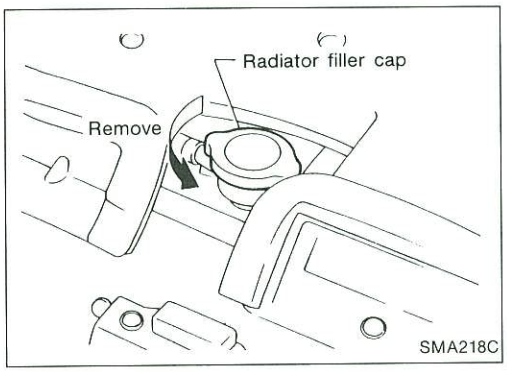
Inspect drive belt deflection when engine is cold.

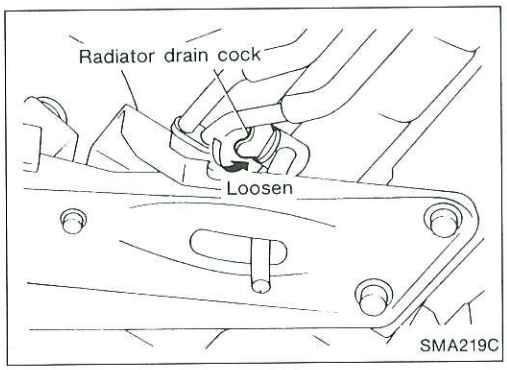
Changing Engine Coolant

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



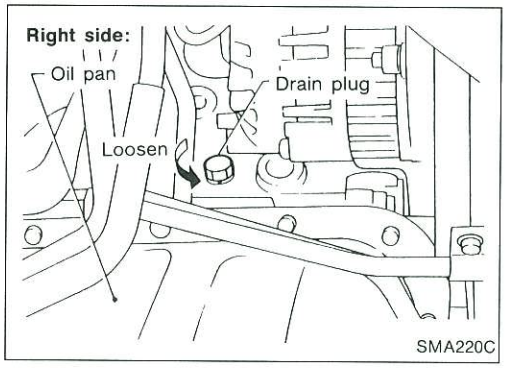
1. Manual air conditioner models:
   Move heater "TEMP" control lever all the way to the "HOT" position.
1. Auto air conditioner models:
   Perform self-diagnosis step 4 of Automatic Air Conditioner system, referring to the following notes. (Refer to HA section.)
1) Turn ignition switch from "OFF" to "ON".
2) In 10 seconds after starting engine (ignition switch is turned "ON"), press OFF switch for at least 5 seconds.
3) Press (HOT) switch 3 times.
4) Press (DEF) switch 2 times.
5) Confirm indication of the A/C display shown at left.
6) Wait 10 seconds before turning ignition switch off.





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

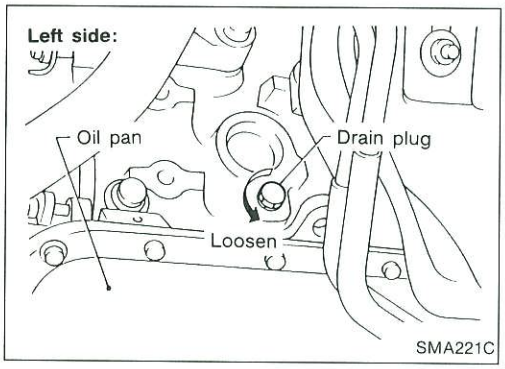
Changing Engine Coolant (Cont'd)

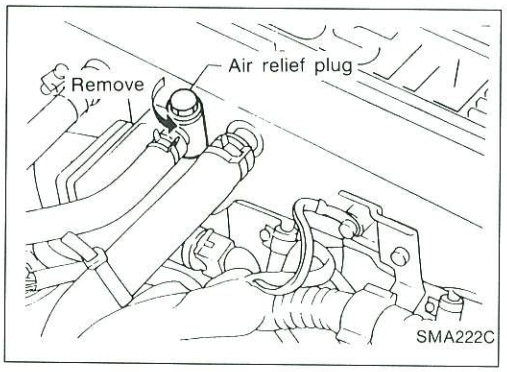


3. Remove drain plugs on both sides of cylinder block.
4. Close drain cock and tighten drain plugs securely.

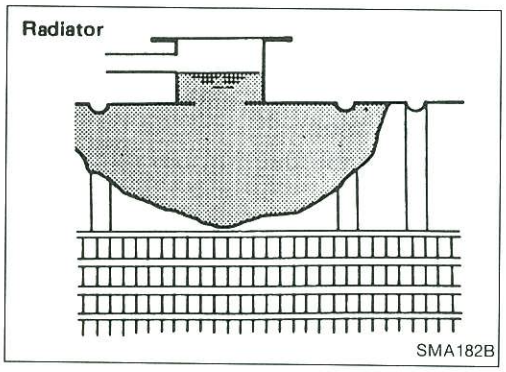
- **Apply sealant to the drain plug thread.**

: 34 - 44 N·m
(3.5 - 4.5 kg-m, 25 - 33 ft-lb)





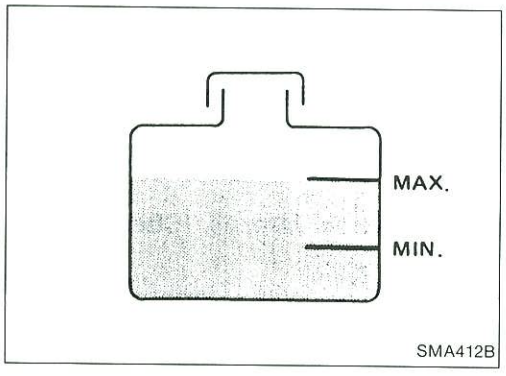
5. Open air relief plug.
6. Fill radiator with water and close air relief plug.
7. Start engine and warm it up sufficiently.
8. Stop engine and wait until it cools down.
9. Repeat step 3 through step 8 until clear water begins to drain from radiator.
10. Drain water.



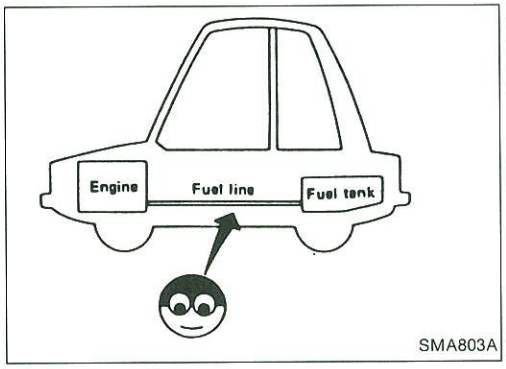
11. Open air relief plug again.
12. Fill radiator with coolant up to specified level.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity (Without reservoir tank):
8.35 ℓ (8-7/8 US qt, 7-3/8 Imp qt)
Reservoir tank:
0.8 ℓ (7/8 US qt, 3/4 Imp qt)

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

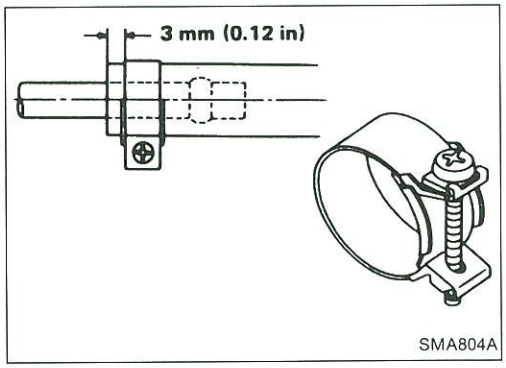


13. Remove reservoir tank, drain coolant, then clean reservoir tank.
14. Fill reservoir tank with coolant up to "MAX" level.
15. Close air relief plug again.
16. Run engine and warm it up.
17. Stop engine and cool it down, then add coolant as necessary.



Checking Fuel Lines

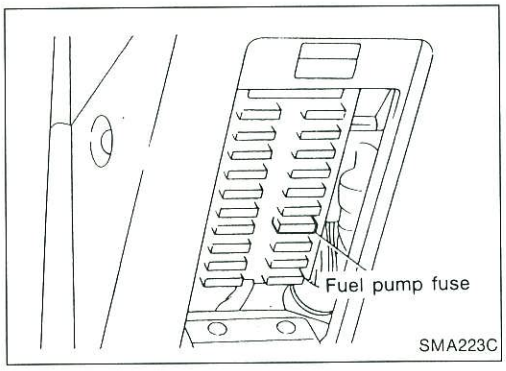
Inspect fuel lines and tank for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.
If necessary, repair or replace malfunctioning parts.



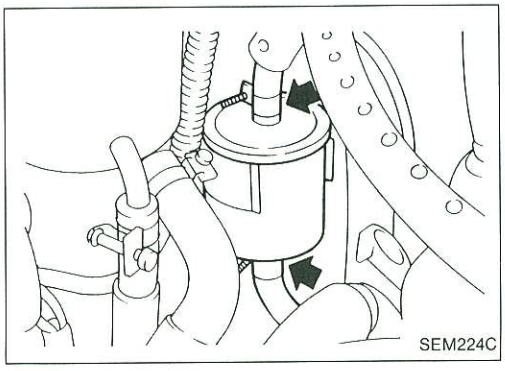
CAUTION:
Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.
Tightening torque specifications are the same for all rubber hose clamps.
Ensure that screw does not contact adjacent parts.

Changing Fuel Filter

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

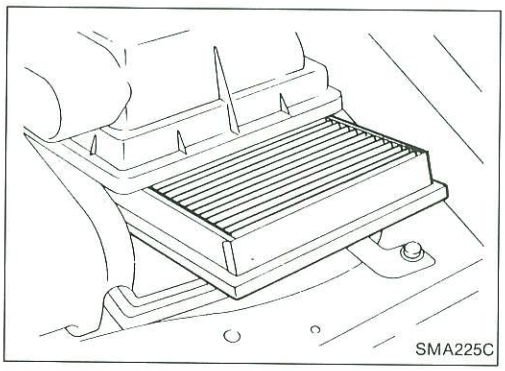


1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.



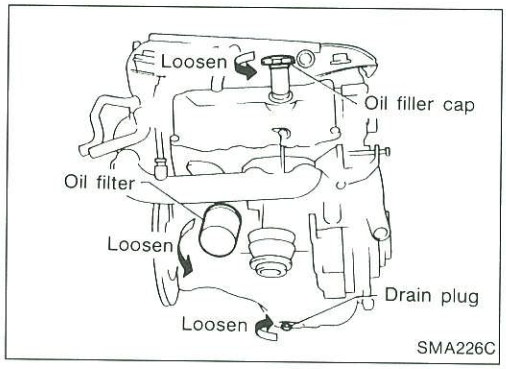
5. Loosen fuel hose clamps.
6. Replace fuel filter.

- **Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.**
- **Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**
- **When tightening fuel hose clamps, refer to "Checking Fuel Lines".**
- **Erase memory (Code No. 22) from control unit. (Refer to EF & EC section.)**


SMA225C

Changing Air Cleaner Filter

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



SMA226C

Changing Engine Oil

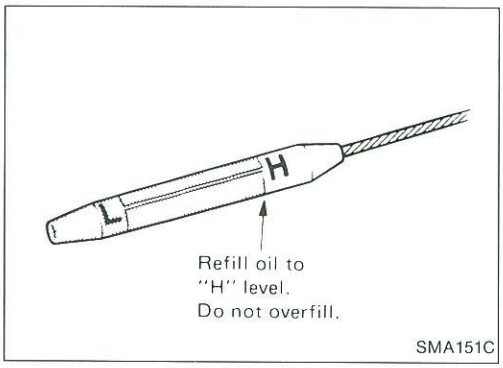
WARNING:

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

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.
3. Drain oil and refill with new engine oil.
   Oil grade: API SG
   Viscosity:
   See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section.
   Refill oil capacity (Approximately):
   With oil filter 4.4 ℓ (4-5/8 US qt, 3-7/8 Imp qt)
   Without oil filter 4.0 ℓ (4-1/4 US qt, 3-1/2 Imp qt)

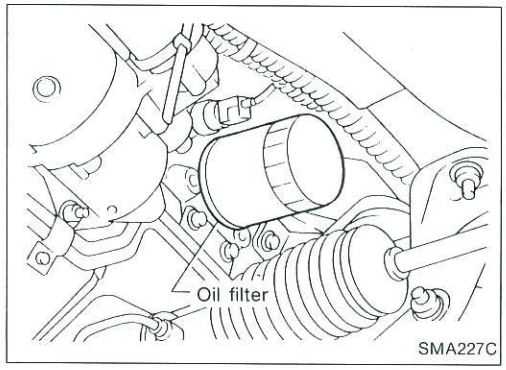
CAUTION:

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



SMA151C

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.



SMA227C

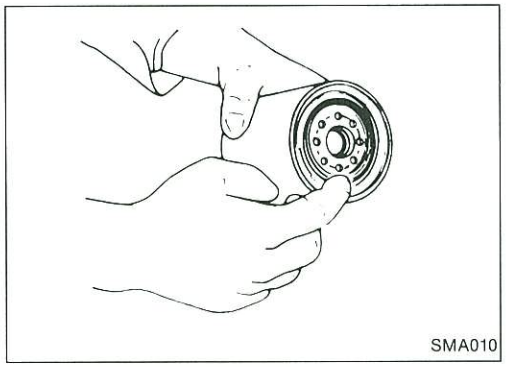
Changing Oil Filter

1. Remove oil filter with a suitable tool.

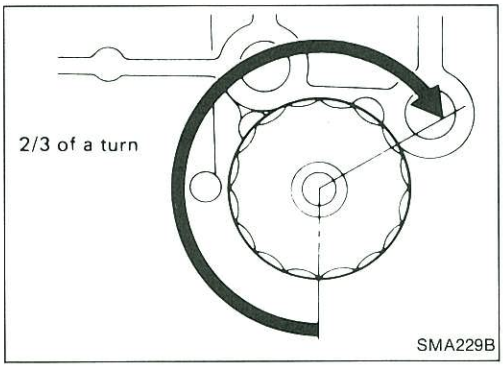
WARNING:

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

Changing Oil Filter (Cont'd)


SMA010

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.

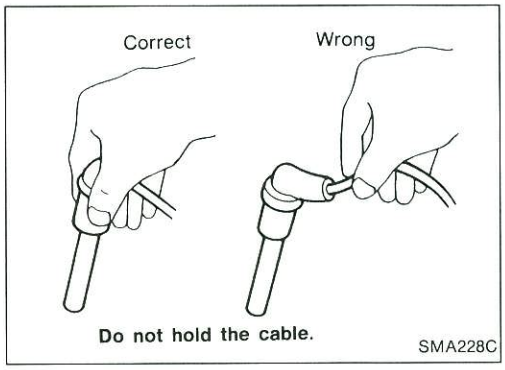


SMA229B

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

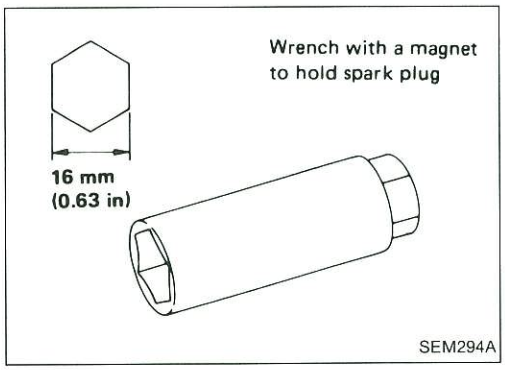
Refer to Changing Engine Oil.

Changing Spark Plugs



SMA228C

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

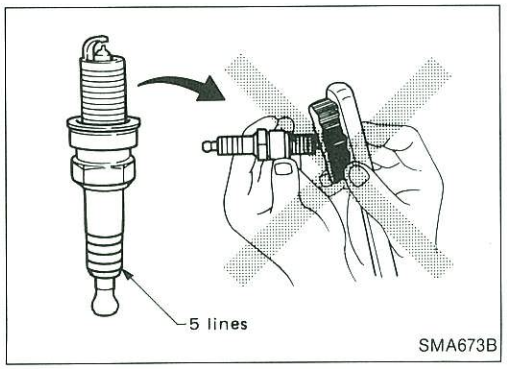


SEM294A

2. Remove spark plugs with suitable spark plug wrench.

Spark plug (Platinum-tipped type):

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



SMA673B

- **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

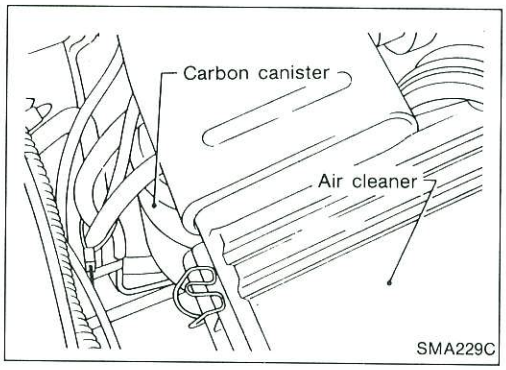
Changing Spark Plugs (Cont'd)

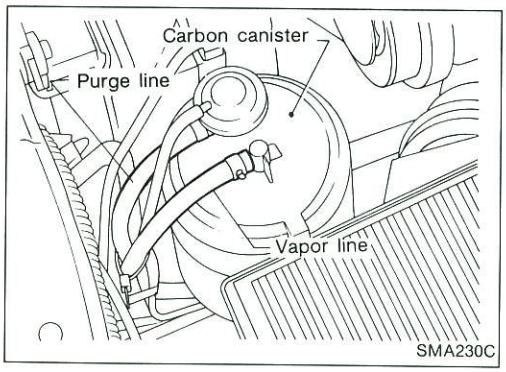
3. Install spark plugs. Reconnect ignition wires according to Nos. indicated on them.

Spark plug:

: 20 - 29 N·m

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

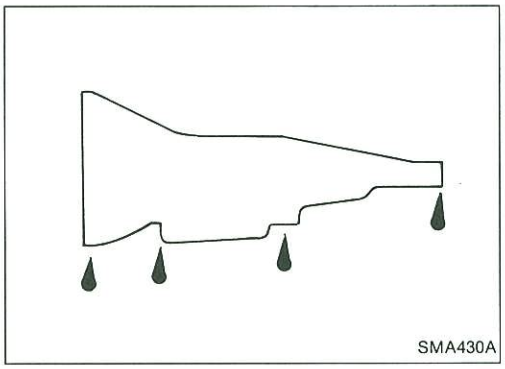




Checking Vapor Lines

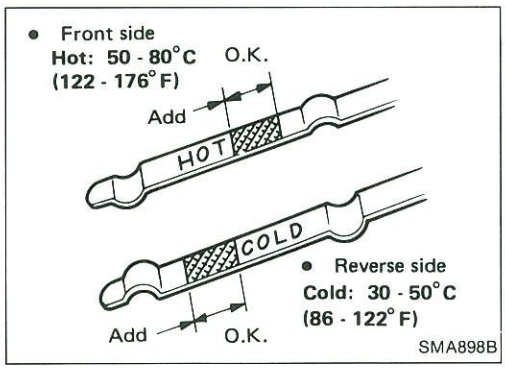
1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

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


SMA430A

Checking A/T Fluid

1. Check for fluid leakage.



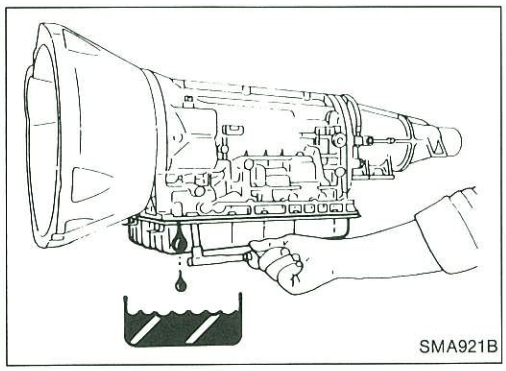
SMA898B

2. If leakage is found, 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) 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.

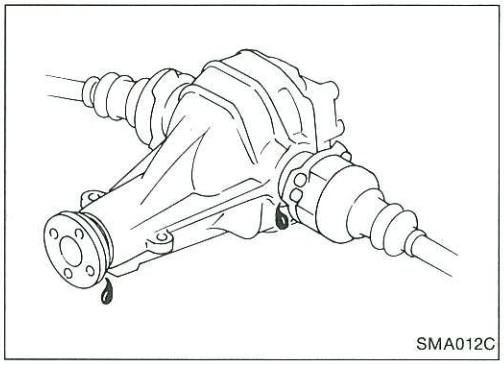
Check fluid for contamination.
SMA853B

3. Check fluid condition.
   Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
   Refer to section AT for checking operation of A/T.


SMA921B

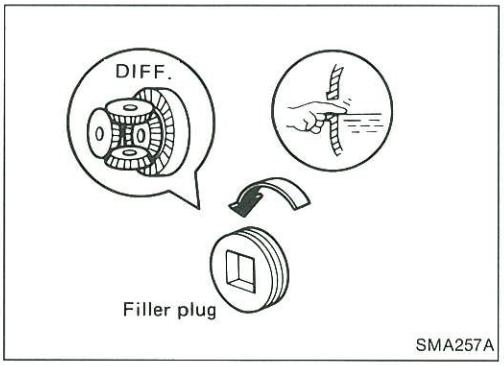
Changing A/T Fluid

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):
   8.3 ℓ (8-3/4 US qt, 7-1/4 Imp qt)


SMA012C

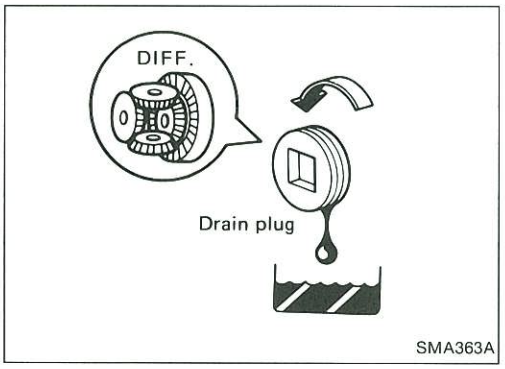
Checking Differential Gear Oil

1. Check differential carrier for oil leakage.



SMA257A

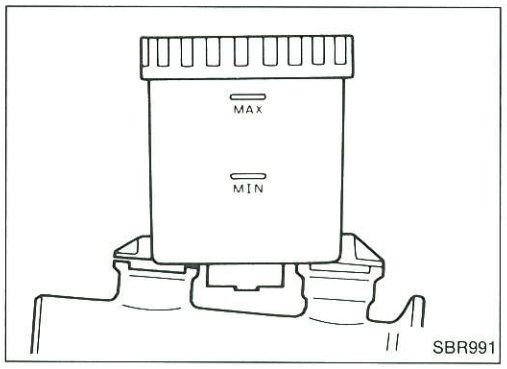
2. If leakage is found, check oil level.
   Filler plug:
   [O]: 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)



SMA363A

Changing Differential Gear Oil

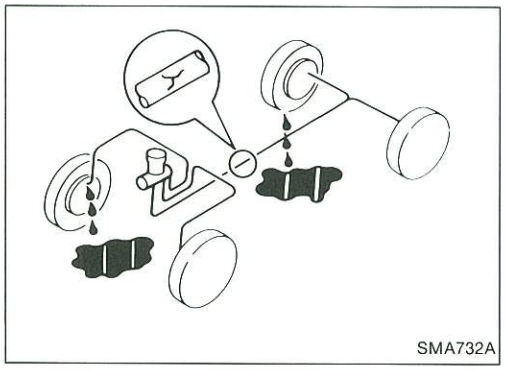
1. Drain oil and refill with new gear oil.
2. Check oil level.
   Oil capacity:
   1.3 ℓ (2-3/4 US pt, 2-1/4 Imp pt)
   Drain plug:
   [O]: 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)



SBR991

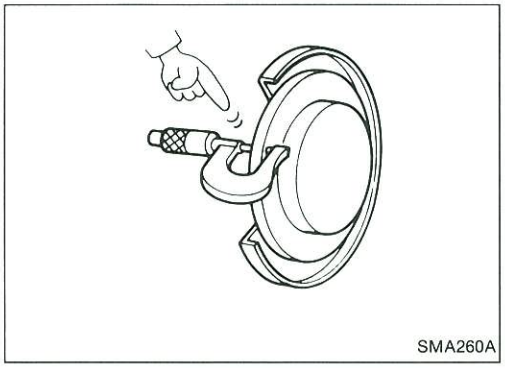
Checking Brake Fluid Level and Leaks

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


SMA732A

Checking Brake Lines and Cables

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


SMA260A

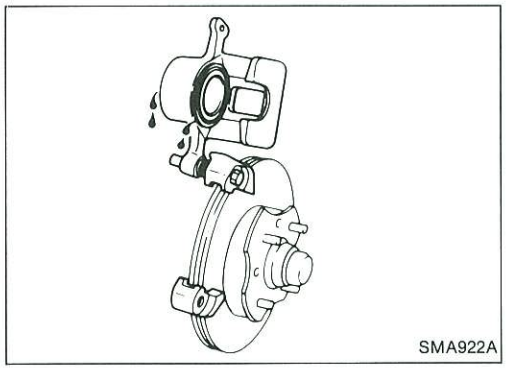
Checking Disc Brake

ROTOR

- Check condition and thickness.

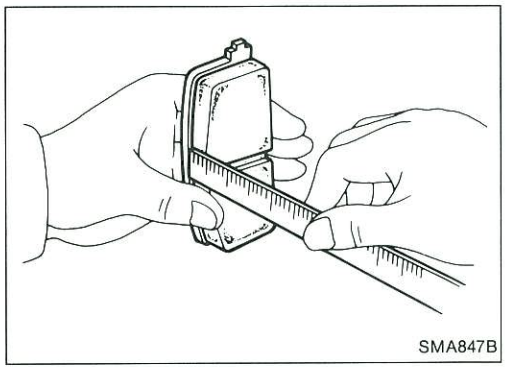
Unit: mm (in)

	Front	Rear
Standard thickness	22.0 (0.866)	10.0 (0.394)
Minimum thickness	20.0 (0.787)	9.0 (0.354)


SMA922A

CALIPER

- Check operation and for leakage.


SMA847B

PAD

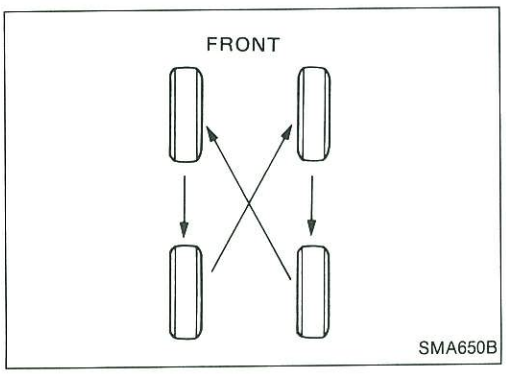
- Check for wear or damage.

Unit: mm (in)

	Front	Rear
Standard thickness	11.0 (0.433)	10.0 (0.394)
Minimum thickness	2.0 (0.079)	

Balancing Wheels

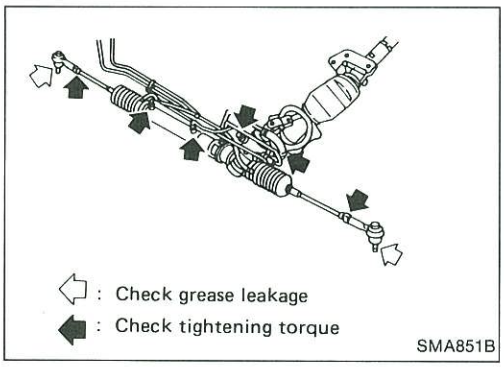
- Adjust wheel balance using road wheel center.
  Wheel balance (Maximum allowable unbalance):
  Refer to S.D.S.



SMA650B

Tire Rotation

- **Do not include the T-type spare tire when rotating the tires.**
  Wheel nuts:
  : 103 - 123 N·m (10.5 - 12.5 kg-m, 76 - 90 ft-lb)



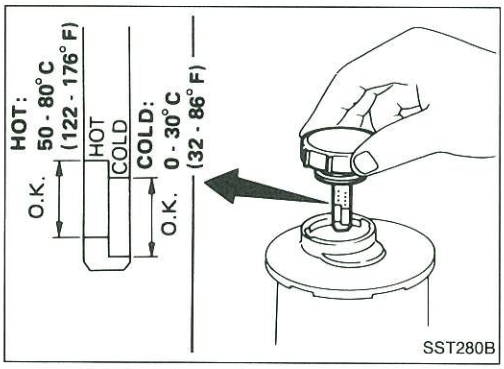
Checking Steering Gear and Linkage

STEERING GEAR

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

STEERING LINKAGE

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



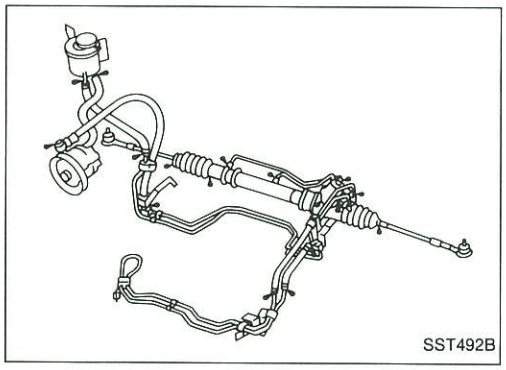
Checking Power Steering Fluid and Lines

- Check fluid level.

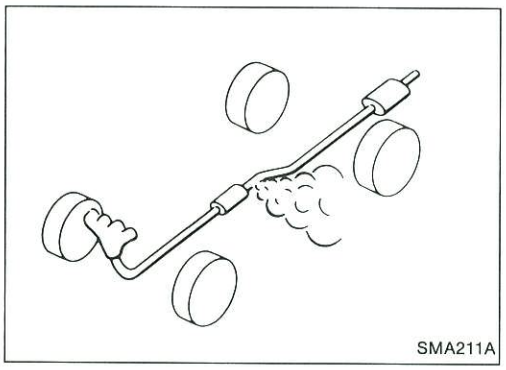
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.**



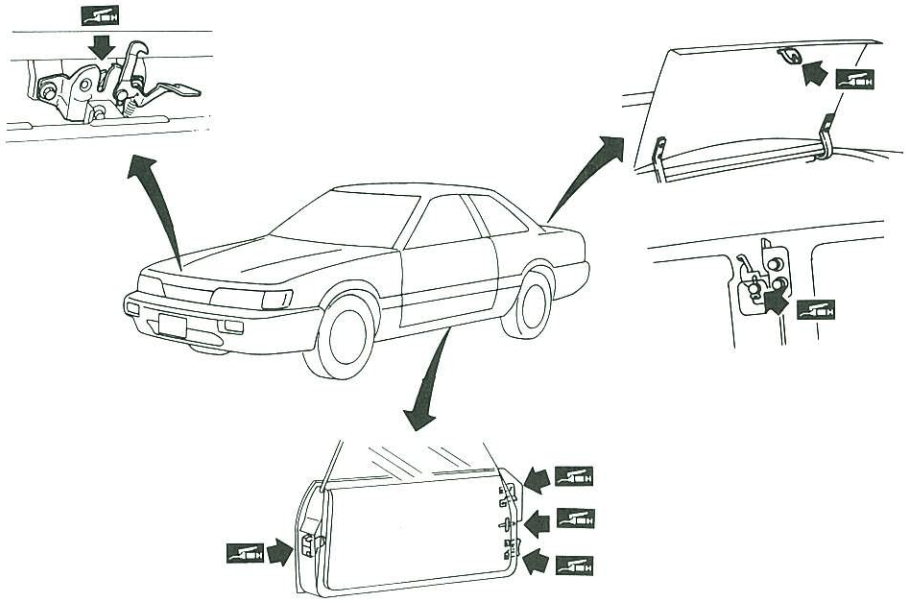
- Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



Checking Exhaust System

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

Lubricating Locks, Hinges and Hood Latches



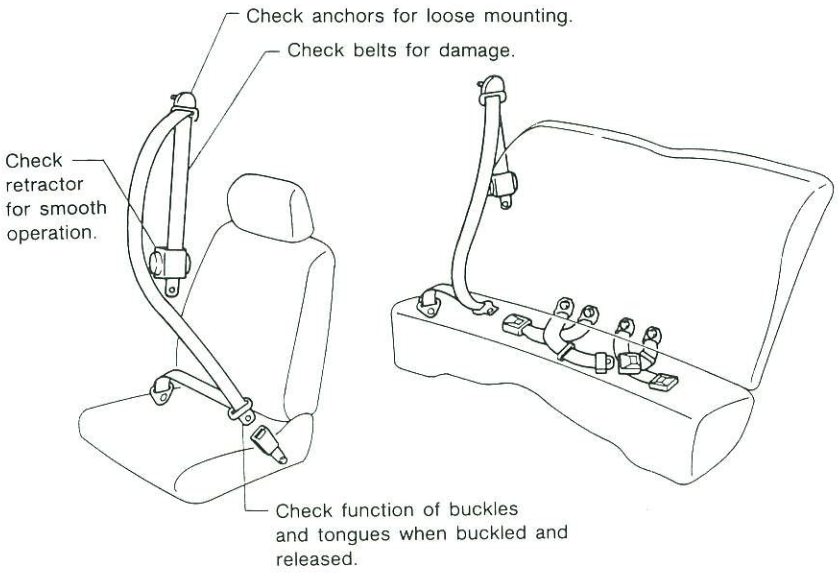
SMA231C

Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

1. **All seat belt assembles, 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 genuine seat belt assembly.**

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



SMA232C

Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	12 (0.47)	7.5 - 8.5 (0.295 - 0.335)	6.5 - 7.5 (0.256 - 0.295)
Air conditioner compressor	14 (0.55)	9 - 10 (0.35 - 0.39)	8 - 9 (0.31 - 0.35)
Power steering oil pump	20 (0.79)	14 - 16 (0.55 - 0.63)	12 - 14 (0.47 - 0.55)
Applied pushing force	98 N (10 kg, 22 lb)		

Oil capacity (Refill)

Unit: ℓ (US qt, Imp qt)

With oil filter	4.4 (4-5/8, 3-7/8)
Without oil filter	4.0 (4-1/4, 3-1/2)

Coolant capacity

Unit: ℓ (US qt, Imp qt)

Without reservoir tank	8.35 (8-7/8, 7-3/8)
Reservoir tank	0.8 (7/8, 3/4)

Spark plug

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

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Front axle and front suspension (Unladen)*

Camber	degree	–35′ to 55′
Caster	degree	3°55′ - 5°25′
Kingpin inclination	degree	11°55′ - 13°25′
Toe-in		
A – B	mm (in)	–1 to 1 (–0.04 to 0.04)
Total angle 2θ	degree	–5′ to 5′
Front wheel turning angle		
Full turn Inside/outside	degree	40°30′ - 44°30′/33°30′

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

Rear axle and rear suspension (Unladen)*

Camber	degree	–1°5′ to 0°25′
Toe in	mm (in)	
A – B	mm (in)	–4.2 to –0.2 (–0.165 to –0.008)
Total angle 2θ	degree	–22′ to –1′

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

Wheel bearing

	Front	Rear
Wheel bearing axle endplay limit mm (in)	0 (0)	0.05 (0.0020)
Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb)	34 - 39 (3.5 - 4.0, 25 - 29)	127 - 177 (13 - 18, 94 - 130)
Return angle degree	90°	—

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	
Pad	
Standard thickness	
Front	11.0 (0.433)
Rear	10.0 (0.394)
Minimum thickness	
Front	2.0 (0.079)
Rear	2.0 (0.079)
Rotor	
Standard thickness	
Front	22.0 (0.866)
Rear	10.0 (0.394)
Minimum thickness	
Front	20.0 (0.787)
Rear	9.0 (0.354)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Final drive			
Drain plug	39 - 59	4 - 6	29 - 43
Filler plug	39 - 59	4 - 6	29 - 43
Front axle and front suspension			
Tie-rod lock nut	78 - 98	8.0 - 10.0	58 - 72
Rear axle and rear suspension			
Toe adjusting pin	98 - 118	10 - 12	72 - 87
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	103 - 123	10.5 - 12.5	76 - 90

ENGINE MECHANICAL

SECTION EM

EM

CONTENTS

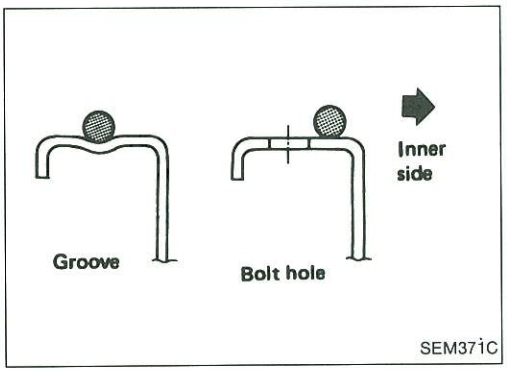
PRECAUTIONS ..... EM- 2
PREPARATION ..... EM- 3
OUTER COMPONENT PARTS ..... EM- 6
COMPRESSION PRESSURE ..... EM- 8
OIL PAN ..... EM- 9
TIMING BELT EM-13
OIL SEAL REPLACEMENT EM-19
CYLINDER HEAD EM-21
ENGINE REMOVAL EM-37
CYLINDER BLOCK EM-40
SERVICE DATA AND SPECIFICATIONS (S.D.S.) EM-51

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:

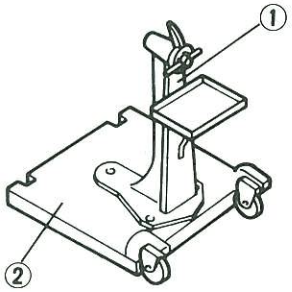
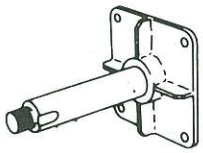
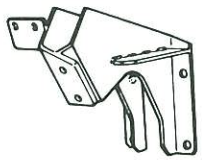
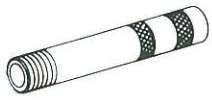
a. **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized INFINITI dealer.**
b. **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal 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".**

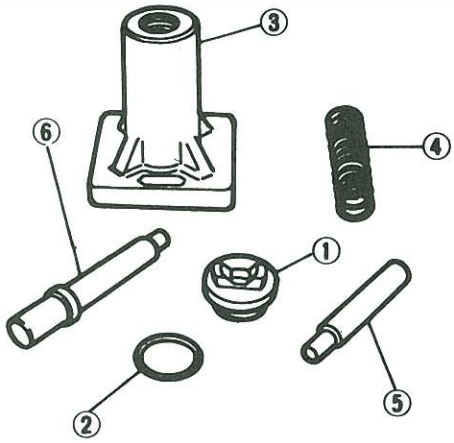
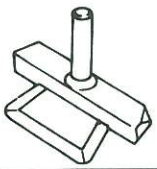
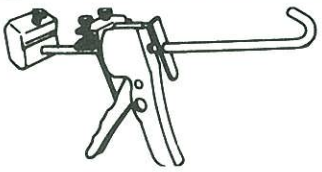


Liquid Gasket Application Procedure

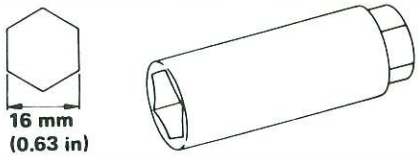
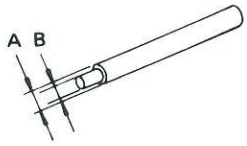
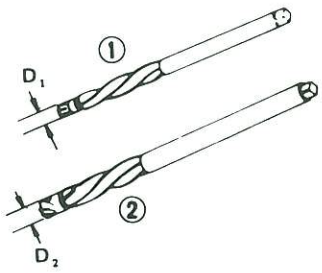
a. **Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.**
b. **Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)**
   - **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.**

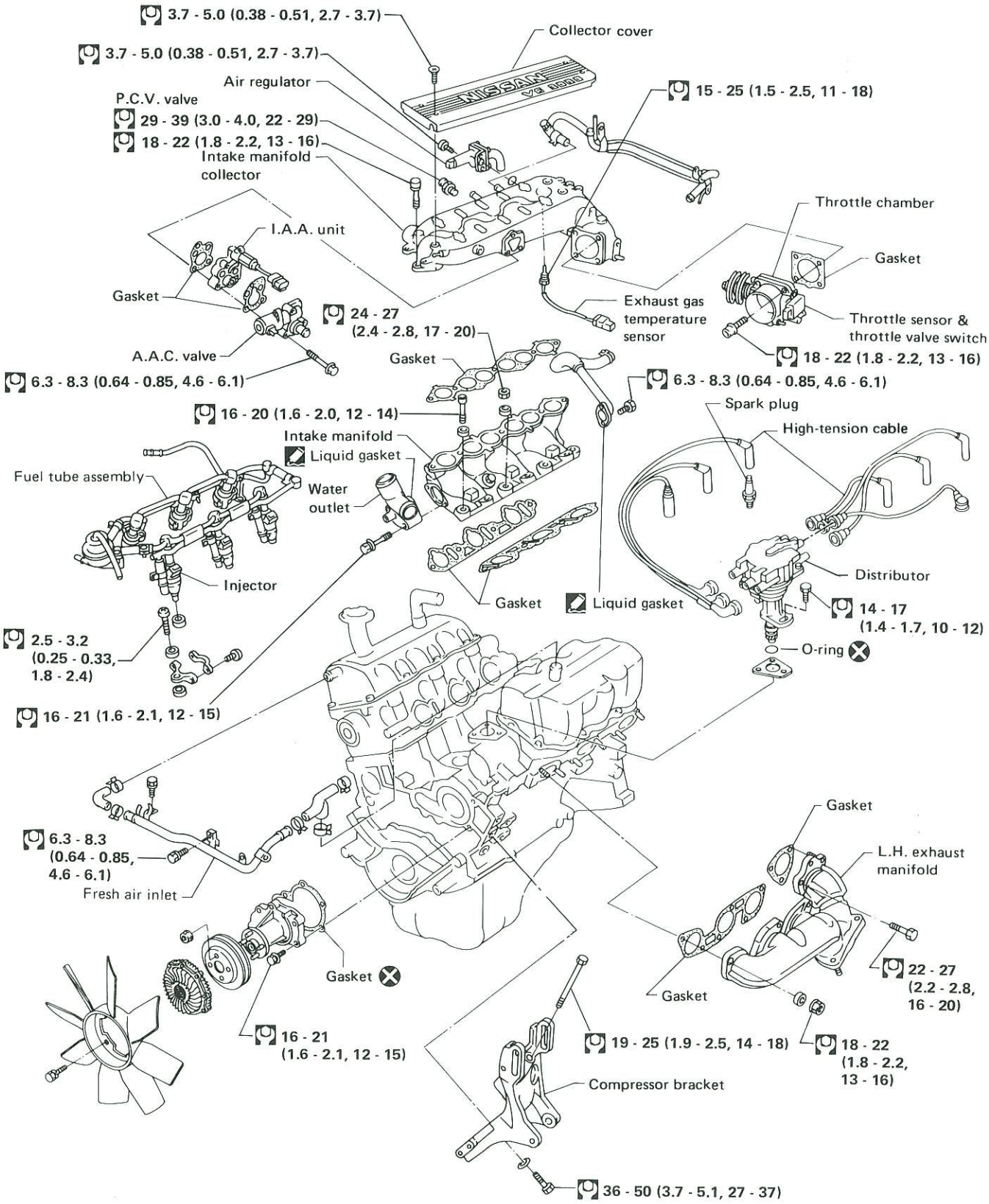
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description
ST0501S000 (—) Engine stand assembly ①ST05011000 (—) Engine stand ②ST05012000 (—) 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
KV10110600 (J33986) Valve spring compressor	Disassembling and assembling valve components
KV10107501 (—) Valve oil seal drift	Installing valve oil seal 

Tool number (Kent-Moore No.) Tool name	Description
KV10110300 (—) Piston pin press stand assembly ①KV10110310 (—) Cap ②KV10110330 (—) Spacer ③ST13030020 (—) Press stand ④ST13030030 (—) Spring ⑤KV10110340 (—) Drift ⑥KV10110320 (—) Center shaft	Disassembling and assembling piston with connecting rod 
EM03470000 (J8037) Piston ring compressor	Installing piston assembly into cylinder bore
ST16610001 (J23907) Pilot bushing puller	Removing crankshaft pilot bushing
KV10111100 (—) Seal cutter	Removing oil pan 
WS39930000 (—) Tube presser	Pressing the tube of liquid gasket 

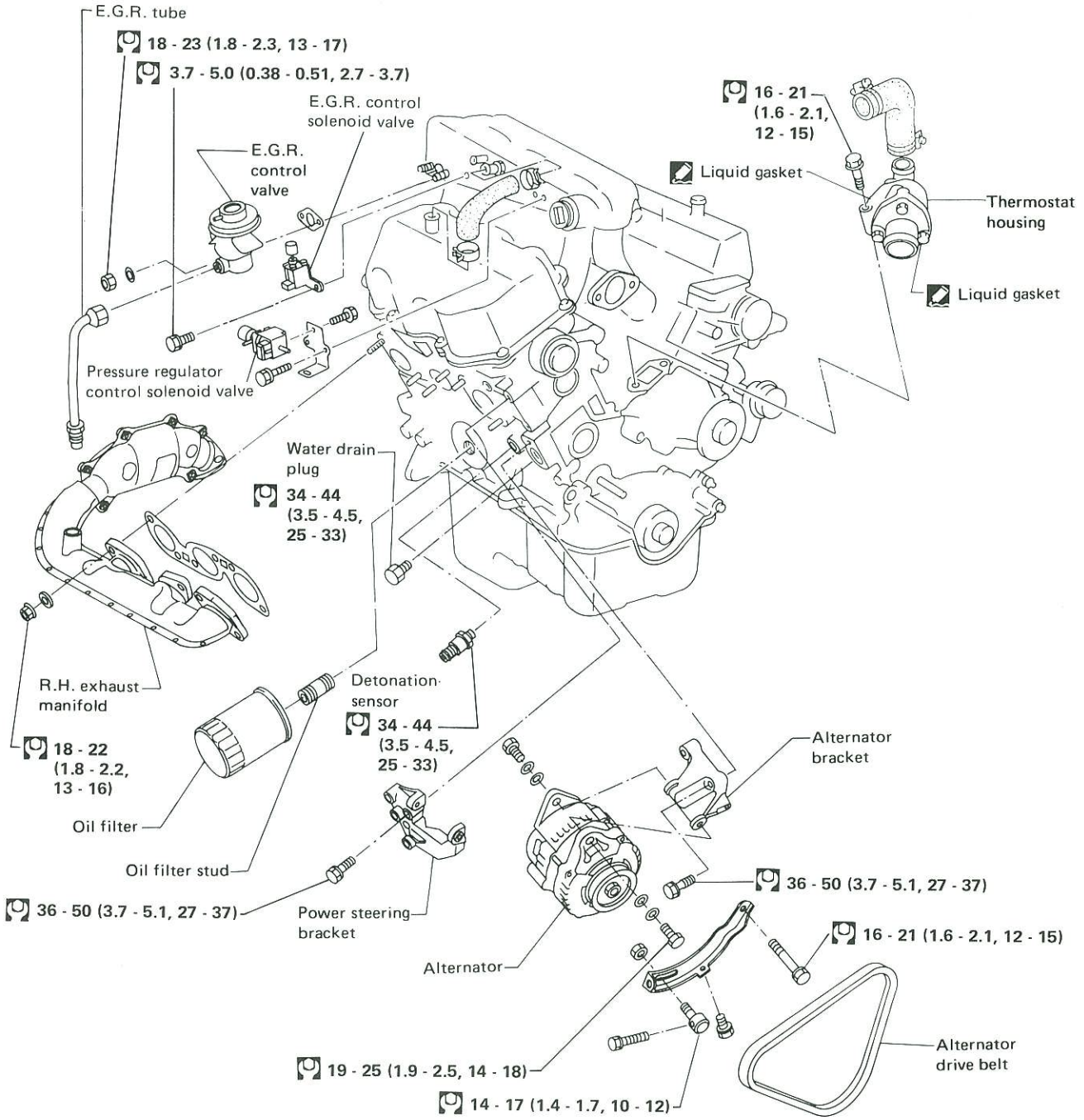
COMMERCIAL SERVICE TOOLS

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 = 10.5 mm (0.413 in) dia.** **B = 6.6 mm (0.260 in) dia.** 
Valve guide reamer	Reaming valve guide ① or hole for oversize valve guide ② **Intake:** **D_1 = 7.0 mm (0.276 in) dia.** **D_2 = 11.2 mm (0.441 in) dia.** **Exhaust:** **D_1 = 8.0 mm (0.315 in) dia.** **D_2 = 12.2 mm (0.480 in) dia.** 



: N·m (kg-m, ft-lb)

SEM853C

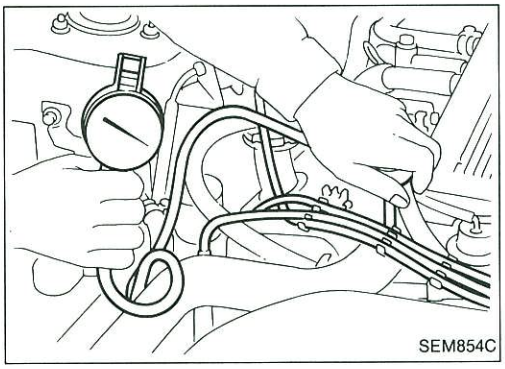


: N·m (kg-m, ft-lb)

SEM843C

Measurement of Compression Pressure

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


SEM854C

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

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

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

Standard

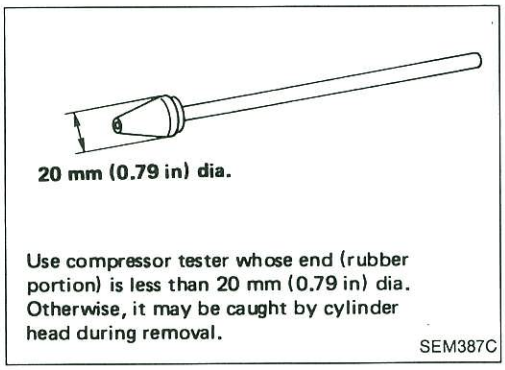
1,196 (12.2, 173)

Minimum

883 (9.0, 128)

Difference limit between cylinders

98 (1.0, 14)



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

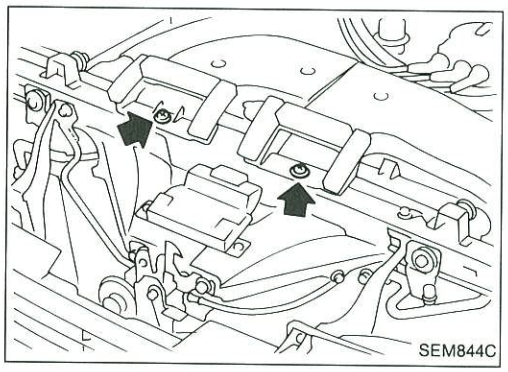
SEM387C

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

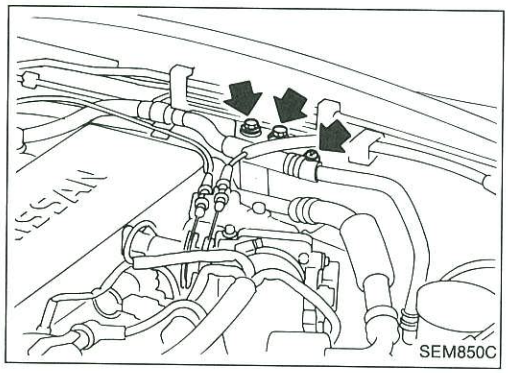
- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
- **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to S.D.S.) If valve or valve seat is damaged excessively,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

Removal

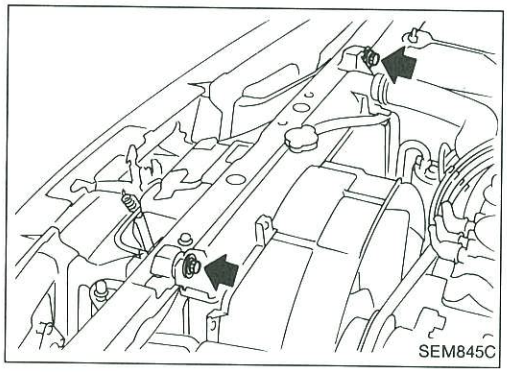
1. Remove engine lower cover.
2. Drain engine oil.
3. Remove engine oil level gauge.



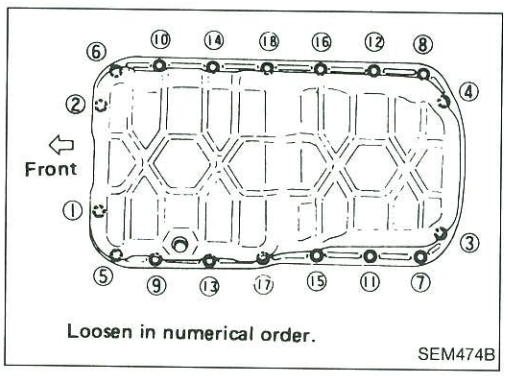
4. Remove air duct.



5. Remove air conditioner hose fixing bolt and brake booster vacuum hose fixing bolt.

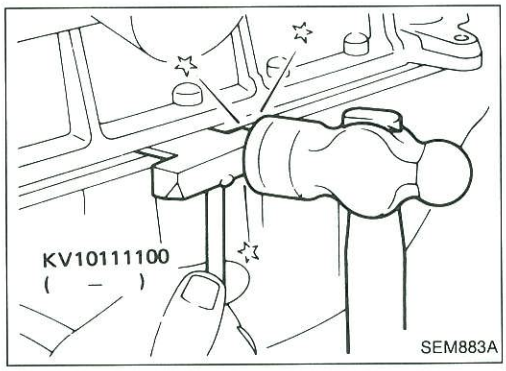


6. Remove radiator fitting bolts.
7. Remove A/T oil cooler tube fitting bolts.



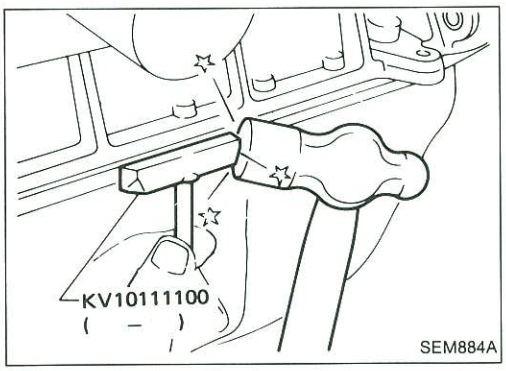
8. Remove oil pan bolts.

Removal (Cont'd)

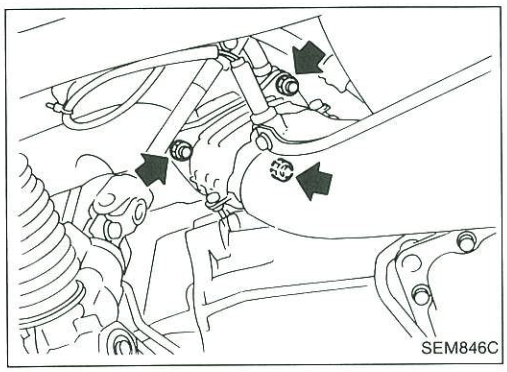


9. Remove oil pan.
(1) Insert Tool between cylinder block and oil pan.

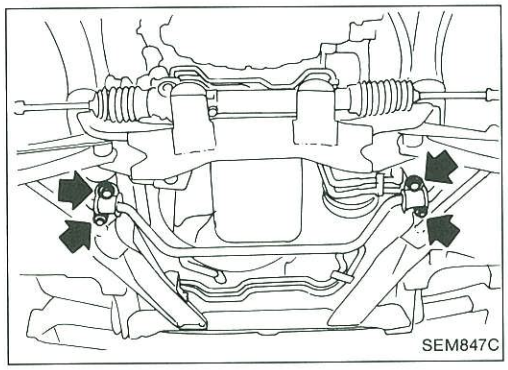
- **Do not drive seal cutter into oil pump or rear oil seal retainer portion, or aluminum mating surfaces will be damaged.**
- **Do not insert screwdriver, or oil pan flange will be deformed.**



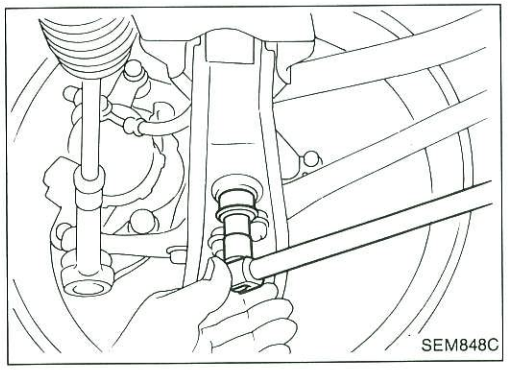
(2) Slide Tool by tapping its side with a hammer, and remove oil pan.



10. Loosen exhaust front tube fitting bolts.

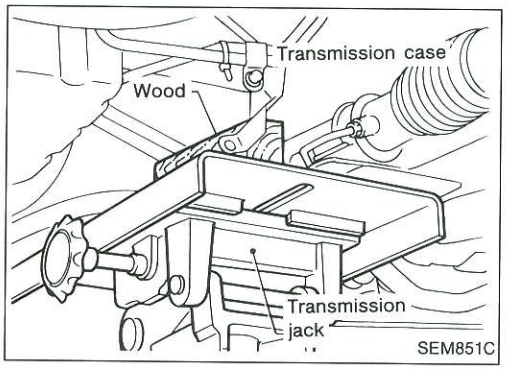


11. Remove front stabilizer fixing brackets.



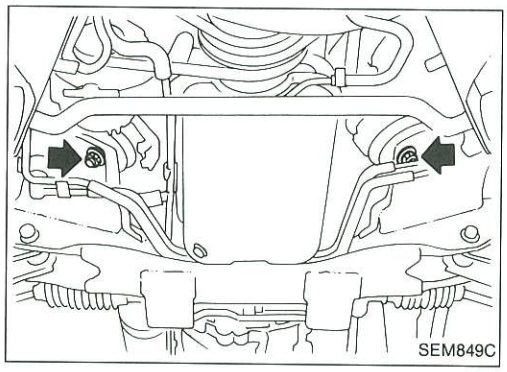
12. Remove right side front stabilizer fixing bolt.
13. Loosen left side front stabilizer fixing bolt.

Removal (Cont'd)

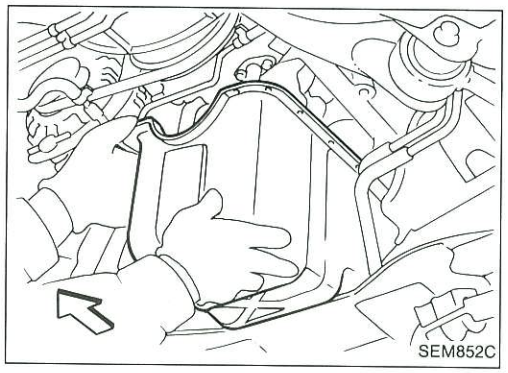


14. Set a suitable transmission jack under the transmission case.

- **Place a suitable piece of wood between transmission jack and transmission case.**

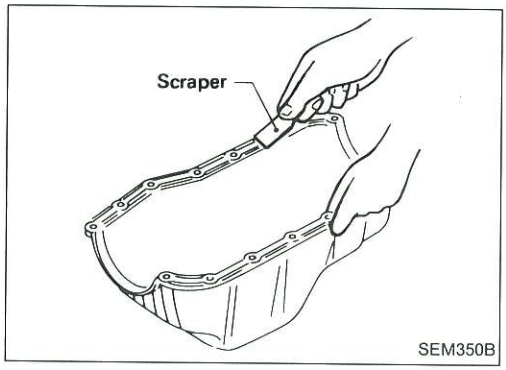


15. Remove engine mounting bolts.
16. Slowly raise transmission jack until oil pan can be removed.



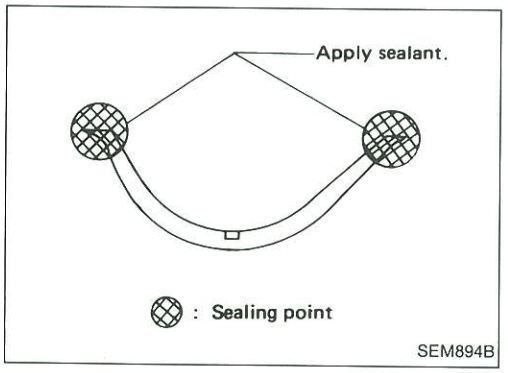
17. Remove oil pan from vehicle.

Installation



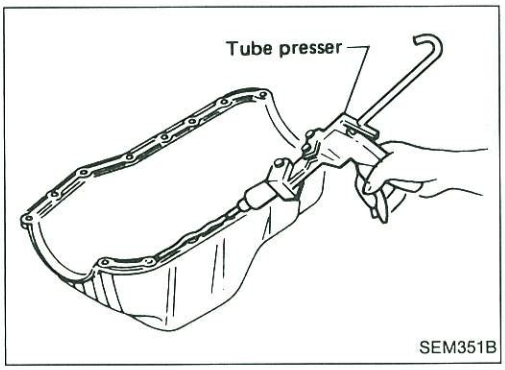
1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.

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

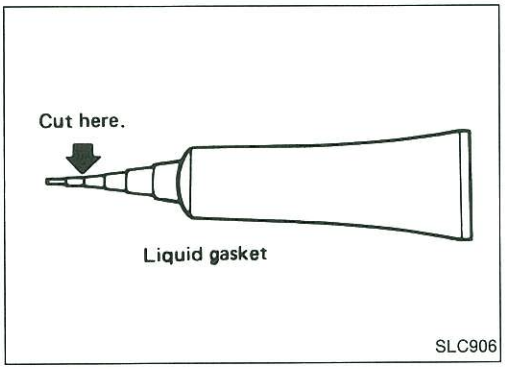


2. Apply sealant to oil pump gasket and rear oil seal retainer gasket.

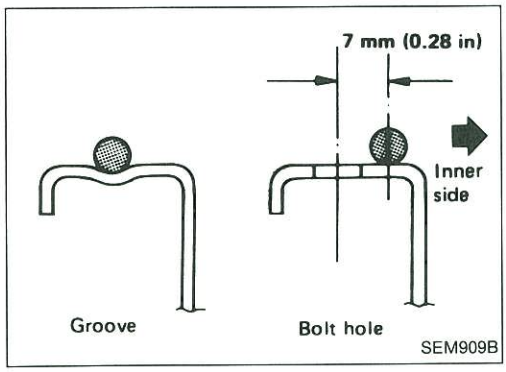
Installation (Cont'd)



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



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

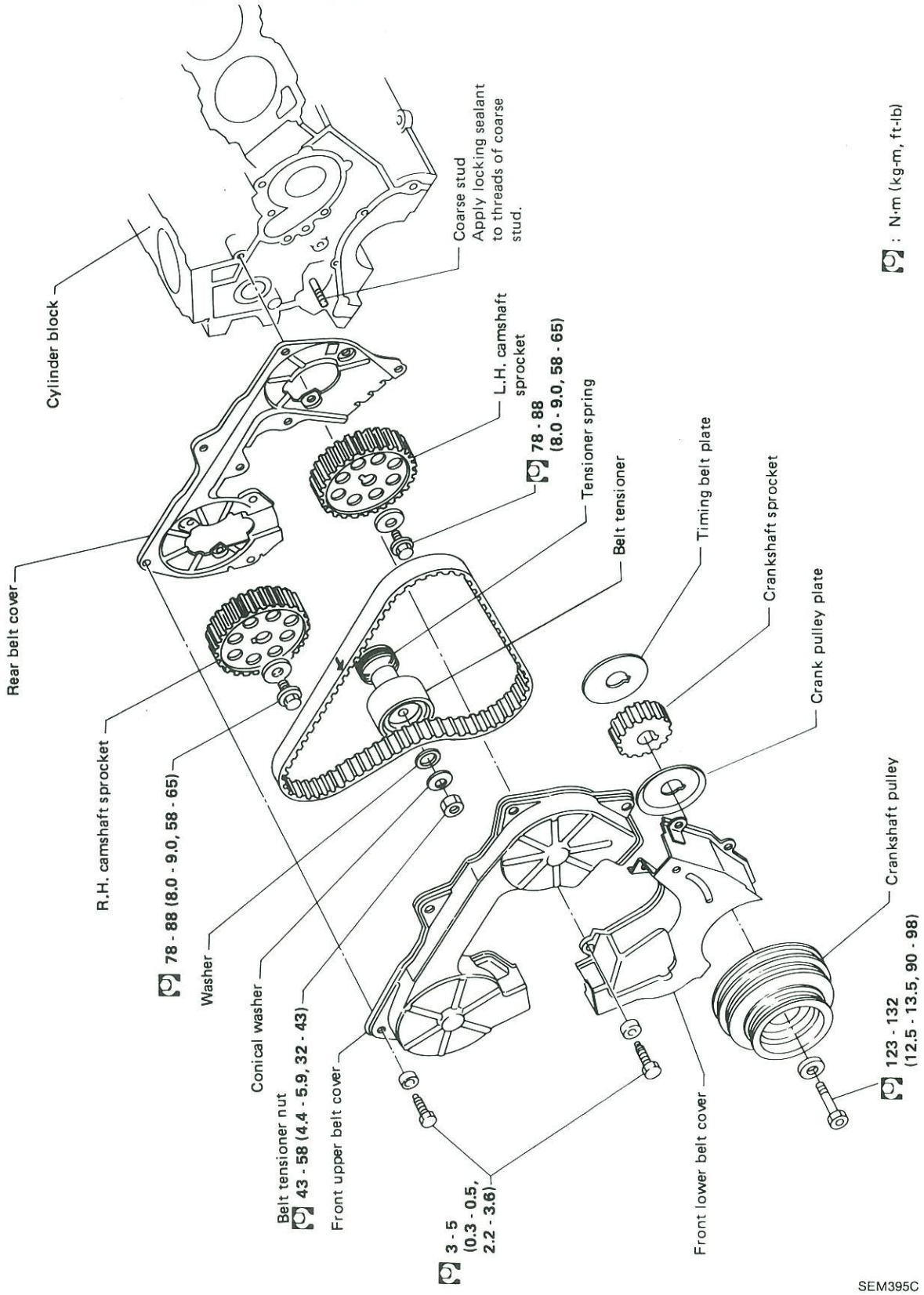


4. Apply liquid gasket to inner sealing surface as shown in figure.
- Attaching should be done within 5 minutes after coating.

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

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 and belt tensioner are clean and free from oil and water.**
d. **Installation should be carried out when engine is cold.**

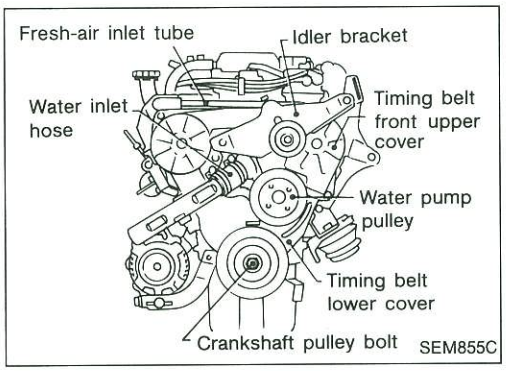


Removal

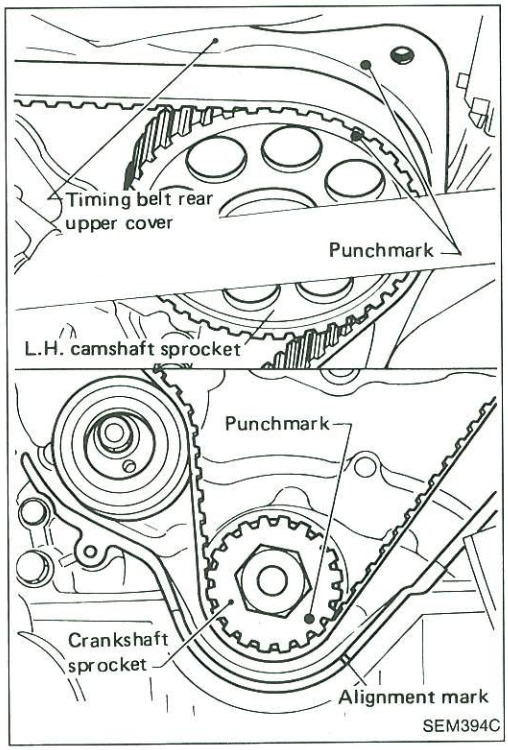
1. Remove engine undercover and air duct.
2. Drain engine coolant from radiator.

Be careful not to spill coolant on drive belts.

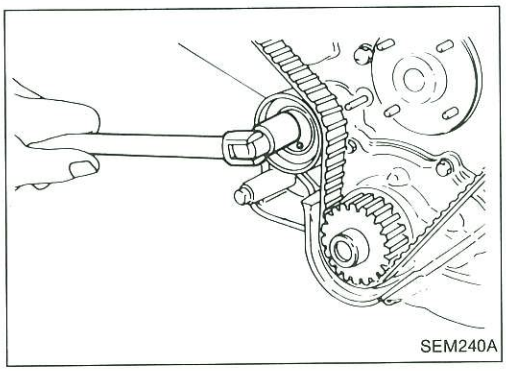
3. Remove radiator. (Refer to LC section.)
4. Remove engine cooling fan.
5. Remove the following belts.
- Power steering pump drive belt
- Compressor drive belt
- Alternator drive belt



6. Remove water pump pulley.
7. Remove all spark plugs.
8. Remove distributor protector.
9. Remove compressor drive belt idler bracket.
10. Remove fresh-air inlet tube for rocker cover.
11. Remove water inlet hose for thermostat housing.
12. Remove crankshaft pulley bolt.
13. Remove crankshaft pulley with a suitable puller.
14. Remove front upper and lower belt covers.



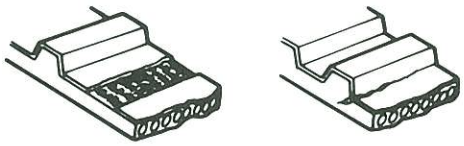
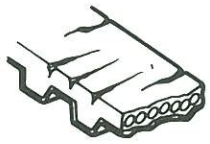
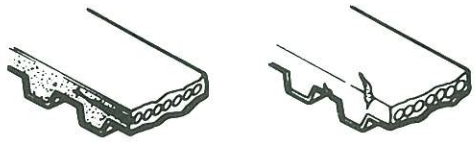
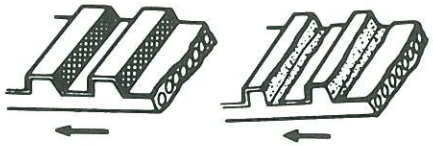
15. Set No. 1 piston at T.D.C. on its compression stroke by rotating crankshaft.
- **Align punchmark on L.H. camshaft sprocket with punchmark on timing belt upper rear cover.**
- **Align punchmark on crankshaft sprocket with notch on oil pump housing.**
- **Temporarily install crank pulley bolt on crankshaft so that crankshaft can be rotated.**



16. Loosen timing belt tensioner nut, turn tensioner, then remove timing belt.

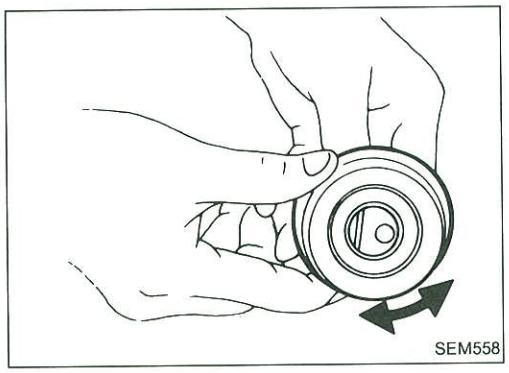
Inspection

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.	 • Belt corners are worn and round. • Wicks are frayed and coming out. SEM396A	• Improper installation of belt • Malfunctioning crankshaft pulley plate/timing belt plate
Teeth are worn.	 Rotating direction • 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. SEM397A	• Poor belt cover sealing • Coolant leakage at water pump • Camshaft not functioning properly • Distributor not functioning properly • Excessive belt tension
Oil/Coolant or water is stuck to belt.		• Poor oil sealing of each oil seal • Coolant leakage at water pump • Poor belt cover sealing

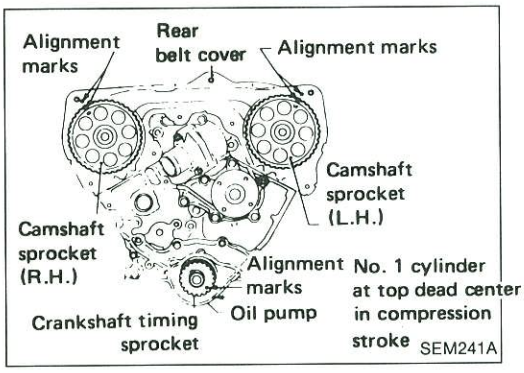
Inspection (Cont'd)

BELT TENSIONER AND TENSIONER SPRING

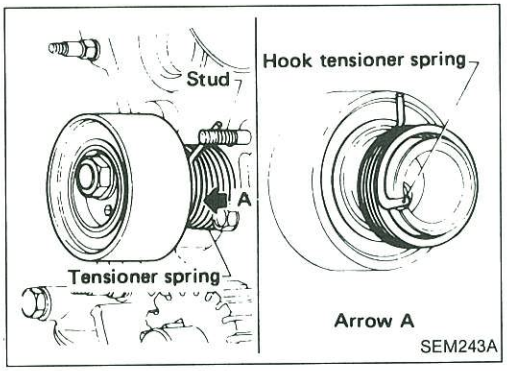


1. Check belt tensioner for smooth turning.
2. Check condition of tensioner spring.

Installation

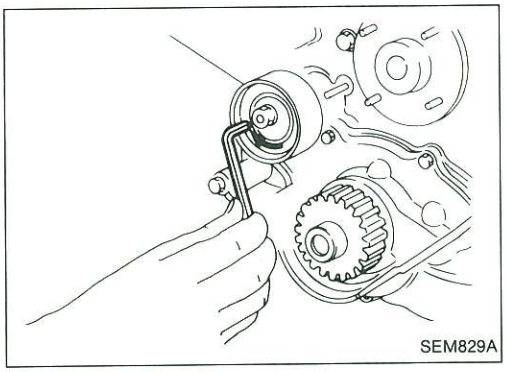


1. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.

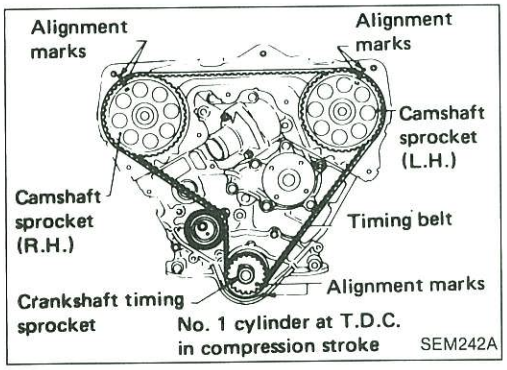


2. Install tensioner and tensioner spring.

If stud is once removed, apply locking sealant to threads before installing.



3. Turn tensioner fully outward with hexagon wrench, and temporarily tighten lock nut.



4. Set timing belt.

(1) Align white lines on timing belt with punchmarks on camshaft sprockets and crankshaft sprocket.

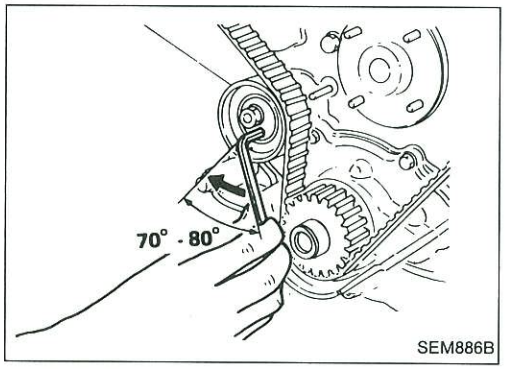
(2) Point arrow on timing belt toward front belt cover.

Number of teeth (reference):

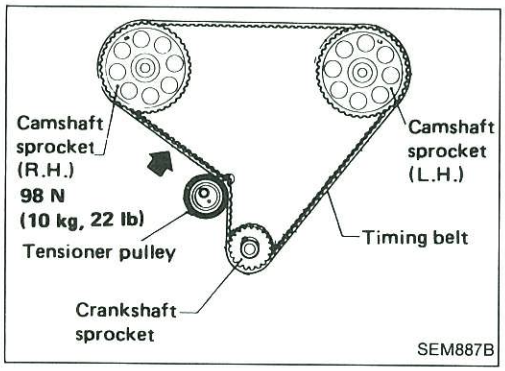
Number of timing belt teeth		133
Number of teeth between timing marks	Between L.H. and R.H. camshaft sprockets	40
	Between L.H. camshaft sprocket and crankshaft timing sprocket	43

Installation (Cont'd)

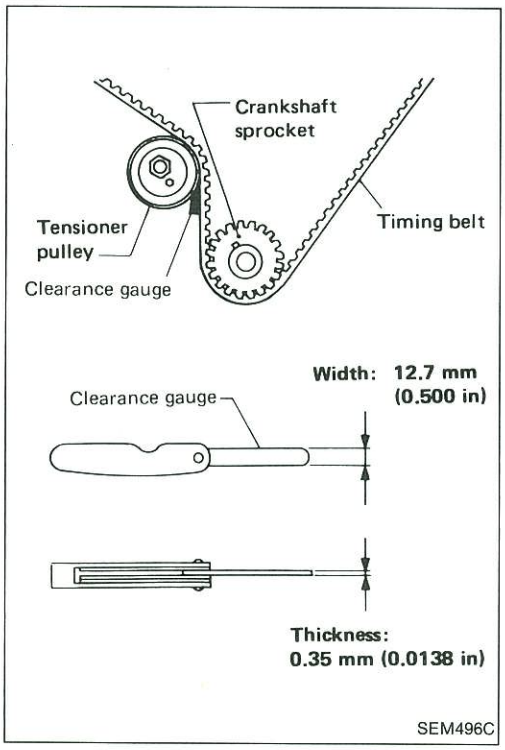
5. Loosen tensioner lock nut, keeping tensioner steady with hexagon wrench.



6. Turn tensioner 70 to 80 degrees clockwise with hexagon wrench, and temporarily tighten lock nut.
7. Turn crankshaft clockwise at least 2 times, then slowly set No. 1 piston at T.D.C. on its compression stroke.

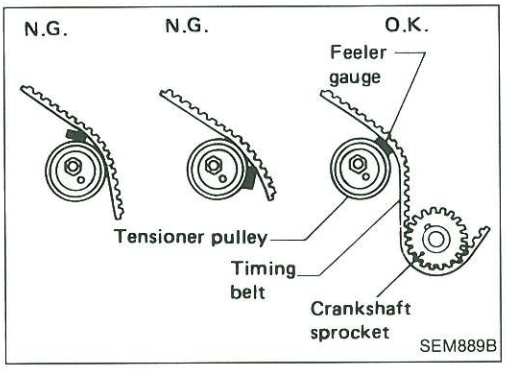


8. Push middle of timing belt between R.H. camshaft sprocket and tensioner pulley with force of 98 N (10 kg, 22 lb).
9. Loosen tensioner lock nut, keeping tensioner steady with hexagon wrench.



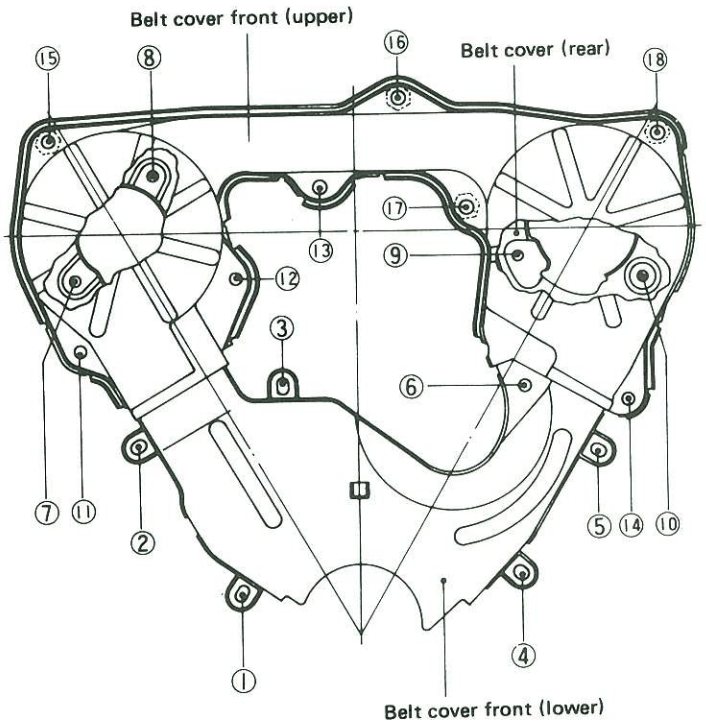
10. Set clearance gauge as shown in figure which is 0.35 mm (0.0138 in) thick and 12.7 mm (0.500 in) wide.

Installation (Cont'd)



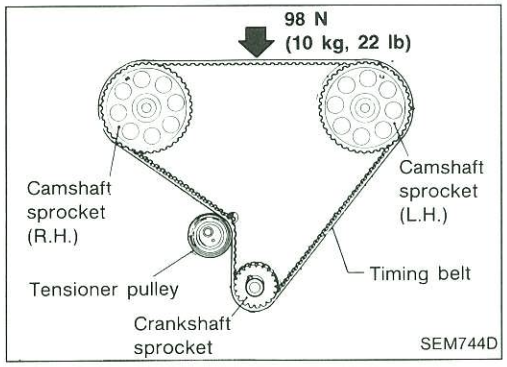
11. Turn crankshaft clockwise, and set clearance gauge as shown in figure.
- Timing belt will move about 2.5 teeth.

12. Tighten tensioner lock nut, keeping tensioner steady with hexagon wrench.
13. Turn crankshaft clockwise or counterclockwise, and remove clearance gauge.
14. Turn crankshaft clockwise at least 2 times, then slowly set No. 1 piston at T.D.C. on its compression stroke.
15. Install lower and upper belt covers.



Tightened parts	Section	Parts tightened with bolts
Bolt A (6 pcs.), Rubber washer, Bolt cover front (lower)	①, ②, ③, ④, ⑤, ⑭	①, ②, ③, ④: Cylinder block; ⑤, ⑭: Compressor bracket
Bolt B (1 pc.), Rubber washer, Belt cover front : (lower), Water pump mounting bolt	⑥	Water pump mounting bolt
Bolt C (4 pcs.), Belt cover (rear)	⑦, ⑧, ⑨, ⑩	Cylinder head
Bolt A (7 pcs.), Rubber washer, Belt cover front (upper), Belt cover (rear), Welded nut (4 pcs.)	⑮, ⑯, ⑰, ⑱, ⑪, ⑫, ⑬	⑮, ⑯, ⑰, ⑱: Welded nuts; ⑪, ⑫: Cylinder head; ⑬: Water outlet

SEM248A

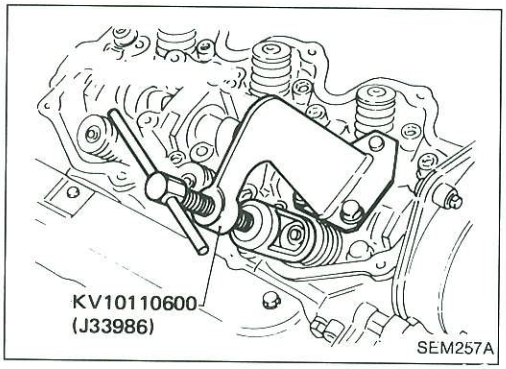


BELT TENSION CHECK

1. Set No. 1 piston at T.C.D. on its compression stroke.
2. Measure deflection of timing belt midway between camshaft pulleys when pushing with 10 kg force.

Belt deflection (Reference value):

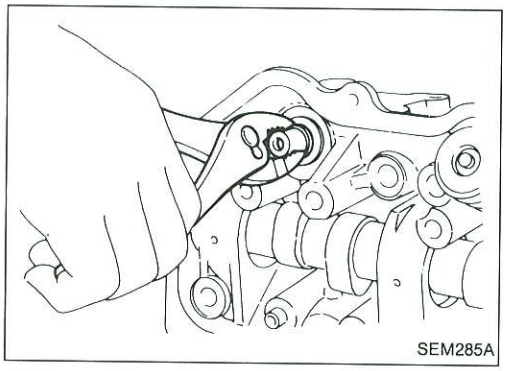
13 - 15 mm (0.51 - 0.59 in)/98 N (10 kg, 22 lb)



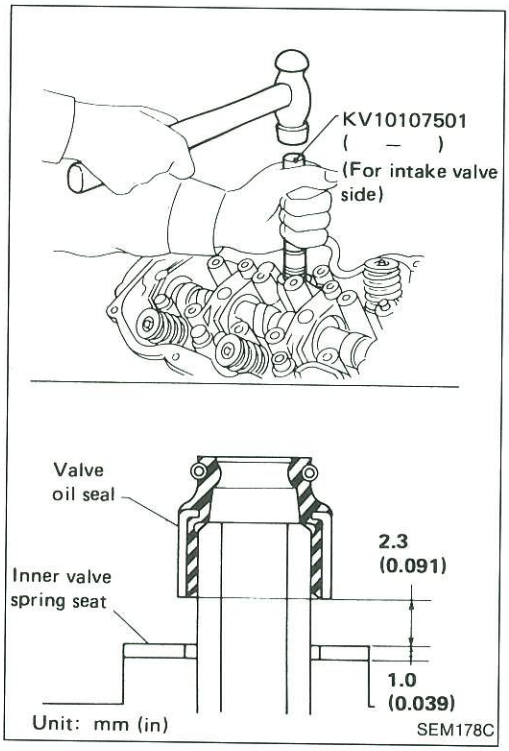
VALVE OIL SEAL

1. Remove rocker cover.
2. Remove rocker shaft assembly and valve lifters with valve lifter guide.
3. Remove valve springs and valve oil seal.

- Piston concerned should be set at T.D.C. to prevent valve from falling.
- When removing intake side valve oil seal, use Tool or suitable tool.

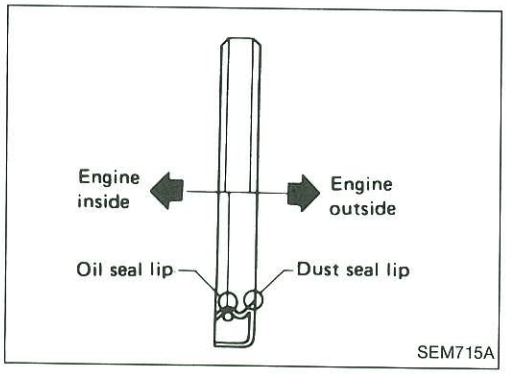


- When removing exhaust side valve oil seal, pull it out with suitable tool.

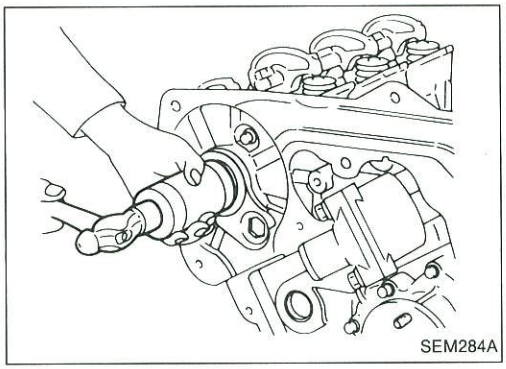


4. Apply engine oil to new valve oil seal and install it.

- Before installing valve oil seal, install inner valve spring seat.
- When installing intake side valve oil seal, use Tool.
- When installing exhaust side valve oil seal, set it by hand.



OIL SEAL INSTALLING DIRECTION

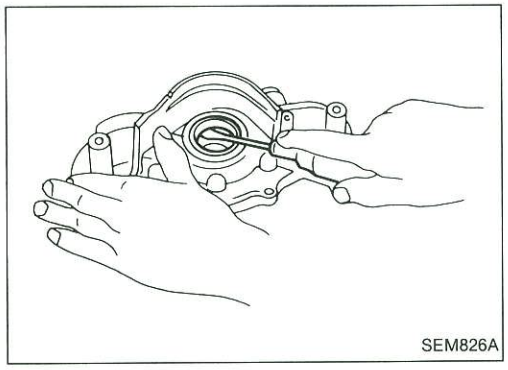

SEM284A

CAMSHAFT OIL SEAL

1. Remove timing belt.
2. Remove camshaft sprocket.
3. Remove camshaft.
4. Remove camshaft oil seal.

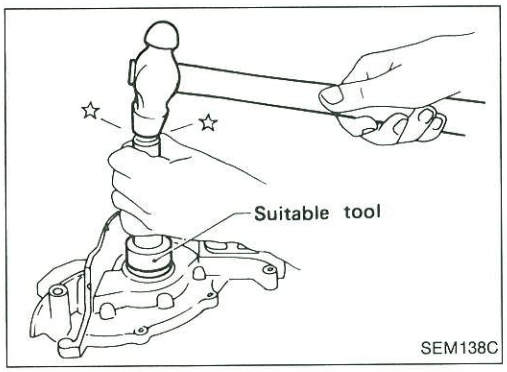
Be careful not to scratch camshaft.

5. Apply engine oil to new camshaft oil seal.


SEM826A

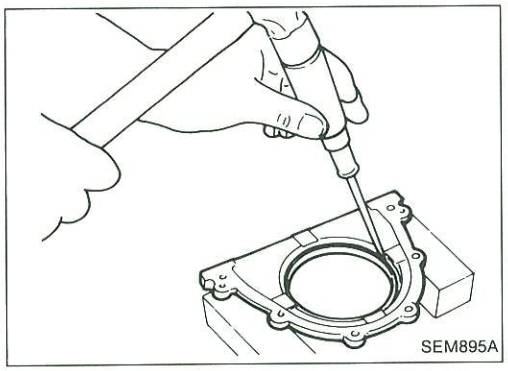
FRONT OIL SEAL

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



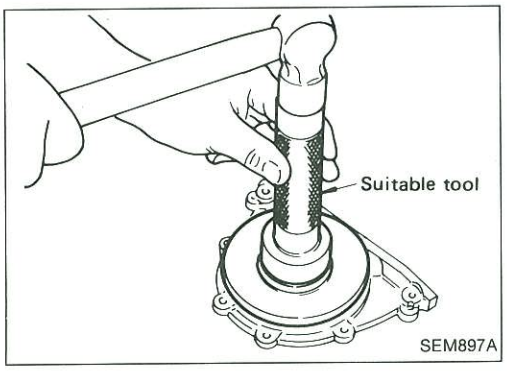
SEM138C

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


SEM895A

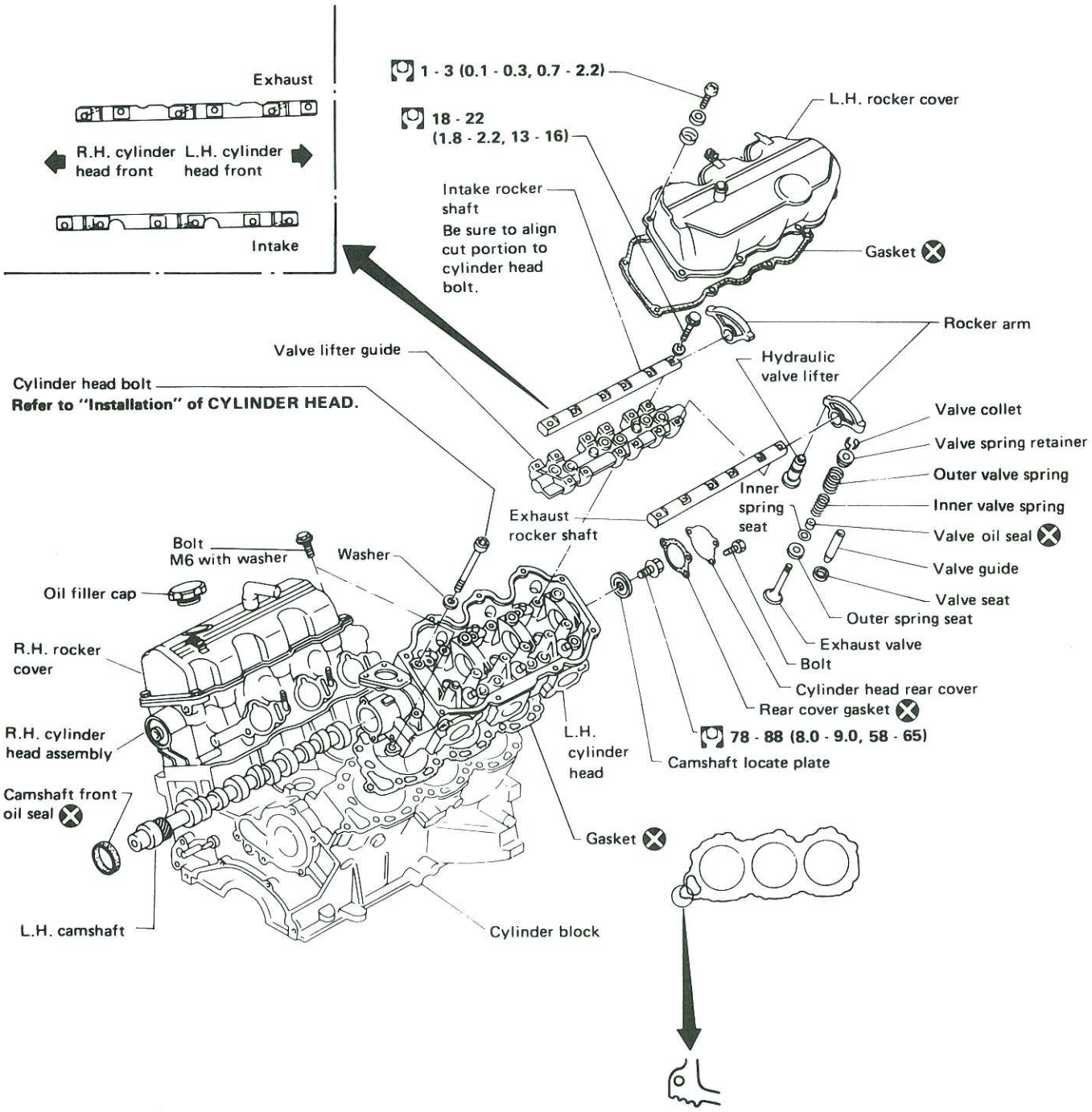
REAR OIL SEAL

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



SEM897A

4. Apply engine oil to new oil seal and install it using suitable tool.
5. Install rear oil seal retainer with a new gasket to cylinder block.

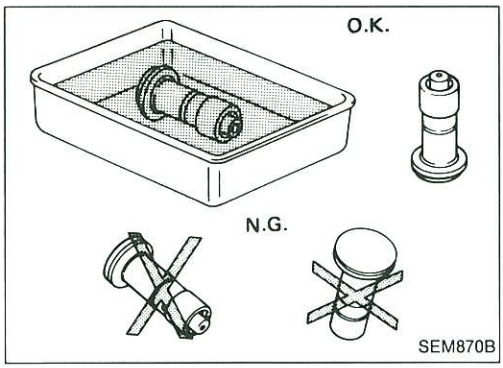


: N·m (kg-m, ft-lb)

SEM912B

CAUTION:

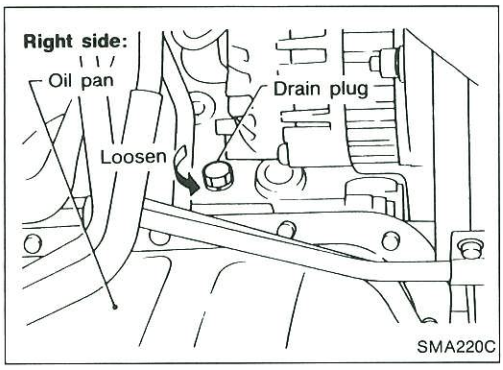
- **When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts and rocker shaft bolts, apply new engine oil to thread portions and seat surfaces of bolts.**



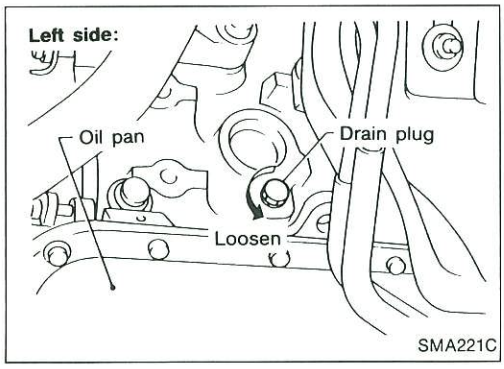
- **If hydraulic valve lifter is kept on its side, there is a risk of air entering it. After removal, always set hydraulic valve lifter straight up, or when laying it on its side, have it soak in new engine oil.**
- **Do not disassemble hydraulic valve lifter.**
- **Attach tags to valve lifters so as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

Removal

1. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in section EF & EC.
2. Remove timing belt.
   Refer to "TIMING BELT — Removal".

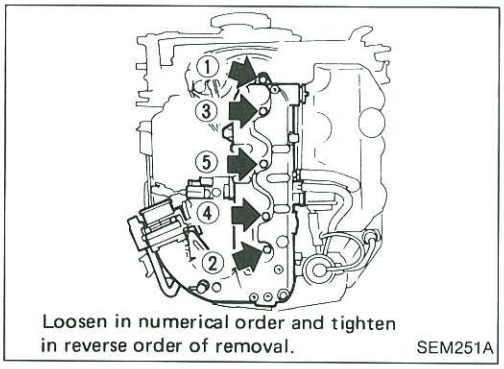


3. Drain coolant by removing drain plugs from both sides of cylinder block.



Removal (Cont'd)

4. Separate A.S.C.D. and accelerator control wire from intake manifold collector.



5. Remove intake manifold collector from engine.

The following parts should be disconnected or removed.

(1) Harness connectors for
- A.A.C. valve
- F.I.C.D. solenoid valve
- Throttle valve switch
- Throttle sensor
- Pressure regulator control solenoid valve
- Air regulator
- E.G.R. control solenoid valve
- Exhaust gas temperature sensor
- Earth harness

(2) P.C.V. hoses

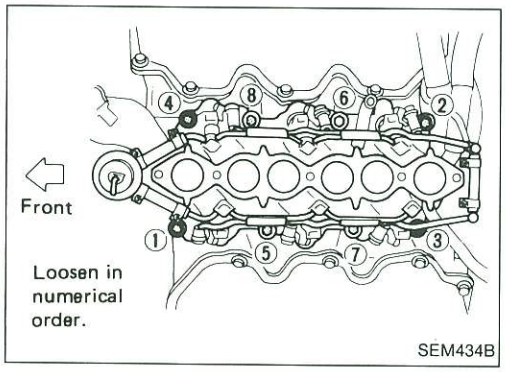
(3) Vacuum hoses for
- Master brake cylinder
- E.G.R. control solenoid valve
- Fuel pressure regulator
- Carbon canister

(4) Air hoses from
- Air duct
- A.A.C. valve
- Air regulator

(5) Water hoses for
- Throttle chamber
- Air relief plug

(6) Carbon canister purge hose

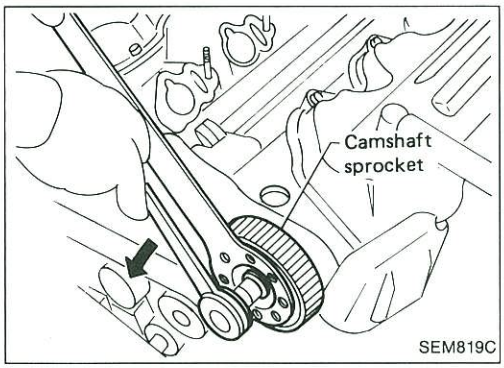
(7) E.G.R. tube



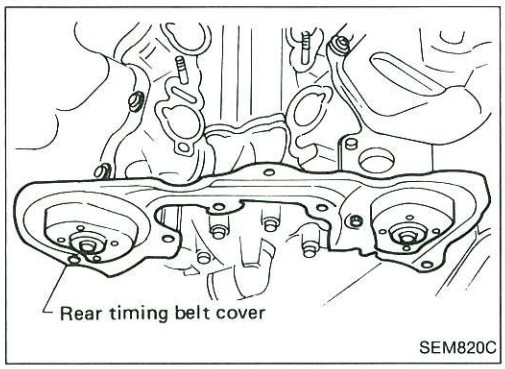
6. Remove intake manifold with fuel tube assembly.

The following parts should be disconnected or removed.
- Vacuum hose for fuel pressure regulator
- Fuel feed and return hoses
- All injectors harness connectors
- Fuel temperature sensor harness connector

Removal (Cont'd)

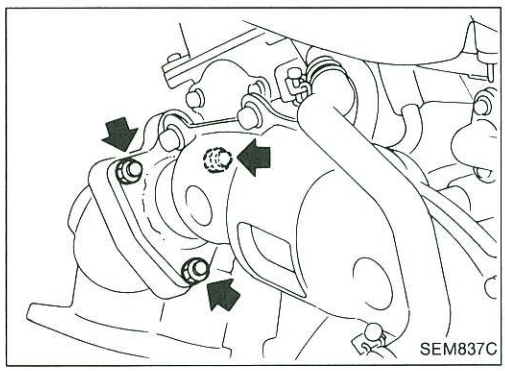


7. Remove both camshaft sprockets.

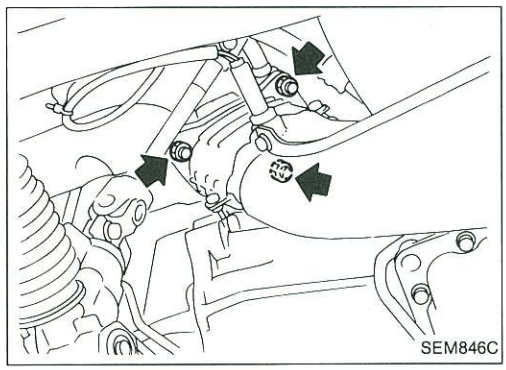


8. Remove rear timing belt cover.
9. Remove distributor and ignition wires.

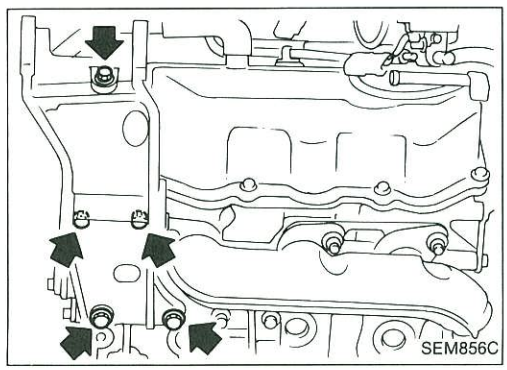
After pulling out distributor from cylinder head, do not rotate distributor rotor.



10. Remove R.H. exhaust manifold from L.H. exhaust manifold.

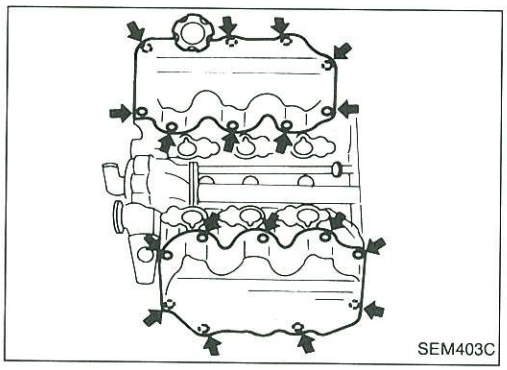


11. Remove front exhaust tube from exhaust manifold.

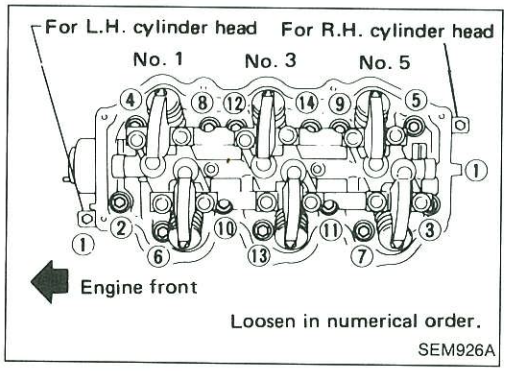


12. Remove compressor from bracket.
13. Remove compressor bracket.

Removal (Cont'd)


SEM403C

14. Remove both rocker covers.

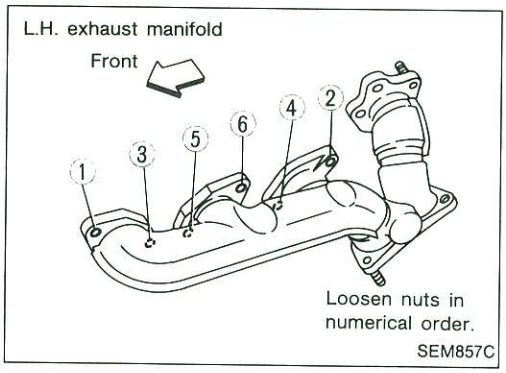


SEM926A

15. Remove cylinder head with exhaust manifold.

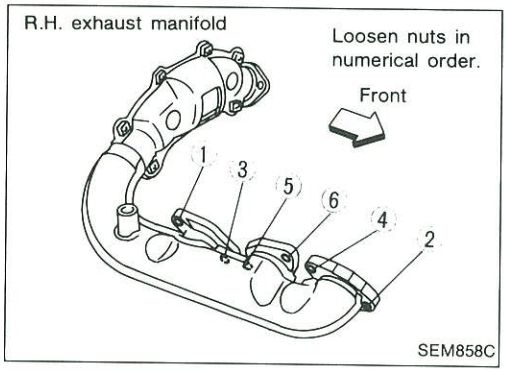
- **Head warpage or cracking could result from removing in incorrect order.**
- **Cylinder head bolts should be loosened in two or three steps.**

Disassembly

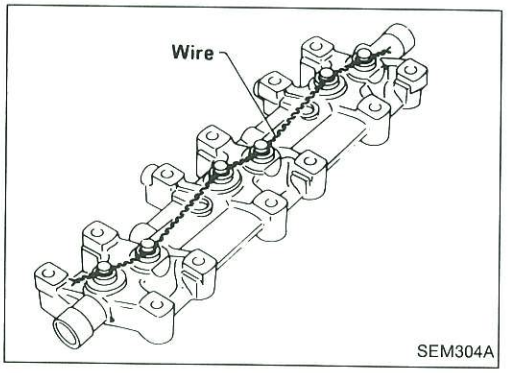


SEM857C

1. Remove exhaust manifolds from cylinder head.



SEM858C



SEM304A

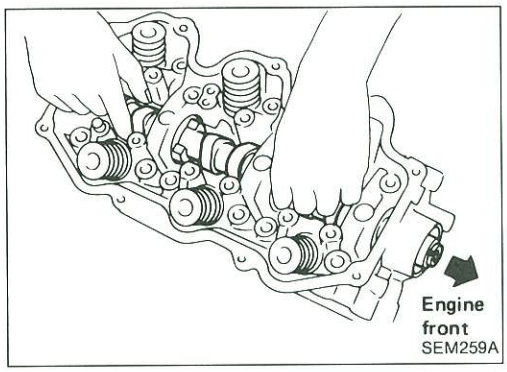
2. Remove rocker shafts with rocker arms.

Bolts should be loosened in two or three steps.

3. Remove hydraulic valve lifters and lifter guide.

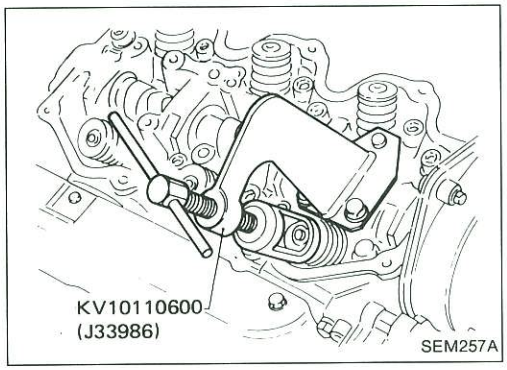
- **Hold hydraulic valve lifters with wire so that they will not drop from lifter guide.**

Disassembly (Cont'd)

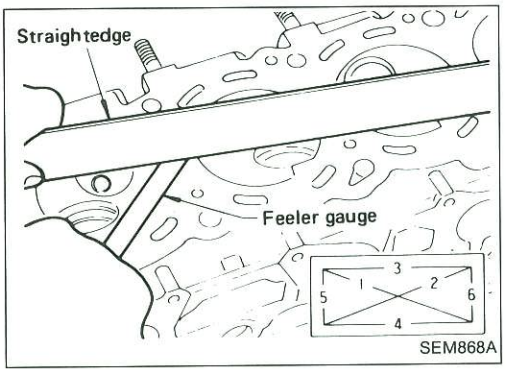


4. Remove oil seal and camshaft.

- **Before removing camshaft, measure camshaft end play.**



5. Remove valve components with Tool.
6. Remove valve oil seals with Tool or suitable tool.



Inspection

CYLINDER HEAD DISTORTION

Head surface flatness:

Less than 0.1 mm (0.004 in)

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

Resurfacing limit:

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

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

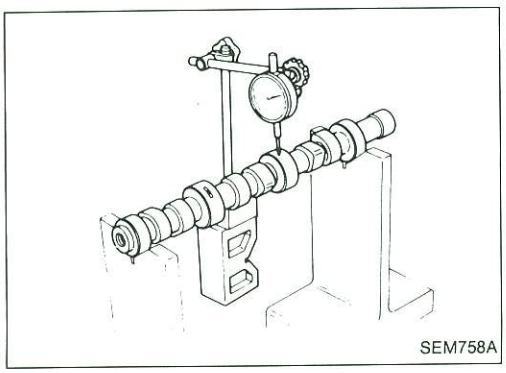
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

106.8 - 107.2 mm (4.205 - 4.220 in)

CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.



CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.

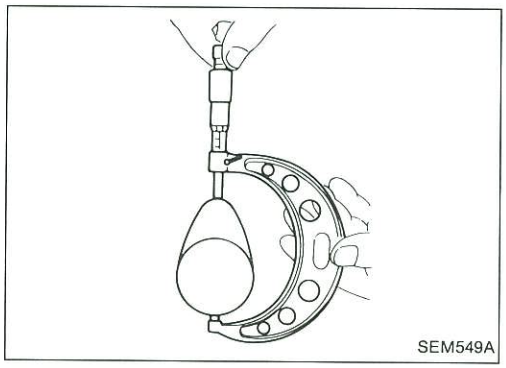
Runout (Total indicator reading):

Limit 0.1 mm (0.004 in)

2. If it exceeds the limit, replace camshaft.

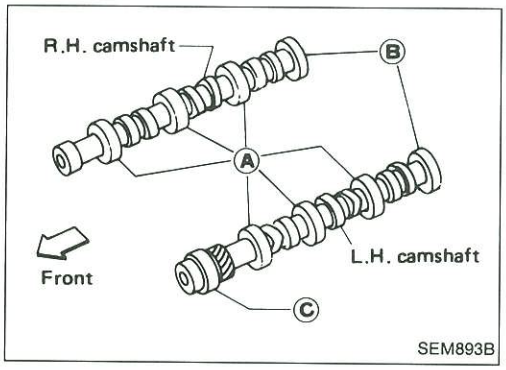
Inspection (Cont'd)

CAMSHAFT CAM HEIGHT

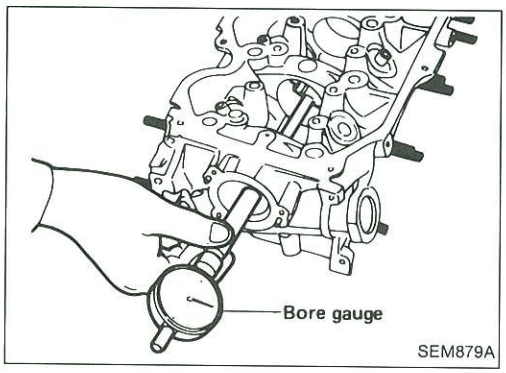

SEM549A

1. Measure camshaft cam height.
   Standard cam height:
   39.537 - 39.727 mm (1.5566 - 1.5641 in)
   Cam wear limit:
   0.15 mm (0.0059 in)
2. If wear is beyond the limit, replace camshaft.

CAMSHAFT JOURNAL CLEARANCE

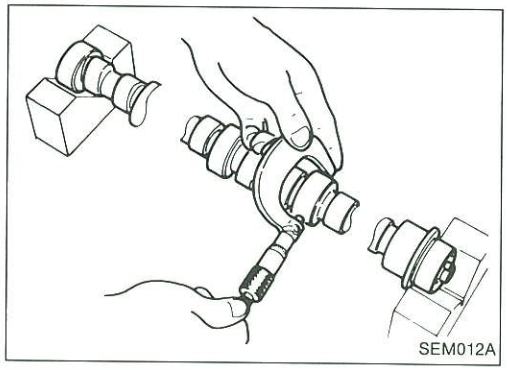


SEM893B



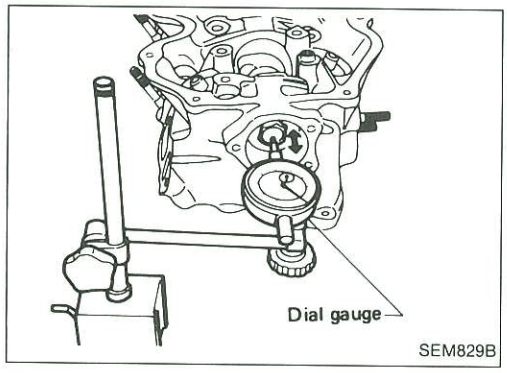
SEM879A

1. Measure inner diameter of camshaft bearing.
   Standard inner diameter:
   A 47.000 - 47.025 mm (1.8504 - 1.8514 in)
   B 42.500 - 42.525 mm (1.6732 - 1.6742 in)
   C 48.000 - 48.025 mm (1.8898 - 1.8907 in)


SEM012A

2. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   A 46.920 - 46.940 mm (1.8472 - 1.8480 in)
   B 42.420 - 42.440 mm (1.6701 - 1.6709 in)
   C 47.920 - 47.940 mm (1.8866 - 1.8874 in)
3. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance limit:
   0.15 mm (0.0059 in)

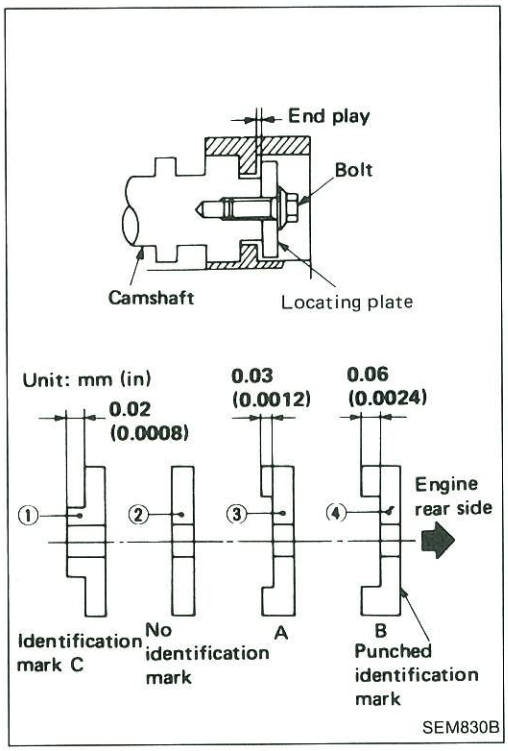
CAMSHAFT END PLAY



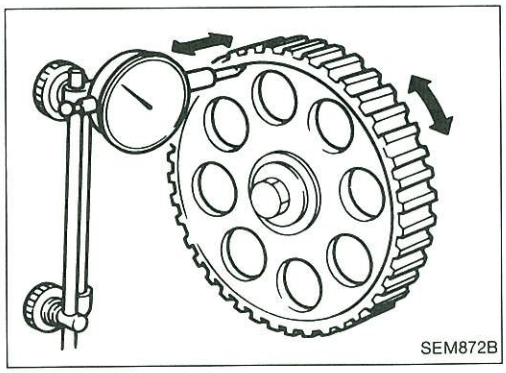
SEM829B

1. Install camshaft and locate plate in cylinder head.
2. Measure camshaft end play.
   Camshaft end play:
   Standard 0.03 - 0.06 mm (0.0012 - 0.0024 in)

Inspection (Cont'd)

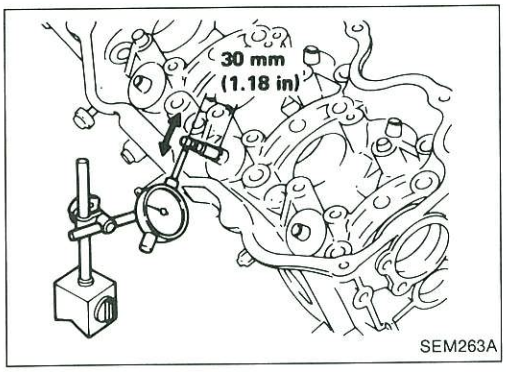


3. If it is out of the specified range, select thickness of camshaft locate plate to obtain standard specified end play.
   Example:
   When camshaft end play is 0.08 mm (0.0031 in) with camshaft locating plate ②, replace camshaft locating plate ② with camshaft locating plate ③ to set the end play at 0.05 mm (0.0020 in).



CAMSHAFT SPROCKET RUNOUT

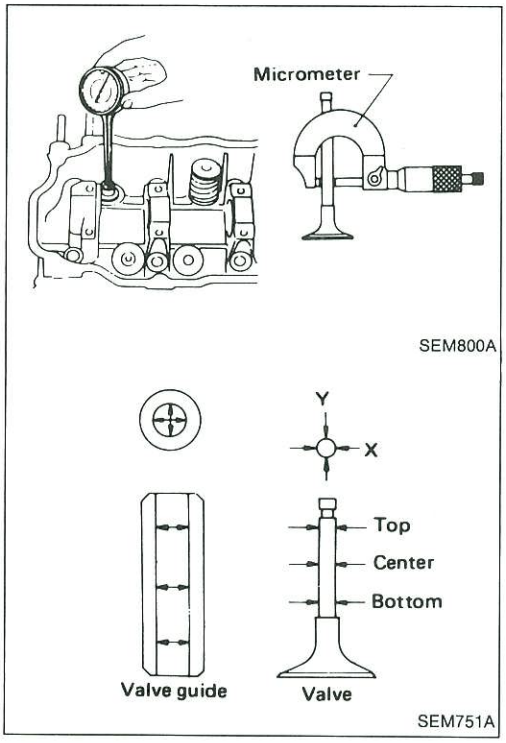
1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit 0.1 mm (0.004 in)
3. If it exceeds the limit, replace camshaft sprocket.



VALVE GUIDE CLEARANCE

1. Measure valve deflection in a right-angled direction with camshaft. (Valve and valve guide mostly wear in this direction.)
   Valve deflection limit (Dial gauge reading):
   0.20 mm (0.0079 in)

Inspection (Cont'd)

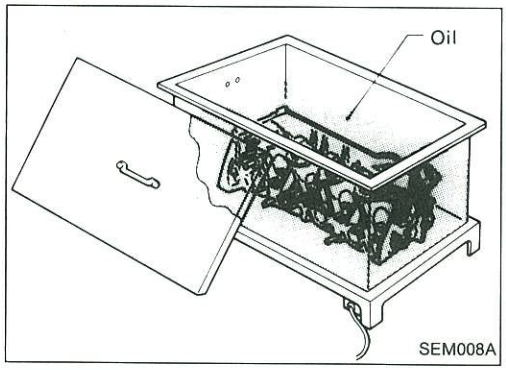


2. If it exceeds the limit, check valve to valve guide clearance.
a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.

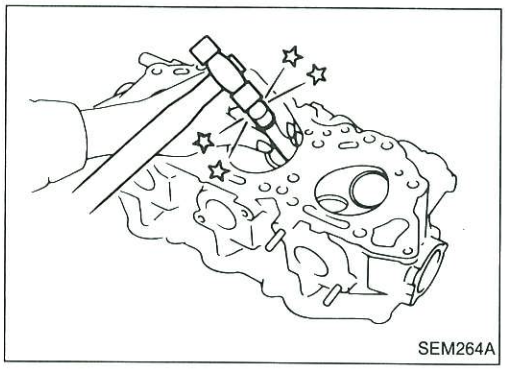
Valve to valve guide clearance:
Intake
0.020 - 0.053 mm (0.0008 - 0.0021 in)
Exhaust
0.040 - 0.073 mm (0.0016 - 0.0029 in)
Limit
0.10 mm (0.0039 in)

c. If it exceeds the limit, replace valve or valve guide.

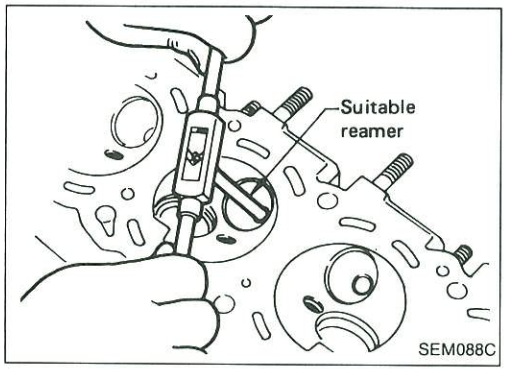
VALVE GUIDE REPLACEMENT



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



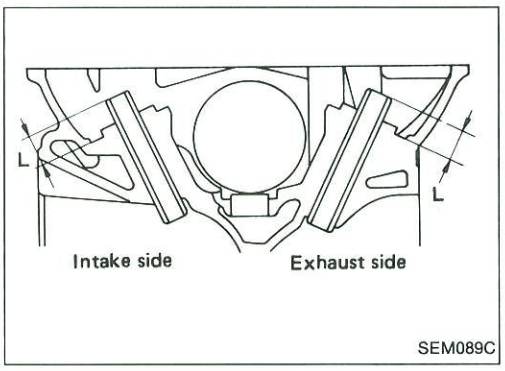
2. Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.



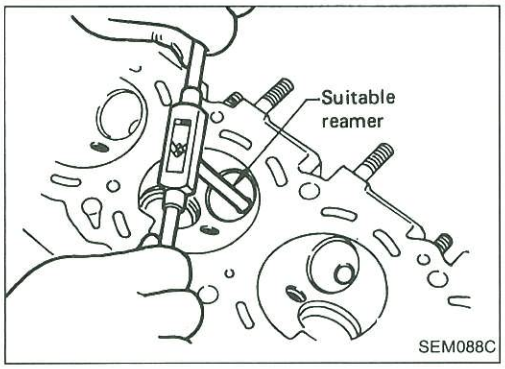
3. Ream cylinder head valve guide hole.

Valve guide hole diameter (for service parts):
Intake
11.175 - 11.196 mm (0.4400 - 0.4408 in)
Exhaust
12.175 - 12.196 mm (0.4793 - 0.4802 in)

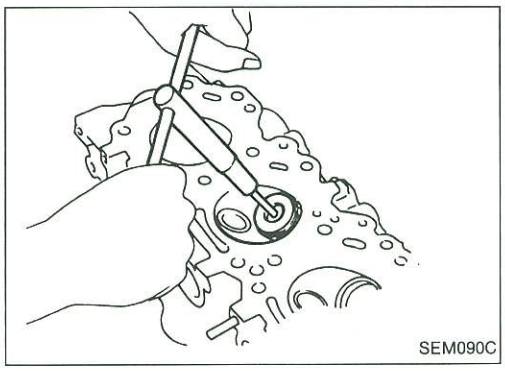
Inspection (Cont'd)



4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.
   Projection "L":
   13.2 - 13.4 mm (0.520 - 0.528 in)



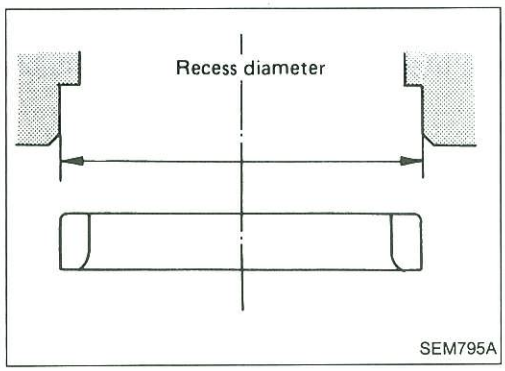
5. Ream valve guide.
   Finished size:
   Intake
   7.000 - 7.018 mm (0.2756 - 0.2763 in)
   Exhaust
   8.000 - 8.018 mm (0.3150 - 0.3157 in)



VALVE SEATS

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

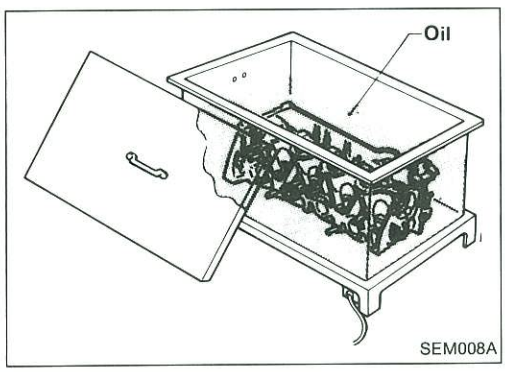
- **Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.**
- **Cut with both hands to maintain a uniform cutting surface.**



REPLACING VALVE SEAT FOR SERVICE PARTS

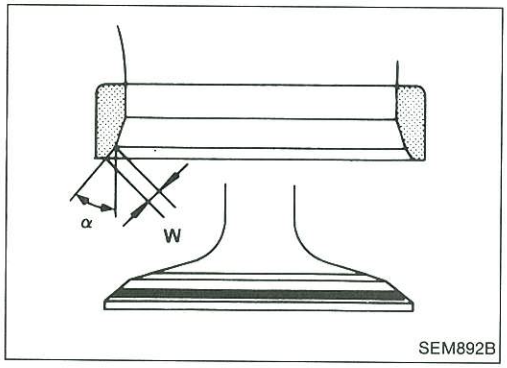
1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.
   Reaming bore for service valve seat
   Oversize [0.5 mm (0.020 in)]:
   Intake 44.500 - 44.516 mm (1.7520 - 1.7526 in)
   Exhaust 37.500 - 37.516 mm (1.4764 - 1.4770 in)

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



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

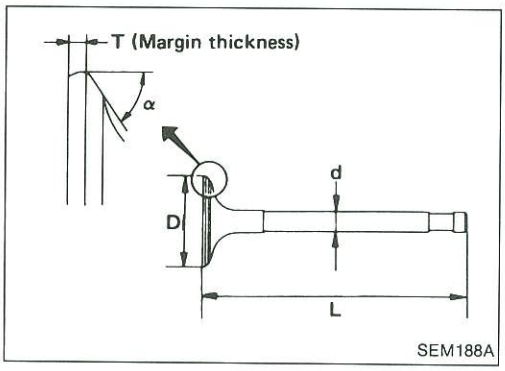
Inspection (Cont'd)



SEM892B

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

		Intake	Exhaust
Seat face angle "α"	degree	45	45
Contacting width "W"	mm (in)	1.75 (0.0689)	1.7 (0.067)

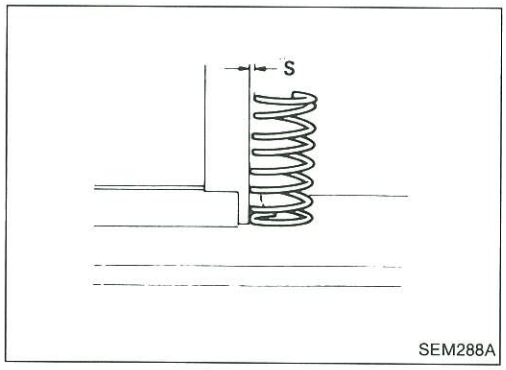


SEM188A

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.

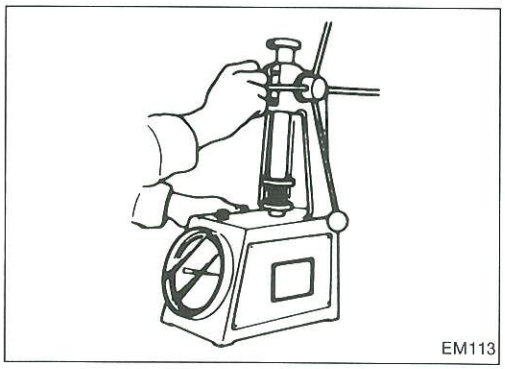


SEM288A

VALVE SPRING

Squareness

1. Measure "S" dimension.
   Out-of-square:
   Outer
   Less than 2.2 mm (0.087 in)
   Inner
   Less than 1.9 mm (0.075 in)
2. If it exceeds the limit, replace spring.

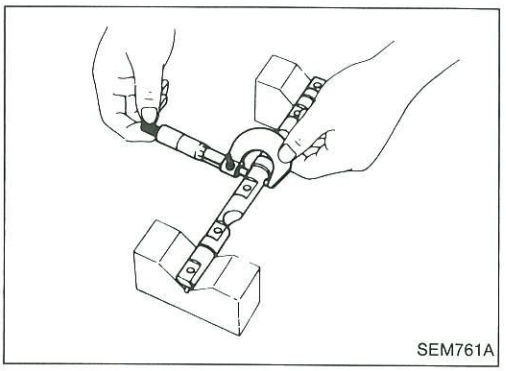

EM113

Pressure

Check valve spring pressure.

Pressure: N (kg, lb) at height mm (in)
Standard
Outer 250.1 (25.5, 56.2) at 40.0 (1.575)
Inner 255.0 (26.0, 57.3) at 25.0 (0.984)
Limit
Outer More than 228.5 (23.3, 51.4) at 25.0 (0.984)
Inner More than 225.6 (23.0, 50.7) at 25.0 (0.984)

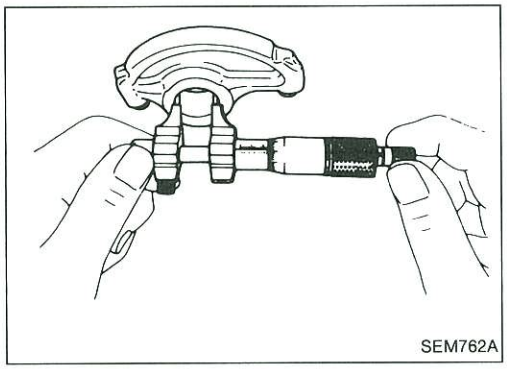
If it exceeds the limit, replace spring.


SEM761A

ROCKER SHAFT AND ROCKER ARM

1. Check rocker shafts for scratches, seizure and wear.
2. Check outer diameter of rocker shaft.
   Diameter:
   17.979 - 18.000 mm (0.7078 - 0.7087 in)

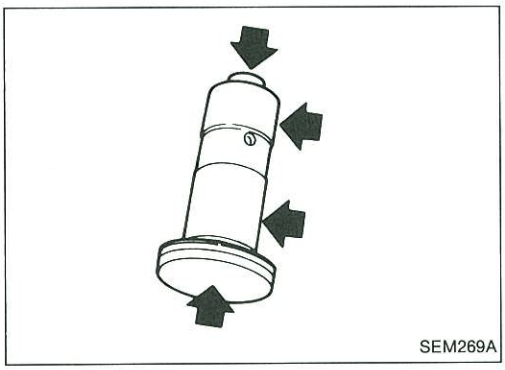
Inspection (Cont'd)


SEM762A

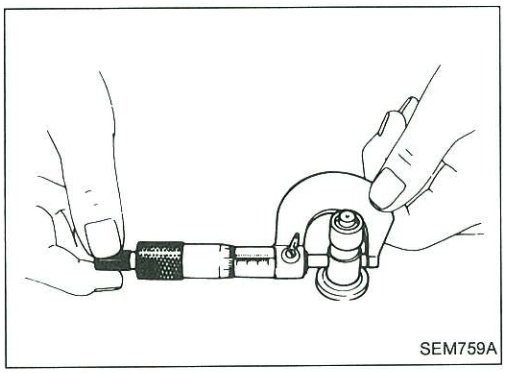
3. Check inner diameter of rocker arm.
   Diameter:
   18.007 - 18.028 mm (0.7089 - 0.7098 in)
   Rocker arm to shaft clearance:
   0.007 - 0.049 mm (0.0003 - 0.0019 in)

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

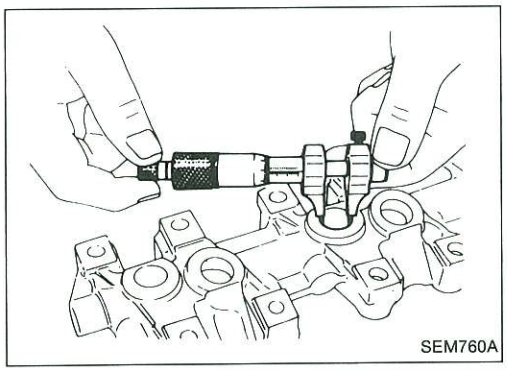
HYDRAULIC VALVE LIFTER


SEM269A

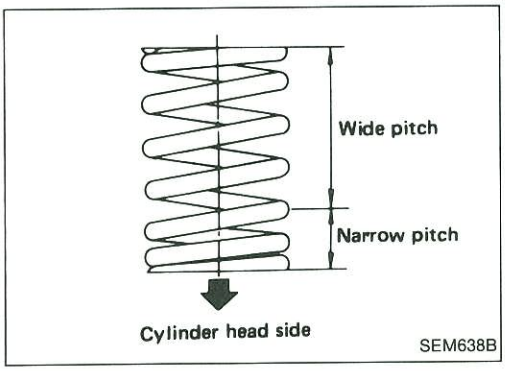
1. Check contact and sliding surfaces for wear or scratches.


SEM759A

2. Check diameter of valve lifter.
   Outer diameter:
   15.947 - 15.957 mm (0.6278 - 0.6282 in)


SEM760A

3. Check valve lifter guide inner diameter.
   Inner diameter:
   16.000 - 16.013 mm (0.6299 - 0.6304 in)
   Standard clearance between valve lifter and lifter guide:
   0.043 - 0.066 mm (0.0017 - 0.0026 in)



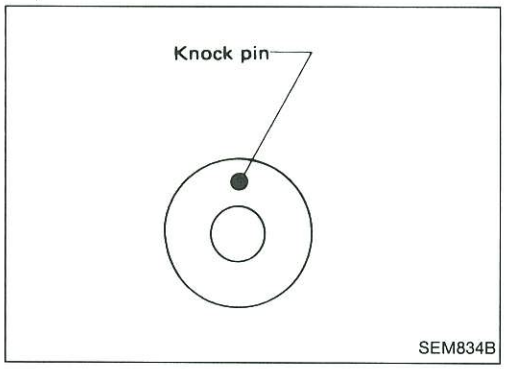
SEM638B

Assembly

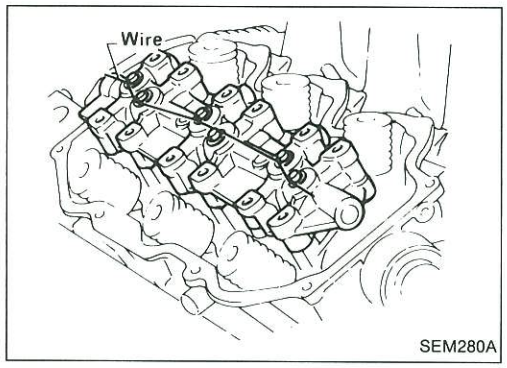
1. Install valve component parts.

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

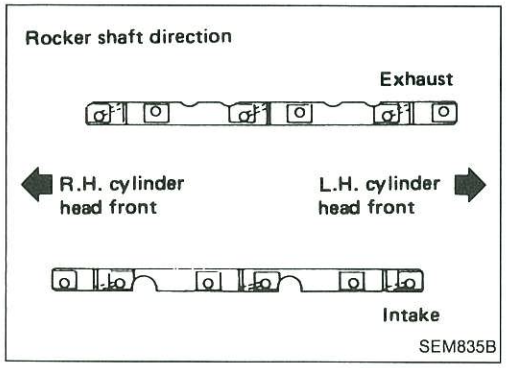
Assembly (Cont'd)



2. Install camshafts, locate plates and cylinder head rear covers.
- **Set knock pin of camshaft at the top.**



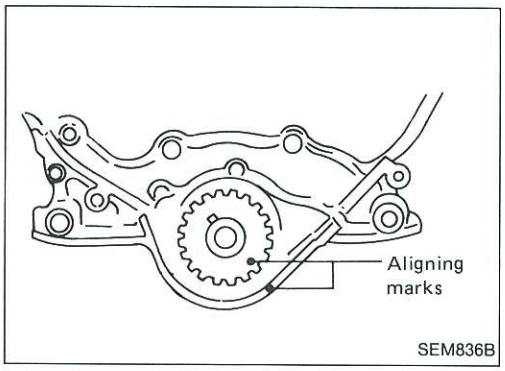
3. Install valve lifters into valve lifter guide.
- **Assemble valve lifters to their original position and hold all valve lifters with wire to prevent lifters from falling off.**
- **After installing them, remove the wire.**



4. Install rocker shafts with rocker arms.
- **Tighten bolts gradually in two or three stages.**
- **Before tightening, be sure to set camshaft the lobe at the position where lobe is not lifted.**

a. Set No. 1 piston at T.D.C. on its compression stroke and tighten rocker shaft bolts for No. 2, No. 4 and No. 6 cylinders.
b. Set No. 4 piston at T.D.C. on its compression stroke and tighten rocker shaft bolts for No. 1, No. 3 and No. 5 cylinders.

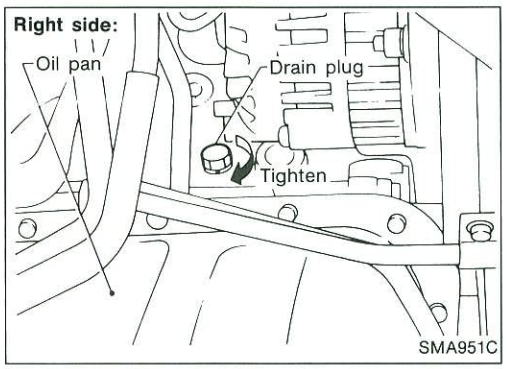
5. Install exhaust manifold to cylinder head in reverse order of removal.



Installation

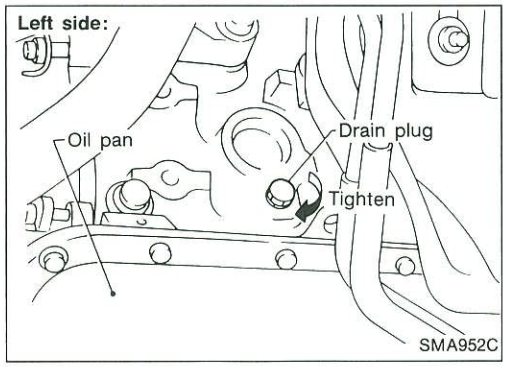
1. Set No. 1 piston at T.D.C. on its compression stroke as follows:
a. Align crankshaft sprocket aligning mark with mark on oil pump body.
b. Confirm that knock pin on camshaft is set at the top.

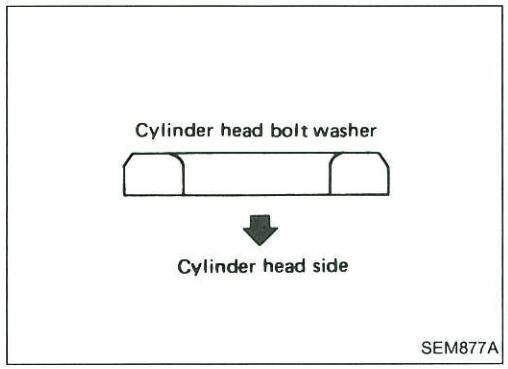
Installation (Cont'd)



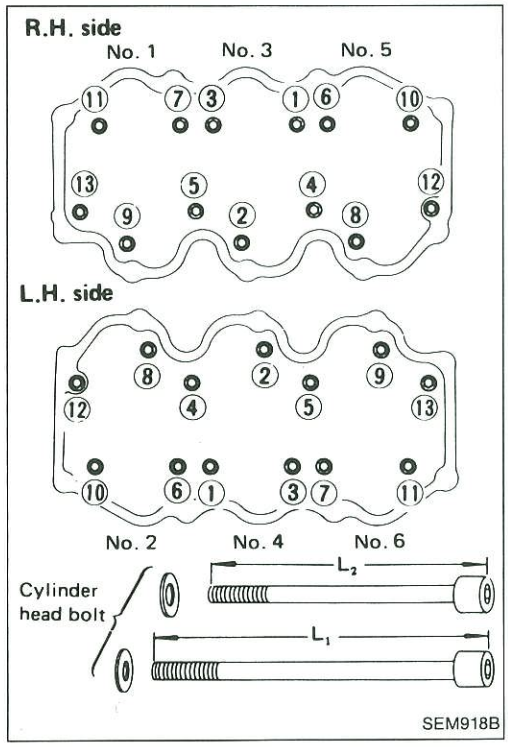
2. Install both drain plugs.
- Apply sealant to drain plug threads.

3. Install exhaust manifolds to cylinder head in reverse order of removal.





4. 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.**

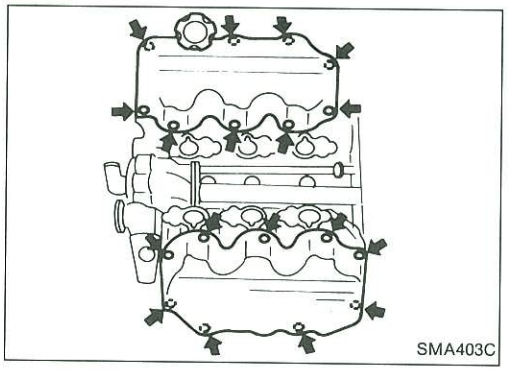


5. Tighten cylinder head bolts in numerical order using ST10120000 (J24239-01).
- **Tightening procedure:**

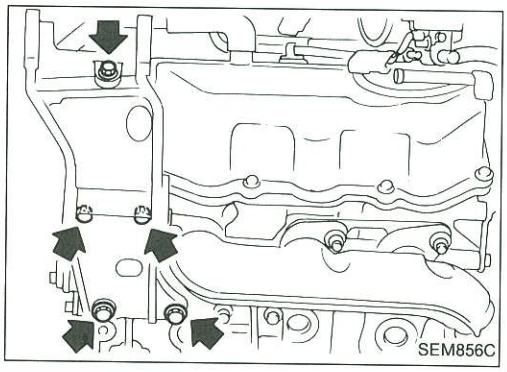
(1) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
(2) Tighten all bolts to 59 N·m (6.0 kg-m, 43 ft-lb).
(3) Loosen all bolts completely.
(4) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
(5) Turn all bolts 60 to 65 degrees clockwise.
If an angle wrench is not available, tighten all bolts to 54 to 64 N·m (5.5 to 6.5 kg-m, 40 to 47 ft-lb).

- **Bolts for ④, ⑤, ⑫ and ⑬ are longer than the others.**
  L_1: 127 mm (5.00 in) for ④, ⑤, ⑫ and ⑬
  L_2: 106 mm (4.17 in) for others

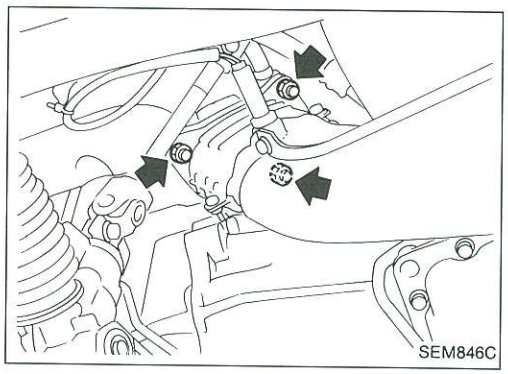
Installation (Cont'd)



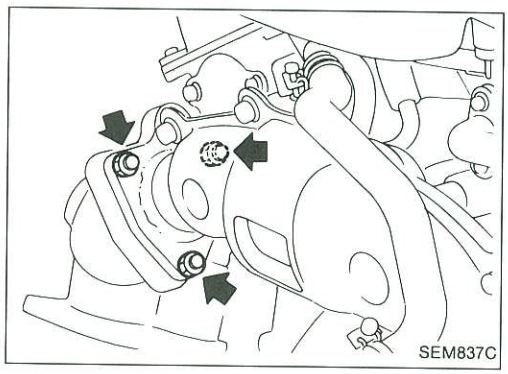
6. Install both rocker covers.



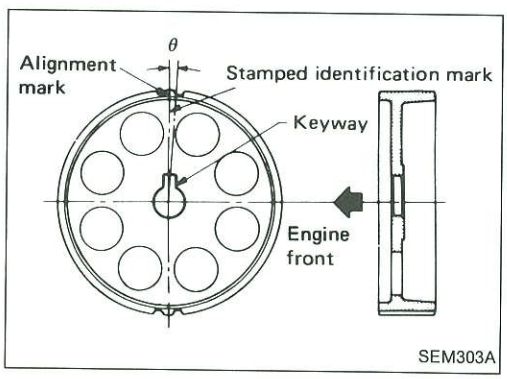
7. Install compressor bracket and compressor.



8. Install front exhaust tube to exhaust manifold.



9. Install R.H. exhaust manifold to L.H. exhaust manifold.



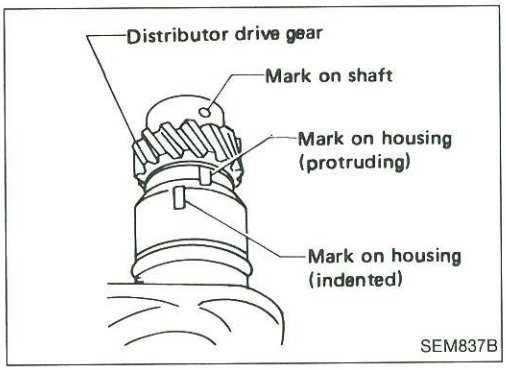
10. Install rear belt cover and camshaft sprocket.

- **R.H. camshaft sprocket and L.H. camshaft sprocket are different parts. Be sure to install them in the correct location.**

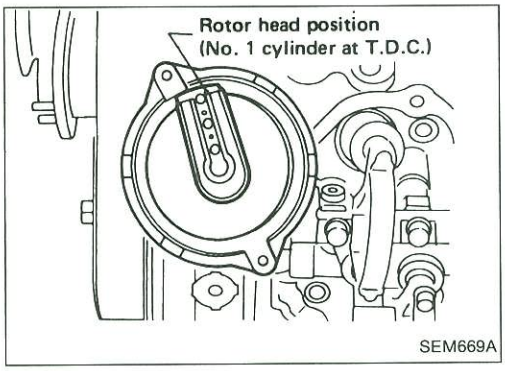
	Identification mark	θ
R.H. camshaft sprocket	R3	0°53'
L.H. camshaft sprocket	L3	–3°27'

Installation (Cont'd)

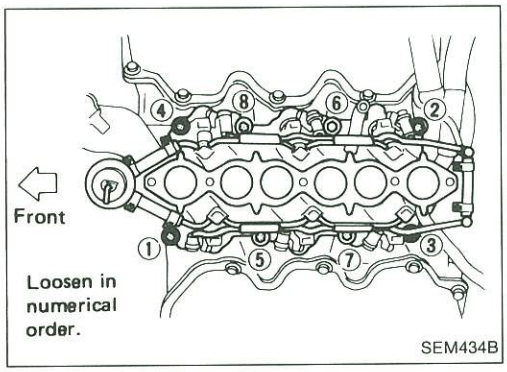
11. Install timing belt and adjust belt tension.
Refer to "TIMING BELT — Installation".



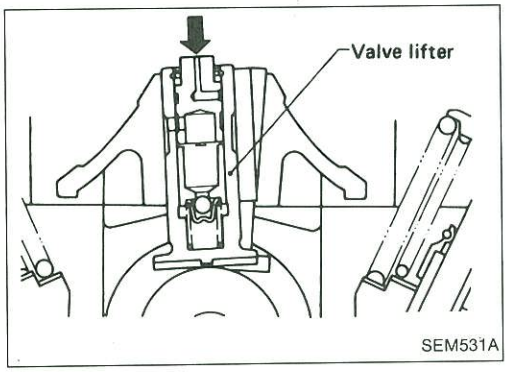
12. Install distributor.
(1) Align mark on shaft with protruding mark on housing.



(2) After installing, confirm that distributor rotor head is set as shown in figure.

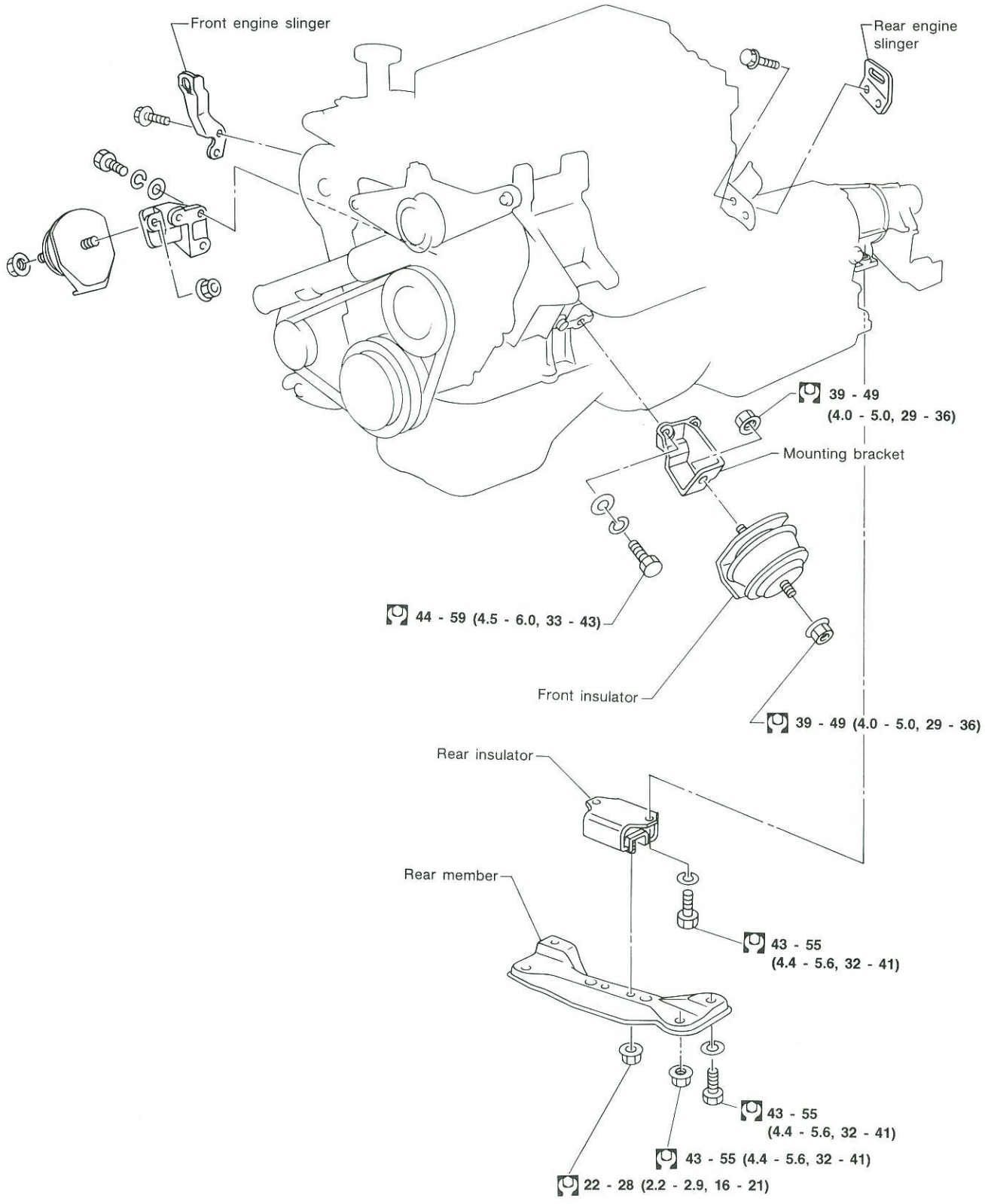


13. Install intake manifold with fuel tube assembly.
Install all parts which were removed in step 6 under "CYLINDER HEAD — Removal". (See page EM-24.)
14. Install intake manifold collector.
Install all parts which were removed in step 5 under "CYLINDER HEAD — Removal". (See page EM-24.)
15. Install A.S.C.D. and accelerator control wire.



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

b. If valve lifter moves more than 1 mm (0.04 in), air may be inside it.
c. Bleed air off by running engine at 1,000 rpm under no load for about 10 minutes.
d. If hydraulic valve lifters are still noisy, replace them and bleed air off again in the same manner as in step 16 (c).



: N•m (kg-m, ft-lb)

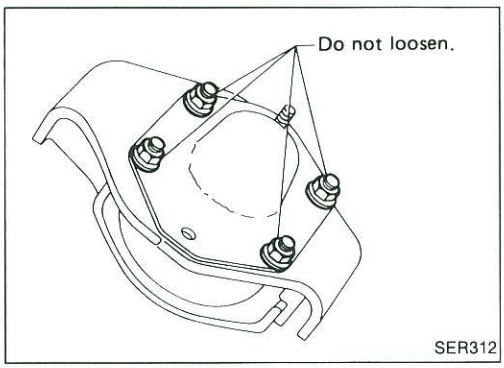
SEM859C

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. Before removing front axle from transmission, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.
g. Be sure to hoist engine and transmission in a safe manner.
h. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

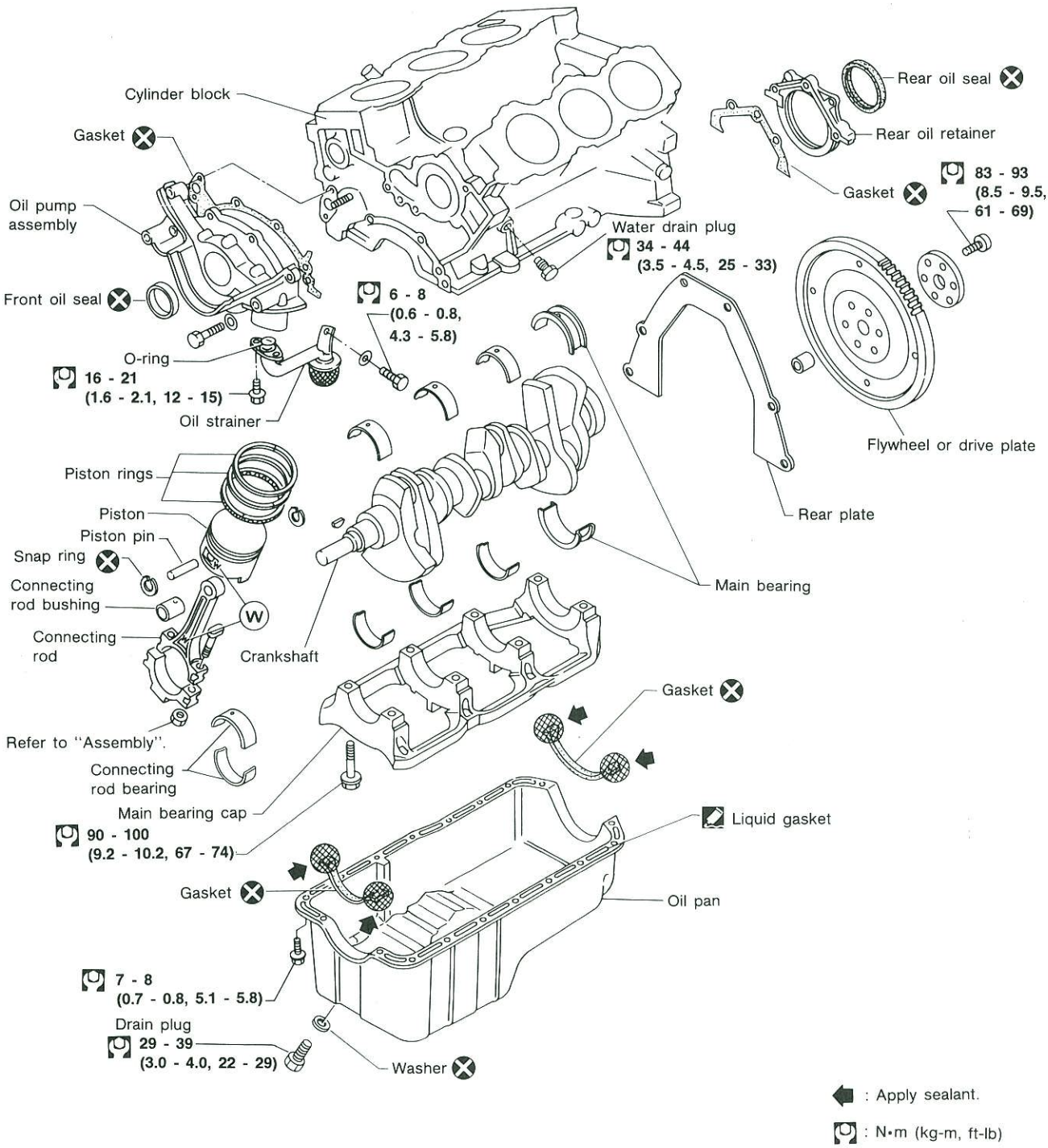
- When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.



- Do not loosen front engine mounting insulator cover securing nuts.
  When cover is removed, damper oil flows out and mounting insulator will not function.
  For tightening torque, refer to sections AT.
  Sealant should be applied between engine and transmission.

Removal

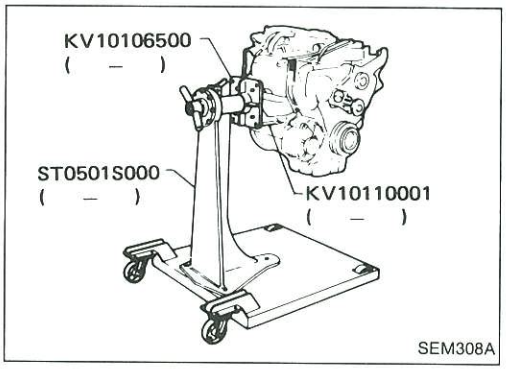
1. Remove engine undercover and hood.
2. Drain engine coolant.
3. Remove vacuum hoses, fuel tubes, wires, harnesses and connectors.
4. Remove radiator with shroud and cooling fan.
5. Remove drive belts.
6. Remove power steering oil pump and air conditioner compressor.
7. Remove front exhaust tube.
8. Install engine slingers.
9. Hoist engine with engine slingers and remove engine mounting bolts from both sides.
10. Remove engine from vehicle.


Cylinder block
Gasket
Oil pump assembly
Front oil seal
O-ring
16 - 21 (1.6 - 2.1, 12 - 15)
Oil strainer
6 - 8 (0.6 - 0.8, 4.3 - 5.8)
Water drain plug
34 - 44 (3.5 - 4.5, 25 - 33)
Rear oil seal
Rear oil retainer
Gasket
83 - 93 (8.5 - 9.5, 61 - 69)
Flywheel or drive plate
Rear plate
Piston rings
Piston
Piston pin
Snap ring
Connecting rod bushing
Connecting rod
W
Crankshaft
Main bearing
Refer to "Assembly".
Connecting rod bearing
Main bearing cap
90 - 100 (9.2 - 10.2, 67 - 74)
Gasket
Liquid gasket
Gasket
Oil pan
7 - 8 (0.7 - 0.8, 5.1 - 5.8)
Drain plug
29 - 39 (3.0 - 4.0, 22 - 29)
Washer
: Apply sealant.
: N•m (kg-m, ft-lb)

SEM860C

CAUTION:

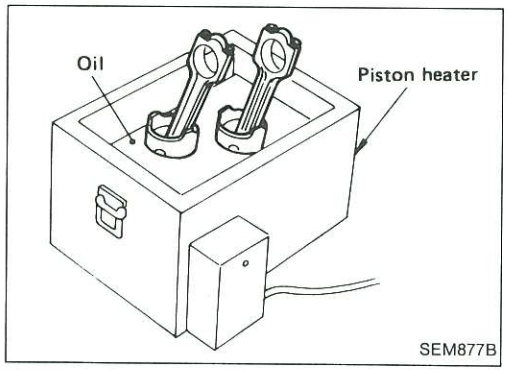
- **When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.**
- **Place removed parts such as bearings and bearing caps in their proper order and direction.**
- **When tightening connecting rod bolts and main bearing cap bolts, apply engine oil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



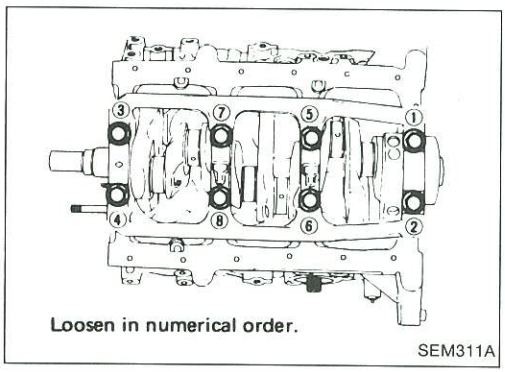
Disassembly

PISTON AND CRANKSHAFT

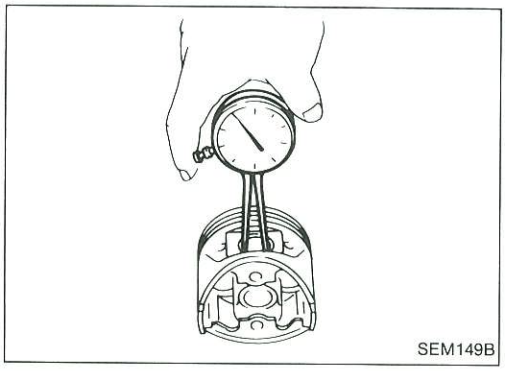
1. Place engine on a work stand.
2. Drain coolant and oil.
3. Remove oil pan and oil pump.
4. Remove timing belt.
5. Remove water pump.
6. Remove cylinder head.



7. Remove pistons with connecting rods.
- 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.**

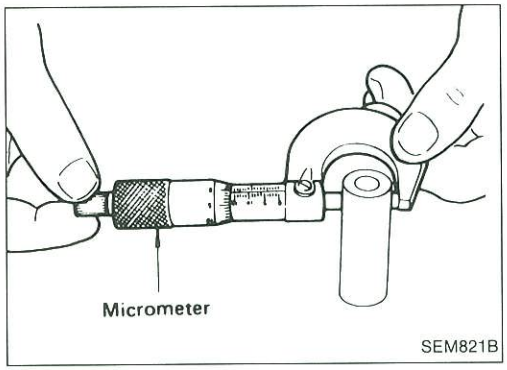


Inspection

PISTON AND PISTON PIN CLEARANCE

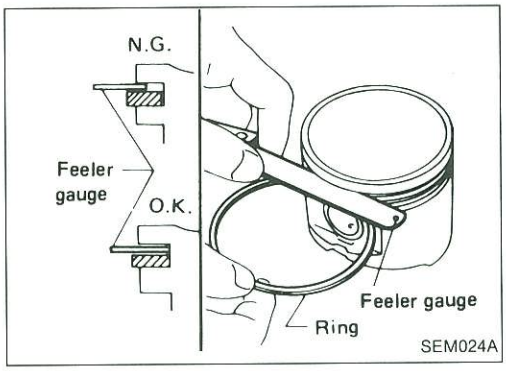
1. Measure inner diameter of piston pin hole "dp".
   Standard diameter "dp":
   20.969 - 20.981 mm (0.8255 - 0.8260 in)

Inspection (Cont'd)



2. Measure outer diameter of piston pin "Dp".
   Standard diameter "Dp":
   20.971 - 20.983 mm (0.8256 - 0.8261 in)
3. Calculate piston pin clearance.
   dp – Dp = 0 to –0.004 mm (0 to –0.0002 in)

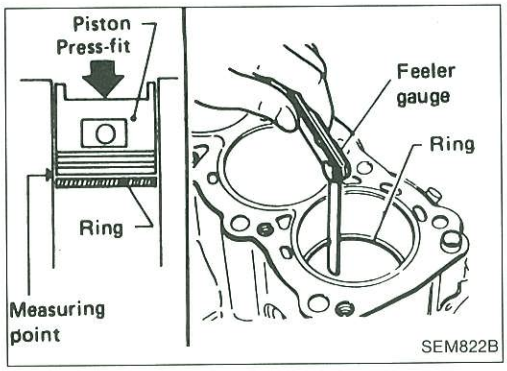
If it exceeds the above value, replace piston assembly with pin.



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)

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

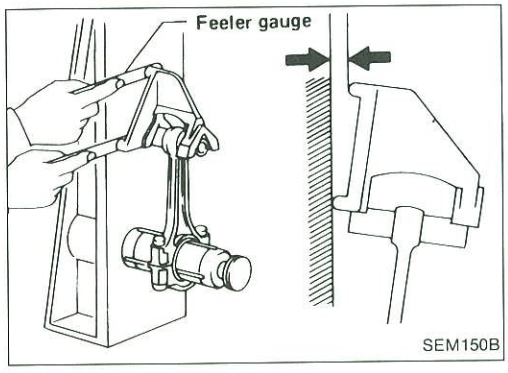


PISTON RING END GAP

End gap:
Top ring
0.21 - 0.44 mm (0.0083 - 0.0173 in)
2nd ring
0.18 - 0.44 mm (0.0071 - 0.0173 in)
Oil ring
0.20 - 0.76 mm (0.0079 - 0.0299 in)
Max. limit of ring gap:
1.0 mm (0.039 in)

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

Refer to S.D.S.



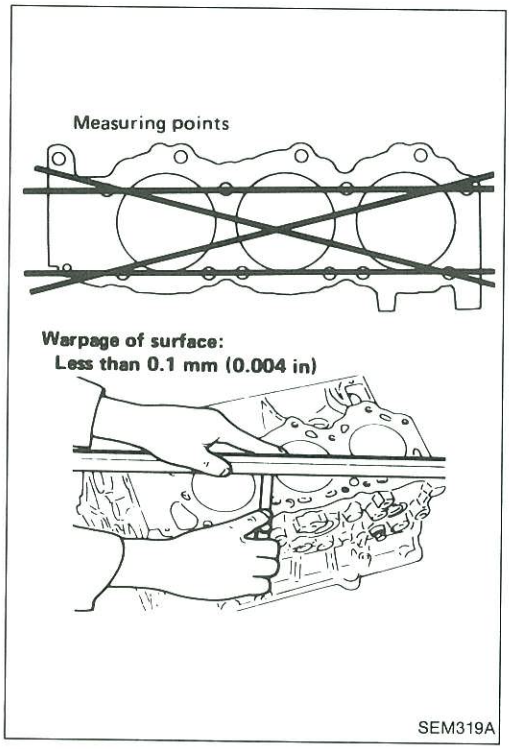
CONNECTING ROD BEND AND TORSION

Bend:
Limit 0.15 mm (0.0059 in)
per 100 mm (3.94 in) length
Torsion:
Limit 0.30 mm (0.0118 in)
per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

Inspection (Cont'd)

CYLINDER BLOCK DISTORTION AND WEAR

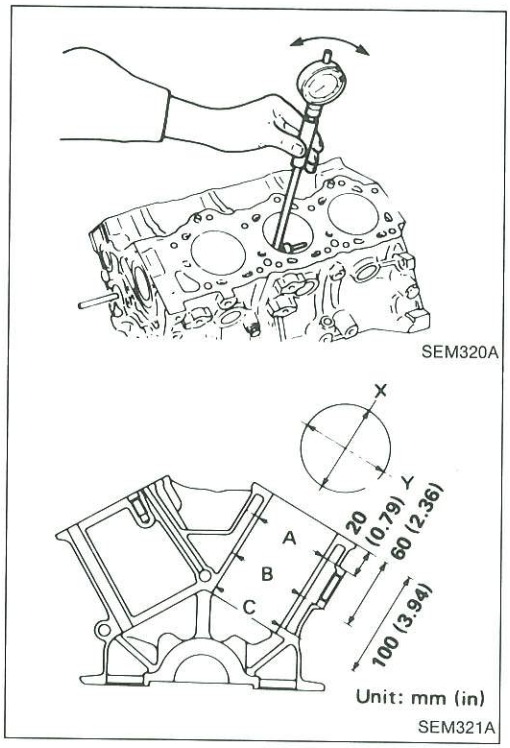


1. Clean upper face of cylinder block and measure the distortion.
   Limit:
   0.10 mm (0.0039 in)
2. If out of specification, resurface it.
   The resurfacing limit is determined by cylinder head resurfacing in engine.

Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)
Nominal cylinder block height from crankshaft center:
227.60 - 227.70 mm (8.9606 - 8.9645 in)

3. If necessary, replace cylinder block.

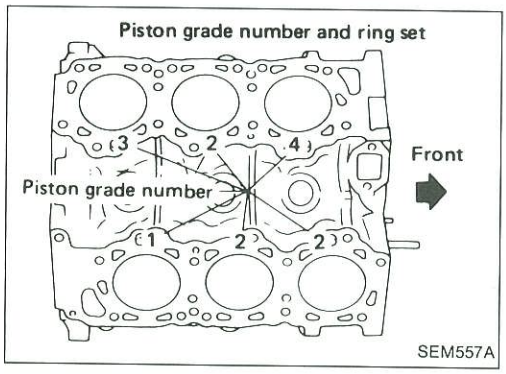
PISTON-TO-BORE CLEARANCE



1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.
   Standard inner diameter:
   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) limit:
   0.015 mm (0.0006 in)

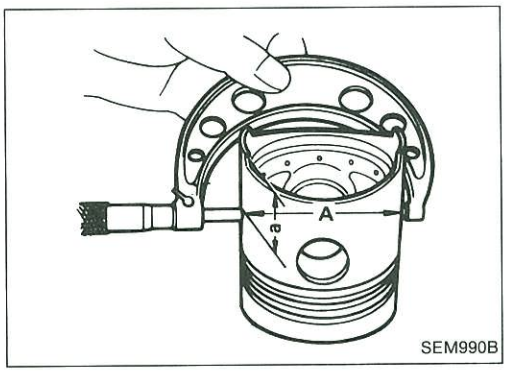
If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

2. Check for scratches and seizure. If seizure is found, hone it.



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

Inspection (Cont'd)



3. Measure piston skirt diameter.
   Piston diameter "A":
   Refer to S.D.S.
   Measuring point "a" (Distance from the bottom):
   18 mm (0.71 in)
4. Check that piston-to-bore clearance is within specification.
   Piston-to-bore clearance "B":
   0.015 - 0.035 mm (0.0006 - 0.0014 in)
5. Determine piston oversize according to amount of cylinder wear.

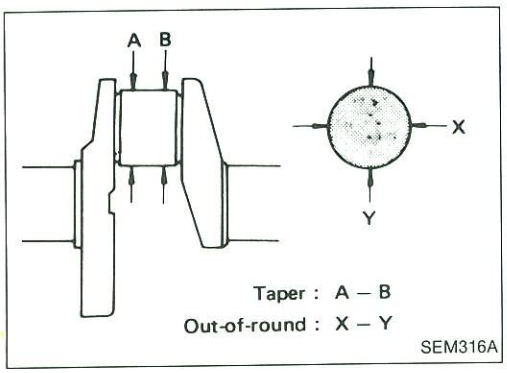
Oversize pistons are available for service. Refer to S.D.S.

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

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

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

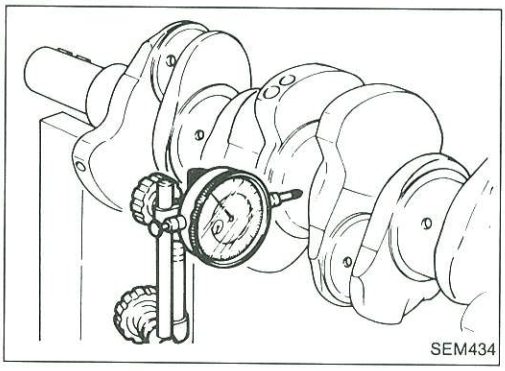
- **Measurement should be done after cylinder bore cools down.**



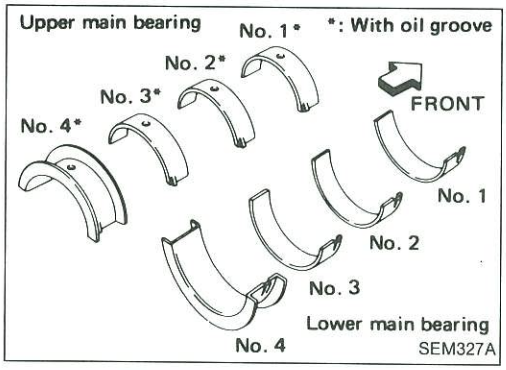
CRANKSHAFT

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

Inspection (Cont'd)



3. Measure crankshaft runout.
   Runout (Total indicator reading):
   Less than 0.10 mm (0.0039 in)



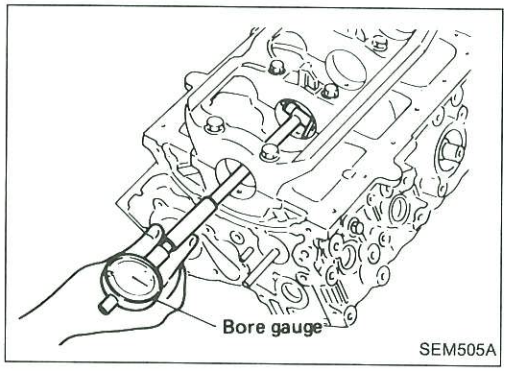
BEARING CLEARANCE

- 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

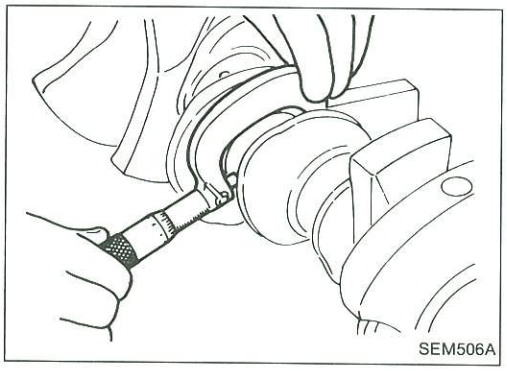
1. Set main bearings in their proper positions on cylinder block and main bearing cap.



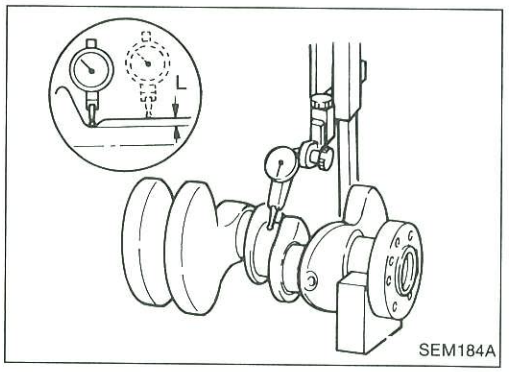
2. Install main bearing cap to cylinder block.

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

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

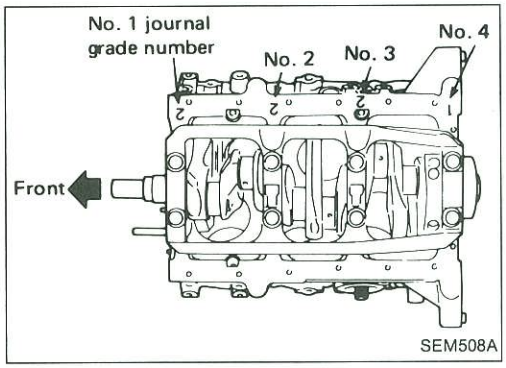


4. Measure outer diameter "Dm" of each crankshaft main journal.
5. Calculate main bearing clearance.
   Main bearing clearance (A – Dm):
   Standard 0.028 - 0.055 mm (0.0011 - 0.0022 in)
   Limit 0.090 mm (0.0035 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.



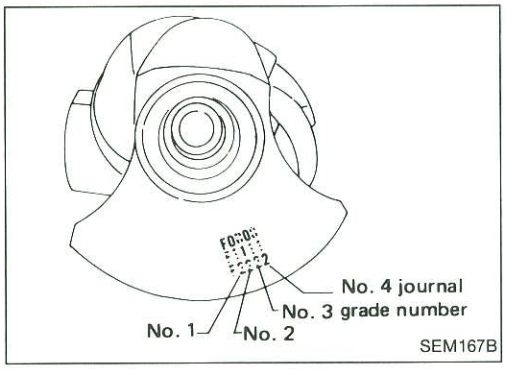
a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.
   "L": 0.1 mm (0.004 in)
b. Refer to S.D.S. for grinding crankshaft and available service parts.

Inspection (Cont'd)



8. If crankshaft is reused, measure main bearing clearances and select thickness of main bearings.
   If crankshaft is replaced with a new one, it is necessary to select thickness of main bearings as follows:

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



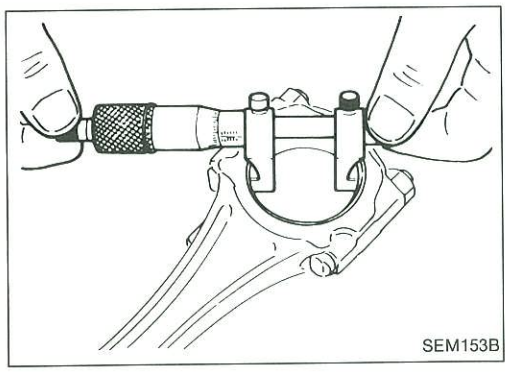
b. Grade number of each crankshaft main journal is punched on the respective crankshaft.

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

Main bearing grade number:

Crankshaft journal grade number \ Main journal grade number	0	1	2
0	0	1	2
1	1	2	3
2	2	3	4

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



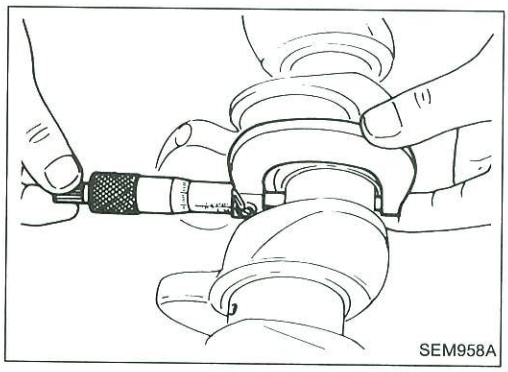
Connecting rod bearing (Big end)

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

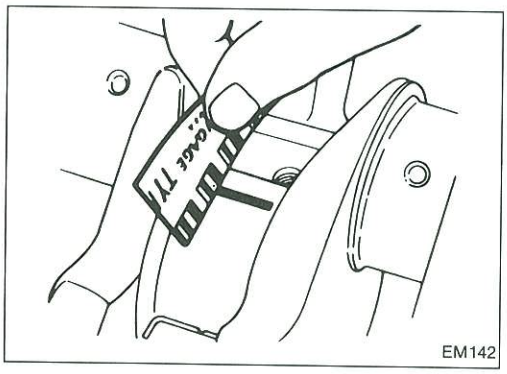
Tighten bolts to the specified torque.

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

Inspection (Cont'd)


SEM958A

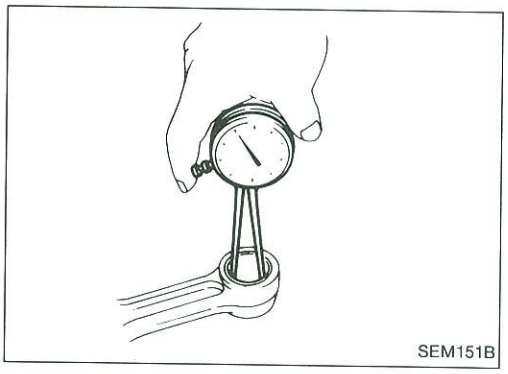
4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance (C – Dp):
   Standard
   0.014 - 0.054 mm (0.0006 - 0.0021 in)
   Limit
   0.090 mm (0.0035 in)
6. If it exceeds the limit, replace bearing.
7. If clearance 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".


EM142

Method B (Using plastigauge)

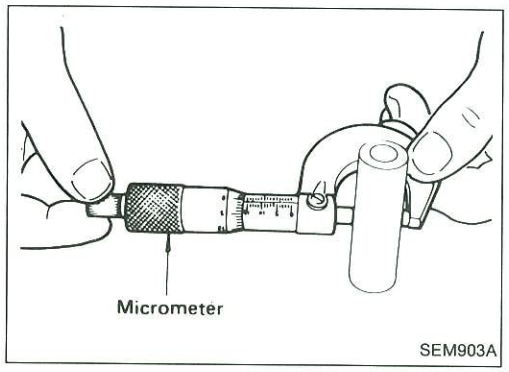
CAUTION:

- **Do not turn crankshaft or connecting rod while plastigauge 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.**


SEM151B

CONNECTING ROD BUSHING CLEARANCE (Small end)

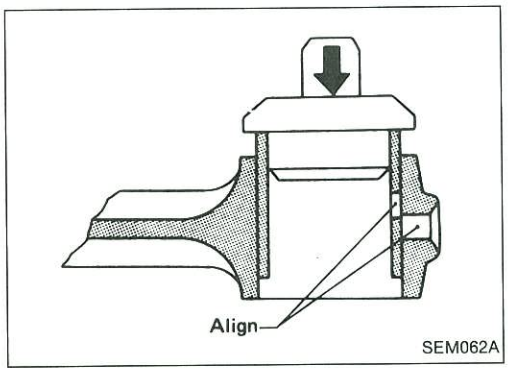
1. Measure inner diameter "C" of bushing.



SEM903A

2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bushing clearance.
   Connecting rod bushing clearance = C – Dp
   Standard:
   0.005 - 0.017 mm (0.0002 - 0.0007 in)
   Limit:
   0.023 mm (0.0009 in)
   If it exceeds the limit, replace connecting rod assembly or connecting rod bushing and/or piston set with pin.

Inspection (Cont'd)



REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

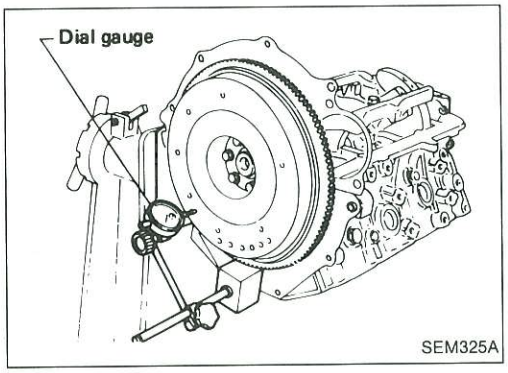
1. Drive in small end bushing until it is flush with end surface of rod.

Be sure to align the oil holes.

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

Clearance between connecting rod bushing and piston pin:

0.005 - 0.017 mm (0.0002 - 0.0007 in)



FLYWHEEL/DRIVE PLATE RUNOUT

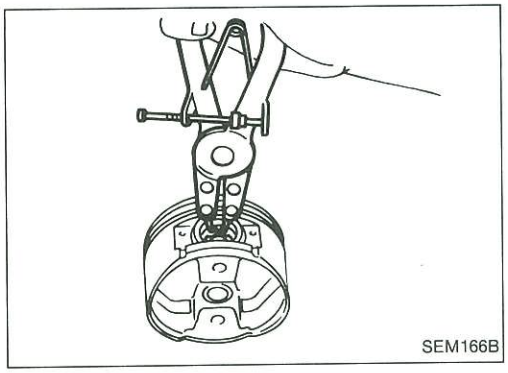
Runout (Total indicator reading):

Flywheel (M/T model)

Less than 0.15 mm (0.0059 in)

Drive plate (A/T model)

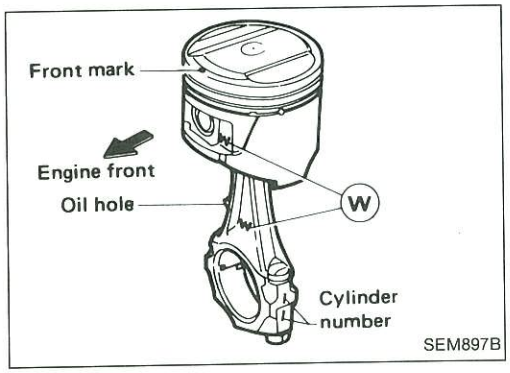
Less than 0.15 mm (0.0059 in)



Assembly

PISTON

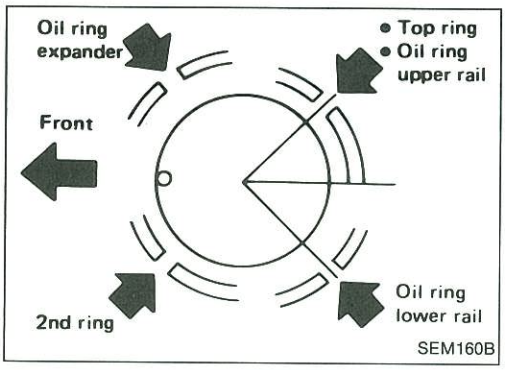
1. Install new snap ring on one side of piston pin hole.



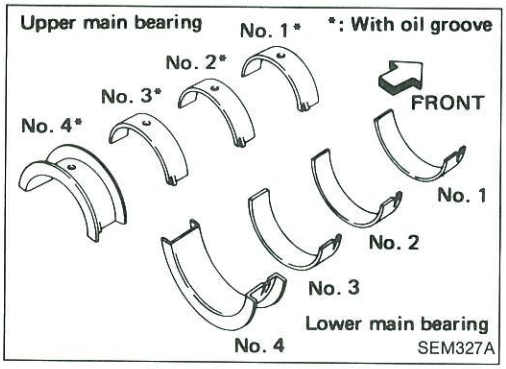
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

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

Assembly (Cont'd)



3. Set piston rings as shown.

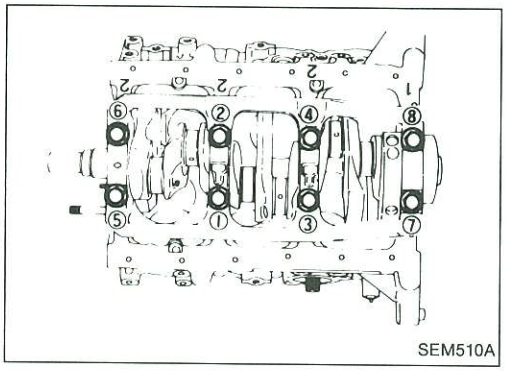


CRANKSHAFT

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

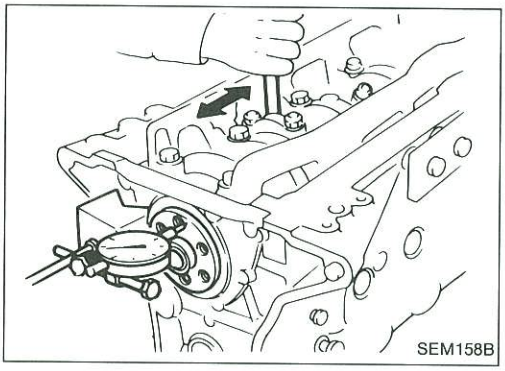
- **Confirm that correct main bearings are used.**

Refer to "Inspection" in this section.



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

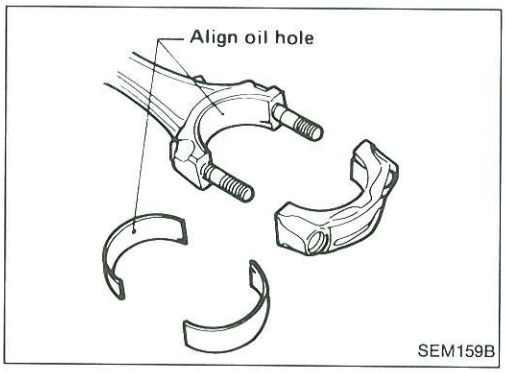
- **Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward sequentially.**
- **After securing bearing cap bolts, make sure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



3. Measure crankshaft end play.

Crankshaft end play:
Standard
0.050 - 0.170 mm (0.0020 - 0.0067 in)
Limit
0.30 mm (0.0118 in)

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



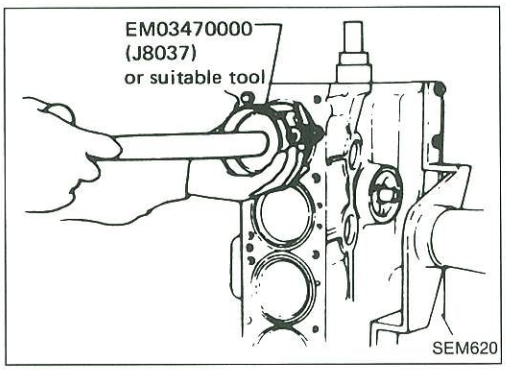
4. Install connecting rod bearings in connecting rods and connecting rod caps.

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

Refer to "Inspection".

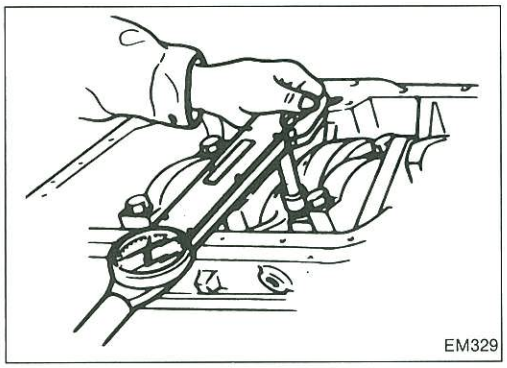
- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.

Assembly (Cont'd)



5. Install pistons with connecting rods.
a. Install them into corresponding cylinders with Tool.

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

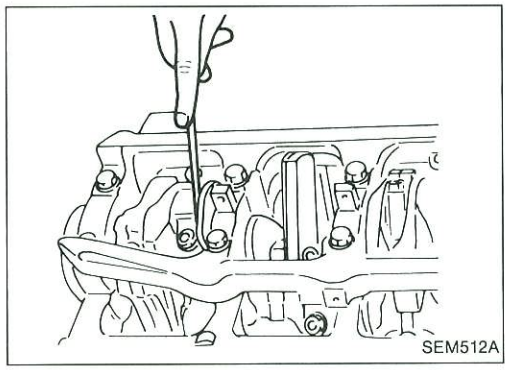


b. Install connecting rod bearing caps. Tighten connecting rod bearing cap nuts to the specified torque.

: Connecting rod bearing nut

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

(2) Turn nuts 60 to 65 degrees clockwise.
If an angle wrench is not available, tighten nuts to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).



6. Measure connecting rod side clearance.

Connecting rod side clearance:

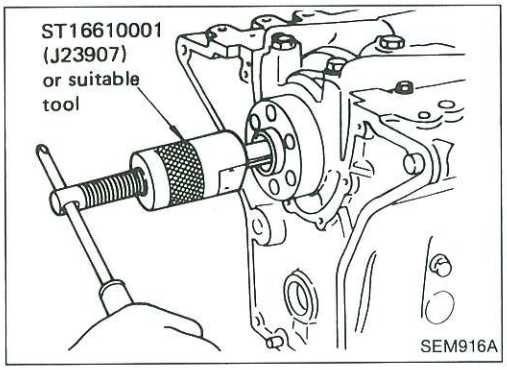
Standard

0.20 - 0.35 mm (0.0079 - 0.0138 in)

Limit

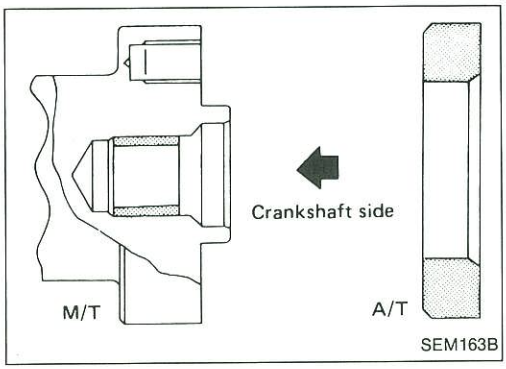
0.40 mm (0.0157 in)

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



REPLACING PILOT CONVERTER

1. Remove pilot converter.

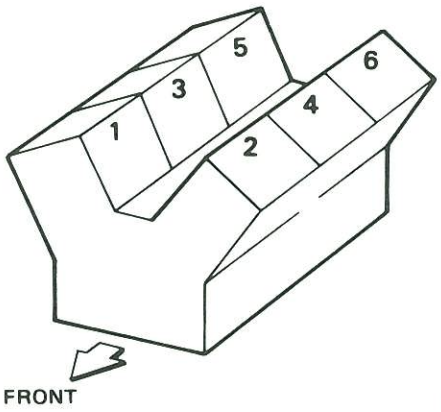


2. Install pilot converter.

General Specifications

Cylinder arrangement		V-6
Displacement	cm^3 (cu in)	2,960 (180.62)
Bore and stroke	mm (in)	87 × 83 (3.43 × 3.27)
Valve arrangement		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		9.0

Cylinder number



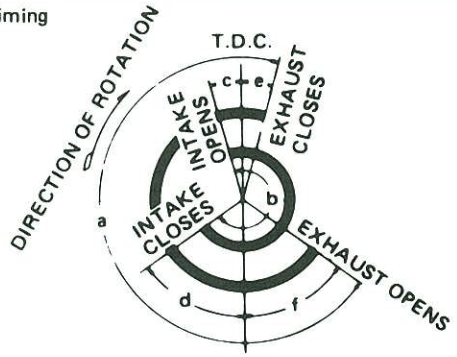
SEM713A

COMPRESSION PRESSURE

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

Compression pressure	
Standard	1,196 (12.2, 173)
Minimum	883 (9.0, 128)
Differential limit between cylinders	98 (1.0, 14)

Valve timing



EM120

Unit: degree

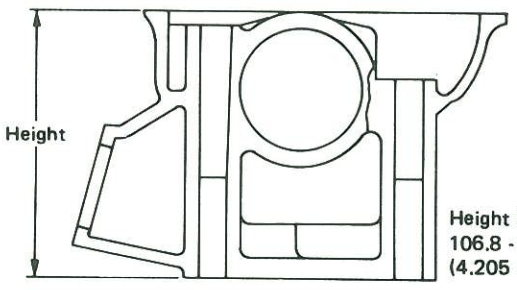
a	b	c	d	e	f
248	248	10	58	10	58

Inspection and Adjustment

CYLINDER HEAD

Unit: mm (in)

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



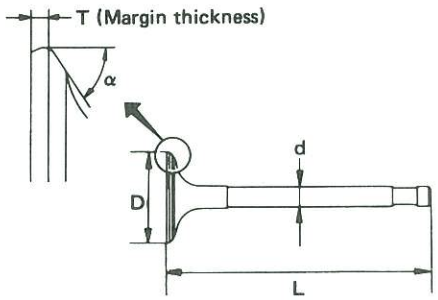
Height (nominal)
106.8 - 107.2
(4.205 - 4.220)

SEM082B

Inspection and Adjustment (Cont'd)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	42.0 - 42.2 (1.654 - 1.661)
Exhaust	35.0 - 35.2 (1.378 - 1.386)
Valve length "L"	
Intake	125.3 - 125.9 (4.933 - 4.957)
Exhaust	124.2 - 124.8 (4.890 - 4.913)
Valve stem diameter "d"	
Intake	6.965 - 6.980 (0.2742 - 0.2748)
Exhaust	7.965 - 7.970 (0.3136 - 0.3138)
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)	Outer	51.2 (2.016)
		Inner	44.1 (1.736)
Pressure N (kg, lb) at height mm (in)		Outer	523.7 (53.4, 117.7) at 30.0 (1.181)
		Inner	255.0 (26.0, 57.3) at 25.0 (0.984)
Out-of-square	mm (in)	Outer	2.2 (0.087)
		Inner	1.9 (0.075)

Hydraulic valve lifter

Unit: mm (in)

Lifter outside diameter	15.947 - 15.957 (0.6278 - 0.6282)
Lifter guide inside diameter	16.000 - 16.013 (0.6299 - 0.6304)
Clearance between lifter and lifter guide	0.043 - 0.066 (0.0017 - 0.0026)

Valve guide

Unit: mm (in)

		Standard	Service
Valve guide Outer diameter	Intake	11.023 - 11.034 (0.4340 - 0.4344)	11.223 - 11.234 (0.4418 - 0.4423)
	Exhaust	12.023 - 12.034 (0.4733 - 0.4738)	12.223 - 12.234 (0.4812 - 0.4817)
Valve guide Inner diameter (Finished size)	Intake	7.000 - 7.018 (0.2756 - 0.2763)	
	Exhaust	8.000 - 8.018 (0.3150 - 0.3157)	
Cylinder head valve guide hole diameter	Intake	10.975 - 10.996 (0.4321 - 0.4329)	11.175 - 11.196 (0.4400 - 0.4408)
	Exhaust	11.975 - 11.996 (0.4715 - 0.4723)	12.175 - 12.196 (0.4793 - 0.4802)
Interference fit of valve guide	Intake	0.027 - 0.059 (0.0011 - 0.0023)	
	Exhaust		
		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)

Rocker shaft and rocker arm

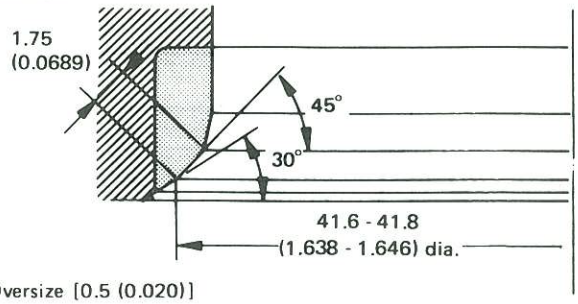
Unit: mm (in)

Rocker shaft	
Outer diameter	17.979 - 18.000 (0.7078 - 0.7087)
Rocker arm	
Inner diameter	18.007 - 18.028 (0.7089 - 0.7098)
Clearance between rocker arm and rocker shaft	0.007 - 0.049 (0.0003 - 0.0019)

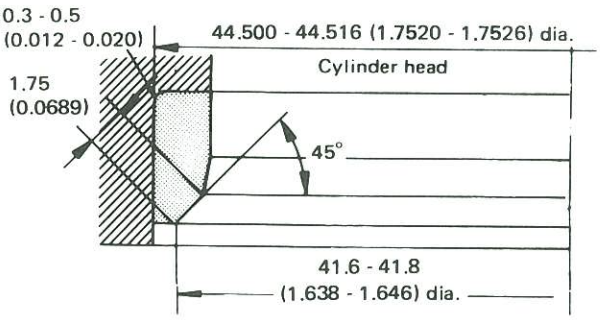
Inspection and Adjustment (Cont'd)

Intake valve seat

Standard



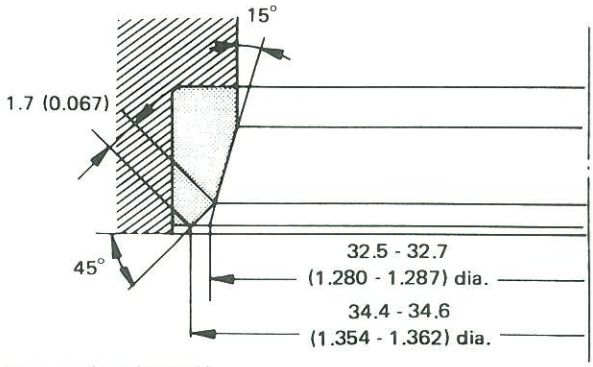
Oversize [0.5 (0.020)]



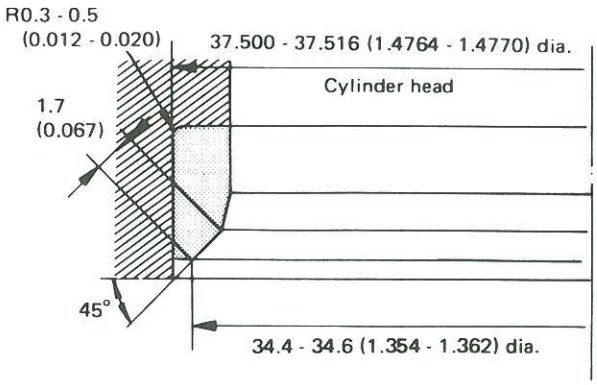
Unit: mm (in) SEM755A

Exhaust valve seat

Standard



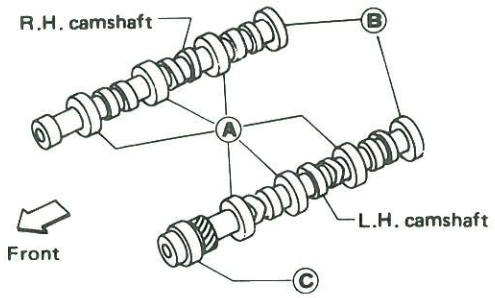
Oversize [0.5 (0.020)]



Unit: mm (in) SEM756A

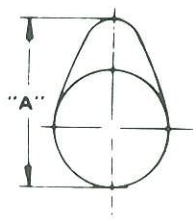
CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)



SEM893B

		Standard	Max. tolerance
Camshaft journal to bearing clearance		0.045 - 0.090 (0.0018 - 0.0035)	0.15 (0.0059)
Inner diameter of camshaft bearing	Ⓐ :	47.000 - 47.025 (1.8504 - 1.8514)	—
	Ⓑ :	42.500 - 42.525 (1.6732 - 1.6742)	—
	Ⓒ :	48.000 - 48.025 (1.8898 - 1.8907)	—
Outer diameter of camshaft journal	Ⓐ :	46.920 - 46.940 (1.8472 - 1.8480)	—
	Ⓑ :	42.420 - 42.440 (1.6701 - 1.6709)	—
	Ⓒ :	47.920 - 47.940 (1.8866 - 1.8874)	—
Camshaft runout [T.I.R.*]		Less than 0.04 (0.0016)	0.1 (0.004)
Camshaft end play		0.03 - 0.06 (0.0012 - 0.0024)	—



EM671

Cam height "A"	
Intake	39.537 - 39.727 (1.5566 - 1.5641)
Exhaust	
Wear limit of cam height	0.15 (0.0059)

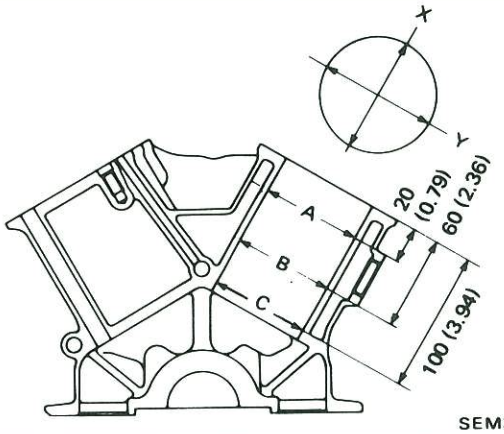
*Total indicator reading

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

CYLINDER BLOCK

Unit: mm (in)

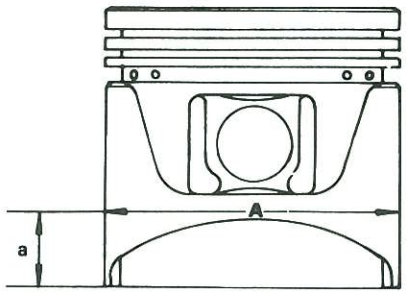


SEM321A

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-or-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)

Available piston

Unit: mm (in)



SEM891B

Piston skirt diameter "A"	
Standard	
Grade No. 1	86.965 - 86.975 (3.4238 - 3.4242)
Grade No. 2	86.975 - 86.985 (3.4242 - 3.4246)
Grade No. 3	86.985 - 86.995 (3.4246 - 3.4250)
0.25 (0.0098) oversize (Service)	87.215 - 87.265 (3.4337 - 3.4356)
0.50 (0.0197) oversize (Service)	87.465 - 87.515 (3.4435 - 3.4455)
"a" dimension	18 (0.71)
Piston pin hole diameter	20.969 - 20.981 (0.8255 - 0.8260)
Piston clearance to cylinder block	0.015 - 0.035 (0.0006 - 0.0014)

Piston ring

Unit: mm (in)

	Standard	Limit
Side clearance		
Top	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
2nd	0.030 - 0.063 (0.0012 - 0.0025)	
Ring gap		
Top	0.21 - 0.44 (0.0083 - 0.0173)	1.0 (0.039)
2nd	0.18 - 0.44 (0.0071 - 0.0173)	
Oil (rail ring)	0.20 - 0.76 (0.0079 - 0.0299)	

Inspection and Adjustment (Cont'd)

Piston pin

Unit: mm (in)

Piston pin outer diameter	20.971 - 20.983 (0.8256 - 0.8261)
Interference fit of piston pin to piston	0 to 0.004 (0 to 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)

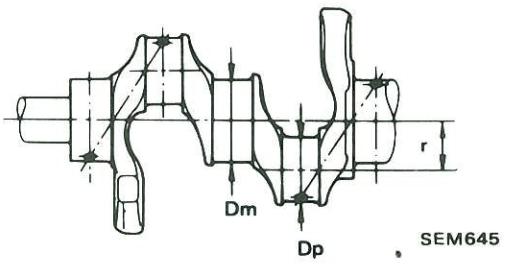
Center distance	154.1 - 154.2 (6.067 - 6.071)
Bend, torsion [per 100 (3.94)]	
Limit	Bend: 0.15 (0.0059) Torsion: 0.30 (0.0118)
Piston pin bushing inner diameter*	20.982 - 20.994 (0.8261 - 0.8265)
Connecting rod big end inner diameter	53.000 - 53.013 (2.0866 - 2.0871)
Side clearance	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.40 (0.0157)

*After installing in connecting rod

CRANKSHAFT

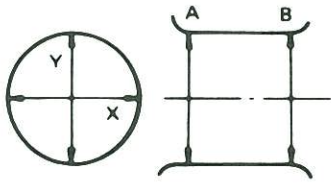
Unit: mm (in)

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"	49.955 - 49.974 (1.9667 - 1.9675)
Center distance "r"	41.5 (1.634)
Out-of-round (X – Y)	
Standard	Less than 0.005 (0.0002)
Taper (A – B)	
Standard	Less than 0.005 (0.0002)
Runout [T.I.R.]	
Standard	Less than 0.10 (0.0039)
Free end play	
Standard	0.050 - 0.170 (0.0020 - 0.0067)
Limit	0.30 (0.0118)



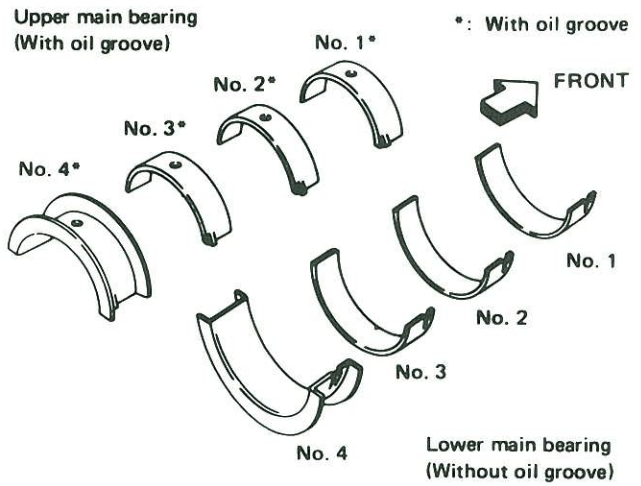
SEM645

Out-of-round X – Y
Taper A – B



EM715

AVAILABLE MAIN BEARING



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

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

Main bearing 0.25 mm (0.0098 in) undersize

Unit: mm (in)

Thickness "T"	1.948 - 1.956 (0.0767 - 0.0770)

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing undersize

Unit: mm (in)

	Thickness	Crank pin journal diameter "Dp"
Standard	1.502 - 1.506 (0.0591 - 0.0593)	49.955 - 49.974 (1.9667 - 1.9675)
Undersize		
0.08 (0.0031)	1.542 - 1.546 (0.0607 - 0.0609)	Grind so that bearing clearance is the specified value.
0.12 (0.0047)	1.562 - 1.566 (0.0615 - 0.0617)	
0.25 (0.0098)	1.627 - 1.631 (0.0641 - 0.0642)	

MISCELLANEOUS COMPONENTS

Unit: mm (in)

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

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	0.014 - 0.054 (0.0006 - 0.0021)
Limit	0.090 (0.0035)

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

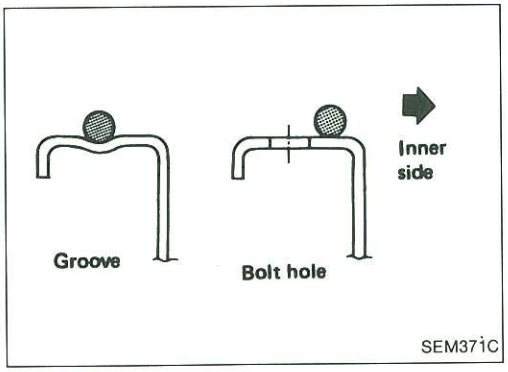
PRECAUTIONS ..... LC- 2
PREPARATION ..... LC- 3
ENGINE LUBRICATION SYSTEM ..... LC- 4
ENGINE COOLING SYSTEM ..... LC- 7
RADIATOR FAN MOTOR ELECTRICAL CIRCUIT LC-12
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-15

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:

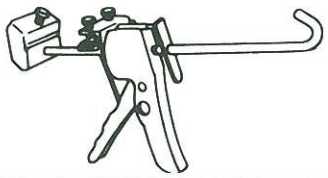
a. **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized INFINITI dealer.**
b. **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal 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".**



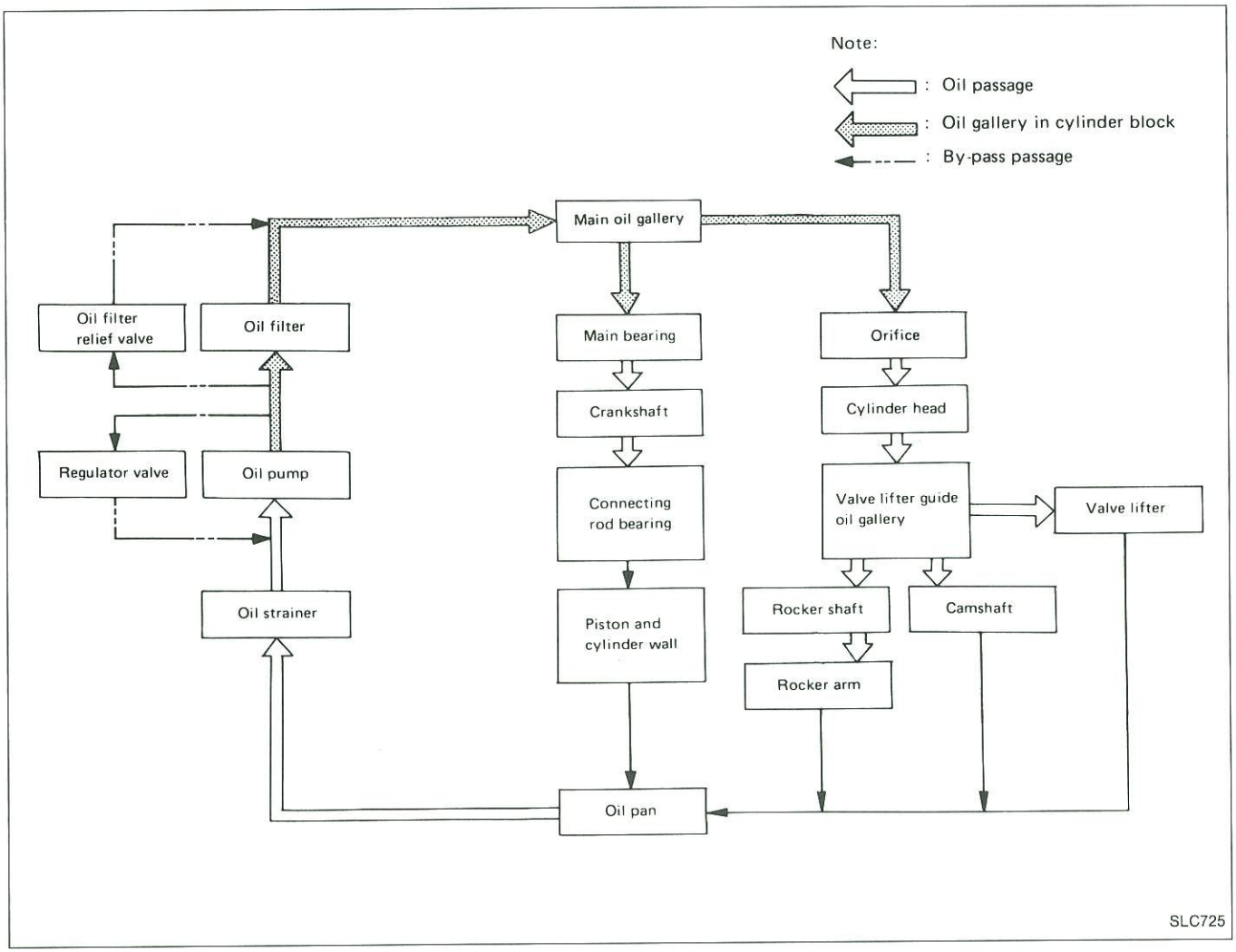
Liquid Gasket Application Procedure

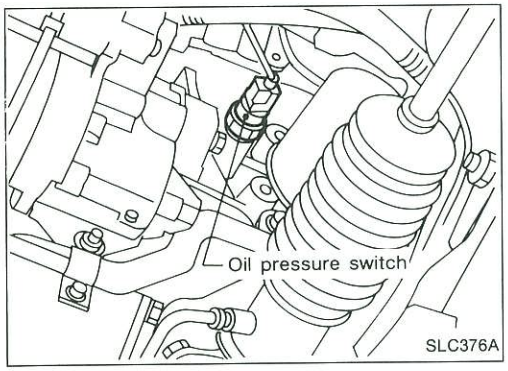
a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.
b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - Be 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		
ST25052000 (J25695-2) Hose	Adapting oil pressure gauge to cylinder block	
WS39930000 (—) Tube presser	Pressing the tube of liquid gasket	
EG17650301 (—) Radiator cap tester adapter	Adapting radiator cap tester to radiator neck	

Lubrication Circuit



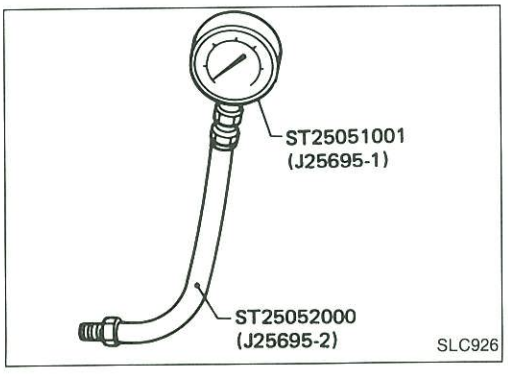


Oil Pressure Check

WARNING:

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

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



3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.

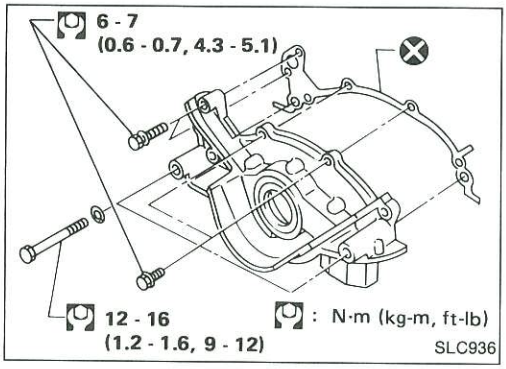
Oil Pressure Check (Cont'd)

5. Check oil pressure with engine running under no-load.

Engine rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	More than 59 (0.6, 9)
3,200	363 - 451 (3.7 - 4.6, 53 - 65)

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

6. Install oil pressure switch with sealant.

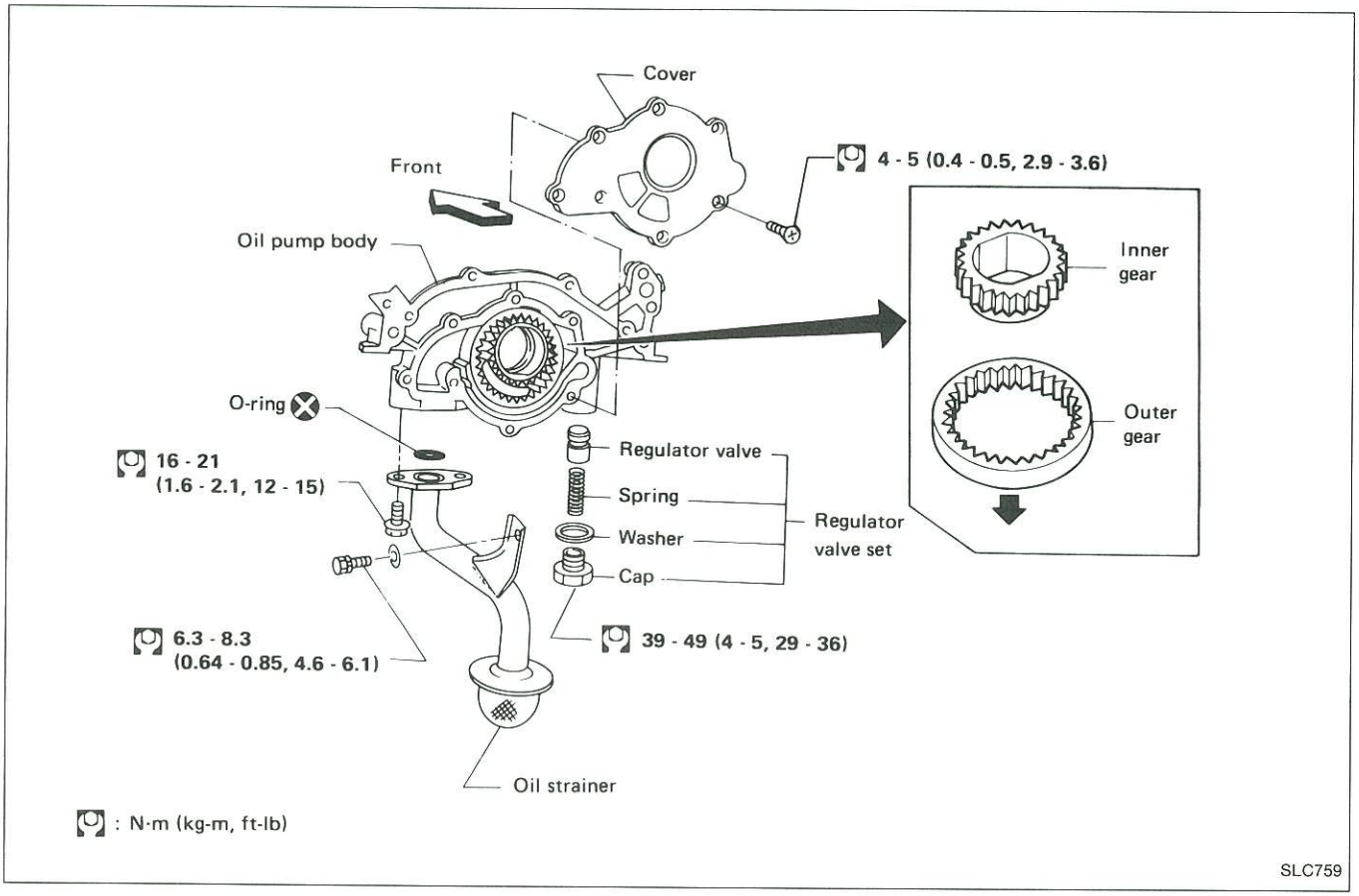


Oil Pump

REMOVAL

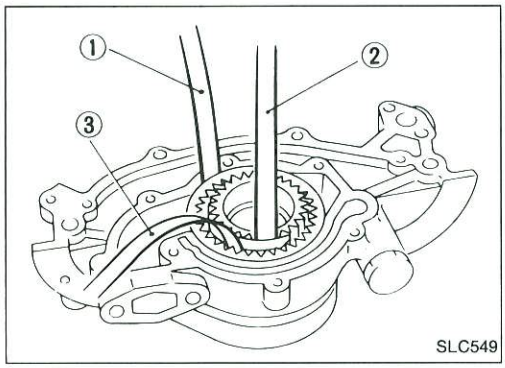
1. Drain oil.
2. Remove oil pan.
3. Remove oil pump assembly.

DISASSEMBLY AND ASSEMBLY

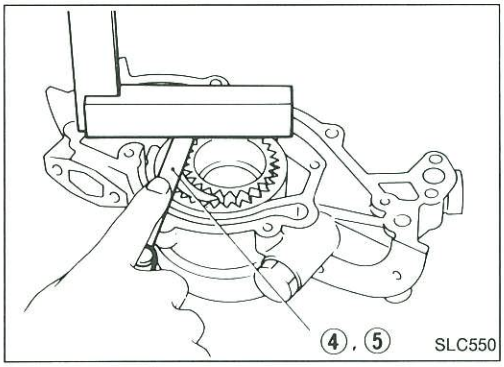


- **Always replace with new oil seal and gasket.**
- **When installing oil pump, apply engine oil to inner and outer gears.**
- **Be sure that O-ring is properly installed.**

Oil Pump (Cont'd)



SLC549



SLC550

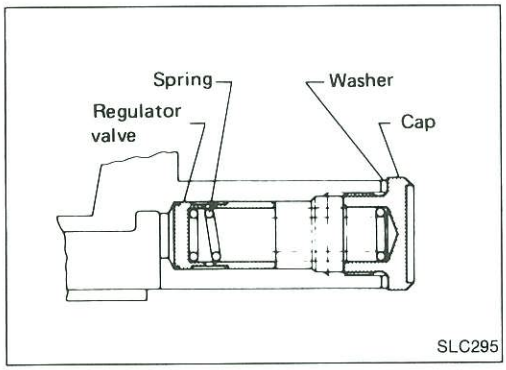
INSPECTION

Using a feeler gauge, check the following clearances:

Standard clearance: Unit: mm (in)

Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)

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

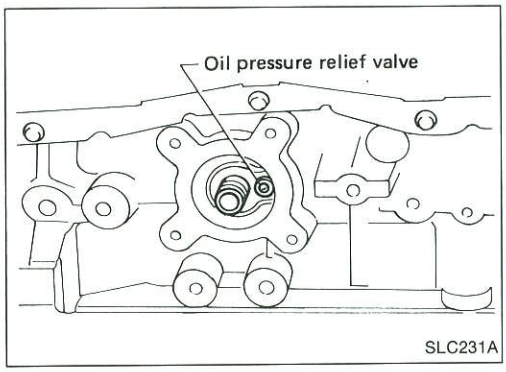


SLC295

REGULATOR VALVE INSPECTION

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

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

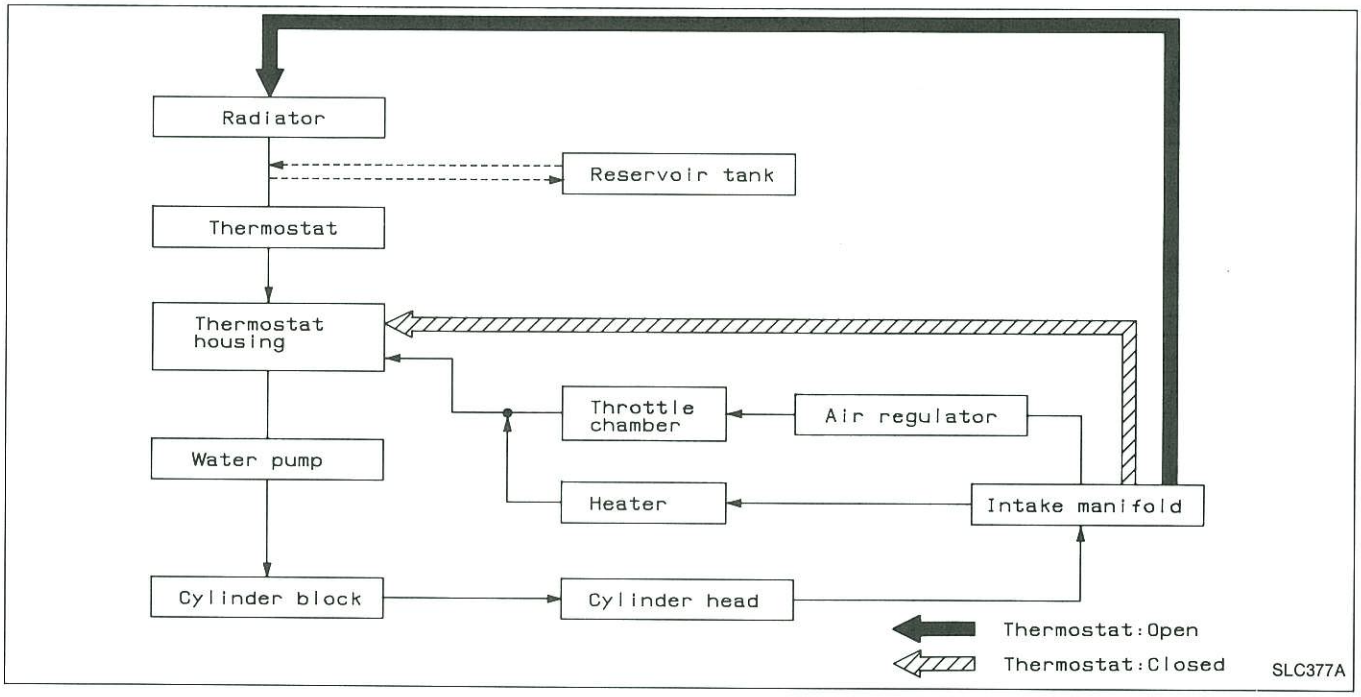


SLC231A

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.

Cooling Circuit



System Check

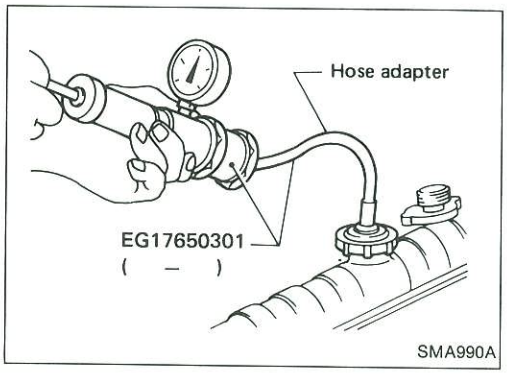
WARNING:

Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around the cap and carefully remove it by turning it a quarter turn to allow built-up pressure to escape. Continue turning the cap until it can be removed.

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:

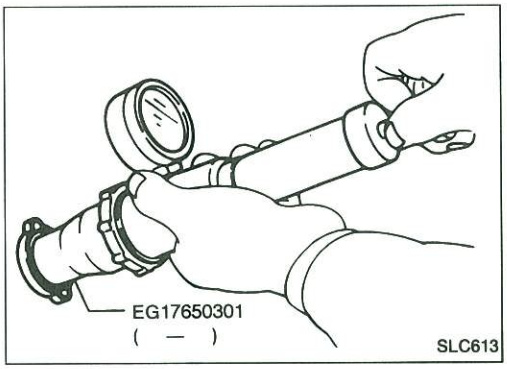
98 kPa (1.0 kg/cm^2, 14 psi)

CAUTION:

Higher than the specified pressure may cause radiator damage.

System Check (Cont'd)

CHECKING RADIATOR CAP



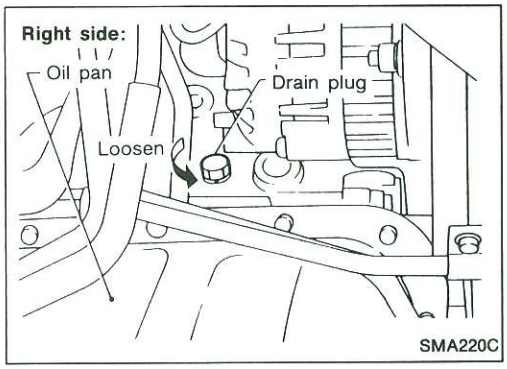
To check radiator cap, apply pressure to cap with a tester.

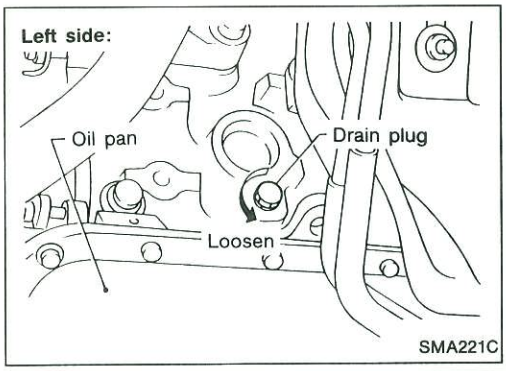
Radiator cap relief pressure:
78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi)

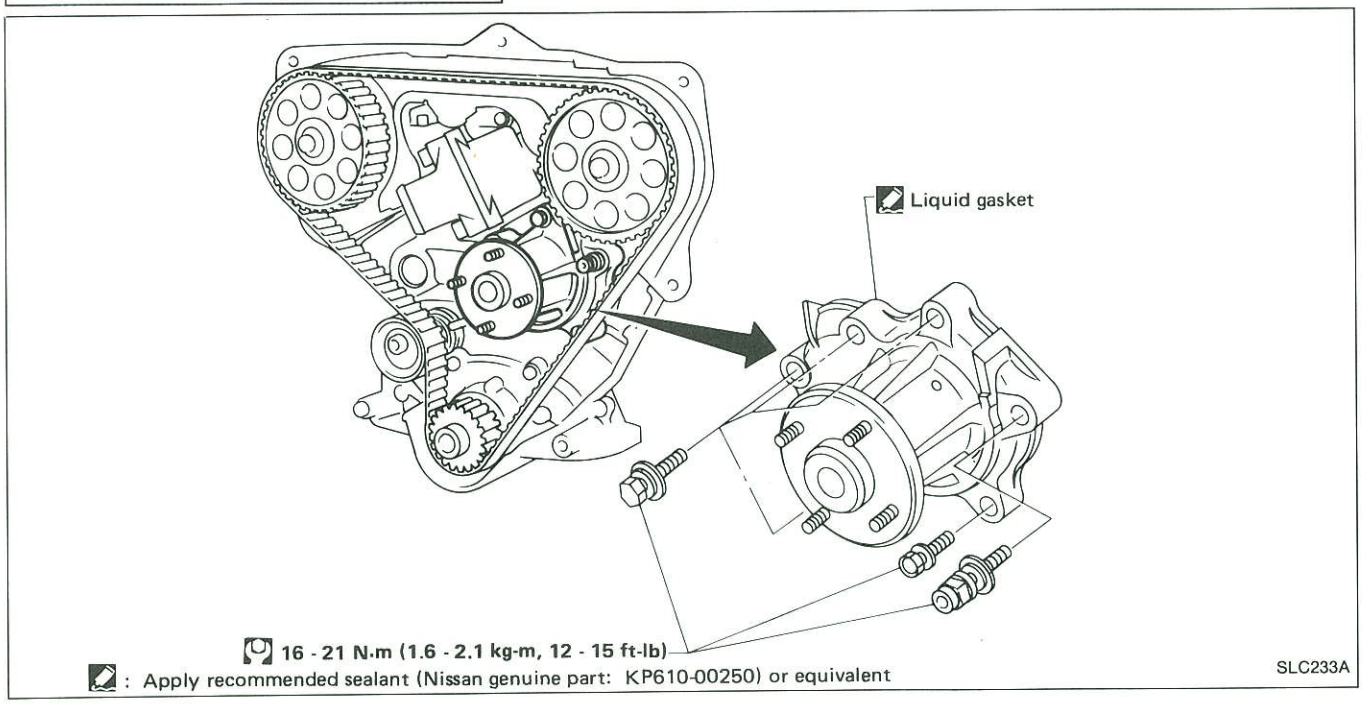
Water Pump

REMOVAL AND INSTALLATION

Drain coolant from drain cocks on both sides of cylinder block and radiator.



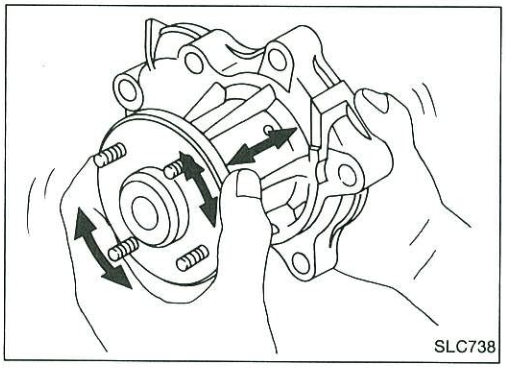




Water Pump (Cont'd)

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.**
- **To avoid deforming timing cover, make sure there is adequate clearance between it and the hose clamp.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**



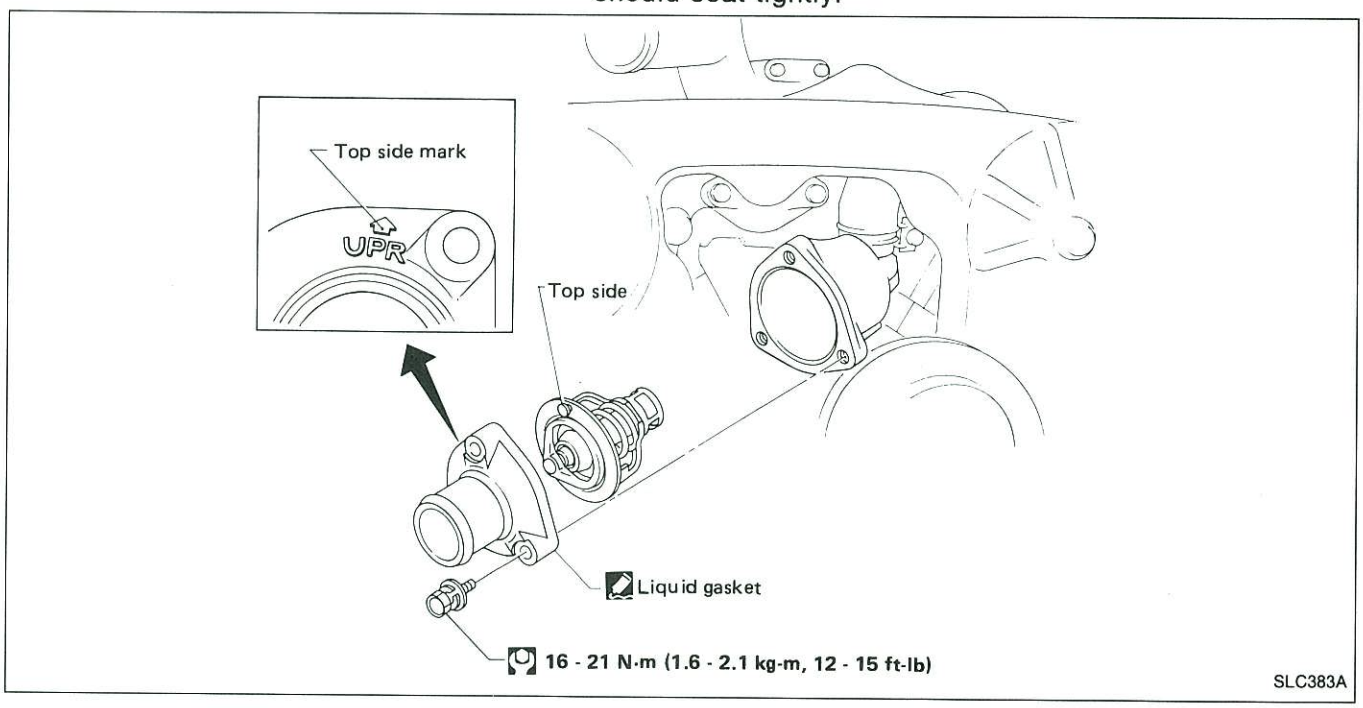
INSPECTION

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

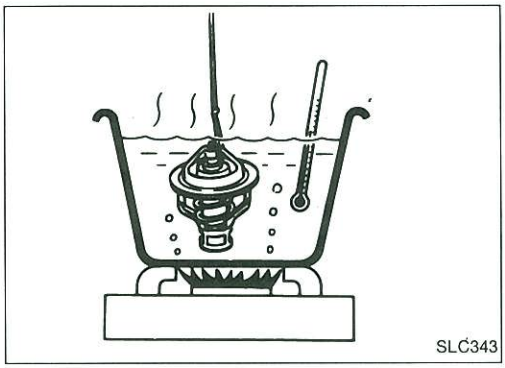
Thermostat

INSPECTION

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



Thermostat (Cont'd)


SLC343

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)

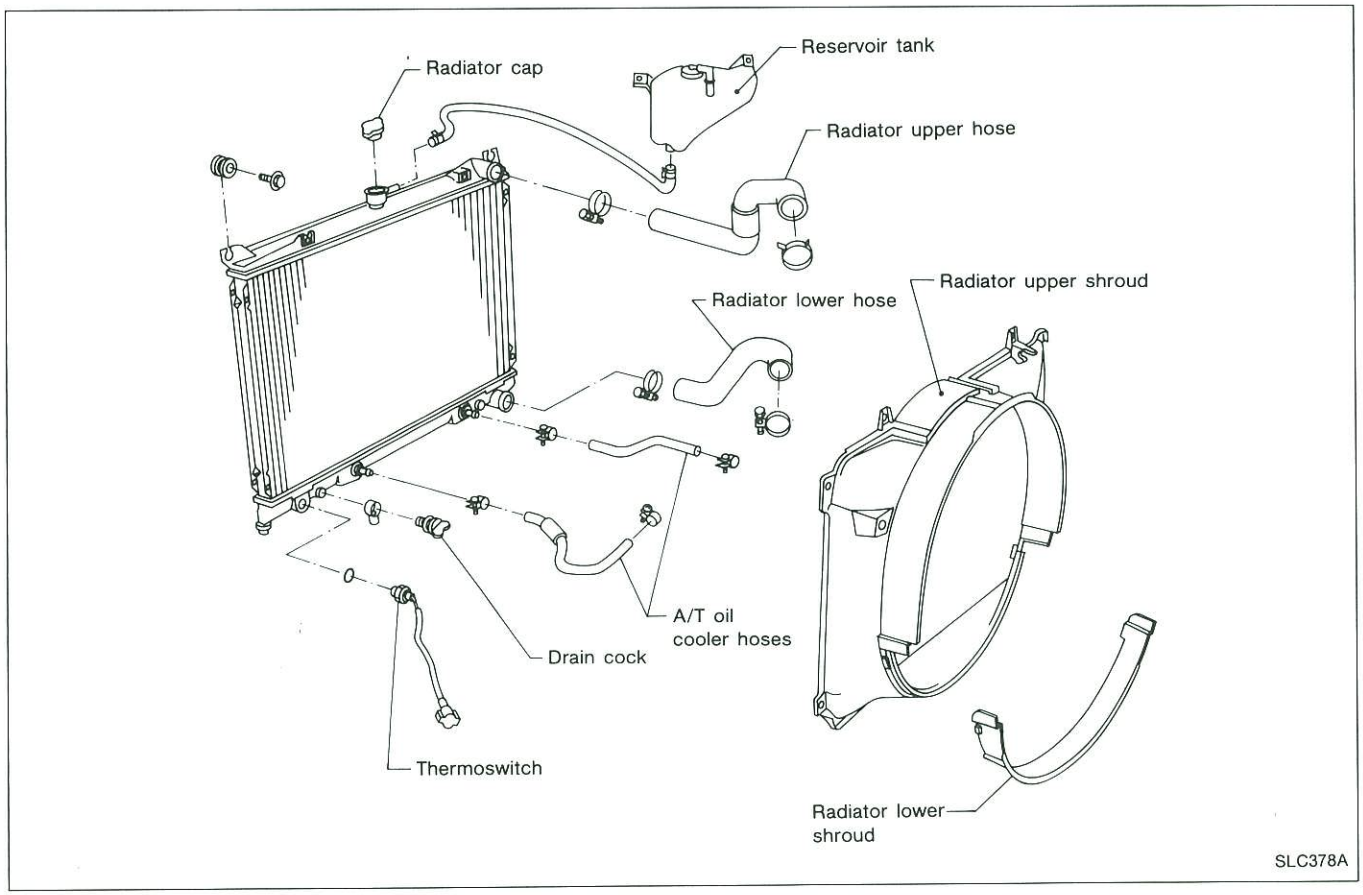
3. Then check if valve is closed at 5°C (9°F) below valve opening temperature.

- **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.**

Radiator

REMOVAL AND INSTALLATION

1. Remove under cover.
2. Drain coolant from radiator drain cock.
3. Disconnect radiator upper and lower hoses.
4. Remove A/T oil cooler hoses.
5. Remove radiator lower shroud.
6. Remove air duct.
7. Disconnect reservoir tank hose.
8. Remove radiator.
9. After repairing or replacing radiator, install any part removed in reverse order of removal.



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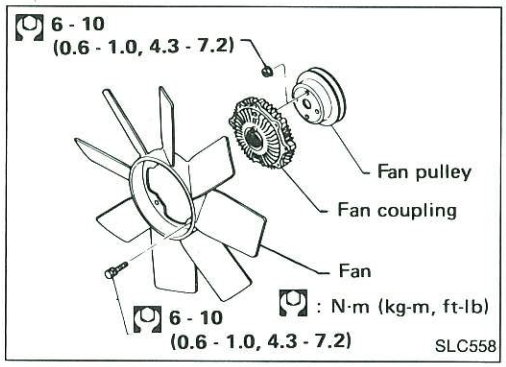
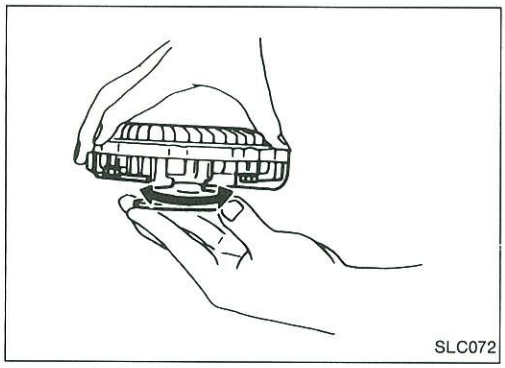


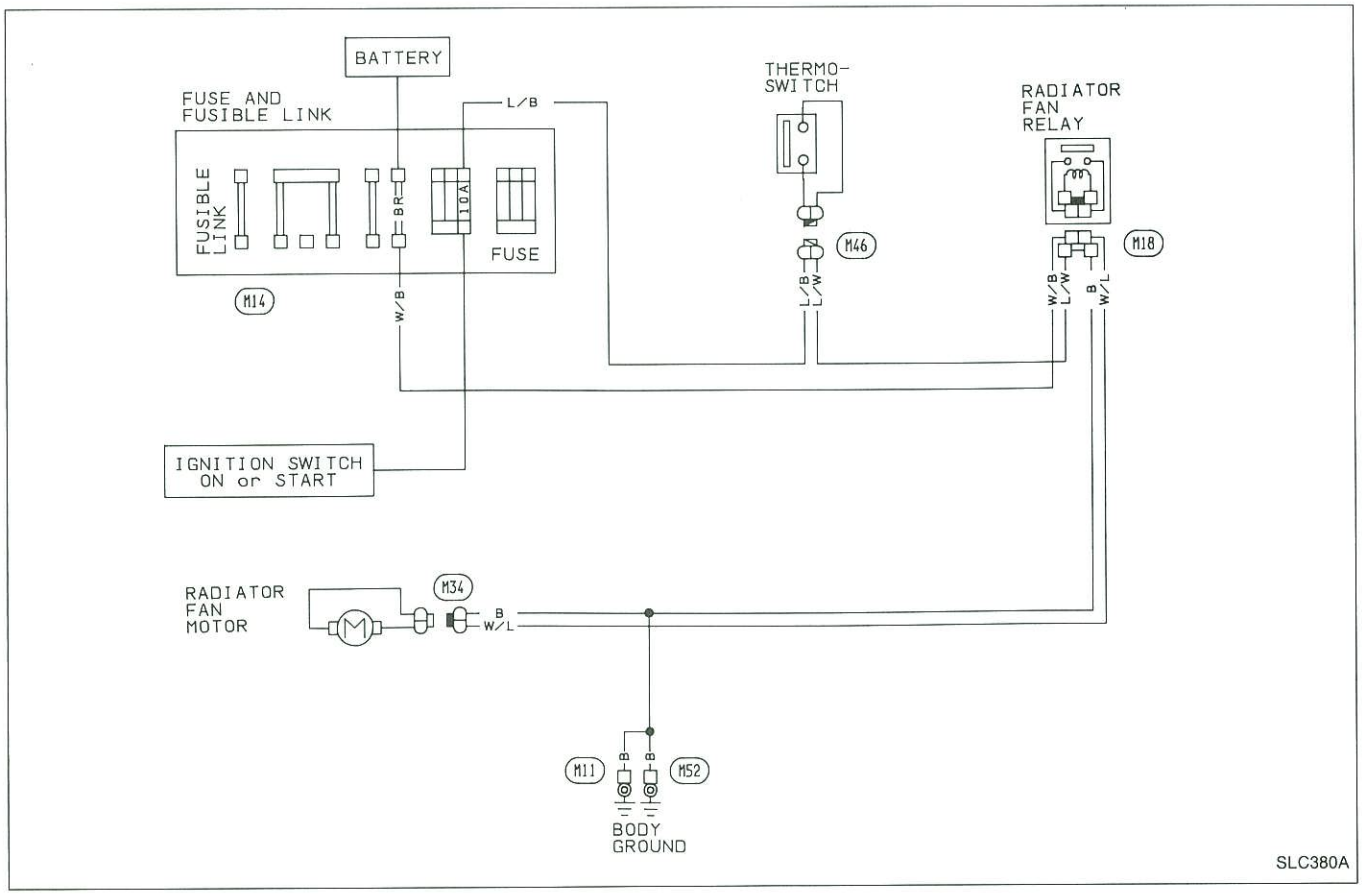
Cooling Fan

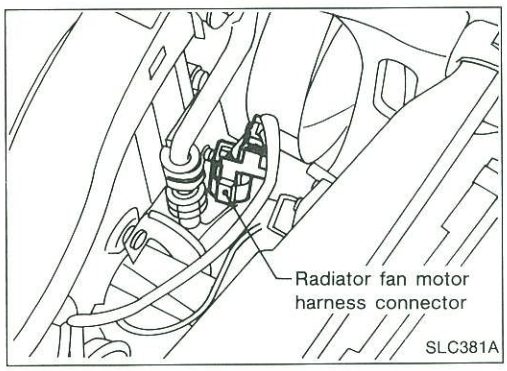


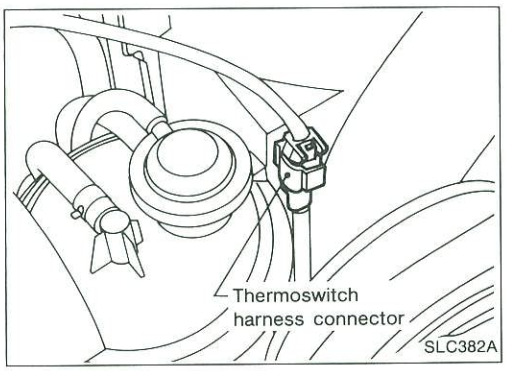
INSPECTION

Check fan coupling for oil leakage or bent bimetal.

Wiring Diagram







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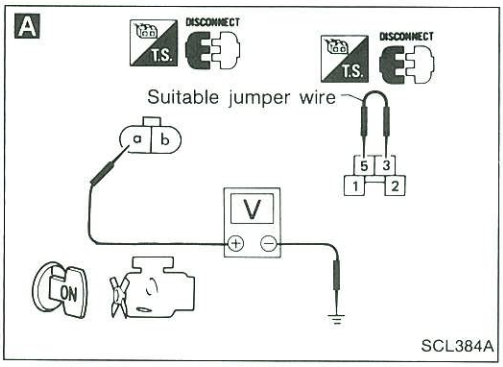

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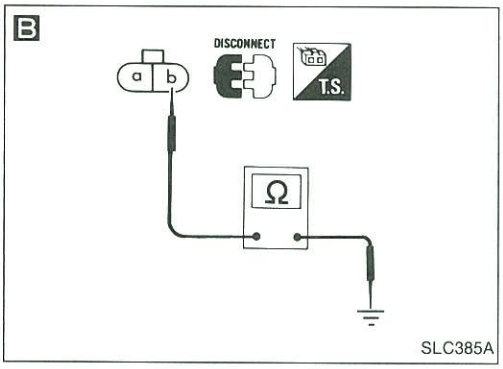
B



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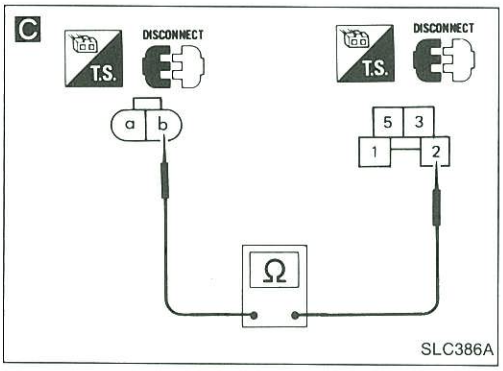
C



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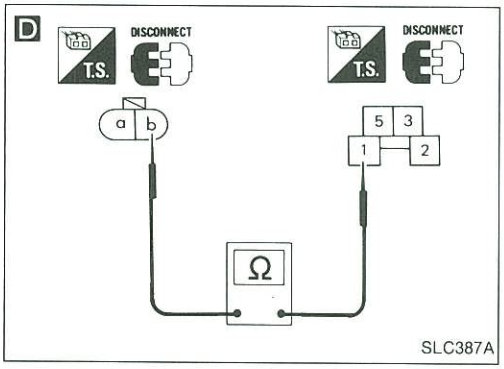
D



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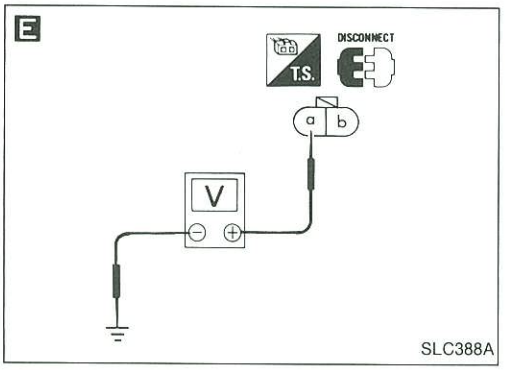
E



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Diagnostic Procedure

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect radiator fan relay.
2) Connect jumper wire between terminals (3) and (5).
3) Disconnect radiator fan motor harness connector.
4) Turn ignition switch "ON".
5) Check voltage between terminal (a) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- "BR" fusible link
- Harness continuity between "BR" fusible link and radiator fan motor.

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect jumper wire.
3) Check harness continuity between terminal (b) and ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK HARNESS CONTINUITY.

C 1) Check harness continuity between terminals (b) and (2).
Continuity should exist.
2) Disconnect thermoswitch harness connector.

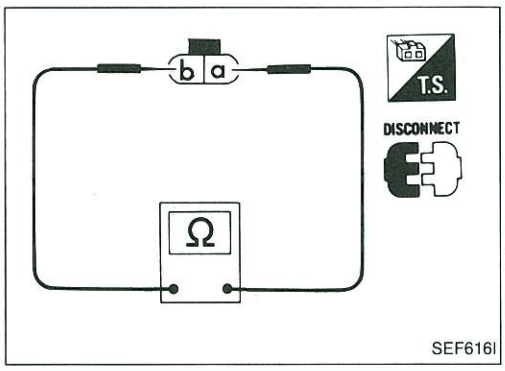
D 3) Check harness continuity between terminals (1) and (b).
Continuity should exist.
4) Check "10A" fuse.
5) Turn ignition switch "ON".

E 6) Check voltage between terminal (a) and ground.
Voltage: Battery voltage

N.G. → Repair harness or connectors.

↓

CHECK COMPONENTS
(Radiator fan motor, radiator fan relay and thermoswitch).
Refer to "Electrical Components Inspection".
(See page LC-14.)

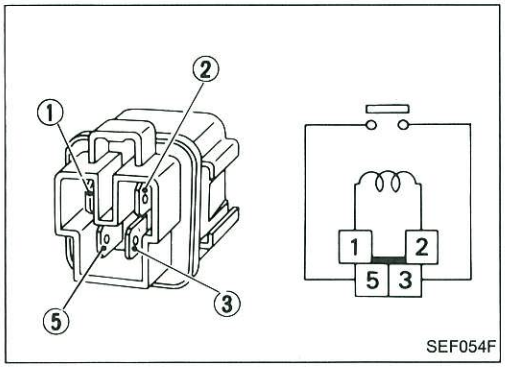


Electrical Components Inspection

RADIATOR FAN MOTOR

1. Disconnect radiator fan motor harness connector.
2. Check continuity between terminals ⓐ and ⓑ.

Continuity should exist.
If N.G., replace radiator fan motor.

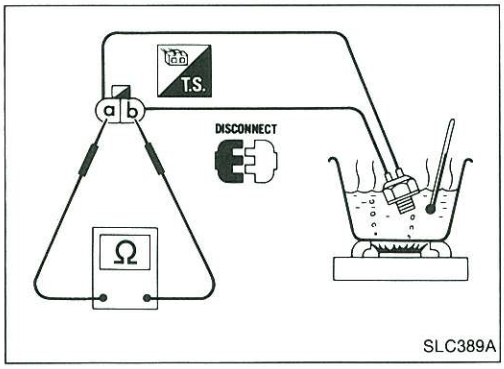


RADIATOR FAN RELAY

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.



THERMOSWITCH

1. Remove thermoswitch.
2. Check thermoswitch for proper operation.
   Operating temperature:
   OFF → ON 90°C (194°F)

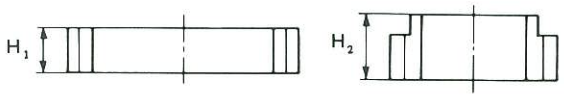
If N.G., replace thermoswitch.

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	More than 59 (0.6, 9)
3,200	363 - 451 (3.7 - 4.6, 53 - 65)

Oil pump



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OUTER GEAR INNER GEAR

Unit: mm (in)

Height	H_1	H_2
	12.5 (0.492)	18.5 (0.728)

Unit: mm (in)

Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear side clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear side clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)

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)

Thermoswitch

Operating temperature (OFF → ON)	°C (°F)	90 (194)

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

CONTENTS

PRECAUTIONS ..... EF & EC- 2
PREPARATION ..... EF & EC- 4
ENGINE AND EMISSION CONTROL OVERALL SYSTEM ..... EF & EC- 5
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION ..... EF & EC- 10
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION ..... EF & EC- 16
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION ..... EF & EC- 26
TROUBLE DIAGNOSES ..... EF & EC- 32
FUEL INJECTION CONTROL SYSTEM INSPECTION ..... EF & EC-162
EVAPORATIVE EMISSION CONTROL SYSTEM ..... EF & EC-165
CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-167
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EF & EC-168

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 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 INFINITI 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".**

Engine Fuel & Emission Control System

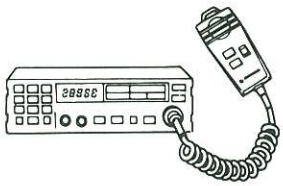
INJECTOR
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

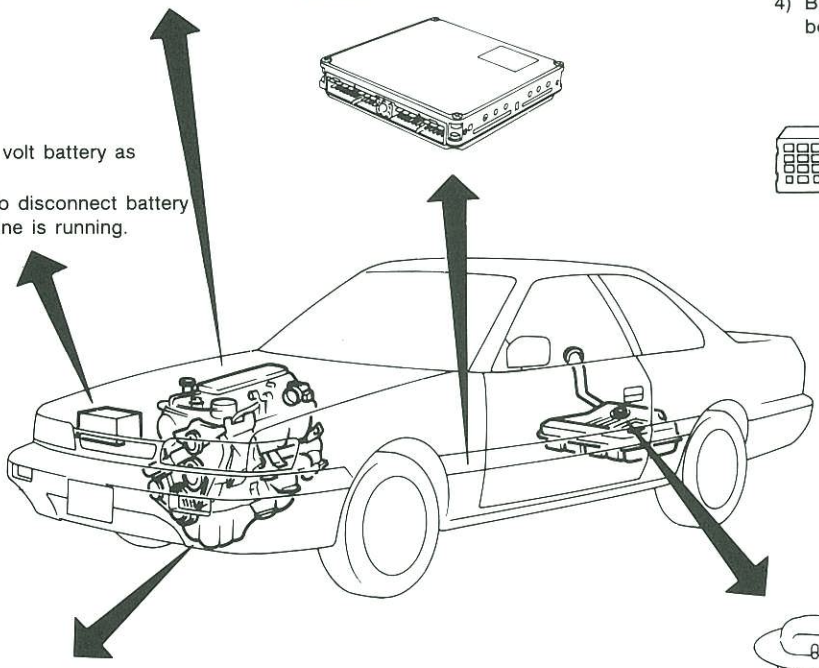
BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

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

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.

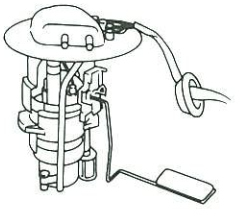
1) Keep the antenna as far away as possible from the electronic control units.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Be sure to ground the radio to vehicle body.





E.C.C.S. PARTS HANDLING
- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with any type of detergent.
- Do not disassemble auxiliary air control valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crank angle sensor.

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



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

E.C.C.S. HARNESS HANDLING
- Securely connect E.C.C.S. 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 E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep E.C.C.S. parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

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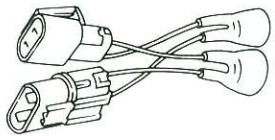
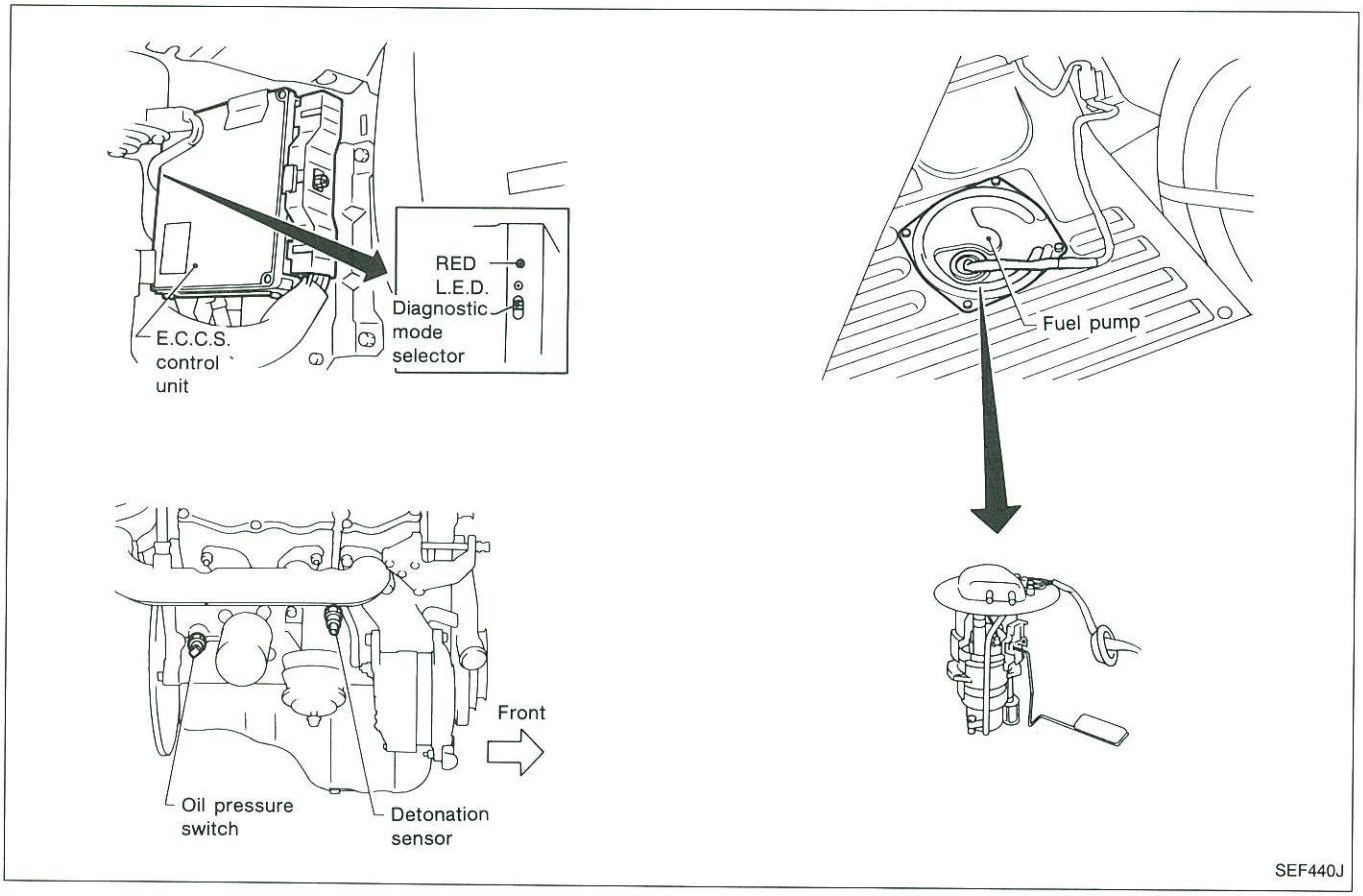
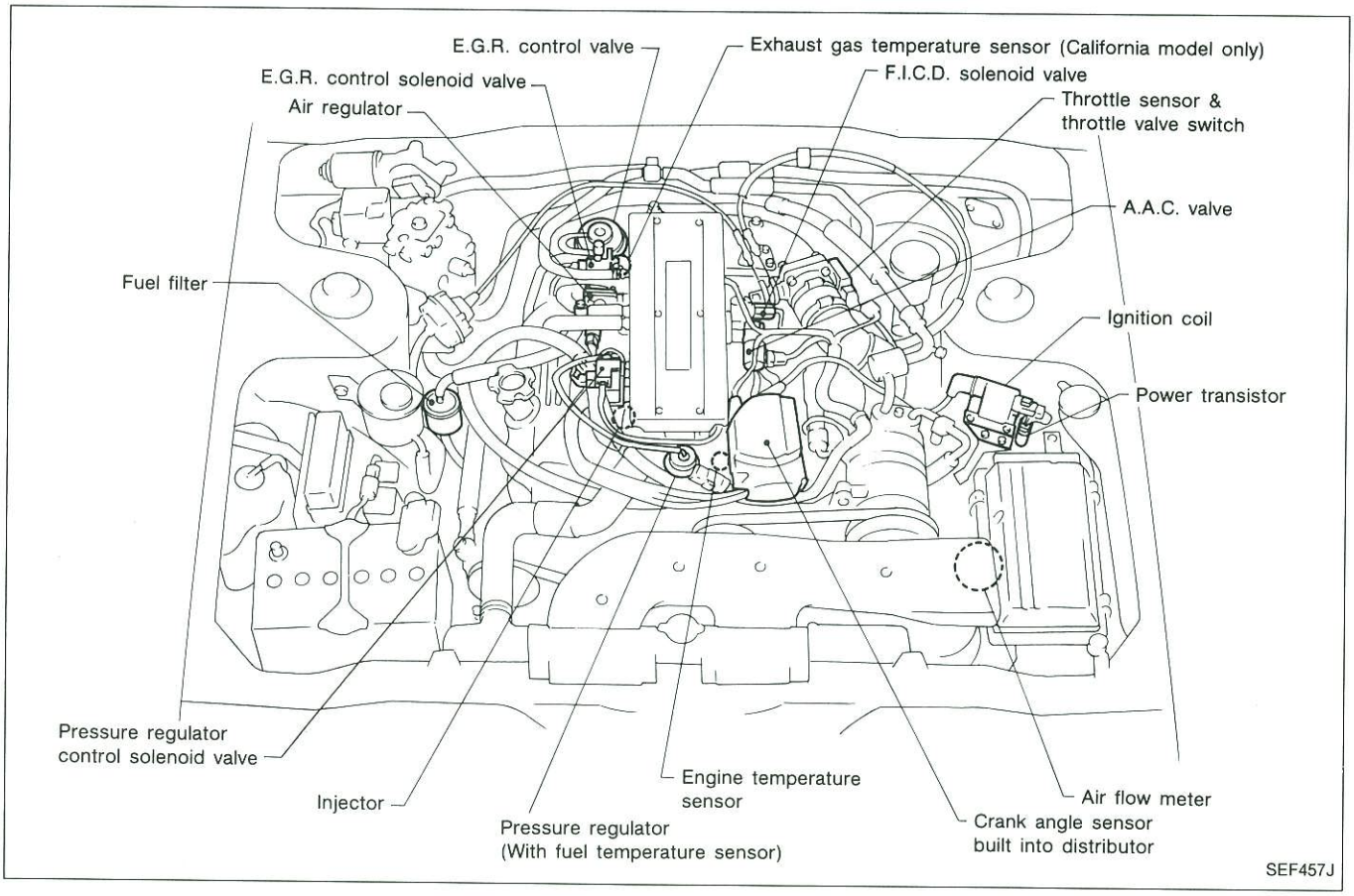
SPECIAL SERVICE TOOL

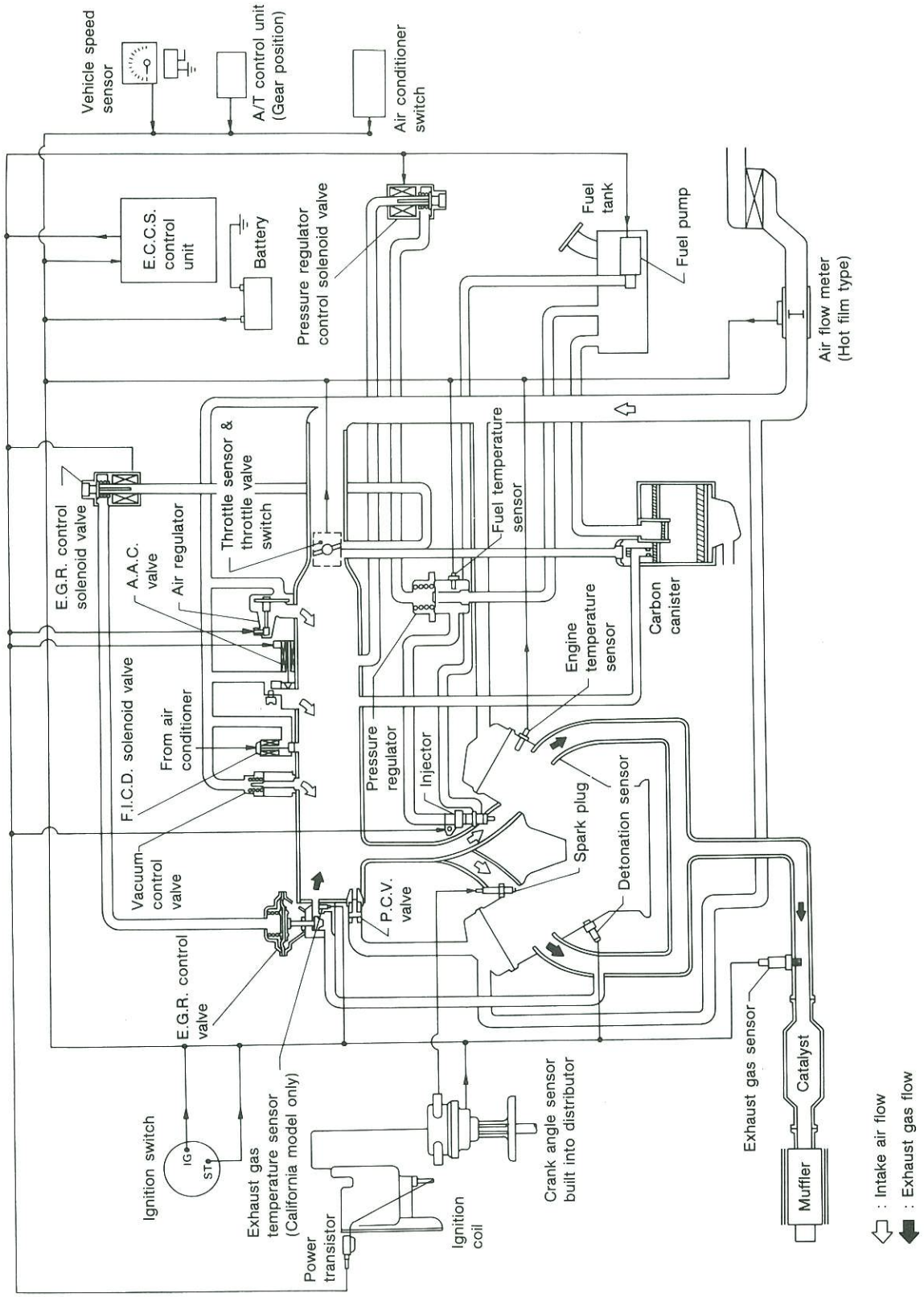
Tool number (Kent-Moore No.) Tool name	Description
EG11160000 (—) Adapter harness	 Measuring engine speed

E.C.C.S. Component Parts Location





System Diagram



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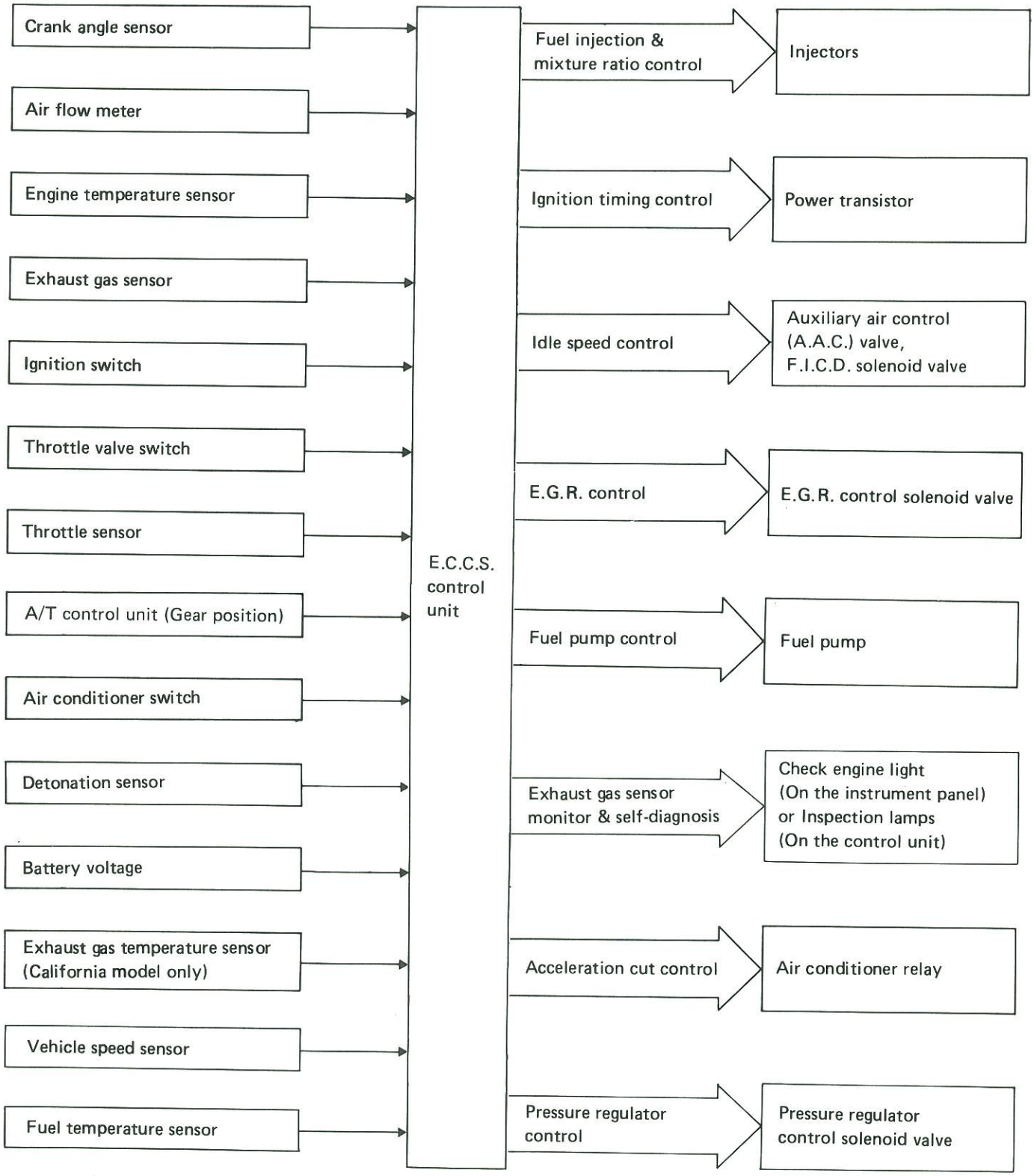
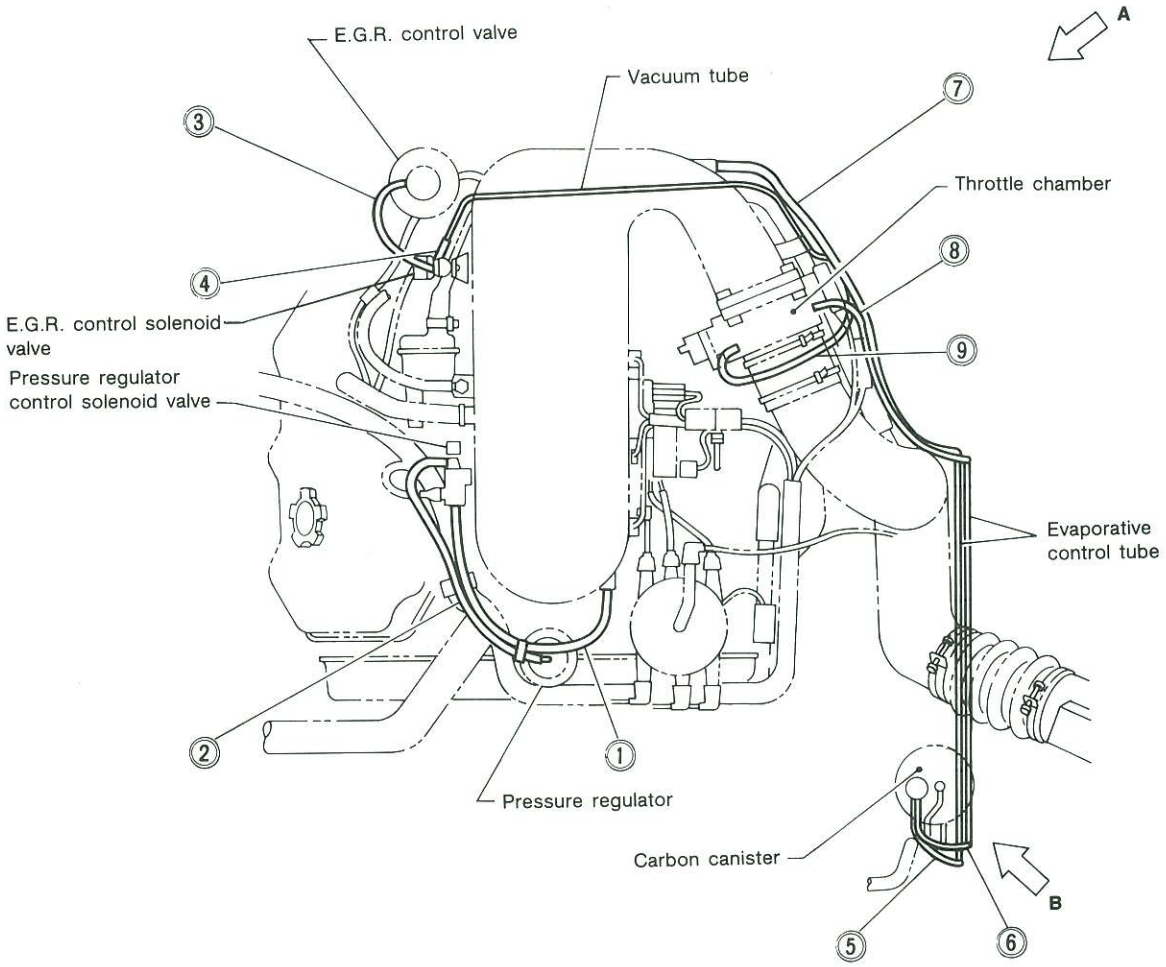
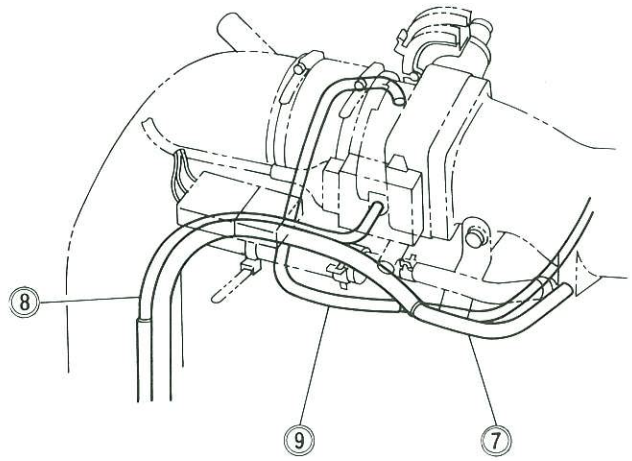
System Chart



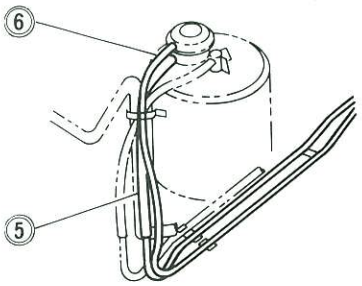
Vacuum Hose Drawing



View A



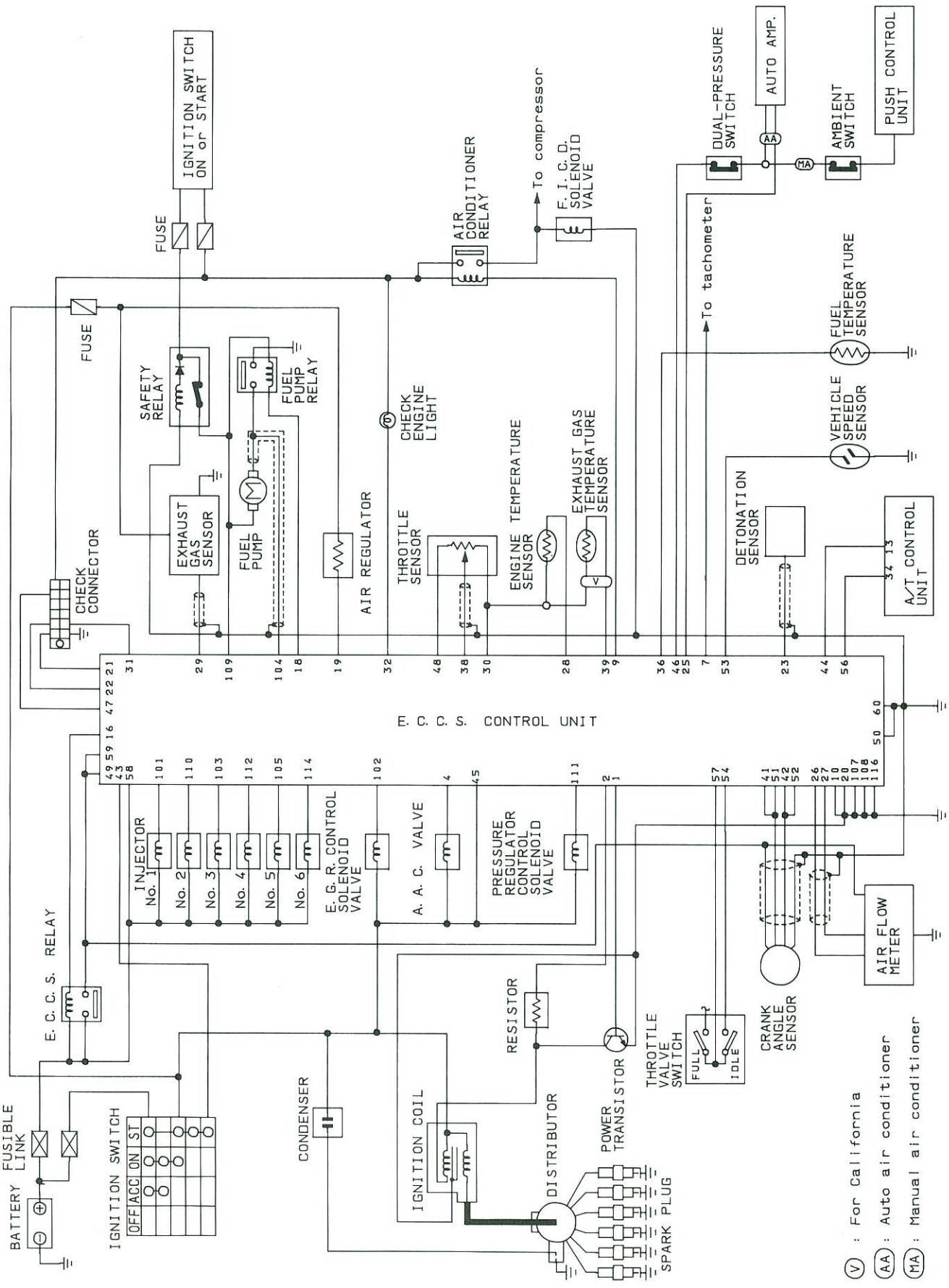
View B



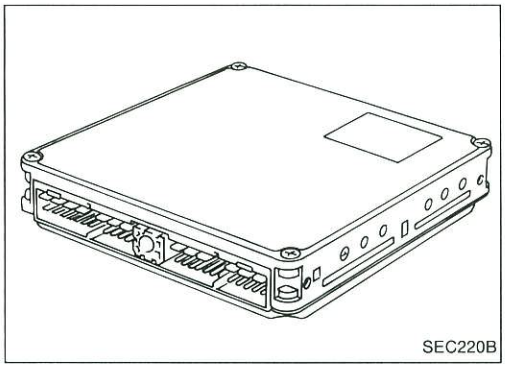
① Pressure regulator control solenoid valve to intake manifold collector
② Pressure regulator control solenoid valve to pressure regulator
③ E.G.R. control valve to E.G.R. control solenoid valve
④ E.G.R. control solenoid valve to vacuum tube
⑤ Canister (purge port) to evaporative control tube
⑥ Canister (vacuum port) to evaporative control tube
⑦ Intake manifold collector to evaporative control tube
⑧ Throttle chamber to evaporative control tube
⑨ Throttle chamber to vacuum tube

SEF441J

Circuit Diagram

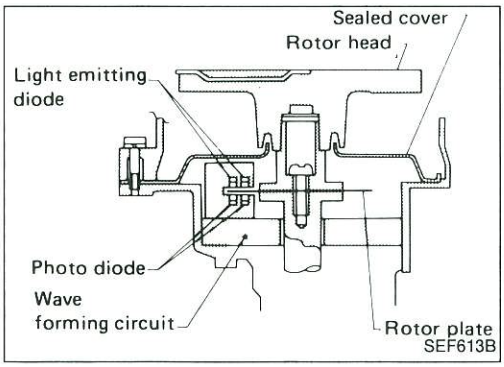


SEF397J


SEC220B

E.C.C.S. Control Unit (E.C.U.)

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

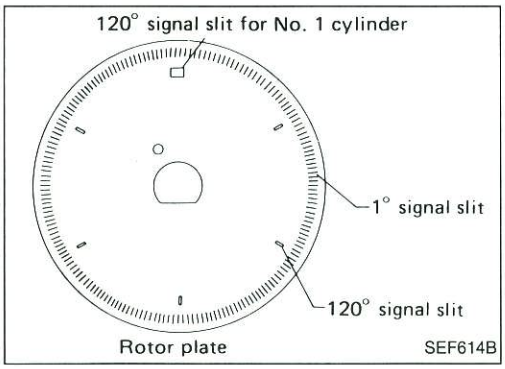


SEF613B

Crank Angle Sensor

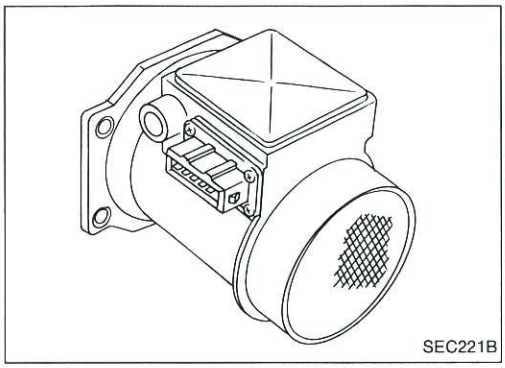
The crank angle sensor is a basic component of the entire E.C.C.S. It monitors engine speed and piston position, and sends signals to the E.C.U. to control fuel injection, ignition timing and other functions.

The crank angle 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.



SEF614B

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 E.C.U.

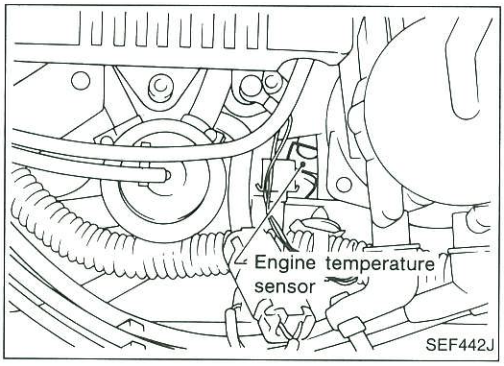

SEC221B

Air Flow Meter

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

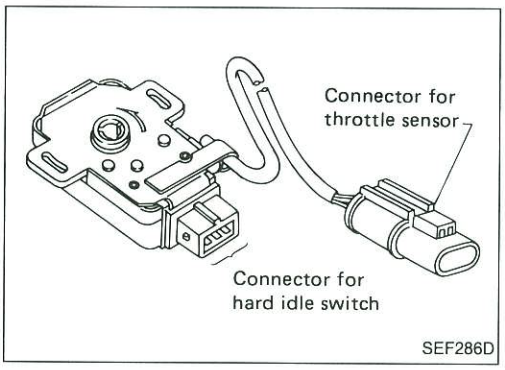
When intake air flows into the intake manifold through a route around the hot film, the heat generated from the hot film is taken away by the air. The amount of heat depends on the air flow. On the other hand, the temperature of the hot film is automatically controlled to a certain number of degrees.

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



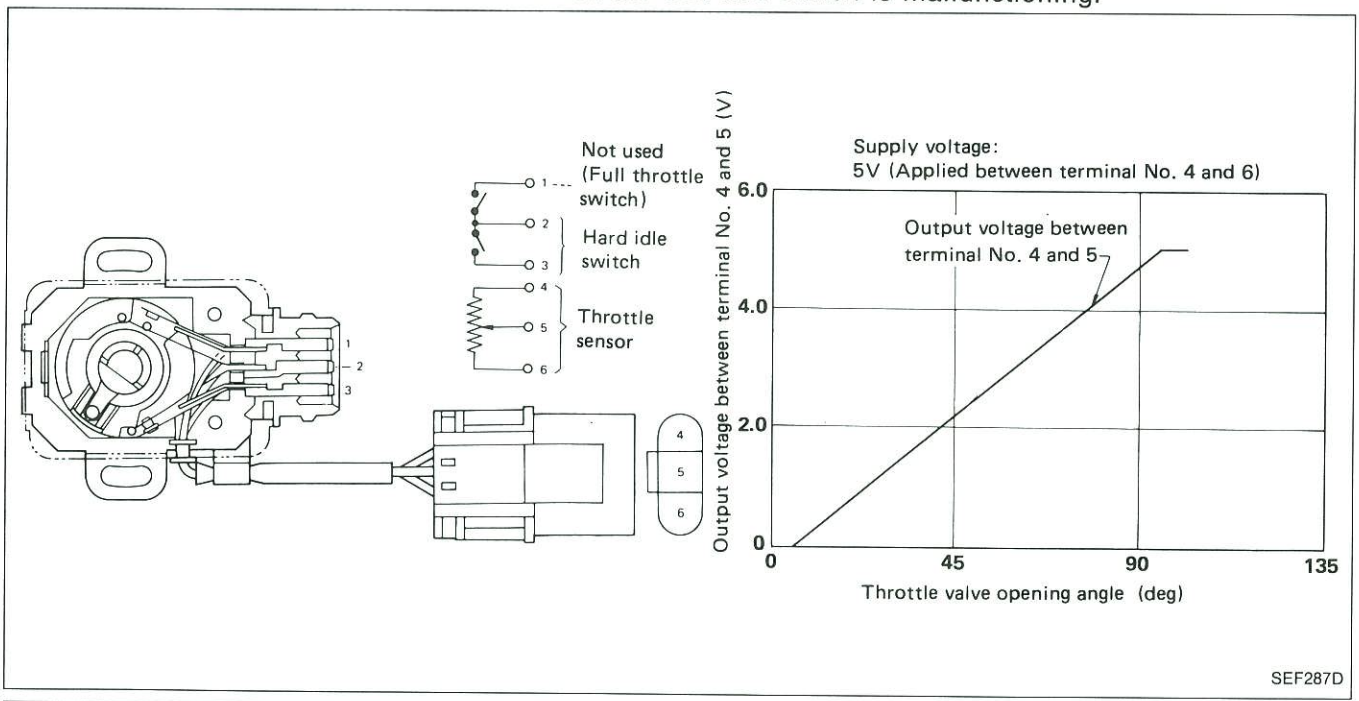
Engine Temperature Sensor

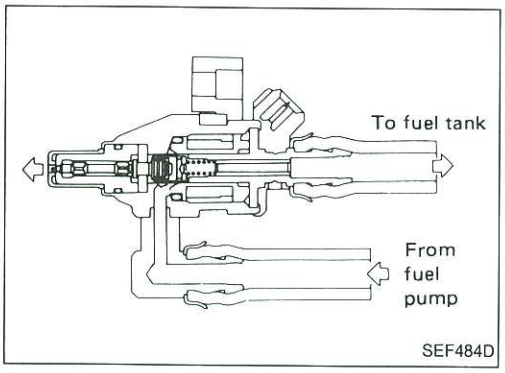
The engine temperature sensor, located on the top of water inlet housing, detects engine coolant temperature and transmits a signal to the E.C.U.
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



Throttle Sensor & Soft/Hard Idle Switch

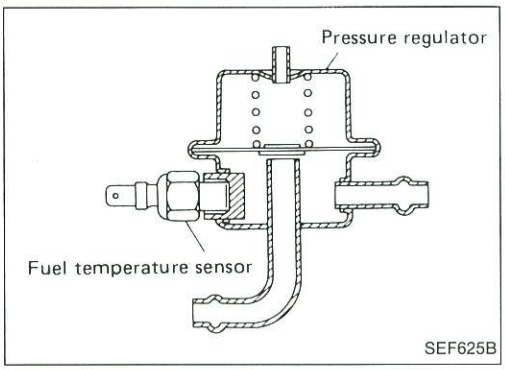
The throttle sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle valve position into output voltage, and emits the voltage signal to the E.C.U. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the E.C.U.
Idle position of the throttle valve is determined by the E.C.U. receiving the signal from the throttle sensor. This system is called "soft idle switch". This one controls engine operation such as fuel cut. On the other hand, "hard idle switch", which is built in the throttle sensor unit, is used for engine control when the soft idle switch is malfunctioning.





Fuel Injector

The fuel injector is a small, elaborate solenoid valve. As the E.C.U. 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 E.C.U. in terms of injection pulse duration.



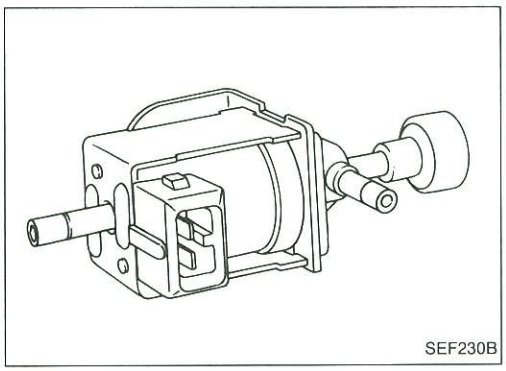
Pressure Regulator

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.

Fuel Temperature Sensor

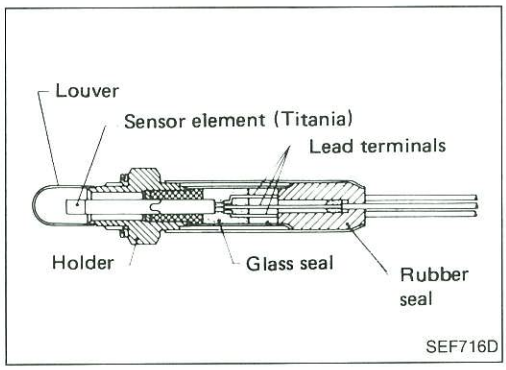
The fuel temperature sensor is built into the pressure regulator, and senses fuel temperature. When the fuel temperature is higher than the specified level, the E.C.U. enriches fuel injected.

Do not remove fuel temperature sensor from pressure regulator. Always replace as an assembly.



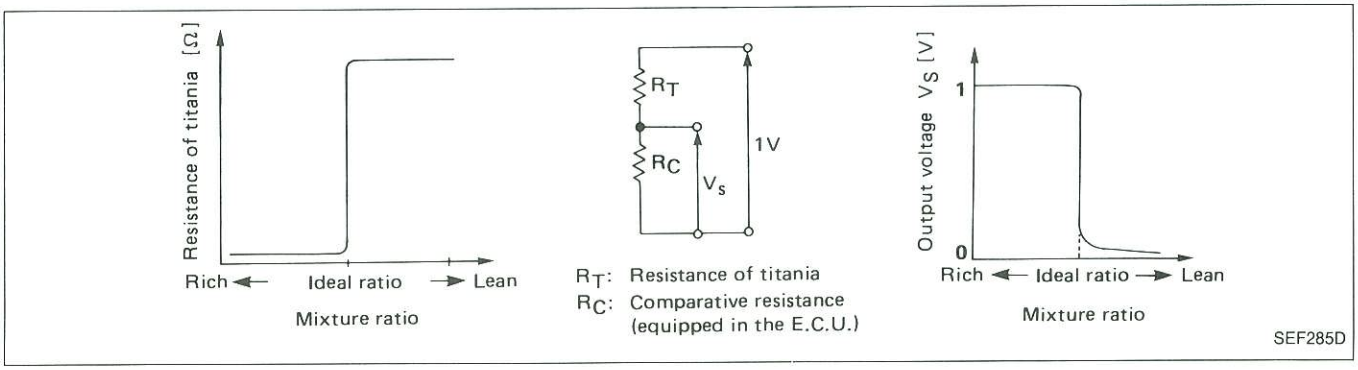
Pressure Regulator Control Solenoid Valve

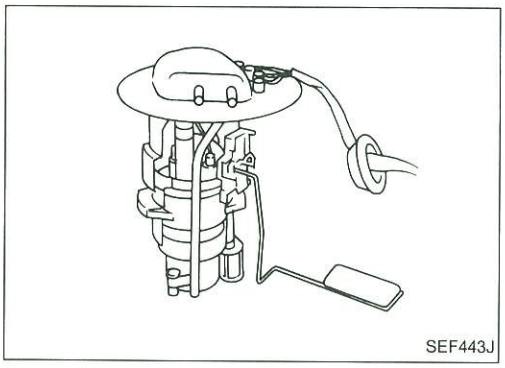
The solenoid valve responds to the ON/OFF signal from the E.C.U. When it is off, a vacuum signal from the intake manifold is fed into the pressure regulator. When the control unit sends an ON signal, the coil pulls the plunger downward and cuts the vacuum signal.



Exhaust Gas Sensor

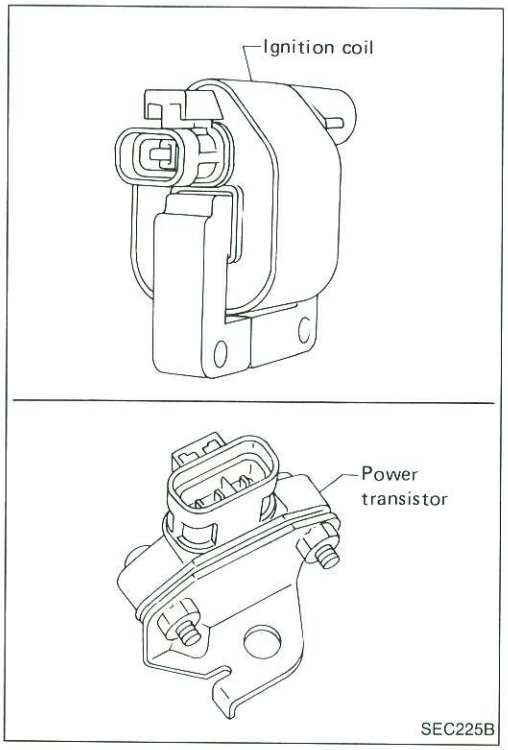
The exhaust gas sensor, located in the exhaust tube, monitors the oxygen level in the exhaust gas.
This sensor is made of ceramic titania, the electric resistance of which drastically changes at the ideal air-fuel ratio.
The E.C.U. supplies the sensor with approximately 1V and then measures the output voltage depending on its resistance. In order to activate the sensor element, it is equipped with a heater.




SEF443J

Fuel Pump

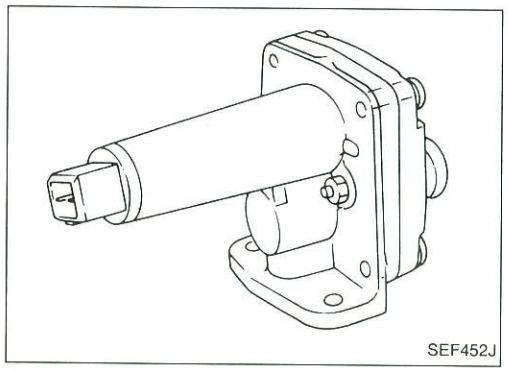
The fuel pump with a fuel damper is an in-tank type, that is the pump and damper are located in the fuel tank.



SEC225B

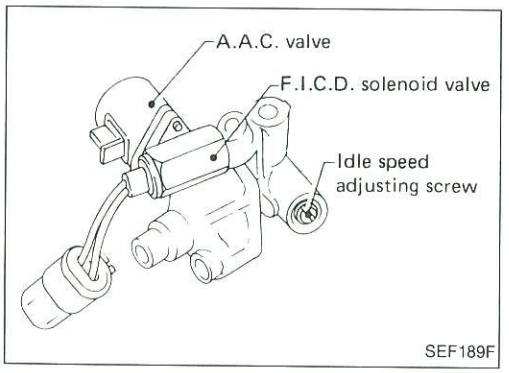
Power Transistor & Ignition Coil

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


SEF452J

Air Regulator

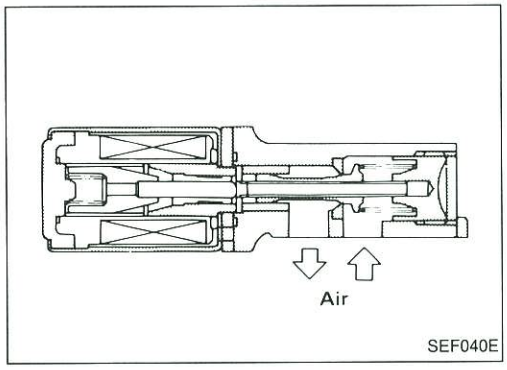
The air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.
A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port opens. As the engine starts and electric current flows through a heater, the 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.



SEF189F

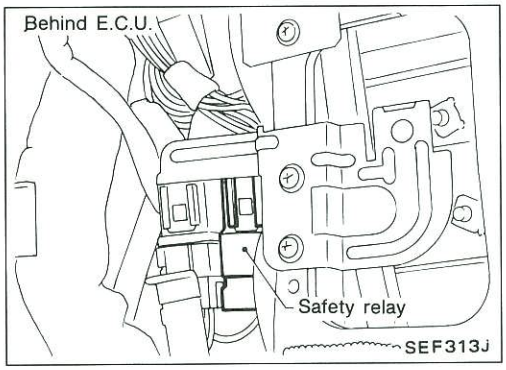
Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjusting screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value.



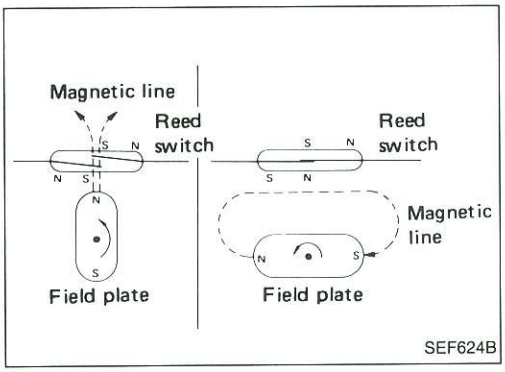
Auxiliary Air Control (A.A.C.) Valve

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



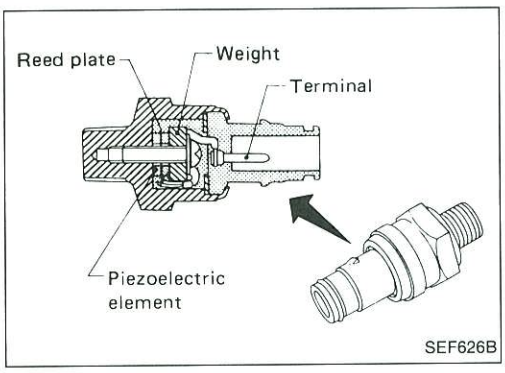
Safety Relay

The safety relay prevents electrical damage to the E.C.U. and injectors when battery terminals are connected in reverse.
The safety relay is built into the fuel pump control circuit.



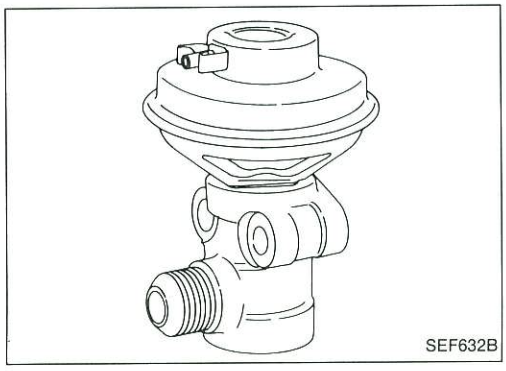
Vehicle Speed Sensor

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



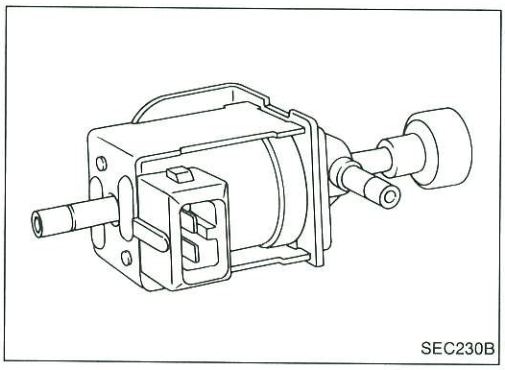
Detonation Sensor

The detonation sensor is attached to the cylinder block and senses engine knocking conditions.
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output.



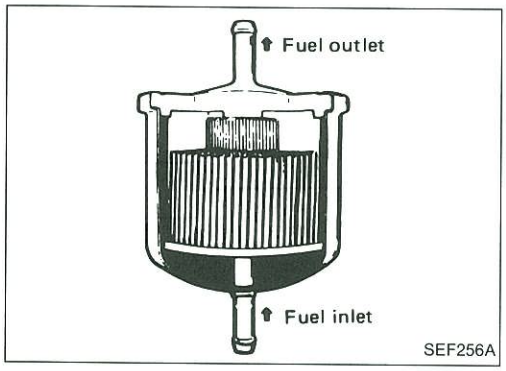
E.G.R. Control Valve

The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.


SEC230B

E.G.R. Control Solenoid Valve

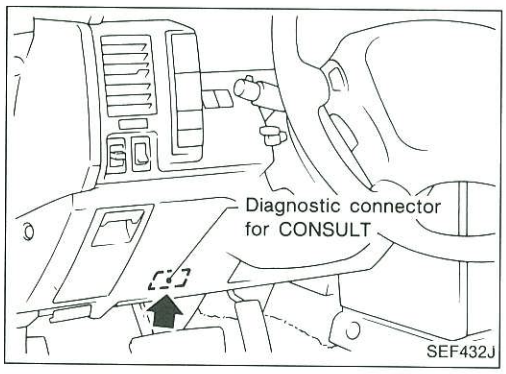
The E.G.R. system is controlled only by the E.C.U. At both low- and high-speed revolutions of engine, the solenoid valve turns on and accordingly the E.G.R. valve cuts the exhaust gas leading to the intake manifold.



SEF256A

Fuel Filter

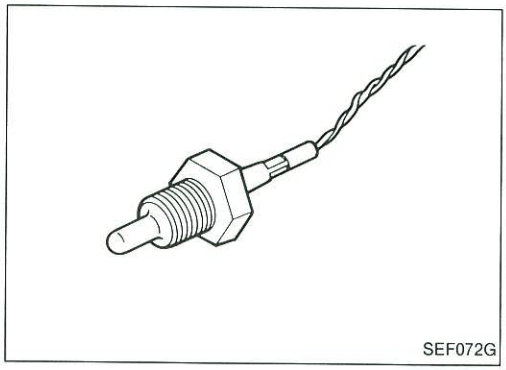
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



SEF432J

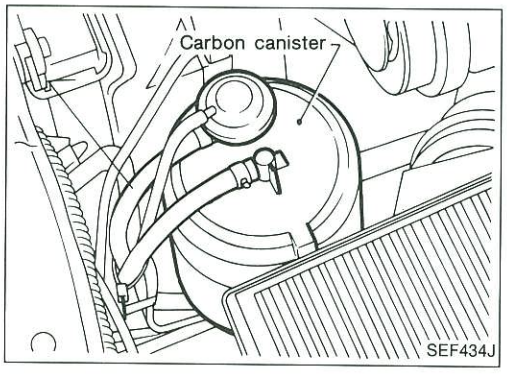
Diagnostic Connector for CONSULT

The diagnostic connector for CONSULT is located in the instrument lower panel, to the rear of the hood release handle.


SEF072G

Exhaust Gas Temperature Sensor

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



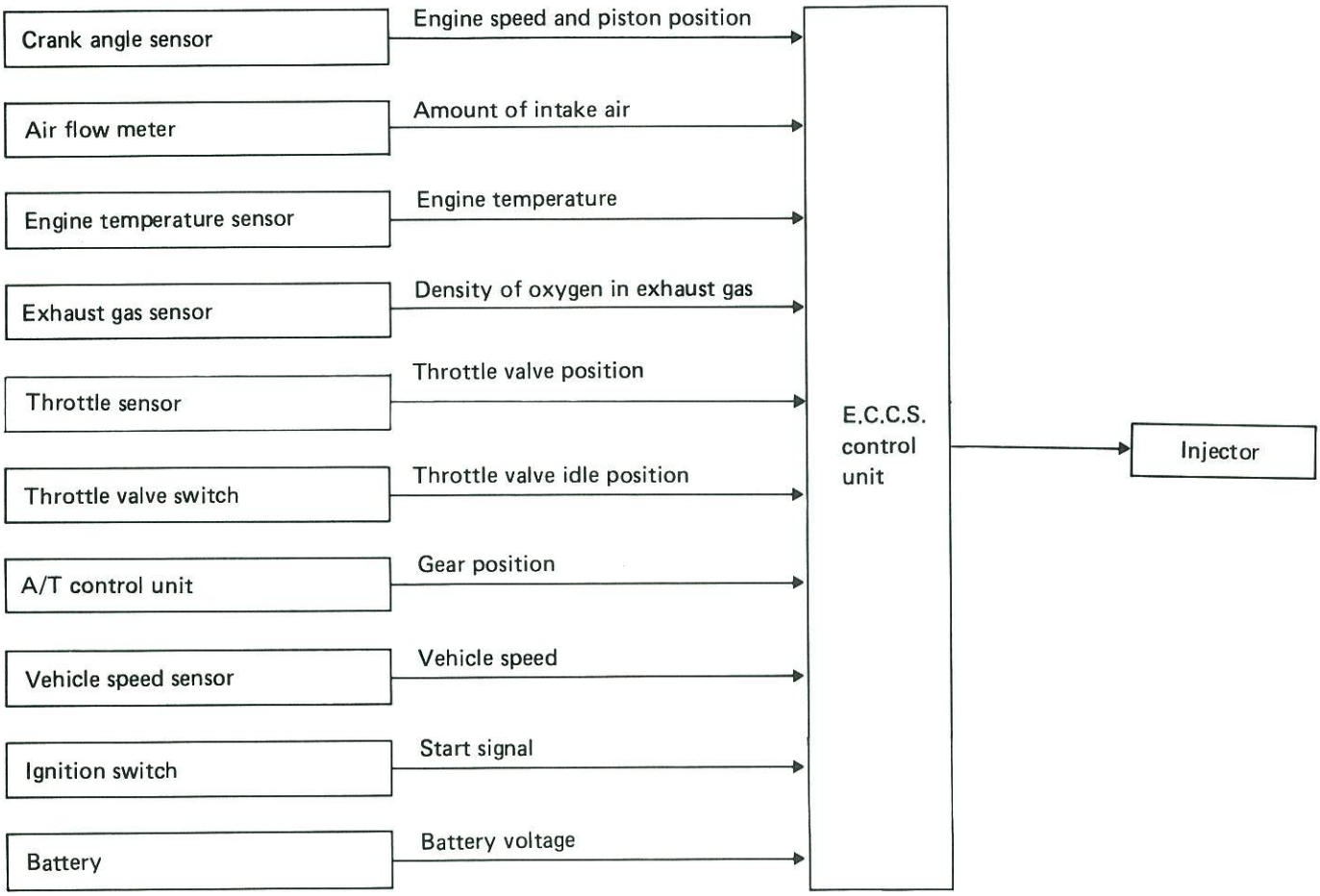
SEF434J

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.

Fuel Injection Control

INPUT/OUTPUT SIGNAL LINE



BASIC FUEL INJECTION CONTROL

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the E.C.U. The basic amount of fuel injected is a program value mapped in the E.C.U. ROM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine rpm and air intake) from both the crank angle sensor and the air flow meter.

VARIOUS FUELINJECTION INCREASE/DECREASE COMPENSATION

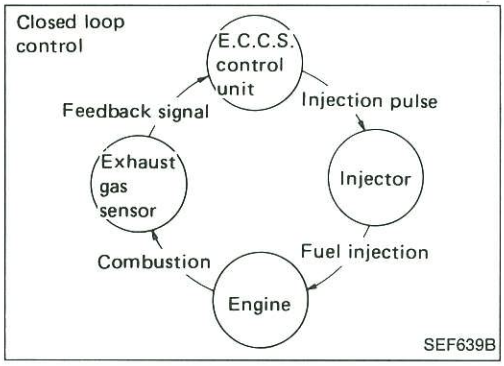
In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below.

<Fuel increase>

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

<Fuel decrease>

1) During deceleration



Fuel Injection Control (Cont'd)

MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NOx emissions. This system uses an exhaust gas sensor in the exhaust manifold to check the air-fuel ratio. The control unit 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.

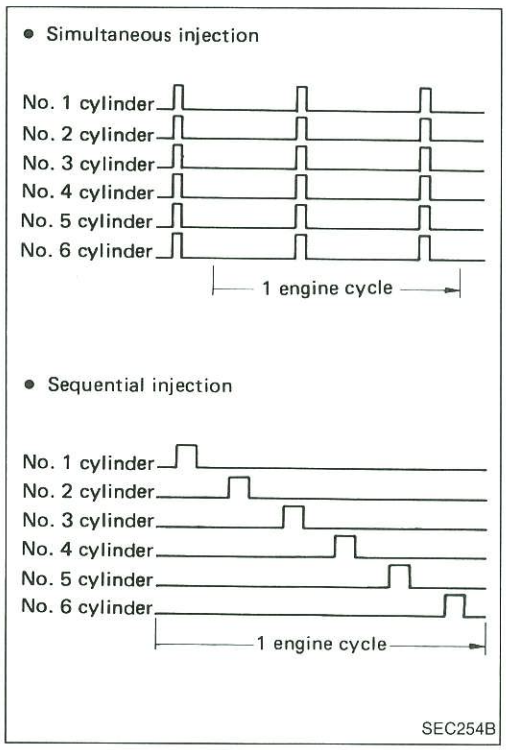
This stage refers to the closed-loop control condition. The open-loop control condition refers to that under which the E.C.U. detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

1) Deceleration
2) High-load, high-speed operation
3) Engine idling
4) Malfunction of exhaust gas sensor or its circuit
5) Insufficient activation of exhaust gas sensor at low engine temperature
6) Engine starting

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the exhaust gas sensor. This feedback signal is then sent to the E.C.U. 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., air flow meter hot film) and changes during operation (injector clogging, etc.) of E.C.C.S. parts which directly affect the mixture ratio.

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



FUEL INJECTION TIMING

Two types of fuel injection systems are used — simultaneous injection and sequential injection. 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 E.C.U. to the six injectors two times for each engine cycle.

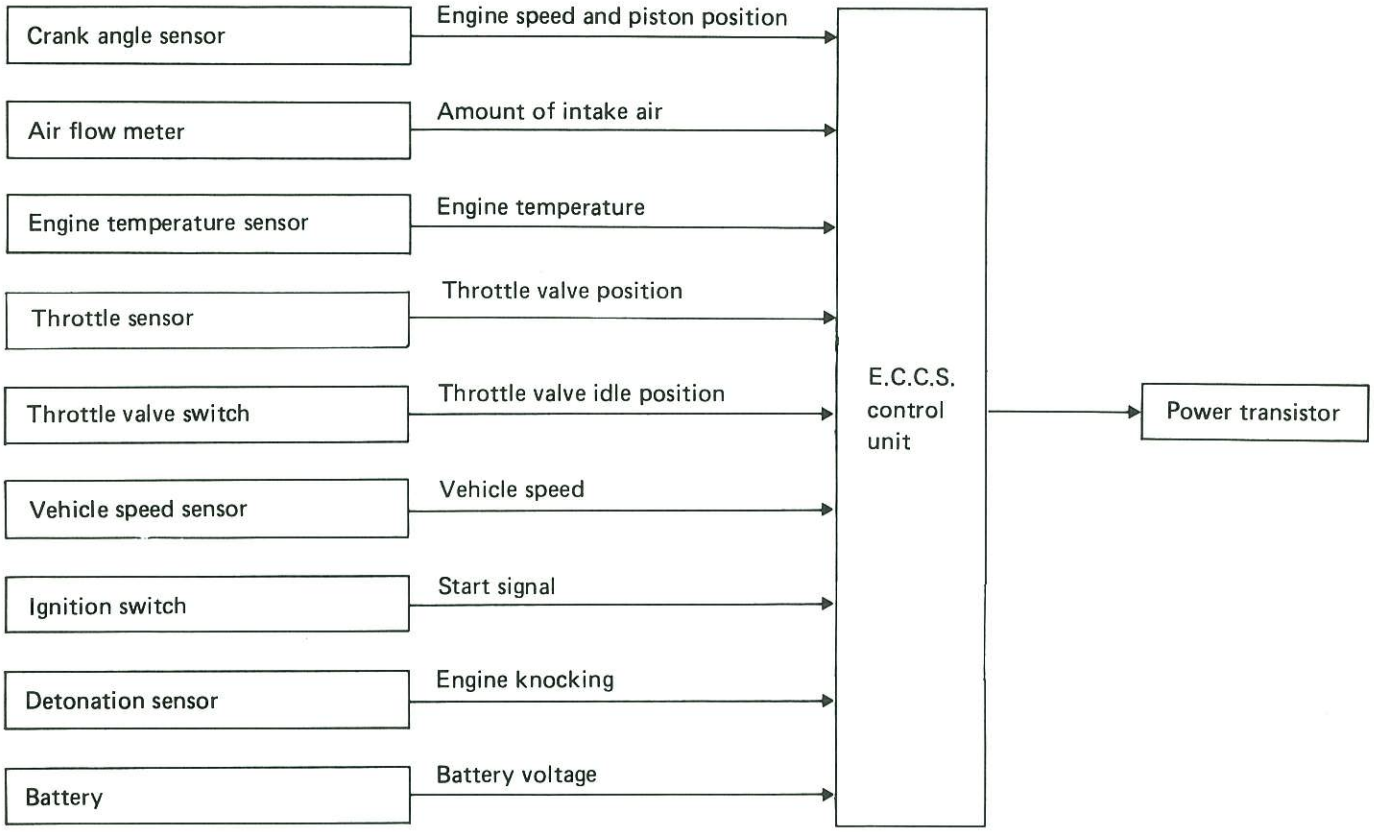
In the sequential injection system, fuel is injected into each cylinder during each engine cycle according to the firing order. When engine is starting, fuel is injected into all six cylinders simultaneously twice a cycle.

FUEL SHUT-OFF

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

Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE



Ignition Timing Control (Cont'd)

SYSTEM DESCRIPTION

The ignition timing is controlled by the E.C.U. 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 ROM located in the E.C.U., in the form of the map shown below.

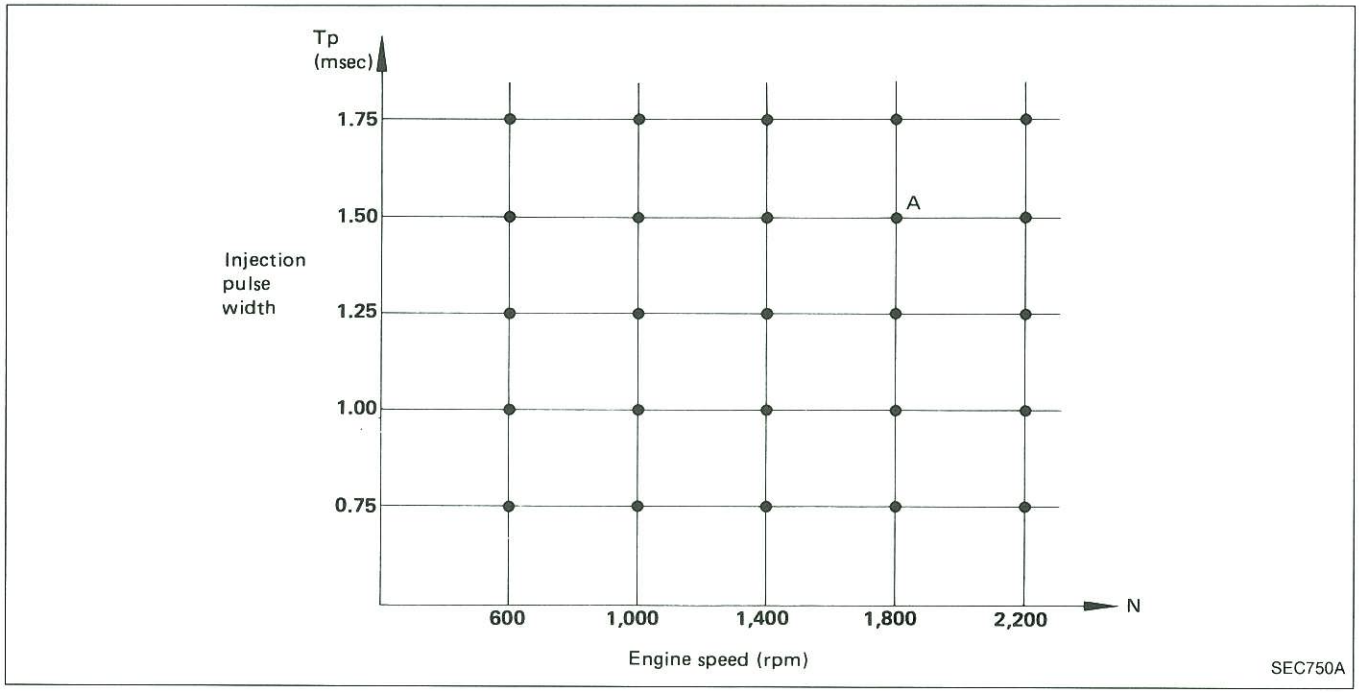
The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

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 E.C.U. according to the other data stored in the ROM.

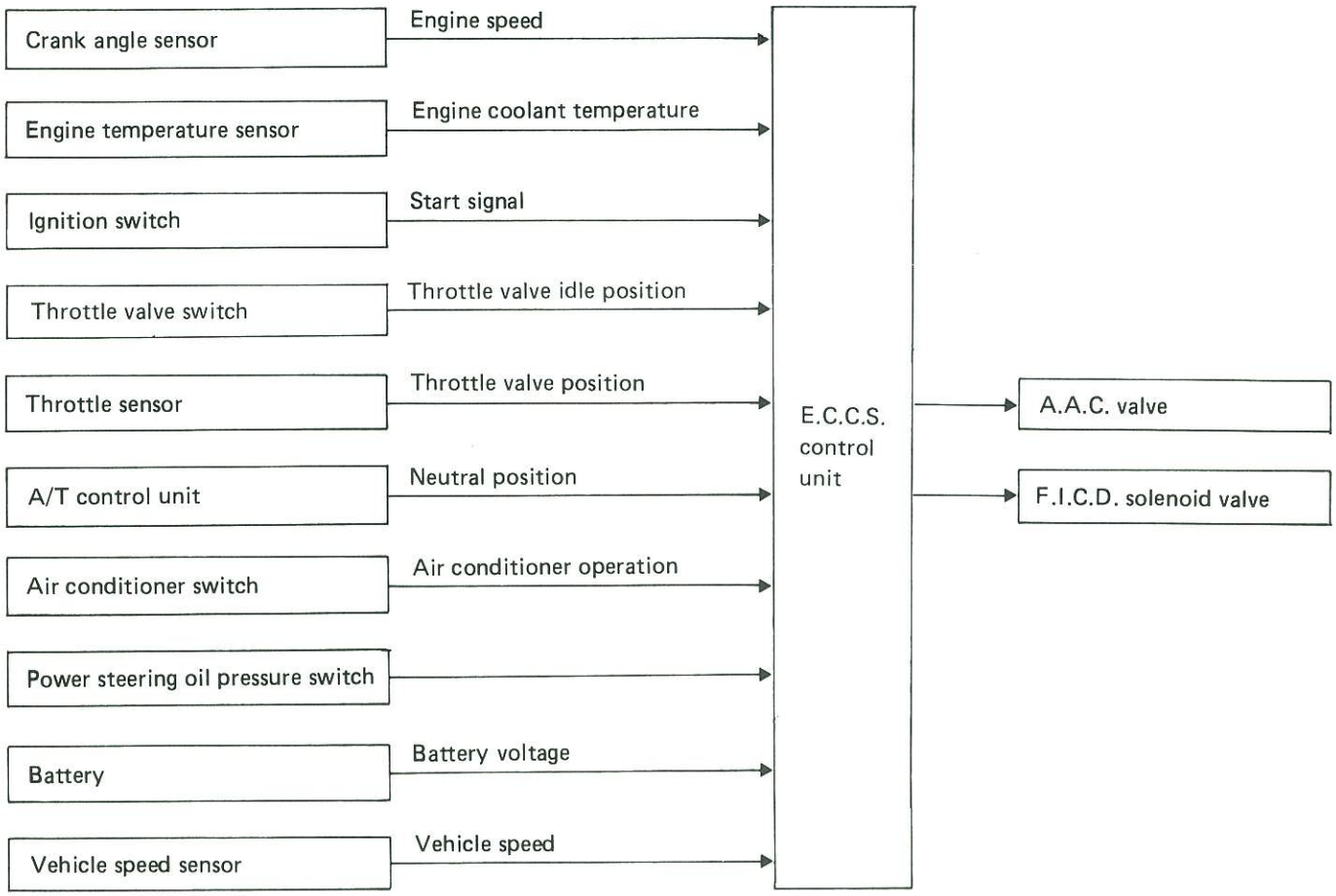


The retard system by detonation sensor is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

However, if engine knocking occurs, the detonation sensor monitors the condition and the signal is transmitted to the E.C.C.S. control unit. After receiving it, the control unit retards the ignition timing to avoid the knocking condition.

Idle Speed Control

INPUT/OUTPUT SIGNAL LINE

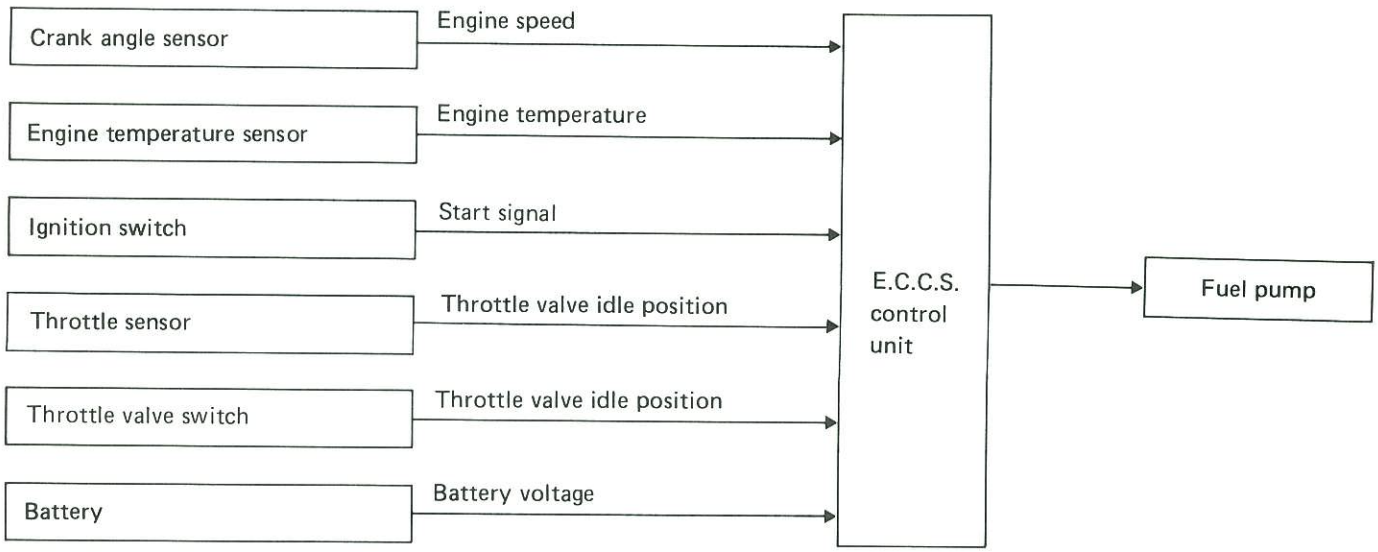


SYSTEM DESCRIPTION

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 A.A.C. valve. The A.A.C. valve changes the opening of the air by-pass passage to control the amount of auxiliary air. The opening of the valve is varied to allow for optimum control of the engine idling speed. The crank angle sensor detects the actual engine speed and sends a signal to the E.C.U. The E.C.U. then controls the ON/OFF time of the A.A.C. valve so that engine speed coincides with the target value memorized in ROM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ROM is determined by taking into consideration various engine conditions, such as warming up and during deceleration, fuel consumption, and engine load (air conditioner, electrical load).

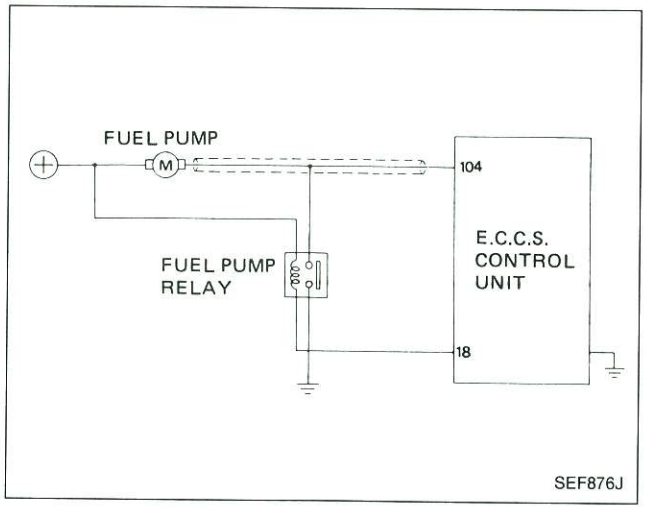
Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

When the fuel pump terminal voltage drops, pump speed, current consumption and fuel discharge decrease. This terminal voltage therefore is finely controlled corresponding to engine operating conditions in order to reduce power consumption and compartment noise level. The control unit receives various signals from sensors and switches and determines operating conditions of the engine. It then transmits a 20 Hz pulse signal to turn ON/OFF the grounding circuit of the fuel pump. The voltage is controlled by changing the mean voltage applied to the pump terminal by varying this on/off time ratio. That is, the longer the on-time in a cycle, the higher the mean voltage becomes, and vice versa. If the on-time reaches 100%, battery voltage is applied directly to the pump. The pump is driven directly by this battery voltage for several seconds after turning on the ignition switch when the engine is cold, when starting, and when the engine is hot.



Fuel pump ON-OFF control

1) Fuel pump ON-OFF control (terminal (104))

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

Fuel Pump Control (Cont'd)

2) Fuel pump relay ON-OFF control (terminal ⑱)

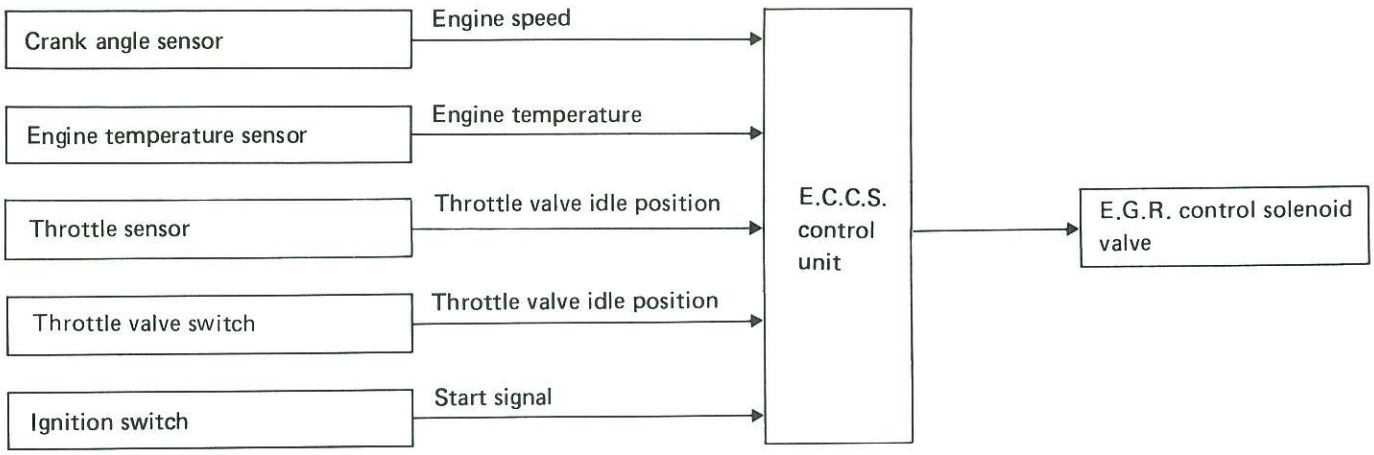
Condition	Fuel pump relay operation	Fuel pump operation
Ignition switch is turned to ON	ON for 5 seconds	Operates for 5 seconds
When engine is starting [Engine temp.: above 100°C (212°F)]	ON	Operates
After started [Engine temp.: above 100°C (212°F)]	ON for 30 seconds	Operates
When engine stalls and except as shown above	OFF	Stops

Fuel pump voltage control

Conditions	Voltage
5 seconds after ignition switch is turned to ON Engine cranking 30 seconds after engine start [above 50°C (122°F)] Engine temp. above 100°C (212°F) [Except idle position] Engine temp. below 10°C (50°F)	0.1 - 0.5V
Except above	9 - 14V

E.G.R. (Exhaust Gas Recirculation) Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

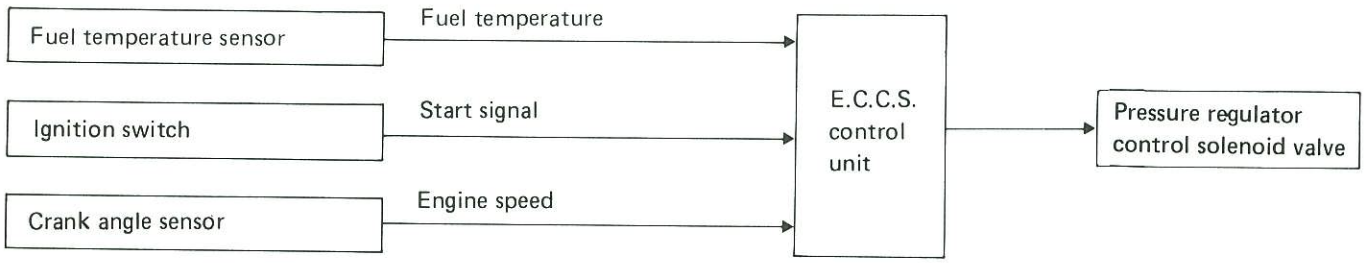
In addition, a system is provided which precisely cuts and controls port vacuum applied to the E.G.R. valve to suit engine operating conditions. This cut-and-control operation is accomplished through the E.C.U. When the E.C.U. detects any of the following conditions, current flows through the solenoid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

This causes the port vacuum to be discharged into the atmosphere so that the E.G.R. control valve remains closed.

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

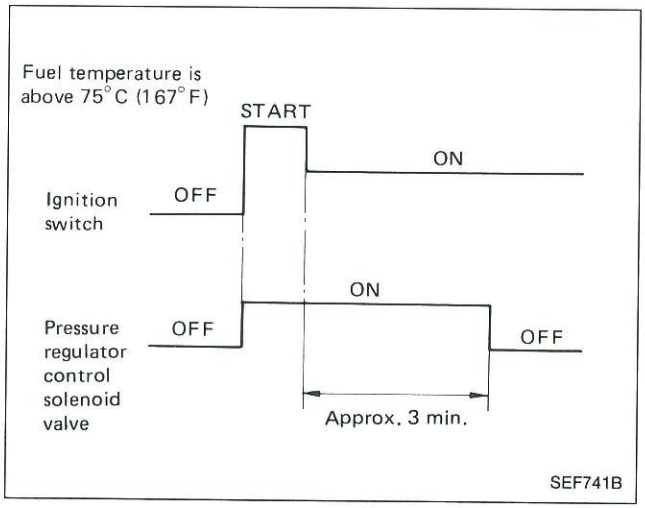
Fuel Pressure Regulator Control

INPUT/OUTPUT SIGNAL LINE



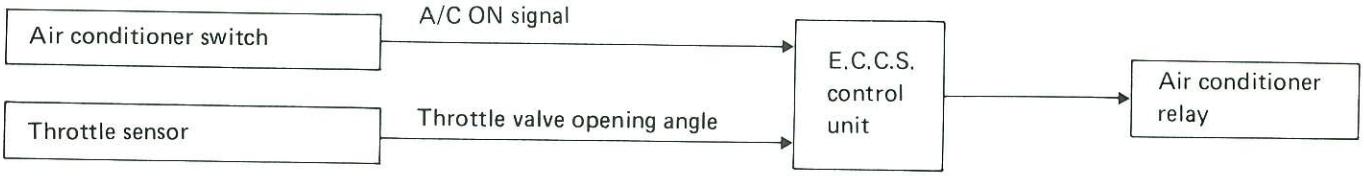
SYSTEM DESCRIPTION

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 E.C.U. 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



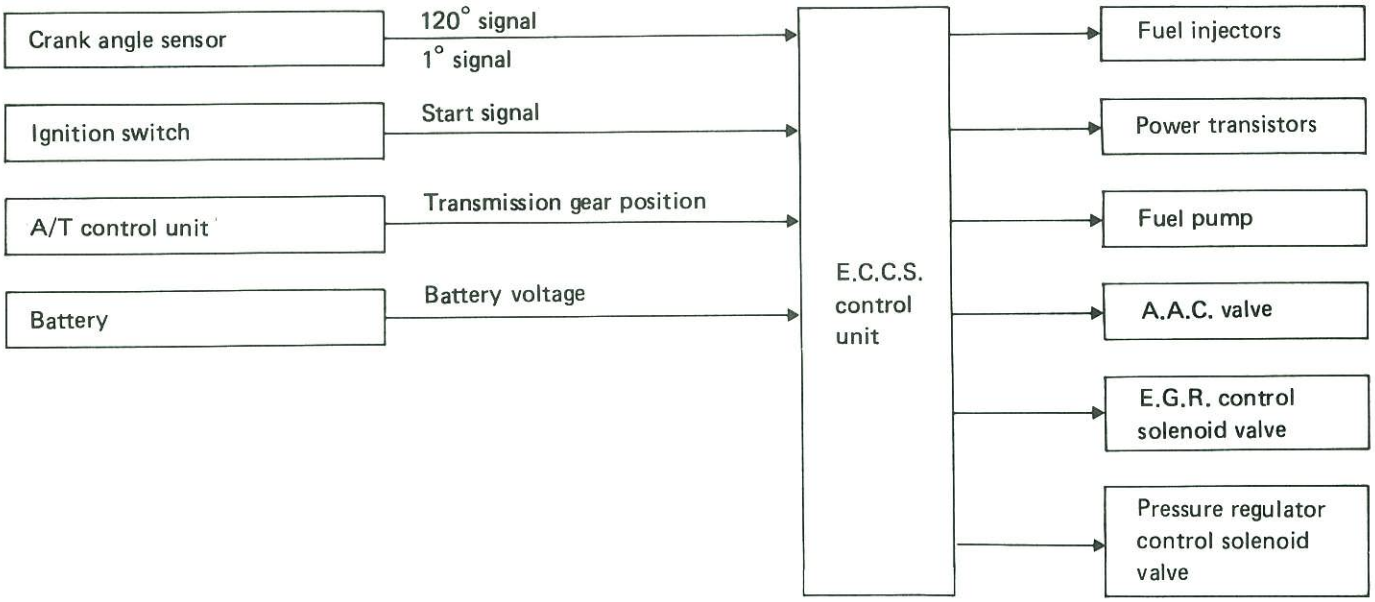
SYSTEM DESCRIPTION

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.

Fail-safe System

C.P.U. MALFUNCTION OF E.C.U. AND CRANK ANGLE SENSOR MALFUNCTION

Input/output signal line



OUTLINE

The fail-safe system makes engine starting possible if there is something malfunctioning in the E.C.U.'s C.P.U. circuit, or if there is a disconnection or short/open circuit in the crank angle sensor circuit. In former models, engine starting was difficult under the conditions mentioned above. But with the provisions provided in this back-up system, it is possible to start the engine.

Fail-safe system activating condition when crank angle sensor is malfunctioning

The fail-safe mode operation starts immediately after all of the following conditions have been satisfied for several seconds.

(1) No pulse of 120° signal (reference signal) detected for several seconds, or 1° signal (position signal) is equivalent to 0 rpm.
(2) Ignition switch in START
(3) Battery voltage is greater than 10 volts with ignition switch ON.
(4) The neutral switch is ON, or the inhibitor switch is in the "P" or "N" position.
(5) When ignition switch is in START, battery voltage is at least 1 volt lower than when ignition switch is ON.

Fail-safe system activating condition when E.C.U. is malfunctioning

The computing function of the E.C.U. was judged to be malfunctioning.

When the fail-safe system activates, i.e. if the E.C.U. detects a malfunction condition in the C.P.U. of E.C.U. or crank angle sensor circuit, the CHECK ENGINE LIGHT on the instrument panel lights to warn the driver.

Engine control, with fail-safe system, operates when E.C.U. or crank angle sensor is malfunctioning

When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, engine idle speed, E.G.R. operation and pressure regulator operation are controlled under certain limitations.

Cancellation of fail-safe system when E.C.U. or crank angle sensor is malfunctioning

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

Fail-safe System (Cont'd)

AIR FLOW METER MALFUNCTION

If the air flow meter output voltage is above or below the specified value, the E.C.U. senses an air flow meter malfunction. In case of a malfunction, the throttle sensor substitutes for the air flow meter.

Though air flow meter is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 2,000 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	—
Cranking	ON	Operates	Engine will be started by a pre-determined injection pulse on E.C.U.
Running	OFF		Engine speed will not rise above 2,000 rpm

ENGINE TEMPERATURE SENSOR MALFUNCTION

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

Operation

Condition	Engine temperature decided
Just as ignition switch is turned ON or Start	20°C (68°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)

DETONATION SENSOR MALFUNCTION

When the output signal of the detonation sensor is abnormal, the E.C.U. judges it to be malfunctioning. When detonation sensor is malfunctioning, ignition timing will retard according to operating conditions.

THROTTLE SENSOR MALFUNCTION

When throttle sensor output voltage is below or above the specified value, throttle sensor output is fixed at the preset value.

PREPARATION

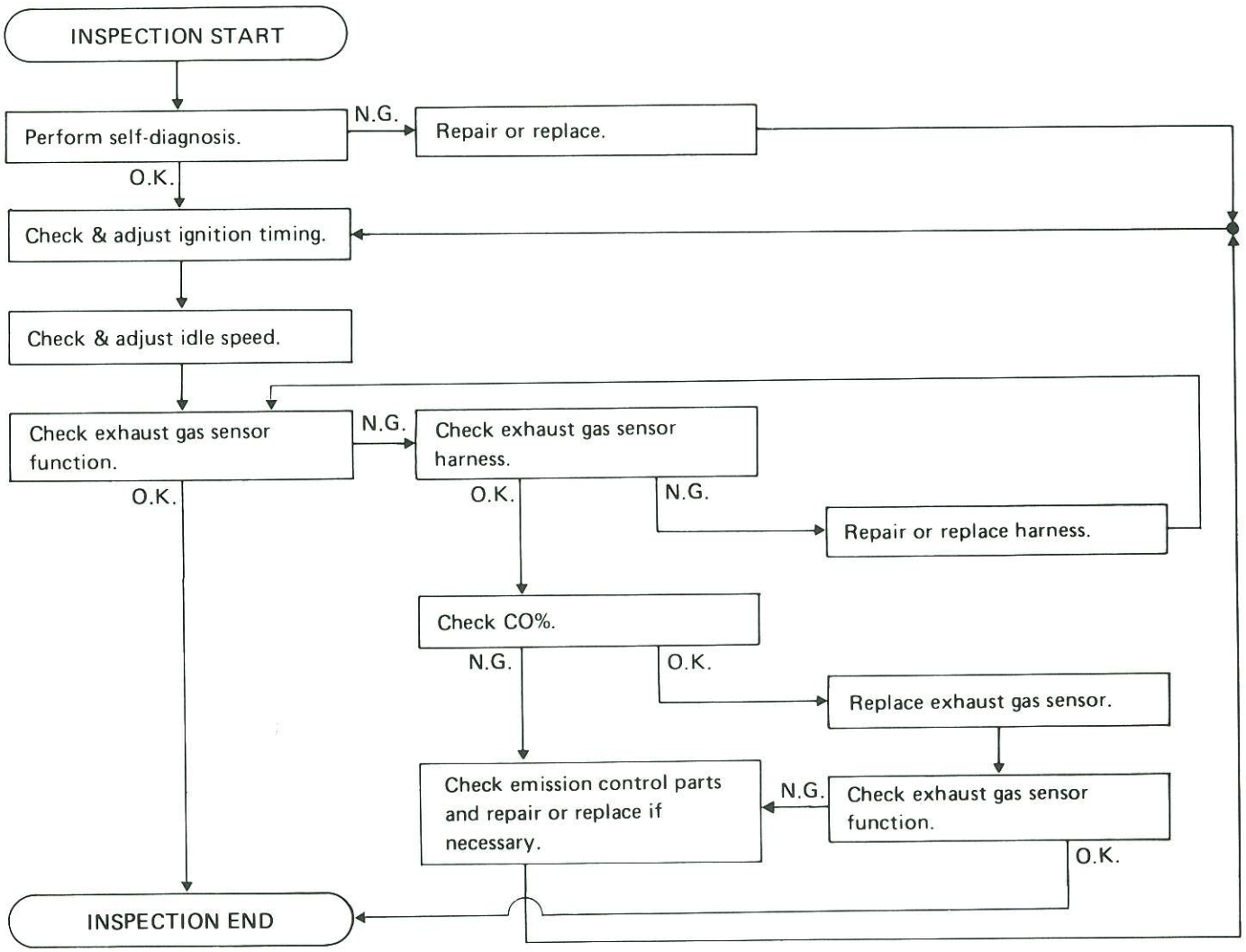
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- E.G.R. control valve operation
- Throttle valve

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. 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.

WARNING:

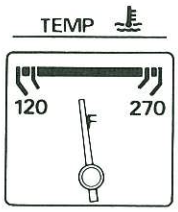
a. When selector lever is shifted to "D" position, apply parking brake and block both front and rear wheels with chocks.
b. Depress brake pedal while racing the engine to prevent forward surge of vehicle.
c. After the adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

Overall inspection sequence



START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- E.G.R. control valve operation
- Electrical connectors
- Gasket



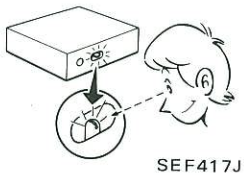
SEF246F

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.

Perform E.C.C.S. self-diagnosis.


SEF417J

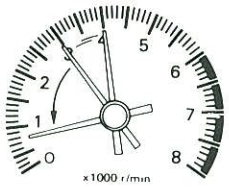
O.K. / N.G.

Repair or replace components as necessary.

Does engine run smoothly?

O.K. / N.G.

Clean injectors.

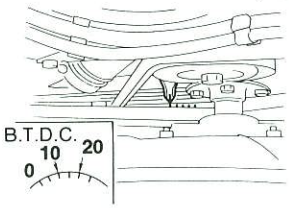


SEF248F

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.

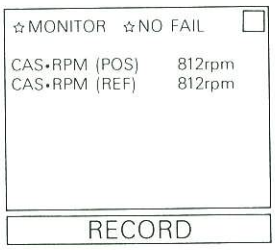


SEF771L

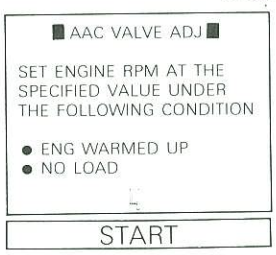
O.K. / N.G.

Adjust ignition timing by turning crank angle sensor after loosening securing bolts.

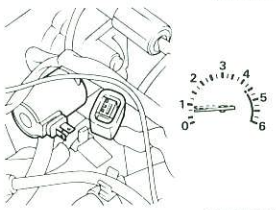
(A) (B) (H)

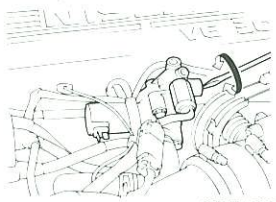


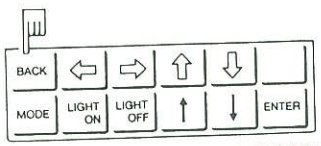
SEF378J



SEF372I


SEF415J


SEF429J



SEF913J

SEF247F

Ⓐ

Check idle speed.

- Read idle speed in "DATA MONITOR" mode with CONSULT.

OR

- Check idle speed.

800±50 rpm (in "N" position)

O.K. / N.G.

1) Select "A.A.C. VALVE ADJ" in "WORK SUPPORT" mode.
2) Touching "START".

OR

1) Disconnect A.A.C. valve harness connector.

Adjust idle speed by turning idle speed adjusting screw.

700 rpm (in "N" position)

1) Touch "BACK".

OR

1) Connect A.A.C. valve harness connector.

Ⓑ

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

Ⓒ

SEF427J

Ⓒ

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

RICH → LEAN → RICH →
1 time 2 times
LEAN → RICH .....

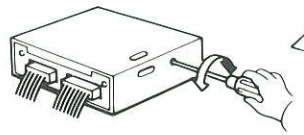
OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-39.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during to seconds.

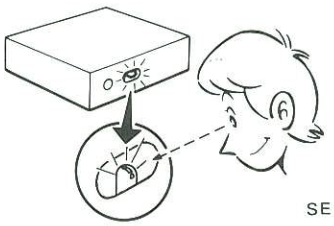
Ⓘ "M/R F/C MNT" does not fluctuate.

Inspection lamp does not blink.

Ⓕ



SEF957D



SEF417J

O.K.

Less than 5 times

Replace exhaust gas sensor.

Ⓙ

O.K.

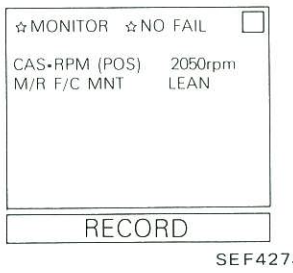
1. See "M/R F/C MNT" in "Data monitor" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

RICH → LEAN → RICH →
1 time 2 times
LEAN → RICH .....

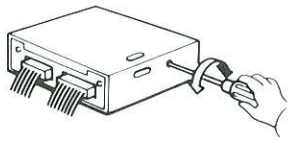
N.G. Ⓚ

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-39.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during to seconds.

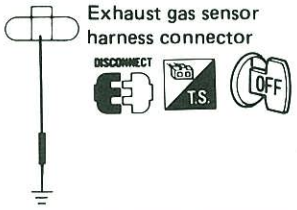


SEF427J



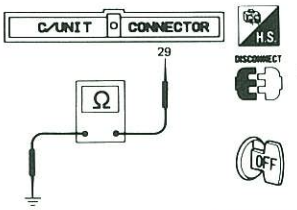
SEF957D

END



As for the location of exhaust gas sensor harness connector, refer to page EF & EC-117.

SEC240B



SEC241B

Check exhaust gas sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect E.C.U. S.M.J. harness connector from E.C.U.
3) Disconnect exhaust gas sensor harness connector and connect main harness side terminal for exhaust gas sensor to ground with a jumper wire.
4) Check for continuity between terminal No. 29 of E.C.U. S.M.J. harness connector and body ground

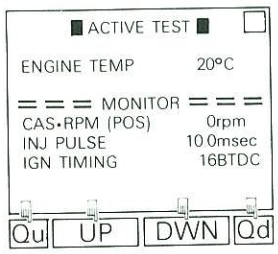
Continuity exists . . . . . O.K.
Continuity does not exist . . . . . N.G.

O.K. / N.G.

Repair or replace harness.

Connect 76-pin connector to control unit.

Connect battery ground cable.

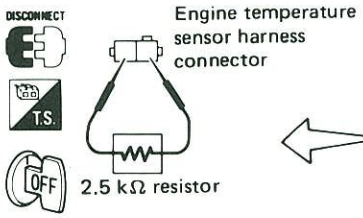


SEF912J

1) Select "ENG TEMPERATURE" in "ACTIVE TEST" mode.
2) Set "ENGINE TEMP" to 20°C (68°F) by touching "Qu" and "Qd" and "UP", "DOWN".

OR

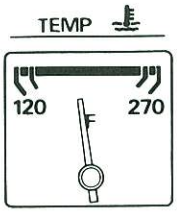
1) Disconnect engine temperature sensor harness connector.
2) Connect a resistor (2.5 kΩ) between terminals of engine temperature sensor harness connector.



SEC242B

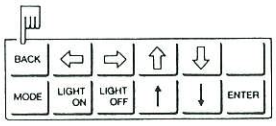
Disconnect jumper wire connected to exhaust gas sensor harness connector (main harness side).

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



SEF246F

SEF248F



SEF913J

Ⓖ

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

Check "CO" %.

Idle CO: 0.2 - 8.0%

After checking CO%,

1) Touch "BACK".

O.K. → Ⓙ

1) Disconnect the resistor from terminals of engine temperature sensor harness connector.
2) Connect engine temperature sensor harness connector to engine temperature sensor.

N.G.

Connect exhaust gas sensor harness connector to exhaust gas sensor.

Check fuel pressure regulator.
(See page EF & EC-162.)

Check air flow meter and its circuit.
(See page EF & EC-97.)

Check injector and its circuit.
(See page EF & EC-131.)
Clean or replace if necessary.

Check engine temperature sensor and its circuit.
(See page EF & EC-100.)

Check E.C.U. function* by substituting another known good E.C.U.

Ⓗ

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

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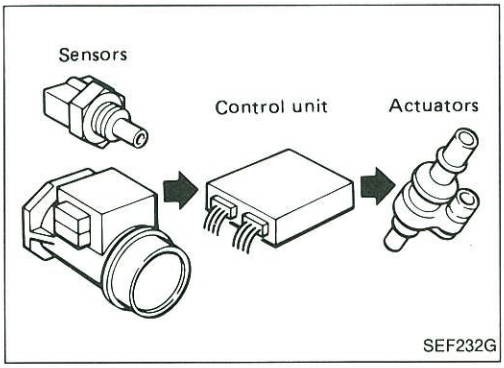
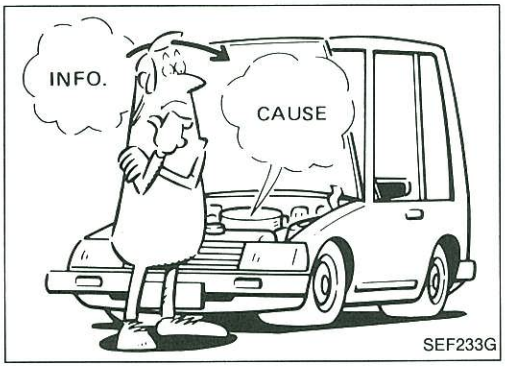
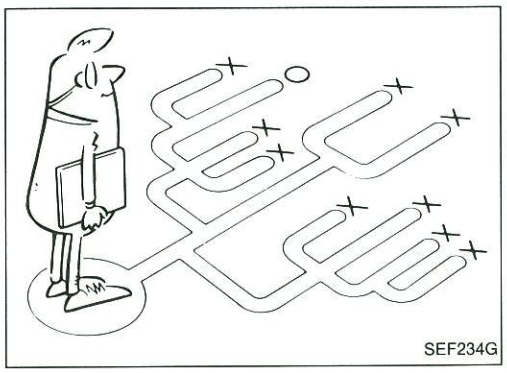






How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The engine has an electronic control unit to control major systems such as fuel control, ignition control, idle speed control, etc. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

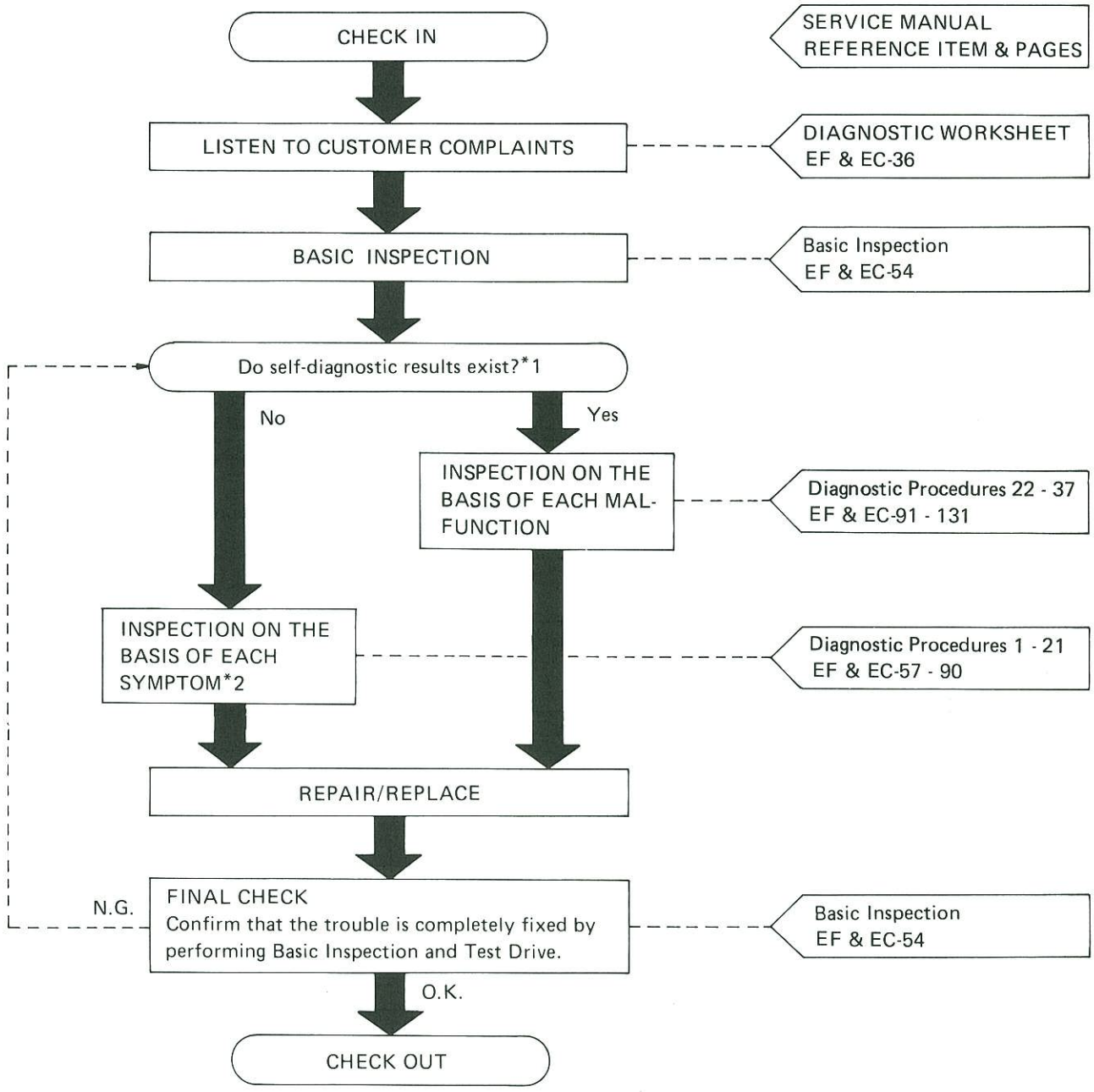
A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

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 self-diagnosis 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-37).

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

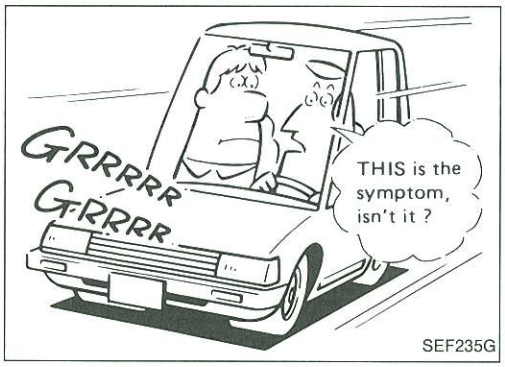
DIAGNOSTIC WORKSHEET

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 ☐ Detonation ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not 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	
Check engine light		☐ Turned on ☐ Not turned on	

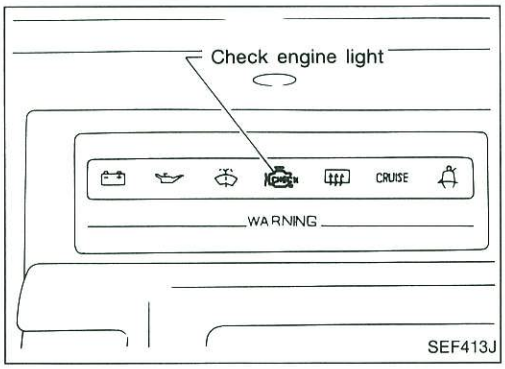
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)



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.

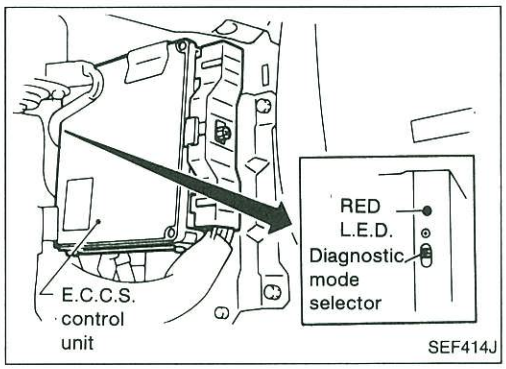
	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Crank angle sensor	Advanced	Rotate distributor counterclockwise.
			Retarded	Rotate distributor clockwise.
3	Mixture ratio feedback control	Exhaust gas sensor	Suspended	Disconnect exhaust gas sensor harness connector.
		Control unit	Operation check	Perform self-diagnosis (Mode II) at 2,000 rpm.
4	Idle speed	A.A.C. 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	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
7	Moisture	Electric parts	Damp	Wet. **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
8	Electric loads	Load switches	Loaded	Turn on headlamps, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Rotate throttle sensor body.
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder using ignition coil adapter (S.S.T.).



Self-diagnosis

CHECK ENGINE LIGHT

A check engine light has been adopted on all models. This light blinks simultaneously with the RED L.E.D. on the E.C.U.



E.C.U. L.E.D.

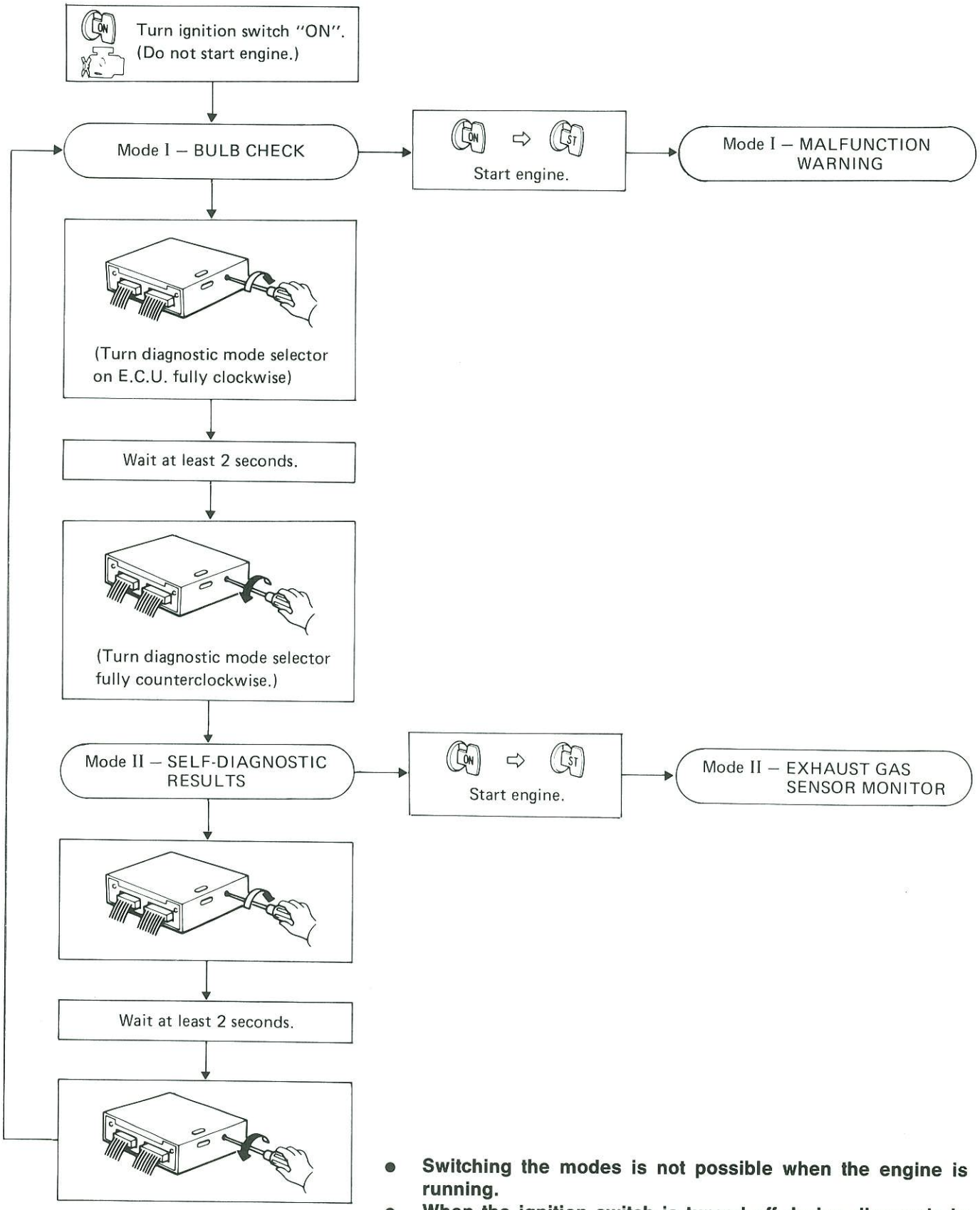
The E.C.U. has only one RED L.E.D.

SELF-DIAGNOSTIC FUNCTION

Condition \ Mode		Mode I	Mode II
Ignition switch in "ON" position	Engine stopped	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running	MALFUNCTION WARNING	EXHAUST GAS SENSOR MONITOR

Self-diagnosis (Cont'd)

HOW TO SWITCH 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 E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.**

Self-diagnosis — Mode I

MODE I — BULB CHECK

In this mode, the RED L.E.D. in the E.C.U. and the CHECK ENGINE LIGHT in the instrument panel stay "ON".
If either remain "OFF", check the bulb in the CHECK ENGINE LIGHT or the RED L.E.D.

MODE I — MALFUNCTION WARNING

FOR CALIFORNIA MODEL

CHECK ENGINE LIGHT and RED L.E.D.	Condition
ON	When the following malfunctions (check engine light item) are detected or the E.C.U.'s C.P.U. or crank angle sensor is malfunctioning.
OFF	O.K.

Code No.	Malfunction
12	Air flow meter circuit
13	Engine temperature sensor circuit
14	Vehicle speed sensor circuit
31	E.C.U. (E.C.C.S. control unit)
32	E.G.R. function
33	Exhaust gas sensor circuit
35	Exhaust gas temperature sensor circuit
43	Throttle sensor circuit
45	Injector leak
51	Injector circuit

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

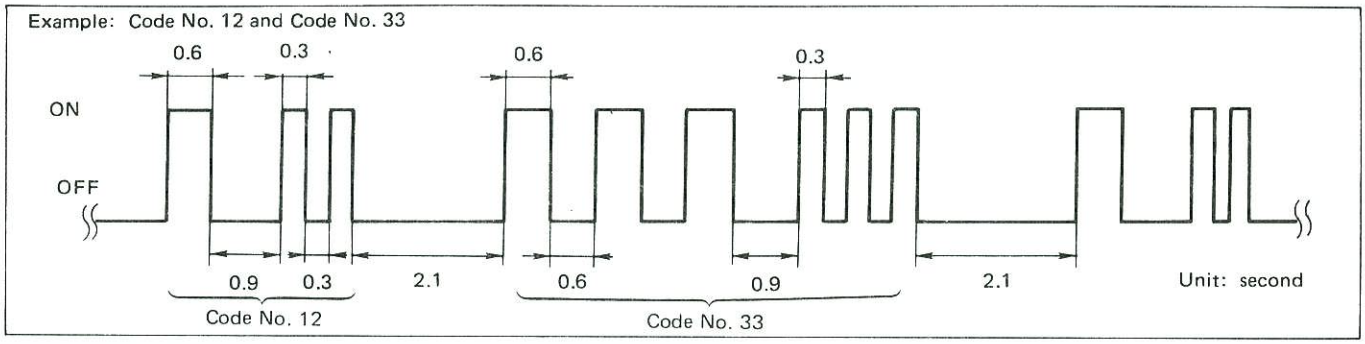
FOR NON-CALIFORNIA MODEL

CHECK ENGINE LIGHT and RED L.E.D.	Condition
ON	When the E.C.U.'s C.P.U. or crank angle sensor is malfunctioning.
OFF	O.K.

Self-diagnosis — Mode II (Self-diagnostic results)

DESCRIPTION

In this mode, a malfunction code is indicated by the number of flashes from the RED L.E.D. or the CHECK ENGINE LIGHT 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 air flow meter. In this way, all the problems are classified by their code numbers.

The diagnostic results will remain in E.C.U. memory.

Display code table

Code No.	Detected items	California model	Non-California model
11*	Crank angle sensor circuit	X	X
12 (CHECK)	Air flow meter circuit	X	X
13 (CHECK)	Engine temperature sensor circuit	X	X
14 (CHECK)	Vehicle speed sensor circuit	X	X
21*	Ignition signal circuit	X	X
22	Fuel pump circuit	X	X
31 (CHECK)	E.C.U.	X	X
32 (CHECK)	E.G.R. function	X	—
33 (CHECK)	Exhaust gas sensor circuit	X	X
34	Detonation sensor circuit	X	X
35 (CHECK)	Exhaust gas temperature sensor circuit	X	—
42	Fuel temperature sensor circuit	X	X
43 (CHECK)	Throttle sensor circuit	X	X
45 (CHECK)	Injector leak	X	—
51 (CHECK)	Injector circuit	X	—
55	No malfunction in the above circuits	X	X

X: Available

—: Not available

(CHECK) : Check engine light item

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

Self-diagnosis — Mode II (Self-diagnostic results) (Cont'd)

Code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
*11	Crank angle 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 crank angle sensor.)
12	Air flow meter circuit	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector (If harness and connector are normal, replace air flow meter.)
13	Engine temperature sensor circuit	• The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Engine 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
22	Fuel pump	• Abnormally high or low current supply to the fuel pump persists.	• Harness and connector • Fuel pump • Fuel pump relay
31	E.C.U.	• E.C.U. calculation function is malfunctioning.	(Replace E.C.C.S. control unit.)
32	E.G.R. function	• E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)	• E.G.R. control valve • E.G.R. control solenoid valve
33	Exhaust gas sensor circuit	• The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Exhaust gas sensor • Fuel pressure • Injectors • Intake air leaks
53	Exhaust gas sensor circuit (Right side)		
34	Detonation sensor circuit	• The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Detonation sensor
35	Exhaust gas temperature sensor circuit	• The exhaust gas temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Exhaust gas 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 sensor circuit	• The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle sensor
45	Injector leak	• Fuel leaks from injector.	• Injector
51	Injector circuit	• The injector circuit is open.	• Injector

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

Self-diagnosis — Mode II (Self-diagnostic results) (Cont'd)

HOW TO ERASE SELF-DIAGNOSTIC RESULTS

The malfunction code is erased from the backup memory on the E.C.U. when the diagnostic mode is changed from Mode II to Mode I. (Refer to "HOW TO SWITCH MODES".)

- **When the battery terminal is disconnected, the malfunction code will be lost from the backup memory within 24 hours.**
- **Before starting self-diagnosis, do not erase the stored memory before beginning self-diagnosis.**

Self-diagnosis — Mode II (Exhaust gas sensor monitor)

DESCRIPTION

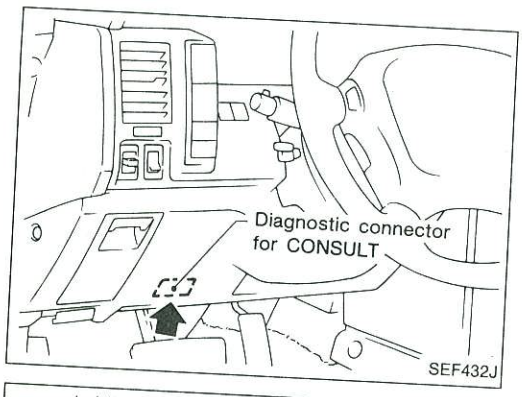
In this mode, the CHECK ENGINE LIGHT and RED L.E.D. display the condition of the fuel mixture (lean or rich) which is monitored by the exhaust gas sensor.

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

*: Maintains conditions just before switching to open loop.

HOW TO CHECK EXHAUST GAS SENSOR

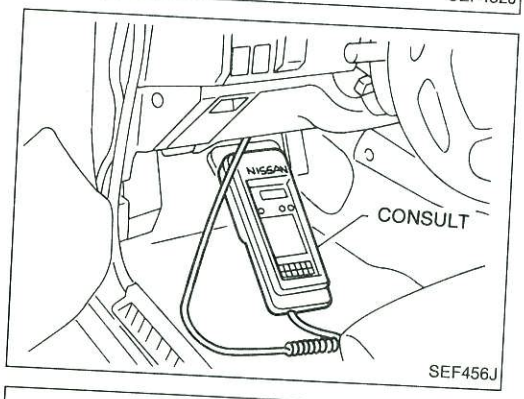
1. Set Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or CHECK ENGINE LIGHT goes ON and OFF more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

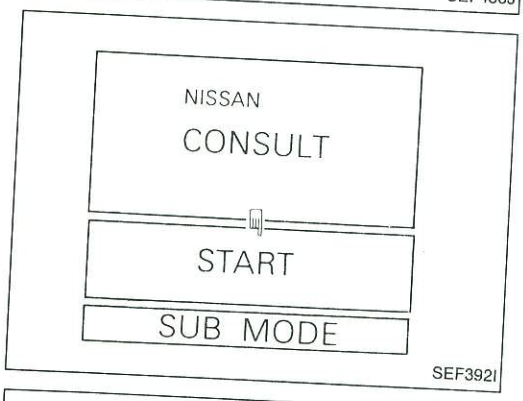


Consult

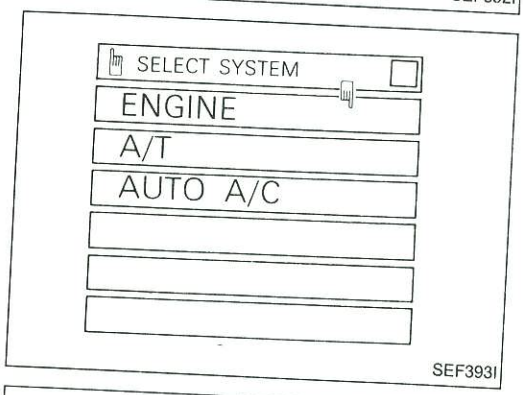
CONSULT INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector. (Diagnostic connector is located in lower side instrument panel.)

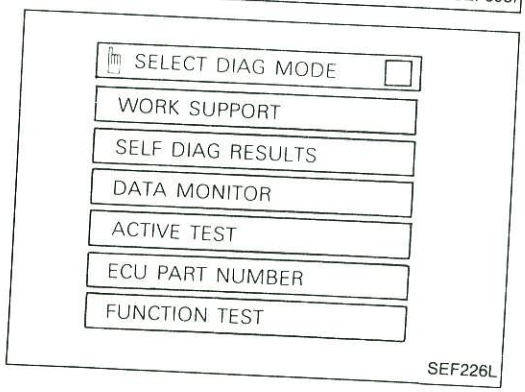




3. Turn on ignition switch.
4. Touch "START".



5. Touch "ENGINE".



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

For further information, see the CONSULT Operation Manual.

Consult (Cont'd)

E.C.C.S. COMPONENT PARTS APPLICATION

E.C.C.S. COMPONENT PARTS \ MODE		WORK SUPPORT	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST	FUNCTION TEST
INPUT	Crank angle sensor		X	X		
	Air flow meter		X	X		
	Engine temperature sensor		X	X	X	
	Exhaust gas sensors		X	X		X
	Vehicle speed sensors		X	X		X
	Throttle sensor	X	X	X		X
	Fuel temperature sensor		X	X		
	Exhaust gas temperature sensor*		X	X		
	Detonation sensor		X			
	Ignition switch (start signal)			X		X
	Air conditioner switch			X		
	Neutral switch			X		X
	Battery			X		
OUT-PUT	Injectors		X	X	X	X
	Power transistor (ignition timing)		X (Ignition signal)	X	X	X
	A.A.C. valve	X		X	X	X
	Pressure regulator control solenoid valve			X	X	X
	E.G.R. control solenoid valve			X	X	X
	Air conditioner relay			X		
	Fuel pump		X			

*: The E.C.C.S. component part marked * is applicable to vehicles for California only.
X: Applicable

FUNCTION

Diagnostic 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 control unit can be read.
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.
E.C.U. part numbers	E.C.U. part numbers can be read.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".

Consult (Cont'd)

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THROTTLE SENSOR ADJUSTMENT	CHECK THE THROTTLE 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 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 CRANK ANGLE SENSOR.	When adjusting initial ignition timing.
AAC VALVE ADJUSTMENT	SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. ● ENGINE WARMED UP ● NO-LOAD	When adjusting idle speed.

*: The ignition timing feedback control is not adopted on model INFINITI M30, 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 ANGLE SENSOR*	• 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 crank angle sensor.)
AIR FLOW METER	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector (If harness and connector are normal, replace air flow meter.)
ENGINE TEMP SENSOR	• The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Engine temperature sensor
CAR SPEED SENSOR	• 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
FUEL PUMP	• Abnormally high or low current supply to the fuel pump persists.	• Harness and connector • Fuel pump • Fuel pump relay
CONTROL UNIT	• E.C.U. calculation function is malfunctioning.	(Replace E.C.C.S. control unit.)
EGR SYSTEM**	• E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)	• E.G.R. control valve • E.G.R. control solenoid valve
EXH GAS SENSOR	• The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Exhaust gas sensor • Fuel pressure • Injectors • Intake air leaks
DETONATION SENSOR	• The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Detonation sensor
EXH GAS TEMP SENSOR**	• The exhaust gas temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Exhaust gas 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 SENSOR	• The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle sensor
INJECTOR LEAK**	• Fuel leaks from injector.	• Injector
INJECTOR OPEN**	• The injector circuit is open.	• Injector

*: Check items causing a malfunction of crank angle sensor circuit first, if both "CRANK ANGLE SENSOR" and "IGN SIGNAL-PRIMARY" come out at the same time.

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

Consult (Cont'd)

DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CAS, RPM (POS) CAS, RPM (REF)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.	• Harness and connector • Crank angle sensor
AIR FLOW MTR	• Engine: After warming up, idle the engine • A/C switch "OFF" • Shift lever "N"	Idle	1.0 - 1.5V	• Harness and connector • Air flow meter
		2,000 rpm	1.4 - 1.9V	
ENG TEMP SEN	• Engine: After warming up		More than 70°C (158°F)	• Harness and connector • Engine temperature sensor
EXH GAS SEN	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 ↔ Approx. 1.5V	• Harness and connector • Exhaust gas sensor • Intake air leaks • Injectors
M/R F/C MNT			LEAN ↔ RICH Changes more than 5 times during 10 seconds.	
CAR SPEED SEN	• 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 • E.C.U. power supply circuit
THROTTLE SEN	• Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.4 - 0.5V	• Harness and connector • Throttle sensor • Throttle 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 • Exhaust gas temperature sensor
START SIGNAL	• Ignition switch: ON → START		OFF → ON	• Harness and connector • Starter switch
IDLE POSITION	• Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON	• Harness and connector • Throttle sensor • Throttle 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	
NEUTRAL SW	• Ignition switch: ON	Shift lever "P" or "N"	ON	• Harness and connector • Neutral switch
		Except above	OFF	
INJ PULSE	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load	Idle	3.1 - 3.8 msec.	• Harness and connector • Injector • Air flow meter • Intake air system
		2,000 rpm	2.9 - 3.6 msec.	
IGN TIMING	ditto	Idle	15° B.T.D.C.	• Harness and connector • Crank angle sensor
		2,000 rpm	More than 25° B.T.D.C.	
AAC VALVE	ditto	Idle	15 - 40%	• Harness and connector • A.A.C. valve
		2,000 rpm	—	

Remarks: The monitor item marked * is applicable to vehicles for California only.
Specifications are reference values.

Consult (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
AIR COND RLY	• Air conditioner switch OFF → ON		OFF → ON	• Harness and connector • Air conditioner switch • Air conditioner relay
PRVR CONT SOL VALVE	• Fuel temperature is above 75°C (167°F)	For 3 minutes after starting engine	ON	• Harness and connector • Pressure regulator control solenoid valve • Fuel temperature sensor
		3 minutes after starting engine	OFF	
EGR CONT S/V	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load	Idle	ON	• Harness and connector • E.G.R. control solenoid valve
		2,000 rpm	OFF	

Remarks: The monitor item marked * is applicable to vehicles for California only.
Specifications are reference values.

ACTIVE TEST MODE

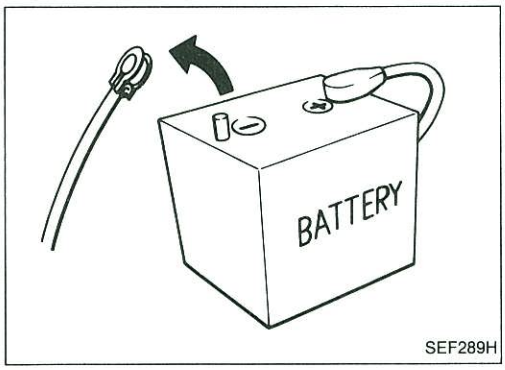
TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION TEST	• Engine: Return to the original trouble condition • Change the amount of fuel injection with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Fuel injectors • Exhaust gas sensor
AAC/V OPENING TEST	• Engine: After warming up, idle the engine. • Change the AAC valve opening percent with the CONSULT.	Engine speed changes according to the opening percent.	• Harness and connector • AAC valve
ENGINE 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 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
EGR CONT SOL/V 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
PRVR CONT SOL/V TEST			
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.		

FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	• Ignition switch: ON (Engine stopped) • Displays the results of self-diagnosis.	—		Objective system
IDLE POSITION (IDLE SWITCH CIRCUIT)	• Ignition switch: ON (Engine stopped) • Idle switch circuit is tested when throttle is opened and closed fully. ("IDLE POSITION" is the test item name for the vehicles in which idle is selected by throttle sensor.)	Throttle valve: opened	OFF	• Harness and connector • Throttle sensor (Idle switch) • Throttle sensor (Idle switch) adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
		Throttle valve: closed	ON	
THROTTLE SENSOR CKT	• Ignition switch: ON (Engine stopped) • Throttle 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 sensor • Throttle sensor adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
NEUTRAL SW CIRCUIT	• Ignition switch: ON (Engine stopped) • Neutral switch circuit is tested when shift lever is manipulated.	OUT OF N/P-RANGE	OFF	• Harness and connector • Neutral switch/Inhibitor switch • Linkage + Inhibitor switch adjustment
		IN N-RANGE	ON	
EGR CONT S/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 • EGR control 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
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, air flow meter output voltage and cranking speed during cranking are displayed.	Start signal: OFF → ON		• Harness and connector • Ignition switch

Consult (Cont'd)

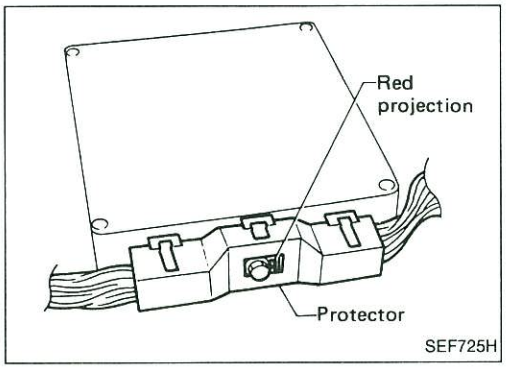
FUNCTION TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
CAR SPEED SEN CIRCUIT	• Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 mph) or higher.	Vehicle speed sensor input signal is greater than 4 km/h (2 MPH)	• Harness and connector • Vehicle speed sensor • 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 crank angle sensor or distributor) • Crank angle sensor drive mechanism
MIXTURE RATIO TEST	• Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the exhaust gas sensor output at 2,000 rpm under non-loaded state.	• O_2 SEN 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) • Exhaust gas sensor circuit • Exhaust gas sensor operation • Fuel pressure high or low • Air flow meter
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 injection system is used.)	Difference in engine rpm 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
AAC VALVE SYSTEM	• After warming up, idle the engine. • AAC valve system is tested by detecting change in engine rpm when AAC valve opening is changed to 0%, 20% and 80%.	Difference in engine rpm is greater than 150 rpm between when valve opening is at 80% (102 steps) and at 20% (25 steps).	• Harness and connector • AAC valve • Air passage restriction between air inlet and AAC valve • IAS (Idle adjusting screw) adjustment



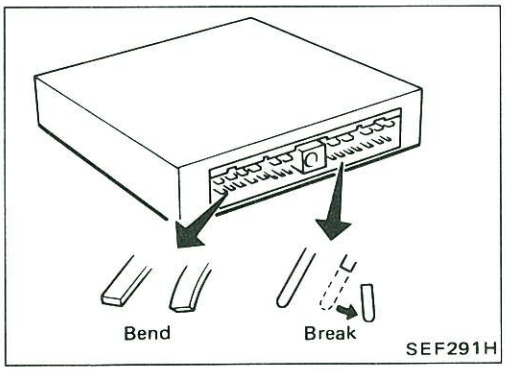
Diagnostic Procedure

CAUTION:

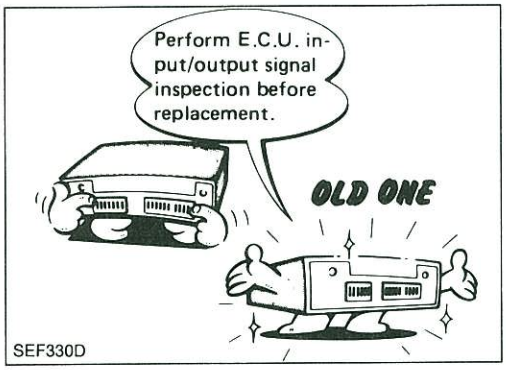
1. **Before connecting or disconnecting the E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off.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



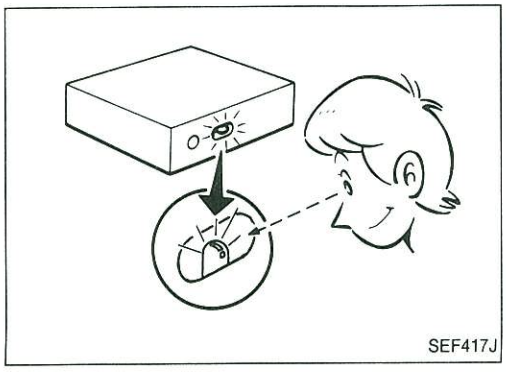
2. **When connecting E.C.U. harness connector, tighten securing bolt until red projection is in line with connector face.**



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

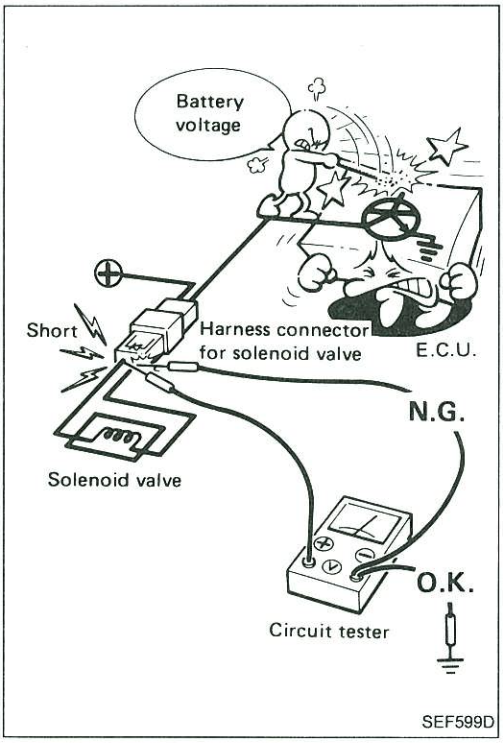


5. **Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-150.)**



6. **After performing this "Diagnostic Procedure", perform E.C.C.S. self-diagnosis and driving test.**

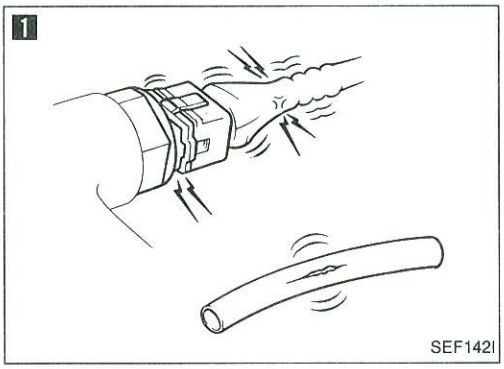
Diagnostic Procedure (Cont'd)



7. **When measuring E.C.U. 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 control unit power transistor.

Basic Inspection

1

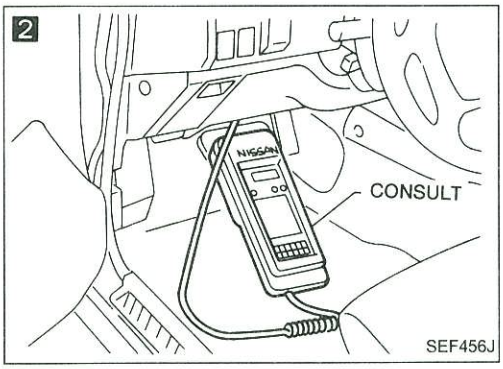


BEFORE STARTING

1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:

- Harness connectors for proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, and cuts

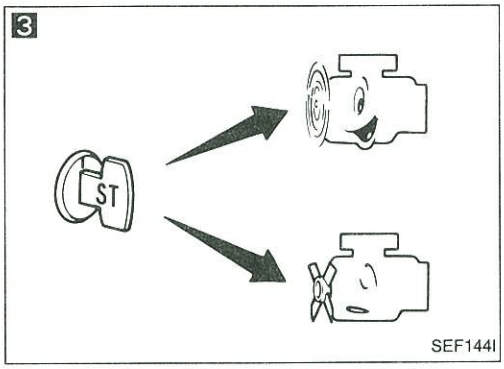
2



CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-44.)

3

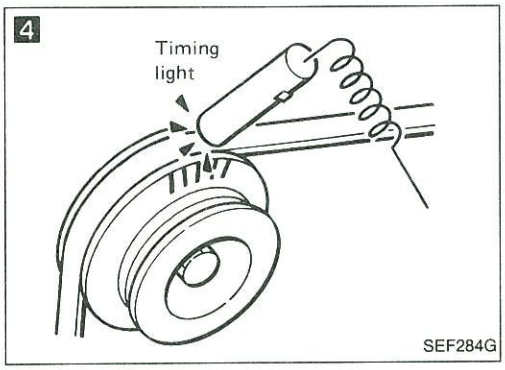


DOES ENGINE START?

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-26.)

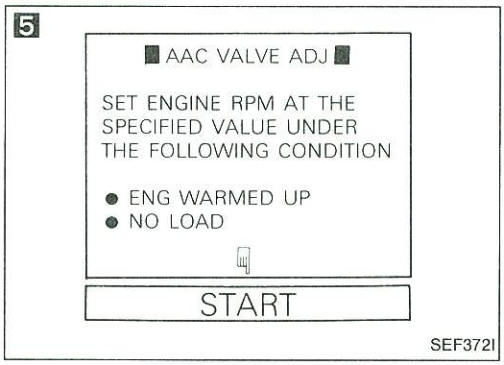
Ignition timing:
15° ± 2° B.T.D.C.

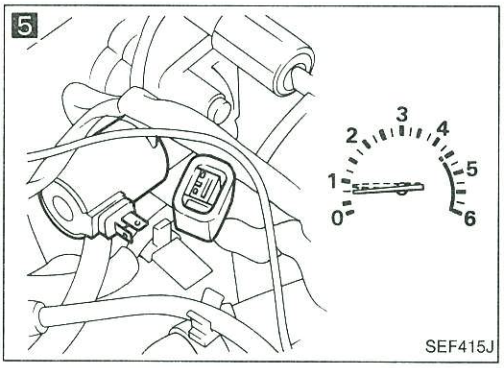
N.G. → Adjust ignition timing by turning crank angle sensor.

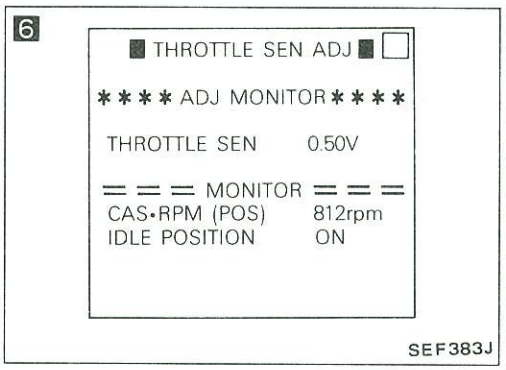
O.K.

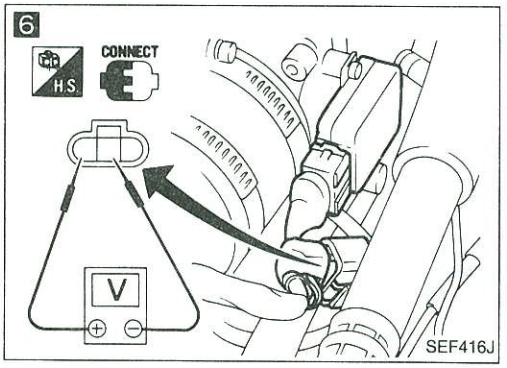
(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)









Ⓐ

5 **CHECK IDLE ADJ. SCREW INITIAL SET RPM.**

1. Select "A.A.C. VALVE ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine rpm fall to 700±50 rpm (in "N" position)?

No → Adjust engine rpm by turning idle adjusting screw.

OR

When disconnecting A.A.C. valve harness connector, does engine rpm fall to 700±50 rpm (in "N" position)?

Yes

6 **CHECK THROTTLE SENSOR IDLE POSITION.**

1. Perform "THROTTLE SEN. ADJ" in "WORK SUPPORT" mode.
2. Check that output voltage of throttle sensor is 0.4 to 0.5V. (Throttle valve fully closes.) and "IDLE POSITION" stays "ON".

N.G. →
1. Adjust output voltage by rotating throttle sensor body.
2. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "IDLE POSITION" stays "ON".

OR

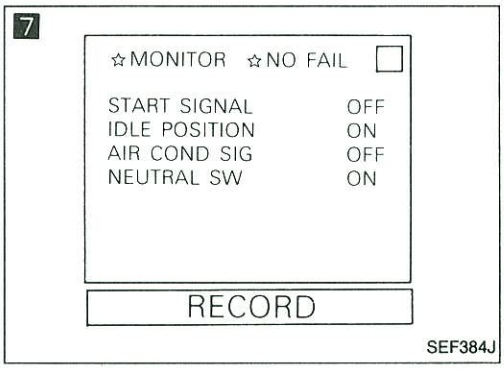
Measure output voltage of throttle sensor using voltmeter, and check that it is 0.4 to 0.5V. (Throttle valve fully closed.)

O.K.

(Go to Ⓑ on next page)

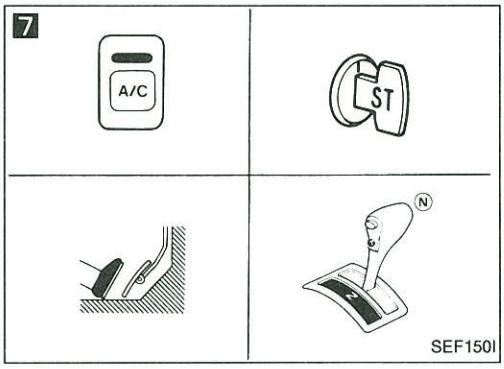
Basic Inspection (Cont'd)

7



SEF384J

7



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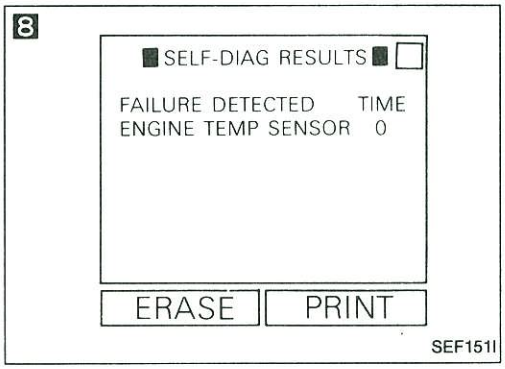
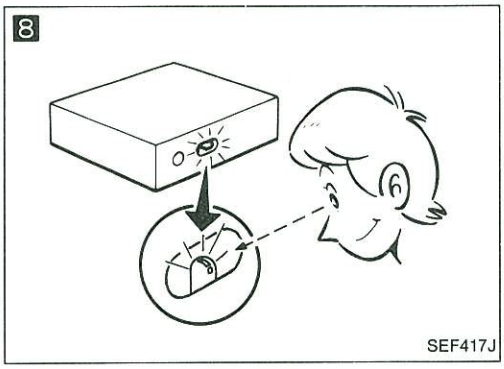
8



SEF151I

8



SEF417J

Ⓑ

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 (Parking) switch,
and check the switches' ON-OFF operation.

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

OR

Remove E.C.U. from right dash side panel and check the above switches' ON-OFF operation using voltmeter at each E.C.U. terminal.

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

O.K.

8

READ SELF-DIAGNOSTIC RESULTS.

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

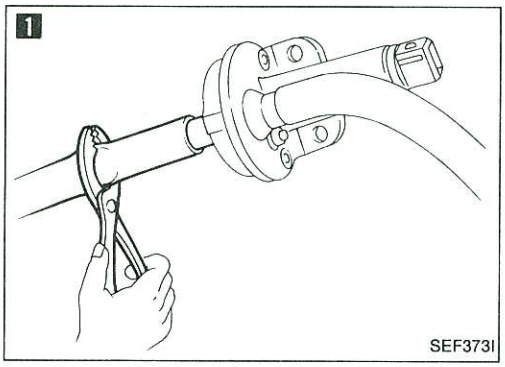
Yes → Go to the relevant inspection procedure.

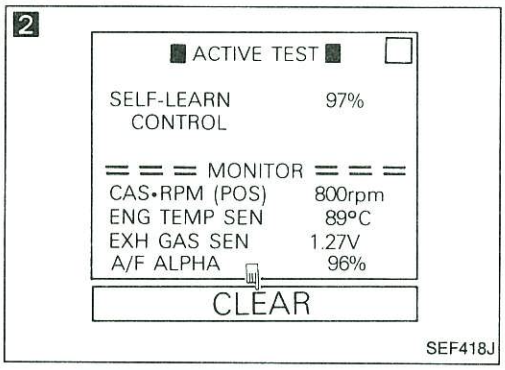
OR

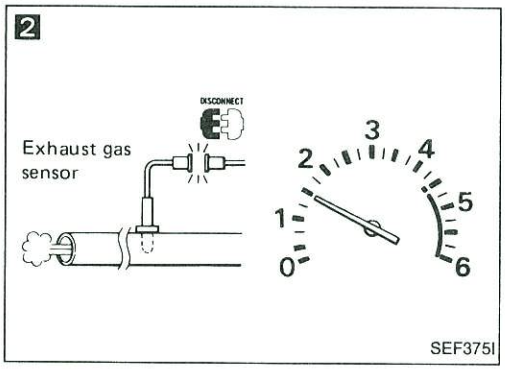
1. Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-39.)
2. Count the number of RED L.E.D. flashes and read out the codes.
3. Are the codes being output?

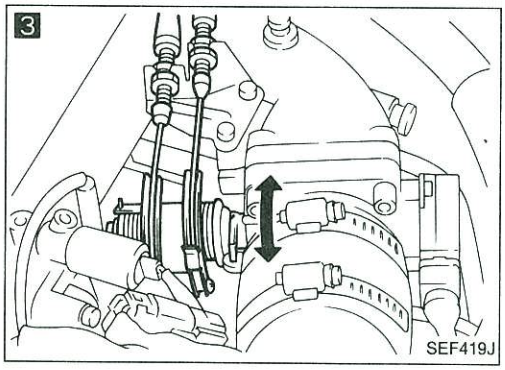
No

INSPECTION END









Diagnostic Procedure 1 — High Idling after Warm-up

1

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

Yes → Check 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 exhaust gas sensor harness connector.
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.

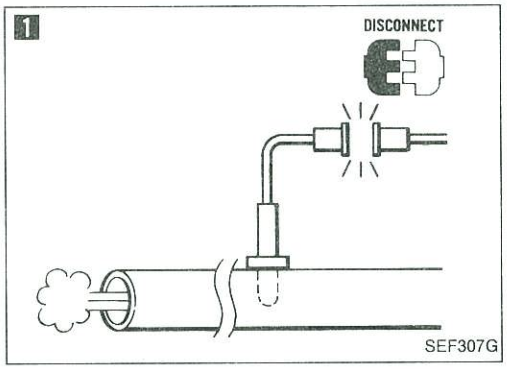
N.G. → Repair throttle linkage or sticking of throttle valve.

O.K. ↓

INSPECTION END

Diagnostic Procedure 2 — Hunting

1

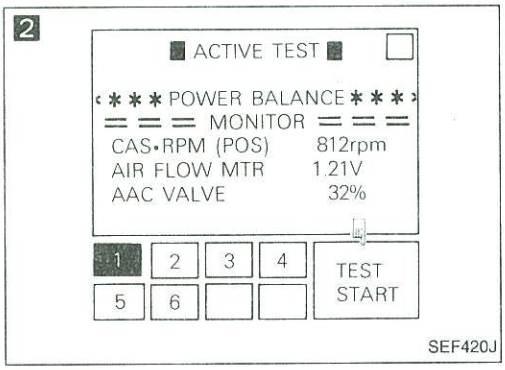


CHECK EXHAUST GAS SENSOR.
When disconnecting exhaust gas sensor harness connector, is the hunting fixed?

Yes → Check exhaust gas sensor. (See page EF & EC-117.)

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?

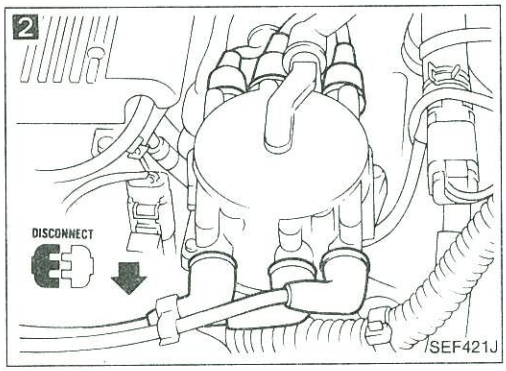
No → Go to 4 .

OR

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

Yes

3



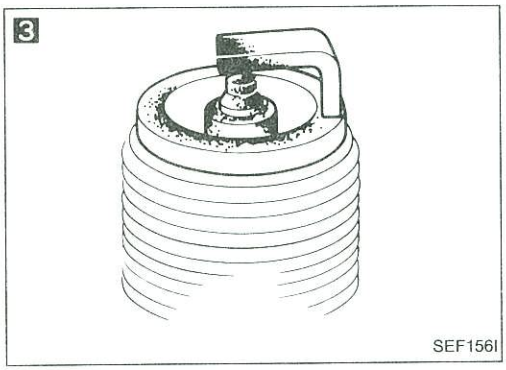
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

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

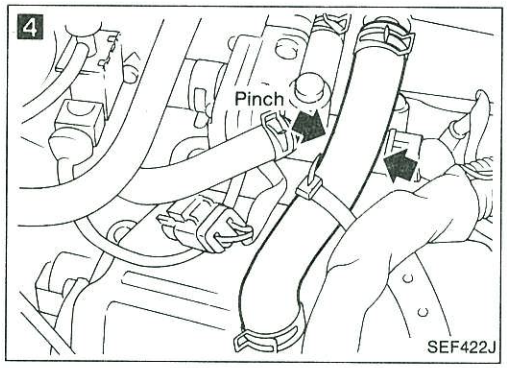
O.K.

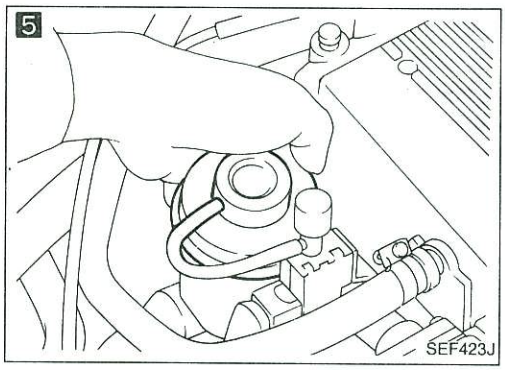
(Go to Ⓐ on next page.)

3



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

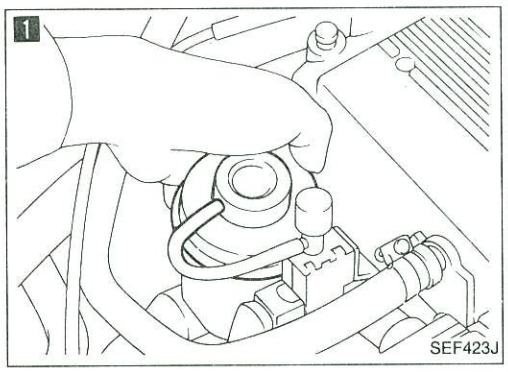
CHECK E.G.R. CONTROL VALVE.
Check E.G.R. control valve for sticking.

N.G. → Repair or replace.

O.K.

INSPECTION END

Diagnostic Procedure 3 — Unstable Idle



1

CHECK E.G.R. CONTROL VALVE.
Check E.G.R. control valve for sticking.

N.G. → Repair or replace.

O.K. ↓

2

PERFORM POWER BALANCE TEST.

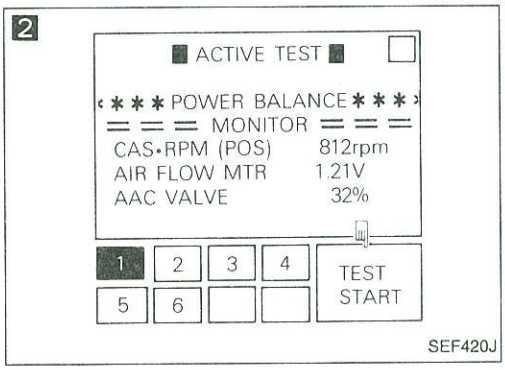
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

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 ↓



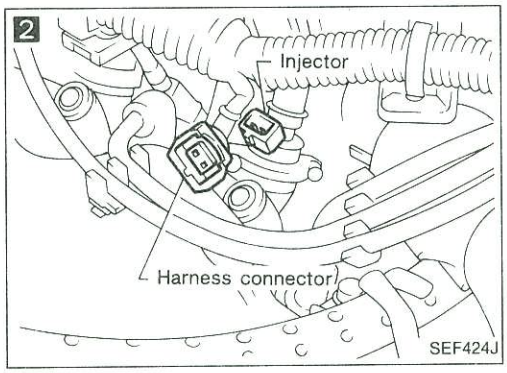
3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

Yes ↓



4

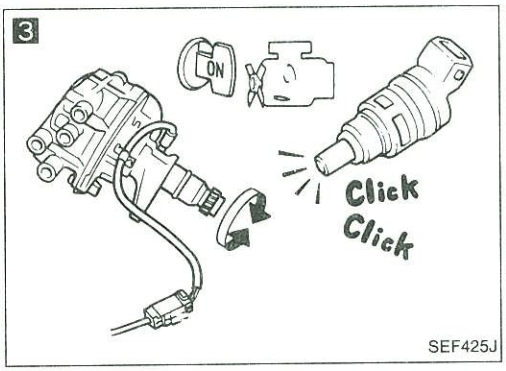
CHECK IGNITION SPARK.

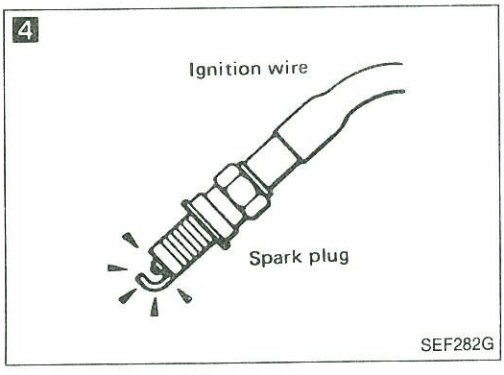
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-104.)

O.K. ↓

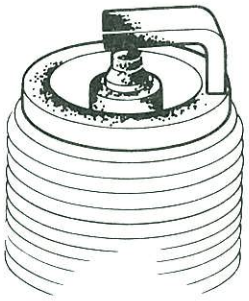
(Go to Ⓐ on next page.)





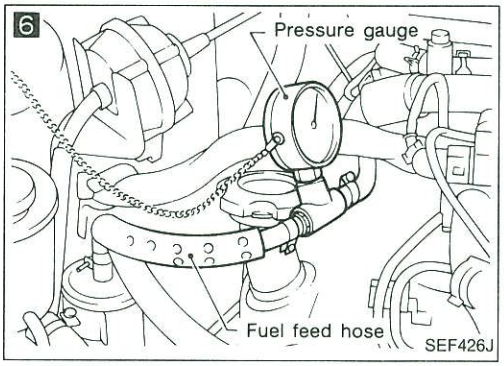
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

5



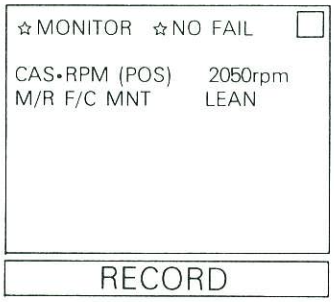
SEF156I

6



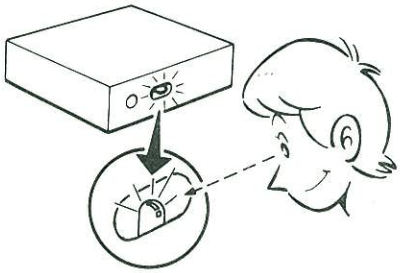
SEF426J

7



SEF427J

7



SEF471J

Ⓐ

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. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 235 kPa
   (2.4 kg/cm², 34 psi)

N.G. → Check fuel pump and circuit.

O.K.

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

N.G. → Replace exhaust gas sensor.

OR

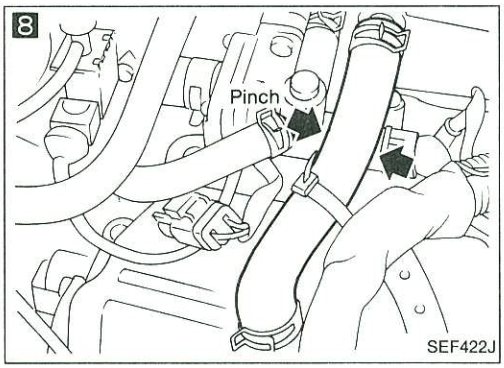
1. Set "Exhaust gas sensor monitor" in the self- diagnostic Mode II. (See page EF & EC-39.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

O.K.

(Go to Ⓑ on next page)

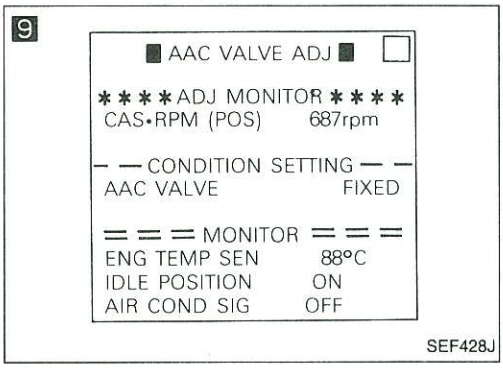
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

8



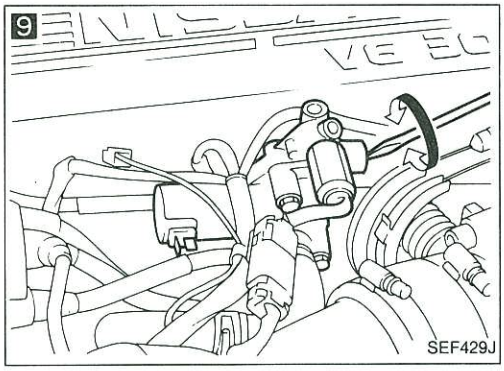
SEF422J

9



SEF428J

9



SEF429J

10

COMPRESSION PRESSURE

SEF309G

Ⓑ

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

9 **CHECK IDLE ADJ. SCREW CLOGGING.**

1. Perform "AAC VALVE ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 700±50 rpm (in "N" position) by turning idle adjusting screw?

No → Check for IAS clogging or throttle valve clogging.

— OR —

1. Disconnect A.A.C. valve harness connector.
2. Can you set engine rpm at 700±50 rpm (in "N" position) by turning idle adjusting screw?

Yes

10 **CHECK COMPRESSION PRESSURE.**

- Check compression pressure.

Standard: kPa (kg/cm², psi)/300 rpm
1,196 (12.2, 173)
Minimum: kPa (kg/cm², psi)/300 rpm
883 (9.0, 128)
Difference between each cylinder: kPa (kg/cm²,psi)/300 rpm
98 (1.0, 14)

N.G. → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

O.K.

11 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

12 **TRY A KNOWN GOOD E.C.U.**

INSPECTION END

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-107.)

Yes ↓

3

CHECK AIR REGULATOR AND A.A.C. VALVE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-142, 144.)

No ↓

4

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

Yes ↓

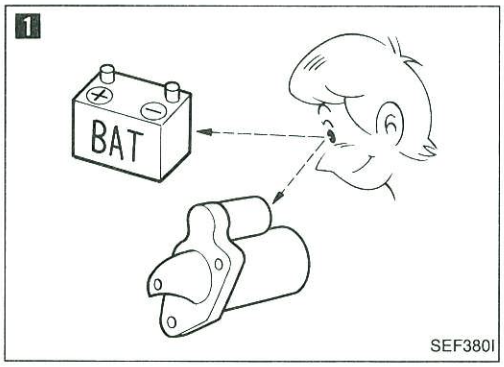
5

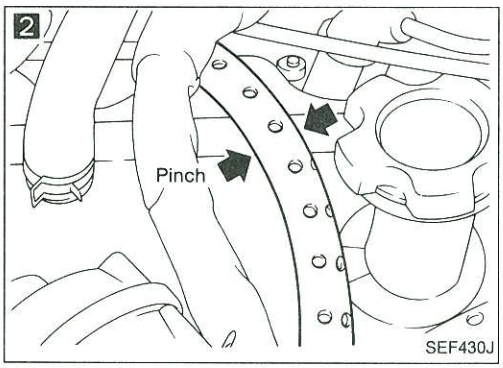
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

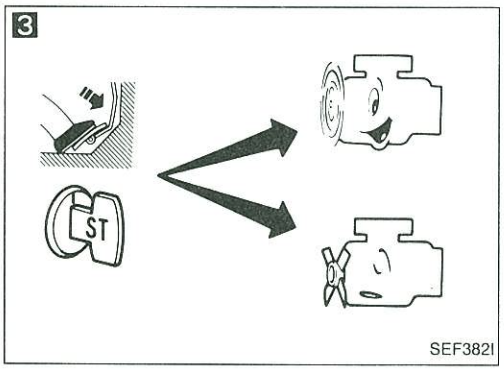
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-104.)

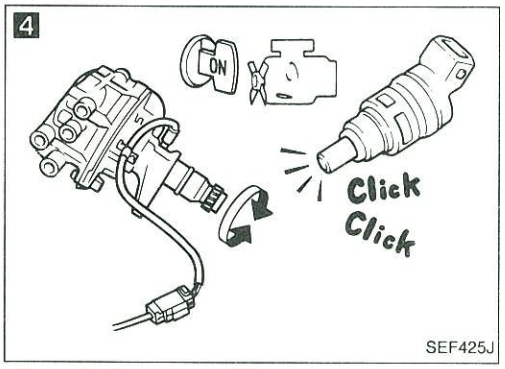
O.K. ↓

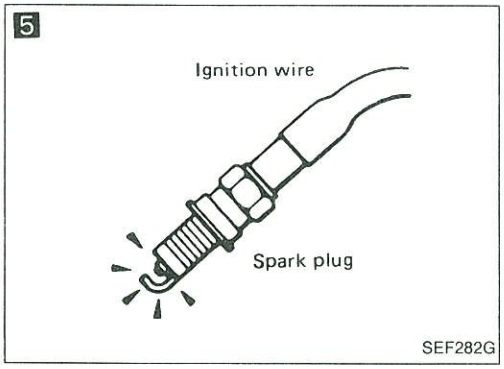
(Go to Ⓐ on next page.)





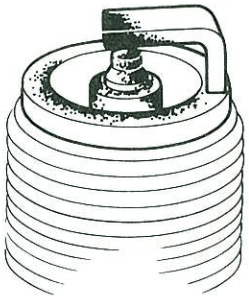






Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)

6



SEF156I

Ⓐ

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 E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

8

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-91.

N.G. → Repair or replace.

O.K.

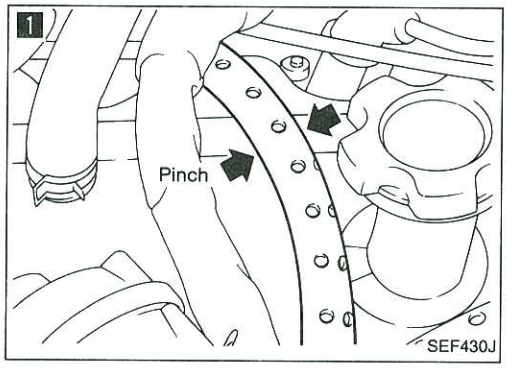
9

TRY A KNOWN GOOD E.C.U.

INSPECTION END

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

1



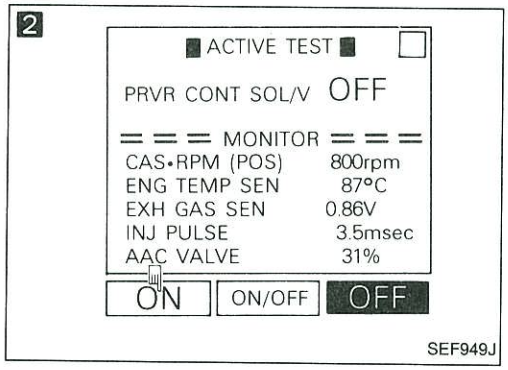
CHECK FUEL PRESSURE.

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-107.)

Yes ↓

2



CHECK FUEL VAPOR.

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

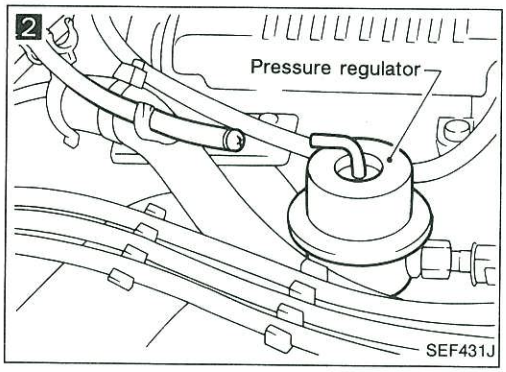
— OR —

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

Yes → Check fuel properties.

No ↓

2



3

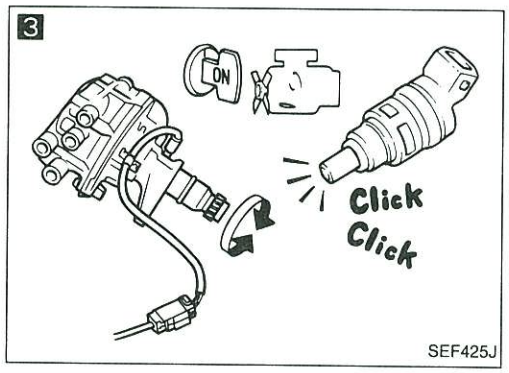
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

Yes ↓

3



4

CHECK IGNITION SPARK.

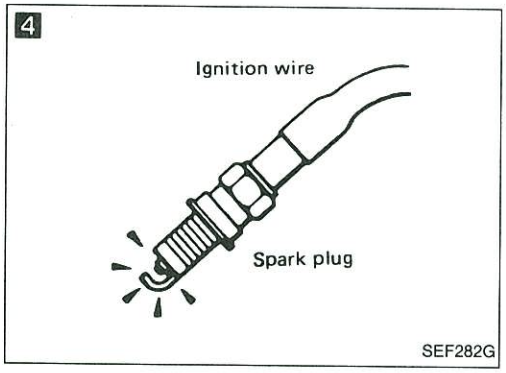
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-104.)

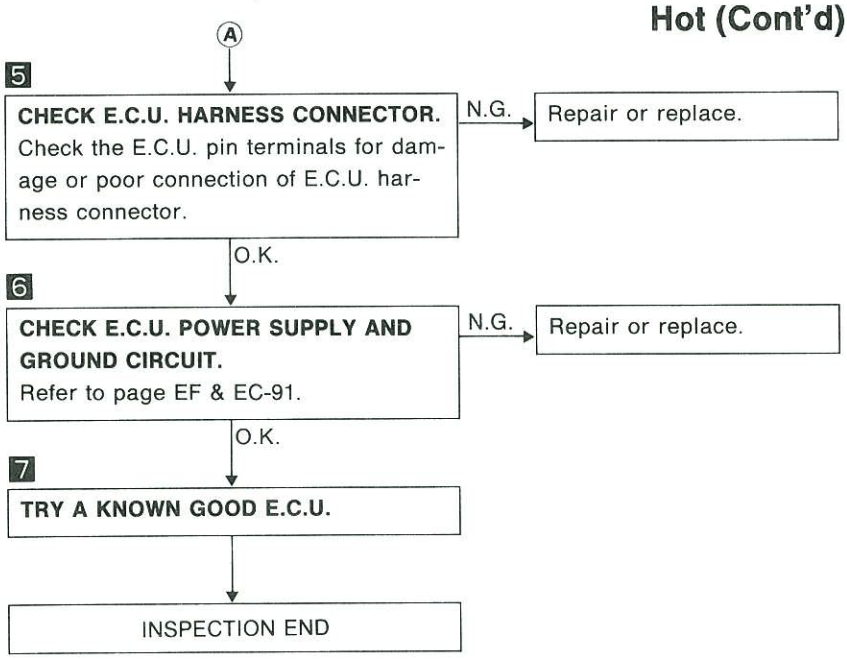
O.K. ↓

(Go to Ⓐ on next page.)

4

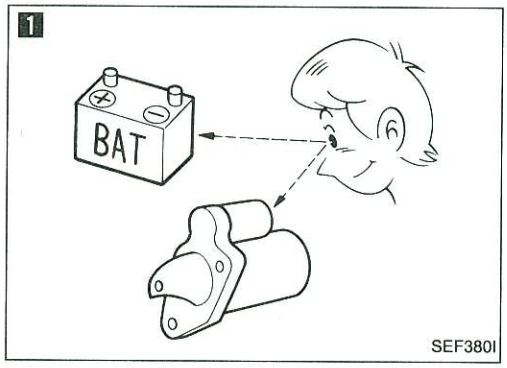


Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)



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

1



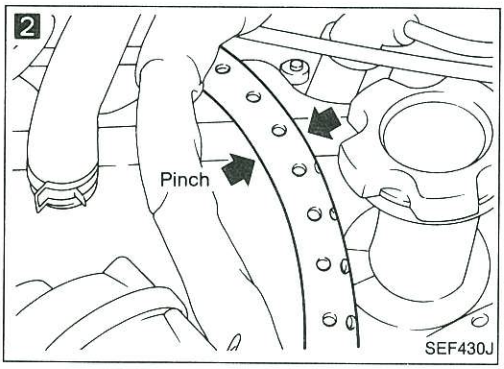
SEF380I

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

N.G. → Repair or replace.

O.K. ↓

2



SEF430J

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-107.)

Yes ↓

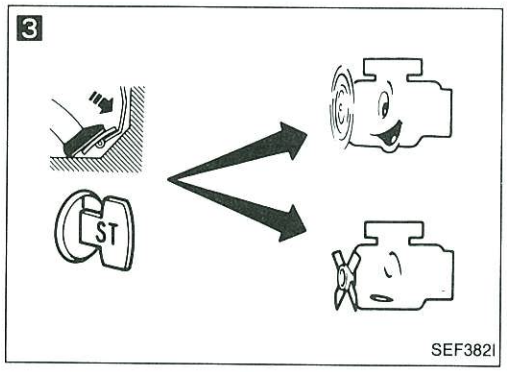
3

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

Yes → Check injector(s) for leakage.

No ↓

4



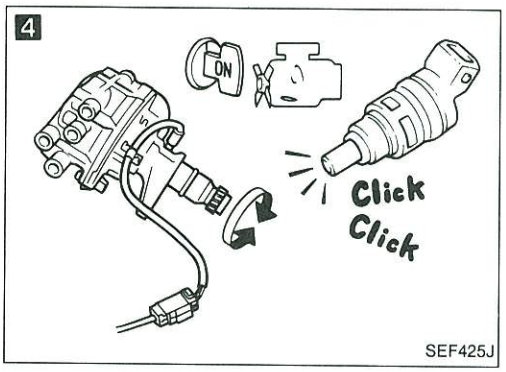
SEF382I

CHECK INJECTOR.
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

No → Check injector(s) for circuits.

Yes ↓

5



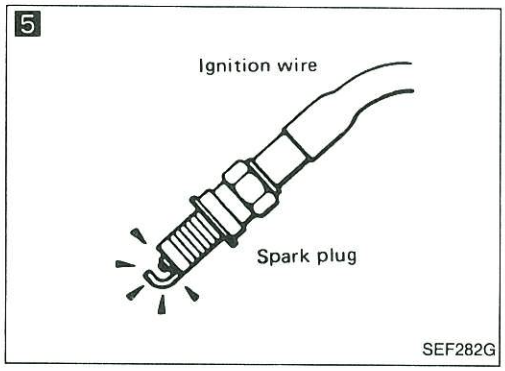
SEF425J

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

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-104.)

O.K. ↓

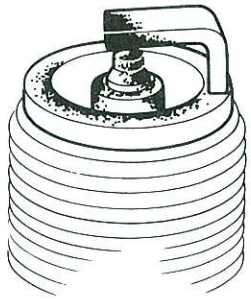
(Go to Ⓐ on next page.)



SEF282G

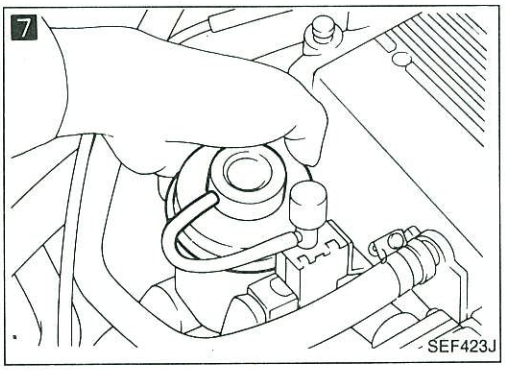
Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

6



SEF156I

7



SEF423J

Ⓐ

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 E.G.R. CONTROL VALVE.**
Check E.G.R. control valve for sticking.
N.G. → Repair or replace.
O.K. ↓

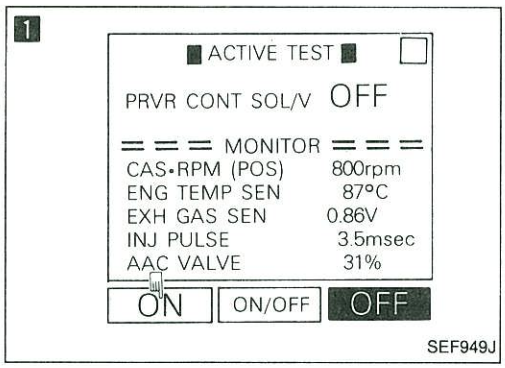
8 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

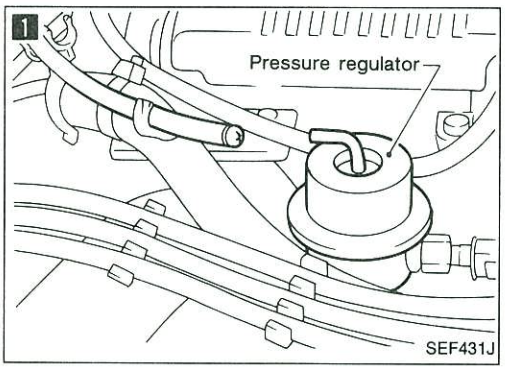
9 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-91.
N.G. → Repair or replace.
O.K. ↓

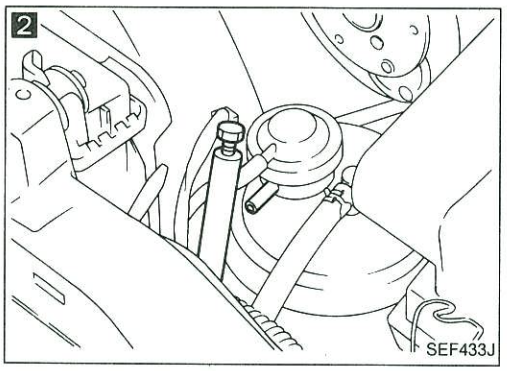
10 **TRY A KNOWN GOOD E.C.U.**
Trouble is fixed. → Replace E.C.U.
Trouble is not fixed. ↓

11 **CHECK TIMING BELT FOR PROPER INSTALLATION.**
N.G. → Replace timing belt.
O.K. ↓

INSPECTION END







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.

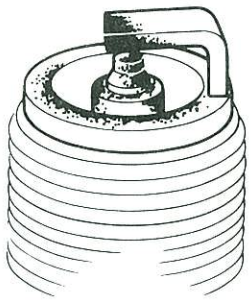
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum line.

No ↓

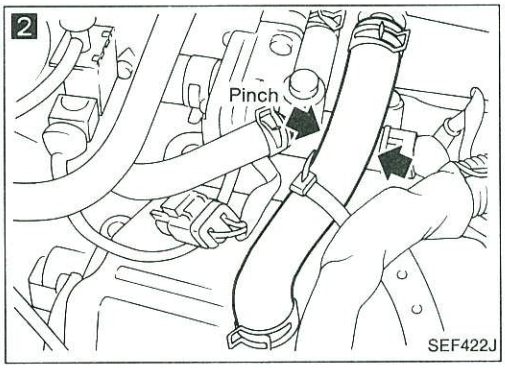
INSPECTION END

1



SEF156I

2



SEF422J

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. ↓

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 AIR FLOW METER.

Trouble is fixed. → Replace air flow meter.

Trouble is not fixed. ↓

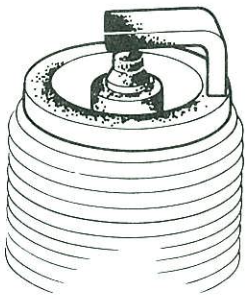
4

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

↓

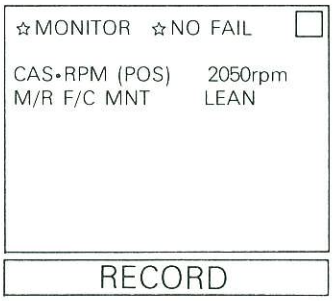
INSPECTION END

1



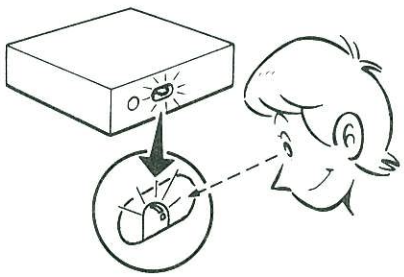
SEF156I

2



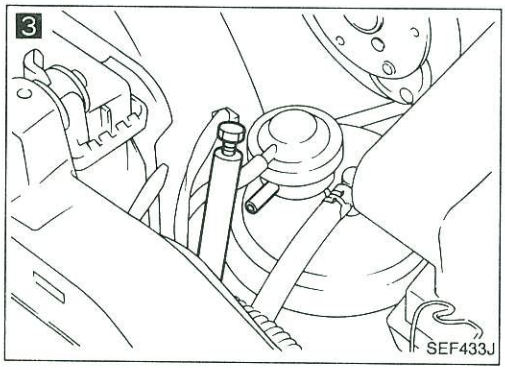
SEF427J

2



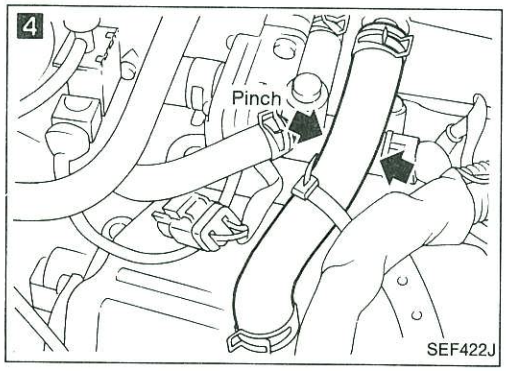
SEF417J

3



SEF433J

4



SEF422J

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 EXHAUST GAS SENSOR.

1. See "M/R F/C MNT" 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)

N.G. → Replace exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self- diagnostic Mode II. (See page EF & EC-39.)
2. Maintaining engine at 2,000 rpm under no load, check that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

O.K.

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 line.

No

4

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

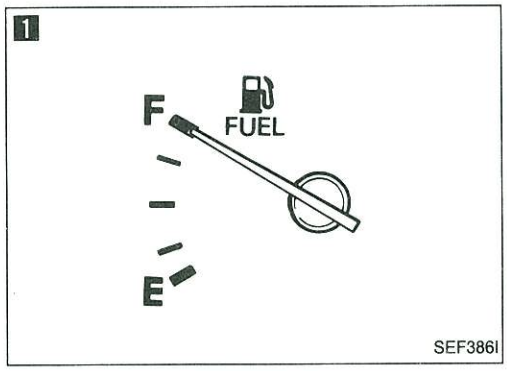
Yes → Discover air leak location and repair.

No

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning

1

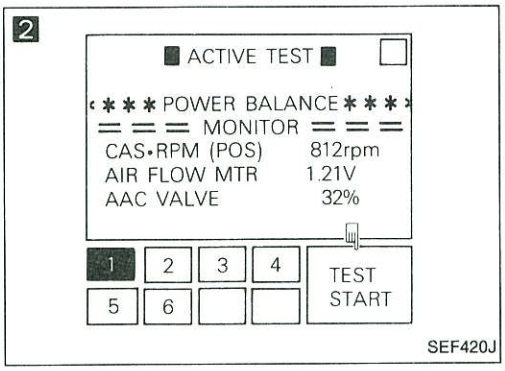


CHECK FUEL LEVEL.
Check to see that there is enough fuel in tank.

N.G. → Fill fuel tank with fuel.

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?

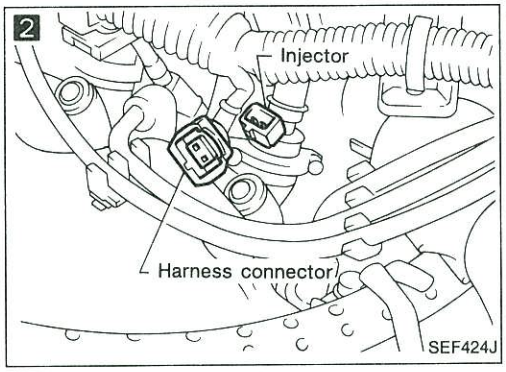
No → Go to 5.

— 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



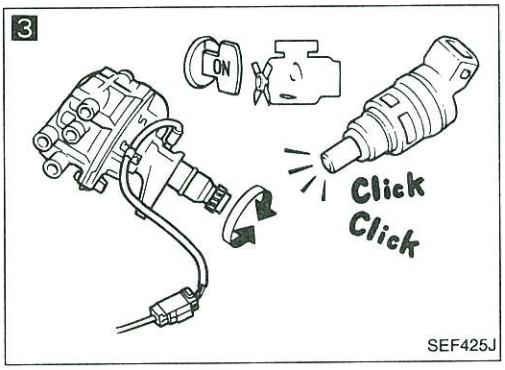
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

Yes ↓

4



CHECK IGNITION SPARK.

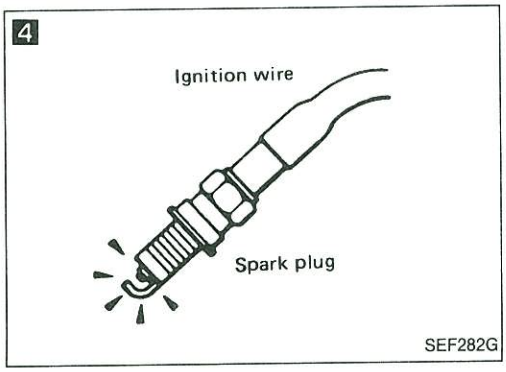
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-104.)

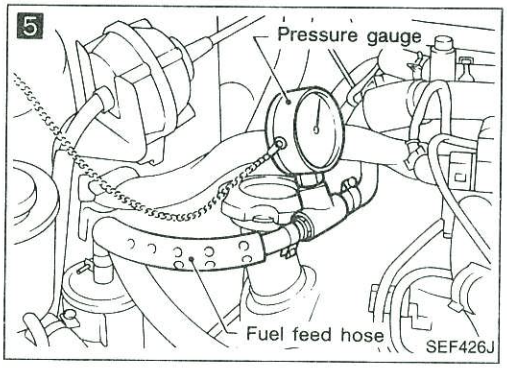
O.K. ↓

(Go to Ⓐ on next page.)

4



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



Ⓐ

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)

The moment throttle valve is fully open:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-91.

N.G. → Repair or replace.

O.K. ↓

8

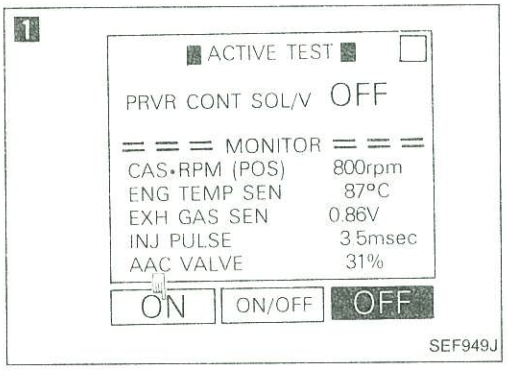
TRY A KNOWN GOOD E.C.U.

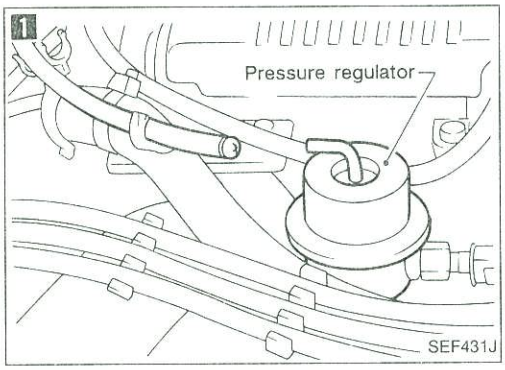
↓

INSPECTION END

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

1





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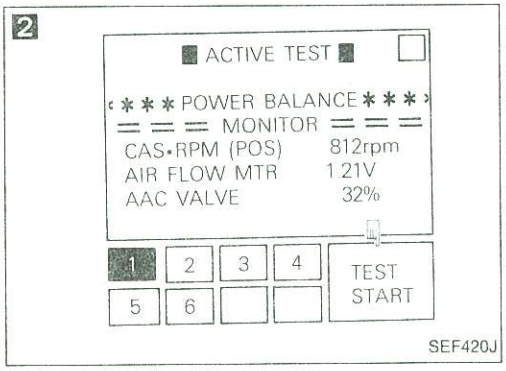
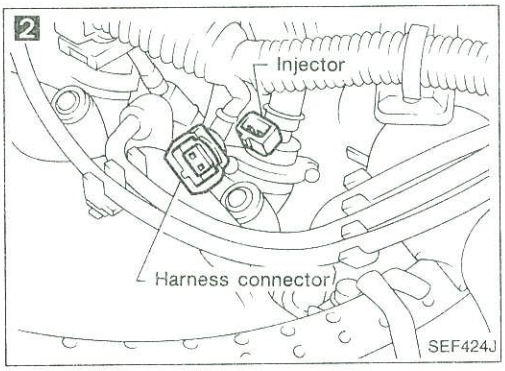
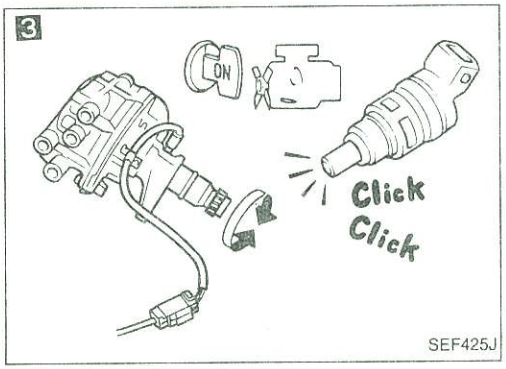






1

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 distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

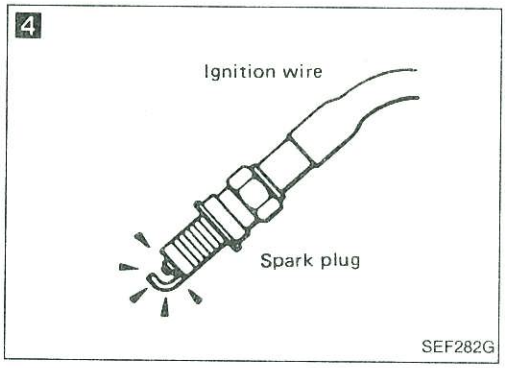
No → Check injector(s) and circuit(s).

Yes

(Go to Ⓐ on next page.)

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

4



Ⓐ

4

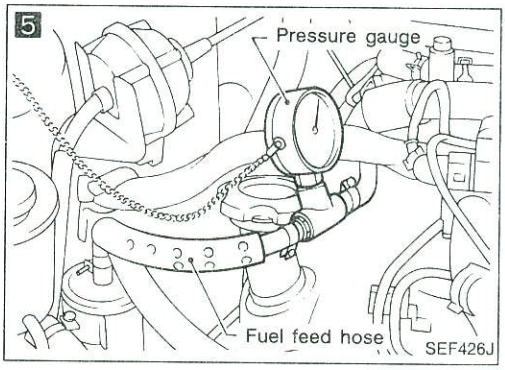
CHECK IGNITION SPARK.

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

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-104.)

O.K. ↓

5



5

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 235 kPa (2.4 kg/cm², 34 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6

CHECK E.C.U. HARNESS CONNECTOR.

Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.

Refer to page EF & EC-91.

N.G. → Repair or replace.

O.K. ↓

8

TRY A KNOWN GOOD E.C.U.

Trouble is fixed. → Replace E.C.U.

Trouble is not fixed. ↓

9

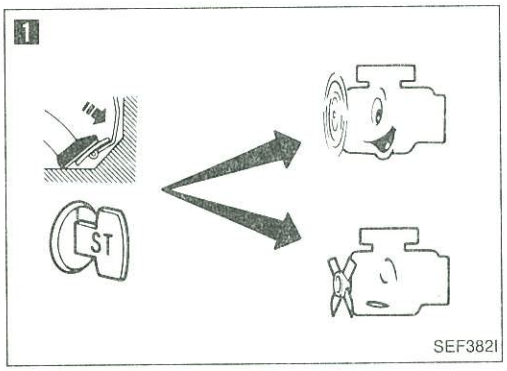
CHECK TIMING BELT FOR PROPER INSTALLATION.

N.G. → Replace timing belt and install new one.

O.K. ↓

INSPECTION END

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

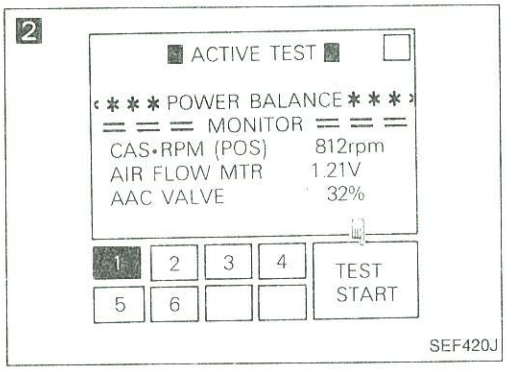


1

CHECK AIR REGULATOR AND A.A.C. VALVE.
When the engine is cold, can you start the engine when pressing accelerator pedal fully?

N.G. → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-142, 144.)

O.K. ↓



2

PERFORM POWER BALANCE TEST.

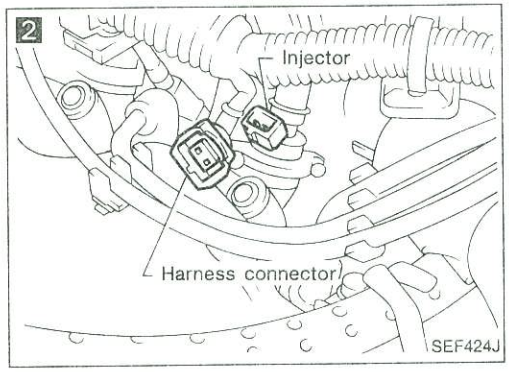
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

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. ↓



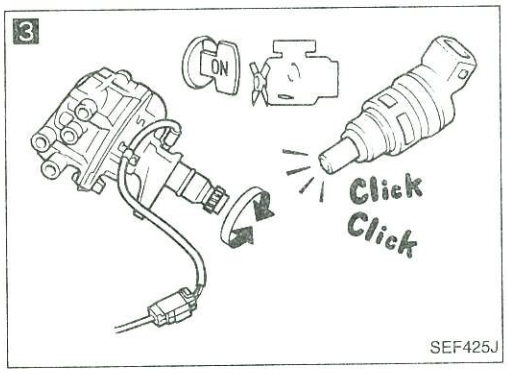
3

CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

O.K. ↓



4

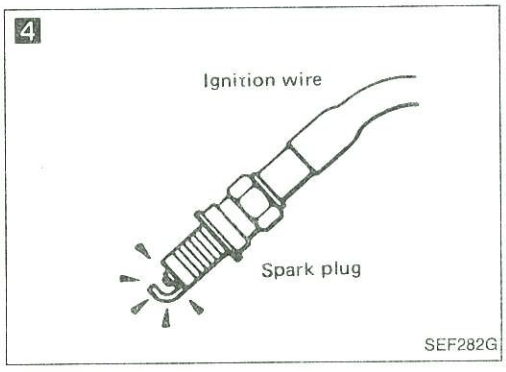
CHECK IGNITION SPARK.

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

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-104.)

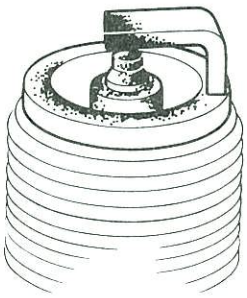
O.K. ↓

(Go to Ⓐ on next page.)



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

5



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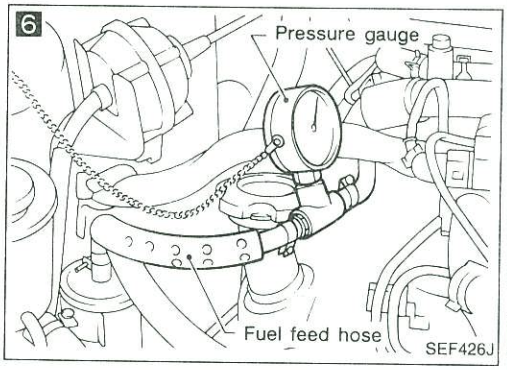
6



SEF426J

Ⓐ

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. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K.

7 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

8 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-91.

N.G. → Repair or replace.

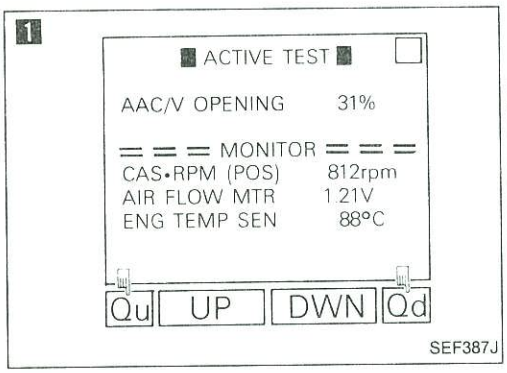
O.K.

9 **TRY A KNOWN GOOD E.C.U.**

INSPECTION END

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

1



SEF387J

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

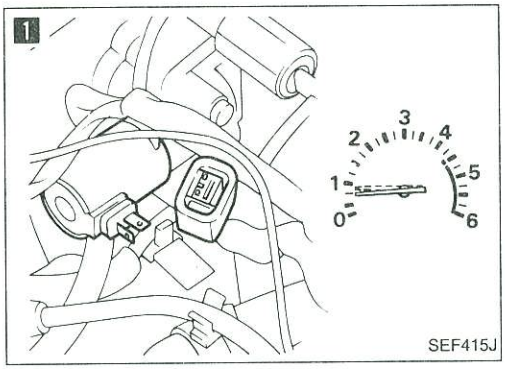
No → Check A.A.C. valve and circuit. (See page EF & EC-144.)

OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes

1



SEF415J

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?

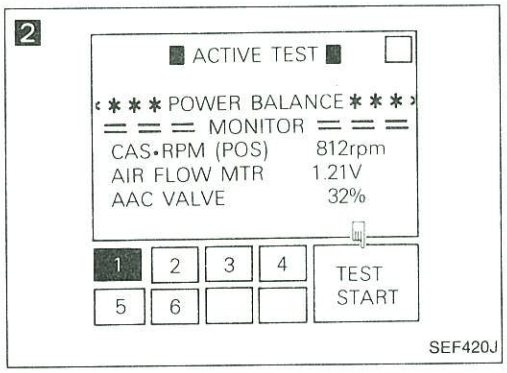
No → Go to 5.

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

2



SEF420J

3

CHECK INJECTOR.

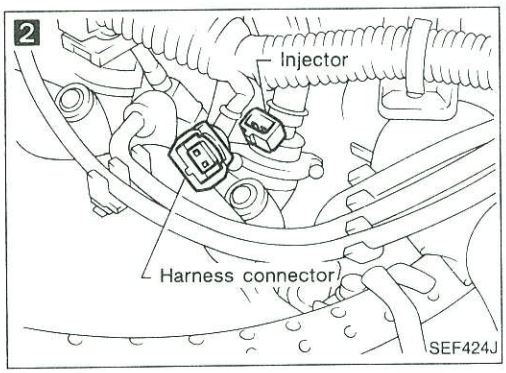
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

Yes

(Go to Ⓐ on next page.)

2



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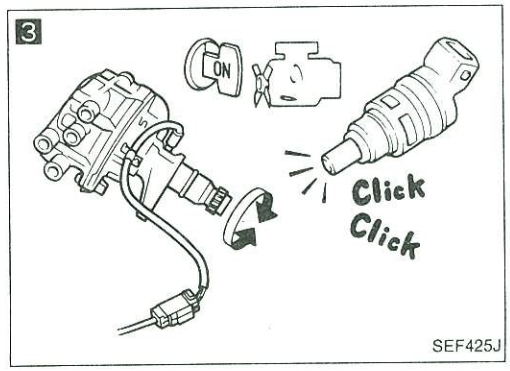
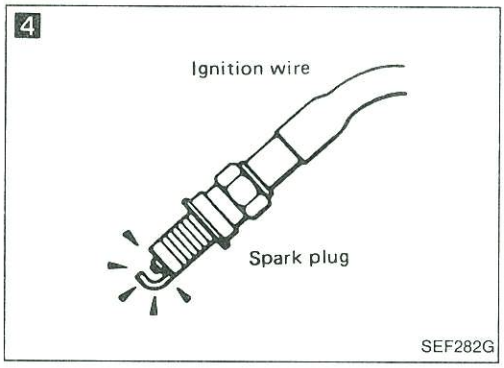
3



SEF425J

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

4



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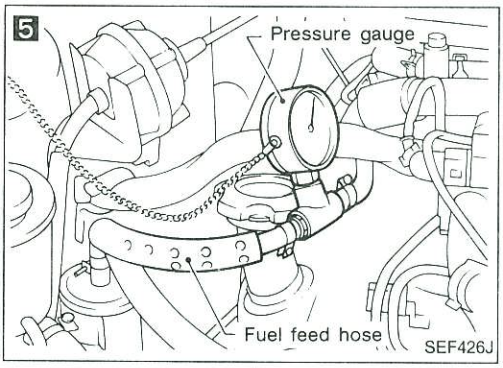


Ⓐ

4

CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against an earth point with engine cranking.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-104.)

O.K. ↓

5

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa
(2.4 kg/cm^2, 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(3.0 kg/cm^2, 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-91.

N.G. → Repair or replace.

O.K. ↓

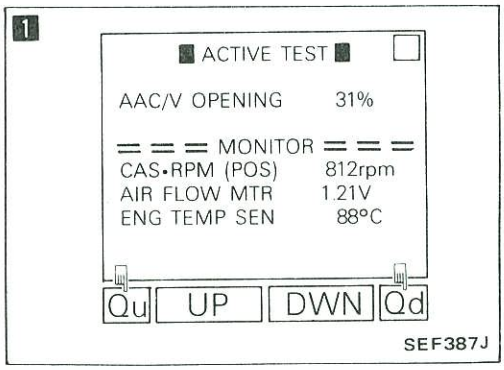
8

TRY A KNOWN GOOD E.C.U.

↓

INSPECTION END

1



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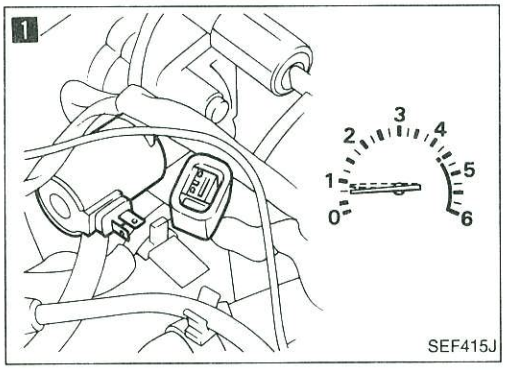

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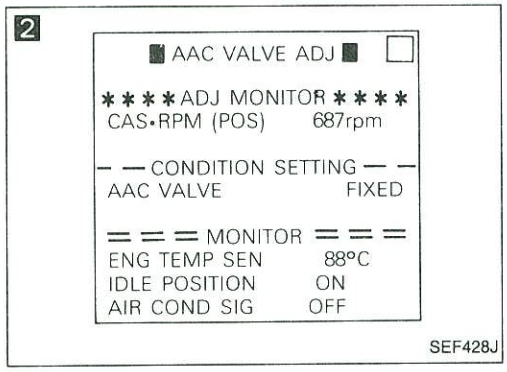

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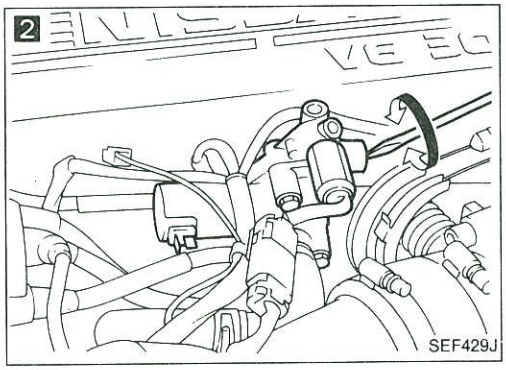


Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-144.)

OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

Yes ↓

2

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "A.A.C. VALVE ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm at 700 ± 50 rpm (in "N" position) by turning idle adjusting screw?

No → Check for IAS clogging or throttle chamber clogging.

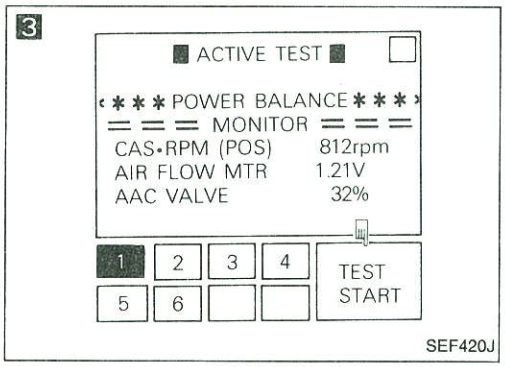
OR

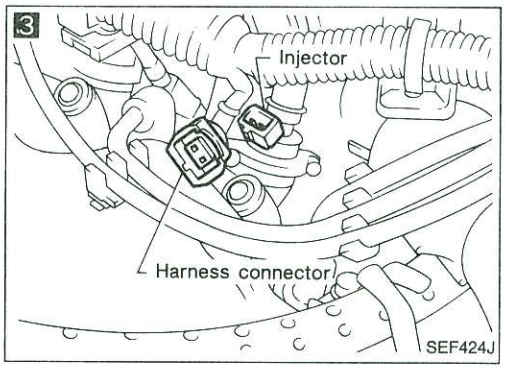
1. Disconnect A.A.C. valve harness connector.
2. Can you set engine rpm at 700 ± 50 rpm (in "N" position) by turning idle adjusting screw?

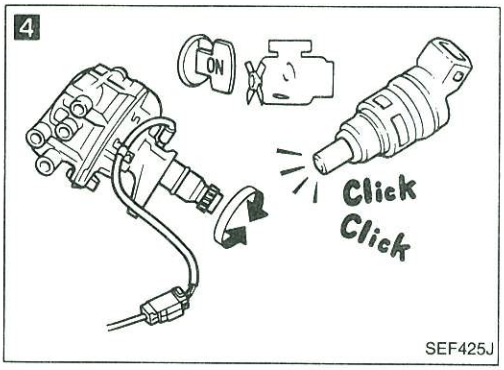
Yes ↓

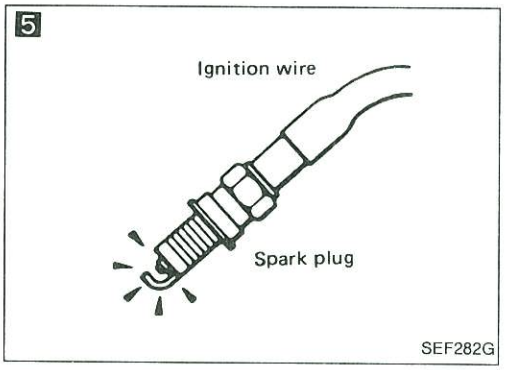
(Go to Ⓐ on next page.)

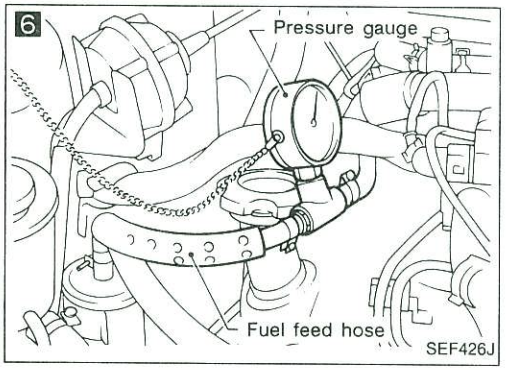
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)











Ⓐ

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 distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

Yes

5

CHECK IGNITION SPARK.

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

No → Check ignition coil, power transistor unit and circuits. (See page EF & EC-104.)

Yes

6

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 235 kPa (2.4 kg/cm², 34 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm², 43 psi)

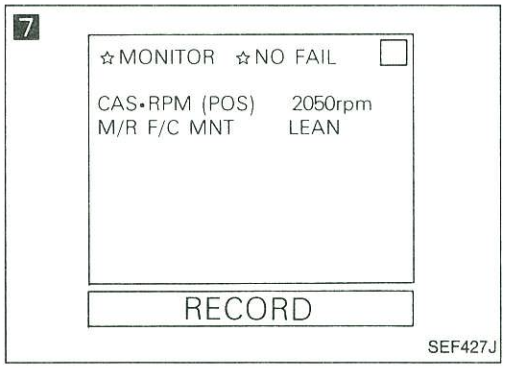
N.G. → Check fuel pressure regulator diaphragm.

O.K.

(Go to Ⓑ on next page.)

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

7



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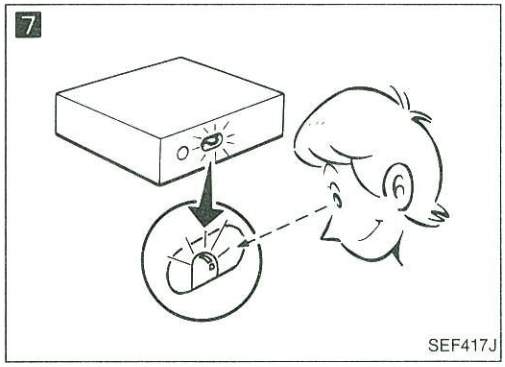
7



SEF417J

Ⓑ

7

CHECK EXHAUST GAS SENSOR.

1. See "M/R F/C MNT" 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)

N.G. → Replace exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self- diagnostic Mode II. (See page EF & EC-39.)
2. Maintaining engine at 2,000 rpm under no load, check that RED LED on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

O.K.

8

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K.

9

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-91.

N.G. → Repair or replace.

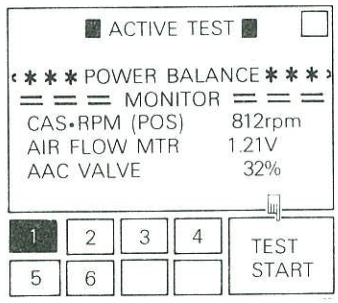
O.K.

10

TRY A KNOWN GOOD E.C.U.

INSPECTION END

1



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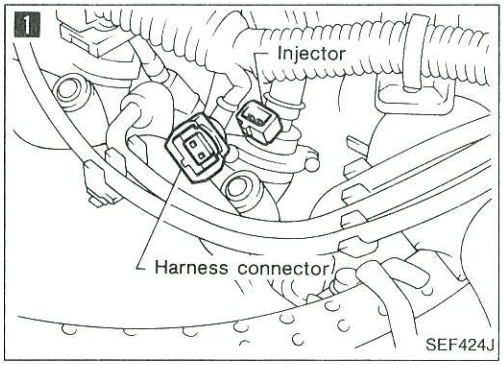
1



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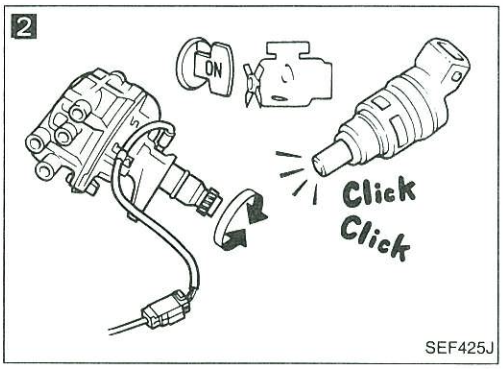
2



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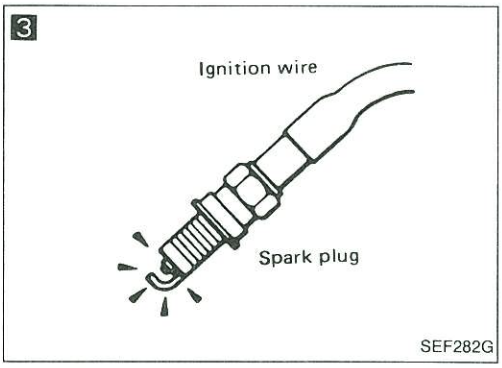
3



SEF282G

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed

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 distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

Yes ↓

3

CHECK IGNITION SPARK.

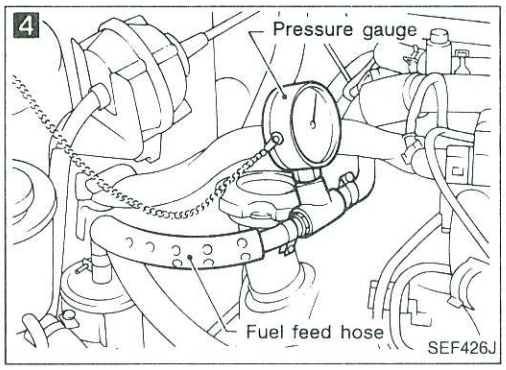
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

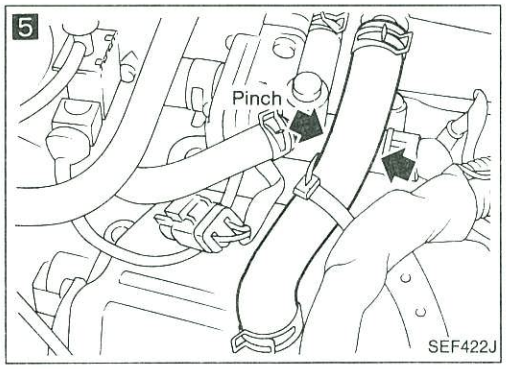
No → Check ignition coil, power transistor unit and circuits. (See page EF & EC-104.)

Yes ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)





Ⓐ

4

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)

The moment throttle valve is fully open:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

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

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 E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-91.

Yes → Repair or replace.

No ↓

8

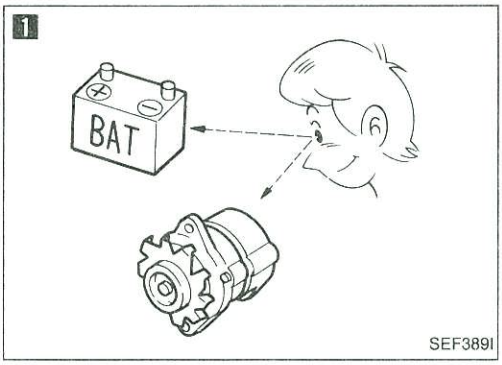
TRY A KNOWN GOOD E.C.U.

↓

INSPECTION END

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

1



SEF389I

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?

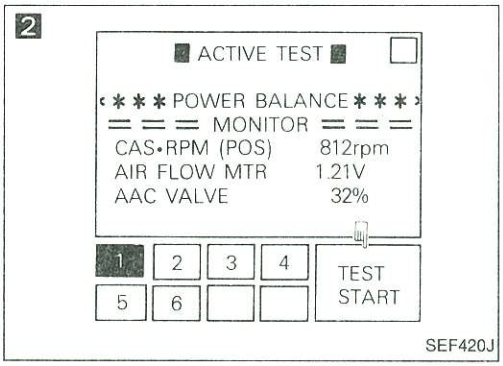
No → Go to 5.

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 ↓

2



SEF420J

3

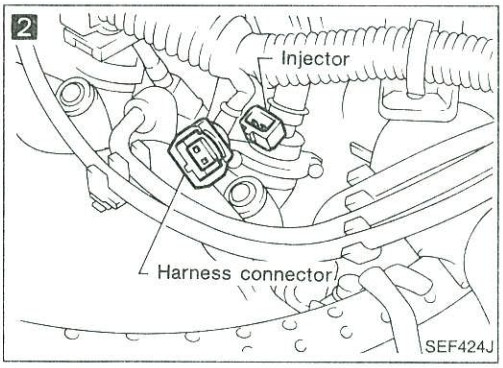
CHECK INJECTOR.

1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating distributor shaft slowly by hand, does each injector make an operating sound?

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

Yes ↓

2



SEF424J

4

CHECK IGNITION SPARK.

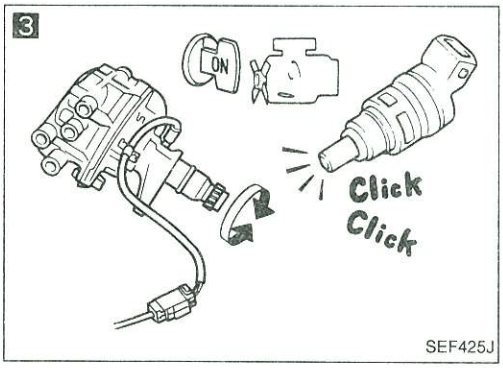
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-104.)

O.K. ↓

(Go to Ⓐ on next page.)

3



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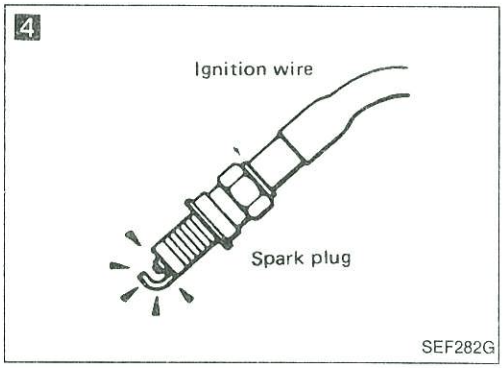

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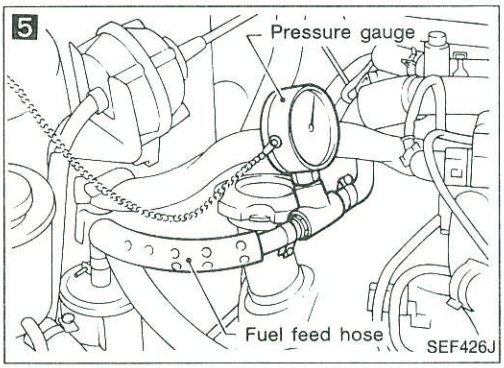
Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)



Ⓐ

5

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

6

CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

O.K. ↓

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-91.

N.G. → Repair or replace.

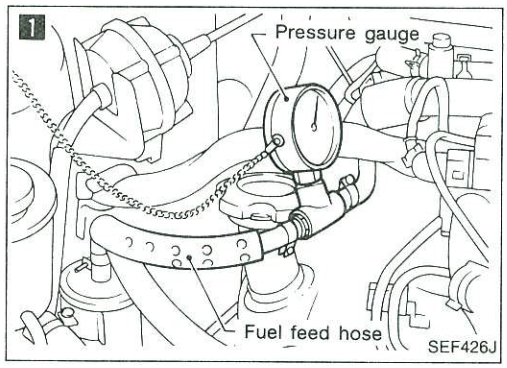
O.K. ↓

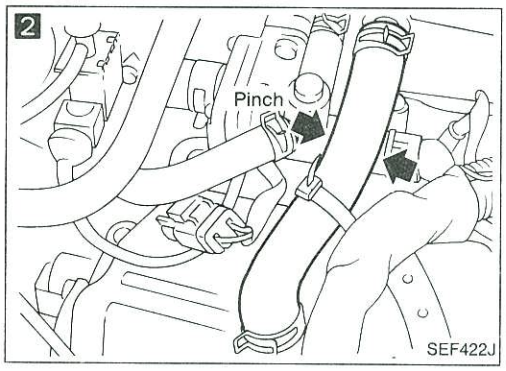
8

TRY A KNOWN GOOD E.C.U.

↓

INSPECTION END





Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-162.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

Approx. 235 kPa (2.4 kg/cm², 34 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

2

CHECK FOR INTAKE AIR LEAK.

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

Yes → Discover air leak location and repair.

No ↓

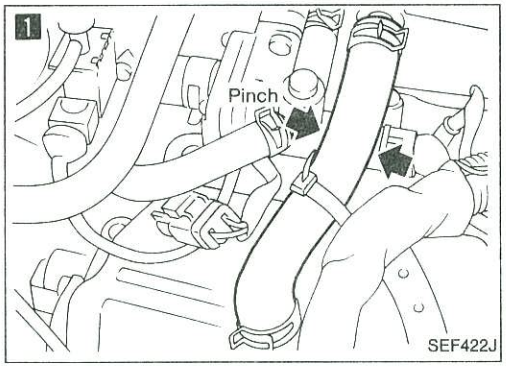
CHECK TIMING BELT FOR PROPER INSTALLATION.

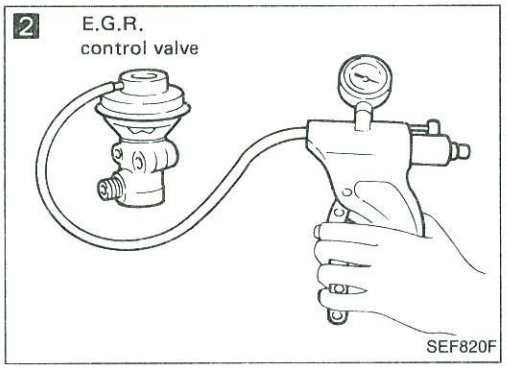
N.G. → Replace timing belt.

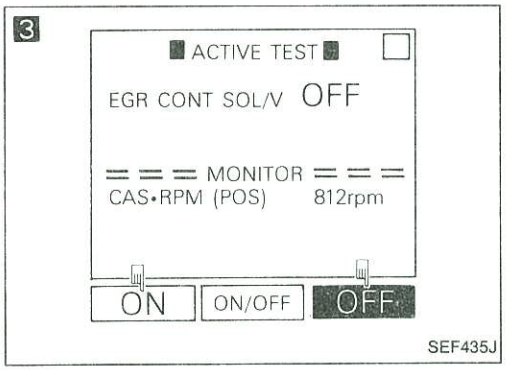
O.K. ↓

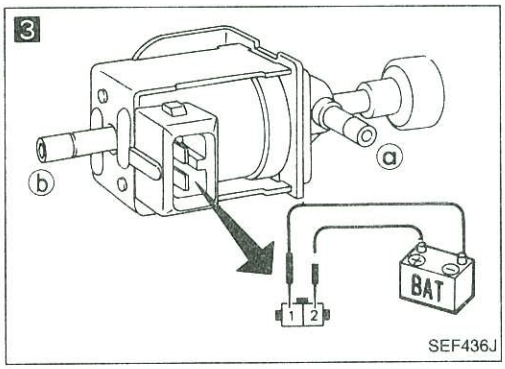
INSPECTION END

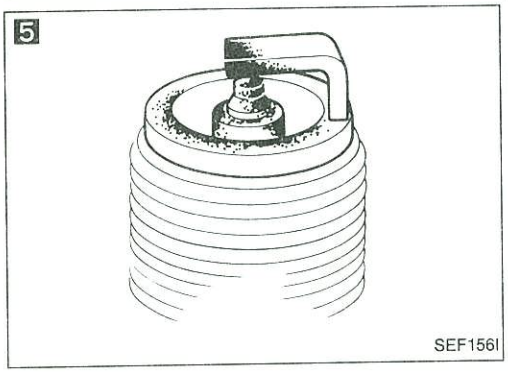
Diagnostic Procedure 18 — Detonation











1

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

Yes → Discover air leak location and repair.

No ↓

2

CHECK E.G.R. OPERATION.
1. Apply vacuum directly to the E.G.R. valve using a handy vacuum pump.
2. Check to see that the engine runs rough or dies.

No → Check E.G.R. valve for sticking.

Yes ↓

3

CHECK E.G.R. CONTROL SOLENOID VALVE.

1. Select "E.G.R. CONT SOL VALVE" in "ACTIVE TEST" mode.
2. Turn E.G.R. control solenoid valve ON and OFF.
3. Check operating sound.

— OR —

1. Disconnect E.G.R. control solenoid valve harness connector.
2. Supply E.G.R. control 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 E.G.R. control valve and E.G.R. control solenoid valve.
b) Vacuum hose between E.G.R. control solenoid valve and throttle chamber port.
(Refer to page EF & EC-8.)

N.G. → Repair or replace.

O.K. ↓

5

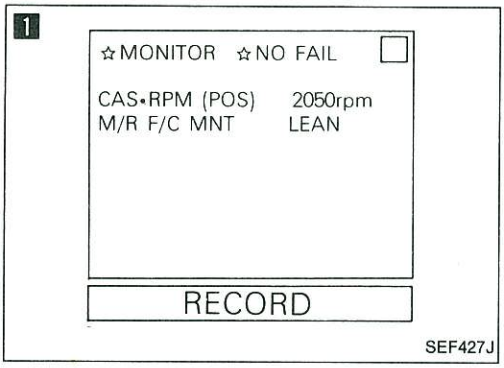
CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

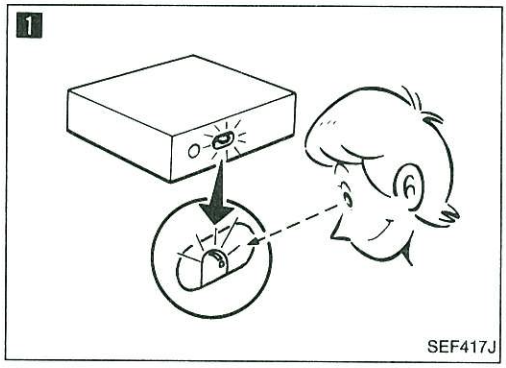
Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

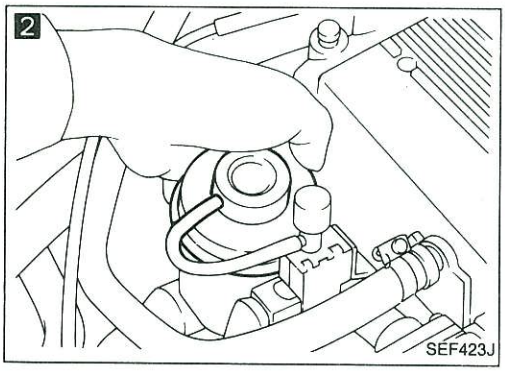
No ↓

INSPECTION END

Diagnostic Procedure 19 — Surge







1

CHECK EXHAUST GAS SENSOR.

1. See "M/R F/C MNT" 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 exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self- diagnostic Mode II. (See page EF & EC-39.)
2. Maintaining engine at 2,000 rpm under no load, check that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

O.K.

2

CHECK E.G.R. CONTROL VALVE.
Check E.G.R. control valve for sticking.

N.G. → Repair or replace.

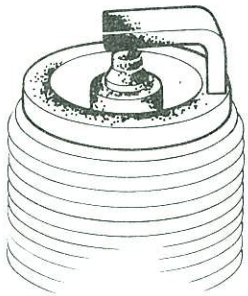
O.K.

3

TRY A KNOWN GOOD E.C.U.

INSPECTION END

1



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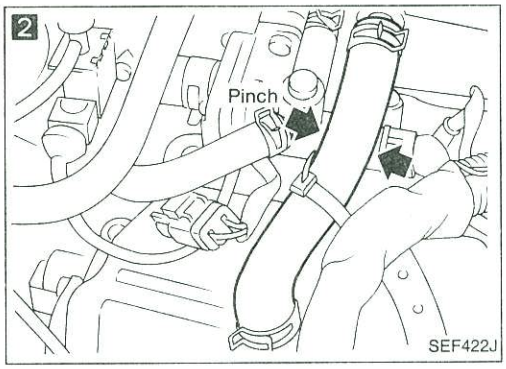
2



SEF422J

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

1

CHECK ENGINE TEMPERATURE SENSOR.
Check engine temperature sensor and its circuit. (See page EF & EC-100.)

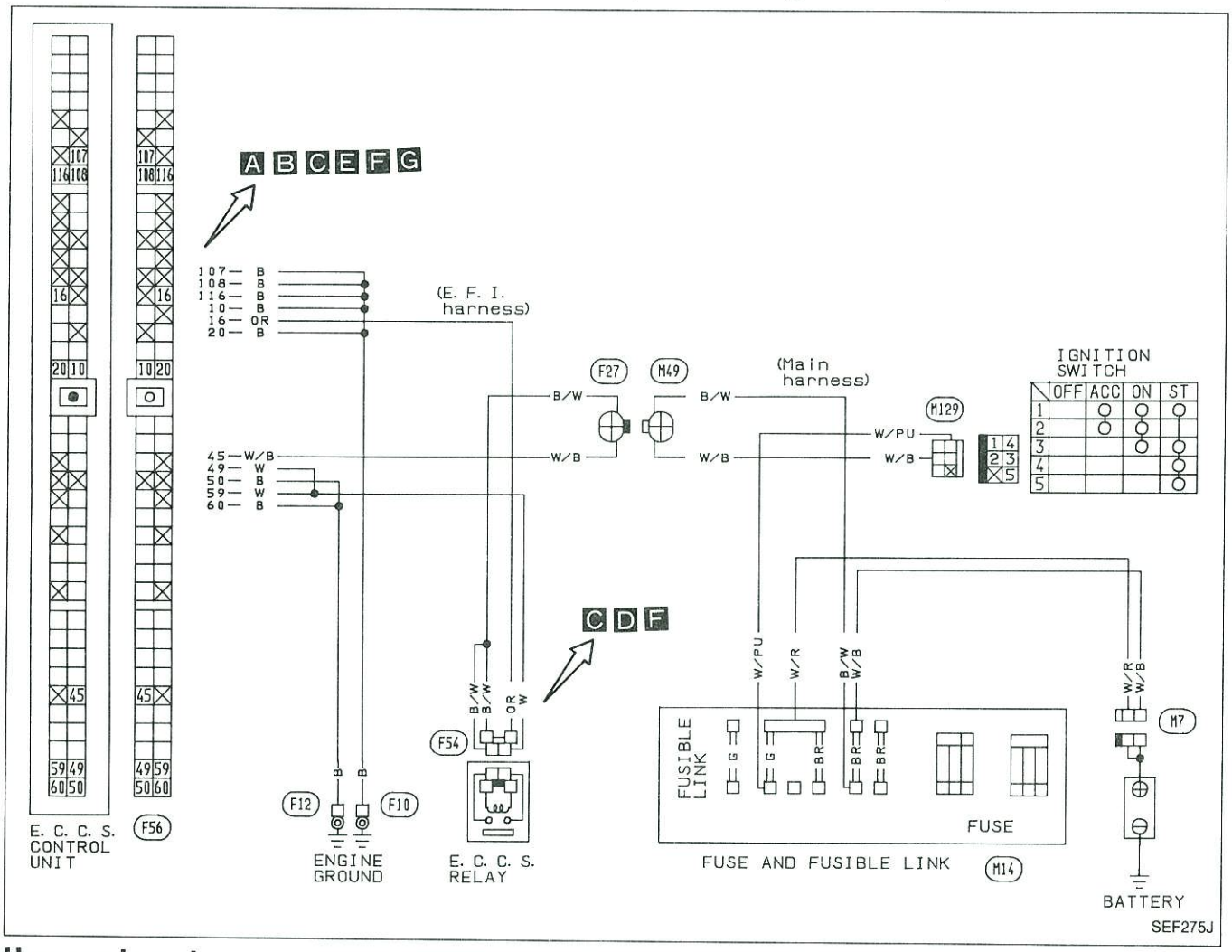
N.G. → Replace or repair.

O.K. ↓

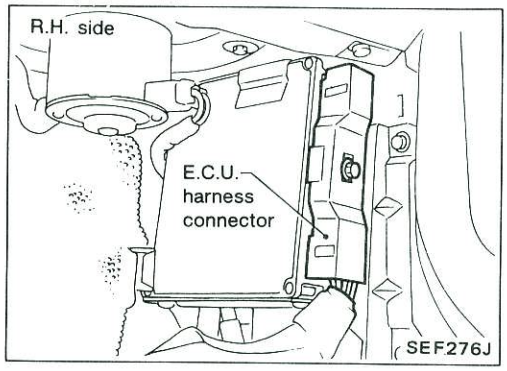
INSPECTION END

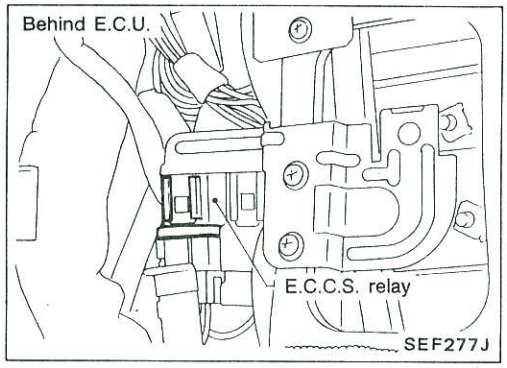
Diagnostic Procedure 22

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

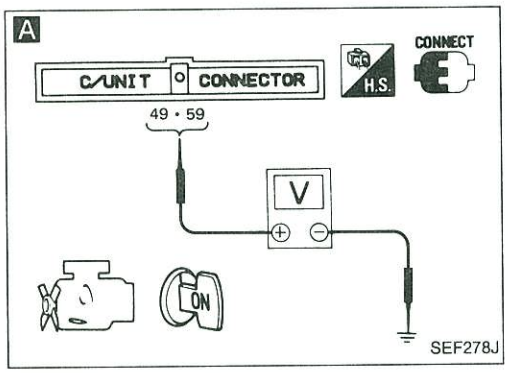


Harness layout





Diagnostic Procedure 22 (Cont'd)



INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminals ㊾, ㊾ and ground.
Voltage: Battery voltage

O.K. → **B**

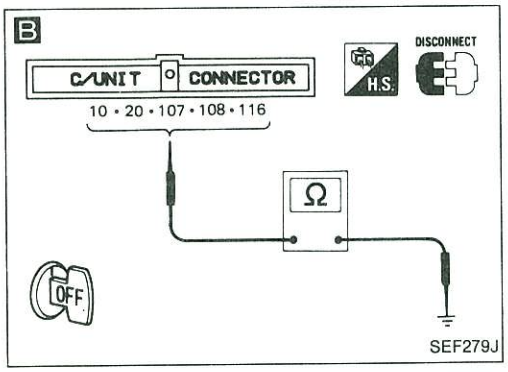
N.G.

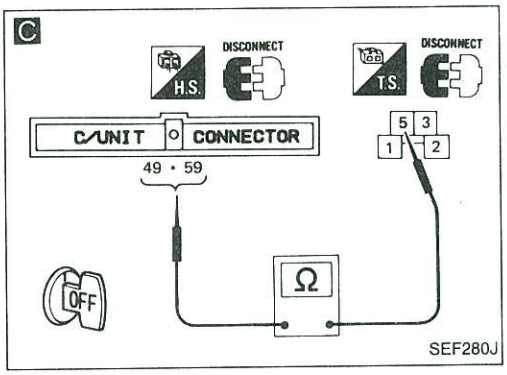
B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminals ⑩, ⑳, ⑩⑦, ⑩⑧, ⑪⑥ and engine ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.



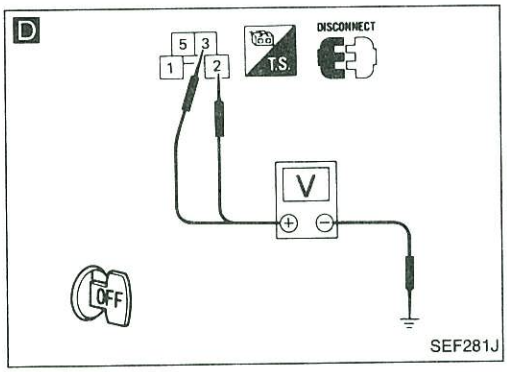


C

CHECK HARNESS CONTINUITY BETWEEN E.C.C.S. RELAY AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.C.C.S. relay.
4) Check harness continuity between E.C.U. terminals ㊾, ㊾ and terminal ⑤.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.



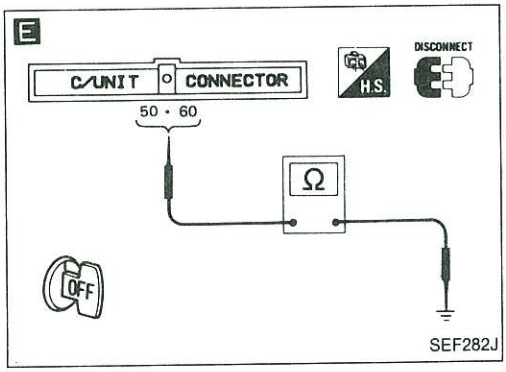
D

CHECK VOLTAGE BETWEEN E.C.C.S. RELAY AND GROUND.
1) Check voltage between terminals ②, ③ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- "BR" fusible link
- Harness continuity between E.C.C.S. relay and battery

If N.G., repair harness or connectors.

O.K.



E

CHECK GROUND CIRCUIT.
1) Check harness continuity between E.C.U. terminals ㊿, ⑥⓪ and engine ground.
Continuity should exist.

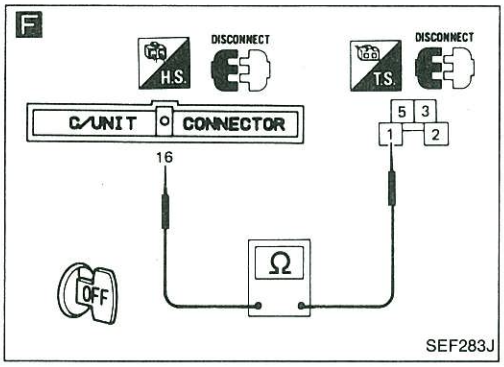
N.G. → Repair harness or connectors.

O.K.

Ⓐ

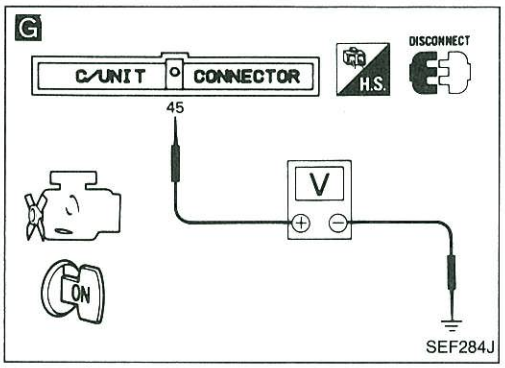
Diagnostic Procedure 22 (Cont'd)

F



SEF283J

G



SEF284J

Ⓐ

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ⑯ and terminal ①.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

G

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ㊺ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- Harness continuity between E.C.U. and ignition switch

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT
(E.C.C.S. relay).
Refer to "Electrical Components Inspection". (See page EF & EC- 160.)

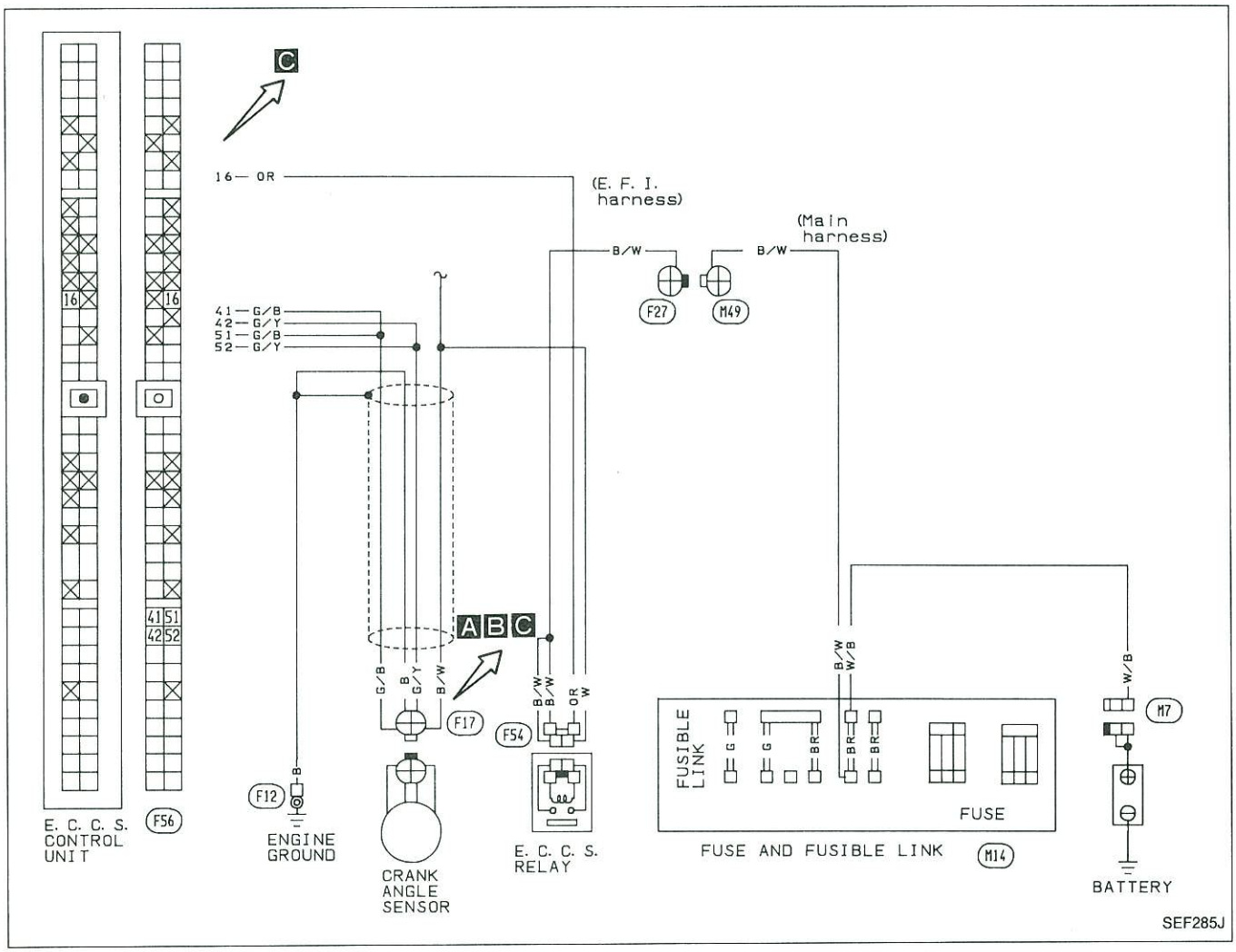
N.G. → Replace E.C.C.S. relay.

O.K.

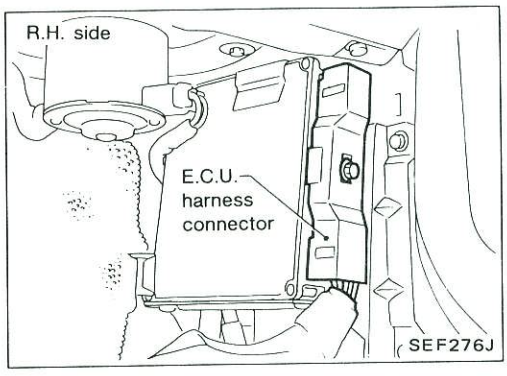
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

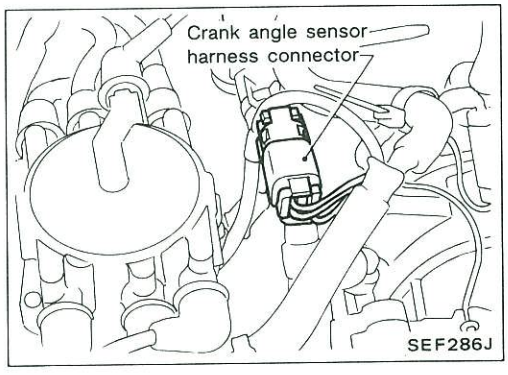
Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)

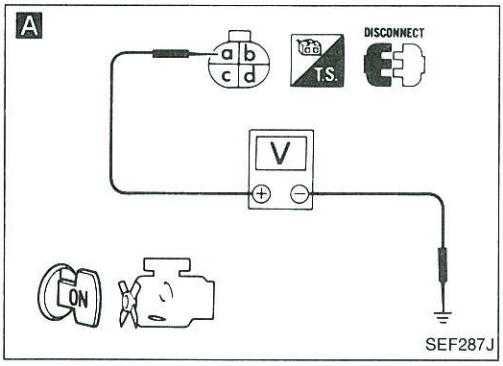


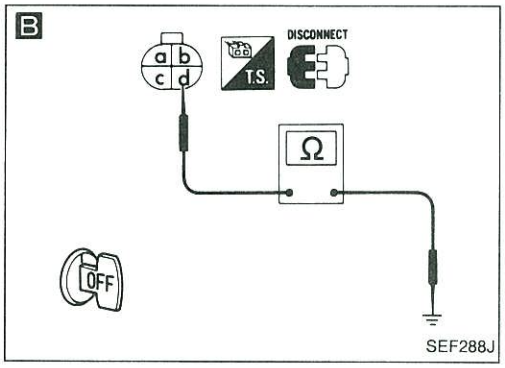
Harness layout

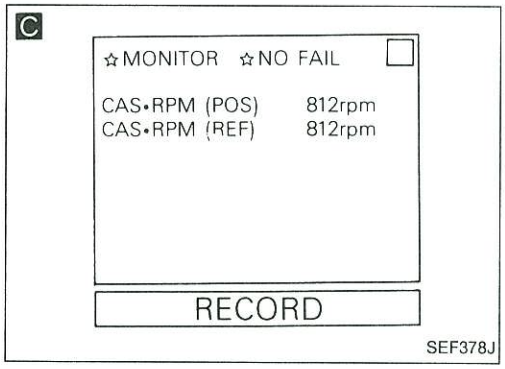


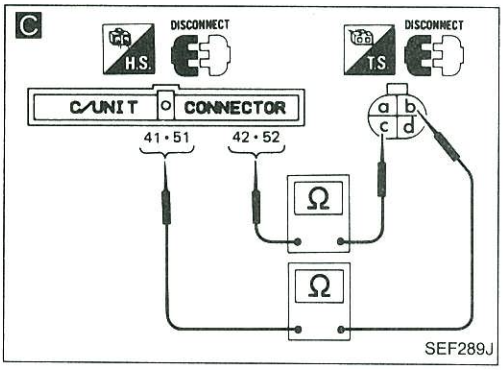


Diagnostic Procedure 23 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect crank angle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness continuity between crank angle sensor and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K.

B

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

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Read crank angle sensor signals in "DATA MONITOR" mode with CONSULT.
rpm: 800 ± 50

N.G. → Repair harness or connectors.

OR

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓒ and E.C.U. terminals ㊷, ㊷ (1° signal), terminal ⓑ and E.C.U. terminals ㊶, ㊶ (120° signal).
Continuity should exist.

O.K.

CHECK COMPONENT
(Crank angle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-155.)

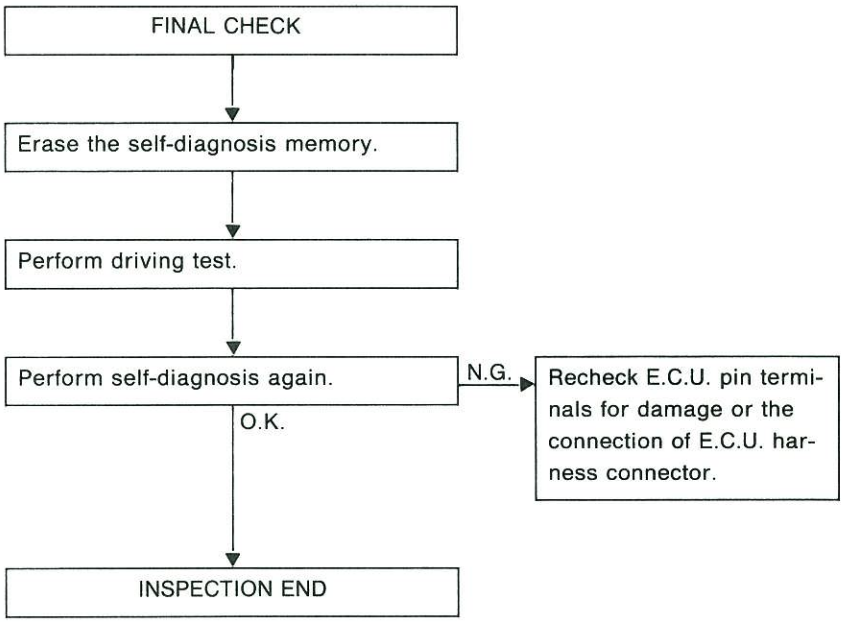
N.G. → Replace crank angle sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

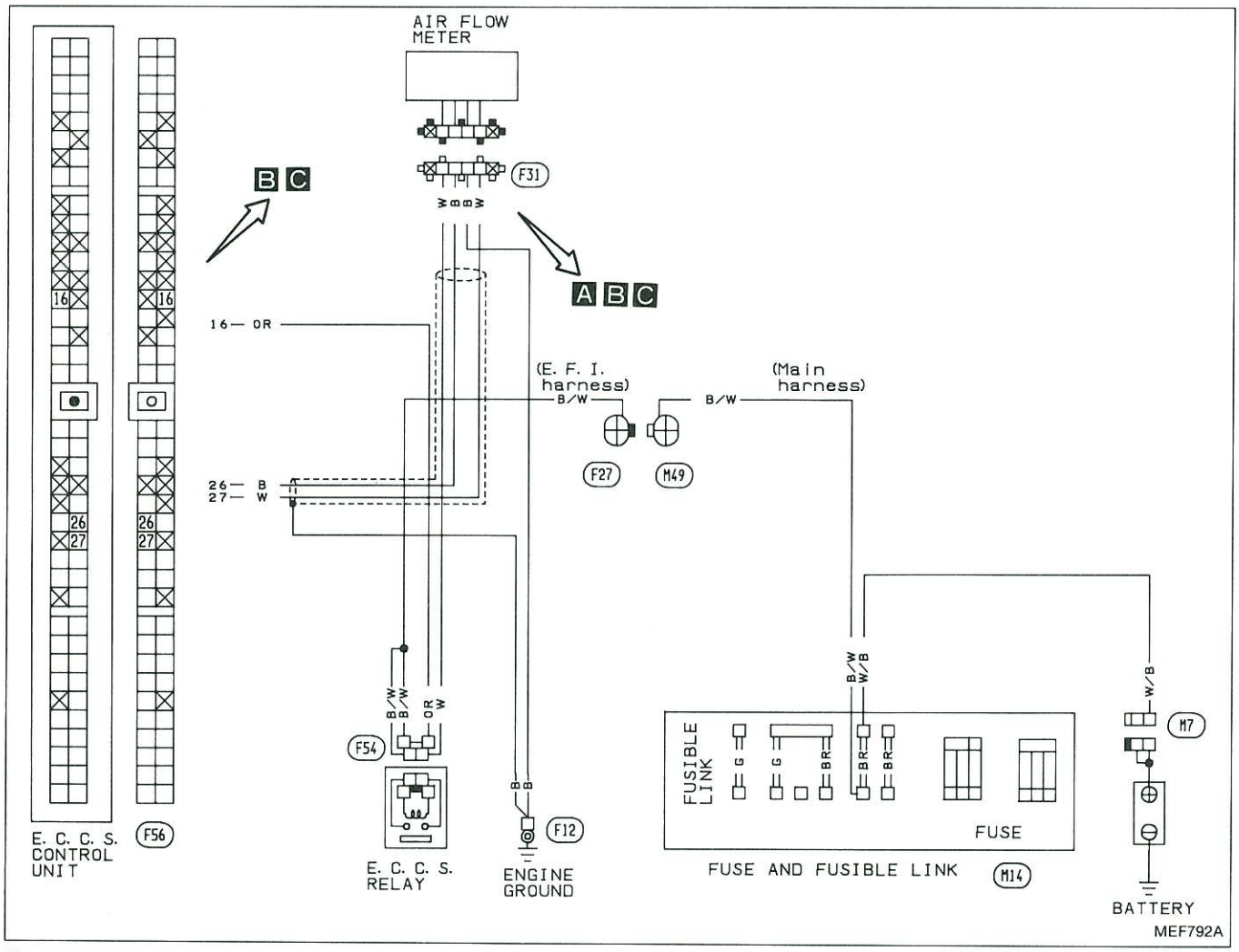
Diagnostic Procedure 23 (Cont'd)

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

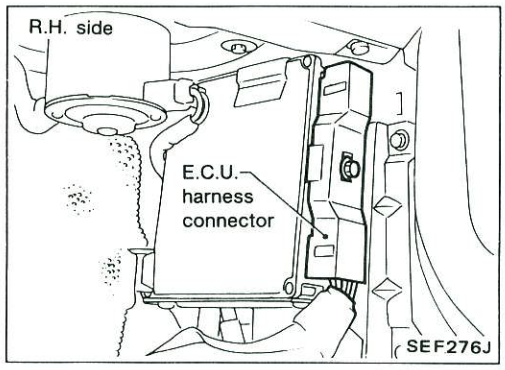


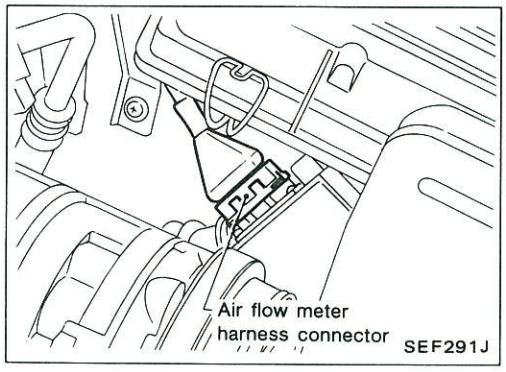
Diagnostic Procedure 24

AIR FLOW METER (Code No. 12) (CHECK ENGINE LIGHT ITEM)

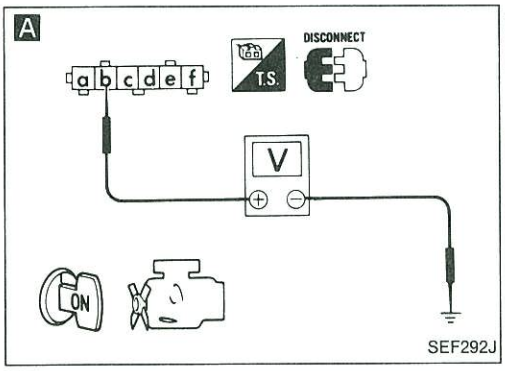


Harness layout





Diagnostic Procedure 24 (Cont'd)



INSPECTION START

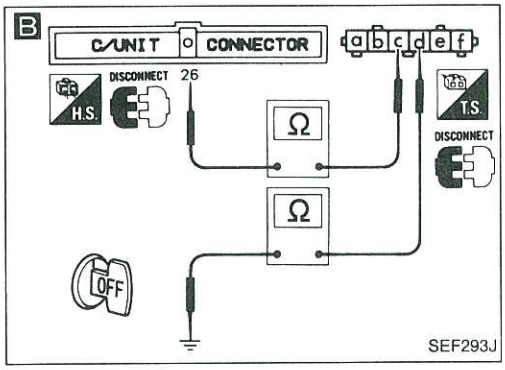
A

CHECK POWER SUPPLY.
1) Disconnect air flow meter harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness continuity between air flow meter and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K.

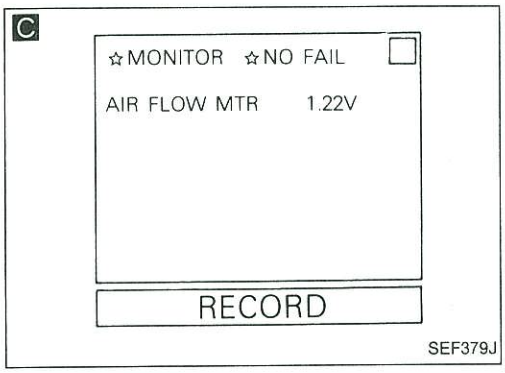


B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between terminal ⓒ and E.C.U. terminal ㉖, terminal ⓓ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.



C

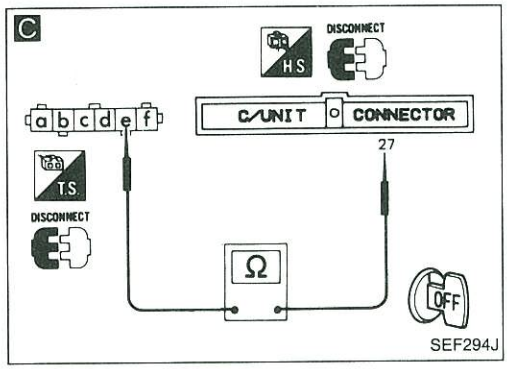
CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect air flow meter harness connector and E.C.U. harness connector.
2) Start engine and warm it up sufficiently.
3) Read air flow meter signal in "DATA MONITOR" mode with CONSULT.
Voltage: 1.0 - 1.5V

N.G. → Repair harness or connectors.

OR

1) Check harness continuity between terminal ⓔ and E.C.U. terminal ㉗.
Continuity should exist.



O.K.

CHECK COMPONENT
(Air flow meter).
Refer to "Electrical Components Inspection".
(See page EF & EC-155.)

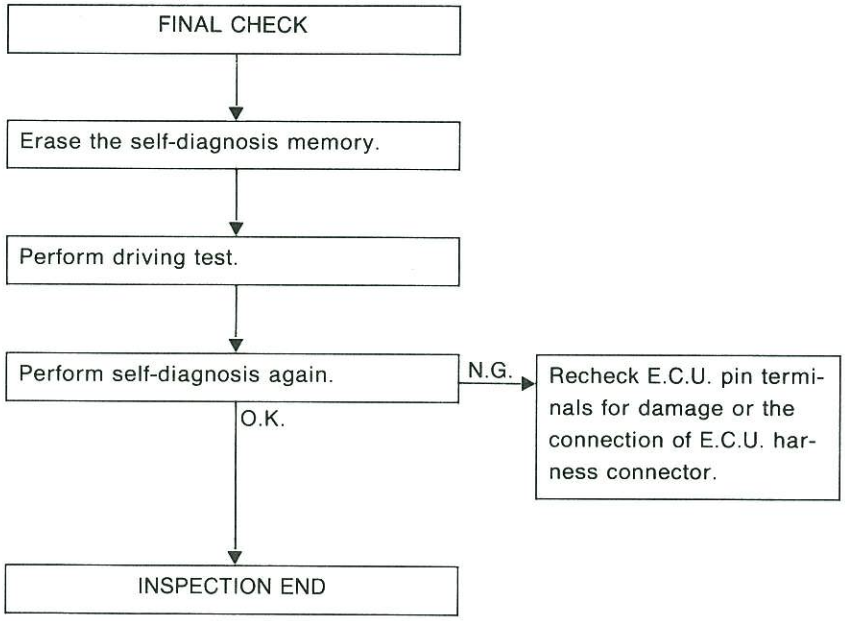
N.G. → Replace air flow meter.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

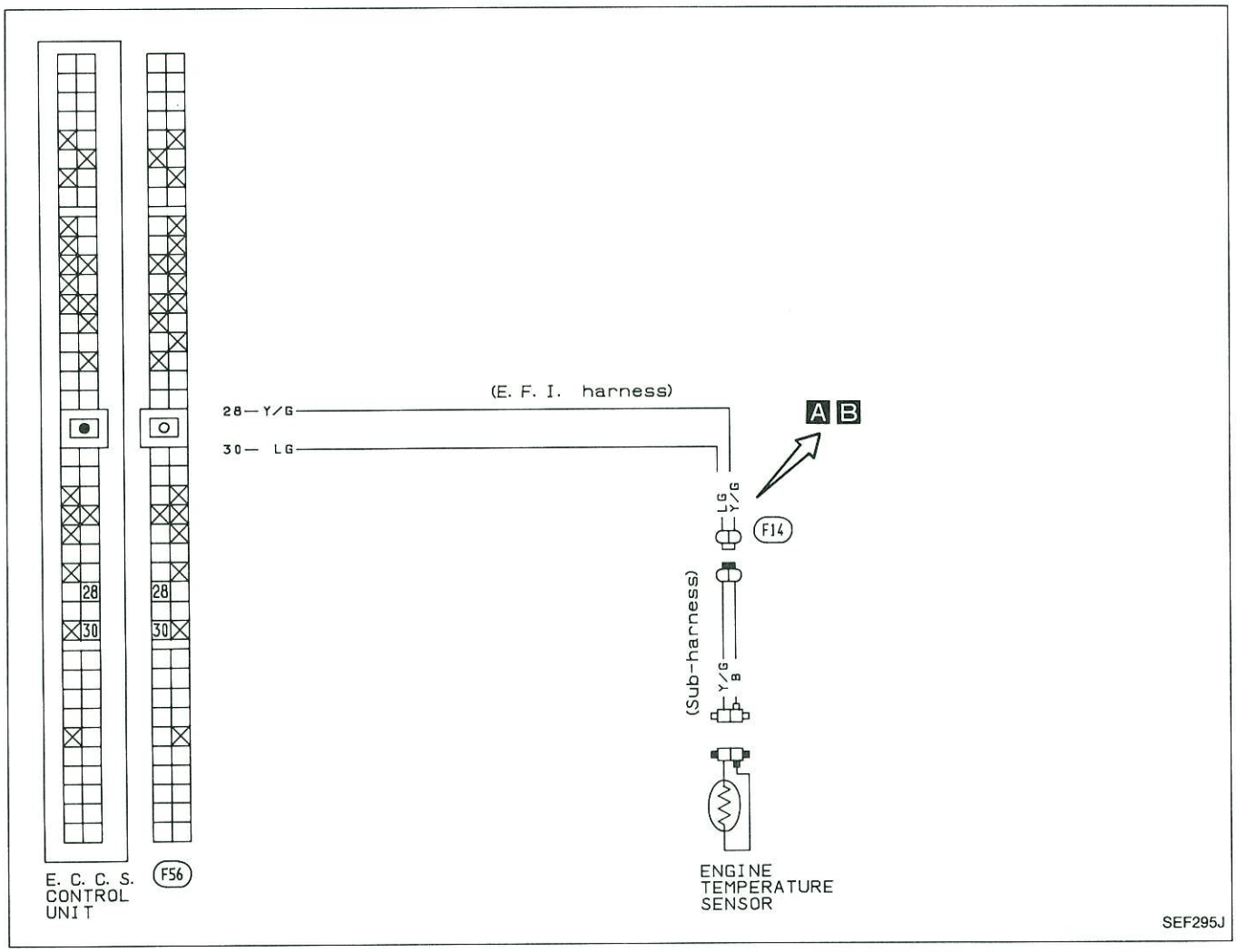
Diagnostic Procedure 24 (Cont'd)

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

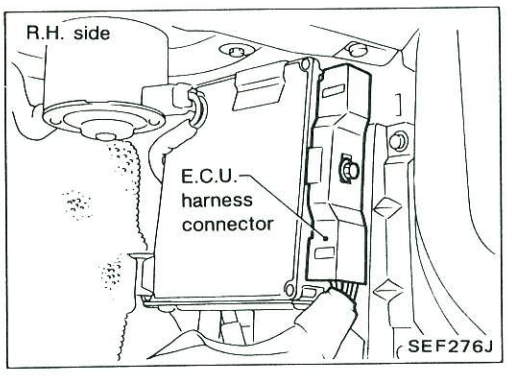


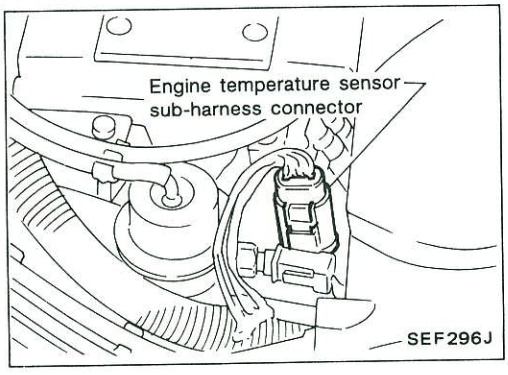
Diagnostic Procedure 25

ENGINE TEMPERATURE SENSOR (Code No. 13) (CHECK ENGINE LIGHT ITEM)

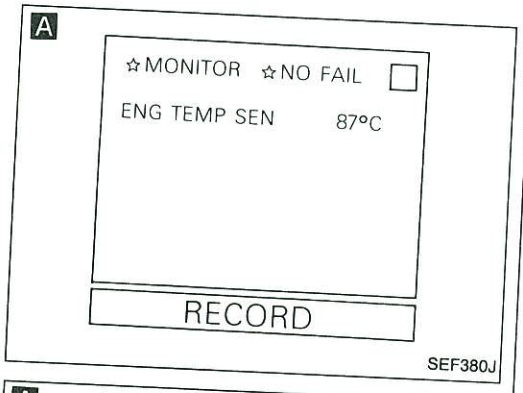


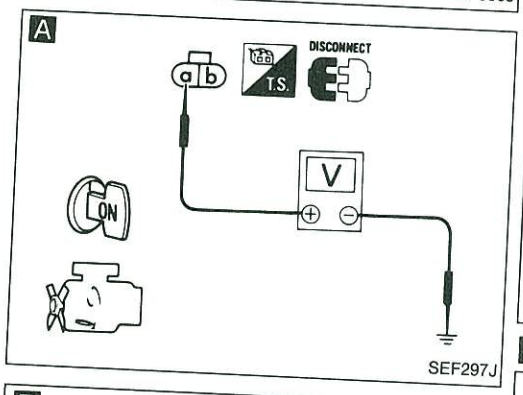
Harness layout

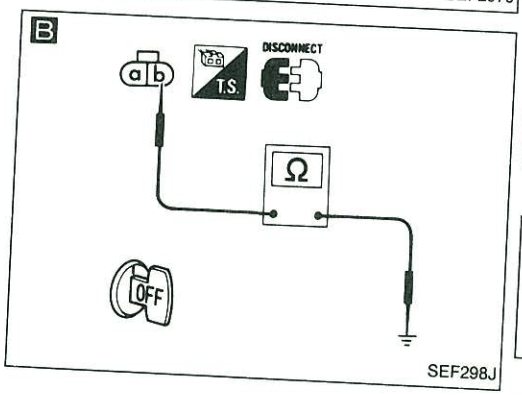




Diagnostic Procedure 25 (Cont'd)







INSPECTION START

A

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

N.G. → Repair harness or connectors.

OR

1) Disconnect engine temperature sensor sub-harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Approximately 5V

O.K.

B

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

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT
(Engine temperature sensor).
Refer to "Electrical Components Inspection". (See page EF & EC-156.)

N.G. → Replace engine temperature sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK

Erase the self-diagnosis memory.

Perform driving test.

Perform self-diagnosis again.

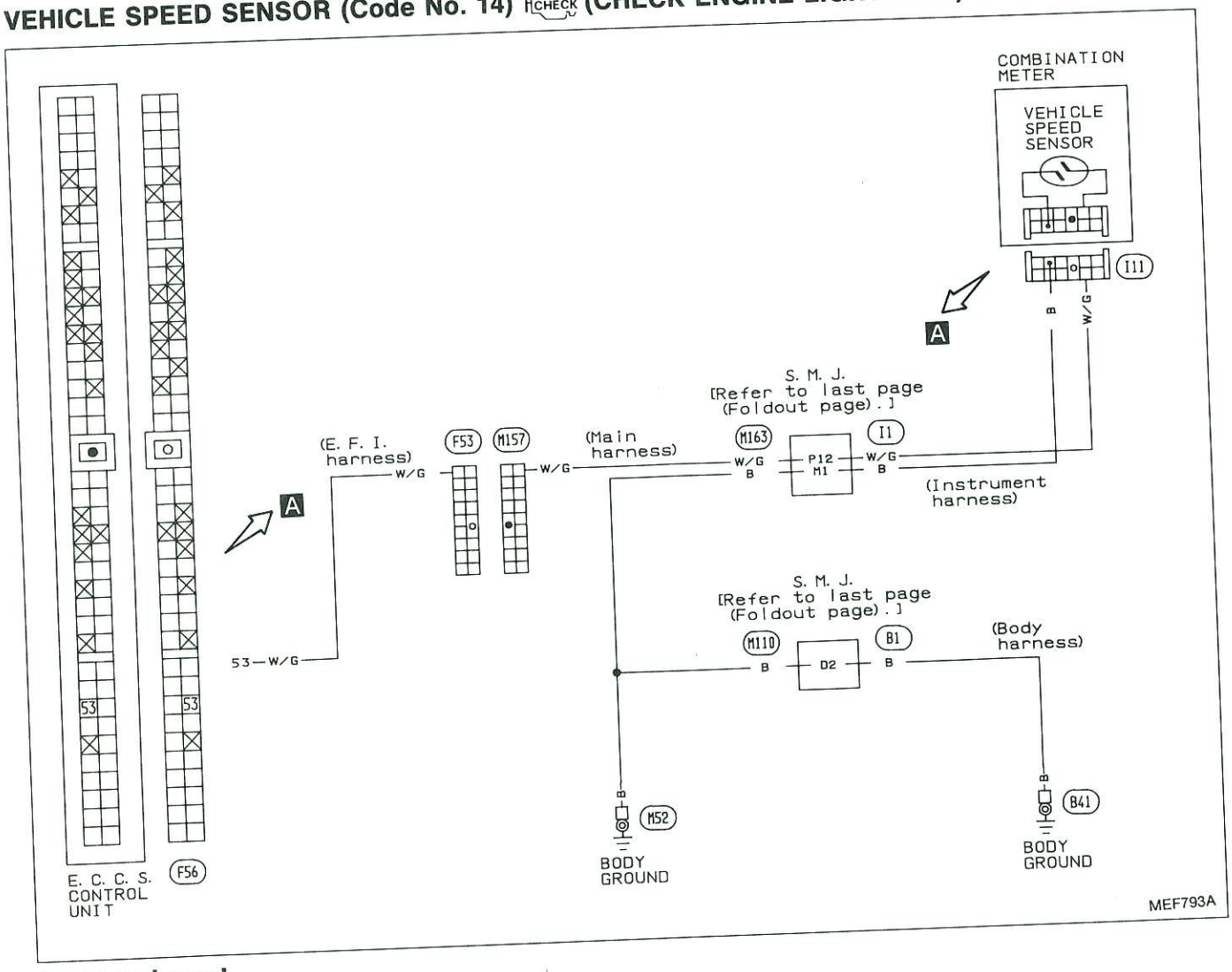
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

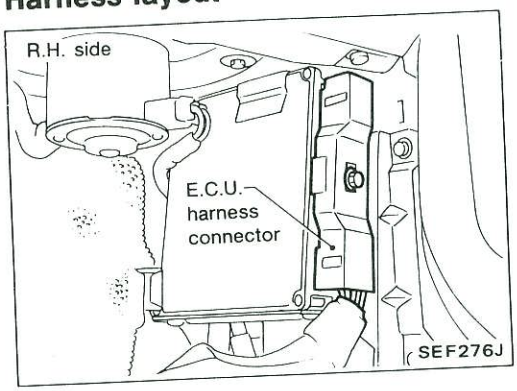
INSPECTION END

Diagnostic Procedure 26

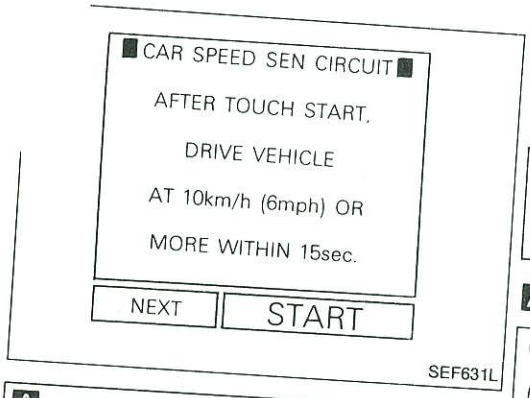
VEHICLE SPEED SENSOR (Code No. 14) CHECK (CHECK ENGINE LIGHT ITEM)

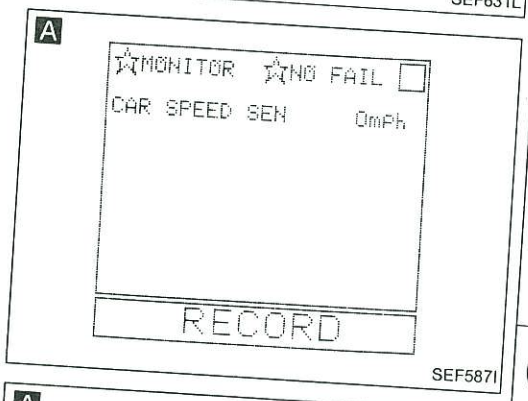


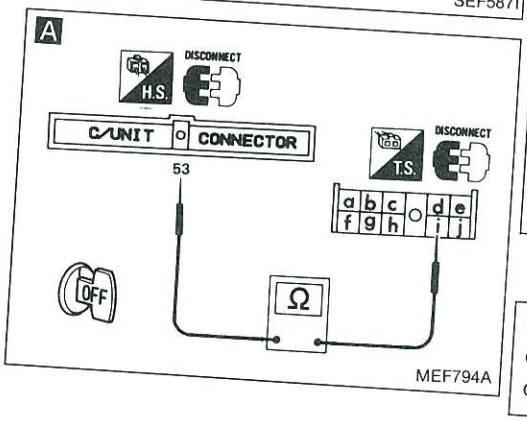
Harness layout



Diagnostic Procedure 26 (Cont'd)







INSPECTION START

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

N.G. → Check vehicle speed sensor and circuit. (Refer to EL section.)

O.K.

A

CHECK INPUT SIGNAL CIRCUIT.

Perform "CAR SPEED SEN CIRCUIT" in "FUNCTION-TEST" mode with CONSULT.

N.G. → Check the following.
- Harness connectors (F53), (M157)
- Harness connectors (M163), (11)
- Harness continuity between E.C.U. and combination meter

If N.G., repair harness or connectors.

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) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and combination meter harness connector.
3) Check harness continuity between E.C.U. terminal (53) and terminal (c).
Continuity should exist.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK

Erase the self-diagnosis memory.

Perform driving test.

Perform self-diagnosis again.

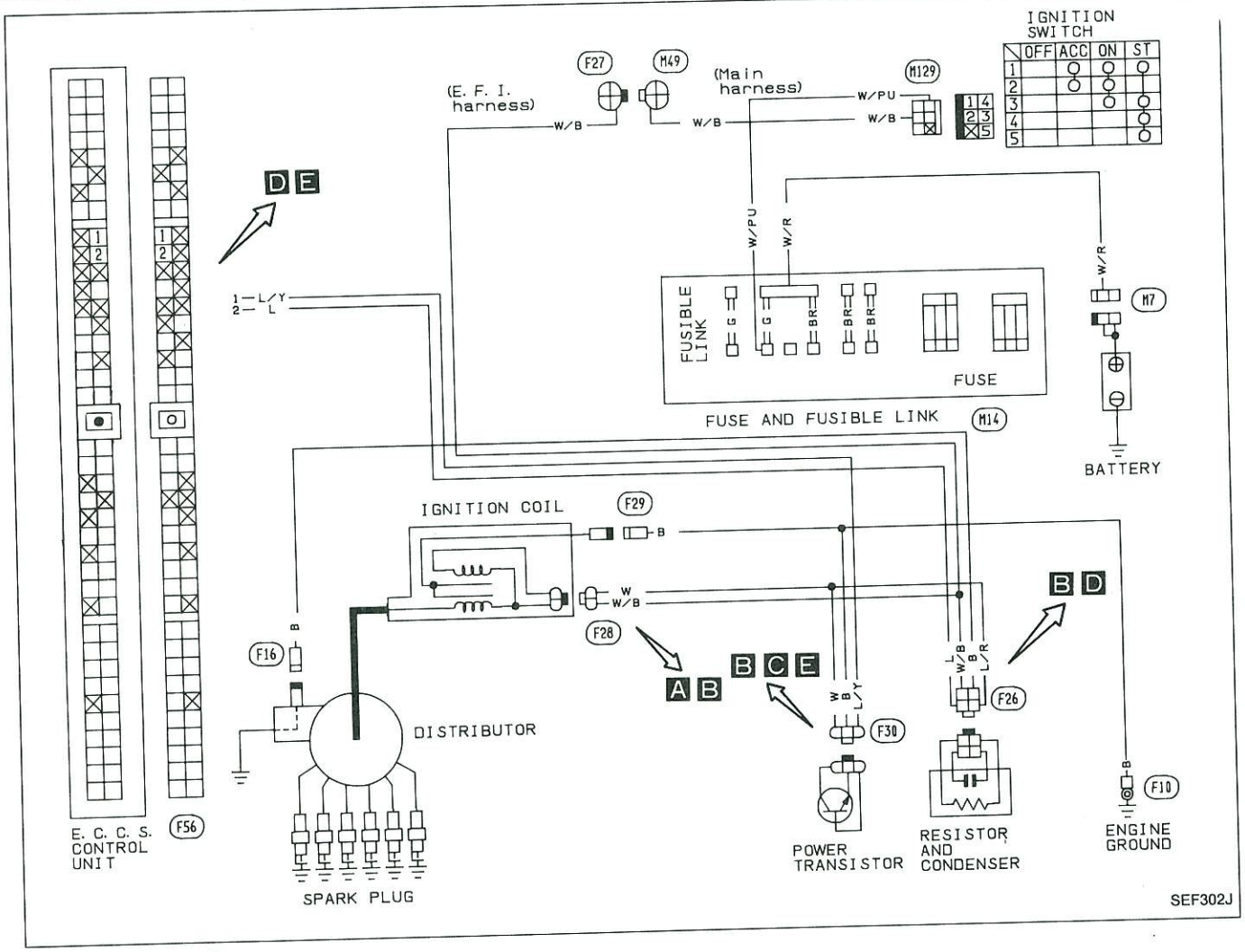
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

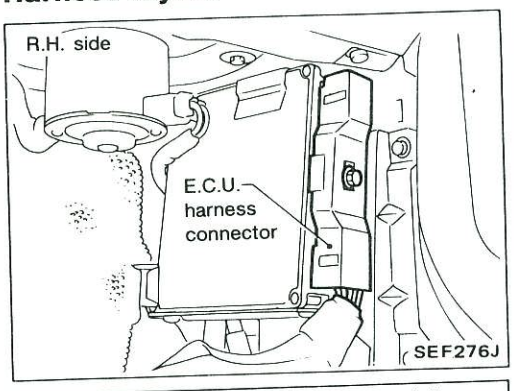
INSPECTION END

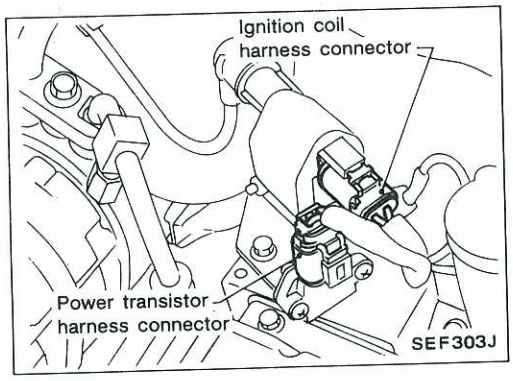
Diagnostic Procedure 27

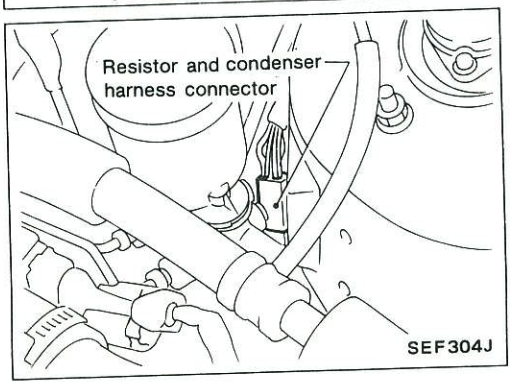
IGNITION SIGNAL (Code No. 21)



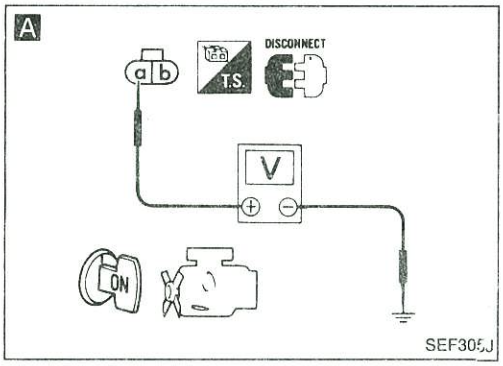
Harness layout

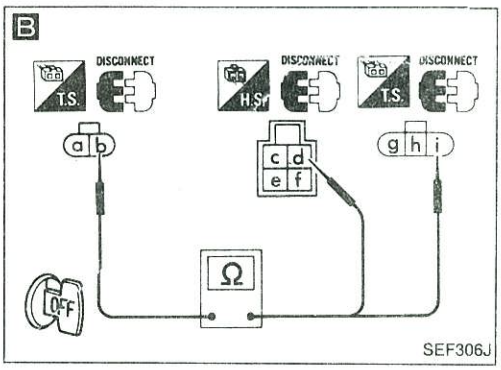


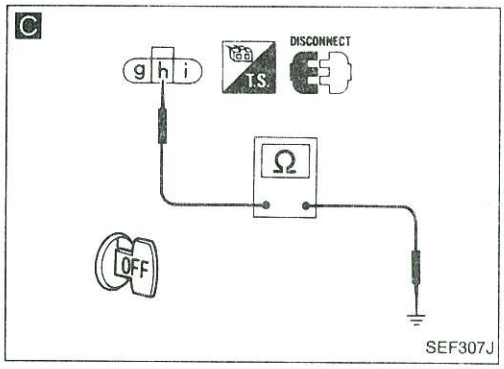


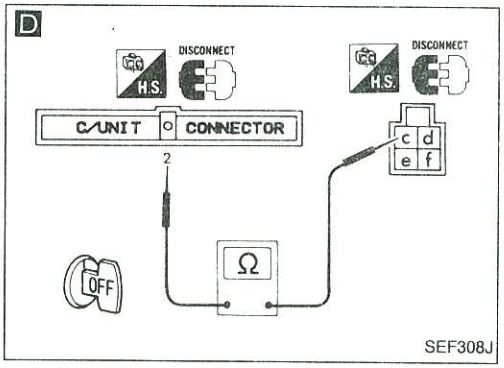


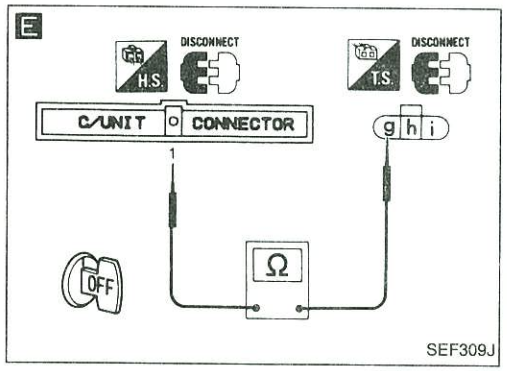
Diagnostic Procedure 27 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect ignition coil harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- Harness continuity between ignition coil and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect resistor and condenser harness connector.
3) Disconnect power transistor harness connector.

B 4) Check harness continuity between terminal ⓑ and ⓓ, ⓘ.
Continuity should exist.

C 5) Check harness continuity between terminal ⓗ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

D

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓒ and E.C.U. terminal ②.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓖ and E.C.U. terminal ①.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENTS
(Ignition coil, resistor and condenser, power transistor).
Refer to "Electrical Components Inspection".
(See pages EF & EC-156, 161.)

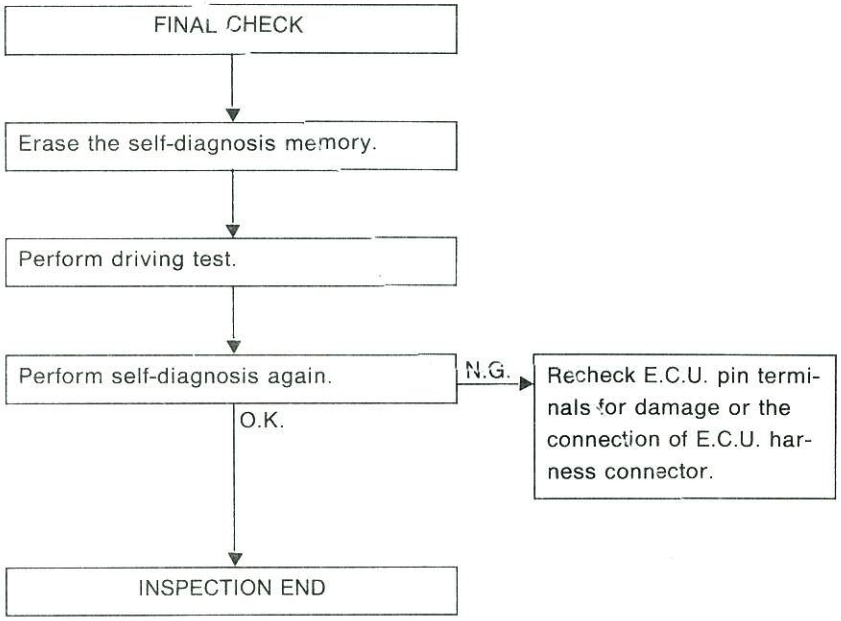
N.G. → Replace malfunctioning component(s).

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

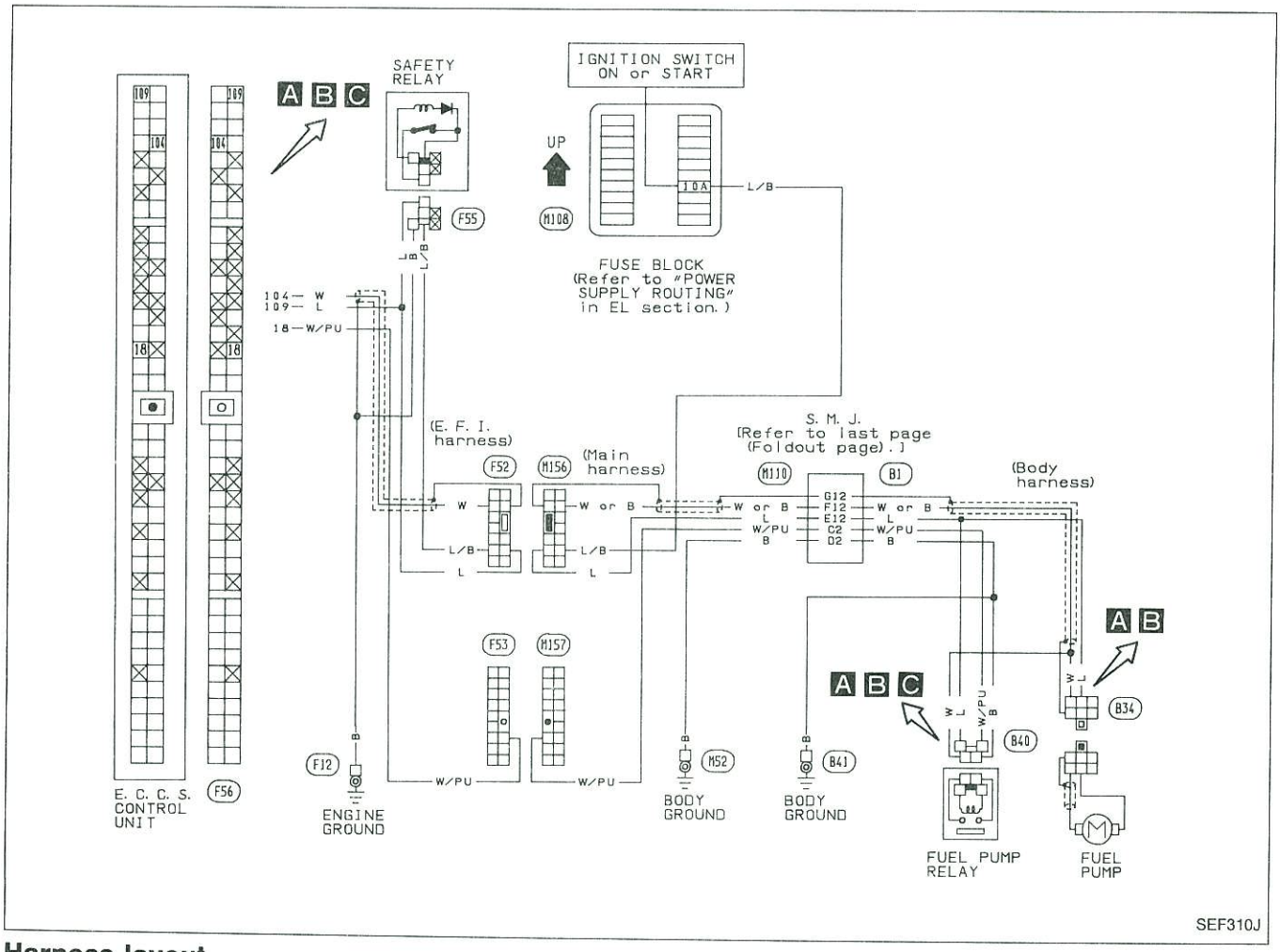
Diagnostic Procedure 27 (Cont'd)

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

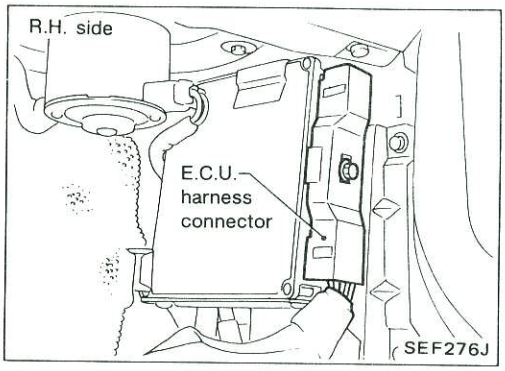


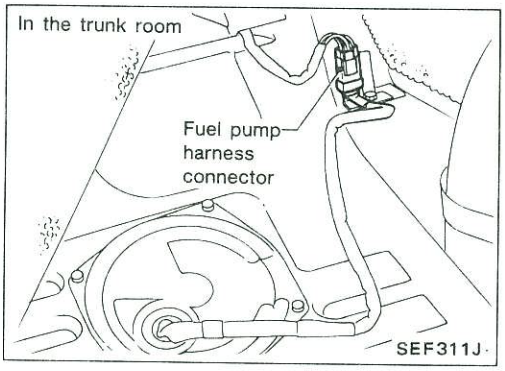
Diagnostic Procedure 28

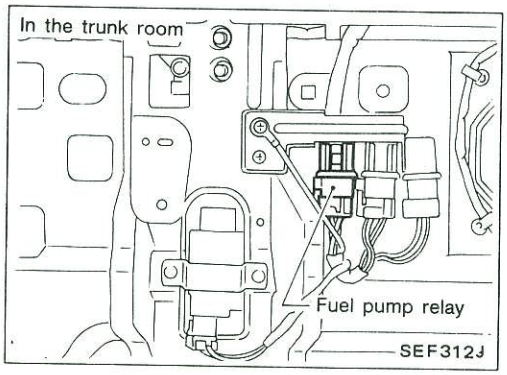
FUEL PUMP CONTROL (Code No. 22)

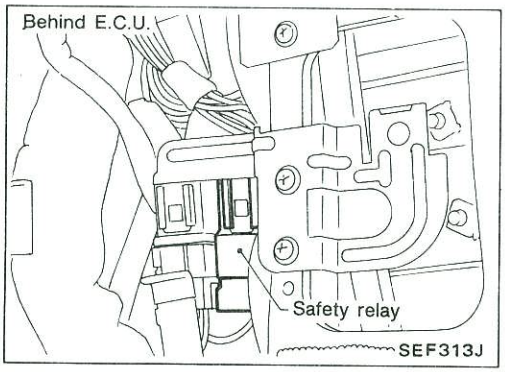


Harness layout

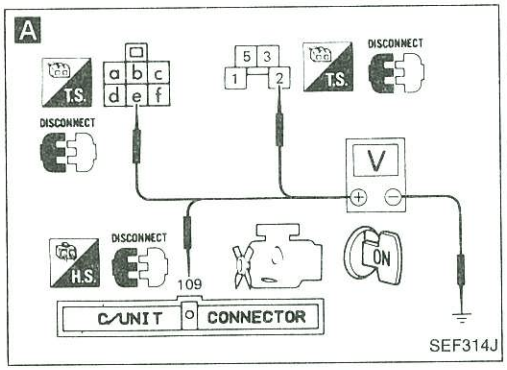


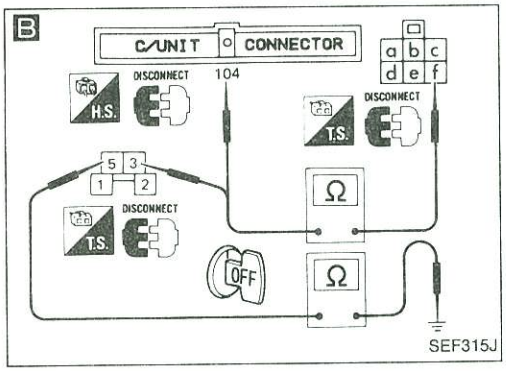


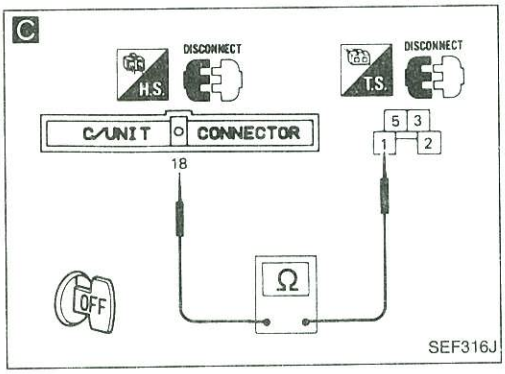




Diagnostic Procedure 28 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect E.C.U. harness connector, fuel pump harness connector and fuel pump relay.
2) Turn ignition switch "ON".
3) Check voltage between terminals ⑥, ②, E.C.U. terminal (109) and ground.
Voltage: Battery voltage

N.G. →
Check the following.
- Harness connectors (M156), (F52)
- Harness connectors (M110), (B1)
- Harness continuity between safety relay and fuse
- Harness continuity between safety relay and E.C.U., fuel pump, fuel pump relay
- 10A fuse

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT (Safety relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-161.)
If N.G., replace safety relay.

O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⑦ and E.C.U. terminal (104), terminal ⑦ and ③, terminal ⑤ and body ground.
Continuity should exist.

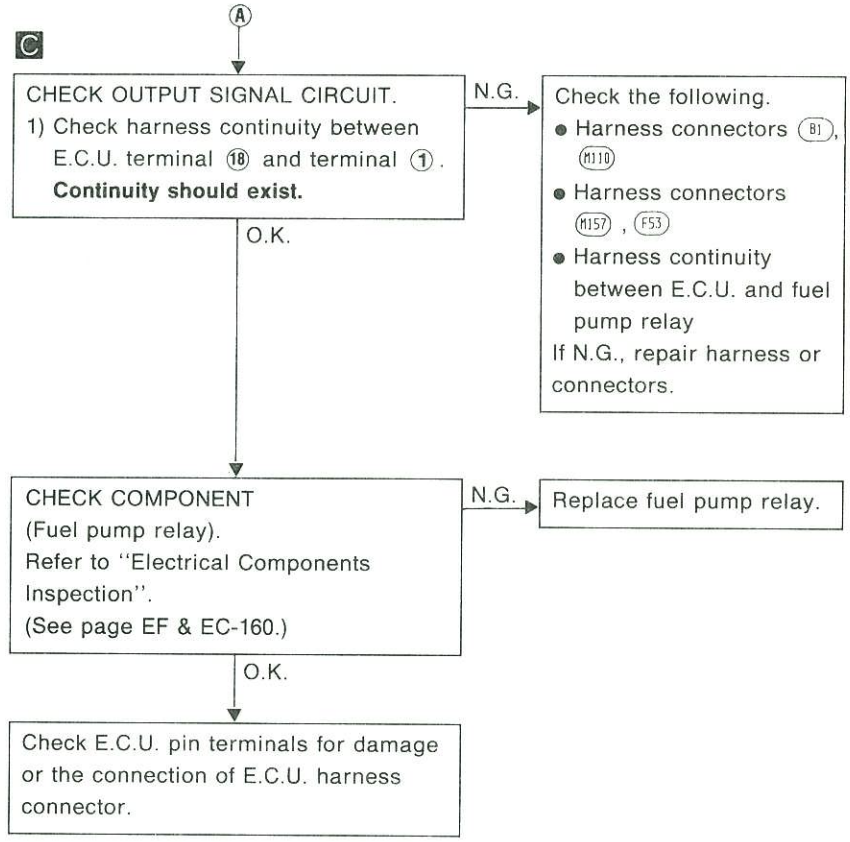
N.G. →
Check the following.
- Harness connectors (B1), (M110)
- Harness connectors (M156), (F52)
- Harness continuity between fuel pump and E.C.U., fuel pump and fuel pump relay, fuel pump relay and body ground

If N.G., repair harness or connectors.

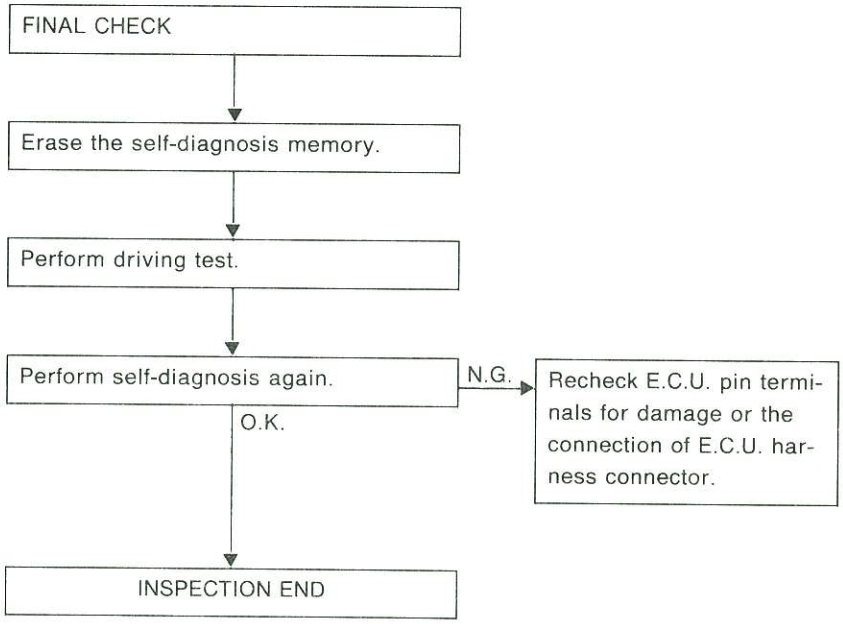
O.K.

Ⓐ

Diagnostic Procedure 28 (Cont'd)

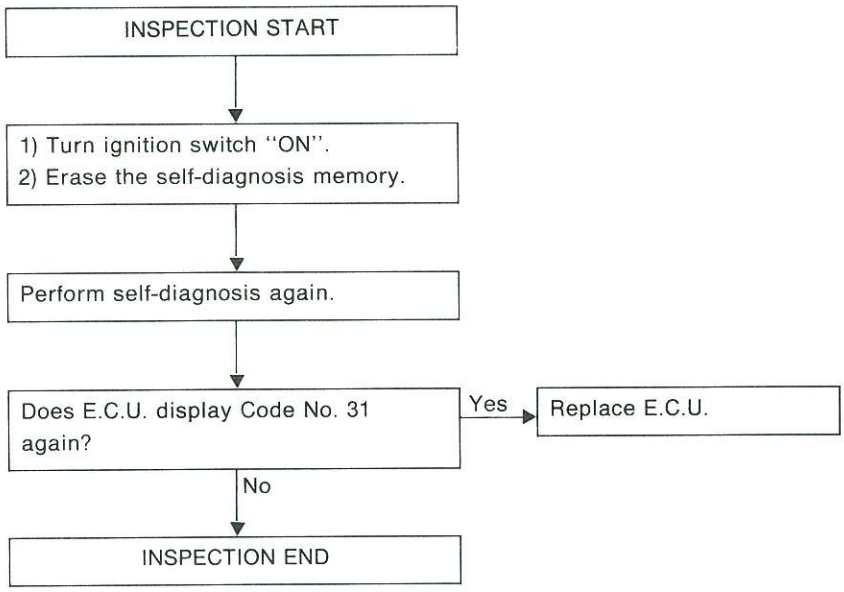


Perform FINAL CHECK by the following procedure after repair is completed.



Diagnostic Procedure 29

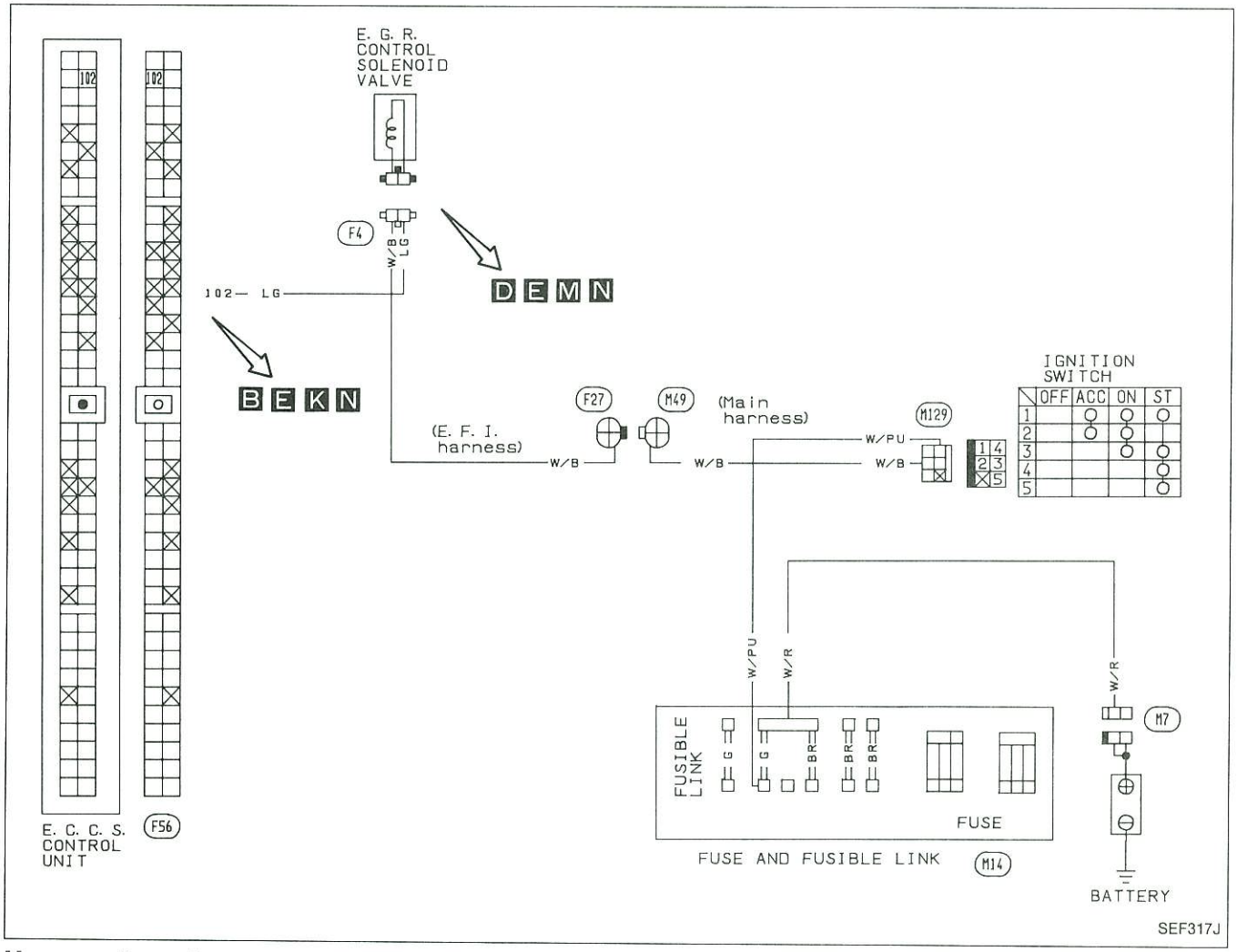
E.C.C.S. CONTROL UNIT (Code No. 31) (CHECK ENGINE LIGHT ITEM)



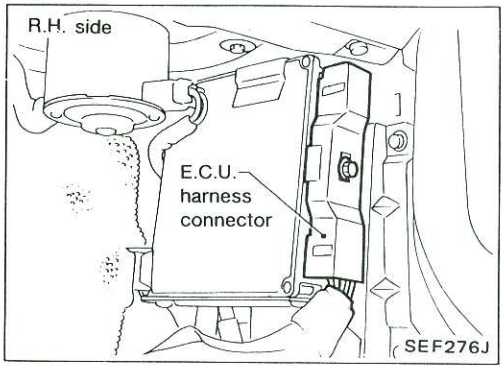
Diagnostic Procedure 30

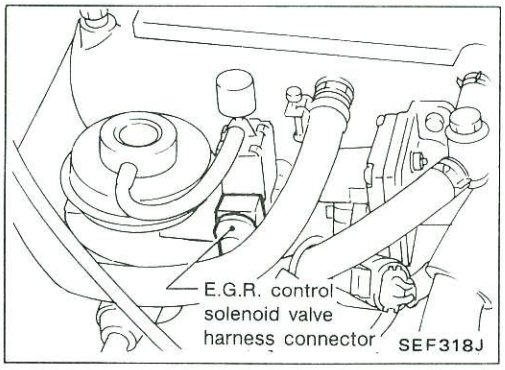
E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): CALIFORNIA MODEL

E.G.R. CONTROL (Not self-diagnostic item): NON-CALIFORNIA MODEL

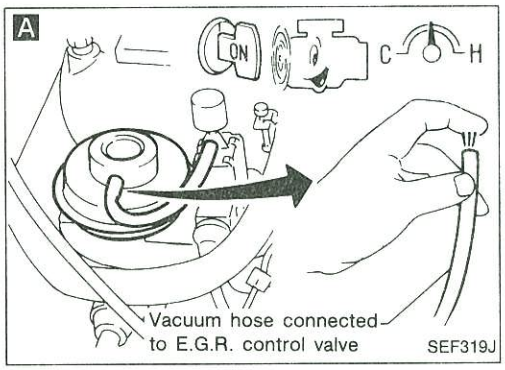


Harness layout





Diagnostic Procedure 30 (Cont'd)



California model

INSPECTION START

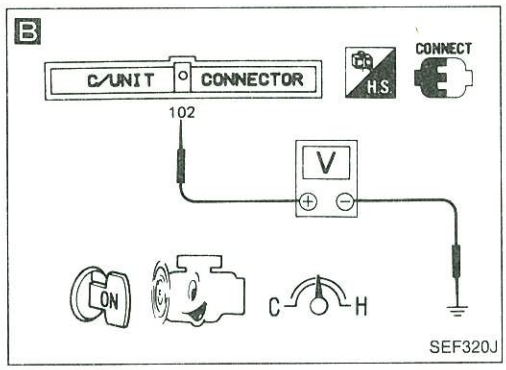
A

CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Start engine and warm it up sufficiently.
2) Perform self-diagnosis.
Make sure that code No. 12 is not displayed.
Make sure that both crank angle sensor and E.C.U.'s C.P.U. are not in "fail-safe" state.
3) Keep engine speed at 2,000 rpm.
4) Disconnect vacuum hose to E.G.R. control valve.
5) Make sure that vacuum exists.
Vacuum should exist.

O.K. → CHECK COMPONENTS (E.G.R. control valve and exhaust gas temperature sensor).
Refer to "Electrical Components Inspection". (See page EF & EC-157.)

N.G. → Replace malfunctioning component(s).

N.G.



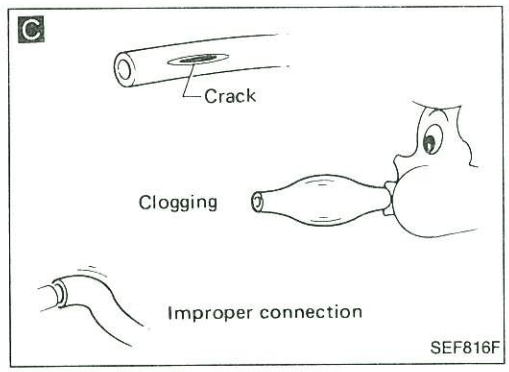
B

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (102) and ground under the following conditions.
Voltage:
At idle
0.7 - 0.8 V
Engine speed is about 2,000 rpm
Battery voltage

O.K. → C

C

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



N.G.

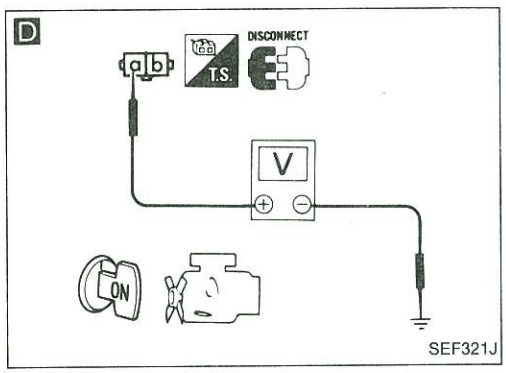
D

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect E.G.R. control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- Harness continuity between E.G.R. control solenoid valve and ignition switch

If N.G., repair harness or connectors.

O.K.



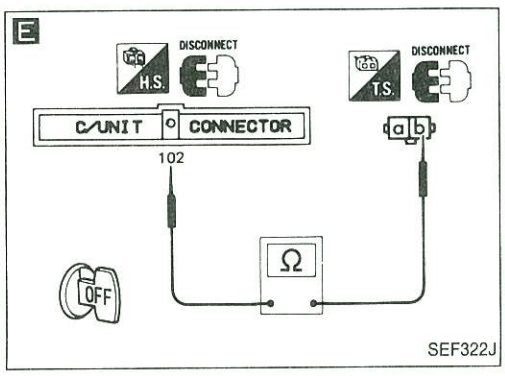
E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (102) and terminal ⓑ.
Continuity should exist.

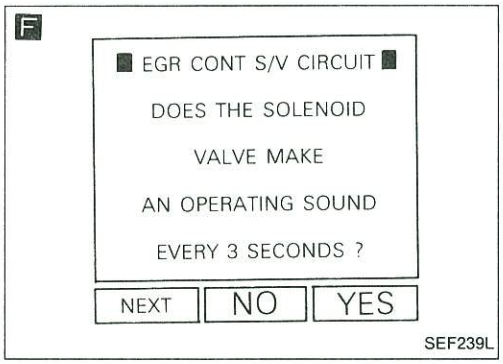
N.G. → Repair harness or connectors.

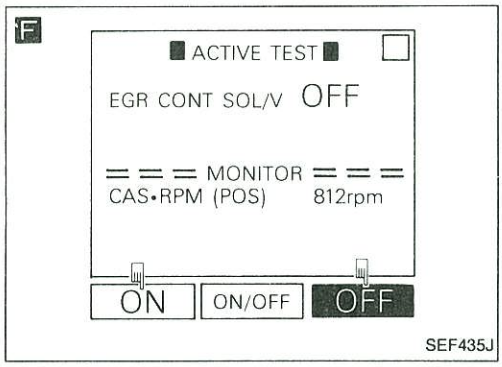
O.K.

Ⓐ



Diagnostic Procedure 30 (Cont'd)





Ⓐ

F

CHECK COMPONENT
(E.G.R. control solenoid valve).

1) Turn ignition switch "ON".
2) Perform "EGR CONT S/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

N.G. → Replace E.G.R. control solenoid valve.

OR

1) Turn ignition switch "ON".
2) Turn E.G.R. control 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-157.)

O.K.

Check resistance of exhaust gas temperature sensor.
(See page EF & EC-157.)

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 30 (Cont'd)

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

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

G

Perform driving test under the following conditions.
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure G

↓

H

Make sure that check engine light does not come on during driving test.

Comes on → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Does not come on ↓

INSPECTION END

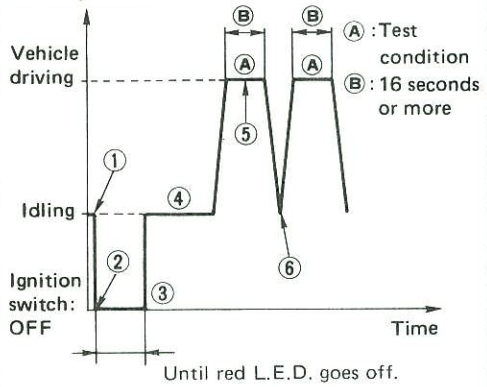
G ROAD TEST

Test condition

Drive vehicle under the following conditions with a suitable shift position.

(1) Engine speed:
2,150±450 rpm
(2) Intake manifold vacuum:
−32.0±6.7 kPa
(−240±50 mmHg, −9.45±1.97 inHg)

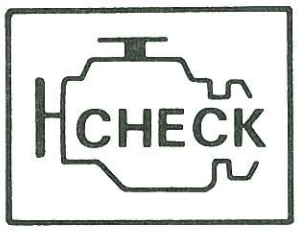
Driving mode



① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until red L.E.D. goes off.
③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
④ Keep engine running for at least 4 minutes.
⑤ Shift to suitable gear position and drive in "Test condition" for at least 16 seconds.
⑥ Decrease engine revolution to less than 2,000 rpm.
⑦ Repeat steps ⑤ through ⑥ at least 1 time.

SEF302H

H

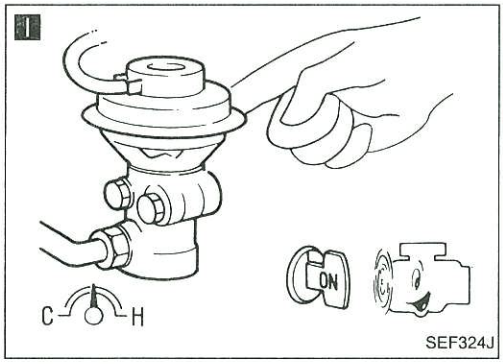


CHECK ENGINE LIGHT

SEF924F

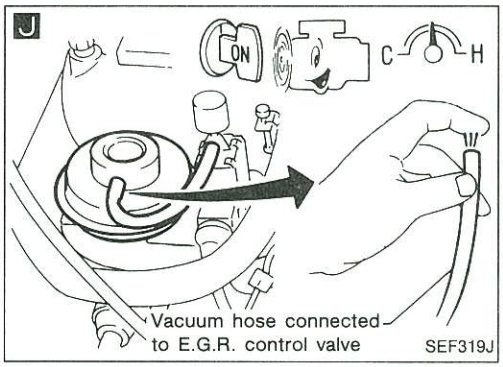
Diagnostic Procedure 30 (Cont'd)

I



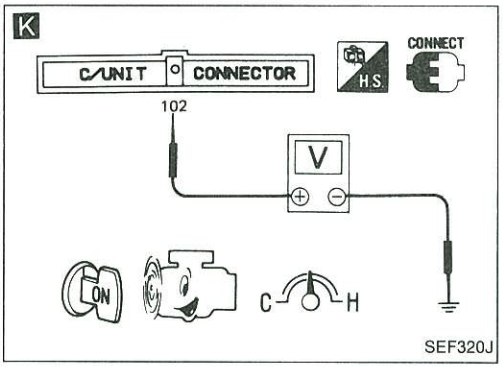
SEF324J

J



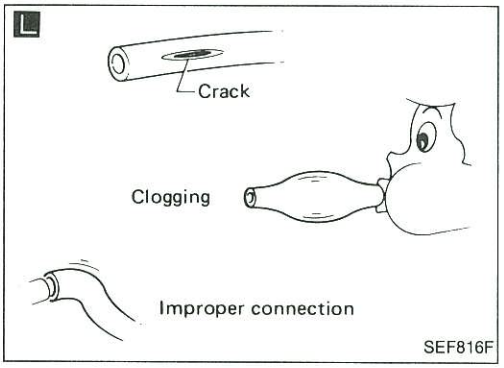
SEF319J

K



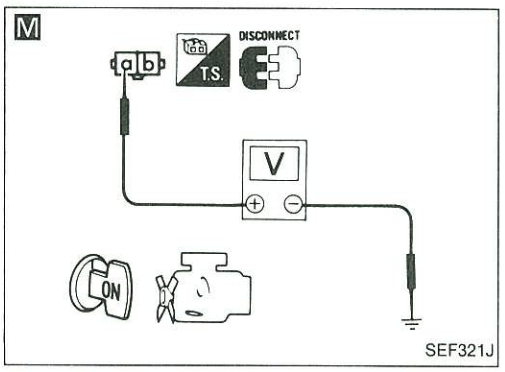
SEF320J

L



SEF816F

M



SEF321J

Non-California model

INSPECTION START

I

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform self-diagnosis.
   Make sure that code No. 12 is not displayed.
   Make sure that both crank angle sensor and E.C.U.'s C.P.U. are not in "fail-safe" state.
3) Make sure that E.G.R. control valve spring is lifted up and down when racing engine.
   (Use your finger.)

Is lifted up and down → INSPECTION END

Is not lifted up and down

J

CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Disconnect vacuum hose to E.G.R. control valve.
2) Make sure that vacuum exists under the following conditions.
   At idle:
   Vacuum should exist.
   Engine speed is about 2,000 rpm:
   Vacuum should not exist.

O.K. → CHECK COMPONENT (E.G.R. control valve). Refer to "Electrical Components Inspection". (See page EF & EC-157.)

N.G. → Replace malfunctioning component(s).

N.G.

K

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (102) and ground under the following conditions.
   Voltage:
   At idle
   0.7 - 0.8V
   Engine speed is about 2,000 rpm
   Battery voltage

O.K. → L

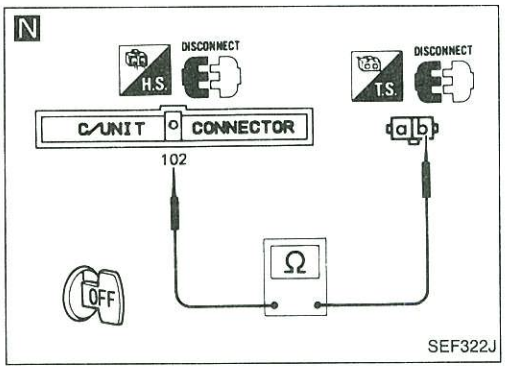
L

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

N.G. → Ⓐ

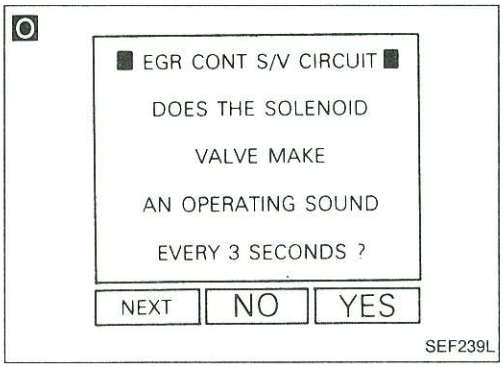
Diagnostic Procedure 30 (Cont'd)

N



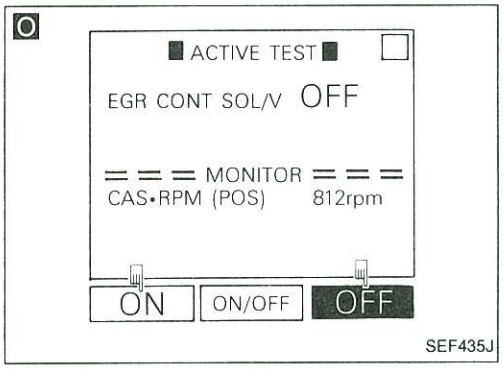
SEF322J

O



SEF239L

O



SEF435J

Ⓐ

M

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect E.G.R. control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- Harness continuity between E.G.R. control solenoid valve and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

N

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. termina (102) and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(E.G.R. control solenoid valve).

1) Turn ignition switch "ON".
2) Perform "EGR CONT S/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Turn ignition switch "ON".
2) Turn E.G.R. control 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-157.)

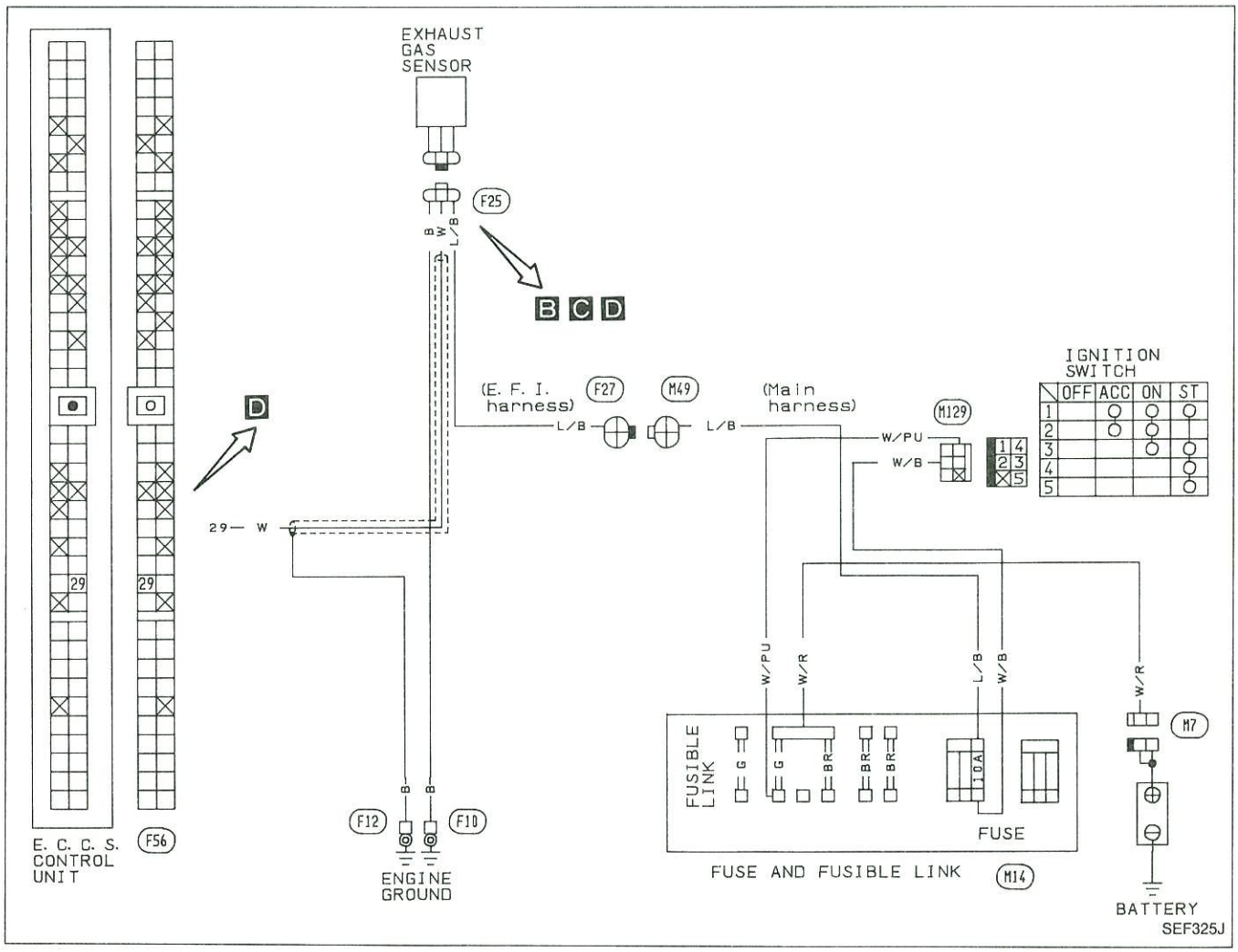
N.G. → Replace E.G.R. control solenoid valve.

O.K. ↓

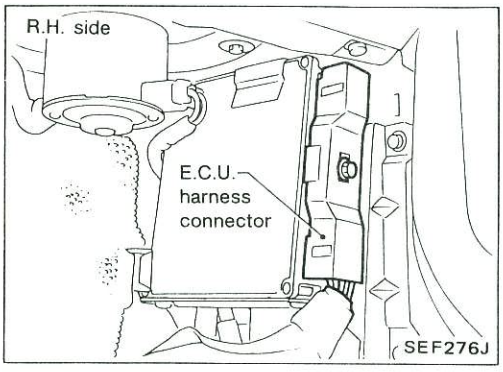
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

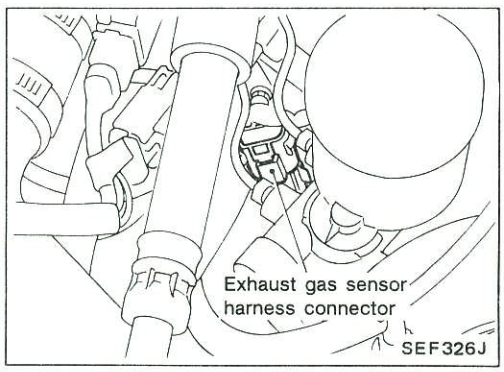
Diagnostic Procedure 31

EXHAUST GAS SENSOR (Code No. 33)



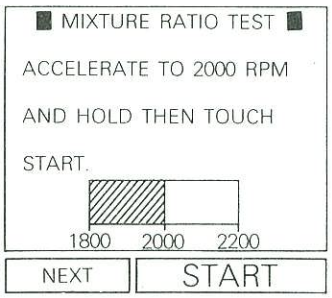
Harness layout





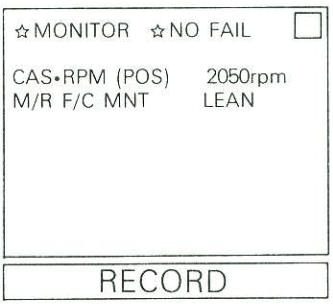
Diagnostic Procedure 31 (Cont'd)

A



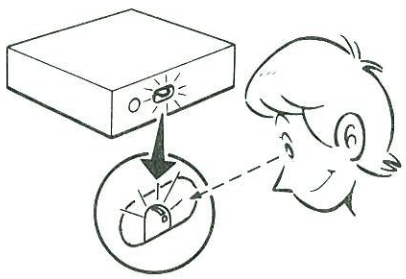
SEF632L

A



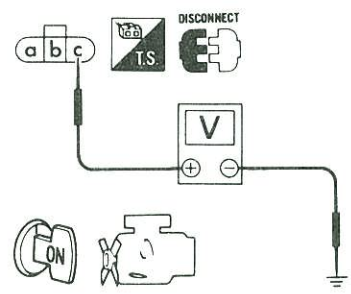
SEF427J

A



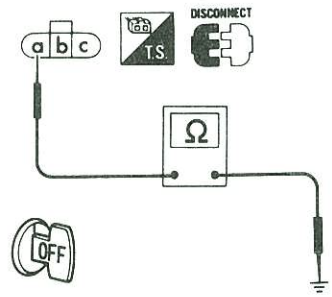
SEF417J

B



SEF327J

C



SEF328J

INSPECTION START

A

CHECK EXHAUST GAS SENSOR CIRCUIT.

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" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

OR

1) Start engine and warm it up sufficiently.
2) Run engine at about 2,000 rpm for about 2 minutes under no- load.
3) Set E.C.U. diagnosis mode to Mode II.
4) Keep engine speed at 2,000 rpm and make sure that inspection lamp on E.C.U. goes on and off more than 5 times during 10 seconds.

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Disconnect exhaust gas sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- 10A fuse
- Harness continuity between exhaust gas sensor and ignition switch

If N.G., repair harness or connectors.

O.K.

C

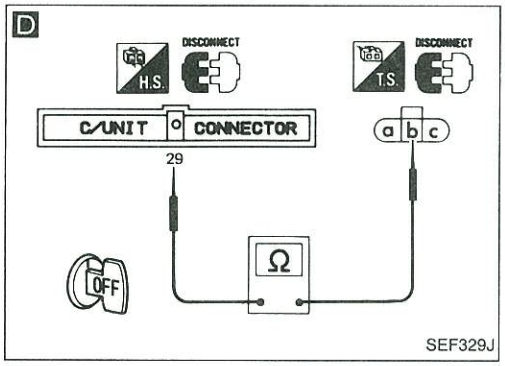
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Ⓐ

Diagnostic Procedure 31 (Cont'd)



D

Ⓐ

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㉙ and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

Replace exhaust gas sensor.

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

FINAL CHECK ↓

Erase the self-diagnosis memory. ↓

Perform driving test. ↓

Perform self-diagnosis again.

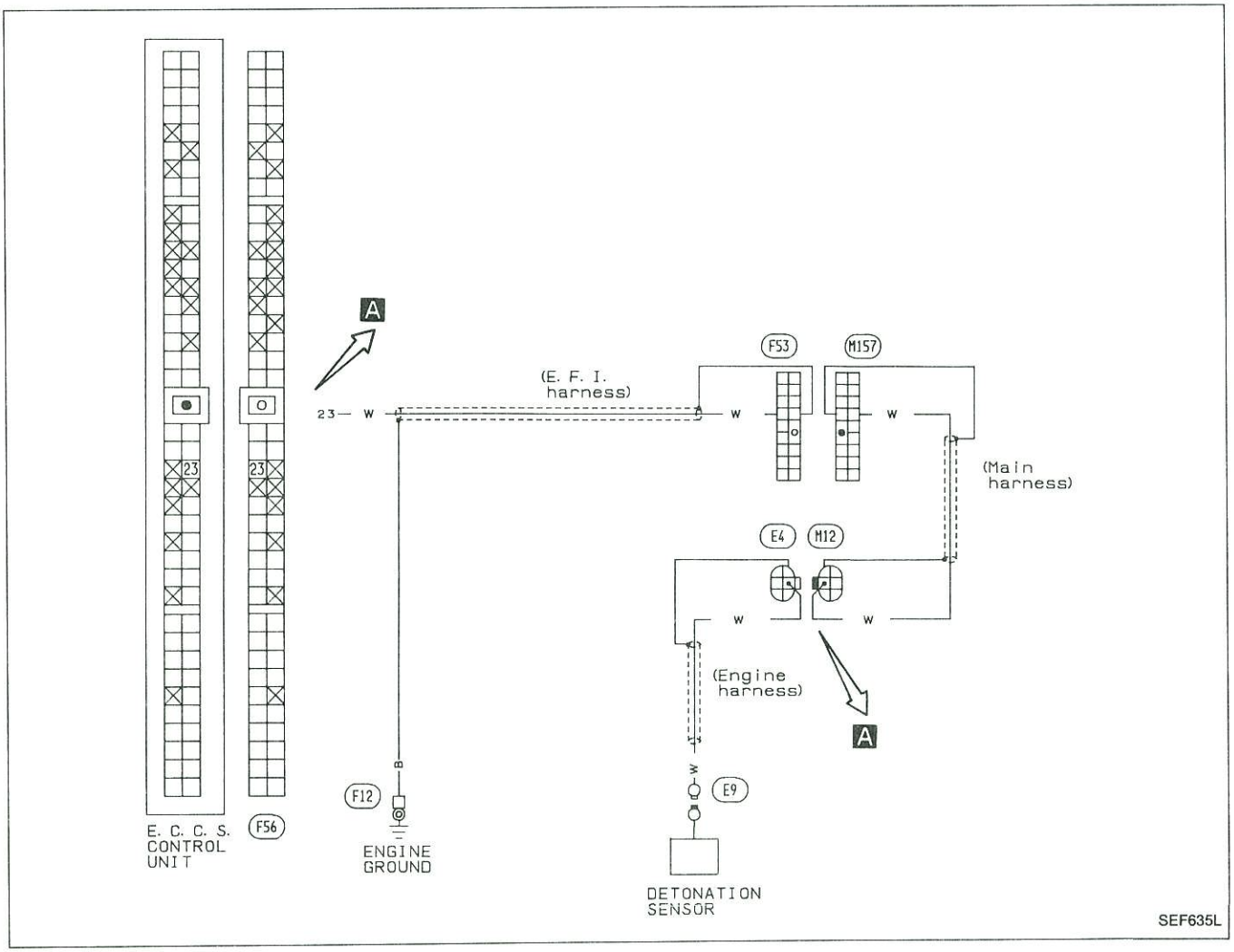
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

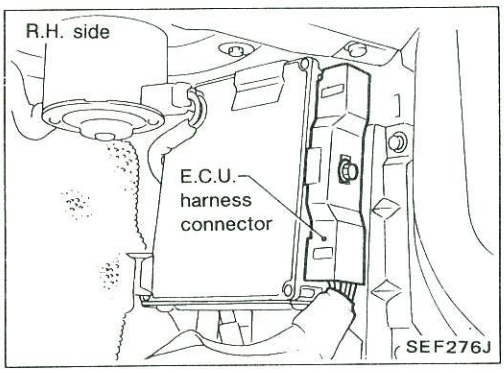
INSPECTION END

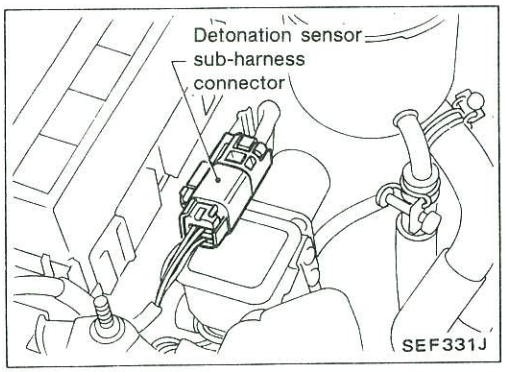
Diagnostic Procedure 32

DETONATION SENSOR (Code No. 34)

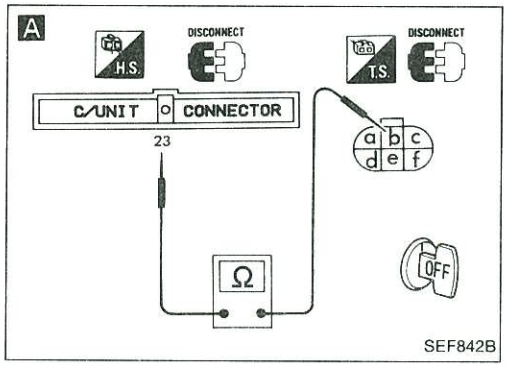


Harness layout





Diagnostic Procedure 32 (Cont'd)



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector and detonation sensor sub-harness connector.
2) Check harness continuity between terminal ⓑ and E.C.U. terminal ㉓.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F53), (M157)
- Harness continuity between E.C.U. and detonation sensor sub-harness connector

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Detonation sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-159.)

N.G. → Replace detonation sensor.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

Perform driving test.

↓

Perform self-diagnosis again.

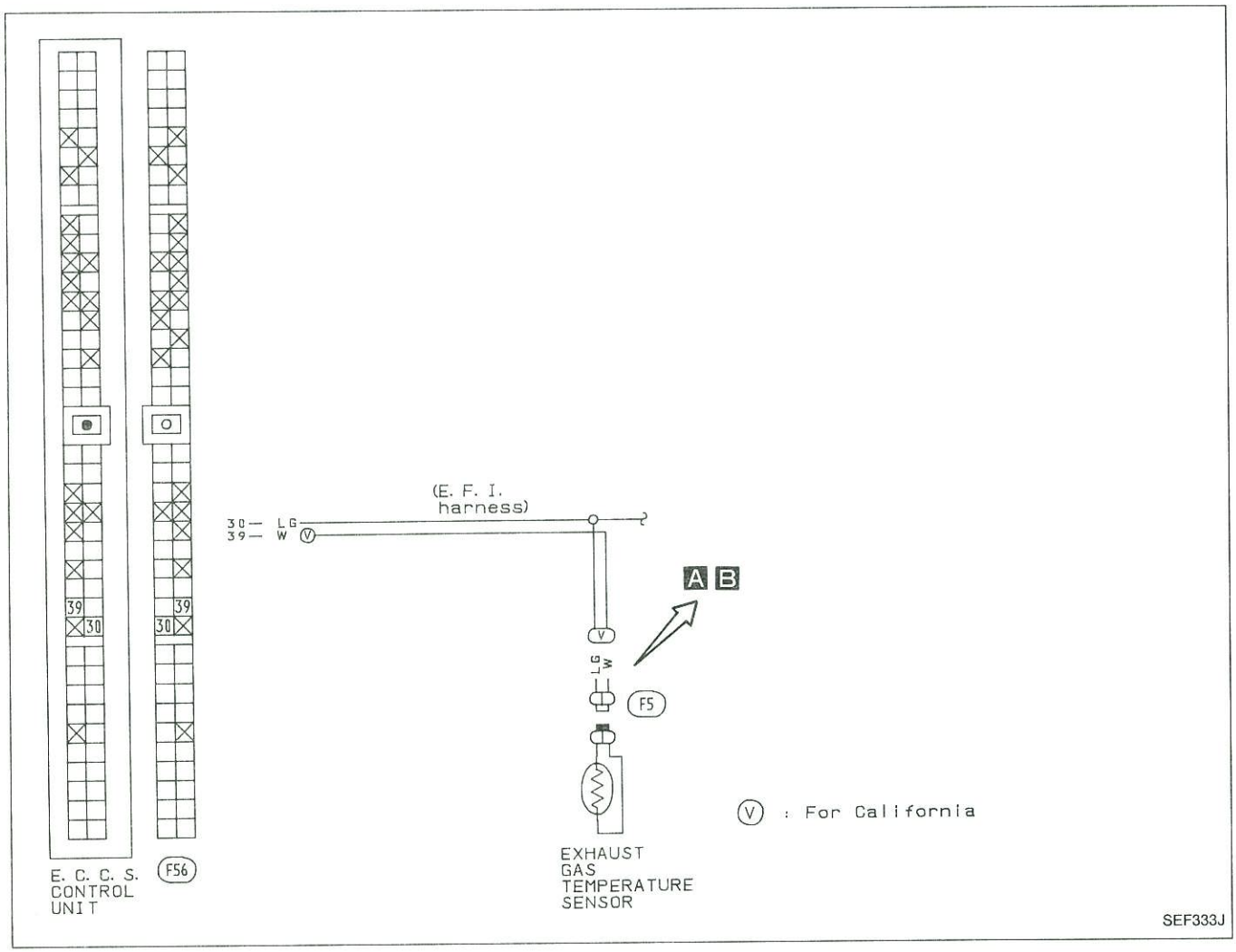
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

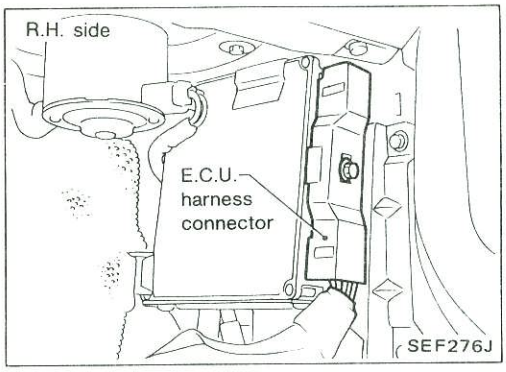
INSPECTION END

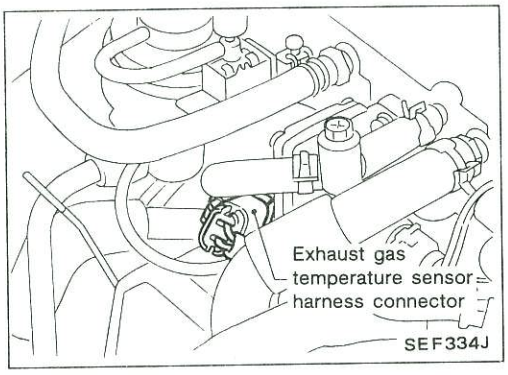
Diagnostic Procedure 33

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM): CALIFORNIA MODEL ONLY

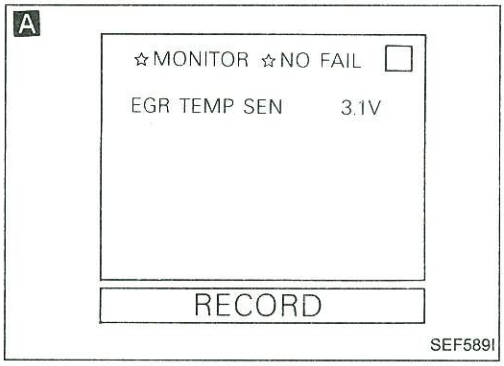


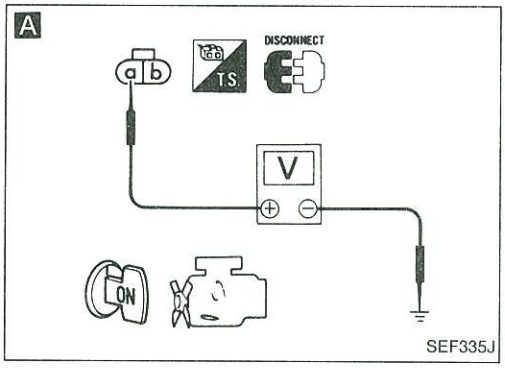
Harness layout

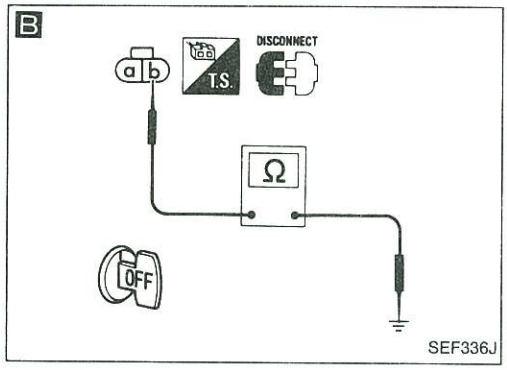




Diagnostic Procedure 33 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.

1) Start engine and warm it up sufficiently.
2) Read exhaust gas temperature sensor signal in "DATA MONITOR" mode with CONSULT.
   Voltage:
   Less than 4.5V

N.G. → Repair harness or connectors.

OR

1) Disconnect exhaust gas temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
   Voltage:
   Approximately 5V

O.K.

B

CHECK GROUND CIRCUIT.

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

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT
(Exhaust gas temperature sensor.)
Refer to "Electrical Components Inspection". (See page EF & EC-157.)

N.G. → Replace exhaust gas temperature sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK

Erase the self-diagnosis memory.

Perform driving test.

Perform self-diagnosis again.

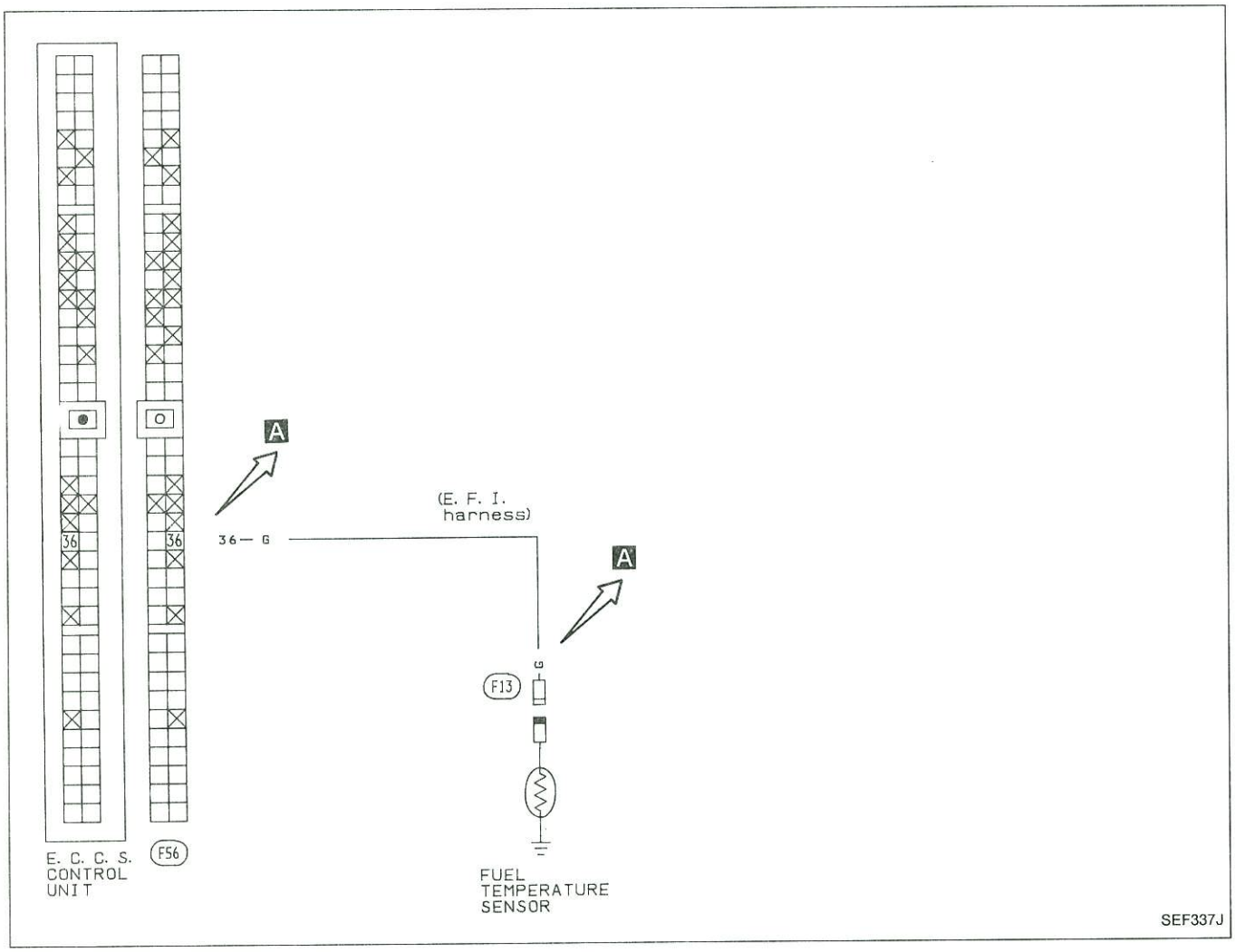
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

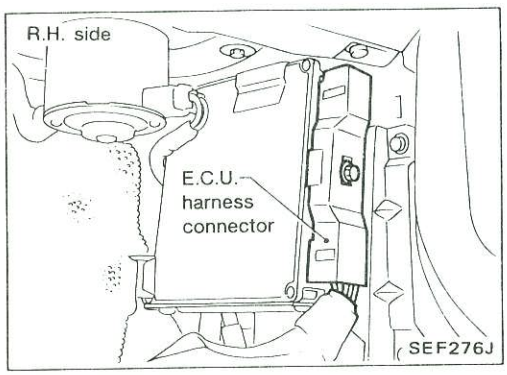
INSPECTION END

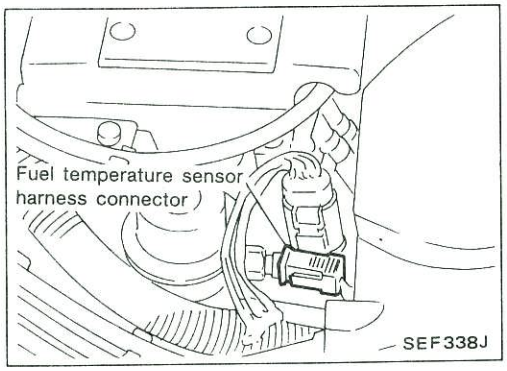
Diagnostic Procedure 34

FUEL TEMPERATURE SENSOR (Code No. 42) (CHECK ENGINE LIGHT ITEM)

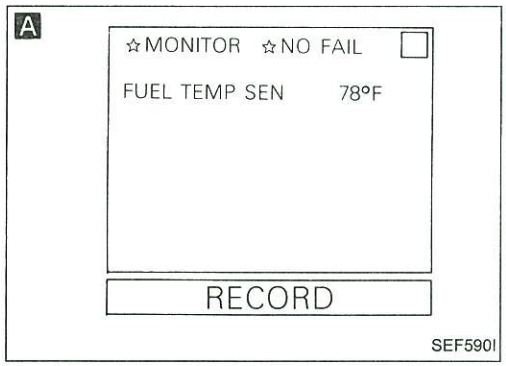


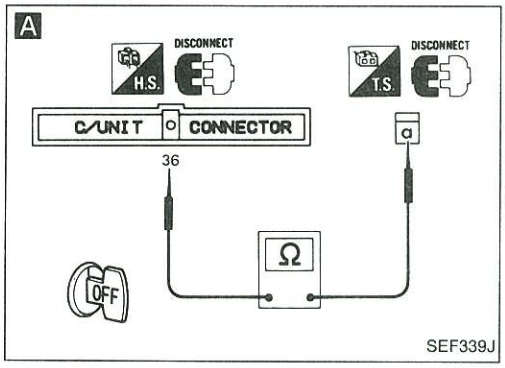
Harness layout





Diagnostic Procedure 34 (Cont'd)





INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
Read fuel temperature sensor signal in "DATA MONITOR" mode with CONSULT after engine warm-up.
Fuel temperature:
20 - 60°C (68 - 140°F)

N.G. → Repair harness or connectors.

OR

1) Disconnect E.C.U. harness connector and fuel temperature sensor harness connector.
2) Check harness continuity between terminal ⓐ and E.C.U. terminal ㊱.
Continuity should exist.

O.K.

CHECK COMPONENT
(Fuel temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-161.)

N.G. → Replace fuel temperature sensor.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK

Erase the self-diagnosis memory.

Perform driving test.

Perform self-diagnosis again.

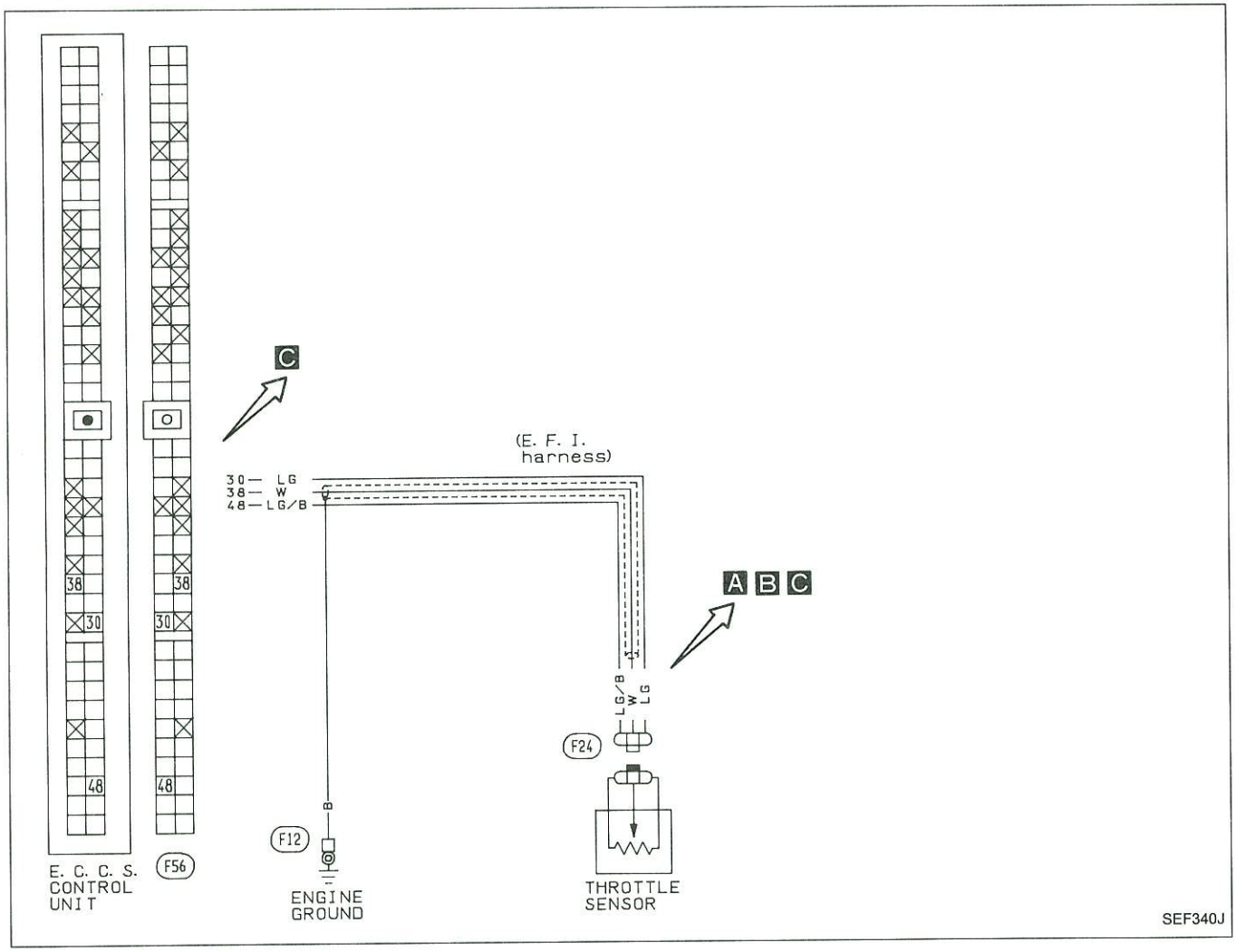
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

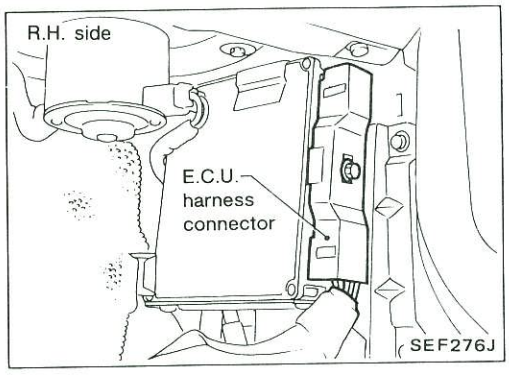
INSPECTION END

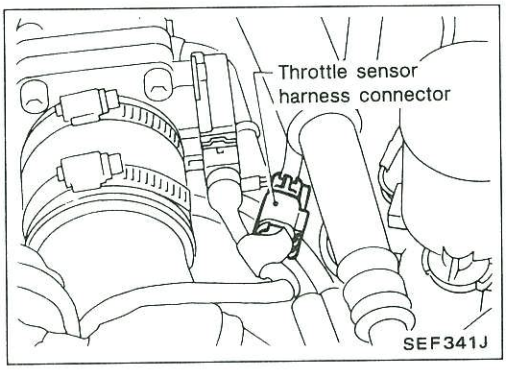
Diagnostic Procedure 35

THROTTLE SENSOR (Code No. 43) CHECK (CHECK ENGINE LIGHT ITEM)

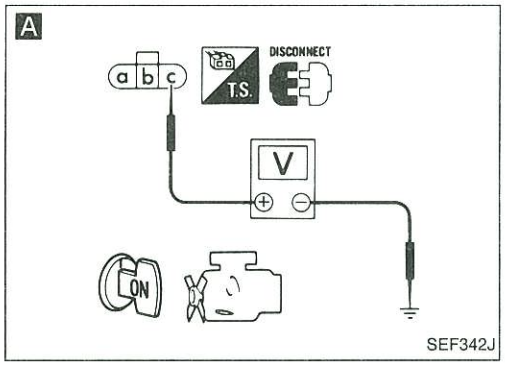


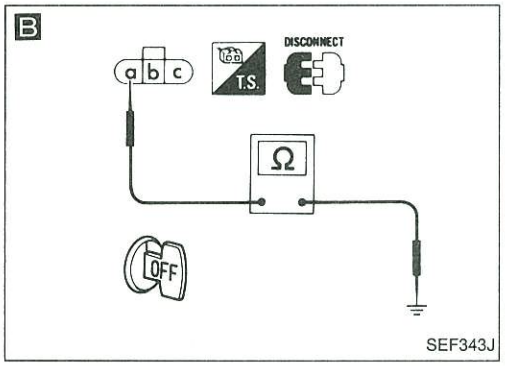
Harness layout

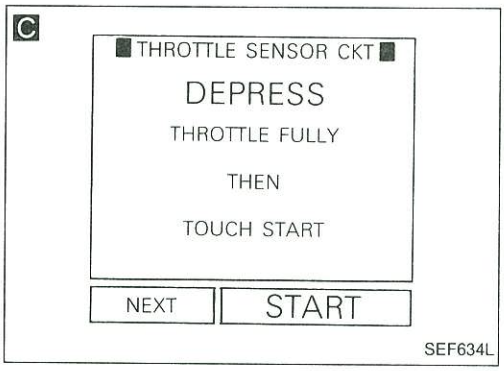


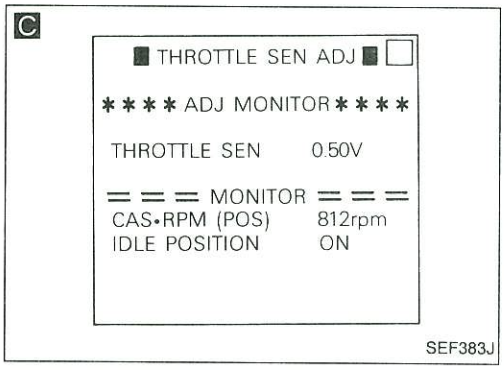


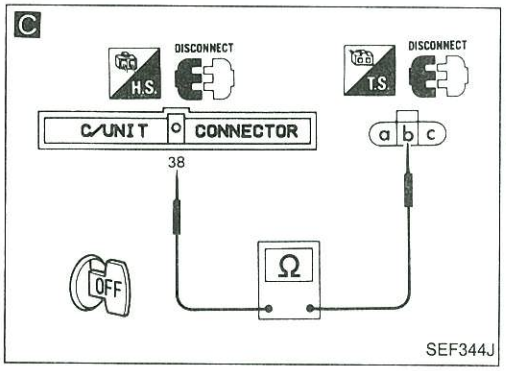
Diagnostic Procedure 35 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Approximately 5V

N.G. → Repair harness or connectors.

O.K.

B

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

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
Perform "THROTTLE SENSOR CKT" in "FUNCTION TEST" mode with CONSULT.

N.G. → Repair harness or connectors.

OR

1) Reconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Read throttle 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

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㊳ and terminal ⓑ.
Continuity should exist.

O.K.

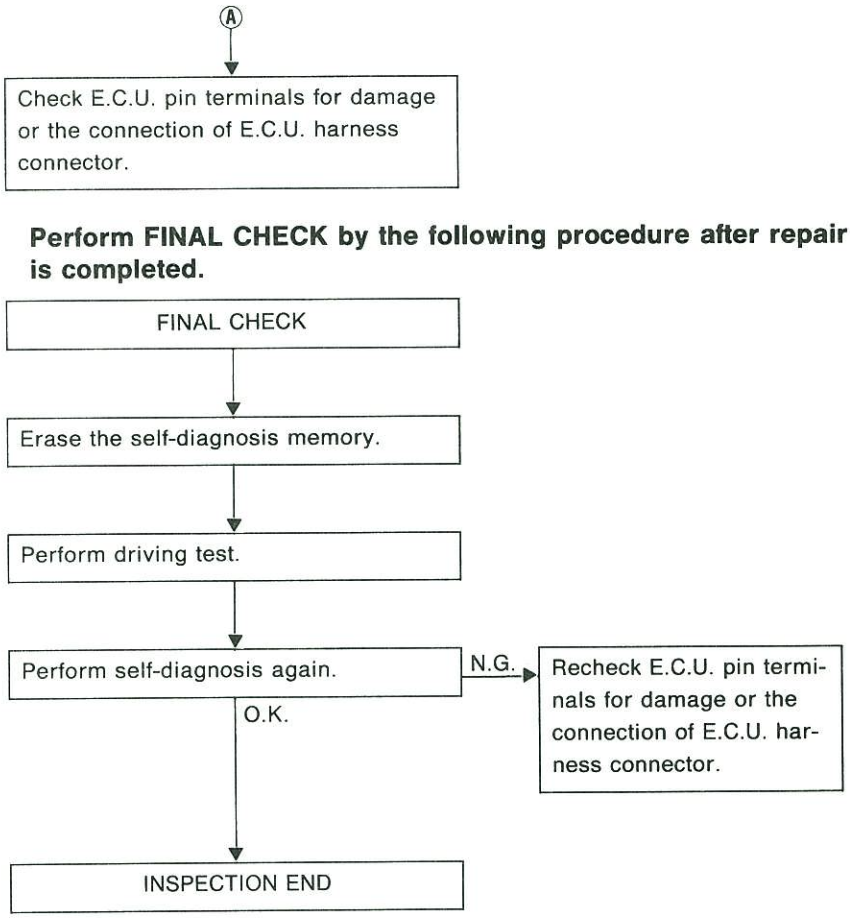
CHECK COMPONENT
(Throttle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-158.)

N.G. → Replace throttle sensor.

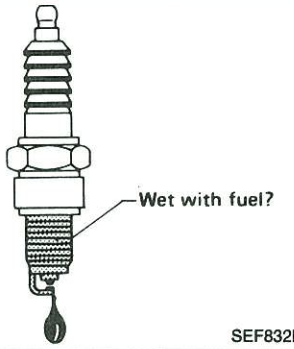
O.K.

Ⓐ

Diagnostic Procedure 35 (Cont'd)

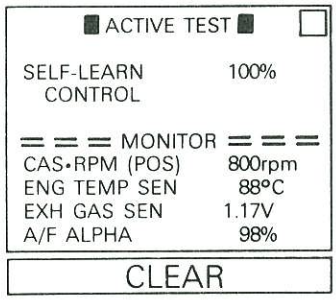


A



SEF832F

B



SEF950J

C **ROAD TEST**

Test condition

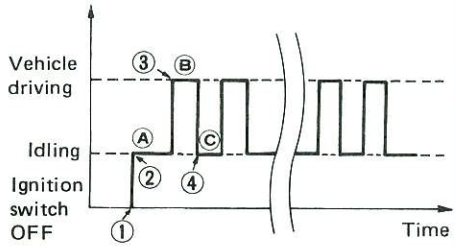
Drive vehicle under the following conditions with a suitable shift position.

(1) Engine speed:
2,500±700 rpm

(2) Intake manifold vacuum:
−46.7±6.7 kPa
(−350±50 mmHg, −13.78±1.97 inHg)

Driving mode

Ⓐ : 60 seconds or more
Ⓑ : 5 seconds or more
Ⓒ : 10 seconds or more



① Start engine and warm it up sufficiently.
② Keep engine at idle speed for at least 60 seconds.
③ Shift to a suitable gear position and drive in "Test condition" for at least 5 seconds.
④ Keep engine at idle speed for at least 10 seconds.
⑤ Repeat steps ② through ④ at least 10 times.

SEF889J

Diagnostic Procedure 36

INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

INSPECTION START

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

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

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

Set diagnosis to Mode II and check that inspection lamps on E.C.U. blink at 2,000 rpm under no-load.

Does not blink → Check idle CO%. (See page EF & EC- 27.)

Blinks → INSPECTION END

Does not run smoothly

Set the diagnosis mode selector of E.C.U. to Mode II.

Check if inspection lamp on E.C.U. stays off for 10 seconds with engine at idle speed.

Stays off

Doe not stay off → Check mixture ratio feedback system. (See page EF & EC-26.)

A

Remove all spark plugs from cylinder head. Is any plug wet with fuel?

Yes → Replace injectors which supply cylinders having wet spark plugs.

No

Remove injector assembly. (See page EF & EC-163.) Keep fuel hose and all injectors connected to injector gallery.

Turn ignition switch "ON". Make sure fuel does not drip from injector.

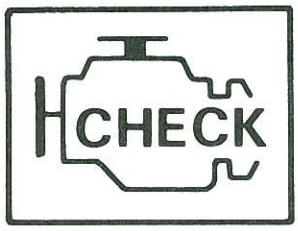
Drips → Replace the injectors from which fuel is dripping.

Does not drip

Go to FINAL CHECK.

Diagnostic Procedure 36 (Cont'd)

D



CHECK ENGINE LIGHT

SEF924F

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

FINAL CHECK

↓

Erase the self-diagnosis memory. Make sure code No. 55 is displayed in Mode II.

↓

B

Clear the self-learning data using the following procedure:

1) Start engine and warm it up sufficiently.

2) Select "SELF- LEARNING CONT" in "ACTIVE TEST" mode.

3) Clear the self-learning control coefficient by touching "CLEAR"

OR

2) Disconnect air flow meter connector, and restart and run engine for at least 30 seconds at 2,000 rpm.

3) Stop engine and reconnect air flow meter connector.

4) Make sure Code No. 12 is displayed in Mode II.

5) Erase the self- diagnosis memory.
Make sure Code No. 55 is displayed in Mode II.

↓

C

Perform engine racing test as indicated in figure C .

↓

D

Make sure that check engine light does not come on during engine test.

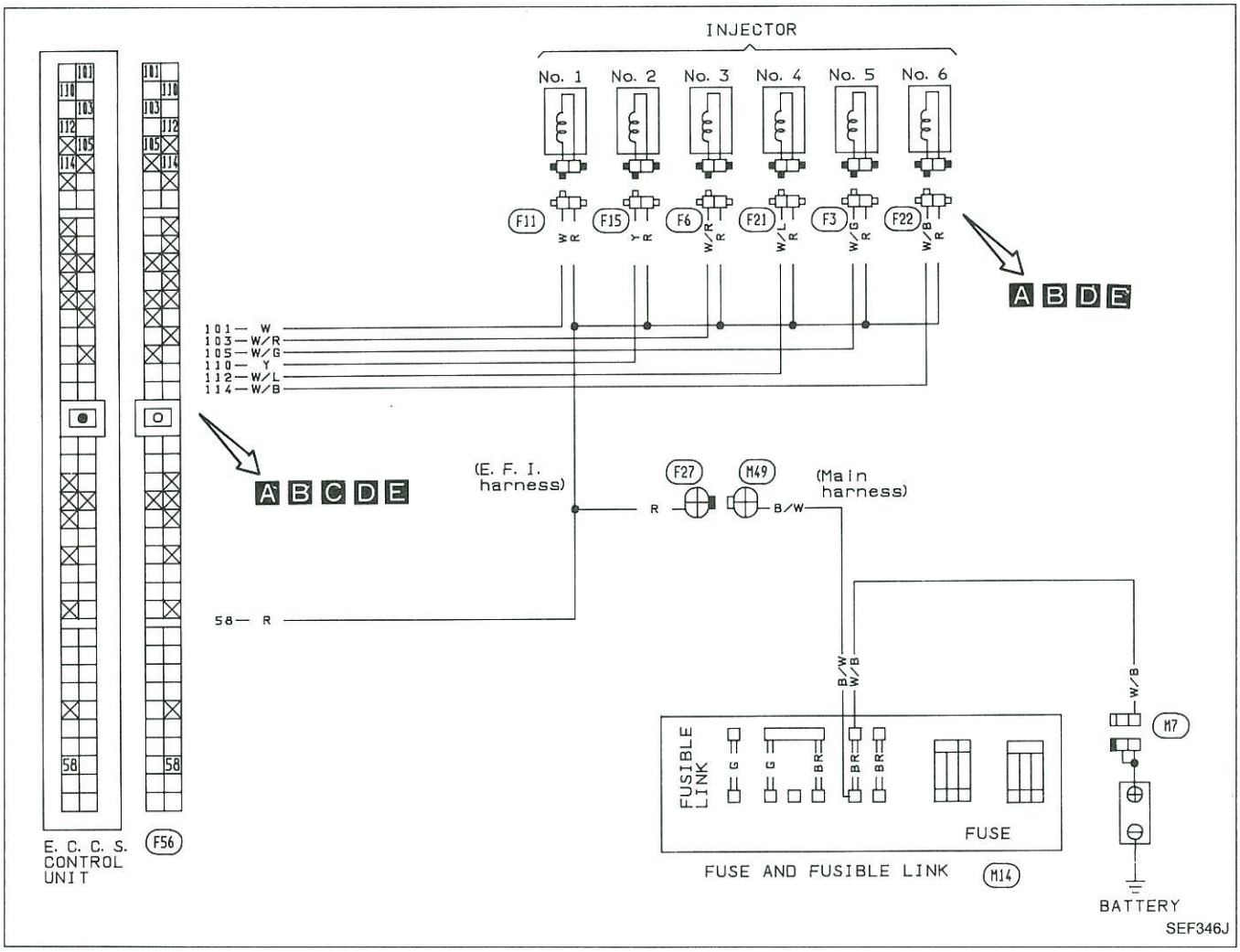
Comes on → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Does not come on ↓

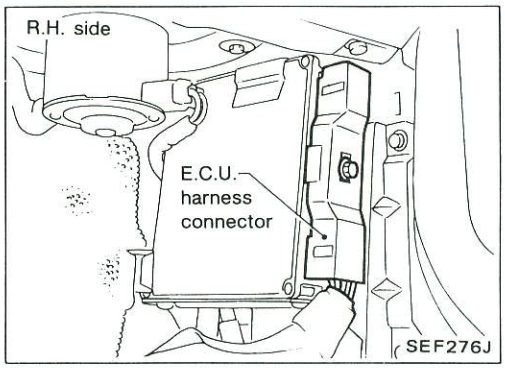
INSPECTION END

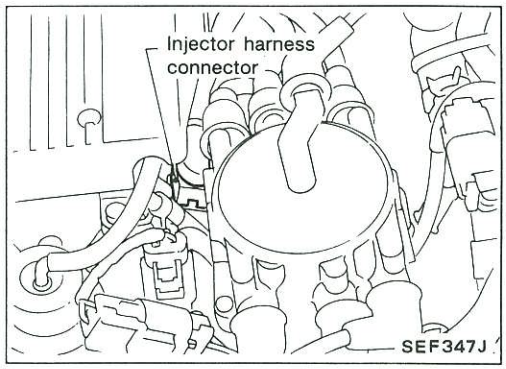
Diagnostic Procedure 37

INJECTOR CIRCUIT (Code No. 51) (CHECK ENGINE LIGHT ITEM): CALIFORNIA MODEL
INJECTOR CIRCUIT (Not self-diagnostic item): NON-CALIFORNIA MODEL

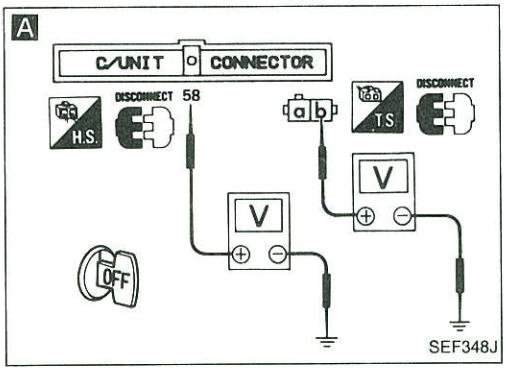


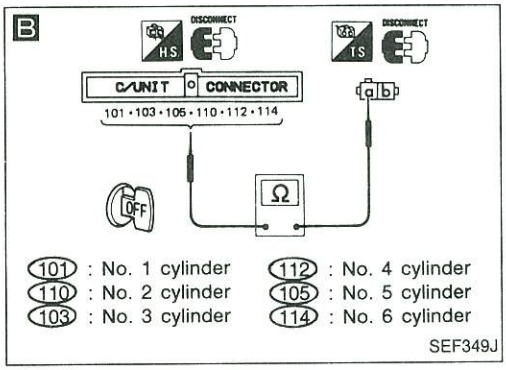
Harness layout





Diagnostic Procedure 37 (Cont'd)





California model

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect injector harness connector and E.C.U. harness connector.
2) Check voltage between terminal ⓑ and ground, E.C.U. terminal ㊽ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- "BR" fusible link
- Harness continuity between battery and injector
- Harness continuity between battery and E.C.U.

If N.G., repair harness or connectors.

O.K. ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓐ and E.C.U. 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-160.)

N.G. → Replace injector.

O.K. ↓

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

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

FINAL CHECK ↓

Erase the self-diagnosis memory. ↓

Perform driving test. ↓

Perform self-diagnosis again.

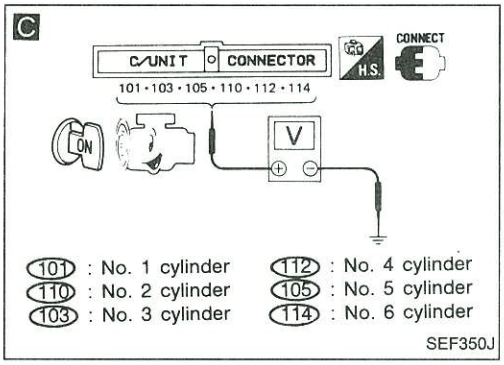
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

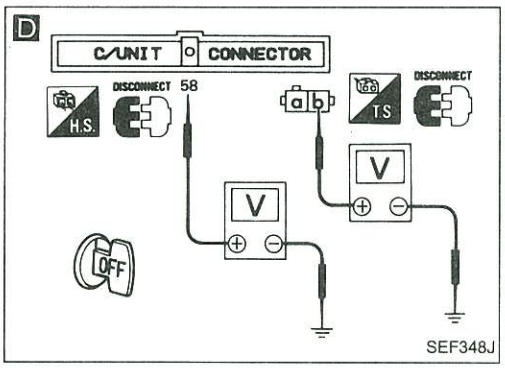
INSPECTION END

Diagnostic Procedure 37 (Cont'd)

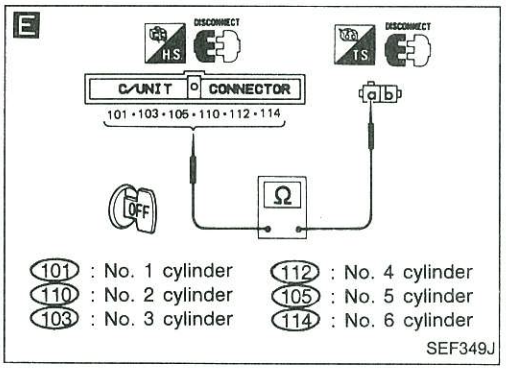
C



D



E



Non-California model

INSPECTION START

C

CHECK CONTROL FUNCTION.
1) Start engine.
2) Check voltage between E.C.U. terminals (101), (103), (105), (110), (112), (114) and ground.
Voltage: Battery voltage

O.K. → INSPECTION END

N.G.

D

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect injector harness connector and E.C.U. harness connector.
3) Check voltage between terminal (b) and ground, E.C.U. terminal (58) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- "BR" fusible link
- Harness continuity between battery and injector
- Harness continuity between battery and E.C.U.

If N.G., repair harness or connectors.

O.K.

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal (a) and E.C.U. 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-160.)

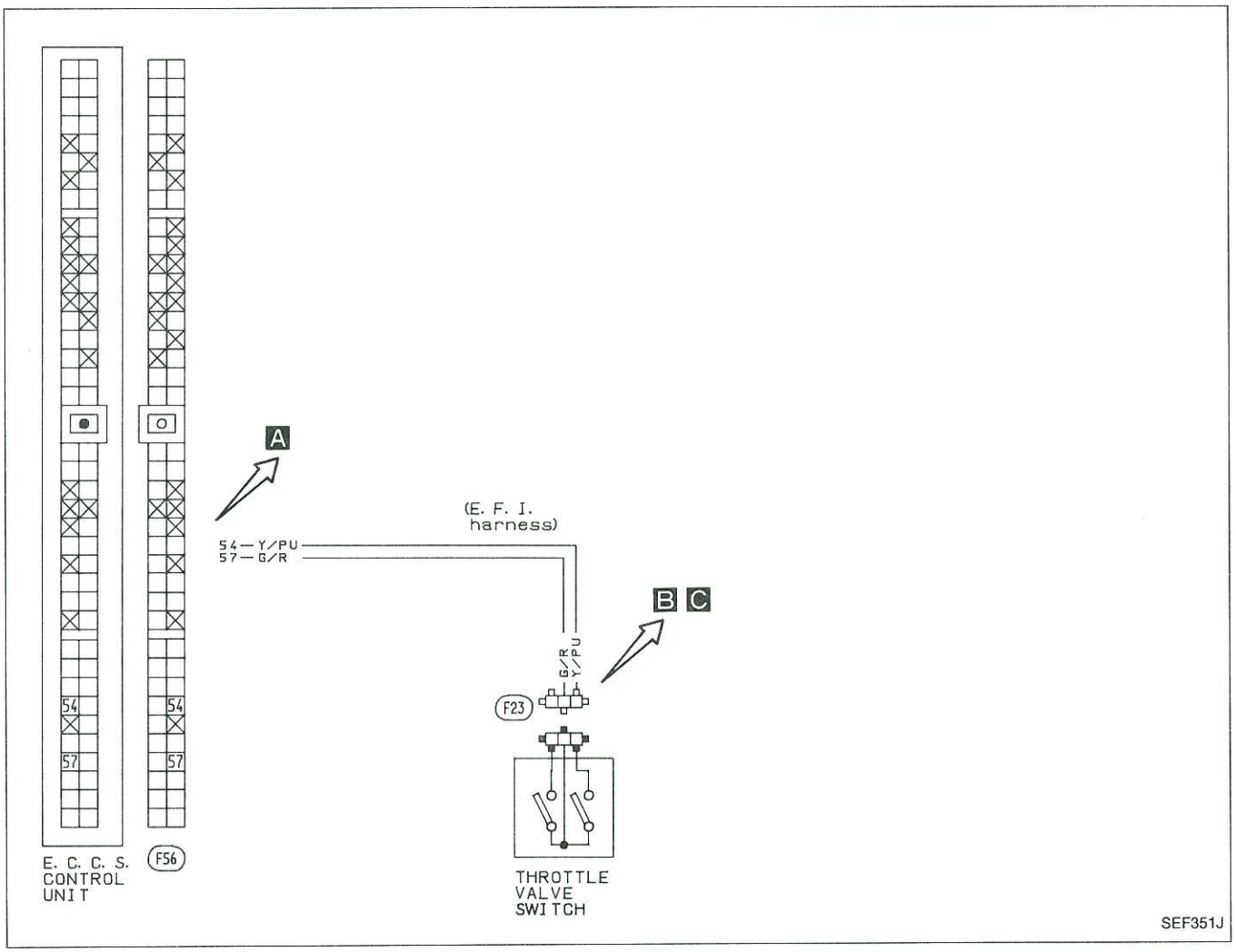
N.G. → Replace injector.

O.K.

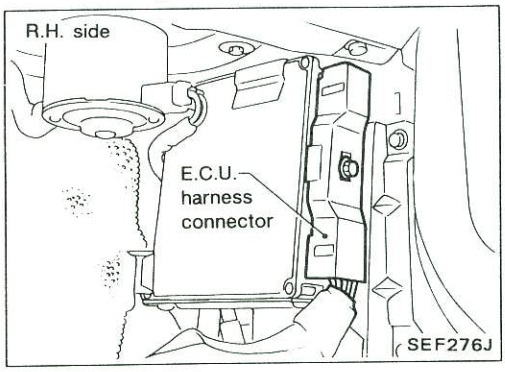
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

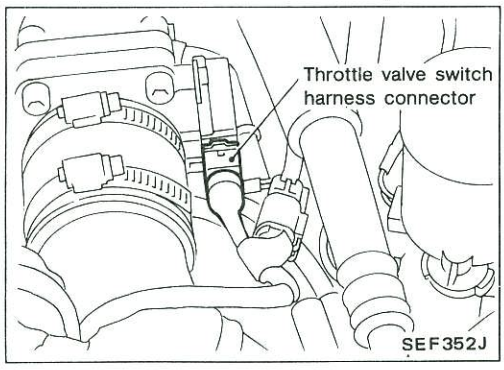
Diagnostic Procedure 38

THROTTLE VALVE SWITCH (Not self-diagnostic item)

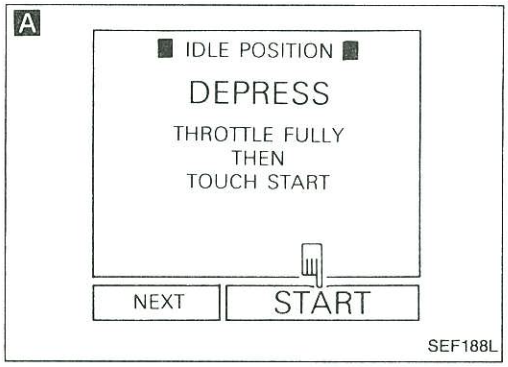


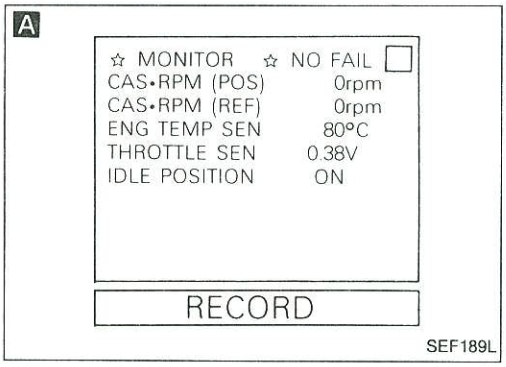
Harness layout

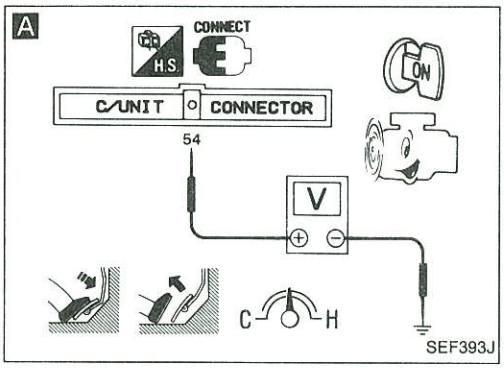


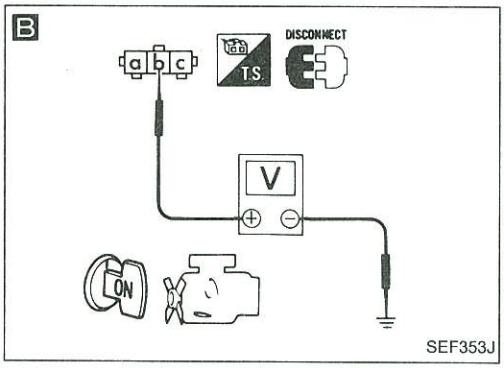


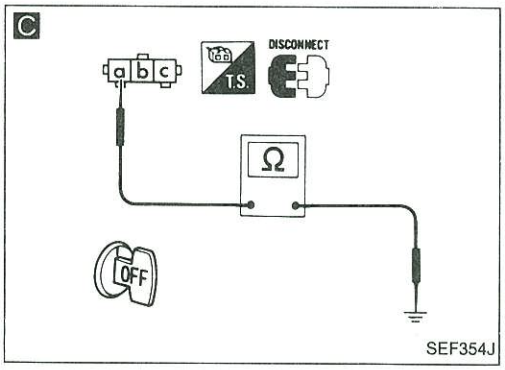
Diagnostic Procedure 38 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF".
3) Disconnect throttle sensor harness connector.
4) Turn ignition switch "ON".
5) Perform "IDLE POSITION" in "FUNCTION TEST" mode with CONSULT.

OR

5) Check "DATA MONITOR" mode with CONSULT.

Idle position:
Accelerator pedal is released ... ON
Accelerator pedal is depressed .. OFF

OR

3) Turn ignition switch "ON".
4) Check voltage between E.C.U. terminal ⑭ and ground under the following conditions.

Voltage:
Accelerator pedal is released
Approximately 8 - 10V
Accelerator pedal is depressed
Approximately 0V

O.K. → INSPECTION END

N.G.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect throttle valve switch harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.

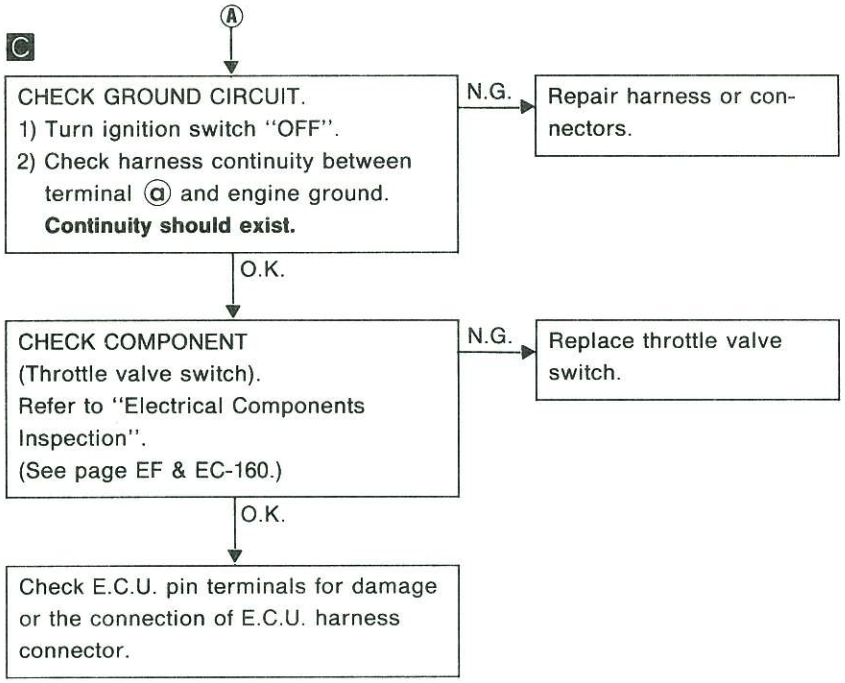
Voltage:
Approximately 8 - 10V

N.G. → Repair harness or connectors.

O.K.

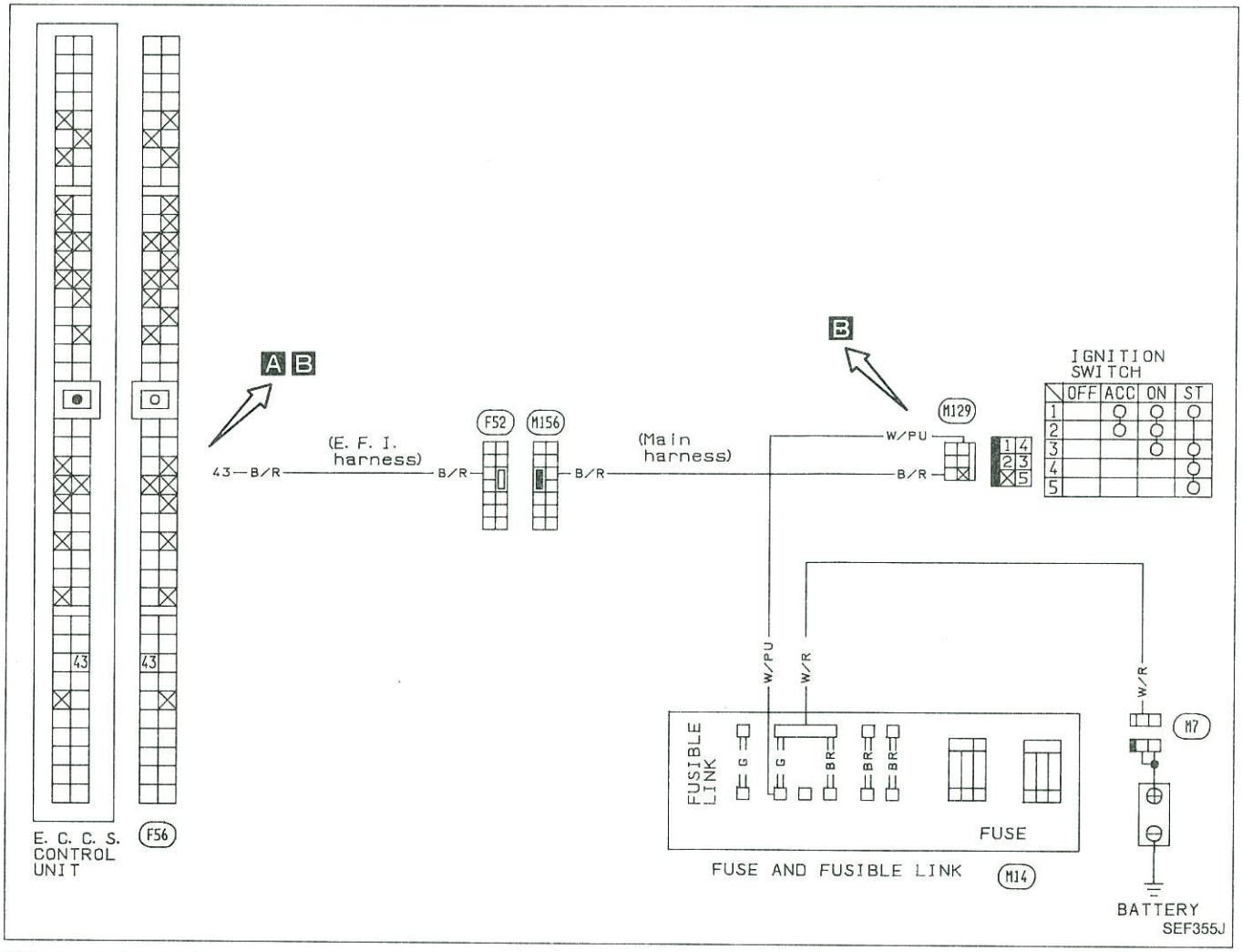
Ⓐ

Diagnostic Procedure 38 (Cont'd)

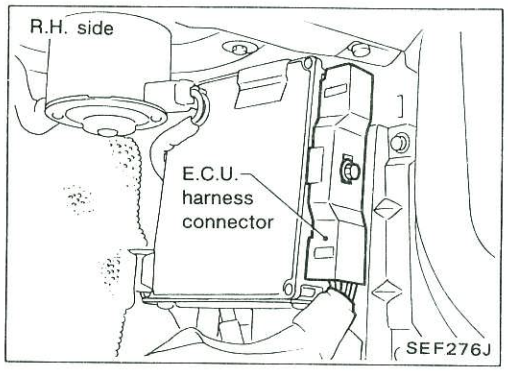


Diagnostic Procedure 39

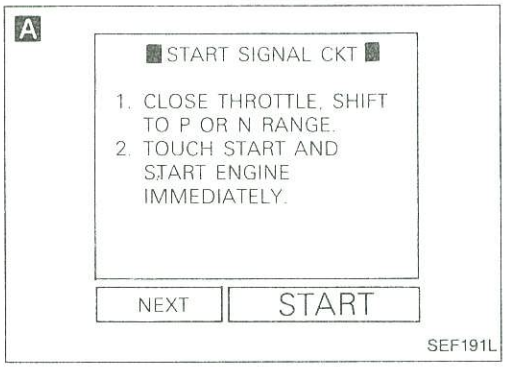
START SIGNAL (Not self-diagnostic item)

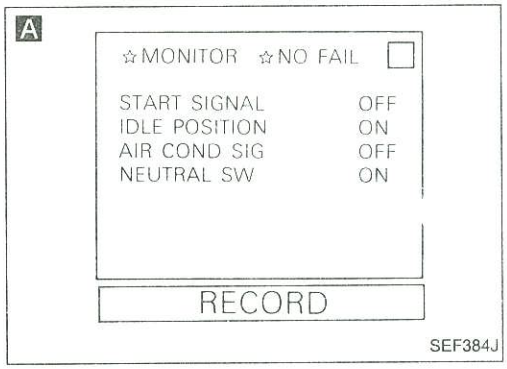


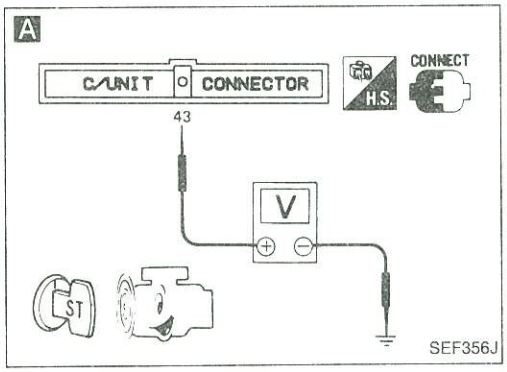
Harness layout

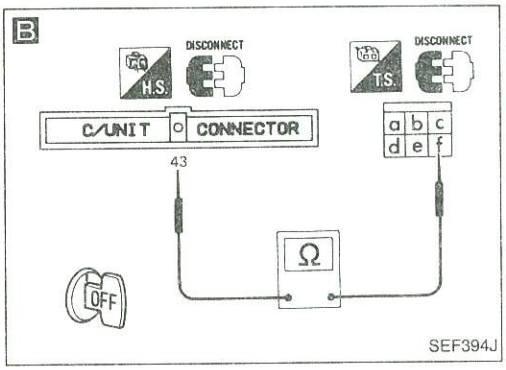


Diagnostic Procedure 39 (Cont'd)









INSPECTION START

A

CHECK OVERALL FUNCTION.

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

O.K. → INSPECTION END

OR

1) Turn ignition switch "ON".
2) Check start signal in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1) Turn ignition switch to "START".
2) Check voltage between E.C.U. terminal ㊸ and ground with CONSULT or tester.

Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

N.G.

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and ignition switch harness connector.
3) Check harness continuity between E.C.U. terminal ㊸ and terminal ⓕ.

Continuity should exist.

N.G. → Check the following.
- Harness connectors (F52), (M156)
- Harness continuity between E.C.U. and ignition switch

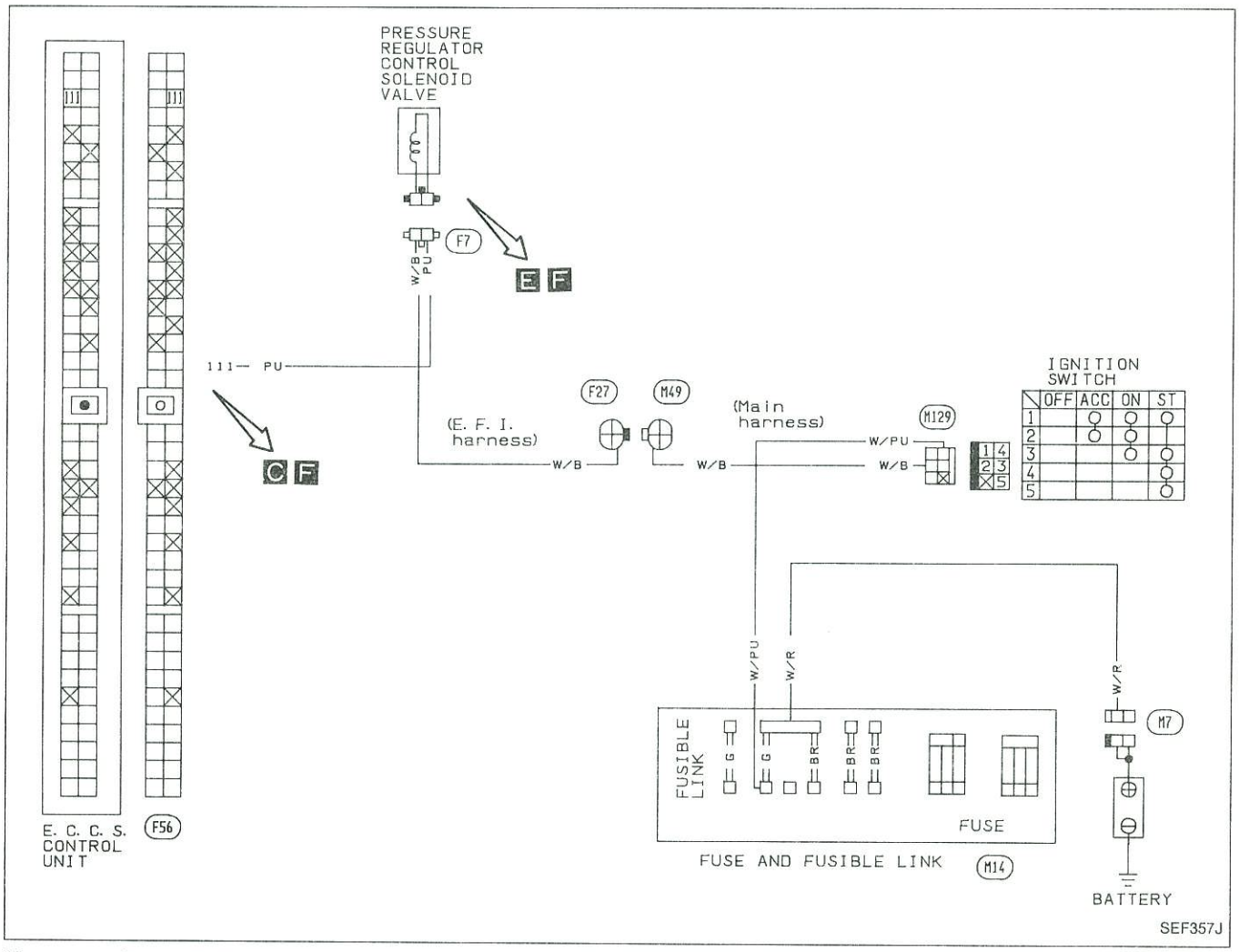
If N.G., repair harness or connectors.

O.K.

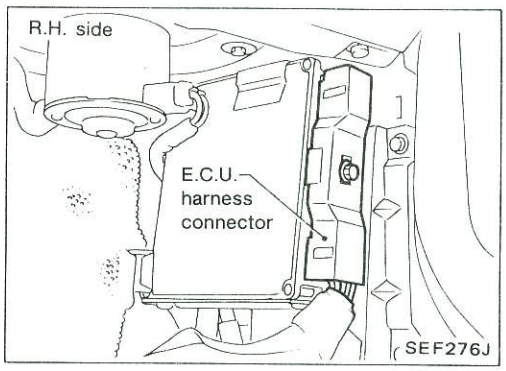
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

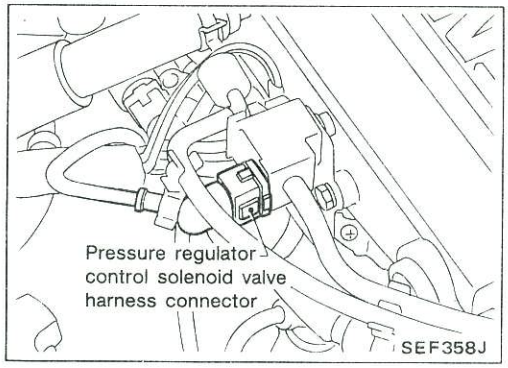
Diagnostic Procedure 40

P.R.V.R. CONTROL (Not self-diagnostic item)

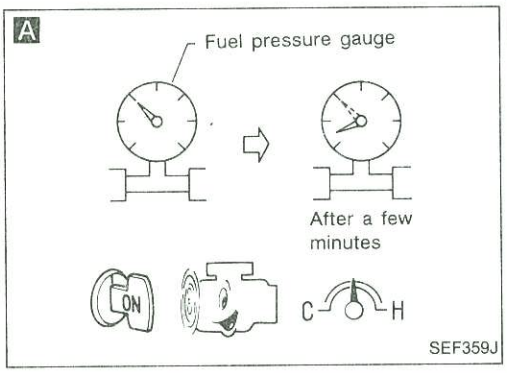


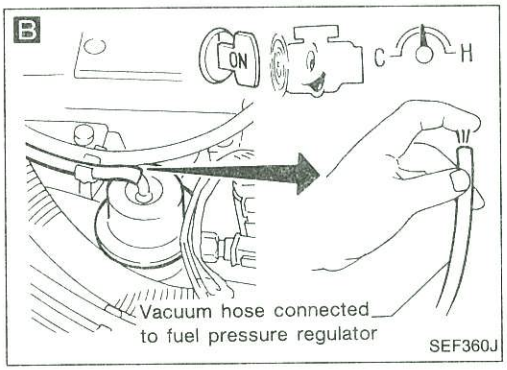
Harness layout

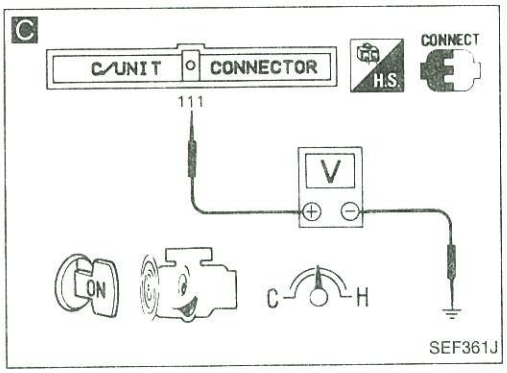


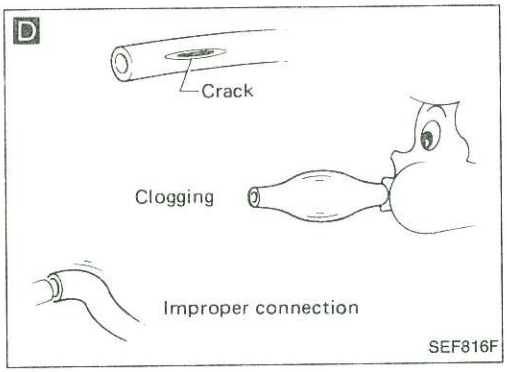


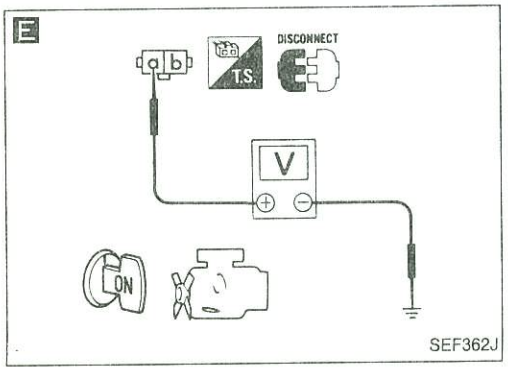
Diagnostic Procedure 40 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Install fuel pressure gauge in fuel feed hose.
(See page EF & EC-162.)
2) Start engine and warm it up sufficiently.
3) Perform self-diagnosis.
Make sure that code No. 42 is not displayed.
4) Stop engine.
5) Disconnect fuel temperature sensor harness connector, and connect a resistor (0.1 kΩ) between fuel temperature sensor harness connector and ground. (*: See NOTE.)
6) Restart engine and check fuel pressure.
Fuel pressure:
Approximately 294 kPa (3.0 kg/cm², 43 psi)
7) Make sure that fuel pressure decreases after a few minutes.
Fuel pressure:
Approximately 235 kPa (2.4 kg/cm², 34 psi)

O.K. → INSPECTION END

N.G. ↓

B

CHECK VACUUM SOURCE TO FUEL PRESSURE REGULATOR.
1) Stop engine.
2) Disconnect vacuum hose connected to fuel pressure regulator.
3) Restart engine.
4) Make sure that vacuum exists.

O.K. → CHECK COMPONENT (Fuel pressure regulator). Refer to "Fuel Pressure Check". (See page EF & EC-162.)

N.G. ↓

C

CHECK CONTROL FUNCTION.
1) Stop engine and reconnect vacuum hose to fuel pressure regulator.
2) Restart engine.
3) Check voltage between E.C.U. terminal (111) and ground.
Voltage: 0 - 1.0V
4) After more than 3 minutes, recheck voltage between E.C.U. terminal (111) and ground.
Voltage: Battery voltage

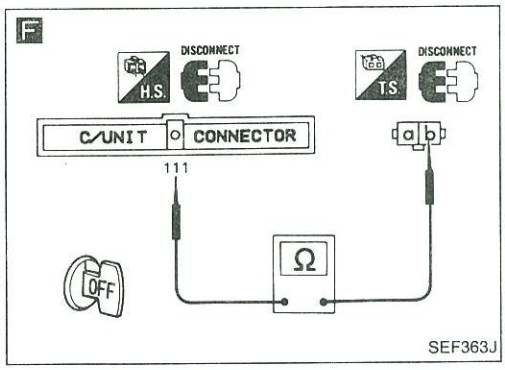
O.K. → D

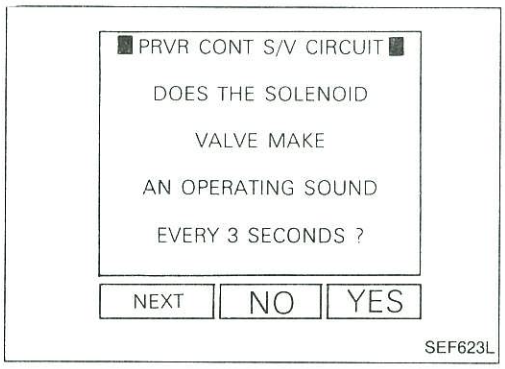
CHECK VACUUM HOSE
1) Check vacuum hose for clogging, cracks and proper connection.

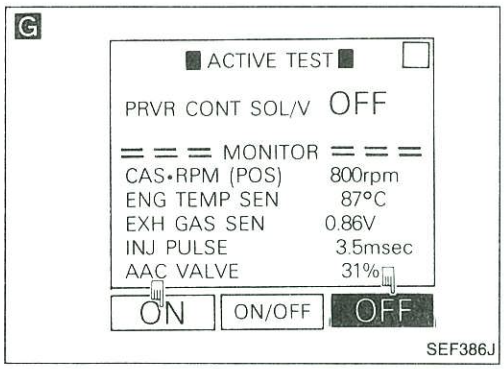
N.G. ↓

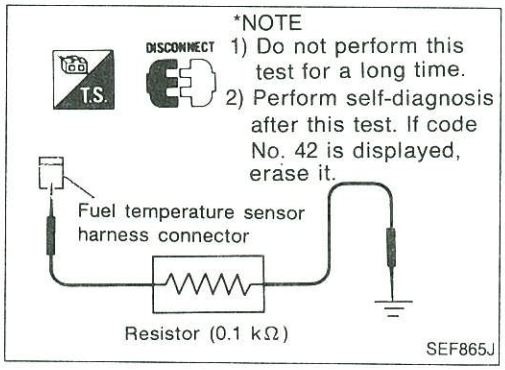
Ⓐ

Diagnostic Procedure 40 (Cont'd)









Ⓐ

E

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect pressure regulator control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- Harness continuity between pressure regulator control solenoid valve and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (111) and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

G

CHECK COMPONENT
(Pressure regulator control solenoid valve).

Perform "PRVR CONT S/V CIRCUIT" in "FUNCTION-TEST" mode with CONSULT.

OR

1) Reconnect pressure regulator control solenoid valve harness connector and E.C.U. harness connector.
2) Start engine.
3) Turn P.R.V.R. control 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-157.)

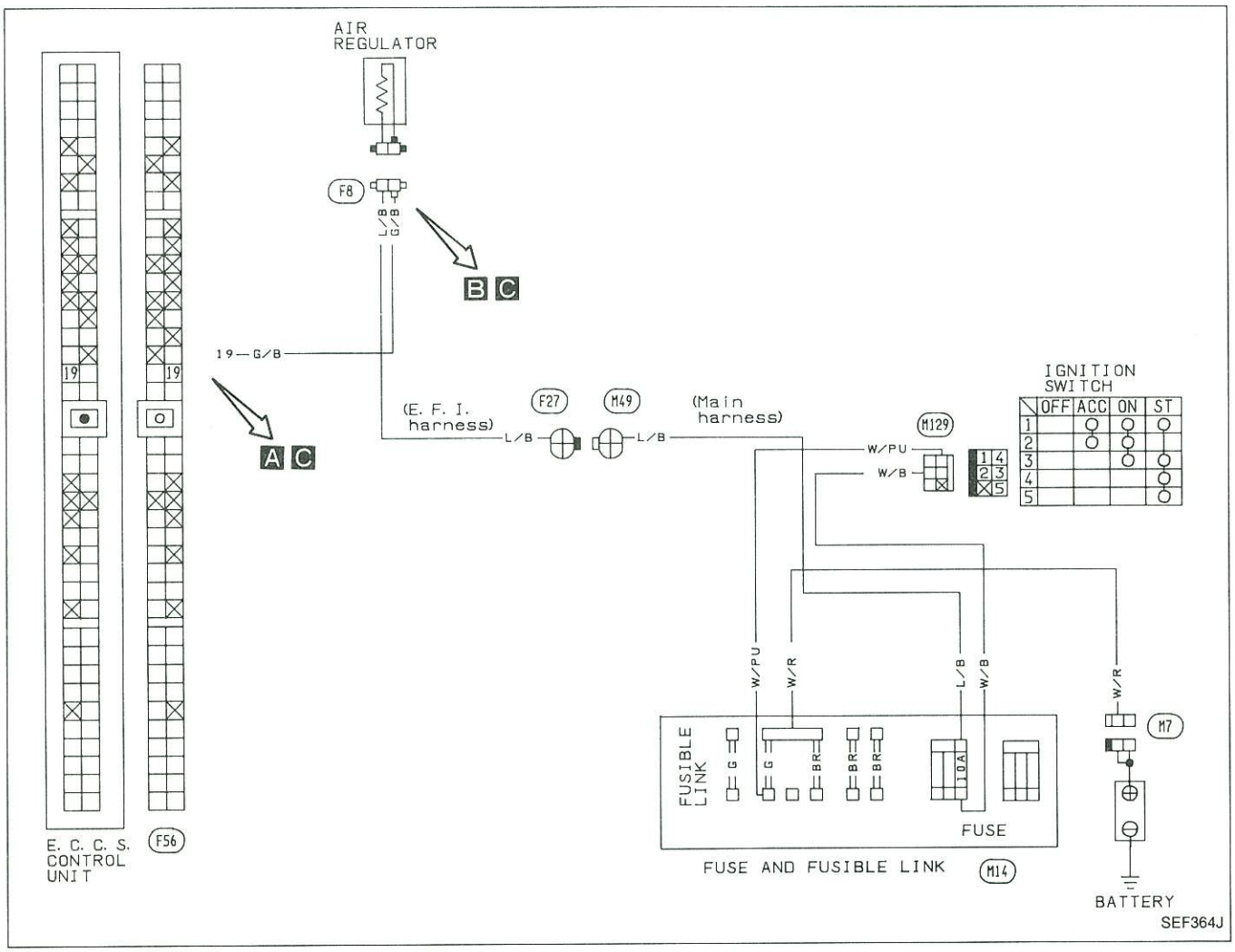
N.G. → Replace pressure regulator control solenoid valve.

O.K. ↓

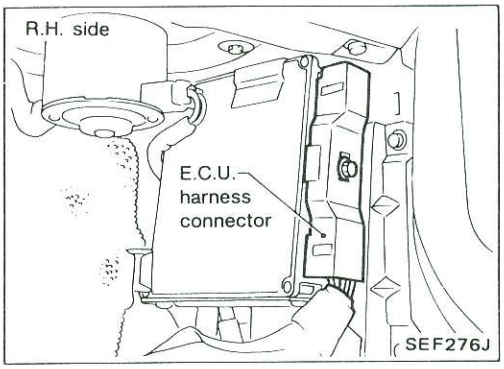
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

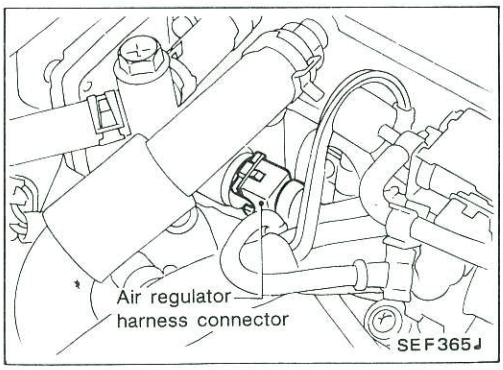
Diagnostic Procedure 41

AIR REGULATOR (Not self-diagnostic item)

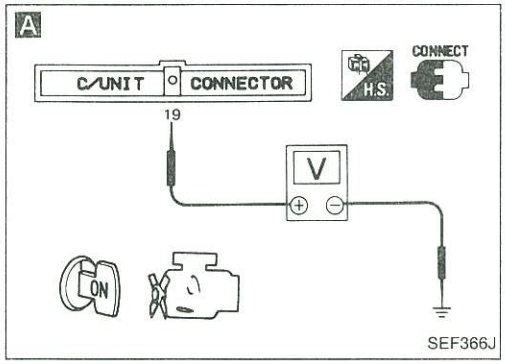


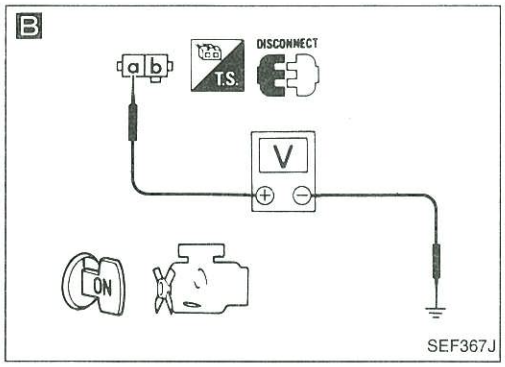
Harness layout

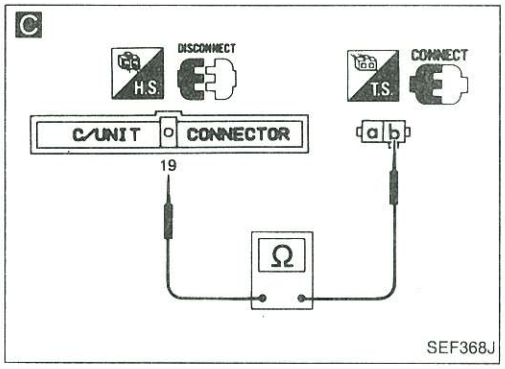




Diagnostic Procedure 41 (Cont'd)







INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ⑲ and ground.
Voltage:
0.7 - 0.9V
3) After 5 seconds, recheck voltage between E.C.U. terminal ⑲ and ground.
Voltage: Battery voltage

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect air regulator harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (F27), (M49)
- 10A fuse
- Harness continuity between air regulator and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ⑲ and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Air regulator).
Refer to "Electrical Components Inspection".
(See page EF & EC-159.)

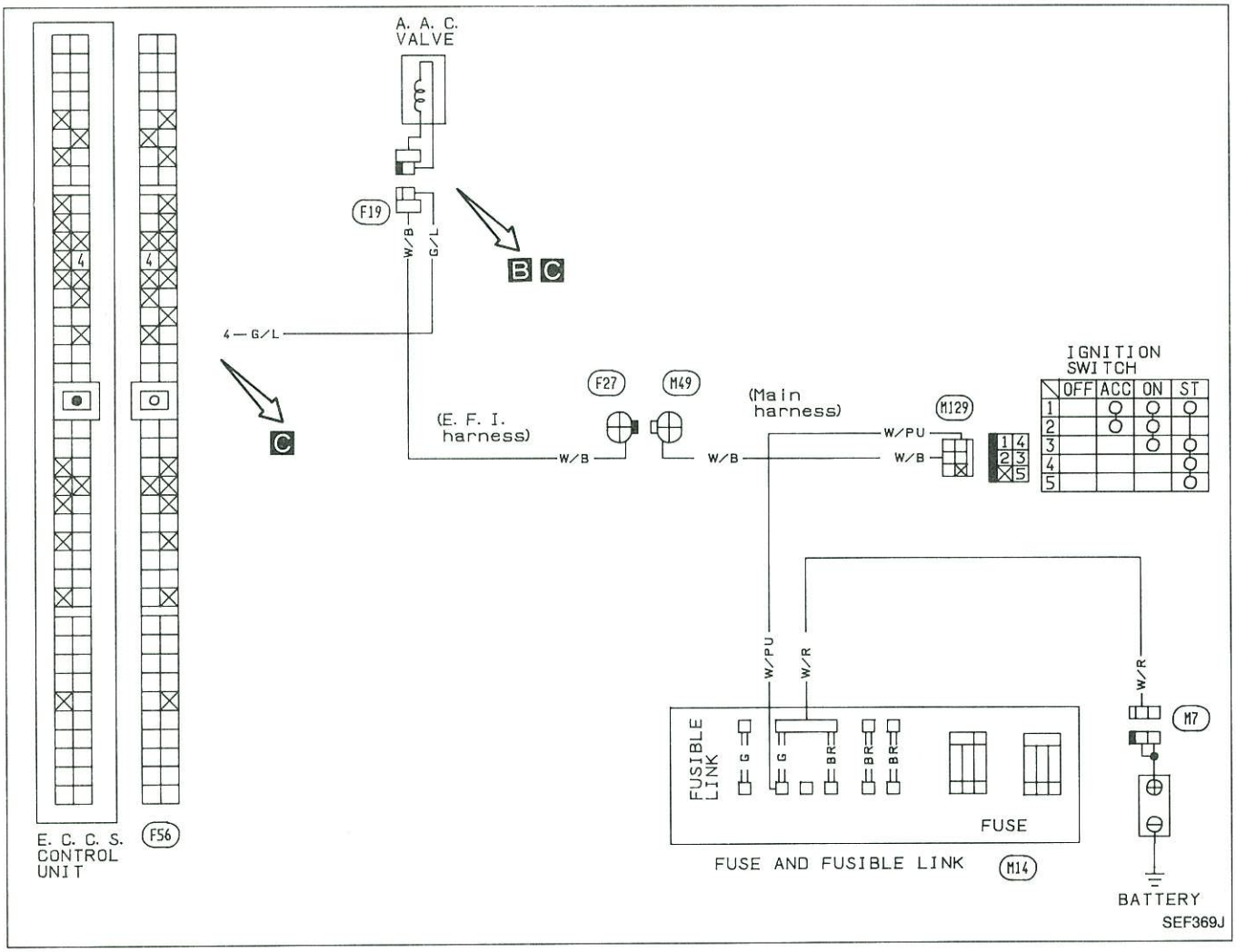
N.G. → Replace air regulator.

O.K. ↓

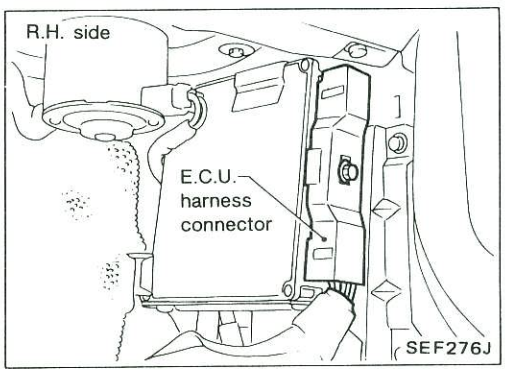
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

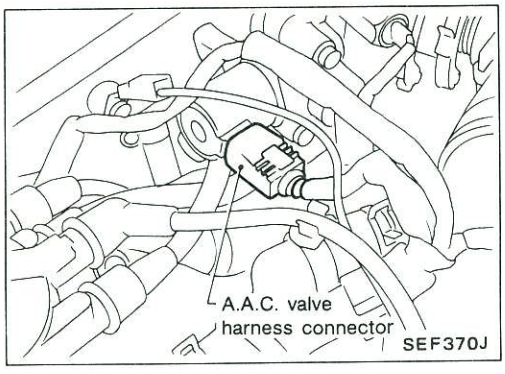
Diagnostic Procedure 42

A.A.C. VALVE (Not self-diagnostic item)

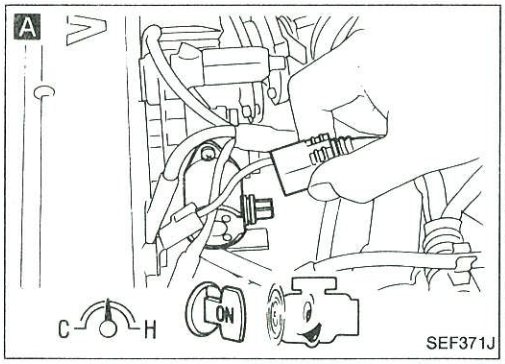


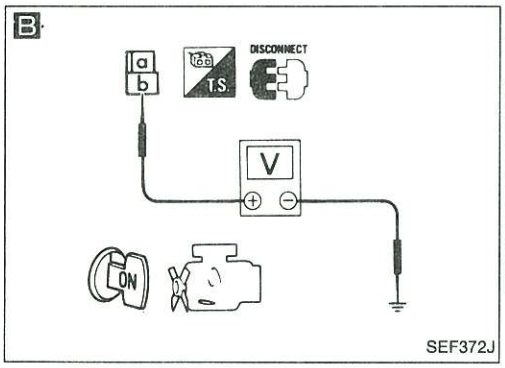
Harness layout

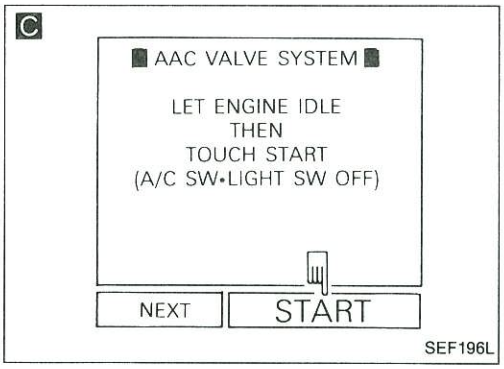


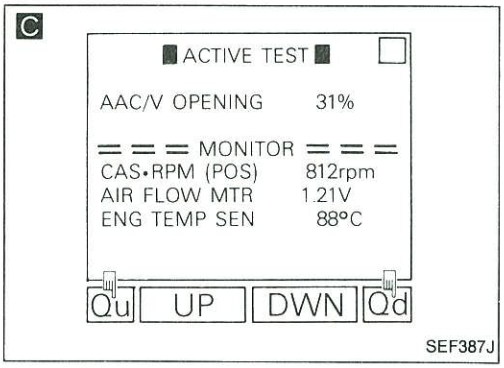


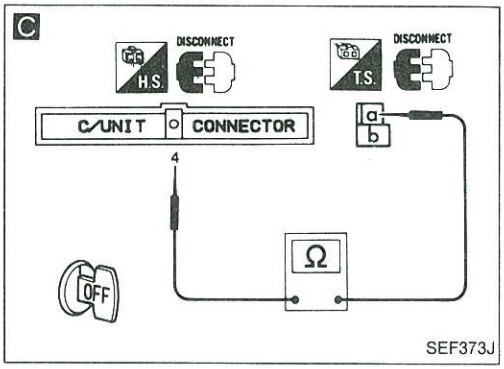
Diagnostic Procedure 42 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
800 ± 50 rpm
If N.G., adjust idle speed.
3) Disconnect A.A.C. valve harness connector.
4) Make sure that idle speed drops.

Drops → INSPECTION END

Does not drop ↓

B

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

N.G. → Check the following.
- Harness connectors (F27), (M49)
- Harness continuity between A.A.C. valve and ignition switch

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Reconnect A.A.C. valve harness connector.
2) Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

1) Reconnect A.A.C. valve harness connector.
2) Perform "AAC VALVE OPENING TEST" in "ACTIVE TEST" mode with CONSULT.

OR

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ④ and terminal ⓐ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(A.A.C. valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-158.)

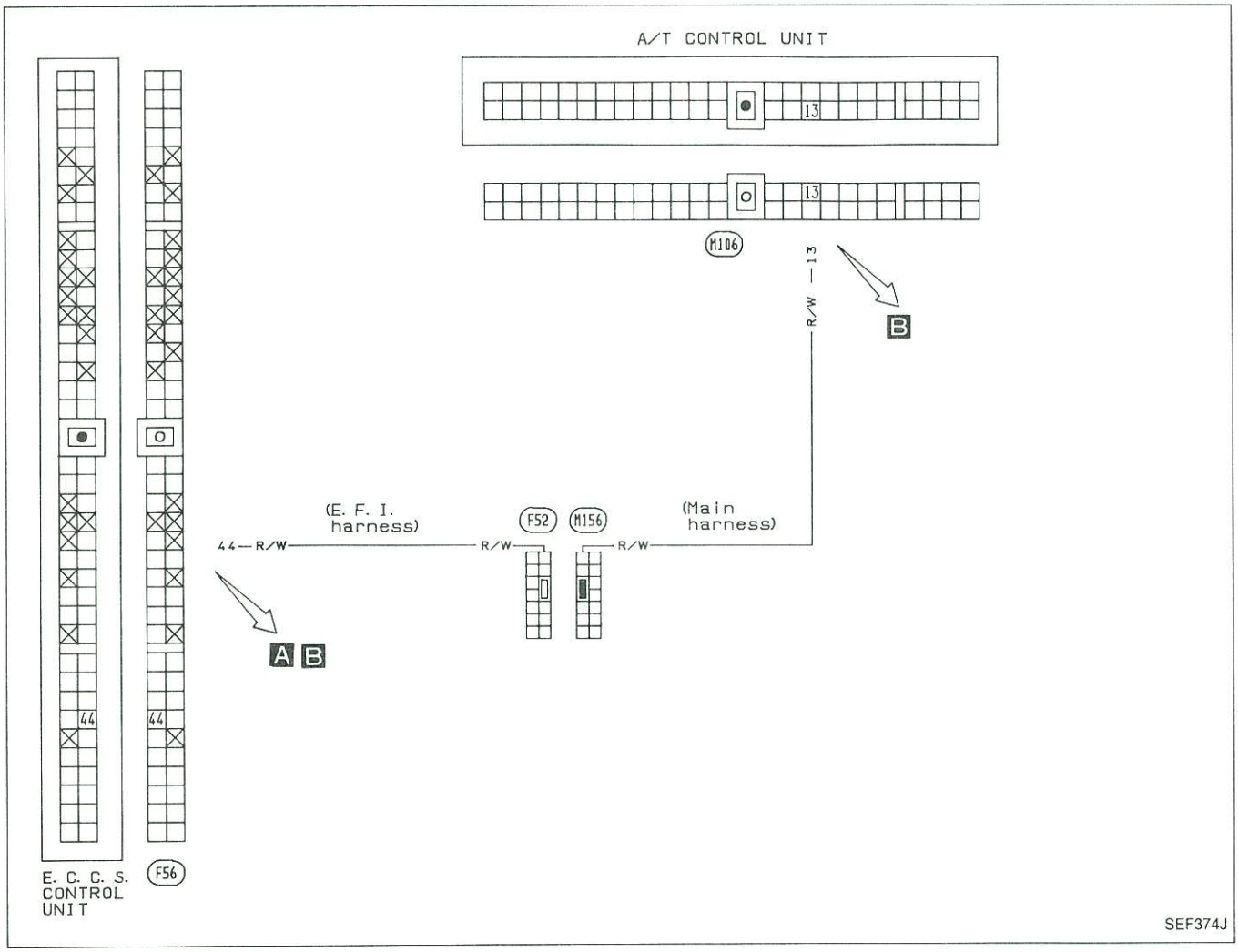
N.G. → Replace A.A.C. valve.

O.K. ↓

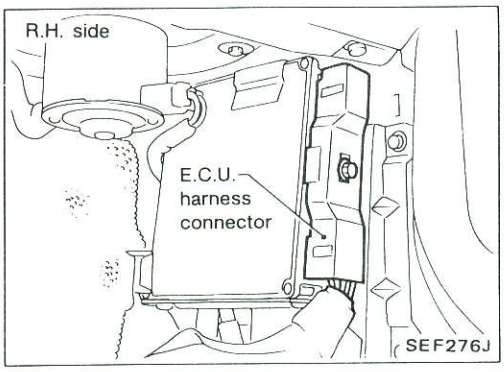
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

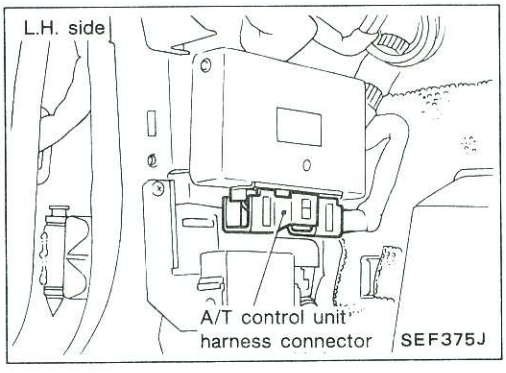
Diagnostic Procedure 43

A/T CONTROL UNIT (NEUTRAL SIGNAL) CIRCUIT (Not self-diagnostic item)



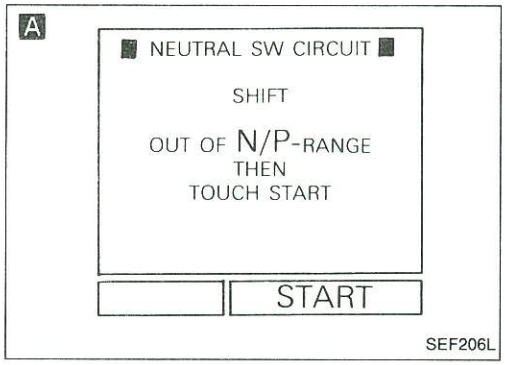
Harness layout





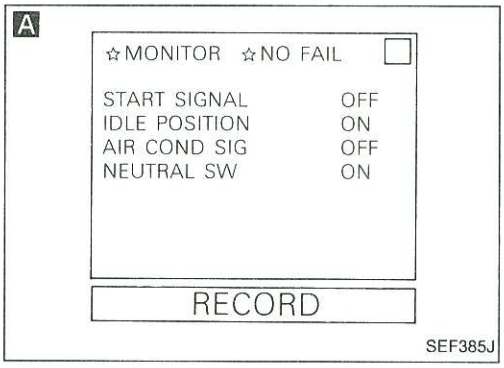
Diagnostic Procedure 43 (Cont'd)

A



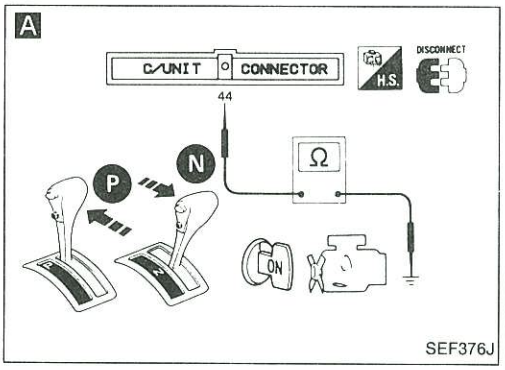
SEF206L

A



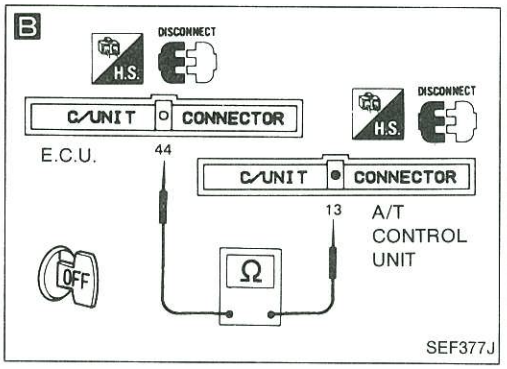
SEF385J

A



SEF376J

B



SEF377J

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

O.K. → INSPECTION END

OR

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

OR

1) Make sure that inhibitor switch circuit functions properly. (Refer to AT section.)
2) Disconnect E.C.U. harness connector.
3) Shift selector lever to "P" range.
4) Turn ignition switch "ON".
5) Check harness continuity between E.C.U. terminal (44) and body ground.
Continuity should exist.
6) Shift selector lever to "N" range.
7) Check harness continuity between E.C.U. terminal (44) and body ground.
Continuity should exist.

N.G.

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect A/T control unit harness connector.
3) Check harness continuity between E.C.U. terminal (44) and terminal (13).
Continuity should exist.

N.G. → Check the following.
- Harness connectors (F52), (M156)
- Harness continuity between E.C.U. and A/T control unit

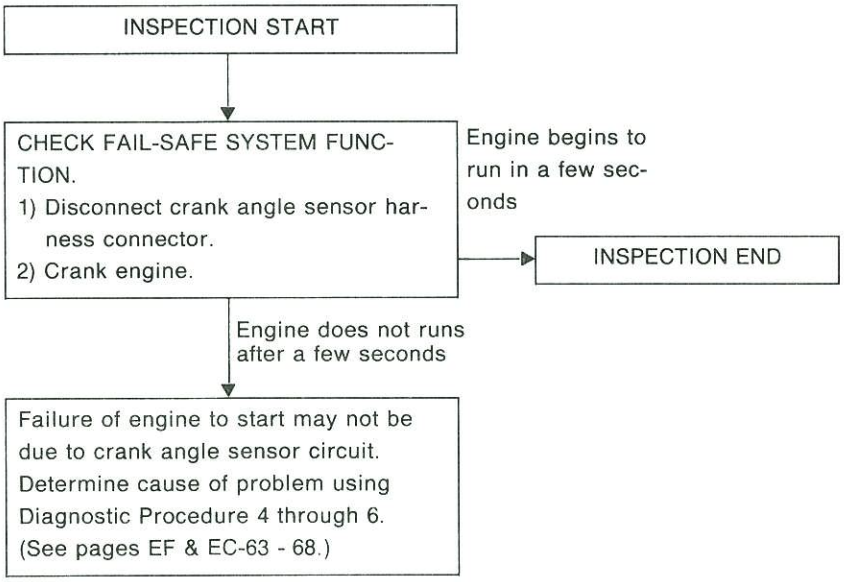
If N.G., repair harness or connectors.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 44

FAIL-SAFE SYSTEM FOR CRANK ANGLE SENSOR AND C.P.U. OF E.C.U.



Diagnostic Procedure 44 (Cont'd)

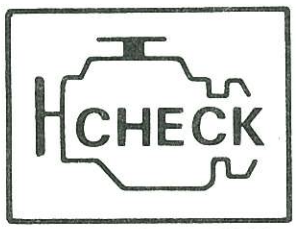
TROUBLE DIAGNOSES FOR FAIL-SAFE SYSTEM

When fail-safe system activates, warning lamp (CHECK ENGINE LIGHT) in instrument panel blinks. When vehicle with such a problem is brought to dealer for checkup, conduct diagnostic procedures using the following chart as a guide.

A

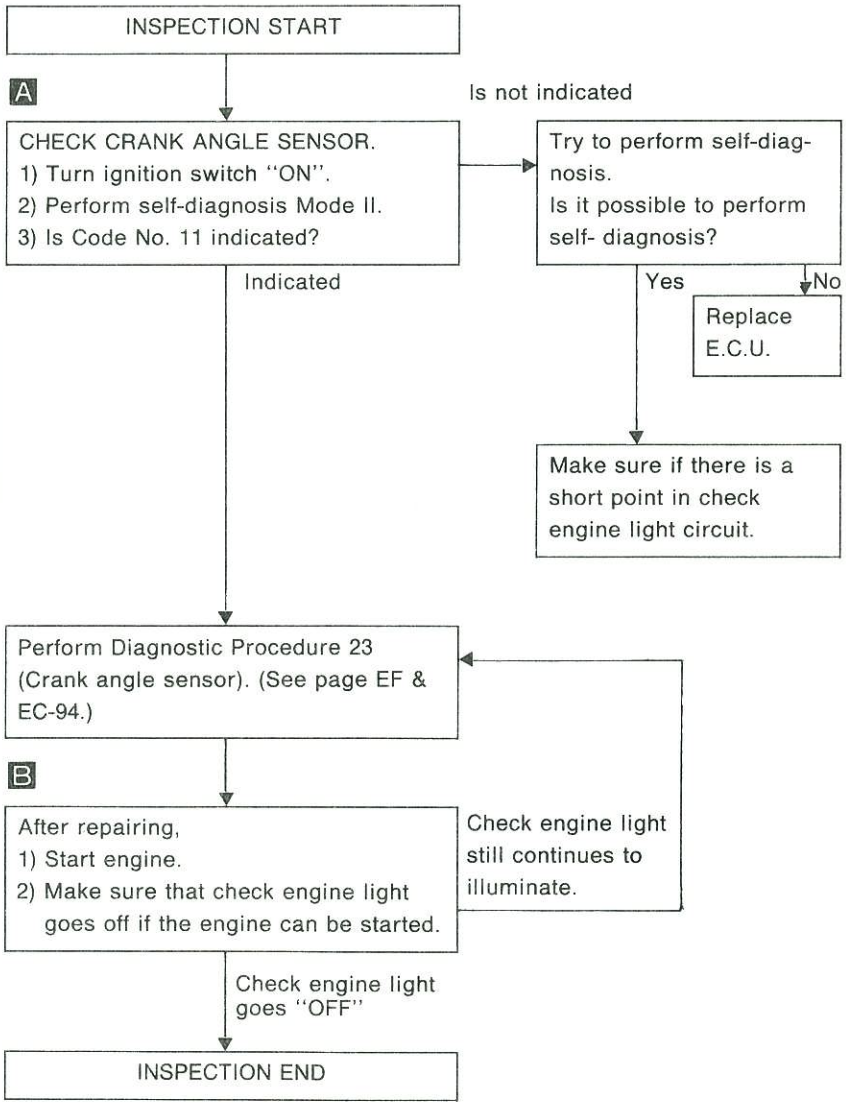
SEF171B

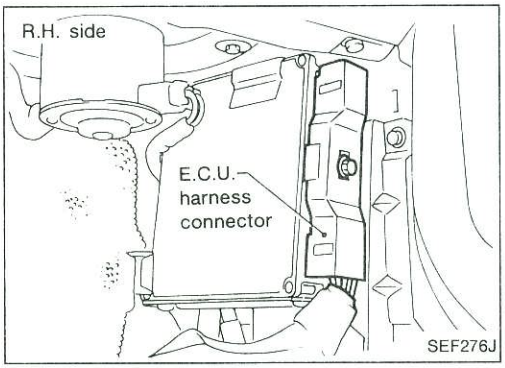
B



CHECK ENGINE LIGHT

SEF924F

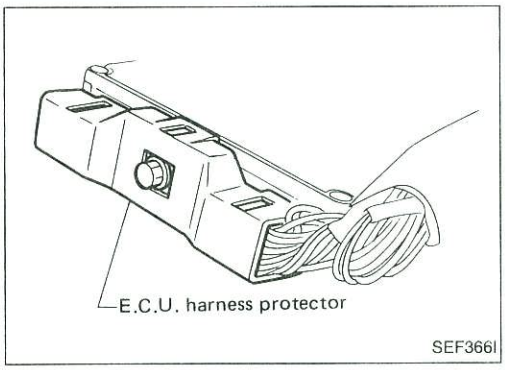




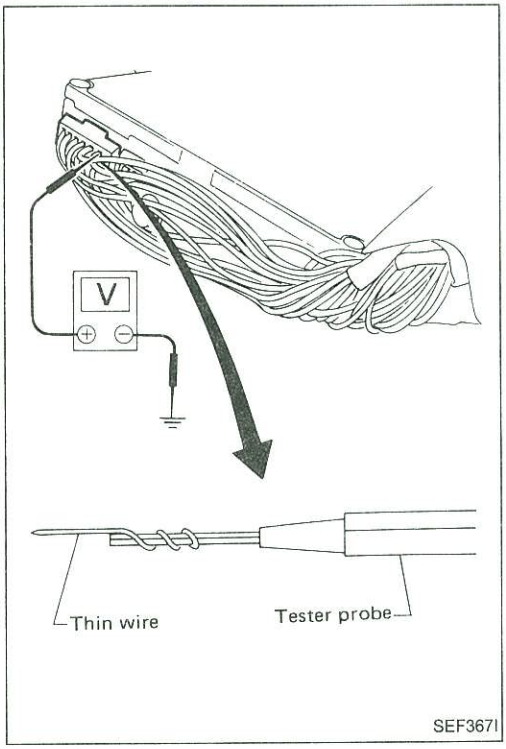
Electrical Components Inspection

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

1. E.C.U. is located behind the right side dash panel. For this inspection, remove the right side dash panel.



2. Remove E.C.U. 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)

E.C.U. Inspection table

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. └Idle speed	0.4 - 0.6V
		Engine is running. └Engine speed is 2,000 rpm	1.3 - 1.4V
2	Ignition check	Engine is running. └Idle speed	BATTERY VOLTAGE (11 - 14V)
4	A.A.C. valve	Engine is running. └Idle speed	9 - 12V
		Engine is running. ├Air conditioner is operating. ├Rear defogger is "ON". └Head lamps are in high position.	5 - 9V
9	Air conditioner relay	Engine is running. └Air conditioner switch "OFF"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └Air conditioner switch "ON"	0.7 - 0.9V
16	E.C.U. 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	Engine is running. └Normal condition	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └Abnormal condition [Fuel pump voltage control circuit (E.C.U. terminal No. (104)) is inoperative.]	0.7 - 0.8V

Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
19	Air regulator	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
23	Detonation sensor	Engine is running. └Idle speed	3.5 - 4.0V
27	Air flow meter	Engine is running. (Warm-up condition) └Idle speed	1.0 - 1.5V
		Engine is running. (Warm-up condition) └Engine speed is 2,000 rpm.	1.4 - 1.9V
28	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine temperature.
29	Exhaust gas sensor	Engine is running. └After warming up sufficiently and engine speed is 2,000 rpm.	0 ⟷ approximately 1.5V
36	Fuel temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with fuel temperature.
38	Throttle sensor	Ignition switch "ON"	0.4 - 4.0V Output voltage varies with throttle valve opening angle.
39	Exhaust gas temperature sensor	Engine is running. (Warm-up condition) └Idle speed	Less than 4.5V
		Engine is running. (Warm-up condition) └E.G.R. system is operating.	0 - 1.0V
41 51	Crank angle sensor (Reference signal)	Engine is running. └**Do not run engine at high speed under no-load.**	0.3 - 0.5V Output voltage varies slightly with engine speed.
42 52	Crank angle 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.
43	Start signal	Ignition switch "ON"	Approx. 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Data are reference values.

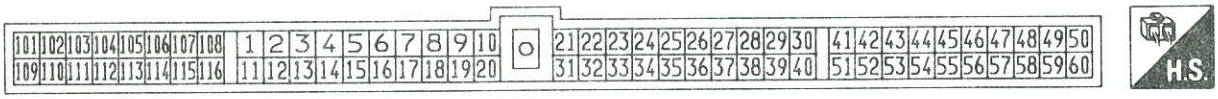
TER-MINAL NO.	ITEM	CONDITION	*DATA
44	A/T control unit (Neutral position)	Ignition switch "ON" └Gear position is "N" or "P"	Approx. 0V
		Ignition switch "ON" └Except the above conditions	7.0 - 9.0V
45	Ignition switch	Ignition switch "ON" └Engine stopped	BATTERY VOLTAGE (11 - 14V)
46	Air conditioner switch	Engine is running. └Air conditioner switch "OFF"	7.0 - 9.0V
		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 59	Power supply	Ignition switch "ON" └Engine stopped	BATTERY VOLTAGE (11 - 14V)
54	Throttle valve switch (Idle position)	Ignition switch "ON" └Accelerator pedal is fully released (Engine running).	8.0 - 10.0V
		Ignition switch "ON" └Accelerator pedal is depressed (Engine running).	0V
57	Power source for idle switch	Ignition switch "ON" └Engine stopped	8.0 - 10.0V
101 103 105 110 112 114	Injectors	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
102	E.G.R. control 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)
		Engine is running. (Warm-up condition) └Engine speed is above 3,100 rpm.	0.8 - 0.9V

Electrical Components Inspection (Cont'd)

*Data are reference values.

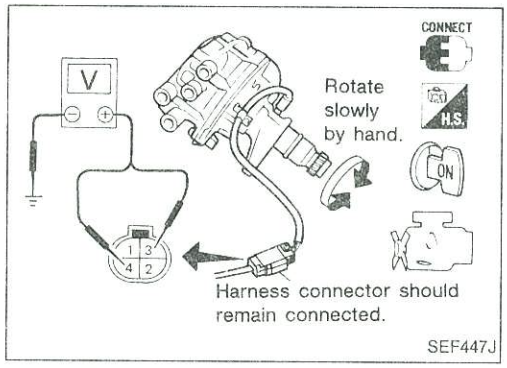
TER-MINAL NO.	ITEM	CONDITION	*DATA
104	Fuel pump voltage control	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON"	Approx. 0.1V
		Engine is running. (Warm-up condition) └For 30 seconds after engine begins to run.	Approx. 0.5V
		Engine is running. └Racing (up to 4,000 rpm)	2.0 - 4.5V
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 3 minutes after restarting engine)
			BATTERY VOLTAGE (11 - 14V) (3 minutes after restarting engine)
		Stop and restart engine after warming it up. └Fuel temperature is below 75°C (167°F)	BATTERY VOLTAGE(11 - 14V)

E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT



SEC250B

Electrical Components Inspection (Cont'd)

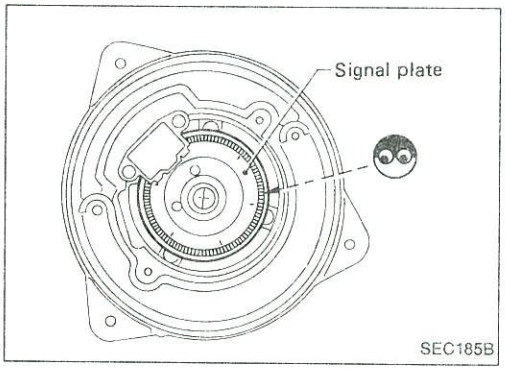


CRANK ANGLE SENSOR

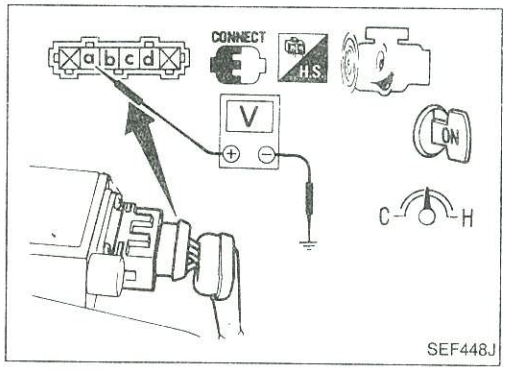
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch "ON".
3. Rotate distributor shaft slowly by hand and check voltage between terminals ③, ④ and ground.

Terminal	Voltage
③ (120° signal)	Tester's pointer fluctuates between 5V and 0V.
④ (1° signal)	

If N.G., replace distributor assembly with crank angle sensor.



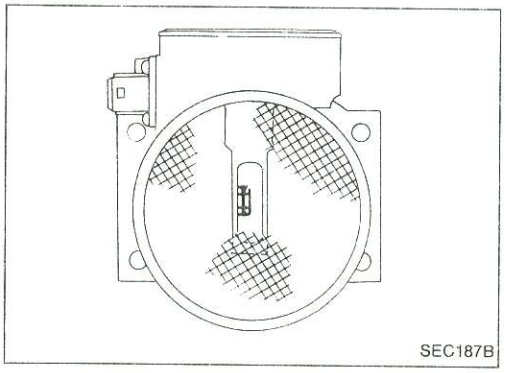
4. Visually check signal plate for damage or dust.



AIR FLOW METER

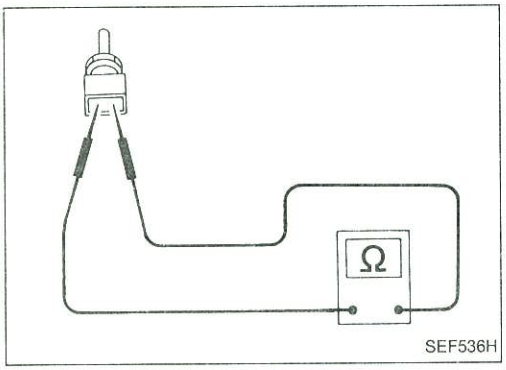
1. Peel air flow meter harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ⓑ and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 0.5
Idle (Engine is warm-up sufficiently.)	Approximately 1.0 - 1.3



5. If N.G., remove air flow meter from air duct. Check hot wire for damage or dust.

Electrical Components Inspection (Cont'd)

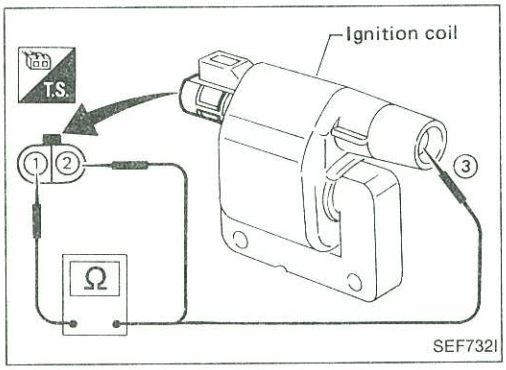


ENGINE TEMPERATURE SENSOR

1. Disconnect engine temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
80 (176)	0.30 - 0.33

If N.G., replace engine temperature sensor.

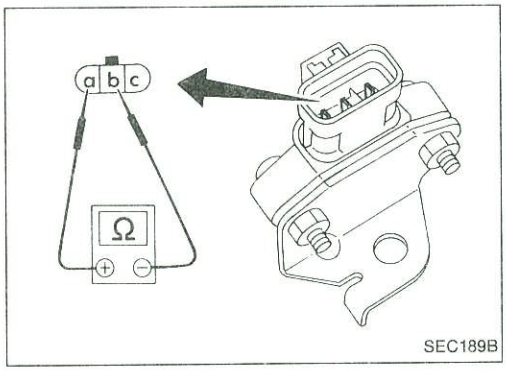


IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 1.0Ω
① - ③	Approximately 10 kΩ

If N.G., replace ignition coil.

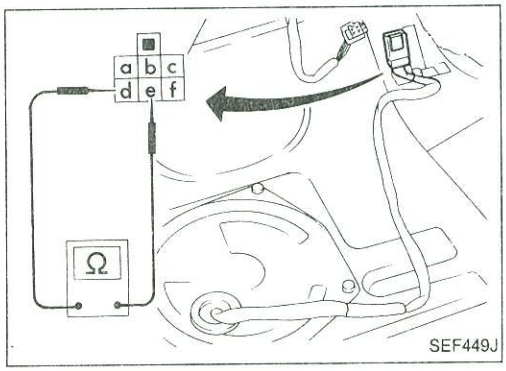


POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals as shown in the figure.

Terminal No.	Tester polarity	Continuity
ⓐ	⊕	Yes
ⓑ	⊖	
ⓐ	⊖	No
ⓑ	⊕	
ⓐ	⊕	Yes
ⓒ	⊖	
ⓐ	⊖	No
ⓒ	⊕	

If N.G., replace power transistor.

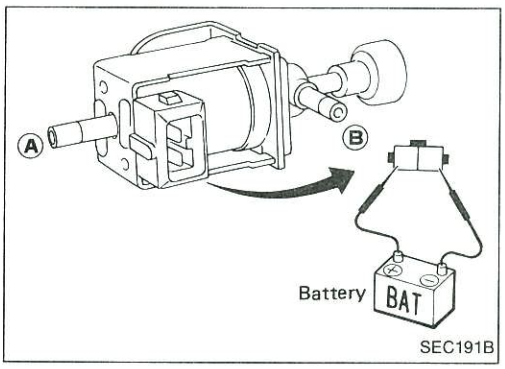


FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓓ and ⓔ.
   Resistance: Approximately 0.5Ω

If N.G., replace fuel pump.

Electrical Components Inspection (Cont'd)

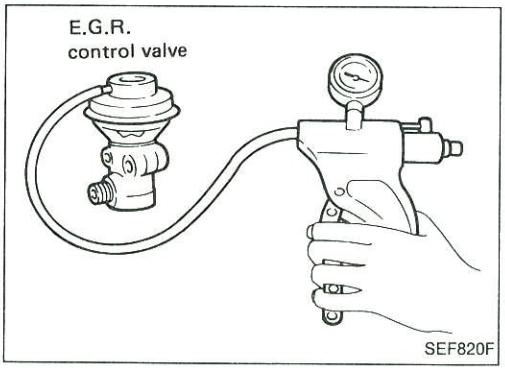


E.G.R. CONTROL SOLENOID VALVE AND PRESSURE REGULATOR CONTROL SOLENOID VALVE

1. Disconnect E.G.R. control solenoid valve harness connector.
2. Check solenoid valve, following the table as shown below:

Conditions	Continuity between port Ⓐ and Ⓑ
Supply 12V direct current between terminals ① and ②	Yes
No current supply	No

If N.G., replace E.G.R. control solenoid valve.



E.G.R. CONTROL VALVE

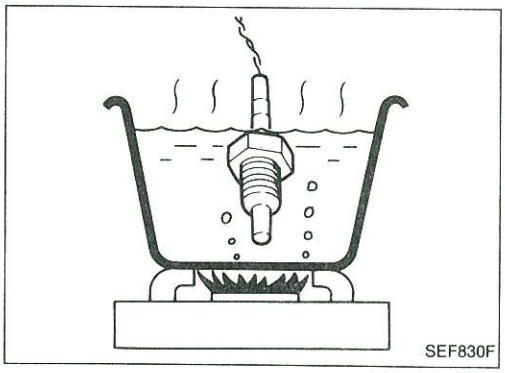
Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.

E.G.R. control valve spring should lift.

If N.G., replace E.G.R. control valve.

EXHAUST GAS SENSOR

Refer to "Diagnostic Procedure 31".
(See page EF & EC-117.)



EXHAUST GAS TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

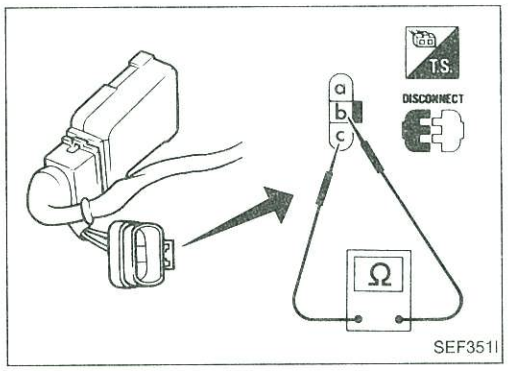
- **Resistance should decrease in response to temperature increase.**

  Resistance: 100°C (212°F)

  85.3 ± 8.53 kΩ

If N.G., replace exhaust gas temperature sensor.

Electrical Components Inspection (Cont'd)



THROTTLE SENSOR

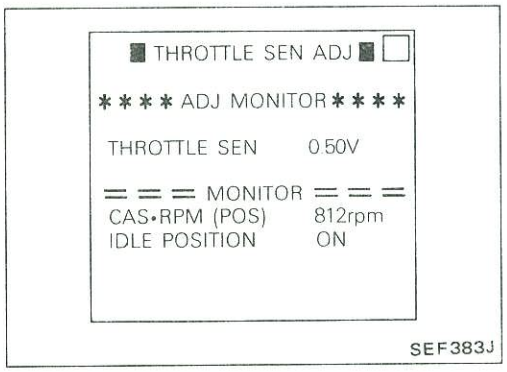
1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals ⓑ and ⓒ changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

If N.G., replace throttle sensor.

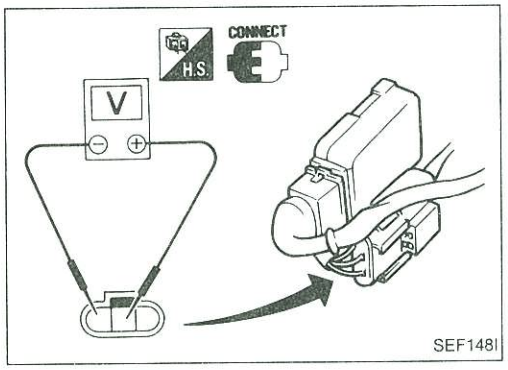
Adjustment

If throttle sensor is replaced or removed, it is necessary to install in proper position, by following the procedure as shown below:

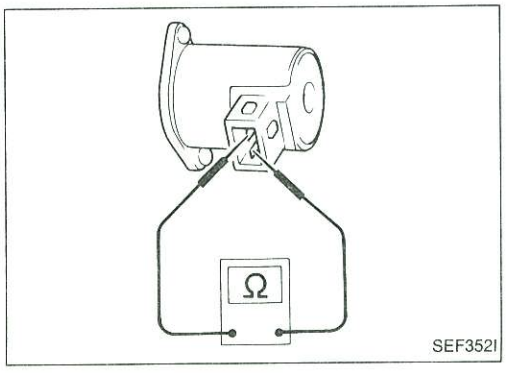


1. Install throttle sensor body in throttle chamber. Do not tighten bolts. Leave bolts loose.
2. Connect throttle sensor and idle switch harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN. ADJ." in "WORK SUPPORT" mode.

   Measure output voltage of throttle sensor using voltmeter.



5. Adjust by rotating throttle sensor body so that output voltage is 0.4 to 0.5V.
6. Tighten mounting bolts.
7. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.



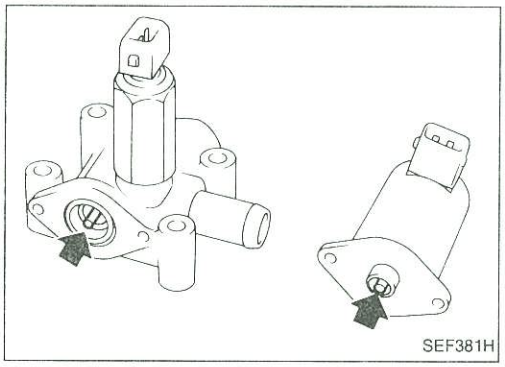
A.A.C. VALVE

- Check A.A.C. valve resistance.

  Resistance:

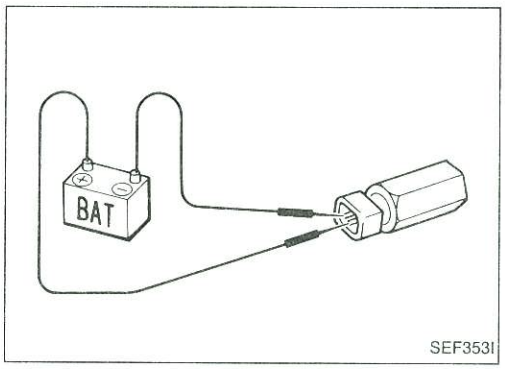
  Approximately 10Ω

Electrical Components Inspection (Cont'd)


SEF381H

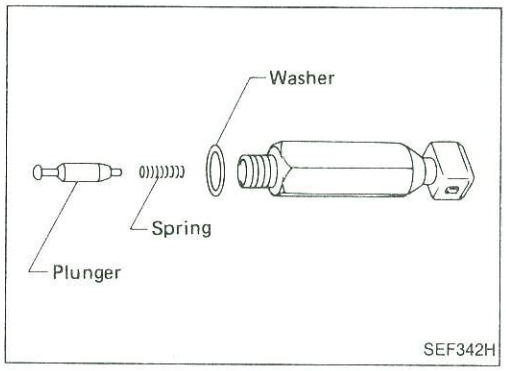
- Check plunger for seizing or sticking.
- Check for broken spring.

F.I.C.D. SOLENOID VALVE



SEF353I

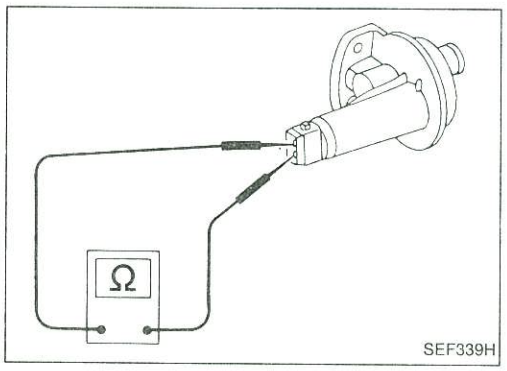
- Check for clicking sound when applying 12V direct current to terminals.



SEF342H

- Check plunger for seizing or sticking.
- Check for broken spring.

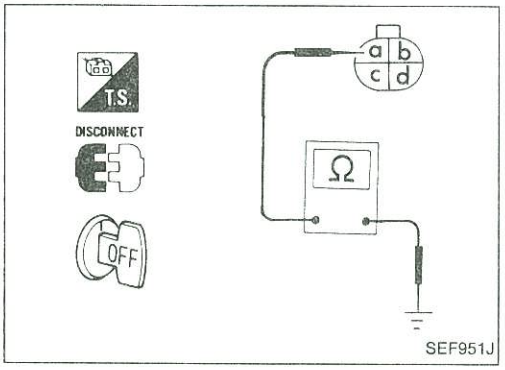
AIR REGULATOR



SEF339H

- Check air regulator resistance.
  Resistance:
  Approximately 70 - 80Ω
- Check air regulator for clogging.

DETONATION SENSOR

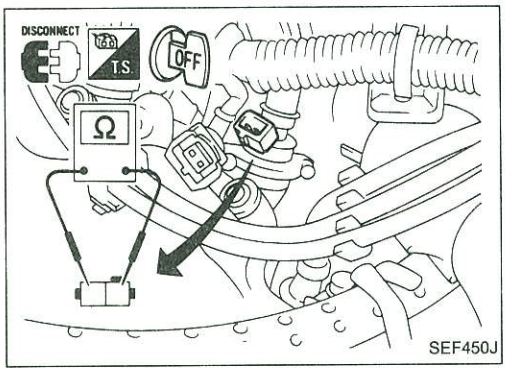


SEF951J

1. Disconnect detonation sensor sub-harness connector.
2. Check continuity between terminal ⓐ and ground.

Continuity should exist.

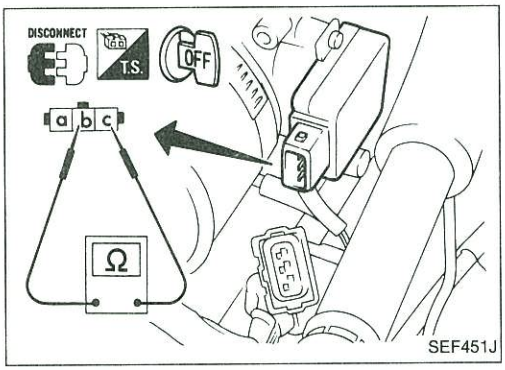
Electrical Components Inspection (Cont'd)



INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω

If N.G., replace injector.



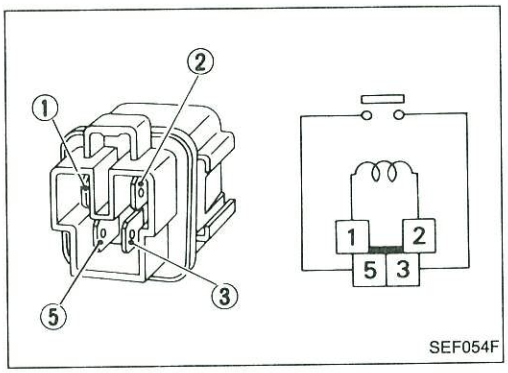
THROTTLE VALVE SWITCH

1. Disconnect idle switch harness connector.
2. Check continuity between terminals ⓑ and ⓒ.

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

If N.G., replace idle switch.

- Adjust idle switch touch speed with A.A.C. valve off.
  Touch speed:
  Idle speed (800 rpm) $^{+400}_{-100}$ rpm in "N" position



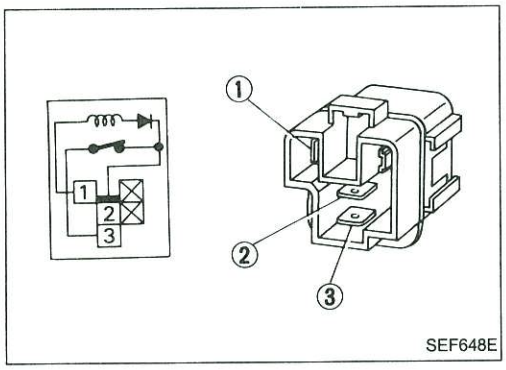
E.C.C.S. RELAY AND FUEL PUMP RELAY

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If N.G., replace relay.

Electrical Components Inspection (Cont'd)

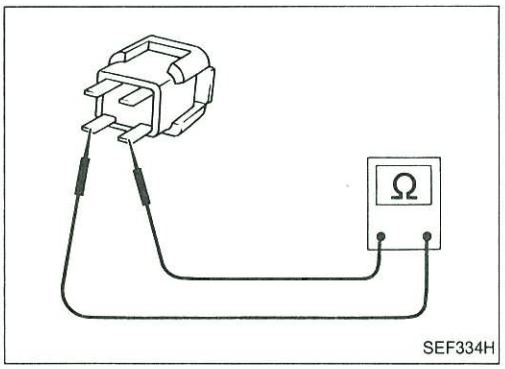


SAFETY RELAY

Check continuity between terminals ② and ③.

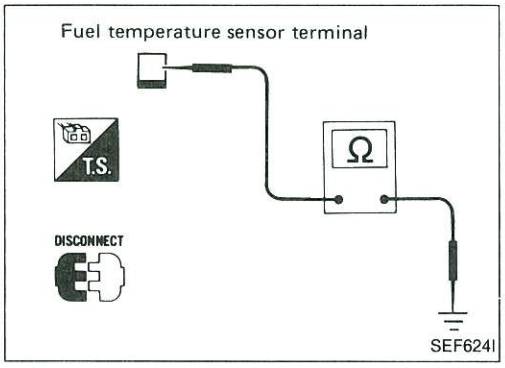
Conditions		Continuity between terminals ② and ③
12V direct current supply between terminals ① and ②		
①	②	
–	+	Yes
+	–	No

If N.G., replace relay.



RESISTOR

1. Disconnect resistor harness connector.
2. Check resistance between terminal ⓐ and ⓑ.
   Resistance: Approximately 2.2Ω
   If N.G., replace resistor.

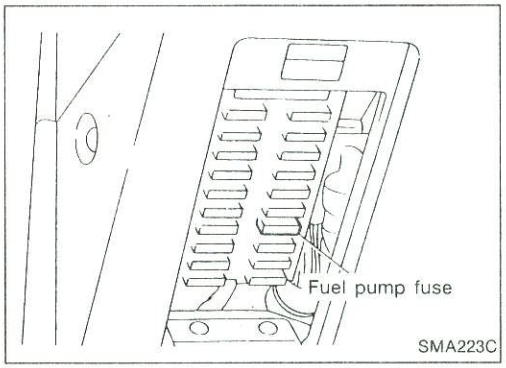


FUEL TEMPERATURE SENSOR

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.

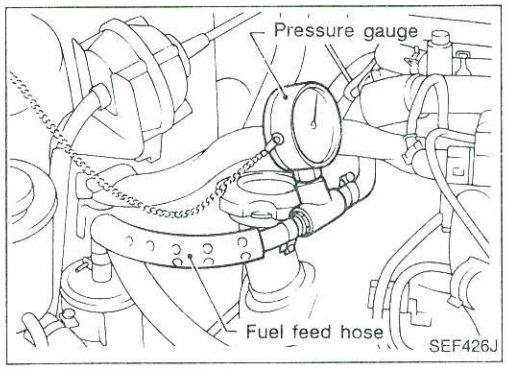
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay.

Erase the memory (Code No. 22) of the self-diagnosis in the control unit.

Fuel Pressure Check

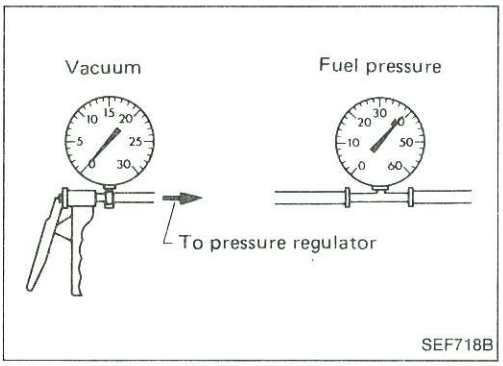
a. **When reconnecting fuel line, always use new clamps.**
b. **Make sure that clamp screw does not contact adjacent parts.**
c. **Use a torque driver to tighten clamps.**
d. **Use Pressure Gauge to check fuel pressure.**
e. **Do not perform fuel pressure check while fuel pressure regulator control system 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.



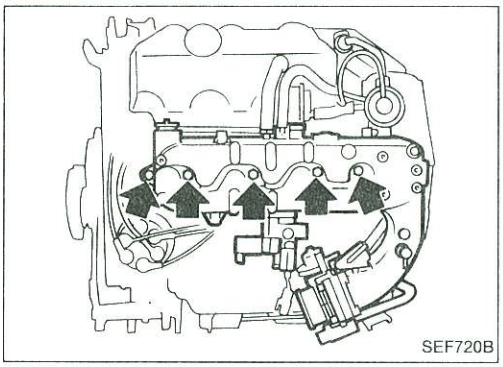
5. Read the indication of fuel pressure gauge.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   Approximately 235 kPa (2.4 kg/cm^2, 34 psi)
   When fuel pressure regulator valve vacuum hose is disconnected.
   Approximately 294 kPa (3.0 kg/cm^2, 43 psi)
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.

Fuel Pressure Check (Cont'd)



9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.



Injector Removal

1. Release fuel pressure to zero.
2. Separate A.S.C.D. and accelerator control wire from intake manifold collector.
3. Remove intake manifold collector from engine.

The following parts should be disconnected or removed.

(1) Harness connectors for
- A.A.C. valve
- F.I.C.D. solenoid valve
- Throttle valve switch
- Throttle sensor
- Pressure regulator control solenoid valve
- Air regulator
- E.G.R. control solenoid valve
- Exhaust gas temperature sensor
- Earth harness

(2) P.C.V. hoses

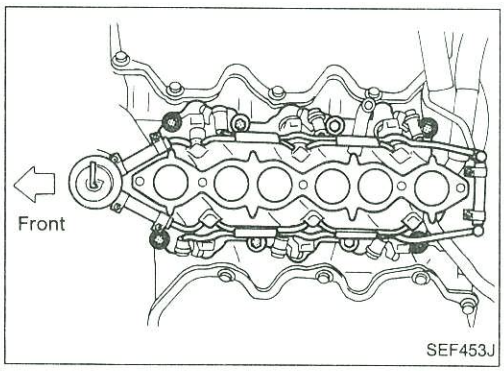
(3) Vacuum hoses for
- Master brake cylinder
- E.G.R. control solenoid valve
- Fuel pressure regulator
- Carbon canister

(4) Air hoses from
- Air duct
- A.A.C. valve
- Air regulator

(5) Water hoses for
- Throttle chamber
- Air relief plug

(6) Carbon canister purge hose

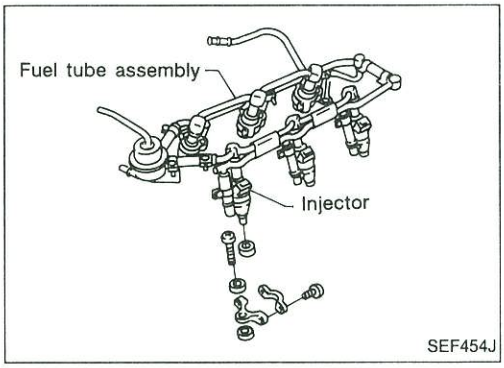
(7) E.G.R. flare tube



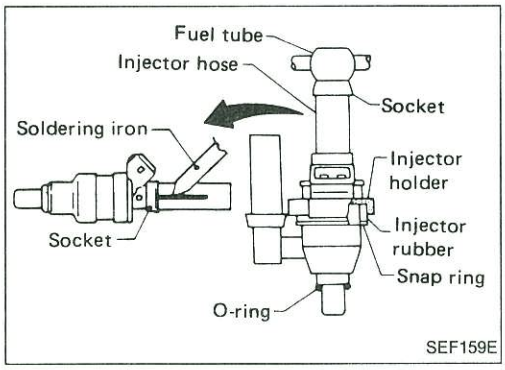
4. Remove injector fuel tube assembly.

The following parts should be disconnected or removed.
- Vacuum hose for fuel pressure regulator
- Fuel feed and return hose
- All injectors harness connectors
- Fuel temperature sensor harness connector

Injector Removal (Cont'd)



5. Remove any malfunctioning injector from injector fuel tube.



6. Remove fuel hose.
1) Heat sharp knife for 15 minutes. Cut into hose braided reinforcement from mark to socket end and fuel tube end.

Do not allow sharp knife to cut all the way through the hose and touch injector tail piece.

2) Then pull rubber hose out with hand.

Never place injector in a vise when disconnecting rubber hose.

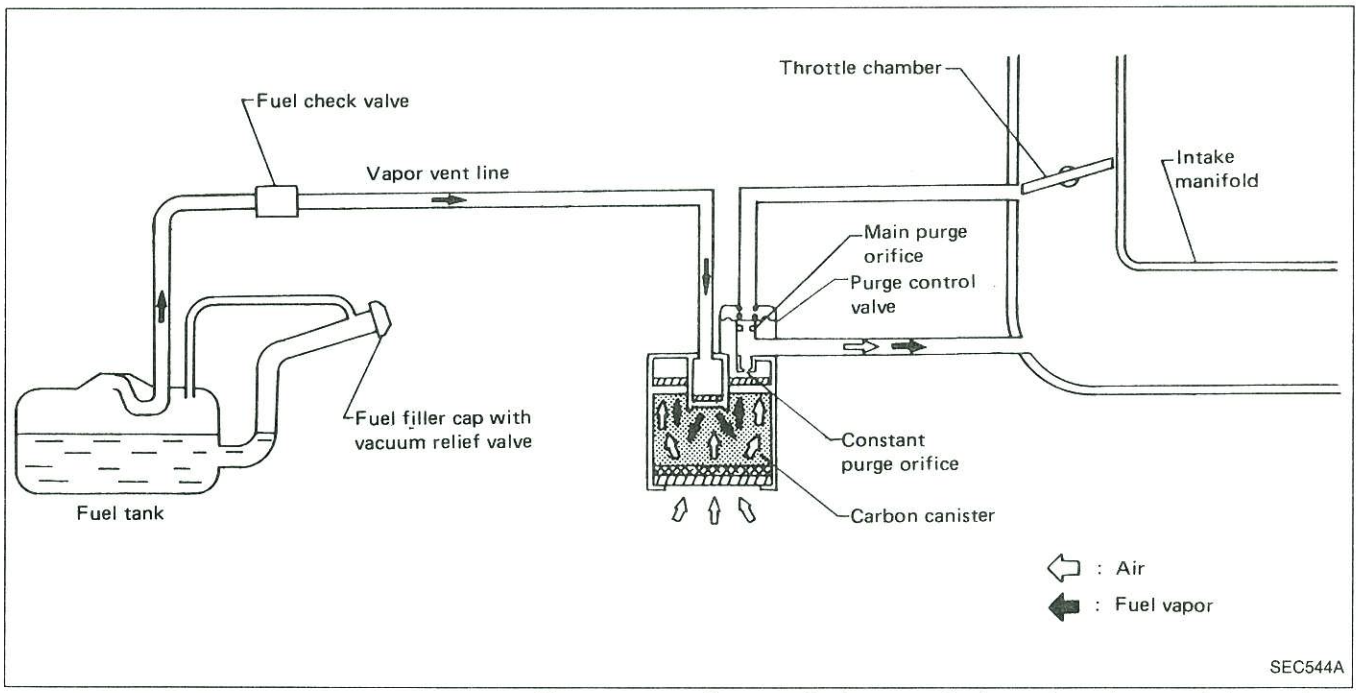
7. Install fuel hose as follows:
1) Clean exterior of injector tail piece and fuel tube end.
2) Wet inside of new rubber hose with fuel.
3) Push end of rubber hose with hose sockets onto injector tail piece and fuel tube end by hand as far as they will go.

Clamp is not necessary at the connections.

8. Reinstall any part removed in reverse order of removal.

CAUTION:
After properly connecting fuel hose to injector and fuel tube, check connection for fuel leakage.

Description

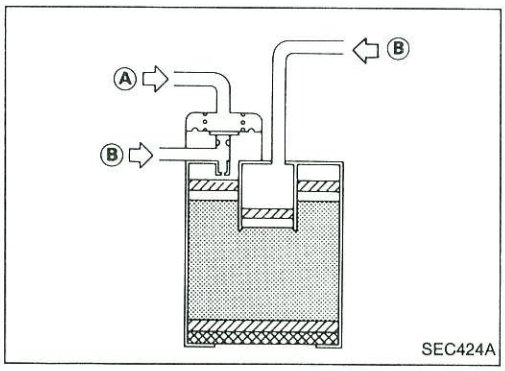


The evaporative emission control system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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

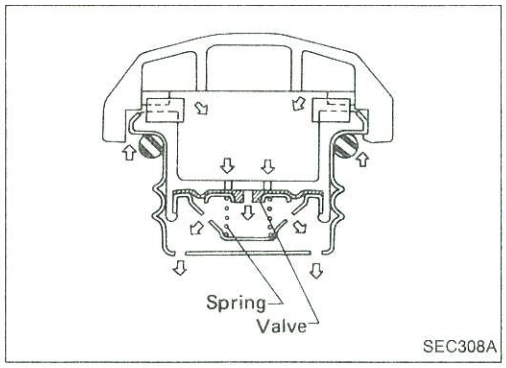
CARBON CANISTER

Check carbon canister as follows:

Ⓐ : Blow air and ensure that there is no leakage.

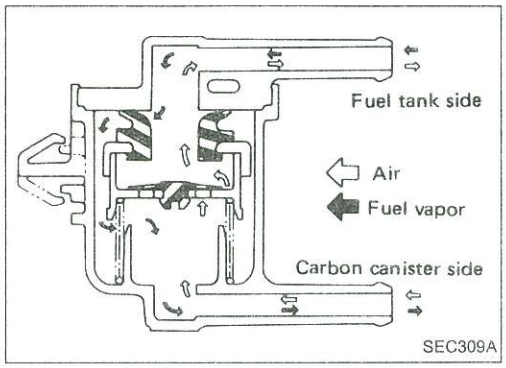
Ⓑ : Blow air and ensure that there is leakage.

Inspection (Cont'd)



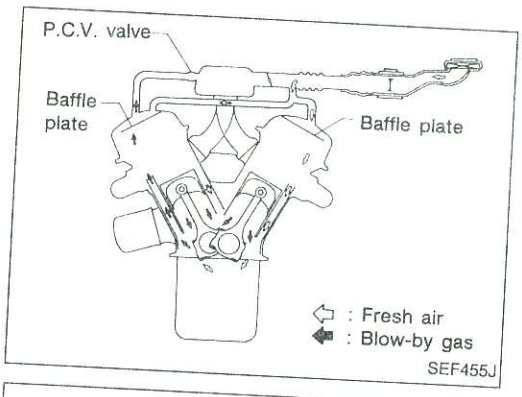
FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Inhale air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should 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.

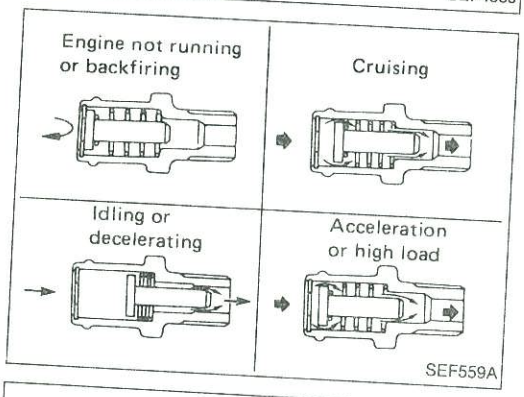
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

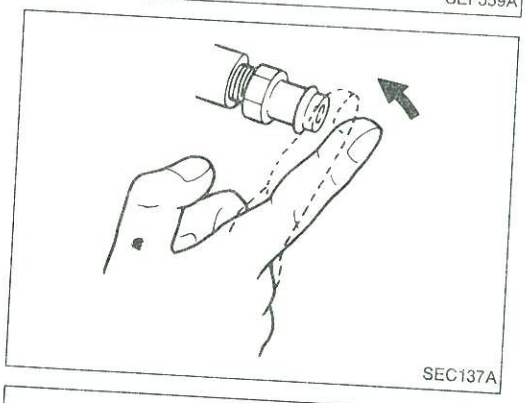
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

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.

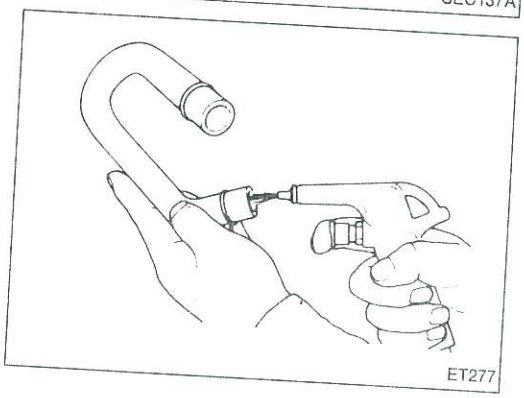




Inspection

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 (in "N" position)	800 ± 50
Air conditioner: ON (in "N" position)	800 ± 50
Ignition timing	15° ± 2° B.T.D.C.
Throttle sensor idle position V	0.4 - 0.5

*1: Feedback controlled and needs no adjustments

*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater, fan & rear defogger)

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 1.0
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 10.0

AIR FLOW METER

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	Approximately 1.0 - 1.3*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE 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

EXHAUST GAS TEMPERATURE SENSOR

Resistance [at 100°C (212°F)]	kΩ	85.3 ± 8.53

A.A.C. VALVE

Resistance	Ω	Approximately 10.0

INJECTOR

Resistance	Ω	10 - 14

RESISTOR

Resistance	kΩ	Approximately 2.2

THROTTLE SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

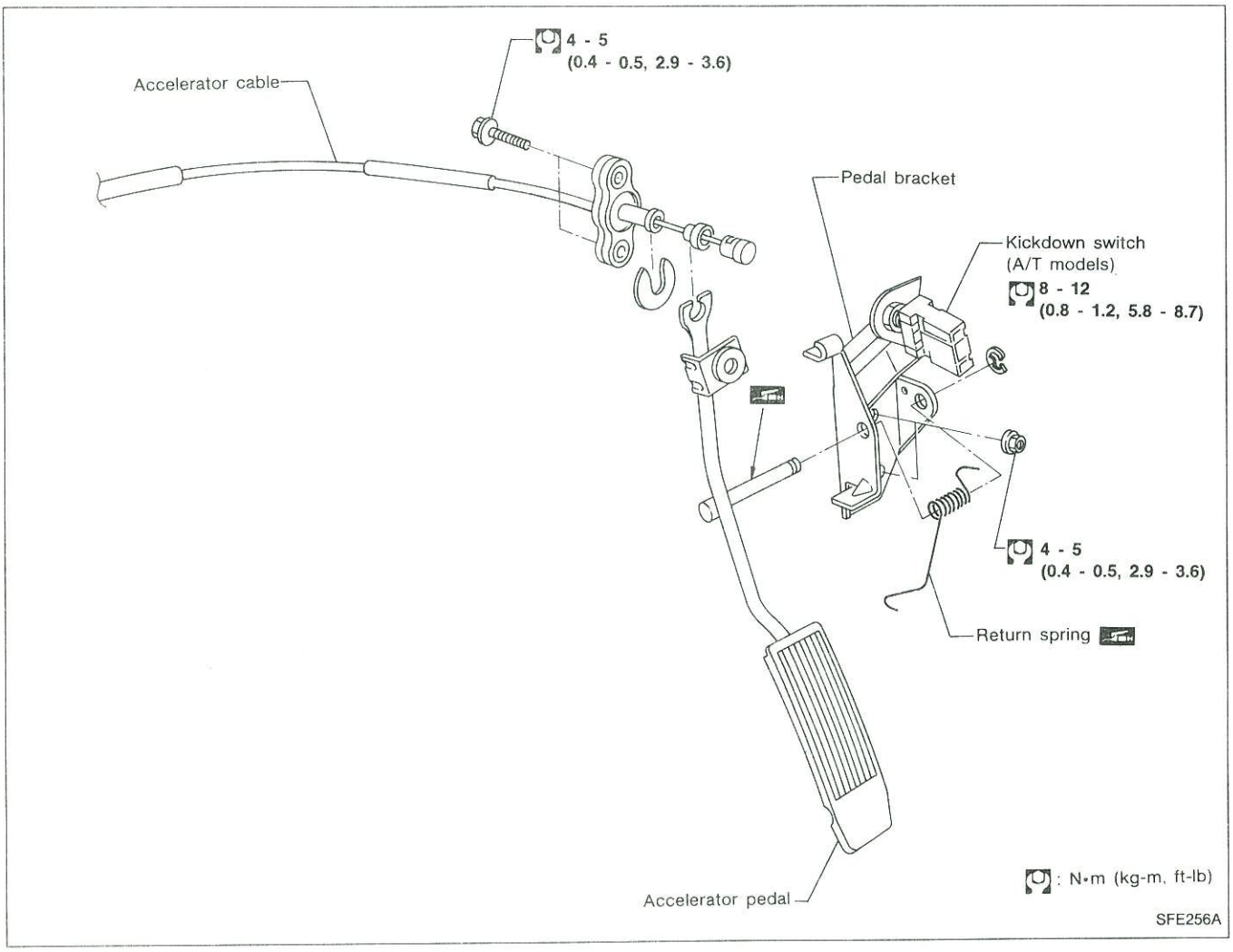
SECTION FE

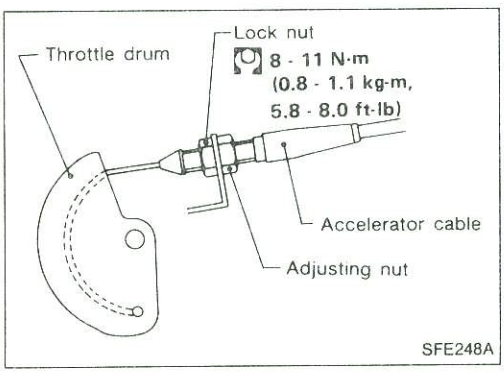
CONTENTS

ACCELERATOR CONTROL SYSTEM FE-2
FUEL SYSTEM FE-3
EXHAUST SYSTEM FE-4

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.

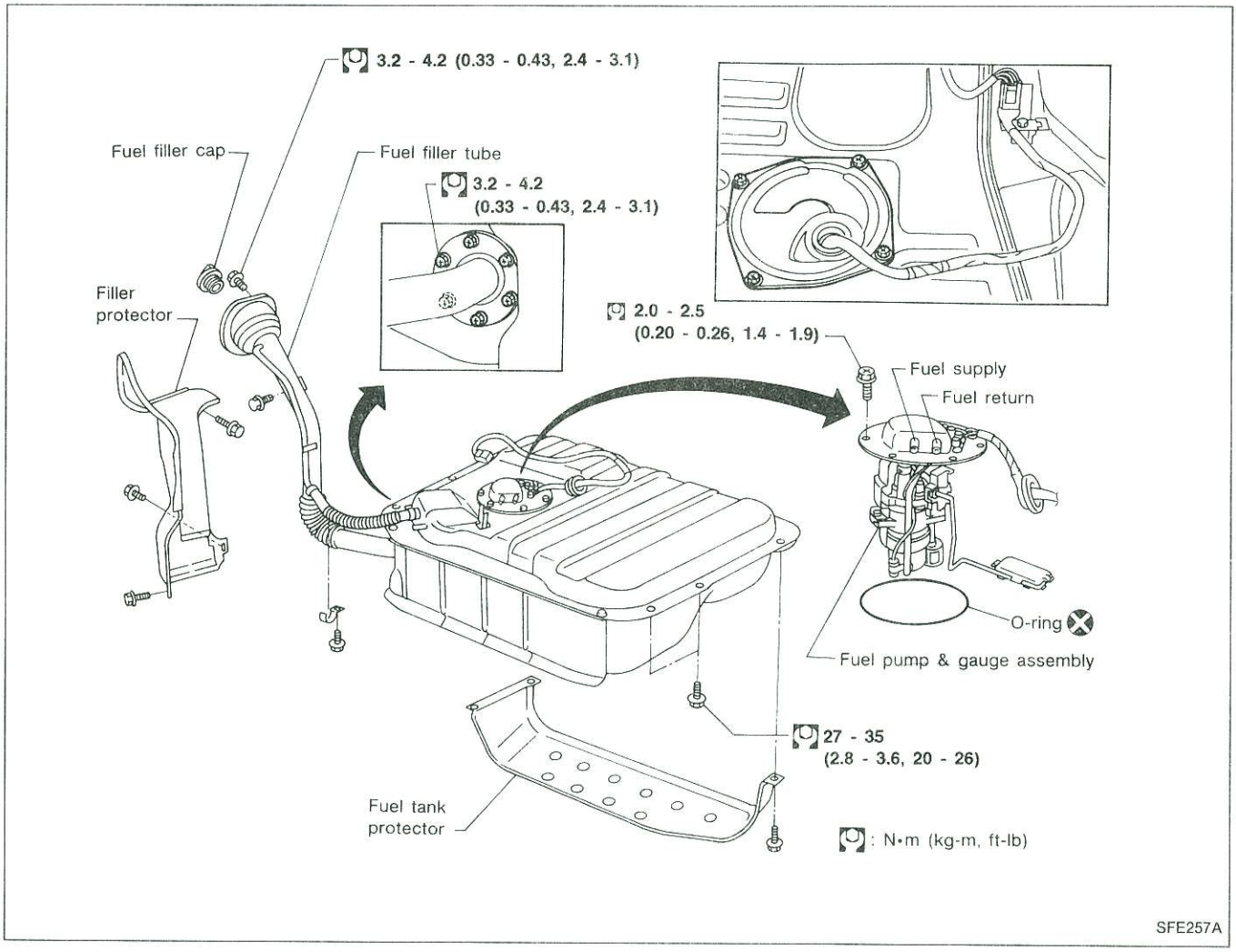
WARNING:

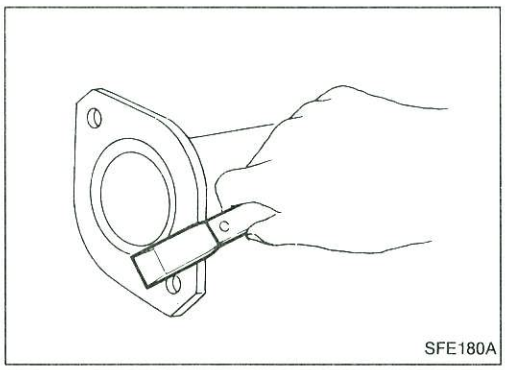
When replacing fuel line parts, be sure to observe the following:

- **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:

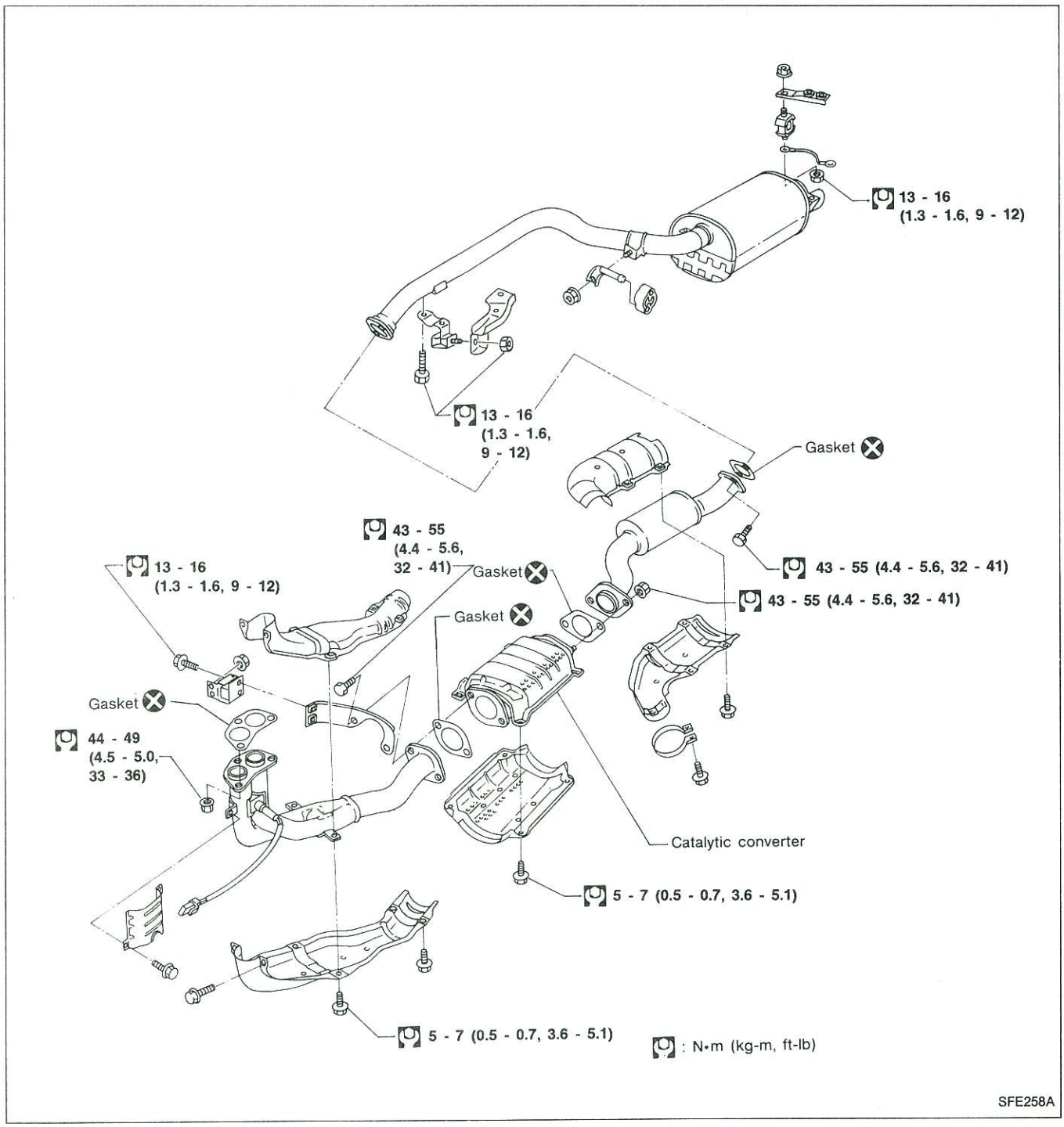
- **Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.**
- **Do not disconnect any fuel line unless absolutely necessary.**
- **Plug hose and pipe openings to prevent entry of dust or dirt.**
- **Always replace O-ring and clamps with new 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.**




SFE180A

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.**



SFE258A

AUTOMATIC TRANSMISSION

SECTION AT

CONTENTS

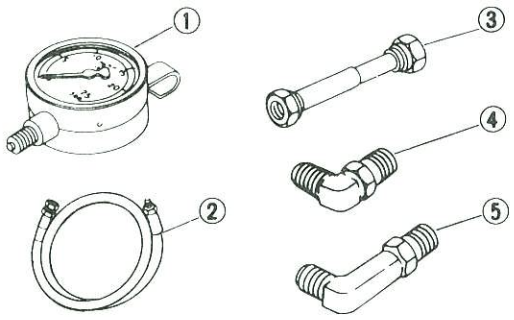
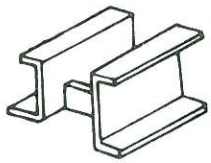
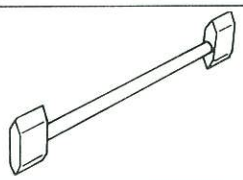
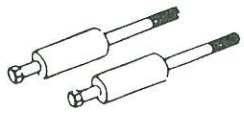
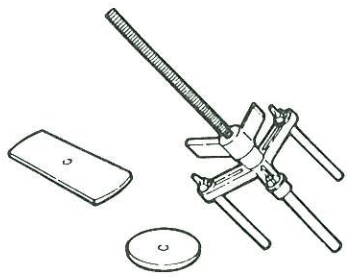
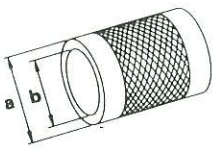
PREPARATION AND PRECAUTIONS ..... AT- 2
A/T CONTROL DIAGRAM ..... AT- 4
ON-VEHICLE SERVICE ..... AT- 7
TROUBLE DIAGNOSES ..... AT- 11
REMOVAL AND INSTALLATION ..... AT- 97
MAJOR OVERHAUL AT-100
DISASSEMBLY AT-104
REPAIR FOR COMPONENT PARTS AT-115
ASSEMBLY AT-158
SERVICE DATA AND SPECIFICATIONS (S.D.S.) AT-176

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

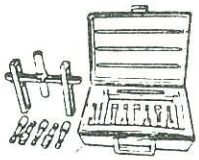
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

Preparation

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
ST07870000 (J37068) Transmission case stand		Disassembling and assembling A/T
KV31102100 (J37065) Torque converter one-way clutch 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
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

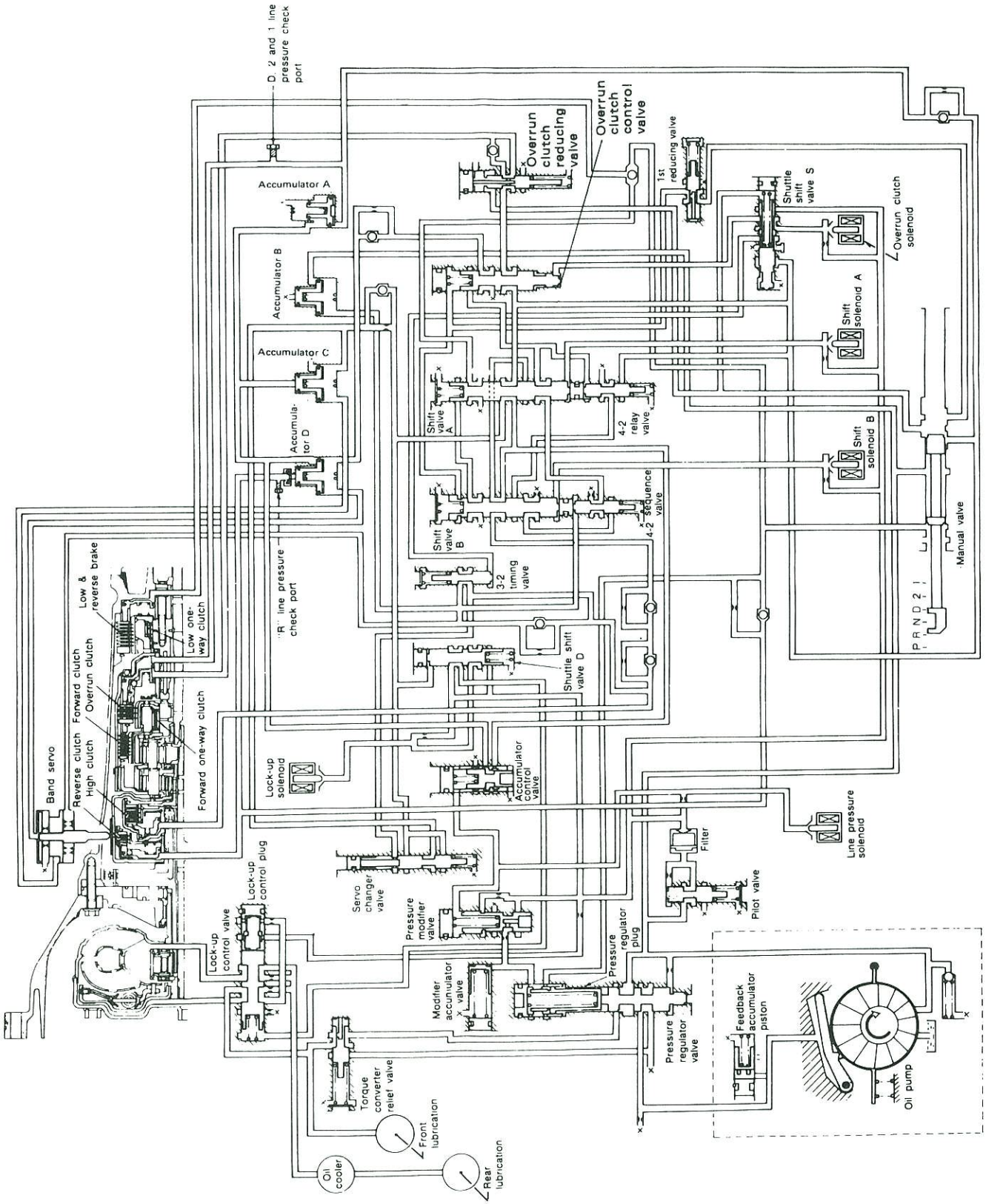
Preparation (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
(J34291) Shim setting gauge set		Selecting oil pump cover bearing race and oil pump thrust washer

Precautions

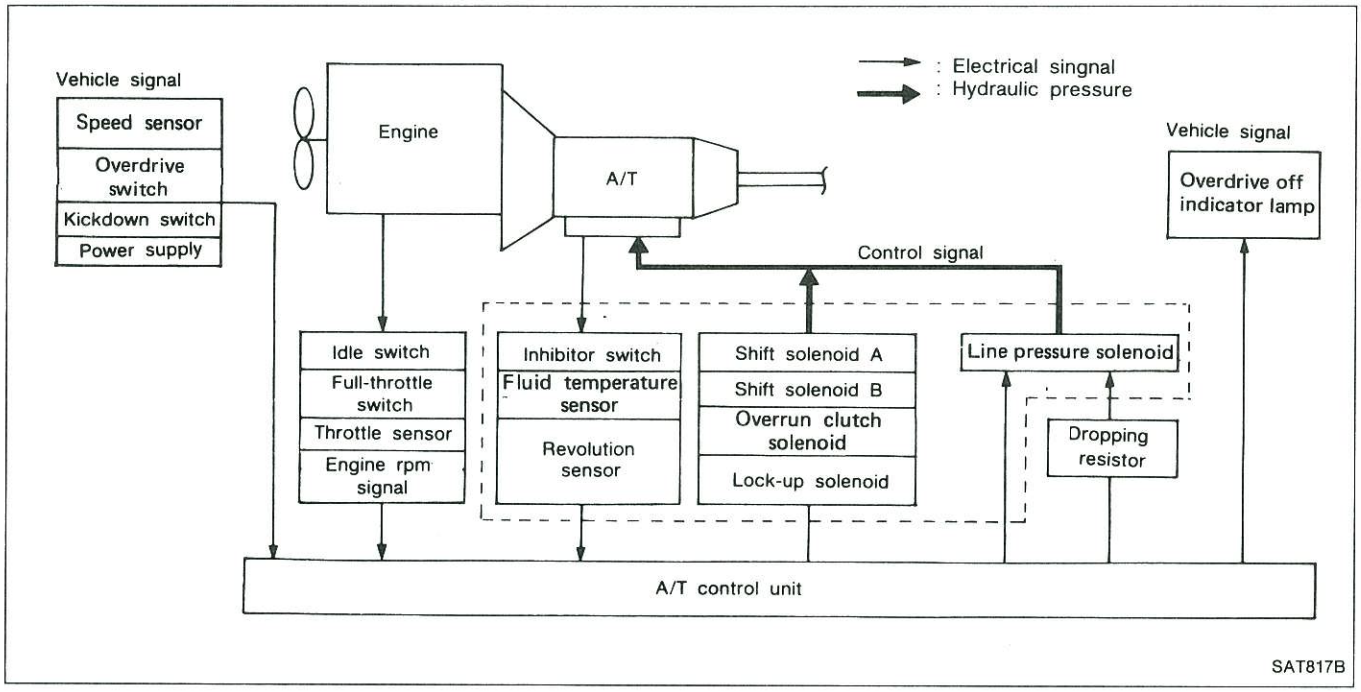
- Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. 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.

Hydraulic Control Circuits



SAT123B

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
R		○									○		REVERSE
N													NEUTRAL
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 in "OFF" position.

*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 in "OFF" position.

○ : Operates.

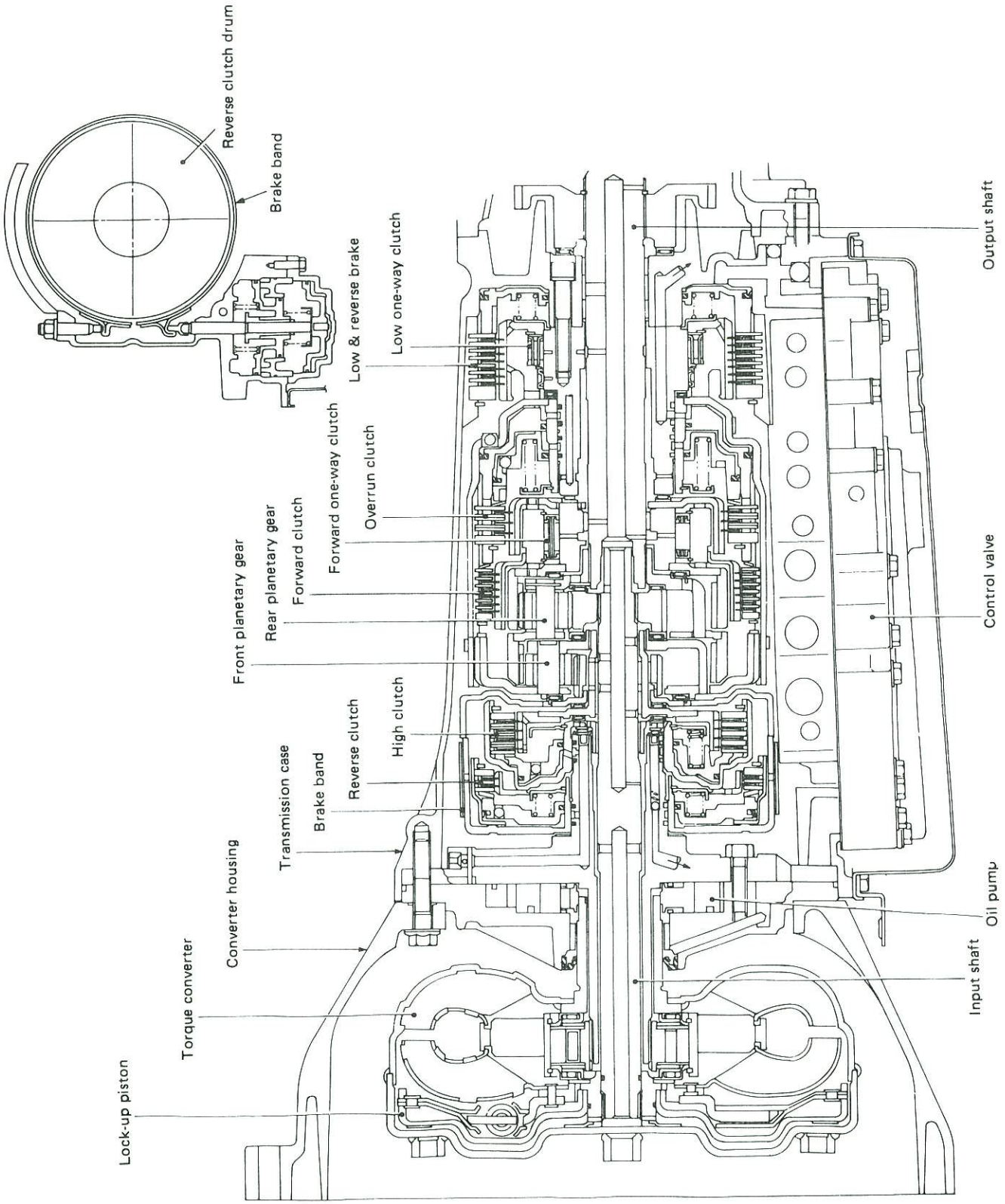
◎ : Operates when throttle opening is less than 1/16. Engine brake activates.

● : Operates during "progressive" acceleration.

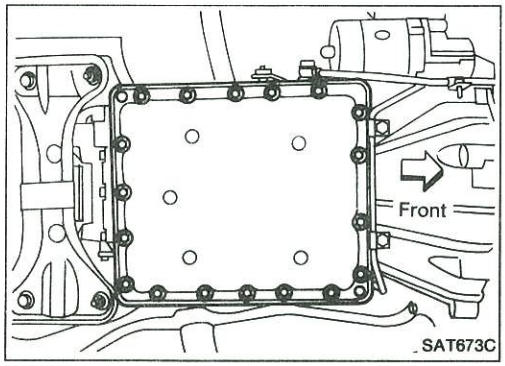
⊗ : Operates but does not affect power transmission.

⊗ : Operates when throttle opening is less than 1/16 but does not affect engine brake.

Cross-Sectional View

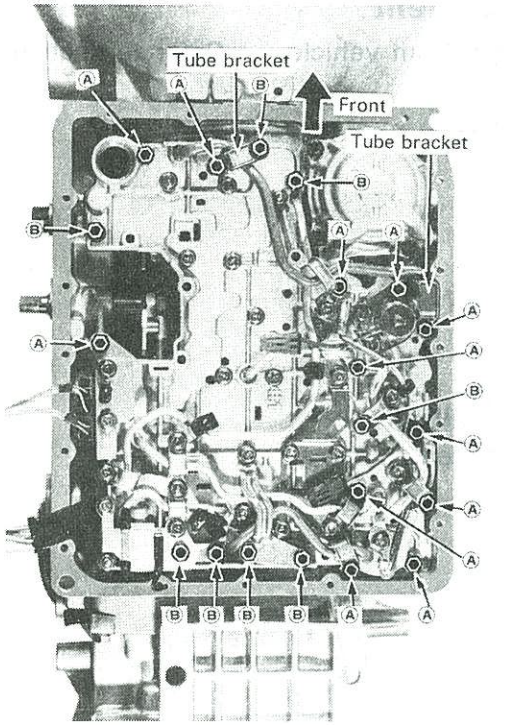


SAT125B



Control Valve Assembly and Accumulators Inspection

1. Remove oil pan and gasket and drain A.T.F.
2. Remove oil strainer.

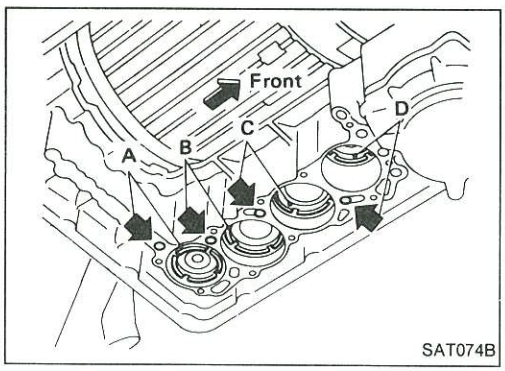


3. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

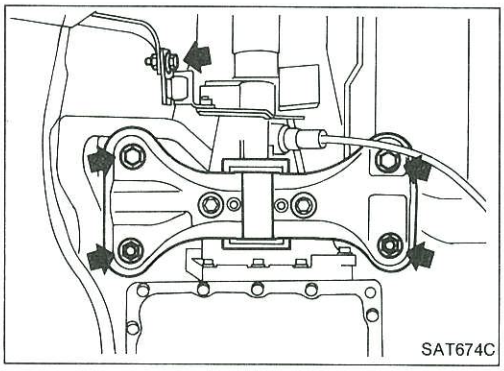
Bolt length and location

Bolt symbol	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

4. Remove solenoids and valves from valve body if necessary.
5. Remove terminal cord assembly if necessary.



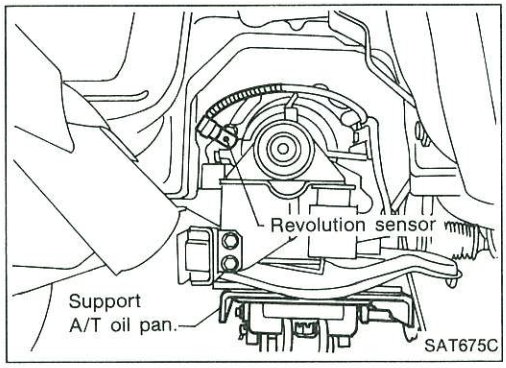
6. Remove accumulators A, B, C and D by applying compressed air if necessary.
- **Hold each piston with rag.**
7. Reinstall any part removed.
- **Always use new sealing parts.**



Revolution Sensor Replacement

1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear engine mounting member from body panel while supporting A/T with jack.
3. Lower A/T assembly as much as possible.

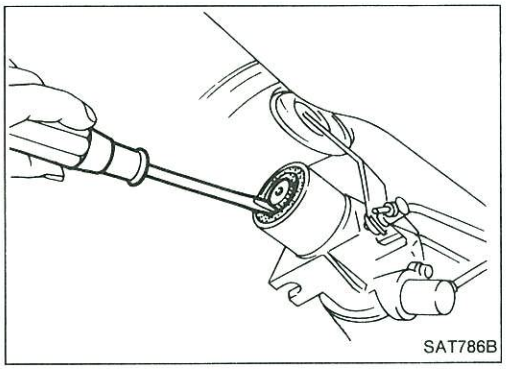
Revolution Sensor Replacement (Cont'd)



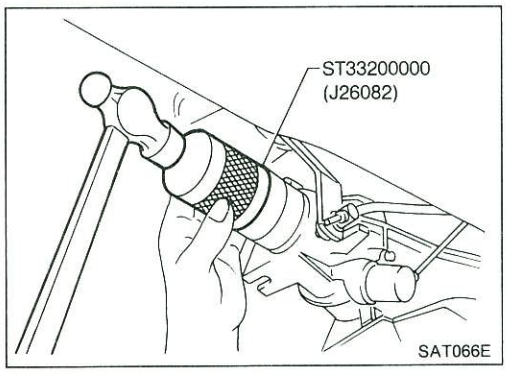
4. Remove revolution sensor from A/T assembly.
5. Reinstall any part removed.

- **Always use new sealing parts.**

Rear Oil Seal Replacement



1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear oil seal.

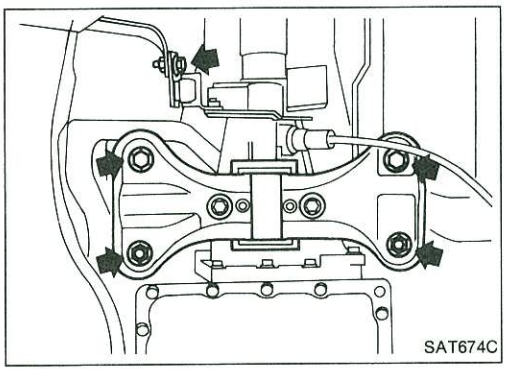


3. Install rear oil seal.

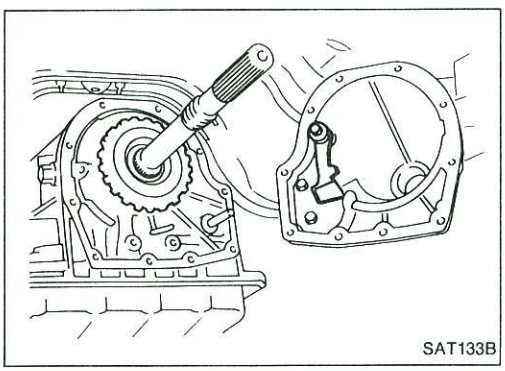
- **Apply A.T.F. before installing.**

4. Reinstall any part removed.

Parking Components Inspection

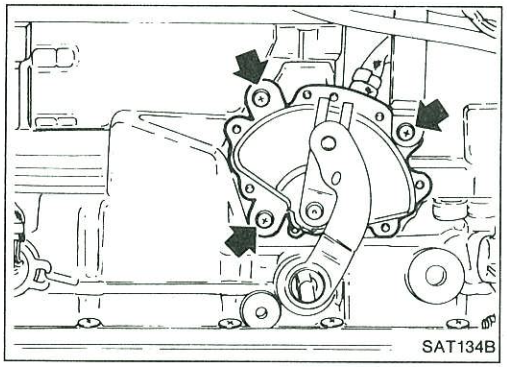


1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear engine mounting member from A/T assembly while supporting A/T with jack.



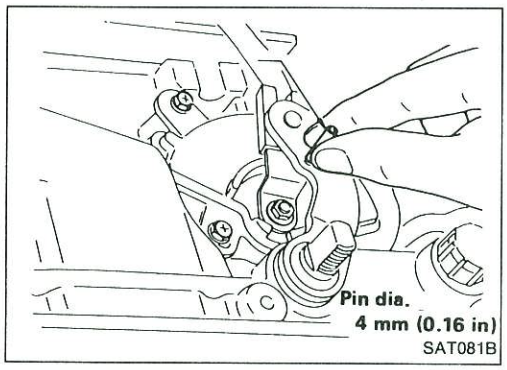
3. Remove rear extension from transmission case.
4. Replace parking components if necessary.
5. Reinstall any part removed.

- **Always use new sealing parts.**


SAT134B

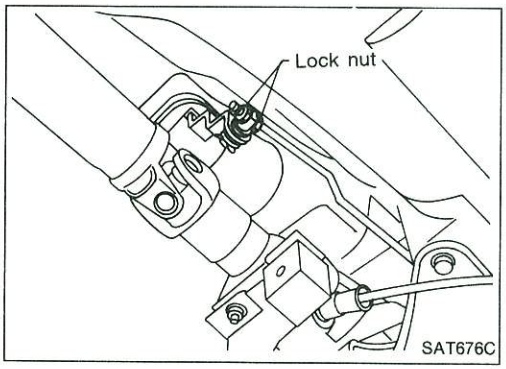
Inhibitor Switch Adjustment

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".

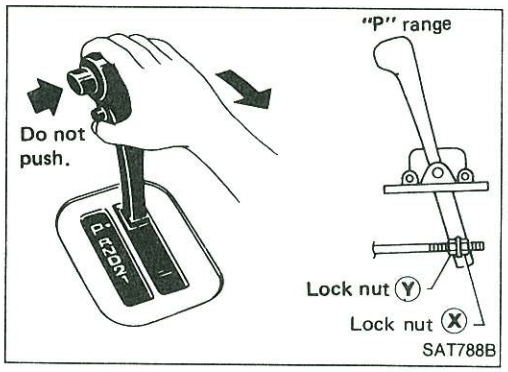


SAT676C

Manual Control Linkage Adjustment

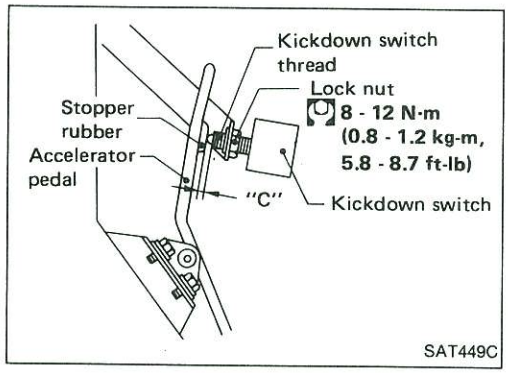
Move selector lever from "P" range to "1" range. You should be able to feel the detents in each range.
If the detents cannot be felt or the pointer indicating the range is improperly aligned, the linkage needs adjustment.

1. Place selector lever in "P" range.
2. Loosen lock nuts.



SAT788B

3. Tighten lock nut Ⓧ until it touches trunnion pulling selector lever toward "R" range side without pushing button.
4. Back off lock nut Ⓧ 1 turn and tighten lock nut Ⓨ to the specified torque.
   Lock nut:
   : 11 - 15 N·m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)
5. Move selector lever from "P" range to "1" range. Make sure that selector lever can move smoothly.



SAT449C

Adjusting Kickdown Switch

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)

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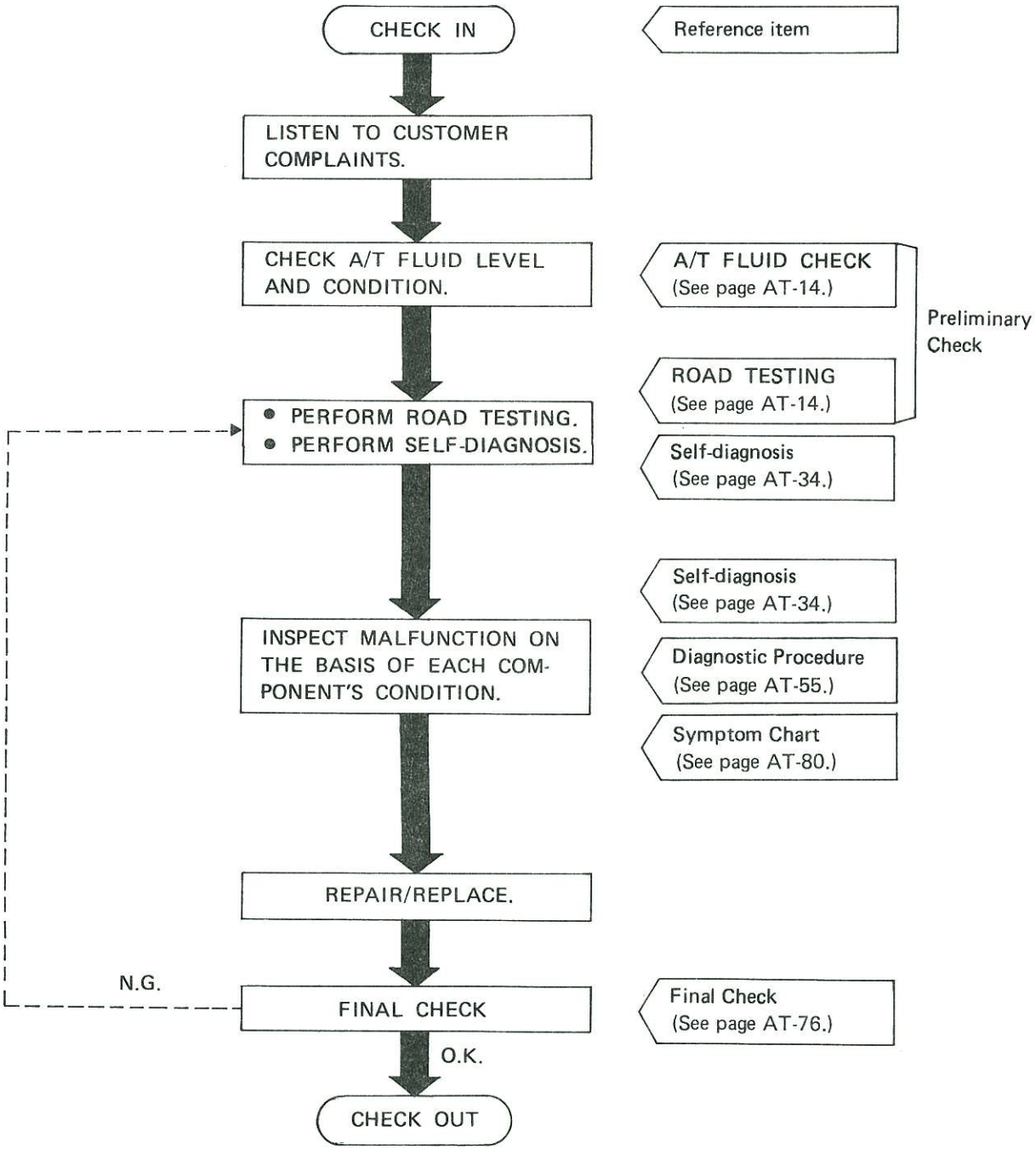
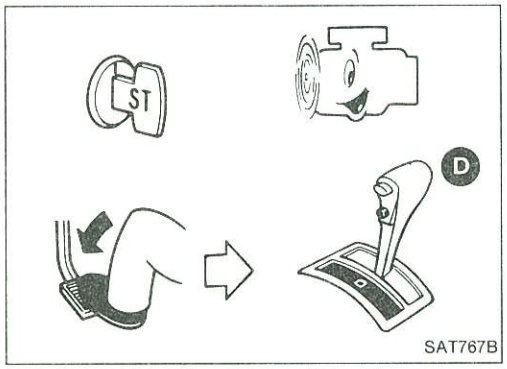
How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW





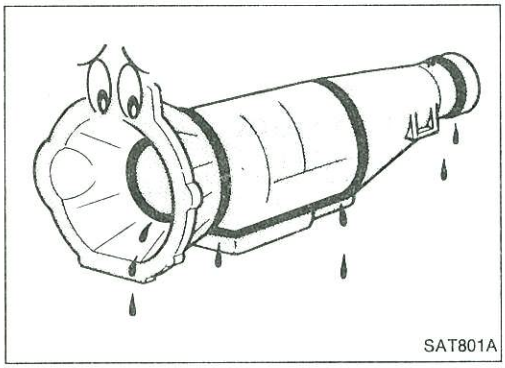
SAT767B

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" range and wait a few minutes.
3. Stop engine.


SAT801A

4. Check for fresh leakage.

Fluid condition check

SAT638A

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling, Overheating

Fluid level check — Refer to section MA.

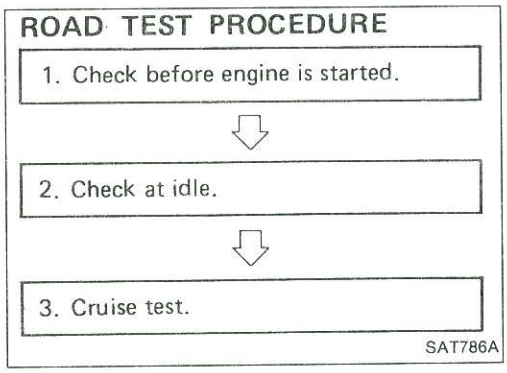
ROAD TESTING

Description

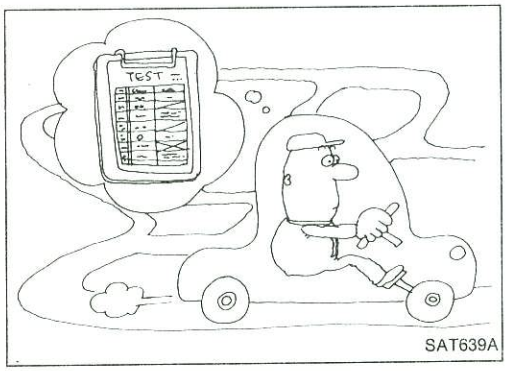
- The purpose of this road test is to determine overall performance of automatic transmission and analyze causes of problems.
- The road test consists of the following three parts:

1. Check before engine is started
2. Check at idle
3. Cruise test

- 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" and "Diagnostic Procedure".



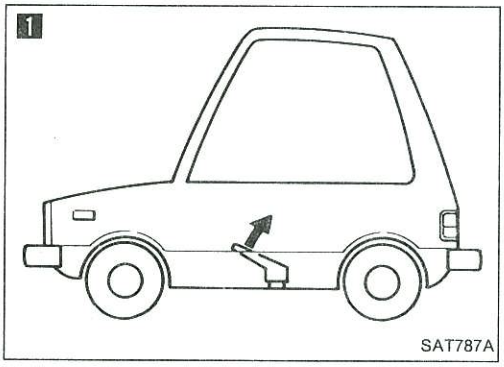
SAT786A

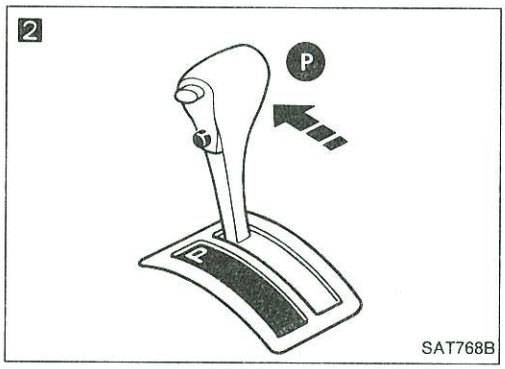


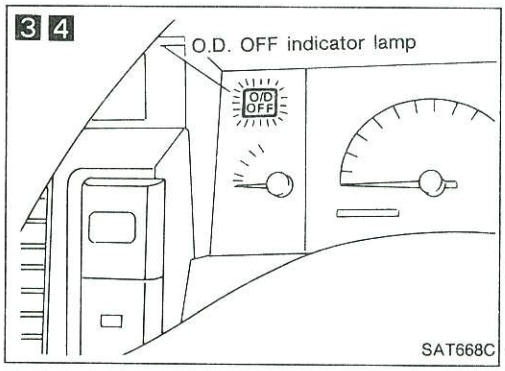
SAT639A

Preliminary Check (Cont'd)

1. Check before engine is started







1

Park vehicle on flat surface.

2

Move selector lever to "P" range.

3

Does O.D. OFF indicator lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

Yes

4

Does O.D. OFF indicator lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.

No

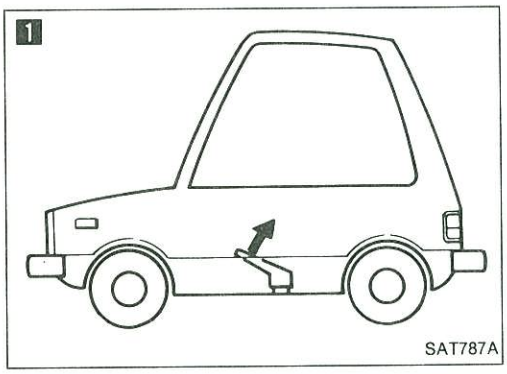
Perform self-diagnosis.
— Refer to SELF-DIAGNOSIS PROCEDURE and note N.G. items.

Go to "ROAD TESTING — 2. Check at idle".

Preliminary Check (Cont'd)

2. Check at idle

1


SAT787A

Park vehicle on flat surface.

↓

↓

2

Move selector lever to "P" or "N" range.

↓

↓

Is engine started? — No → Go to Diagnostic Procedure 2.

↓ Yes

↓

3

Move selector lever to "D", "1", "2" or "R" range.

↓

↓

Is engine started? — Yes → Go to Diagnostic Procedure 2.

↓ No

↓

4

Move selector lever to "P" range.

↓

↓

5

Push vehicle forward or backward.

↓

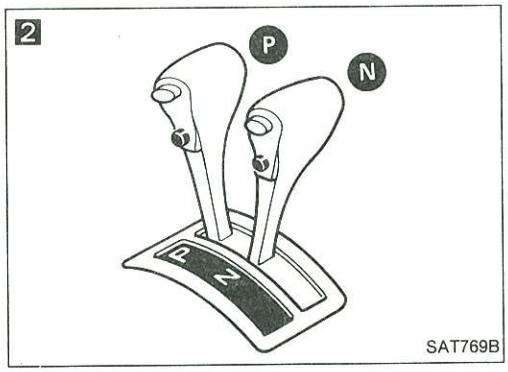
Does vehicle move when it is pushed forward or backward? — Yes → Go to Diagnostic Procedure 3.

↓ No

↓

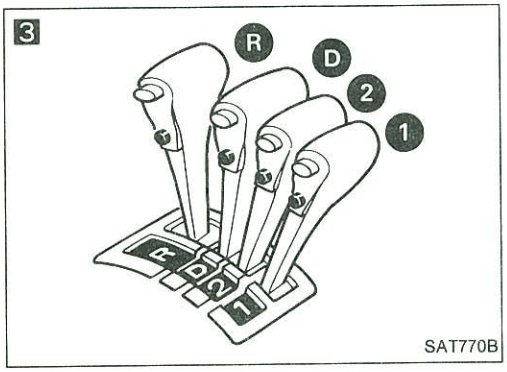
Ⓐ

2



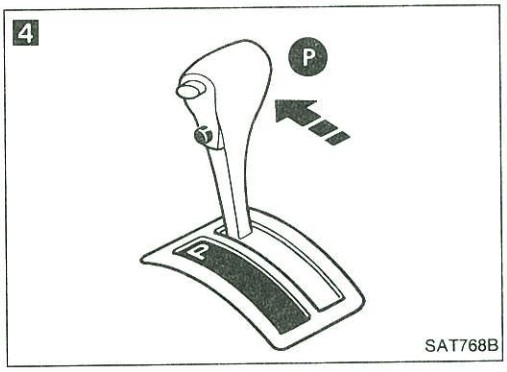
SAT769B

3



SAT770B

4

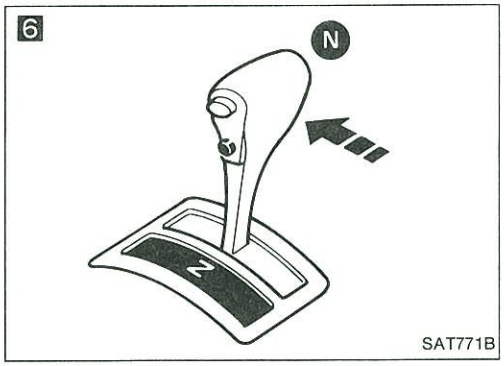


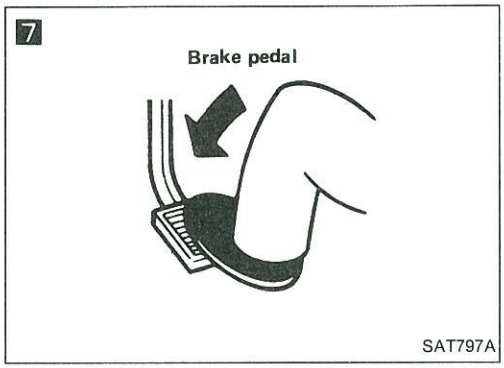
SAT768B

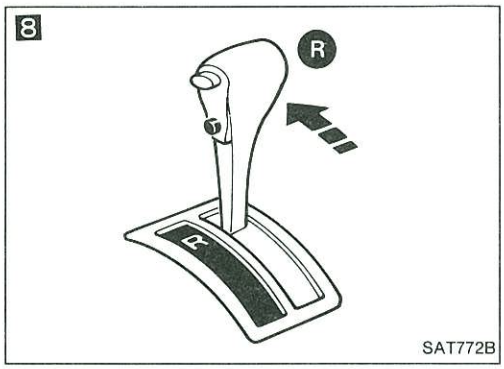
5

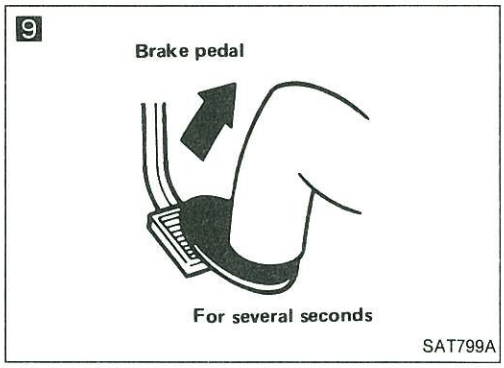
SAT796A

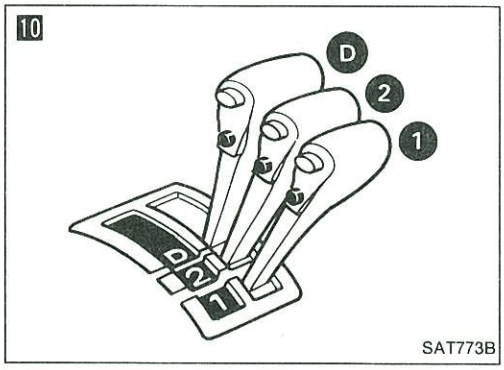
Preliminary Check (Cont'd)











Ⓐ

6 Move selector lever to "N" range.

Does vehicle move forward or backward? — Yes → Go to Diagnostic Procedure 4.

No

7 Apply foot brake.

8 Move selector lever to "R" range.

Is there large shock when changing from "N" to "R" range? — Yes → Go to Diagnostic Procedure 5.

No

9 Release foot brake for several seconds.

Does vehicle creep backward when foot brake is released? — No → Go to Diagnostic Procedure 6.

Yes

10 Move selector lever to "D", "1" and "2" ranges and check if vehicle creeps forward.

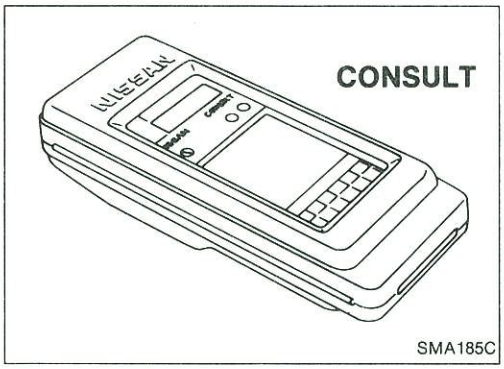
Does vehicle creep forward in all three ranges? — Yes → Go to Cruise test.

No

Go to Diagnostic Procedure 7.

Preliminary Check (Cont'd)

3. Cruise test



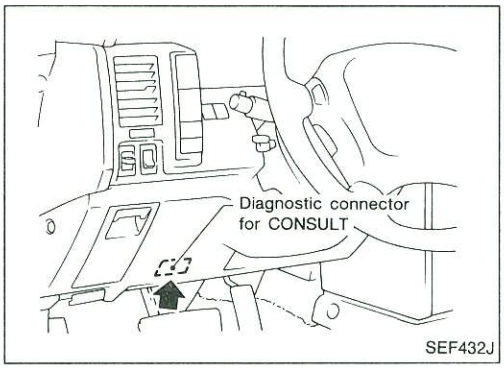
SMA185C

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.

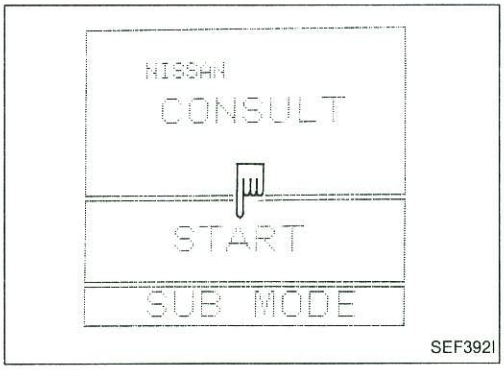
CONSULT setting procedure

1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector. (Diagnostic connector is located in left dash side panel.)



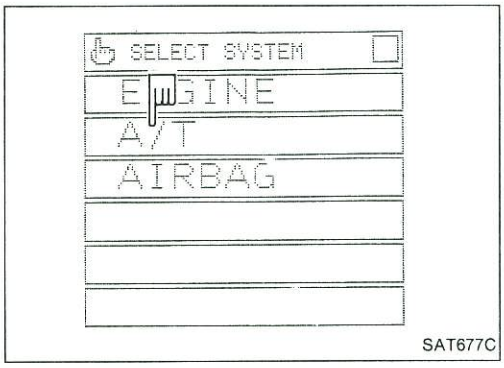
SEF432J

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



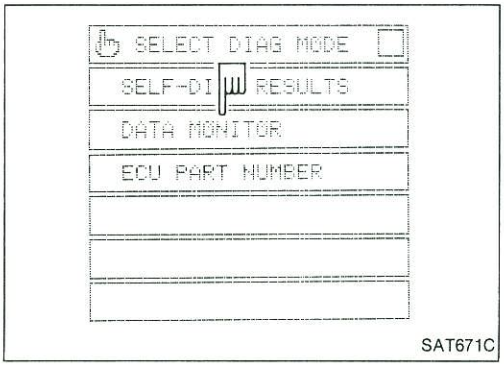
SEF392I

5. Touch "A/T".



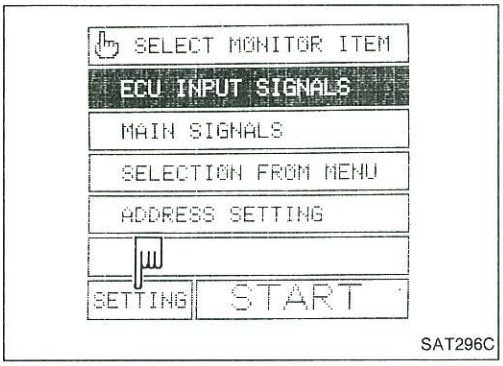
SAT677C

6. Touch "DATA MONITOR".

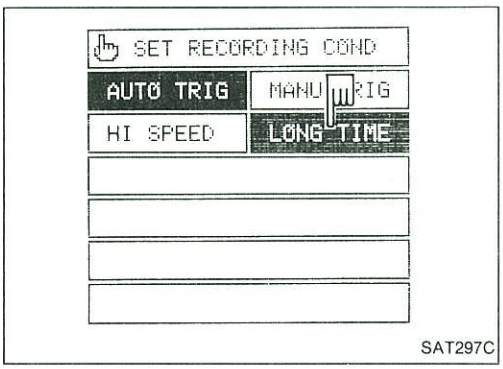


SAT671C

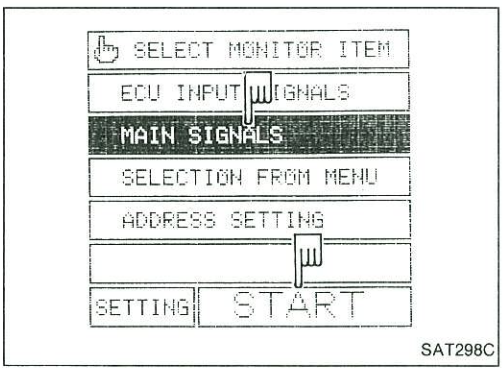
Preliminary Check (Cont'd)



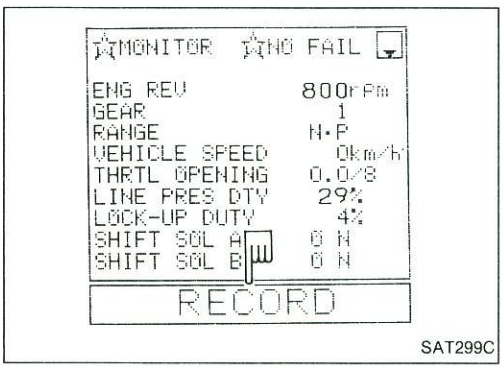
7. Touch "SETTING" to set recording condition.



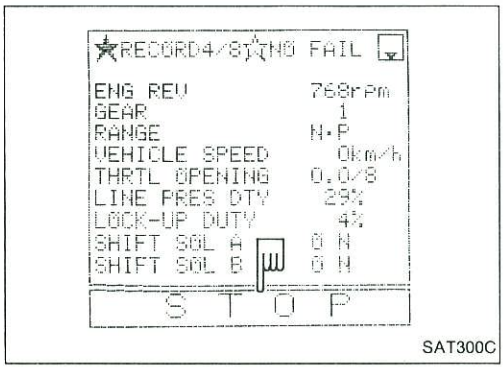
8. Touch "LONG TIME" and "ENTER" key.



9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".
10. Touch "START".



11. When performing cruise test, touch "RECORD".

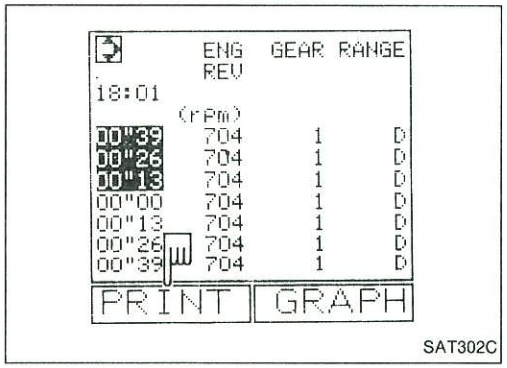


12. After finishing cruise test part 1, touch "STOP".

Preliminary Check (Cont'd)

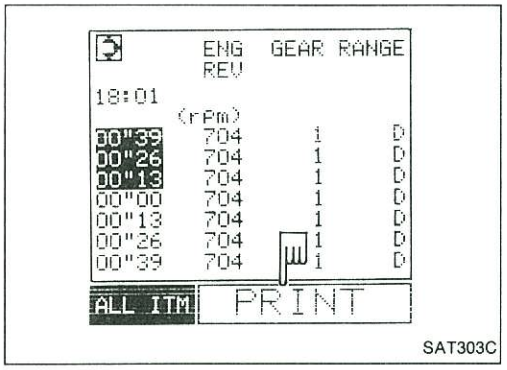
SAT301C

13. Touch "DISPLAY".



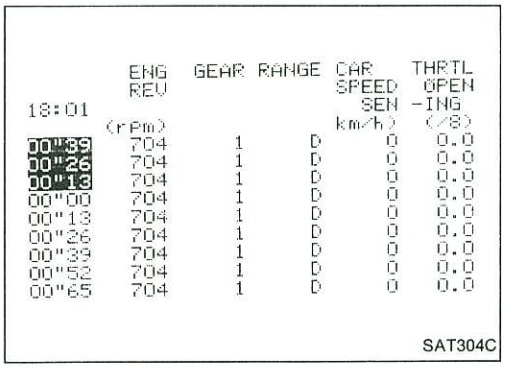
SAT302C

14. Touch "PRINT".



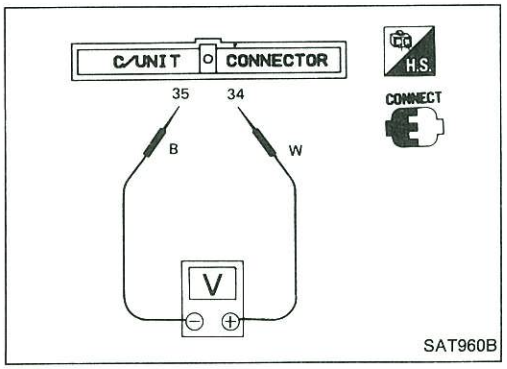
SAT303C

15. Touch "PRINT" again.



SAT304C

16. Check the monitor data printed out.
17. Continue cruise test part 2 and 3.



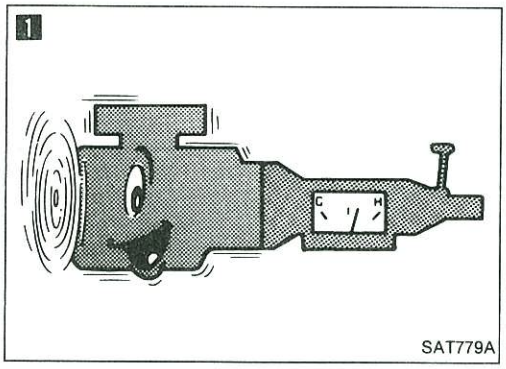
SAT960B

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

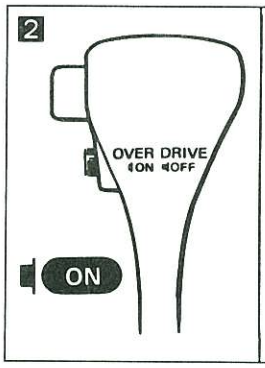


1

Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

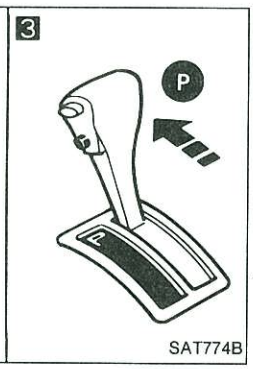
A.T.F. operating temperature:
50 - 80°C (122 - 176°F)

Park vehicle on flat surface.



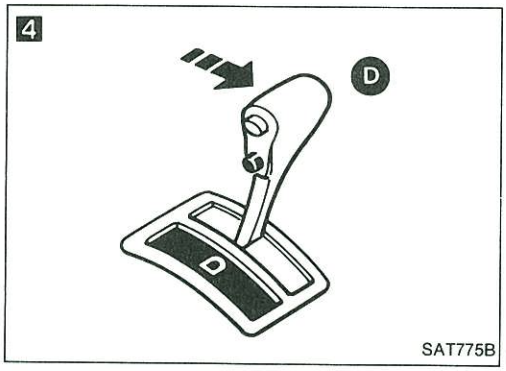
2

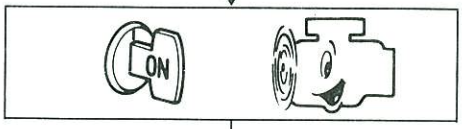
Set overdrive switch in "ON" position.



3

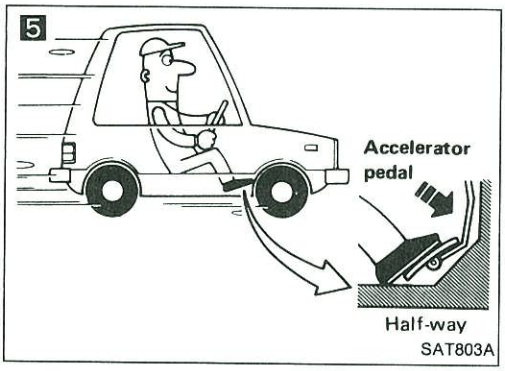
Move selector lever to "P" range.





4

Move selector lever to "D" range.



5

Accelerate vehicle to half throttle.

Does vehicle start from D_1?

Read gear position.

No → Go to Diagnostic Procedure 8.

Yes

6

Does A/T shift from D_1 to D_2 at the specified speed?

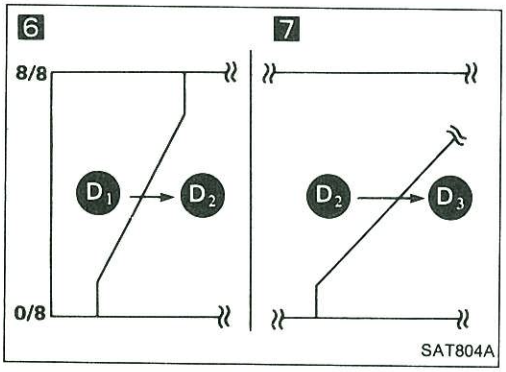
Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_1 to D_2:
Refer to Shift schedule.

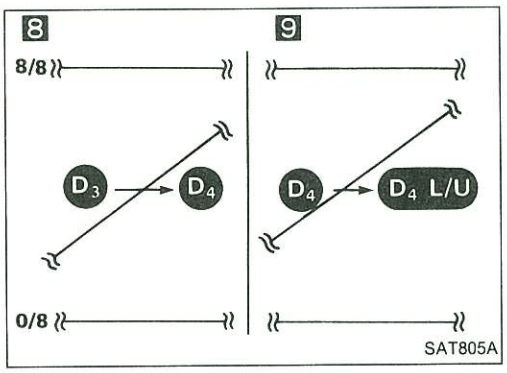
No → Go to Diagnostic Procedure 9.

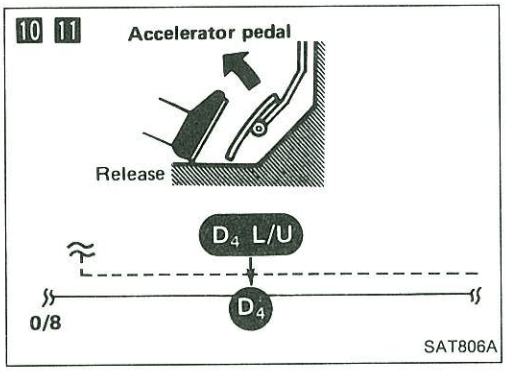
Yes

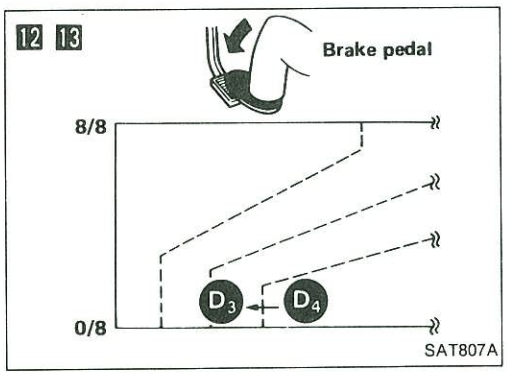
Ⓐ



Preliminary Check (Cont'd)







Ⓐ

7 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 ↓

8 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 ↓

9 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 ↓

10 Release accelerator pedal.

11 Is lock-up released when accelerator pedal is released?

No → Go to Diagnostic Procedure 14.

Yes ↓

12 Decelerate vehicle by applying foot brake lightly.

13 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 ↓

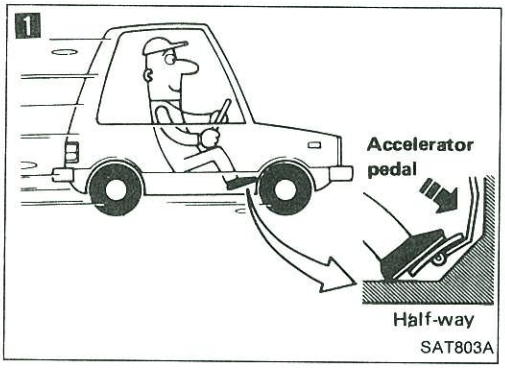
Stop vehicle.

↓

Go to "Cruise test — Part 2".

Preliminary Check (Cont'd)

Cruise test — Part 2

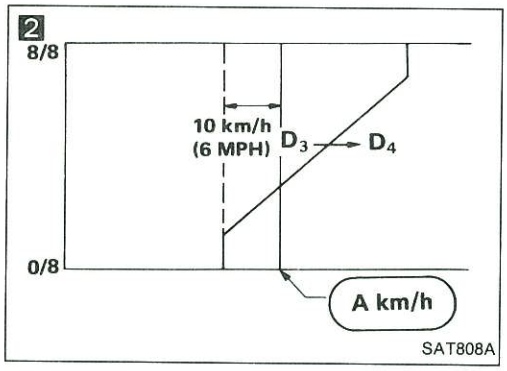


Confirm overdrive switch is in "ON" position.

Confirm selector lever is in "D" range.

1

Accelerate vehicle to half throttle again.



Does vehicle start from D_1?

Read gear position.

No → Go to Diagnostic Procedure 16.

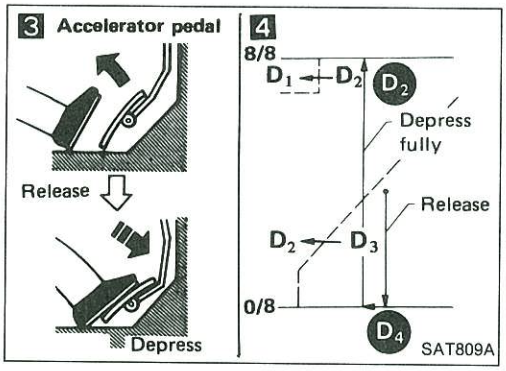
Yes

2

Accelerate vehicle to A km/h as shown in illustration.

3

Release accelerator pedal and then quickly depress it fully.



4

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

5

Does A/T shift from D_2 to D_3 at the specified speed?

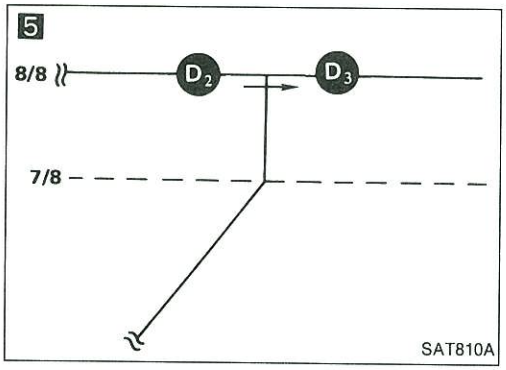
Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_2 to D_3:

Refer to Shift schedule.

No → Go to Diagnostic Procedure 10.

Yes



6

Release accelerator pedal after shifting from D_2 to D_3.

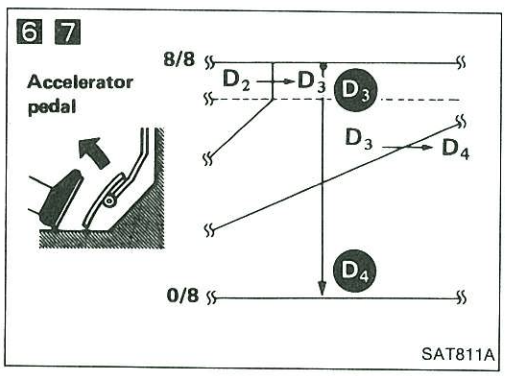
7

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

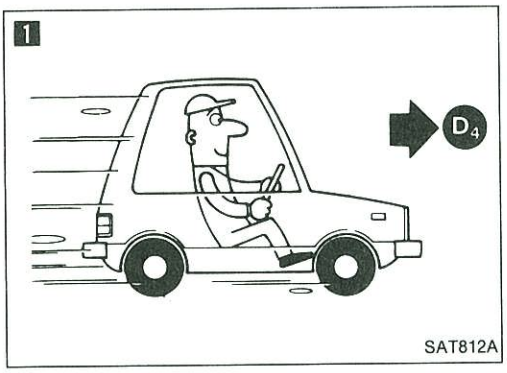


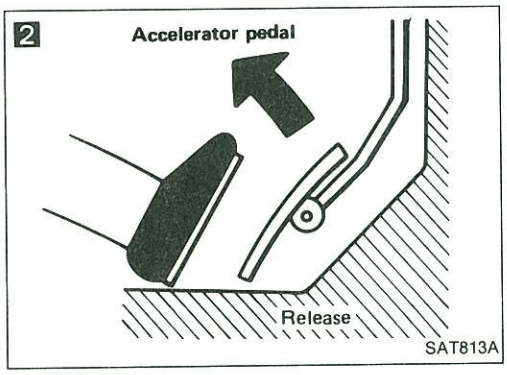
Stop vehicle.

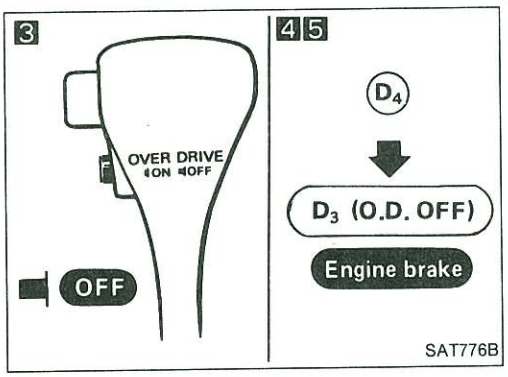
Go to "Cruise test — Part 3".

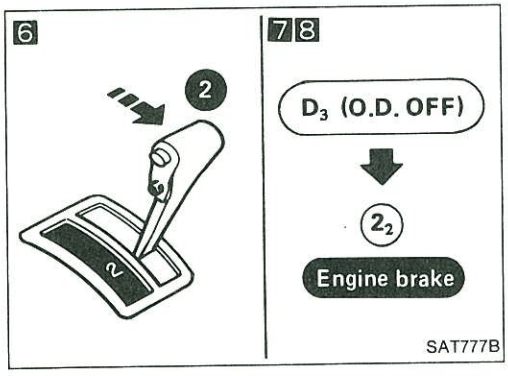
Preliminary Check (Cont'd)

Cruise test — Part 3









Confirm overdrive switch is in "ON" position.

↓

Confirm selector lever is in "D" range.

↓

1 Accelerate vehicle, using half- throttle, to D_4.

↓

2 Release accelerator pedal.

↓

3 Set overdrive switch in "OFF" position while driving in D_4 range.

↓

4 Does A/T shift from D_4 to D_3? **Read gear position and vehicle speed.**

- No → Go to Diagnostic Procedure 17.
- Yes ↓

5 Does vehicle decelerate by engine brake?

- No → Go to Diagnostic Procedure 15.
- Yes ↓

6 Move selector lever from "D" to "2" range while driving in D_3.

↓

7 Does A/T shift from D_3 to 2_2? **Read gear position.**

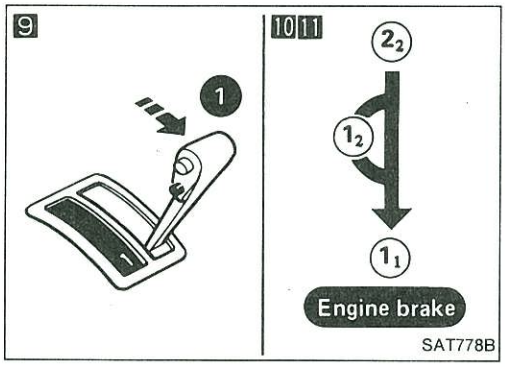
- No → Go to Diagnostic Procedure 18.
- Yes ↓

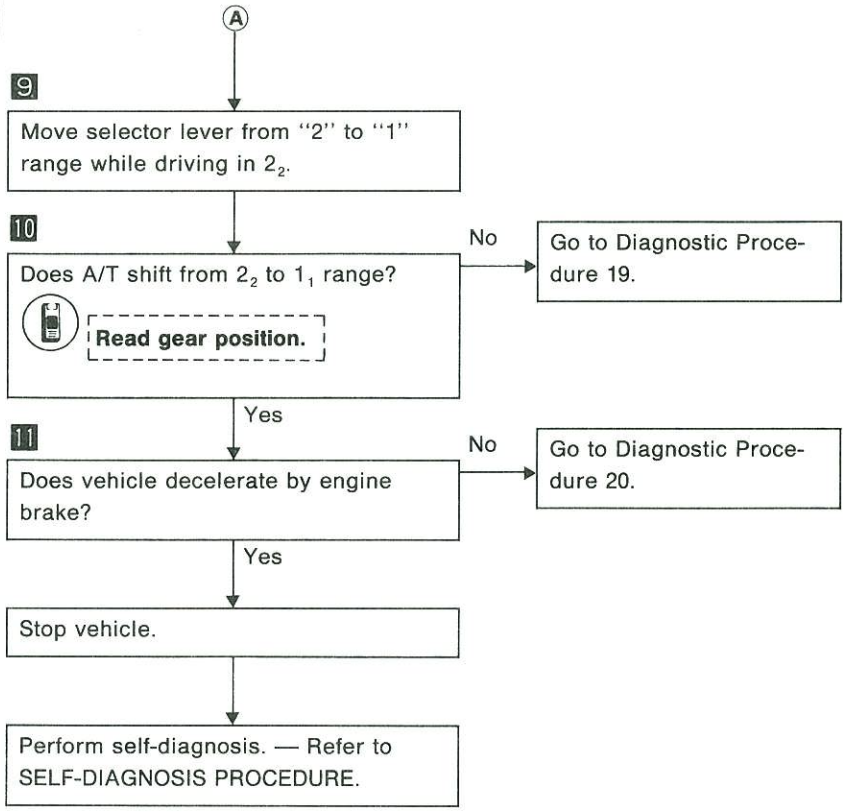
8 Does vehicle decelerate by engine brake?

- No → Go to Diagnostic Procedure 15.
- Yes ↓

Ⓐ

Preliminary Check (Cont'd)





Vehicle speed when shifting gears

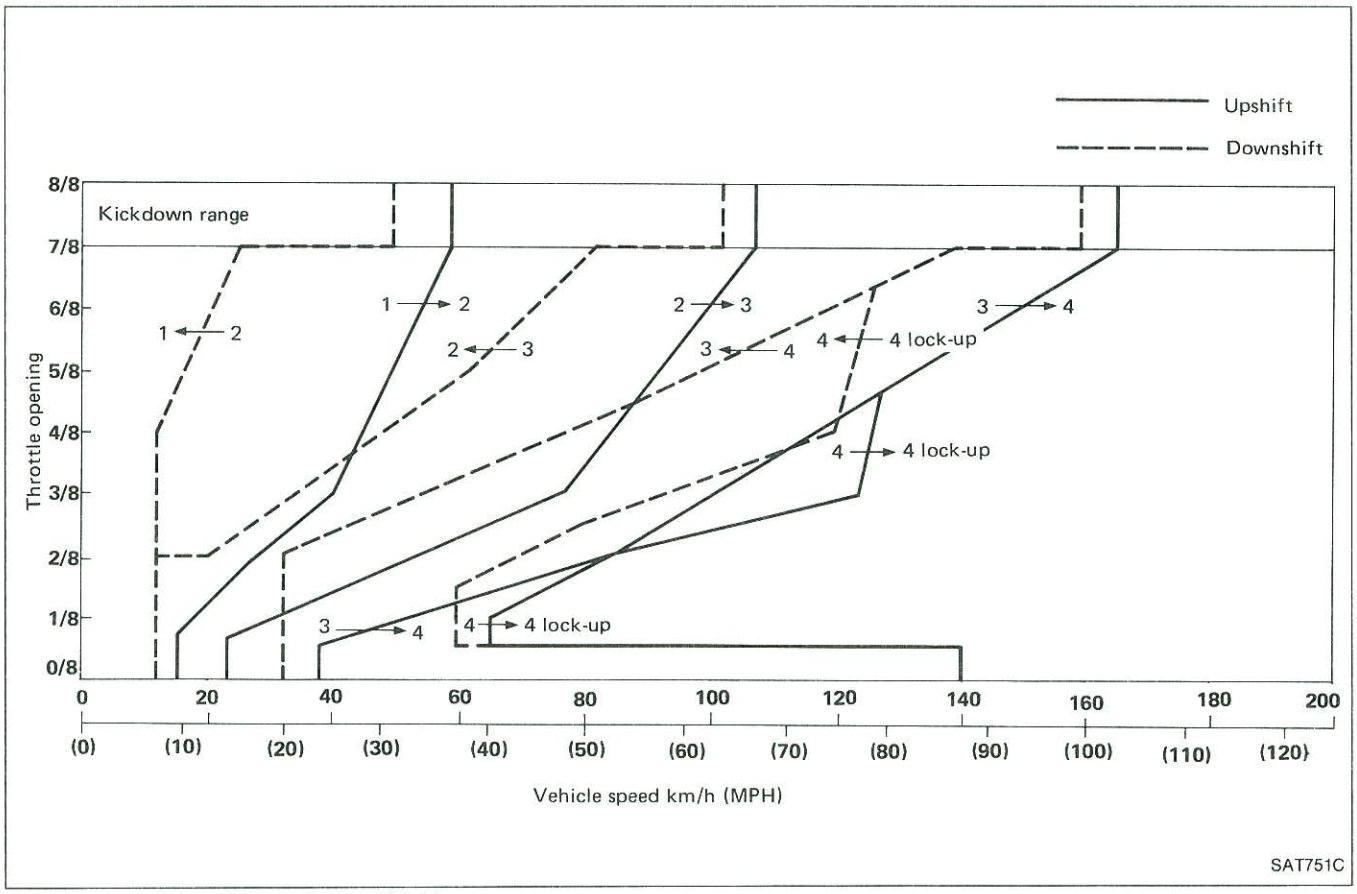
Throttle position	Vehicle speed km/h (MPH)					
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$
Full throttle	58 - 61 (36 - 38)	103 - 111 (64 - 69)	160 - 170 (99 - 106)	154 - 164 (96 - 102)	98 - 106 (61 - 66)	48 - 52 (30 - 32)
Half throttle	42 - 46 (26 - 29)	81 - 87 (50 - 54)	112 - 122 (70 - 76)	73 - 81 (45 - 50)	45 - 51 (28 - 32)	10 - 14 (6 - 9)

Vehicle speed when performing

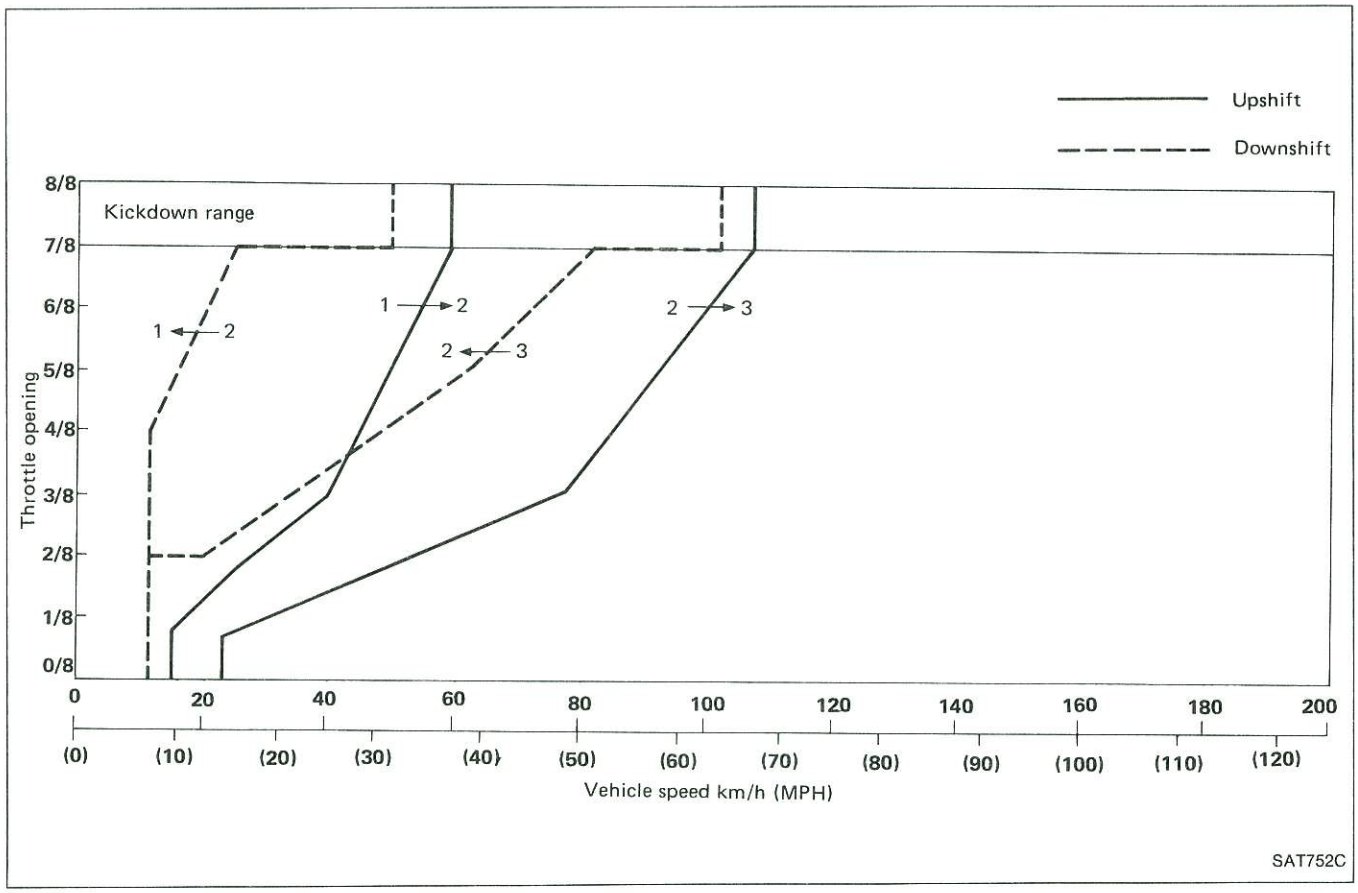
Throttle position	O.D. switch [Shift range]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D_4]	161 - 169 (100 - 105)	155 - 163 (96 - 101)
Half throttle	ON [D_4]	121 - 129 (75 - 80)	116 - 124 (72 - 77)

Preliminary Check (Cont'd)

Shift schedule (Overdrive ON)



Shift schedule (Overdrive OFF)



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 "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).

Diagnosis by CONSULT (Cont'd)

DATA MONITOR APPLICATION

Item	Application
Vehicle speed sensor 1 (A/T)	X
Vehicle speed sensor 2 (meter)	X
Throttle sensor	X
Fluid temperature sensor	X
Battery voltage	X
Engine rpm	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	—
Idle switch	X
Full throttle switch	X
Shift solenoid A	X
Shift solenoid B	X
Overrun clutch solenoid	X
*Shift solenoid A (feedback)	X
*Shift solenoid B (feedback)	X
*Overrun clutch solenoid (feedback)	X
Hold mode switch	—
1 range switch	X
2 range switch	X
D range switch	X
N range switch	X
R range switch	X
Gear position	X
Range position	X
Vehicle speed	X
Throttle opening	X
Line-pressure solenoid	X
Lock-up solenoid	X

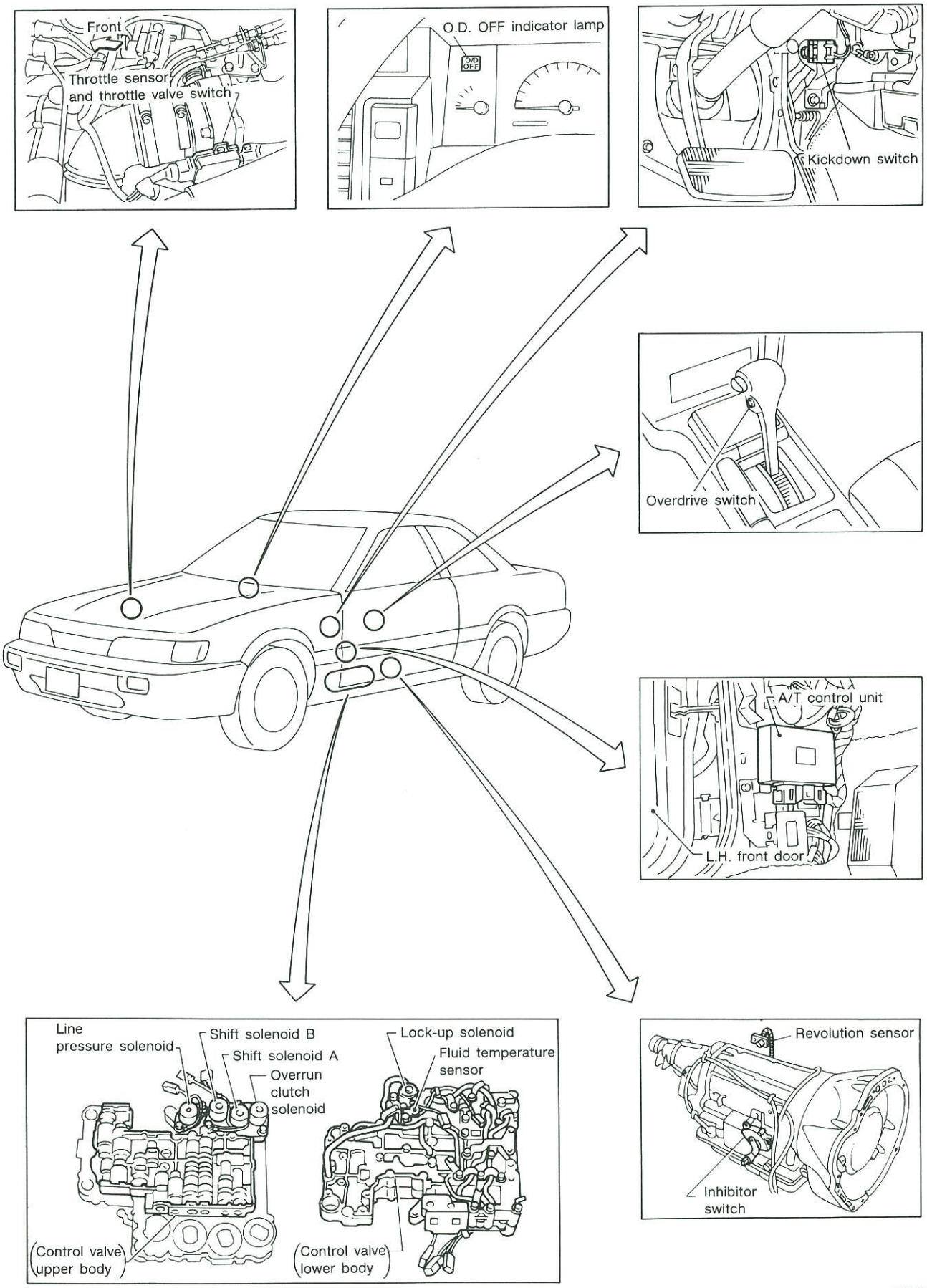
X: Applicable —: Not applicable

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 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)]

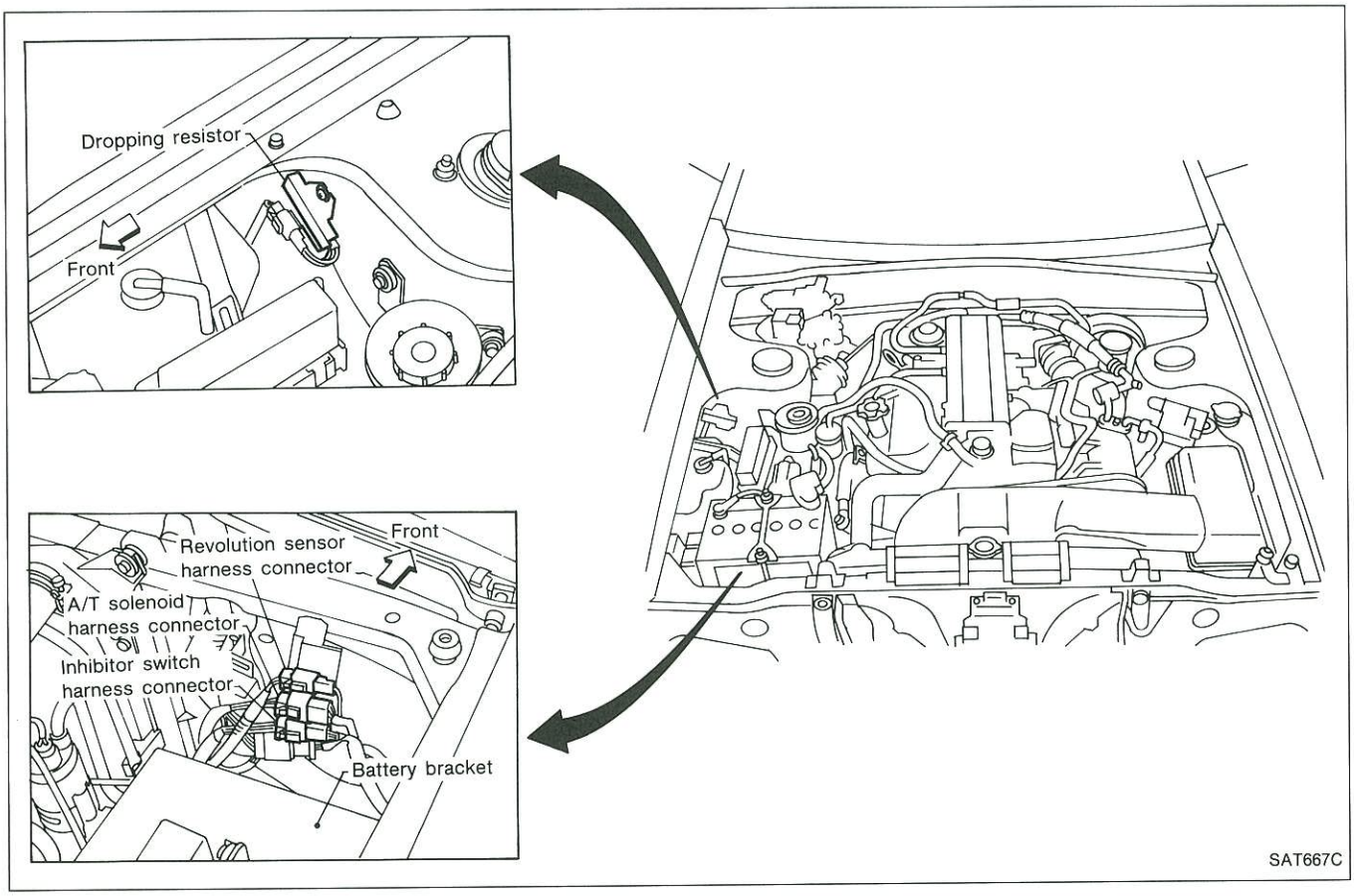
Gear position	1	2	3	4
Shift solenoid A	ON	OFF	OFF	ON
Shift solenoid B	ON	ON	OFF	OFF

A/T Electrical Parts Location

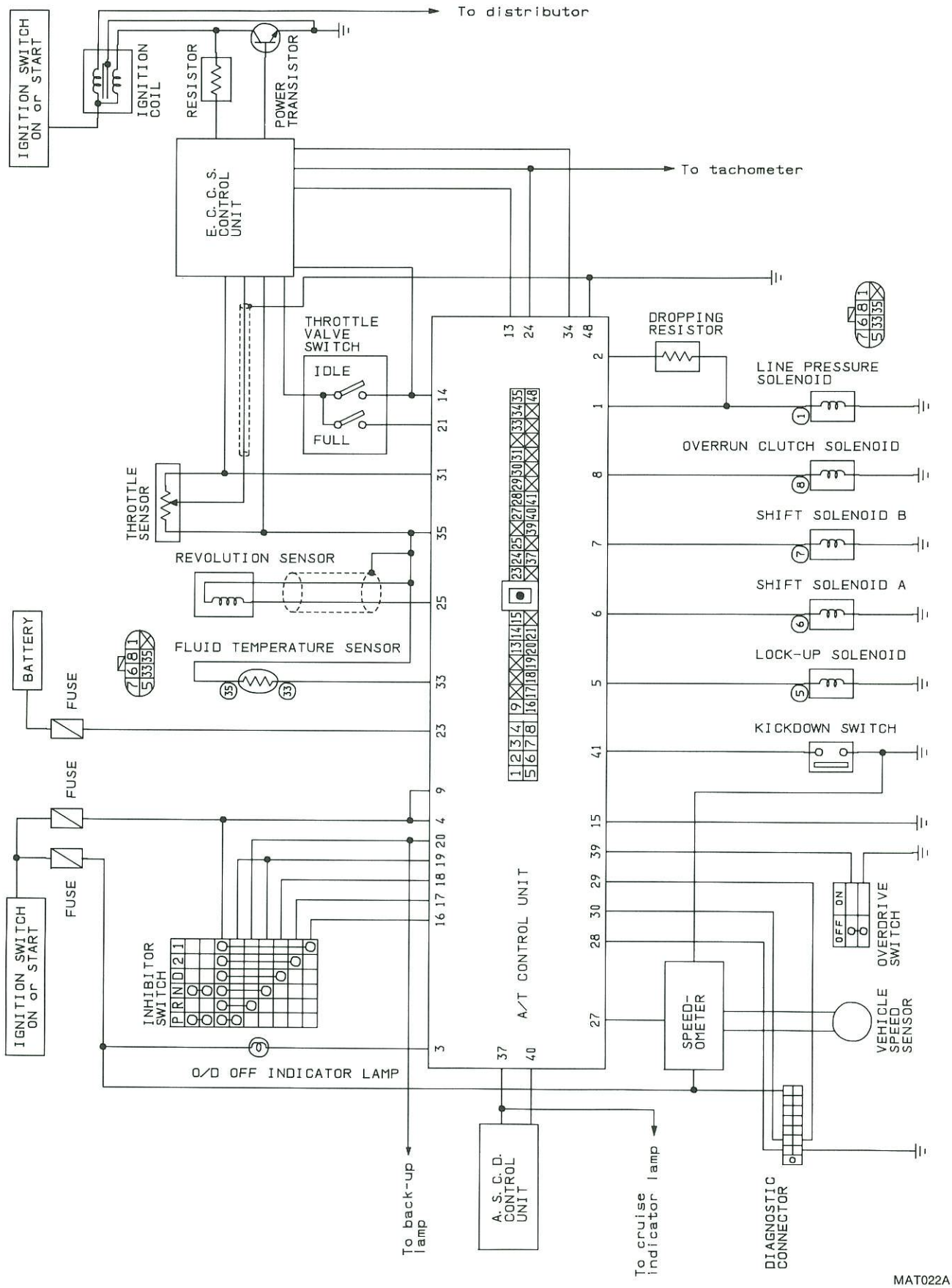


SAT666C

A/T Electrical Parts Location (Cont'd)

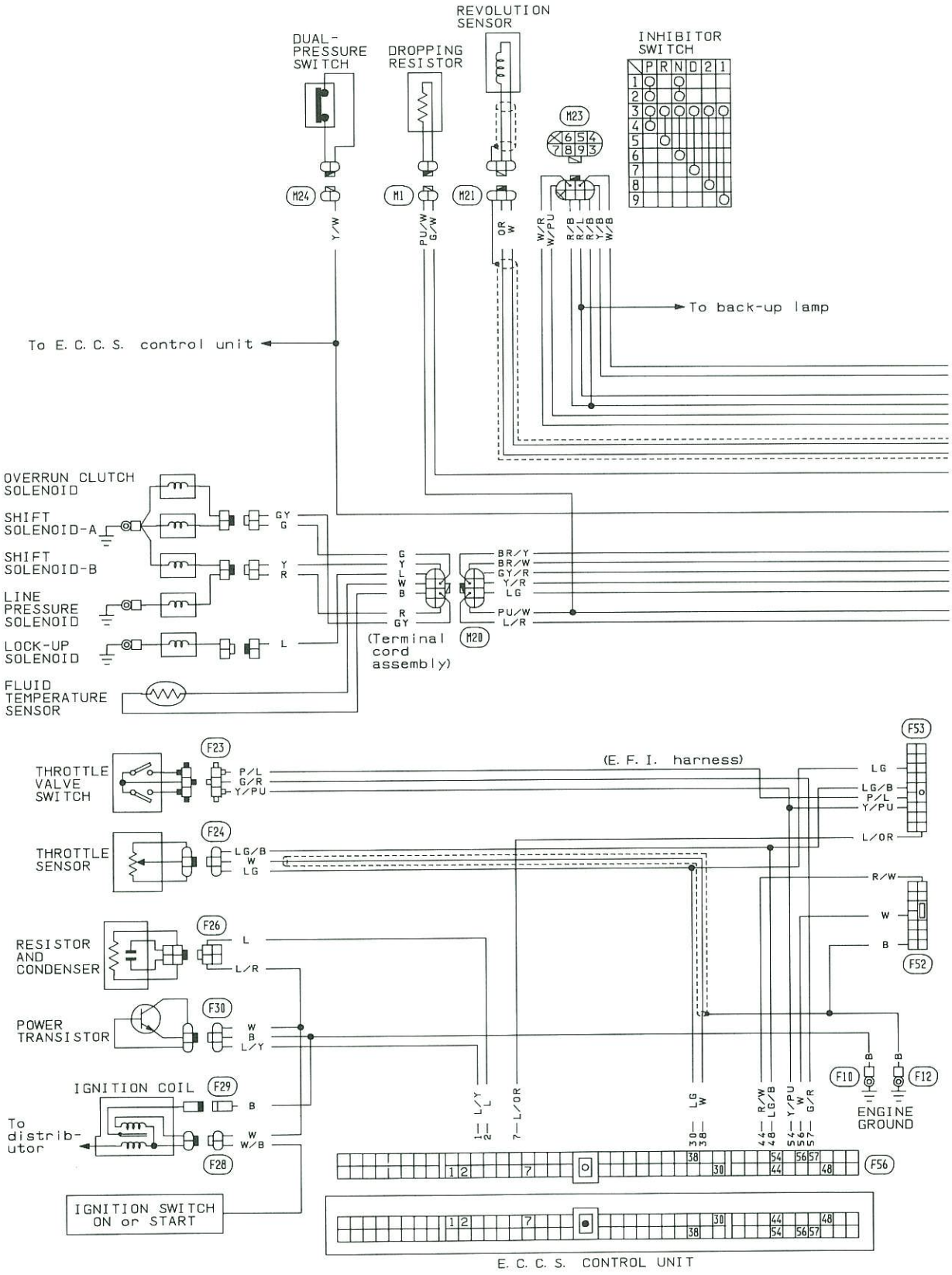


Circuit Diagram for Quick Pinpoint Check

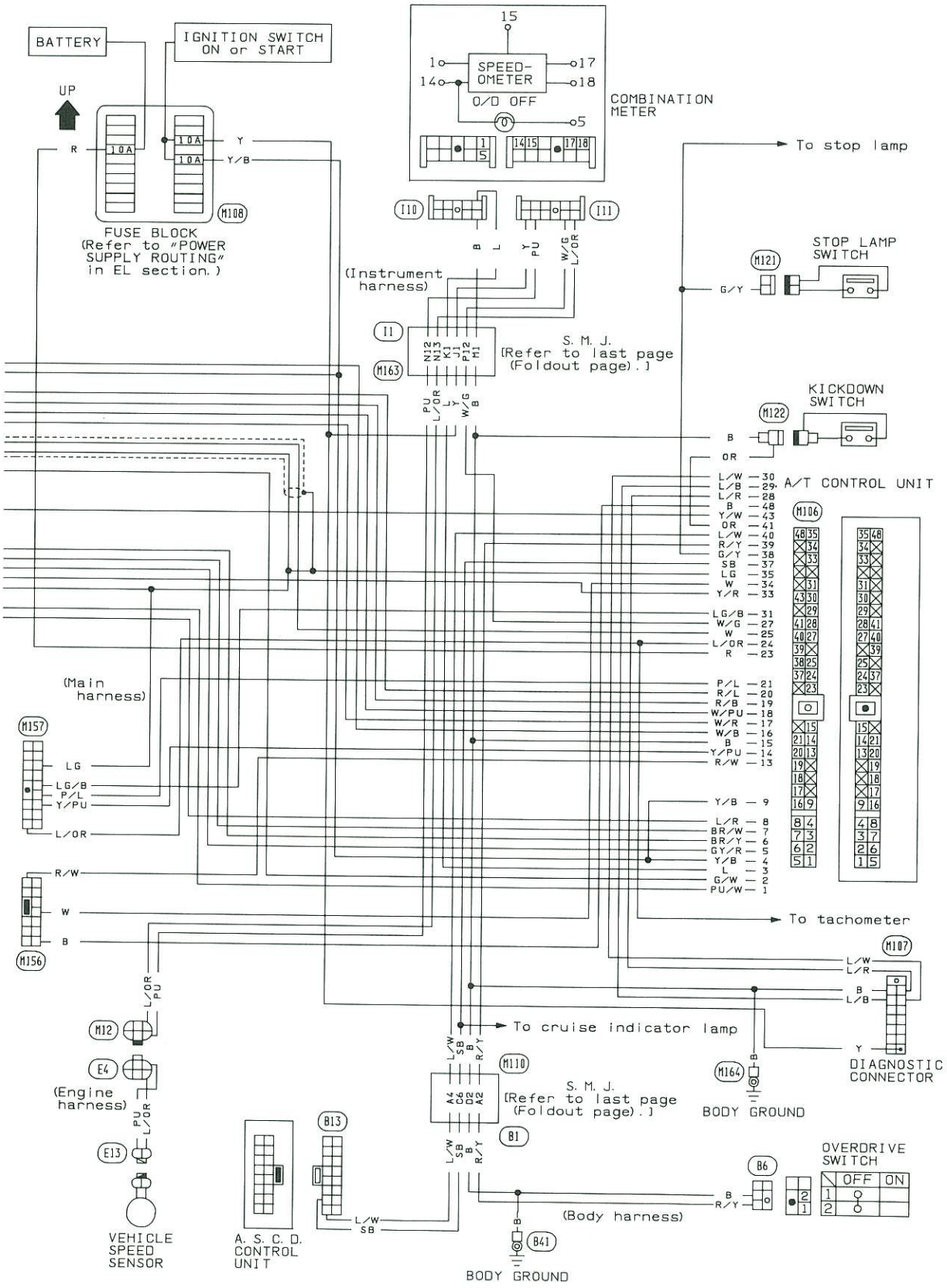


MAT022A

Wiring Diagram



Wiring Diagram (Cont'd)

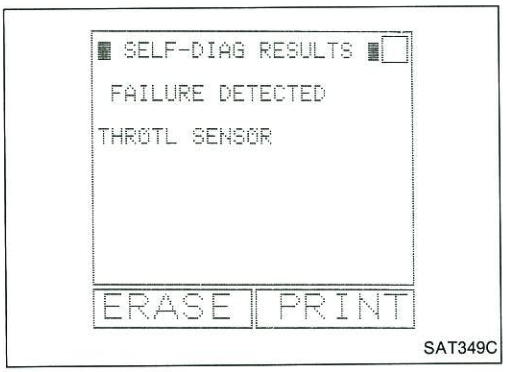


SAT454E

Self-diagnosis

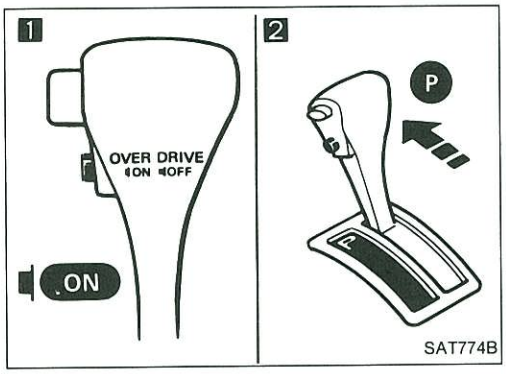
SELF-DIAGNOSTIC PROCEDURE (With CONSULT)

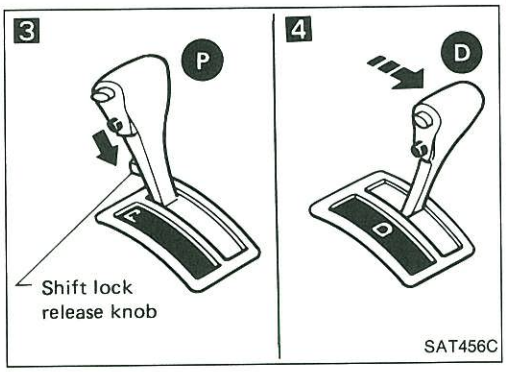
1. Turn on CONSULT.
2. Touch "A/T".

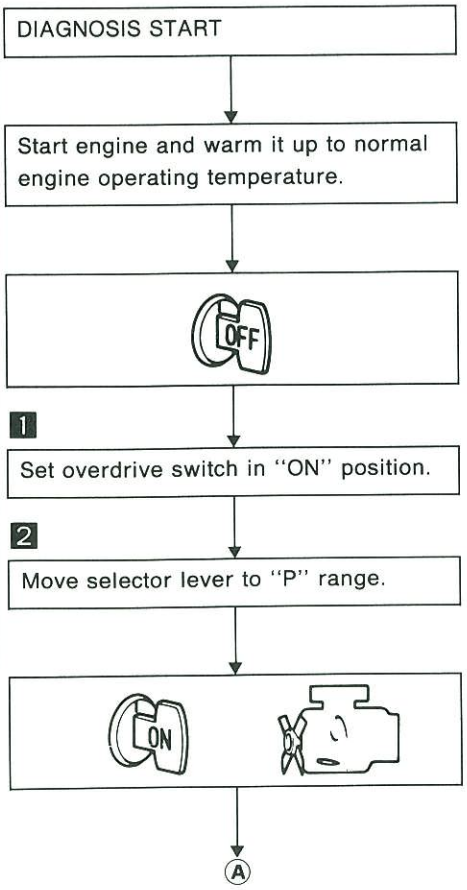


3. Touch "SELF-DIAGNOSIS".
   CONSULT performs REAL-TIME SELF-DIAGNOSIS.

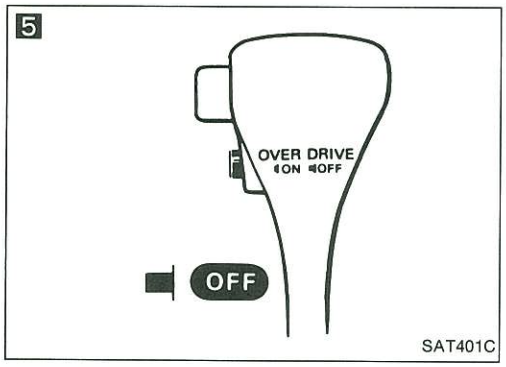
SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)

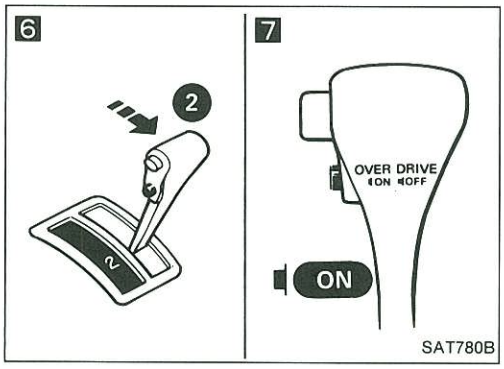


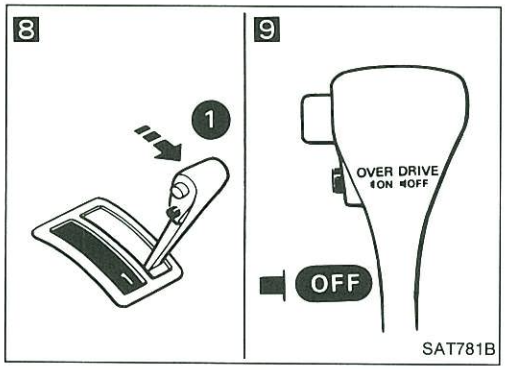


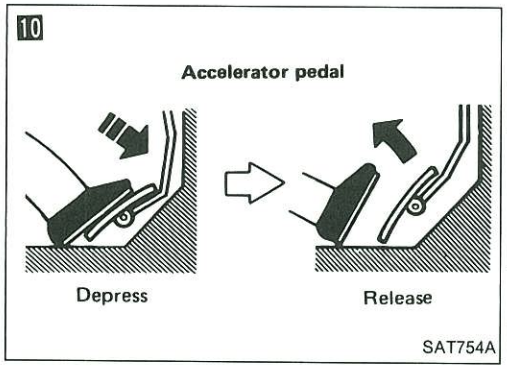


Self-diagnosis (Cont'd)









Ⓐ

Does O.D. OFF indicator lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

Yes

3. Push shift lock release knob.
4. Move selector lever to "D" range.
5. Set overdrive switch in "OFF" position.

Wait for more than 2 seconds after ignition switch "ON".

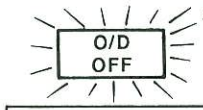
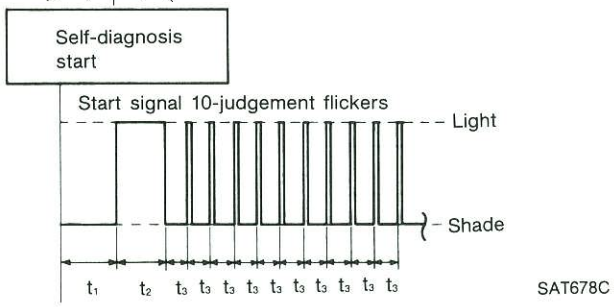
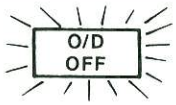
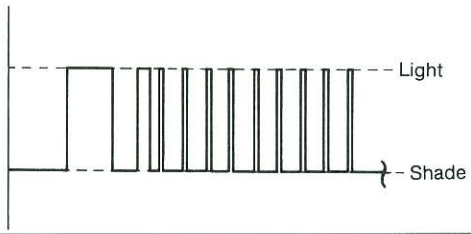
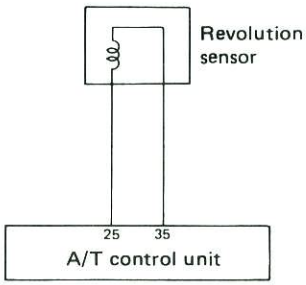
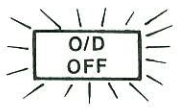
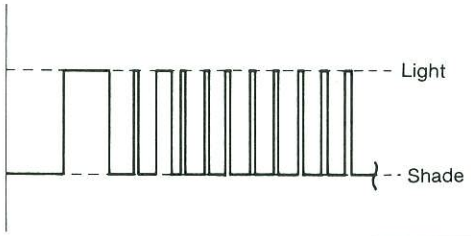
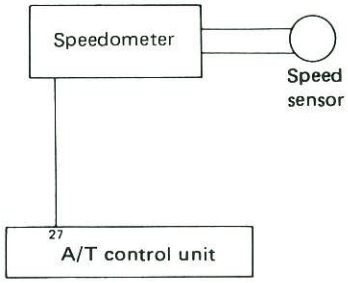
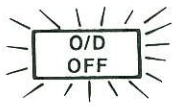
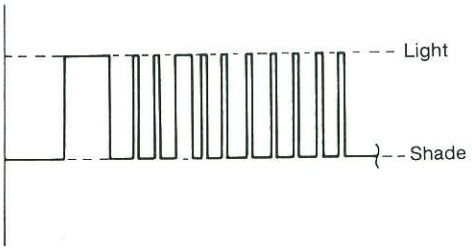
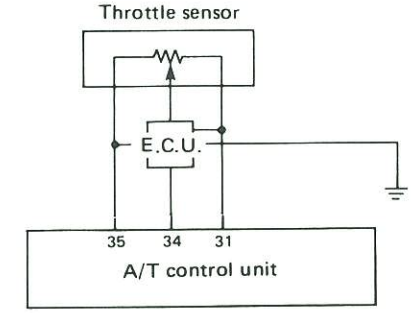
6. Move selector lever to "2" range.
7. Set overdrive switch in "ON" position.
8. Move selector lever to "1" range.
9. Set overdrive switch in "OFF" position.
10. Depress accelerator pedal fully and release it.

Check O.D. OFF indicator lamp.
Refer to JUDGEMENT OF SELF-DIAGNOSIS CODE on next page.

DIAGNOSIS END

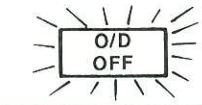
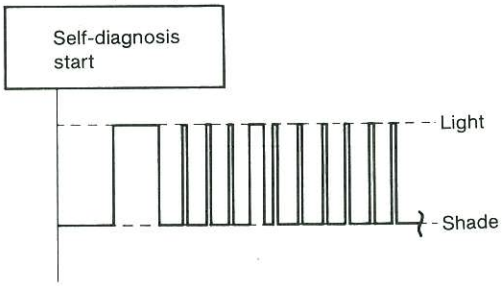
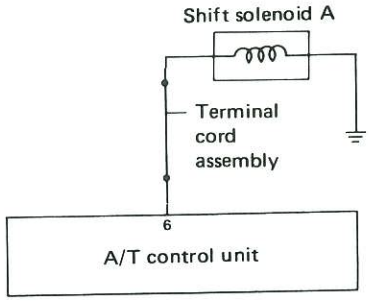
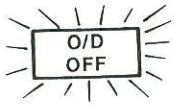
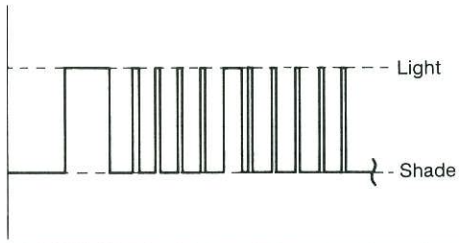
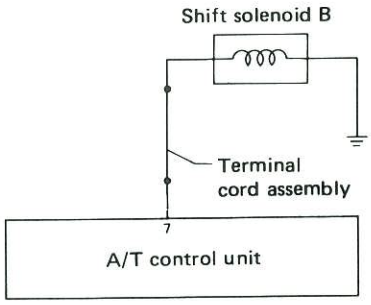
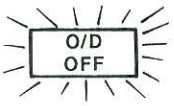
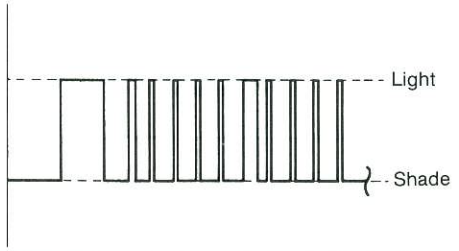
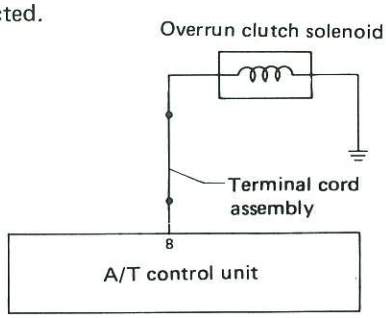
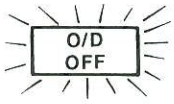
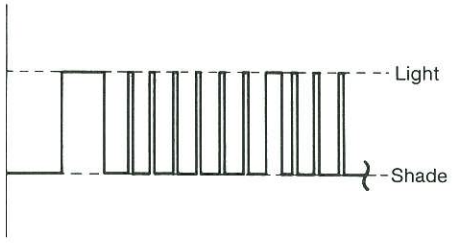
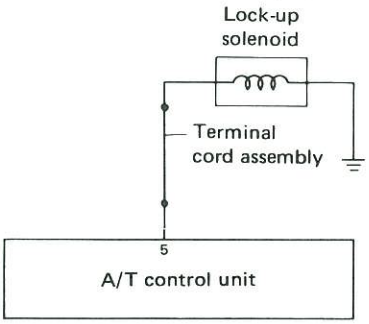
Self-diagnosis (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE

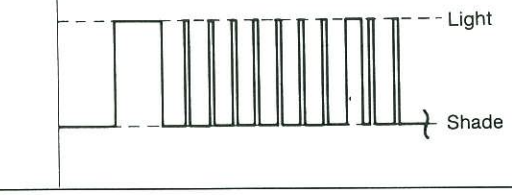
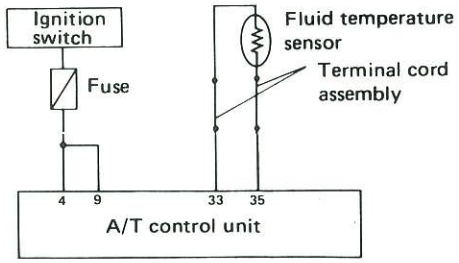
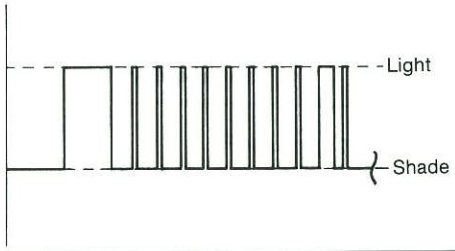
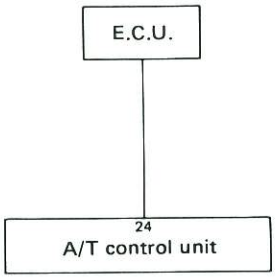
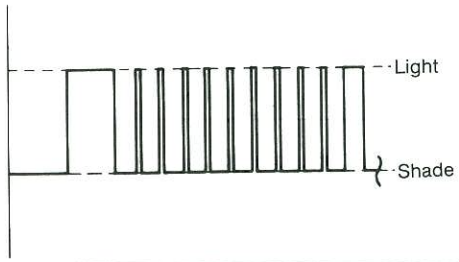
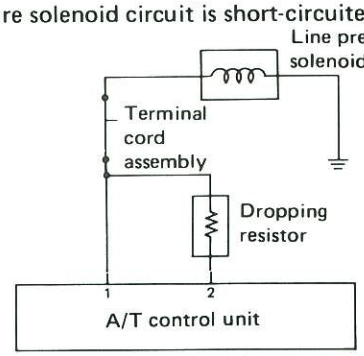
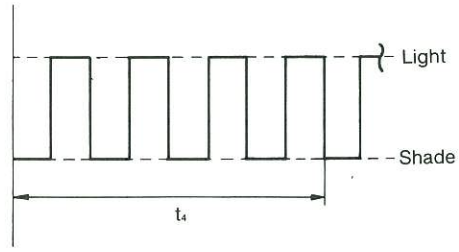
O.D. OFF indicator lamp	Damaged circuit
 All judgement flickers are same.  SAT678C	All circuits that can be confirmed by self-diagnosis are O.K.
 1st judgement flicker is longer than others.  SAT679C	Revolution sensor circuit is short-circuited or disconnected.  ➡ **Go to revolution sensor circuit check.** SAT965B
 2nd judgement flicker is longer than others.  SAT680C	Speed sensor circuit is short-circuited or disconnected.  ➡ **Go to speed sensor circuit check.** SAT067E
 3rd judgement flicker is longer than others.  SAT681C	Throttle sensor circuit is short-circuited or disconnected.  ➡ **Go to throttle sensor circuit check.** SAT967B

t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second

Self-diagnosis (Cont'd)

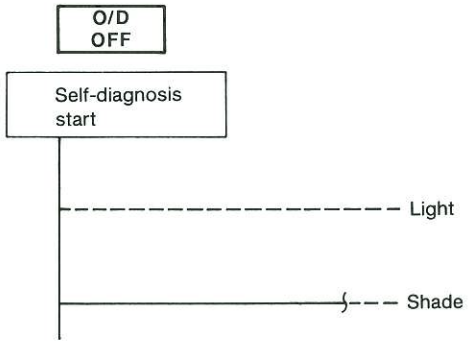
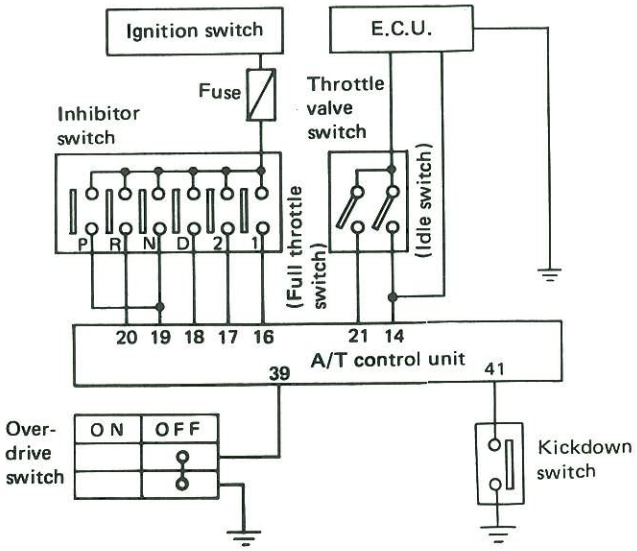
O.D. OFF indicator lamp	Damaged circuit
 4th judgement flicker is longer than others.  SAT682C	Shift solenoid A circuit is short-circuited or disconnected.  ➡ **Go to shift solenoid A circuit check.** SAT968B
 5th judgement flicker is longer than others.  SAT683C	Shift solenoid B circuit is short-circuited or disconnected.  ➡ **Go to shift solenoid B circuit check.** SAT969B
 6th judgement flicker is longer than others.  SAT684C	Overrun clutch solenoid circuit is short-circuited or disconnected.  ➡ **Go to overrun clutch solenoid circuit check.** SAT970B
 7th judgement flicker is longer than others.  SAT685C	Lock-up solenoid circuit is short-circuited or disconnected.  ➡ **Go to lock-up solenoid circuit check.** SAT971B

Self-diagnosis (Cont'd)

O.D. OFF indicator lamp	Damaged circuit
O/D OFF 8th judgement flicker is longer than others. Self-diagnosis start  SAT686C	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.** SAT972B
O/D OFF 9th judgement flicker is longer than others.  SAT687C	Engine revolution signal circuit is short-circuited or disconnected.  ➡ **Go to engine revolution signal circuit check.** SAT973B
O/D OFF 10th judgement flicker is longer than others.  SAT688C	Line pressure solenoid circuit is short-circuited or disconnected.  ➡ **Go to line pressure solenoid circuit check.** SAT974B
O/D OFF Flickers as shown below.  SAT689C	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.)

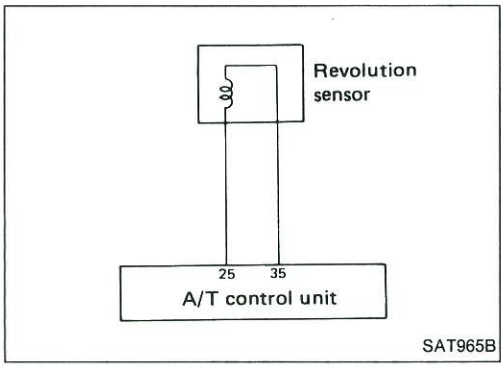
t_4 = 1.0 second

Self-diagnosis (Cont'd)

O.D. OFF indicator lamp	Damaged circuit
Does not come on.  SAT690C	Inhibitor switch, overdrive switch, kickdown switch or idle switch circuit is disconnected or A/T control unit is damaged.  ➡ **Go to inhibitor, overdrive, kickdown and idle switch circuit checks.** SAT319C

Self-diagnosis (Cont'd)

REVOLUTION SENSOR CIRCUIT CHECK



CHECK REVOLUTION SENSOR. — Refer to "Electrical Components Inspection".

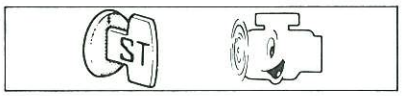
N.G. → Repair or replace revolution sensor.

O.K. ↓

A

CHECK INPUT SIGNAL.

1.



2.

- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "CAR SPEED SENSOR 1" 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. range.)
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. ↓

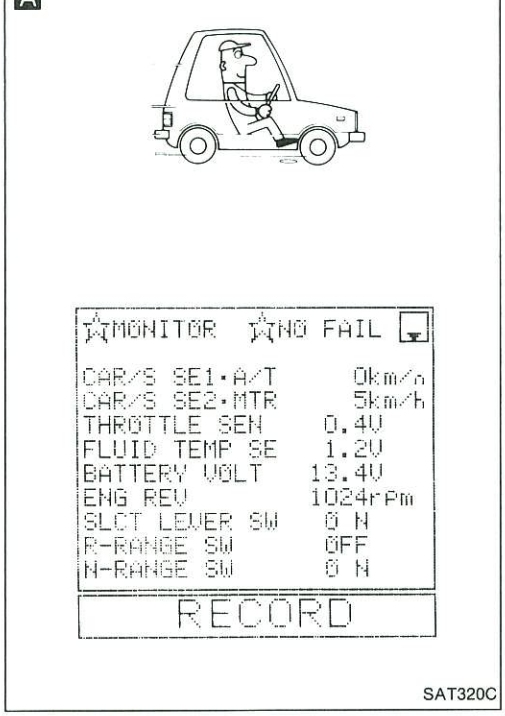
Perform self-diagnosis again after driving for a while.

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.

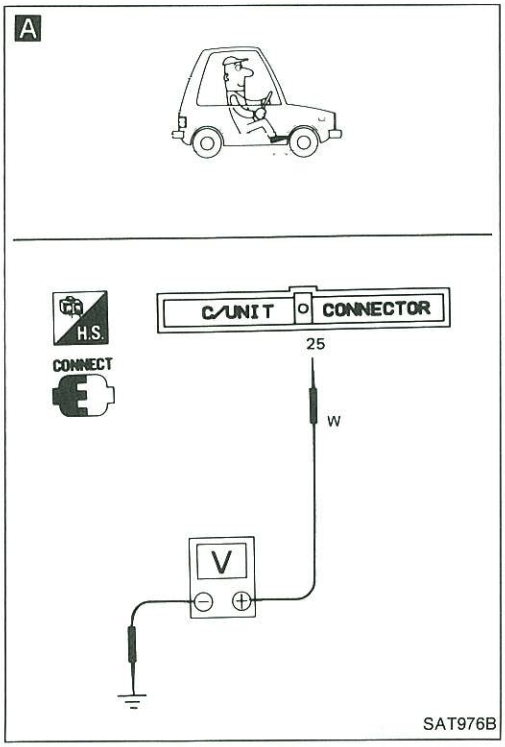
O.K. ↓

INSPECTION END

A



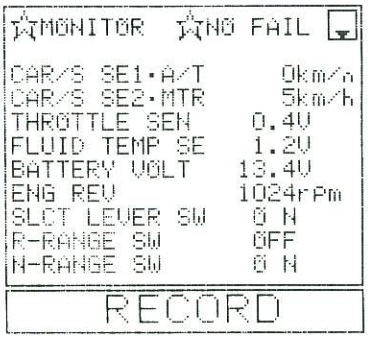
A



Self-diagnosis (Cont'd)

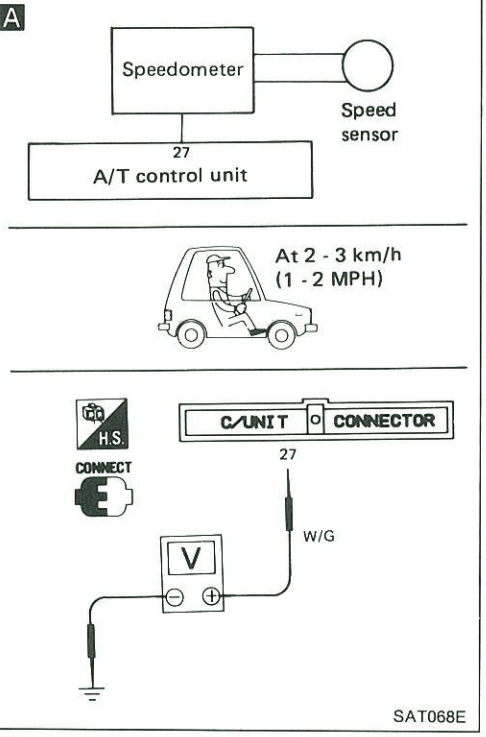
SPEED SENSOR CIRCUIT CHECK

A



SAT320C

A



SAT068E

A

CHECK INPUT SIGNAL.

1.

2.
- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "CAR SPEED SENSOR 2" while driving.
- Check the value changes according to driving speed.

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

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

O.K. ↓

Perform self-diagnosis again after driving for a while.

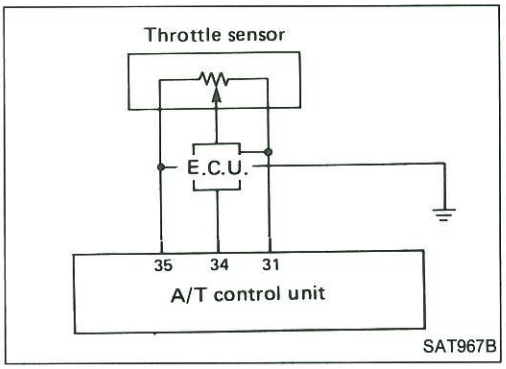
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

Self-diagnosis (Cont'd)

THROTTLE SENSOR CIRCUIT CHECK



Perform self-diagnosis (Mode III) for engine control.

N.G. → Check throttle sensor circuit for engine control. — Refer to section EF & EC.

O.K.

A

CHECK INPUT SIGNAL.

1.

2. ● Select "E.C.U. INPUT SIGNALS".
● Read out the value of "THROTTLE SENSOR".

Voltage:
Fully-closed throttle:
Approximately 0.5V
Fully-open throttle:
Approximately 4V

N.G. → Check harness continuity between E.C.U. and A/T control unit regarding throttle 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.

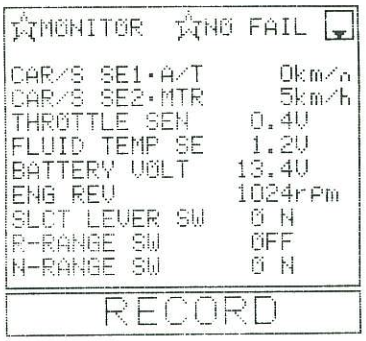
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

INSPECTION END

A

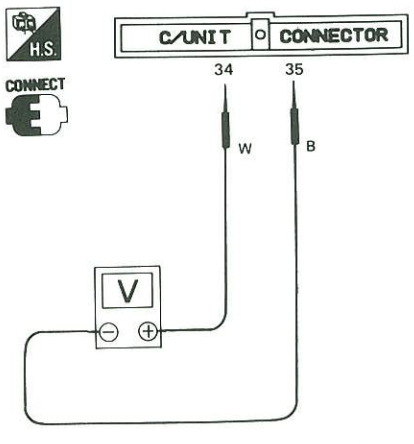
Depress slowly.



SAT321C

A

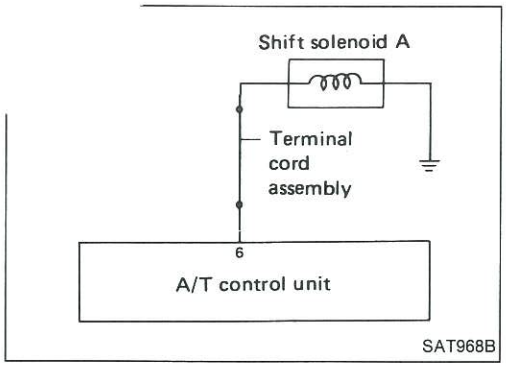
Depress slowly.

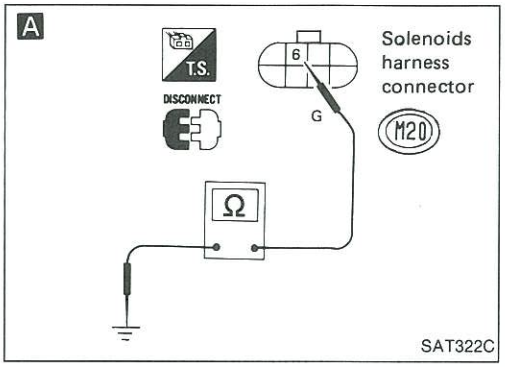


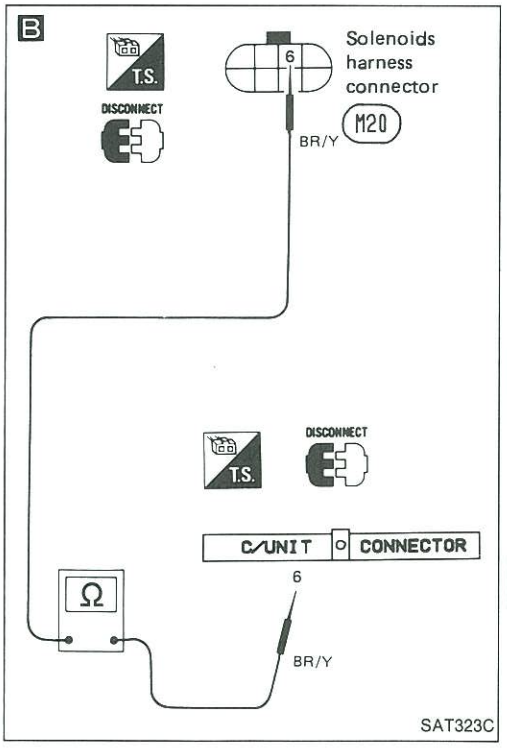
SAT978B

Self-diagnosis (Cont'd)

SHIFT SOLENOID A CIRCUIT CHECK

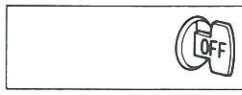






A

CHECK GROUND CIRCUIT.

1. 

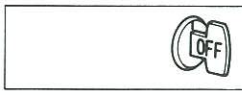
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑥ and ground.
   Resistance: 20 - 40Ω

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Shift solenoid A — Refer to "Electrical Components Inspection".
   - Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. 

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.

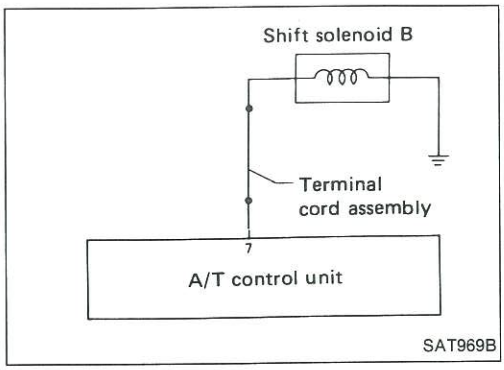
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

Self-diagnosis (Cont'd)

SHIFT SOLENOID B CIRCUIT CHECK



A

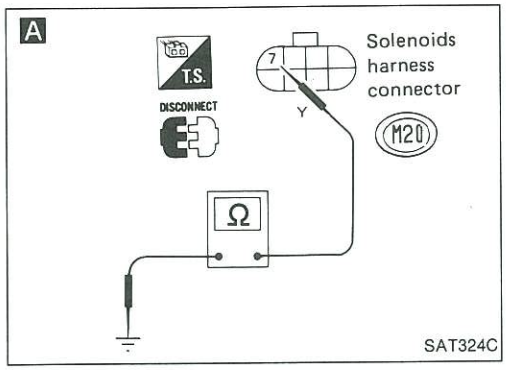
CHECK GROUND CIRCUIT.

1.

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 B — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓



B

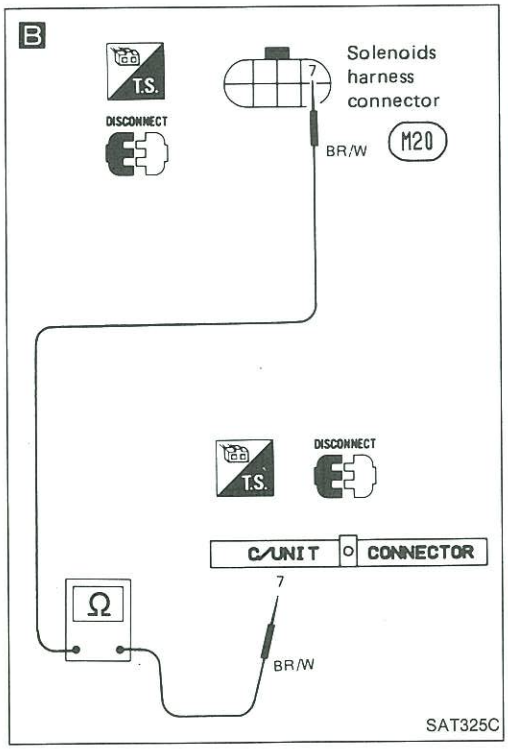
CHECK POWER SOURCE CIRCUIT.

1.

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.

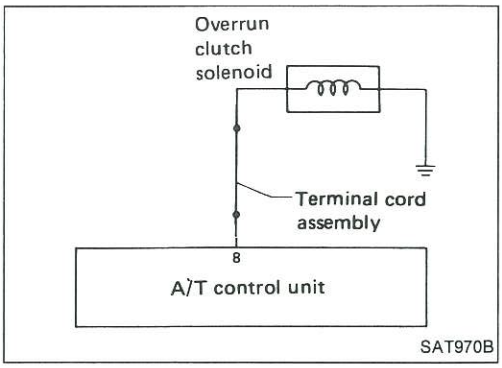
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

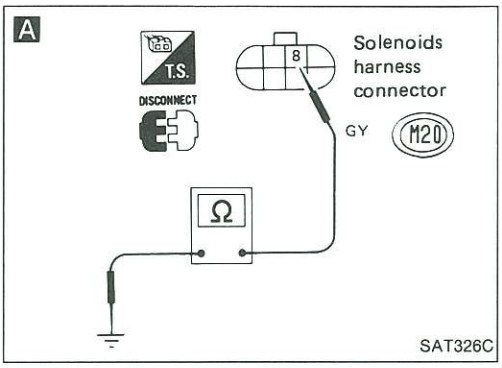
O.K. ↓

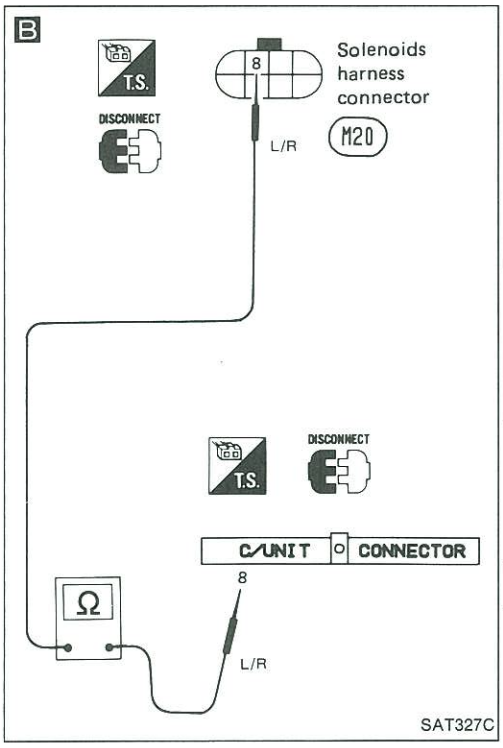
INSPECTION END

Self-diagnosis (Cont'd)

OVERRUN CLUTCH SOLENOID CIRCUIT CHECK

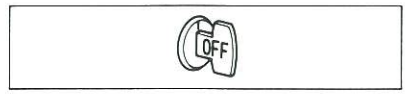






A

CHECK GROUND CIRCUIT.

1. 

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. — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1.

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.

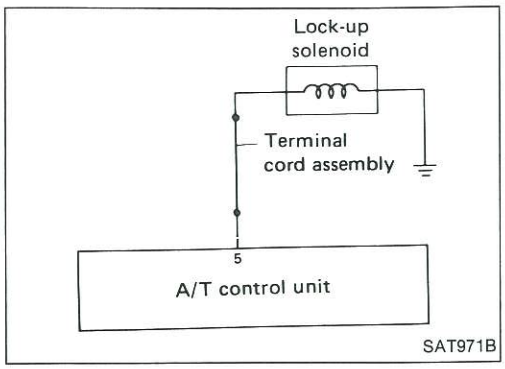
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

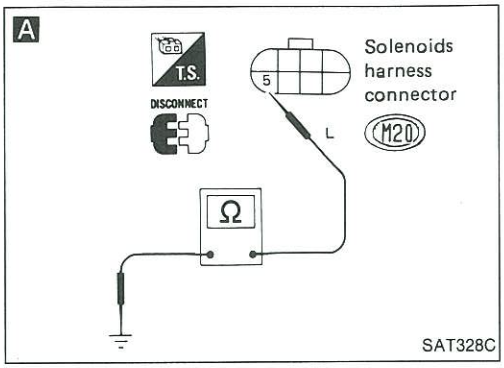
INSPECTION END

Self-diagnosis (Cont'd)

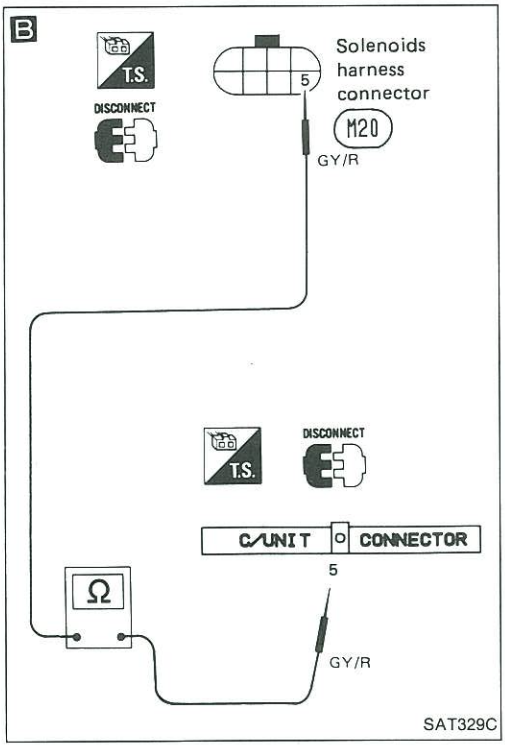
LOCK-UP SOLENOID CIRCUIT CHECK



SAT971B



SAT328C



SAT329C

A

CHECK GROUND CIRCUIT.

1.

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.
   - Lock-up solenoid — Refer to "Electrical Components Inspection".
   - Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1.

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.

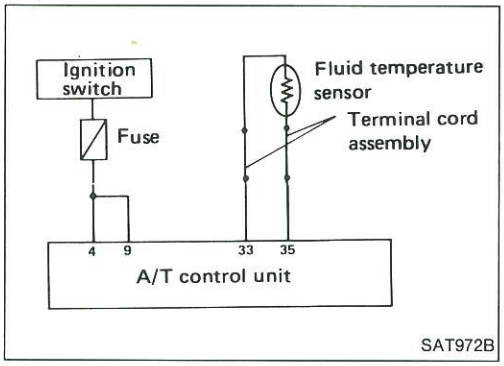
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

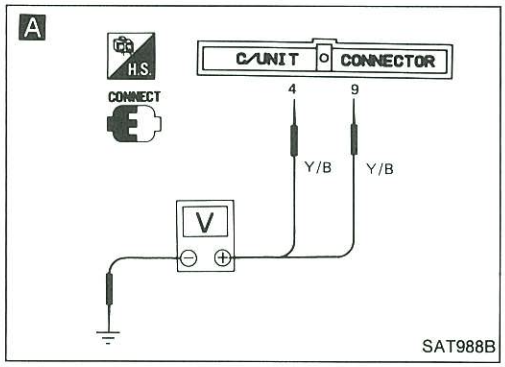
O.K. ↓

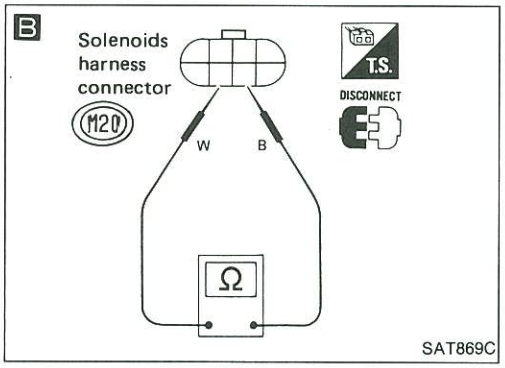
INSPECTION END

Self-diagnosis (Cont'd)

FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS

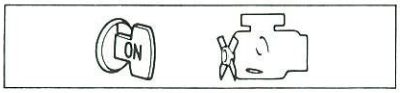






A

CHECK A/T CONTROL UNIT POWER SOURCE.

1. 

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.

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.

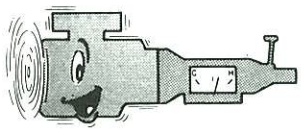
N.G. → 1. Remove control valve cover.
2. Check the following items.
- Fluid temperature sensor — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

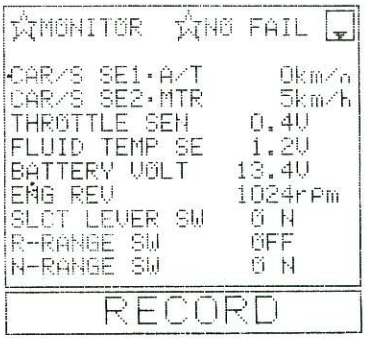
O.K. ↓

Ⓐ

Self-diagnosis (Cont'd)

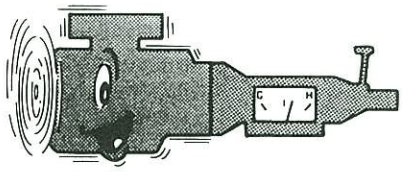
C

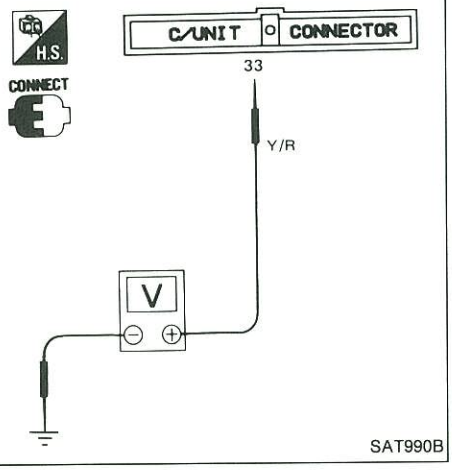




SAT330C

C





SAT990B

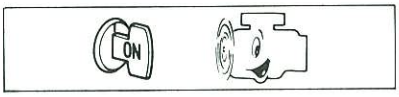
Ⓐ

C

CHECK INPUT SIGNAL OF FLUID TEMPERATURE SENSOR.

N.G. → Check harness continuity between A/T control unit and terminal cord assembly.

1.



2.

- Select "E.C.U. 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

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.

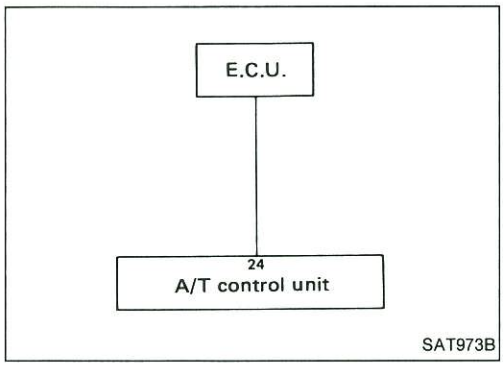
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

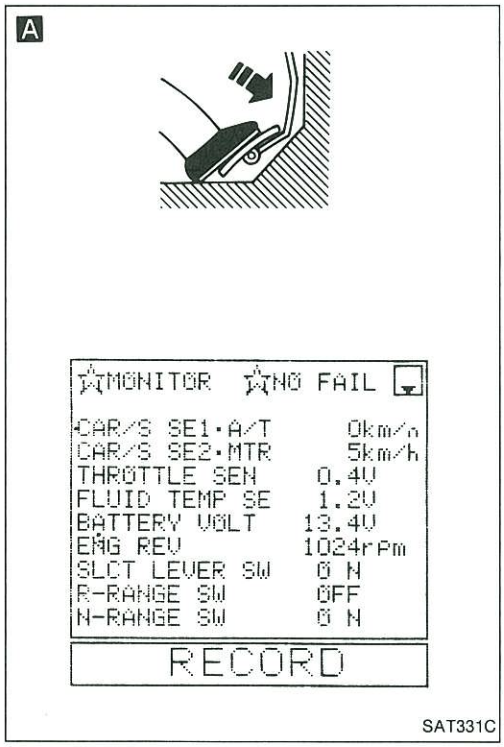
O.K.

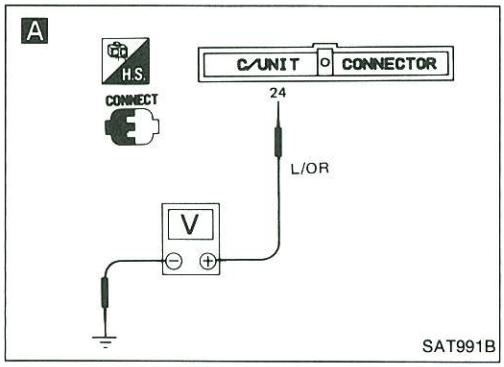
INSPECTION END

Self-diagnosis (Cont'd)

ENGINE REVOLUTION SIGNAL CIRCUIT CHECK





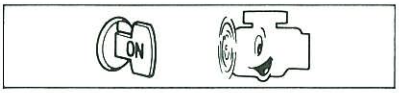


Check ignition circuit condition for engine. — N.G. → Repair or replace. — Refer to section EF & EC.

O.K.

A

CHECK INPUT SIGNAL.

1. 

2. ● Select "E.C.U. INPUT SIGNALS".
● Read out the value of "ENGINE REVOLUTION".
● Check engine revolution changes according to throttle opening.

N.G. → Check harness continuity between A/T control unit and E.C.C.S. control unit.

OR

● Check voltage between A/T control unit terminal (24) and ground.
Voltage: 0.9 - 4.5V

O.K.

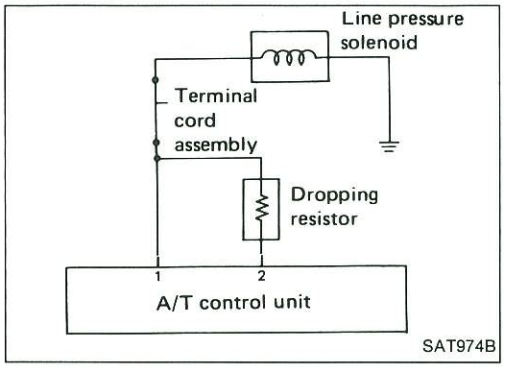
Perform self-diagnosis again after driving for a while. — N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

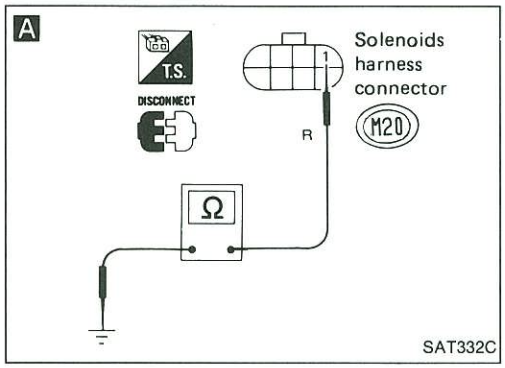
O.K.

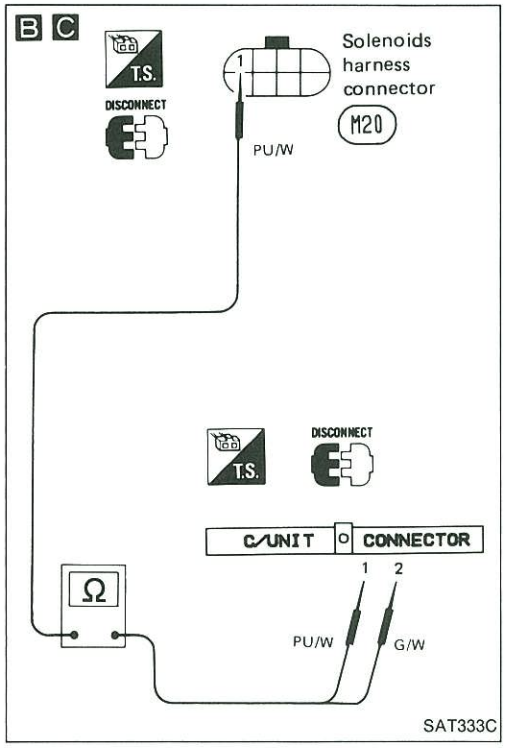
INSPECTION END

Self-diagnosis (Cont'd)

LINE PRESSURE SOLENOID CIRCUIT CHECK

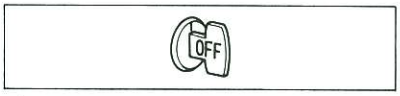






A

CHECK GROUND CIRCUIT.

1. 

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 — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1.

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.

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.

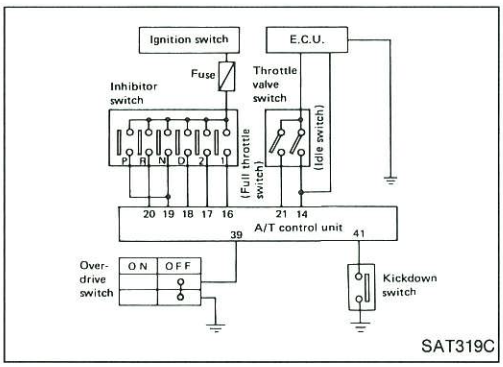
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

Self-diagnosis (Cont'd)

INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS

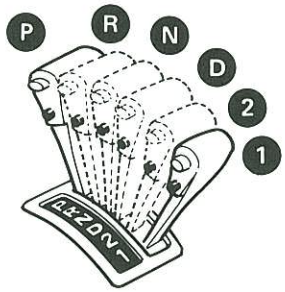


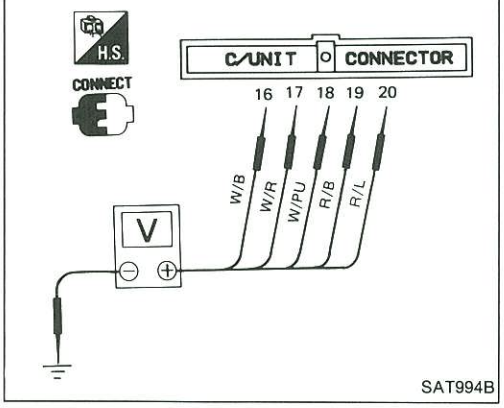
SAT319C

A

SAT334C

A



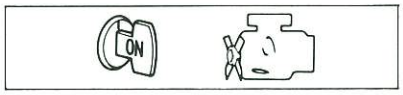


SAT994B

A

CHECK INHIBITOR SWITCH CIRCUIT.

1.



2.

- Select "E.C.U. INPUT signals".
- Read out "R, N, D, 1 and 2 range switches" moving selector lever to each range.
- Check the selector lever position is indicated properly.

OR

Check voltage between A/T control unit terminals ⑯, ⑰, ⑱, ⑲, ⑳ and ground while moving selector lever through each range.

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

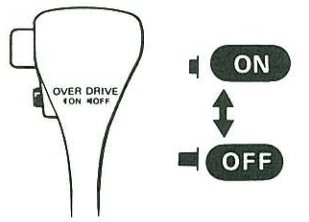
N.G. → Check the following items.

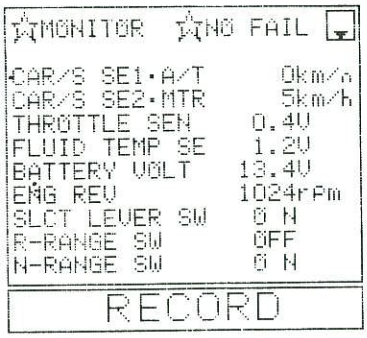
- Inhibitor switch — Refer to "Electrical Components Inspection".
- Harness continuity between ignition switch and inhibitor switch
- Harness continuity between inhibitor switch and A/T control unit

O.K. → Ⓐ

Self-diagnosis (Cont'd)

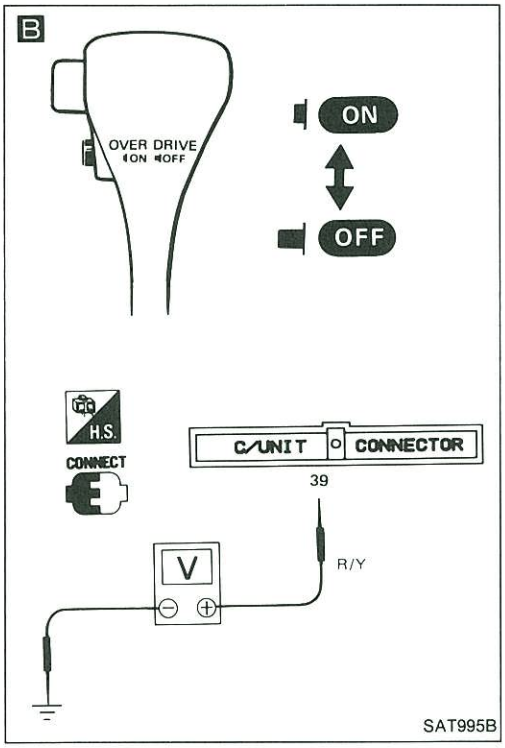
B





SAT335C

B

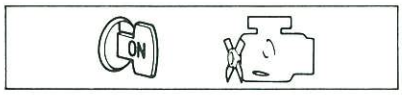


SAT995B

A

B

CHECK OVERDRIVE SWITCH CIRCUIT.

1. 

2.
- Select "E.C.U. 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".)

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

N.G.

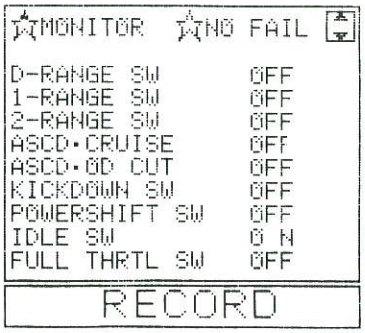
Check the following items.
- Overdrive switch — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit and overdrive switch
- Harness continuity of ground circuit for overdrive switch

O.K.

B

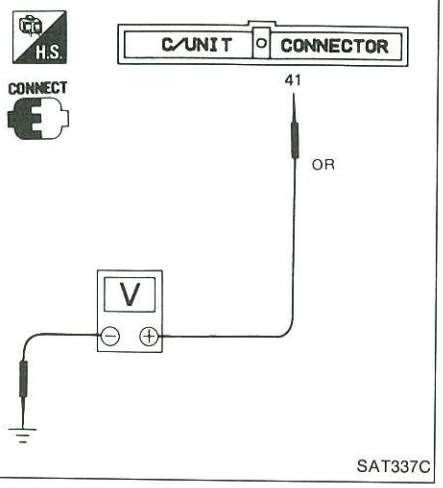
Self-diagnosis (Cont'd)

C



SAT336C

C



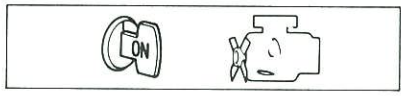
SAT337C

Ⓑ

C

CHECK KICKDOWN SWITCH CIRCUIT.

1.



2.

- Select "E.C.U. INPUT SIGNALS".
- Read out "KICKDOWN SWITCH" depressing accelerator pedal fully.
- Check kickdown switch position is indicated properly.

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

OR

- Check voltage between A/T control unit terminal (41) and ground while depressing accelerator pedal slowly. (after warming up engine)

Voltage:

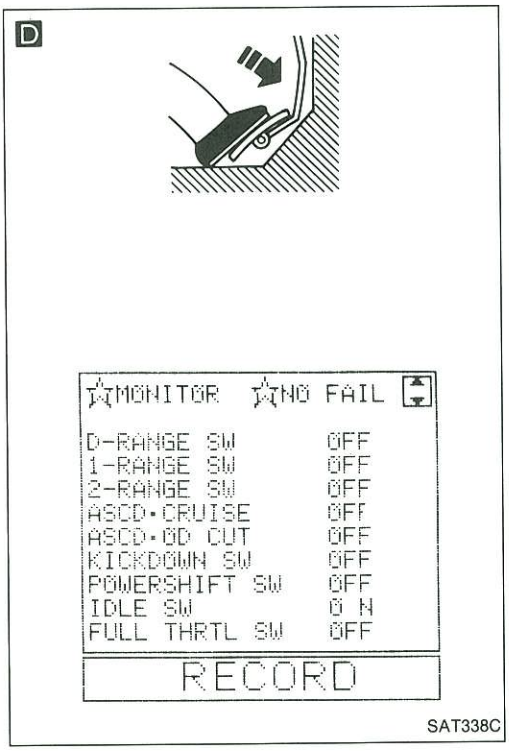
When releasing accelerator pedal:
3 - 8V

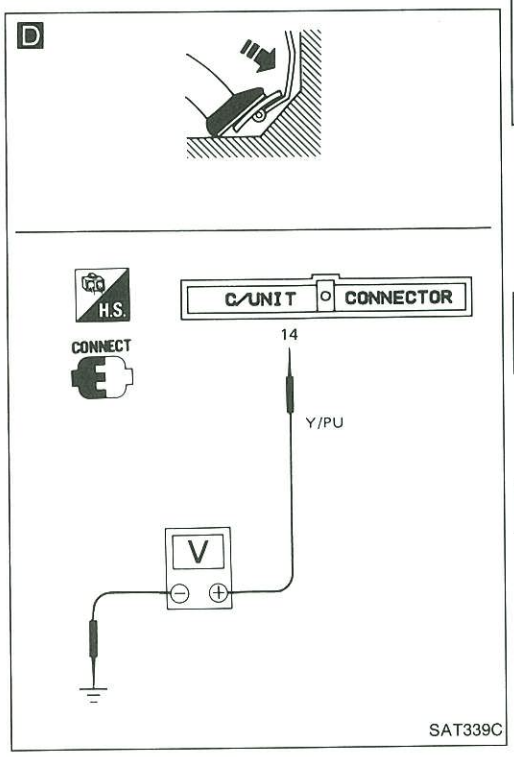
When depressing accelerator pedal fully:
1V or less

O.K.

Ⓒ

Self-diagnosis (Cont'd)

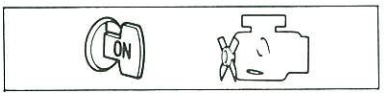




Ⓒ

D

CHECK IDLE SWITCH CIRCUIT.

1. 

2. ● Select "E.C.U. INPUT SIGNALS".
● Read out "IDLE SWITCH" depressing and releasing accelerator pedal.
● Check idle switch changes ON or OFF.

N.G. → Perform self-diagnosis (Mode IV) for engine control.
Check idle switch circuit.

O.K. → Check harness continuity between A/T control unit and idle switch.

N.G. → Check idle 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.
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.

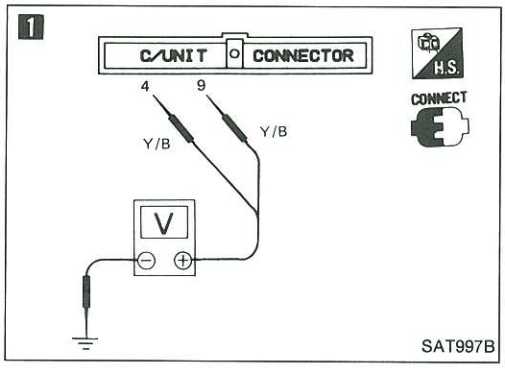
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

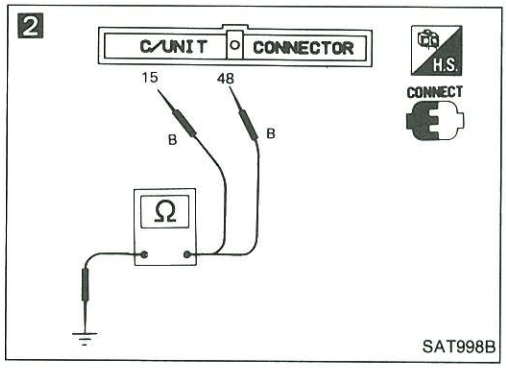
O.K. →

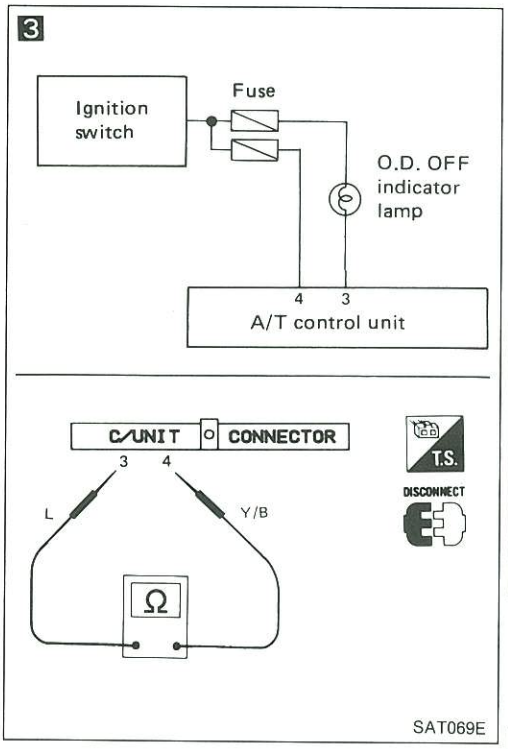
INSPECTION END

Diagnostic Procedure 1

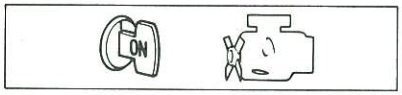
SYMPTOM: O.D. OFF indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".







1 **CHECK A/T CONTROL UNIT POWER SOURCE.**

1. 

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.

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.

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.
- O.D. OFF indicator lamp
- Harness continuity between ignition switch and O.D. OFF indicator lamp
- Harness continuity between O.D. OFF indicator lamp and A/T control unit

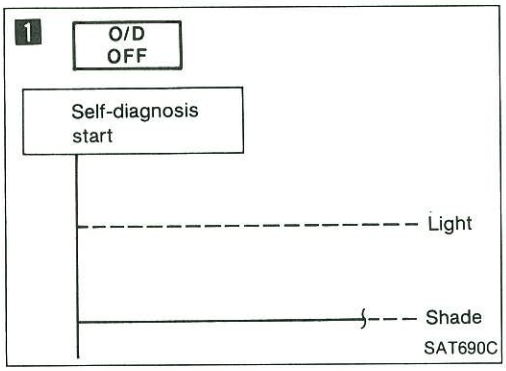
O.K. ↓

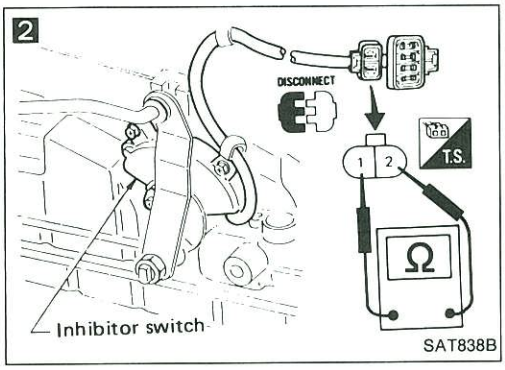
Check again.

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" range or engine can be started with selector lever in "D", "2", "1" or "R" range.

Does "E.C.U. 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

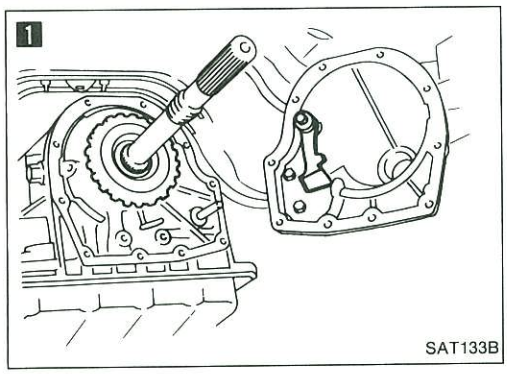
2 Check continuity of inhibitor switch 2-pin connector. — Refer to "Electrical Components Inspection". — N.G. → Repair or replace inhibitor switch.

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" range.

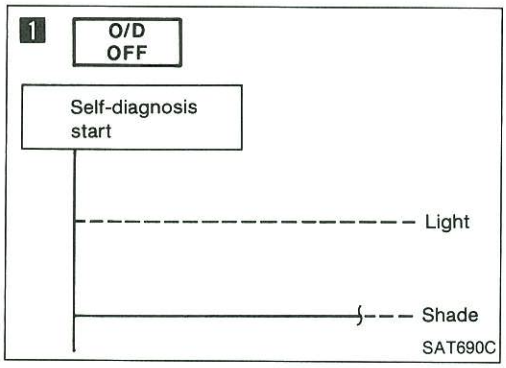
1 Check parking components. — Refer to "ON-VEHICLE SERVICE". — N.G. → Repair or replace damaged parts.

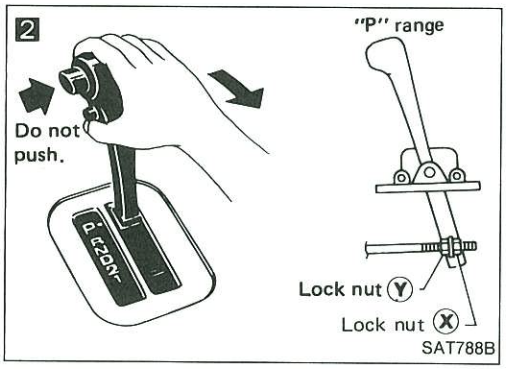
O.K.

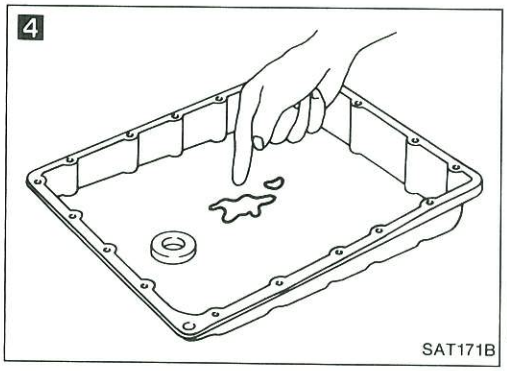
INSPECTION END

Diagnostic Procedure 4

SYMPTOM: Vehicle moves forward or backward when selecting "N" range.







Does "E.C.U. 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.

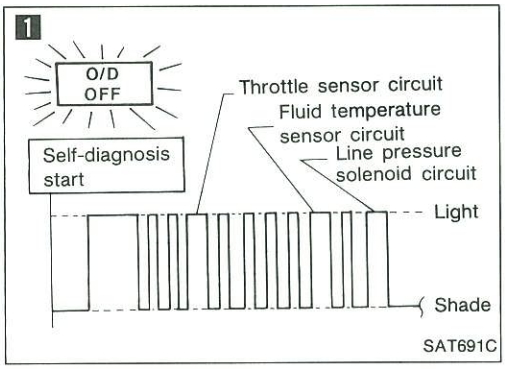
4 1. Remove oil pan.
2. Check A/T fluid condition. — N.G. →
1. Disassemble A/T.
2. Check the following items.
- Forward clutch assembly
- Overrun clutch assembly
- Reverse clutch assembly
- Accumulator piston D

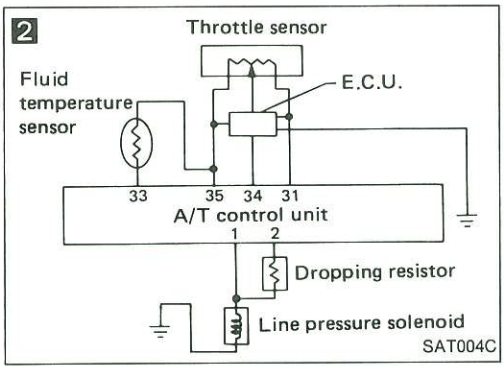
O.K.

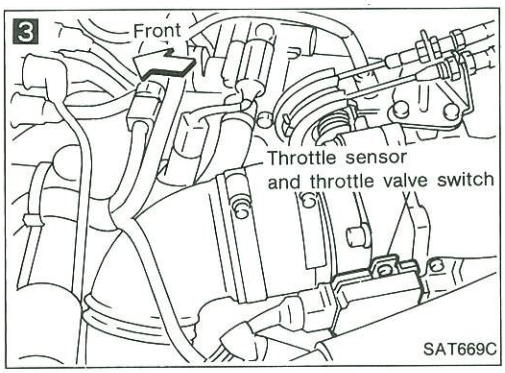
Check again. — N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

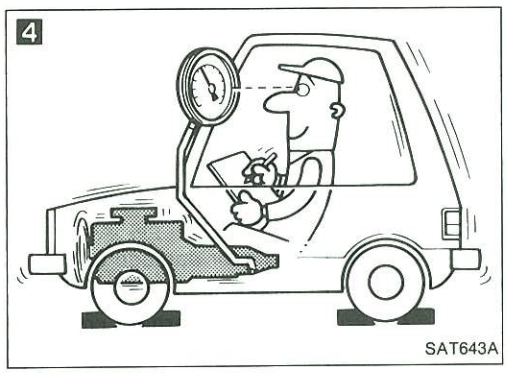
O.K.

INSPECTION END









Diagnostic Procedure 5

SYMPTOM: There is large shock when changing from "N" to "R" range.

1 Does self-diagnosis show damage to throttle sensor, line pressure solenoid or fluid temperature sensor circuit?

Yes → **2** Check damaged circuit. — Refer to "Self-diagnosis".

No ↓

3 Check throttle sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle sensor.

O.K. ↓

4 Check line pressure at idle with selector lever in "D" range. — 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

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" range.

1

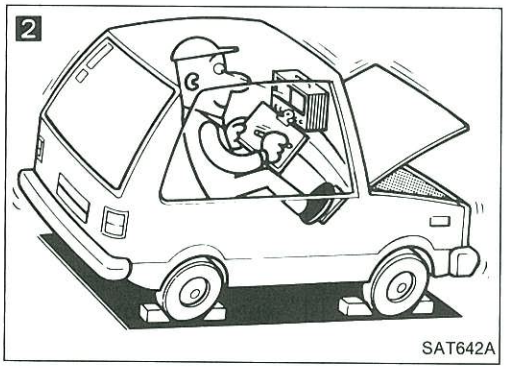
SAT638A

Check A/T fluid level again. — N.G. → Refill A.T.F.

O.K.

N.G. in both "1" and "R" range

2


SAT642A

Check stall revolution with selector lever in "1" and "R" range

O.K.

O.K. in "1" range
N.G. in "R" range

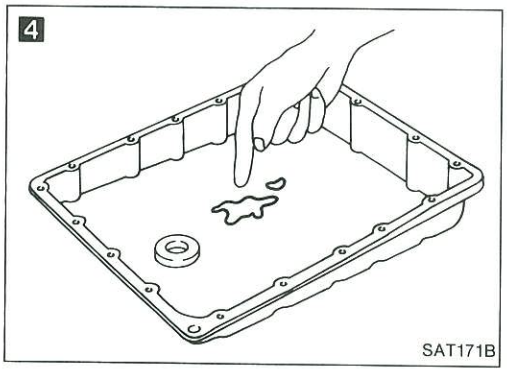
3

SAT643A

Check line pressure at idle with selector lever in "R" range. — Refer to "PRESSURE TESTING". — N.G. →

O.K.

4


SAT171B

1. Remove oil pan.
2. Check fluid condition. — N.G. →

O.K.

Check again. — N.G. →

O.K.

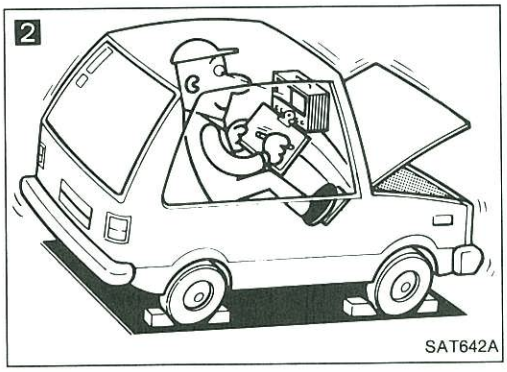
INSPECTION END

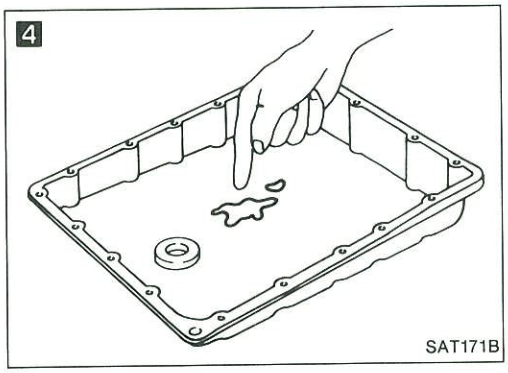
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Valves to control line pressure (Pressure regulator valve, pilot valve and pilot filter)
   - Line pressure solenoid
3. Disassemble A/T.
4. Check the following items.
   - Oil pump assembly
   - Torque 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" range.





1 Check A/T fluid level again. — N.G. → Refill A.T.F.

O.K. ↓

2 Check stall revolution with selector lever in "D" range. — 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
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. ↓

3 Check line pressure at idle with selector lever in "D" range. — Refer to "PRESSURE TESTING". — N.G. →

O.K. ↓

4 1. Remove oil pan. 2. Check A/T fluid condition. — N.G. →

O.K. ↓

Check again. — N.G. →

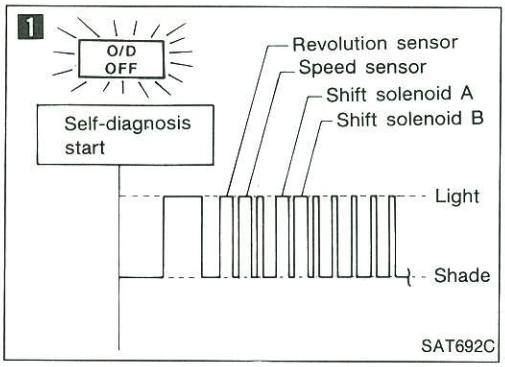
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

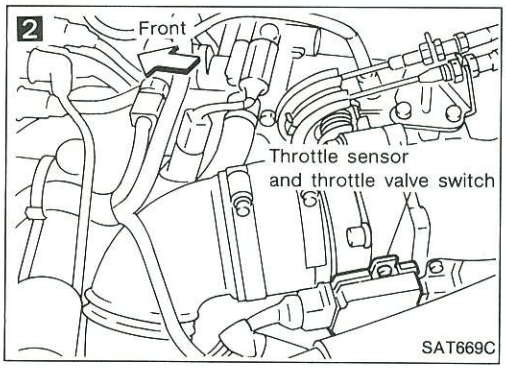
O.K. ↓

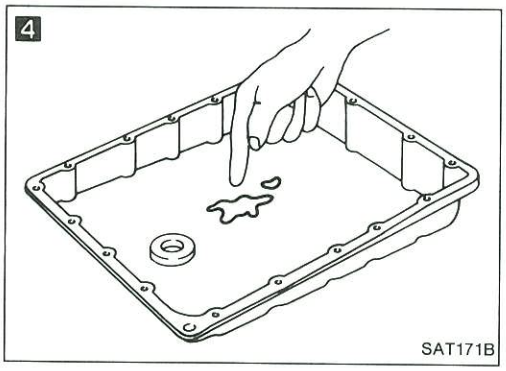
INSPECTION END

Diagnostic Procedure 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 A or B after cruise test? — Yes → Check damaged circuit. — Refer to "Self-diagnosis".

No ↓

2 Check throttle sensor. — Refer to section EF & EC. — N.G. → Repair or replace throttle sensor.

O.K. ↓

3 Check line pressure at stall point with selector lever in "D" range. — 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 A
   - Shift solenoid B
   - Pilot valve
   - Pilot filter
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

O.K. ↓

4
1. Remove oil pan.
2. Check A/T fluid condition.

O.K. → (Control valve assembly items)

N.G. → (Disassemble A/T items)

O.K. → (Forward clutch assembly items)

O.K. → (Forward one-way clutch items)

Check again. — N.G. →

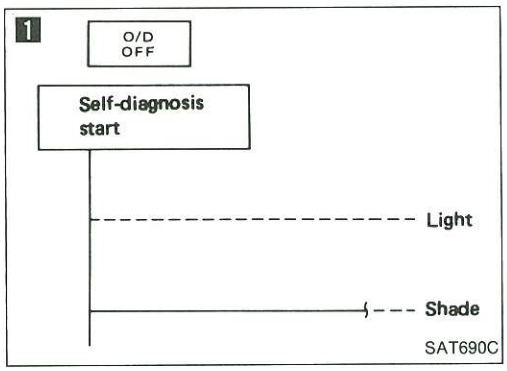
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

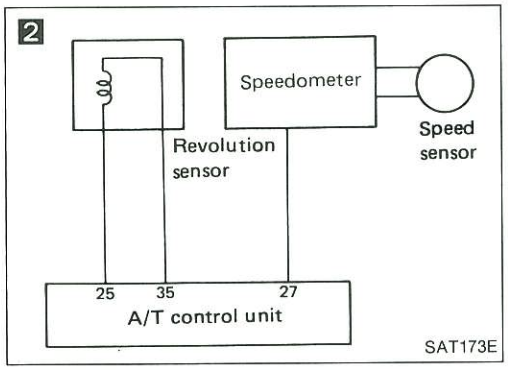
O.K. ↓

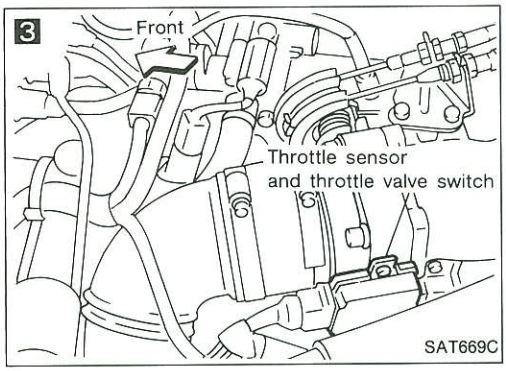
INSPECTION END

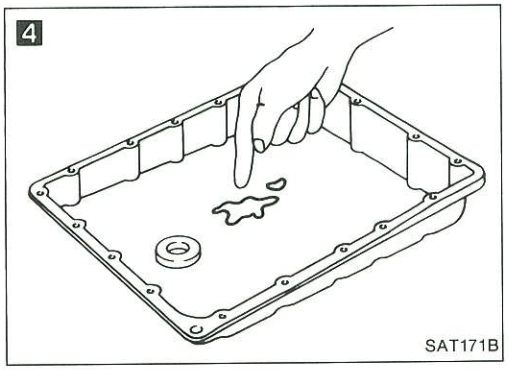
Diagnostic Procedure 9

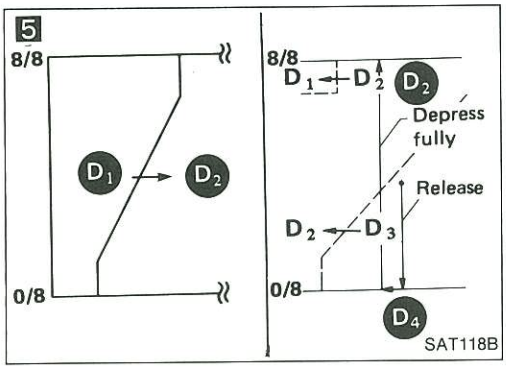
SYMPTOM: A/T does not shift from D_1 to D_2 at the specified speed.
A/T does not shift from D_4 to D_2 when depressing accelerator pedal fully at the specified speed.











Are Diagnostic Procedures 7 and 8 O.K.? — No → Go to Diagnostic Procedure 7 or 8.

Yes ↓

Does "E.C.U. 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 revolution sensor and speed sensor circuit. — Refer to "Self-diagnosis". — N.G. → Repair or replace revolution sensor and speed sensor circuits.

O.K. ↓

3 Check throttle sensor. — Refer to section EF & EC. — N.G. → Repair or replace throttle sensor.

O.K. ↓

4 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 A
- Pilot valve
- Pilot filter

O.K. ↓

3. Disassemble A/T.
4. Check the following items.
- Servo piston assembly
- Brake band
- Oil pump assembly

O.K. ↓

5 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 "E.C.U. 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 ↓

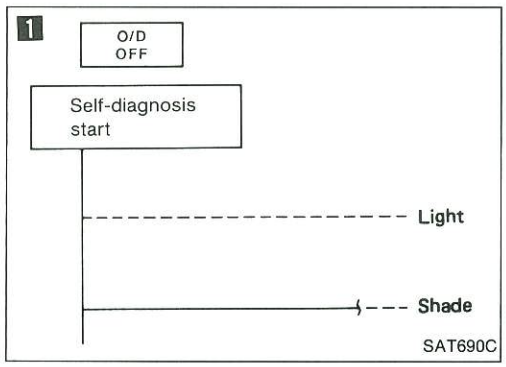
2 Check throttle sensor. — Refer to section EF & EC.
- N.G. → Repair or replace throttle sensor.
- O.K. ↓

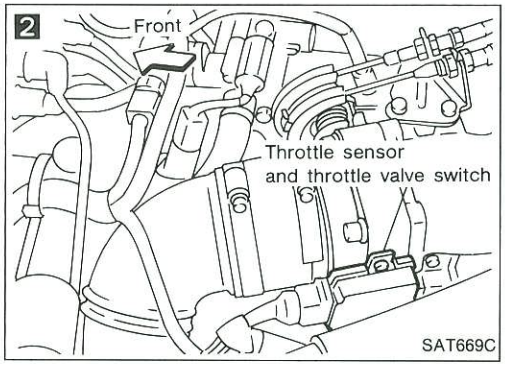
3 1. Remove oil pan.
2. Check A/T fluid condition.
- N.G. → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Shift valve B
  - Shift solenoid B
  - Pilot valve
  - Pilot filter
- O.K. ↓

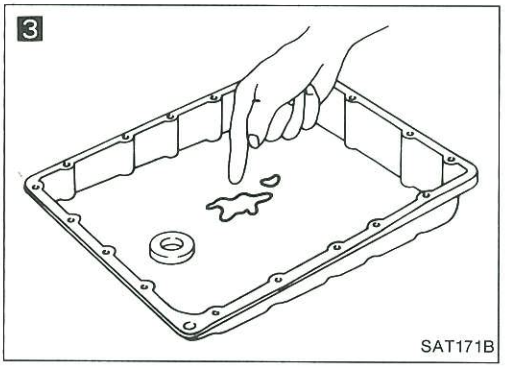
3. Disassemble A/T.
4. Check the following items.
  - Servo piston assembly
  - High clutch assembly
  - Oil pump assembly
- O.K. ↓

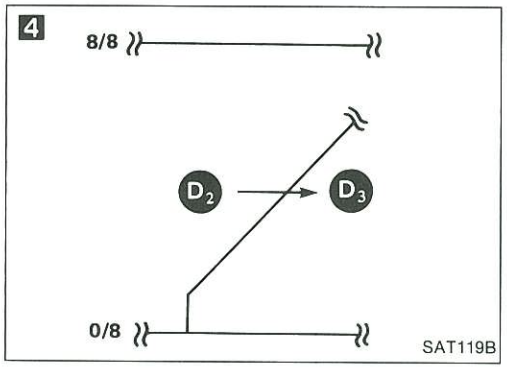
4 Check again.
- N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

INSPECTION END



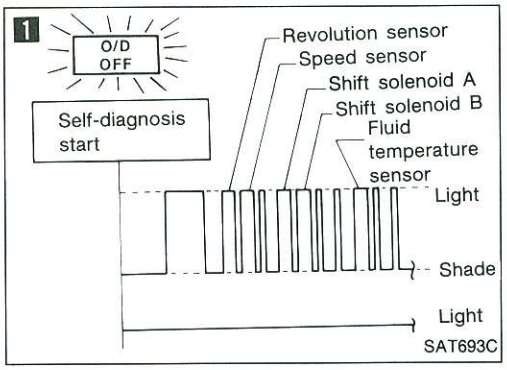


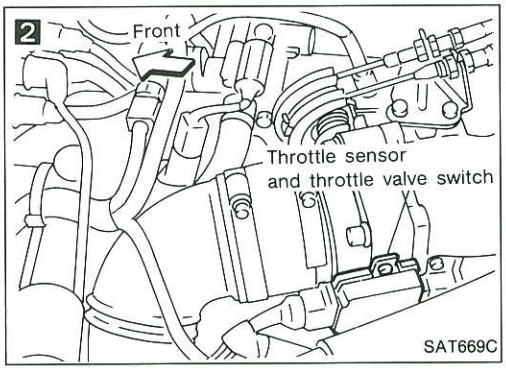


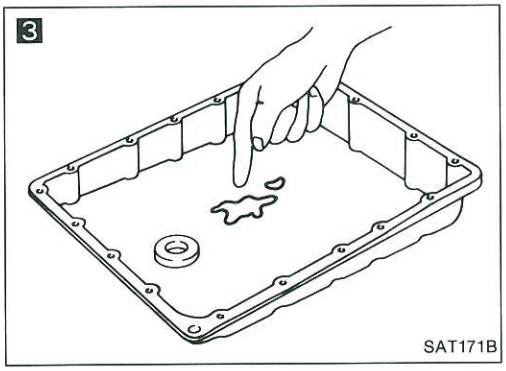


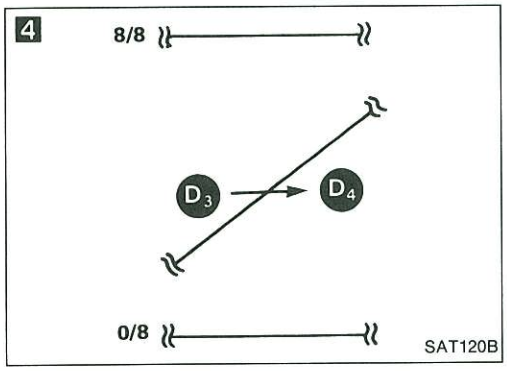
Diagnostic Procedure 11

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 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 sensor. — Refer to section EF & EC. — N.G. → Repair or replace throttle sensor.

O.K. ↓

3
1. Remove oil pan.
2. Check A/T fluid condition.

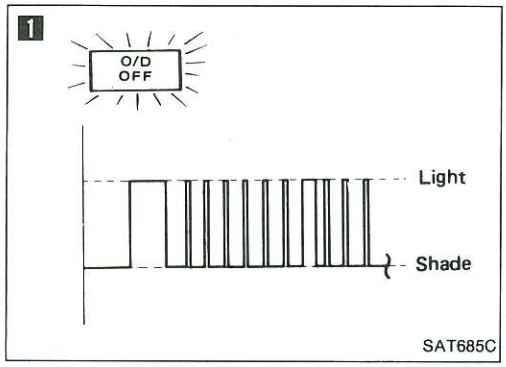
N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Shift valve B
   - Overrun clutch control valve
   - Shift solenoid B
   - Pilot valve
   - Pilot filter
3. Disassemble A/T.
4. Check the following items.
   - Servo piston assembly
   - Brake band
   - Torque converter
   - Oil pump assembly

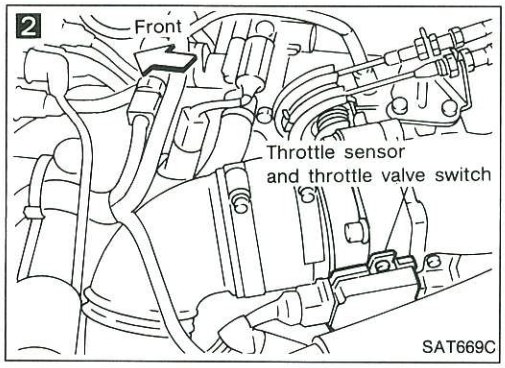
O.K. ↓

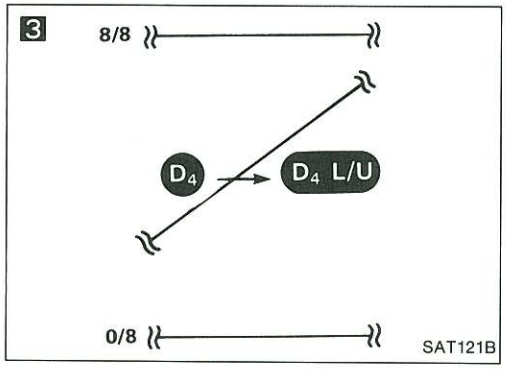
4 Check again. — N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END







Diagnostic Procedure 12

SYMPTOM: A/T does not perform lock-up at the specified speed.

1

Does self-diagnosis show damage to lock-up solenoid circuit after cruise test?

Yes → Check lock-up solenoid circuit. — Refer to "Self-diagnosis".

No

2

Check throttle sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle 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
   - Lock-up solenoid
   - Pilot valve
   - Pilot filter

N.G. → Repair or replace damaged parts.

O.K.

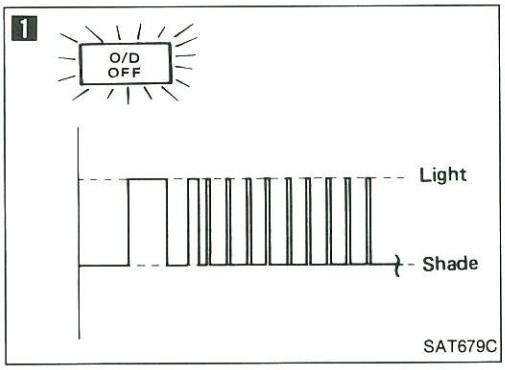
3

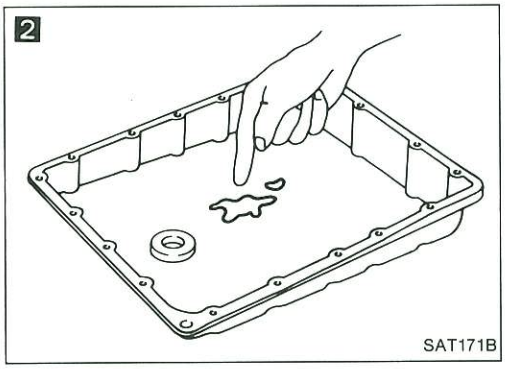
Check again.

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 revolution signal circuit after cruise test?

Yes → Check engine revolution signal circuit. — Refer to "Self-diagnosis".

No

2

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.

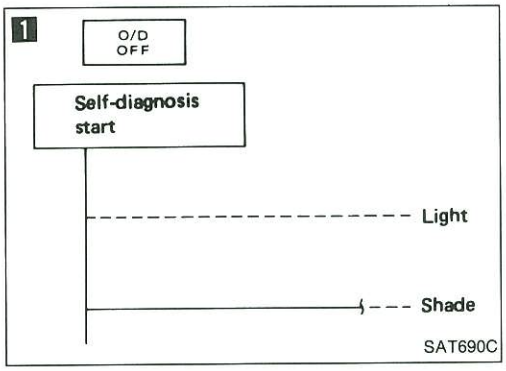
O.K.

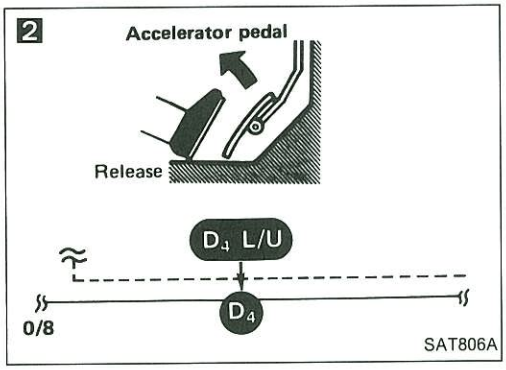
Check again.

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 "E.C.U. INPUT SIGNALS" show damage to idle switch circuit?

Yes → Check idle switch circuit. — Refer to "Self-diagnosis".

OR

1

Does self-diagnosis show damage to idle 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.

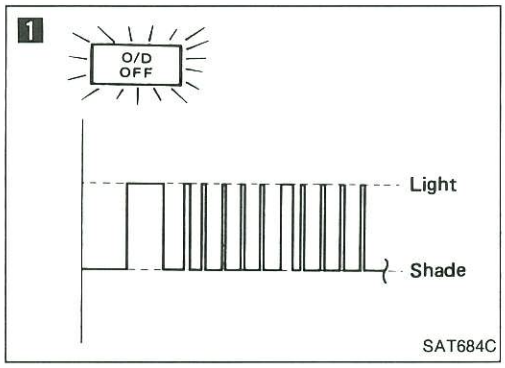
O.K.

INSPECTION END

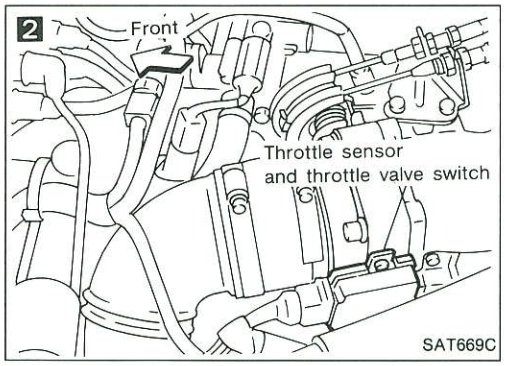
Diagnostic Procedure 15

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" range with accelerator pedal released.

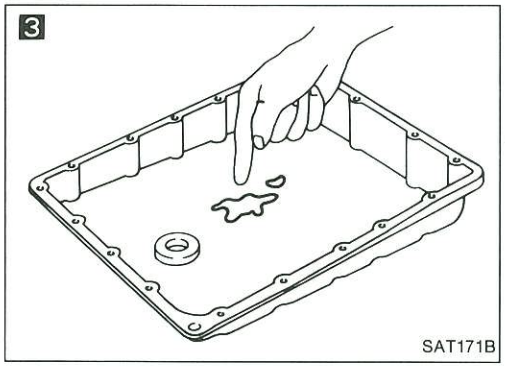
1



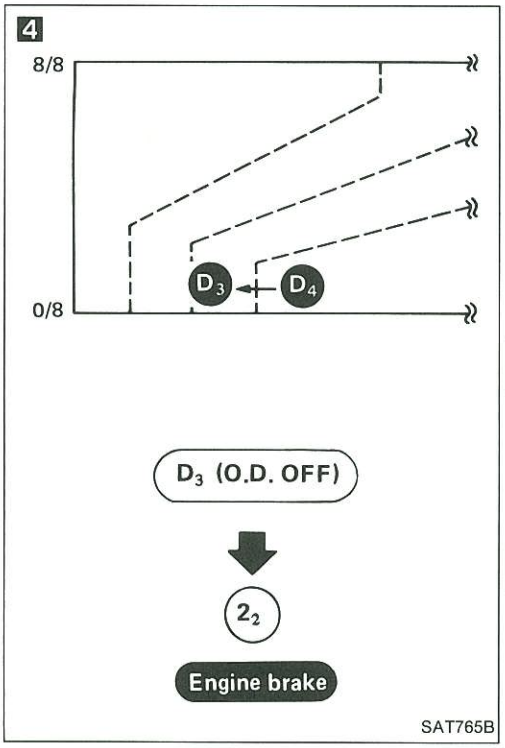
2



3



4



1

Does self-diagnosis show damage to overrun clutch solenoid circuit after cruise test?

Yes → Check overrun clutch solenoid circuit. — Refer to "Self- diagnosis".

No

2

Check throttle sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle sensor.

O.K.

3

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.
   - Overrun clutch control valve
   - Overrun clutch reducing valve
   - Overrun clutch solenoid

O.K. (from 1. Remove oil pan. 2. Check A/T fluid condition.)

O.K. (from Overrun clutch control valve / Overrun clutch reducing valve / Overrun clutch solenoid)

3. Disassemble A/T.
4. Check the following items.
   - Overrun clutch assembly
   - Oil pump assembly

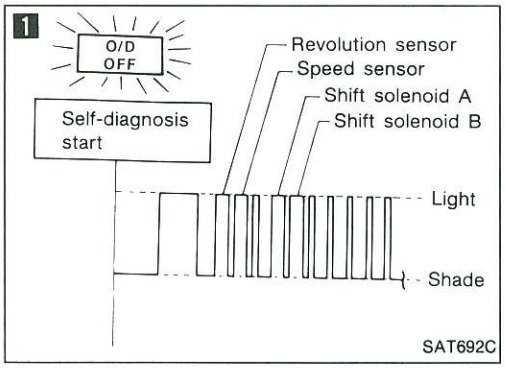
4

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 A or B after cruise test?

Yes → Check damaged circuit. — Refer to "Self-diagnosis".

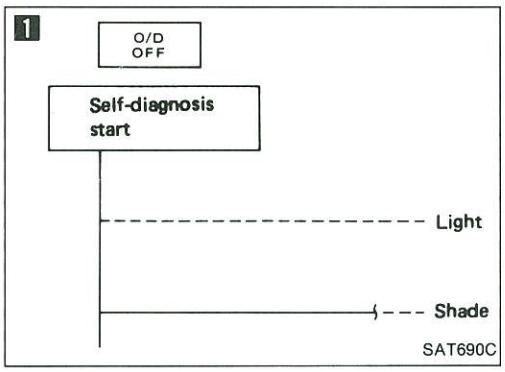
No ↓

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 "E.C.U. INPUT SIGNALS" show damage to overdrive switch circuit?

Yes → Check overdrive switch circuit. — Refer to "Self-diagnosis".

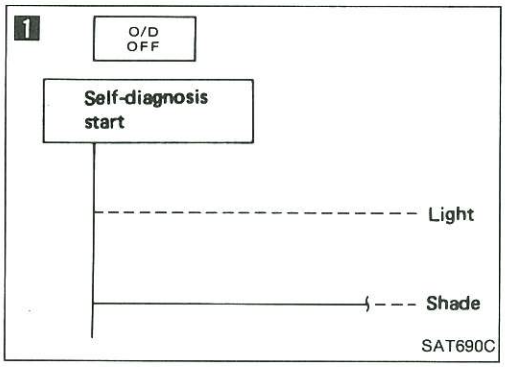
OR

1

Does self-diagnosis show damage to overdrive switch circuit?

No ↓

Go to Diagnostic Procedure 10.



Diagnostic Procedure 18

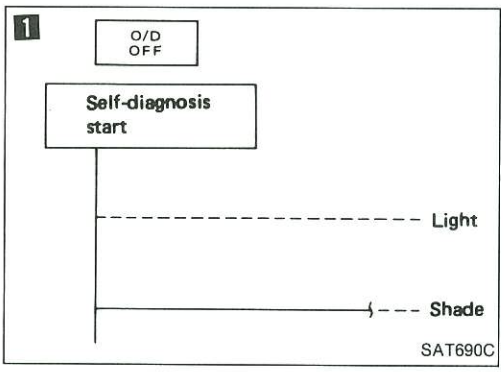
SYMPTOM: A/T does not shift from D_3 to 2_2 when changing selector lever from "D" to "2" range.

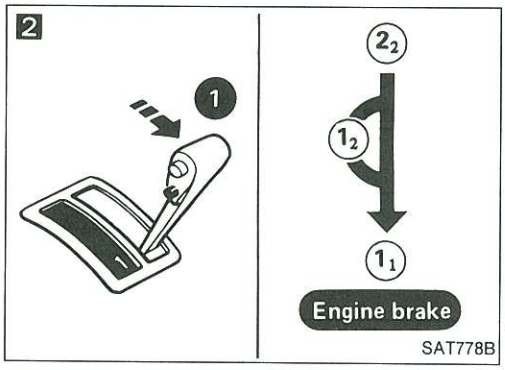
Does "E.C.U. INPUT SIGNALS" show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

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" range.

Does "E.C.U. 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.

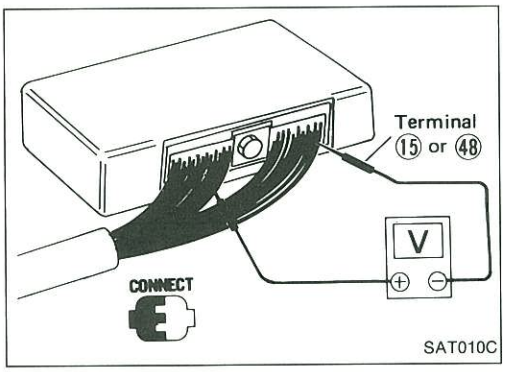
O.K. → INSPECTION END

Diagnostic Procedure 20

SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 2_2 (1_2) to 1_1.

Is diagnostic procedure 6 O.K.? — No → Go to Diagnostic Procedure 6.

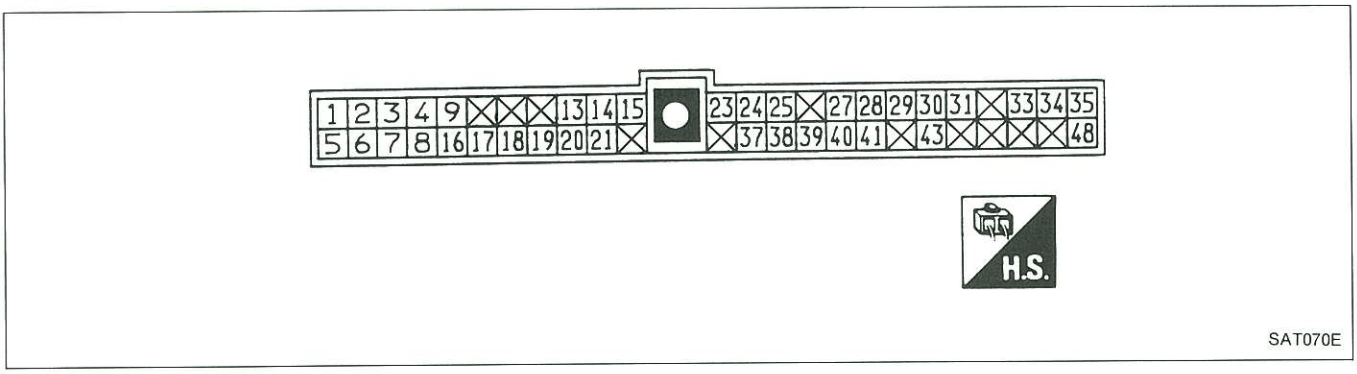
Yes → Go to Diagnostic Procedure 15.



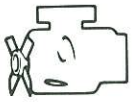
Electrical Components Inspection

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.



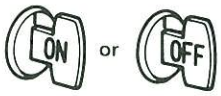
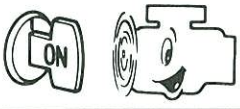
A/T CONTROL UNIT INSPECTION TABLE
(Data are reference values.)

Terminal No.	Item	Condition		Judgement standard
1	Line pressure solenoid		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 (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

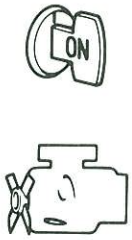
Electrical Components Inspection (Cont'd)

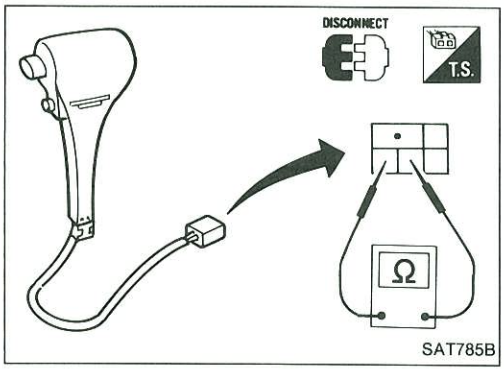
Terminal No.	Item	Condition		Judgement standard
5	Lock-up solenoid		When A/T is performing lock-up.	8 - 15V
			When A/T is not performing lock-up.	1V or less
6	Shift solenoid A		When shift solenoid A is operating. (When driving in "D_1" or "D_4".)	Battery voltage
			When shift solenoid A is not operating. (When driving in "D_2" or "D_3".)	1V or less
7	Shift solenoid B		When shift solenoid B is operating. (When driving in "D_1" or "D_2".)	Battery voltage
			When shift solenoid B is not operating. (When driving in "D_3" or "D_4".)	1V or less
8	Overrun clutch solenoid		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
9	Power source		Same as No. 4	
10	—		—	—
11	—		—	—
12	—		—	—
13	—		—	—
14	Idle switch (in throttle valve 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" range switch		When selector lever is set to "1" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
17	Inhibitor "2" range switch		When selector lever is set to "2" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
18	Inhibitor "D" range switch		When selector lever is set to "D" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
19	Inhibitor "N" or "P" range switch		When selector lever is set to "N" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
20	Inhibitor "R" range switch		When selector lever is set to "R" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
21	Full throttle 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	—		—	—

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 revolution 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 range)		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 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 sensor		When accelerator pedal is depressed slowly after warming up engine.	Fully-closed throttle: Approximately 0.5V
			Voltage rises gradually in response to throttle opening angle.	Fully-open throttle: Approximately 4V
35	Throttle 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 come 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	—		—	—
44	—		—	—
45	—		—	—
46	—		—	—
47	—		—	—
48	Ground		—	—



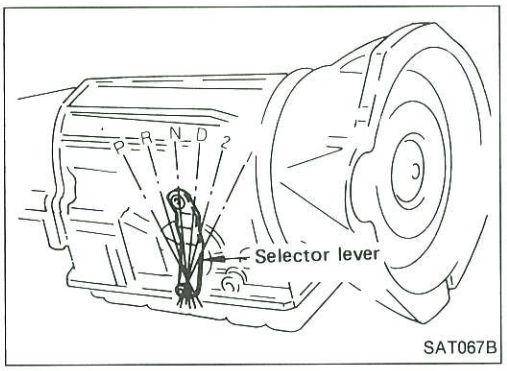
OVERDRIVE SWITCH

- Check continuity between two terminals.

O.D. switch position	Continuity
ON	No
OFF	Yes

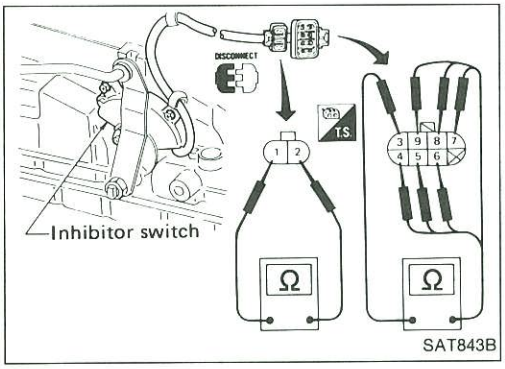
Electrical Components Inspection (Cont'd)

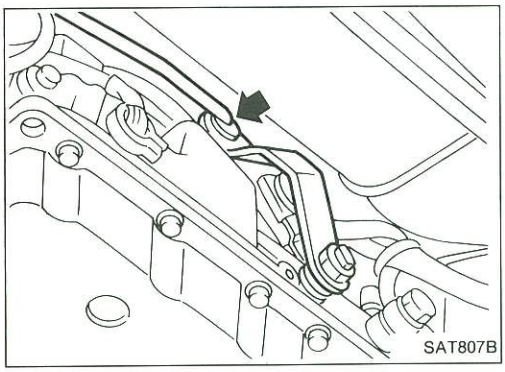
INHIBITOR SWITCH



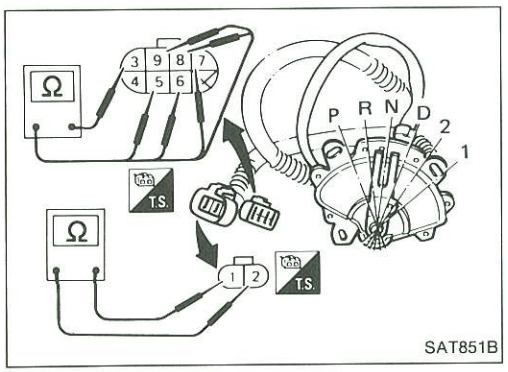
1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each range.

Lever position \ Terminal No.	①	②	③	④	⑤	⑥	⑦	⑧	⑨
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
2			○					○	
1			○						○

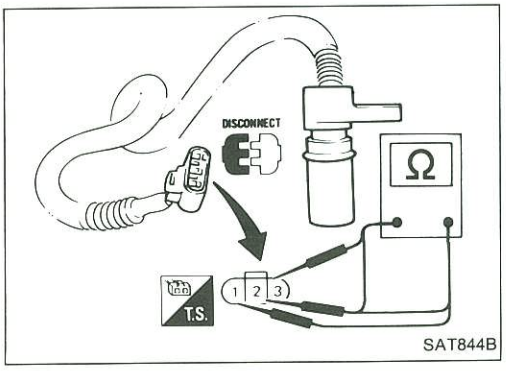




2. If N.G., check again with manual control linkage disconnected from manual shaft of A/T assembly. — Refer to step 1.
3. If O.K. on step 2, adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".



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.

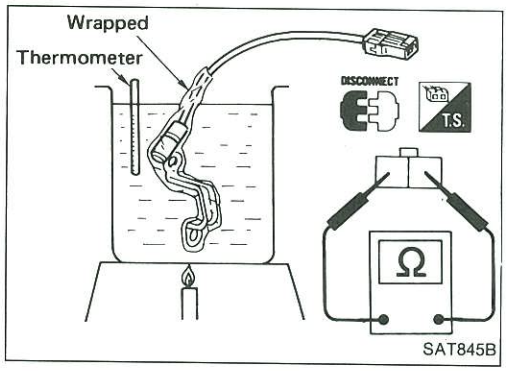


REVOLUTION SENSOR

- 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

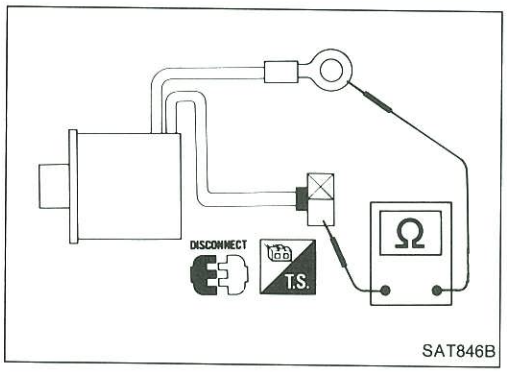
Electrical Components Inspection (Cont'd)



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

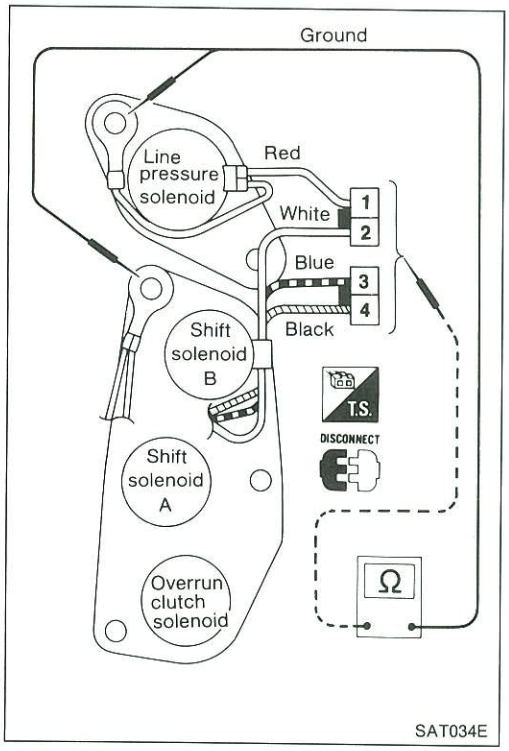


LOCK-UP SOLENOID

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

Resistance:

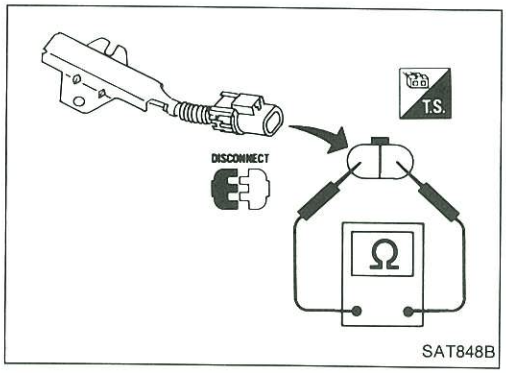
Lock-up solenoid 10 - 20Ω



3-UNIT SOLENOID ASSEMBLY (Shift solenoids A, B and overrun clutch solenoid) AND LINE PRESSURE SOLENOID

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.

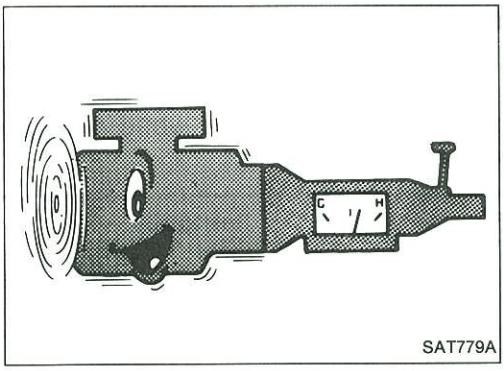
Solenoid	Terminal No.		Resistance
Shift solenoid A	③	Ground terminal	20 - 40Ω
Shift solenoid B	②		
Overrun clutch solenoid	④		
Line pressure solenoid	①		2.5 - 5Ω



DROPPING RESISTOR

- Check resistance between two terminals.

Resistance: 11.2 - 12.8Ω


SAT779A

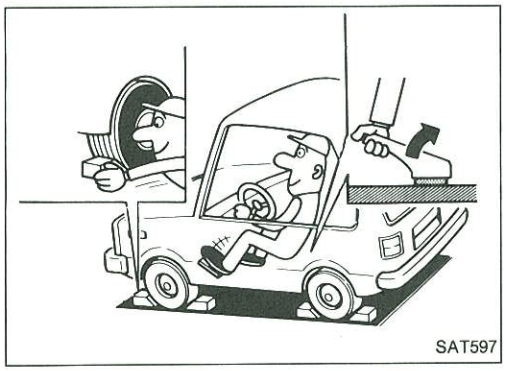
Final Check

STALL TESTING

Stall test procedure

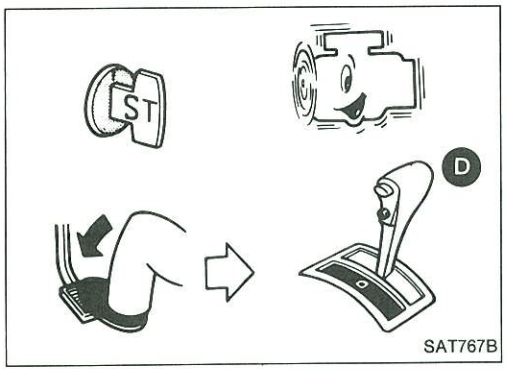
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

A.T.F. operating temperature:
50 - 80°C (122 - 176°F)


SAT597

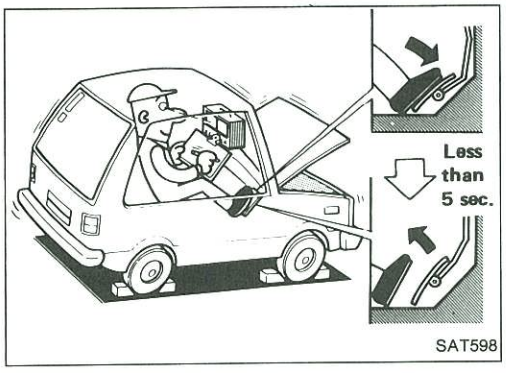
3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark on point of specified engine rpm on indicator.**



SAT767B

5. Start engine, apply foot brake, and place selector lever in "D" range.

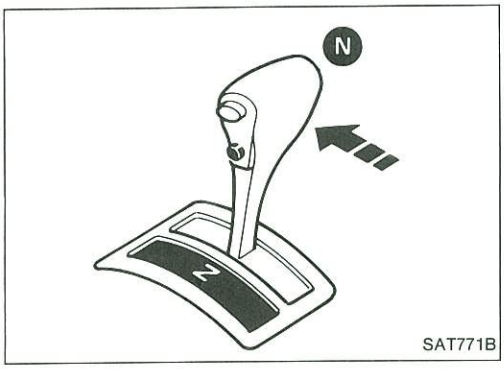


SAT598

6. Accelerate to wide-open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- **During test, never hold throttle wide-open for more than 5 seconds.**

Stall revolution:
2,200 - 2,400 rpm



SAT771B

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.

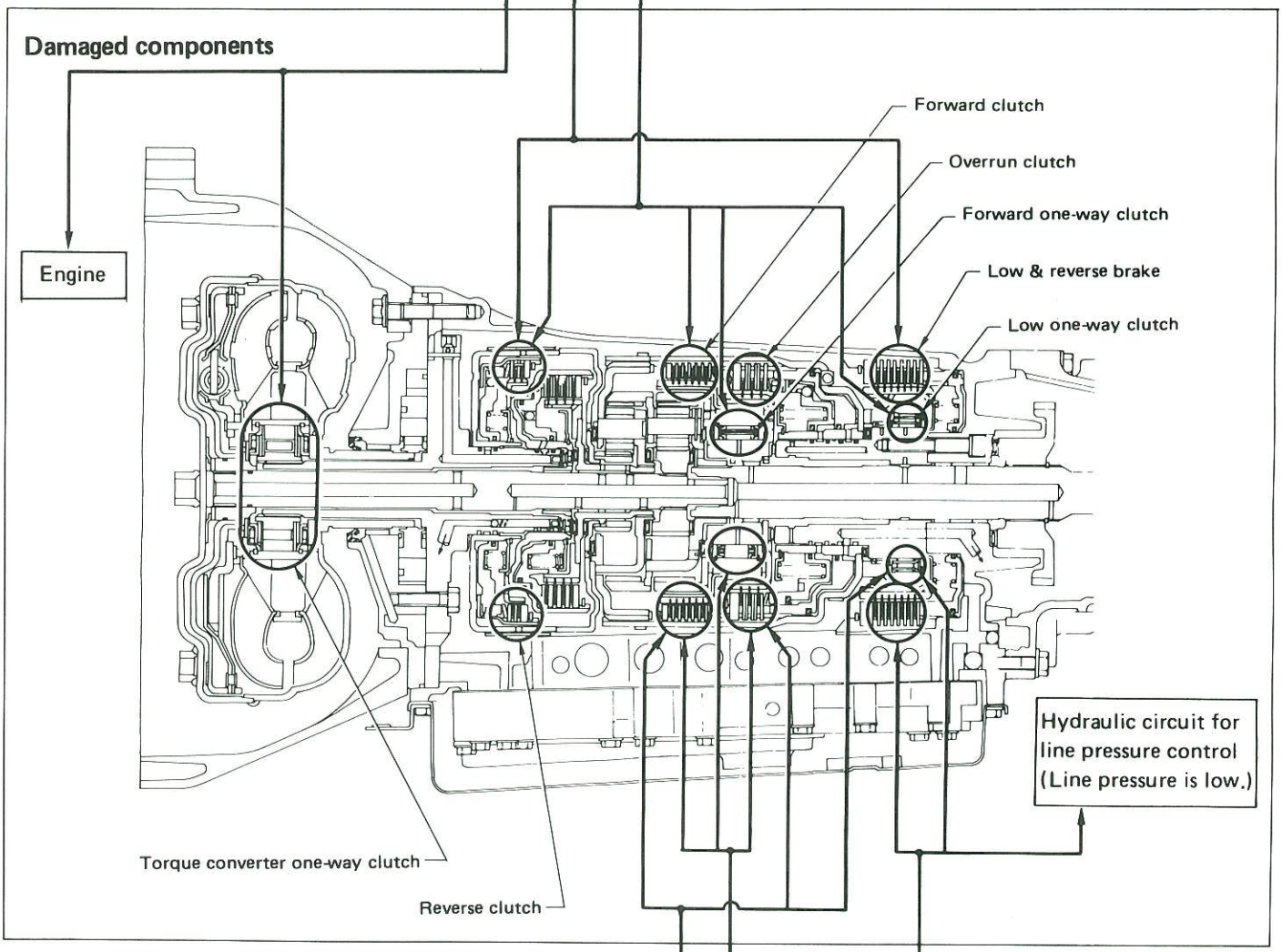
Final Check (Cont'd)

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



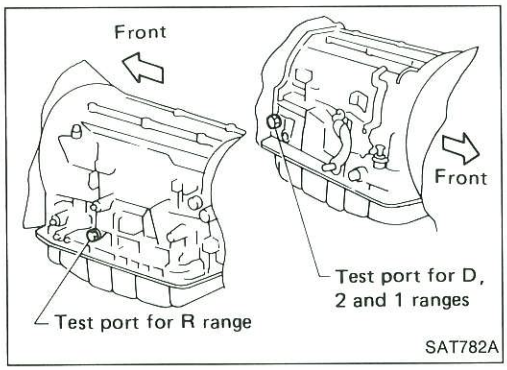
Clutches and brakes except high clutch and brake band are O.K. (Condition of high clutch and brake band cannot be confirmed by stall test.)

D	H	H	H	O
2	H	H	H	O
1	O	H	H	O
R	O	O	H	O
Selector lever position	Judgement			

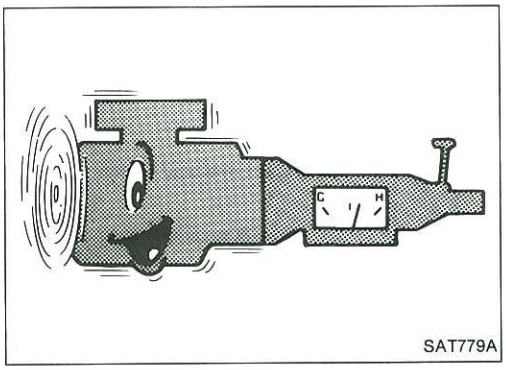
SAT107B

Final Check (Cont'd)

PRESSURE TESTING



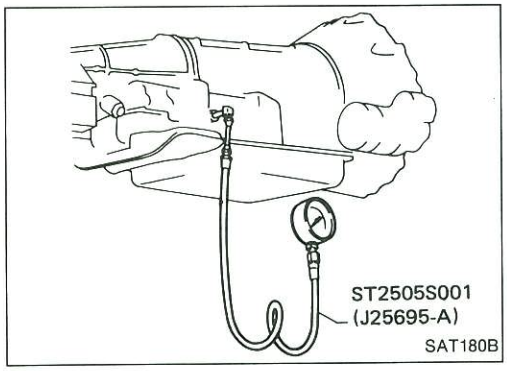
- Location of line pressure test port
- **Line pressure plugs are hexagon headed bolts.**
- **Always replace line pressure plugs as they are self-sealing bolts.**



Line pressure test procedure

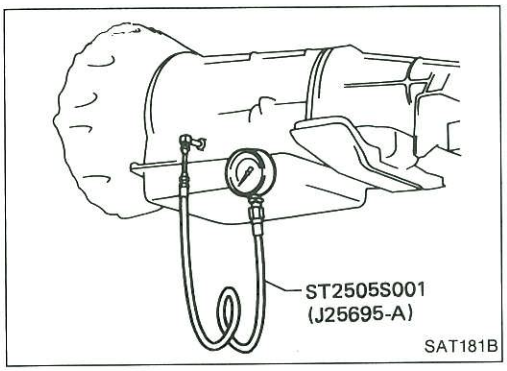
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

   A.T.F. operating temperature:
   50 - 80°C (122 - 176°F)

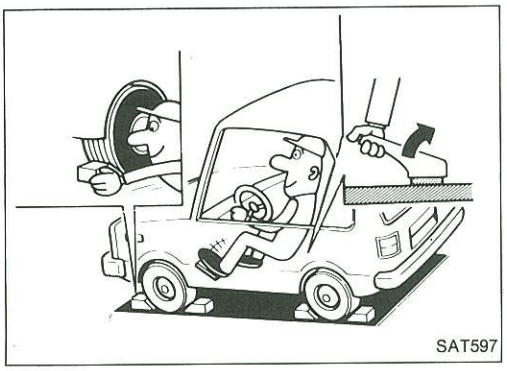


3. Install pressure gauge to line pressure port.

— D, 2 and 1 ranges —



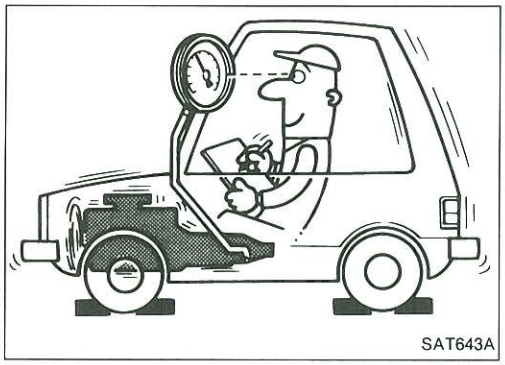
— R range —



4. Set parking brake and block wheels.

- **Continue to depress brake pedal fully while line pressure test at stall speed is performed.**

Final Check (Cont'd)


SAT643A

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 ranges	R range
Idle	432 - 471 (4.4 - 4.8, 63 - 68)	667 - 706 (6.8 - 7.2, 97 - 102)
Stall	883 - 961 (9.0 - 9.8, 128 - 139)	1,393 - 1,471 (14.2 - 15.0, 202 - 213)

JUDGEMENT OF LINE PRESSURE TEST

Judgement		Suspected parts
At idle	Line pressure is low in all ranges.	• 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 range.	• Fluid pressure leakage between manual valve and particular clutch. • For example; If line pressure is low in "R" and "1" ranges but is normal in "D" and "2" range, fluid leakage exists at or around low & reverse brake circuit.
	Line pressure is high.	• Mal-adjustment of throttle sensor • Fluid temperature sensor damaged • Line pressure solenoid sticking • Short circuit of line pressure solenoid circuit • Pressure modifier valve sticking • Pressure regulator valve or plug sticking
At stall speed	Line pressure is low.	• Mal-adjustment of throttle sensor • Control piston damaged • Line pressure solenoid sticking • Short circuit of line pressure solenoid circuit • Pressure regulator valve or plug sticking • Pressure modifier valve sticking • Pilot valve sticking

Symptom Chart

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 page (AT-)	9, 14	74	74	78	75, 119	75	75	7, 75	7	7	104, 115	132, 136	138, 149	138, 146	142	156
		Fluid level Control linkage	Inhibitor switch Throttle sensor (Adjustment)	Revolution sensor and speed sensor Engine revolution signal	Engine idling rpm Line pressure	Control valve assembly Shift solenoid A	Shift solenoid B Line pressure solenoid	Lock-up solenoid Overrun clutch solenoid	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
56	Engine does not start in "N", "P" ranges.	. 2	3 .	. .	. .	. .	. .	. .	. .	. .	. 1	. .	. .	. .	. .	. .	.
56	Engine starts in range other than "N" and "P".	. 1	2 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
—	Transmission noise in "P" and "N" ranges.	1 .	. 3	4 5	. 2	. .	. .	. .	. .	. .	. .	⑦⑥	. .	. .	. .	. .	.
56	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	. 1	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	②
57	Vehicle runs in "N" range.	. 1	. .	. .	. .	. .	. .	. .	. .	. .	4 .	. .	③ .	② .	⑤ .	. .	.
59	Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.	. 1	. .	. .	. 2	4 .	. 3	. .	. .	. .	. .	. .	⑤⑥	⑦ .	⑧ .	⑨ .	.
—	Vehicle braked when shifting into "R" range.	1 2	. .	. .	. 3	5 .	. 4	. .	. .	. .	. .	. .	. ⑥	⑧ .	⑨ .	. ⑦	.
—	Sharp shock in shifting from "N" to "D" range.	. .	. 2	. 5	1 3	7 .	. 6	. .	4 8	. .	. .	. .	. .	⑨ .	. .	. .	.
—	Vehicle will not run in "D" and "2" ranges (but runs in "1" and "R" range).	. 1	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. ②	. .	.
60	Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1 .	. .	. .	. 2	4 .	. 3	. .	. 5	. .	. .	. .	⑥⑦	⑧⑨	. ⑩	. .	.
—	Clutches or brakes slip somewhat in starting.	1 2	. 3	. .	. 4	6 .	. 5	. .	. 7	. .	8 .	⑬⑫	⑩ .	⑨ .	. .	⑪ .	.
—	Excessive creep.	. .	. .	. .	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
59, 60	No creep at all.	1 .	. .	. .	. 2	3 .	. .	. .	. .	. .	. .	⑥⑤	. .	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	.
62, 63, 64	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)

Reference page (AT-)		ON vehicle										OFF vehicle					
	Reference page (AT-)	9, 14	74	74	78	75, 119	75	75	7, 75	7	7	104, 115	132, 136	138, 149	138, 146	142	156
	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 sensor (Adjustment)	Revolution sensor and speed sensor Engine revolution signal	Engine idling rpm Line pressure	Control valve assembly Shift solenoid A	Shift solenoid B Line pressure solenoid	Lock-up solenoid Overrun clutch solenoid	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 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	②④	. .	. 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 .	. .	. .	. .	. .	⑪⑩	⑥⑦	. .	. .	⑨⑧	.
—	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	. .	. .	. .	. .	. .	. ⑥⑦	. .	. .	. .	.
—	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	. .	. .	. ⑨⑦	. .	. .	. 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	. .	. .	. .	. .	. .	. .	⑥⑦	. ⑧	. .	.
—	Vehicle will not run in any range.	1 2	. .	. .	. 3	. .	. 4	. .	. .	. .	. .	⑨⑤	. ⑥	. .	. .	⑧⑦	⑩
—	Transmission noise in "D", "2", "1" and "R" ranges.	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	② .	. .	. .	. .	. .	.

Symptom Chart (Cont'd)

Reference page (AT-)		ON vehicle										OFF vehicle					
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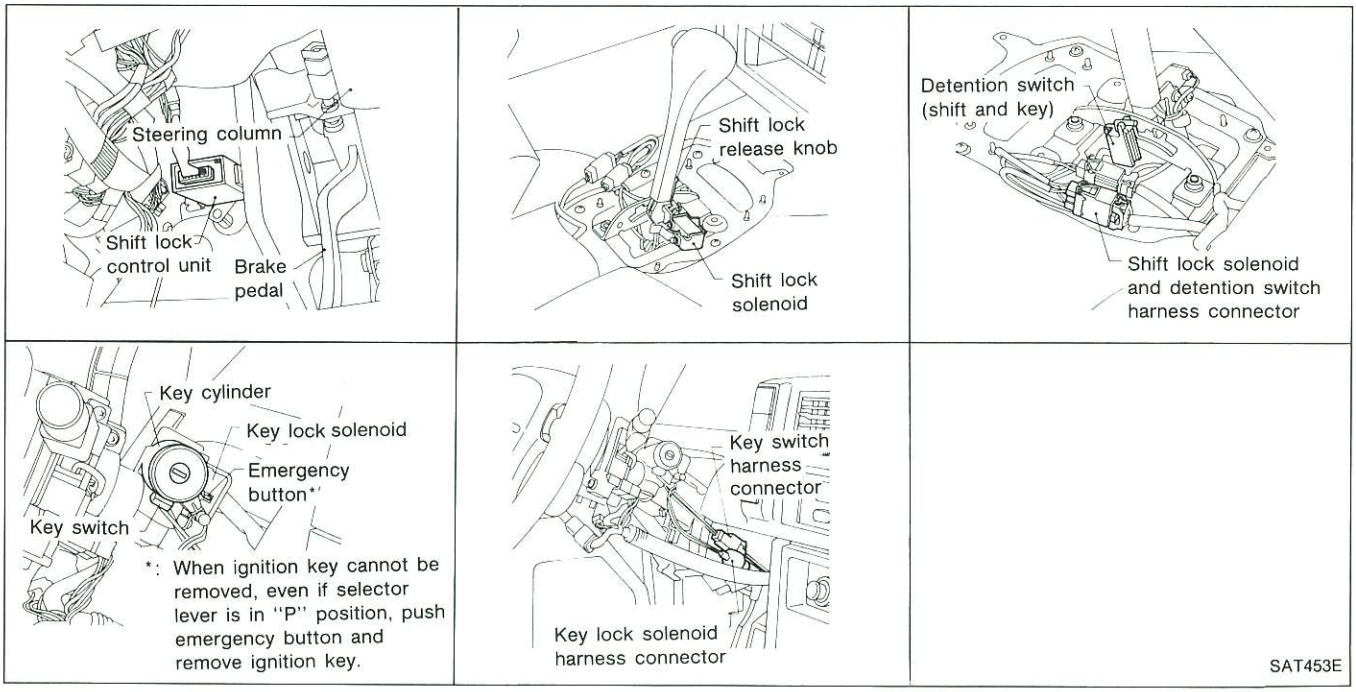
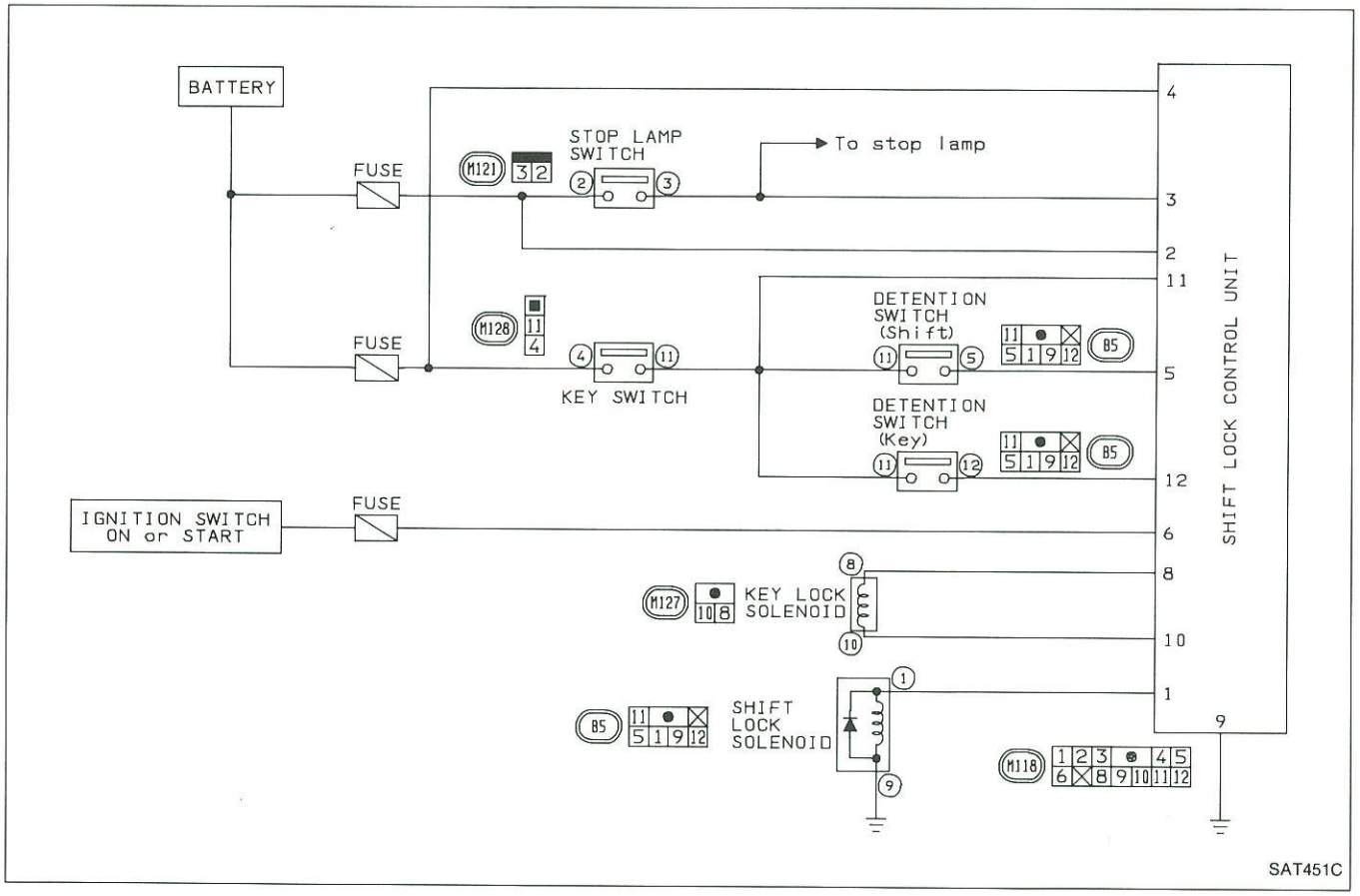
69	Failure to change from "D_3" to "D_2" when changing lever into "2" range.	7	1 2			6 5	4	3							⑨	⑧	
—	Gear change from "2_2" to "2_3" in "2" range.		1														
69	Engine brake does not operate in "1" range.	2	1 3	4		6 5		7							⑧	⑨	
—	Gear change from "1_1" to "1_2" in "1" range.	2	1														
—	Does not change from "1_2" to "1_1" in "1" range.		1	2		4 3		5							⑥	⑦	
—	Large shock changing from "1_2" to "1_1" in "1" range.					1										②	
—	Transmission overheats.	1	3		2 4	6	5					⑭⑦	⑧⑨	⑪	⑫	⑬⑩	
—	A.T.F. shoots out during operation. White smoke emitted from exhaust pipe during operation.	1											②③	⑤	⑥	⑦④	
—	Offensive smell at fluid charging pipe.	1										②③	④⑤	⑦	⑧	⑨⑥	
—	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					
65	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" ranges.	1				5 4	3	2									

A/T Shift Lock System

SHIFT LOCK SYSTEM ELECTRICAL PARTS LOCATION

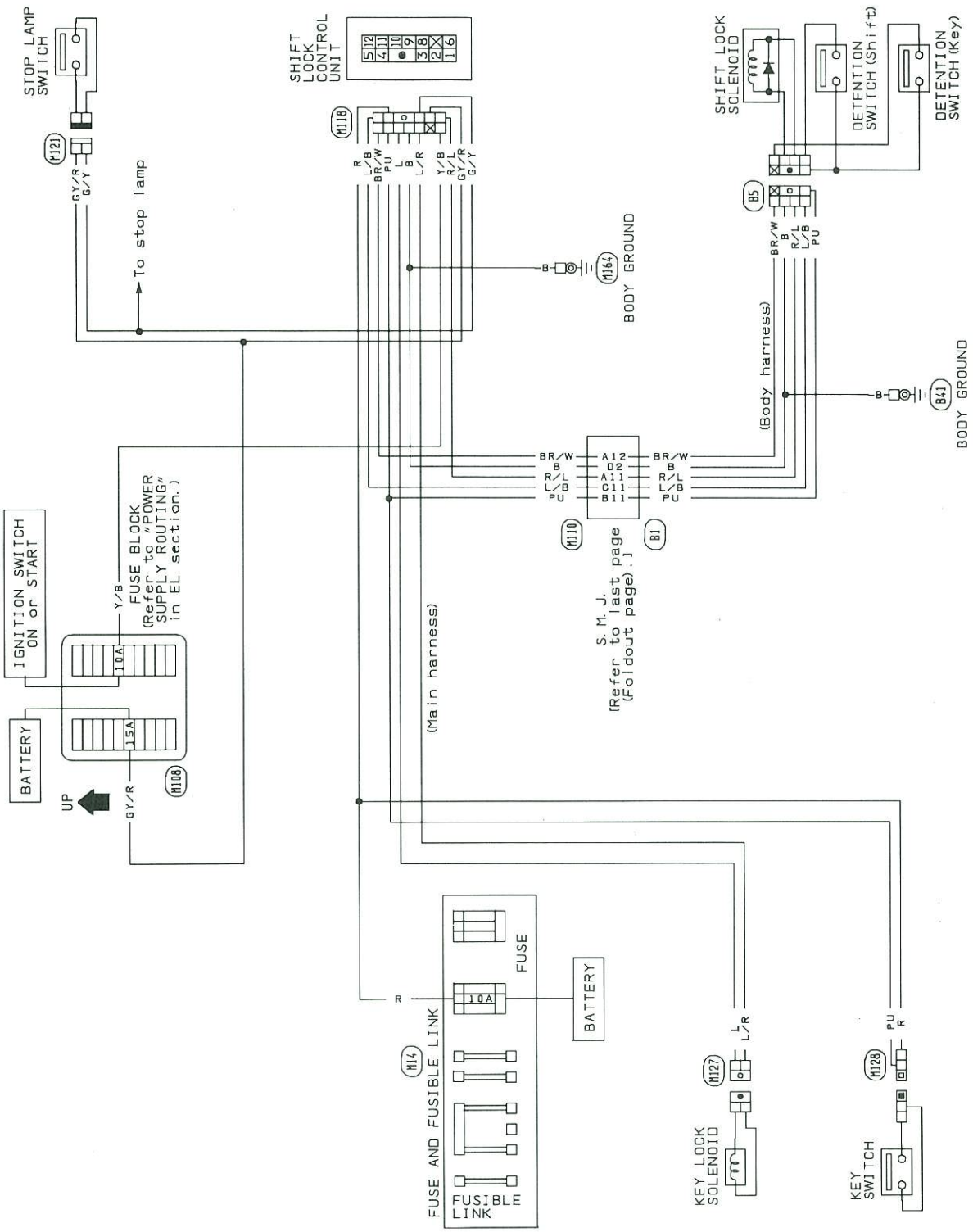


CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



A/T Shift Lock System (Cont'd)

WIRING DIAGRAM



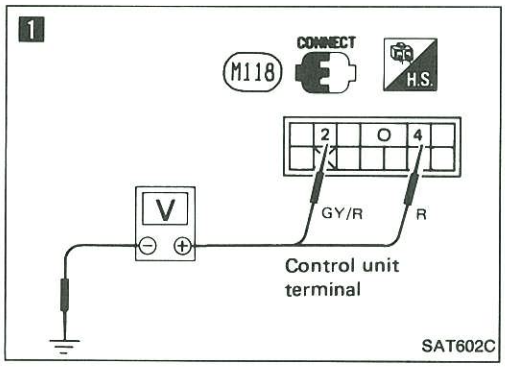
SAT452E

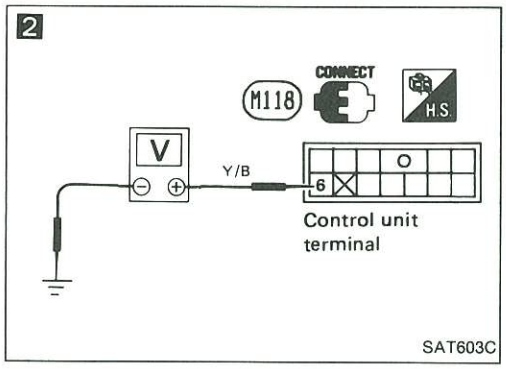
A/T Shift Lock System (Cont'd)

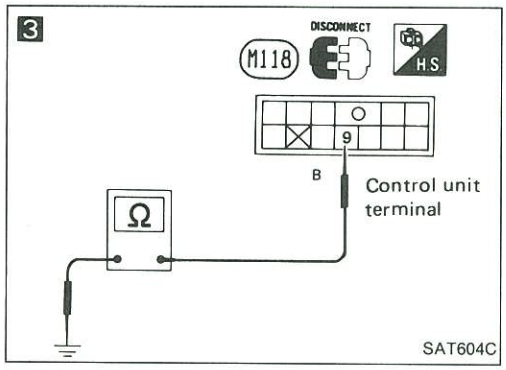
DIAGNOSTIC PROCEDURE 1

SYMPTOM:

Selector lever cannot be moved from "P" range when applying brake pedal or can be moved when releasing brake pedal.
Selector lever can be moved from "P" range when key is removed from key cylinder.

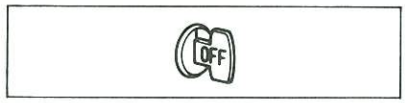






1

CHECK POWER SOURCE.

1. 

2. Check voltage between control unit harness terminals ②, ④ and ground.
   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

2

CHECK IGNITION SIGNAL.

1.

2. Check voltage between control unit harness terminal ⑥ and ground.
   0V
3.

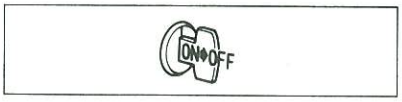
4. Check voltage between control unit harness terminal ⑥ and ground.
   Battery voltage should exist.

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. 

2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
   Continuity should exist.

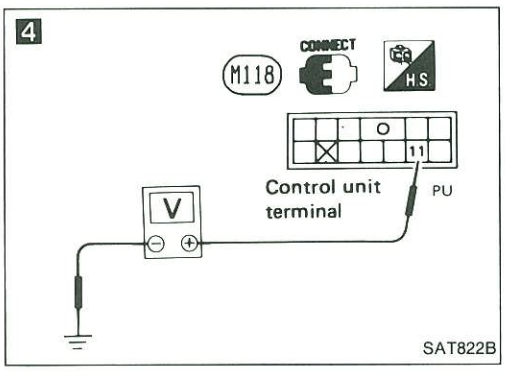
N.G. → Repair harness or connector.

O.K. ↓

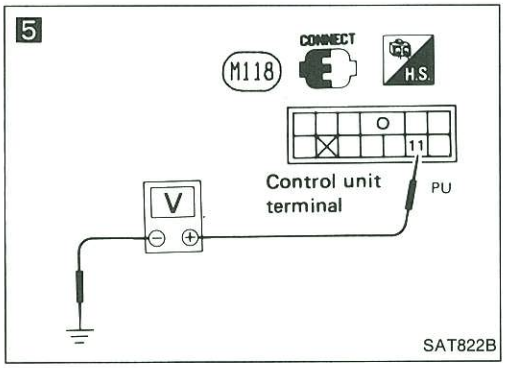
Ⓐ

A/T Shift Lock System (Cont'd)

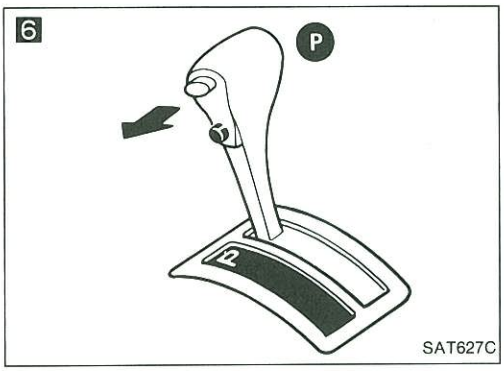
4



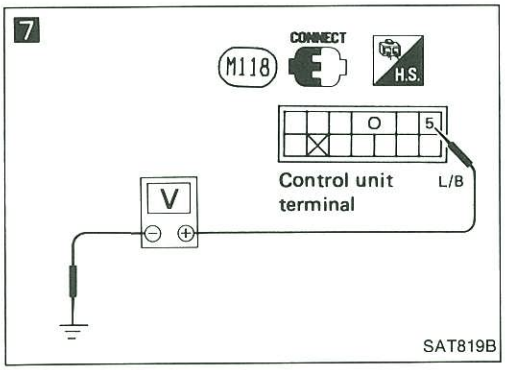
5



6



7



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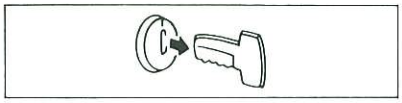
4

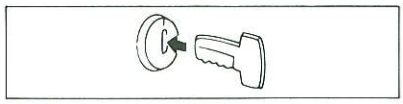
CHECK INPUT SIGNAL (KEY SWITCH).

1. Reconnect control unit harness connector.
2. 
3. Check voltage between control unit terminal ⑪ and ground.
   0V

N.G. → Check key switch. (Refer to "COMPONENT CHECK".)

O.K. ↓

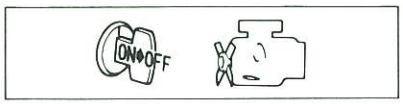
5

1. 
2. Check voltage between control unit harness terminal ⑪ and ground.
   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ⑪ and key switch harness terminal ⑪.
2. Harness continuity between key switch harness terminal ④ and fuse
3. Key switch (Refer to "COMPONENT CHECK".)

O.K. ↓

CHECK INPUT SIGNAL (DETENTION SWITCH—SHIFT).

1. 

6 2. Set selector lever in "P" position and release selector lever button.

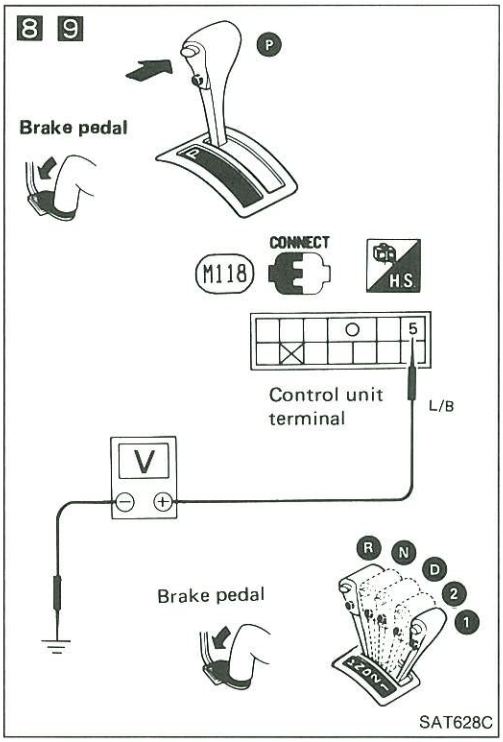
7 3. Check voltage between control unit harness terminal ⑤ and ground.
   0V

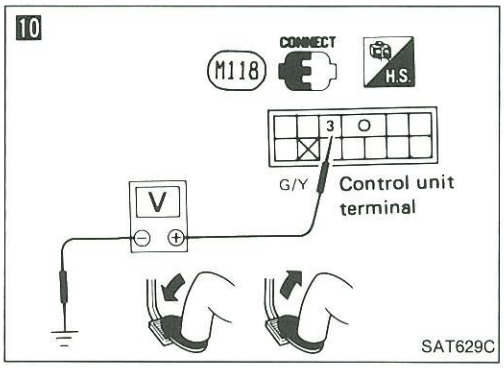
N.G. → Check detention switch—shift. (Refer to "COMPONENT CHECK".)

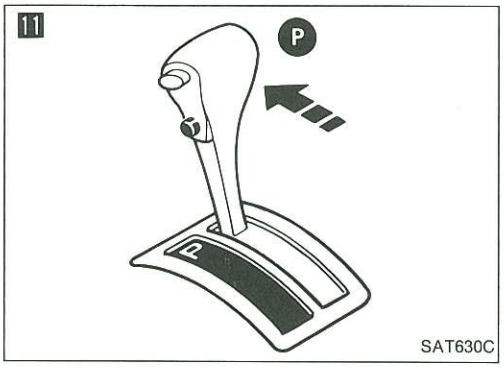
O.K. ↓

Ⓑ

A/T Shift Lock System (Cont'd)







Ⓑ

CHECK INPUT SIGNAL (DETENTION SWITCH—SHIFT).

1.

8 2. Check voltage between control unit harness terminal ⑤ and ground with brake pedal depressed and selector lever button pushed.
Battery voltage should exist.

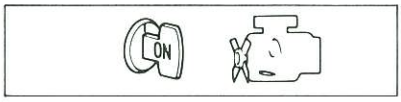
9 3. Check voltage between control unit harness terminal ⑤ and ground with selector lever set in any position except "P".
When selector lever cannot be moved from "P" position with brake pedal depressed, push shift lock release knob.
Battery voltage should exist.

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 ⑪ and key switch harness terminal ⑪
3. Detention switch—shift (Refer to "COMPONENT CHECK".)

O.K. ↓

10

CHECK INPUT SIGNAL (STOP LAMP SWITCH).



- 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 ③
2. Harness continuity between stop lamp switch harness terminal ② and fuse
3. Stop lamp switch (Refer to "COMPONENT CHECK".)

O.K. ↓

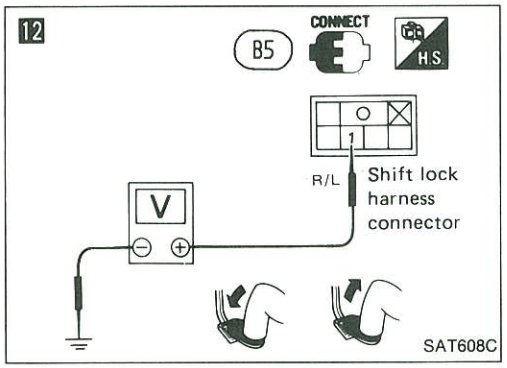
11

Set selector lever in "P" position.

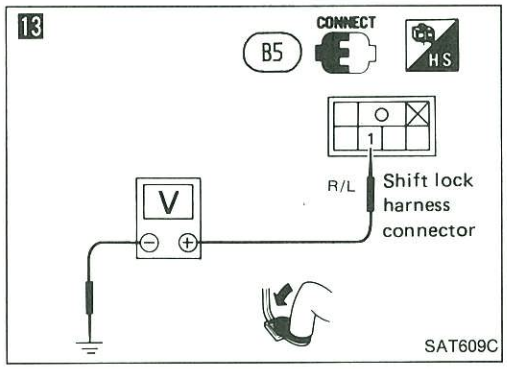
Ⓒ

A/T Shift Lock System (Cont'd)

12



13



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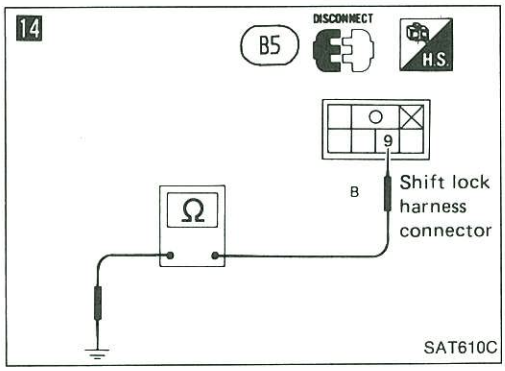


Ⓒ

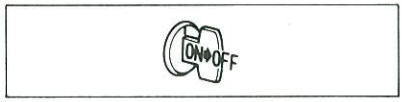
CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).

1.

12 2. Check voltage between shift lock harness connector terminal ① and body ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

3.



13 4. Check voltage between shift lock harness connector terminal ① and ground with brake pedal depressed.
0V

N.G. → Check harness continuity between control unit harness terminal ① and shift lock solenoid harness terminal ①.

O.K. ↓

14

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.

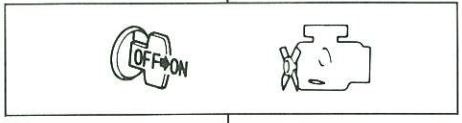
O.K. ↓

Check shift lock solenoid. (Refer to "COMPONENT CHECK".)

N.G. → Replace A/T shift lock control device assembly.

O.K. ↓

Reconnect shift lock harness connector.



Recheck shift lock operation.

N.G. → 1. Perform control unit input/ output signal inspection test.
2. If N.G., recheck harness connector connection.

O.K. ↓

INSPECTION END

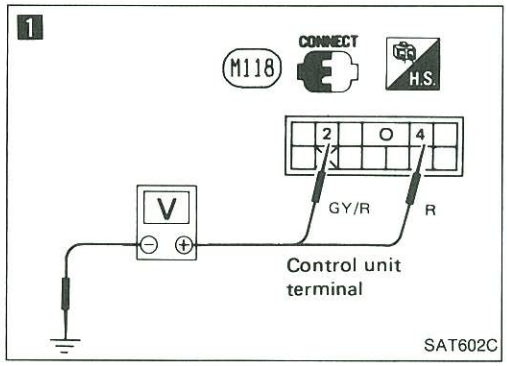
A/T Shift Lock System (Cont'd)

DIAGNOSTIC PROCEDURE 2

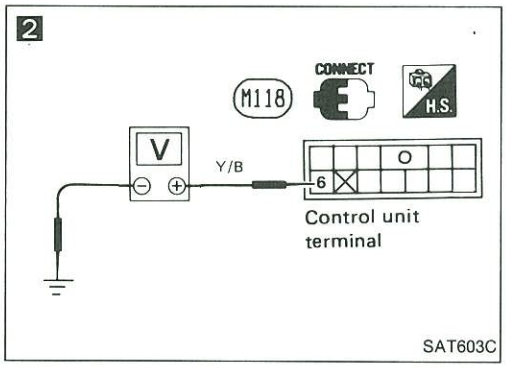
SYMPTOM:

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".

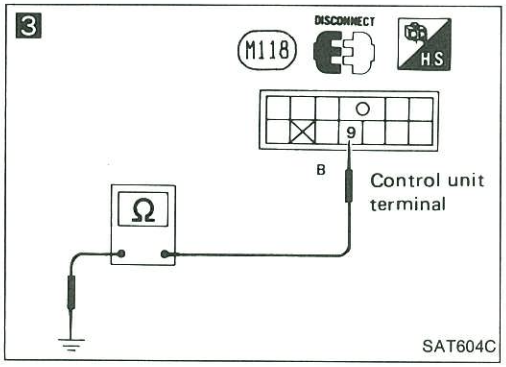
1



2

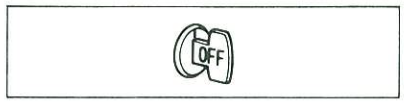


3



1

CHECK POWER SOURCE.

1. 

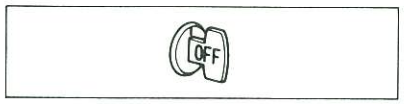
2. Check voltage between control unit harness terminals ②, ④ and ground.
   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

2

CHECK IGNITION SIGNAL.

1. 

2. Check voltage between control unit harness terminal ⑥ and ground.
   0V
3.

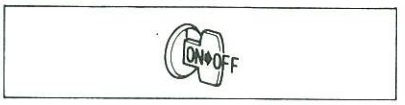
4. Check voltage between control unit harness terminal ⑥ and ground.
   Battery voltage should exist.

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. 

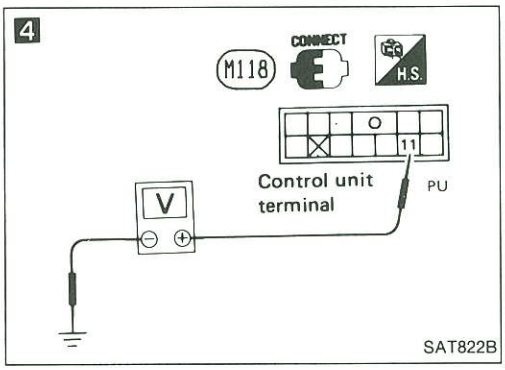
2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
   Continuity should exist.

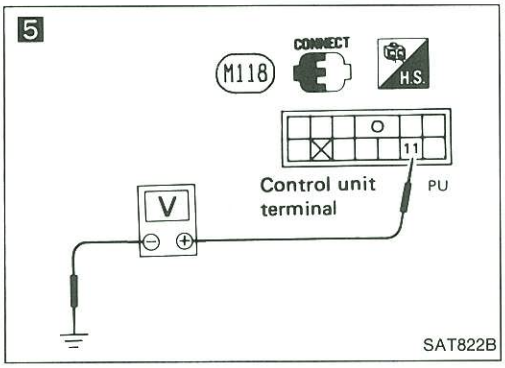
N.G. → Repair harness or connector.

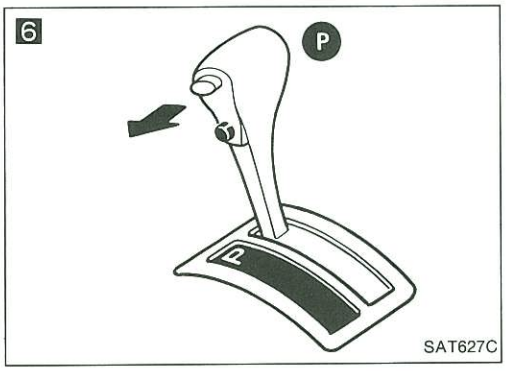
O.K. ↓

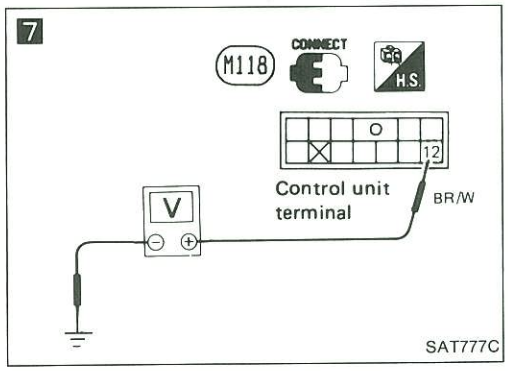
Ⓐ

A/T Shift Lock System (Cont'd)





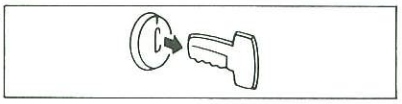




Ⓐ

4

CHECK INPUT SIGNAL (KEY SWITCH).

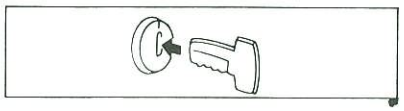
1. Reconnect control unit harness connector.
2. 

   When ignition key cannot be removed, even if selector lever is in "P" position, use emergency button.
3. Check voltage between control unit terminal ⑪ and ground.
   0V

N.G. → Check key switch. (Refer to "COMPONENT CHECK".)

O.K. ↓

5

1. 
2. Check voltage between control unit harness terminal ⑪ and ground.
   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ⑪ and key switch harness terminal ⑪.
2. Harness continuity between key switch harness terminal ④ and fuse
3. Key switch (Refer to "COMPONENT CHECK".)

O.K. ↓

CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).

1.

6 2. Set selector lever in "P" position and release selector lever button.

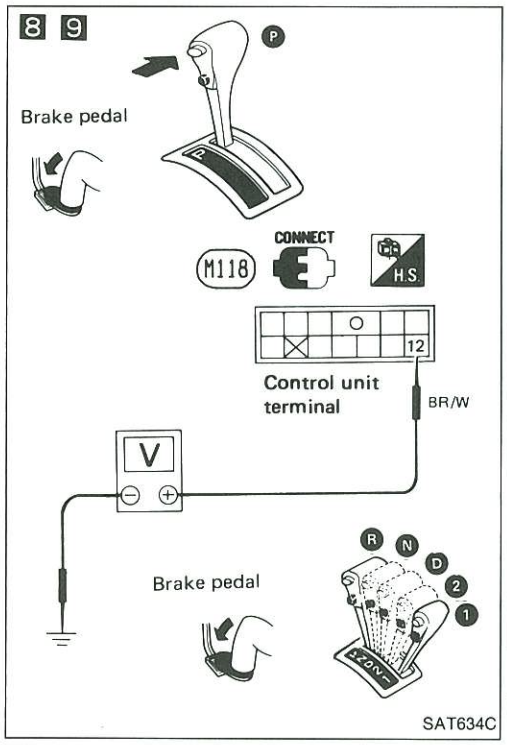
7 3. Check voltage between control unit harness terminal ⑫ and ground.
   0V

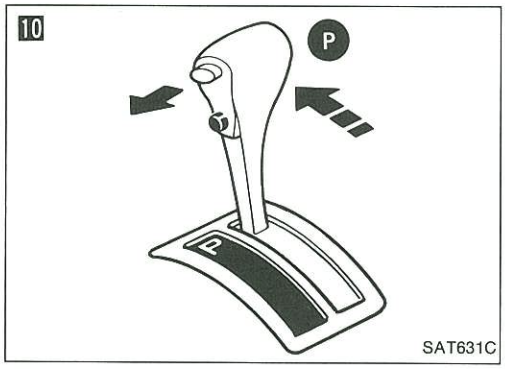
N.G. → Check detention switch—key. (Refer to "COMPONENT CHECK".)

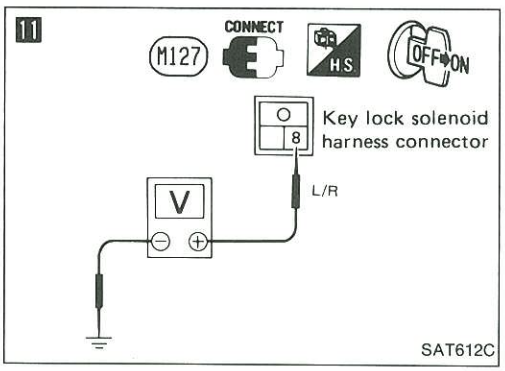
O.K. ↓

Ⓑ

A/T Shift Lock System (Cont'd)

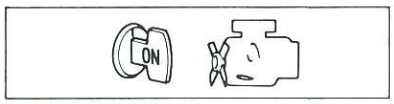






Ⓑ

CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).



8 1. Check voltage between control unit harness terminal ⑫ and ground with brake pedal depressed and selector lever button pushed.
Battery voltage should exist.

9 2. Check voltage between control unit harness terminal ⑫ 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 ⑫ and detention switch harness terminal ⑫
2. Harness continuity between detention switch harness terminal ⑪ and key switch harness terminal ⑪
3. Detention switch—key (Refer to "COMPONENT CHECK".)

O.K.

10 Set selector lever in "P" position and release selector lever button.

11 **CHECK OUTPUT SIGNAL (KEY LOCK SIGNAL).**

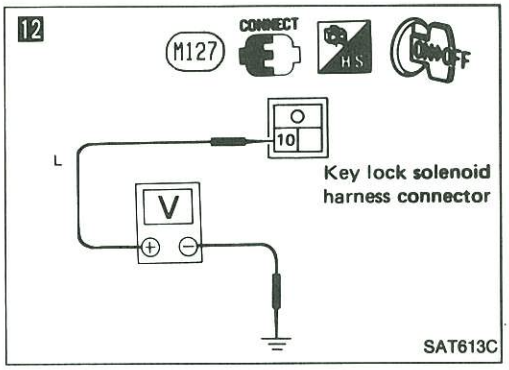
Check voltage between key lock solenoid harness terminal ⑧ and ground at the moment ignition key is turned from OFF to ON.
Battery voltage should exist for approximately 0.1 seconds.

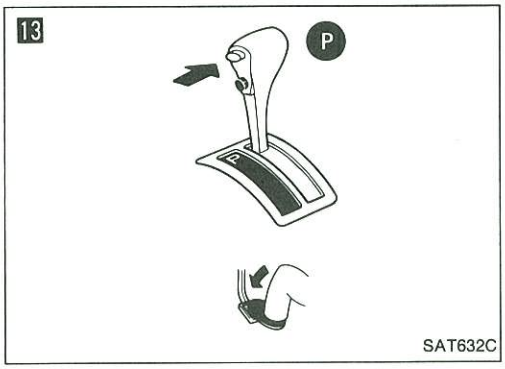
N.G. → Check harness continuity between shift lock solenoid harness terminal ⑧ and control unit harness terminal ⑧.
- O.K. → Replace control unit.
- N.G. → Repair harness or connector.

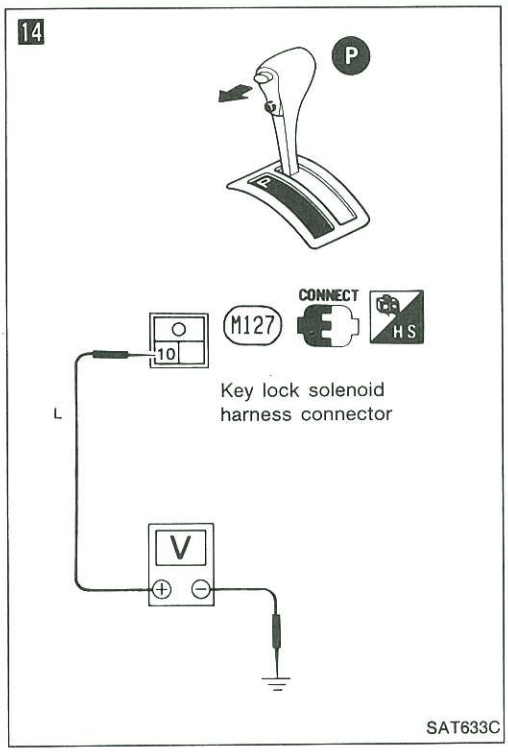
O.K.

Ⓒ

A/T Shift Lock System (Cont'd)







Ⓒ

12

CHECK OUTPUT SIGNAL (KEY UNLOCK SIGNAL CAUSED BY IGNITION SIGNAL).

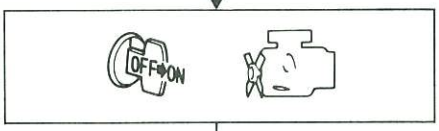
Check voltage between key lock solenoid harness terminal ⑩ and ground at the moment ignition key is turned from ON to OFF.

Battery voltage should exist for approximately 0.1 seconds.

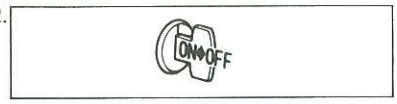
N.G. → Check harness continuity between shift lock solenoid harness terminal ⑩ and control unit harness terminal ⑩.

- O.K. → Replace control unit.
- N.G. → Repair harness or connector.

O.K. ↓



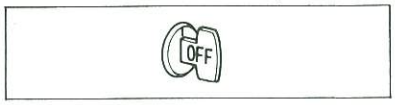
13

1. Push selector lever button with brake pedal depressed.
2. 

When turning ignition key, keep selector lever button pushed and brake pedal depressed.

14

CHECK OUTPUT SIGNAL (KEY UNLOCK SIGNAL CAUSED BY DETENTION SWITCH—KEY).



Check voltage between key lock solenoid harness terminal ⑩ and ground at the moment selector lever button is released.

Battery voltage should exist for approximately 0.1 seconds.

N.G. → Replace control unit.

O.K. ↓

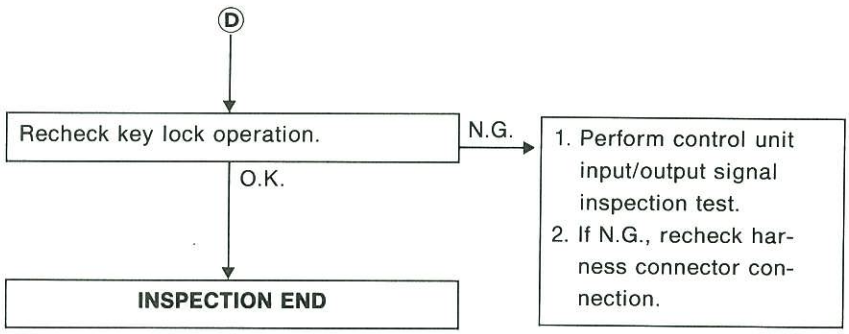
Check key lock solenoid. (Refer to "COMPONENT CHECK".)

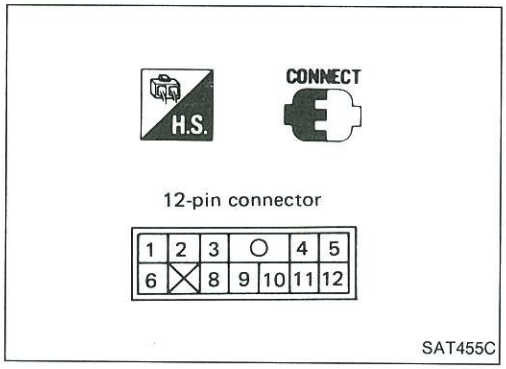
N.G. → Replace key lock solenoid.

O.K. ↓

Ⓓ

A/T Shift Lock System (Cont'd)





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.

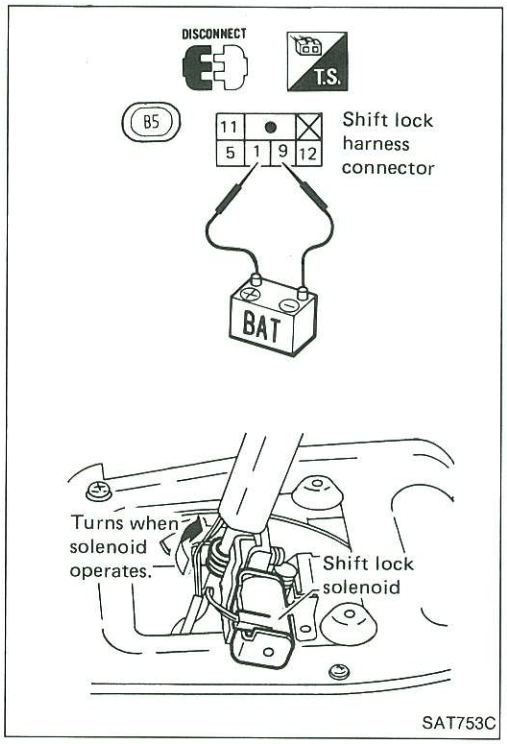
A/T Shift Lock System (Cont'd)

SHIFT LOCK CONTROL UNIT INSPECTION TABLE (Data are reference values.)

Terminal No. ⊕	Terminal No. ⊖	Item	Condition	Judgement 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		Battery voltage
3		Stop lamp switch	When brake pedal is depressed	Battery voltage
			When brake pedal is released	0V
4		Power source		Battery voltage
5		Detention switch (Shift)	When key is inserted into key cylinder, selector lever is set in "P" position and selector lever button is released	0V
			Except above	Battery voltage
6		Ignition signal		Battery voltage
8	10	Key lock signal	When ignition switch is turned from LOCK, OFF or ACC to ON.	Battery voltage (Approximately 0.1 seconds)
			Except above	0V
9	—	Ground	—	—
10	8	Key unlock signal	When ignition switch is turned from ON to LOCK, OFF or ACC, selector lever is set in "P" position and selector lever button is released	Battery voltage (Approximately 0.1 seconds)
			Except above	0V
11	9	Key switch	When key is inserted into key cylinder	Battery voltage
			When key is removed from key cylinder	0V
12		Detention switch (Key)	When key is inserted into key cylinder, selector lever is set in "P" position and selector lever button is released	0V
			Except above	Battery voltage

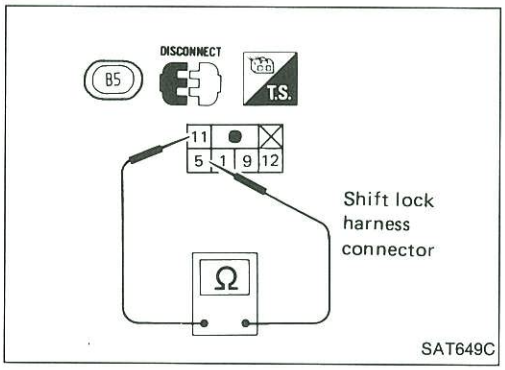
A/T Shift Lock System (Cont'd)

COMPONENT CHECK



Shift lock solenoid

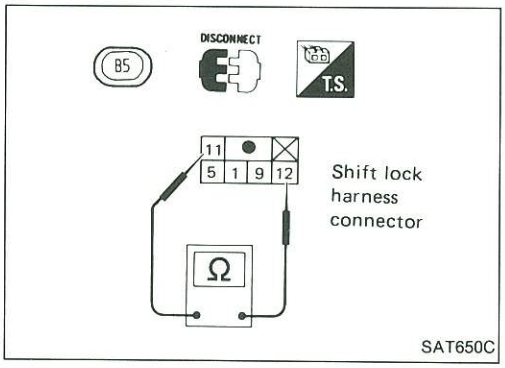
- Check operation by applying battery voltage to shift lock harness connector.



Detention switch—shift

- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.

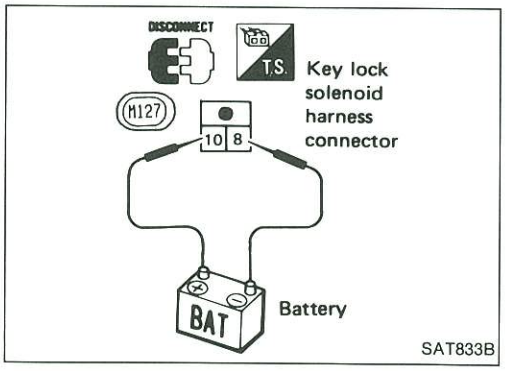
Condition	Continuity
When selector lever is set to "P" position and selector lever button is released	Yes
Except above	No



Detention switch—key

- Check continuity between terminals ⑪ and ⑫ of shift lock harness connector.

Condition	Continuity
When selector lever is set to "P" position and selector lever button is released	Yes
Except above	No

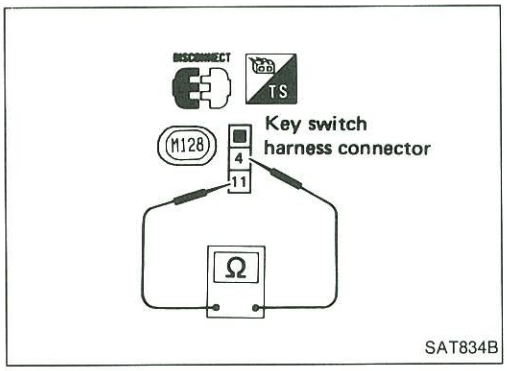


Key lock solenoid

- Check operation by applying battery voltage to key lock solenoid harness connector.

Operating sound must be emitted.

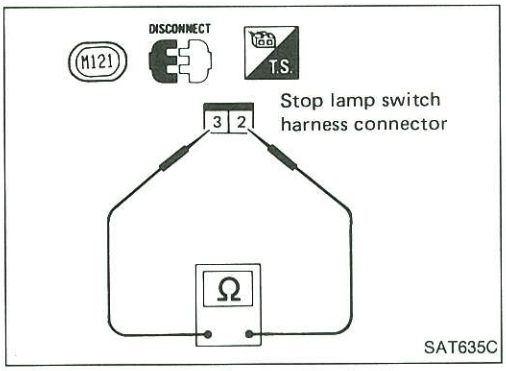
A/T Shift Lock System (Cont'd)



Key switch

- Check continuity between terminals ④ and ⑪ of key switch harness connector.

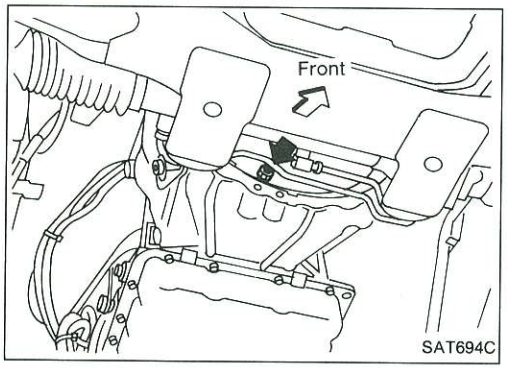
Condition	Continuity
When key is inserted into key cylinder	Yes
When key is removed from key cylinder	No

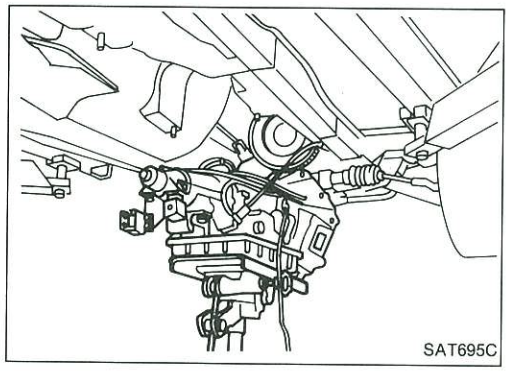


Stop lamp switch

- Check stop lamp switch after adjusting brake pedal — refer to section BR.
- Check continuity between terminals ③ and ② of stop lamp switch harness connector.

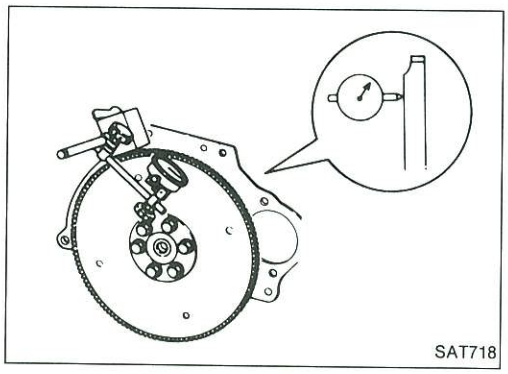
Condition	Continuity
When depressing brake pedal	Yes
When releasing brake pedal is released	No





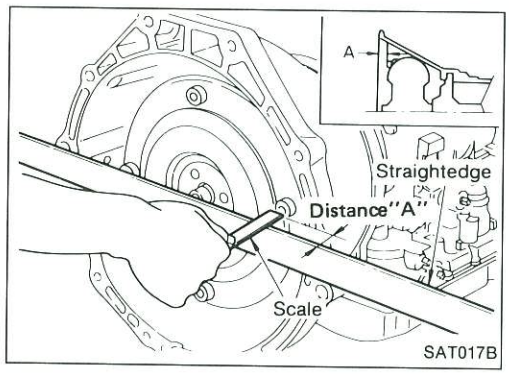
Removal

- 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.**
- 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.**



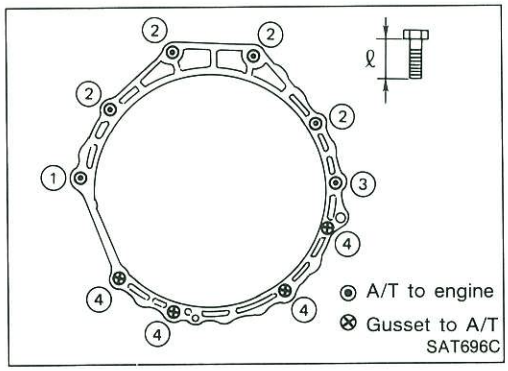
Installation

- 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.



- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.
  Distance "A":
  26 mm (1.02 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.

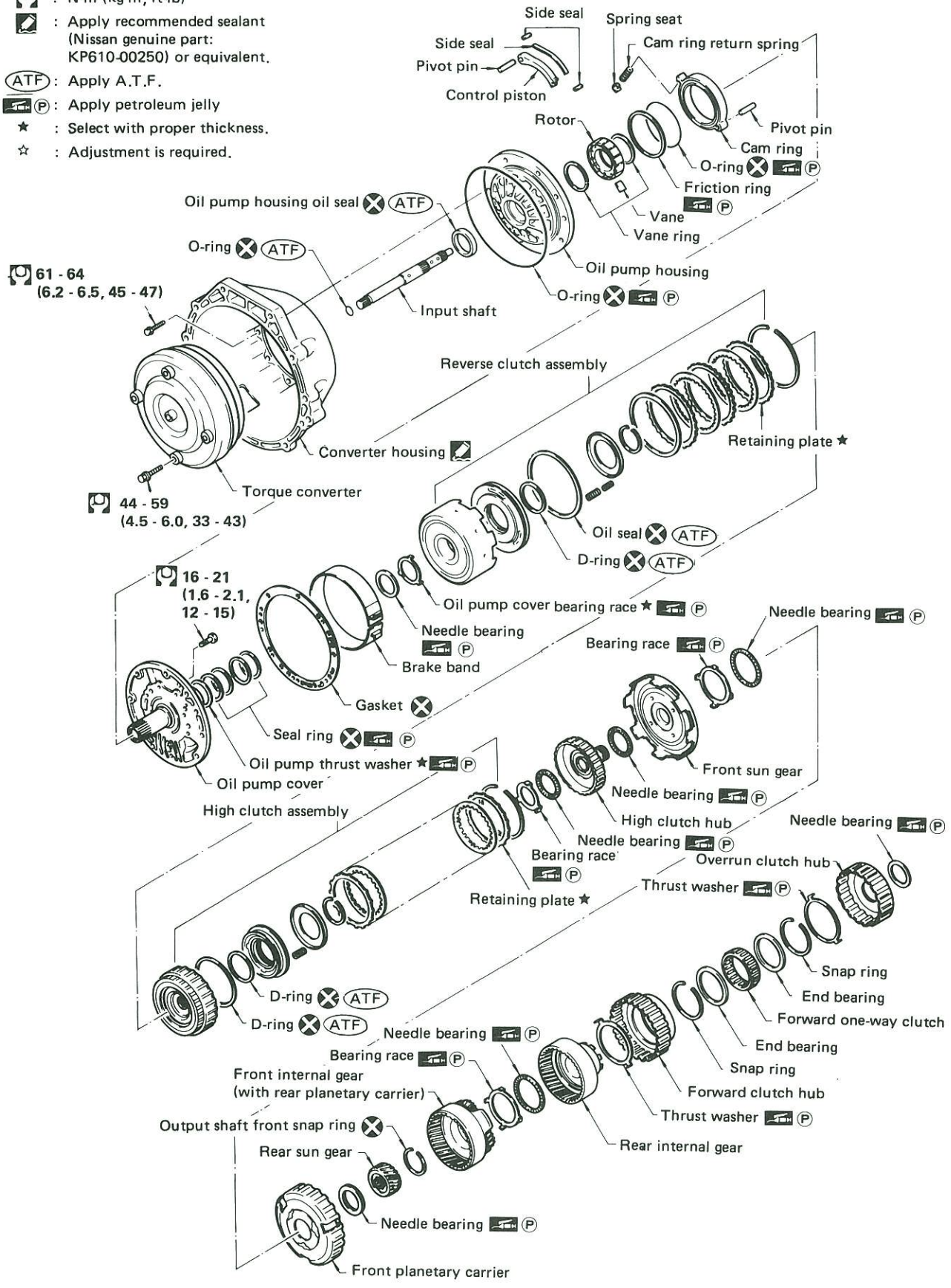
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
2	39 - 49 (4.0 - 5.0, 29 - 36)	50 (1.97)
3	39 - 49 (4.0 - 5.0, 29 - 36)	45 (1.77)
4	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
Gusset to engine	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.98)

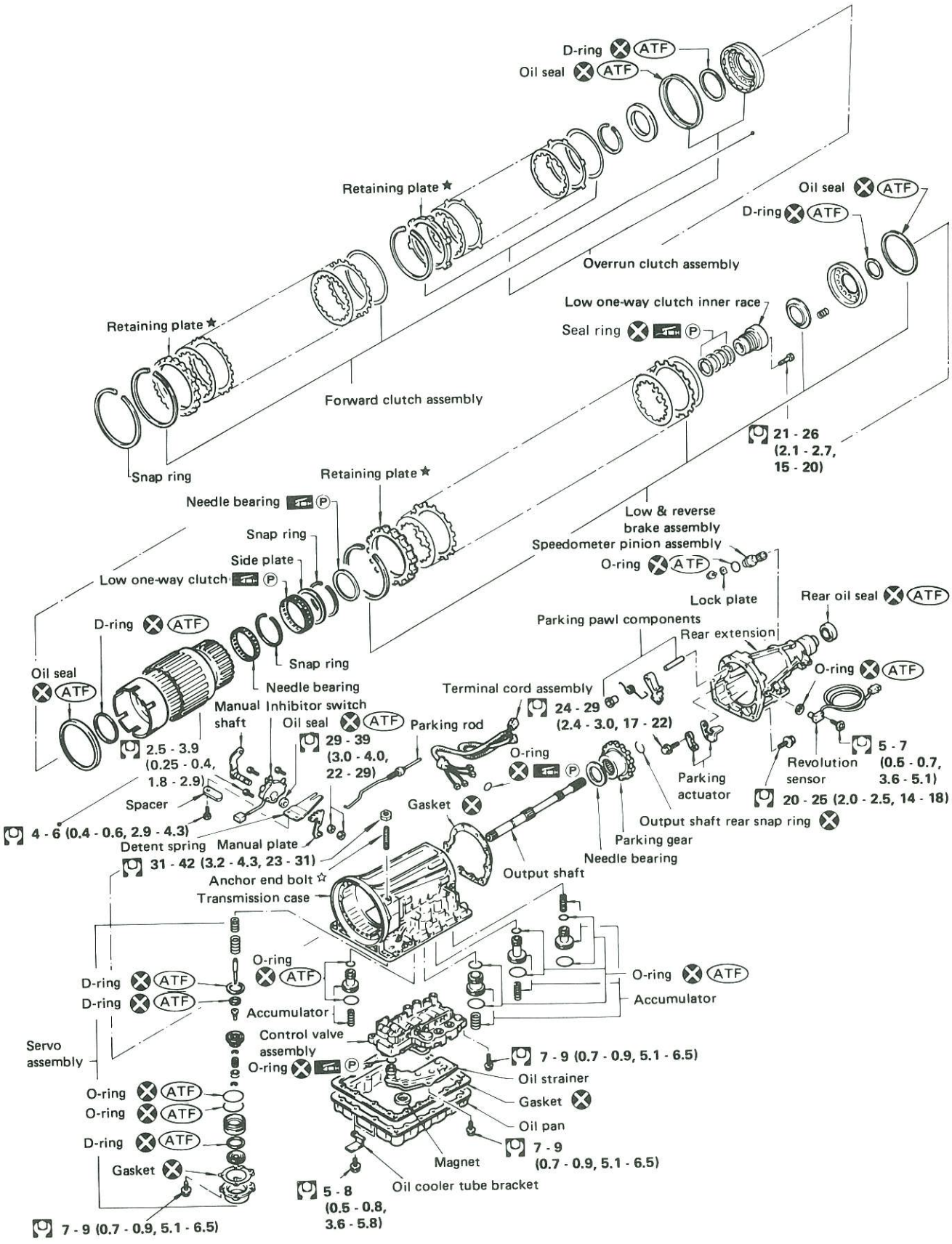
- Reinstall any part removed.

- 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".

NOTE

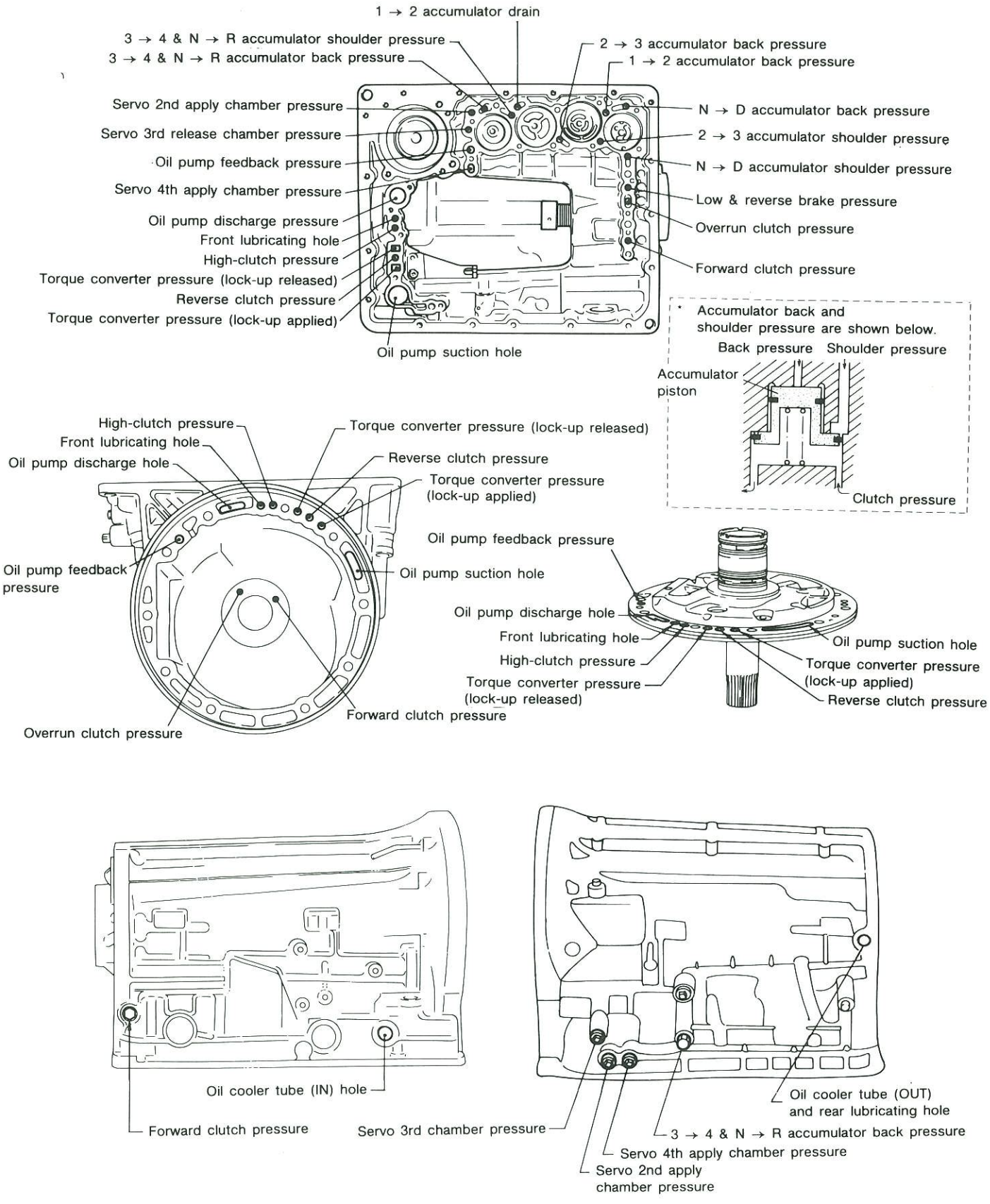
: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.
(ATF): Apply A.T.F.
Ⓟ: Apply petroleum jelly
★: Select with proper thickness.
☆: Adjustment is required.




D-ring ⊗ ATF
Oil seal ⊗ ATF
Retaining plate ★
Oil seal ⊗ ATF
D-ring ⊗ ATF
Overrun clutch assembly
Low one-way clutch inner race
Seal ring ⊗ P
Retaining plate ★
Forward clutch assembly
21 - 26 (2.1 - 2.7, 15 - 20)
Snap ring
Retaining plate ★
Needle bearing P
Low & reverse brake assembly
Speedometer pinion assembly
Snap ring
Side plate
Low one-way clutch P
O-ring ⊗ ATF
Lock plate
Rear oil seal ⊗ ATF
Parking pawl components
Rear extension
D-ring ⊗ ATF
Oil seal ⊗ ATF
Snap ring
Needle bearing
Terminal cord assembly
24 - 29 (2.4 - 3.0, 17 - 22)
O-ring ⊗ ATF
Manual shaft
Inhibitor switch
Oil seal ⊗ ATF
Parking rod
2.5 - 3.9 (0.25 - 0.4, 1.8 - 2.9)
29 - 39 (3.0 - 4.0, 22 - 29)
O-ring ⊗ P
Parking actuator
Revolution sensor
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
20 - 25 (2.0 - 2.5, 14 - 18)
Spacer
Gasket ⊗
Output shaft rear snap ring ⊗
4 - 6 (0.4 - 0.6, 2.9 - 4.3)
Detent spring
Manual plate
Parking gear
31 - 42 (3.2 - 4.3, 23 - 31)
Needle bearing
Anchor end bolt ☆
Output shaft
Transmission case
O-ring ⊗ ATF
O-ring ⊗ ATF
D-ring ⊗ ATF
D-ring ⊗ ATF
Accumulator
Accumulator
Servo assembly
Control valve assembly
O-ring ⊗ P
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Oil strainer
Gasket ⊗
O-ring ⊗ ATF
O-ring ⊗ ATF
D-ring ⊗ ATF
Oil pan
7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Magnet
Gasket ⊗
Oil cooler tube bracket
5 - 8 (0.5 - 0.8, 3.6 - 5.8)
7 - 9 (0.7 - 0.9, 5.1 - 6.5)

SAT071E

Oil Channel



SAT185B

Locations of Needle Bearings, Thrust Washers and Snap Rings

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

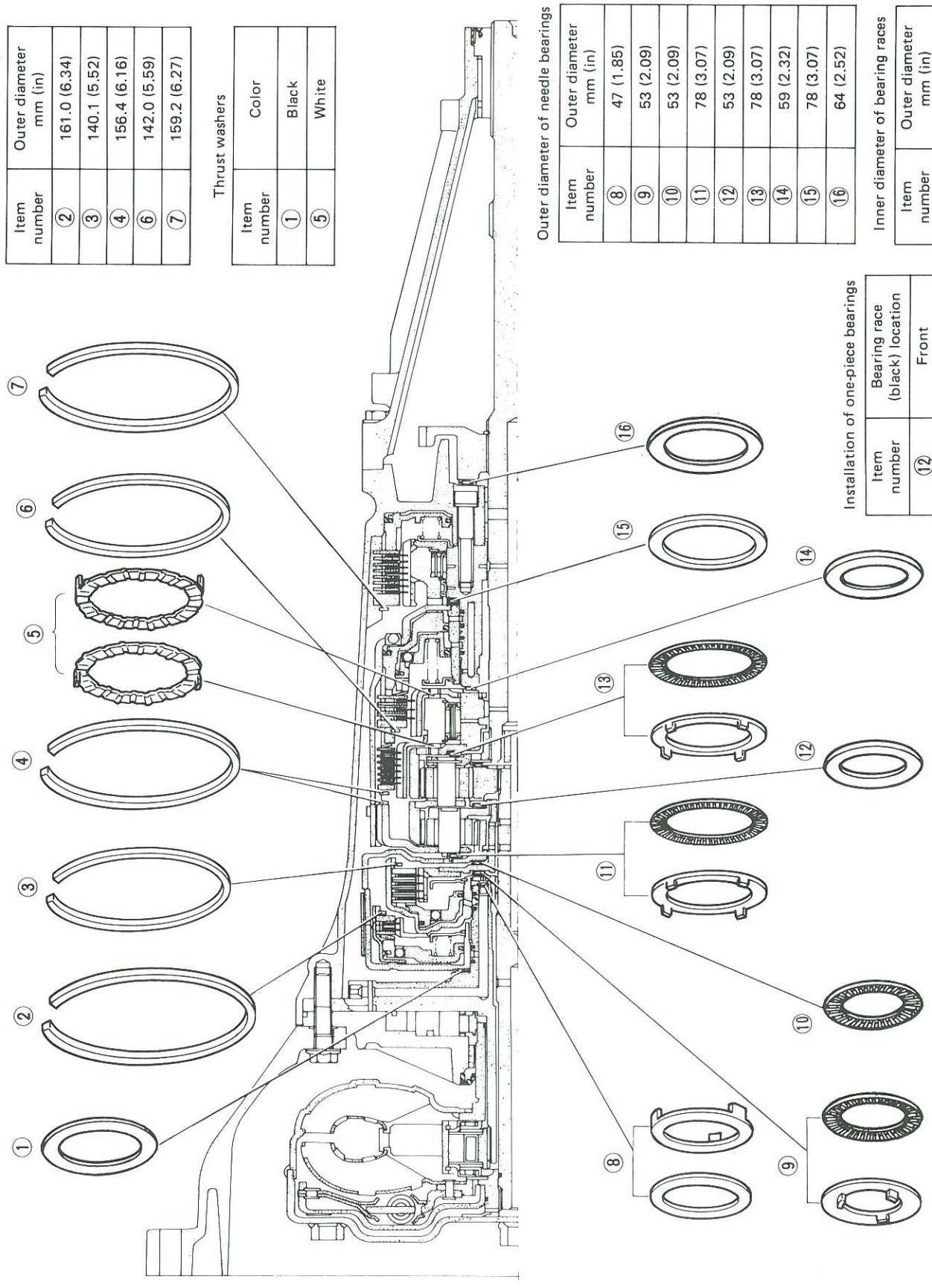
Item number	Outer diameter mm (in)
⑧	47 (1.85)
⑨	53 (2.09)
⑩	53 (2.09)
⑪	78 (3.07)
⑫	53 (2.09)
⑬	78 (3.07)
⑭	59 (2.32)
⑮	78 (3.07)
⑯	64 (2.52)

Inner diameter of bearing races

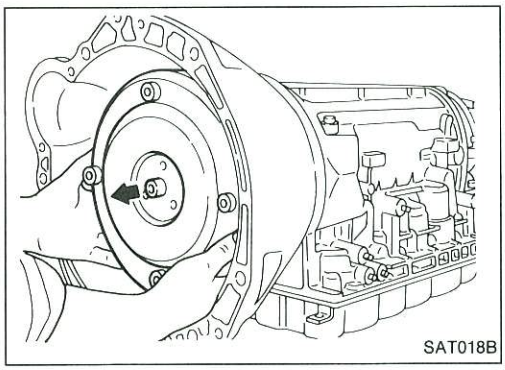
Item number	Outer diameter mm (in)
⑪	58 (2.28)
⑬	58.8 (2.315)

Installation of one-piece bearings

Item number	Bearing race (black) location
⑫	Front
⑮	Rear side
⑯	Rear side

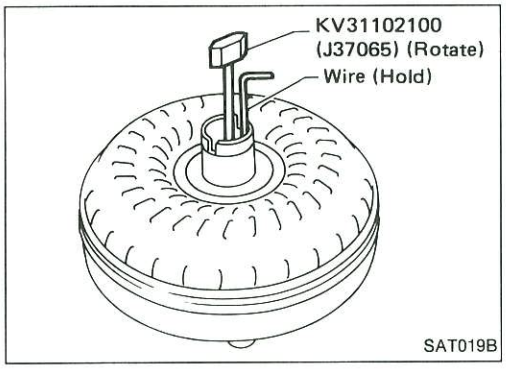


SAT647A


SAT018B

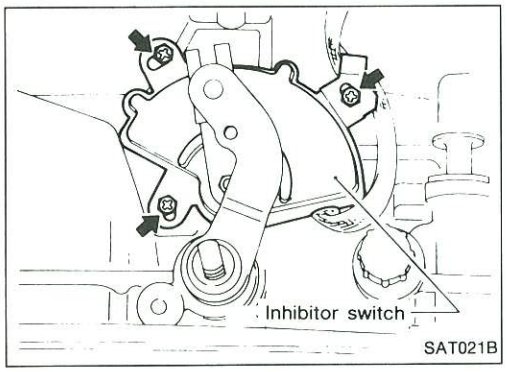
Disassembly

1. Remove torque converter by holding it firmly and turning while pulling straight out.



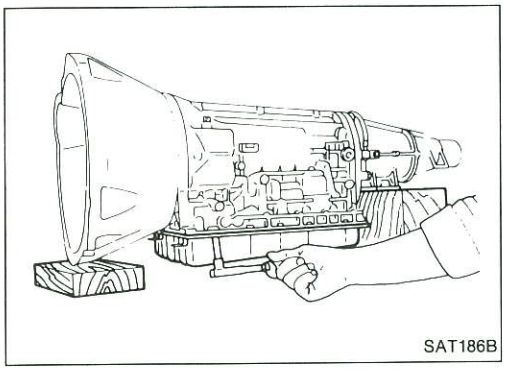
SAT019B

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.



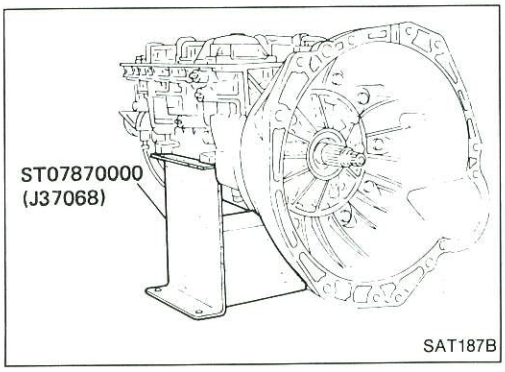
SAT021B

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.

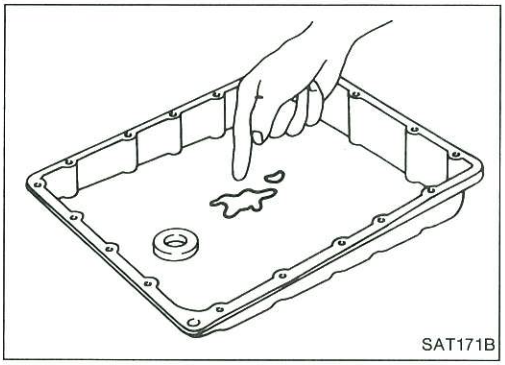
- **Always place oil pan straight down so that foreign particles inside will not move.**



SAT187B

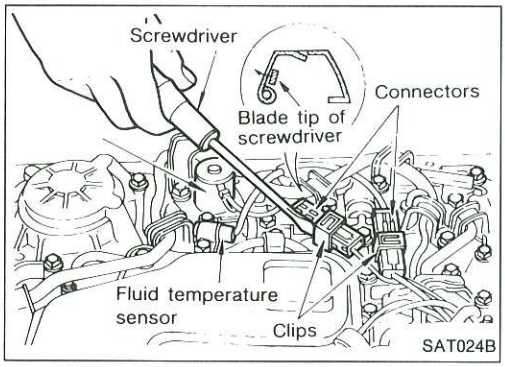
5. Place transmission into Tool with the control valve facing up.

Disassembly (Cont'd)

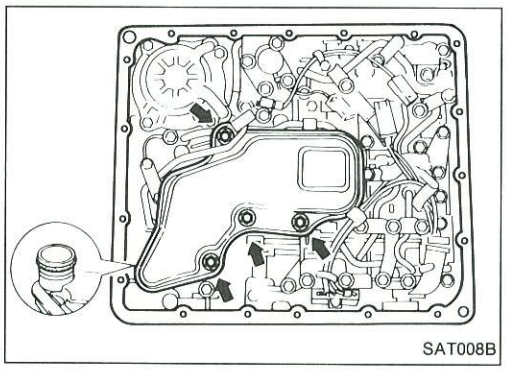


6. Check oil pan and oil strainer for accumulation of foreign particles.
- If materials of clutch facing are found, clutch plates may be worn.
- If metal filings are found, clutch plates, brake bands, etc. may be worn.
- If aluminum filings are found, bushings or aluminum cast parts may be worn.

In above cases, replace torque converter and check unit for cause of particle accumulation.

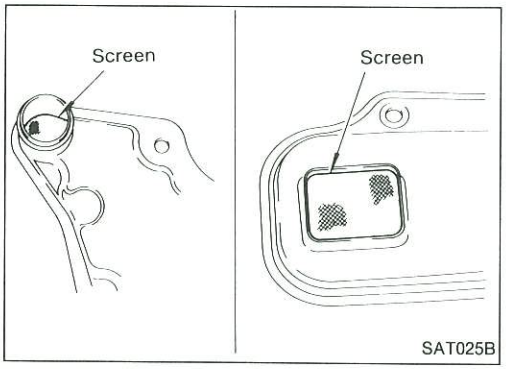


7. Remove lock-up solenoid and fluid temperature sensor connectors.
- **Be careful not to damage connector.**

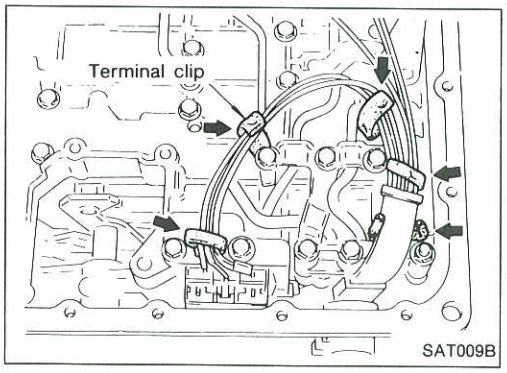


8. Remove oil strainer.

a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.



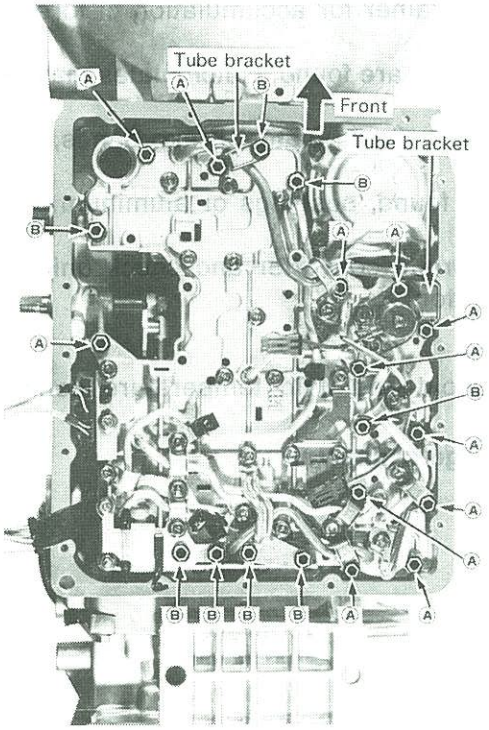
b. Check oil strainer screen for damage.



9. Remove control valve assembly.

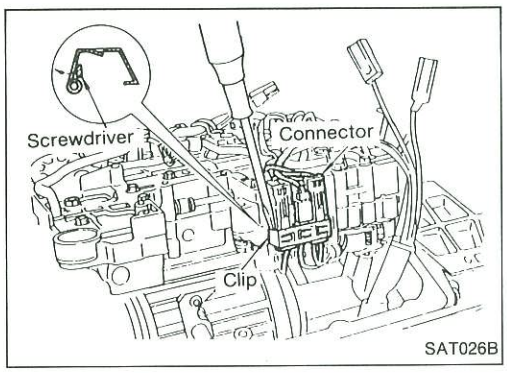
a. Straighten terminal clips to free terminal cords then remove terminal clips.

Disassembly (Cont'd)



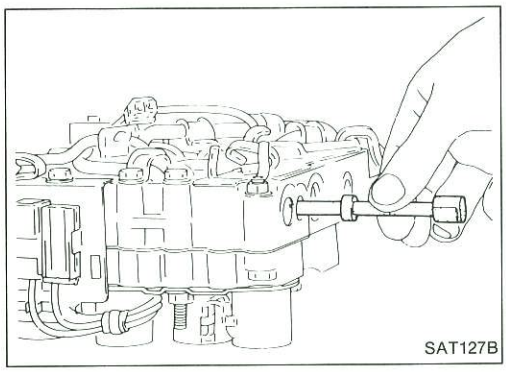
b. Remove bolts Ⓐ and Ⓑ, and remove control valve assembly from transmission.

Bolt	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

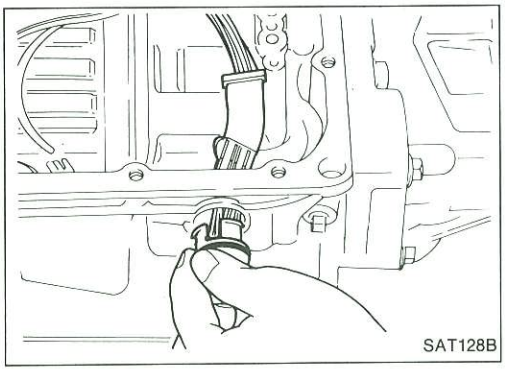


c. Remove solenoid connector.

- **Be careful not to damage connector.**



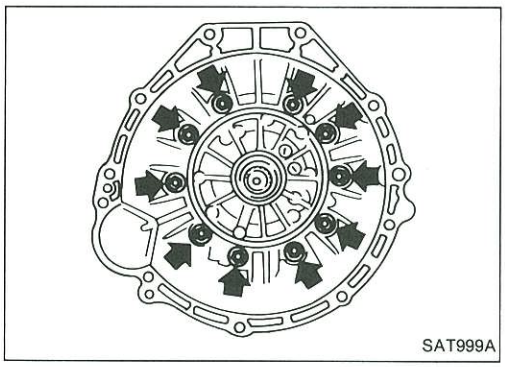
d. Remove manual valve from control valve assembly.



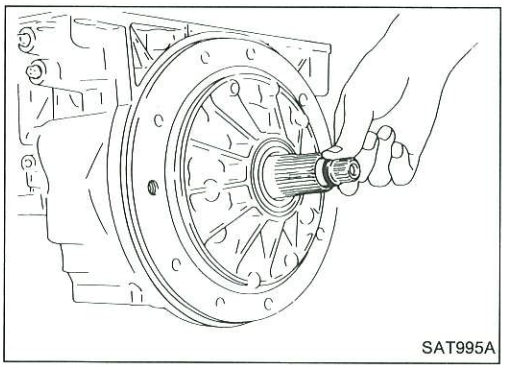
10. Remove terminal cord assembly from transmission case while pushing on stopper.

- **Be careful not to damage cord.**
- **Do not remove terminal cord assembly unless it is damaged.**

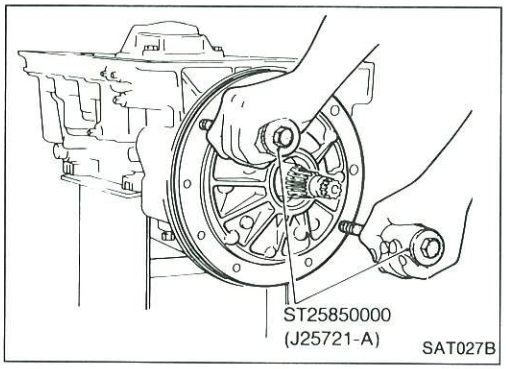
Disassembly (Cont'd)



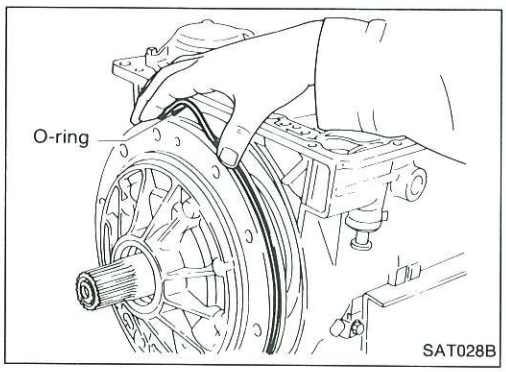
11. Remove converter housing from transmission case.



12. Remove O-ring from input shaft.

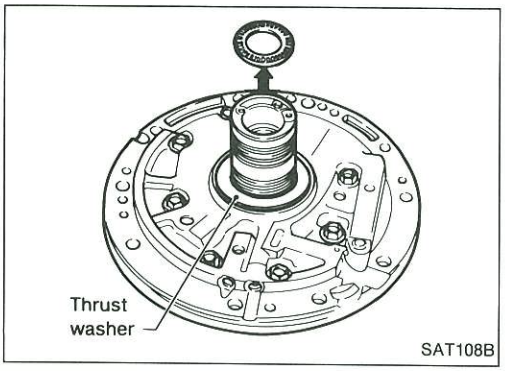


13. Remove oil pump assembly.
a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



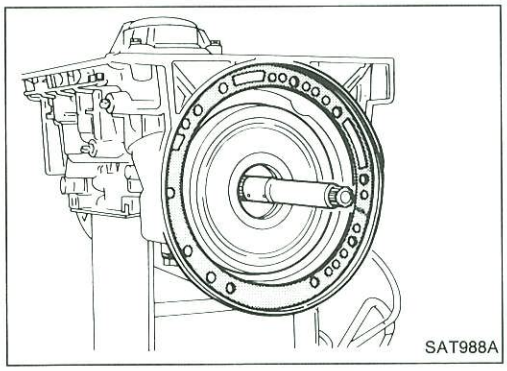
b. Remove O-ring from oil pump assembly.
c. Remove traces of sealant from oil pump housing.

- **Be careful not to scratch pump housing.**

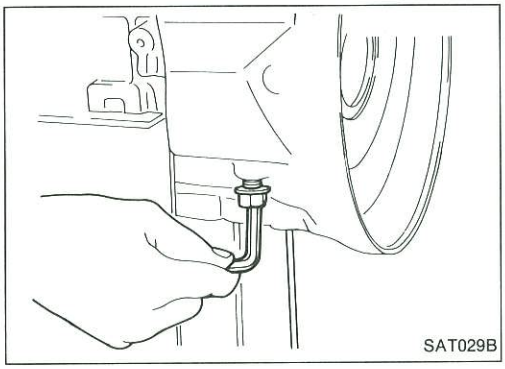


d. Remove needle bearing and thrust washer from oil pump assembly.

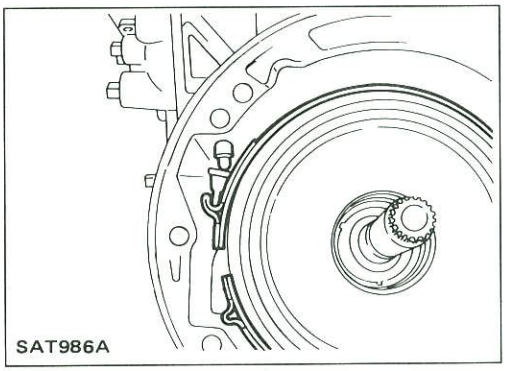
Disassembly (Cont'd)


SAT988A

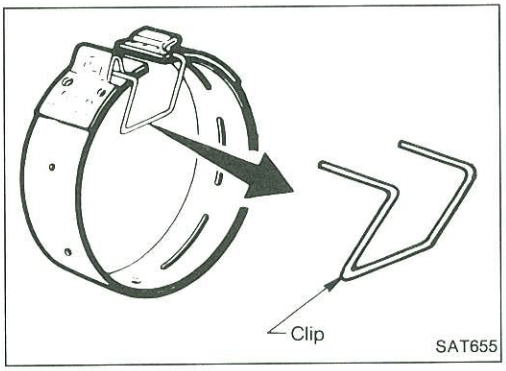
14. Remove input shaft and oil pump gasket.


SAT029B

15. Remove brake band and band strut.
a. Loosen lock nut and remove band servo anchor end pin from transmission case.

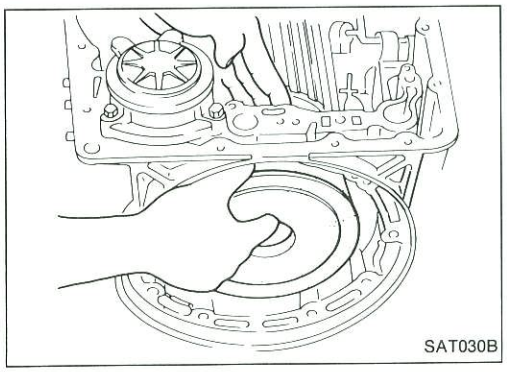

SAT986A

b. Remove brake band and band strut from transmission case.



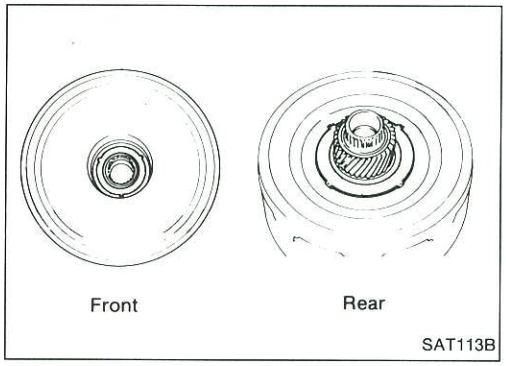
SAT655

c. Hold brake band in a circular shape with clip.

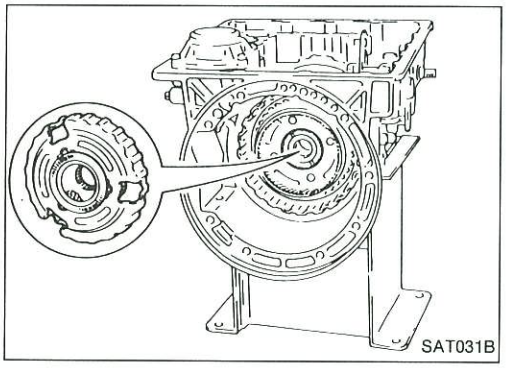

SAT030B

16. Remove front side clutch and gear components.
a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

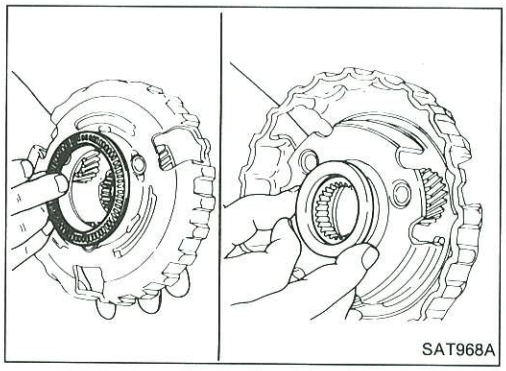
Disassembly (Cont'd)



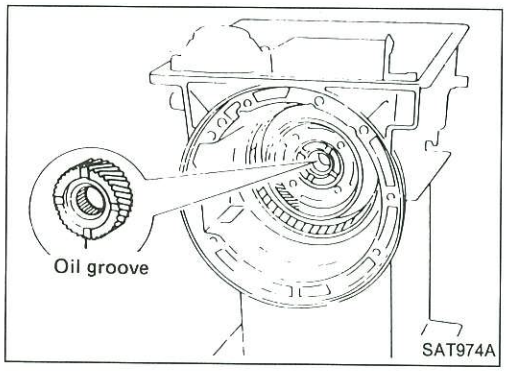
b. Remove front bearing race from clutch pack.
c. Remove rear bearing race from clutch pack.



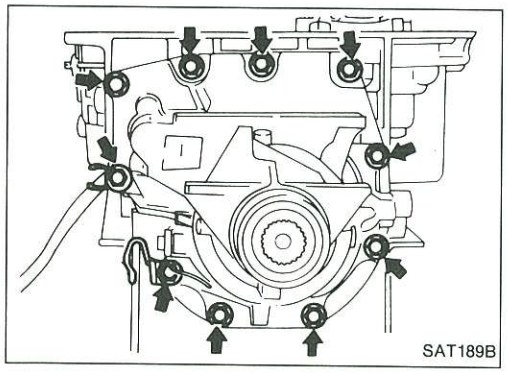
d. Remove front planetary carrier from transmission case.



e. Remove front needle bearing from front planetary carrier.
f. Remove rear needle bearing from front planetary carrier.

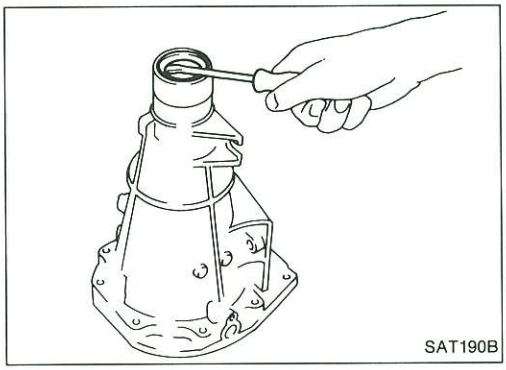


g. Remove rear sun gear from transmission case.



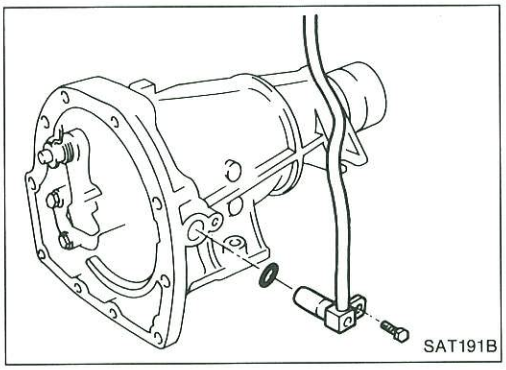
17. Remove rear extension.
a. Remove rear extension from transmission case.
b. Remove rear extension gasket from transmission case.

Disassembly (Cont'd)

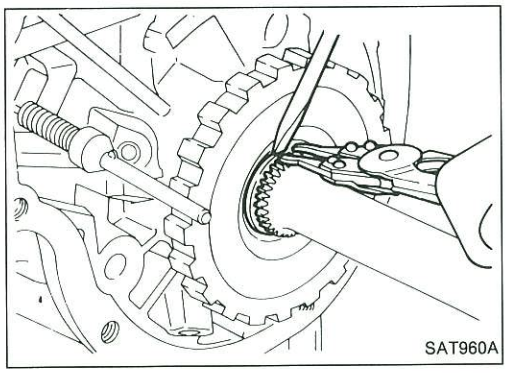


c. Remove oil seal from rear extension.

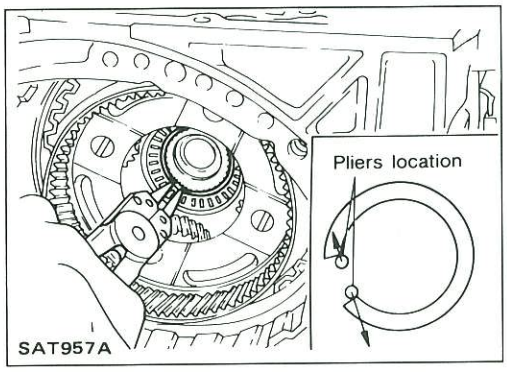
- **Do not remove oil seal unless it is to be replaced.**



d. Remove revolution sensor from rear extension.
e. Remove O-ring from revolution sensor.



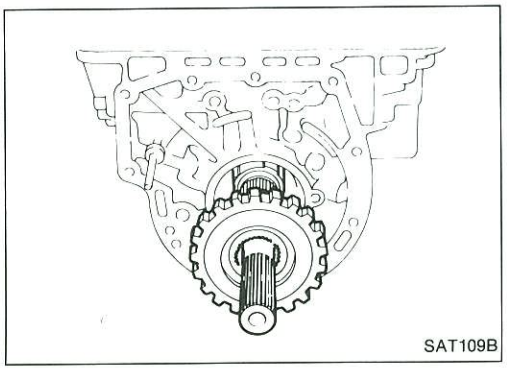
18. Remove output shaft and parking gear.
a. Remove rear snap ring from output shaft.



b. Slowly push output shaft all the way forward.

- **Do not use excessive force.**

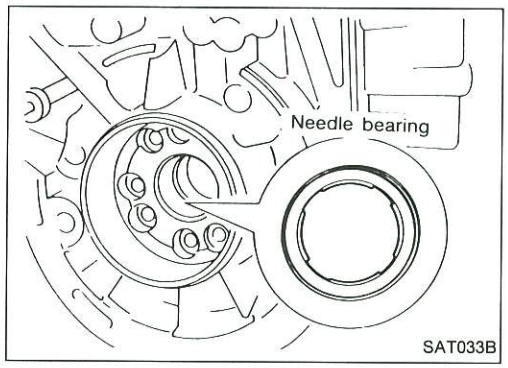
c. Remove snap ring from output shaft.



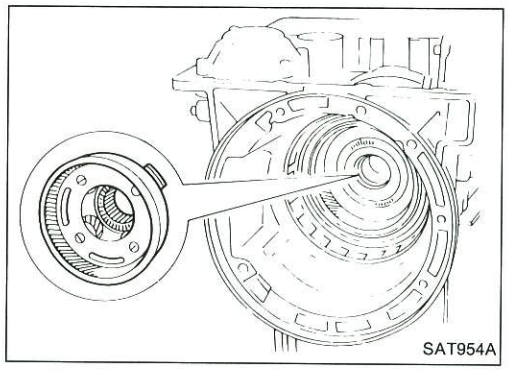
d. Remove output shaft and parking gear as a unit from transmission case.
e. Remove parking gear from output shaft.

Disassembly (Cont'd)

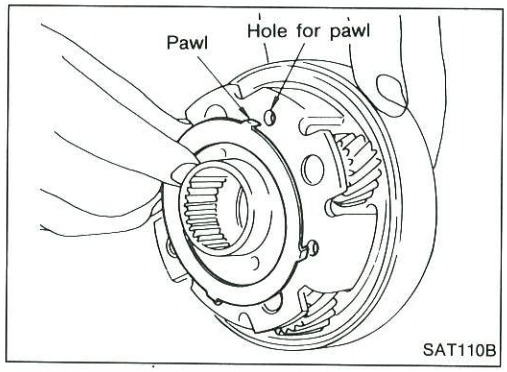
f. Remove needle bearing from transmission case.



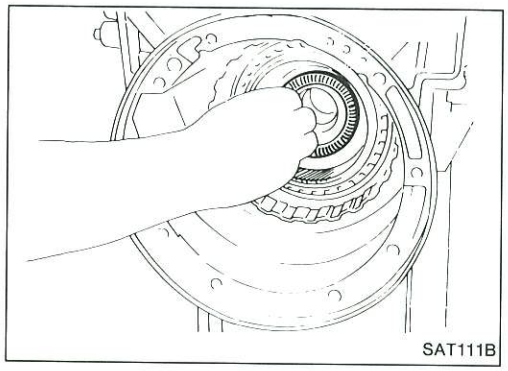
19. Remove rear side clutch and gear components.
a. Remove front internal gear.



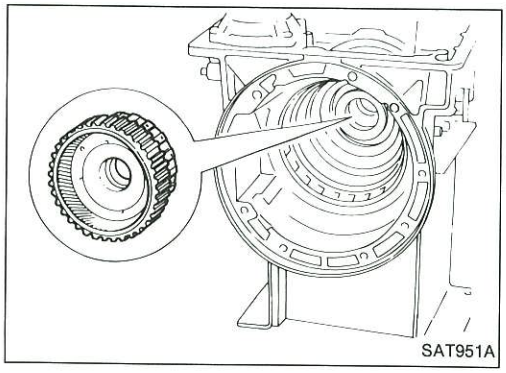
b. Remove bearing race from front internal gear.



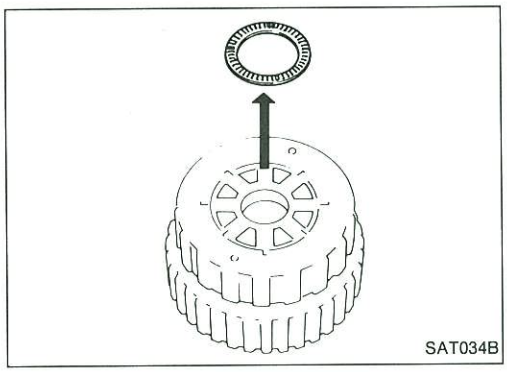
c. Remove needle bearing from rear internal gear.



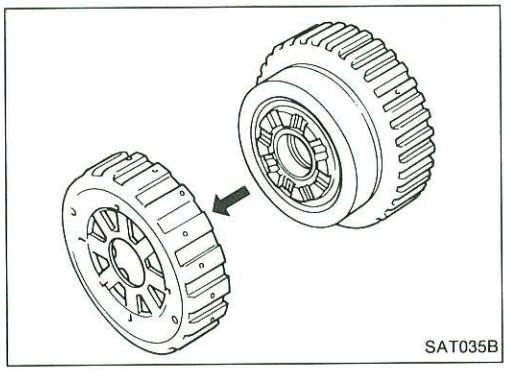
d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.



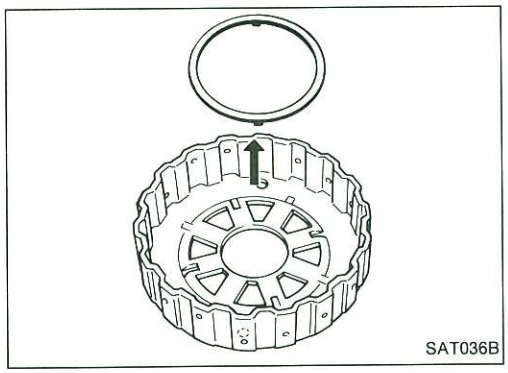
Disassembly (Cont'd)


SAT034B

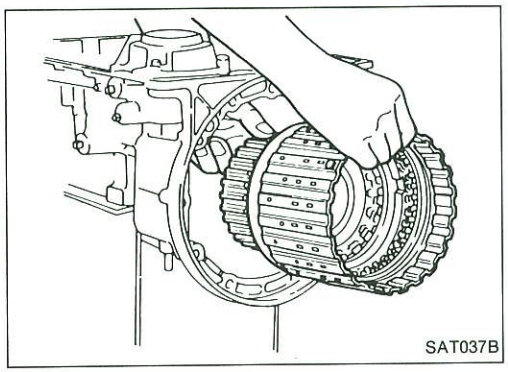
e. Remove needle bearing from overrun clutch hub.


SAT035B

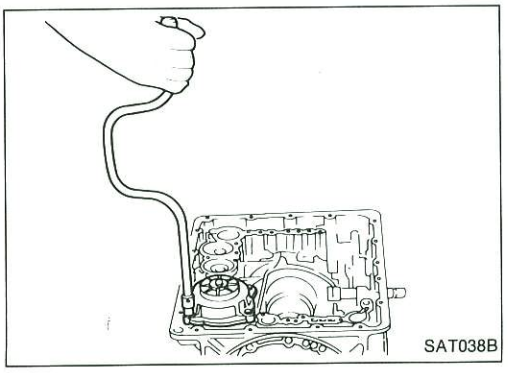
f. Remove overrun clutch hub from rear internal gear and forward clutch hub.


SAT036B

g. Remove thrust washer from overrun clutch hub.

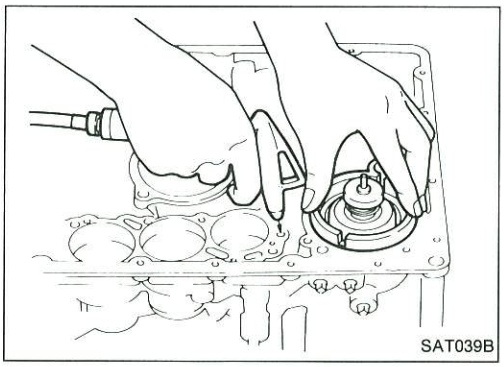

SAT037B

h. Remove forward clutch assembly from transmission case.


SAT038B

20. Remove band servo and accumulator components.
a. Remove band servo retainer from transmission case.

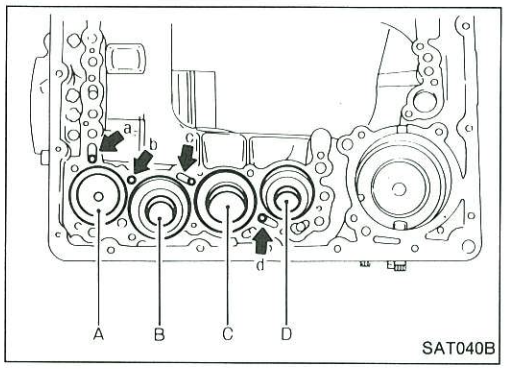
Disassembly (Cont'd)



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.**

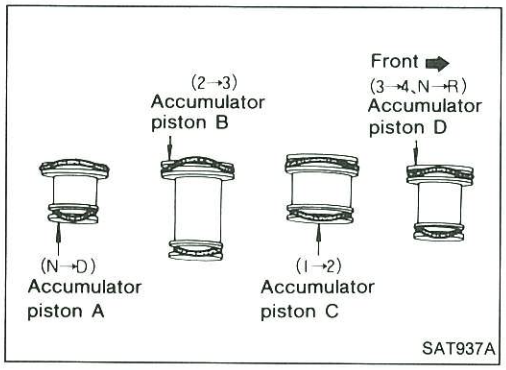
c. Remove return springs.



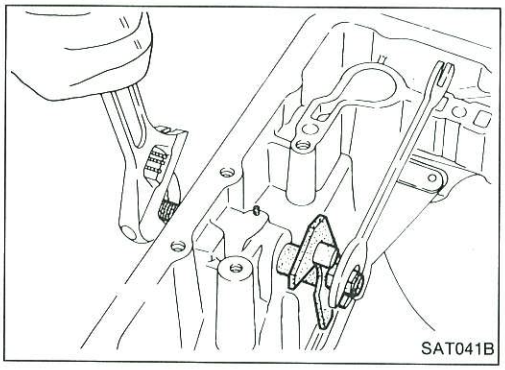
d. Remove springs from accumulator pistons B, C and D.
e. Apply compressed air to each oil hole until piston comes out.

- **Hold piston with a rag and gradually direct air to oil hole.**

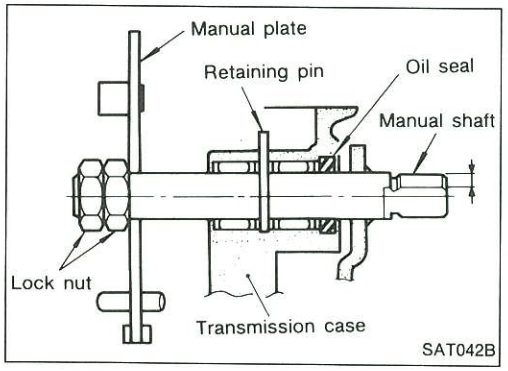
Identification of accumulator pistons	A	B	C	D
Identification of oil holes	a	b	c	d



f. Remove O-ring from each piston.

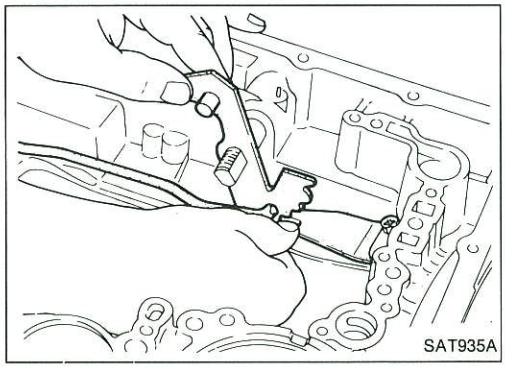


21. Remove manual shaft components, if necessary.
a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.

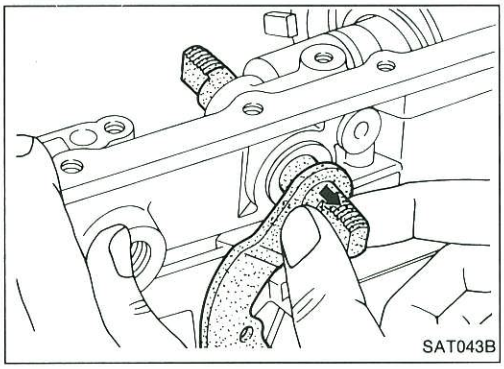


b. Remove retaining pin from transmission case.

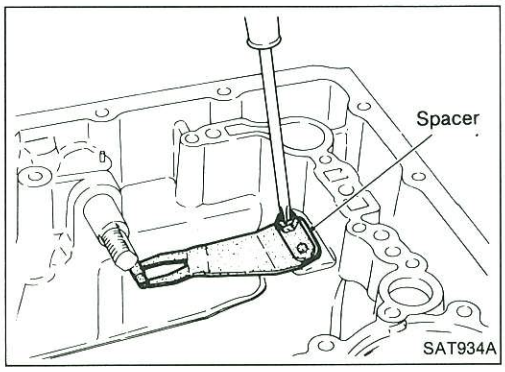
Disassembly (Cont'd)



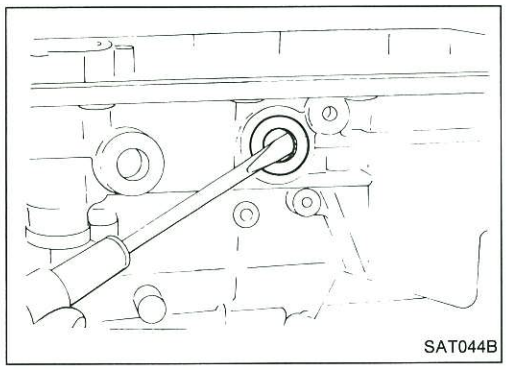
c. While pushing detent spring down, remove manual plate and parking rod from transmission case.



d. Remove manual shaft from transmission case.

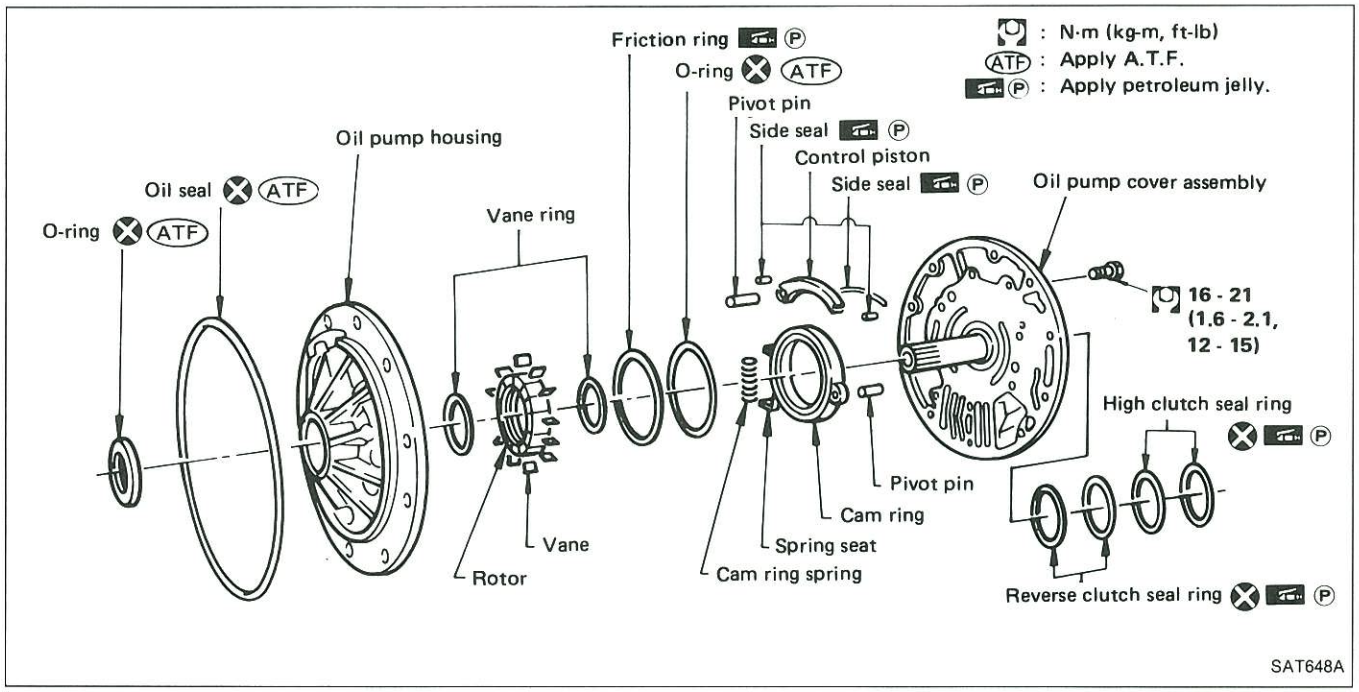


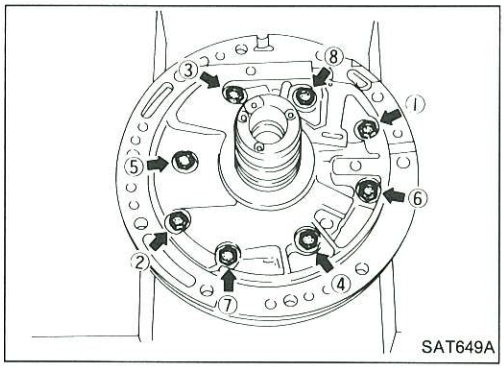
e. Remove spacer and detent spring from transmission case.



f. Remove oil seal from transmission case.

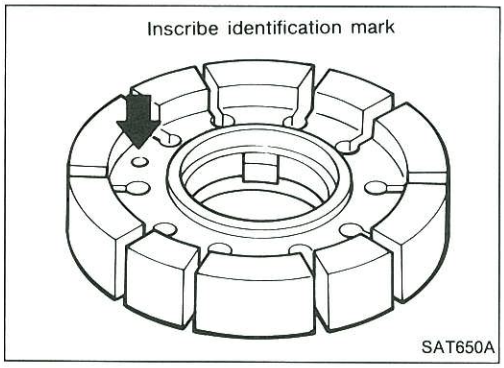
Oil Pump





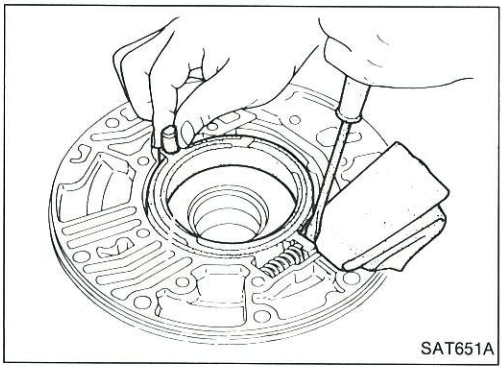
DISASSEMBLY

1. Loosen bolts in numerical order and remove oil pump cover.



2. Remove rotor, vane rings and vanes.

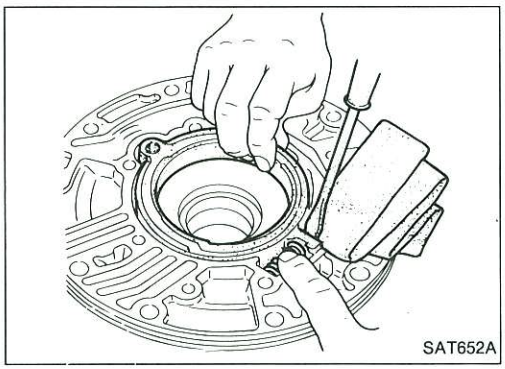
- **Inscribe a mark on back of rotor for identification of fore-aft direction when reassembling rotor. Then remove rotor.**



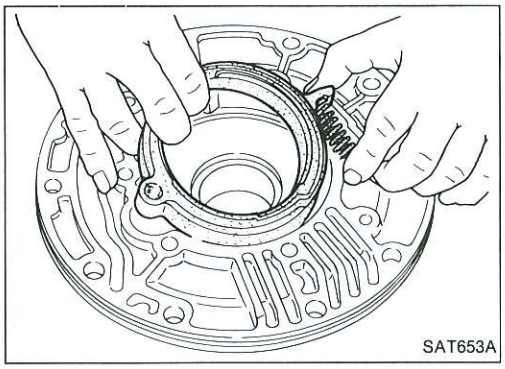
3. While pushing on cam ring remove pivot pin.

- **Be careful not to scratch oil pump housing.**

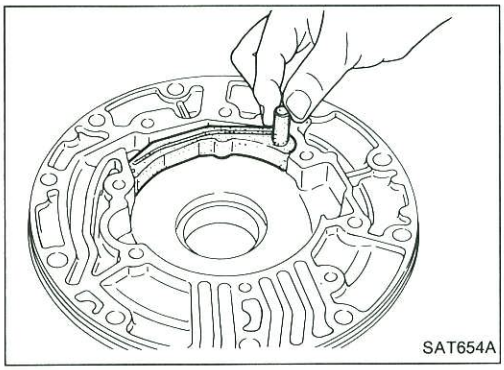
Oil Pump (Cont'd)


SAT652A

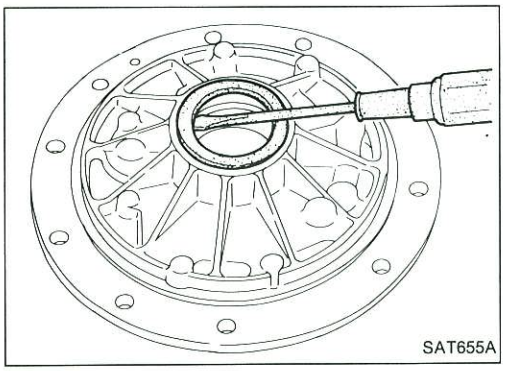
4. While holding cam ring and spring lift out cam ring spring.
- **Be careful not to damage oil pump housing.**
- **Hold cam ring spring to prevent it from jumping.**


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.

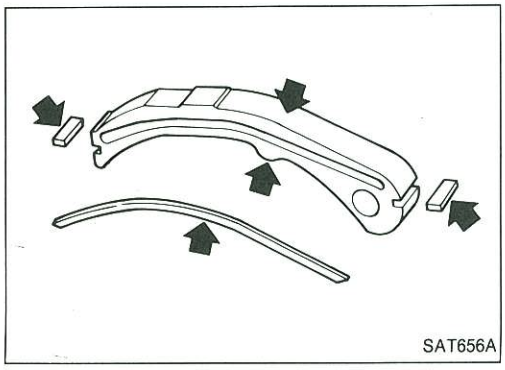

SAT655A

7. Remove oil seal from oil pump housing.
- **Be careful not to scratch oil pump housing.**

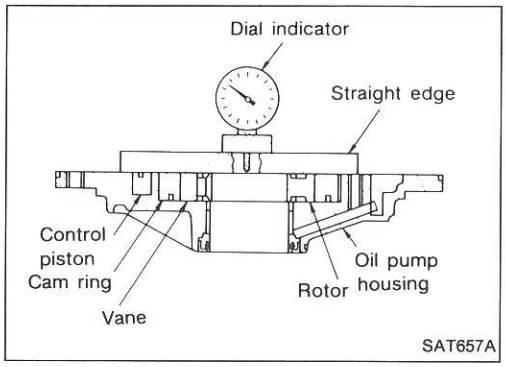
INSPECTION

Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring

- Check for wear or damage.

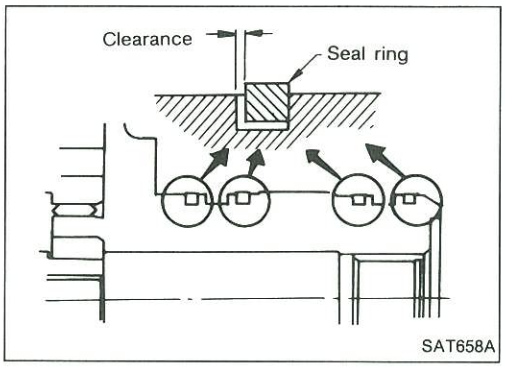

SAT656A

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 ranges.
- **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.

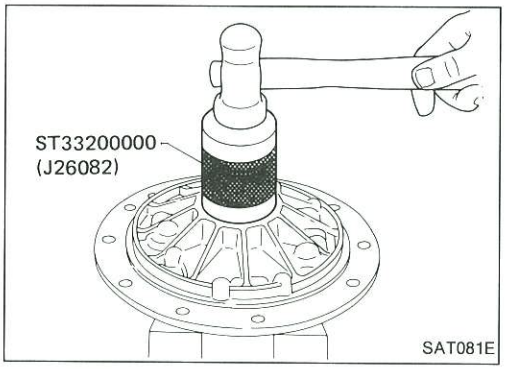


Seal ring clearance

- 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

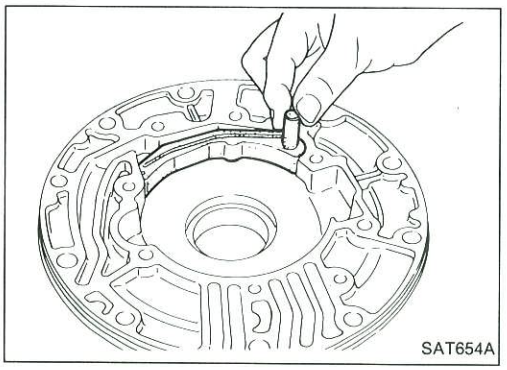
1. Drive oil seal into oil pump housing.
- **Apply A.T.F. to outer periphery and lip surface.**



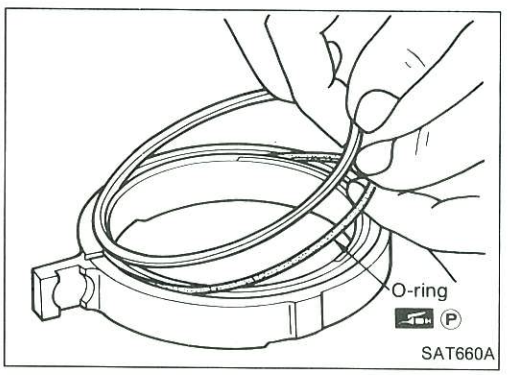
2. Install cam ring in oil pump housing by the following steps.

a. Install side seal on control piston.
- **Pay attention to its direction — Black surface goes toward control piston.**
- **Apply petroleum jelly to side seal.**

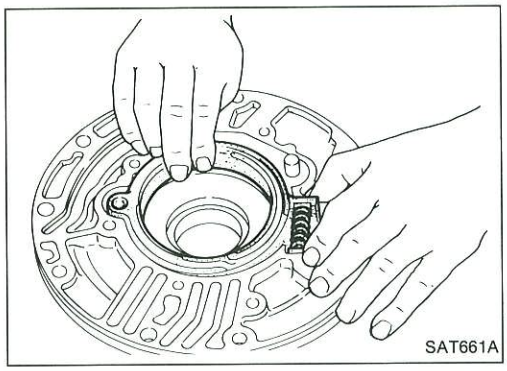
b. Install control piston on oil pump.



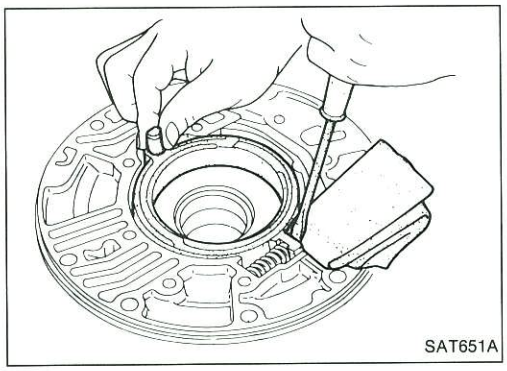
c. Install O-ring and friction ring on cam ring.
- **Apply petroleum jelly to O-ring.**



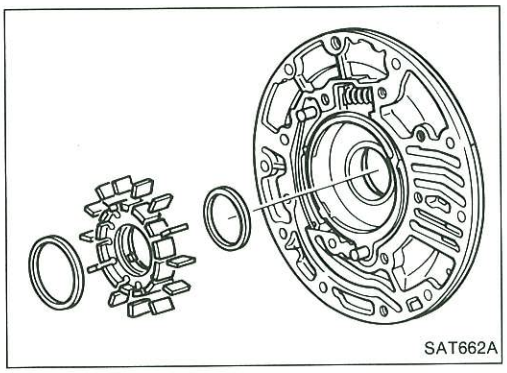
Oil Pump (Cont'd)


SAT661A

d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.

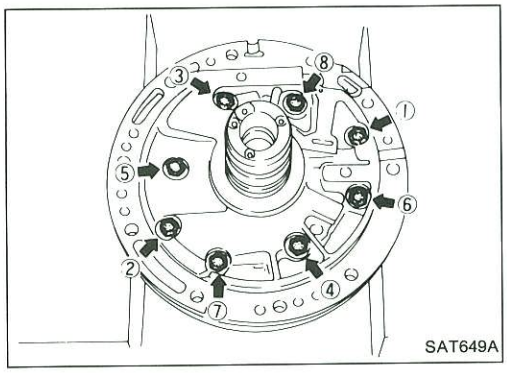

SAT651A

e. While pushing on cam ring install pivot pin.


SAT662A

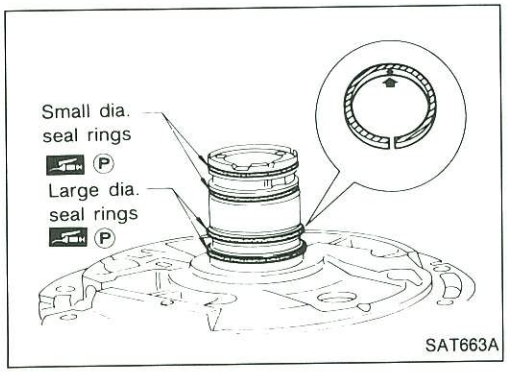
3. Install rotor, vanes and vane rings.

- **Pay attention to direction of rotor.**



SAT649A

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.

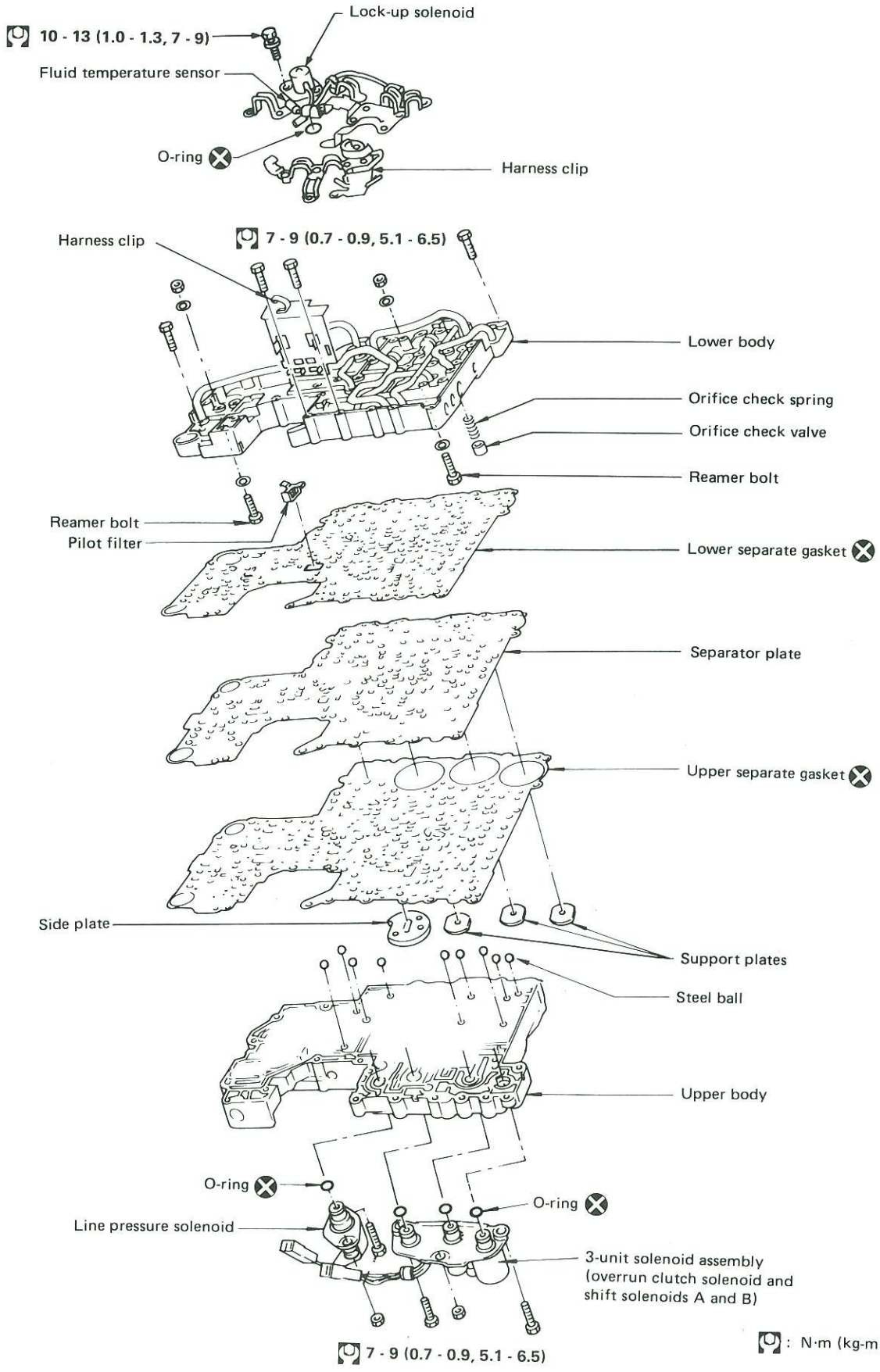


SAT663A

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.**

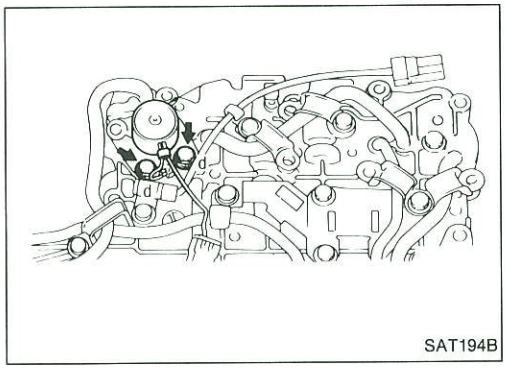
Control Valve Assembly



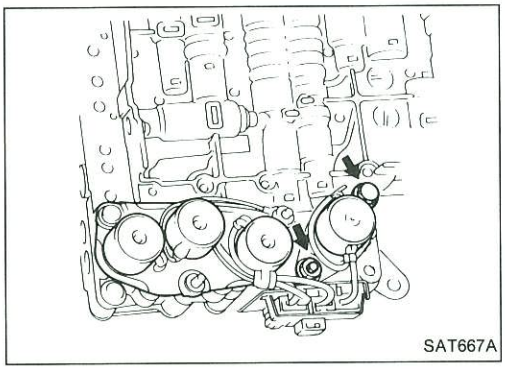
SAT072E

Control Valve Assembly (Cont'd)

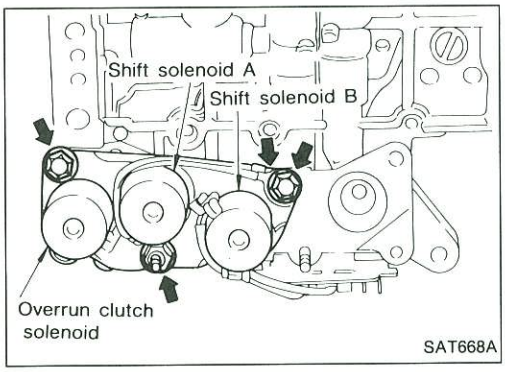
DISASSEMBLY


SAT194B

1. Remove solenoids.
a. Remove lock-up solenoid and side plate from lower body.
b. Remove O-ring from solenoid.

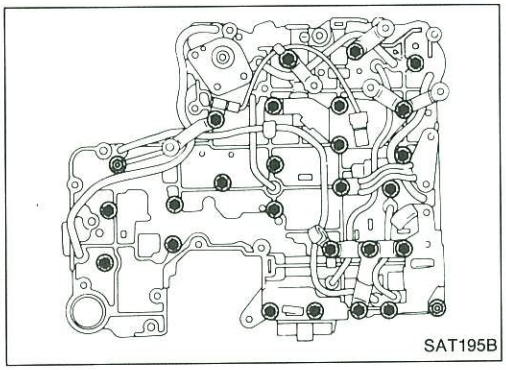

SAT667A

c. Remove line pressure solenoid from upper body.
d. Remove O-ring from solenoid.



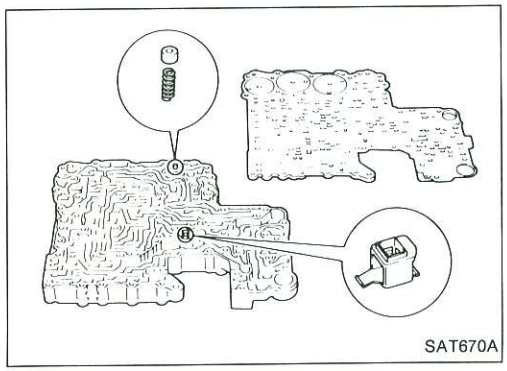
SAT668A

e. Remove 3-unit solenoid assembly from upper body.
f. Remove O-rings from solenoids.


SAT195B

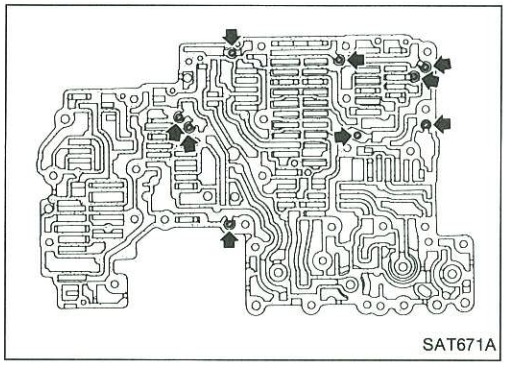
2. Disassemble upper and lower bodies.
a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
b. Remove lower body, separator plate and separate gasket as a unit from upper body.

- **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.

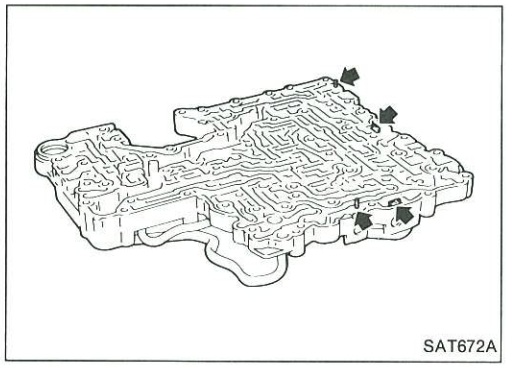
Control Valve Assembly (Cont'd)


SAT671A

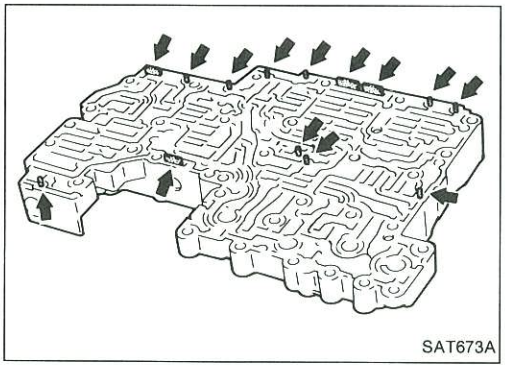
e. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.

INSPECTION

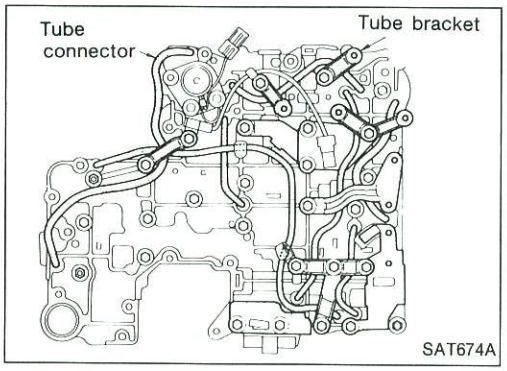
Lower and upper bodies


SAT672A

- Check to see that there are pins and retainer plates in lower body.

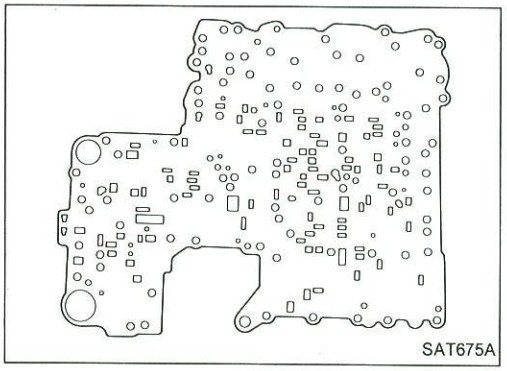

SAT673A

- Check to see that there are pins and retainer plates in upper body.
- **Be careful not to lose these parts.**



SAT674A

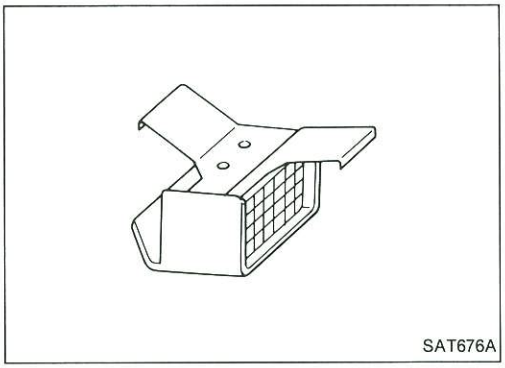
- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.


SAT675A

Separator plates

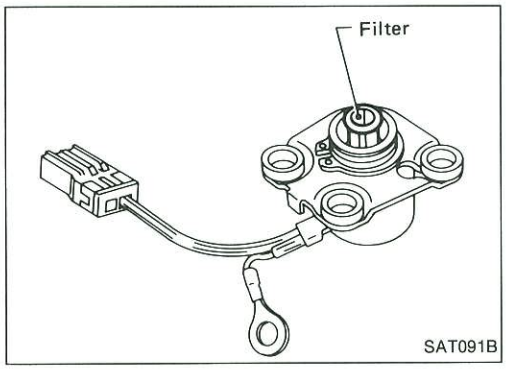
- Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.

Control Valve Assembly (Cont'd)


SAT676A

Pilot filter

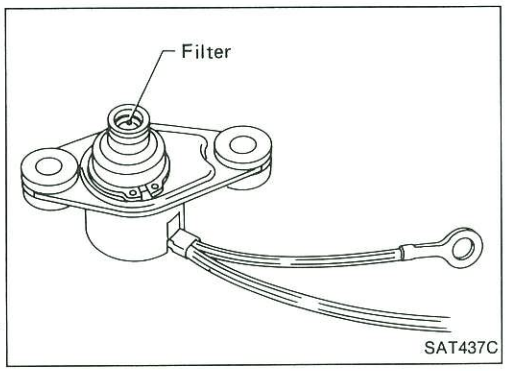
- Check to make sure that filter is not clogged or damaged.



SAT091B

Lock-up solenoid

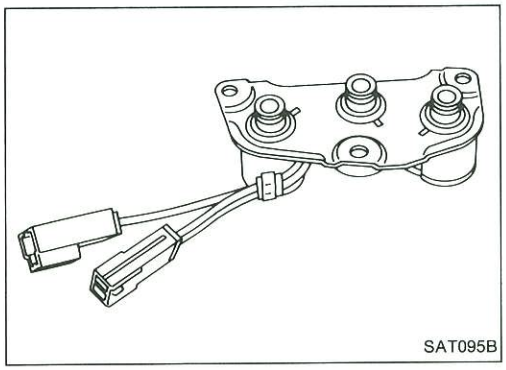
- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



SAT437C

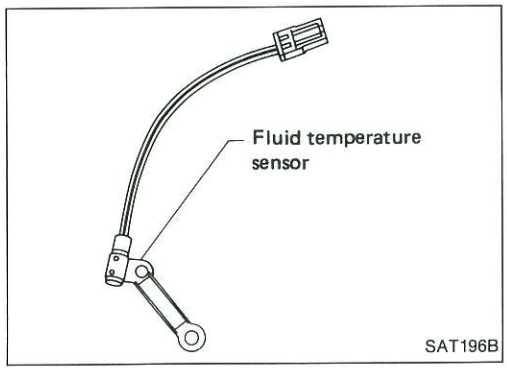
Line pressure solenoid

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".


SAT095B

3-unit solenoid assembly (Overrun clutch solenoid and shift solenoids A and B)

- Measure resistance of each solenoid. — Refer to "Electrical Components Inspection".



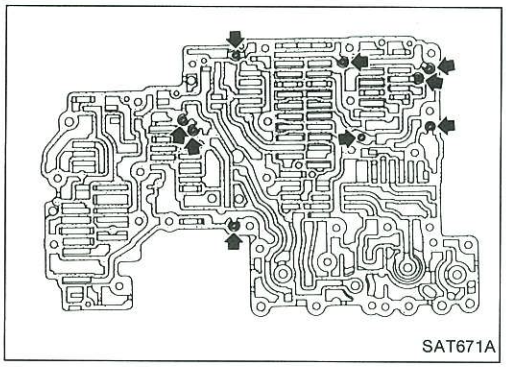
SAT196B

Fluid temperature sensor

- Measure resistance. — Refer to "Electrical Components Inspection".

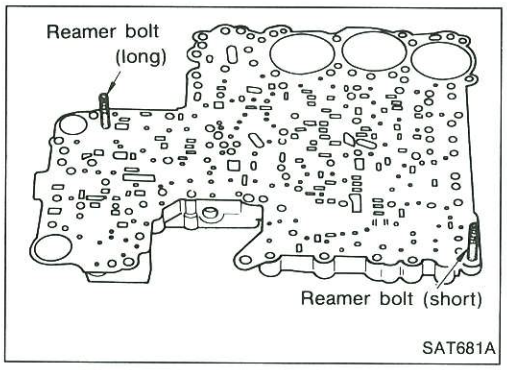
Control Valve Assembly (Cont'd)

ASSEMBLY


SAT671A

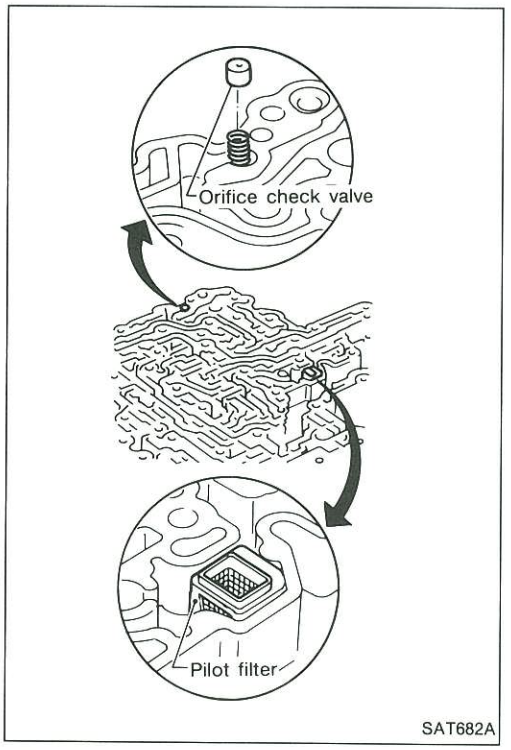
1. Install upper and lower bodies.

a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



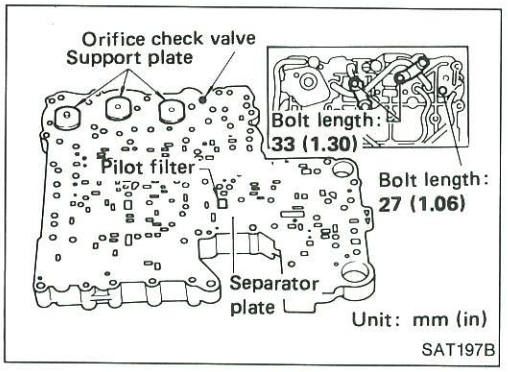
SAT681A

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.

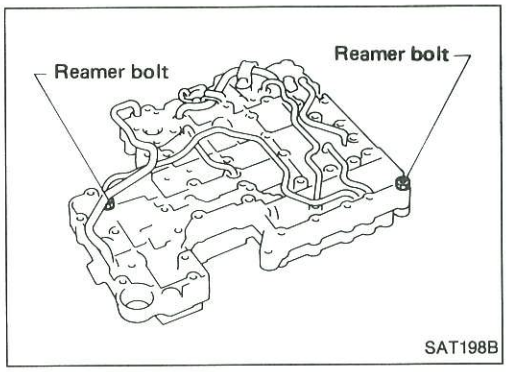


SAT197B

d. Install lower separate gaskets and separator plates on lower body.

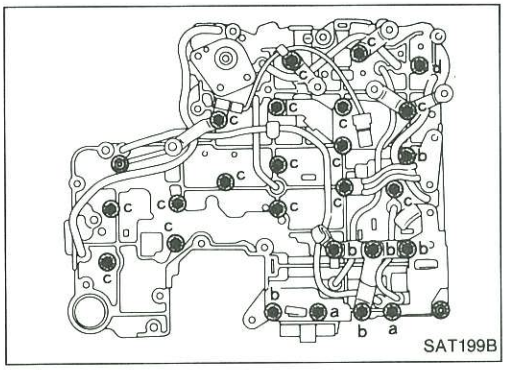
e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.

Control Valve Assembly (Cont'd)



f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

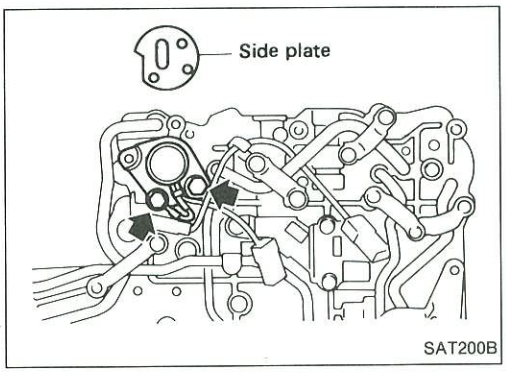
- **Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.**



g. Install and temporarily tighten bolts and tube brackets in their proper locations.

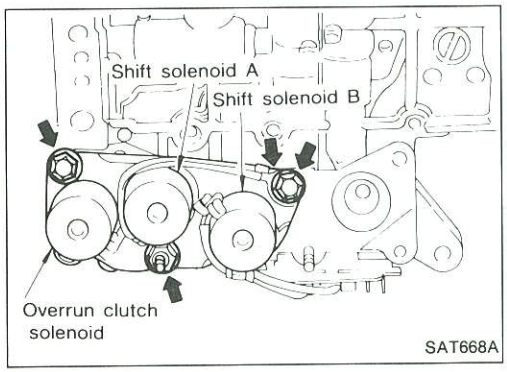
Bolt length and location:

Item \ Bolt symbol	a	b	c	d
Bolt length mm (in)	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)

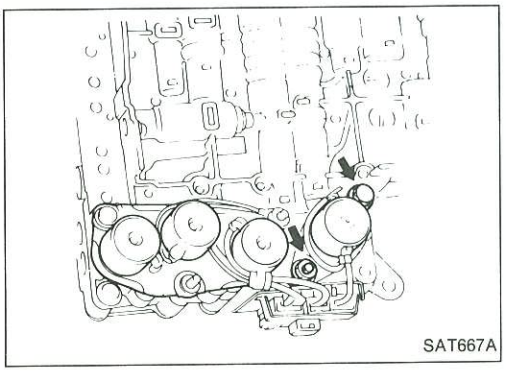


2. Install solenoids.

a. Attach O-ring and install lock-up solenoid and side plates onto lower body.



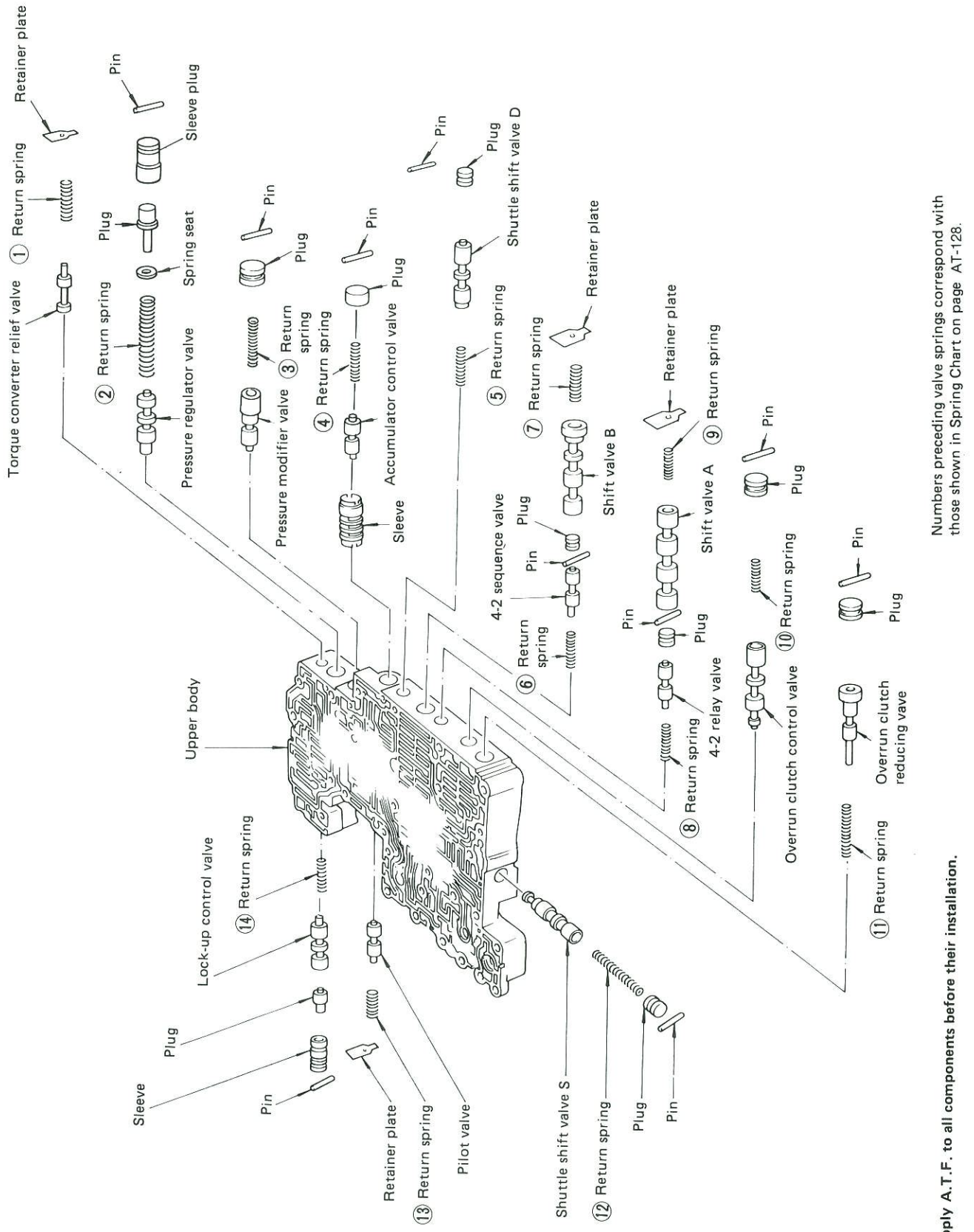
b. Attach O-rings and install 3-unit solenoids assembly onto upper body.



c. Attach O-ring and install line pressure solenoid onto upper body.

3. Tighten all bolts.

Control Valve Upper Body



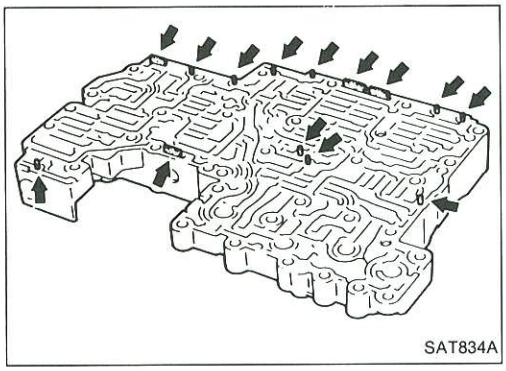
Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-128.

Apply A.T.F. to all components before their installation.

SAT870C

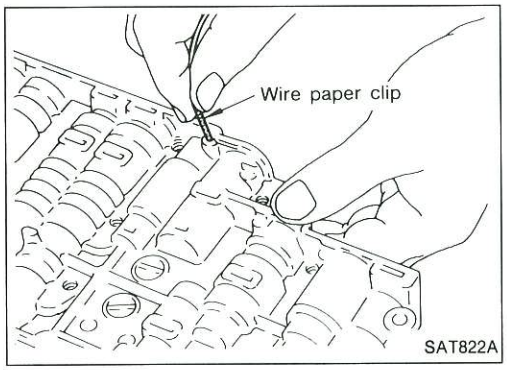
Control Valve Upper Body (Cont'd)

DISASSEMBLY


SAT834A

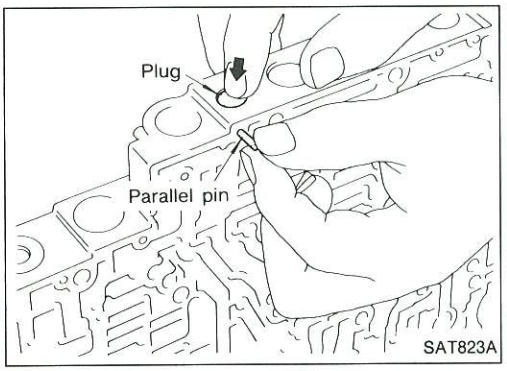
1. Remove valves at parallel pins.

- **Do not use a magnetic hand.**



SAT822A

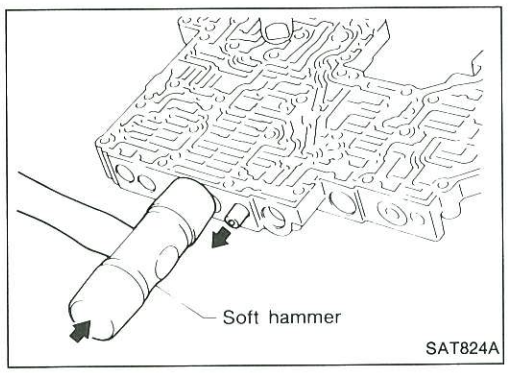
a. Use a wire paper clip to push out parallel pins.



SAT823A

b. Remove parallel pins while pressing their corresponding plugs and sleeves.

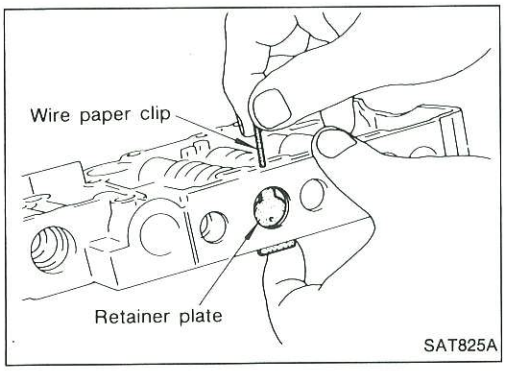
- **Remove plug slowly to prevent internal parts from jumping out.**



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.**

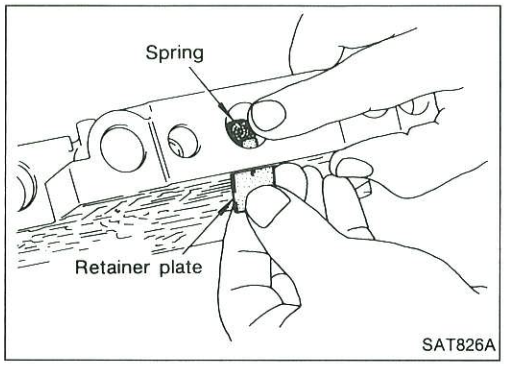


SAT825A

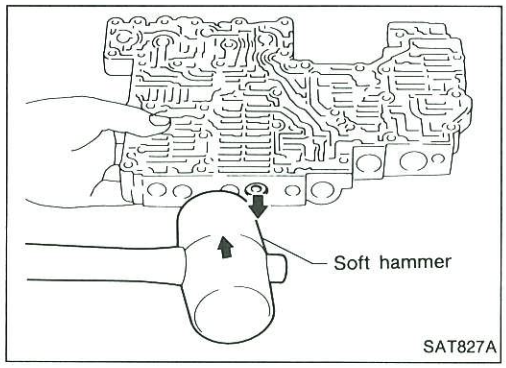
2. Remove valves at retainer plates.

a. Pry out retainer plate with wire paper clip.

Control Valve Upper Body (Cont'd)

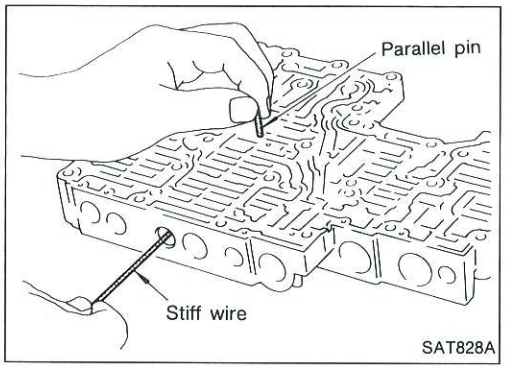


b. Remove retainer plates while holding spring.

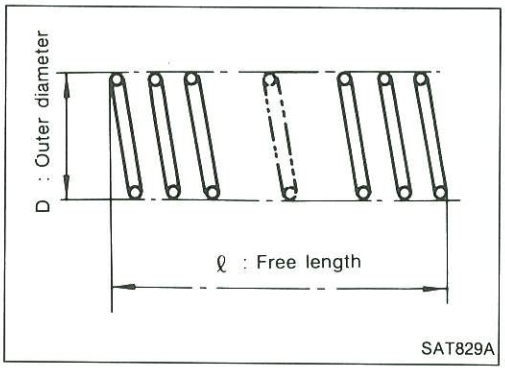


c. Place mating surface of valve facedown, and remove internal parts.

- **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

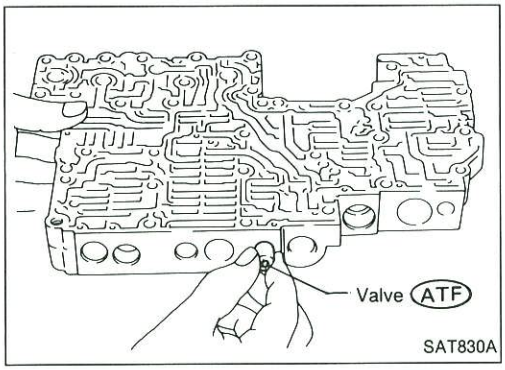
- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in the table on next page are the same as those in the figure on page AT-125.

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	Accumulator control valve spring	31742-41X60	17.0 (0.669)	10.5 (0.413)
⑤	Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
⑥	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑦	Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑧	4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑨	Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑩	Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
⑪	Overrun clutch reducing valve spring	31742-41x20	32.5 (1.280)	7.0 (0.276)
⑫	Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
⑬	Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
⑭	Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)



- Replace valve springs if deformed or fatigued.

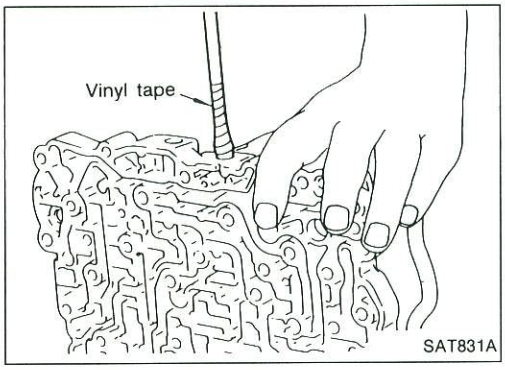
Control valves

- Check sliding surfaces of valves, sleeves and plugs.

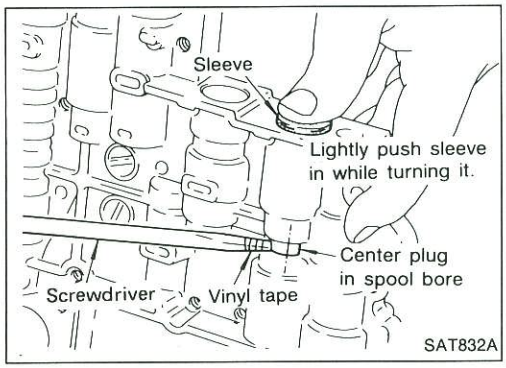
ASSEMBLY

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.**



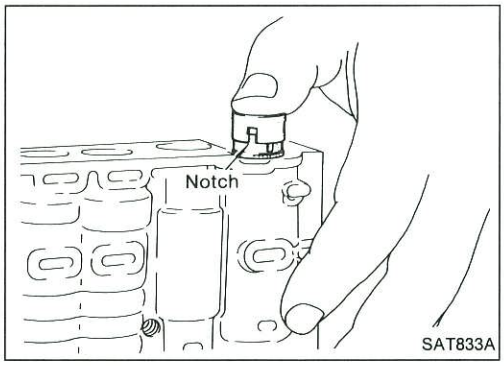
- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.



Pressure regulator valve

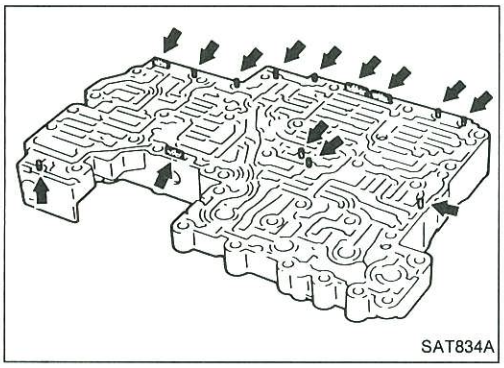
- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body.
  If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.

Control Valve Upper Body (Cont'd)

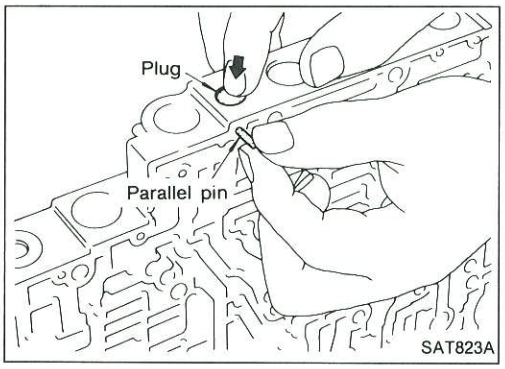


Accumulator control plug

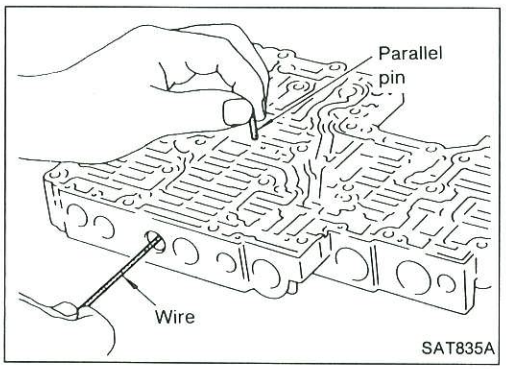
- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



2. Install parallel pins and retainer plates.

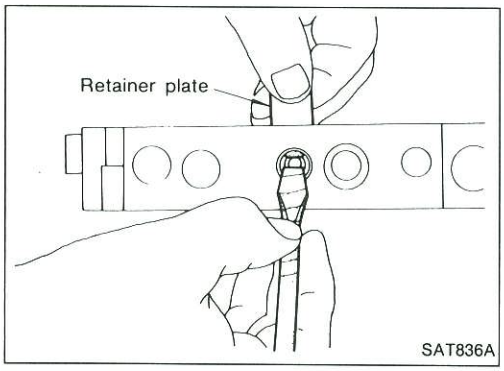


- **While pushing plug, install parallel pin.**



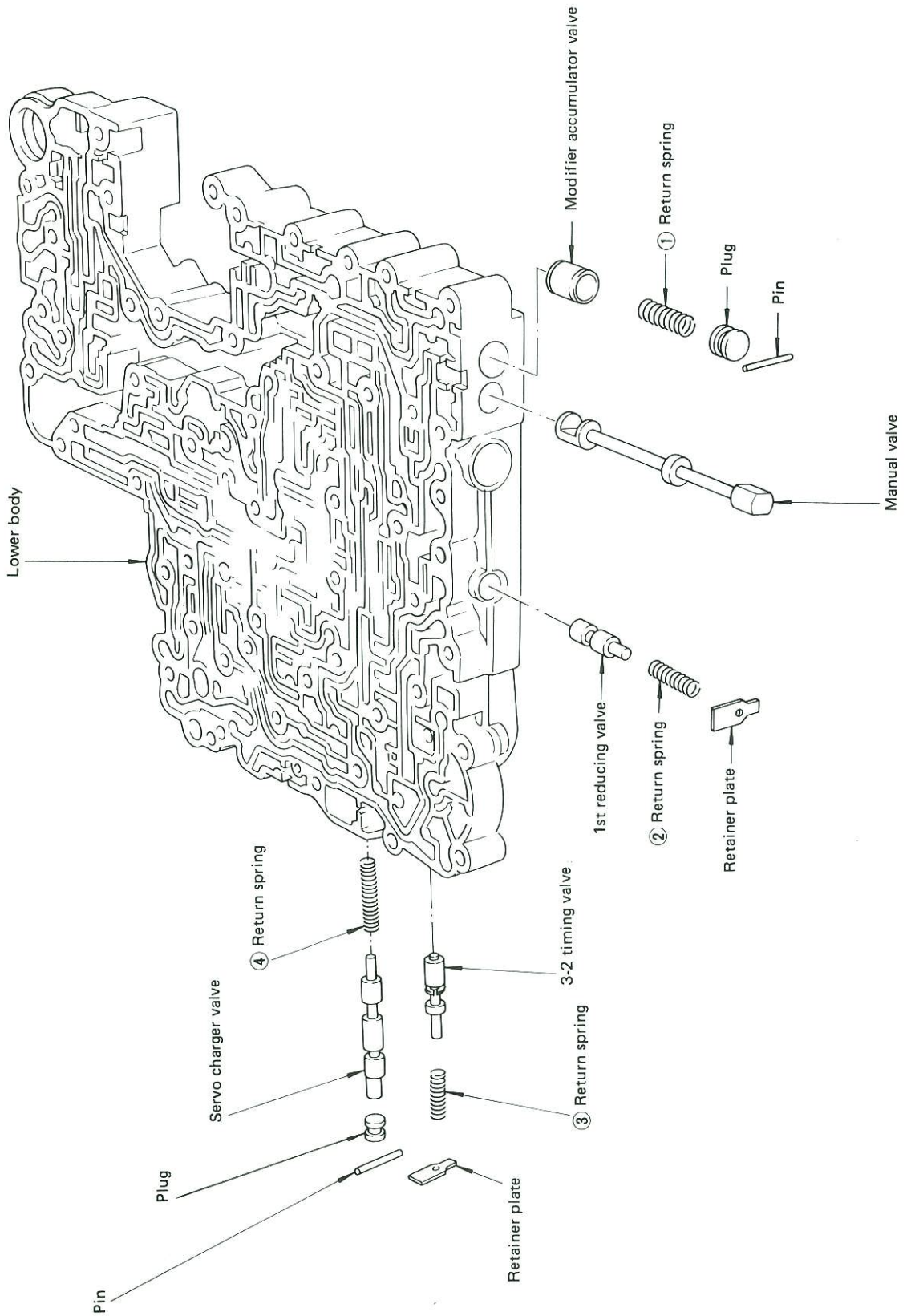
4-2 sequence valve and relay valve

- 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

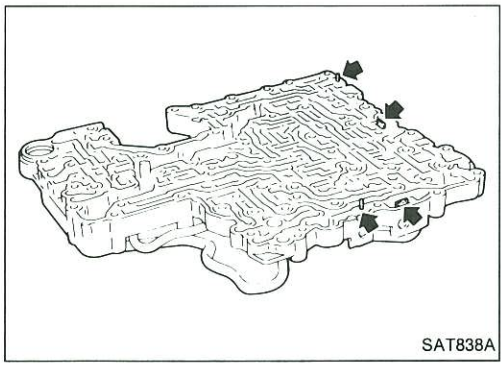


Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-131.

Apply A.T.F. to all components before their installation.

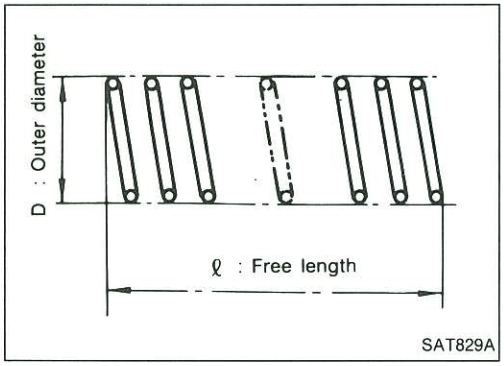
SAT640C

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 page AT-130.

Inspection standard:

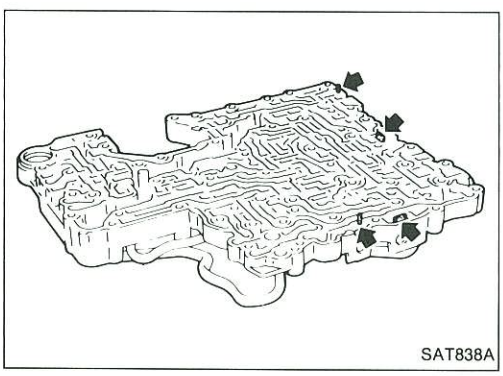
Unit: mm (in)

Parts	Item	Part No.	ℓ	D
①	Modifier accumulator valve spring	31742-41X15	30.5 (1.201)	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

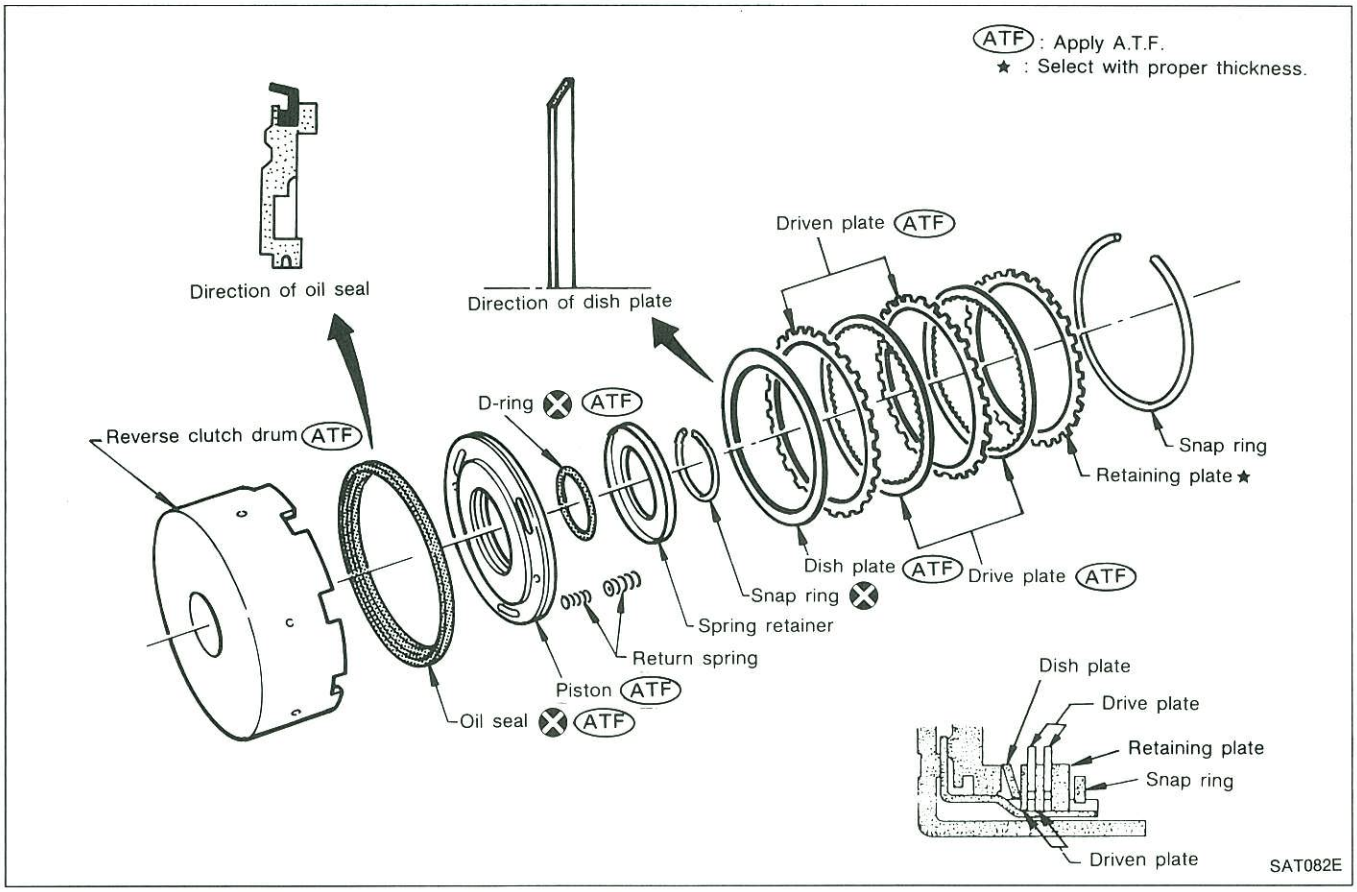
- Check sliding surfaces of control valves, sleeves and plugs for damage.

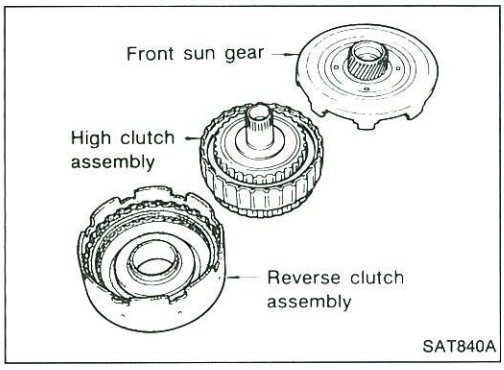

SAT838A

ASSEMBLY

- Install control valves.
  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.

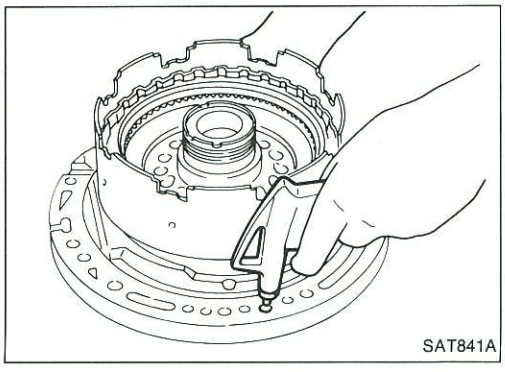
Reverse Clutch





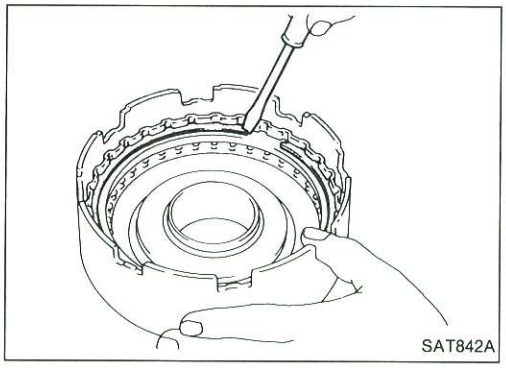
DISASSEMBLY

1. Remove reverse clutch assembly from clutch pack.

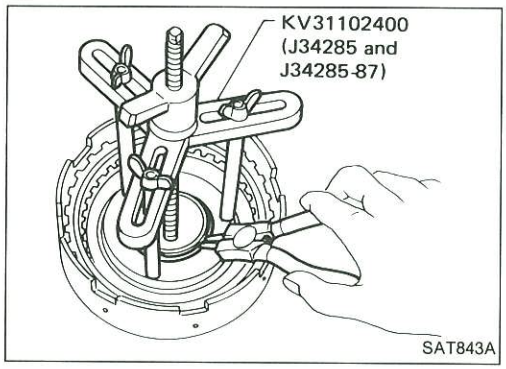


2. Check operation of reverse clutch.
a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

Reverse Clutch (Cont'd)


SAT842A

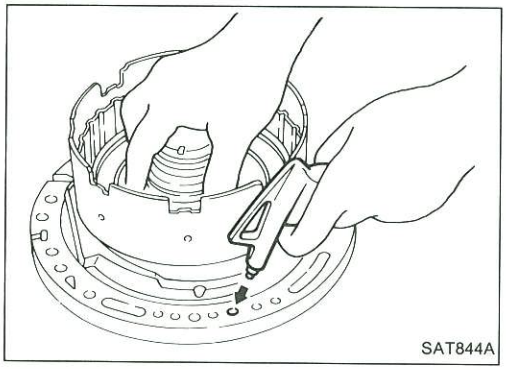
3. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.



SAT843A

4. Remove snap ring from clutch drum while compressing clutch springs.
- **Do not expand snap ring excessively.**

5. Remove spring retainer and return spring.


SAT844A

6. 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.**

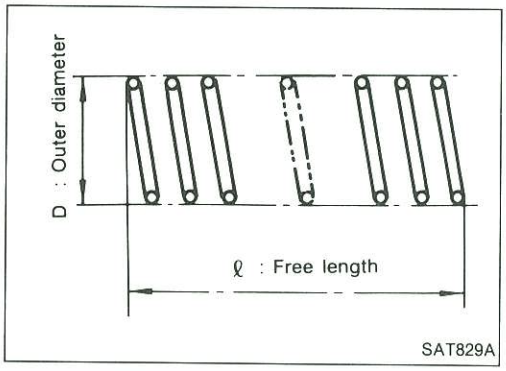
7. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.

Reverse clutch return springs



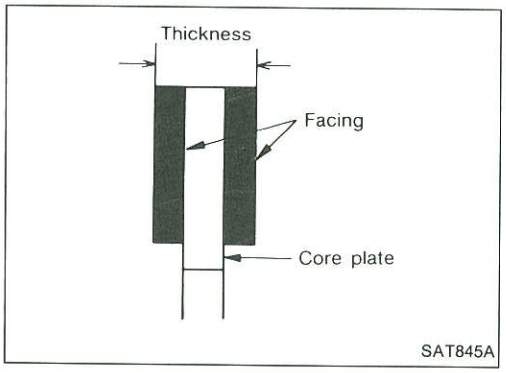
SAT829A

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

Part No.	ℓ	D
31505-41X02	19.69 (0.7752)	11.6 (0.457)



SAT845A

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)

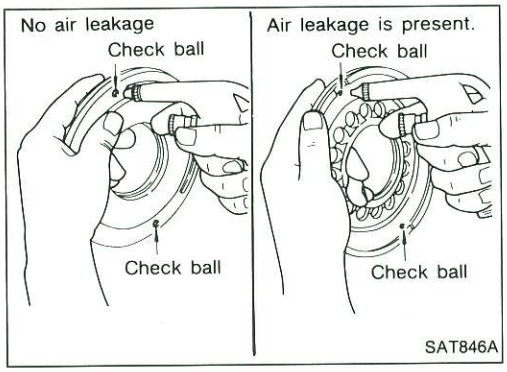
  Wear limit: 1.8 mm (0.071 in)
- If not within wear limit, replace.

Reverse clutch dish plate

- Check for deformation or damage.

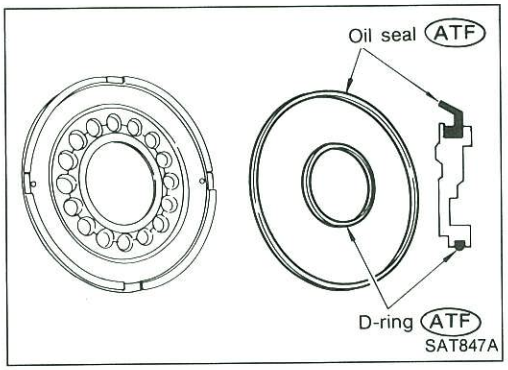
Reverse Clutch (Cont'd)

Reverse clutch piston

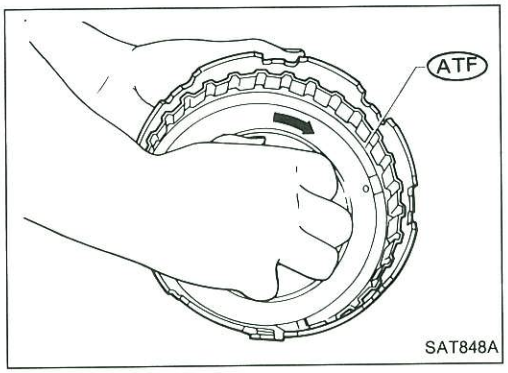


- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring to assure that there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

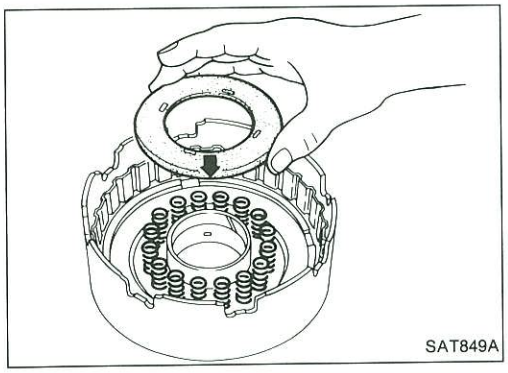
ASSEMBLY



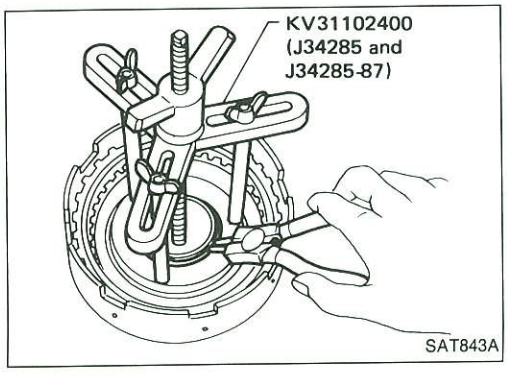
1. Install D-ring and oil seal on piston.
- **Apply A.T.F. to both parts.**



2. Install piston assembly by turning it slowly and evenly.
- **Apply A.T.F. to inner surface of drum.**

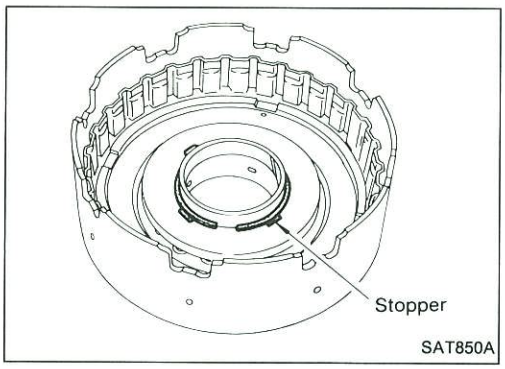


3. Install return springs and spring retainer.

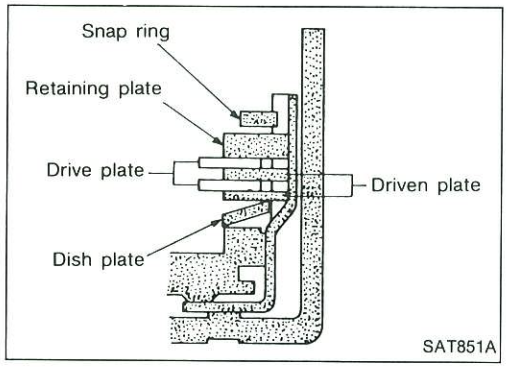


4. Install snap ring while compressing clutch springs.

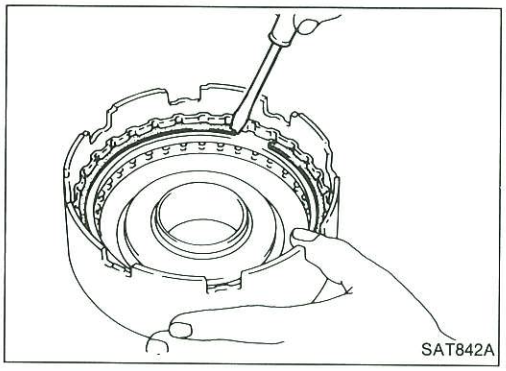
Reverse Clutch (Cont'd)



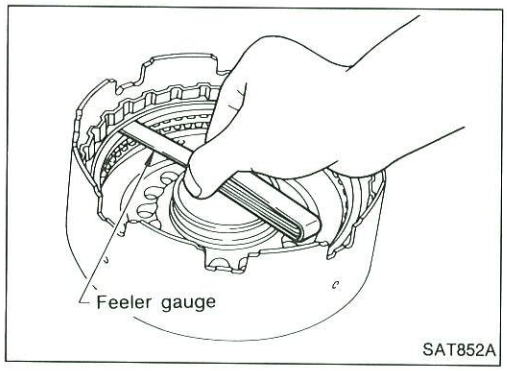
- **Do not align snap ring gap with spring retainer stopper.**



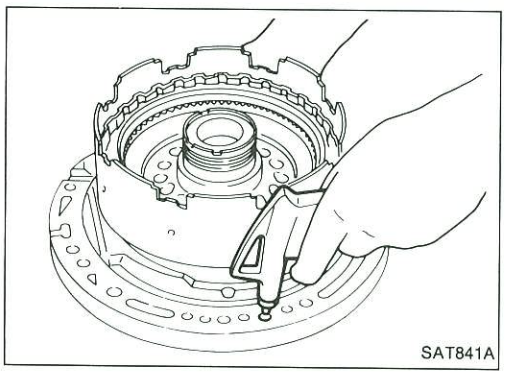
5. Install drive plates, driven plates, retaining plate and dish plate.



6. Install snap ring.

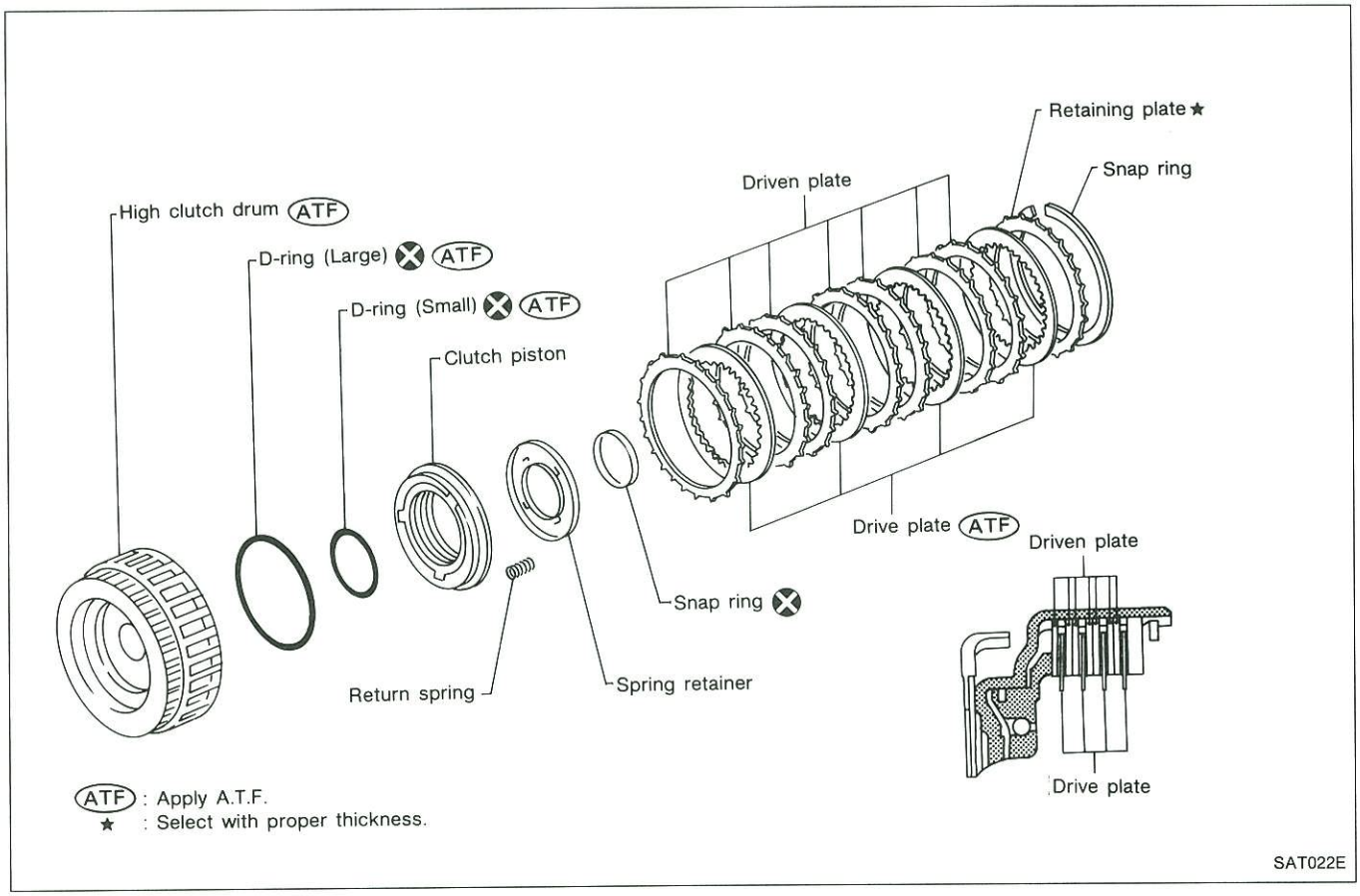


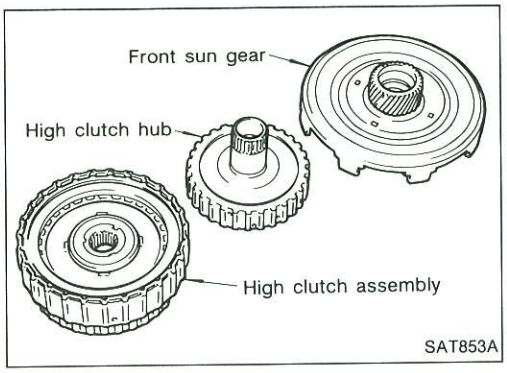
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard
   0.5 - 0.8 mm (0.020 - 0.031 in)
   Allowable limit
   1.2 mm (0.047 in)
   Retaining plate:
   Refer to S.D.S.



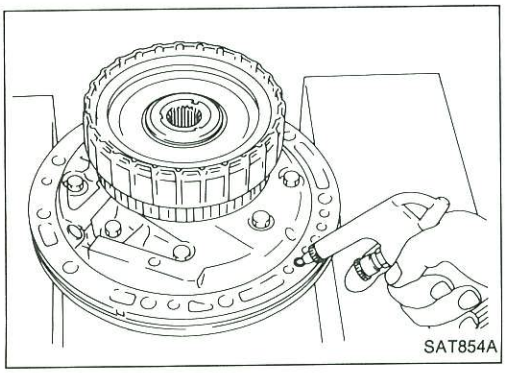
8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch.

High Clutch



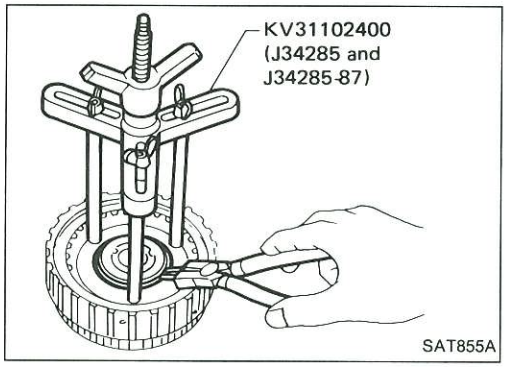


Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

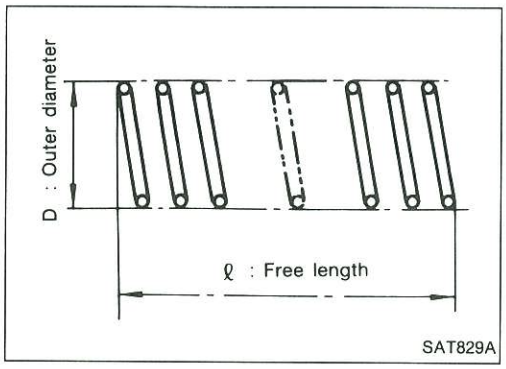


- Check of high clutch operation

High Clutch (Cont'd)



- Removal and installation of return spring

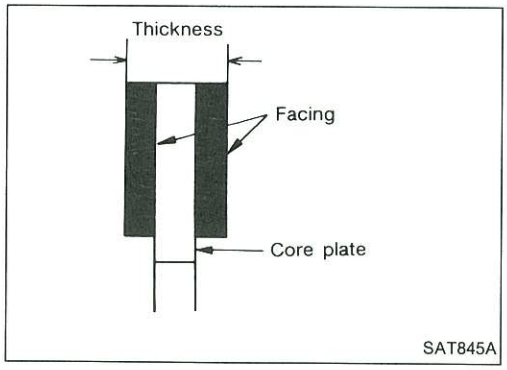


- Inspection of high clutch return springs

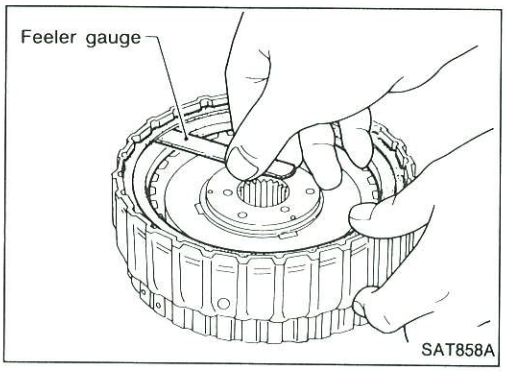
Inspection standard:

Unit: mm (in)

Part No.	ℓ	D
31505-21X03	22.06 (0.8685)	11.6 (0.457)



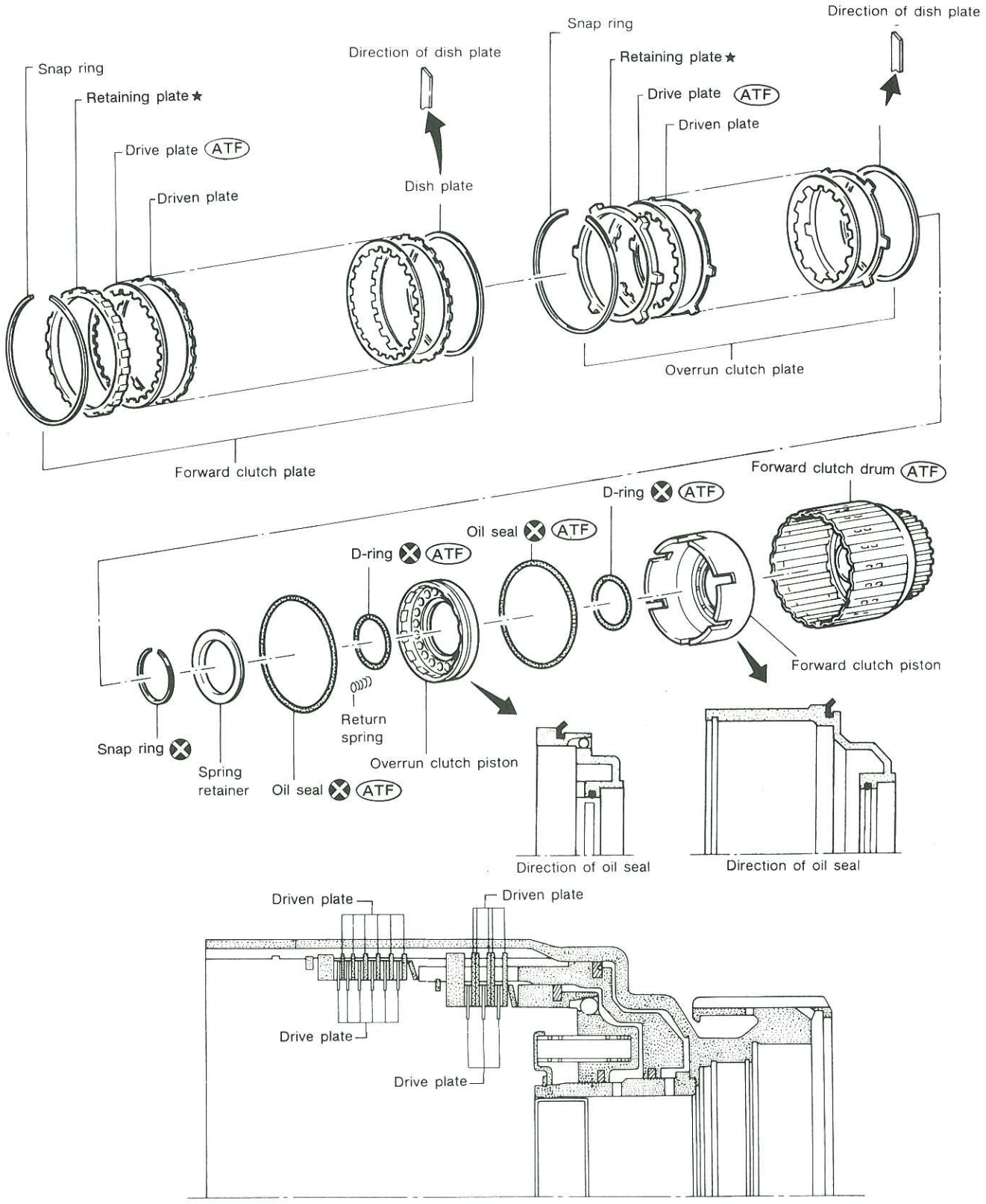
- Inspection of high clutch drive plate
  - **Thickness of drive plate:**
    - **Standard**
      - **1.6 mm (0.063 in)**
    - **Wear limit**
      - **1.4 mm (0.055 in)**



- Measurement of clearance between retaining plate and snap ring
  - **Specified clearance:**
    - **Standard**
      - **1.8 - 2.2 mm (0.071 - 0.087 in)**
    - **Allowable limit**
      - **3.0 mm (0.118 in)**
  - **Retaining plate:**
    - **Refer to S.D.S.**

Forward and Overrun Clutches

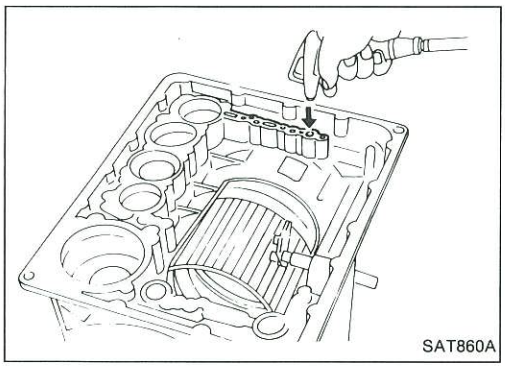
For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



(ATF) : Apply A.T.F.
★ : Select with proper thickness.

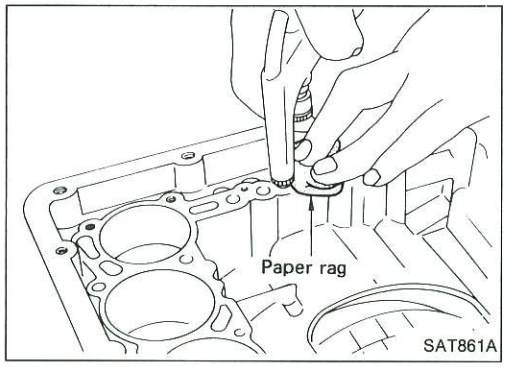
SAT084E

Forward and Overrun Clutches (Cont'd)


SAT860A

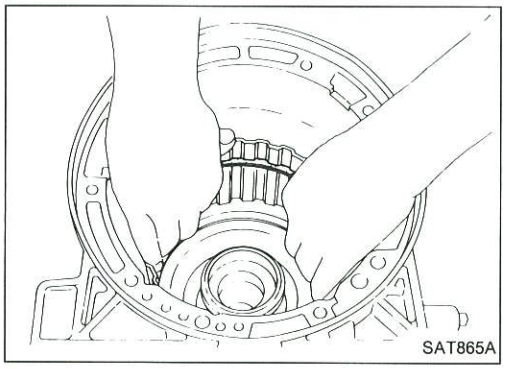
Service procedures for forward and overrun clutches are essentially the same as those for reverse clutch, with the following exception:

- Check of forward clutch operation.



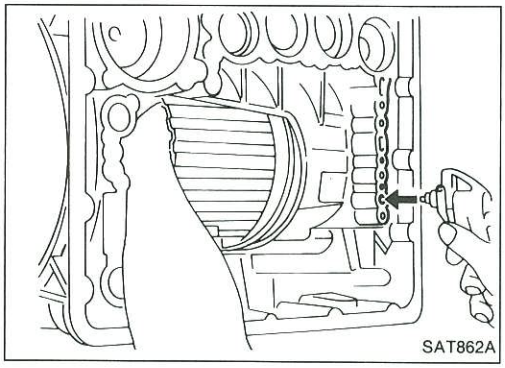
SAT861A

- Check of overrun clutch operation.


SAT865A

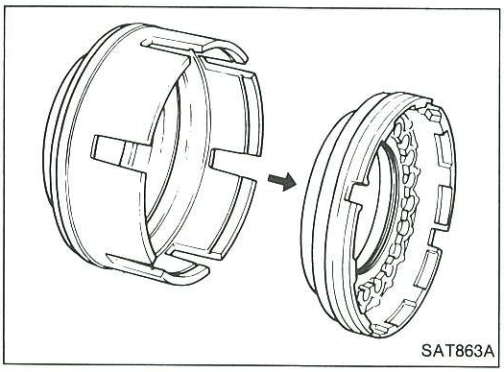
- Removal of forward clutch drum

  Remove forward clutch drum from transmission case by holding snap ring.


SAT862A

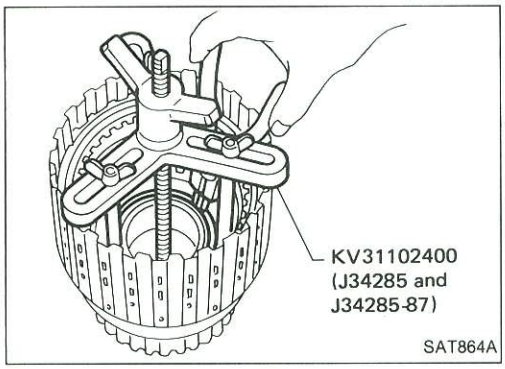
- Removal of forward clutch and overrun clutch pistons

1. While holding overrun clutch piston, gradually apply compressed air to oil hole.

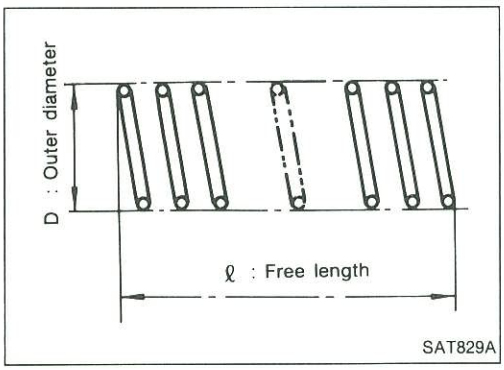

SAT863A

2. Remove overrun clutch from forward clutch.

Forward and Overrun Clutches (Cont'd)



- Removal and installation of return springs

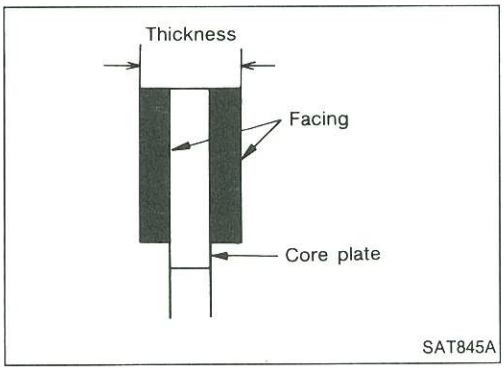


- Inspection of forward clutch and overrun clutch return springs

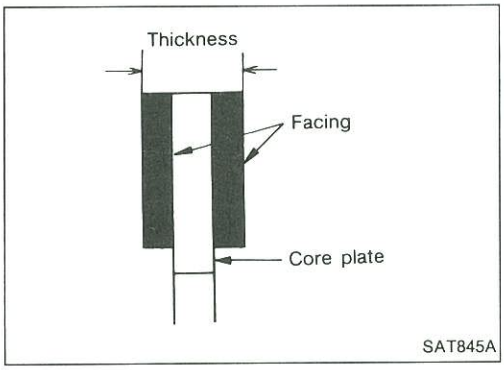
Inspection standard:

Unit: mm (in)

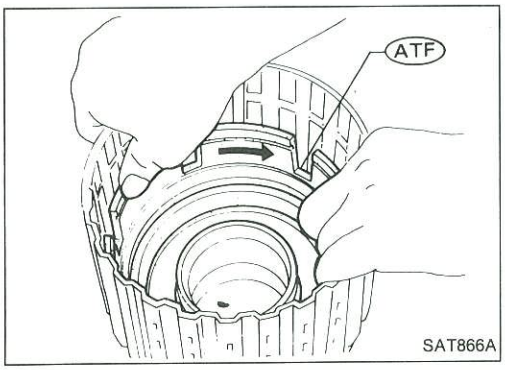
Part No.	ℓ	D
31505-41X01	35.77 (1.4083)	9.7 (0.382)



- Inspection of forward clutch drive plates
  Thickness of drive plate:
  Standard
  1.6 mm (0.063 in)
  Wear limit
  1.4 mm (0.055 in)



- Inspection of overrun clutch drive plates
  Thickness of drive plate:
  Standard
  2.0 mm (0.079 in)
  Wear limit
  1.8 mm (0.071 in)

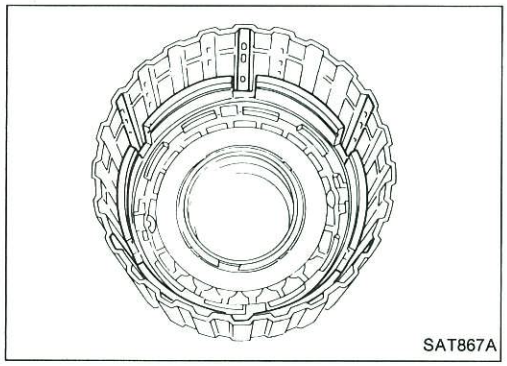


- Installation of forward clutch piston and overrun clutch piston

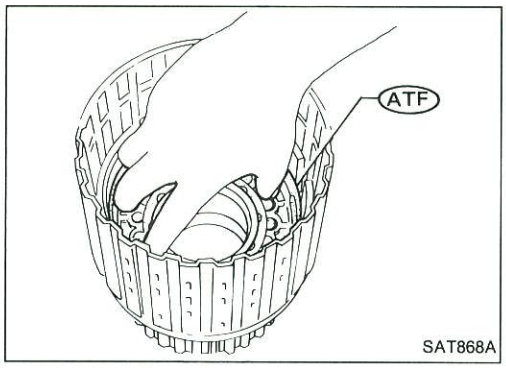
1. Install forward clutch piston by turning it slowly and evenly.

- **Apply A.T.F. to inner surface of clutch drum.**

Forward and Overrun Clutches (Cont'd)

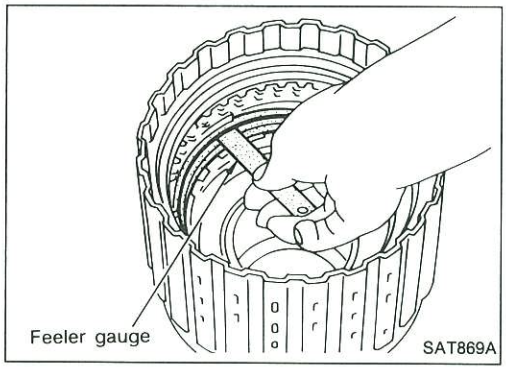

SAT867A

- **Align notch in forward clutch piston with groove in forward clutch drum.**



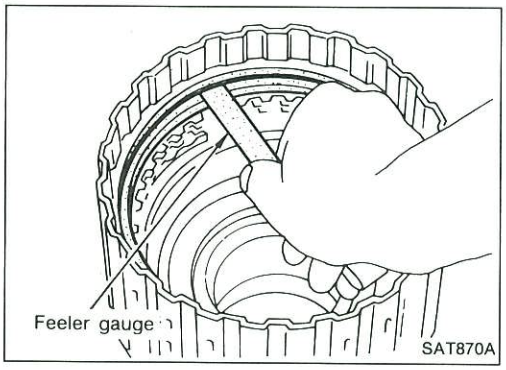
SAT868A

2. Install overrun clutch by turning it slowly and evenly.
- **Apply A.T.F. to inner surface of forward clutch piston.**



SAT869A

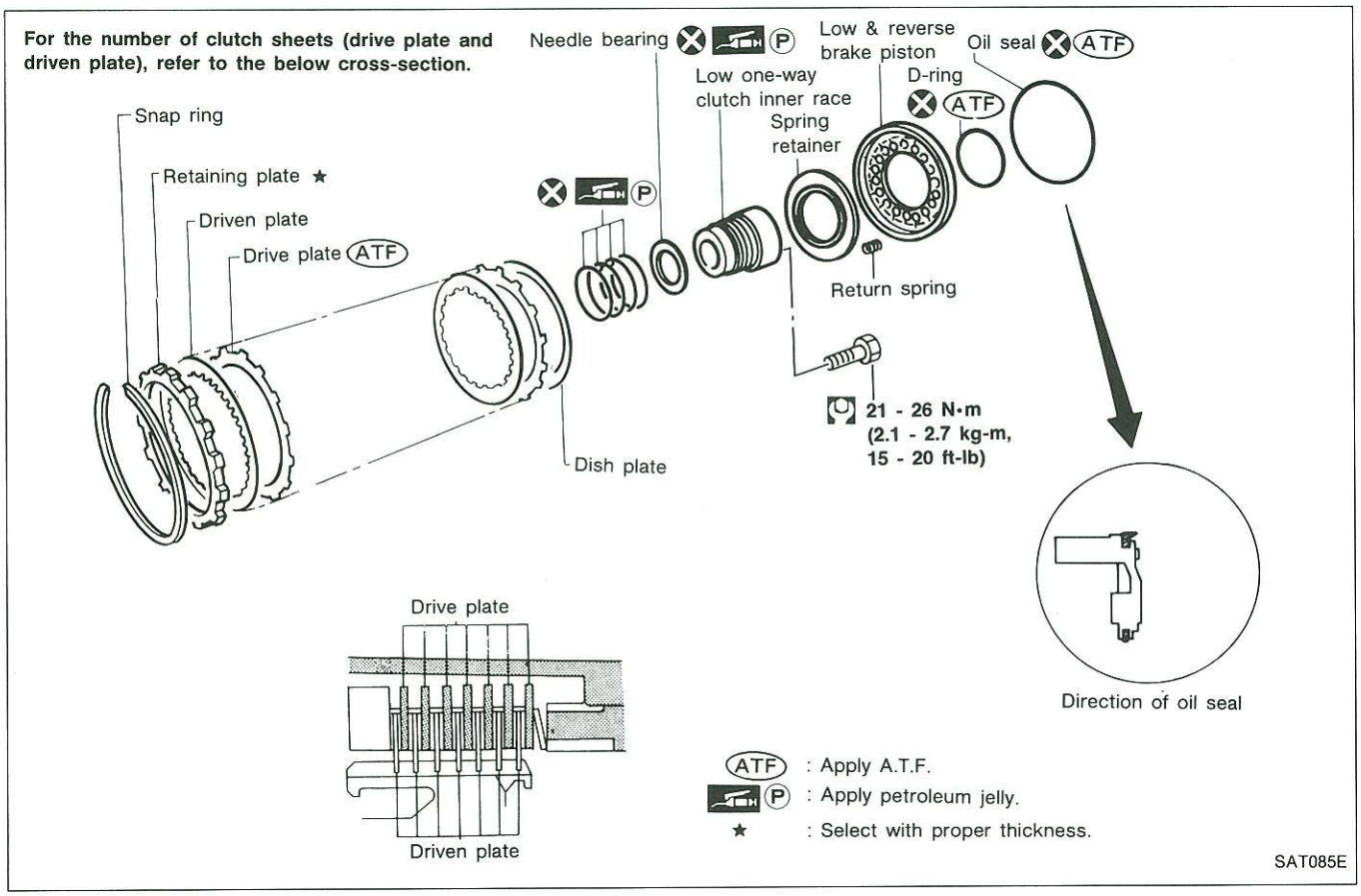
- Measurement of clearance between retaining plate and snap ring of overrun clutch
  Specified clearance:
  Standard
  1.0 - 1.4 mm (0.039 - 0.055 in)
  Allowable limit
  2.0 mm (0.079 in)
  Retaining plate:
  Refer to S.D.S.

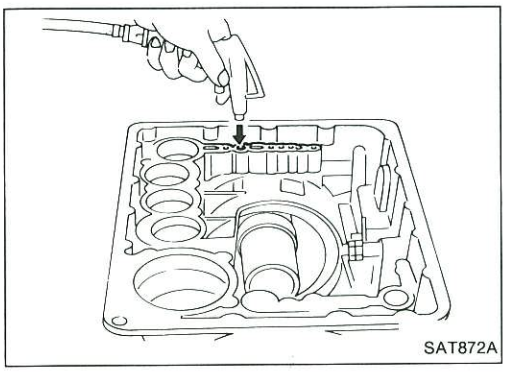


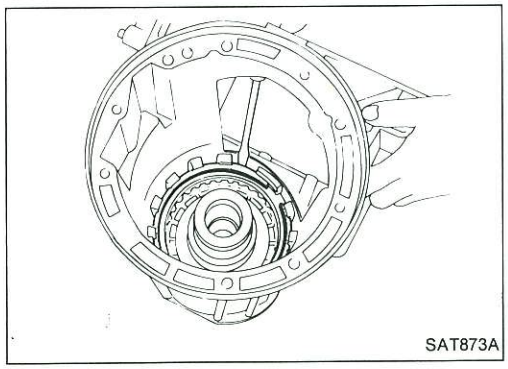
SAT870A

- 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
  2.05 mm (0.0807 in)
  Retaining plate:
  Refer to S.D.S.

Low & Reverse Brake





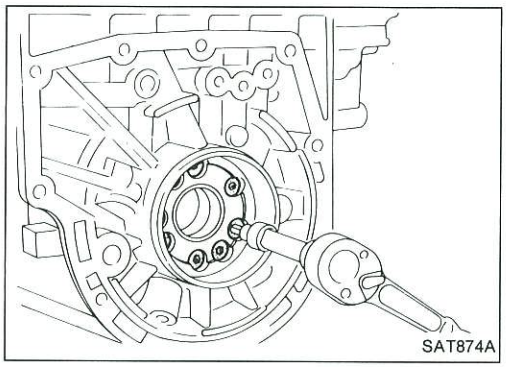


DISASSEMBLY

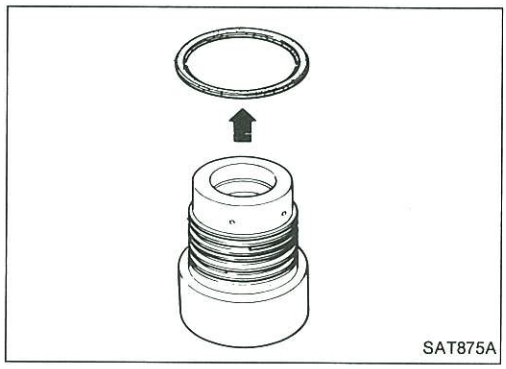
1. Check operation of low and reverse brake.
   a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
   b. Check to see that retaining plate moves to snap ring.
   c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

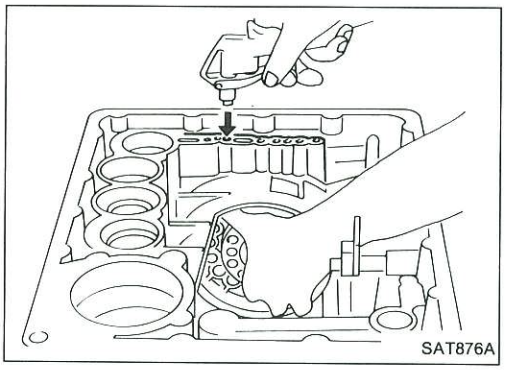
Low & Reverse Brake (Cont'd)


SAT874A

3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.


SAT875A

4. Remove seal rings from low one-way clutch inner race.
5. Remove needle bearing from low one-way clutch inner race.


SAT876A

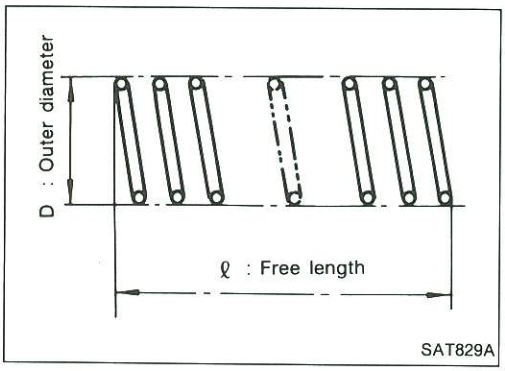
6. Remove low and reverse brake piston using compressed air.
7. Remove oil seal and D-ring from piston.

INSPECTION

Low and reverse brake snap ring and spring retainer

- Check for deformation or damage.

Low and reverse brake return springs



SAT829A

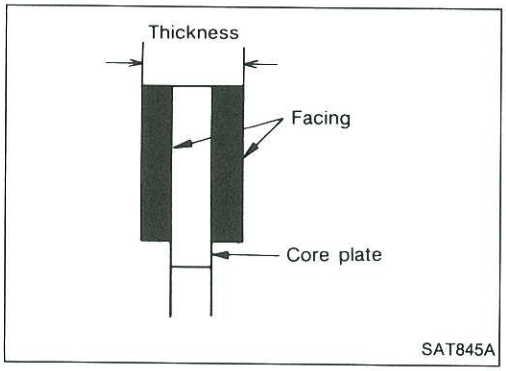
- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

Part No.	ℓ	D
31521-21X00	23.7 (0.933)	11.6 (0.457)

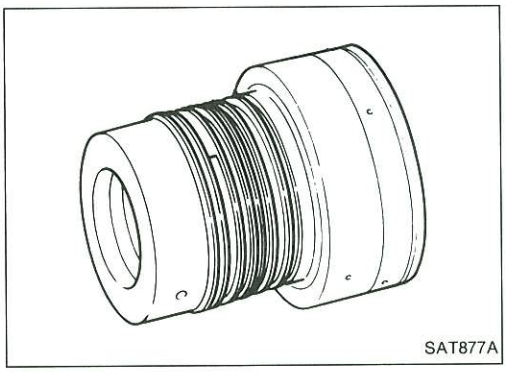
Low and reverse brake drive plates



SAT845A

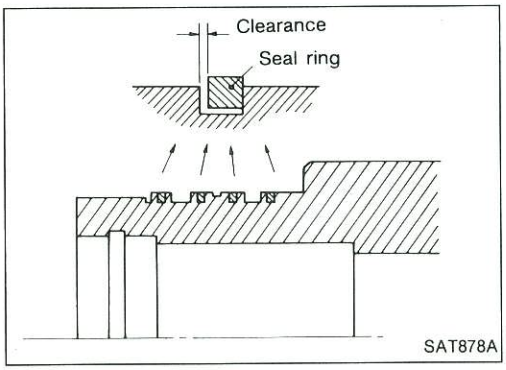
- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  Thickness of drive plate:
  Standard value
  2.0 mm (0.079 in)
  Wear limit
  1.8 mm (0.071 in)
- If not within wear limit, replace.

Low & Reverse Brake (Cont'd)


SAT877A

Low one-way clutch inner race

- Check frictional surface of inner race for wear or damage.



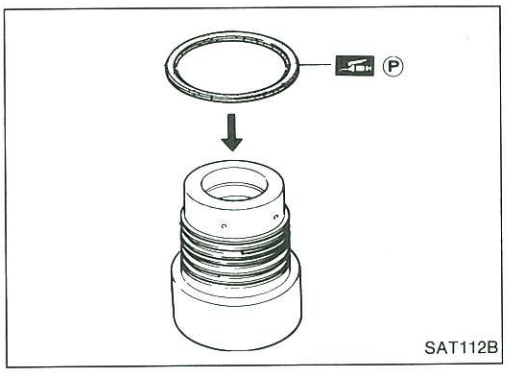
SAT878A

- 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)

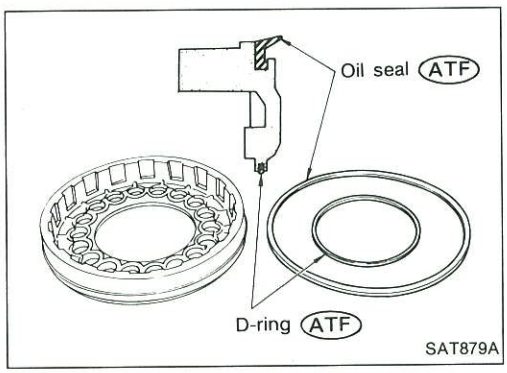
  Allowable limit: 0.25 mm (0.0098 in)
- If not within allowable limit, replace low one-way clutch inner race.



SAT112B

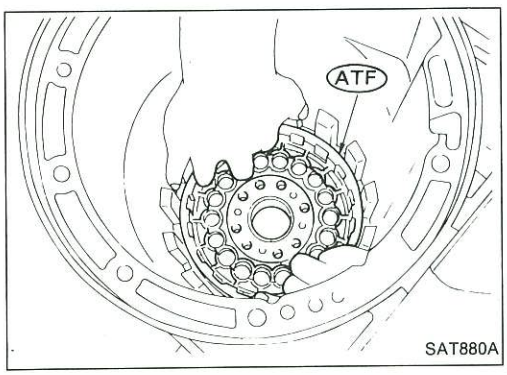
ASSEMBLY

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.**



SAT879A

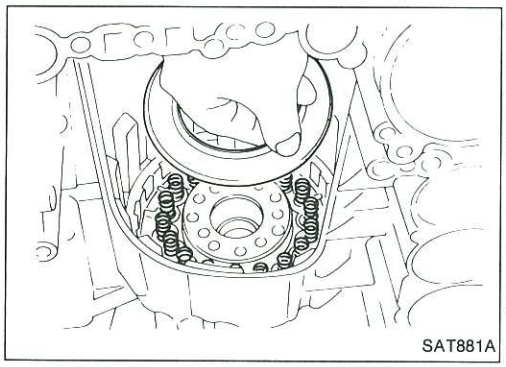
2. Install oil seal and D-ring onto piston.
- **Apply A.T.F. to oil seal and D-ring.**



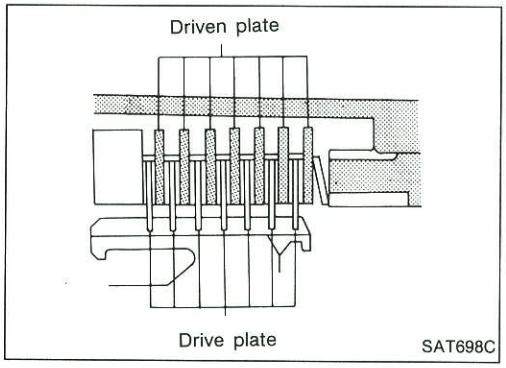
SAT880A

3. Install piston by rotating it slowly and evenly.
- **Apply A.T.F. to inner surface of transmission case.**

Low & Reverse Brake (Cont'd)

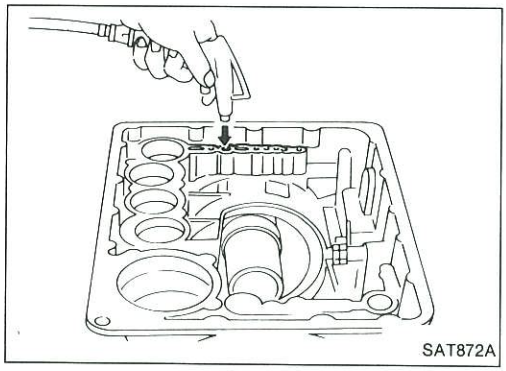

SAT881A

4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.

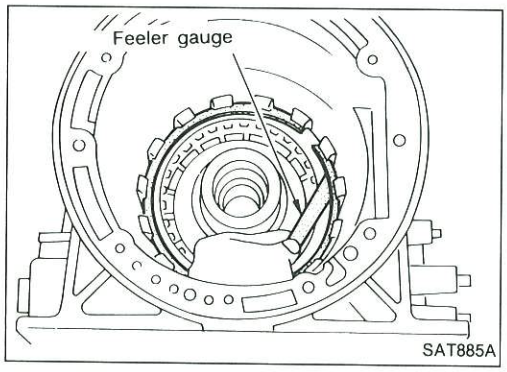


SAT698C

5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.
6. Install snap ring on transmission case.

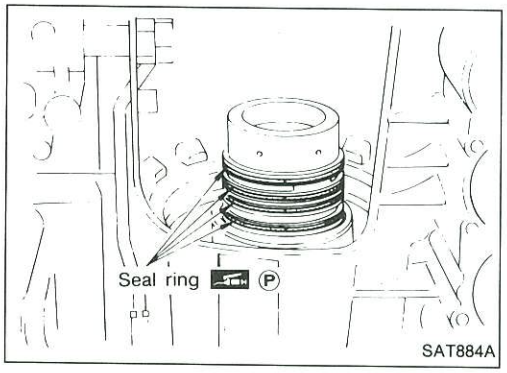

SAT872A

7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY".



SAT885A

8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard
   0.7 - 1.1 mm (0.028 - 0.043 in)
   Allowable limit
   2.5 mm (0.098 in)
   Retaining plate:
   Refer to S.D.S.

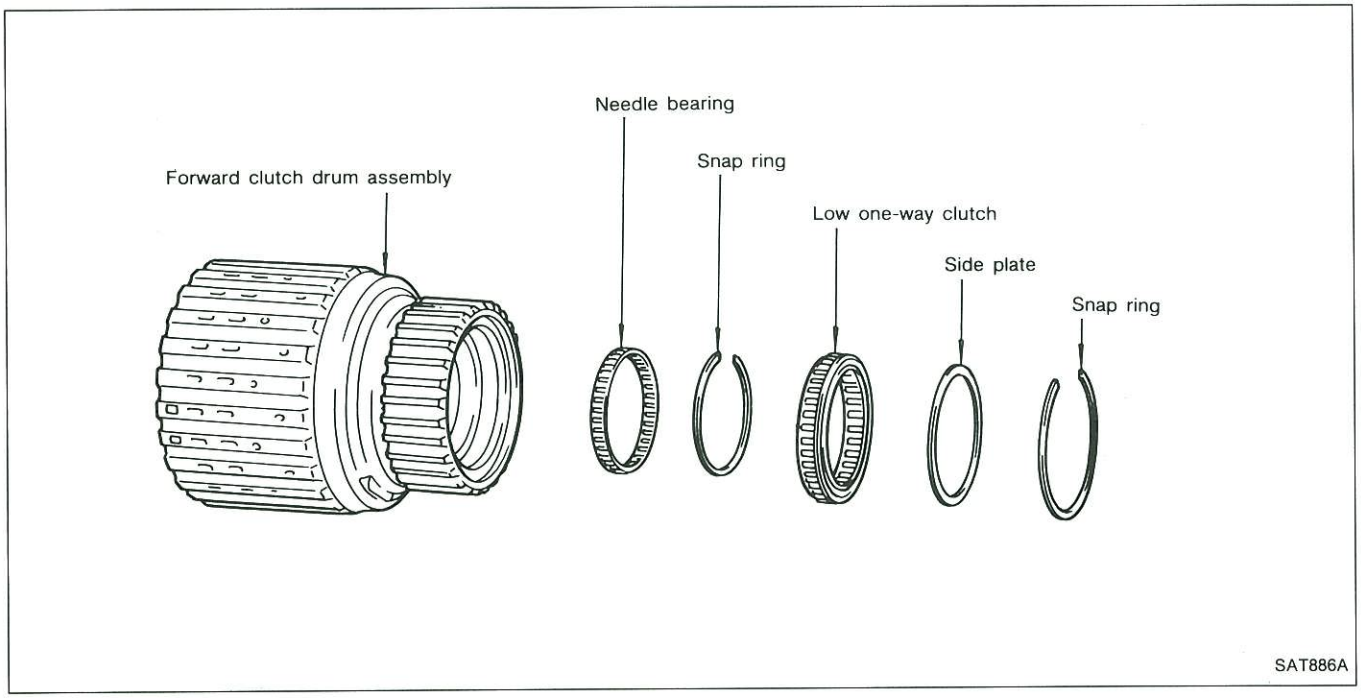


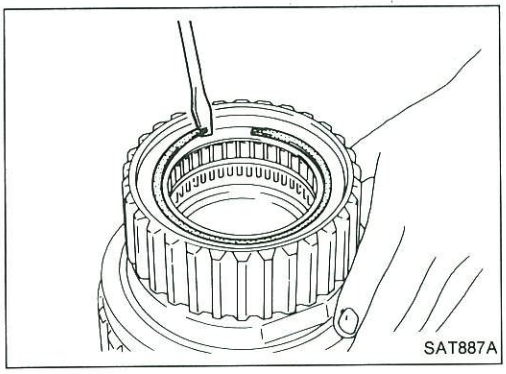
SAT884A

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.**

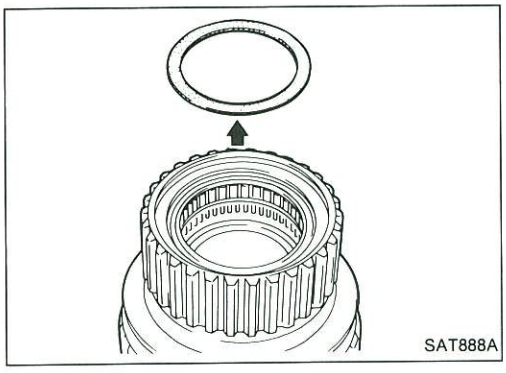
Forward Clutch Drum Assembly



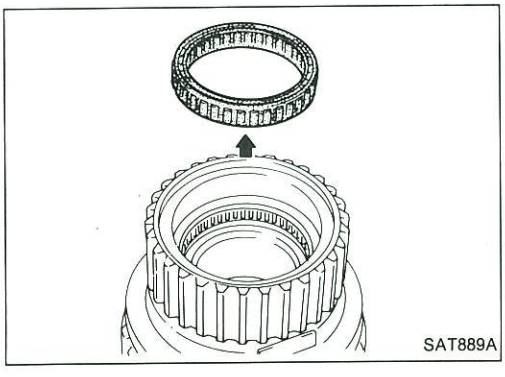


DISASSEMBLY

1. Remove snap ring from forward clutch drum.

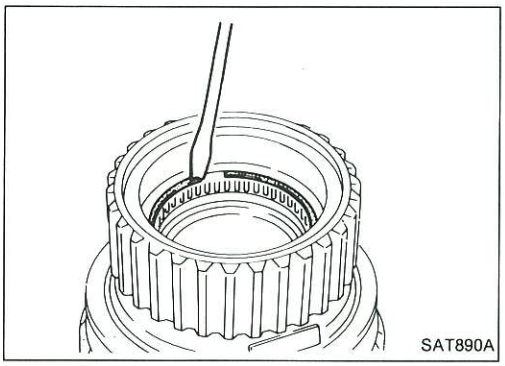


2. Remove side plate from forward clutch drum.

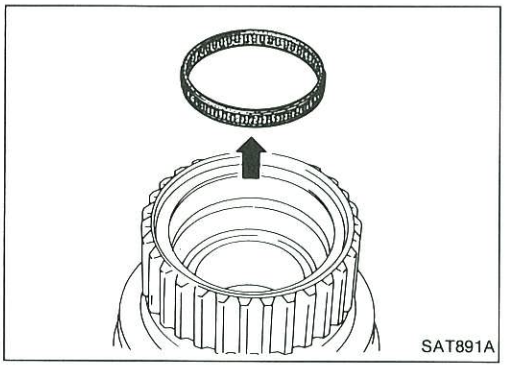


3. Remove low one-way clutch from forward clutch drum.

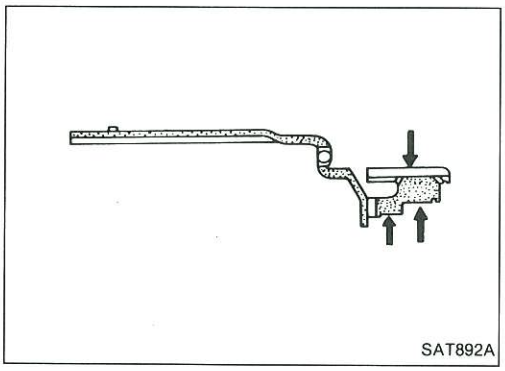
Forward Clutch Drum Assembly (Cont'd)


SAT890A

4. Remove snap ring from forward clutch drum.


SAT891A

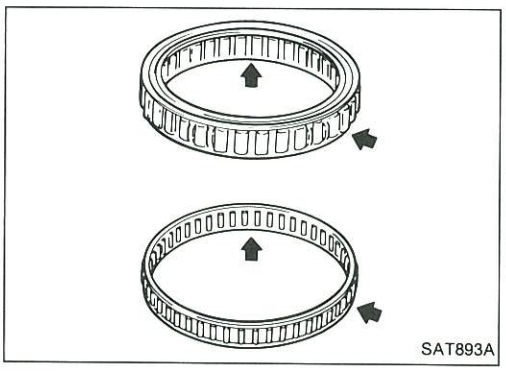
5. Remove needle bearing from forward clutch drum.


SAT892A

INSPECTION

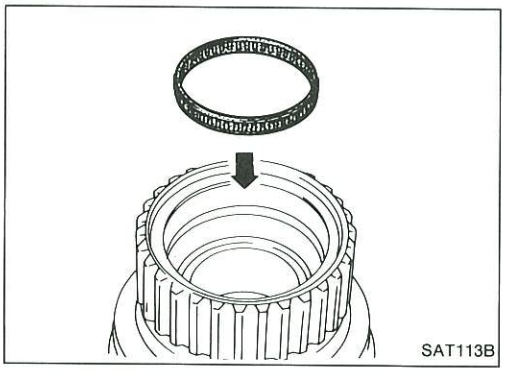
Forward clutch drum

- 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

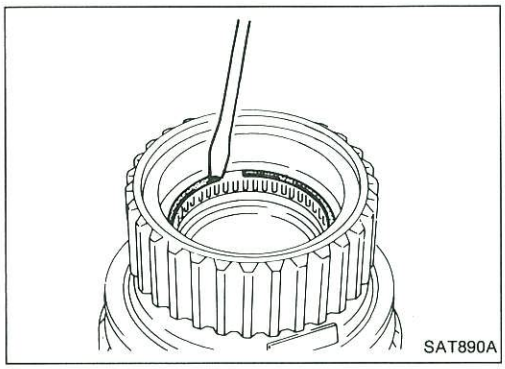
- Check frictional surface for wear or damage.


SAT113B

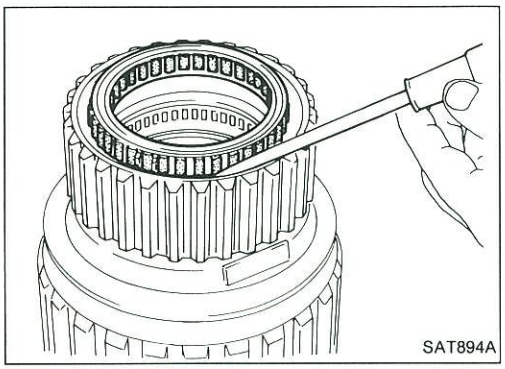
ASSEMBLY

1. Install needle bearing in forward clutch drum.

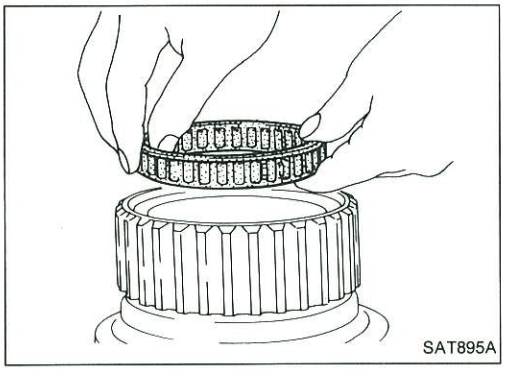
Forward Clutch Drum Assembly (Cont'd)


SAT890A

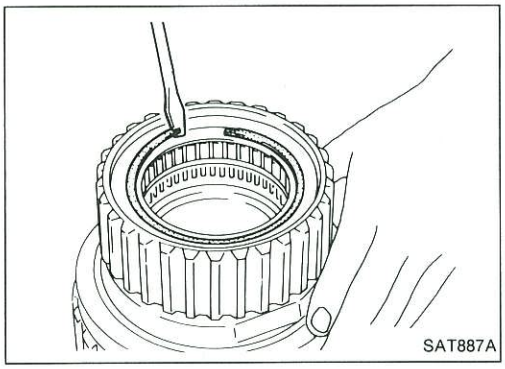
2. Install snap ring onto forward clutch drum.


SAT894A

3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.

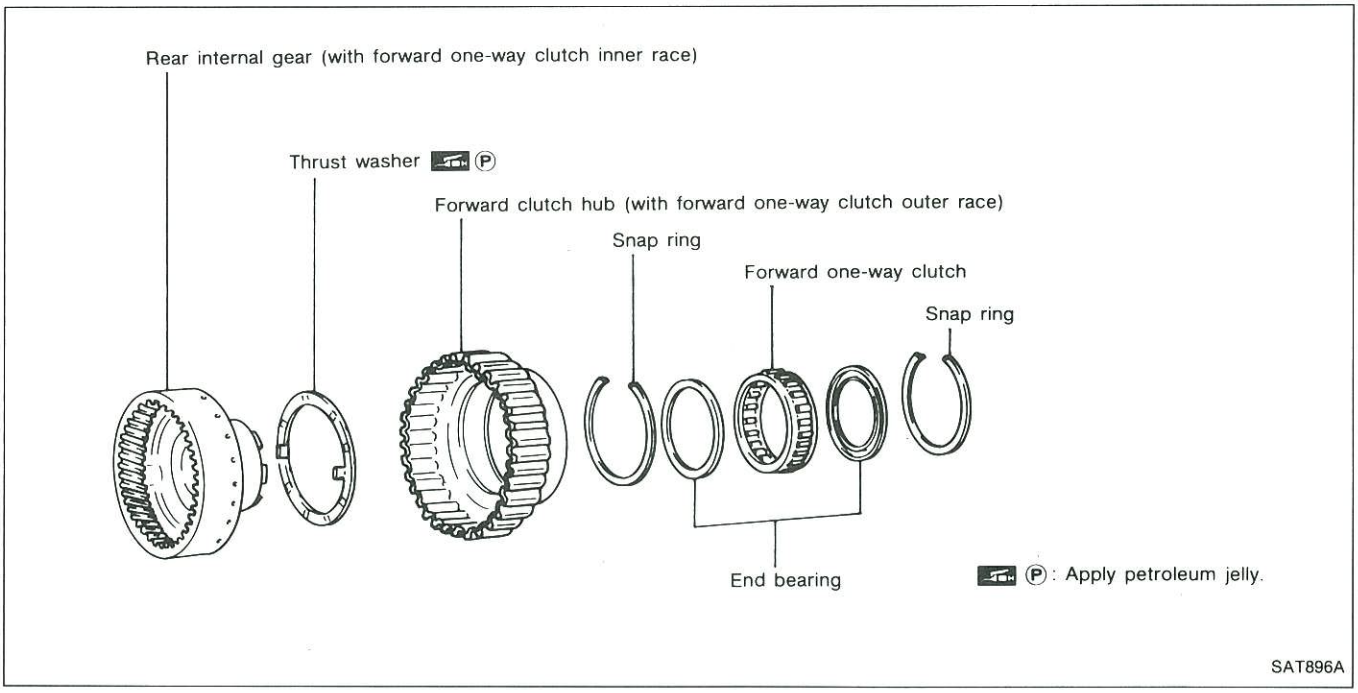

SAT895A

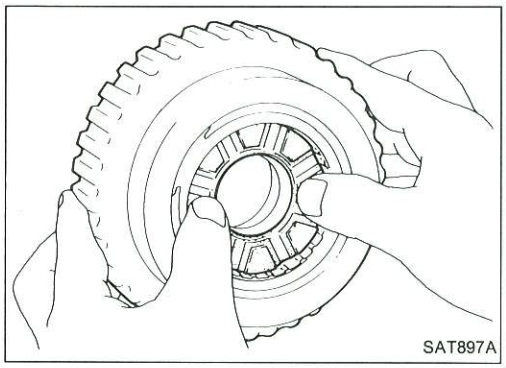
- **Install low one-way clutch with flange facing rearward.**


SAT887A

4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

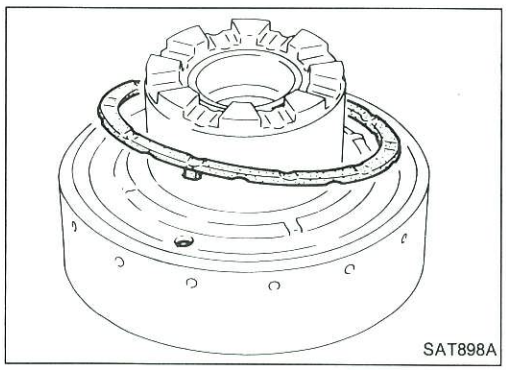
Rear Internal Gear and Forward Clutch Hub



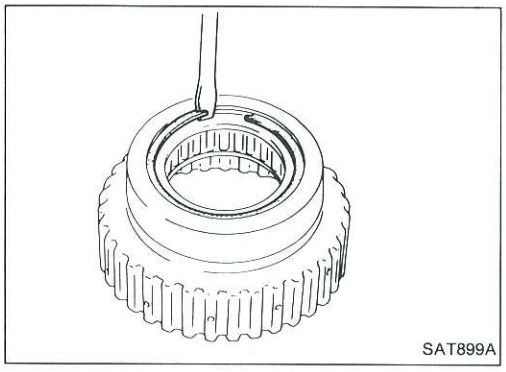


DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.

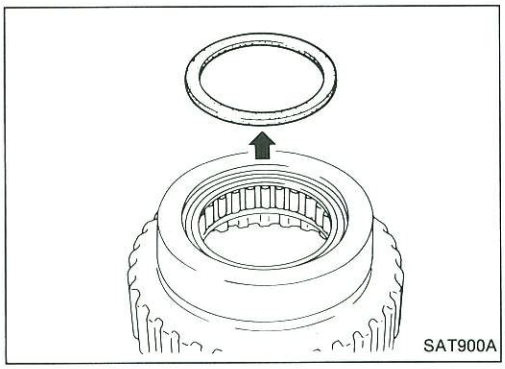


2. Remove thrust washer from rear internal gear.

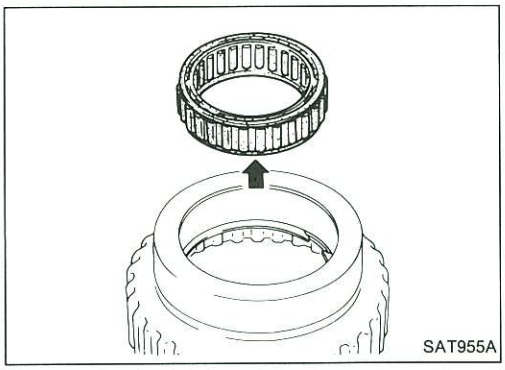


3. Remove snap ring from forward clutch hub.

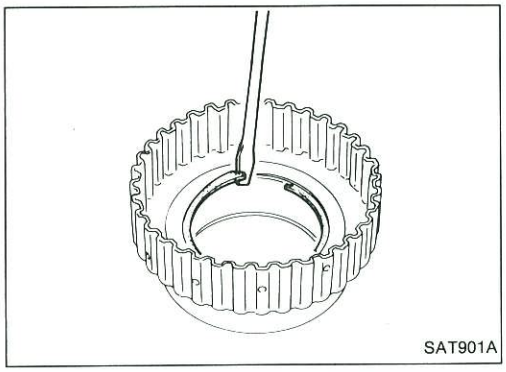
Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT900A

4. Remove end bearing.


SAT955A

5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.

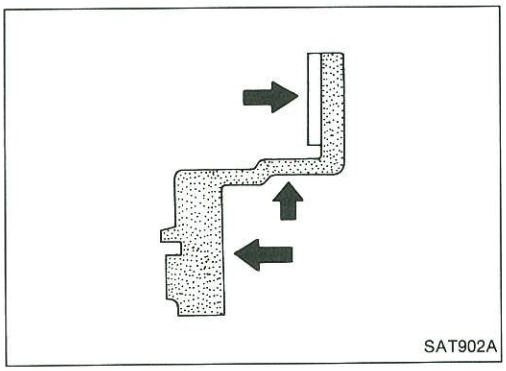

SAT901A

6. Remove snap ring from forward clutch hub.

INSPECTION

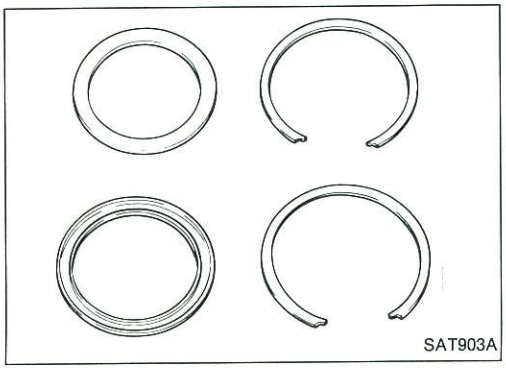
Rear internal gear and forward clutch hub

- 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

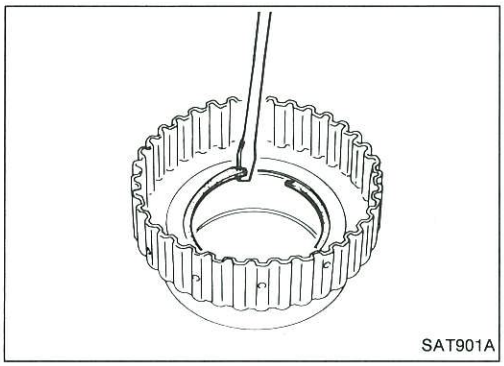
Snap ring and end bearing

- Check for deformation or damage.

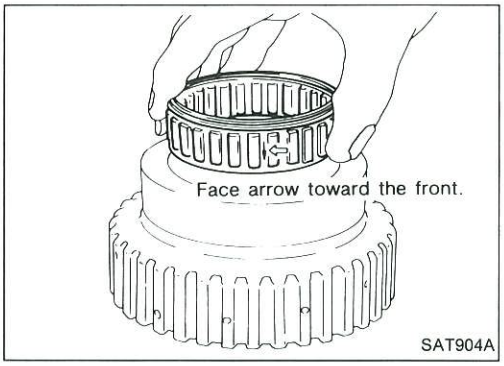

SAT903A

Rear Internal Gear and Forward Clutch Hub (Cont'd)

ASSEMBLY

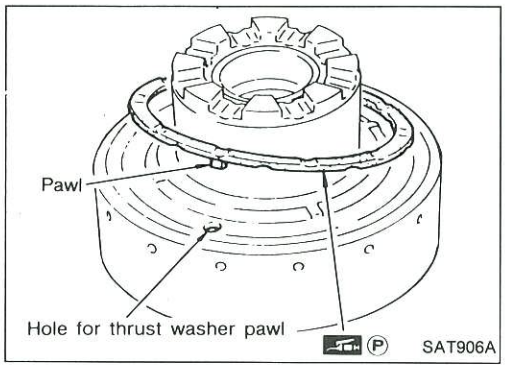

SAT901A

1. Install snap ring onto forward clutch hub.
2. Install end bearing.



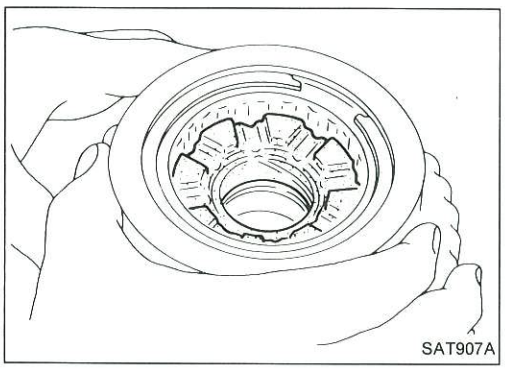
SAT904A

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.

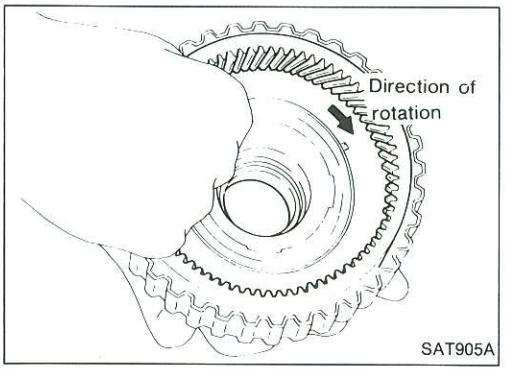


SAT906A

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

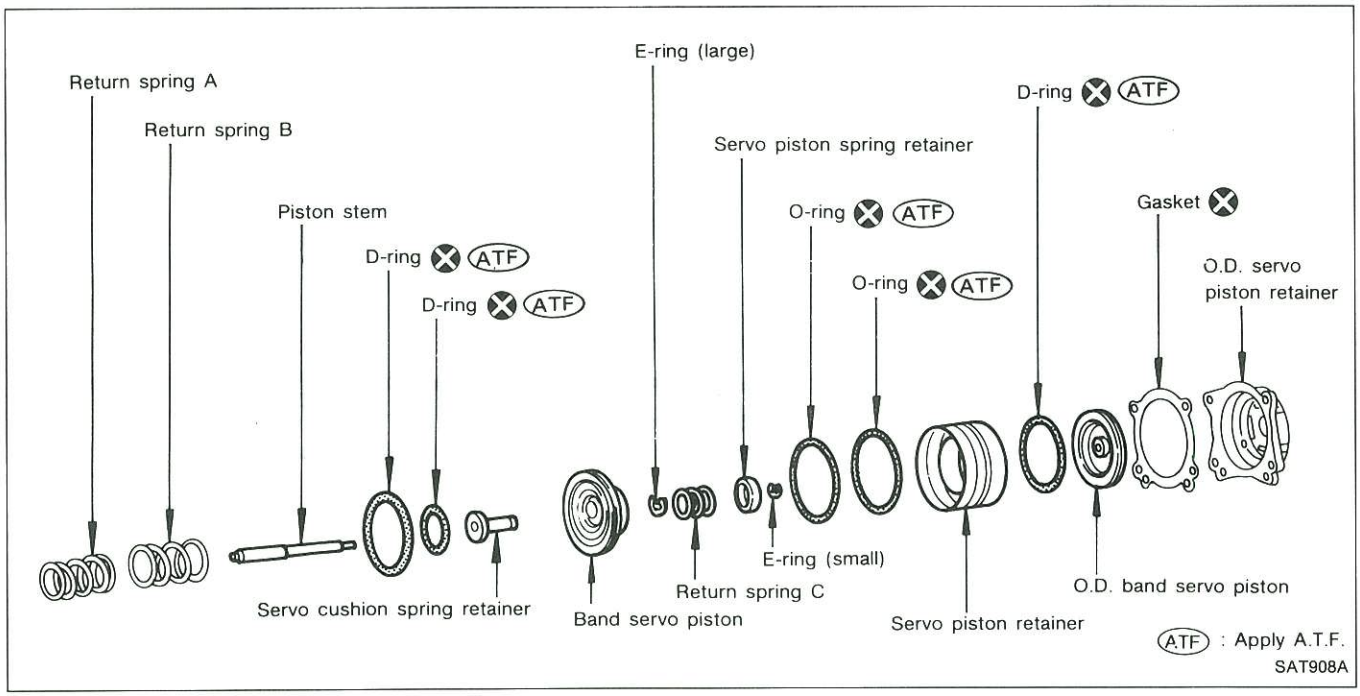
7. Position forward clutch hub in rear internal gear.

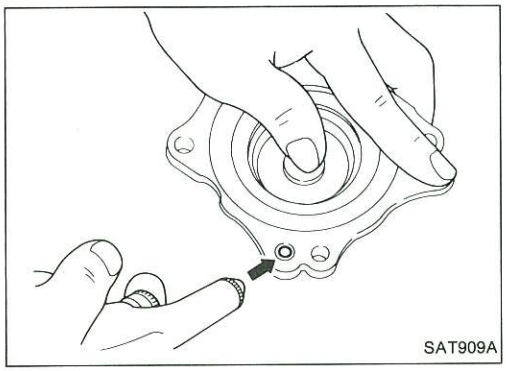


SAT905A

8. After installing, check to assure that forward clutch hub rotates clockwise.

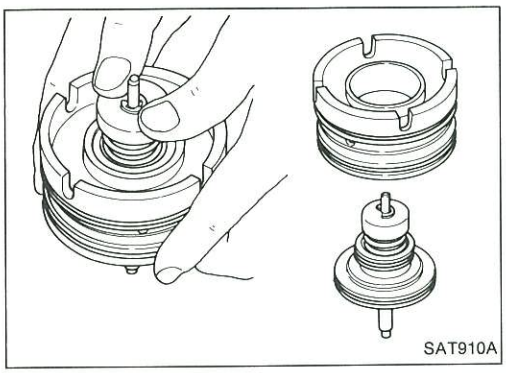
Band Servo Piston Assembly



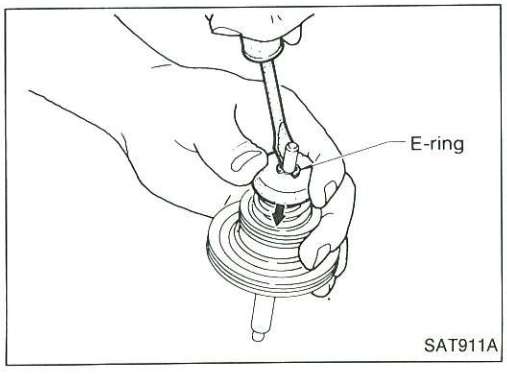


DISASSEMBLY

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.

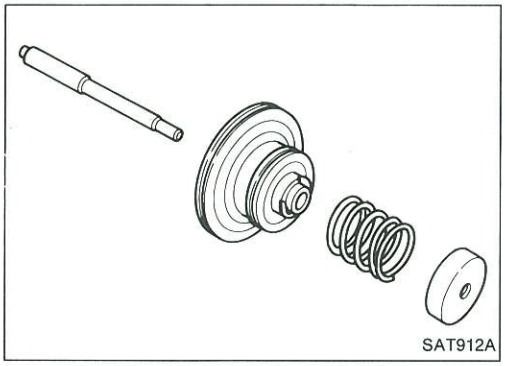


4. Remove band servo piston assembly from servo piston retainer by pushing it forward.

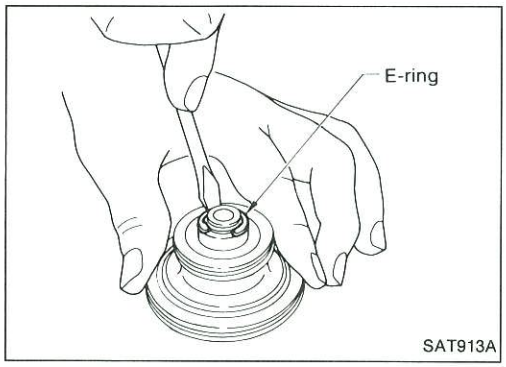


5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

Band Servo Piston Assembly (Cont'd)

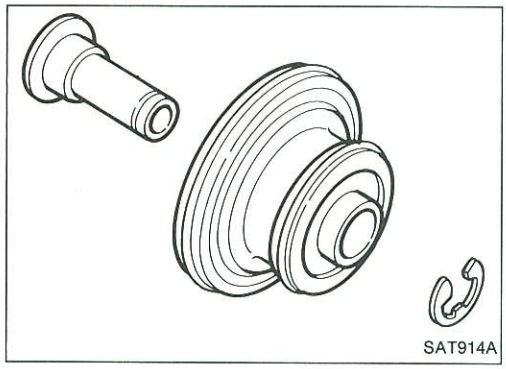

SAT912A

6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.

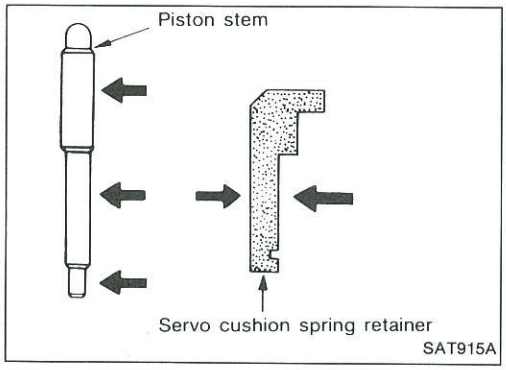


SAT913A

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.

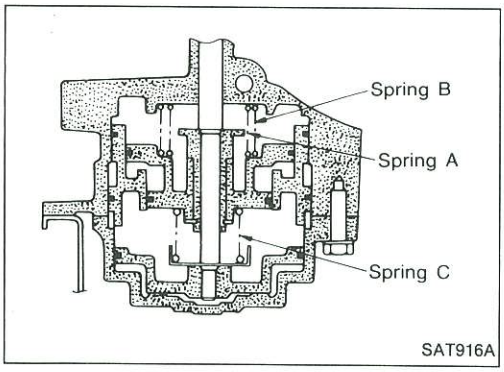


SAT915A

INSPECTION

Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



SAT916A

Return springs

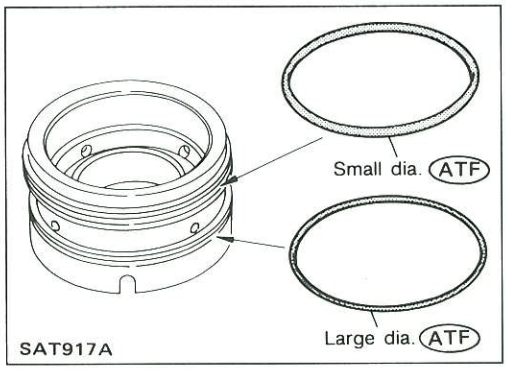
- Check for deformation or damage. Measure free length and outer diameter.

Inspection standard: Unit: mm (in)

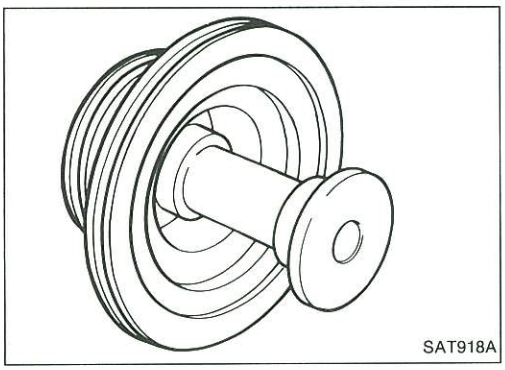
Parts	Free length	Outer diameter
Spring A	45.6 (1.795)	34.3 (1.350)
Spring B	53.8 (2.118)	40.3 (1.587)
Spring C	29.0 (1.142)	27.6 (1.087)

Band Servo Piston Assembly (Cont'd)

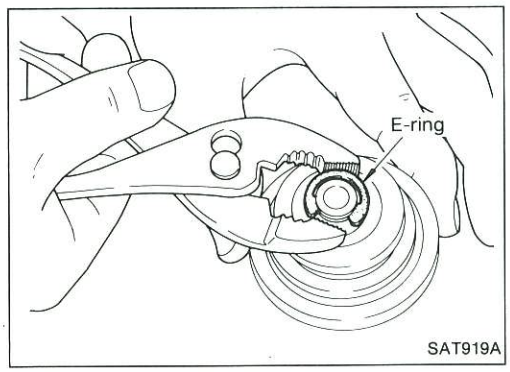
ASSEMBLY



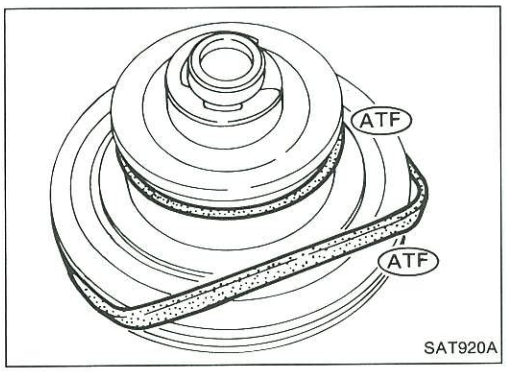
1. Install O-rings onto servo piston retainer.
- **Apply A.T.F. to O-rings.**
- **Pay attention to position of each O-ring.**



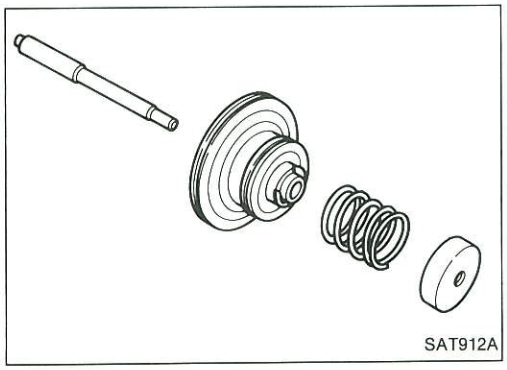
2. Install servo cushion spring retainer onto band servo piston.



3. Install E-ring onto servo cushion spring retainer.

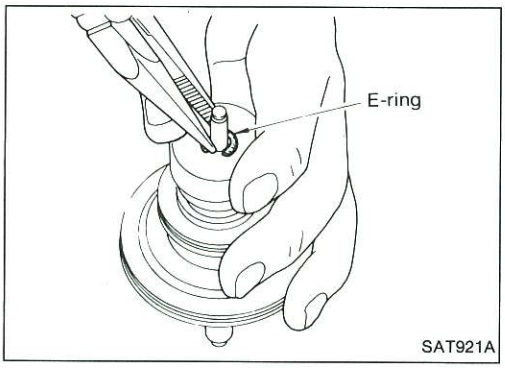


4. Install D-rings onto band servo piston.
- **Apply A.T.F. to D-rings.**

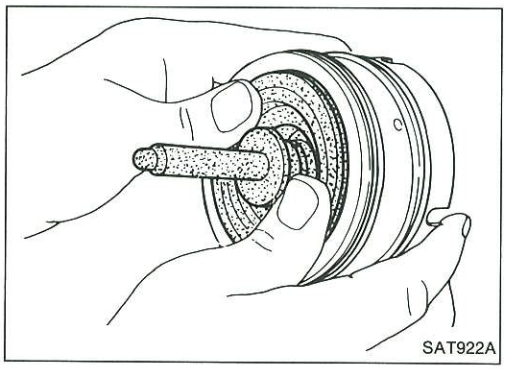


5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.

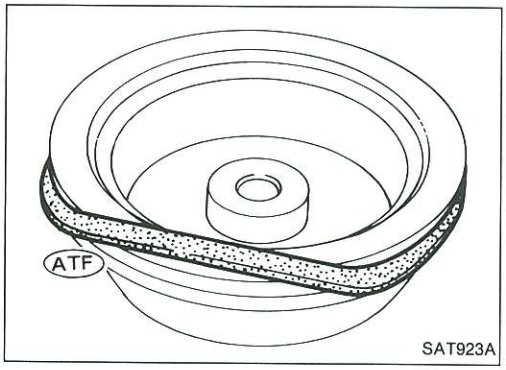
Band Servo Piston Assembly (Cont'd)



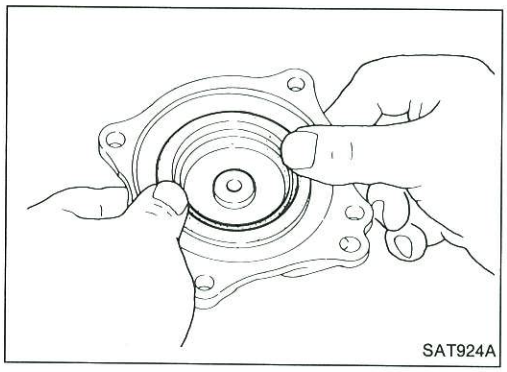
6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



7. Install band servo piston assembly onto servo piston retainer by pushing it inward.

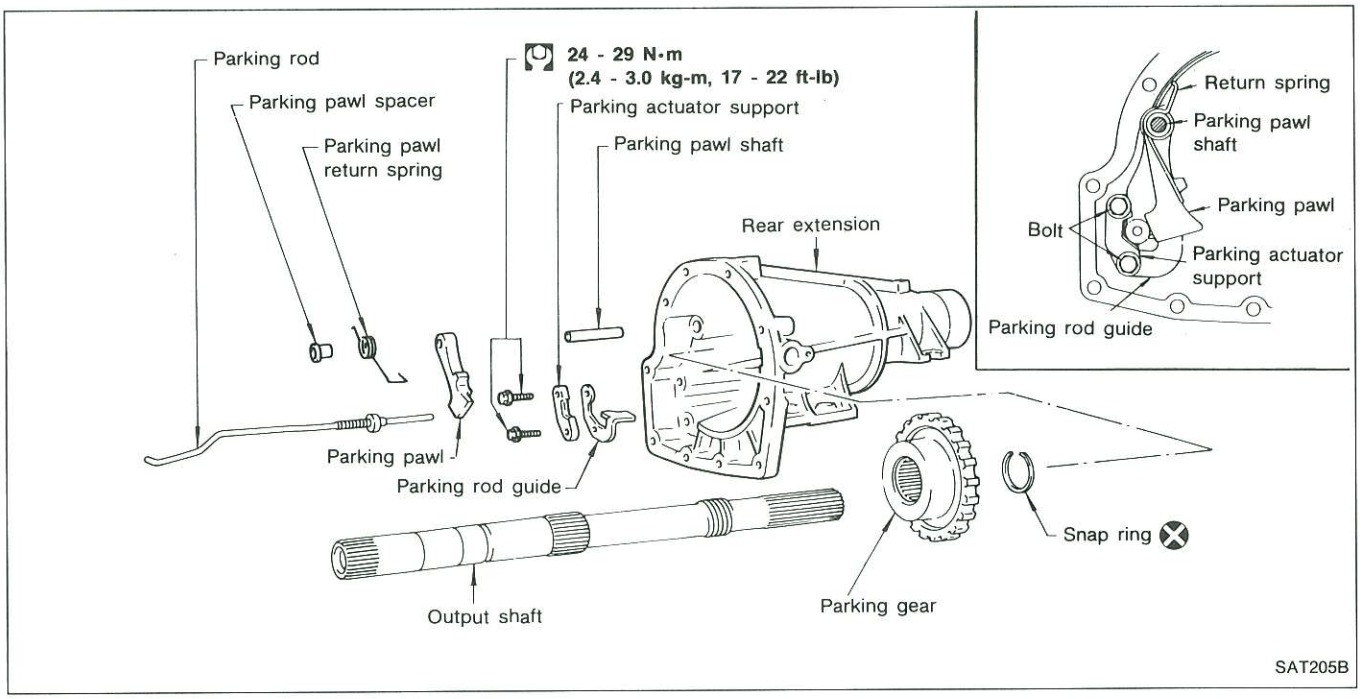


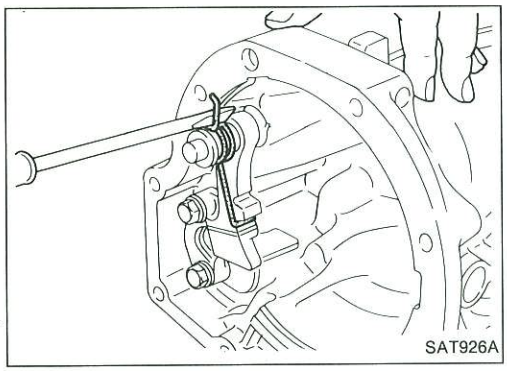
8. Install D-ring on O.D. band servo piston.
- **Apply A.T.F. to D-ring.**



9. Install O.D. band servo piston onto servo piston retainer by pushing it inward.

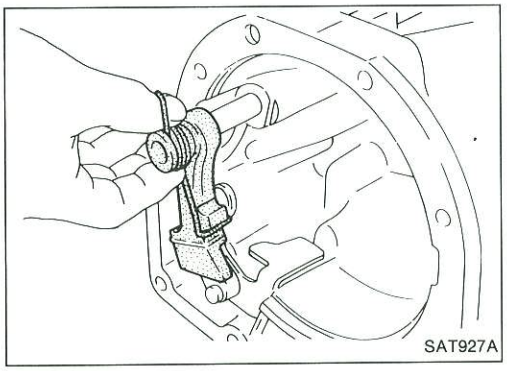
Parking Pawl Components



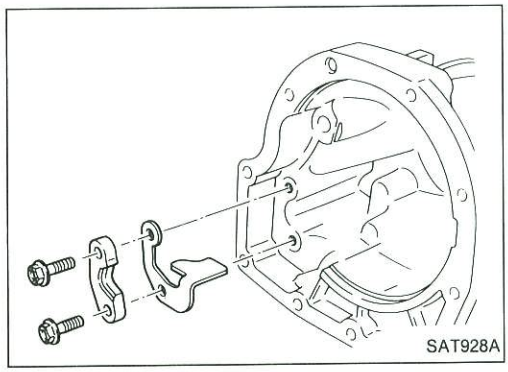


DISASSEMBLY

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.



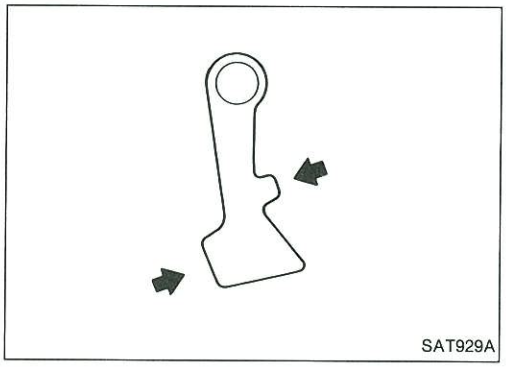
4. Remove parking actuator support and rod guide from rear extension.

Parking Pawl Components (Cont'd)

INSPECTION

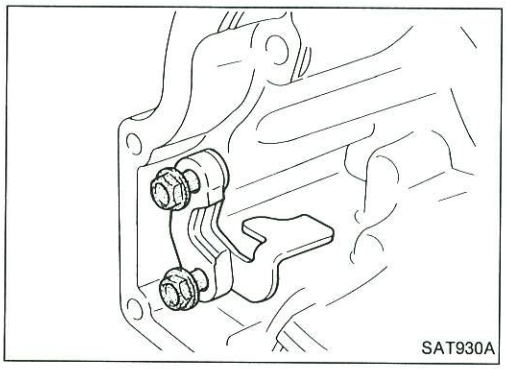
Parking pawl and parking actuator support

- Check contact surface of parking rod for wear.

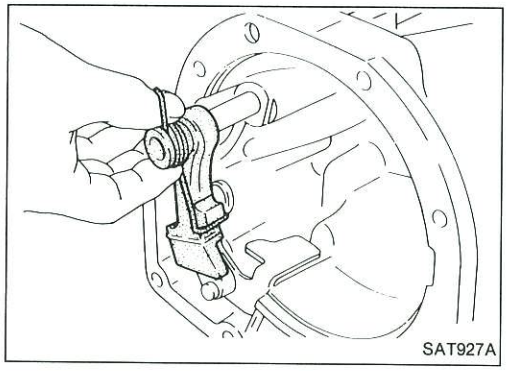

SAT929A

ASSEMBLY

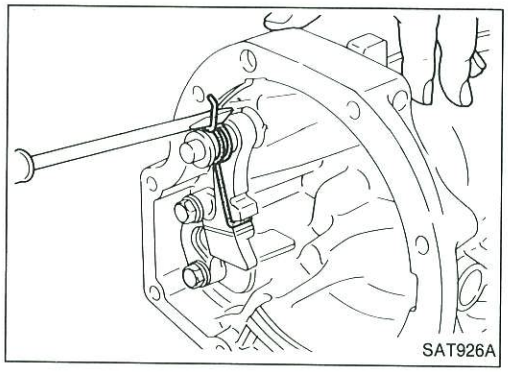
1. Install rod guide and parking actuator support onto rear extension.
2. Insert parking pawl shaft into rear extension.

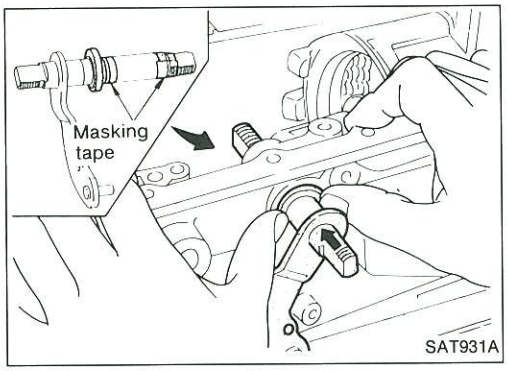

SAT930A

3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.


SAT927A

4. Bend return spring upward and install it onto rear extension.


SAT926A



Assembly

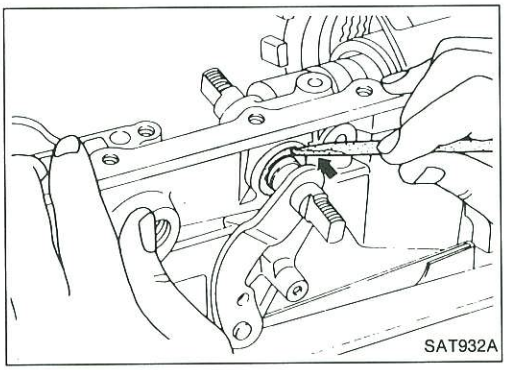
1. Install manual shaft components.

a. Install oil seal onto manual shaft.

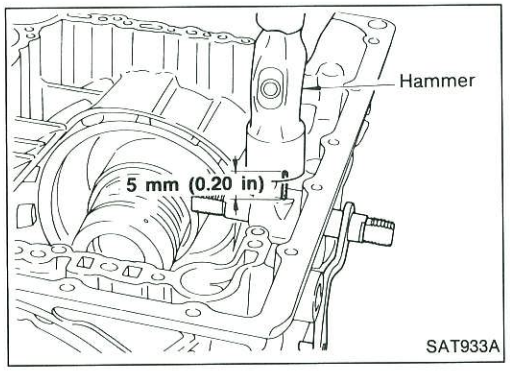
- **Apply A.T.F. to oil seal.**
- **Wrap threads of manual shaft with masking tape.**

b. Insert manual shaft and oil seal as a unit into transmission case.

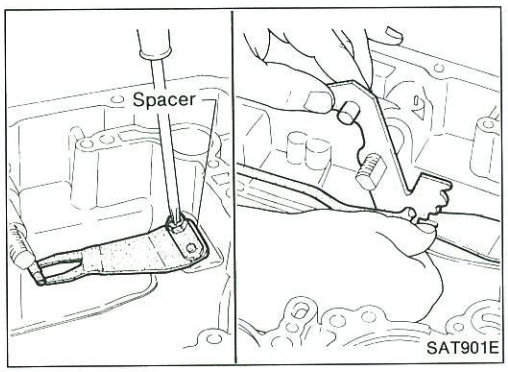
c. Remove masking tape.



d. Push oil seal evenly and install it onto transmission case.

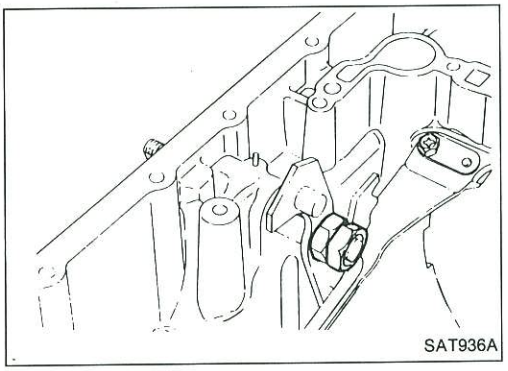


e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.



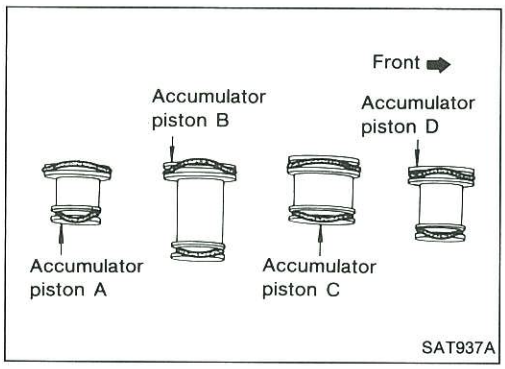
f. Install detent spring and spacer.

g. While pushing detent spring down, install manual plate onto manual shaft.



h. Install lock nuts onto manual shaft.

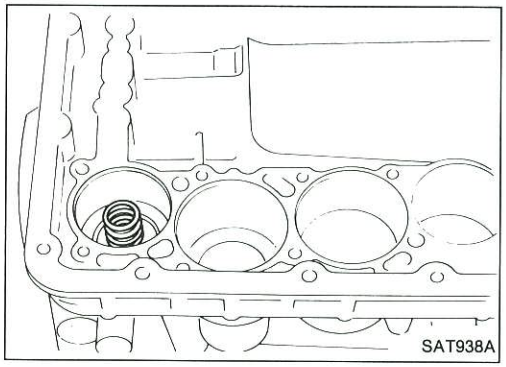
Assembly (Cont'd)



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)

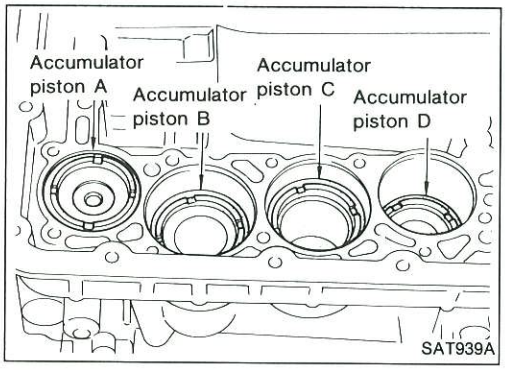
Accumulator	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)



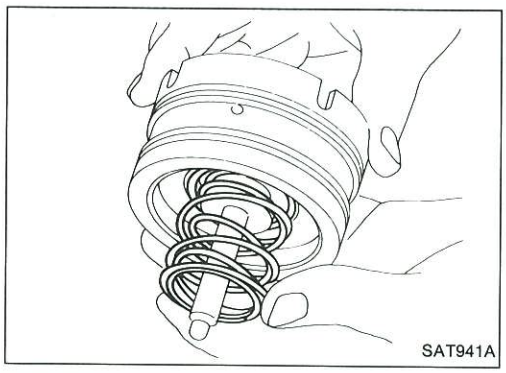
b. Install return spring for accumulator A onto transmission case.

Free length of return spring: Unit: mm (in)

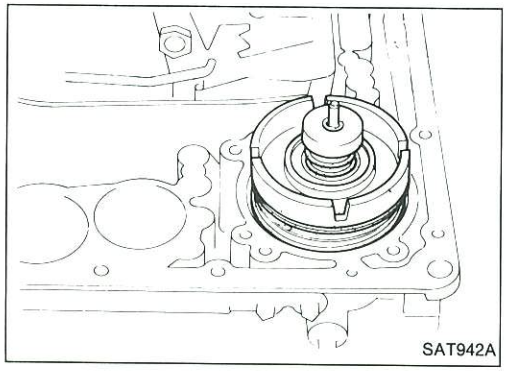
Accumulator	A
Free length	43 (1.69)



c. Install accumulator pistons A, B, C and D.
- **Apply A.T.F. to transmission case.**



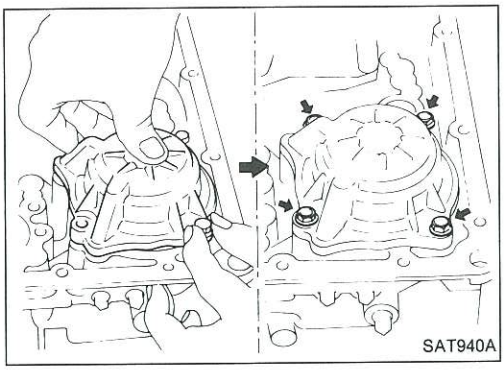
3. Install band servo piston.
a. Install return springs onto servo piston.



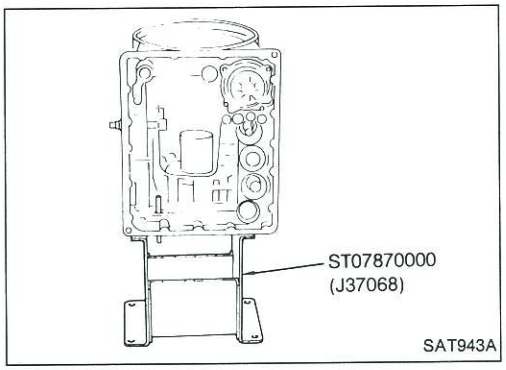
b. Install band servo piston onto transmission case.
- **Apply A.T.F. to O-ring of band servo piston and transmission case.**

c. Install gasket for band servo onto transmission case.

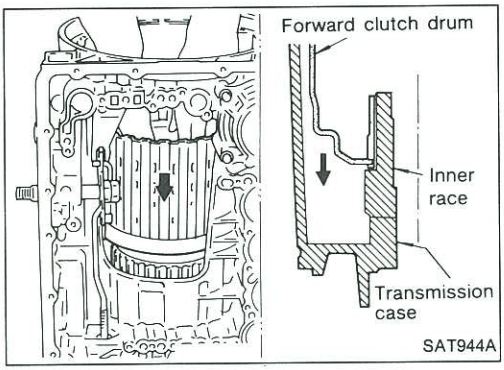
Assembly (Cont'd)



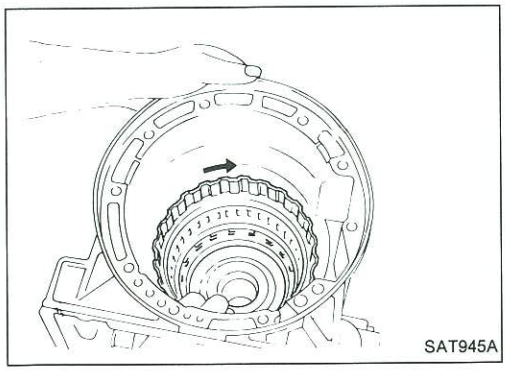
d. Install band servo retainer onto transmission case.



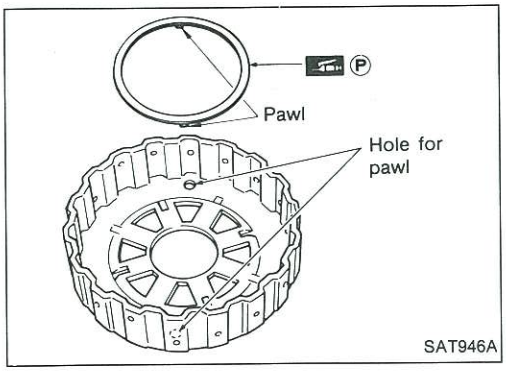
4. Install rear side clutch and gear components.
a. Place transmission case in vertical position.



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.



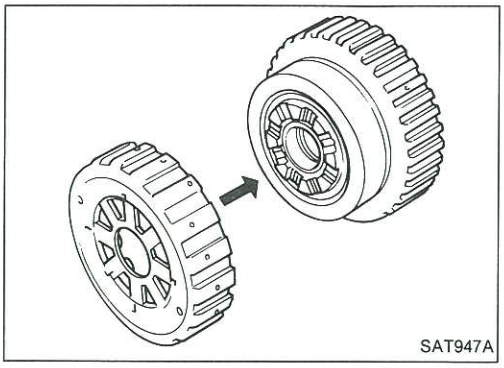
c. Check to be sure that rotation direction of forward clutch assembly is correct.



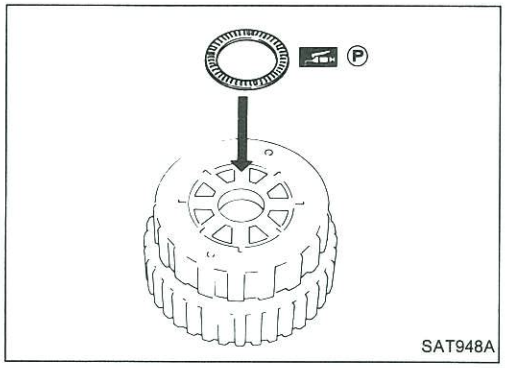
d. Install thrust washer onto front of overrun clutch hub.

- **Apply petroleum jelly to the thrust washer.**
- **Insert pawls of thrust washer securely into holes in overrun clutch hub.**

Assembly (Cont'd)

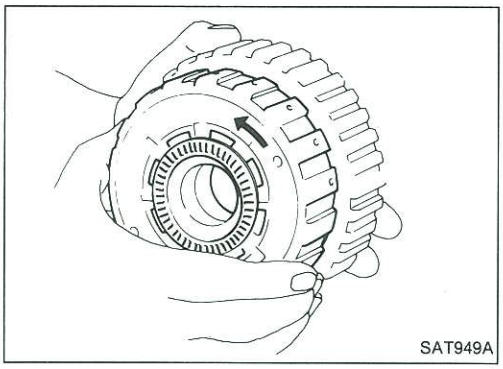


e. Install overrun clutch hub onto rear internal gear assembly.

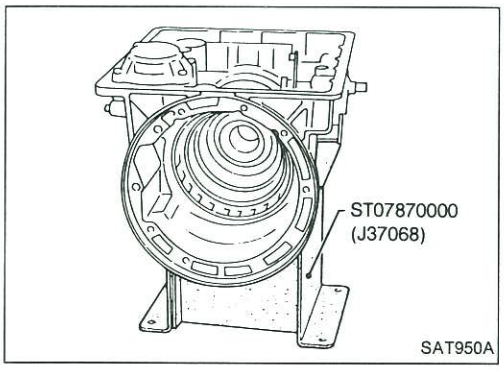


f. Install needle bearing onto rear of overrun clutch hub.

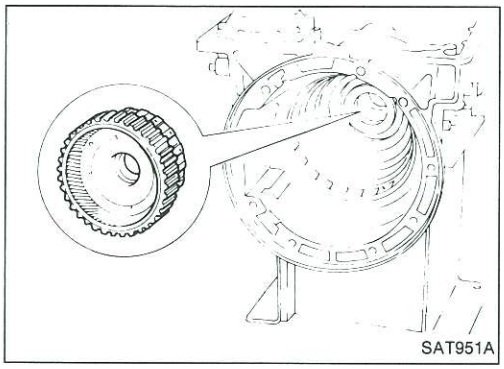
- **Apply petroleum jelly to needle bearing.**



g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.

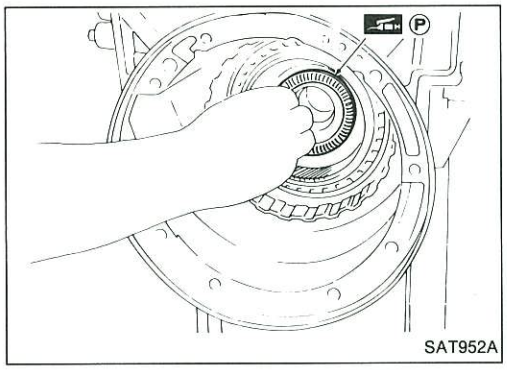


h. Place transmission case into horizontal position.



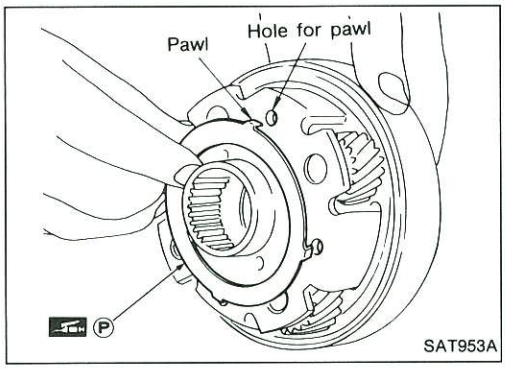
i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.

Assembly (Cont'd)



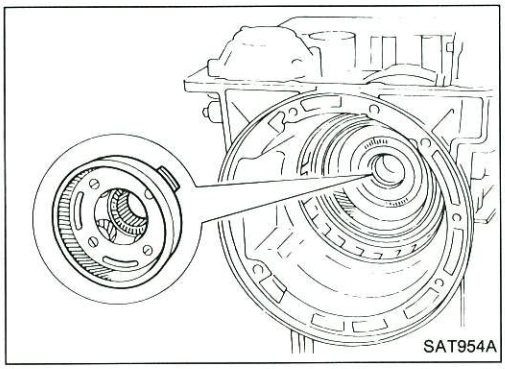
j. Install needle bearing onto rear internal gear.

- **Apply petroleum jelly to needle bearing.**



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.**



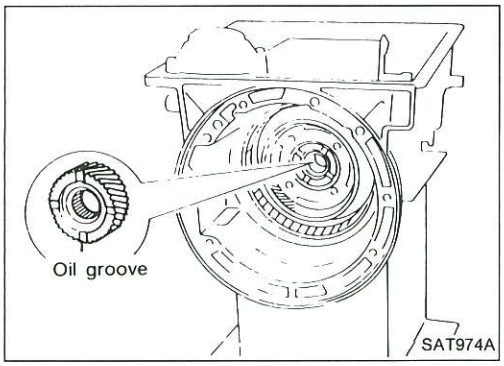
l. Install front internal gear on transmission case.

Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

Item / 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	—	●

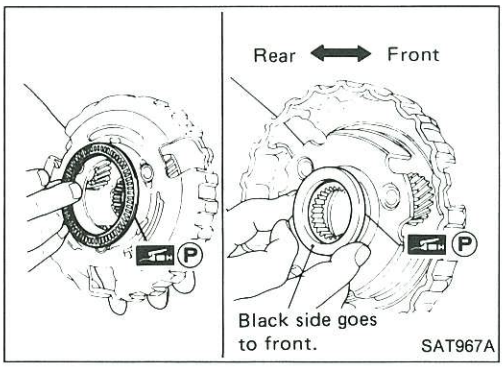
Adjustment (Cont'd)



1. Install front side clutch and gear components.

a. Install rear sun gear on transmission case.

- **Pay attention to its direction.**

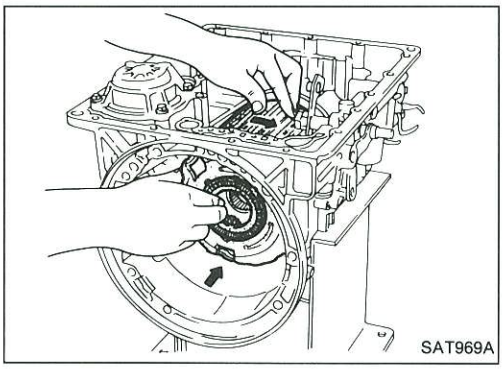


b. Install needle bearing on front of front planetary carrier.

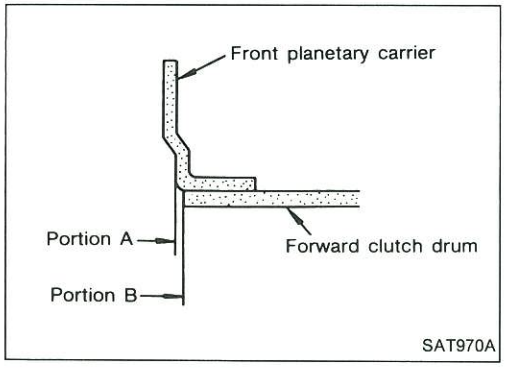
- **Apply petroleum jelly to needle bearing.**

c. Install needle bearing on rear of front planetary carrier.

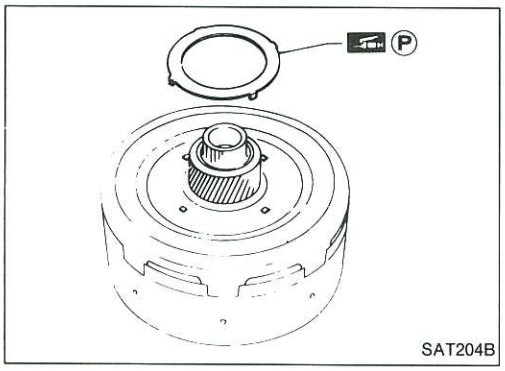
- **Apply petroleum jelly to bearing.**
- **Pay attention to its direction — Black side goes to front.**



d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



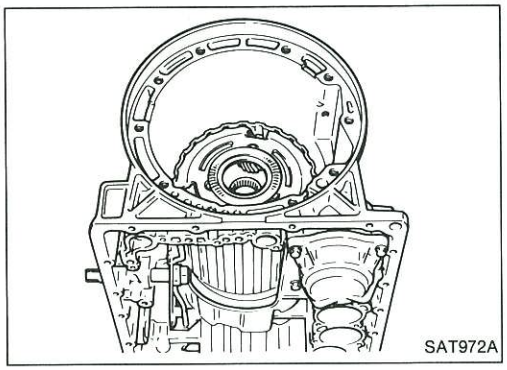
- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.**



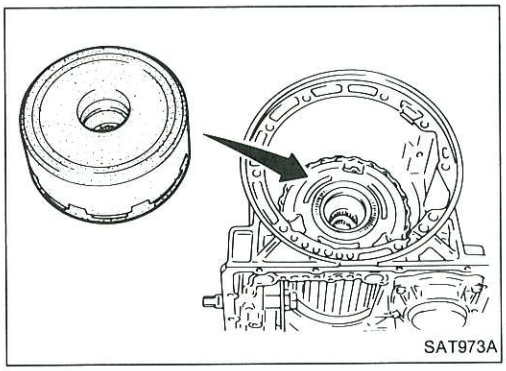
e. Install bearing race on rear of clutch pack.

- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing race with hole in clutch pack.**

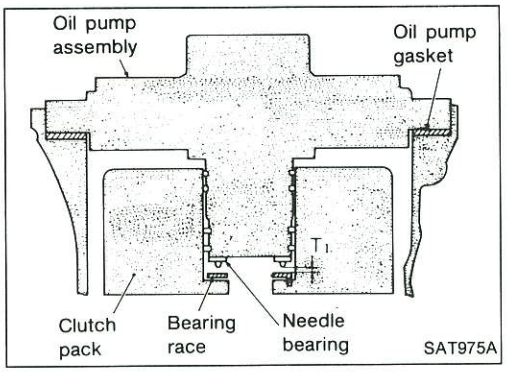
Adjustment (Cont'd)



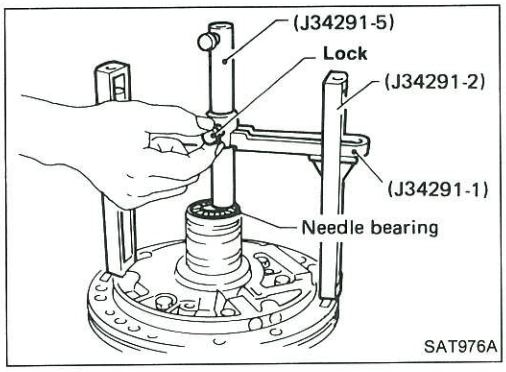
f. Place transmission case in vertical position.



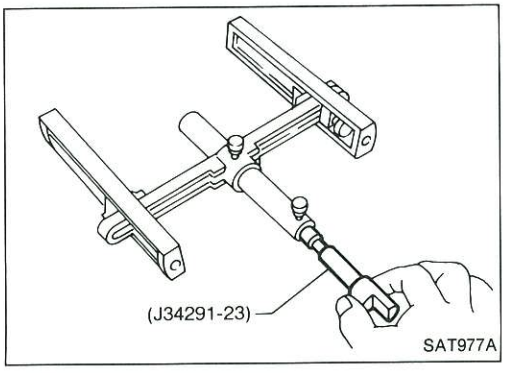
g. Install clutch pack into transmission case.



2. Adjust total end play.
   Total end play "T_1":
   0.25 - 0.55 mm (0.0098 - 0.0217 in)

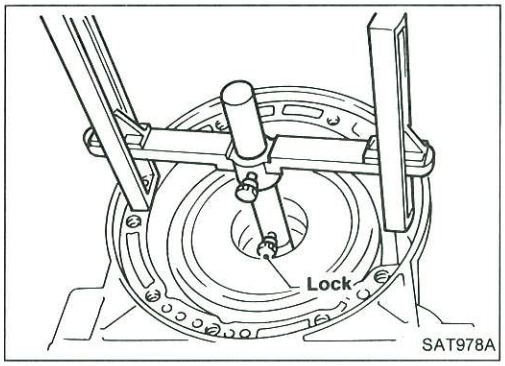


a. With needle bearing installed, place J34291-1 (bridge), J34291-2 (legs) and the J34291-5 (gauging cylinder) onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly and gauging cylinder should rest on top of the needle bearing. Lock gauging cylinder in place with set screw.

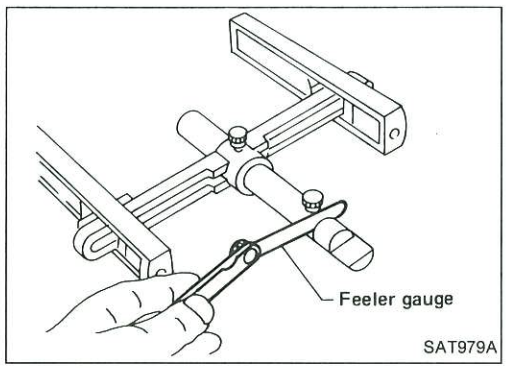


b. Install J34291-23 (gauging plunger) into gauging cylinder.

Adjustment (Cont'd)



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.

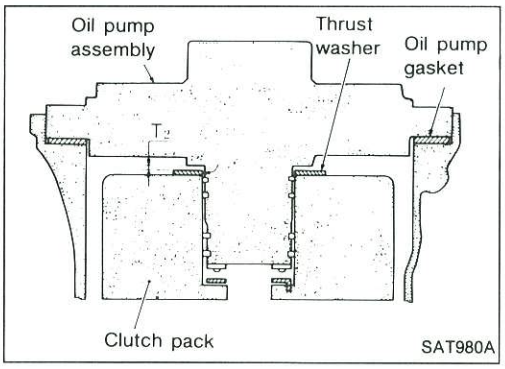


d. Remove Tool and use feeler gauge to measure gap between gauging cylinder and gauging plunger. This measurement should give exact total end play.

Total end play "T_1":
0.25 - 0.55 mm (0.0098 - 0.0217 in)

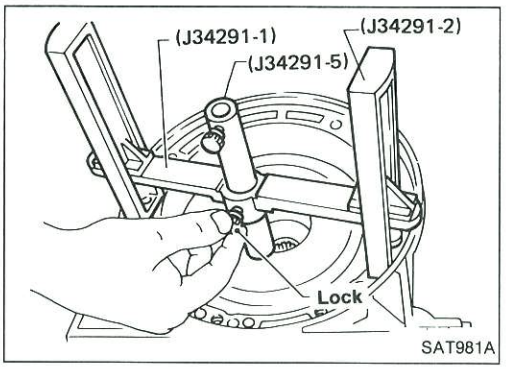
- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

Available oil pump cover bearing race:
Refer to S.D.S.

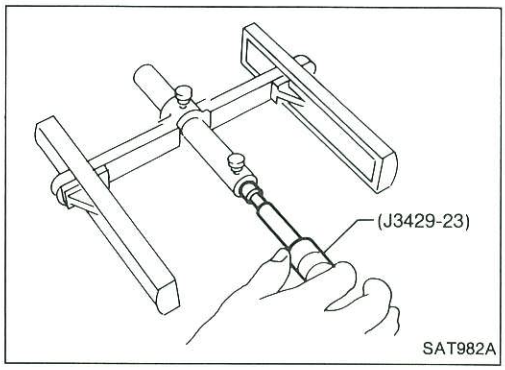


3. Adjust reverse clutch drum end play.

Reverse clutch drum end play "T_2":
0.55 - 0.90 mm (0.0217 - 0.0354 in)

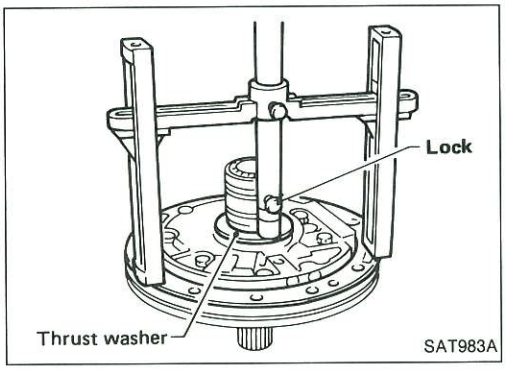


a. Place J34291-1 (bridge), J34291-2 (legs) and J34291-5 (gauging cylinder) on machined surface of transmission case (no gasket) and allow gauging cylinder to rest on front thrust surface of reverse clutch drum. Lock cylinder in place with set screw.

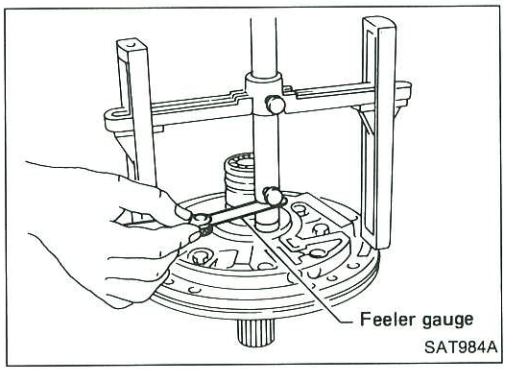


b. Install J34291-23 (gauging plunger) into gauging cylinder.

Adjustment (Cont'd)



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 end 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.

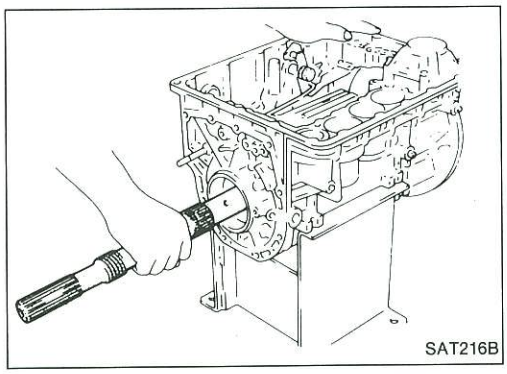
Available oil pump thrust washer:
Refer to S.D.S.

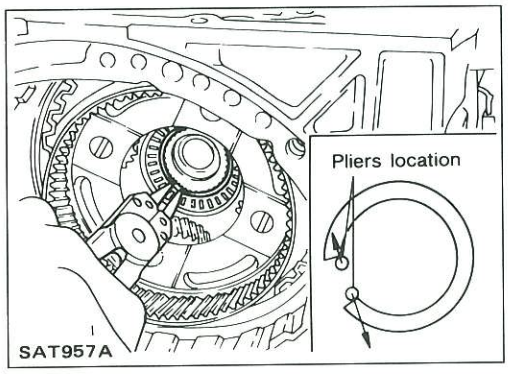
Assembly

1. Install output shaft and parking gear.

a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.

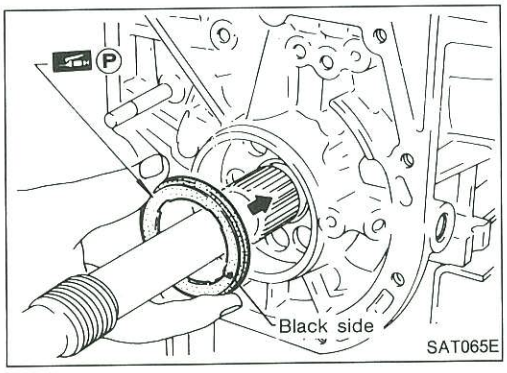
- **Do not force output shaft against front of transmission case.**





b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.

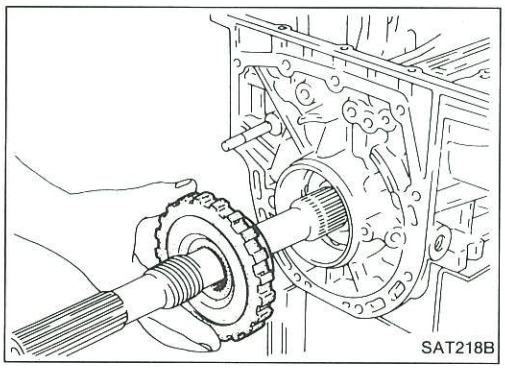
- **Check to be sure output shaft cannot be removed in rear direction.**



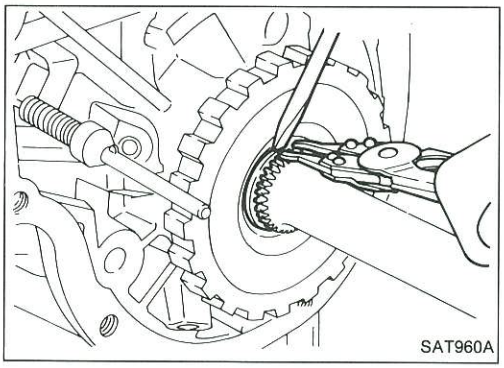
c. Install needle bearing on transmission case.

- **Pay attention to its direction — Black side goes to rear.**
- **Apply petroleum jelly to needle bearing.**

Assembly (Cont'd)

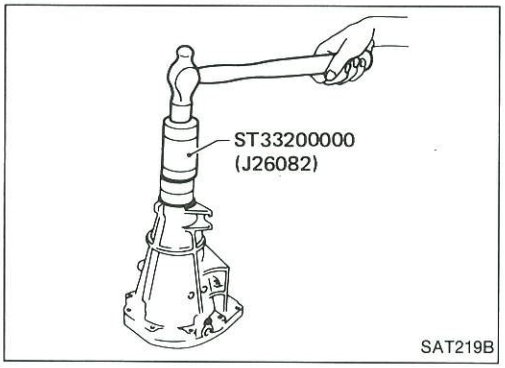


d. Install parking gear on transmission case.



e. Install snap ring on rear of output shaft.

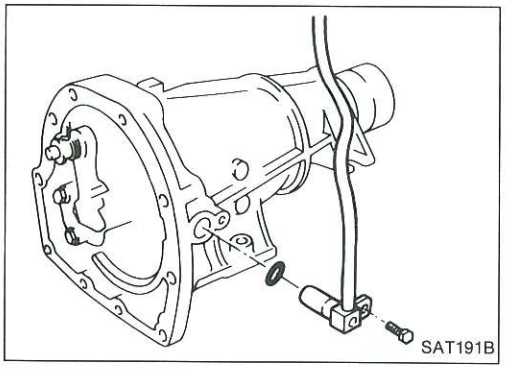
- **Check to be sure output shaft cannot be removed in forward direction.**



2. Install rear extension.

a. Install oil seal on rear extension.

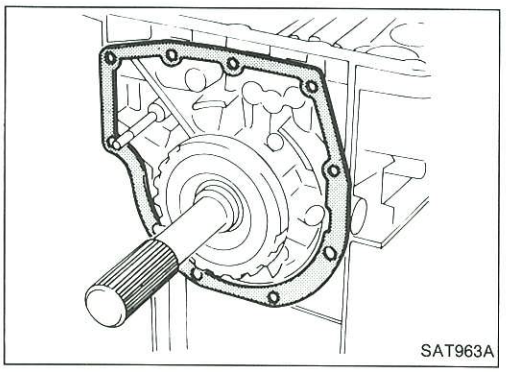
- **Apply A.T.F. to oil seal.**



b. Install O-ring on revolution sensor.

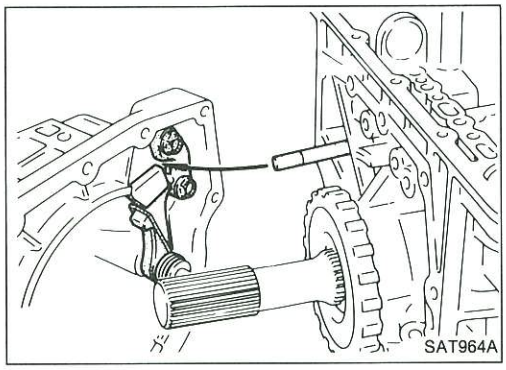
- **Apply A.T.F. to O-ring.**

c. Install revolution sensor on rear extension.

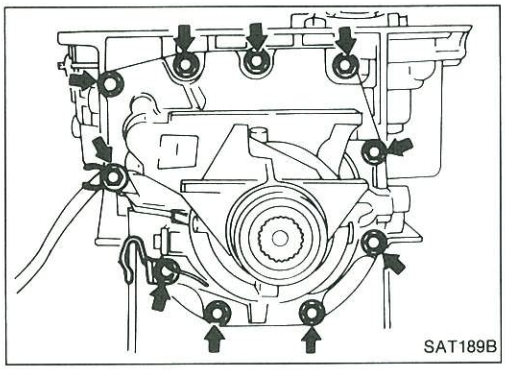


d. Install rear extension gasket on transmission case.

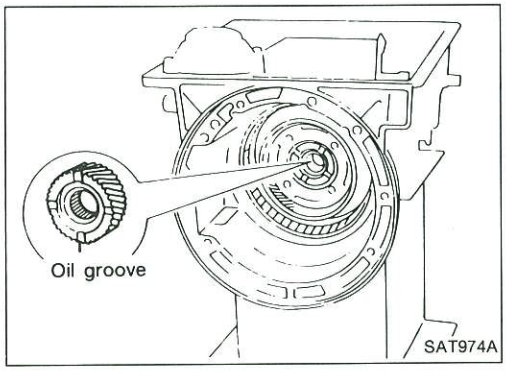
Assembly (Cont'd)



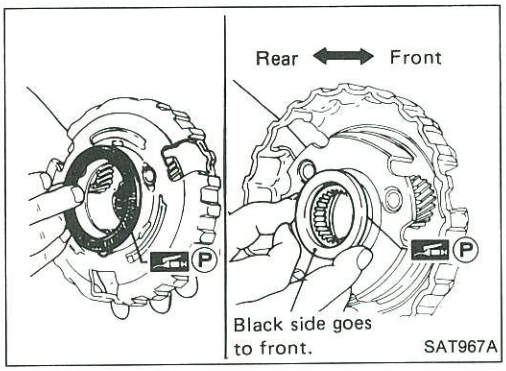
e. Install parking rod on transmission case.



f. Install rear extension on transmission case.

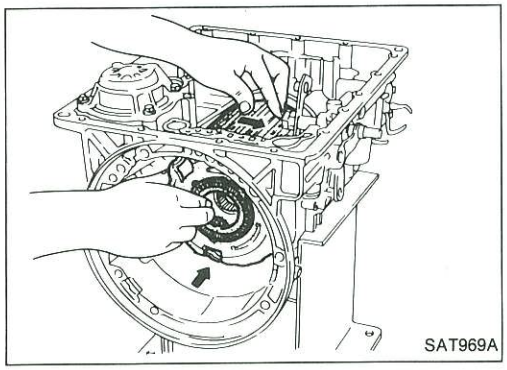


3. Install front side clutch and gear components.
a. Install rear sun gear on transmission case.
- **Pay attention to its direction.**



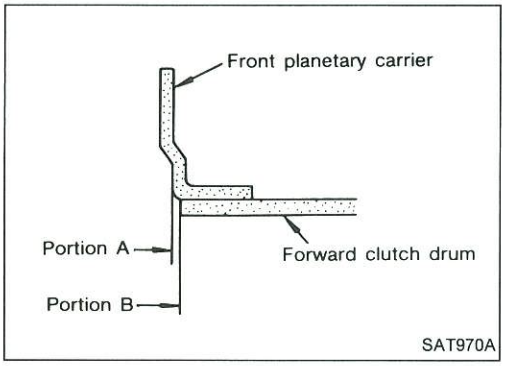
b. Make sure needle bearing is on front of front planetary carrier.
- **Apply petroleum jelly to needle bearing.**

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.**

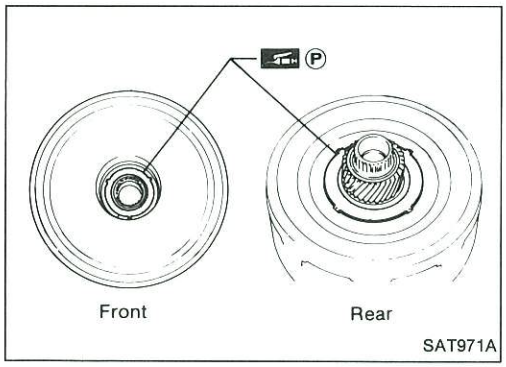


d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.

Assembly (Cont'd)

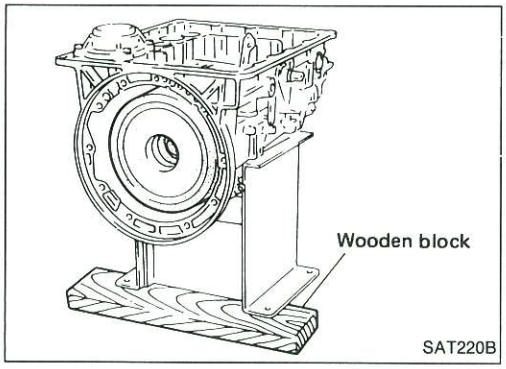


- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.**

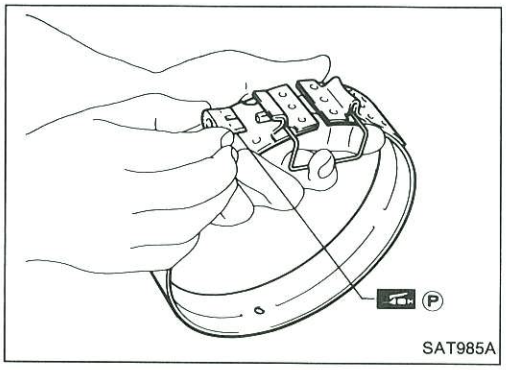


e. Make sure bearing races are on front and rear of clutch pack.

- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing races with holes in clutch pack.**

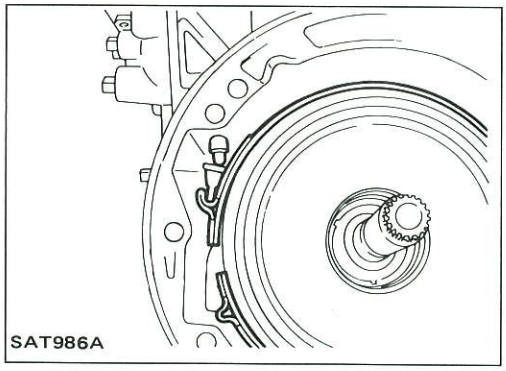


f. Install clutch pack into transmission case.



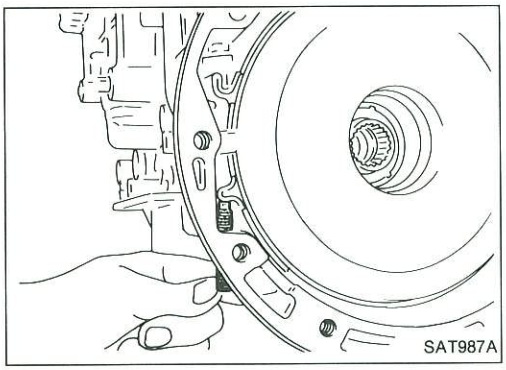
4. Install brake band and band strut.
a. Install band strut on brake band.

- **Apply petroleum jelly to band strut.**

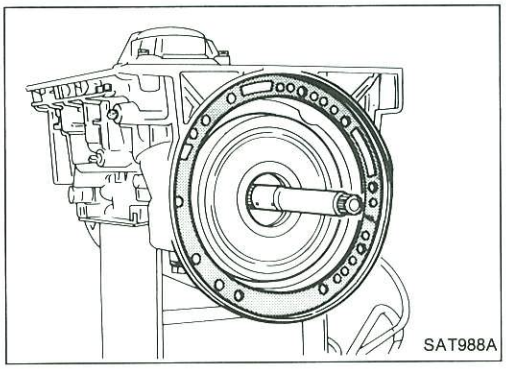


b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.

Assembly (Cont'd)

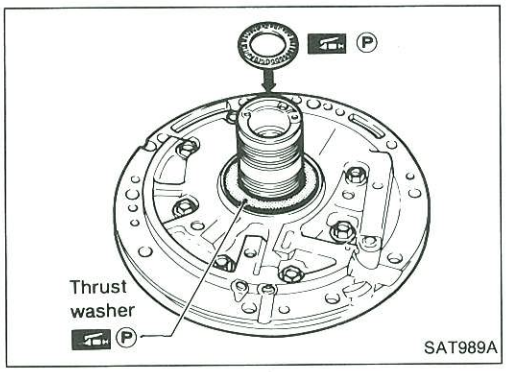


c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.



5. Install input shaft on transmission case.
- **Pay attention to its direction — O-ring groove side is front.**

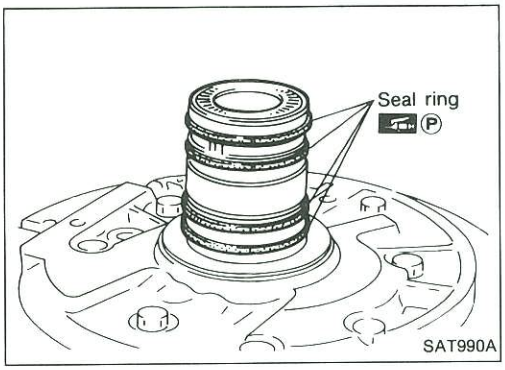
6. Install gasket on transmission case.



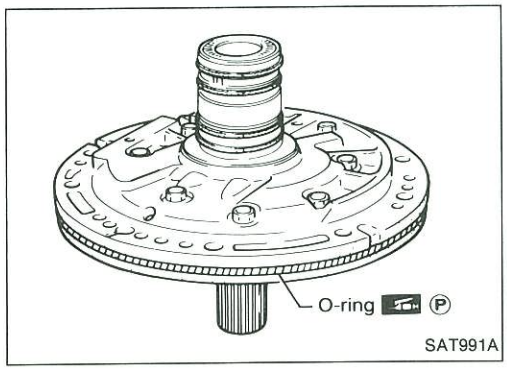
7. Install oil pump assembly.

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.**

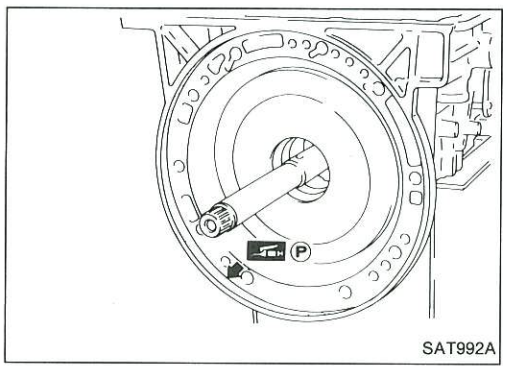


c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.

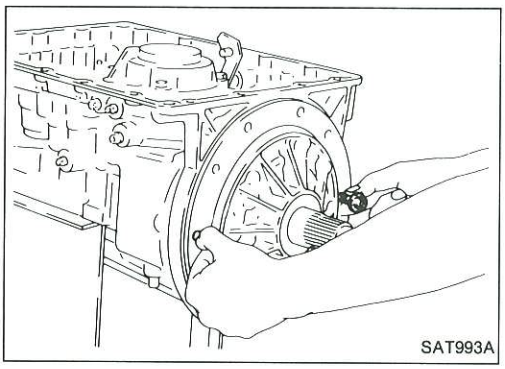


d. Install O-ring on oil pump assembly.
- **Apply petroleum jelly to O-ring.**

Assembly (Cont'd)

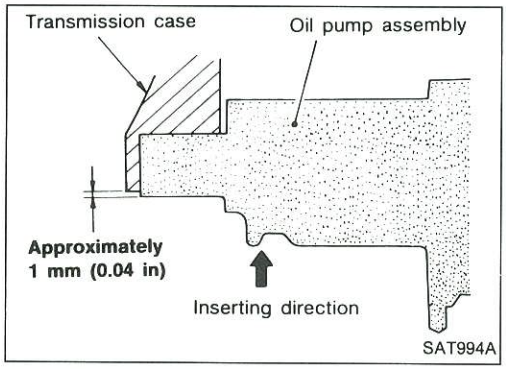


e. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.

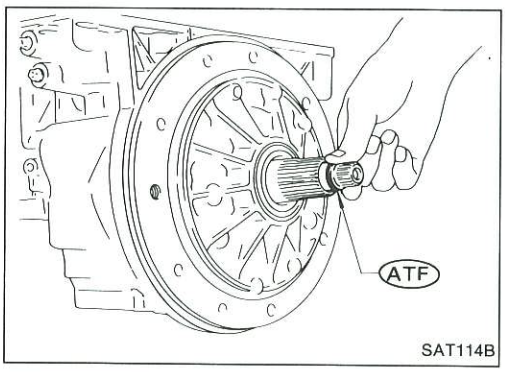


f. Install oil pump assembly.

- **Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.**

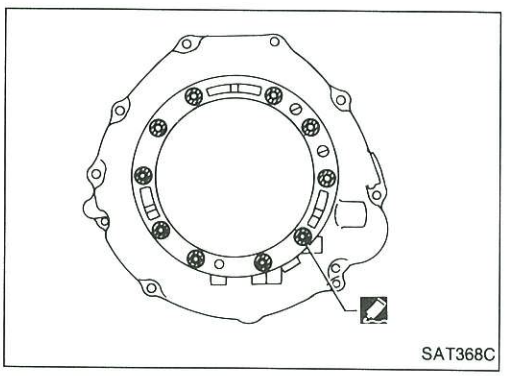


- **Insert oil pump assembly to the specified position in transmission, as shown at left.**



8. Install O-ring on input shaft.

- **Apply A.T.F. to O-rings.**

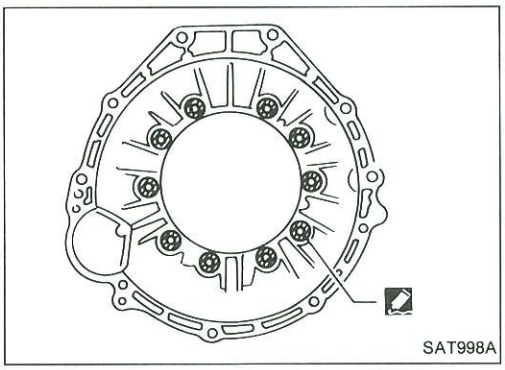


9. Install converter housing.

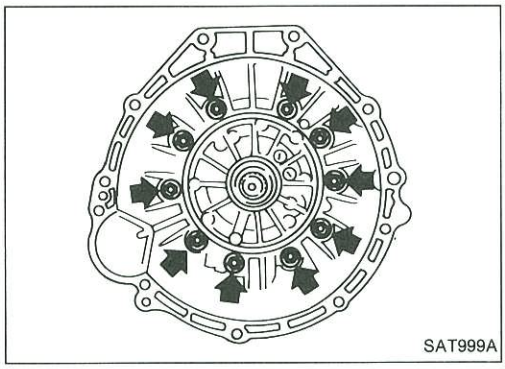
a. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.

- **Do not apply too much sealant.**

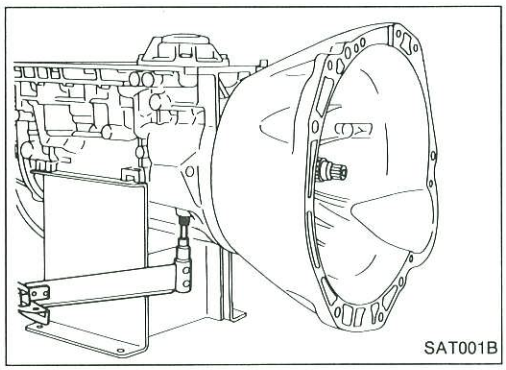
Assembly (Cont'd)


SAT998A

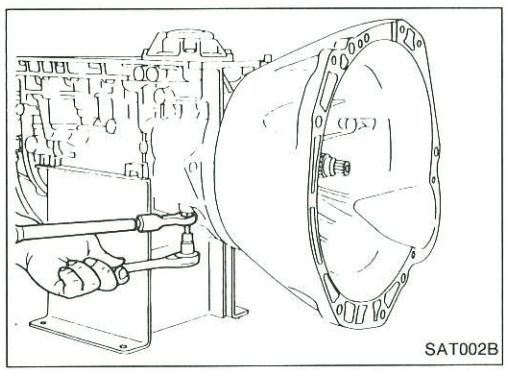
b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.


SAT999A

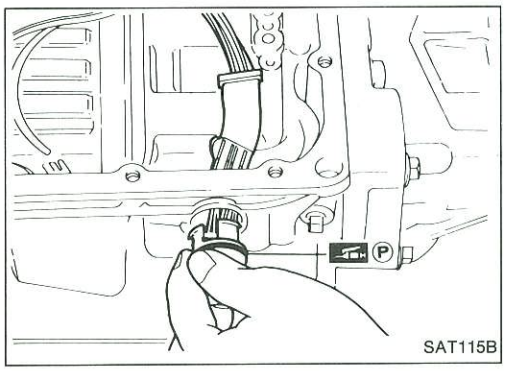
c. Install converter housing on transmission case.


SAT001B

10. Adjust brake band.
a. Tighten anchor end bolt to specified torque.
Anchor end bolt:
: 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

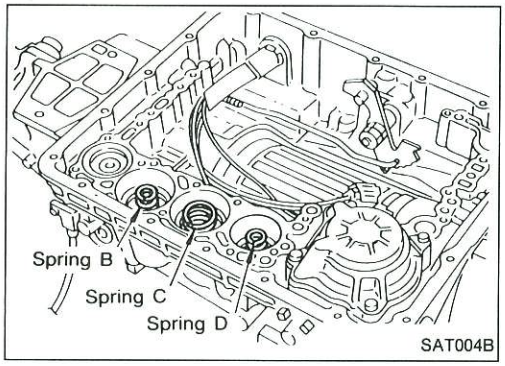
c. While holding anchor end pin, tighten lock nut.


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.

Assembly (Cont'd)

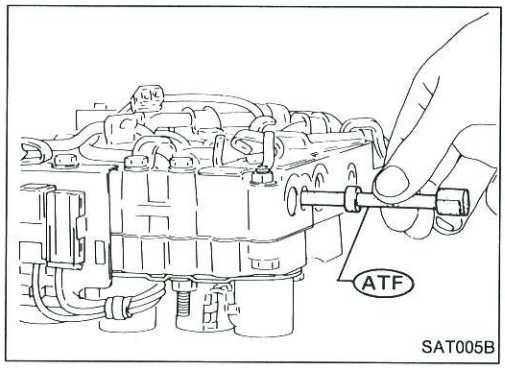


12. Install control valve assembly.
a. Install accumulator piston return springs B, C and D.

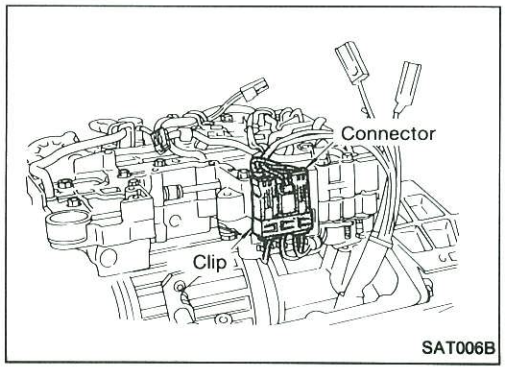
Free length of return springs:

Unit: mm (in)

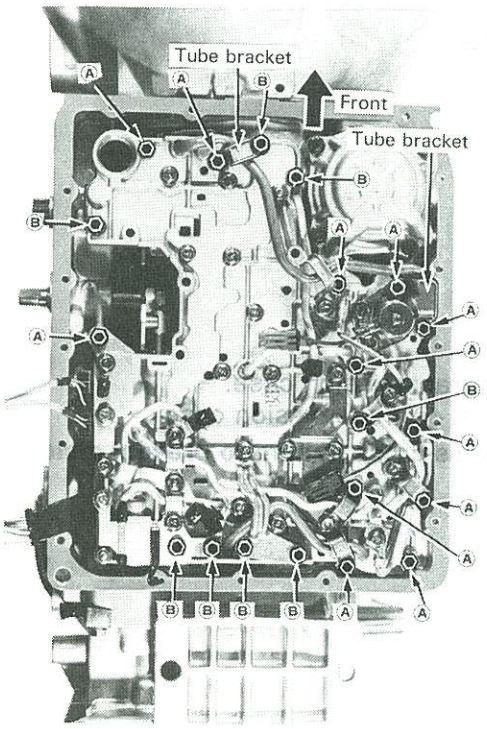
Item \ Accumulator	B	C	D
Free length	66 (2.60)	45 (1.77)	58.4 (2.299)



b. Install manual valve on control valve.
- **Apply A.T.F. to manual valve.**



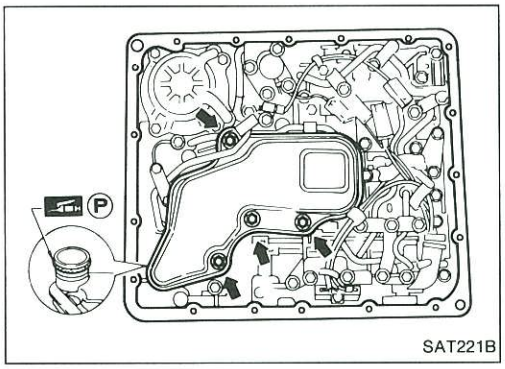
c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
d. Install connector clip.



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	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

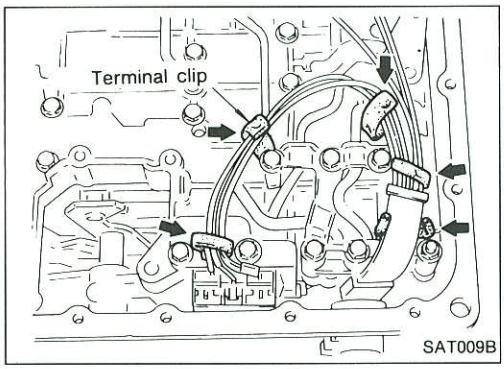
Assembly (Cont'd)



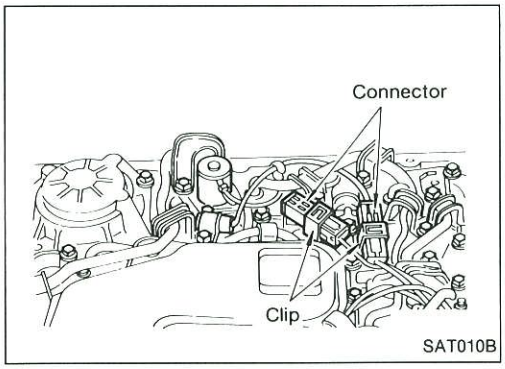
g. Install O-ring on oil strainer.

- **Apply petroleum jelly to O-ring.**

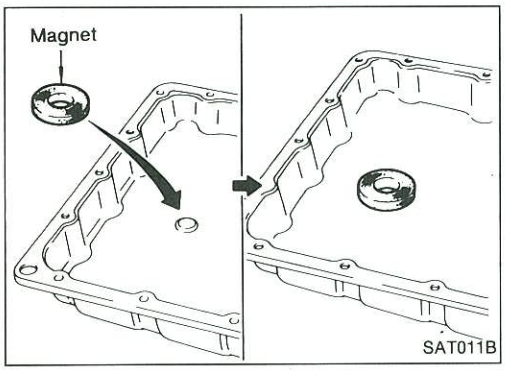
h. Install oil strainer on control valve.



i. Securely fasten terminal harness with clips.

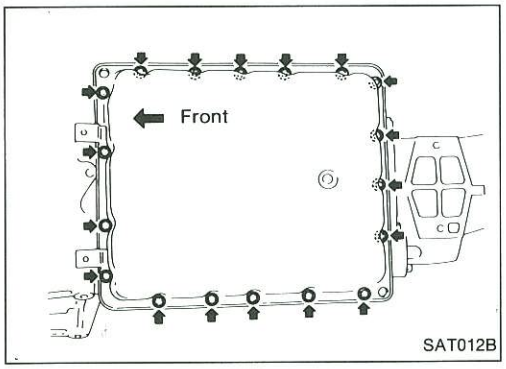


j. Install lock-up solenoid and fluid temperature sensor connectors.



13. Install oil pan.

a. Attach a magnet to oil pan.

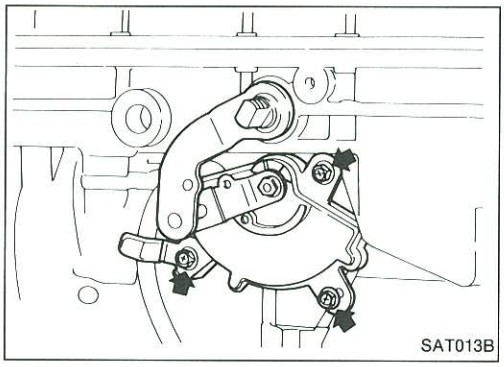


b. Install oil pan gasket on transmission case.

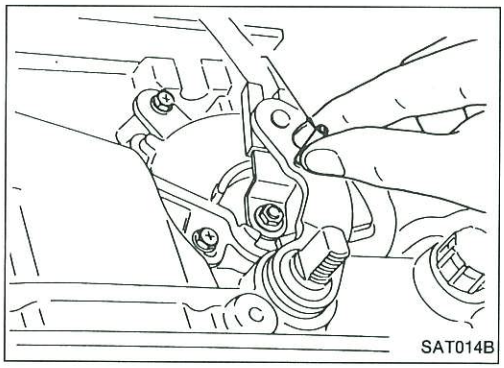
c. Install oil pan and bracket on transmission case.

- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

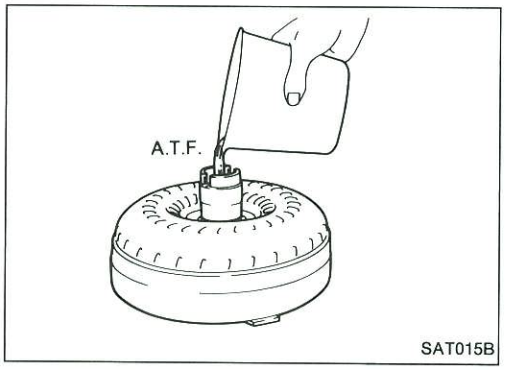
Assembly (Cont'd)



14. Install inhibitor switch.
a. Check that manual shaft is in "1" range.
b. Temporarily install inhibitor switch on manual shaft.
c. Move manual shaft to "N".

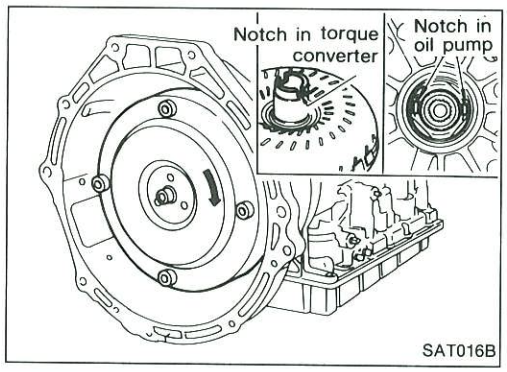


d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.

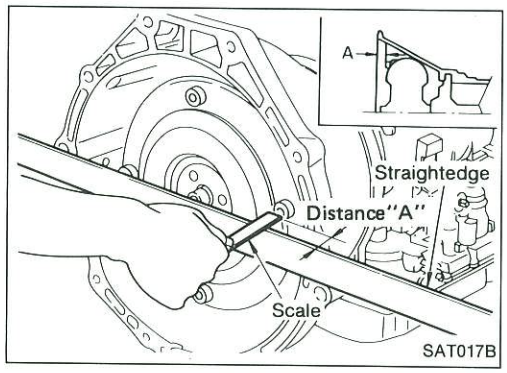


15. Install torque converter.
a. Pour A.T.F. into torque converter.

- **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":
26 mm (1.02 in) or more

General Specifications

Engine	VG30E
Automatic transmission model	RE4R01A
Transmission model code number	45 x 05
Stall torque ratio	2.0 : 1
Transmission gear ratio	
1st	2.785
2nd	1.545
Top	1.000
O.D.	0.694
Reverse	2.272
Recommended oil	Automatic transmission fluid Type DEXRON™
Oil capacity ℓ (US qt, Imp qt)	8.3 (8-3/4, 7-1/4)

Specifications and Adjustment

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	58 - 61 (36 - 38)	103 - 111 (64 - 69)	160 - 170 (99 - 106)	154 - 164 (96 - 102)	98 - 106 (61 - 66)	48 - 52 (30 - 32)
Half throttle	42 - 46 (26 - 29)	81 - 87 (50 - 54)	112 - 122 (70 - 76)	73 - 81 (45 - 50)	45 - 51 (28 - 32)	10 - 14 (6 - 9)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Throttle position	O.D. switch [Shift range]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D_4]	161 - 169 (100 - 105)	155 - 163 (96 - 101)
Half throttle	ON [D_4]	121 - 129 (75 - 80)	116 - 124 (72 - 77)

STALL REVOLUTION

Stall revolution rpm
2,200 - 2,400

LINE PRESSURE

Engine speed rpm	Line pressure kPa (kg/cm^2, psi)	
	D, 2 and 1 ranges	R range
Idle	432 - 471 (4.4 - 4.8, 63 - 68)	667 - 706 (6.8 - 7.2, 97 - 102)
Stall	883 - 961 (9.0 - 9.8, 128 - 139)	1,393 - 1,471 (14.2 - 15.0, 202 - 213)

Specifications and Adjustment (Cont'd)

RETURN SPRINGS

Unit: mm (in)

Parts		Item	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)
		Accumulator control valve spring	31742-41X60	17.0 (0.669)	10.5 (0.413)
		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 valve spring	31742-41X15	30.5 (1.201)	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 (0.315)
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	29.0 (1.142)	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)	

ACCUMULATOR O-RING

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	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	0.5 - 0.8 (0.020 - 0.031)	
Allowable limit	2.05 (0.0807)	
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)	31567-41X13
	5.8 (0.228)	31567-41X14

High 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	1.8 - 2.2 (0.071 - 0.087)	
Allowable limit	3.0 (0.118)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.0 (0.118)	31537-41X69
	3.2 (0.126)	31537-41X70
	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

Forward clutch		
Number of drive plates	6	
Number of driven plates	6	
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	2.05 (0.0807)	
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)	31537-41X12
	5.2 (0.205)	31537-41X13

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 (Cont'd)

Low & reverse brake		
Number of drive plates	7	
Number of driven plates	7	
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	2.5 (0.098)	
	Thickness mm (in)	Part number
Thickness of retaining plate	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 mm (in)	Part number
Thickness of oil pump cover bearing race	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 mm (in)	Part number
Thickness of oil pump thrust washer	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	11 - 15 N·m (1.1 - 1.5 kg-m, 8 - 11 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)

PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION PD

CONTENTS

PREPARATION ..... PD- 2

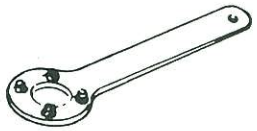
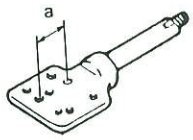
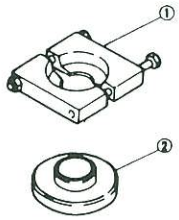
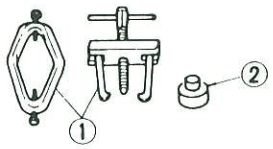
PROPELLER SHAFT

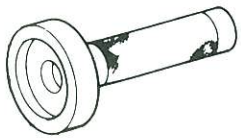
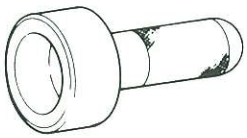
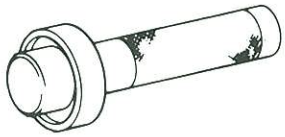
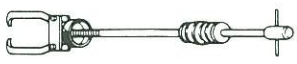
PROPELLER SHAFT ..... PD- 5

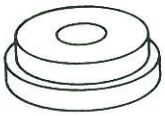
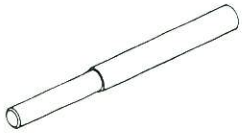
FINAL DRIVE

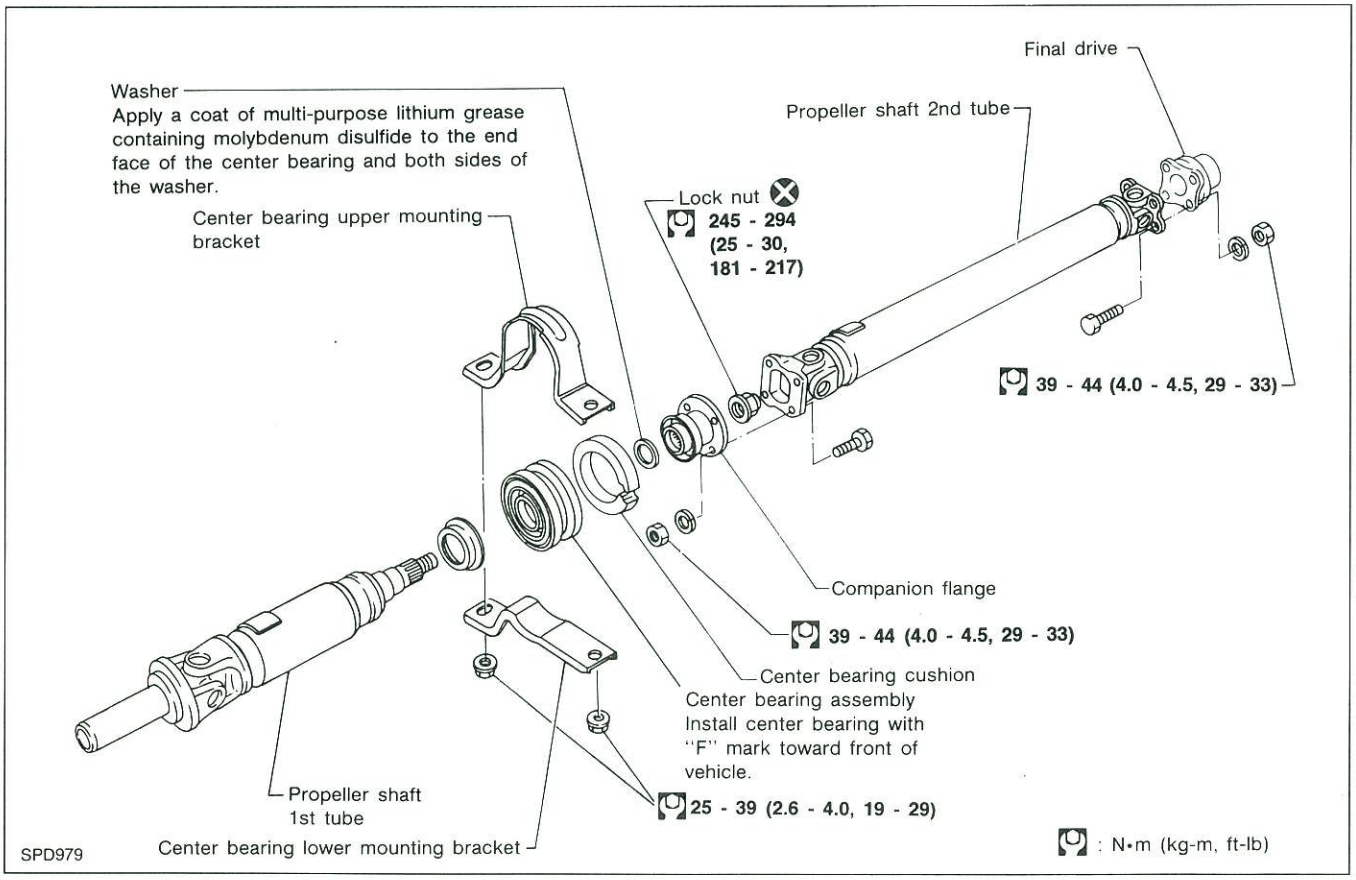
ON-VEHICLE SERVICE/REMOVAL AND INSTALLATION ..... PD- 9
FINAL DRIVE PD-11
DISASSEMBLY PD-12
INSPECTION PD-17
ADJUSTMENT PD-18
ASSEMBLY PD-25
SERVICE DATA AND SPECIFICATIONS (S.D.S.) PD-30

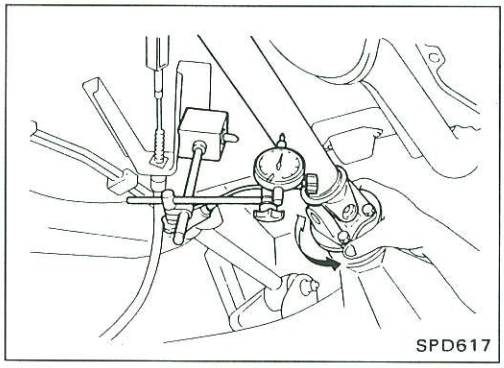
SPECIAL SERVICE TOOLS

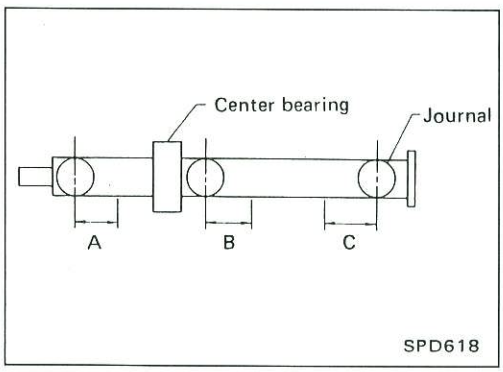
Tool number (Kent-Moore No.) Tool name	Description	
ST31520000 (—) Drive pinion flange wrench		Removing and installing propeller shaft lock nut, and drive pinion lock nut
KV38100800 (—) Equivalent tool (J25604-01) Differential attachment	 **a: 152 mm (5.98 in)**	Mounting final drive (To use, make a new hole.)
ST3090S000 (—) Drive pinion rear inner race puller set ①ST30031000 (J22912-01) Puller ②ST30901000 (—) Equivalent tool (J26010-01) Base		Removing and installing drive pinion rear cone
ST3306S001 (—) Differential side bearing puller set ①ST33051001 (—) Equivalent tool (J22888) Body ②ST33061000 (J8107-2) Equivalent tool (J26010-01) Adapter		Removing and installing differential side bearing inner cone
ST30611000 (J25742-1) Drift		Installing pinion rear bearing outer race
ST30613000 (J25742-3) Drift		Installing pinion front bearing outer race

Tool number (Kent-Moore No.) Tool name	Description
ST30621000 (—) Drift	Installing pinion rear bearing outer race
KV38100200 (J26233) Gear carrier side oil seal drift	Installing side oil seal 
KV38100500 (—) Gear carrier front oil seal drift	Installing front oil seal 
KV38100300 (J25523) Differential side bearing inner cone	Installing side bearing inner cone 
KV38100600 (J25267) Side bearing spacer drift	Installing side bearing spacer
ST3127S000 (See J25765-A) Preload gauge ① GG91030000 (J25765) Torque wrench ② HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter	Measuring pinion bearing preload and total preload
HT72400000 (—) Slide hammer	Removing differential case assembly 

Tool number (Kent-Moore No.) Tool name	Description	
(J34309) Differential shim selector		Adjusting bearing preload and gear height
(J25269-4) Side bearing discs (2 Req'd)		Selecting pinion height adjusting washer
(J8129) Spring gauge		Measuring carrier turning torque
ST33290001 (J2581-A) Side bearing outer race puller		Removing and installing differential side bearing outer race
KV38100401 (—) Pilot bearing drift		Removing pilot bearing, pilot bearing spacer and front bearing inner cone







On-vehicle Service

PROPELLER SHAFT VIBRATION

If vibration is present at high speed, inspect propeller shaft runout first.

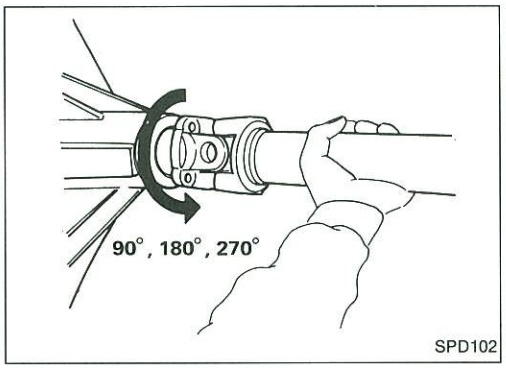
1. Raise rear wheels.
2. Measure propeller shaft runout at indicated points by rotating final drive companion flange with hands.

Runout limit: 0.6 mm (0.024 in)

Propeller shaft runout measuring points:

Distance "A"
162 mm (6.38 in)
Distance "B"
172 mm (6.77 in)
Distance "C"
192 mm (7.56 in)

On-vehicle Service (Cont'd)



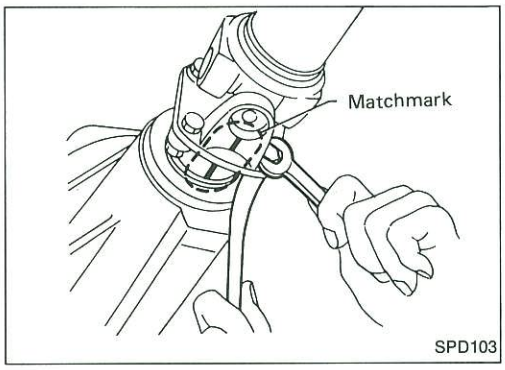
SPD102

3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange; then rotate companion flange 90, 180 or 270 degrees and reconnect propeller shaft.
4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.

APPEARANCE CHECKING

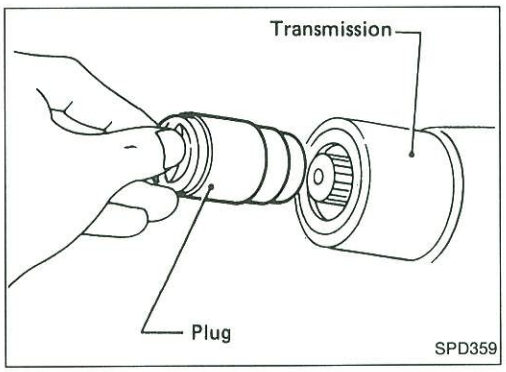
- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace it.

Removal and Installation



SPD103

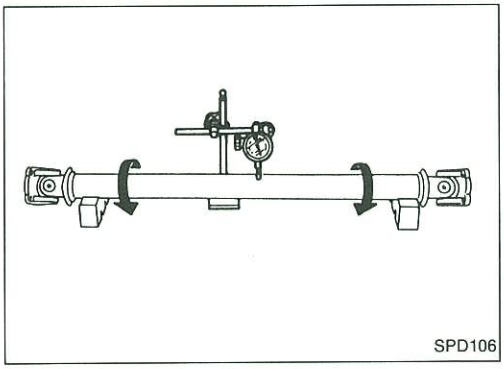
- Put matchmarks on flanges and separate propeller shaft from final drive.



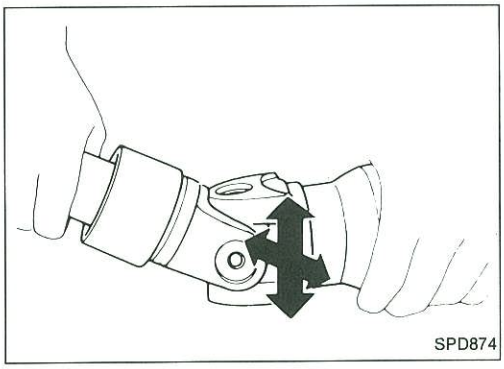
SPD359

- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.

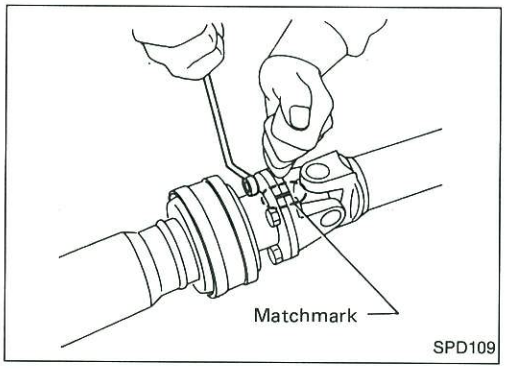
Inspection


SPD106

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.
  Runout limit: 0.6 mm (0.024 in)


SPD874

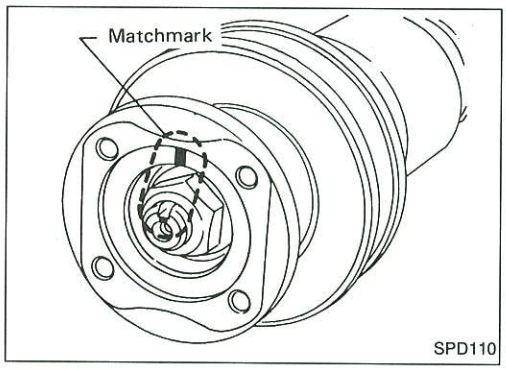
- Inspect journal axial play.
  If the play exceeds specifications, replace propeller shaft assembly.
  Journal axial play: 0 mm (0 in)



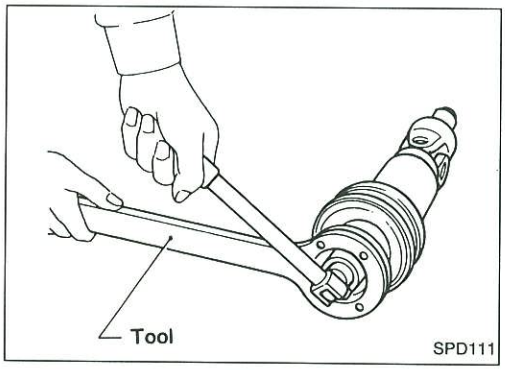
Disassembly

CENTER BEARING

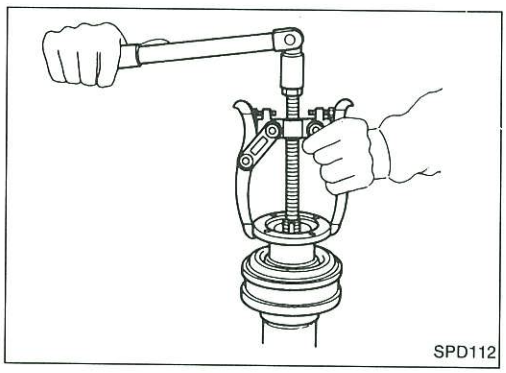
1. Put matchmarks on flanges, and separate 2nd tube from 1st tube.



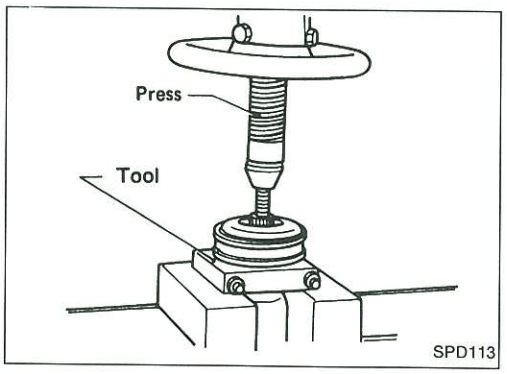
2. Put matchmarks on the flange and shaft.



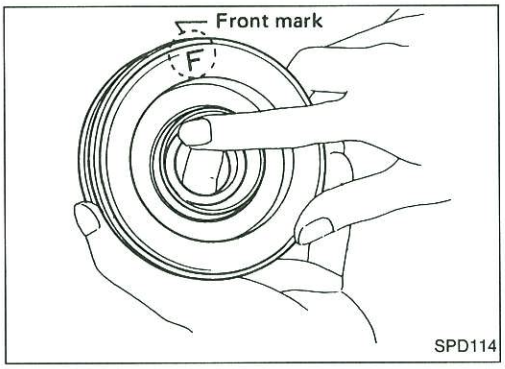
3. Remove lock nut with Tool.
   Tool number: ST31520000 (—)



4. Remove companion flange with puller.



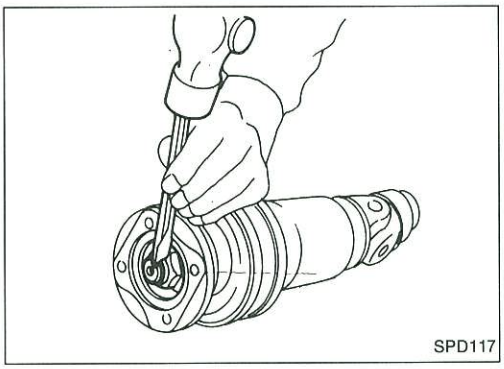
5. Remove center bearing with Tool and press.
   Tool number: ST30031000 (J22912-01)



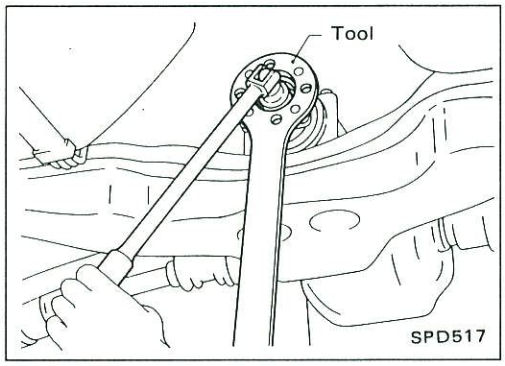
Assembly

CENTER BEARING

- When installing center bearing, position the "F" mark on center bearing toward 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.**

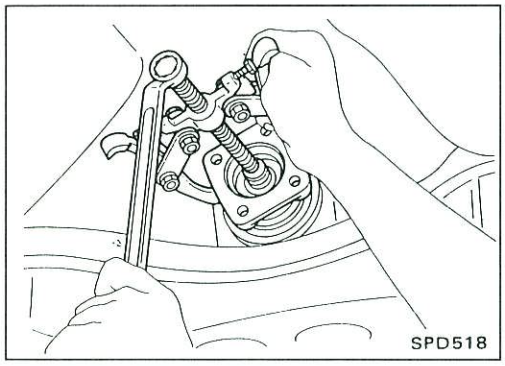


- Stake the nut. Always use new one.
- Align matchmarks when assembling tubes.

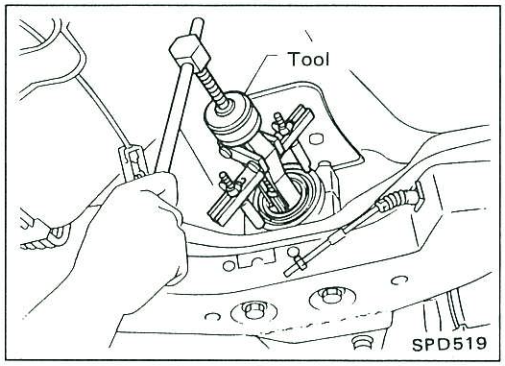


Front Oil Seal Replacement

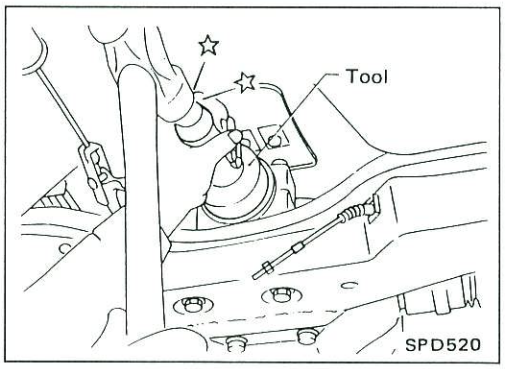
1. Remove propeller shaft.
2. Loosen drive pinion nut with Tool.
   Tool number: ST31520000 (—)



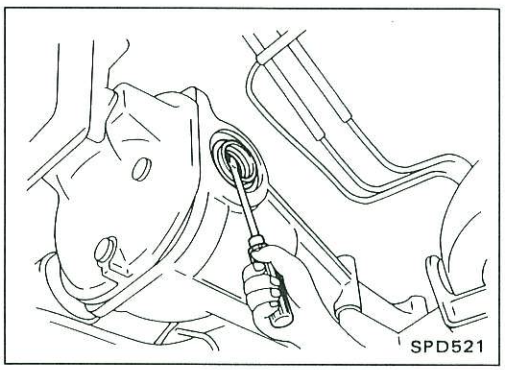
3. Remove companion flange.



4. Remove front oil seal with Tool.
   Tool number: ST33290001 (J25810-A)



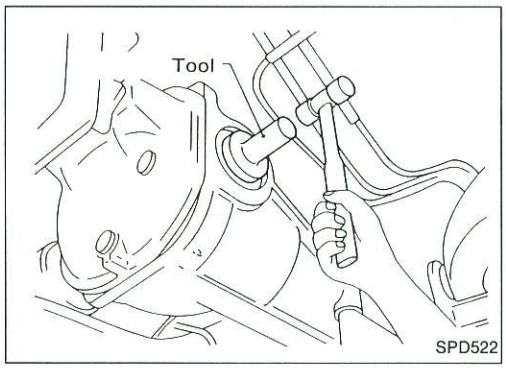
5. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Press front oil seal into carrier.
   Tool number: KV38100500 (—)
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.



Side Oil Seal Replacement

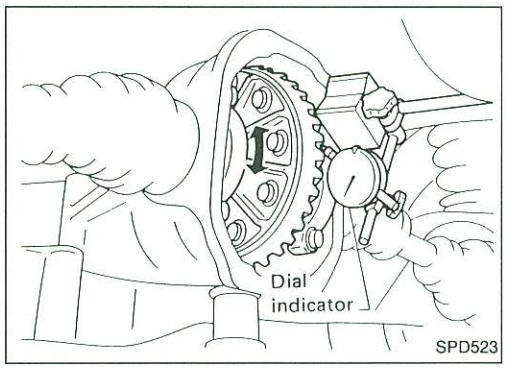
1. Remove drive shafts.
   Refer to RA section.
2. Remove oil seal.

Side Oil Seal Replacement (Cont'd)



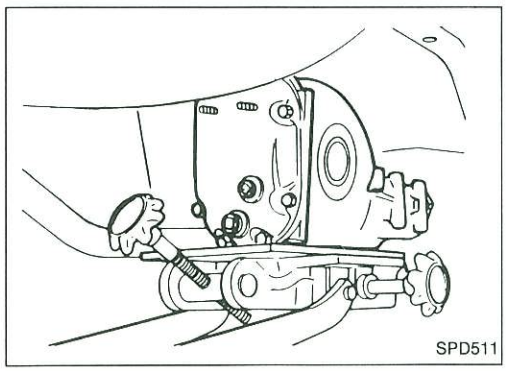
3. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Press-fit oil seal into carrier.
   Tool number: KV38100200 (J26233)
4. Install drive shafts.

Ring Gear to Drive Pinion Backlash



1. Support carrier with a jack.
2. Remove rear cover.
3. Check ring gear to drive pinion backlash with a dial indicator, at several points. If it is not within specifications, adjust it after removing final drive assembly.
   Ring gear to drive pinion backlash:
   0.10 - 0.15 mm (0.0039 - 0.0059 in)

Removal



- Remove propeller shaft.

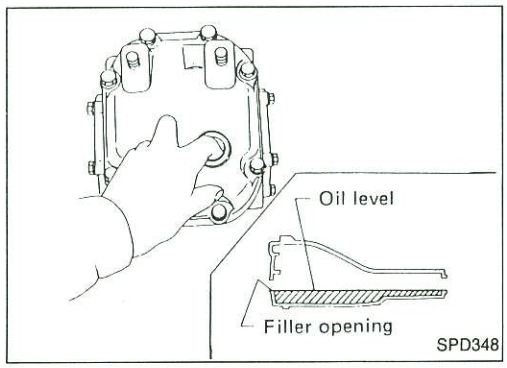
Plug up rear end of transmission rear extension housing.

- Remove drive shafts.
  Refer to RA section.
- Pull off final drive backward together with jack.

CAUTION:

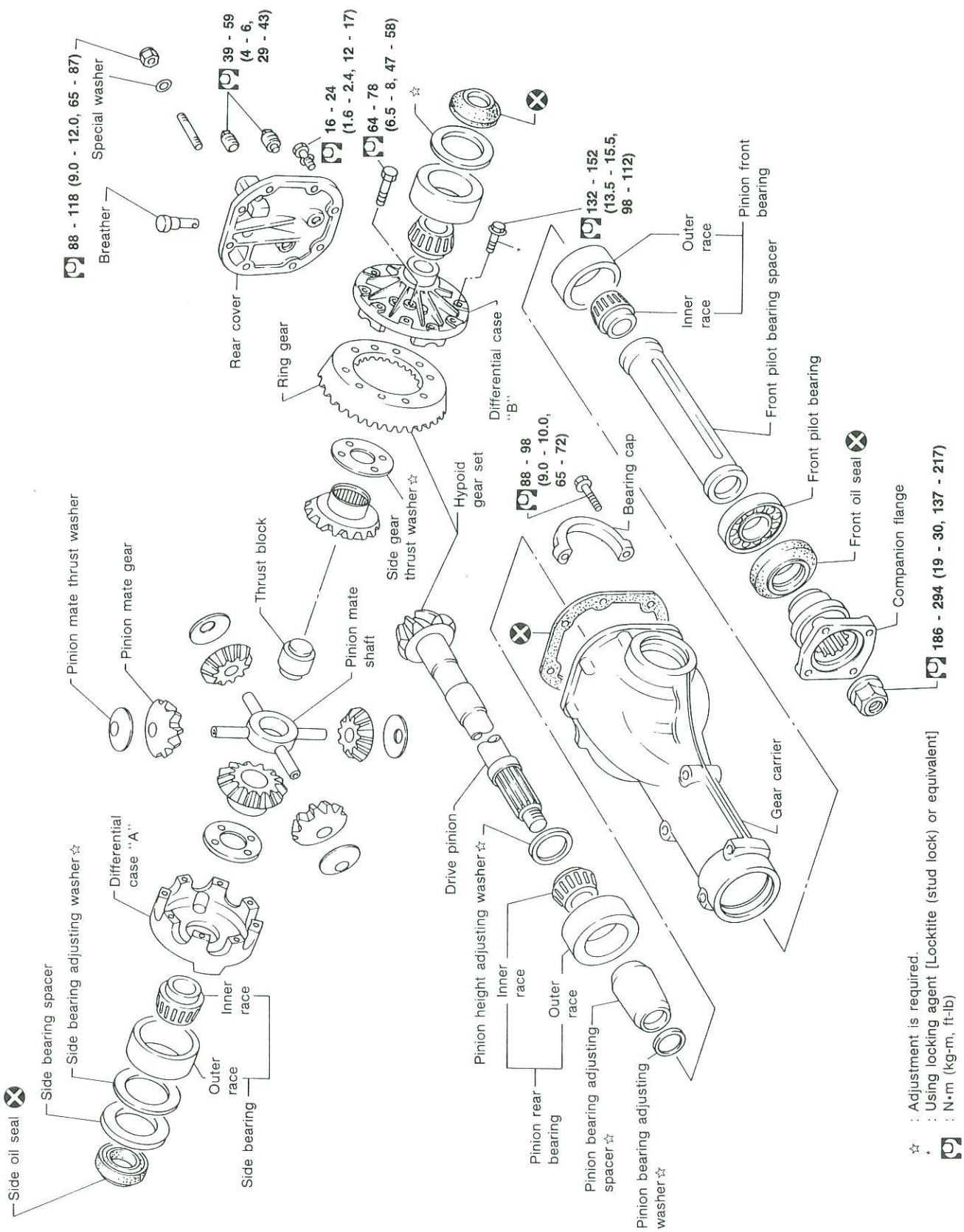
- **Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.**
- **After final drive is removed, support suspension member on a stand to prevent its insulators being twisted or damaged.**

Installation

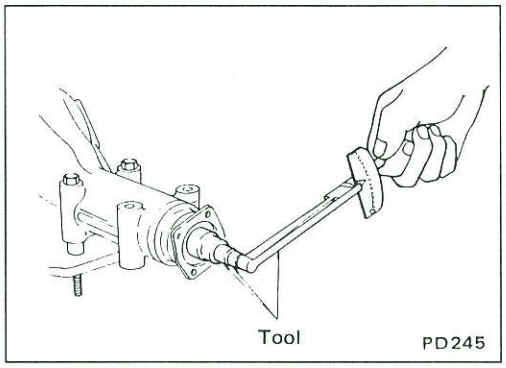


- Fill final drive with recommended gear oil.

R200



SPD119A

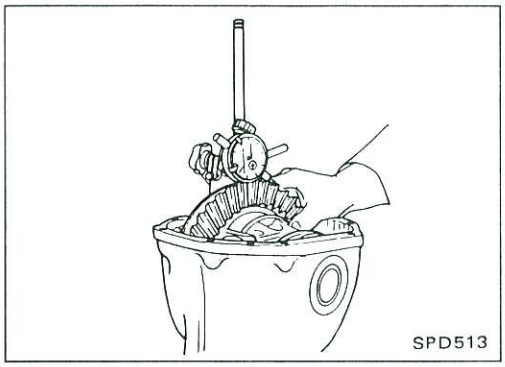


Pre-inspection

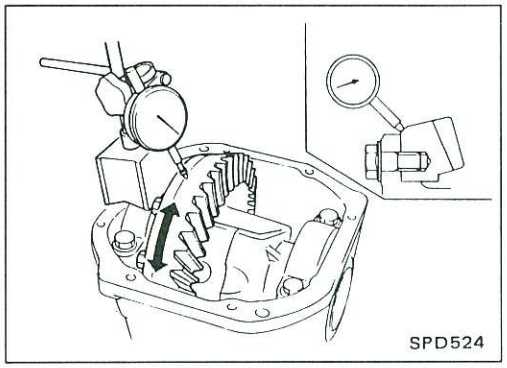
Before disassembling final drive, perform the following inspection.

- Total preload

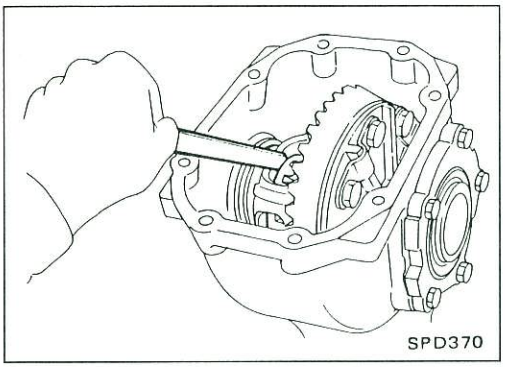
1) Turn drive pinion in both directions several times to set bearing rollers.
2) Check total preload with Tool.
   Tool number: ST3127S000 (See J25765-A.)
   Total preload:
   1.4 - 1.7 N·m
   (14 - 17 kg-cm, 12 - 15 in-lb)



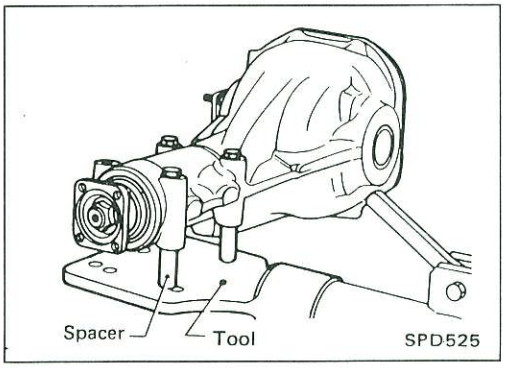
- Ring gear to drive pinion backlash
  Check ring gear to drive pinion backlash with a dial indicator at several points.
  Ring gear to drive pinion backlash:
  0.10 - 0.15 mm (0.0039 - 0.0059 in)



- 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.)



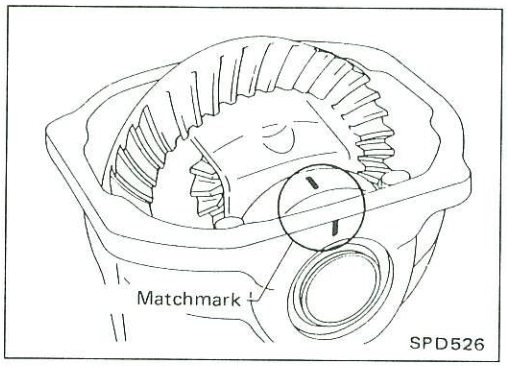
- Side gear to pinion mate gear backlash
  Measure clearance between side gear thrust washer and differential case with a feeler gauge.
  Clearance between side gear thrust washer and differential case:
  0.1 - 0.2 mm (0.004 - 0.008 in)



Differential Carrier

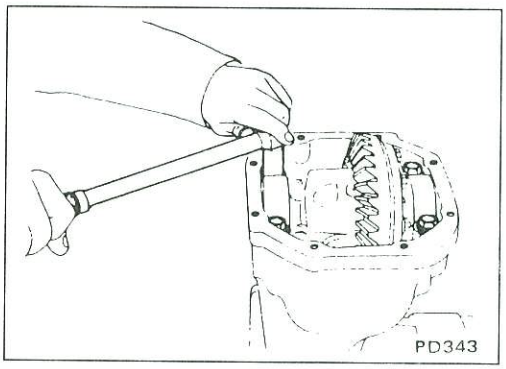
1. Using three 45 mm (1.77 in) spacers, mount carrier on Tool.
   Tool number: KV38100800 (J25604-01)

Differential Carrier (Cont'd)

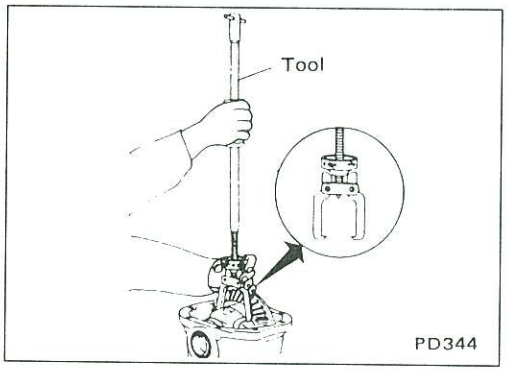


2. Paint or punch matchmarks on one side of side bearing cap so it can be properly reinstalled.

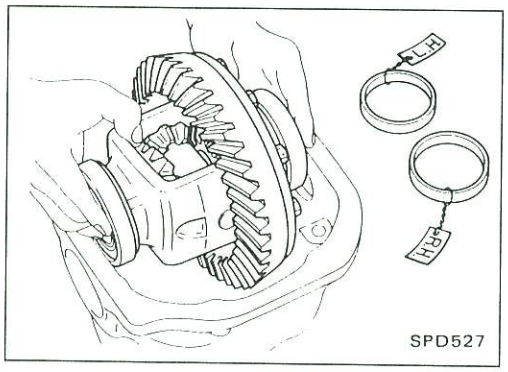
Bearing caps are line-bored during manufacture. Replace them in their proper positions.



3. Remove side bearing caps.

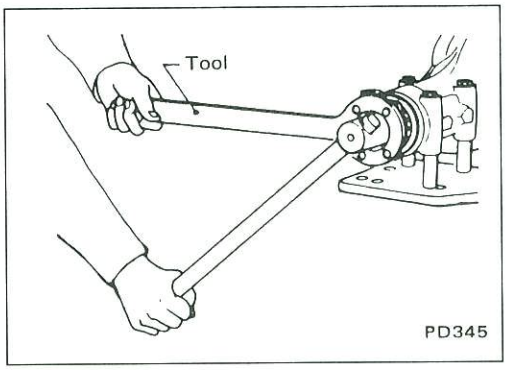


4. Lift differential case assembly out with Tool.
   Tool number: HT72400000 (—)

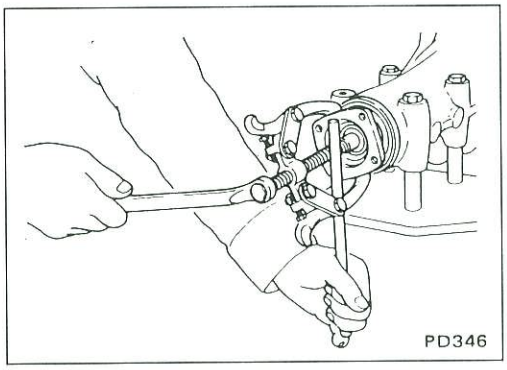


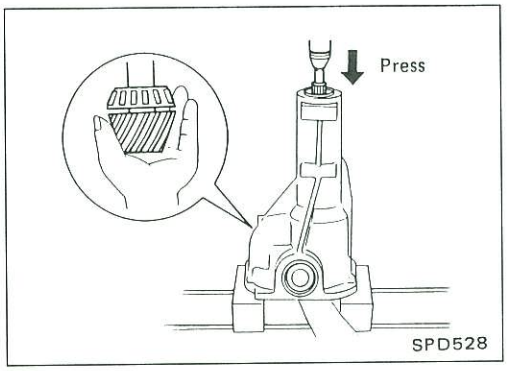
Keep the side bearing outer races together with inner cone — don't mix them up.

Differential Carrier (Cont'd)

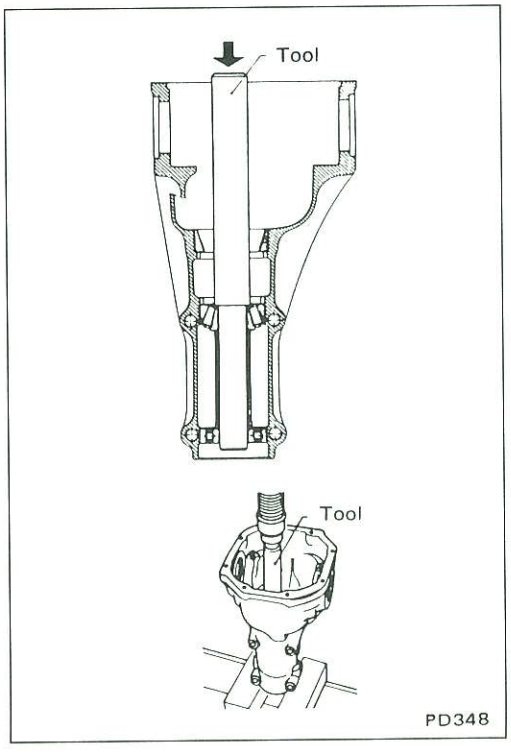


5. Loosen drive pinion nut and pull off companion flange.
   Tool number: ST31520000 (—)



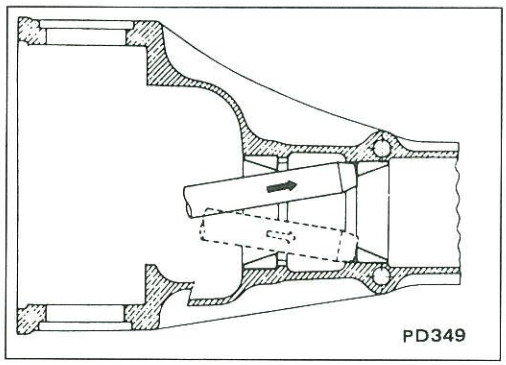


6. Take out drive pinion together with rear bearing inner race, bearing spacer and adjusting washer.
7. Remove oil seal.

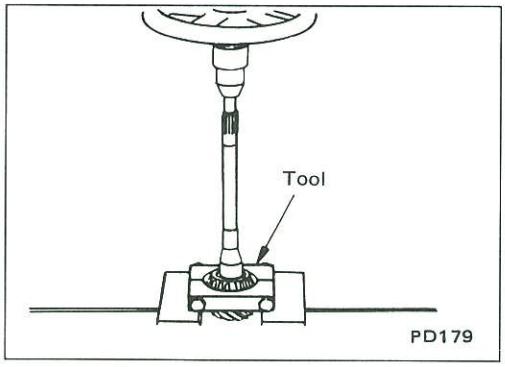


8. Remove pilot bearing together with pilot bearing spacer and front bearing inner cone with Tool.
   Tool number: KV38100401 (—)

Differential Carrier (Cont'd)

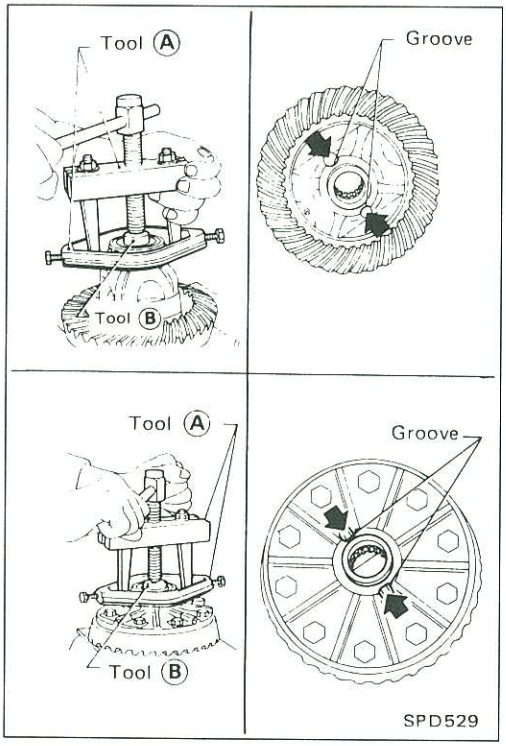


9. Remove side oil seal.
10. Remove pinion bearing outer races with a brass drift.



11. Remove pinion rear bearing inner race and pinion height adjusting washer.
    Tool number: ST30031000 (J22912-01)

Differential Case

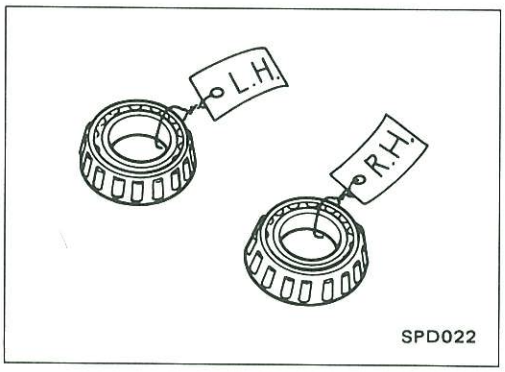


1. Remove side bearing inner races.

To prevent damage to bearing, engage puller paws with grooves.

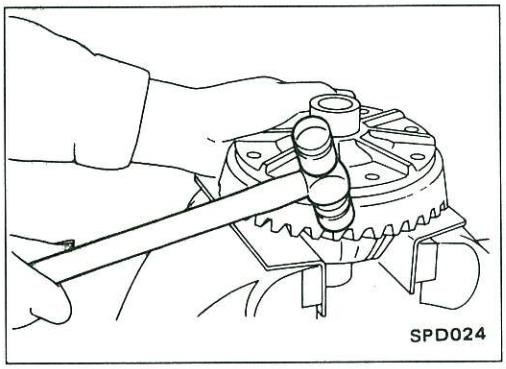
Tool number:

Ⓐ ST33051001 (—)
Equivalent tool (J22888)
Ⓑ ST33061000 (J8107-2)



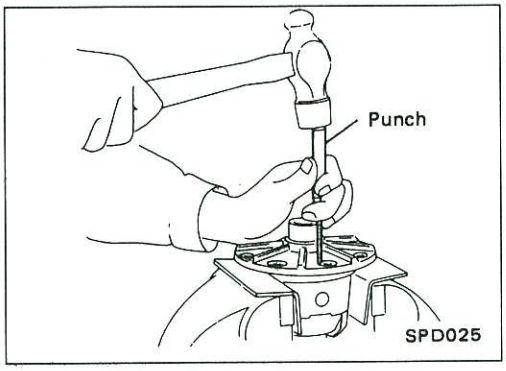
Do not mix the right and left hand parts.

Differential Case (Cont'd)



2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off the gear case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



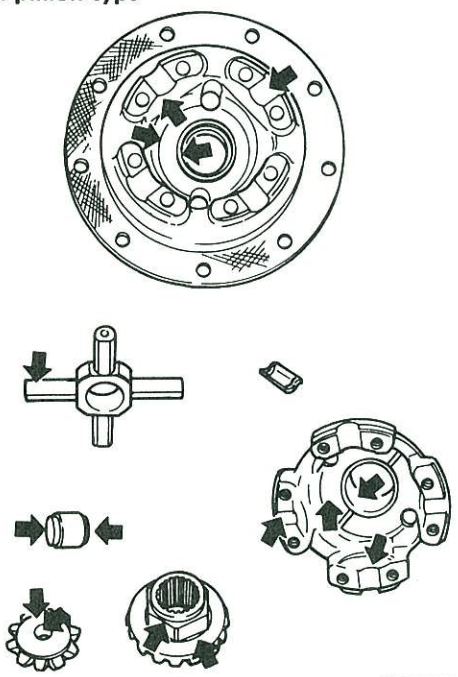
4. Punch off pinion mate shaft lock pin from ring gear side.

Lock pin is calked at pin hole mouth on differential case.

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).

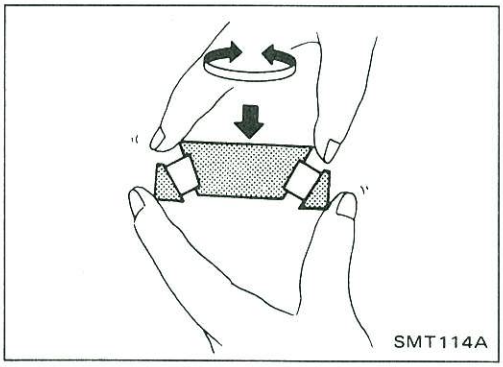
4-pinion type



SPD717

Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft, thrust block and thrust washers.



SMT114A

Bearing

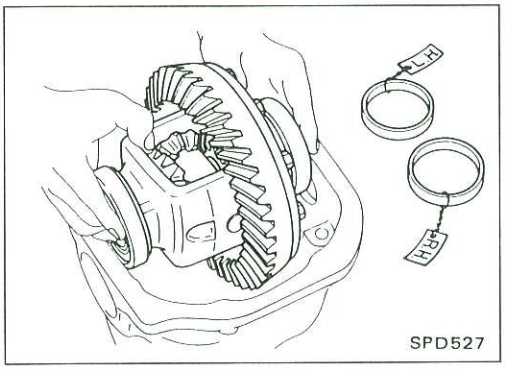
1. Thoroughly clean bearing and dry with compressed air.
2. Check bearings for wear, scratches, pitching or flaking. Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

For quiet and reliable final drive operation, the following five adjustments must be made correctly.

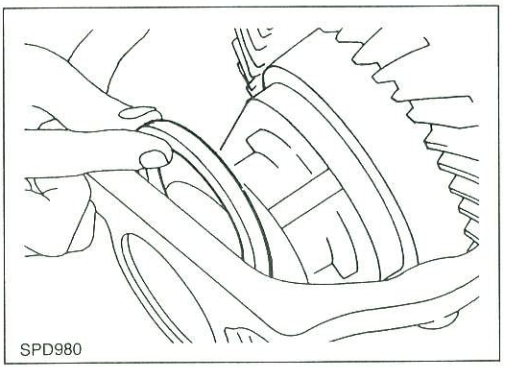
1. Side bearing preload
2. Pinion gear height
3. Pinion bearing preload
4. Ring gear to pinion backlash (Refer to ASSEMBLY.)
5. Ring and pinion gear tooth contact pattern

Side Bearing Preload

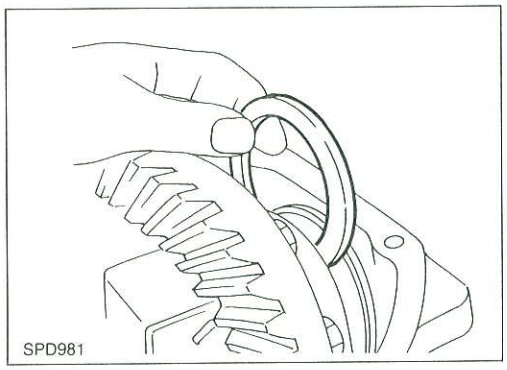
A selection of carrier side bearing preload shims is required for successful completion of this procedure.



1. Make sure all parts are clean and that the bearings are well lubricated with light oil or Dexron™ type automatic transmission fluid.
2. Place the differential carrier, with side bearings and bearing races installed, into the final drive housing.

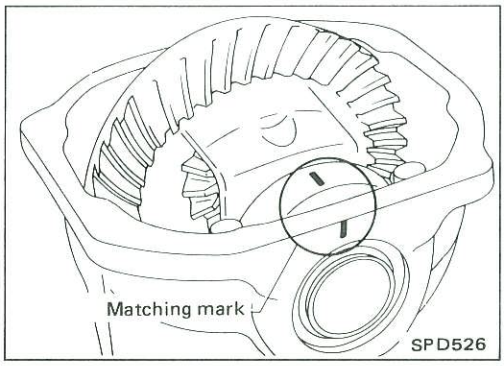


3. Put the side bearing spacer in place on the carrier end, opposite the ring gear.

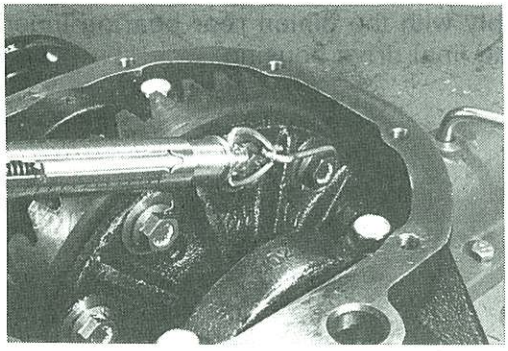


4. Using the J-25267 side bearing spacer drift, place both of the original carrier side bearing preload shims on the gear end of the carrier.

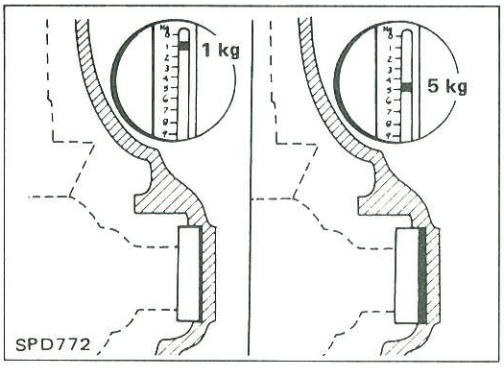
Side Bearing Preload (Cont'd)



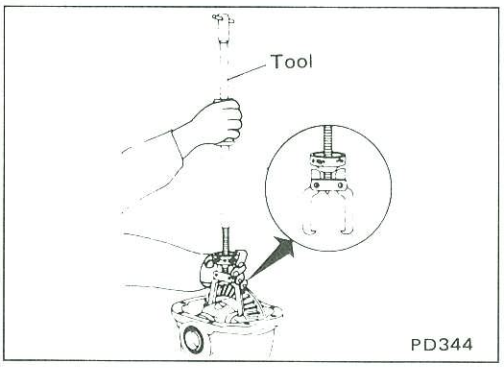
5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.
   Specification:
   88 - 98 N·m
   (9 - 10 kg-m, 65 - 72 ft-lb)
6. Turn the carrier several times to seat the bearings.



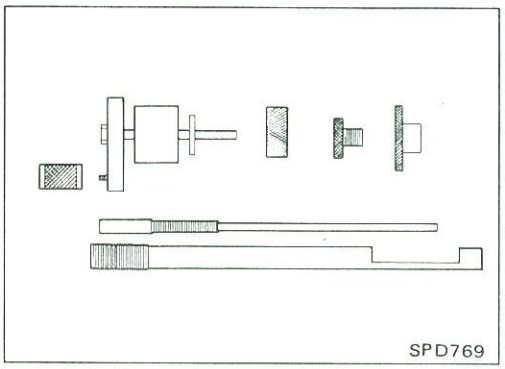
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J-8129.
   Specification:
   34.3 - 39.2 N
   (3.5 - 4 kg, 7.7 - 8.8 lb)
   of pulling force at the ring gear bolt.



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.



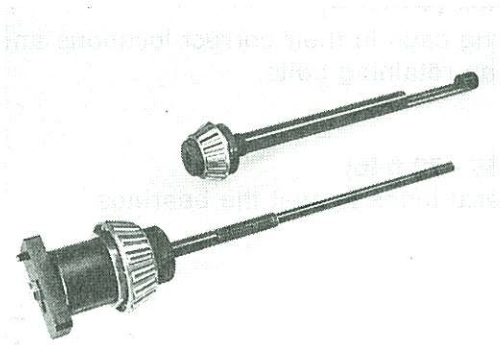
10. Remove the carrier from the final drive housing, saving the selected preload washers for later use during the assembly of the final drive unit.
    Tool number: HT72400000 (—)



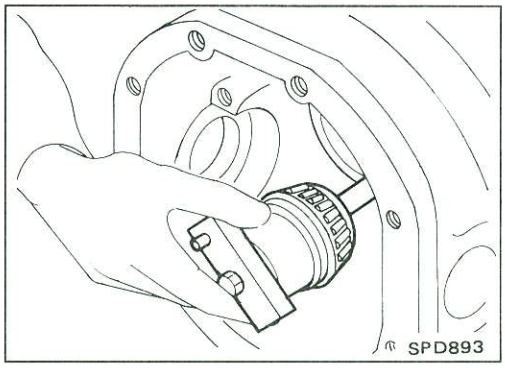
Pinion Gear Height and Pinion Bearing Preload

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, J-34309.

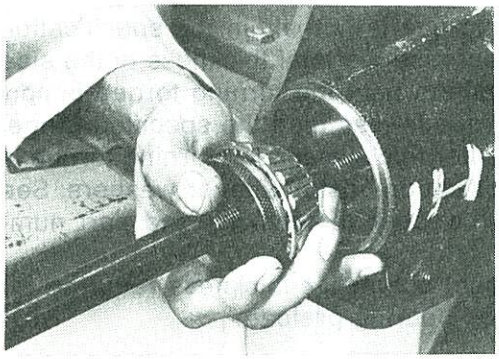
Pinion Gear Height and Pinion Bearing Preload (Cont'd)



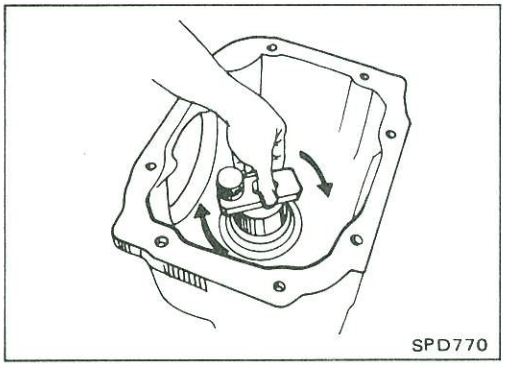
- **Front pinion bearing** — make sure the J-34309-3 front pinion bearing seat is secured tightly against the J-34309-2 gauge anvil. Then turn the front pinion bearing pilot, J-34309-5, to secure the bearing in its proper position.
- **Rear pinion bearing** — the rear pinion bearing pilot, J-34309-8, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J-34309-4, is used to lock the bearing to the assembly.



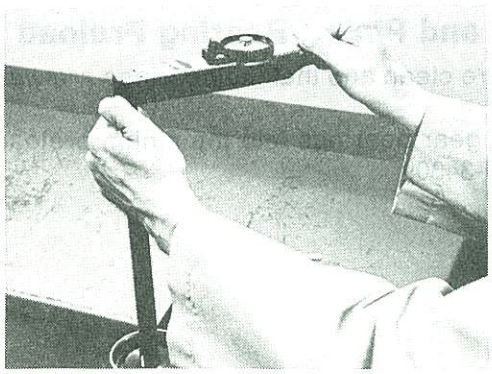
3. Place the pinion preload shim selector Tool, J-34309-1, gauge screw assembly with the pinion rear bearing inner cone installed into the final drive housing.



4. Assemble the front pinion bearing inner cone and the J-34309-2 gauge anvil together with the J-34309-1 gauge screw in the final drive housing. Make sure that the pinion height gauge plate, J-34309-16, will turn a full 360 degrees, and tighten the two sections together by hand.



5. Turn the assembly several times to seat the bearings.



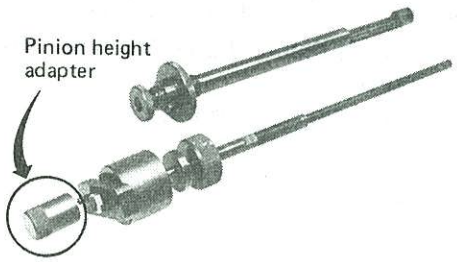
6. Measure the turning torque at the end of the J-34309-2 gauge anvil using torque wrench J-25765A.

   Turning torque specification:

   1.0 - 1.3 N·m

   (10 - 13 kg-cm, 8.7 - 11.3 in-lb)

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

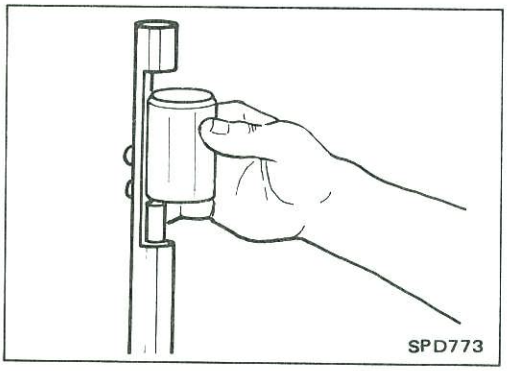


7. Place the J-34309-11 "R200A" pinion height adapter onto the gauge plate and tighten it by hand.

CAUTION:
Make sure all machined surfaces are clean.

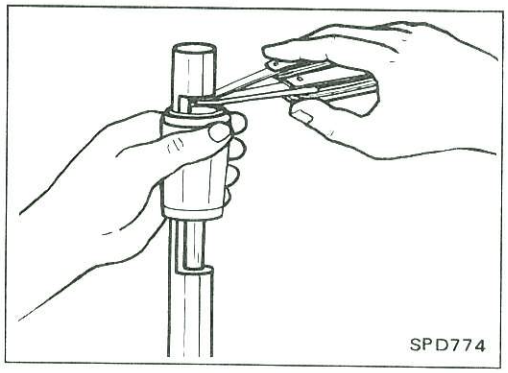
— PINION BEARING PRELOAD WASHER SELECTION —

8. Place the solid pinion bearing spacer, small end first, over the J-34309-2 gauge anvil and seat the small end squarely against the tip of the J-34309-1 gauge screw in the tool recessed portion.



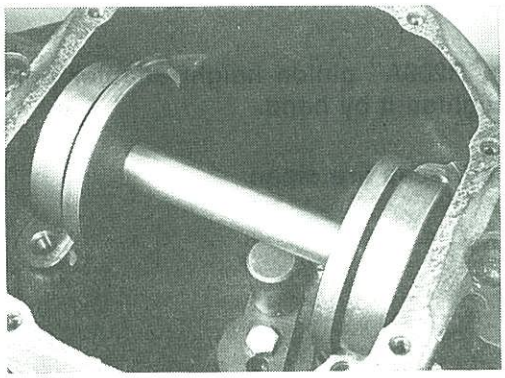
9. Select the correct thickness of pinion bearing preload adjusting washer using a standard gauge of 3.5 mm (0.138 in) and your J-34309-101 feeler gauge. The exact measure you get with your gauges is the thickness of the adjusting washer required. Select the correct washer.

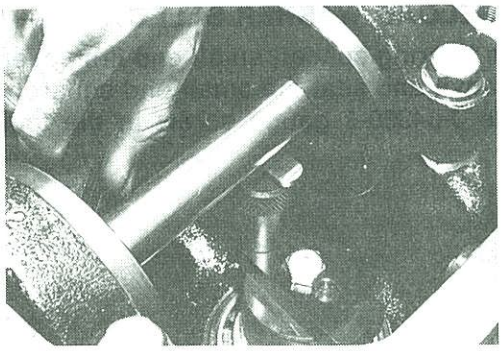
Drive pinion bearing preload adjusting washer:
Refer to S.D.S.



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 Gear Height and Pinion Bearing Preload (Cont'd)

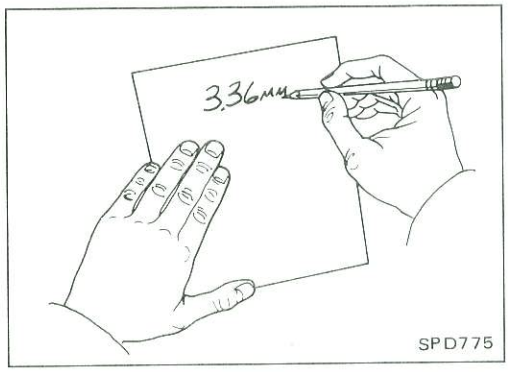




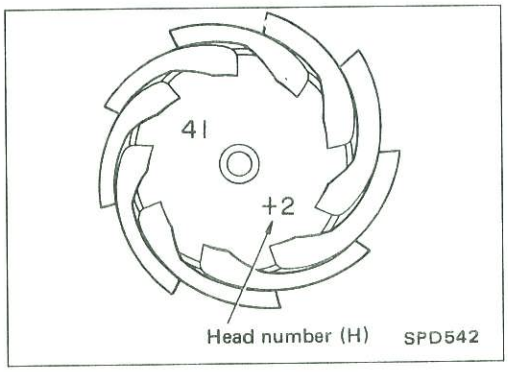
— PINION HEIGHT ADJUSTING WASHER SELECTION —

11. Now, position the side bearing discs, J-25269-4, and arbor firmly into the side bearing bores.
    Install the side bearing caps and tighten the cap bolts.
    Specification:
    88 - 98 N·m
    (9 - 10 kg-m, 65 - 72 ft-lb)

12. Select the correct standard pinion height adjusting washer thickness using a standard gauge of 3 mm (0.12 in) and your J-34309-101 feeler gauge. Measure the distance between the J-34309-10 pinion height adapter and the arbor.



13. Write down your exact total measurement.



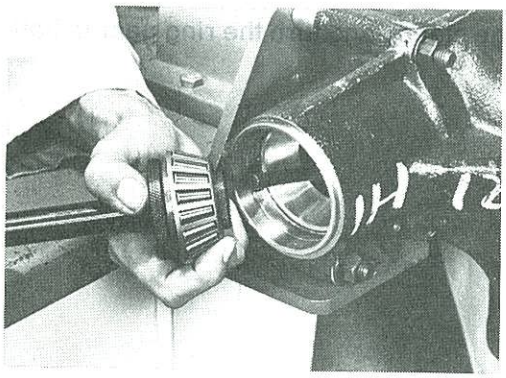
14. Correct the pinion height washer size by referring to the "pinion head number."

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)

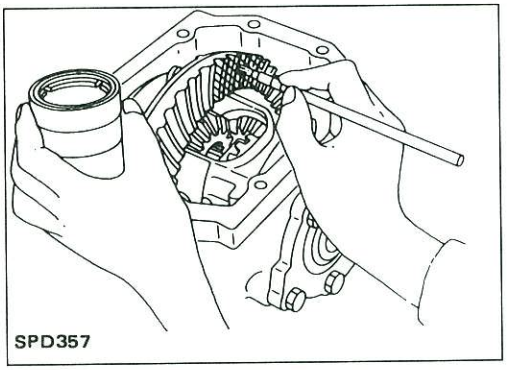
15. Select the correct pinion height washer from the following chart.
    Drive pinion height adjusting washer (R200):
    Refer to S.D.S.



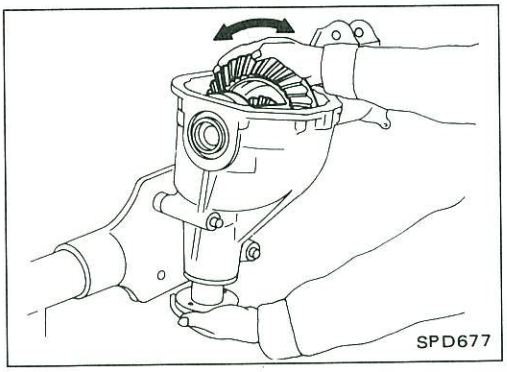
16. Remove the J-34309 pinion preload shim selector Tool from the final drive housing and disassemble to retrieve the pinion bearings.

Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gear sets which are not positioned properly may be noisy, or have short life, or both. Low noise and a long life can be assured with a pattern check.

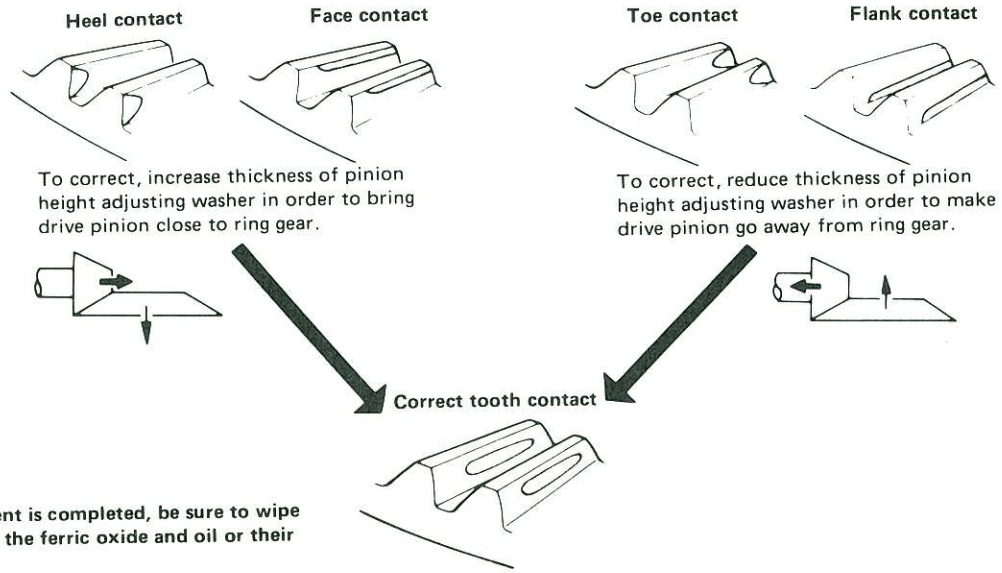

SPD357

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.


SPD677

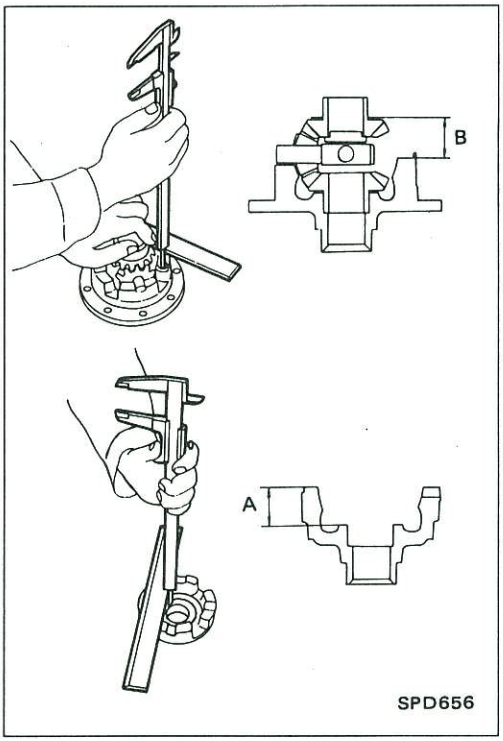
3. Hold companion flange steady and turn the ring gear in both directions.

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.



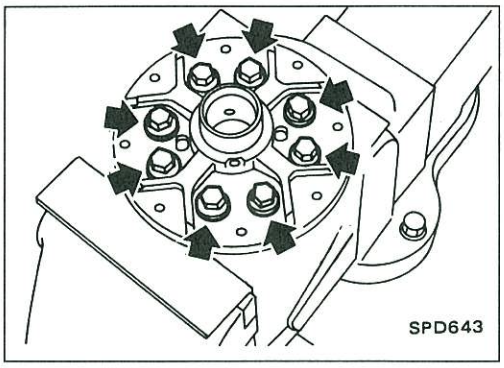
When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

SPD007

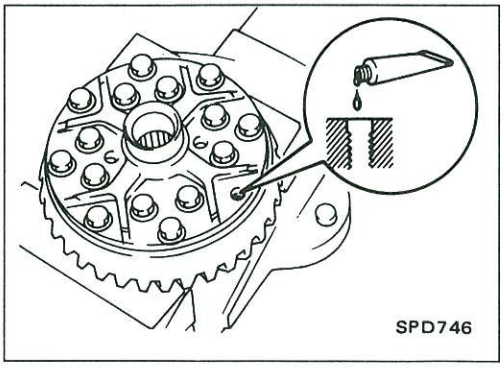


Differential Case

1. Measure clearance between side gear thrust washer and differential case.
   Clearance between side gear thrust washer and differential case (A — B):
   0.10 - 0.20 mm (0.0039 - 0.0079 in)
   The clearance can be adjusted with side gear thrust washer.
   (Refer to S.D.S.)
2. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.

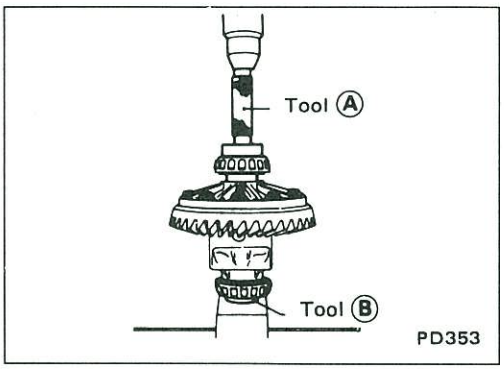


3. Install differential case L.H. and R.H.

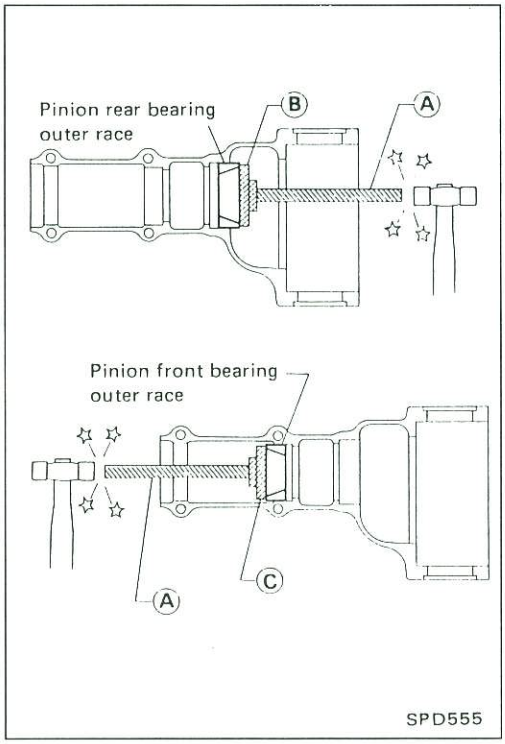


4. Place differential case on ring gear.
5. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.

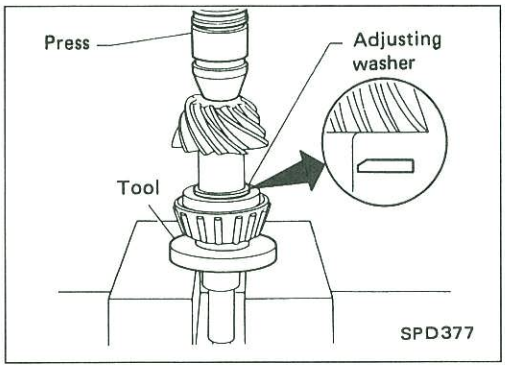


6. Press-fit side bearing inner cones on differential case with Tool.
   Tool number:
   Ⓐ KV38100300 (J25523)
   Ⓑ ST33061000 (J8107-2)

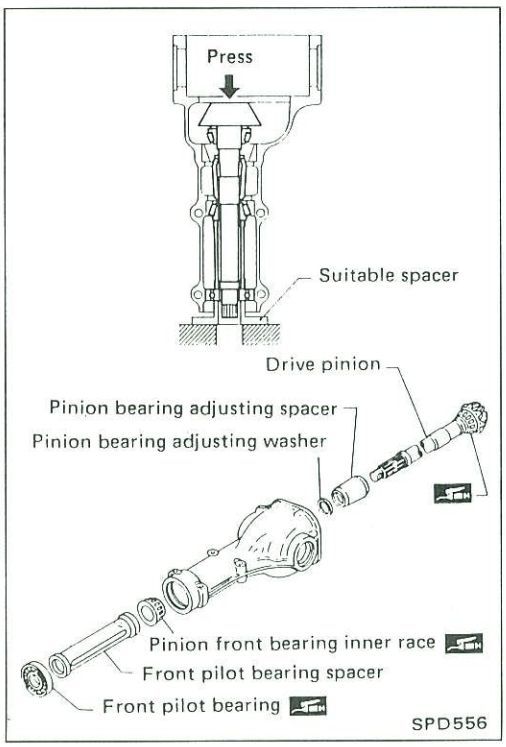


Differential Carrier

1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   - **Ⓐ ST30611000 (J25742-1)**
   - **Ⓑ ST30621000 (—)**
   - **Ⓒ ST30613000 (J25742-3)**



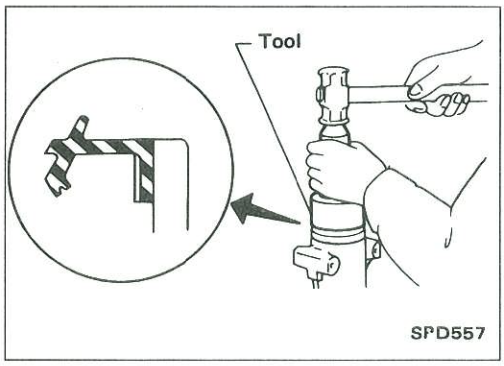
2. Select pinion height adjusting washer and pinion bearing adjusting washer spacer, referring to Adjustment.
3. Install pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it, with press and Tool.
   Tool number: ST30901000 (—)



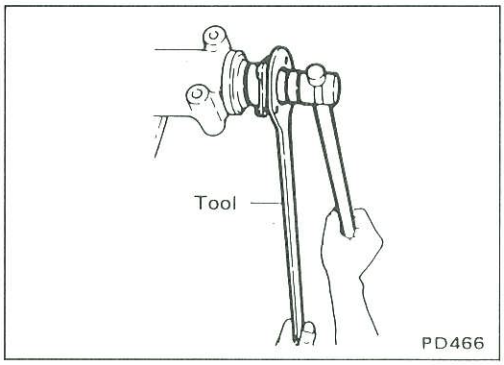
4. Set drive pinion assembly (as shown in figure to the left) in differential carrier and install drive pinion, with press and a suitable tool.

Stop when drive pinion touches bearing.

Differential Carrier (Cont'd)



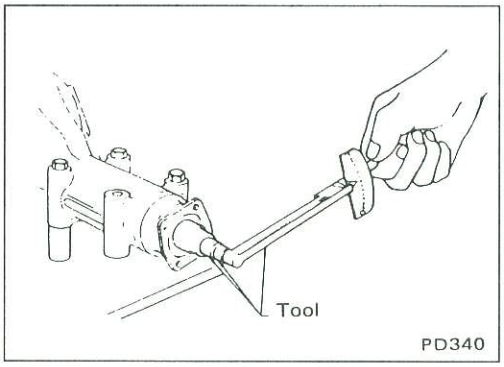
5. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Install front oil seal with Tool.
   Tool number: KV38100500 (—)



6. Install companion flange, and tighten pinion nut to specified torque.

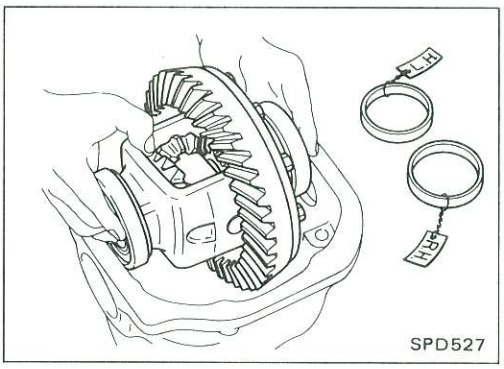
Ascertain that threaded portion of drive pinion and pinion nut are free from oil or grease.

Tool number: ST31520000 (—)

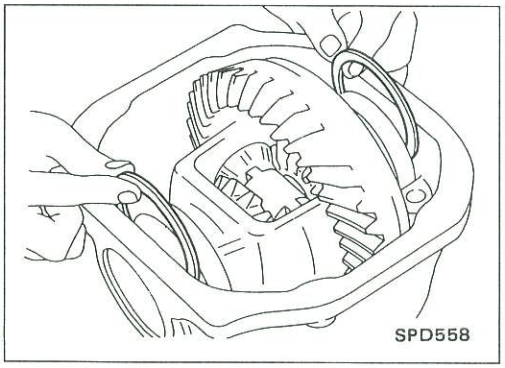


7. Turn drive pinion in both directions several times, and measure pinion bearing preload.
   Pinion bearing preload:
   1.1 - 1.4 N·m
   (11 - 14 kg-cm, 9.5 - 12.2 in-lb)

When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

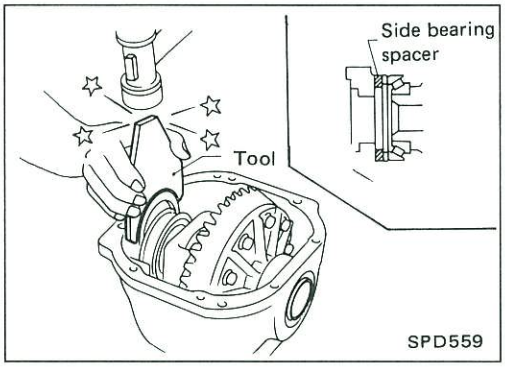


8. Select side bearing adjusting washer.
   Refer to Adjustment.
9. Install differential case assembly with side bearing outer races into gear carrier.

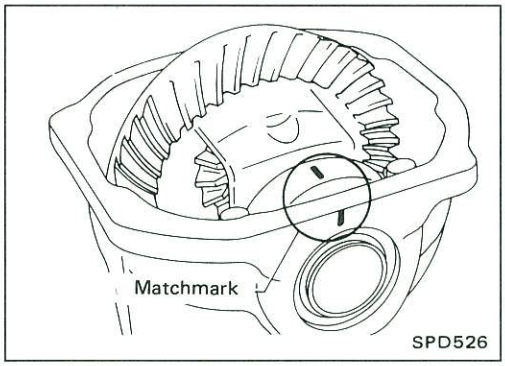


10. Insert left and right side bearing adjusting washers in place between side bearings and carrier.

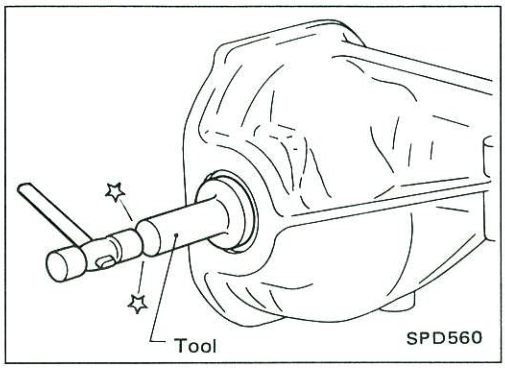
Differential Carrier (Cont'd)



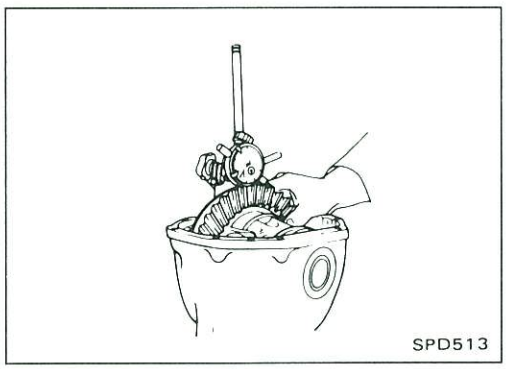
11. Drive in side bearing spacer with Tool.
    Tool number: KV38100600 (J25267)



12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.



13. Apply multi-purpose grease to cavity at sealing lips of oil seal.
    Install side oil seal with Tool.
    Tool number: KV38100200 (J26233)

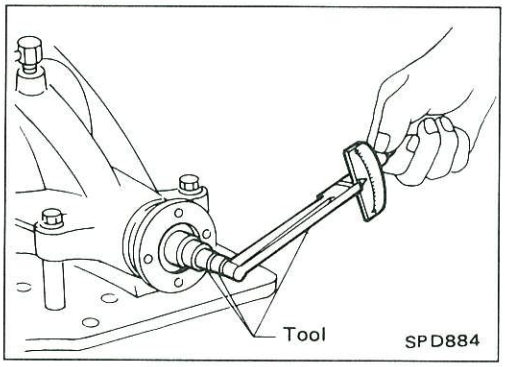


14. Measure ring gear to drive pinion backlash with a dial indicator.
    Ring gear to drive pinion backlash:
    0.10 - 0.15 mm
    (0.0039 - 0.0059 in)

- 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.

Differential Carrier (Cont'd)



15. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.

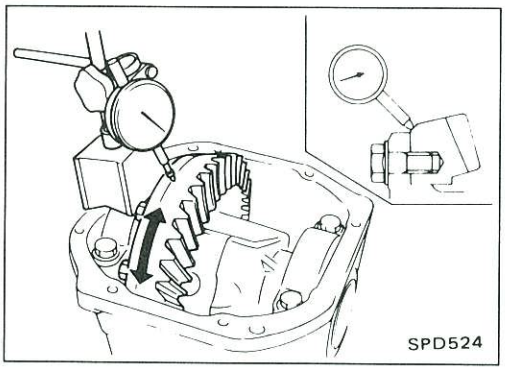
Total preload:

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, add the same amount of shim to each side.
- If preload is too small, remove 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.



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, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.

18. Check tooth contact.
    Refer to Adjustment.
19. Install rear cover and gasket.

Propeller Shaft

GENERAL SPECIFICATIONS

Unit: mm (in)

Propeller shaft model	3S71A-T
Number of joints	3
Coupling method with transmission	Sleeve type
Type of journal bearings	Shell type (Non-disassembly type)
Distance between yokes	71 (2.80)
Shaft length (Spider to spider)	
1st	545 (21.46)
2nd	560 (22.05), 575 (22.64)*
Shaft outer diameter	
1st	75 (2.95)
2nd	
Outer	75 (2.95)
Inner	63.5 (2.500)

*: Without A.B.S.

INSPECTION AND ADJUSTMENT

Unit: mm (in)

Propeller shaft model	3S71A-T
Propeller shaft runout limit	0.6 (0.024)
Measuring point	
A	162 (6.38)
B	172 (6.77)
C	192 (7.56)
Journal play	0 (0)

Final Drive

GENERAL SPECIFICATIONS

Final drive model	R200
Number of pinions	4
Ring gear pitch diameter mm (in)	205 (8.07)
Gear ratio	3.916
Number of gear teeth (Ring gear/drive pinion)	47/12
Oil capacity (Approx.) ℓ (US pt, Imp pt)	1.3 (2-3/4, 2-1/4)

INSPECTION AND ADJUSTMENT (Model R200)

Ring gear runout

Ring gear runout limit mm (in)	0.05 (0.0020)

Side bearing adjustment

Backlash between side gear and mate gear (Clearance between side gear to differential case) mm (in)	0.1 - 0.2 (0.004 - 0.008)

Available side gear thrust washers

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003

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

Final Drive (Cont'd)

Drive pinion preload adjustment

Drive pinion preload N·m (kg-cm, in-lb) With front oil seal	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
55.10 (2.1693)	38165-B4002
55.40 (2.1811)	38165-B4003
55.70 (2.1929)	38165-B4004
56.00 (2.2047)	38165-61001

Total preload adjustment

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
Backlash of drive pinion and ring gear mm (in)	0.10 - 0.15 (0.0039 - 0.0059)

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-N3113

FRONT AXLE & FRONT SUSPENSION

SECTION FA

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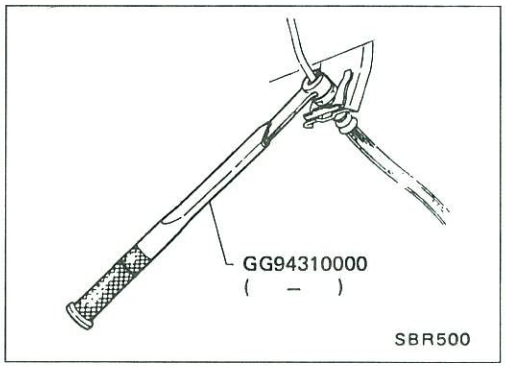
FRONT SUSPENSION — Transverse Link Assembly FA-18
SONAR SUSPENSION SYSTEM — Trouble Diagnoses FA-19
SERVICE DATA AND SPECIFICATIONS (S.D.S.) FA-39

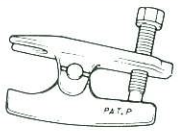
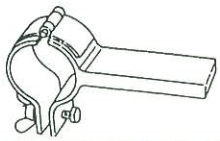


Precautions

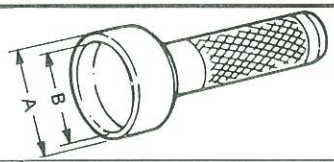
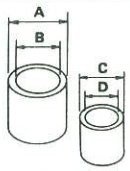
- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Use Tool when removing or installing brake tubes.**

Preparation

SPECIAL SERVICE TOOLS

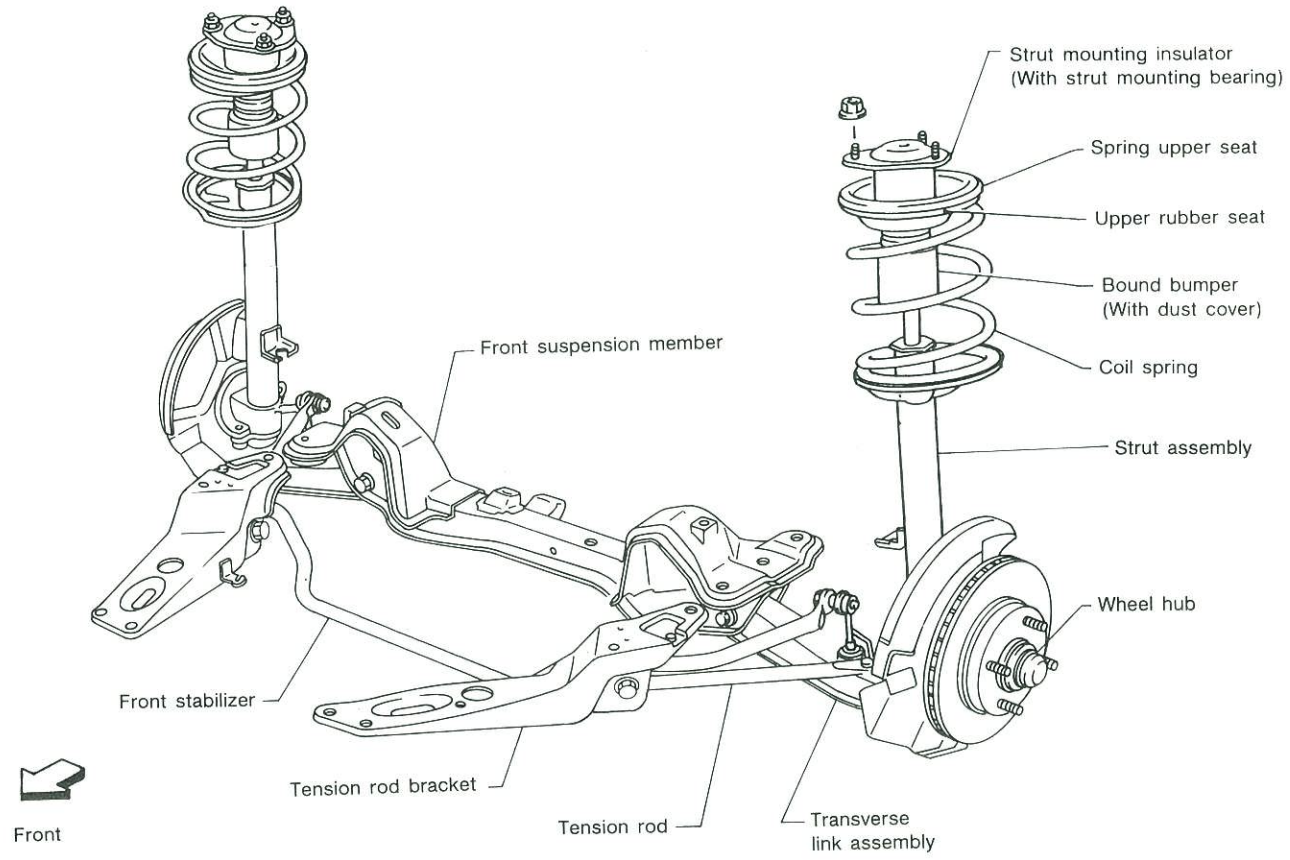
Tool number (Kent-Moore No.) Tool name	Description	
KV401021S0 (—) Bearing race drift		Installing wheel bearing outer race
HT72520000 (J25730-A) Ball joint remover		Removing tie-rod outer end and lower ball joint
HT71780000 (—) Spring compressor		Removing and installing coil spring
ST35652000 (—) Strut attachment		Fixing strut assembly
GG94310000 (—) Flare nut torque wrench		Removing and installing brake piping

COMMERCIAL SERVICE TOOLS

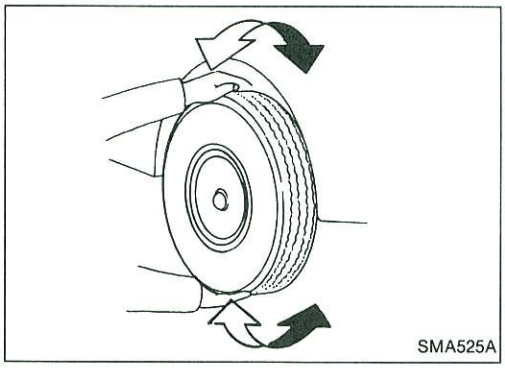
Tool name	Description	
Front axle grease seal drift		Installing front axle grease seal **A: 70 mm (2.76 in) dia.** **B: 60 mm (2.36 in) dia.**
Tension rod bushing drift		Removing and installing tension rod bushing **A: 75 mm (2.95 in) dia.** **B: 66 mm (2.60 in) dia.** **C: 62 mm (2.44 in) dia.** **D: 25 - 55 mm (0.98 - 2.17 in) dia.**

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.**



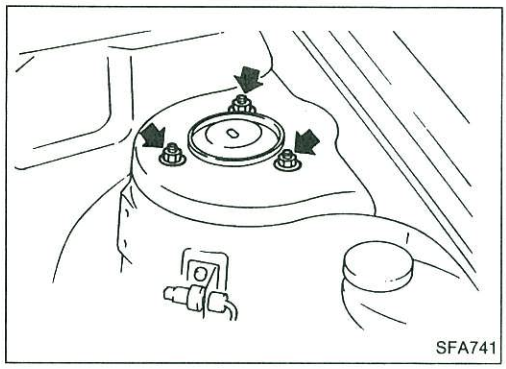
SFA812A


SMA525A

Front Axle and Front Suspension Parts

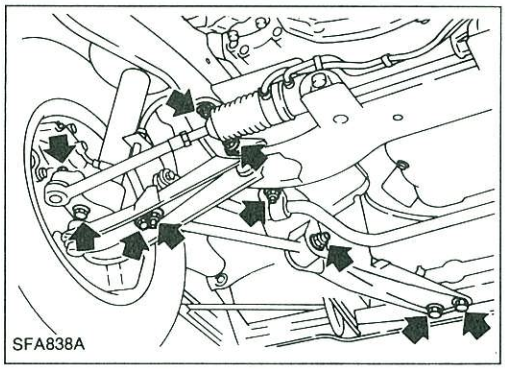
Check front axle and front suspension parts for looseness, cracks, wear or other damage.

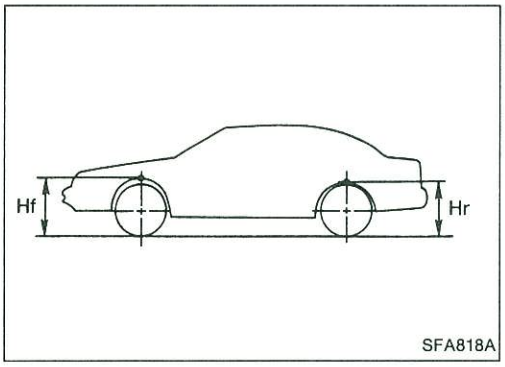
- Shake each front wheel to check for excessive play.


SFA741

- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

Tightening torque:
Refer to FRONT SUSPENSION.


SFA838A



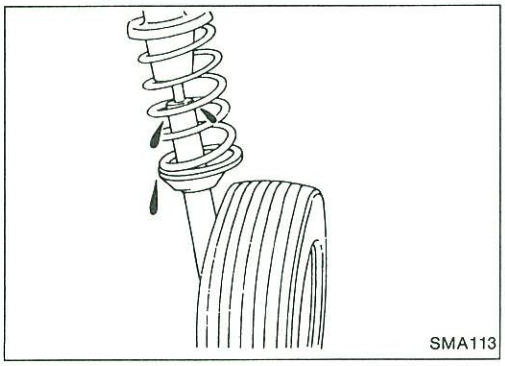
SFA818A

- 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.

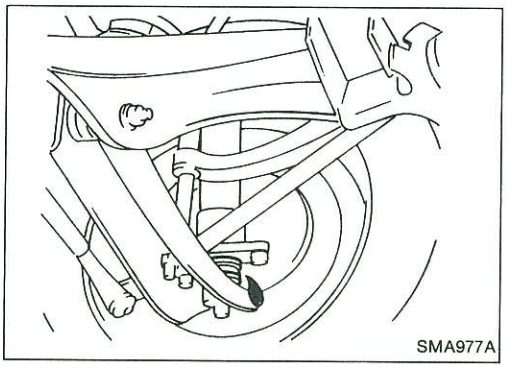
(2) Bounce vehicle up and down several times before measuring.
Standard height: Refer to S.D.S.

(3) Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.

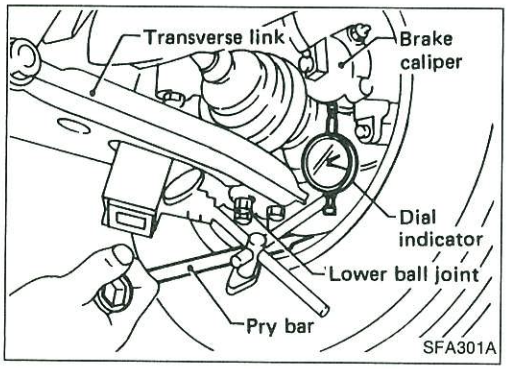

SMA113

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

Front Axle and Front Suspension Parts (Cont'd)


SMA977A

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



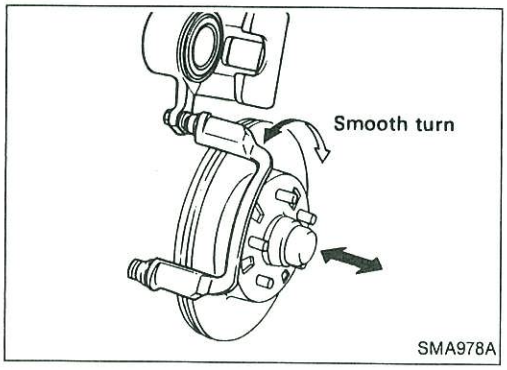
SFA301A

- Check suspension ball joint end play.

(1) Jack up front of vehicle and set the stands.
(2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
(3) Make sure front wheels are straight and brake pedal is depressed.
(4) Place a pry bar between transverse link and inner rim of road wheel.
(5) While raising and releasing pry bar, observe maximum dial indicator value.

Vertical end play:
0.1 - 1.3 mm (0.004 - 0.051 in)

(6) If ball joint movement is beyond specifications, remove and recheck it.



SMA978A

Front Wheel Bearing

Check that wheel bearings operate smoothly, as well as axial end play and grease leakage.

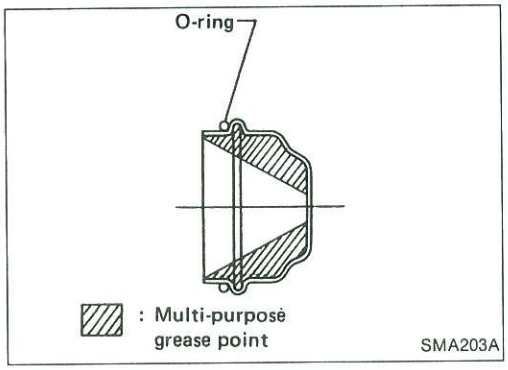
Axial end play limit: 0 mm (0 in)

PRELOAD ADJUSTMENT

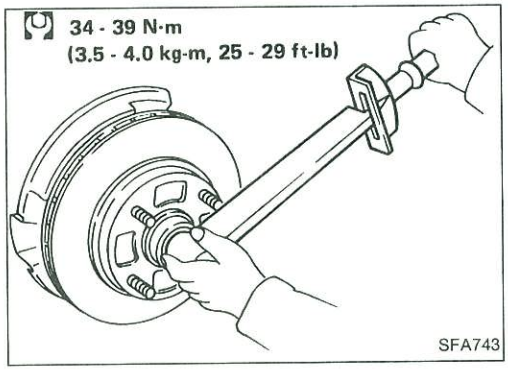
Be sure to adjust wheel bearing preload as described below after wheel bearing has been replaced or front axle has been reassembled.

1. Before adjustment, thoroughly clean all parts to prevent dirt entry.

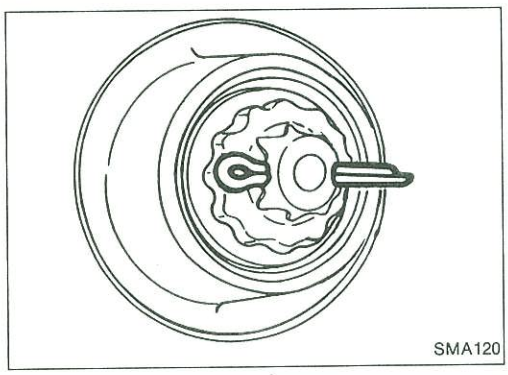
Front Wheel Bearing (Cont'd)



2. Apply recommended multi-purpose grease sparingly to the following parts.
- Rubbing surface of spindle
- Contact surface between lock washer and outer wheel bearing
- Hub cap (as shown at the left)
- Grease seal lip



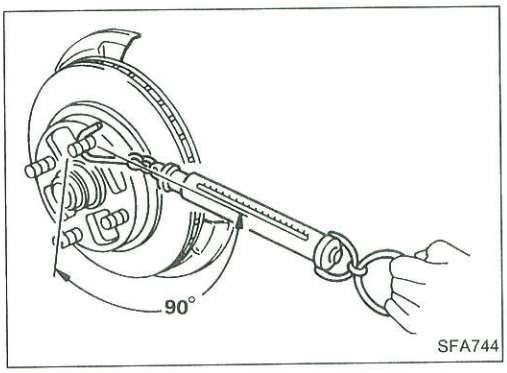
3. Tighten wheel bearing lock nut to the specified torque.
4. Turn wheel hub several times in both directions to seat wheel. bearing correctly.
5. Again tighten wheel bearing nut to the specified torque.
6. Turn back wheel bearing lock nut at 90°.



7. Fit adjusting cap and new cotter pin.

Do not turn nut back for cotter pin insertion.

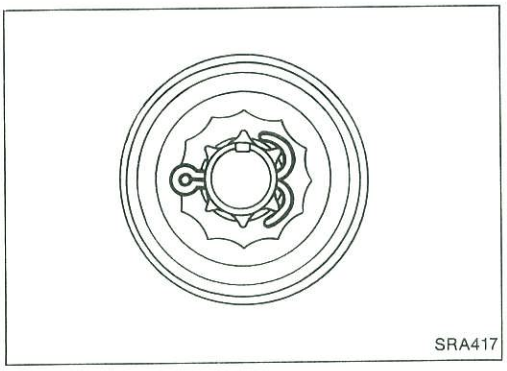
Align cotter pin slot, by retightening nut within 15°.



8. Measure wheel bearing preload and axial end play.

Axial end play limit: 0.05 mm (0.0020 in)
Wheel bearing preload
(As measured at wheel hub bolt):
13.7 N (1.4 kg, 3.1 lb) or less

Repeat above procedures until correct bearing preload is obtained.

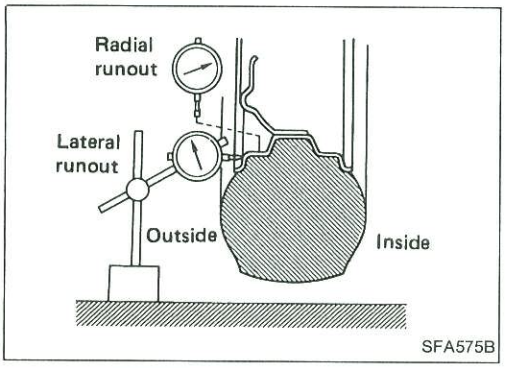


9. Spread cotter pin.
10. Install hub cap with new O-ring.

Front Wheel Alignment

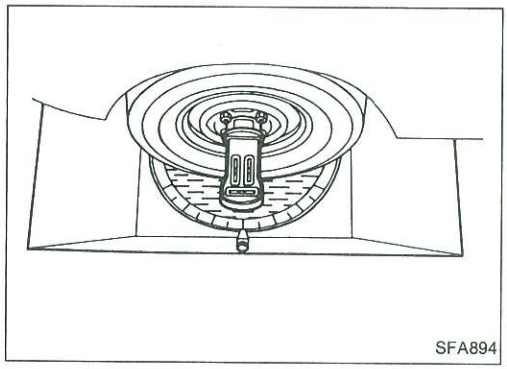
Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen*).

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



PRELIMINARY INSPECTION

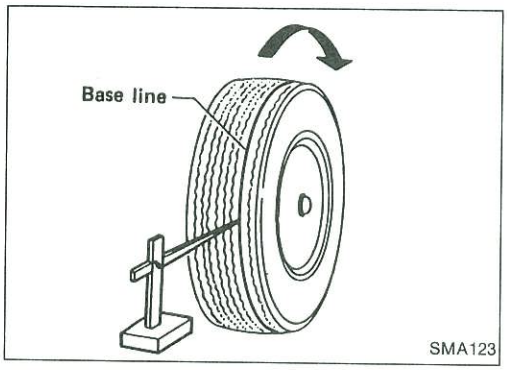
1. Check tires for wear and improper inflation.
2. Check wheel runout.
   Wheel runout:
   Refer to S.D.S.
3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work properly by using the standard bounce test.
7. Check vehicle posture (Unladen).



CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

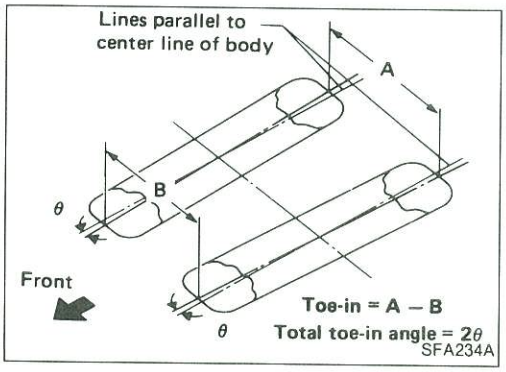
1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.
   Camber, Caster and Kingpin inclination:
   Refer to S.D.S.
2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.



TOE-IN

1. Draw a base line across the tread.

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

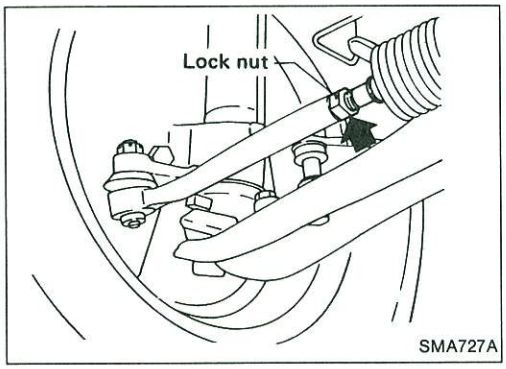


2. Measure toe-in.

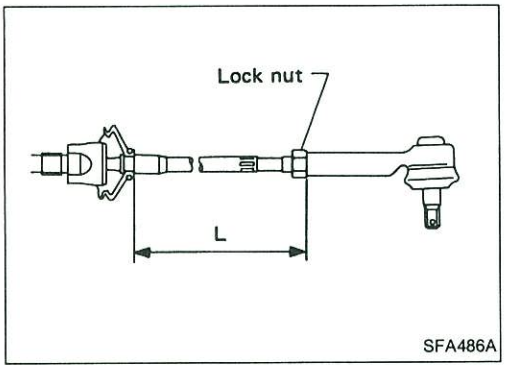
- Measure distance "A" and "B" at the same height as hub center.

   Toe-in:
   Refer to S.D.S.

Front Wheel Alignment (Cont'd)



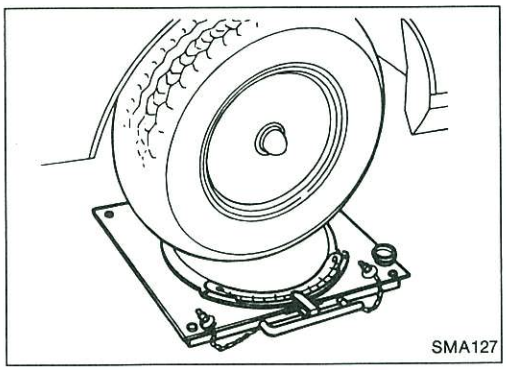
3. Adjust toe-in by varying the length of steering tie-rods.
(1) Loosen lock nuts.
(2) Adjust toe-in by screwing tie-rods in and out.



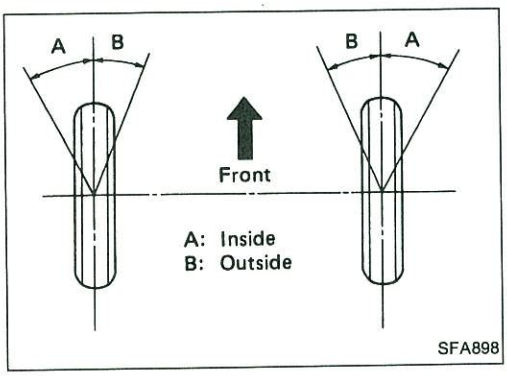
Standard length "L":
Refer to section ST.

(3) Tighten lock nuts to specified torque.
Lock nut tightening torque:
Refer to section ST.

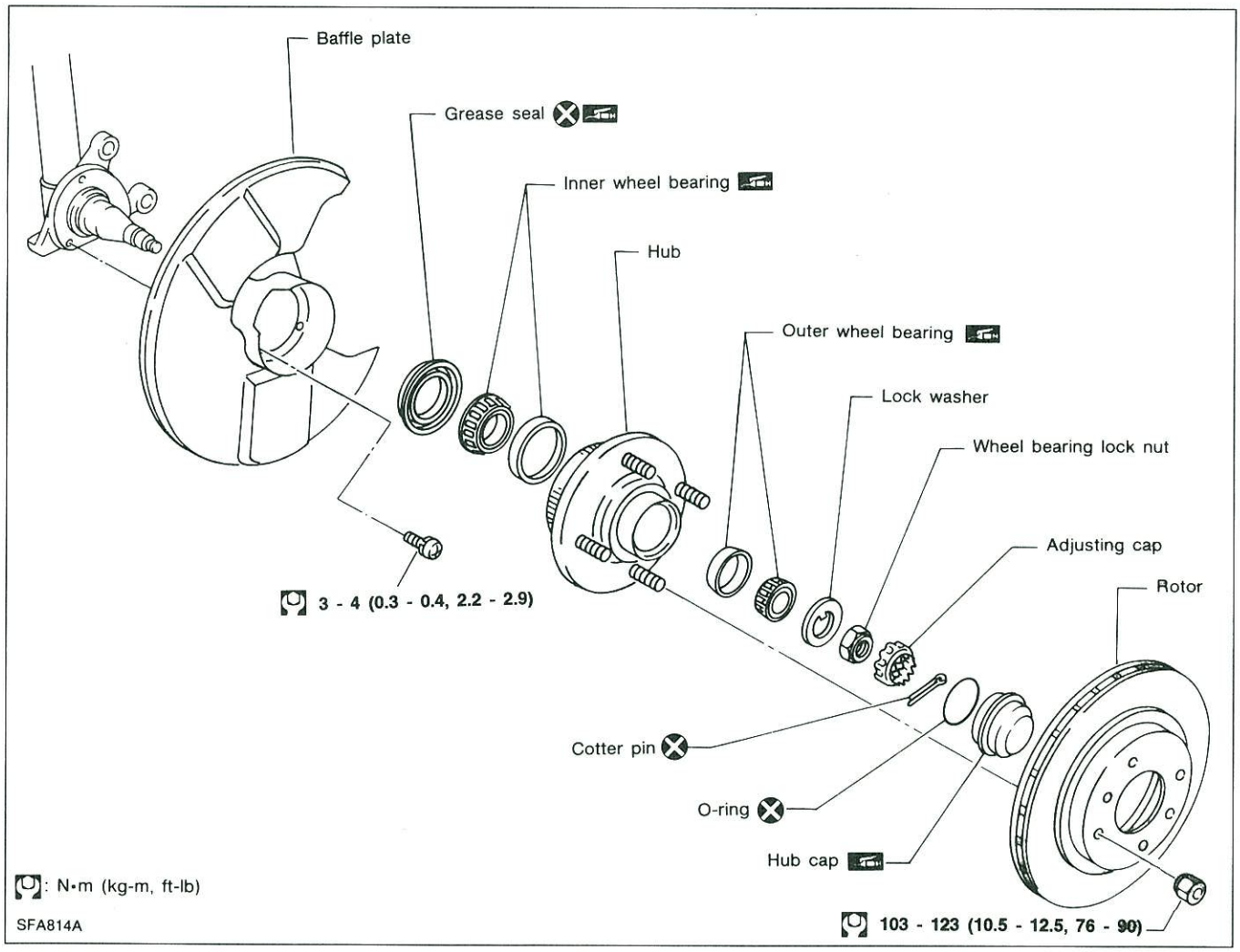
FRONT WHEEL TURNING ANGLE

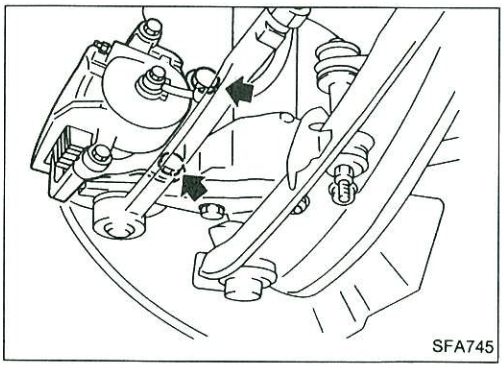


1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.



2. Rotate steering wheel all the way right and left; measure turning angle.
Wheel turning angle (Full turn):
Inside wheel: 40°30' - 44°30'
Outside wheel: 33°30'

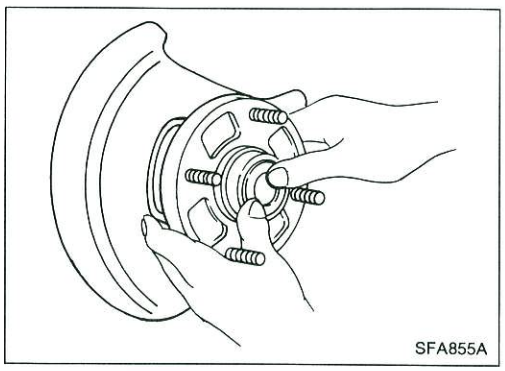




Removal

- Remove brake caliper assembly and rotor.

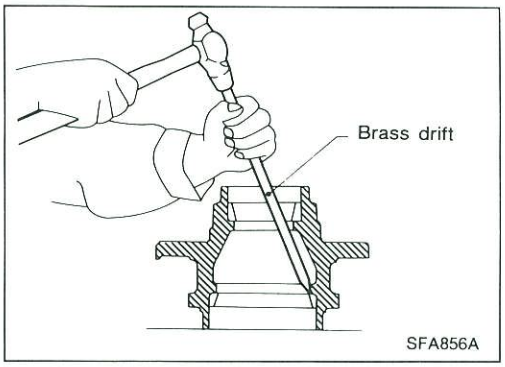
Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Do not pull or twist brake hose.



- Remove wheel hub and wheel bearing from spindle.

Be careful not to drop outer bearing.

Removal (Cont'd)



- If bearing or bearing race needs to be replaced, drive out outer race from hub with a brass drift and replace bearing and race as a set.

Inspection

WHEEL BEARING

Check wheel bearing to see that it rolls freely and is free from noise, crack, pitting, or wear, and replace if damaged.

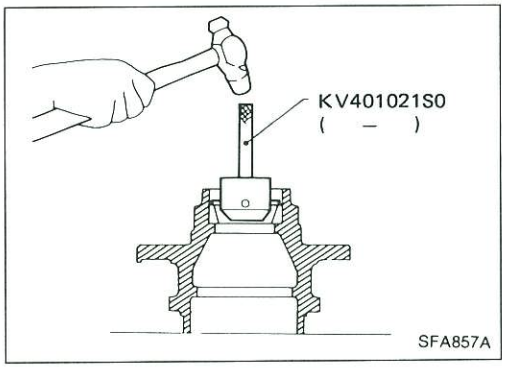
WHEEL HUB

Check wheel hub for crack by a magnetic exploration or dyeing test, and replace if cracked.

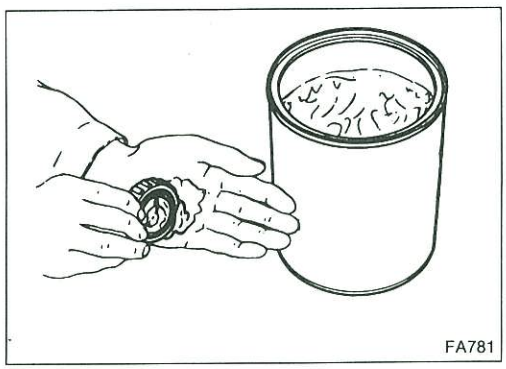
KNUCKLE SPINDLE

Check knuckle spindle for deformation, tapping mark, or cracks (by magnetic or dyeing test) and replace if damaged.

Installation

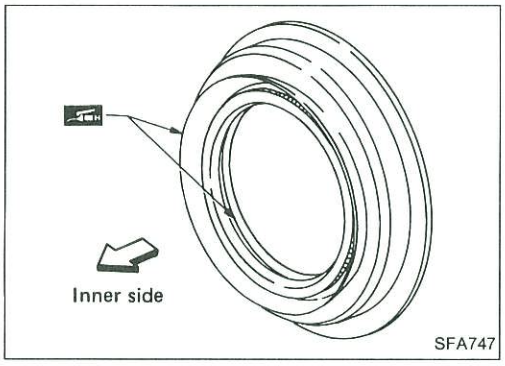


- Install bearing outer race with Tool until it seats in hub.

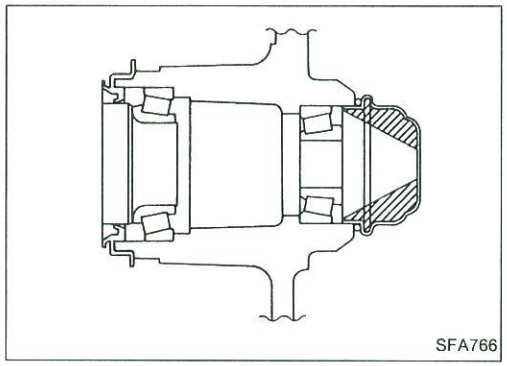


- Coat each bearing cone with recommended multi-purpose grease.

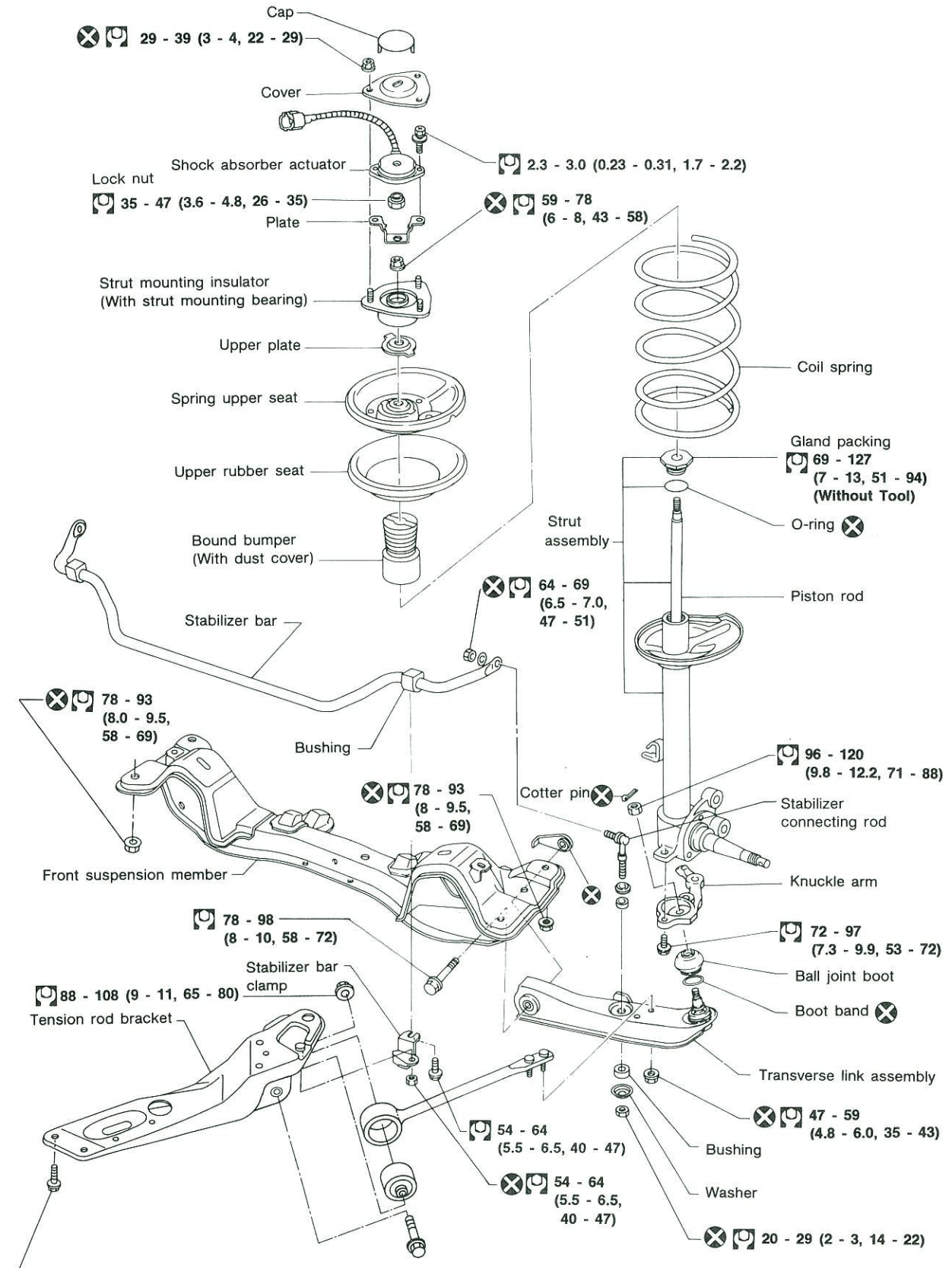
Installation (Cont'd)



- Pack grease seal lip with recommended multi-purpose grease, then install it with suitable drift until it seats in hub.



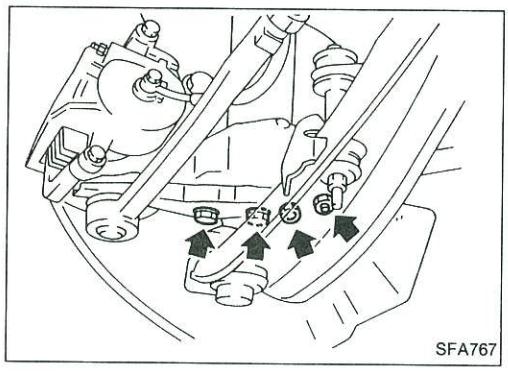
- Pack hub and hub cap with recommended multi-purpose grease up to shaded portions.
- For wheel bearing adjustment, refer to ON-VEHICLE SERVICE.



- 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)

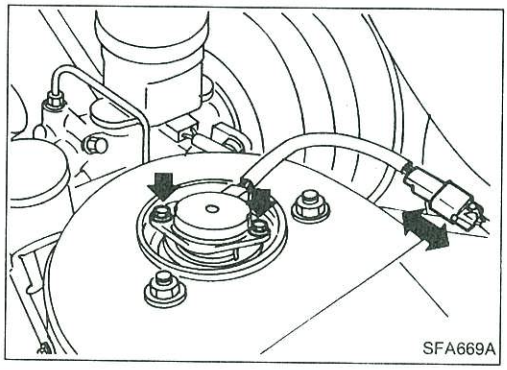
SFA813A



Removal and Installation

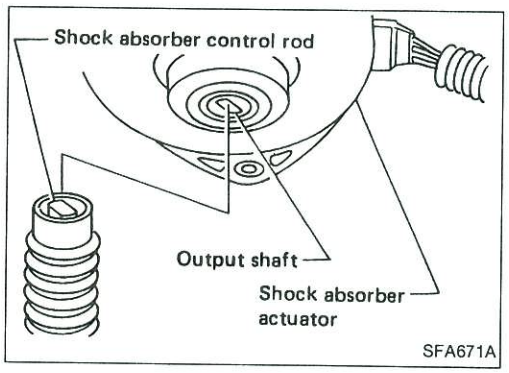
- Remove tension rod nuts and knuckle arm fixing bolts.

Make sure brake hose is secure and not twisted.

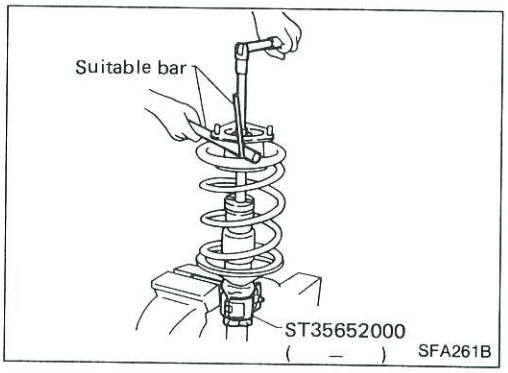


- Disconnect sub-harness connector and then remove shock absorber actuator fixing bolt.
- Remove strut assembly fixing nut (to hoodledge).

Do not remove piston rod lock nut on vehicle.



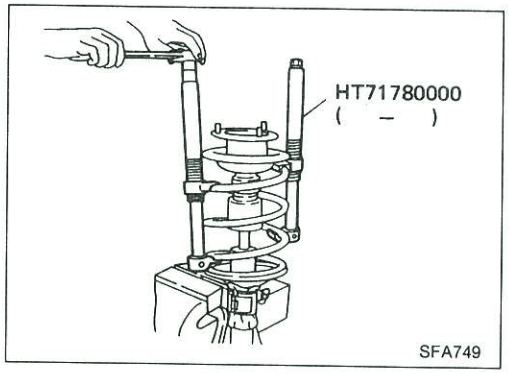
Before installing actuator, ensure angle of shock absorber control rod is aligned with that of actuator output shaft. Otherwise, actuator may be damaged.



Disassembly

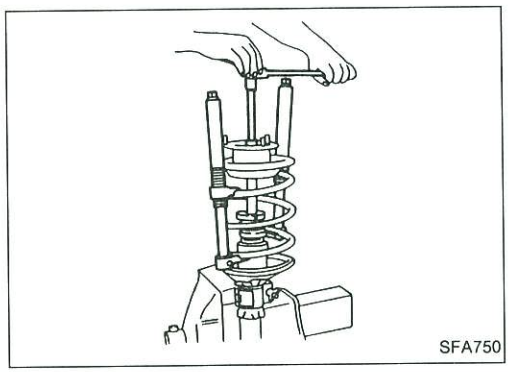
1. Set strut assembly on vice with attachment, then loosen piston rod lock nut.

Do not remove piston rod lock nut.

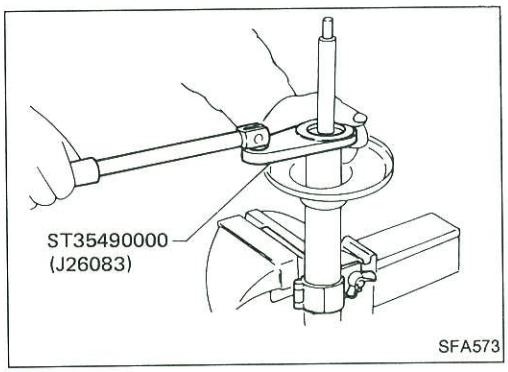


2. Compress spring with Tool so as to permit turning of strut mounting insulator by hand.

Disassembly (Cont'd)


SFA750

3. Remove piston rod lock nut. Then remove coil spring.



SFA573

4. Remove gland packing with Tool.
- **Avoid dirt and dust getting into gland packing portion.**

5. Retract piston rod by pushing it down until it bottoms. Then, slowly withdraw piston rod from cylinder together with piston guide.

Inspection

Wash all parts, except for nonmetallic parts, clean with suitable solvent and dry with compressed air.
Blow dirt and dust off of nonmetallic parts using compressed air.

STRUT ASSEMBLY

- Oil oozing out around gland packing does not need strut replacement.
  If oil leakage is evident on spring seat, check piston rod gland packing and O-ring.
  If oil leakage occurs on welded portion of outer strut casing, replace strut assembly.
- If shock absorber itself is malfunctioning, replace as shock absorber kit.

GLAND PACKING

Check gland packing for oil leakage. Replace gland packing if necessary.

STRUT MOUNTING INSULATOR

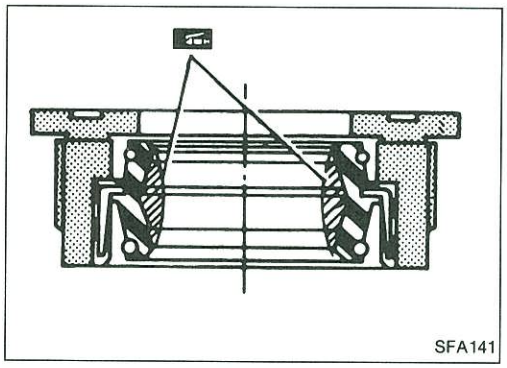
Check cemented rubber-to-metal portion for melting or cracks. Check rubber parts for deterioration. Replace if necessary.

THRUST SEAT

Check for cracks, deformation or other damage. Replace if necessary.

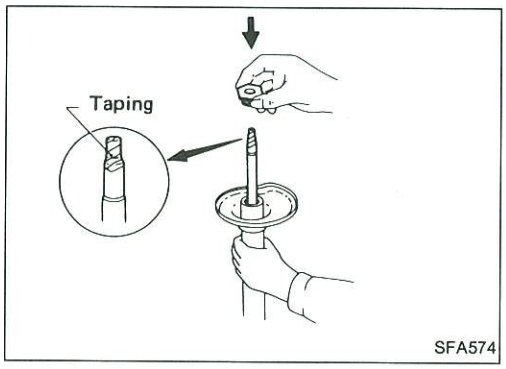
COIL SPRING

Check for cracks, deformation or other damage. Replace if necessary.


SFA141

Assembly

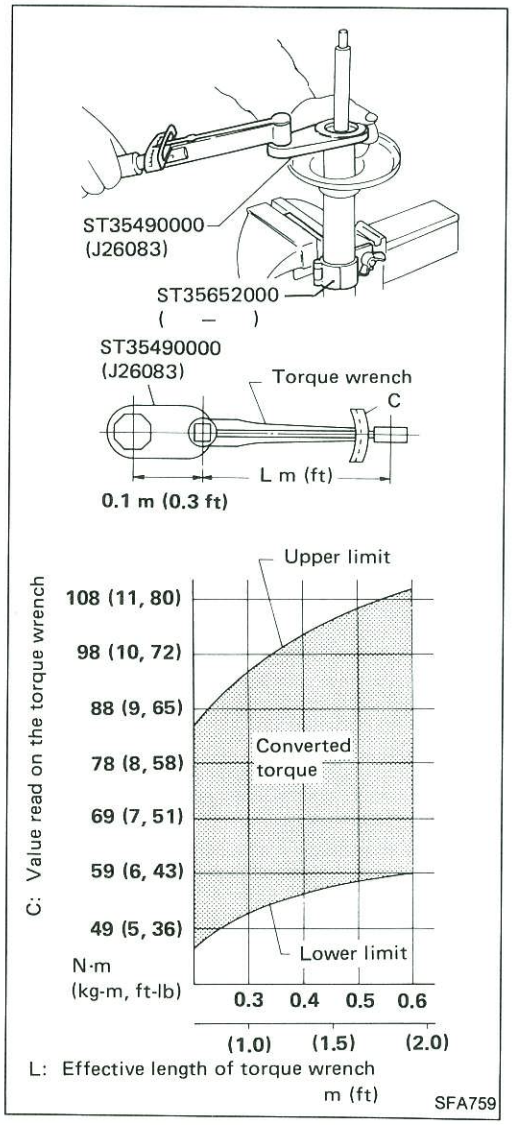
- Lubricate sealing lip of gland packing.



SFA574

- Install gland packing.

Cover piston rod with tape so as not to damage oil sealing lip.



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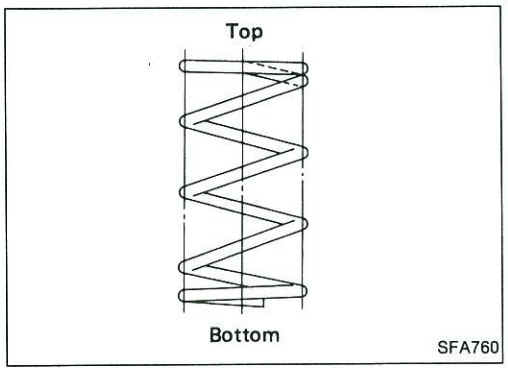
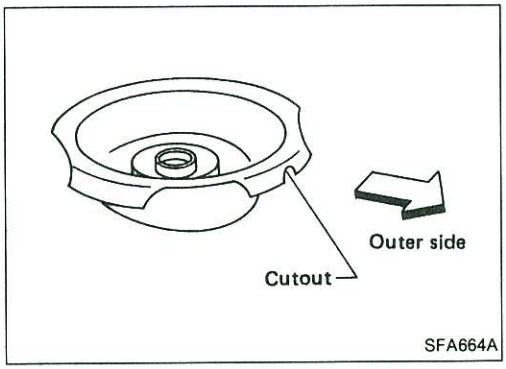
- Tighten gland packing to the specified torque (refer to chart at left) with Tool.

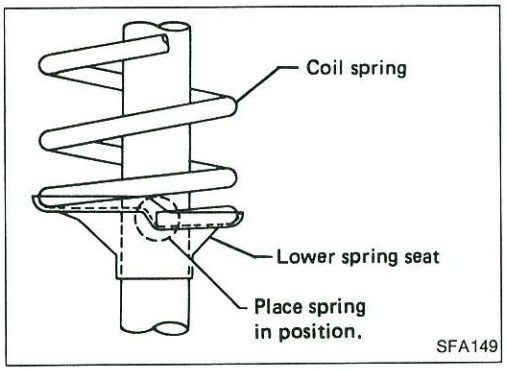
Assembly (Cont'd)



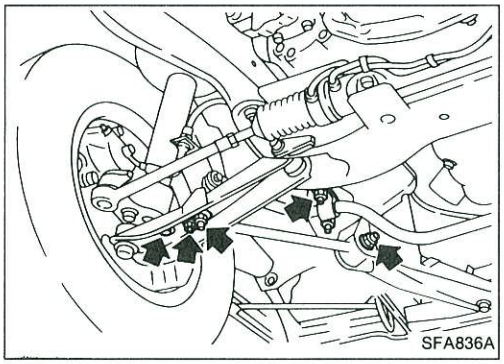
- When installing coil spring, be careful not to reverse top and bottom direction. (top end is flat.)



- Install upper spring seat with its cutout facing the outer side of vehicle.

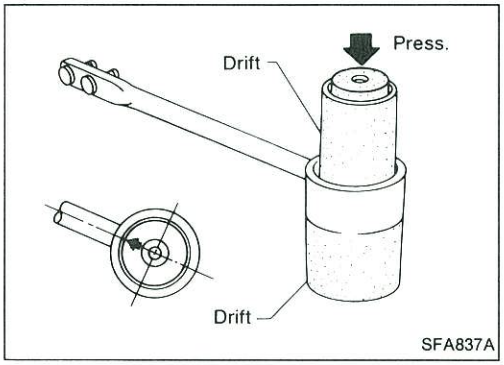


After placing spring in position on lower spring seat, release spring compressor gradually.


SFA836A

Removal and Installation

- Remove tension rod and stabilizer bar.



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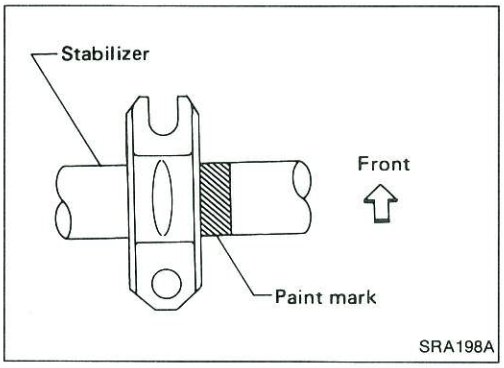
- When removing tension rod bushing, place one drift on lower side of bushing and the other on upper side, as shown at left, and press bushing out.
- Place arrow mark on bushing facing tension rod before installing bushing.



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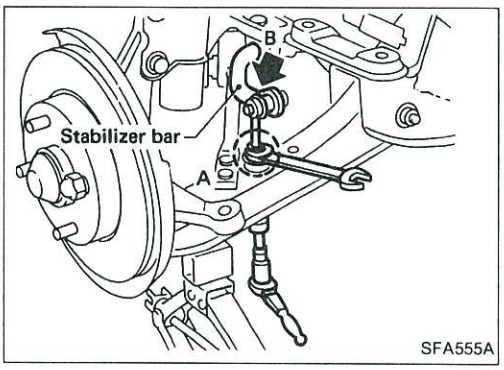
- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.



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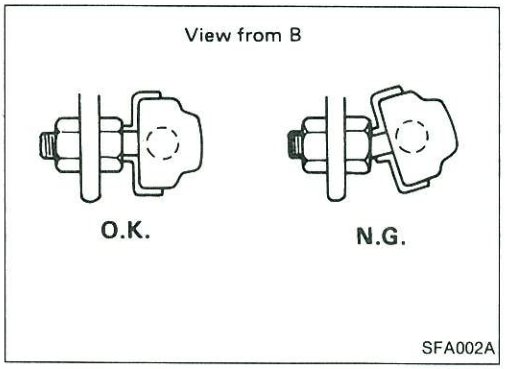
- When removing and installing stabilizer bar, fix portion A.



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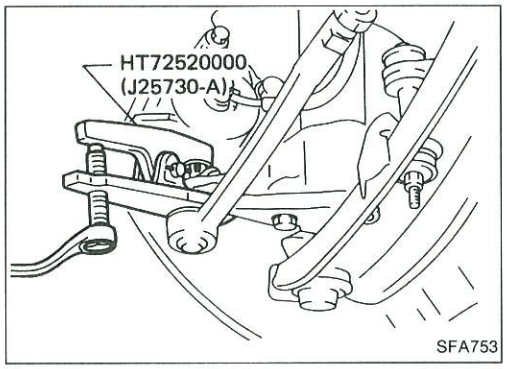
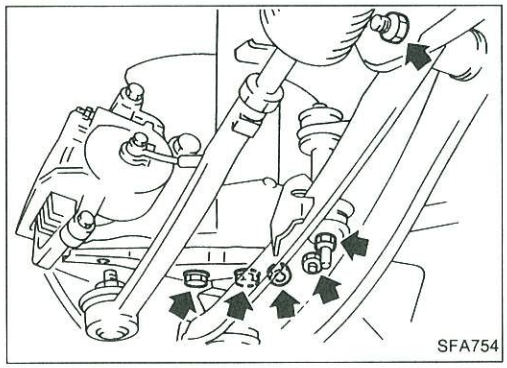
- Install stabilizer bar with ball joint socket properly placed.

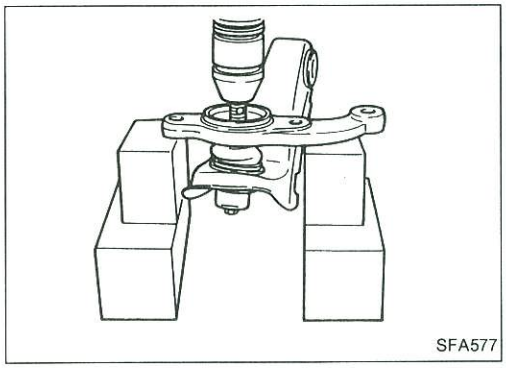


Removal and Installation

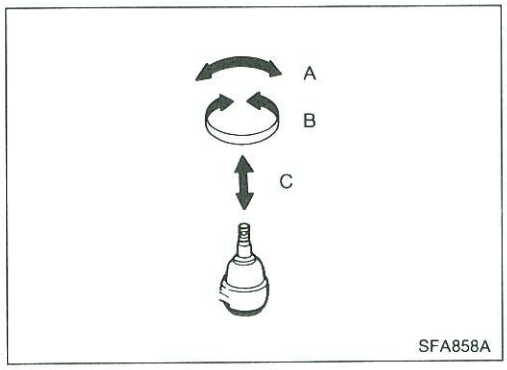
- Separate knuckle arm from tie-rod.



- Separate knuckle arm from strut. Remove stabilizer, tension rod and transverse link assembly.



- Separate ball joint from knuckle arm with press.
- Install transverse link assembly to front suspension member, first temporarily tighten nuts.



Inspection

- Check transverse link for damage, cracks, deformation; replace transverse link assembly if necessary.
- Check rubber bushing for damage, cracks and deformation; replace transverse link assembly if necessary.
- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace lower ball joint.
  Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.
  Swinging force "A":
  (measuring point: cotter pin hole of ball stud)
  24.5 - 80.4 N (2.5 - 8.2 kg, 5.5 - 18.1 lb)
  Turning torque "B":
  1.5 - 4.9 N·m (15 - 50 kg-cm, 13 - 43 in-lb)
  Vertical end play "C":
  0.1 - 1.3 mm (0.004 - 0.051 in)
- Check dust cover for damage. Replace it and cover clamp if necessary.

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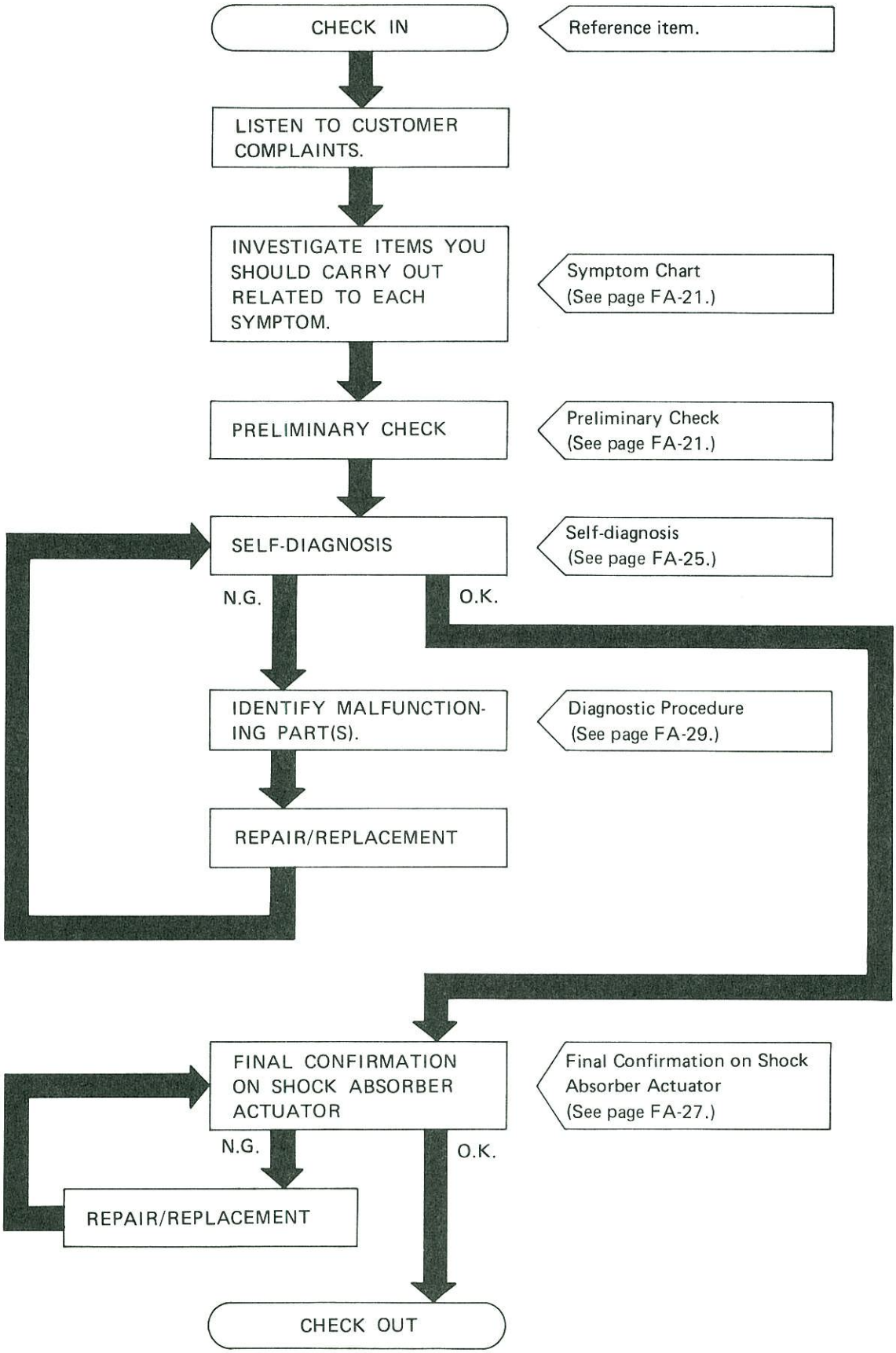
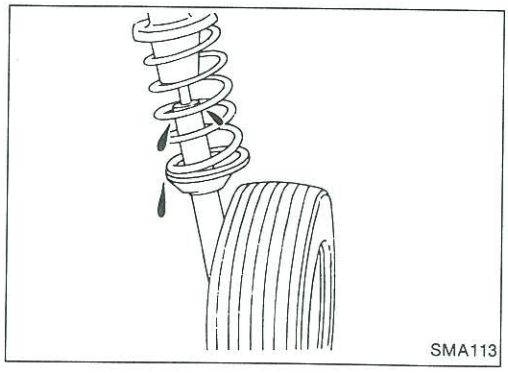
How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



Symptom Chart

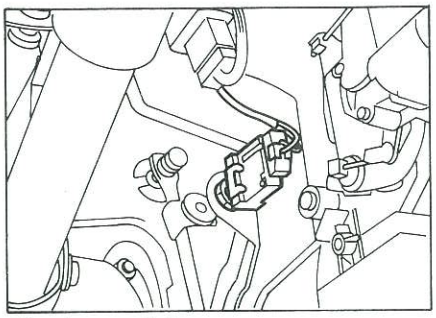
REFERENCE PAGE		FA-21	FA-29	FA-30	FA-31	FA-32	FA-34	FA-35	FA-35	FA-36	FA-27
SYMPTOM		Preliminary check	Select switch	Control unit	Vehicle speed sensor	Steering angle sensor	Stop lamp switch	Front shock absorber actuator	Rear shock absorber actuator	Sonar road surface sensor	Shock absorber
No indicator lamps come on.			○	○							
Self-diagnostic results	Self-diagnosis fails to start.		○	○							
	Vehicle speed signal is not entered.			○	○						
	Steering angle signal is not entered.			○		○					
	Brake signal is not entered.			○			○				
	Actuator drive circuit is shorted.			○				○	○		
	Sonar road surface sensor signal is not entered.			○						○	
Riding comfort is too "firm" or too "soft".		○		○				○	○		○
Damping force of shock absorber (for a particular wheel only) cannot be changed.		○						○	○		○



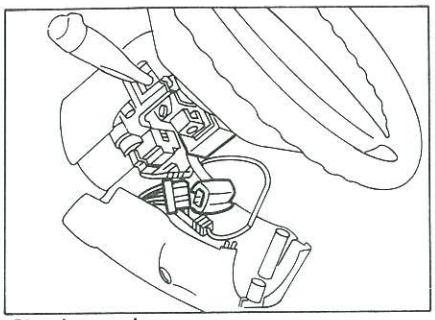
Preliminary Check

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

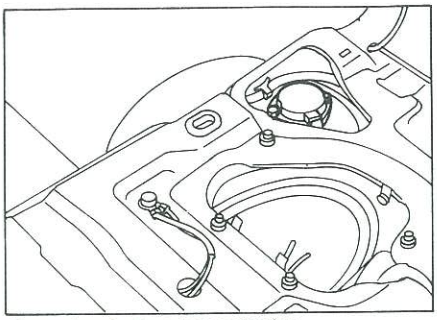
Component Parts and Harness Connector Location



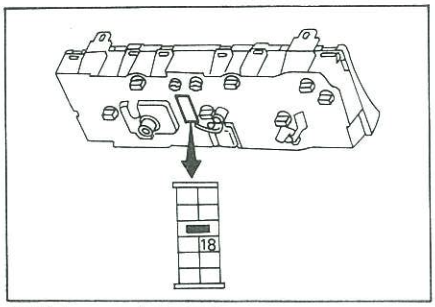
Stop lamp switch



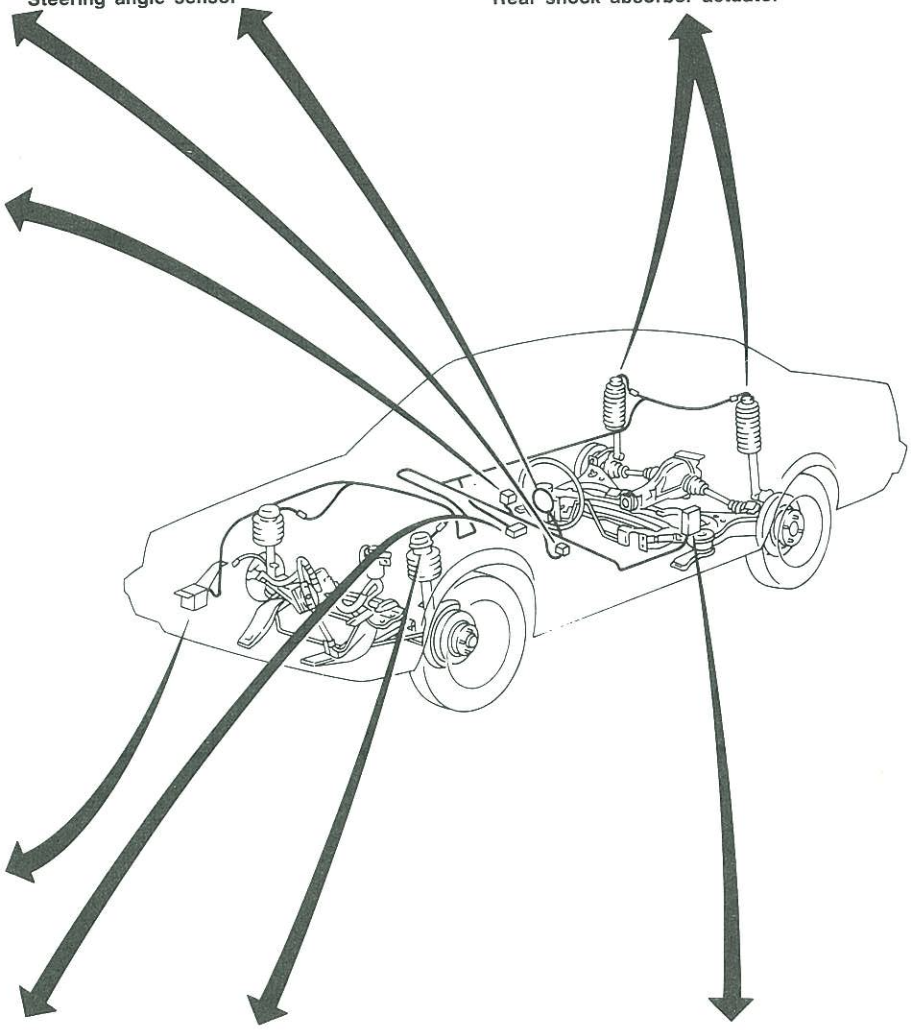
Steering angle sensor

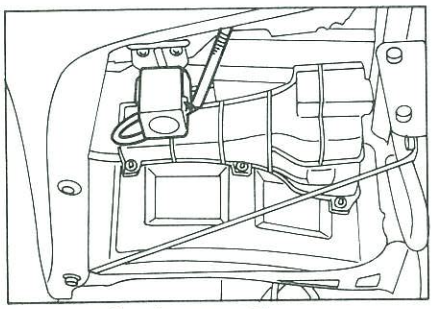


Rear shock absorber actuator

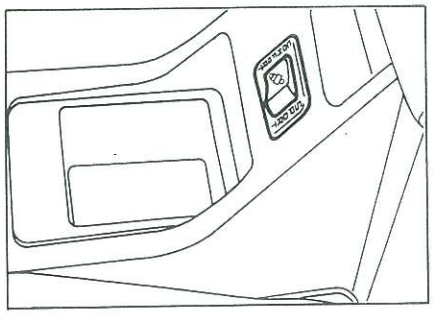


Vehicle speed sensor

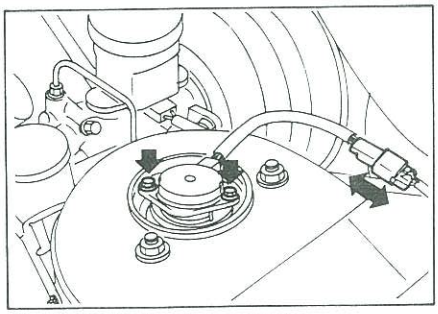




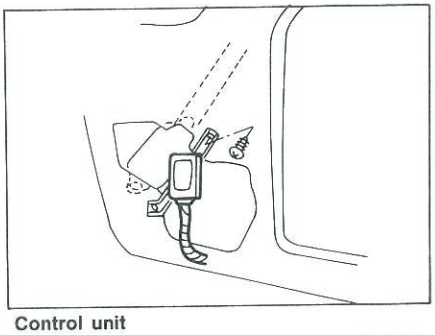
Sonar road surface sensor



Select switch



Front shock absorber actuator



Control unit

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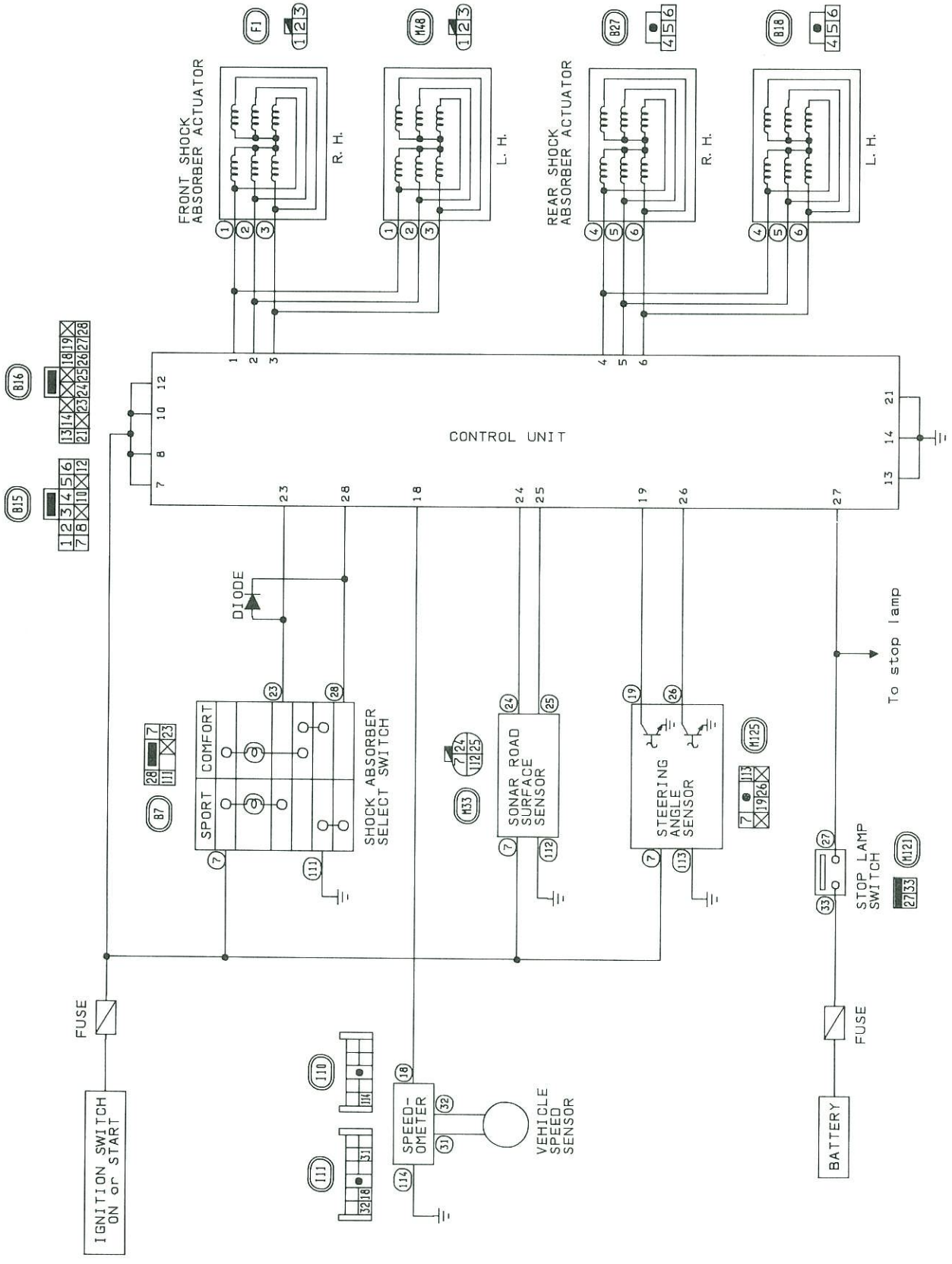
Circuit Diagram for Quick Pinpoint Check



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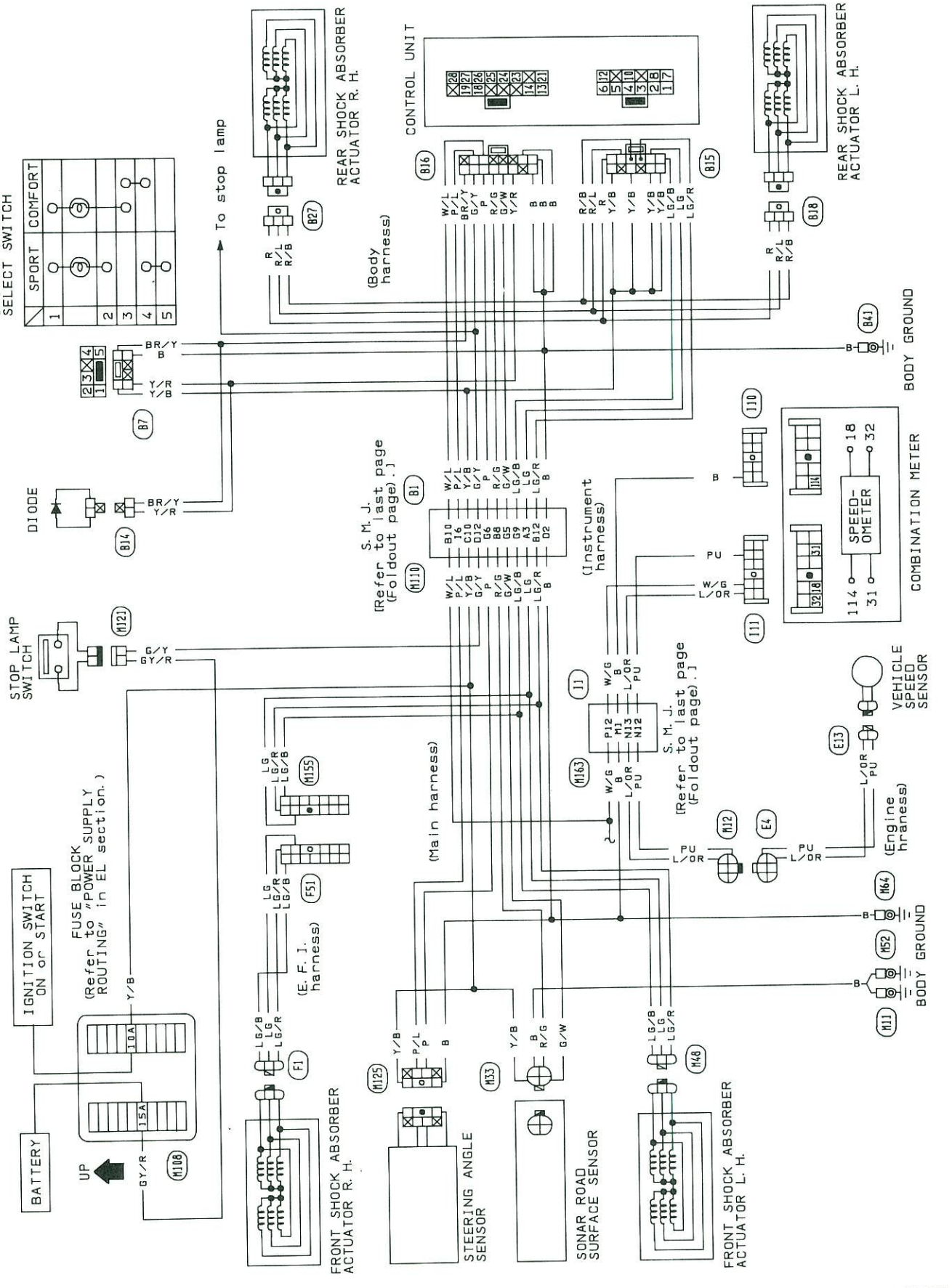
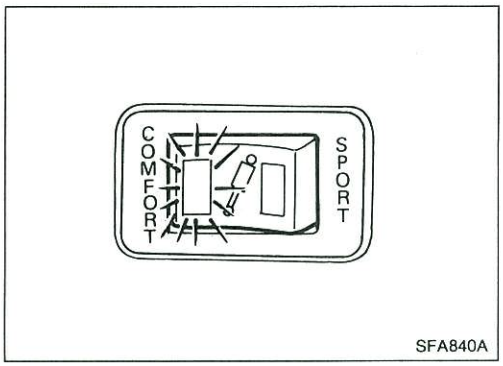
Wiring Diagram



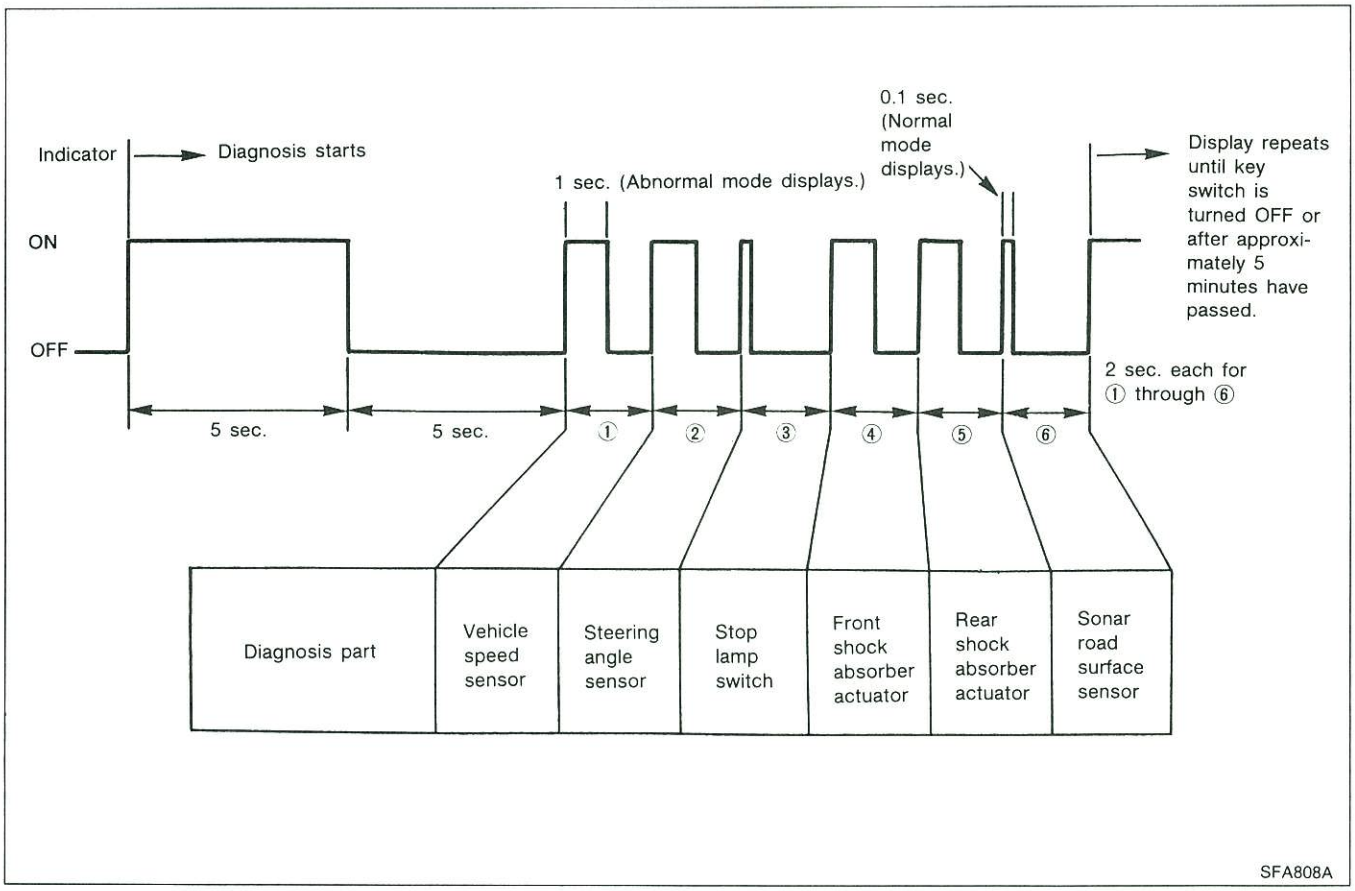
MFA005A



Self-diagnosis

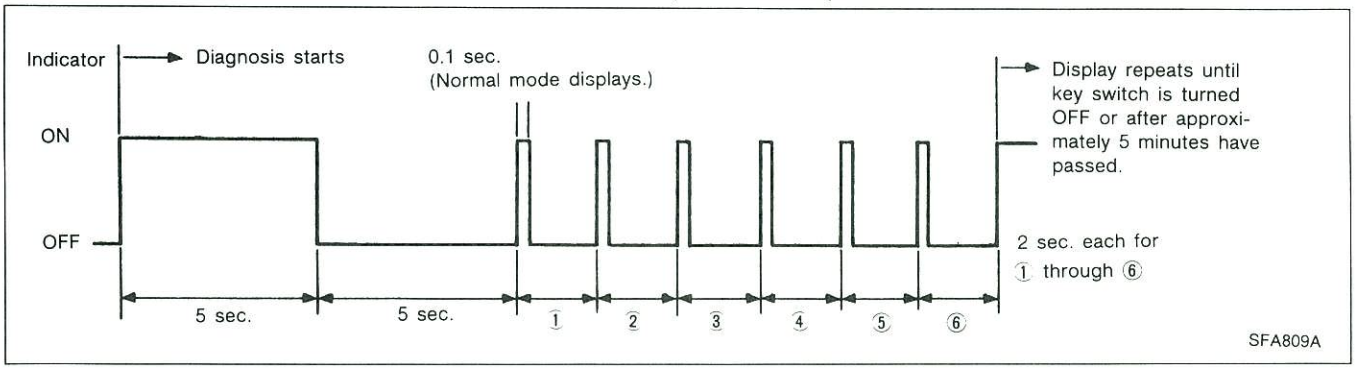
SELF-DIAGNOSIS PROCEDURES

1. Input starting conditions for self-diagnosis.
(1) Turn ignition switch "OFF".
(2) Immediately start engine.
(3) Within 10 seconds after engine has started, push select switch alternately to "COMFORT" and "SPORT" five times or more, ending up on "COMFORT".
(4) Drive the vehicle forward at least 2 to 3 m (7 to 10 ft), turn steering wheel at 90° or more, stop the vehicle, depress brake pedal and release it.
2. The self-diagnosis mode will then appear in the "COMFORT" position.



- **When all systems are normal**

  When all systems are normal, the indicator displays normal mode (0.1 sec. ON).

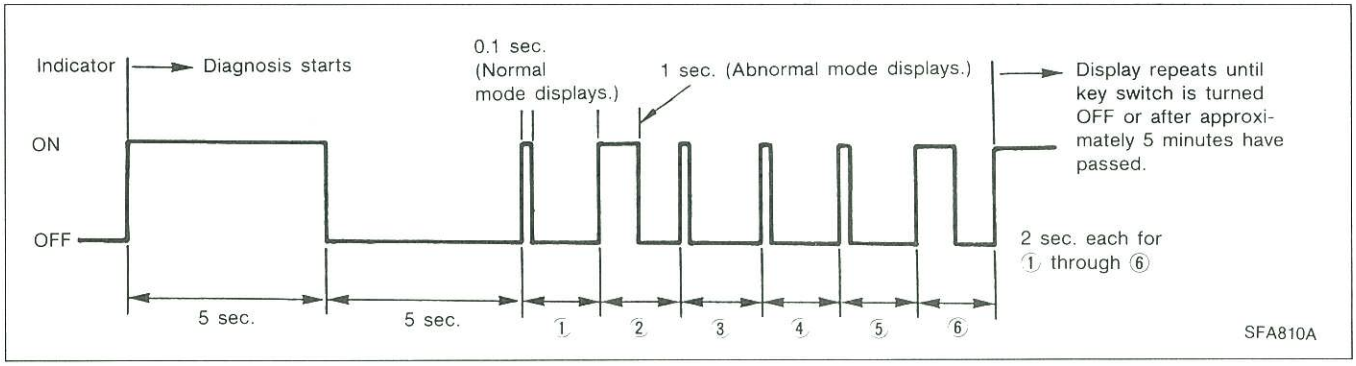


Self-diagnosis (Cont'd)

- **When there is a system malfunction**

  Example: When ② steering angle sensor and ⑥ sonar road surface sensor experience malfunction.

  The indicator displays abnormal mode (1 sec. ON).



CANCELING THE SELF-DIAGNOSIS FUNCTION

There are two methods of canceling the self-diagnosis function, as described below:

- The self-diagnosis system is canceled by turning ignition switch "OFF".
- After the self-diagnosing has been operated for approximately 5 minutes, the self-diagnosis system will be automatically canceled.

PRECAUTIONS DURING SELF-DIAGNOSIS

a. When the distance between sonar road surface sensor and road surface is greater than 500 mm (19.69 in) (such as over a workpit) or when it is less than 200 mm (7.87 in), the surface sensor will indicate a malfunction.

b. Place vehicle on a flat surface to provide proper self-diagnosing so that reflective surface of sonar road surface sensor is free from surface irregularities (i.e. holes, bumps, etc.).

c. Self-diagnosis indication on shock absorber actuators shows only abnormalities of the command signal from control unit to actuators. For diagnosing problems on electrical circuit between control unit and actuators as well as malfunctions of actuators themselves, final confirmation should be performed using procedures described in "Final Confirmation on Shock Absorber Actuator". (See page FA-31.)

Final Confirmation on Shock Absorber Actuator

Check shock absorbers in self-diagnosis mode after repairing malfunctioning items.

START

Set system in self-diagnosis mode.

A

CHECK SWITCHING SHOCK ABSORBER ACTUATOR.

1) Shock absorber actuator automatically switches from on position to another so check damping force of respective shock absorbers changes by pushing vehicle.
2) Switching sequence of shock absorber actuator is shown below:

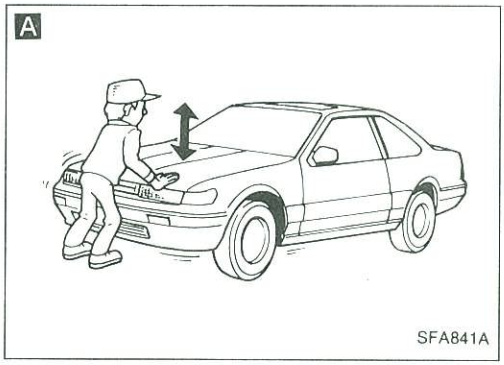
F (Firm) —5 sec.→ N (Normal) —5 sec.→ S (Soft) —5 sec.→ F

3) Shock absorber actuator automatically switches from one position to another within approx. 5 seconds for approx. 5 minutes after starting self-diagnosis or before ignition switch is turned "OFF".
   All four shock absorbers become firm or soft. ... O.K.
   One of shock absorber does not change. ... N.G.

O.K. → All four shock absorbers are in good condition. → END

N.G. ↓

A



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B

CHECK ACTUATOR.

1) Remove actuator from top side of strut. Check if output shaft rotates properly when system is set in self-diagnosis mode.
   - Each actuator output shaft rotates, shifting positions from "F" to "N", then to "S" in that order at five second intervals. ... O.K.
   - Particular actuator output shaft does not rotate. ... N.G.

O.K. ↓

C

CHECK SHOCK ABSORBER.

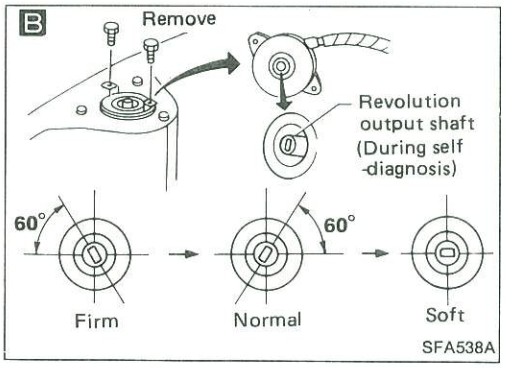
1) Turn shock absorber control rod two or three times using long-nosed pliers:
   It turns smoothly. ... O.K.
   It does not turn smoothly. ... N.G.

O.K. ↓ Ⓑ

N.G. → Seized control rod → Replace shock absorber.

N.G. ↓ Ⓐ

B



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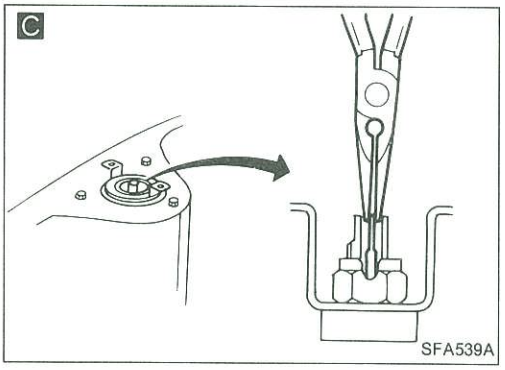
C



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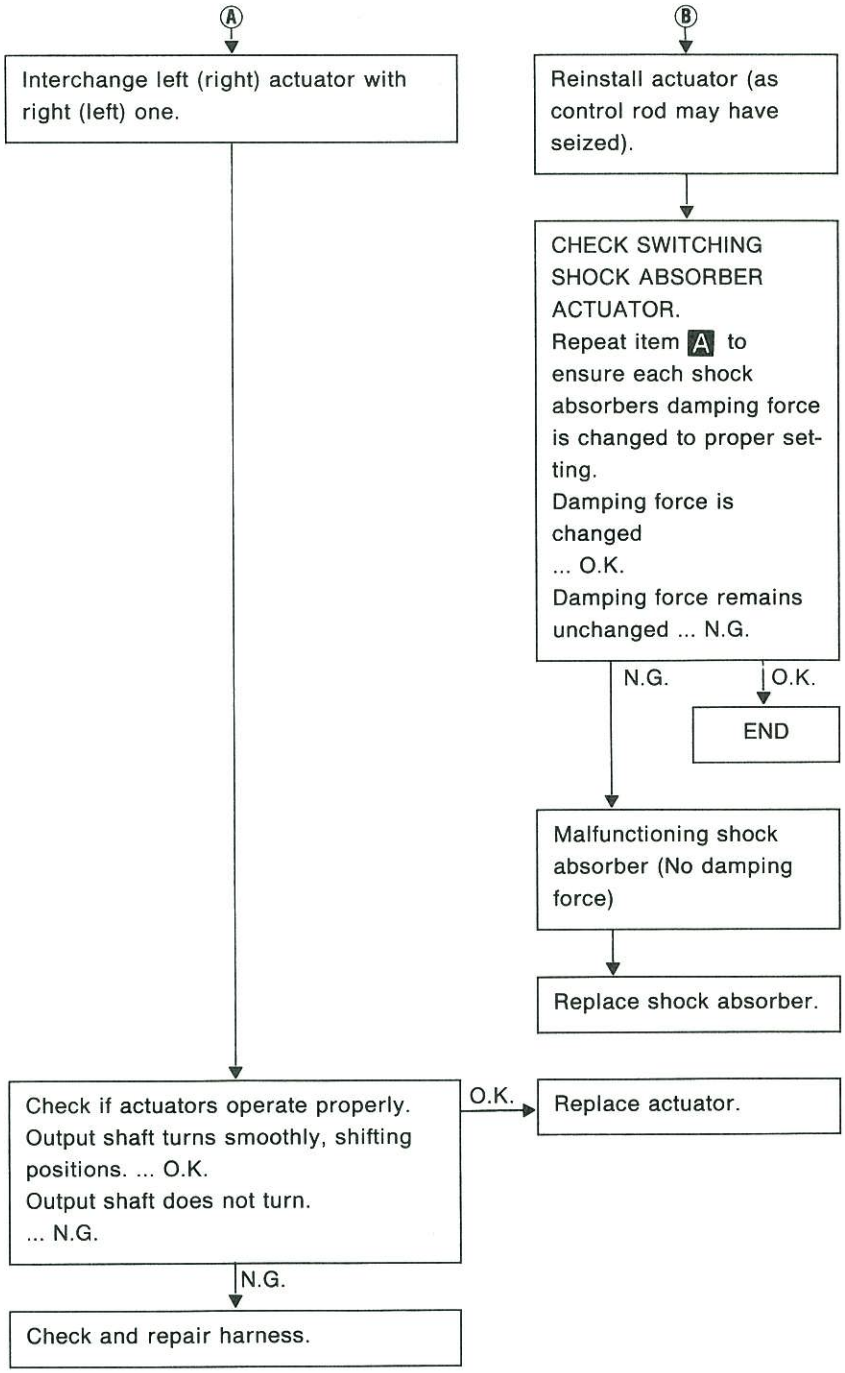
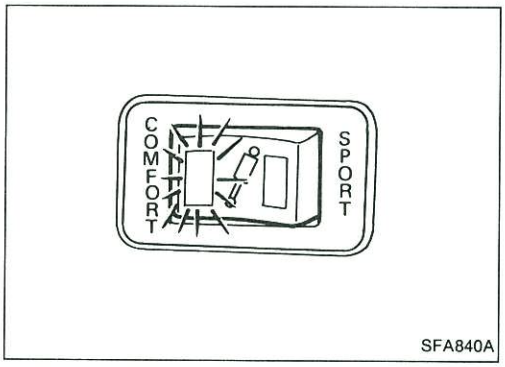
Final Confirmation on Shock Absorber Actuator (Cont'd)



Before installing actuator, ensure angle of shock absorber control rod is aligned with that of actuator output shaft. Otherwise, actuator may be damaged.



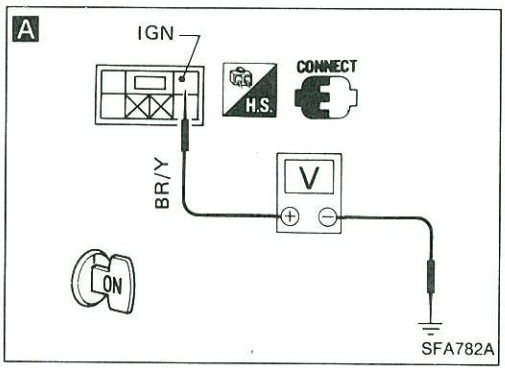
Diagnostic Procedure 1

SYMPTOM:

No indicator lamp comes on when ignition switch is turned "ON".

Normal condition (with ignition switch "ON")

- Select switch indicator lamp:
  Either "COMFORT" or "SPORT" indicator corresponding to select switch position comes on.



START

A

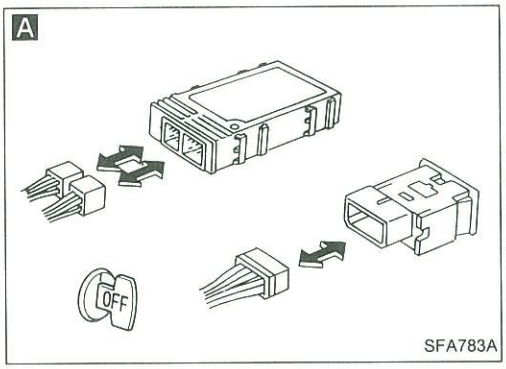
CHECK SELECT SWITCH POWER SUPPLY.
1) Turn ignition switch "ON".
2) Measure voltage across select switch connector terminal IGN and ground.
Voltage:
Approximately 12V

N.G. → Check and repair wiring.

O.K.

Replace select switch.

A



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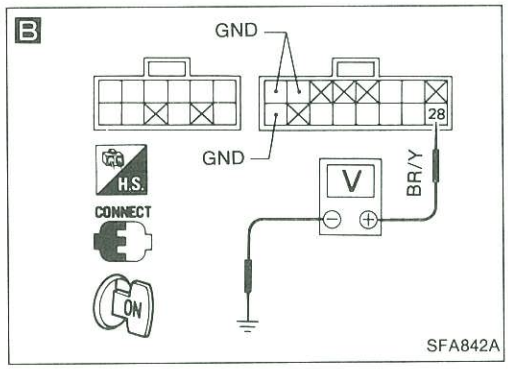
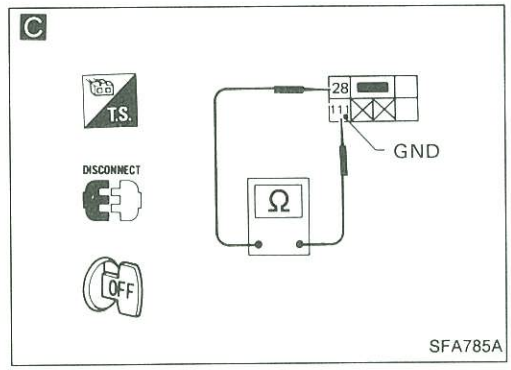
B



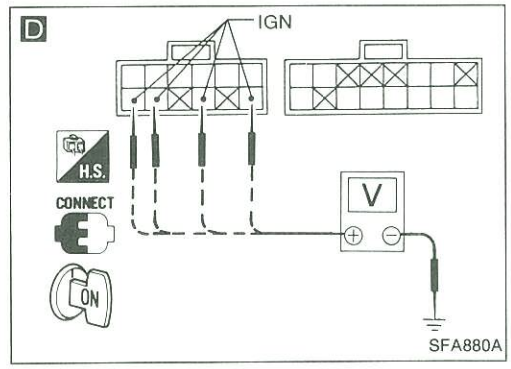
SFA842A

C



SFA785A

D



SFA880A

Diagnostic Procedure 2

SYMPTOM:

System is not set in self-diagnosis mode.

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect select switch connector and control unit connector, and reconnect them firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.
Measure voltage variations between control unit terminal (28) and ground as indicated below when select switch is moved from "COMFORT" to "SPORT", and vice versa.
COMFORT:
Approximately 12V
SPORT:
0V

O.K. → D

CHECK CONTROL UNIT POWER SUPPLY.
1) Turn ignition switch "ON".
2) Measure voltage across control unit connector terminal IGN and ground.
Voltage:
Approximately 12V

N.G. → Check and repair harness.

O.K. → Replace control unit.

N.G.

C

CHECK SELECT SWITCH CONTINUITY.
1) Disconnect select switch connector.
2) Check if continuity between terminals (28) and GND is as indicated below when select switch is moved from "COMFORT" to "SPORT", and vice versa.
COMFORT:
Continuity should not exist.
SPORT:
Continuity should exist.

O.K. → Check and repair harness.

N.G.

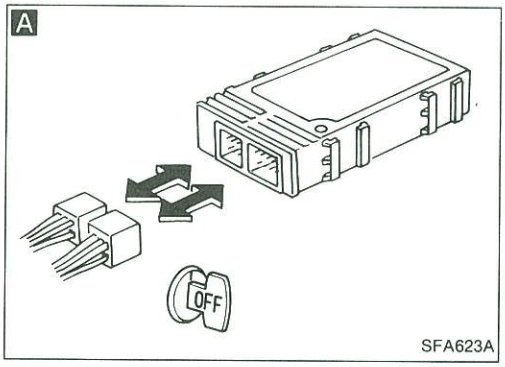
Replace select switch.

O.K. → After repair, conduct self-diagnosis to ensure malfunction has been eliminate.

O.K.

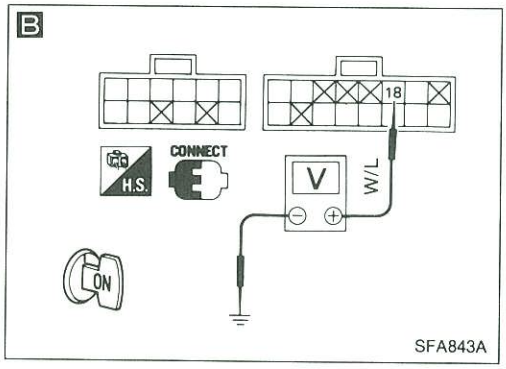
Final confirmation on shock absorber actuator (See page FA-27.)

A



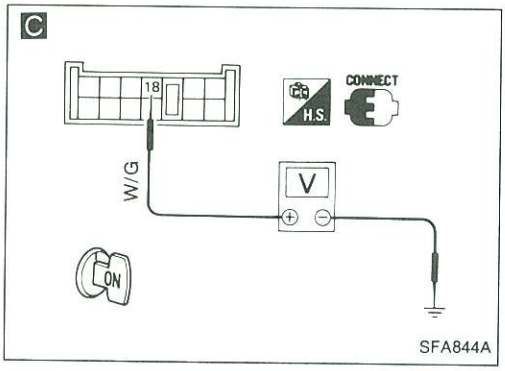
SFA623A

B



SFA843A

C



SFA844A

Diagnostic Procedure 3

SYMPTOM:

Vehicle speed sensor system malfunctions.

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) Measure voltage variations between control unit connector terminal ⑱ and ground while slowly rotating rear wheels using your hand.
Voltage must change between 0 and 5V.

O.K. → Replace control unit. → Ⓐ

N.G.

C

CHECK SPEED SENSOR OUTPUT SIGNAL.
Measure voltage variations between terminal ⑱ on rear of combination meter and ground while slowly rotating rear wheels using your hand.
Voltage must change between 0 and 5V.

O.K. → Check and repair harness. → Ⓐ

N.G.

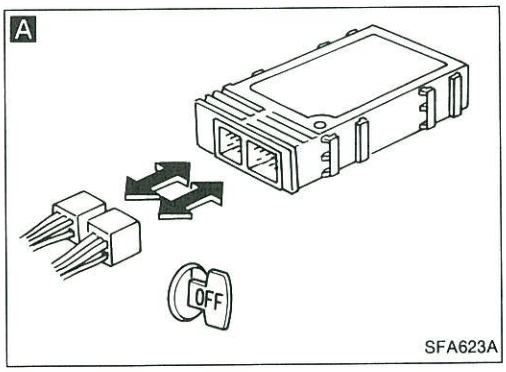
Replace vehicle speed sensor.

O.K. → Ⓐ → After repair, conduct self-diagnosis to ensure malfunction has been eliminated.

O.K.

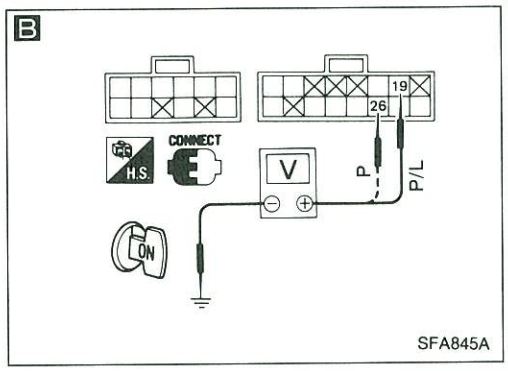
Final confirmation on shock absorber actuator (See page FA-27.)

A



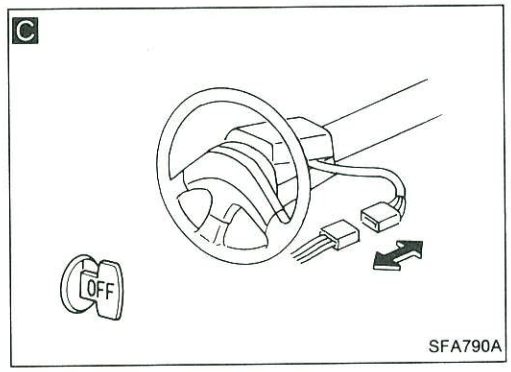
SFA623A

B



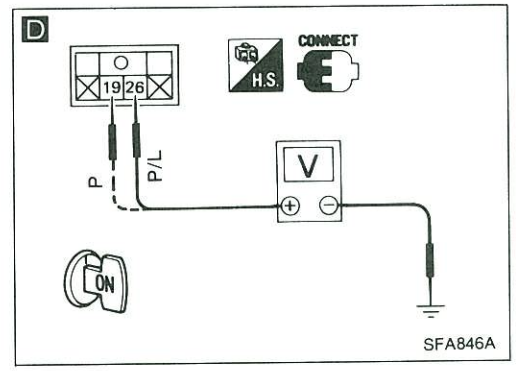
SFA845A

C



SFA790A

D



SFA846A

Diagnostic Procedure 4

SYMPTOM:

Steering angle sensor system malfunctions.

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) Measure voltage variations between control unit terminals ⑲ and ㉖, and ground when steering wheel is turned slowly.
Do not turn steering wheel quickly.
Voltage must change from approximately 0 to at least 5V.

O.K. → Replace control unit. → Ⓐ

N.G.

C

CHECK CONNECTOR CONTINUITY.
Disconnect steering angle sensor connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection → Ⓐ

N.G.

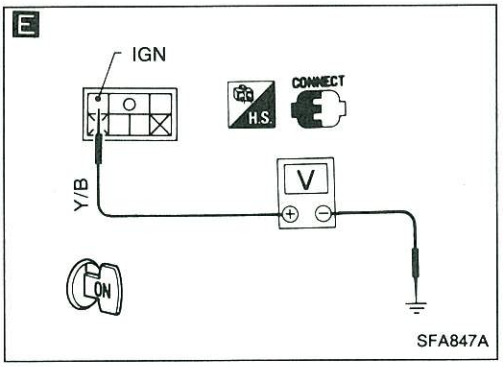
D

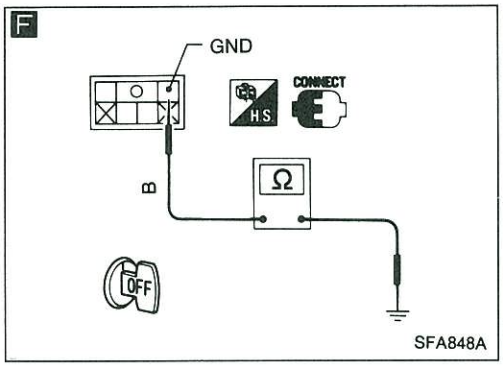
CHECK STEERING ANGLE SENSOR OUTPUT SIGNAL.
1) Turn ignition switch "ON".
2) Measure voltage variations between steering angle sensor connector terminals ⑲ and ㉖, and ground while turning steering wheel slowly.
Voltage must change from approximately 0 to at least 5V.

O.K. → Check and repair harness. → Ⓐ

N.G. → Ⓑ

Diagnostic Procedure 4 (Cont'd)





Ⓑ

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

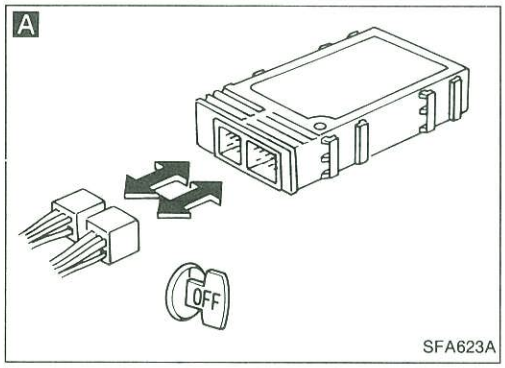
F CHECK STEERING ANGLE SENSOR GROUND CIRCUIT.
Check continuity between steering angle sensor terminal GND and body metal (ground).
Continuity should exist.

O.K. → Replace steering angle sensor. → Ⓐ

N.G. → Check and repair harness. → O.K. → Ⓐ

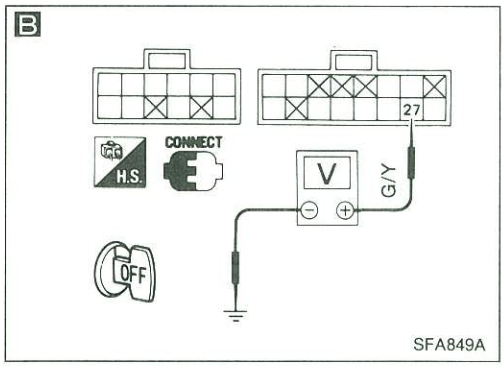
Ⓐ → After repair, conduct self-diagnosis to ensure malfunction has been eliminated. → O.K. → Final confirmation on shock absorber actuator (See page FA-27.)

A



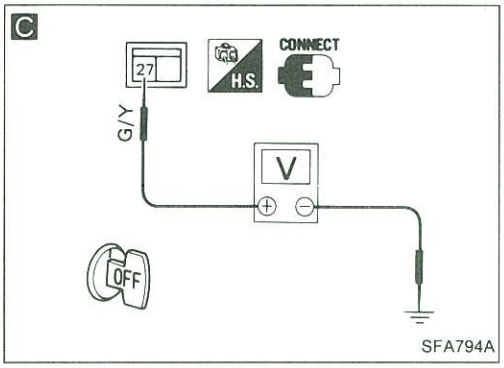
SFA623A

B



SFA849A

C



SFA794A

Diagnostic Procedure 5

SYMPTOM:

Brake signal system malfunctions.

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.
Measure voltage variations between control unit terminal ㉗ and ground when brake pedal is depressed and released.

Voltage:
Pedal depressed
Approximately 12V
Pedal released
0V

O.K. → Replace control unit. → Ⓐ

N.G.

C

CHECK STOP LAMP SWITCH OUTPUT SIGNAL.
Measure voltage variations between stop lamp switch connector terminal ㉗ and ground when brake pedal is depressed and released.

Voltage:
Pedal depressed
Approximately 12V
Pedal released
0V

O.K. → Check and repair harness. → Ⓐ

N.G.

Check stop lamp fuse.

N.G. → Replace fuse. → Ⓐ

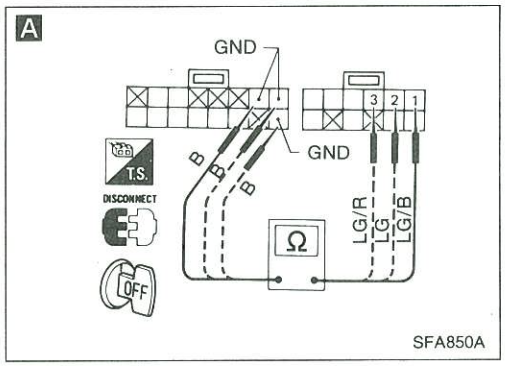
O.K.

Check stop lamp switch and harness.

O.K. → After repair, conduct self-diagnosis to ensure malfunction has been eliminated.

O.K.

Final confirmation on shock absorber actuator (See page FA-27.)



Diagnostic Procedure 6

SYMPTOM:

Front shock absorber actuator malfunctions.

START

A

CHECK SHOCK ABSORBER ACTUATOR CONTINUITY.
1) Disconnect control unit connector.
2) Check continuity between harness connectors ①, ②, ③ and GND, respectively.
Continuity should not exist.

O.K. → Replace control unit.

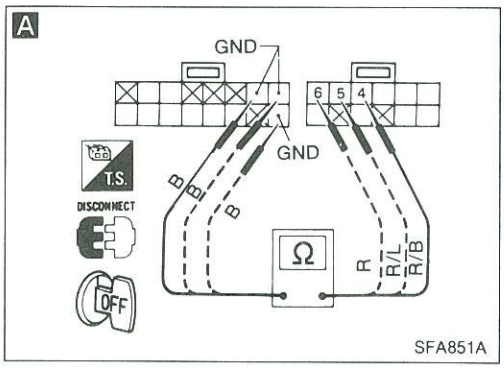
N.G.

Check and repair harness.

O.K. → After repair, conduct self-diagnosis to ensure malfunction has been eliminated.

O.K.

Final confirmation on shock absorber actuator (See page FA-27.)



Diagnostic Procedure 7

SYMPTOM:

Rear shock absorber actuator malfunctions.

START

A

CHECK SHOCK ABSORBER ACTUATOR CONTINUITY.
1) Disconnect control unit connector.
2) Check continuity between harness terminals ④, ⑤, ⑥ and GND, respectively.
Continuity should not exist.

O.K. → Replace control unit.

O.K.

N.G.

Check and repair harness.

O.K. → After repair, conduct self-diagnosis to ensure malfunction has been eliminated.

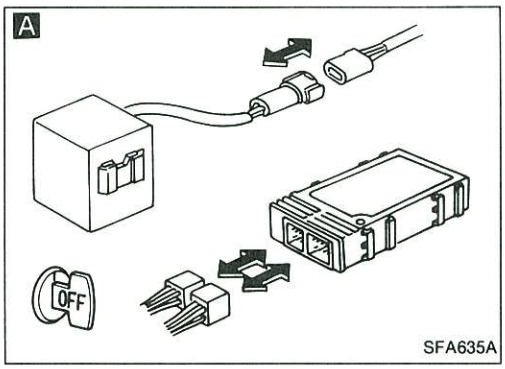
O.K.

Final confirmation on shock absorber actuator (See page FA-27.)

Diagnostic Procedure 8

SYMPTOM:

Sonar road surface sensor system malfunctions.



START

A

CHECK CONNECTOR CONTINUITY.
Disconnect sonar road surface sensor connector and control unit connector, and reconnect them firmly.
Conduct self-diagnosis.
- Ensure sonar's reflective surface is flat and even.
- Ensure distance between sonar road surface sensor and reflective surface is in the 200 to 500 mm (7.87 to 19.69 in) range.

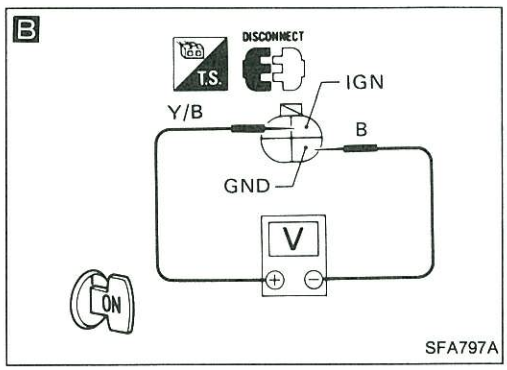
O.K. → Poor connector connection → Ⓐ

N.G.

B

CHECK SONAR ROAD SURFACE SENSOR POWER SUPPLY.
1) Disconnect sonar road surface sensor connector.
2) Turn ignition switch "ON".
3) Measure voltage across sonar road surface sensor terminals IGN and GND.
Voltage:
Approximately 12V

N.G. → Check and repair harness. → Ⓐ

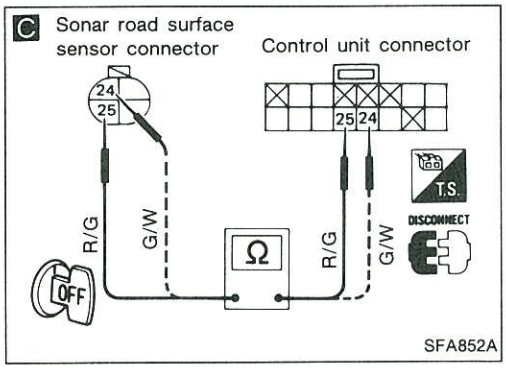


O.K.

C

CHECK HARNESS CONTINUITY BETWEEN CONTROL UNIT AND SONAR ROAD SURFACE SENSOR.
1) Disconnect control unit and sonar road surface sensor connectors.
2) Check continuity between sonar road surface sensor connector terminals ㉔ and ㉕ and their corresponding terminals of control unit connector.
Continuity should exist.

N.G. → Check and repair harness. → Ⓐ

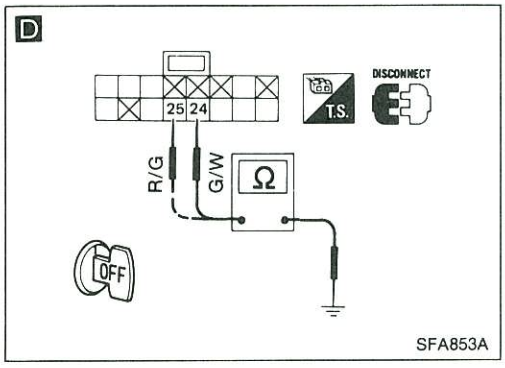


O.K.

D

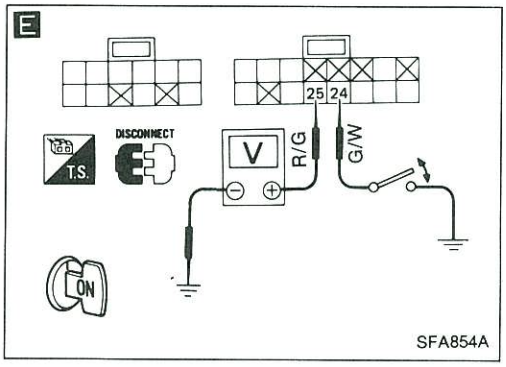
CHECK CONTROL UNIT CONTINUITY.
1) Disconnect control unit connector.
2) Check continuity between control unit connector terminals ㉔ and ㉕ and ground, respectively.
Continuity should not exist.

N.G. → Check and repair harness. → Ⓐ



O.K. → Ⓑ

Diagnostic Procedure 8 (Cont'd)



Ⓑ

E

CHECK SONAR ROAD SURFACE SENSOR OUTPUT SIGNAL.
1) Turn ignition switch "ON".
2) Measure voltage variations between control unit connector terminal ㉕ and ground when terminal ㉔ is shorted to ground.
Voltage must be momentarily 1.2V when terminal ㉔ is shorted and then return to approximately 5V.

O.K. → Replace control unit. → Ⓐ

N.G. ↓

Replace sonar road surface sensor.

O.K. →

Ⓐ ↓

After repair, conduct self-diagnosis to ensure malfunction has been eliminated.

O.K. ↓

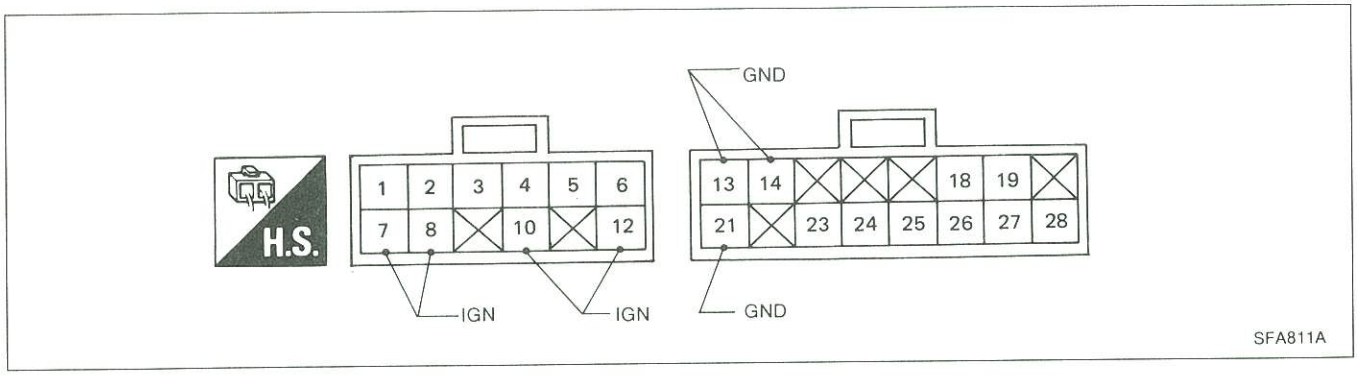
Final confirmation on shock absorber actuator (See page FA-27.)

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	Front *S/A actuator command signal "S"	Approx. 12V Drops to 2V immediately on output of a command signal.
2	Front S/A actuator command signal "N"	
3	Front S/A actuator command signal "F"	
4	Rear S/A actuator command signal "S"	
5	Rear S/A actuator command signal "N"	
6	Rear S/A actuator command signal "F"	
7	Power	Approx. 12V
8	Power	
10	Power	
12	Power	
13	Ground	0V
14	Ground	
18	Vehicle speed sensor input	When rear wheels are slowly rotated by hand: Changes between 0V and approx. 5V.
19	Steering angle sensor input (1)	When steering wheel is being rotated: Changes between 0V and approx. 5V.
21	Ground	0V
23	Indicator lamp output	Illuminated: Approx. 0 - 1V Not illuminated: Approx. 11V
24	Sonar road surface oscillation order	Approx. 12V 1V on output of oscillation signal
25	Sonar road surface vehicle height input	Approx. 5V 1.2V on input of vehicle height signal
26	Steering angle sensor input (2)	When steering wheel is being rotated: Changes between 0V and approx. 5V.
27	Stop lamp switch input	Pressed: Approx. 12V Released: 0V
28	Select switch input	"COMFORT" position: 12V "SPORT" position: 0V

*S/A: Shock Absorbers



General Specifications

COIL SPRING

Wire diameter	mm (in)	13.8 (0.543)
Coil diameter	mm (in)	160.8 (6.33)
Free length	mm (in)	360 (14.17)
Spring constant N/mm (kg/mm, lb/in)		22.0 (2.24, 125.4)
Identification color		Orange x 2

SHOCK ABSORBER (STRUT)

Piston rod diameter mm (in)	22 (0.87)		
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)	Soft	Normal	Firm
Expansion	461 - 696 (47 - 71, 104 - 157)	883 - 1,314 (90 - 134, 198 - 295)	1,059 - 1,589 (108 - 162, 238 - 357)
Compression	216 - 353 (22 - 36, 49 - 79)	314 - 490 (32 - 50, 71 - 110)	333 - 510 (34 - 52, 75 - 115)

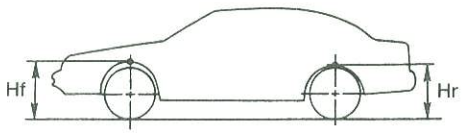
FRONT STABILIZER BAR

Stabilizer diameter	mm (in)	25 (0.98)
Identification color		Yellow

TENSION ROD

Rod diameter	mm (in)	20 (0.79)

WHEELARCH HEIGHT (Unladen*)



SFA818A

Applied model		All
Front (Hf)	mm (in)	673 (26.50)
Rear (Hr)	mm (in)	664 (26.14)

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

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Camber	degree	–35′ to 55′
Caster	degree	3°55′ - 5°25′
Kingpin inclination	degree	11°55′ - 13°25′
Toe-in		
A – B	mm (in)	–1 to 1 (–0.04 to 0.04)
Total angle 2θ	degree	–5′ to 5′
Front wheel turning angle*2	degree	
Inside		40°30′ - 44°30′
Outside		33°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 at idle.

WHEEL BEARING

Wheel bearing end play limit	mm (in)	0 (0)
Wheel bearing lock nut		
Tightening torque	N·m (kg-m, ft-lb)	34 - 39 (3.5 - 4.0, 25 - 29)
Return angle	degree	90°
Maximum wheel bearing preload measured at wheel hub bolt	N (kg, lb)	13.7 (1.4, 3.1)

LOWER BALL JOINT

Swinging force at cotter pin hole	N (kg, lb)	24.5 - 80.4 (2.5 - 8.2, 5.5 - 18.1)
Turning torque	N·m (kg-cm, in-lb)	1.5 - 4.9 (15 - 50, 13 - 43)
Vertical end play	mm (in)	0.1 - 1.3 (0.004 - 0.051)

WHEEL RUNOUT (Radial and lateral)

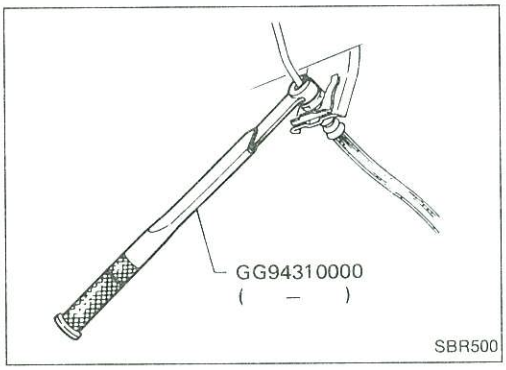
Wheel type		Aluminum wheel
Radial runout limit	mm (in)	0.3 (0.012)
Lateral runout limit	mm (in)	

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS

PRECAUTIONS AND PREPARATION ..... RA- 2
REAR AXLE AND REAR SUSPENSION ..... RA- 4
ON-VEHICLE SERVICE ..... RA- 5
REAR AXLE ..... RA- 8
REAR AXLE — Drive Shaft RA-11
REAR SUSPENSION RA-17
SERVICE DATA AND SPECIFICATIONS (S.D.S.) RA-23

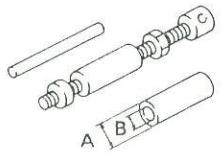
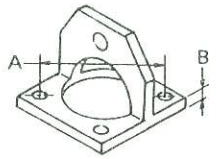
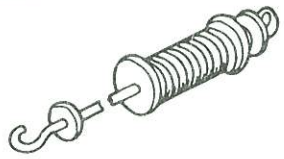
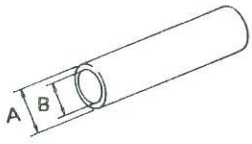


Precautions

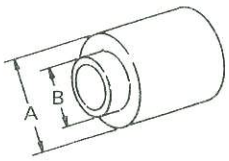
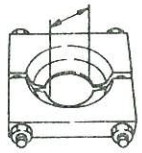
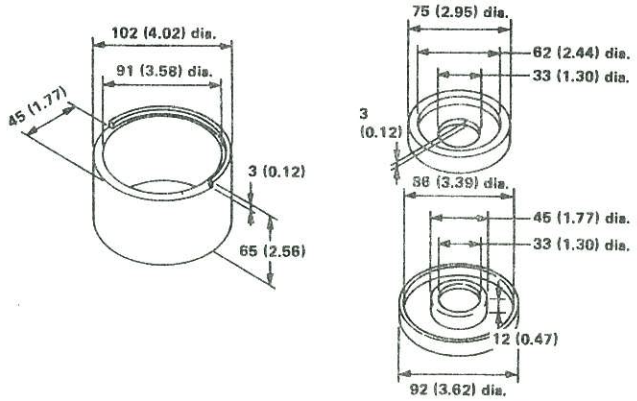
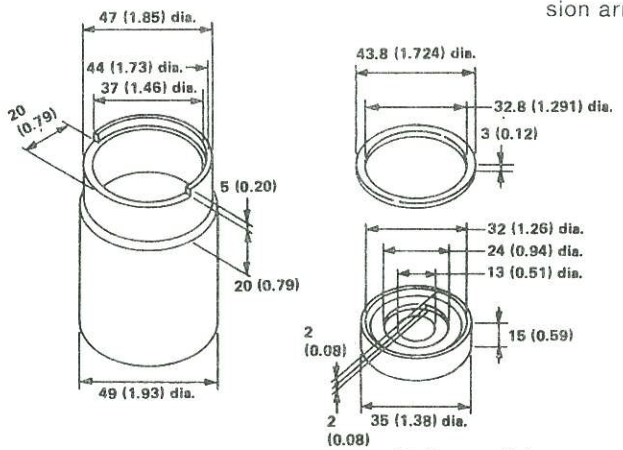
- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **Use Tool when removing or installing brake tubes.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**

Preparation

SPECIAL SERVICE TOOLS

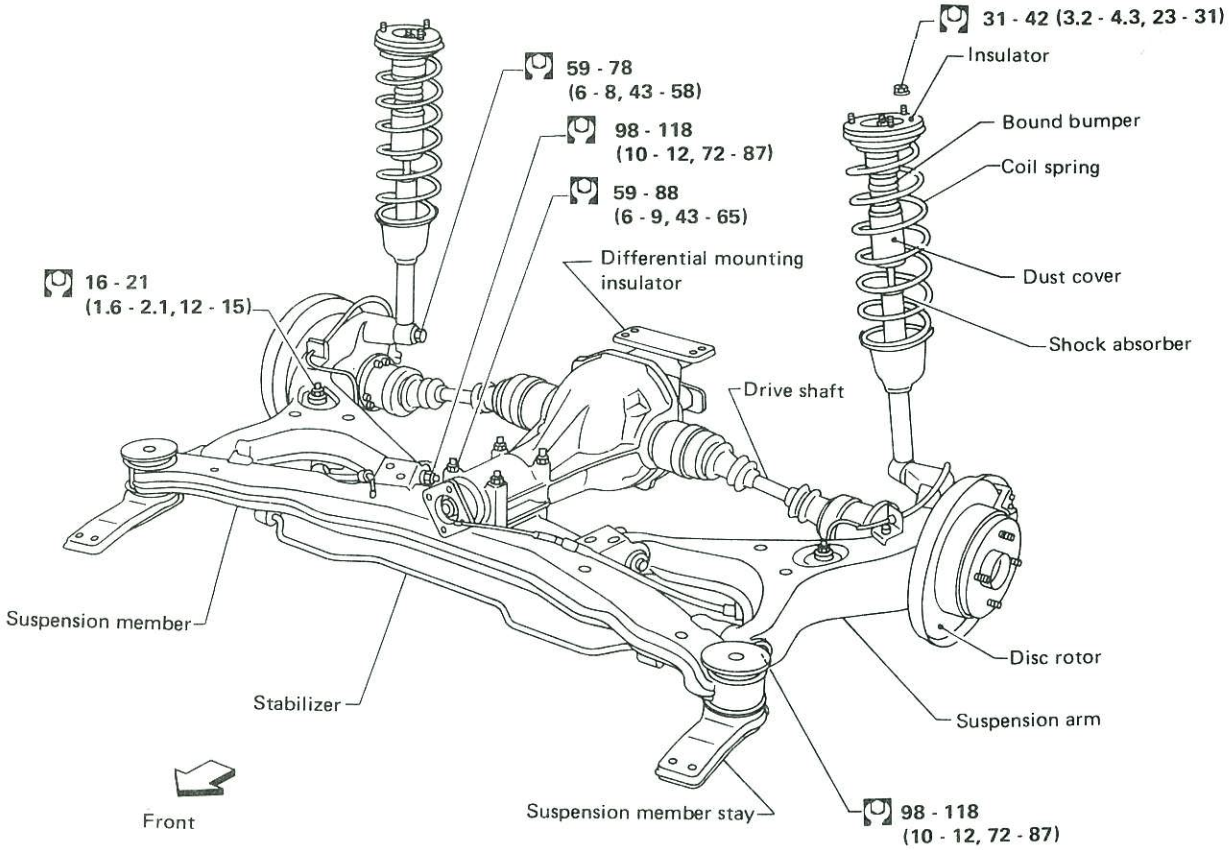
Tool number (Kent-Moore No.) Tool name	Description	
GG94310000 (—) Flare nut torque wrench		Removing or installing each type of brake piping
ST38280000 (—) Rear suspension arm bushing drift	 **A: 42 mm (1.65 in) dia.** **B: 32 mm (1.26 in) dia.**	Removing or installing rear suspension bushing
ST07640000 (—) Axle stand	 **A: 114.3 mm (4.50 in) dia.** **B: 12 mm (0.47 in)**	Removing axle shaft
ST36230000 (J25840-A) Sliding hammer		Removing rear axle shaft
ST37750000 (J25863-01) Rear axle shaft bearing drift	 **A: 40 mm (1.57 in) dia.** **B: 31 mm (1.22 in) dia.**	Installing axle shaft bearing

Preparation (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description
ST37710000 (—) Rear axle grease seal drift	Installing grease seal  **A: 60 mm (2.36 in) dia.** **B: 38 mm (1.50 in) dia.**
ST30021000 (—) Bearing replacer	Removing outer bearing in rear suspension arm  **68 mm (2.68 in) dia.**
KV401052S0 (—) ├ KV40105210 (—) ├ KV40105220 (—) └ KV40105230 (—) Drift-suspension member insulator	Removing or installing suspension member insulator  Unit: mm (in)
KV401051S0 (—) ├ KV40105110-1 (—) ├ KV40105110-2 (—) └ KV40105120 (—) Drift-rear suspension arm bushing	Removing or installing rear suspension arm bushing  Unit: mm (in)

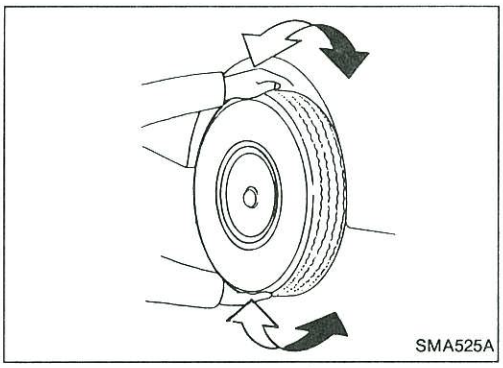
When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

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



: N·m (kg-m, ft-lb)

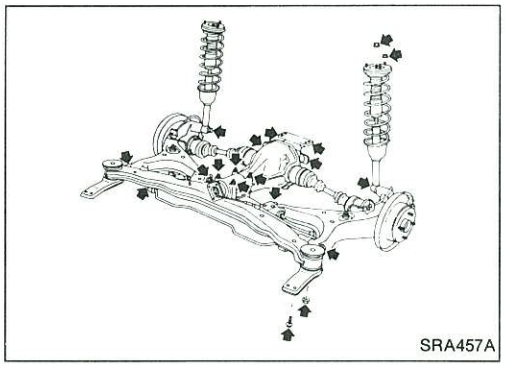
SRA566


SMA525A

Rear Axle and Rear Suspension Parts

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

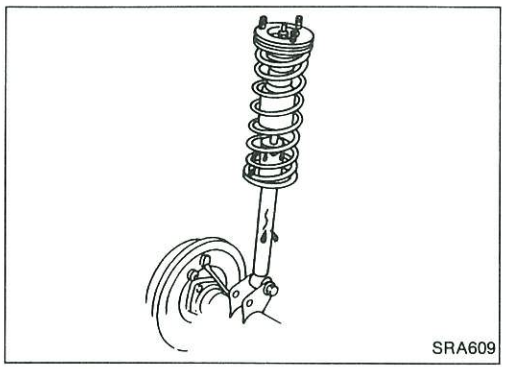
- Shake each rear wheel to check for excessive play.


SRA457A

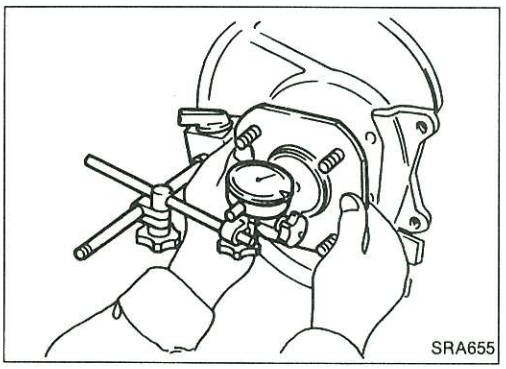
- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

  Tightening torque:

  Refer to drawing in REAR SUSPENSION.


SRA609

- Check shock absorber for oil leakage or other damage.
- Check wheelarch height — refer to ON-VEHICLE SERVICE in section FA.


SRA655

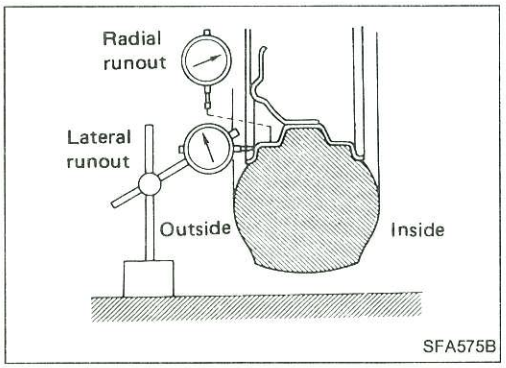
Rear Wheel Bearing

- Check axial end play.

  Axial end play limit:

  0.05 mm (0.0020 in)
- Check that wheel bearings operate smoothly.
- Check tightening torque of wheel bearing lock nut.

  : 127 - 177 N·m (13 - 18 kg-m, 94 - 130 ft-lb)
- If there is any axial end play or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to REAR AXLE.



Rear Wheel Alignment

PRELIMINARY INSPECTION

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

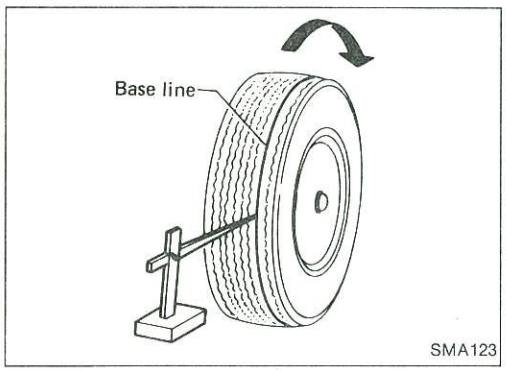
- Check tires for wear and for improper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.
  Wheel runout: Refer to S.D.S. in section FA.
- Check that rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen*).
  *: Fuel, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

CAMBER

Camber is preset at factory and cannot be adjusted.

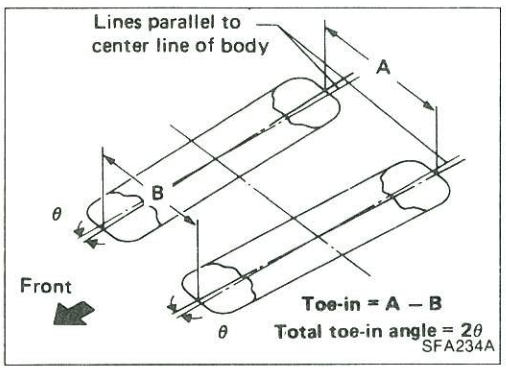
Camber:
Refer to S.D.S.

- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.

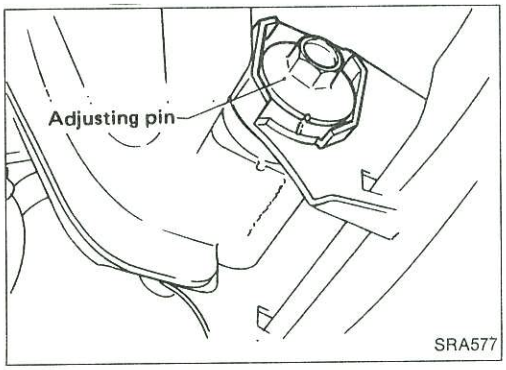


TOE-IN

1. Draw a base line across the tread.
- After lowering rear of vehicle, move it up and down to eliminate friction.

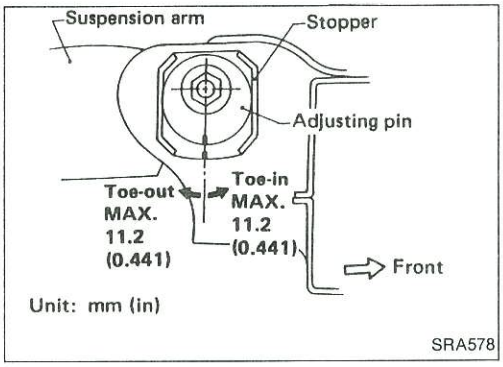


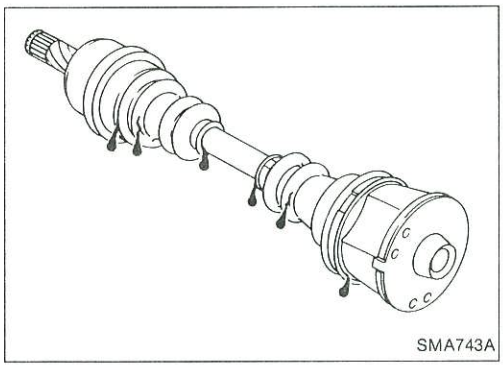
2. Measure toe-in.
- Measure distance "A" and "B" at the same height as hub center.
  Toe-in:
  Refer to S.D.S.



- If not within specification, turn the left and right adjusting pins equal amounts to adjust.

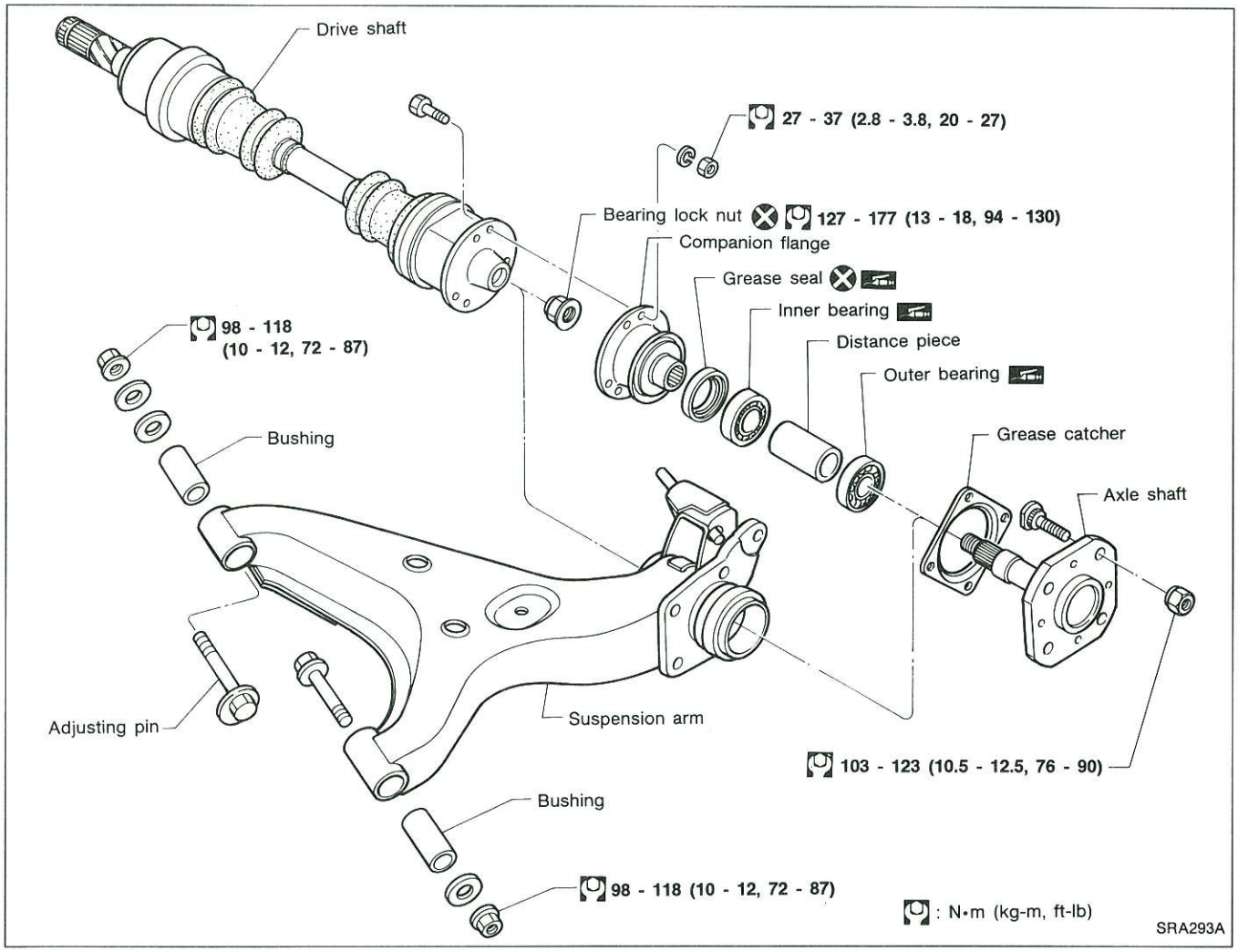
Rear Wheel Alignment (Cont'd)





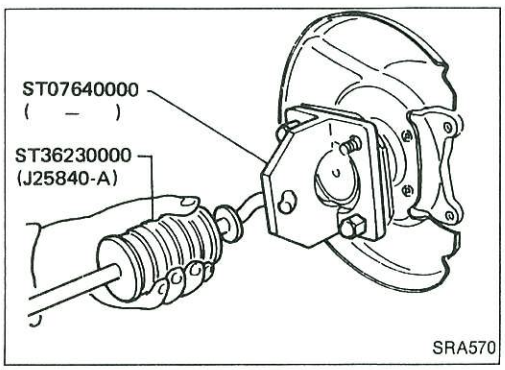
Drive Shaft

Check for grease leakage or other damage.



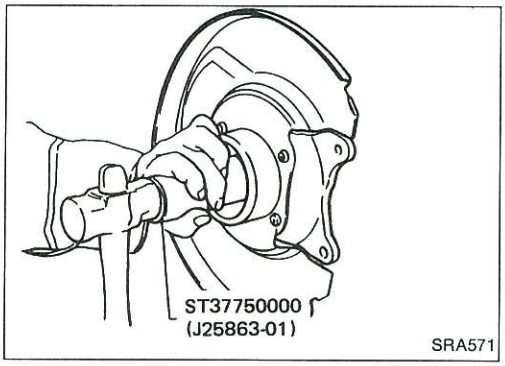
Disassembly

- Disconnect drive shaft. Refer to Drive Shaft for removal and installation.
- Remove wheel bearing lock nut while operating parking brake or brake pedal depressed.
- Remove brake caliper and rotor. Refer to section BR.

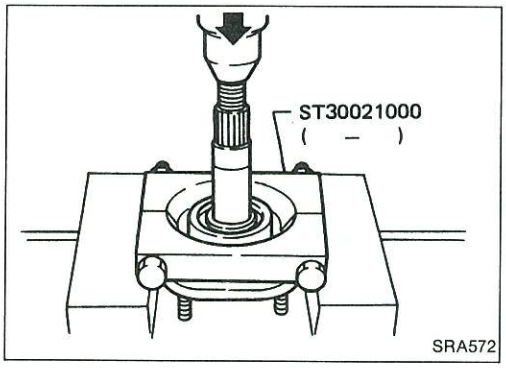


- Draw out rear axle shaft with Tool.

Disassembly (Cont'd)



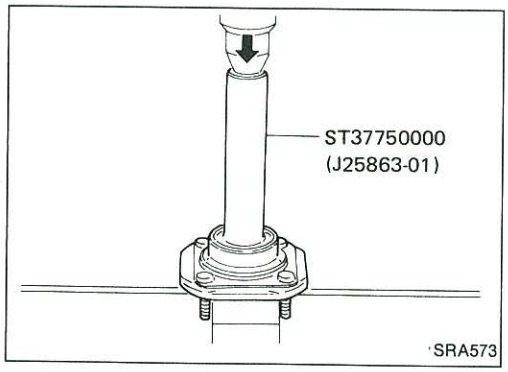
- Remove companion flange and distance piece.
- Remove grease seal and inner bearing with Tool.



- Remove outer bearing from axle shaft with Tool.

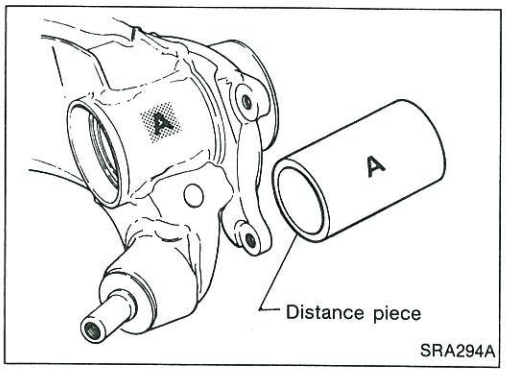
Inspection

- Check wheel bearing for end play and rolling surface for flaking or wear. Replace if necessary.
- Check rear axle shaft for cracks, wear or deformation. Replace if necessary.
- Check companion flange for wear, deformation or other damage. Replace if necessary.
- Check distance piece for wear or other damage. Replace if necessary.
- Check grease seal for cracks, wear or deformation. Replace if necessary.



Assembly

- When installing wheel bearing, make sure that the sealed side of bearing faces outside.
- When installing outer bearing to rear axle shaft, use Tool.

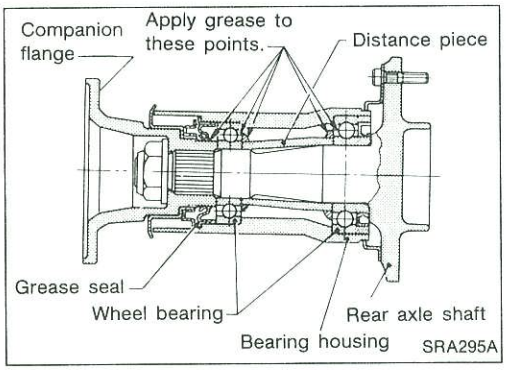


- Select a distance piece according to the chart below.

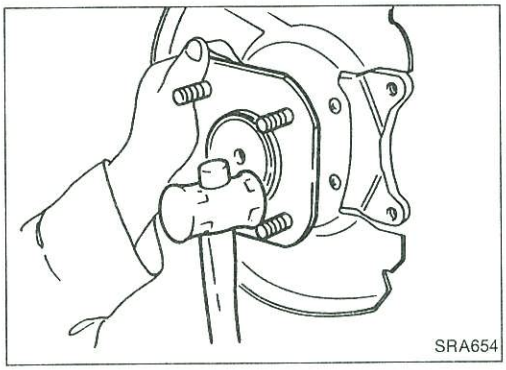
Bearing housing	Distance piece
A	A
B	B
C	C

When a distance piece is reused, make sure that both ends are not collapsed or deformed.
When installing, make sure that larger side faces axle shaft flange.

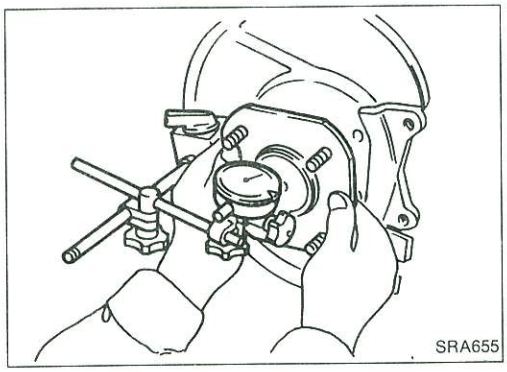
Assembly (Cont'd)



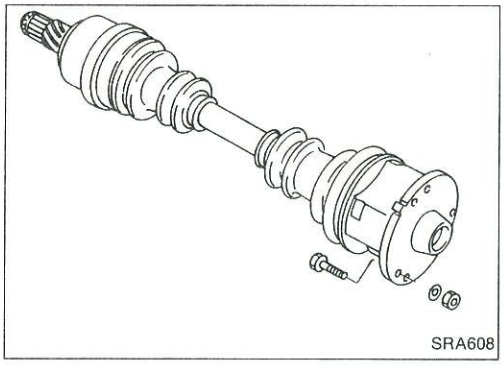
- Apply recommended multi-purpose grease to the portions indicated to the left.



- Install rear axle shaft by slightly tapping with brass hammer.
- Tighten wheel bearing lock nut to the specified torque.
  [O]: 127 - 177 N·m (13 - 18 kg-m, 94 - 130 ft-lb)
- Check that wheel bearing operates smoothly.
- Stake wheel bearing lock nut.

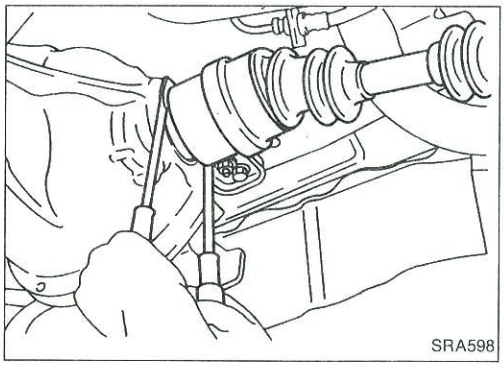


- Check wheel bearing axial end play.
  Axial end play limit:
  0.05 mm (0.0020 in)


SRA608

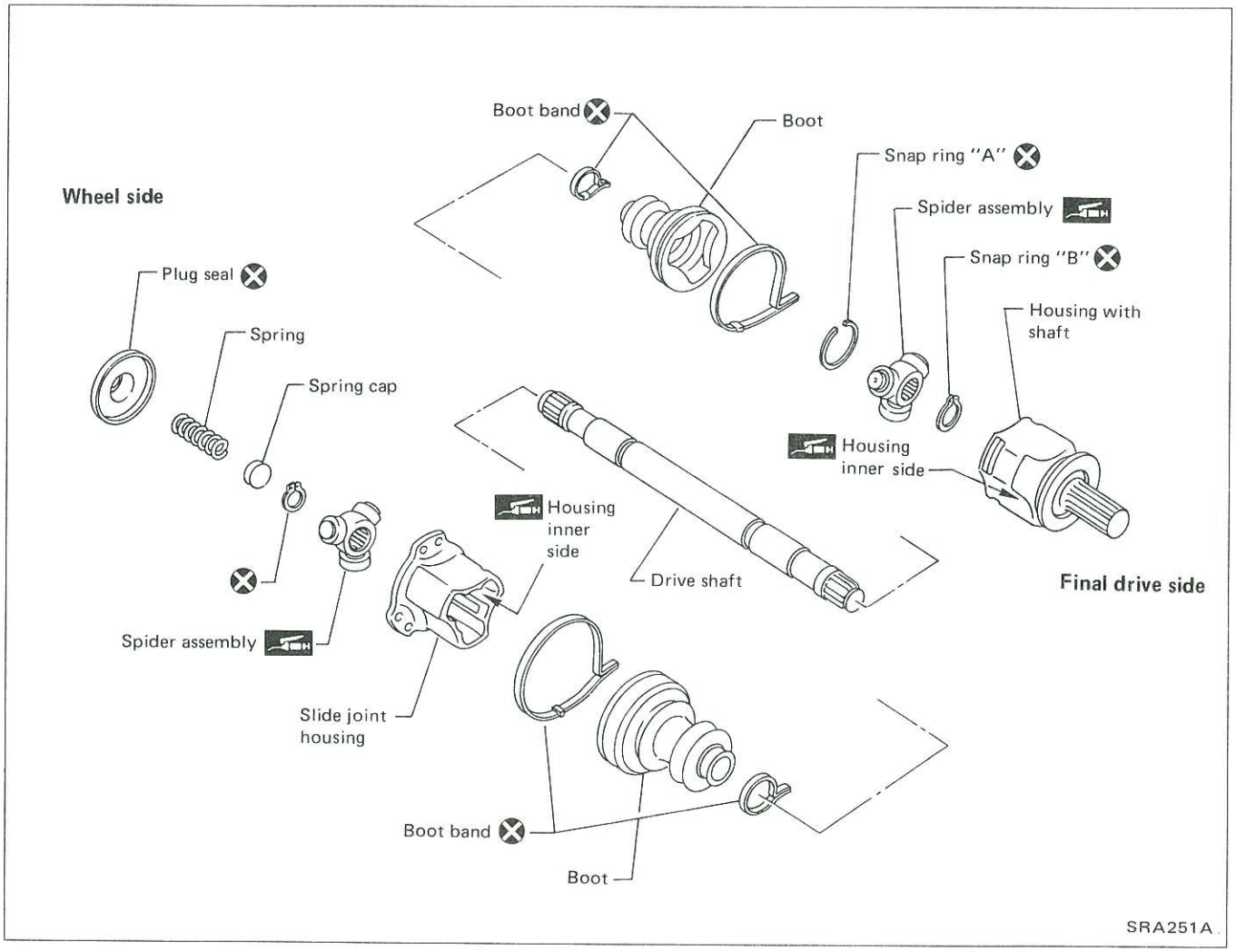
Removal and Installation

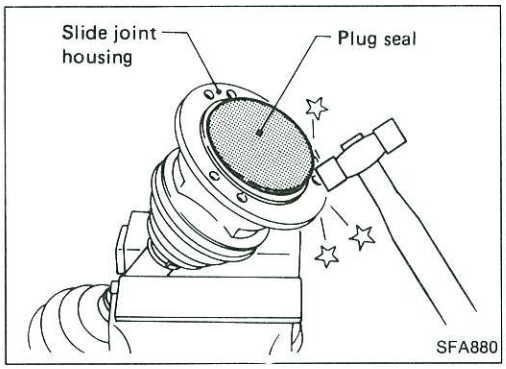
Cover boots with shop towel so as not to damage them when replacing.


SRA598

- Extract drive shaft from differential carrier by prying it with a suitable tool.

CAUTION:
Be careful not to damage oil seal of differential carrier.
Make sure that circular clip is properly meshed with side gear and will not come out.

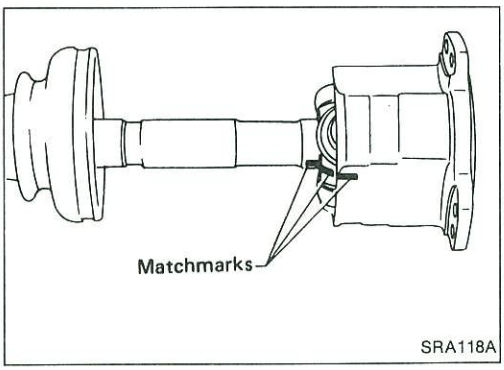




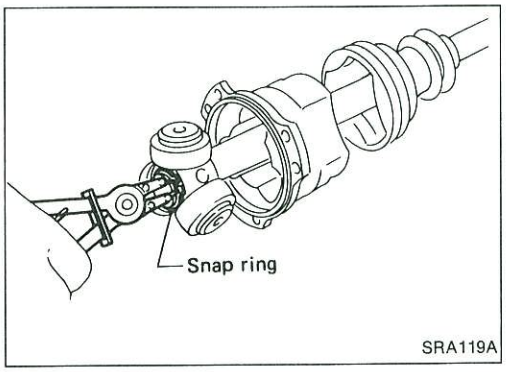
Disassembly

WHEEL SIDE

1. Remove plug seal from slide joint housing by lightly tapping around slide joint housing.



2. Remove boot bands.
3. Put matchmarks on slide joint housing and drive shaft before separating joint assembly.
4. Put matchmarks on spider assembly and drive shaft.

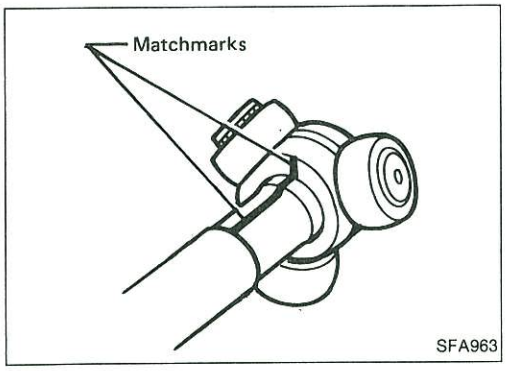


5. Pry off snap ring, then remove spider assembly.

CAUTION:
Do not disassemble spider assembly.

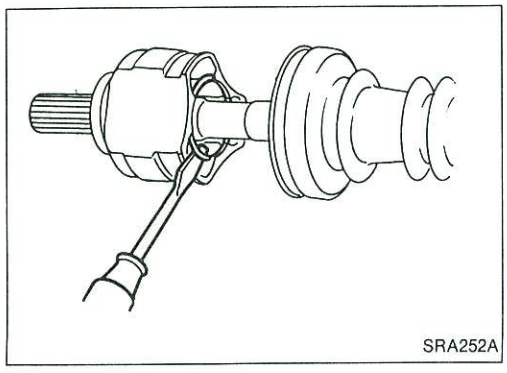
6. Draw out slide joint housing.
7. Draw out boot.

Cover drive shaft serration with tape to prevent damage to the boot.



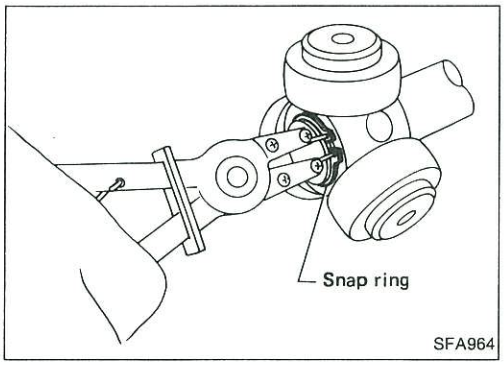
FINAL DRIVE SIDE

1. Remove boot bands.
2. Put matchmarks on housing together with shaft and drive shaft before separating joint assembly.
3. Put matchmarks on spider assembly and drive shaft.



4. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.

Disassembly (Cont'd)



5. Pry off snap ring "B", then remove spider assembly.

CAUTION:
Do not disassemble spider assembly.

6. Draw out boot.

Cover drive shaft serration with tape to prevent damage to the boot.

Inspection

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for deformation or other damage.

DRIVE SHAFT

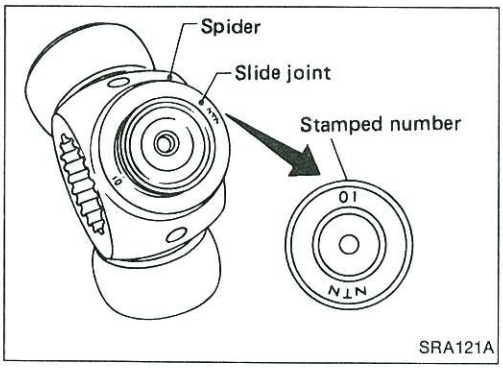
Replace drive shaft if it is twisted or cracked.

BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

JOINT ASSEMBLY

- Check spider assembly for bearing, roller and washer damage. Replace spider assembly if necessary.
- Check housing for any damage. Replace housing set and spider assembly, if necessary.



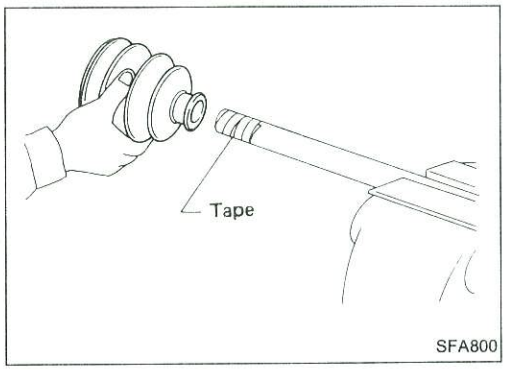
- When replacing only spider assembly, select a new spider assembly from among those listed in table below. Ensure the number stamped on sliding joint is the same as that stamped on new part.

Housing alone cannot be replaced. It must be replaced together with spider assembly.

Stamped number	Part No.
00	39720 10V10
01	39720 10V11
02	39720 10V12

Assembly

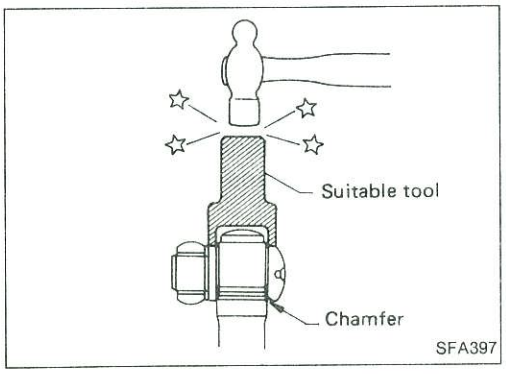
- **After drive shaft has been assembled, make sure it moves smoothly over its entire range without binding.**
- **Use Nissan Genuine Grease or equivalent after every overhaul.**



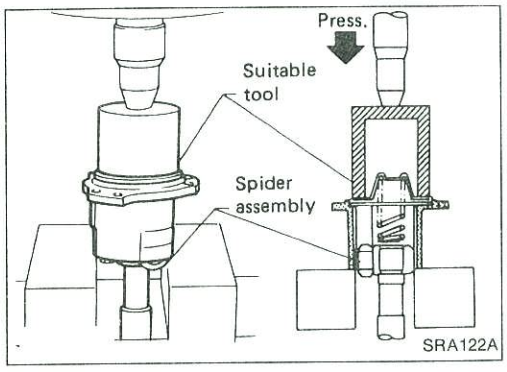
WHEEL SIDE

1. Install new small boot band, boot and slide joint housing to drive shaft.

Cover drive shaft serration with tape to prevent damage to boot during installation.



2. Install spider assembly securely, making sure marks are properly aligned.
- Press-fit with spider assembly serration chamfer facing shaft.
3. Install new snap ring.



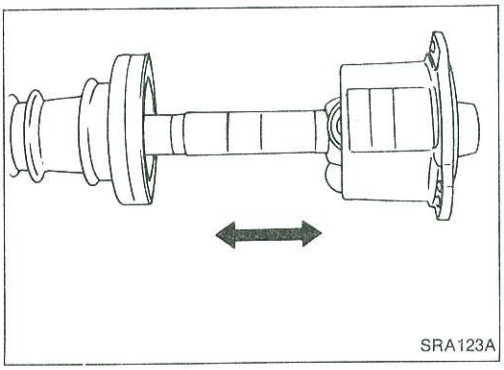
4. Install coil spring, spring cap and new plug seal to slide joint housing. Press plug seal.

Apply sealant to mating surface of plug seal.

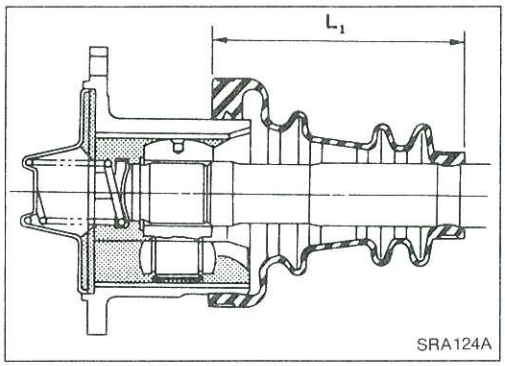
CAUTION:

a. When pressing plug seal into place, hold it horizontal so that spring inside it does not tilt or fall down.

b. Move shaft in axial direction to ensure that spring is installed properly. If shaft drags or if spring is not installed properly, remove plug seal and install a new one. Discard plug seal after removal.

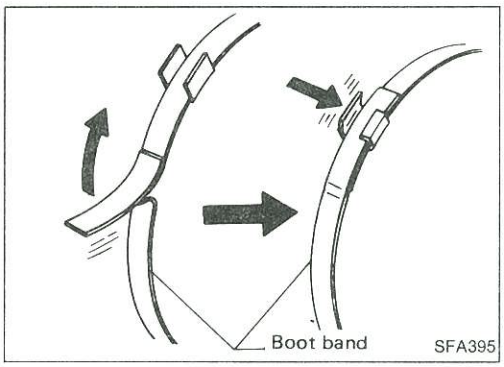


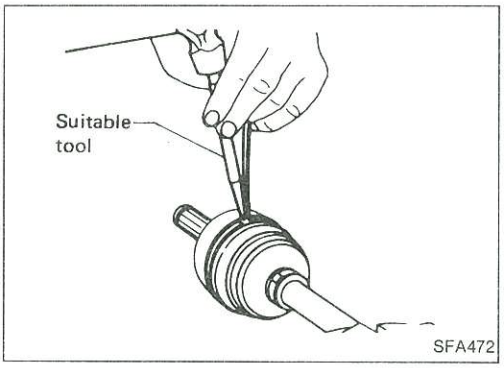
Assembly (Cont'd)



5. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   185 - 195 g (6.52 - 6.88 oz)
6. Set boot so that it does not swell and deform when its length is "L_1".
   Length "L_1":
   110.5 - 112.5 mm (4.35 - 4.43 in)

Make sure that boot is properly installed on the drive shaft groove.



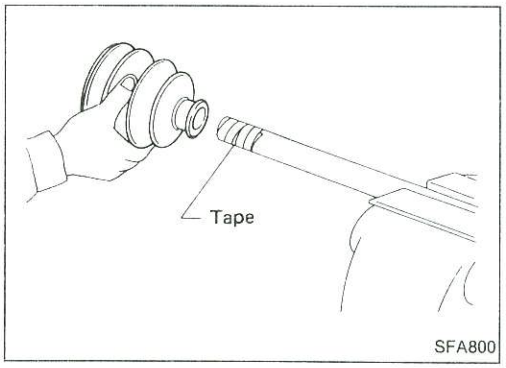


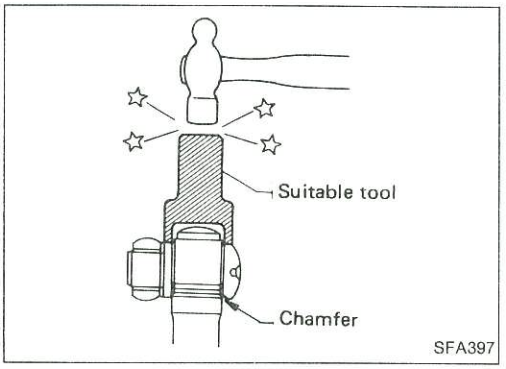
7. Lock new larger boot band securely with a suitable tool, then lock new smaller boot band.

FINAL DRIVE SIDE

1. Install new small boot band and boot on drive shaft.

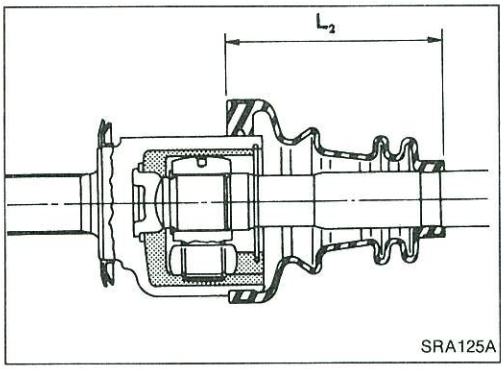
Cover drive shaft serration with tape to prevent damage to boot during installation.





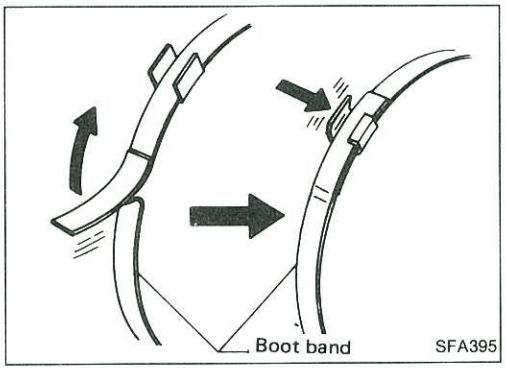
2. Install spider assembly securely, making sure marks are properly aligned.
   - Press-fit with spider assembly serration chamfer facing shaft.
3. Install new snap ring.

Assembly (Cont'd)



4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   155 - 165 g (5.47 - 5.82 oz)
5. Install slide joint housing, then install new snap ring "A".
6. Set boot so that it does not swell and deform when its length is "L_2".
   Length "L_2":
   110.5 - 112.5 mm (4.35 - 4.43 in)

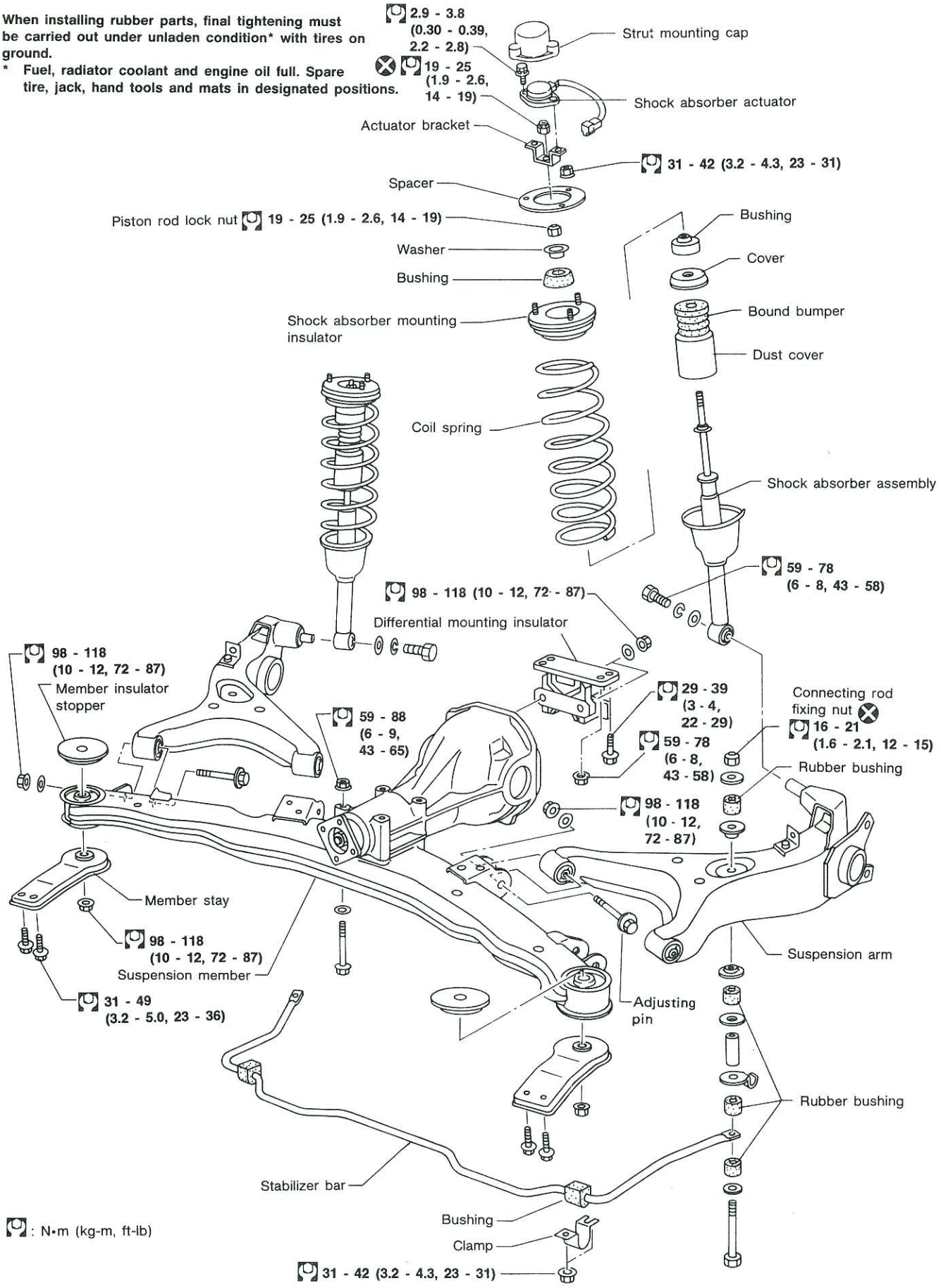
Make sure that boot is properly installed on the drive shaft groove.



7. Lock new larger and smaller boot bands securely with a suitable tool.

When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

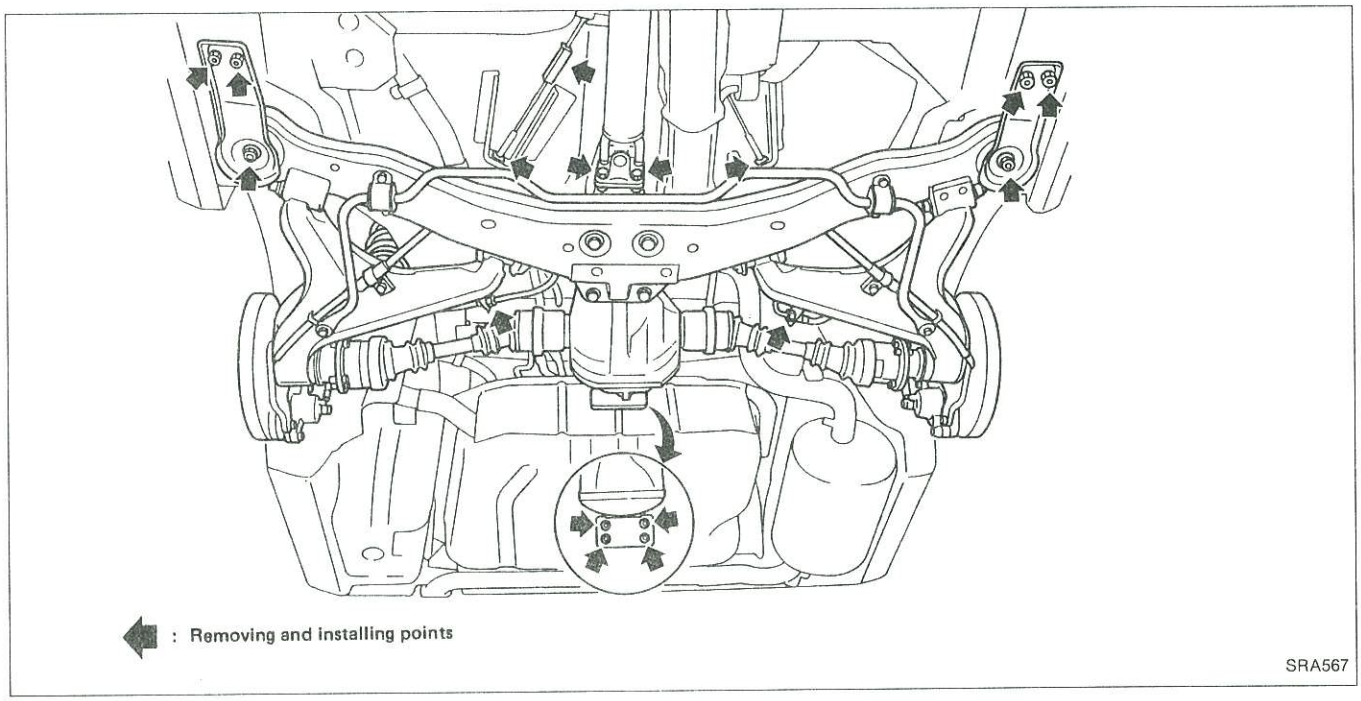
* **Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**

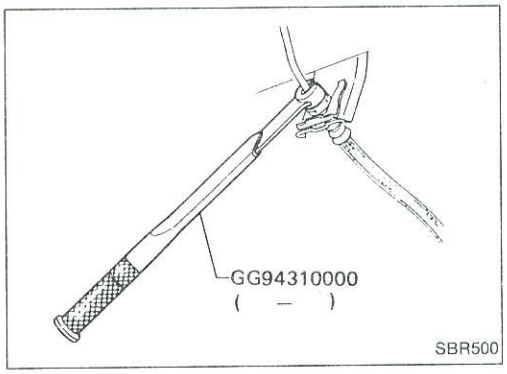


: N•m (kg-m, ft-lb)

SRA454A

Removal and Installation

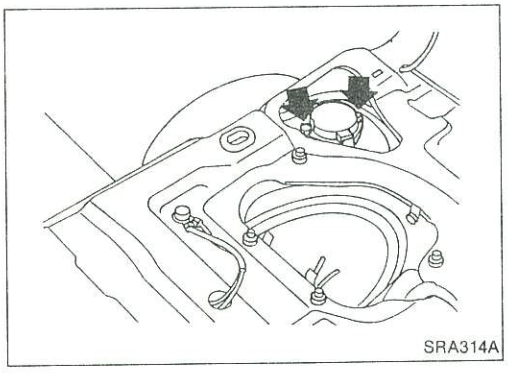




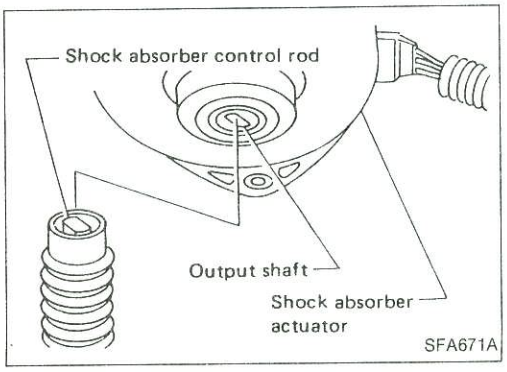
- Disconnect brake hydraulic line and parking brake cable.

CAUTION:
Use Tool when removing or installing brake tubes.
Final tightening for rubber parts requires to be carried out under unladen condition with tires on ground.

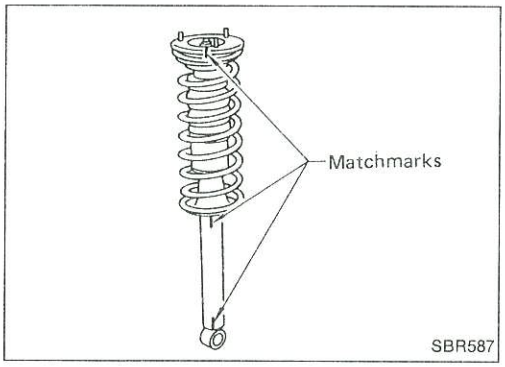
- Disconnect propeller shaft. Refer to section PD.



- Remove rear parcel shelf. Refer to section BF.
- Disconnect sub-harness connector.
- Remove strut mounting cap.
- Remove shock absorber actuator fixing bolts.
- Remove shock absorber upper end nuts.



- **Before installing actuator, ensure angle of shock absorber control rod is aligned with that of actuator output shaft. Otherwise, actuator may be damaged.**



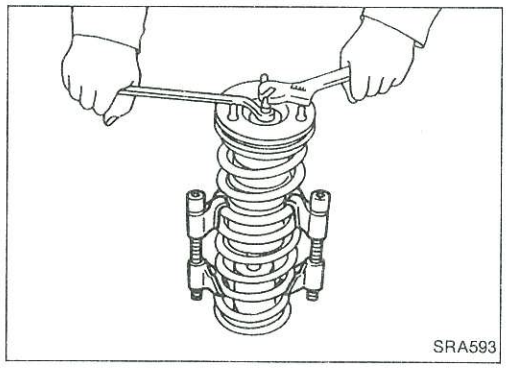
Coil Spring and Shock Absorber

REMOVAL

- Refer to Removal and Installation in REAR SUSPENSION.

DISASSEMBLY AND ASSEMBLY

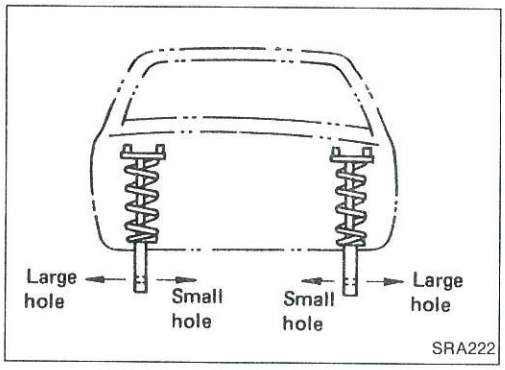
Make matchmarks on insulator and shock absorber before disassembling.



- Remove coil spring with a suitable tool.
- Tighten lock nut as far as it goes when assembling.

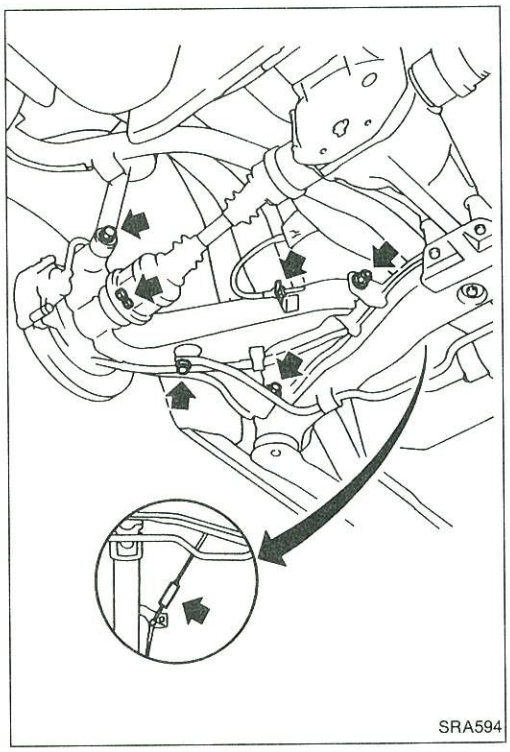
INSPECTION

- Check coil spring for yield, deformation or cracks.
- Check coil spring specifications. Refer to S.D.S.
- Check shock absorber for oil leakage, cracks or deformation.
- Check shock absorber specifications. Refer to S.D.S.
- Check shock absorber mounting insulator and other rubber parts for wear, cracks or deformation. Replace if necessary.
- Check sonar suspension system. Refer to SONAR SUSPENSION SYSTEM — Trouble Diagnoses in section FA.



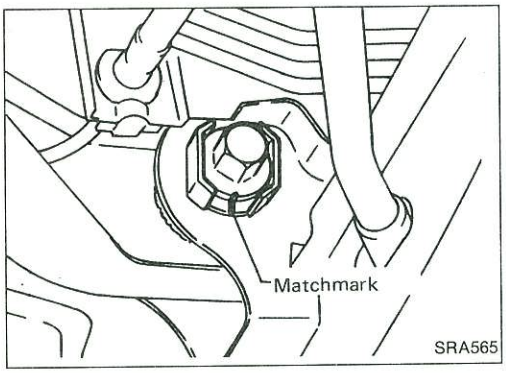
INSTALLATION

Install shock absorber so that the larger hole on the lower end faces out.


SRA594

Suspension Arm

- Remove axle shaft assembly. Refer to Disassembly in REAR AXLE.
- Remove stabilizer bar bolt.
- Disconnect parking cable.
- Disconnect shock absorber lower end.



SRA565

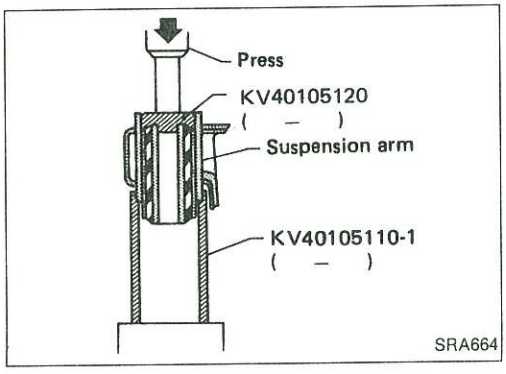
- Remove suspension arm pin.

Before removing, put matchmark on suspension arm pin.

- When installing, tighten suspension arm pin nut to specified torque after installing wheels and placing vehicle on ground under the unladen condition.
- Adjust wheel alignment after installing suspension arm. Refer to Rear Wheel Alignment in ON-VEHICLE SERVICE.

INSPECTION

- Check suspension arm for deformation or cracks. Replace if necessary.



SRA664

Suspension Arm Bushing

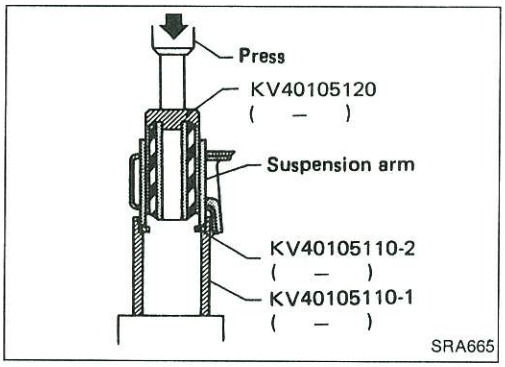
REMOVAL

- Remove bushing with Tool.

Suspension Arm Bushing (Cont'd)

INSPECTION

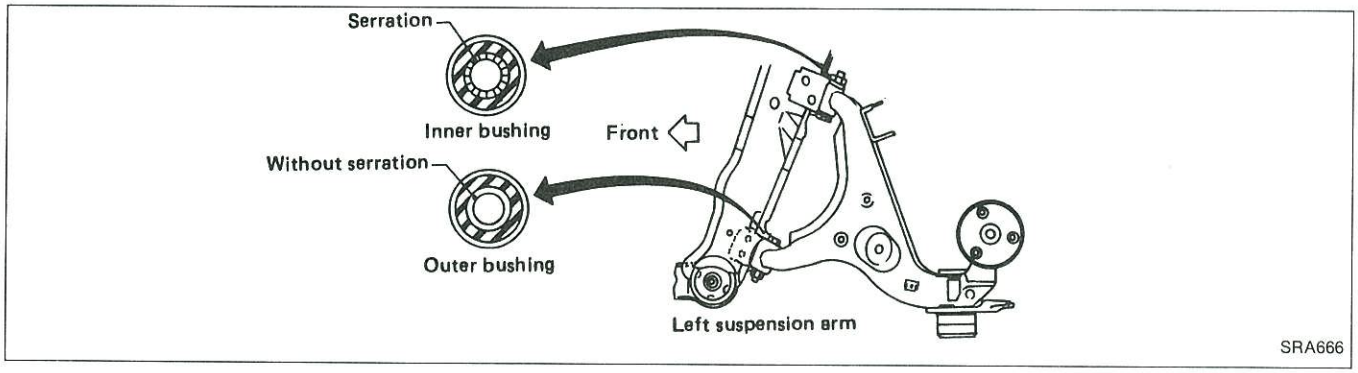
- Check rubber bushings for wear or other damage. Replace if necessary.



INSTALLATION

- Install bushing with Tool.

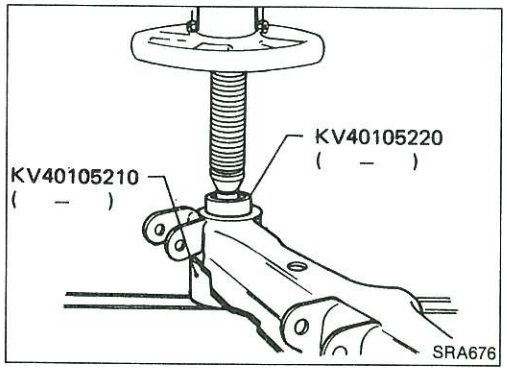
Avoid misusing of inner bushing and outer bushing.



Suspension Member

INSPECTION

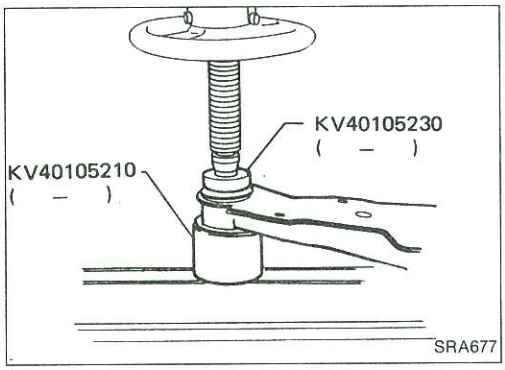
- Check differential mounting insulator for deformation or cracks. Replace if necessary.
- Check suspension member for deformation or cracks. Replace if necessary.
- Check insulator on suspension member for deformation or cracks. Replace if necessary.



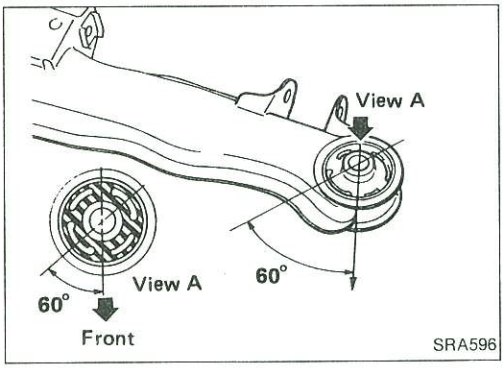
a. If member insulator is deformed or cracked, replace using Tool.

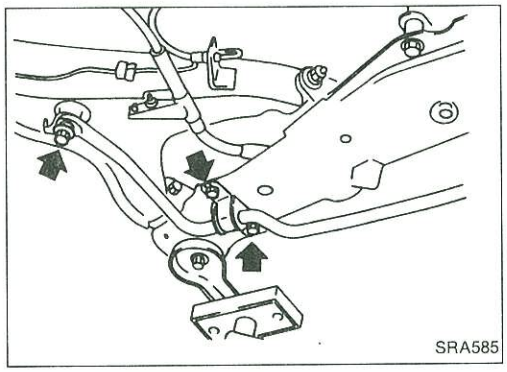
Insulator diameter:
76.3 mm (3.004 in)

Suspension Member (Cont'd)



b. Install member insulator from bottom of suspension member with Tool. Be sure to install in its proper place.





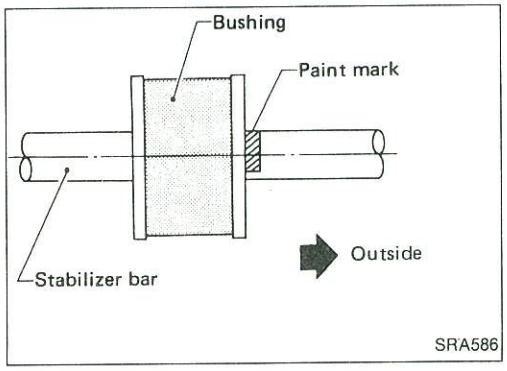
Stabilizer Bar

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

- Install bushing, aligning with paint mark.

General Specifications

COIL SPRING

Model		All
Wire diameter	mm (in)	12 (0.47)
Coil diameter	mm (in)	110 (4.33)
Free length	mm (in)	374.5 (14.74)
Spring constant N/mm (kg/mm, lb/in)		23.3 (2.38, 133.3)
Identification color		Orange

SHOCK ABSORBER

Model	All		
Piston rod diameter mm (in)	12.5 (0.492)		
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)	Soft	Normal	Firm
Expansion	324 - 500 (33 - 51, 73 - 112)	765 - 1,157 (78 - 118, 172 - 260)	1,059 - 1,589 (108 - 162, 238 - 357)
Compression	157 - 275 (16 - 28, 35 - 62)	363 - 559 (37 - 57, 82 - 126)	432 - 647 (44 - 66, 97 - 146)

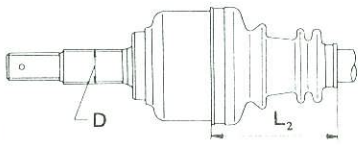
REAR STABILIZER BAR

Stabilizer diameter	mm (in)	22.2 (0.874)

DRIVE SHAFT

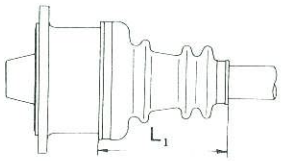
Joint type		
Final drive side		TS82C
Wheel side		TS82F
Diameter	mm (in)	
Final drive side "D"		30 (1.18)
Grease		
Quality		Nissan genuine grease or equivalent
Specified amount	g (oz)	
Final drive side		155 - 165 (5.47 - 5.82)
Wheel side		185 - 195 (6.52 - 6.88)
Boot length	mm (in)	
Final drive side "L_2"		110.5 - 112.5 (4.35 - 4.43)
Wheel side "L_1"		

Final drive side



SRA134A

Wheel side



SRA133A

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Camber	degree	–1°5′ to 0°25′
Toe-in		
A—B	mm (in)	–4.2 to –0.2 (–0.165 to –0.008)
Total angle 2θ	degree	–22′ to –1′

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

WHEEL BEARING

Axial end play limit	mm (in)	0.05 (0.0020)
Wheel bearing lock nut		
Tightening torque N·m (kg-m, ft-lb)		127 - 177 (13 - 18, 94 - 130)

WHEEL RUNOUT (Radial and lateral)

Wheel type		Aluminum wheel
Radial runout limit	mm (in)	0.3 (0.012)
Lateral runout limit	mm (in)	

BRAKE SYSTEM

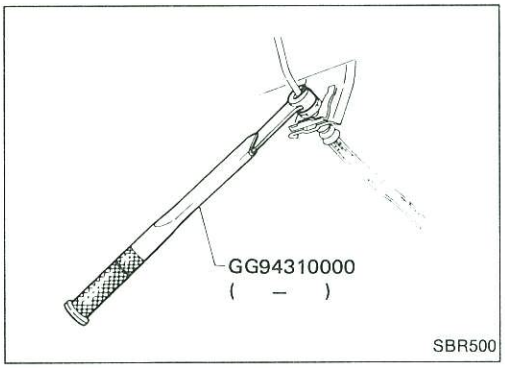
SECTION BR

CONTENTS

PRECAUTIONS AND PREPARATION ..... BR- 2
CHECK AND ADJUSTMENT ..... BR- 3
AIR BLEEDING ..... BR- 4
BRAKE HYDRAULIC LINE ..... BR- 5
CONTROL VALVE ..... BR- 7
BRAKE PEDAL AND BRACKET ..... BR- 8
MASTER CYLINDER BR-10
BRAKE BOOSTER BR-12
VACUUM HOSE BR-14
FRONT DISC BRAKE BR-15
REAR DISC BRAKE BR-19
REAR DISC BRAKE — Parking Drum Brake BR-23
PARKING BRAKE CONTROL BR-26
ANTI-LOCK BRAKING SYSTEM BR-28
TROUBLE DIAGNOSES BR-32
SERVICE DATA AND SPECIFICATIONS (S.D.S.) BR-54

Precautions

- **Use brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.**
- **Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.**



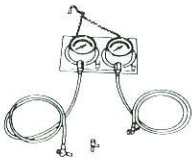
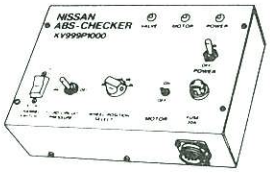
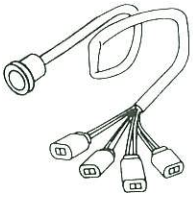
- **Use Tool when removing and installing brake tube.**

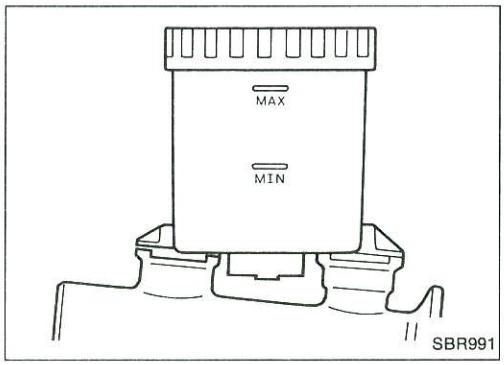
WARNING:

- **Clean brake pads and shoes with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.**

Preparation

SPECIAL SERVICE TOOL

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
KV999P1010 (—) ABS checker adapter harness		Checking brake fluid pressure of ABS actuator



Checking Brake Fluid Level

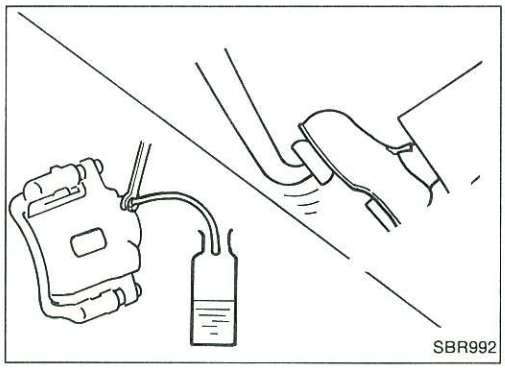
- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.
- When brake warning lamp comes on even when parking brake lever is released, check brake system for leaks.

Checking Brake Line

CAUTION:

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

1. Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.

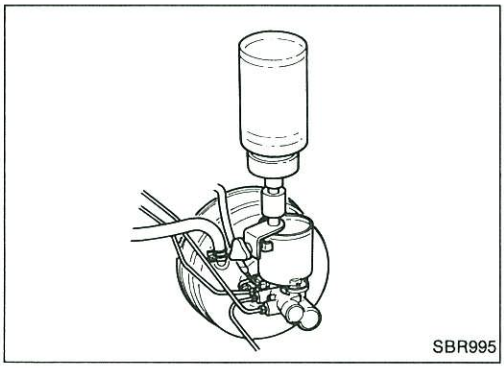


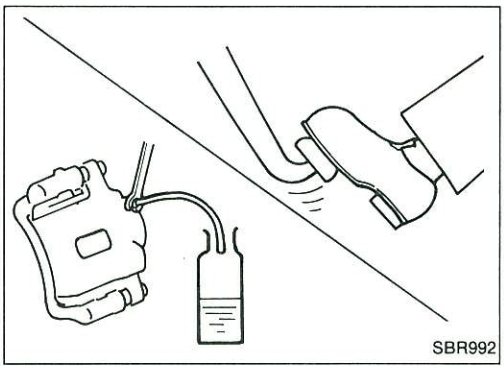
Changing Brake Fluid

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**

1. Connect a vinyl tube to each air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to "Bleeding Procedure" in "AIR BLEEDING".


SBR995


SBR992

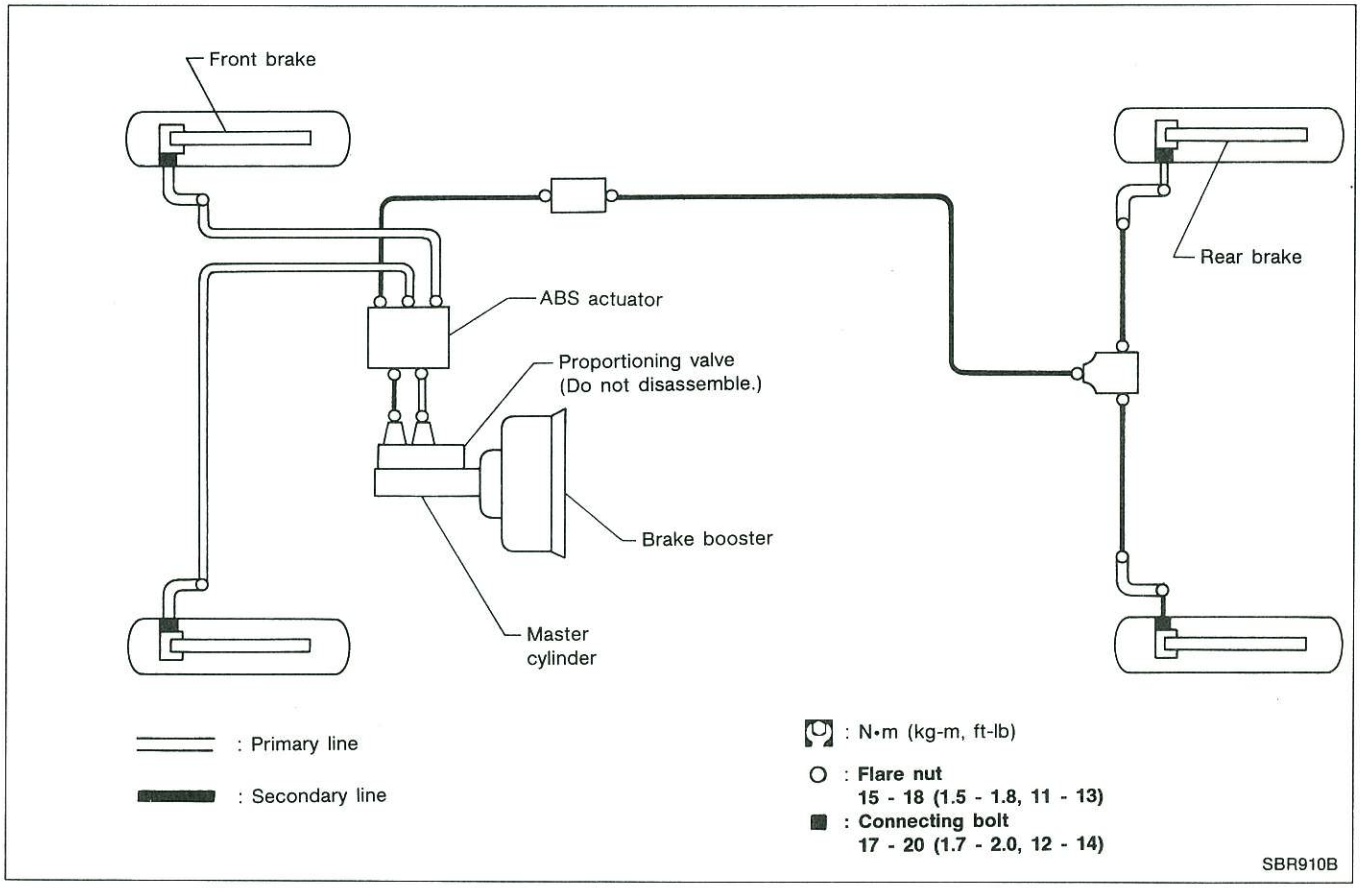
Bleeding Procedure

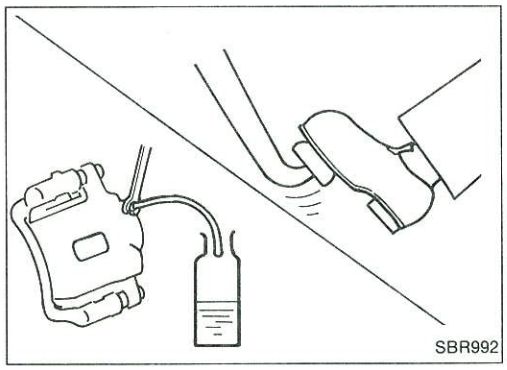
CAUTION:

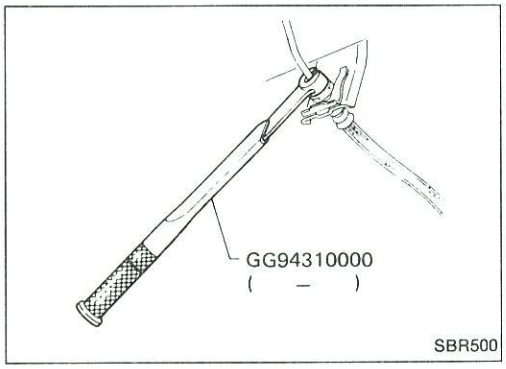
- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.**
- **Place a container under master cylinder to avoid spillage of brake fluid.**

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.

- Bleed air in the following order.
  Left rear caliper
  ↓
  Right rear caliper
  ↓
  Left front caliper
  ↓
  Right front caliper
  ↓
  Front side air bleeder on ABS actuator
  ↓
  Rear side air bleeder on ABS actuator


Front brake
Rear brake
ABS actuator
Proportioning valve
(Do not disassemble.)
Brake booster
Master
cylinder
: Primary line
: Secondary line
: N•m (kg-m, ft-lb)
: Flare nut
15 - 18 (1.5 - 1.8, 11 - 13)
: Connecting bolt
17 - 20 (1.7 - 2.0, 12 - 14)
SBR910B


SBR992



SBR500

Removal

CAUTION:
Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Remove flare nut securing brake tube to hose, then withdraw lock spring.
4. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.
5. All hoses must be free from excessive bending, twisting and pulling.

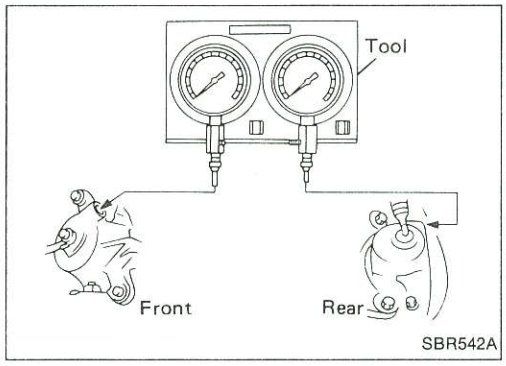
Inspection

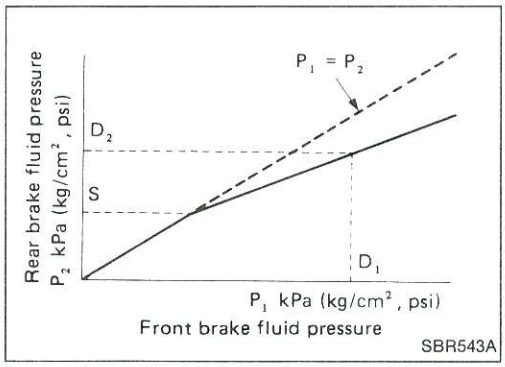
Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.

Installation

CAUTION:
- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

1. Tighten all flare nuts and connecting bolts.
   Specification:
   Flare nut
   15 - 18 N·m
   (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
   Connecting bolt
   17 - 20 N·m
   (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".





Proportioning Valve

INSPECTION

CAUTION:

- **Carefully monitor brake fluid level at master cylinder.**
- **Use new brake fluid "DOT 3".**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.**

1. Connect Tool to air bleeders of front and rear brakes on either L.H. and R.H. side.
   Tool number: KV991V0010
   (—)
2. Bleed air from the Tool.
3. Check fluid pressure by depressing brake pedal.

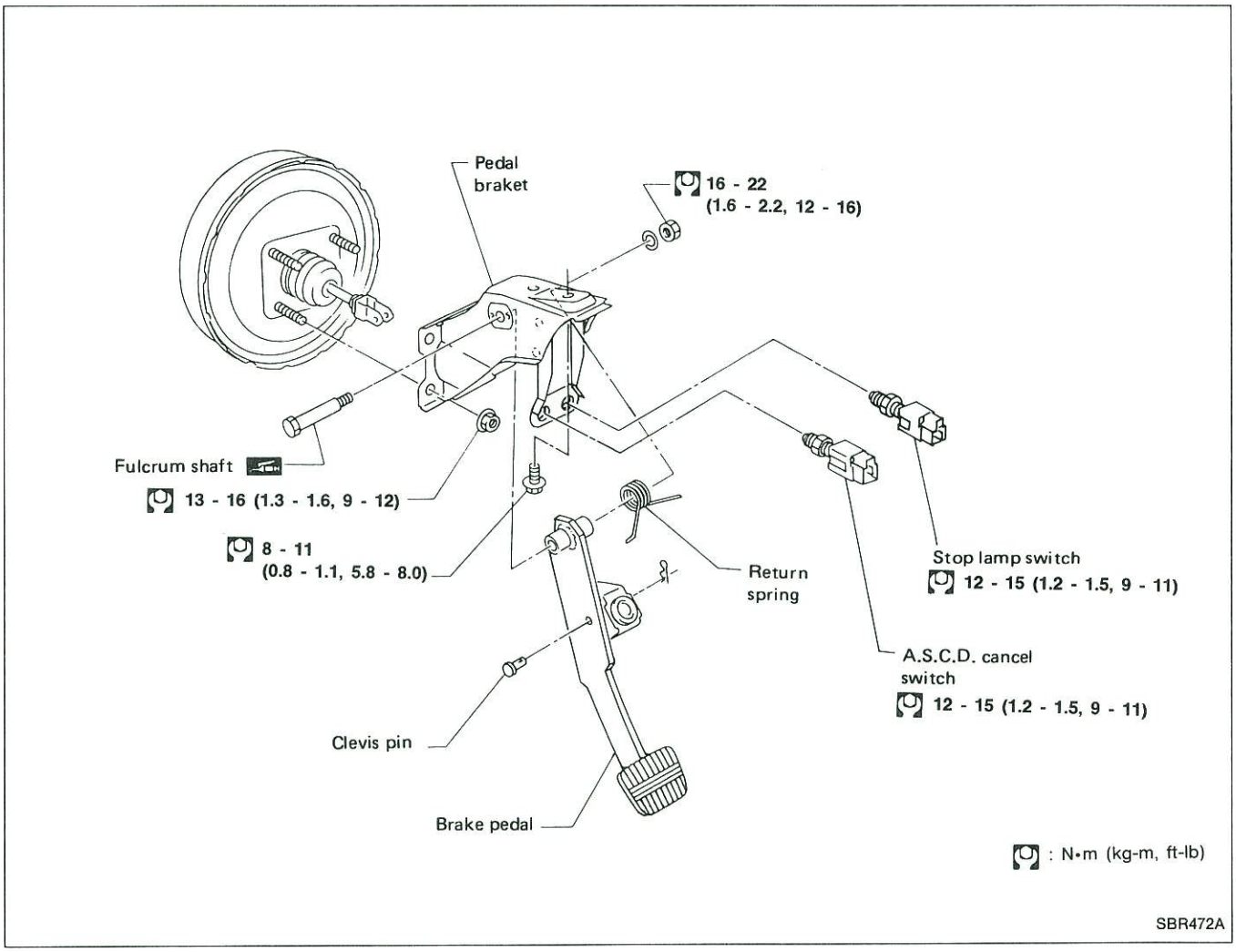
Disconnect harness connectors from ABS actuator before checking.

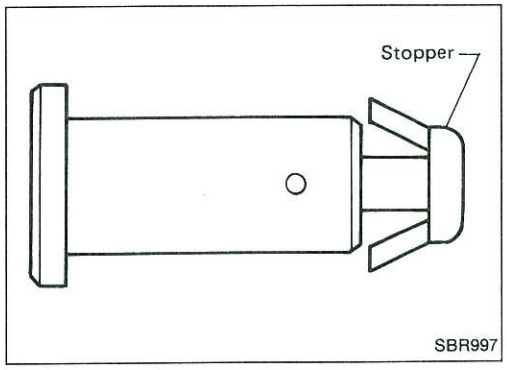
Unit: kPa (kg/cm^2, psi)

Applied pressure (Front brake)	D_1	6,375 (65, 924)
Output pressure (Rear brake)	D_2	4,119 - 4,511 (42 - 46, 597 - 654)

4. Bleed air after disconnecting the Tool. Refer to "Bleeding Procedure" in "AIR BLEEDING".

Removal and Installation

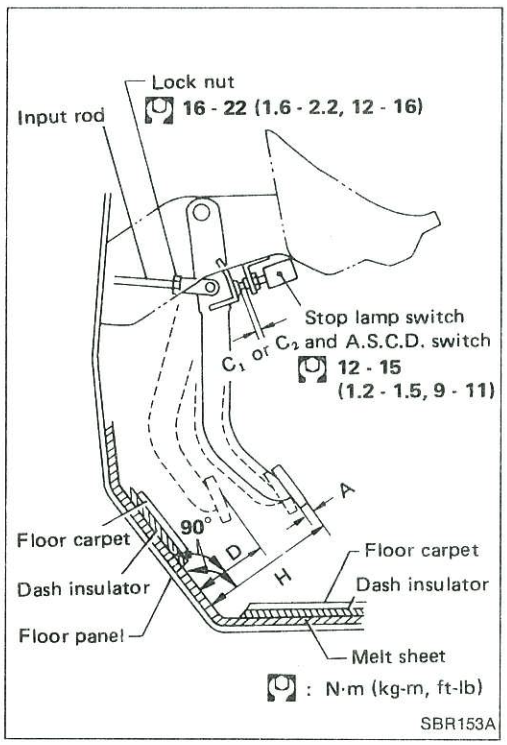




Inspection

Check brake pedal for following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion
- Crack or deformation of clevis pin stopper



Adjustment

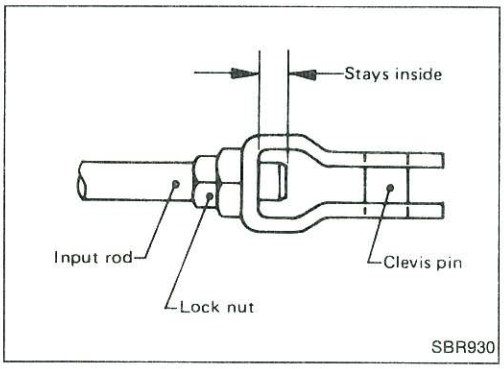
Check brake pedal free height from dash reinforcement panel. Adjust if necessary.

H: Free height
199 - 209 mm (7.83 - 8.23 in)

D: Depressed height
110 mm (4.33 in) or less
Under force of 490 N (50 kg, 110 lb)
with engine running

C_1, C_2: Clearance between pedal stopper and threaded end of stop lamp switch and A.S.C.D. switch
0.3 - 1.0 mm (0.012 - 0.039 in)

A: Pedal free play
1 - 3 mm (0.04 - 0.12 in)



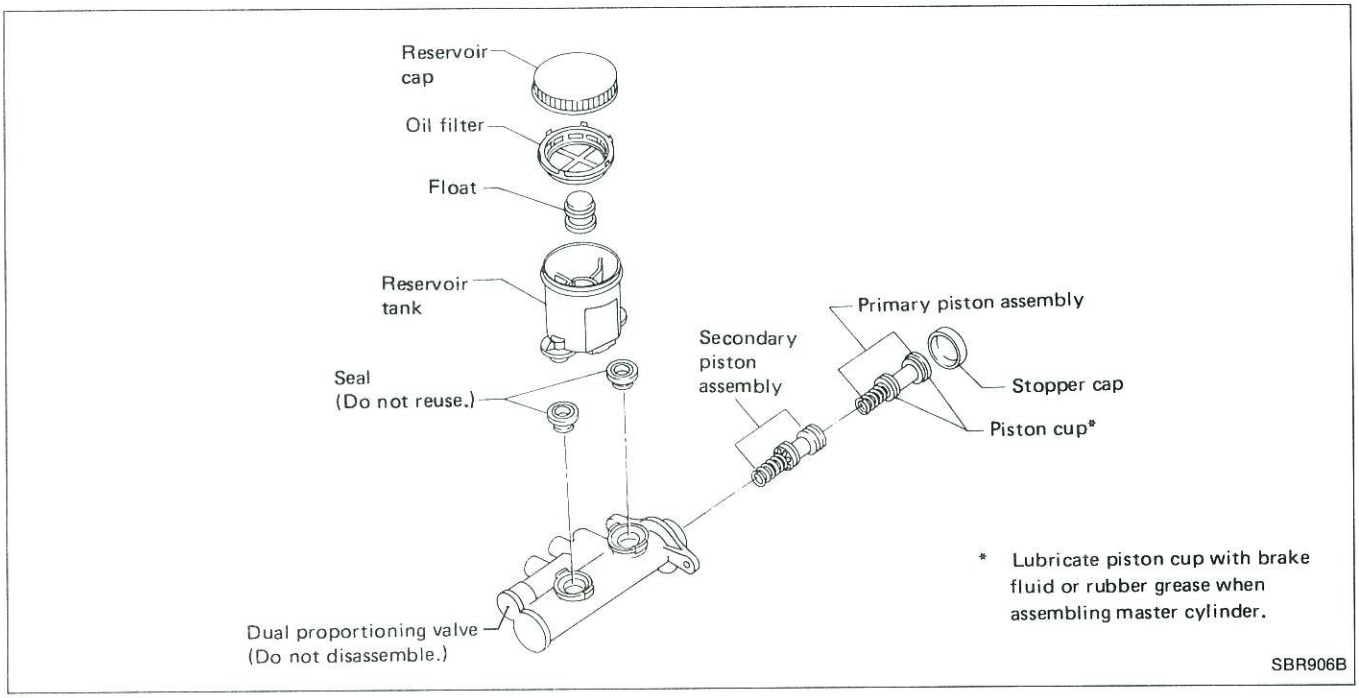
1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.

Make sure that tip of input rod stays inside.

2. Loosen lock nut and 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 lamps go 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

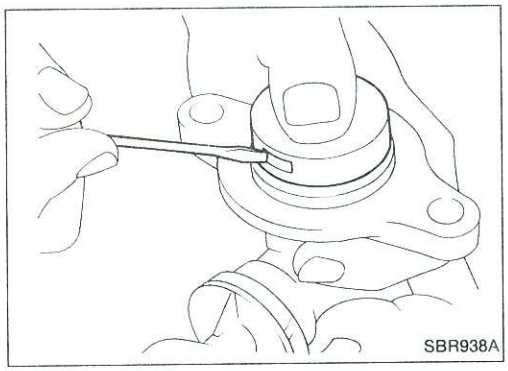
CAUTION:

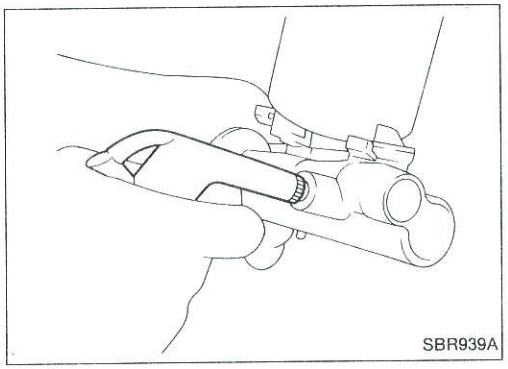
Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.

Disassembly

1. Bend claws of stopper cap outward.





2. Remove piston assemblies.

If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.

3. Draw out reservoir tank.

Inspection

Check for the following items.

Replace any part if damaged.

Master cylinder:

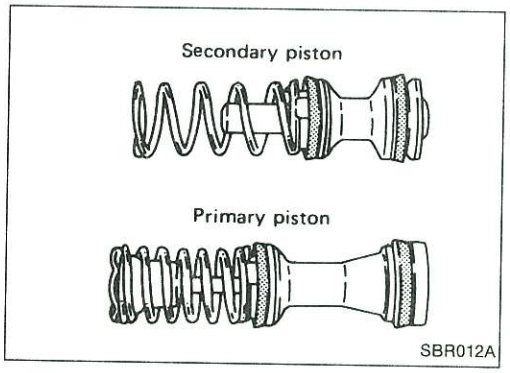
- Pin holes or scratches on inner wall.

Piston:

- Deformation of or scratches on piston cups.

Stopper cap:

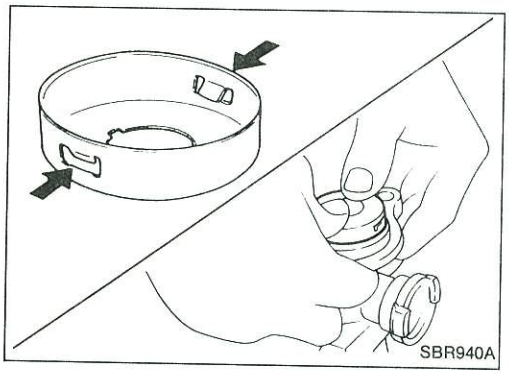
- Damage or excessive deformation of claws.



Assembly

1. Insert secondary piston assembly. Then insert primary piston assembly.

Pay attention to direction of piston cups in figure at left. Also, insert pistons squarely to avoid scratches on cylinder bore.



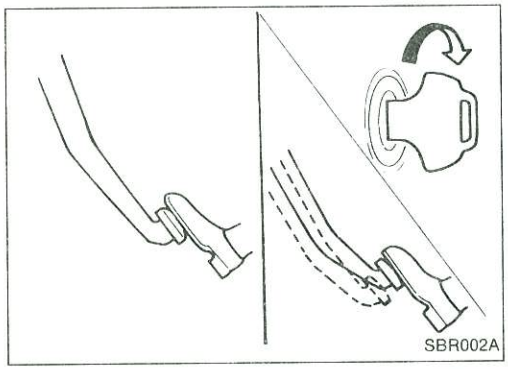
2. Bend claws inward.
3. Install stopper cap.
4. Install seals.
5. Push reservoir tank into master cylinder.

Installation

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

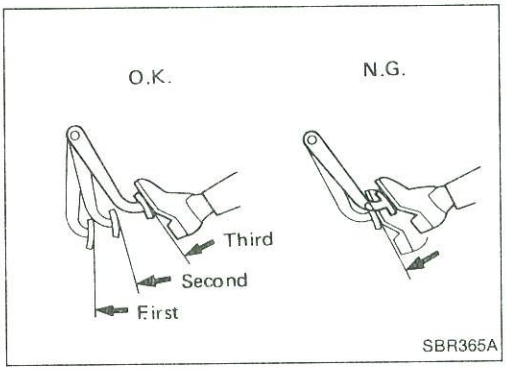
1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Fit flare nuts to master cylinder.
3. Tighten mounting nuts.
   Specification:
   8 - 11 N·m
   (0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)
4. Tighten flare nuts.
   Specification:
   15 - 18 N·m
   (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
5. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".



On-vehicle Service

OPERATING CHECK

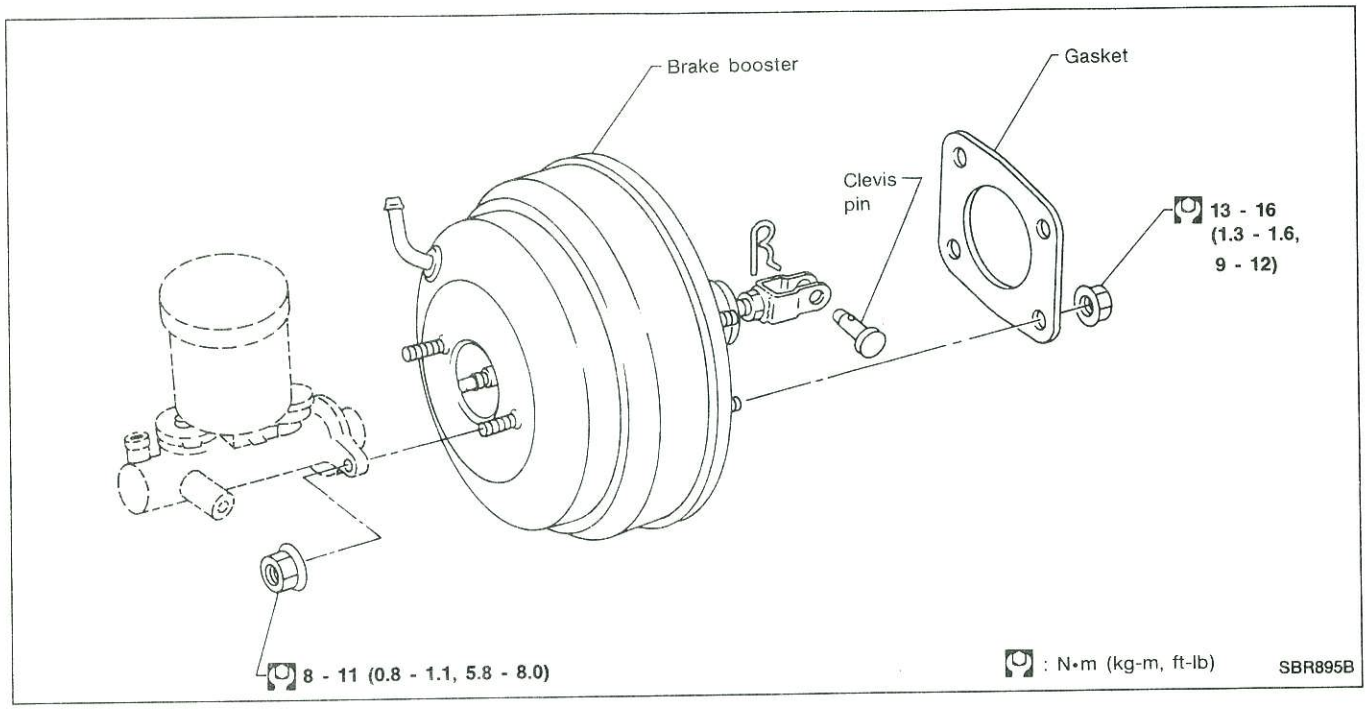
- Depress brake pedal several times with engine off, and check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



AIRTIGHT CHECK

- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down **30 seconds**, brake booster is airtight.

Removal

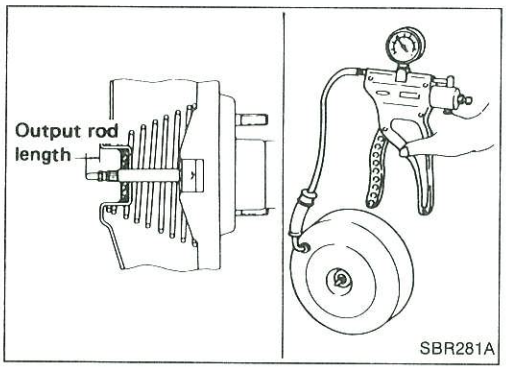


CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **Be careful not to deform or bend brake pipes, during removal of booster.**

Removal (Cont'd)

1. Remove master cylinder. Refer to "Removal" in "MASTER CYLINDER".
2. Remove clevis pin (brake pedal to booster input rod).
3. Remove mounting nuts (brake pedal bracket to booster).
4. Draw out brake booster.



Inspection

OUTPUT ROD LENGTH CHECK

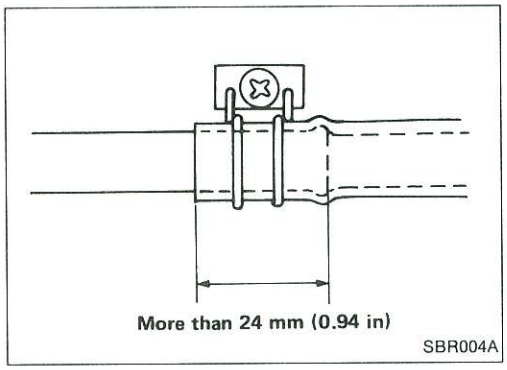
1. Supply brake booster with vacuum of -66.7 kPa (-500 mmHg, -19.69 inHg) using a handy vacuum pump.
2. Check output rod length.
   Specified length:
   10.275 - 10.525 mm (0.4045 - 0.4144 in)

Installation

CAUTION:

- **Be careful not to deform or bend brake pipes, during installation of booster.**
- **Replace clevis pin if damaged.**
- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

1. Fit booster, then secure mounting nuts (brake pedal bracket to master cylinder) lightly.
2. Connect brake pedal and booster input rod with clevis pin.
3. Secure mounting nuts.
   Specification:
   8 - 11 N·m
   (0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)
4. Install master cylinder. Refer to "Installation" in "MASTER CYLINDER".
5. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".

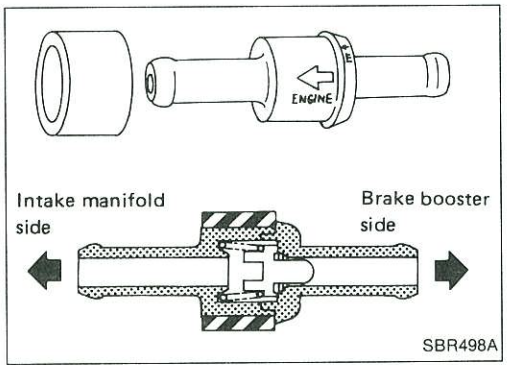


Removal and Installation

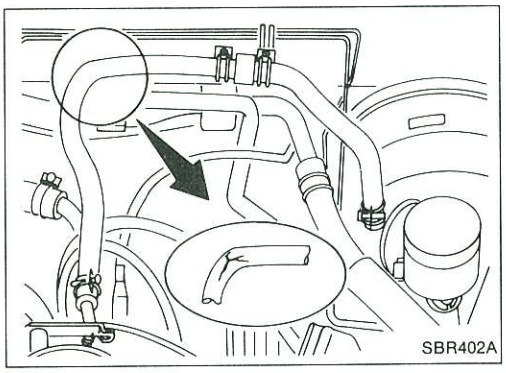
CAUTION:

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 hose more than 24 mm (0.94 in).**



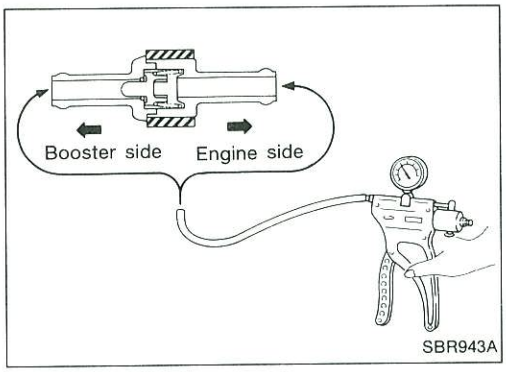
- **Install check valve, paying attention to its direction.**



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.

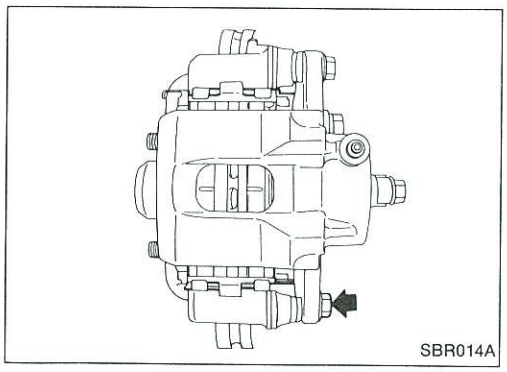
Pad Replacement

WARNING:

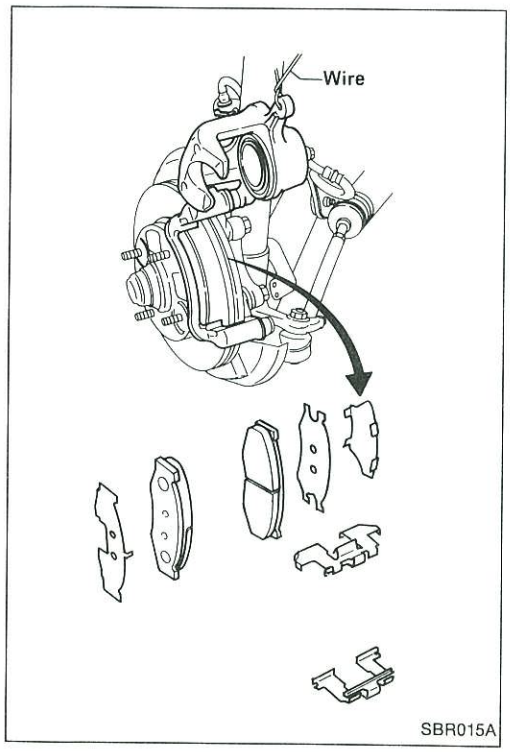
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

CAUTION:

- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.**
- **If shims are rusted or show peeling of the rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**


SBR014A

1. Remove master cylinder reservoir cap.
2. Remove pin bolt.



SBR015A

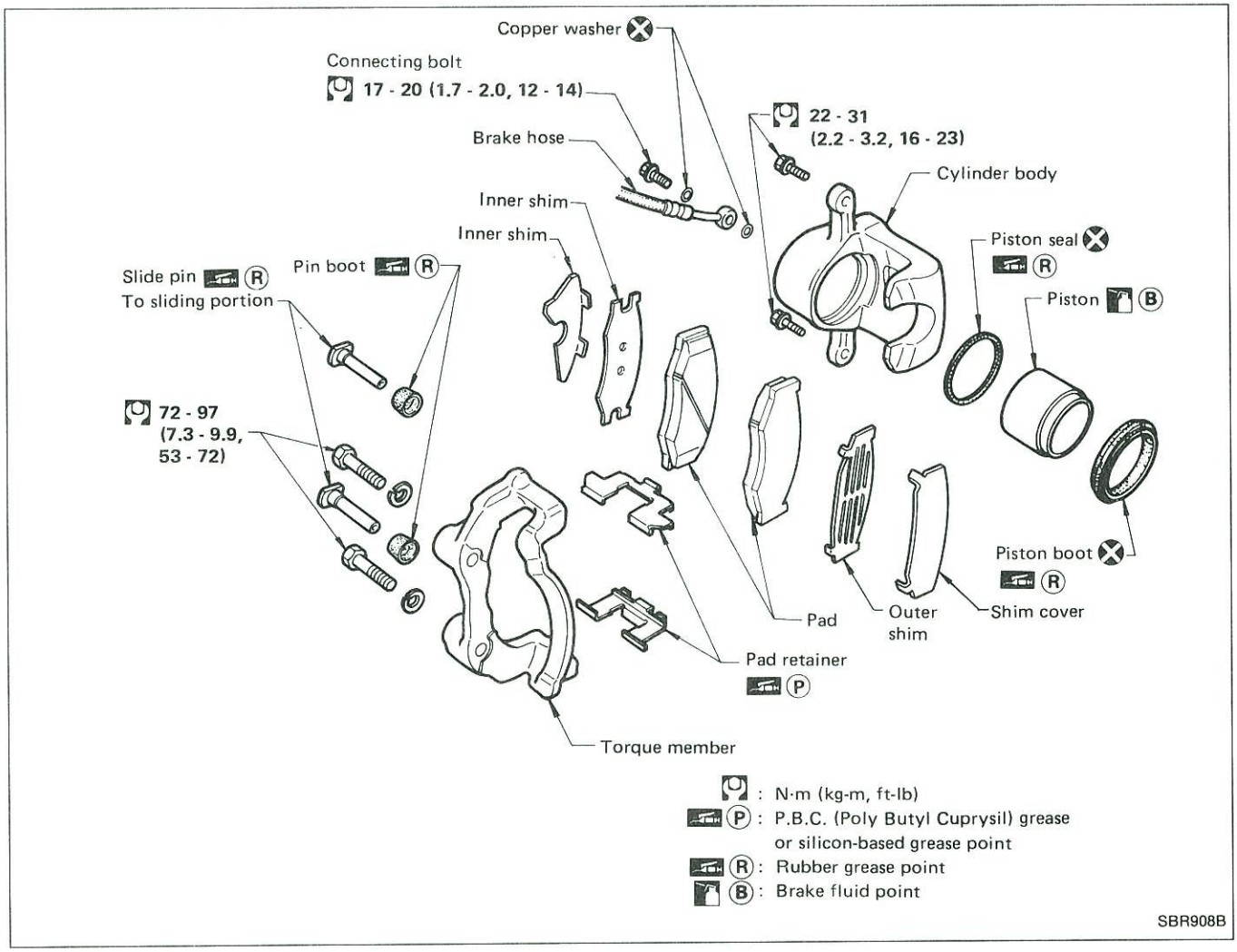
3. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

Pad wear limit:

2.0 mm (0.079 in)

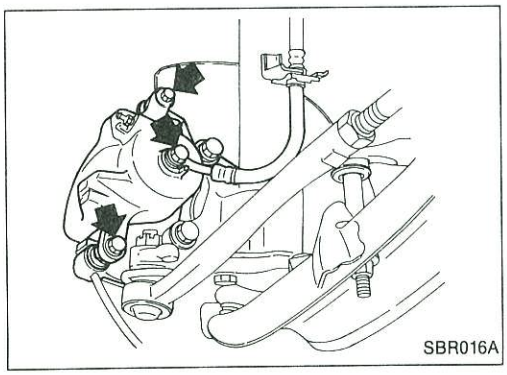
Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

Pad Replacement (Cont'd)



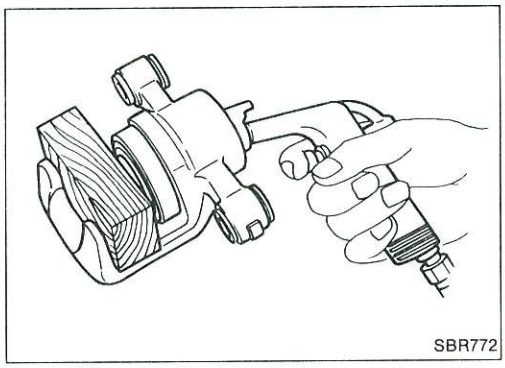
Removal

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.



Remove torque member fixing bolts and connecting bolt.

It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.


SBR772

Disassembly

WARNING:
Do not place your fingers in front of piston.

CAUTION:
Do not scratch or score cylinder wall.

1. Push out piston with dust seal with compressed air.
2. Remove piston seal with suitable tool.

Inspection — Caliper

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

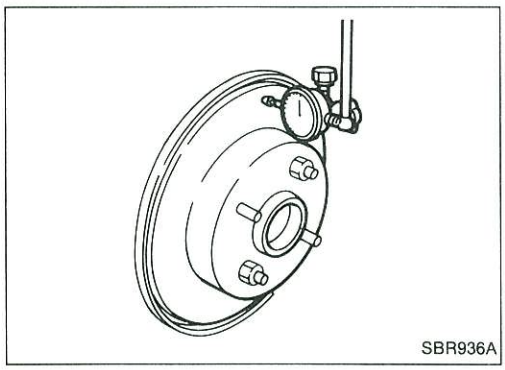
PISTON

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

SLIDE PIN, PIN BOLT, AND PIN BOOT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.


SBR936A

Inspection — Rotor

RUNOUT

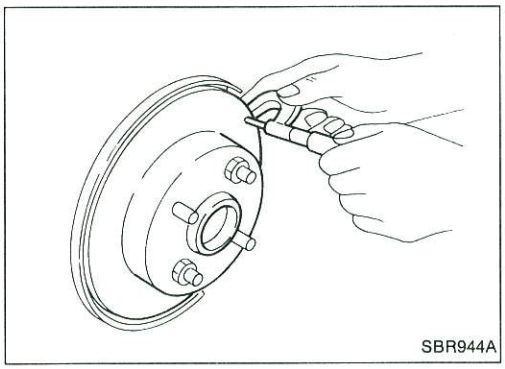
1. Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to section FA.

Maximum runout:
0.07 mm (0.0028 in)

Inspection — Rotor (Cont'd)

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).

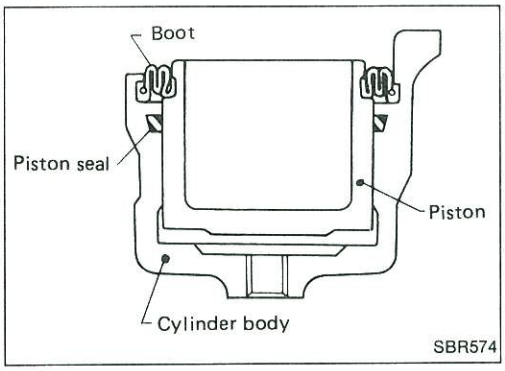

SBR944A

THICKNESS

Thickness variation (At least 8 positions):
Maximum 0.01 mm (0.0004 in)

If thickness variation exceeds the specification, turn rotor with on-car brake lathe.

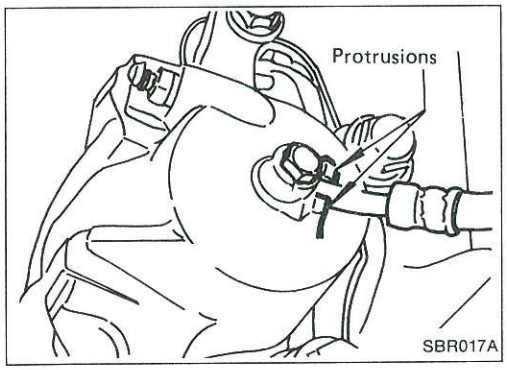
Rotor repair limit:
20.0 mm (0.787 in)



SBR574

Assembly

1. Insert piston seal into groove on cylinder body.
2. With piston boot fitted to piston, insert piston boot into groove on cylinder body and install piston.
3. Properly secure piston boot.



SBR017A

Installation

CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

1. Install brake hose to caliper securely.
2. Install all parts and secure all bolts.
3. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".

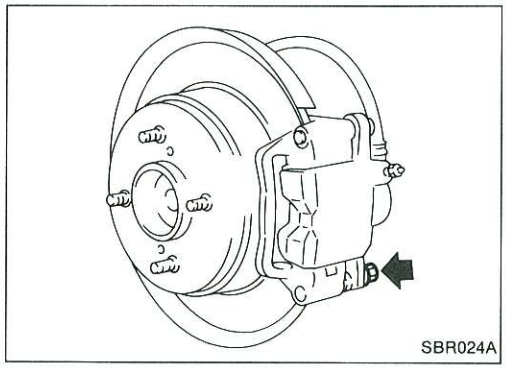
Pad Replacement

WARNING:

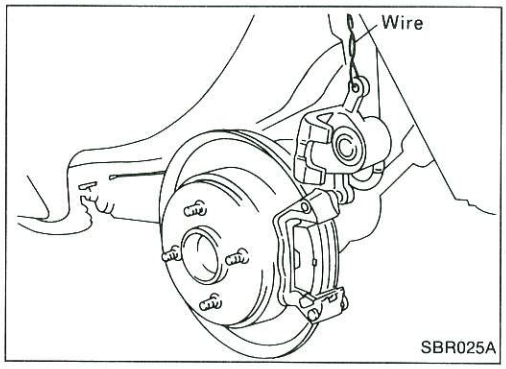
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

CAUTION:

- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.**
- **If shims are rusted or show peeling of rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**



1. Remove master cylinder reservoir cap.
2. Remove pin bolt.



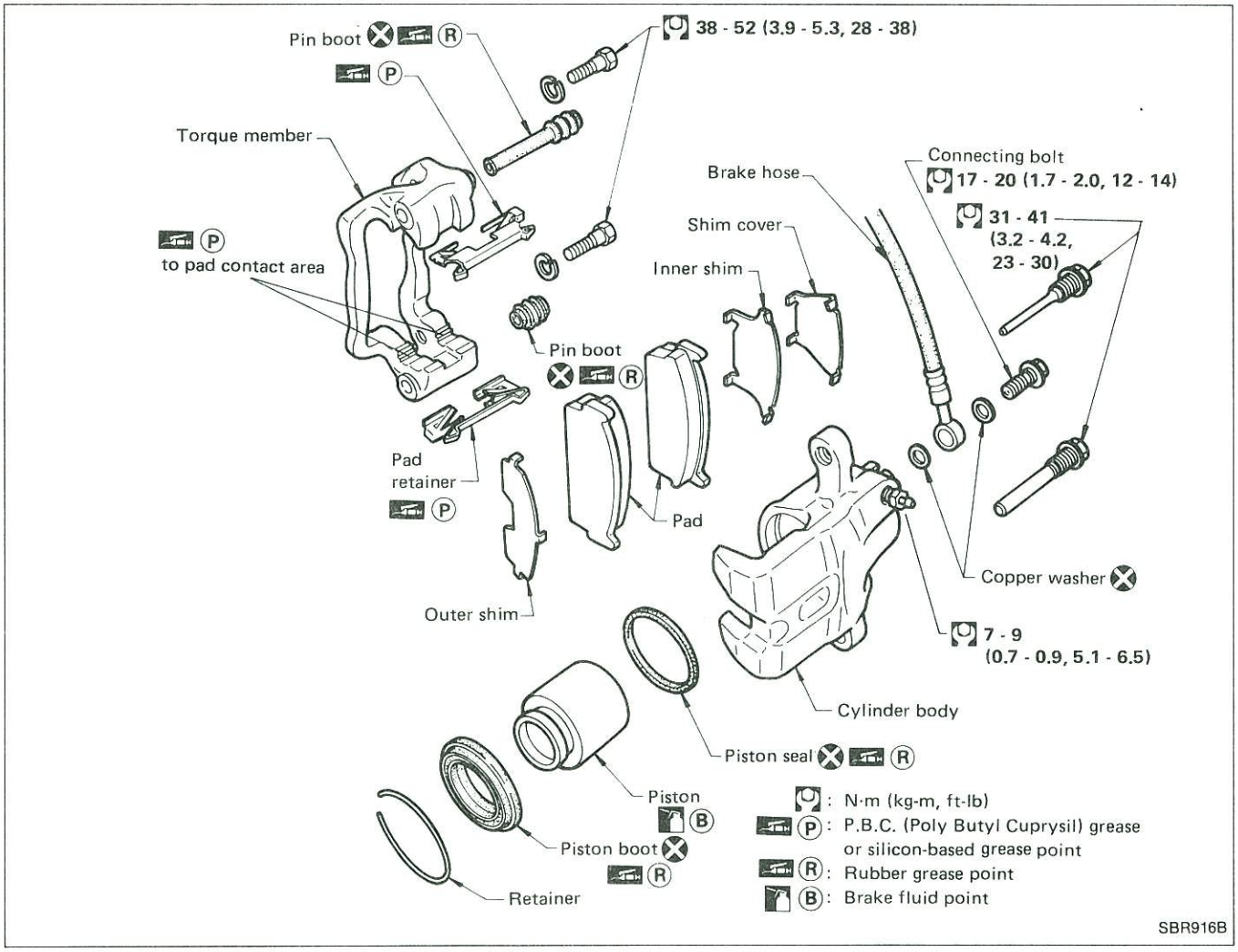
3. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

   Pad wear limit:

   2.0 mm (0.079 in)

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

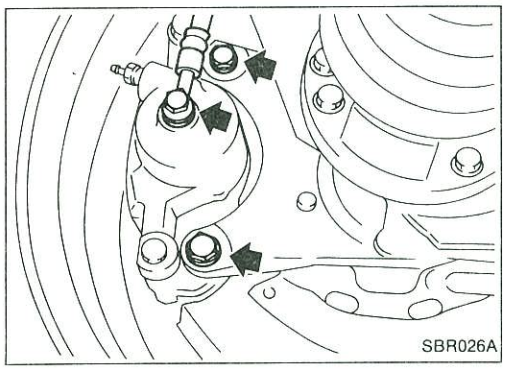
Pad Replacement (Cont'd)



Removal

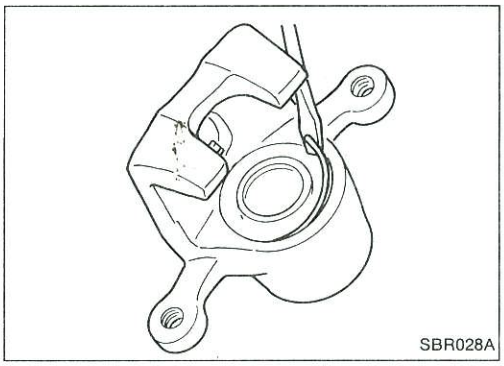
WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.



Remove torque member fixing bolts and connecting bolt.

It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.

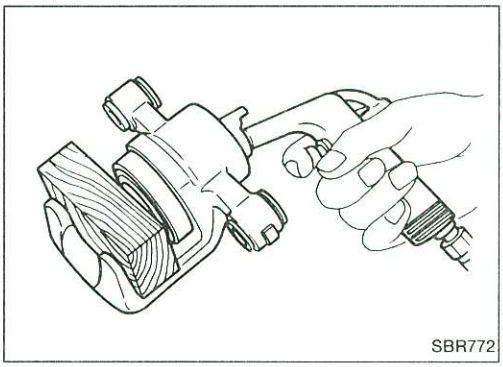

SBR028A

Disassembly

WARNING:
Do not place your fingers in front of piston.

CAUTION:
Do not scratch or score cylinder wall.

1. Remove dust cover retainer with a screwdriver.


SBR772

2. Push out piston with dust seal with compressed air.
3. Remove piston seal with suitable tool.

Inspection — Caliper

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

PISTON

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

SLIDE PIN, PIN BOLT, AND PIN BOOT

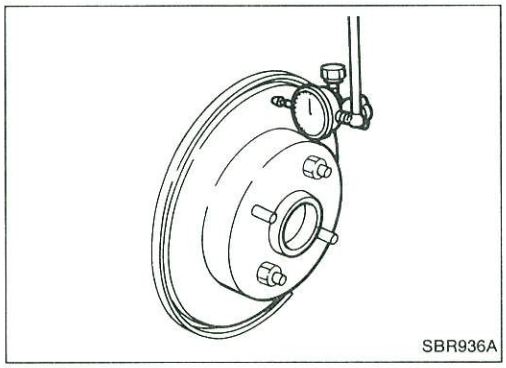
Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

Inspection — Rotor (Cont'd)

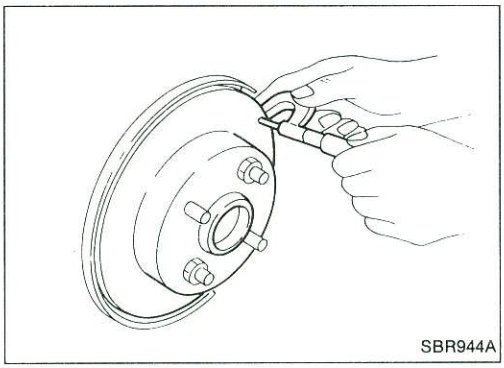


RUNOUT

1. Secure rotor to wheel hub with two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

Make sure that axial end play is within the specifications before measuring. Refer to section RA.

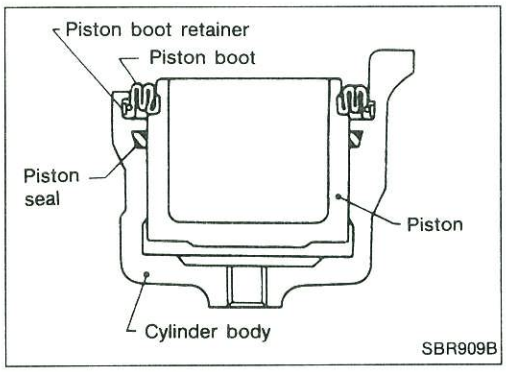
Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)



THICKNESS

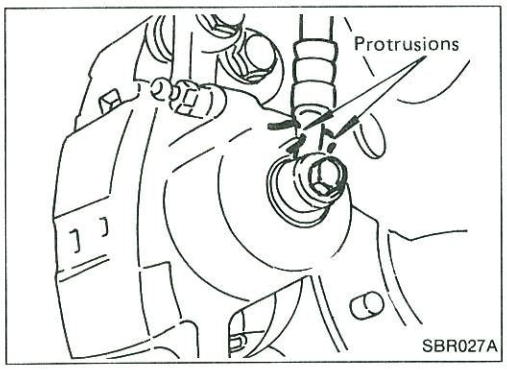
Rotor repair limit:
Minimum thickness
9.0 mm (0.354 in)

Assembly



1. Insert piston seal into groove on cylinder body.
2. With piston boot fitted to piston, insert piston boot into groove on cylinder body and install piston.
3. Properly secure piston boot.
4. Secure piston boot with retainer.

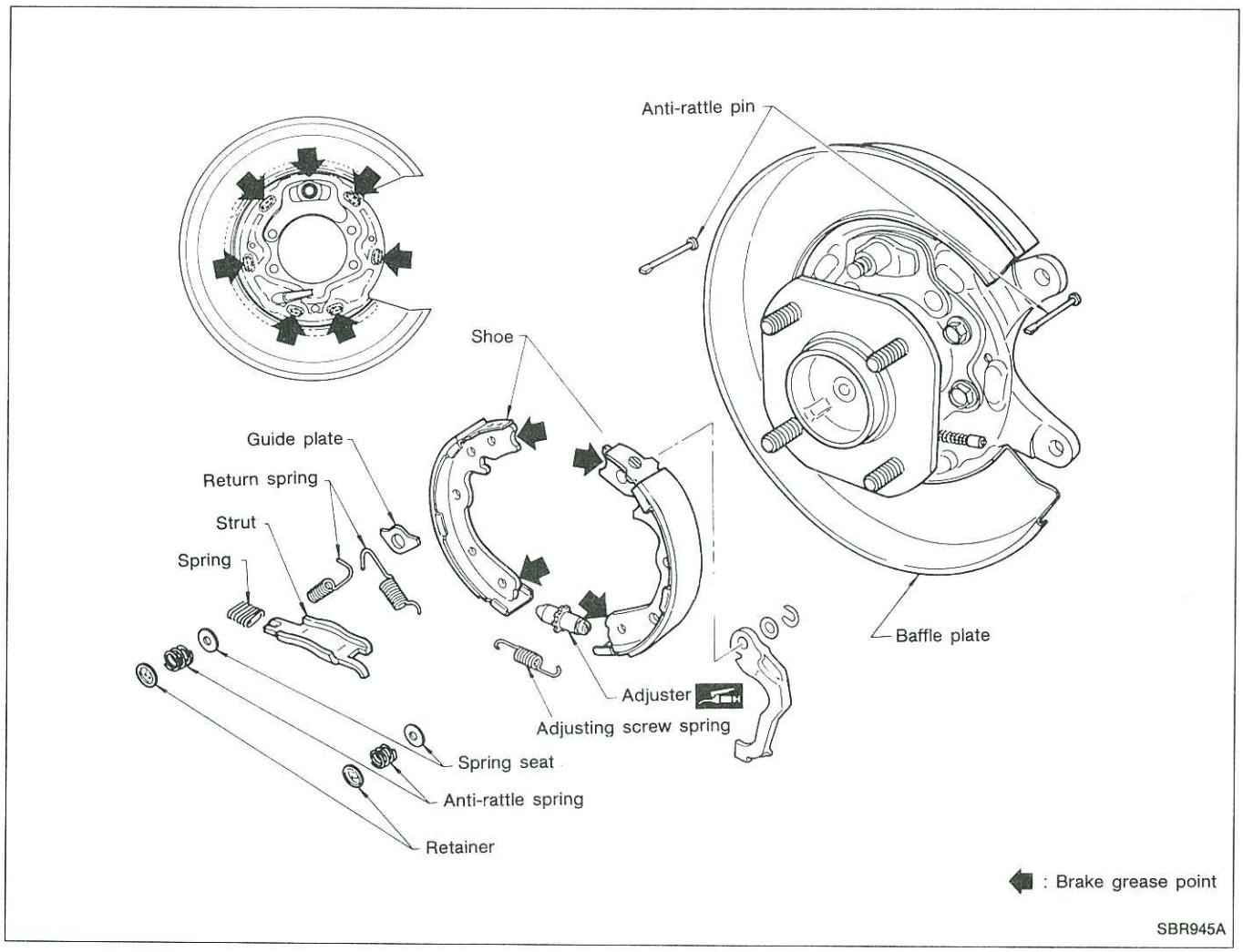
Installation



CAUTION:

- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

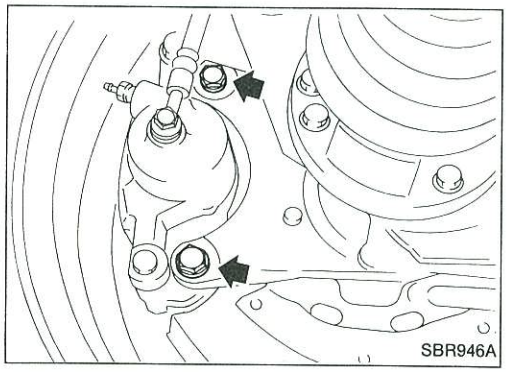
1. Install brake hose to caliper securely.
2. Install all parts and secure all bolts.
3. Bleed air. Refer to "Bleeding Procedure" in "AIR BLEEDING".



Removal

WARNING:
Clean brake lining with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

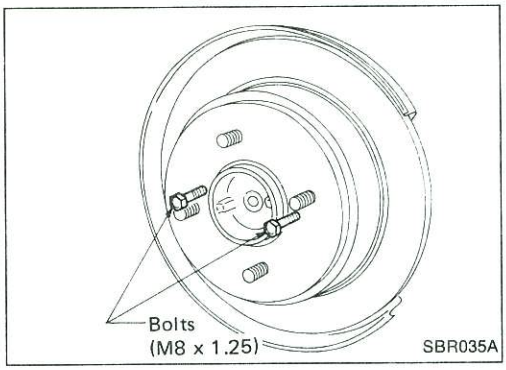
CAUTION:
Make sure parking brake lever is released completely.



1. Remove torque member fixing bolts (Rear disc brake assembly mounting bolts).

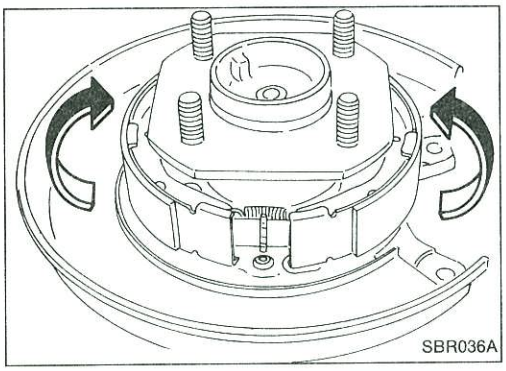
Suspend caliper assembly with wire so as not to stretch brake hose.

Removal (Cont'd)



2. Remove disc rotor (With parking drum brake).

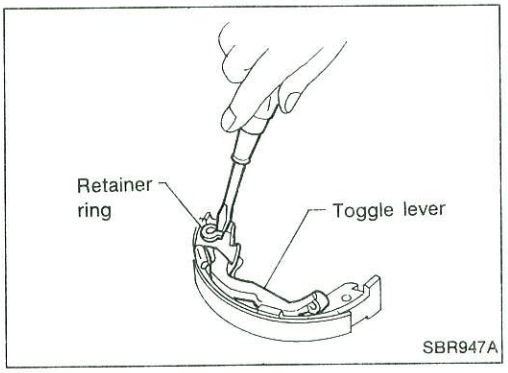
Tighten two bolts gradually if disc rotor is hard to remove.



3. After removing retainer, remove spring by rotating shoes.

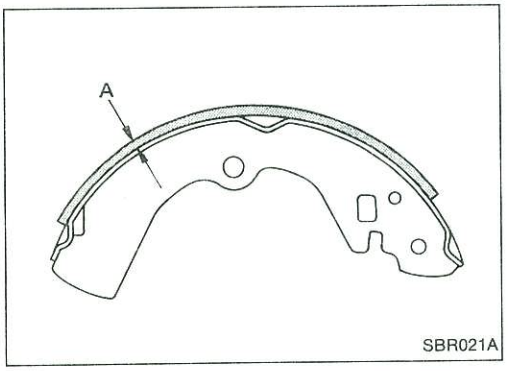
Be careful not to damage parking brake cable when separating it.

4. Remove adjuster.
5. Remove strut.
6. Disconnect parking brake cable from toggle lever.



7. Remove retainer ring with a suitable tool. Then separate toggle lever and brake shoe.

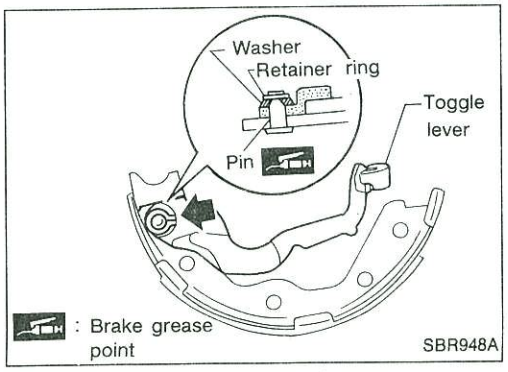
Inspection



Check lining thickness.

Lining wear limit (A):
1.5 mm (0.059 in)

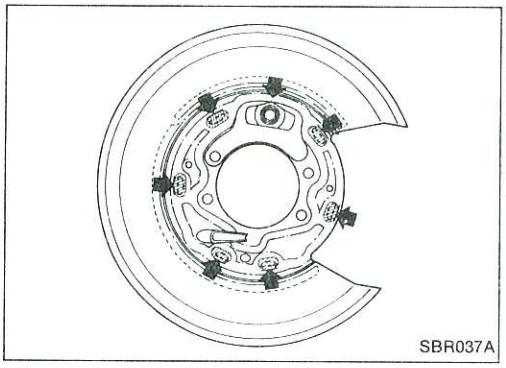
Installation



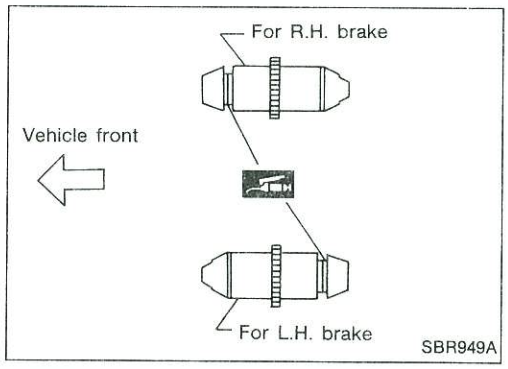
1. Fit toggle lever to brake shoe with retainer ring.

Pay attention to retainer ring direction.

Installation (Cont'd)



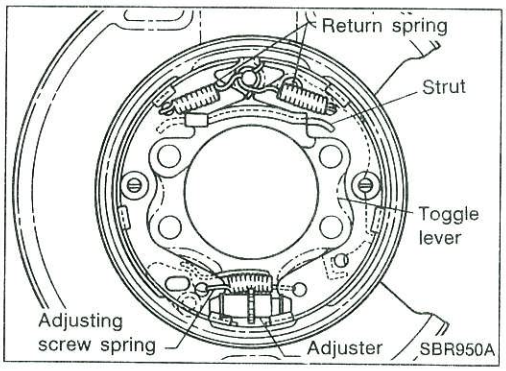
2. Apply brake grease to the contact areas shown at left.



3. Shorten adjuster by rotating it.

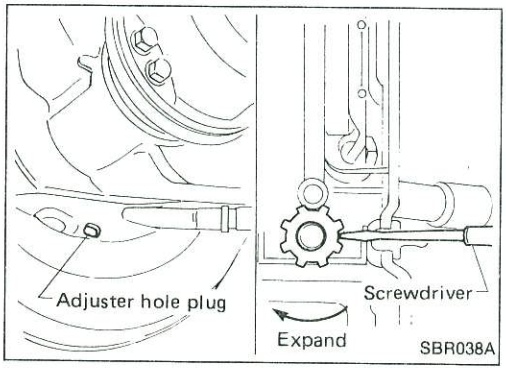
Pay attention to direction of adjuster.

4. Connect parking brake cable to toggle lever.
5. Install all parts.



6. Check all parts are installed properly.

Pay attention to direction of adjuster.



Shoe Clearance Adjustment

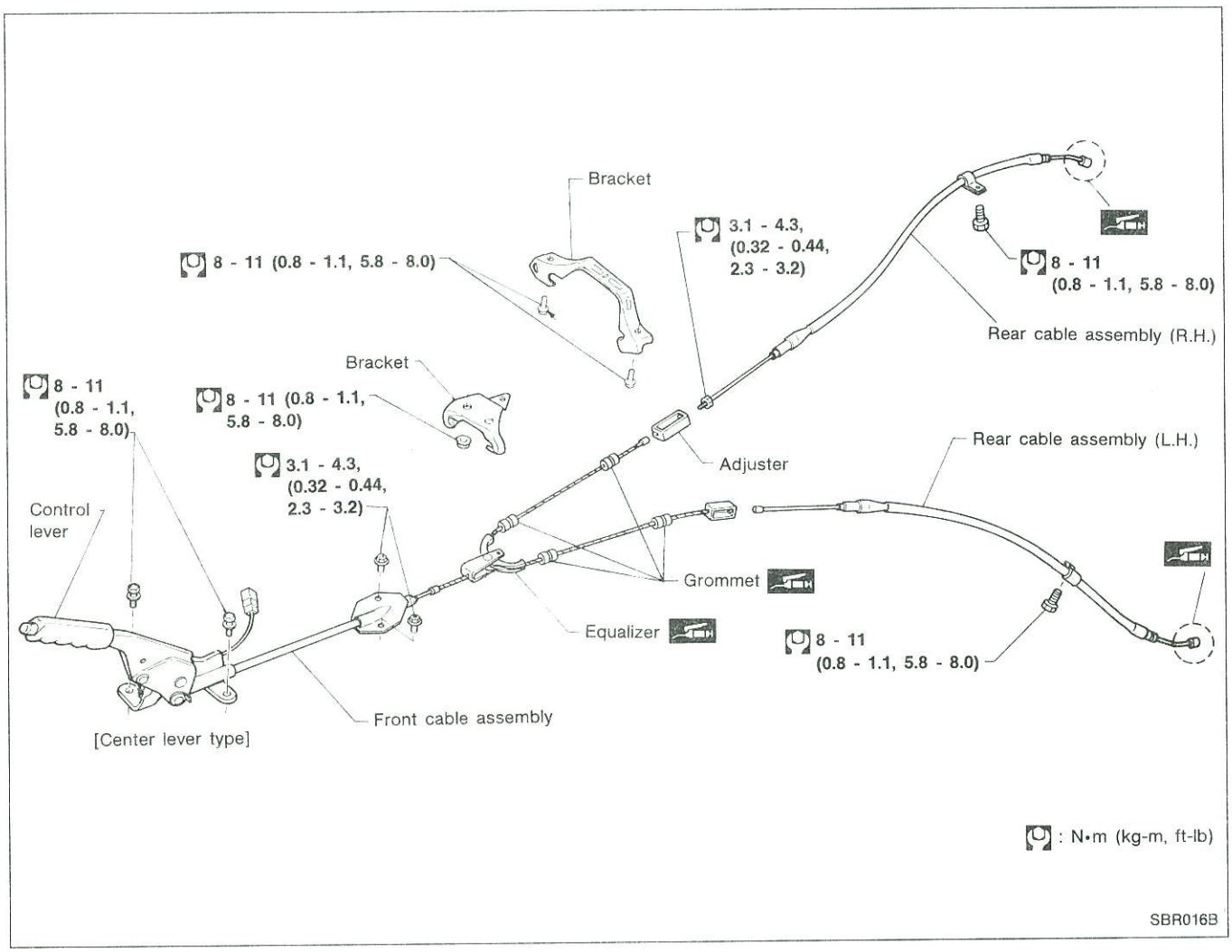
1. Remove adjuster hole plug, and turn down adjuster wheel with a screwdriver until shoe touches brake drum.

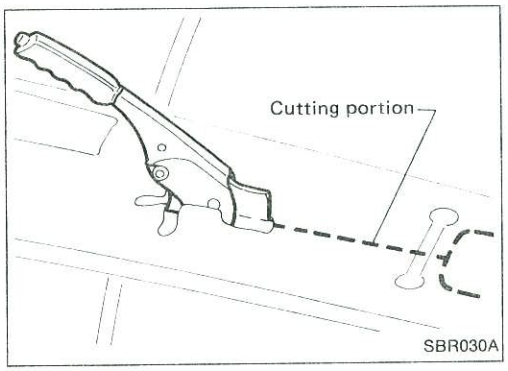
Make sure that parking control lever is released completely.

2. Return adjuster wheel 7 to 8 latches.
3. Install adjuster hole plug, and make sure that there is no drag between shoes and brake drum when rotating disc rotor.
4. Adjust parking brake cable. Refer to "Adjustment" in "PARKING BRAKE CONTROL".

Breaking in Drum and Lining

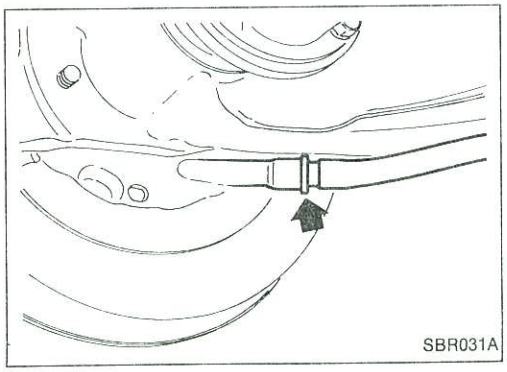
1. Using either low or 2nd transmission speed, drive the unloaded vehicle on a safe, level and dry road.
2. Depress the release button of parking brake lever, then pull the lever with a force of 98 N (10 kg, 22 lb).
3. While holding the lever, continue to drive the vehicle forward 100 m (328 ft) at approximately 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 3 three times and then repeat only step 4 one more time.





Removal and Installation

- To replace parking brake cable, cut carpet at the area shown at left.



- Install rear cable by tapping the flanged section of cable cover with a hammer and punch.

Be careful not to damage cable.
Make sure there is no free play after installation.

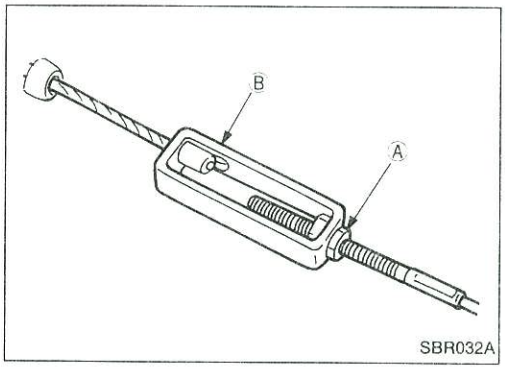
Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.

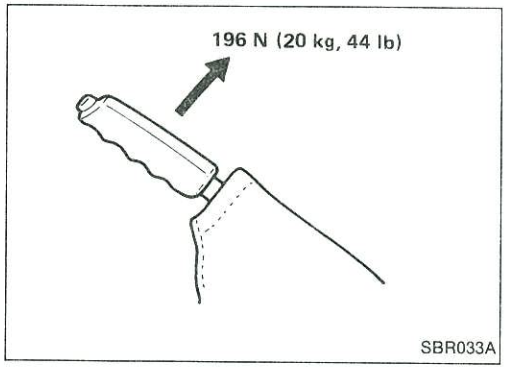
Adjustment

Adjust control lever stroke as follows:

On models equipped with parking drum brake, perform shoe clearance adjustment before adjusting control lever stroke.



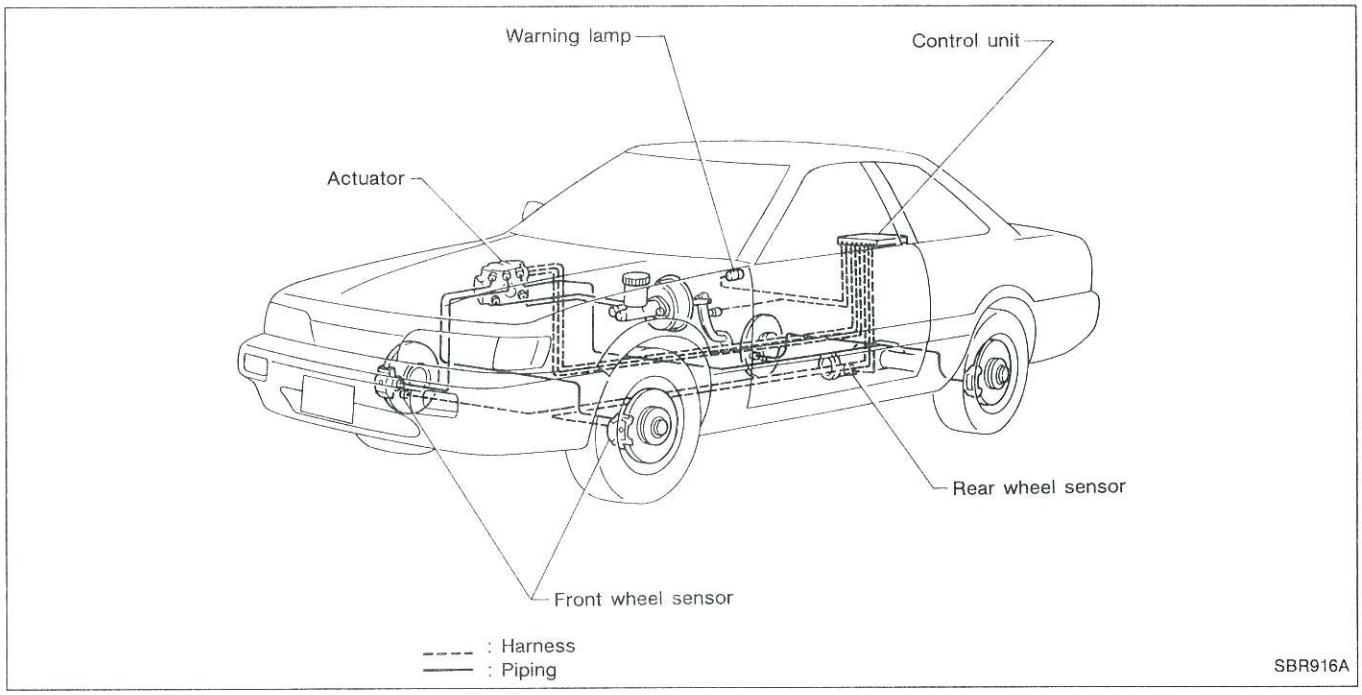
1. Loosen lock nut Ⓐ, rotate adjuster Ⓑ.
2. Tighten lock nut Ⓐ.



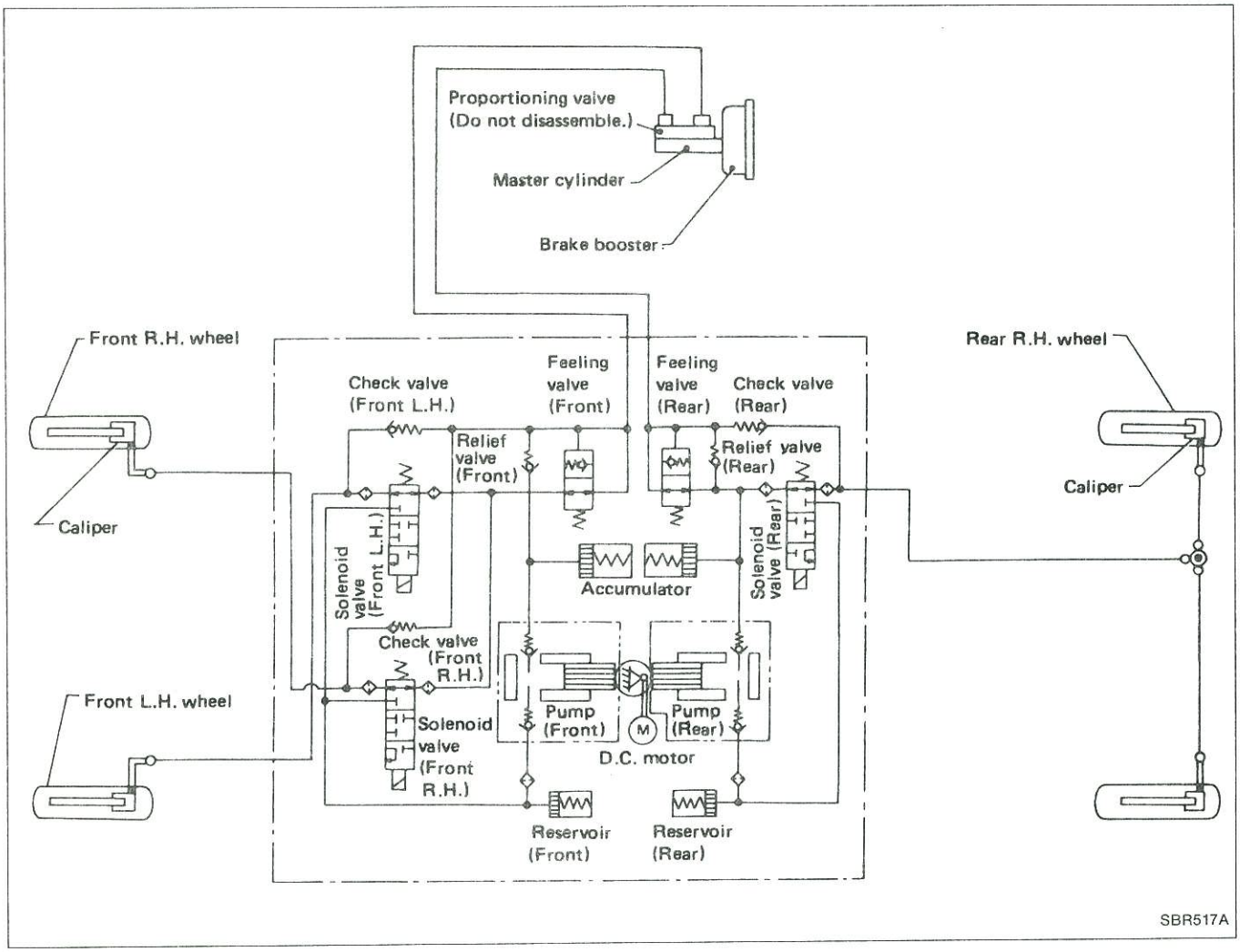
3. Pull control lever with specified amount of force. Check lever stroke.
   Number of notches: 8 - 9

4. Bend parking brake warning lamp switchplate so that brake warning lamp goes on when ratchet at parking brake lever is pulled "A" notches and goes off when fully released.
   Number of notches "A": 2

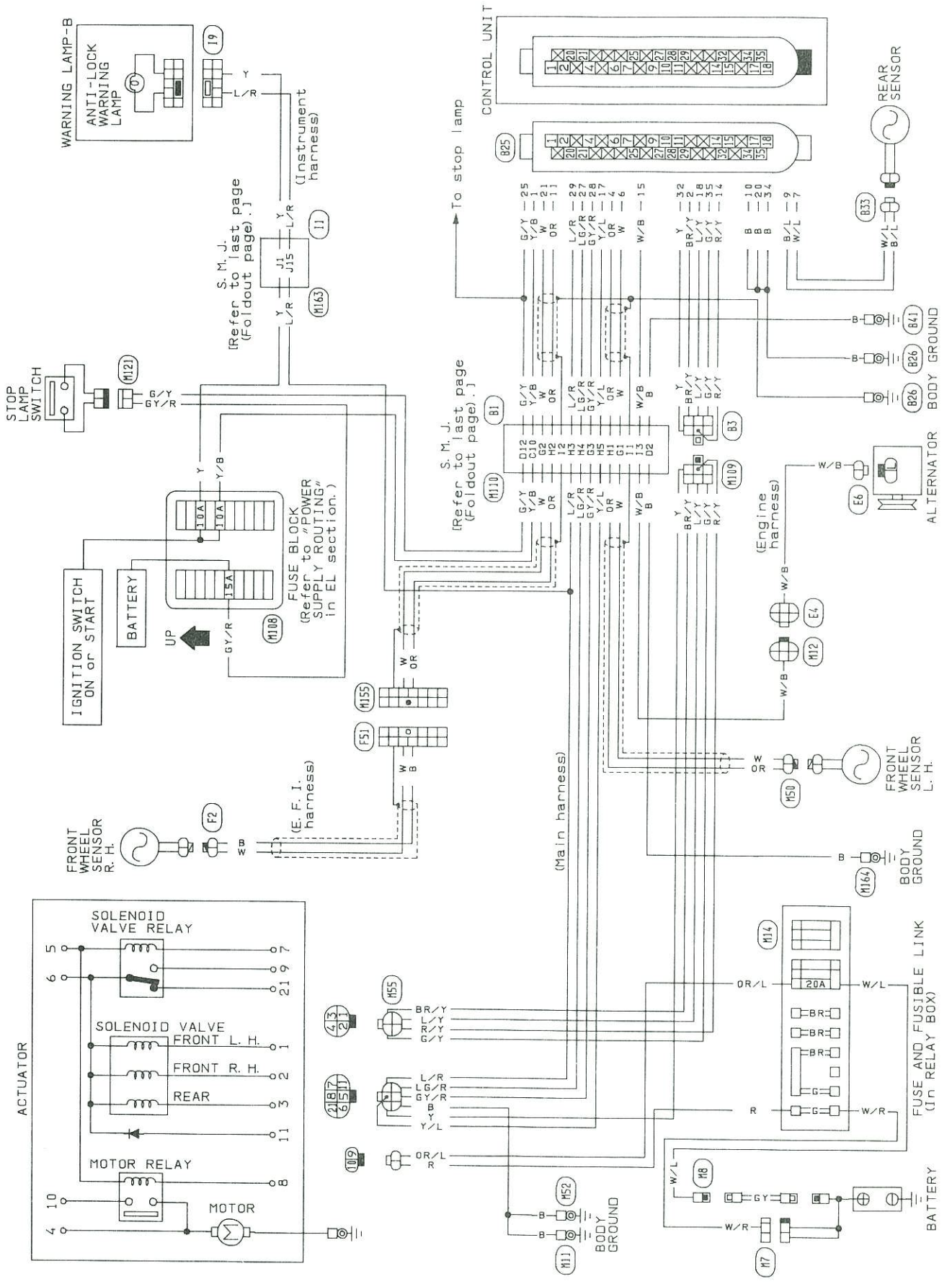
System Components



Hydraulic Circuit



Wiring Diagram



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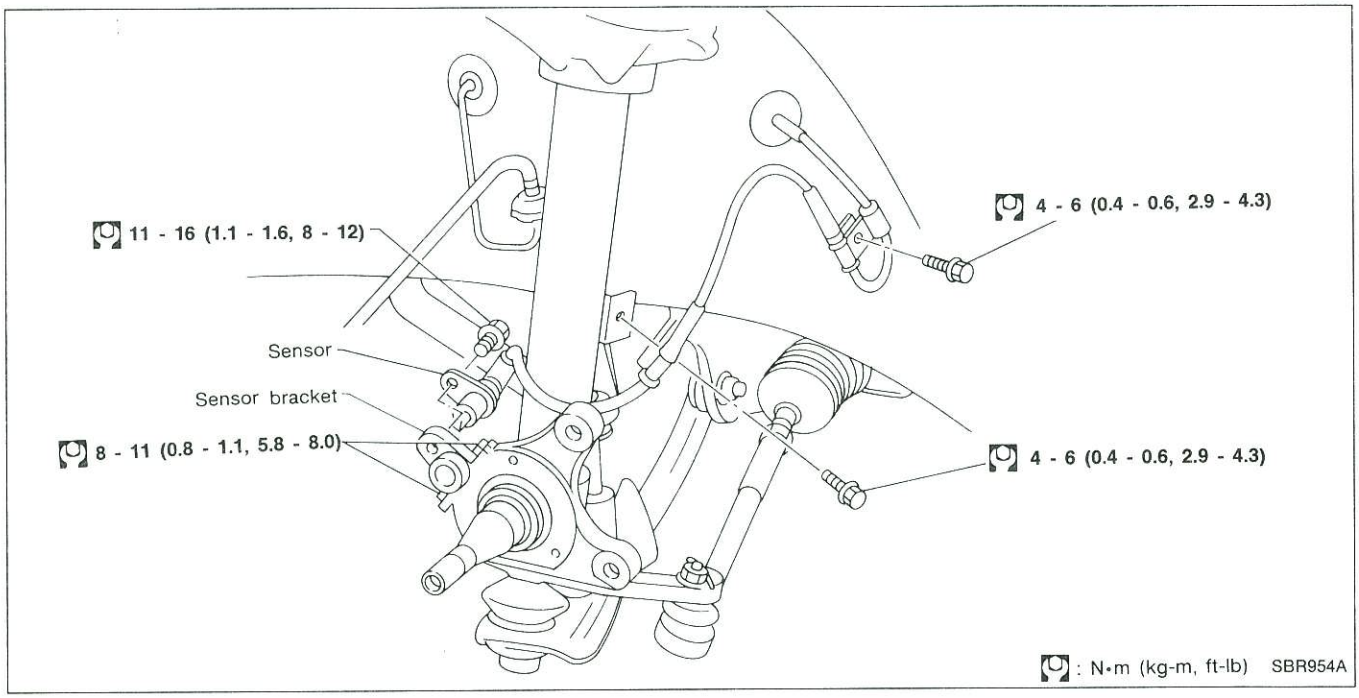
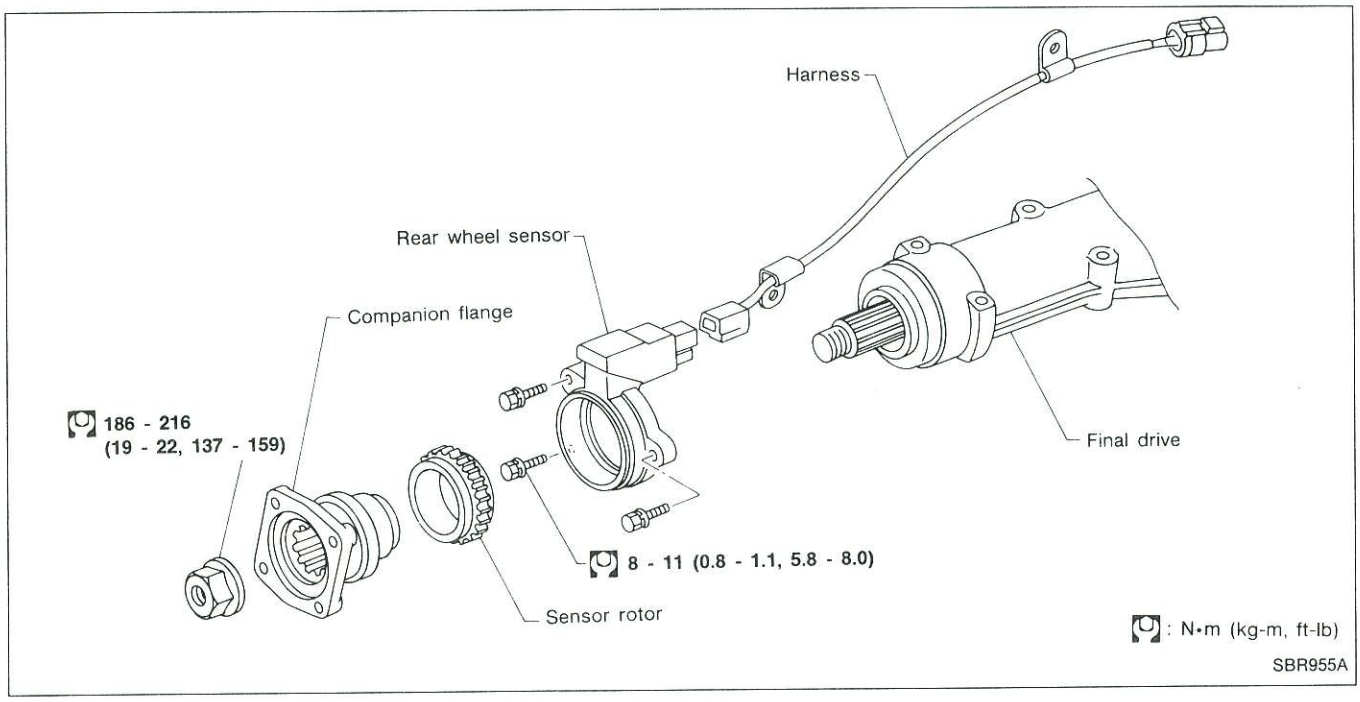
Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR

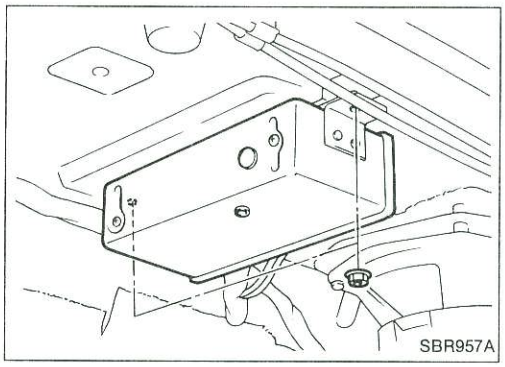


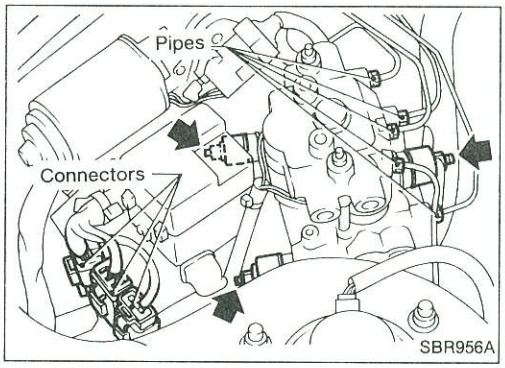
REAR WHEEL SENSOR



Removal and Installation (Cont'd)

CONTROL UNIT





Removal

ACTUATOR

1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid" in "CHECK AND ADJUSTMENT".
3. Disconnect connectors, brake pipes and remove fixing nuts.

Installation

CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "CHECK AND ADJUSTMENT" and "AIR BLEEDING" respectively.

1. Connect brake pipes temporarily.
2. Secure fixing nuts.
3. Torque brake pipes.
4. Connect connectors and battery cable.

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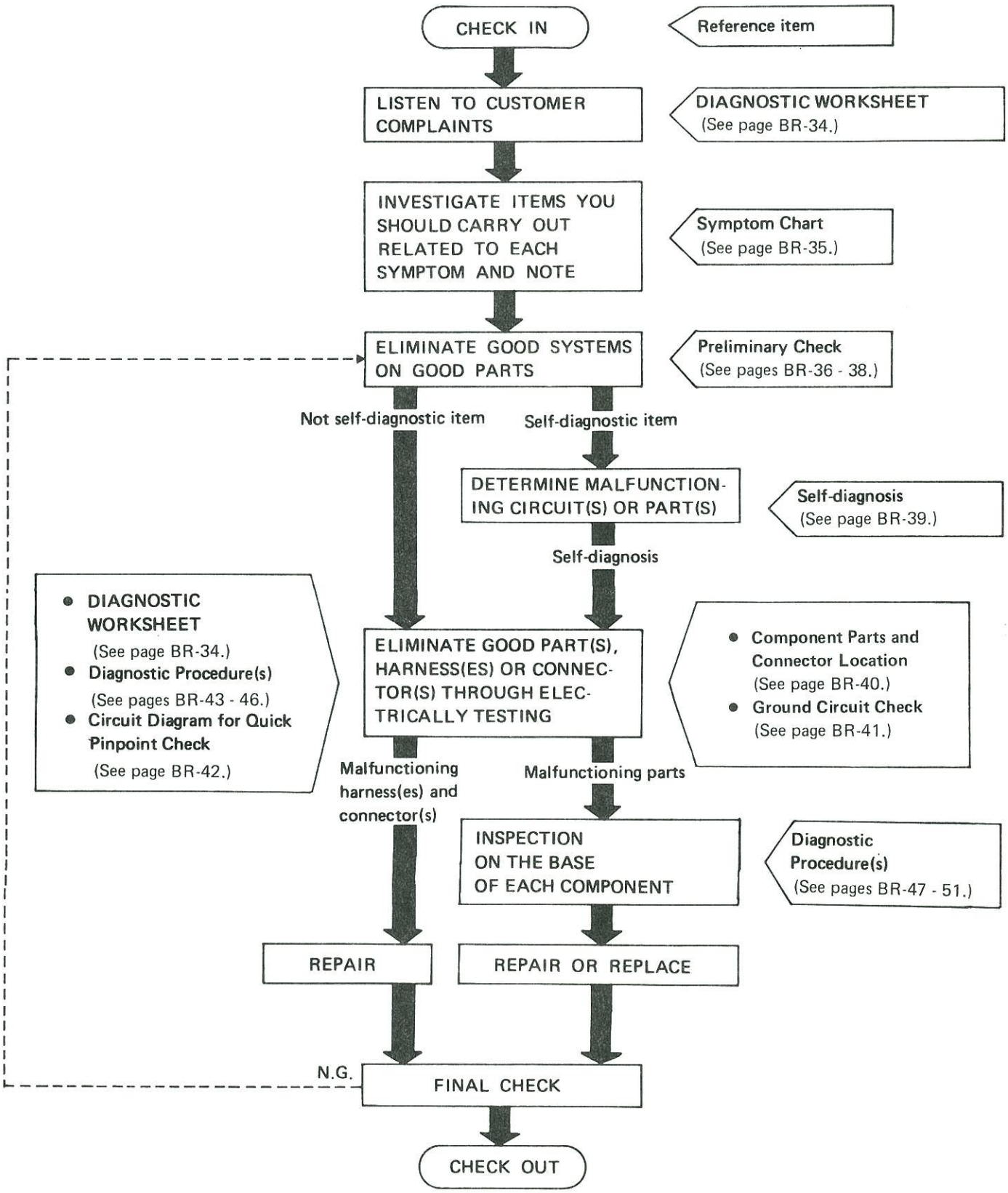
Electrical Components Inspection BR-52

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

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

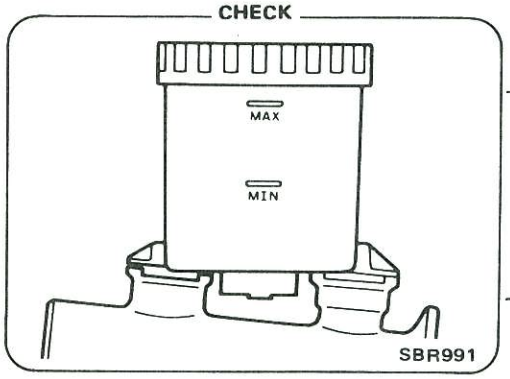
Customer name MR/MS		Model & Year			VIN		
Engine #		Trans.			Mileage		
Incident Date		Manuf. Date			In Service Date		
Symptoms	☐ Pedal vibration and noise	☐ Warning activates	☐ Long stopping distance	☐ Unexpected pedal action	☐ ABS doesn't work	☐ ABS works but warning activates	☐ ABS works frequently
Engine conditions		☐ When starting ☐ After starting ☐ Engine speed: 5,000 rpm or more					
Road conditions		☐ Low friction road (☐ Snow ☐ Gravel ☐ Other) ☐ Protrusion					
Driving conditions		☐ High speed cornering ☐ Vehicle speed: Greater than 10 km/h (6 MPH) ☐ Vehicle speed: 10 km/h (6 MPH) or less ☐ Vehicle is stopped					
Applying brake conditions		☐ Suddenly ☐ Gradually					
Other conditions		☐ Operation of electrical equipment ☐ Large pedal stroke ☐ Operation of clutch					

Symptom Chart

PROCEDURE	REFERENCE PAGE	SYMPTOM	Pedal vibration & noise	Warning activates	Long stopping distance	Unexpected pedal action	ABS doesn't work	ABS works but warning activates
Electrical Components Inspection	BR-52	Actuator inspection					○	
Ground Circuit Check	BR-41	Motor ground					○	
	BR-41	Control unit ground					○	
Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	BR-51	Diagnostic Procedure 11	○	○	○	○	○	○
	BR-51	Diagnostic Procedure 10	○	○	○	○	○	○
	BR-50	Diagnostic Procedure 9	○	○	○	○	○	○
	BR-49	Diagnostic Procedure 8	○	○	○	○	○	○
	BR-48	Diagnostic Procedure 7	○	○	○	○	○	○
	BR-47	Diagnostic Procedure 6	○	○	○	○	○	○
Diagnostic Procedure	BR-46	Diagnostic Procedure 5						○
	BR-46	Diagnostic Procedure 4					○	
	BR-45	Diagnostic Procedure 3				○		
	BR-45	Diagnostic Procedure 2			○			
	BR-43	Diagnostic Procedure 1	○					
Preliminary Check	BR-38	Preliminary Check 4	○	○	○	○	○	○
	BR-38	Preliminary Check 3	○	○				
	BR-37	Preliminary Check 2		○			○	
	BR-36	Preliminary Check 1			○	○		

Preliminary Check 1

CHECK

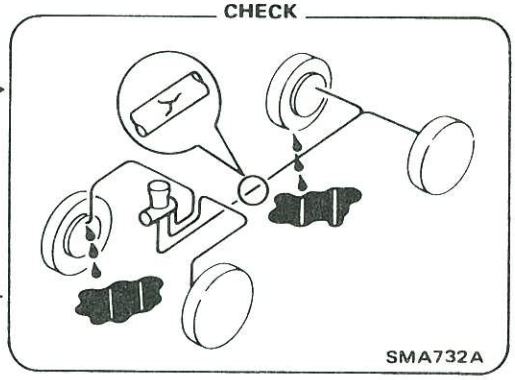


Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

O.K.

CHECK

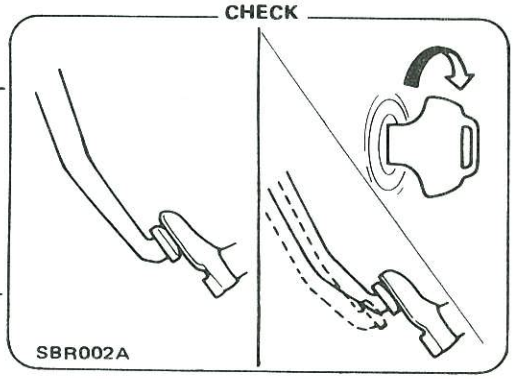


Check brake system.
Refer to CHECK AND ADJUSTMENT.

N.G. ← Repair brake system.

O.K.

CHECK

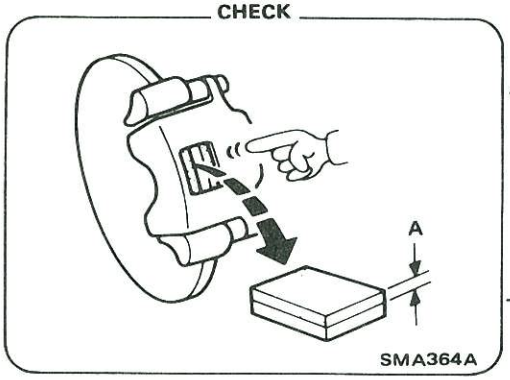


Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

N.G. ← Repair or replace booster system.

O.K.

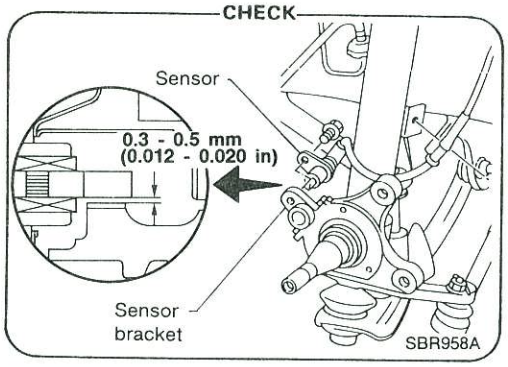
CHECK



Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

N.G. → Replace malfunctioning parts.

Preliminary Check 2



Check sensor clearance.

Clearance:

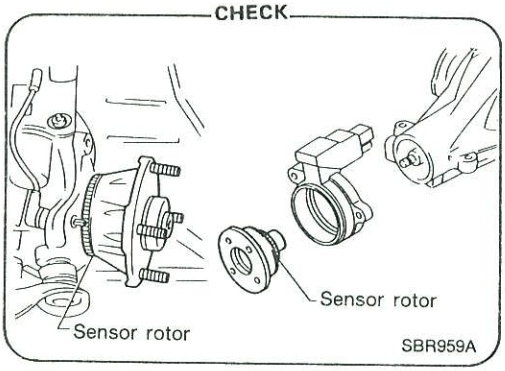
0.3 - 0.5 mm

(0.012 - 0.020 in)

N.G. → When out of specification, align sensor by sliding sensor bracket.
Check sensor for the following items:

- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K. ↓



Check sensor rotor for teeth damage.

N.G. → Replace sensor rotor with wheel hub or companion flange as a set..

O.K. → ←

N.G. ↓

Repair or replace malfunctioning sensor.

Preliminary Check 3

CHECK

See page BR-40.

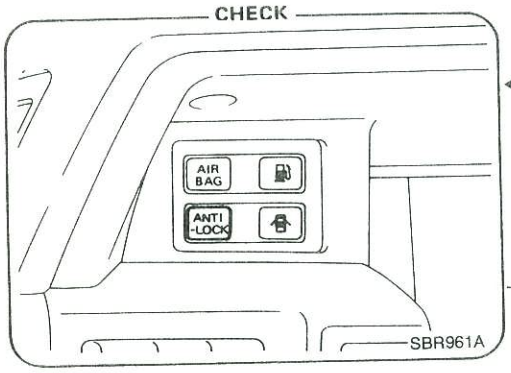
Measure each sensor resistance.
0.8 - 1.2 kΩ

N.G. → Replace.

O.K.

Preliminary Check 3, 4

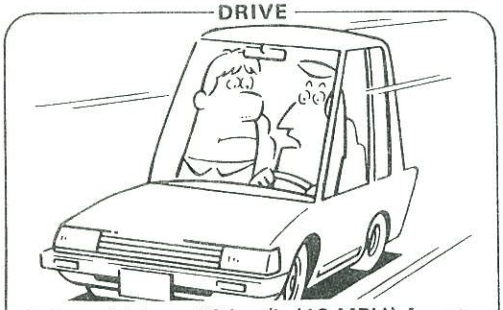
CHECK



Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

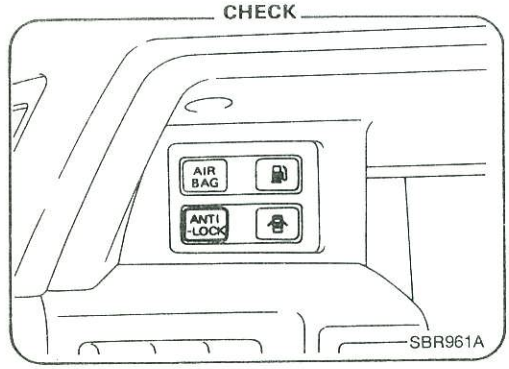
O.K.

DRIVE



Drive vehicle at 30 km/h (19 MPH) for at least one minute. SBR530A

CHECK



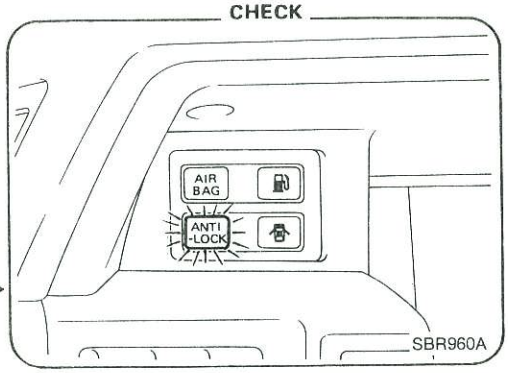
Ensure warning lamp remains off while driving.

O.K. → If Preliminary Check 2 is not performed and there is abnormal ABS operation, perform Preliminary Check 2.

N.G.

Preliminary Check 4

CHECK



Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

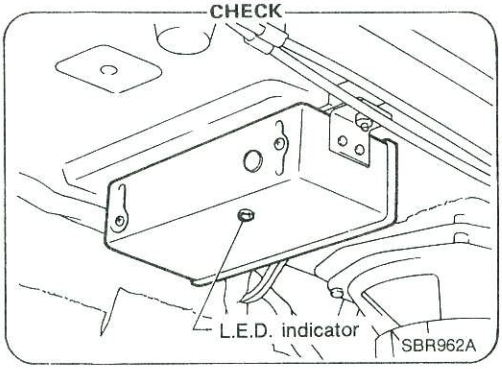
O.K.

N.G.

Check fuse.
Check bulb condition and remedy.

N.G.

CHECK



- Keep engine on and running.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

Go to Self-diagnosis.
(See next page.)

Self-diagnosis

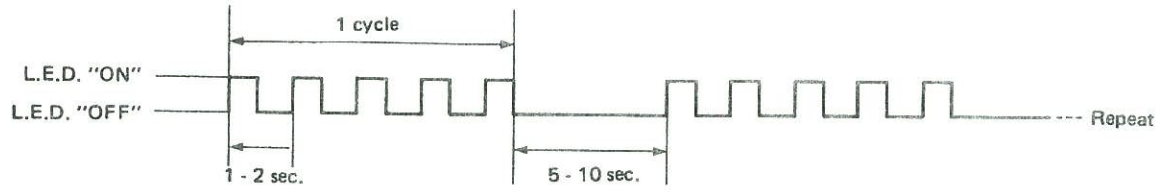
CHECKING THE NUMBER OF L.E.D. FLASHES

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	Diagnostic Procedure
1	Left front actuator solenoid circuit	Diagnostic Procedure 6
2	Right front actuator solenoid circuit	
3 or 4	Rear actuator solenoid circuit	
5	Left front wheel sensor circuit	Diagnostic Procedure 7
6	Right front wheel sensor circuit	
7 or 8	Rear wheel sensor circuit	
9	Motor and motor relay	Diagnostic Procedure 8
10	Solenoid valve relay	Diagnostic Procedure 9
16 or continuous	Control unit	Diagnostic Procedure 10
Warning activates and L.E.D. "OFF"	Power supply or ground circuit for control unit	Diagnostic Procedure 11

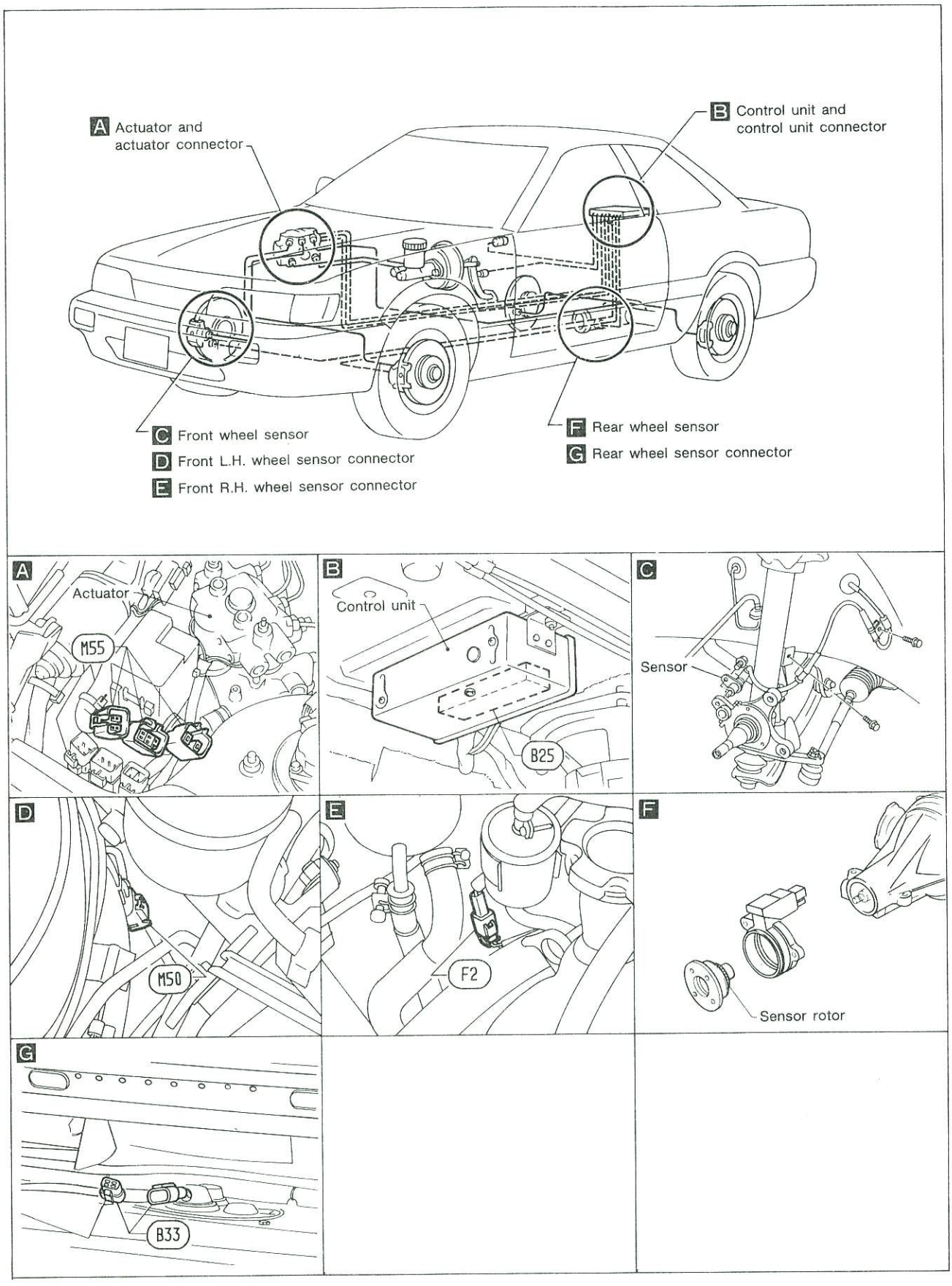
Example

Improper operation of left front rotor sensor circuit

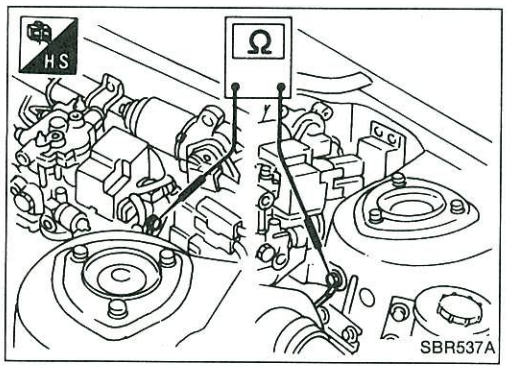


SBR531A

Component Parts and Connector Location



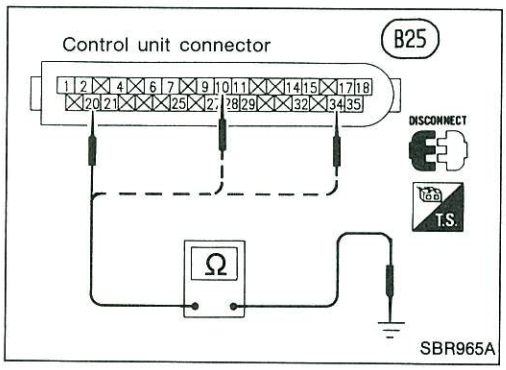
SBR964A



Ground Circuit Check

ACTUATOR MOTOR GROUND

- Check resistance between both terminals.
  Resistance: 0Ω

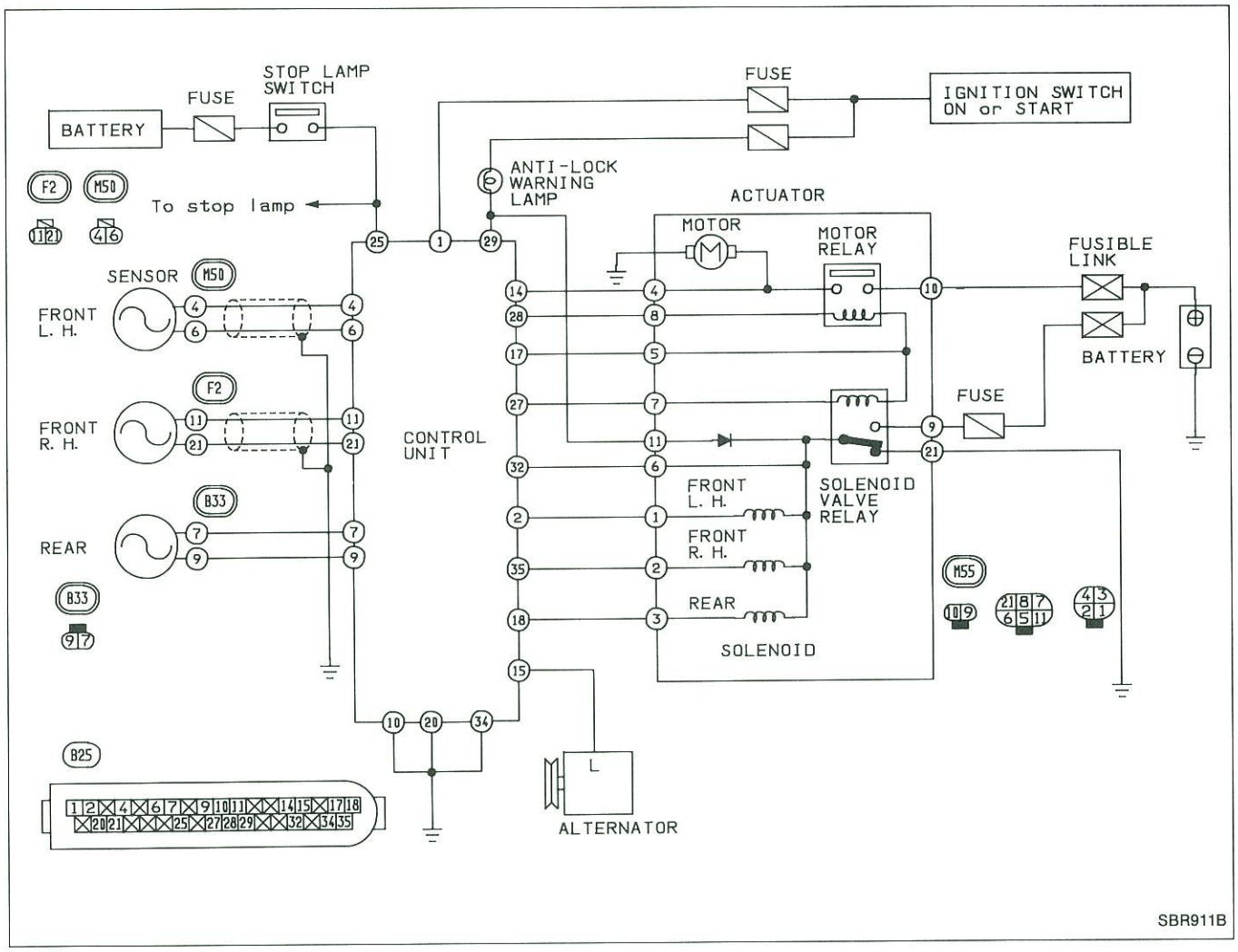


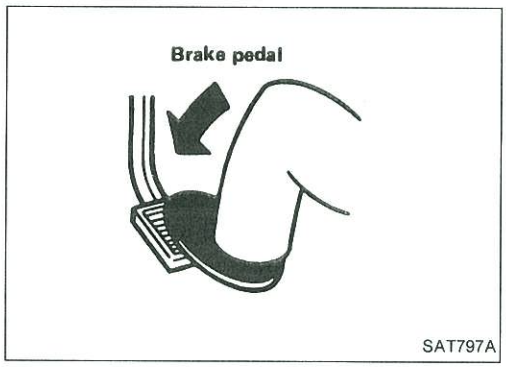
CONTROL UNIT GROUND

- Check resistance between both terminals.
  Resistance: 0Ω

Circuit Diagram for Quick Pinpoint Check

- The unit side connectors with a double circle "◯" are connected to the harness side connectors shown in the "Component Parts and Connector Location". (See page BR-40.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".





Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

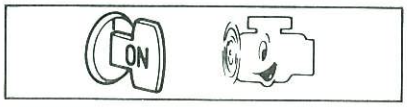
Refer to worksheet result.

Check whether the symptom appears only when brake is applied suddenly.

Yes → When brake is normally applied, 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.

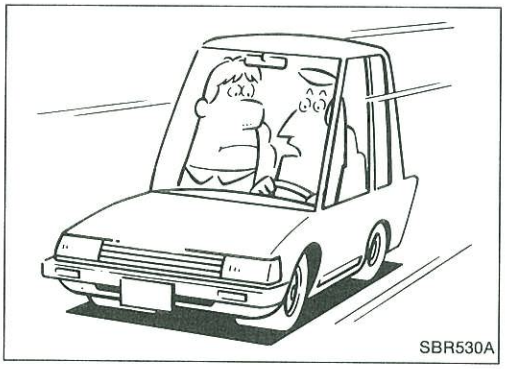
No ↓

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 → ABS may sometimes operate when load is high and voltage is low due to insufficient alternator output.

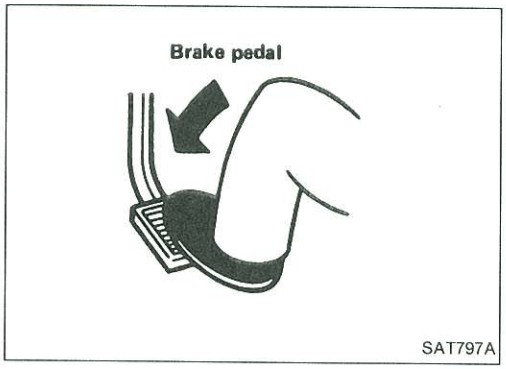
No ↓



Check whether the symptom appears while the vehicle is being driven.

No → Ⓐ

Yes ↓



Check whether the symptom appears when brake is applied gradually.

No (Appears when brake is not applied.) → Check if there are any conditions, among those listed below, when symptom appears.

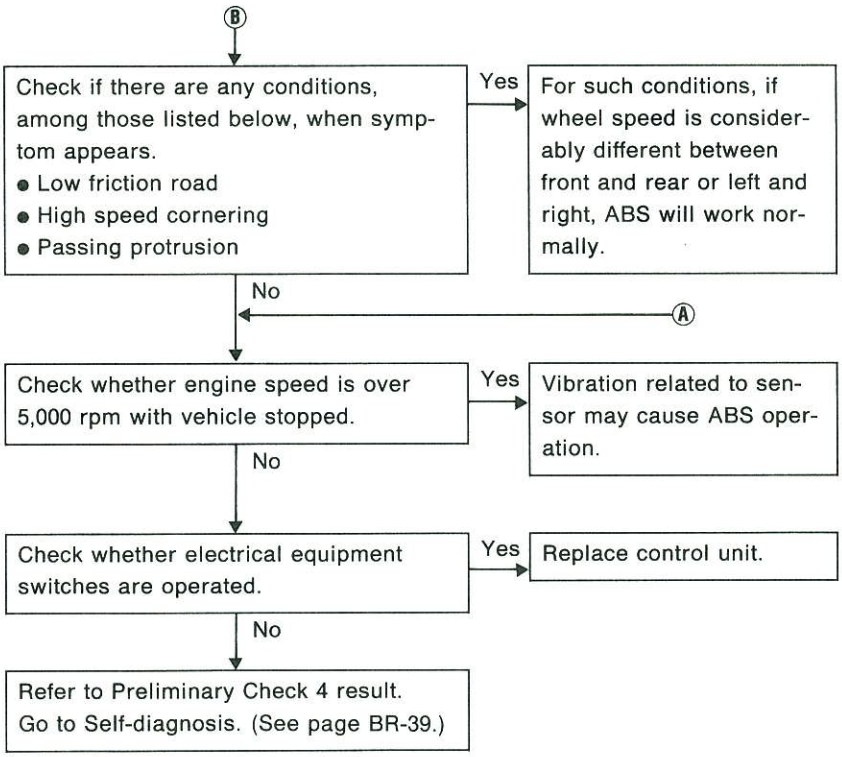
- Shifting
- Operating clutch
- Passing protrusion

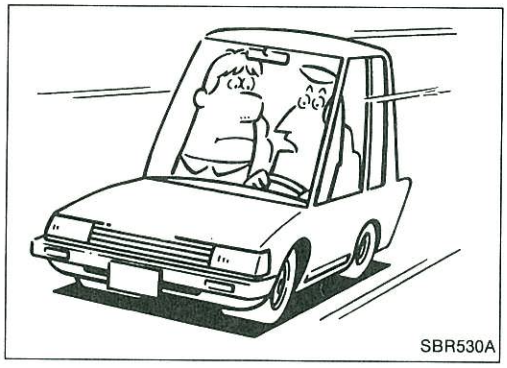
- No → Ⓑ
- Yes → Under these conditions individual wheel speed can change suddenly. This may sometimes cause the ABS to operate.

Yes ↓

Ⓑ

Diagnostic Procedure 1 (Cont'd)




SBR530A

Diagnostic Procedure 2

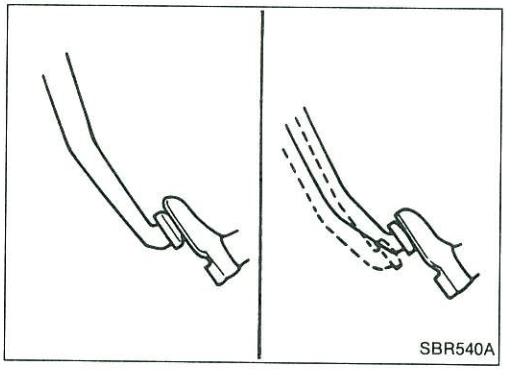
SYMPTOM: Long stopping distance

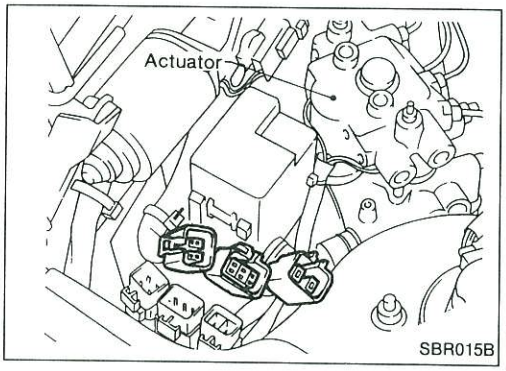
Refer to worksheet results.

Check if road condition is slippery with snow or gravel.
- Yes → Stopping distance may be longer than vehicles which are not equipped with ABS.
- No ↓

Disconnect actuator connector and check whether stopping distance is still long.
- No → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-39.)
- Yes ↓

Perform Preliminary Check 1 and air bleeding.


SBR540A



SBR015B

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

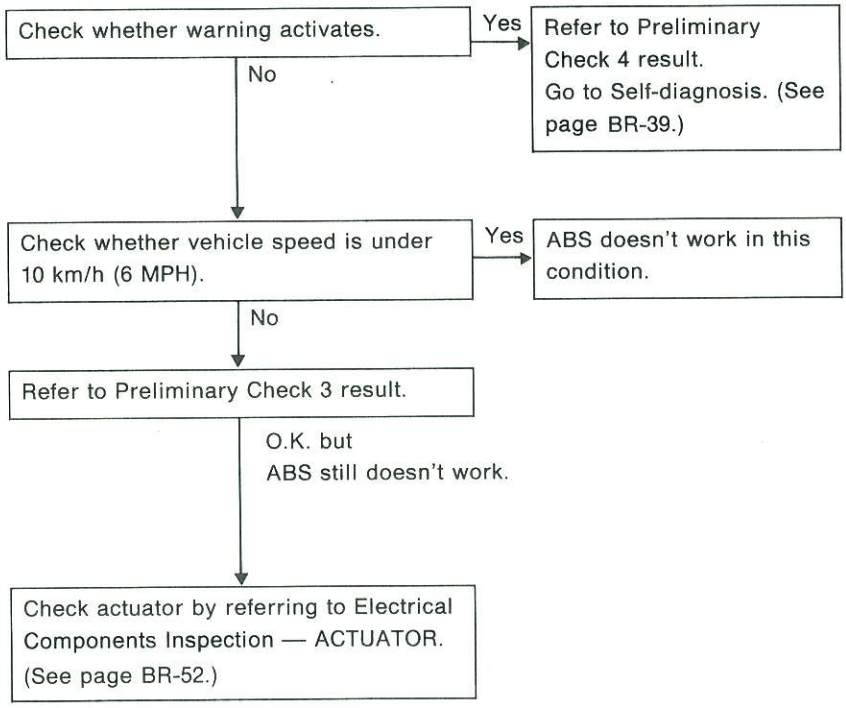
Disconnect actuator connector and check whether brake is effective.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-39.)
- No ↓

Perform Preliminary Check 1.

Diagnostic Procedure 4

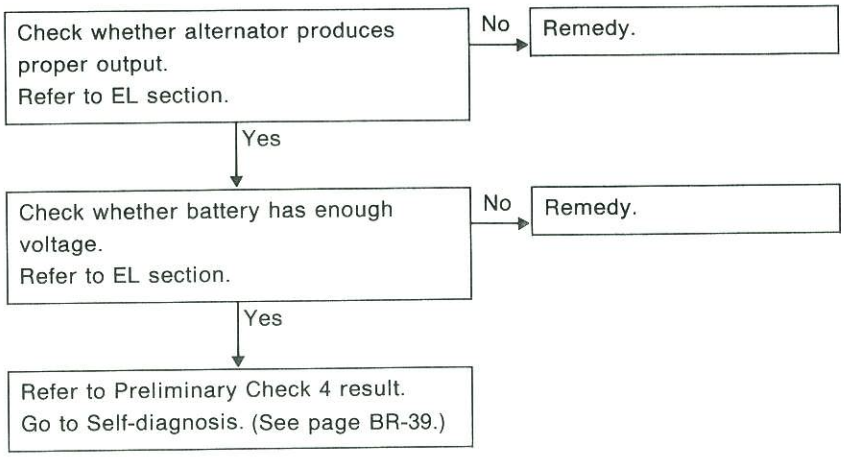
SYMPTOM: ABS doesn't work.

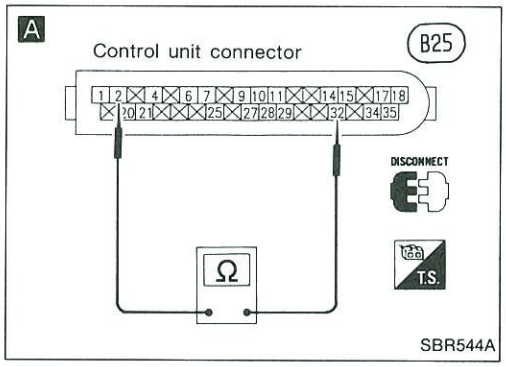
Refer to worksheet results.

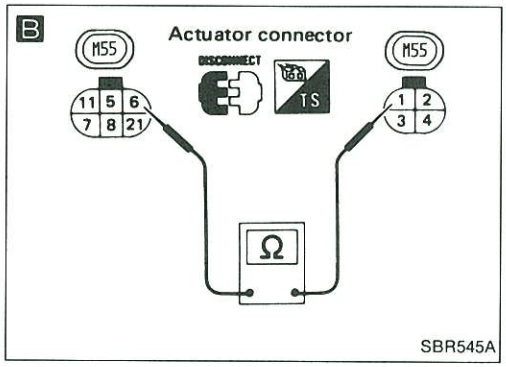


Diagnostic Procedure 5

SYMPTOM: ABS works but warning activates.







Diagnostic Procedure 6

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. ↓

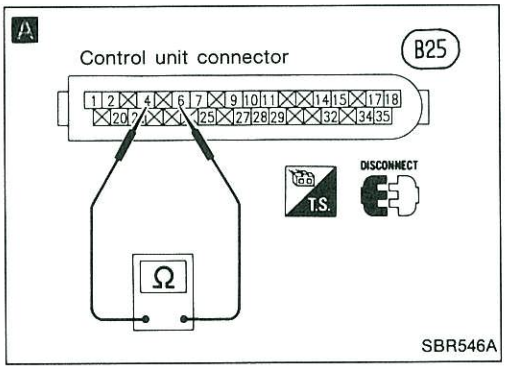
B

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 7

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:
Terminals ④ and ⑥
Flashing number 6:
Terminals ⑪ and ㉑
Flashing number 7 or 8:
Terminals ⑦ and ⑨
Resistance: 0.8 - 1.2 kΩ

O.K. → Replace control unit.

N.G.

Refer to Preliminary Check 3 result.
Check whether sensor has 0.8 - 1.2 kΩ resistance.

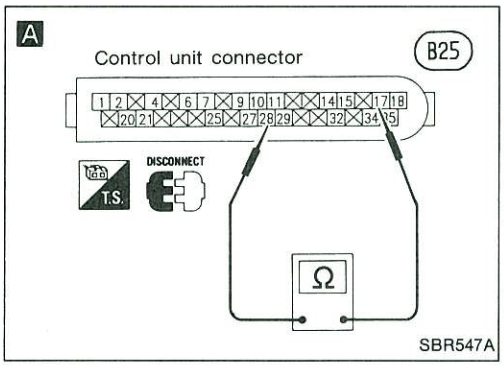
N.G. → Replace sensor.

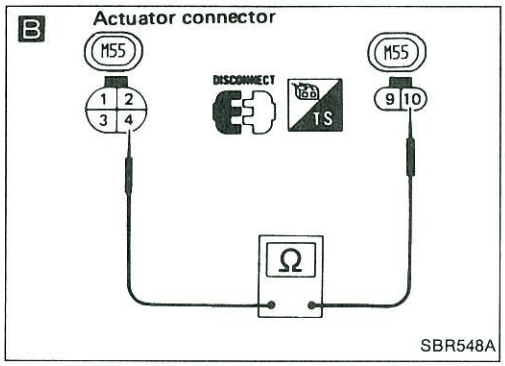
O.K.

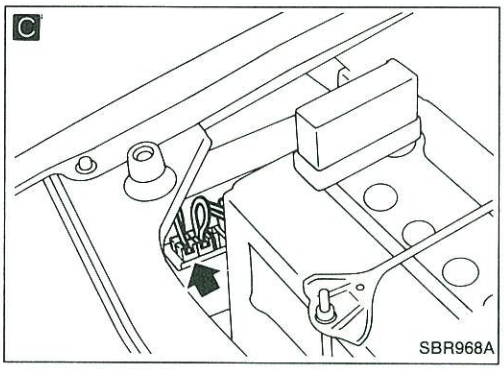
Repair harness between sensor connector and control unit connector.

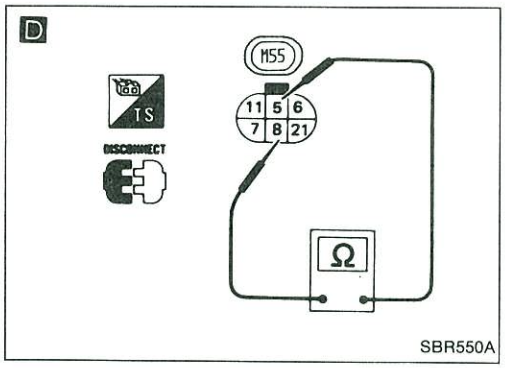
Diagnostic Procedure 8

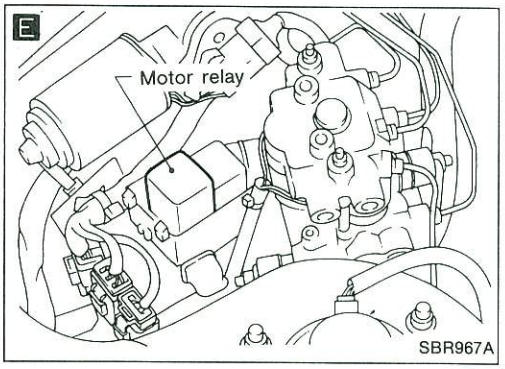
ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)











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

O.K. →

N.G. →

E

Replace motor relay.

O.K. ↓

Repair harness between actuator and control unit.

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 if motor's fusible link is blown.

No →

Perform Electrical Components Inspection -- ACTUATOR.
(See page BR-52.)

Yes ↓

Replace fusible link.

O.K. →

N.G. →

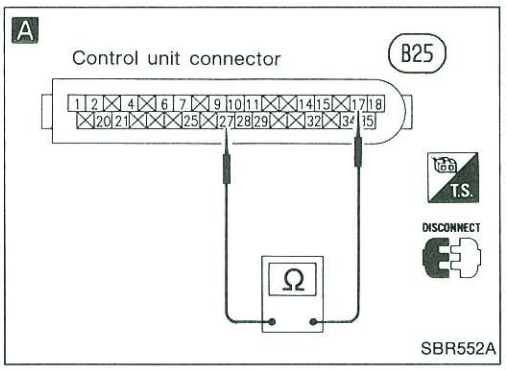
Replace actuator.

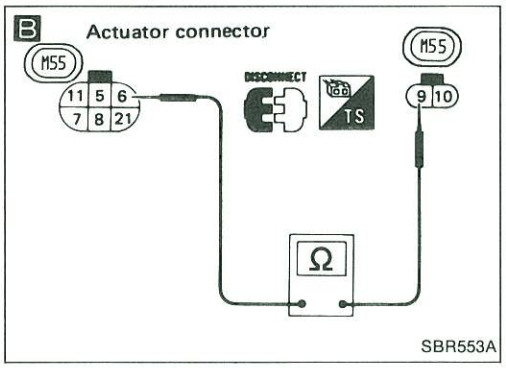
O.K. ↓

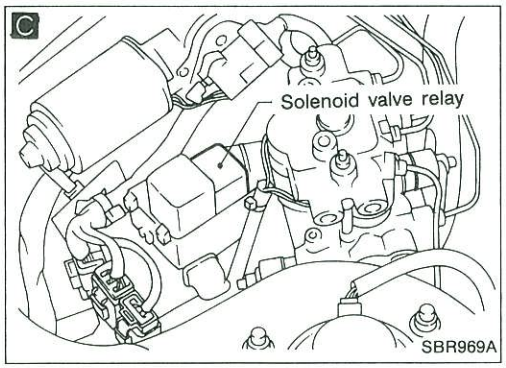
Replace control unit.

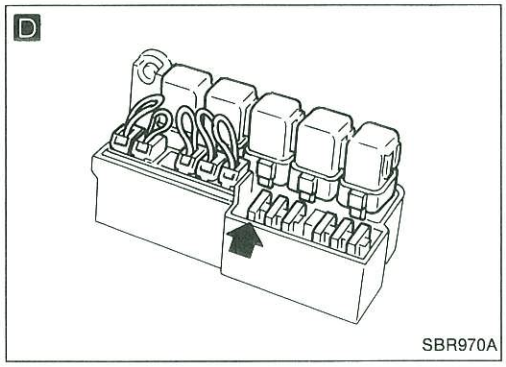
Diagnostic Procedure 9

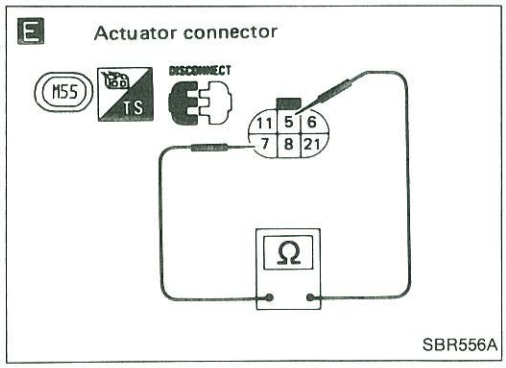
ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)











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 if solenoid valve relay fuse is blown.

No → Perform Electrical Components Inspection -- ACTUATOR.
(See page BR-52.)

Yes → Replace fuse.

N.G. → Replace actuator.

O.K. → Replace control unit.

Diagnostic Procedure 10

CONTROL UNIT (L.E.D. flashing number 16)

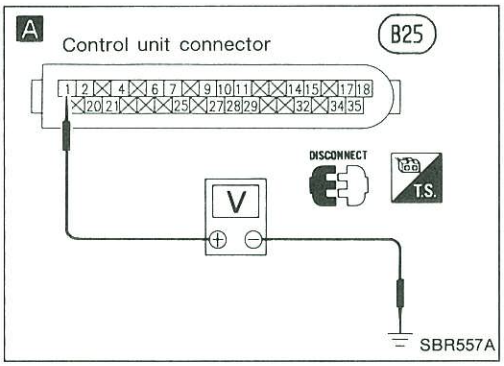
INSPECTION START

↓

Control unit malfunction.

↓

Replace control unit.



Diagnostic Procedure 11

CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)

INSPECTION START

↓

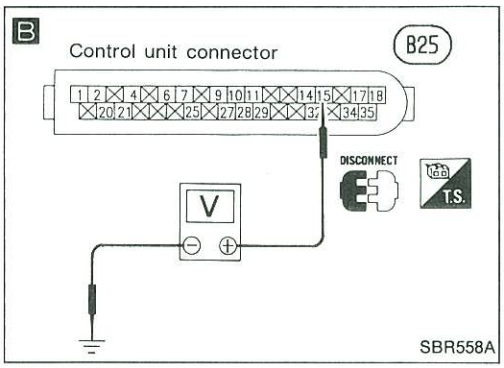
A

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. ↓



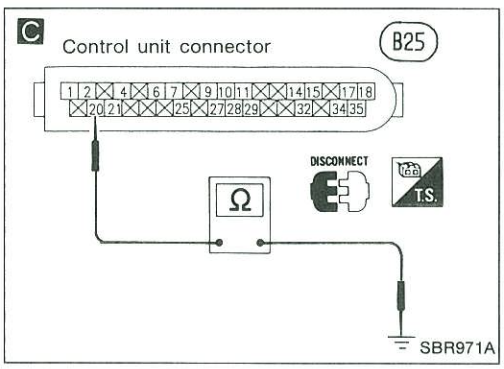
B

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".

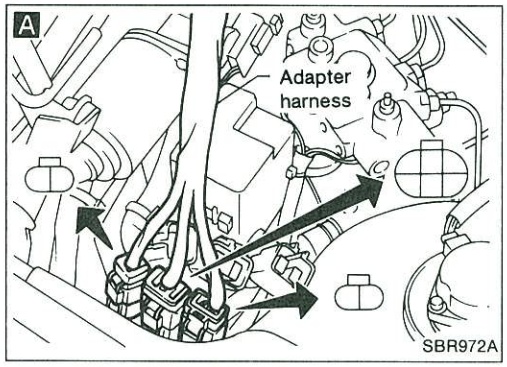
N.G. → Repair ground harness.

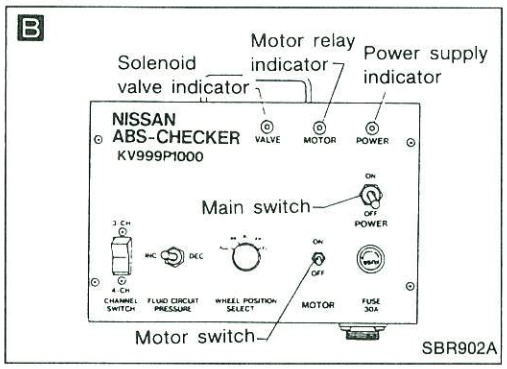
O.K. ↓

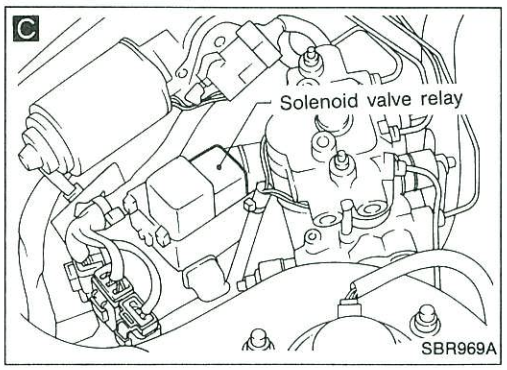
Replace control unit.

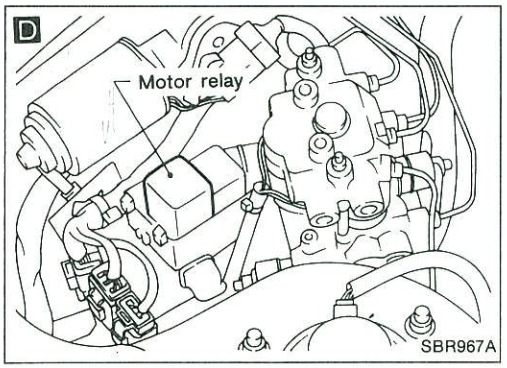
Electrical Components Inspection

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 (A)

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

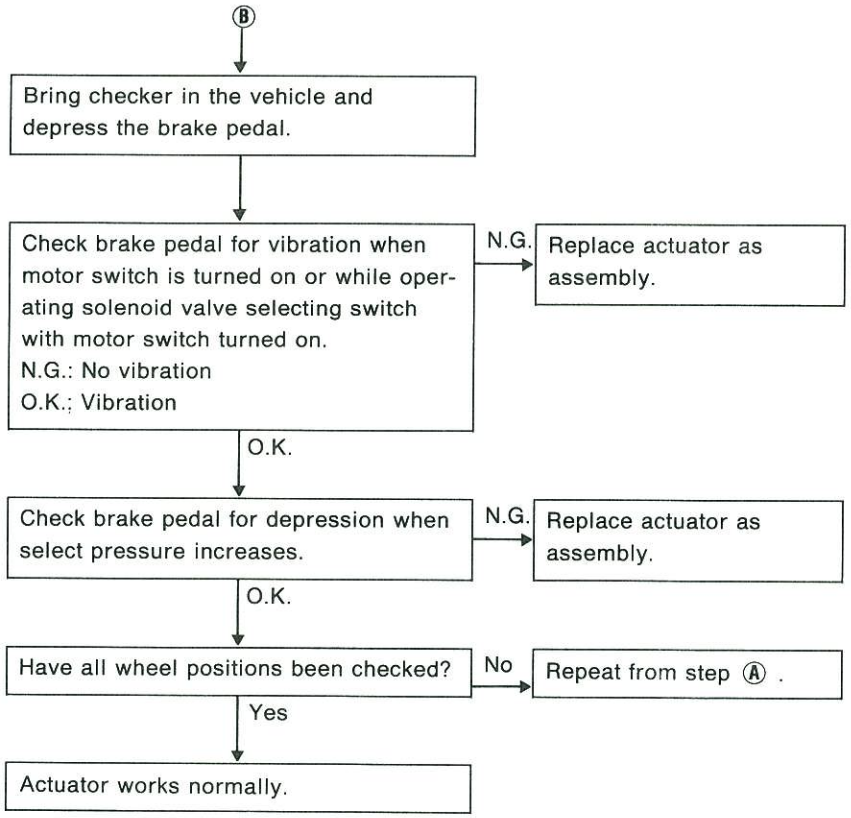
Check motor for operational sound beside the actuator in a quiet place.

No → Replace actuator as assembly, if Diagnostic Procedures 6 - 11 are already performed and checker connection is correct.

Yes

(B)

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

BRAKE SYSTEM

Front brake	
Brake model	CL28VB
Cylinder bore diameter mm (in)	60.6 (2.386)
Pad length x width x thickness mm (in)	129 x 43 x 11 (5.08 x 1.69 x 0.43)
Rotor outer diameter x thickness mm (in)	274 x 22 (10.79 x 0.87)
Rear brake	
Brake model	AD14
Cylinder bore diameter mm (in)	42.8 (1.685)
Pad length x width x thickness mm (in)	93.8 x 33.4 x 10 (3.693 x 1.315 x 0.39)
Rotor outer diameter x thickness mm (in)	266 x 10 (10.47 x 0.39)

Parking brake	
Brake model	DS17HB
Lining length x width x thickness mm (in)	165.1 x 35 x 3.3 (6.50 x 1.38 x 0.130)
Drum inner diameter mm (in)	172 (6.77)
Master cylinder	
Cylinder bore diameter mm (in)	25.40 (1)
Control valve	
Valve model	Proportioning valve (within master cylinder)
Sprit point x reducing ratio kPa (kg/cm^2, psi)	2,942 (30, 427) x 0.4
Brake booster	
Booster model	M195T
Diaphragm diameter mm (in)	Primary: 205 (8.07) Secondary: 180 (7.09)
Brake fluid	
Recommended brake fluid	DOT 3

Inspection and Adjustment

FRONT & REAR DISC BRAKE

Unit: mm (in)

Item \ Brake model	CL28VB	AD14
Pad wear limit Minimum thickness	2.0 (0.079)	
Rotor repair limit Minimum thickness	20.0 (0.787)	9.0 (0.354)

BRAKE PEDAL

Unit: mm (in)

Free height	199 - 209 (7.83 - 8.23)
Depressed height [Under force of 490 N (50 kg, 110 lb) with engine running]	110 (4.33) or less
Clearance between pedal stopper and threaded end of switches	0.3 - 1.0 (0.012 - 0.039)
Pedal free play at pedal pad	1.0 - 3.0 (0.039 - 0.118)

PARKING BRAKE

Unit: mm (in)

Item \ Brake model	DS17HB
Lining wear limit Minimum thickness	1.5 (0.059)
Drum repair limit Inner diameter (Max.)	173.0 (6.81)

PARKING BRAKE LEVER

Item \ Control type	Center lever
Number of notches [Under force of 196 N (20 kg, 44 lb)]	8 - 9
Number of notches when warning lamp comes on	2 or less

STEERING SYSTEM

SECTION ST

CONTENTS

PRECAUTIONS AND PREPARATION ..... ST- 2
ON-VEHICLE SERVICE ..... ST- 4
STEERING WHEEL AND STEERING COLUMN ..... ST- 8
POWER STEERING GEAR AND LINKAGE (Model PR26SC) ST-11
POWER STEERING OIL PUMP ST-23
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ST-26

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 **section BF** 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 INFINITI 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".**

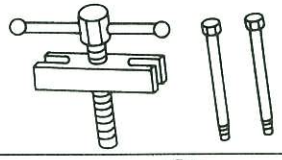
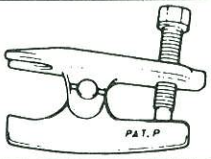
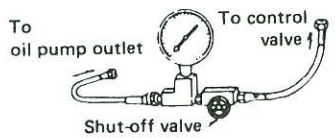
STEERING SYSTEM

- **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 on a part rack so they can be reinstalled in their proper positions.**
- **Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.**
- **Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.**
- **Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.**
- **Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.**

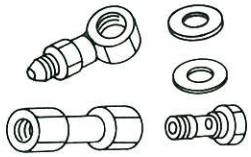
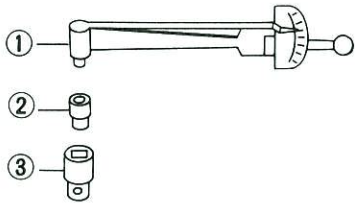
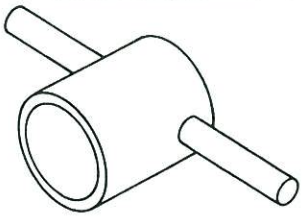
***: Automatic transmission fluid**

Preparation

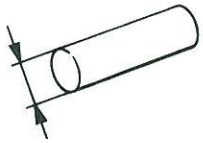
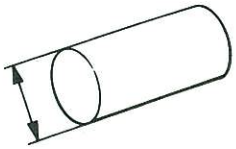
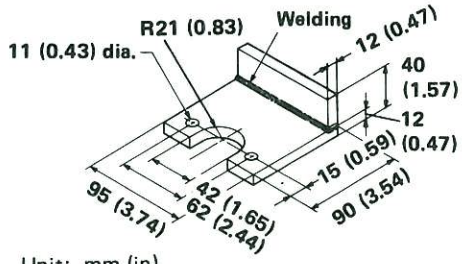
SPECIAL SERVICE TOOLS

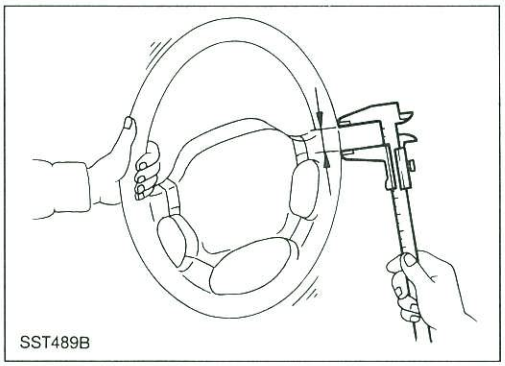
Tool number (Kent-Moore No.) Tool name	Description	
KV48100700 (J26364) Torque adapter		Measuring pinion rotating torque
ST27180001 (J25726-A) Steering wheel puller		Removing and installing steering wheel
HT72520000 (J25730-A) Ball joint remover		Removing ball joint
ST27091000 (J26357) Pressure gauge		Measuring oil pressure

Preparation (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 HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter	 Measuring turning torque
KV48104400 (—) Rack seal ring reformer	 Reforming teflon ring

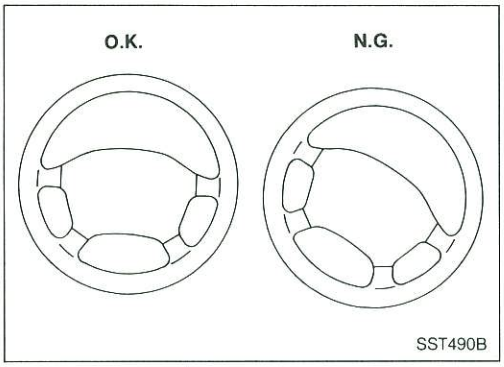
COMMERCIAL SERVICE TOOLS

Tool name	Description
Rear oil seal drift	 Installing rear oil seal **28 mm (1.10 in) dia.**
Pinion oil seal drift	 Installing pinion oil seal **35 mm (1.38 in) dia.**
Oil pump attachment	 Unit: mm (in) SST481A Disassembling and assembling oil pump


SST489B

Checking Steering Wheel Play

1. With wheels in a straight-ahead position, check steering wheel play.
   Steering wheel play:
   35 mm (1.38 in) or less
2. If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.



SST490B

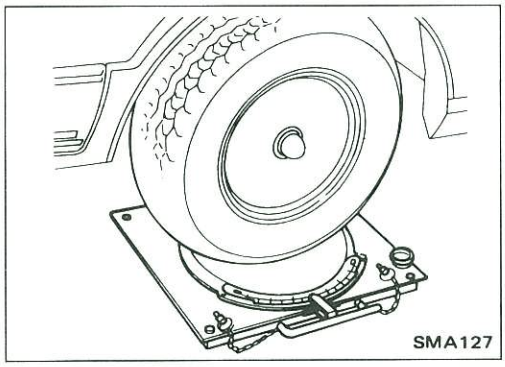
Checking Neutral Position on Steering Wheel

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.

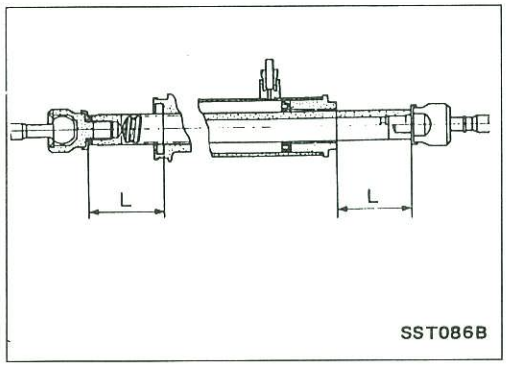
Checking

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

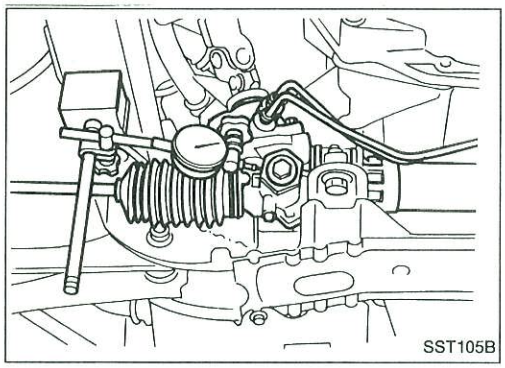
Front Wheel Turning Angle

- 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.



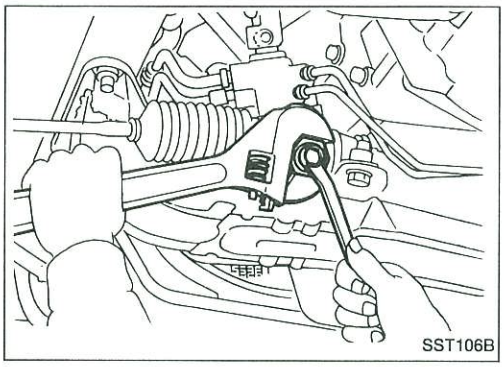
SST086B

- If it is not within specification, check rack stroke.
  Rack stroke "L":
  Refer to S.D.S.


SST105B

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.

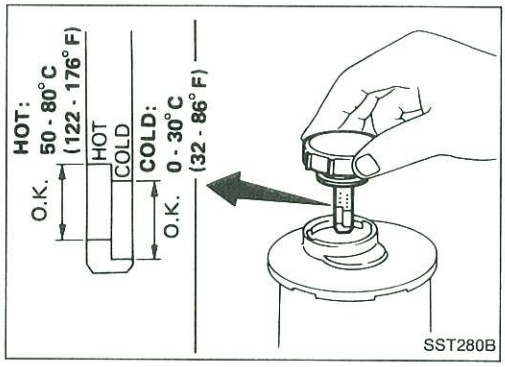

SST106B

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.

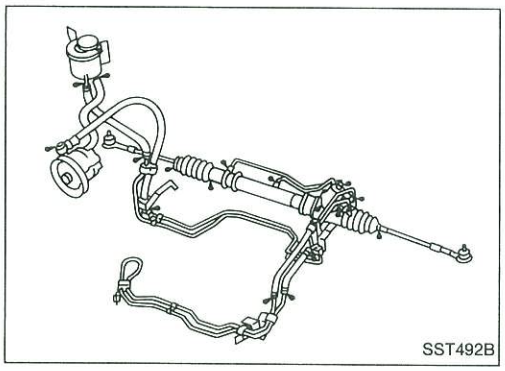


SST280B

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™" type.**


SST492B

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 oil tank rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

Checking Fluid Leakage (Cont'd)

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.

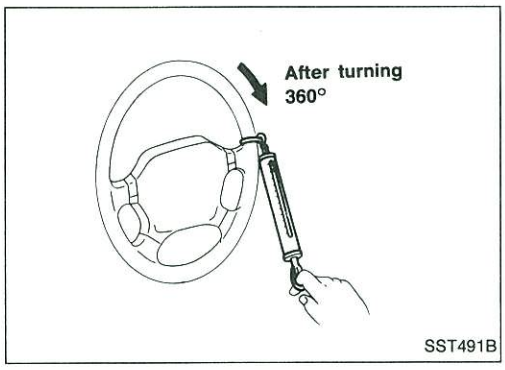
Bleeding Hydraulic System

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.

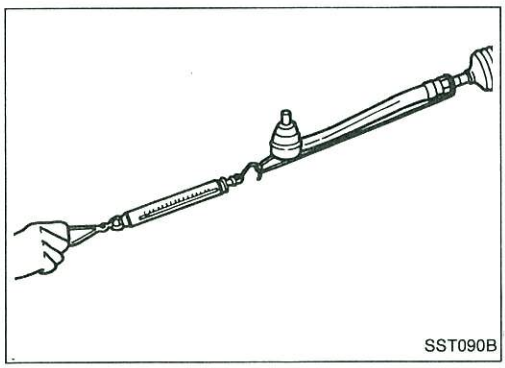
- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

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.



SST491B


SST090B

Checking Steering Wheel Turning Force

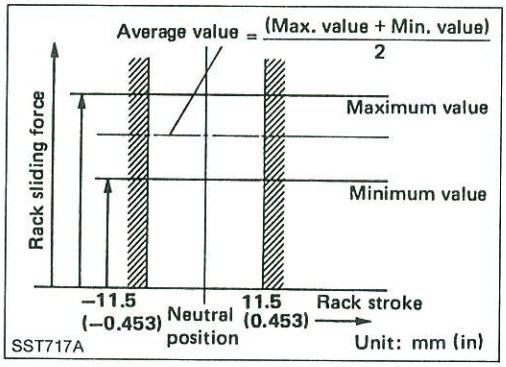
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.
   Steering wheel turning force:
   29 N (3 kg, 7 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.

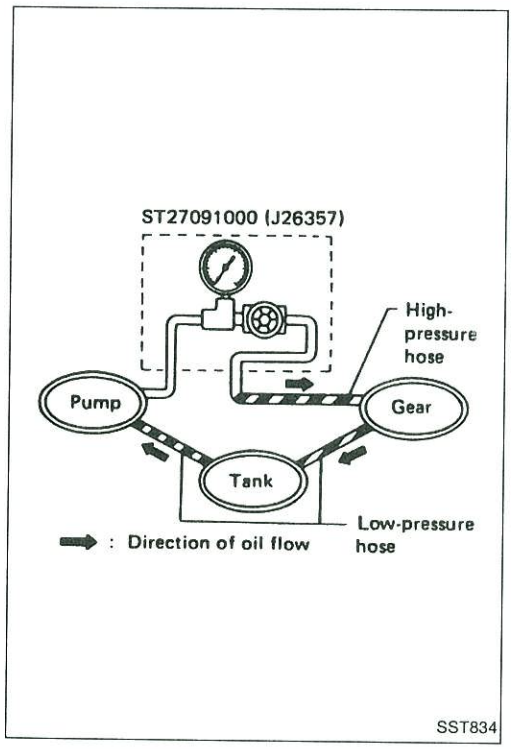
Checking Steering Wheel Turning Force (Cont'd)



Average rack sliding force:
235 - 284 N (24 - 29 kg, 53 - 64 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)

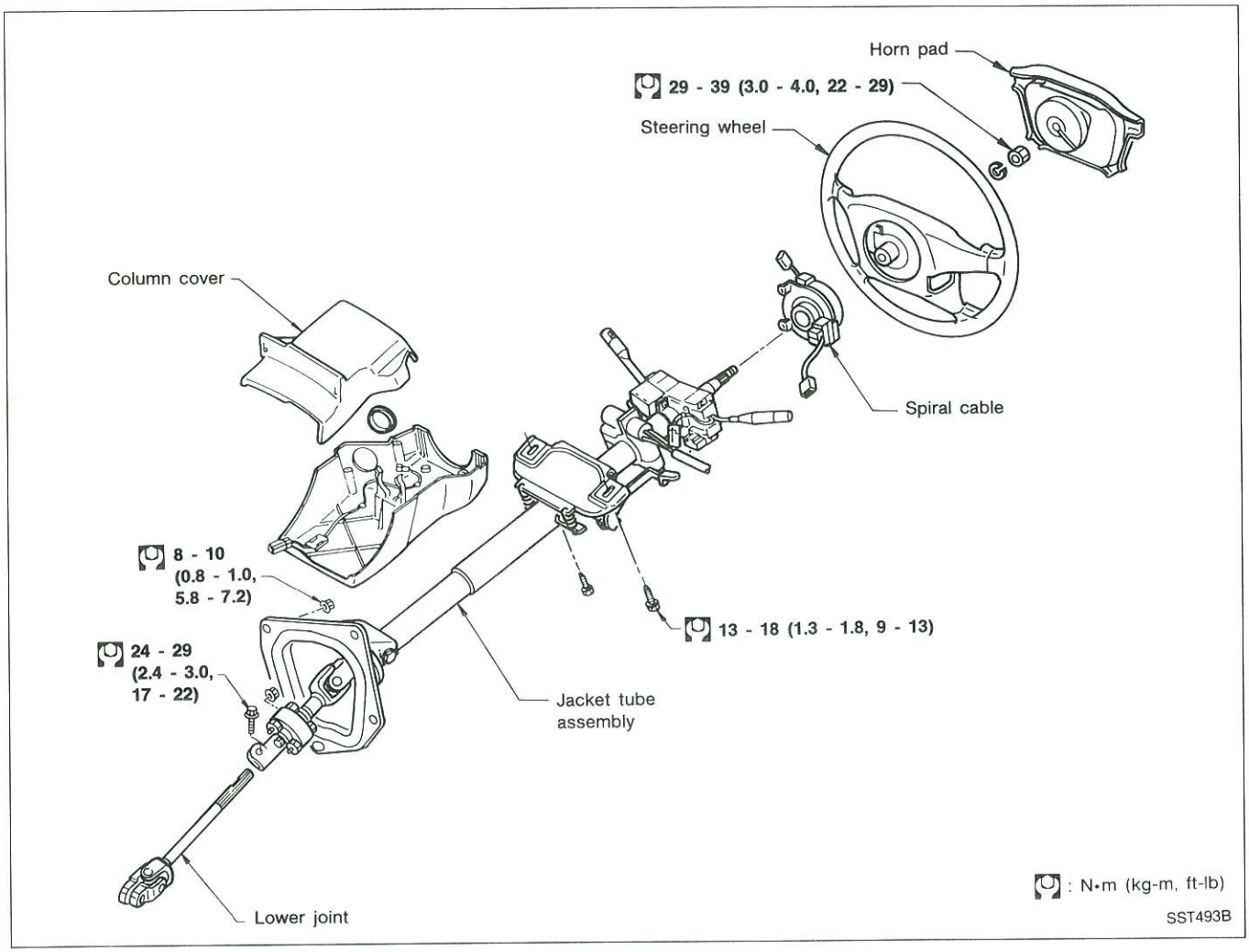
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.

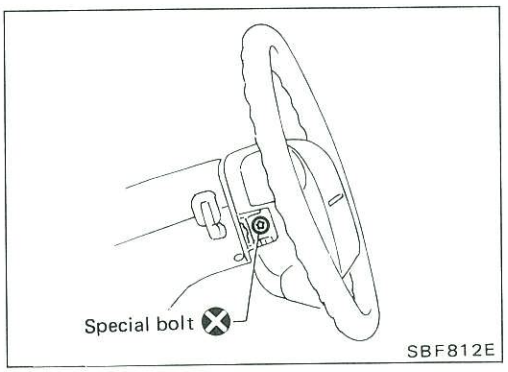
- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

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.

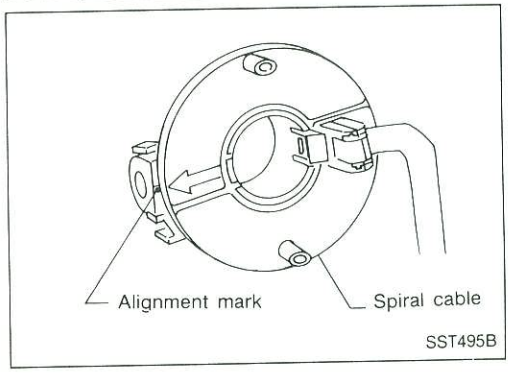




Removal and Installation

STEERING WHEEL

Refer to section BF for Air Bag Module and Spiral Cable Removal.

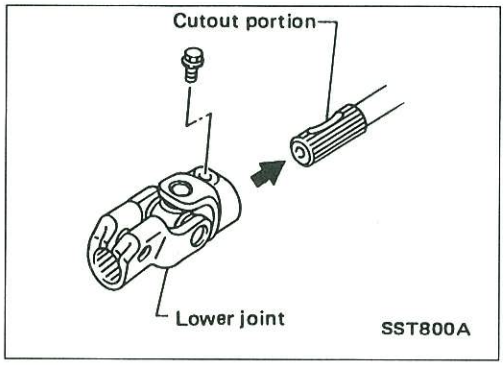


STEERING COLUMN

CAUTION:

The rotation of the spiral cable (SRS "Airbag" component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.

Removal and Installation (Cont'd)



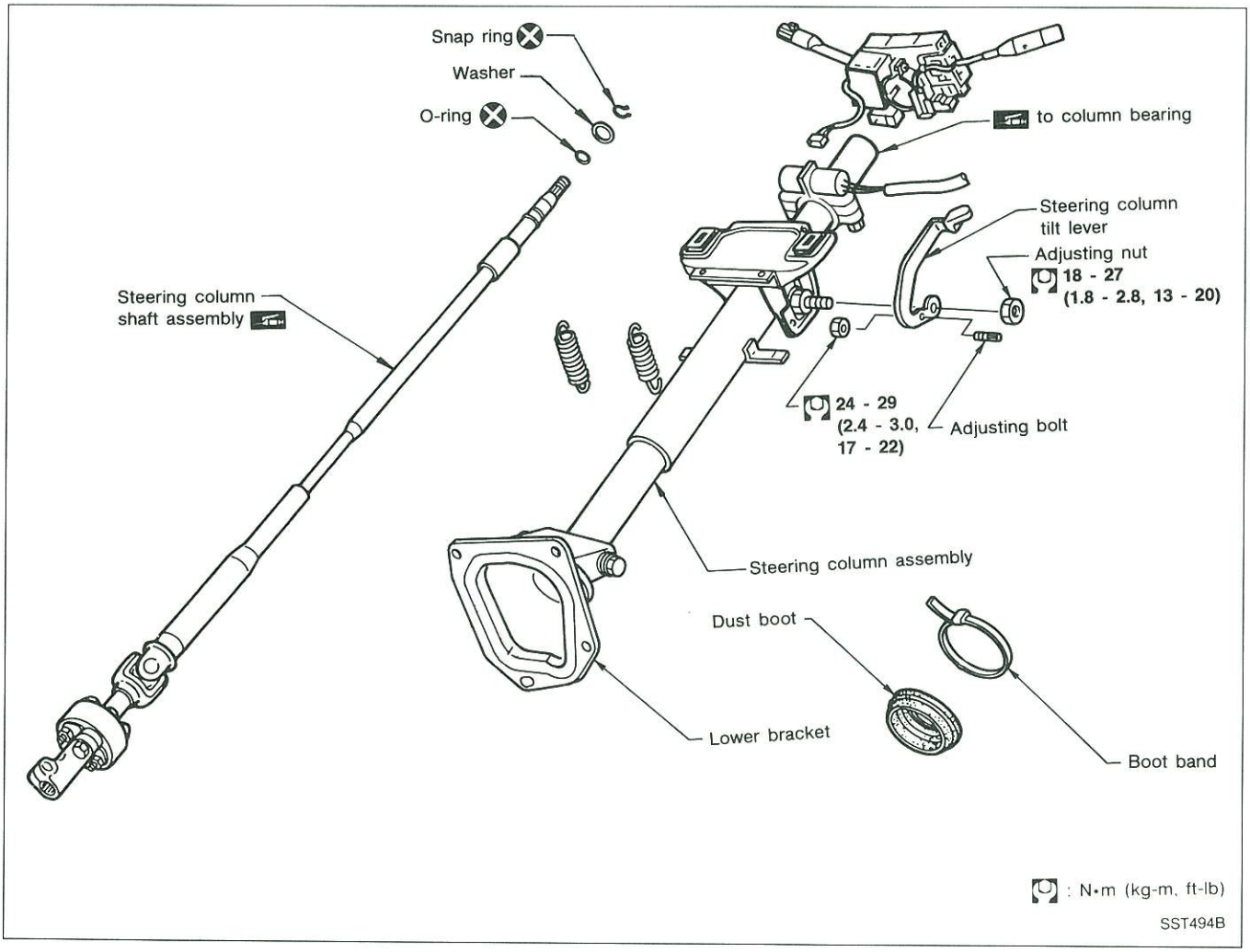
- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching coupling joint, be sure tightening bolt faces cutout portion.

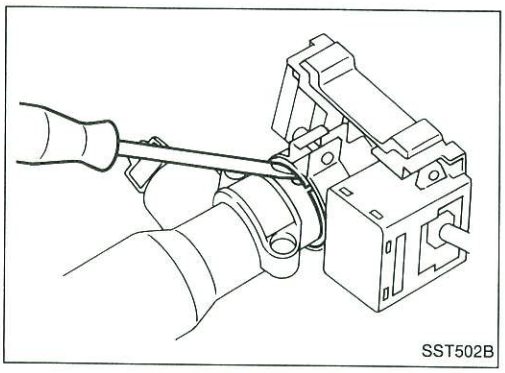
CAUTION:

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 the neutral position when driving straight ahead.

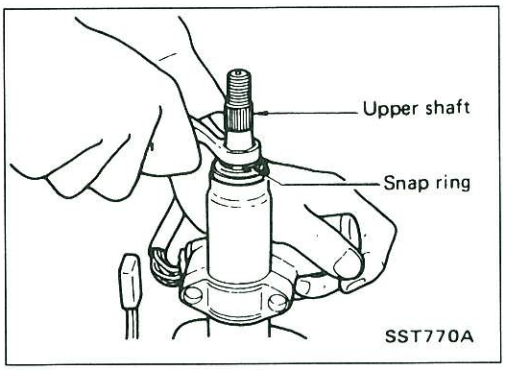
Disassembly and Assembly



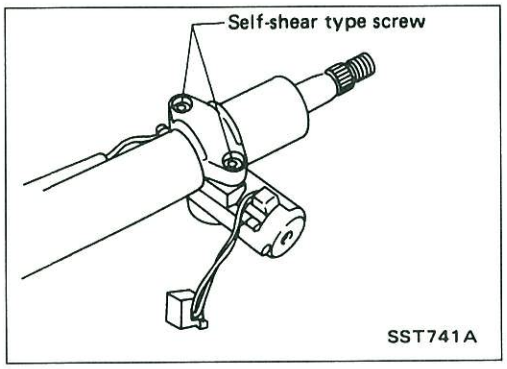


- When disassembling and assembling, unlock steering lock with key.
- To remove combination switch, insert a suitable tool between mating portions. Lift switch with bracket and pull it out.

Disassembly and Assembly (Cont'd)

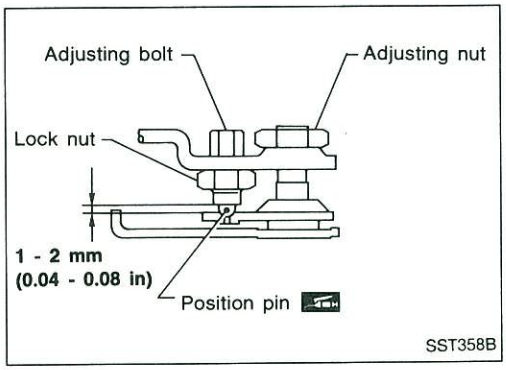


- Install snap ring on upper shaft with box wrench.



- Steering lock

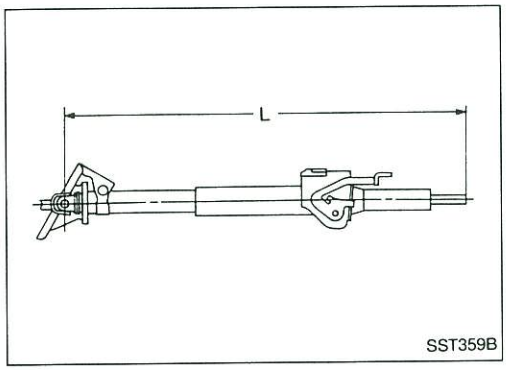
a. Break self-shear type screws with a drill or other appropriate tool.
b. Install self-shear type screws and then cut off self-shear type screw heads.



Tilt mechanism

Adjust tilt lever as follows:

(1) When tilt lever is in the lock position, tighten adjusting nut securely.
(2) Turn tilt lever to the free position and check that steering column moves smoothly without binding.
(3) Return tilt lever to the lock position. Make sure there is no movement of steering column when steering wheel is pushed up or down by force.
(4) Check position pin to see it works smoothly.



Inspection

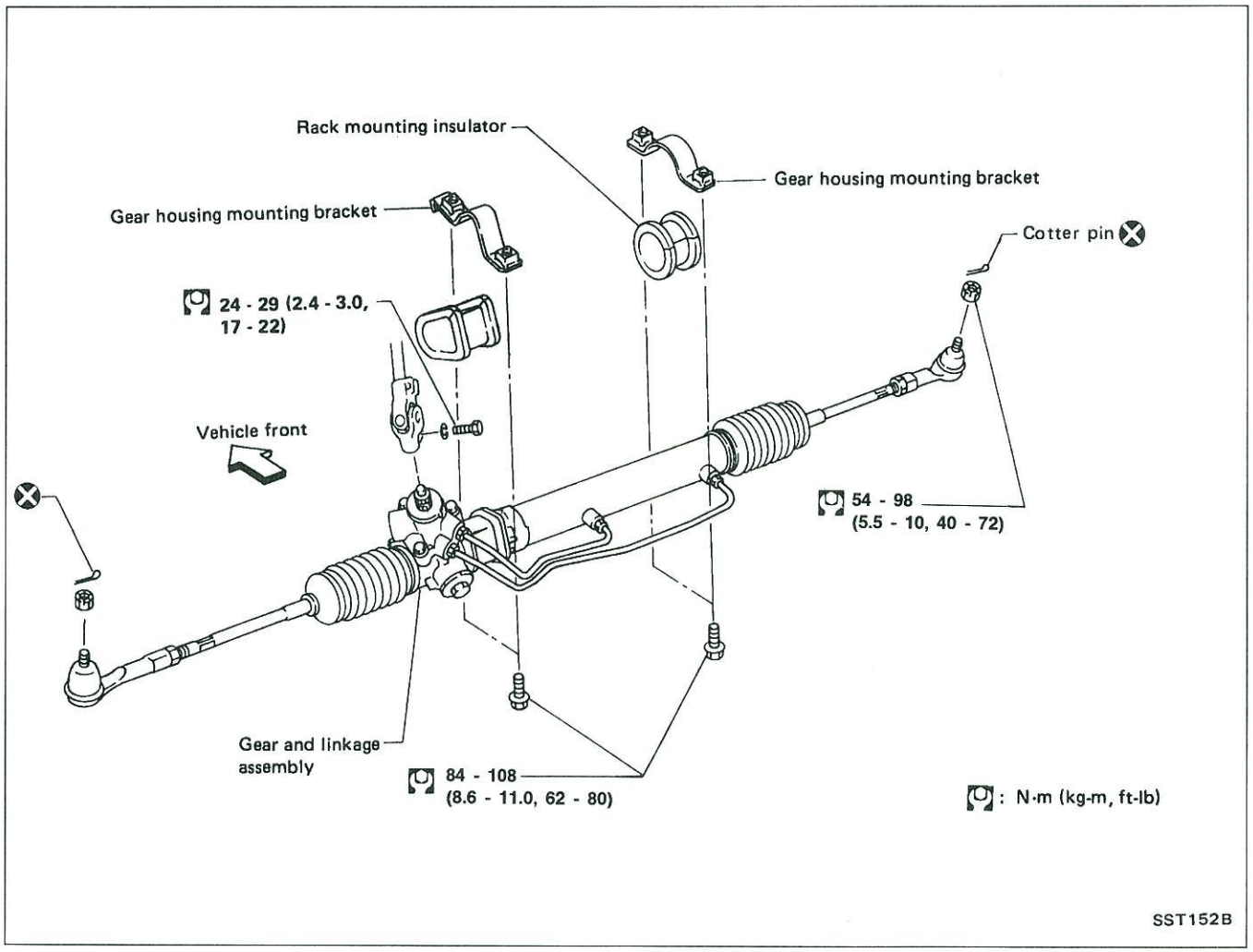
- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

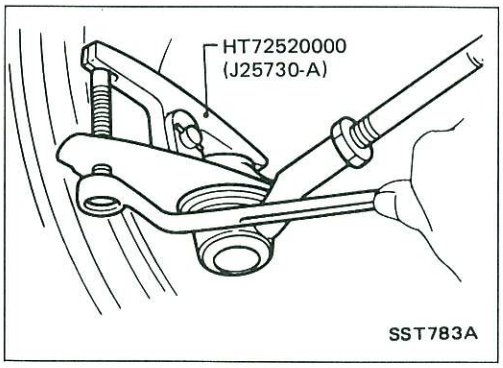
a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
b. Check steering column shaft, lower shaft and jacket tube for deformation or breakage. Replace if necessary.

- When the vehicle is involved in a light collision, check steering column length "L". If it is not within specifications, replace steering column as an assembly.

Steering column length "L":
745.2 - 746.8 mm (29.34 - 29.40 in)

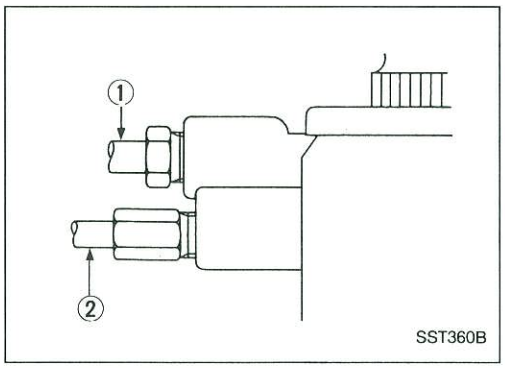
Removal and Installation





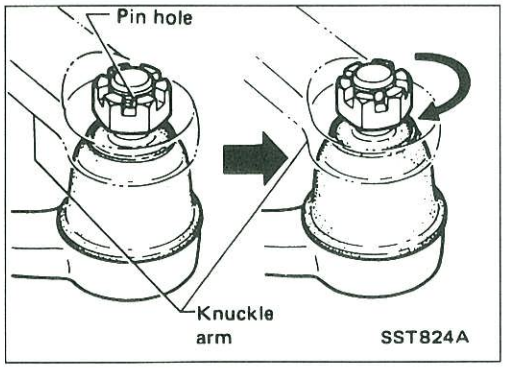
- Detach tie-rod outer sockets from knuckle arms with Tool.

Removal and Installation (Cont'd)



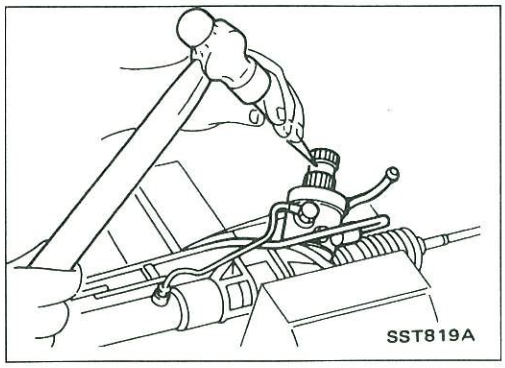
- Install pipe connector.
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.

Connector tightening torque:
Low-pressure side "1"
27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)
High-pressure side "2"
15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)

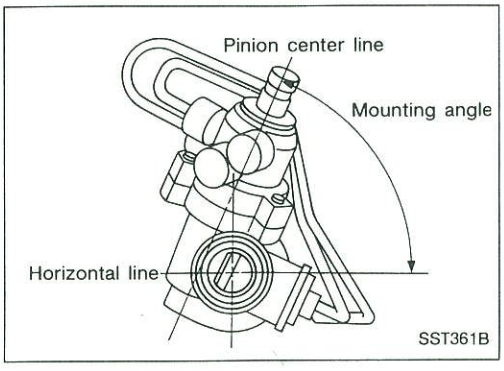


- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:
Tightening torque must not exceed 98 N·m (10 kg-m, 72 ft-lb).



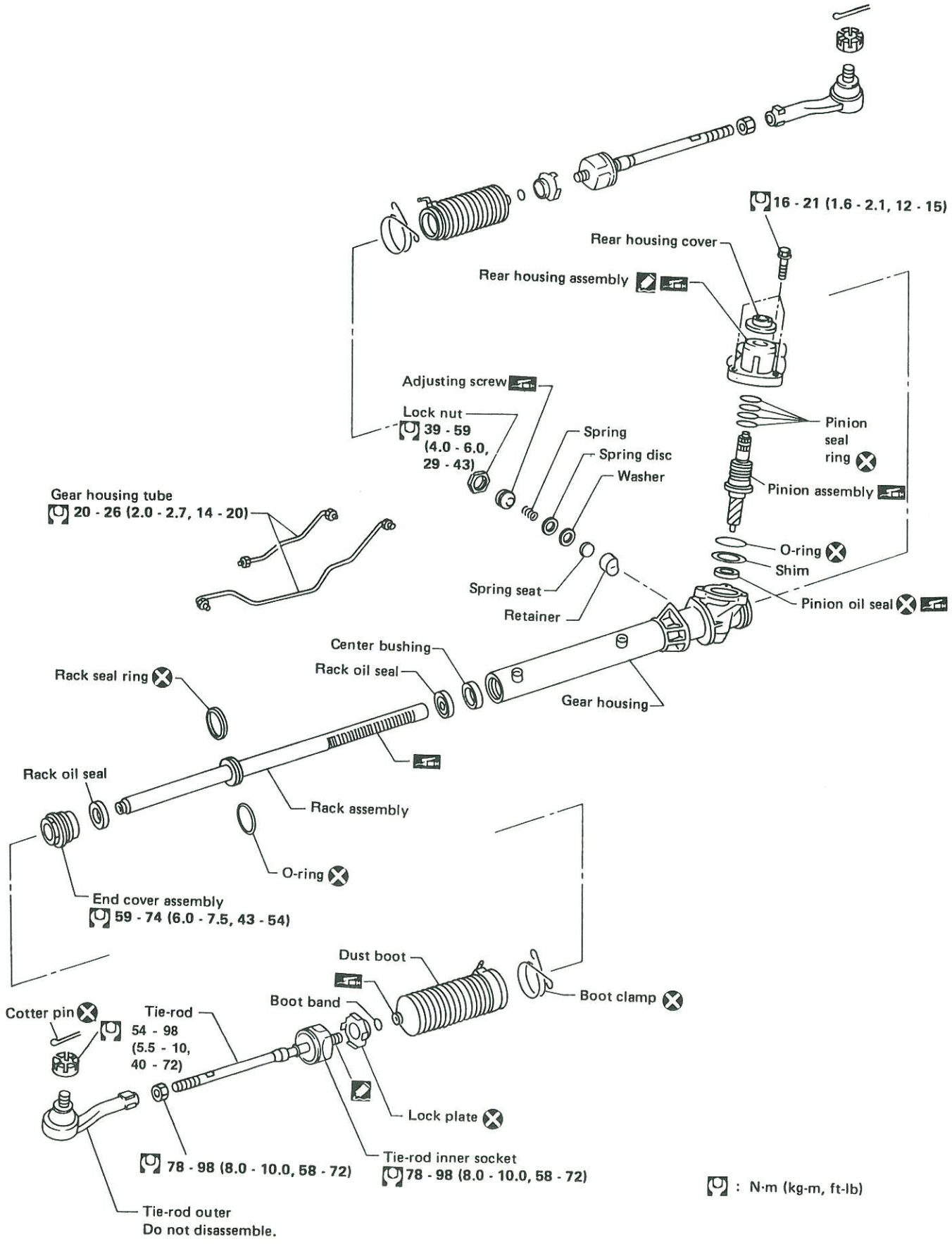
- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matchmarks on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matchmarks of pinion shaft and pinion housing.



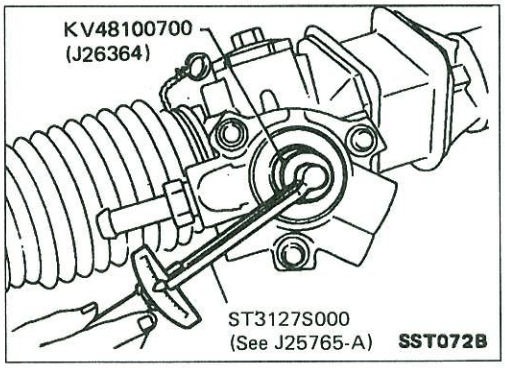
- Mount steering gear and linkage assembly with respect to the horizontal.

Mounting angle: 67.3°

Disassembly and Assembly



SST200B



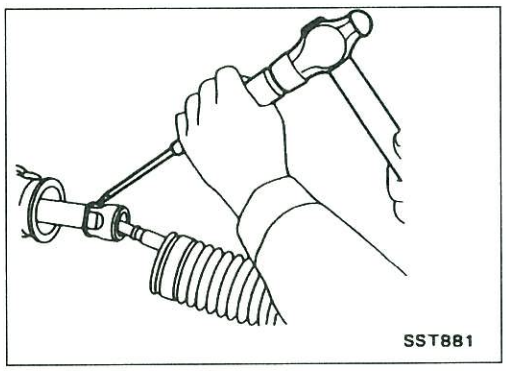
Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

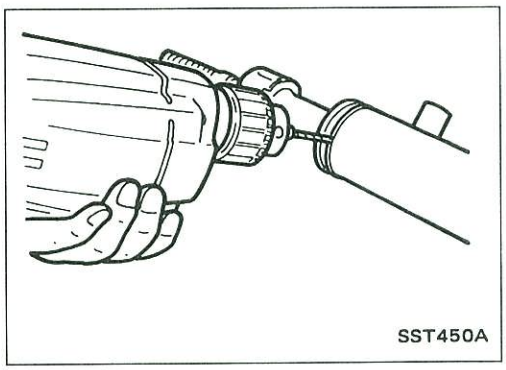
- **Before measuring, disconnect gear housing tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.**

2. Remove pinion gear.

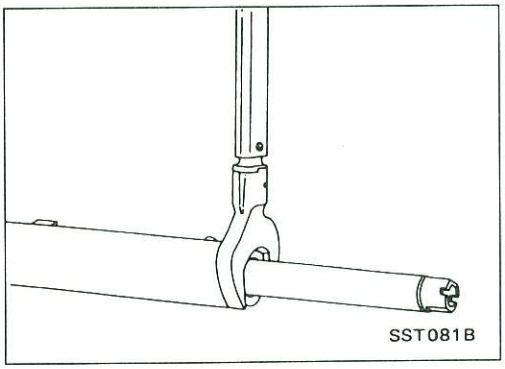
- **Be careful not to damage pinion gear when removing pinion seal ring.**



3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.

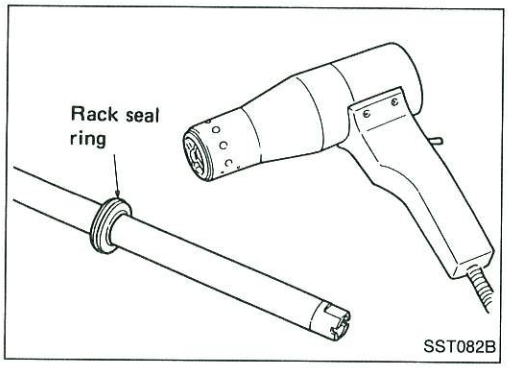


7. Drill staked portion of gear housing end with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.



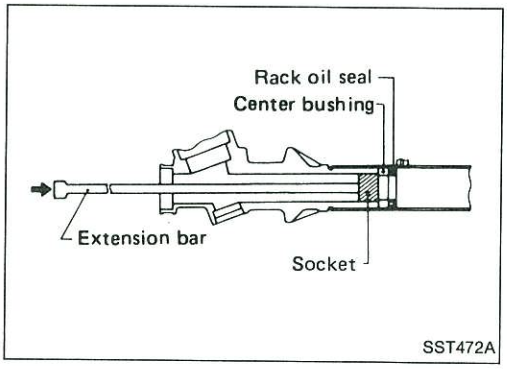
8. Remove end cover assembly with a suitable tool.
9. Draw out rack assembly.

Disassembly (Cont'd)



10. Remove rack seal ring.
- Using a heat gun, heat rack seal to approximately 40°C (104°F).
- Remove rack seal ring.

Be careful not to damage rack.



11. Remove center bushing and rack oil seal using tape wrapped socket and extension bar.

Do not scratch inner surfaces of pinion housing.

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "DEXRON™" type, and blow dry with compressed air, if available.

BOOT

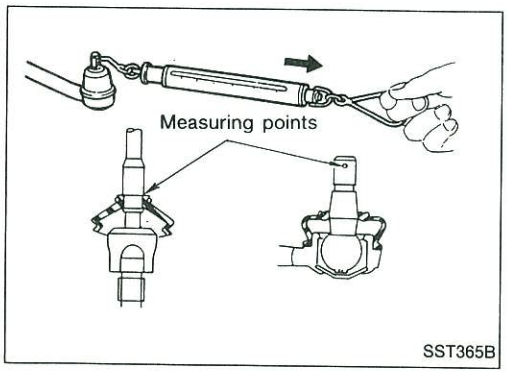
Check condition of boot. If cracked excessively, replace it.

RACK

Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

PINION ASSEMBLY

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

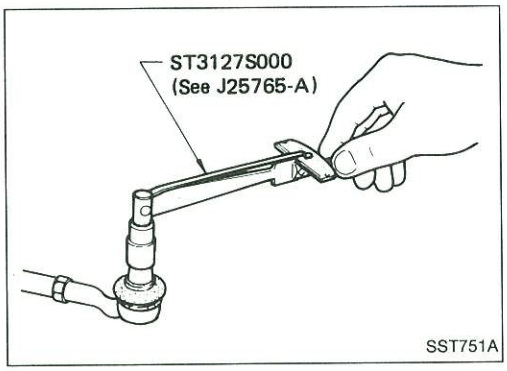


TIE-ROD OUTER AND INNER SOCKET

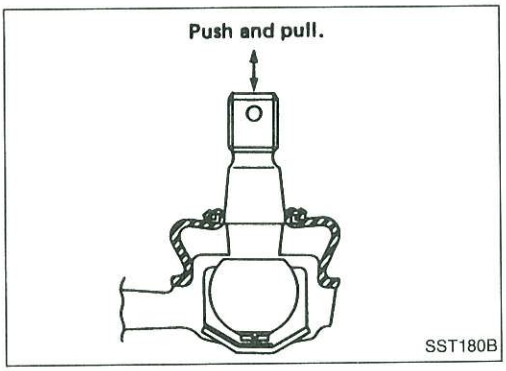
- Check ball joint for swinging force.

Tie-rod outer ball joint:
Refer to S.D.S.
Tie-rod inner ball joint:
Refer to S.D.S.

Inspection (Cont'd)



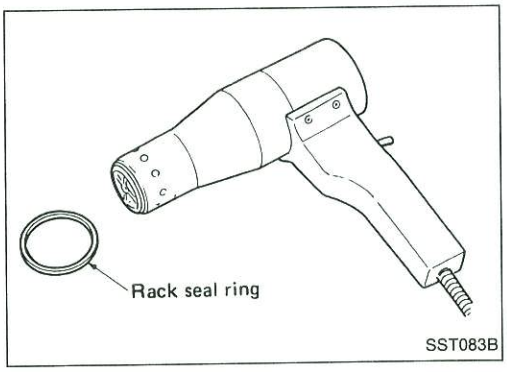
- Check ball joint for rotating torque.
  Tie-rod outer ball joint:
  Refer to S.D.S.



- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  Refer to S.D.S.
  Tie-rod inner ball joint:
  Refer to S.D.S.
- Check condition of dust cover. If cracked excessively, replace it.

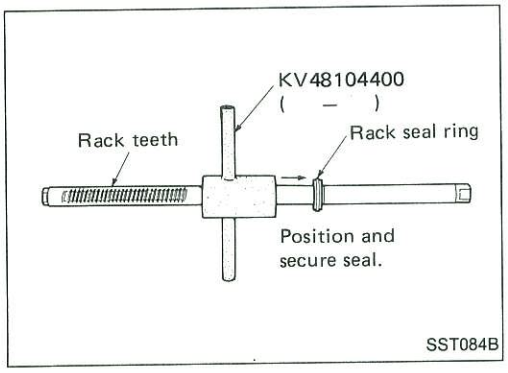
GEAR HOUSING CYLINDER

Check gear housing cylinder for scratches or other damage. Replace if necessary.



Assembly

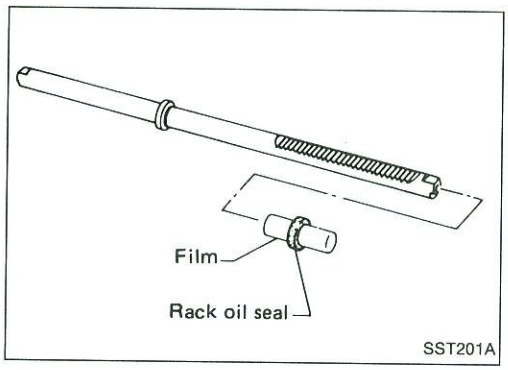
1. Using a heat gun, heat rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.



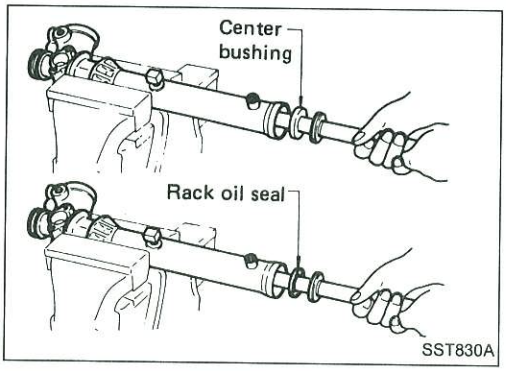
2. Using Tool, compress periphery of rack seal ring to position and secure it on rack.

Always insert Tool from the rack gear side.

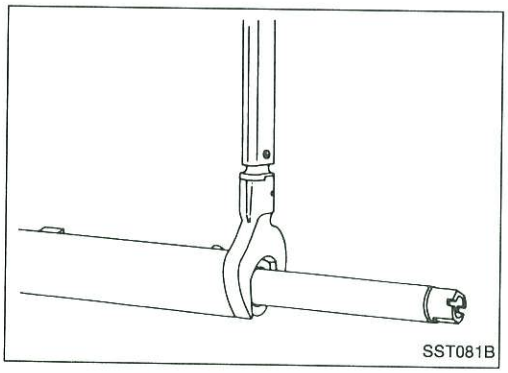
Assembly (Cont'd)



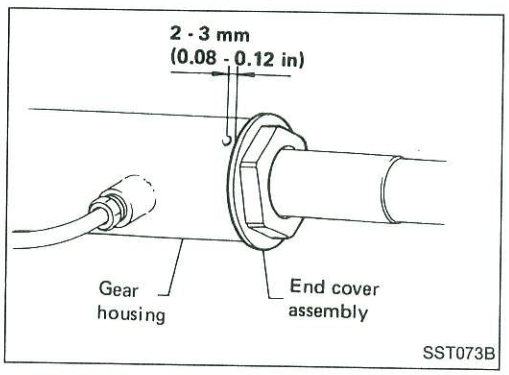
3. Insert rack oil seal.
   - **Place plastic film into rack oil seal to prevent damage by rack teeth.**
   - **Always remove plastic film after rack oil seal is positioned properly.**
   - **Make sure lips of rack oil seal face each other.**



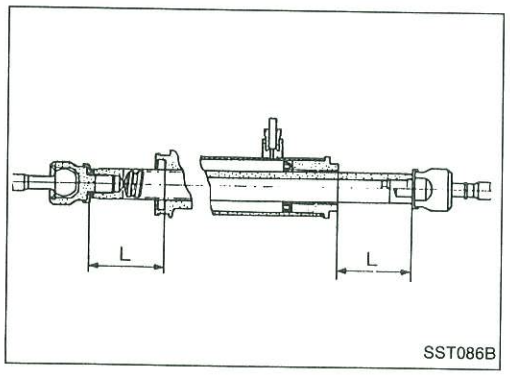
4. Install center bushing and rack oil seal with rack assembly.



5. Tighten end cover assembly with a suitable tool.

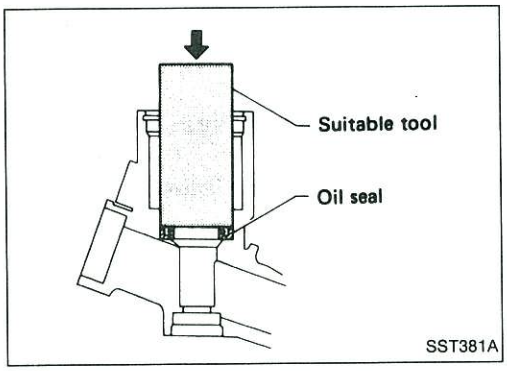


6. Fasten end cover assembly to gear housing by staking.



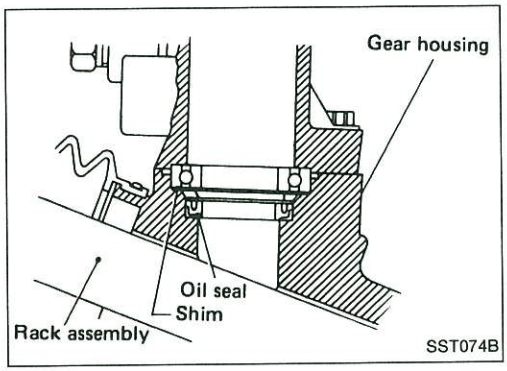
7. Set rack gear in the neutral position.
   Rack stroke "L":
   Refer to S.D.S.

Assembly (Cont'd)

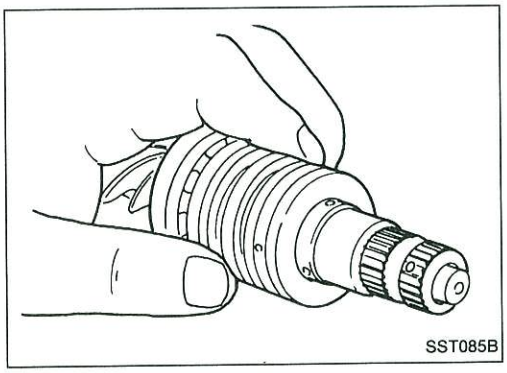


8. Coat seal lip of oil seal with multi-purpose grease and install it to pinion housing of gear housing with a suitable tool.

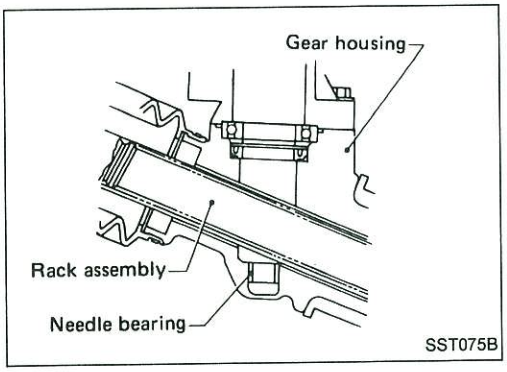
Make sure lip of oil seal faces up when installed.



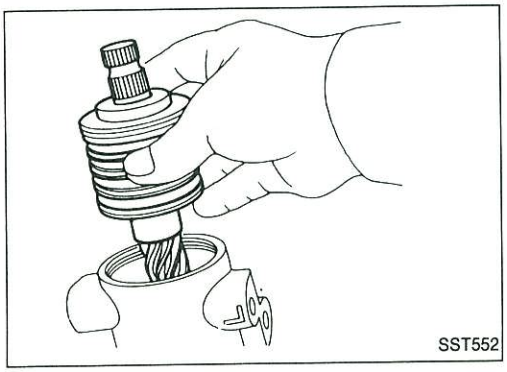
9. Install pinion bearing adjusting shim(s).
- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



10. Install 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.



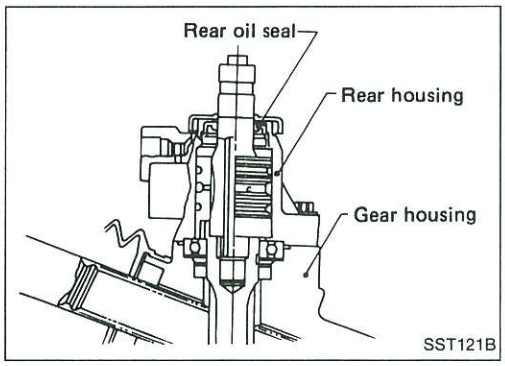
11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



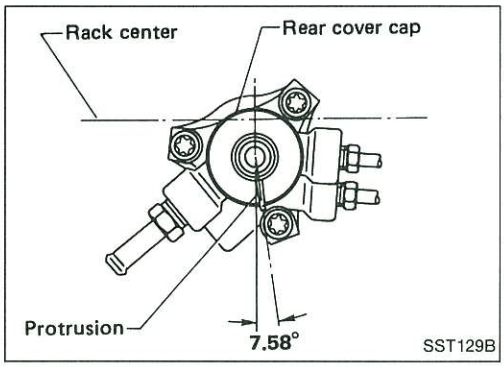
12. Install pinion assembly to pinion housing of gear housing.

Be careful not to damage pinion oil seal.

Assembly (Cont'd)

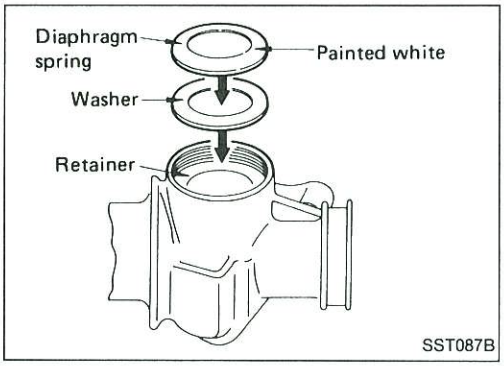


13. Apply a coat of multi-purpose grease to rear oil seal lip before installing rear housing.



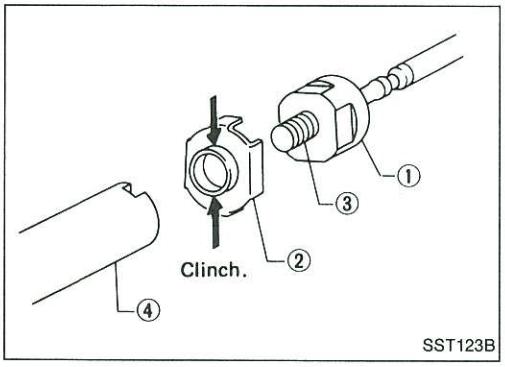
14. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left when rack is centralized.

Be careful not to damage worm ring and oil seal.



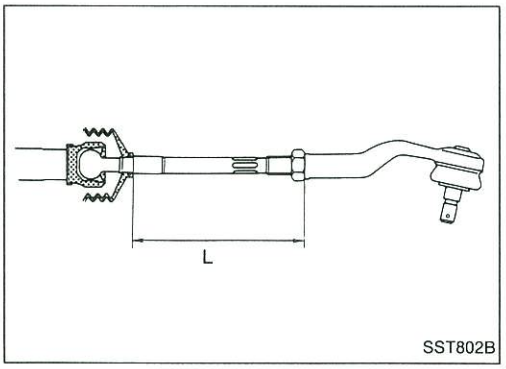
15. Install diaphragm spring at retainer.
- Always install retainer, spring washer and diaphragm spring in that order.
- Make sure convex end (painted white) of diaphragm spring faces outward when installing.

16. Install retainer spring and adjusting screw temporarily.



17. Install new lock plate.
- Attach lock plate ② to side rod inner socket ①.
- Apply locking sealant to inner socket threads ③. Screw inner socket into rack ④ and tighten to specified torque.
- Clinch two places of lock plate at rack's groove.

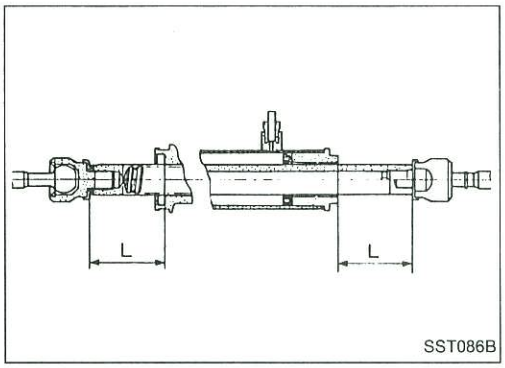
CAUTION:
To prevent scratching the boot, remove burrs from lock plate.



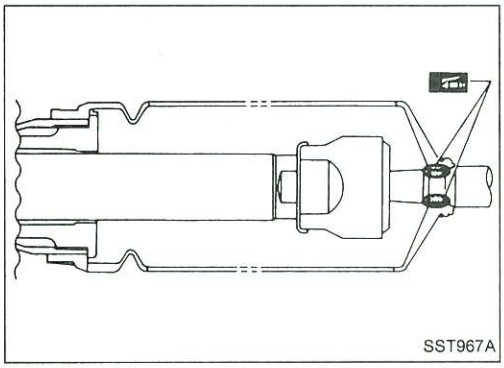
18. Tighten outer socket lock nut.

Tie-rod length "L":
Refer to S.D.S.

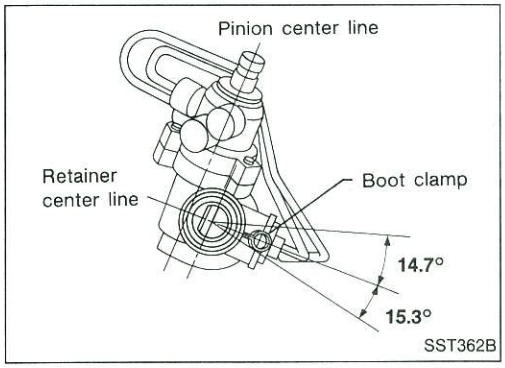
Assembly (Cont'd)



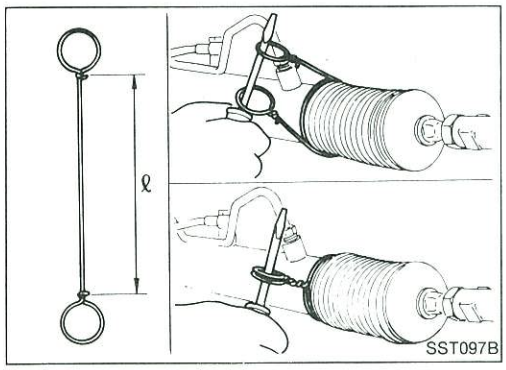
19. Measure rack stroke.
    Rack stroke "L":
    Refer to S.D.S.



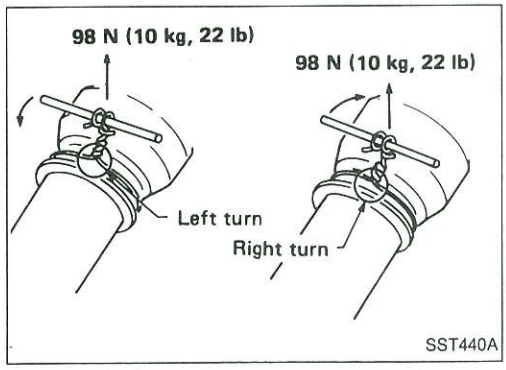
20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



21. Install boot clamps.
- Install boot clamps where they will not interfere with other parts.

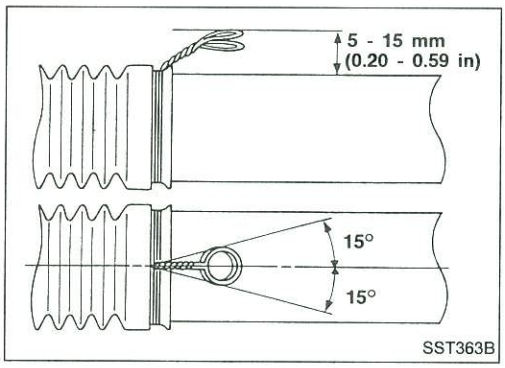


- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).

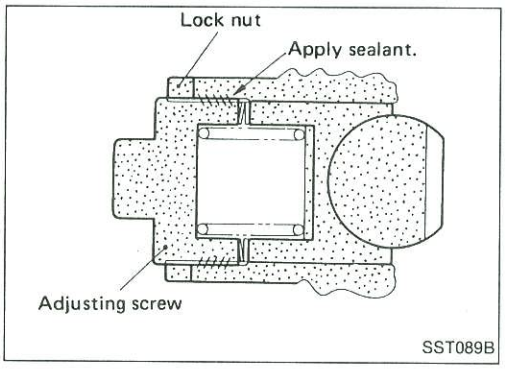


- Twist boot clamp in the direction shown in figure at left.

Assembly (Cont'd)



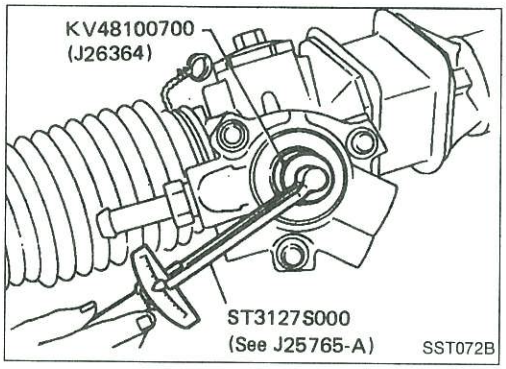
- After twisting boot clamp, bend twisted portion inward so it does not contact boot.



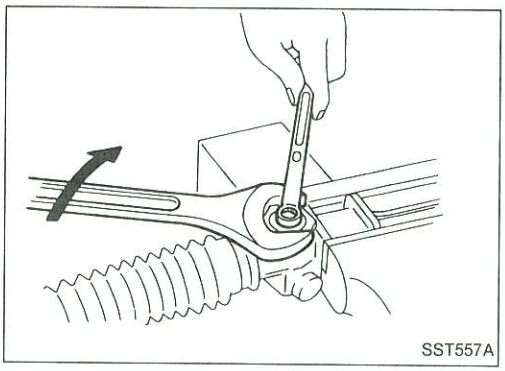
Adjustment

Adjust pinion rotating torque as follows:

1. Set rack to the neutral position without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.2 N·m (2 kg-cm, 1.7 in-lb).

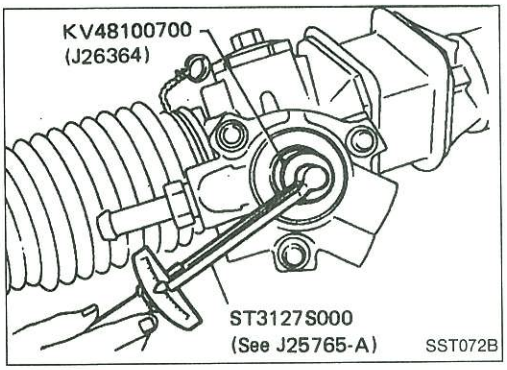


6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of 180° from neutral position.
   Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 N·m (50 kg-cm, 43 in-lb).
9. Loosen adjusting screw by 70° to 110°.



10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

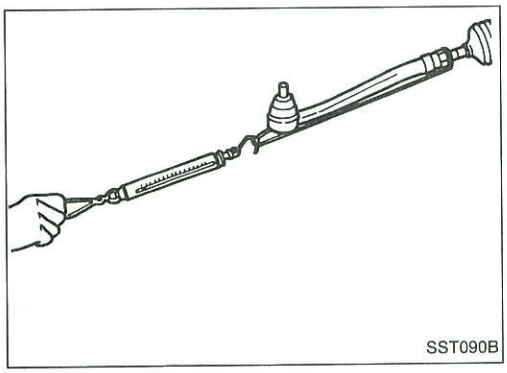
Adjustment (Cont'd)



11. Measure pinion rotating torque.

Within ±100° from the neutral position:
Average rotating torque
0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)
Maximum torque deviation
0.4 N·m (4 kg-cm, 3.5 in-lb)
Except for above measuring range:
Maximum rotating torque
1.9 N·m (19 kg-cm, 16 in-lb)
Maximum force deviation
0.6 N·m (6 kg-cm, 5.2 in-lb)

- If pinion rotating torque is not within specifications, readjust it starting from procedure 4. If pinion rotating torque is still out of specifications after readjustment, replace steering gear assembly.



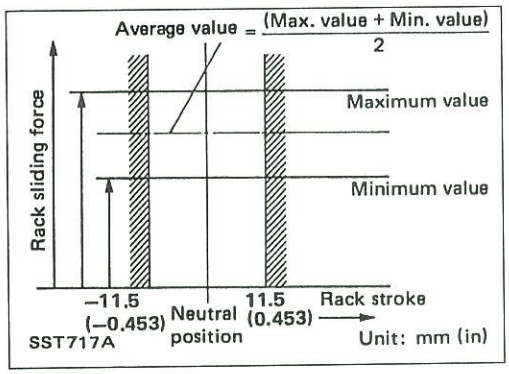
12. Check rack sliding force on vehicle as follows:
a. Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
b. Connect all piping and fill with steering fluid.
c. Start engine and bleed air completely.
d. Disconnect steering column lower joint from the gear.
e. Keep engine at idle and make sure steering fluid has reached normal operating temperature.
f. While pulling tie-rod slowly in the ±11.5 mm (±0.453 in) range from the neutral position, make sure rack sliding force is within specification.

Average rack sliding force:
235 - 284 N (24 - 29 kg, 53 - 64 lb)

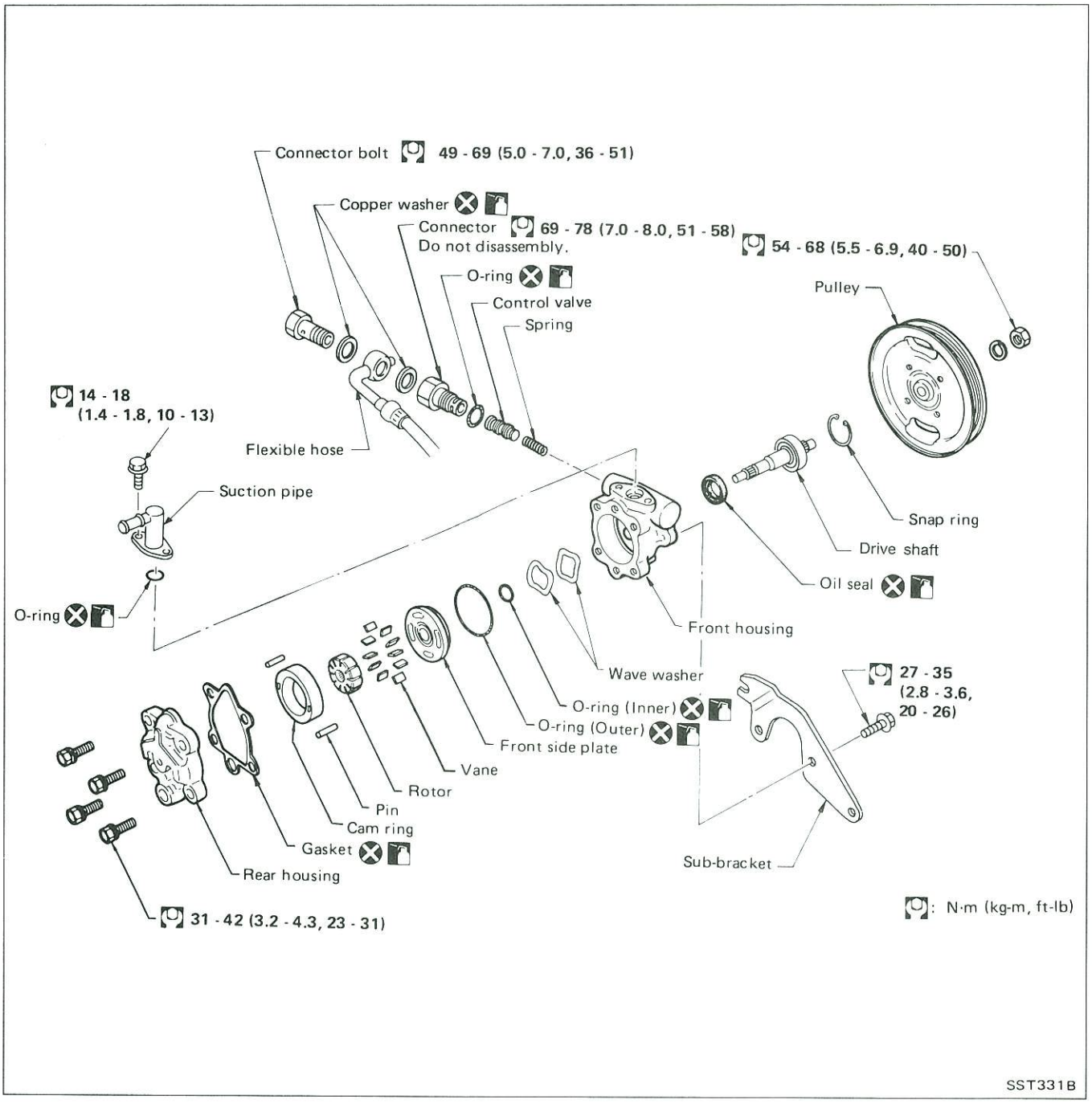
g. Check sliding force outside above range.

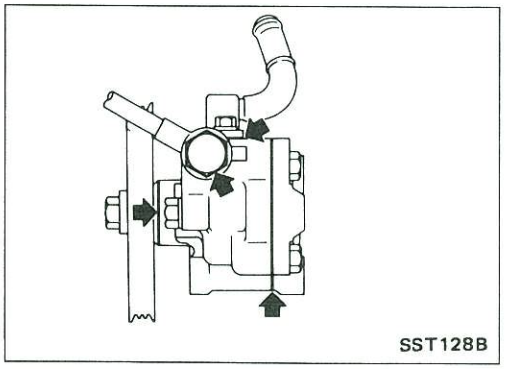
Maximum rack sliding force:
Not more than 39 N (4 kg, 9 lb) beyond above value

- 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.



Disassembly and Assembly





Pre-disassembly Inspection

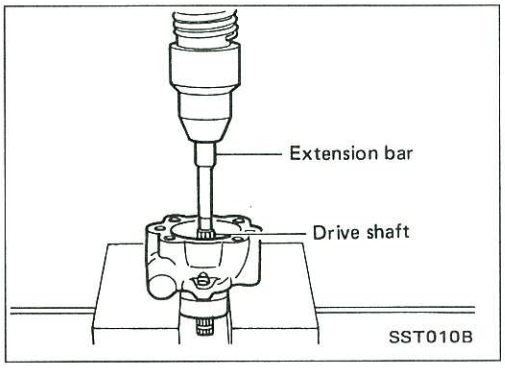
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance.

Disassembly

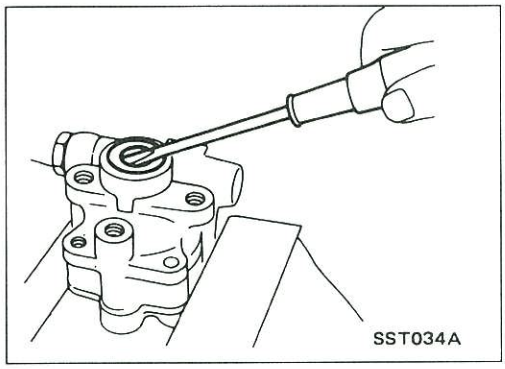
CAUTION:

- **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.**



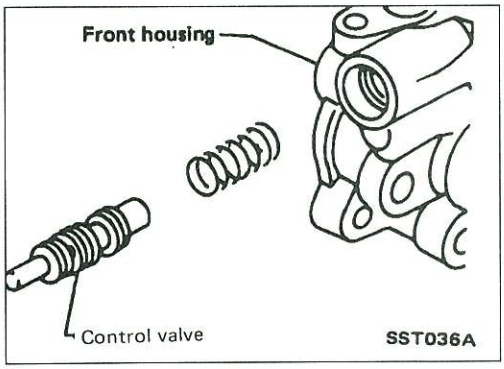
- Remove snap ring, then draw drive shaft out.

Be careful not to drop drive shaft.



- Remove oil seal.

Be careful not to damage front housing.

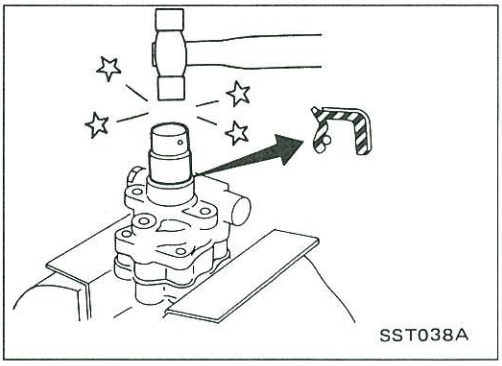


- Remove connector.

Be careful not to drop control valve.

Inspection

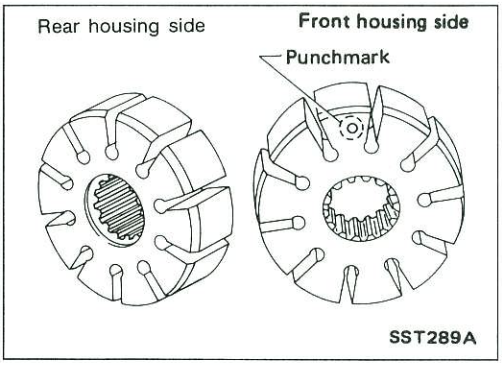
Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.


SST038A

Assembly

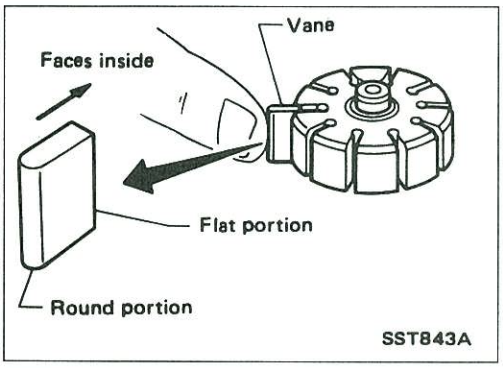
Assemble oil pump, noting the following instructions.

- 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.



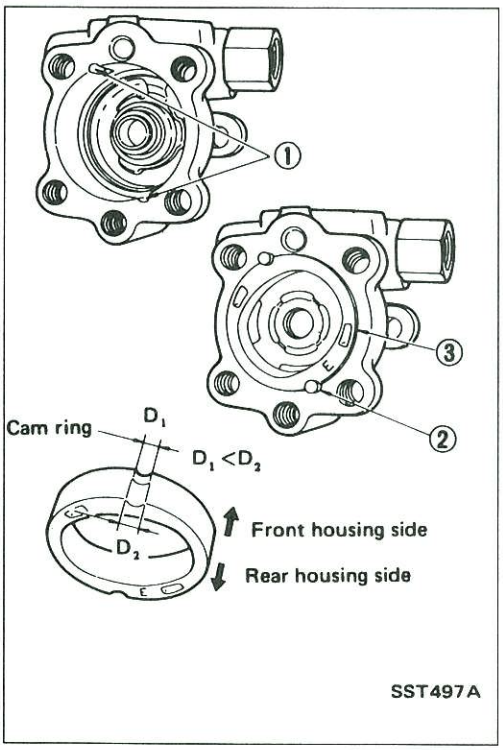
SST289A

- Pay attention to the direction of rotor.



SST843A

- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.



SST497A

- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

General Specifications

Applied model	All
Steering model	Power steering
Steering gear type	PR26SC
Steering overall gear ratio	18.3
Turns of steering wheel (Lock to lock)	3.1
Steering column type	Collapsible, tilt

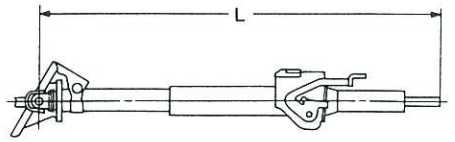
Inspection and Adjustment

GENERAL

Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Movement of gear housing mm (in)	±2 (±0.08) or less

STEERING COLUMN

Steering column length "L" mm (in)	745.2 - 746.8 (29.34 - 29.40)

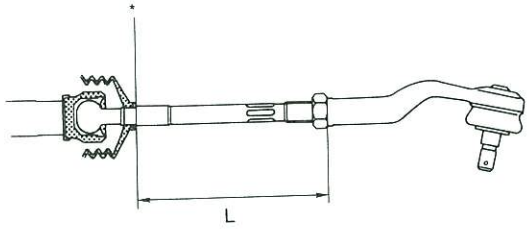


SST359B

STEERING GEAR AND LINKAGE

Steering gear type		PR26SC
Side rod outer ball joint		
Swinging force at cotter pin hole	N (kg, lb)	6.9 - 67.7 (0.7 - 6.9, 1.5 - 15.2)
Rotating torque	N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Axial end play	mm (in)	0.5 (0.020) or less
Side rod inner ball joint		
Swinging force*	N (kg, lb)	28.4 - 259.9 (2.9 - 26.5, 6.4 - 58.4)
Rotating torque	N·m (kg-cm, in-lb)	1.0 - 8.8 (10 - 90, 8.7 - 78.1)
Axial end play	mm (in)	0 (0)
Side rod standard length "L"	mm (in)	143.5 (5.65)

*: Measuring point

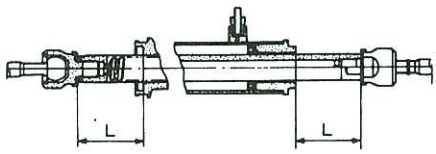


SST801B

Inspection and Adjustment (Cont'd)

STEERING GEAR AND LINKAGE (Cont'd)

Steering gear type	PR26SC
Rack stroke "L" mm (in)	71 (2.80)



SST086B

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	70° - 110°
Pinion gear preload without gear oil N·m (kg-cm, in-lb)	
Within ±100° from the neutral position	
Average rotating torque	0.78 - 1.27 (8.0 - 13.0, 6.9 - 11.3)
Maximum torque deviation	0.4 (4, 3.5)
Except above range	
Maximum rotating torque	1.9 (19, 16)
Maximum torque deviation	0.6 (6, 5.2)

POWER STEERING

Rack sliding force N (kg, lb)	
Without gear oil	
Within ±5.5 mm (±0.217 in) from the neutral position	122.6 - 166.7 (12.5 - 17.0, 27.6 - 37.5)
Except above range	122.6 - 186.3 (12.5 - 19.0, 27.6 - 41.9)
Under normal operating oil pressure	
Within ±11.5 mm (±0.453 in) from the neutral position	235 - 284 (24 - 29, 53 - 64)
Except above range	Not more than 39 (4, 9) beyond above value
Steering wheel turning force when idle (Measured at one full turn from the neutral position) N (kg, lb)	29 (3, 7) or less
Normal operating temperature of power steering fluid °C (°F)	60 - 80 (140 - 176)
Fluid capacity (Approximate) ℓ (US qt, Imp qt)	0.9 (1, 3/4)
Oil pump maximum pressure kPa (kg/cm^2, psi)	7,649 - 8,238 (78 - 84, 1,109 - 1,194)

SECTION BF

CONTENTS

GENERAL SERVICING
(Including all clips & fasteners) ..... BF- 2
BODY END ..... BF- 6
DOOR
(Including "Power Window" and "Power Door Lock") BF-11
INSTRUMENT PANEL BF-21
INTERIOR AND EXTERIOR
(In EXTERIOR, including "Weatherstrips") BF-23
SEAT BF-32
SUN ROOF BF-34
WINDSHIELD AND WINDOWS BF-37
MIRROR — Door Mirror BF-42
BODY ALIGNMENT BF-44
SUPPLEMENTAL RESTRAINT SYSTEM (SRS) BF-49
TROUBLE DIAGNOSES — Supplemental Restraint System (SRS) BF-60

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

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

★ **For seat belt, refer to MA section.**

Precautions

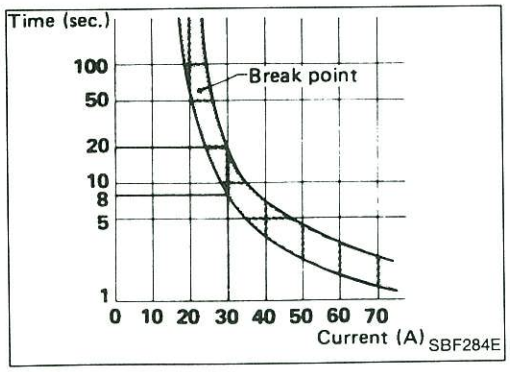
- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removal or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing 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 (SRS) "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 INFINITI 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 circuits related to the SRS "Air Bag".**



Circuit Breaker Inspection

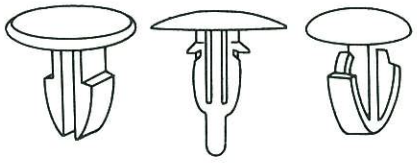
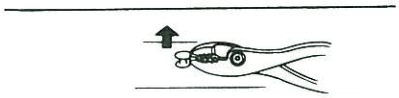
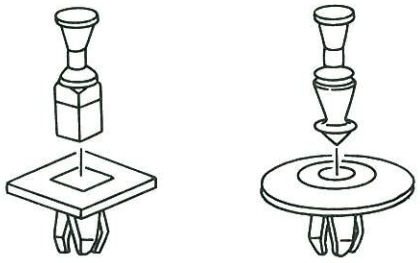
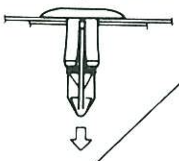
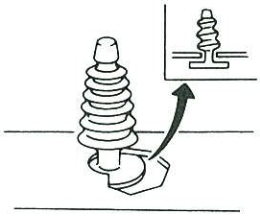
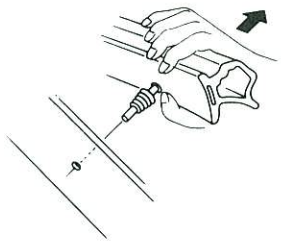
For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

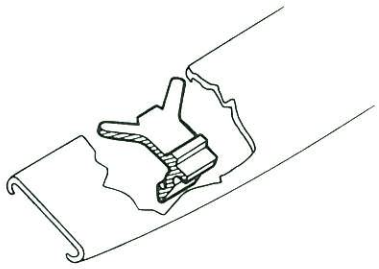
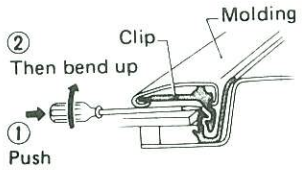
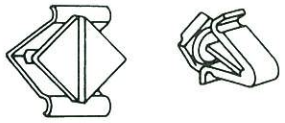
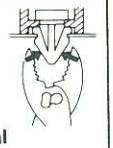
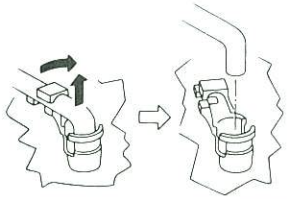
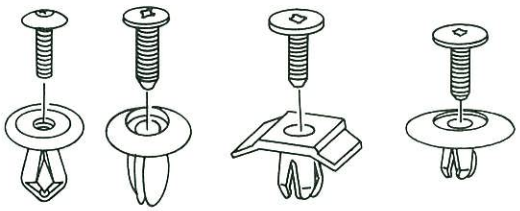
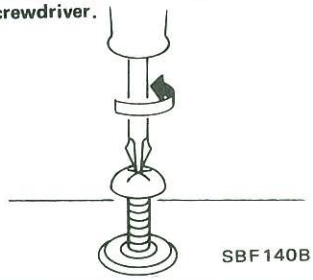
- Power window & power door lock
- Power seat
- Power sun roof

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
C103	 SBF257G	**Removal:** **Remove with a flat-bladed screwdriver or pliers.**  SBF292C
C203	 SBF258G	**Push center pin to catching position. (Do not remove center pin by hitting it.)** Push  Push **Installation:** SBF708E
CE103	 SBF104B	**Removal:**  SBF147B

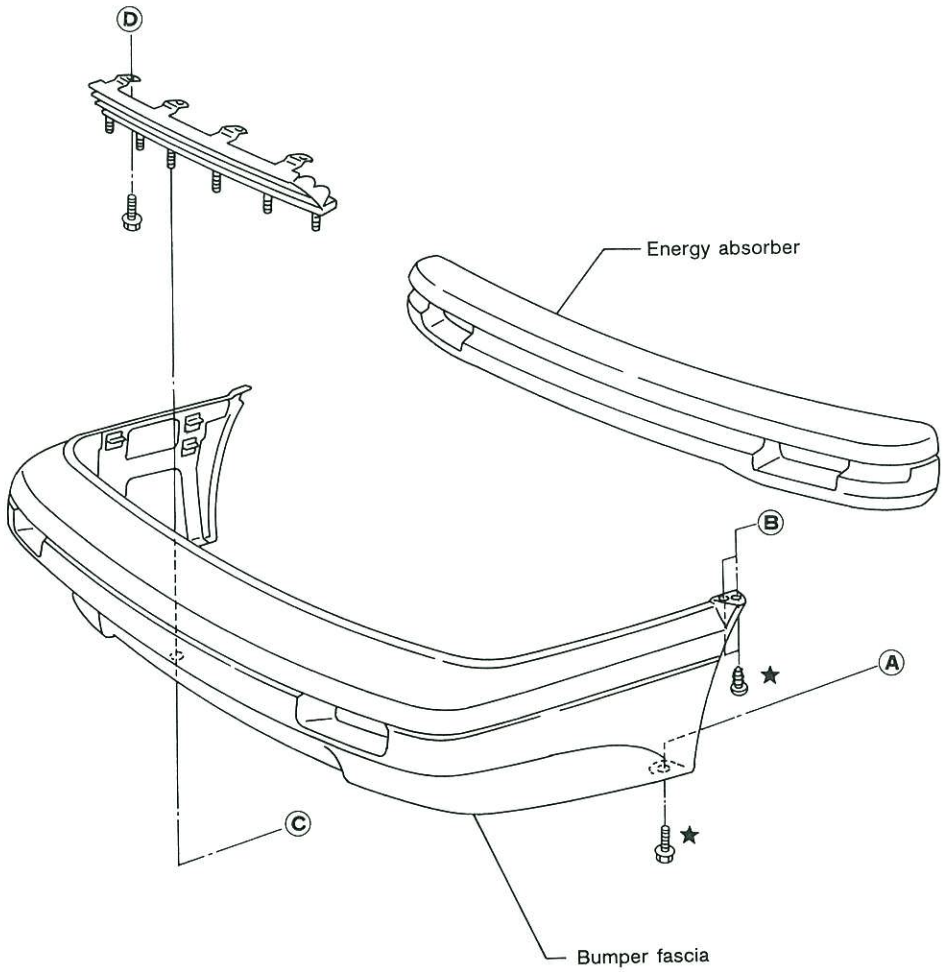
Clip and Fastener (Cont'd)

Symbol No.	Shapes	Removal & Installation
CE106	 SBF653B	**Removal:**  SBF654B
CG101	 SBF145B	**Removal** **Installation** **Rotate 45° to remove.**  **Removal** SBF085B
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

NOTE

Body Front End

- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.



REMOVAL — Front bumper assembly

1. Remove bumper fascia securing bolts Ⓐ and screws Ⓑ.
2. Remove bumper reinforcement stay bolts and loosen nuts.
3. Pull out bumper assembly.

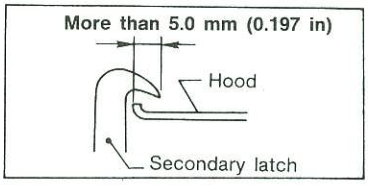
INSTALLATION — Front bumper assembly

- Insert pins of bumper reinforcement stay into body holes.

Body Front End (Cont'd)

Hood lock adjustment
- Adjust hood so that hood primary lock meshes at a position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length



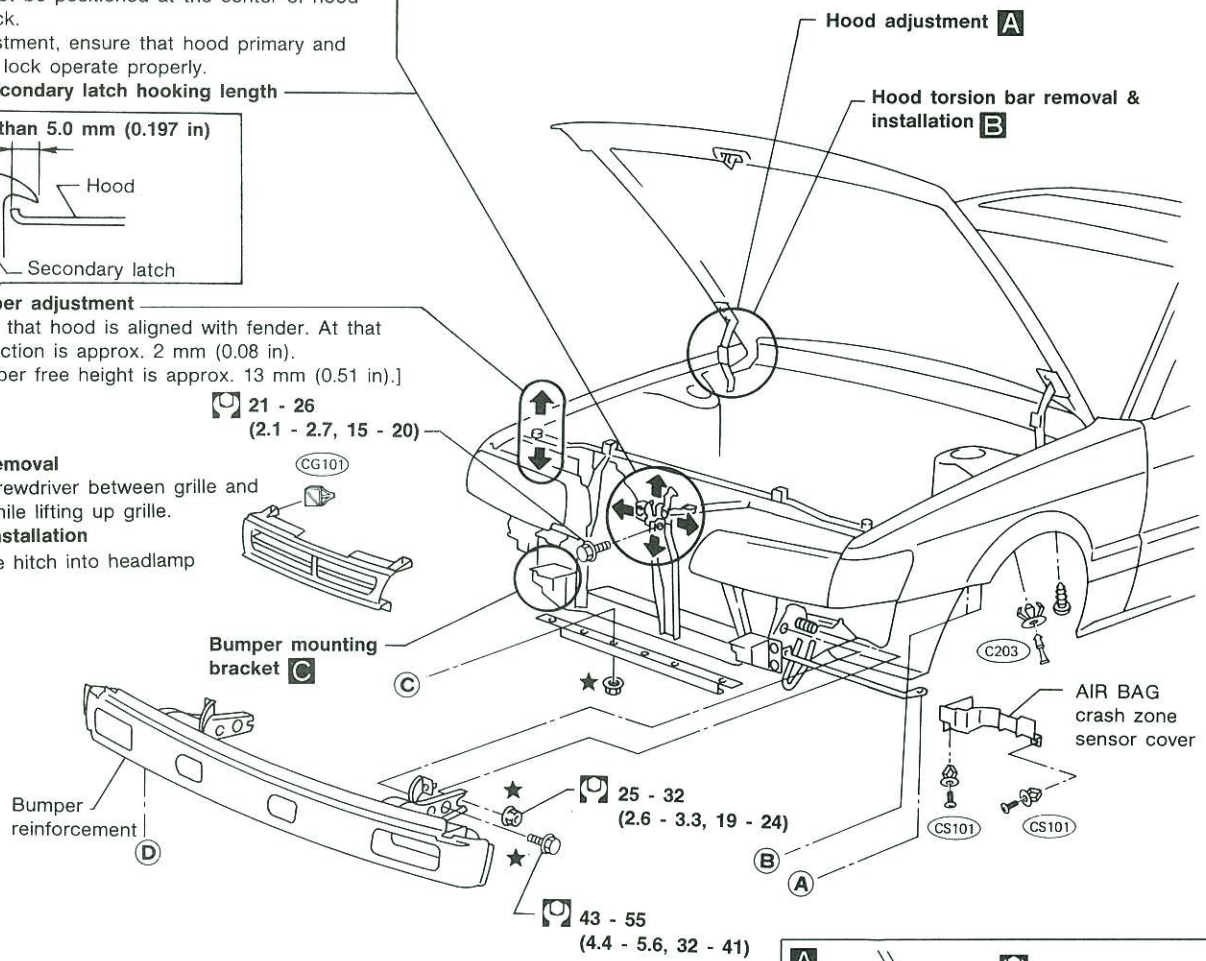
Bumper rubber adjustment
- Adjust so that hood is aligned with fender. At that time deflection is approx. 2 mm (0.08 in).

[Bumper rubber free height is approx. 13 mm (0.51 in).]

21 - 26 (2.1 - 2.7, 15 - 20)

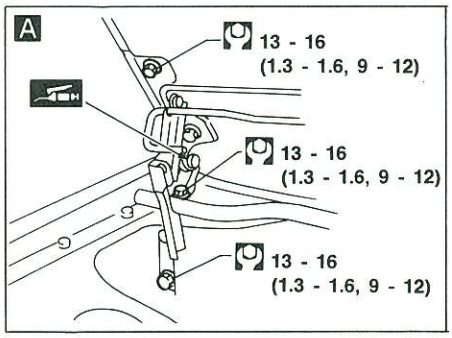
Front grille removal
- Set ⊖ screwdriver between grille and bumper while lifting up grille.

Front grille installation
- Insert grille hitch into headlamp finisher.



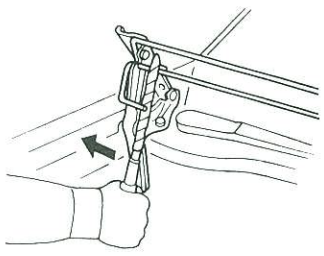
★ : Bumper assembly mounting bolts, nuts & screws

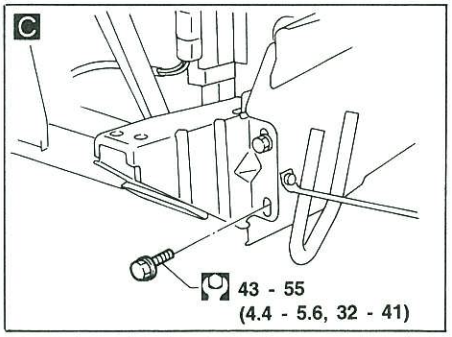
: N•m (kg-m, ft-lb)



B

WARNING:
When removing and installing torsion bar, be careful as it is under tension.

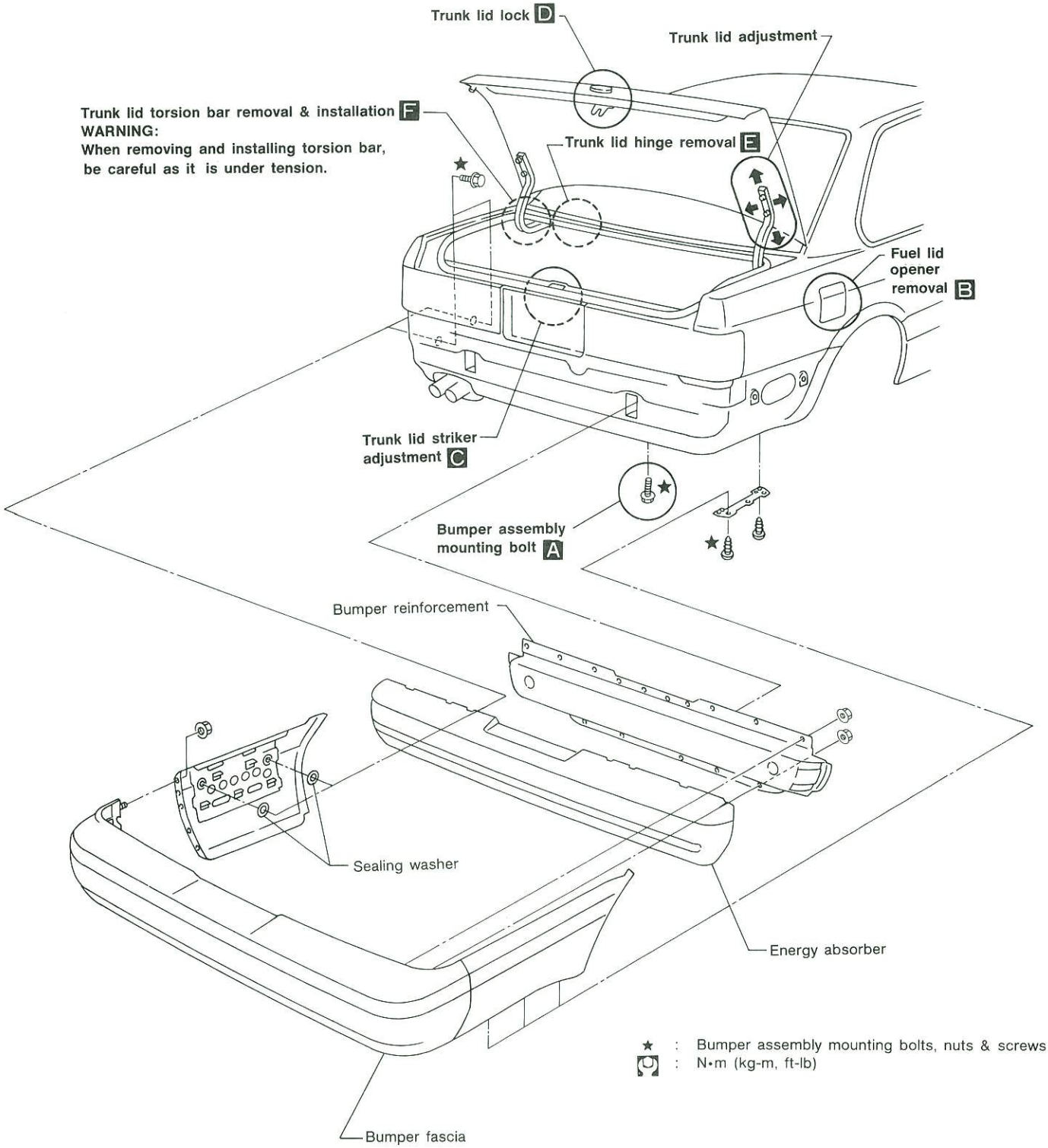




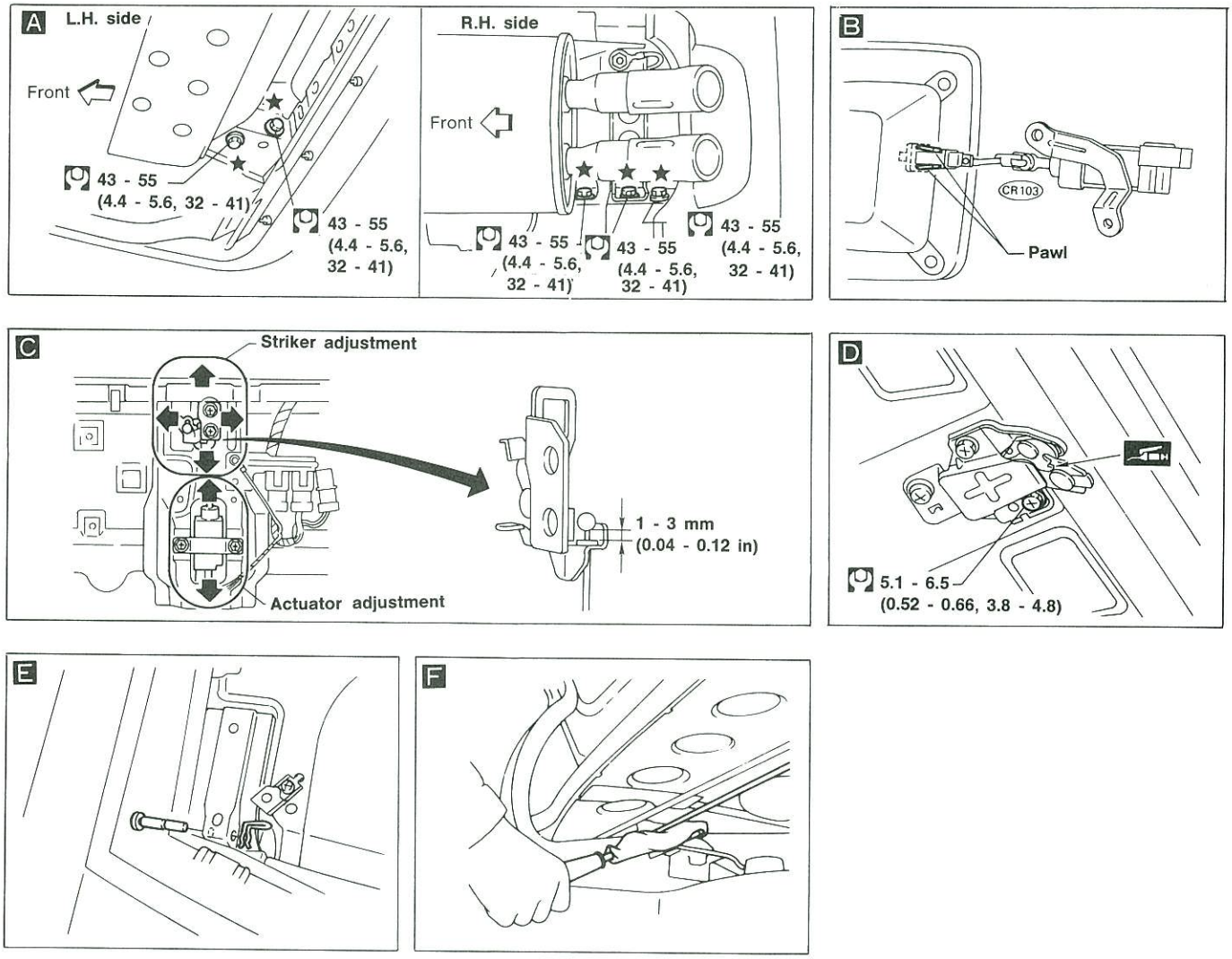
MBF502A

Body Rear End and Opener

- 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 installation, make sure that trunk lid and fuel filler lid open smoothly.



Body Rear End and Opener (Cont'd)



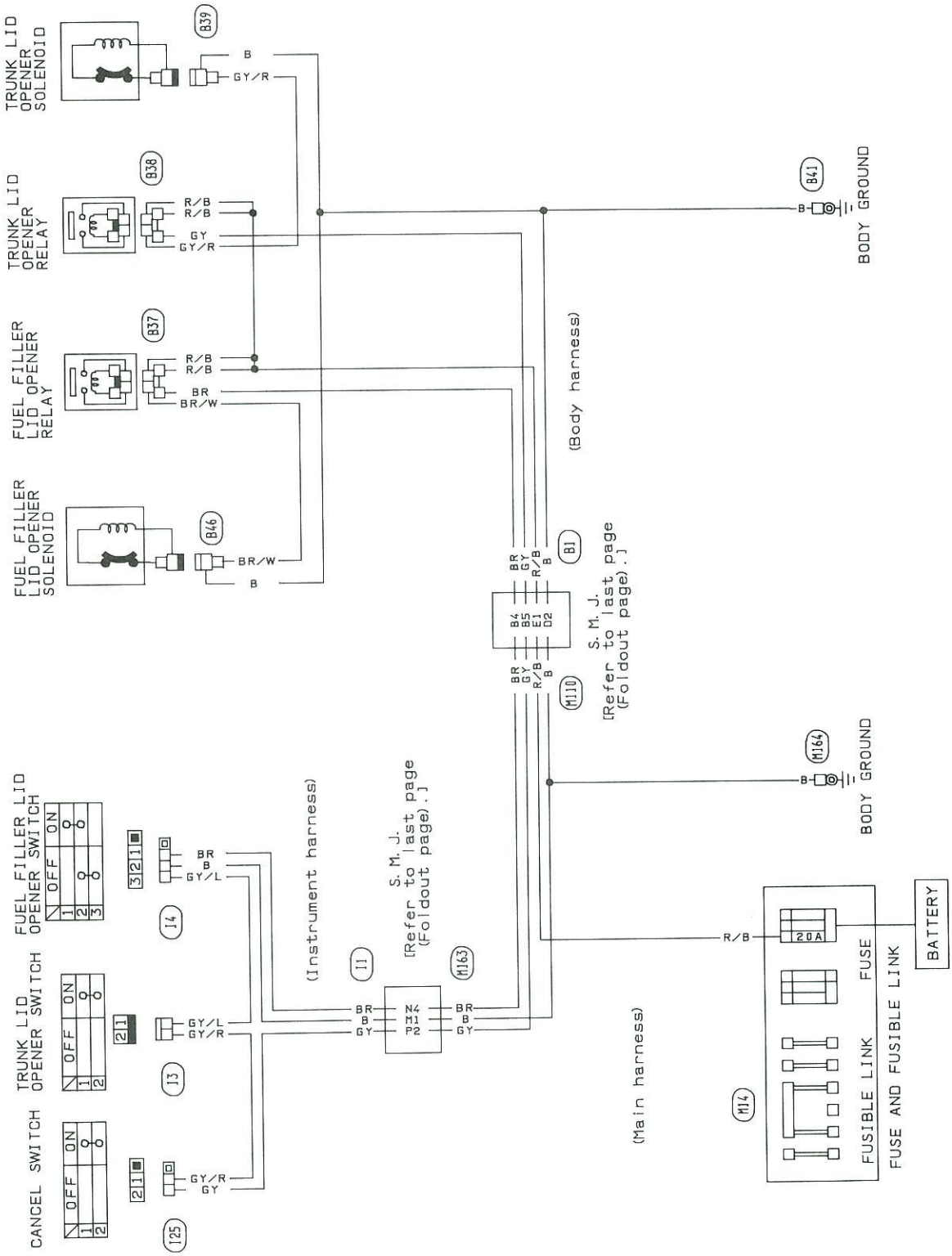
SBF121F

REMOVAL — Rear bumper assembly

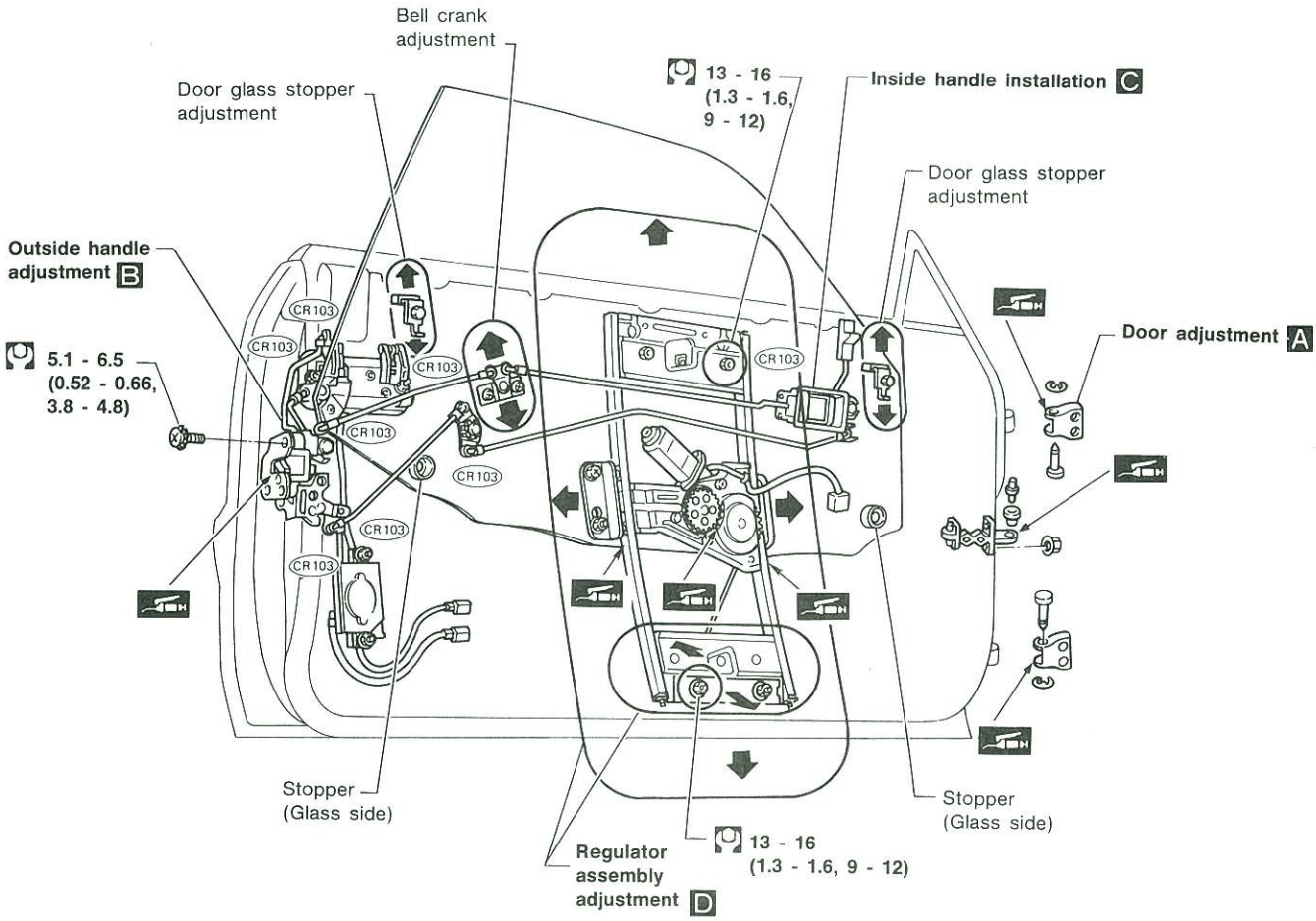
1. Remove bumper fascia securing bolts from luggage room and screws from the bottom.
2. Remove bumper assembly mounting bolts A.
3. Pull out bumper assembly.

Body Rear End and Opener (Cont'd)

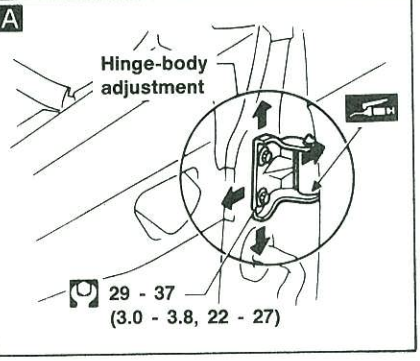
TRUNK LID OPENER AND FUEL FILLER LID OPENER/WIRING DIAGRAM



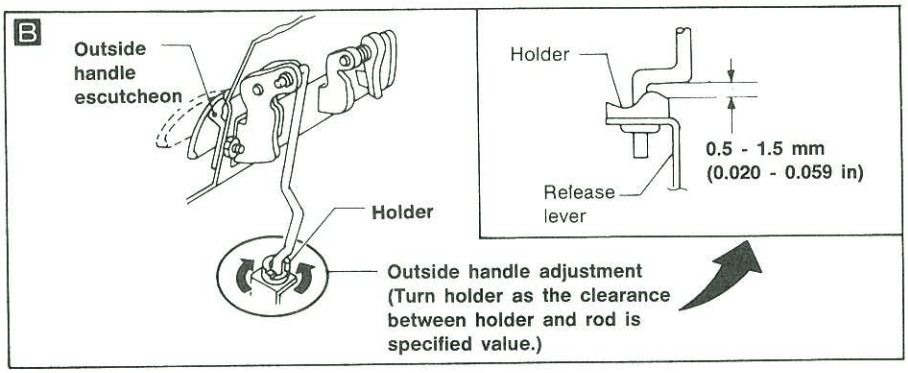
SBF011F


Bell crank adjustment
Door glass stopper adjustment
13 - 16 (1.3 - 1.6, 9 - 12)
Inside handle installation C
Door glass stopper adjustment
Outside handle adjustment B
5.1 - 6.5 (0.52 - 0.66, 3.8 - 4.8)
Door adjustment A
CR103
Stopper (Glass side)
Regulator assembly adjustment D
13 - 16 (1.3 - 1.6, 9 - 12)
Stopper (Glass side)
: N•m (kg-m, ft-lb)

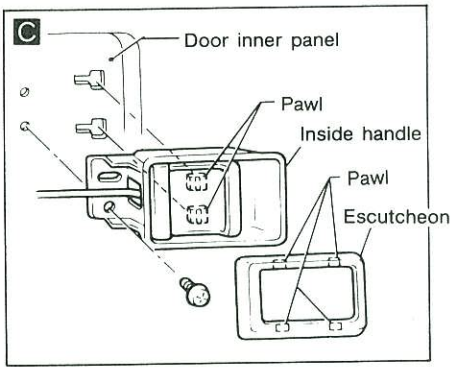
A



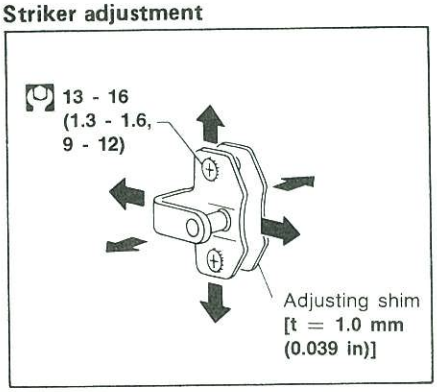
B



C



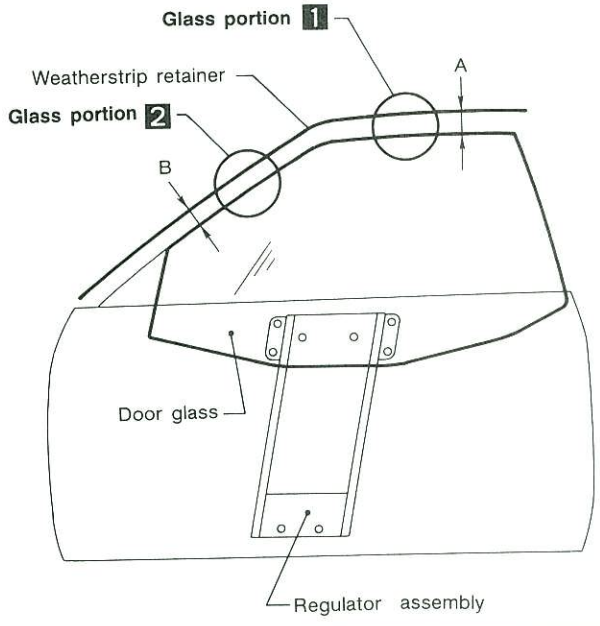
Striker adjustment



D

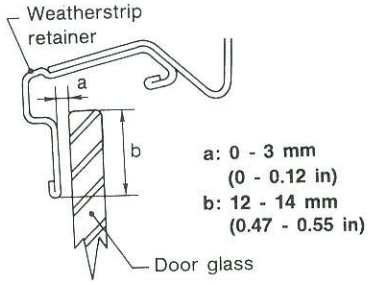
- **Remove weatherstrip from retainer.**

- **Door glass-to-retainer clearances A and B**
  Adjust so that clearances A and B are equal.
- **Ensure door glass is not tilted.**

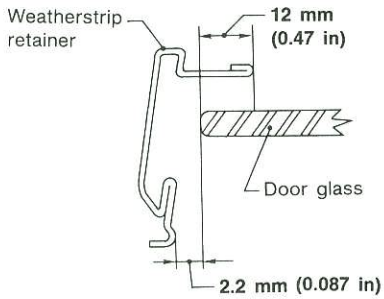


Glass portion 1

- **Adjust to provide proper light surface contact of glass and retainer.**



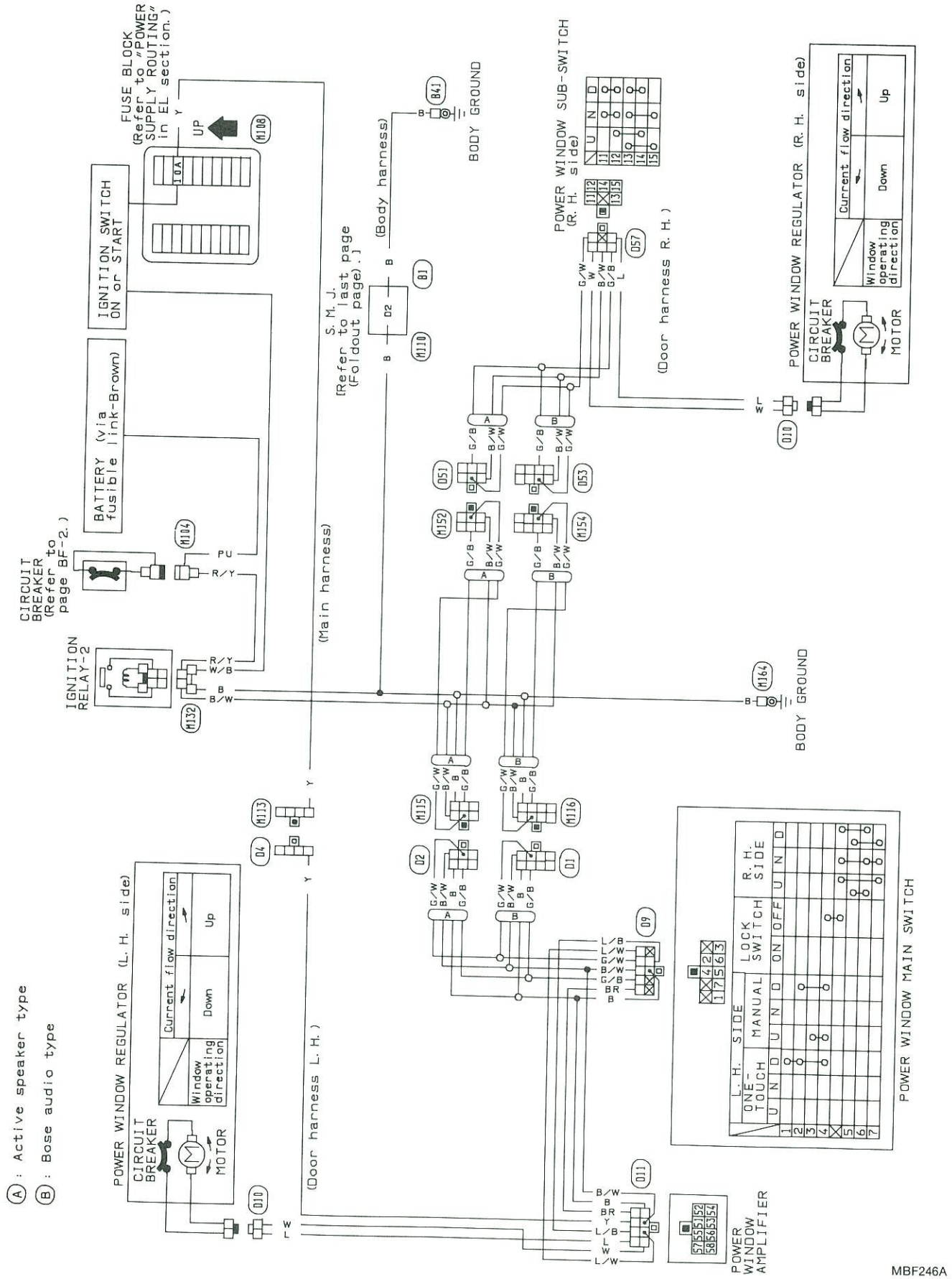
Glass portion 2



SBF122F

Power Window

WIRING DIAGRAM

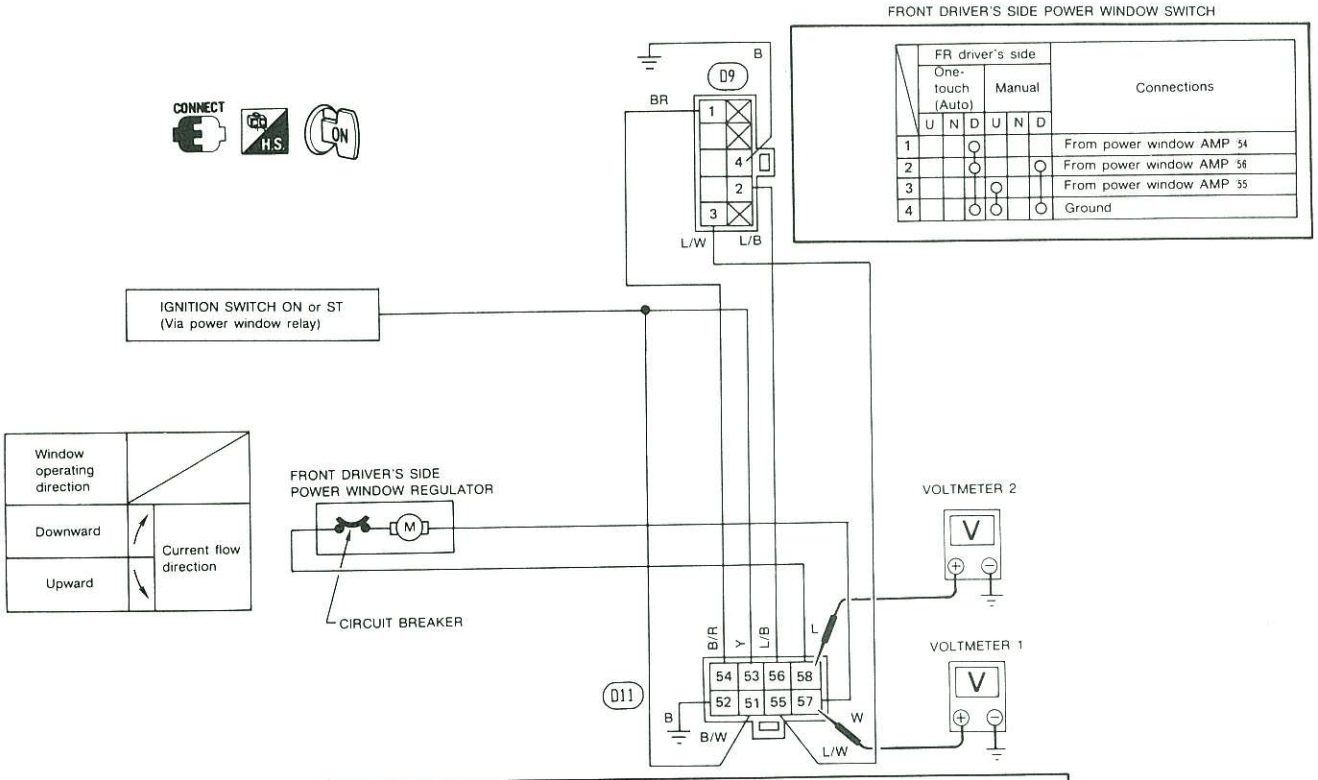


Power Window (Cont'd)

POWER WINDOW AMP. INSPECTION

Carry out the inspections below.

(1) Power source and ground: Battery voltage should exist between terminals ㊶ and ㊷.
(2) Input signals: Battery voltage should exist between terminal ㊸ and ground (IGN "ON" or "ST"). Continuity should exist between terminal ㊹, ㊺ or ㊻ and ground in "ON" condition, and should not exist in "OFF" condition.
(3) Output signals: Battery voltage shown in the chart should exist.



AMP. OPERATION

		Connections	Operations					
			Manual operation			One-touch (Auto) operation		
			N	UP	Down	N	Down →	N
51		Power source (IGN)	12V	12V	12V	12V	12V	12V
52		Ground	Ground	Ground	Ground	Ground	Ground	Ground
53	Input signal	From ignition SW (ON or ST)	12V	12V	12V	12V	12V	12V
54	Input signal	To FR driver's side power window SW (AUTO) ①	OFF	OFF	OFF	OFF	ON	OFF
55	Input signal	To FR driver's side power window SW (UP) ③	OFF	ON	OFF	OFF	OFF	OFF
56	Input signal	To FR driver's side power window SW (DOWN) ②	OFF	OFF	ON	OFF	ON	OFF
57	Output signal	FR driver's side regulator (Upward power source) VOLTMETER 1	Approx. 0V	Approx. over 9V	Approx. 0V	Approx. 0V	Approx. 0V	Approx. 0V
58	Output signal	FR driver's side regulator (Downward power source) VOLTMETER 2	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. 0V	Approx. over 9V	Approx. over 9V

Regulator Operating Condition	Stop	Upward operation	Downward operation	Stop	Starting	Keeping operation until fully open, then stops automatically
					Downward operation	

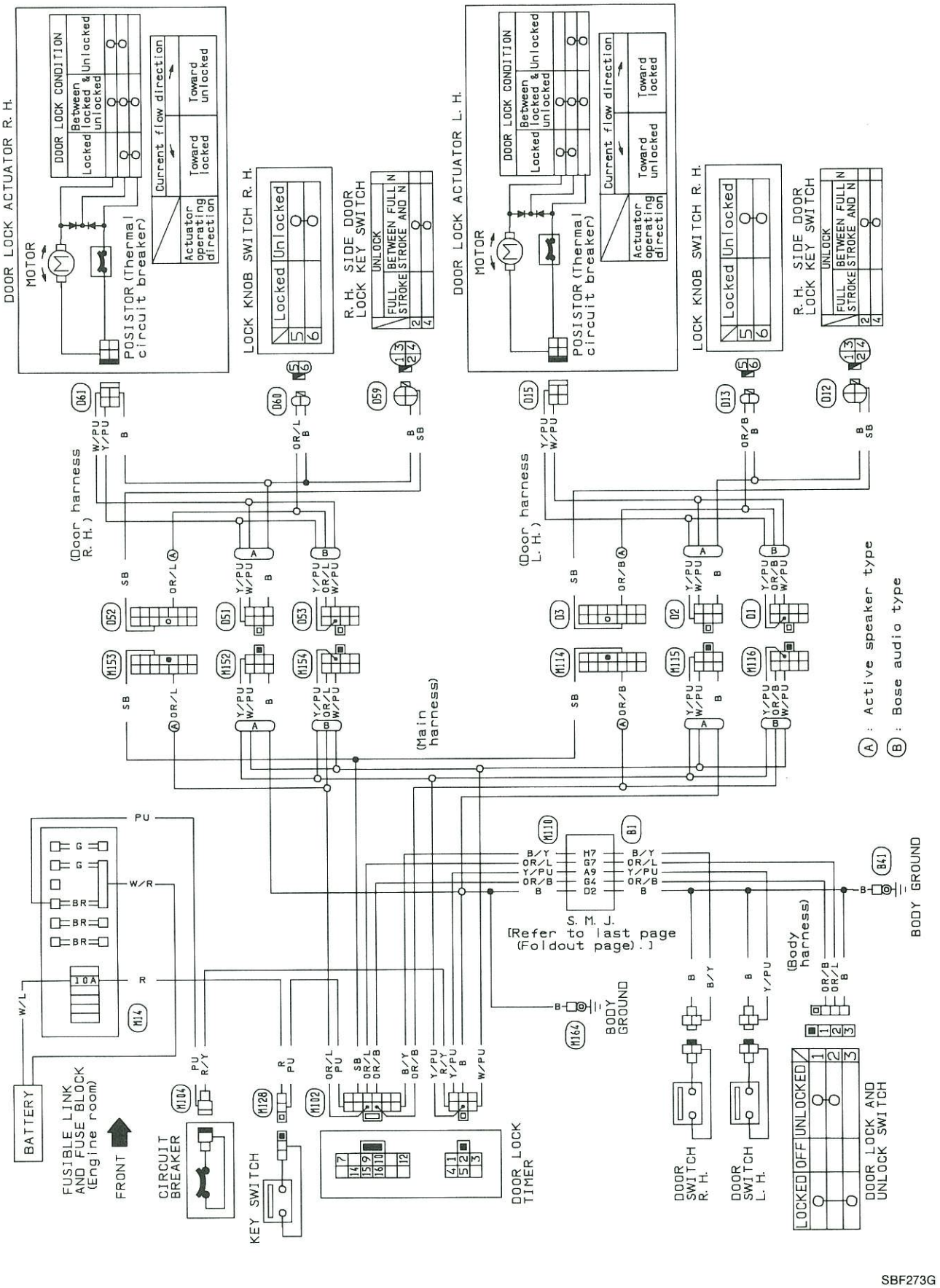
Carry out the operation check in this chart from left to right continuously.

POWER WINDOW AMP — Driver's side door

SBF989F

Power Door Lock

WIRING DIAGRAM



SBF273G

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.	Main switch	
			Unlock → Lock	Unlock → Lock	N → Unlock	N → Lock
1	Power source		12V	12V	12V	12V
5	Ground		Ground	Ground	Ground	Ground
7	Input signals	Key switch	Either key switch or door switches are off. (Key is not in the ignition or all doors are closed.)			
4		Door switch L.H.				
12		Door switch R.H.				
10		Lock knob switch L.H.	OFF (Open)→ ON (Ground)	—	—	—
9		Lock knob switch R.H.	—	OFF (Open)→ ON (Ground)	—	—
14		Door lock key switch	—	—	—	—
16		Lock & unlock switch (Lock)	—	—	—	ON (Ground)→ OFF (Open)
15		Lock & unlock switch (Unlock)	—	—	ON (Ground)→ OFF (Open)	—
2	Output signals	Door lock actuator (Lock power source)	0V → 12V → 0V (Approx. 1.0 sec.)	0V → 12V → 0V (Approx. 1.0 sec.)	0V	0V → 12V → 0V (Approx. 1.0 sec.)
3		Door lock actuator (Unlock power source)	0V	0V	0V → 12V → 0V (Approx. 1.0 sec.)	0V

Power Door Lock (Cont'd)

Unlock operation by door lock key switch

(The voltages are approximate values.)

Connections			Operations		
			Door lock key switch L.H.		
			N → Unlock → N → Unlock		Unlock → Lock
1	Power source		12V	12V	12V
5	Ground		Ground	Ground	Ground
7	Input signal	Key switch	Either key switch or door switches are off. (Key is not in the ignition or all doors are closed.)		
4		Door switch L.H.			
12		Door switch R.H.			
10		Lock knob switch L.H.	—	—	ON (Ground) → OFF (Open)
9		Lock knob switch R.H.	—	—	—
14		Door lock key switch	OFF (Open) → ON (Ground) → OFF (Open) → ON (Ground) → OFF (Open)		OFF (Open)
16		Main switch lock	—	—	—
15		Main switch unlock	—	—	—
2	Output signal	Door lock actuator (Lock power source)	0V	0V	0V → 12V → 0V (Approx. 1.0 sec.)
3		Door lock actuator (Unlock power source)	0V	0V → 12V → 0V (Approx. 1.0 sec.)	0V

- The second unlock signal of door lock key switch is counted when it is within approximately 4 seconds of the first signal.
- Lock operation by key is mechanically transmitted to the lock knob switch.
- Operation of door lock key switch R.H. is the same as L.H.

Power Door Lock (Cont'd)

Key reminder operation

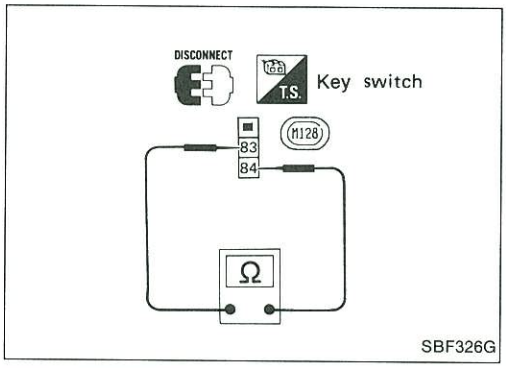
(The voltages are approximate values.)

	Connections		Operations	
			Lock knob switch L.H.	Main switch
			Unlock → Lock → Automatically unlocked	N → Lock → Automatically unlocked
1	Power source		12V	12V
5	Ground		0V	0V
7	Input signal	Key switch	ON (12V) — Key is in the ignition.	
4		Door switch L.H.	ON (Ground) — Either door is open.	
12		Door switch R.H.		
10		Lock knob switch L.H.	ON (Ground) → OFF (Open) → ON (Ground)	—
9		Lock knob switch R.H.	—	—
14		Door lock key switch	—	—
16		Main switch lock	—	OFF (Open) → ON (Ground) → OFF (Open)
15		Main switch unlock	—	—
2	Output signal	Door lock actuator (Lock power source)	0V → 12V → 0V (Approx. 0.3 sec.)	0V → 12V → 0V (Approx. 0.3 sec.)
3		Door lock actuator (Unlock power source)	0V → 12V → 0V (Approx. 1.4 sec.)	0V → 12V → 0V (Approx. 1.4 sec.)

- Operation of lock knob switch R.H. is the same as L.H.

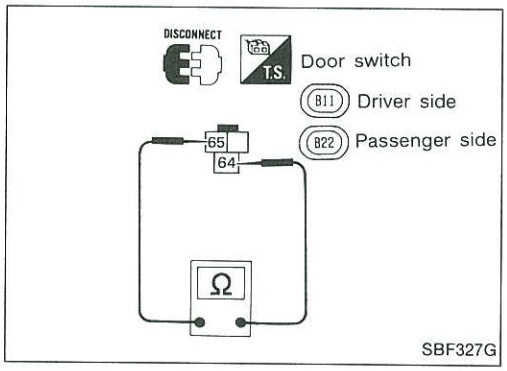
Power Door Lock (Cont'd)

ELECTRICAL COMPONENTS INSPECTION



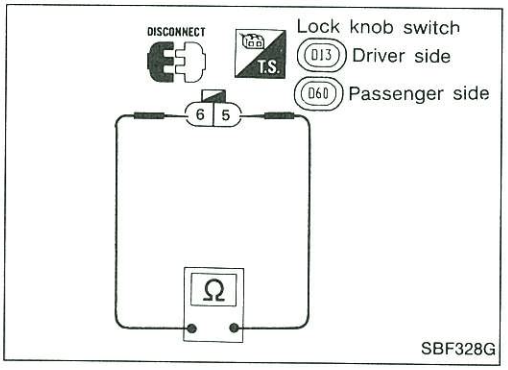
Key switch

Terminals	Condition	Continuity
⑧③ - ⑧④	Key is in the ignition.	Yes
	Key is not in the ignition.	No



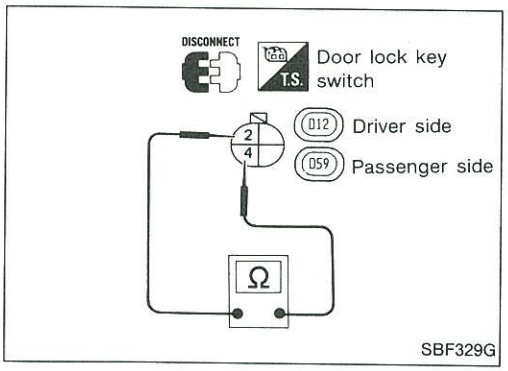
Door switch

Terminals	Condition	Continuity
⑥④ - ⑥⑤	Door is closed.	No
	Door is open.	Yes



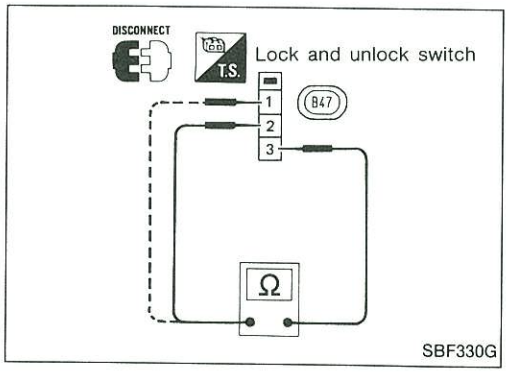
Lock knob switch

Terminals	Condition	Continuity
⑤ - ⑥	Lock	No
	Unlock	Yes



Door unlock key switch

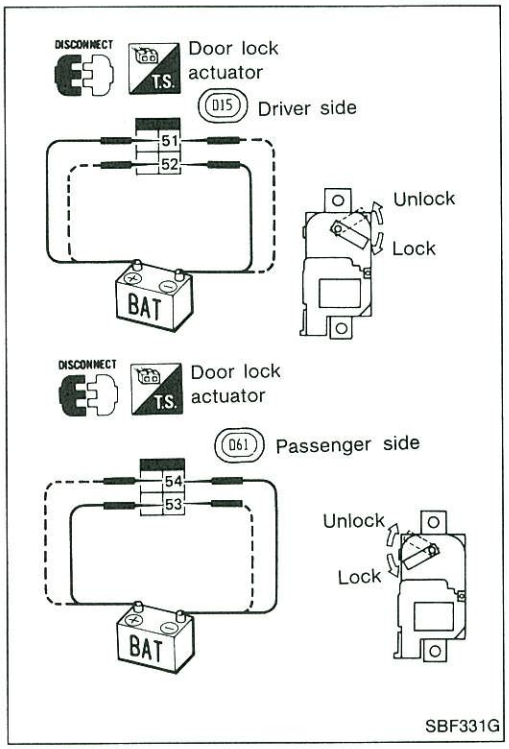
Terminals	Operation	Continuity
② - ④	Key is turned toward unlock	Yes
	Except above	No



Lock and unlock switch

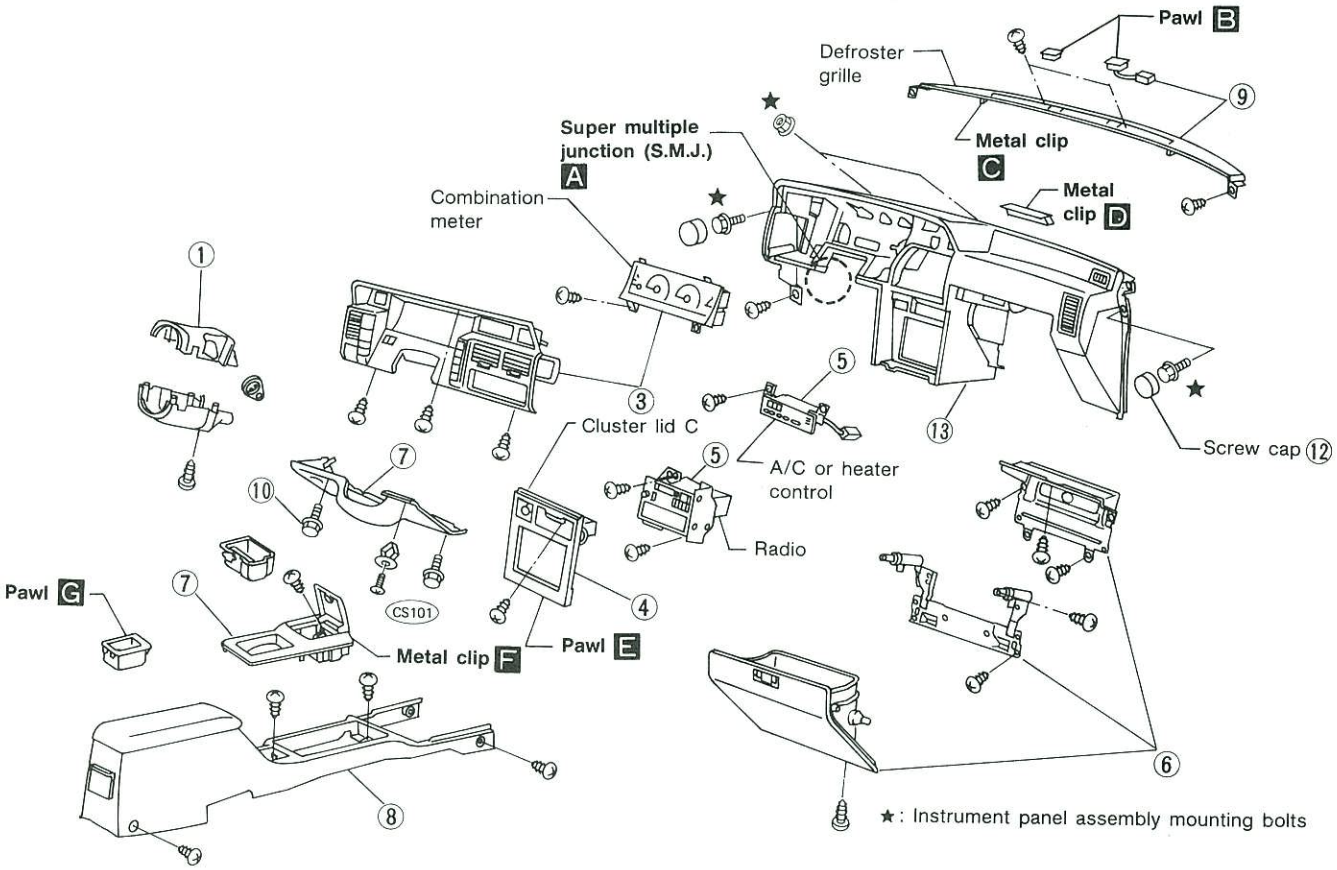
Terminals	Operation	Continuity
① - ③	Lock	Yes
	Neutral and unlock	No
② - ③	Unlock	Yes
	Neutral and unlock	No

Power Door Lock (Cont'd)



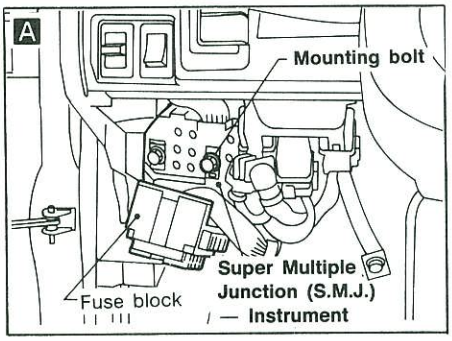
Door lock actuator

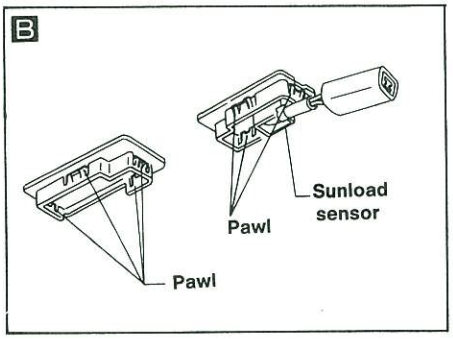
	Terminals		Operation
	⊕	⊖	
Driver side	⑤①	⑤②	Lock
	⑤②	⑤①	Unlock
Passenger side	⑤③	⑤④	Lock
	⑤④	⑤③	Unlock

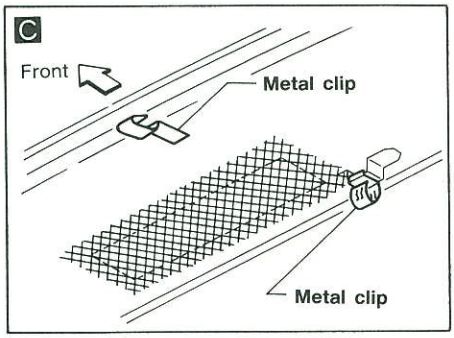


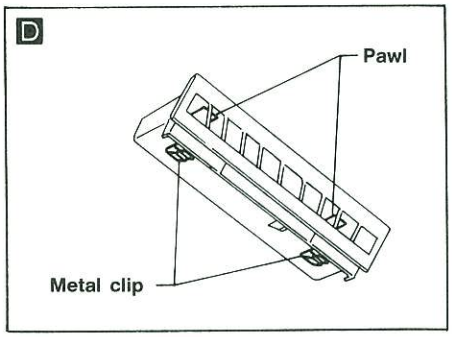
REMOVAL — Instrument panel assembly

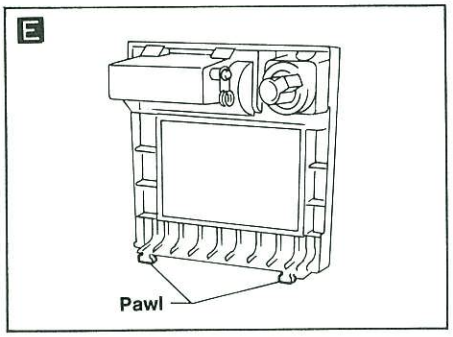
① Remove steering column covers and steering column securing bolts.
② Remove front pillar garnish and instrument lower finishers.
③ Remove cluster lid and combination meter.
④ Remove heater control finisher and cluster lid C.
⑤ Remove radio and A/C or heater control.
⑥ Remove glove box lower finisher and glove box (10 screws).
⑦ Remove instrument reinforcement (4 screws) and A/T shift lever cover.
⑧ Remove floor console box (6 screws).
⑨ Remove defroster grille and sensors.
⑩ Remove hood lock cable bracket (2 screws) and rear heater ducts.
⑪ Remove fuse block (2 screws) and disconnect S.M.J.
⑫ Remove combination switch and instrument securing screw caps.
⑬ Remove instrument panel assembly (4 bolts, 2 nuts and 2 screws).

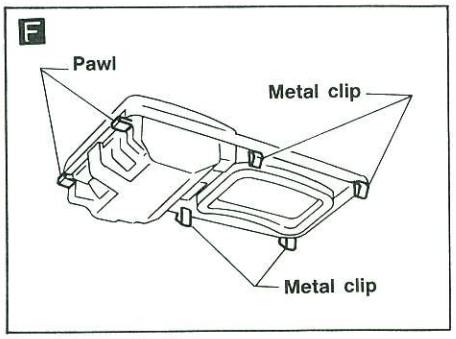

A
Mounting bolt
Super Multiple
Junction (S.M.J.)
Fuse block
Instrument

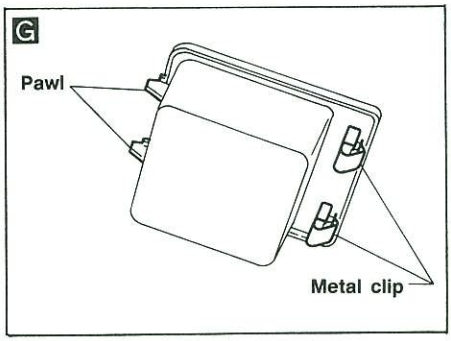

B
Sunload
sensor
Pawl
Pawl


C
Front
Metal clip
Metal clip


D
Pawl
Metal clip


E
Pawl

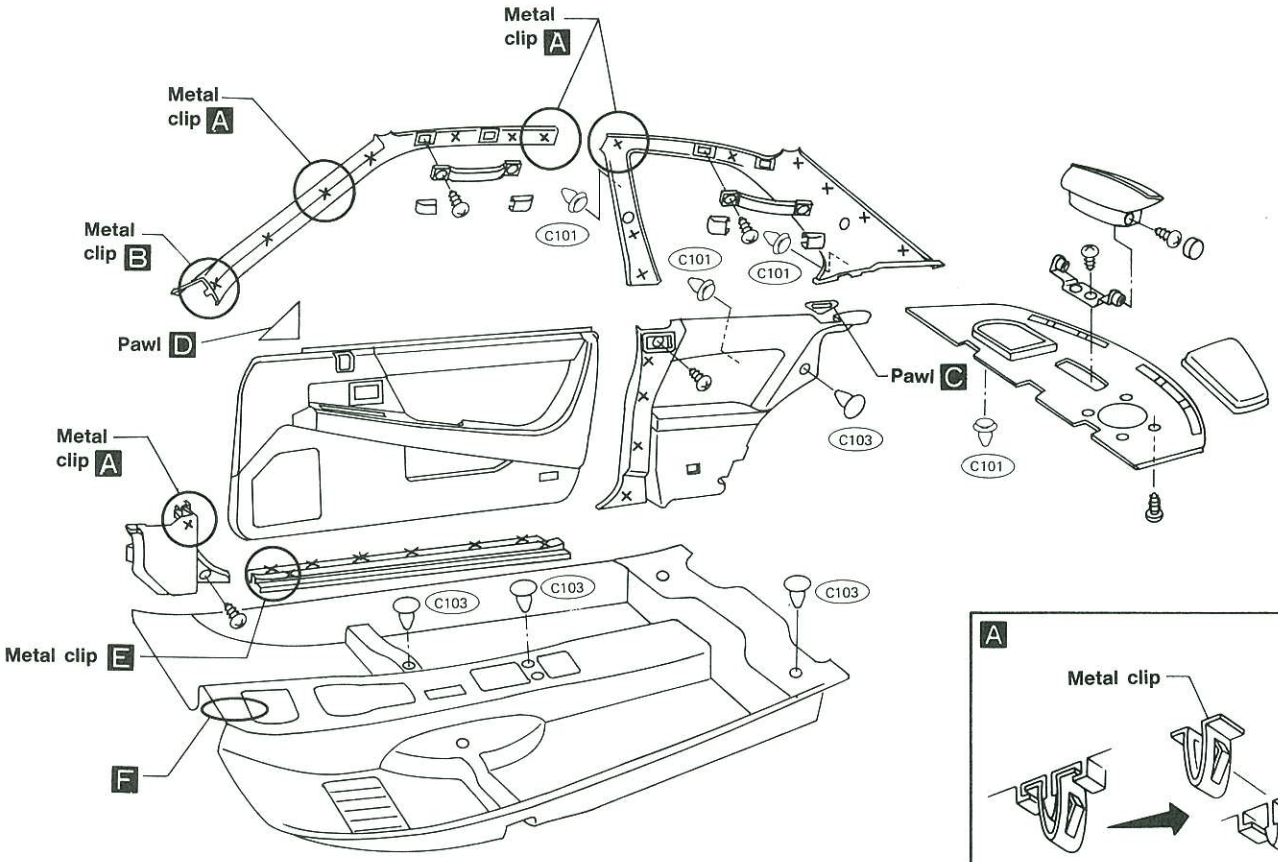

F
Pawl
Metal clip
Metal clip


G
Pawl
Metal clip

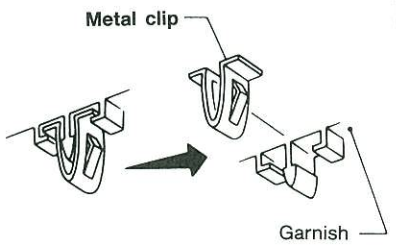
MBF503A

Interior

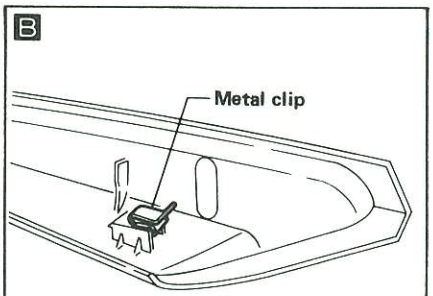
SIDE AND FLOOR TRIM — Passenger room



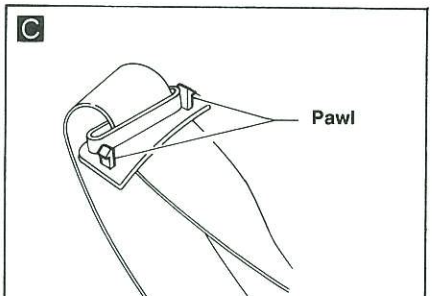
A



B

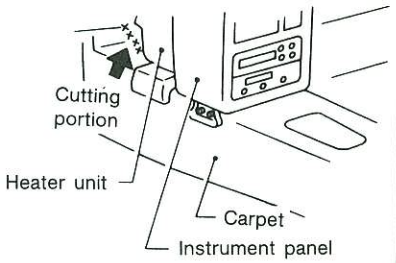


C

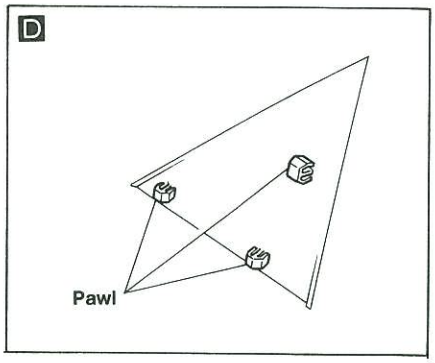


F

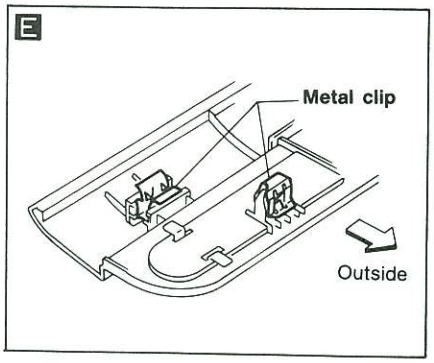
When removing or installing carpet, instrument panel has to be removed or carpet has to be cut at the portion shown by arrow, as carpet is a one-piece design.

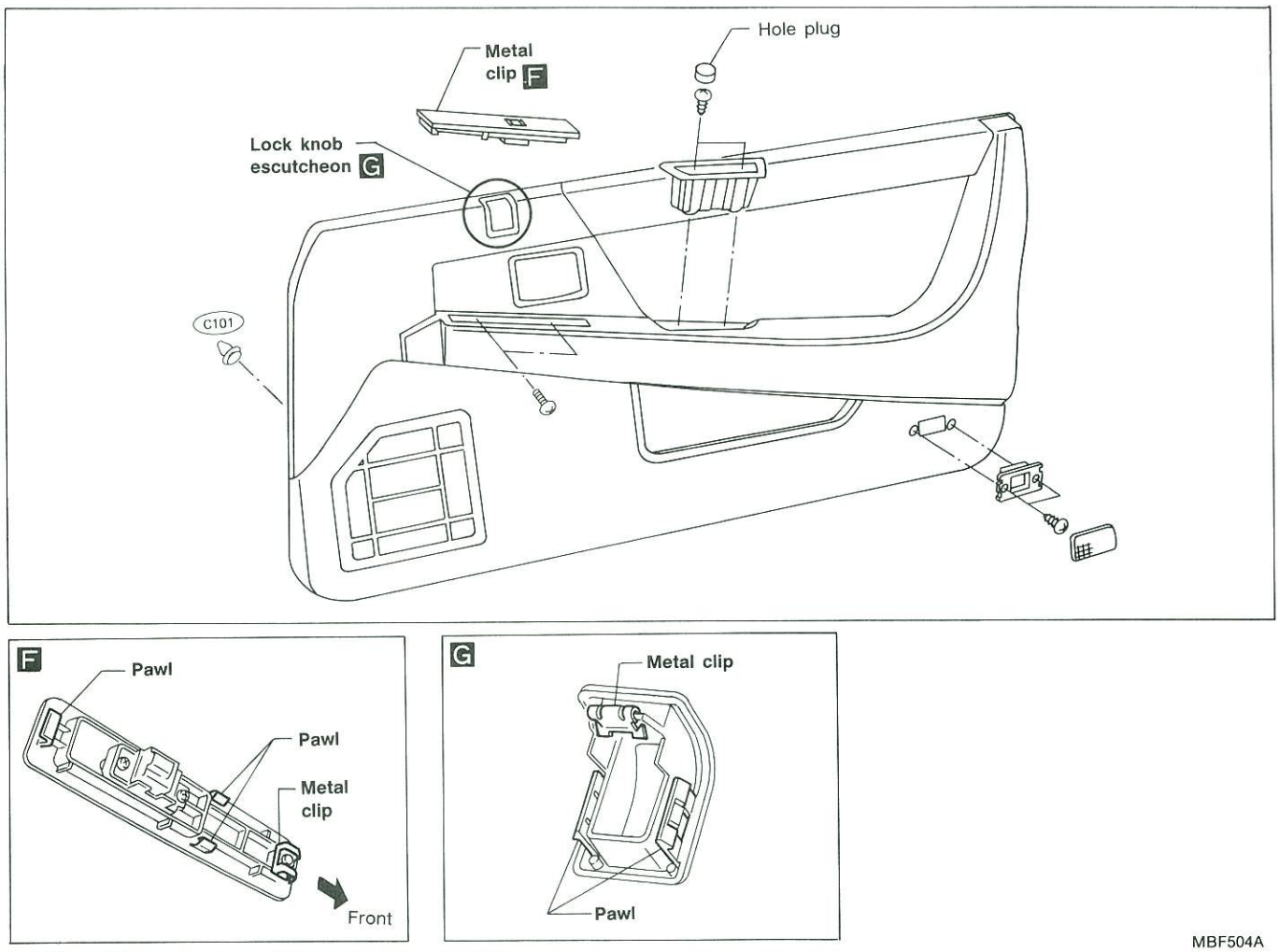


D



E





REMOVAL — Door finisher assembly

1. Remove power window switch F and disconnect connectors.
2. Remove lock knob escutcheon and door step lamp.
3. Disconnect door step lamp connector and remove screws from power window switch hole.
4. Remove door finisher assembly

REMOVAL — Front pillar garnish

1. Remove assist strap and body side welt.
2. Remove front pillar garnish.

REMOVAL — Rear quarter garnish

1. Remove assist strap and rear seatback.
2. Remove screw at center pillar of side finisher and body side welt.
3. Remove rear quarter garnish while pulling outside side finisher.

REMOVAL — Rear side finisher

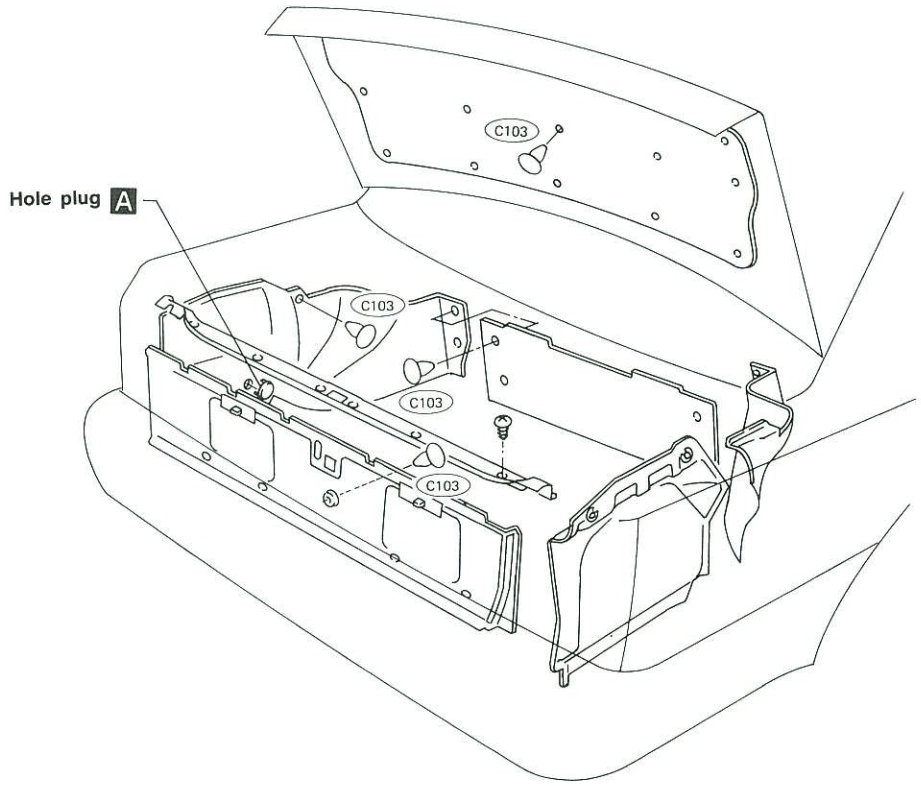
1. Remove rear seat and screw at center pillar
2. Remove body side welt and rear side finisher.

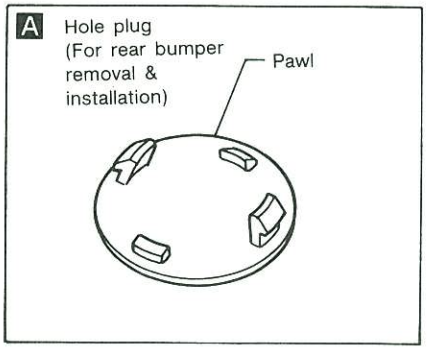
REMOVAL — Floor carpet

1. Remove front seats and rear seat cushion.
2. Remove floor console box and front seat belts.
3. Remove kick plate and rear side finisher.
4. Cut part of floor carpet and remove floor carpet.

Interior (Cont'd)

LUGGAGE ROOM TRIM — Trunk space

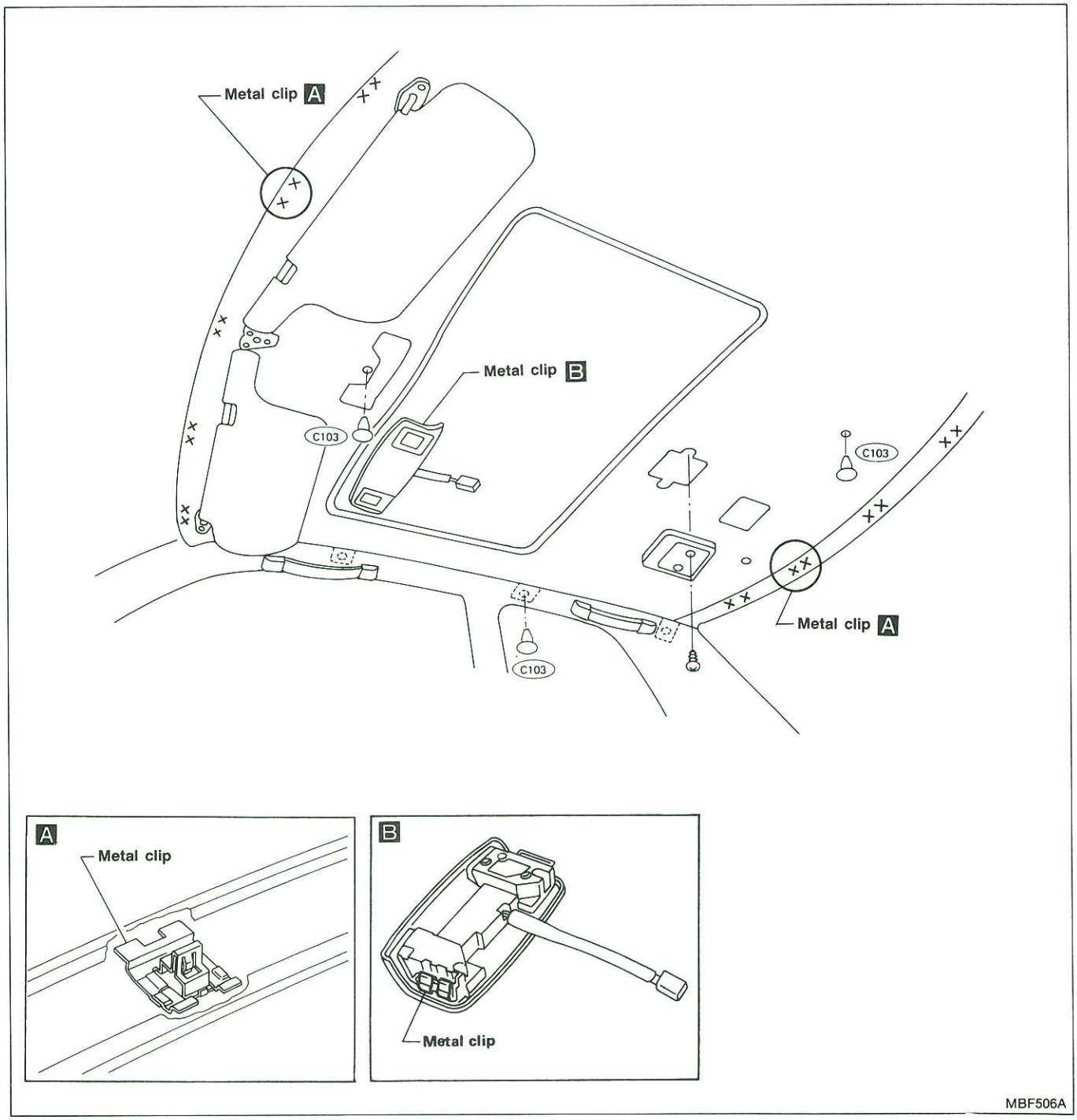




MBF505A

Interior (Cont'd)

ROOF TRIM

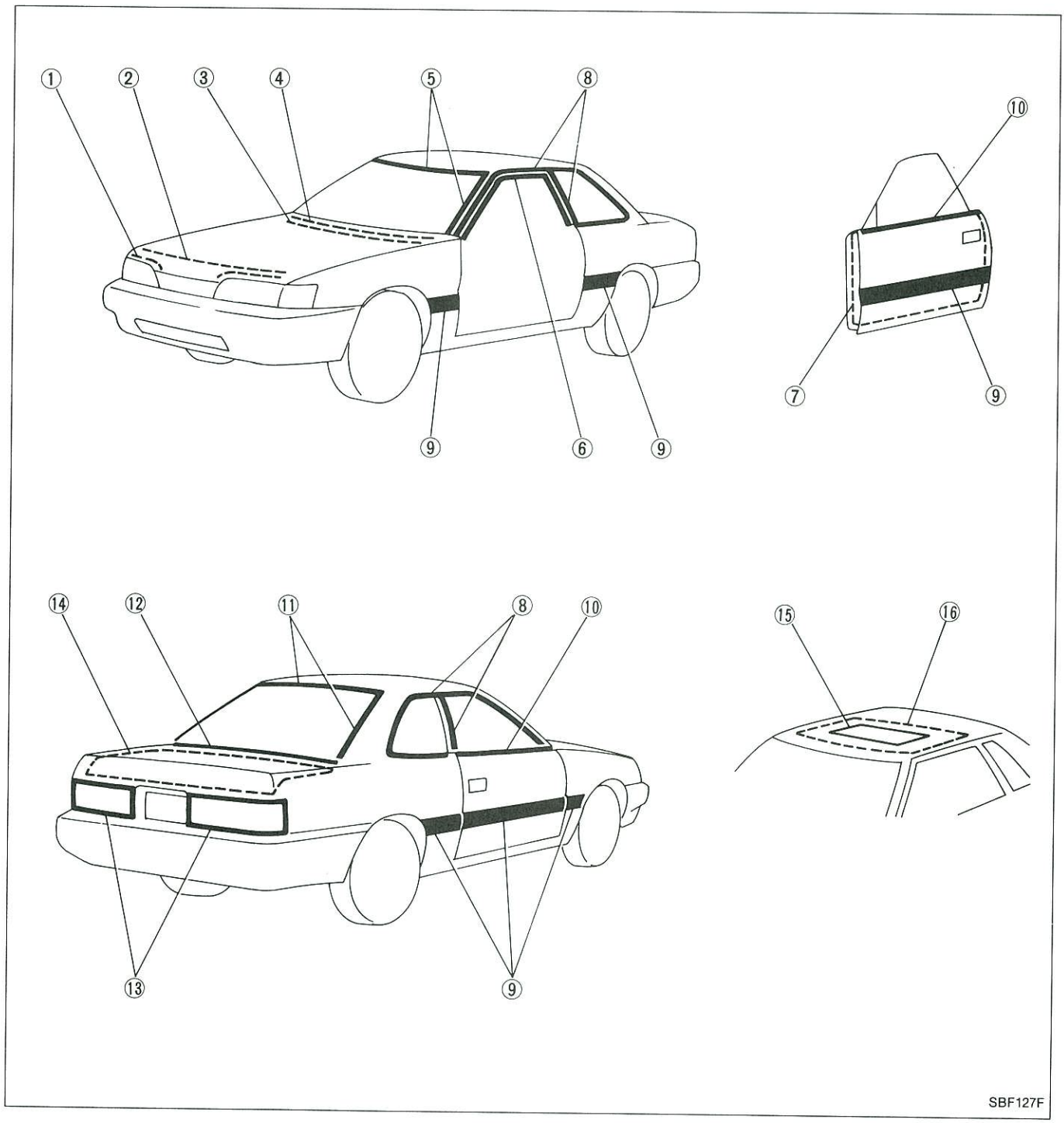


MBF506A

REMOVAL — headlining cloth

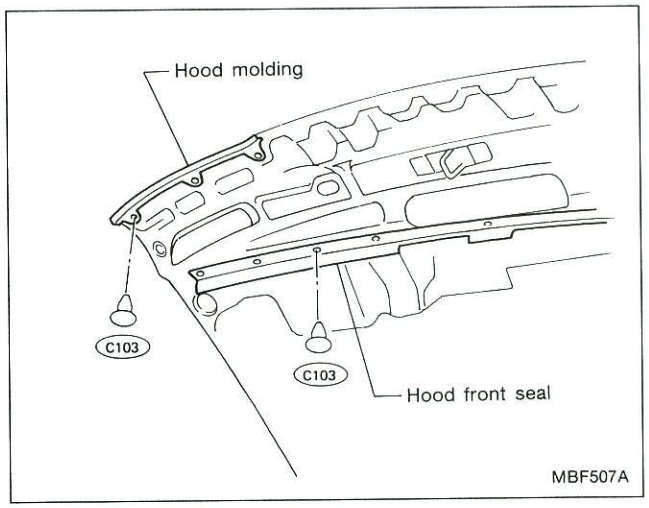
1. Remove sunvisors, assist straps, room lamp and inside mirror.
2. Remove body side welts.
3. Remove front pillar garnishes, rear quarter garnishes and roof finishers.
4. Remove clips and headlining cloth.

Exterior

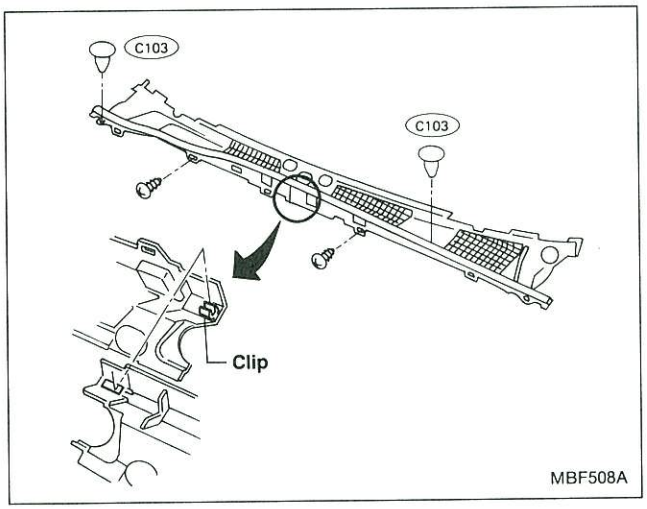


Exterior (Cont'd)

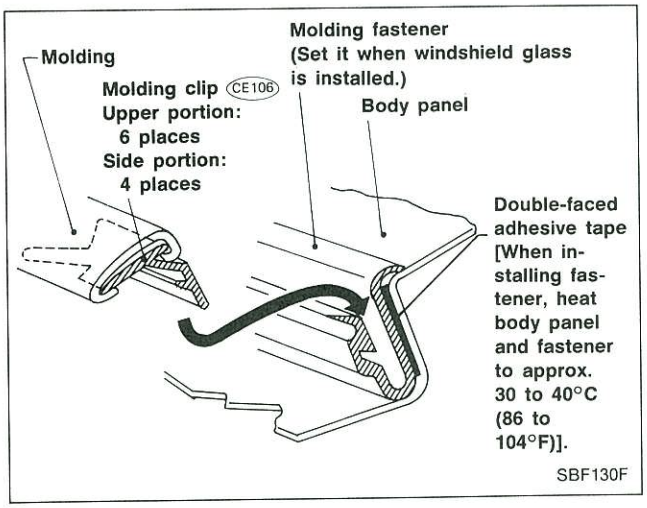
① ② Hood molding and hood front seal



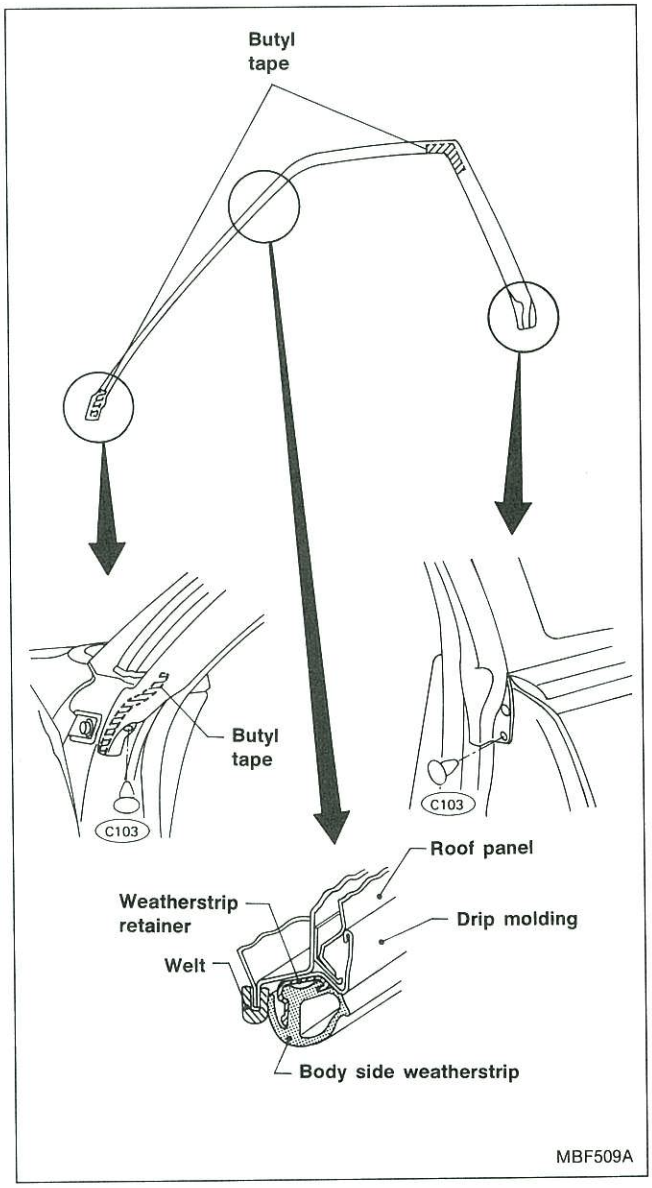
③ ④ Cowl top seal and cowl top grille



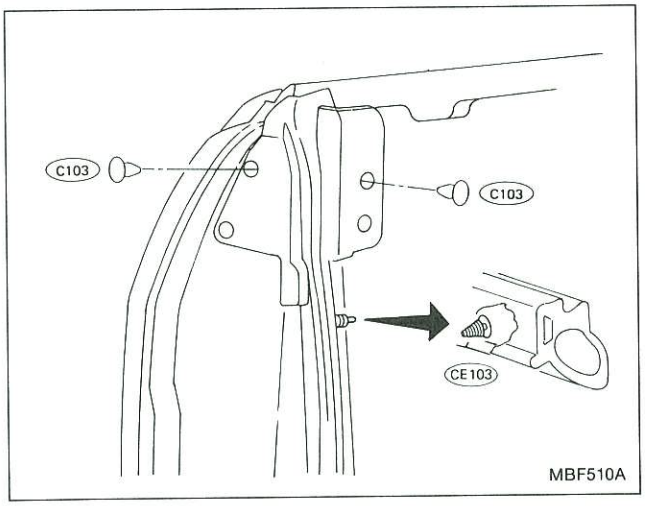
⑤ Windshield upper molding and side molding



⑥ Body side weatherstrip

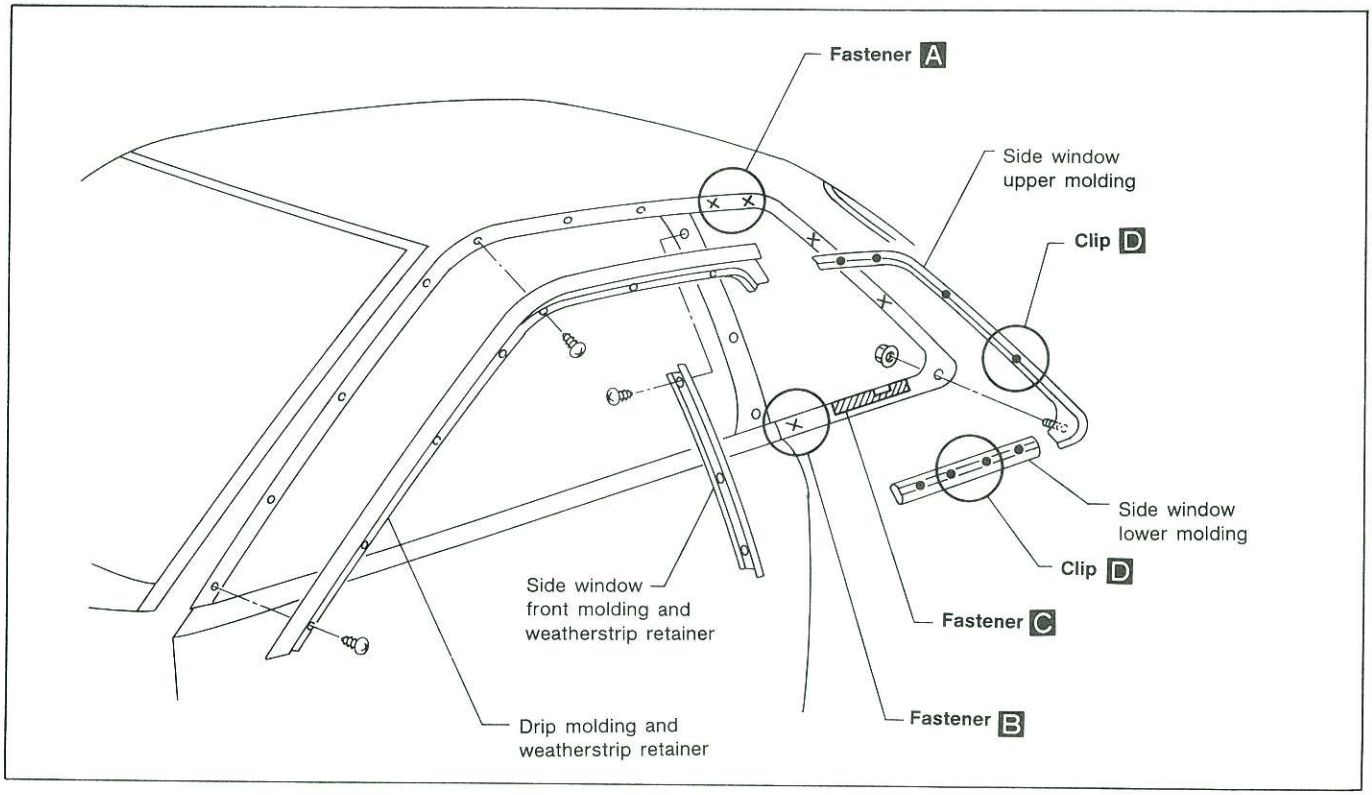


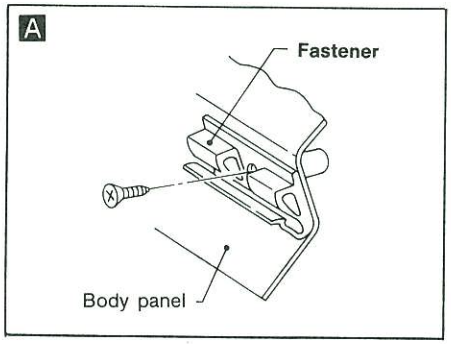
⑦ Door weatherstrip

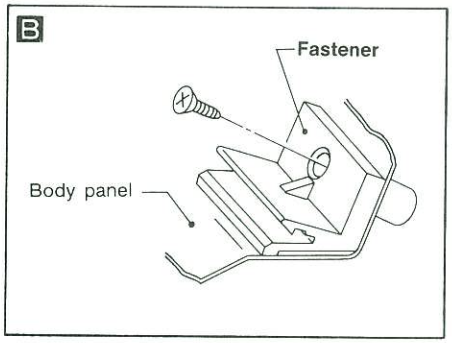


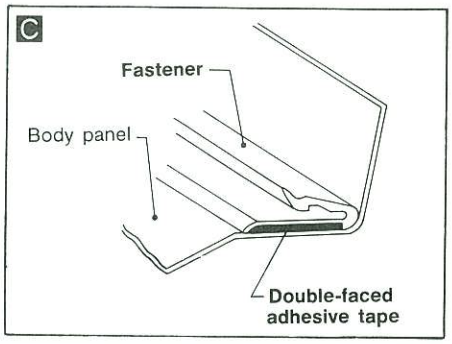
Exterior (Cont'd)

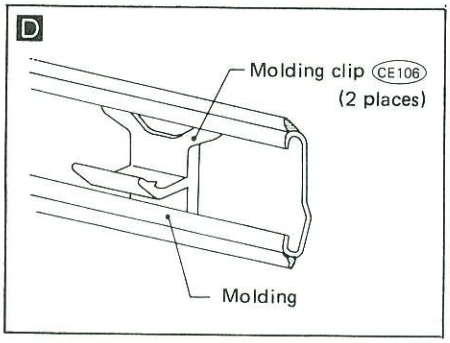
⑧ Drip molding







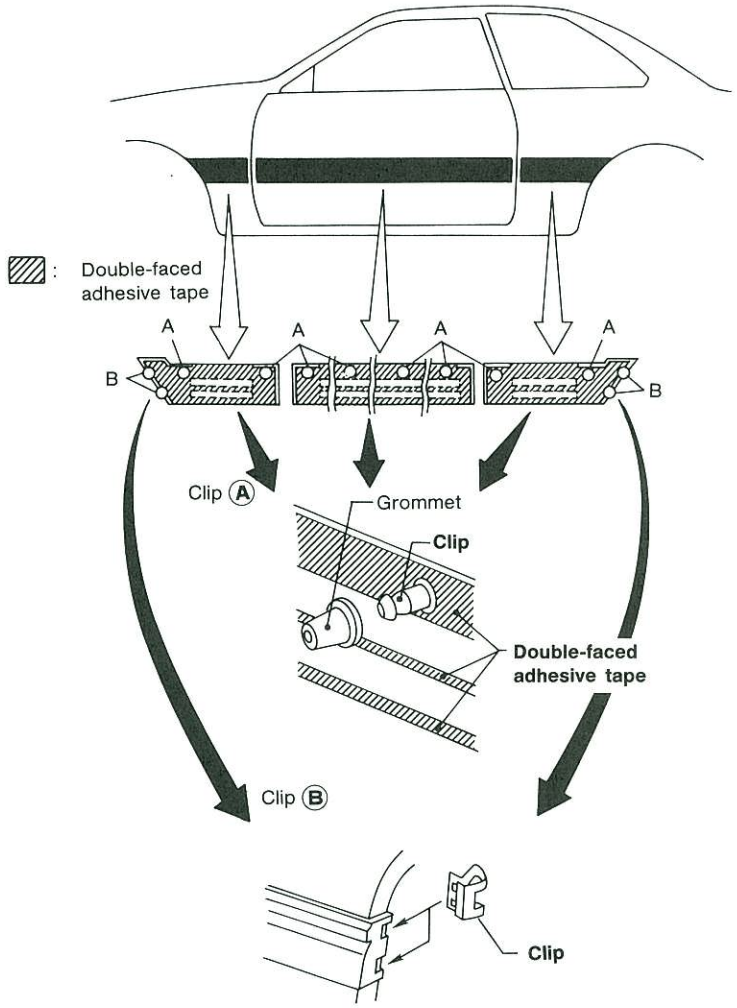




SBF133F

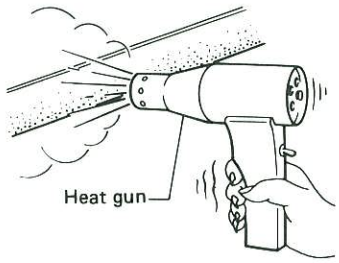
Exterior (Cont'd)

⑨ Side guard molding



- **Remove it only if it is necessary to do so.**
- **Removal:**

1. Heat molding portion to 30 to 40°C (86 to 104°F) with a heat gun.



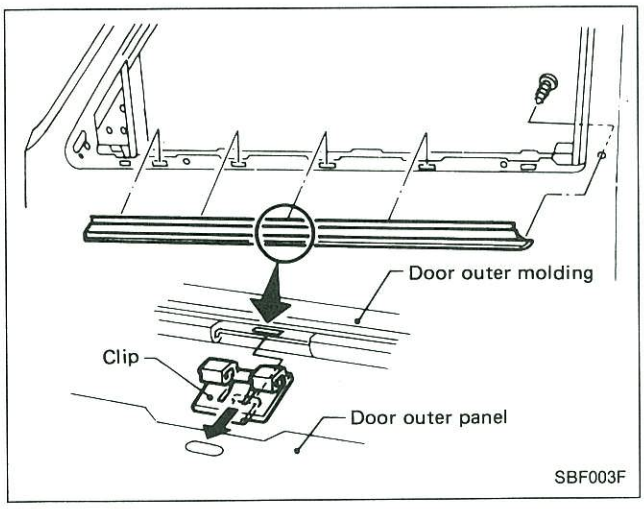
2. Raise end of molding and, while cutting off bonding agent, detach molding.

- **Installation**

1. Remove all traces of bonding agent from body panel. Then clean contact face of body.
2. Heat body panel and molding to 30 to 40°C (86 to 104°F) with a heat gun. Then install molding.

SBF134F

⑩ Door waist outside molding



SBF003F

⑪ Rear window upper molding and side molding

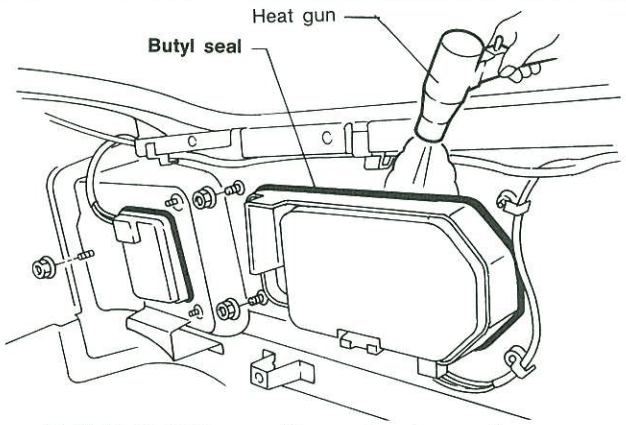
Basically the same as windshield upper molding. Refer to " ⑤ Windshield upper molding and side molding".

⑫ Rear window lower molding

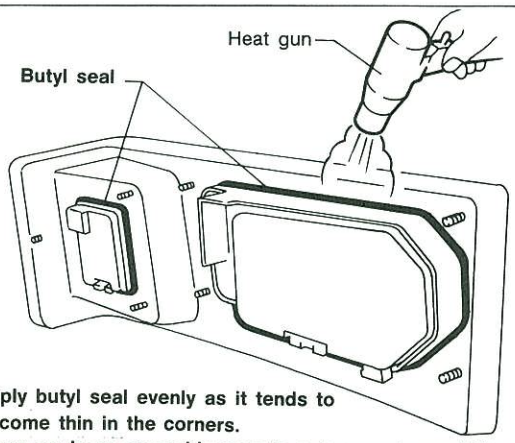
Mounted with screws.

Exterior (Cont'd)

⑬ Rear combination lamp



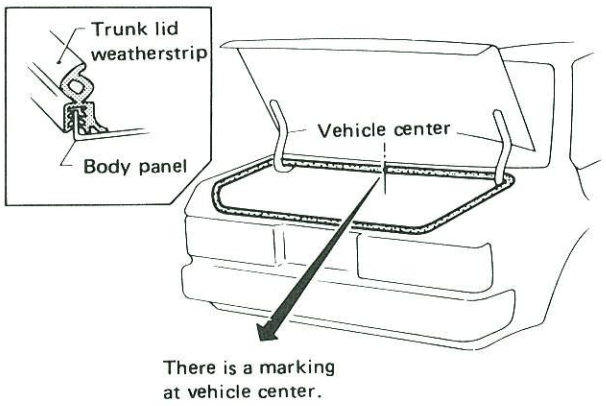
- Warm up lamp assembly area to a temperature a little below 60°C (140°F).



- 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).

SBF135F

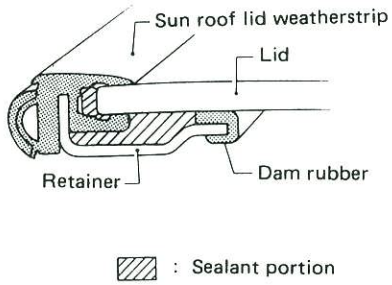
⑭ Trunk lid weatherstrip



SBF971C

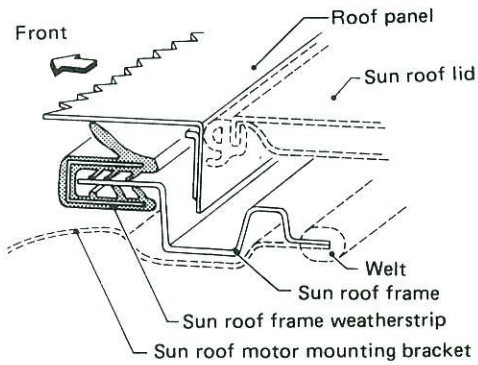
⑮ Sun roof lid weatherstrip

Sun roof lid weatherstrip is bonded to lid.



SBF994F

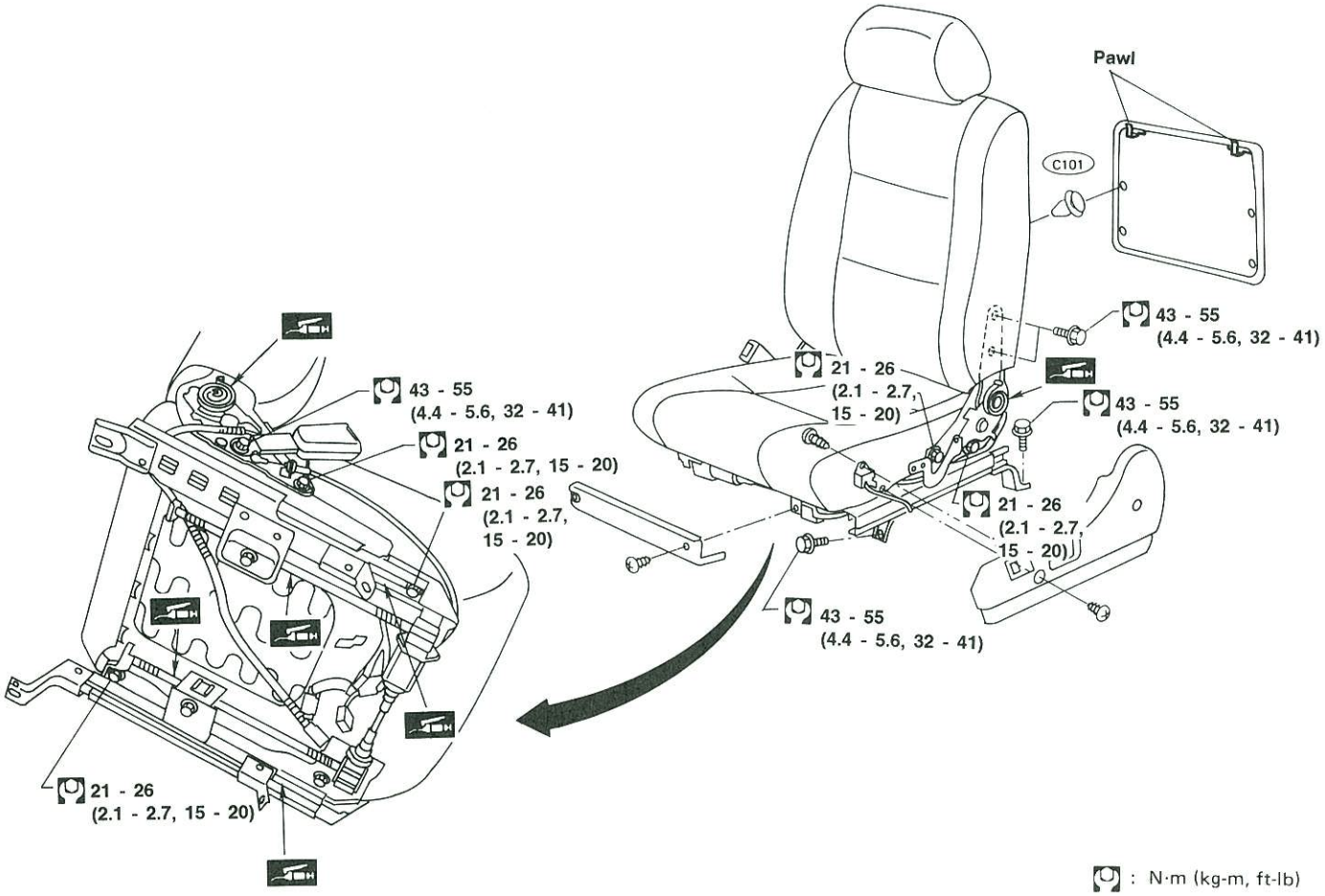
⑯ Sun roof frame weatherstrip

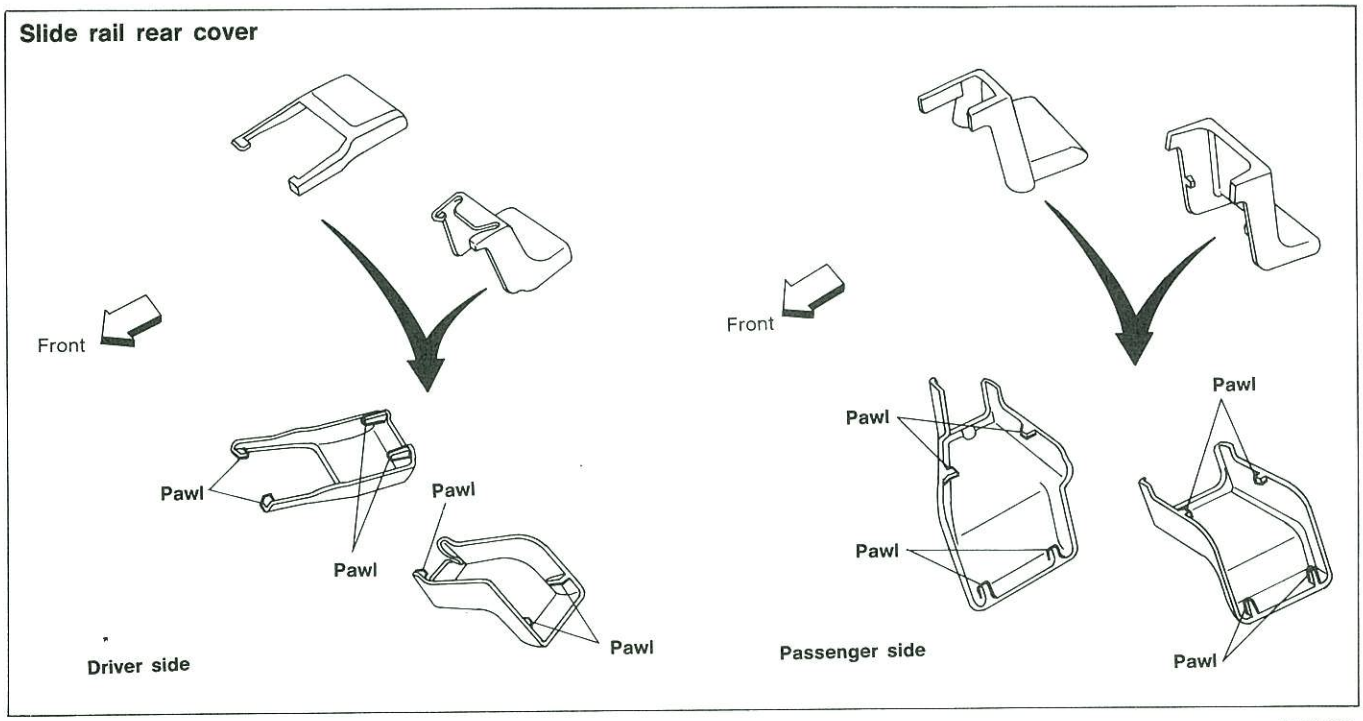


SBF443C

- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat

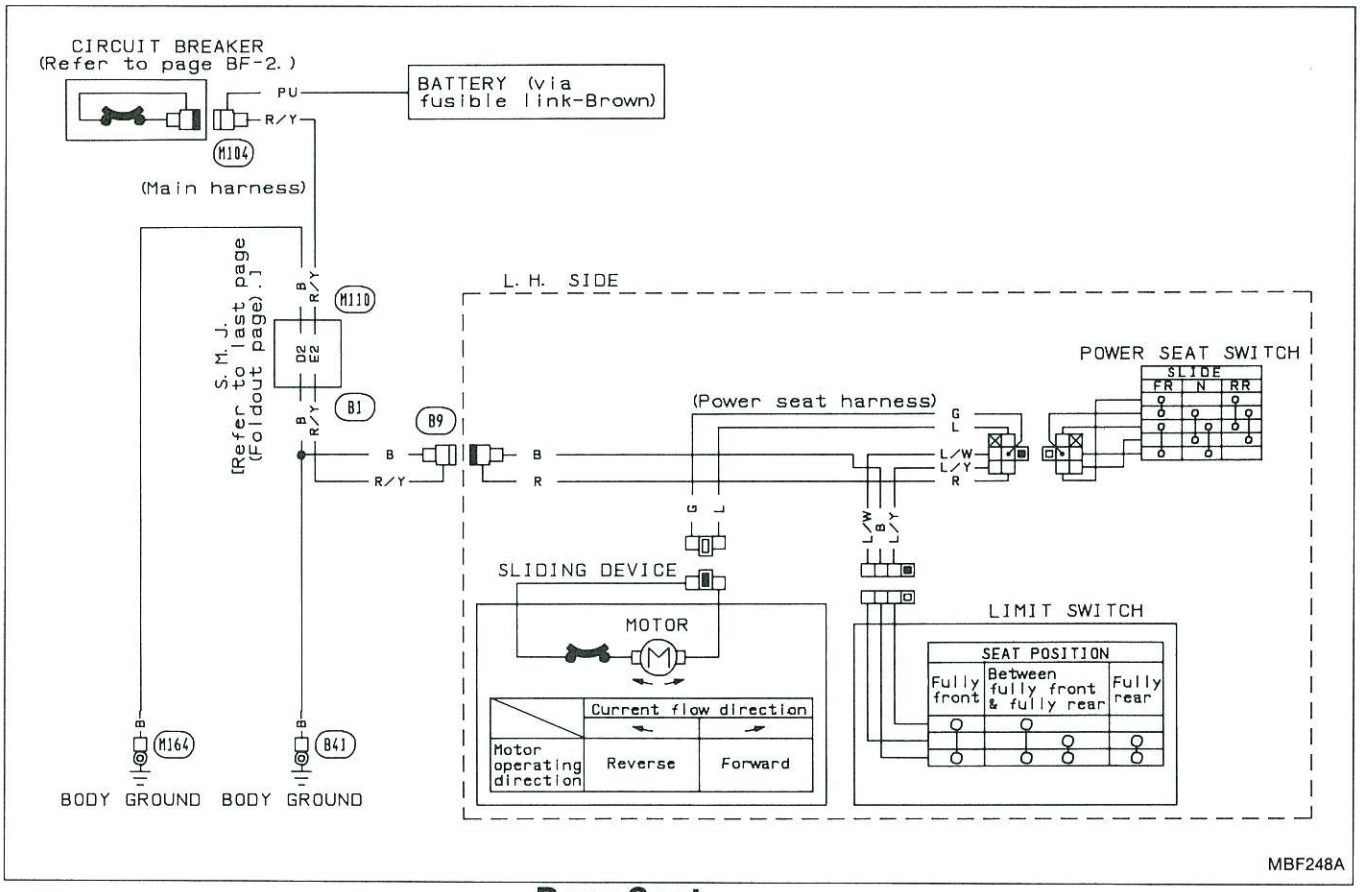




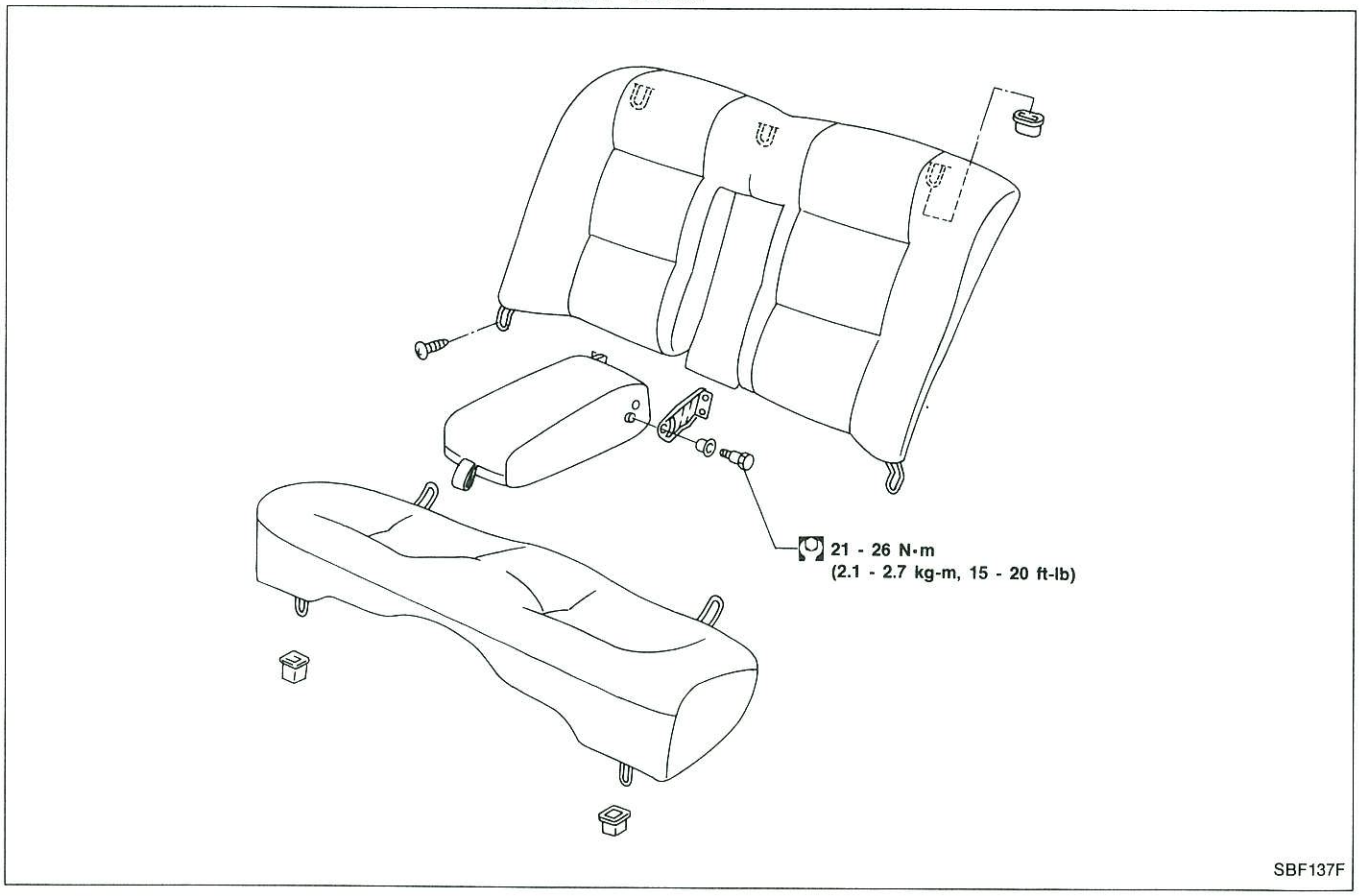
MBF520A

Front Seat (Cont'd)

POWER SEAT/WIRING DIAGRAM

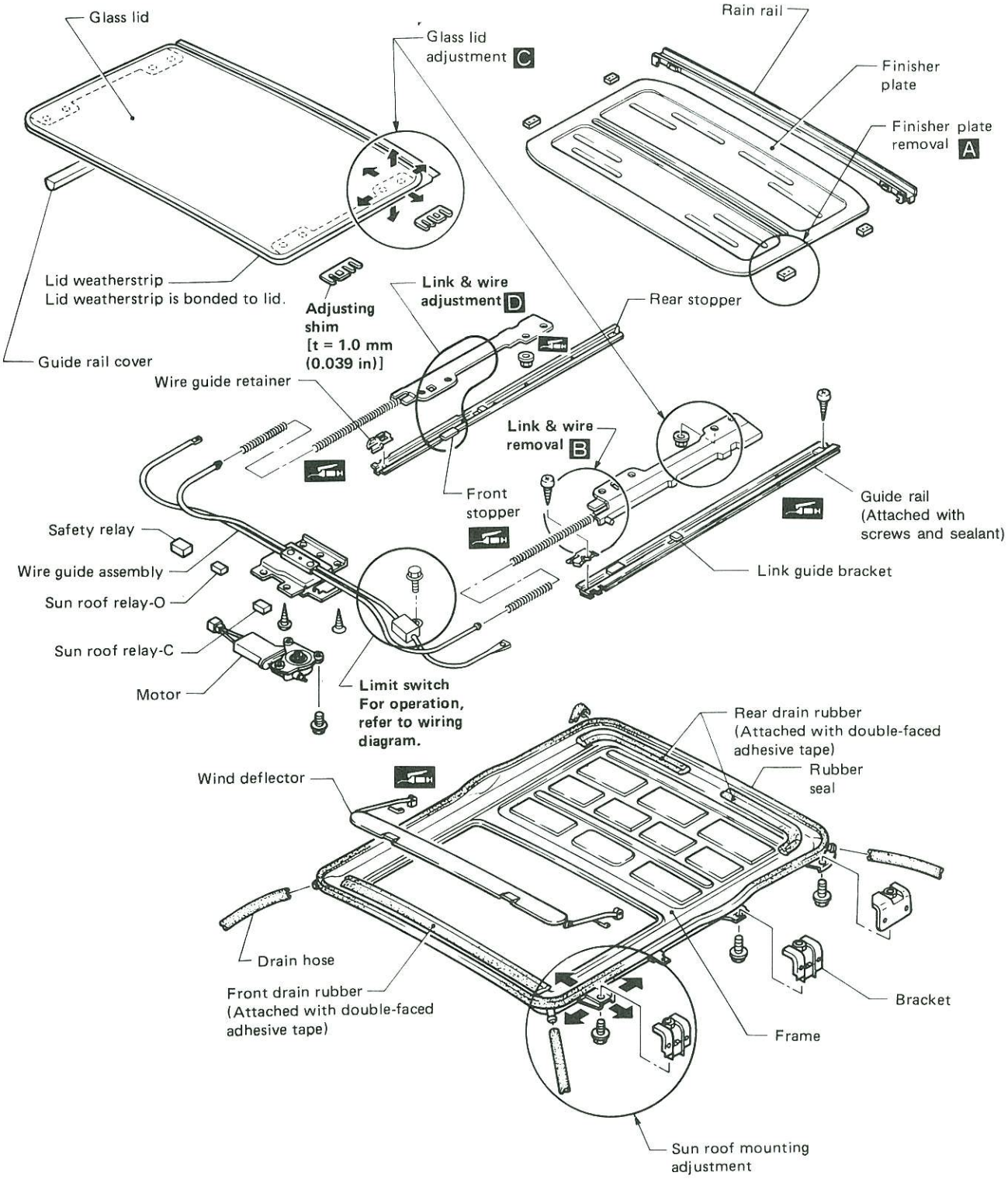


Rear Seat



Electric Sun Roof

- After any adjustment, check sun roof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to damage it.
- It is desirable for easy installation to mark each point before removal.

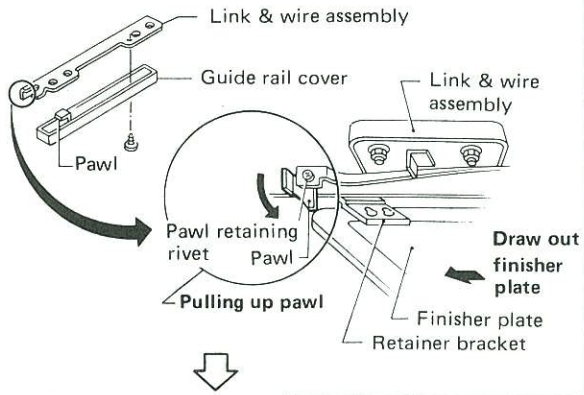


Electric Sun Roof (Cont'd)

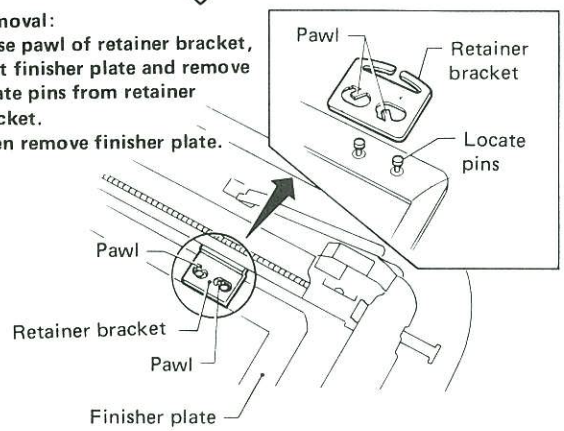
Finisher plate removal & installation

A

Remove guide rail cover and pull up pawl, then draw out finisher plate with sun roof lid open.



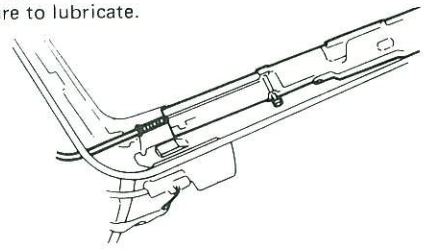
Removal:
Raise pawl of retainer bracket, shift finisher plate and remove locate pins from retainer bracket.
Then remove finisher plate.



Link & wire removal & installation

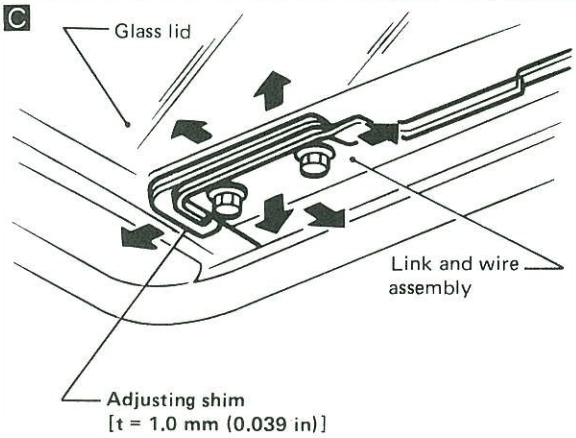
B

- When replacing wire, remove rail first and then link & wire assembly.
- Be sure to lubricate.



Glass lid adjustment

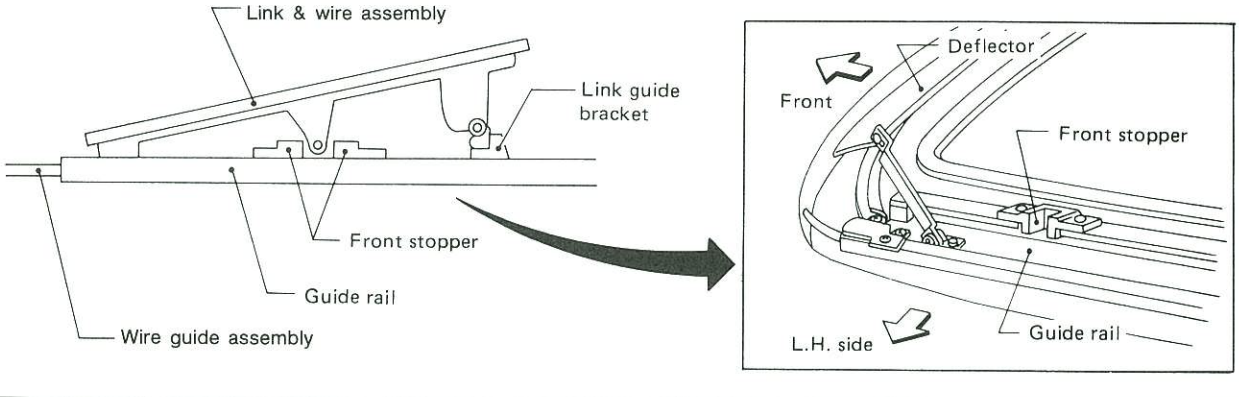
C



Link & wire adjustment

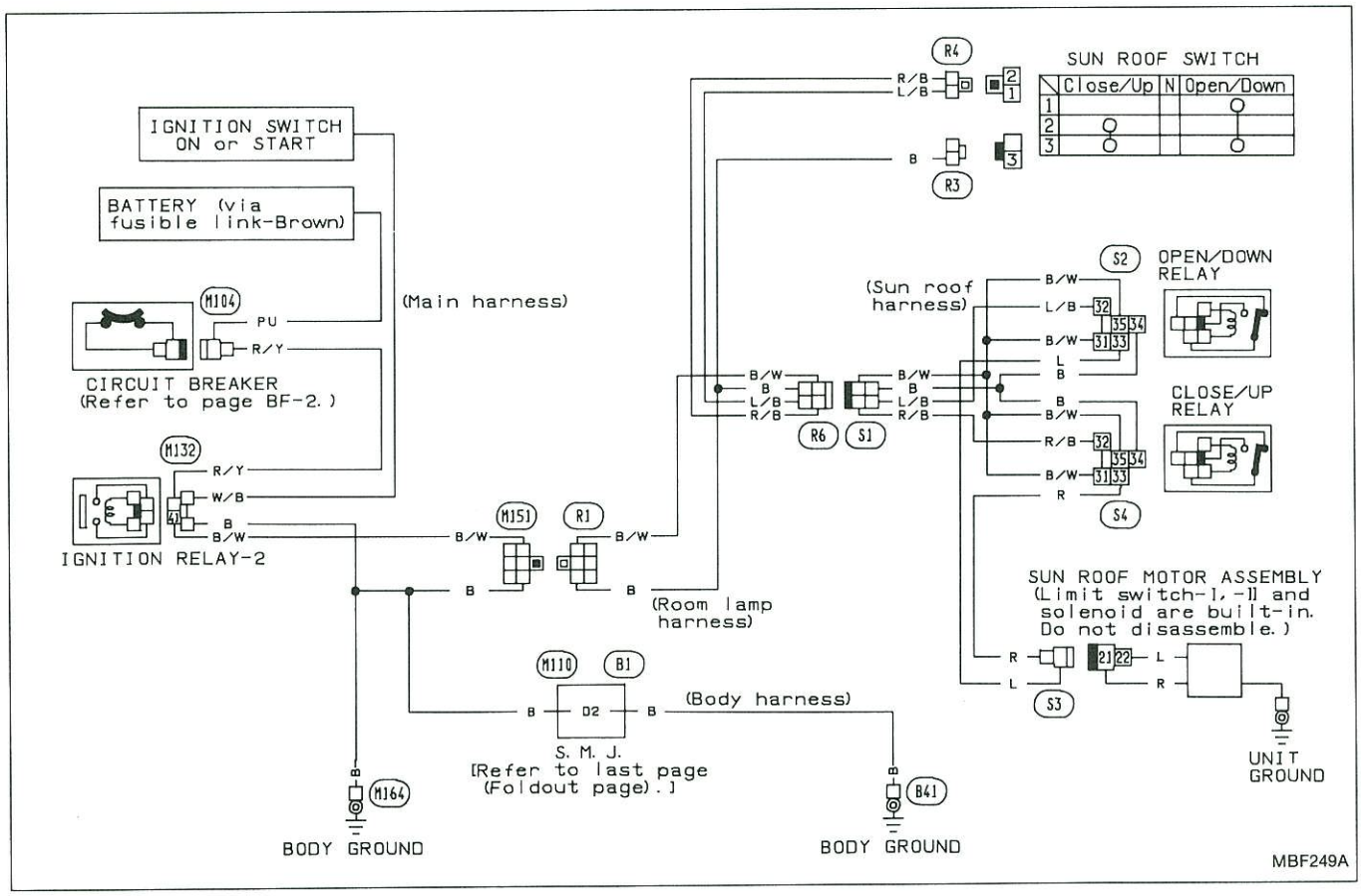
D

Move link & wire assembly to closed lid position and after closing fully (as shown in figure below), install motor.



SBF995F

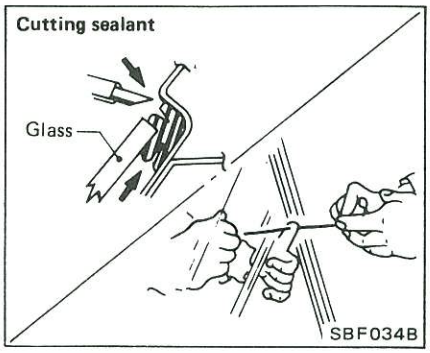
Wiring Diagram



Windshield and Rear Window

REMOVAL

After removing moldings, remove glass.

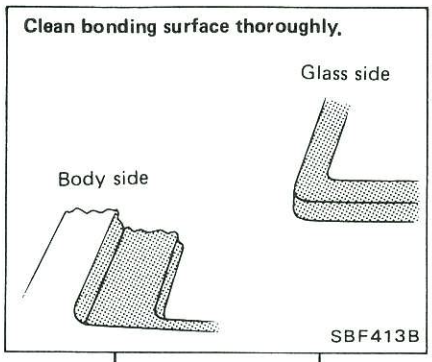


CAUTION:
Be careful not to scratch glass when removing.

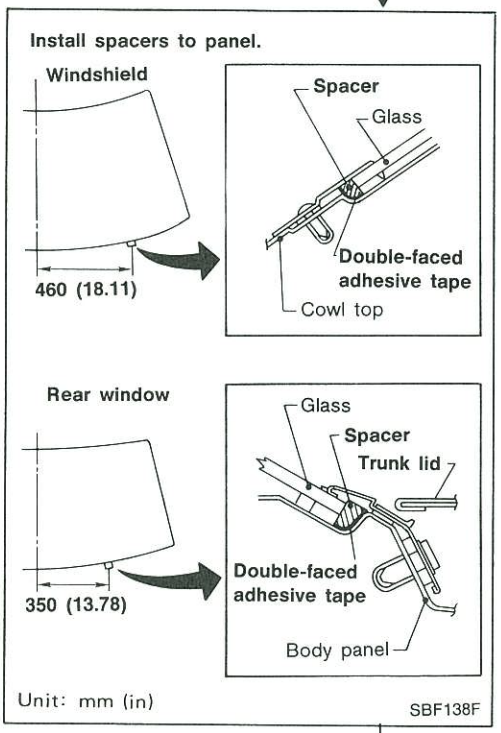
INSTALLATION

- **Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.**
- **After installation, the vehicle should remain stationary for about 24 hours.**
- **Do not use sealant which is more than 12 months past its production date.**
- **Do not leave cartridge unattended with its cap open.**
- **Keep primers and sealant in a cool, dry place. Ideally, sealant should be stored in a refrigerator.**
- **Be sure to install moldings.**

WARNING:
Keep heat or open flames away as primers are flammable.

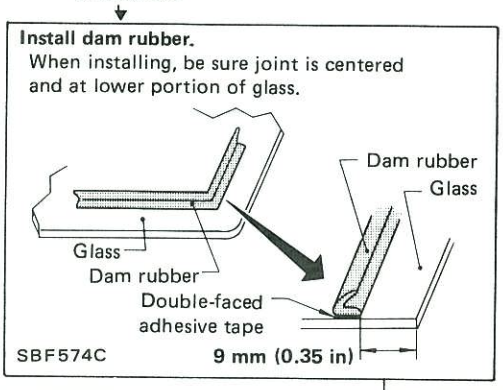


Body side

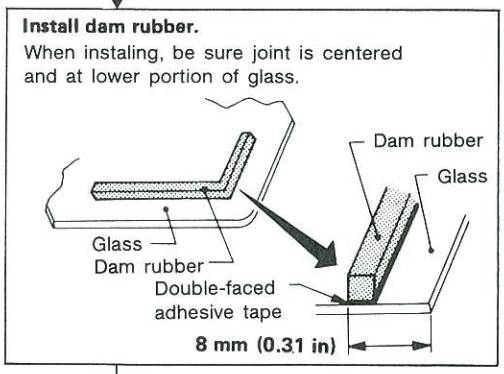


Glass side

Windshield



Rear window

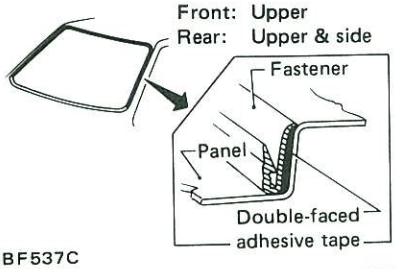


Ⓐ Ⓑ

Windshield and Rear Window (Cont'd)

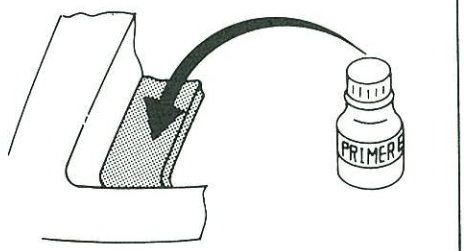
Ⓐ

Install molding fastener.
When installing it, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F)



SBF537C

Apply primer E.

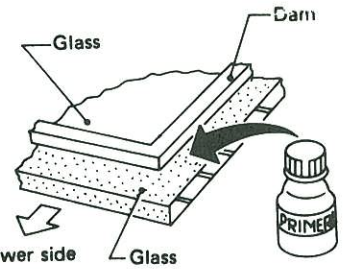


SBF038B

CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Ⓑ

Apply primer A.

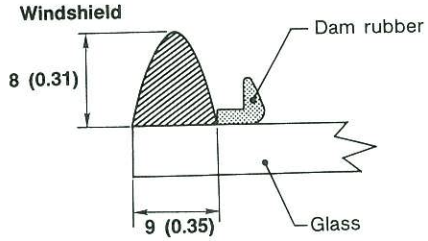


SBF719C

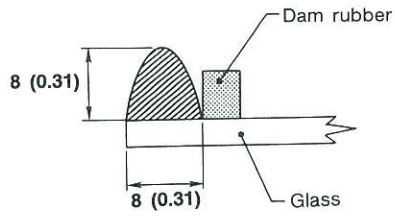
CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Apply sealant evenly.

Windshield



Rear window



SBF139F

Unit: mm (in)

Set glass in position and press glass lightly and evenly.

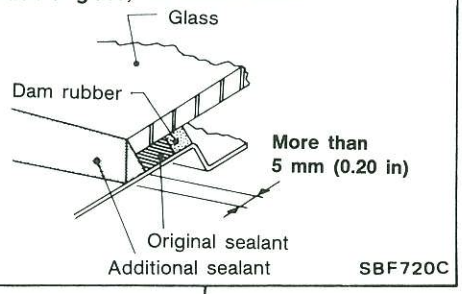
CAUTION:
Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

Ⓒ

Windshield and Rear Window (Cont'd)

Ⓒ

Apply additional sealant uniformly to the lower portion of glass, as shown below:



Check for water leakage.

CAUTION:
For sealant drying period, refer to "Drying Time for Sealant".

Apply sealant to upper & side molding fixing portion.

Set upper and side moldings.

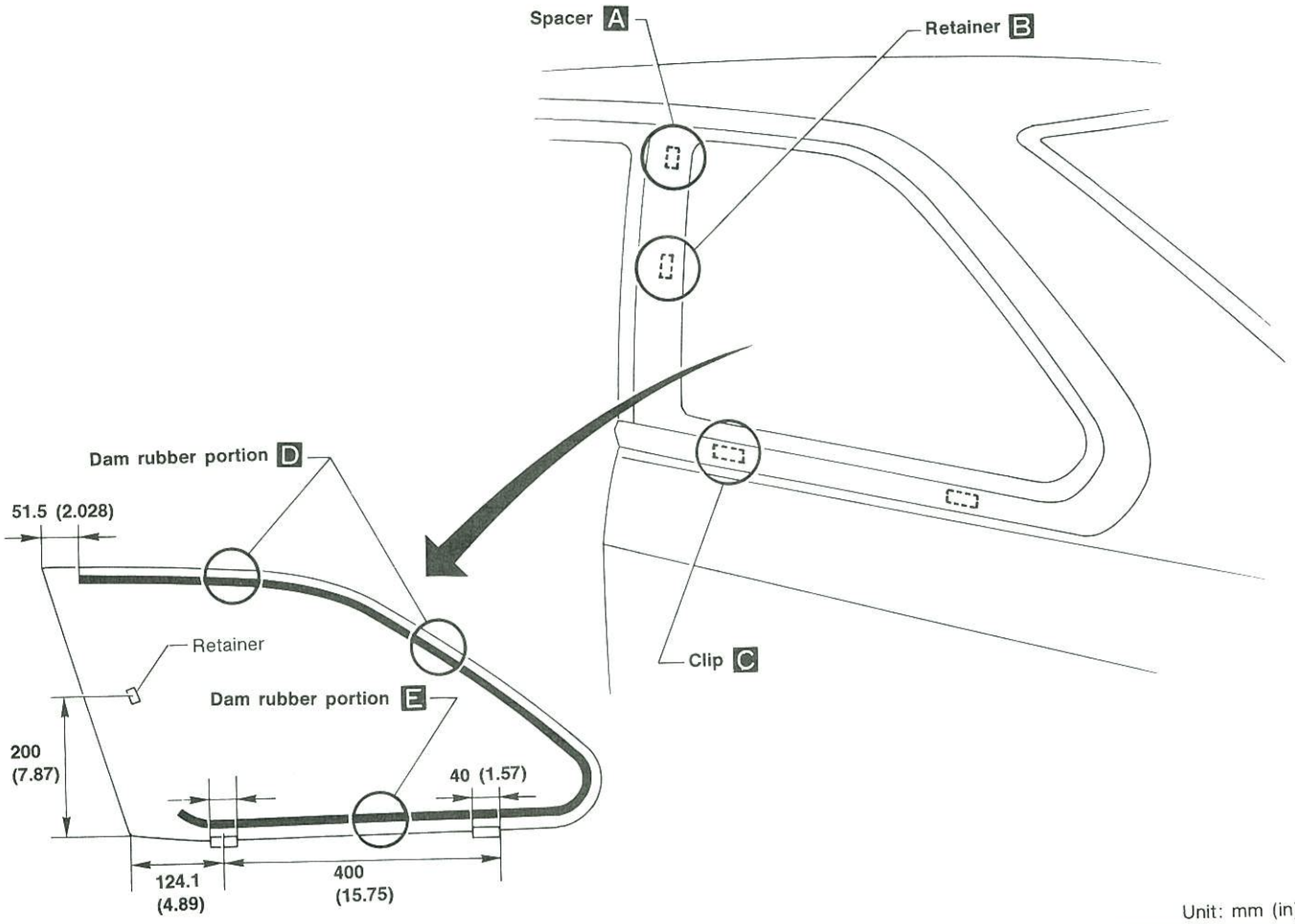
CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

Install lower molding.

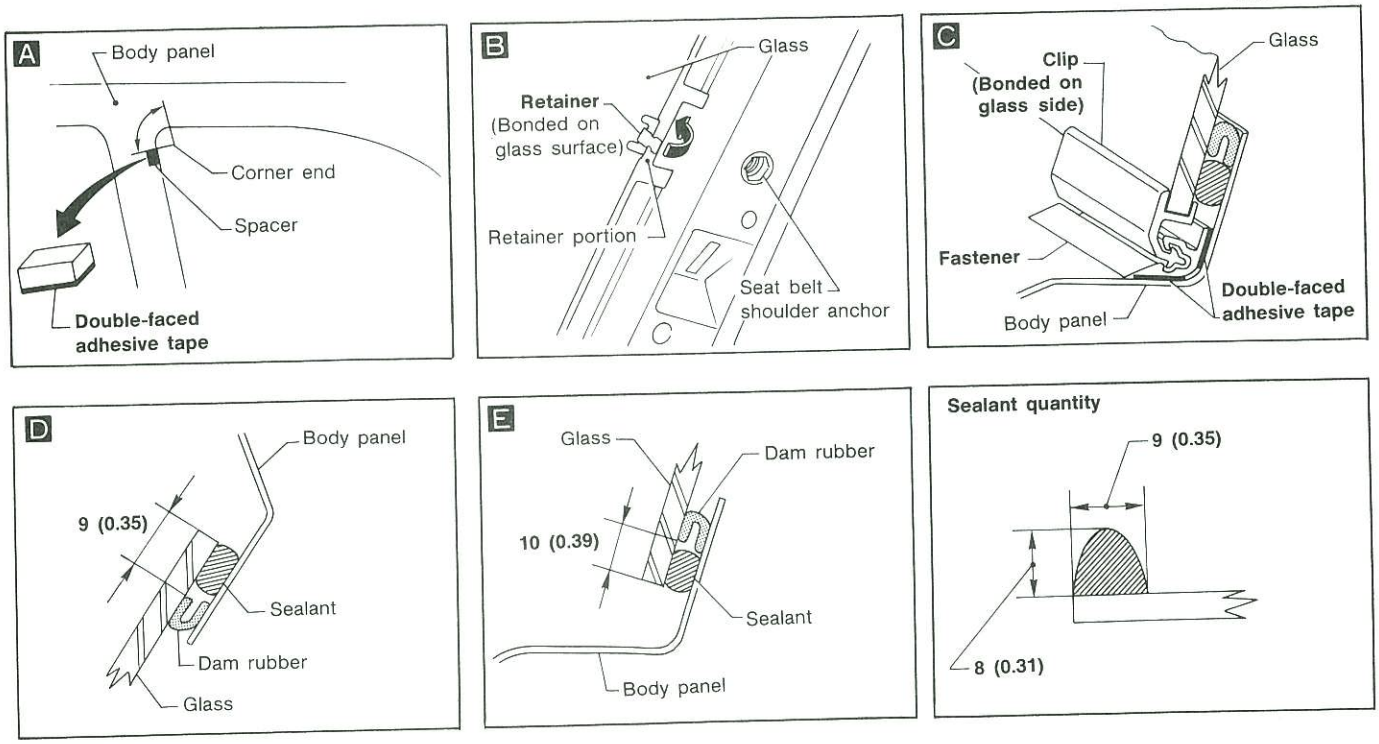
For details of moldings, refer to "Exterior".

Side Window

- For mounting and removing moldings, refer to "Exterior". (See page BF-27.)



Unit: mm (in)



SBF140F

Drying Time for Sealant

Reference: Time required for sealant to dry to desired hardness.

Unit: days

Relative humidity % / Temperature °C (°F)	Windshield, rear window and side window		
	90	50	25
40 (104)	1.0	1.5	3.0
25 (77)	1.5	2.0	4.0
5 (41)	2.5	6.5	10.5

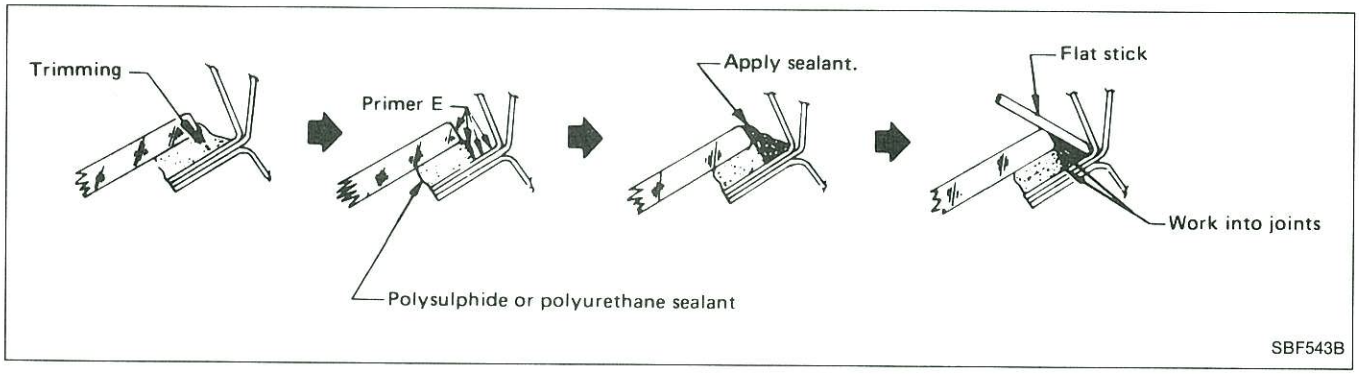
CAUTION:
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repairing Water Leaks for Windshield and Rear Window

Leaks can be repaired without removing and reinstalling glass.

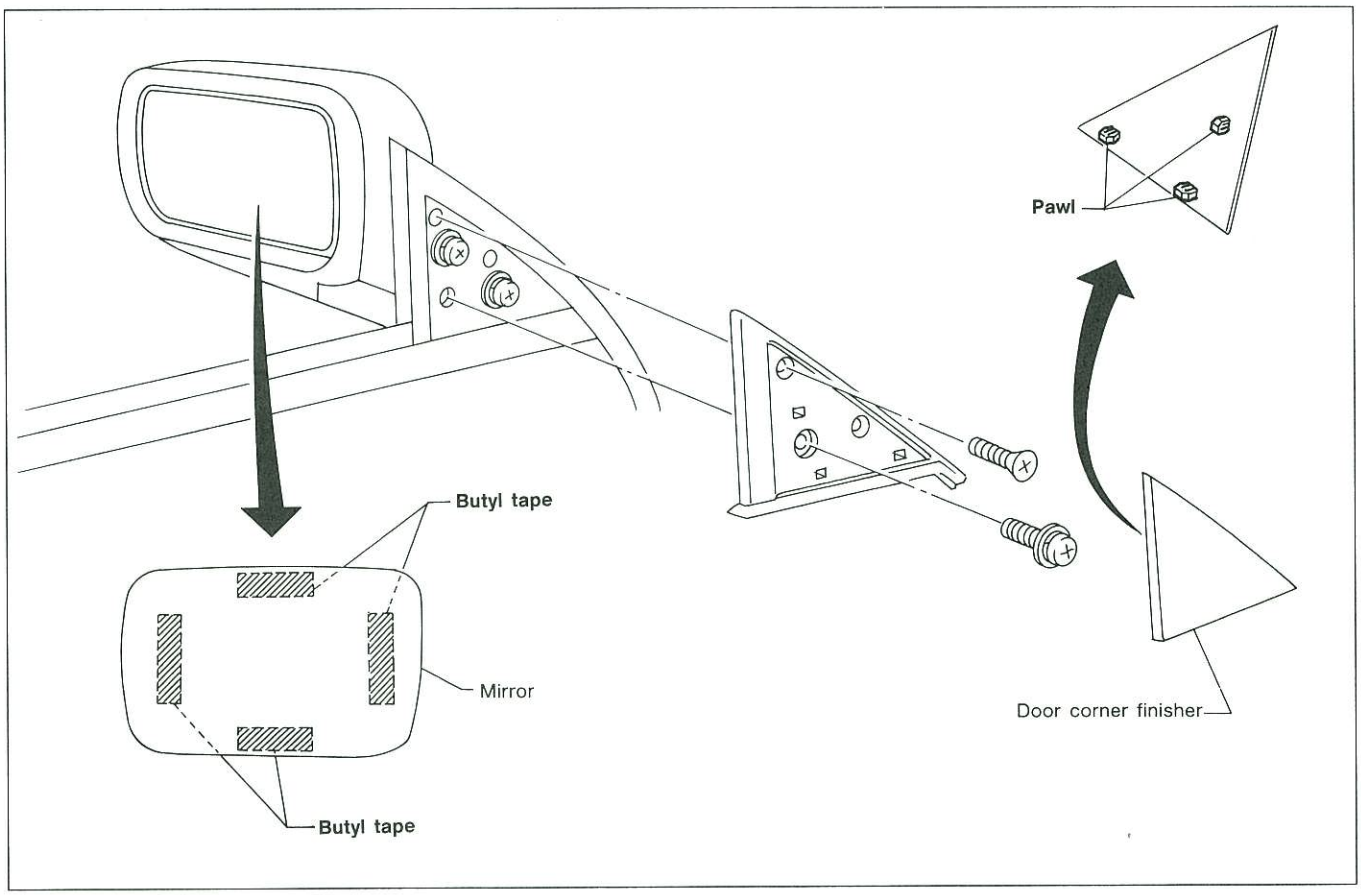
If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

To stop the leak, apply primer and then sealant to the leak point.

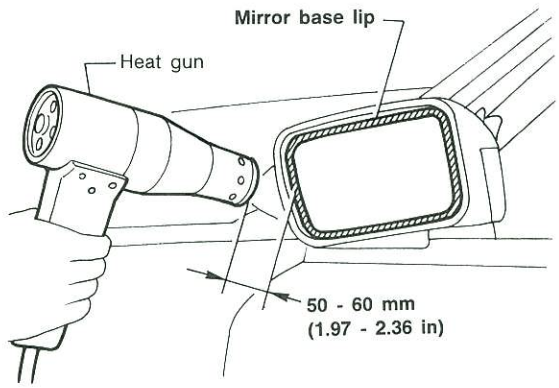


Afterwards, install molding securely.

Door Mirror

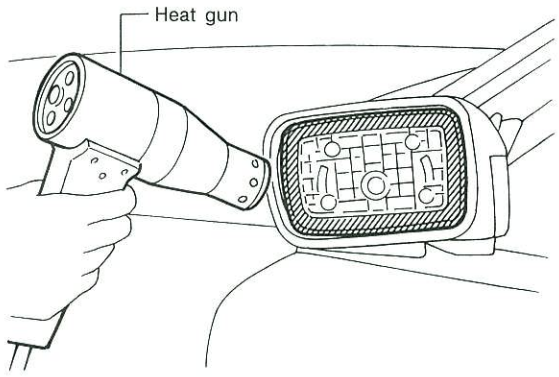


MIRROR REMOVAL AND INSTALLATION



: Heated portion

- Heat door mirror base lip to a temperature of less than 60°C (140°F).
- Remove door mirror, being careful not to scratch it.

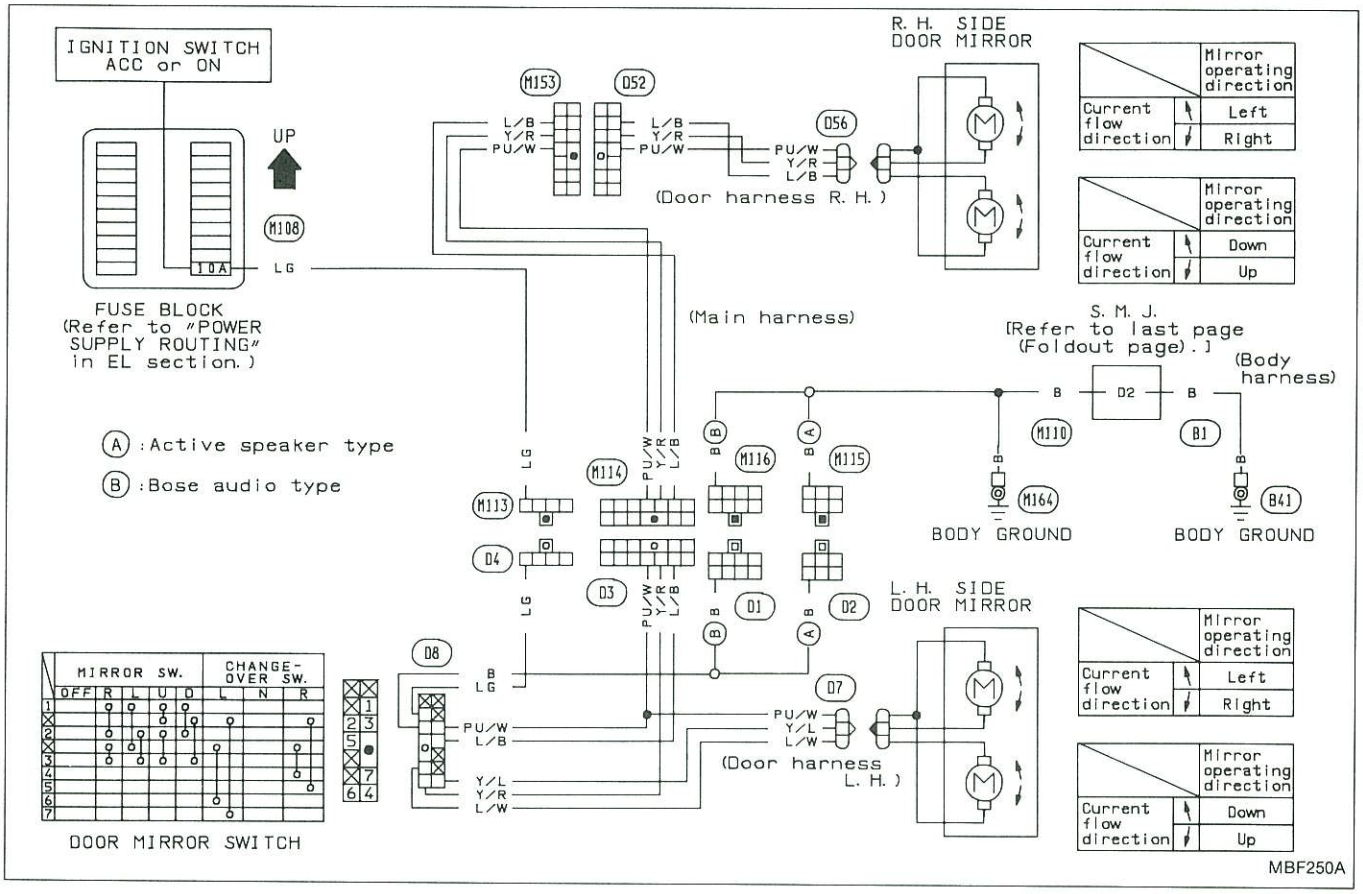


- Heat door mirror base lip to a temperature of less than 60°C (140°F).
- Install door mirror.

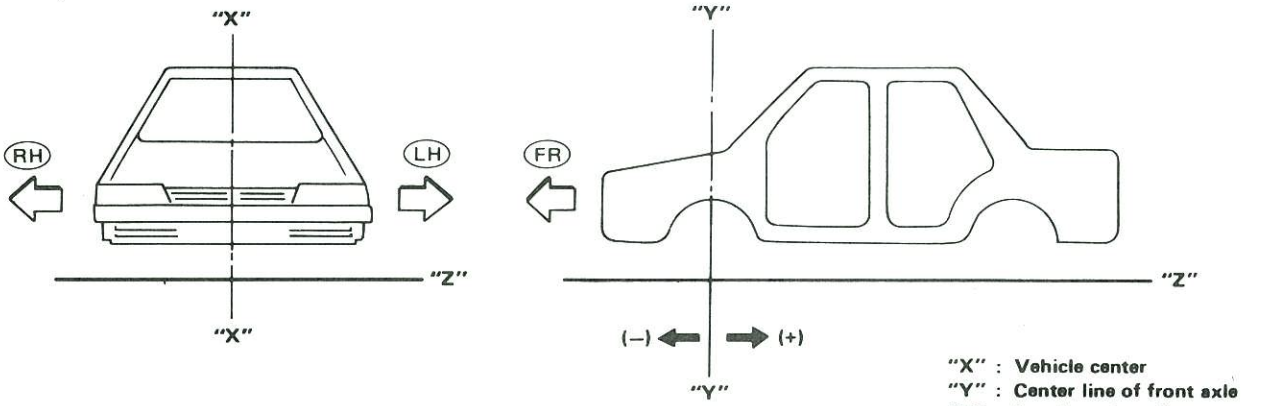
SBF141F

Door Mirror (Cont'd)

WIRING DIAGRAM



- 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".

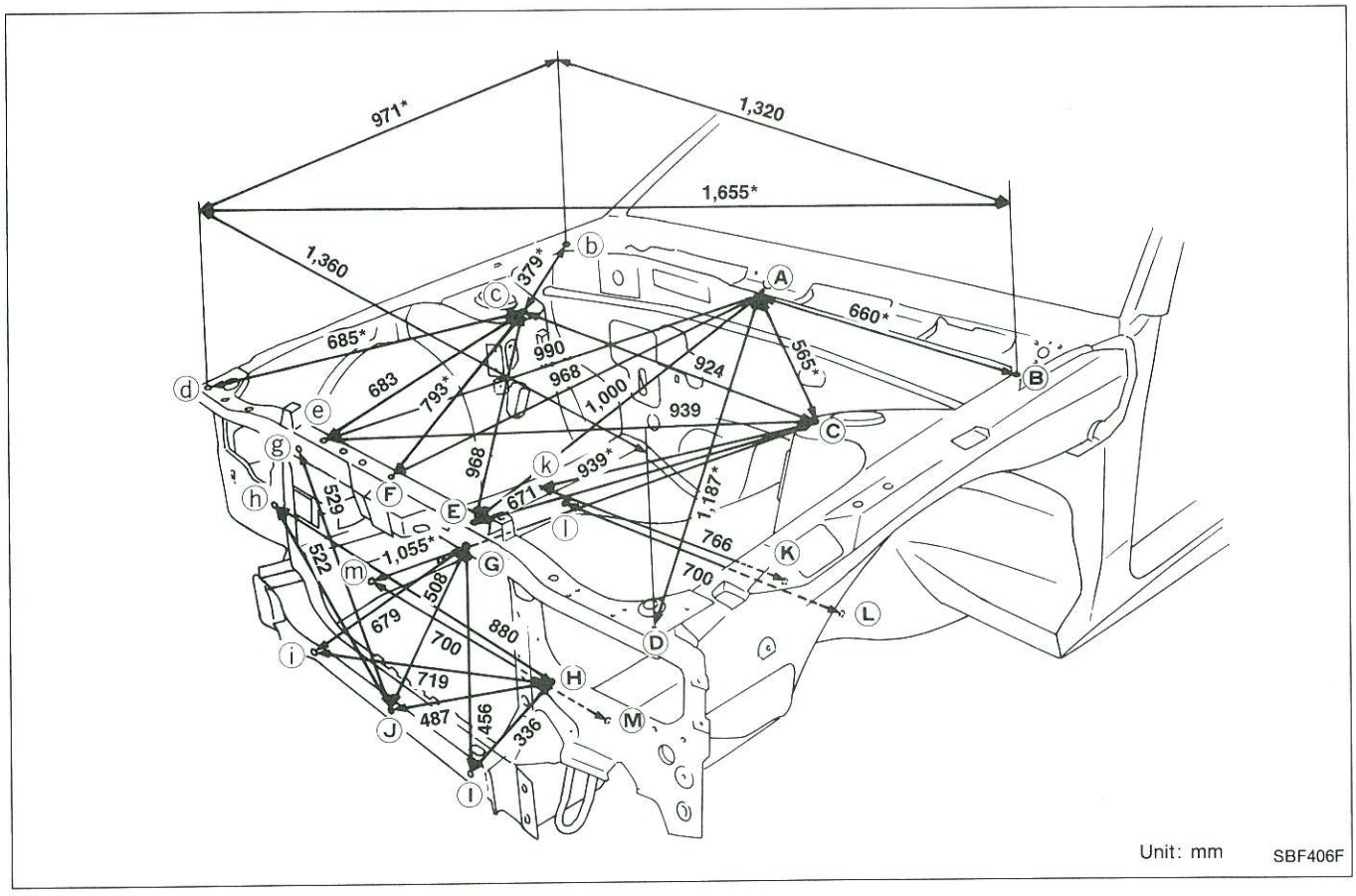


"X" : Vehicle center
"Y" : Center line of front axle
"Z" : Imaginary base line [200 mm below datum line ("OZ" at design plan)]

(LH) : L.H. side
(RH) : R.H. side

Engine Compartment

MEASUREMENT

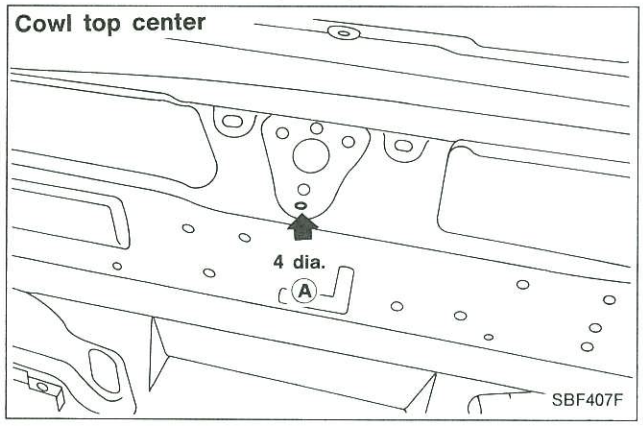


Engine Compartment (Cont'd)

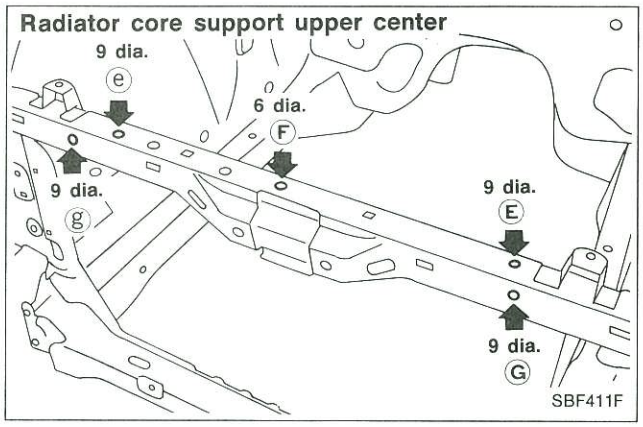
MEASUREMENT POINTS

Unit: mm

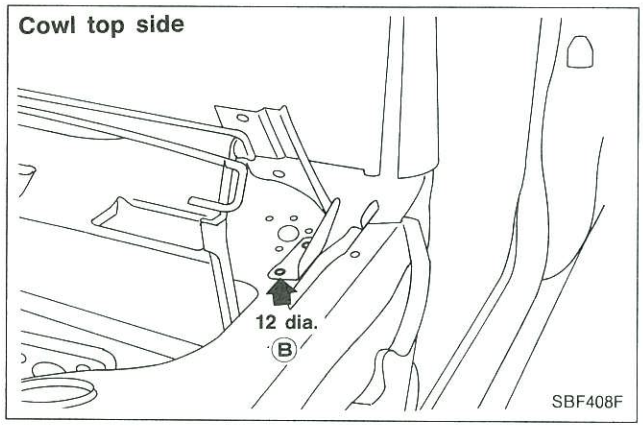
Cowl top center



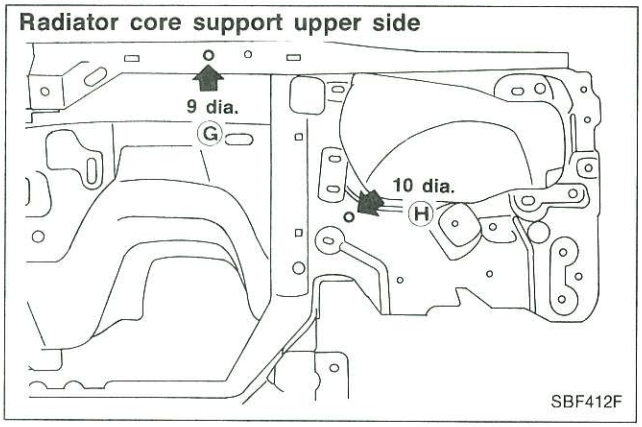
Radiator core support upper center



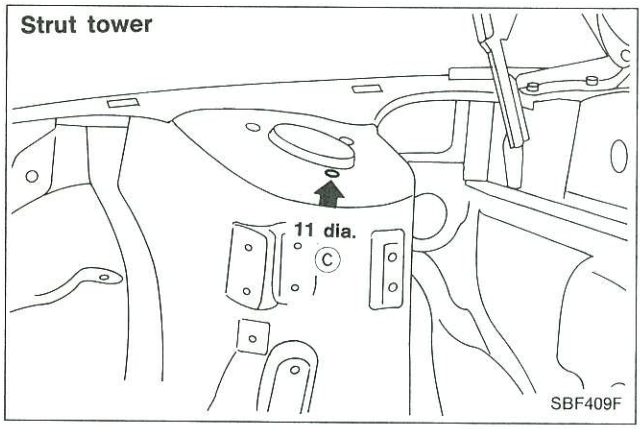
Cowl top side



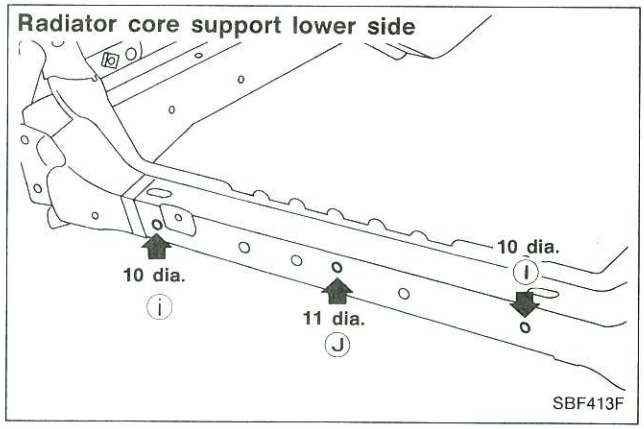
Radiator core support upper side



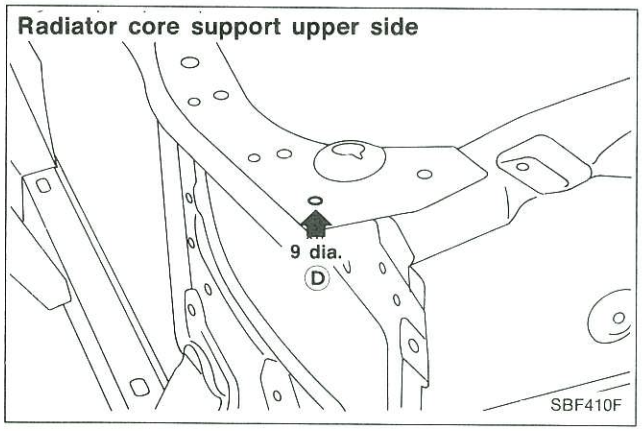
Strut tower



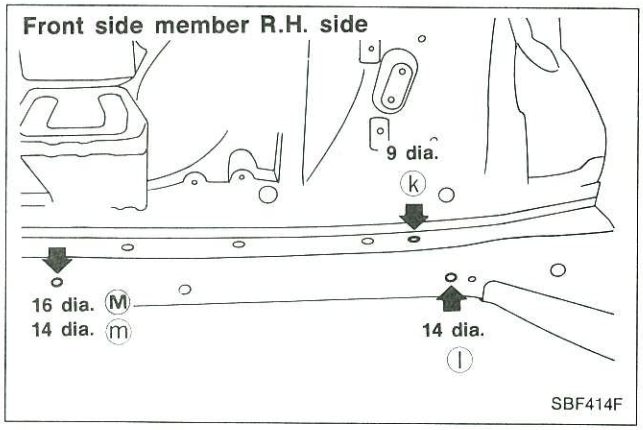
Radiator core support lower side



Radiator core support upper side

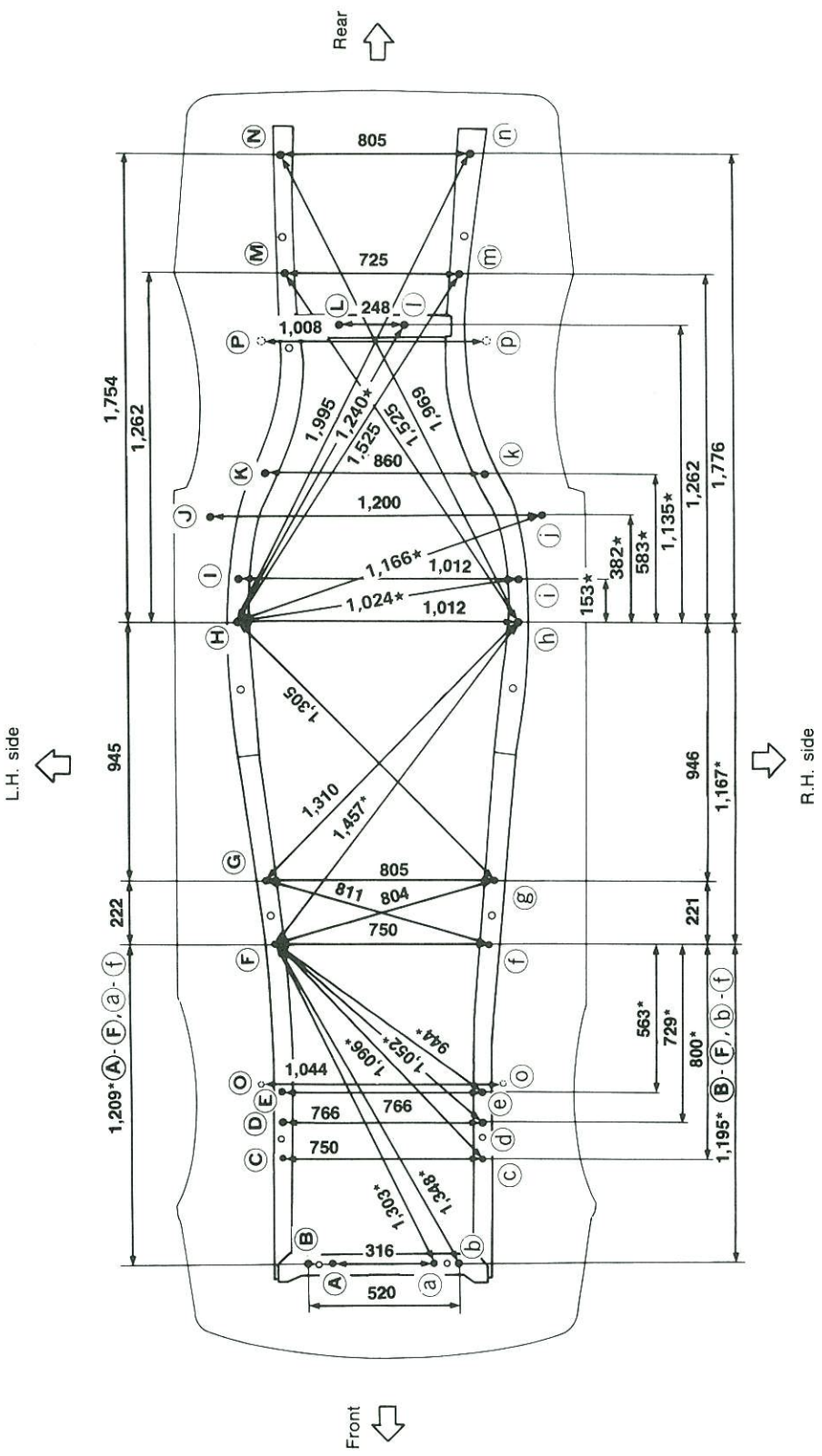


Front side member R.H. side



Underbody

MEASUREMENT

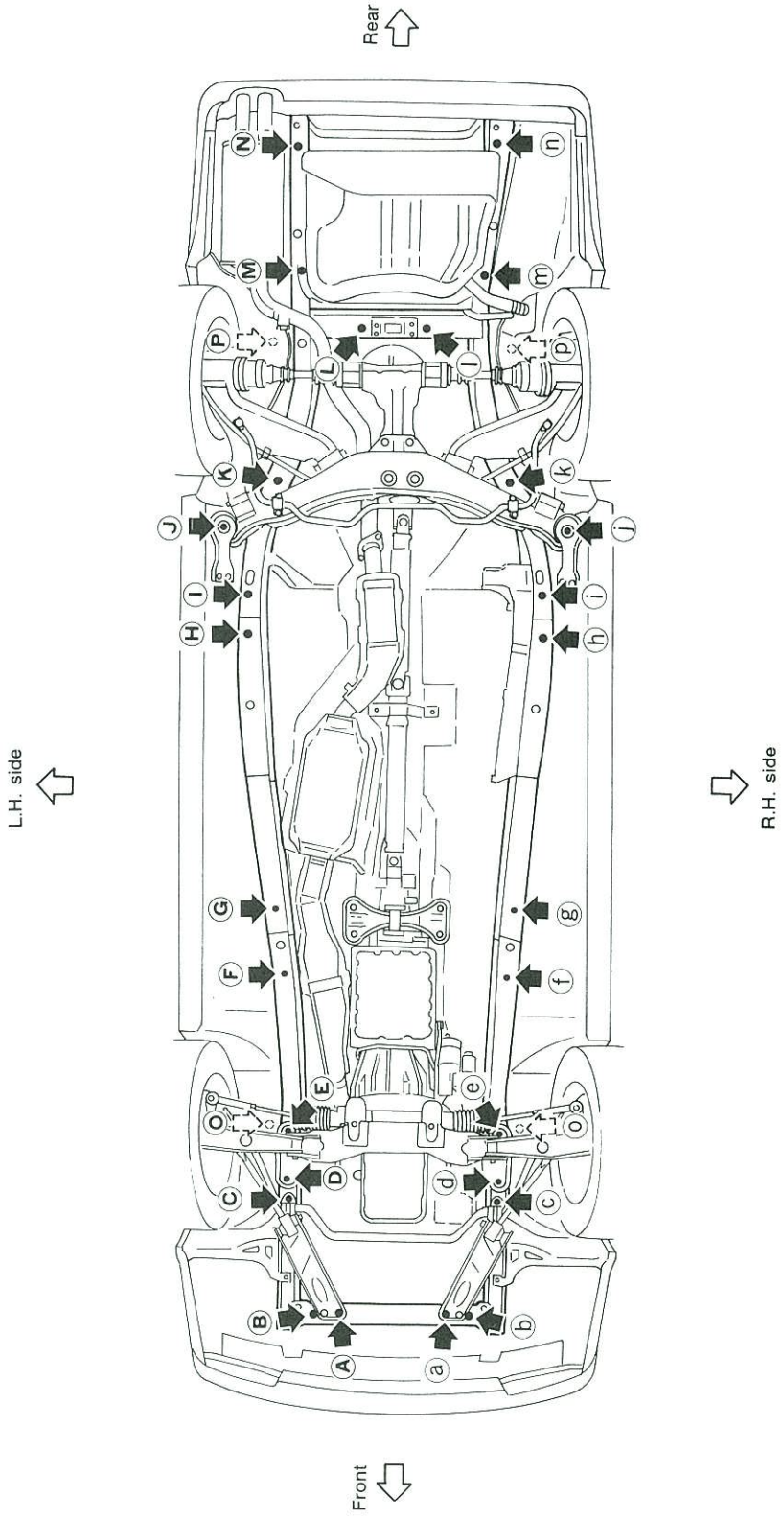


All dimensions indicated in these figures are actual ones.
(There are no projected dimensions.)

SBF683F

Underbody (Cont'd)

MEASUREMENT POINTS

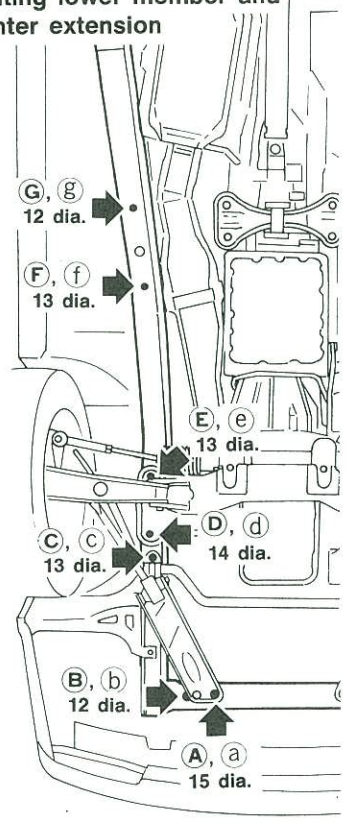


SBF405F

Underbody (Cont'd)

Unit: mm

Radiator core lower support, front side member, front suspention mounting lower member and front side member center extension



Coordinates:

Ⓐ, ⓐ
X: 158
Y: –605
Z: 244.5

Ⓑ, ⓑ
X: 260
Y: –605
Z: 244.5

Ⓒ, ⓒ
X: 375
Y: –206
Z: 290

Ⓓ, ⓓ
X: 383
Y: –134
Z: 290

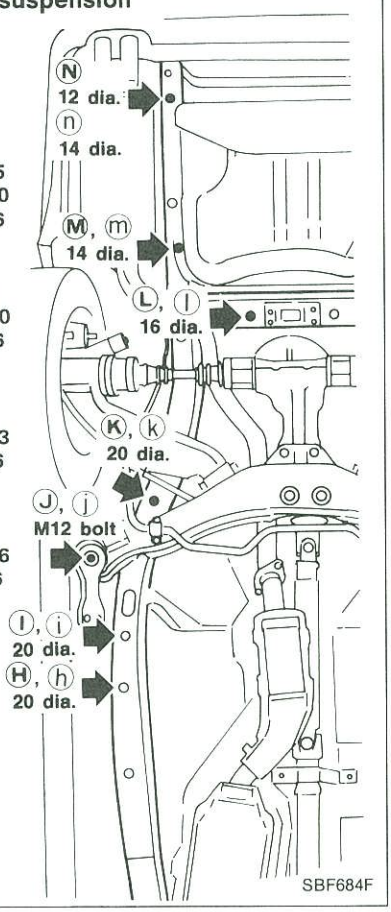
Ⓔ, ⓔ
X: 383
Y: 37
Z: 290

Ⓕ, ⓕ
X: 375
Y: 580
Z: 141.8

Ⓖ, LH
X: 406
Y: 800
Z: 141.8

ⓖ, RH
X: 398.6
Y: 800
Z: 141.8

Front side member rear extension, rear side member, rear side member extension and rear suspension mounting bolt top



Coordinates:

Ⓗ, ⓗ
X: 506
Y: 1,740
Z: 139

Ⓘ, ⓘ
X: 506
Y: 1,893
Z: 136.7

Ⓙ, ⓙ
X: 600
Y: 2,110
Z: 156.6

Ⓚ, ⓚ
X: 430
Y: 2,303
Z: 272.1

Ⓛ, ⓛ
X: 124
Y: 2,775
Z: 404.8

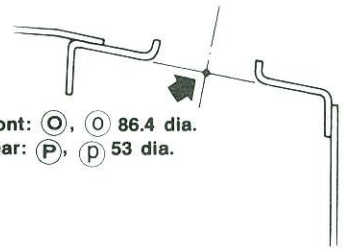
Ⓜ LH
X: 361,5
Y: 2,970
Z: 383.6

ⓜ RH
X: 363
Y: 2,970
Z: 383.6

Ⓝ LH
X: 397
Y: 3,473
Z: 383.6

ⓝ RH
X: 408
Y: 3,496
Z: 383.6

Front and rear strut tower centers



Coordinates:

Ⓞ, ⓞ
X: 521.9
Y: 48.8
Z: 793.3

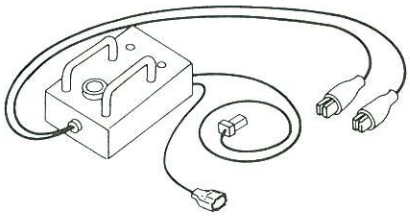
Ⓟ, ⓟ
X: 504.1
Y: 2,679.3
Z: 867.4

Precautions for SRS "AIR BAG" Service

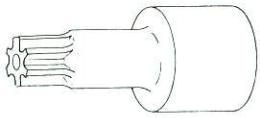
- Do not use a circuit tester to check SRS circuits.
- Before servicing the SRS, turn ignition switch "OFF", disconnect battery ground cable and wait for at least 10 minutes. For approximately ten minutes after the cables are removed, it is still possible for the air bag to inflate. Therefore, do not 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 special 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 three crash zone sensors and the wiring harness.

Preparation for SRS "AIR BAG" Service

SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.) Tool name	Description	
(J38381) Deployment tool		Disposing of air bag module

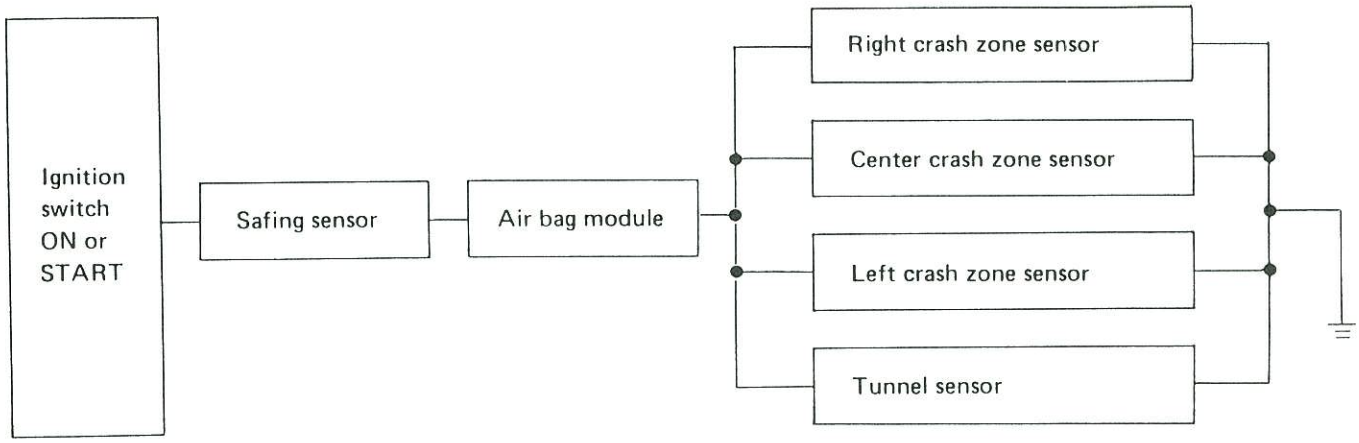
COMMERCIAL SERVICE TOOLS

Tool name	Description	
Special torx bit		Use for special bolt (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 sensor, 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



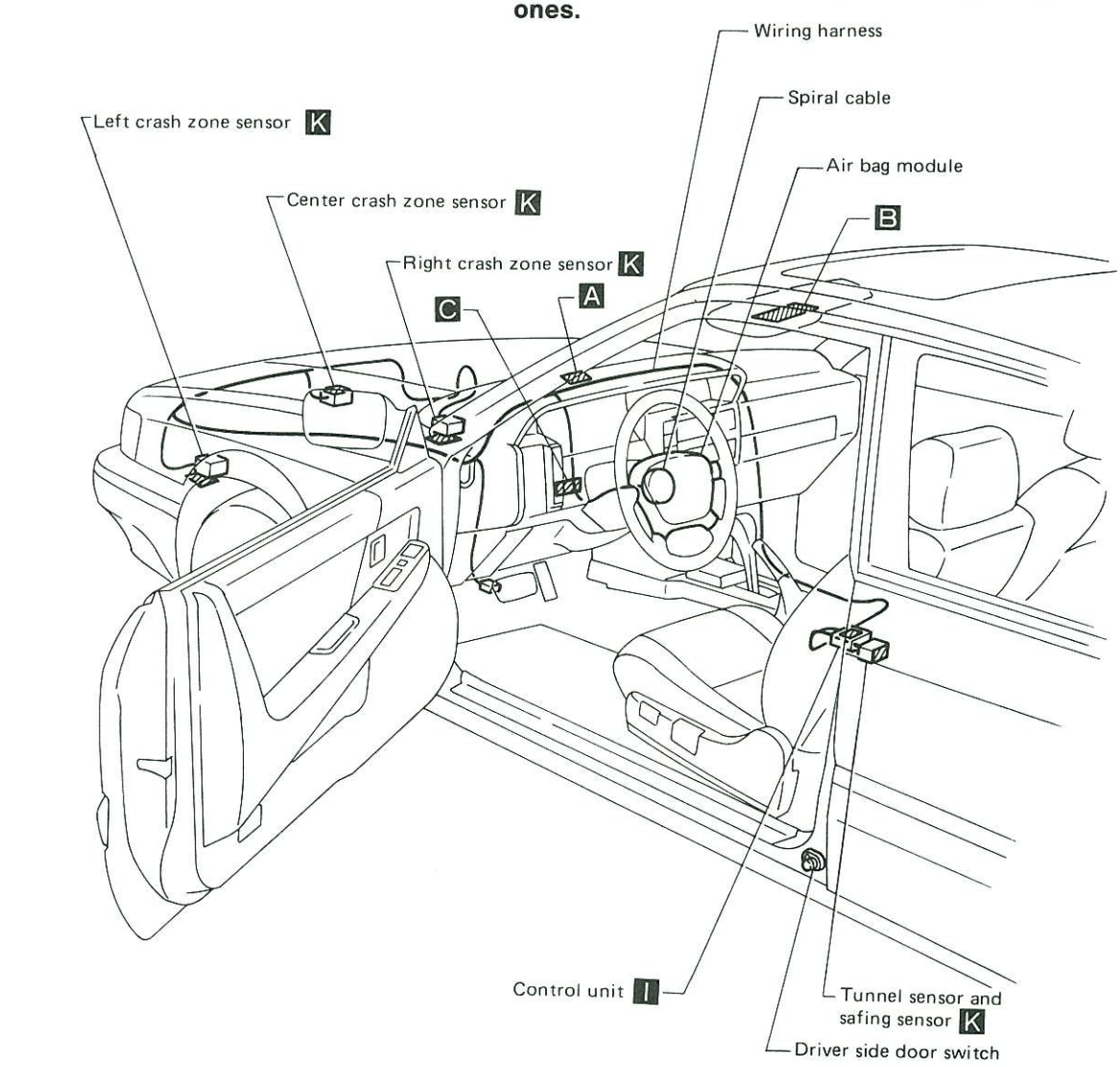
SBF215F

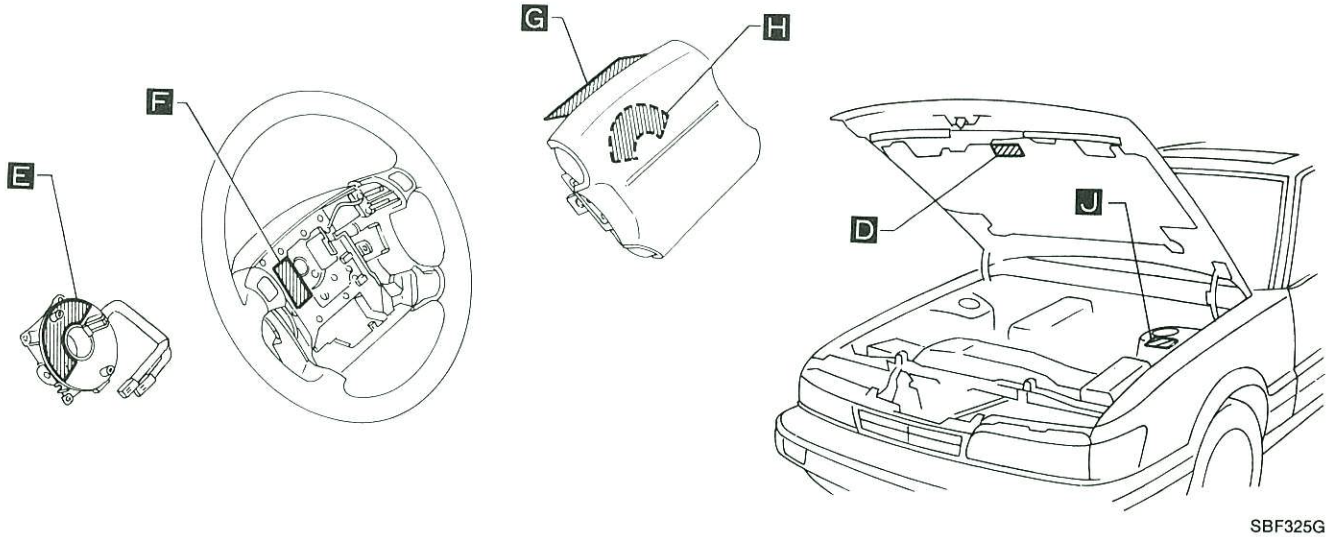
Self-diagnosis

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.





SBF325G

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.

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.

Caution Labels and SRS Component Parts Location (Cont'd)

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.

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.

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.

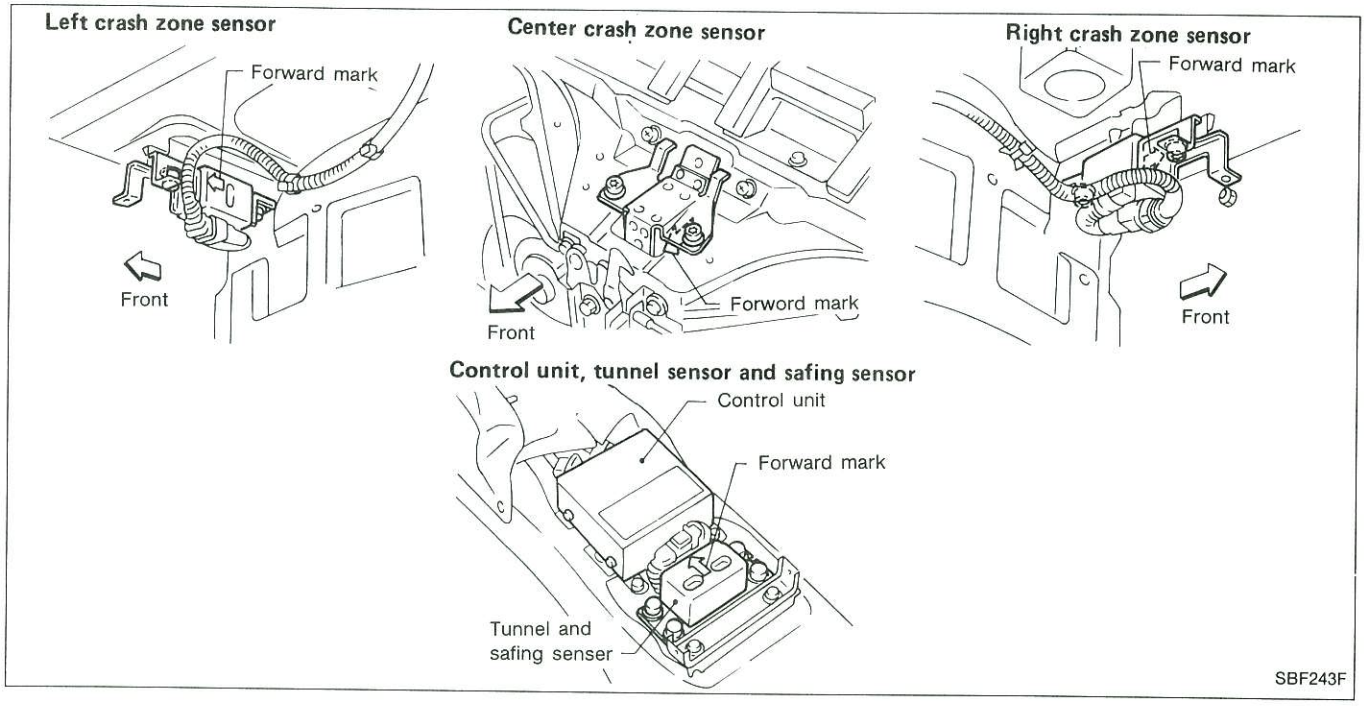
K

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 case and bracket for dents, cracks or deformities.
- Check connectors for damage, and terminals for deformities.

(3) Main harness and instrument harness

- Check connectors for poor connections.
- Check harnesses for binds, connectors for damage, and terminals 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.

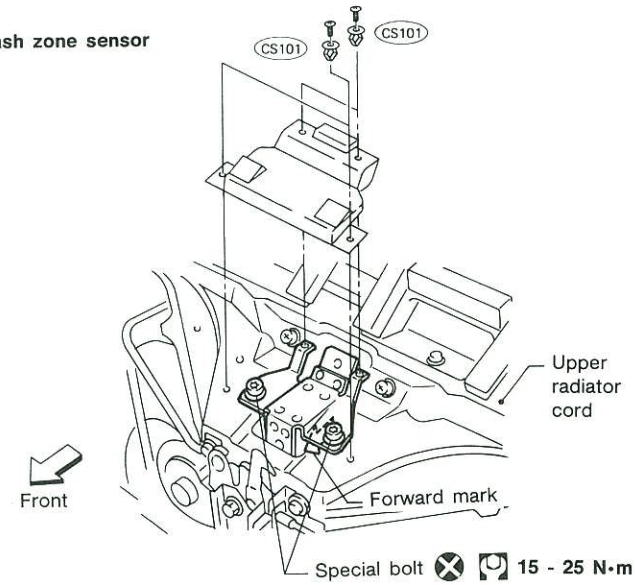
Removal and Installation — Control Unit and Sensors

CAUTION:

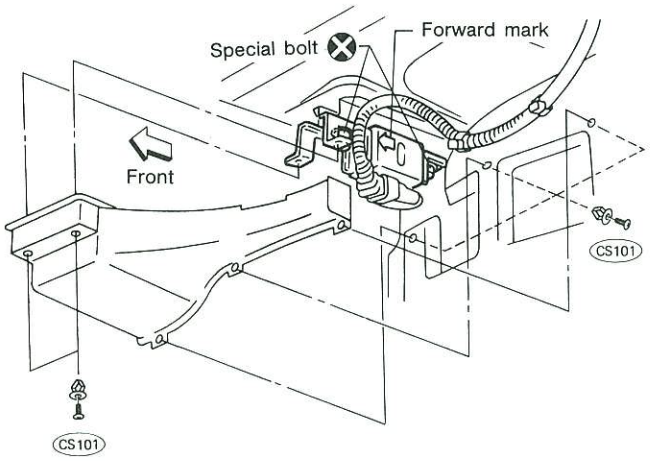
- **Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minites.**
- **The special bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.**
- Check all sensors for proper installation.
- Check all sensors to 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.

Removal and Installation — Control Unit and Sensors (Cont'd)

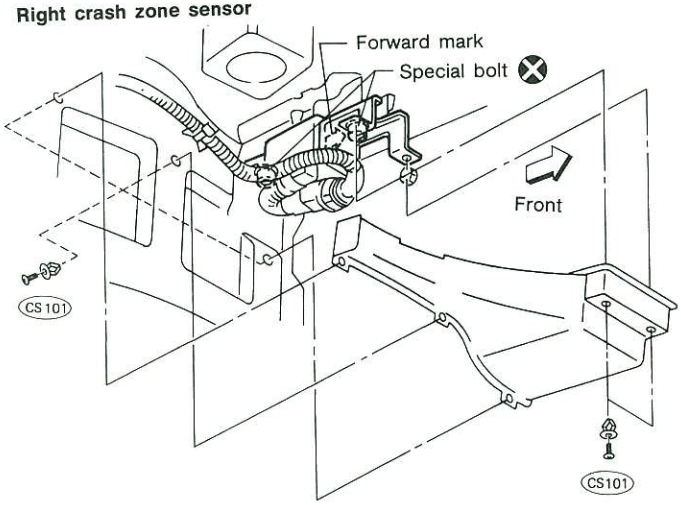
Center crash zone sensor



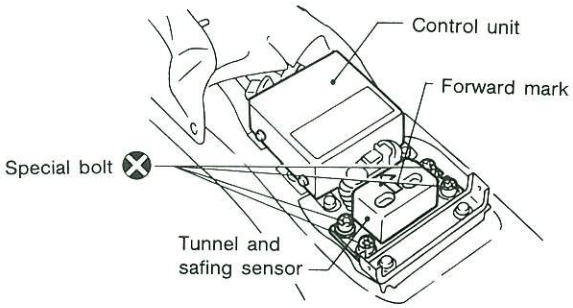
Left crash zone sensor



Right crash zone sensor

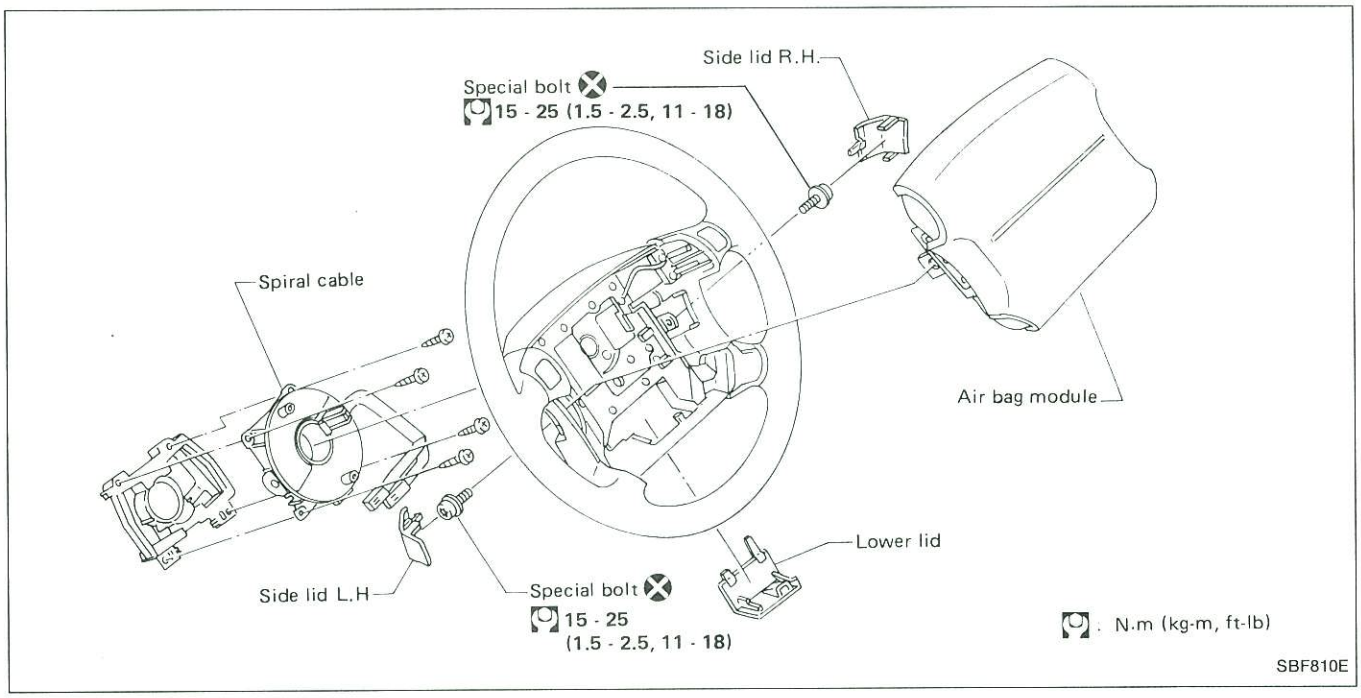


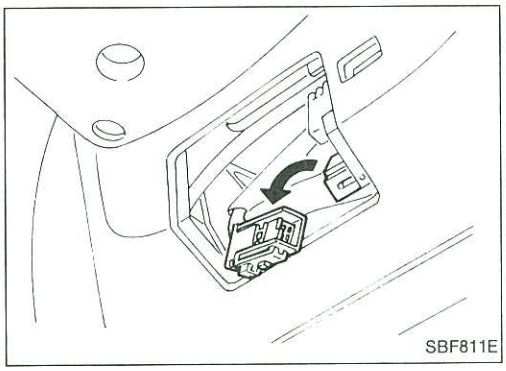
Control unit, tunnel sensor and safing sensor



MBF511A

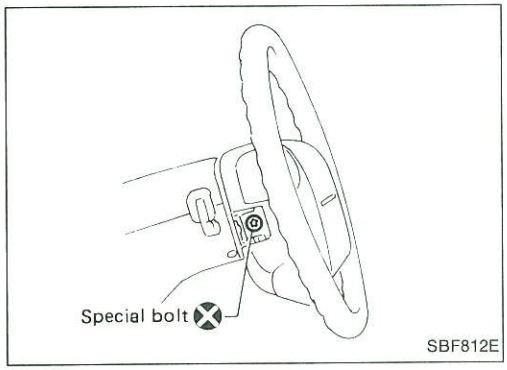
Removal — Air Bag Module and Spiral Cable



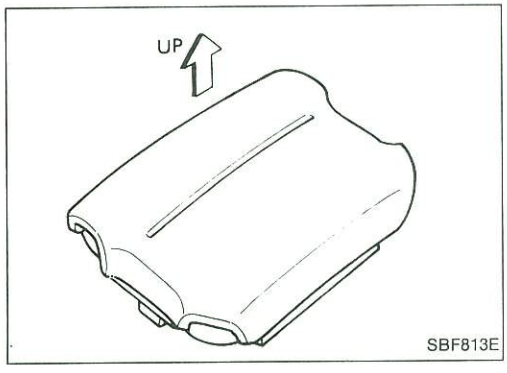


CAUTION:
Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes.

1. Remove lower lid from steering wheel, and disconnect air bag module connector.

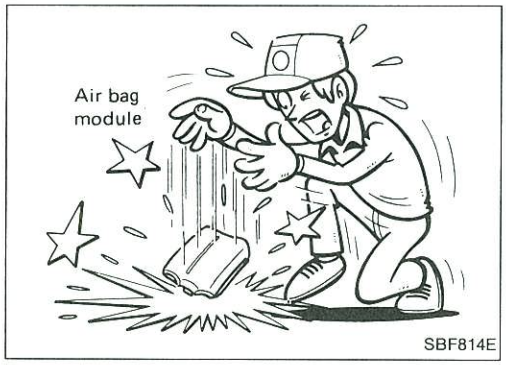


2. Remove side lid. Using T50H torx bit, remove left and right special bolts. Air bag module can then be removed.

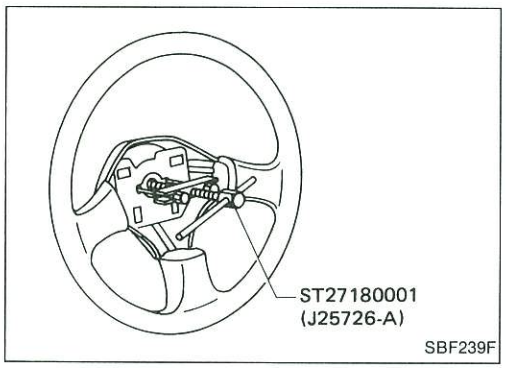


CAUTION:
- **Always place air bag module with pad side facing upward.**
- **Do not attempt to disassemble air bag module.**
- **The special bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.**

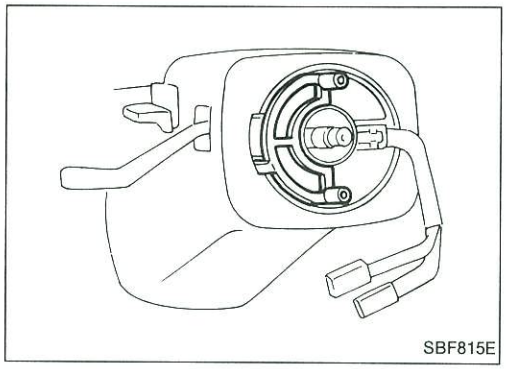
Removal — Air Bag Module and Spiral Cable (Cont'd)



- **Do not drop or impact air bag module. If any portion is deformed or cracked, replace the module.**
- **Do not expose the air bag module to temperatures exceeding 100°C (212°F).**
- **Do not allow oil, grease or water to come in contact with the air bag module.**



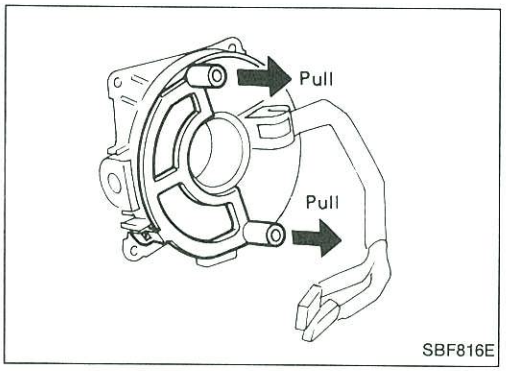
3. Set steering wheel in the neutral position.
4. Disconnect horn connector and remove nuts.
5. Using steering wheel puller, remove steering wheel. Be careful not to over-tighten puller bolt on steering wheel.



6. Attach spiral cable to stopper.
7. Remove steering column cover.
8. Disconnect connector and remove the four screws. The spiral cable can then be removed.

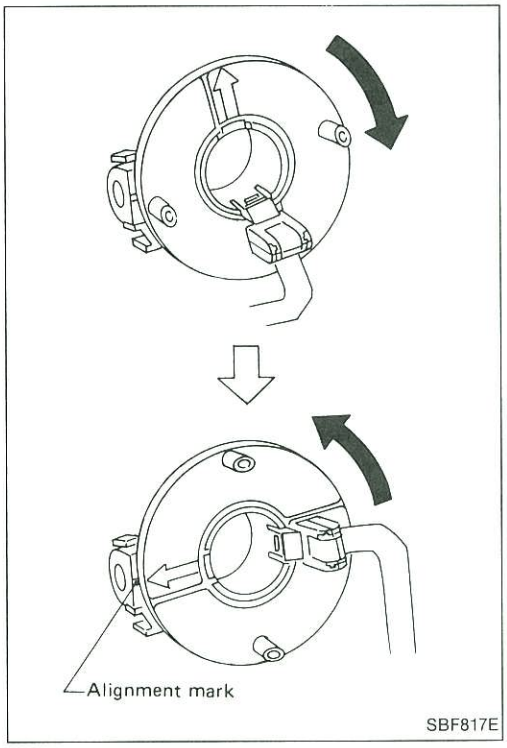
Installation — Air Bag Module and Spiral Cable

1. Connect spiral cable connector and tighten with screws. Install steering column cover.

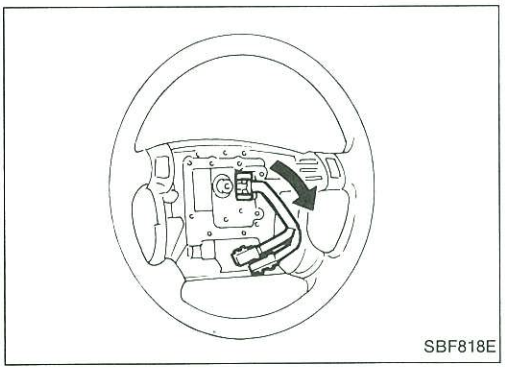


2. Remove stopper by pulling two pin guides.

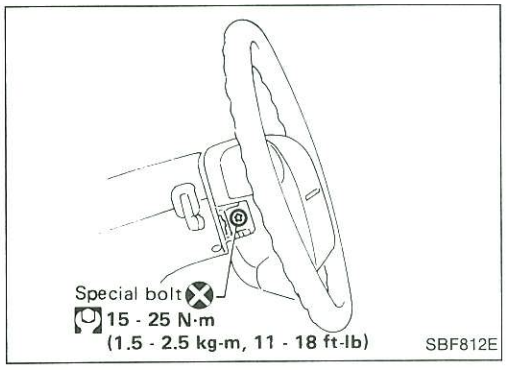
Installation — Air Bag Module and Spiral Cable (Cont'd)



- Alignment of spiral cable with neutral position
  If stopper is not used, align spiral cable with neutral position as follows:
  Turn spiral cable clockwise until it catches stopper. Then, back spiral cable off approximately two turns until yellow alignment mark appears on left gear. Align arrow mark "⇦" of spiral cable with this yellow mark.

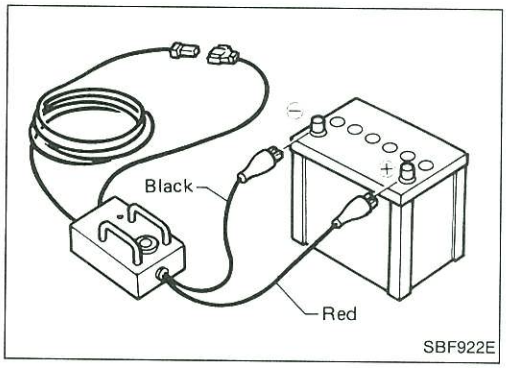


3. Install steering wheel setting spiral cable pin guides, and pull spiral cable through.
4. Connect horn connector and engage spiral cable with pawls in steering wheel.
5. Tighten nuts.



6. Position air bag module and tighten with new special bolts.
7. Connect air bag module connector.
8. Install all lids.

9. Conduct self-diagnosis to ensure entire SRS operates properly. (Use CONSULT or warning lamp check.)

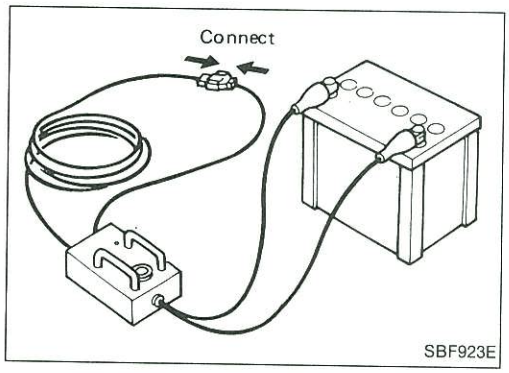


Scrapping the Air Bag

Before scrapping an air bag module or a vehicle equipped with an SRS air bag, be sure to deploy air bag.

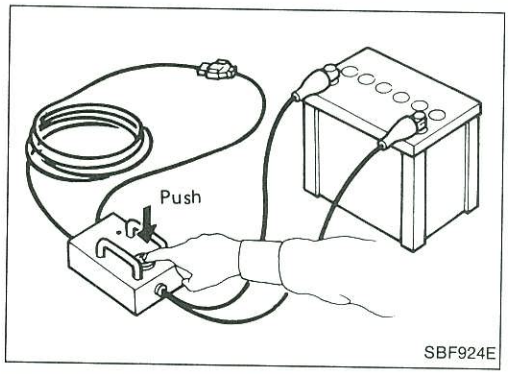
CONNECTING TO BATTERY

Prepare a 12-volt battery. Locate it approximately 5 m (16 ft) away from vehicle and connect deployment tool's battery cable. Ensure red light illuminates. If it does not, replace the battery with a new one.

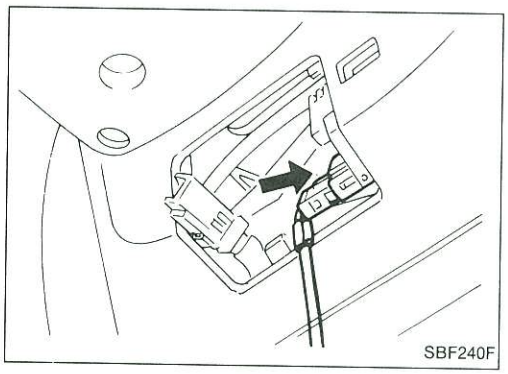


DEPLOYMENT TOOL CHECK

Connect check connector.

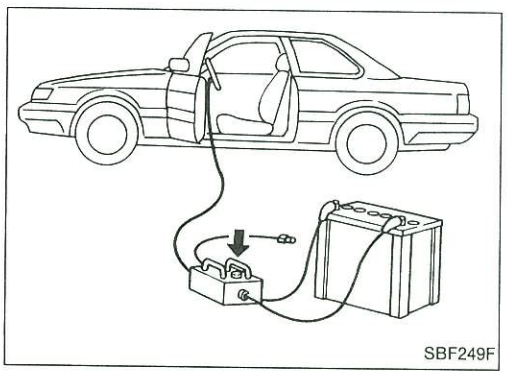


Push deployment tool switch to "ON" to ensure green light illuminates. If it does not, replace the deployment tool.



CONNECTING TO AIR BAG

1. Disconnect the prepared battery cable.
2. Also disconnect the vehicle battery ground cable and wait 10 minutes.
3. Remove lower lid from steering wheel and disconnect air bag module connector.
4. Connect deployment tool connector.
5. Reconnect the battery cable to the prepared battery. Ensure red light illuminates.



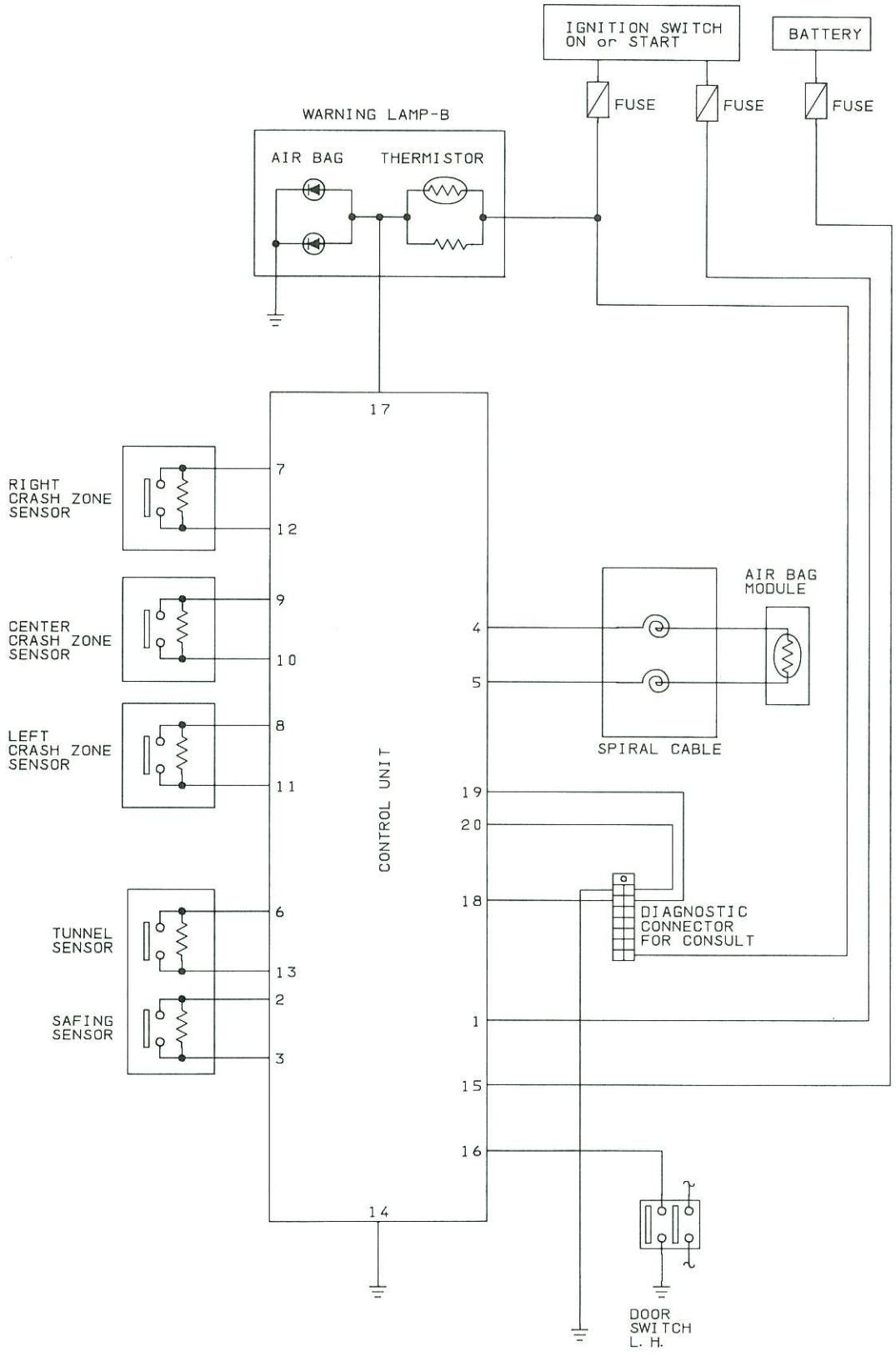
DEPLOYMENT

Press deployment tool switch. Green light will illuminate and air bag will deploy.

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.**

Schematic

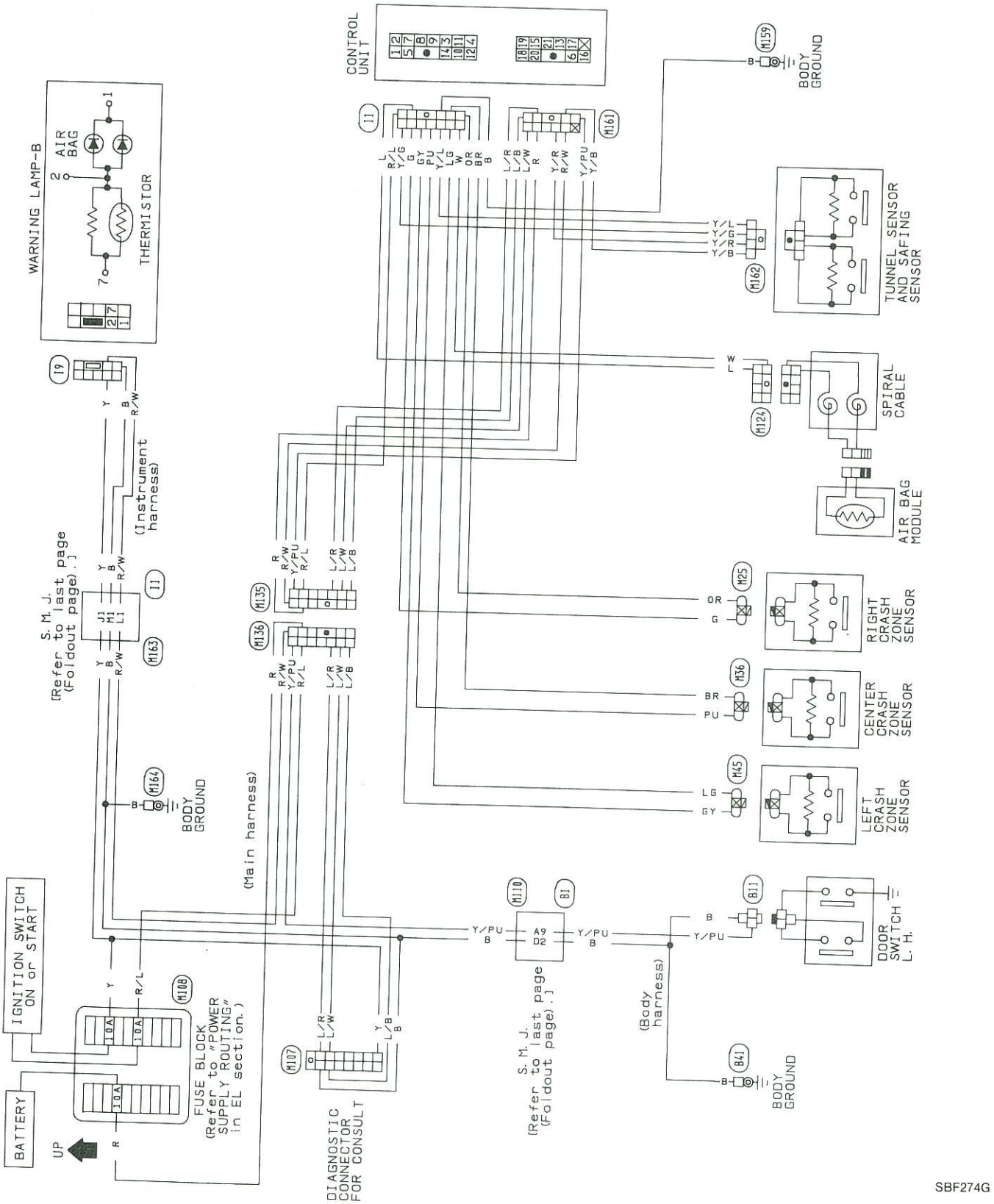


SBF017F

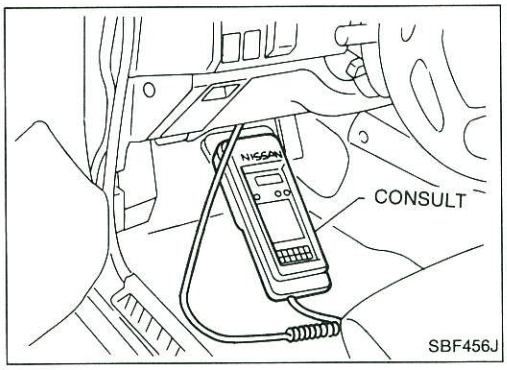
Wiring Diagram

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.**



SBF274G



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.

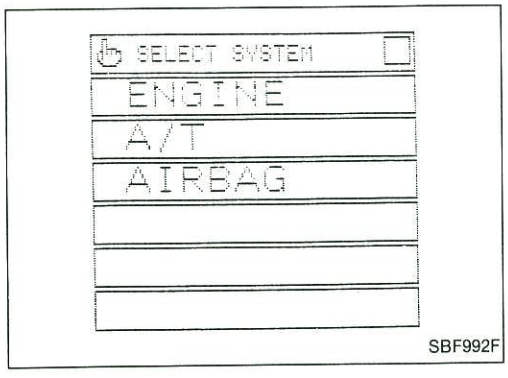
5. Touch "SELF DIAG RESULTS" to read self-diagnosis results.

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.

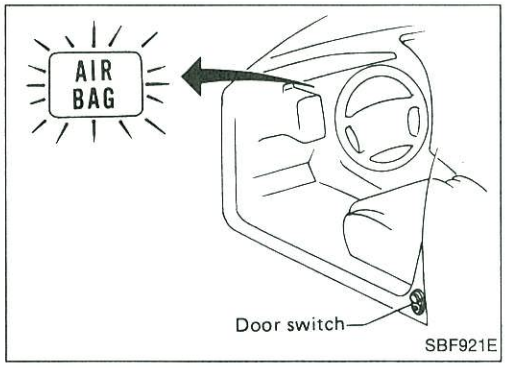
Self-diagnosis (Cont'd)

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 bef spedified 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.

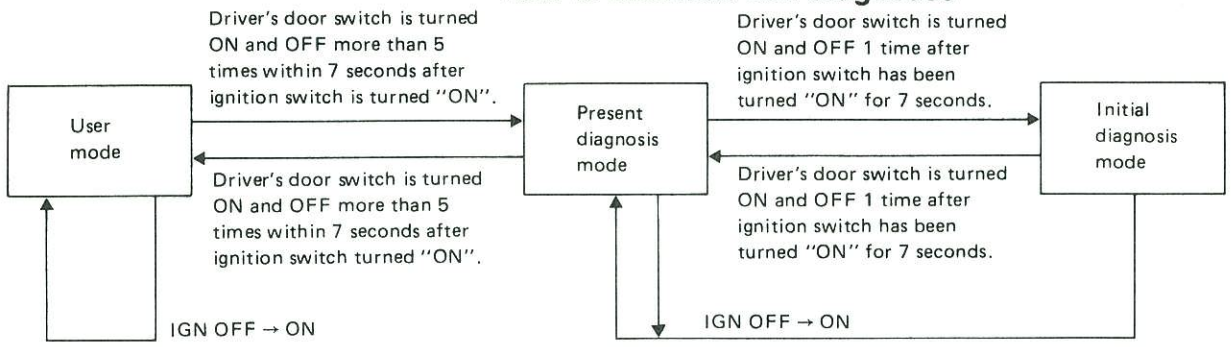
Self-diagnosis (Cont'd)

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:

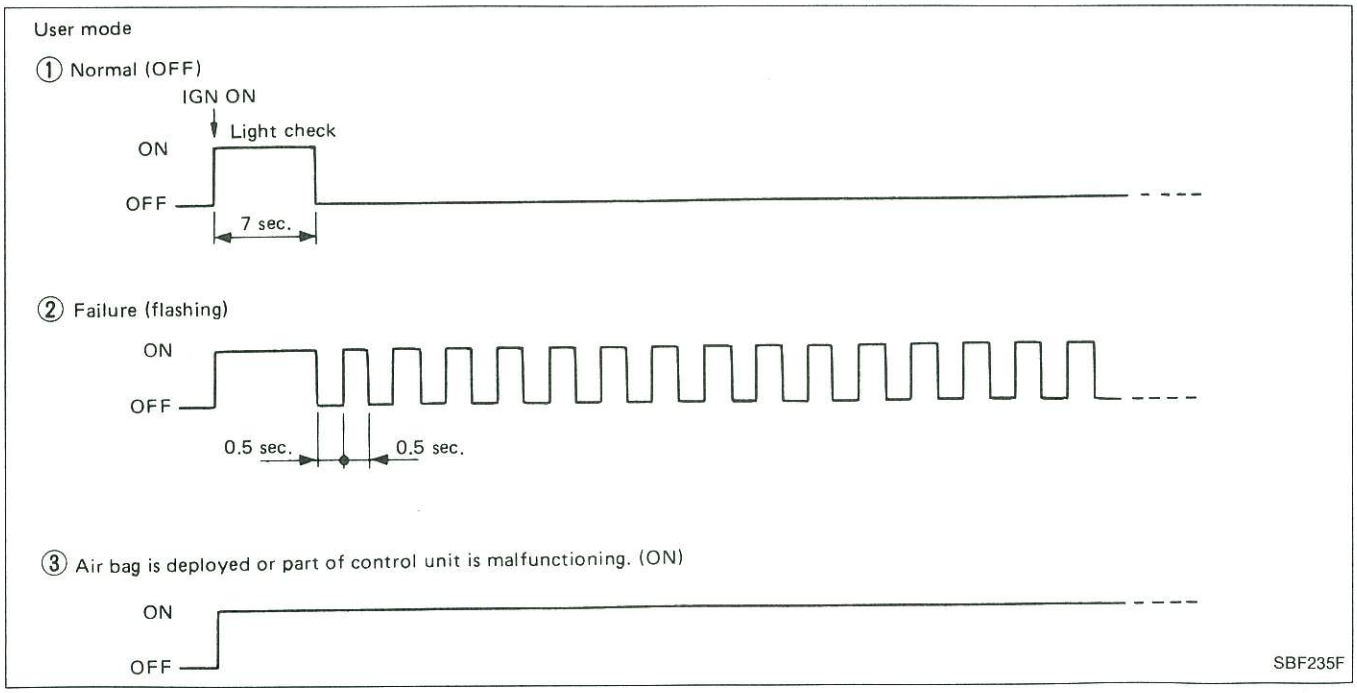
How to alternate self-diagnoses



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.

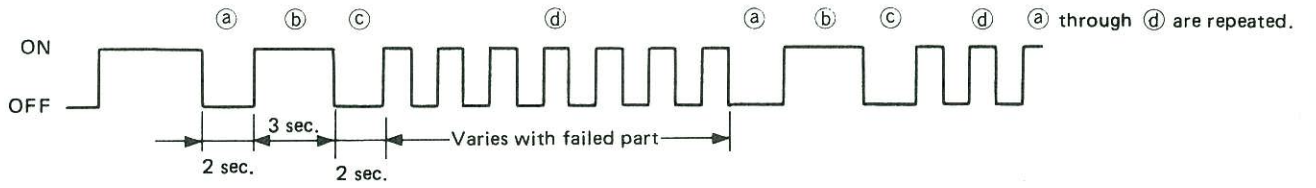
- **After repairing malfunctioning part, attempt to clear self-diagnosis results from memory.**
- **If a malfunctioning part is not completely repaired, information stored in memory will not be cleared.**



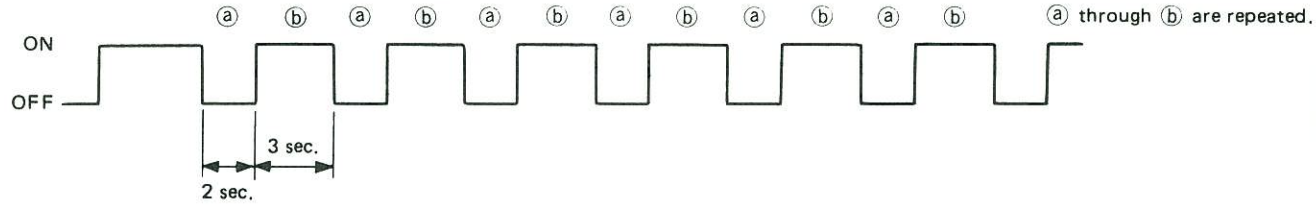
Self-diagnosis (Cont'd)

Present diagnosis mode (self-diagnosis result 1)

ⓑ Start signal; Start signal identifies display modes.



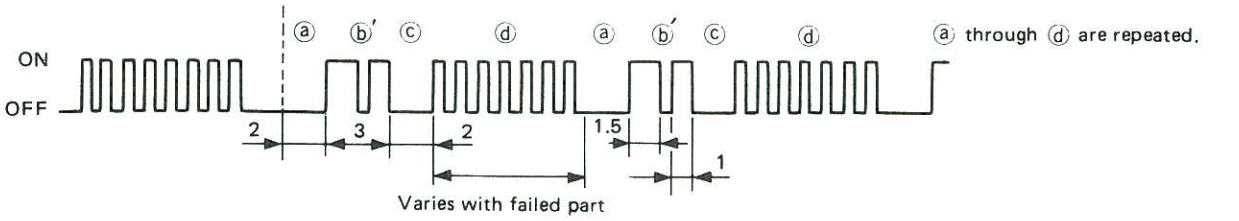
- No failure (or intermittent failure/repair completion)



SBF236F

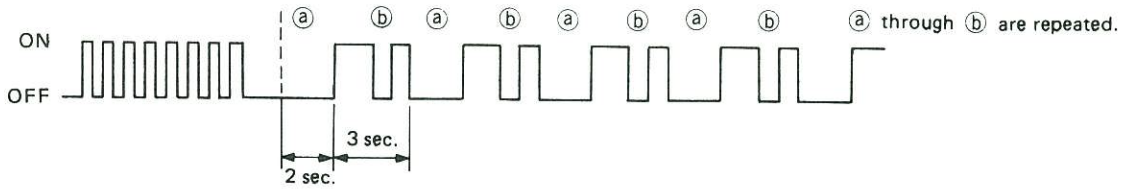
Initial diagnosis mode (self-diagnosis result 2)

ⓑ Start signal; Start signal identifies display modes.



Unit: sec.

- No failure



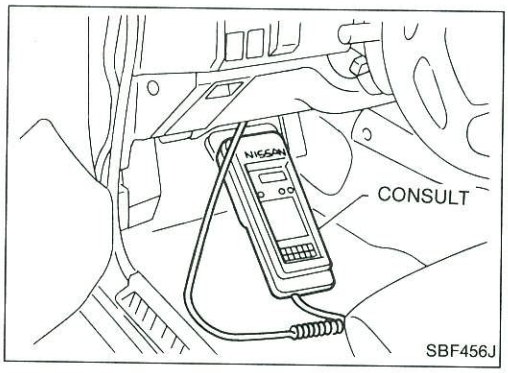
SBF237F

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

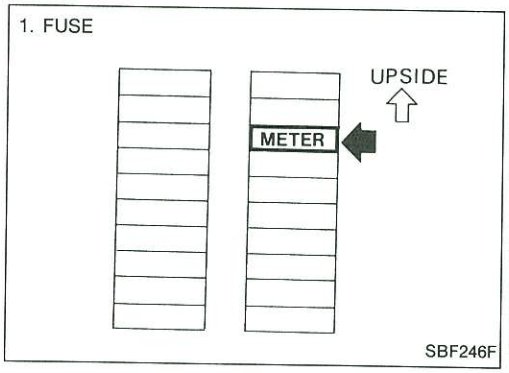
Flash code ⓓ (# of flashes)	Explanation	Repair order * Recheck SRS at each replacement.
0	Normal. The SRS "Air Bag" is in good order.	—
1	The circuit for the safing sensor is out of order.	1. Visually check the wiring harness connections. 2. Replace the safing sensor. (safing sensor and tunnel sensor 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.

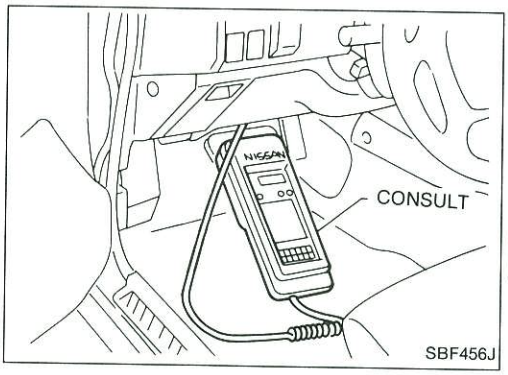


Diagnostic Procedure 1

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.

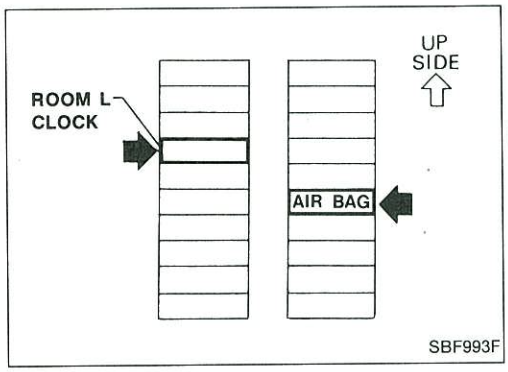


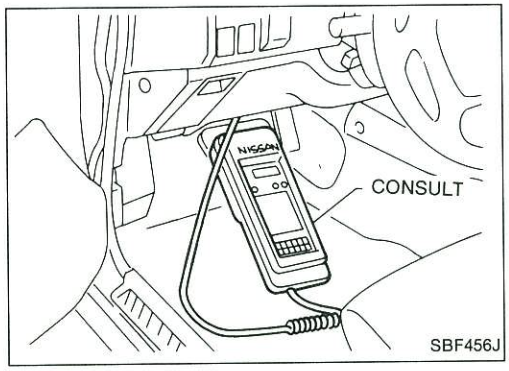


Diagnostic Procedure 2

SYMPTOM: Warning lamp does not come on.

1. Check the warning lamp fuse.
   - N.G. → Replace the fuse.
   - O.K. ↓
2. Connecting 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.





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 fuse used for the SRS "Air Bag" and "Room L, Clock".
   - 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 clear.)

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

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When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

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

Supplemental Restraint System "AIR BAG"

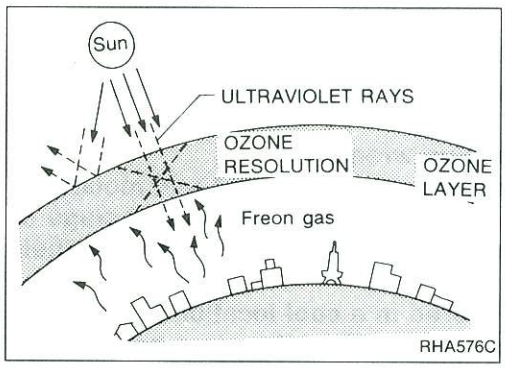
The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a control unit, warning lamp, wiring harness and spiral cable. 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 INFINITI dealer.**

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

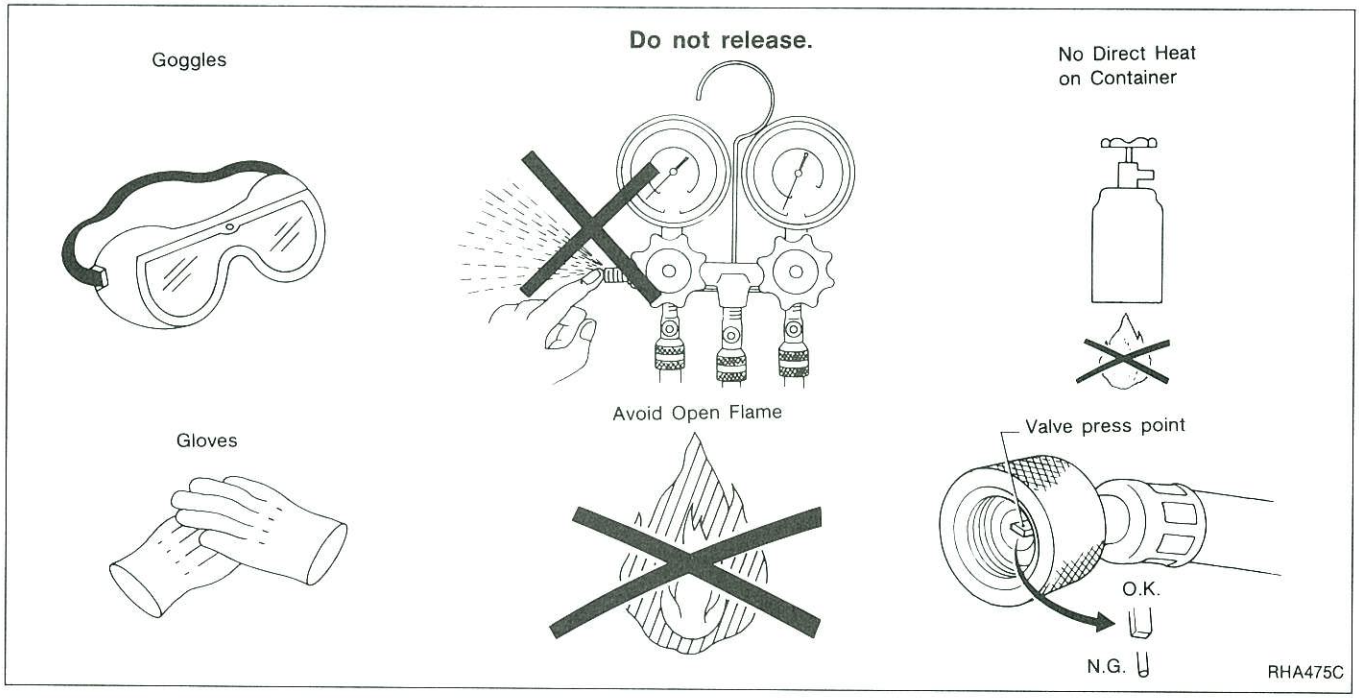
c. **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**



Precautions for the Handling of Refrigerant

- **Do not release refrigerant into the air. Use your refrigerant recycling equipment to capture the refrigerant every time you need to discharge an air conditioning system.**

  The release of refrigerant into the air can cause damage to the Earth's ozone layer.



- **Always wear eye protection when working around the system.**
- **Always be careful that refrigerant does not come in contact with your skin.**
- **Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.**
- **Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.**
- **Keep refrigerant away from open flames because poisonous gas will be produced if it burns.**
- **Do not increase can temperature beyond 40°C (104°F) in charging.**
- **Do not heat refrigerant container with an open flame. There is a danger that container will explode.**

CAUTION:

- **Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.**
- **Do not use compressed air to clean out a contaminated A/C tube or hose. Shake the line over a clean, white paper towel. If it contains obvious moisture or contaminants, replace it. Do not blow out the line with refrigerant.**
- **Do not use manifold gauge set whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.**
- **Do not over-tighten service valve cap.**
- **Follow the manufacturer's instructions for discharging into your refrigerant recycling equipment.**

Precautions for Refrigerant Connection

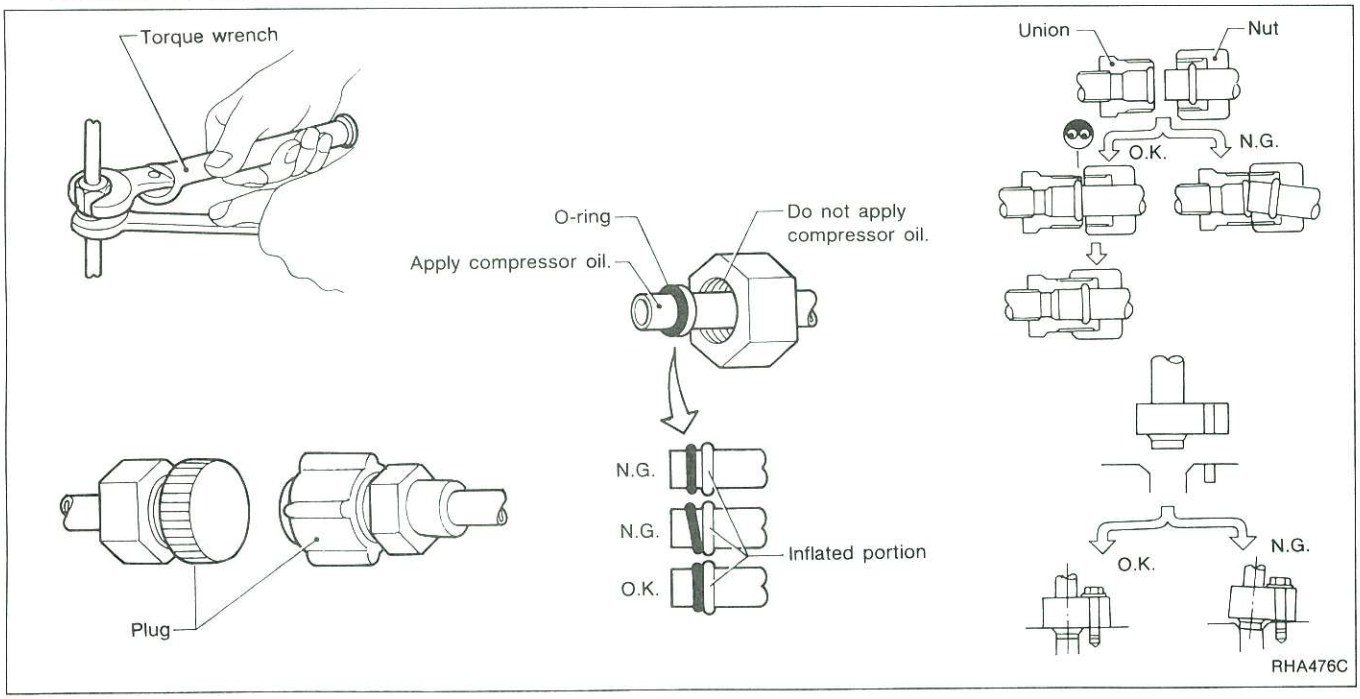
WARNING:

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.

Precautions for Refrigerant Connection (Cont'd)

CAUTION:
When replacing or cleaning refrigerant cycle components, observe the following.

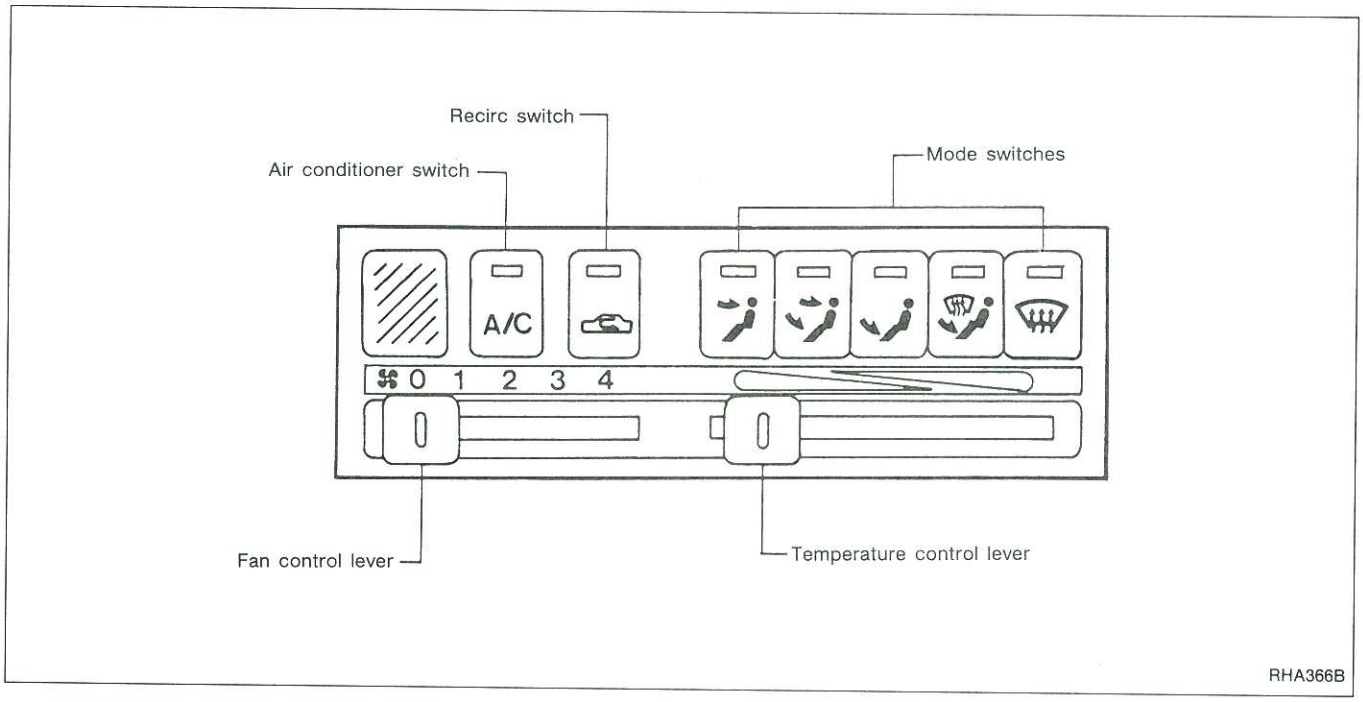
- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench and a back-up wrench.**
- **After disconnecting tubes, plug all openings immediately to prevent entrance of dirt 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 compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.
- After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.
- After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.



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 COMPRESSOR OIL.**
- **Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.**
- **When replacing compressor clutch, be careful not to scratch shaft or bend pulley.**
- **When replacing compressor clutch assembly, do not forget BREAK-IN OPERATION.**

Control Operation — Manual Air Conditioner



FAN CONTROL LEVER

This lever turns the fan ON and OFF, and controls fan speed.

MODE SWITCHES

These switches allow you to select the outlet air flow.
When the MODE is set to "DEF" or "F/D", the push control unit sets the intake door to "FRE". The compressor turns on when the MODE is set to "DEF".

TEMPERATURE CONTROL LEVER

This lever allows you to adjust the temperature of the outlet air.

RECIRC SWITCH

OFF position:
Outside air is drawn into the passenger compartment when this switch is OFF.
ON position:
Interior air is recirculated inside the vehicle.
RECIRC is canceled when DEF or F/D are selected. RECIRC resumes when another mode is chosen.

AIR CONDITIONER SWITCH

Start the engine, move the fan control 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.

Introduction — Auto Air Conditioner

The Automatic Temperature Control (ATC) system provides automatic regulation of the vehicles interior temperature based on the operator selected "set temperature", regardless of the outside temperature changes. This is done by utilizing a microcomputer, also referred to as the automatic amplifier, which receives input signals from several sensors. The automatic amplifier uses these input signals (including the set temperature) to automatically control the ATC system's outlet air volume, air temperature, and air distribution.

Features — Auto Air Conditioner

Air mix door control

The air mix door is automatically controlled so that in-vehicle temperature will reach, and be maintained at the operator selected "set temperature". For a given set temperature, the mix door position will depend on: Ambient temperature, in-vehicle temperature, amount of sunload, and intake air temperature.

Fan speed control

The blower speed is automatically controlled, with the actual speed (for a given set temperature) depending on: Ambient temperature, in-vehicle temperature, amount of sunload, intake air temperature, and mix door position. Additionally, when the system is turned on, the blower will start slowly and then increase speed (over a period of approximately 5 seconds) until the objective speed is reached. When cold starting in cold ambient temperatures, the blower operation will be delayed to prevent blowing cold air on the occupants feet.

Intake door control

The intake door position will be determined by: Ambient temperature, in-vehicle temperature, and whether the compressor is on or off.

Outlet door control

The outlet door position will be determined by: Ambient temperature, in-vehicle temperature, intake air temperature, and amount of sunload.

Compressor clutch control

The compressor operation (ON-OFF) is automatically controlled by the ambient sensor to prevent compressor damage in very cold ambient temperatures.

Recirculation switch

If the operator does not want outside air, the RECIRC switch should be pushed. The passenger compartment air will be recirculated for approx. 10 minutes, then the RECIRC function will be automatically canceled.

Self-diagnostic system

The self-diagnostic system consists of five steps. Each step can be accessed by pushing the switches on the automatic amplifier.

STEP 1: Checks L.E.D.s and segments of the display.
STEP 2: Checks each sensor circuit for open or short circuit.
STEP 3: Checks mode door position.
STEP 4: Checks operation of each actuator.
STEP 5: Checks temperature detected by each sensor.
AUXILIARY TRIMMER MECHANISM: Set temperature trimmer.

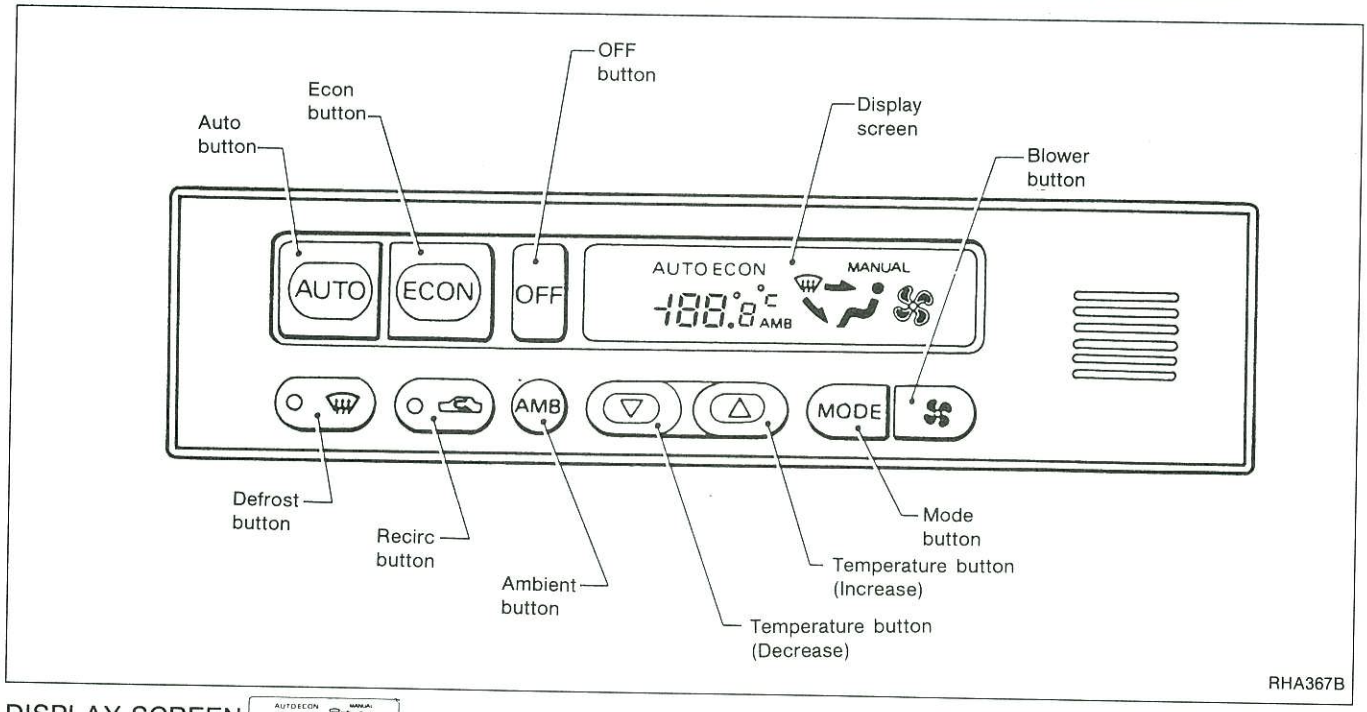
Memory function

When the ignition switch is turned from "ON" to "OFF", the auto amplifier stores the set temperature and inputs of various switches in its memory. When the ignition switch is turned from "OFF" to "ON", the system begins operation with the information stored in the memory, then immediately compensates for the actual operating conditions.

Refrigeration cycle

Refer to page HA-12 for the description of the refrigeration cycle.

Control Operation — Auto Air Conditioner



DISPLAY SCREEN
Displays the operational status of the system.

AUTO BUTTON
The compressor, air inlet door, air mix door, outlet doors, and blower speed are automatically controlled so that the in-vehicle temperature will reach, and be maintained at the set temperature selected by the operator.

ECON BUTTON
Fully automatic control with the compressor off. With the compressor off, the system will not remove heat (cool) or de-humidify. The system will maintain the in-vehicle temperature at the set temperature when the set temperature is above the ambient (outside) temperature.

TEMPERATURE INCREASE/DECREASE BUTTON
Increases or decreases the set temperature.

OFF BUTTON
The compressor and blower are off, the air inlet door is set to the outside air position, and the air outlet doors are set to the foot (70% foot and 30% defrost) position. In the off position the ATC system uses the vehicle's "flow through" ventilation to try to maintain the interior temperature based on the temperature set when the system was last operating.

BLOWER BUTTON
Manual control of the blower speed. Four speeds are available for manual control (as shown on the display screen):
low, medium low, medium high, high

MODE BUTTON
Manual control of the air discharge outlets. There selections are available (as shown on the display screen):
face, bi-level, foot

AMBIENT BUTTON
Shows the ambient (outside) air temperature on the display screen for 5 seconds.

Control Operation — Auto Air Conditioner (Cont'd)

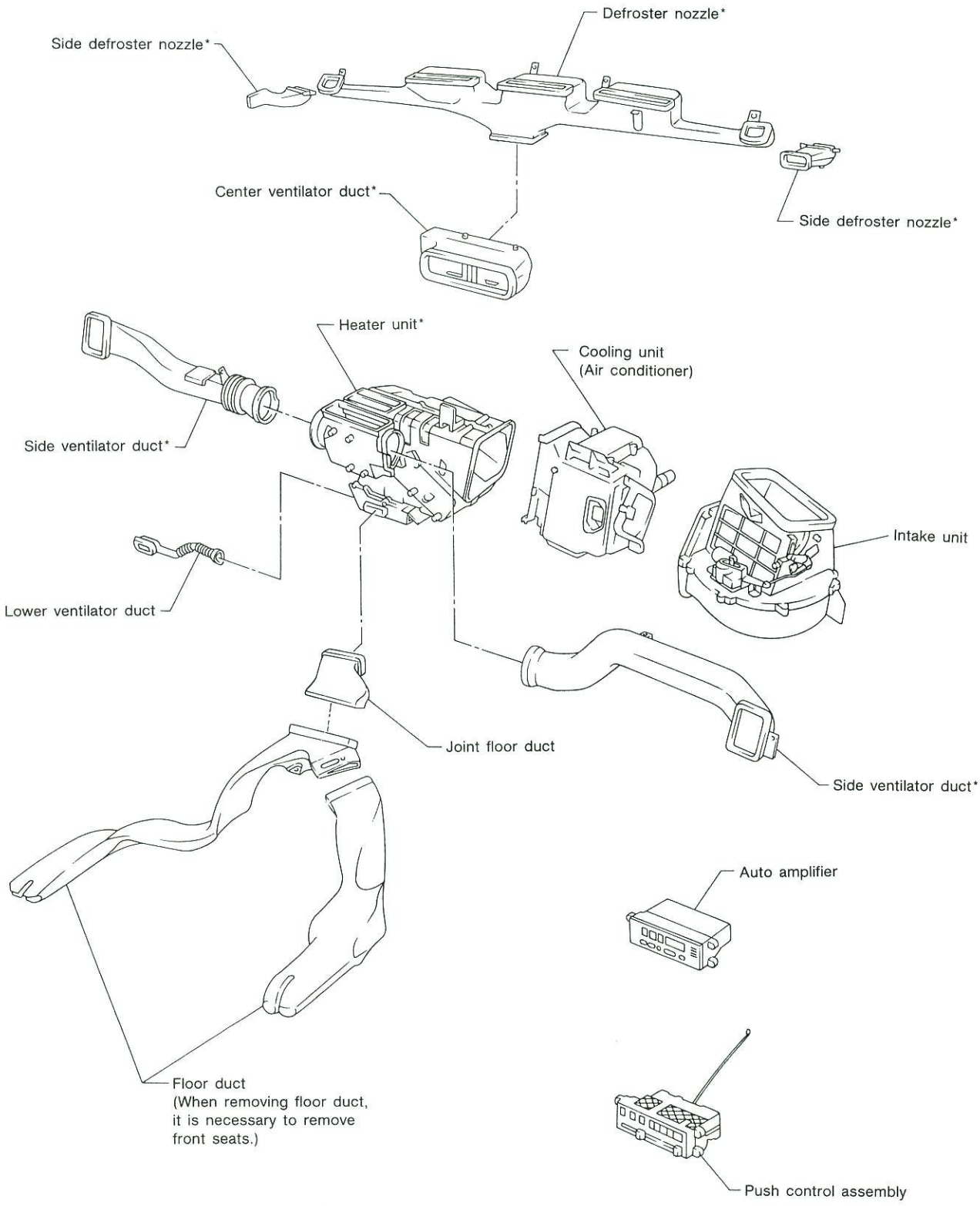
RECIRC BUTTON

Positions the air inlet door to the recirculation position for 10 minutes, after which automatic control resumes.

DEFROST BUTTON

Positions the air discharge doors to the defrost position. Also positions the air inlet door to the outside air position. The compressor operates at ambient temperature approx. 2°C (35°F) or above.

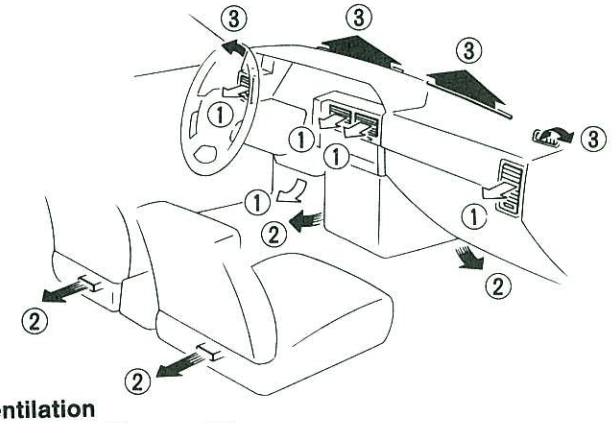
Component Layout



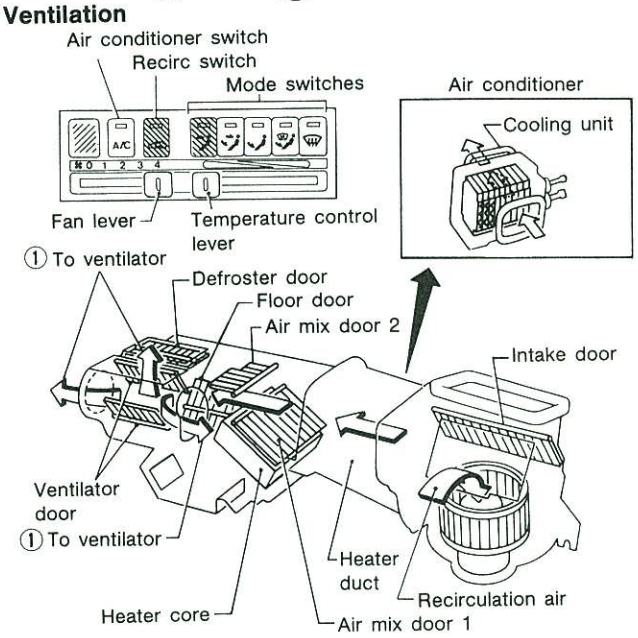
*: For removal, it is necessary to remove instrument assembly.

RHA229C

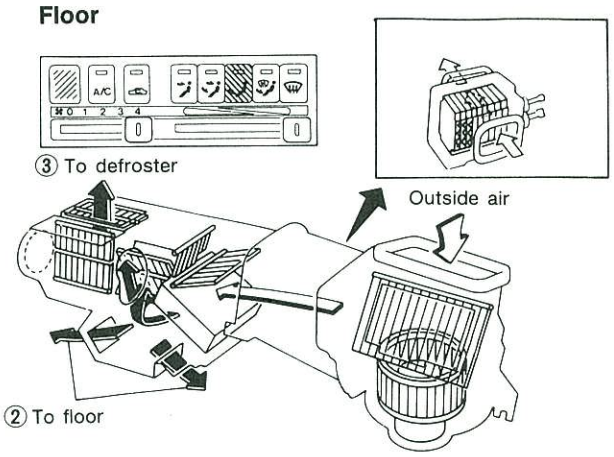
Air Flow — Manual Air Conditioner



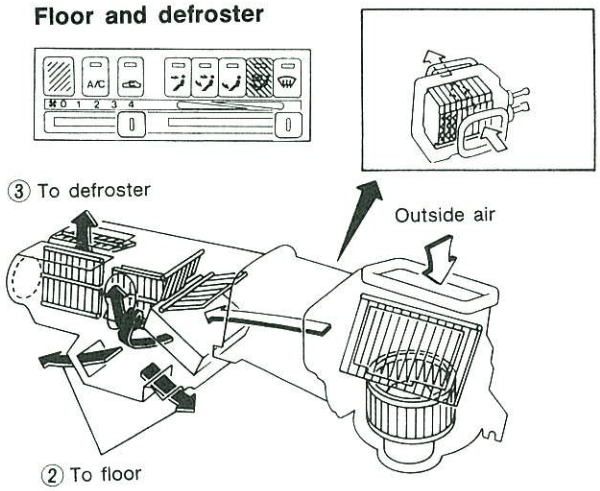
Ventilation



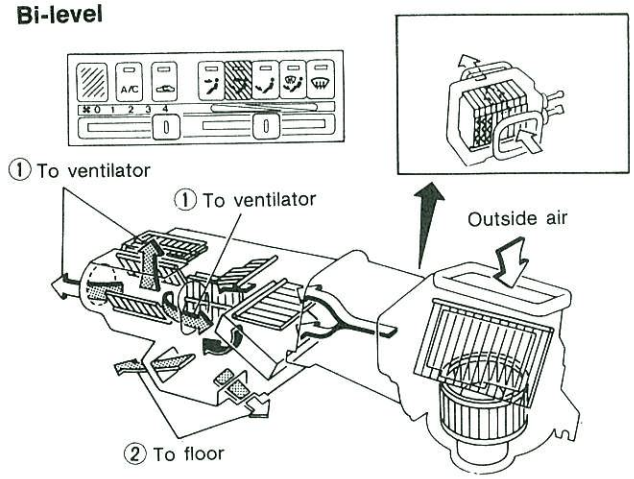
Floor



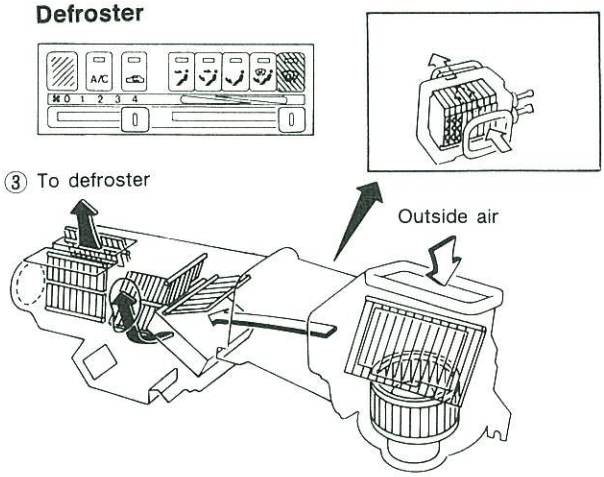
Floor and defroster



Bi-level



Defroster



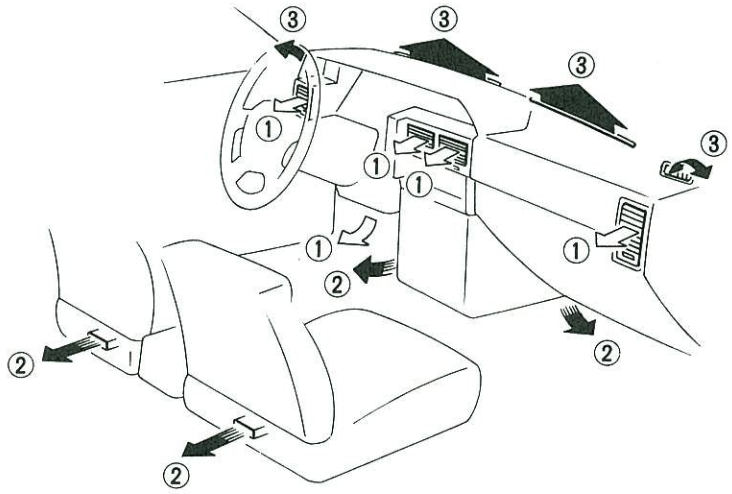
: Air passed through heater core

: Mixed air (⬅ + ⇦)

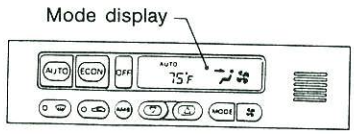
⇦ : Air not passed through heater core

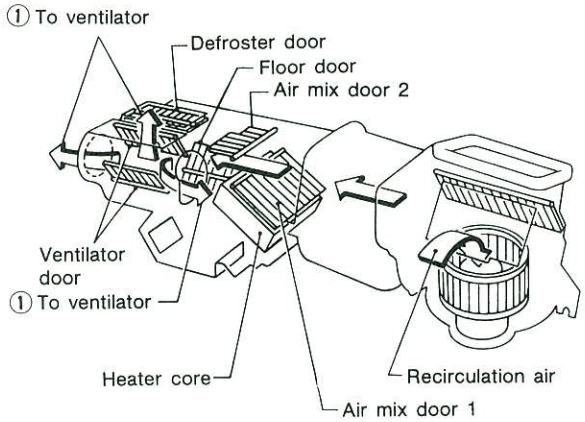
RHA369B

Air Flow — Auto Air Conditioner

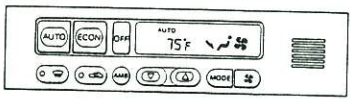


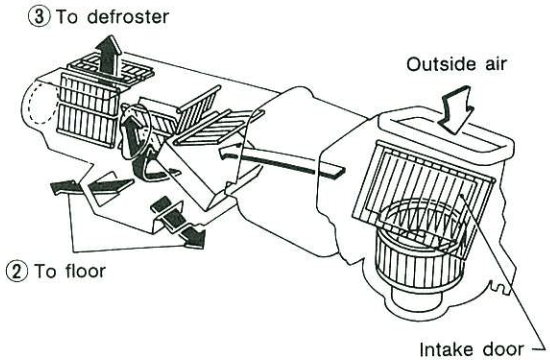
Ventilation



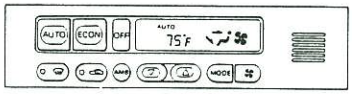


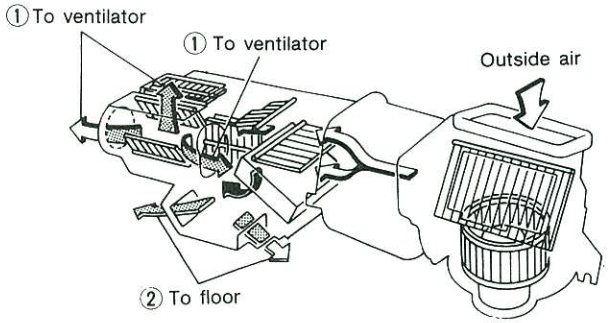
Floor



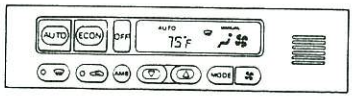


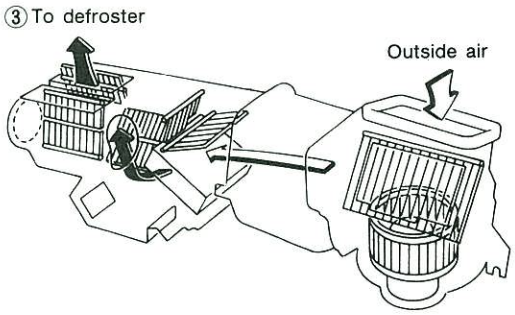
Bi-level





Defroster





: Air passed through heater core

: Mixed air (+)

: Air not passed through heater core

RHA370B

Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the evaporator, and back to the compressor.
The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION

When the A/C is switched on, the compressor runs continuously, and the evaporator pressure is controlled by a suction throttle valve (S.T.V.) to prevent freeze up.

REFRIGERANT SYSTEM PROTECTION

Dual-pressure switch

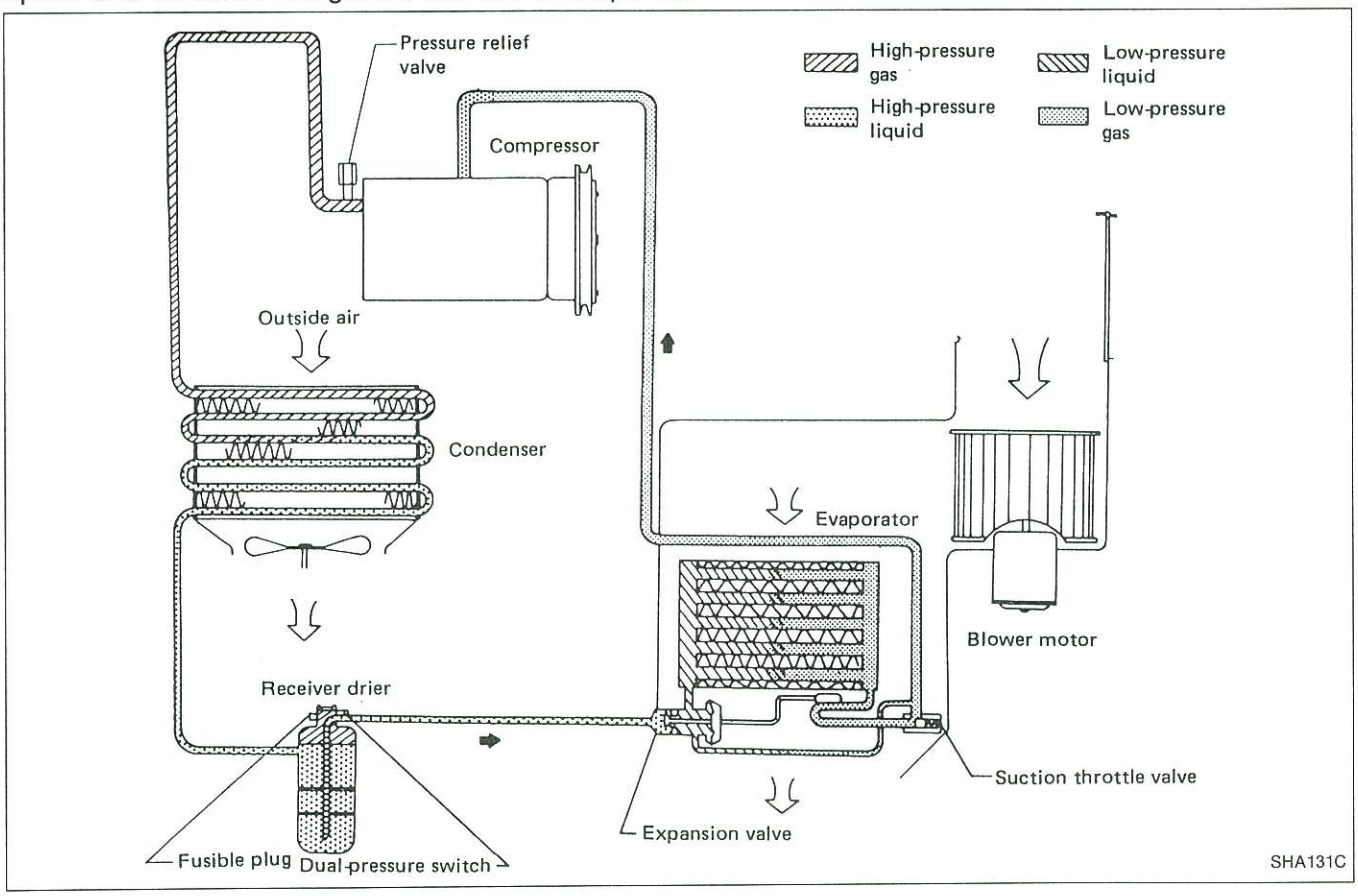
The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

Fusible plug

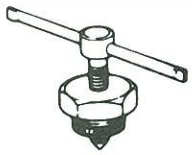
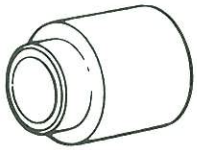
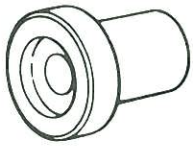
Open at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace receiver drier.

Pressure relief valve

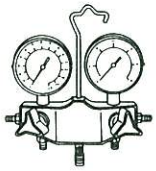
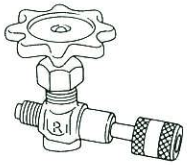
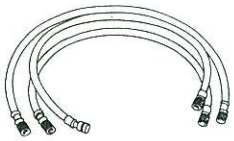
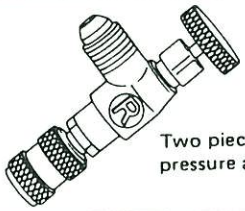
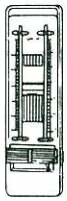
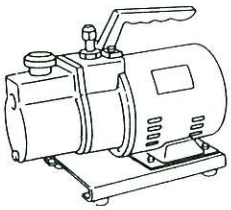
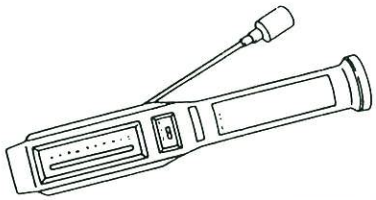
The refrigerant system is also protected by a pressure relief valve, located on the end of high flexible hose near compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm^2, 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



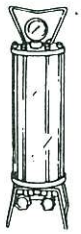
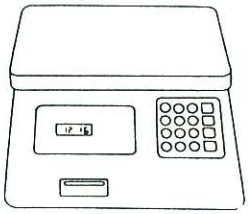
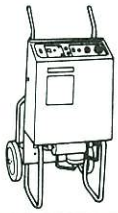
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
KV99232022 (J26571-A) Clutch disc puller		Removing clutch disc
KV99231010 (J37877) Clutch disc wrench		Removing shaft nut and clutch disc
KV99233040 (J26720-A) Puller pilot		Removing pulley
KV99234160 (J37879) Pulley installer		Installing pulley
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

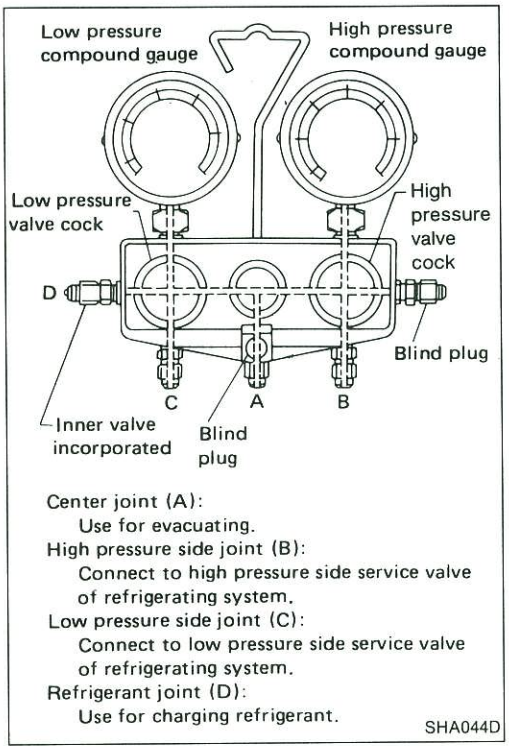
Service Tools (Cont'd)

Tool name	Description	
Charging cylinder	 RHA578B	Checking amount of refrigerant and charging refrigerant
Weight scale	 RHA579B	Checking amount of refrigerant
Refrigerant recycling equipment	 SHA732C	Capturing and recycling refrigerant

For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.

Service Tools (Cont'd)

HANDLING METHOD AND STRUCTURE



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

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:

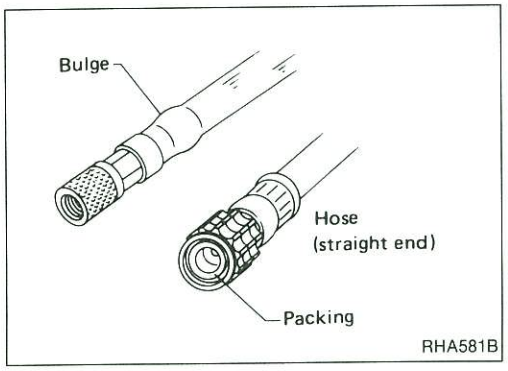
- **When installing the gauge to the refrigerating system, use utmost care not to mistake high pressure and low pressure line connections. (Wrong connections will lead to a damaged gauge.)**
- **Before evacuating, confirm that the gauge has a negative pressure scale. (If not, the gauge will be damaged.)**

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 refrigerant canister.
4. Connect the charging 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
Refrigerant canister hose	Blue or green (with valve core)
Vacuum pump hose	Blue or green

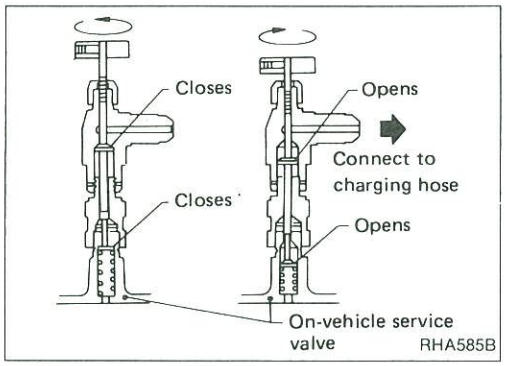


RHA581B

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.**

Service Tools (Cont'd)



Installing the adapter valve

Install the adapter valve to each of the high pressure and low pressure service valves so that air purging from the charging hose can be omitted. This also ensures that refrigerant leakage upon disconnection of the hose can be prevented.

1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

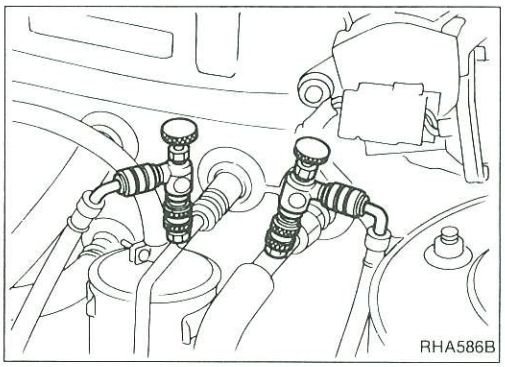
CAUTION:

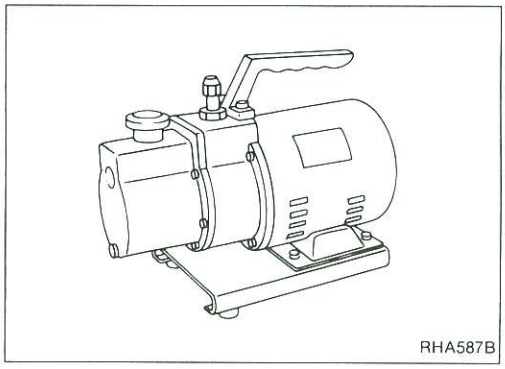
Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace it with a new one.

2. Connect the charging hose to the adapter valve.

Turning the handle clockwise will cause the on-vehicle service valve pin to be pushed open by the adapter valve pin, thus opening the refrigerant passage.

Turning the handle counterclockwise will close the passage. Before removing the adapter valve from the on-vehicle service valve, be sure to fully turn the handle counterclockwise to shut off the refrigerant passage.

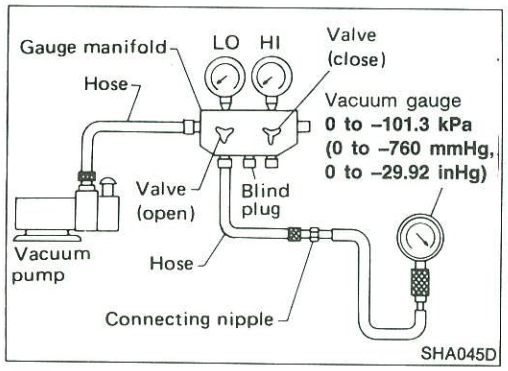




Vacuum pump

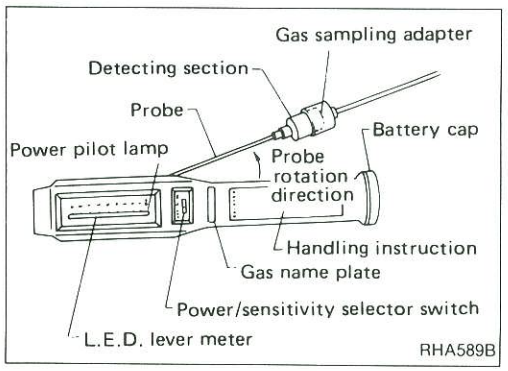
The vacuum pump is used to purge air and moisture from the inside of the refrigeration system by evacuation, thereby ensuring proper functioning of the air conditioner system.

Check the vacuum pump to see that the vacuum pump capacity is greater than –100.0 kPa (–750 mmHg, –29.53 inHg).



Vacuum pump performance check procedure

1. Connect the vacuum gauge to the system.
2. Run the vacuum pump, and check to see that the needle pointers of the gauge manifold and vacuum gauge move smoothly, indicating a similar value.
3. After running the vacuum pump for two or three minutes, read the vacuum gauge. The measured value indicates the capacity of the vacuum pump.



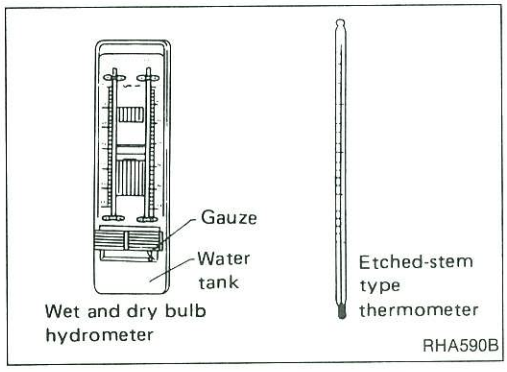
Gas leak detector

The gas leak detector is used to check whether the refrigeration system is leaking. The features of this gas leak detector are listed on the next page.

Service Tools (Cont'd)

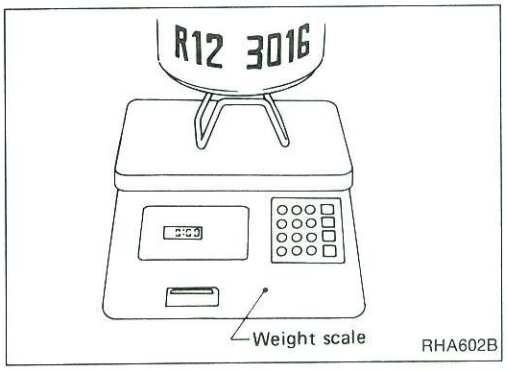
Type		Detection ability	Features
Electrical	Discharge type (Suction type)	3 - 50 g (0.11 - 1.76 oz)/year	• Easy handling • Medium sensitivity • Each point needs tow or more seconds for detection.
	Positive ion emission type (Suction type)	2 g (0.07 oz)/year	• High sensitivity • High price • Warm-up time is needed because a heater is incorporated.
Other simple checking method: Change in vacuum when evacuating		1 kg (2 lb)/month; if 13.3 kPa (100 mmHg, 3.94 inHg) change in vacuum is detected in 10 minutes.	• Can be used easily in refrigerant charging operation. • Detection ability is very low with vacuum gauge in gauge manifold.

- **Leakage inspection of a refrigeration system needs a sensitivity greater than 20 g (0.71 oz)/year.**
- **The actual amount of leak is estimated at 5 to 10 times the detected amount.**
- **Insufficient cooling may be felt if leakage exceeds 150 to 200 g (5.29 to 7.05 oz).**



Temperature gauge

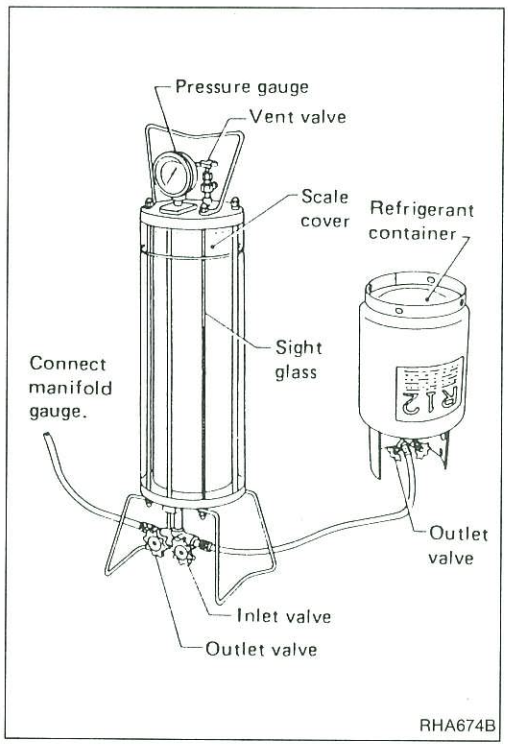
Use to check the air conditioner performance. An etched stem type thermometer may be used. A hygrometer must also be used because the air conditioner performance depends on the humidity.



Scale

Measure the weight of the refrigerant to determine how much the refrigerant is charged.

Service Tools (Cont'd)



Charging cylinder

The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

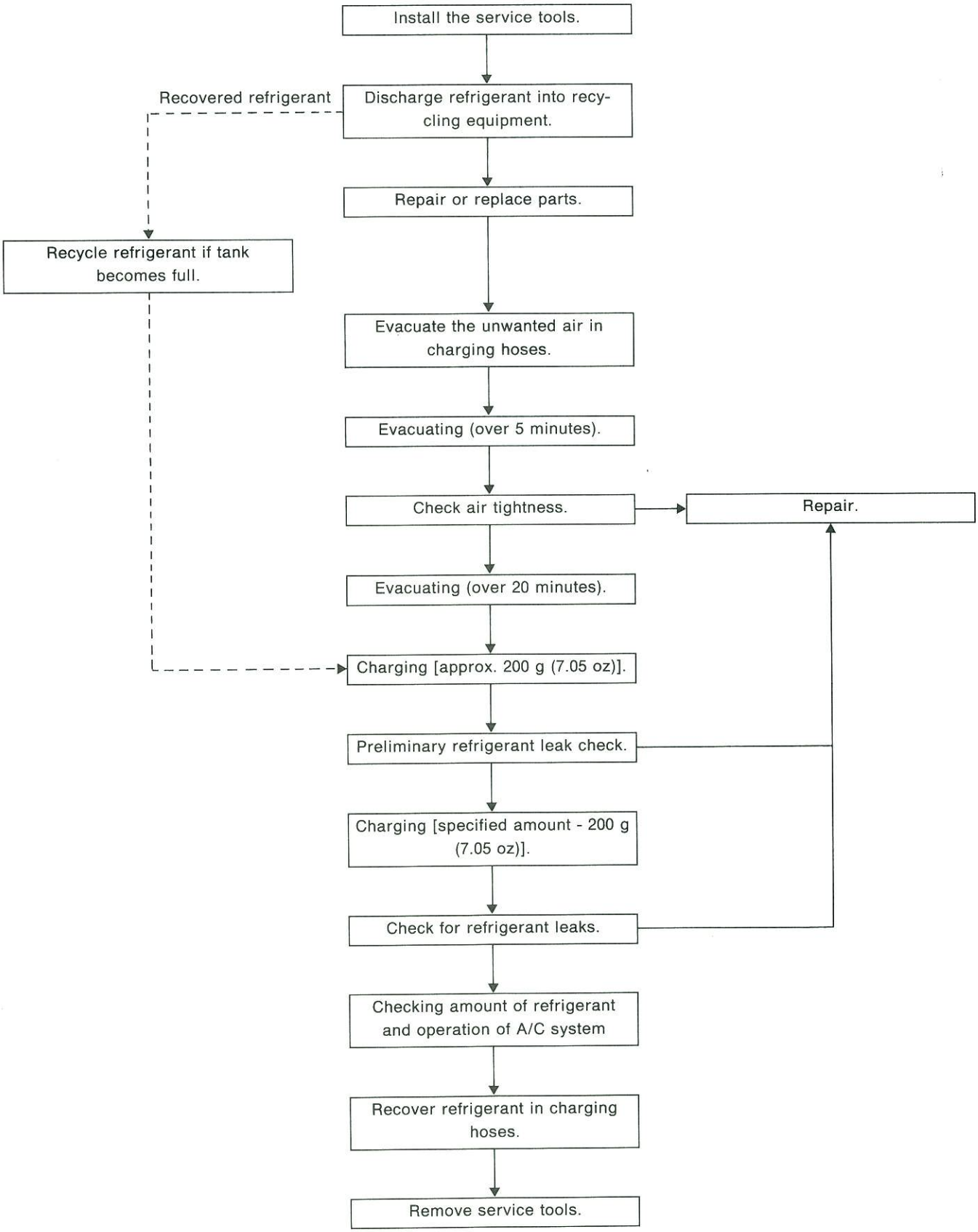
Features

- With the charging cylinder, the operator can measure correctly the amount of refrigerant to be charged into the system.
- Change in the refrigerant volume due to a change in temperature and pressure can be supplemented, and this ensures correct charging of refrigerant.

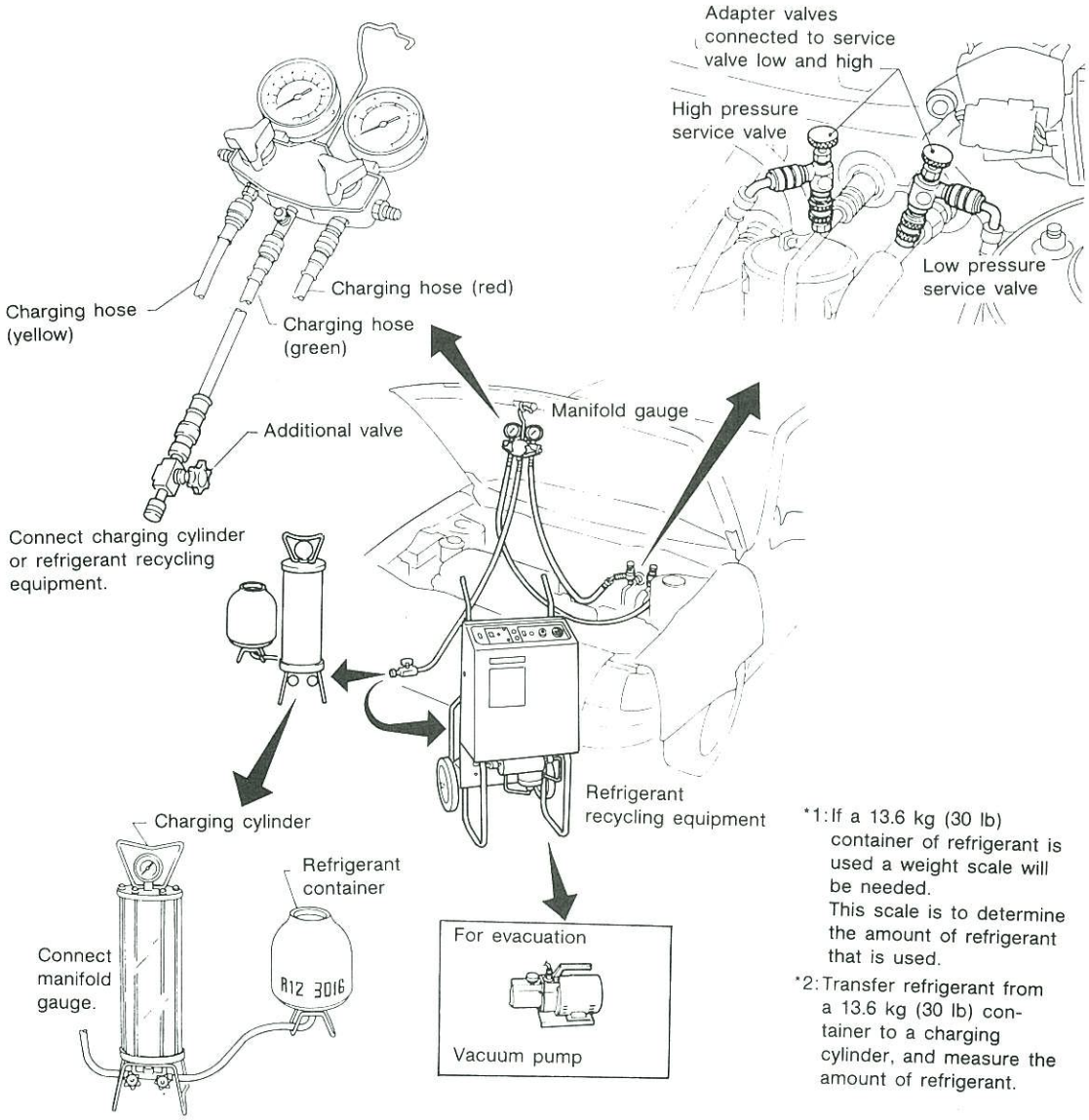
CAUTION:

- **Never attempt to carry the charging cylinder containing refrigerant.**
- **Do not put the charging cylinder in a hot place. If the temperature and pressure of the refrigerant in the cylinder increase, the safety valve will be pushed open and the refrigerant will be released into the atmosphere.**
- **Do not expose the cylinder to the direct sunlight.**
- **Do not over-charge the refrigerant so that it exceeds the maximum limit of the cylinder.**
- **Do not charge the cylinder with more refrigerant than is needed.**

Work Procedure

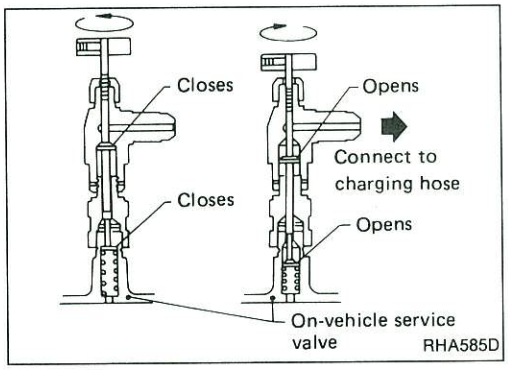


Setting of Service Tools



WARNING:
Discharge only into your recycling equipment. Do not release refrigerant into the air.

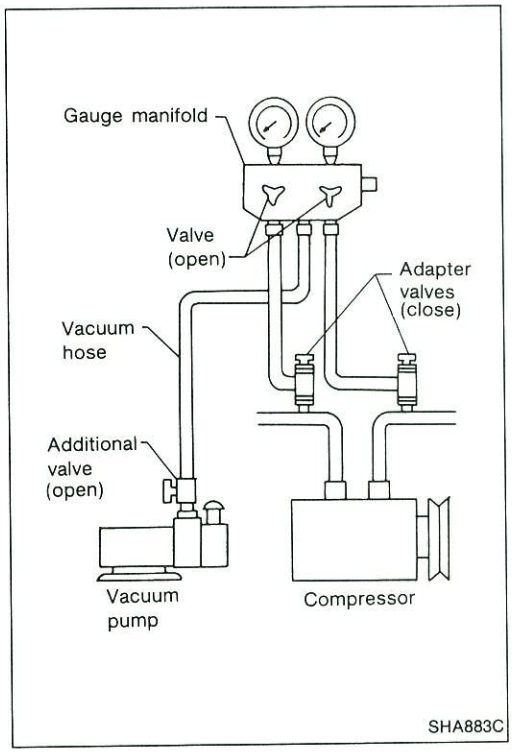
Setting of Service Tools (Cont'd)

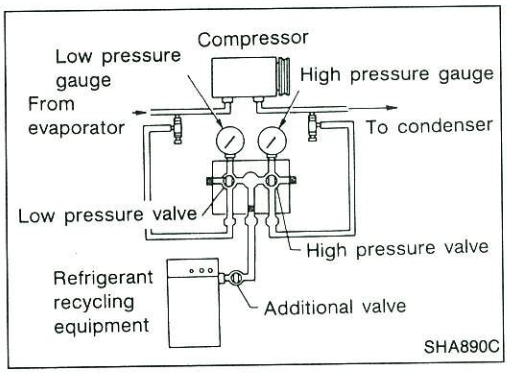


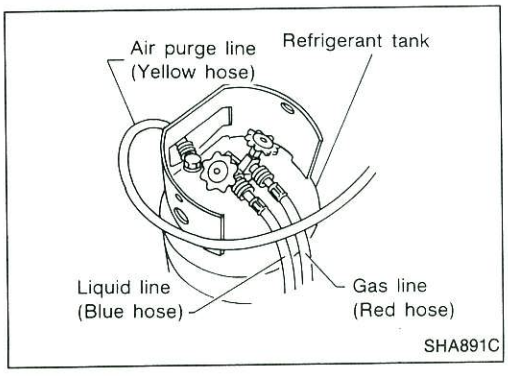
1. Install adapter valve to each of high pressure and low pressure service valves.

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.

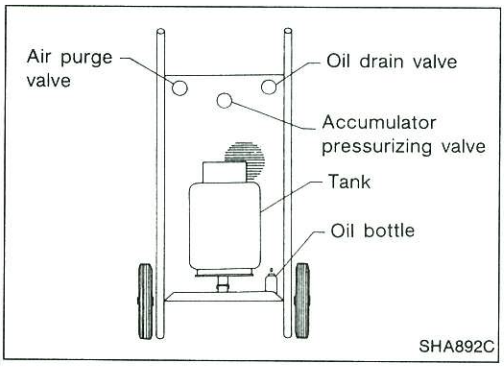
Use only authorized refillable refrigerant tanks for your recycling equipment.

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)



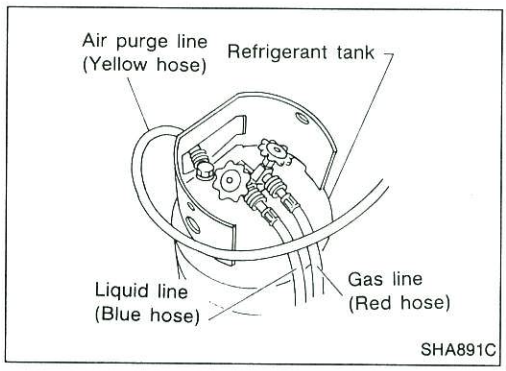
6. To drain A/C system oil accumulator, open "Accumulator Pressurizing" valve for approximately 15 seconds to allow some compressor discharge pressure back into accumulator. Close "Accumulator Pressurizing" valve and open "Oil Drain" valve slowly and drain accumulator. Do not allow accumulator to completely 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

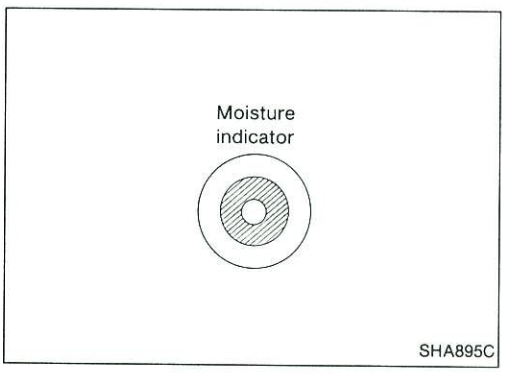
The recycling of reclaimed refrigerant is essential in order to assure that the refrigerant which meets the standards is re-used.

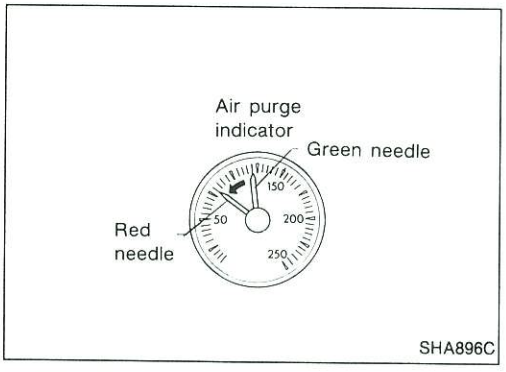
For maximum efficiency, full tanks of recovered refrigerant should be recycled. As required, tanks containing a minimum of 3.6 kg (8 lb) of refrigerant can be recycled.

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.

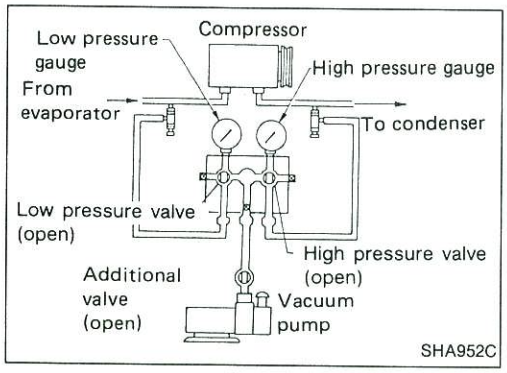




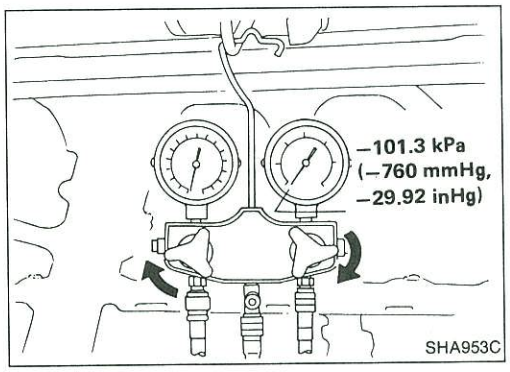
Evacuation

EVACUATION PROCEDURE

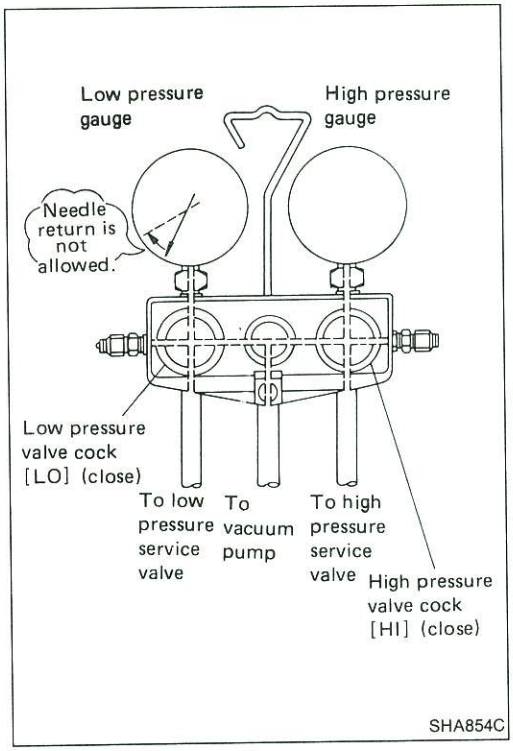
1. Connect vacuum hose to vacuum pump.
2. Open high and low pressure valves of manifold gauge set and additional valve.
3. Run vacuum pump.



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.

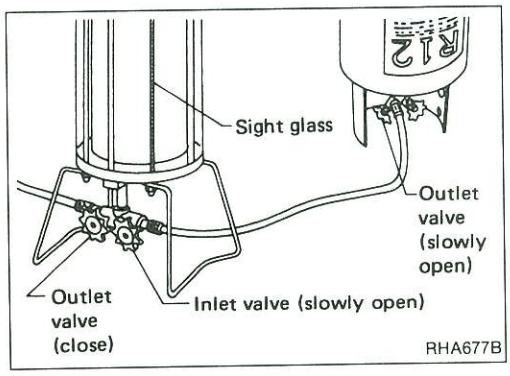
1. Run vacuum pump.
2. Open high and low pressure valve and additional valve.
3. Evacuate for more than 20 minutes.
4. Close high and low pressure valves and additional valve.

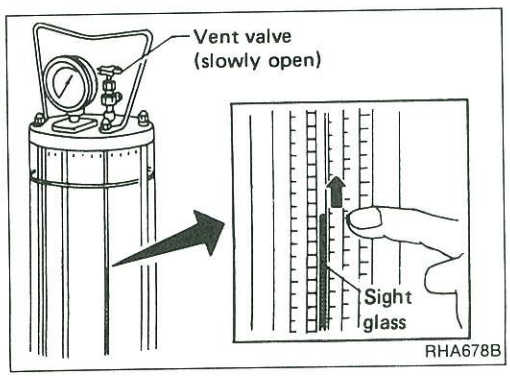
Charging Refrigerant

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.



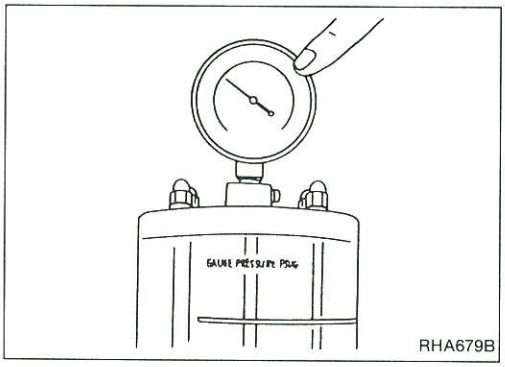


4. Slowly open upper vent valve to release pressure from charging cylinder. While doing so, continue charging until required amount of refrigerant is reached.

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).

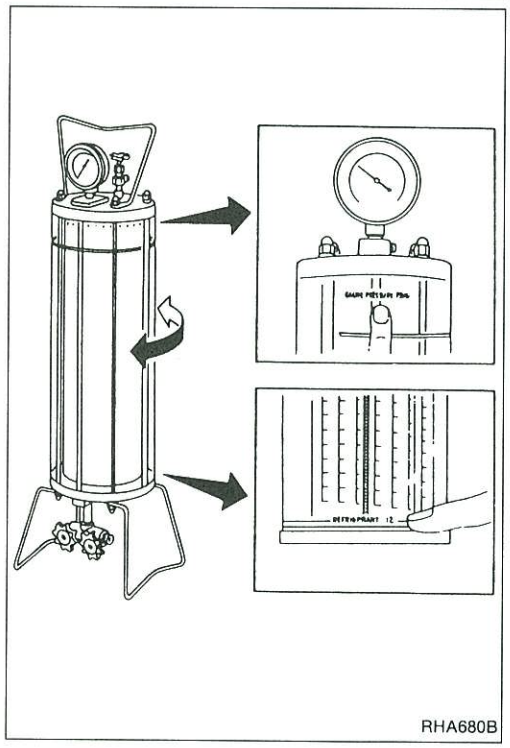
5. Close inlet valve and upper vent valve of charging cylinder.

Charging Refrigerant (Cont'd)



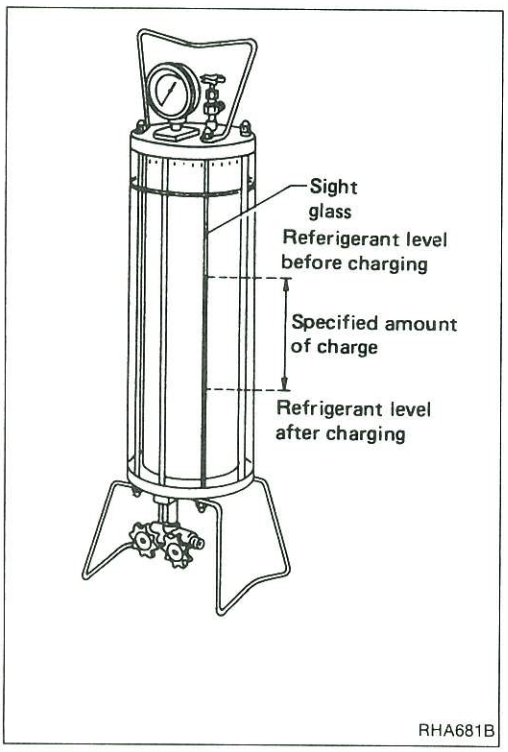
6. Turn on heater switch (charging cylinder is provided with a heater.)

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.



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.



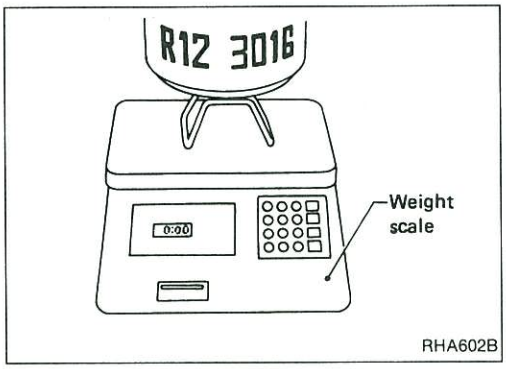
CALCULATING CHARGING AMOUNT OF REFRIGERANT

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.

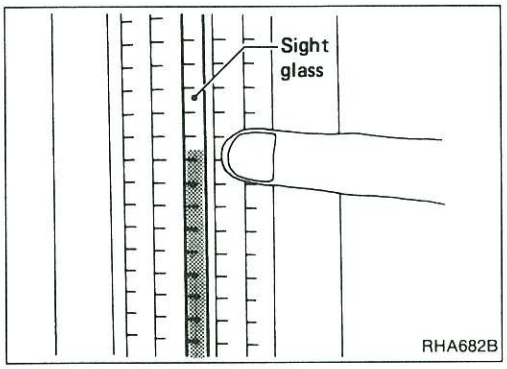
Example:

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)



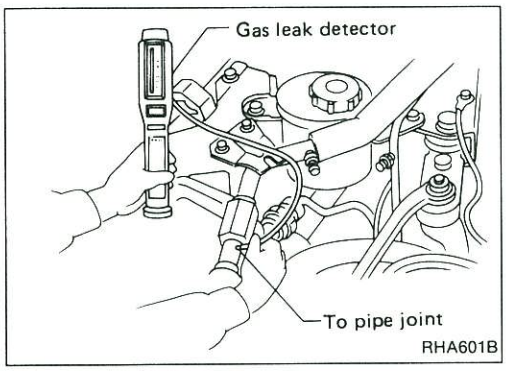
If a flow meter is not available, the amount of charged refrigerant also can be determined by subtracting the weight of the container measured after charging from its weight measured before charging.



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).

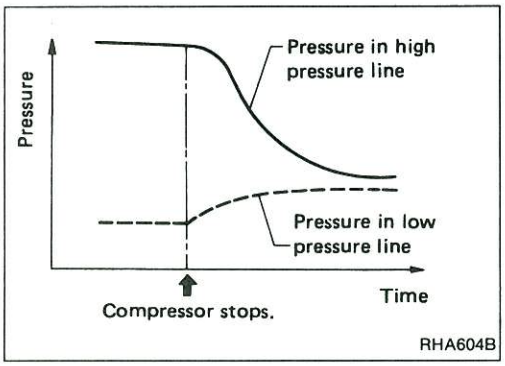
Inspection for Refrigerant Leaks

WORK PROCEDURE

To facilitate inspection for refrigerant leaks, establish the following conditions:

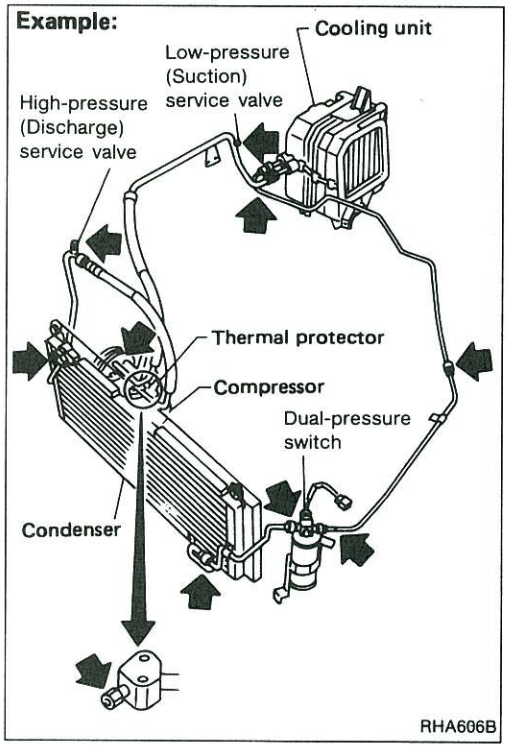
- Start engine.
- Run air conditioner.
- Set blower fan control to MAX.
- Set temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate refrigerant through the system).

Inspection for Refrigerant Leaks (Cont'd)



Refrigerant leaks should be checked immediately after stopping the engine, beginning with the high pressure line, using a gas leak detector. This is because the pressure in the high pressure line drops gradually after the refrigerant circulation stops while the pressure in the low pressure line rises gradually as shown in the graph. 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 the vehicle. It is also necessary to shield the vehicle from the wind so that the leaking refrigerant is not blown away.



INSPECTION POINTS

Check carefully each of the tube joints. To check, wipe the portion to be checked with waste cloth, and move the tester probe all around the joint.

Compressor

Check the shaft seals and bolt holes, and also around the magnet clutch.

Receiver drier

Check the pressure valve, safety valve and the fusible plug mounts.

Service valve

Check all around the service valves. Ensure that the valve core is not loose. The service valve cap must be attached to the valve (to prevent leak). Also check that there are no foreign objects inside the cap.

Inside of cooling unit

To check, insert the leak tester probe into the drain hose immediately after stopping the engine. (Keep the probe inserted for more than 10 seconds.)

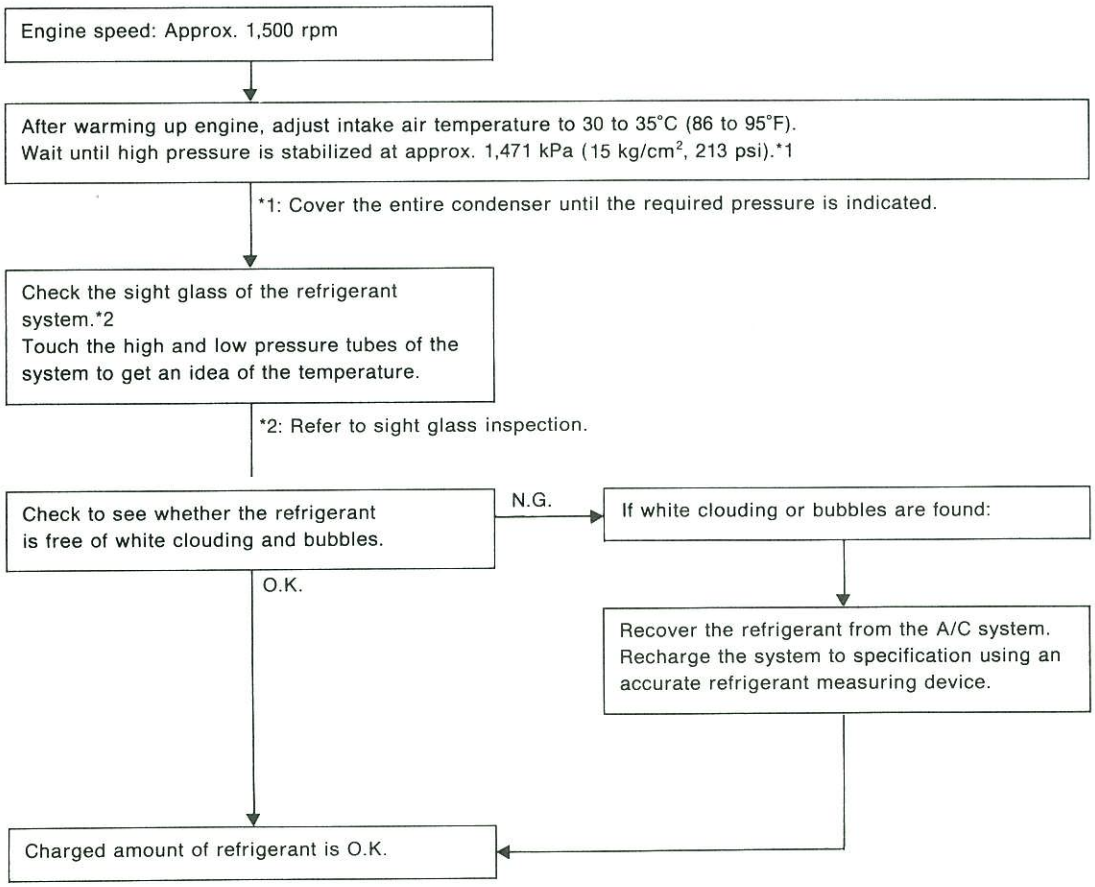
Confirmation of Amount of Charged Refrigerant

The amount of refrigerant charged into the system can be observed through the sight glass by watching the flow of the refrigerant and by reading the high pressure and low pressure manifold gauges under the following conditions:

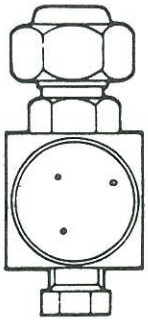
CONDITIONS

- Doors:
  Close completely.
- Window glasses:
  Close completely.
- Intake door position:
  RECIRC
- Mode door position:
  VENT
- Blower fan:
  HI
- TEMP control:
  Optional (Set so that intake air temperature is 30 to 35°C (86 to 95°F).
- A/C or AUTO switch:
  ON
- Engine speed:
  Approx. 1,500 rpm
  Approx. 1,500 rpm

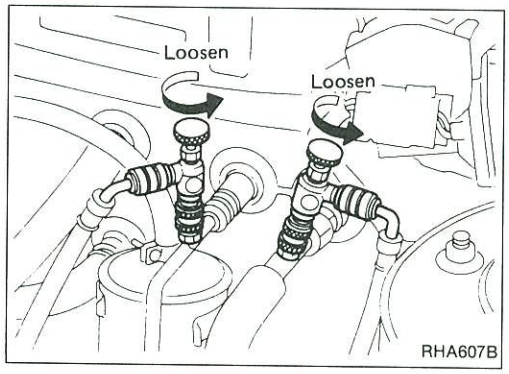
WORK PROCEDURE



Confirmation of Amount of Charged Refrigerant (Cont'd)

Check item \ Amount of charge	Appropriate	Refrigerant is insufficient	Almost no refrigerant	Overcharged, or air in system
Temperature of high and low pressure pipes	High pressure side is hot while low pressure side is cold.	High pressure side is warm and low pressure side is somewhat cold.	No difference is felt between high and low presser sides.	High pressure side is very hot.
Flow of refrigerant viewed through sight glass	Mostly transparent. Occasionally some bubbles are seen when engine rpm 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 receiver drier strainer is clogged, or when the expansion valve is opened excessively.**	Add refrigerant after checking for leaks.	Check the refrigerant system.	Stop the compressor and extract excessive refrigerant. If air is found, perform evacuation, then charge the specified amount of refrigerant.

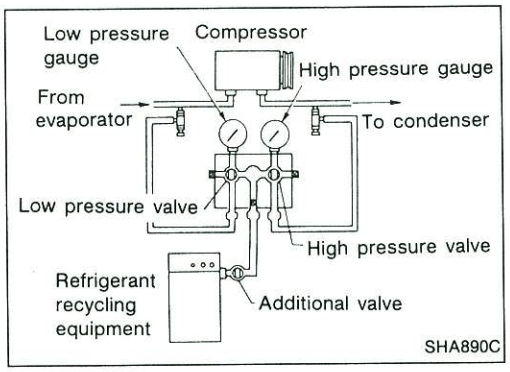
CAUTION:
The condition of bubbles seen through the sight glass as well as the intake and discharge pressures are influenced by the ambient temperature, wind velocity, weather, and by the air temperature in front of the condenser, etc.



Removal of Service Tools

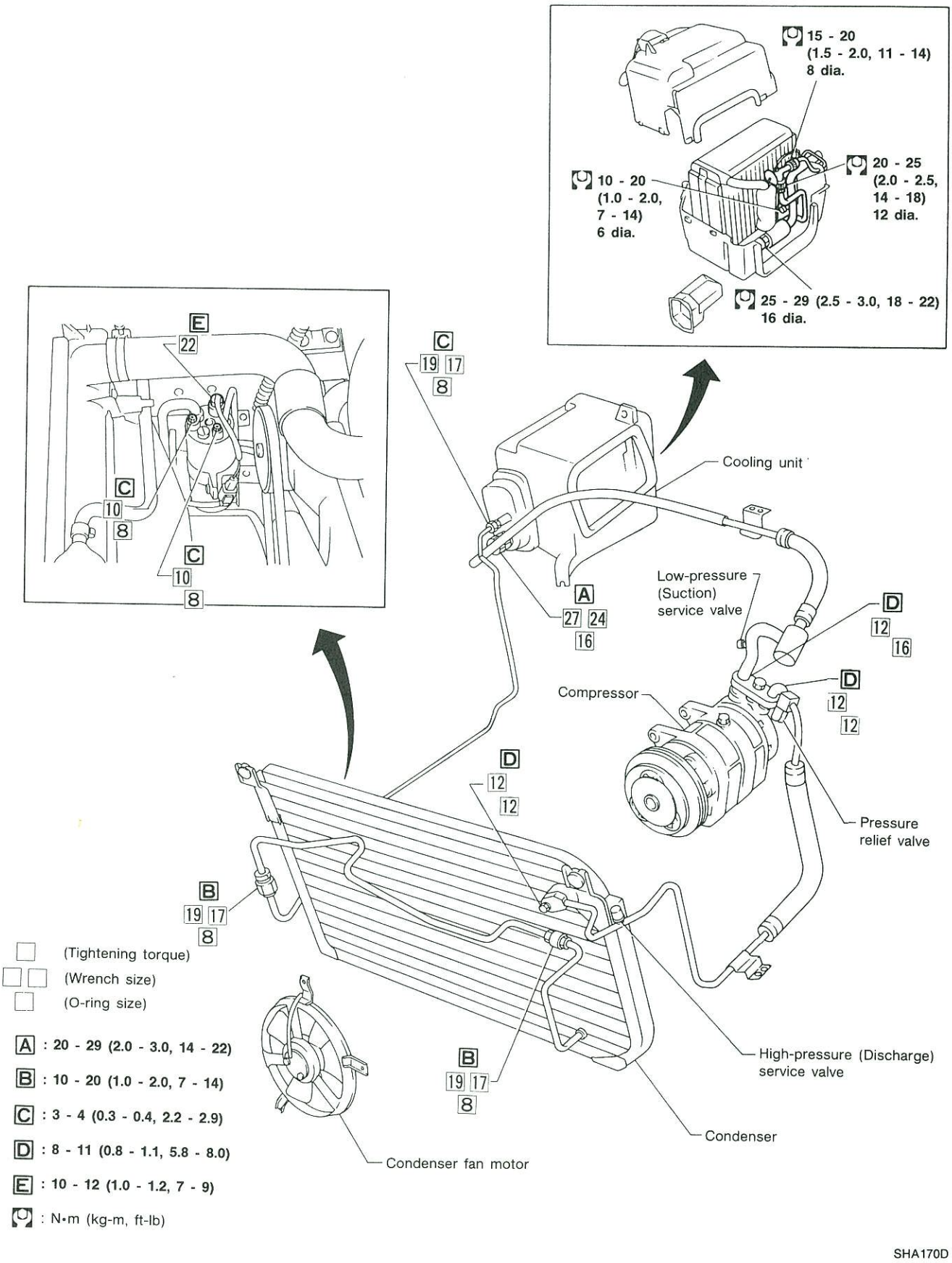
1. Completely loosen adapter valves of low pressure and high pressure lines.
2. Close additional valve and remove center hose from charging cylinder.
3. Connect center hose to refrigerant recycling equipment.
4. Open additional valve and both valves on gauge manifold.
5. Capture refrigerant in charging system.
6. After recovering refrigerant, remove adapter valves from on-car service valves.

Removal of Service Tools (Cont'd)



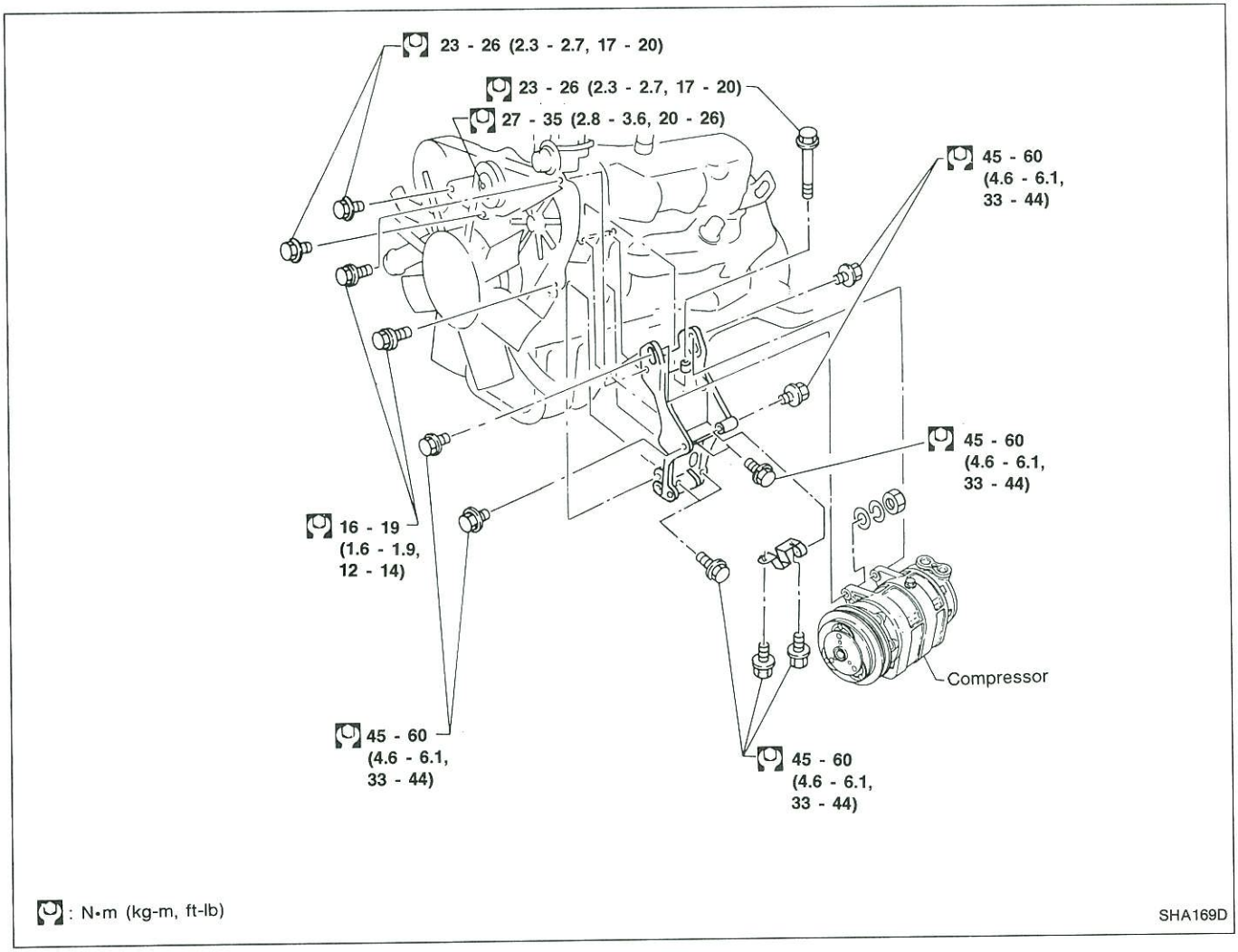
Refrigerant Lines

- **Refer to page HA-3 regarding "Precautions for Refrigerant Connections".**



SHA170D

Compressor Mounting



Belt Tension

- **Refer to MA section.**

Fast Idle Control Device (F.I.C.D.)

- **Refer to EF & EC section.**

General

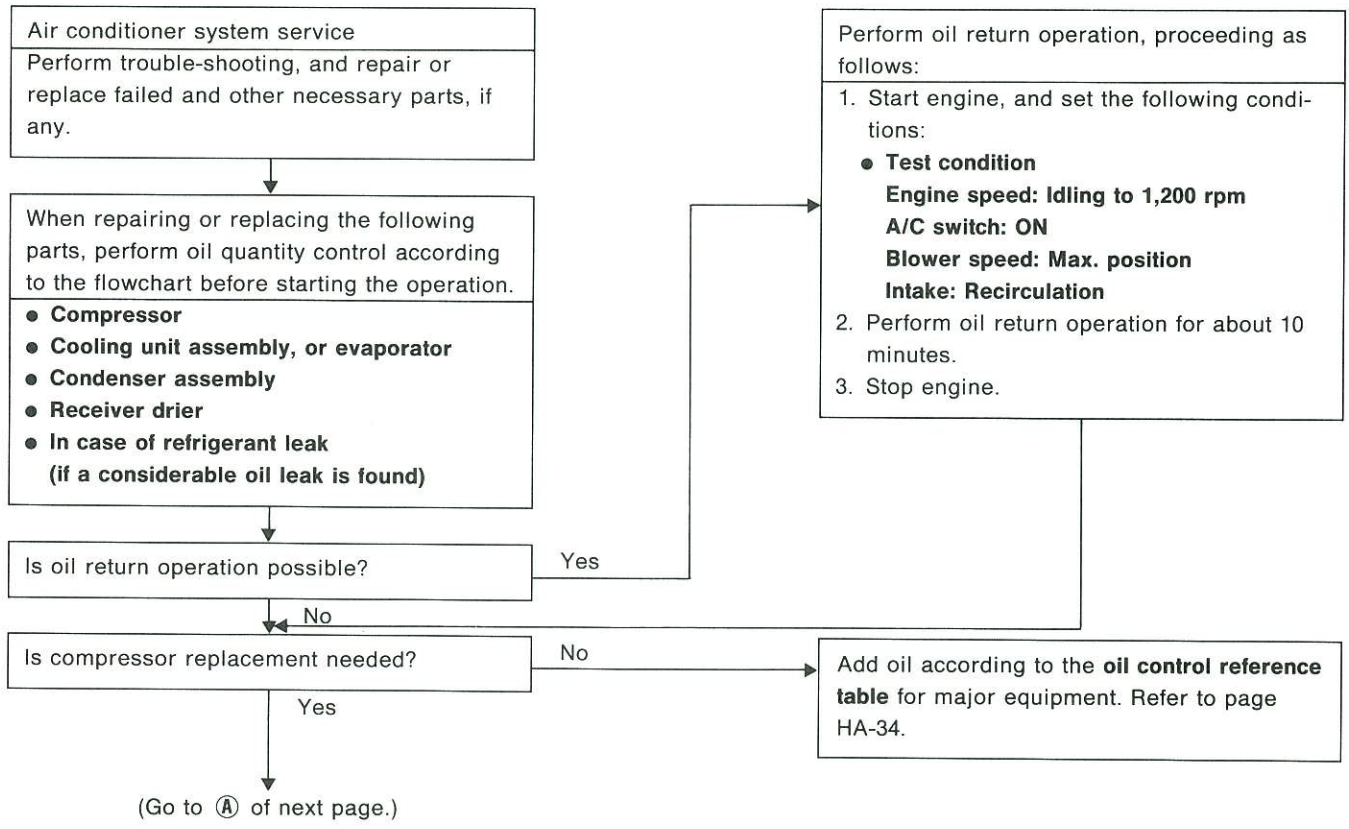
When replacing any refrigerant cycle component part of a compressor, condenser, liquid tank, cooling unit, etc., it is essential to recover the refrigerant in advance.
The refrigerant has a large affinity for the compressor oil, and a part of the oil is always circulating throughout the cycle together with the refrigerant. In other words, the oil is distributed throughout the cycle. Before recovering the refrigerant, it is therefore necessary to collect as much compressor oil as possible by performing the oil return operation. If the compressor oil is not replenished, or if too much is added after replacing component parts of refrigerant cycle, the following trouble may occur:

- **Insufficient oil: Seized compressor**
- **Excessive oil: Poor cooling (Excess oil attached to parts obstructs normal heat exchange.)**

For this reason, whenever replacing any parts of the refrigerant cycle (except the compressor), it is necessary to replenish the compressor oil removed together with such parts. On the other hand, a new compressor contains a full system charge of compressor oil, and simple installation of the new compressor results in excessive oil quantity in the cycle. To prevent this, the oil must be extracted from the cycle so that the optimum oil quantity can be ensured inside the refrigerant cycle.

Checking and Adjusting

Adjust the oil quantity according to the flowchart shown below.



Checking and Adjusting (Cont'd)

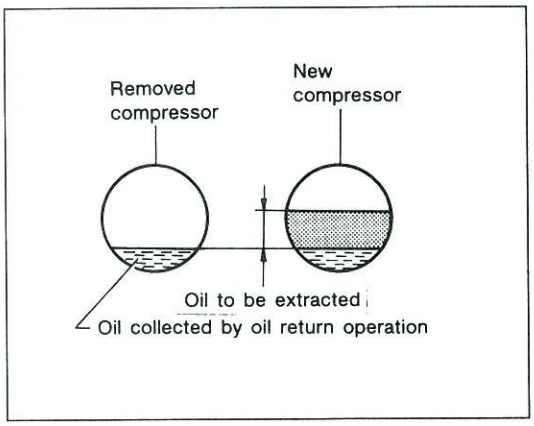
Ⓐ

Remove compressor oil from the new compressor according to the following table so that the remaining amount of oil in the new compressor is equal to the amount of recollected oil in the removed compressor.

Unit: mℓ (US fl oz, Imp fl oz)

	Oil quantity contained in new compressor		Amount of collected oil	Amount of oil extracted from new compressor
Rotary type	DKV14C DKV14B DKV14D	200 (6.8, 7.0)	70 (2.4, 2.5) or over	200 (6.8, 7.0) — [Amount collected + 20 (0.7, 0.7)]
			Below 70 (2.4, 2.5)	110 (3.7, 3.9)
	NVR140 NVR140S	200 (6.8, 7.0)	90 (3.0, 3.2) or over	200 (6.8, 7.0) — [Amount collected + 20 (0.7, 0.7)]
			Below 90 (3.0, 3.2)	90 (3.0, 3.2)
Swash plate type	DKS16H DKS16N	200 (6.8, 7.0)	130 (4.4, 4.6) or over	200 (6.8, 7.0) — [Amount collected + 20 (0.7, 0.7)]
			Below 130 (4.4, 4.6)	70 (2.4, 2.5)
	MJS170 MJS130	150 (5.1, 5.3)	—	80 (2.7, 2.8)

Precharged amount of oil for some models differes from figures listed above. Refer to S.D.S. of each model when servicing compressor oil.



Is it necessary to replace any parts other than compressor?

Yes → Add oil according to the oil management table for major equipment. Refer to oil management standard.

No

Perform performance test. Refer to **performance test.**

If the result of performance test is N.G., carry out oil return operation again, and check the oil quantity.

Oil Management Standard for Major Equipment

When any major unit of the air conditioner has been replaced, add the following amount of oil.

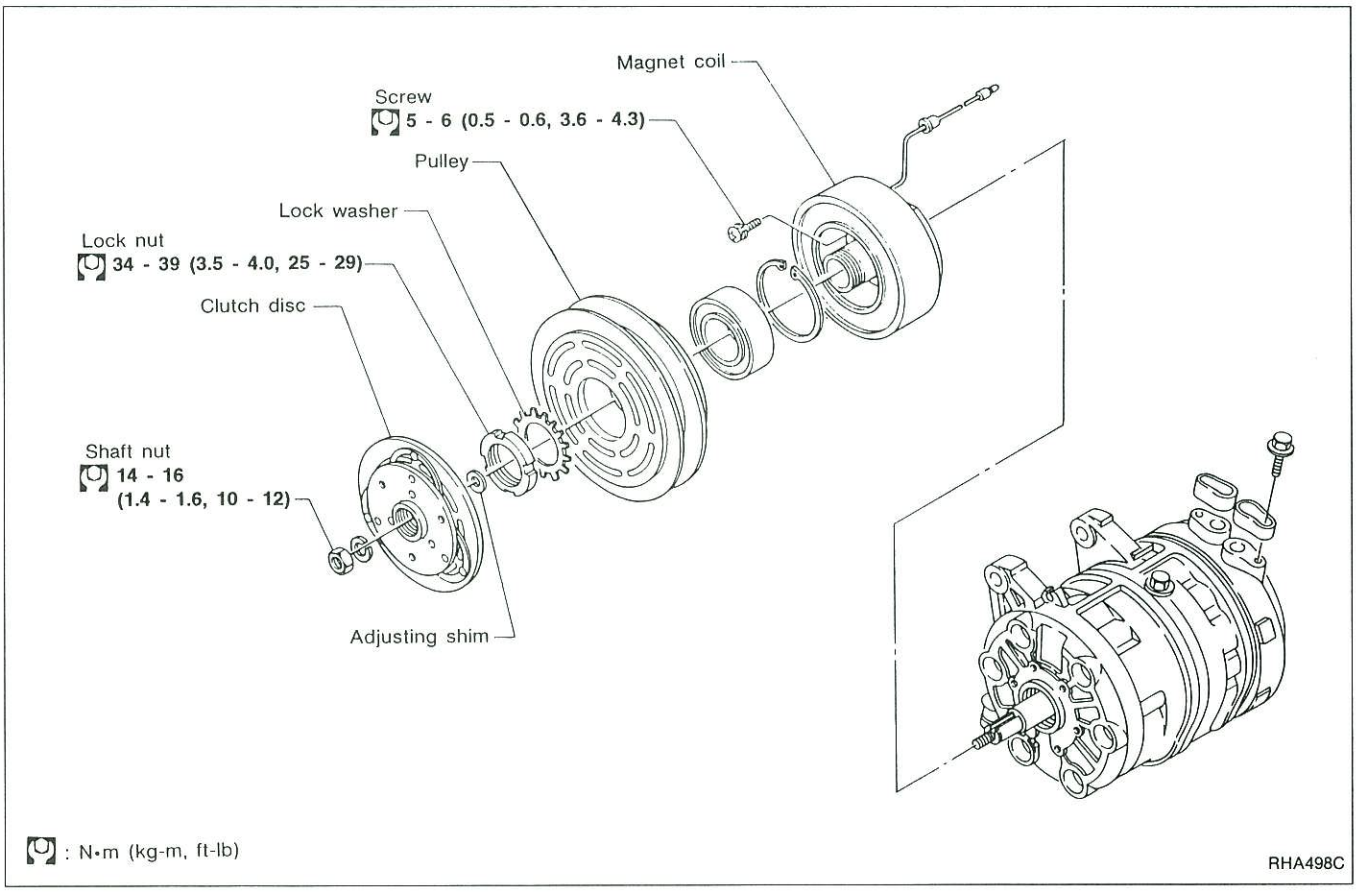
Major unit	Amount of oil to be added		Remarks
	mℓ (US fl oz, Imp fl oz)	Percent (%)*1	
Cooling unit, evaporator	45 - 75 (1.5 - 2.5, 1.6 - 2.6)	30	Add compressor oil little by little from the low pressure side of the system cycle.
Condenser	30 - 50 (1.0 - 1.7, 1.1 - 1.8)	20	
Receiver drier	15 - 25 (0.5 - 0.8, 0.5 - 0.9)	10	Add if compressor is not replaced.*2
In case of refrigerant leak	30 - 50 (1.0 - 1.7, 1.1 - 1.8)	—	Add if large of oil leak is indicated.*3
	—	—	Addition of oil is not required if no oil leak is indicated.

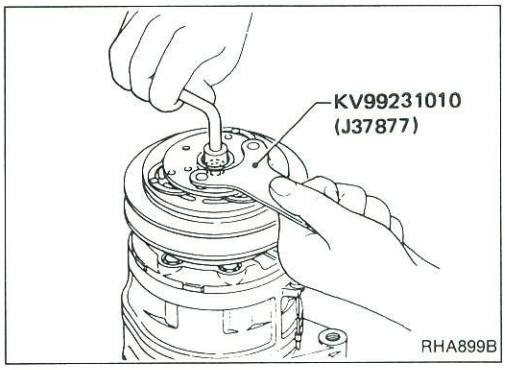
*1: The percentage of the total amount of system oil
*2: If compressor is replaced, addition of oil is included in the flow chart.
*3: Sudden leakage of refrigerant due to fusion of a fusible plug, opening of a relief valve, or damage of a component may accompany oil leak.

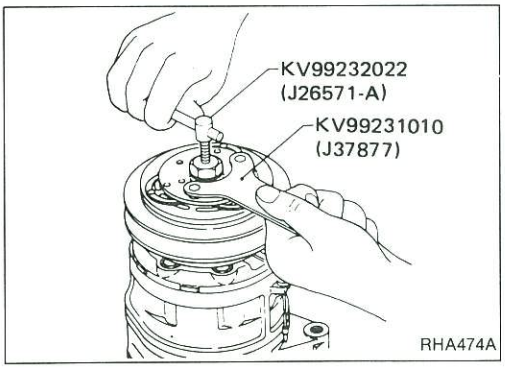
Compressor Oil

The recommended brand of compressor oil for a car air conditioner system is shown below. For the oil quantity, refer to the section **"Checking and Adjusting"**.

SUNISO 5GS or equivalent





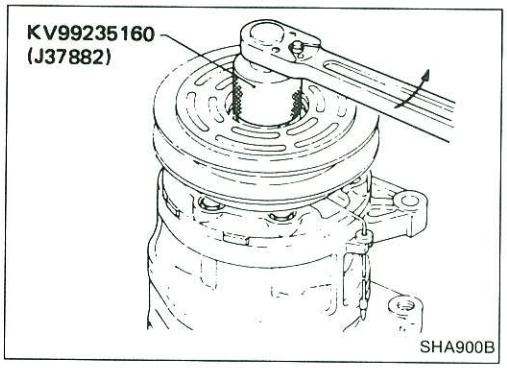


Compressor Clutch

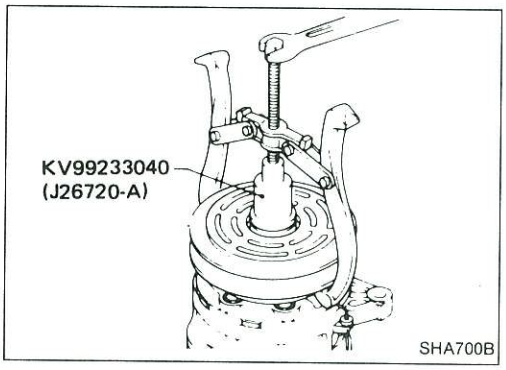
REMOVAL

- When removing shaft nut, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed easily.

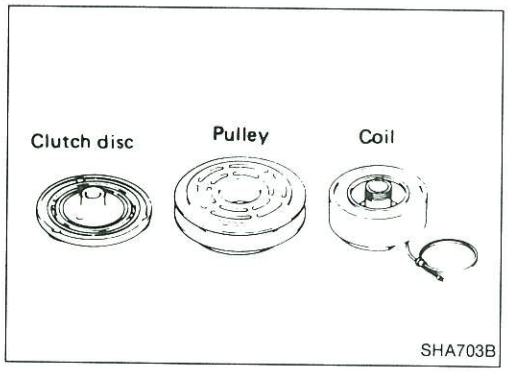
Compressor Clutch (Cont'd)



- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.



- Remove the pulley by hand. If difficult, use puller pilot.



INSPECTION

Clutch disc

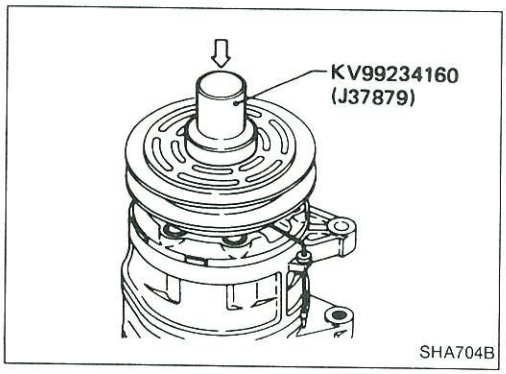
If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

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

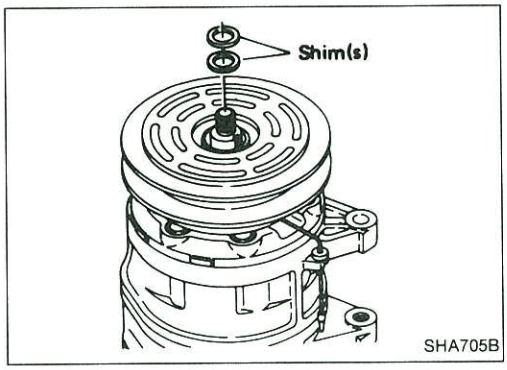
Check coil for loose connection or cracked insulation.



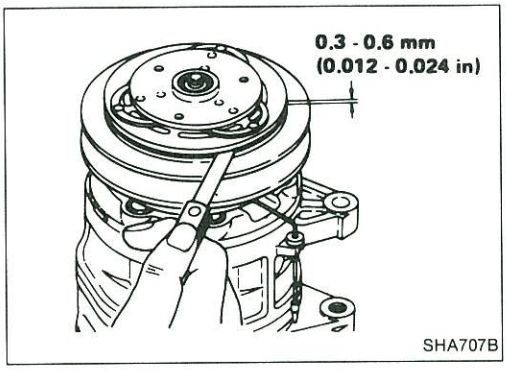
INSTALLATION

- 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 with its holder into the hold.

Compressor Clutch (Cont'd)



- 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.



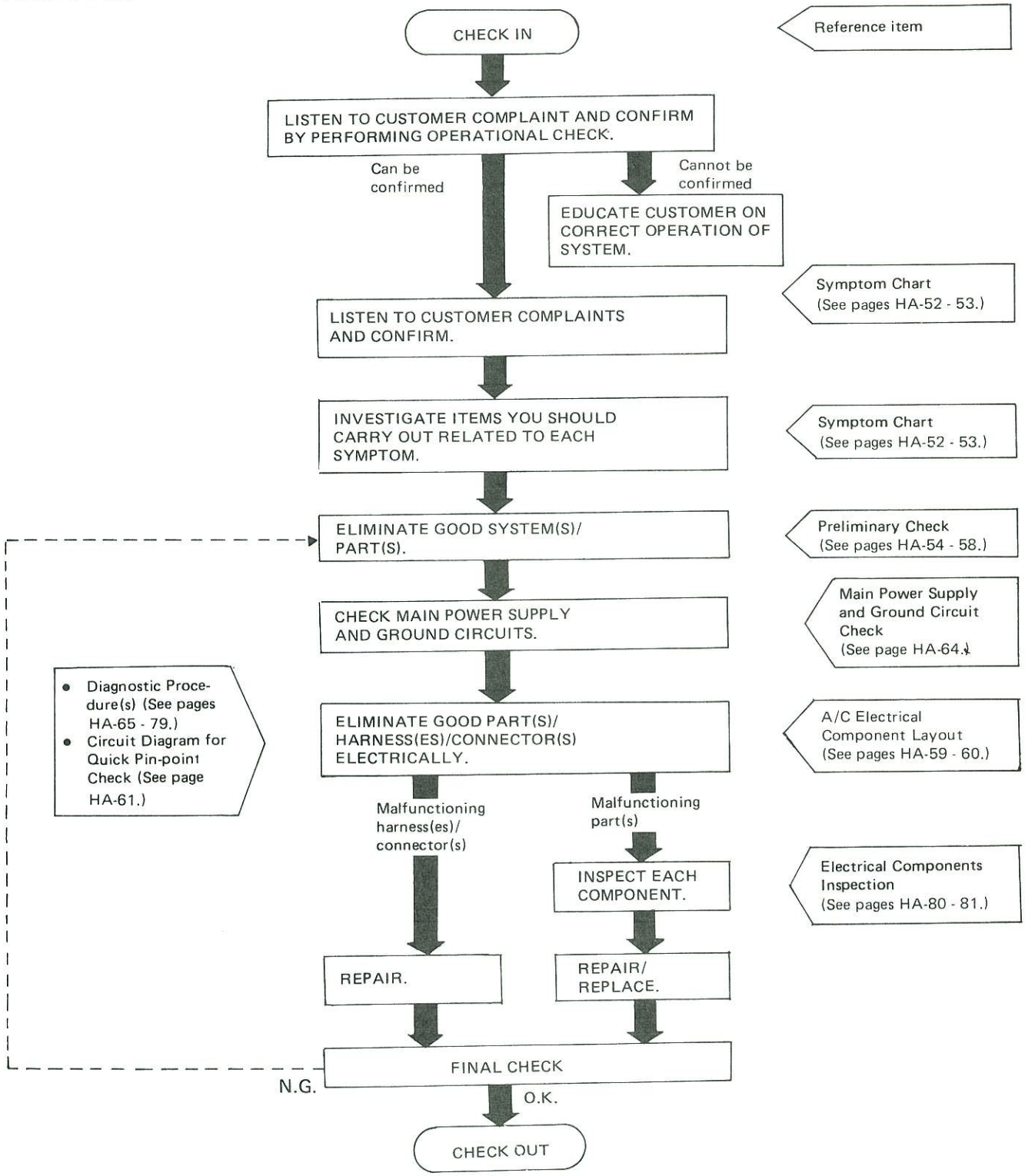
- Check to ensure that the clutch clearance is between 0.3 to 0.6 mm (0.012 to 0.024 in). Adjust the clearance using shim(s) as necessary.

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.

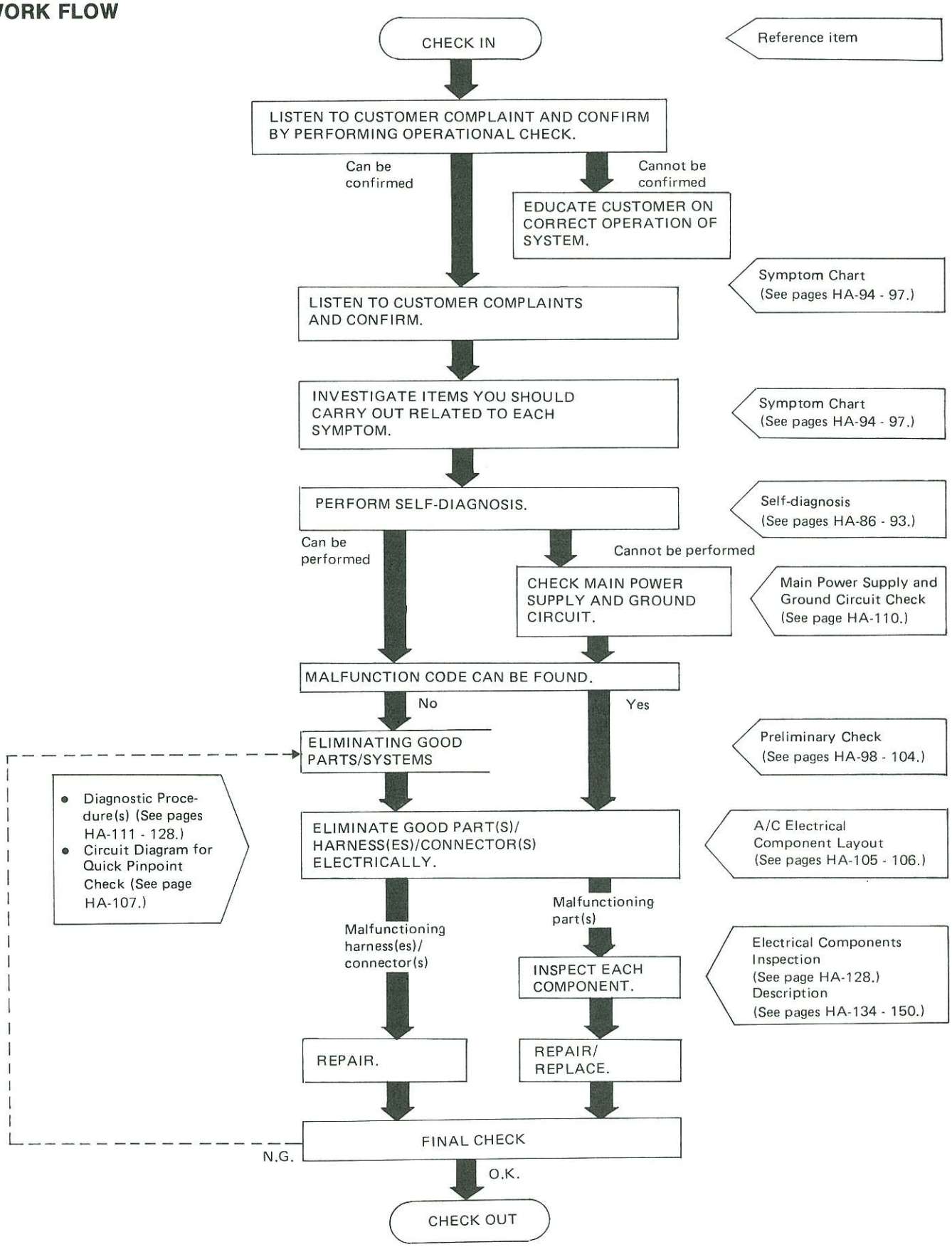
How to Perform Trouble Diagnoses for Quick and Accurate Repair — Manual Air Conditioner

WORK FLOW



How to Perform Trouble Diagnoses for Quick and Accurate Repair — Auto Air Conditioner

WORK FLOW

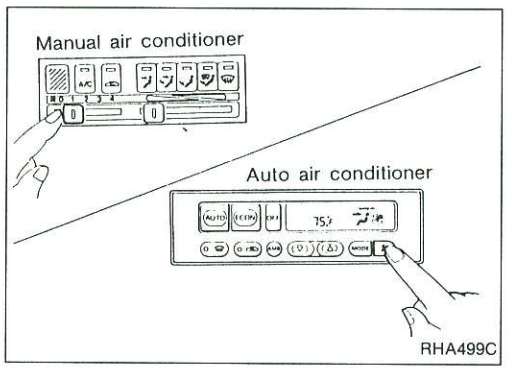


Operational Check

The purpose of the operational check is to confirm that the system is as it should be. The systems which will be checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase, A/C switch and the memory function (Auto air conditioner type only).

CONDITIONS:

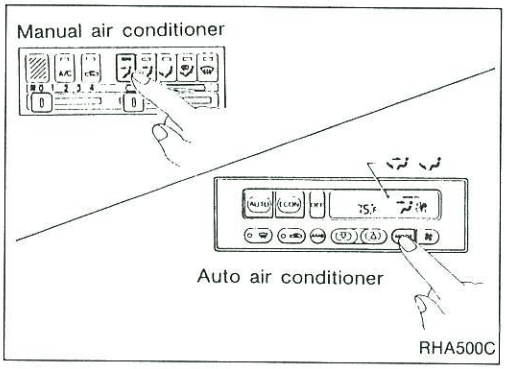
Engine running and at normal operating temperature.



PROCEDURE:

1. Check blower

1) Slide fan lever to 1-speed or press fan button once.
   Blower should operate at low speed.
   The fan symbol should have one blade lit. (Auto Air Conditioner type only).
2) Then slide fan lever to 2-speed or press fan button one more time.
3) Continue checking blower speed until all speeds are checked.
   Continue checking fan symbol until all speeds are checked. (Auto Air Conditioner type only)
4) Leave blower on speed 4 or high speed.

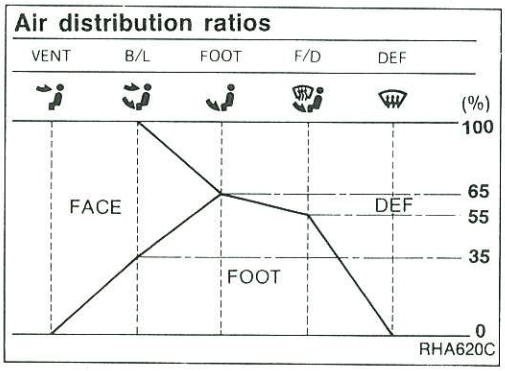


2. Check discharge air

1) Press each MODE button. (Manual Air Conditioner type)
   Press MODE button three times and DEF button. (Auto Air Conditioner type)
2) Confirm that all discharge air comes out according to the air distribution ratios table left.

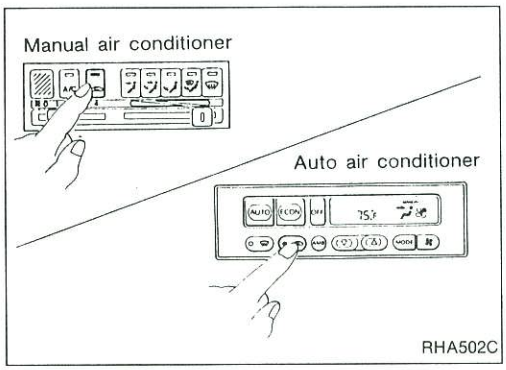
NOTE:

Confirm that the compressor clutch is engaged (visual inspection) and intake door position is at FRE when the DEF button is pressed.



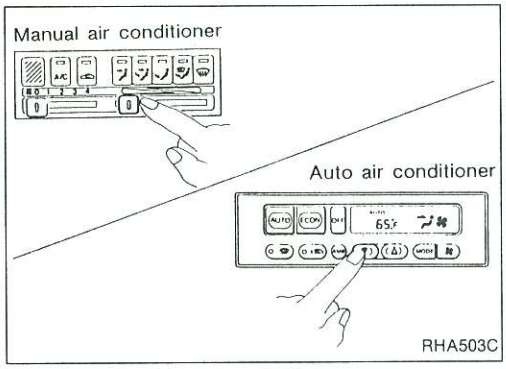
Confirm that the intake door position is at FRE when the F/D button is pressed. (Manual Air Conditioner type only)

Operational Check (Cont'd)



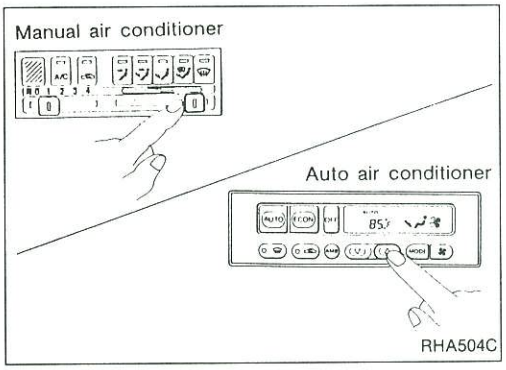
3. Check recirc

1) Press RECIRC button.
   Recirc indicator should light.
2) Listen for intake door position change (you should hear blower sound change slightly).



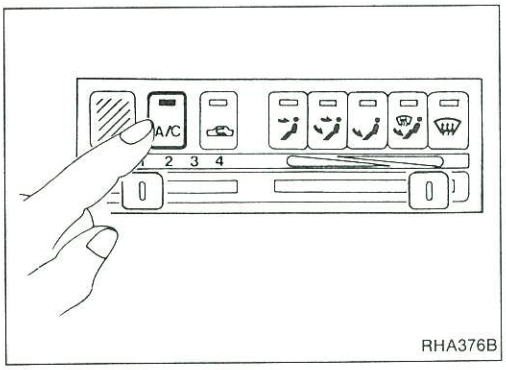
4. Check temperature decrease

1) Slide temperature control lever to full cold (Manual Air Conditioner type).
   Press the temperature decrease button until 18°C (65°F) is displayed (Auto Air Conditioner type).
2) Check for cold air at discharge air outlets.



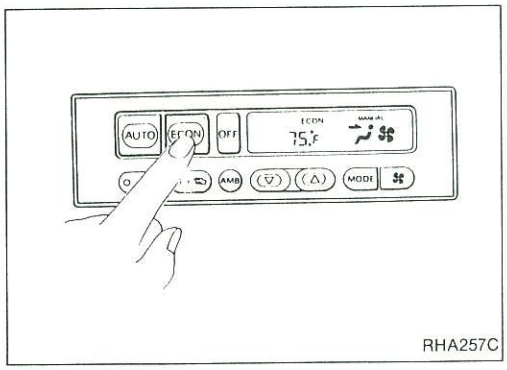
5. Check temperature increase

1) Slide temperature control lever to full hot (Manual Air Conditioner type).
   Press the temperature increase button until 32°C (85°F) is displayed (Auto Air Conditioner type).
2) Check for hot air at discharge air outlets.



6. Check air conditioner switch (Manual Air Conditioner type only)

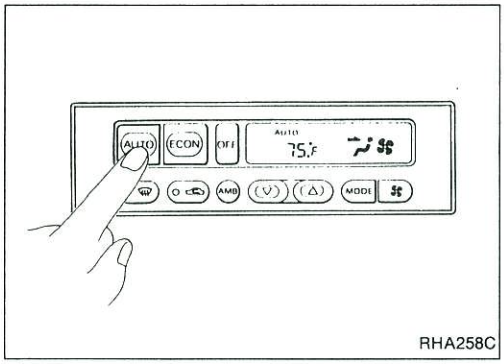
Move the fan control lever to the desired (1 to 4 speed) position and push the A/C button to turn ON the air conditioner.
The indicator light should come on when air conditioner is ON.



7. Check ECON mode (Auto Air Conditioner type only)

1) Press ECON button.
2) Display should indicate ECON (no AUTO, no MANUAL).
   Confirm that the compressor clutch is not engaged (visual inspection)
   (Discharge air will depend on ambient, in-vehicle, and set temperatures).

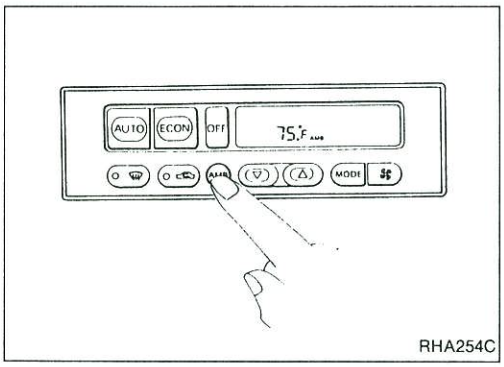
Operational Check (Cont'd)



RHA258C

8. Check AUTO mode (Auto Air Conditioner type only)

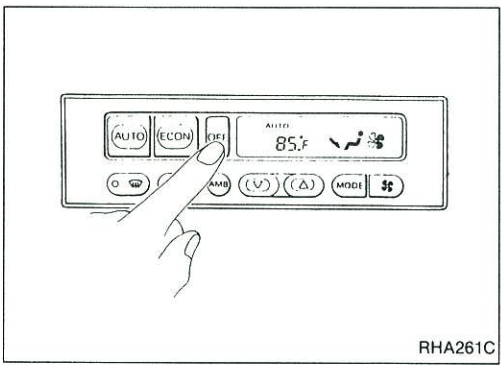
1) Press AUTO button.
2) Display should indicate AUTO (no ECON, no MANUAL). Confirm that the compressor clutch engages (audio or visual inspection).
(Discharge air will depend on ambient, in-vehicle, and set temperatures).



RHA254C

9. Check ambient display (Auto Air Conditioner type only)

1) Press the AMB button.
2) Display should show the outside (ambient) temperature for approximately 5 seconds.



RHA261C

10. Check memory function (Auto Air Conditioner type only)

1) Press OFF button.
2) Turn the ignition off.
3) Wait 15 seconds.
4) Turn the ignition on.
5) Press the AUTO button.
6) Confirm that the set temperature remained at previous temperature.

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 window: Open
- Hood: Open
- TEMP. lever position: Max. COLD
- Air control lever position: (Ventilation)
- (REC) switch: (Recirculation) set
- FAN lever 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

Before conducting performance test, disconnect ambient sensor harness connector and make short circuit using jumper cable.

Testing must be performed as follows:

- Vehicle location: Indoors or in the shade (in a well ventilated place)
- Doors: Closed
- Door window: Open
- Hood: Open
- switch (P.T.C.): 18°C (65°F) set
- (mode) switch: (Ventilation) set
- (REC) switch: (Recirculation) set
- (fan) switch: Max. speed set
- Engine speed: 1,500 rpm
- Time required before starting testing after air conditioner starts operating: More than 10 minutes

Performance Chart (Cont'd)

TEST READING

Recirculating-to-discharge air temperature table

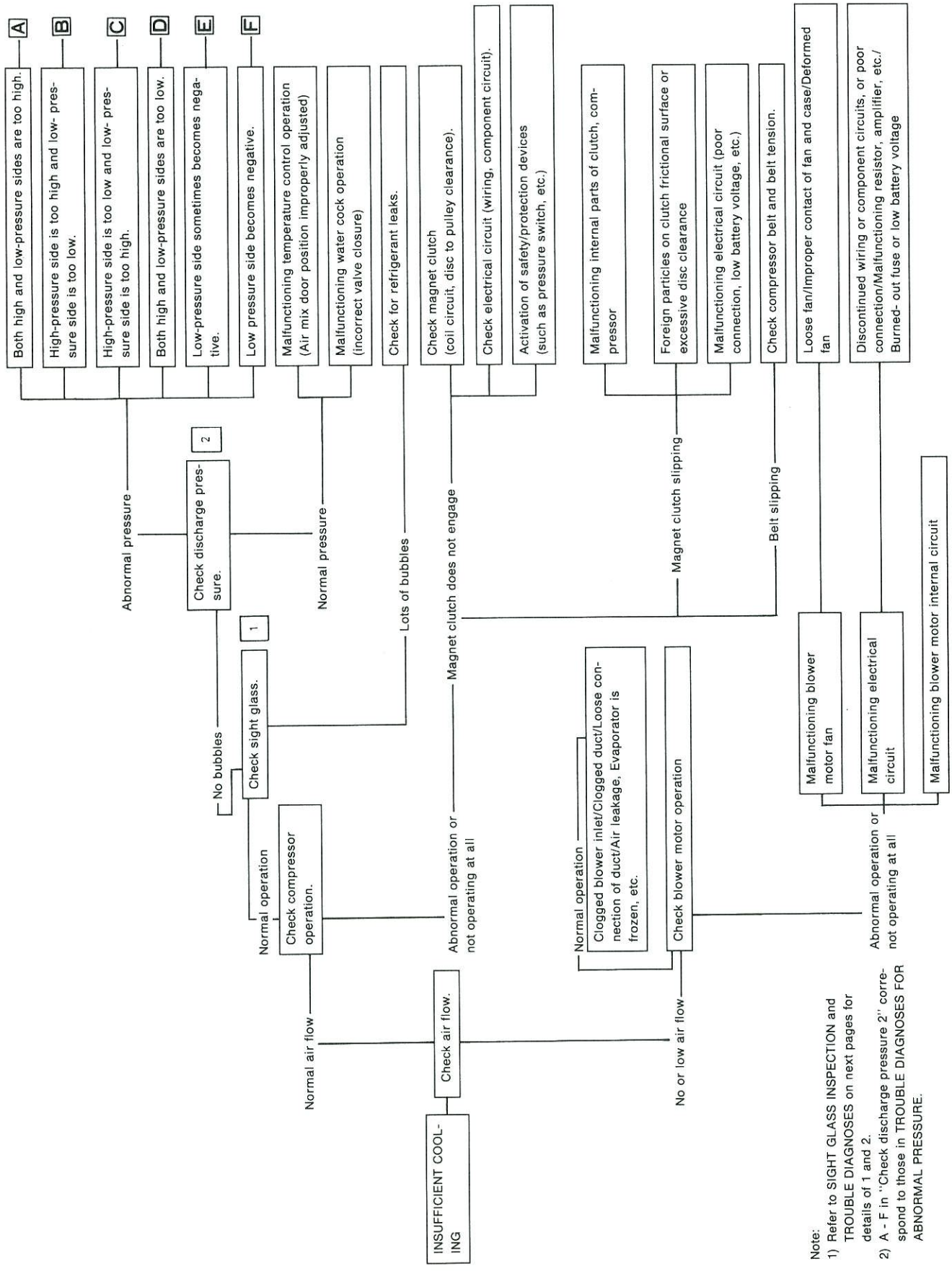
Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	5.6 - 7.4 (42 - 45)
	25 (77)	8.6 - 10.8 (47 - 51)
	30 (86)	11.6 - 14.0 (53 - 57)
	35 (95)	14.6 - 17.4 (58 - 63)
60 - 70	20 (68)	7.4 - 9.6 (45 - 49)
	25 (77)	10.8 - 13.2 (51 - 56)
	30 (86)	14.0 - 17.0 (57 - 63)
	35 (95)	17.4 - 20.6 (63 - 69)

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)	1,098 - 1,373 (11.2 - 14.0, 159 - 199)	88 - 118 (0.9 - 1.2, 13 - 17)
	25 (77)	1,216 - 1,419 (12.4 - 15.2, 176 - 216)	98 - 137 (1.0 - 1.4, 14 - 20)
	30 (86)	1,334 - 1,628 (13.6 - 16.6, 193 - 236)	108 - 147 (1.1 - 1.5, 16 - 21)
	35 (95)	1,451 - 1,785 (14.8 - 18.2, 210 - 259)	127 - 157 (1.3 - 1.6, 18 - 23)
	40 (104)	1,569 - 1,922 (16.0 - 19.6, 228 - 279)	137 - 186 (1.4 - 1.9, 20 - 27)

Performance Test Diagnoses

INSUFFICIENT COOLING



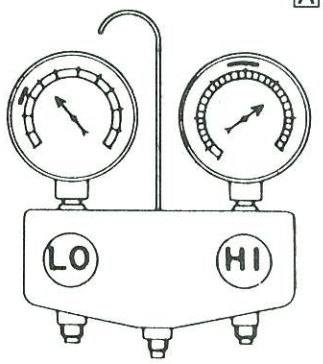
Note:
1) Refer to SIGHT GLASS INSPECTION and TROUBLE DIAGNOSES on next pages for details of 1 and 2.
2) A - F in "Check discharge pressure 2" correspond to those in TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE.

Performance Test Diagnoses (Cont'd)

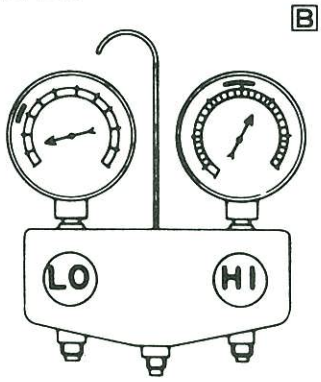
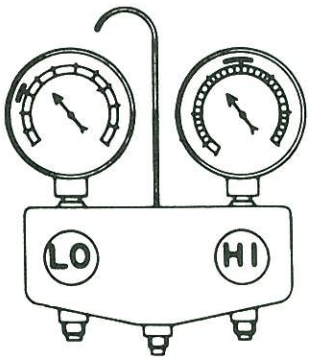
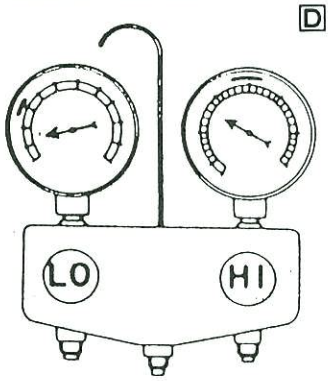
TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE

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.

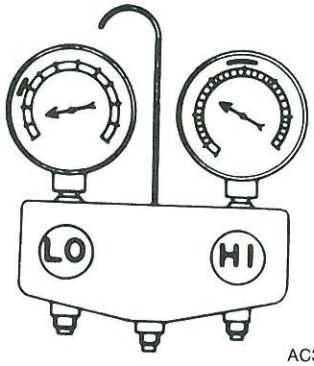
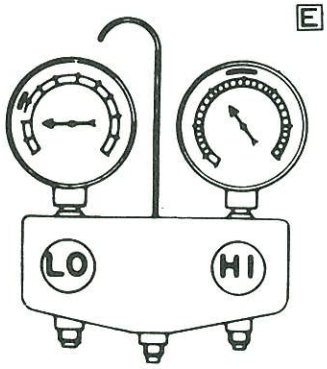
Pressure measurements are effective only when ambient temperature is in the range indicated under the heading "INSPECTION DATA (2) Measurement of compressor's high and low pressures".
Boldface indicates defect symptoms peculiar to V-5 compressor.

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 bubbles appear in sight glass when pressure is reduced.	Excessive refrigerant charge in refrigeration cycle	Reduce refrigerant until specified pressure is obtained.
	Air suction by radiator or condenser fan is insufficient.	Insufficient condenser cooling performance ↓ ① Condenser fins are clogged. ② Improper rotation of radiator fan or condenser fan	• Clean condenser. • Check and repair radiator or condenser fan as necessary.
	• Low-pressure pipe is not cold. • When compressor is stopped high-pressure value quickly drops by approximately 196 kPa (2 kg/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.

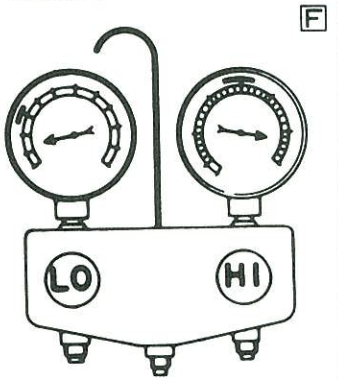
Performance Test Diagnoses (Cont'd)

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, receiver drier 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 receiver drier outlet and inlet. Outlet temperature is extremely low. • Receiver drier inlet and expansion valve are frosted.	Receiver drier inside is clogged a little.	• Replace receiver drier • Check compressor oil for contamination.
	• Temperature of expansion valve inlet is extremely low as compared with areas near receiver drier. • Expansion valve inlet may be frosted. • Temperature difference occurs somewhere in high-pressure side	High-pressure pipe located between receiver drier 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. ↓ ① **Compressor discharge capacity does not change. (Compressor stroke is set at maximum length.)** ② Malfunctioning thermo control amp. or suction throttle valve.	• Replace compressor. • Replace thermo control amp. or suction throttle valve.
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 receiver drier.

Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side becomes negative. [F]  AC362A	Receiver drier 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 receiver drier 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 receiver drier. ● Check compressor oil for contamination.

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(Air outlet does not change.) HA-57
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Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check					Diagnostic Procedure						Main Power Supply and Ground Circuit Check			
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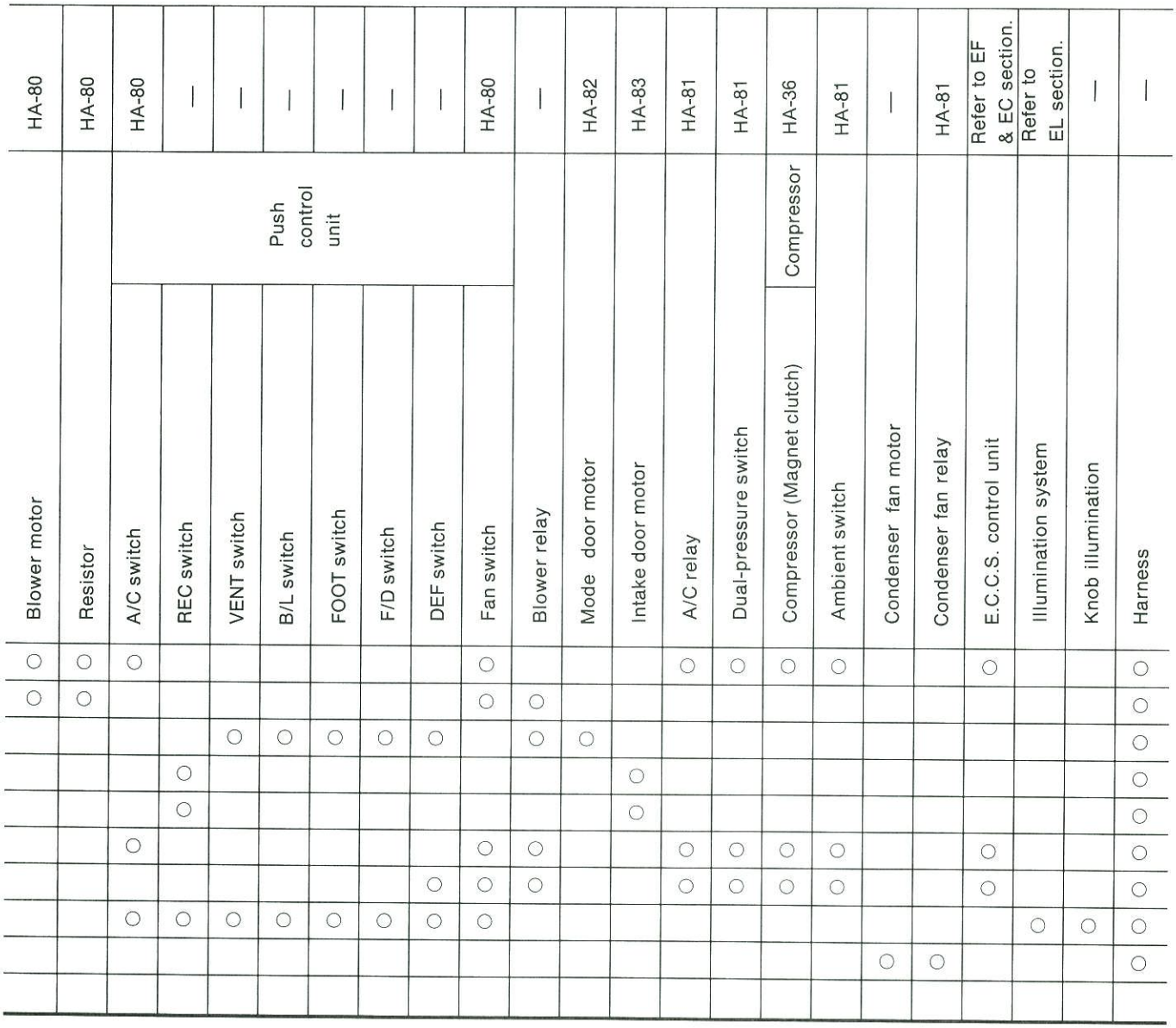
SYMPTOM	Preliminary check 1	Preliminary check 2	Preliminary check 3	Preliminary check 4	Preliminary check 5	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	Diagnostic procedure 6	15A Fuses (#4 - #5)	10A Fuses (#10)	10A Fuses (#20)	Push control unit
A/C does not blow cold air.		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 mode.								❶					○		○
Intake door is not set at "FRESH" in DEF or F/D mode.	❶							○					○		○
Magnet clutch does not engage with A/C switch and fan switch are ON.		❶							❷				○	○	
Magnet clutch does not engage in DEF mode.		❶	❷						○				○	○	
Illumination or indicators of push control unit do not come on.										❶			○		
Condenser fan motor does not operate.											❶		○		
Noise					❶										

❶, ❷: The number means checking order.
○: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Symptom Chart (Cont'd)

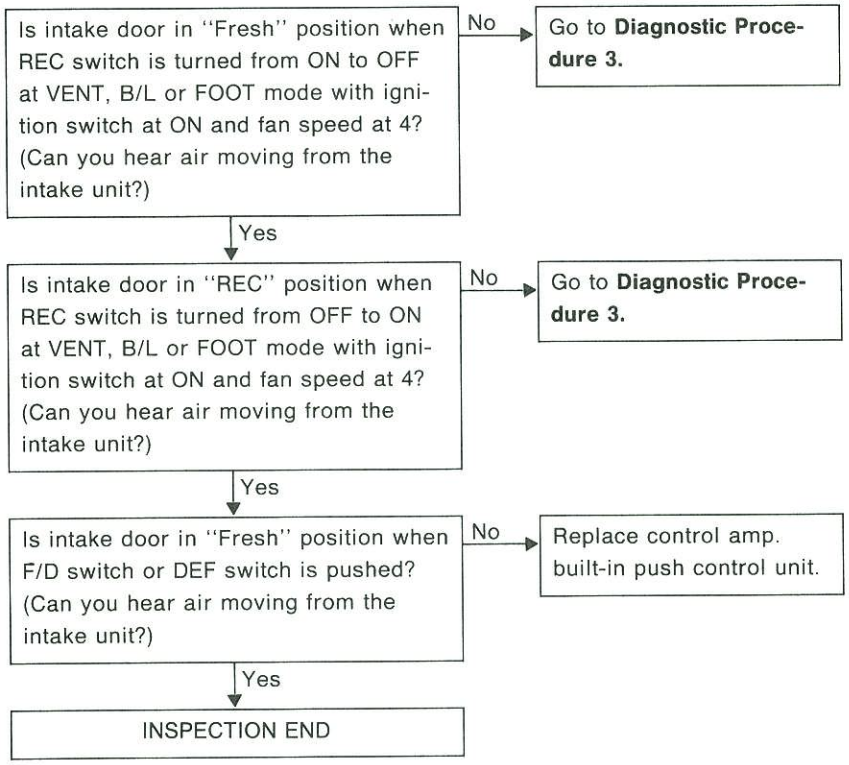
Electrical Components Inspection



Preliminary Check

PRELIMINARY CHECK 1

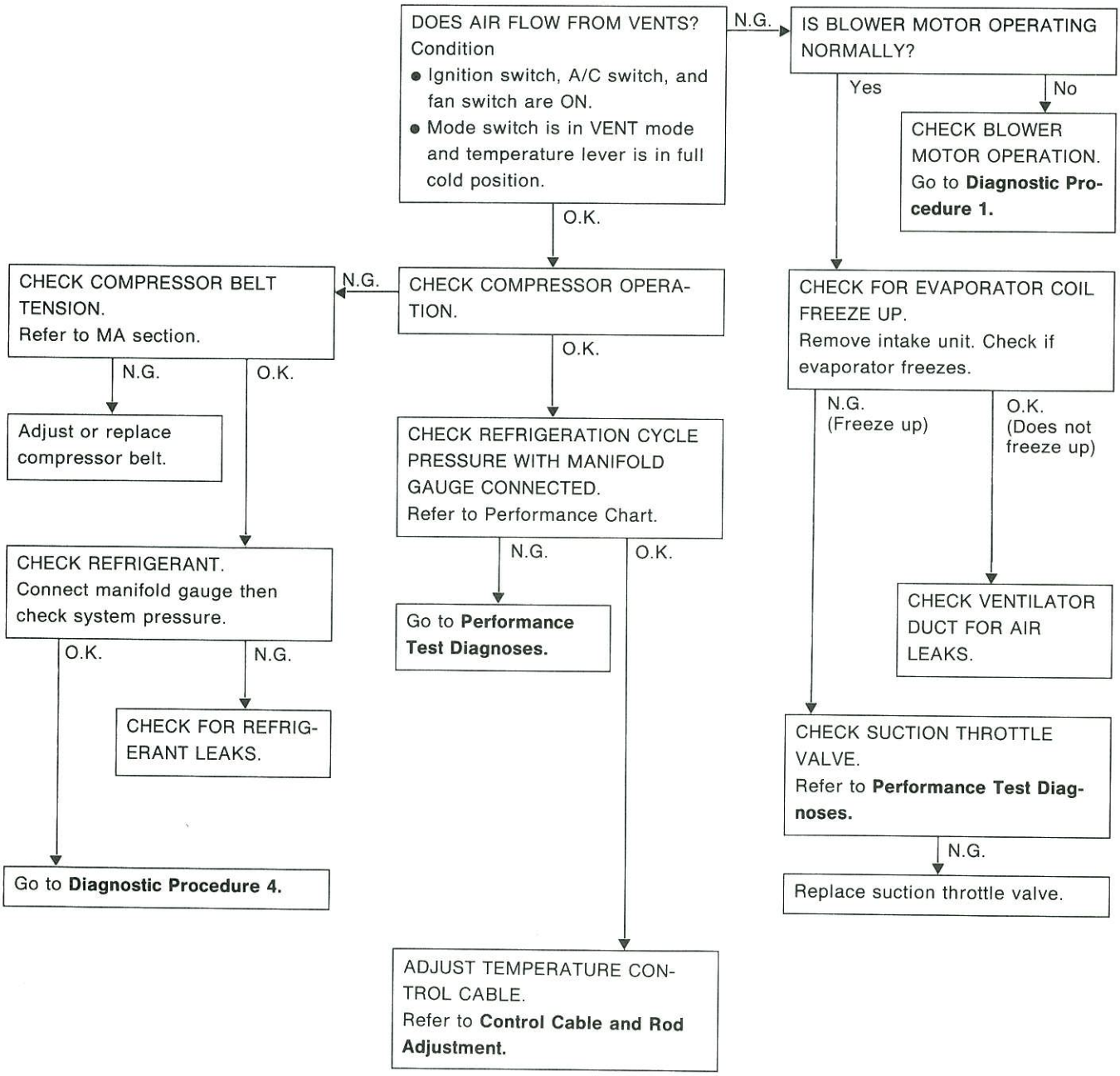
Intake door is not set at "FRESH" in DEF or F/D mode.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.

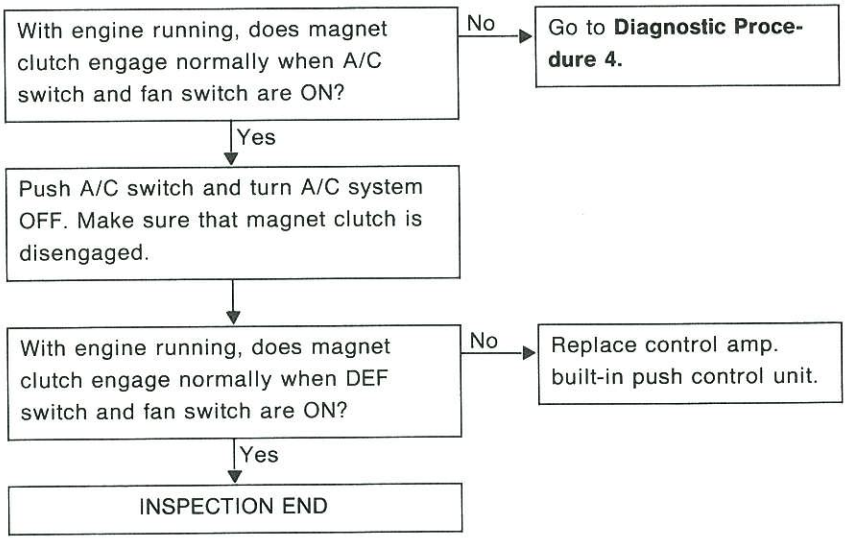


Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

Magnet clutch does not engage in DEF mode.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**



Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

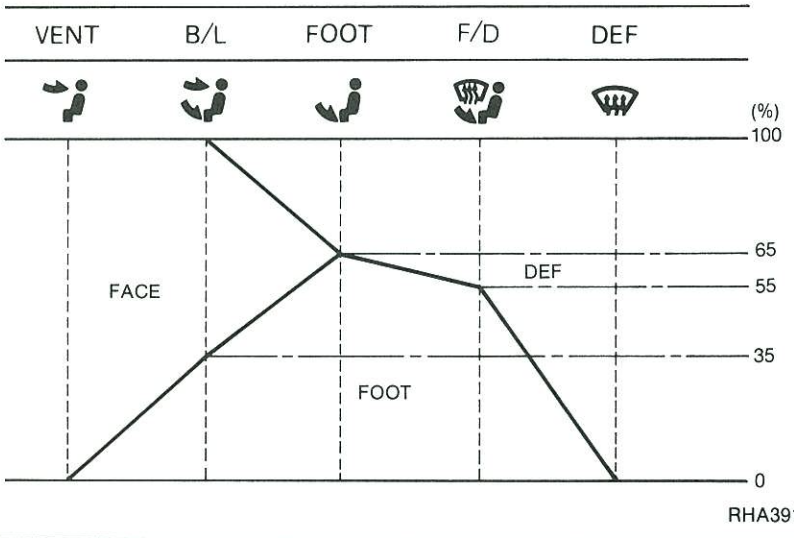
Air outlet does not change.

DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS PUSHED WITH IGNITION SWITCH AT ON?

No → Go to **Diagnostic Procedure 2.**

Switch	Indicator illuminates					Air outlet
Mode						
	○					VENT
		○				FOOT & VENT
			○			FOOT & DEF
				○		FOOT & DEF
					○	DEF

Air distribution ratios



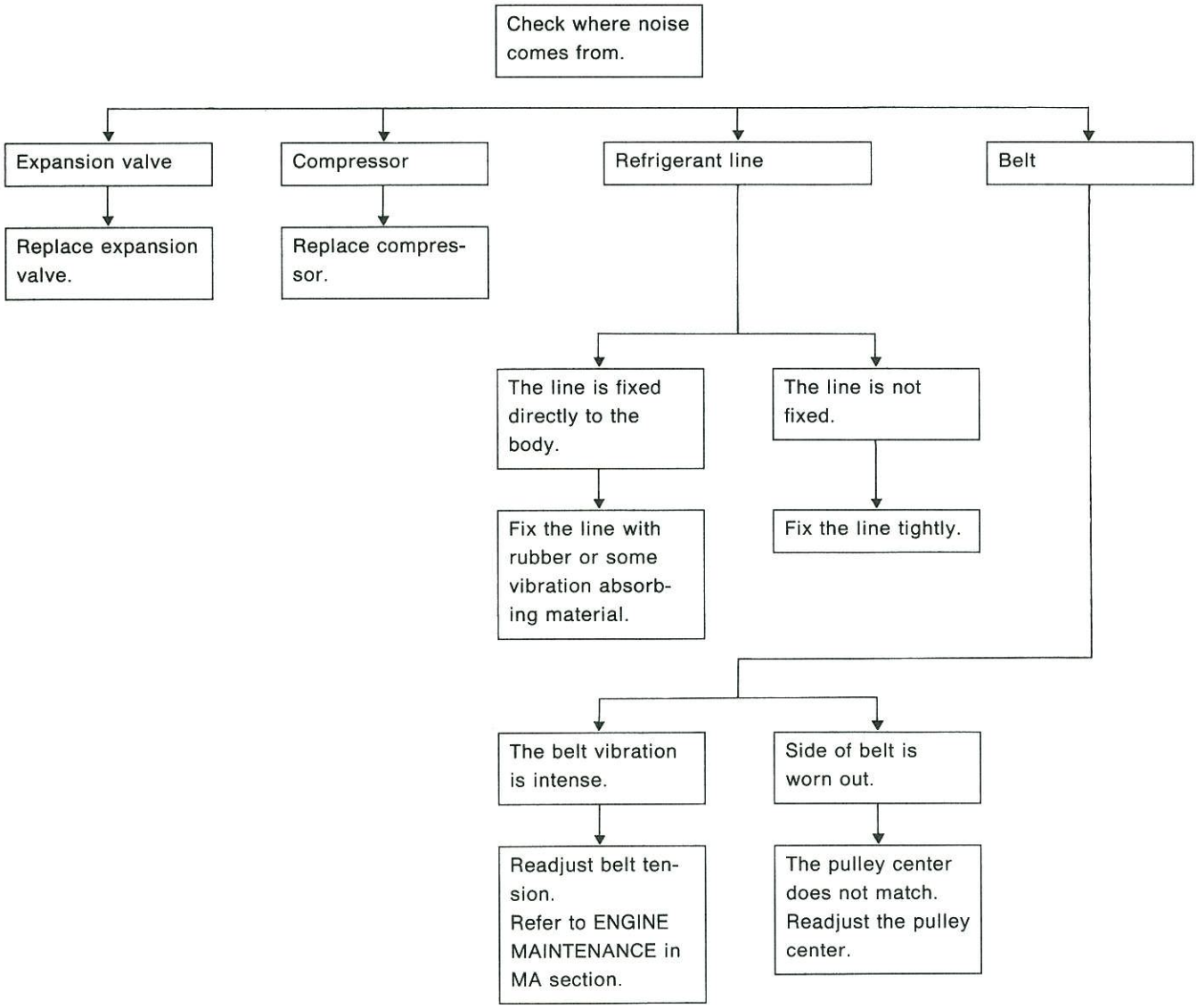
Yes

INSPECTION END

Preliminary Check (Cont'd)

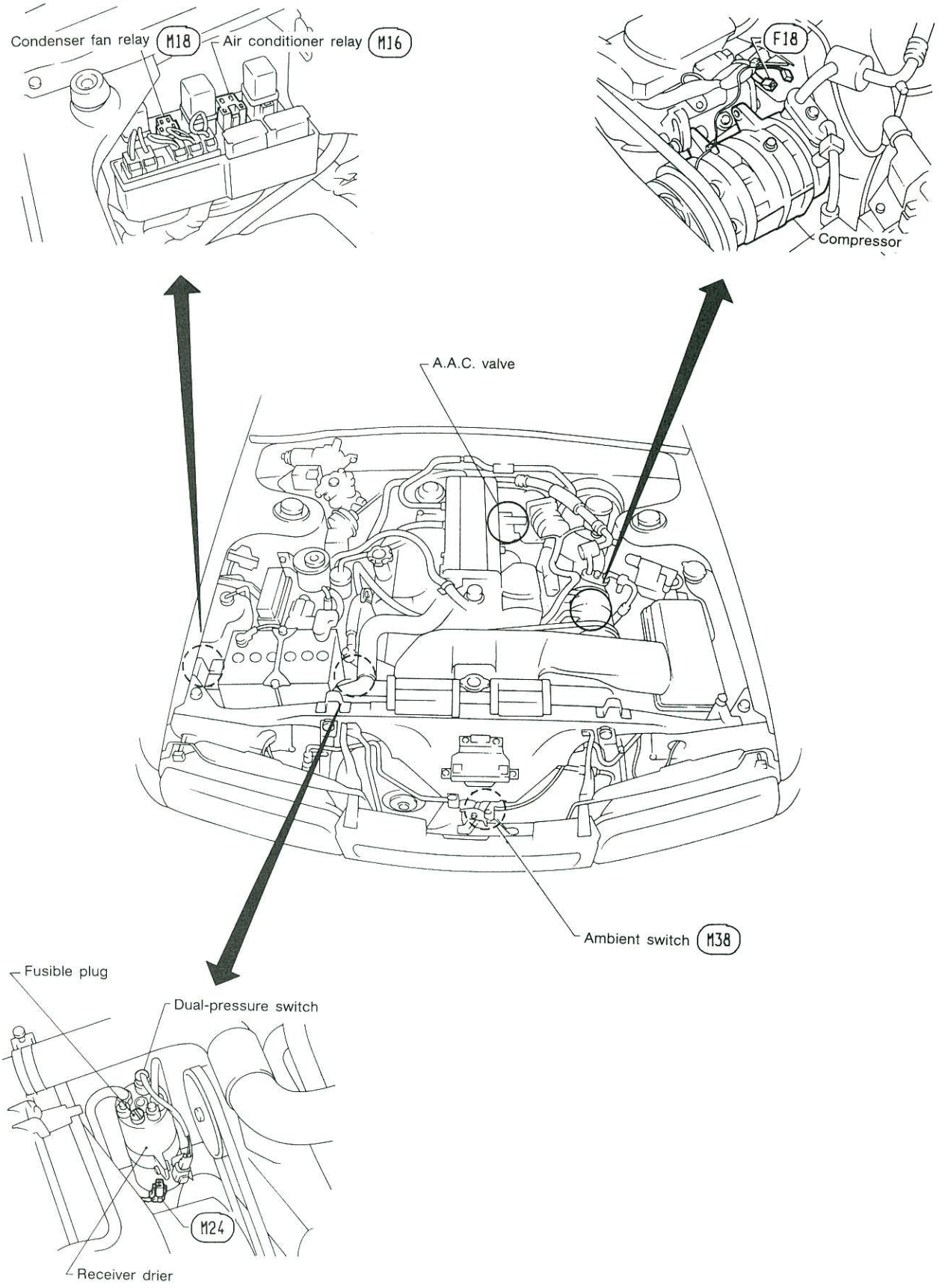
PRELIMINARY CHECK 5

Noise



A/C Electrical Component Layout

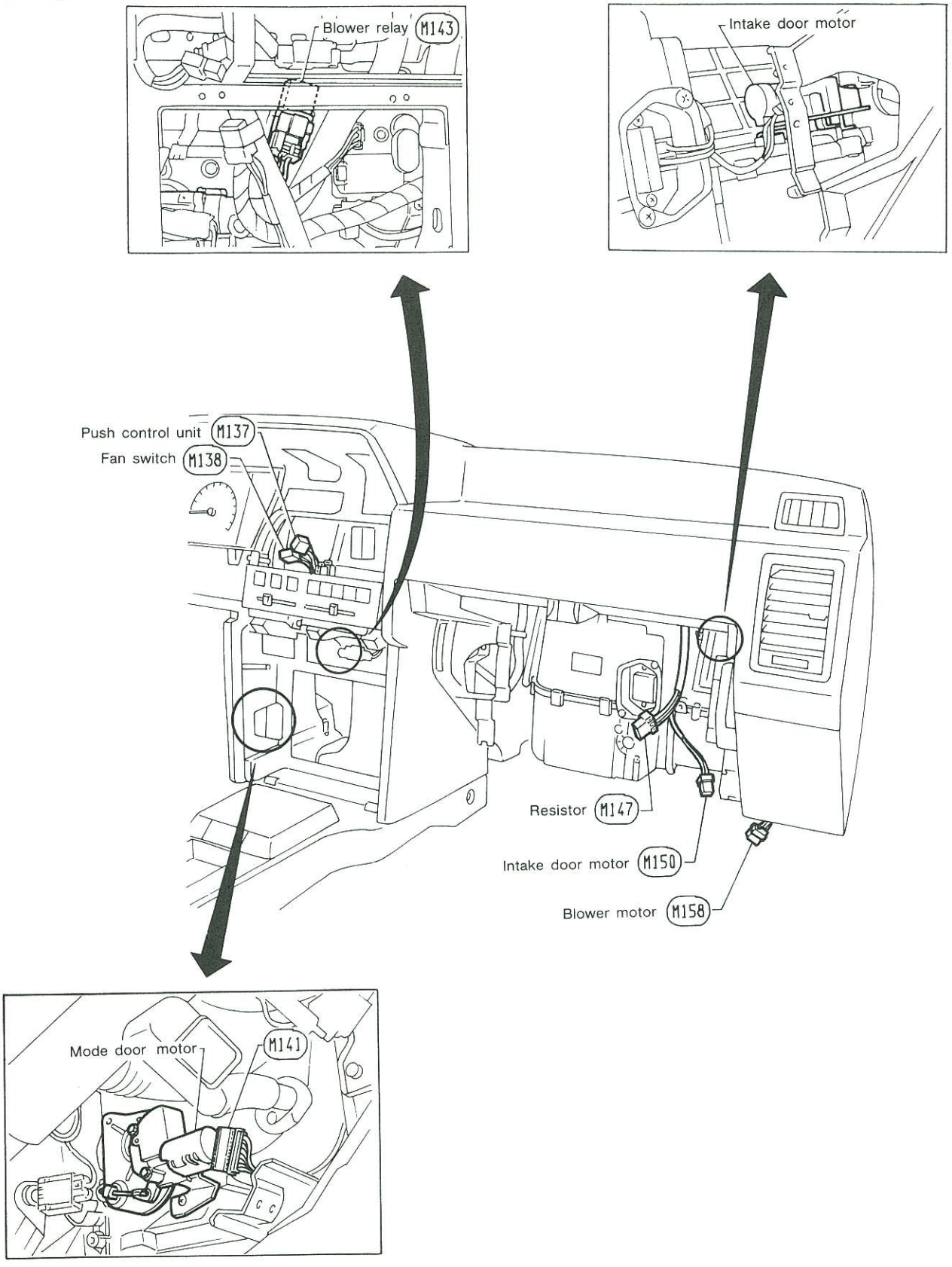
Engine compartment



RHA621C

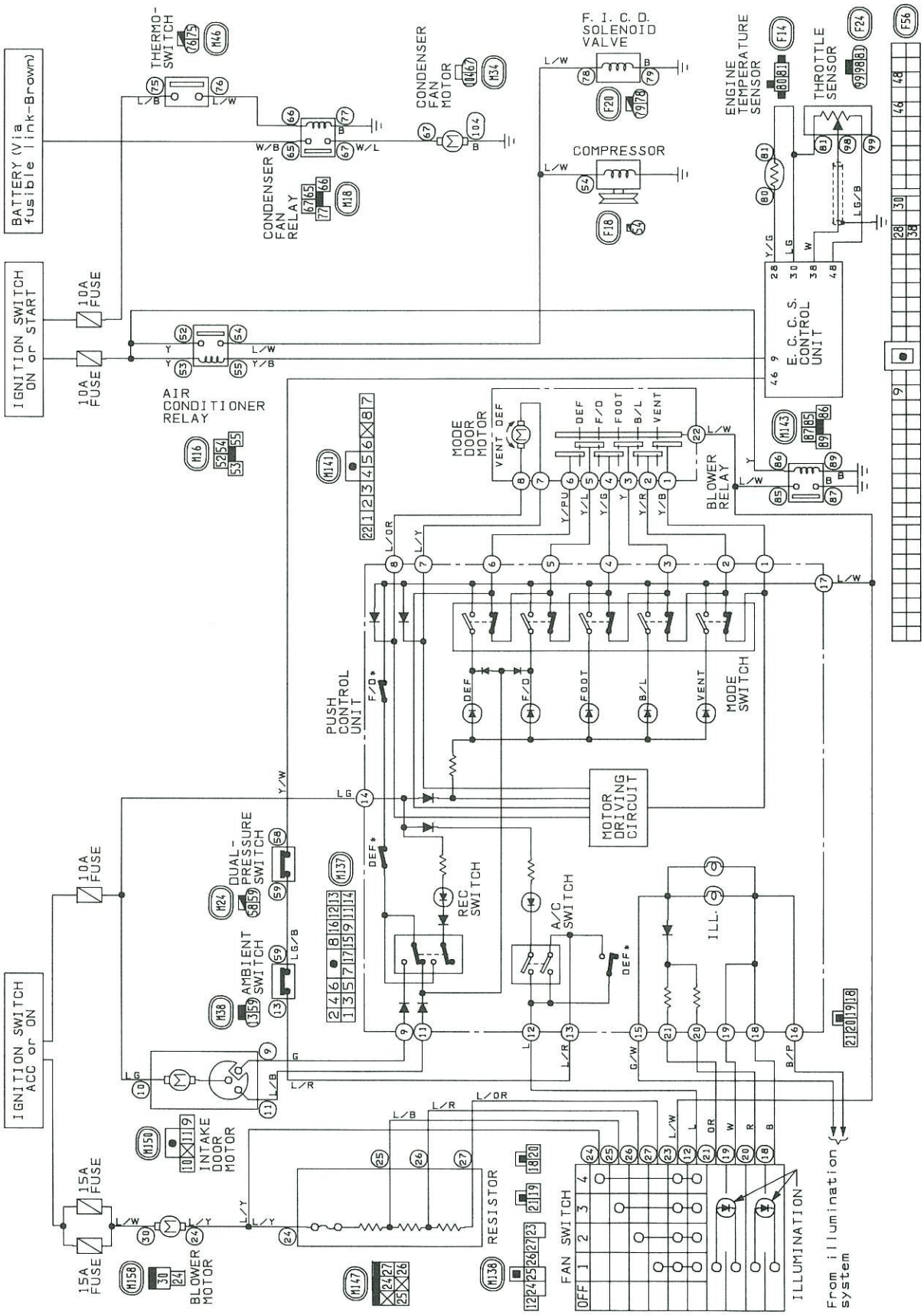
A/C Electrical Component Layout (Cont'd)

Passenger compartment



RHA622C

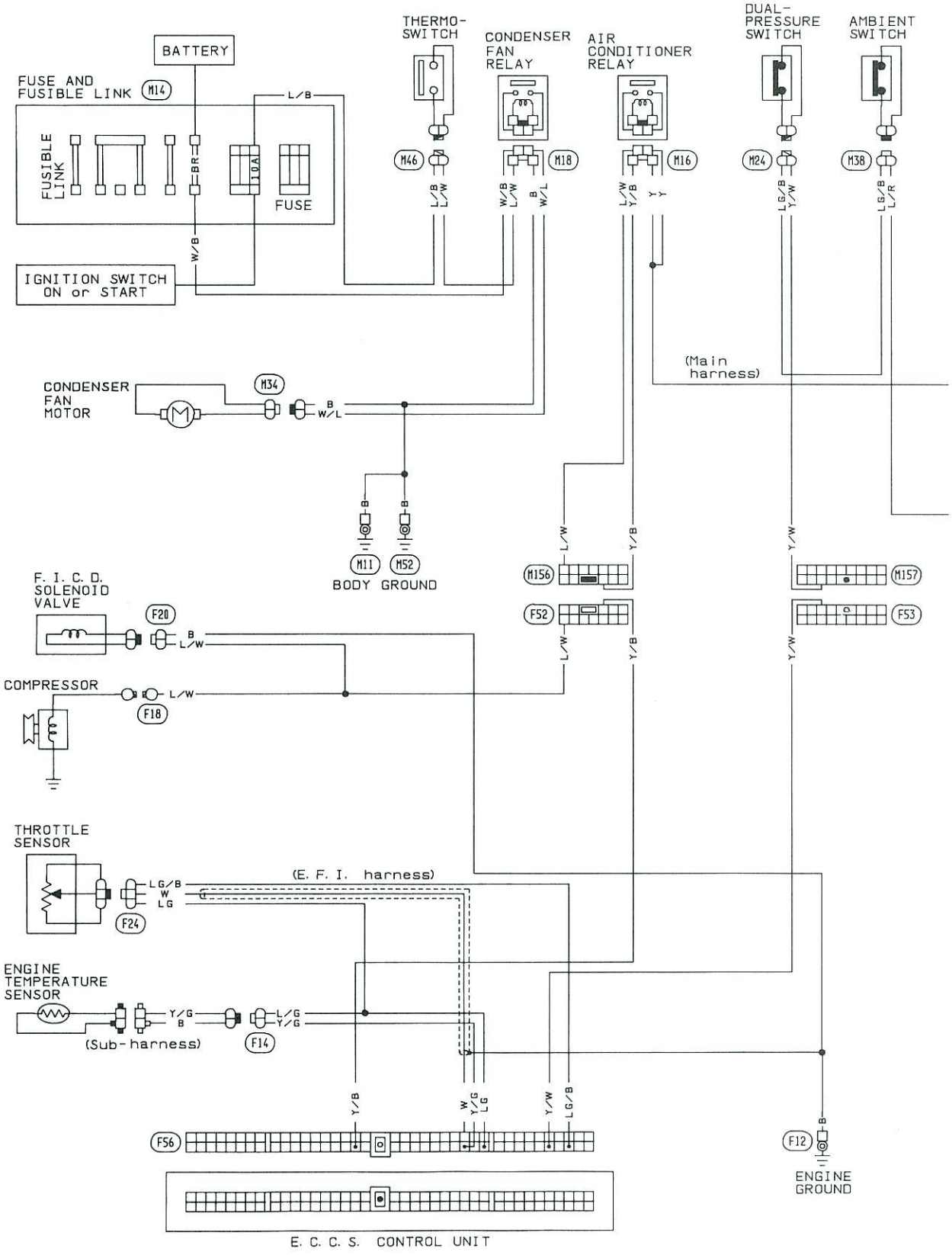
Circuit Diagram for Quick Pinpoint Check



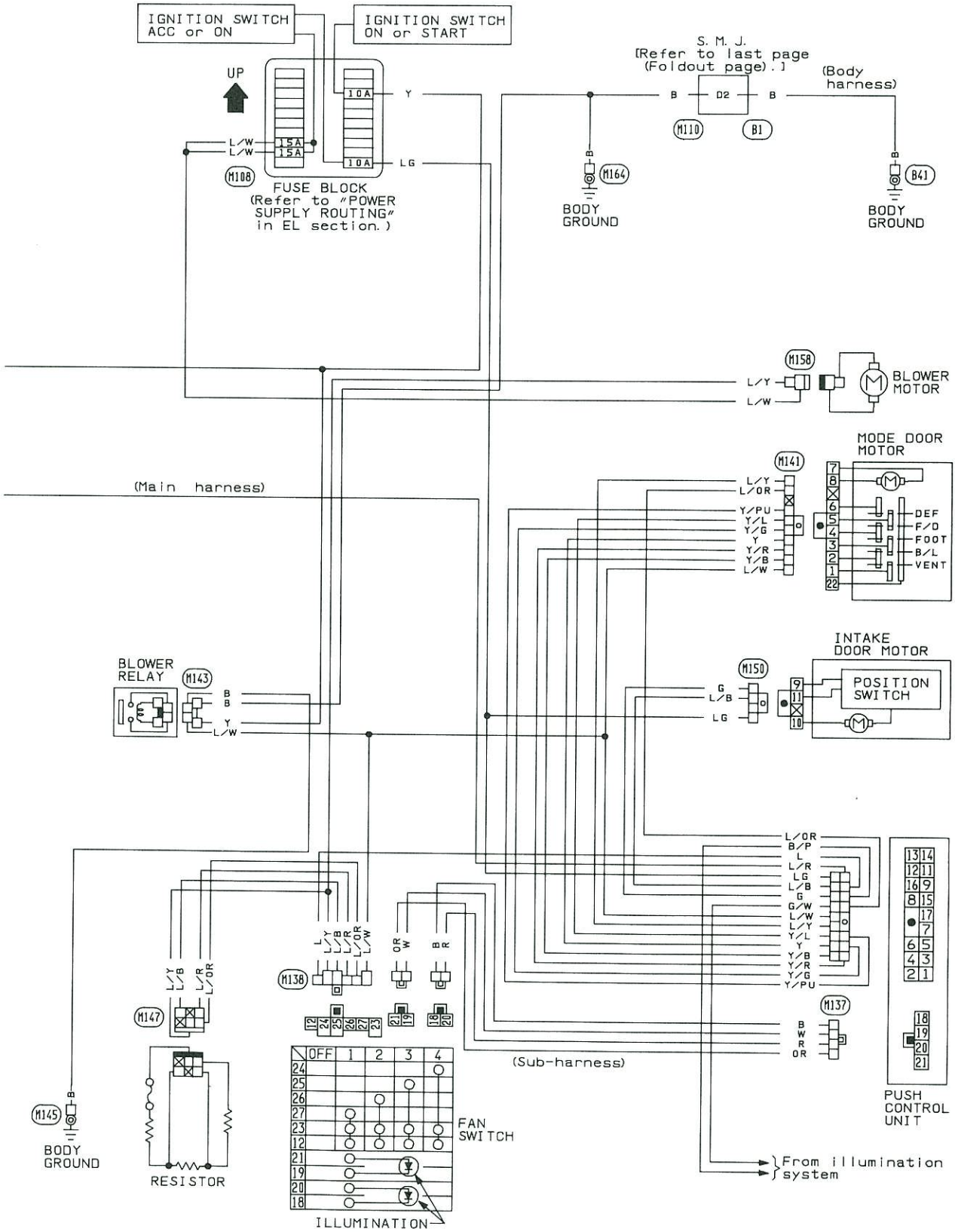
- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle "◯◯" are connected to the harness side connectors shown in the "A/C Electrical Component Layout". (See pages HA-59, HA-60.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "◯".
- *: These switches are built into push control unit and mechanically linked to corresponding switches.

SHA962C

Wiring Diagram



Wiring Diagram (Cont'd)



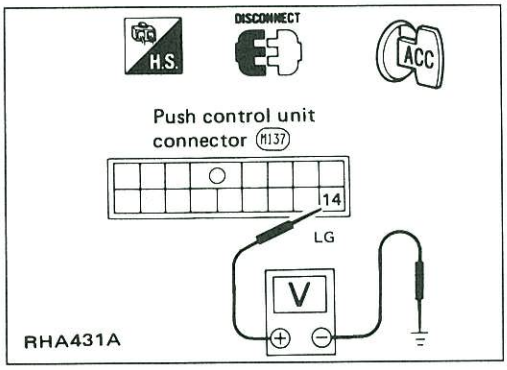
SHA963C

Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.

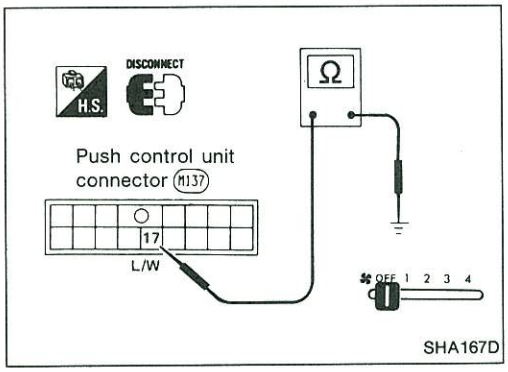


PUSH CONTROL UNIT CHECK

Check power supply circuit for push control unit with ignition switch at ACC.

1. Disconnect push control unit harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑭ and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
⑭	Body ground	Approx. 12V



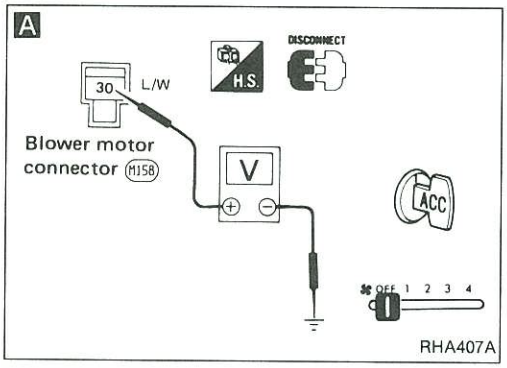
Check body ground circuit for push control unit with ignition switch ON.

1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑰ and body ground.

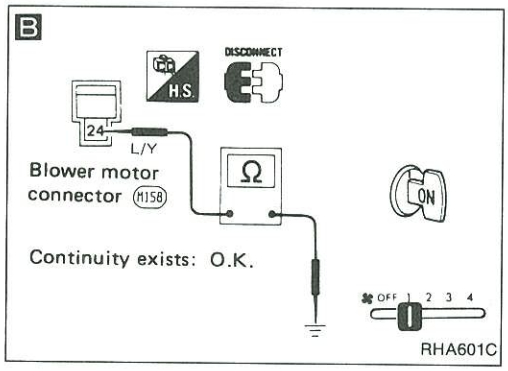
Ohmmeter terminal		Continuity
⊕	⊖	
⑰	Body ground	Yes

	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

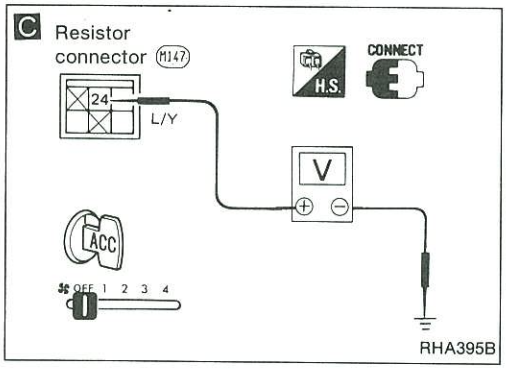
A



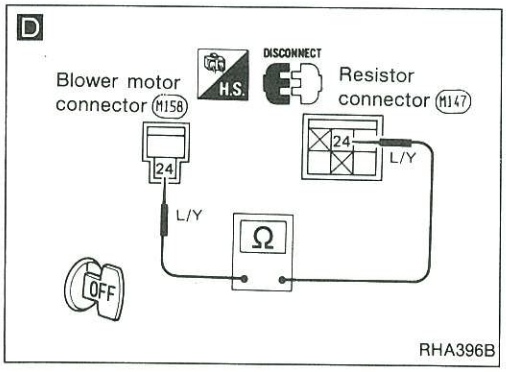
B



C



D



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 check as per flow chart at left.

→ 1 → A

2 3 4 5 → Ⓑ Ⓒ Ⓓ Ⓔ (Go to next page.)

A

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
Do approx. 12 volts exist between blower motor harness terminal No. 30 and body ground?

N.G. → Check 15A fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓

B

Check circuit continuity between blower motor harness terminal No. 24 and body ground.

N.G. → Reconnect blower motor harness connector.

O.K. ↓

CHECK BLOWER MOTOR.
(Refer to Electrical Components Inspection.)

N.G. ↓

Replace blower motor.

C

CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
Do approx. 12 volts exist between resistor harness terminal No. 24 and body ground?

N.G. → Disconnect blower motor and resistor harness connectors.

D Note

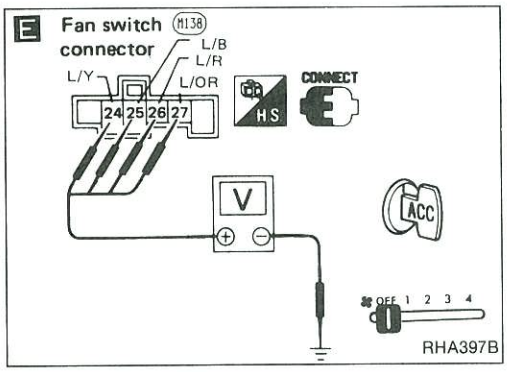
Check circuit continuity between blower motor harness terminal No. 24 and resistor harness terminal No. 24.

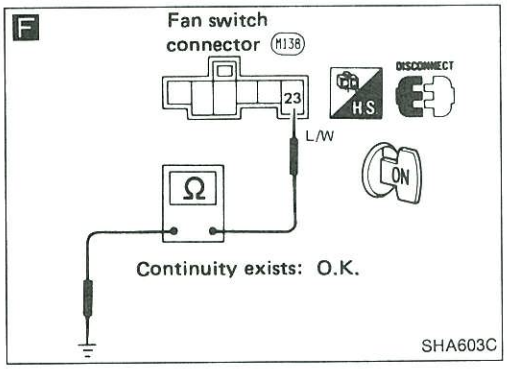
O.K. ↓

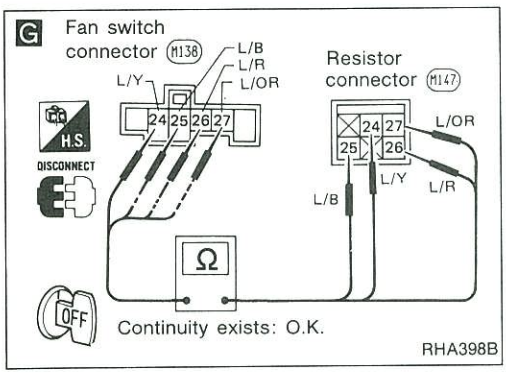
Ⓐ (Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)







Ⓐ 1

CHECK RESISTOR AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

Ⓑ 2 Ⓒ 3 Ⓓ 4 Ⓔ 5

O.K. — N.G.

N.G. → Replace resistor.

Reconnect resistor harness connector.

1 → CHECK FAN SWITCH AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

2 3 4 5 → E

E

CHECK FAN SWITCH CIRCUIT.
Do approx. 12 volts exist between each fan switch harness terminal and body ground?

Flow chart No.	Terminal No. ⊕	Terminal No. ⊖	Voltage
2	27	Body ground	Approx. 12V
3	26		
4	25		
5	24		

O.K. → 2 3 4 5 → CHECK FAN SWITCH AFTER DISCONNECTING IT.

N.G. → G

G

Check circuit continuity between fan switch and resistor.

Note

CHECK FAN SWITCH AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace fan switch.

O.K. → Disconnect push control unit harness connector.

O.K. → F

F

Check circuit continuity between fan switch harness terminal No. 23 and body ground.

N.G. → Disconnect blower motor relay harness connector.

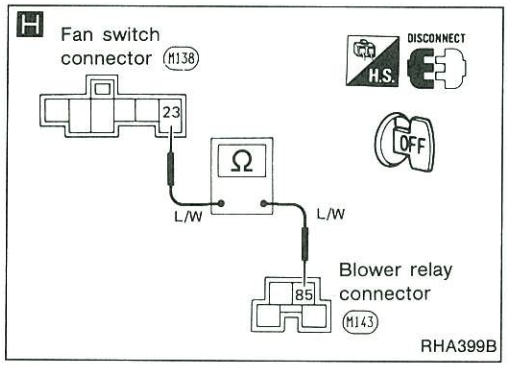
O.K. → Replace blower motor.

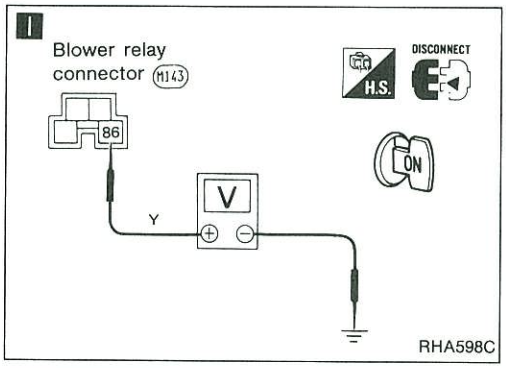
Disconnect blower motor relay harness connector. → Ⓕ

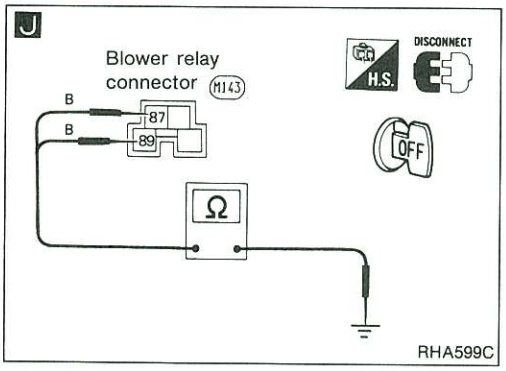
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)







Ⓕ

H Note

Check circuit continuity between fan switch harness terminal No. 23 and blower relay harness terminal No. 85.

O.K.

I

CHECK POWER SUPPLY FOR BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness terminal No. 86 and body ground?

N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K.

J Note

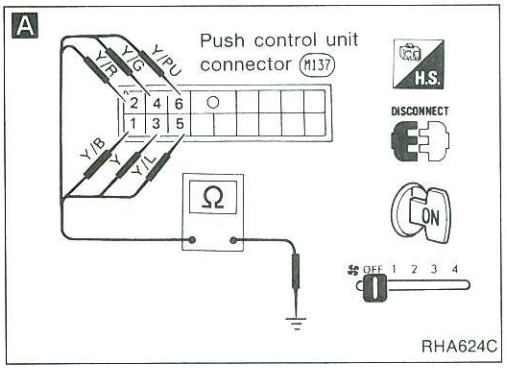
Check circuit continuity between blower relay harness terminal No. 87, 89 and body ground.

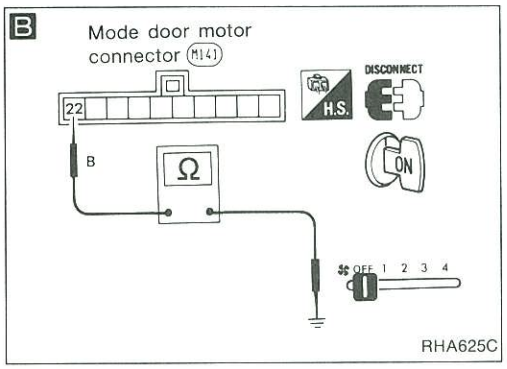
O.K.

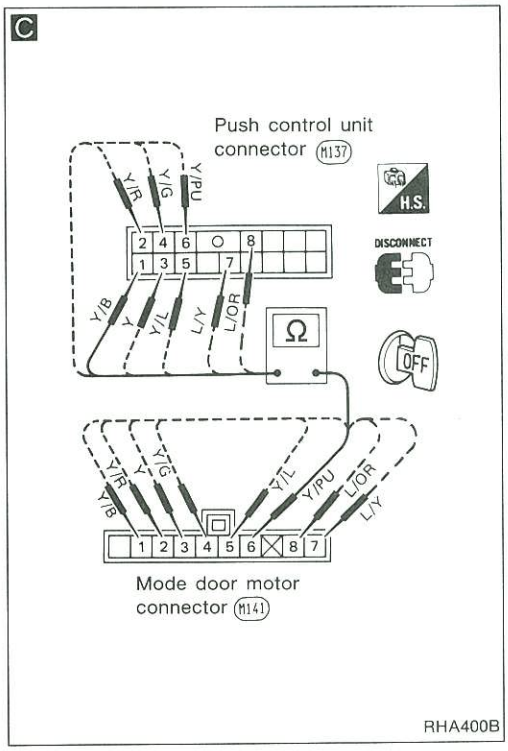
CHECK BLOWER RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace blower relay.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.







Diagnostic Procedure 2

SYMPTOM: Air outlet does not change.

- **Perform PRELIMINARY CHECK 4 and Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

A

CHECK MODE DOOR MOTOR POSITION SWITCH.
1. Turn VENT switch ON with ignition switch at ON position.
2. Disconnect push control unit connector after mode change sound is heard.
3. Check if continuity exists between terminal No. ① or ② of push control unit harness connector and body ground.
4. Using above procedures, check for continuity in any other mode, as indicated in chart.

Mode switch	Terminal No. ⊕	Terminal No. ⊖	Continuity
VENT	① or ②	Body ground	Yes
B/L	② or ③		
FOOT	③ or ④		
F/D	④ or ⑤		
DEF	⑤ or ⑥		

N.G. → Disconnect mode door motor harness connector.

B

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness terminal No. ㉒ and body ground?

O.K. → C

N.G. → Disconnect blower relay harness connector → Ⓑ (Go to next page.)

C

Note: Check circuit continuity between each terminal on push control unit and on mode door motor.

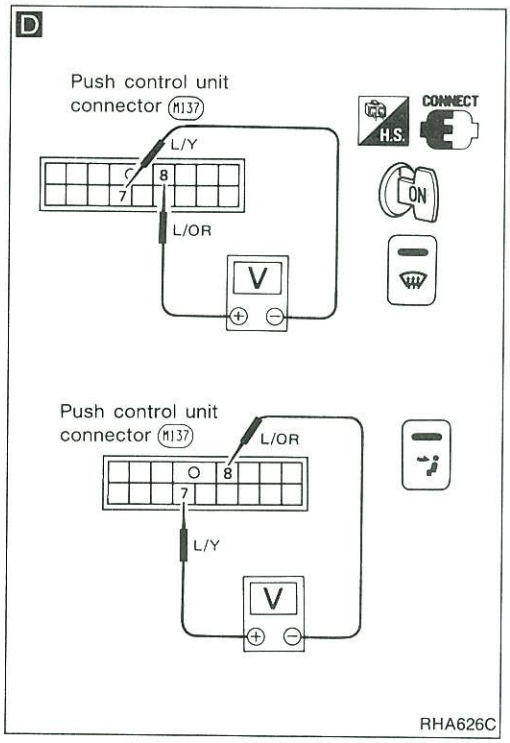
Terminal No. ⊕ Push control unit	Terminal No. ⊖ Mode door motor	Continuity
①	①	Yes
②	②	
③	③	
④	④	
⑤	⑤	
⑥	⑥	
⑦	⑦	
⑧	⑧	

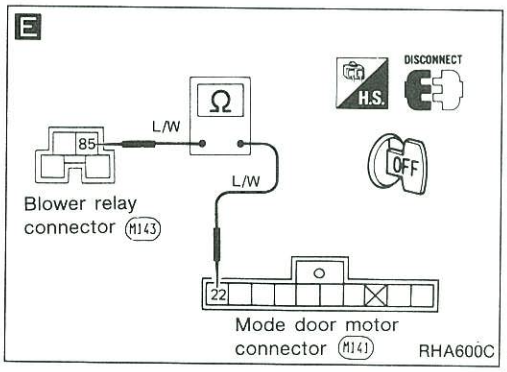
O.K. → Ⓐ (Go to next page.)

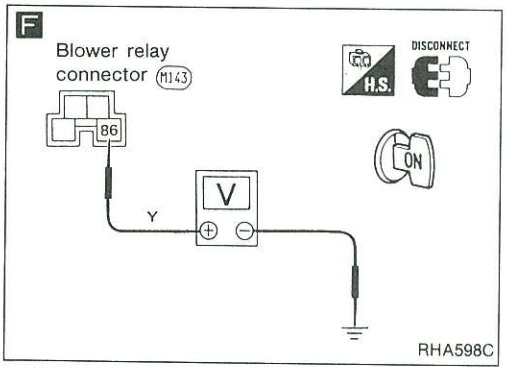
O.K. → CHECK SIDE LINK.
Refer to Control Linkage Adjustment — Manual Air Conditioner.

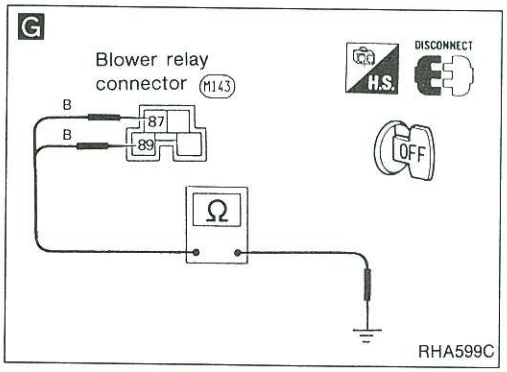
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 2 (Cont'd)









Ⓐ

Reconnect push control unit and mode door motor harness connectors.

D

CHECK FOR OUTPUT OF PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑦ and ⑧ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Clock-wise
⊕	⊖	DEF → VENT	Counter-clock-wise

N.G. → Replace control amp. built-in push control unit.

O.K. → Replace mode door motor.

Ⓑ

E

Note: Check circuit continuity between mode door motor harness terminal No. ㉒ and blower relay harness terminal No. ㉟.

O.K.

F

CHECK POWER SUPPLY FOR BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness terminal No. ㊱ and body ground?

O.K. → G

N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

G

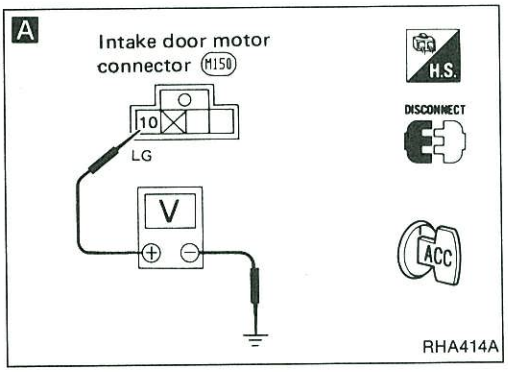
Note: Check circuit continuity between blower relay harness terminal No. ㊲, ㊴ and body ground.

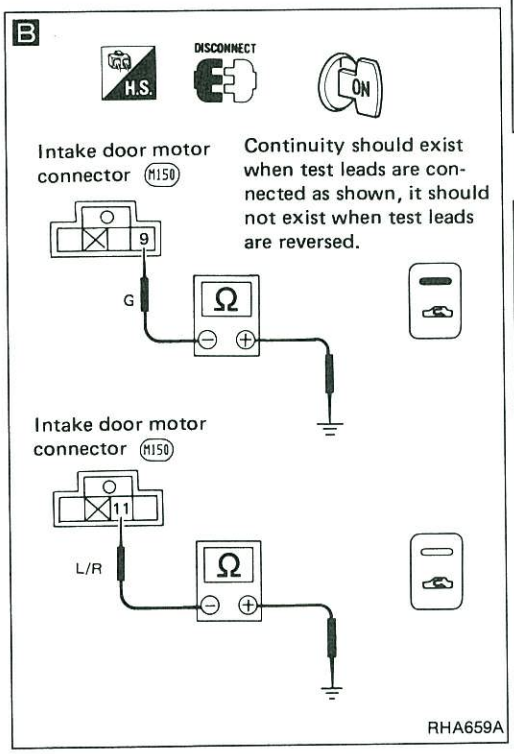
O.K.

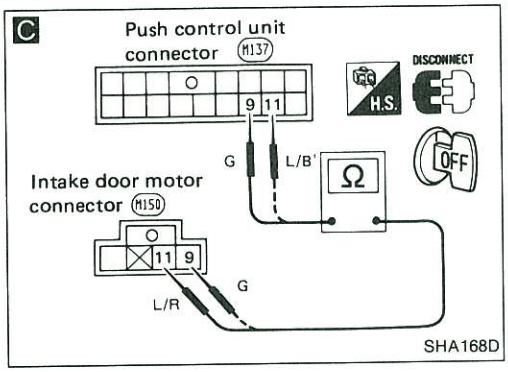
CHECK BLOWER RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace blower relay.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.







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. ⑩ and body ground?

N.G. → Check 10A fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓

B

CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR.
Does continuity exist between intake door motor harness terminal No. ⑨ and body ground when REC switch is ON?
Does continuity exist between intake door motor harness terminal No. ⑪ and body ground when REC switch is OFF?

N.G. → Disconnect push control unit harness connector.

C

Check circuit continuity between push control unit harness terminal No. ⑨ (⑪) and intake door motor harness terminal No. 9 (⑪)?

Note

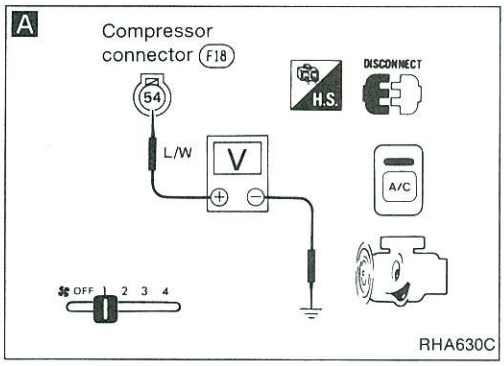
O.K. ↓

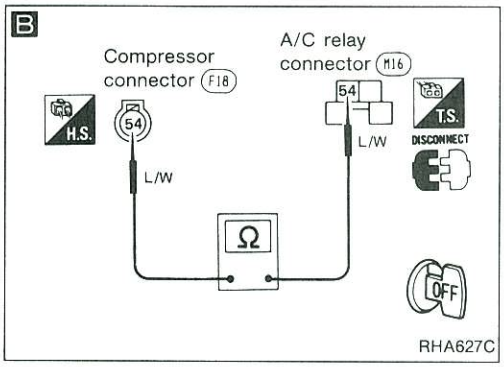
Replace control amp. built-in push control unit.

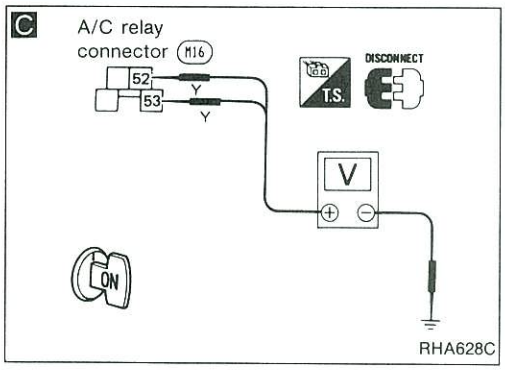
O.K. ↓

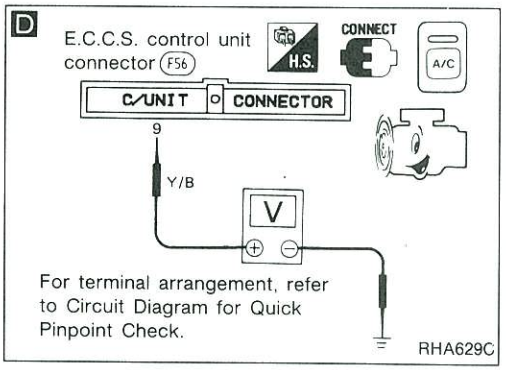
Replace intake door motor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.









Diagnostic Procedure 4

SYMPTOM: Magnet clutch does not engage when A/C switch and fan switch are 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 terminal No. 54 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.

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. 52, 53 and body ground?

O.K. → B

N.G. → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK. Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

B

Note

Check circuit continuity between A/C relay harness terminal No. 54 and compressor harness terminal No. 54.

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.

D

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between E.C.C.S. control unit harness terminal No. 9 and body ground?

O.K. → Ⓐ

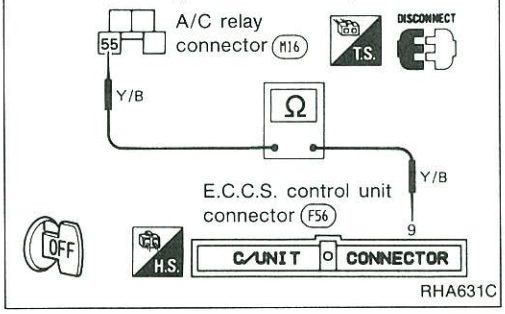
N.G. → Ⓑ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)

E For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.



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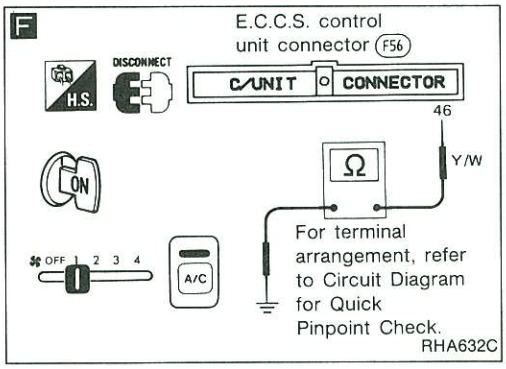
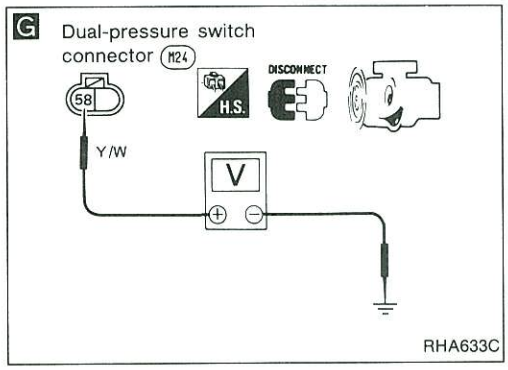
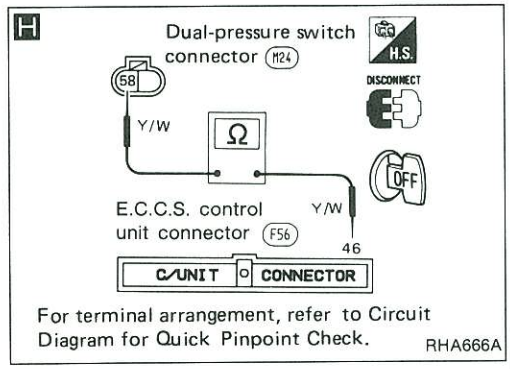


G Dual-pressure switch connector M24



H Dual-pressure switch connector M24



Ⓐ

F CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Disconnect E.C.C.S. control unit harness connector.
Does continuity exist between E.C.C.S. control unit harness terminal No. 46 and body ground?

N.G. → Reconnect E.C.C.S. control unit harness connector.

O.K. →

CHECK E.C.C.S. CONTROL UNIT.
Refer to EF & EC section.

Ⓑ

E Check circuit continuity between A/C relay harness terminal No. 55 and E.C.C.S. control unit harness terminal No. 9.

Note

G CHECK DUAL-PRESSURE SWITCH CIRCUIT BETWEEN DUAL-PRESSURE SWITCH AND E.C.C.S. CONTROL UNIT.
Disconnect dual-pressure switch harness connector.
Do more than 8 volts exist between dual-pressure switch harness terminal No. 58 and body ground?

O.K. →

N.G. → Disconnect E.C.C.S. control unit harness connector.

H Check circuit continuity between E.C.C.S. control unit harness terminal No. 46 and dual-pressure switch harness terminal No. 58.

Note

CHECK DUAL-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

N.G. → Replace dual-pressure switch.

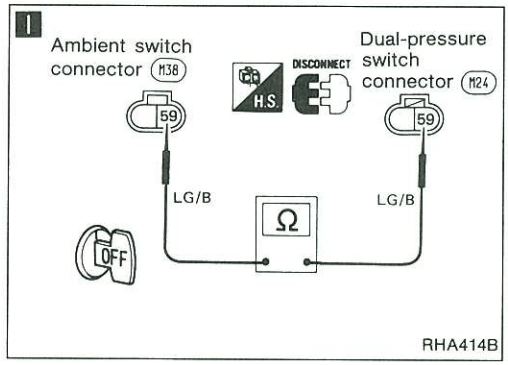
O.K. →

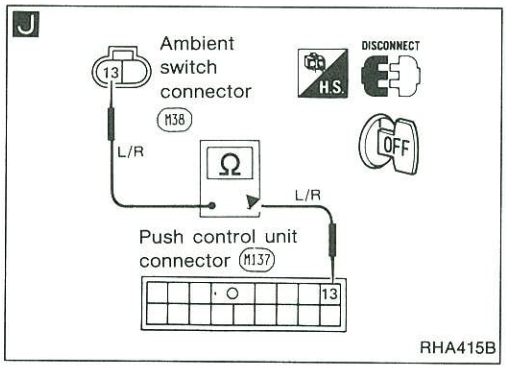
Ⓒ

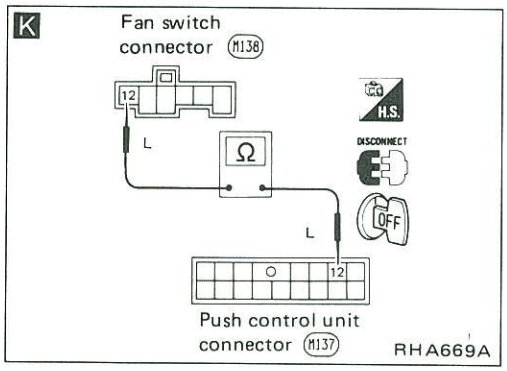
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)







Ⓒ

Disconnect ambient switch harness connector.

I Note

Check continuity between dual-pressure switch harness terminal No. ⑲ and ambient switch harness terminal No. ⑲.

O.K.

CHECK AMBIENT SWITCH.
(Refer to Electrical Components Inspection.)

N.G. → Replace ambient switch.

O.K.

Disconnect push control unit harness connector.

J Note

Check circuit continuity between ambient switch harness terminal No. ⑬ and push control unit harness terminal No. ⑬.

O.K.

CHECK A/C SWITCH OF PUSH CONTROL UNIT.
(Refer to Electrical Components Inspection.)

N.G. → Replace control amp. built-in push control unit.

O.K.

Disconnect fan switch harness connector.

K Note

Check circuit continuity between push control unit harness terminal No. ⑫ and fan switch harness terminal No. ⑫.

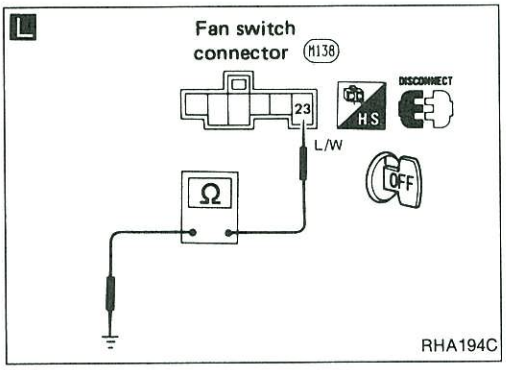
O.K.

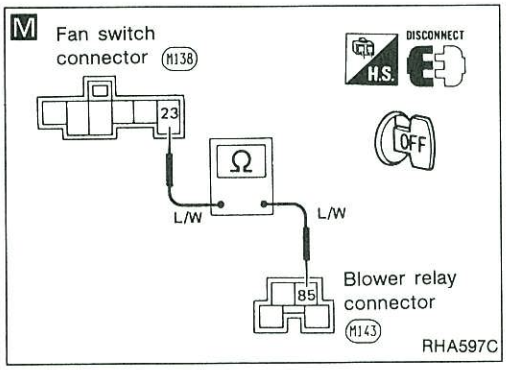
Ⓓ

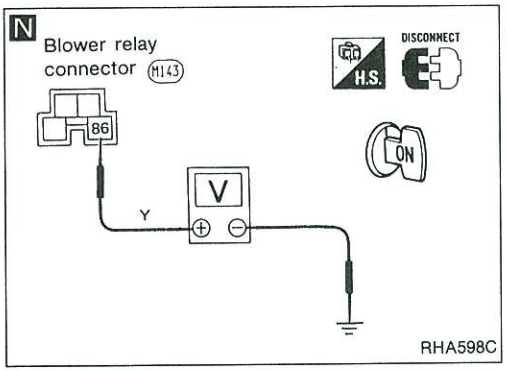
(Go to next page.)

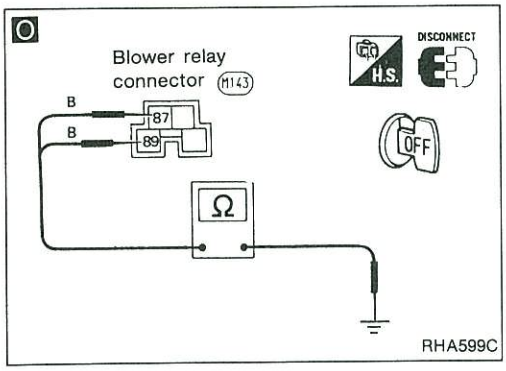
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)









Ⓓ

L

CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Disconnect push control unit harness connector.
Does continuity exist between fan switch harness terminal No. ㉓ and body ground?

N.G. → M Note: Check circuit continuity between fan switch harness terminal No. ㉓ and blower relay harness terminal No. ㉟.

O.K. ↓

CHECK FAN SWITCH.
(Refer to Electrical Components Inspection.)

N.G. ↓

Replace fan switch.

O.K. → N

N

CHECK POWER SUPPLY FOR BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness terminal No. ㊱ and body ground?

N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓

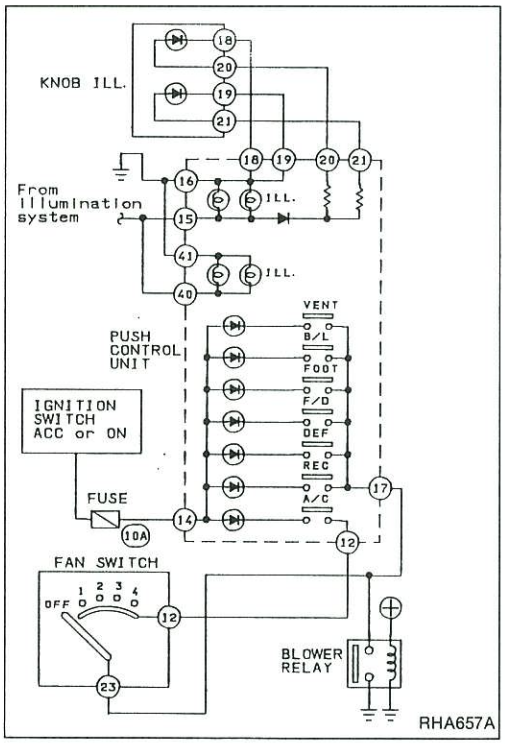
O Note: Check circuit continuity between blower relay harness terminal No. ㊲, ㊴ and body ground.

O.K. ↓

CHECK BLOWER RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace blower relay.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 5

SYMPTOM: Illumination or indicators of push control unit 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.

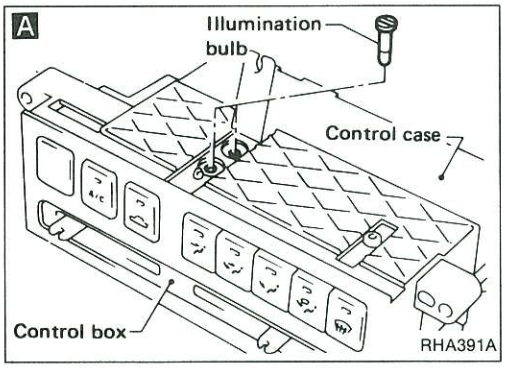
- Turn A/C, REC and fan switches ON.
- Push VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown:

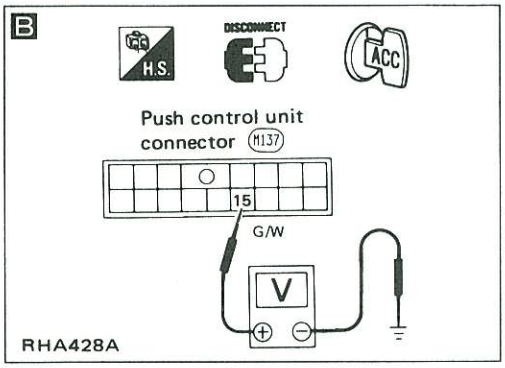
INCIDENTS								
ILL. / Push control unit	VENT	B/L	FOOT	F/D	DEF	REC	A/C	"How to repair"
×	○	○	○	○	○	○		Go to DIAGNOSTIC PROCEDURE 5-1.
	○	○	○	○	○	○	×	Go to DIAGNOSTIC PROCEDURE 5-2.
○	×	×	×	×	×	×		Go to DIAGNOSTIC PROCEDURE 5-3.
	△							Replace control amp. built-in push control unit.
○	×	×	×	×	×	×	○	Replace control amp. built-in push control unit.
	×	×	×	×	×	×	○	Go to DIAGNOSTIC PROCEDURE 5-4.

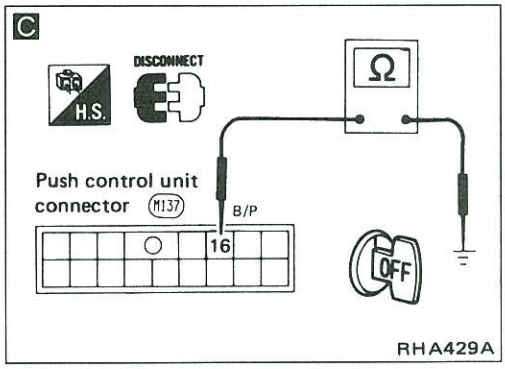
○: Illumination or indicator comes on.
×: Illumination or indicator does not come on.
△: Some indicators for VENT, B/L, FOOT, F/D, DEF or REC come on.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-1







CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illumination come on with ignition switch and lighting switch ON?

N.G. → CHECK ILLUMINATION SYSTEM.
Refer to Illumination/ Wiring Diagram in EL section.

O.K. ↓

Turn ignition switch and lighting switch OFF.

A

CHECK ILLUMINATION BULB.
Remove push control unit and disconnect harness connectors.
Remove illumination bulb(s) and check them.

N.G. → Replace illumination bulb(s).

O.K. ↓

B

CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.
Do approx. 12 volts exist between push control unit harness terminal No. ⑮ and body ground?

N.G. → CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM.
Refer to Illumination/ Wiring Diagram in EL section.

O.K. ↓

C

Note

CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.
Does continuity exist between push control unit harness terminal No. ⑯ and body ground?

O.K. ↓

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)

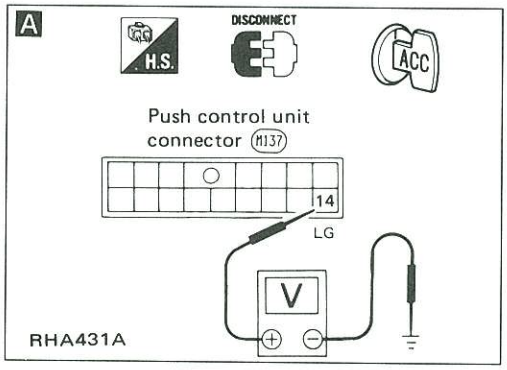
DIAGNOSTIC PROCEDURE 5-2

CHECK MAGNET CLUTCH OPERATION.
Does magnet clutch operate normally when engine ON. A/C switch, fan switch are ON?

N.G. → Go to Diagnostic Procedure 4.

O.K. ↓

Replace control amp. built-in push control unit.



DIAGNOSTIC PROCEDURE 5-3

Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

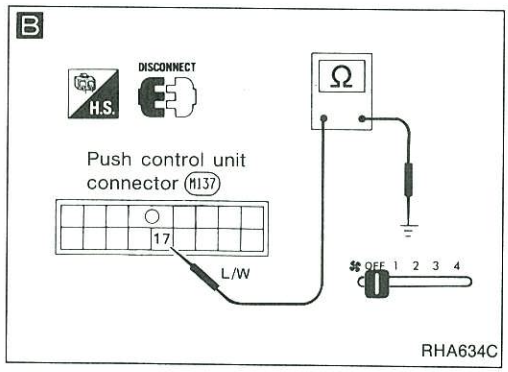
↓

A

CHECK POWER SUPPLY FOR PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑭ and body ground?

N.G. → Check 10A fuse at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓



B

Note

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

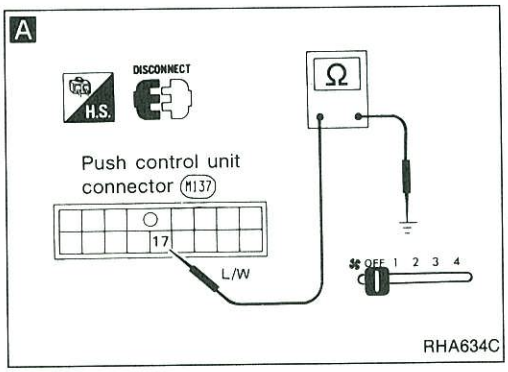
O.K. ↓

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-4



Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

↓

A

Note

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. (17) and body ground?

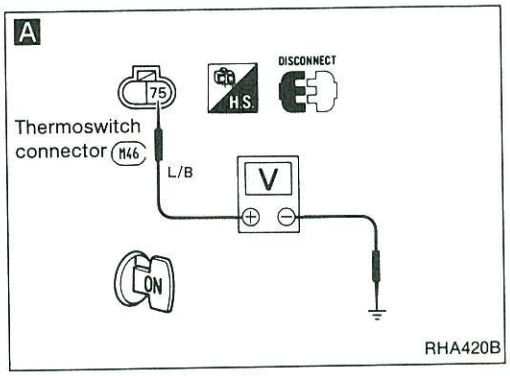
↓ O.K.

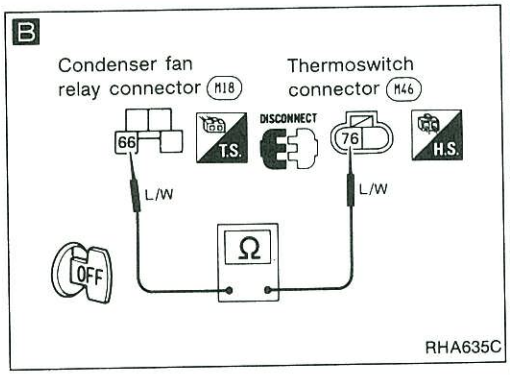
Replace control amp. built-in push control unit.

Diagnostic Procedure 6

SYMPTOM: Condenser fan motor does not operate.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**





A

CHECK POWER SUPPLY FOR THERMOSWITCH.
Disconnect thermoswitch harness connector.
Do approx. 12 volts exist between thermoswitch harness terminal No. (75) and body ground?

N.G. → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

↓ O.K.

CHECK THERMOSWITCH. (Refer to EF & EC section.)

N.G. → Replace thermoswitch.

↓ O.K.

Disconnect condenser fan relay harness connector.

↓

B

Note

Check circuit continuity between thermoswitch harness terminal No. (76) and condenser fan relay harness terminal No. (66).

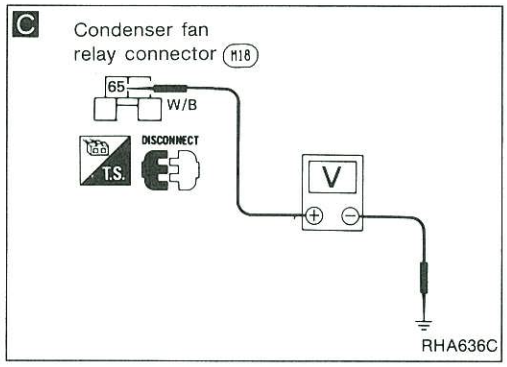
↓ O.K.

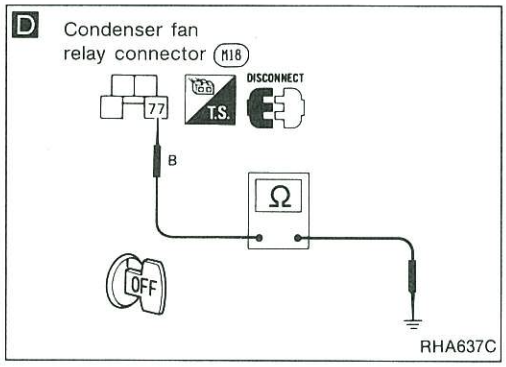
Ⓐ

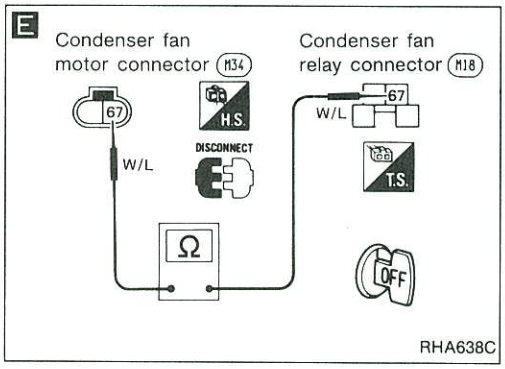
(Go to next page.)

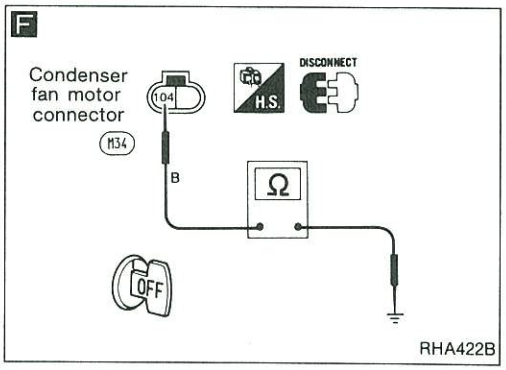
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 6 (Cont'd)









Ⓐ

C

CHECK POWER SUPPLY FOR CONDENSER FAN RELAY.
Do approx. 12 volts exist between condenser fan relay harness terminal No. (65) and body ground?

N.G. → CHECK POWER SUPPLY CIRCUIT.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓

D Note

CHECK BODY GROUND CIRCUIT FOR CONDENSER FAN RELAY.
Does continuity exist between condenser fan relay harness terminal No. (77) and body ground?

O.K. ↓

CHECK CONDENSER FAN RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace condenser fan relay.

O.K. ↓

E Note

Disconnect condenser fan motor harness connector.
Check circuit continuity between condenser fan relay harness terminal No. (67) and condenser fan motor harness terminal No. (67).

O.K. ↓

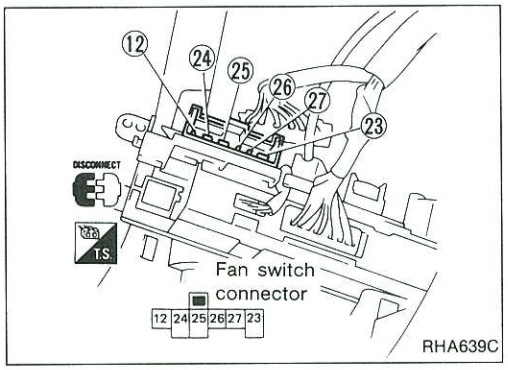
F Note

CHECK BODY GROUND CIRCUIT FOR CONDENSER FAN MOTOR.
Does continuity exist between condenser fan motor harness terminal No. (104) and body ground?

O.K. ↓

Replace condenser fan motor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

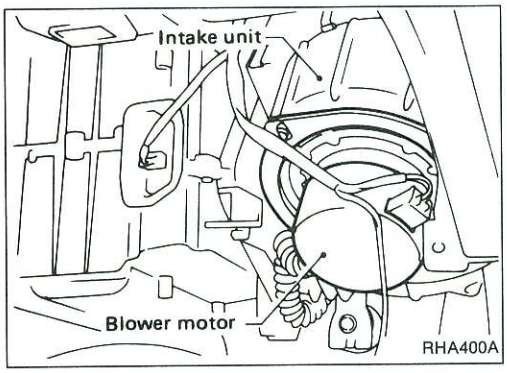


Electrical Components Inspection

FAN SWITCH

Check continuity between terminals at each switch position.

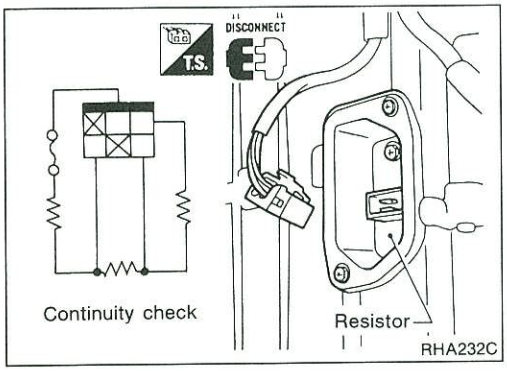
LEVER POSITION / TERMINAL	OFF	1	2	3	4
㉔					○
㉕				○	
㉖			○		
㉗		○			
㉓		○	○	○	○
⑫		○	○	○	○



BLOWER MOTOR

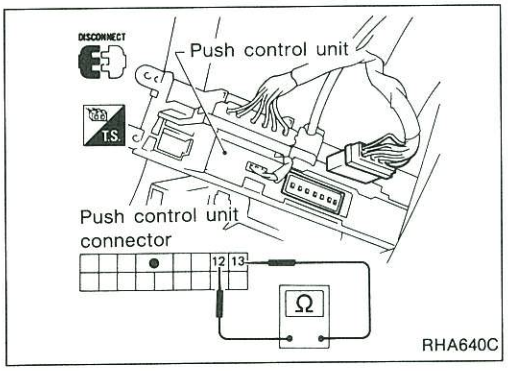
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.

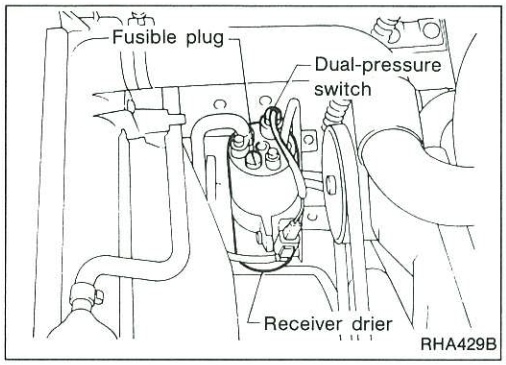


A/C SWITCH

Check continuity between terminals at each switch position.

Switch condition		Terminal No.		Continuity
A/C	DEF	⊕	⊖	
ON	ON	⑬	⑫	Yes
ON	OFF			
OFF	ON			

Electrical Components Inspection (Cont'd)

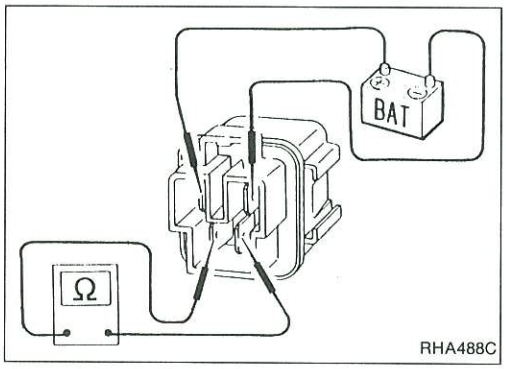


DUAL-PRESSURE SWITCH

High-pressure side line pressure kPa (kg/cm^2, psi)	Operation	Continuity
Decreasing to 177 - 216 (1.8 - 2.2, 26 - 31) Increasing to 2,452 - 2,844 (25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 177 - 235 (1.8 - 2.4, 26 - 34) Decreasing to 1,863 - 2,256 (19 - 23, 270 - 327)	Turn ON	Exists

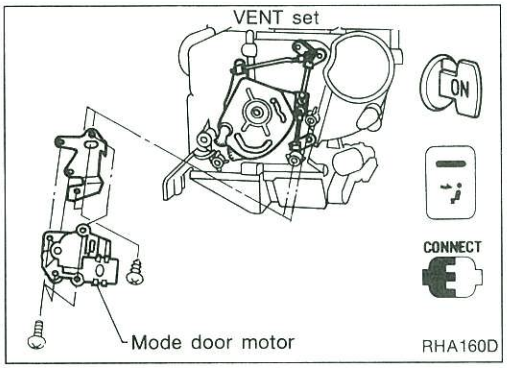
AMBIENT SWITCH

Ambient temperature °C (°F)	Operation
Increasing to approx. 0 - 3 (32 - 37)	Turn OFF
Decreasing to approx. 2 - 5 (36 - 41)	Turn ON



A/C RELAY AND CONDENSER FAN RELAY

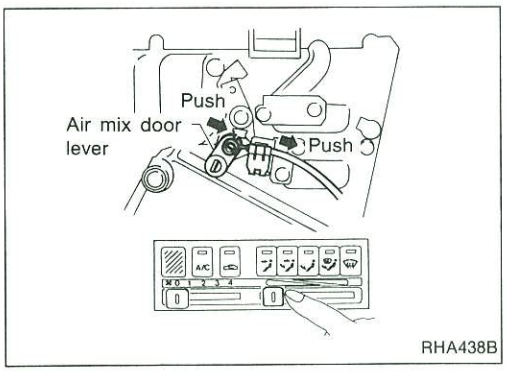
Check circuit continuity between terminals by supplying 12 volts to coil side terminals of the relay.



Control Linkage Adjustment

MODE DOOR

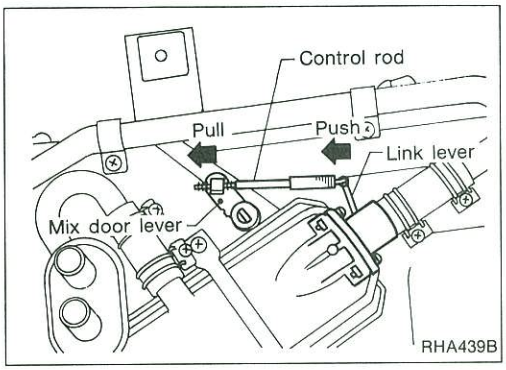
1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ON.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.



TEMPERATURE CONTROL CABLE

- Slide temperature control lever to full cold. Push air mix door lever in direction of arrow. Pull on outer cable in direction of arrow and then clamp it.

After positioning control cable, check it operates properly.



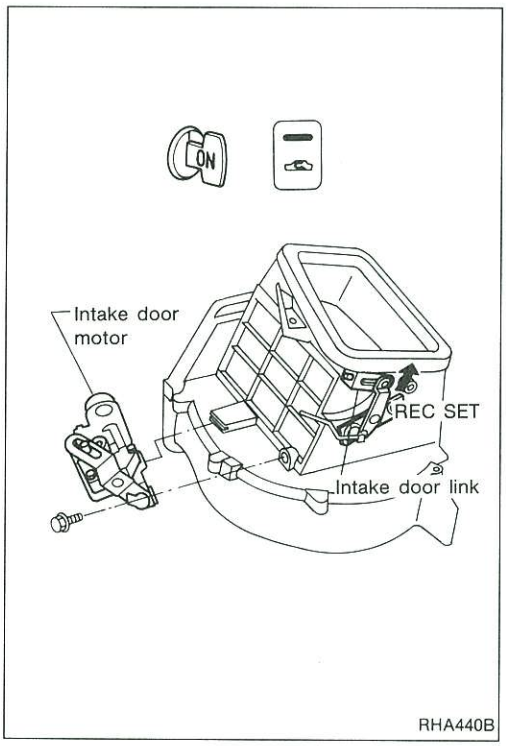
WATER COCK CONTROL ROD

- **When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever. Reconnect and readjust temperature control cable.**

1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.

After connecting control rod, check it operates properly.

Control Linkage Adjustment (Cont'd)



INTAKE DOOR

1. Connect the intake door motor harness connector before installing to the intake door motor.
2. Turn ignition switch to ON.
3. Turn REC switch ON.
4. Install intake door motor on intake unit.
5. Install intake door lever.
6. Set intake door rod in REC position and fasten door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

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(22 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.) HA-112
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SYMPTOM: Intake sensor circuit is open.
(24 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.) HA-113
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SYMPTOM: Sunload sensor circuit is open.
(25 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.) HA-114
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(26 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.) HA-115
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SYMPTOM: Ambient sensor circuit is shorted.
(-21 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.) HA-116
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(-22 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.) HA-116

Contents (Cont'd)

Diagnostic Procedure 8
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(-24 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.) HA-117
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SYMPTOM: sunload sensor circuit is shorted.
(-25 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.) HA-117
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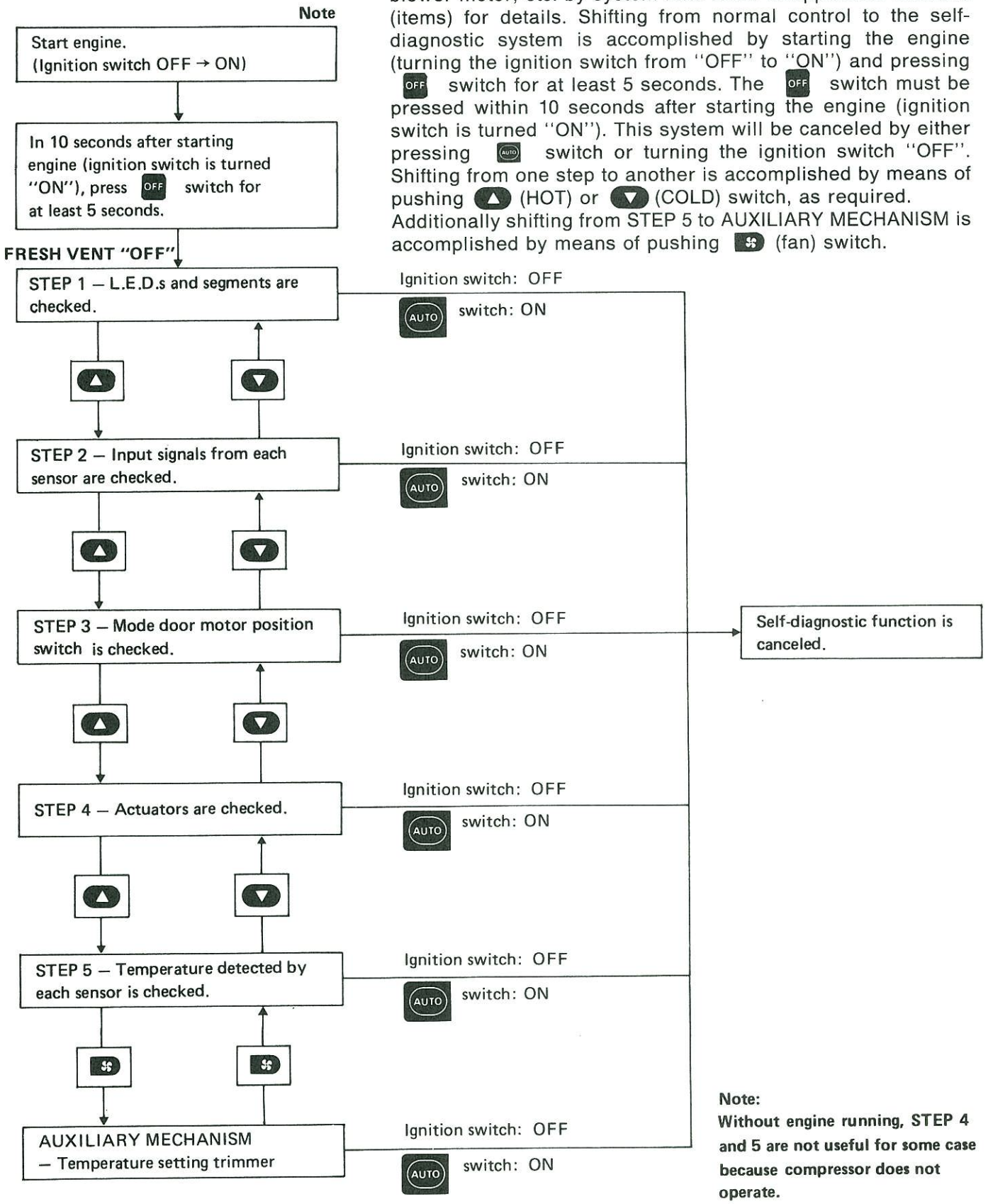
Self-diagnosis

INTRODUCTION AND GENERAL DESCRIPTION

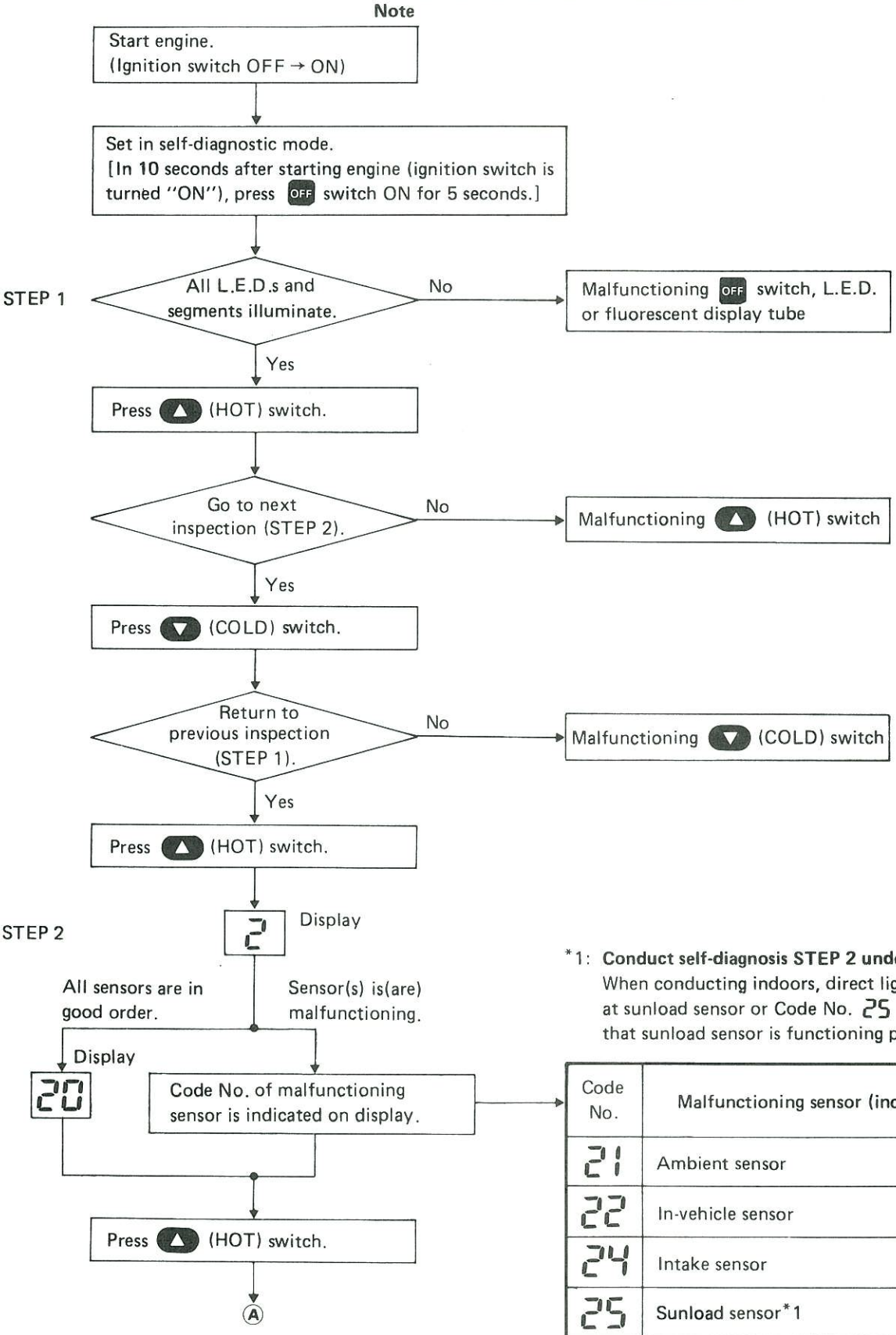
The self-diagnostic system diagnoses sensors, door motors, blower motor, etc. by system line. Refer to applicable sections (items) for details. Shifting from normal control to the self-diagnostic system is accomplished by starting the engine (turning the ignition switch from "OFF" to "ON") and pressing OFF switch for at least 5 seconds. The OFF switch must be pressed within 10 seconds after starting the engine (ignition switch is turned "ON"). This system will be canceled by either pressing AUTO switch or turning the ignition switch "OFF". Shifting from one step to another is accomplished by means of pushing ▲ (HOT) or ▼ (COLD) switch, as required. Additionally shifting from STEP 5 to AUXILIARY MECHANISM is accomplished by means of pushing (fan) switch.



Note:
Without engine running, STEP 4 and 5 are not useful for some case because compressor does not operate.

Self-diagnosis (Cont'd)

STEP BY STEP PROCEDURE

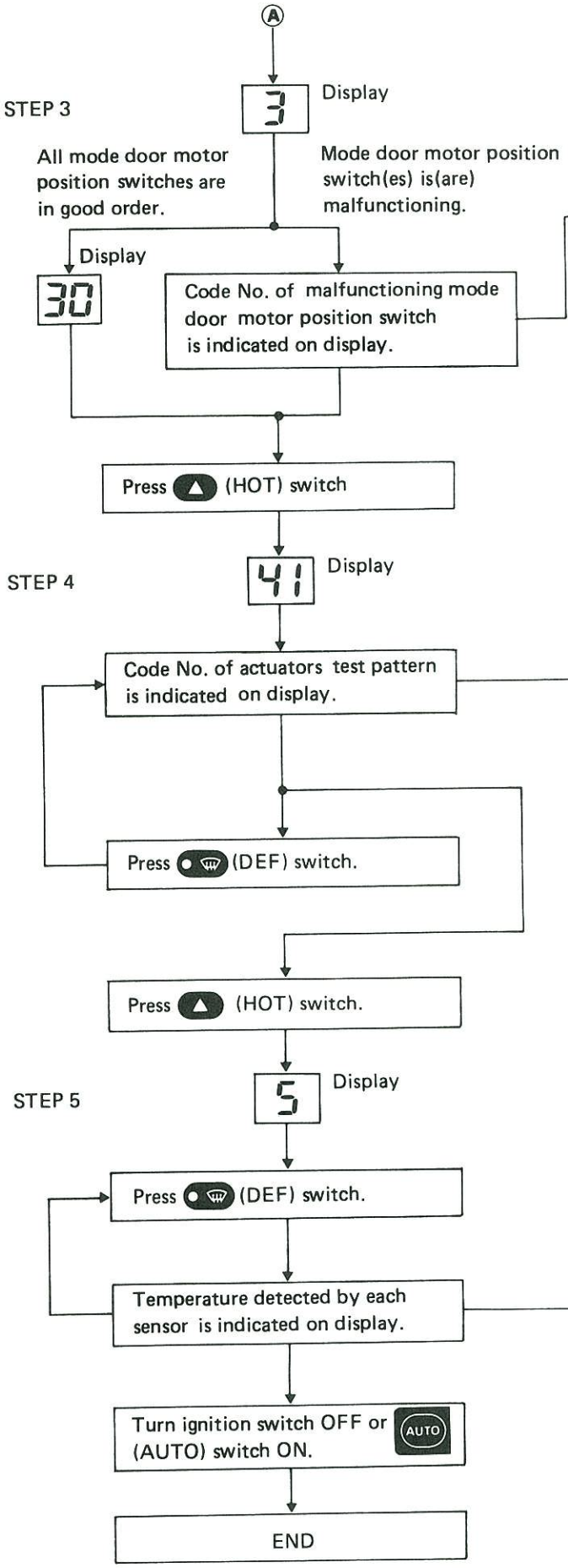


*1: **Conduct self-diagnosis STEP 2 under sunshine.**
When conducting indoors, direct light (more than 60W) at sunload sensor or Code No. 25 will indicate despite that sunload sensor is functioning properly.

Code No.	Malfunctioning sensor (including circuits)
21	Ambient sensor
22	In-vehicle sensor
24	Intake sensor
25	Sunload sensor*1
26	P.B.R.

Note:
Without engine running, STEP 4 and 5 are not useful for some case because compressor does not operate.

Self-diagnosis (Cont'd)



Code No.	Malfunctioning mode door motor position switch (including circuits)
31	VENT
32	B/L
33	B/L
34	FOOT/DEF 1
35	FOOT/DEF 2
36	DEF

Code No.	Actuators test pattern				
	Mode door	Intake door	Air mix door	Blower motor	Compressor
41	VENT	REC	Full Cold	4 - 5V	ON
42	B/L	REC	Full Cold	9 - 11V	ON
43	B/L	20% FRE	Full Hot	7 - 9V	ON
44	D/F 1	FRE	Full Hot	7 - 9V	OFF
45	D/F 2	FRE	Full Hot	7 - 9V	OFF
46	DEF	FRE	Full Hot	10 - 12V	ON

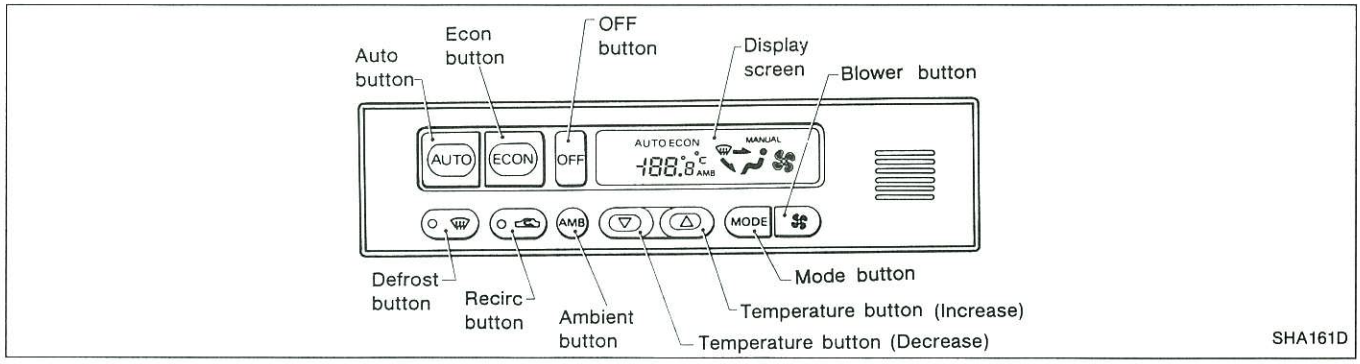
Ambient sensor
In-vehicle sensor
Intake sensor

Self-diagnosis (Cont'd)

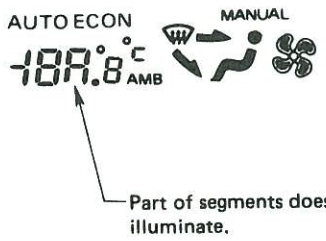
HOW TO INTERPRET THE RESULTS

STEP 1: Checks L.E.D.s and segments

When switch's L.E.D. and segments are in good order in STEP 1 mode, the corresponding L.E.D. and fluorescent display tube will illuminate.

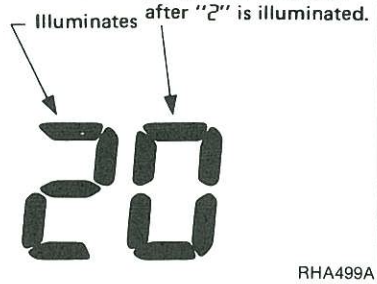


Display malfunction



If L.E.D.s or segments malfunction, L.E.D. does not come on or display shows incomplete segment.

Display (when all sensors are in good order)

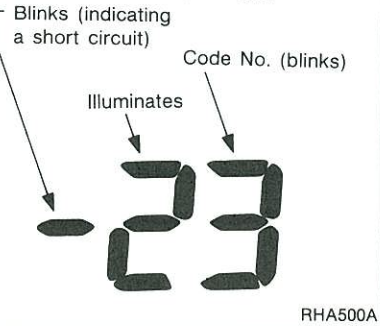


STEP 2: Checks each sensor circuit for open or short circuit

Display shows "2" in STEP 2 mode.
When all sensors are in good order, display shows "20".

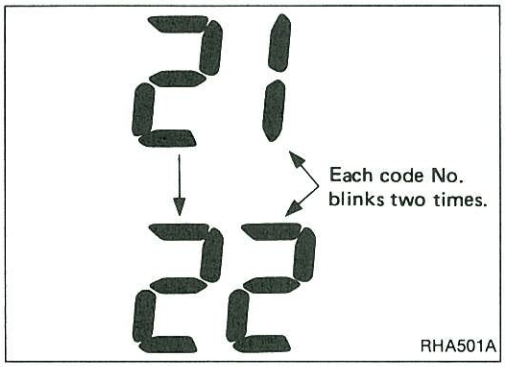
It takes approximately 4 seconds to check all sensors.

Display (when sensor malfunctions)



If a sensor is malfunctioning, the corresponding code No. blinks on display. A short circuit is identified by a blinking "– " mark preceding mode number.

Self-diagnosis (Cont'd)



If two or more sensors malfunction, corresponding code Nos. respectively blink two times.

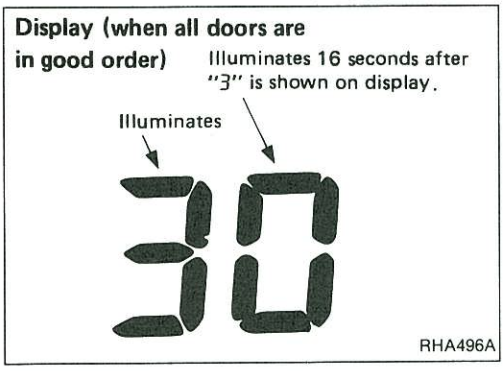
Sensors and abnormalities

If a circuit is opened or shorted, display shows its code No. when input corresponds with any of following conditions.

Code No.	Sensor	Open circuit	Short circuit
21	Ambient sensor	Less than -41.9°C (-43°F)	Greater than 100°C (212°F)
22	In-vehicle sensor	Less than -41.9°C (-43°F)	Greater than 100°C (212°F)
24	Intake sensor	Less than -41.9°C (-43°F)	Greater than 100°C (212°F)
25	Sunload sensor*2	Less than 0.0319 mA	Greater than 1.147 mA
26	P.R.B.*1	Greater than 50%	Less than 30%

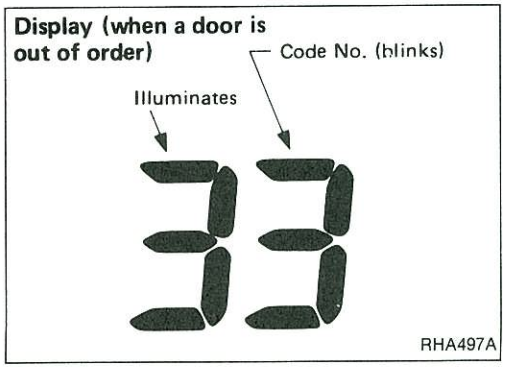
*1: "50%" and "30%" refer to percentage with respect to full stroke of air mix door. (Full cold: 0%, Full hot: 100%)

*2: **Conduct self-diagnosis STEP 2 under sunshine.**
When conducting indoors, direct light (more than 60W) at sunload sensor.



STEP 3: Checks mode door position

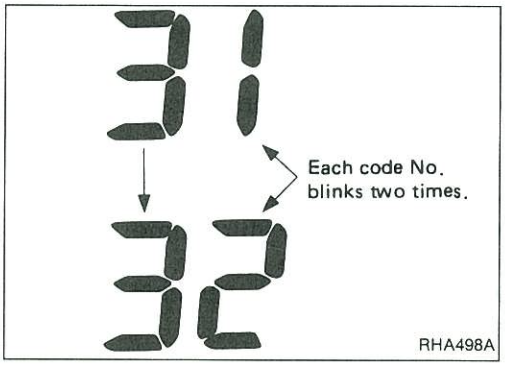
Display shows "3" in STEP 3 mode.
When all doors are in good order, display will then show "30".
It takes approximately 16 seconds to check all mode doors.



When abnormalities are detected, display shows a code No. corresponding with malfunctioning part.

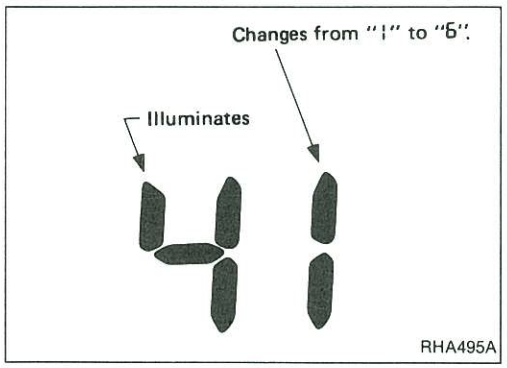
Code No.	31	32	33	34	35	36
Malfunctioning part	VENT	B/L	B/L	F/D 1	F/D 2	DEF

Self-diagnosis (Cont'd)



If two or more mode doors are out of order, corresponding code numbers respectively blink two times.

If any mode door motor position switch is malfunctioning, mode door motor will also malfunction.



STEP 4: Checks operation of each actuator

Display shows "41" in STEP 4 mode.
When (DEF) switch is pressed one time, display shows "42". Thereafter, each time the switch is pressed, display advances one number at a time, up to "46", then returns to "41".

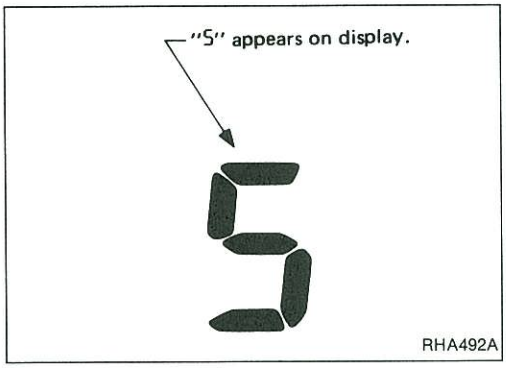
During inspection in STEP 4 mode, auto amplifier will forcefully transmit an output to the affected actuators in response to code No. shown on display, as indicated in table below.

Checks must be made visually, by listening to any noise, or by touching air outlets with your hand, etc. for improper operation.

Code No. / Actuator	41	42	43	44	45	46
Mode door	VENT	B/L	B/L	F/D 1	F/D 2	DEF
Intake door	REC	REC	20% FRE	FRE	FRE	FRE
Air mix door	Full Cold	Full Cold	Full Hot	Full Hot	Full Hot	Full Hot
Blower motor	4 - 5 V	9 -11 V	7 - 9 V	7 - 9 V	7 - 9 V	10 - 12 V
Compressor	ON	ON	ON	OFF	OFF	ON

Operating condition of each actuator cannot be checked by indicators.

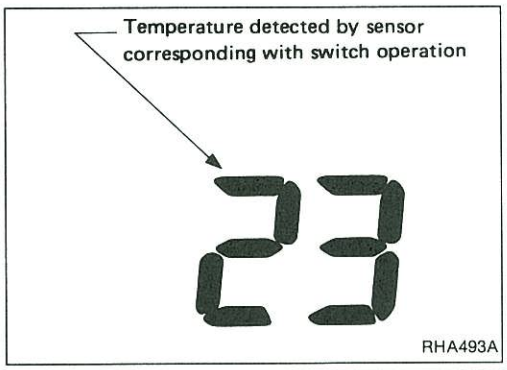
Self-diagnosis (Cont'd)

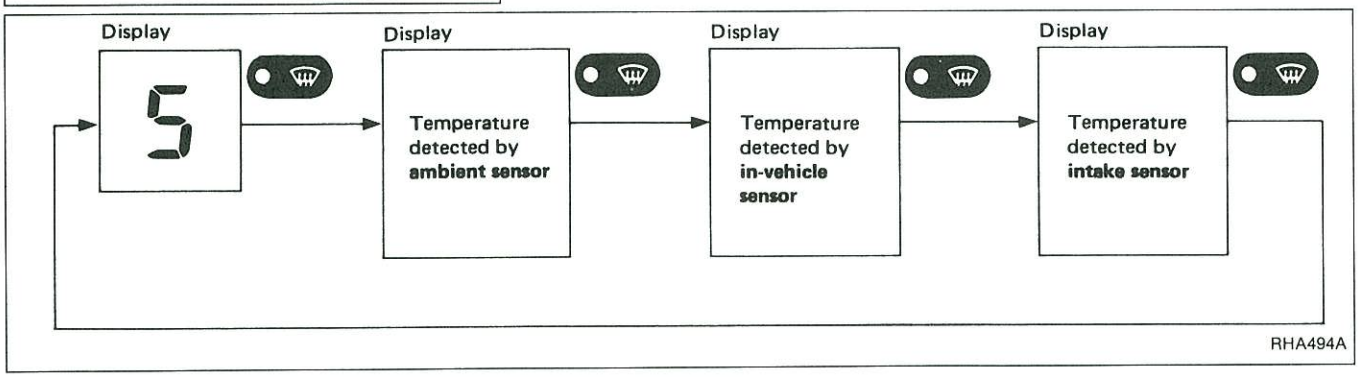


STEP 5: Checks temperature detected by sensors

Display shows "5" in STEP 5 mode.

- When (DEF) switch is pressed one time, display shows temperature detected by ambient sensor.
- When (DEF) switch is pressed second time, display shows temperature detected by in-vehicle sensor.
- When (DEF) switch is pressed third time, display shows temperature detected by intake sensor.
- When (DEF) switch is pressed fourth time, display returns to original presentation "5".





If temperature shown on display greatly differs from actual temperature, check sensor circuit at first then inspect sensor itself according to the procedures described in **Electrical Components Inspection**.

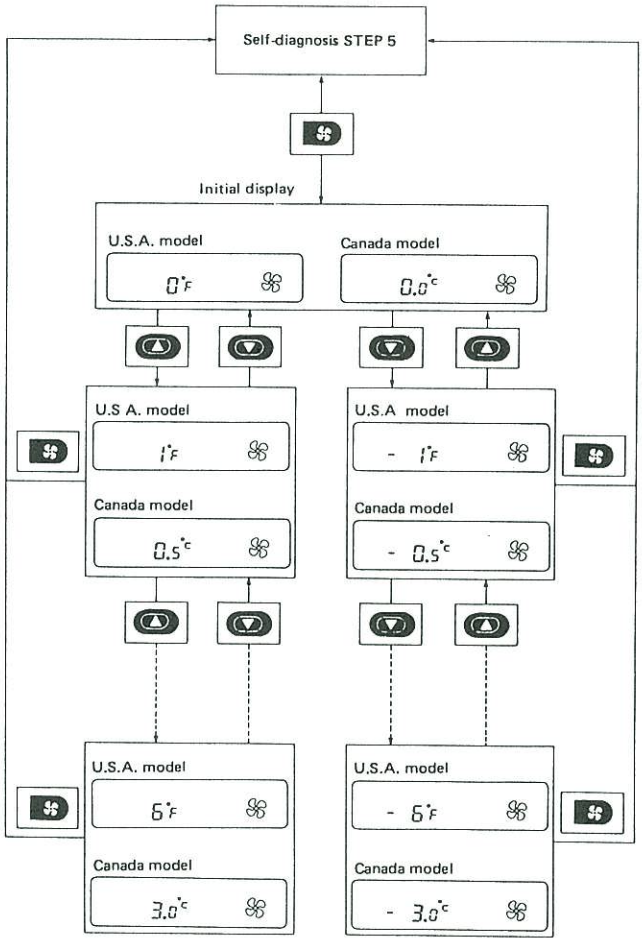
Self-diagnosis (Cont'd)

AUXILIARY MECHANISM (Temperature setting trimmer)

This trimmer compensates for differences between temperature setting (displayed digitally) and temperature felt by driver in a range of ±3°C (±6°F).

Operating procedures for this trimmer are as follows:

Starting with STEP 5 under "Self-diagnostic mode", press (fan) switch to set air conditioning system in auxiliary mode. Then, press either (HOT) or (COLD) switch as desired. Temperature will change at a rate of 0.5°C (1°F) each time a switch is pressed.



RHA491A

When battery cable is disconnected, trimmer operation is canceled and temperature set becomes that of initial condition i.e. 0°C (0°F).

Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE			Self-diagnosis						Preliminary Check								Diagnostic Procedure										
REFERENCE PAGE			HA-87, 89	HA-87, 89	HA-88, 90	HA-88, 91	HA-88, 92	HA-86, 93	HA-98	HA-99	HA-100	HA-101	HA-102	HA-103	HA-104	HA-104	HA-111	HA-112	HA-113	HA-114	HA-115	HA-116	HA-116	HA-117	HA-117	HA-118	HA-118
SYMPTOM			STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	AUXILIARY MECHANISM	Preliminary Check 1	Preliminary Check 2	Preliminary Check 3	Preliminary Check 4	Preliminary Check 5	Preliminary Check 6	Preliminary Check 7	Preliminary Check 8	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
Air outlet does not change.			❶	❷	○	○	○		❸								○	○	○	○	○	○	○	○	○	○	
Intake door does not change.			❶	❷		○	○			❸							○	○	○	○	○	○	○	○	○	○	
Insufficient cooling			○	○	○	○	○	○	○	○	❶		○	○	○		○	○	○	○	○	○	○	○	○	○	○
Insufficient heating			○	○	○	○	○	○	○	○		❶	○		○		○	○	○	○	○	○	○	○	○	○	
Blower motor operation is malfunctioning.			❶	❷		○	○						❸				○	○	○	○	○	○	○	○	○	○	
Magnet clutch does not engage.			❶	❷		○	○							❸			○	○	○	○	○	○	○	○	○	○	
Discharged air temperature does not change.			❶	❷		○	○								❸		○	○	○	○	○	○	○	○	○	○	
Noise																❶											
Result of Self-diagnosis STEP 2	21	Ambient sensor circuit is open.	❶	❷			❸										❹										
	22	In-vehicle sensor circuit is open.	❶	❷			❸											❹									
	24	Intake sensor circuit is open.	❶	❷			❸												❹								
	25	Sunload sensor circuit is open.	❶	❷																❸							
	26	P.B.R. circuit is open.	❶	❷																	❸						

❶, ❷: The number means checking order.
○: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Symptom Chart (Cont'd)

| Diagnostic Procedure | | | | | | | Main Power Supply and Ground Circuit Check | | | | | Electrical Components Inspection | | | | | | |

Symptom Chart (Cont'd)

PROCEDURE			Self-diagnosis						Preliminary Check								Diagnostic Procedure										
REFERENCE PAGE			HA-87, 89	HA-87, 89	HA-88, 90	HA-88, 91	HA-88, 92	HA-86, 93	HA-98	HA-99	HA-100	HA-101	HA-102	HA-103	HA-104	HA-104	HA-111	HA-112	HA-113	HA-114	HA-115	HA-116	HA-116	HA-117	HA-117	HA-118	HA-118
SYMPTOM			STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	AUXILIARY MECHANISM	Preliminary Check 1	Preliminary Check 2	Preliminary Check 3	Preliminary Check 4	Preliminary Check 5	Preliminary Check 6	Preliminary Check 7	Preliminary Check 8	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
Result of Self-diagnosis STEP 2	-21	Ambient sensor circuit is shorted.	❶	❷			③															❹					
	-22	In-vehicle sensor circuit is shorted.	❶	❷			③																❹				
	-24	Intake sensor circuit is shorted.	❶	❷			❸																	❹			
	-25	Sunload sensor circuit is shorted.	❶	❷																					❸		
	-26	P.B.R. circuit is shorted.	❶	❷																						❹	
Condenser fan motor does not operate.																											❶
Mode door motor does not operate normally.			❶	❷	❸	❹	○										○	○	○	○	○	○	○	○	○	○	
Intake door motor does not operate normally.			❶	❷		❸	○										○	○	○	○	○	○	○	○	○	○	
Air mix door motor does not operate normally.			❶	❷		❸	○										○	○	○	○	○	○	○	○	○	○	
Blower motor operation is malfunctioning under out of Starting Fan Speed Control.			❶	❷		○	○						❸				○	○	○	○	○	○	○	○	○	○	
Magnet clutch does not operate after performing Preliminary Check 6.			❶	❷		○	○							❸			○		○								
Self-diagnosis cannot be performed.																											

❶, ❷: The number means checking order.
○: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Symptom Chart (Cont'd)

Diagnostic Procedure							Main Power Supply and Ground Circuit Check						Electrical Components Inspection																				
HA-119 - 120	HA-121 - 122	HA-122	HA-123 - 125	HA-126 - 127	HA-128		HA-110	HA-110	HA-110	HA-110	HA-110		HA-136	HA-134 - 135	HA-137 - 138	HA-136 - 137	HA-144	HA-143	HA-131, HA-145 - 146	HA-131, HA-140 - 141	HA-80	—	HA-81, 128	HA-81, 128	HA-81, 128	HA-36	—	Refer to EF & EC section.				—
Diagnostic Procedure 12	Diagnostic Procedure 13	Diagnostic Procedure 14	Diagnostic Procedure 15	Diagnostic Procedure 16	Diagnostic Procedure 17		Auto amp.	10A Fuse #23	15A Fuses #4 and #5	10A Fuse #10	10A Fuse #20		Ambient sensor	In-vehicle sensor	Intake sensor	Sunload sensor	P.B.R.	Air mix door motor	Mode door motor	Intake door motor	Blower motor	Fan control amp.	Blower high relay	A/C relay	Dual-pressure switch	Magnet clutch (Compressor)	Auto amp.	E.C.C.S. control unit	Condenser fan relay	Condenser fan motor	Thermoswitch	Harness
							○	○	○	○	○		○														○					○
														○													○					○
															○												○					○
																○											○					○
																	○										○					○
❺							○	○	○		○		○	○	○	○	○		○								○					○
	❹						○	○	○		○		○	○	○	○	○			○								○					○
		❹					○	○	○		○		○	○	○	○	○	○										○					○
			❹				○	○	○		○		○	○	○	○	○				○	○	○					○					○
				❹			○	○	○	○	○		○		○									○	○	○	○	○					○
					❶	❷																					○					○

Preliminary Check

PRELIMINARY CHECK 1

Air outlet does not change.

- **Perform Self-diagnosis STEP 1 before referring to the flow chart.**

CHECK SENSOR CIRCUIT.
Set up Self-diagnosis STEP 2.
Is each sensor circuit normal?
Code No. 20 should be indicated on the display after approx. 4 seconds.

N.G. → CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

Code No.	How to repair	Reference page
21	Go to Diagnostic Procedure 1.	HA-111
22	Go to Diagnostic Procedure 2.	HA-112
24	Go to Diagnostic Procedure 3.	HA-113
25	Go to Diagnostic Procedure 4.	HA-114
26	Go to Diagnostic Procedure 5.	HA-115
-21	Go to Diagnostic Procedure 6.	HA-116
-22	Go to Diagnostic Procedure 7.	HA-116
-24	Go to Diagnostic Procedure 8.	HA-117
-25	Go to Diagnostic Procedure 9.	HA-117
-26	Go to Diagnostic Procedure 10.	HA-118

When malfunctioning sensor circuits for ambient sensor, in-vehicle sensor and intake sensor, are suspected it is useful to check temperature detected by each sensor with Self-diagnosis STEP 5 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK MODE DOOR MOTOR.
Set up Self-diagnosis STEP 3.
Is mode door motor operating normally?
Code No. 30 should be indicated on the display after approx. 16 seconds.

N.G. → **Go to Diagnostic Procedure 12.**

O.K. ↓

CHECK MODE DOOR OPERATION.
Set up Self-diagnosis STEP 4.
Does air outlet change according to each code No.?

41	42	43	44	45	46
VENT	B/L	B/L	F/D1	F/D2	DEF

Refer to AIR DISTRIBUTION.

N.G. → CHECK SIDE LINK MECHANISM.
Refer to Control Rod Adjustment.

N.G. → Repair or adjust.

O.K. ↓

Go to **Diagnostic Procedure 12.**

O.K. ↓

Air outlet control system is normal. Refer to **Outlet door control specification.**

Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

Intake door does not change.

- **Perform Self-diagnosis STEP 1 before referring to the following flow chart.**

CHECK SENSOR CIRCUIT.
Set up Self-diagnosis STEP 2.
Is each sensor circuit normal?
Code No. 20 should be indicated on the display after approx. 4 seconds later.

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDED TO EACH CODE NO.

Code No.	How to repair	Reference page
21	Go to Diagnostic Procedure 1.	HA-111
22	Go to Diagnostic Procedure 2.	HA-112
24	Go to Diagnostic Procedure 3.	HA-113
25	Go to Diagnostic Procedure 4.	HA-114
26	Go to Diagnostic Procedure 5.	HA-115
-21	Go to Diagnostic Procedure 6.	HA-116
-22	Go to Diagnostic Procedure 7.	HA-116
-24	Go to Diagnostic Procedure 8.	HA-117
-25	Go to Diagnostic Procedure 9.	HA-117
-26	Go to Diagnostic Procedure 10.	HA-118

When malfunctioning sensor circuits for ambient sensor, in-vehicle sensor and intake sensor, are suspected it is useful to check temperature detected by each sensor with Self-diagnosis STEP 5 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK INTAKE DOOR MOTOR OPERATION.
Set up Self-diagnosis STEP 4.
Does intake air change according to each code No.?

41	42	43	44	45	46
REC	REC	20% FRE	FRE	FRE	FRE

N.G. →

CHECK INTAKE DOOR ROD or LEVER MECHANISM.
Refer to Control Rod Adjustment.

N.G. → Repair or Adjust.

O.K. ↓

Go to **Diagnostic Procedure 13.**

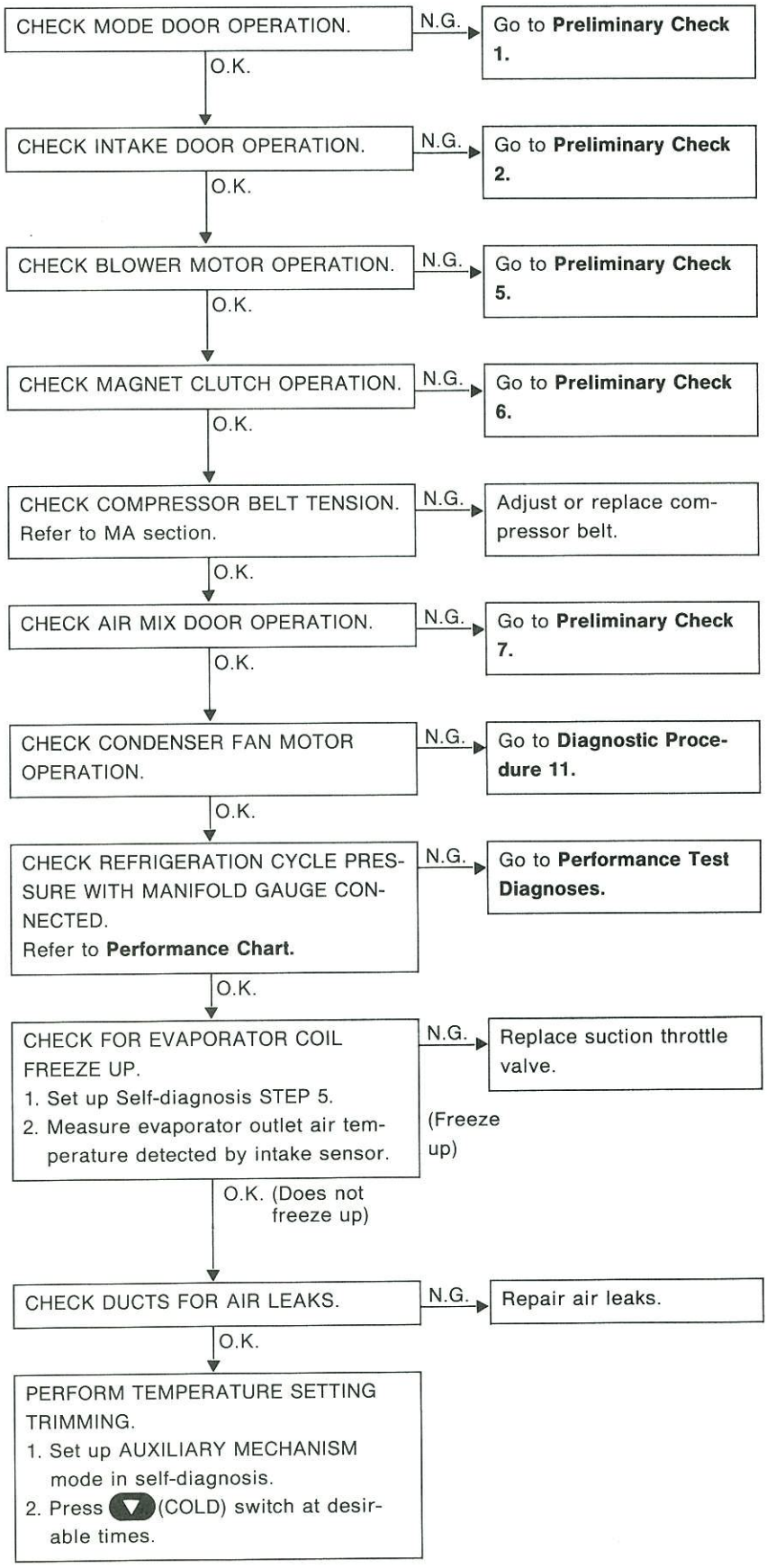
O.K. ↓

Intake door control system is normal.
Refer to **Intake door control specification.**

Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

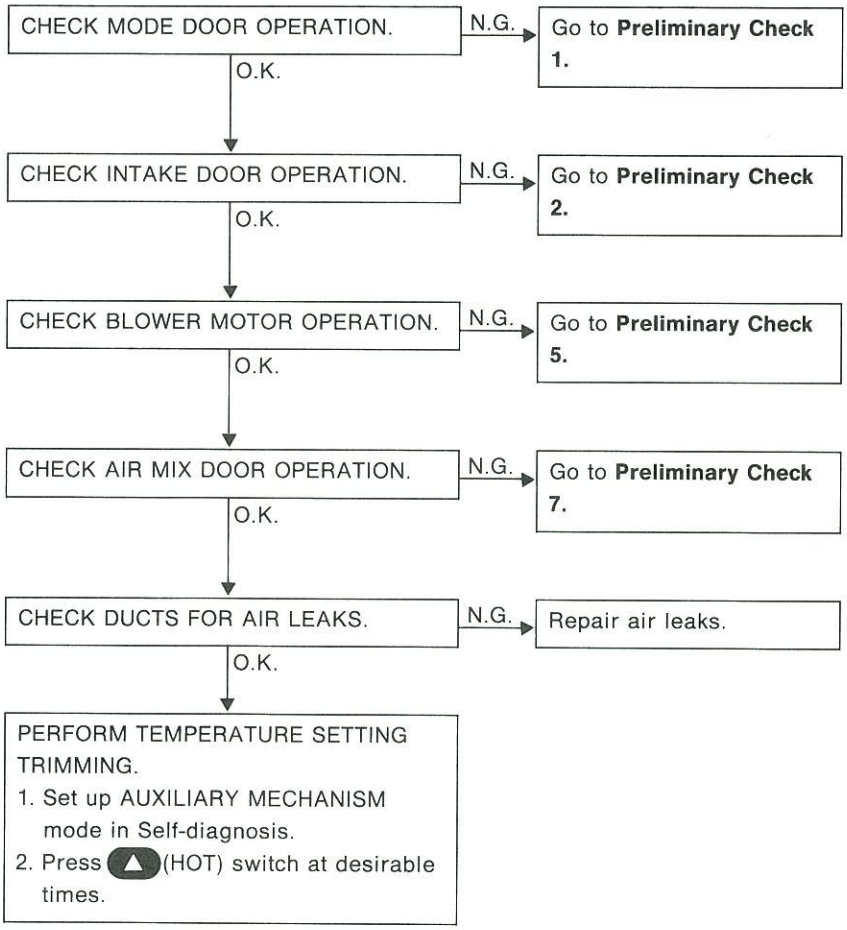
Insufficient cooling



Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

Insufficient heating



Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

Blower motor operation is malfunctioning.

- **Perform Self-diagnosis STEP 1 before referring to the following flow chart.**

CHECK SENSOR CIRCUIT.
Set up Self-diagnosis STEP 2.
Is each sensor circuit normal?
Code No. 20 should be indicated on the display after approx. 4 seconds.

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

Code No.	How to repair	Reference page
21	Go to Diagnostic Procedure 1.	HA-111
22	Go to Diagnostic Procedure 2.	HA-112
24	Go to Diagnostic Procedure 3.	HA-113
25	Go to Diagnostic Procedure 4.	HA-114
26	Go to Diagnostic Procedure 5.	HA-115
-21	Go to Diagnostic Procedure 6.	HA-116
-22	Go to Diagnostic Procedure 7.	HA-116
-24	Go to Diagnostic Procedure 8.	HA-117
-25	Go to Diagnostic Procedure 9.	HA-117
-26	Go to Diagnostic Procedure 10.	HA-118

When malfunctioning sensor circuits for ambient sensor, in-vehicle sensor and intake sensor, are suspected it is useful to check temperature detected by each sensor with Self-diagnosis STEP 5 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK BLOWER MOTOR OPERATION.
Set up Self-diagnosis STEP 4.
Does blower speed change according to each code No.?

Code No.	41	42	43	44	45	46
Blower motor speed	Low	Middle high	Middle low			high

N.G. → Go to **Diagnostic Procedure 15.**

O.K. ↓

Is engine coolant temperature below 50°C (122°F) and ambient temperature below 15°C (59°F)?

No → Blower motor operation is normal
Refer to **Fan speed control specification.**

Yes ↓

IS BLOWER MOTOR CONTROLLED UNDER FAN STARTING SPEED CONTROL?
Refer to **Starting fan speed control specification.**

No → Check engine 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.

- **Perform Self-diagnosis STEP 1 before referring to the following flow chart.**

CHECK SENSOR CIRCUIT.
Set up Self-diagnosis STEP 2.
Is each sensor circuit normal?
Code No. 20 should be indicated on the display after approx. 4 seconds.

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDED TO EACH CODE NO.

Code No.	How to repair	Reference page
21	Go to Diagnostic Procedure 1.	HA-111
22	Go to Diagnostic Procedure 2.	HA-112
24	Go to Diagnostic Procedure 3.	HA-113
25	Go to Diagnostic Procedure 4.	HA-114
26	Go to Diagnostic Procedure 5.	HA-115
-21	Go to Diagnostic Procedure 6.	HA-116
-22	Go to Diagnostic Procedure 7.	HA-116
-24	Go to Diagnostic Procedure 8.	HA-117
-25	Go to Diagnostic Procedure 9.	HA-117
-26	Go to Diagnostic Procedure 10.	HA-118

When malfunctioning sensor circuits for ambient sensor, in-vehicle sensor and intake sensor, are suspected it is useful to check temperature detected by each sensor with Self-diagnosis STEP 5 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK MAGNET CLUTCH OPERATION.
Set up Self-diagnosis STEP 4.
Does magnet clutch operate according to each code No.?

Code No. / Actuator	41	42	43	44	45	46
Compressor	ON	ON	ON	OFF	OFF	ON

N.G. →

CHECK REFRIGERANT.
Connect manifold gauge, then check system pressure.

N.G. → Check refrigerant leaks.

O.K. ↓

Go to **Diagnostic Procedure 16.**

O.K. ↓

Magnet clutch control system is normal.
Refer to Compressor Clutch.

Preliminary Check (Cont'd)

PRELIMINARY CHECK 7

Discharged air temperature does not change.

- **Perform Self-diagnosis STEP 1 before referring to the following flow chart.**

CHECK SENSOR CIRCUIT.
Set up Self-diagnosis STEP 2.
Is each sensor circuit normal?
Code No. 20 should be indicated on the display after approx. 4 seconds later.

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

Code No.	How to repair	Reference page
21	Go to Diagnostic Procedure 1.	HA-111
22	Go to Diagnostic Procedure 2.	HA-112
24	Go to Diagnostic Procedure 3.	HA-113
25	Go to Diagnostic Procedure 4.	HA-114
26	Go to Diagnostic Procedure 5.	HA-115
-21	Go to Diagnostic Procedure 6.	HA-116
-22	Go to Diagnostic Procedure 7.	HA-116
-24	Go to Diagnostic Procedure 8.	HA-117
-25	Go to Diagnostic Procedure 9.	HA-118
-26	Go to Diagnostic Procedure 10.	HA-118

When malfunctioning sensor circuits for ambient sensor, in-vehicle sensor and intake sensor, are suspected it is useful to check temperature detected by each sensor with Self-diagnosis STEP 5 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK AIR MIX DOOR OPERATION.
Set up Self-diagnosis STEP 4.
Does discharged air temperature change according to each code No.?

41	42	43	44	45	46
Full cold		Full hot			

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 14.**

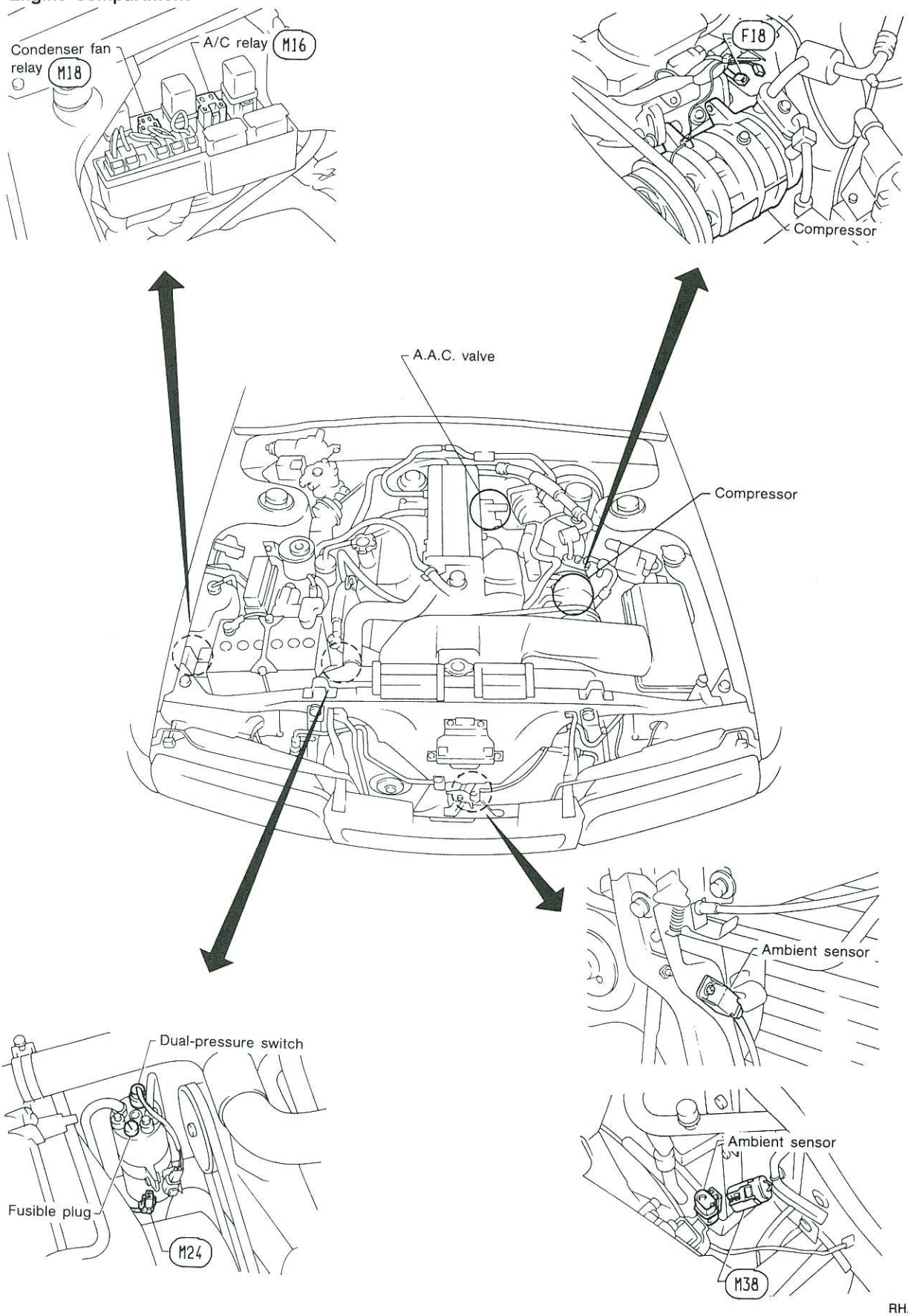
PRELIMINARY CHECK 8

Noise

- **Refer to HA-58.**

A/C Electrical Component Layout

Engine compartment



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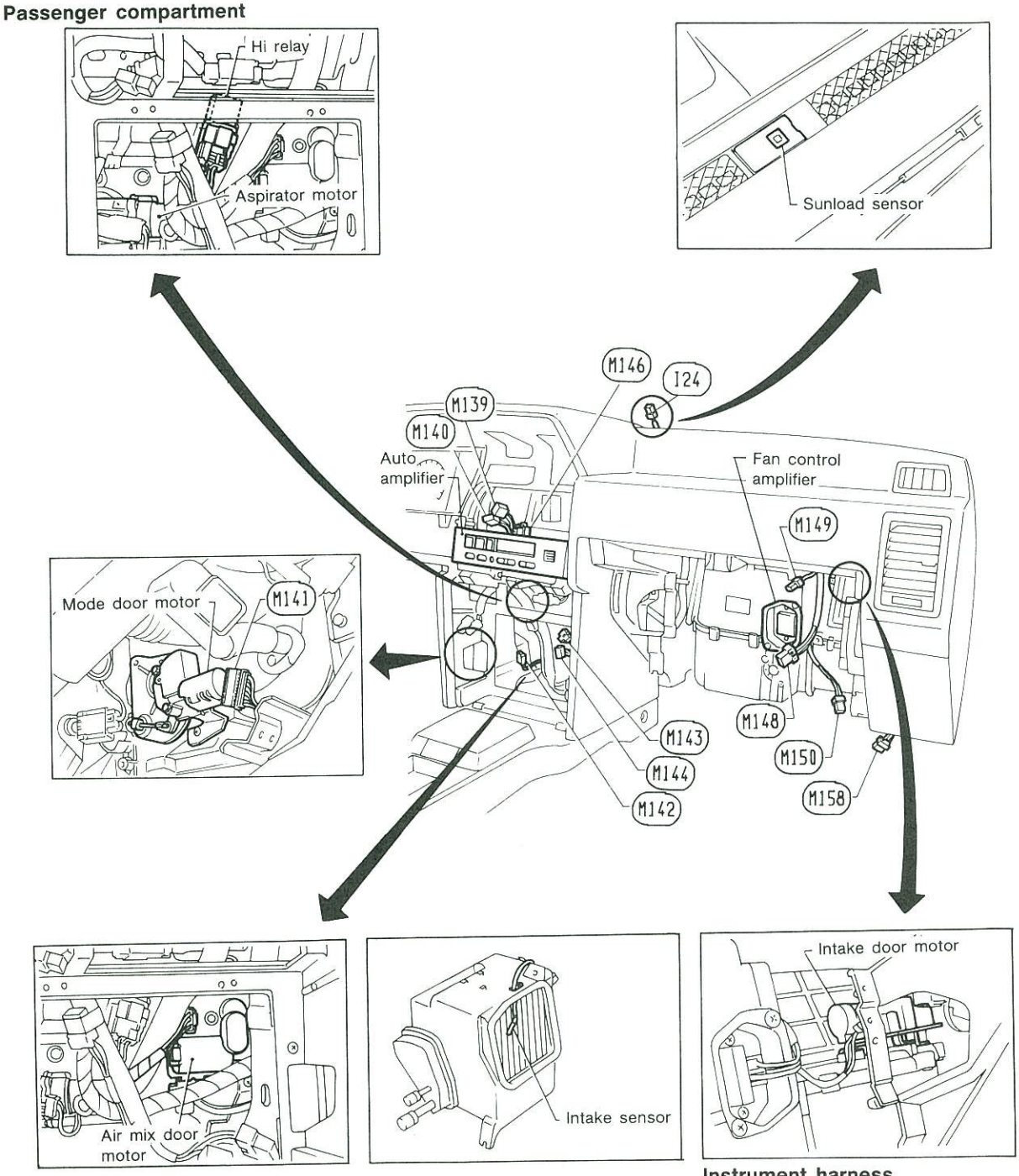
A/C Electrical Component Layout (Cont'd)

Passenger compartment



Main harness

- M16 : A/C relay
- M18 : Condenser fan relay
- M24 : Dual-pressure switch
- M34 : Condenser fan motor
- M38 : Ambient sensor
- M46 : Thermoswitch
- M139 : Auto amp.
- M140 : Auto amp.
- M141 : Mode door motor
- M142 : Aspirator fan motor
- M143 : Blower HI relay
- M144 : Air mix door motor
- M146 : In-vehicle sensor
- M148 : Fan control amp.
- M149 : Intake sensor
- M150 : Intake door motor
- M158 : Blower motor

Instrument harness

- I24 : Sunload sensor

E.F.I. harness

- F14 : Engine temperature sensor
- F18 : Compressor

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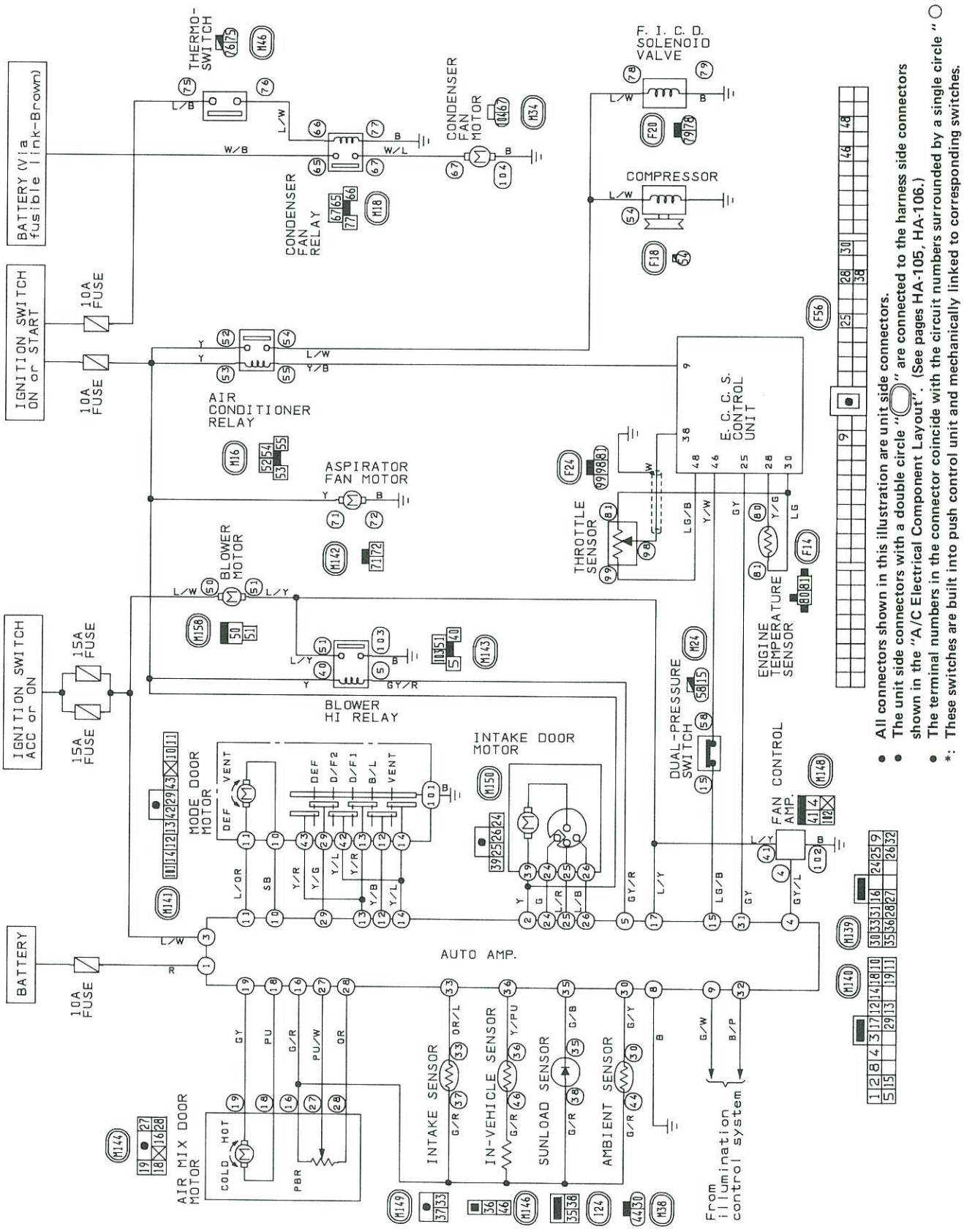
Circuit Diagram for Quick Pinpoint Check



- 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 "A/C Electrical Component Layout". (See pages HA-105, HA-106.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".
- *: These switches are built into push control unit and mechanically linked to corresponding switches.

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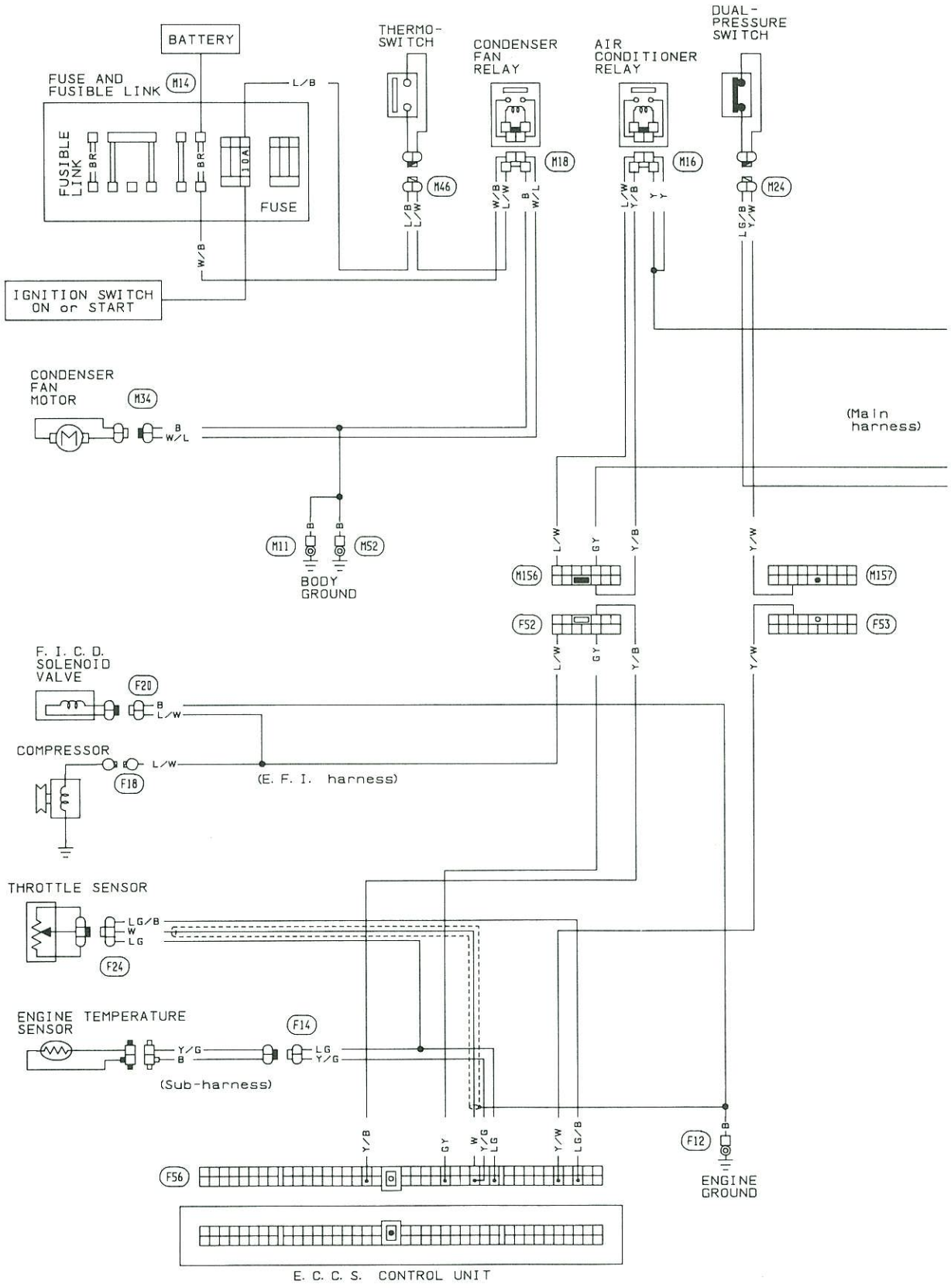
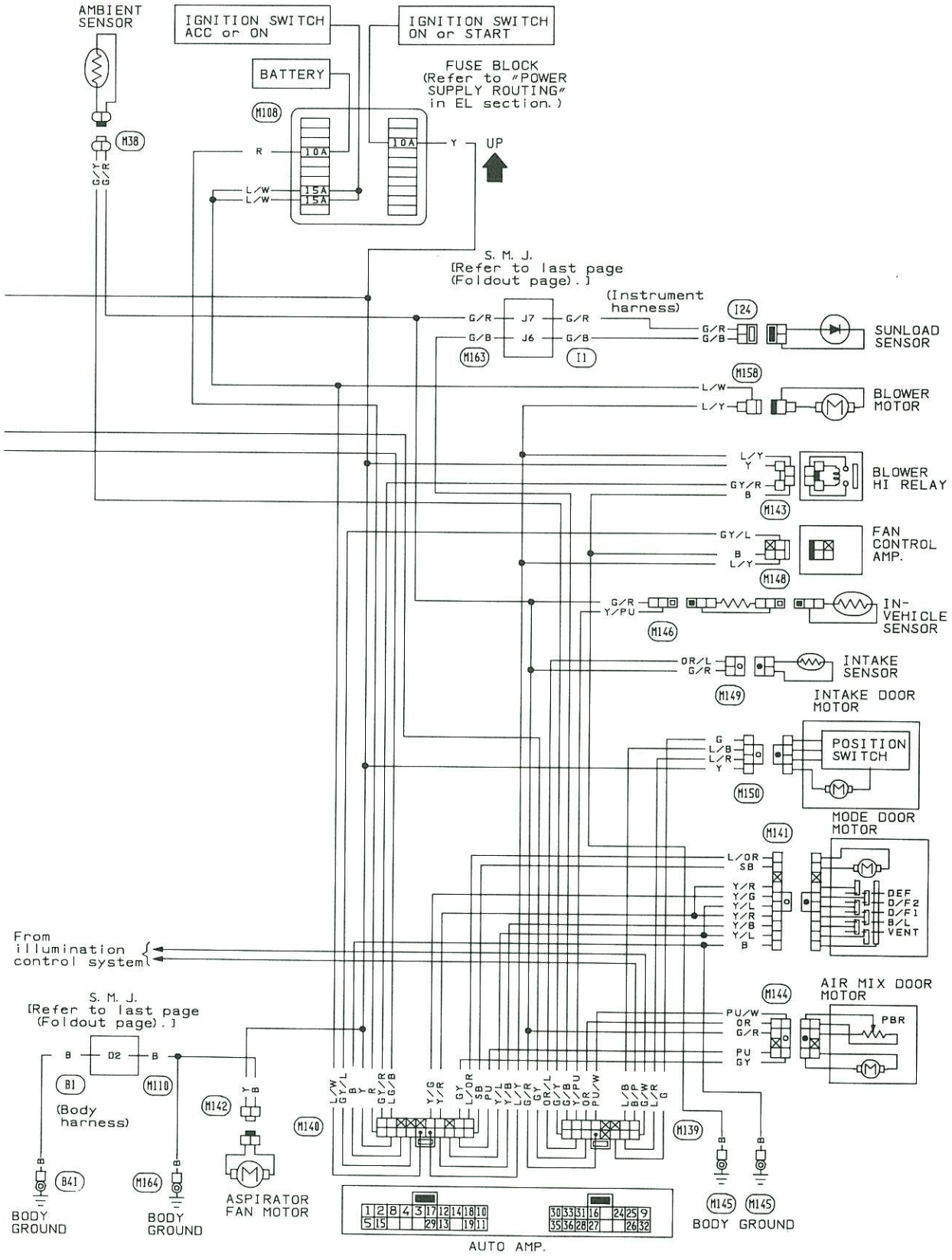
Wiring Diagram



Wiring Diagram (Cont'd)



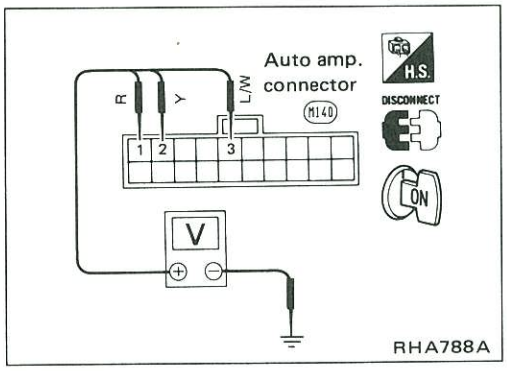
RHA234C

Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR AUTO A/C SYSTEM

Check power supply circuit for auto air conditioning system.

Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.

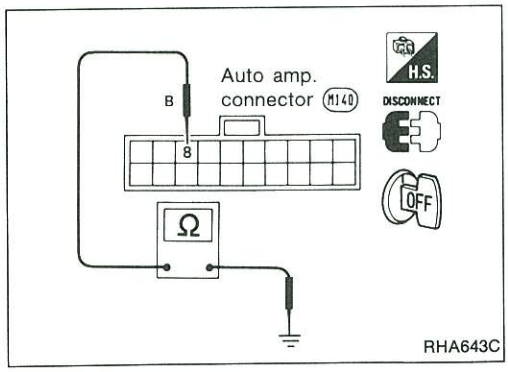


AUTO AMP. CHECK

Check power supply circuit for auto amp. with ignition switch ON.

1. Disconnect auto amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ①, ②, ③ and body ground.

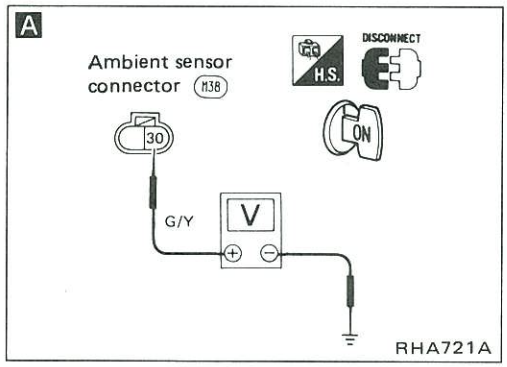
Voltmeter terminal		Voltage
⊕	⊖	
①	Body ground	Approx. 12V
②		
③		

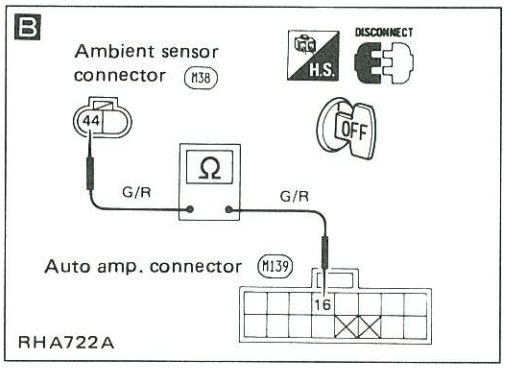


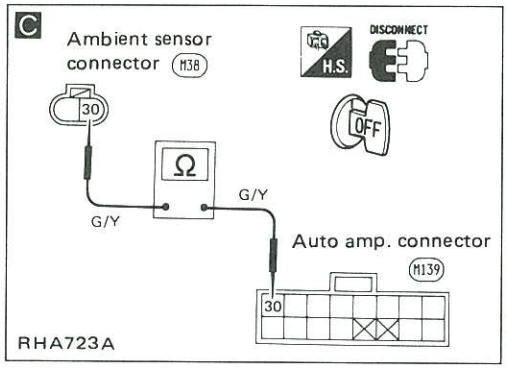
Check body ground circuit for auto amp. with ignition switch OFF.

1. Disconnect auto amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑧ and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
⑧	Body ground	Yes







Diagnostic Procedure 1

SYMPTOM: Ambient sensor circuit is open. (21 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

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 terminal No. (30) and body ground?

N.G. → Disconnect auto amp. harness connector.

C

Note

Check circuit continuity between ambient sensor harness terminal No. (30) and auto amp. harness terminal No. (30).

O.K. → Replace auto amp.

O.K. → Disconnect auto amp. harness connector.

B

Note

Check circuit continuity between ambient sensor harness terminal No. (44) and auto amp. harness terminal No. (16).

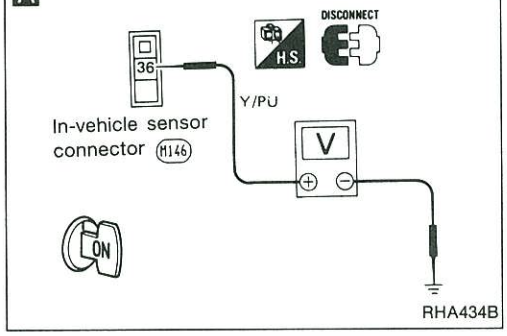
O.K. → CHECK AMBIENT SENSOR. (Refer to Control System Input Components.)

N.G. → Replace ambient sensor.

O.K. → Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A



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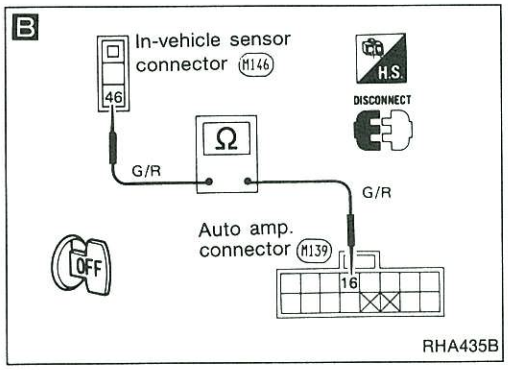

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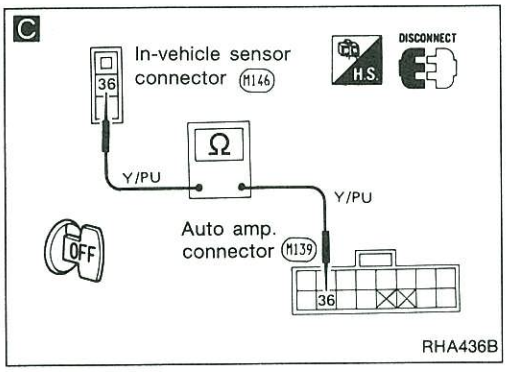


Diagnostic Procedure 2

SYMPTOM: In-vehicle sensor circuit is open. (22 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

A

CHECK IN-VEHICLE SENSOR CIRCUIT BETWEEN IN-VEHICLE SENSOR AND AUTO AMP.
Disconnect in-vehicle sensor harness connector.
Do approx. 5 volts exist between in-vehicle sensor harness terminal No. ㊱ and body ground?

N.G. → Disconnect auto amp. harness connector.

C — Note

Check circuit continuity between in-vehicle sensor harness terminal No. ㊱ and auto amp. harness terminal No. ㊱.

O.K. → Replace auto amp.

O.K. → Disconnect auto amp. harness connector.

B — Note

Check circuit continuity between in-vehicle sensor harness terminal No. ㊻ and auto amp. harness terminal No. ⑯.

O.K. →

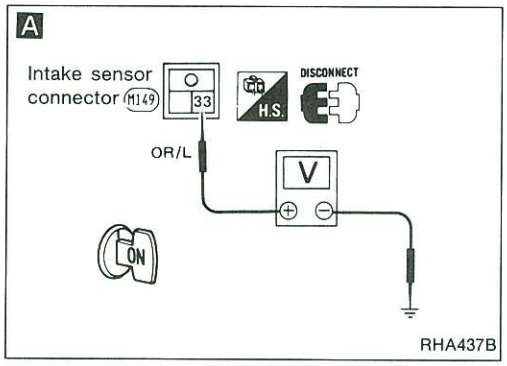
CHECK IN-VEHICLE SENSOR.
(Refer to Control System Input Components.)

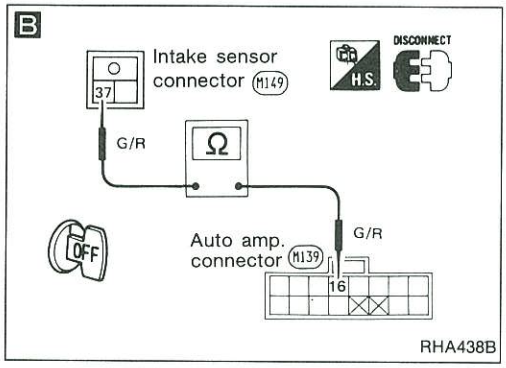
N.G. → Replace in-vehicle sensor.

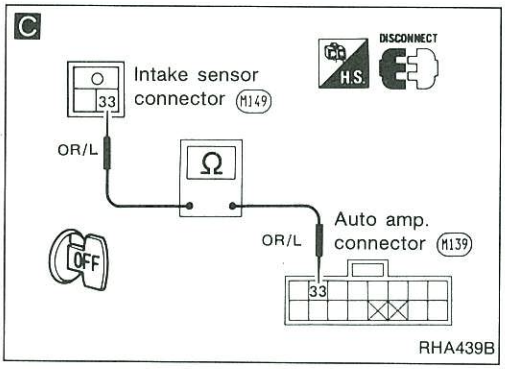
O.K. →

Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.







Diagnostic Procedure 3

SYMPTOM: Intake sensor circuit is open. (24 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

A

CHECK INTAKE SENSOR CIRCUIT BETWEEN INTAKE SENSOR AND AUTO AMP.
Disconnect intake sensor harness connector.
Do approx. 5 volts exist between intake sensor harness terminal No. (33) and body ground?

N.G. → Disconnect auto amp. harness connector.

C

Note

Check circuit continuity between intake sensor harness terminal No. (33) and auto amp. harness terminal No. (33).

O.K. → Replace auto amp.

O.K. → Disconnect auto amp. harness connector.

B

Note

Check circuit continuity between intake sensor harness terminal No. (37) and auto amp. harness terminal No. (16).

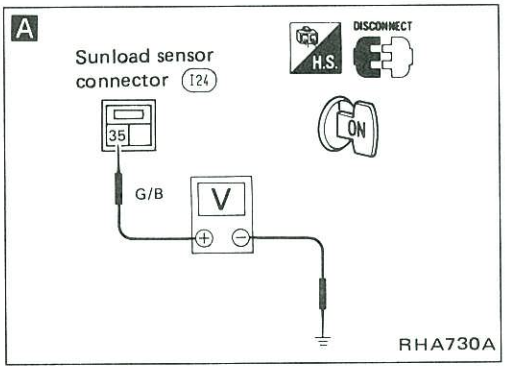
O.K. → CHECK INTAKE SENSOR. (Refer to Control System Input Components.)

N.G. → Replace intake sensor.

O.K. → Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A



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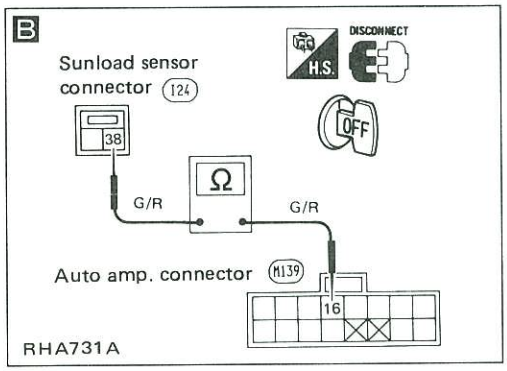

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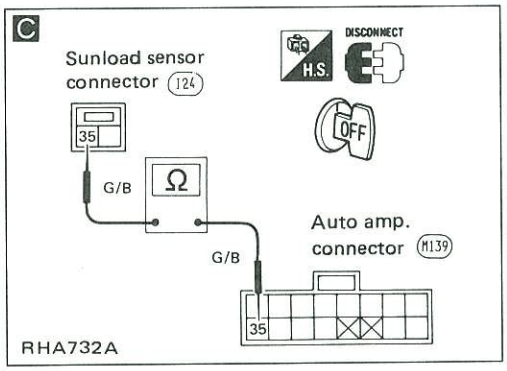


Diagnostic Procedure 4

SYMPTOM: Sunload sensor circuit is open. (25 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

A

CHECK SUNLOAD SENSOR CIRCUIT BETWEEN SUNLOAD SENSOR AND AUTO AMP.
Disconnect sunload sensor harness connector.
Do approx. 5 volts exist between sunload sensor harness terminal No. (35) and body ground?

N.G. → Disconnect auto amp. harness connector.

C Note

Check circuit continuity between sunload sensor harness terminal No. (35) and auto amp. harness terminal No. (35).

O.K. → Replace auto amp.

O.K. → Disconnect auto amp. harness connector.

B Note

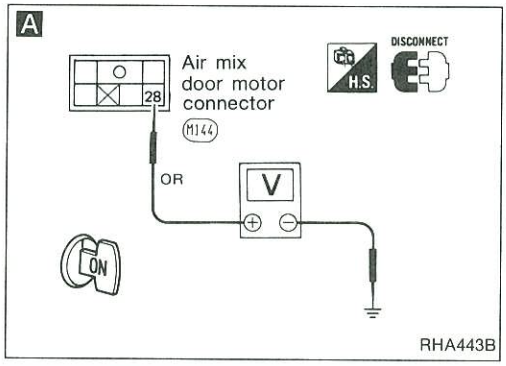
Check circuit continuity between sunload sensor harness terminal No. (38) and auto amp. harness terminal No. (16).

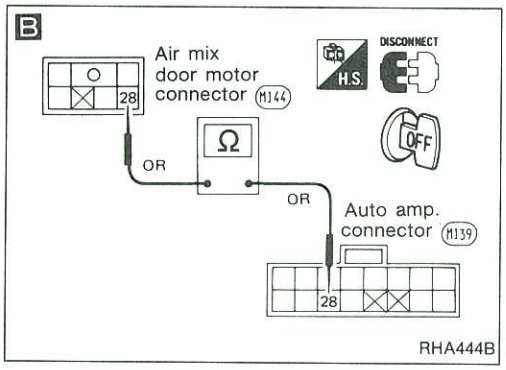
O.K. → CHECK SUNLOAD SENSOR.
(Refer to Control System Input Components.)

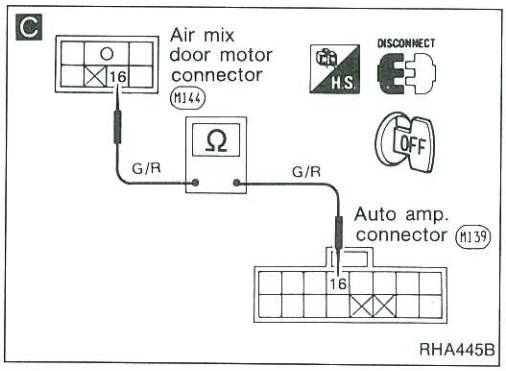
N.G. → Replace sunload sensor.

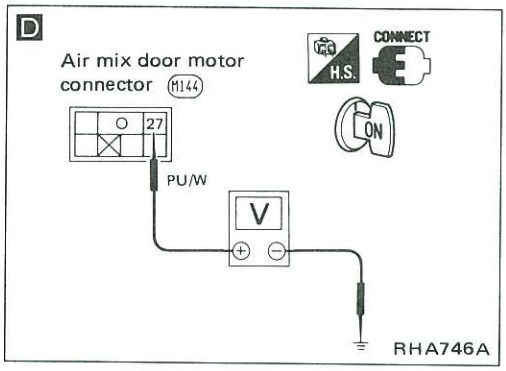
O.K. → Replace auto amp.

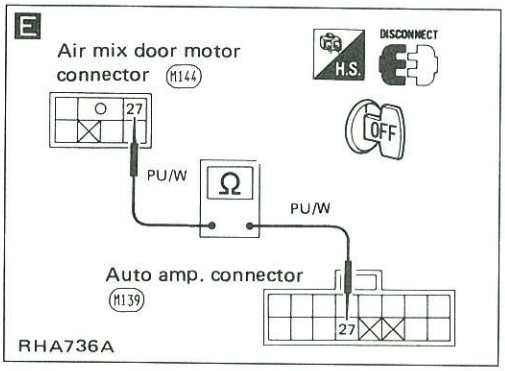
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.











Diagnostic Procedure 5

SYMPTOM: P.B.R. circuit is open. (26 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

A

CHECK P.B.R. CIRCUIT BETWEEN P.B.R. AND AUTO AMP.
Disconnect air mix door motor harness connector.
Do approx. 5 volts exist between air mix door motor harness terminal No. (28) and body ground?

N.G. → Disconnect auto amp. harness connector.

B Note

Check circuit continuity between air mix door motor harness terminal No. (28) and auto amp. harness terminal No. (28).

O.K. → Replace auto amp.

O.K. → Disconnect auto amp. harness connector.

C Note

Check circuit continuity between air mix door motor harness terminal No. (16) and auto amp. harness terminal No. (16).

O.K.

D Note

CHECK P.B.R. CIRCUIT BETWEEN P.B.R. AND AUTO AMP.
Reconnect auto amp. harness connector.
Do approx. 5 volts exist between air mix door motor harness terminal No. (27) and body ground?

N.G. → Disconnect auto amp. harness connector.

E Note

Check circuit continuity between air mix door motor harness terminal No. (27) and auto amp. harness terminal No. (27).

O.K. → Replace auto amp.

O.K.

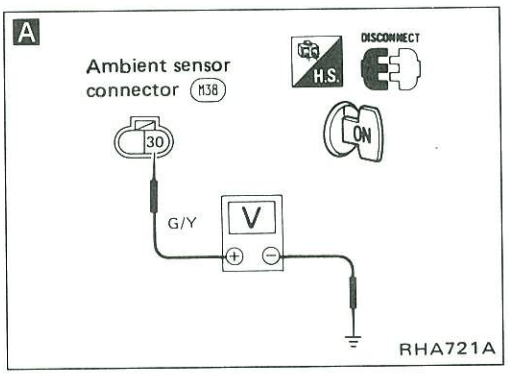
CHECK P.B.R.
(Refer to Control System Output Components.)

N.G. → Replace air mix door motor (P.B.R.).

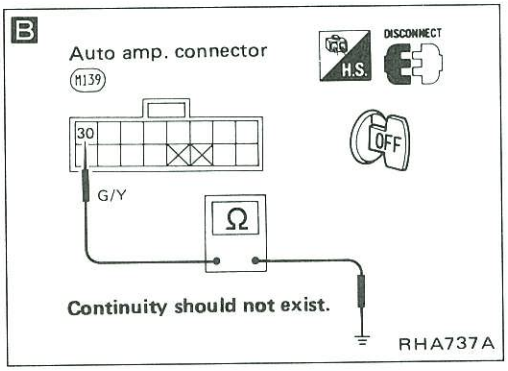
O.K. → Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A



B



Diagnostic Procedure 6

SYMPTOM: Ambient sensor circuit is shorted. (-21 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

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 terminal No. 30 and body ground?

N.G. → Disconnect auto amp. harness connector.

B

Note: Check circuit continuity between auto amp. harness terminal No. 30 and body ground.

O.K. → Replace auto amp.

O.K. →

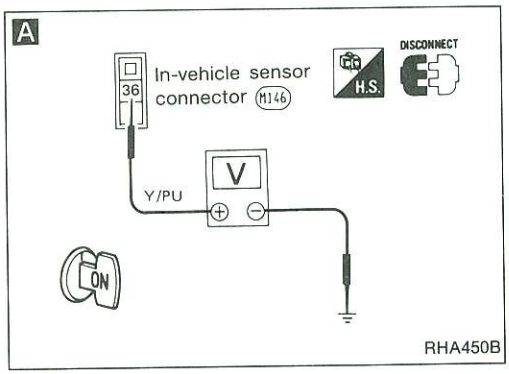
CHECK AMBIENT SENSOR.
(Refer to Control System Input Components.)

N.G. → Replace ambient sensor.

O.K. →

Replace auto amp.

A



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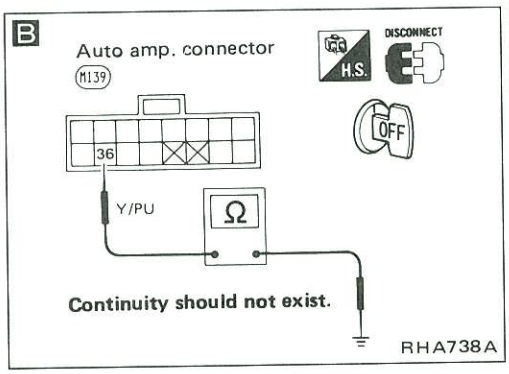


Diagnostic Procedure 7

SYMPTOM: In-vehicle sensor circuit is shorted. (-22 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

A

CHECK IN-VEHICLE SENSOR CIRCUIT BETWEEN IN-VEHICLE SENSOR AND AUTO AMP.
Disconnect in-vehicle sensor harness connector.
Do approx. 5 volts exist between in-vehicle sensor harness terminal No. 36 and body ground?

N.G. → Disconnect auto amp. harness connector.

B

Note: Check circuit continuity between auto amp. harness terminal No. 36 and body ground.

O.K. → Replace auto amp.

O.K. →

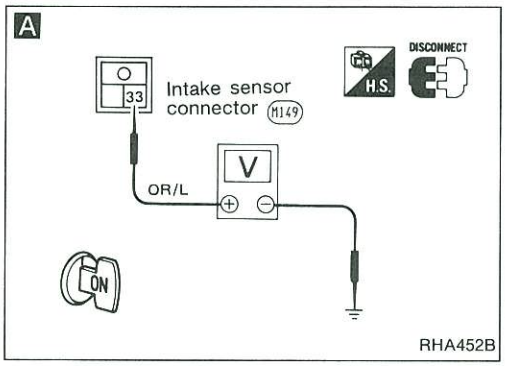
CHECK IN-VEHICLE SENSOR.
(Refer to Control System Input Components.)

N.G. → Replace in-vehicle sensor.

O.K. →

Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector short.



Diagnostic Procedure 8

SYMPTOM: Intake sensor circuit is shorted. (-24 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

A

CHECK INTAKE SENSOR CIRCUIT BETWEEN INTAKE SENSOR AND AUTO AMP.
Disconnect intake sensor harness connector.
Do approx. 5 volts exist between intake sensor harness terminal No. 33 and body ground?

N.G. → Disconnect auto amp. harness connector.

B

Check circuit continuity between auto amp. harness terminal No. 33 and body ground.

Note

O.K. → Replace auto amp.

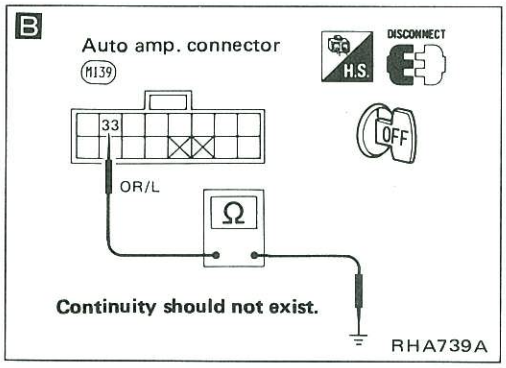
O.K. ↓

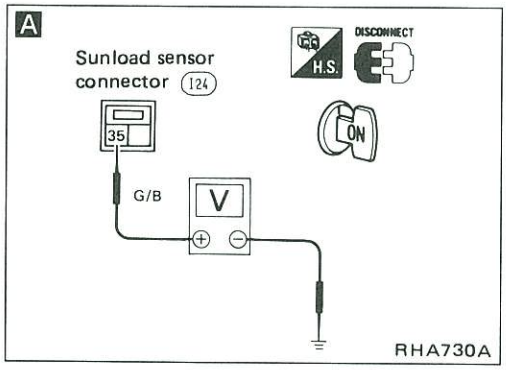
CHECK INTAKE SENSOR.
(Refer to Control System Input Components.)

N.G. → Replace intake sensor.

O.K. ↓

Replace auto amp.





Diagnostic Procedure 9

SYMPTOM: Sunload sensor circuit is shorted. (-25 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

A

CHECK SUNLOAD SENSOR CIRCUIT BETWEEN SUNLOAD SENSOR AND AUTO AMP.
Disconnect sunload sensor harness connector.
Do approx. 5 volts exist between sunload sensor harness terminal No. 35 and body ground?

N.G. → Disconnect auto amp. harness connector.

B

Check circuit continuity between auto amp. harness terminal No. 35 and body ground.

Note

O.K. → Replace auto amp.

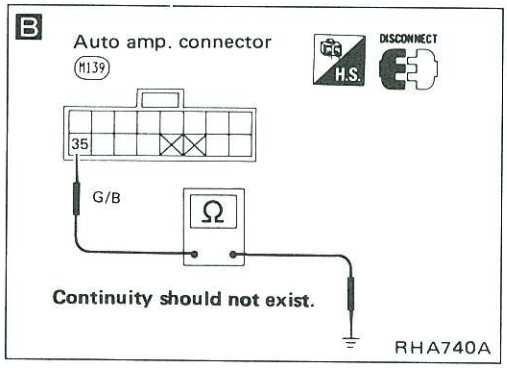
O.K. ↓

CHECK SUNLOAD SENSOR.
(Refer to Control System Input Components.)

N.G. → Replace sunload sensor.

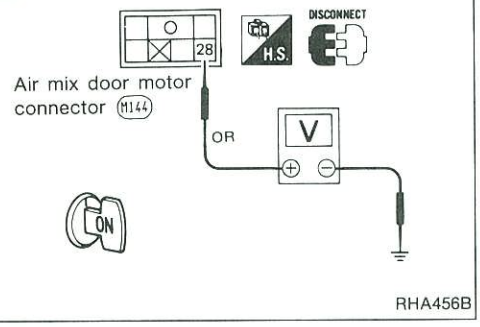
O.K. ↓

Replace auto amp.



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector short.

A



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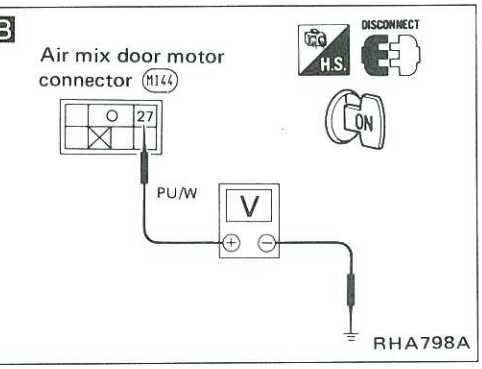

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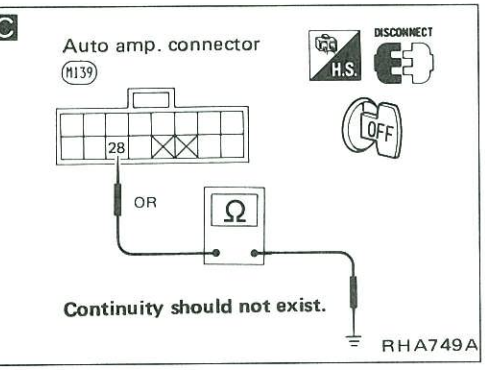

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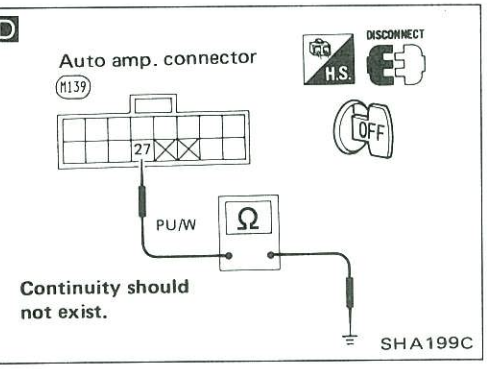


Diagnostic Procedure 10

SYMPTOM: P.B.R. circuit is shorted. (-26 is indicated on auto amp. as a result of conducting Self-diagnosis STEP 2.)

A

CHECK P.B.R. CIRCUIT BETWEEN P.B.R. AND AUTO AMP.
Disconnect air mix door motor harness connector.
Do approx. 5 volts exist between air mix door motor harness terminal No. (28) and body ground?

N.G. → Disconnect auto amp. harness connector.

C Note
Check circuit continuity between auto amp. harness terminal No. (28) and body ground.

O.K. → Replace auto amp.

O.K.

B Note
CHECK P.B.R. CIRCUIT BETWEEN P.B.R. AND AUTO AMP.
Do approx. 5 volts exist between air mix door motor harness terminal No. (27) and body ground?

N.G. → Disconnect auto amp. harness connector.

D Note
Check circuit continuity between auto amp. harness terminal No. (27) and body ground.

O.K. → Replace auto amp.

O.K.

CHECK P.B.R.
(Refer to Control System Output Components.)

O.K. → INSPECTION END

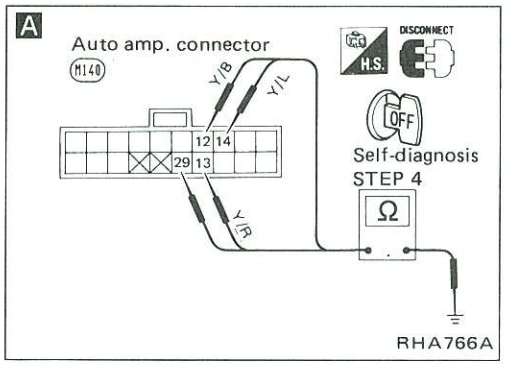
N.G. → Replace air mix door motor.

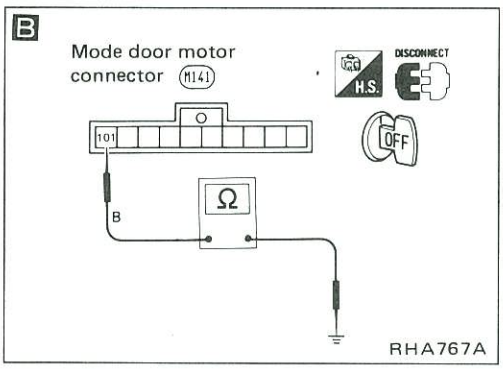
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector short.

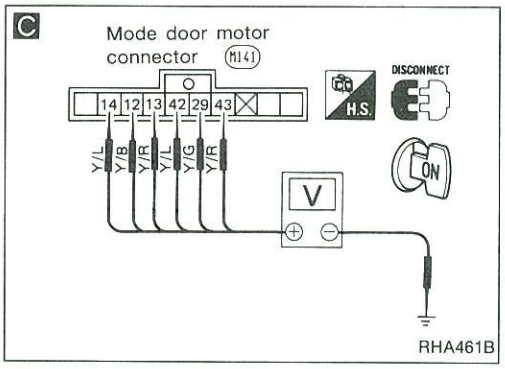
Diagnostic Procedure 11

SYMPTOM: Condenser fan motor does not operate.

- **Refer to HA-78.**







Diagnostic Procedure 12

SYMPTOM: Mode door motor does not operate normally.

- **Perform Self-diagnosis STEPS 1 to 4 before referring to the following flow chart.**

A

CHECK MODE DOOR MOTOR POSITION SWITCH.
1. Set up code No. 41 in Self- diagnosis STEP 4.
2. Disconnect auto amp. harness connector after turning ignition switch OFF.
3. Check if continuity exists between terminal No. (12) or (14) of auto amp. harness connector and body ground.
4. Using above procedure, check for continuity in any other mode, as indicated in chart.

Code No.	Condition	Terminal No. ⊕	Terminal No. ⊖	Continuity
41	VENT	(12) or (14)	Body ground	Yes
42 or 43	B/L	(12) or (13)		
44	F/D 1	(13) or (14)		
45	F/D 2	(14) or (29)		
46	DEF	(13) or (29)		

N.G. → Disconnect mode door motor harness connector.

O.K. → INSPECTED END

B

Note

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness terminal No. (101) and body ground?

O.K. → Reconnect auto amp. harness connector.

C

CHECK POWER SUPPLY FOR MODE DOOR MOTOR CONTROL CIRCUIT.
Do approx. 5 volts exist between mode door motor harness terminals and body ground?

Terminal No. ⊕	Terminal No. ⊖	Voltage
(14)	Body ground	Approx. 5V
(12)		
(13)		
(42)		
(29)		
(43)		

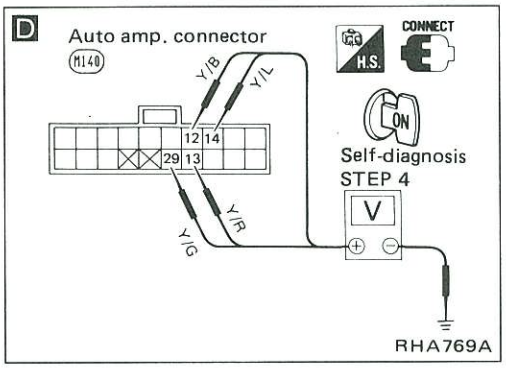
O.K. → Reconnect mode door motor harness connector. → Ⓐ

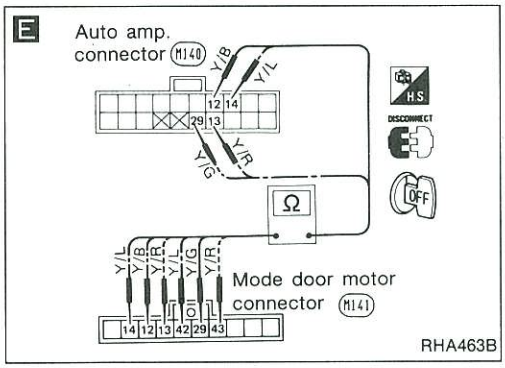
N.G. → Ⓑ

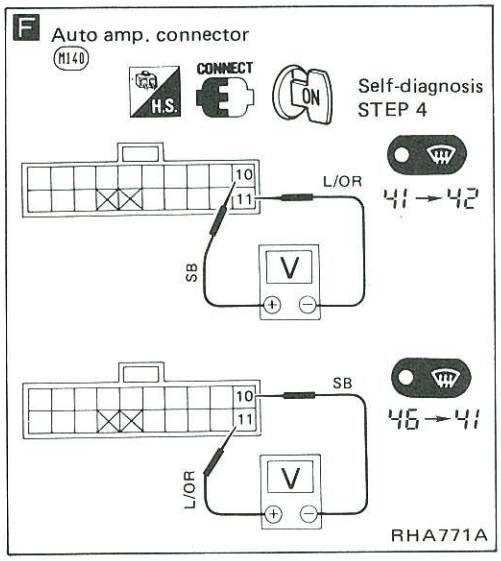
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 12 (Cont'd)







Ⓐ

D CHECK MODE DOOR MOTOR POSITION SWITCH.

Set up Self-diagnosis STEP 4.

Measure voltage across auto amp. harness terminals and body ground.

Code No.	Condition	Terminal No. ⊕ ⑭	⑫	⑬	㉙	Terminal No. ⊖
41	VENT	0V	0V	5V	5V	Body ground
42 or 43	B/L	5V	0V	0V	5V	
44	D/F 1	0V	5V	0V	5V	
45	D/F 2	0V	5V	5V	0V	
46	DEF	5V	5V	0V	0V	

0V: Approx. 0V
5V: Approx. 5V

O.K. ↓

N.G. → Replace mode door motor.

Ⓑ

E Check circuit continuity between each terminal on auto amp. and on mode door motor.

Note

Terminal No. ⊕	Terminal No. ⊖	Continuity
Auto amp.	Mode door motor	Yes
㉙	㉙	
⑬	⑬ or (43)	
⑫	⑫	
⑭	⑭ or (42)	

O.K. ↓

Replace auto amp.

F CHECK FOR OUTPUT OF AUTO AMP.

Do approx. 10.5 volts exist between auto amp. harness terminals No. ⑩ and ⑪ when code No. is switched from "41" to "42" or when code No. is switched from "46" to "41"?

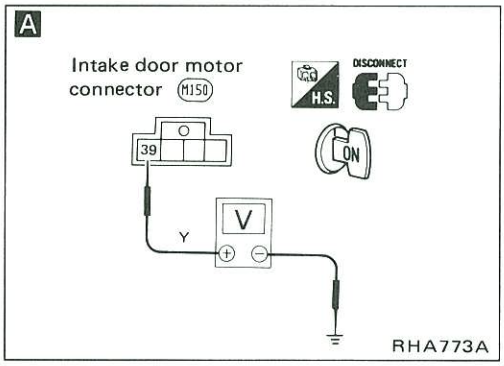
N.G. → Replace auto amp.

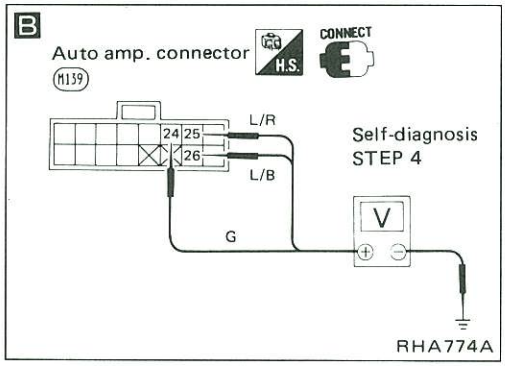
Code No.	Mode door motor operation	Terminal No. ⑩	⑪	Voltage V
41 → 42	VENT → B/L	⊕	⊖	Approx. 10.5
46 → 41	DEF → VENT	⊖	⊕	
–	Stop	⊖	⊖	0

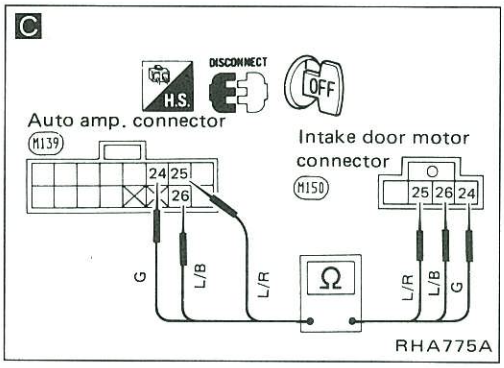
O.K. ↓

Replace mode door motor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.







Diagnostic Procedure 13

SYMPTOM: Intake door motor does not operate normally.

- **Perform Self-diagnosis STEPS 1, 2 and 4 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. (39) and body ground?

N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓

Reconnect intake door motor harness connector.

O.K. ↓

B

CHECK FOR OUTPUT OF AUTO AMP.
Set up Self-diagnosis STEP 4.
Measure voltage across auto amp. harness terminals and body ground.

Code No.	Terminal No. ⊕	Terminal No. ⊖	Condition	Voltage V
41, 42	24	Body ground	REC	0
Other				12
43	25		20% FRE	0
Other				12
44, 45, 46	26		FRE	0
Other				12

0V: Approx. 0V
12V: Approx. 12V

N.G. → Disconnect auto amp. and intake door motor harness connectors.

C

Note

Check circuit continuity between each terminal on auto amp. and on intake door motor.

Terminal No. Auto amp.	Terminal No. Intake door motor	Continuity
⊕	⊖	
24	24	Yes
25	25	
26	26	

O.K. ↓

Ⓐ

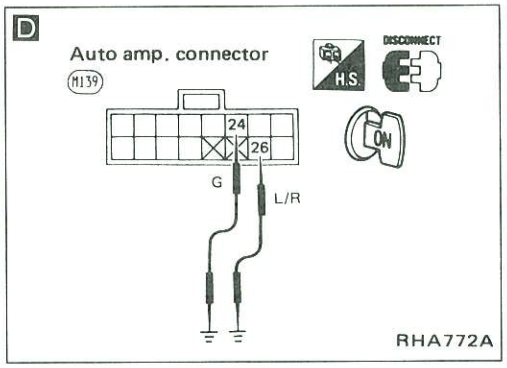
(Go to next page.)

O.K. ↓

INSPECTION END

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 13 (Cont'd)



Ⓐ

Reconnect intake door motor harness connector.

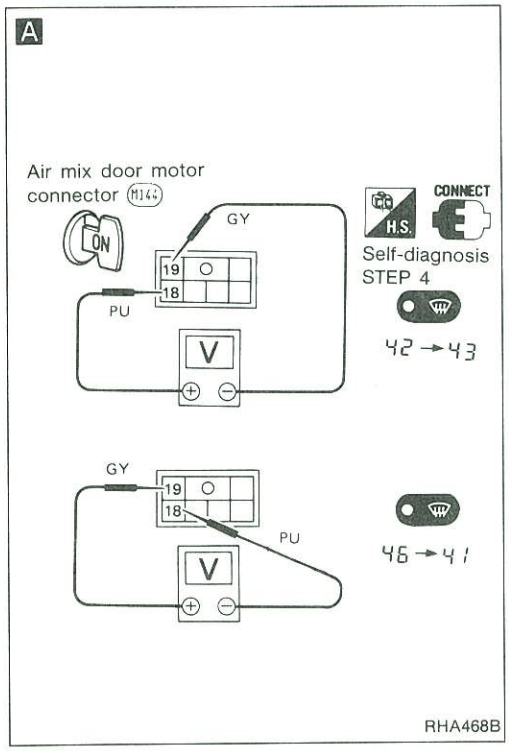
D

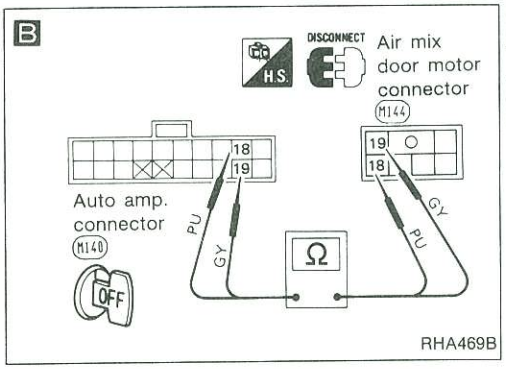
CHECK INTAKE DOOR MOTOR.
Does intake door move to "REC" position after connecting auto amp. harness terminal No. ㉔ and body ground with a jumper cable?
Then, does intake door move to "FRE" position after connecting auto amp. harness terminal No. ㉖ and body ground with a jumper cable?

N.G. → Replace intake door motor.

O.K. ↓

Replace auto amp.





Diagnostic Procedure 14

SYMPTOM: Air mix door motor does not operate normally.

- **Perform Self-diagnosis STEPS 1, 2 and 4 before referring to the following flow chart.**

IS P.B.R. OPERATING NORMALLY?
Refer to Self-diagnoses STEP 2.

N.G. → CHECK P.B.R. CIRCUIT.
Go to **Diagnostic Procedure 5 or 10.**

O.K. ↓

A

CHECK FOR OUTPUT OF AUTO AMP.
Set up Self-diagnosis STEP 4.
Do approx. 10.5 volt exist between air mix door motor harness terminals No. ⑱ and ⑲ when code No. is switched from "42" to "43" or when code No. is switched from "46" to "41"?

N.G. → Disconnect auto amp. and air mix door motor harness connectors.

Code No.	Air mix door operation	Terminal No. ⑱	Terminal No. ⑲	Voltage V
42 → 43	Cold → Hot	⊕	⊖	Approx. 10.5
46 → 41	Hot → Cold	⊖	⊕	
–	Stop	⊖	⊖	0

O.K. ↓

Replace air mix door motor.

B

Note

Check circuit continuity between auto amp. harness terminal No. ⑱ (⑲) and air mix door motor harness terminal No. ⑱ (⑲).

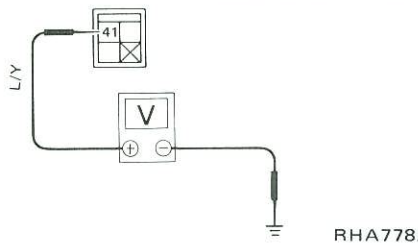
O.K. ↓

Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

A

Fan control amp. connector M148



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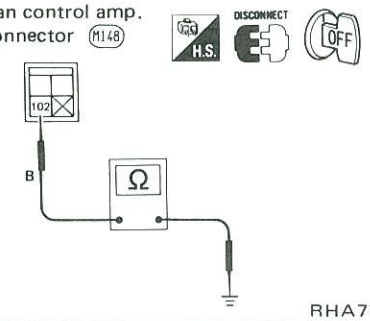
B

Fan control amp. connector M148



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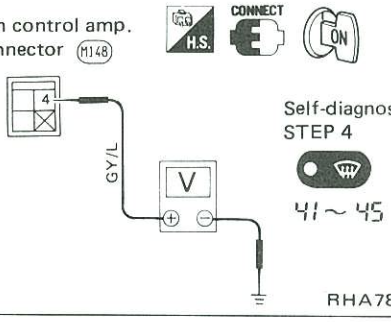
C

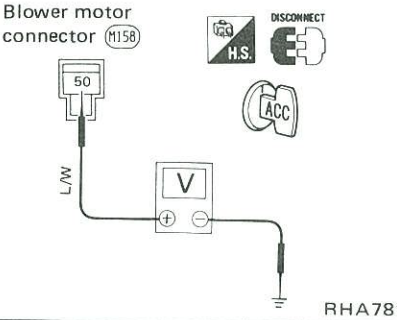
Fan control amp. connector M148



RHA780A

D

Blower motor connector M158



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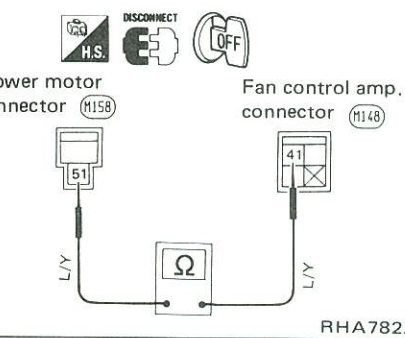
E



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Diagnostic Procedure 15

SYMPTOM: Blower motor operation is malfunctioning under out of Starting Fan Speed Control.

- **Perform Preliminary Check 5 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR FAN CONTROL AMP.
Disconnect fan control amp. harness connector.
Do approx. 12 volts exist between fan control amp. harness terminal No. (41) 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 terminal No. (102) and body ground?

O.K. ↓

Reconnect fan control amp. harness connector.

C

CHECK FOR OUTPUT OF AUTO AMP.
Set up Self-diagnosis STEP 4.
Measure voltage across fan control amp. harness terminal No. (4) and body ground.

Code No.	Terminal No. ⊕	Terminal No. ⊖	Voltage
41 - 45	(4)	Body ground	Approx. 1 - 3V

N.G. → (A) (Go to next page.)

O.K. ↓

Replace fan control amp.

D

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
Do approx. 12 volts exist between blower motor harness terminal No. (50) and body ground?

O.K. ↓ E

N.G. → Check 15A fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

E

Note

Check circuit continuity between blower motor harness terminal No. (51) and fan control amp. harness terminal No. (41).

O.K. ↓

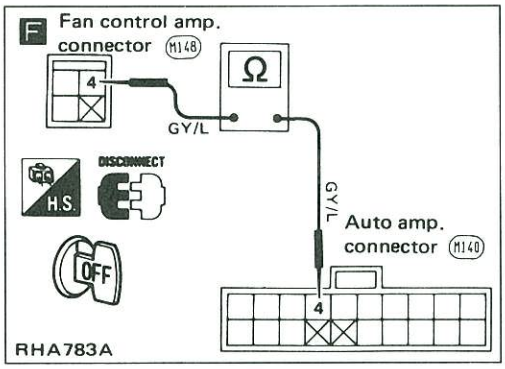
CHECK BLOWER MOTOR.
(Refer to Electrical Components Inspection.)

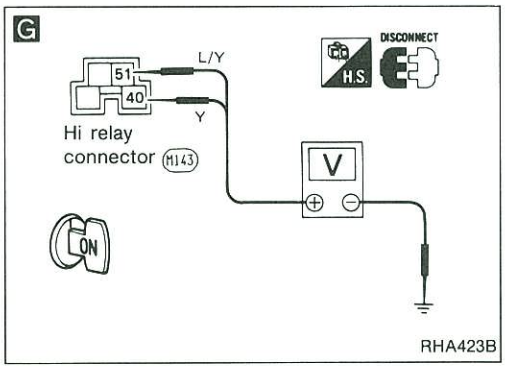
N.G. ↓

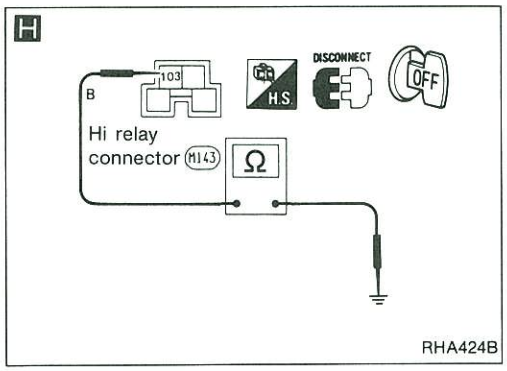
Replace blower motor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 15 (Cont'd)







Ⓐ

Disconnect auto amp. and fan control amp. harness connector.

F — Note

Does continuity exist between auto amp. harness terminal No. ④ and fan control amp. harness terminal No. ④?

O.K.

G

CHECK POWER SUPPLY FOR HI RELAY.
Do approx. 12 volts exist between Hi relay harness terminals No. ㊵, ㊶ and body ground?

N.G. → Check 10A or 15A fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K.

H — Note

CHECK BODY GROUND CIRCUIT FOR HI RELAY.
Does continuity exist between Hi relay harness terminal No. ⑩③ and body ground?

O.K.

CHECK HI RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace Hi relay.

O.K.

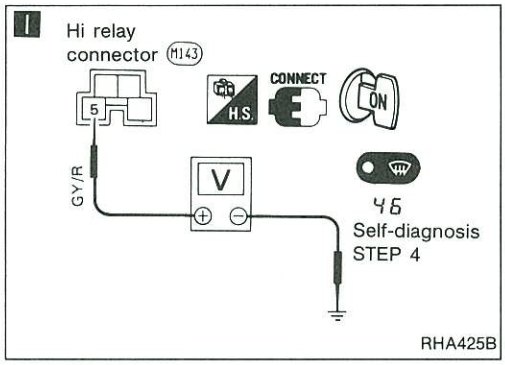
Reconnect Hi relay.

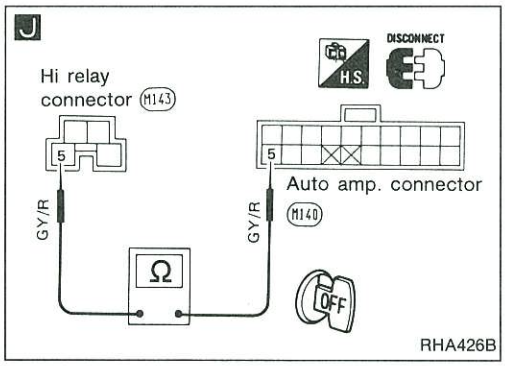
Ⓑ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 15 (Cont'd)





Ⓑ

I

CHECK FOR OUTLET OF AUTO AMP.
Set up Self-diagnosis STEP 4.
Measure voltage across Hi relay harness terminal No. ⑤ and body ground.

Code No.	Terminal No. ⊕	Terminal No. ⊖	Voltage
46	⑤	Body ground	Less than approx. 1.5V

N.G. → Disconnect Hi relay and auto amp. harness connectors.

J Note

Does continuity exist between Hi relay harness terminal No. ⑤ and auto amp. harness terminal No. ⑤?

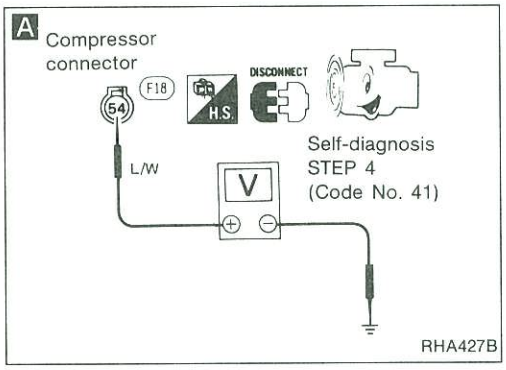
O.K. → Replace auto amp.

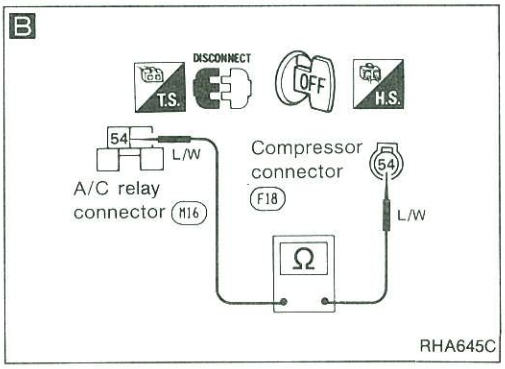
O.K. → Replace blower motor.

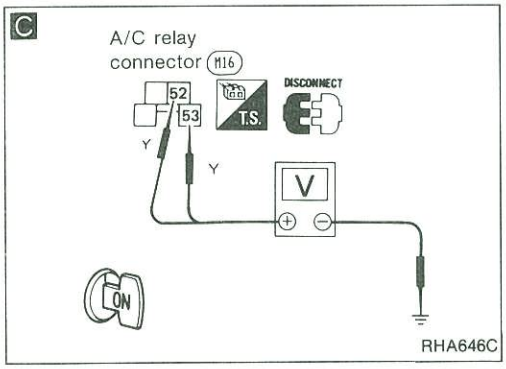
Diagnostic Procedure 16

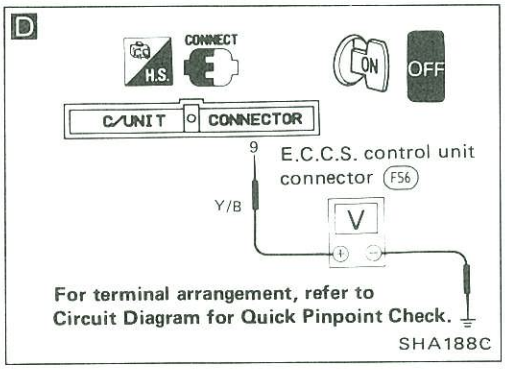
SYMPTOM: Magnet clutch does not engage after performing Preliminary Check 6.

- **Perform Preliminary Check 6 before referring to the flow chart.**









A

CHECK POWER SUPPLY FOR COMPRESSOR.
1. Disconnect compressor harness connector.
2. Set up code No. 41 in Self-diagnosis STEP 4.
3. Do approx. 12 volts exist between compressor harness terminal No. (54) and body ground?

N.G. → Disconnect A/C relay harness connector.

O.K. ↓

Check magnet clutch.

N.G. ↓

Replace magnet clutch.
Refer to COMPRESSOR — Model DKS-16H (ZEXEL make).

B

Check circuit continuity between A/C relay harness terminal No. (54) and compressor harness terminal No. (54).

Note

O.K. ↓

Turn ignition switch OFF to cancel Self-diagnosis STEP 4.

C

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminal No. (52), (53) and body ground?

N.G. → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK.
(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.

Turn ignition switch ON and press OFF switch.

D

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between E.C.C.S. control unit harness terminal No. (9) and body ground?

O.K. → (A)

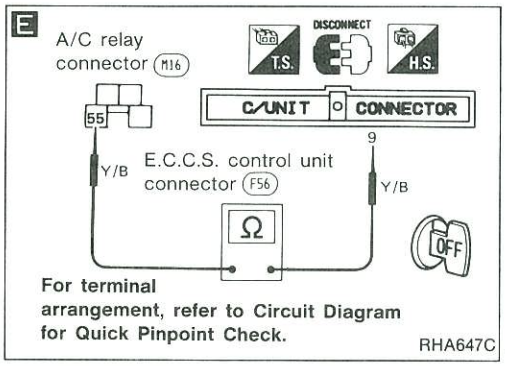
N.G. → (B)

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 16 (Cont'd)

E



For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.

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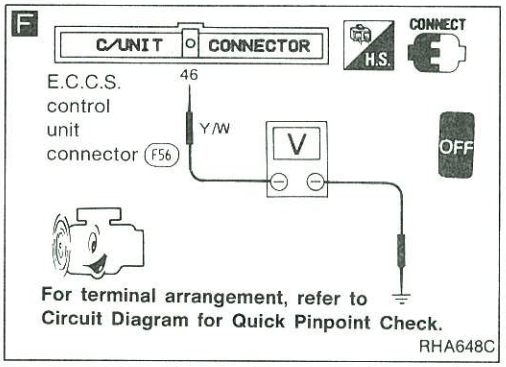
F



For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.

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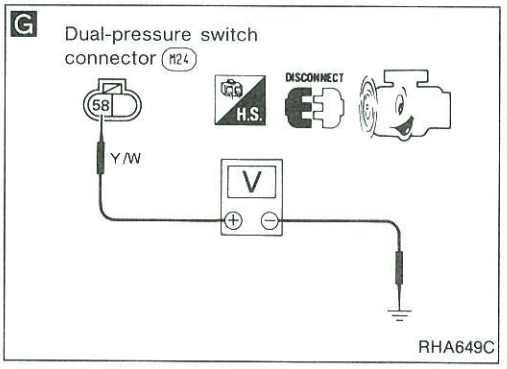
G



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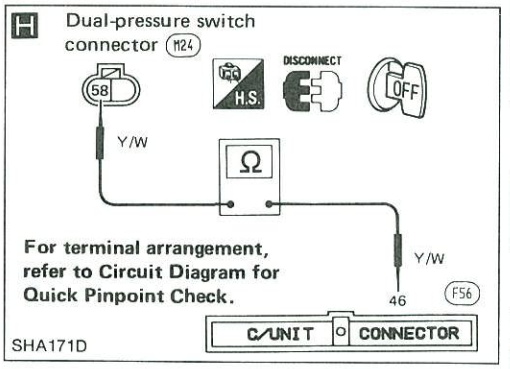
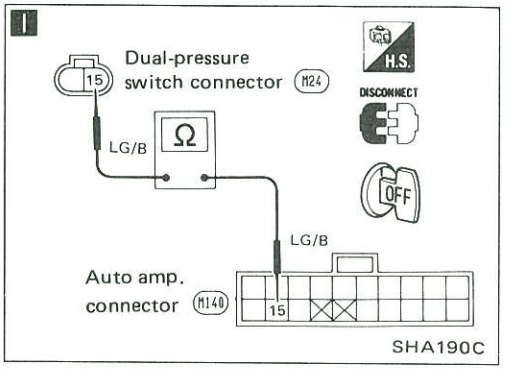
H



For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.

SHA171D

I



SHA190C

Ⓐ

F

CHECK COIL SIDE CIRCUIT OF A/C RELAY CONTROLLED BY E.C.C.S. CONTROL UNIT.
Do more than 8 volts exist between E.C.C.S. control unit harness terminal No. 46 and body ground?

N.G. → CHECK E.C.C.S. CONTROL UNIT. (Refer to EF & EC section.)

O.K. ↓

G

CHECK DUAL-PRESSURE SWITCH CIRCUIT BETWEEN DUAL-PRESSURE SWITCH AND E.C.C.S. CONTROL UNIT.
Disconnect dual-pressure switch harness connector.
Do more than 8 volts exist between dual-pressure switch harness terminal No. 58 and body ground?

N.G. → Disconnect E.C.C.S. control unit harness connector.

Disconnect E.C.C.S. control unit harness connector. ↓

H Note

Check circuit continuity between E.C.C.S. control unit harness terminal No. 46 and dual- pressure switch harness terminal No. 58.

O.K. ↓

CHECK DUAL-PRESSURE SWITCH. (Refer to Electrical Components inspection.)

N.G. → Replace dual-pressure switch.

O.K. ↓

Disconnect auto amp. harness connector. ↓

I Note

Check circuit continuity between auto amp. harness terminal No. 15 and dual-pressure switch harness terminal No. 15.

O.K. → Replace auto amp.

Ⓑ

E Note

Check circuit continuity between A/C relay harness terminal No. 55 and E.C.C.S. control unit harness terminal No. 9.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 17

SYMPTOM: Self-diagnosis cannot be performed.

CHECK MAIN POWER SUPPLY AND GROUND CIRCUIT FOR AUTO AMP. (Refer to page HA-110.)

N.G. → Repair Main Power Supply and Ground Circuit.

O.K. ↓

Replace auto amp.

Electrical Components Inspection

BLOWER MOTOR

- Refer to page HA-80.

HI RELAY

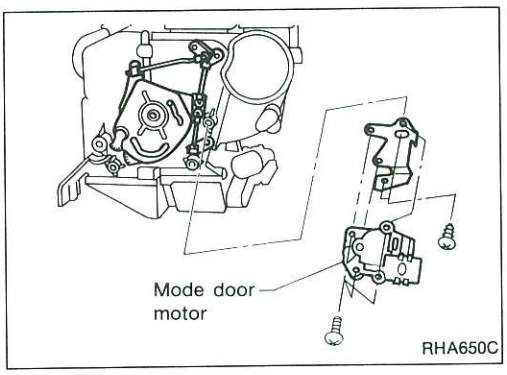
- Inspection method is the same as that of A/C relay. Refer to page HA-80.

A/C RELAY AND CONDENSER FAN RELAY

- Refer to page HA-80.

DUAL-PRESSURE SWITCH

- Refer to page HA-81.



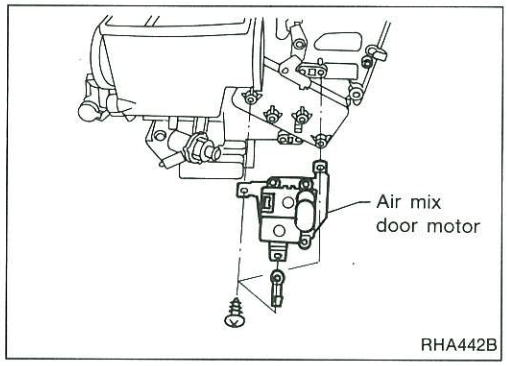
Control Linkage Adjustment

MODE DOOR

1. Install mode door motor on heater unit and connect it to body harness.
2. Set up code No. 41 in Self-diagnosis STEP 4.
3. Move side link by hand and hold mode door in VENT mode.
4. Attach mode door motor rod to side link rod holder.
5. Check mode door operates properly when changing code No. 41 to 46 by pushing (DEF) switch.

41	42	43	44	45	46
VENT	B/L	B/L	D/F1	D/F2	DEF

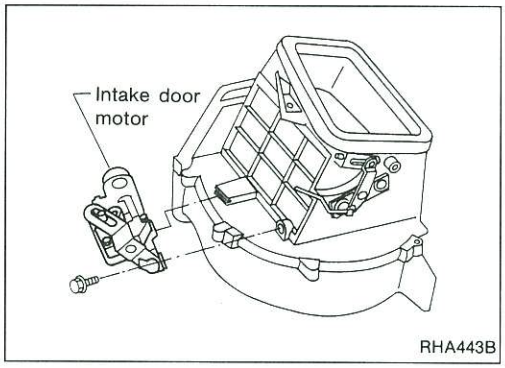
Control Linkage Adjustment (Cont'd)



AIR MIX DOOR

1. Install air mix door motor on heater unit and connect it to body harness.
2. Set up code No. 41 in Self-diagnosis STEP 4.
3. Move air mix door lever by hand and hold it at full cold position.
4. Attach air mix door lever to rod holder.
5. Check air mix door operates properly when changing code No. 41 to 46 by pushing (DEF) switch.

41	42	43	44	45	46
Full Cold		Full Hot			

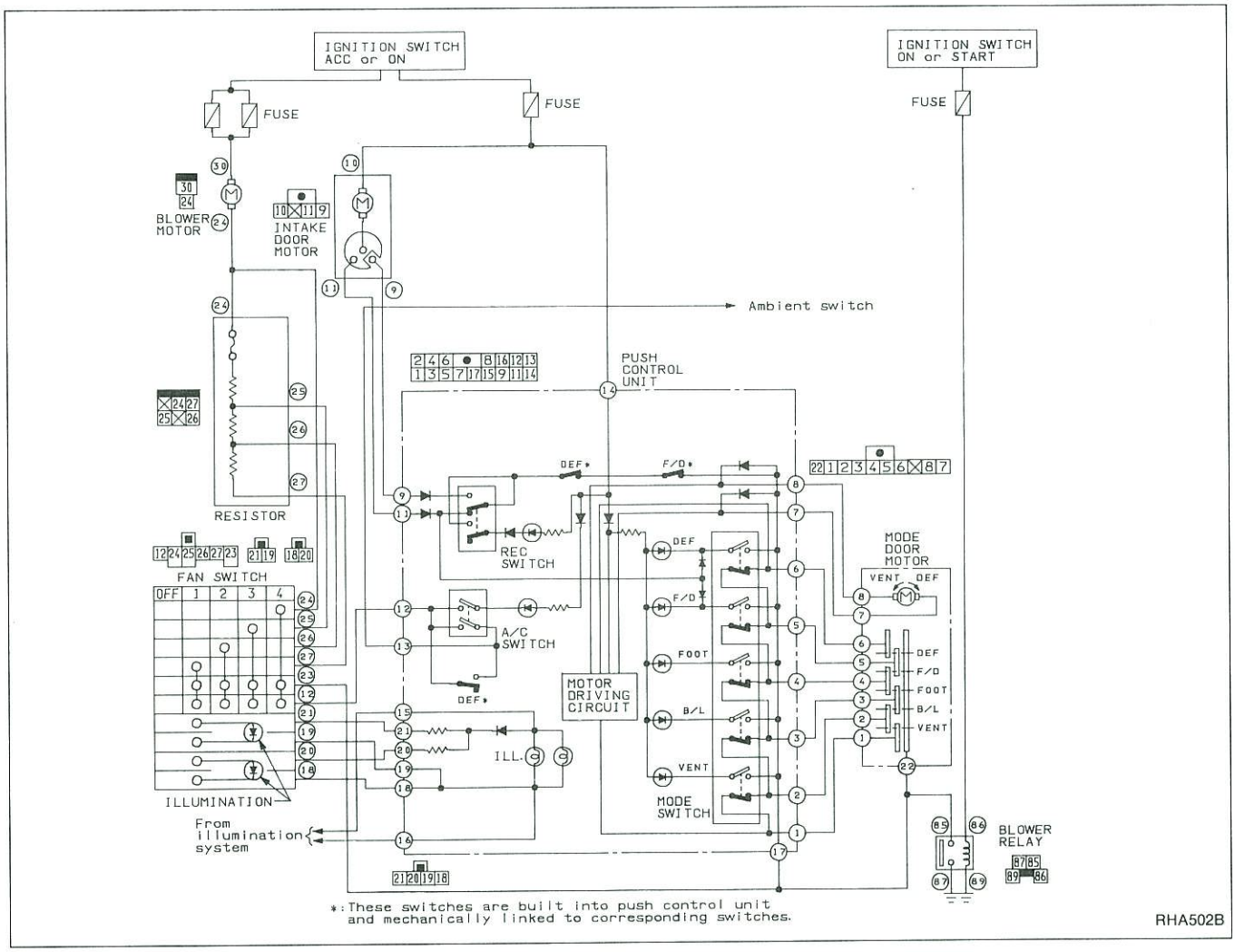


INTAKE DOOR

1. Install intake door motor on intake unit and connect it to body harness.
2. Set up code No. 41 in Self-diagnosis STEP 4.
3. Move intake door link by hand and hold it at REC position.
4. Attach intake door lever to rod holder.
5. Check intake door operates properly when changing code No. 41 to 46 by pushing (DEF) switch.

41	42	43	44	45	46
REC		20% FRE	FRE		

Push Control System



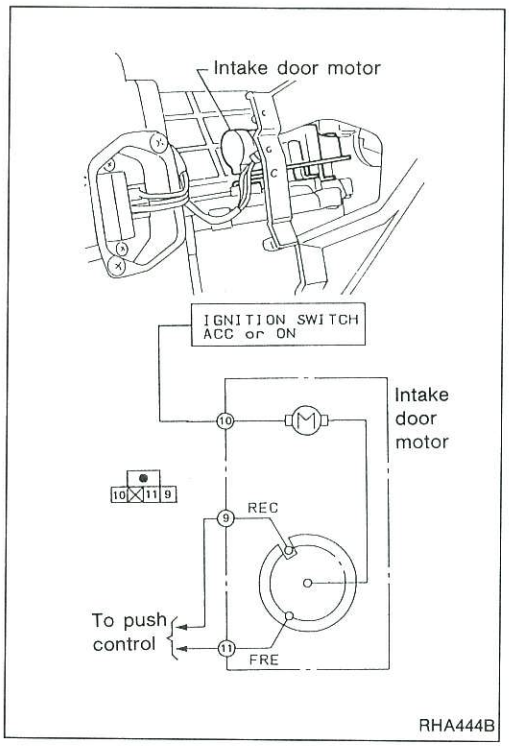
This push control system operates the intake and mode door motors to activate their corresponding doors.

SWITCHES AND THEIR CONTROL FUNCTIONS

Switch		Indicator illuminates: A/C							Air outlet	Intake air	Compressor
A/C		○									ON*1
Mode			○						VENT		
				○					B/L		
					○				FOOT		
						○			F/D	FRE	
							○		DEF	FRE	ON*1
								○*2		REC*2	

*1: Compressor operation depends on ambient temperature.

*2: Depending on mode switch position

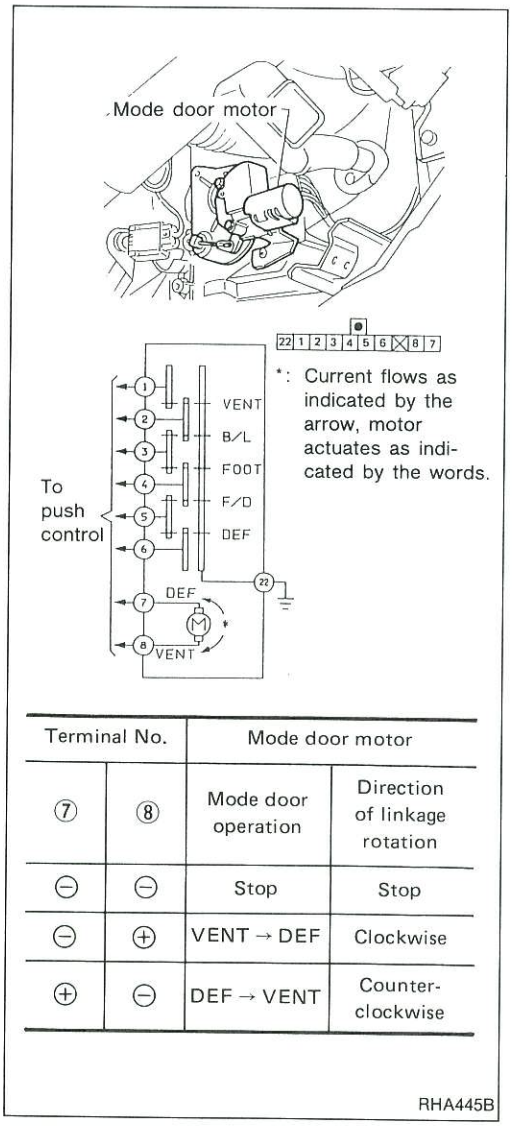


RHA444B

Intake Door Motor

The intake door motor is installed on the front 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 ⑪ to ⑨ (⑨ to ⑪). This causes the motor to start because the position switch contacts built into it are set to the current flow position. The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop. The motor always turns in the same direction.



Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Clockwise
⊕	⊖	DEF → VENT	Counter-clockwise

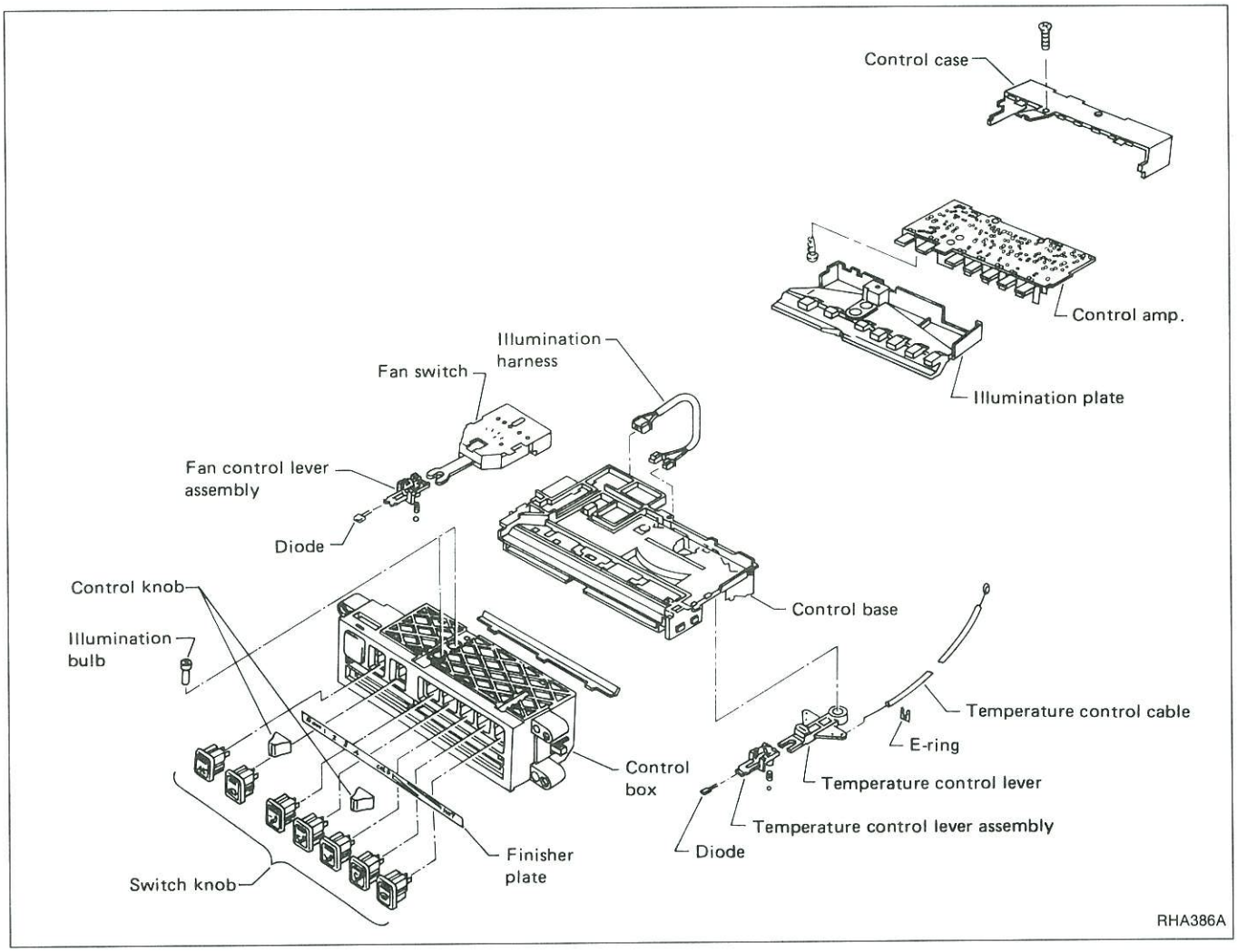
RHA445B

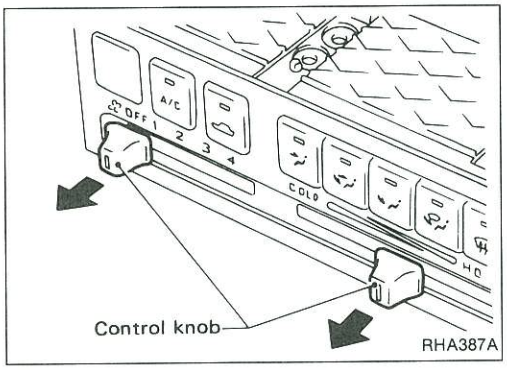
Mode Door Motor

The mode door motor is located on the left side of the heater unit. Through the side link it opens and closes the vent, foot and defroster door.

When one mode switch is pushed, the position switch built into it reads the corresponding mode to determine the direction of the motor rotation. As soon as the desired mode is set, the position switch stops the motor.

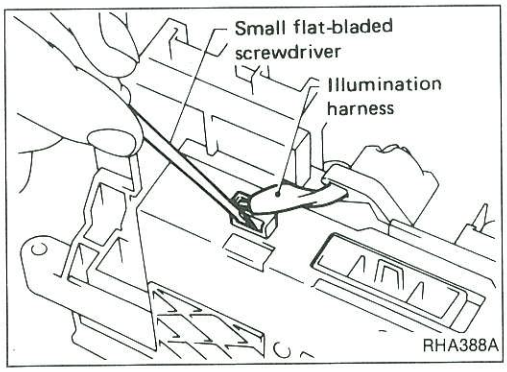
Overhaul — Push control unit assembly





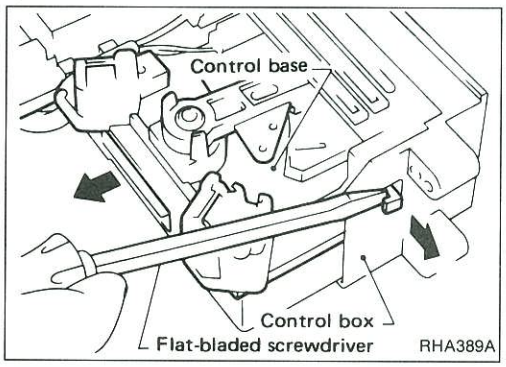
1. Remove control knobs.

Wrap knobs with a cloth and withdraw in direction indicated by arrow as shown in figure at left. Be careful not to scratch knobs during removal.



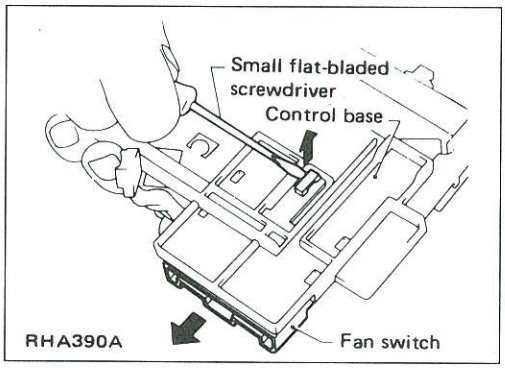
2. Disconnect illumination harness connectors.

Overhaul — Push control unit assembly (Cont'd)



3. Remove control base.

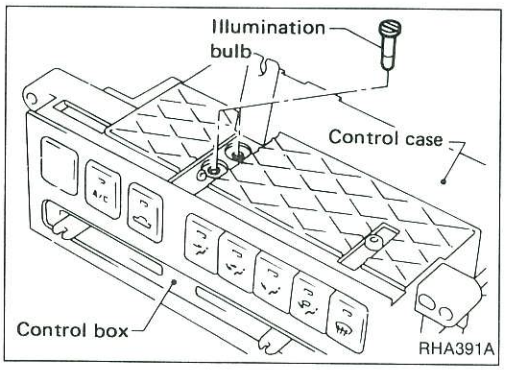
Undo hook at each end of control box and remove control base from control box by moving it in direction indicated by arrow.



4. Remove fan switch.

5. Remove switch knobs.

Wrap finisher with a cloth and remove knobs using pliers or similar tool. Be careful not to scratch finisher's surface.



6. Remove illumination bulb.
7. Remove control case.
8. Remove illumination plate.

Be careful not to scratch control amp. when removing illumination plate.

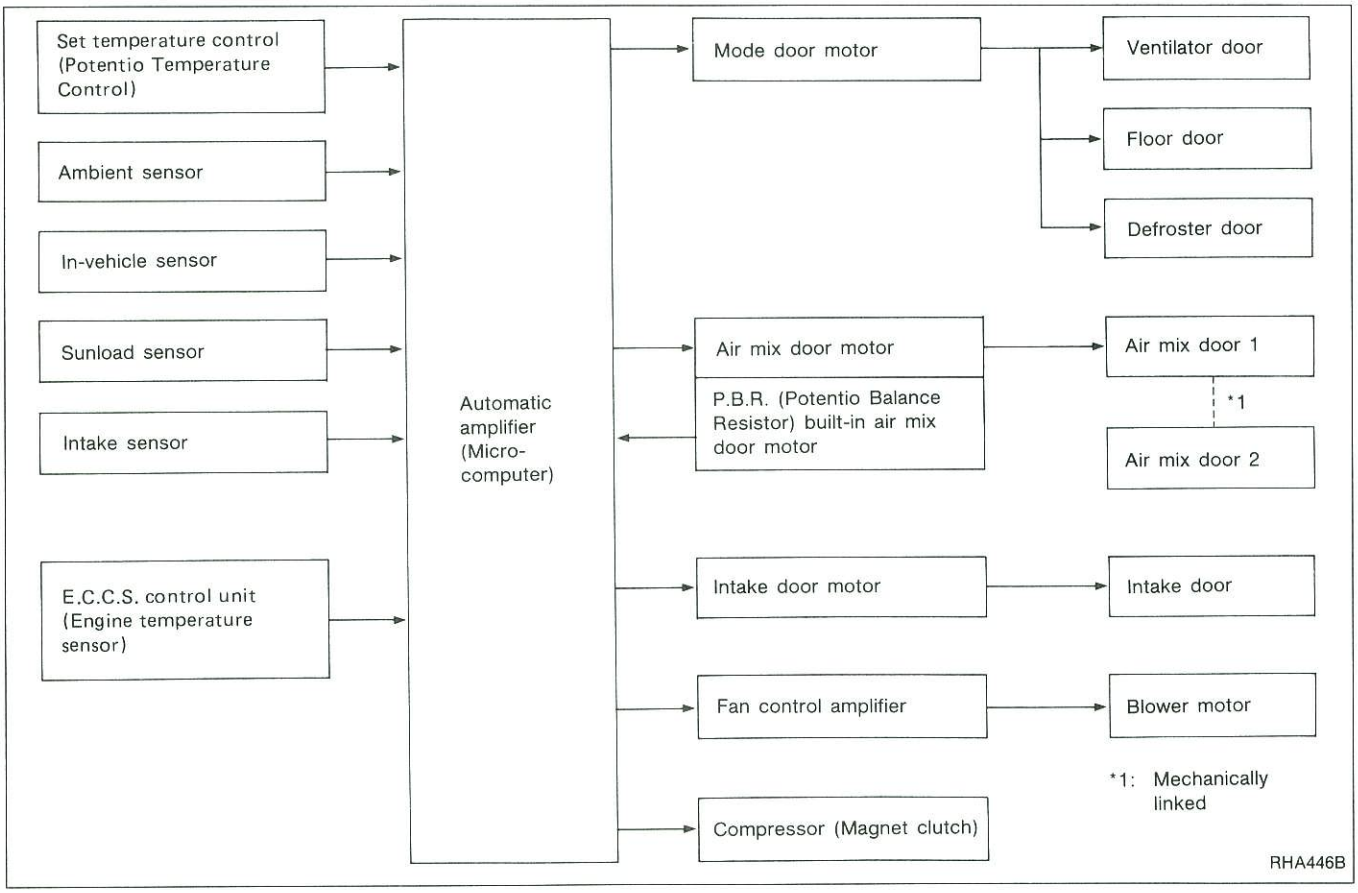
9. Remove finisher plate.
10. Remove control amp.

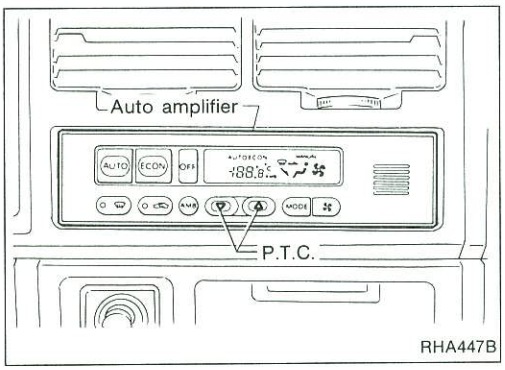
Be careful not to damage substrate when removing.

11. Disconnect temperature control cable.
12. Installation is in reverse order of removal.

Overview of Control System

The control system consists of a) input sensors and switches, b) the automatic amplifier (microcomputer), and c) outputs. The relationship of these components is shown in the diagram below:

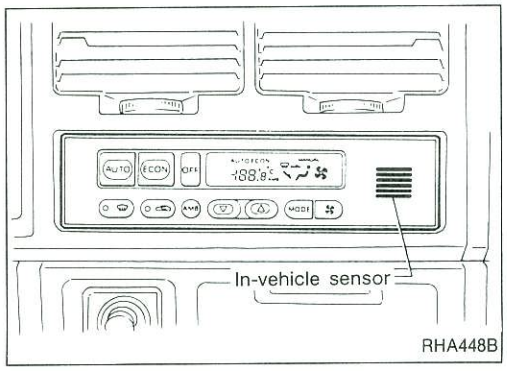




Control System Input Components

POTENTIO TEMPERATURE CONTROL (P.T.C.)

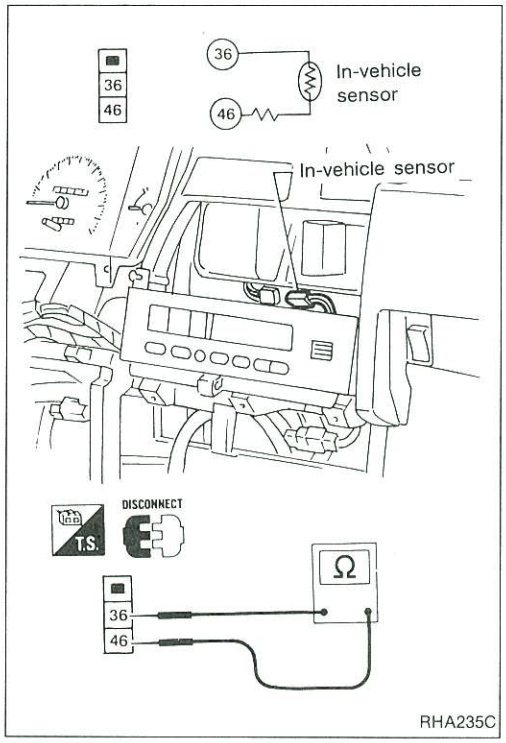
The P.T.C. is built into the auto amplifier. It can be set at an interval of 0.5°C (1.0°F) through both ▼ (HOT) and ▼ (COLD) control switches. Setting temperature is digitally displayed.



IN-VEHICLE SENSOR

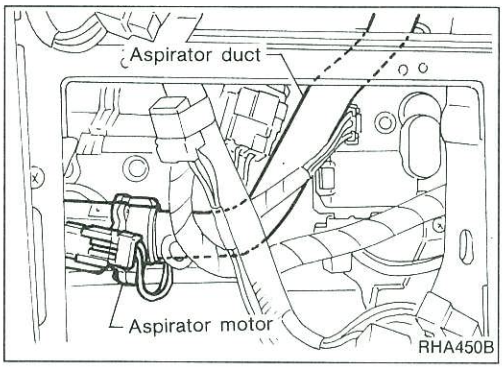
The in-vehicle sensor is attached to the control finisher. It converts variations in temperature of compartment air drawn from the aspirator motor into a resistance value which is then input into the auto amplifier. (A more detailed description of the aspirator motor is shown on the following page.)

Control System Input Components (Cont'd)



After disconnecting in-vehicle sensor harness connector, measure resistance between terminals ㊱ and ㊻ at sensor harness side, using the table below.

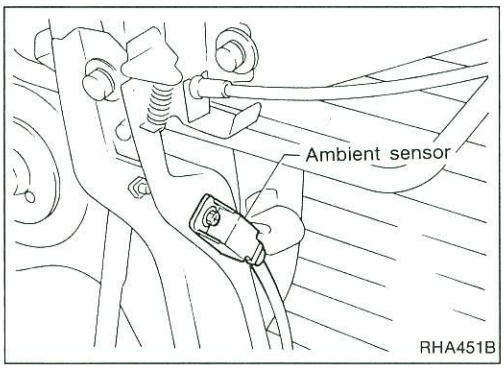
Temperature °C (°F)	Resistance kΩ
–35 (–31)	38.64
–30 (–22)	28.90
–25 (–13)	21.89
–20 (–4)	16.78
–15 (5)	13.01
–10 (14)	10.20
–5 (23)	8.08
0 (32)	6.47
5 (41)	5.23
10 (50)	4.27
15 (59)	3.52
20 (68)	2.93
25 (77)	2.47
30 (86)	2.09
35 (95)	1.79
40 (104)	1.55
45 (113)	1.35
50 (122)	1.19
55 (131)	1.05
60 (140)	0.94
65 (149)	0.85



ASPIRATOR MOTOR

The aspirator motor is located in front of the heater unit.
The aspirator motor activates when the ignition switch is "ON".
The aspirator is connected to the in-vehicle sensor via the aspirator duct so that the in-vehicle sensor monitors the compartment temperature. The aspirator continuously draws in a very small amount of compartment air.

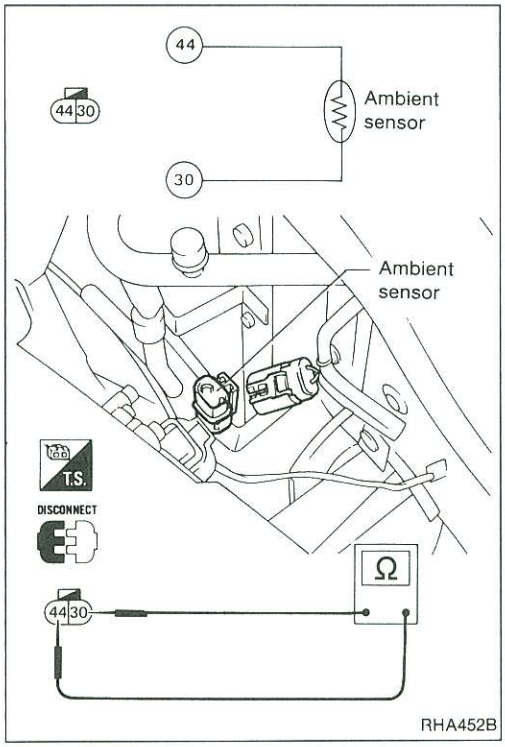
Control System Input Components (Cont'd)



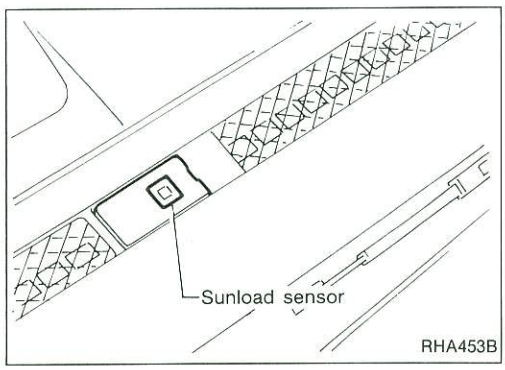
AMBIENT SENSOR

The ambient sensor is attached to hood lock stay. It detects ambient temperature and converts it into a resistance value which is then input to the auto amplifier.

After disconnecting ambient sensor harness connector, measure resistance between terminals ㉚ and ㊹ at sensor harness side, using the table below.



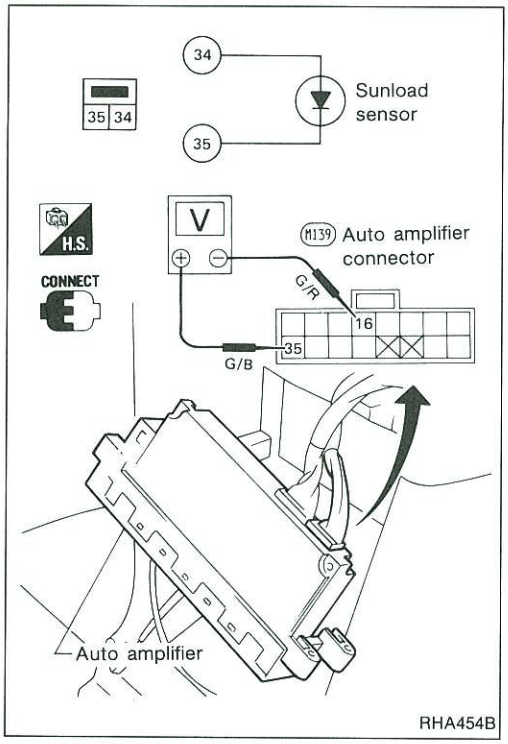
Temperature °C (°F)	Resistance kΩ
-35 (-31)	38.35
-30 (-22)	28.62
-25 (-13)	21.61
-20 (-4)	16.50
-15 (5)	12.73
-10 (14)	9.92
-5 (23)	7.80
0 (32)	6.19
5 (41)	4.95
10 (50)	3.99
15 (59)	3.24
20 (68)	2.65
25 (77)	2.19
30 (86)	1.81
35 (95)	1.51
40 (104)	1.27
45 (113)	1.07
50 (122)	0.91
55 (131)	0.77
60 (140)	0.66
65 (149)	0.57



SUNLOAD SENSOR

The sunload sensor is located on the right defroster grille. It detects sunload entering through windshield by means of a photo diode and converts it into a current value which is then input to the auto amplifier.

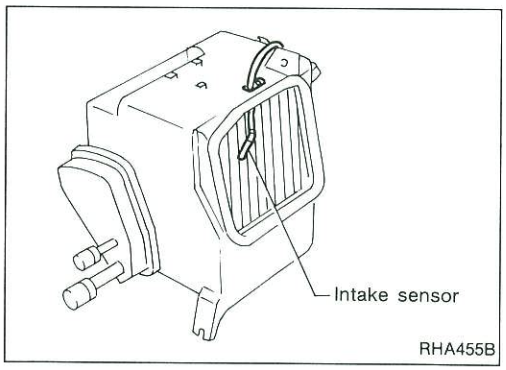
Control System Input Components (Cont'd)



Measure voltage between terminals ⑯ and ㉟ at vehicle harness side, using the table below.

Input current mA	Output voltage V
0	5.0
0.1	4.1
0.2	3.1
0.3	2.2
0.4	1.3
0.5	0.4

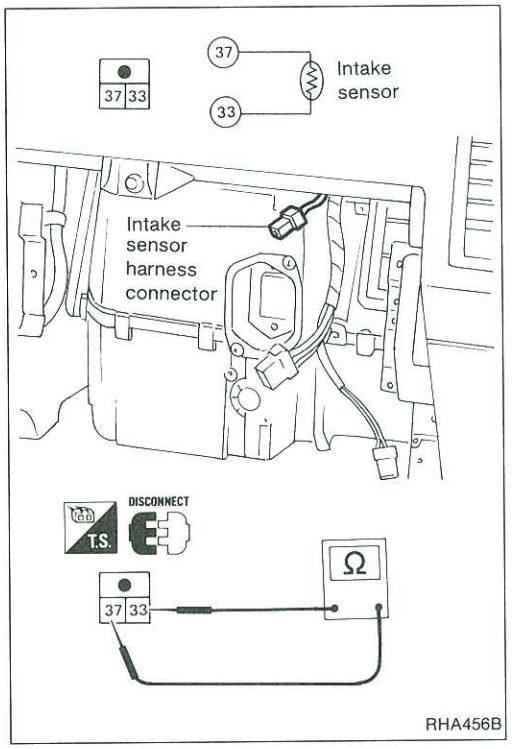
- **When checking sunload sensor, select a place where sun shines directly on it.**



INTAKE SENSOR

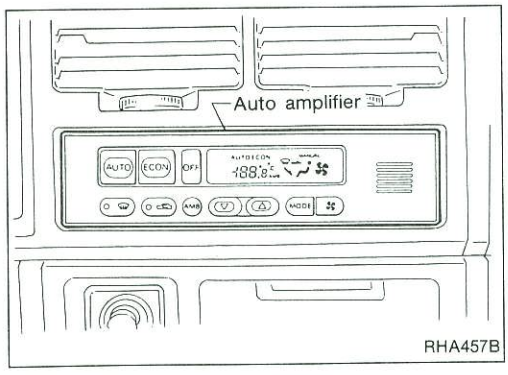
The intake sensor is located on the cooling unit. It converts temperature of air after it passes through the evaporator into a resistance value which is then input to the auto amplifier.

Control System Input Components (Cont'd)



After disconnecting intake sensor harness connector, measure resistance between terminals ㉝ and ㊲ at sensor harness side, using the table below.

Temperature °C (°F)	Resistance kΩ
-35 (-31)	38.35
-30 (-22)	28.62
-25 (-13)	21.61
-20 (-4)	16.50
-15 (5)	12.73
-10 (14)	9.92
-5 (23)	7.80
0 (32)	6.19
5 (41)	4.95
10 (50)	3.99
15 (59)	3.24
20 (68)	2.65
25 (77)	2.19
30 (86)	1.81
35 (95)	1.51
40 (104)	1.27
45 (113)	1.07
50 (122)	0.91
55 (131)	0.77
60 (140)	0.66
65 (149)	0.57



Control System Automatic Amplifier (Auto amp.)

The auto amplifier has a built-in microcomputer which processes information sent from various sensors needed for air conditioner operation. The air mix door motor, mode door motor, intake door motor, blower motor and compressor are then controlled.

The auto amplifier is unitized with control mechanisms. Signals from various switches and Potentio Temperature Control (P.T.C.) are directly entered into auto amplifier.

Self-diagnostic functions are also built into auto amplifier to provide quick check of malfunctions in the auto air conditioner system.

Control System Automatic Amplifier (Auto amp.) (Cont'd)

AMBIENT TEMPERATURE INPUT PROCESS

The automatic amplifier includes a "processing circuit" for the ambient sensor input. When the temperature detected by the ambient sensor increases quickly, the processing circuit allows the auto amp. to recognize an ambient temperature increase of only 0.33°C (0.6°F) per 100 seconds.
As an example, consider stopping for a cup of coffee after high speed driving. Even though the actual ambient temperature has not changed, the temperature detected by the ambient sensor will increase because heat radiated from the engine compartment can radiate to the front grille area (where the ambient sensor is located).

SUNLOAD INPUT PROCESS

The auto amp. also includes a processing circuit which "average" the variations in detected sunload over a period of time. This prevents drastic swings in the A.T.C. system operation due to small or quick variations in detected sunload.
For example, consider driving along a road bordered by an occasional group of large trees. The sunload detected by the sunload sensor will vary whenever the trees obstruct the sunlight. The processing circuit averages the detected sunload over a period of time, so that the (insignificant) effect of the trees momentarily obstructing the sunlight does not cause any change in the A.T.C. system operation. On the other hand, shortly after entering a long tunnel, the system will recognize the change in sunload, and the system will react accordingly.

Control System Output Components

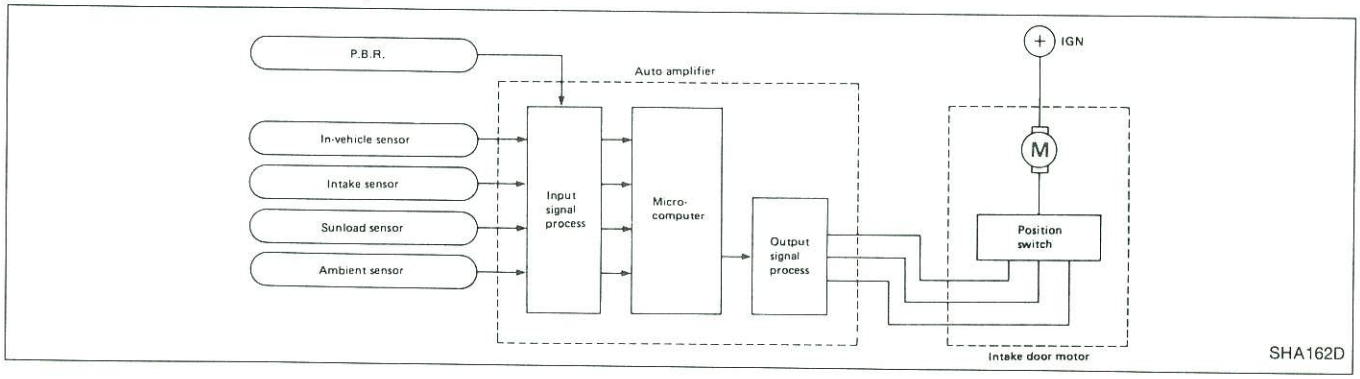
INTAKE DOOR CONTROL

Components parts

Intake door control system components are:
1) Auto amplifier
2) Intake door motor
3) P.B.R.
4) In-vehicle sensor
5) Ambient sensor
6) Sunload sensor
7) Intake sensor

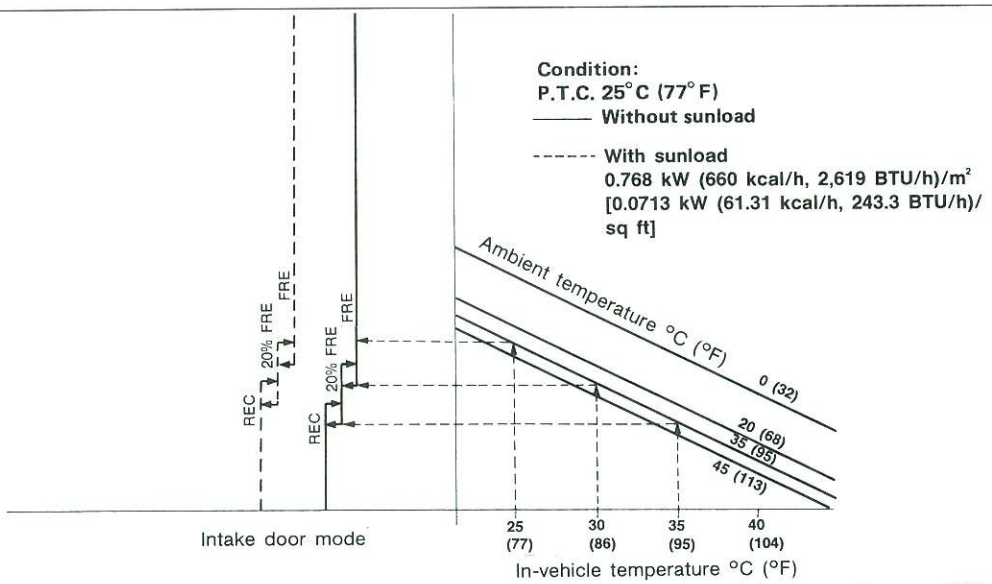
System operation

The intake door control determines intake door position based on the ambient temperature and the in-vehicle temperature. When the ECON, DEF, or OFF buttons are pushed, the auto amplifier sets the intake door at the "Fresh" position.



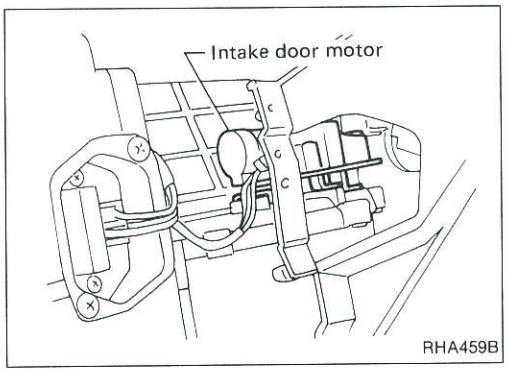
Control System Output Components (Cont'd)

Intake door control specification



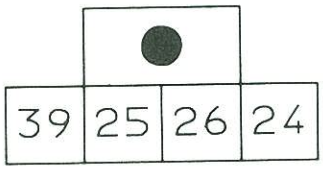
Example:

- **If temperature setting is set at 25°C (77°F) under no sunload condition when ambient and in-vehicle temperature are 35°C (95°F), intake door is set automatically at REC position to make in-vehicle temperature cool down efficiently.**
- **In-vehicle temperature will lower and when 30°C (86°F) is reached, intake door will shift to 20% FRE position.**
- **In the state when in-vehicle temperature reaches the objective temperature 25°C (77°F), intake door is set at FRE position.** SHA163D



INTAKE DOOR MOTOR

The intake door motor is attached to the intake unit. It rotates so that air is drawn from inlets set by the auto amplifier. Motor rotation is conveyed to a lever which activates the intake door.

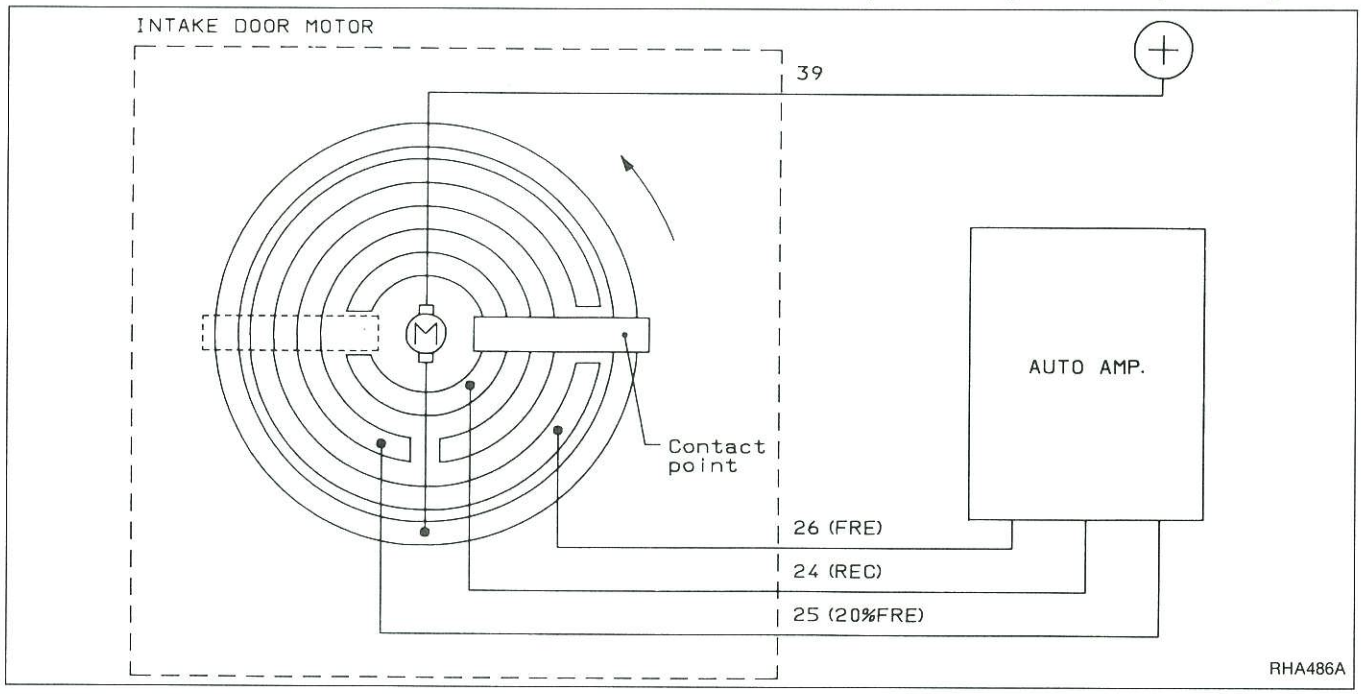


24	25	26	Intake door operation	Direction of lever rotation
CL	OP	OP	REC	Clockwise
OP	CL	OP	20% FRE	
OP	OP	CL	FRE	

OP: Open
CL: Close

RHA485A

Control System Output Components (Cont'd)



AIR MIX DOOR CONTROL (Automatic temperature control)

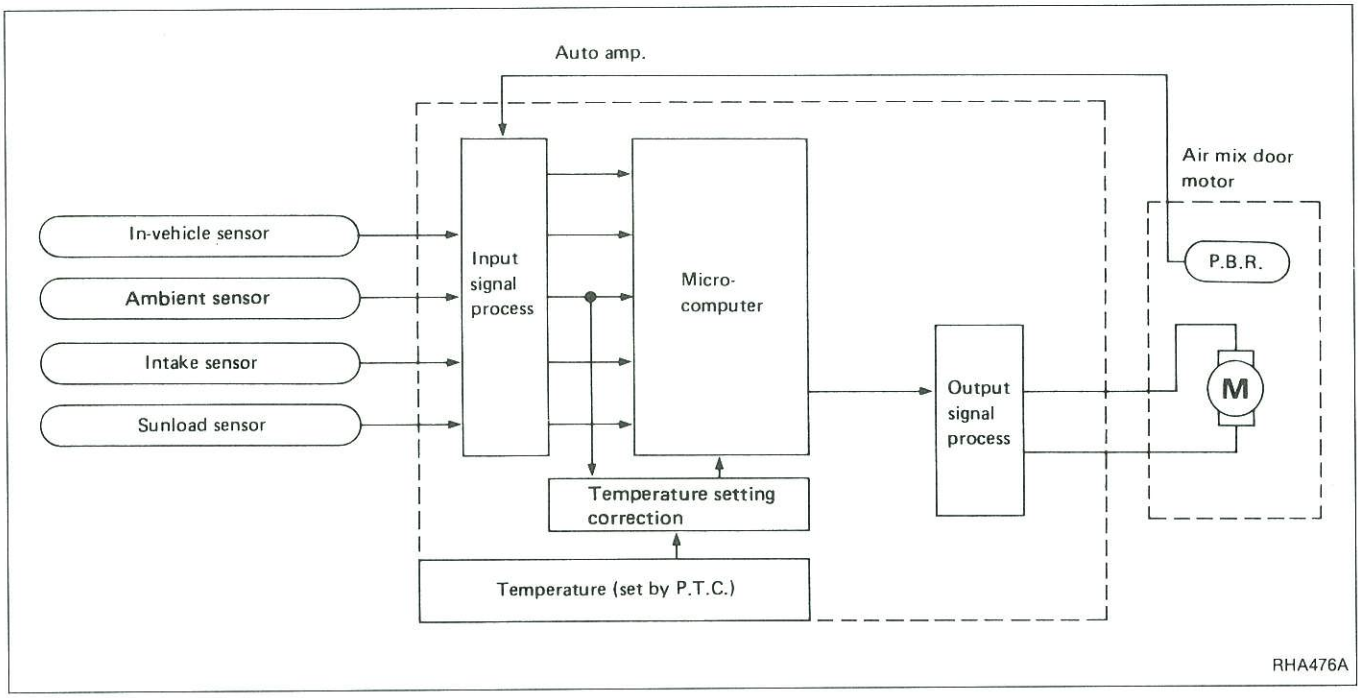
Component parts

Air mix door control system components are:
1) Auto amplifier
2) Air mix door motor (P.B.R.)
3) In-vehicle sensor
4) Ambient sensor
5) Sunload sensor
6) Intake sensor

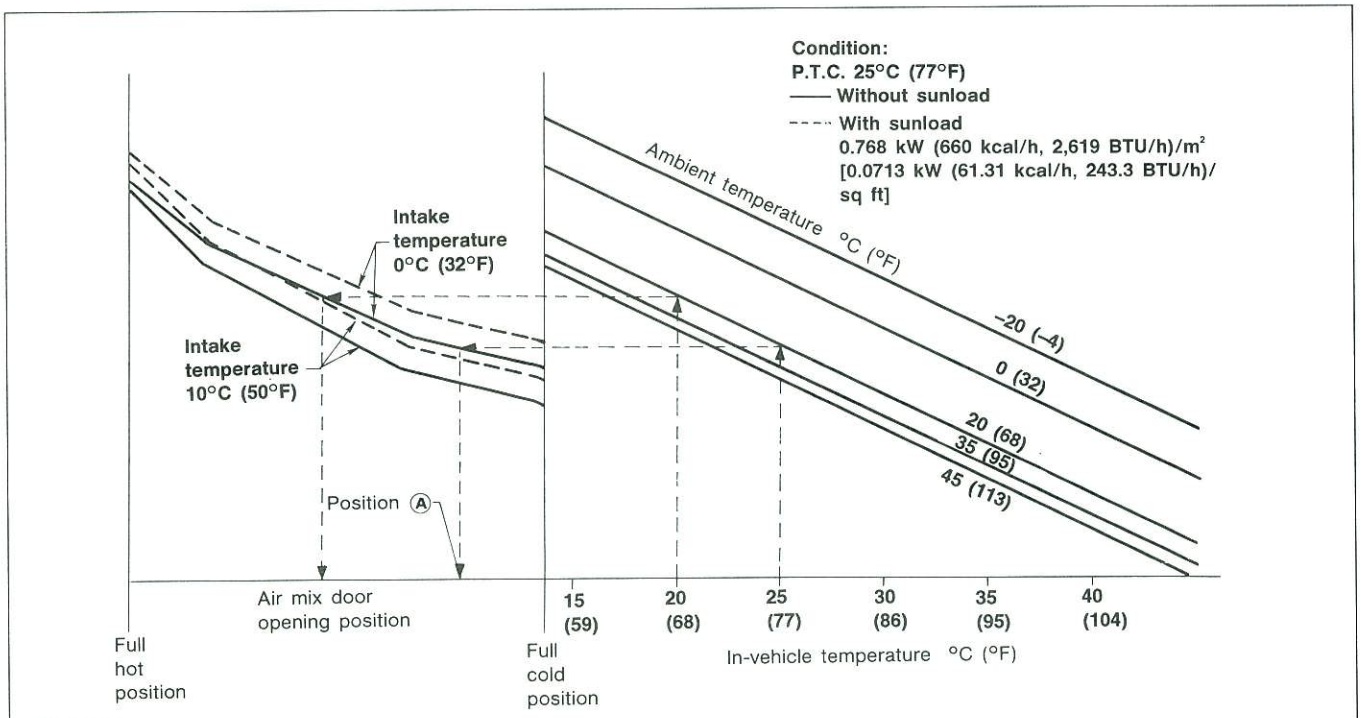
System operation

Temperature set by Potentio Temperature Control (P.T.C.) is compensated through setting temperature correction circuit to determine target temperature.
Auto amplifier will operate air mix door motor to set air conditioning system in HOT or COLD position, depending upon relationship between conditions (target temperature, sunload, in-vehicle temperature and ambient temperature) and conditions (air mix door position and intake air temperature).

Control System Output Components (Cont'd)



Air mix door control specification



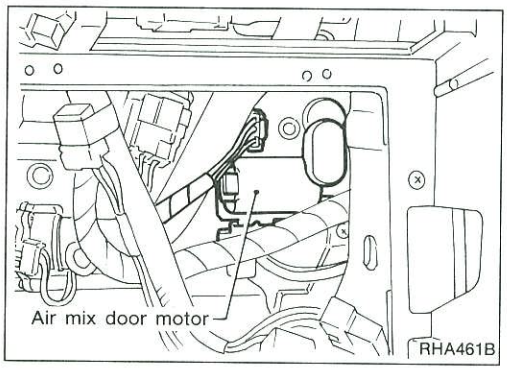
Example:

- **If temperature setting is set at 25°C (77°F) under no sunload condition when ambient and in-vehicle temperature is 35°C (95°F), air mix door is initially automatically set in full cold position.**
- **Within some period, in-vehicle temperature will lower towards the objective temperature, and the air mix door position will shift incrementally towards the hot side and finally stay in this position Ⓐ if intake temperature is 10°C (50°F).**
  Air mix door opening position is always fed back to auto amplifier by P.B.R. built-in air mix door motor.

RHA460B

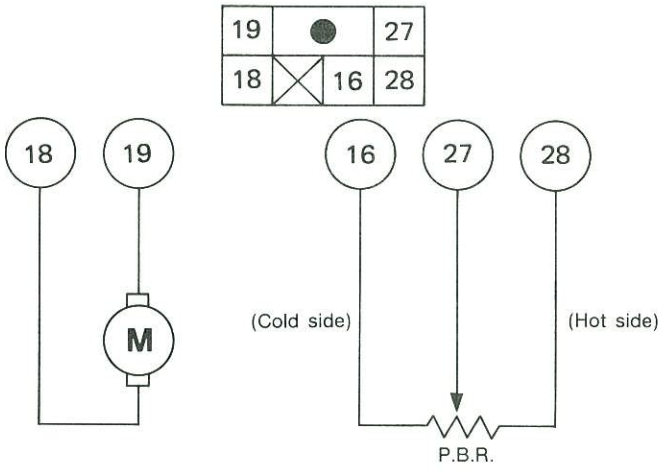
Control System Output Components (Cont'd)

AIR MIX DOOR MOTOR



The air mix door motor is attached to the heater unit. It rotates so that the air mix door is opened to a position set by the auto amplifier. Motor rotation is then conveyed through a shaft and air mix door position is then fed back to the auto amplifier by P.B.R. built-in air mix door motor.

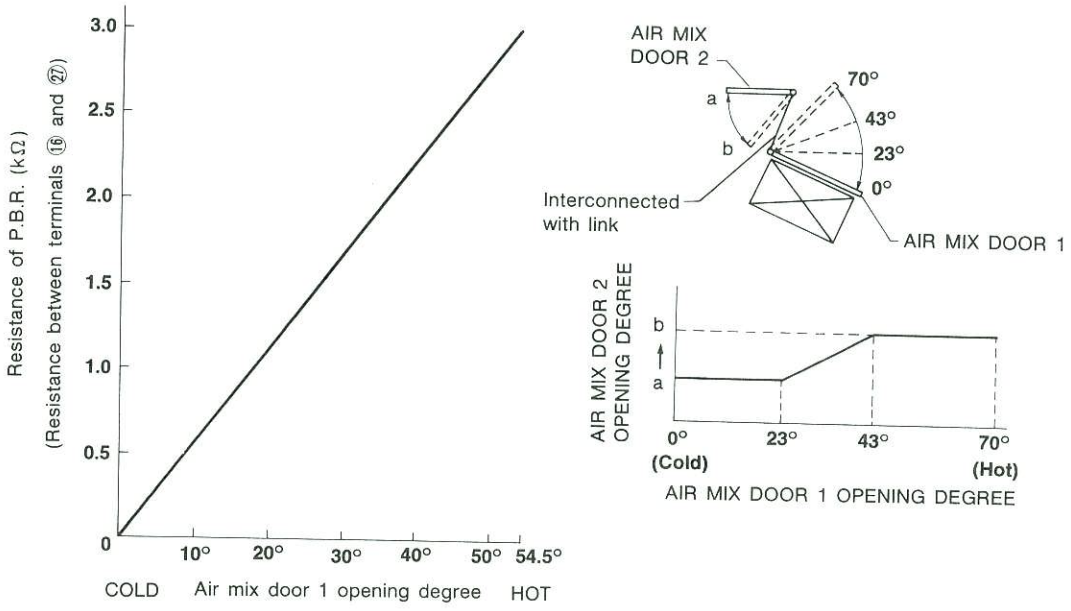
Air mix door motor operation



18	19	Air mix door operation	Direction of lever movement
⊕	⊖	COLD → HOT	Clockwise (Upward)
⊖	⊖	STOP	STOP
⊖	⊕	HOT → COLD	Counterclockwise (Downward)

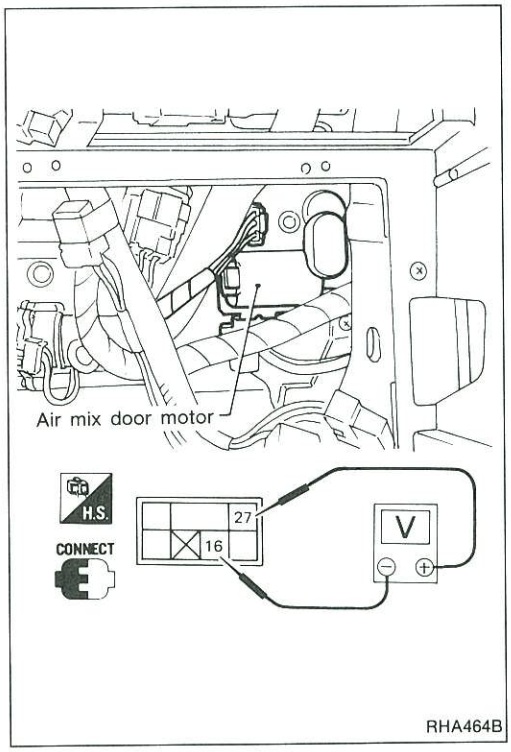
RHA462B

Characteristics of P.B.R.



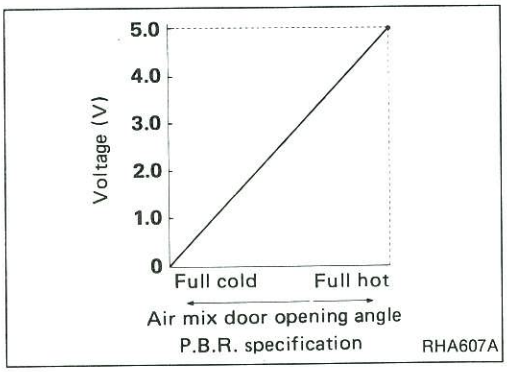
RHA463B

Control System Output Components (Cont'd)



P.B.R.

Measure voltage between terminals ㉗ and ⑯ at vehicle harness side.



Ignition switch: ON

- Ensure tester pointer deflects smoothly when P.T.C. is moved from 18°C (65°F) to 32°C (85°F) and vice versa.

WATER COCK

The water cock lever is linked to the air mix door shaft, so the amount of hot water flowing to the heater core is a function of the aperture of the air mix door.

OUTLET DOOR CONTROL

Component parts

Outlet door control system components are:

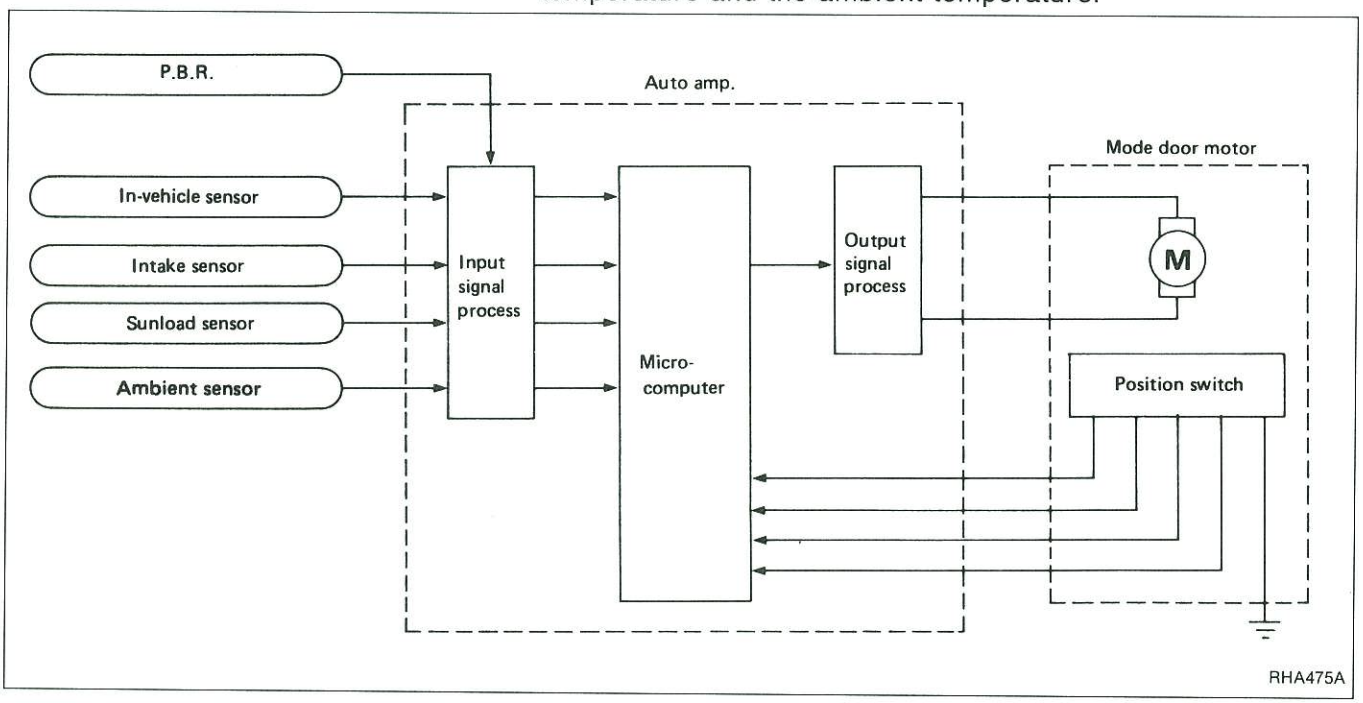
1) Auto amplifier
2) Mode door motor
3) P.B.R.
4) In-vehicle sensor
5) Ambient sensor
6) Sunload sensor
7) Intake sensor

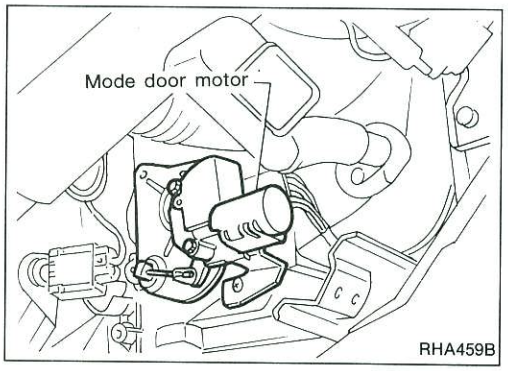
Control System Output Components (Cont'd)

System operation

The auto amplifier computes the air outlet conditions according to the ambient temperature and the in-vehicle temperature. The computed outlet conditions are then corrected for sunload to determine air outlets through which air is discharged into the passenger compartment.

When the air outlets is automatically selected as FOOT/DEF, the actual outlet will be either F/D1 or F/D2 depending on the target temperature and the ambient temperature.

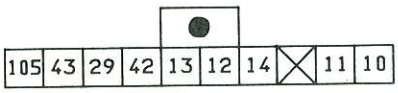




MODE DOOR MOTOR

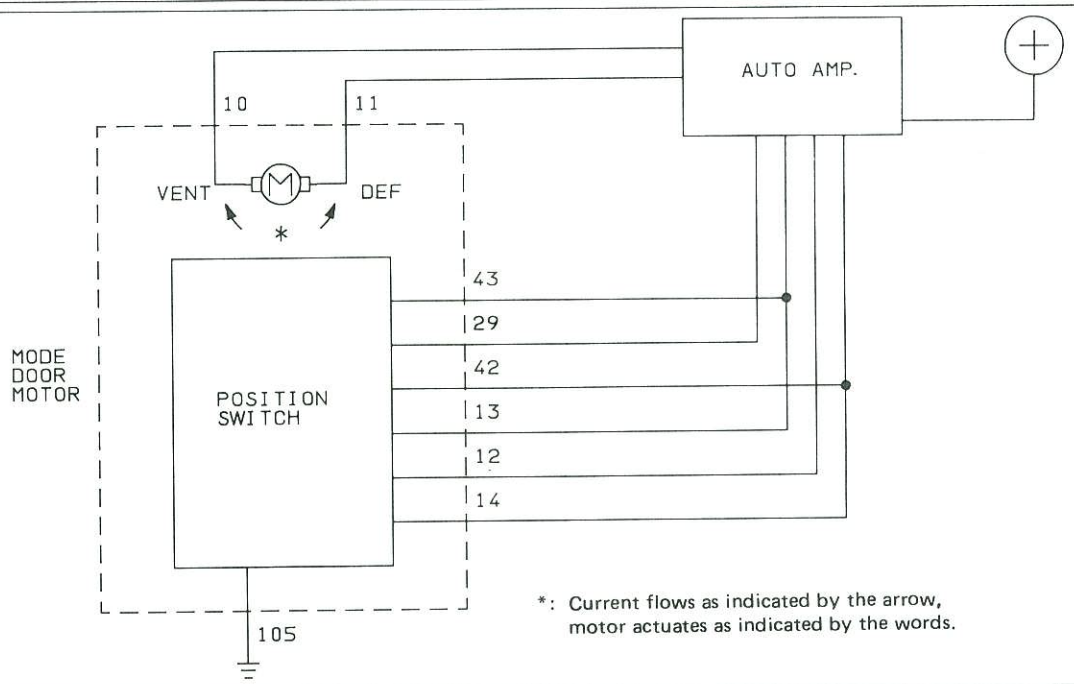
The mode door motor is attached to the heater unit. It rotates so that air is discharged from outlet set by the auto amplifier. Motor rotation is conveyed to a link which activates the mode door.

Control System Output Components (Cont'd)



10	11	Mode door operation	Direction of side link rotation
⊕	⊖	VENT → DEF	Clockwise
⊖	⊖	STOP	STOP
⊖	⊕	DEF → VENT	Counterclockwise

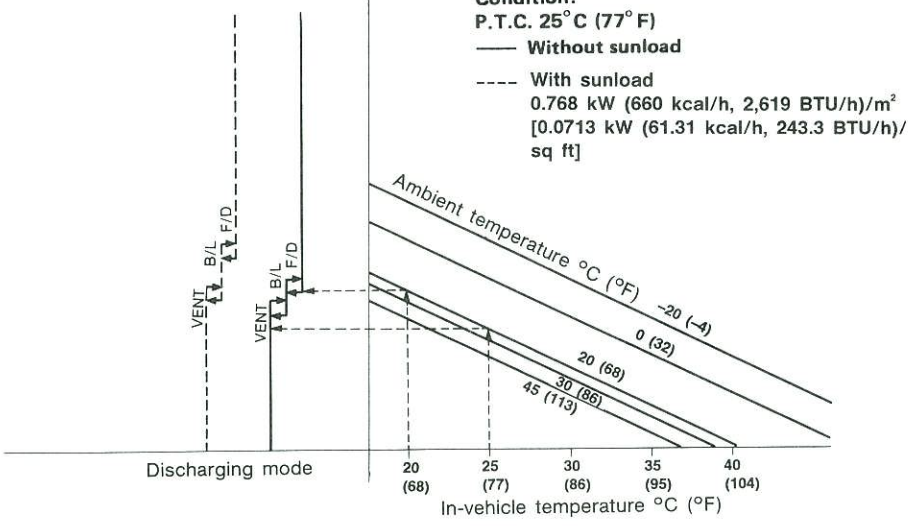
SHA164D



*: Current flows as indicated by the arrow, motor actuates as indicated by the words.

SHA166D

Outlet door control specification

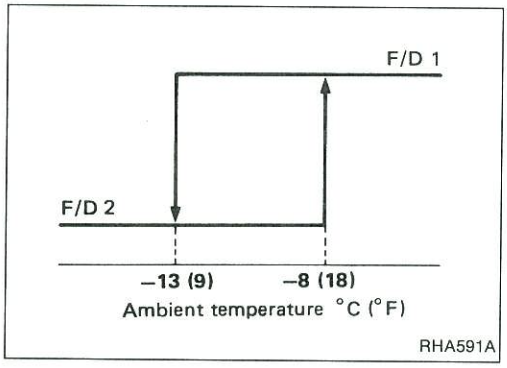


Example:

- **If temperature setting is set at 25°C (77°F) under no sunload condition when ambient and in-vehicle temperature are 20°C (68°F), mode door is set automatically at F/D position.**
- **Then in-vehicle temperature will lower and when objective temperature 25°C (77°F) is reached mode door will shift from F/D position to VENT.**

SHA165D

Control System Output Components (Cont'd)



FOOT/DEF mode specification

When the air outlet is automatically selected as F/D, and the target temperature is high, the air outlet is fixed at F/D 1.
When the target temperature is low, the air outlet will be either F/D 1 or F/D 2 depending on the ambient temperature.

- When the ambient temperature decreases to –13°C (9°F), air outlet is changed from F/D 1 to F/D 2.
- When the ambient temperature increases to –8°C (18°F), air outlet is changed from F/D 2 to F/D 1.

FAN SPEED CONTROL

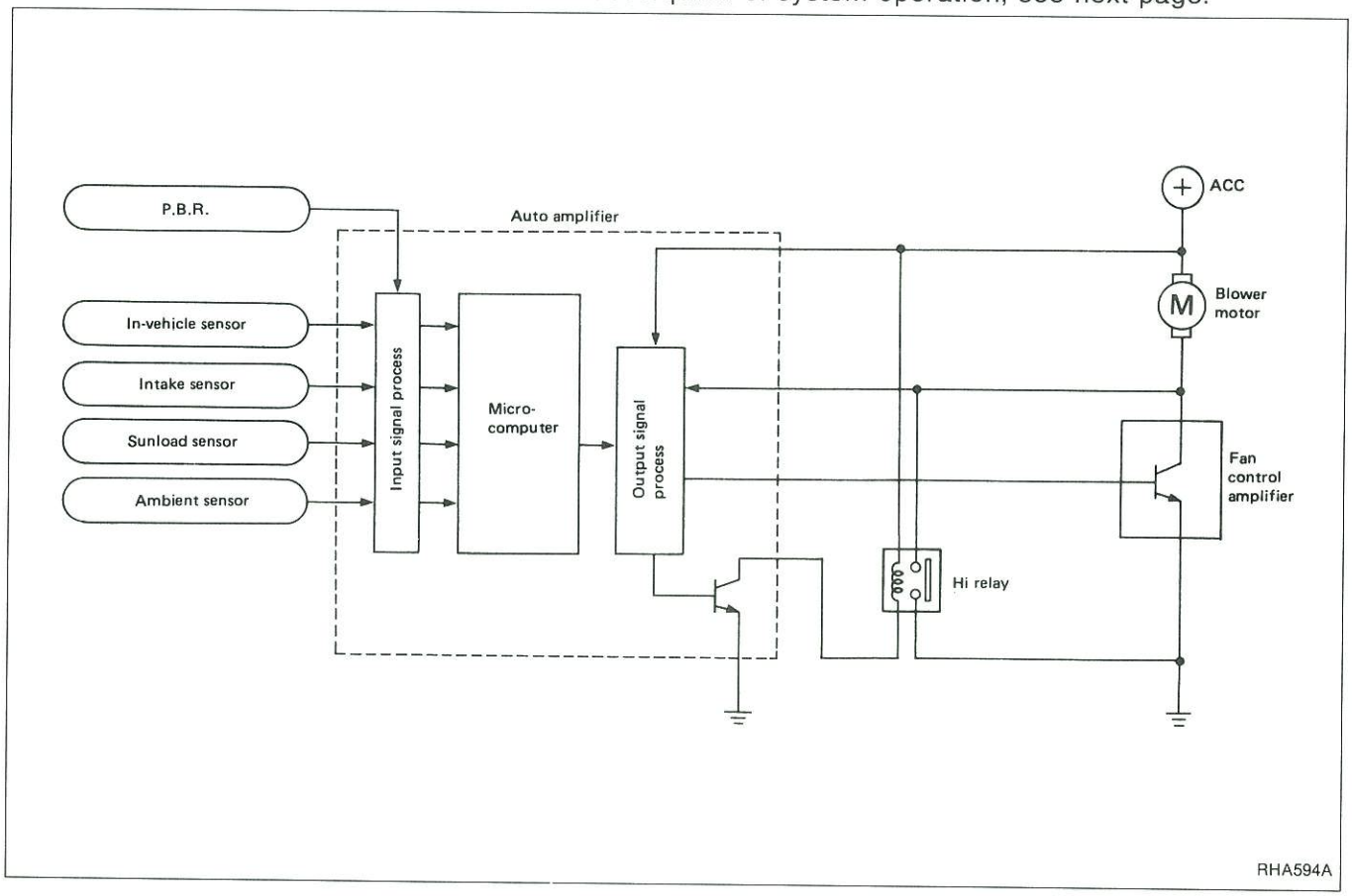
Component parts

Fan speed control system components are:

1) Auto amplifier
2) Fan control amplifier
3) P.B.R.
4) In-vehicle sensor
5) Ambient sensor
6) Sunload sensor
7) Intake sensor
8) Hi relay
9) E.C.C.S. control unit (Engine temperature sensor)

System operation

For description of system operation, see next page.



AUTOMATIC MODE

In the automatic mode, the blower motor speed is calculated by the automatic amplifier based on inputs from the P.B.R., in- vehicle sensor, sunload sensor, and ambient sensor. The blower motor applied voltage ranges from approximately 5 volts (lowest speed) to 12 volts (highest speed).
The control blower speed (in the range of 5 to 10.5V), the automatic amplifier supplies a signal to the fan control amplifier. Based on this signal, the fan control amplifier controls the current flow from the blower motor to ground. If the computed blower voltage (from automatic amplifier) is above 10.5 volts, the high blower relay is activated. The high blower relay provides a direct path to ground (bypassing the fan control amplifier), and the blower motor operates at high speed.

STARTING FAN SPEED CONTROL

Start up from "COLD SOAK" condition (Automatic mode)

In a cold start up condition where the engine temperature is below 50°C (122°F) and the ambient temperature is below 15°C (59°F), the blower will not operate for a short period of time (up to 150 seconds). The exact start delay time varies depending on the ambient and engine temperature.
In the most extreme case (very low ambient) the blower starting delay will be 150 seconds. After this delay, the blower will operate at low speed until the engine temperature rises above 50°C (122°F), at which time the blower speed will increase to the objective speed.

Start up from normal or "HOT SOAK" condition (Automatic mode)

The blower will begin operation momentarily after the AUTO button is pushed. The blower speed will gradually rise to the objective speed over a time period of 5 seconds or less (actual time depends on the objective blower speed).

BLOWER SPEED COMPENSATION

Sunload

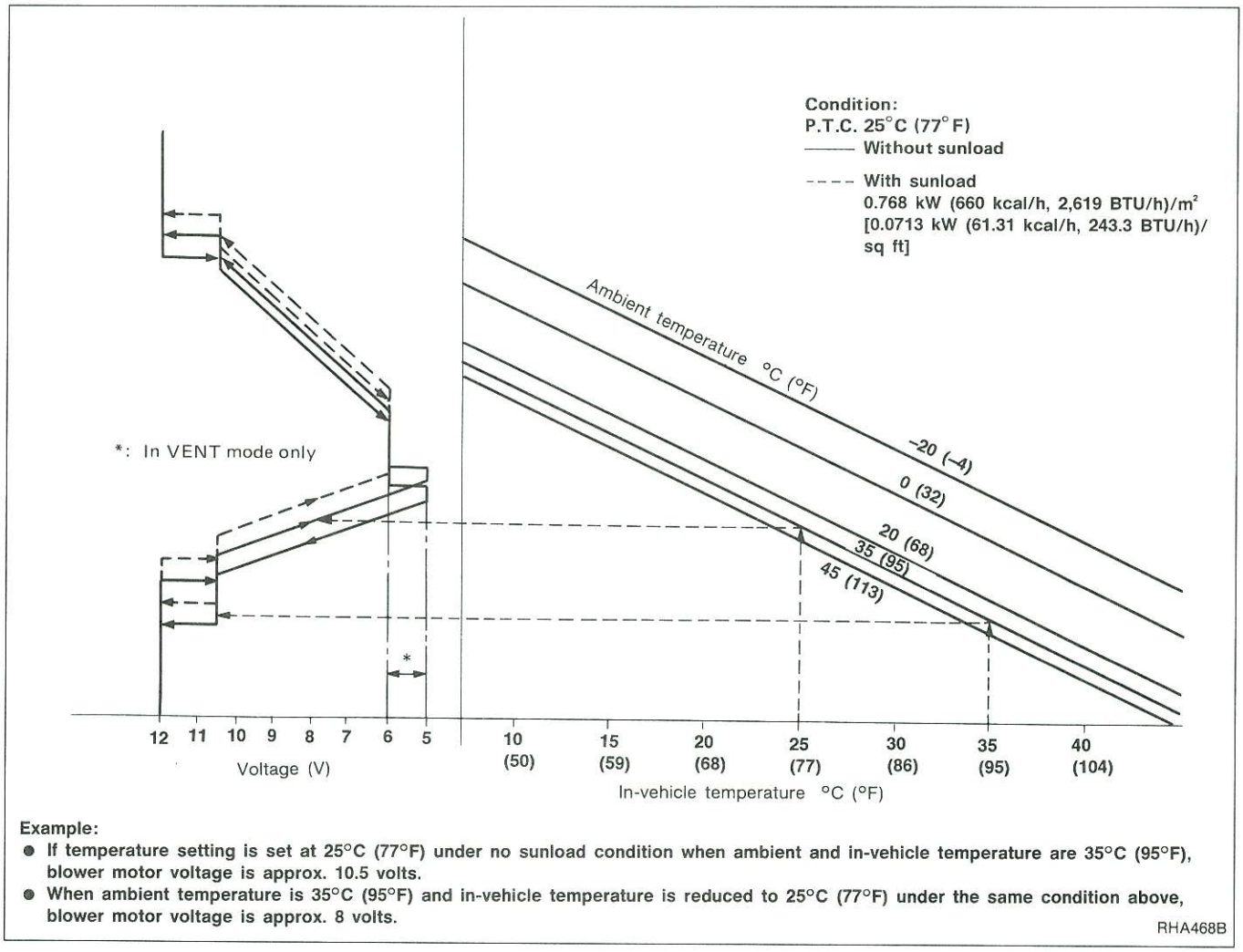
When the in-vehicle temperature and the set temperature are very close, the blower will be operating at low speed. The low speed will vary depending on the sunload. During conditions of high sunload, the blower low speed is "normal" low speed (approx. 6V). During low or no sunload conditions, the low speed will drop to "low" low speed (approx. 5V).

Ambient

When the ambient temperature is in the "moderate" range [10 to 15°C (50 to 59°F)], the computed blower voltage will be compensated (reduced) by up to 3.5V (depending on the blower speed). In the "extreme" ambient ranges [below 0°C (32°F) and above 20°C (68°F)] the computed objective blower voltage is not compensated at all. In the ambient temperature ranges between "moderate" and "extreme"[0 to 10°C (32 to 50°F) and 15 to 20°C (59 to 68°F)], the amount of compensation (for a given blower speed) varies depending on the ambient temperature.

Control System Output Components (Cont'd)

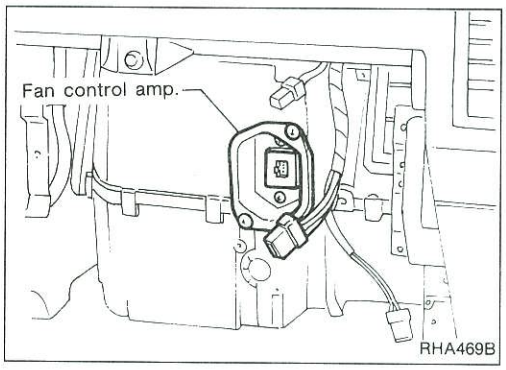
Fan speed control specification



Example:

- **If temperature setting is set at 25°C (77°F) under no sunload condition when ambient and in-vehicle temperature are 35°C (95°F), blower motor voltage is approx. 10.5 volts.**
- **When ambient temperature is 35°C (95°F) and in-vehicle temperature is reduced to 25°C (77°F) under the same condition above, blower motor voltage is approx. 8 volts.**

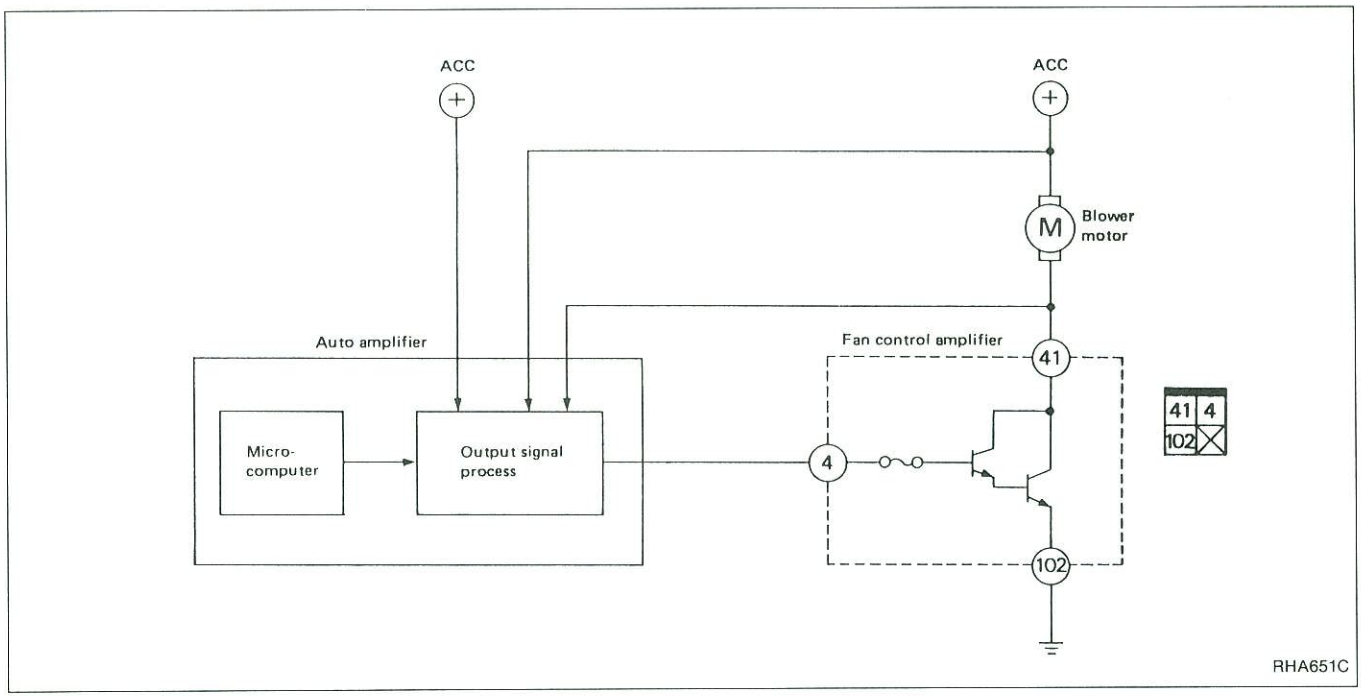
RHA468B

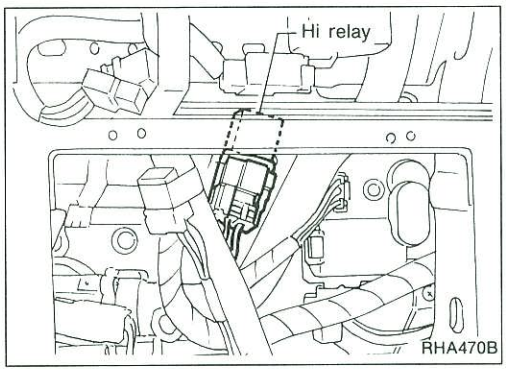


FAN CONTROL AMPLIFIER

The fan control amplifier is located on the cooling unit. It amplifies a 12-step base current flowing from the auto amplifier to change blower speed.

Control System Output Components (Cont'd)



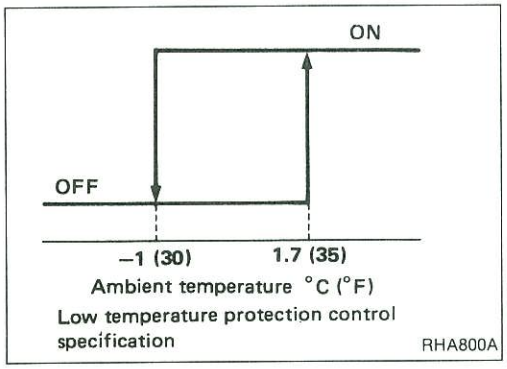


HI RELAY

The Hi relay is located on the heater unit. It receives a signal from the auto amplifier to operate the blower motor at high speed.

MAGNET CLUTCH CONTROL

Auto amplifier controls compressor operation by ambient temperature and signal from E.C.C.S. control unit.



Low temperature protection control

Auto amplifier will turn the compressor "ON" or "OFF" as determined by a signal detected by 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 or equivalent
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	R-12
Capacity kg (lb)	0.8 - 0.9 (1.8 - 2.0)

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

PRECAUTIONS ..... EL- 2
HARNESS CONNECTOR ..... EL- 3
STANDARDIZED RELAY ..... EL- 4
POWER SUPPLY ROUTING ..... EL- 6
BATTERY ..... EL- 9
STARTING SYSTEM ..... EL- 17
STARTING SYSTEM — Starter — ..... EL- 19
CHARGING SYSTEM ..... EL- 27
CHARGING SYSTEM — Alternator — ..... EL- 29
COMBINATION SWITCH ..... EL- 35
HEADLAMP ..... EL- 37
EXTERIOR LAMP ..... EL- 40
INTERIOR LAMP ..... EL- 44
METER AND GAUGES ..... EL- 47
WARNING LAMPS AND CHIME ..... EL- 53
TIME CONTROL SYSTEM ..... EL- 57
WIPER AND WASHER ..... EL- 73
HORN, CIGARETTE LIGHTER, CLOCK ..... EL- 76
REAR WINDOW DEFOGGER ..... EL- 77
AUDIO AND POWER ANTENNA ..... EL- 80
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.) ..... EL- 86
THEFT WARNING SYSTEM EL-103
LOCATION OF ELECTRICAL UNITS EL-123
HARNESS LAYOUT EL-127
SUPER MULTIPLE JUNCTION (S.M.J.) EL-139

EL

WIRING DIAGRAM REFERENCE CHART

E.C.C.S. (Ignition system) ..... EF & EC SECTION
AUTOMATIC TRANSMISSION CONTROL SYSTEM, SHIFT LOCK SYSTEM ..... AT SECTION
SONAR SUSPENSION SYSTEM ..... FA SECTION
ABS ..... BR SECTION
TRUNK LID AND FUEL FILLER LID OPENER, POWER WINDOW AND
POWER DOOR LOCK, SRS "AIR BAG", POWER SEAT, SUN ROOF, DOOR MIRROR ..... BF SECTION
HEATER AND AIR CONDITIONER ..... HA SECTION

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 INFINITI 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".**

Description

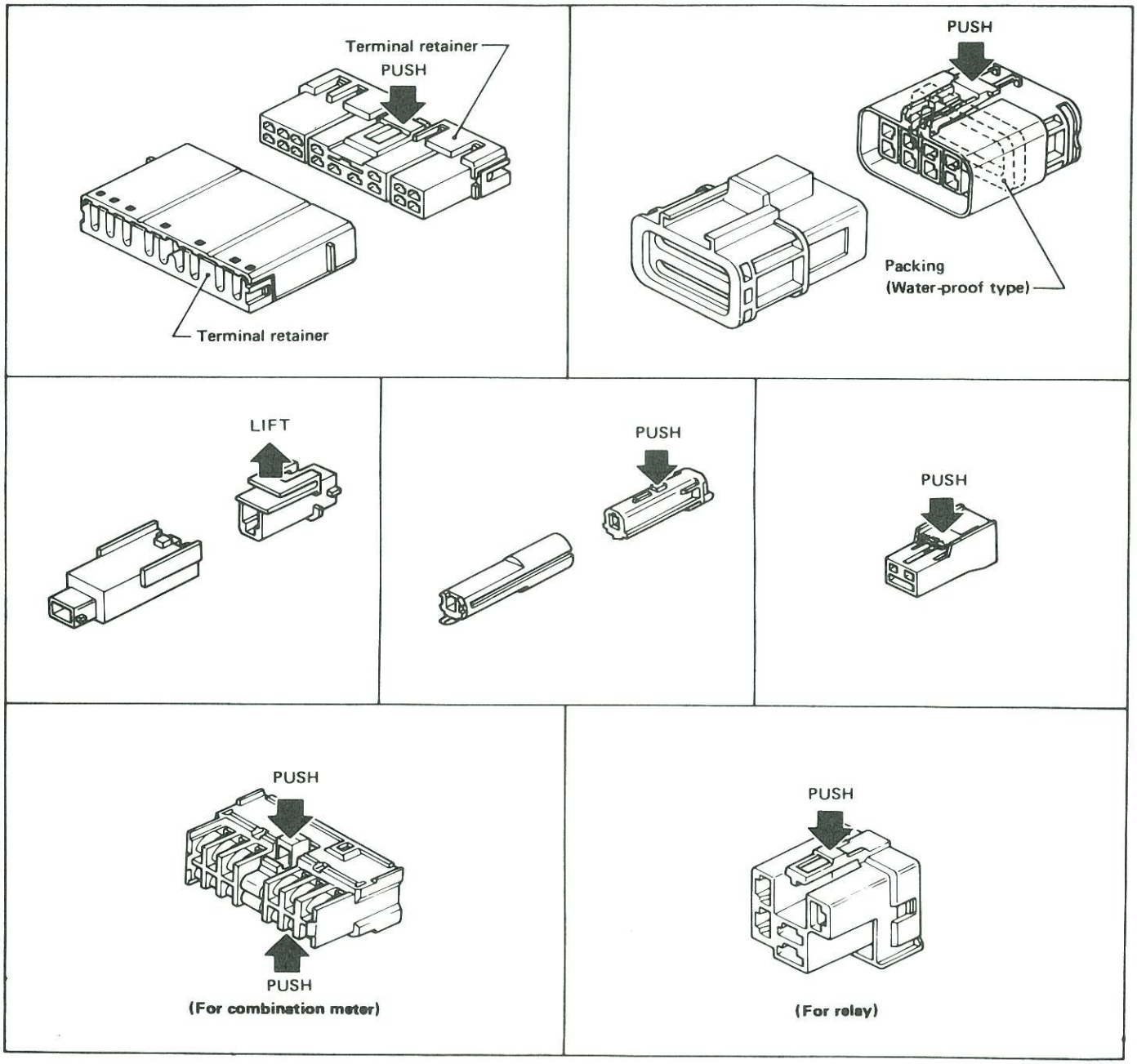
HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental loosing or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

CAUTION:

Do not pull the harness when disconnecting the connector.

[Example]

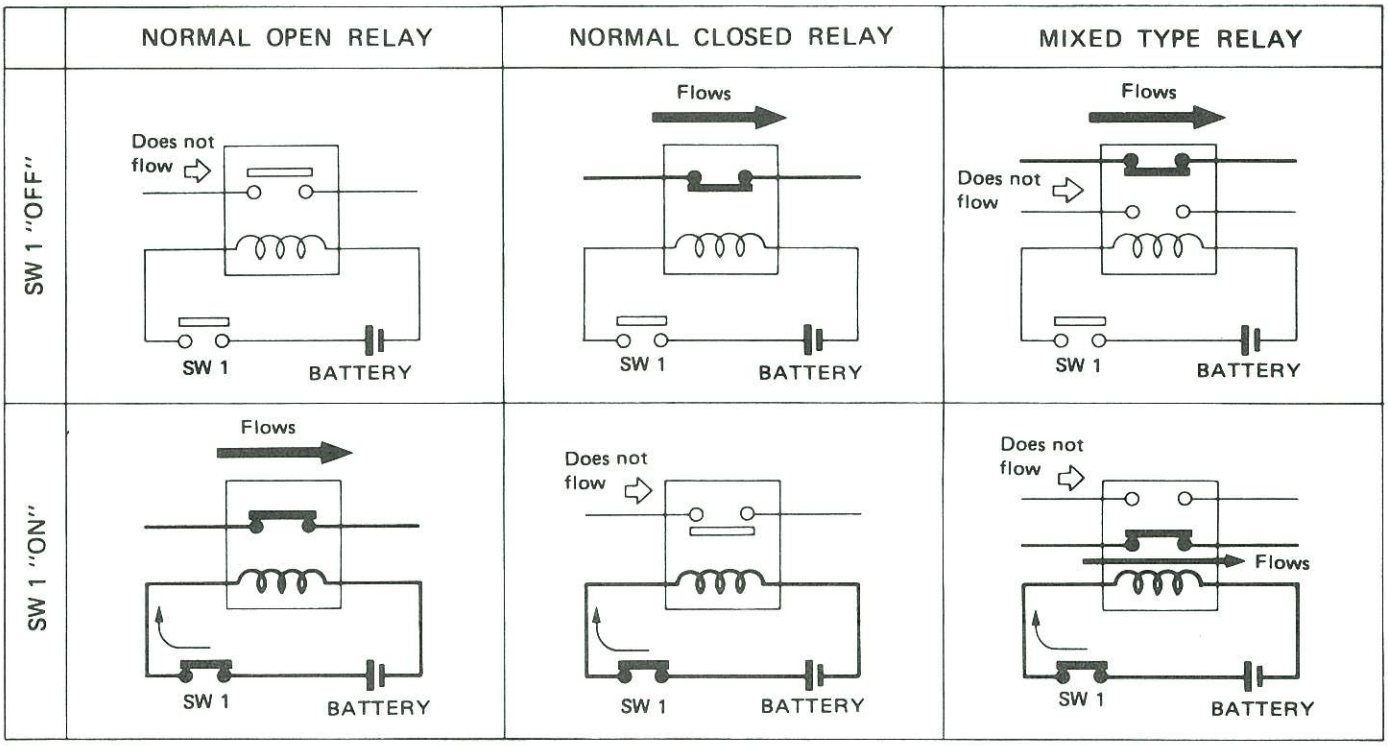


SEL769D

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

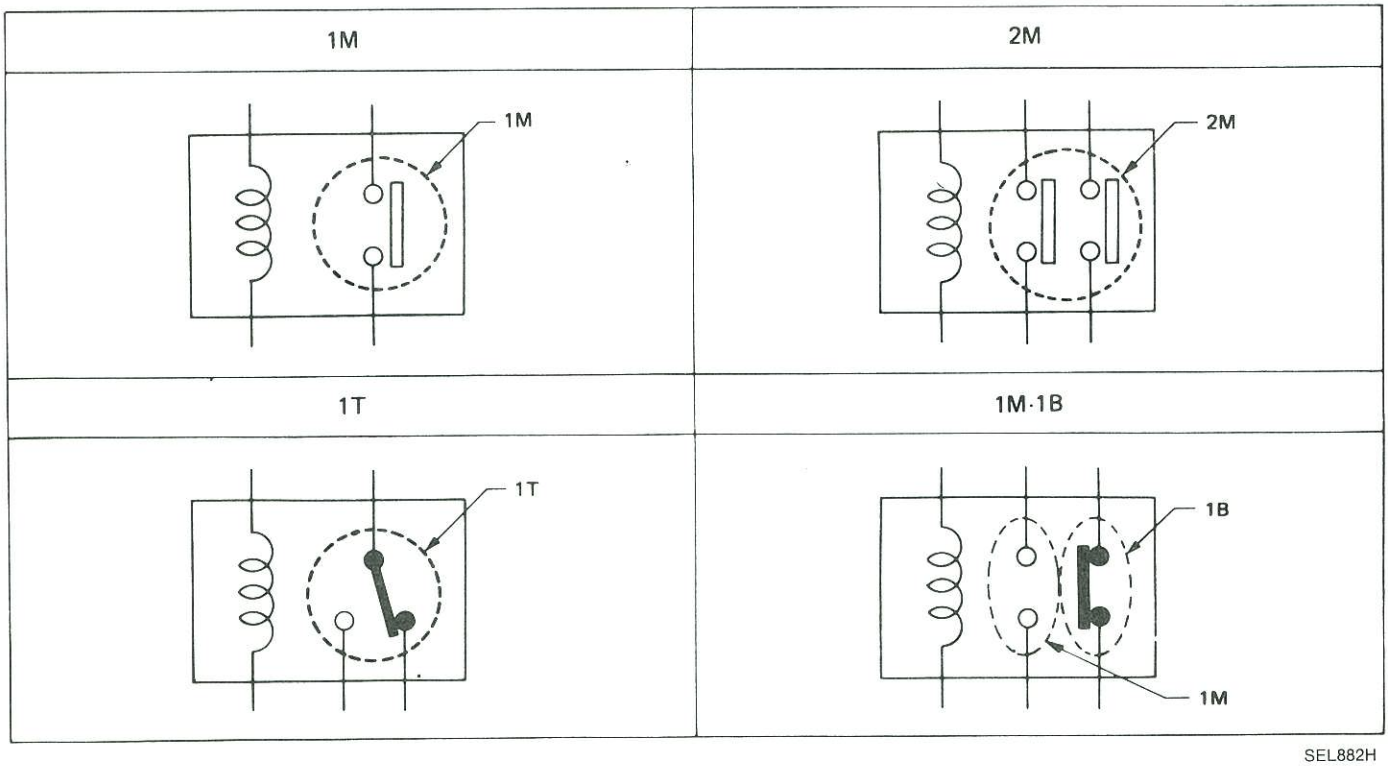
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



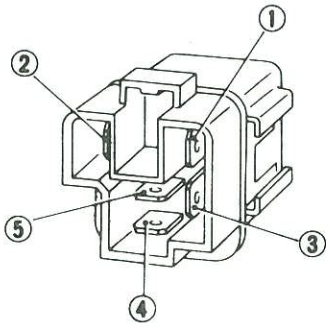
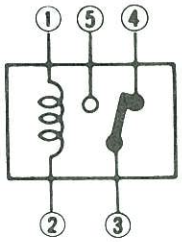
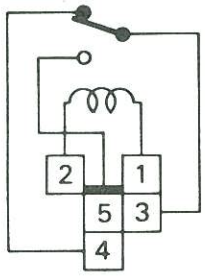
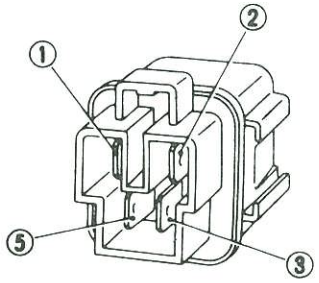
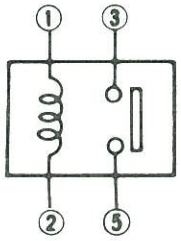
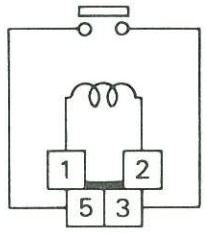
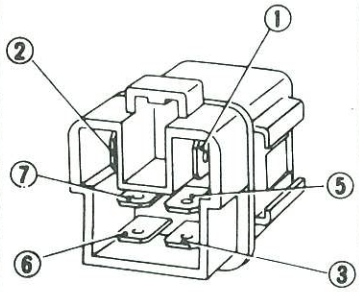
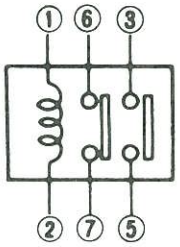
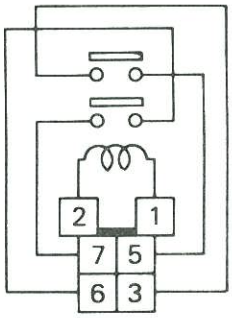
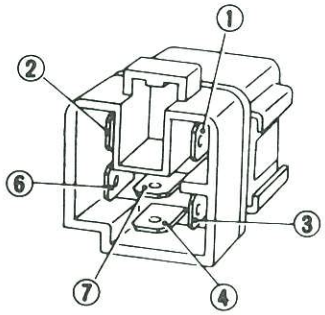
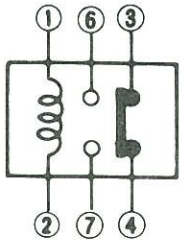
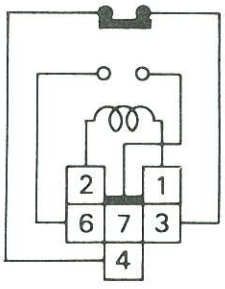
SEL881H

TYPE OF STANDARDIZED RELAYS

1M ..... 1 Make
1T ..... 1 Transfer
2M ..... 2 Make
1M·1B ..... 1 Make 1 Break



SEL882H

Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE or GREEN
2M				BROWN
1M·1B				GRAY

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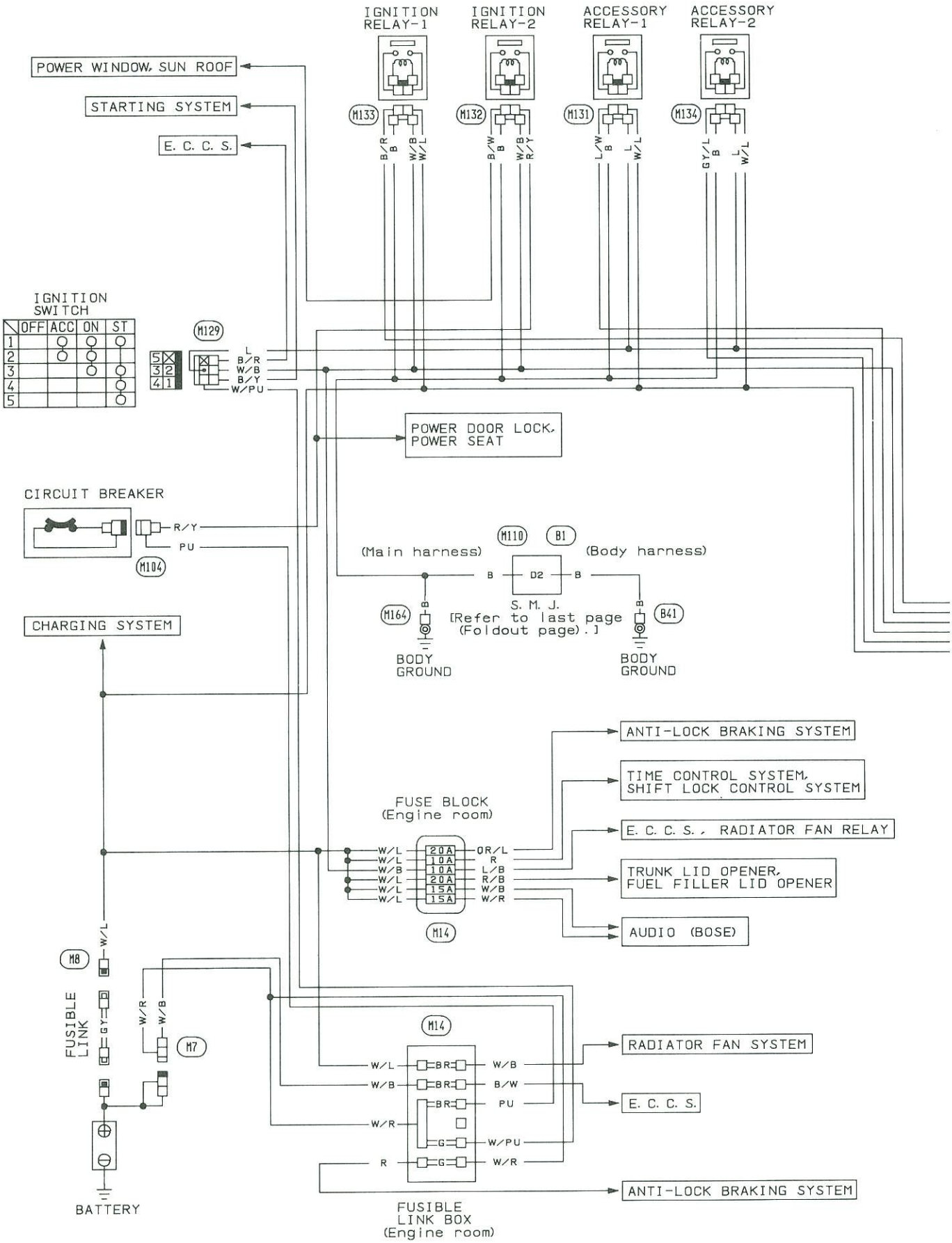
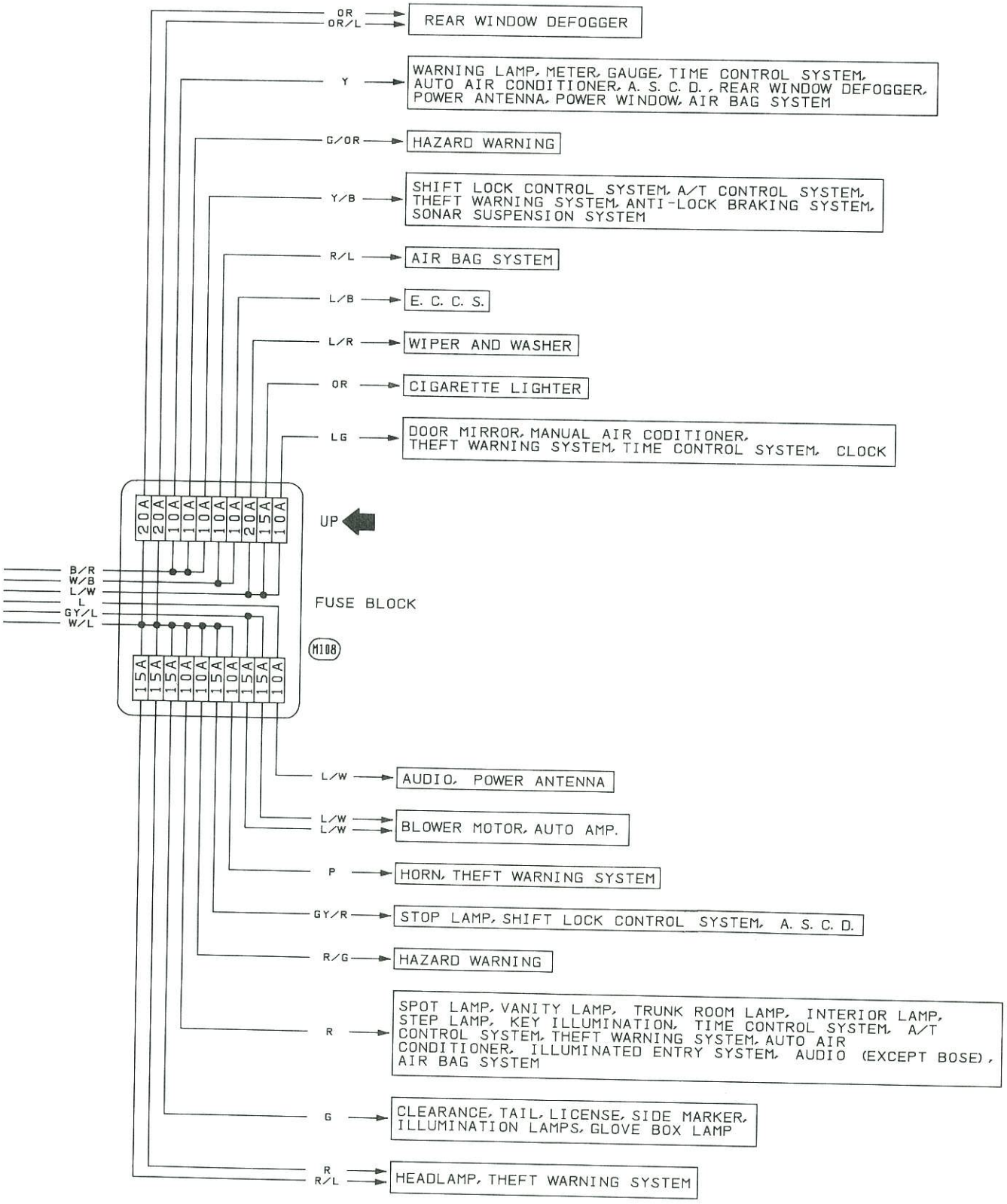
Wiring Diagram



Wiring Diagram (Cont'd)



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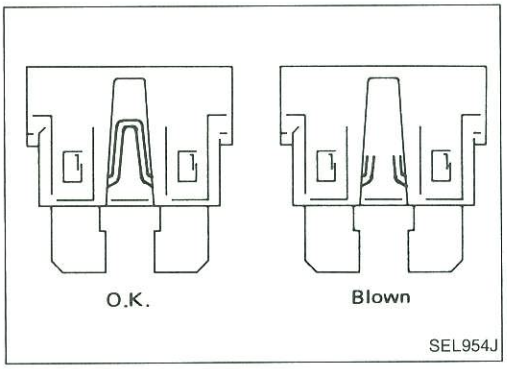
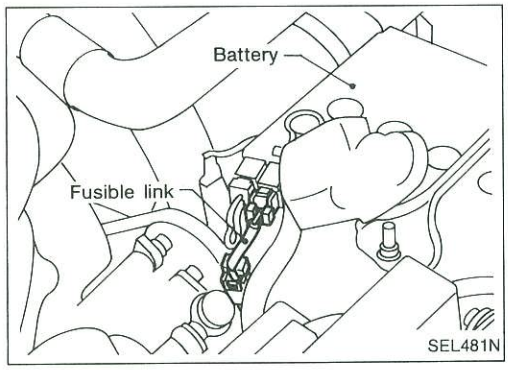
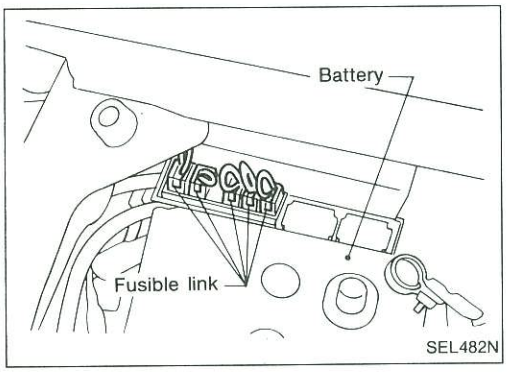


Fuse

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 a critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check these circuits and eliminate cause of problem.**
b. **Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness, or vinyl or rubber parts.**

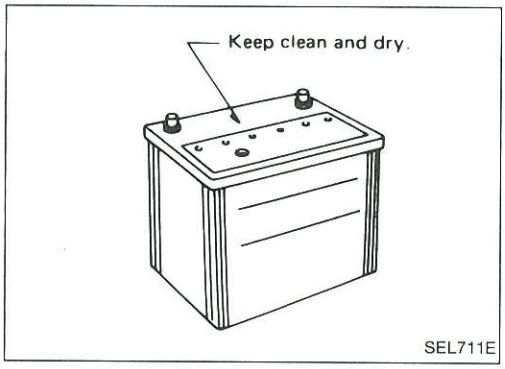
FUSIBLE LINK (Wire type) VARIATION

Color	Maximum amperage (A)
Brown	15
Green	20
Red	30
Black	35
Gray	40

*Temperature condition: Less than 80°C (176°F)

CAUTION:

a. **If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.**
b. **After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.**
c. **Never add distilled water through the hole used to check specific gravity.**

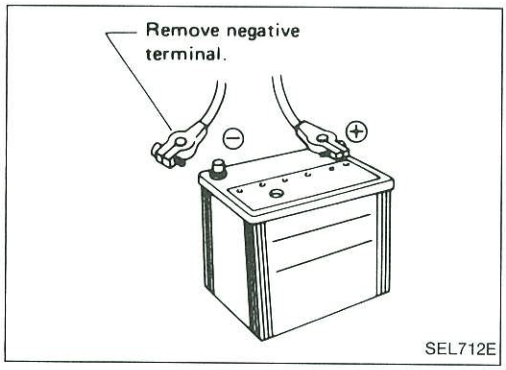


How to Handle Battery

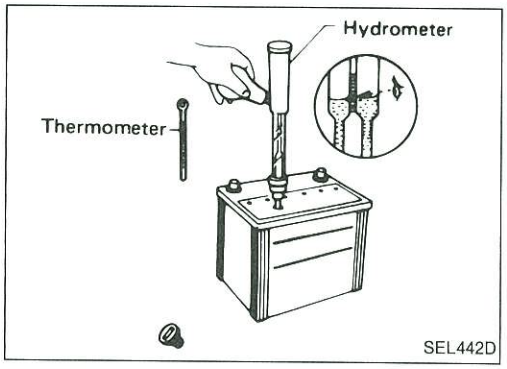
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
  If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.



- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)



- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent overdischarge.

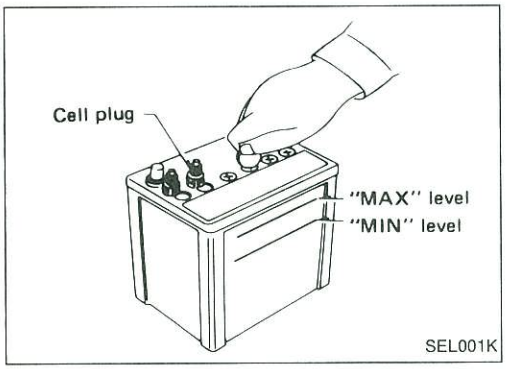
CHECKING ELECTROLYTE LEVEL

WARNING:

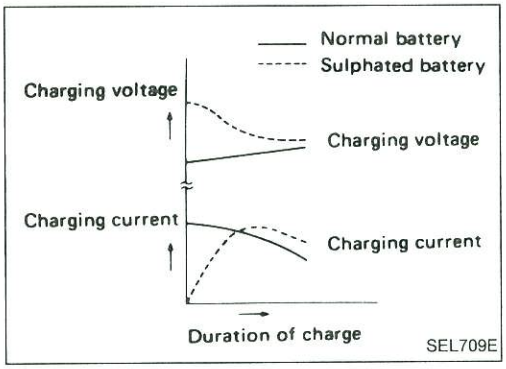
Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.

How to Handle Battery (Cont'd)



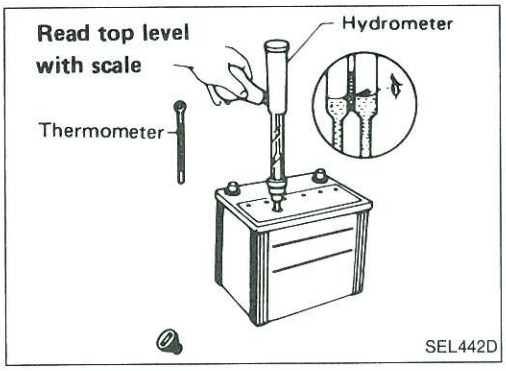
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



SULPHATION

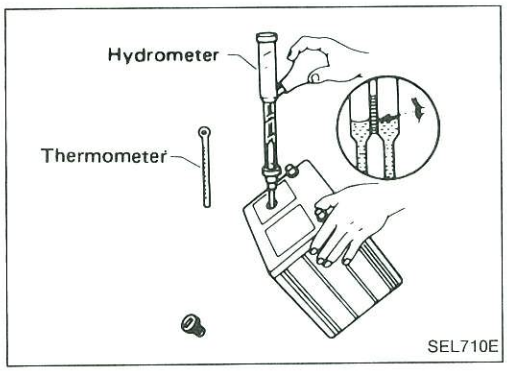
When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

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

1. Read hydrometer and thermometer indications at eye level.



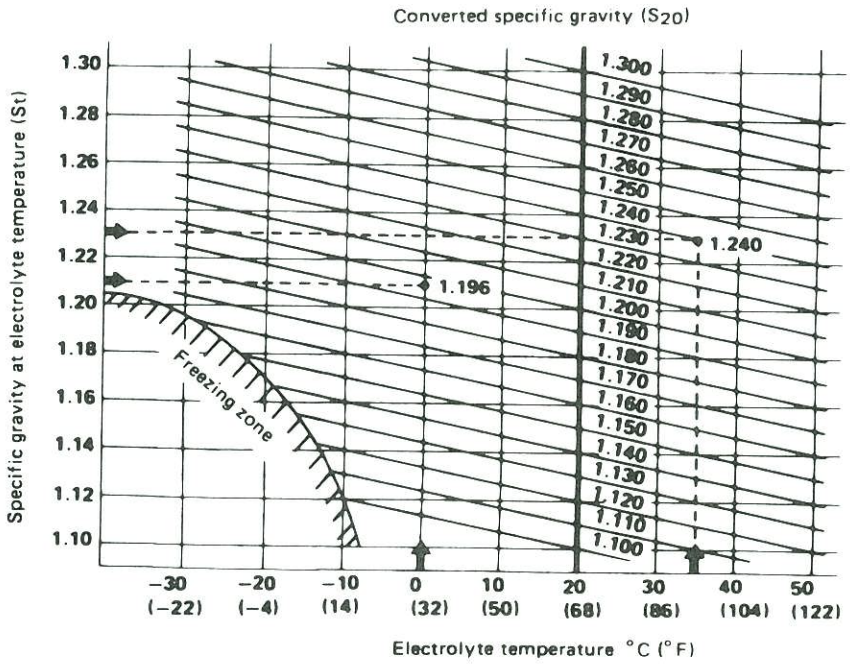
- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

2. Convert into specific gravity at 20°C (68°F).

Example:

- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.

How to Handle Battery (Cont'd)



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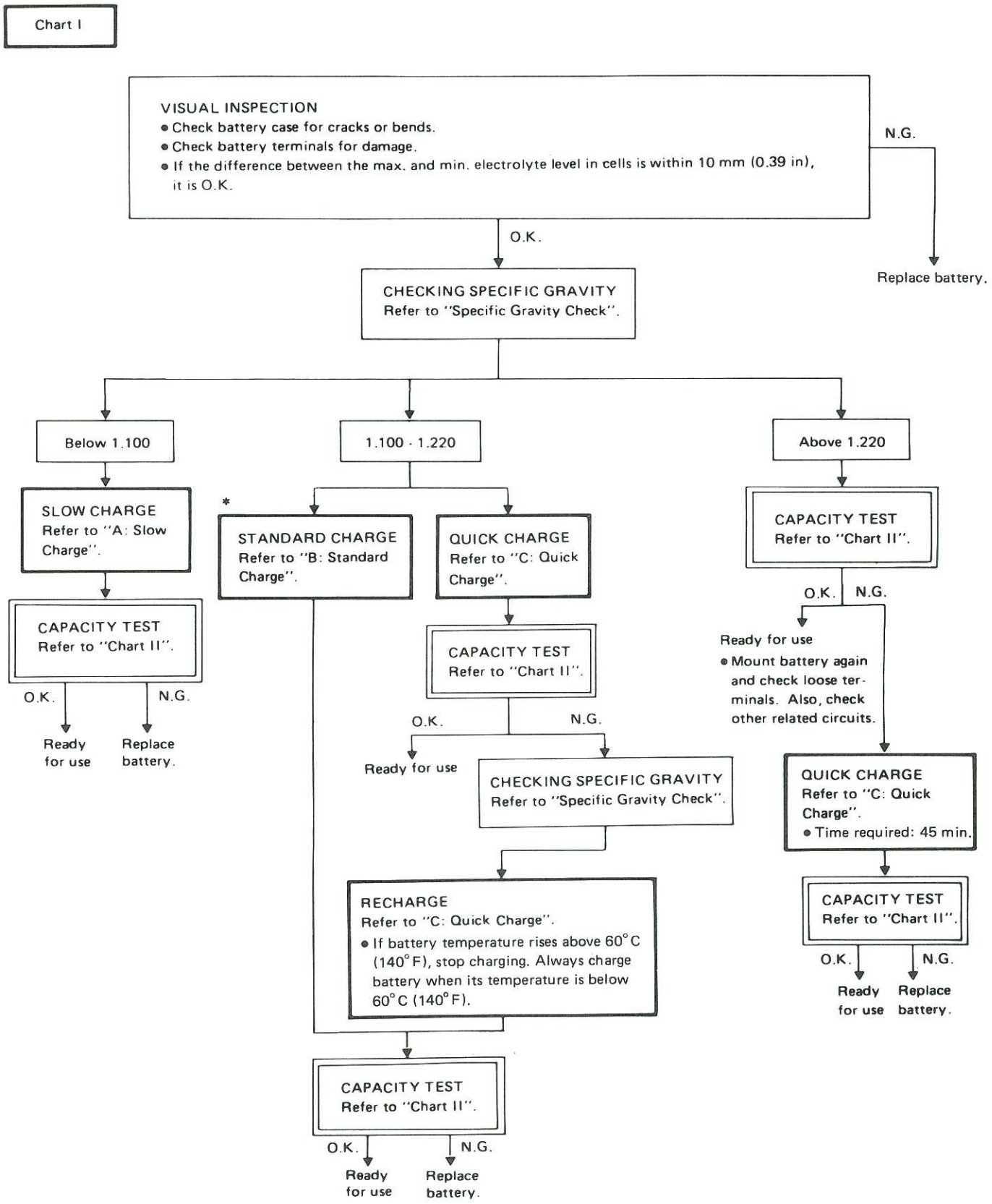
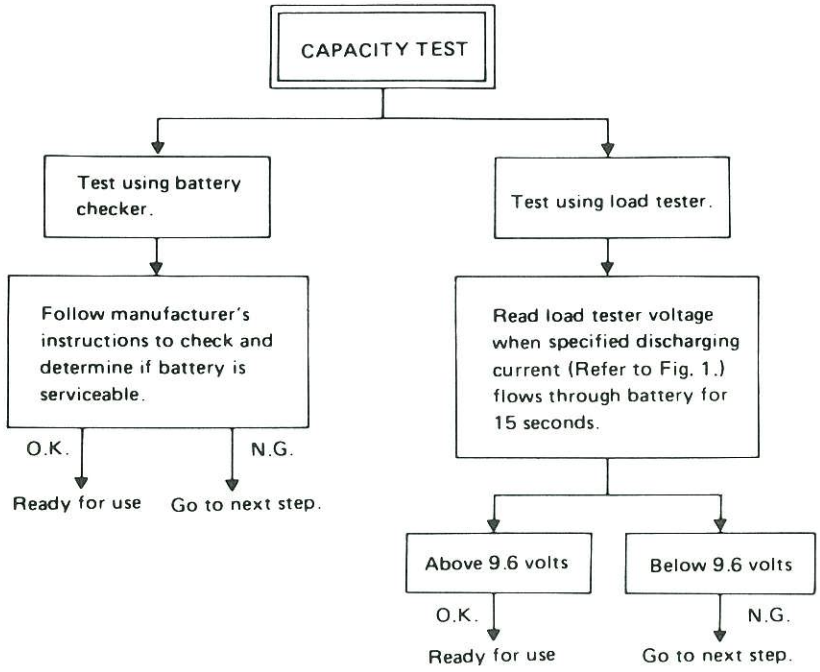
Battery Test and Charging Chart



* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

Battery Test and Charging Chart (Cont'd)

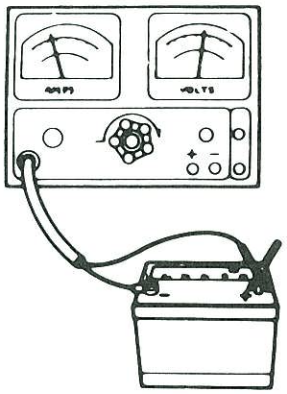
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D26R(L)	195
75D31R(L)	210
95D31R(L)	240
95E41R(L)	300
130E41R(L)	330



SEL697B

Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

Determine initial charging current from specific gravity referring to Fig. 2.

- Charge battery.
- Check charging voltage 30 minutes after starting the battery charge.

12 to 15 volts — O.K. → Continue to charge for 12 hours.

Below 12 volts or above 15 volts — N.G. → Replace battery.

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

Conduct additional charge as per Fig 3, if necessary.

Go to "CAPACITY TEST".

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
Below 1.100	4.0 (A)	5.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	14.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 3 ADDITIONAL CHARGE (Slow charge)

Below 1.150	1.150 - 1.200	1.200 - 1.240	Above 1.240
Charge for 5 hours at initial charging current setting.	Charge for 4 hours at initial charging current setting.	Charge for 2 hours at initial charging current setting.	

Go to "CAPACITY TEST".

CAUTION:

a. **Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
b. **Keep battery away from open flame while it is being charged.**
c. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
d. **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

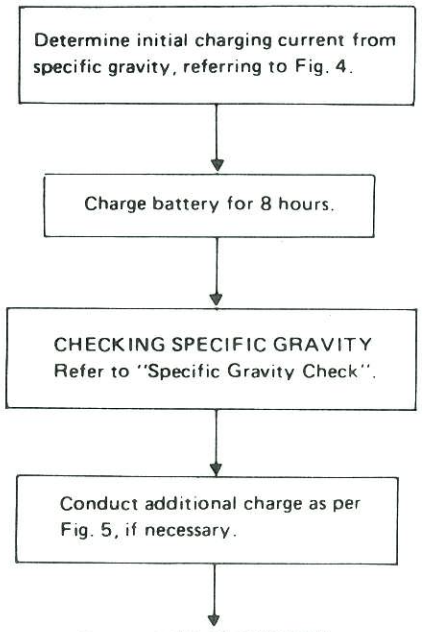
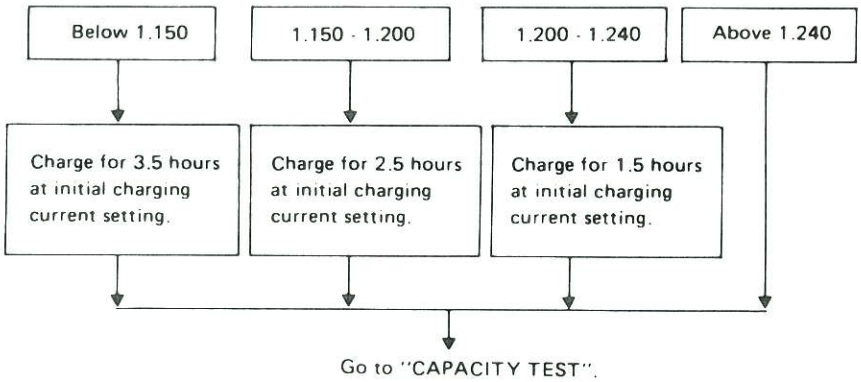


Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
1.100 - 1.130	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	13.0 (A)
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	11.0 (A)
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	9.0 (A)
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	5.0 (A)	7.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 ADDITIONAL CHARGE (Standard charge)



CAUTION:

a. **Do not use standard charge method on a battery whose specific gravity is less than 1.100.**
b. **Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
c. **Keep battery away from open flame while it is being charged.**
d. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
e. **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

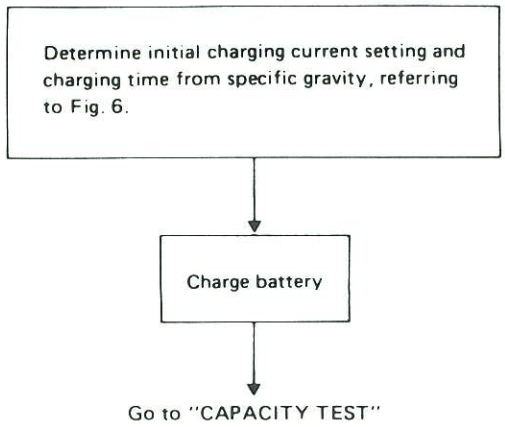


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

BATTERY TYPE / CURRENT [A] / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L) 50D23R(L)	55D23R(L) 65D26R(L) 80D26R(L)	75D31R(L) 95D31R(L) 95E41R(L)	130E41R(L)
	10 (A)	15 (A)	20 (A)	30 (A)	40 (A)
1.100 - 1.130	2.5 hours				
1.130 - 1.160	2.0 hours				
1.160 - 1.190	1.5 hours				
1.190 - 1.220	1.0 hours				
Above 1.220	0.75 hours (45 min.)				

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

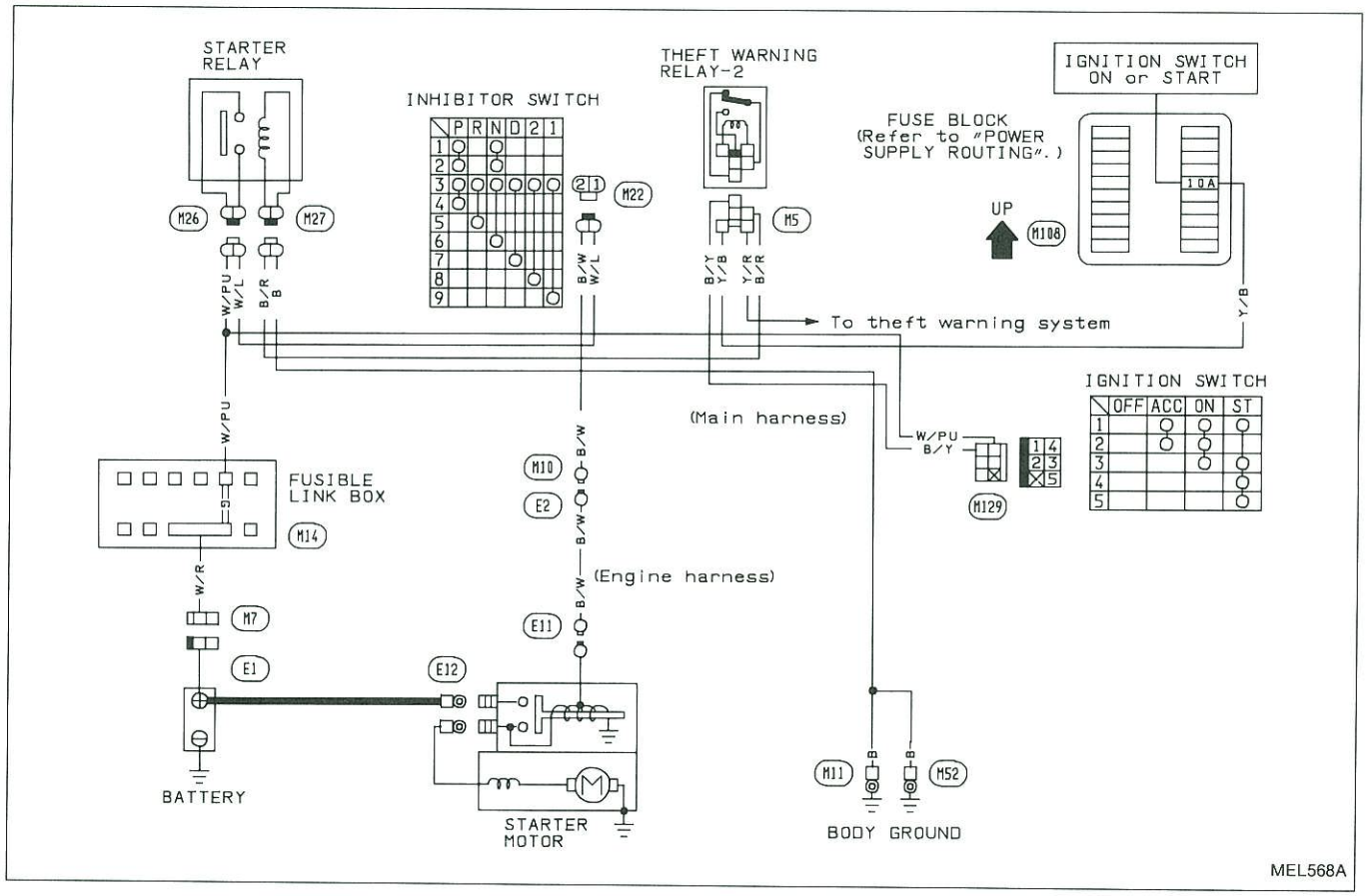
CAUTION:

a. **Do not use quick charge method on a battery whose specific gravity is less than 1.100.**
b. **Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
c. **Keep battery away from open flame while it is being charged.**
d. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
e. **Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.**
   If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
f. **Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.**

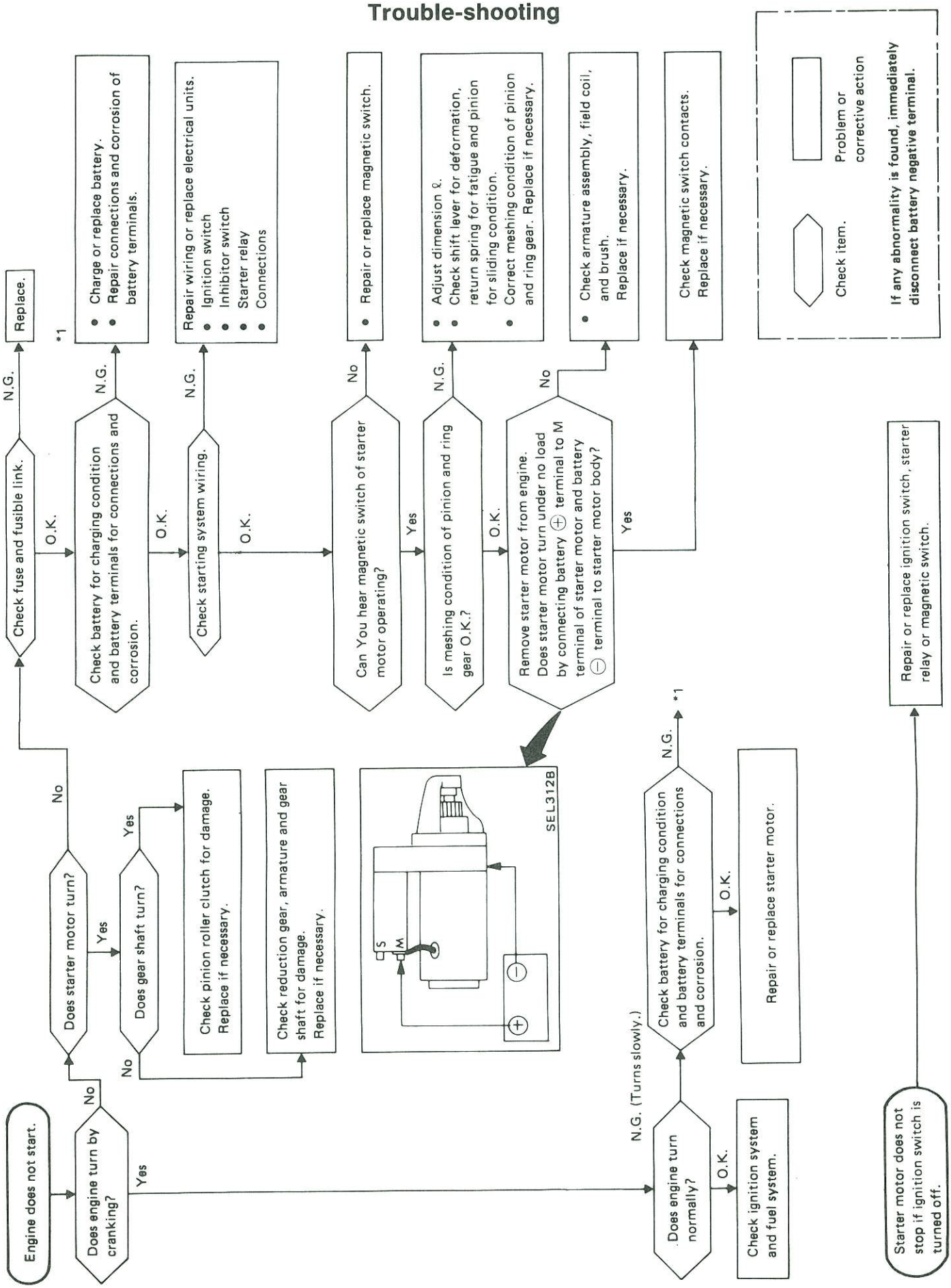
Service Data and Specifications (S.D.S.)

	Standard	Option
Type	65D26R	80D26R
Capacity V-AH	12-65	

Wiring Diagram

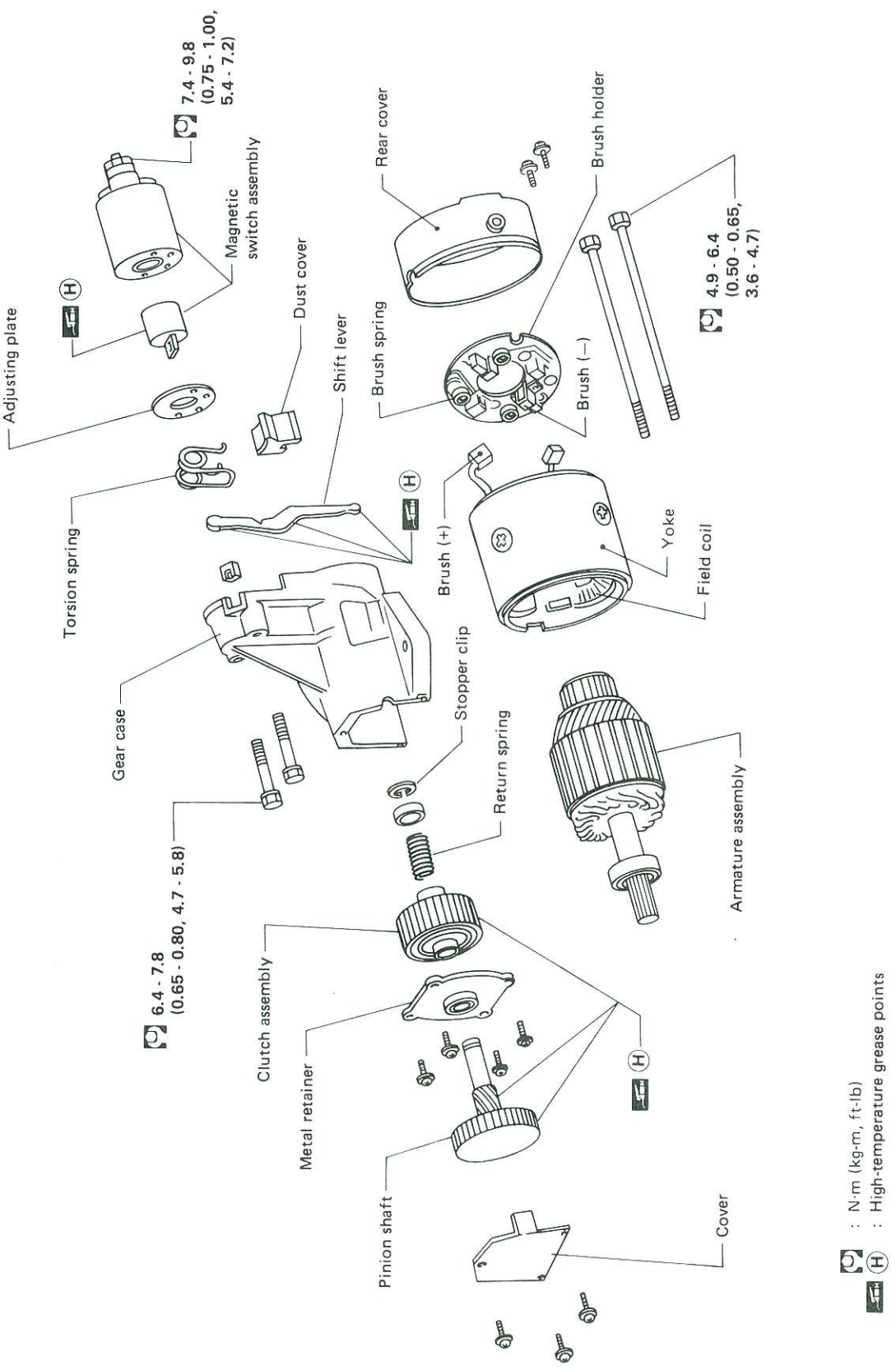


Trouble-shooting



Construction

S114-484A



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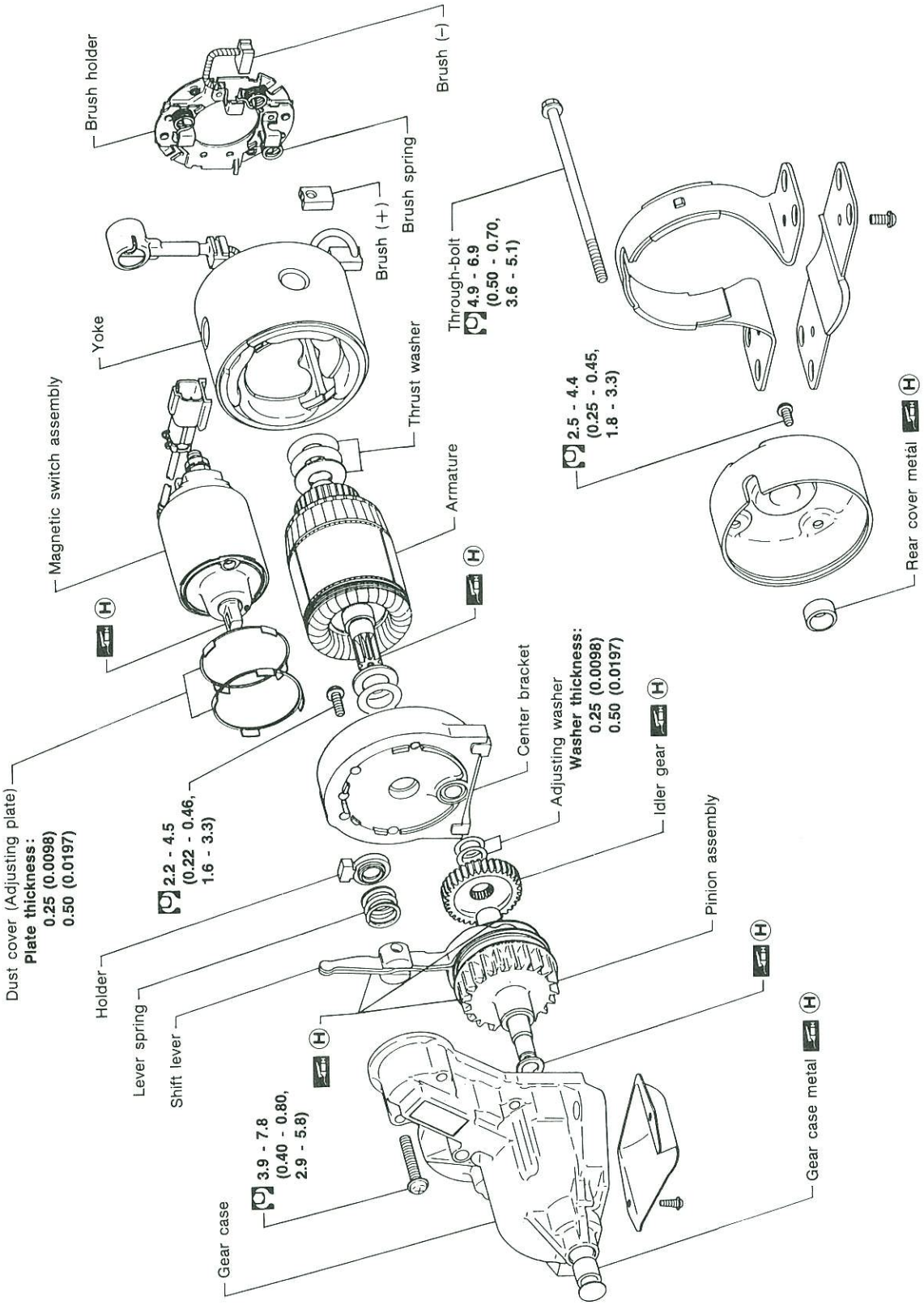
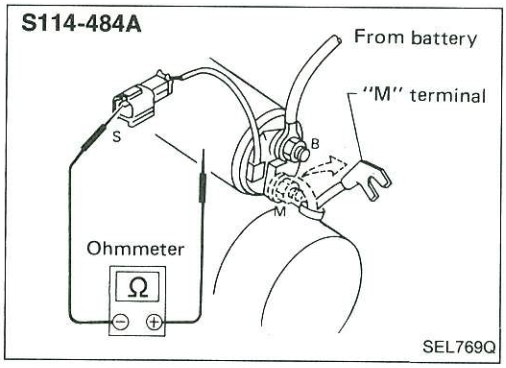
Construction (Cont'd)

M3T26785



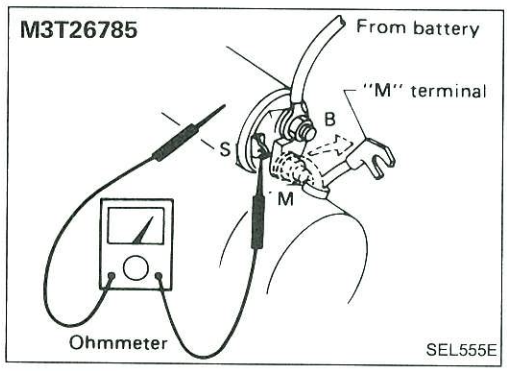
SEL783N

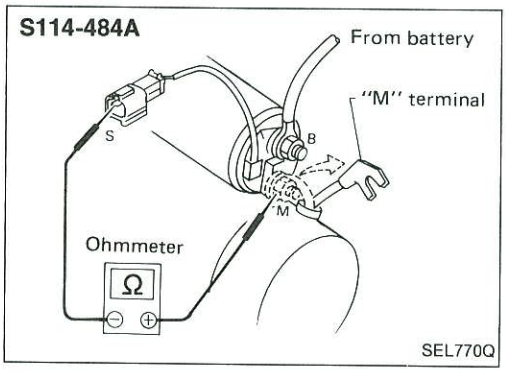


Magnetic Switch Check

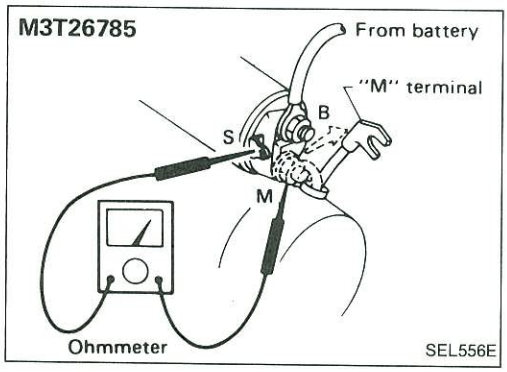
- Disconnect battery ground cable before starting to check.
- Disconnect "M" terminal of starter motor.

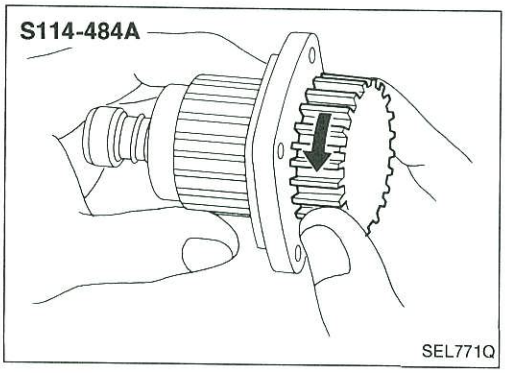
1. Continuity test (between "S" terminal and switch body).
- No continuity ... Replace.





2. Continuity test (between "S" terminal and "M" terminal).
- No continuity ... Replace.



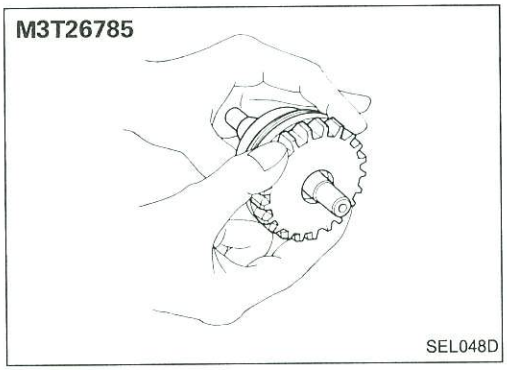


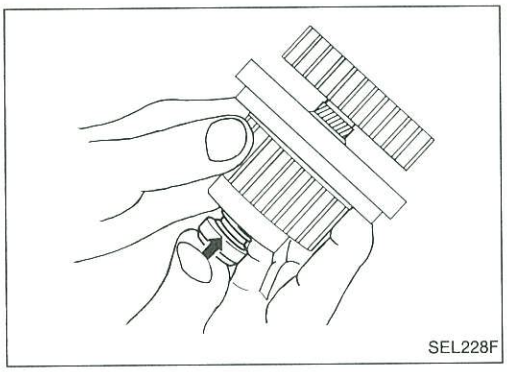
Pinion/Clutch Check

1. Inspect pinion teeth.
- Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)

2. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
- If it does not lock (or locks) in either direction or unusual resistance is evident ... Replace.

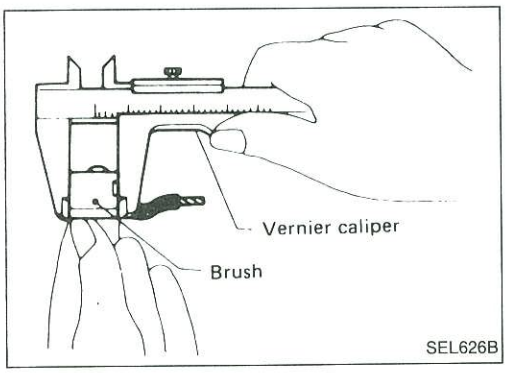
Pinion/Clutch Check (Cont'd)





REDUCTION GEAR TYPE

3. Inspect reduction gear teeth.
- Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
4. Check pinion movement.
- If it is hard to move, apply high-temperature grease or, if necessary, replace.



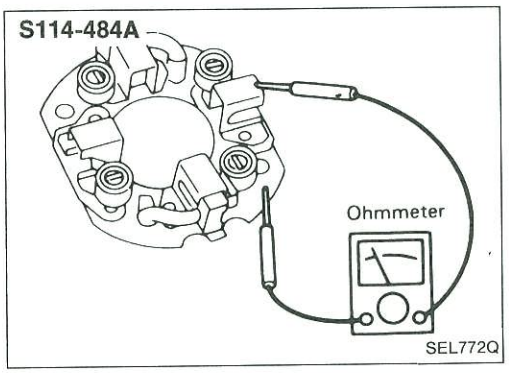
Brush Check

BRUSH

Check wear of brush.

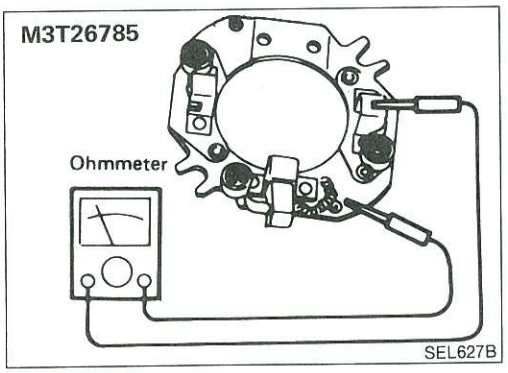
Wear limit length:
Refer to S.D.S.

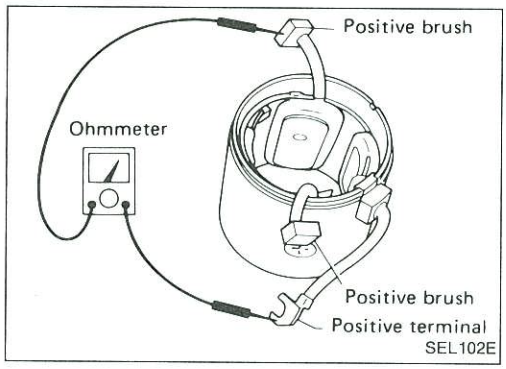
- Excessive wear ... Replace.



BRUSH HOLDER

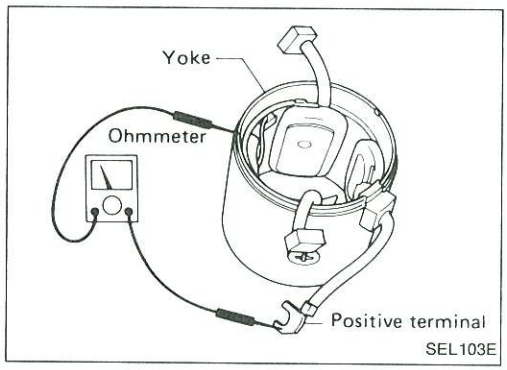
1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Continuity exists. ... Replace.
2. Check brushes to see if they move smoothly.
- If brush holder is bent, replace it; if sliding surface is dirty, clean.



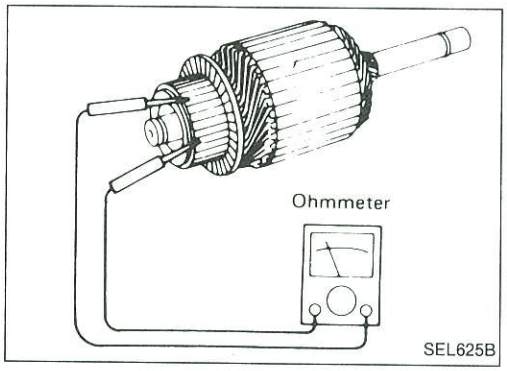


Field Coil Check

1. Continuity test (between field coil positive terminal and positive brushes).
- No continuity ... Replace yoke.

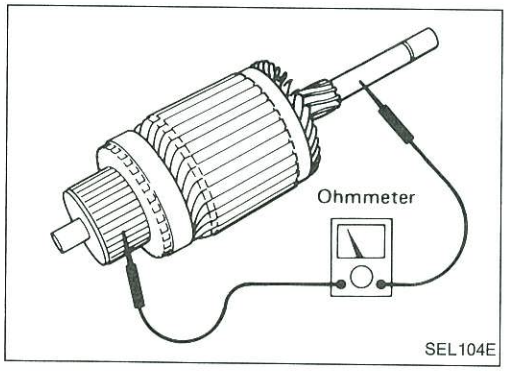


2. Insulation test (between field coil positive terminal and yoke).
- Continuity exists. ... Replace yoke.

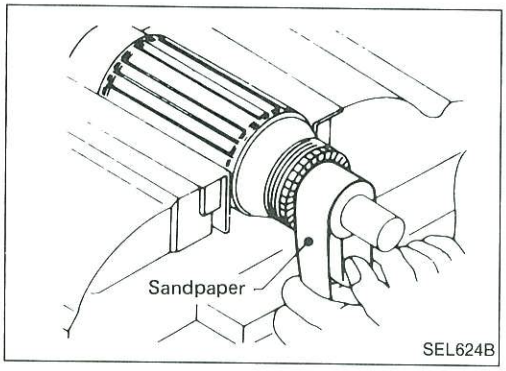


Armature Check

1. Continuity test (between two segments side by side).
- No continuity ... Replace.

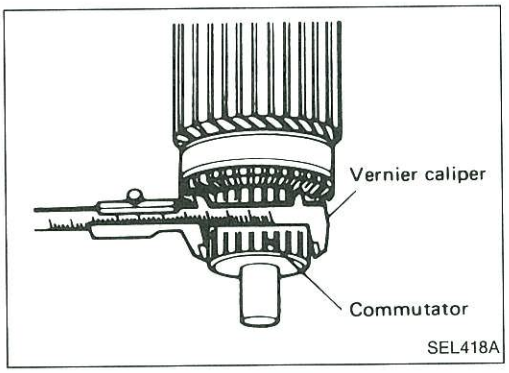


2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.

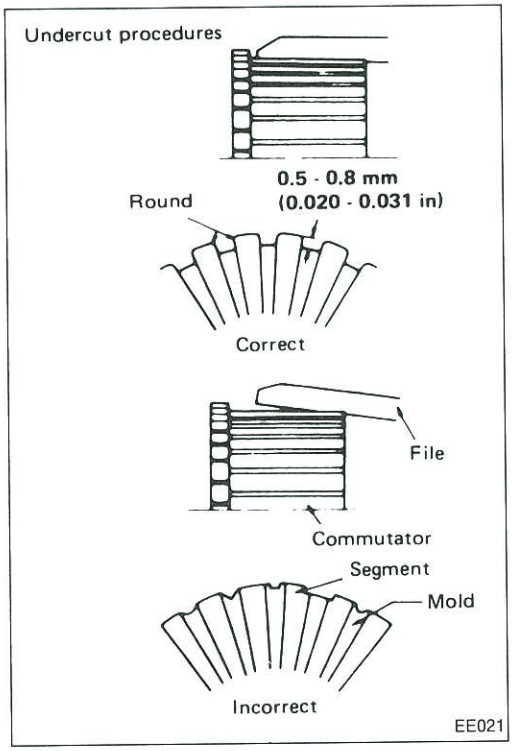


3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 sandpaper.

Armature Check (Cont'd)



4. Check diameter of commutator.
   Commutator minimum diameter:
   Refer to S.D.S.
- Less than specified value ... Replace.



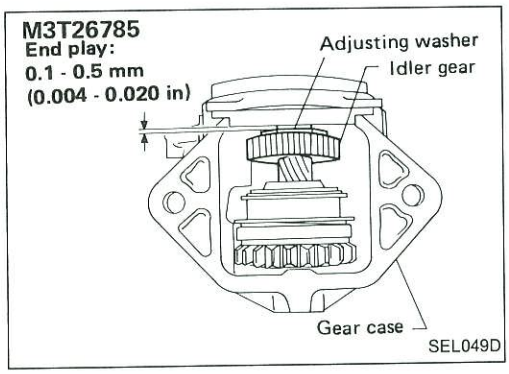
5. Check depth of insulating mold from commutator surface.
- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in)

Assembly

Carefully observe the following instructions.

HIGH-TEMPERATURE GREASE POINT

- Rear metal cover
- Gear metal case
- Frictional pinion surface
- Moving portion of shift lever
- Magnetic switch plunger



a. **After assembling gear case, pinion assembly, idler gear, adjusting washers and center bracket, turn idler gear with your hand in axial direction and adjust end play to the 0.1 to 0.5 mm (0.004 to 0.020 in) range using adjusting washer(s).**
b. **Check pinion to see if its engagement length is correct.**

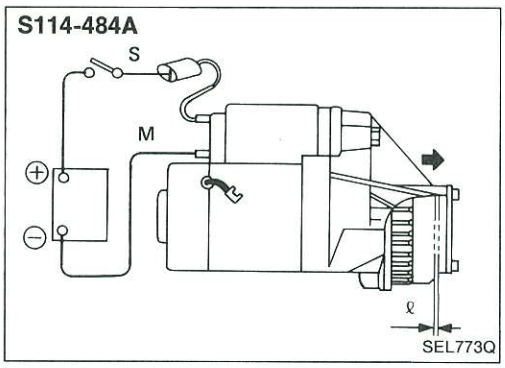
Assembly (Cont'd)

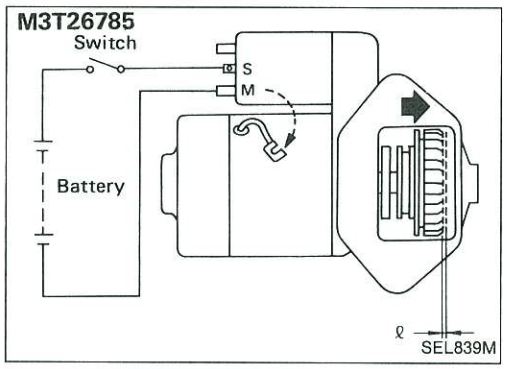
PINION PROTRUSION LENGTH ADJUSTMENT

Reduction gear type

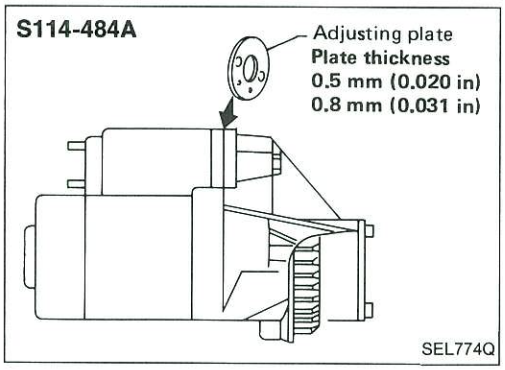
Compare movement "ℓ" in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

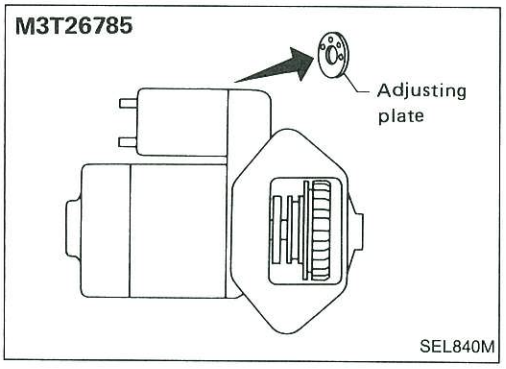
Movement "ℓ":
Refer to S.D.S.





- Not in the specified value ... Adjust using adjusting plate.



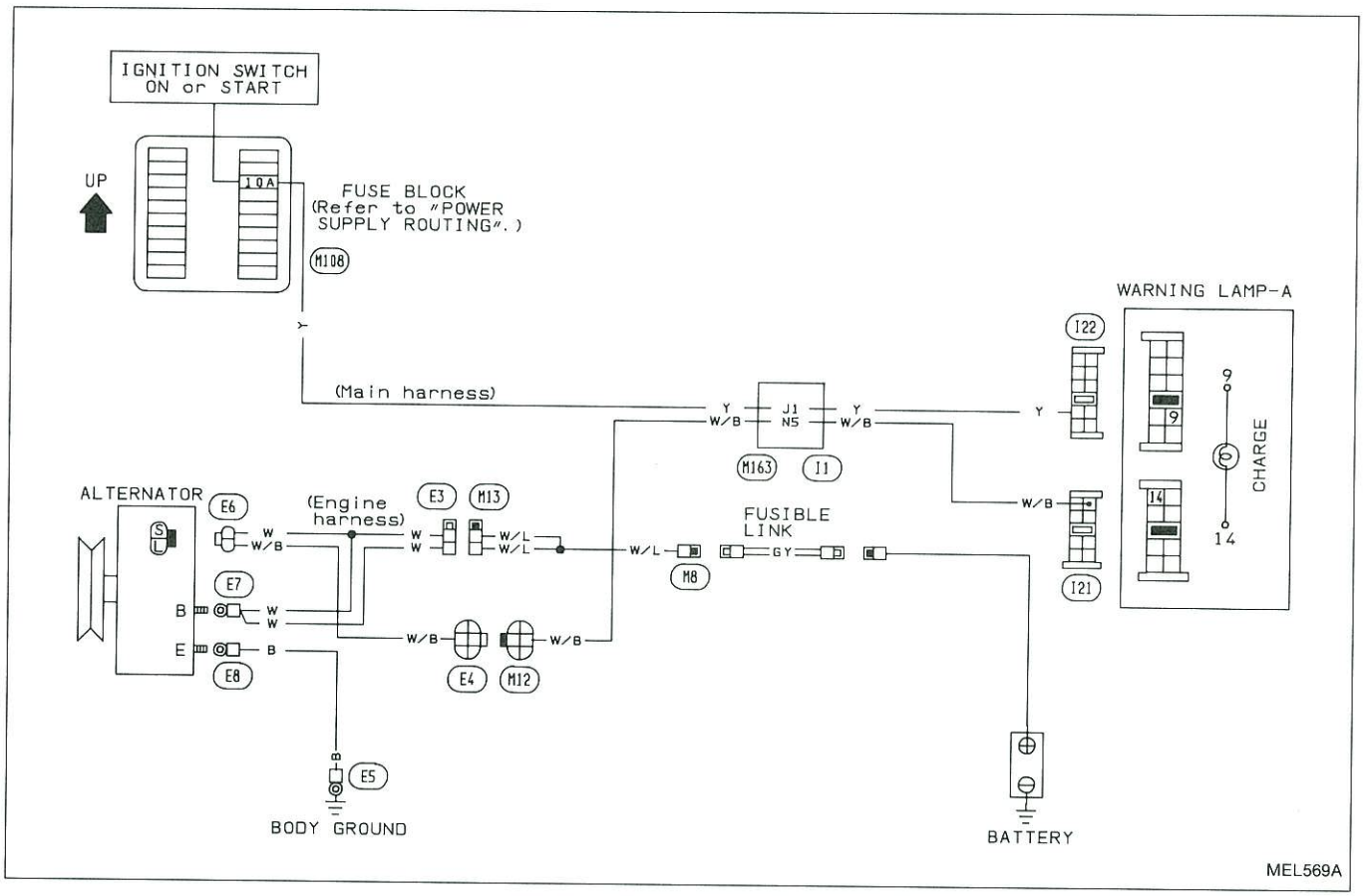


Service Data and Specifications (S.D.S.)

STARTER MOTOR

Type		S114-484A	M3T26785
		HITACHI	MITSUBISHI
		Reduction gear type	
System voltage	V	12	
No-load			
Terminal voltage	V	11.0	
Current	A	Less than 100	70
Revolution	rpm	More than 3,000	2,200
Minimum diameter of commutator	mm (in)	32.0 (1.260)	38.1 (1.500)
Minimum length of brush	mm (in)	12.0 (0.472)	11.5 (0.453)
Brush spring tension	N (kg, lb)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)
Movement "ℓ" in height of pinion assembly	mm (in)	0.05 - 0.8 (0.0020 - 0.0315)	0.3 - 2.0 (0.012 - 0.079)
Clearance of bearing metal and armature shaft	mm (in)	—	—
Clearance "ℓ" between pinion front edge and pinion stopper	mm (in)	—	—

Wiring Diagram

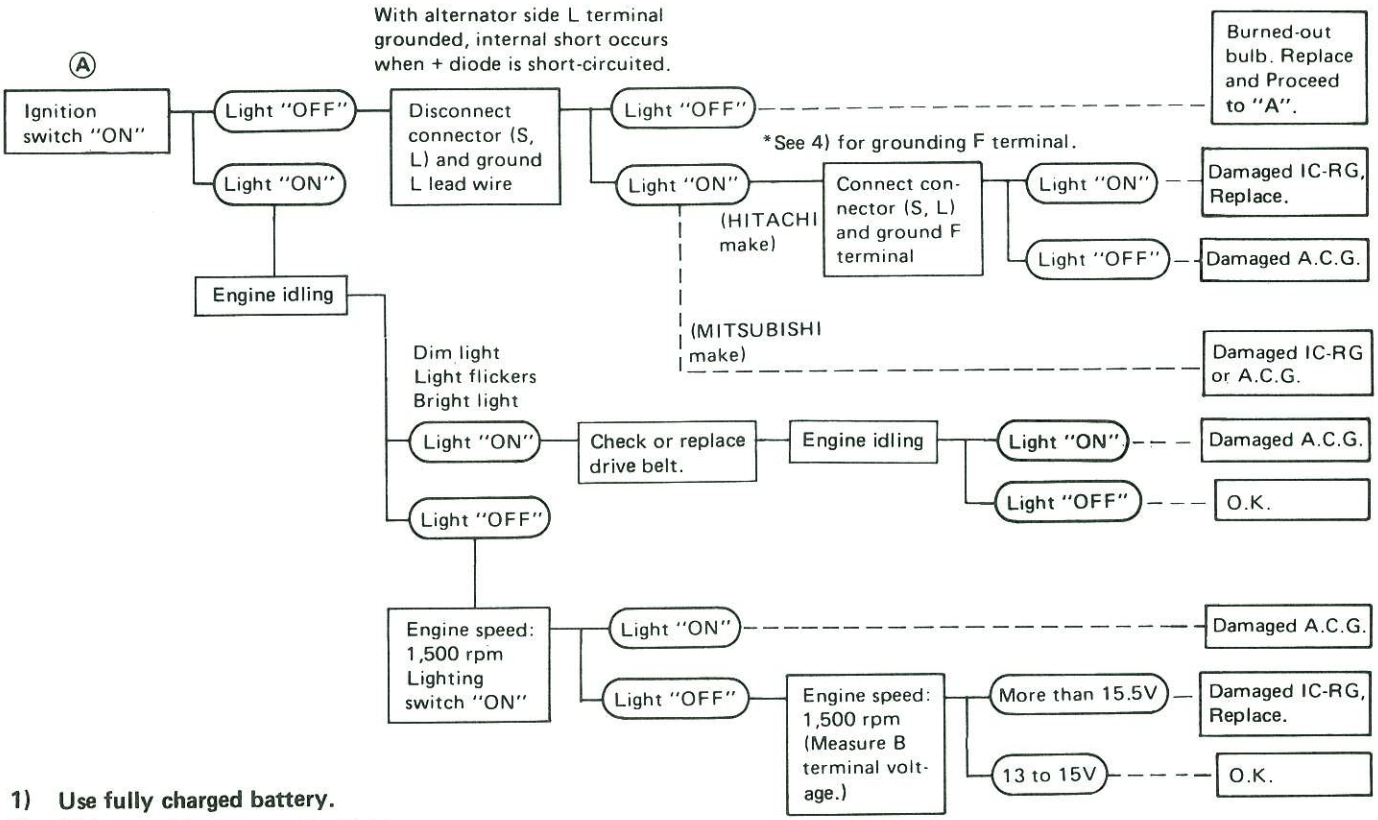


Trouble-shooting

Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

Before starting trouble-shooting, inspect the fusible link.

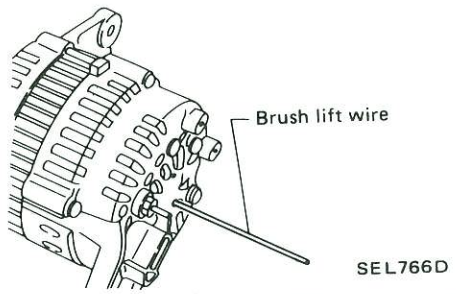
WITH IC REGULATOR



1) **Use fully charged battery.**
2) **Light : Charge warning light**
   A.C.G. : Alternator parts except IC regulator
   IC-RG : IC regulator
   O.K. : IC alternator is in good condition.
3) **When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts.**
4) ***Method of grounding F terminal (HITACHI make only)**

Gasoline engine model

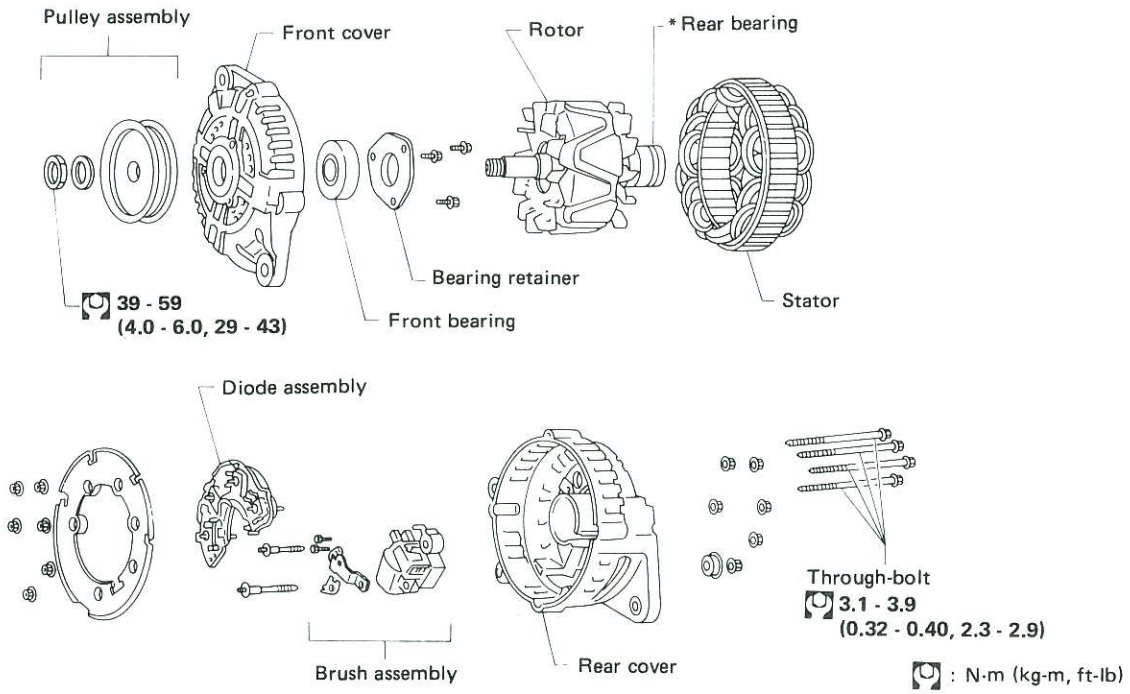
Contact tip of wire with brush and attach wire to alternator body.



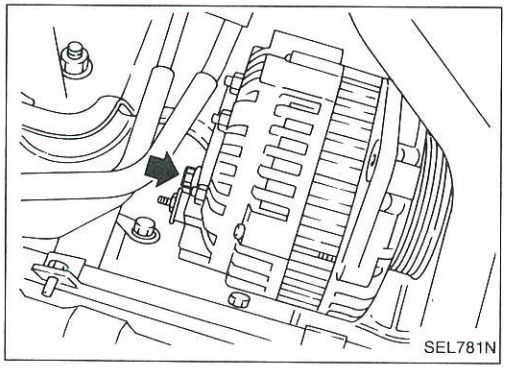
5) **Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.**

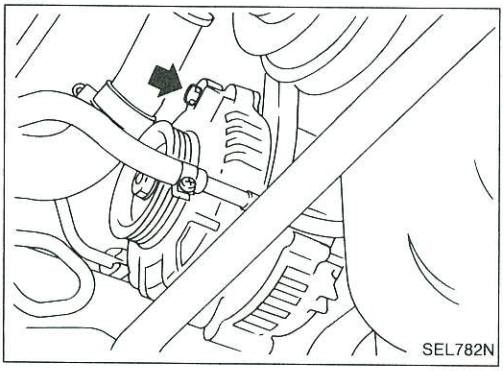
Construction

LR190-714



***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.



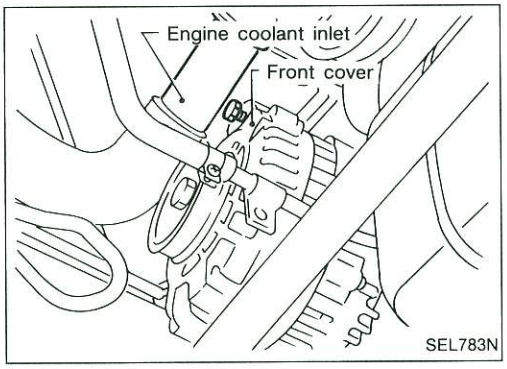


Removal and Installation

REMOVAL

1. Loosen alternator belt.
2. Remove alternator adjusting bar.
3. Remove harness connector and cable from alternator.
4. Remove alternator mounting rear bolt.
5. Loosen alternator mounting front bolt.

Removal and Installation (Cont'd)

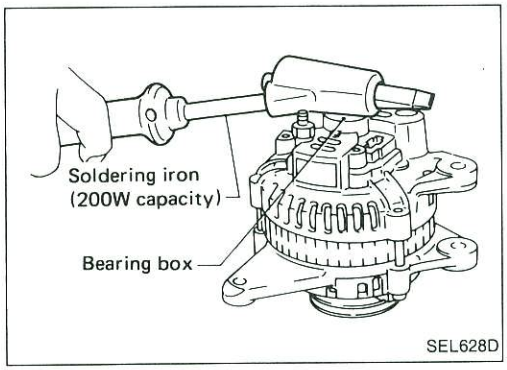


6. Remove alternator with alternator front mounting bolt.

Front alternator mounting bolt cannot be removed or installed separately due to insufficient clearance between alternator front cover and engine coolant inlet.

INSTALLATION

- Installation procedure is in reverse order of removal.

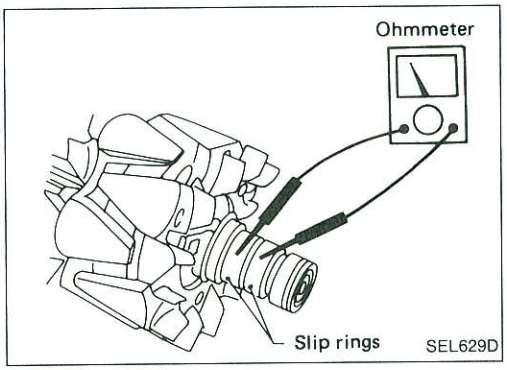


Disassembly

REAR COVER REMOVAL

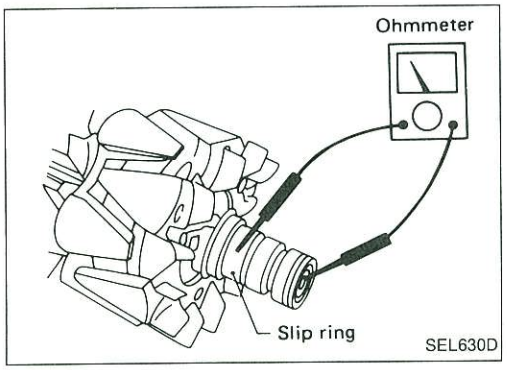
CAUTION:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron. Do not use a heat gun, as it can damage diode assembly.



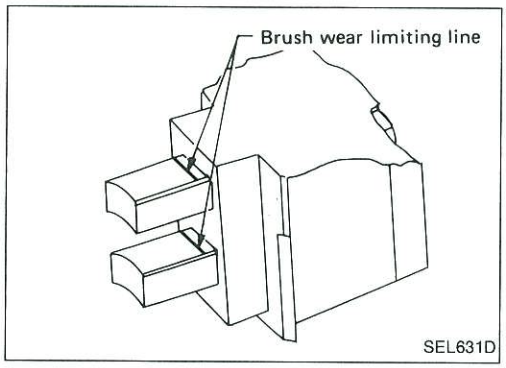
Rotor Slip Ring Check

1. Continuity test
   - No continuity ... Replace rotor.



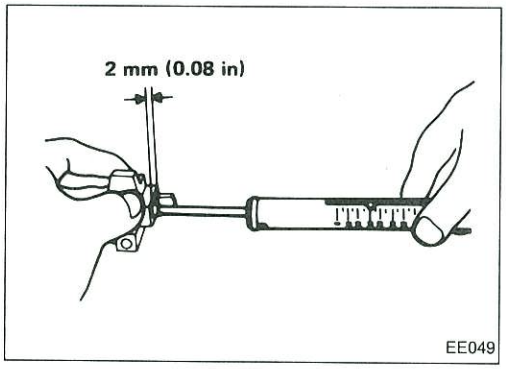
2. Insulator test
   - Continuity exists ... Replace rotor.
3. Check slip ring for wear.

   Slip ring minimum outer diameter:
   Refer to S.D.S.

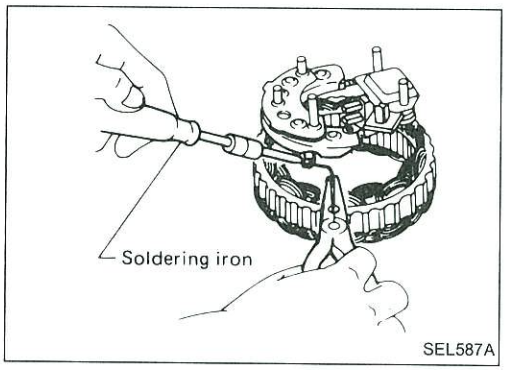


Brush Check

1. Check smooth movement of brush.
   - Not smooth ... Check brush holder and clean.
2. Check brush for wear.
   - Replace brush if it is worn down to the limit line.

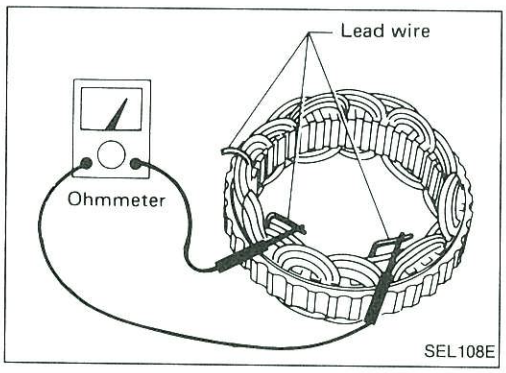


3. Check brush lead wire for damage.
   - Damaged ... Replace.
4. Check brush spring pressure.
   Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.
   Spring pressure:
   Refer to S.D.S.
   - Not within the specified values ... Replace.

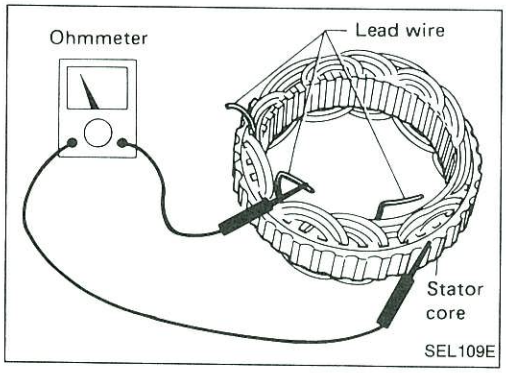


Stator Check

To test the stator or diode, you must separate them by unsoldering the connecting wires.
CAUTION:
Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.



1. Continuity test
   - No continuity ... Replace stator.



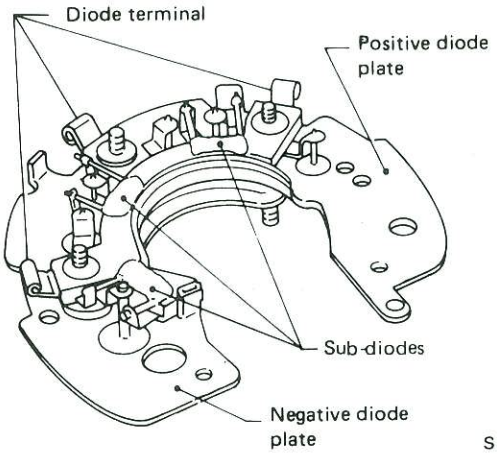
2. Ground test
   - Continuity exists ... Replace stator.

Diode Check

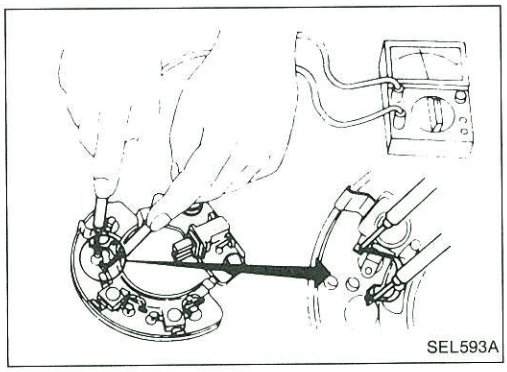
MAIN DIODES

- Use an ohmmeter to check condition of diodes as indicated in chart below.
- If any of the test results is not satisfactory, replace diode assembly.

	Ohmmeter probes		Continuity
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes



SEL768D


SEL593A

SUB-DIODES

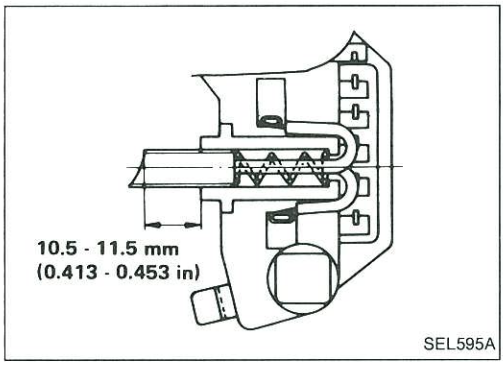
- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

Assembly

Carefully observe the following instructions.

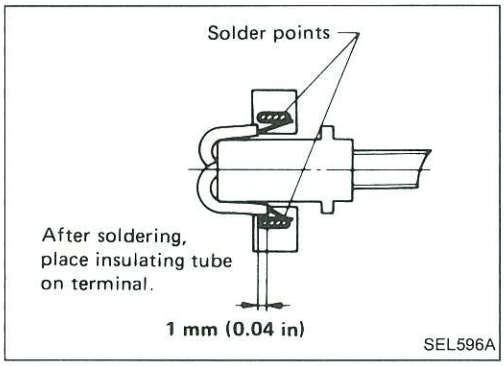
- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.

Assembly (Cont'd)



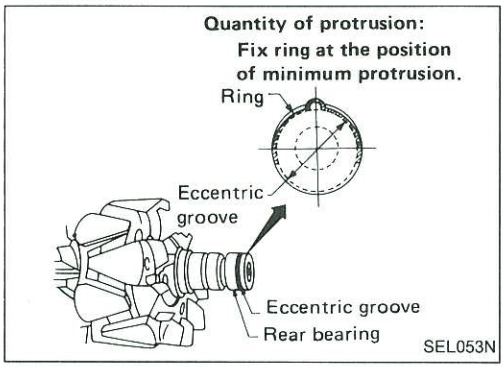
WHEN SOLDERING BRUSH LEAD WIRE

(1) Position brush so that it extends 10.5 - 11.5 mm (0.413 - 0.453 in) from brush holder.



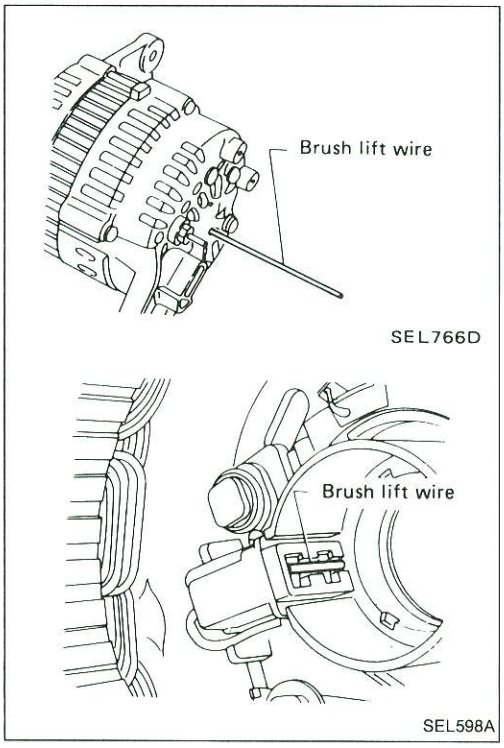
(2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.



RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.



REAR COVER INSTALLATION

(1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.

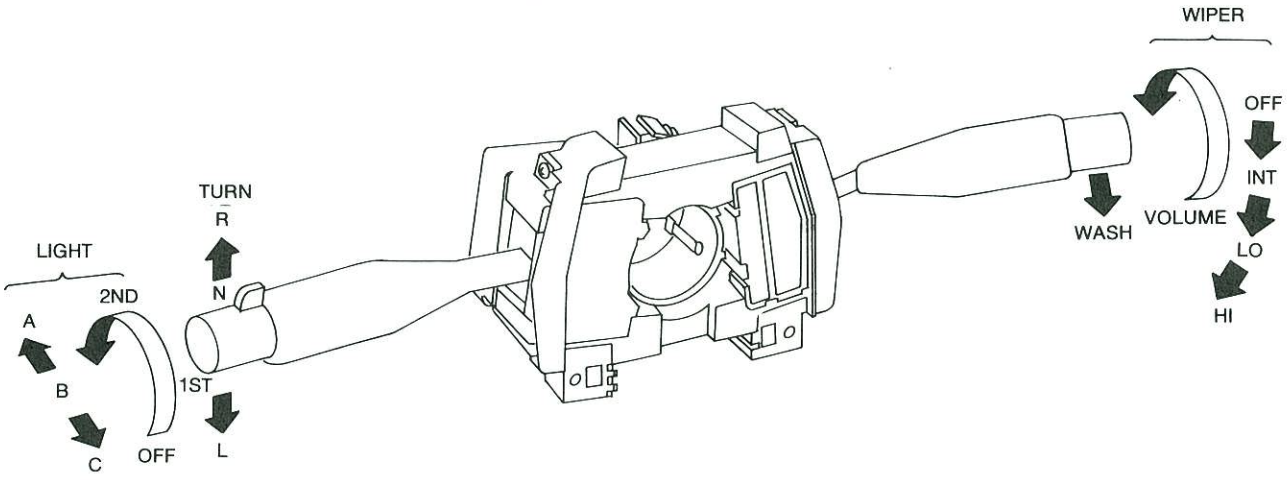
(2) After installing front and rear sides of alternator, pull out brush lift wire.

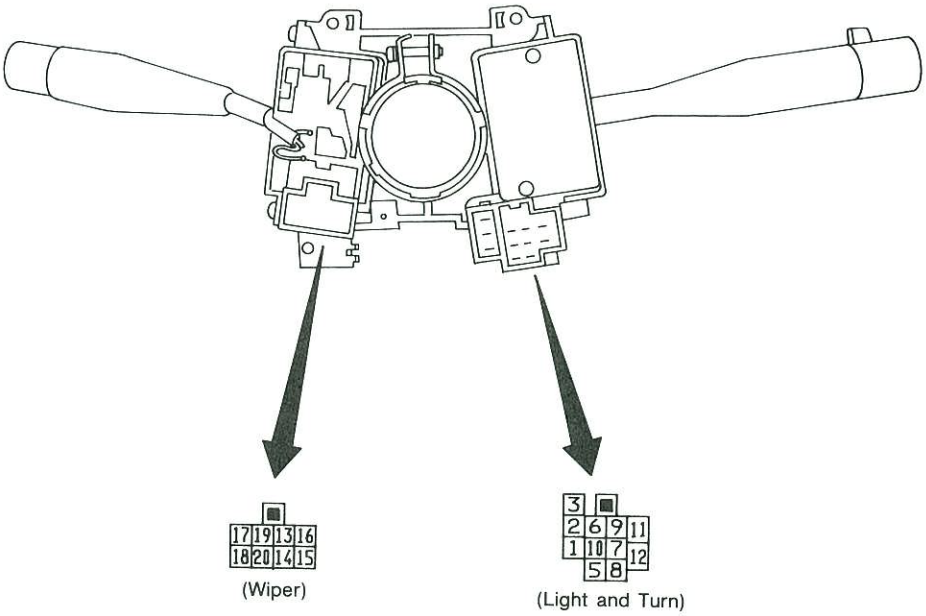
Service Data and Specifications (S.D.S.)

ALTERNATOR

Type		LR190-714 HITACHI make
Applied engine		VG30E
Nominal rating	V-A	12-90
Ground polarity		Negative
Minimum revolution under no-load (when 13.5 volts is applied)	rpm	Less than 950
Hot output current	A/rpm	More than 22/1,300 More than 65/2,500 More than 80/5,000
Regulated output voltage	V	14.1 - 14.7
Minimum length of brush	mm (in)	More than 6.0 (0.236)
Brush spring pressure	N (g, oz)	1.471 - 3.432 (150 - 350, 5.29 - 12.34)
Slip ring minimum outer diameter	mm (in)	More than 30.6 (1.205)

Check





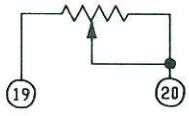
LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○		○
7			○			○	○	○	○
8			○			○	○	○	○
9			○			○	○		○
10			○			○	○	○	○
11				○	○	○	○	○	○
12				○	○	○	○	○	○

WIPER SWITCH

	OFF	INT	LO	HI	WASH
13	○	○			
14	○	○	○		
15		○			
16				○	
17		○	○	○	○
18					○

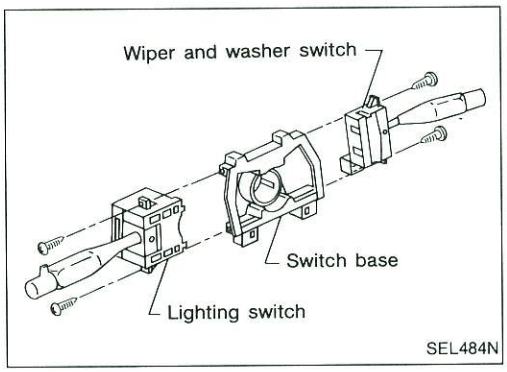
INTERMITTENT WIPER VOLUME



TURN SIGNAL SWITCH

	R	N	L
1	○		○
2	○		
3			○

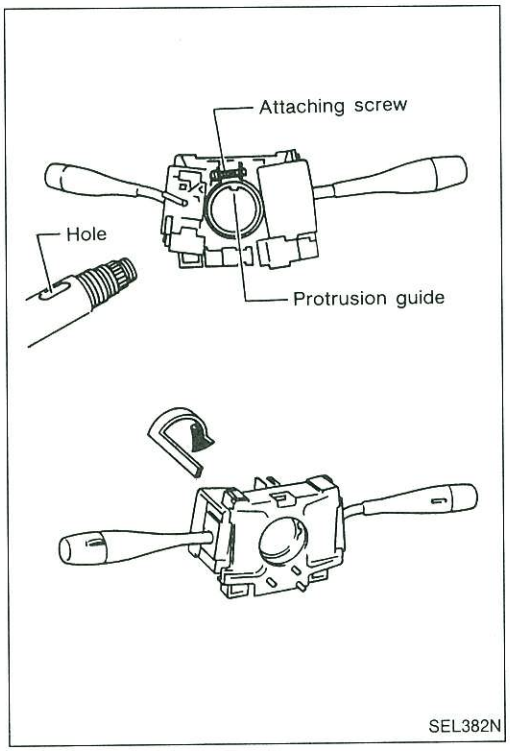
SEL483N



Replacement

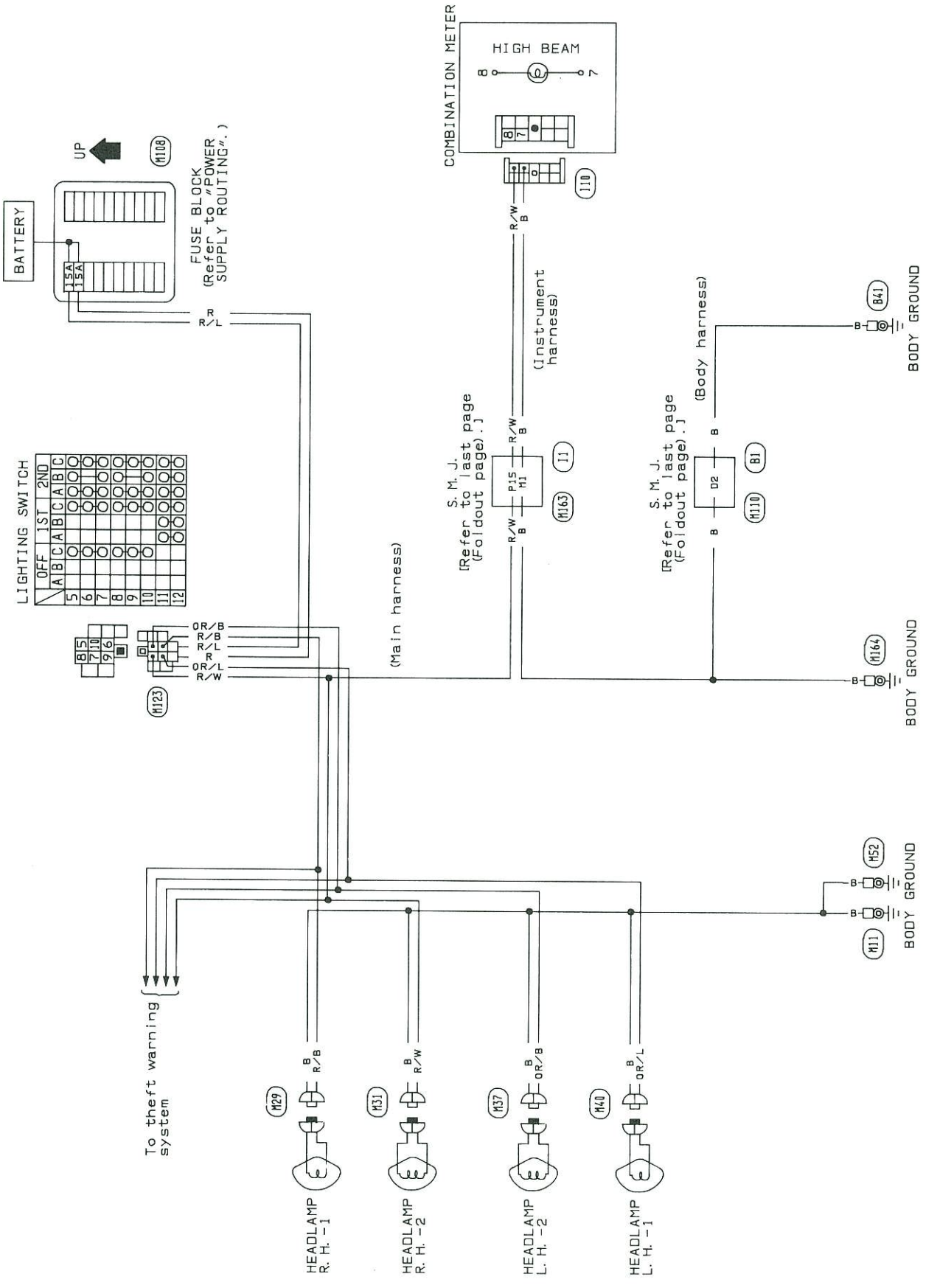
For removing/installing air bag module and spiral cable, refer to BF section.

- Each switch can be replaced without removing combination switch base.

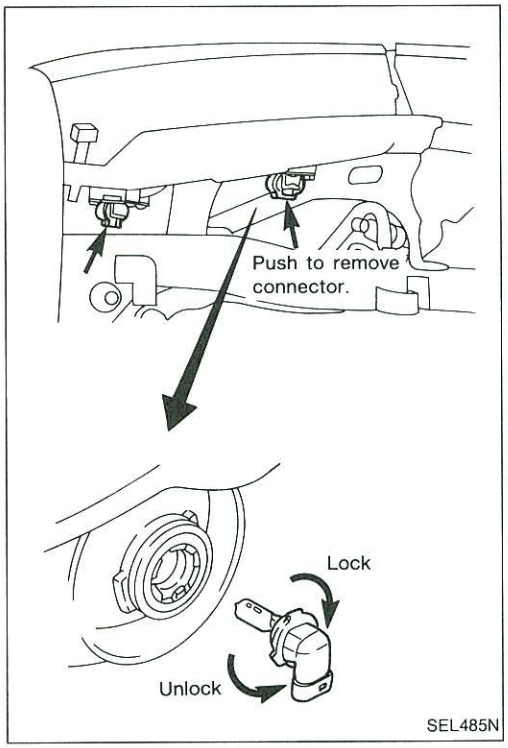


- To remove combination switch base, remove base attaching screw and turn after pushing on it.

Wiring Diagram



MEL570A



Bulb Replacement

The headlamp is a semi-sealed beam type which uses a replaceable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.

- **Grasp only the plastic base when handling the bulb. Never touch the glass envelope.**

1. Disconnect battery negative cable.
2. Disconnect harness 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.
5. Install in the reverse order of removal.

CAUTION:

- **Do not leave the bulb out of the headlamp reflector for a long period of time as dust, moisture, smoke, etc. may enter the headlamp body and affect the performance of the headlamp. Thus, the headlamp bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed.**

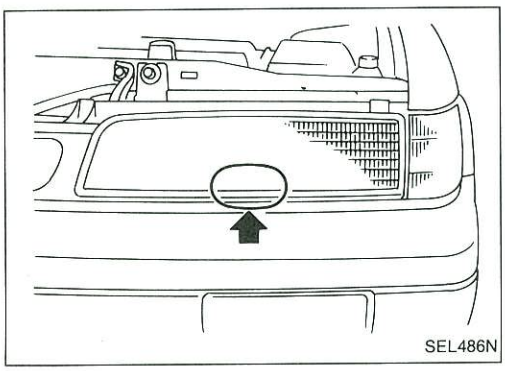
Aiming Adjustment

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

a. **Keep all tires inflated to correct pressures.**
b. **Place vehicle and tester on one and same flat surface.**
c. **See that there is no-load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).**



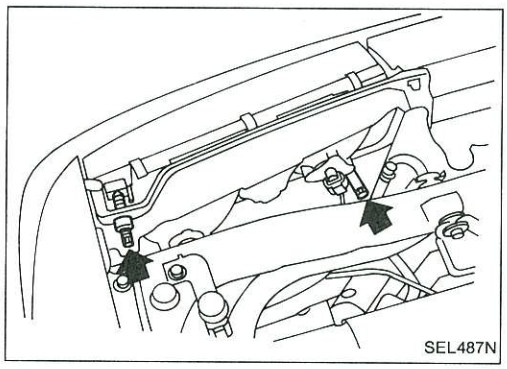
AIMER ADJUSTMENT MARK

When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

Example:

4H2V
- 4H: Horizontal side: 4
- 2V: Vertical side: 2

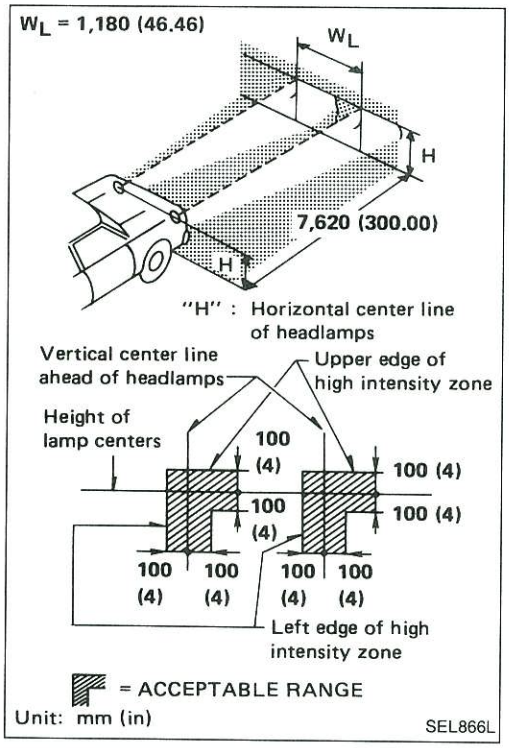
Aiming Adjustment (Cont'd)


SEL487N

LOW BEAM

1. Turn headlamp low beam on.
2. Use adjusting screws to perform aiming adjustment.

- **First tighten the adjusting screw all the way and then make adjustment by loosening the screw.**

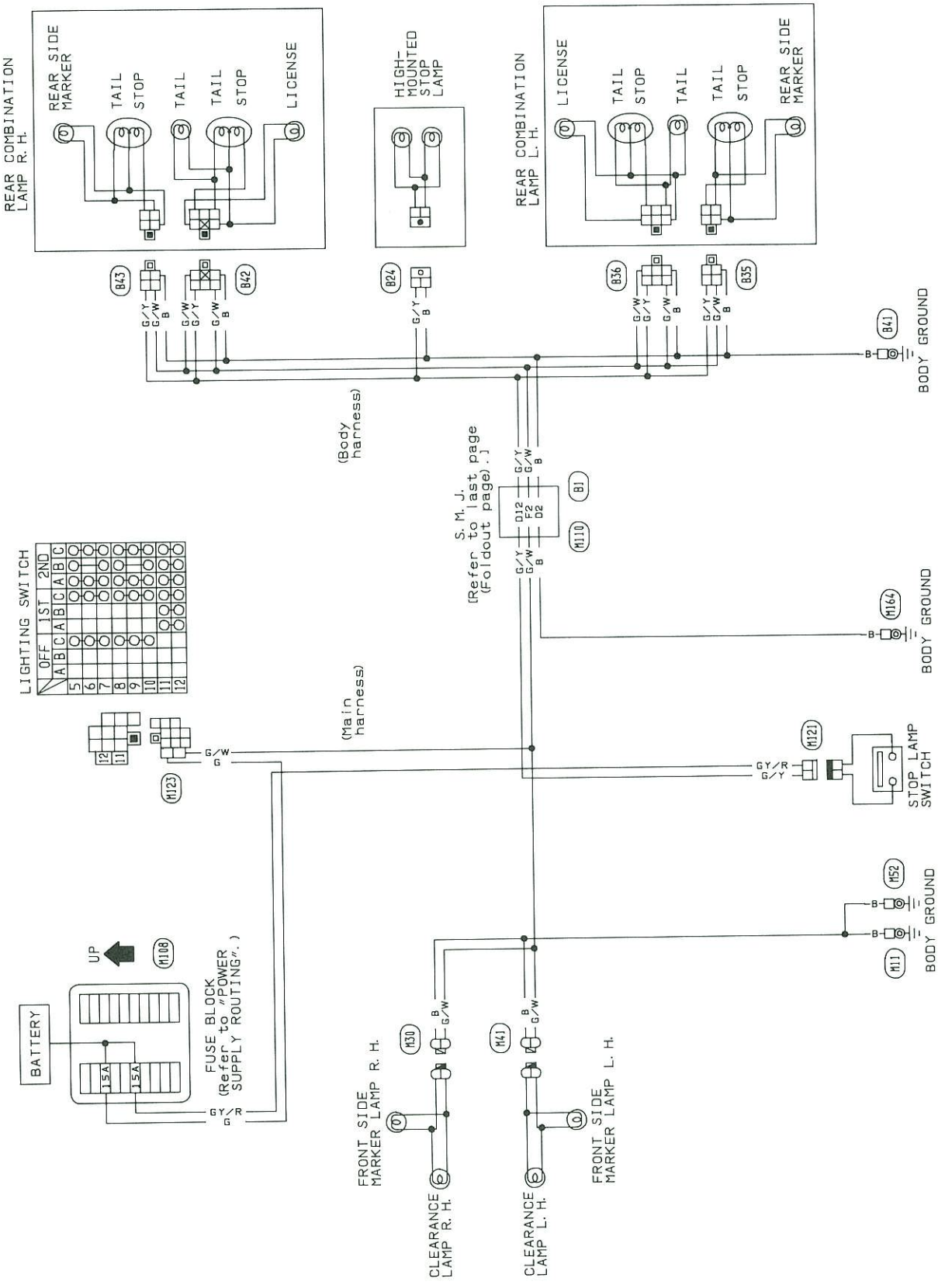


SEL866L

- **Adjust headlamps so that upper edge and left edge of high intensity zone are within the acceptable range as shown at left.**
- **Dotted lines in illustration show center of headlamp.**

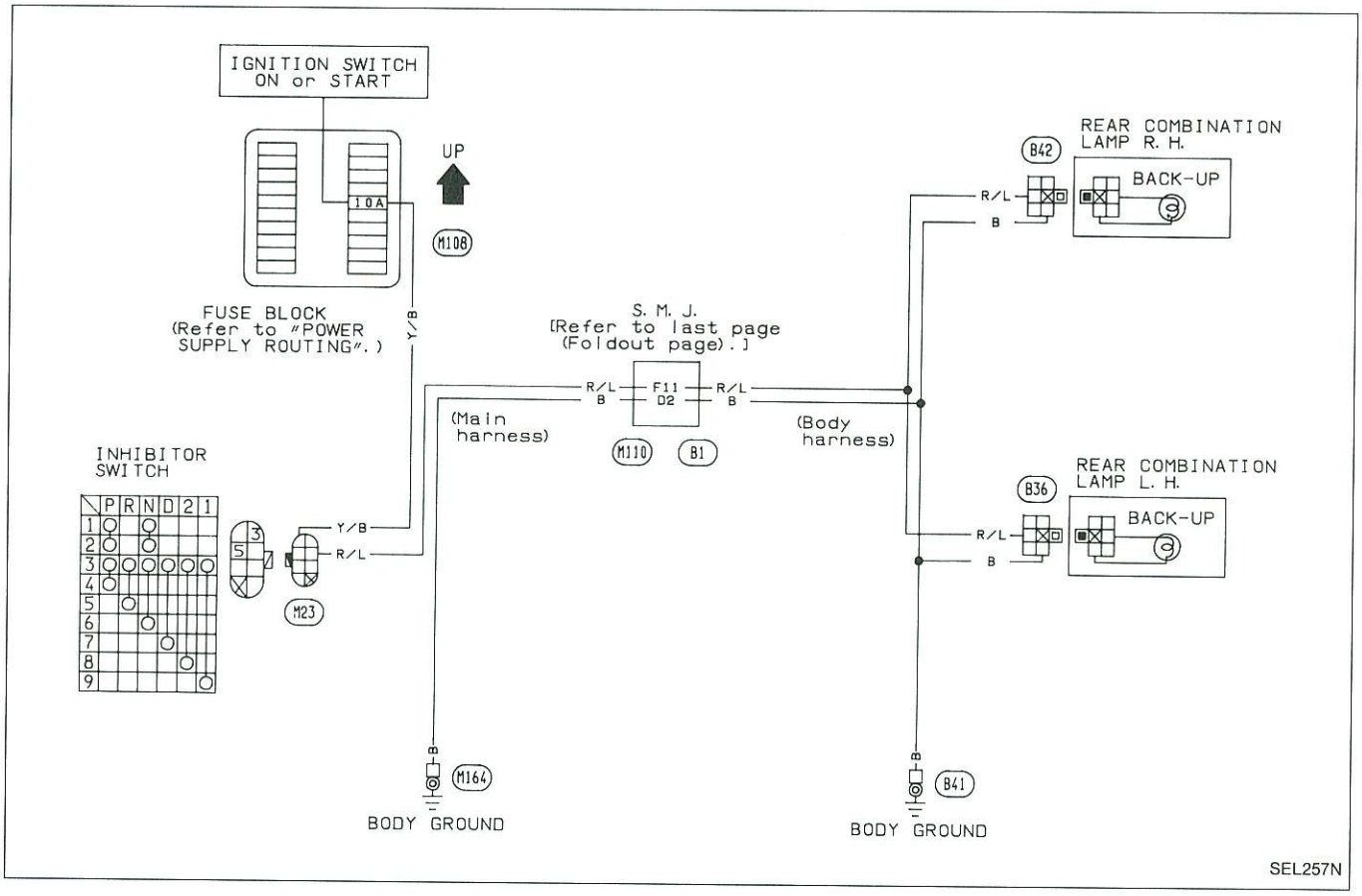
"H": Horizontal center line of headlamps
"W_L": Distance between each headlamp center

Clearance, License, Tail and Stop Lamps/Wiring Diagram

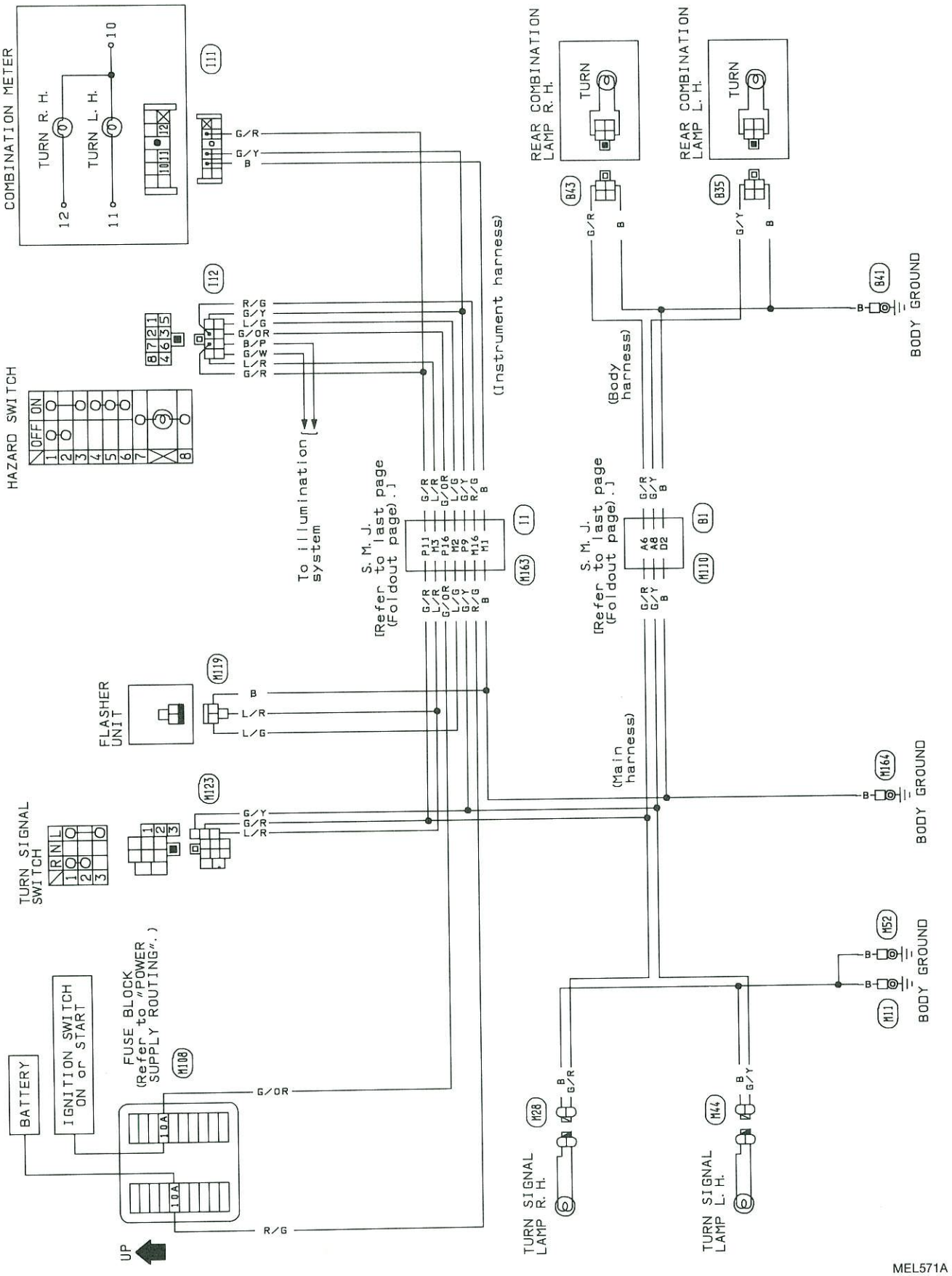


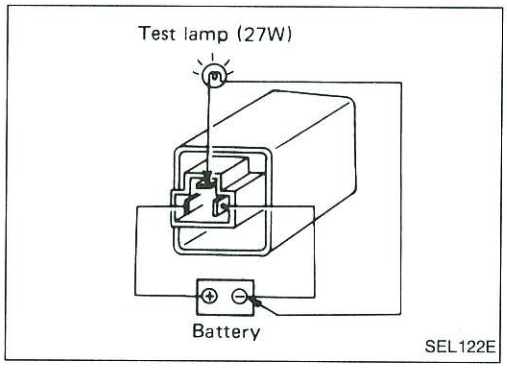
SEL256N

Back-up Lamp/Wiring Diagram



Turn Signal and Hazard Warning Lamps/Wiring Diagram





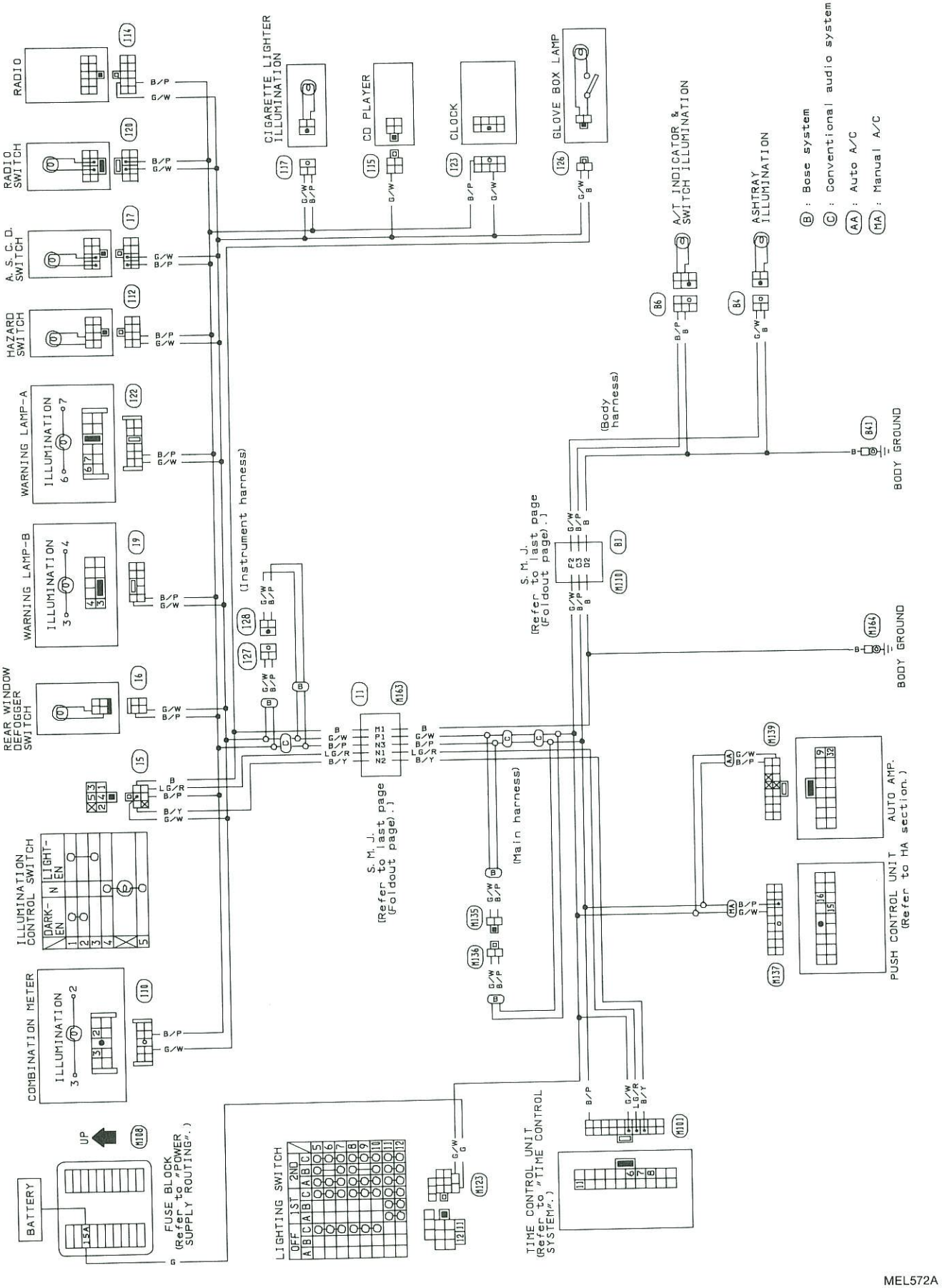
Combination Flasher Unit Check

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

Bulb Specifications

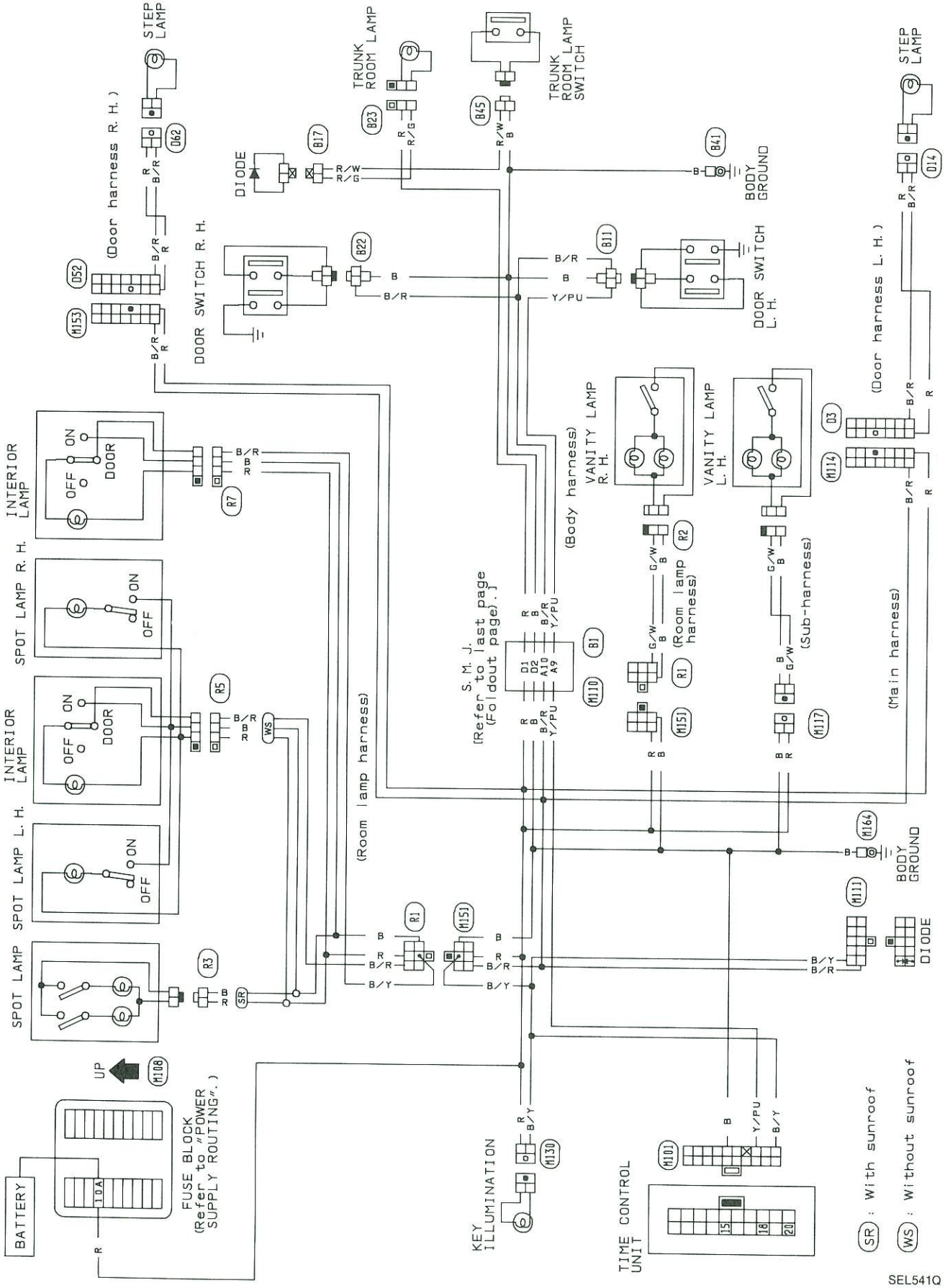
	Wattage (12 volt)	Bulb No.
Headlamp (Semi-sealed beam)		
High (Inside)	65	9005
Low (Outside)	55	9006
Front turn signal lamp	27	1156
Front clearance lamp	3.8	194
Front side marker lamp	3.8	194
Rear combination lamp		
Turn signal	27	1156
Stop/Tail	27/8	1157
Tail	3.8	194
Back-up	27	1156
Rear side marker lamp	3.8	194
License plate lamp	8	67
High-mounted stop lamp	18	921
Interior lamp	10	—
Spot lamp	10	—
Step lamp	3.4	—
Trunk room lamp	3.4	158

Illumination/Wiring Diagram

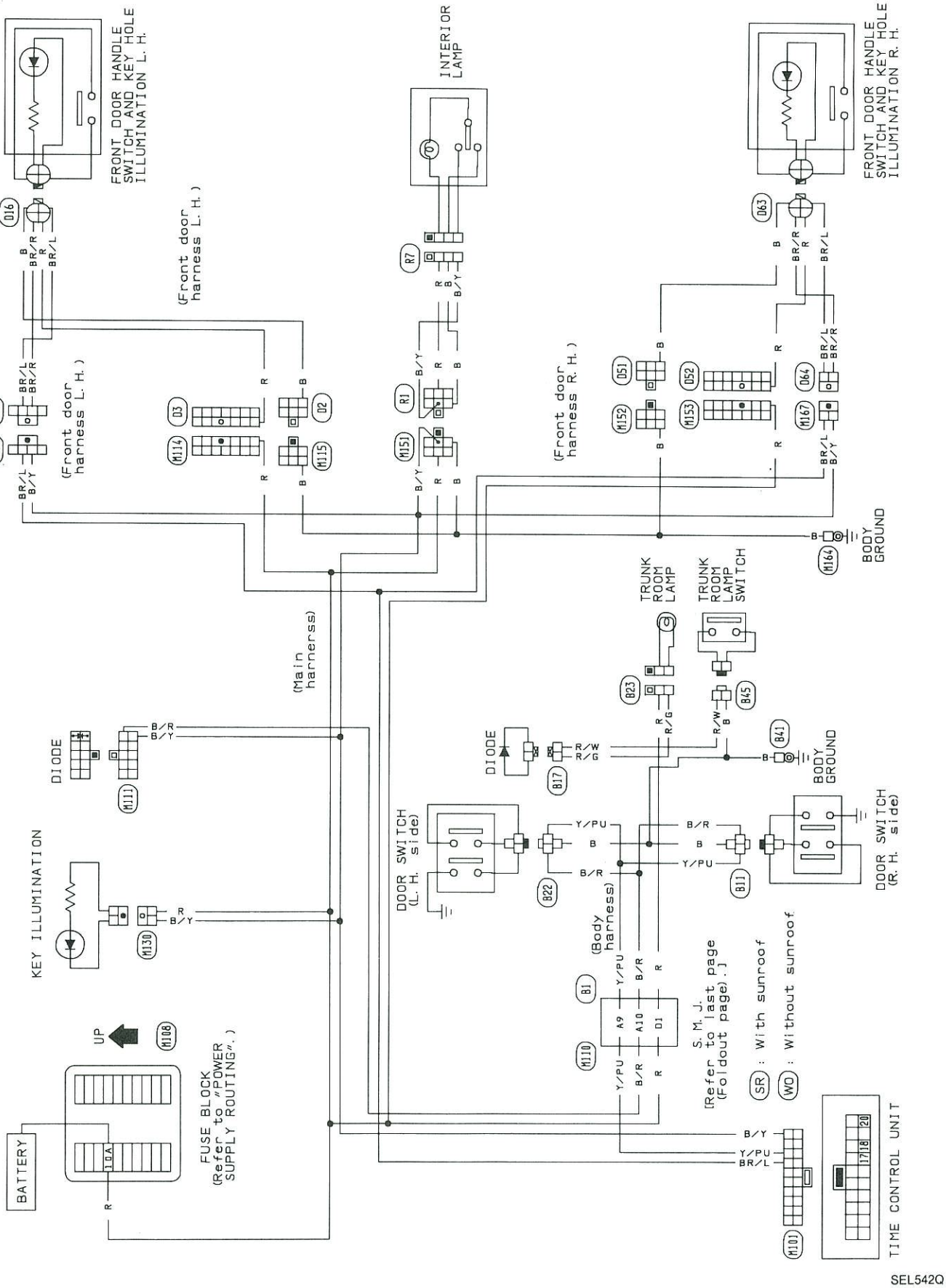


MEL572A

Interior, Spot, Step and Trunk Room Lamps/ Wiring Diagram

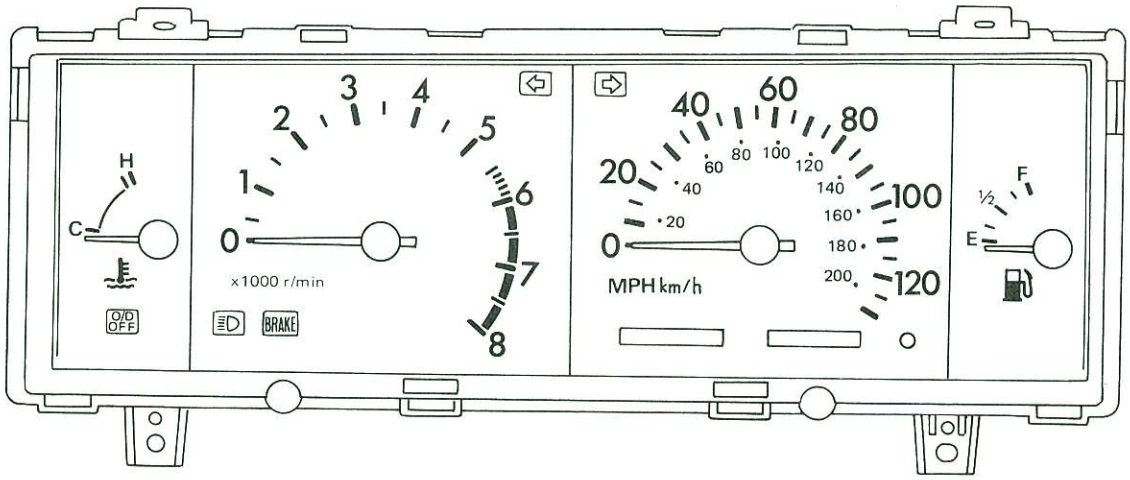


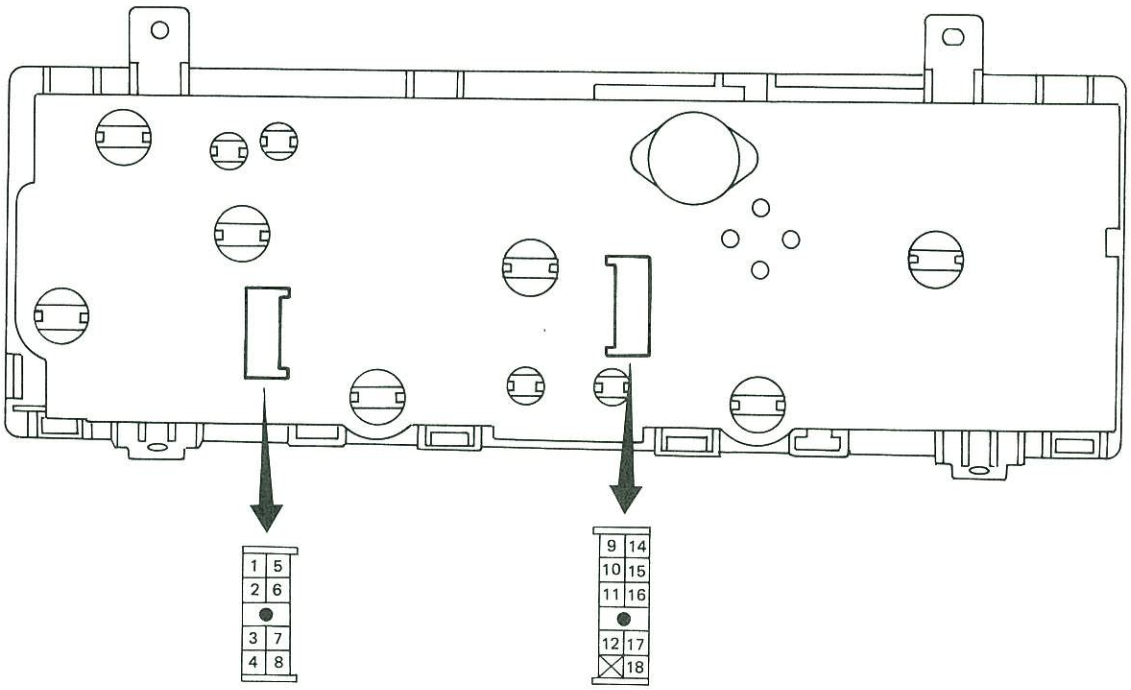
Illuminated Entry System and Key Illumination/ Wiring Diagram

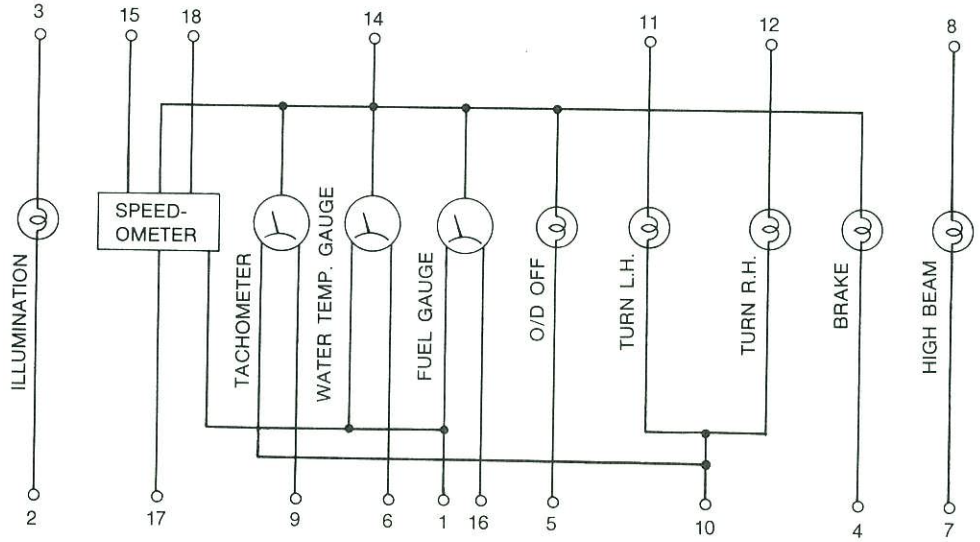


SEL542Q

Combination Meter

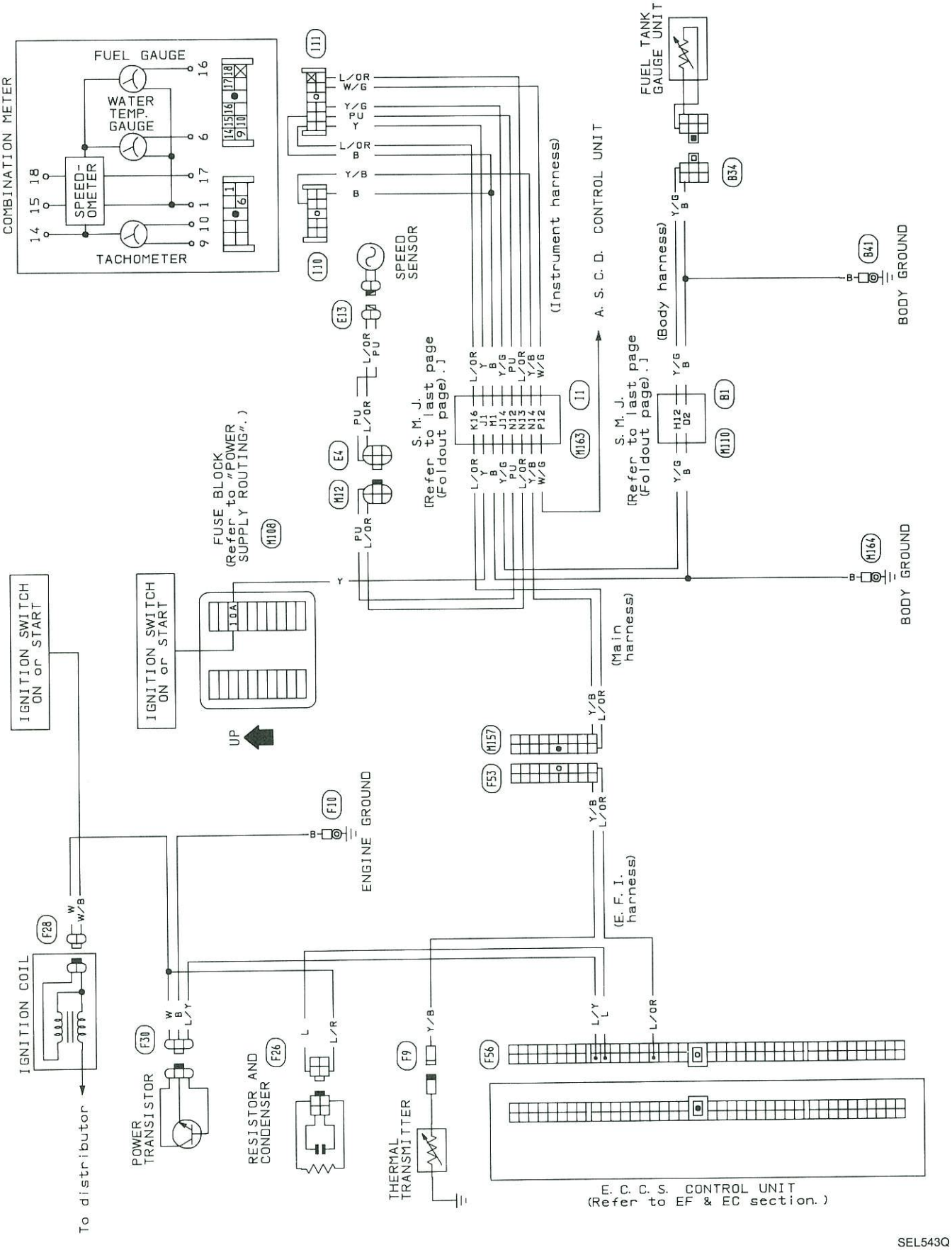




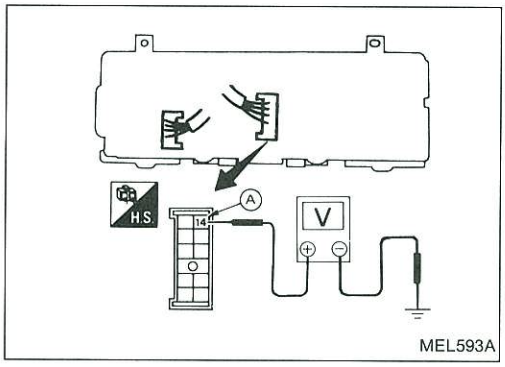


MEL575A

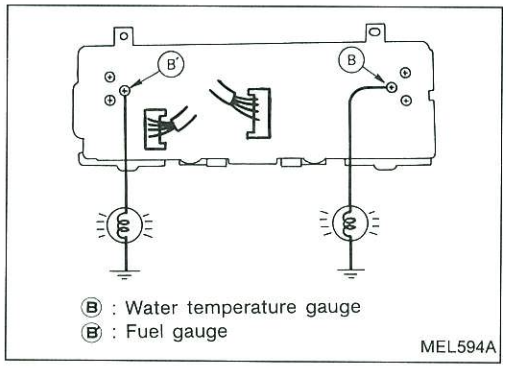
Tachometer, Temp., and Fuel Gauges/Wiring Diagram



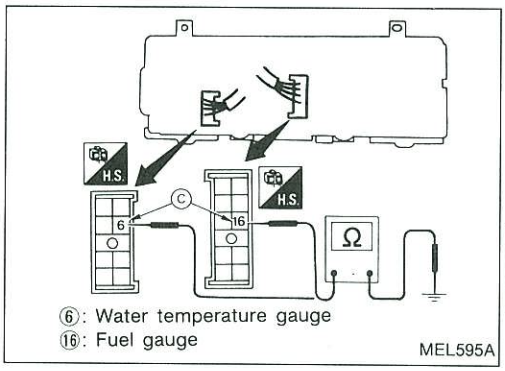
SEL543Q



MEL593A



Ⓑ : Water temperature gauge
Ⓑ' : Fuel gauge
MEL594A



⑥: Water temperature gauge
⑯: Fuel gauge
MEL595A

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-1
3) Fusible link and fuse
4) Ignition switch

O.K.

CHECK GAUGE OPERATION
1) Turn ignition switch "ON".
2) Connect terminal Ⓑ, Ⓑ' and ground with wire through 3.4 W test bulb.
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 Ⓒ.

N.G. → Repair or replace.

O.K.

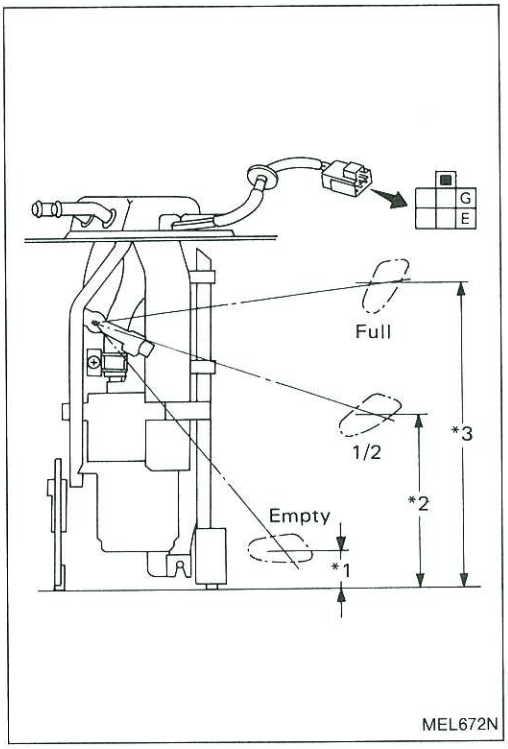
CHECK COMPONENT
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check", "Thermal Transmitter Check".

N.G. → Repair or replace.
Refer to FE section. (Fuel tank gauge unit)

O.K.

Reinstall any part removed.

INSPECTION END

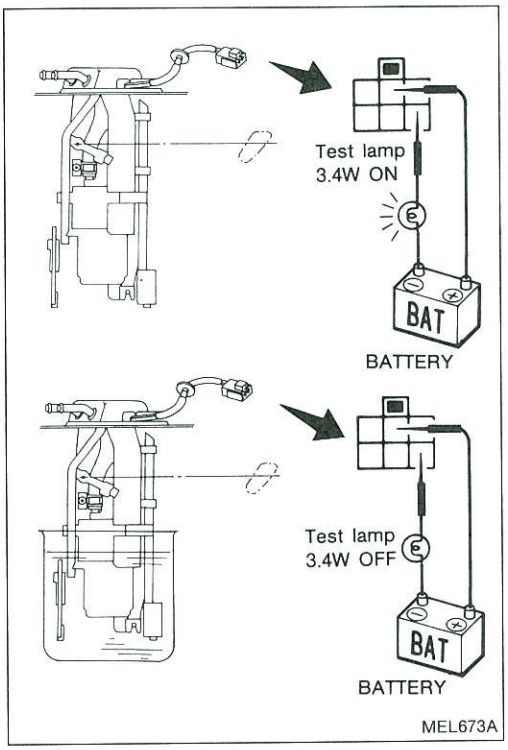


Fuel Tank Gauge Unit Check

- For removal, refer to FE section.

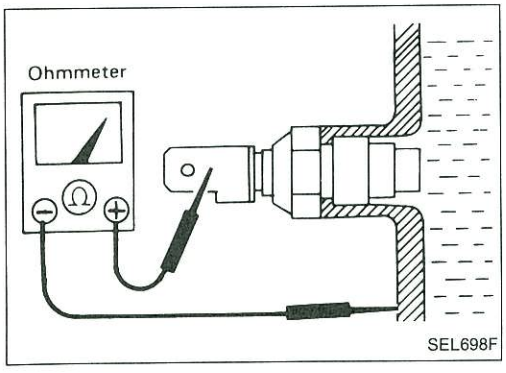
Check the resistance between terminals Ⓖ and Ⓔ.

Ohmmeter		Float position mm (in)			Resistance value (Ω)
(+)	(−)				
G	E	*3	Full	187 (7.36)	Approx. 4 - 6
		*2	1/2	110 (4.33)	Approx. 31 - 34
		*1	Empty	26 (1.02)	Approx. 80 - 83



Fuel Warning Lamp Sensor Check

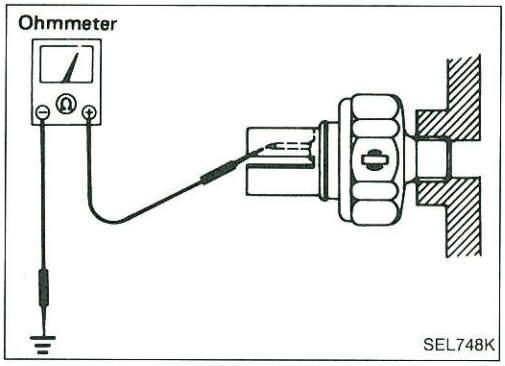
- It will take a short time for the bulb to light.



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

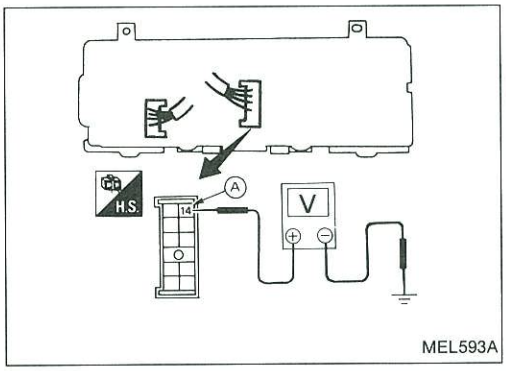


Oil Pressure Switch Check

Check the continuity between the terminals of oil pressure switch and body ground.

	Oil pressure kPa (kg/cm^2, psi)	Continuity
Engine start	More than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)	YES

Inspection/Speed Sensor Signal Circuit

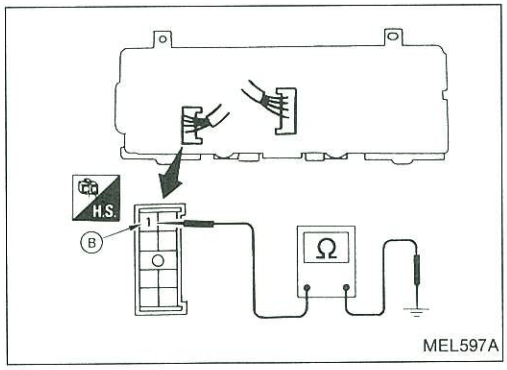


INSPECTION START

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

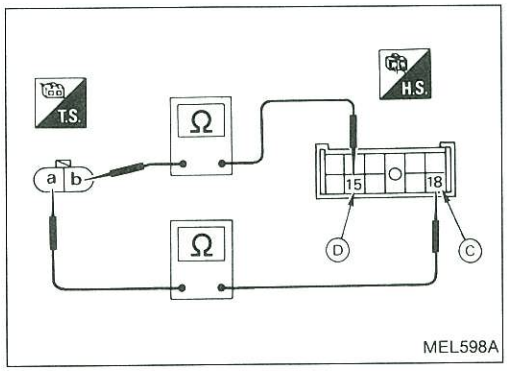
O.K.



CHECK GROUND CIRCUIT.
Check harness continuity between terminal Ⓑ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

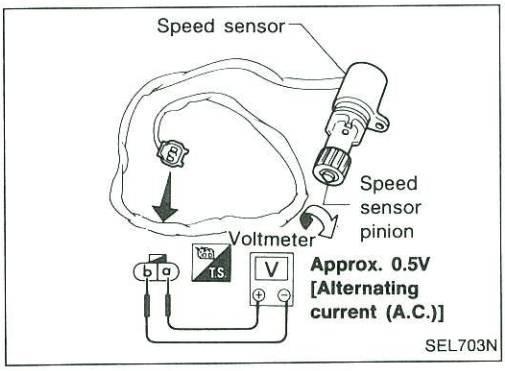
O.K.



CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal Ⓒ, Ⓓ and speed sensor terminal ⓐ, ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

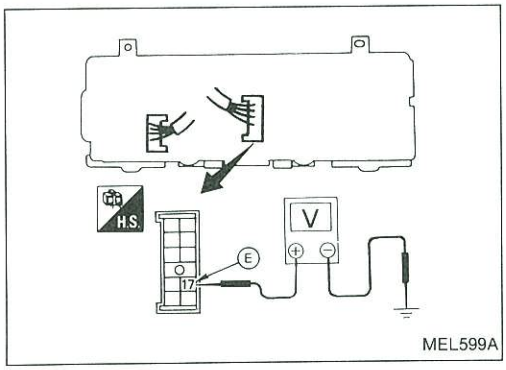
O.K.



CHECK COMPONENT.
1) Remove speed sensor from transmission.
Location: Refer to "Location of Electrical Units".
2) Turn speedometer pinion quickly and check voltage between terminal ⓐ and ⓑ.

N.G. → Replace speed sensor

O.K.



CHECK OUTPUT SIGNAL CIRCUIT.
1) Install speed sensor.
2) Jack up one rear wheel.
3) Turn ignition switch "ON".
4) Turn rear wheel by hand, make sure that needle of voltmeter swings between approx. 0V and approx. 5V.

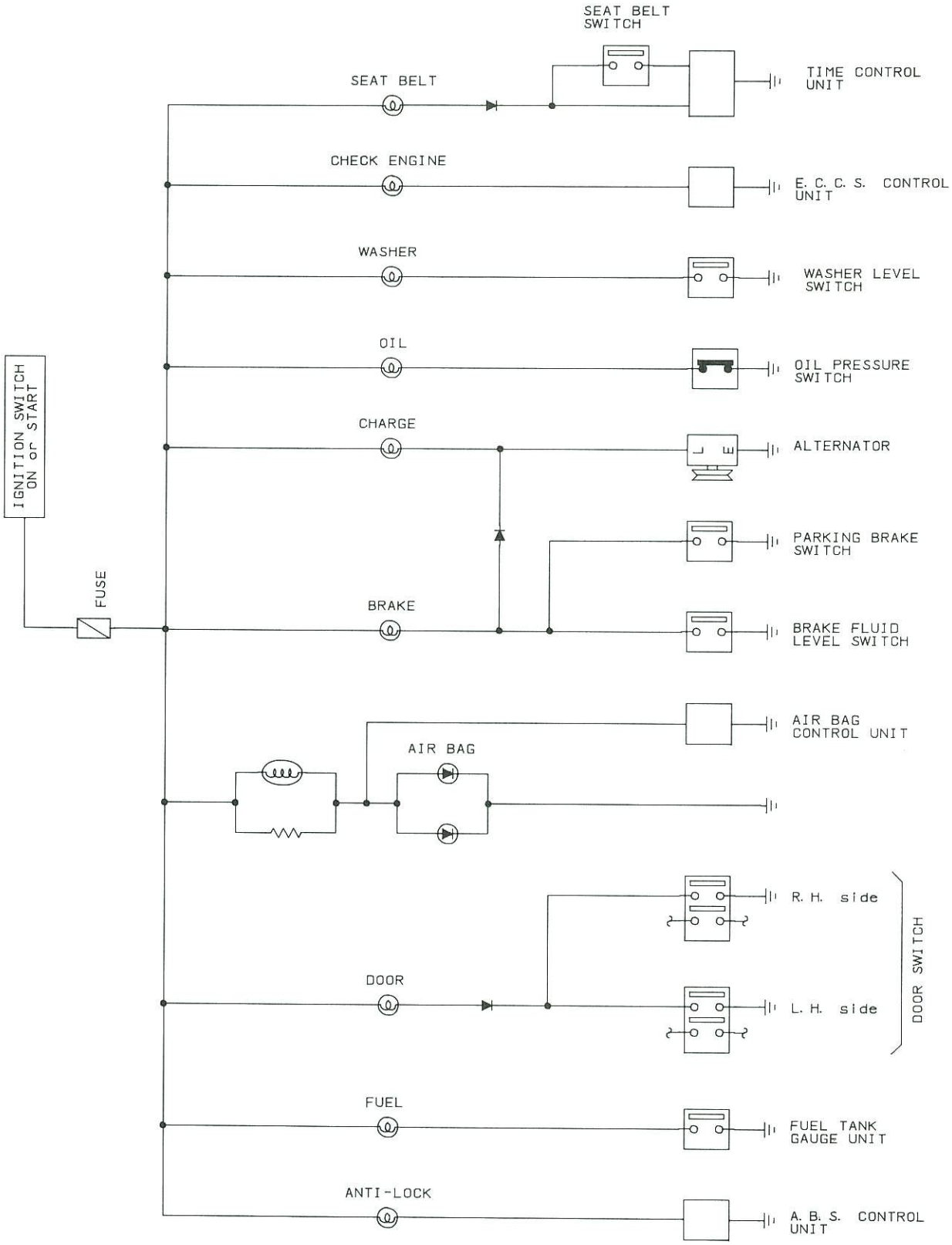
N.G. → Replace speedometer.

O.K.

Reinstall any part removed.

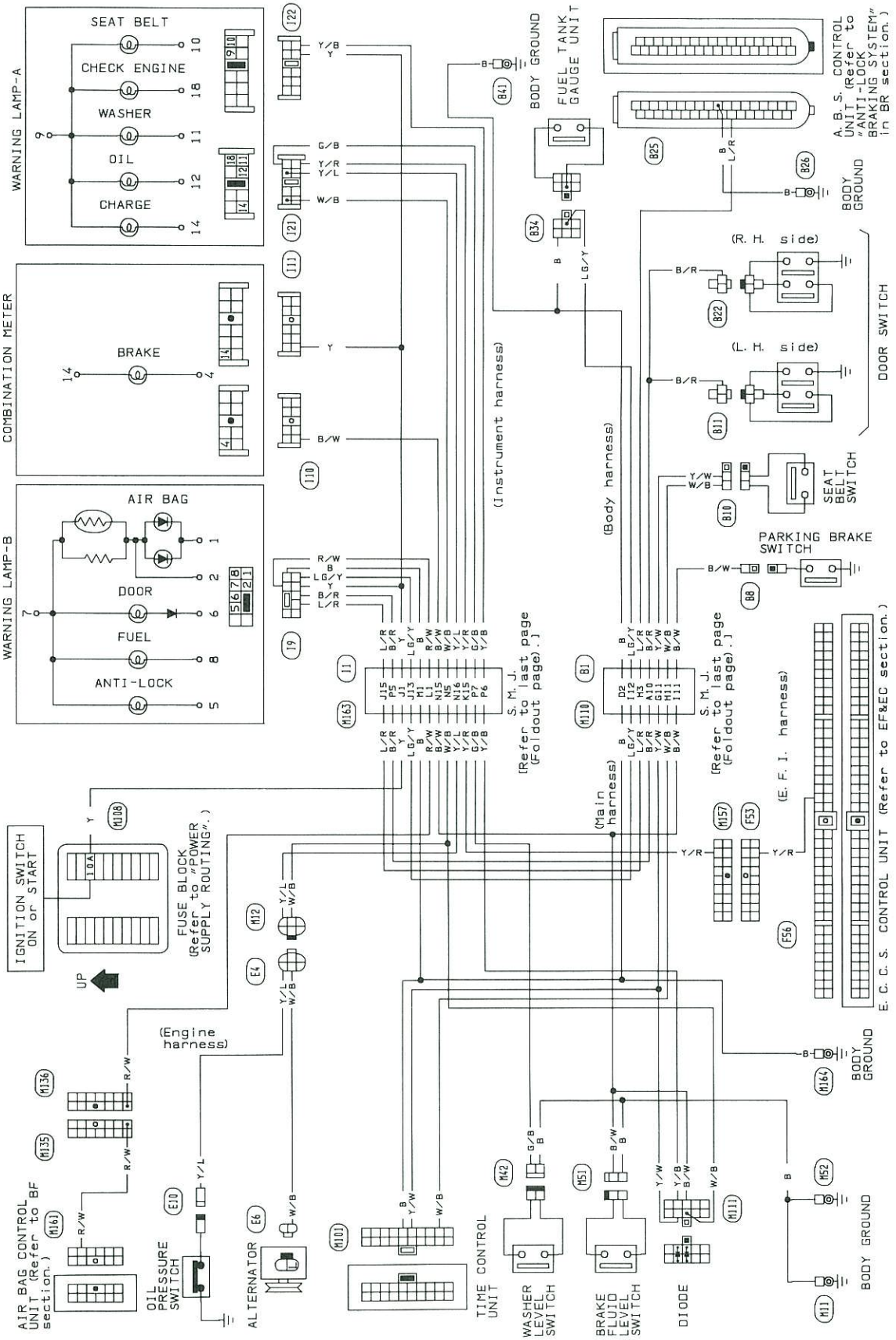
INSPECTION END

Warning Lamps/Schematic



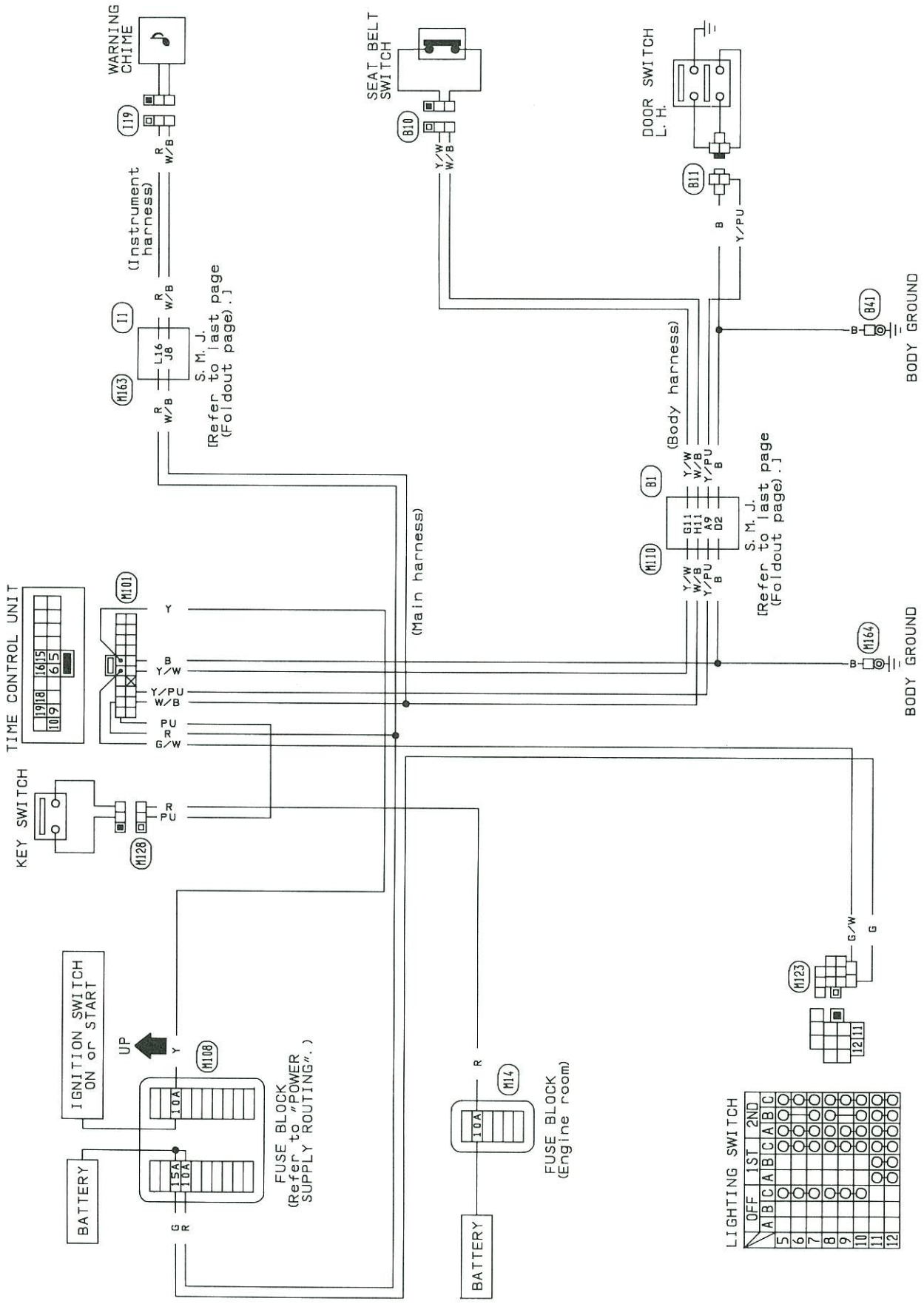
SEL262N

Warning Lamps/Wiring Diagram

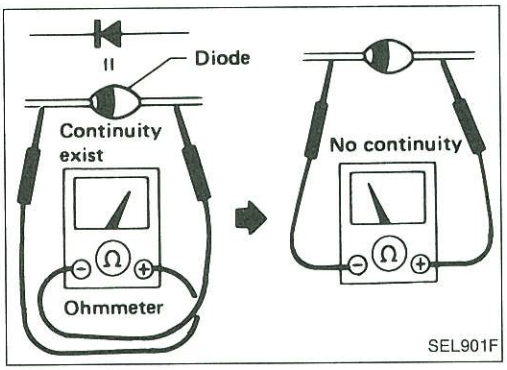


SEL544Q

Warning Chime/Wiring Diagram

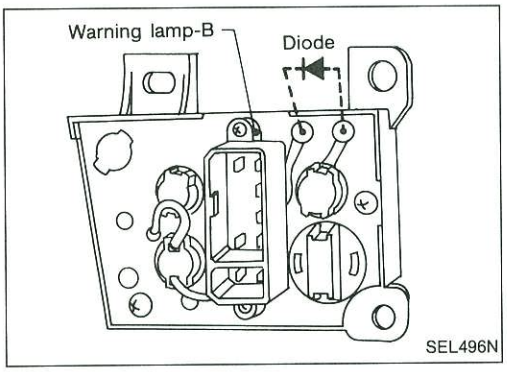


SEL545Q

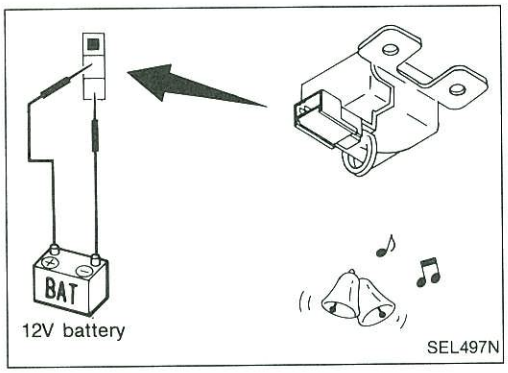


Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.



- Diode for warning lamp is built into the warning lamp-B printed circuit.



Warning Chime Check

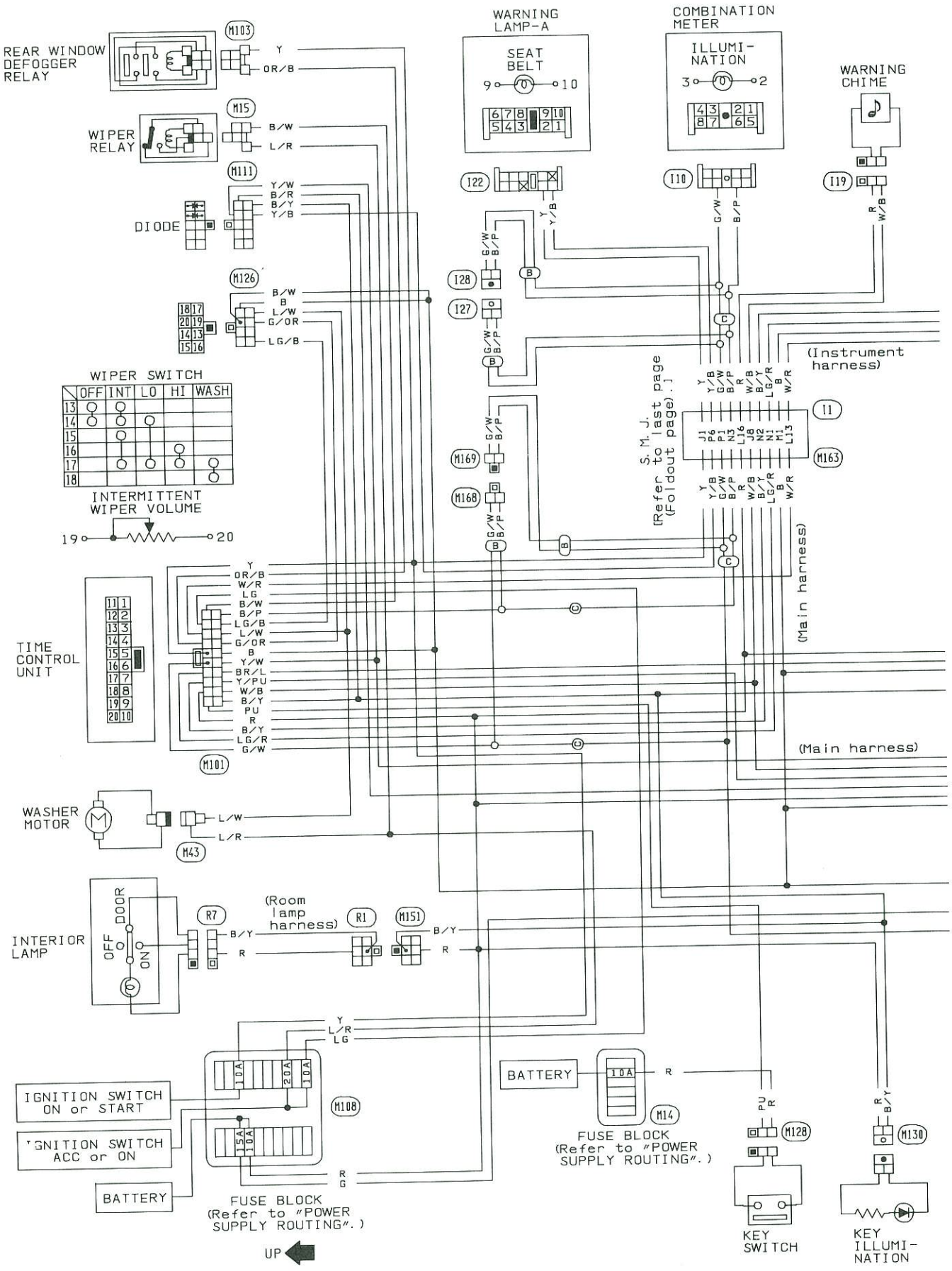
Description

FUNCTION

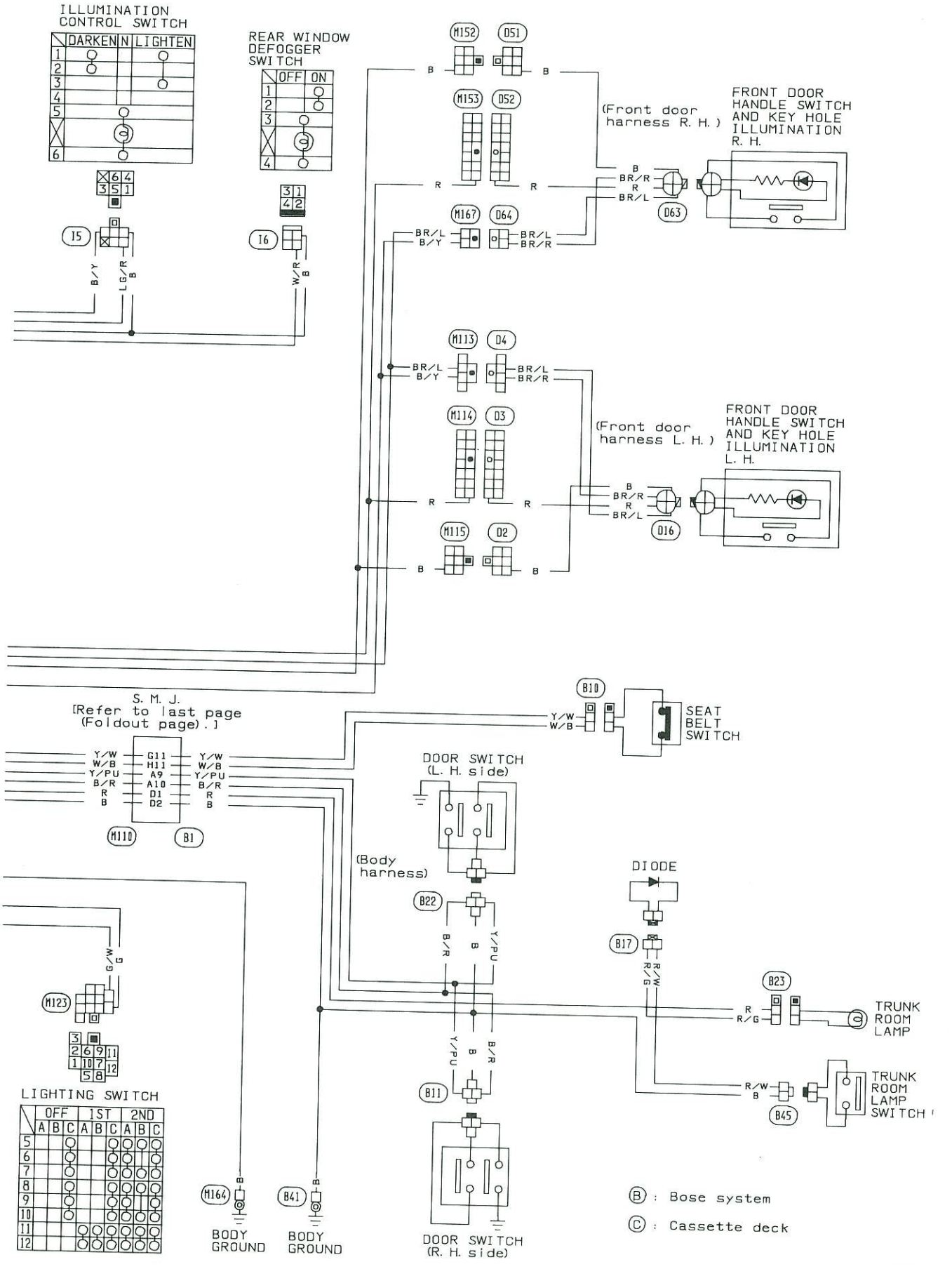
- Time control unit has the following functions.

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



Wiring Diagram (Cont'd)



SEL546Q

Trouble Diagnoses

SYMPTOM CHART

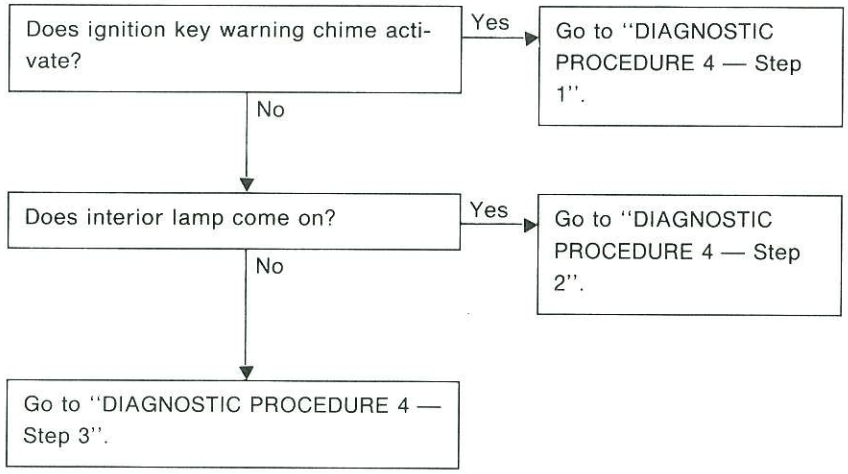
PROCEDURE		Preliminary Check			Main Power Supply and Ground Circuit Check	Diagnostic Procedure										
REFERENCE PAGE		EL-61	EL-61	EL-61	EL-62	EL-64	EL-65	EL-65	EL-66	EL-67	EL-68	EL-69	EL-69	EL-70	EL-71	EL-72
SYMPTOM		Procedure 1	Procedure 2	Procedure 3	Main power supply and Ground circuit	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8	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

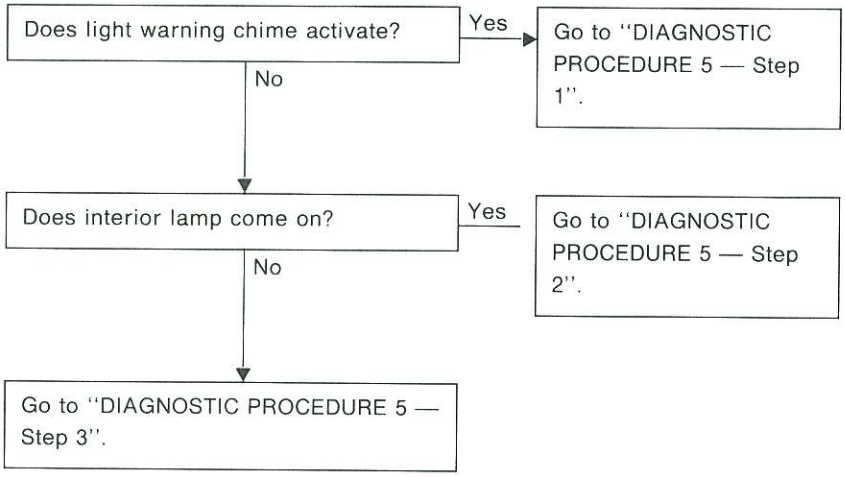
Preliminary check 1

- **Light warning chime does not activate.**



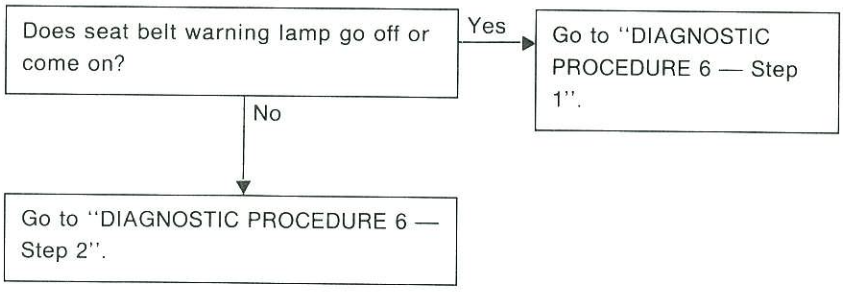
Preliminary check 2

- **Ignition key warning chime does not activate.**



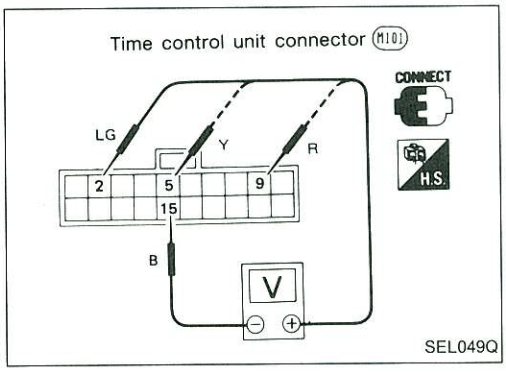
Preliminary check 3

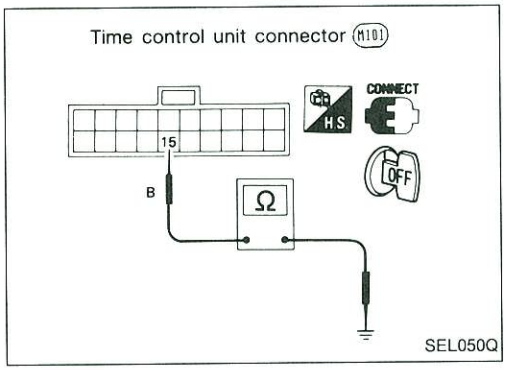
- **Seat belt warning chime does not activate.**



Trouble Diagnoses (Cont'd)

MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK





Main power supply

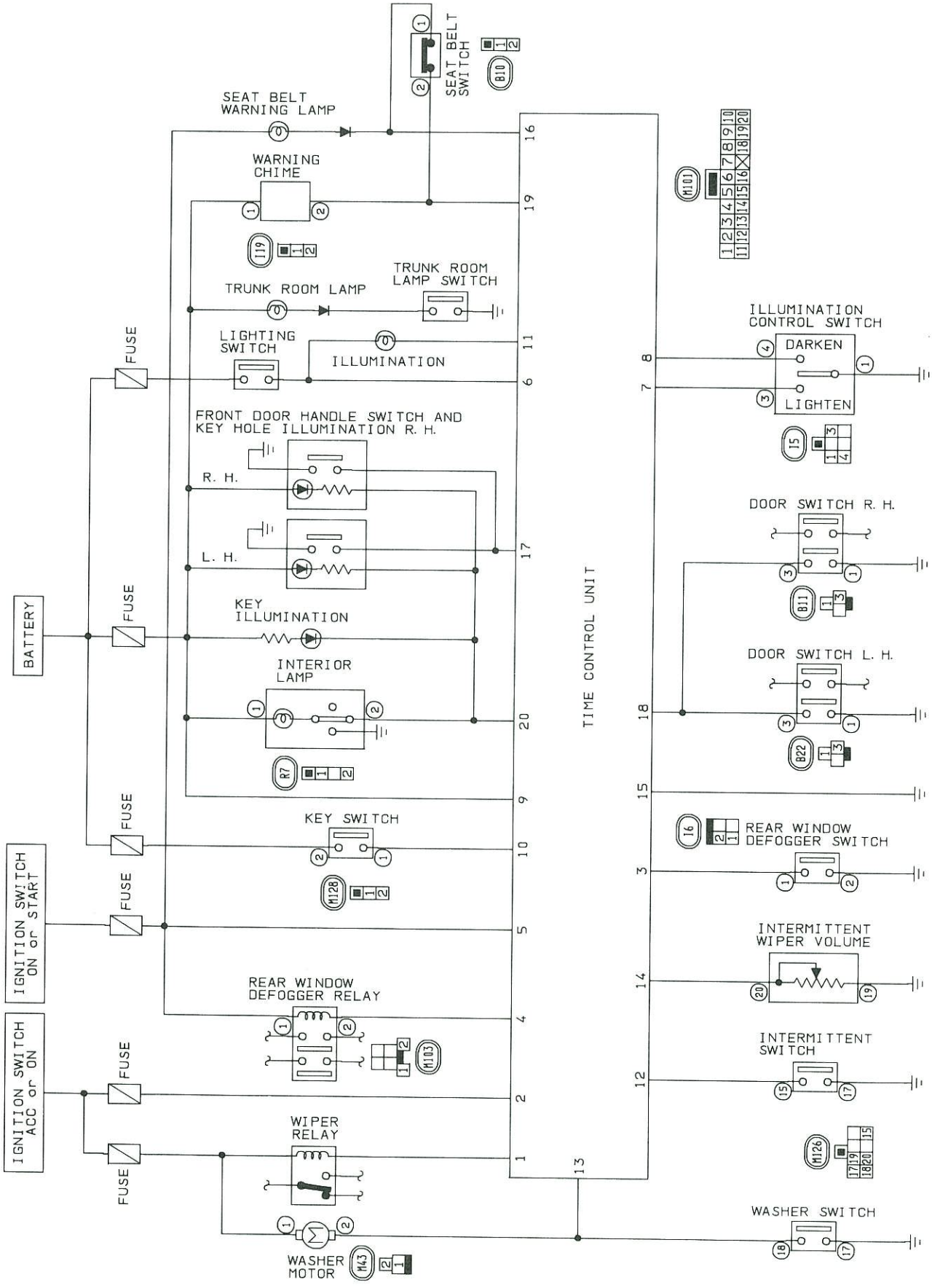
Terminals	Battery voltage existence condition		
	Ignition switch position		
	OFF	ACC	ON
⑨ - ⑮	Yes	Yes	Yes
⑤ - ⑮	No	No	Yes
② - ⑮	No	Yes	Yes

Ground circuit

Terminals	Continuity
⑮ - Ground	Yes

Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



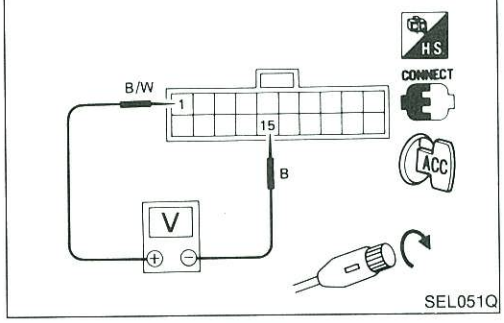
SEL671Q

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

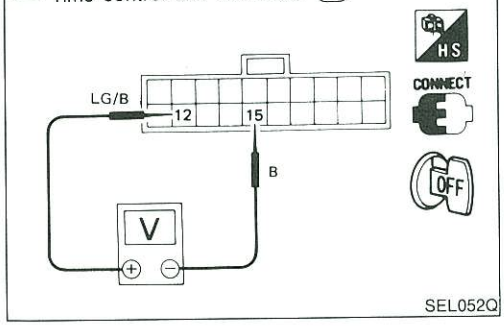
SYMPTOM: Intermittent wiper does not operate.

A Time control unit connector (M101)



SEL051Q

B Time control unit connector (M101)



SEL052Q

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 relay. Refer to "WIPER AND WASHER".

- O.K. → Check wiper relay circuit.
- N.G. → Replace wiper relay.

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.

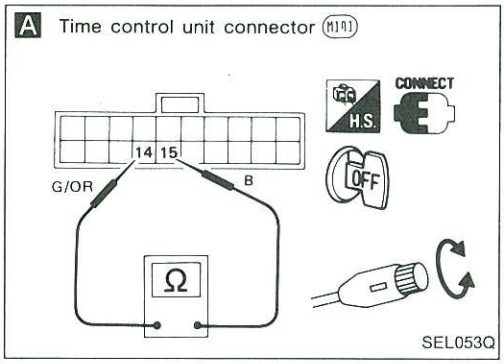
O.K. ↓

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

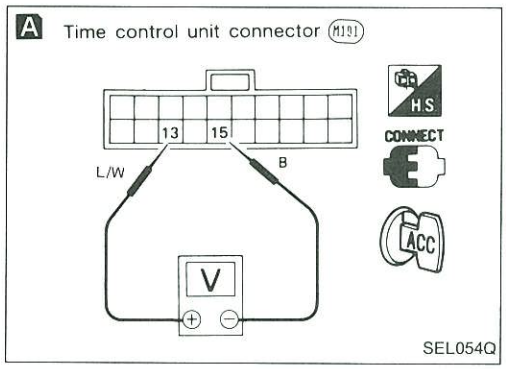
O.K. → Replace control unit.

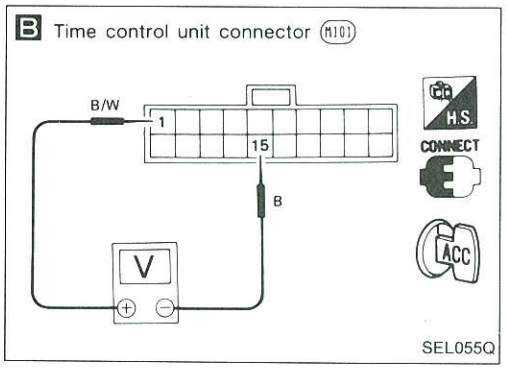
N.G. ↓

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 RELAY 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 relay.

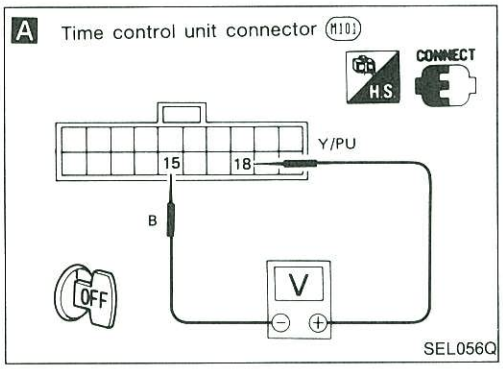
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

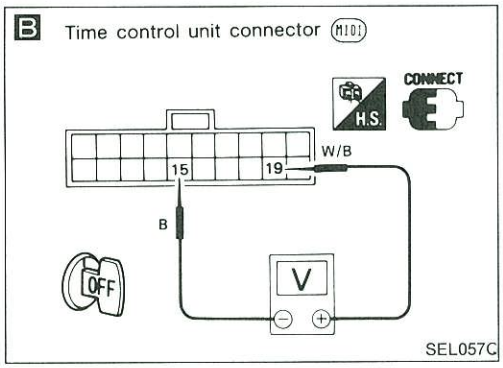
SYMPTOM: Light warning chime does not activate.

- Perform "PRELIMINARY CHECK — Procedure 1" before referring to the following flow chart.

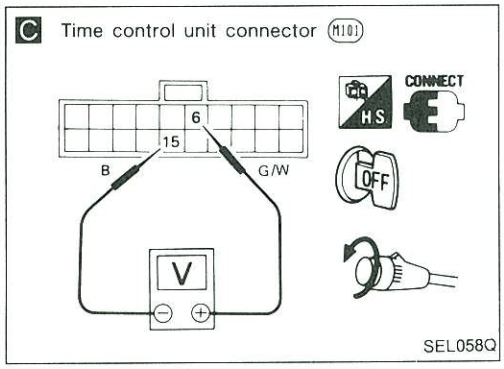
A Time control unit connector (M101)



B Time control unit connector (M101)



C Time control unit connector (M101)



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.

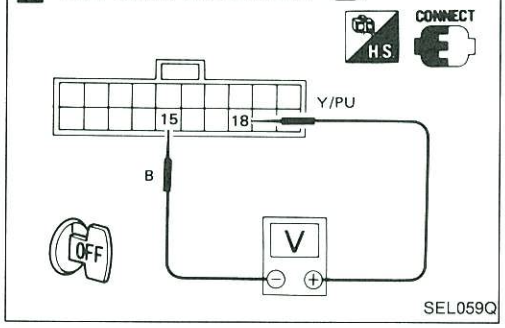
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

SYMPTOM: Ignition key warning chime does not activate.

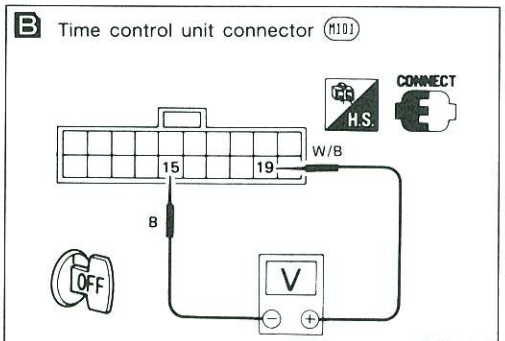
- Perform "PRELIMINARY CHECK — Procedure 2" before referring to the following flow chart.

A Time control unit connector (M101)



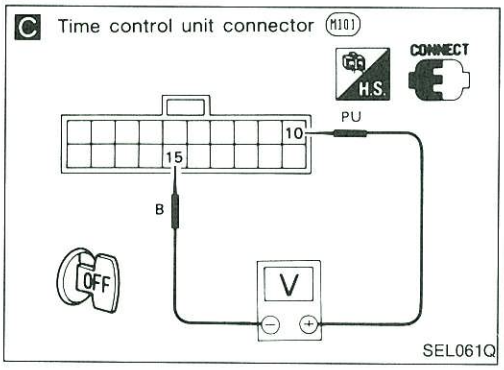
SEL059Q

B Time control unit connector (M101)



SEL060Q

C Time control unit connector (M101)



SEL061Q

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

O.K. → 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.

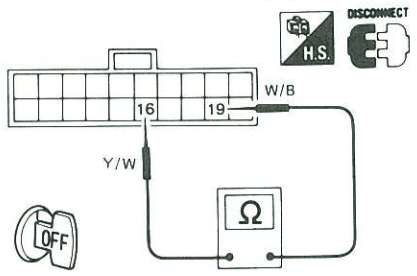
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

SYMPTOM: Seat belt warning chime does not activate.

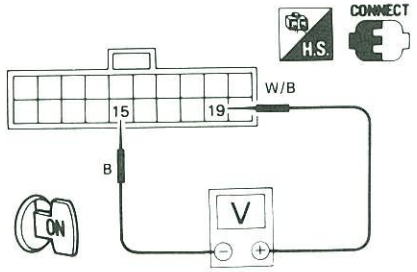
- Perform "PRELIMINARY CHECK — Procedure 3" before referring to the following flow chart.

A Time control unit connector (M101)



SEL062Q

B Time control unit connector (M101)



SEL063Q

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.

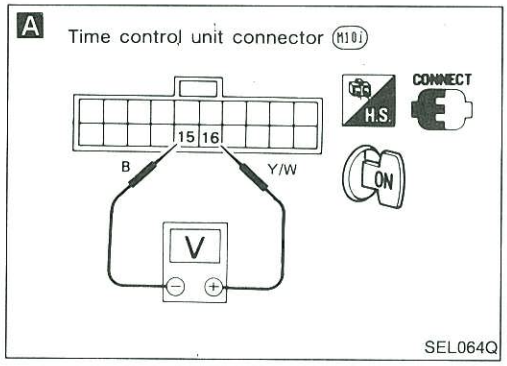
N.G. ↓

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"?

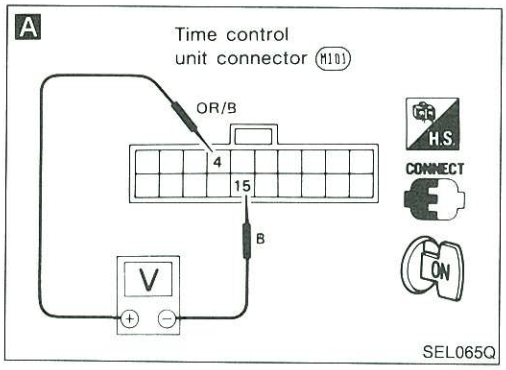
Yes → Check warning lamp. Check harness continuity between T.C.U. and warning lamp.

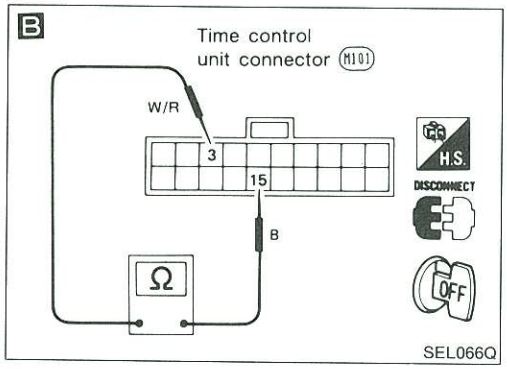
No ↓

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. ↓

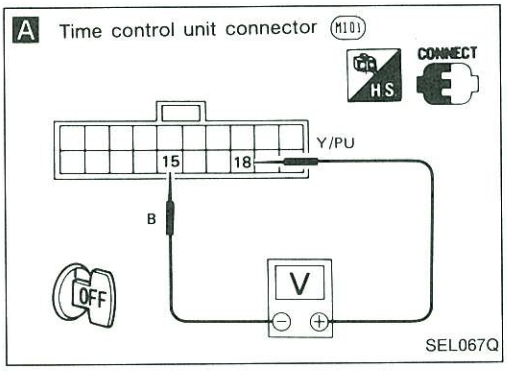
Replace control unit.

Trouble Diagnoses (Cont'd)

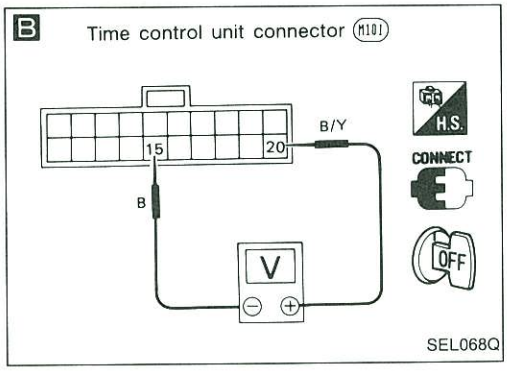
DIAGNOSTIC PROCEDURE 9

SYMPTOM: Interior lamp does not fade out after driver's door is closed.

A Time control unit connector (M101)



B Time control unit connector (M101)



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. ↓

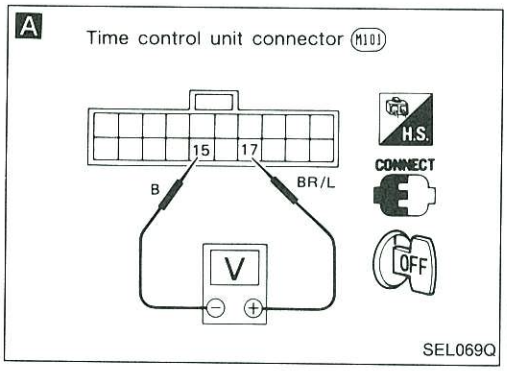
Replace T.C.U.

Trouble Diagnoses (Cont'd)

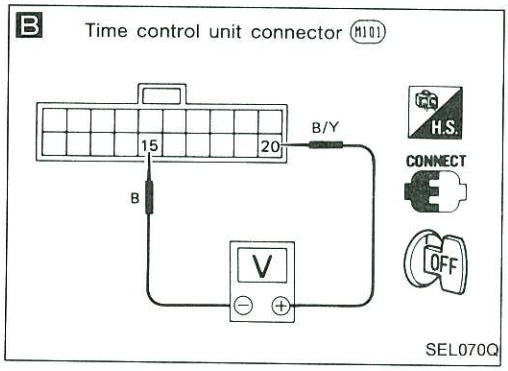
DIAGNOSTIC PROCEDURE 10

SYMPTOM: Door key hole illumination does not come on even if door handle is pulled.

A



B



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. ↓

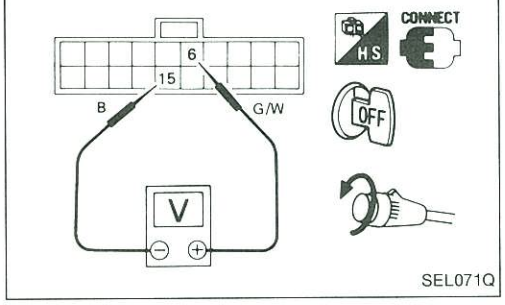
Replace T.C.U.

Trouble Diagnoses (Cont'd)

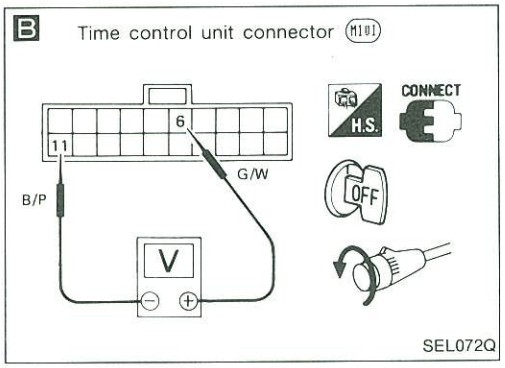
DIAGNOSTIC PROCEDURE 11

SYMPTOM: Illumination control does not activate.

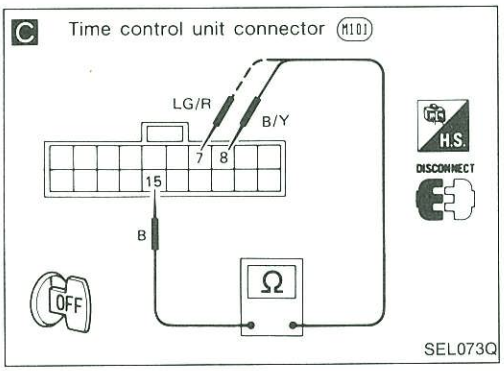
A Time control unit connector (M101)



B Time control unit connector (M101)



C Time control unit connector (M101)



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.

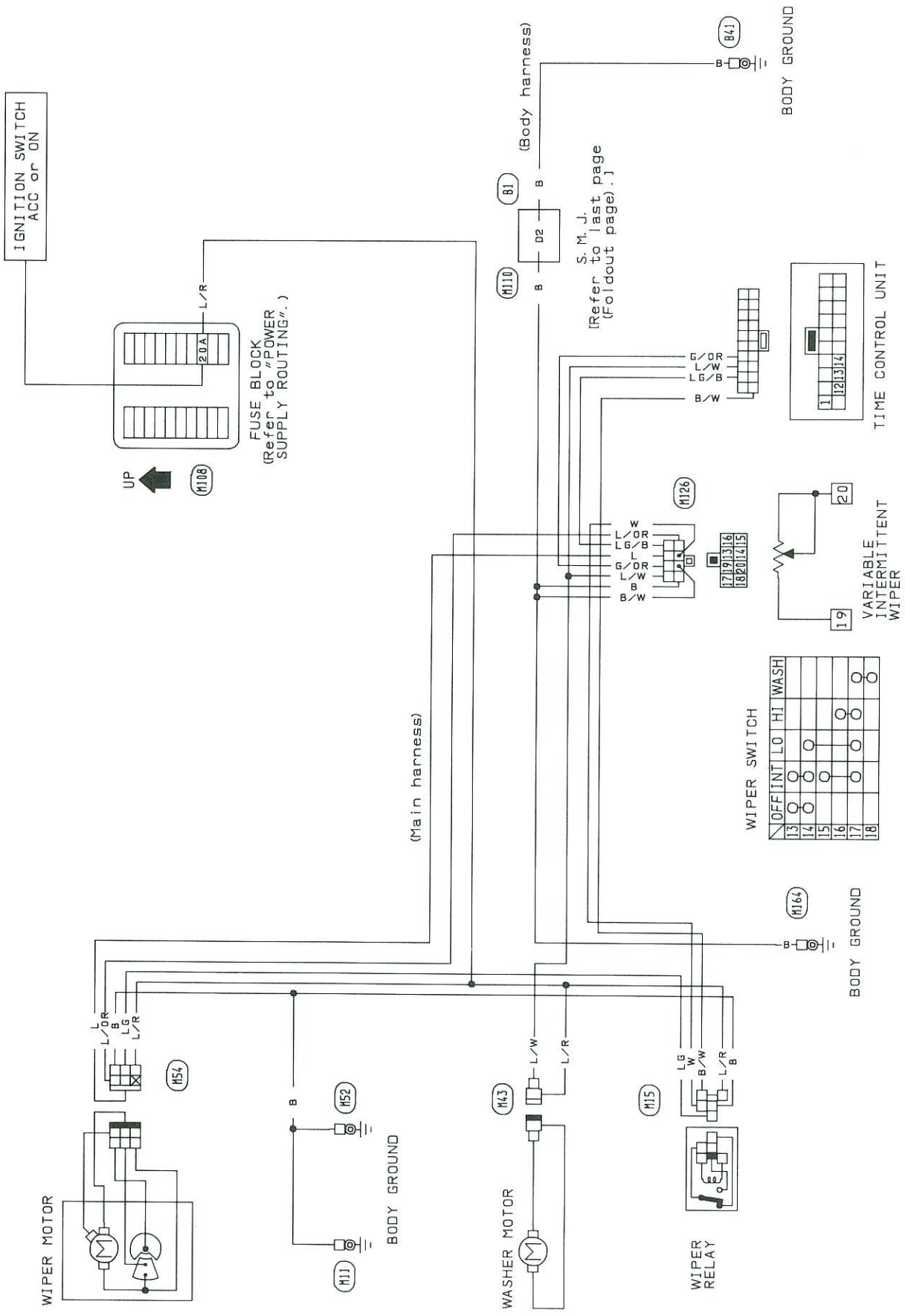
Terminals		Illumination control switch condition	Resistance [Ω]
⑧	⑮	DARK	0
		BRIGHT	Except 0
⑦	⑮	DARK	Except 0
		BRIGHT	0

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



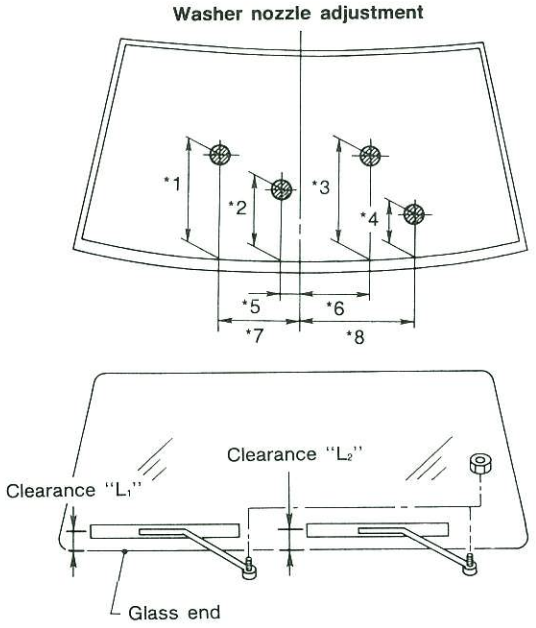
SEL547Q

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 "L_1" or "L_2" 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 "L_1" & "L_2".
   Clearance "L_1": 25 - 35 mm (0.98 - 1.38 in)
   Clearance "L_2": 35 - 45 mm (1.38 - 1.77 in)

- Tighten windshield wiper arm nuts to specified torque.
  Windshield wiper:
  [O]: 13 - 18 N·m (1.3 - 1.8 kg-m, 9 - 13 ft-lb)

Windshield wiper and washer

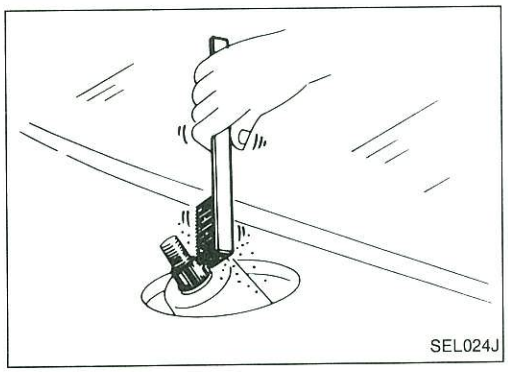


*1:	460 (18.11)
*2:	200 (7.87)
*3:	405 (15.94)
*4:	235 (9.25)
*5:	135 (5.31)
*6:	200 (7.87)
*7:	305 (12.01)
*8:	432 (17.01)

Unit: mm (in)

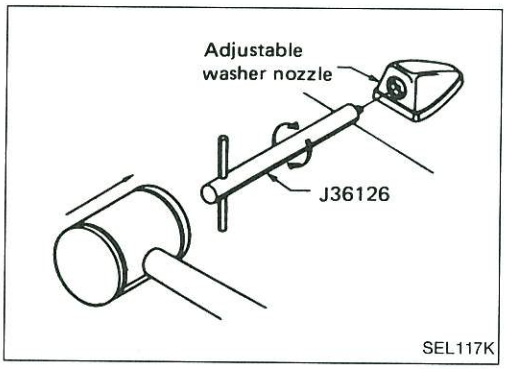
All the diameters of these circles are less than 80 (3.15).

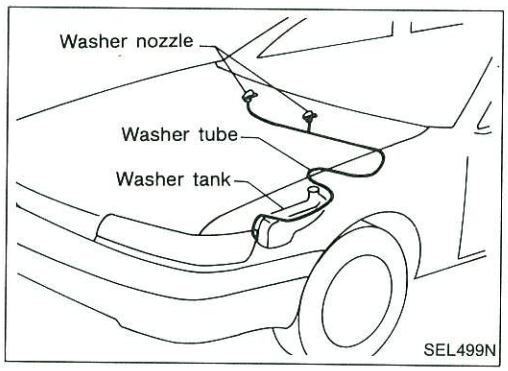
SEL498N



SEL024J

- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**





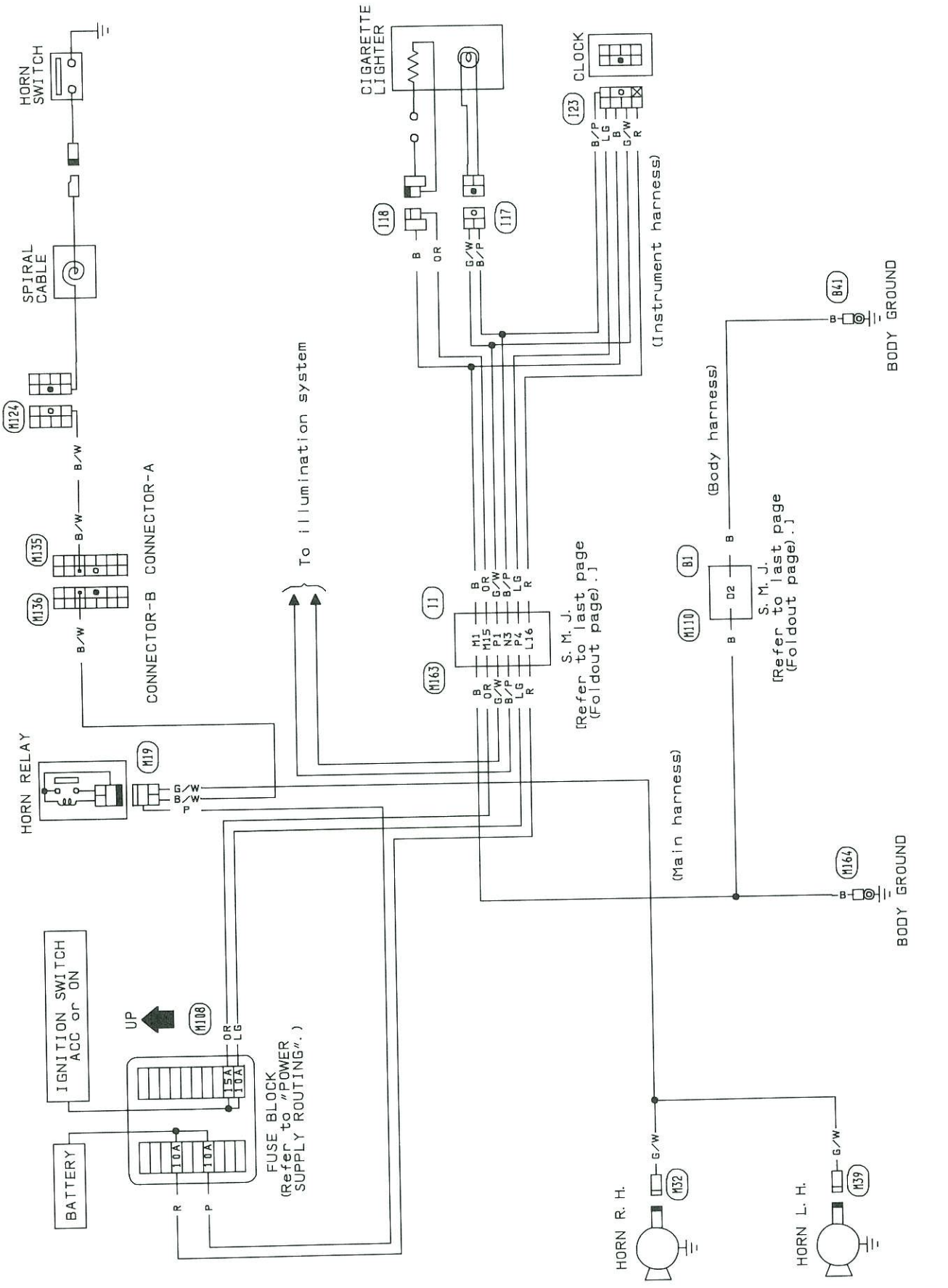
Washer Nozzle Adjustment

- Using Tool J36126, adjust windshield washer nozzle to correct its spray pattern.

Before attempting to turn the nozzle, gently tap the end of Tool to free the nozzle.
This will prevent "rounding out" the small female square in the center of the nozzle.

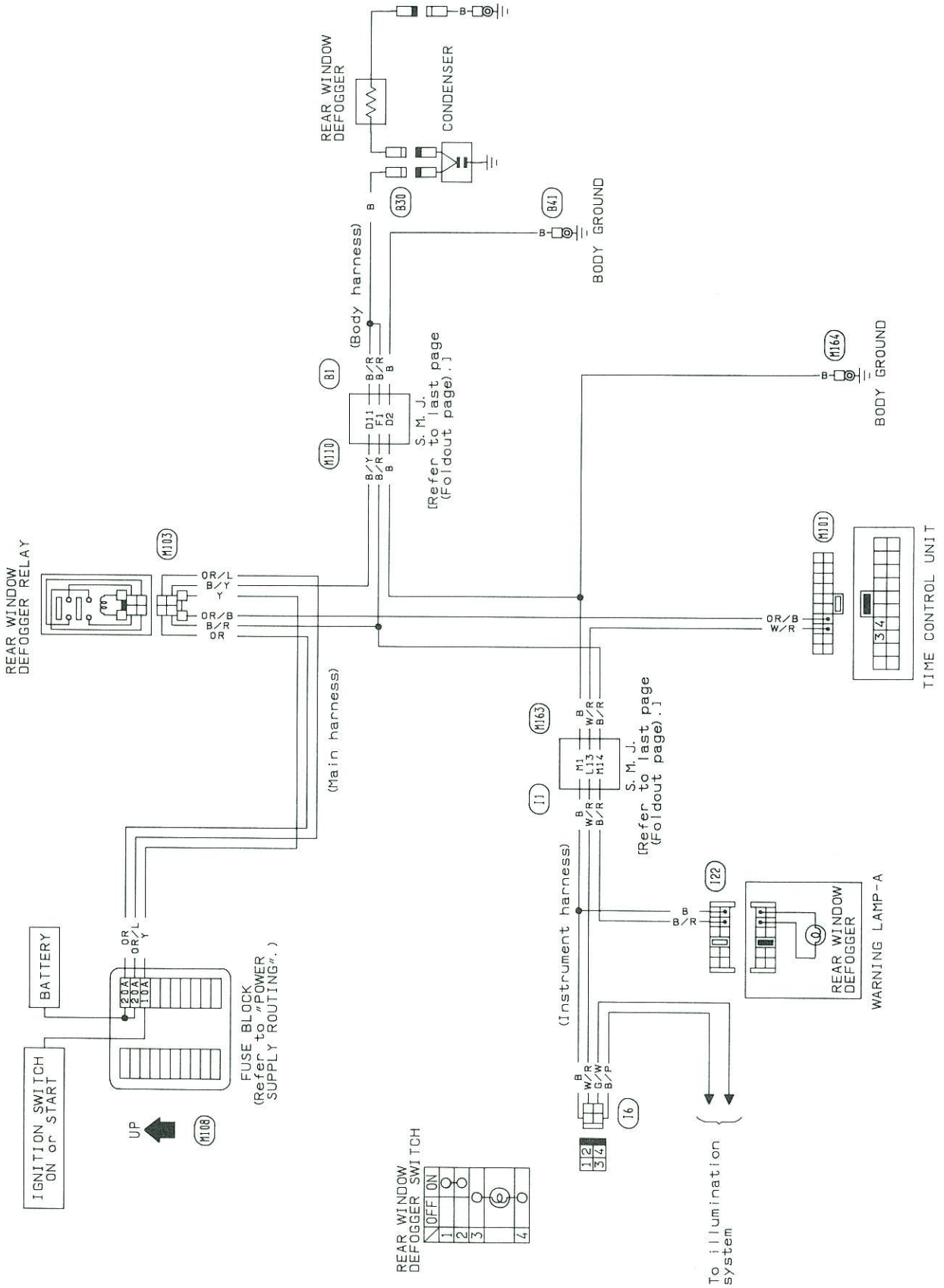
Special service tool
Tool number: J36126
Tool name: Washer nozzle adjusting tool

Wiring Diagram

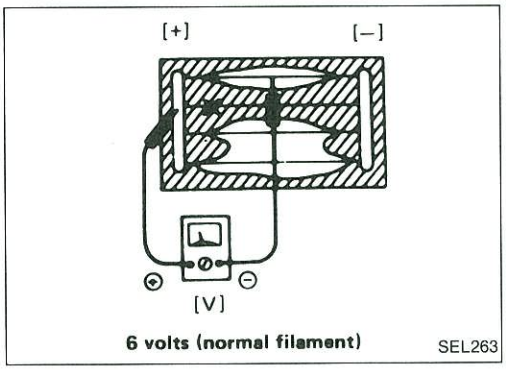


MEL580A

Wiring Diagram



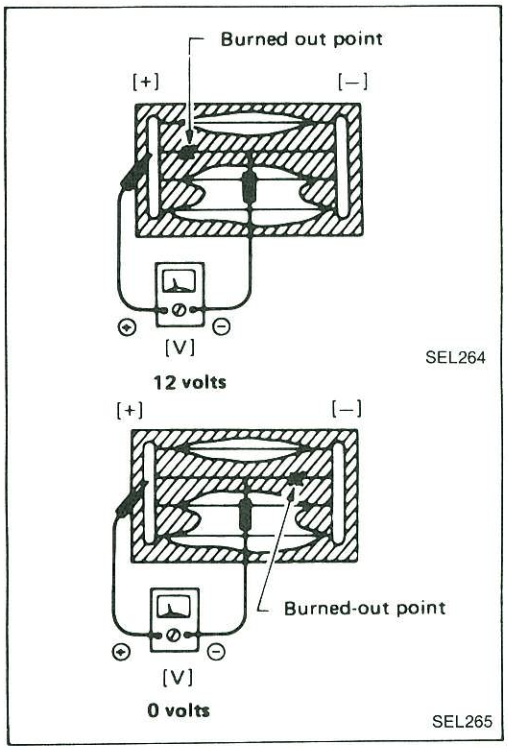
SEL269N



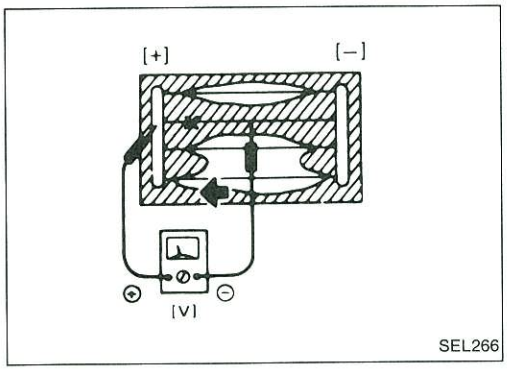
6 volts (normal filament) SEL263

Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.



2. If a filament is burned out, circuit tester registers 0 or 12 volts.

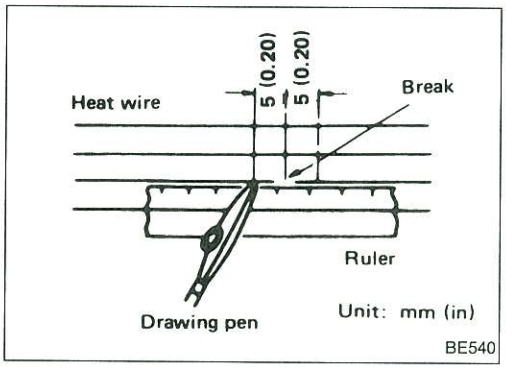


3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

Filament Repair

REPAIR EQUIPMENT

1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth



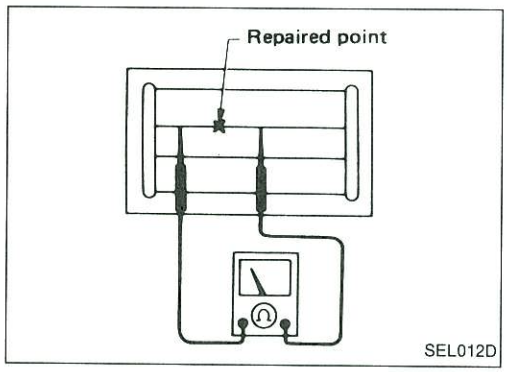
REPAIRING PROCEDURE

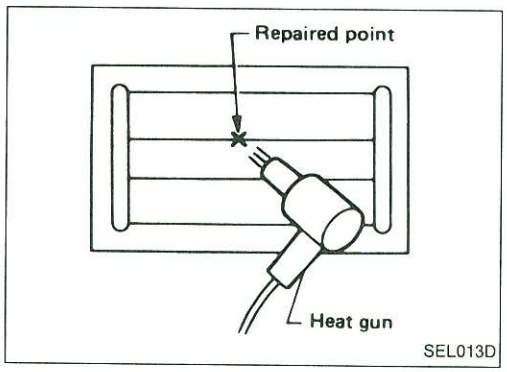
1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

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.

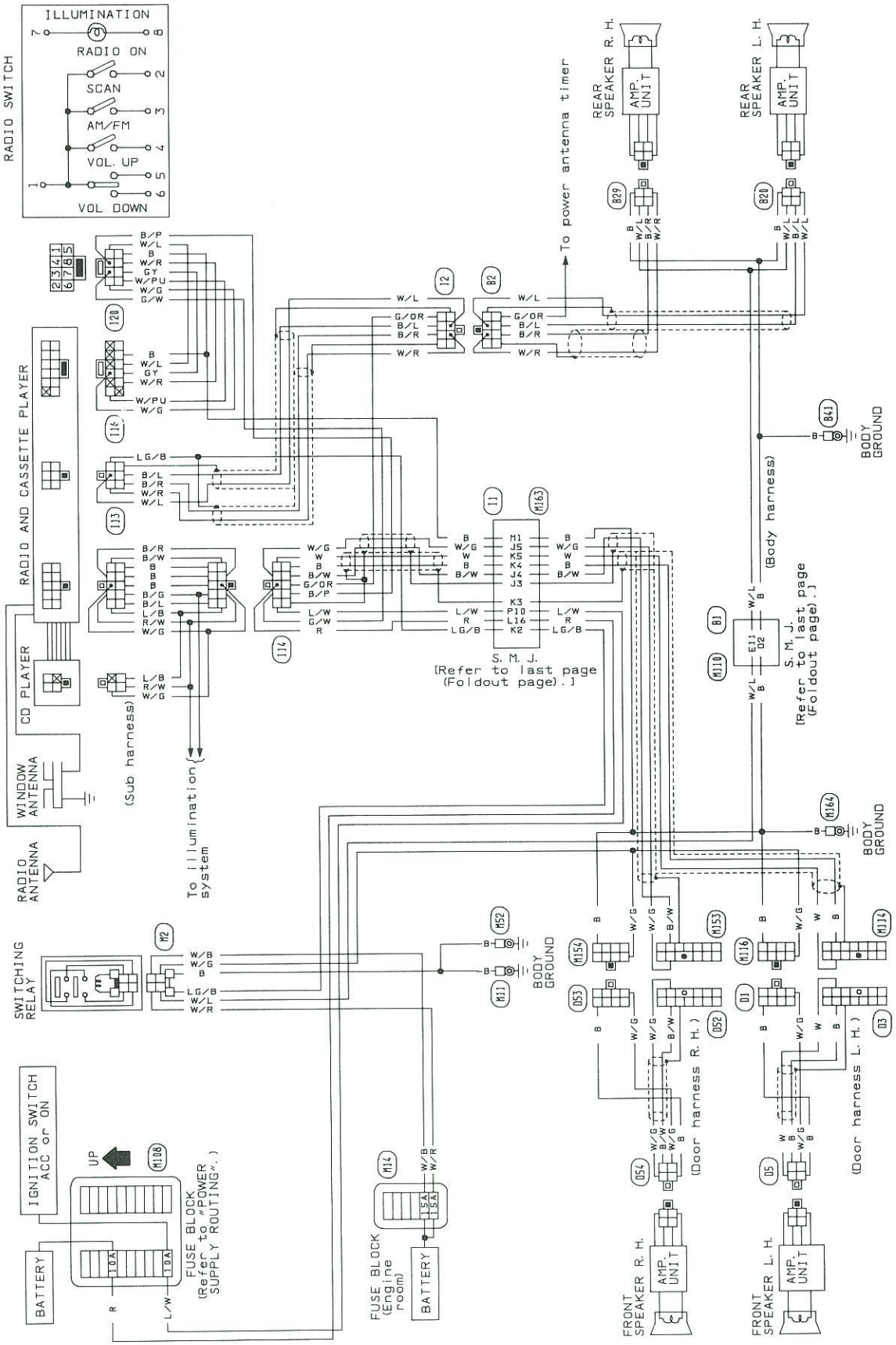




5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

Audio/Wiring Diagram

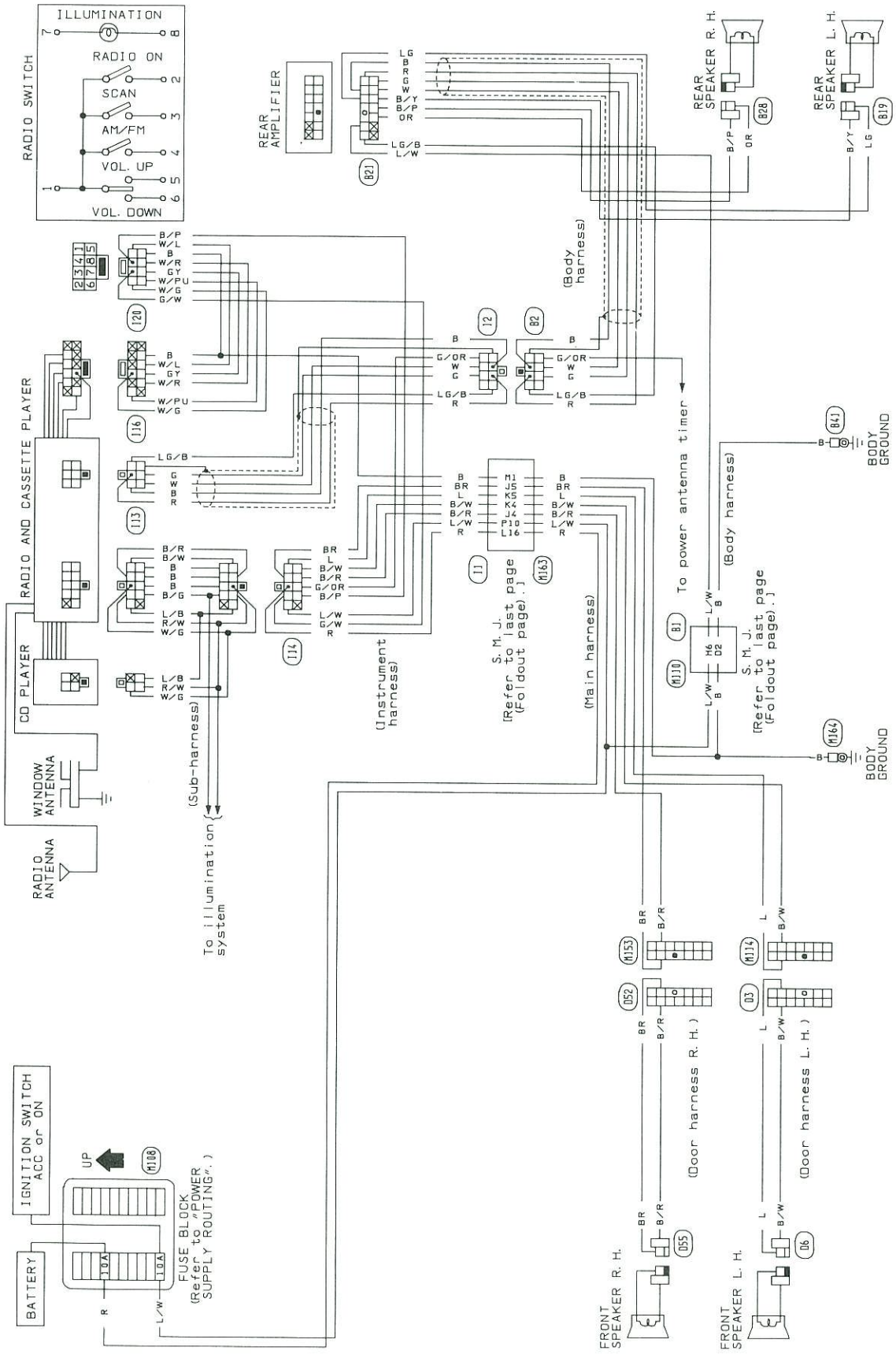
BOSE SYSTEM



MEL581A

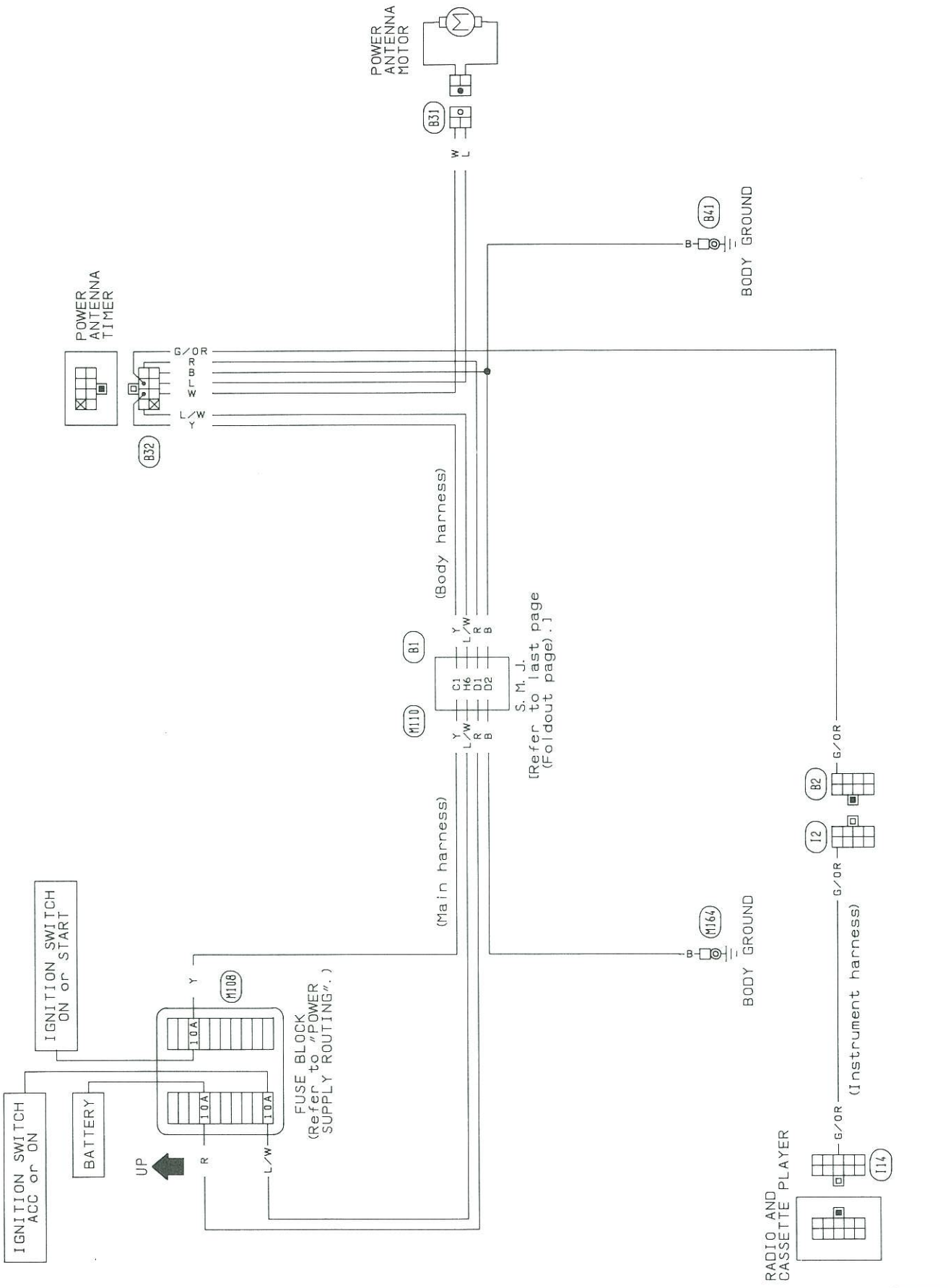
Audio/Wiring Diagram (Cont'd)

EXCEPT BOSE SYSTEM



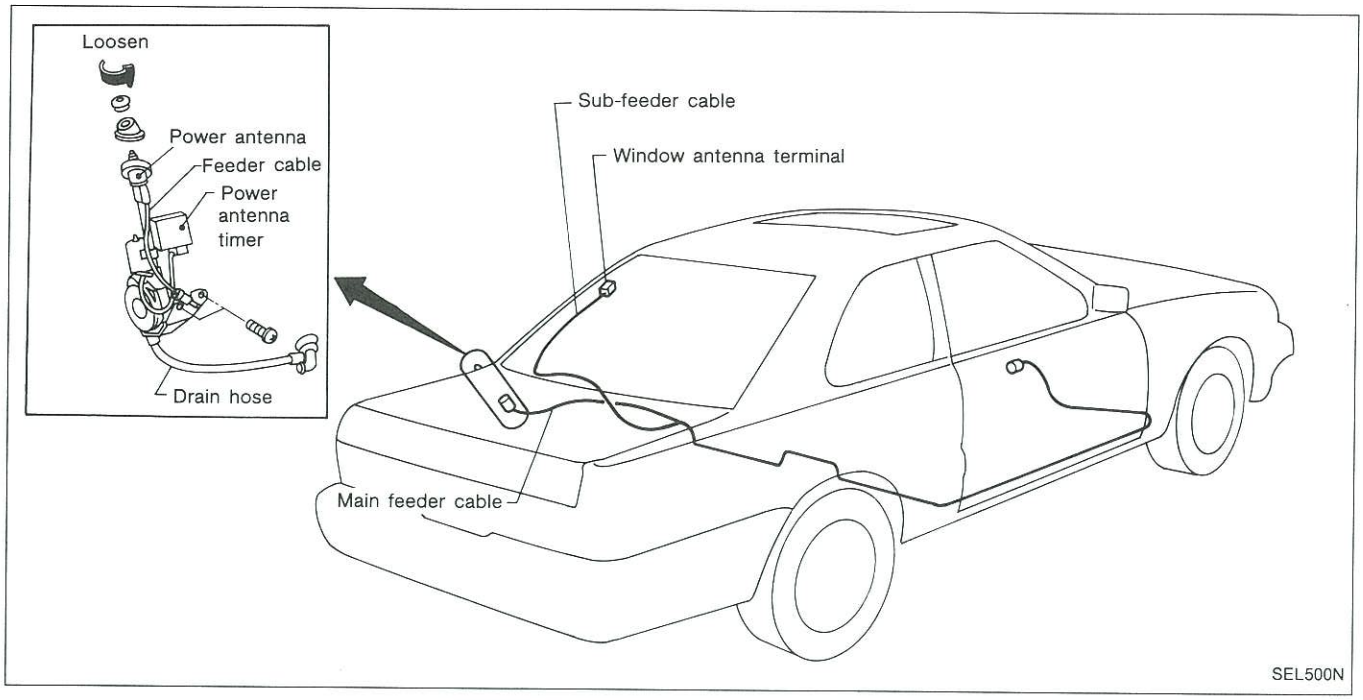
MEL582A

Power Antenna/Wiring Diagram

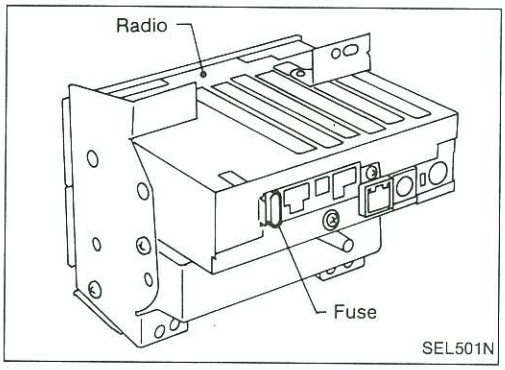


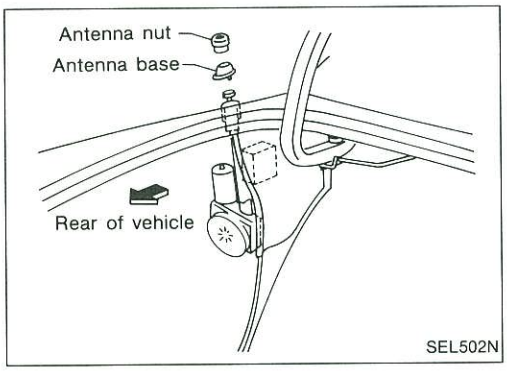
SEL272N

Location of Antenna



Radio Fuse Check

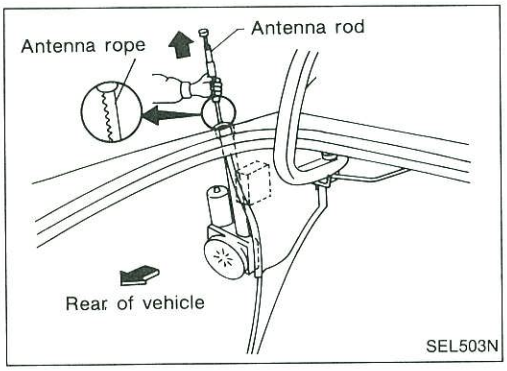




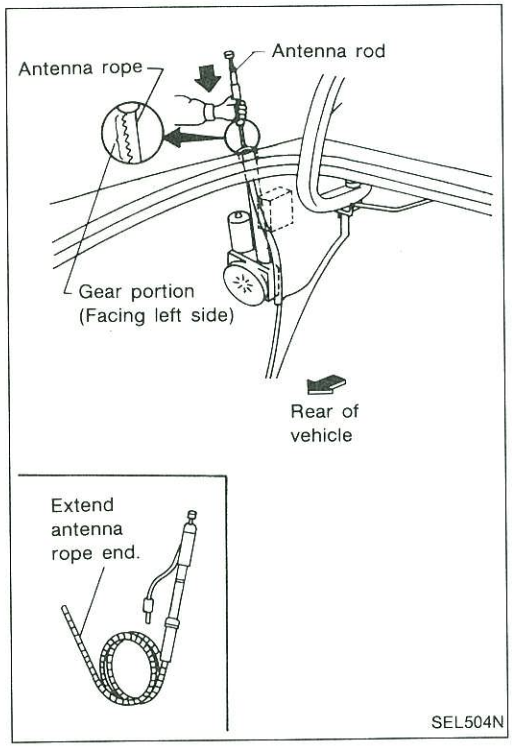
Antenna Rod Replacement

REMOVAL

1. Remove antenna nut and antenna base.

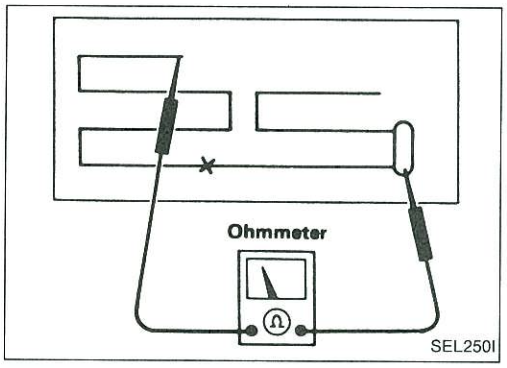


2. Withdraw antenna rod while raising it by operating antenna motor.



INSTALLATION

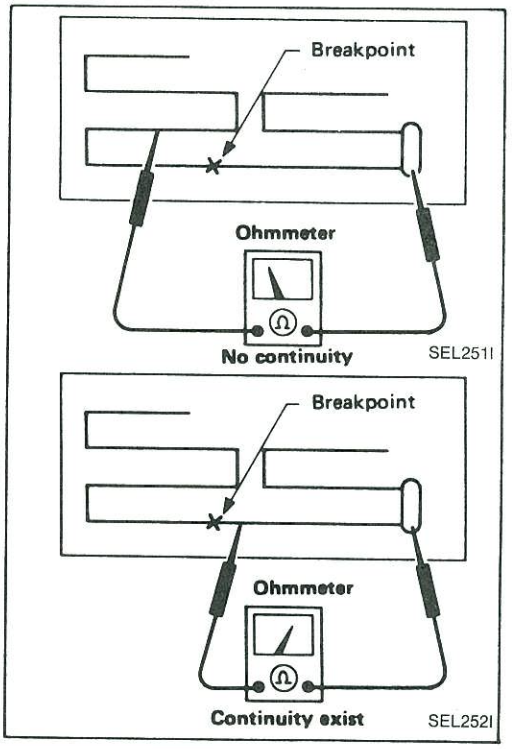
1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.



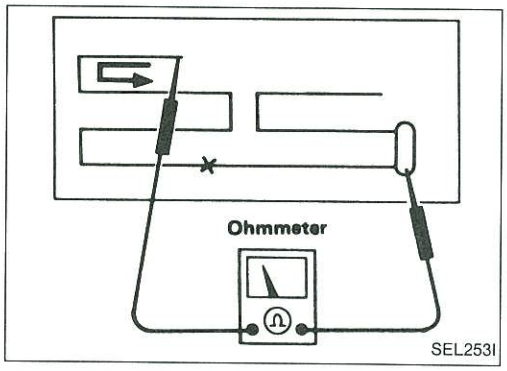
Window Antenna Repair

ELEMENT CHECK

1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



2. If an element is broken, no continuity will exist.

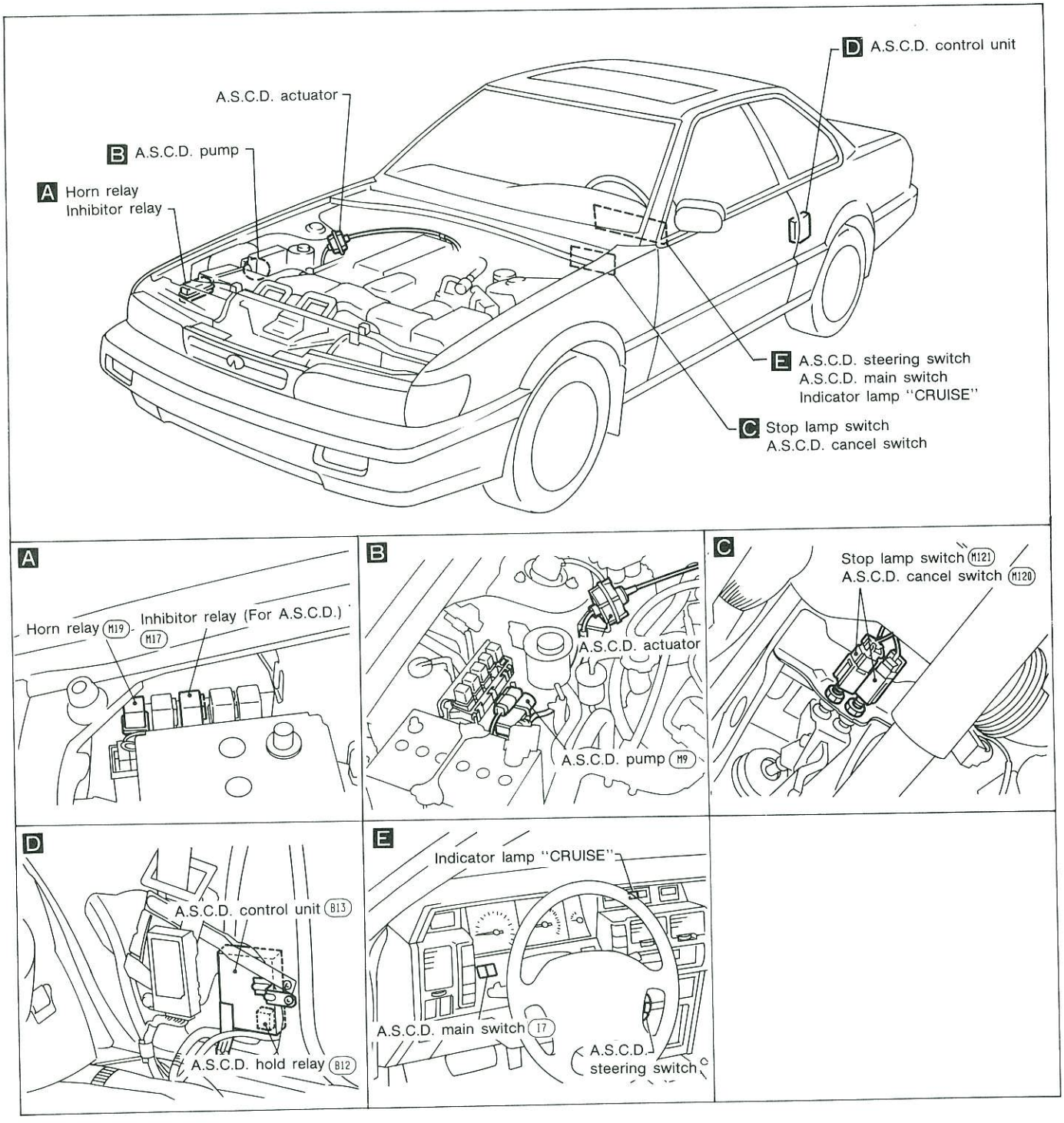


3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

ELEMENT REPAIR

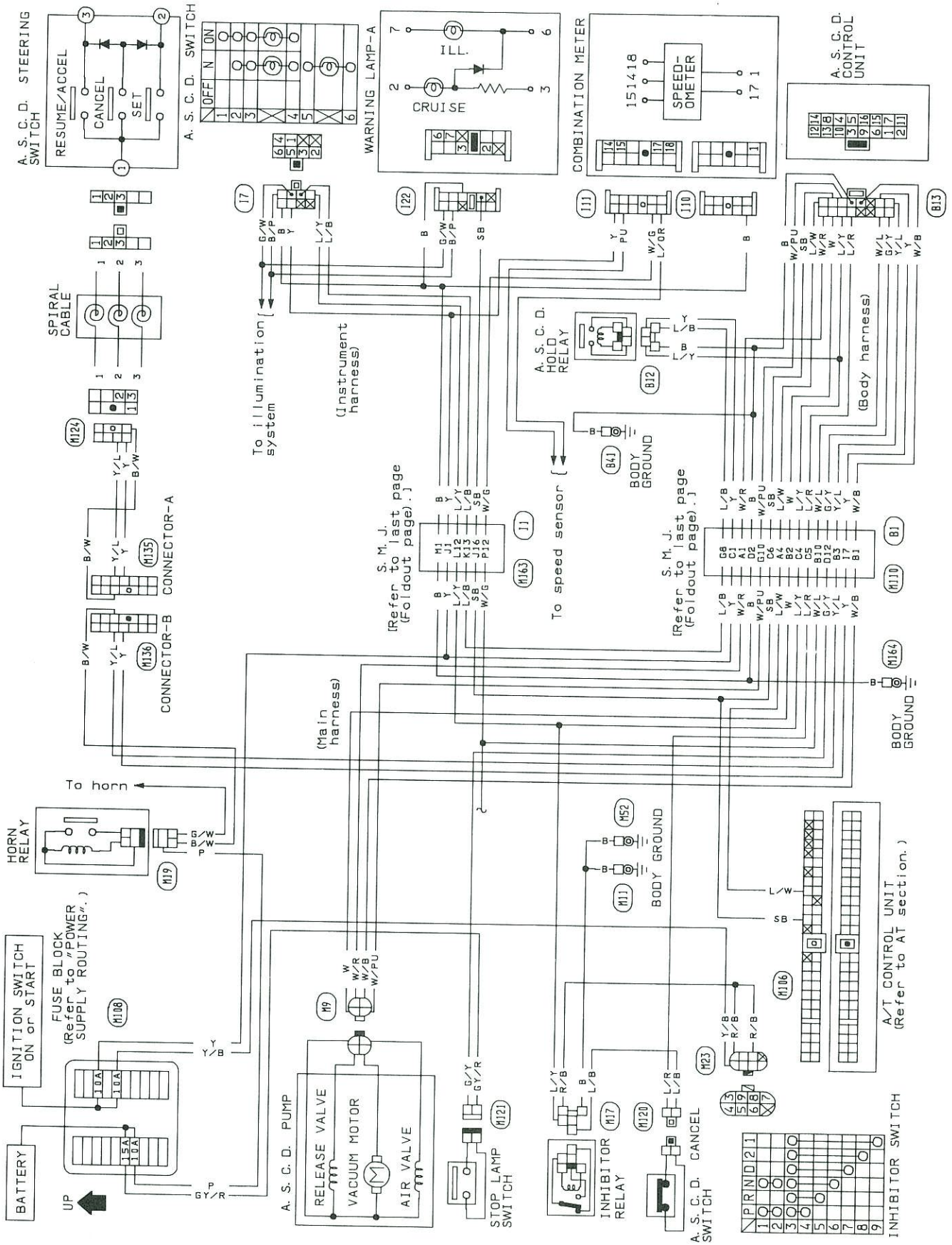
Refer to REAR WINDOW DEFOGGER "Filament Repair".

Component Parts and Harness Connector Location



SEL074Q

Wiring Diagram



MEL583A

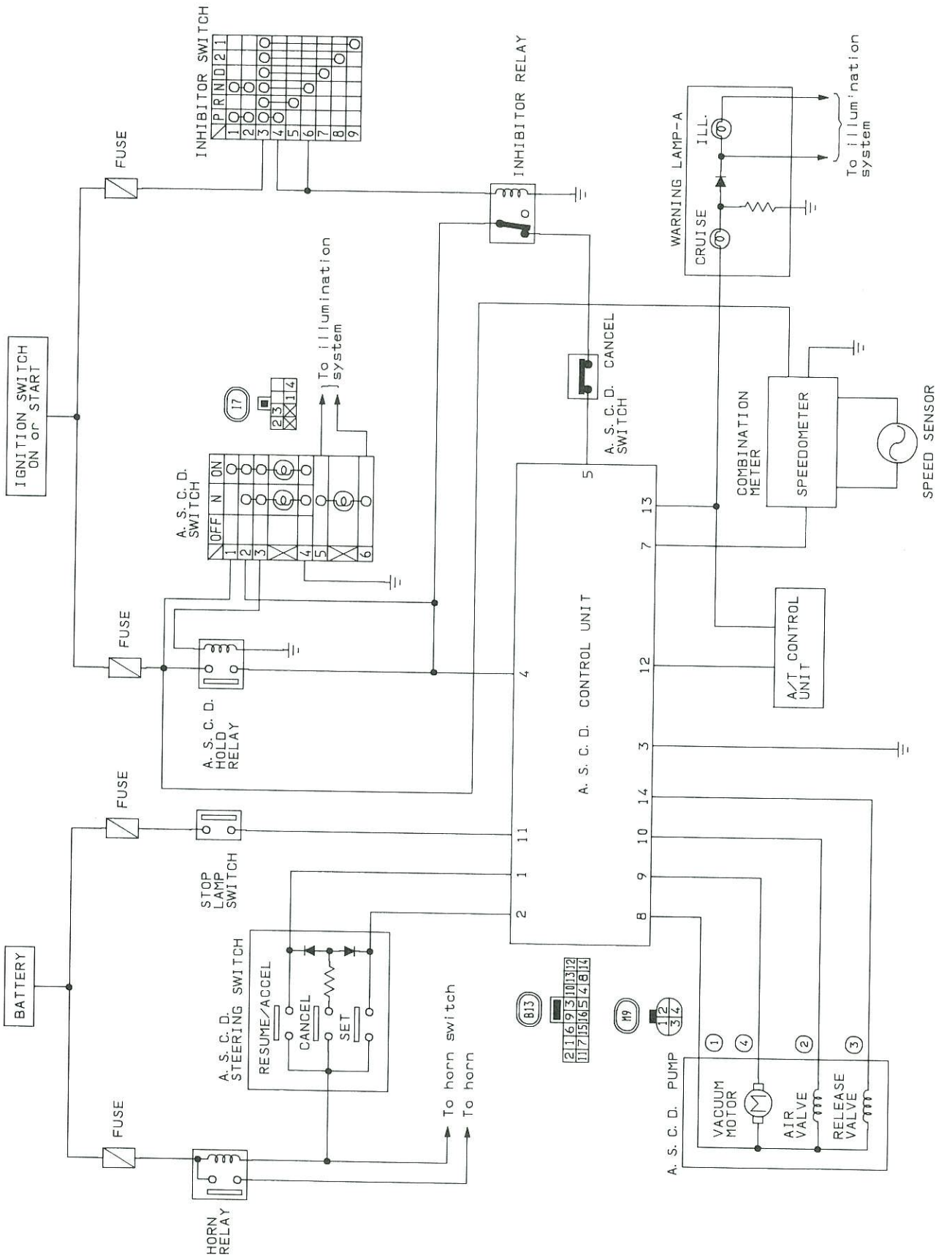
Trouble Diagnoses

SYMPTOM CHART

PROCEDURE	Diagnostic Procedure								Electrical Components Inspection						
REFERENCE PAGE	EL-90	EL-92	EL-92	EL-93	EL-94	EL-95	EL-96	EL-97	EL-98	EL-99	EL-100	EL-100	EL-100	EL-101	EL-101
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 (For A/T models)	Speed sensor
A.S.C.D. control unit cannot be set properly.	○									○	○	○	○	○	○
Engine hunts		○							○	○					
Large difference between set speed and actual vehicle speed.			○						○	○					
Deceleration is greatest immediately after A.S.C.D. has been set.				○					○	○					
ACCEL switch will not operate.	○				○							○			
RESUME switch will not operate.	○					○						○	○		
Set speed cannot be cancelled.							○		○	○			○		
"CRUISE" indicator lamp blinks.								○		○		○	○		

Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



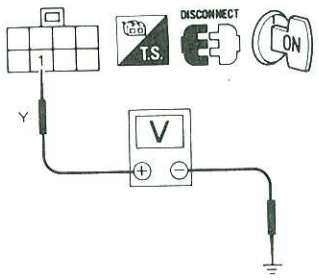
MEL584A

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

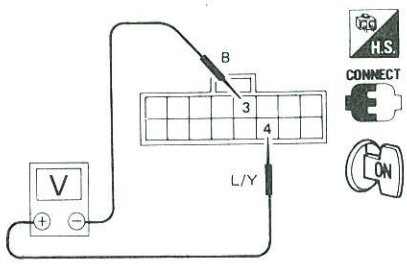
SYMPTOM: A.S.C.D. control cannot be set.

A A.S.C.D. main switch connector (17)



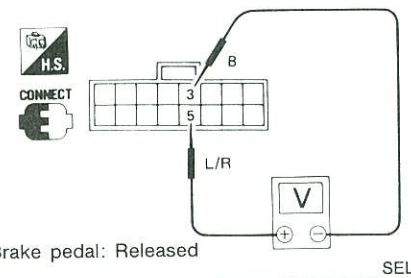
SEL075Q

B A.S.C.D. control unit connector (B13)



SEL076Q

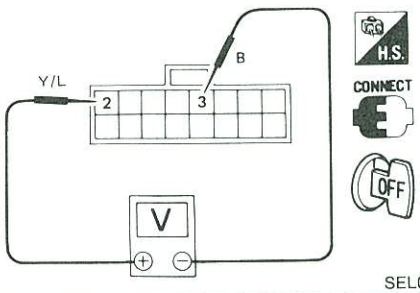
C A.S.C.D. control unit connector (B13)
A/T shift lever → Except "N" and "P"



Brake pedal: Released

SEL077Q

D A.S.C.D. control unit connector (B13)



SEL078Q

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 ① 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 terminal 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.
Check voltage between control unit harness terminals ⑤ and ③.
Battery voltage should exist.

N.G. → CHECK A.S.C.D. CANCEL SWITCH AND INHIBITOR SWITCH.
Refer to "Electrical Components Inspection".
CHECK INHIBITOR RELAY.

O.K. ↓

D

CHECK SET/COAST SWITCH CIRCUIT FOR A.S.C.D. CONTROL UNIT.
1. Push and hold SET/COAST button on A.S.C.D. steering switch.
2. Check voltage between control unit harness terminals ② and ③.
Battery voltage should exist.

N.G. → Does horn work?

No → Check fuse and horn relay.

Yes → CHECK A.S.C.D. STEERING SWITCH.
Refer to "Electrical Components Inspection".

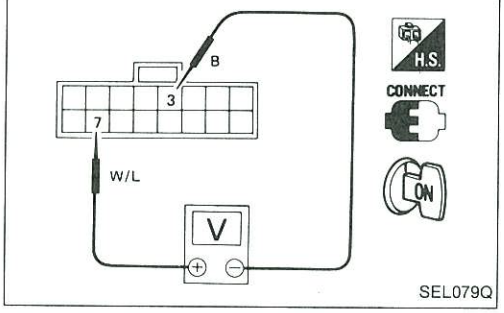
O.K. ↓

Ⓐ

(Next page)

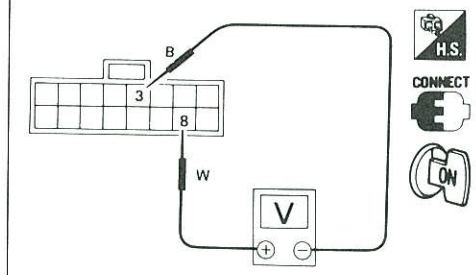
Trouble Diagnoses (Cont'd)

E A.S.C.D. control unit connector (B13)

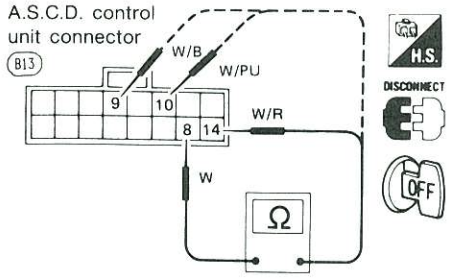


F

A.S.C.D. control unit connector (B13)



A.S.C.D. control unit connector (B13)



Ⓐ

E

CHECK SPEED SENSOR CIRCUIT.
1. Apply wheel chocks and jack up front of vehicle.
2. Connect voltmeter between control unit harness terminals ⑦ and ③.
3. Slowly turn front wheel.
4. Check deflection of voltmeter pointer.

N.G. → CHECK SPEED SENSOR. Refer to "Electrical Components Inspection".

O.K. ↓

CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP.
Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. actuator/A.S.C.D. pump.

O.K. ↓

F

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.

Terminals		Resistance [Ω]
⑧	⑨	Approx. 8 - 45
	⑩	Approx. 65
	⑭	Approx. 65

N.G. → Repair short or open circuit in A.S.C.D. actuator/ A.S.C.D. pump harness.

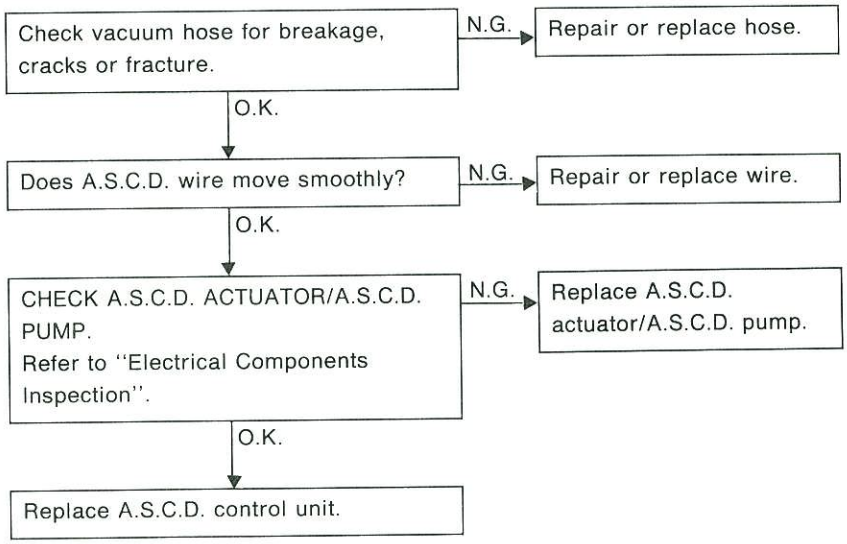
O.K. ↓

Replace A.S.C.D. control unit.

Trouble Diagnoses (Cont'd)

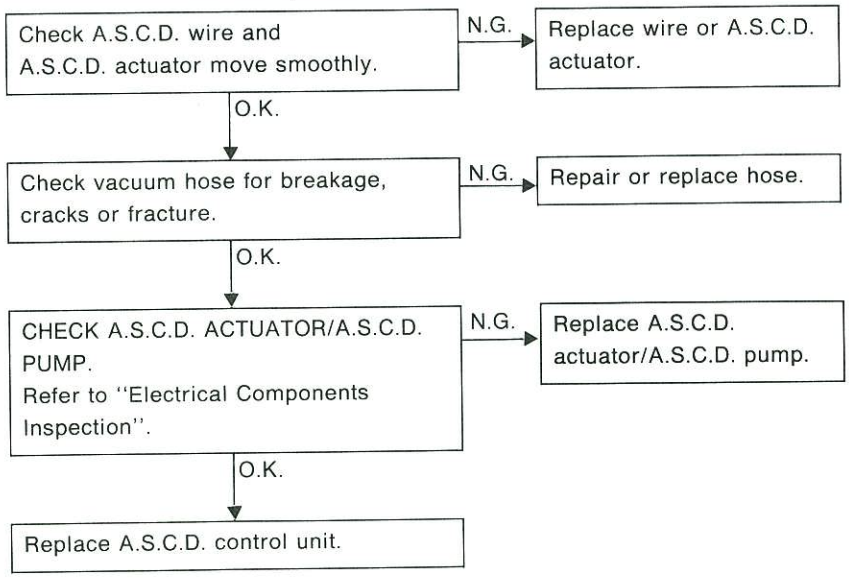
DIAGNOSTIC PROCEDURE 2

SYMPTOM: Engine hunts.



DIAGNOSTIC PROCEDURE 3

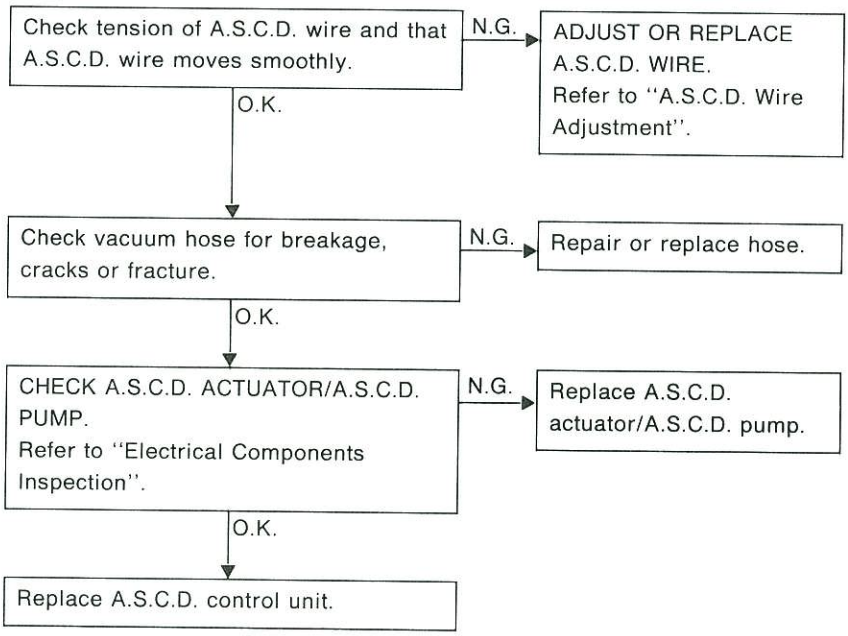
SYMPTOM: Large difference between set vehicle speed and actual speed.



Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Deceleration is greatest immediately after A.S.C.D. has been set.

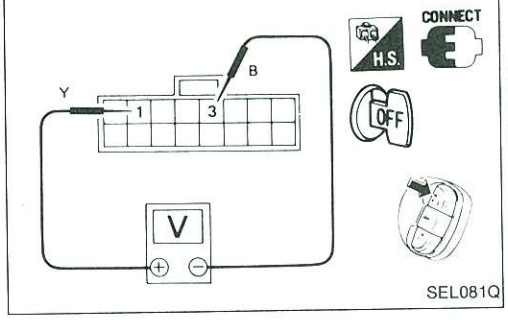


Trouble Diagnoses (Cont'd)

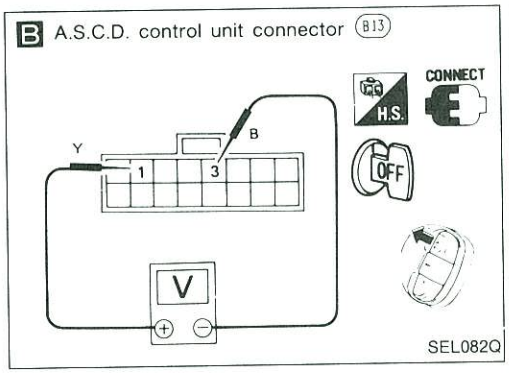
DIAGNOSTIC PROCEDURE 5

SYMPTOM: ACCEL switch will not operate.

A A.S.C.D. control unit connector (B13)



B A.S.C.D. control unit connector (B13)



C

Check constant-speed function for operating using SET/COAST switch.
- N.G. → Go to "DIAGNOSTIC PROCEDURE 1".
- O.K. ↓

A

Check voltage between control unit harness terminals ① and ③ after pressing and holding RESUME/ACCEL switch.
Battery voltage should exist.
- N.G. → CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".
- O.K. ↓

B

Check voltage between control unit harness terminals ① and ③ after releasing RESUME/ACCEL switch.
Voltage is 0V.
- N.G. → CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".
- O.K. ↓

C

Does vehicle accelerate when RESUME/ACCEL switch is pressed?
- No → Replace control unit.
- Yes ↓

D

Does vehicle maintain the new (faster) speed when RESUME/ACCEL switch is released?
- No → Replace control unit.
- Yes ↓

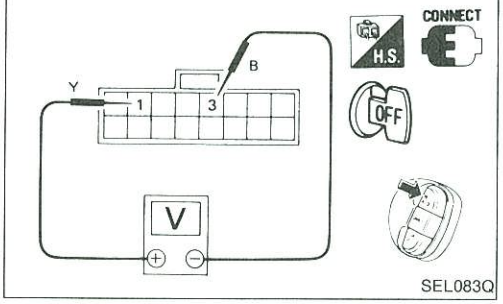
System is O.K.

Trouble Diagnoses (Cont'd)

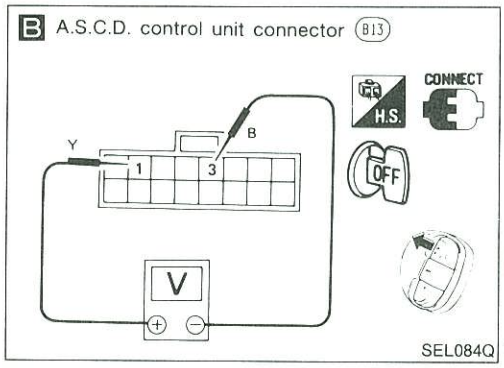
DIAGNOSTIC PROCEDURE 6

SYMPTOM: RESUME switch will not operate.

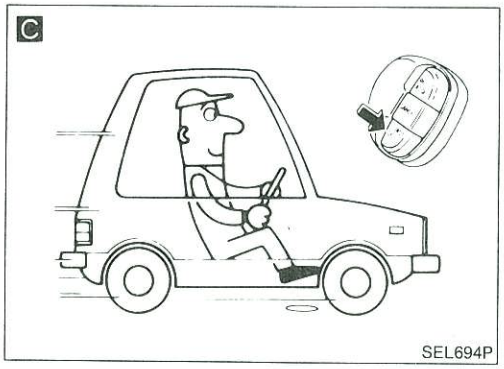
A A.S.C.D. control unit connector (B13)



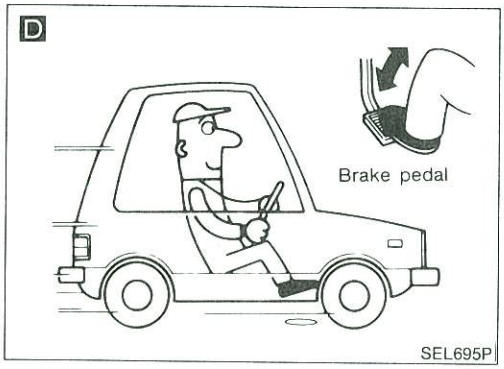
B A.S.C.D. control unit connector (B13)



C



D



E

Check constant-speed function for operation using SET/COAST switch.
- N.G. → Go to "DIAGNOSTIC PROCEDURE 1".
- O.K. ↓

A

Check voltage between control unit harness terminals ① and ③ after pressing and holding RESUME/ACCEL switch.
Battery voltage should exist.
- N.G. → CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".
- O.K. ↓

B

Check voltage between control unit harness terminals ① and ③ after releasing RESUME/ACCEL switch.
Voltage is 0V.
- N.G. → CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".
- O.K. ↓

C

Set vehicle speed at 80 km/h (50 MPH) by pressing SET/COAST switch.
- O.K. ↓

D

While cruising at set speed, depress and release brake pedal.
- O.K. ↓

Does speed control disengage and "CRUISE" lamp turn off?
- No → CHECK STOP LAMP SWITCH AND A.S.C.D. CANCEL SWITCH. Refer to "Electrical Components Inspection".
- Yes ↓

E

Above 48 km/h (30 MPH), press and release RESUME/ACCEL switch.
- O.K. ↓

Does vehicle return to previously set speed [80 km/h (50 MPH)]?
- No → Replace control unit.
- Yes ↓

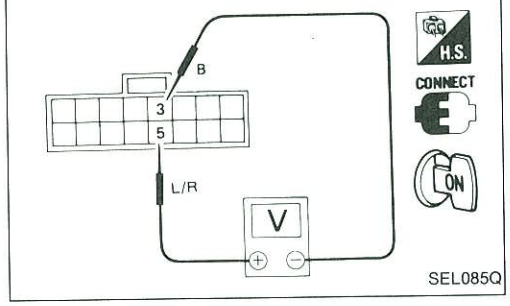
System is O.K.

Trouble Diagnoses (Cont'd)

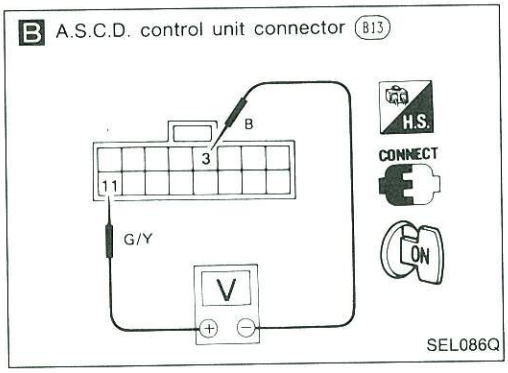
DIAGNOSTIC PROCEDURE 7

SYMPTOM: Set speed cannot be cancelled.

A A.S.C.D. control unit connector (B13)



B A.S.C.D. control unit connector (B13)



A

CHECK A.S.C.D. CANCEL SWITCH AND INHIBITOR SWITCH CIRCUIT.
1. Turn A.S.C.D. main switch "ON".
2. Check voltage between control unit harness terminals ⑤ and ③.

Conditions		Voltage [V]
A.S.C.D. cancel switch	De-pressed	0
	Released	Approx. 12
A/T shift lever position is at any position except N or P.		Approx. 12
A/T shift lever position is at N or P.		0

N.G. → CHECK A.S.C.D. CANCEL SWITCH AND INHIBITOR SWITCH.
Refer to "Electrical Components Inspection".

O.K. ↓

B

CHECK STOP LAMP SWITCH CIRCUIT.
Check voltage between control unit harness terminals ⑪ and ③.

Condition		Voltage [V]
Stop lamp switch	Depressed	Approx. 12
	Released	0

N.G. → CHECK STOP LAMP SWITCH.
Refer to "Electrical Components Inspection".

O.K. ↓

Check A.S.C.D. wire moves smoothly.

N.G. → Replace A.S.C.D. wire.

O.K. ↓

CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP.
Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. actuator/A.S.C.D. pump.

O.K. ↓

Replace A.S.C.D. control unit.

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".

N.G. → Replace A.S.C.D. actuator/ A.S.C.D. pump

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.

Terminals		Resistance [Ω]
⑧	⑨	Approx. 8 - 45
	⑩	Approx. 65
	⑭	Approx. 65

N.G. → Repair short or open circuit in A.S.C.D. actuator/ A.S.C.D. pump harness.

O.K. → Replace A.S.C.D. control unit.

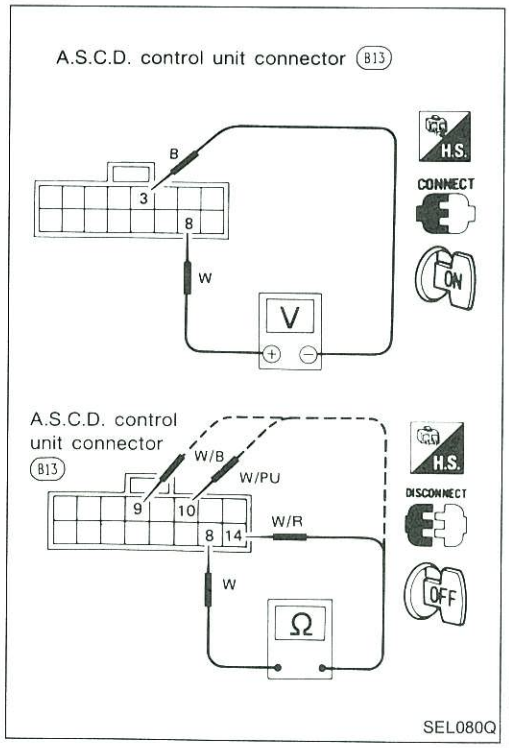
Does indicator lamp blink when brake pedal is depressed slowly?

No → CHECK A.S.C.D. STEERING SWITCH.
Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. steering switch.

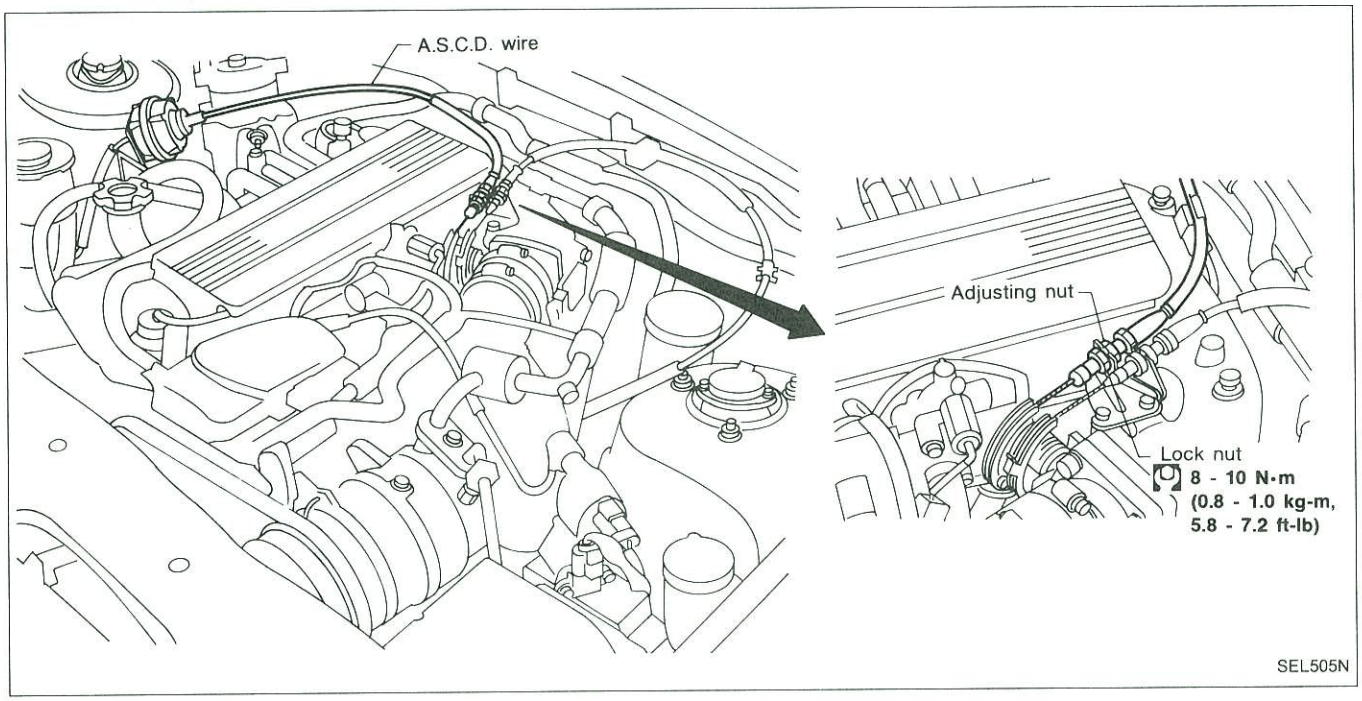
O.K. → Replace control unit.

Yes → Adjust installation of stop lamp switch and A.S.C.D. cancel switch.
Refer to BR section.



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.

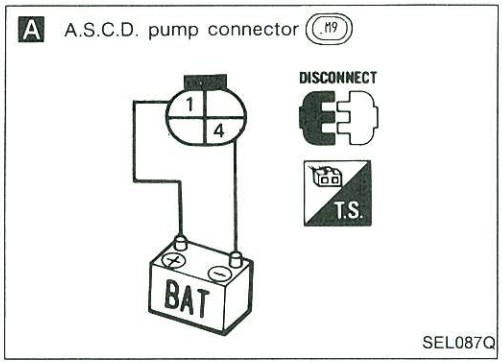
Trouble Diagnoses (Cont'd)

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 A.S.C.D. pump connector M9



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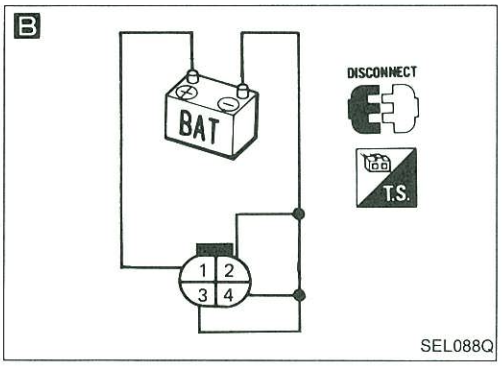
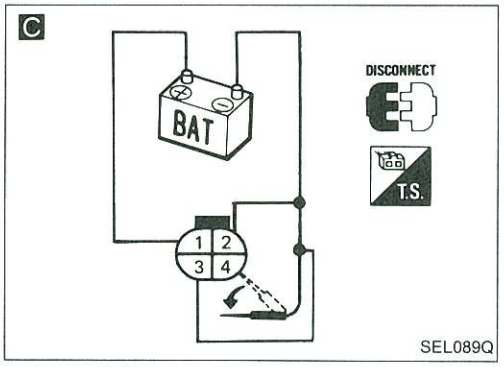
B



SEL088Q

C



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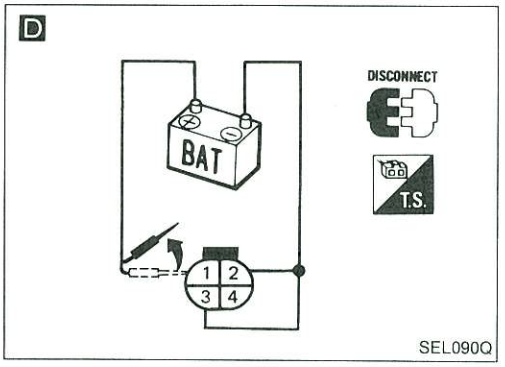
D



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A

Check to see if motor starts when 12V D.C. is applied across ① and ④.

N.G. → Replace A.S.C.D. pump.

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. → Disconnect vacuum hose from A.S.C.D. actuator and check for presence of vacuum pressure at A.S.C.D. pump.

- N.G. → Replace A.S.C.D. pump.
- O.K. → Replace A.S.C.D. actuator.

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. pump.

O.K. (Wire does not return.) ↓

D

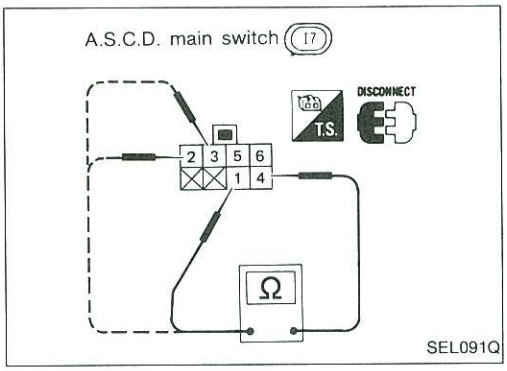
Disconnect lead from ① to see if A.S.C.D. wire returns immediately.

N.G. → Replace A.S.C.D. pump.

O.K. (Wire returns.) ↓

A.S.C.D. actuator/A.S.C.D. pump are O.K.

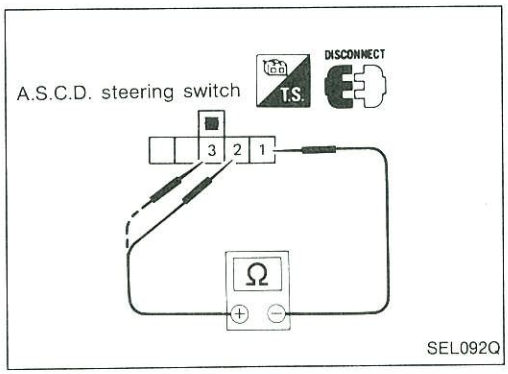
Trouble Diagnoses (Cont'd)



A.S.C.D. main switch

Check continuity between terminals by pushing switch to each position.

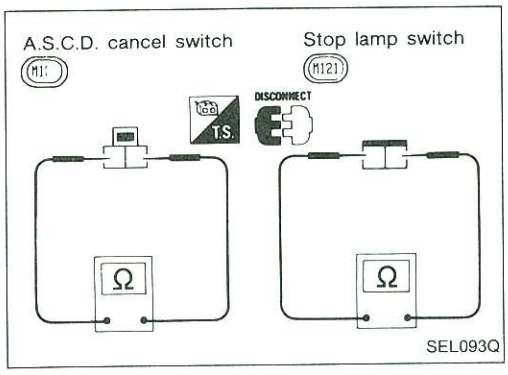
Switch position \ Terminals	1	2	3	4	5	6
ON	○	○	○	○		
N		○	○	○	ILL.	
OFF						



A.S.C.D. steering switch

Check continuity between terminals by pushing each button.

Button \ Terminal	1	2	3
SET/COAST	○	○	
RESUME/ACCEL	○		○
CANCEL	○	▶○	
	○	▶○	○

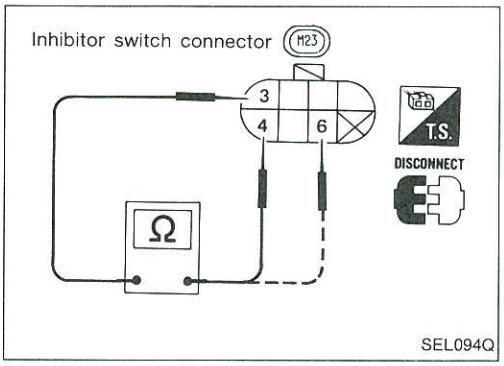


A.S.C.D. cancel switch and stop lamp switch

Condition	Continuity	
	A.S.C.D. cancel switch	Stop lamp switch
When brake pedal is depressed	No	Yes
When brake pedal is released	Yes	No

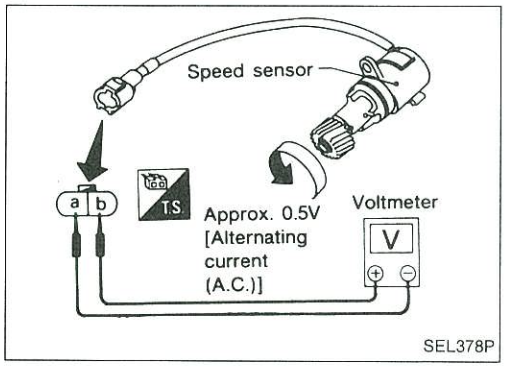
Check each switch after adjusting brake pedal — refer to BR section.

Trouble Diagnoses (Cont'd)



Inhibitor switch

Condition	Continuity
When shift lever position is "N" or "P"	Yes
When shift lever position is any position except "N" or "P"	No

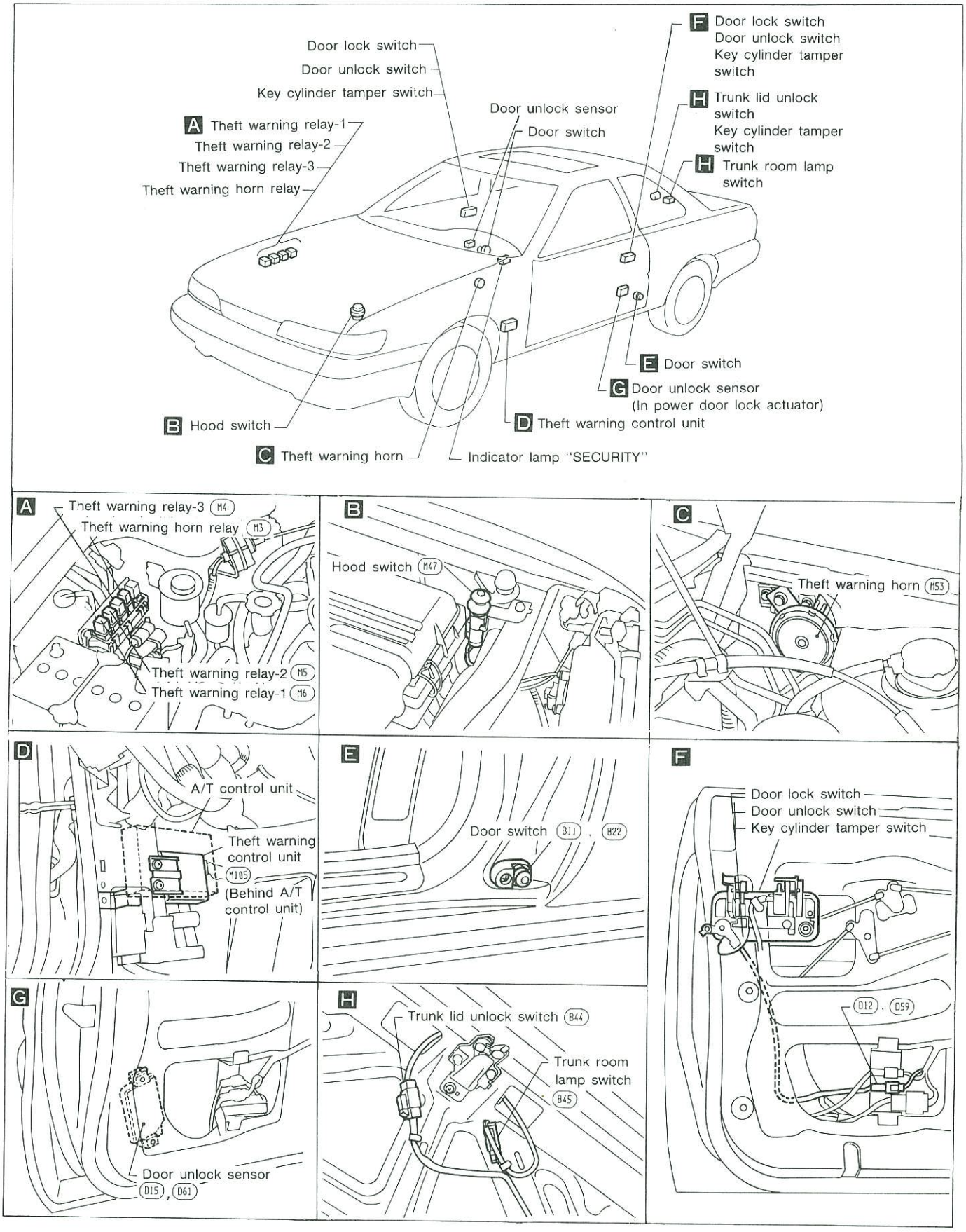


Speed sensor

1. Remove speed sensor from transaxle.
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

NOTE

Component Parts and Harness Connector Location



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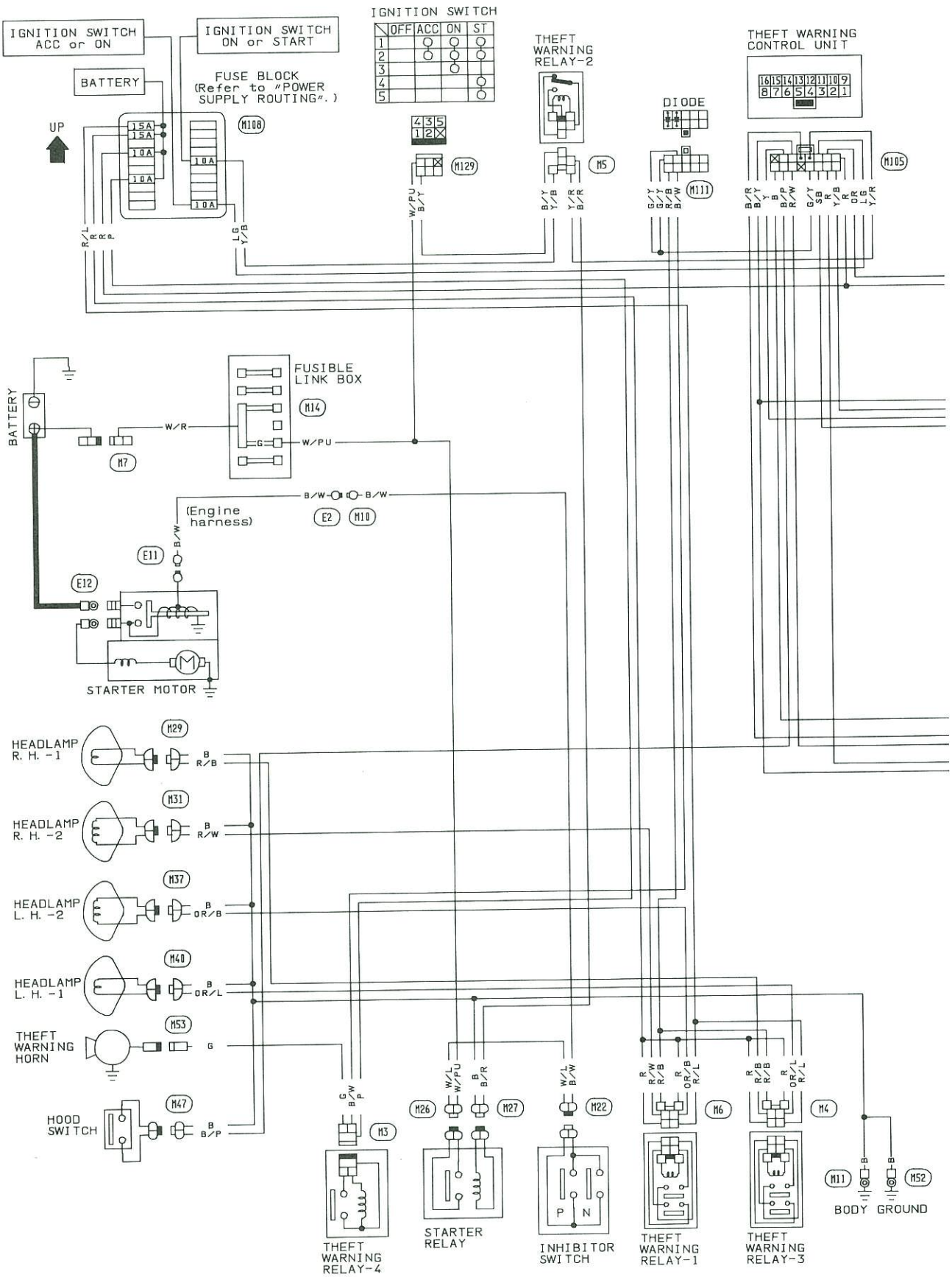
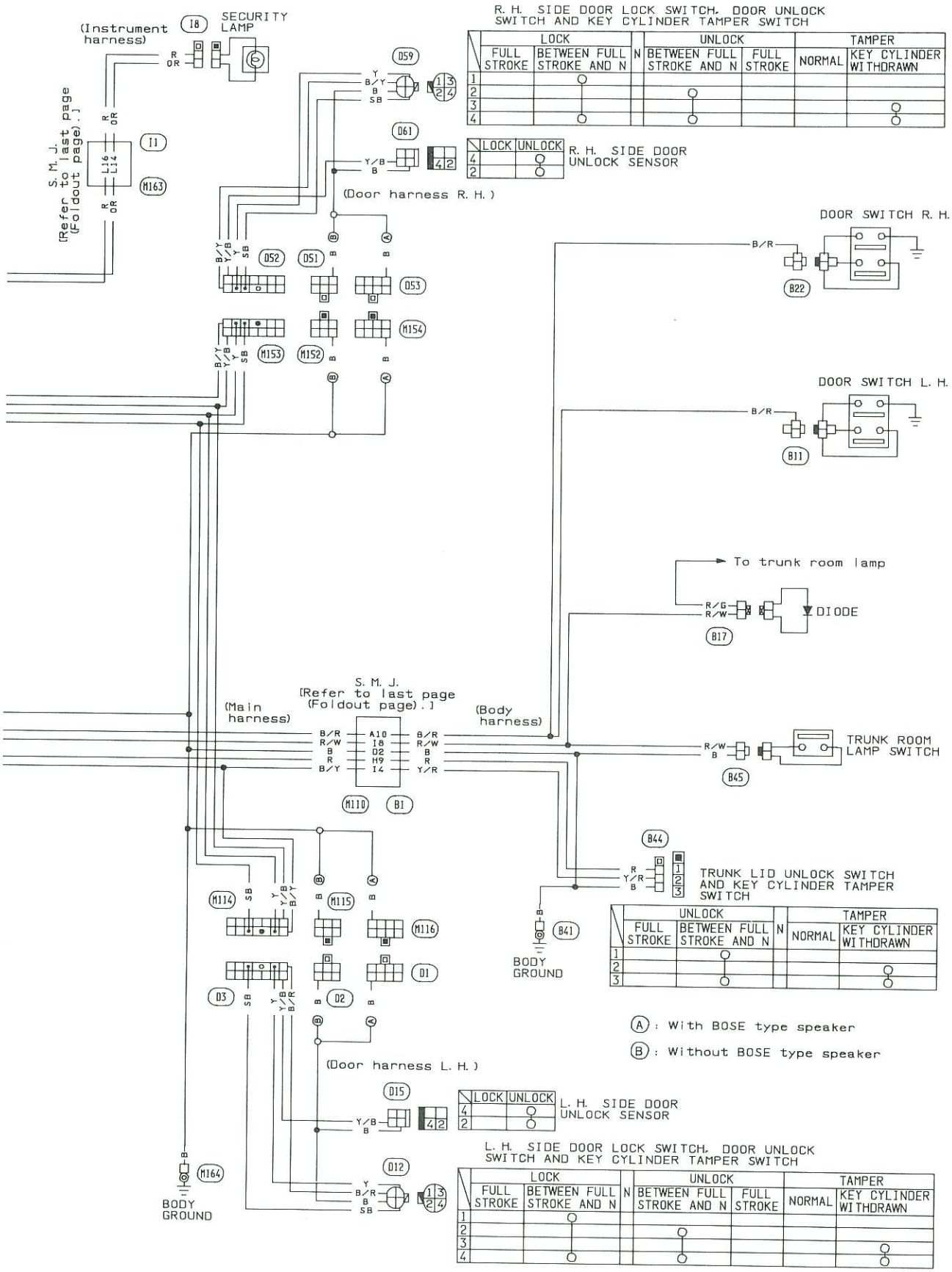
Wiring Diagram



Wiring Diagram (Cont'd)



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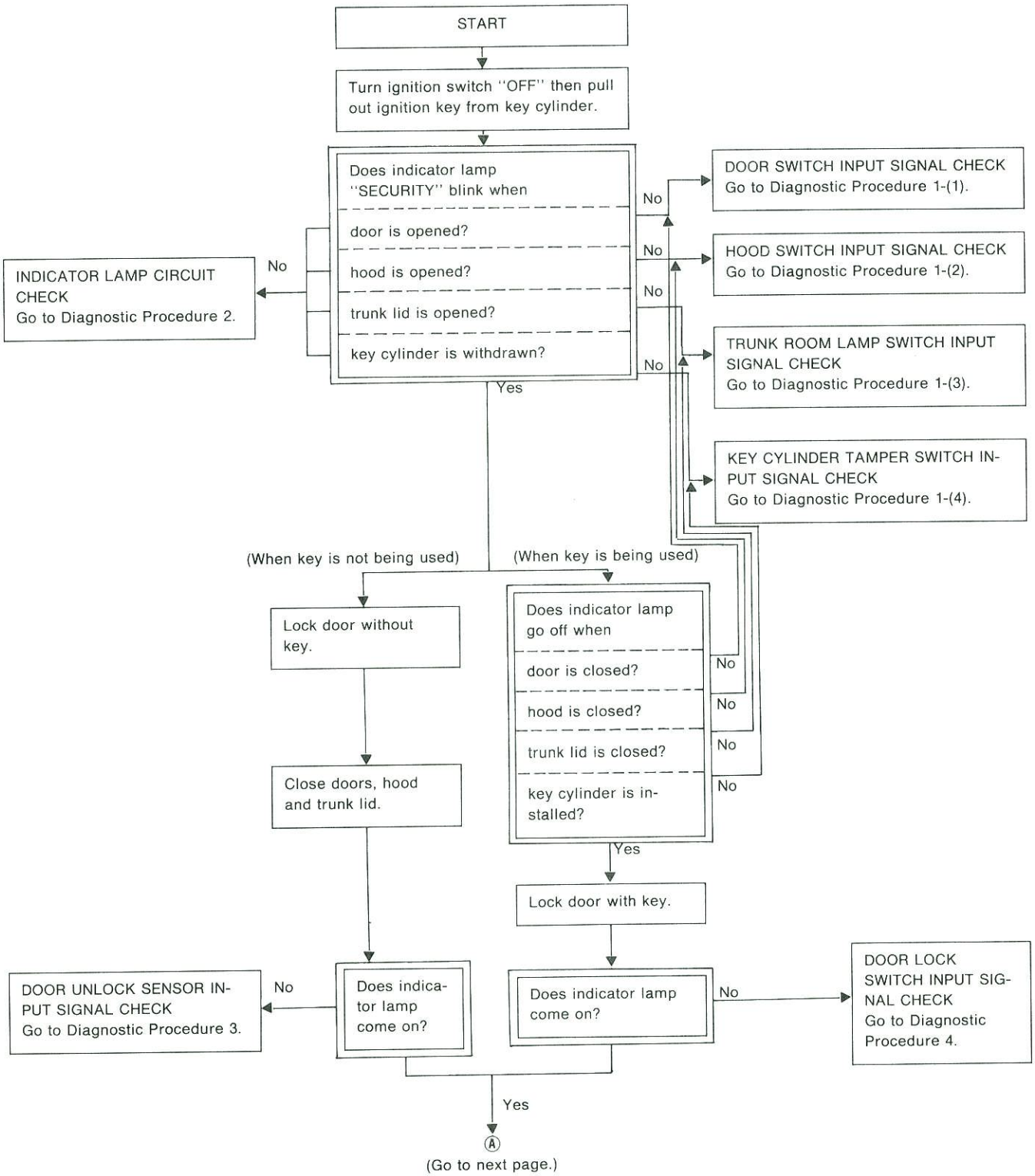
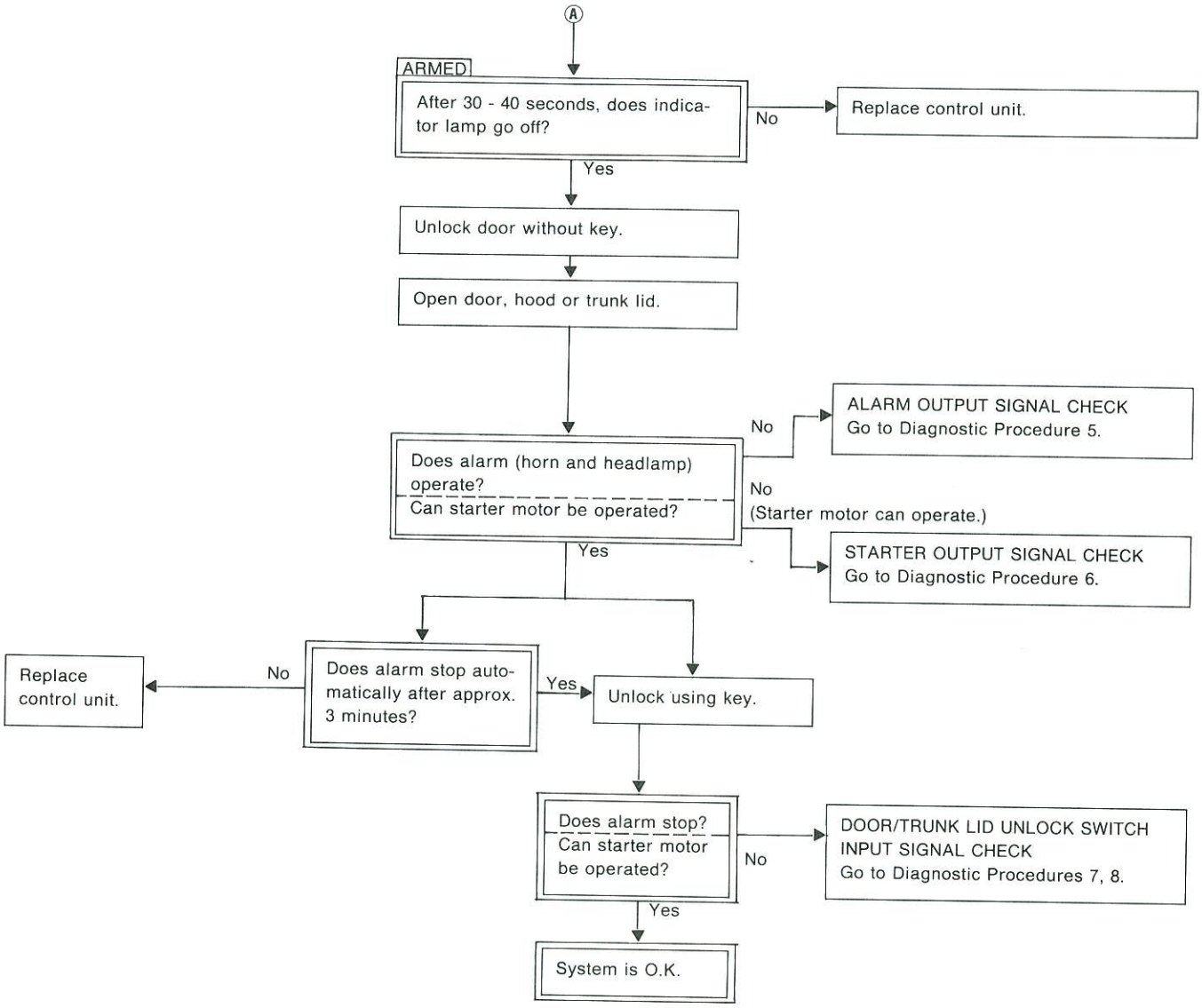
Trouble Diagnoses

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.

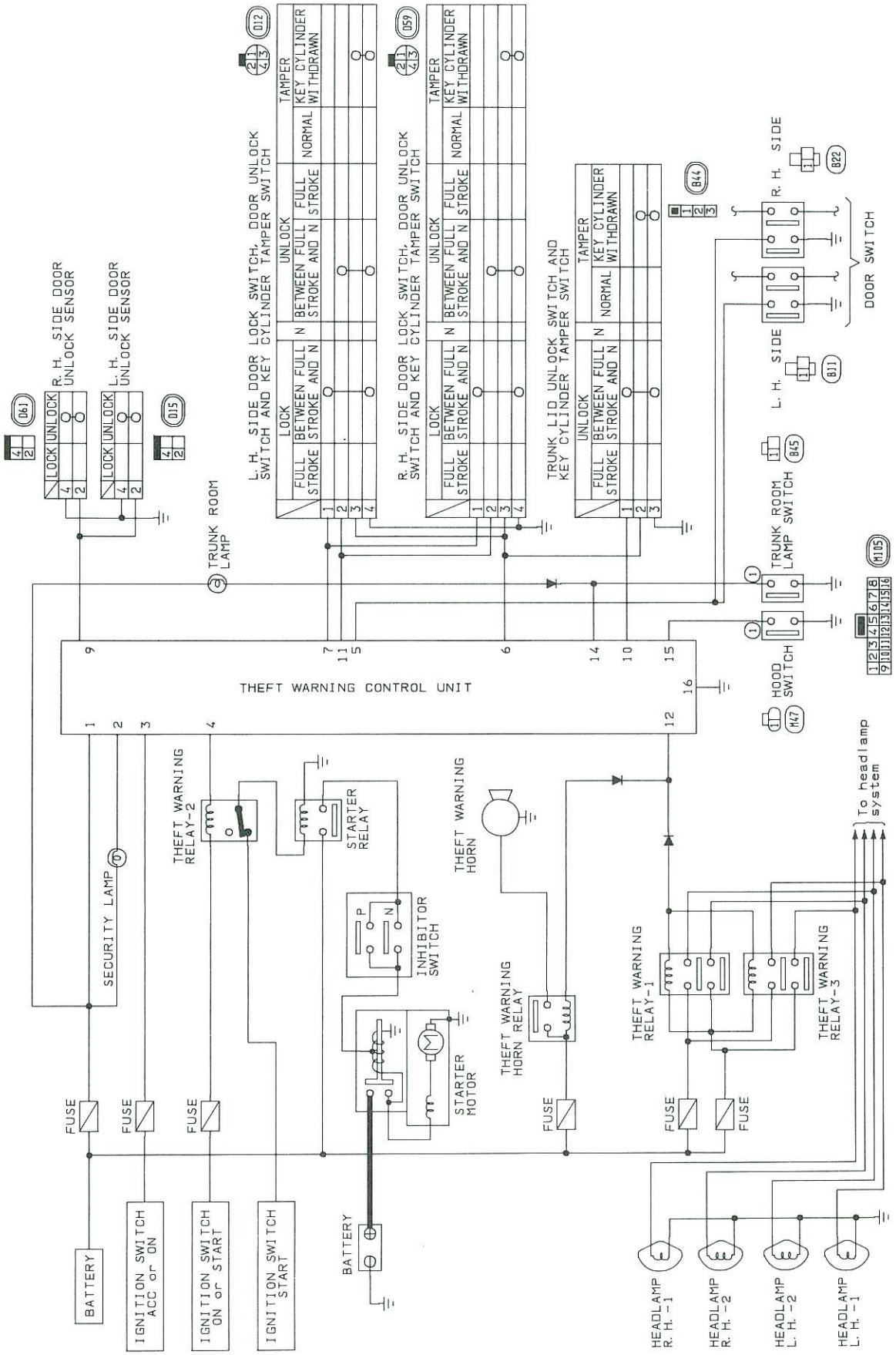


Trouble Diagnoses (Cont'd)



Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



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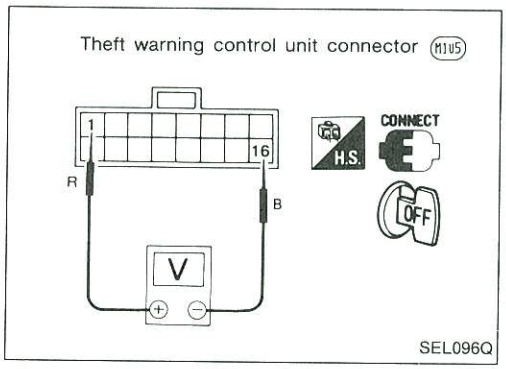
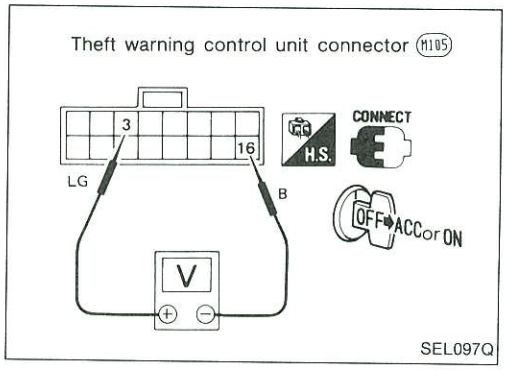
Trouble Diagnoses (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT CHECK



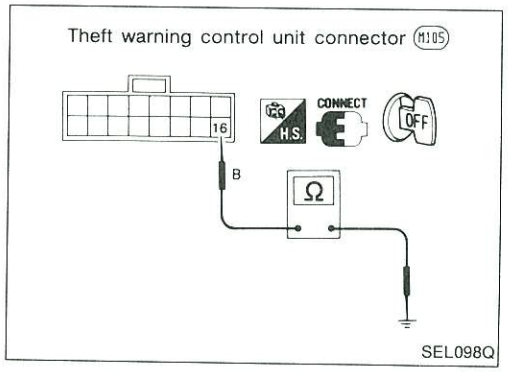
Main power supply circuit check

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

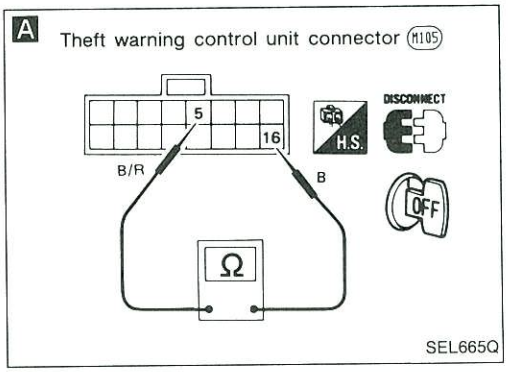
Terminals	Continuity
⑯ - Ground	Yes

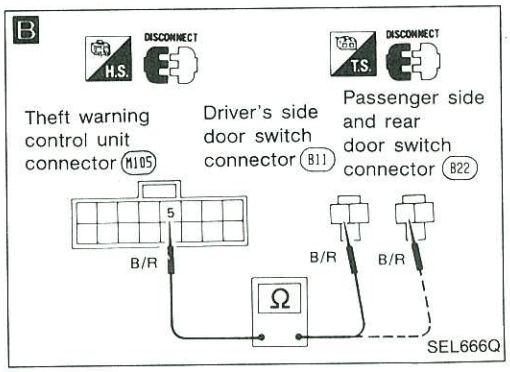
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

SYMPTOM:
- **Indicator lamp does not blink.**
- **Indicator lamp remains blinking.**

Diagnostic procedure 1-(1)





A

DOOR SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑤ and ⑯.

Condition	Continuity
All doors are closed	No
At least one door is open	Yes

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 ⑤ and door switch harness terminal.
Continuity should exist.

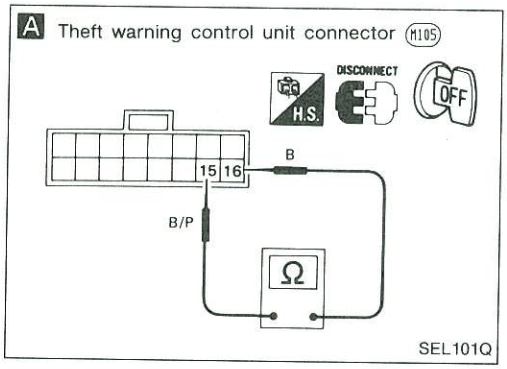
N.G. → Repair harness or connectors.

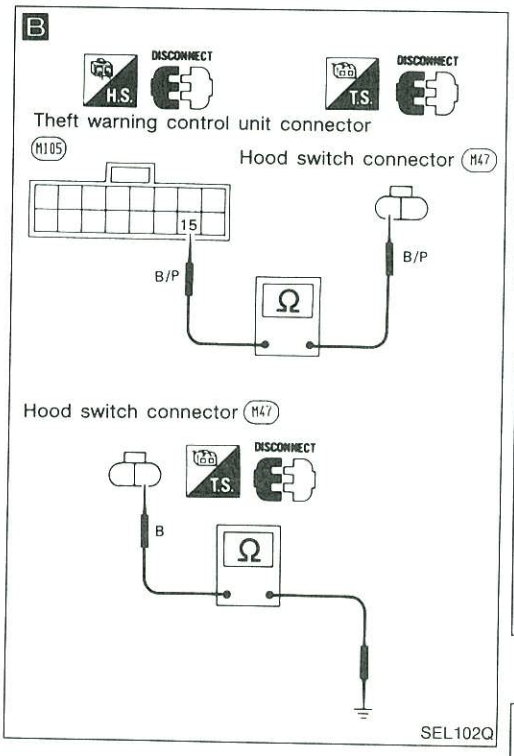
O.K. ↓

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.

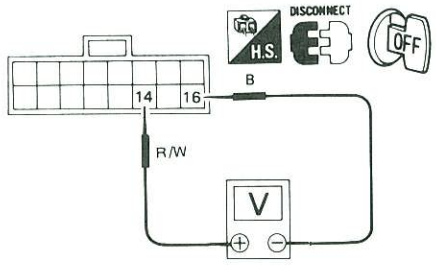
O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

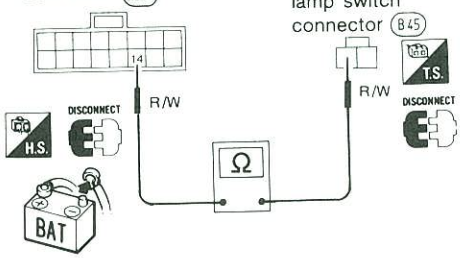
Diagnostic procedure 1-(3)

A Theft warning control unit connector (M105)



B Theft warning control unit connector (M105)

Trunk room lamp switch connector (B45)



A

TRUNK ROOM LAMP SWITCH INPUT SIGNAL CHECK

Check voltage between control unit harness terminals ⑭ and ⑯.

Condition	Voltage
Trunk lid is open	Approx. 0V
Trunk lid is closed	Approx. 12V

O.K. → Go to Diagnostic Procedure 2.

N.G. ↓

Does trunk room lamp come on?

Yes → B

No ↓

TRUNK ROOM LAMP SWITCH CHECK

Refer to "Electrical Components Inspection".

O.K. → B

N.G. ↓

Replace trunk room lamp switch.

B

TRUNK ROOM LAMP SWITCH CIRCUIT CHECK

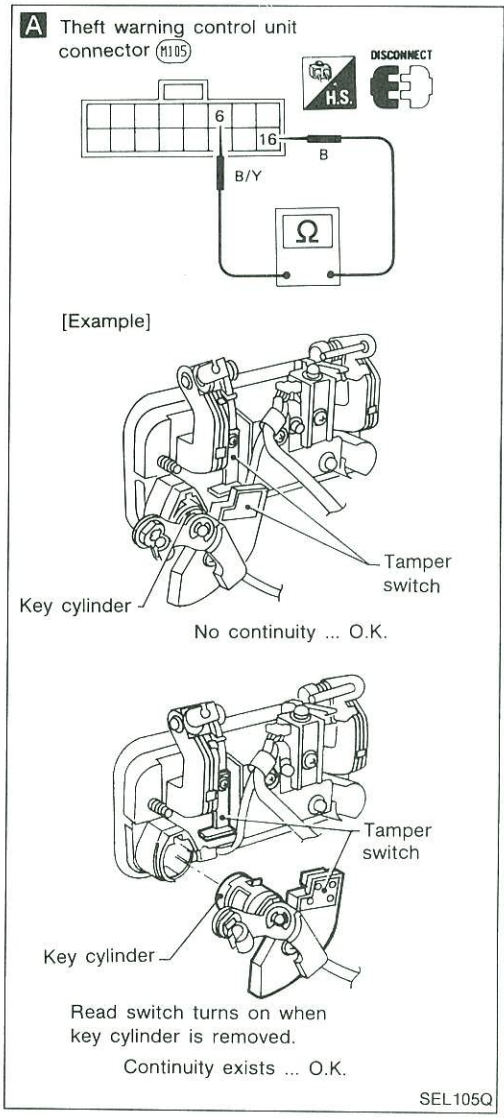
Check harness continuity between control unit harness terminal ⑭ and trunk room lamp harness terminal.

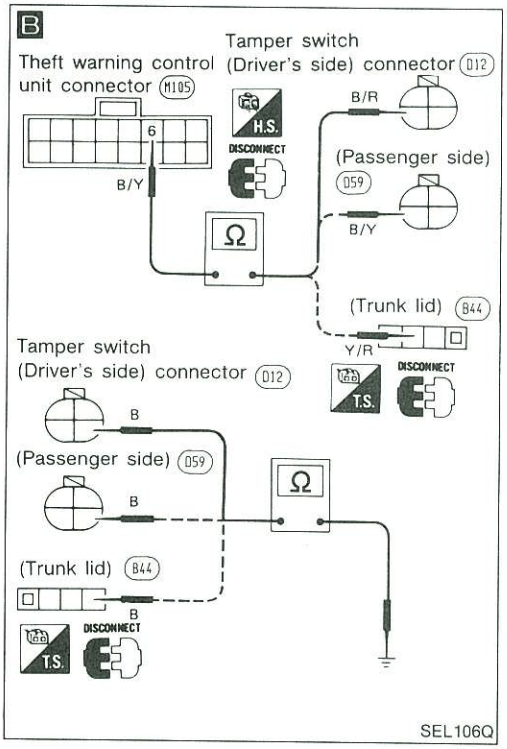
O.K. ↓

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 ⑥ 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.

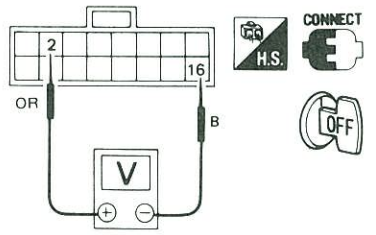
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

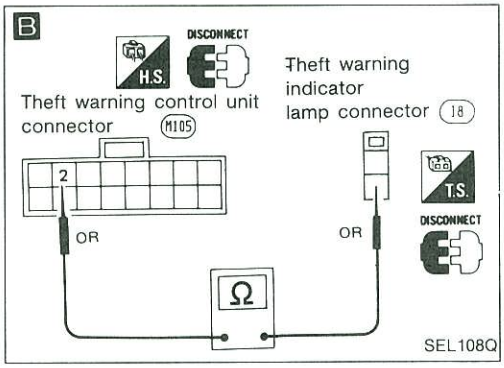
SYMPTOM: Indicator lamp does not blink.

A

Theft warning control unit connector (M105)



B



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.

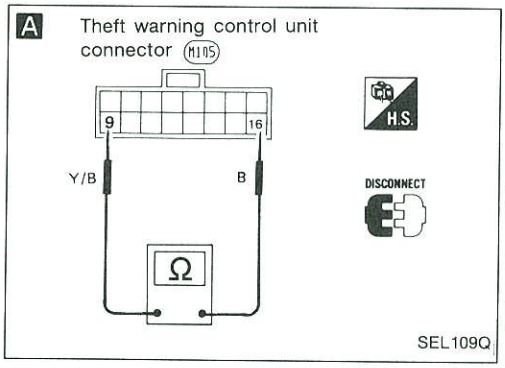
O.K. ↓

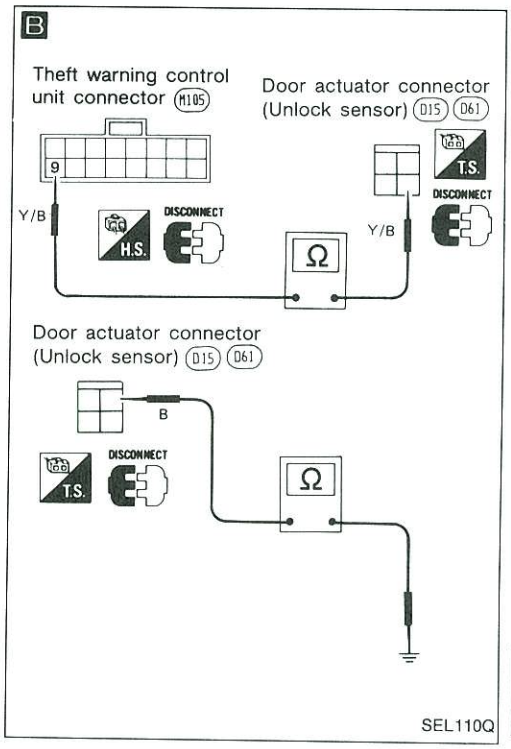
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 3

SYMPTOM: Indicator lamp does not come on.





A

DOOR UNLOCK SENSOR INPUT SIGNAL CHECK

Check continuity between control unit harness terminals ⑨ and ⑯.

Condition	Continuity
Locked	No
Unlocked	Yes

O.K. → Go to Diagnostic Procedure 4.

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 ⑨ and door actuator terminal.
- Check harness continuity between door actuator terminal and body ground.

Continuity should exist.

N.G. → Repair harness or connectors.

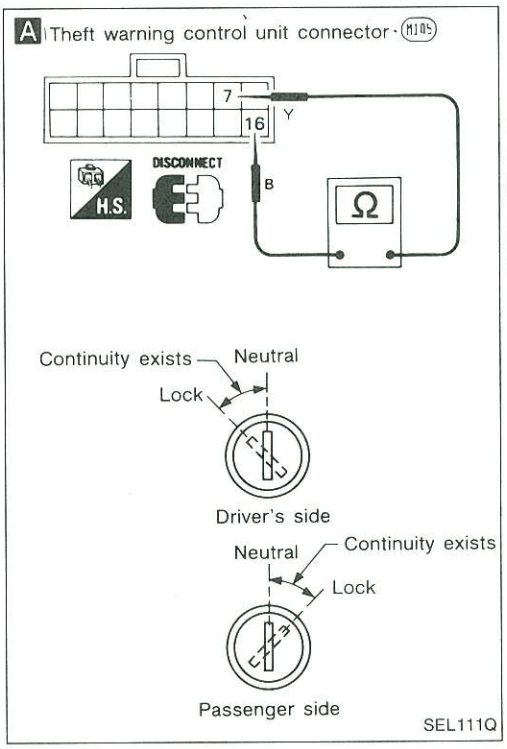
O.K. →

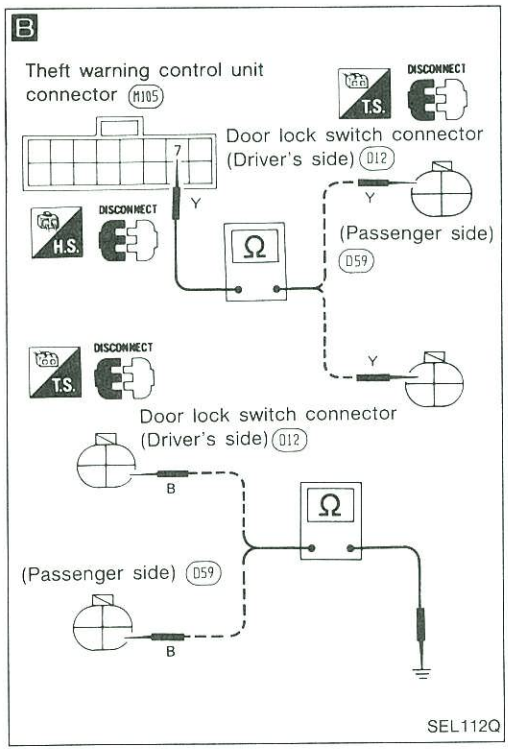
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Indicator lamp does not come on.





A

DOOR LOCK SWITCH INPUT SIGNAL CHECK (LOCK SIGNAL)
Check continuity between control unit harness terminals ⑦ and ⑯.

Key position	Continuity
Neutral/Lock	No
Between neutral and lock	Yes

O.K. → Go to Diagnostic Procedure 3.

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. ↓

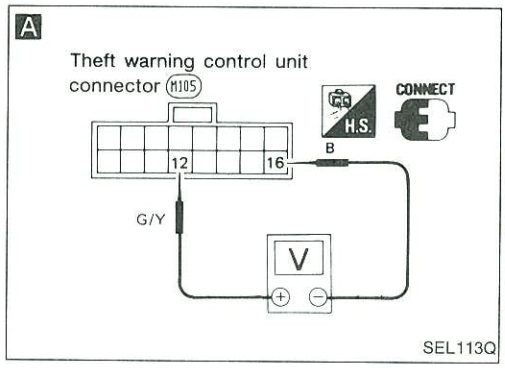
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

SYMPTOM: Alarm does not operate.

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

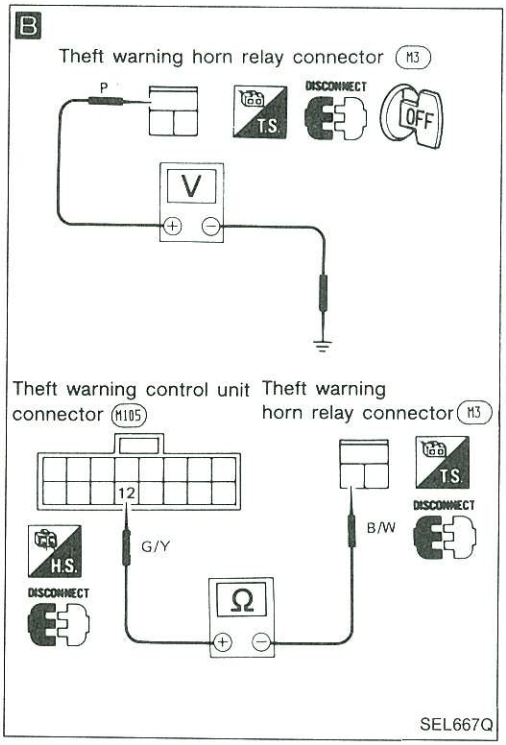
N.G. → Replace control unit.

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.

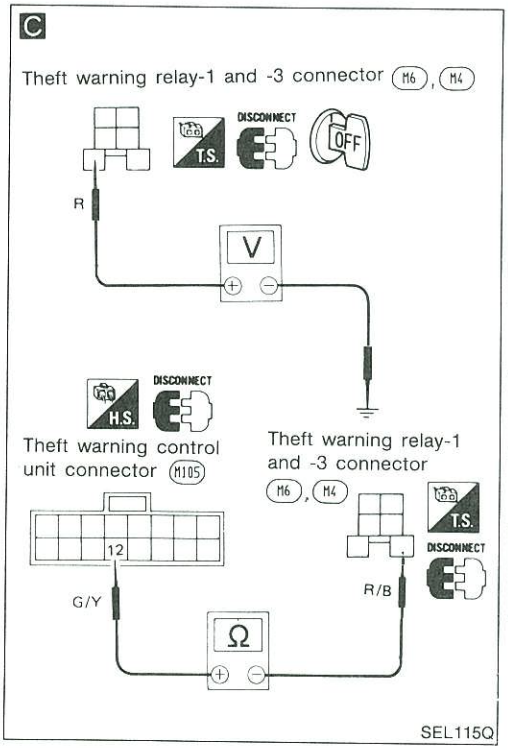
N.G. → Repair harness and connectors.

O.K. ↓

Check theft warning relay-1 and -3. → N.G. → Replace theft warning relay-1 and -3.

O.K. ↓

C



THEFT WARNING HEADLAMP CIRCUIT CHECK
Check if voltage across theft warning relay-1 and -3 harness terminals and body is 12V.
Check continuity between theft warning relay-1 and -3 terminals and control unit harness terminal ⑫.

N.G. → Repair harness and connectors.

O.K. ↓

Does headlamp come on when turning lighting switch "ON"? → No → Check headlamp system. Refer to "HEADLAMP".

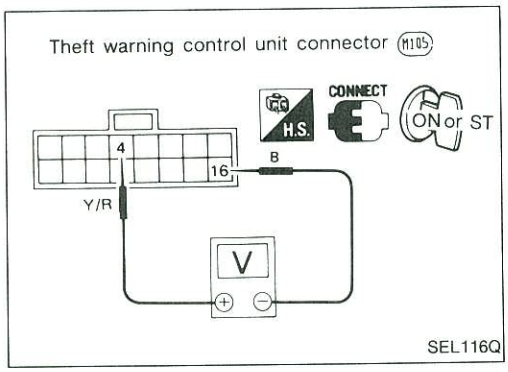
Yes ↓

Repair harness and connectors between lamp relay and headlamp.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

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-2.

N.G. → Replace theft warning relay-2.

O.K. ↓

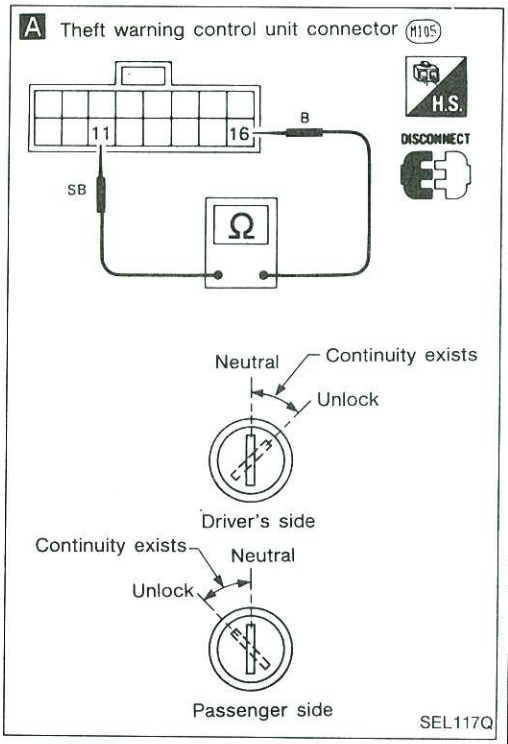
Repair harness between control unit and theft warning relay-2.

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.

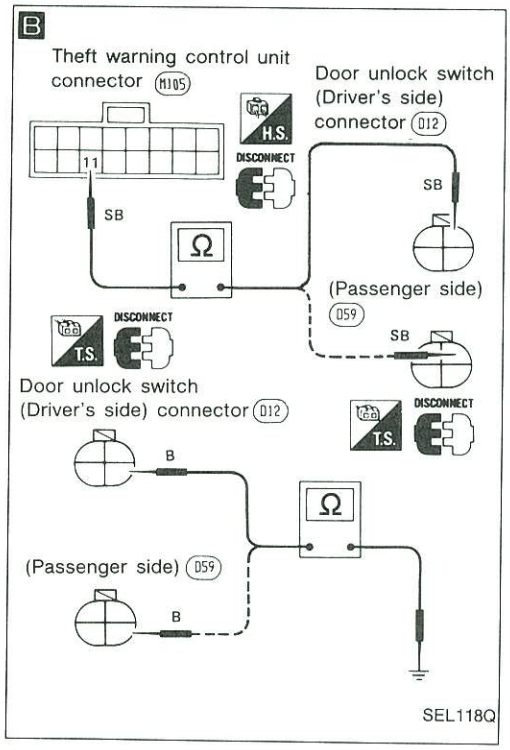
N.G. ↓

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.

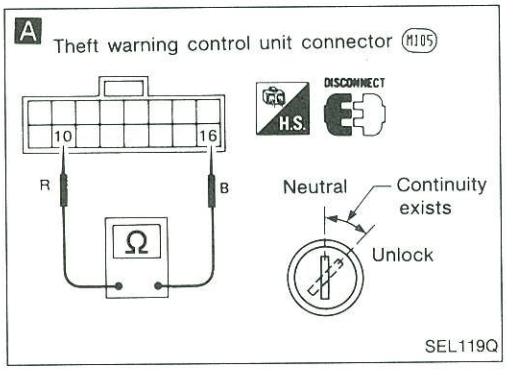
O.K. ↓

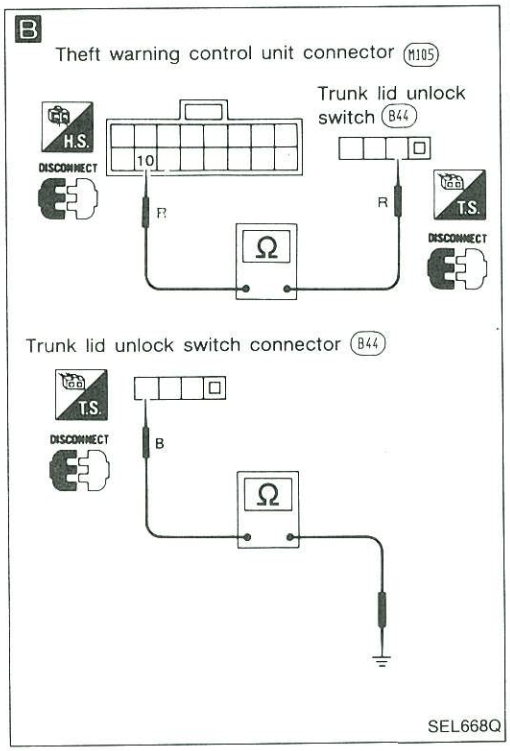
CHECK THE CONNECTIONS AT EACH CONNECTOR.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 8

SYMPTOM: Alarm does not stop even if stop signal is given.





A

TRUNK LID UNLOCK SWITCH INPUT SIGNAL CHECK (UNLOCK SIGNAL)
Check continuity between control unit harness terminals ⑩ and ⑯.

Key position	Continuity
Neutral/Unlock	No
Between neutral and unlock	Yes

O.K. → Replace control unit.

N.G. ↓

TRUNK LID UNLOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder switch.

O.K. ↓

B

TRUNK LID UNLOCK SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑩ and trunk lid unlock switch terminal.
- Check harness continuity between trunk lid unlock switch terminal and body ground.

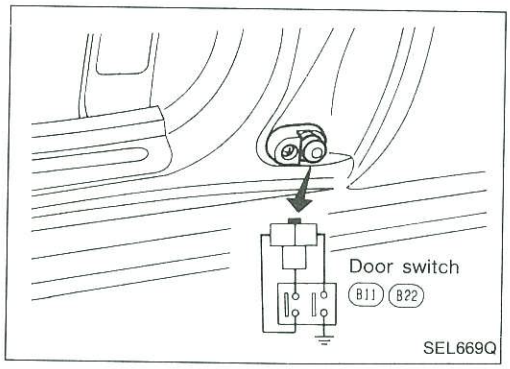
N.G. → Repair harness or connectors.

O.K. ↓

CHECK THE CONNECTIONS AT EACH CONNECTOR.

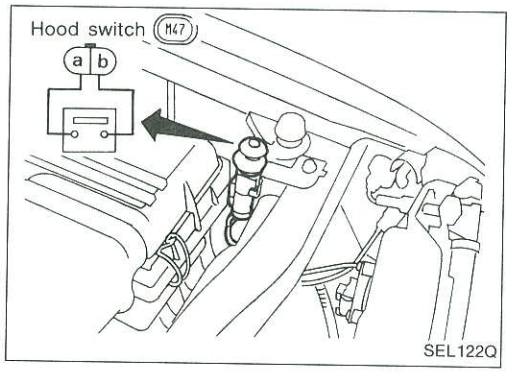
Trouble Diagnoses (Cont'd)

ELECTRICAL COMPONENTS INSPECTION



Door switches

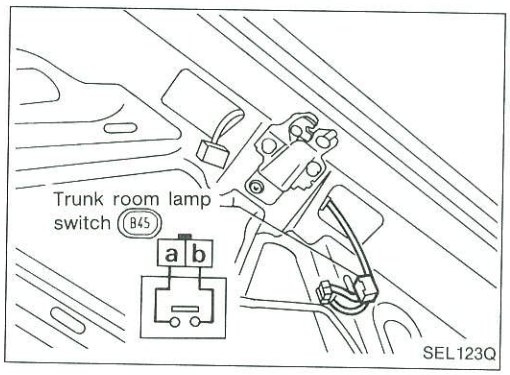
Check continuity between terminal and switch body.



Hood switch

Check continuity between terminals when hood switch is pushed and released.

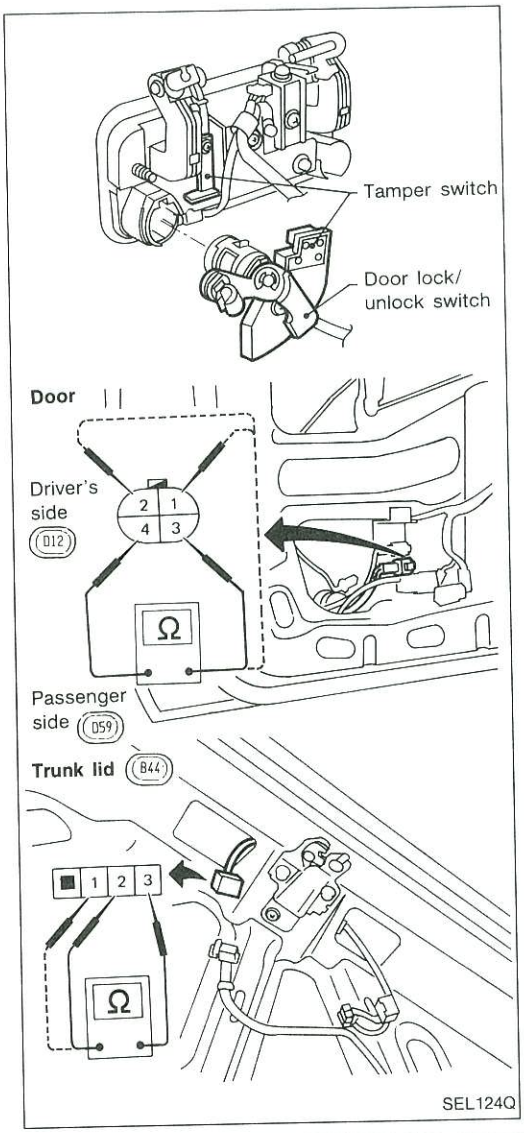
Terminal	Pushed	Released
a		○
b		○



Trunk room lamp switch

Terminal \ Trunk lid	Closed	Open
a		○
b		○

Trouble Diagnoses (Cont'd)



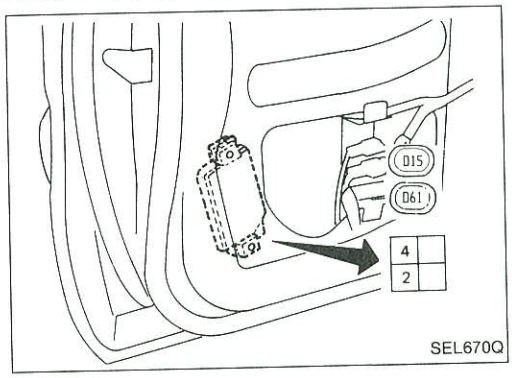
Key cylinder tamper switch, door lock switch and door unlock switch

- **Door**

	TAMPER SWITCH		DOOR LOCK SWITCH			DOOR UNLOCK SWITCH	
	Key cylinder is installed	Key cylinder is removed	Full stroke	Between full stroke and neutral	Neutral	Between full stroke and neutral	Full stroke
1				○			
2				○		○	
3		○		○		○	
4		○		○		○	

Trunk lid

	TAMPER SWITCH		Trunk lid unlock switch		
	Key cylinder is installed	Key cylinder is removed	Full stroke	Between full stroke and neutral	Neutral
1				○	
2		○		○	
3		○		○	

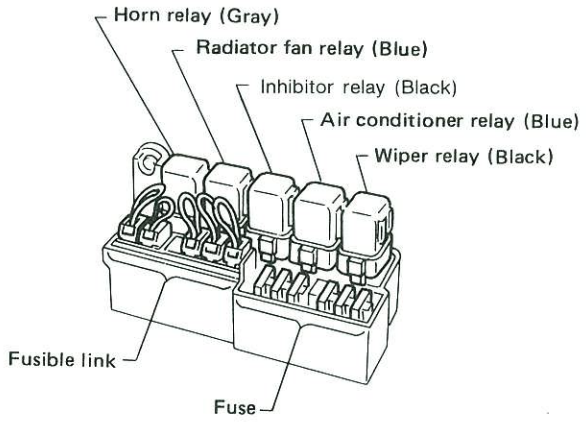


Door unlock sensor

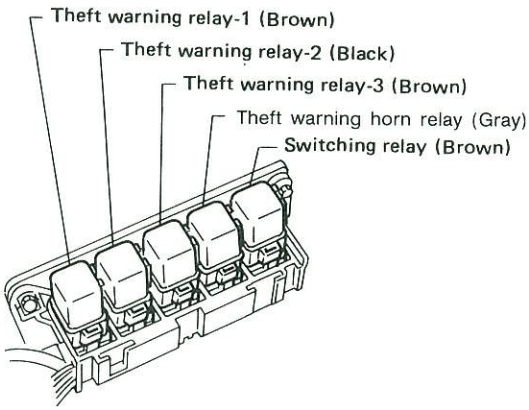
	LOCK	UNLOCK
4		○
2		○

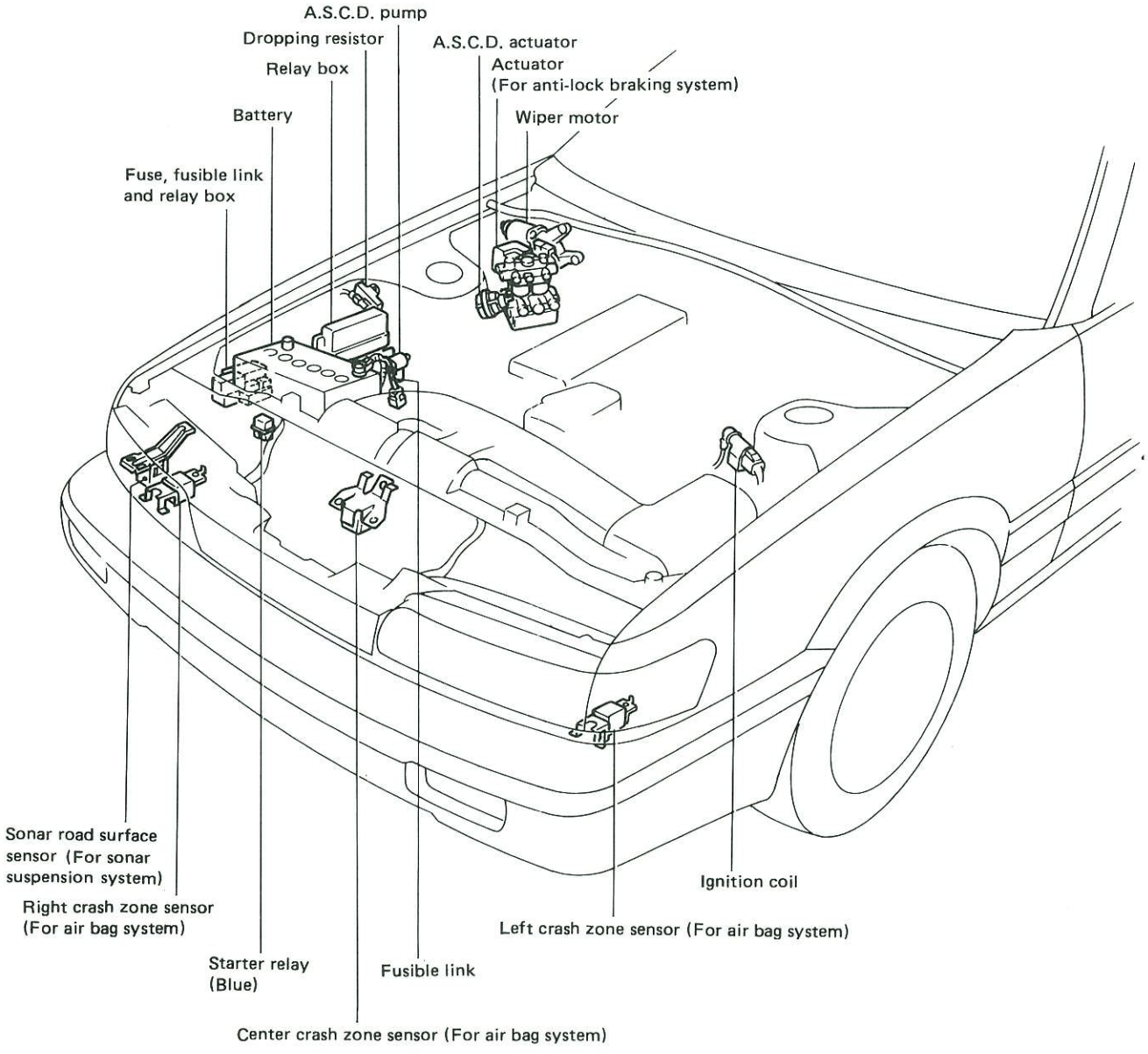
Engine Compartment

Fuse, fusible link and relay box



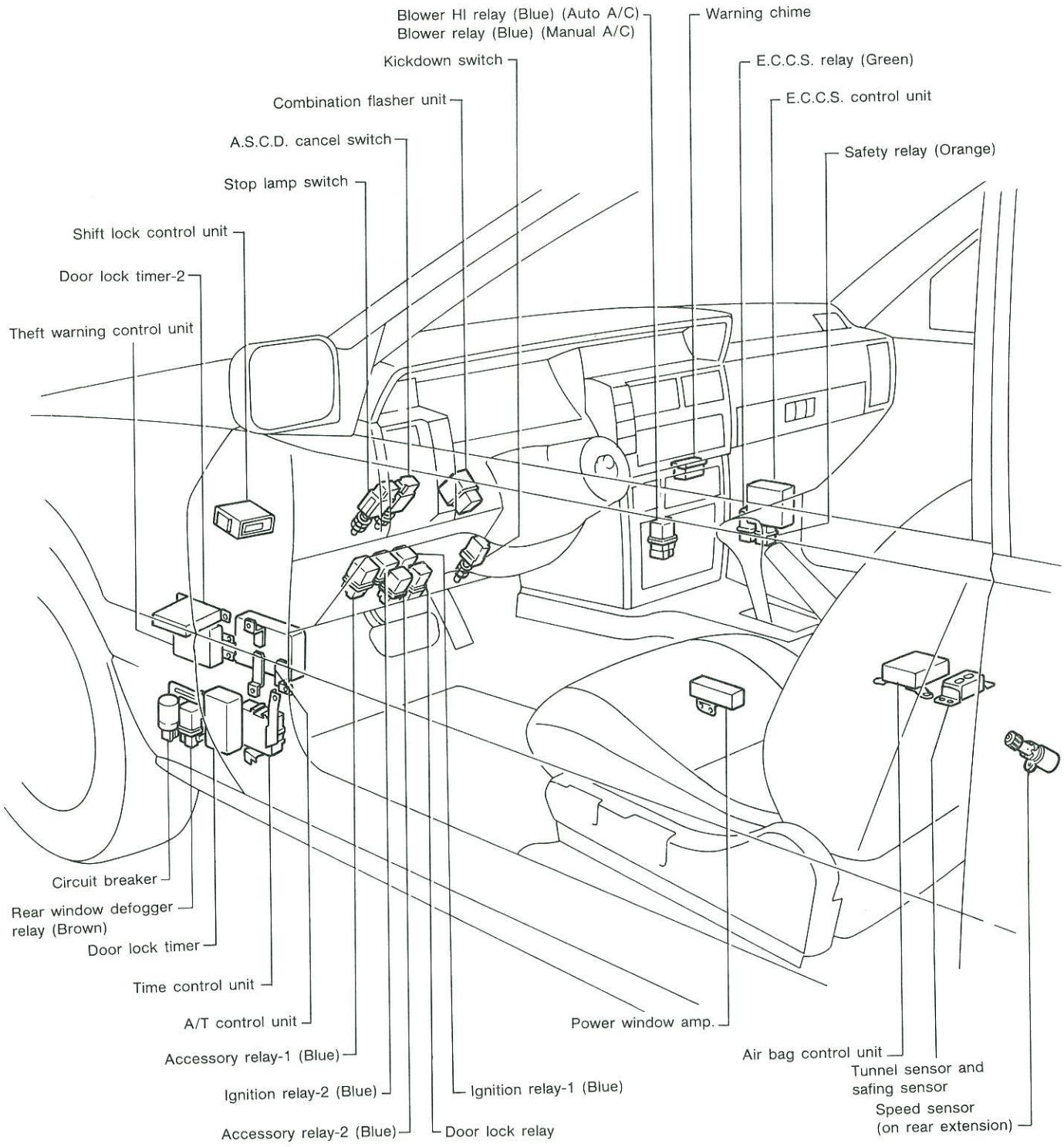
Relay box





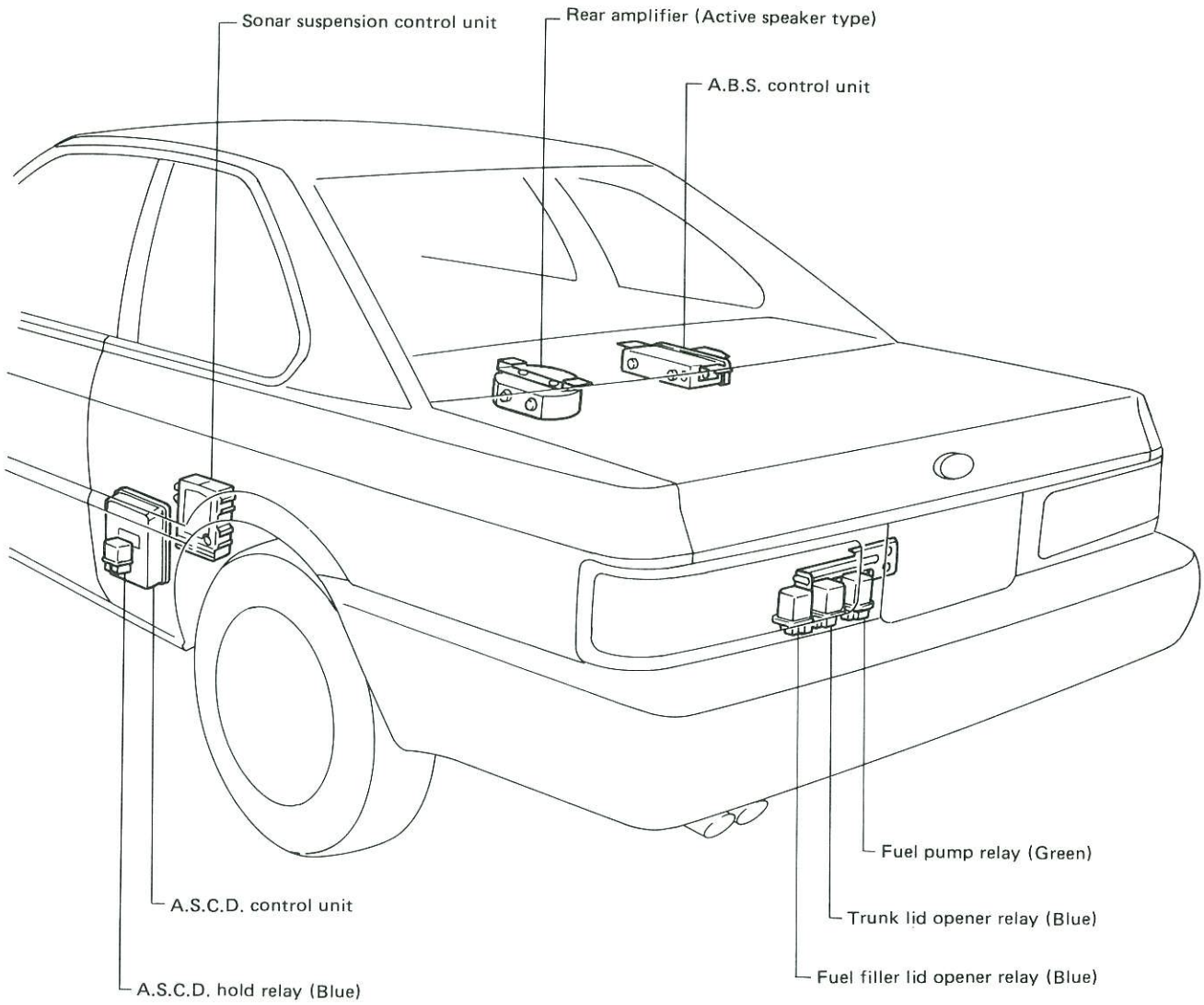
SEL508M

Passenger Compartment



SEL509N

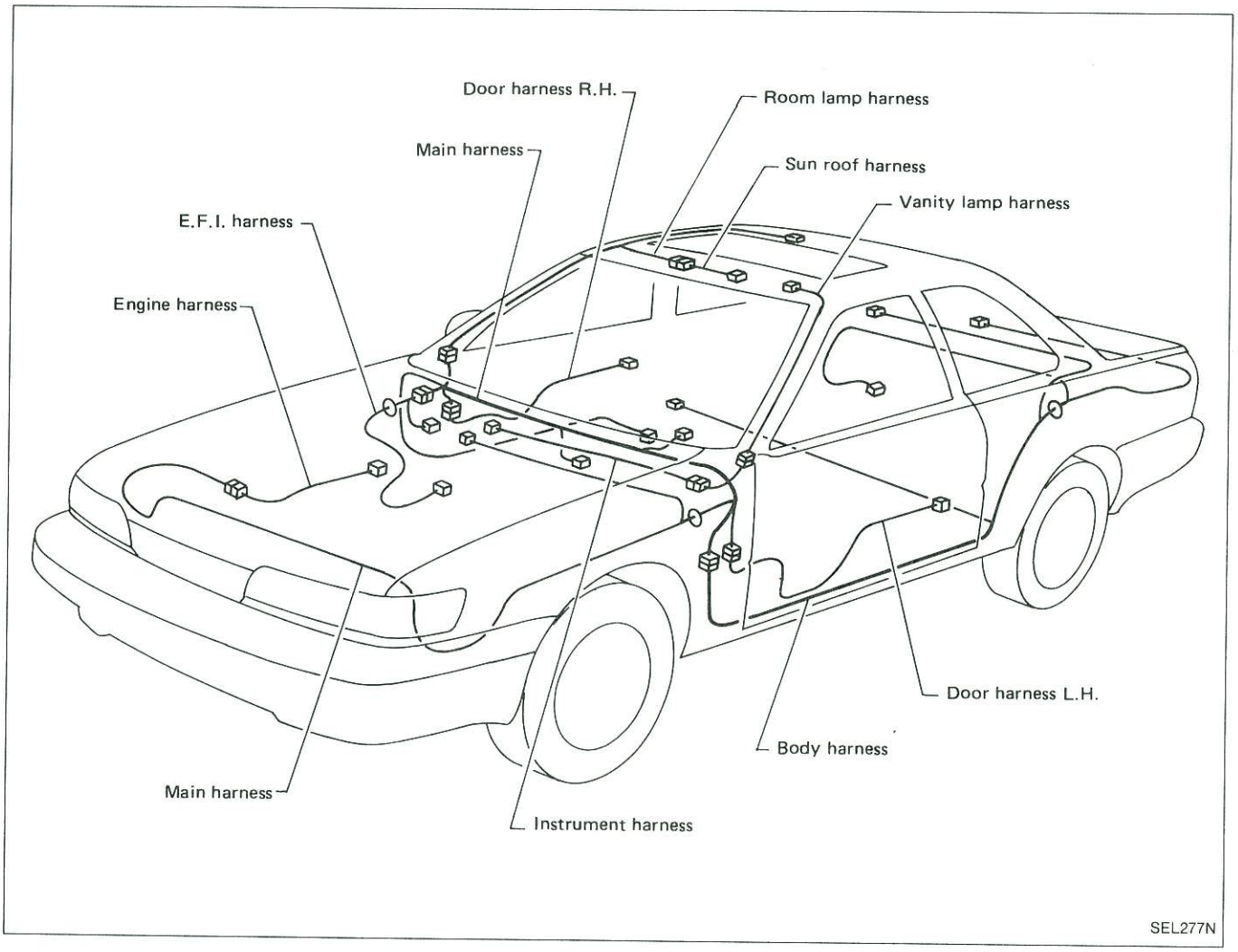
Luggage Compartment



SEL510N

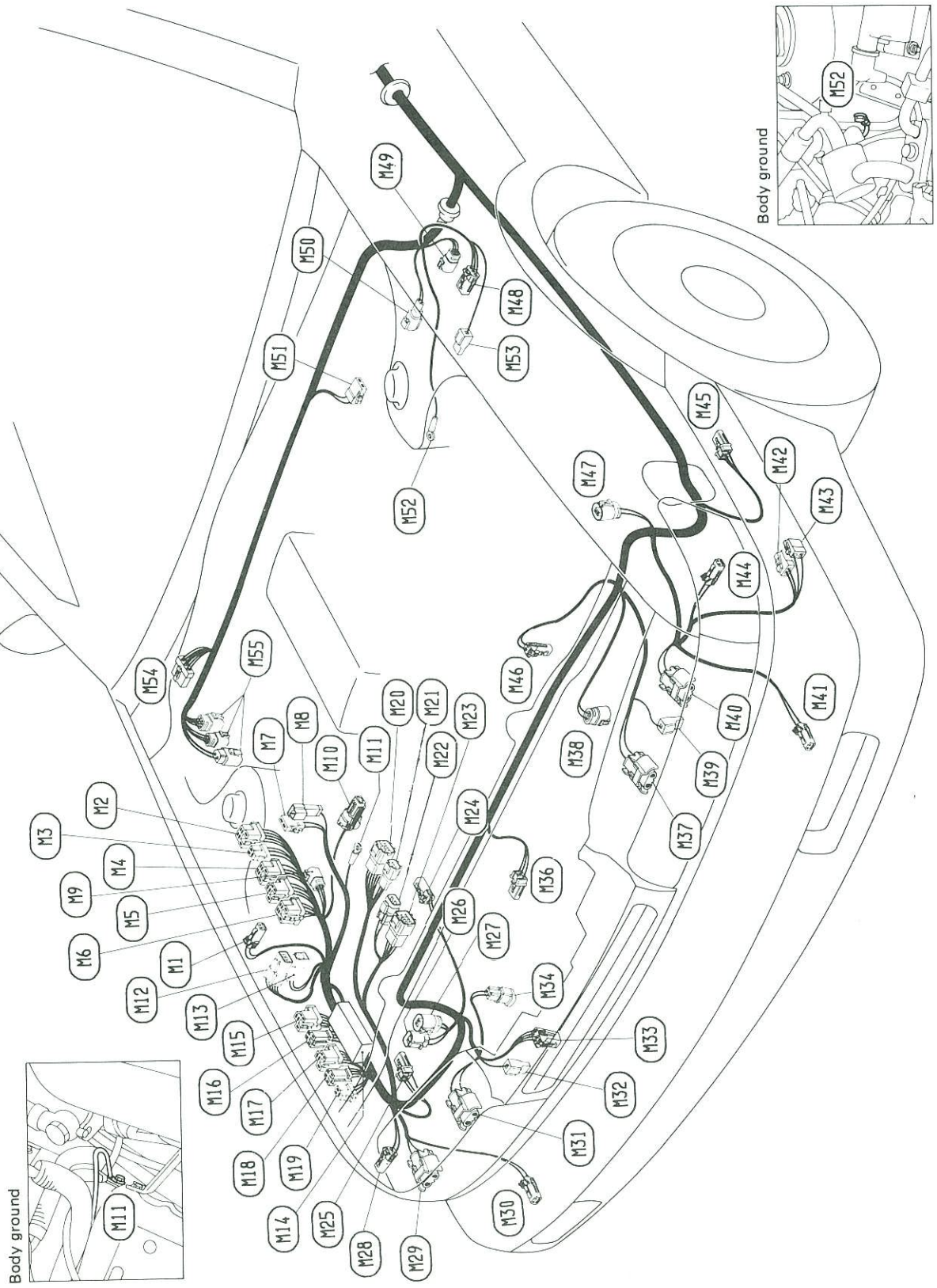
NOTE

Outline


Door harness R.H.
Room lamp harness
Main harness
Sun roof harness
Vanity lamp harness
E.F.I. harness
Engine harness
Door harness L.H.
Body harness
Main harness
Instrument harness
SEL277N

Main Harness

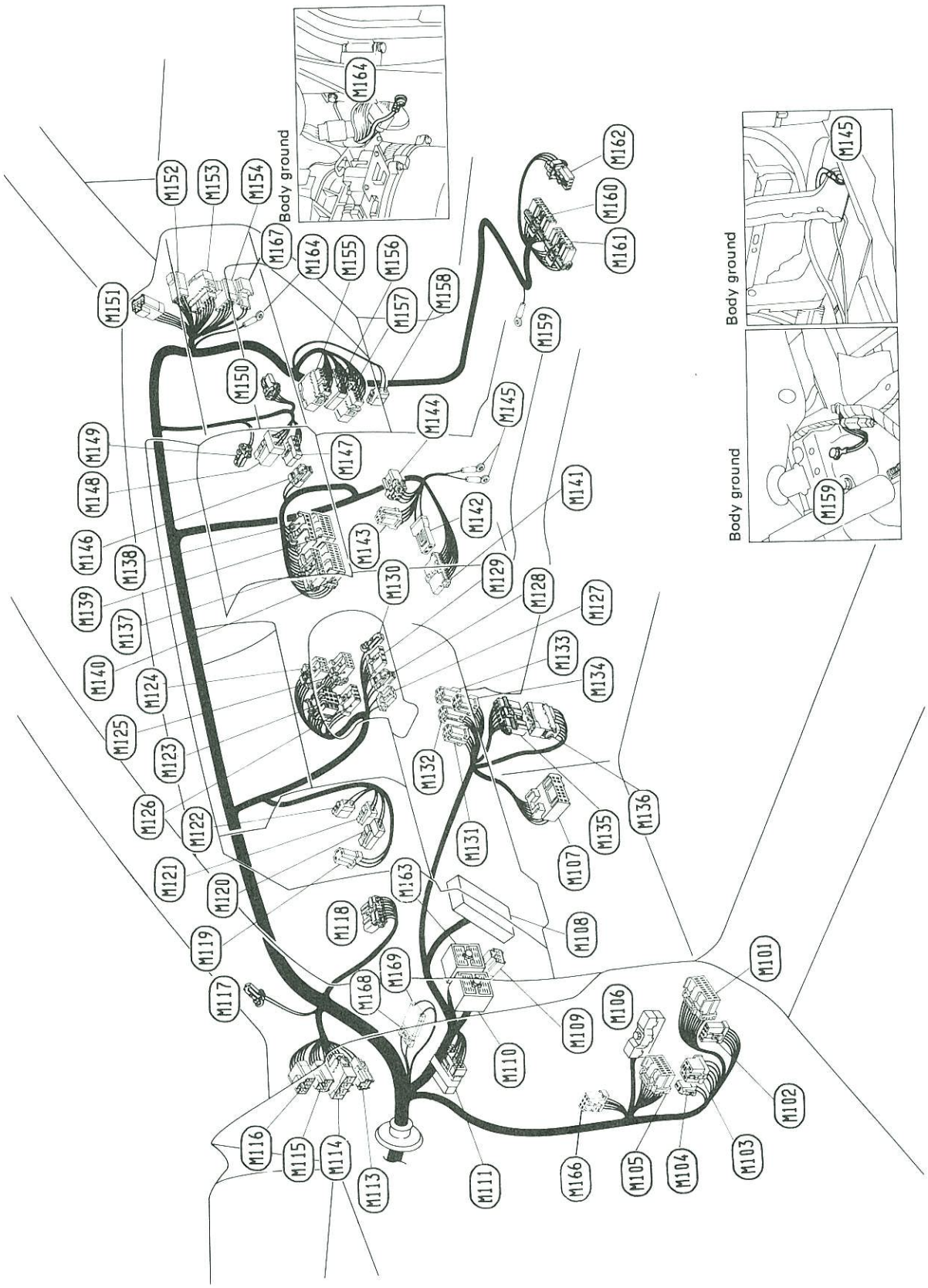
ENGINE COMPARTMENT



(M1) : Dropping resistor
(M2) : Switching relay
(M3) : Theft warning horn relay
(M4) : Theft warning relay-3
(M5) : Theft warning relay-2
(M6) : Theft warning relay-1
(M7) : Battery
(M8) : Fusible link
(M9) : A.S.C.D. pump
(M10) : To (E2)
(M11) : Body ground
(M12) : To (E4)
(M13) : To (E3)
(M14) : Fusible link box & Fuse block
(M15) : Wiper relay
(M16) : Air conditioner relay
(M17) : Inhibitor relay
(M18) : Radiator fan relay
(M19) : Horn relay
(M20) : To terminal cord assembly
(M21) : Revolution sensor
(M22) : Inhibitor switch
(M23) : Inhibitor switch
(M24) : Dual-pressure switch
(M25) : Right crash zone sensor (Air bag)
(M26) : Starter relay
(M27) : Starter relay
(M28) : Front turn signal lamp R.H.
(M29) : Headlamp R.H.-1
(M30) : Front clearance lamp R.H.
(M31) : Headlamp R.H.-2
(M32) : Horn R.H.
(M33) : Sonar road surface sensor
(M34) : Radiator fan motor
(M36) : Center crach zone sensor (Air bag)
(M37) : Headlamp L.H.-2
(M38) : Ambient switch (Manual A/C)
: Ambient sensor (Auto A/C)
(M39) : Horn L.H.
(M40) : Headlamp L.H.-1
(M41) : Front clearance lamp L.H.
(M42) : Washer sensor
(M43) : Washer motor
(M44) : Front turn signal lamp L.H.
(M45) : Left crash zone sensor (Air bag)
(M46) : Thermoswitch
(M47) : Hood switch
(M48) : Front shock absorber actuator-L.H.
(For sonar suspension system)
(M49) : To (F27)
(M50) : Front sensor L.H.
(For anti-lock braking system)
(M51) : Brake fluid level switch
(M52) : Body ground
(M53) : Theft warning horn
(M54) : Wiper motor
(M55) : Actuator (For anti-lock braking system)

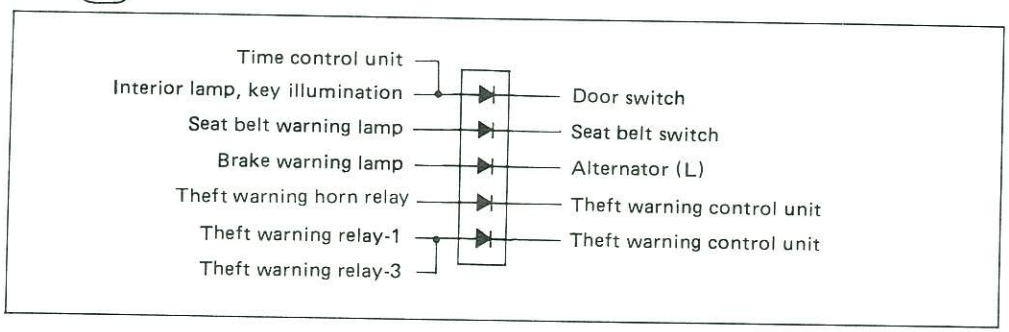
Main Harness (Cont'd)

PASSENGER COMPARTMENT

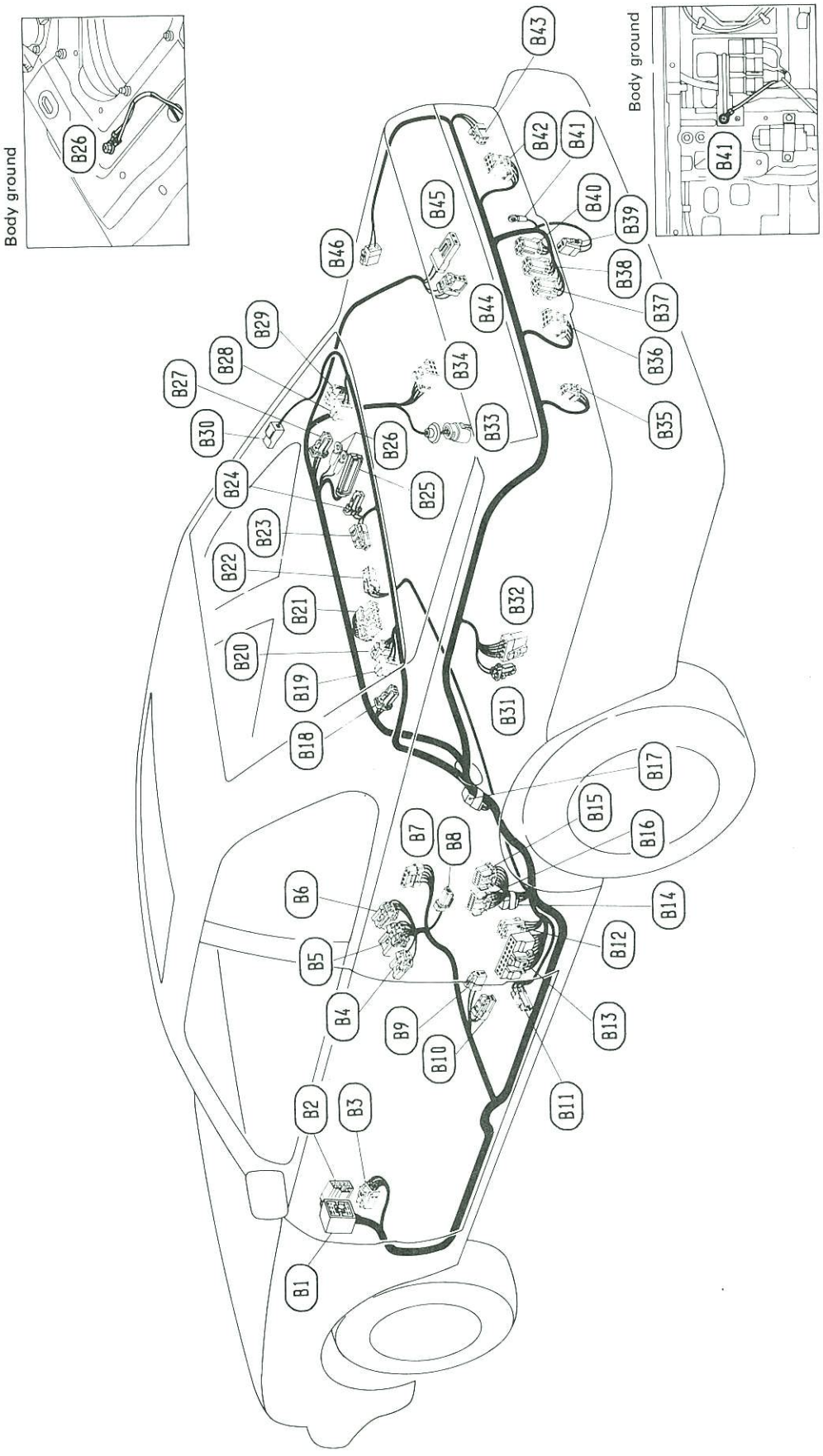


(M101) : Time control unit
(M102) : Door lock timer-1
(M103) : Rear window defogger relay
(M104) : Circuit breaker
(M105) : Theft warning control unit
(M106) : A/T control unit
(M107) : Diagnostic connector
(M108) : Fuse block
(M109) : To (B3)
(M110) : To (B1) (S.M.J.)
(M111) : Diode
(M113) : To (D4)
(M114) : To (D3)
(M115) : To (D2)
(M116) : To (D1)
(M117) : To sub-harness (Vanity lamp)
(M118) : Shift lock control unit
(M119) : Combination flasher unit
(M120) : A.S.C.D. cancel switch
(M121) : Stop lamp switch
(M122) : Kickdown switch
(M123) : Lighting switch
(M124) : A.S.C.D. steering switch, horn switch and air bag module
(M125) : Steering angle sensor
(M126) : Wiper switch
(M127) : Key lock solenoid
(M128) : Key-in switch
(M129) : Ignition switch
(M130) : Key illumination
(M131) : Accessory relay-1
(M132) : Ignition relay-2
(M133) : Ignition relay-1
(M134) : Accessory relay-2
(M135) : Connector-A
(M136) : Connector-B
(M137) : Push control unit (Manual A/C)
(M138) : Fan switch (Manual A/C)
(M139) : Auto air conditioner amp. (Auto A/C)
(M140) : Auto air conditioner amp. (Auto A/C)
(M141) : Mode door motor (A/C)
(M142) : Aspirator fan (Auto A/C)
(M143) : Blower relay (Manual A/C)
Blower HI relay (Auto A/C)
(M144) : Air mix door motor (Auto A/C)
(M145) : Body ground
(M146) : In-vehicle sensor (Auto A/C)
(M147) : Resistor (Manual A/C)
(M148) : Fan control amp. (Auto A/C)
(M149) : Intake sensor (Auto A/C)
(M150) : Intake door motor
(M151) : To (R1)
(M152) : To (D51)
(M153) : To (D52)
(M154) : To (D53)
(M155) : To (F51)
(M156) : To (F52)
(M157) : To (F53)
(M158) : Blower motor
(M159) : Body ground
(M160) : Air bag control unit
(M161) : Air bag control unit
(M162) : Tunnel sensor and safing sensor (Air bag)
(M163) : (I1)
(M164) : Body ground
(M166) : Door lock timer
(M167) : To (D64)
(M168) : To (M169)
(M169) : To (M168)

Diode (M111)



Body Harness

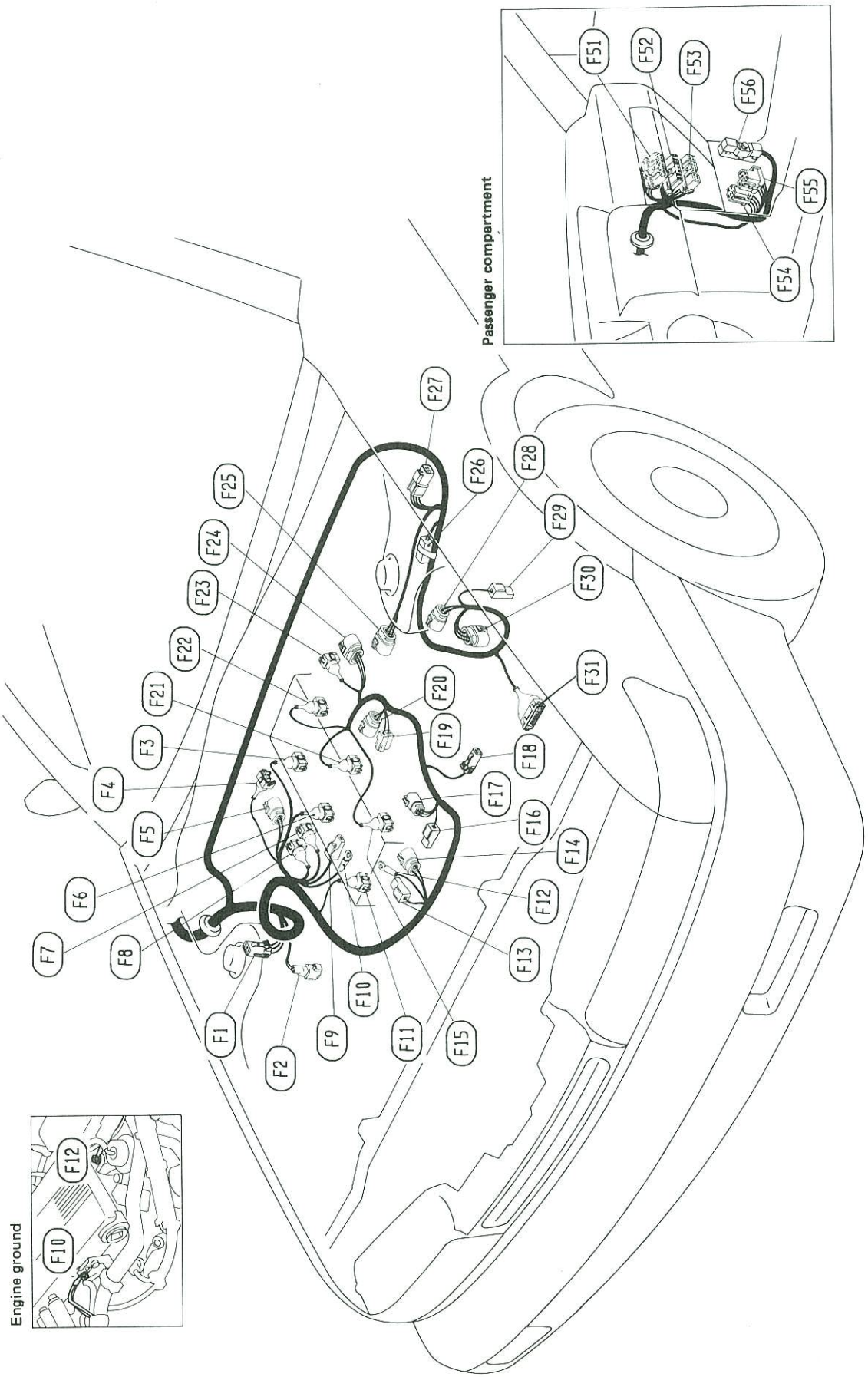


Body Harness (Cont'd)

B1 : To M110 (S.M.J.)
B2 : To J2
B3 : To M109
B4 : Ash tray illumination
B5 : Shift lock solenoid and detention switch
B6 : Overdrive switch and A/T indicator illumination
B7 : Shock absorber select switch (For sonar suspension system)
B8 : Parking brake switch
B9 : To power seat harness L.H.
B10 : Seat belt switch
B11 : Door switch L.H.
B12 : A.S.C.D. hold relay
B13 : A.S.C.D. control unit
B14 : Diode
B15 : Sonar suspension control unit
B16 : Sonar suspension control unit
B17 : Diode
B18 : Rear shock absorber actuator L.H.
B19 : Rear speaker L.H. (Active speaker type)
B20 : Rear speaker L.H. (BOSE type)
B21 : Rear amplifier (Active speaker type)
B22 : Door switch R.H.
B23 : Trunk room lamp
B24 : High-mounted stop lamp
B25 : A.B.S. control unit
B26 : Body ground
B27 : Rear shock absorber actuator R.H. (For sonar suspension system)
B28 : Rear speaker R.H. (Active speaker type)
B29 : Rear speaker R.H. (BOSE type)
B30 : Rear window defogger
B31 : Power antenna motor
B32 : Power antenna timer
B33 : Rear sensor braking (For anti-lock braking system)
B34 : Fuel tank gauge unit
B35 : Rear combination lamp L.H.
B36 : Rear combination lamp L.H.
B37 : Fuel filler lid opener relay
B38 : Trunk lid opener relay
B39 : Trunk lid opener solenoid
B40 : Fuel pump relay
B41 : Body ground
B42 : Rear combination lamp R.H.
B43 : Rear combination lamp R.H.
B44 : Trunk room unlock switch
B45 : Trunk room lamp switch
B46 : Fuel filler lid opener solenoid

SEL280N

E.F.I. Harness

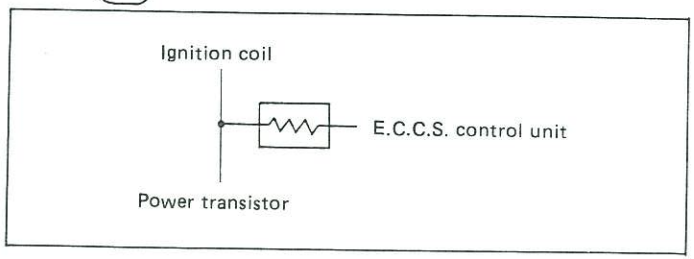

Passenger compartment
F51
F52
F53
F56
F55
F54
Engine ground
F12
F10
F27
F26
F28
F29
F30
F31
F25
F24
F23
F22
F21
F20
F19
F18
F17
F16
F14
F12
F13
F3
F4
F5
F6
F7
F8
F1
F2
F9
F10
F11
F15

(F1) : Front shock absorber actuator R.H. (For sonar suspension system)
(F2) : Front sensor R.H. (For anti-lock braking system)
(F3) : Injector No. 5
(F4) : E.G.R. control solenoid valve
(F5) : Exhaust gas temperature sensor (For California)
(F6) : Injector No. 3
(F7) : Pressure regulator control solenoid valve
(F8) : Air regulator
(F9) : Thermal transmitter
(F10) : Engine ground
(F11) : Injector No. 1
(F12) : Engine ground
(F13) : Fuel temperature sensor
(F14) : Sub-harness (To engine temperature sensor)
(F15) : Injector No. 2
(F16) : Distributor
(F17) : Crank angle sensor
(F18) : Compressor (A/C)
(F19) : A.A.C. valve
(F20) : F.I C.D. control solenoid valve
(F21) : Injector No. 4
(F22) : Injector No. 6
(F23) : Throttle valve switch
(F24) : Throttle sensor
(F25) : Exhaust gas sensor
(F26) : Resistor and condenser
(F27) : To (M49)
(F28) : Ignition coil
(F29) : Ignition coil
(F30) : Power transistor
(F31) : Air flow meter

Passenger compartment

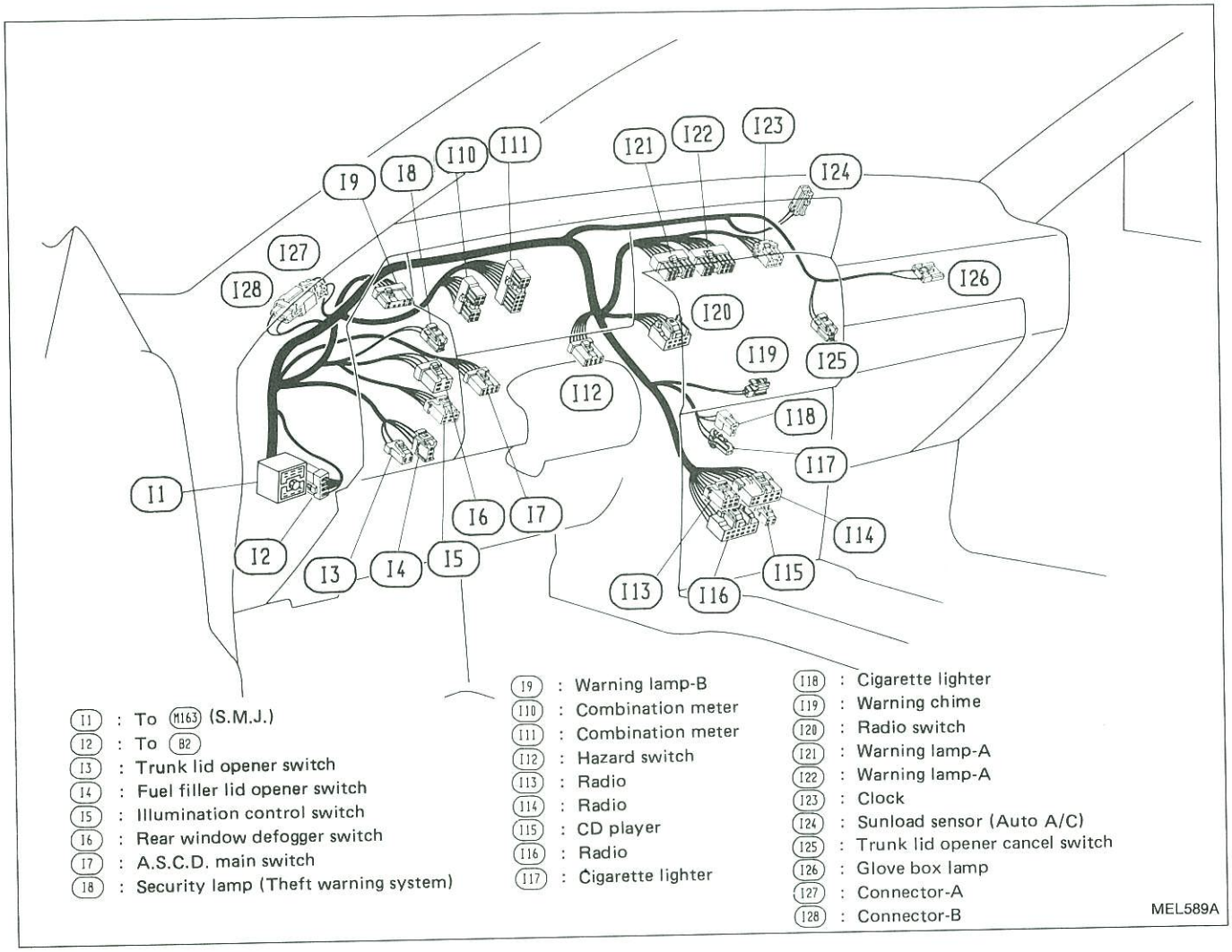
(F51) : To (M155)
(F52) : To (M156)
(F53) : To (M157)
(F54) : E.C.C.S. relay
(F55) : Safety relay
(F56) : E.C.C.S. control unit

Resistor (F26)



SEL281N

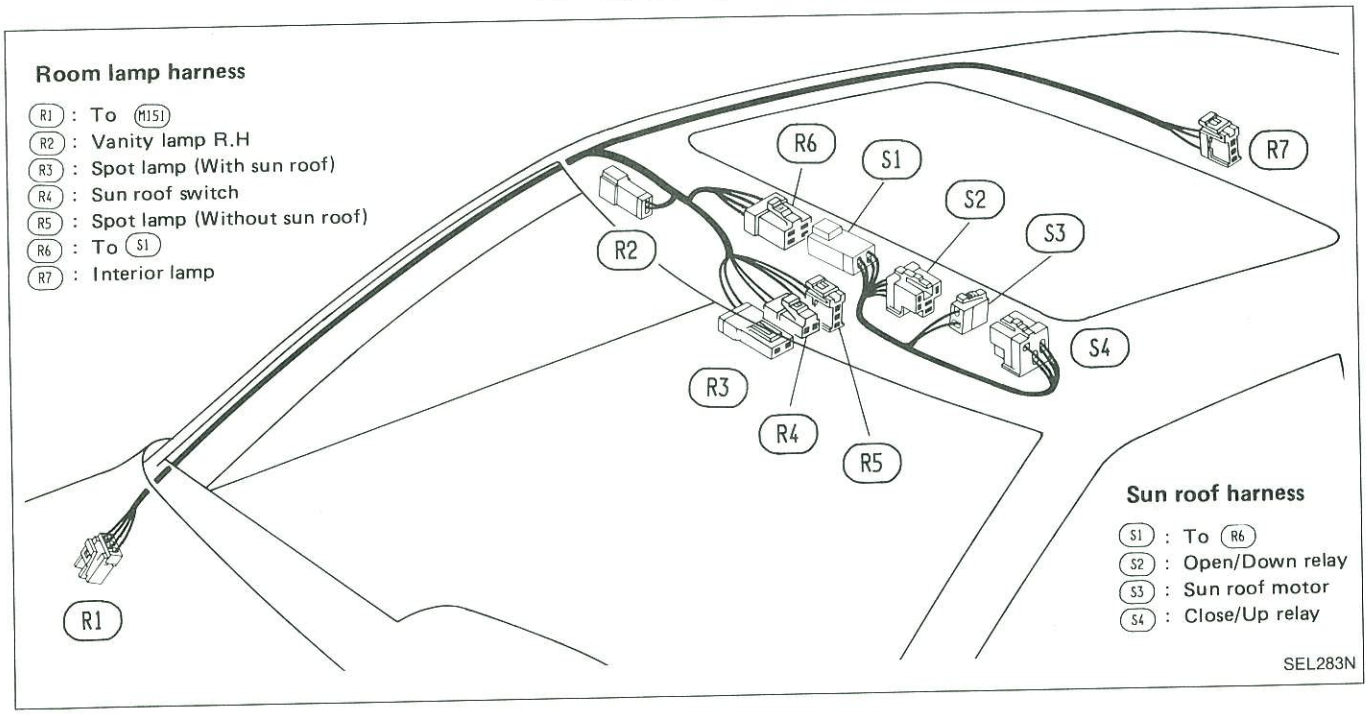
Instrument Harness



I1 : To M163 (S.M.J.)
I2 : To B2
I3 : Trunk lid opener switch
I4 : Fuel filler lid opener switch
I5 : Illumination control switch
I6 : Rear window defogger switch
I7 : A.S.C.D. main switch
I8 : Security lamp (Theft warning system)
I9 : Warning lamp-B
I10 : Combination meter
I11 : Combination meter
I12 : Hazard switch
I13 : Radio
I14 : Radio
I15 : CD player
I16 : Radio
I17 : Cigarette lighter
I18 : Cigarette lighter
I19 : Warning chime
I20 : Radio switch
I21 : Warning lamp-A
I22 : Warning lamp-A
I23 : Clock
I24 : Sunload sensor (Auto A/C)
I25 : Trunk lid opener cancel switch
I26 : Glove box lamp
I27 : Connector-A
I28 : Connector-B

MEL589A

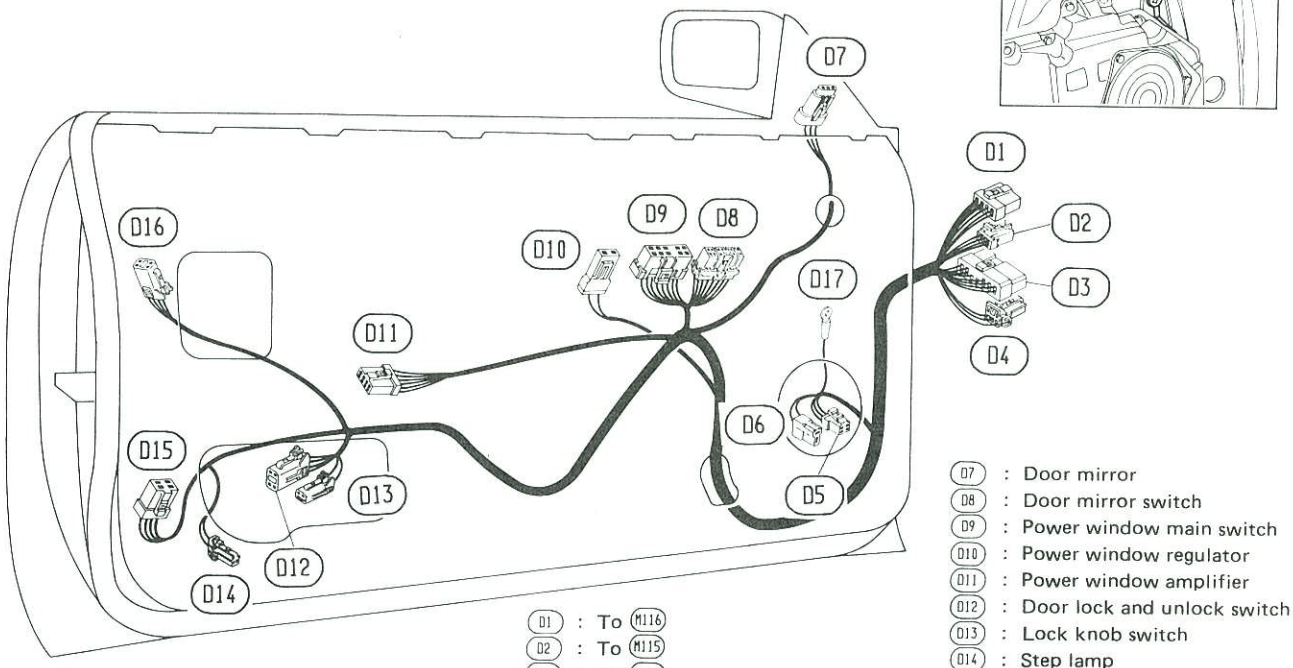
Room Lamp and Sun Roof Harness



SEL283N

Door Harness

L.H. SIDE



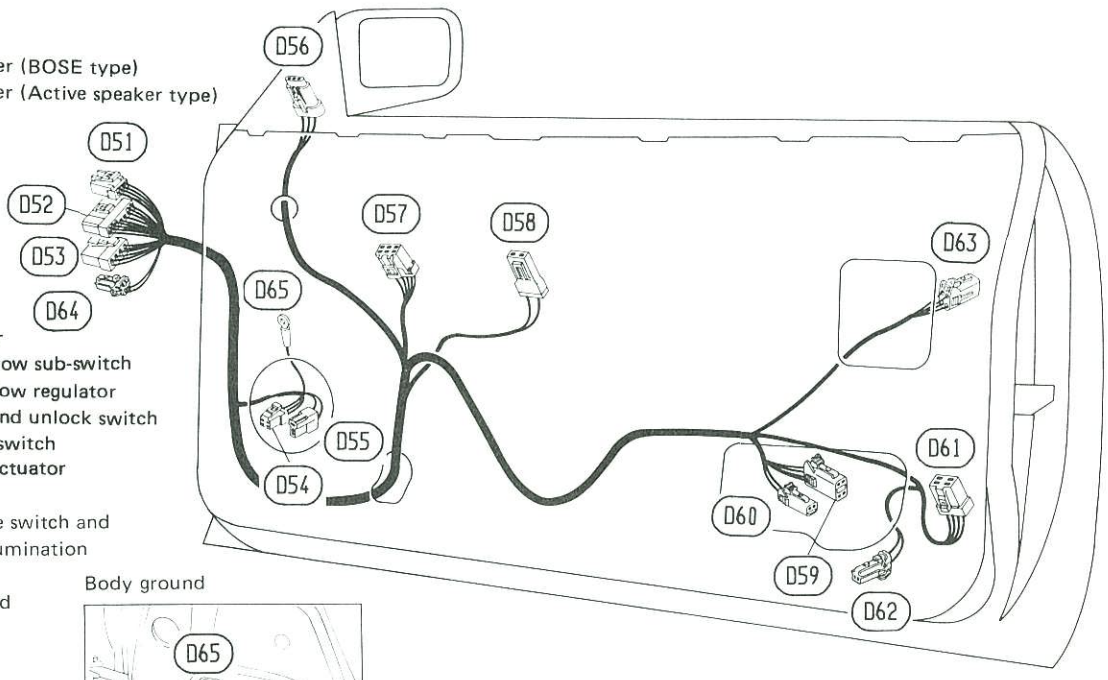
(D1) : To (M116)
(D2) : To (M115)
(D3) : To (M114)
(D4) : To (M113)
(D5) : Door speaker (BOSE type)
(D6) : Door speaker (Active speaker type)

(D7) : Door mirror
(D8) : Door mirror switch
(D9) : Power window main switch
(D10) : Power window regulator
(D11) : Power window amplifier
(D12) : Door lock and unlock switch
(D13) : Lock knob switch
(D14) : Step lamp
(D15) : Door lock actuator
(D16) : Door handle switch and key hole illumination
(D17) : Body ground

MEL590A

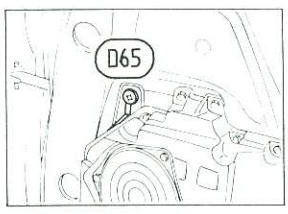
R.H. SIDE

(D51) : To (M152)
(D52) : To (M153)
(D53) : To (M154)
(D54) : Door speaker (BOSE type)
(D55) : Door speaker (Active speaker type)



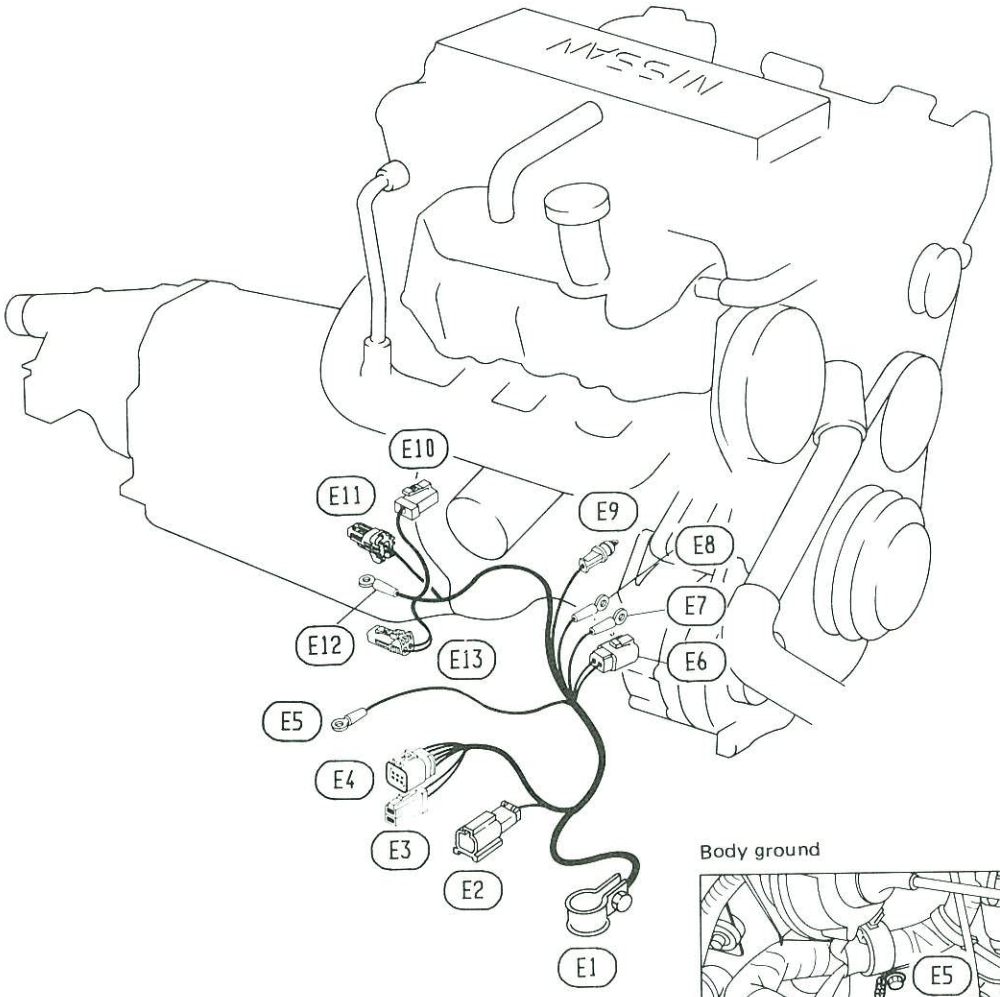
(D56) : Door mirror
(D57) : Power window sub-switch
(D58) : Power window regulator
(D59) : Door lock and unlock switch
(D60) : Lock knob switch
(D61) : Door lock actuator
(D62) : Step lamp
(D63) : Door handle switch and key hole illumination
(D64) : To (M167)
(D65) : Body ground

Body ground



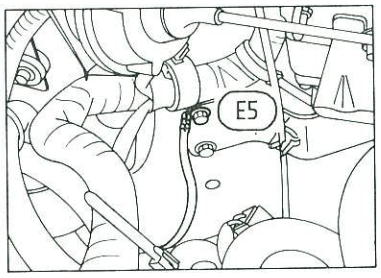
MEL591A

Engine Harness

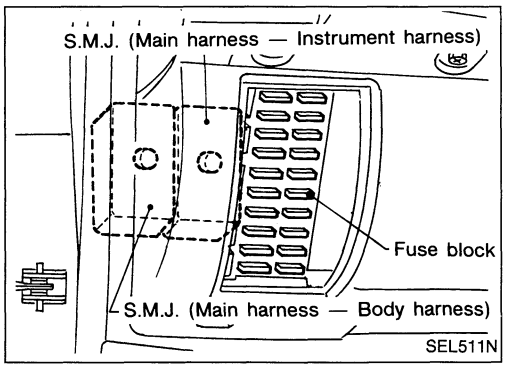


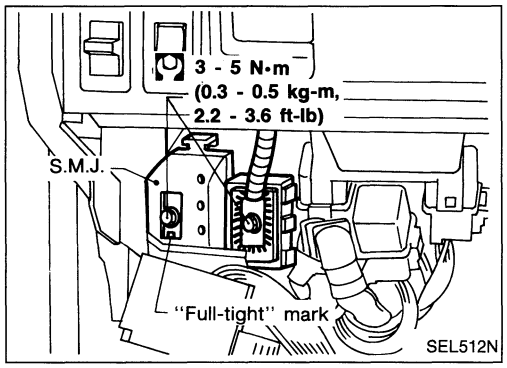
E1 : Battery
E2 : To M10
E3 : To M13
E4 : To M12
E5 : Body ground
E6 : Alternator
E7 : Alternator
E8 : Alternator
E9 : Detonation sensor
E10 : Oil pressure switch
E11 : Starter motor
E12 : Starter motor
E13 : Speed sensor

Body ground



MEL592A





INSTALLATION

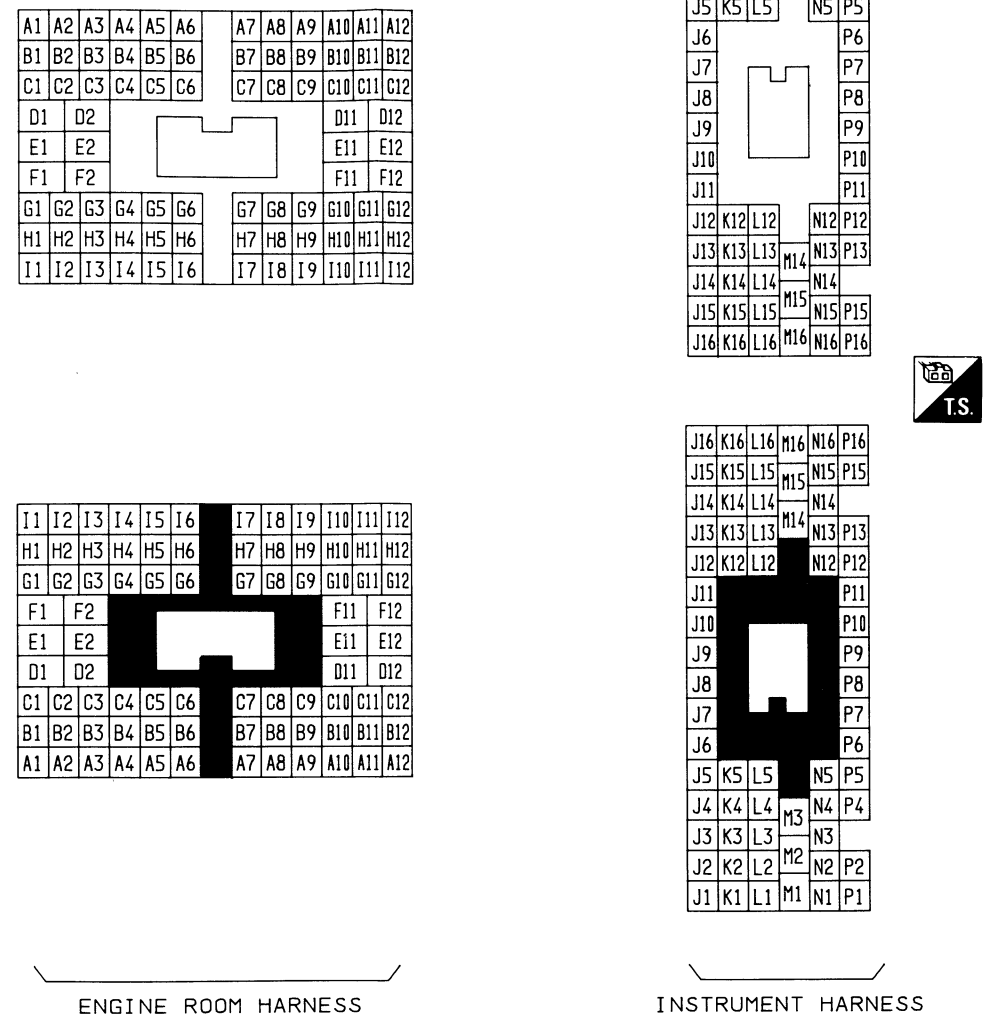
To install S.M.J., tighten bolts until orange "full-tight" mark appears and then retighten to specified torque as required.

: 3 - 5 N·m
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

CAUTION:
Do not overtighten bolts, otherwise, they may be damaged.

Terminal Arrangement

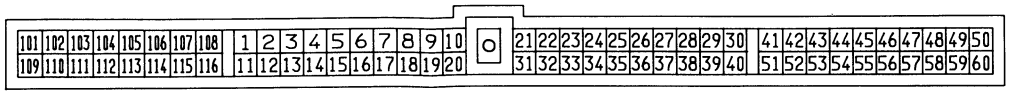
MAIN HARNESS



ENGINE ROOM HARNESS

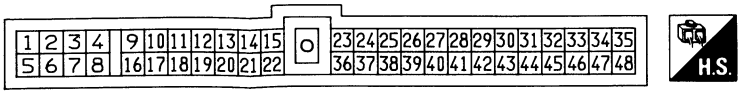
INSTRUMENT HARNESS

E.C.C.S. CONTROL UNIT



View from harness side

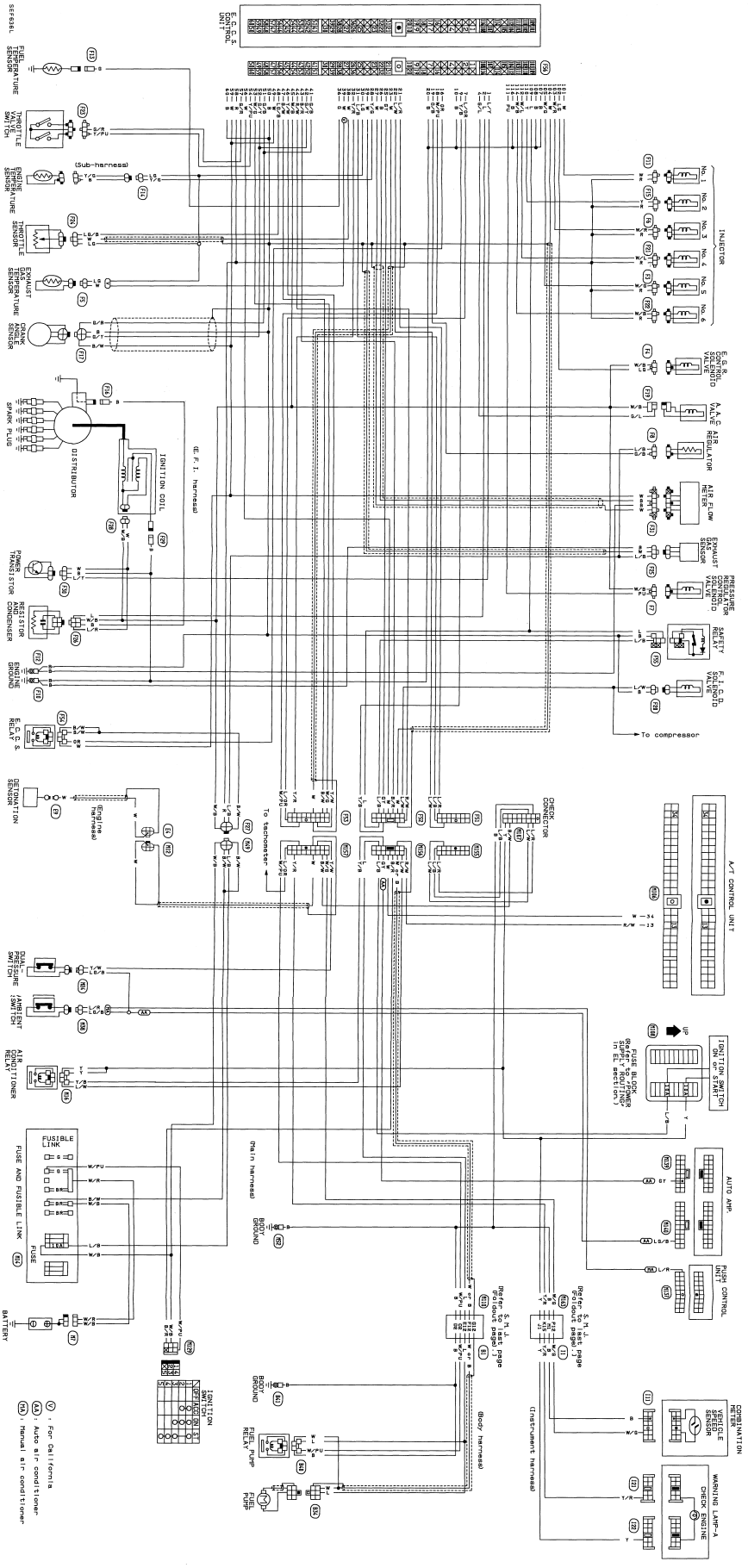
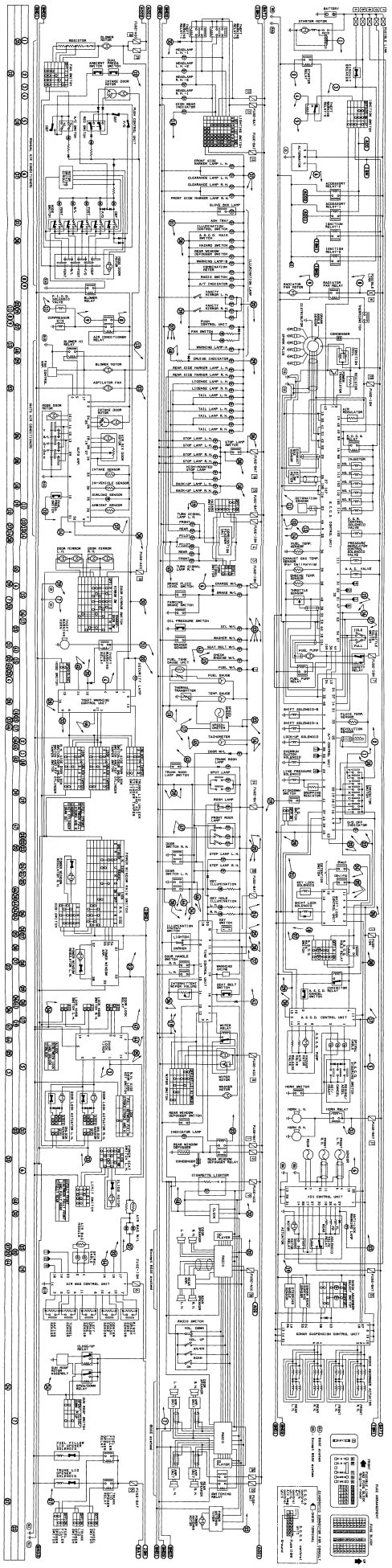
A/T CONTROL UNIT



View from harness side

SEL287N

1992 INFINITI M30
E. C. C. S. WIRING DIAGRAM



1992 INFINITI M30
CIRCUIT DIAGRAM