# NISSAN 300ZX

MODEL Z32 SERIES

## QUICK REFERENCE INDEX


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


© 1991 NISSAN MOTOR CO., LTD. Printed in Japan

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

# FOREWORD

This manual contains maintenance and repair procedures for the 1992 Nissan 300ZX.

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

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

# IMPORTANT SAFETY NOTICE

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

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

# GENERAL INFORMATION

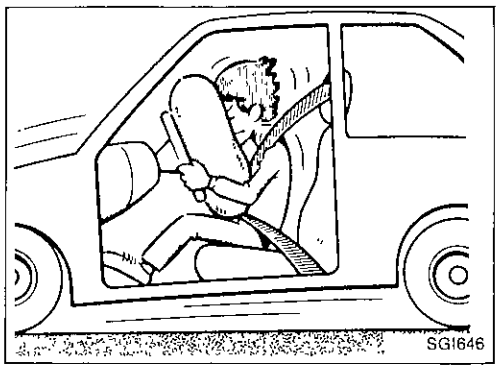
GI

# SECTION GI

## CONTENTS


PRECAUTIONS ..... GI- 2
HOW TO USE THIS MANUAL ..... GI- 5
HOW TO READ WIRING DIAGRAMS ..... GI- 7
HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES ..... GI-10
CONSULT CHECKING SYSTEM ..... GI-13
IDENTIFICATION INFORMATION ..... GI-14
LIFTING POINTS AND TOW TRUCK TOWING ..... GI-19
TIGHTENING TORQUE OF STANDARD BOLTS ..... GI-22

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

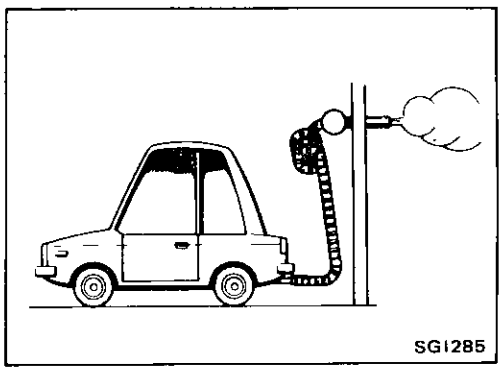

SGI646

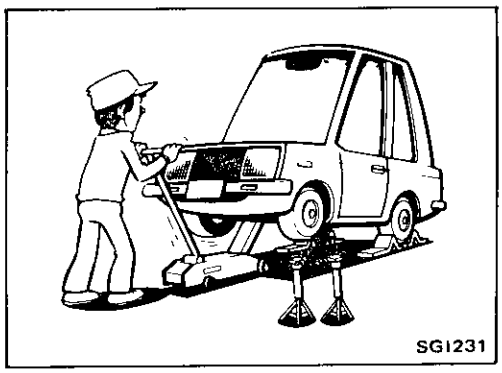
## Precautions for Supplemental Restraint System "AIR BAG"

This model has a Supplemental Restraint System "Air Bag" to help reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), five sensors, a 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 NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on these circuits.**

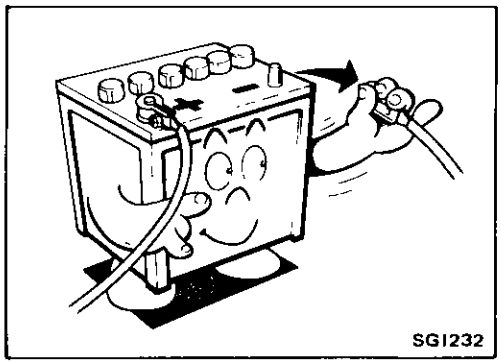

SGI285


SGI231

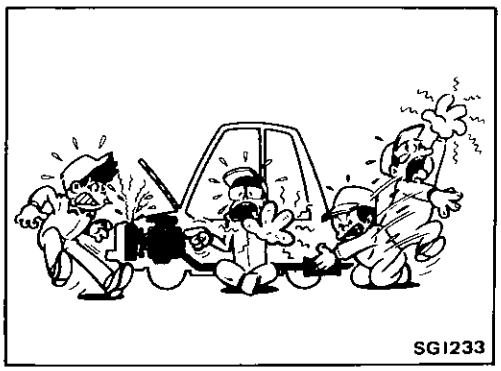
## General Precautions

1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials.
   Do not smoke while working on the vehicle.
2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.
   These operations should be done on a level surface.
3. When removing a heavy component such as the engine or transaxle/transmission, be careful not to lose your balance and drop them. Also, do not allow them to strike adjacent parts, especially the brake tubes and master cylinder.

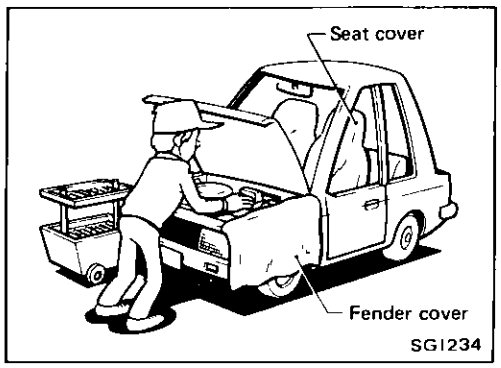
## General Precautions (Cont'd)


SGI232

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


SGI233

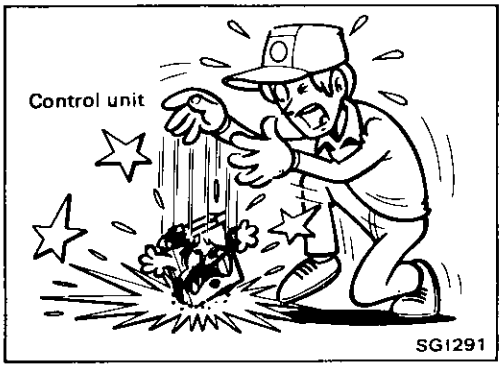
5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler. Do not remove the radiator cap when the engine is hot.



SGI234

6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers.
   Take caution that keys, buckles or buttons on your person do not scratch the paint.

7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
9. Replace inner and outer races of tapered roller bearings and needle bearings as a set.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which use microcomputers (such as 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.



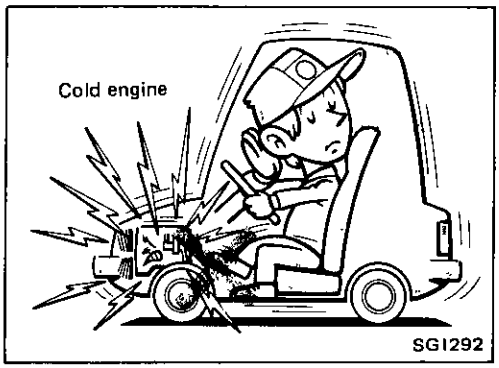

## Precautions for E.F.I. or E.C.C.S. Engine

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 Turbocharger

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

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

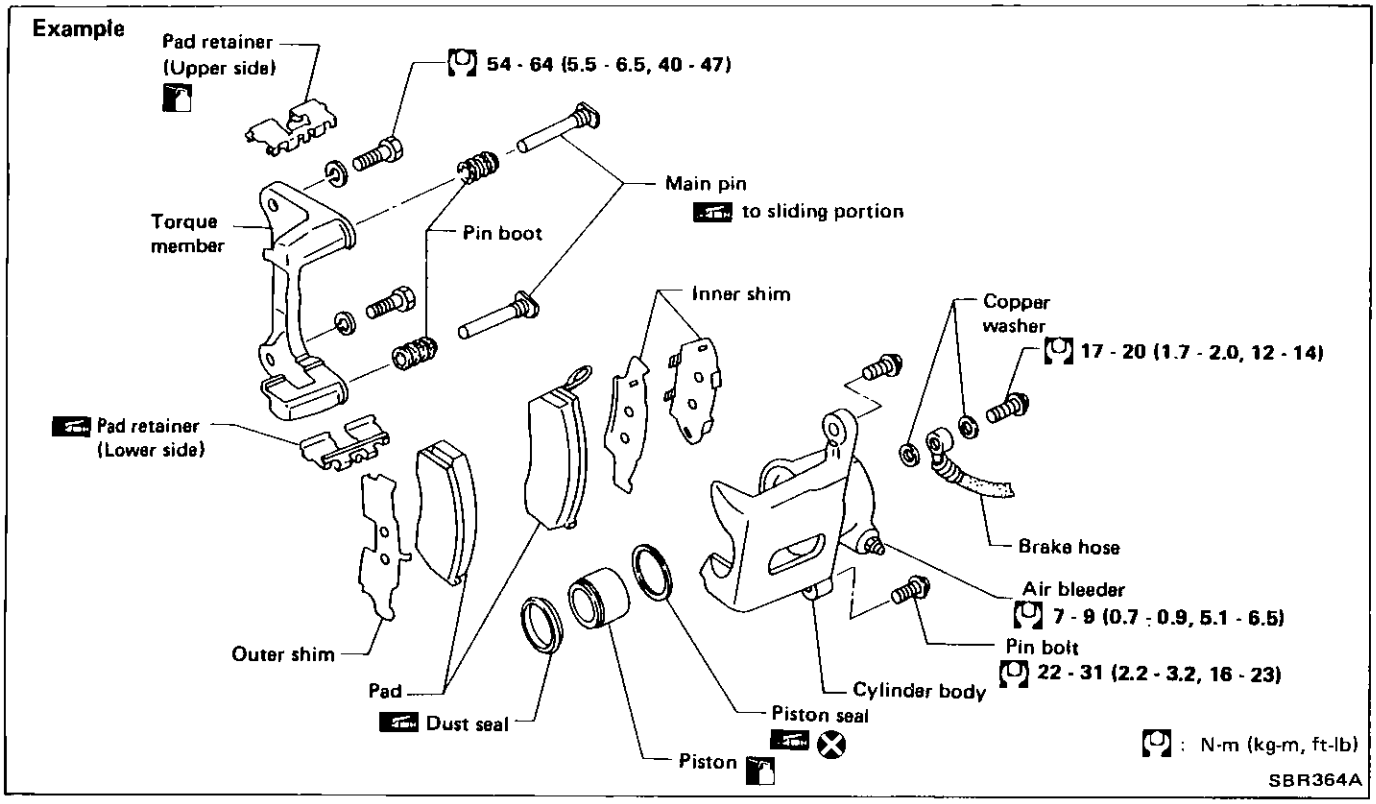
## Precautions for Fuel

To maintain engine and exhaust system durability and performance, UNLEADED PREMIUM gasoline with an octane rating of at least 91 AKI (Research octane number 96) must be used.
If premium unleaded gasoline is not available, REGULAR UNLEADED gasoline with an octane rating of 87 AKI (Research octane number 91) may be used temporarily, but only under the following conditions:

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

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

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




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

| | | |
|---|---|---|
| | : | Tightening torque |
| | : | 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. |

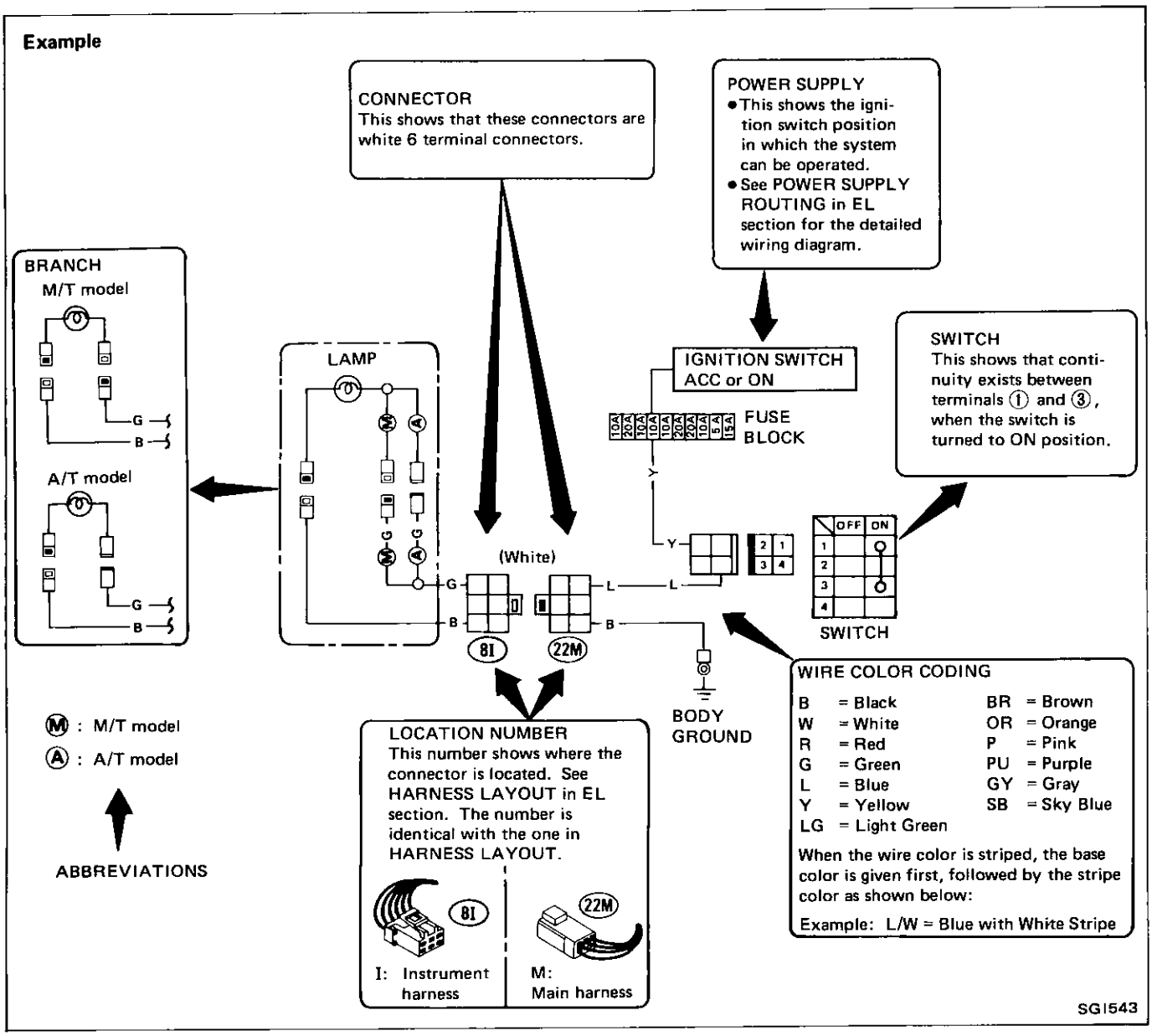
| | | |
|---|---|---|
| S.D.S. | : | Service Data and Specifications |
| L.H., R.H. | : | Left-Hand, Right-Hand |
| M/T | : | Manual Transaxle/Transmission |
| A/T | : | Automatic Transaxle/Transmission |
| Tool | : | Special Service Tools |
| A.T.F. | : | Automatic Transmission Fluid |
| $D_1$ | : | 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 |
| $2_2$ | : | 2nd range 2nd gear |
| $2_1$ | : | 2nd range 1st gear |
| $1_2$ | : | 1st range 2nd gear |
| $1_1$ | : | 1st range 1st gear |

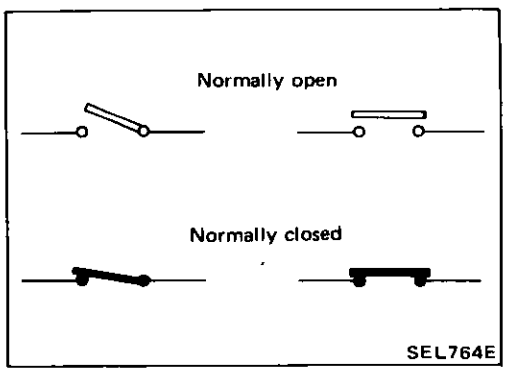
8. The **UNITS** given in this manual are primarily expressed as SI UNITS (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.
   **"Example"**
   **Tightening torque:**
   **59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)**
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.

- **WARNING** indicates the possibility of personal injury if instructions are not followed.
- **CAUTION** indicates the possibility of component damage if instructions are not followed.
- **BOLD TYPED STATEMENTS** except **WARNING** and **CAUTION** give you helpful information.

## WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:



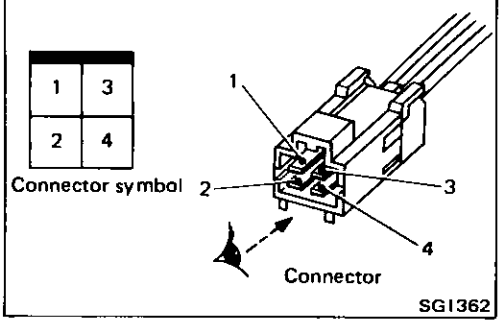




## SWITCH POSITIONS

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

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

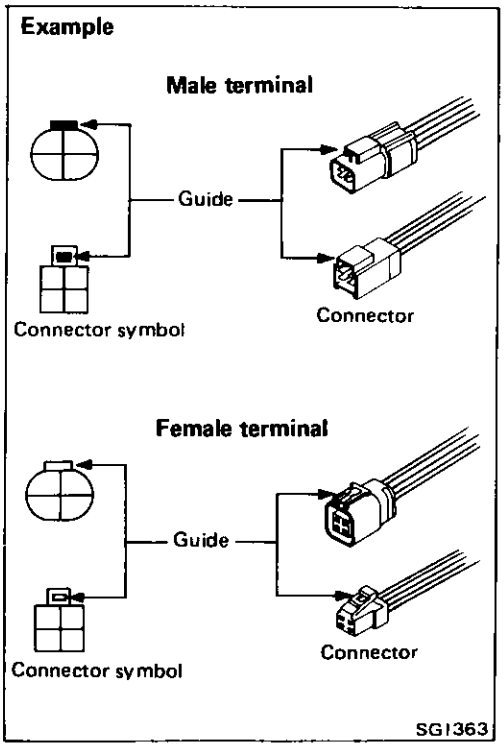
Example




## CONNECTOR SYMBOLS

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

Example

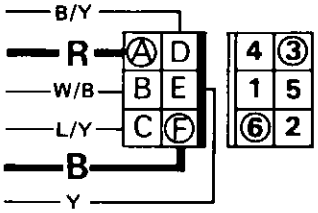



- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

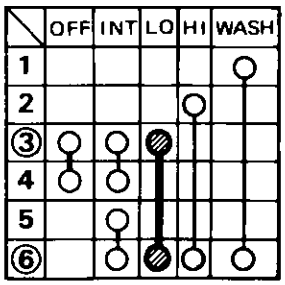
## MULTIPLE SWITCH

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

Example




WIPER SWITCH




Continuity circuit of wiper switch

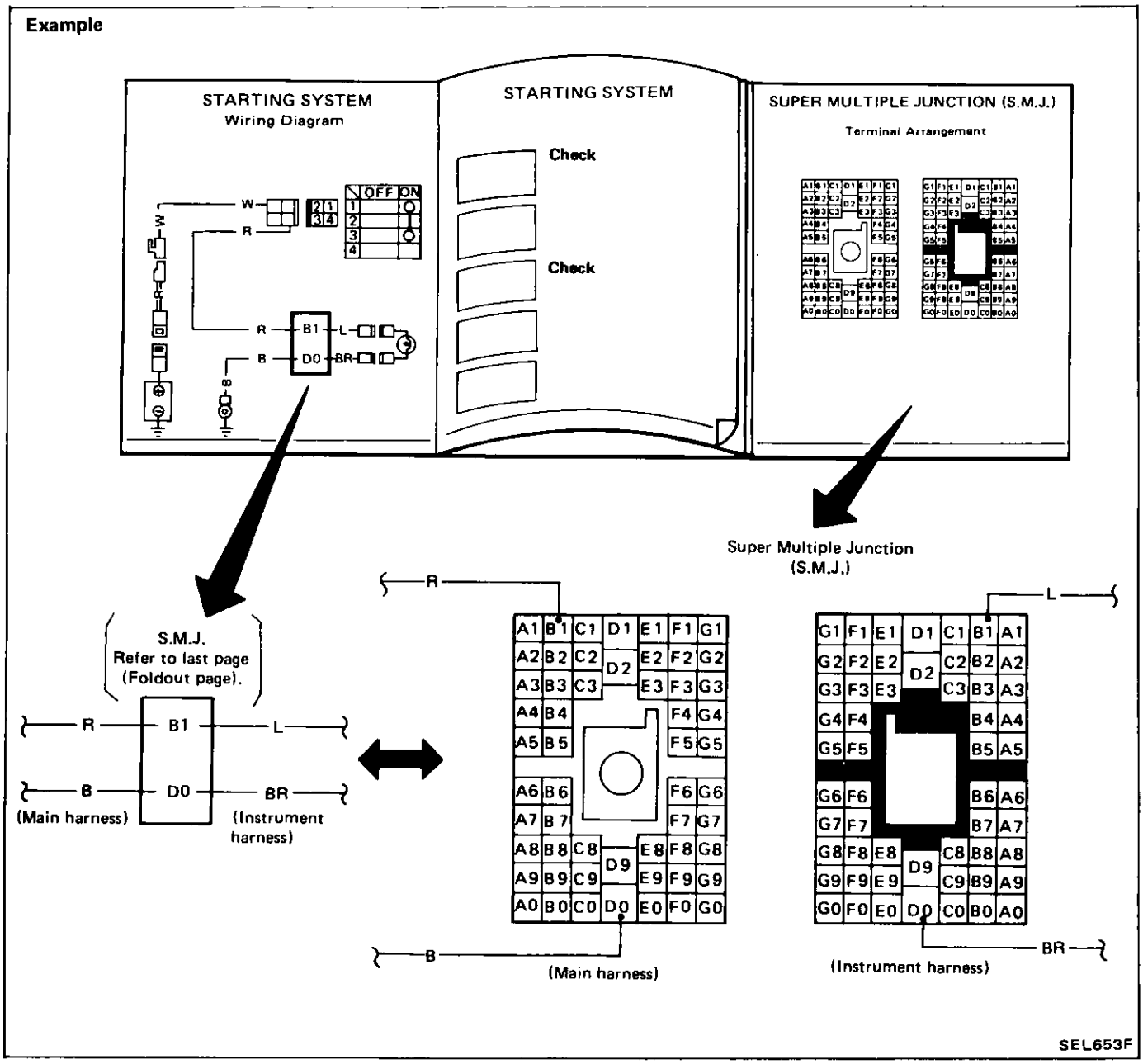
| SWITCH POSITION | CONTINUITY CIRCUIT |
|---|---|
| OFF | 3 - 4 |
| INT | 3 - 4, 5 - 6 |
| LO | 3 - 6 |
| HI | 2 - 6 |
| WASH | 1 - 6 |

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

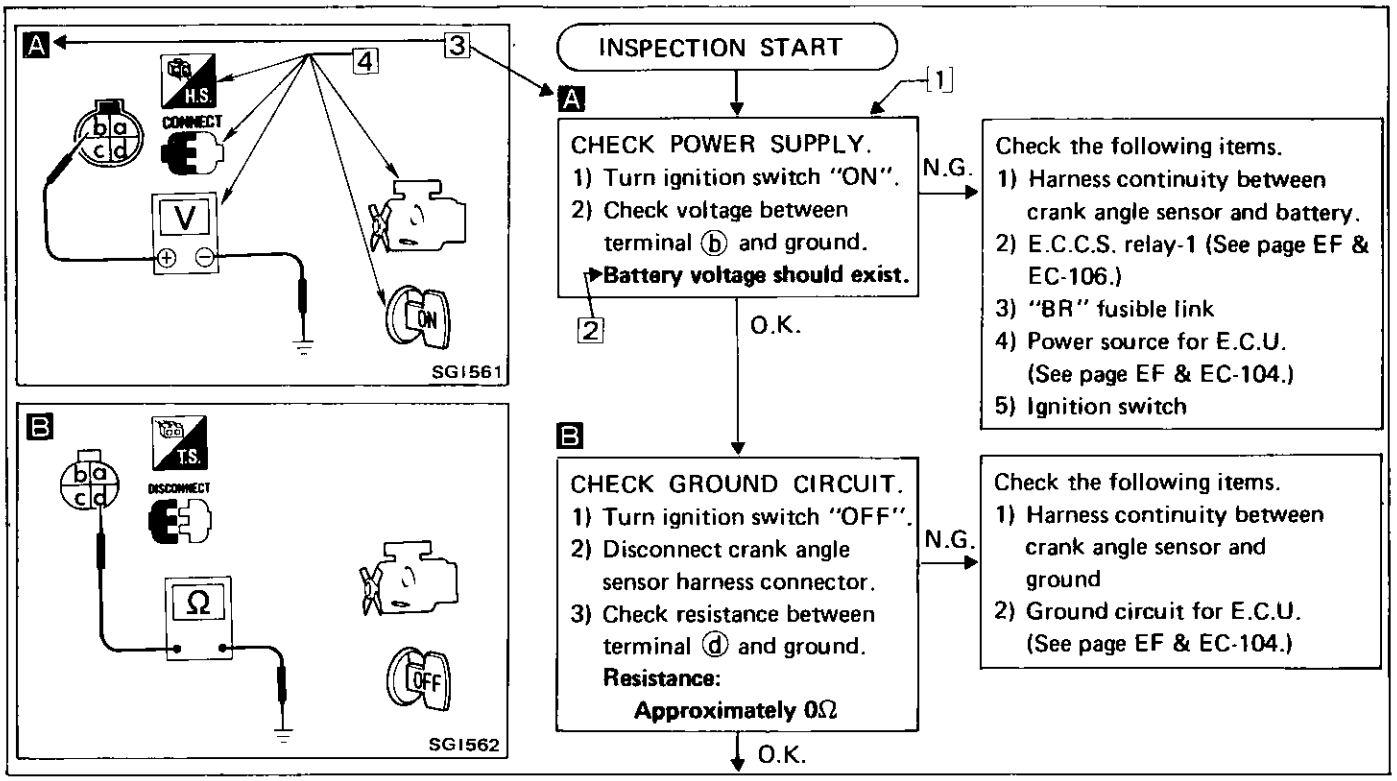
SGI365

## 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**



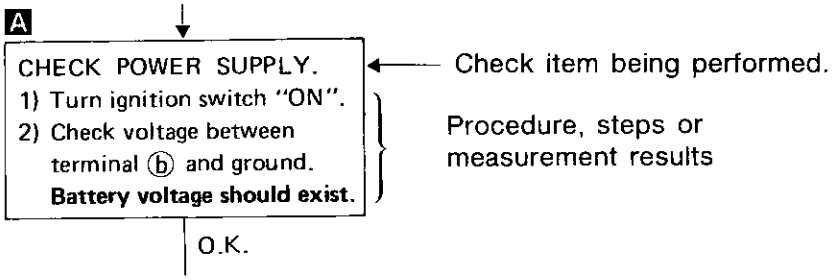

## NOTICE

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

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

## HOW TO FOLLOW THIS FLOW CHART

[1] **Work and diagnostic procedure**
Start to diagnose a problem using procedures indicated in enclosed blocks, as shown in the following example.

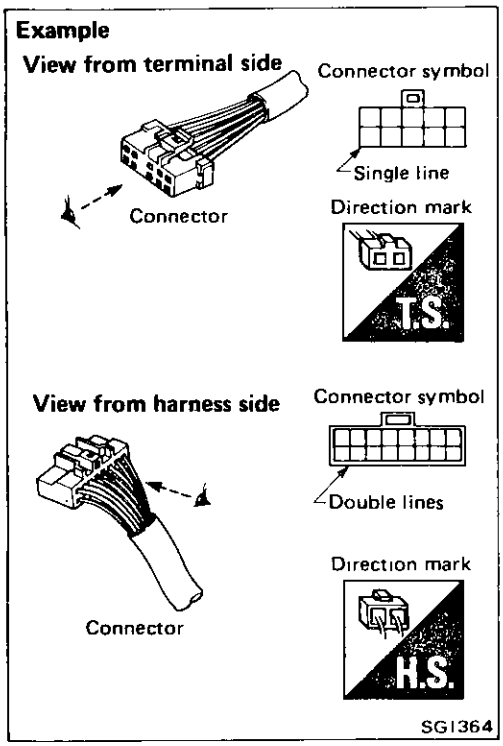



[2] **Measurement results**
Required results are indicated in bold type in the corresponding block, as shown below:
These have the following meanings:

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

[3] **Cross reference of work symbols in the text and illustrations**
Illustrations are provided as visual aids for work procedures. For example, symbol A indicated in the left upper portion of each illustration corresponds with the symbol in the flowchart for easy identification. More precisely, the procedure under the "CHECK POWER SUPPLY" outlined previously is indicated by an illustration A .

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




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

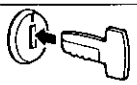
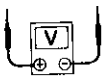
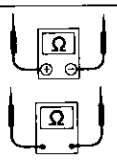
: **View from terminal side ... T.S.**

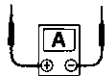
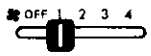
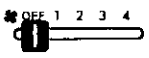
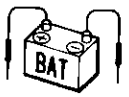
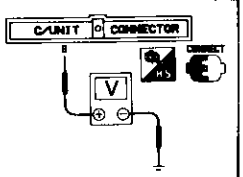
- **All connector symbols shown from the terminal side are enclosed by a single line.**

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

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

**Key to symbols signifying measurements or procedures**

| Symbol | Symbol explanation |
|---|---|
| | Check after disconnecting the connector to be measured. |
| | Check after connecting the connector to be measured. |
|  | Insert key into 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.** |

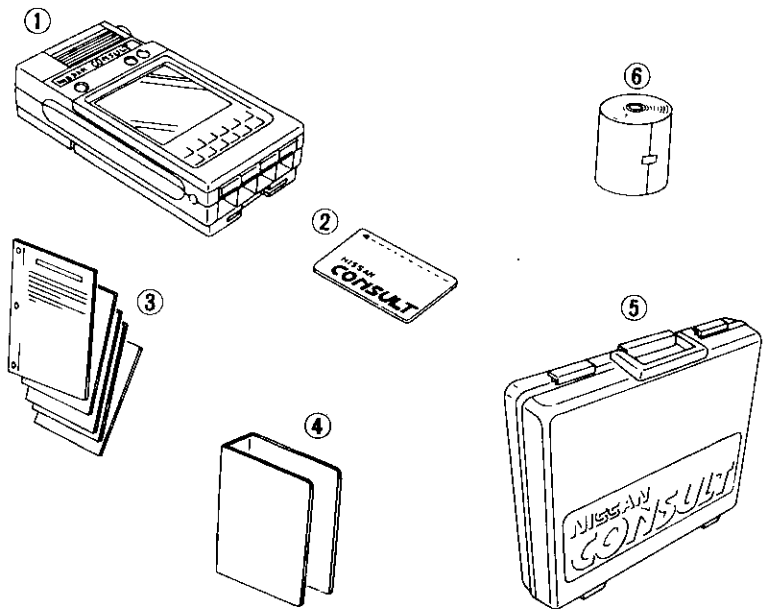
## Function and System Application

| Diagnostic mode | Function | E.C. C.S. | Auto A/C | A/T | HICAS | Air bag |
|---|---|---|---|---|---|---|
| Work support | This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT. | X | X | – | – | – |
| Self-diagnostic results | Self-diagnostic results can be read and erased quickly. | X | X | X | X | X |
| Data monitor | Input/Output data in the control unit can be read. | X | X | 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 | X | – | X | – |
| E.C.U. part number | E.C.U. part number can be read. | X | – | X | X | – |
| Function test | E.C.C.S. faults can be isolated to a general area, semi-automatically and in a short time, by following the directions on the screen. | X | – | – | – | – |

X: Applicable

## Checking Equipment

**When ordering the below equipment, contact your NISSAN distributor.**

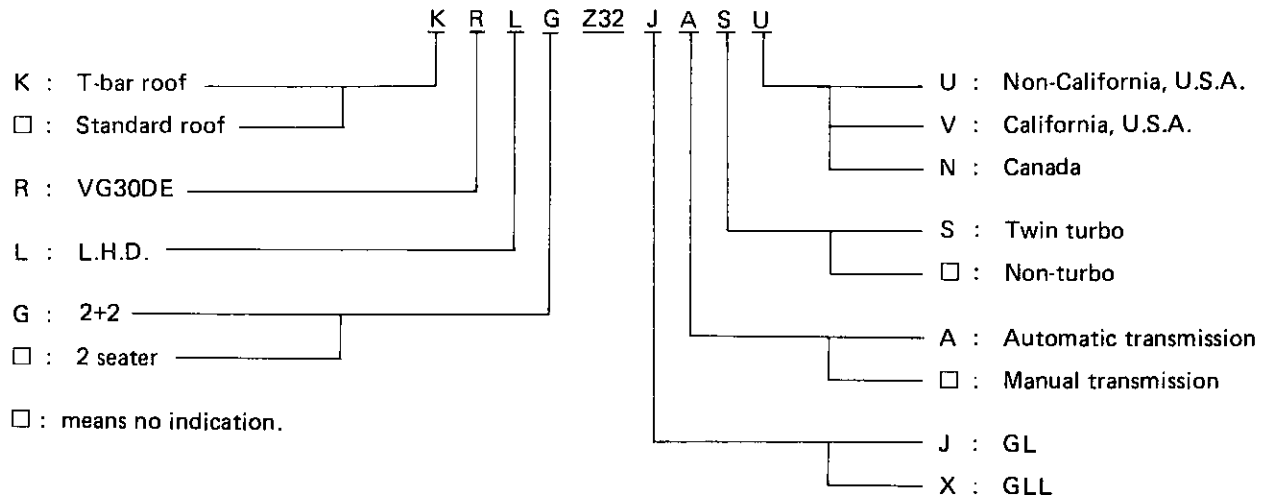
| Tool name | Description |
|---|---|
| **NISSAN CONSULT kit**<br>① CONSULT unit and accessories<br>② Program card (UE 900)<br>③ Operation manuals<br>④ Binder<br>⑤ Carrying case<br>⑥ Thermal paper (Rolls) |  |

## Model Variation

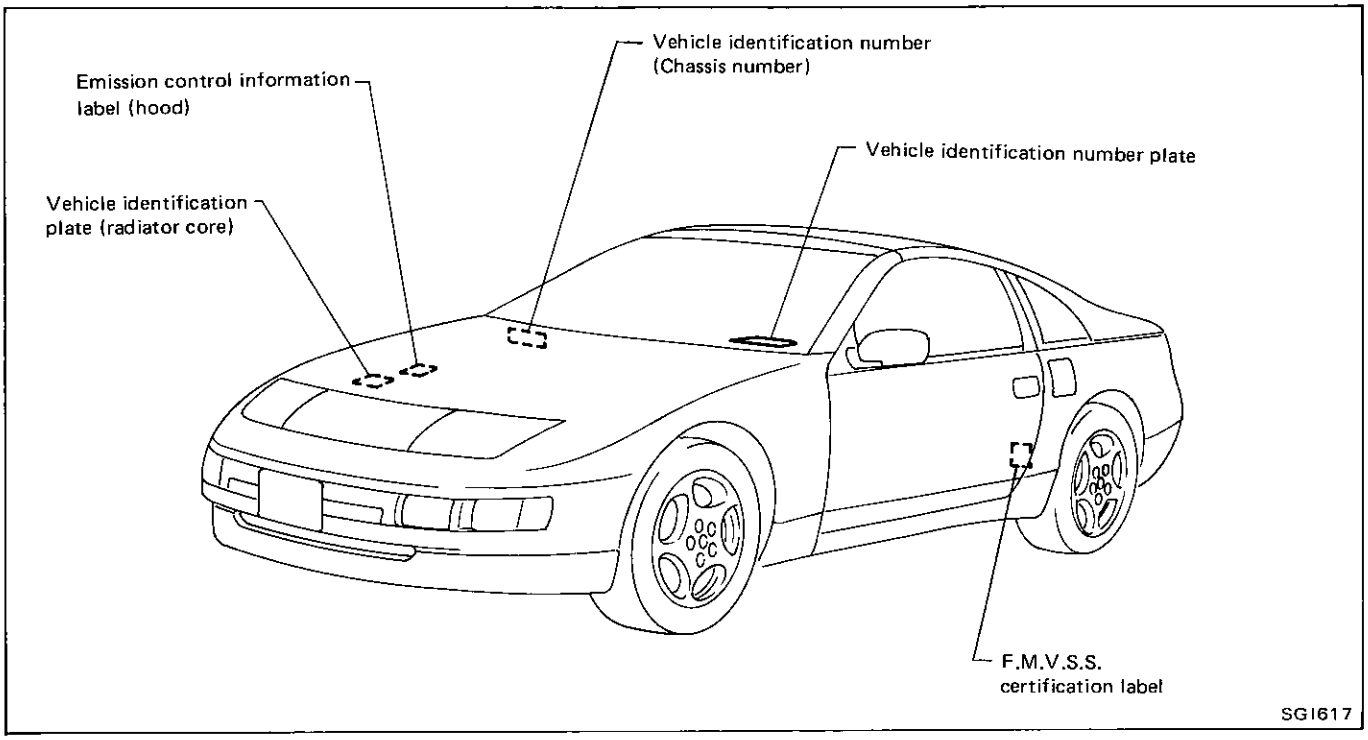
| Body | Destination | | Model | | Engine | Transmis-sion | Differential carrier | Road wheel size ... offset mm (in) | Tire size |
|---|---|---|---|---|---|---|---|---|---|
| Standard roof | U.S.A. | Non-California | 2 seater | RL-JU | VG30DE | RS5R30A | R200V | 7-1/2JJx16 ... 45 (1.77) | P225/50R16 91V |
| | | | | RL-JAU | | RE4R01A | | | |
| | | | | KRL-XU | | RS5R30A | | | |
| | | | | KRL-XAU | | RE4R01A | | | |
| T-bar roof | | | | KRL-XSU | VG30DETT | RS5R30A | R230V | FR: 7.5JJ-16 ... 45 (1.77) RR: 8.5JJ-16 ... 35 (1.38) | FR: P225/50ZR16 RR: P245/45ZR16 |
| | | | | KRL-XASU | | RE4R03A | | | |
| | | | 2+2 | KRLG-XU | VG30DE | RS5R30A | R200V | 7-1/2JJx16 ... 45 (1.77) | P225/50R16 91V |
| Standard roof | | California | 2 seater | RL-JV | VG30DE | RS5R30A | R200V | 7-1/2JJx16 ... 45 (1.77) | P225/50R16 91V |
| | | | | RL-JAV | | RE4R01A | | | |
| | | | | KRL-XV | | RS5R30A | | | |
| | | | | KRL-XAV | | RE4R01A | | | |
| T-bar roof | | | | KRL-XSV | VG30DETT | RS5R30A | R230V | FR: 7.5JJ-16 ... 45 (1.77) RR: 8.5JJ-16 ... 35 (1.38) | FR: P225/50ZR16 RR: P245/45ZR16 |
| | | | | KRL-XASV | | RE4R03A | | | |
| | | | 2+2 | KRLG-XV | VG30DE | RS5R30A | R200V | 7-1/2JJx16 ... 45 (1.77) | R225/50R16 91V |
| Standard roof | Canada | | 2 seater | RL-JN | VG30DE | RS5R30A | R200V | 7-1/2JJx16 ... 45 (1.77) | P225/50R16 91V |
| | | | | RL-JAN | | RE4R01A | | | |
| | | | | KRL-XN | | RS5R30A | | | |
| | | | | KRL-XAN | | RE4R01A | | | |
| T-bar roof | | | | KRL-XSN | VG30DETT | RS5R30A | R230V | FR: 7.5JJ-16 ... 45 (1.77) RR: 8.5JJ-16 ... 35 (1.38) | FR: P225/50ZR16 RR: P245/45ZR16 |
| | | | | KRL-XASN | | RE4R03A | | | |
| | | | 2+2 | KRLG-XN | VG30DE | RS5R30A | R200V | 7-1/2JJx16 ... 45 (1.77) | R225/50R16 91V |
| | | | | KRLG-XAN | | RE4R01A | | | |

## Model Variation (Cont'd)

**Prefix and suffix designations:**



## Identification Number




### VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JN1 R Z 2 4 S * N X 000001

Manufacturer
JN1 : Nissan, Passenger vehicle

Engine type
R : VG30DE
C : VG30DETT

Vehicle line
Z : NISSAN 300ZX

Model change

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

Vehicle serial number

Manufacture plant
X : Hiratsuka

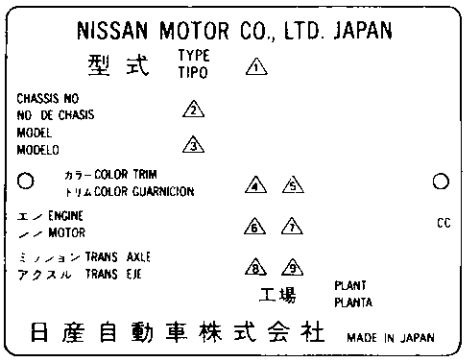
Model year
N : 1992 year model

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

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

## Identification Number (Cont'd)

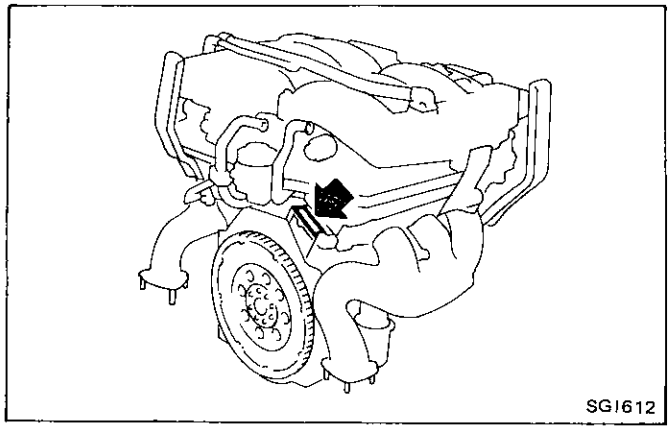
### IDENTIFICATION PLATE




SGI315

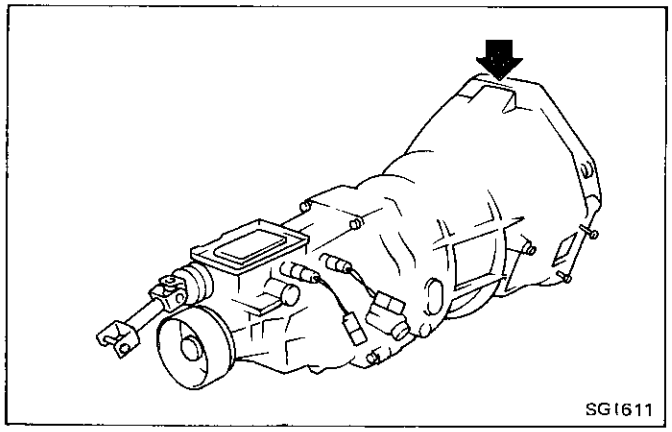
1 Type
2 Vehicle identification number (Chassis number)
3 Model
4 Body color code
5 Trim color code
6 Engine model
7 Engine displacement
8 Transmission model
9 Axle model

### ENGINE SERIAL NUMBER



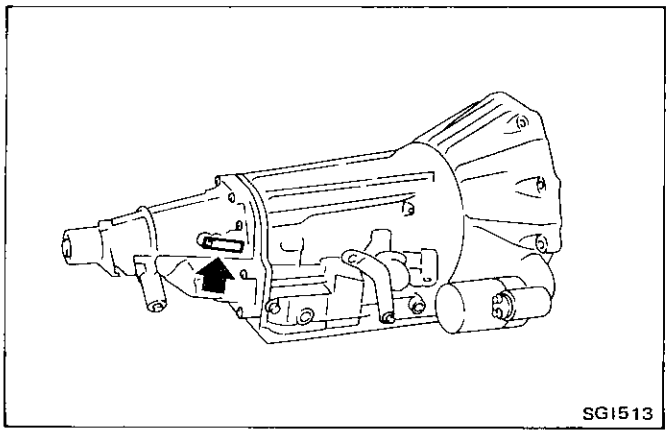
SGI612

### MANUAL TRANSMISSION NUMBER



SGI611

### AUTOMATIC TRANSMISSION NUMBER



SGI513

## Dimensions

Unit: mm (in)

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

## Wheels and Tires

Road wheel

| | Aluminum | Steel | Offset mm (in) |
|---|---|---|---|
| Conventional | 16 x 7.5JJ<br>16 x 8.5JJ*1 | – | 45 (1.77)<br>35 (1.38)*1 |
| T-type | – | 16 x 4T | 30 (1.18) |
| Space-saver tire | – | 15 x 5J | 30 (1.18) |

Tire size

| | |
|---|---|
| Conventional | P225/50R16 91V<br>P225/50ZR16*2<br>P245/45ZR16*3 |
| Spare | |
| T-type | T125/90D16 |
| Space-saver tire | 165/80D15FS |

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

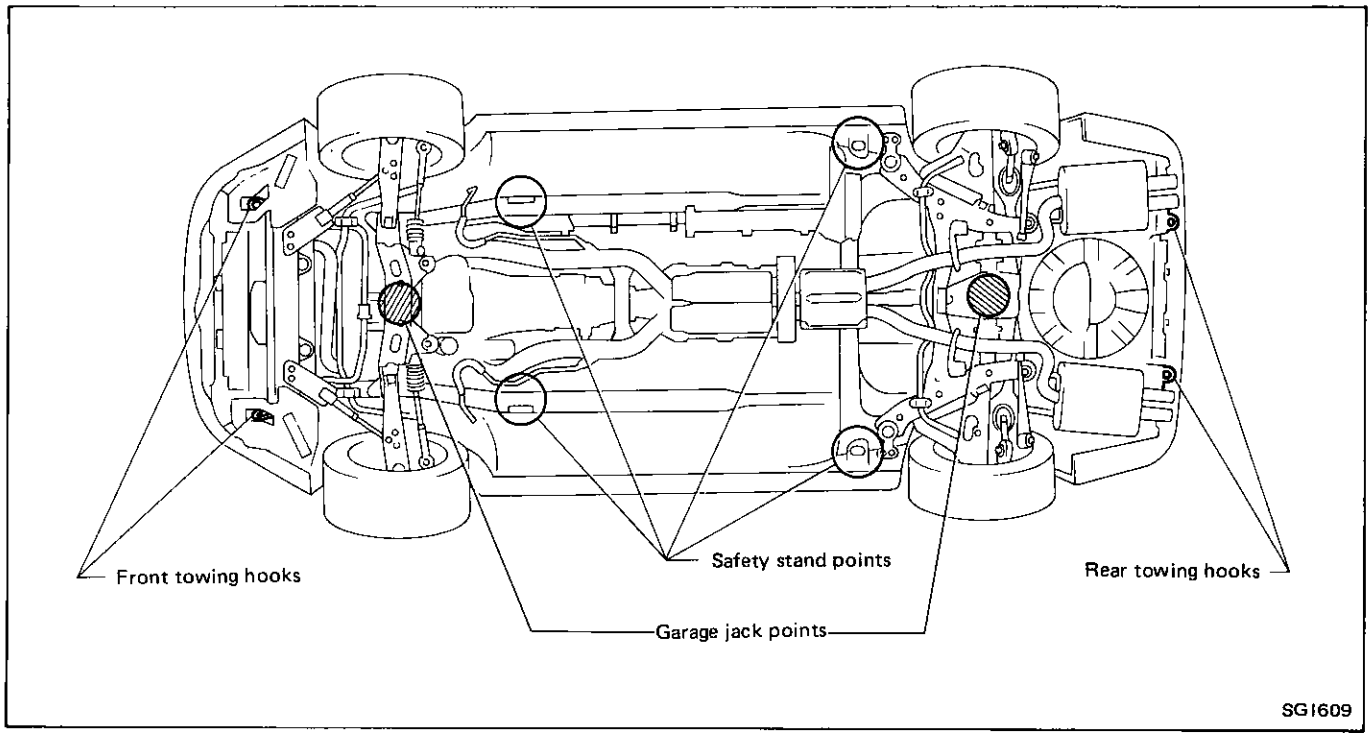
## Garage Jack and Safety Stand

**WARNING:**

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

**CAUTION:**

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

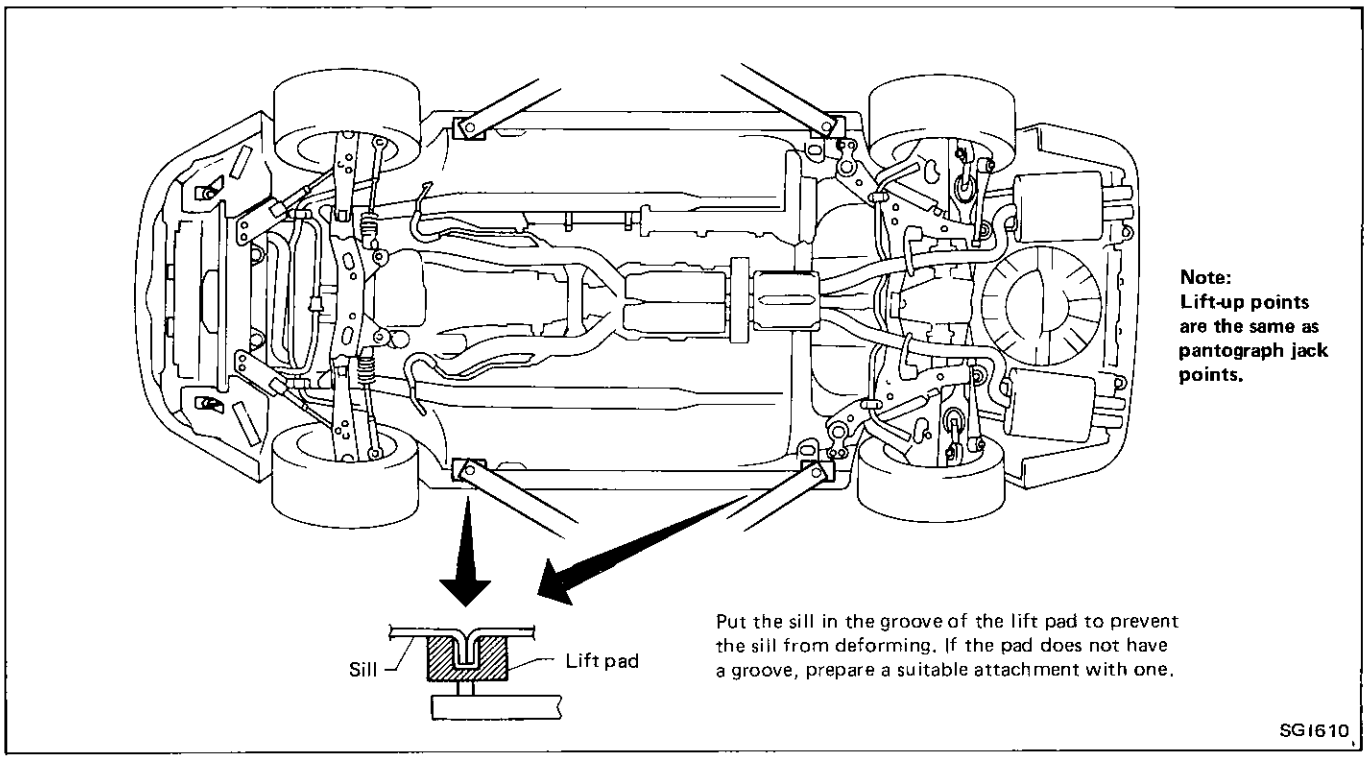


## 2-pole Lift

**WARNING:**

**When lifting the vehicle, open the lift arms as wide as possible and ensure that the front and rear of the vehicle are well balanced.**

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



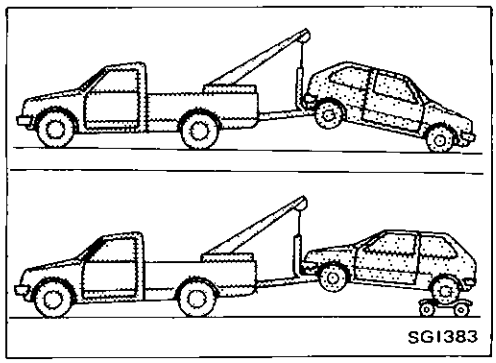

**Note:**
**Lift-up points are the same as pantograph jack points.**

## Tow Truck Towing

**CAUTION:**

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

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



## Tow Truck Towing (Cont'd)

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

Observe the following restricted towing speeds and distances.

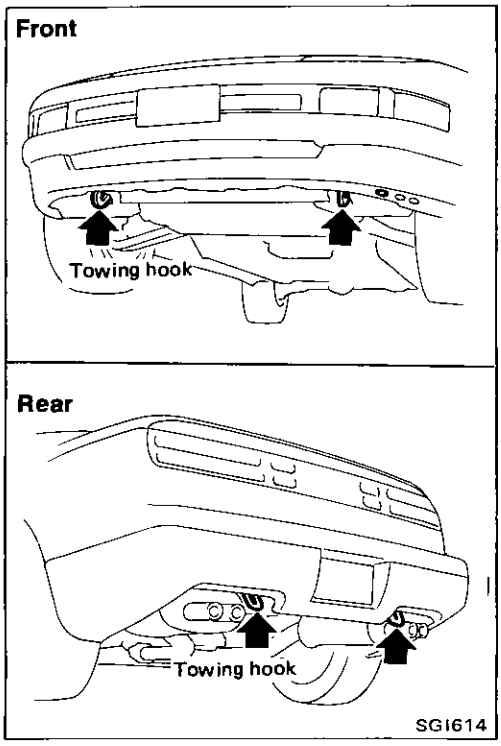
**Speed:**

**Below 50 km/h (30 MPH)**

**Distance:**

**Less than 65 km (40 miles)**

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




### TOWING POINT

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

# TIGHTENING TORQUE OF STANDARD BOLTS

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

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

| Grade | Mark |
|---|---|
| 4T | 4 |
| 7T | 7 |
| 9T | 9 |

*: Nominal diameter

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

# MAINTENANCE

# SECTION MA

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-22

## Supplemental Restraint System "AIR BAG"

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

**WARNING:**

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

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

| Item | Reference page |
|---|---|
| **OUTSIDE THE VEHICLE**<br>The maintenance items listed here should be performed from time to time, unless otherwise specified. | |
| **Tires** Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear. | – |
| **Wheel nuts** When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary. | – |
| **Tire rotation** Tires should be rotated every 12,000 km (7,500 miles) for non-turbo models. | MA-19 |
| **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-19<br>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 and back hatch. Also, ensure that all latches lock securely. Lubricate hinges and latches if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released.<br>When driving in areas using road salt or other corrosive materials, check lubrication frequently. | MA-21 |
| **INSIDE THE VEHICLE**<br>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.<br>**Free play: Less than 35 mm (1.38 in)** | – |
| **Seats** Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restrains move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks. | – |
| **Seat belts** Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage. | MA-21 |

| Item | Reference page |
|---|---|
| **Clutch pedal** Make sure the pedal operates smoothly and check that it has the proper free travel. | CL-6 |
| **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 the floor mats away from the pedal. | BR-7<br>BR-8 |
| **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-20 |
| **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**<br>The maintenance items listed here should be checked periodically (e.g. each time you check the engine oil or refuel). | |
| **Windshield washer fluid** Check that there is adequate fluid in the tank. | — |
| **Engine coolant level** Check the coolant level when the engine is cold. | MA-11 |
| **Radiator and hoses** Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections. | — |
| **Brake and clutch fluid levels** Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir. | MA-16, 18 |
| **Battery** Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines. | — |
| **Engine drive belts** Make sure that no belt is frayed, worn, cracked or oily. | MA-9 |
| **Engine oil level** Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine. | MA-13 |
| **Power steering fluid level and lines** Check the level when the fluid is cold and the engine is turned off. Check the lines for proper attachment, leaks, cracks, etc. | MA-19 |
| **Automatic transmission fluid level** Check the level on the dipstick after putting the selector lever in "P" with the engine idling. | MA-17 |
| **Exhaust system** Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it. | MA-20 |
| **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 = Repalce I = Inspect. Correct or replace if necessary. [ ] : At the mileage intervals only

| MAINTENANCE OPERATION | MAINTENANCE INTERVAL | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Perform at number of miles, kilometers or months, whichever comes first. | Miles x 1,000 | 3.00 | 3.75 | 7.5 | 11.25 | 15 | 18.75 | 22.5 | 26.25 | 30 | 33.75 | 37.5 | 41.25 | 45 | 48.75 | 52.5 | 56.25 | 60 | Reference page |
| | (km x 1,000) | (5) | (6) | (12) | (18) | (24) | (30) | (36) | (42) | (48) | (54) | (60) | (66) | (72) | (78) | (84) | (90) | (96) | |
| | Months | 3 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | 39 | 42 | 45 | 48 | |
| **EMISSION CONTROL SYSTEM MAINTENANCE** | | | | | | | | | | | | | | | | | | | |
| Drive belts | See NOTE (1). | | | | | | | | | | | | | | | | | I* | MA-9 |
| Air cleaner filter | See NOTE (2). | | | | | | | | | [R] | | | | | | | | [R] | MA-12 |
| Vapor lines | | | | | | | | | | I* | | | | | | | | I* | MA-15 |
| Fuel lines | | | | | | | | | | I* | | | | | | | | I* | MA-11 |
| Fuel filter | See NOTE (3).* | | | | | | | | | | | | | | | | | | MA-12 |
| Engine coolant | See NOTE (4). | | | | | | | | | | | | | | | | | R* | MA-10 |
| Engine oil | | | R | R | R | R | R | R | R | R | R | R | R | R | R | R | R | R | MA-12 |
| | Turbo model | R | Then replace every 3,000 miles (5,000 km) or 3 months. | | | | | | | | | | | | | | | | MA-12 |
| Engine oil filter (Use part No. 15208-60U00 or equivalent.) | | | R | R | R | R | R | R | R | R | R | R | R | R | R | R | R | R | MA-13 |
| | Turbo model | R | Then replace every oil change. | | | | | | | | | | | | | | | | MA-13 |
| Spark plugs (PLATINUM-TIPPED type) | | | | | | | | | | | | | | | | | | [R] | MA-14 |
| Timing belt | | | | | | | | | | | | | | | | | | [R] | EM-13 |
| **CHASSIS AND BODY MAINTENANCE** | | | | | | | | | | | | | | | | | | | |
| Brake lines & cables | | | | | | I | | | | I | | | | I | | | | I | MA-18 |
| Brake pads & discs | | | | I | | I | | I | | I | | I | | I | | I | | I | MA-18 |
| Manual & automatic transmission oil, & differential gear oil | See NOTE (5). | | | | | I | | | | I | | | | I | | | | I | MA-16, 17 |
| 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-5 |
| SUPER HICAS linkage (Turbo model) | | | | I | | I | | I | | I | | I | | I | | I | | I | MA-20 |
| Exhaust system | | | | I | | I | | I | | I | | I | | I | | I | | I | MA-20 |
| Air bag system | See NOTE (6). | | | | | | | | | | | | | | | | | | BF-53 |

**NOTE:** (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
(2) If operating mainly in dusty conditions, more frequent maintenance may be required.
(3) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.
(4) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.
(5) 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 NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

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

| MAINTENANCE OPERATION | | MAINTENANCE INTERVAL | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Perform at number of miles, kilometers or months, whichever comes first. | Miles x 1,000 | 5.0 | 7.5 | 15 | 22.5 | 30 | 37.5 | 45 | 52.5 | 60 | |
| | (km x 1,000) | (8) | (12) | (24) | (36) | (48) | (60) | (72) | (84) | (96) | |
| | Months | 6 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | |
| **EMISSION CONTROL SYSTEM MAINTENANCE** | | | | | | | | | | | |
| Drive belts | See NOTE (1). | | | | | | | | | I* | MA-9 |
| Air cleaner filter | | | | | | [R] | | | | [R] | MA-12 |
| Vapor lines | | | | | | I* | | | | I* | MA-15 |
| Fuel lines | | | | | | I* | | | | I* | MA-11 |
| Fuel filter | See NOTE (2)*. | | | | | | | | | | MA-12 |
| Engine coolant | See NOTE (3). | | | | | | | | | R* | MA-10 |
| Engine oil | | | R | R | R | R | R | R | R | R | MA-12 |
| | Turbo model | R | Then replace every 5,000 miles (8,000 km) or 6 months. | | | | | | | | MA-12 |
| Engine oil filter (Use Part No. 15208-60U00 or equivalent.) | | | R | | R | | R | | R | | MA-13 |
| | Turbo model | R | Then replace every second oil change. | | | | | | | | MA-13 |
| Spark plugs (PLATINUM-TIPPED type) | | | | | | | | | | [R] | MA-14 |
| Timing belt | | | | | | | | | | [R] | EM-13 |
| **CHASSIS AND BODY MAINTENANCE** | | | | | | | | | | | |
| Brake lines & cables | | | | I | | I | | I | | I | MA-18 |
| Brake pads & discs | | | | I | | I | | I | | I | MA-18 |
| Manual & automatic transmission oil, & differential gear oil | | | | I | | I | | I | | I | MA-16, 17 |
| Steering gear linkage, axle & suspension parts | | | | | | I | | | | I | MA-19, FA-5, RA-5 |
| SUPER HICAS linkage (Turbo model) | | | | | | I | | | | I | MA-20 |
| Exhaust system | | | | I | | I | | I | | I | MA-20 |
| Air bag system | See NOTE (4). | | | | | | | | | | BF-53 |

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

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

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

**(4) Inspect the air bag system 10 years after the date of manufacture as noted on the F.M.V.S.S. certification label.**

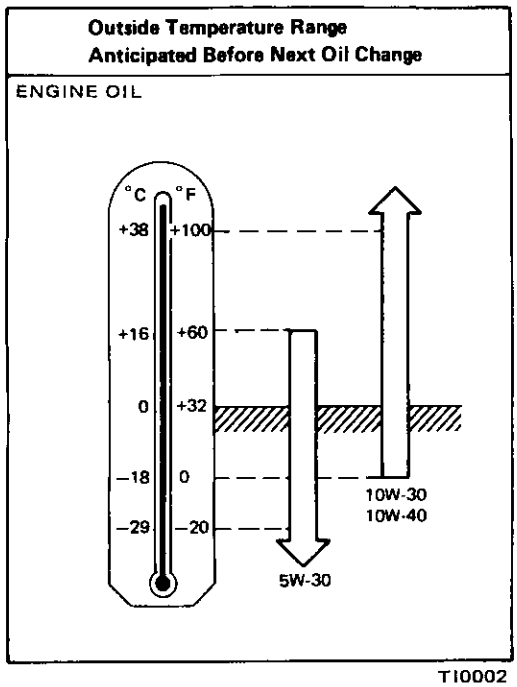
**(5) Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.**

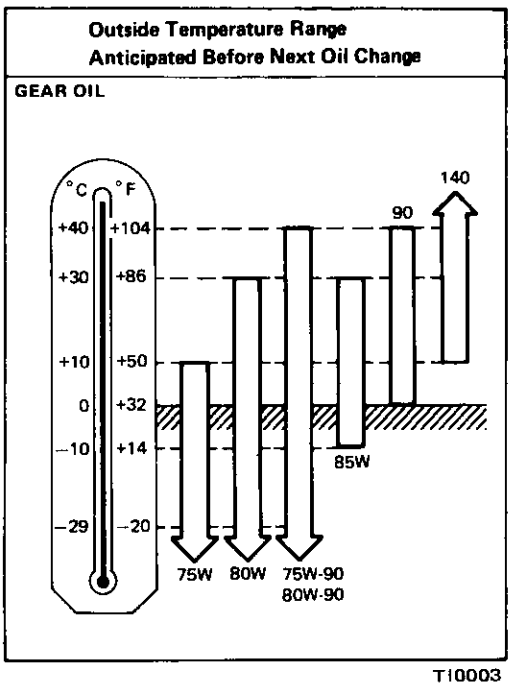
## Fluids and Lubricants

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

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

## SAE Viscosity Number

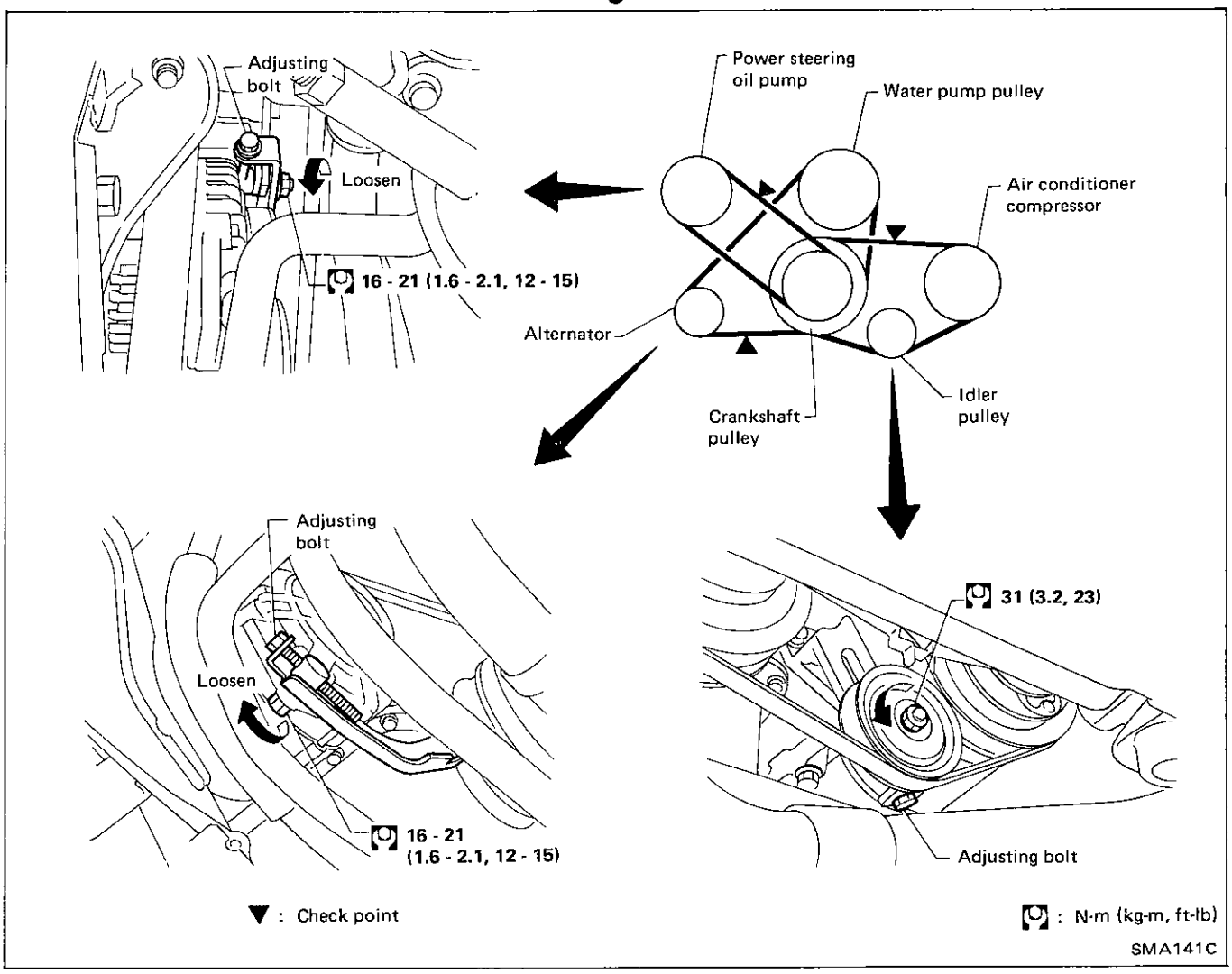



**10W-30 is preferable for ambient temperatures above –18°C (0°F). 20W-40 and 20W-50 are usable for ambient temperatures above 10°C (50°F) for all seasons.**
**For turbo engines, 5W-30 should be used only under extremely cold conditions.**

**75W-90 for transmission and 80W-90 for differential gear are preferable for ambient temperatures below 40°C (104°F).**

## Checking Drive Belts




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

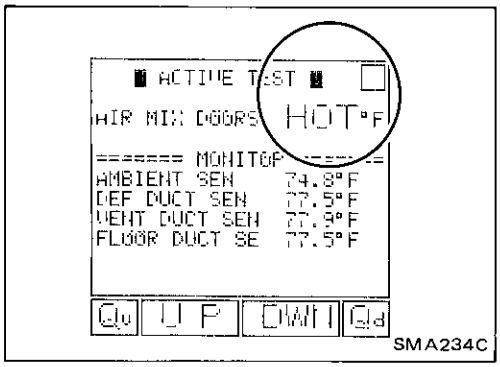
**Adjust if belt deflection exceed the limit.**

**Belt deflection:**

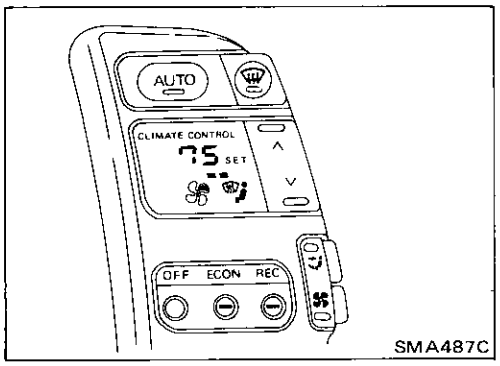
Unit: mm (in)

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

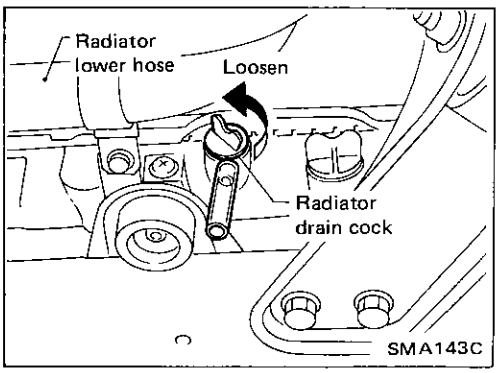
**Inspect drive belt deflection when engine is cold.**



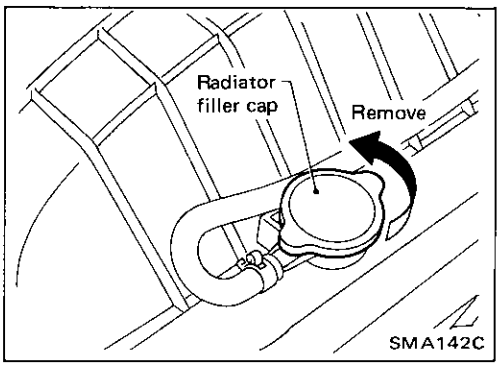
SMA234C



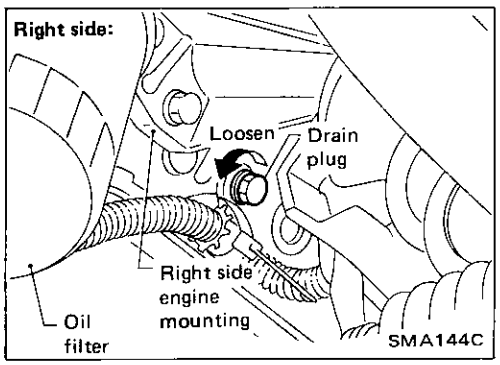
SMA487C



SMA143C



SMA142C



SMA144C

## Changing Engine Coolant

**WARNING:**

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

### MANUAL CONTROL

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

### AUTOMATIC CONTROL

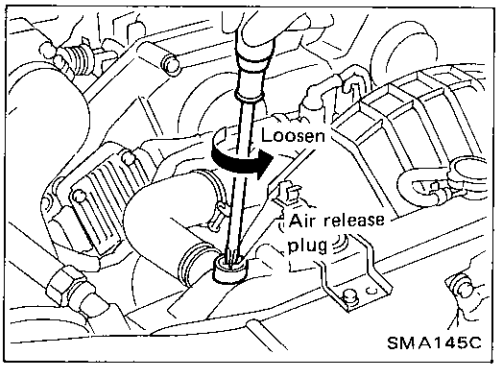
1. Perform "AIR MIX DOORS" test in "ACTIVE TEST" mode of "AUTO A/C" (Automatic Air Conditioner) system.
   Set "AIR MIX DOORS" at (full) HOT and wait 10 seconds before turning ignition switch off.

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

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

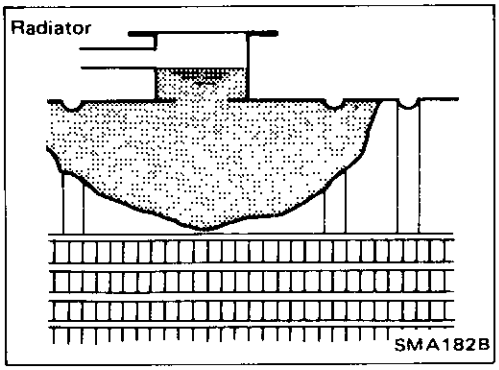
3. Open drain plugs on both sides of cylinder block.
   - **Left side drain plug is located beside the left side engine mounting.**

## Changing Engine Coolant (Cont'd)




4. Open air release plug to drain coolant.
5. Flush cooling system by running fresh water through radiator.
6. Close drain cock and tighten drain plugs securely.
   - **Apply sealant to the drain plug thread.**

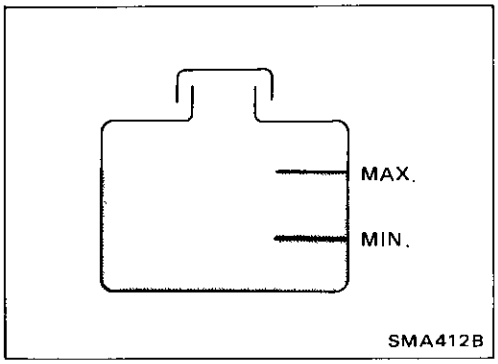
   **: 34 - 44 N·m**
   **(3.5 - 4.5 kg-m, 25 - 33 ft-lb)**




7. Fill radiator slowly with proper mixture of coolant and water. Fill reservoir tank up to the "H" level. Then install radiator cap and close air release plug.

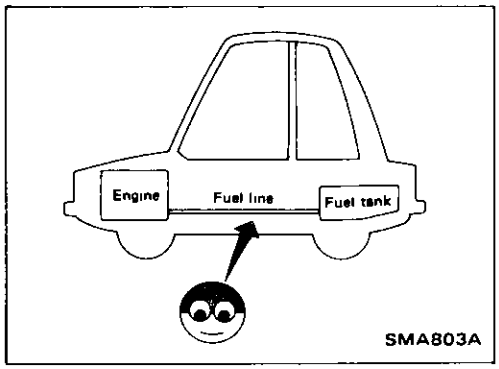
   **Coolant capacity (With reservoir tank):**
   **9.0 ℓ (9-1/2 US qt, 7-7/8 Imp qt)**
   **Reservoir tank:**
   **0.6 ℓ (5/8 US qt, 1/2 Imp qt)**

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

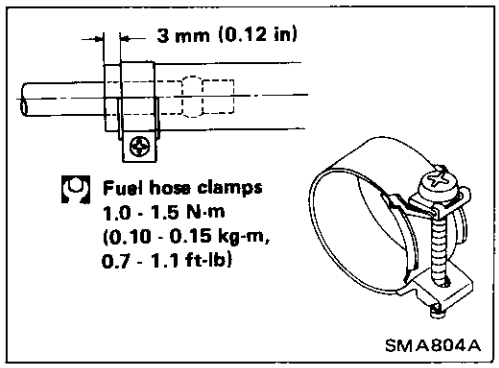



8. Start engine and warm it up until it reaches normal operating temperature. Then race engine 2 or 3 times under no-load. Watch coolant temperature gauge for signs of overheating.
9. Stop engine. After it completely cools down, refill radiator up to filler opening. Fill reservoir tank up to the "H"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

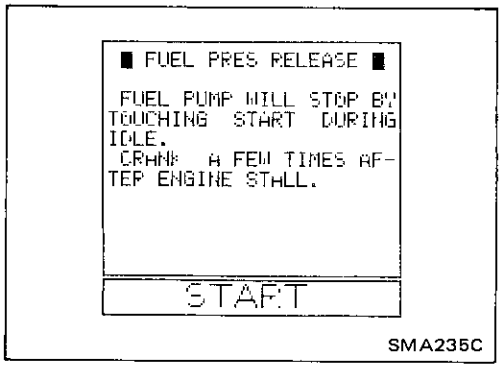
## Checking Fuel Lines




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




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

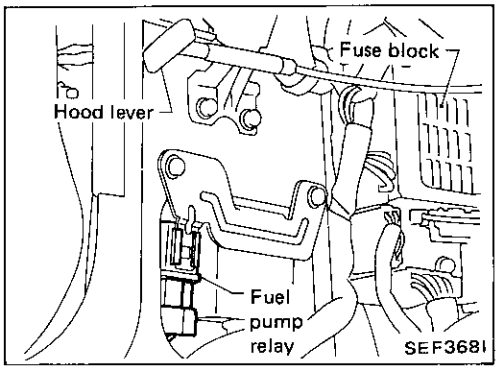



## Changing Fuel Filter

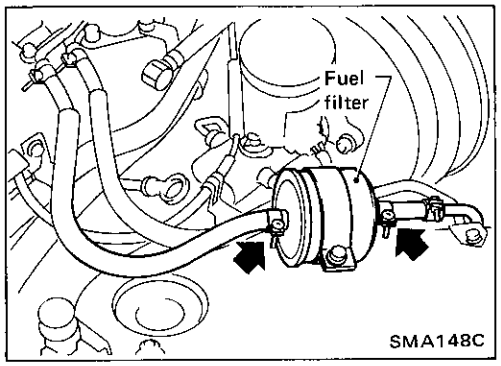
**WARNING:**

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

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




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

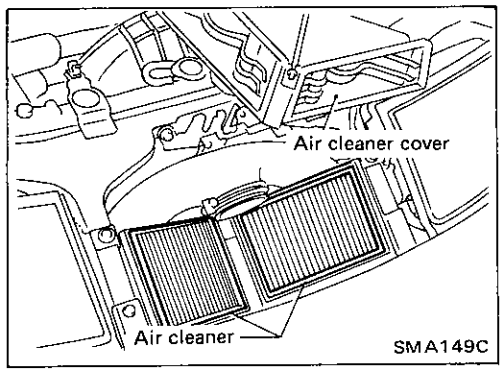



3. Loosen fuel hose clamps.
4. Replace fuel filter.

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

## Changing Air Cleaner Filter

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

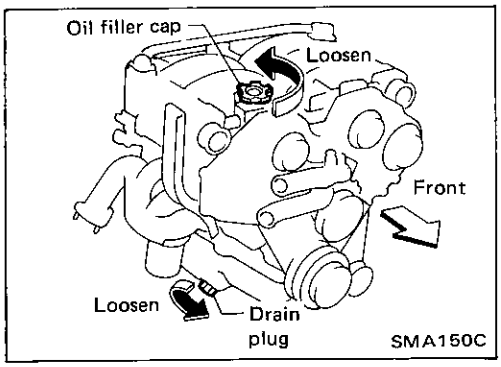



## Changing Engine Oil

**WARNING:**

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

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

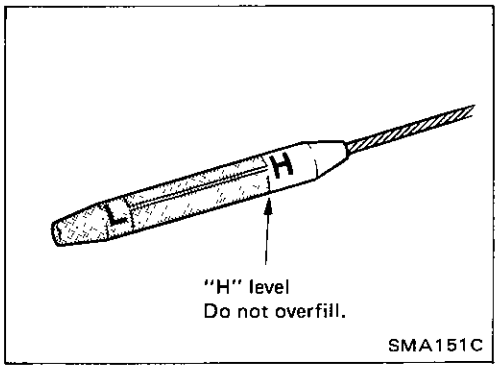


## Changing Engine Oil (Cont'd)

3. Drain oil and refill with new engine oil.
   **Oil grade: API SG**
   **Viscosity:**
   **See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section.**
   **Refill oil capacity (Approximately): ℓ (US qt, Imp qt)**
   **With oil filter**
   **3.4 (3-5/8, 3)**
   **Without oil filter**
   **3.0 (3-1/8, 2-5/8)**

**CAUTION:**

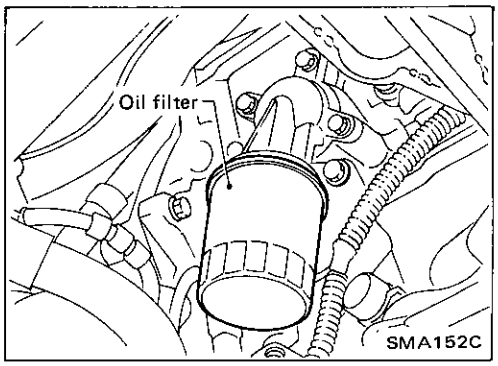
- **Be sure to clean drain plug and install with new washer.**
  **Oil pan drain plug:**
  **[O]: 29 - 39 N·m**
  **(3.0 - 4.0 kg-m, 22 - 29 ft-lb)**
- **Since the refill capacity changes depending on the oil temperature and drain time, use these values as a reference and be certain to check with the dipstick when changing the oil.**



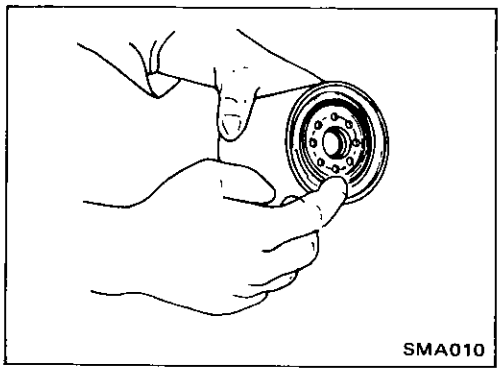

4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

## Changing Oil Filter

1. Remove oil filter with a suitable tool.

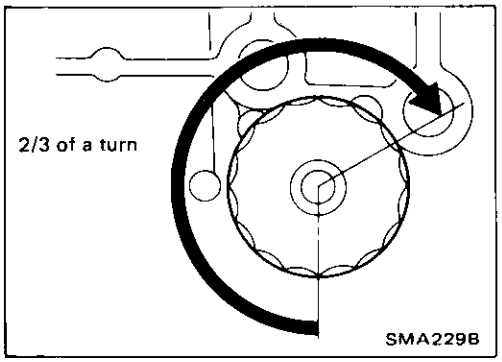



**WARNING:**
**Be careful not to burn yourself, as the engine and engine oil are hot.**




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

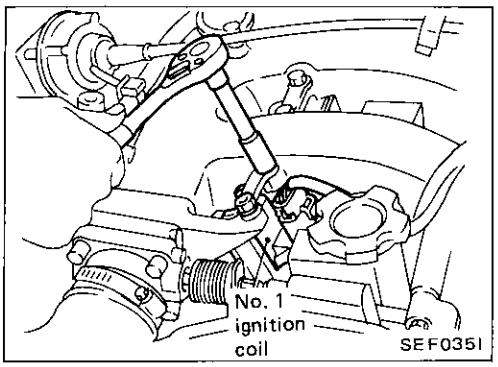
## Changing Oil Filter (Cont'd)



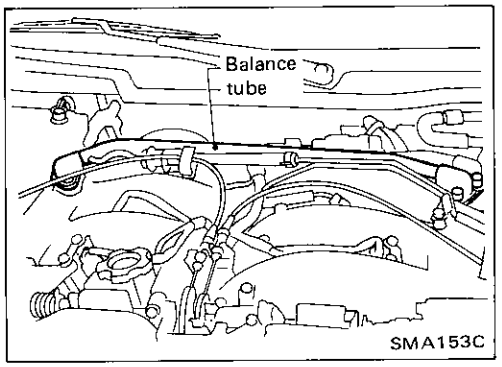

3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
4. Add engine oil.

**Refer to Changing Engine Oil.**

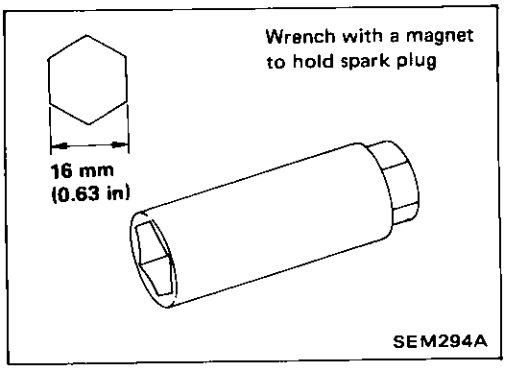
## Changing Spark Plugs




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




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

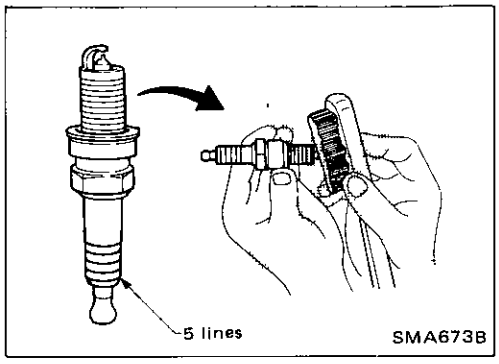



3. Remove spark plugs with suitable spark plug wrench.

**Spark plug (Platinum-tipped type):**

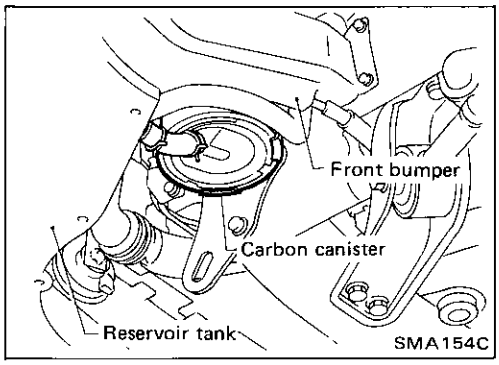
| | Non-turbo | Turbo |
|---|---|---|
| Standard type | PFR6B-11 | PFR5B-11B |
| Hot type | PFR5B-11 | Ditto |
| Cold type | PFR7B-11 | PFR6B-11B |
| | | PFR6B-11 |

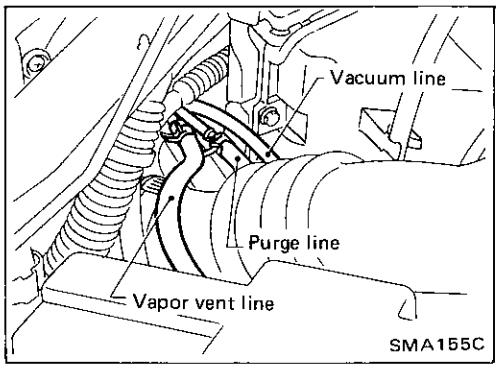
**(O): 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)**




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

**Cleaner air pressure:**
**Less than 588 kPa (6 kg/cm², 85 psi)**
**Cleaning time:**
**Less than 20 seconds**

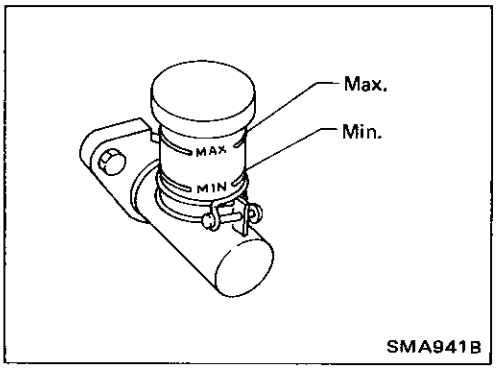



## Checking Vapor Lines

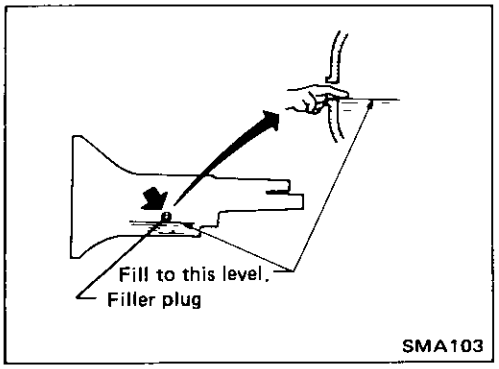
1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

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




## Checking Clutch Fluid Level and Leaks

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



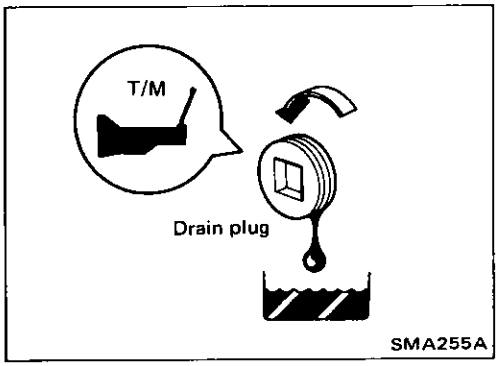

## Checking M/T Oil

1. Check for oil leakage.
2. If leakage is found, check oil level.

**Never start engine while checking oil level.**

**Filler plug:**

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




## Changing M/T Oil

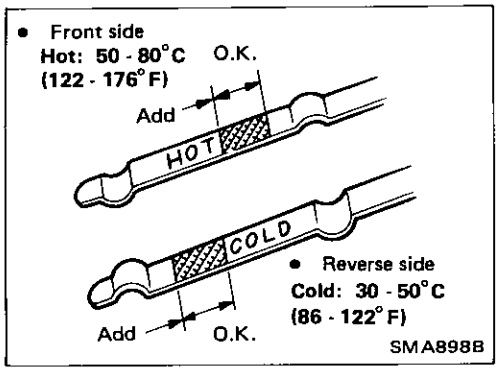
1. Drain oil and refill with new gear oil.
2. Check oil level.

**Oil capacity:**

**2.8 ℓ (5-7/8 US pt, 4-7/8 Imp pt)**

**Drain plug:**

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



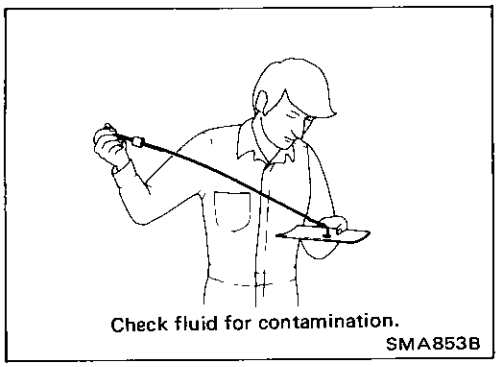

## Checking A/T Fluid

1. Check for fluid leakage.
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.

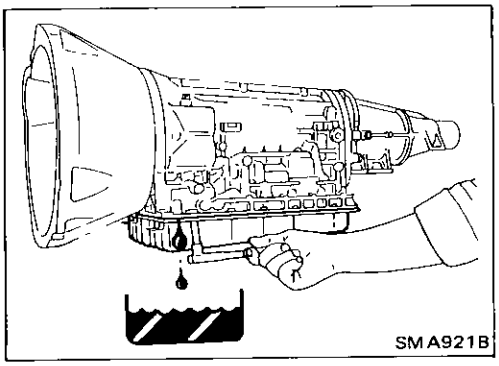
**Do not overfill.**

## Checking A/T Fluid (Cont'd)


Check fluid for contamination.
SMA853B

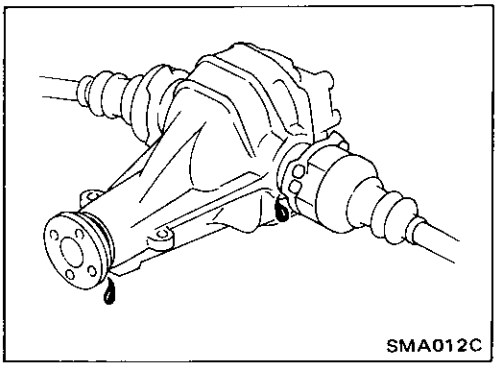
3. Check fluid condition.
   Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
   Refer to section AT for checking operation of A/T.

## Changing A/T Fluid

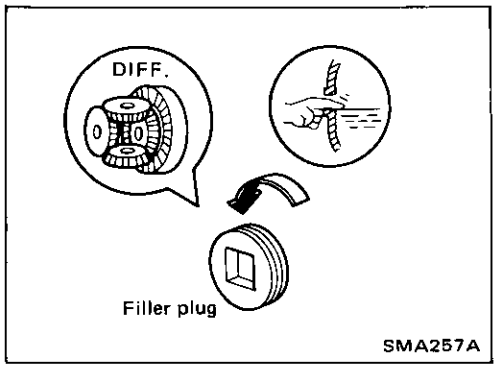

SMA921B

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

## Checking Differential Gear Oil


SMA012C

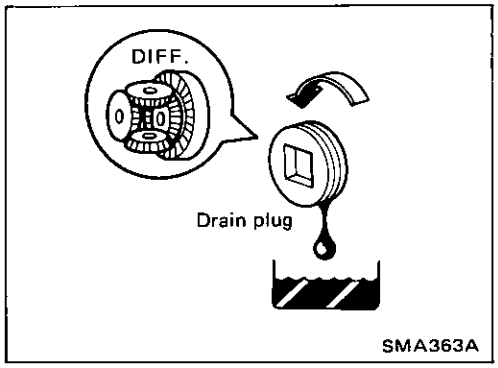
1. Check differential carrier for oil leakage.



SMA257A

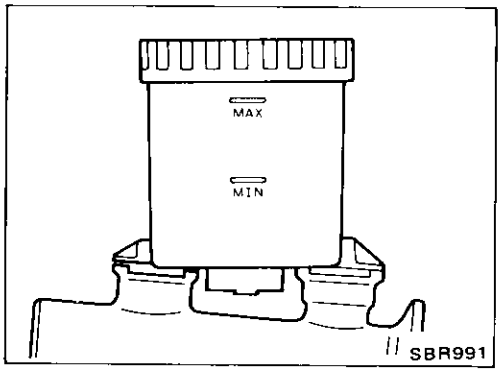
2. If leakage is found, check oil level.
   **Filler plug:**
   **: 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)**

## Changing Differential Gear Oil



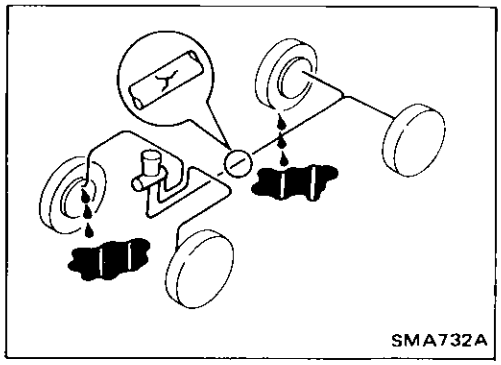
SMA363A

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



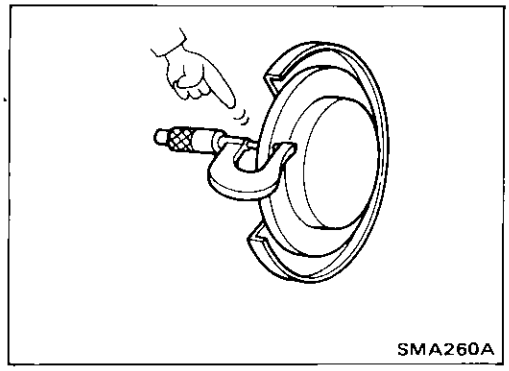

## Checking Brake Fluid Level and Leaks

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




## Checking Brake Lines and Cables

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



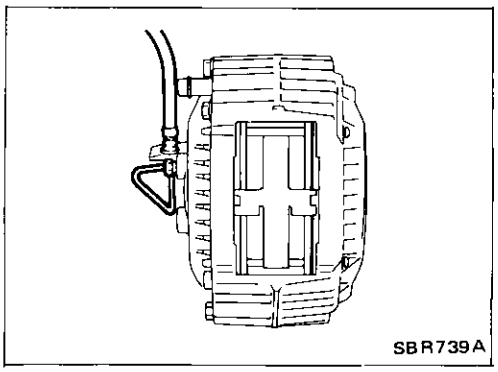

## Checking Disc Brake

### ROTOR

- Check condition and thickness.

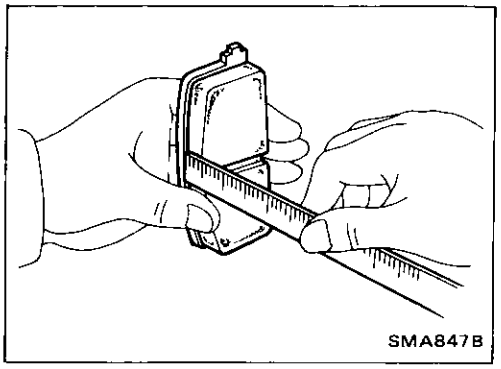
Unit: mm (in)

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




### CALIPER

- Check operation and for leakage.




### PAD

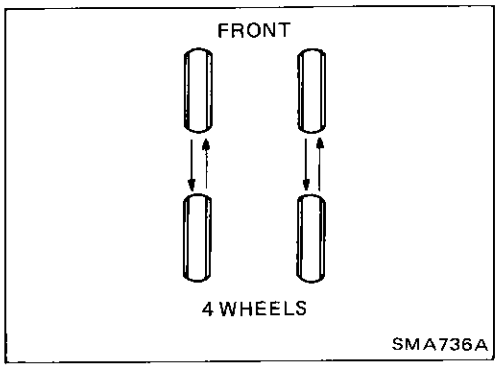
- Check for wear or damage.

Unit: mm (in)

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

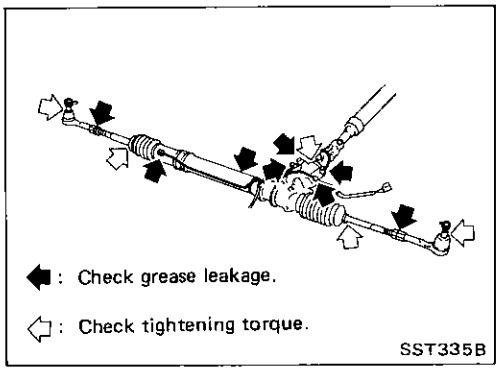
## Balancing Wheels

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




## Tire Rotation (Non-turbo model only)

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



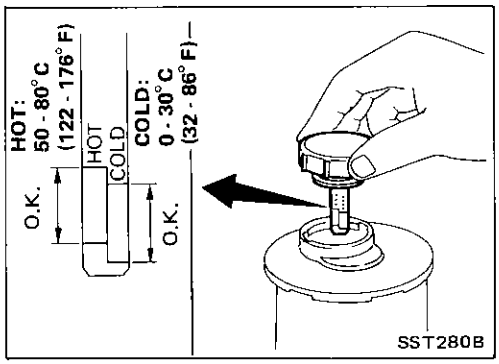

## Checking Steering Gear and Linkage

### 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.

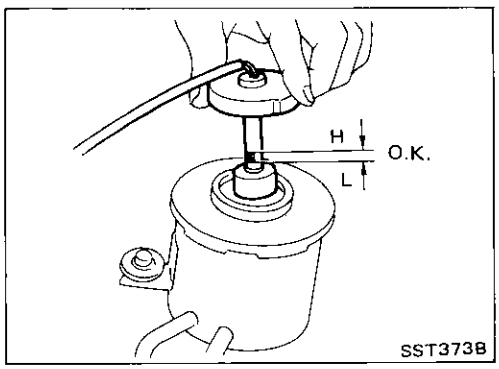



## Checking Power Steering Fluid and Lines

### CHECKING FLUID LEVEL (WITHOUT SUPER HICAS SYSTEM)

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

**CAUTION:**
**Do not overfill.**



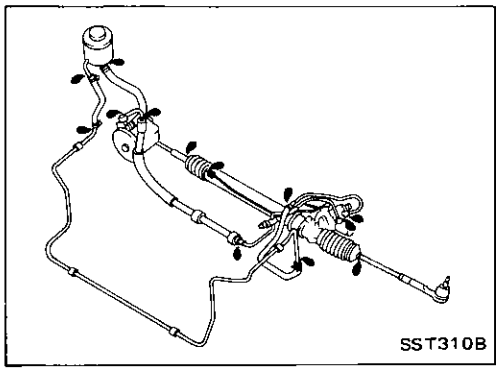

### CHECKING FLUID LEVEL (WITH SUPER HICAS SYSTEM)

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

**CAUTION:**

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

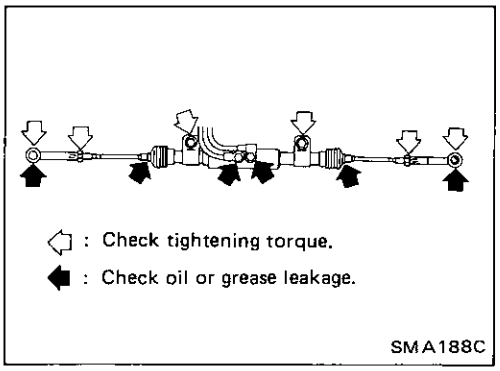
## Checking Power Steering Fluid and Lines (Cont'd)




### CHECKING LINES

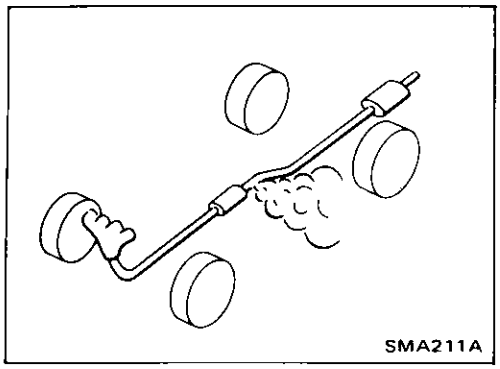
Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

## Checking SUPER HICAS Linkage (With SUPER HICAS system)



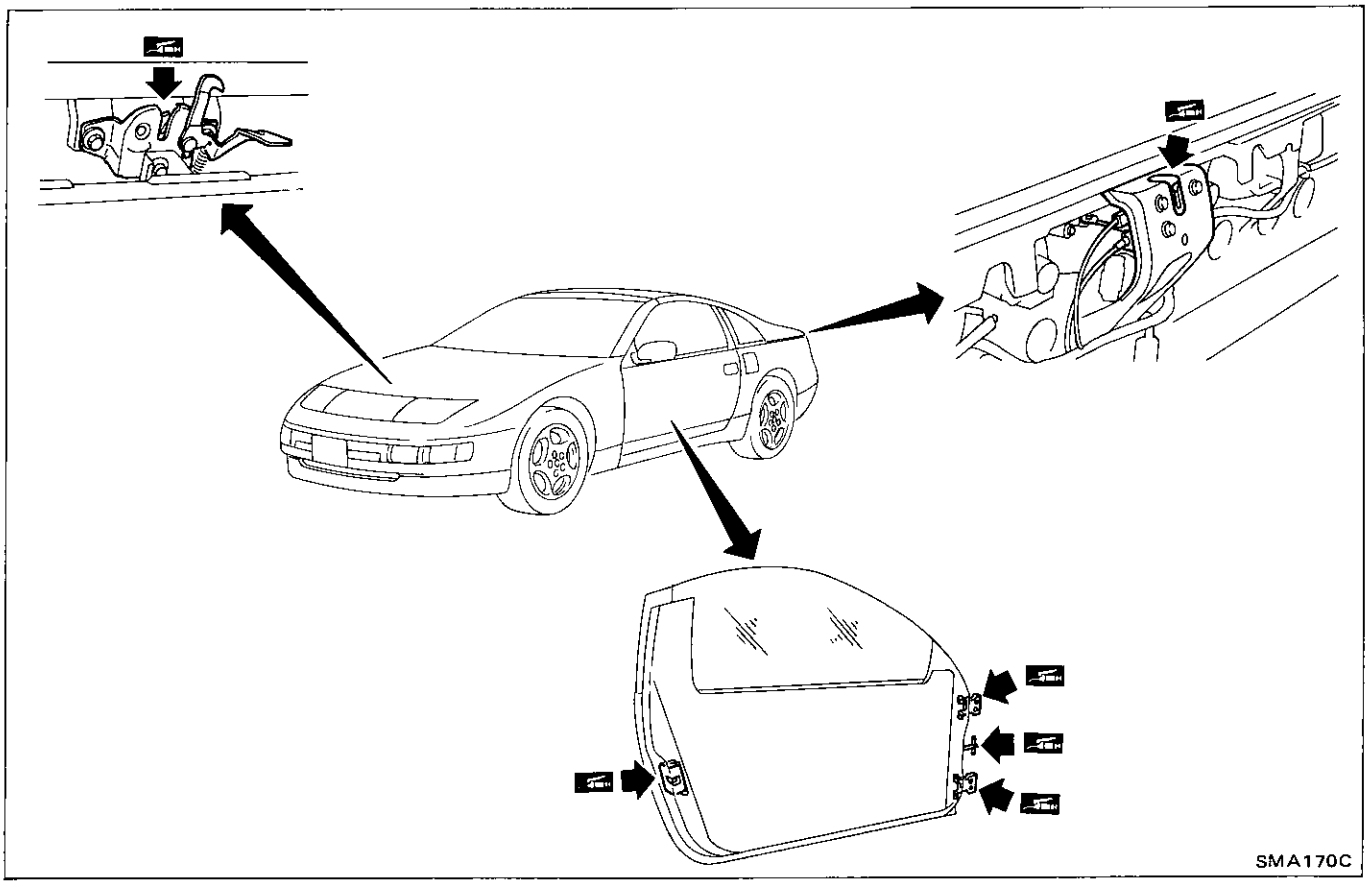

- Check power cylinder and linkage for damage, looseness and leakage of oil or grease.

## Checking Exhaust System




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

## Lubricating Locks, Hinges and Hood Latches



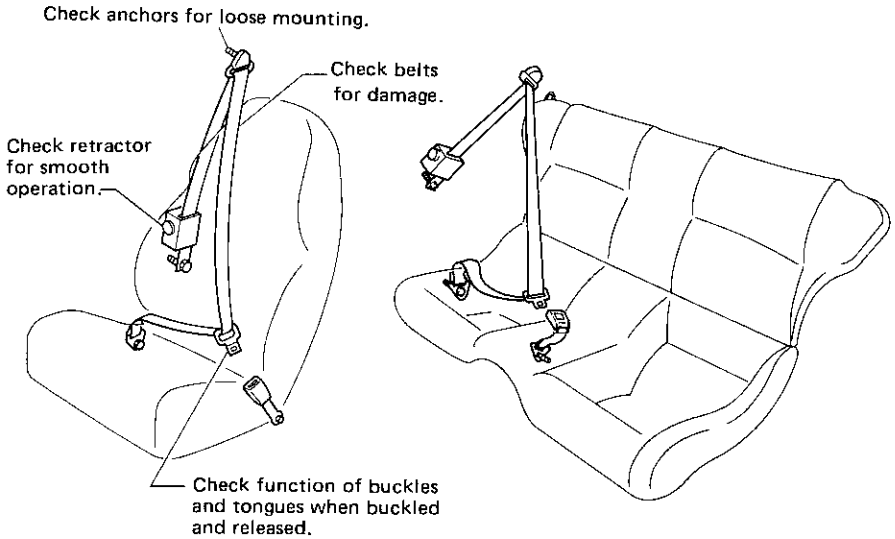

## Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

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

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

For automatic seat belt details, refer to BF section.



# Engine Maintenance

## INSPECTION AND ADJUSTMENT

### Drive belt deflection

Unit: mm (in)

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

### Oil capacity (Refill)

Unit: ℓ (US qt, Imp qt)

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

### Coolant capacity

Unit: ℓ (US qt, Imp qt)

| | |
|---|---|
| With reservoir tank | 9.0 (9-1/2, 7-7/8) |
| Reservoir tank | 0.6 (5/8, 1/2) |

### Spark plug

**Non-Turbo**

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

**Turbo**

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

# Chassis and Body Maintenance

## INSPECTION AND ADJUSTMENT

### Clutch

Unit: mm (in)

| Engine | VG30DE | VG30DETT |
|---|---|---|
| Pedal free height | 197 - 207 (7.76 - 8.15) | 183 - 193 (7.20 - 7.60) |
| Pedal free play | 1 - 3 (0.04 - 0.12) | |

### Front axle and front suspension (Unladen)*

| | | |
|---|---|---|
| Camber | degree | −1°35′ to −0°05′ |
| Caster | degree | 8°55′ - 10°25′ |
| Toe-in A − B | mm (in) | 0 - 2 (0 - 0.08) |
| Total angle 2θ | degree | 0′ - 11′ |
| Kingpin inclination | degree | 12°10′ - 13°40′ |
| Front wheel turning angle Fullturn Inside/outside | degree | 32°30′ - 36°30′/ 26°30′ - 30°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°36′ to −0°36′ |
| Toe-in A − B | mm (in) | 0.4 - 4.4 (0.016 - 0.173) |
| Total angle 2θ | degree | 1′ - 24′ |

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

### Wheel bearing

| | Front | Rear |
|---|---|---|
| Wheel bearing axle end play mm (in) | 0.05 (0.0020) or less | |
| Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb) | 206 - 284 (21 - 29, 152 - 210) | 206 - 275 (21 - 28, 152 - 203) |

### 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 | 10.0 (0.394) |
| Rear | 11.5 (0.453) |
| Minimum thickness | |
| Front | 2.0 (0.079) |
| Rear | 2.0 (0.079) |
| Rotor | |
| Standard thickness | |
| Front | 30.0 (1.181) |
| Rear | 18.0 (0.709) |
| Minimum thickness | |
| Front | 28.0 (1.102) |
| Rear | 16.0 (0.630) |

## TIGHTENING TORQUE

| Unit | N·m | kg-m | ft-lb |
|---|---|---|---|
| Clutch | | | |
| A.S.C.D. cancel switch, HICAS clutch switch and power steering clutch switch lock nut | 12 - 15 | 1.2 - 1.5 | 9 - 11 |
| Manual transmission | | | |
| Drain and filler plugs | 25 - 34 | 2.5 - 3.5 | 18 - 25 |
| Final drive | | | |
| Drain plug | 39 - 59 | 4 - 6 | 29 - 43 |
| Filler plug | | | |
| (For non-turbo) | 39 - 59 | 4 - 6 | 29 - 43 |
| (For turbo) | 59 - 98 | 6 - 10 | 43 - 72 |
| 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 | 69 - 88 | 7.0 - 9.0 | 51 - 65 |
| Camber adjusting pin (Models without super HICAS) | 69 - 88 | 7.0 - 9.0 | 51 - 65 |
| Lower link lock nut (Models with super HICAS) | 37 - 46 | 3.8 - 4.7 | 27 - 34 |
| Brake system | | | |
| Air bleed valve | 7 - 9 | 0.7 - 0.9 | 5.1 - 6.5 |
| Wheel and tire | | | |
| Wheel nut | 98 - 118 | 10.0 - 12.0 | 72 - 87 |

# ENGINE MECHANICAL

# SECTION EM

EM

## CONTENTS


PRECAUTIONS ..... EM- 2
PREPARATION ..... EM- 3
OUTER COMPONENT PARTS ..... EM- 6
COMPRESSION PRESSURE ..... EM- 9
OIL PAN ..... EM-10
TIMING BELT ..... EM-13
OIL SEAL REPLACEMENT ..... EM-21
THROTTLE CHAMBERS ..... EM-23
CYLINDER HEAD ..... EM-25
TURBOCHARGERS ..... EM-36
INTERCOOLERS ..... EM-41
ENGINE REMOVAL ..... EM-42
CYLINDER BLOCK ..... EM-46
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EM-58

## Supplemental Restraint System "AIR BAG"

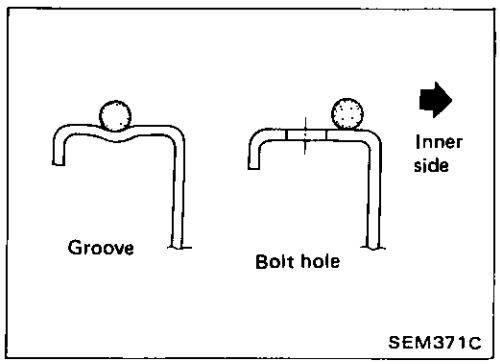
The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a control unit, warning lamp, wiring harness and spiral cable.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

**WARNING:**

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

## Parts Requiring Angular Tightening

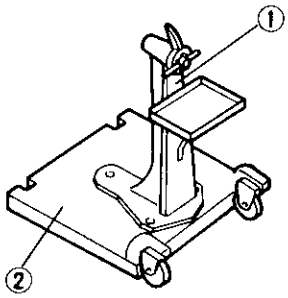
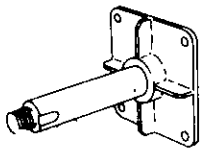
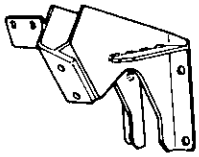
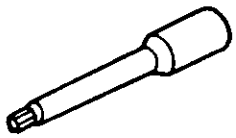
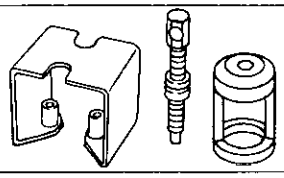
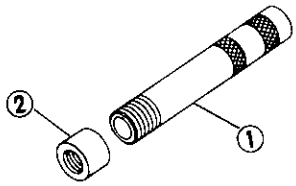
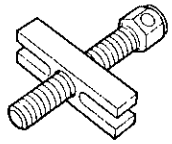
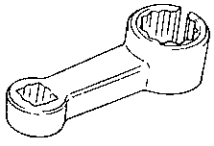
- Some important engine parts are tightened using an angular-tightening method rather than a torque setting method.
- If these parts are tightened using a torque setting method, dispersal of the tightening force (axial bolt force) will be two or three times that of the dispersal produced by using the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

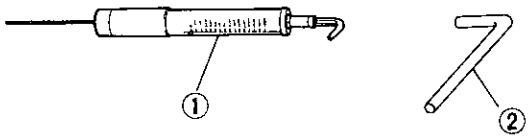
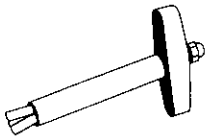
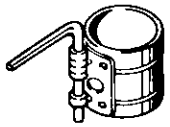
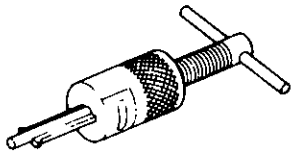
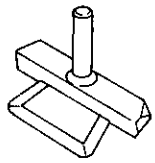
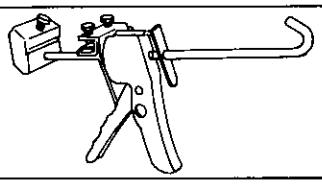
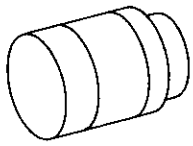
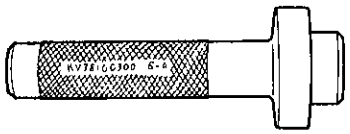
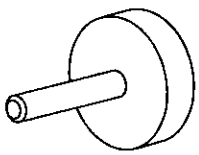



## Liquid Gasket Application Procedure

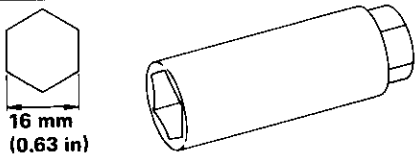
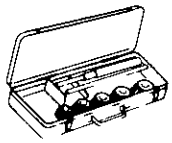
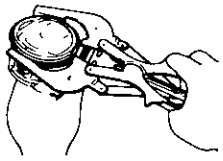
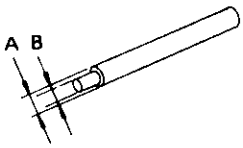
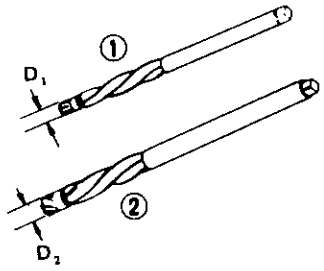
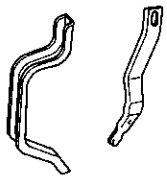
a. **Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.**
b. **Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)**
   - **Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).**
   - **Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).**
c. **Apply liquid gasket to inner surface around hole perimeter area.**
   **(Assembly should be done within 5 minutes after coating.)**
d. **Wait at least 30 minutes before refilling engine oil and engine coolant.**

## SPECIAL SERVICE TOOLS

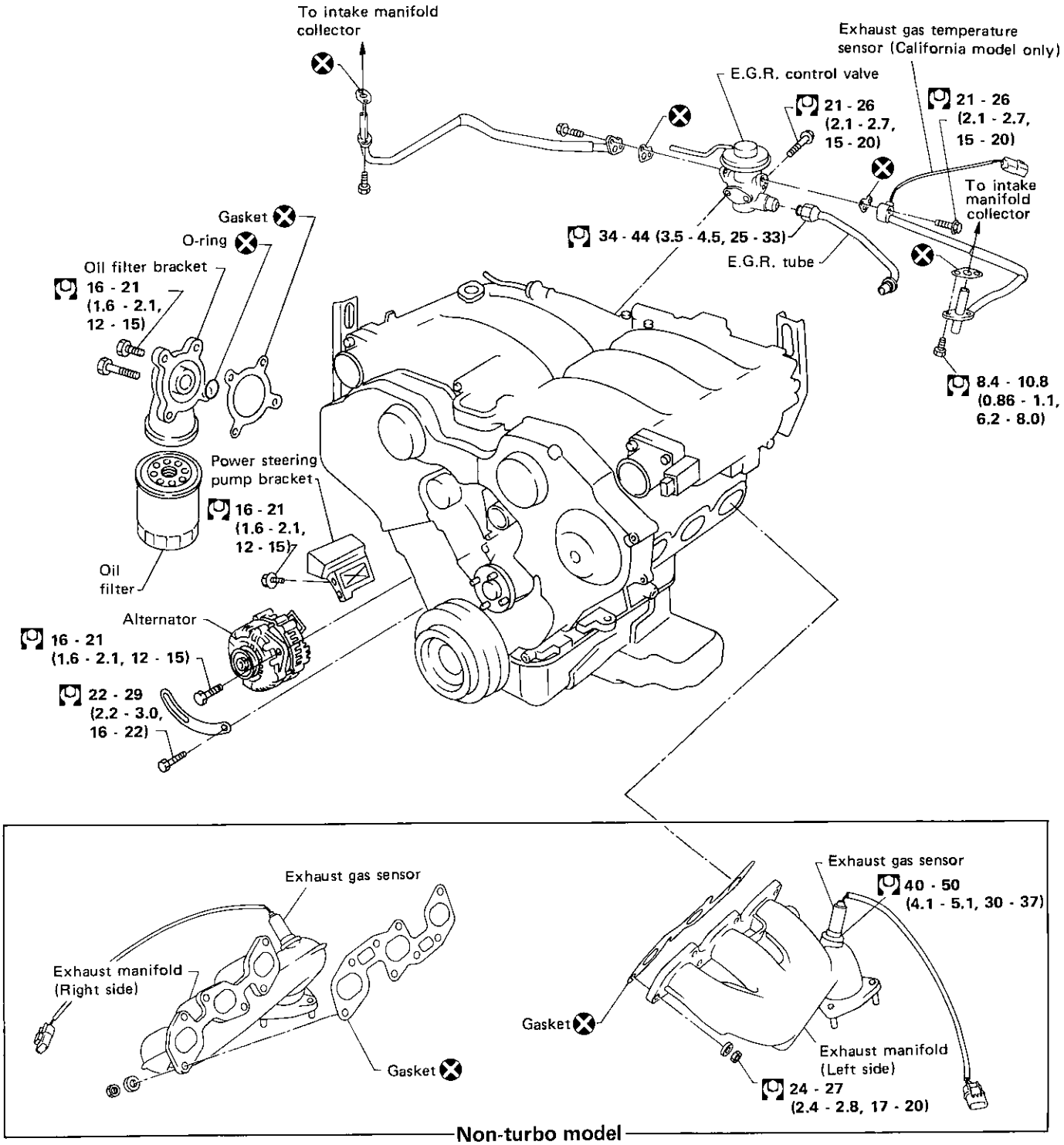
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| ST0501S000<br>( – )<br>Engine stand assembly<br>① ST05011000<br>( – )<br>Engine stand<br>② ST05012000<br>( – )<br>Base | Disassembling and assembling |  |
| KV10106500<br>( – )<br>Engine stand shaft | |  |
| KV10110001<br>( – )<br>Engine sub-attachment | |  |
| ST10120000<br>(J24239-01)<br>Cylinder head bolt wrench | Loosening and tightening cylinder head bolt |  |
| KV10111300<br>( – )<br>Valve spring compressor | Disassembling and assembling valve components |  |
| ① KV10107501<br>( – )<br>Valve oil seal drift<br>② KV10111400<br>( – )<br>Attachment | Installing valve oil seal |  |
| ST27180001<br>(J25726-A)<br>Steering wheel puller | Removing crankshaft pulley |  |
| KV10114400<br>(J-38365)<br>Exhaust gas sensor wrench | Loosening or tightening exhaust gas sensor |  |

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description |
|---|---|
| ① EG14860000<br>(J-38387)<br>Push-pull gauge<br>② KV10112000<br>( — )<br>Hook | Adjusting timing belt tension  |
| (J36467)<br>Valve oil<br>seal remover | Removing valve oil seals  |
| EM03470000<br>(J8037)<br>Piston ring compressor | Installing piston assembly into<br>cylinder bore  |
| ST16610001<br>(J23907)<br>Pilot bushing puller | Removing crankshaft pilot bushing  |
| KV10111100<br>(J37228)<br>Seal cutter | Removing oil pan  |
| WS39930000<br>( — )<br>Tube presser | Pressing the tube of liquid gasket  |
| ST33200000<br>(J26082)<br>Drift | Installing camshaft oil seal  |
| KV38100300<br>(J22888)<br>Drift | Installing front oil seal  |
| ST15310000<br>(J25640-B)<br>Drift | Installing rear oil seal  |

## COMMERICAL SERVICE TOOLS

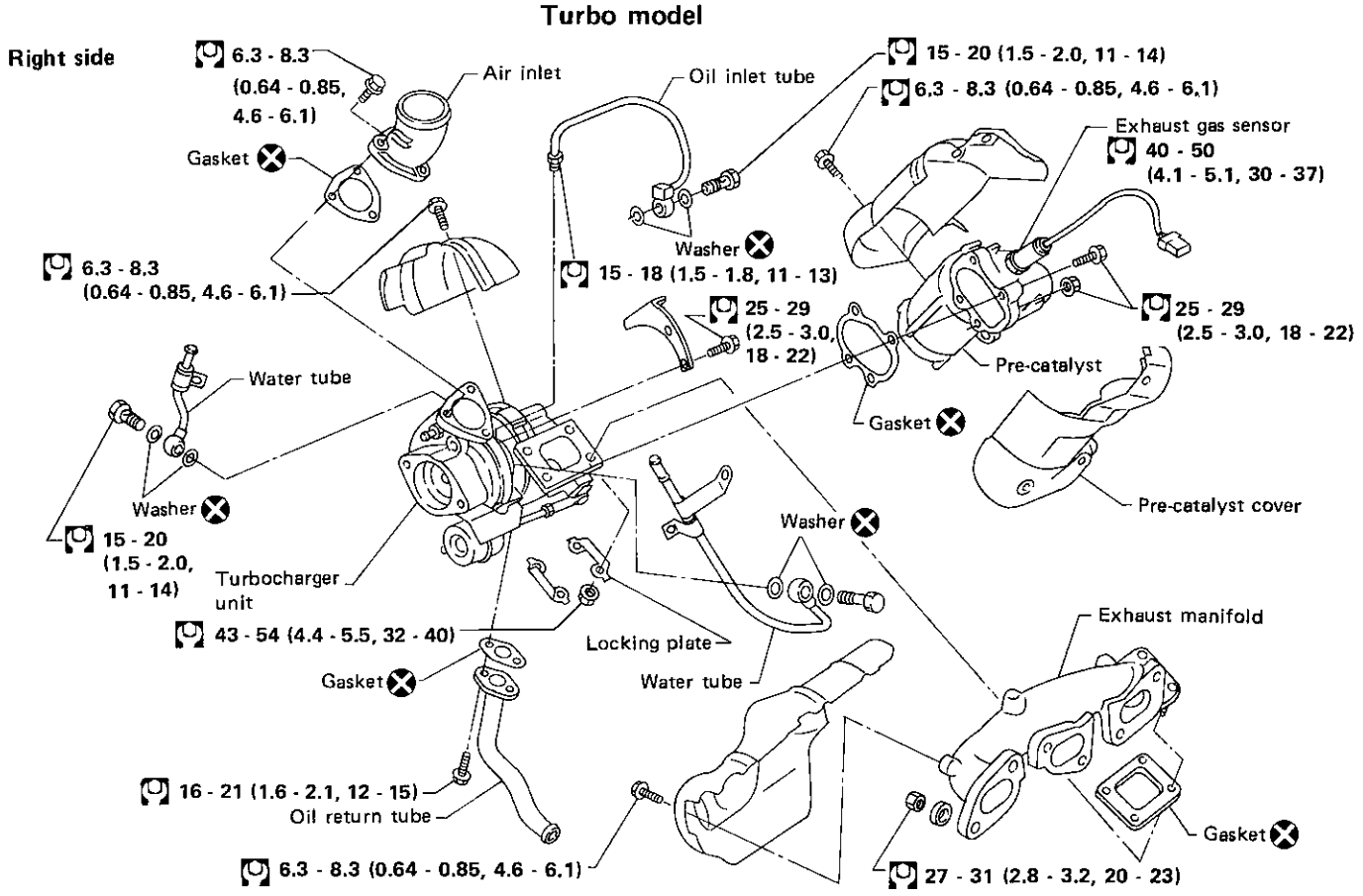
| Tool name | Description |
|---|---|
| Spark plug wrench | Removing and installing spark plug   |
| Pulley holder | Holding camshaft pulley while tightening or loosening camshaft bolt |
| Valve seat cutter set | Finishing valve seat dimensions  |
| Piston ring expander | Removing and installing piston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

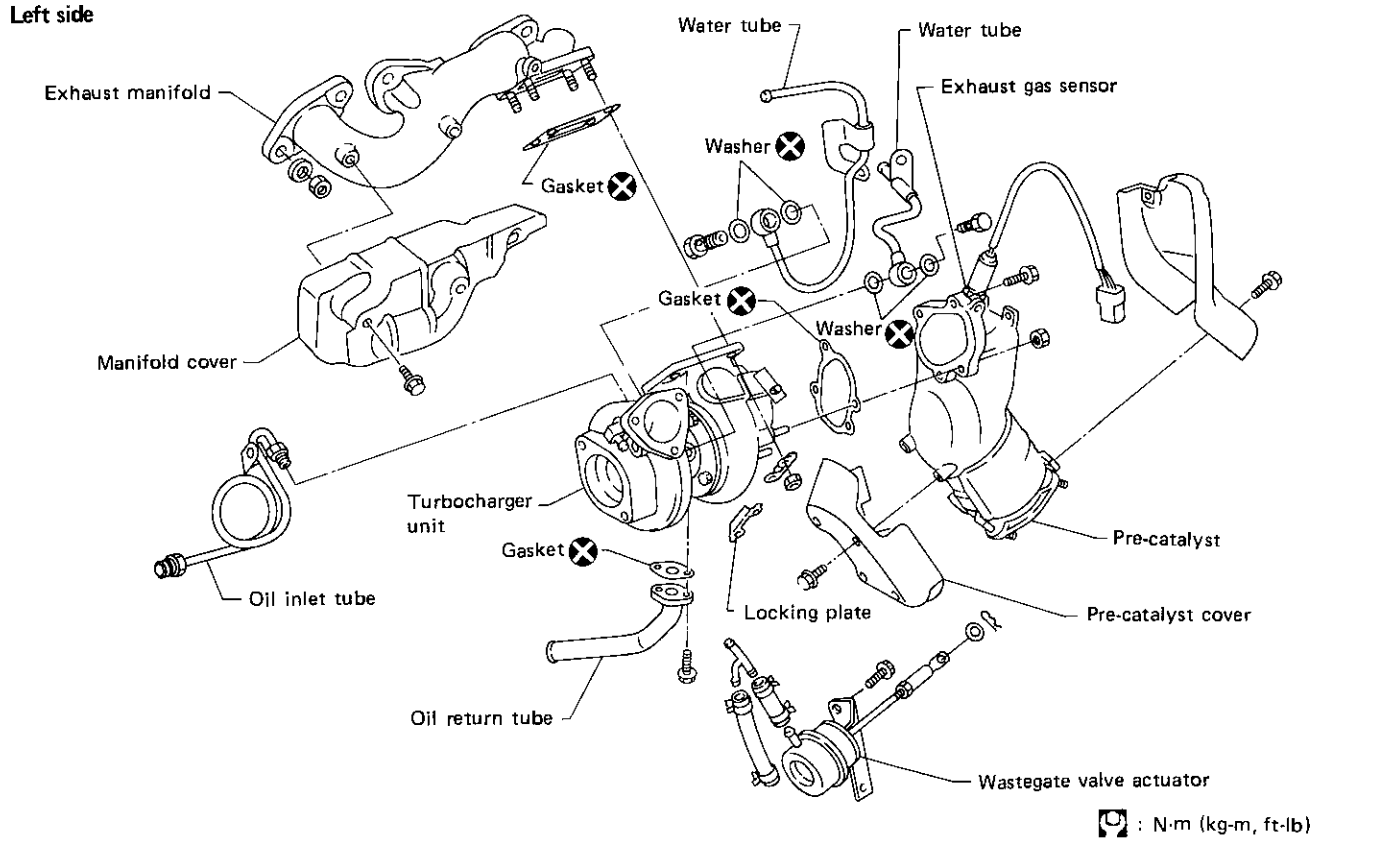
| Engine | VG30DE | VG30DETT |
|---|---|---|
| Front | 10005-30P10 | 10005-40P10 |
| Rear | 10006-30P10 | |



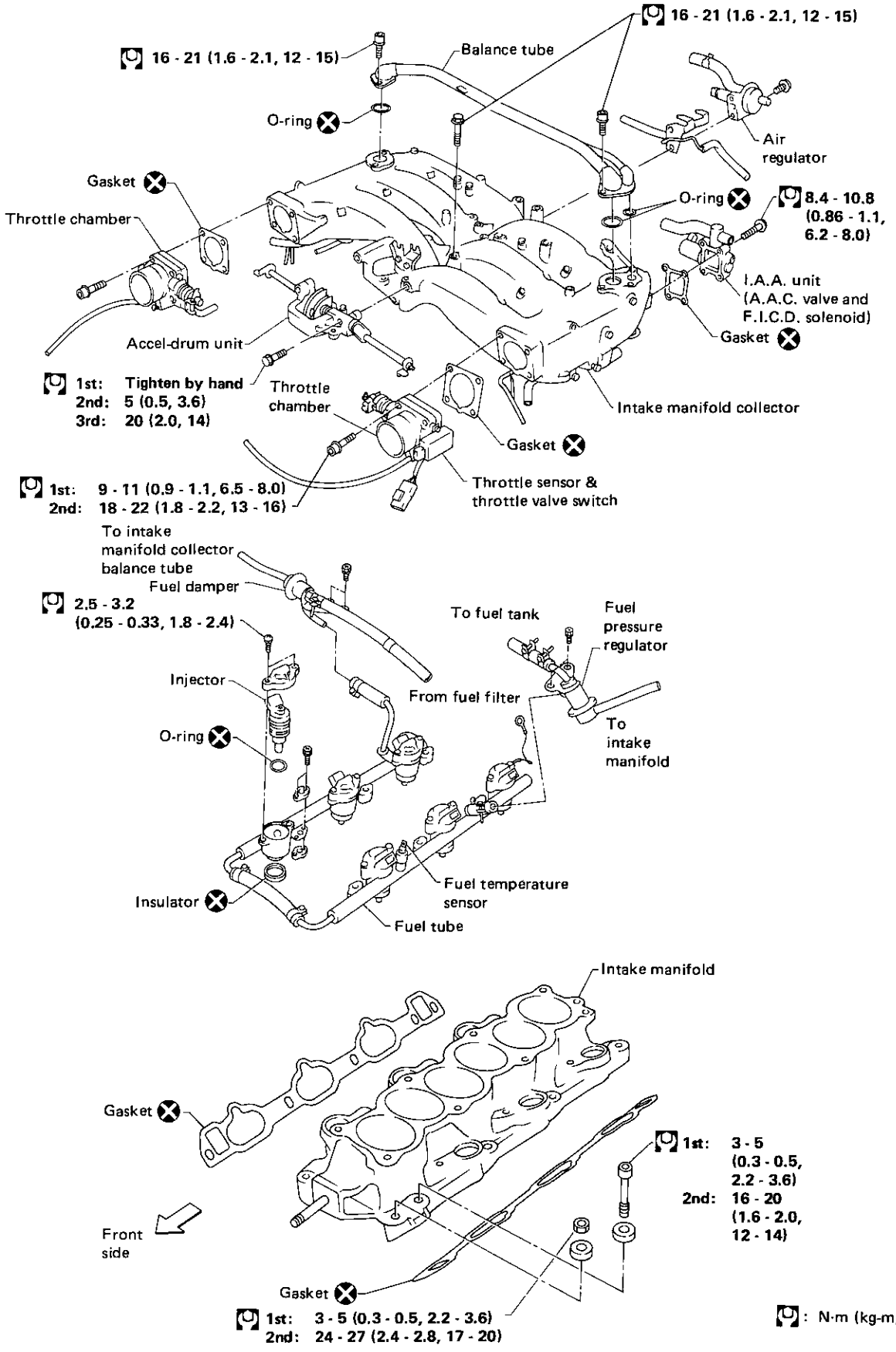

: N·m (kg-m, ft-lb)

SEM807C


Turbo model
Right side
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Air inlet
Oil inlet tube
15 - 20 (1.5 - 2.0, 11 - 14)
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Exhaust gas sensor
40 - 50 (4.1 - 5.1, 30 - 37)
Gasket
Washer
15 - 18 (1.5 - 1.8, 11 - 13)
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
25 - 29 (2.5 - 3.0, 18 - 22)
25 - 29 (2.5 - 3.0, 18 - 22)
Water tube
Pre-catalyst
Gasket
Pre-catalyst cover
Washer
Washer
15 - 20 (1.5 - 2.0, 11 - 14)
Turbocharger unit
43 - 54 (4.4 - 5.5, 32 - 40)
Locking plate
Exhaust manifold
Gasket
Water tube
16 - 21 (1.6 - 2.1, 12 - 15)
Oil return tube
Gasket
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
27 - 31 (2.8 - 3.2, 20 - 23)


Left side
Water tube
Water tube
Exhaust manifold
Exhaust gas sensor
Washer
Gasket
Gasket
Washer
Manifold cover
Turbocharger unit
Gasket
Pre-catalyst
Oil inlet tube
Locking plate
Pre-catalyst cover
Oil return tube
Wastegate valve actuator
: N·m (kg-m, ft-lb)

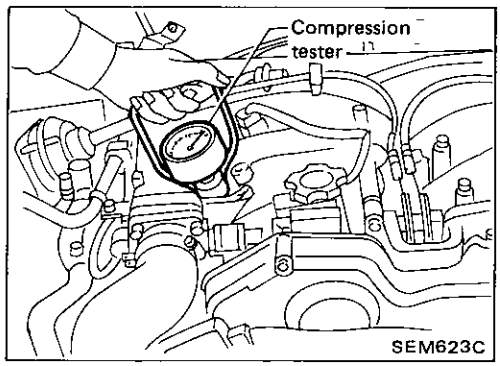
SEM773C


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

SEM618C

## Measurement of Compression Pressure

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




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

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

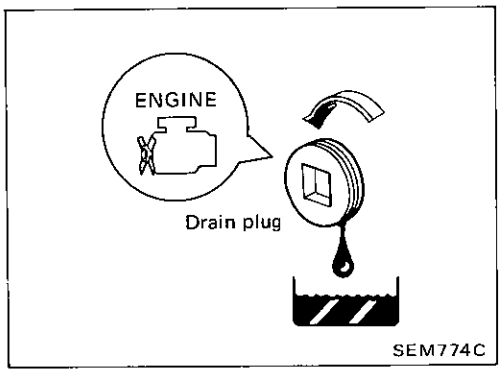
**Compression pressure:**

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

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

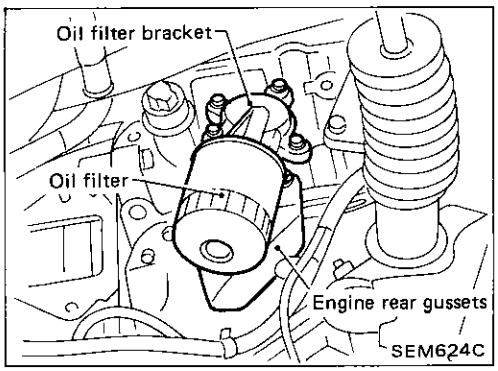
10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the spark plug holes and retest compression.

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

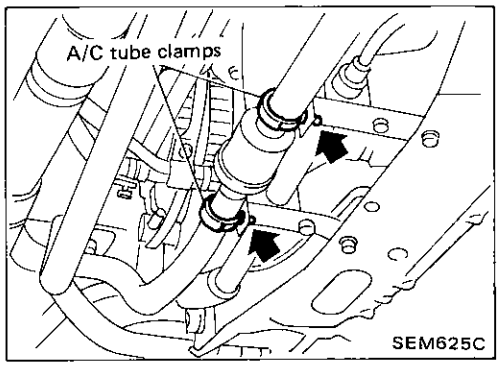



## Removal

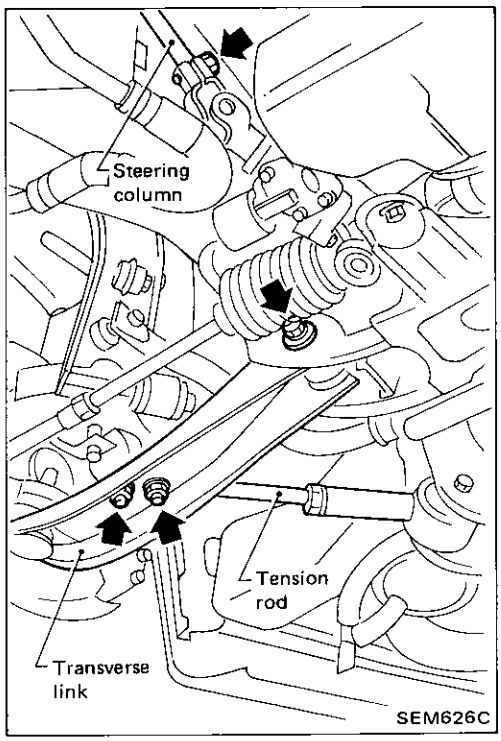
1. Drain engine oil.
2. Remove engine under cover.




3. Remove oil filter and bracket.
4. Remove engine rear gussets from both sides.

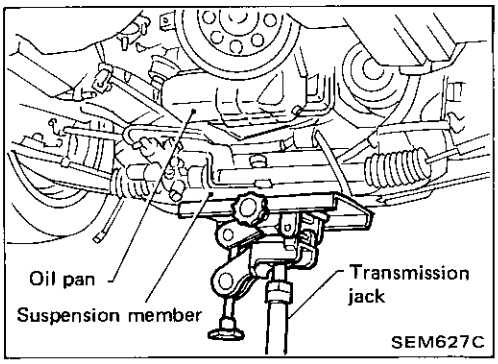



5. Disconnect A/C tube clamps as shown.

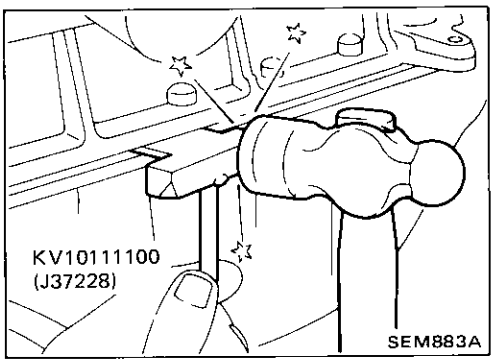



6. Disconnect steering column lower joint.
7. Remove tension rod fixing bolts from both sides.
8. Loosen transverse link bolts on both sides.

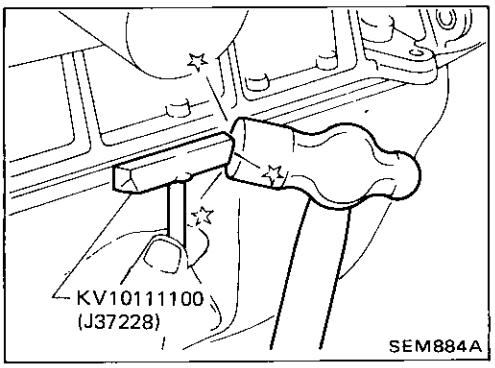
## Removal (Cont'd)



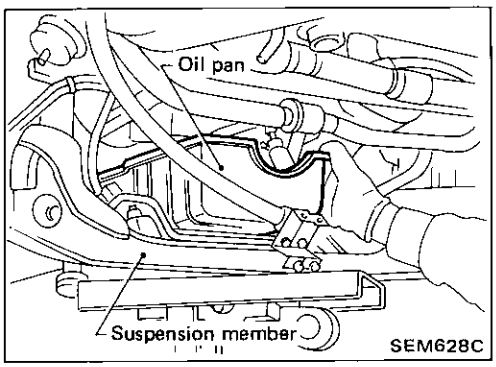

9. Set a suitable transmission jack under the suspension member.
● At this time, hoist engine with engine slingers.
10. Remove suspension member fixing bolts.
11. Remove engine mounting bolts from both sides and then slowly lower transmission jack.
12. Remove oil pan bolts.




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

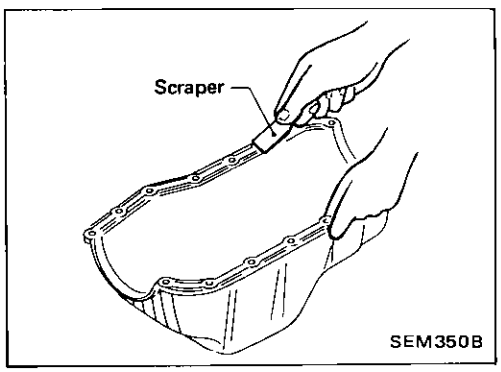



(2) Slide Tool by tapping its side with a hammer, and remove oil pan.



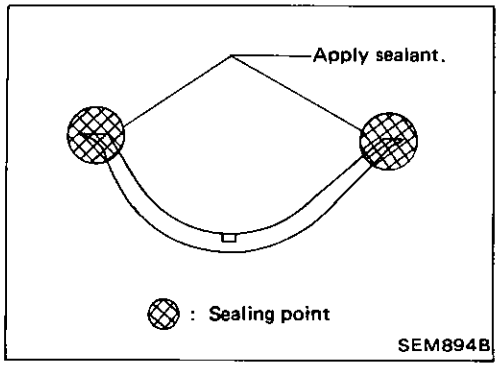

(3) Remove oil pan.

## Installation

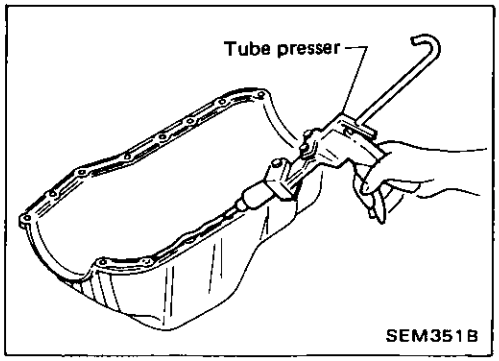



1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
● Also remove traces of liquid gasket from cylinder block mating surface.

## Installation (Cont'd)

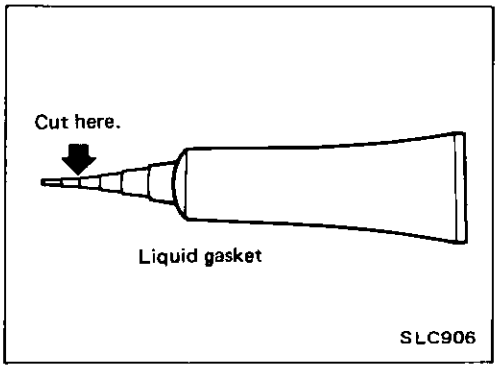



2. Apply sealant to oil pump gasket and rear oil seal retainer gasket.

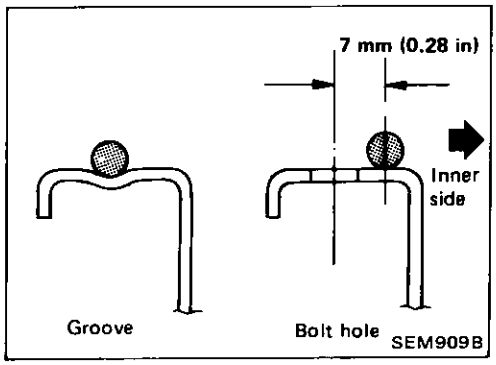



3. Apply a continuous bead of liquid gasket to oil pan mating surface.

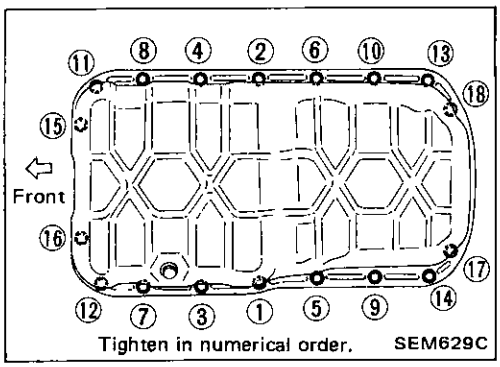
**Use Genuine Liquid Gasket or equivalent.**




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



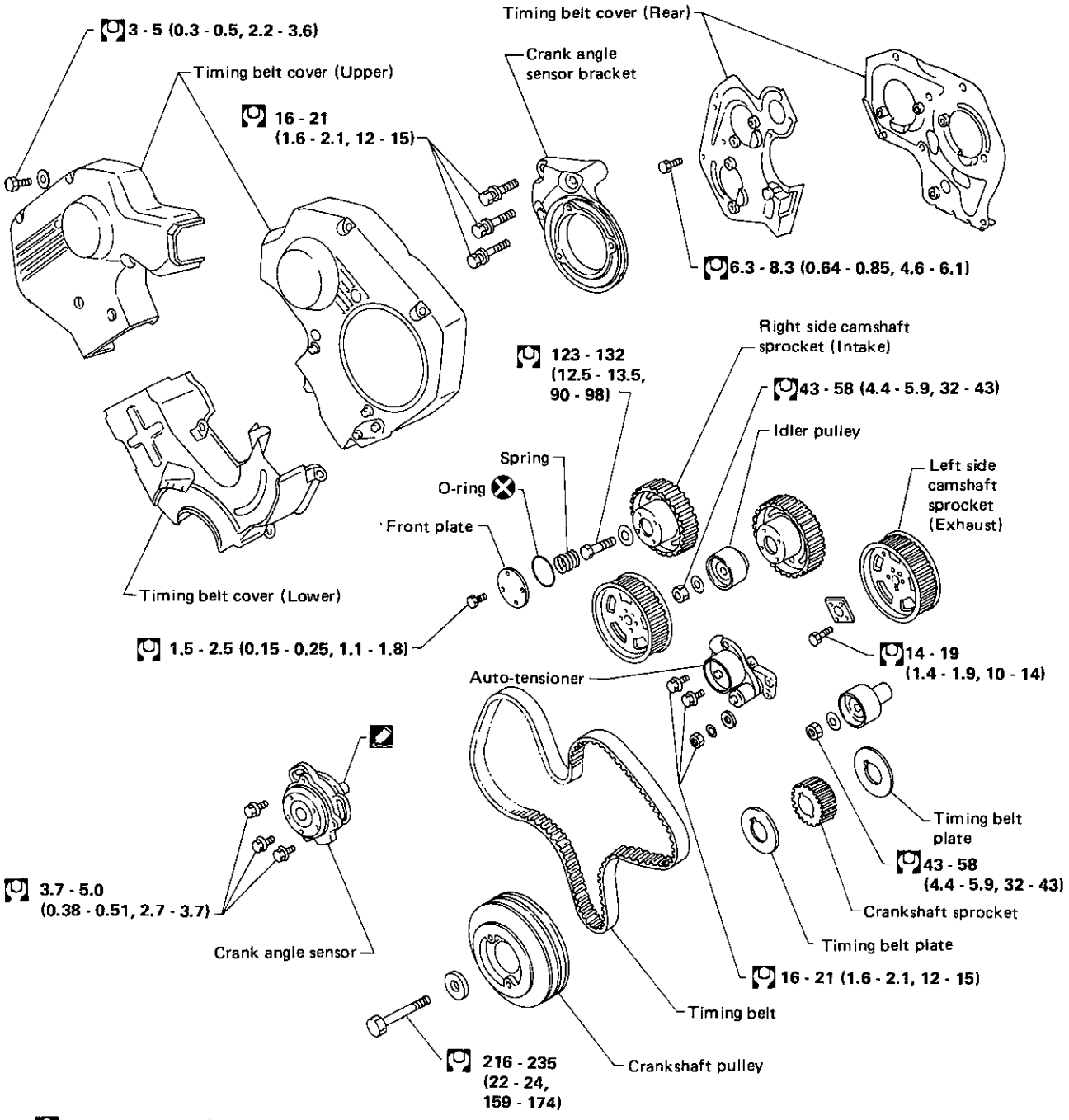

4. Apply liquid gasket to inner sealing surface as shown in figure.
- Attaching should be done within 5 minutes after coating.




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, idler pulley and auto-tensioner are clean and free of oil and water.**
d. **Timing belt installation should be carried out when engine is cold.**

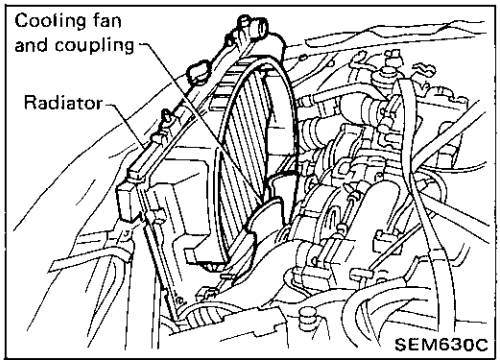



: N·m (kg-m, ft-lb)

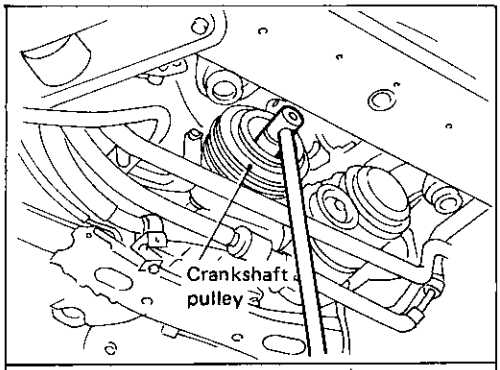
SEM619C

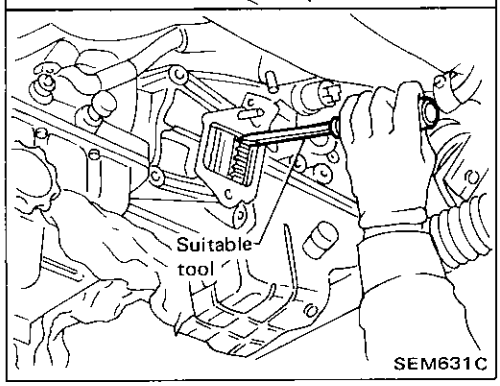
## Removal

1. Remove engine under cover.
2. Drain coolant from both cylinder block drain plugs, and radiator drain cock.

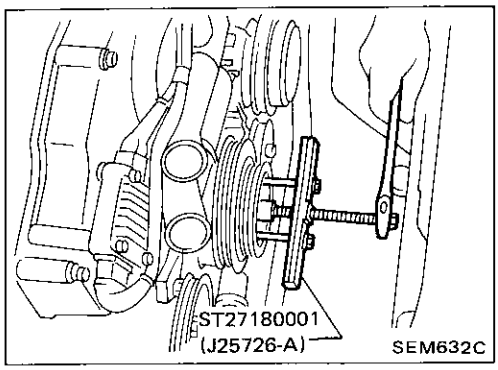



3. Remove radiator.
4. Remove drive belts, cooling fan and coupling.



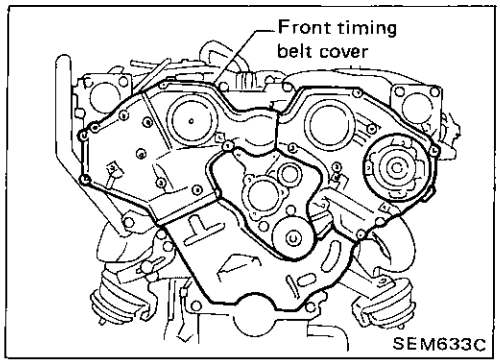




5. Remove crankshaft pulley bolt.
   (At this time, remove starter motor and set a suitable tool to ring gear so that crankshaft cannot rotate.)

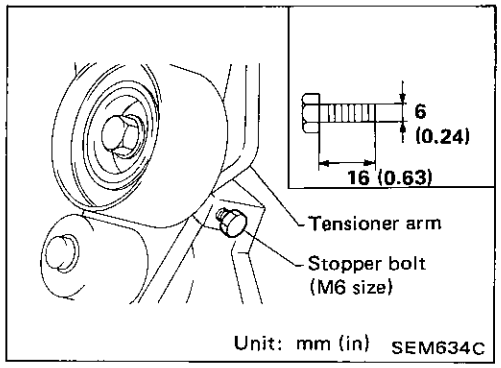



6. Remove crankshaft pulley using Tool.

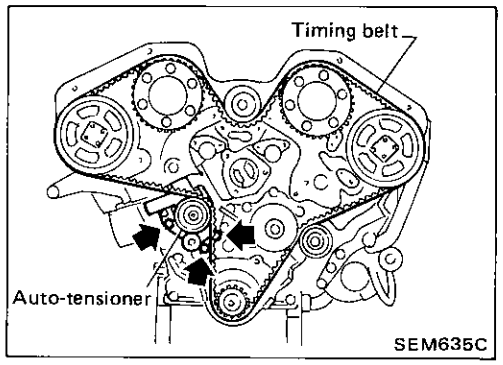
## Removal (Cont'd)




7. Remove water inlet and outlet.
8. Remove front timing belt covers.



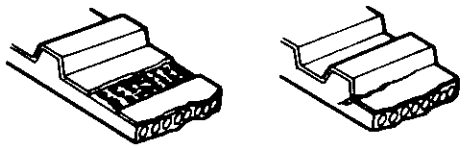
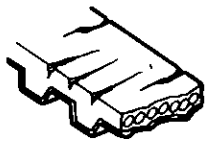
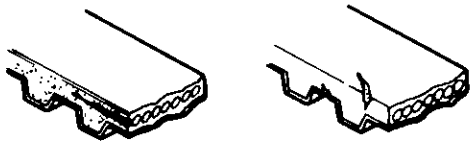
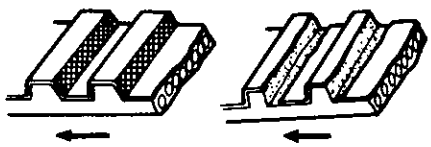

9. Install a suitable stopper bolt (M6) into tensioner arm of auto-tensioner so that auto-tensioner pusher does not spread out.




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

## Inspection

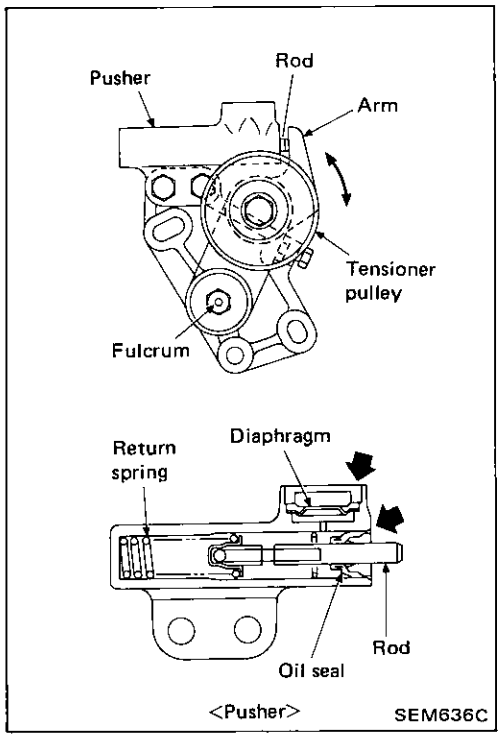
Visually check the condition of timing belt.
Replace if any abnormality is found.

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

## Inspection (Cont'd)

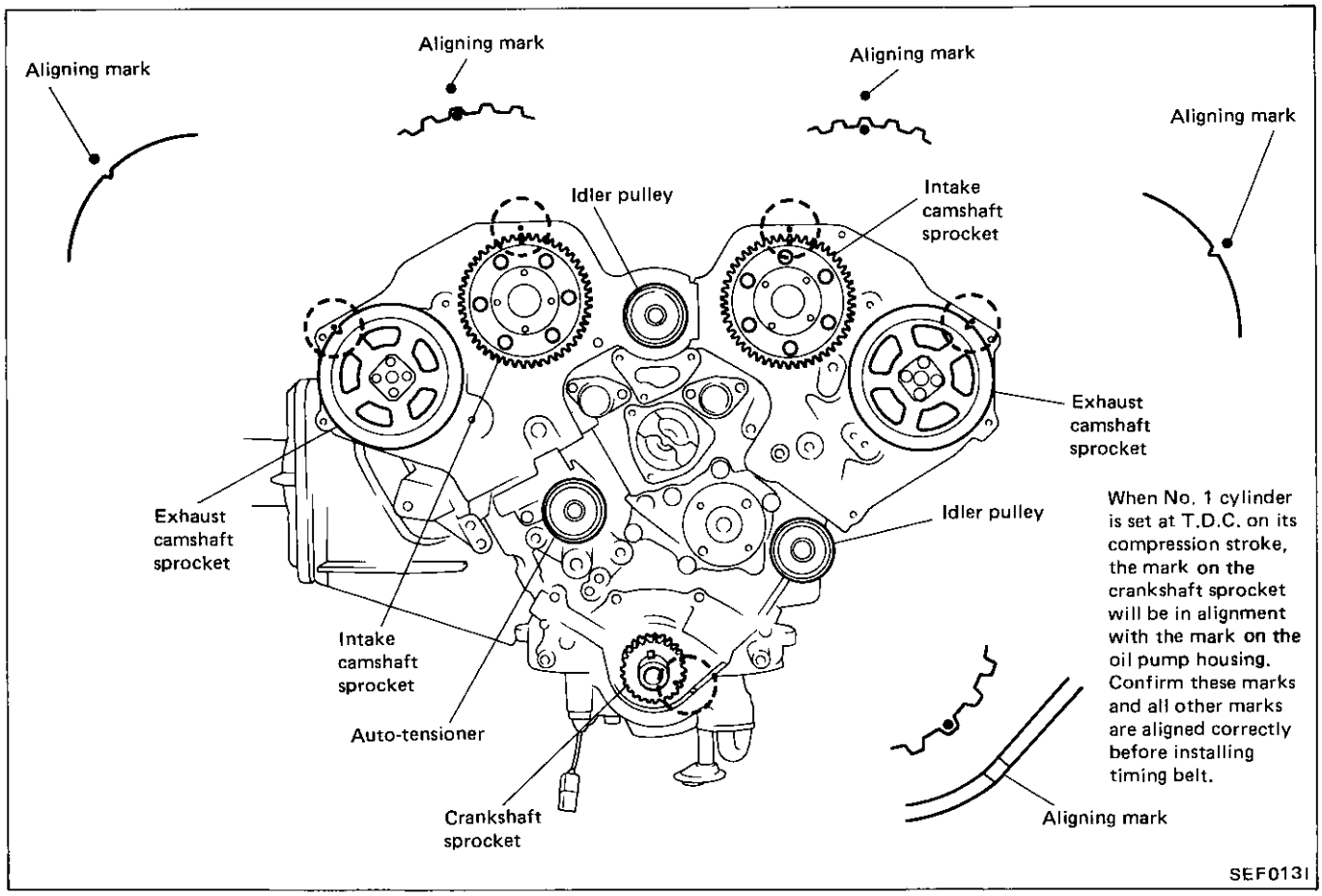
### AUTO-TENSIONER

Check for oil leaks from pusher rod and diaphragm.




## Installation

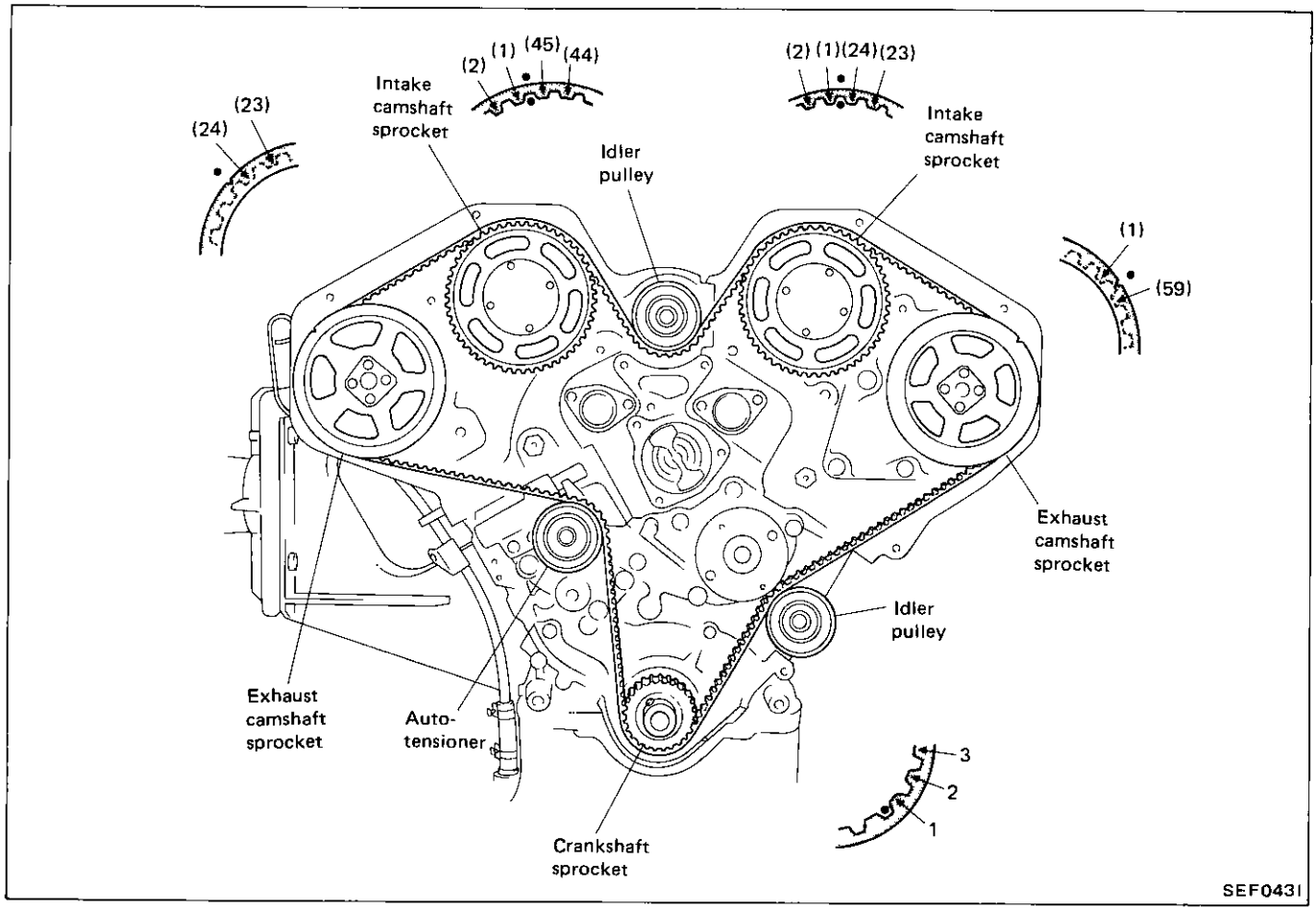
1. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.
2. Align matching marks on camshaft and crankshaft sprockets with aligning marks on rear belt cover and oil pump housing.
3. Remove all spark plugs.

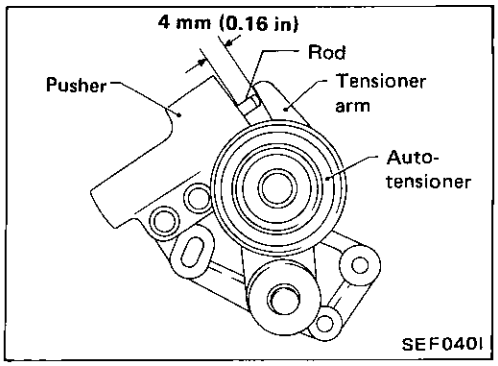


## Installation (Cont'd)

4. Set timing belt.

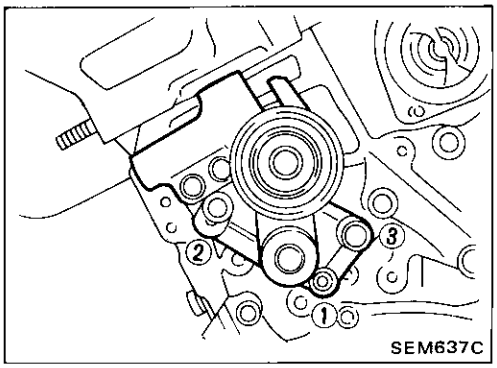
**a. Ensure timing belt and sprockets are clean and free from oil or water. Do not bend or twist timing belt.**
**b. Align white lines on timing belt with matching mark on camshaft sprocket and crankshaft sprocket.**
**c. Point arrow on timing belt towards the front.**



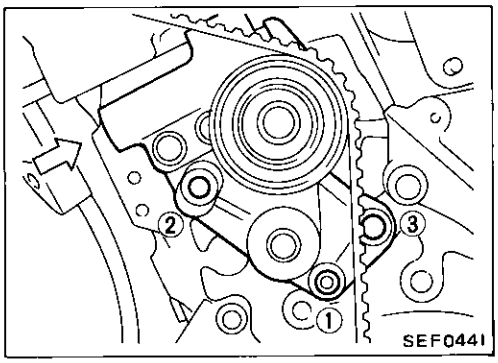

5. Adjust tensioner arm to give 4 mm (0.16 in) clearance with pusher of auto-tensioner using a suitable vise, and then insert stopper bolt into tensioner arm in order that clearance does not change.

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



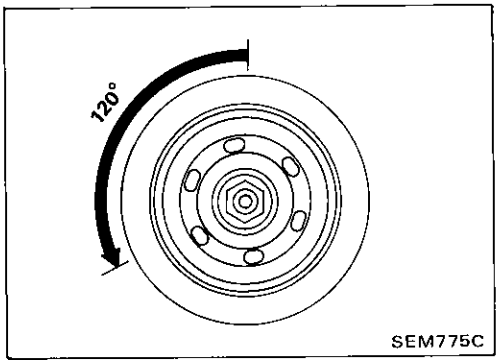

6. Install auto-tensioner and tighten nut (①) and bolts (②, ③) slightly by hand.

## Installation (Cont'd)

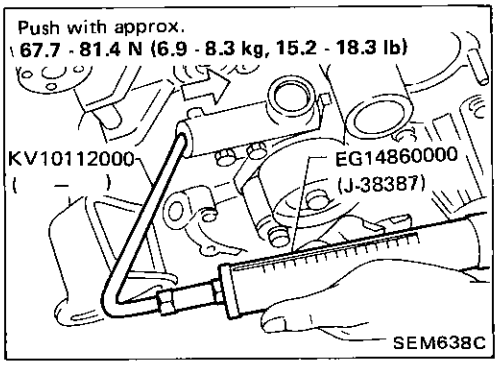



7. Push auto-tensioner slightly towards timing belt to prevent belt from slipping.
   Set tensioner slightly by pushing timing belt. Then, turn crankshaft 10 degrees clockwise and tighten nut (①) and bolts (②, ③) to 16 to 21 N•m (1.6 to 2.1 kg-m, 12 to 15 ft-lb).

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

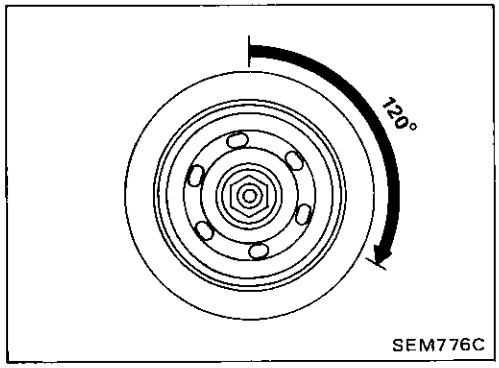



8. Turn crankshaft 120 degrees counterclockwise.
9. Loosen nut (①) and bolts (②, ③) 1/2 turn to set tensioner body as for back as it will go.
10. Turn crankshaft clockwise and set No. 1 cylinder at T.D.C. on its compression stroke.

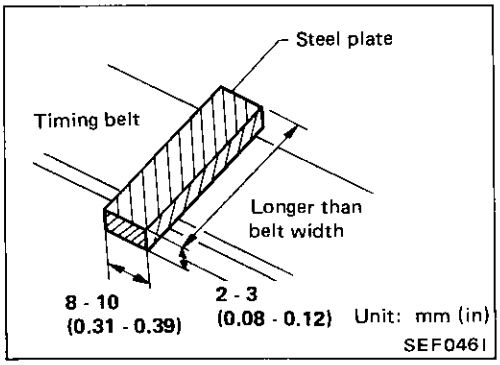



11. Push the end of pusher with approx. 58.8 N (6.0 kg, 13.2 lb) force using Tool (push-pull gauge) and tighten nut (①) and bolts (②, ③) to 16 to 21 N•m (1.6 to 2.1 kg-m, 12 to 15 ft-lb).

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

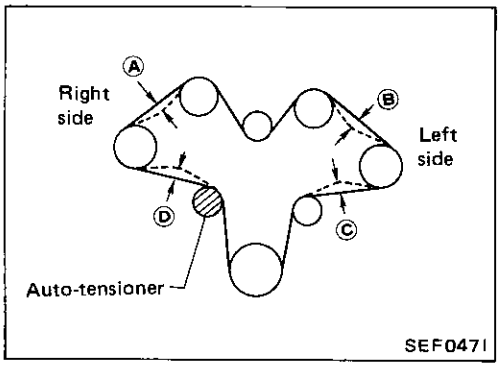



12. Turn crankshaft 120 degrees clockwise.
13. Turn crankshaft 120 degrees counterclockwise and set No. 1 cylinder at T.D.C. on its compression stroke.




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

## Installation (Cont'd)




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

**Deflection:**

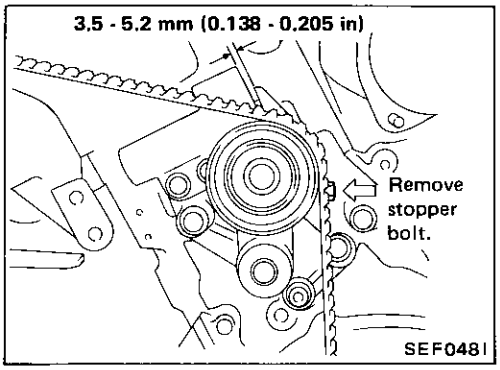
**6 - 7 mm (0.24 - 0.28 in) or the average of each portion**

$$\frac{Ⓐ + Ⓑ + Ⓒ + Ⓓ}{4}$$

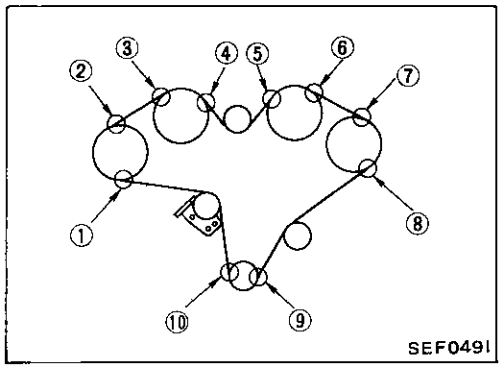
**is 6 - 7 mm (0.24 - 0.28 in)**

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

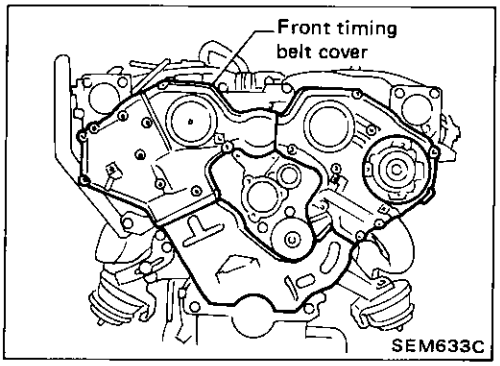
16. Confirm auto tensioner fixing nuts and bolts are tightened to 16 to 21 N•m (1.6 to 2.1 kg-m, 12 to 15 ft-lb).



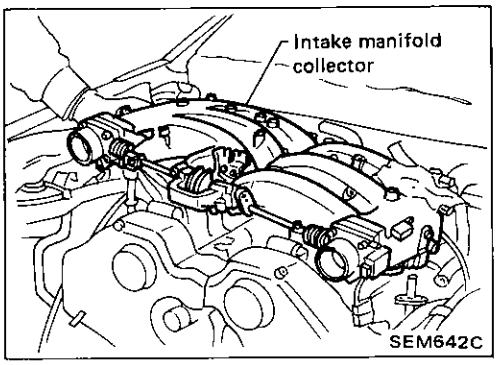

17.
- Remove the auto-tensioner stopper bolt.
- After 5 minutes check the projection of the rod (clearance between tensioner arm and pusher) stays at 3.5 - 5.2 mm (0.138 - 0.205 in).




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

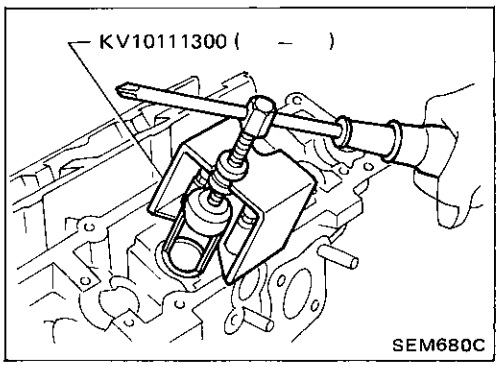



19. Install timing belt covers.

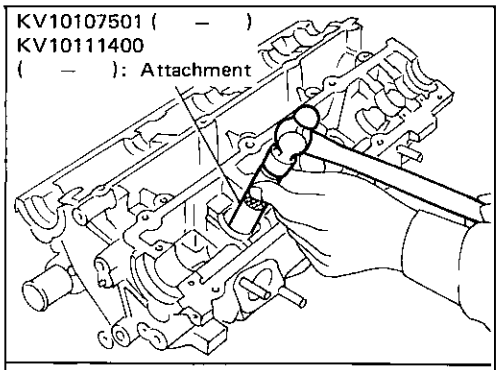


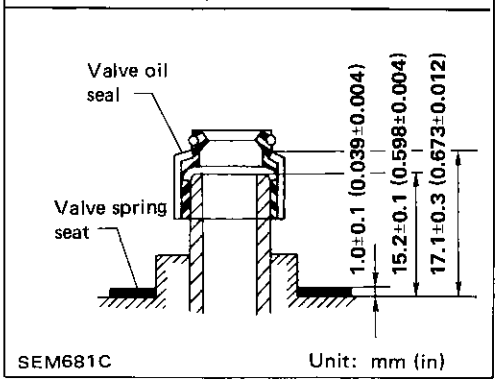

## VALVE OIL SEAL

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



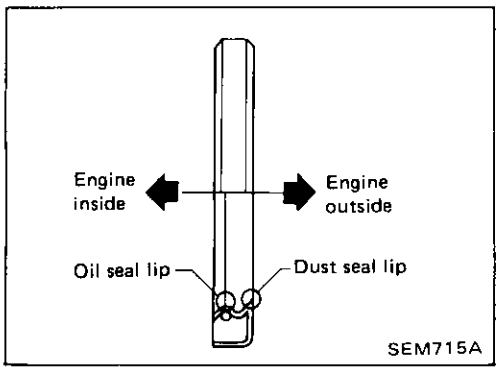

4. Remove valve spring using Tool or a suitable tool.
   - Piston concerned should be set at T.D.C. to prevent valve from falling.
5. Pry out valve oil seal.

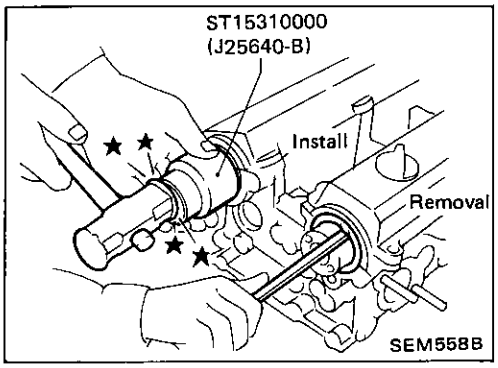



6. Apply engine oil to new valve oil seal and install it.
   - Before installing valve oil seal, install inner valve spring seat.

## OIL SEAL INSTALLATION DIRECTION



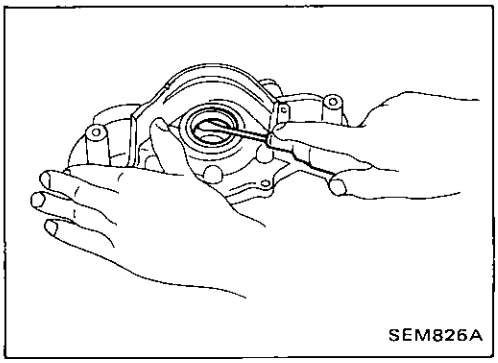



## CAMSHAFT OIL SEAL

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

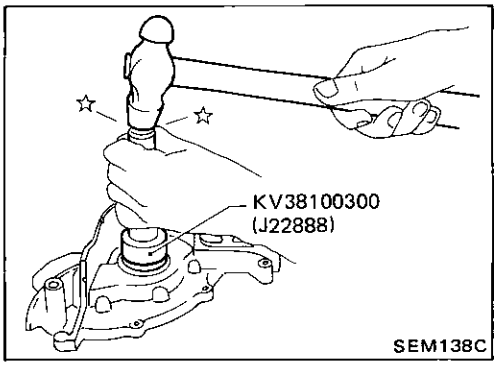
**Be careful not to scratch camshaft.**

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

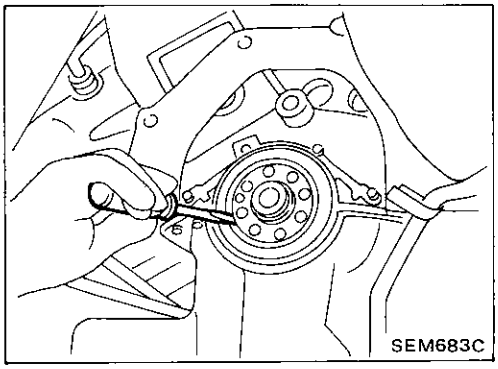



## FRONT OIL SEAL

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



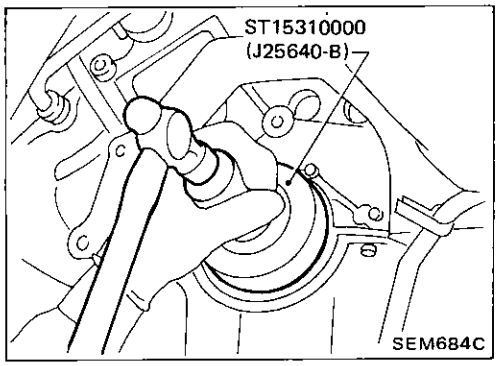

4. Apply engine oil to new oil seal and install it using Tool or a suitable tool.




## REAR OIL SEAL

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

**Be careful not to scratch crankshaft.**



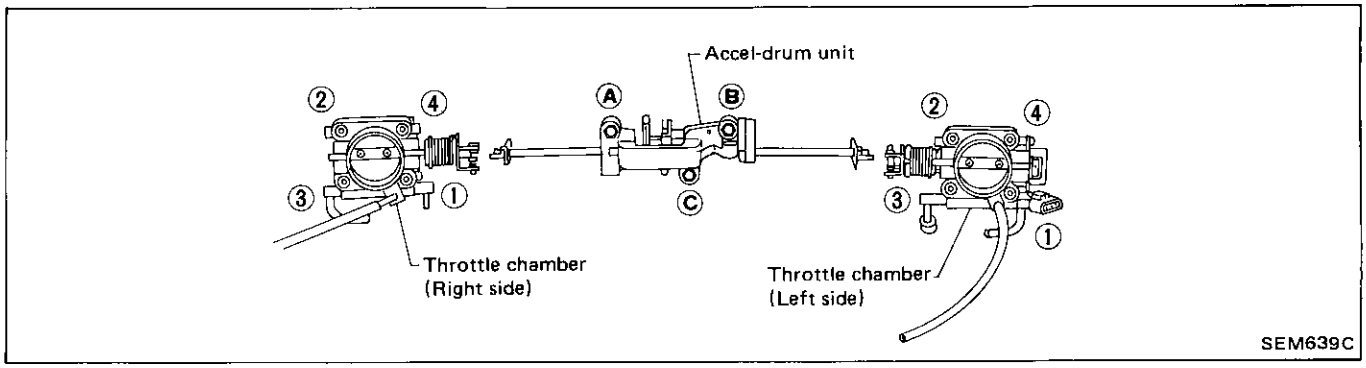

3. Apply engine oil to new oil seal and install it using Tool or a suitable tool.

## Precaution

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

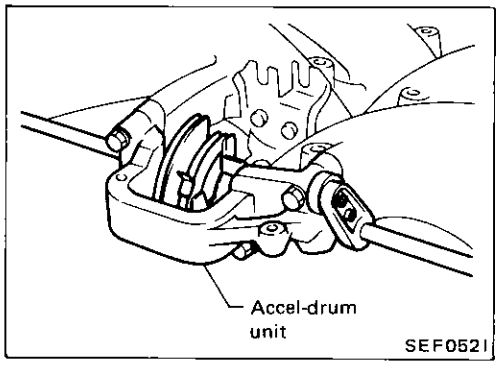
## Installation

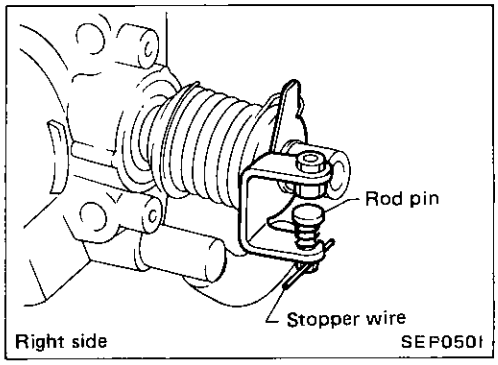
**The intention of this installation and adjustment procedure is to assure accurate synchronization of the throttle chamber opening points.**




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

- **When tightening bolts, free accel-drum unit so that drum unit is left under its own weight. Do not apply external force to accel-drum unit.**
- **When replacing throttle chambers only, you need not perform procedures (3), (4) and (5).**




- **Before installing each throttle chamber, confirm that stopper wire is installed in hole of rod pin.**
  **If not, install suitable wire.**

**Tightening order:**

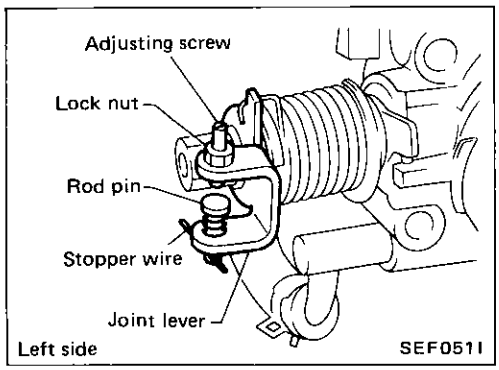
**(1) ① → ② → ③ → ④:**
**9 - 11 N·m (0.9 - 1.1 kg-m, 6.5 - 8.0 ft-lb)**

**(2) ① → ② → ③ → ④:**
**18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)**

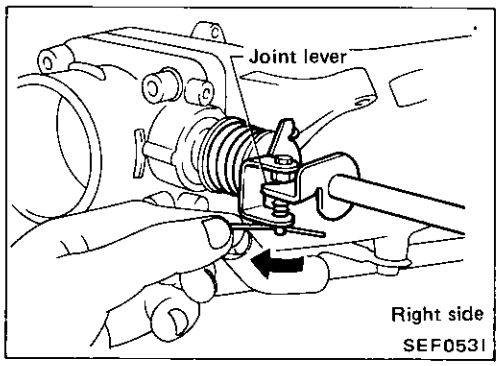
**(3) Ⓐ → Ⓑ → Ⓒ: Tighten by hand**

**(4) Ⓐ → Ⓑ → Ⓒ:**
**5 N·m (0.5 kg-m, 3.6 ft-lb)**

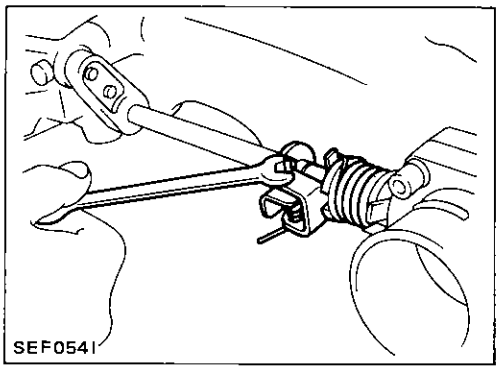
**(5) Ⓐ → Ⓑ → Ⓒ:**
**20 N·m (2.0 kg-m, 14 ft-lb)**



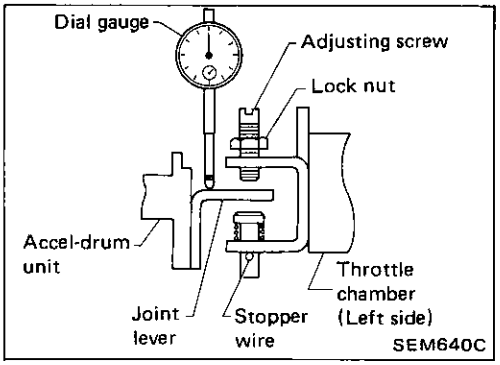
## Installation (Cont'd)



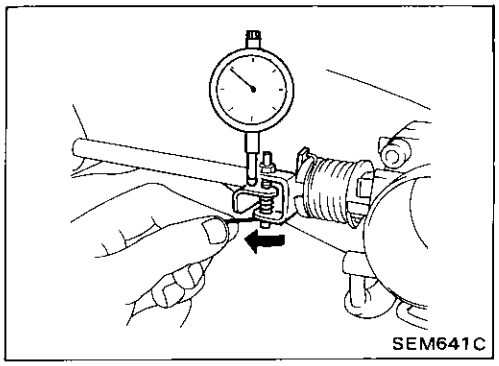

2. Pull out stopper wire of right side throttle chamber in order to secure right side joint lever.



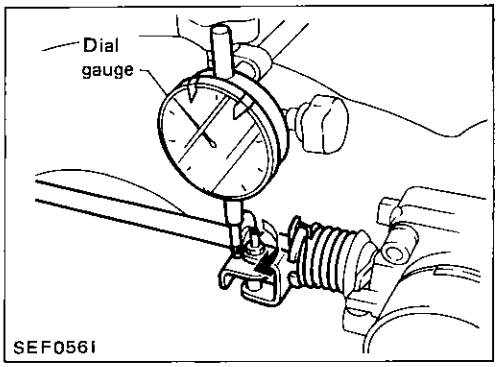

3. Loosen left side throttle chamber lock nut and back-out adjusting screw until there is clearance between the screw and joint lever.




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




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

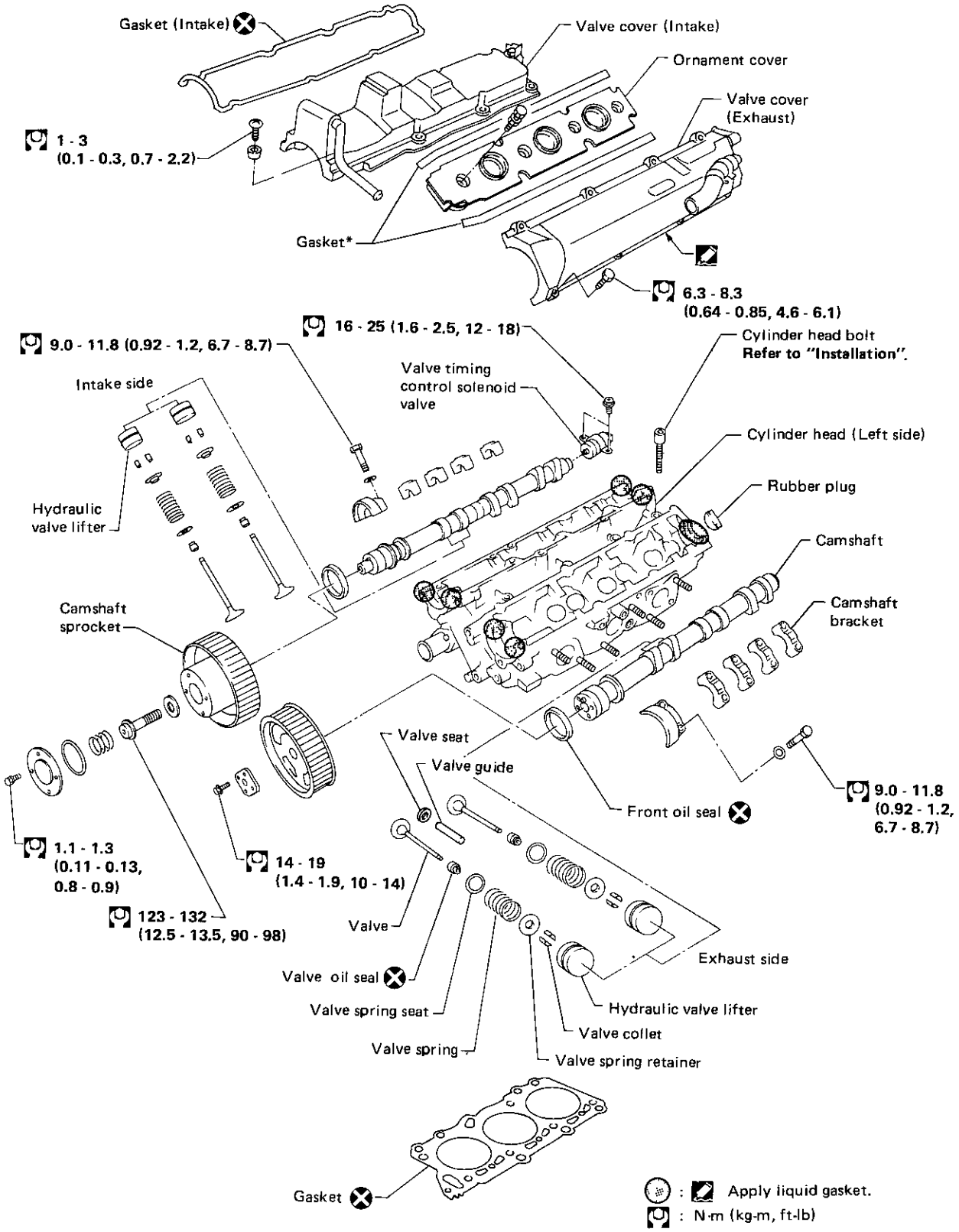



6. Turn adjusting screw until dial gauge indicator is within the following range.

   **Range: 0.07 - 0.13 mm (0.0028 - 0.0051 in)**

**Then tighten lock nut.**

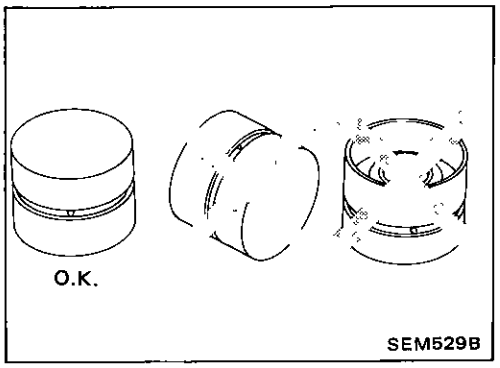
7. Confirm that the dial gauge indicator is still within the above range.


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

SEM620C

**CAUTION:**

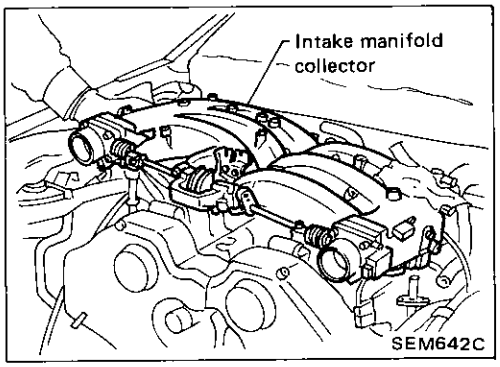
- **When installing sliding parts such as camshaft, camshaft bracket and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts, intake camshaft sprocket bolts and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces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



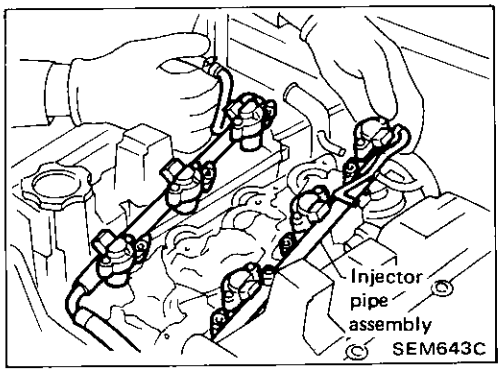

- **Do not put hydraulic valve lifters upside down, otherwise air will enter valve lifter, causing it to make a noise.**
- **Do not disassemble hydraulic valve lifter.**
- **Attach tags to valve lifters so as not to mix them up.**
- **Valve lifters should be immersed in engine oil.**

## Removal

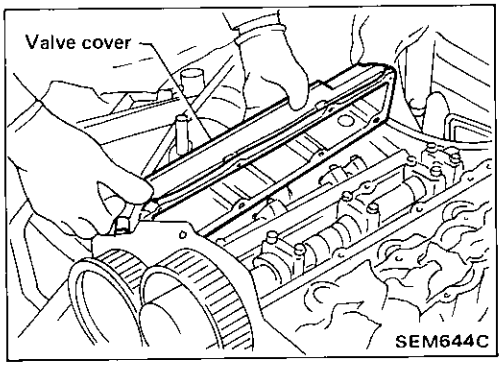
1. Remove intake manifold collector.



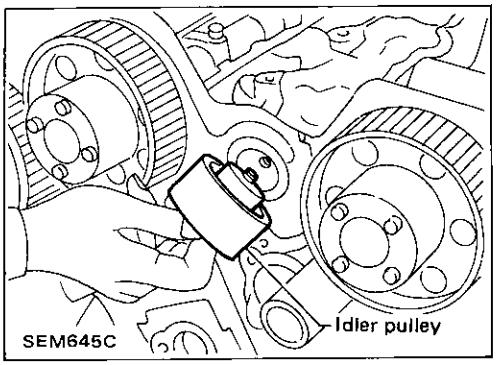

2. Remove injector pipe assembly.




3. Remove valve covers.



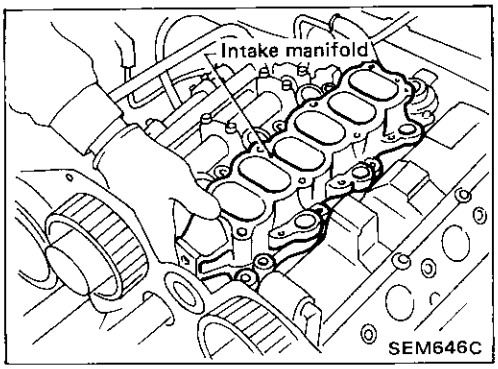
## Removal (Cont'd)



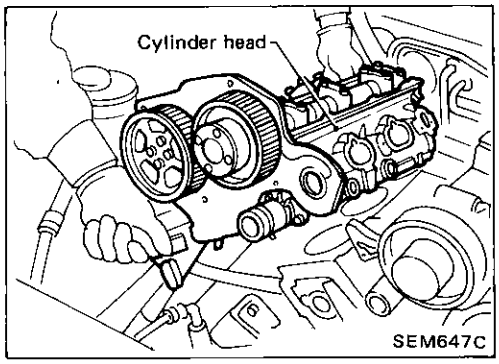

4. Remove timing belt.

**Refer to "Removal" of TIMING BELT.**

5. Remove idler pulley and its stud bolt.



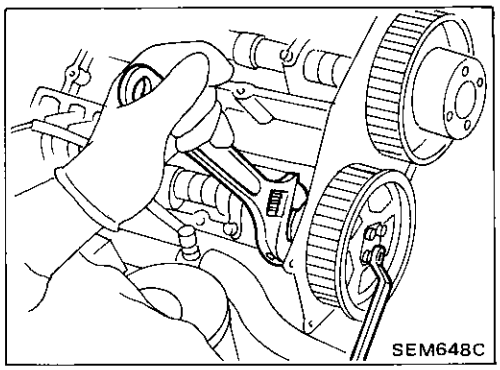

6. Remove intake manifold.



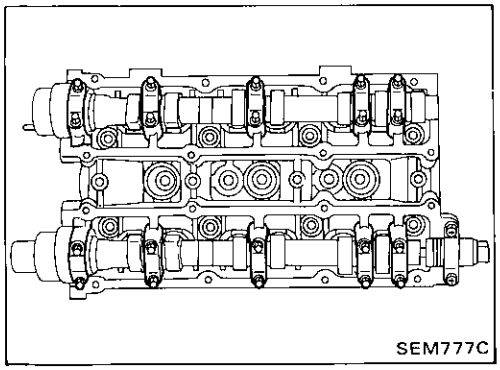

7. Disconnect front exhaust tube from exhaust manifold.
8. Remove cylinder head with exhaust manifold.

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

## Disassembly




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



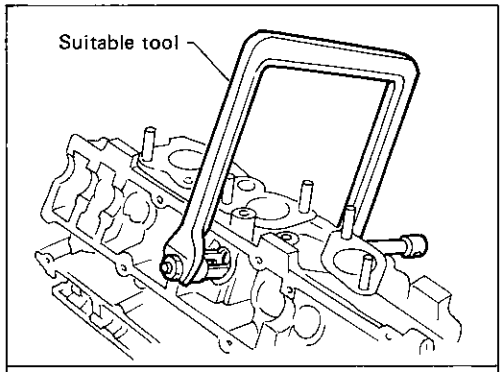

4. Remove camshaft brackets.

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

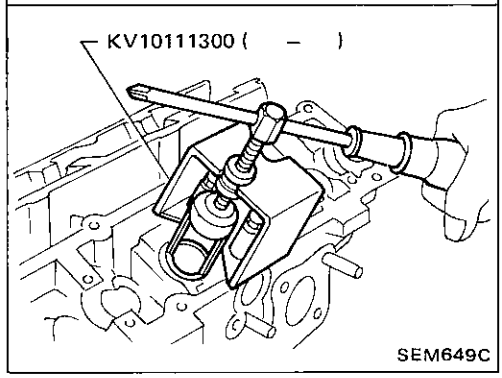
**Before removing camshaft, measure camshaft end play.**

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

## Disassembly (Cont'd)




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




## Inspection

### CYLINDER HEAD DISTORTION

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

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

**Resurfacing limit:**

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

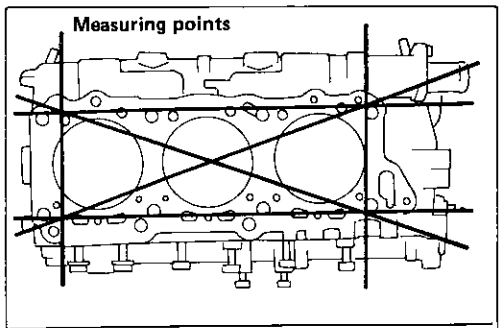
**Amount of cylinder head resurfacing is "A".**

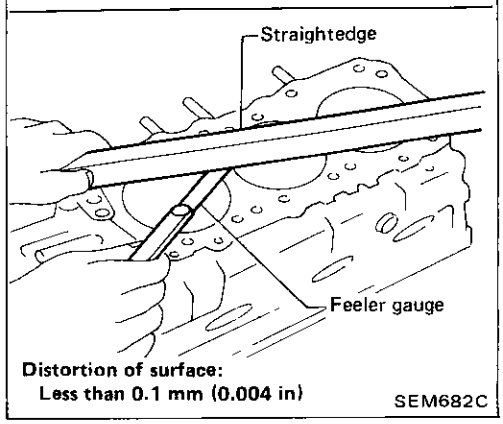
**Amount of cylinder block resurfacing is "B".**

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

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

**Nominal cylinder head height from camshaft center:**
**Refer to S.D.S.**



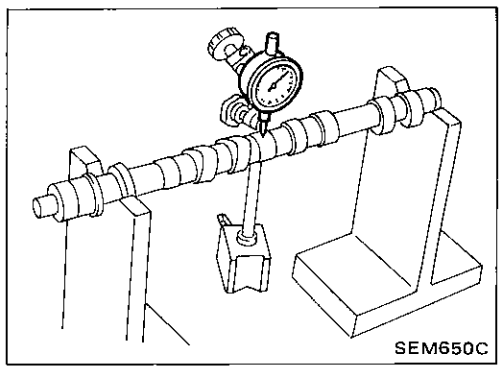




### CAMSHAFT VISUAL CHECK

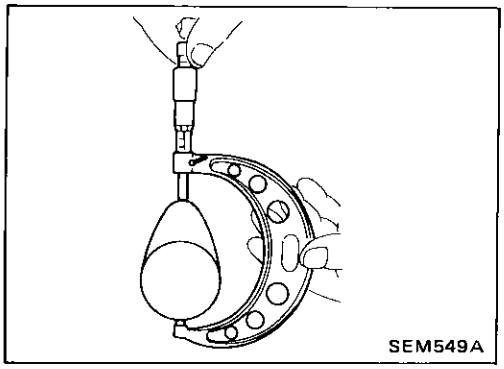
Check camshaft for scratches, seizure and wear.

### CAMSHAFT RUNOUT

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

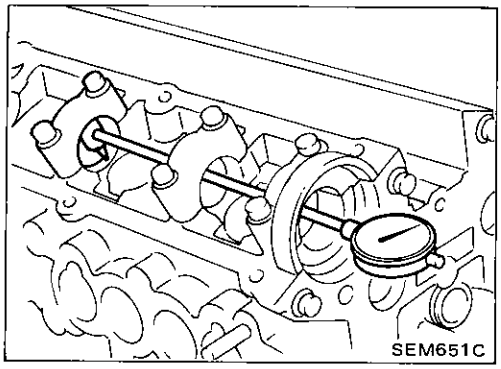


## Inspection (Cont'd)



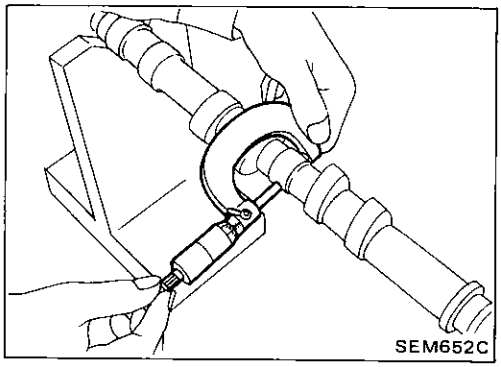

### CAMSHAFT CAM HEIGHT

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

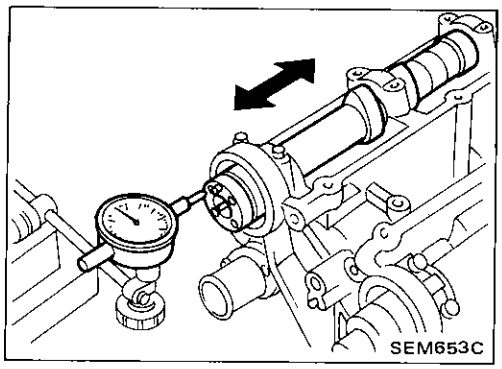



### CAMSHAFT JOURNAL CLEARANCE

1. Install camshaft bracket and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.
   **Standard inner diameter:**
   **28.000 - 28.021 mm (1.1024 - 1.1032 in)**

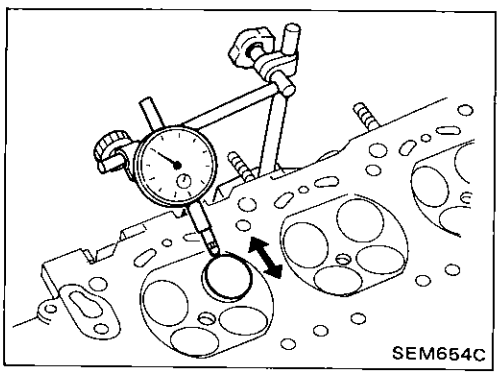



3. Measure outer diameter of camshaft journal.
   **Standard outer diameter:**
   **27.935 - 27.955 mm (1.0998 - 1.1006 in)**
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   **Camshaft journal clearance limit:**
   **0.15 mm (0.0059 in)**




### CAMSHAFT END PLAY

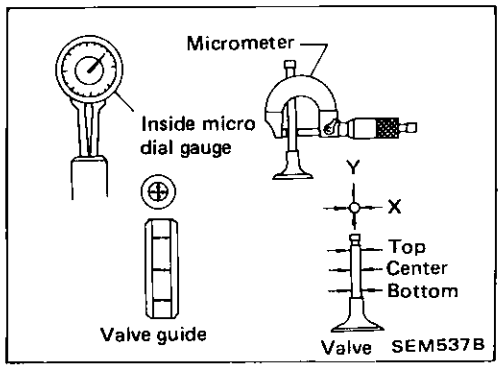
1. Install camshaft in cylinder head.
2. Measure camshaft end play.
   **Camshaft end play:**
   **Standard**
   **0.03 - 0.08 mm (0.0012 - 0.0031 in)**




### VALVE GUIDE CLEARANCE

1. Push valve stem out so that its end is even with valve guide height. Measure valve runout by moving valve.
   **Valve deflection limit (Dial gauge reading):**
   **0.2 mm (0.008 in)**

## Inspection (Cont'd)

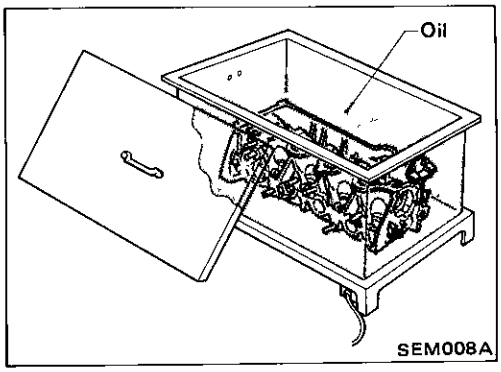



2. If it exceeds the limit, check valve to valve guide clearance.
a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.

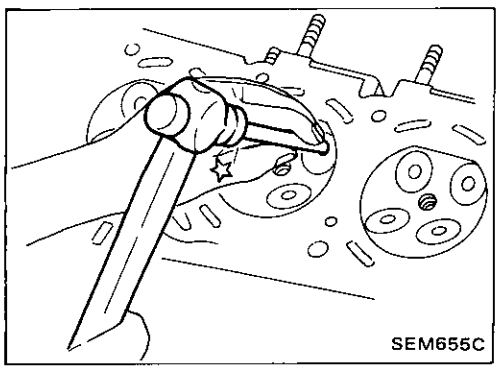
**Valve to valve guide clearance limit:**
**0.10 mm (0.0039 in)**

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

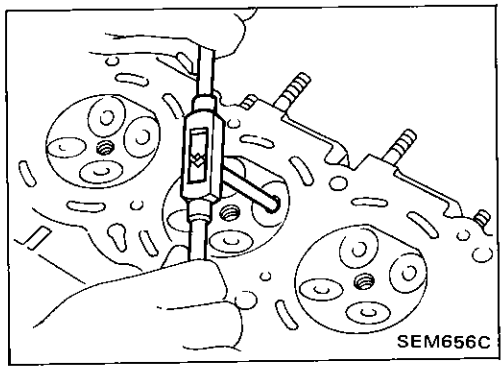
### VALVE GUIDE REPLACEMENT




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

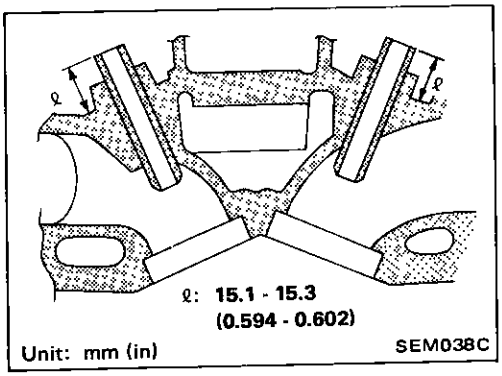



2. Drive out valve guide with a press [under a 20 kN (2 t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.




3. Ream cylinder head valve guide hole.

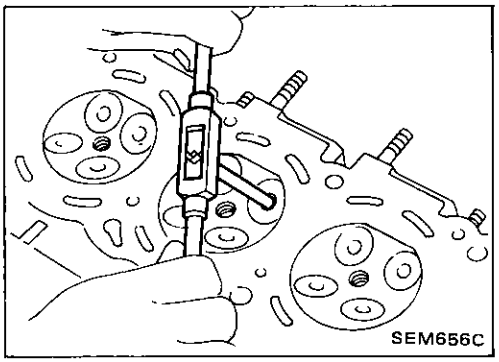
**Valve guide hole diameter**
**(for service parts):**
**Intake and Exhaust**
**10.175 - 10.196 mm (0.4006 - 0.4014 in)**




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

**Projection " ℓ ":**
**15.1 - 15.3 mm (0.594 - 0.602 in)**

## Inspection (Cont'd)

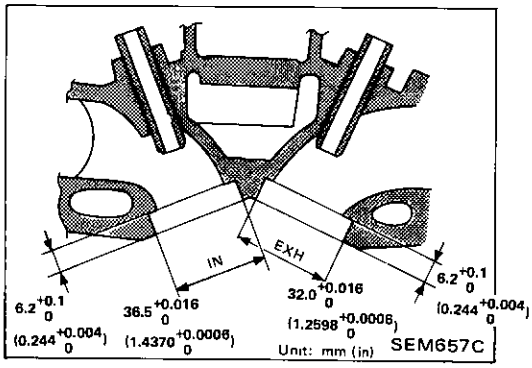



5. Ream valve guide.
   **Finished size:**
   **Intake and Exhaust**
   **6.000 - 6.018 mm (0.2362 - 0.2369 in)**

### VALVE SEATS

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

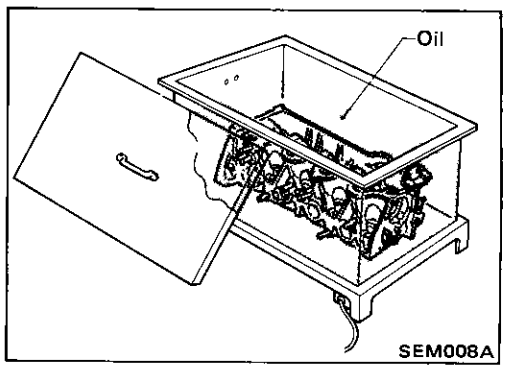
- **Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.**
- **Cut with both hands to assure a uniform surface.**



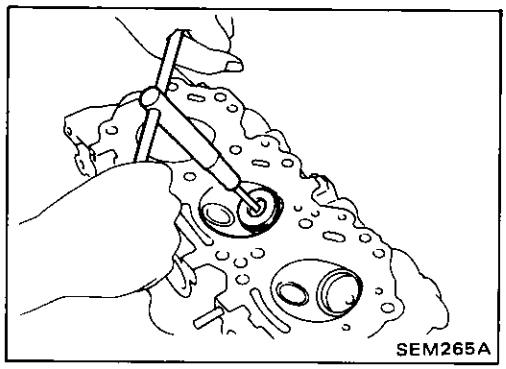

### REPLACING VALVE SEAT FOR SERVICE PARTS

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

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



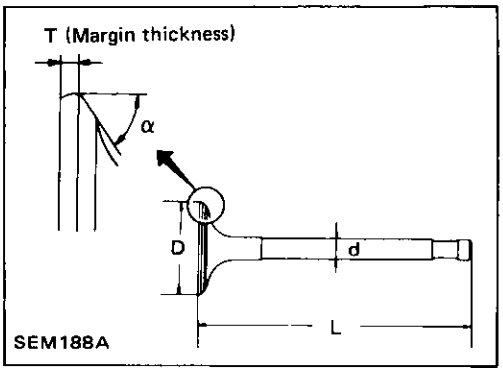

3. Heat cylinder head to 150 to 160°C (302 to 320°F).
4. Press fit valve seat until it seats on the bottom.




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

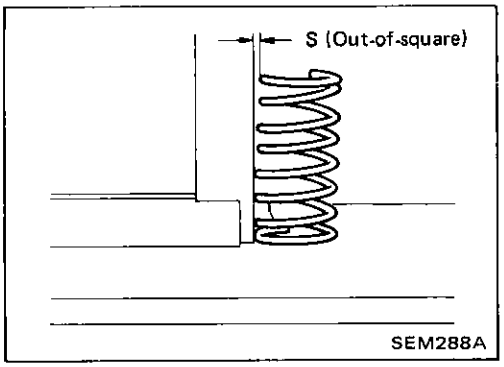
## Inspection (Cont'd)

### VALVE DIMENSIONS



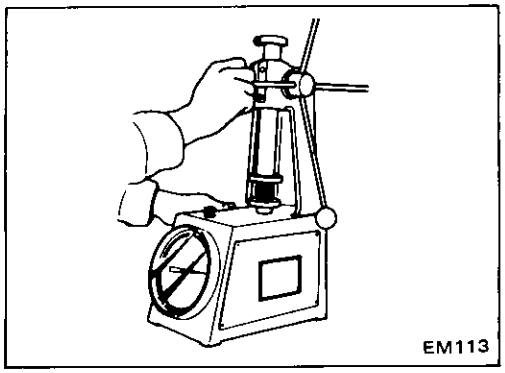

Check dimensions in each valve. For dimensions, refer to S.D.S.
When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.
**Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.**

### VALVE SPRING




**Squareness**

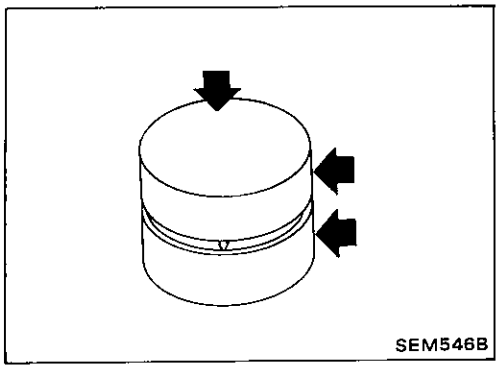
1. Measure "S" dimension.
   **Out-of-square:**
   **Less than 1.8 mm (0.071 in)**
2. If it exceeds the limit, replace spring.



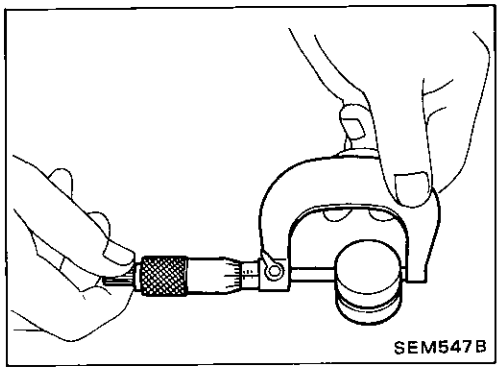

**Pressure**

Check valve spring pressure.
**Pressure: N (kg, lb) at height mm (in)**
**Standard**
**536.4 (54.7, 120.6) at 26.5 (1.043)**
**Limit**
**More than 452.79 (46.17, 101.80) at 26.5 (1.043)**
**If it exceeds the limit, replace spring.**

### HYDRAULIC VALVE LIFTER

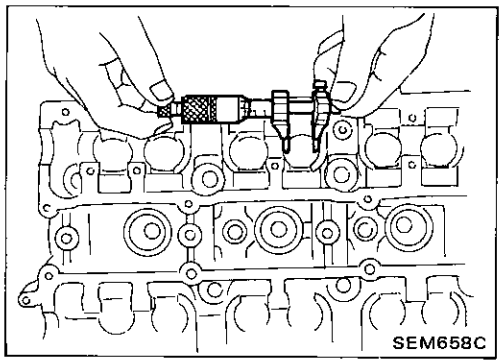



1. Check contact and sliding surfaces for wear or scratches.




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

## Inspection (Cont'd)



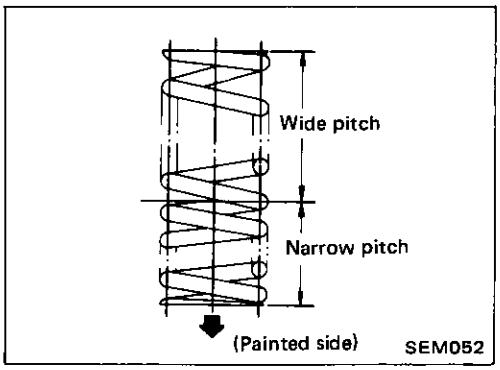

3. Check valve lifter guide inner diameter.

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

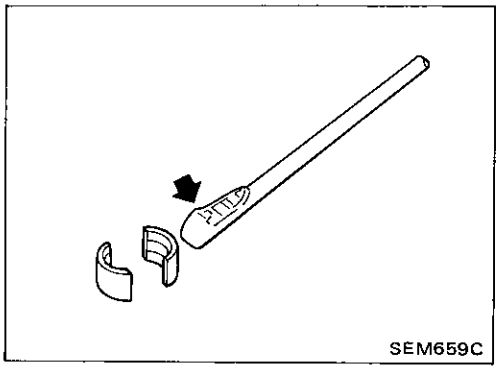
## Assembly

1. Install valve component parts.

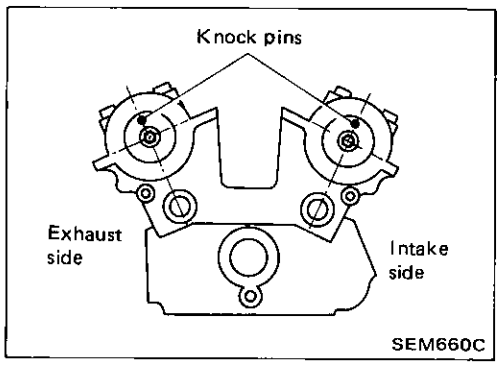
- **Always use new valve oil seal. (Refer to OIL SEAL REPLACEMENT.)**
- **Install valve spring (uneven pitch type) with its narrow pitch side (painted side) toward cylinder head side.**



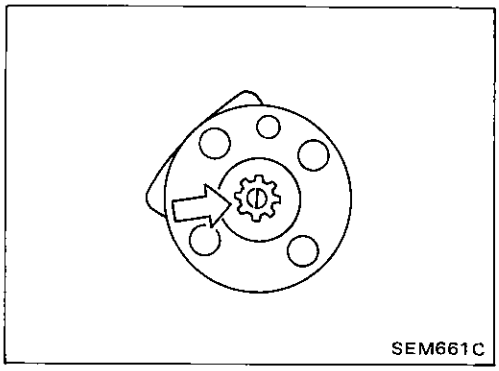

- To facilitate installation of collet, apply a small amount of grease to a piece of wire or a pencil and attach collet to wire or pencil, as shown.



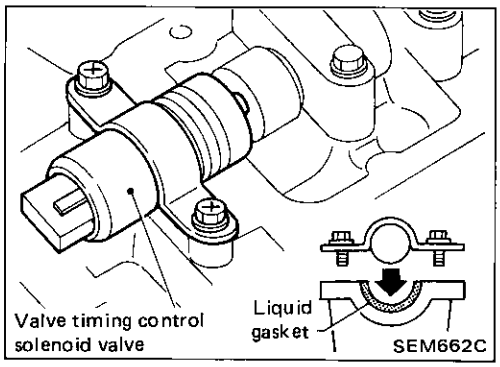

2. Install camshafts as shown.



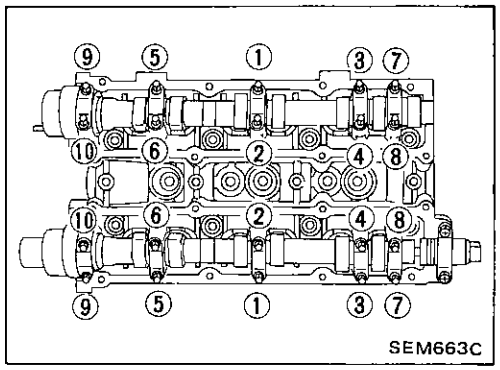

- Exhaust camshaft (left side) has spline for crank angle sensor.



## Assembly (Cont'd)

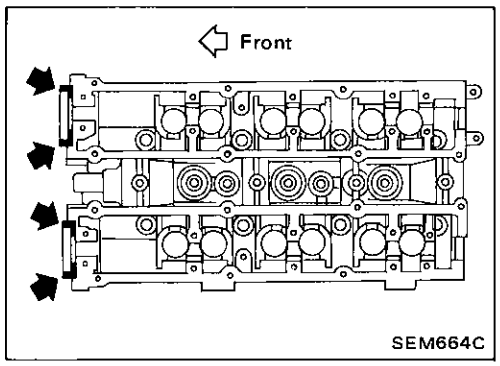



- When installing valve timing control solenoid valves, apply liquid gasket to solenoid valve surfaces.




3. Install camshaft brackets.

**Tighten camshaft bracket bolts gradually in two or three stages.**




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

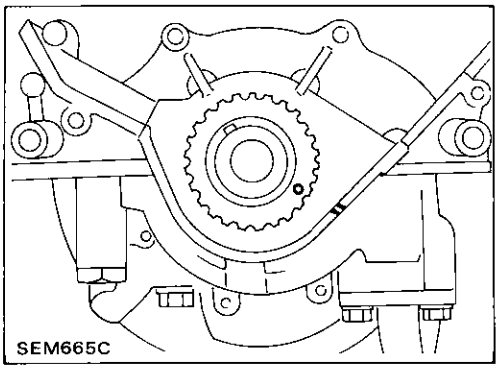
4. Apply engine oil to camshaft oil seal lip and install it in place.

**Always use new camshaft oil seal.**

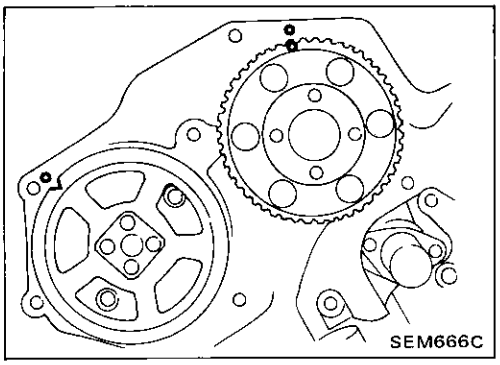
5. Install rear timing belt cover.
6. Install camshaft sprockets.

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

## Installation

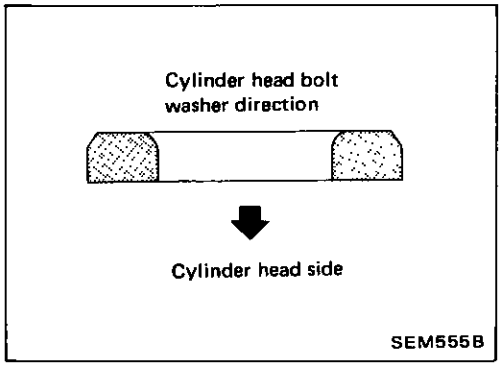



1. Set No. 1 piston at T.D.C. on its compression stroke as follows:
(1) Align crankshaft sprocket aligning mark with mark on oil pump body.



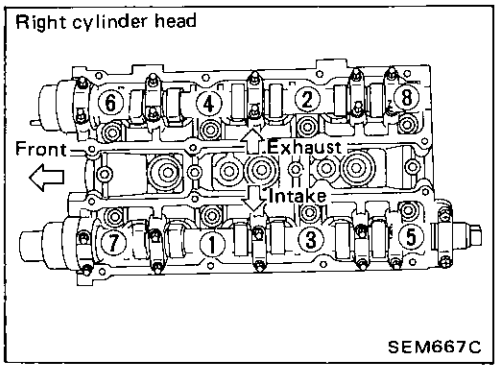

(2) Align camshaft sprocket aligning mark with mark on timing belt rear cover.

## Installation (Cont'd)



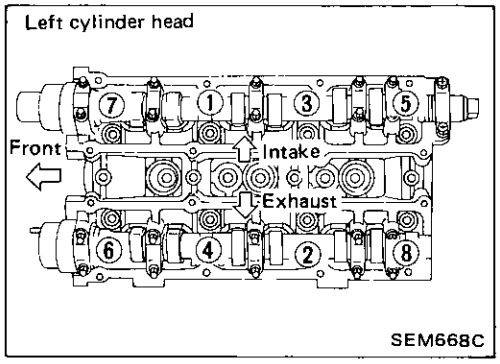

2. Install cylinder head with new gasket.
- **Be sure to install washers between bolts and cylinder head.**
- **Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.**

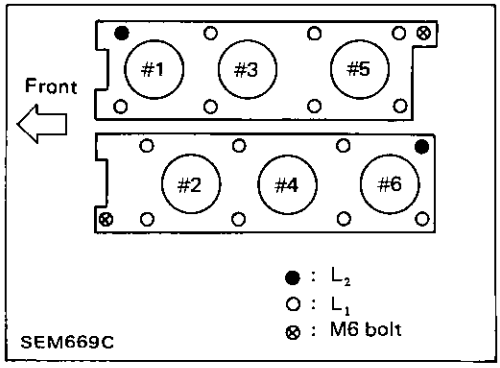
3. Install cylinder head bolts.
- **Install short bolts ($L_2$) into the correct holes of cylinders #1 and #6 as shown in figure of step (6).**



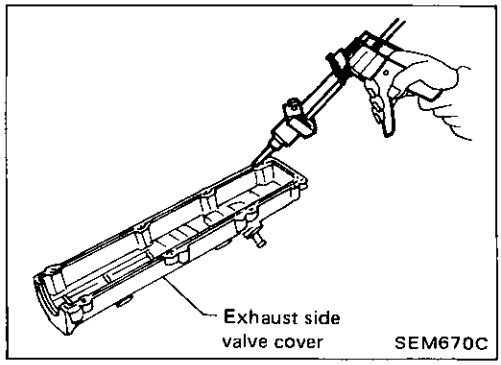

4. Tighten cylinder head bolts in numerical order.
- **Tightening procedure**

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

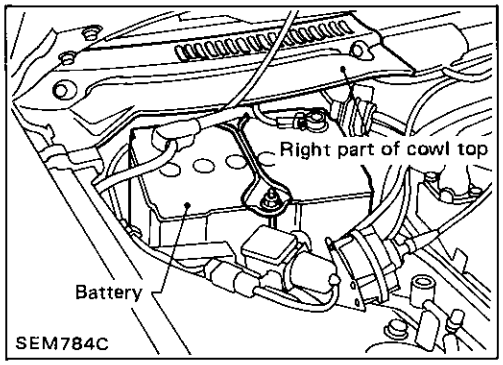



**(6) Tighten bolts ( ⊗ ) as shown to 10 to 12 N·m (1.0 to 1.2 kg-m, 7 to 9 ft-lb).**



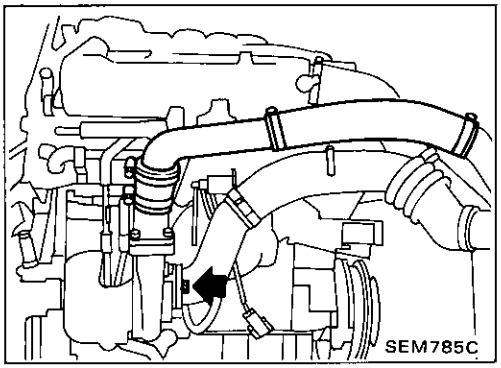

5. Install valve covers.
   When installing exhaust side valve covers, apply liquid gasket as shown.
6. Install remaining parts.



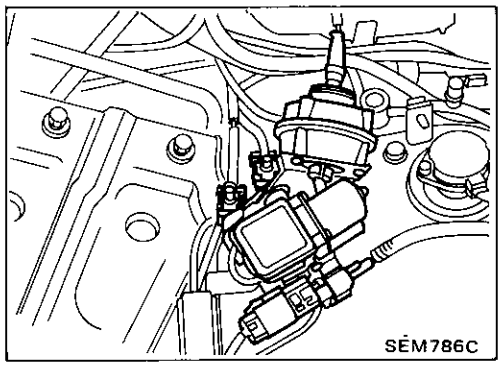

## Removal

### RIGHT SIDE UNIT

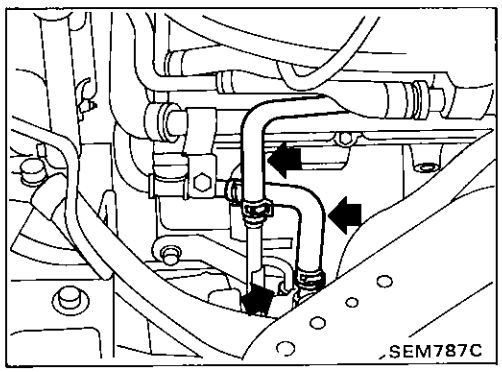
1. Remove right part of cowl top.
2. Remove battery.



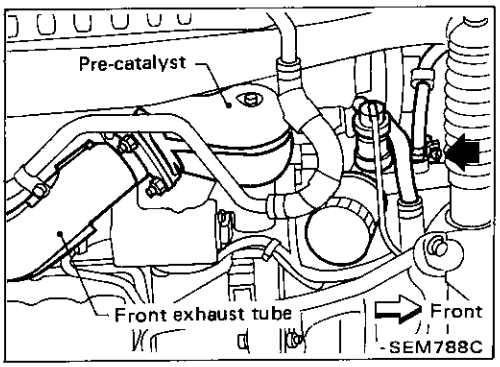

3. Remove air inlet hose and pipe.
4. Disconnect lower pipe from turbocharger unit.




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

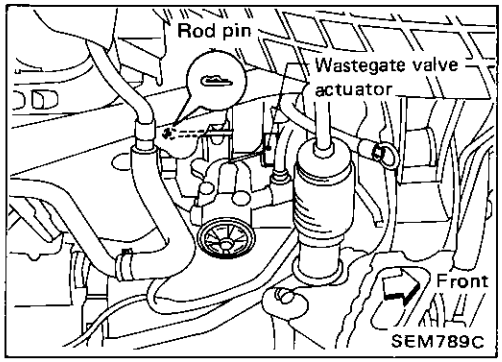



7. Remove turbocharger water hoses, and disconnect turbocharger oil inlet tube.
8. Remove two bolts fastening pre-catalyst to turbocharger unit.

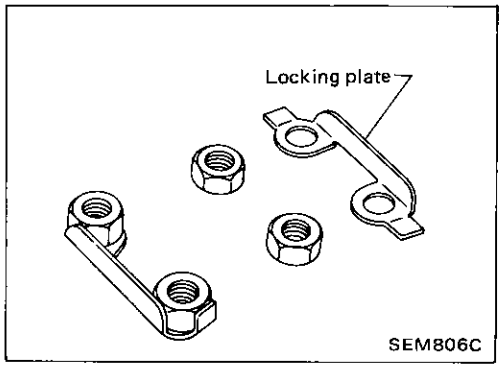



9. Remove the following parts;
   - oil pressure switch,
   - oil filter,
   - turbocharger oil return tube,
   - front exhaust tube,
   - pre-catalyst
10. Disconnect oil hose from oil filter bracket, and turbocharger water tubes from turbocharger unit.

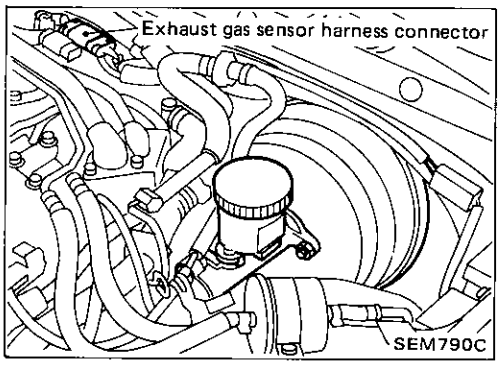
## Removal (Cont'd)




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

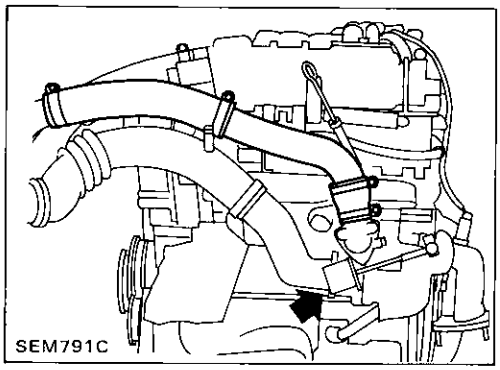



13. Unbend locking plates for fastening nuts of turbocharger unit.
14. Remove turbocharger unit.

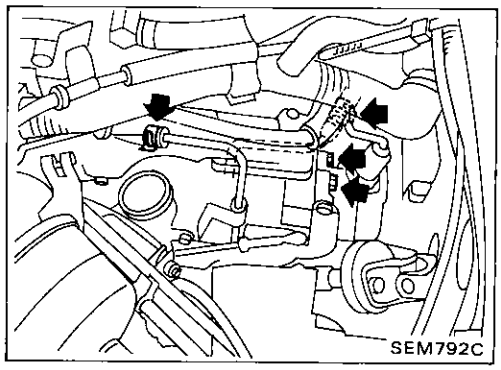



**LEFT SIDE UNIT**

1. Remove brake master cylinder and brake booster.
2. Disconnect exhaust gas sensor harness connector.

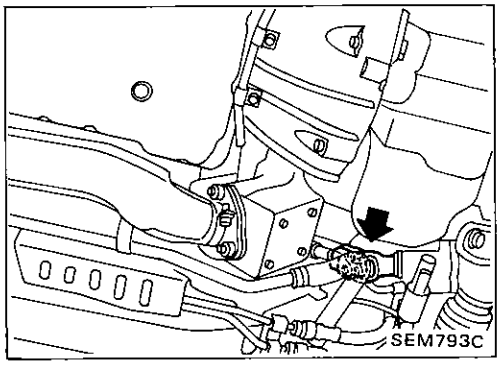



3. Remove air inlet hose and pipe.
4. Disconnect lower pipe from turbocharger unit.

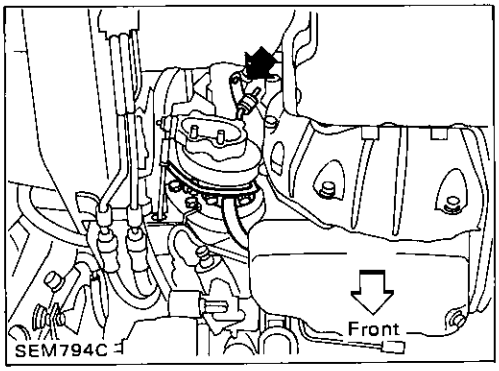



5. Disconnect water tubes.
6. Remove two bolts fastening pre-catalyst to turbocharger unit.

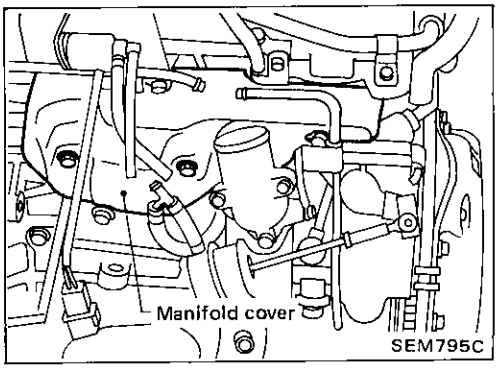
## Removal (Cont'd)




7. Remove front exhaust tube and pre-catalyst.
8. Disconnect steering lower joint.



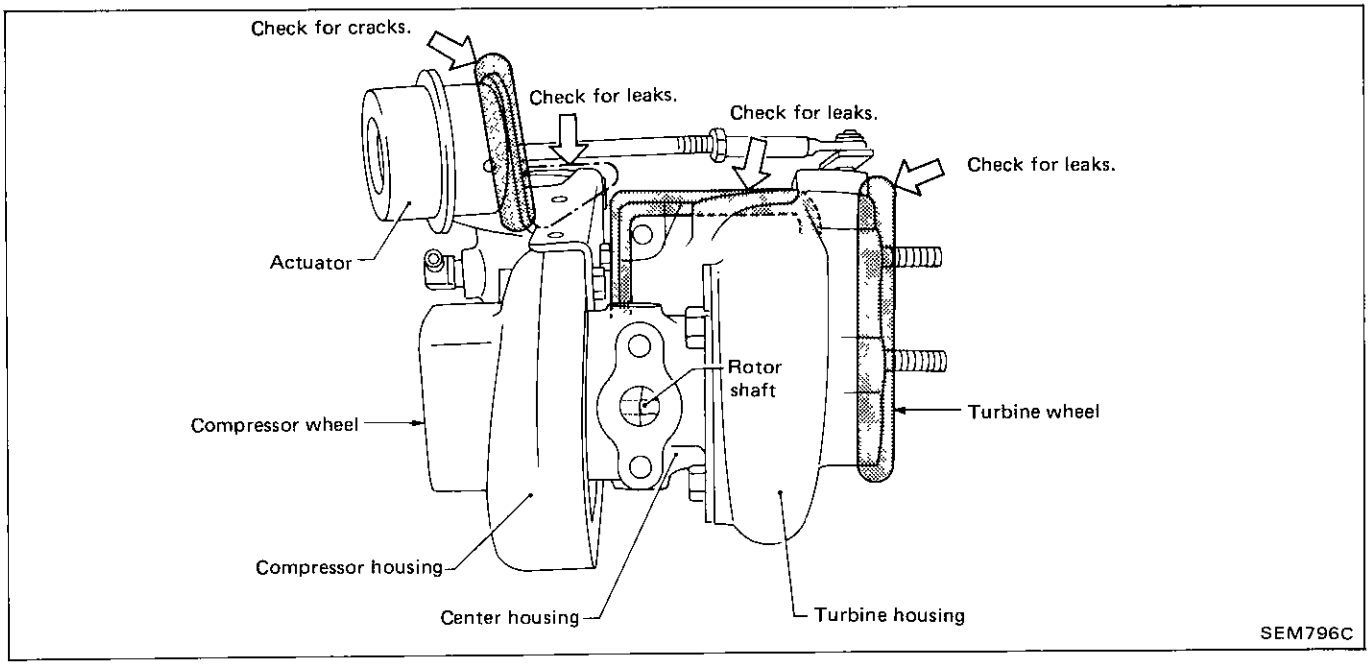

9. Remove turbocharger oil return tube and water tubes.
10. Disconnect E.G.R. tube and actuator bracket of turbocharger wastegate valve.




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

## Inspection

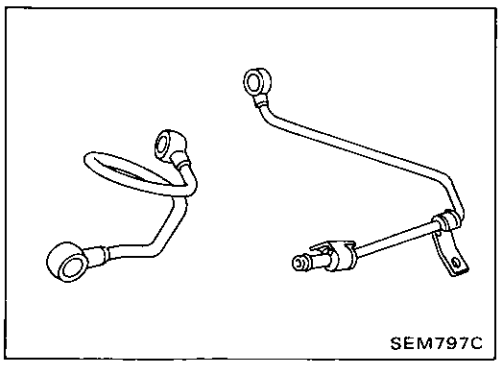
Proceed the following checks. If N.G., replace turbocharger unit.



## Inspection (Cont'd)

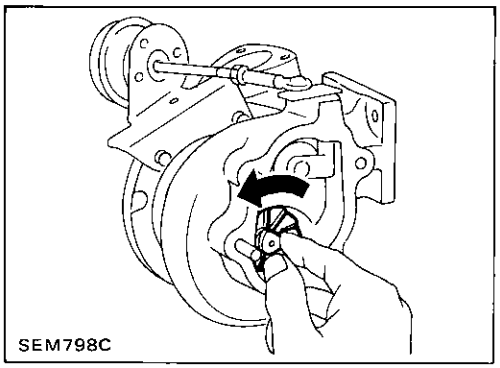
### OIL AND WATER TUBES

Check tubes for clogging.

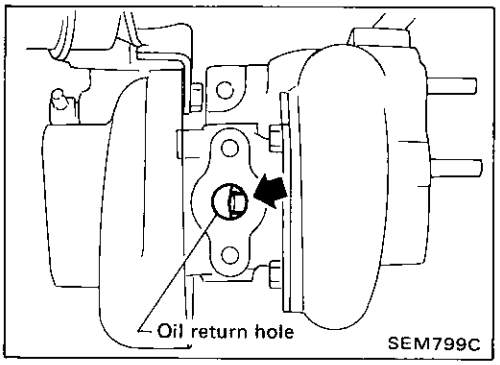

SEM797C

### ROTOR SHAFT

1. Check rotor shaft for smooth rotating.

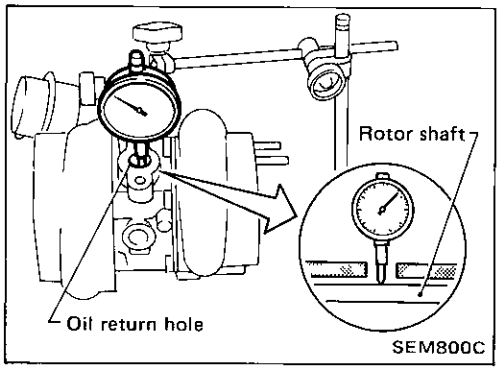

SEM798C

2. Check rotor shaft for carbon deposits.



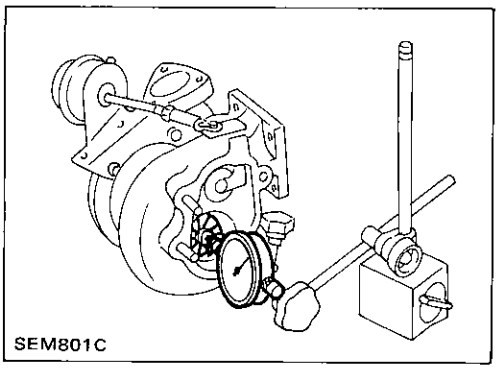
SEM799C

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



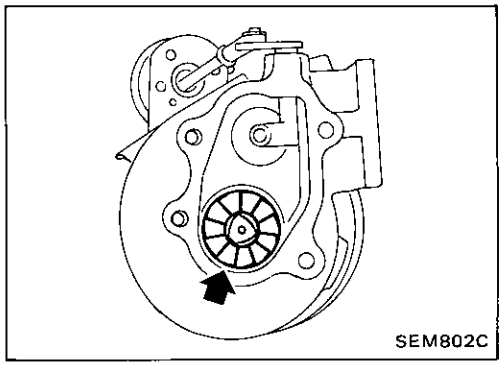
SEM800C

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


SEM801C

## Inspection (Cont'd)

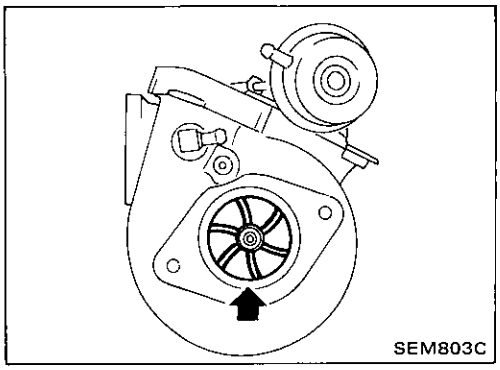
### TURBINE WHEEL


SEM802C

Check turbine wheel for the following:

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

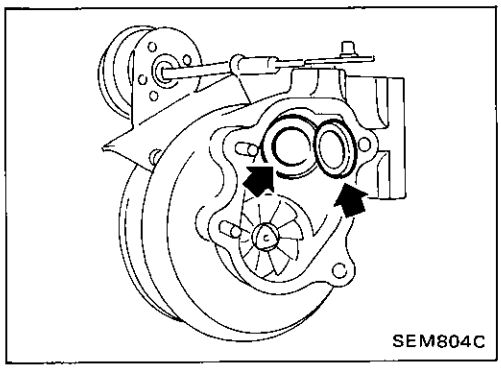
### COMPRESSOR WHEEL


SEM803C

Check compressor wheel for the following:

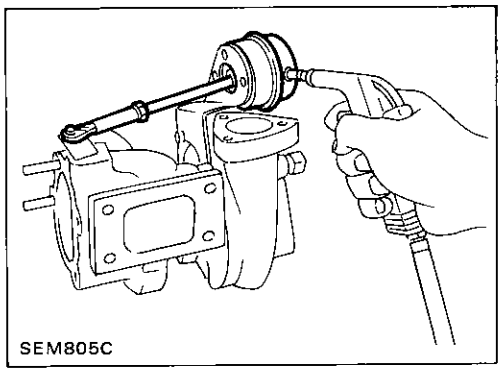
- Oil
- Deformed fins
- Contact with compressor housing

### WASTEGATE VALVE


SEM804C

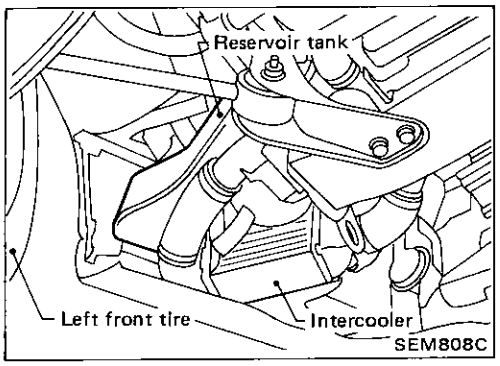
Remove rod pin and check wastegate valve for cracks, deformation and smooth movement.
Check valve seat surface for smoothness.

### WASTEGATE VALVE ACTUATOR


SEM805C

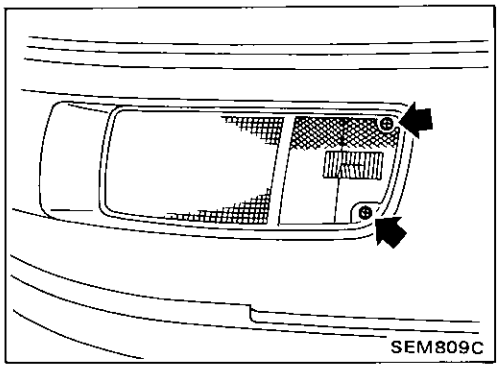
Apply air pressure to wastegate valve actuator and check it for smooth movement.

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

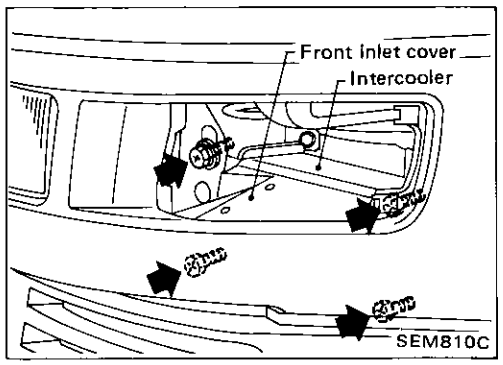



## Removal

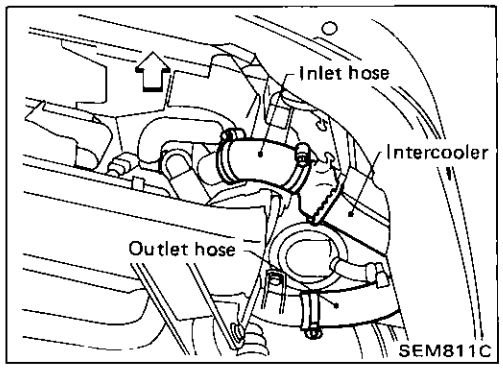
1. Remove front part of front fender protector.
2. Remove reservoir tank (left intercooler service only).



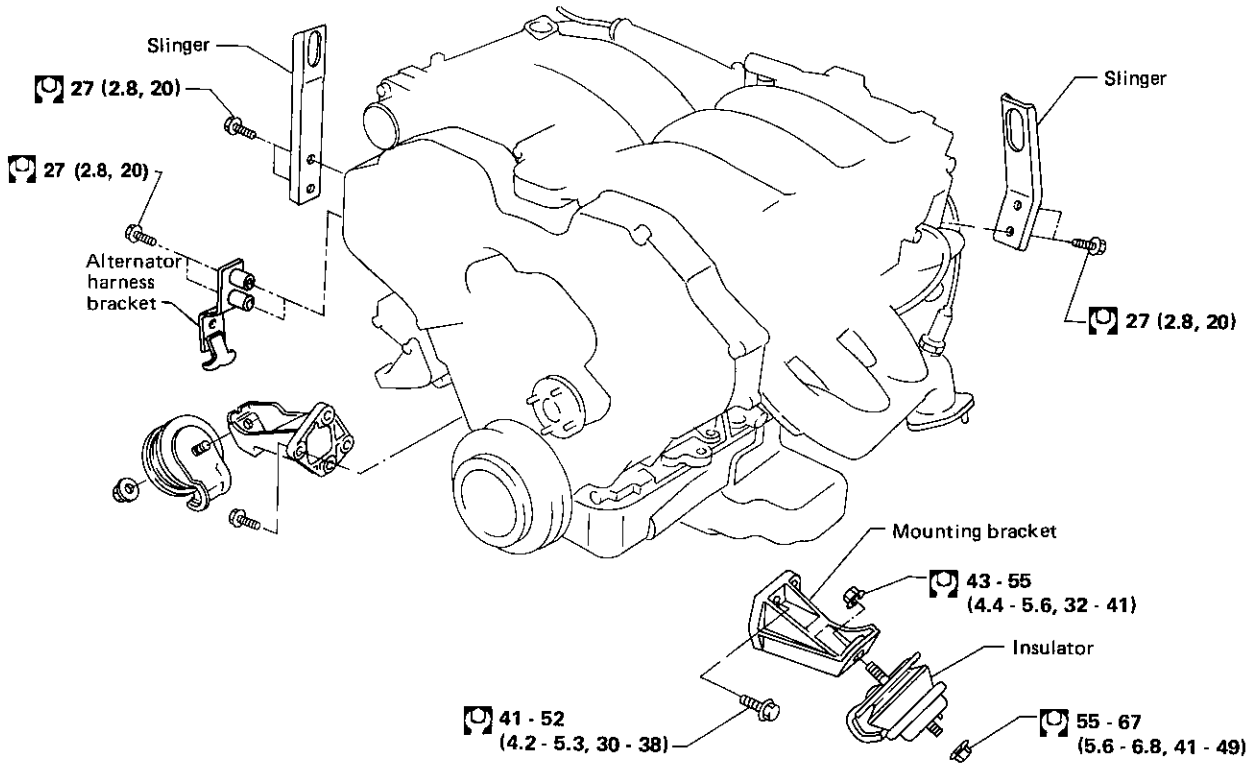

3. Remove front combination lamp.

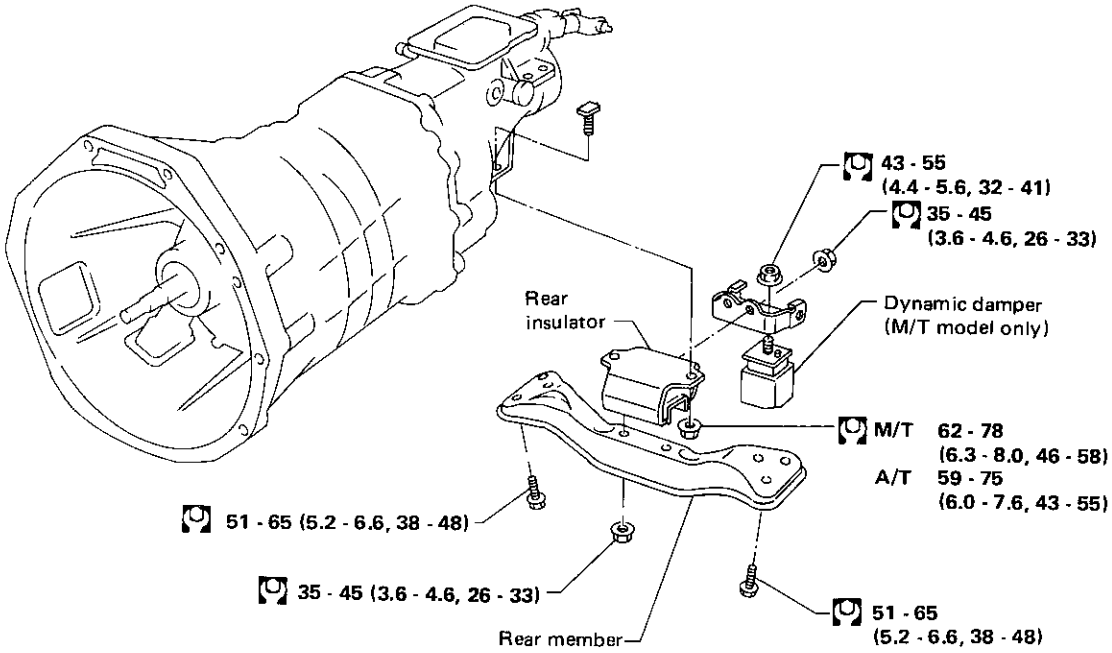



4. Remove bolts fastening intercooler and front inlet cover.




5. Remove inlet and outlet hoses.
6. Remove intercooler unit.




: N·m (kg-m, ft-lb)

SEM890D

**WARNING:**

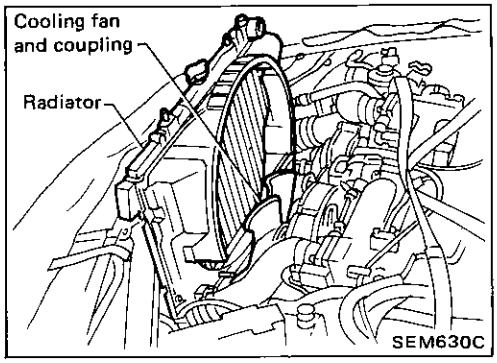
a. **Situate vehicle on a flat and solid surface.**
b. **Place chocks at front and back of rear wheels.**
c. **Do not remove engine until exhaust system has completely cooled off. Otherwise, you may burn yourself and/or fire may break out in fuel line.**
d. **For safety during subsequent steps, the tension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

**CAUTION:**

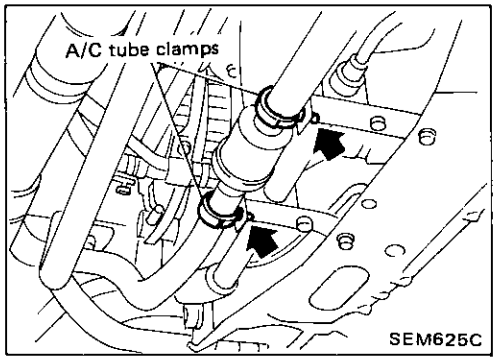
- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **In hoisting the engine, always use engine slingers in a safe manner.**

## M/T model

1. Remove engine under cover and hood.
2. Drain coolant from both cylinder block drain plugs, and radiator drain cock.
3. Drain engine oil from drain plug of oil pan.
4. Remove vacuum hoses, fuel tubes, wires, harnesses and connectors and so on.
5. Remove front exhaust tubes and propeller shaft.

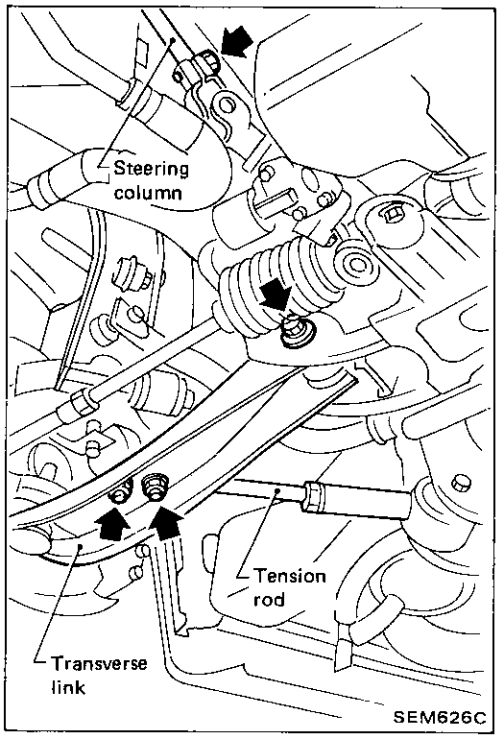



6. Remove radiator.
7. Remove drive belts, cooling fan and coupling.
8. Remove P/S oil pump, alternator, A/C pump from engine, and starter motor, and clutch operating cylinder.

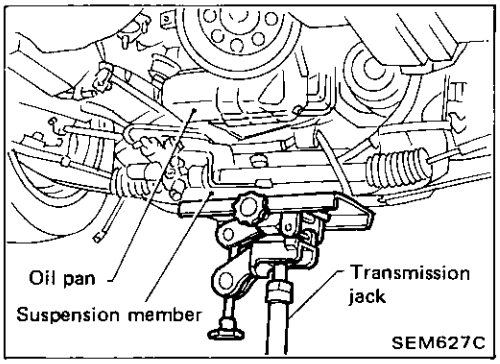



9. Disconnect A/C tube clamps as shown.

## M/T model (Cont'd)




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

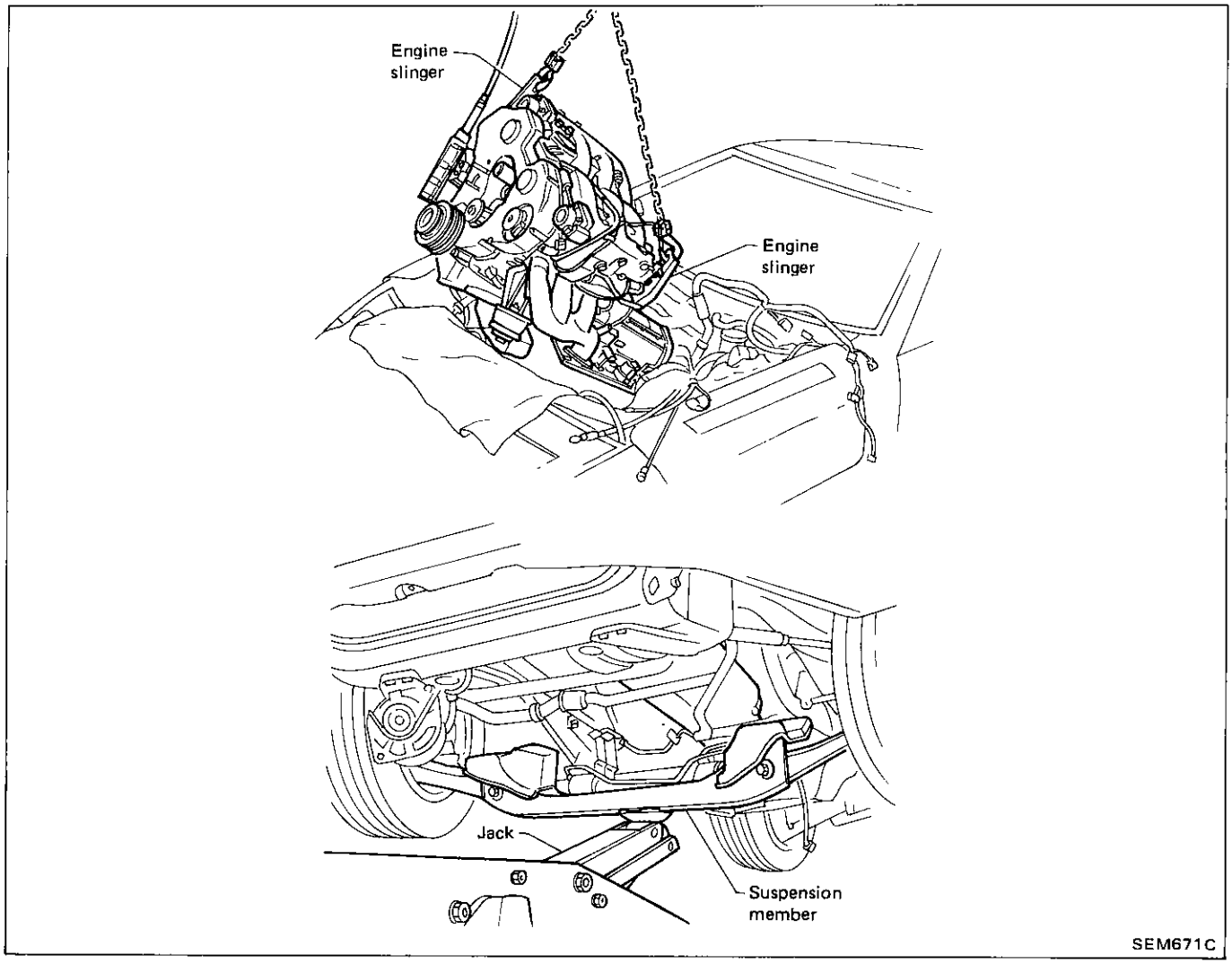



13. Set a suitable transmission jack under suspension member.
- At this time, hoist engine with engine slinger.

14. Remove suspension member fixing bolts.
15. Remove engine mounting bolts from both sides and then slowly lower transmission jack.

## M/T model (Cont'd)

16. Remove engine with transmission as shown.

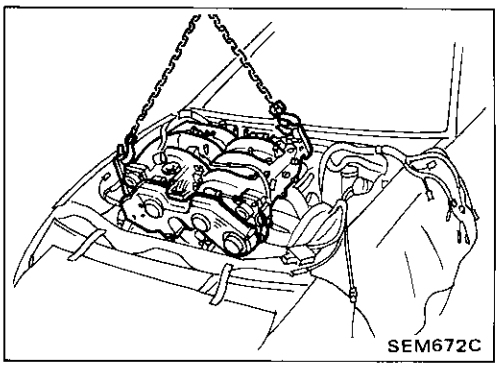



## A/T model

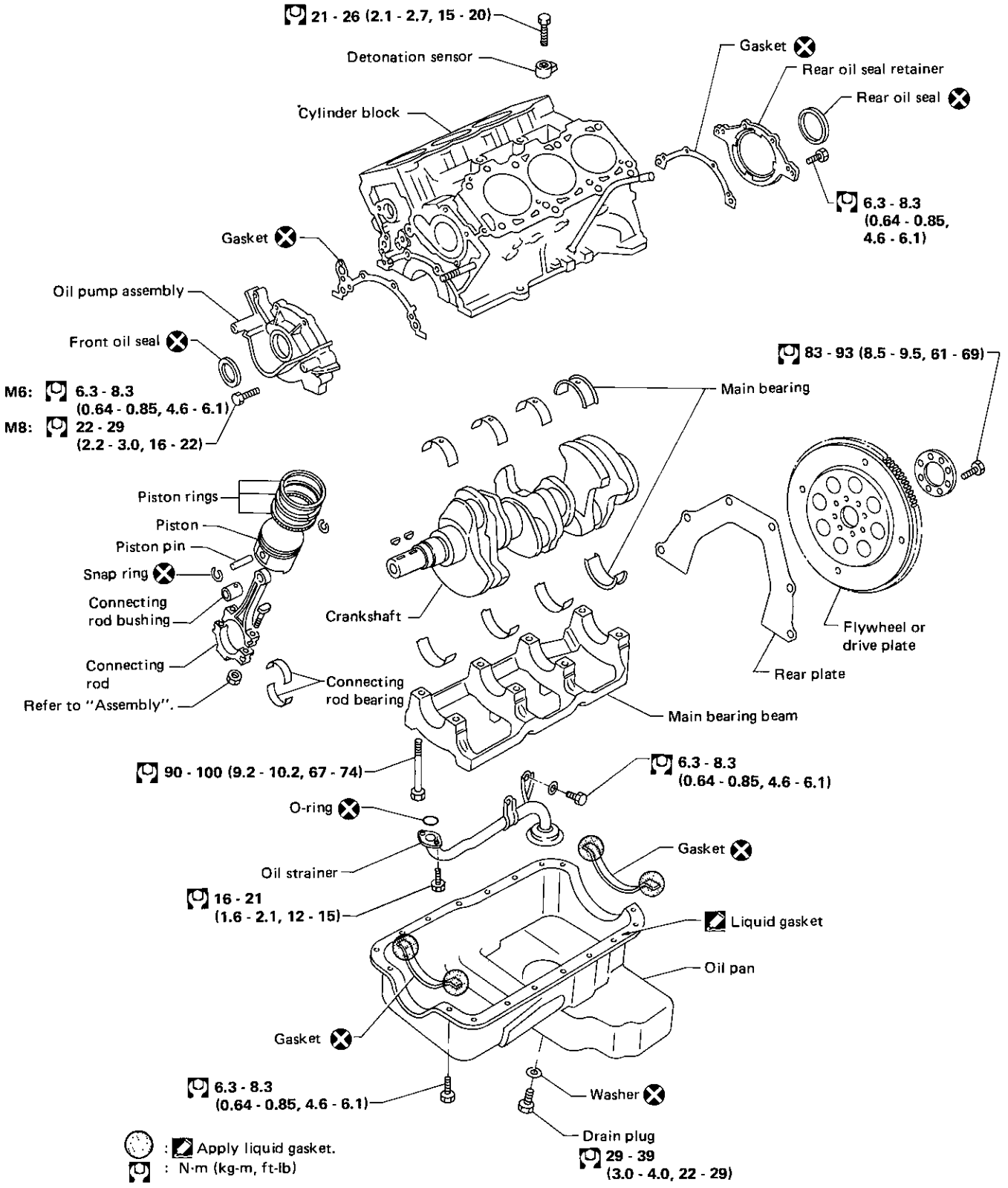
1. Perform the same procedures (1 to 8) as for M/T model.
2. Remove transmission from vehicle.

**Refer to AT section.**

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



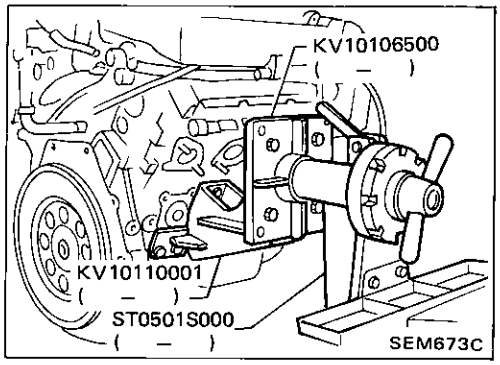

4. Remove engine from vehicle as shown.


21 - 26 (2.1 - 2.7, 15 - 20)
Detonation sensor
Cylinder block
Gasket
Rear oil seal retainer
Rear oil seal
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Gasket
Oil pump assembly
Front oil seal
M6: 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
M8: 22 - 29 (2.2 - 3.0, 16 - 22)
83 - 93 (8.5 - 9.5, 61 - 69)
Main bearing
Piston rings
Piston
Piston pin
Snap ring
Connecting rod bushing
Connecting rod
Refer to "Assembly".
Crankshaft
Connecting rod bearing
Flywheel or drive plate
Rear plate
Main bearing beam
90 - 100 (9.2 - 10.2, 67 - 74)
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
O-ring
Gasket
Oil strainer
16 - 21 (1.6 - 2.1, 12 - 15)
Liquid gasket
Oil pan
Gasket
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Washer
Drain plug
29 - 39 (3.0 - 4.0, 22 - 29)
: Apply liquid gasket.
: N·m (kg-m, ft-lb)

SEM622C

**CAUTION:**

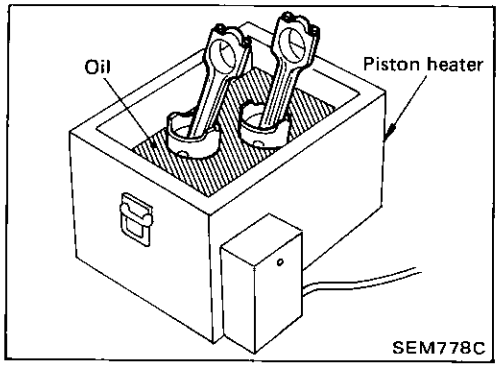
- **When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.**
- **Place removed parts such as bearings and bearing caps in their proper order and direction.**
- **When tightening connecting rod bolts and main bearing cap bolts, apply engine oil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



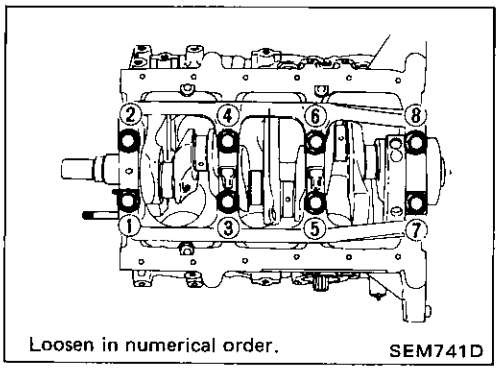

## Disassembly

### PISTON AND CRANKSHAFT

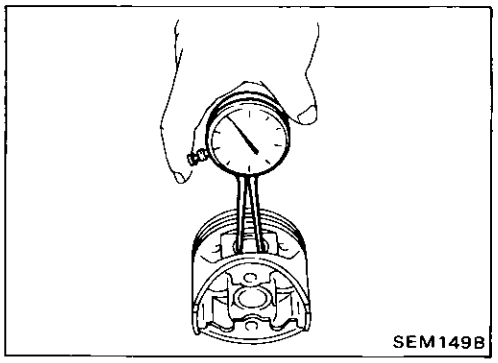
1. Place engine on a work stand.
2. Remove timing belt.
3. Drain coolant and remove water pump.
4. Drain oil.
5. Remove oil pan, oil pump and rear oil seal retainer.
6. Remove intake manifold collector, intake manifold and cylinder head.




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




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




## Inspection

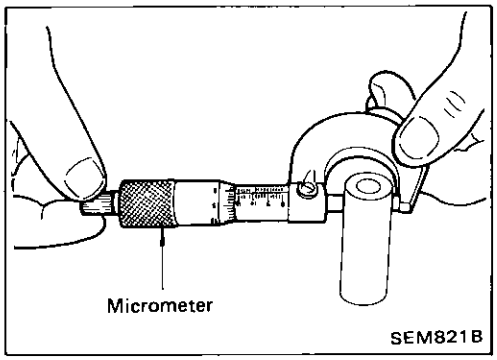
### PISTON AND PISTON PIN CLEARANCE

- Confirm the fitting of piston pin into piston pin hole by checking if it can be pressed in smoothly by finger pressure at room temperature.

1. Measure inner diameter of piston pin hole "dp".

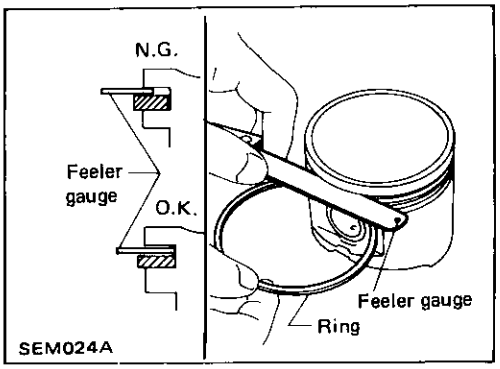
**Standard diameter "dp":**
**21.987 - 21.999 mm (0.8656 - 0.8661 in)**

## Inspection (Cont'd)




2. Measure outer diameter of piston pin "Dp".
   **Standard diameter "Dp":**
   **21.989 - 22.001 mm (0.8657 - 0.8662 in)**
3. Calculate piston pin clearance.
   **dp – Dp = –0.004 to 0 mm (–0.0002 to 0 in)**

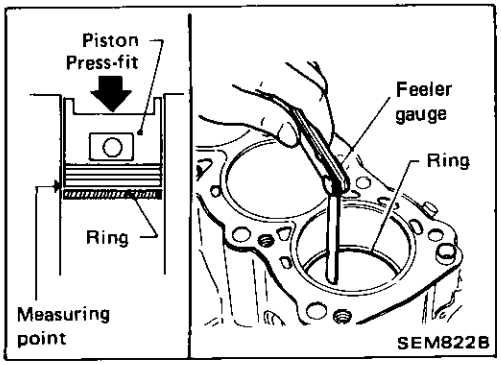
If it exceeds the above value, replace piston assembly with pin.




### PISTON RING SIDE CLEARANCE

**Side clearance:**
**Top ring**
**0.040 - 0.073 mm (0.0016 - 0.0029 in)**
**2nd ring**
**0.030 - 0.063 mm (0.0012 - 0.0025 in)**
**Max. limit of side clearance:**
**0.1 mm (0.004 in)**
**O-ring:**
**0.015 - 0.185 mm (0.0006 - 0.0073 in)**

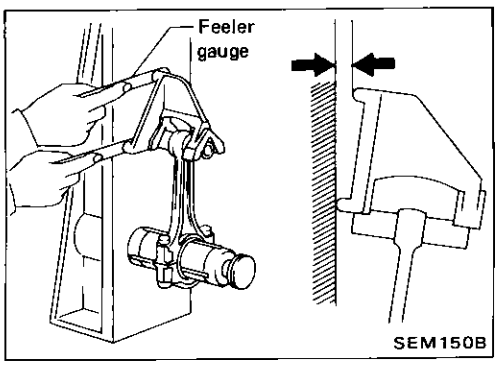
If out of specification, replace piston and/or piston ring assembly.




### PISTON RING END GAP

**End gap:**
**Top ring**
**0.21 - 0.40 mm (0.0083 - 0.0157 in)**
**2nd ring**
**0.50 - 0.76 mm (0.0197 - 0.0299 in)**
**Oil ring**
**0.20 - 0.76 mm (0.0079 - 0.0299 in)**
**Max. limit of end gap:**
**1.0 mm (0.039 in)**

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



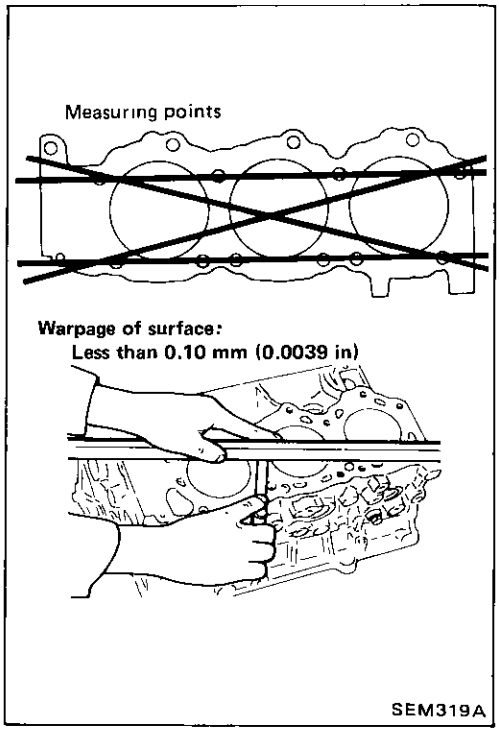

### CONNECTING ROD BEND AND TORSION

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

If it exceeds the limit, replace connecting rod assembly.

## Inspection (Cont'd)

### CYLINDER BLOCK DISTORTION AND WEAR

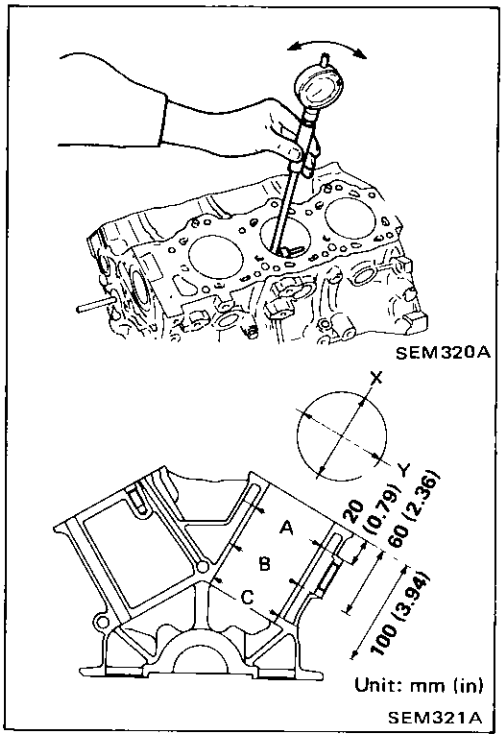



1. Clean upper face of cylinder block and measure the distortion.
   **Limit:**
   **0.10 mm (0.0039 in)**
2. If out of specification, resurface it.
   The resurfacing limit is determined by cylinder head resurfacing in engine.

**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)**

3. If necessary, replace cylinder block.

### PISTON-TO-BORE CLEARANCE

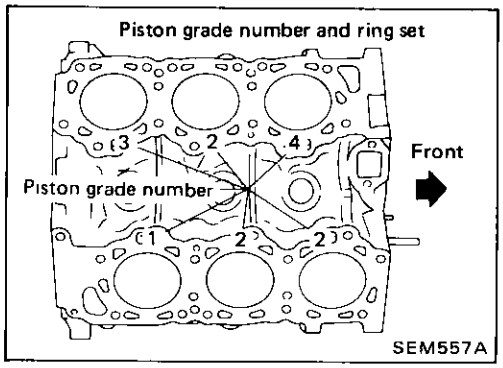



**Method A (Using bore gauge and micrometer)**

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

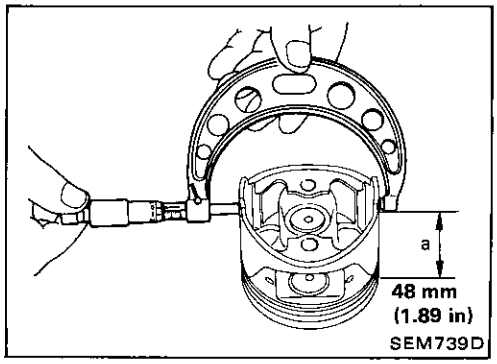
If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

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

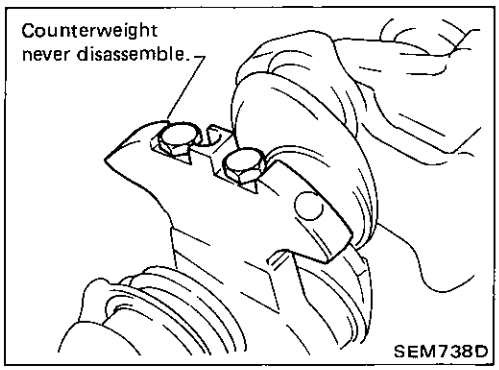
**Oversize pistons are available for service. Refer to S.D.S.**

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. Do not cut more than 0.05 mm (0.0020 in) in diameter at a time.**

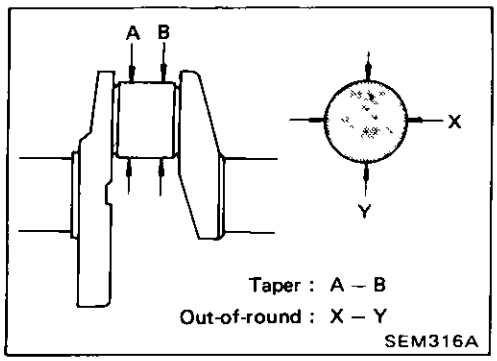
9. Hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.

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



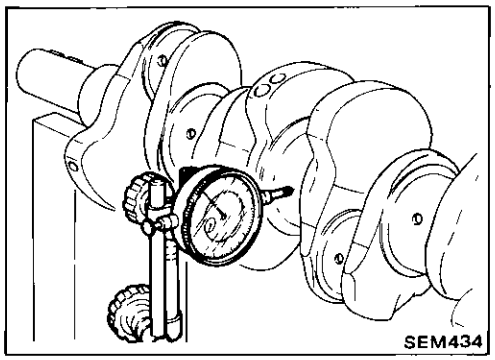

### CRANKSHAFT

**CAUTION:**
**Never attempt to disassemble crankshaft counter weight.**

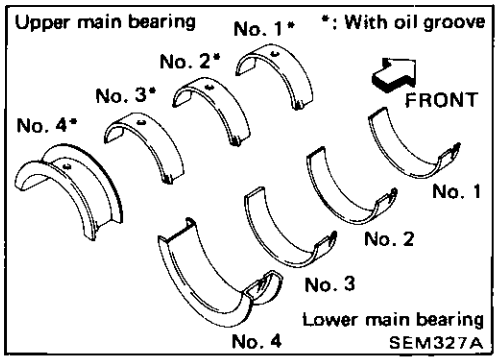



1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.
   **Out-of-round (X – Y):**
   **Less than 0.005 mm (0.0002 in)**
   **Taper (A – B):**
   **Less than 0.005 mm (0.0002 in)**
   **Limit:**
   **0.02 mm (0.0008 in)**

## Inspection (Cont'd)


SEM434

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



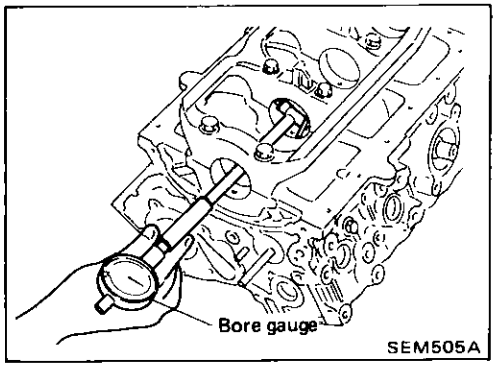

### BEARING CLEARANCE

- 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**

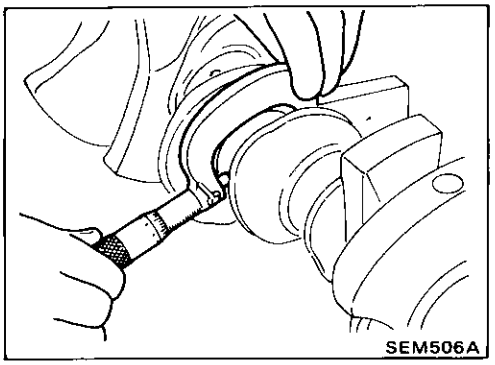
1. Set main bearings in their proper positions on cylinder block and main bearing cap.



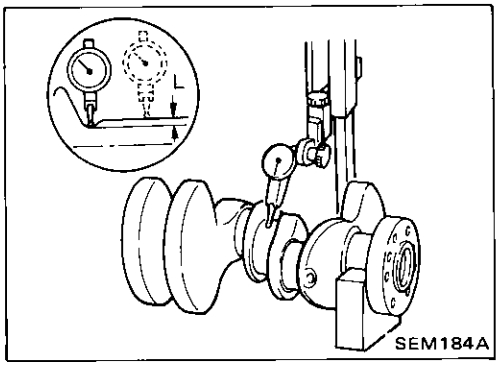

2. Install main bearing cap to cylinder block.

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

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

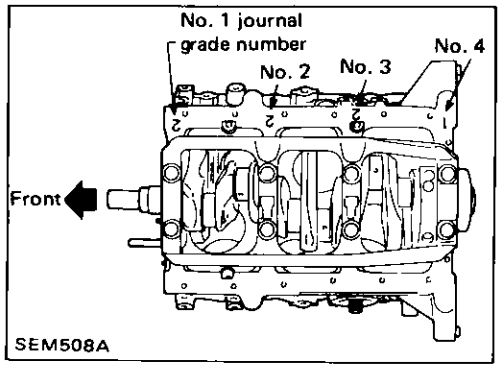

SEM506A

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



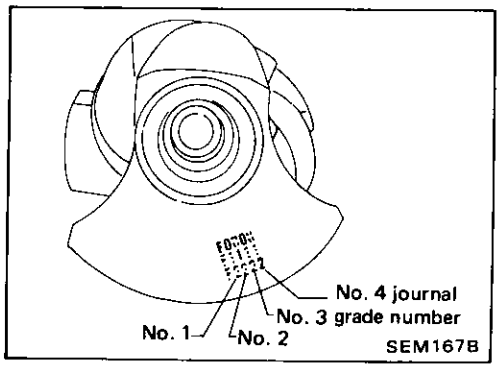

a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.
   **"L": 0.1 mm (0.004 in)**
b. Refer to S.D.S. for grinding crankshaft and available service parts.

## Inspection (Cont'd)




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

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



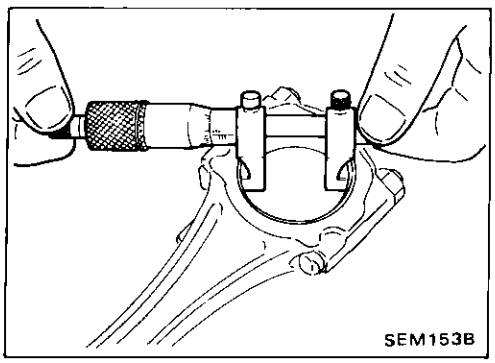

b. Grade number of each crankshaft main journal is punched on the No. 1 counter weight of crankshaft.

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

**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



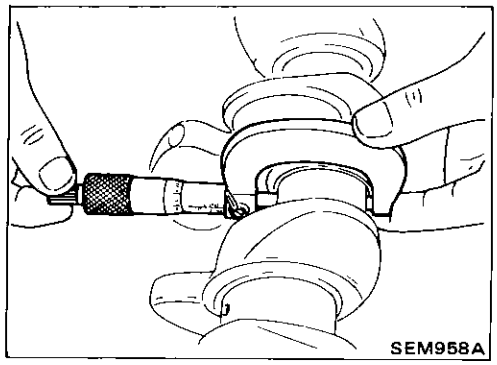

### Connecting rod bearing (Big end)

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)




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

**Connecting rod bearing clearance (C – Dp):**

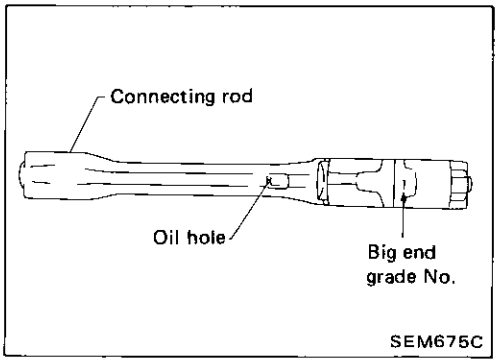
**Standard**

**0.028 - 0.048 mm (0.0011 - 0.0019 in)**

**Limit**

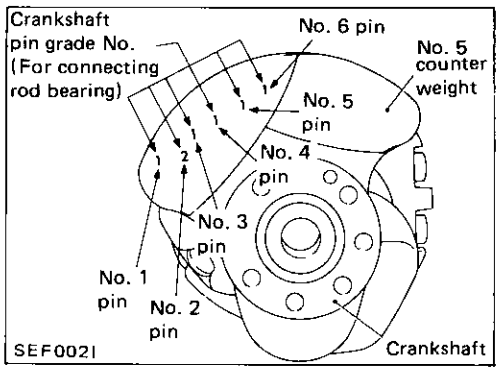
**0.090 mm (0.0035 in)**

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




8. If crankshaft, connecting rods or bearings are replaced with new ones, it is necessary to select thickness of connecting rod bearings as follows:

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




b. Grade number of each crankshaft pin journal is punched on the No. 5 counter weight of crankshaft.

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

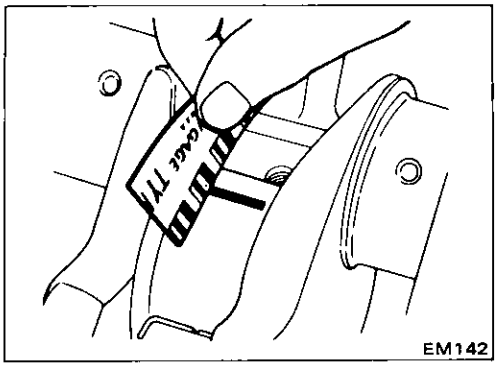
**Connecting rod bearing grade number:**

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

For example:

Connecting rod big end grade number: 1
Crankshaft pin grade number: 2
Connecting rod bearing grade number = 1 + 2
= 3

## Inspection (Cont'd)

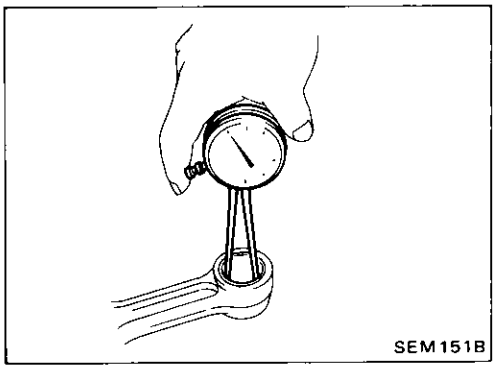

EM142

**Method B (Using "plastigage")**

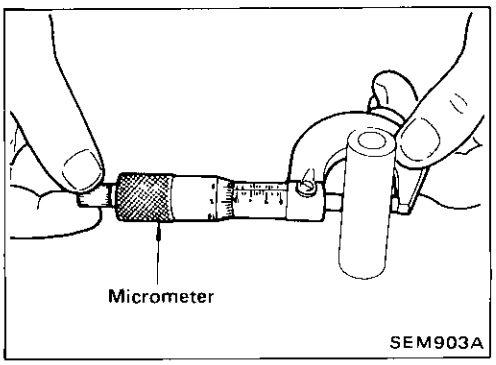
**CAUTION:**

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

### CONNECTING ROD BUSHING CLEARANCE (Small end)


SEM151B

1. Measure inner diameter "C" of bushing.



SEM903A

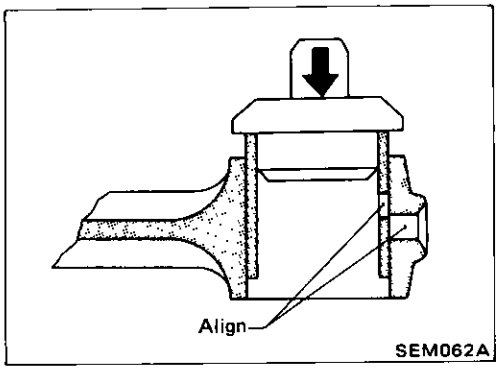
2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bushing clearance.

   **C – Dp = 0.005 - 0.017 mm (0.0002 - 0.0007 in)**

   **Limit: 0.023 mm (0.0009 in)**

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

### REPLACEMENT OF CONNECTING ROD BUSHING (Small end)



SEM062A

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

**Be sure to align the oil holes.**

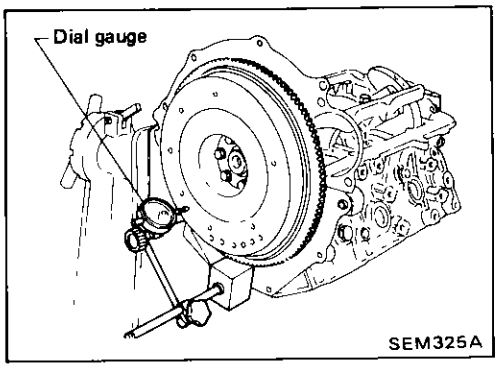
2. After driving in small end bushing, ream the bushing.

   **Small end bushing inside diameter:**

   **Finished size**

   **22.000 - 22.012 mm (0.8661 - 0.8666 in)**

### FLYWHEEL/DRIVE PLATE RUNOUT



SEM325A

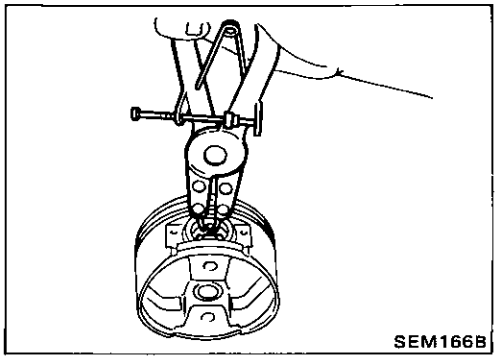
**Runout (Total indicator reading):**

**Flywheel (M/T model)**

**Less than 0.15 mm (0.0059 in)**

**Drive plate (A/T model)**

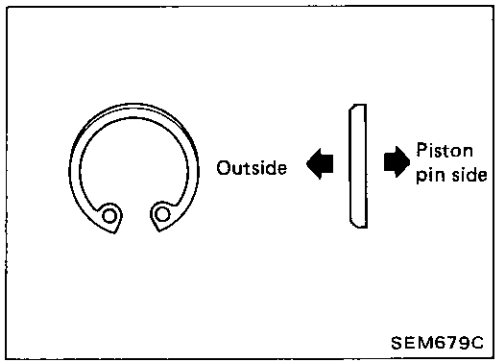
**Less than 0.15 mm (0.0059 in)**


SEM166B

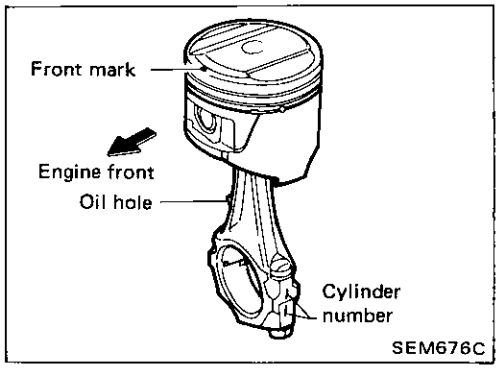
## Assembly

### PISTON

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

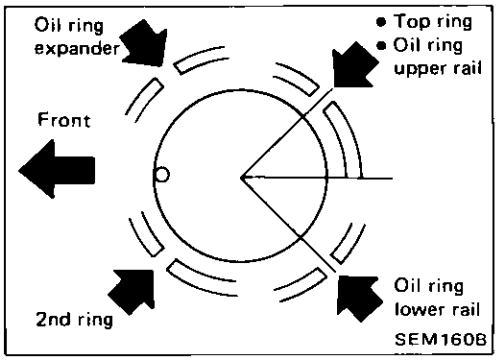


SEM679C



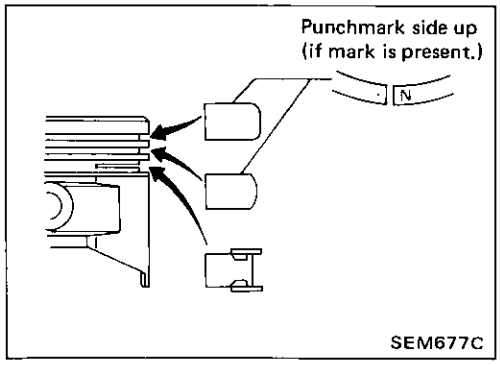
SEM676C

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.**



SEM160B

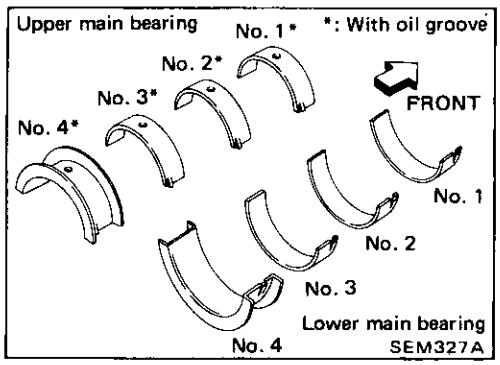
3. Set piston rings as shown.



SEM677C

## Assembly (Cont'd)

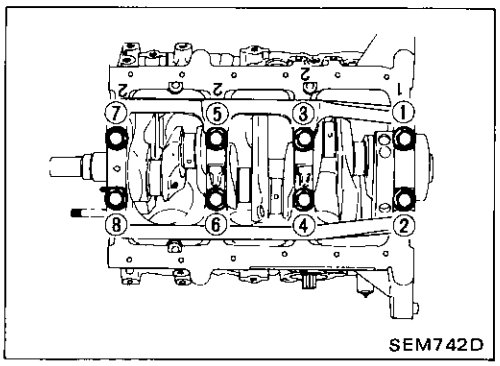
### CRANKSHAFT




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

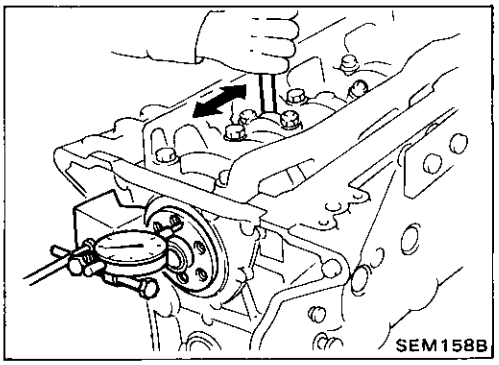
- **Confirm that correct main bearings are used.**

**Refer to "Inspection".**




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

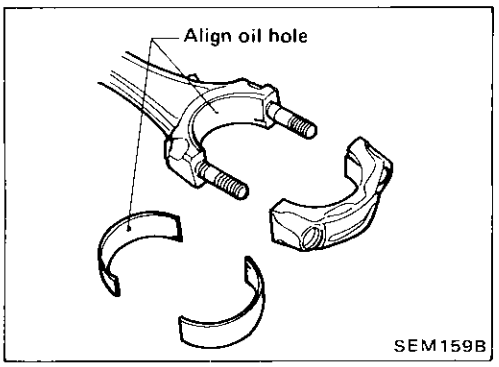
- **Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward sequentially.**
- **After securing bearing cap bolts, make sure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




3. Measure crankshaft end play.

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

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

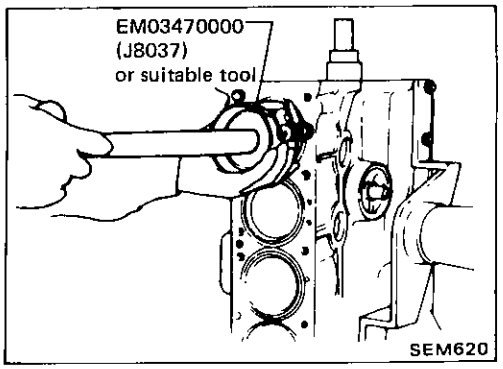



4. Install connecting rod bearings in connecting rods and connecting rod caps.

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

**Refer to "Inspection".**

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

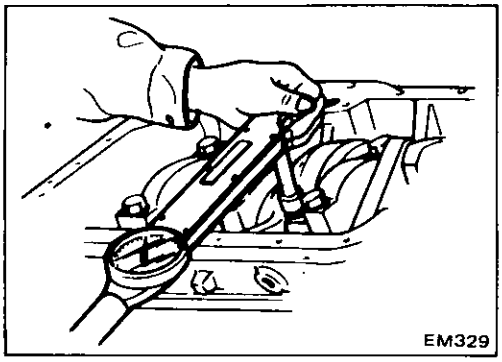



5. Install pistons with connecting rods.

a. Install them into corresponding cylinders with Tool.

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

## Assembly (Cont'd)

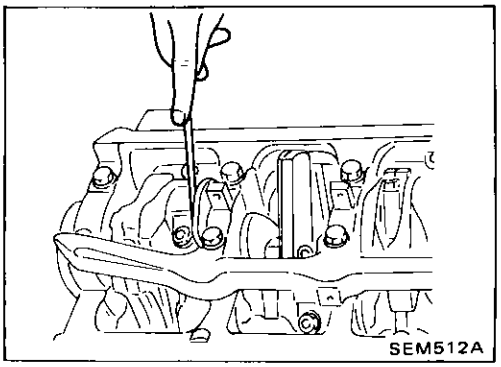



b. Install connecting rod bearing caps.
Tighten connecting rod bearing cap nuts to the specified torque.

**: Connecting rod bearing nut**

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

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




6. Measure connecting rod side clearance.

**Connecting rod side clearance:**

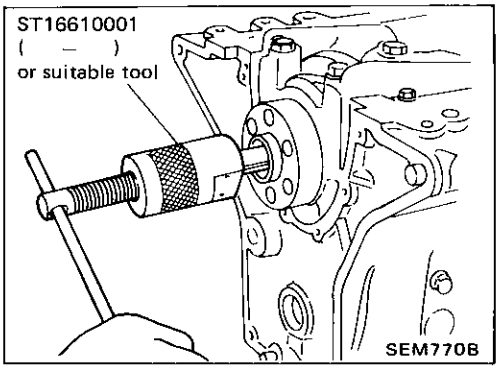
**Standard**

**0.20 - 0.35 mm (0.0079 - 0.0138 in)**

**Limit**

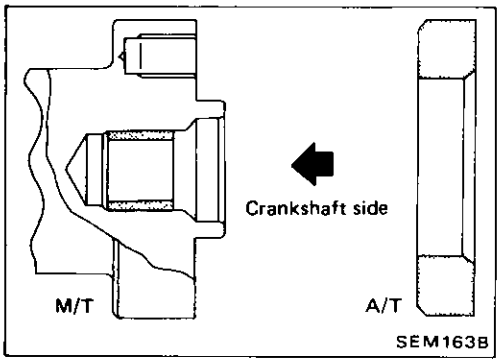
**0.40 mm (0.0157 in)**

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




### REPLACING PILOT BUSHING

1. Remove pilot bushing (M/T)/pilot converter (A/T).

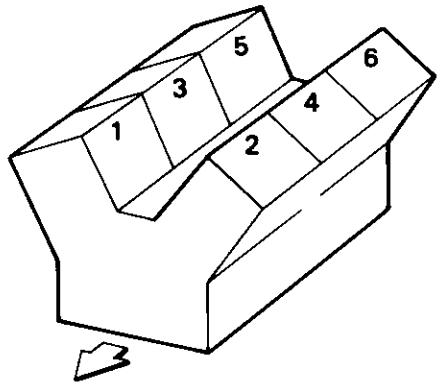



2. Install pilot bushing (M/T)/pilot converter (A/T).

## General Specifications

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

Cylinder number




SEM713A

### COMPRESSION PRESSURE

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

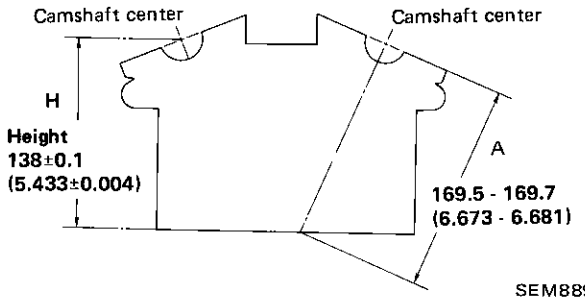
| | Non-Turbo | Turbo |
|---|---|---|
| Compression pressure | | |
| Standard | 1,285 (13.1, 186) | 1,177 (12.0, 171) |
| Minimum | 981 (10.0, 142) | 883 (9.0, 128) |
| Differential limit between cylinders | 98 (1.0, 14) | |

## Inspection and Adjustment

### CYLINDER HEAD

Unit: mm (in)

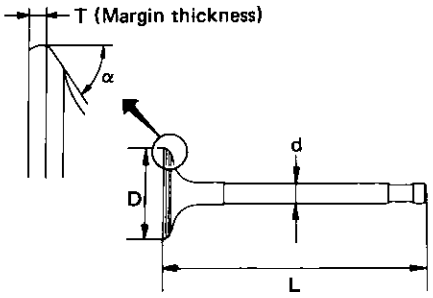
| | Standard | Limit |
|---|---|---|
| Head surface distortion | Less than 0.05 (0.0020) | 0.1 (0.004) |




SEM889D

### VALVE

Unit: mm (in)




SEM188

| | |
|---|---|
| Valve head diameter "D" | |
| Intake | 34.0 - 34.2 (1.339 - 1.346) |
| Exhaust | 29.5 - 29.7 (1.161 - 1.169) |
| Valve length "L" | |
| Intake | 103.1 - 103.3 (4.059 - 4.067) |
| Exhaust | 103.6 - 103.8 (4.079 - 4.087) |
| Valve stem diameter "d" | |
| Intake | 5.965 - 5.980 (0.2348 - 0.2354) |
| Exhaust | 5.945 - 5.960 (0.2341 - 0.2346) |
| Valve seat angle "α" | |
| Intake | 45°15' - 45°45' |
| Exhaust | |
| Valve margin "T" | |
| Intake | 1.15 - 1.45 (0.0453 - 0.0571) |
| Exhaust | 1.35 - 1.65 (0.0531 - 0.0650) |
| Valve margin "T" limit | More than 0.5 (0.020) |
| Valve stem end surface grinding limit | Less than 0.2 (0.008) |
| Valve clearance | |
| Intake | 0 (0) |
| Exhaust | 0 (0) |

### Valve spring

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

### Hydraulic valve lifter

Unit: mm (in)

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

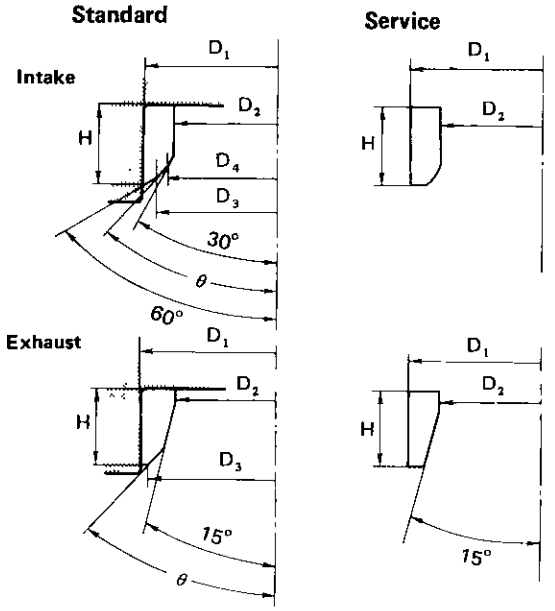
### Valve guide

Unit: mm (in)

| | | Standard | Service |
|---|---|---|---|
| Valve guide Outer diameter | | 10.023 - 10.034 (0.3946 - 0.3950) | 10.223 - 10.234 (0.4025 - 0.4029) |
| Valve guide Inner diameter (Finished size) | | 6.000 - 6.018 (0.2362 - 0.2369) | |
| Cylinder head valve guide hole diameter | | 9.975 - 9.996 (0.3927 - 0.3935) | 10.175 - 10.196 (0.4006 - 0.4014) |
| Interference fit of valve guide | | 0.027 - 0.059 (0.0011 - 0.0023) | |
| | | Standard | Max. tolerance |
| Stem to guide clearance | Intake | 0.020 - 0.053 (0.0008 - 0.0021) | 0.10 (0.0039) |
| | Exhaust | 0.040 - 0.073 (0.0016 - 0.0029) | |
| Valve deflection limit | | — | 0.20 (0.0079) |

## Inspection and Adjustment (Cont'd)

### VALVE SEAT




SEM529C

Unit: mm (in)

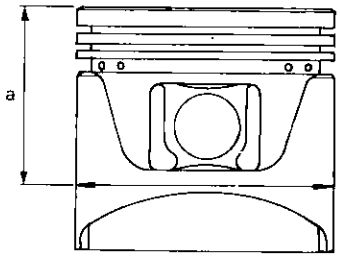
| | | Standard | Service* |
|---|---|---|---|
| Cylinder head seat recess diameter ($D_1$) | In. | 36.000 - 36.016 (1.4173 - 1.4179) | 36.500 - 36.516 (1.4370 - 1.4376) |
| | Ex. | 31.500 - 31.516 (1.2402 - 1.2408) | 32.000 - 32.016 (1.2598 - 1.2605) |
| Valve seat interference fit | In. | 0.081 - 0.113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

## Inspection and Adjustment (Cont'd)

### PISTON, PISTON RING AND PISTON PIN

#### Available piston

Unit: mm (in)




SEM740D

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

#### Piston ring

Unit: mm (in)

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

#### Piston pin

Unit: mm (in)

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

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

### CONNECTING ROD

Unit: mm (in)

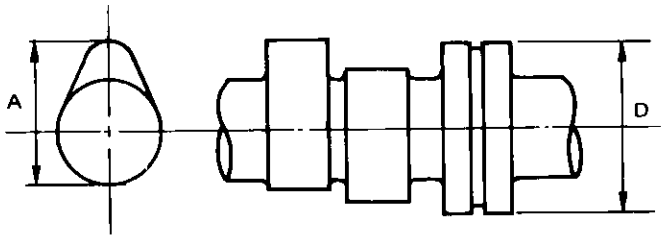
| | |
|---|---|
| Center distance | 154.1 - 154.2 (6.067 - 6.071) |
| Bend [per 100 (3.94)] Limit | 0.15 (0.0059) |
| Torsion [per 100 (3.94)] Limit | 0.3 (0.012) |
| Piston pin bushing inner diameter* | 22.000 - 22.012 (0.8661 - 0.8666) |
| Connecting rod big end inner diameter | 53.000 - 53.013 (2.0866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

*After installing in connecting rod

## Inspection and Adjustment (Cont'd)

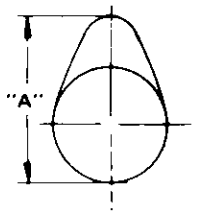
### CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)




SEM568A

| | Standard | Max. tolerance |
|---|---|---|
| Camshaft journal to bearing clearance | 0.045 - 0.086 (0.0018 - 0.0034) | 0.15 (0.0059) |
| Inner diameter of camshaft bearing | 28.000 - 28.021 (1.1024 - 1.1032) | – |
| Outer diameter of camshaft journal | 27.935 - 27.955 (1.0998 - 1.1006) | – |
| Camshaft runout [T.I.R.*] | Less than 0.04 (0.0016) | 0.1 (0.004) |
| Camshaft end play | 0.03 - 0.08 (0.0012 - 0.0031) | – |

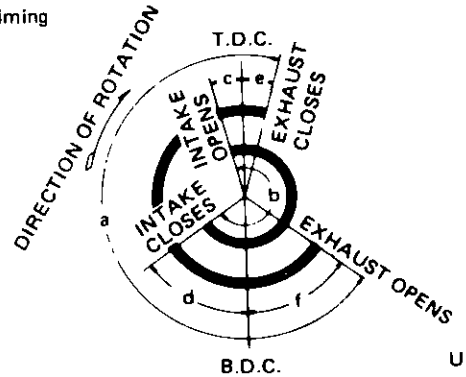



EM671

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

*Total indicator reading

Valve timing



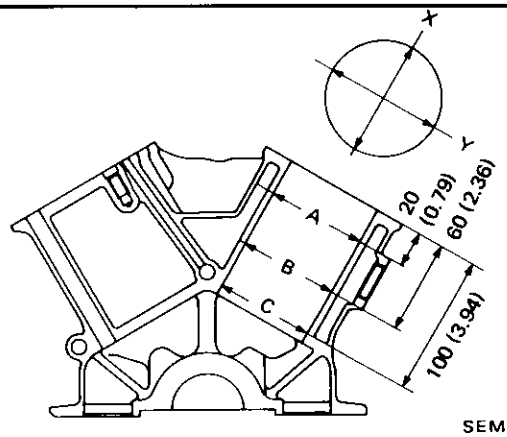

EM120

Unit: degree

| a | b | c | d | e | f |
|---|---|---|---|---|---|
| 248 | 248 | –1 | 69 | 9 | 59 |

### CYLINDER BLOCK

Unit: mm (in)




SEM321A

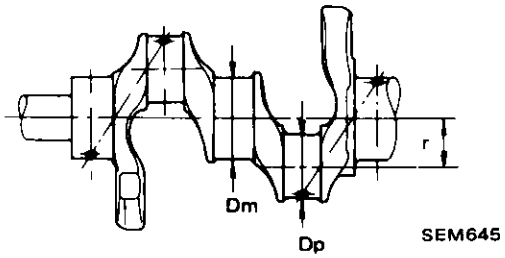
| | |
|---|---|
| Surface flatness | |
| Standard | Less than 0.03 (0.0012) |
| Limit | 0.10 (0.0039) |
| Cylinder bore | |
| Inner diameter | |
| Standard | |
| Grade No. 1 | 87.000 - 87.010 (3.4252 - 3.4256) |
| Grade No. 2 | 87.010 - 87.020 (3.4256 - 3.4260) |
| Grade No. 3 | 87.020 - 87.030 (3.4260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

## Inspection and Adjustment (Cont'd)

### CRANKSHAFT

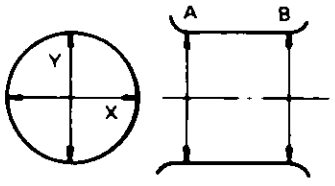
Unit: mm (in)

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



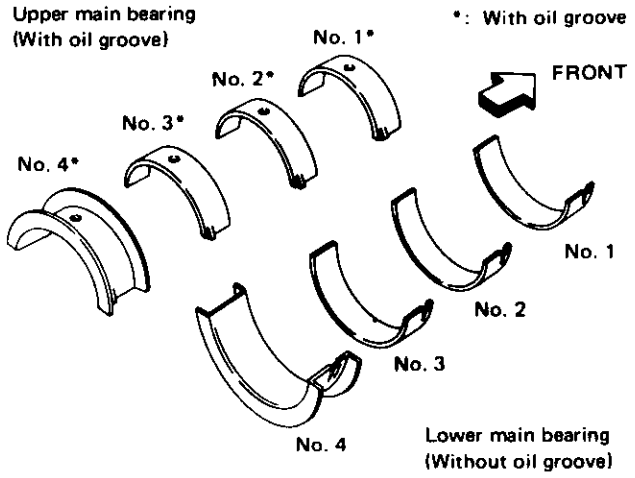

SEM645

Out-of-round X – Y
Taper A – B




EM715

### AVAILABLE MAIN BEARING




SEM327A

#### No. 1 main bearing

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

#### No. 2 and 3 main bearing

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

## Inspection and Adjustment (Cont'd)

### No. 4 main bearing

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

### Undersize

Unit: mm (in)

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

## AVAILABLE CONNECTING ROD BEARING

### Connecting rod bearing

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

### Undersize

Unit: mm (in)

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

## TURBOCHARGER

Unit: mm (in)

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

*Total indicator reading

## MISCELLANEOUS COMPONENTS

Unit: mm (in)

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

*Total indicator reading

### Bearing clearance

Unit: mm (in)

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

# ENGINE LUBRICATION & COOLING SYSTEMS

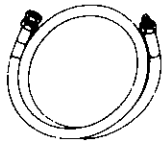
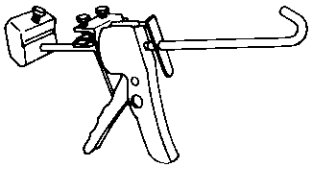
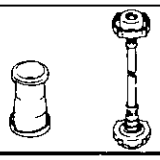
# SECTION LC

LC

## CONTENTS


PREPARATION ..... LC- 2
PRECAUTIONS ..... LC- 3
ENGINE LUBRICATION SYSTEM ..... LC- 4
ENGINE COOLING SYSTEM ..... LC- 8
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... LC-14

## SPECIAL SERVICE TOOLS

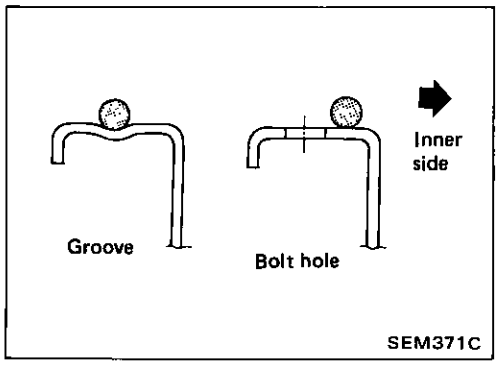
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description |
|---|---|
| ST25051001<br>(J25695-1)<br>Oil pressure gauge | |
| ST25052000<br>(J25695-2)<br>Hose | Adapting oil pressure gauge to cylinder block<br>  |
| WS39930000<br>( — )<br>Tube presser | Pressing the tube of liquid gasket<br>  |
| EG17650301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

## Supplemental Restraint System "AIR BAG"

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

**WARNING:**

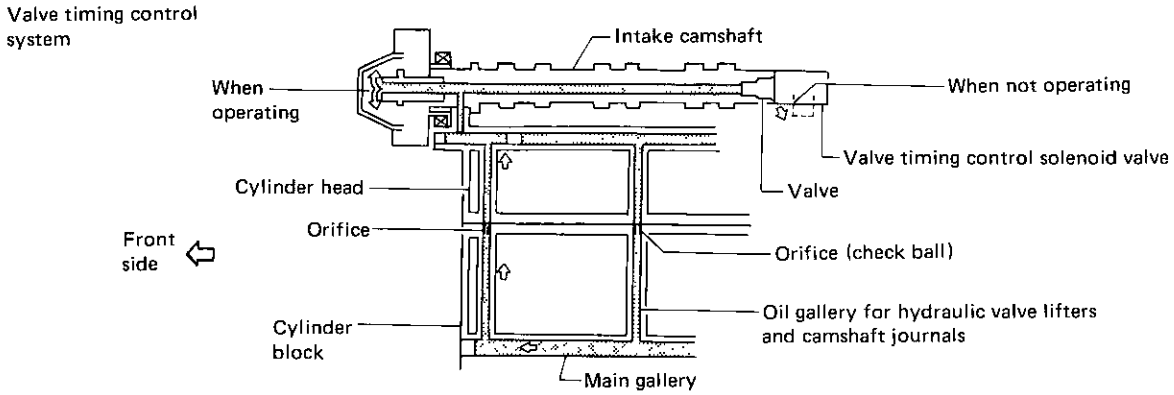
a. **To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.**
b. **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal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

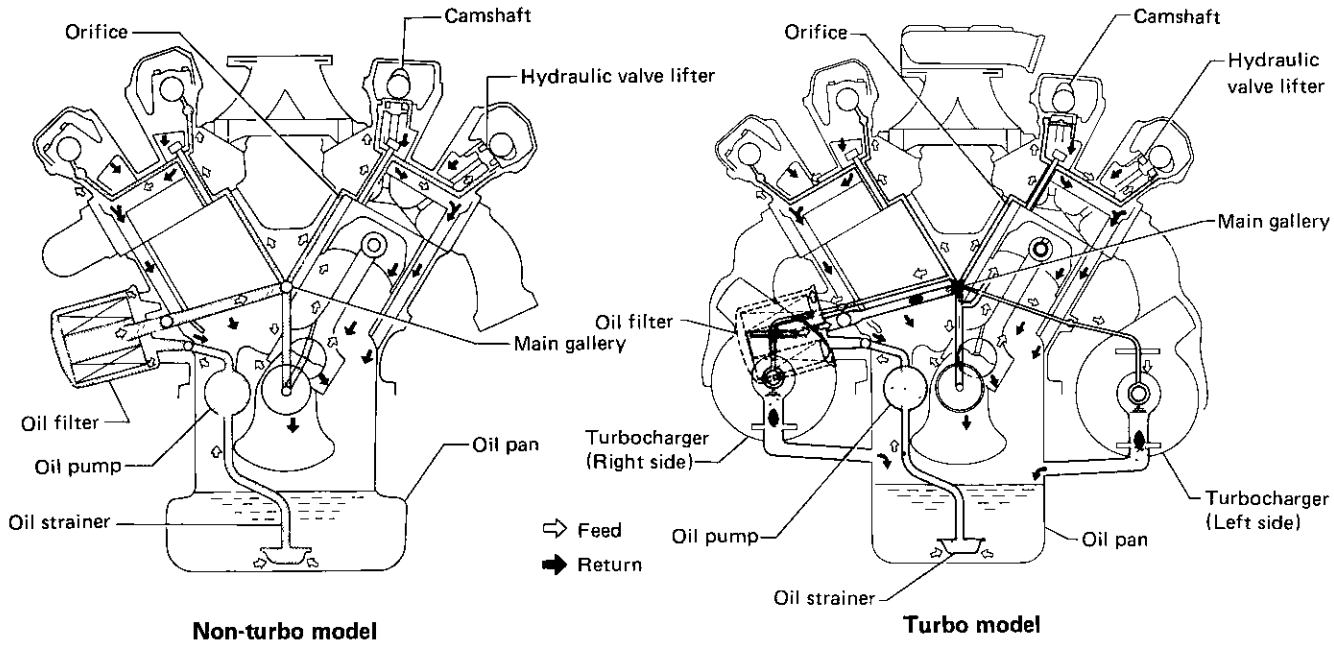



## Liquid Gasket Application Procedure

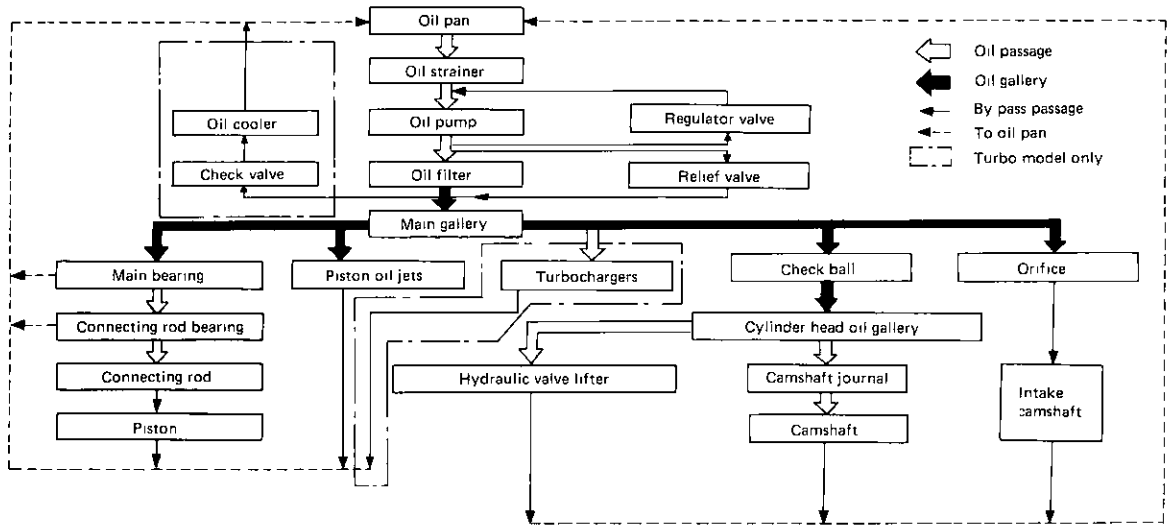
a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.
b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - Be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

## Lubrication Circuit

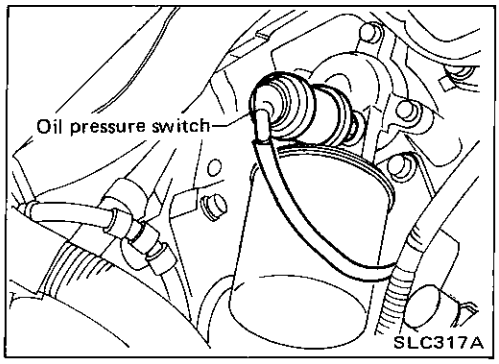



**Non-turbo model** **Turbo model**




SLC580A

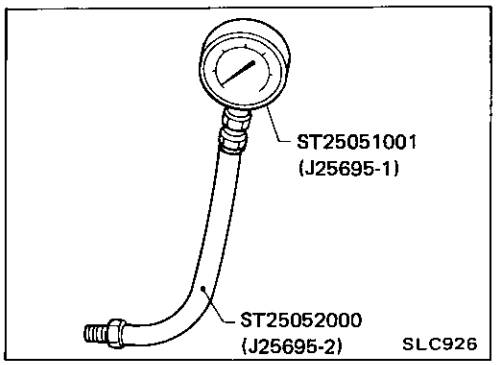



## Oil Pressure Check

**WARNING:**

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

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

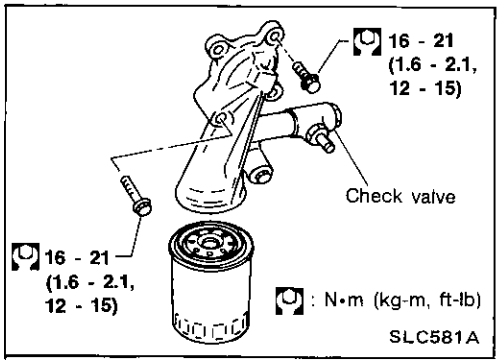



3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

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

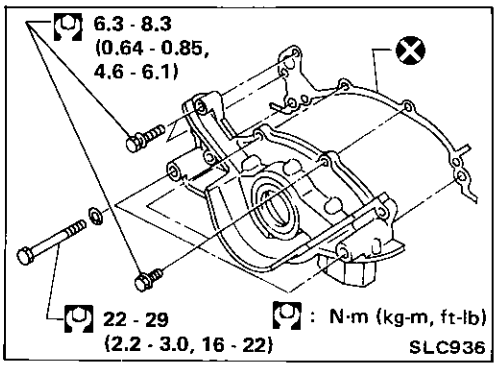
**If difference is extreme, check oil passage and oil pump for oil leaks.**

6. Install oil pressure switch with sealant.




## Oil Filter Bracket (Turbo model)

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



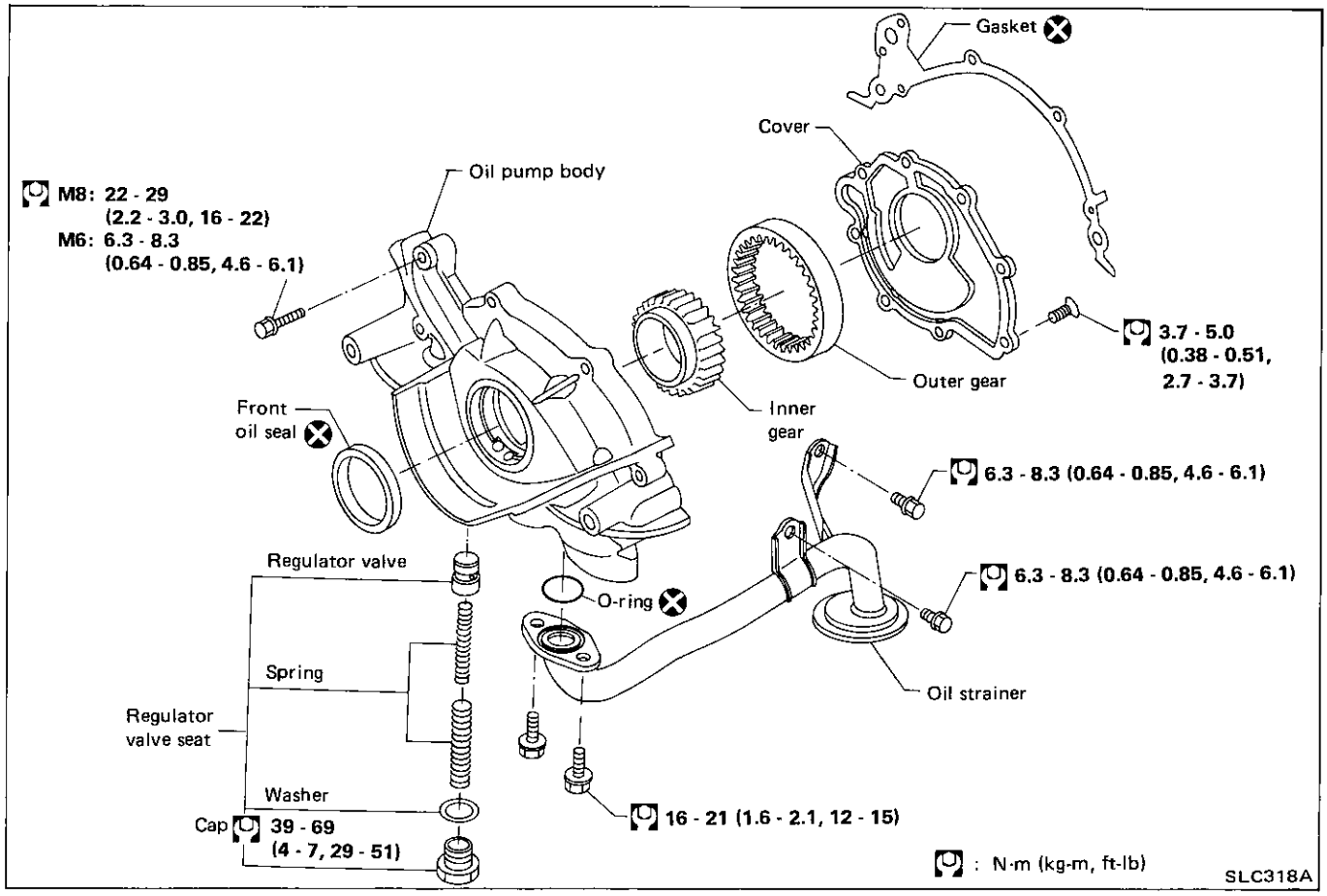

## Oil Pump

### REMOVAL

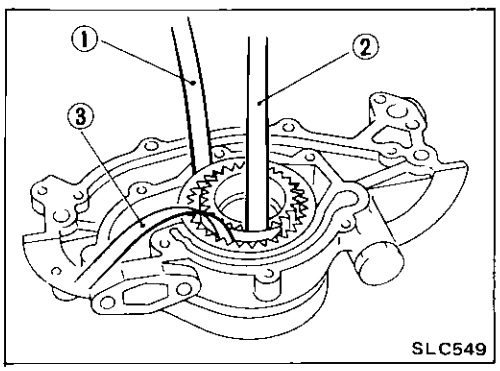
1. Drain oil.
2. Remove oil pan. (Refer to "OIL PAN — Removal" in EM section.)
3. Remove oil pump assembly.

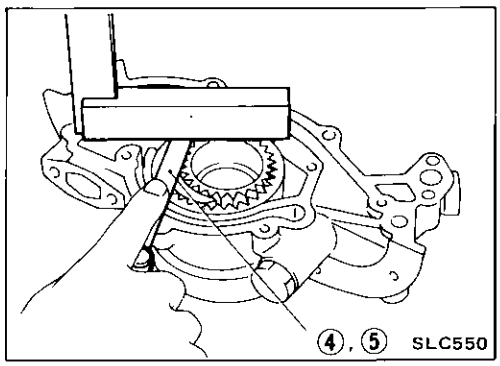
## Oil Pump (Cont'd)

### DISASSEMBLY AND ASSEMBLY




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



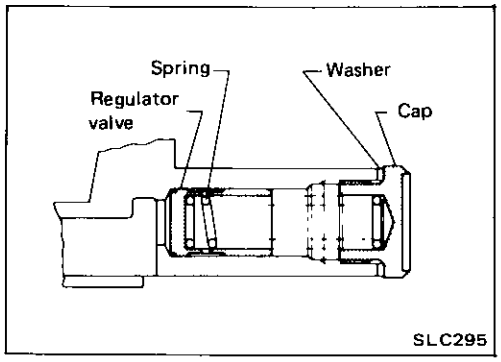

### INSPECTION

Using a feeler gauge, check the following clearances:

| **Standard clearance:** | Unit: mm (in) |
|---|---|
| Body to outer gear clearance ① | 0.110 - 0.200 (0.0043 - 0.0079) |
| Inner gear to crescent clearance ② | 0.223 - 0.333 (0.0088 - 0.0131) |
| Outer gear to crescent clearance ③ | 0.210 - 0.320 (0.0083 - 0.0126) |
| Housing to inner gear clearance ④ | 0.050 - 0.090 (0.0020 - 0.0035) |
| Housing to outer gear clearance ⑤ | 0.050 - 0.110 (0.0020 - 0.0043) |

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

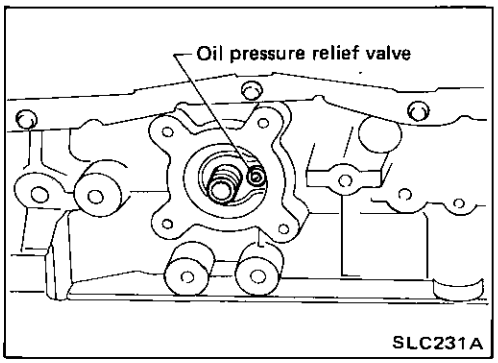
## Oil Pump (Cont'd)




### REGULATOR VALVE INSPECTION

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check 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.**

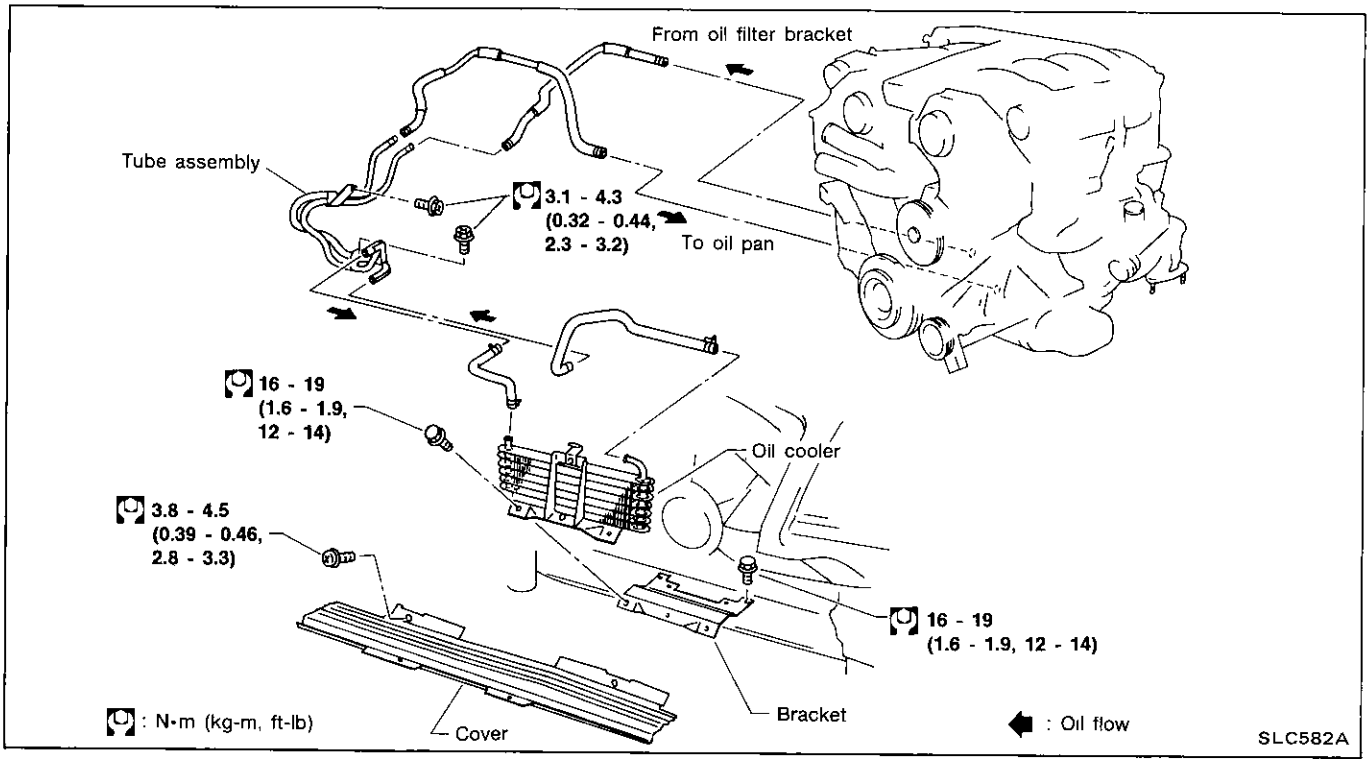



### OIL PRESSURE RELIEF VALVE INSPECTION

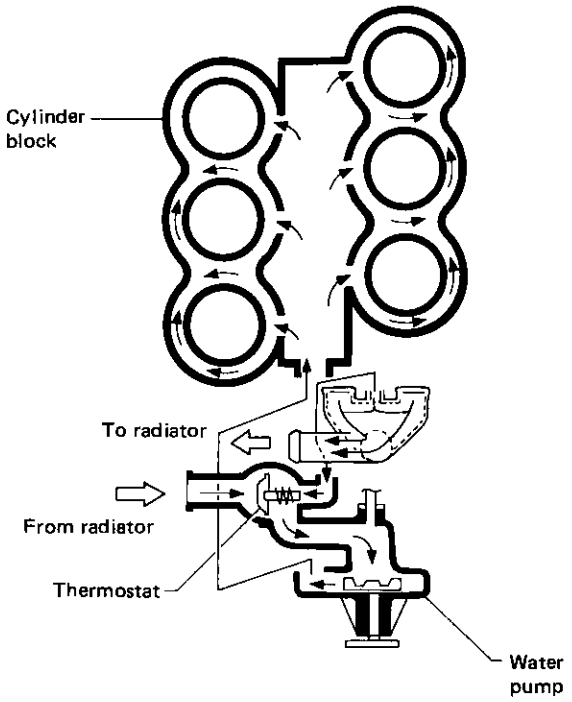
Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a suitable tool.
Install a new valve by tapping it in place.

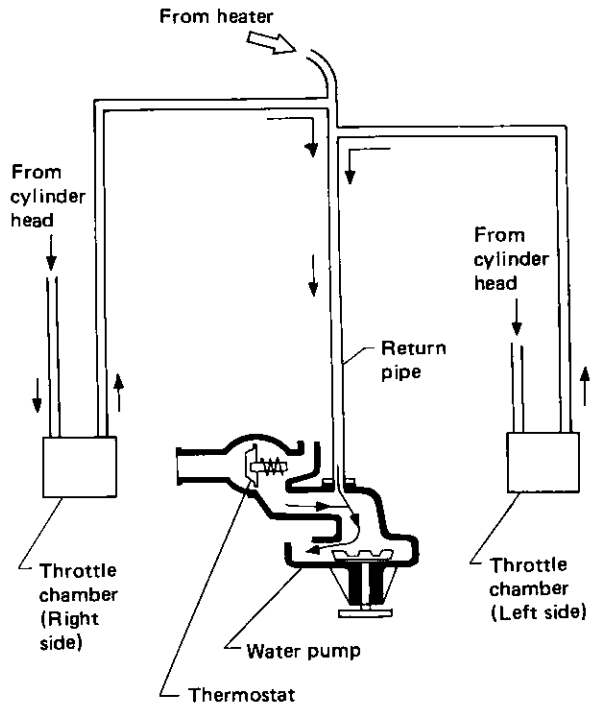
## Oil Cooler (Turbo model)

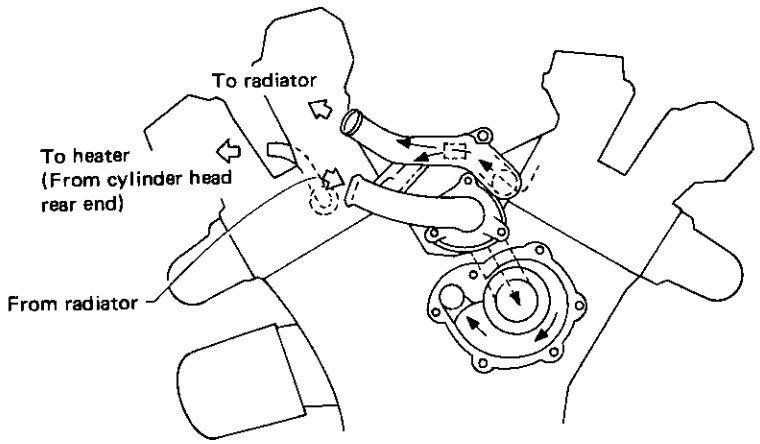
### DISASSEMBLY AND ASSEMBLY

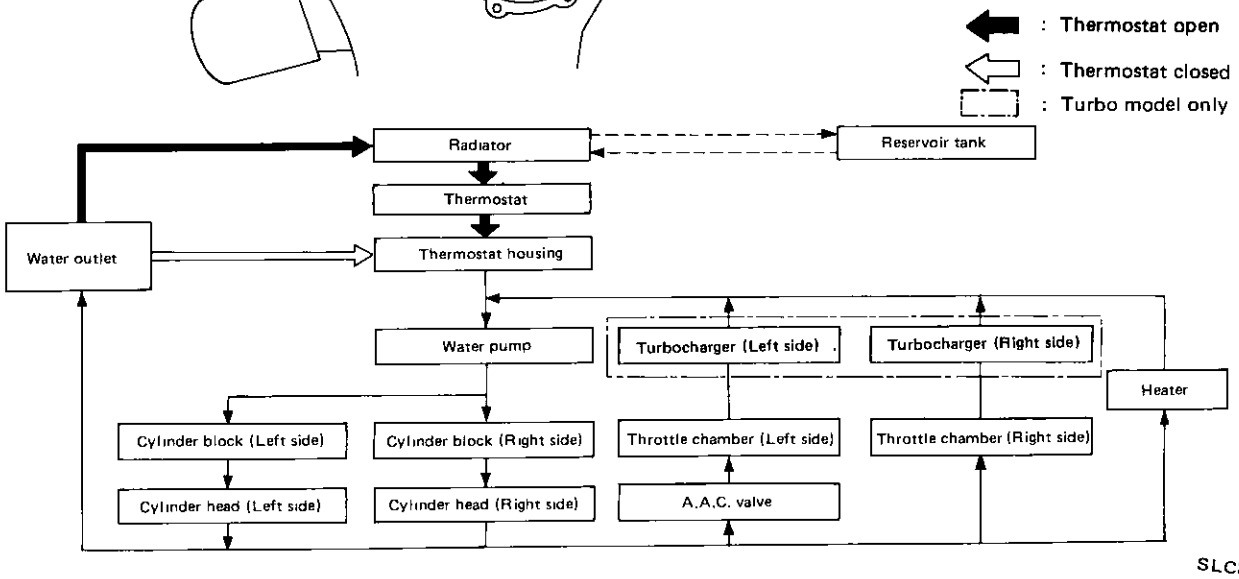


## Cooling Circuit



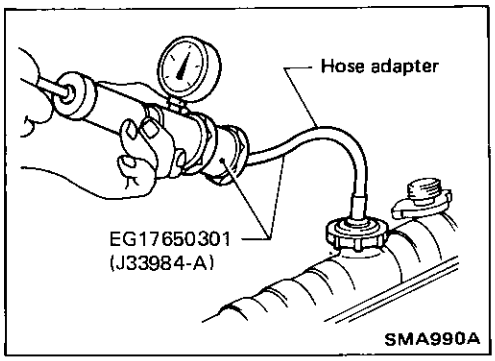

SLC343A

## System Check

**WARNING:**
**Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.**
**Wrap a thick cloth around the cap and carefully remove by turning it a quarter turn to allow built-up pressure to escape. Then continue to turn the cap until it can be removed safely.**

### CHECKING COOLING SYSTEM HOSES

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

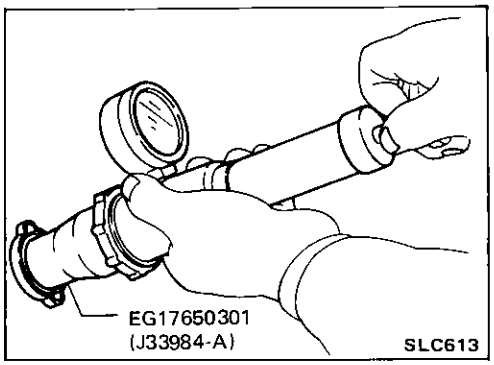



### CHECKING COOLING SYSTEM FOR LEAKS

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

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

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




### CHECKING RADIATOR CAP

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

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

## Water Pump

### REMOVAL AND INSTALLATION

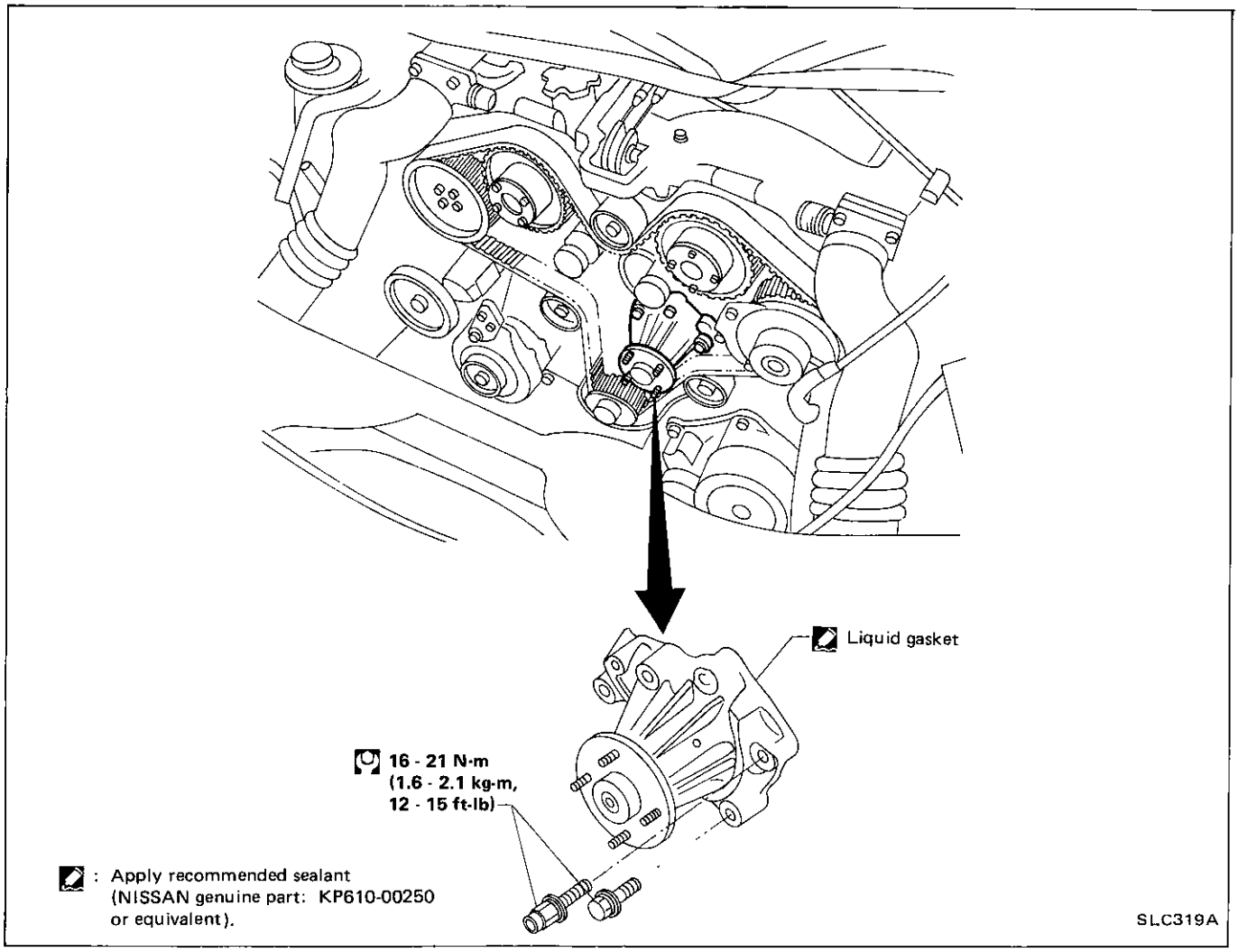
1. Drain coolant from drain cocks on both sides of cylinder block and radiator.
2. Remove the following parts:

- Under cover
- Radiator
- Drive belts
- Cooling fan and coupling
- Water inlet and outlet

## Water Pump (Cont'd)

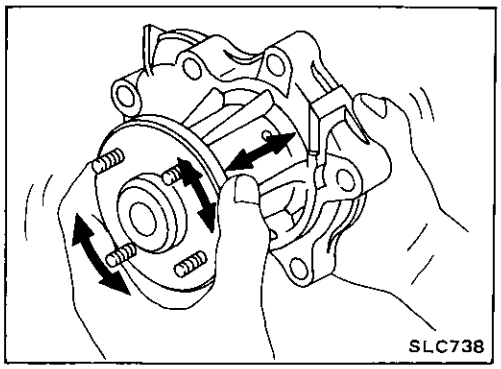
- Crank pulley
- Timing belt cover

3. Remove water pump
4. After repairing or replacing water pump, install any parts removed in reverse order of removal.




**CAUTION:**

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



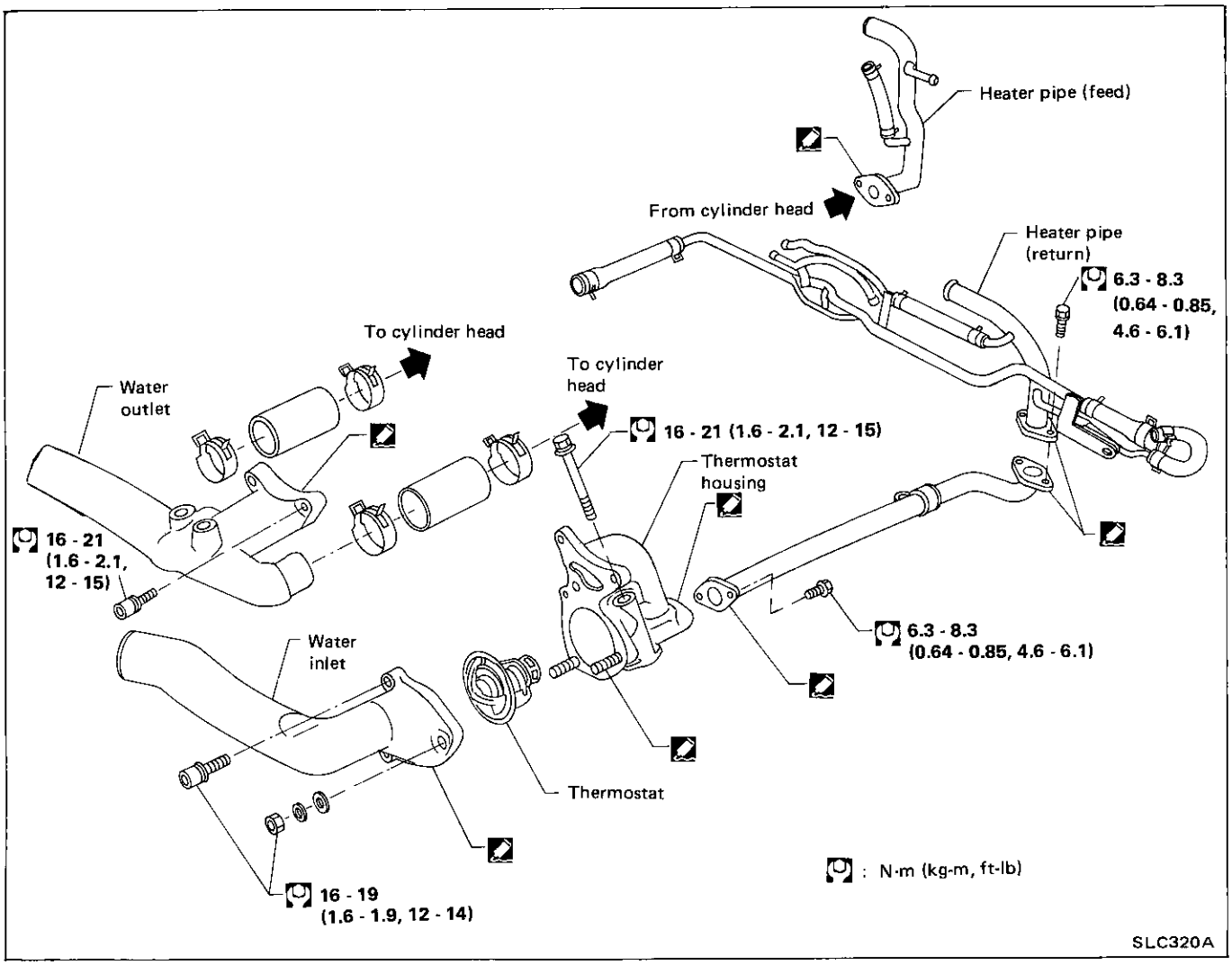

### INSPECTION

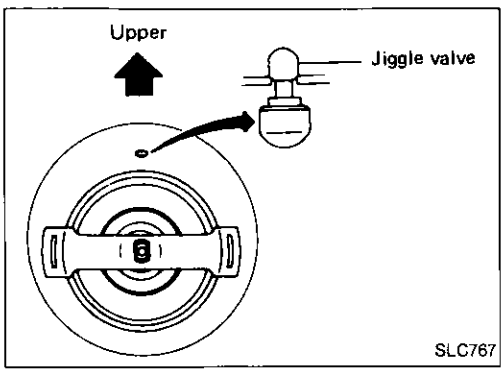
1. Check for badly rusted or corroded vanes and body assembly.
2. Check for rough operation due to excessive end play.

## Thermostat

### REMOVAL AND INSTALLATION

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



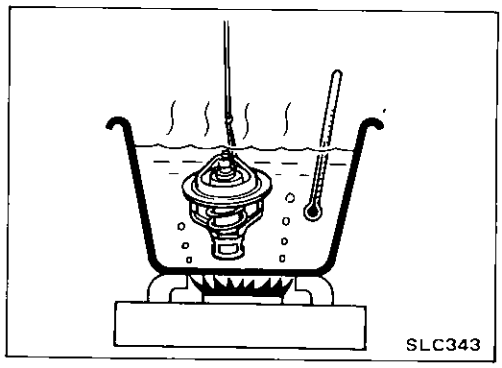




4. After repairing or replacing thermostat, install thermostat with jiggle valve facing upward.

## Thermostat (Cont'd)

### INSPECTION

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

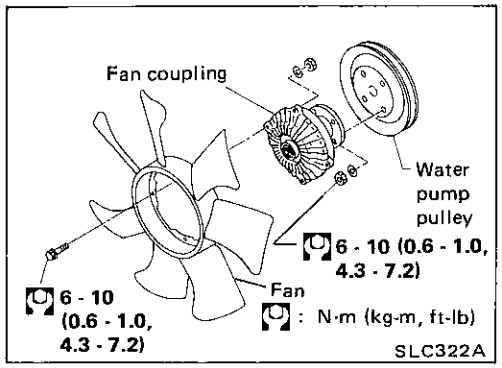



2. Check valve opening temperature and maximum valve lift.

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

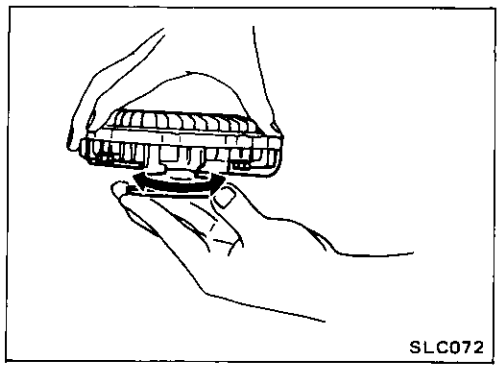
3. Then check if valve is 5°C (9°F) below valve opening temperature.

- **After installation, run engine for a few minutes, and check for leaks.**
- **Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.**




## Cooling Fan

### DISASSEMBLY AND ASSEMBLY



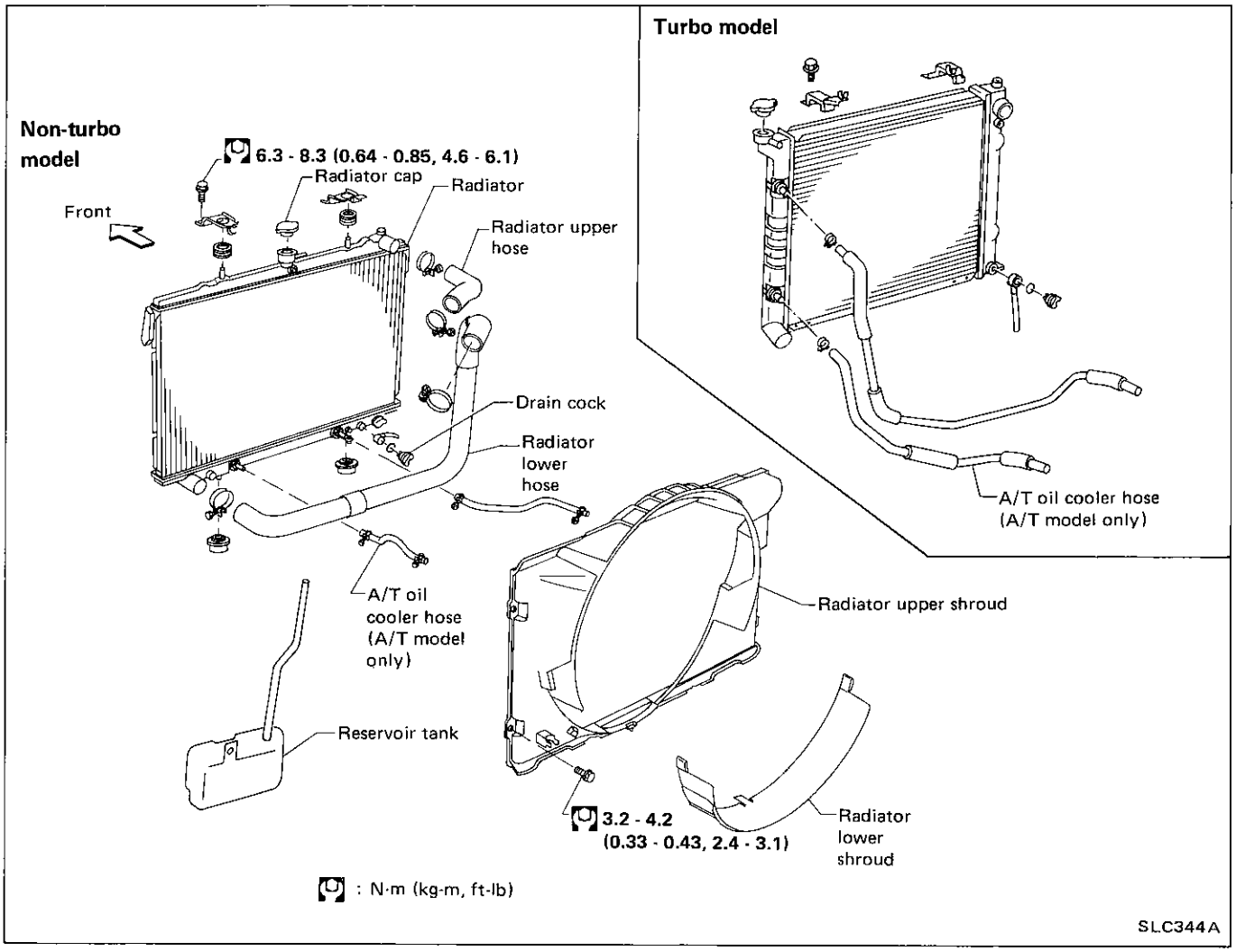

### INSPECTION

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

## Radiator

### REMOVAL AND INSTALLATION

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




## Electric Cooling Fan Control System

Radiator (Condenser) fan is controlled by E.C.C.S. control unit. For details, refer to EF & EC section.

# Engine Lubrication System

## Oil pressure check

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

## Oil pump

Unit: mm (in)

| | |
|---|---|
| Body to outer gear clearance ① | 0.110 - 0.200 (0.0043 - 0.0079) |
| Inner gear to crescent clearance ② | 0.223 - 0.333 (0.0088 - 0.0131) |
| Outer gear to crescent clearance ③ | 0.210 - 0.320 (0.0083 - 0.0126) |
| Housing to inner gear side clearance ④ | 0.050 - 0.090 (0.0020 - 0.0035) |
| Housing to outer gear side clearance ⑤ | 0.050 - 0.110 (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) |

# ENGINE FUEL & EMISSION CONTROL SYSTEM

# SECTION EF & EC



## CONTENTS

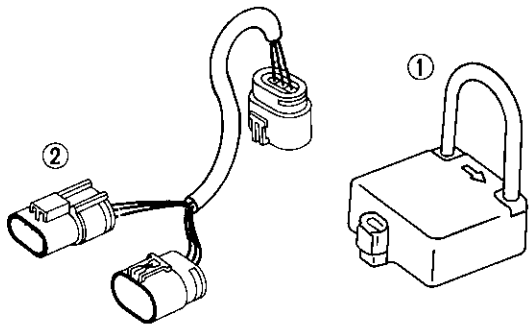
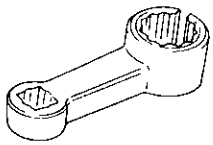

PREPARATION ..... EF & EC- 2
PRECAUTIONS ..... EF & EC- 3
ENGINE AND EMISSION CONTROL OVERALL SYSTEM ..... EF & EC- 4
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION ..... EF & EC- 14
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION ..... EF & EC- 21
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION ..... EF & EC- 37
TROUBLE DIAGNOSES ..... EF & EC- 42
FUEL INJECTION CONTROL SYSTEM INSPECTION ..... EF & EC-188
EVAPORATIVE EMISSION CONTROL SYSTEM ..... EF & EC-190
CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-192
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EF & EC-193


**For assistance with wiring diagrams:**
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

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

**Note: Refer to Foldout page for "E.C.C.S. WIRING DIAGRAM".**

## SPECIAL SERVICE TOOLS

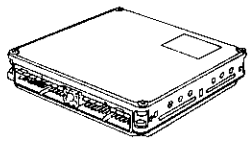
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| ① KV109D0010<br>(J-36777-1)<br>Ignition timing adapter coil<br>② KV10114200<br>(J-38386)<br>Adapter harness |  | Measuring ignition timing |
| KV10114400<br>(J-38365)<br>Exhaust gas sensor wrench |  | Loosening or tightening exhaust gas sensor |

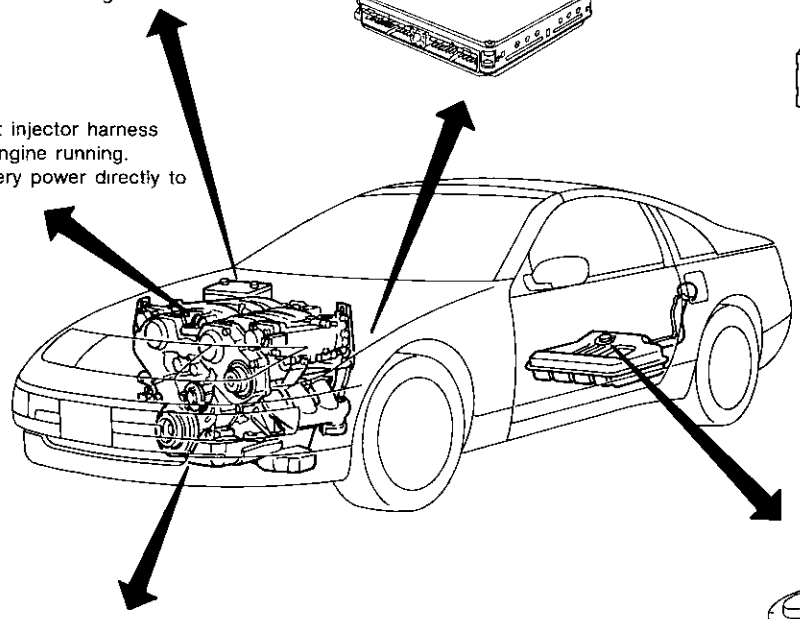
**BATTERY**
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

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

**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.

**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.

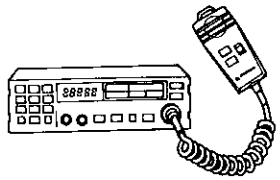


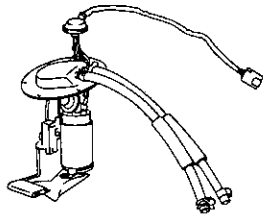


**WHEN STARTING**
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

**WIRELESS EQUIPMENT**
- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.

1) Keep the antenna as far as possible from the 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.





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

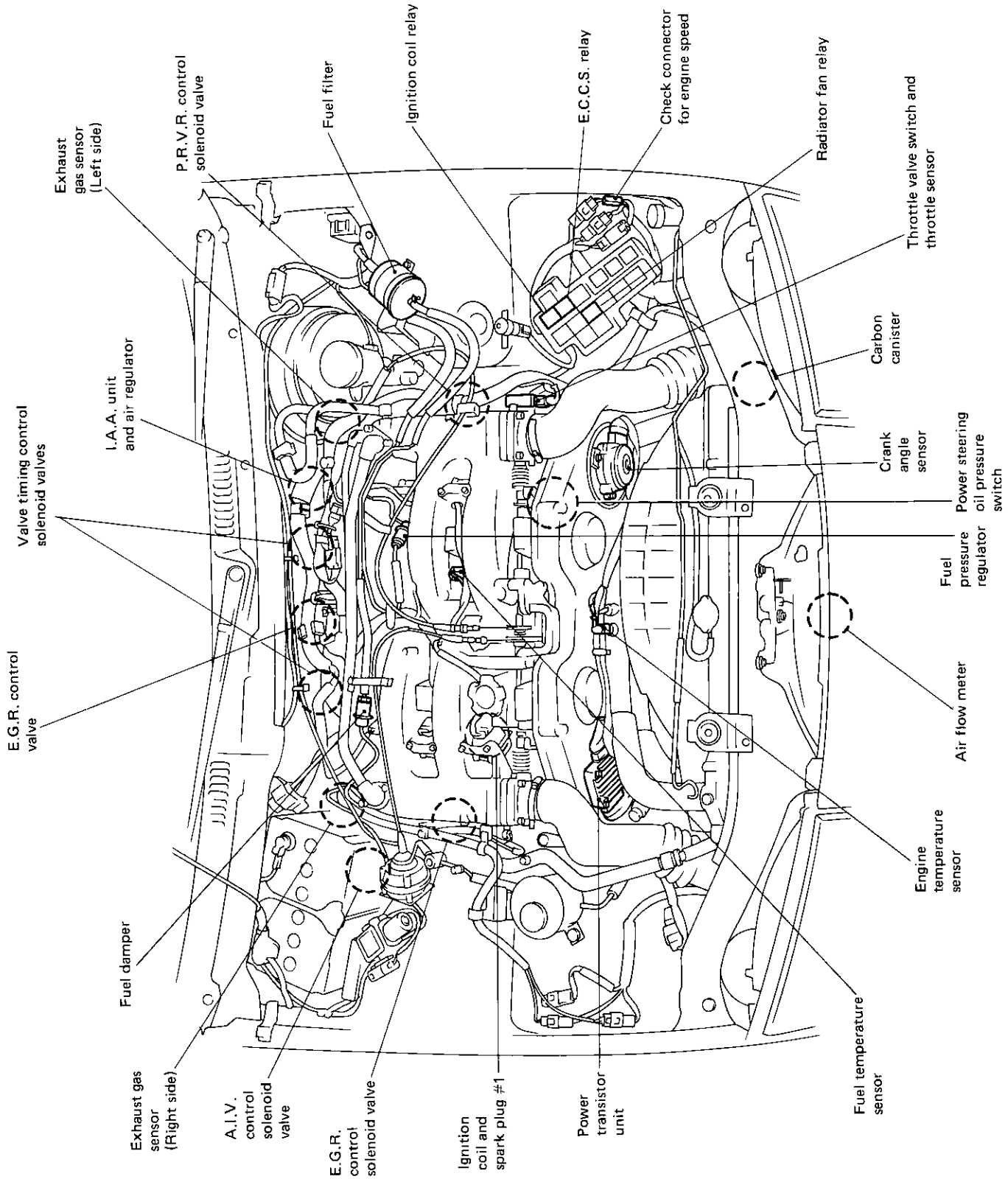
**E.C.C.S. HARNESS HANDLING**
- Securely connect E.C.C.S. harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S.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

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

SEF323I

## E.C.C.S. Component Parts Location

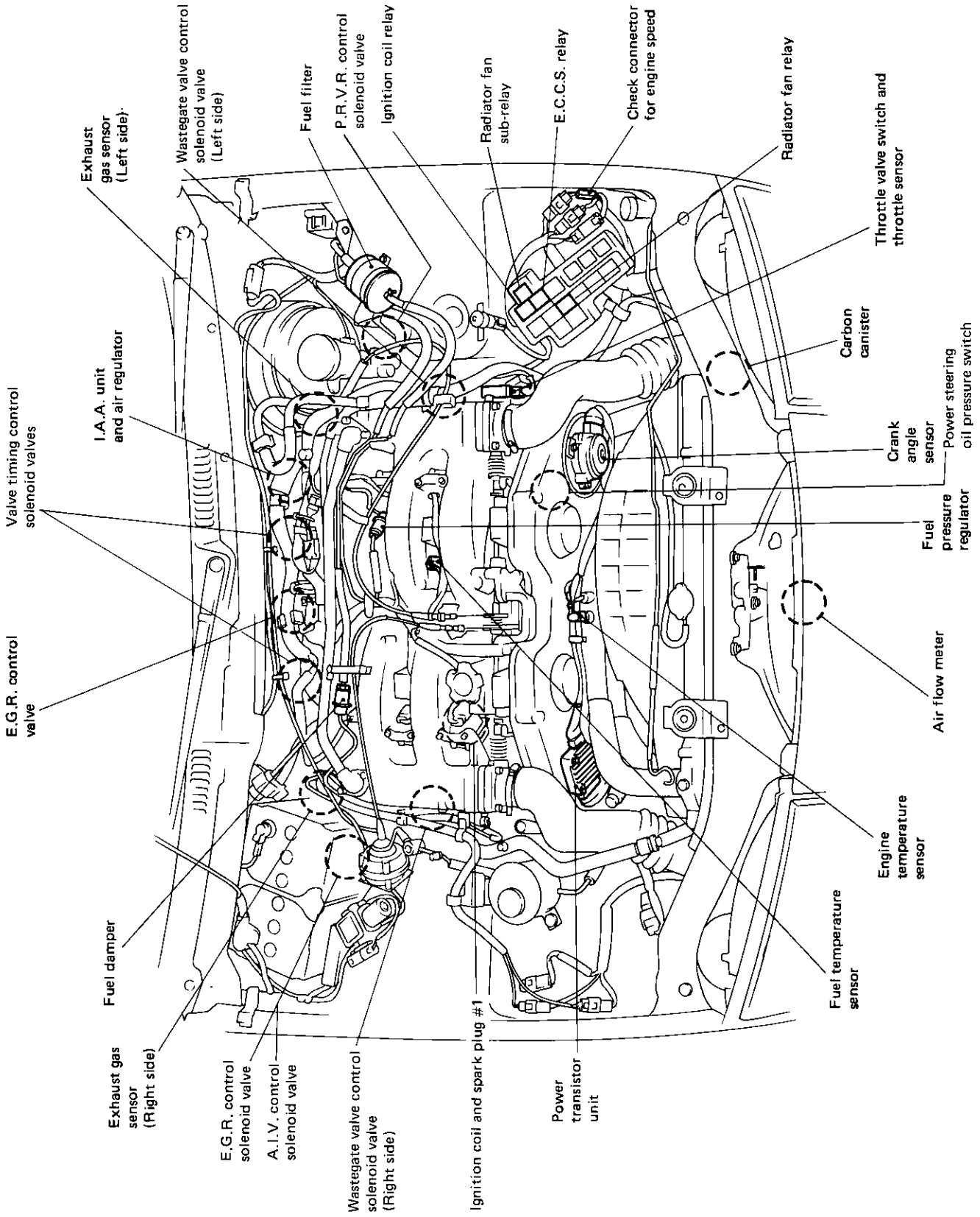
**NON-TURBO MODEL**




SEF193J

## E.C.C.S. Component Parts Location (Cont'd)

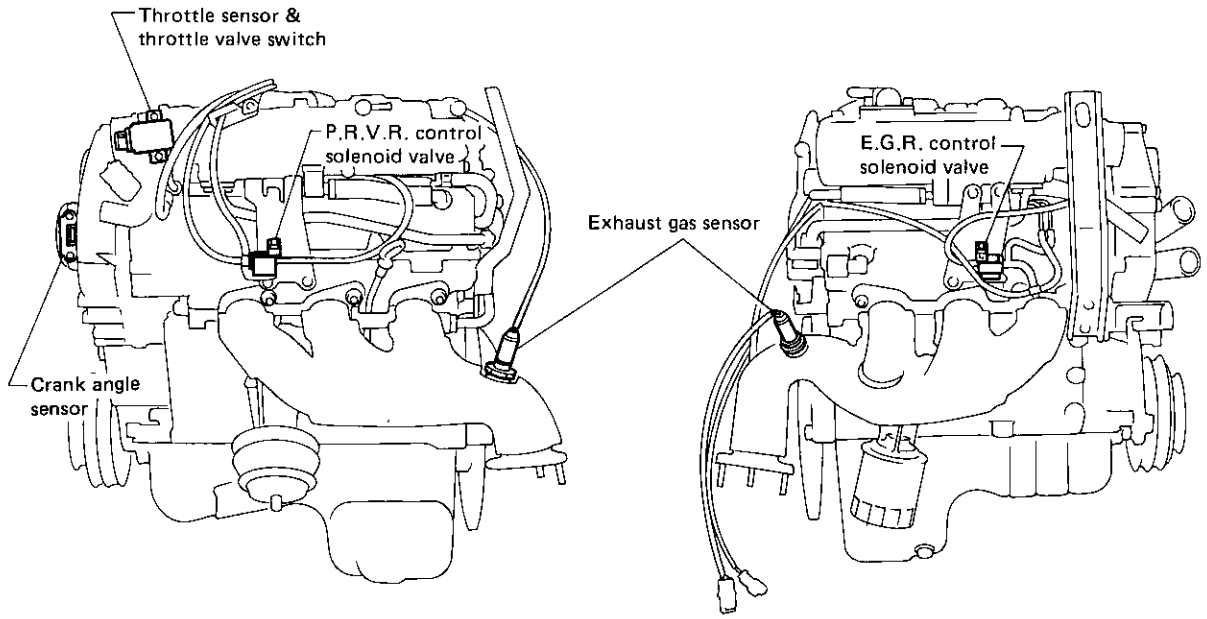
**TURBO MODEL**

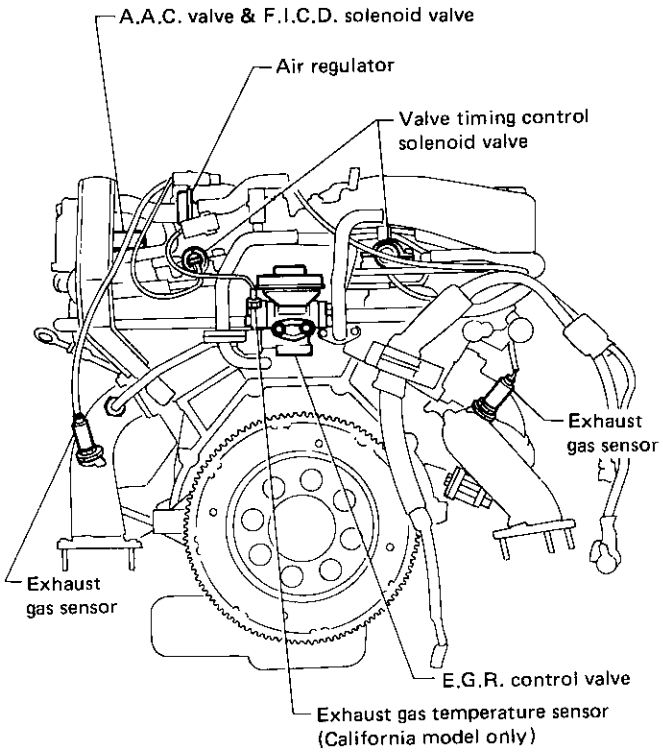


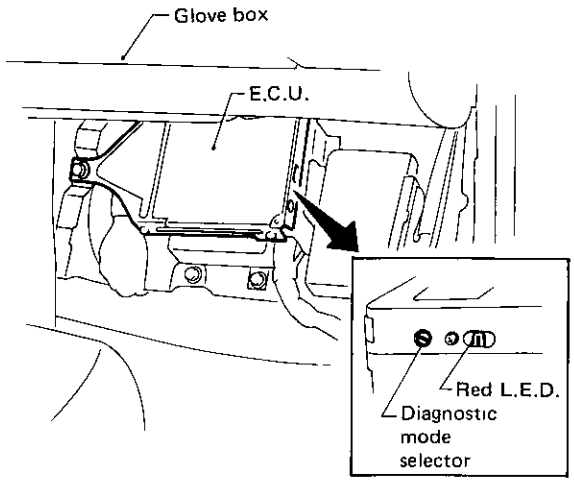

SEF194J

## E.C.C.S. Component Parts Location (Cont'd)

### NON-TURBO MODEL



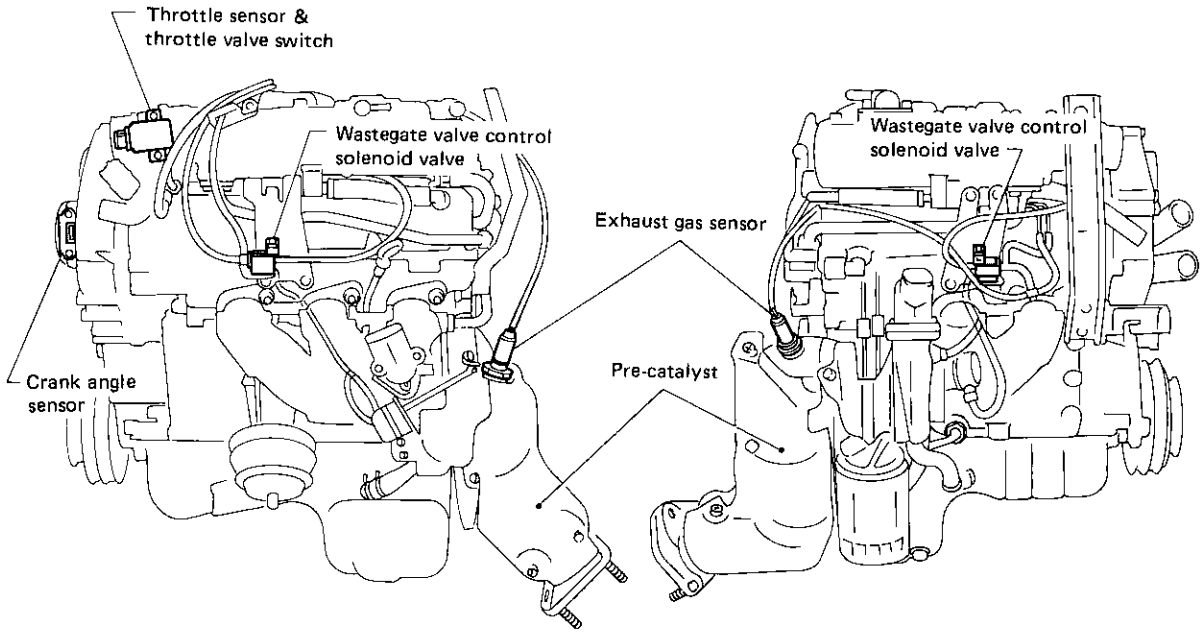



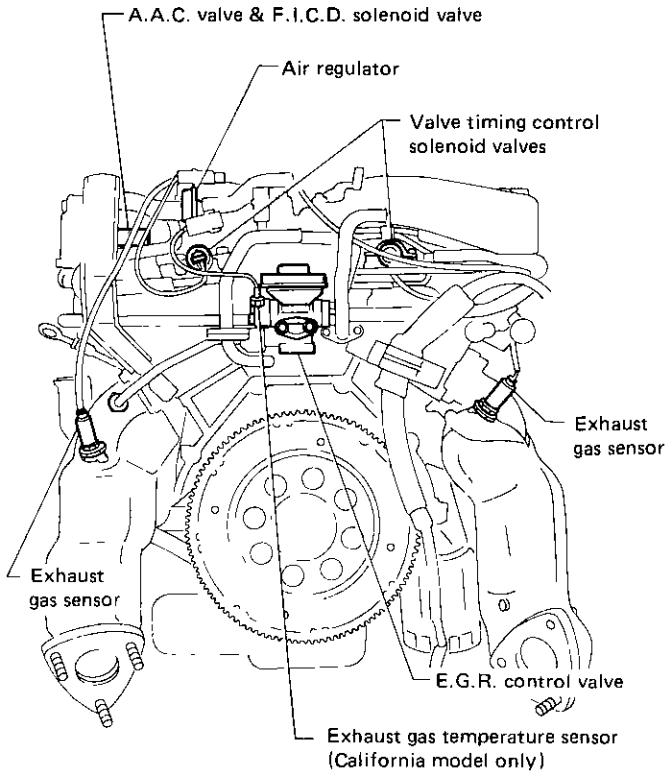



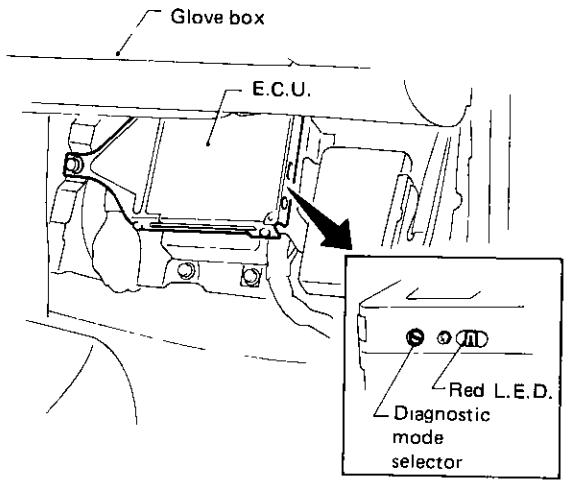

SEF195J

## E.C.C.S. Component Parts Location (Cont'd)

**TURBO MODEL**



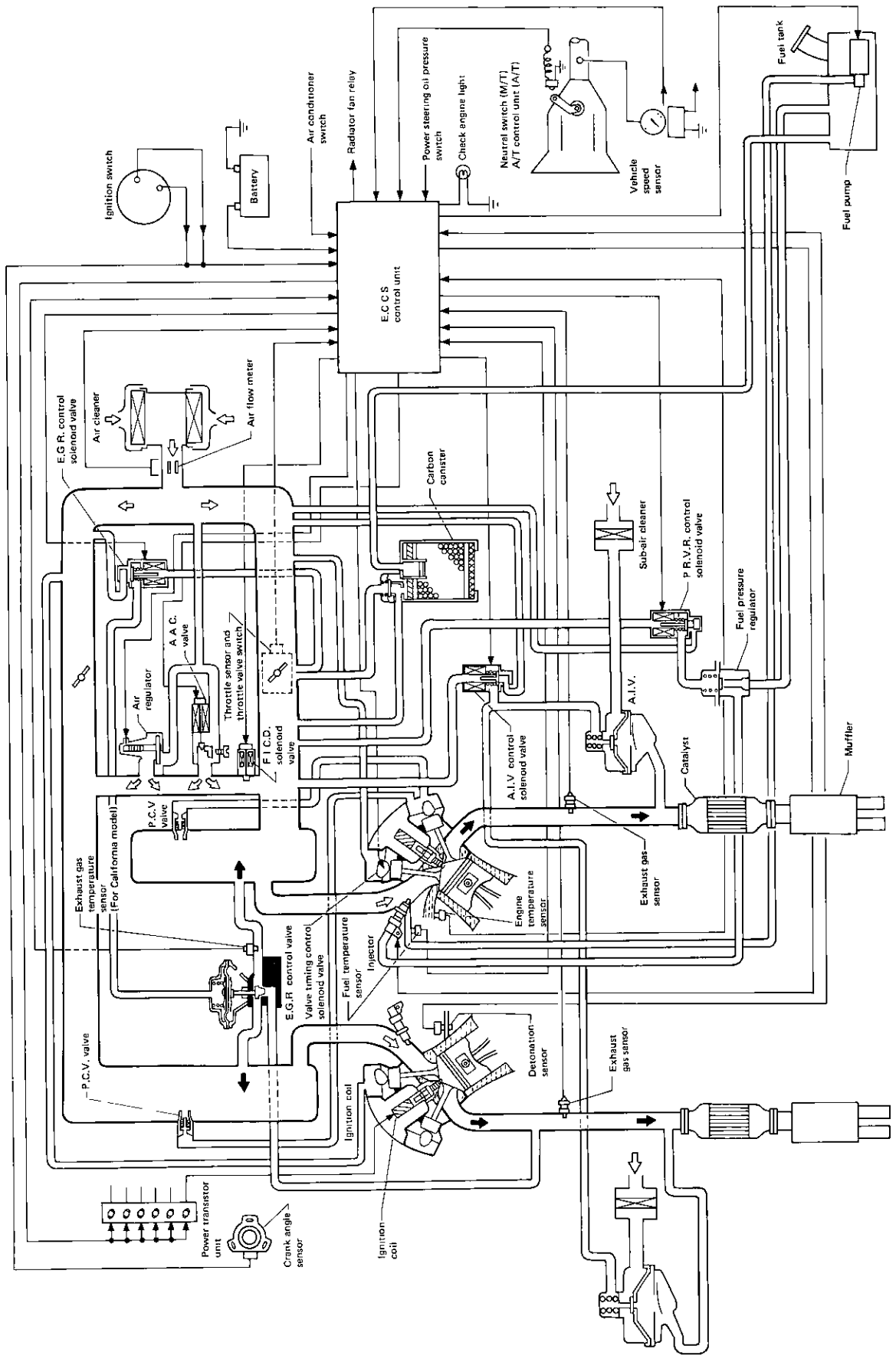




SEF196J

## System Diagram

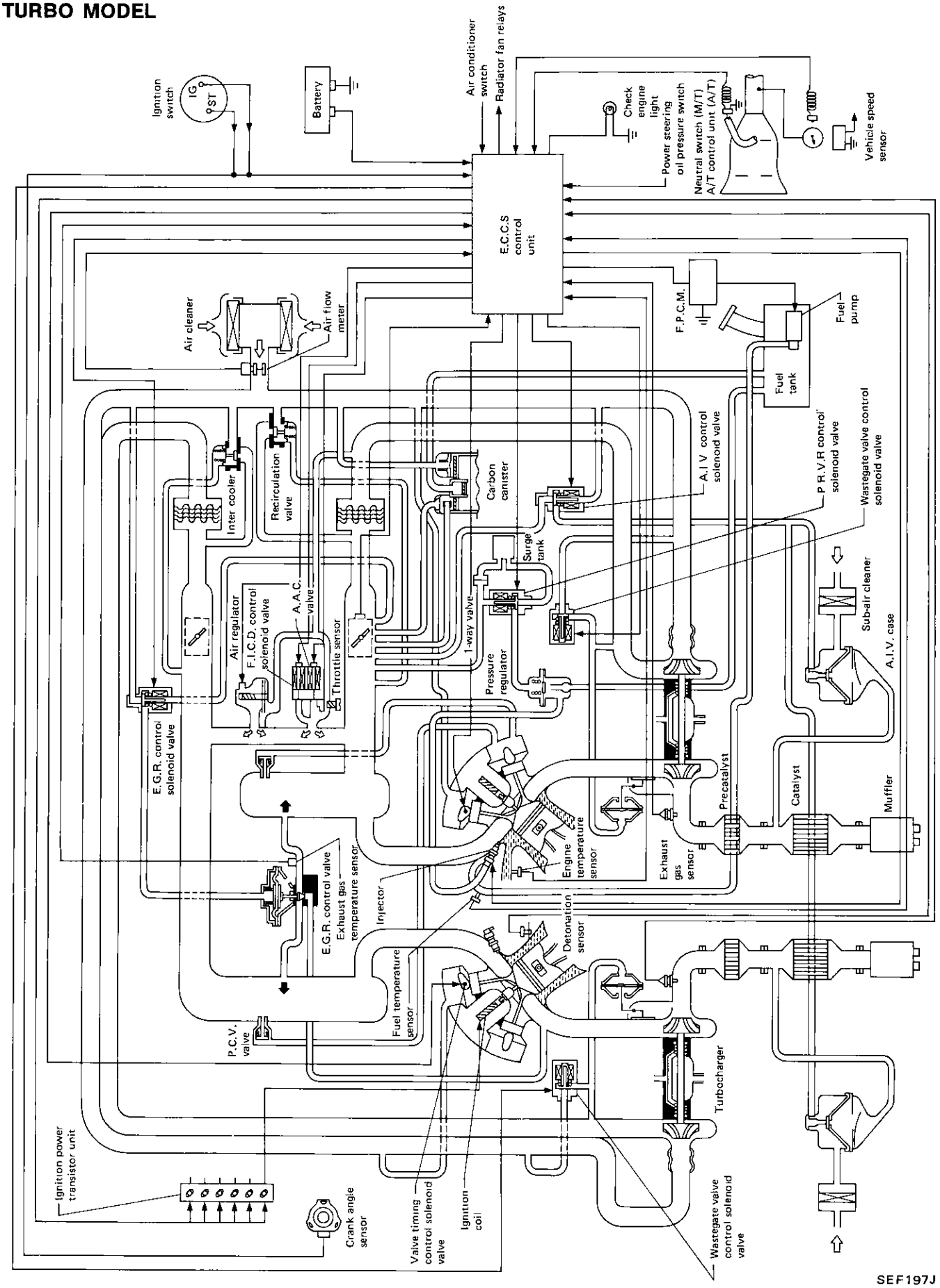
### NON-TURBO MODEL




SEF406J

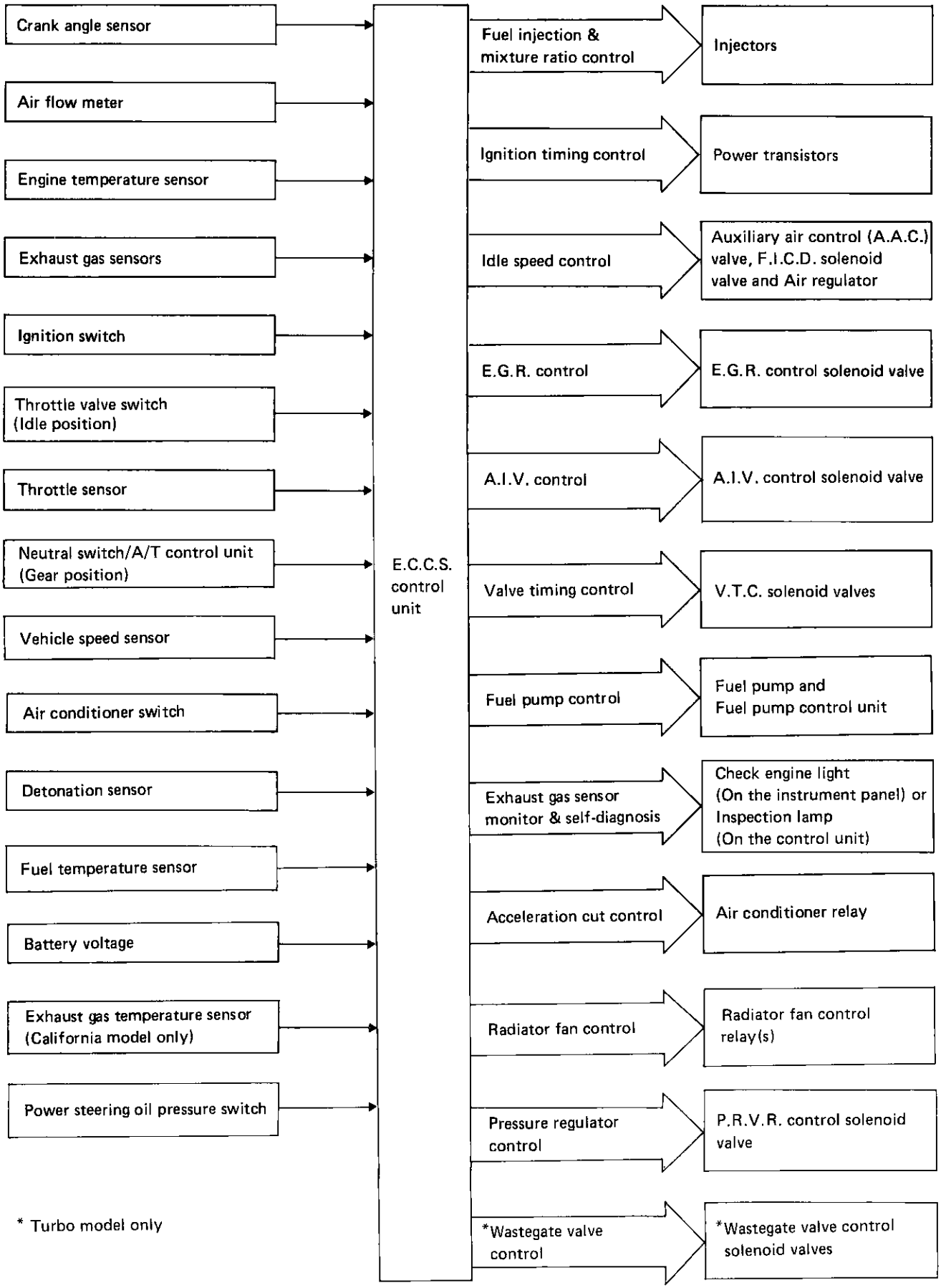
## System Diagram (Cont'd)

**TURBO MODEL**




SEF197J

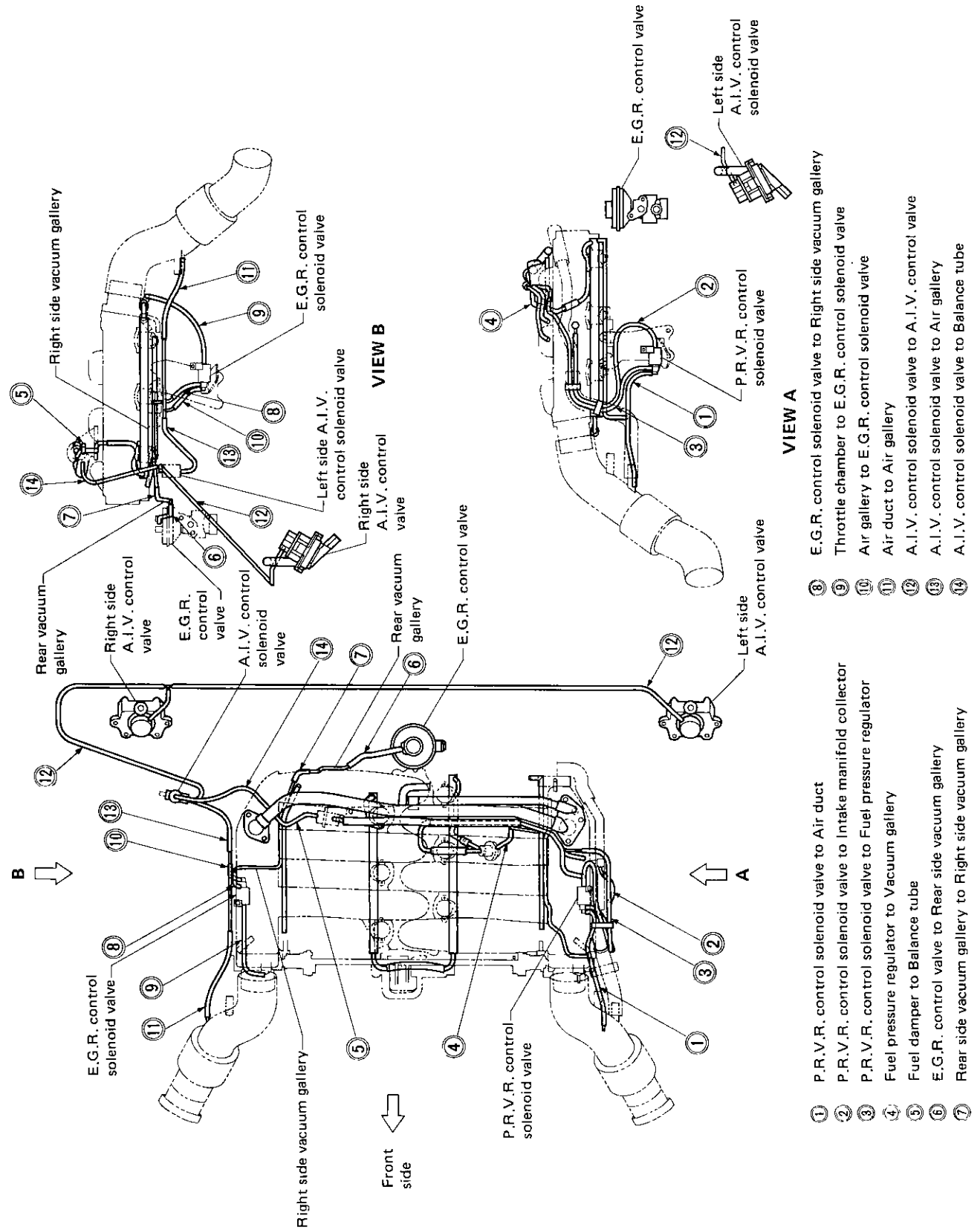
## System Chart




* Turbo model only

## Vacuum Hose Drawing

### NON-TURBO MODEL

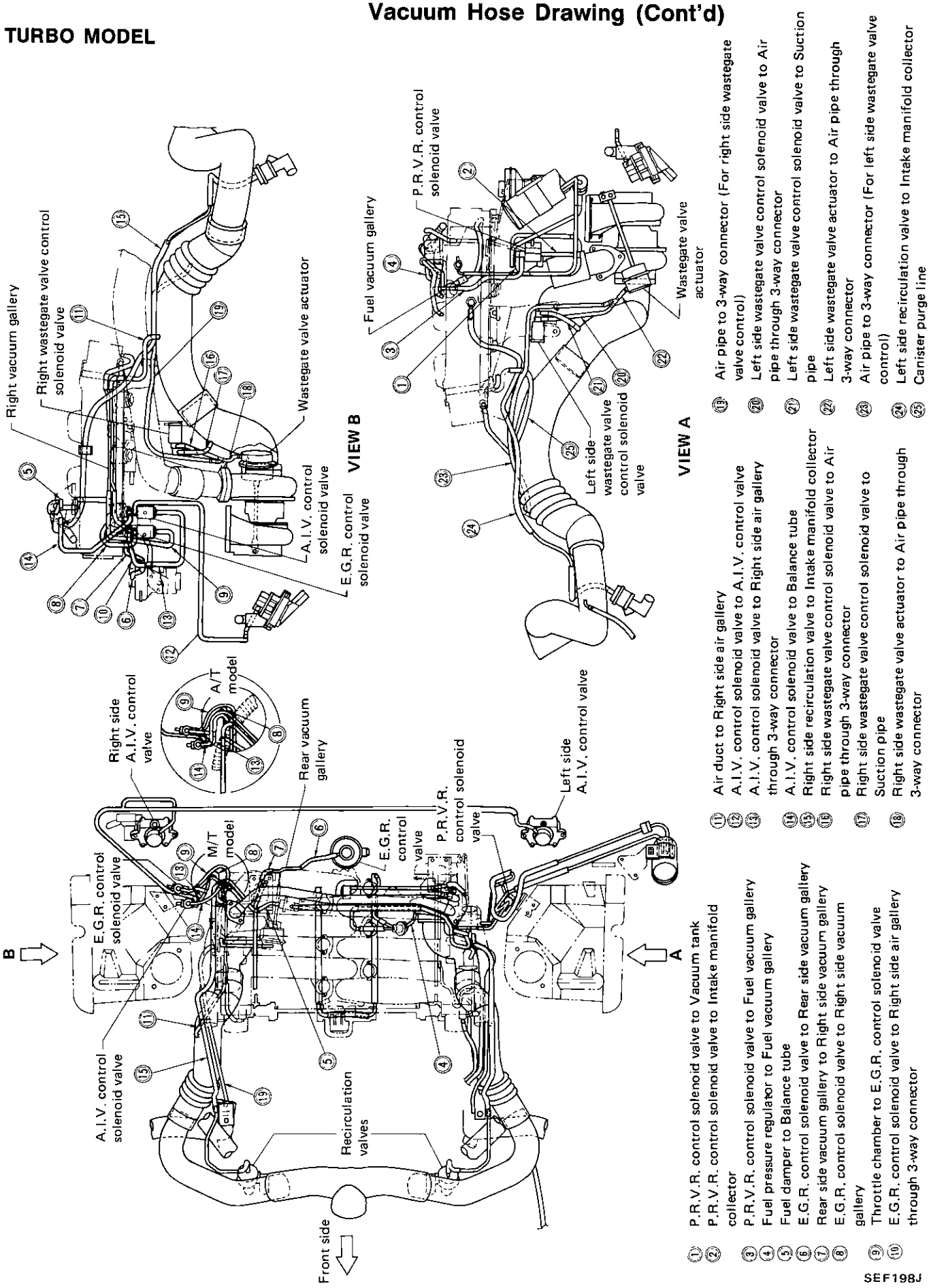



① P.R.V.R. control solenoid valve to Air duct
② P.R.V.R. control solenoid valve to Intake manifold collector
③ P.R.V.R. control solenoid valve to Fuel pressure regulator
④ Fuel pressure regulator to Vacuum gallery
⑤ Fuel damper to Balance tube
⑥ E.G.R. control valve to Rear side vacuum gallery
⑦ Rear side vacuum gallery to Right side vacuum gallery
⑧ E.G.R. control solenoid valve to Right side vacuum gallery
⑨ Throttle chamber to E.G.R. control solenoid valve
⑩ Air gallery to E.G.R. control solenoid valve
⑪ Air duct to Air gallery
⑫ A.I.V. control solenoid valve to A.I.V. control valve
⑬ A.I.V. control solenoid valve to Air gallery
⑭ A.I.V. control solenoid valve to Balance tube

SEF325I

## Vacuum Hose Drawing (Cont'd)

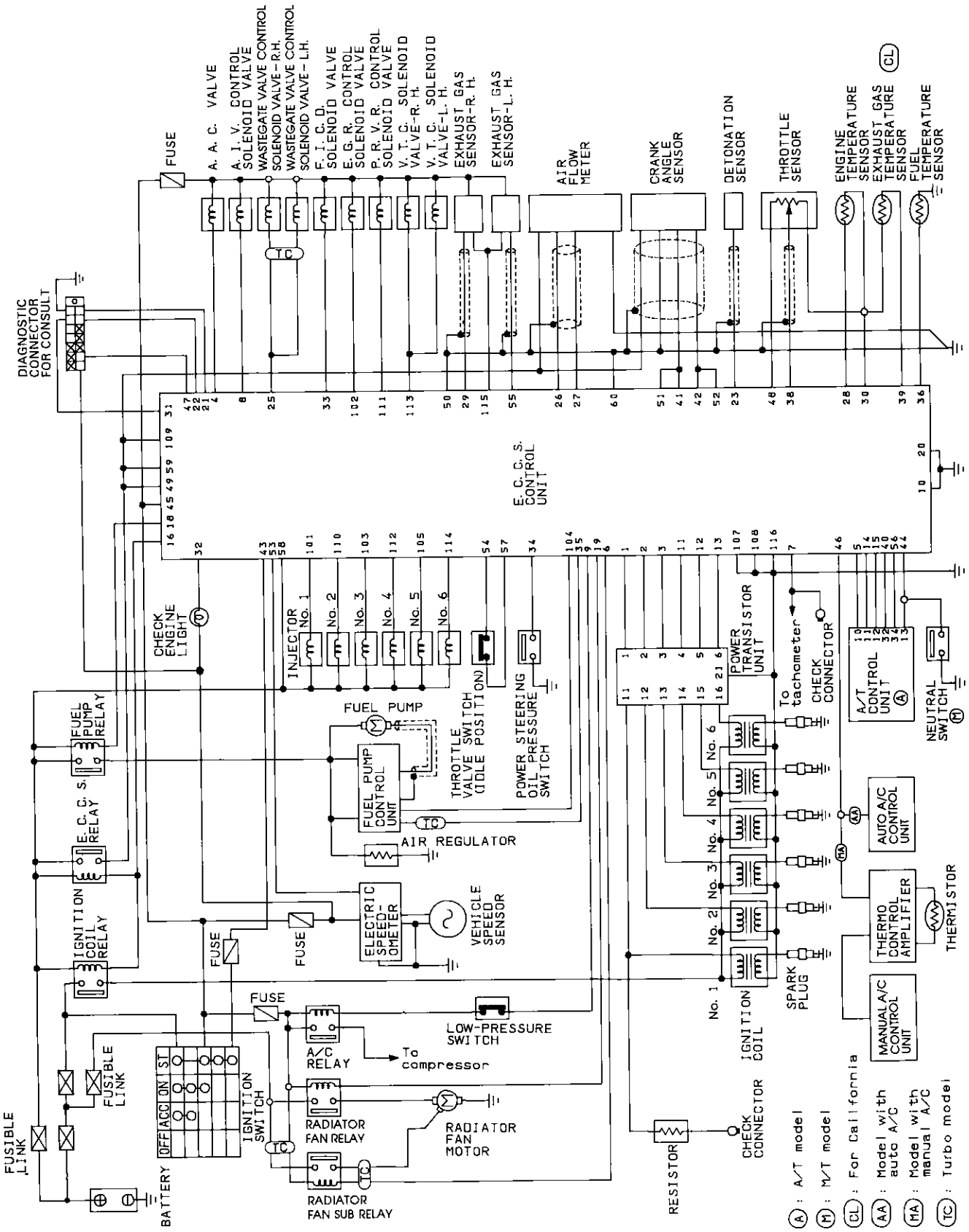
### TURBO MODEL



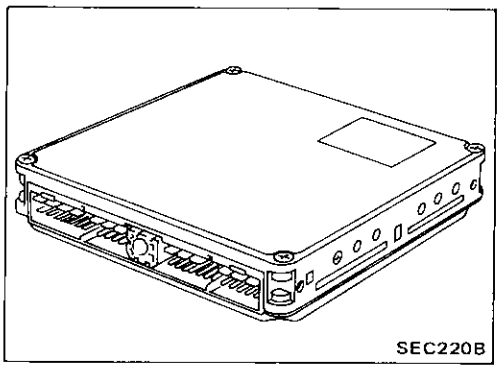

① P.R.V.R. control solenoid valve to Vacuum tank
② P.R.V.R. control solenoid valve to Intake manifold collector
③ P.R.V.R. control solenoid valve to Fuel vacuum gallery
④ Fuel pressure regulator to Fuel vacuum gallery
⑤ Fuel damper to Balance tube
⑥ E.G.R. control solenoid valve to Rear side vacuum gallery
⑦ Rear side vacuum gallery to Right side vacuum gallery
⑧ E.G.R. control solenoid valve to Right side vacuum gallery
⑨ Throttle chamber to E.G.R. control solenoid valve
⑩ E.G.R. control solenoid valve to Right side air gallery through 3-way connector
⑪ Air duct to Right side air gallery
⑫ A.I.V. control solenoid valve to A.I.V. control valve
⑬ A.I.V. control solenoid valve to Right side air gallery through 3-way connector
⑭ A.I.V. control solenoid valve to Balance tube
⑮ Right side recirculation valve to Intake manifold collector
⑯ Right side wastegate valve control solenoid valve to Air pipe through 3-way connector
⑰ Right side wastegate valve control solenoid valve to Suction pipe
⑱ Right side wastegate valve actuator to Air pipe through 3-way connector
⑲ Air pipe to 3-way connector (For right side wastegate valve control)
⑳ Left side wastegate valve control solenoid valve to Air pipe through 3-way connector
㉑ Left side wastegate valve control solenoid valve to Suction pipe
㉒ Left side wastegate valve actuator to Air pipe through 3-way connector
㉓ Air pipe to 3-way connector (For left side wastegate valve control)
㉔ Left side recirculation valve to Intake manifold collector
㉕ Canister purge line

SEF198J

## Circuit Diagram

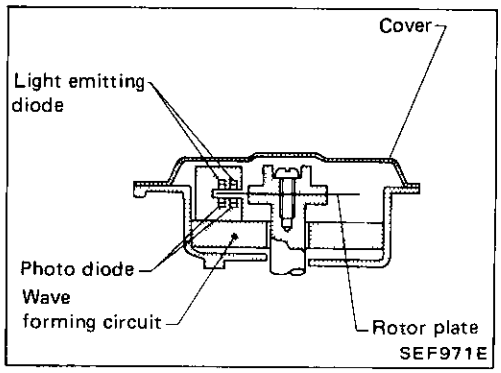



SEF100M


SEC220B

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

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

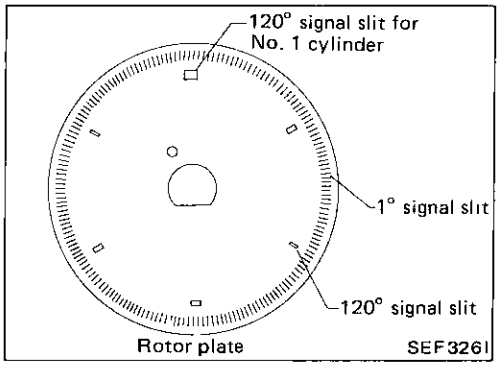


SEF971E

## Crank Angle Sensor

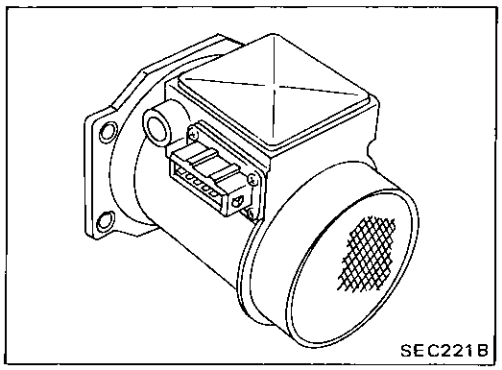
The crank angle sensor is a basic component of the E.C.C.S. It monitors engine speed and piston position, and sends signals to the E.C.U. to control fuel injection, ignition timing and other functions.

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.



SEF326I

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

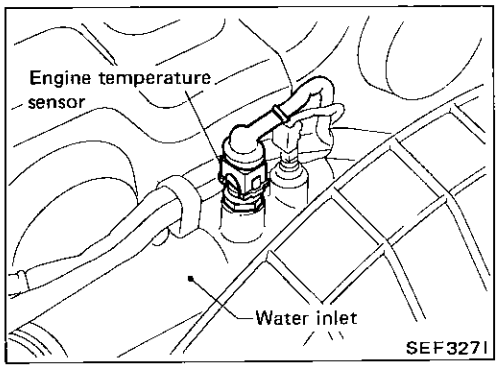

SEC221B

## Air Flow Meter

The air flow meter measures the intake air flow rate by measuring a part of the entire flow. Measurements are made in such a way 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.

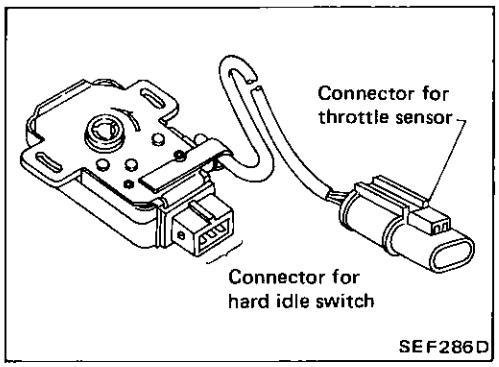
When intake air flows into the intake manifold through a route around the hot film, the heat generated from the hot film is taken away by the air. The amount of heat reduction depends on the air flow. The temperature of the hot film is automatically controlled to a certain number of degrees.

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



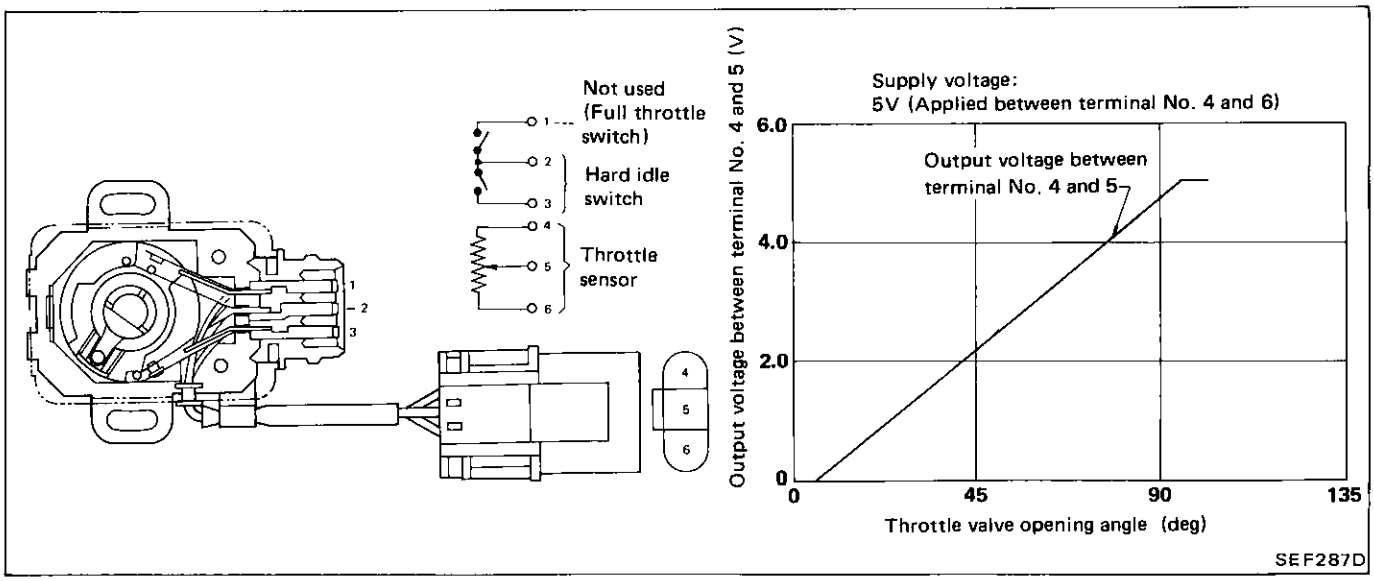

## Engine Temperature Sensor

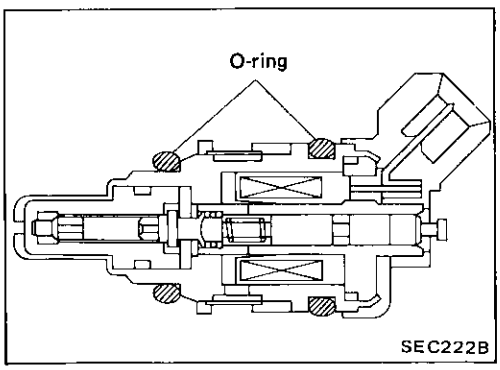
The engine temperature sensor, located on the top of water inlet housing, detects engine coolant temperature and transmits a signal to the E.C.U.
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response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




## Throttle Sensor & Soft/Hard Idle Switch

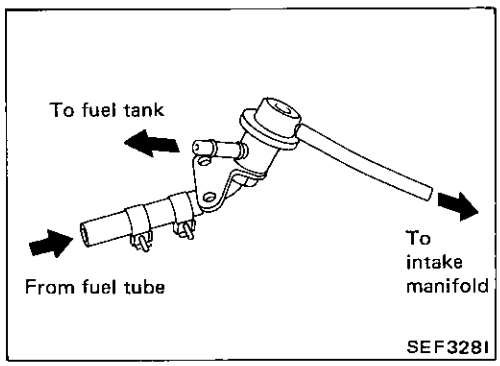
The throttle sensor responds to accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle valve position into output voltage, and emits the voltage signal to the E.C.U. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds 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". It 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 soft idle switch is malfunctioning.



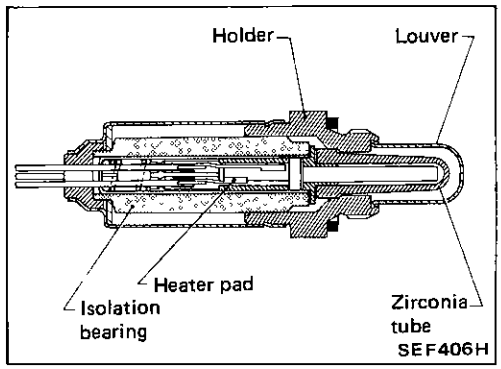

## Fuel Injector

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.



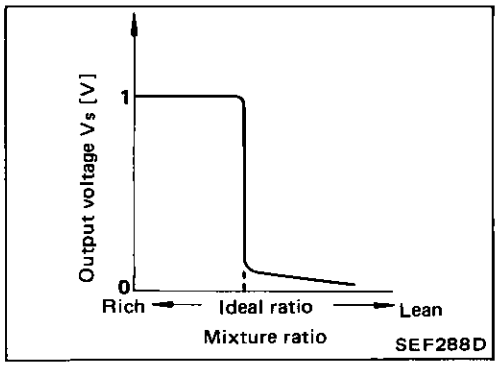

## Pressure Regulator

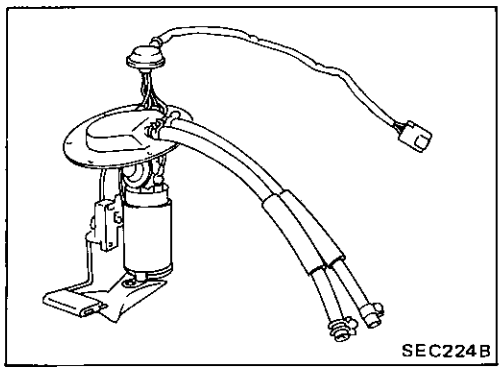
The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm$^2$, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.




## Exhaust Gas Sensor

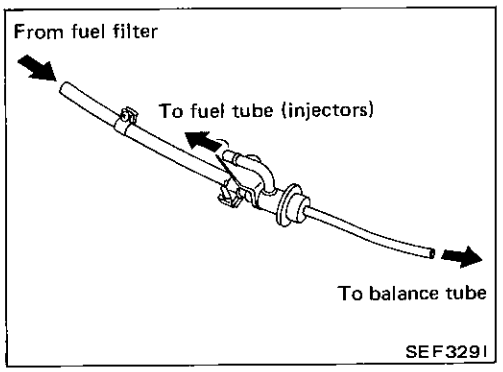
The exhaust gas sensor, which is placed into the exhaust outlet, monitors the amount of oxygen in the exhaust gas.
The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares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



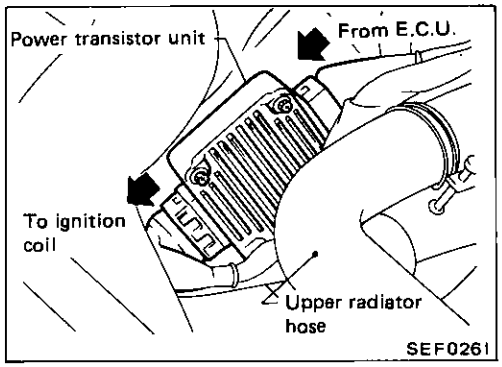

## Fuel Pump

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



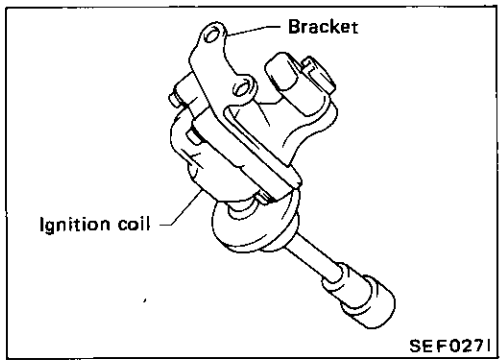

## Fuel Damper

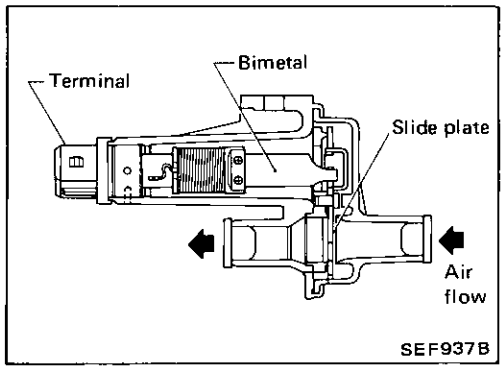
The fuel damper, which consists of a diagram, reduces fuel pressure pulsation in the fuel feed line between the fuel filter and injectors.




## Power Transistor Unit & Ignition Coil

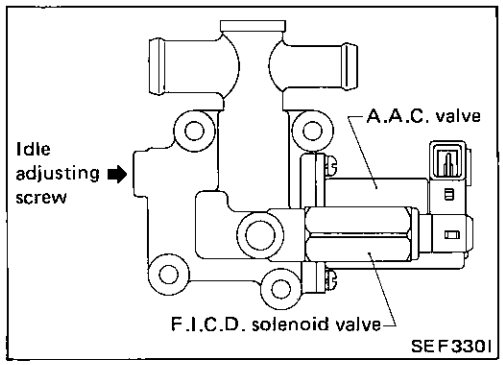
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.



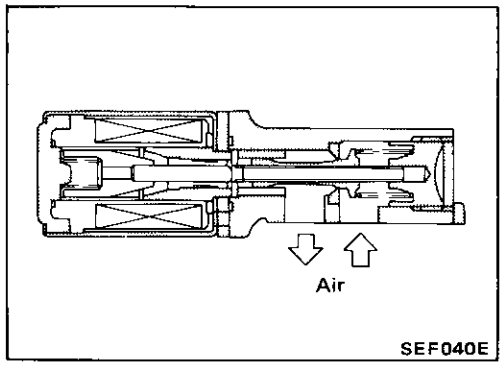

## Air Regulator

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.



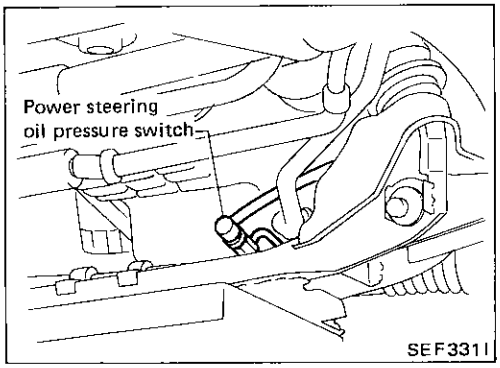

## Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjust screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value.
The F.I.C.D. solenoid valve compensates for changes in idle speed caused by the operation of the air compressor.



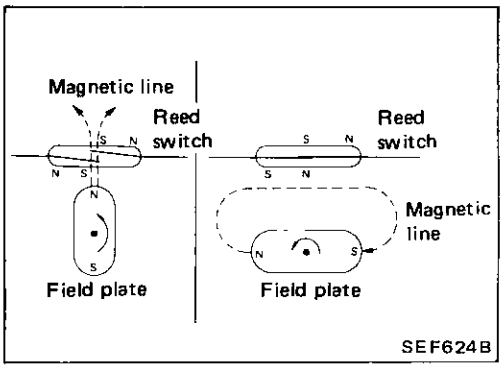

## Auxiliary Air Control (A.A.C.) Valve

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.



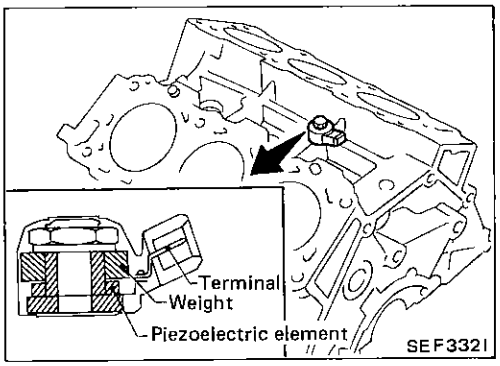

## Power Steering Oil Pressure Switch

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the E.C.U. The E.C.U. then sends the idle-up signal to the A.A.C valve.



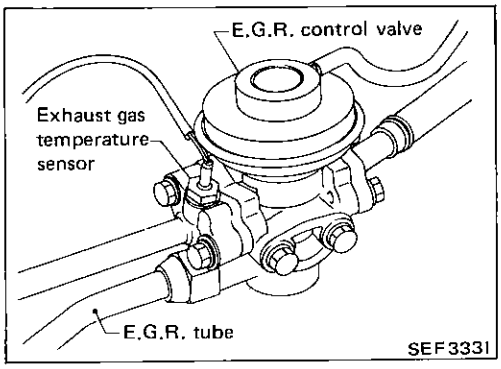

## Vehicle Speed Sensor

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.



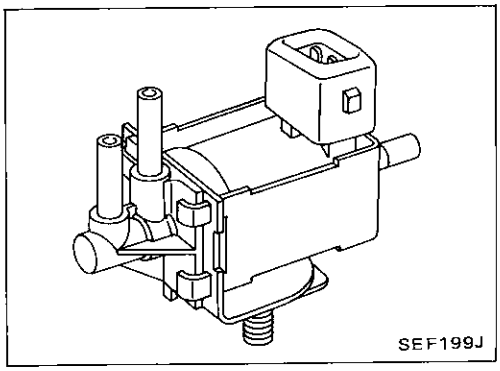

## Detonation Sensor

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 sent to the E.C.U.



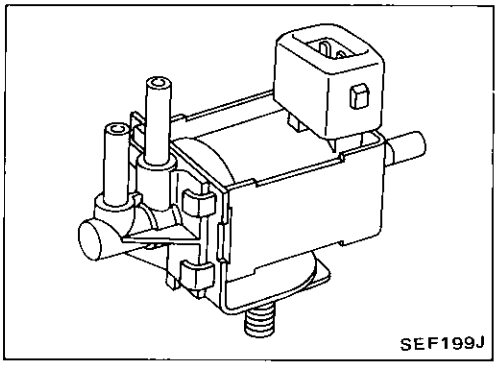

## E.G.R. Control Valve

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



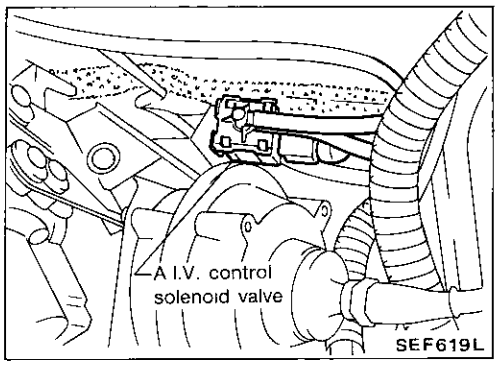

## E.G.R. Control Solenoid Valve

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



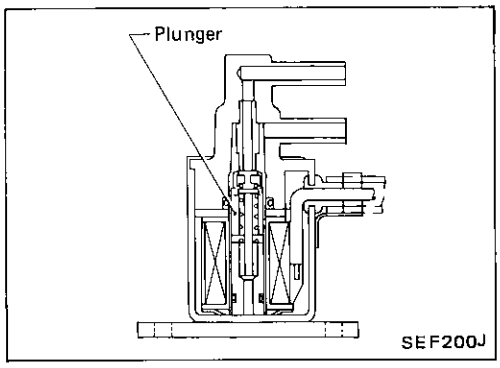

## Pressure Regulator Vacuum Relief (P.R.V.R.) Control Solenoid Valve

The solenoid valve responds to the ON/OFF signal from the 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.



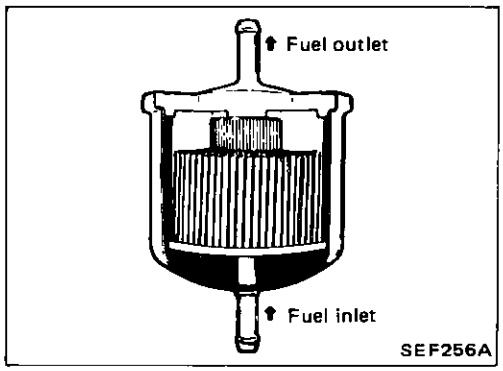

## A.I.V. Control Solenoid Valve

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



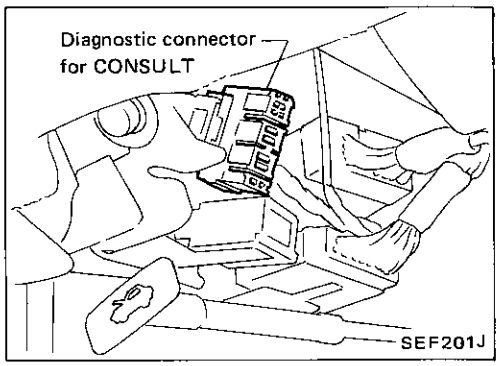

## Wastegate Valve Control Solenoid Valve

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



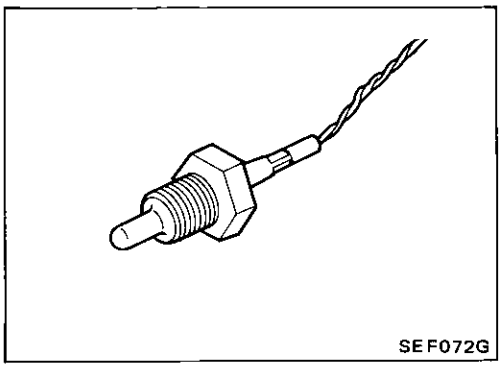

## Fuel Filter

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



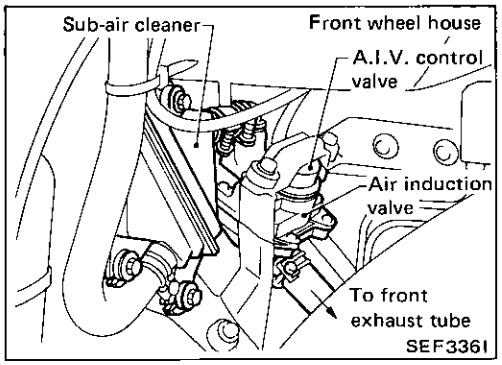

## Diagnostic Connector for CONSULT

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


SEF072G

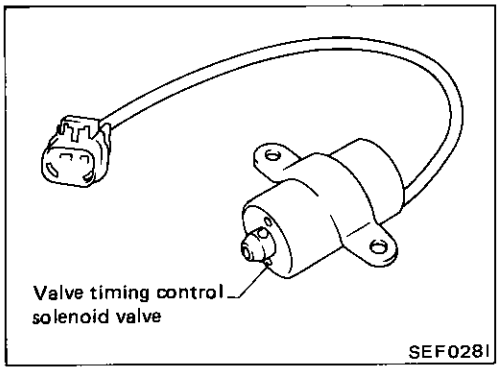
## Exhaust Gas Temperature Sensor

The exhaust gas temperature sensor monitors the 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.



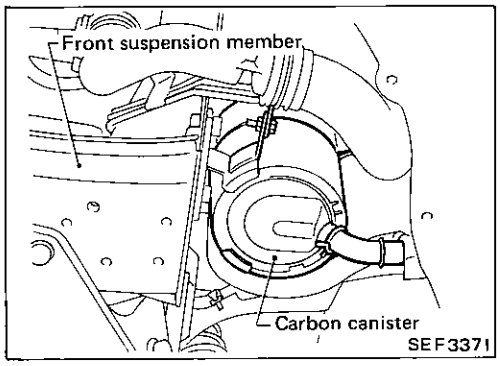

## Air Induction Valve (A.I.V.)

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



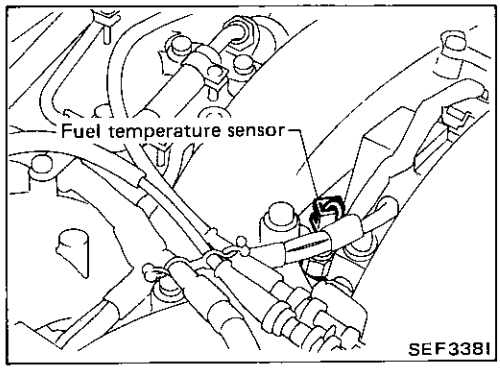

## Valve Timing Control Solenoid Valve

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




## 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.

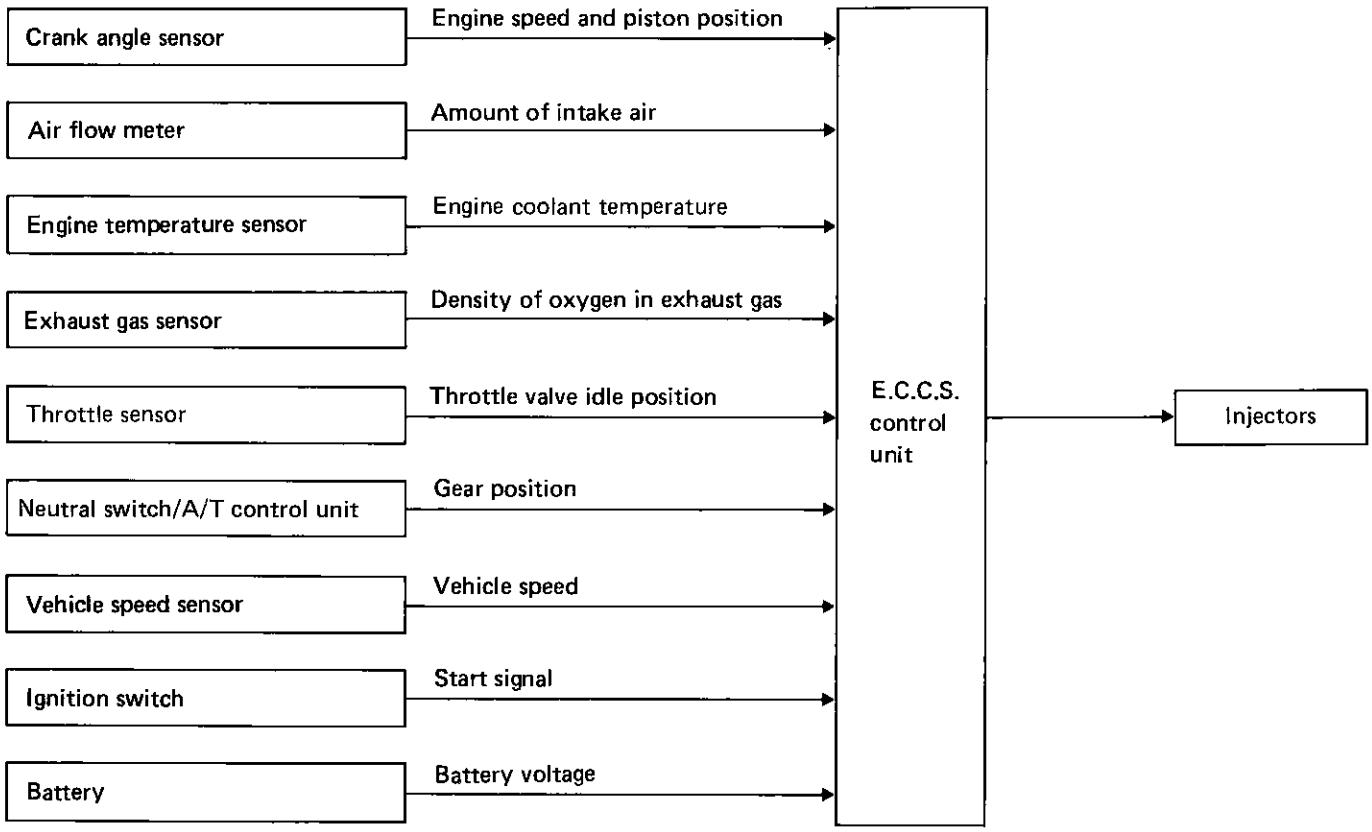



## Fuel Temperature Sensor

The fuel temperature sensor, built into the fuel tube, senses fuel temperature. When the fuel temperature is higher than specified, the E.C.C.S. control unit turns the P.R.V.R. control solenoid valve ON and raises fuel pressure.

## Fuel Injection Control

### INPUT/OUTPUT SIGNAL LINE




### BASIC FUEL INJECTION CONTROL

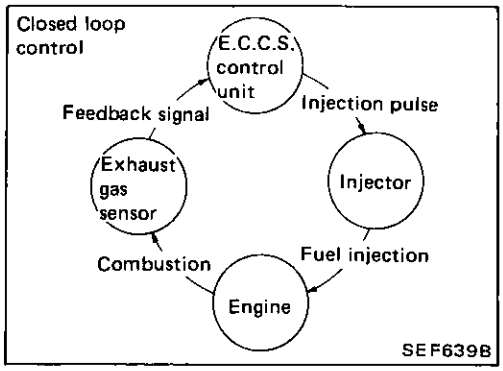
The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the E.C.U. The basic amount of fuel injected is a program value mapped in the E.C.U. ROM memory. In other words, the program value is preset by engine operating conditions determined by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

### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

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

<Fuel decrease>
1) During deceleration




## Fuel Injection Control (Cont'd)

### MIXTURE RATIO FEEDBACK CONTROL

The mixture ratio feedback system is used for precise control of the mixture ratio to the stoichiometric point, so that the three-way catalyst can reduce CO, HC and NOx emissions. This system uses an 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.

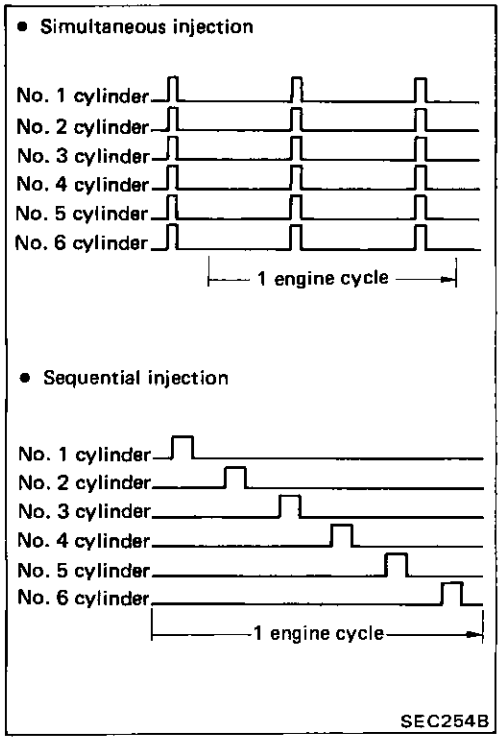
This stage refers to the closed-loop control condition. The open-loop control condition refers to that under which the E.C.U. detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

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
7) Exhaust gas sensor high output voltage

### 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 wire) 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 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 per cycle.

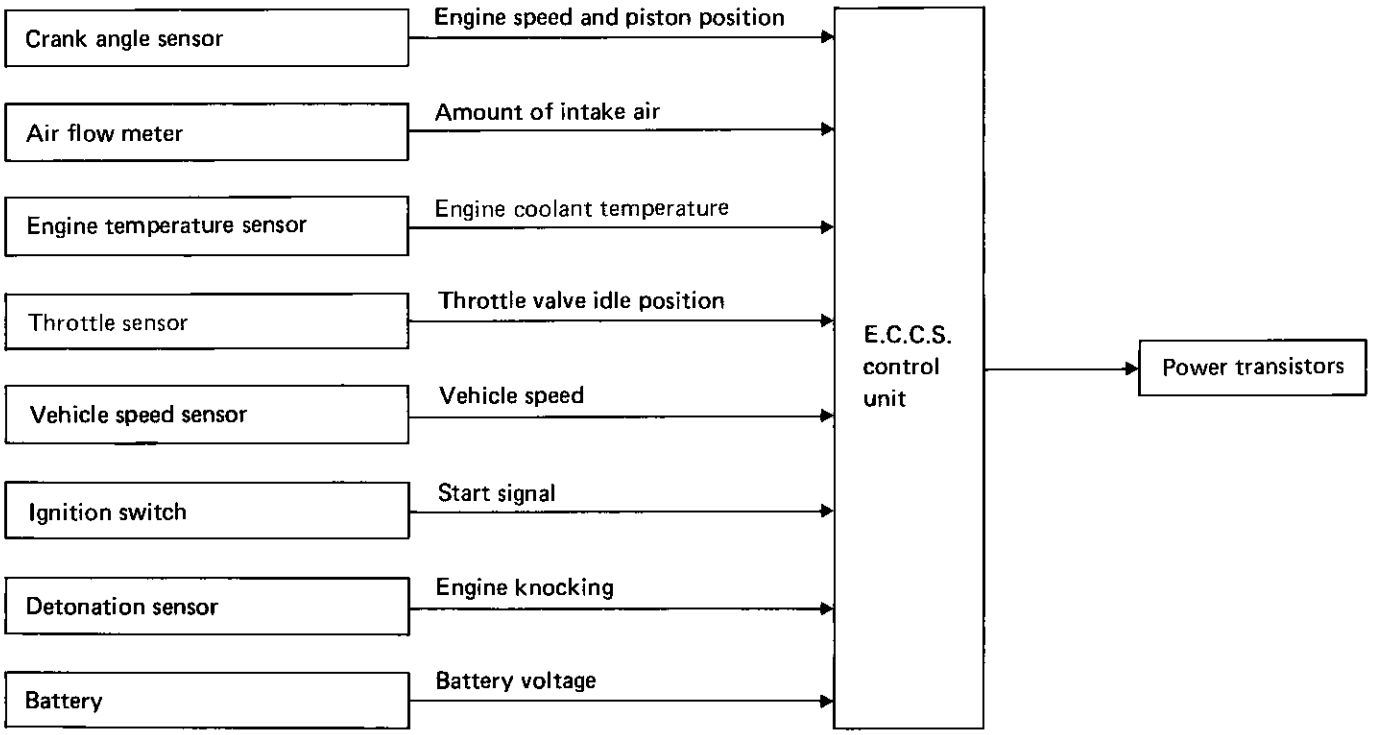
## Fuel Injection Control (Cont'd)

### 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.

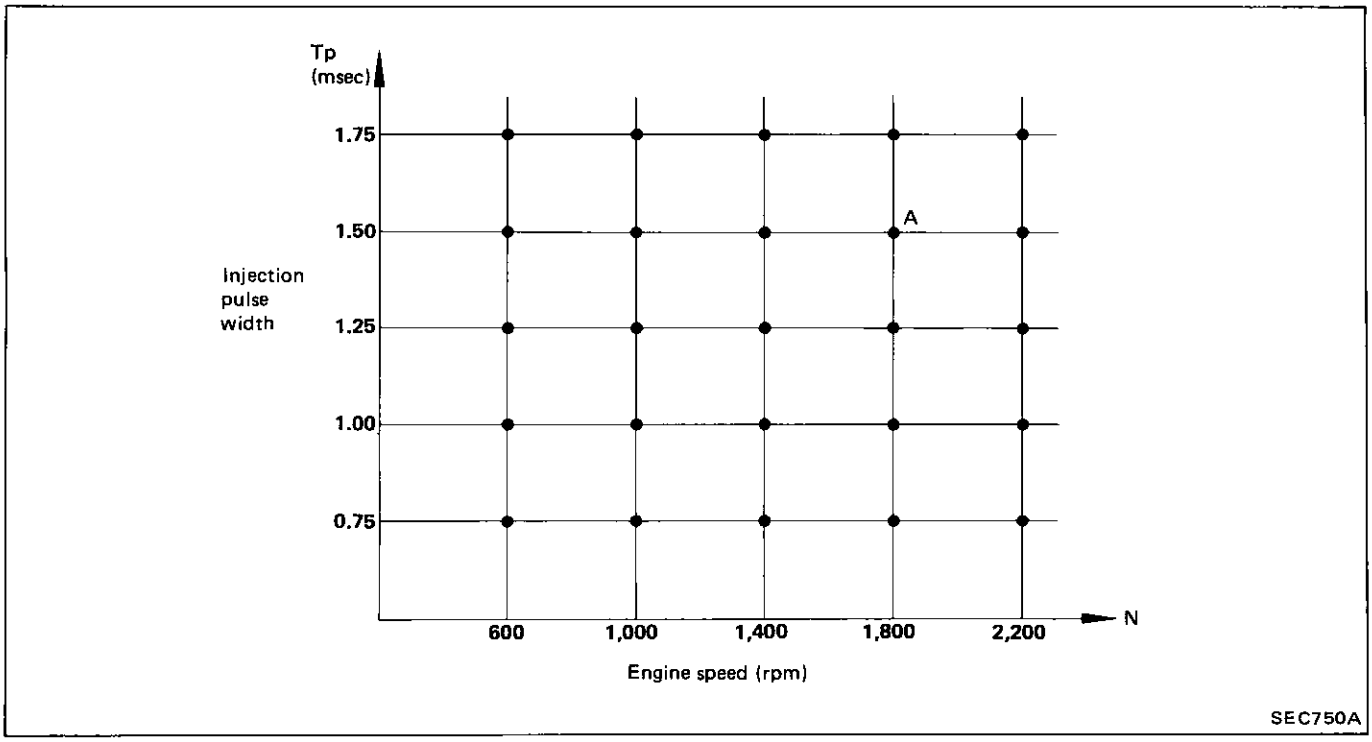
The ignition timing data is stored in the ROM located in the E.C.U. This data forms the map shown below. The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the 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.

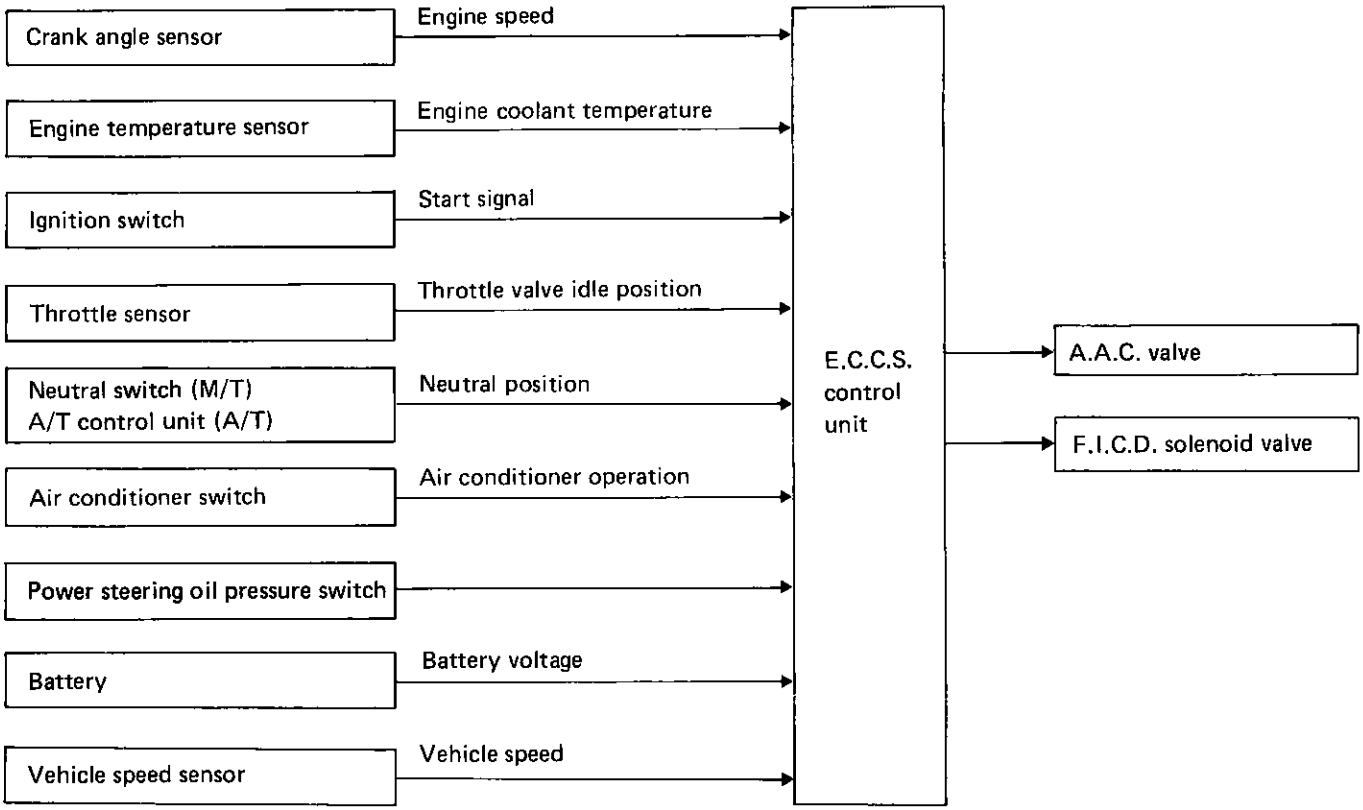



The retard system, actuated by the detonation sensor, is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

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 eliminate the knocking condition.

## Idle Speed Control

### INPUT/OUTPUT SIGNAL LINE

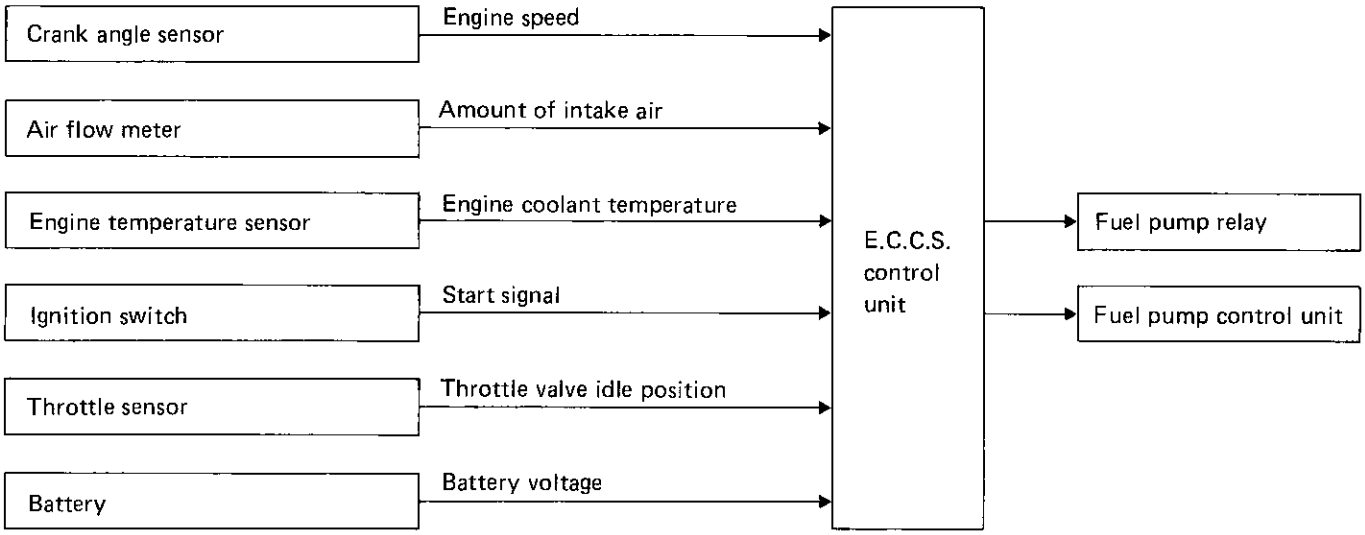



### SYSTEM DESCRIPTION

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 repeats ON/OFF operation according to the signal sent from the E.C.U. 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 noise and vibration transmitted to the vehicle interior, fuel consumption, and engine load.

## Fuel Pump Control

### INPUT/OUTPUT SIGNAL LINE




### SYSTEM DESCRIPTION

**Fuel pump and air regulator ON-OFF control**

The E.C.U. activates the fuel pump for several seconds after the ignition switch is turned on to improve engine start-up. If the E.C.U. receives a 1° signal from the crank angle sensor, it knows that the engine is rotating, and causes the pump to activate. If the 1° signal is not received when the ignition switch is on, the engine stalls. The E.C.U. stops pump operation and prevents battery discharging, thereby improving safety. The E.C.U. does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

| Condition | Fuel pump operation |
|---|---|
| Ignition switch is tunred to ON. | Operates for 1 second |
| Engine running and cranking | Operates |
| When engine is stopped | Stops in 1.5 seconds |
| Except as shown above | Stops |

**Fuel pump voltage control**

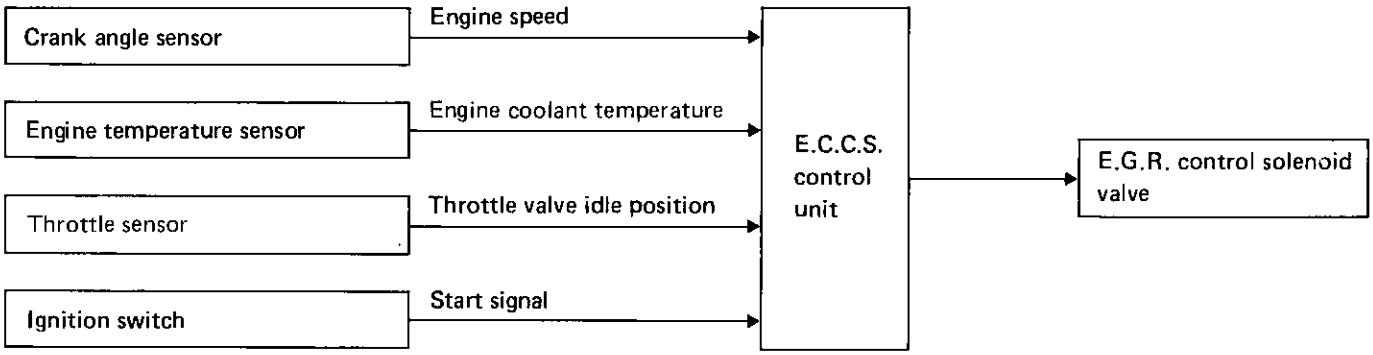
The fuel pump is controlled by the fuel pump control unit adjusting the voltage supplied to the fuel pump.

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

*NA: Non-turbo model **TC: Turbo model

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

### INPUT/OUTPUT SIGNAL LINE



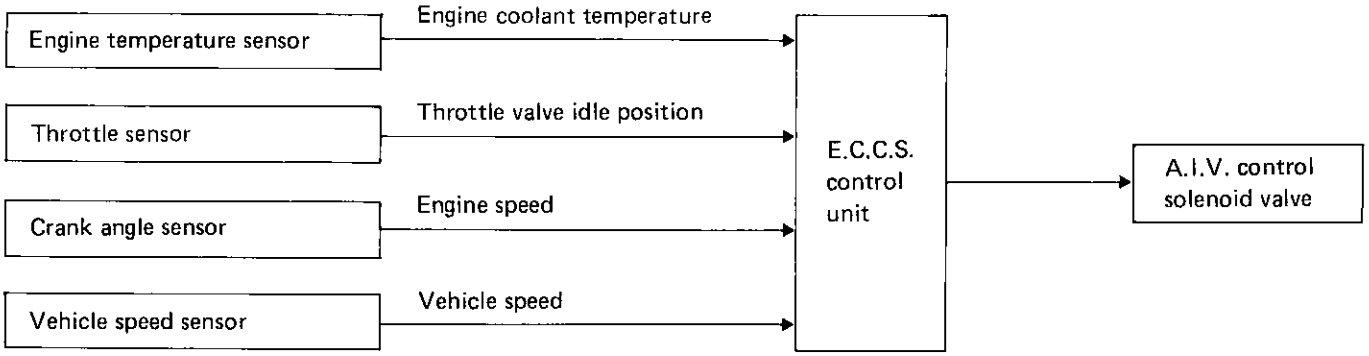

### SYSTEM DESCRIPTION

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

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

### INPUT/OUTPUT SIGNAL LINE




### SYSTEM DESCRIPTION

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

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

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

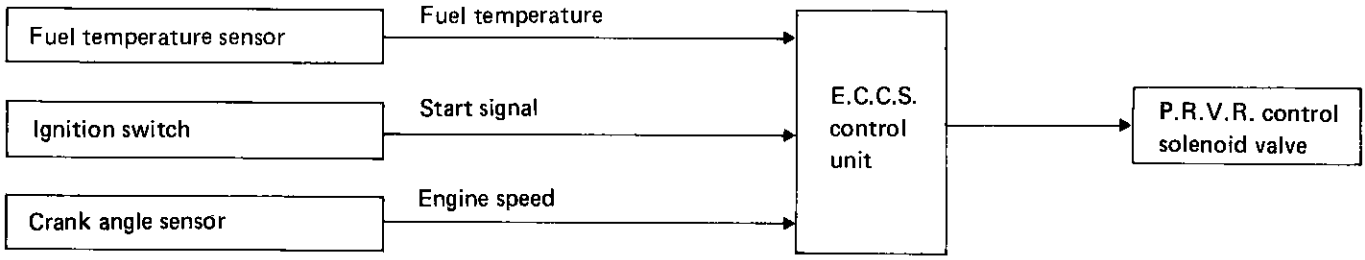
The air induction valve is controlled by the E.C.C.S. control unit, corresponding to the engine temperature. When the engine is cold, the A.I.V. control system operates to reduce HC and CO.

This system also operates during deceleration for the purpose of blowing off water around the air induction valve.

| Engine condition | Engine coolant temperature °C (°F) | Vehicle speed km/h (MPH) | A.I.V. control solenoid valve | A.I.V. control system |
|---|---|---|---|---|
| Throttle valve is at idle position | Below 64 (147) | Any condition | ON | Operates |
| | Above 65 (149) | Below 24 (15) | | |

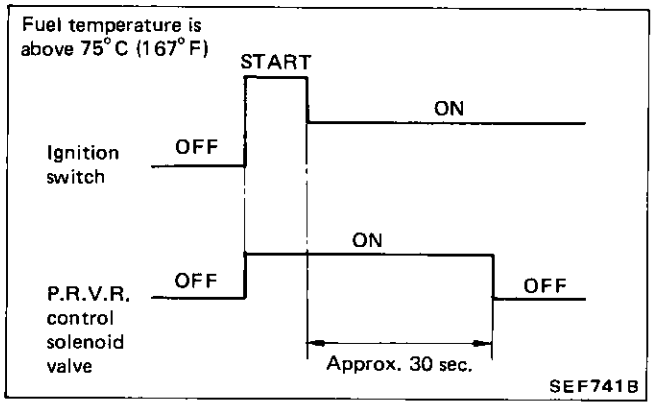
## Fuel Pressure Regulator Control

### INPUT/OUTPUT SIGNAL LINE



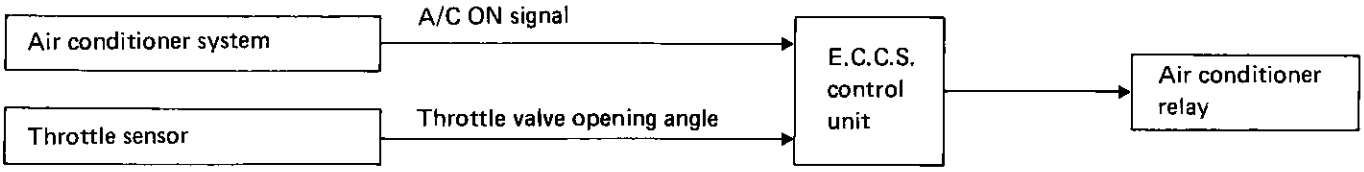

### SYSTEM DESCRIPTION

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

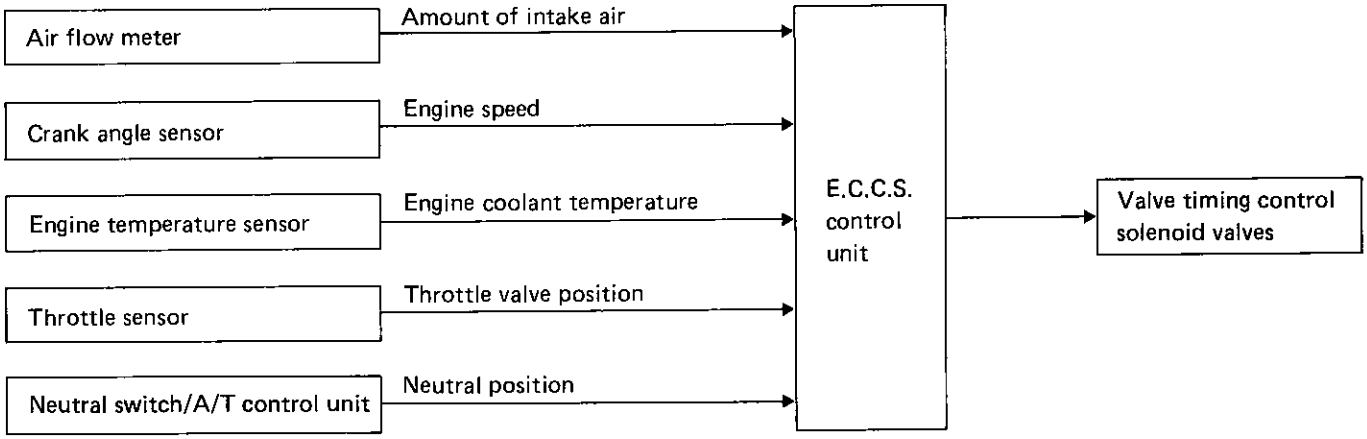



### SYSTEM DESCRIPTION

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.

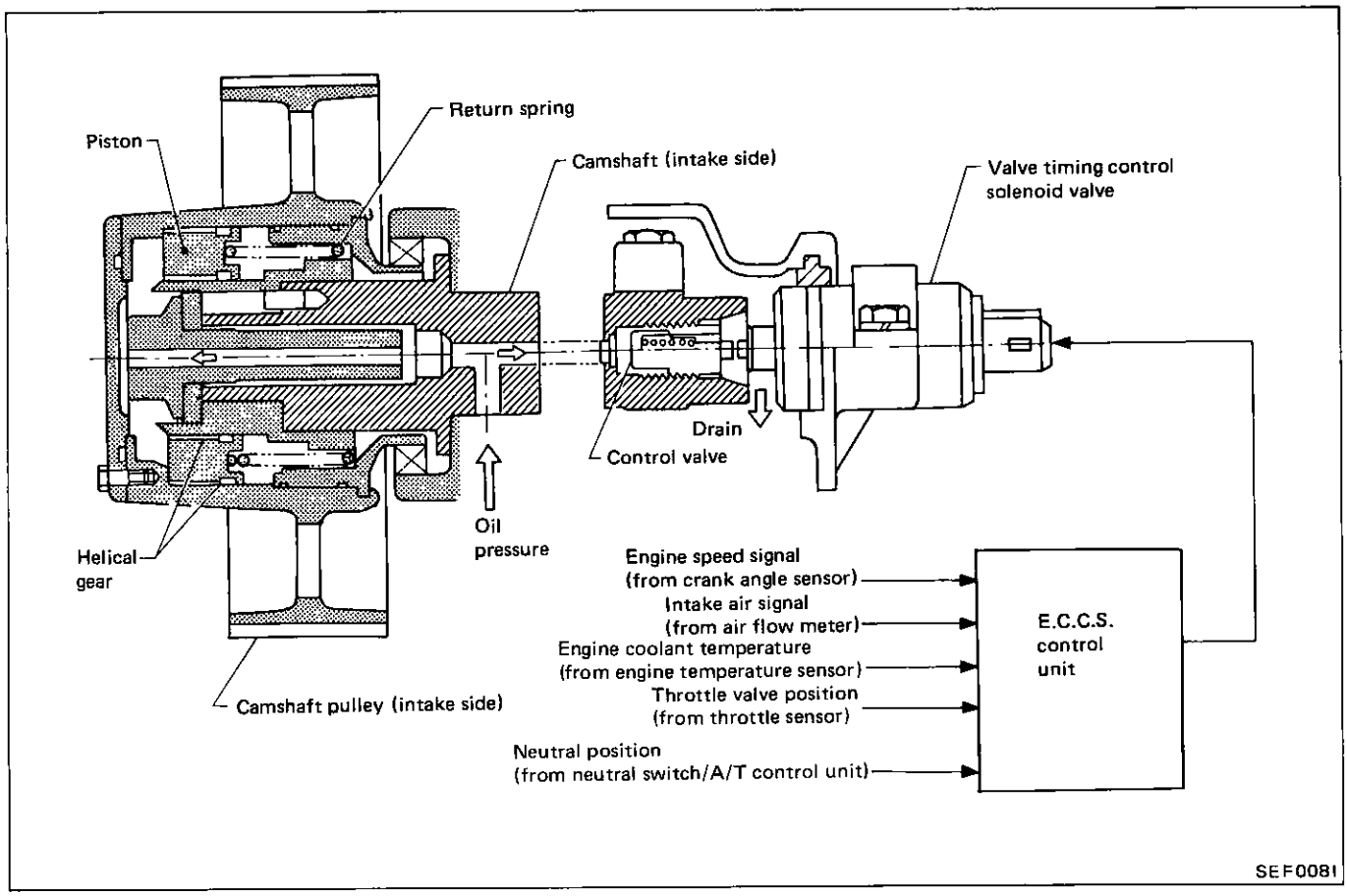
## Valve Timing Control

### INPUT/OUTPUT SIGNAL LINE




### SYSTEM DESCRIPTION

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

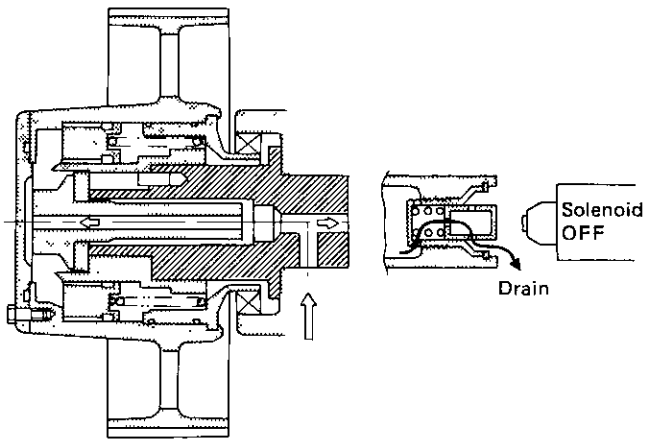


## Valve Timing Control (Cont'd)

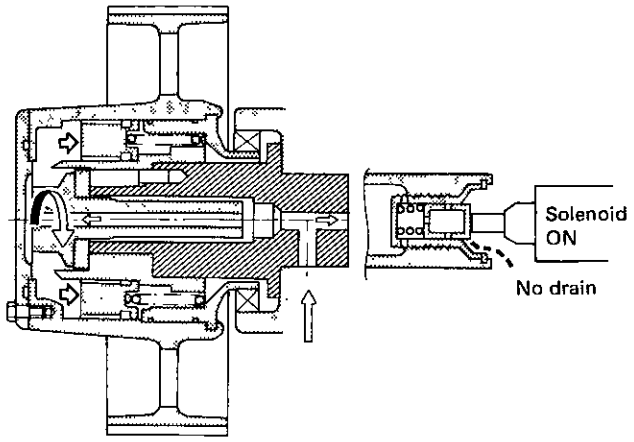
### OPERATION

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

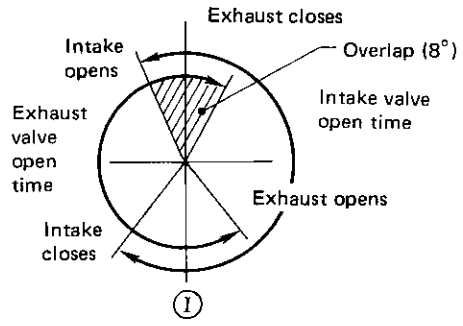
(I) Valve timing control solenoid valve is OFF.

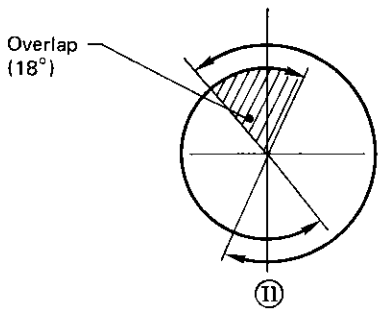


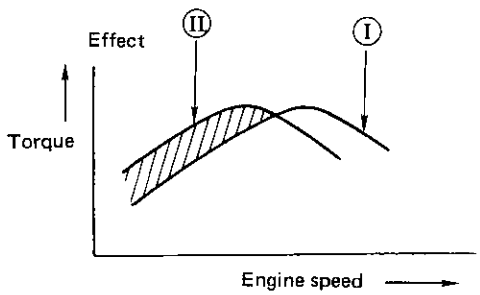

(II) Valve timing control solenoid valve is ON.




SEF009I



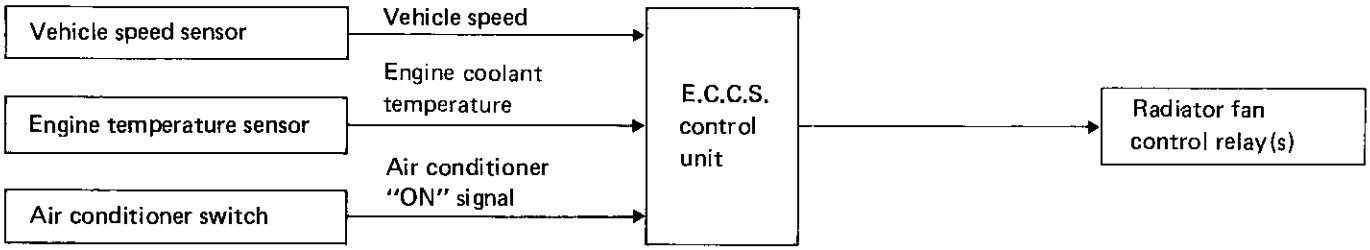




SEF010I

## Radiator Fan Control

### INPUT/OUTPUT SIGNAL LINE




The E.C.U. controls the radiator fan corresponding to the vehicle speed, engine temperature, and air conditioner ON signal. The non-turbo model has 2-step control [ON (HIGH)/OFF], and the turbo model 3-step control [HIGH/LOW/OFF].

### OPERATION

**[Non-turbo model]**

**Air conditioner switch is "OFF"**

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

**Air conditioner switch is "ON"**

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

**[Turbo model]**

**Air conditioner switch is "OFF"**

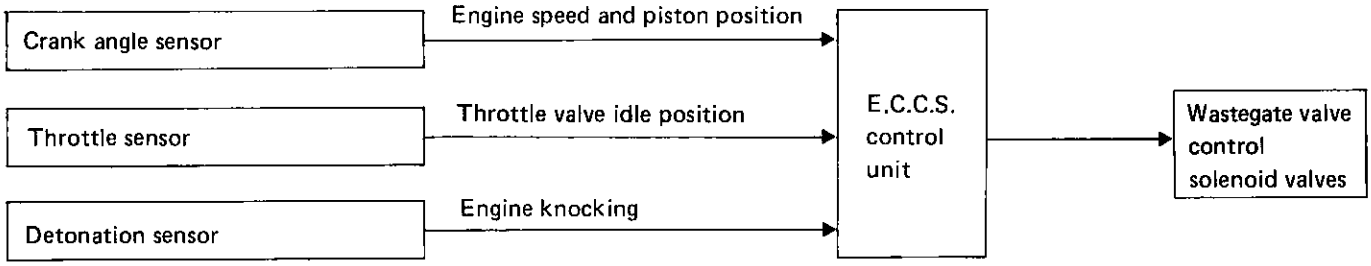
| Engine coolant temperature °C (°F) | Radiator fan |
|---|---|
| Below 104 (219) | OFF |
| Above 105 (221) | ON |

**Air conditioner switch is "ON"**

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

## Wastegate Valve Control

### INPUT/OUPTUT SIGNAL LINE




### SYSTEM DESCRIPTION

The wastegate valve control solenoid valve changes the source vacuum which activates the actuator. This results in a suitable turbo-pressure.

When detonation signs are detected, which means a low octane fuel is being used, the solenoid valve turns OFF, and turbocharger pressure becomes low.

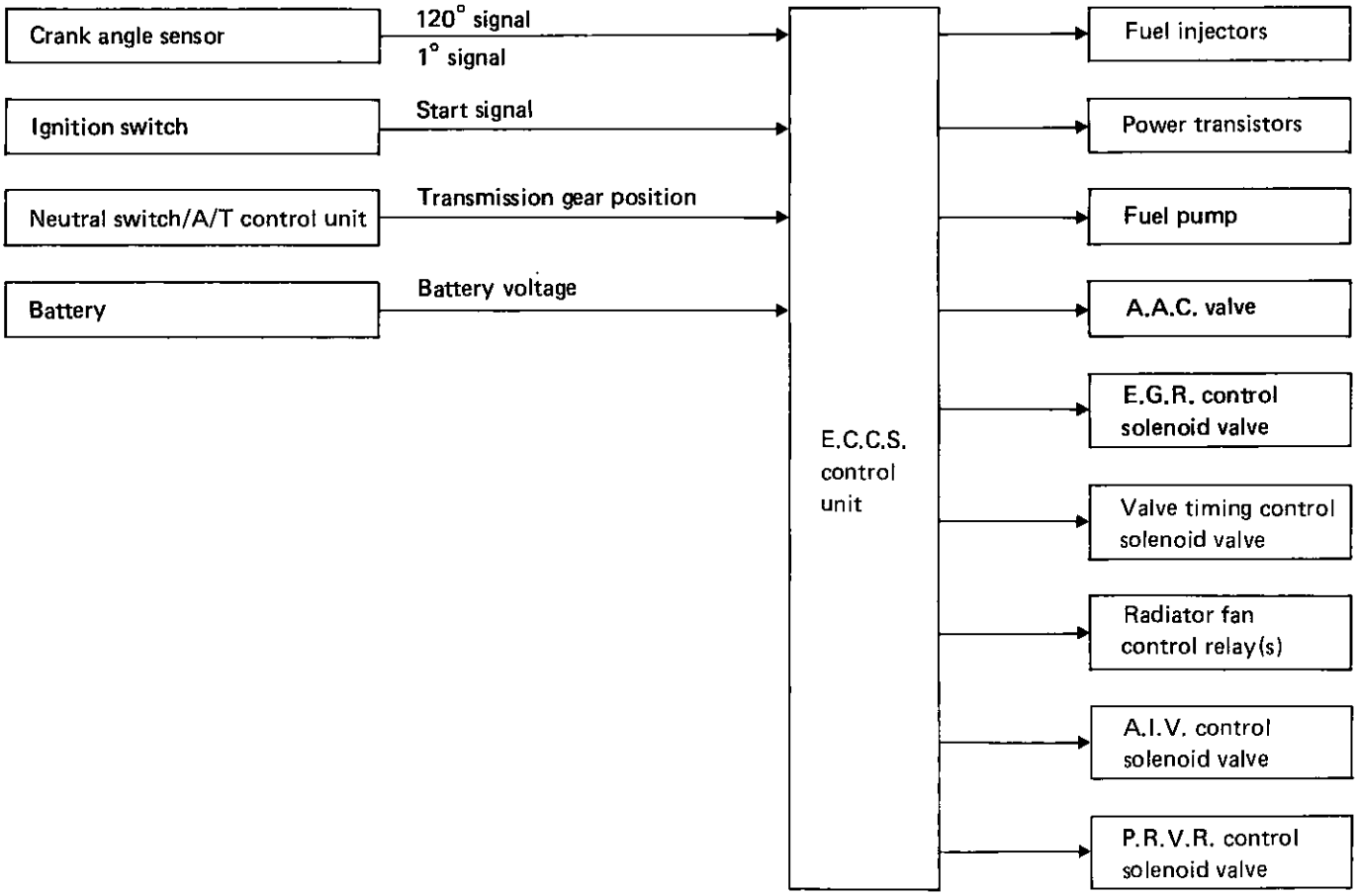
### OPERATION

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

## Fail-safe System

### C.P.U. MALFUNCTION OF E.C.U.

**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.

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

## Fail-safe System (Cont'd)

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

The fail-safe mode operation starts when the computing function of the E.C.U. is judged to be malfunctioning.

When the fail-safe system activates, i.e. if a malfunction condition is detected in the C.P.U. of the E.C.U., the CHECK ENGINE LIGHT on the instrument panel lights to warn the driver.

**Engine control, with fail-safe system, operates when E.C.U. is malfunctioning**

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

**Cancellation of fail-safe system when E.C.U. is malfunctioning**

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

### 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.

Although the air flow meter is malfunctioning, it is possible to start the engine and drive the vehicle. But engine speed will not rise more than 2,400 rpm in order to inform the driver of fail-safe system operation while driving.

**Operation**

| Engine condition | Starter switch | Fail-safe system | Fail-safe functioning |
|---|---|---|---|
| Stopped | ANY | Does not operate | – |
| Cranking | ON | Operates | Engine will be started by a pre-determined injection pulse on E.C.U. |
| Running | OFF | | Engine speed will not rise above 2,400 rpm |

### ENGINE TEMPERATURE SENSOR MALFUNCTION

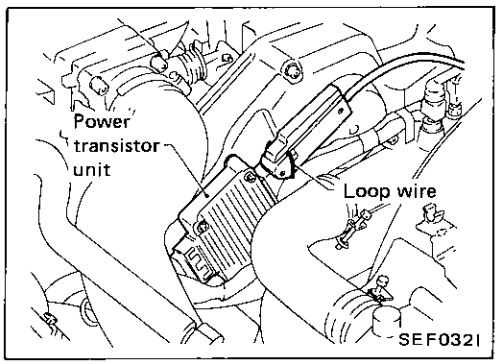
When engine temperature sensor output voltage is below or above the specified value, engine coolant temperature signal is fixed at the preset value as follows:

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

### FUEL TEMPERATURE SENSOR MALFUNCTION

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

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



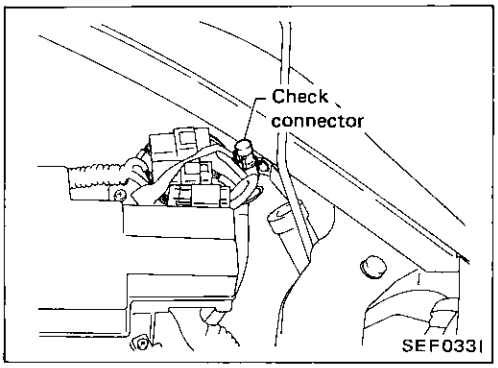

## Direct Ignition System

### CHECKING IDLE SPEED AND IGNITION TIMING

**Idle speed**

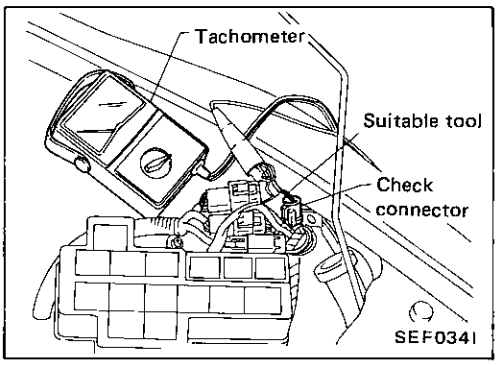
- **Method A (With pulse type tachometer)**

Clamp loop wire as shown.




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

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

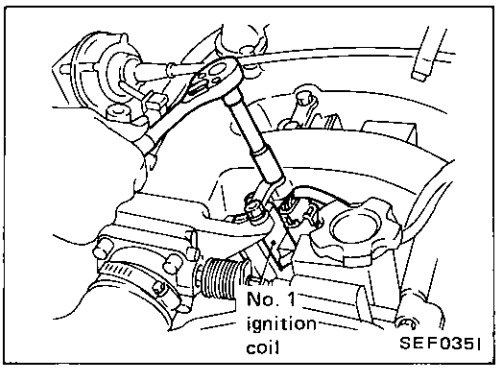


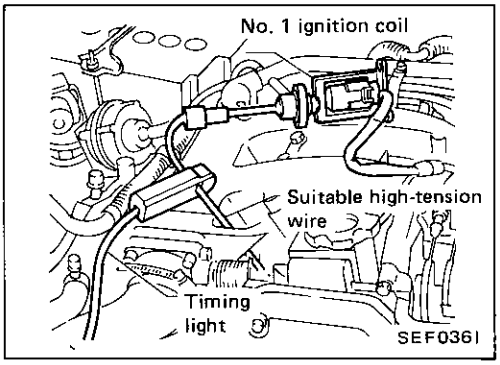

2. Connect tachometer using suitable tool.

**Ignition timing**

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

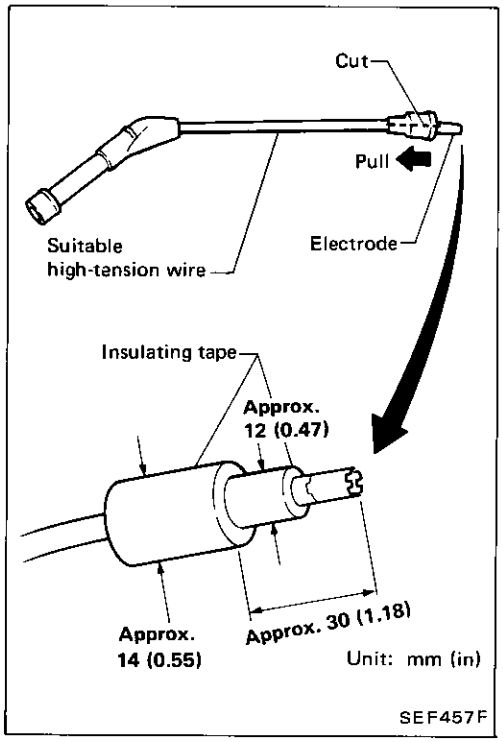
1. Remove No. 1 ignition coil.



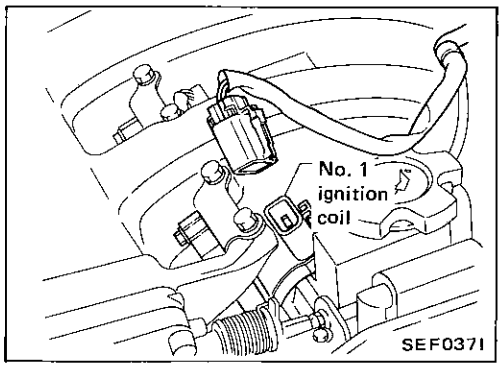




2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.
3. Check ignition timing.

## Direct Ignition System (Cont'd)

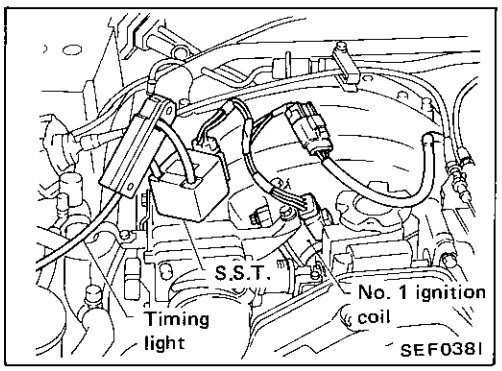



4. For above procedures, enlarge suitable high-tension wire end with insulating tape as shown.

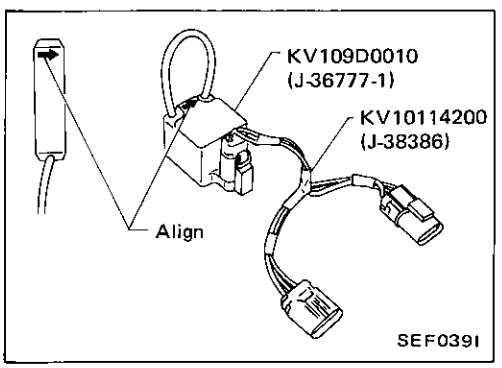



- **Method B (With S.S.T.)**

1. Disconnect connector of No. 1 ignition coil.




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



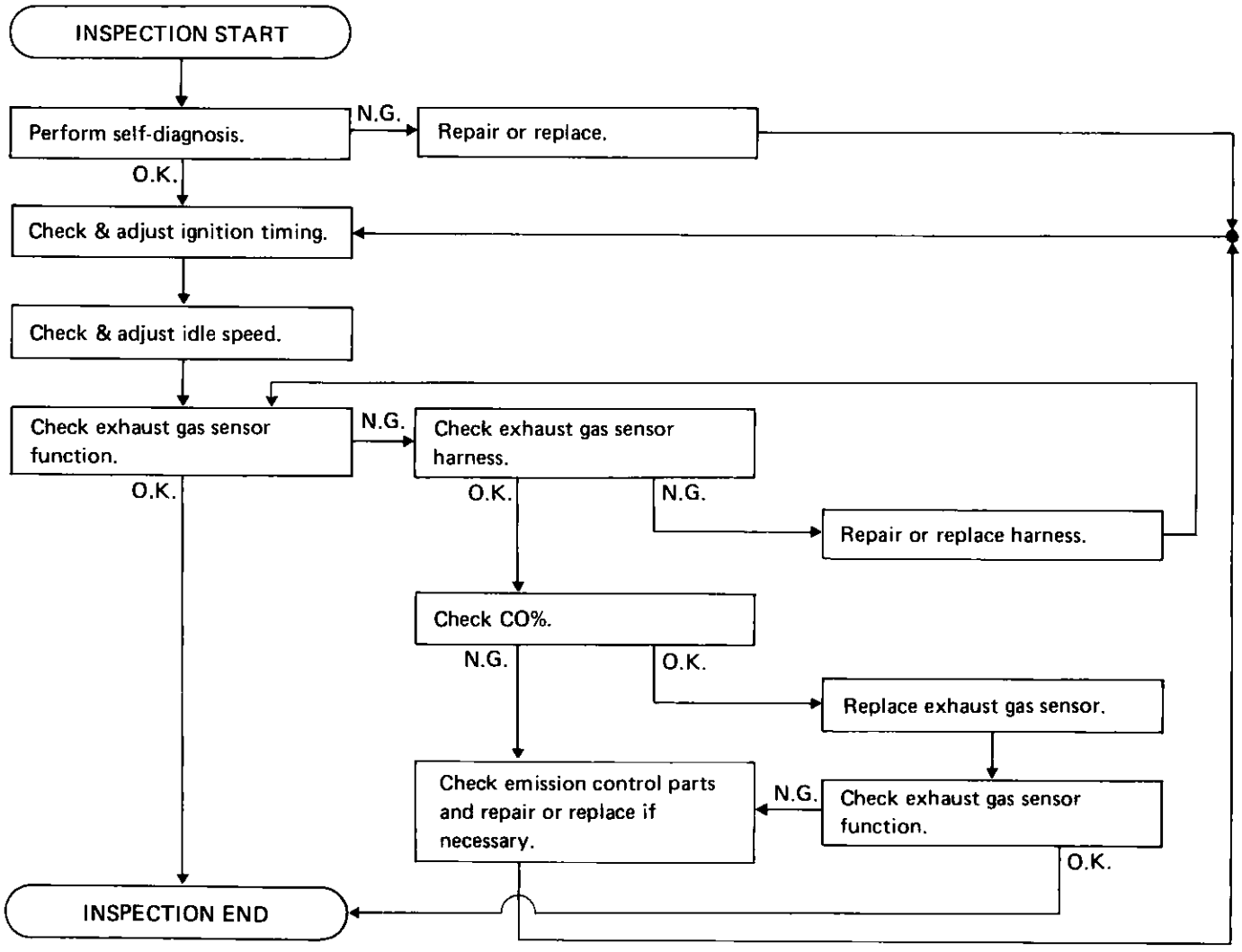

**Align direction marks on S.S.T. and timing light clamp if aligning mark is punched.**

## PREPARATION

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- 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

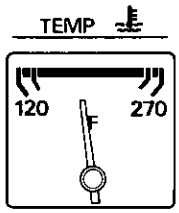
2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
4. When measuring "CO" percentage,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

### Overall inspection sequence



START

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



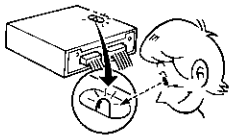
SEF246F

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.


SEF362I

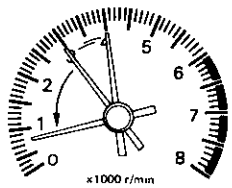
O.K. / N.G.

Repair or replace components as necessary.

Does engine run smoothly?

O.K. / N.G.

Clean injectors.



SEF248F

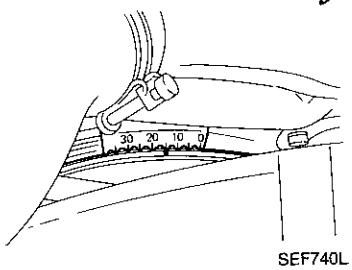
Race engine two or three times under no-load, then run engine at idle speed.

Check ignition timing with a timing light.

15°±2° B.T.D.C.

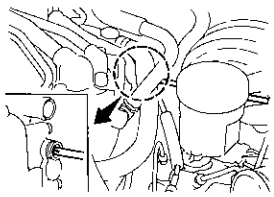
O.K. / N.G.

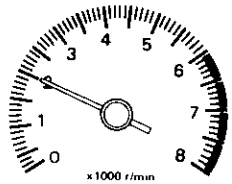
Adjust ignition timing by turning crank angle sensor after loosening securing bolts.


SEF740L

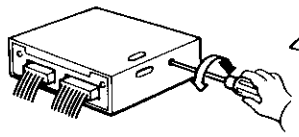
Ⓗ

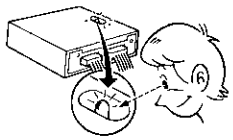
Ⓐ Ⓑ


SEF364I



SEF247F


SEF957D


SEF362I

Check idle speed.

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

O.K.

N.G.

Disconnect A.A.C. valve harness connector.

Adjust idle speed by turning idle speed adjusting screw.

**A/T: 720 rpm (in "N" position) [Non-turbo]**
**700 rpm (in "N" position) [Turbo]**
**M/T: 650 rpm**

Connect A.A.C. valve harness connector.

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

Set the diagnosis mode of E.C.U. to Mode II. ← Ⓘ

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

Inspection lamp does not blink.

O.K.

Less than 5 times

Replace left side exhaust gas sensor. ← Ⓙ

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

O.K.

N.G. → Ⓚ

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

Inspection lamp does not blink.

O.K.

Less than 5 times

END

Replace right side exhaust gas sensor.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ

Ⓒ

Ⓓ

Ⓔ

Ⓕ

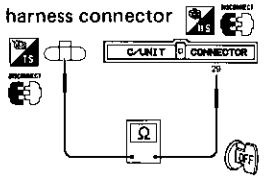
Check right side exhaust gas sensor signal.
Make sure that inspection lamp goes on and off more than 5 times during 10 seconds at 2,000 rpm.

N.G.

O.K.

END

Exhaust gas sensor harness connector




SEF571I

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

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

Ⓘ

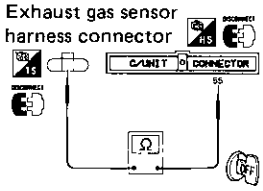
O.K.

N.G.

Repair or replace harness.

Connect 76-pin connector to E.C.U.

Exhaust gas sensor harness connector




SEF363I

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

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

Ⓘ

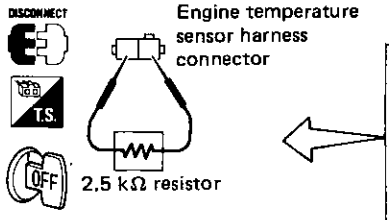
O.K.

N.G.

Repair or replace harness.

Connect 76-pin connector to control unit.

Ⓖ

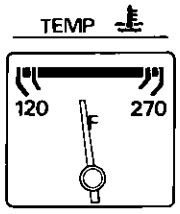



SEC242B

Ⓖ

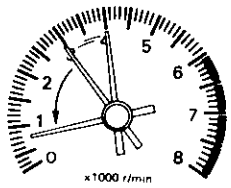
1) Disconnect engine temperature sensor harness connector.
2) Connect a resistor (2.5 kΩ) between terminals of engine temperature sensor harness connector.
3) Disconnect A.I.V. control solenoid valve harness connector.

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




SEF246F

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




SEF248F

Check "CO" %.

**Idle CO: 0.2 ~ 8%**

After checking CO%,
1) Disconnect the resistor from terminals of engine temperature sensor.
2) Connect engine temperature sensor harness connector to engine temperature sensor.
3) Connect A.I.V. control solenoid valve harness connector.

O.K. → Ⓙ

N.G.

Connect exhaust gas sensor harness connector to exhaust gas sensor.

Check fuel pressure regulator. ← Ⓚ

Check air flow meter.

Check injector.
Clean or replace if necessary.

Check engine temperature sensor.

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

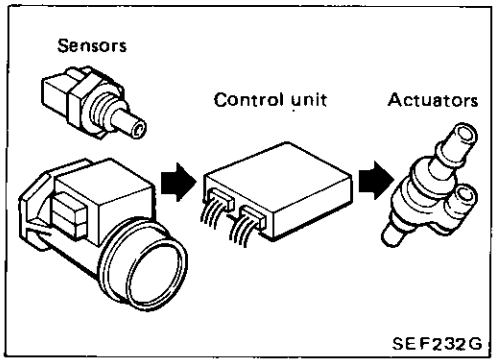
*: E.C.U. may be the cause of a problem, but this is rarely the case.

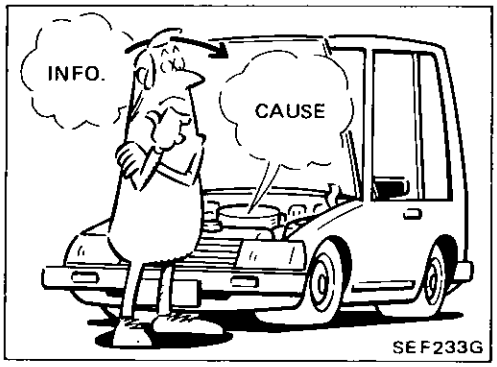
## Contents

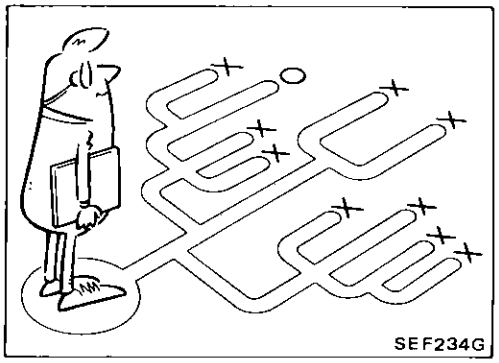
**How to Perform Trouble Diagnoses for Quick and Accurate Repair** ..... EF & EC- 44
**Self-diagnosis** ..... EF & EC- 48
**Self-diagnosis — Mode I** ..... EF & EC- 50
**Self-diagnosis — Mode II (Self-diagnostic results)** ..... EF & EC- 51
**Self-diagnosis — Mode II (Exhaust gas sensor monitor)** ..... EF & EC- 54
**Consult** ..... EF & EC- 55
**Diagnostic Procedure** ..... EF & EC- 66
**Basic Inspection** ..... EF & EC- 68
**Diagnostic Procedure 1 — High Idling after Warm-up** ..... EF & EC- 71
**Diagnostic Procedure 2 — Hunting** ..... EF & EC- 72
**Diagnostic Procedure 3 — Unstable Idle** ..... EF & EC- 74
**Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold** ..... EF & EC- 78
**Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot** ..... EF & EC- 80
**Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions** ..... EF & EC- 82
**Diagnostic Procedure 7 — Hesitation when the Engine is Hot** ..... EF & EC- 84
**Diagnostic Procedure 8 — Hesitation when the Engine is Cold** ..... EF & EC- 85
**Diagnostic Procedure 9 — Hesitation under Normal Conditions** ..... EF & EC- 86
**Diagnostic Procedure 10 — Engine Stalls when Turning** ..... EF & EC- 88
**Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot** ..... EF & EC- 90
**Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold** ..... EF & EC- 92
**Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily** ..... EF & EC- 94
**Diagnostic Procedure 14 — Engine Stalls after Decelerating** ..... EF & EC- 97
**Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising** ..... EF & EC-101
**Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy** ..... EF & EC-104
**Diagnostic Procedure 17 — Lack of Power and Stumble** ..... EF & EC-106
**Diagnostic Procedure 18 — Detonation** ..... EF & EC-107
**Diagnostic Procedure 19 — Surge** ..... EF & EC-109
**Diagnostic Procedure 20 — Backfire through the Intake** ..... EF & EC-110
**Diagnostic Procedure 21 — Backfire through the Exhaust** ..... EF & EC-110
**Diagnostic Procedure 22**
MAIN POWER SUPPLY AND GROUND CIRCUIT ..... EF & EC-111
**Diagnostic Procedure 23**
CRANK ANGLE SENSOR ..... EF & EC-113
**Diagnostic Procedure 24**
AIR FLOW METER ..... EF & EC-116
**Diagnostic Procedure 25**
ENGINE TEMPERATURE SENSOR ..... EF & EC-119
**Diagnostic Procedure 26**
VEHICLE SPEED SENSOR ..... EF & EC-121
**Diagnostic Procedure 27**
IGNITION SIGNAL ..... EF & EC-123
**Diagnostic Procedure 28**
ENGINE CONTROL UNIT ..... EF & EC-125
**Diagnostic Procedure 29**
E.G.R. FUNCTION ..... EF & EC-126
**Diagnostic Procedure 30**
EXHAUST GAS SENSOR ..... EF & EC-130
**Diagnostic Procedure 31**
DETONATION SENSOR ..... EF & EC-133
**Diagnostic Procedure 32**
EXHAUST GAS TEMPERATURE SENSOR ..... EF & EC-135
**Diagnostic Procedure 33**
FUEL TEMPERATURE SENSOR ..... EF & EC-137
**Diagnostic Procedure 34**
THROTTLE SENSOR ..... EF & EC-139

## Contents (Cont'd)

**Diagnostic Procedure 35**
INJECTOR LEAK ..... EF & EC-142
**Diagnostic Procedure 36**
INJECTOR CIRCUIT ..... EF & EC-144
**Diagnostic Procedure 37**
THROTTLE VALVE SWITCH ..... EF & EC-146
**Diagnostic Procedure 38**
START SIGNAL ..... EF & EC-148
**Diagnostic Procedure 39**
POWER STEERING OIL PRESSURE SWITCH ..... EF & EC-150
**Diagnostic Procedure 40**
NEUTRAL SWITCH & A/T CONTROL UNIT (NEUTRAL SIGNAL) CIRCUIT ..... EF & EC-152
**Diagnostic Procedure 41**
FUEL PUMP ..... EF & EC-154
**Diagnostic Procedure 42**
AIR REGULATOR ..... EF & EC-157
**Diagnostic Procedure 43**
A.A.C. VALVE ..... EF & EC-160
**Diagnostic Procedure 44**
F.I.C.D. SOLENOID VALVE ..... EF & EC-162
**Diagnostic Procedure 45**
A.I.V. CONTROL SOLENOID VALVE ..... EF & EC-164
**Diagnostic Procedure 46**
P.R.V.R. CONTROL SOLENOID VALVE ..... EF & EC-166
**Diagnostic Procedure 47**
V.T.C. SOLENOID VALVE ..... EF & EC-168
**Diagnostic Procedure 48**
RADIATOR FAN CONTROL ..... EF & EC-170
**Diagnostic Procedure 49**
WASTEGATE VALVE CONTROL SOLENOID VALVE ..... EF & EC-173
**Electrical Components Inspection** ..... EF & EC-175




## 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.

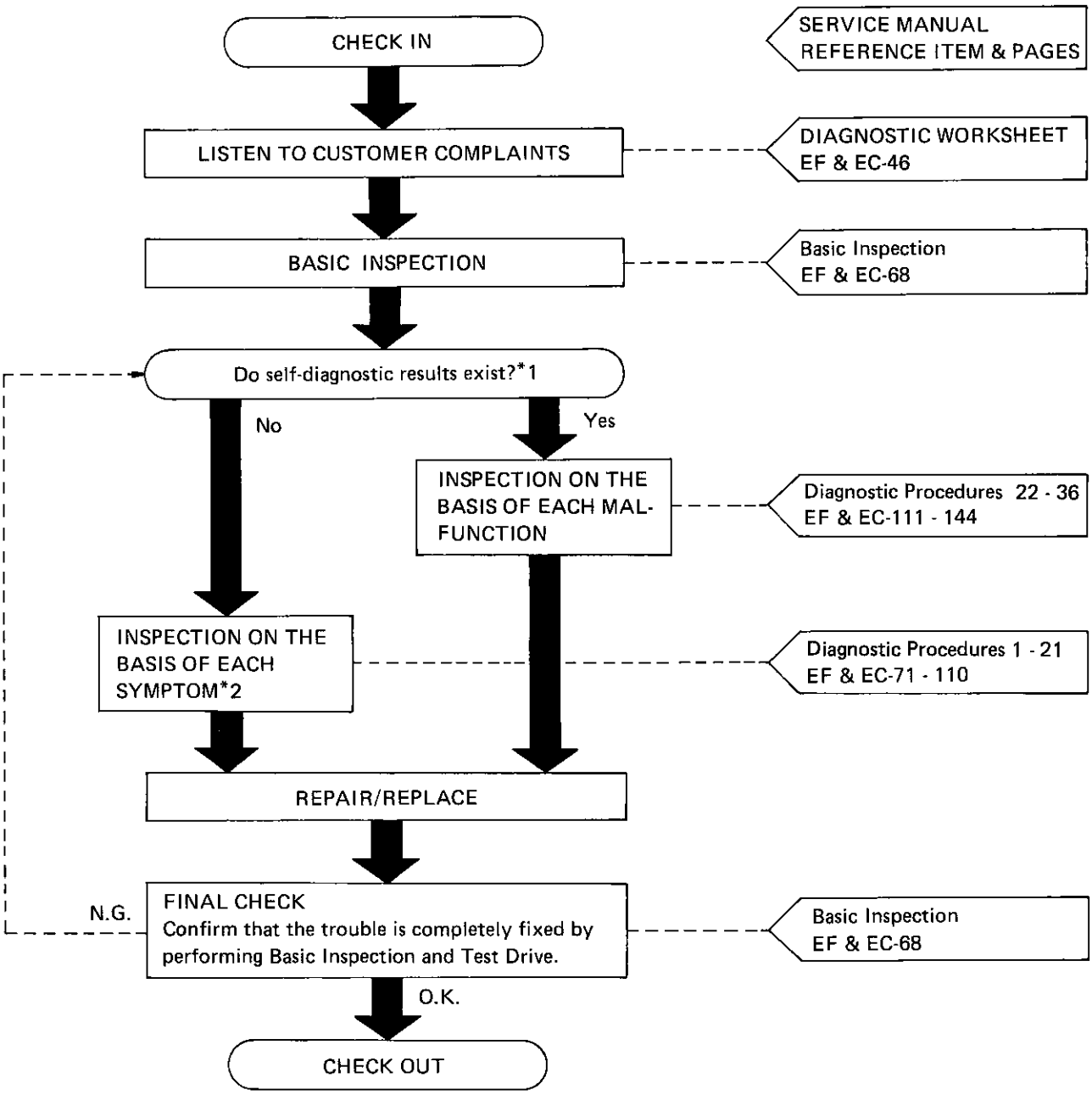
A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

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-47).

**KEY POINTS**

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

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

### DIAGNOSTIC WORKSHEET

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

A good grasp of such conditions can make trouble-shooting faster and more accurate.

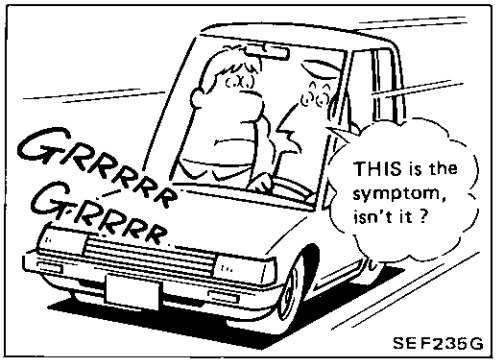
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.

Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for 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<br>☐ Partial combustion affected by throttle position<br>☐ Partial combustion NOT affected by throttle position<br>☐ Possible but hard to start ☐ Others [ ] |
| | ☐ Idling | ☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle<br>☐ Others [ ] |
| | ☐ Driveability | ☐ Stumble ☐ Surge ☐ Detonation ☐ Lack of power<br>☐ Intake backfire ☐ Exhaust backfire<br>☐ Others [ ] |
| | ☐ Engine stall | ☐ At the time of start ☐ While idling<br>☐ While accelerating ☐ While decelerating<br>☐ Just after stopping ☐ While loading |
| Incident occurrence | | ☐ Just after delivery ☐ Recently<br>☐ 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<br>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<br>☐ At starting ☐ While idling ☐ At racing<br>☐ While accelerating ☐ While cruising<br>☐ While decelerating ☐ While turning (RH/LH)<br>Vehicle speed 0 10 20 30 40 50 60 MPH |
| Check engine light | | ☐ Turned on ☐ Not turned on |

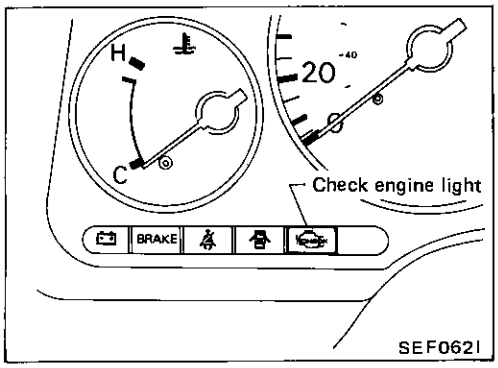


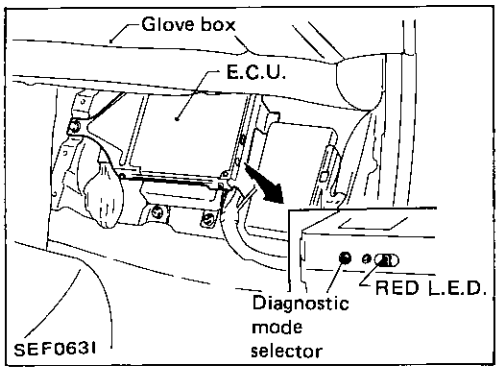

## How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

### 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.<br>**[WARNING: Do not overheat the unit.]** |
| 7 | Moisture | Electric parts | Damp | Wet.<br>**[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 the California, Federal and Canada models. This light blinks simultaneously with the RED L.E.D. on the E.C.U.

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

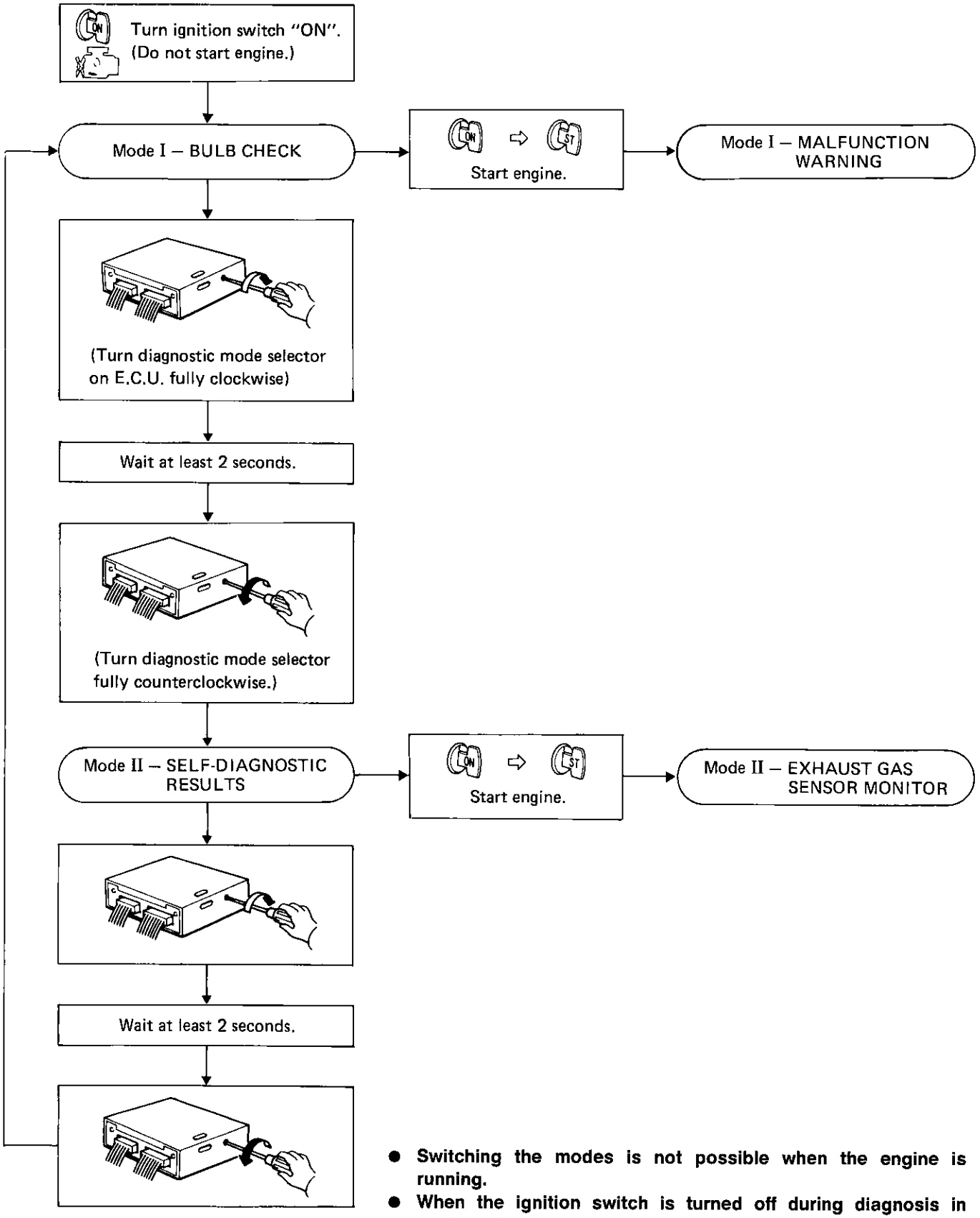
In the E.C.U., the Green and Red L.E.D.'s have now been permanently changed to one RED L.E.D.

### 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 malfunction (check engine light item) is detected or the E.C.U.'s C.P.U. 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 (Left side) |
| 35 | Exhaust gas temperature sensor circuit |
| 43 | Throttle sensor circuit |
| 45 | Injector leak |
| 51 | Injector circuit |
| 53 | Exhaust gas sensor circuit (Right side) |

- **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.**

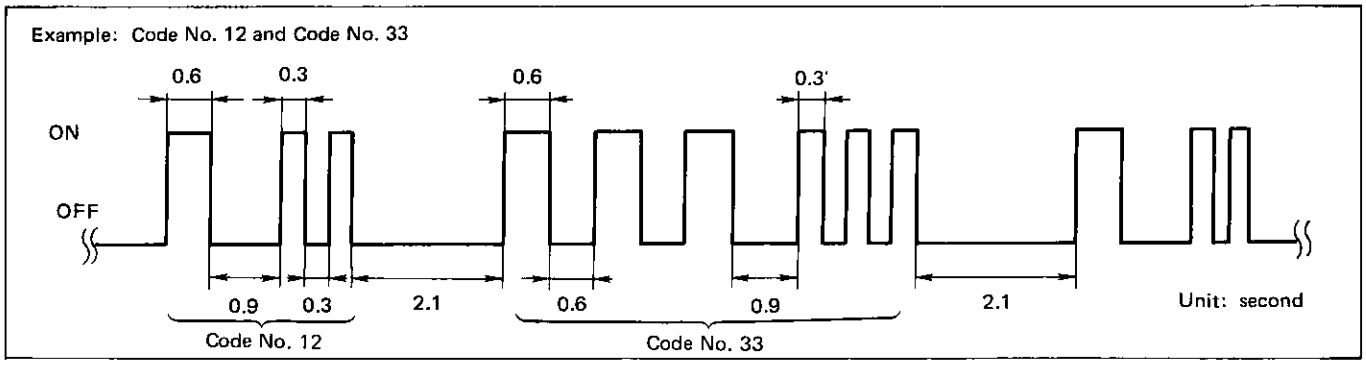
**FOR NON-CALIFORNIA MODEL**

| CHECK ENGINE LIGHT and RED L.E.D. | Condition |
|---|---|
| ON | When the E.C.U.'s C.P.U. 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 |
| 31 CHECK | E.C.U. | X | X |
| 32 CHECK | E.G.R. function | X | – |
| 33 CHECK | Exhaust gas sensor circuit (Left side) | 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 | – |
| 53 CHECK | Exhaust gas sensor circuit (Right side) | X | X |
| 54 | Signal circuit from A/T control unit to E.C.U. (A/T only) | X | X |
| 55 | No malfunction in the above circuits | X | X |

X: Available
–: Not available
CHECK : Check engine light item

## 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.<br>• 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<br>• Engine temperature sensor |
| 14 | Vehicle speed sensor circuit | • The vehicle speed sensor circuit is open or shorted. | • Harness and connector<br>• 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<br>• Power transistor unit |
| 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<br>• E.G.R. control solenoid valve |
| 33 | Exhaust gas sensor circuit (Left side) | • The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) | • Harness and connector<br>• Exhaust gas sensor<br>• Fuel pressure<br>• Injectors<br>• 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<br>• 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<br>• 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<br>• 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<br>• Throttle sensor |

*: 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) |
|---|---|---|---|
| 45 | Injector leak | • Fuel leaks from injector. | • Injector |
| 51 | Injector circuit | • The injector circuit is open. | • Harness and connector<br>• Injector |
| 54 | Signal circuit from A/T control unit to E.C.U. (A/T only) | • The A/T communication line is open or shorted. | • Harness and connector |

### 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 |

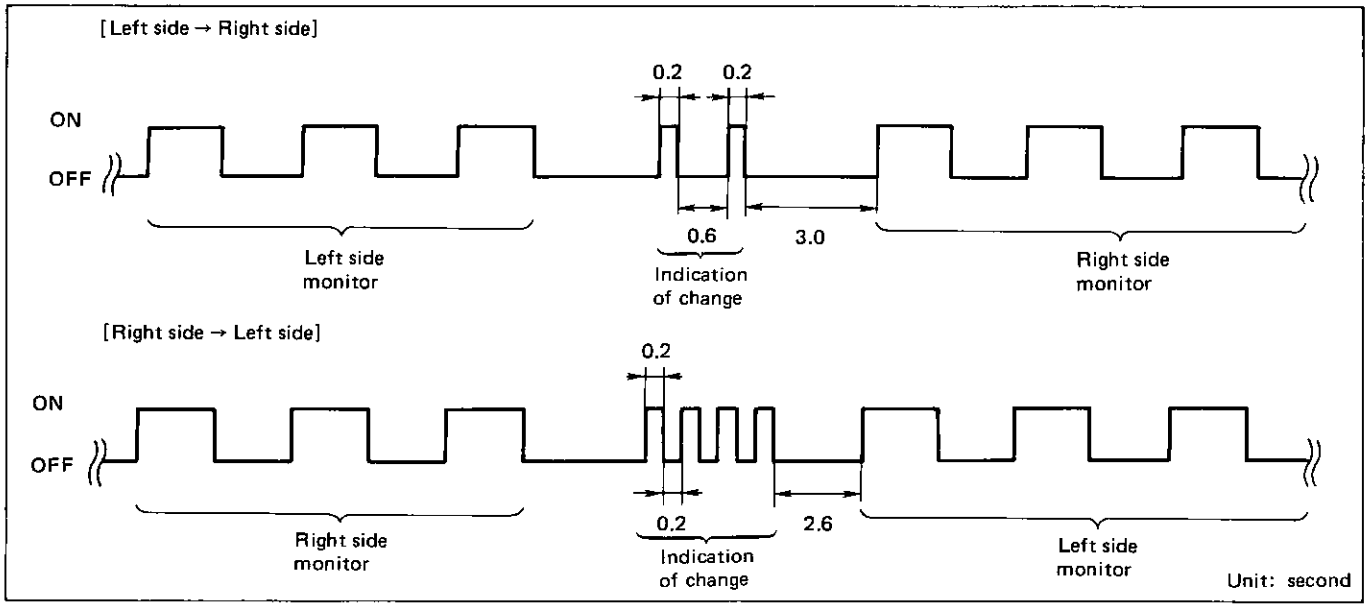
*: Maintains conditions just before switching to open loop.

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

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

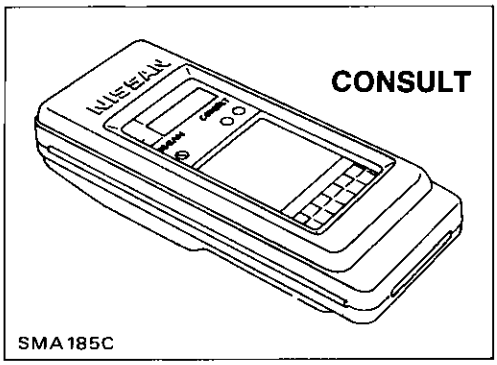
1. Turn diagnostic mode selector on E.C.U. fully clockwise.
2. Wait at least 2 seconds.
3. Turn diagnostic mode selector on E.C.U. fully counterclockwise.

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




### HOW TO CHECK EXHAUST GAS SENSOR

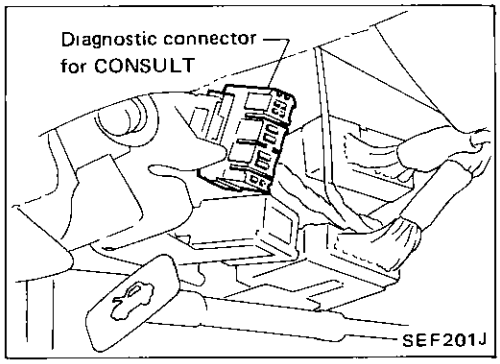
1. Set Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or CHECK ENGINE LIGHT goes ON and OFF more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

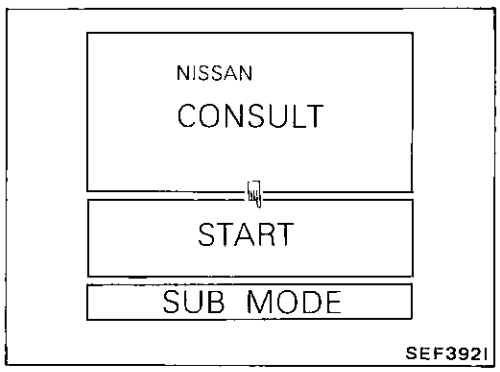



## Consult

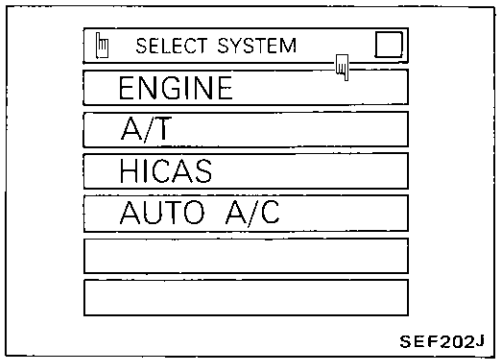
### CONSULT INSPECTION PROCEDURE

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

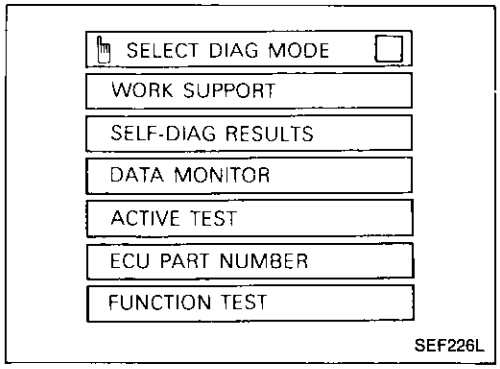



3. Turn on ignition switch.
4. Touch "START".




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

| | MODE / E.C.C.S. COMPONENT PARTS | 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 sensor | | 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 | | |
| | Power steering oil pressure switch | | | X | | X |
| | Battery | | | X | | |
| | A/T signal | | X | | | |
| OUTPUT | Injectors | | X | X | X | X |
| | Power transistors (ignition timing) | | X (Ignition signal) | X | X | X |
| | A.A.C. valve | X | | X | X | X |
| | F.I.C.D. solenoid valve | | | X | X | X |
| | Valve timing control solenoid valve | | | X | X | X |
| | A.I.V. control solenoid valve | | | X | X | |
| | P.R.V.R. control solenoid valve | | | X | X | X |
| | E.G.R. control solenoid valve | | | X | X | X |
| | Wastegate valve control solenoid valves | | | X | | |
| | Air conditioner relay | | | X | | |
| | Fuel pump relay | X | | X | X | X |
| | Radiator fan | | | X | X | X |

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

## Consult (Cont'd)

### 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 number | E.C.U. part number can be read. |
| Function test | Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG". |

### WORK SUPPORT MODE

| WORK ITEM | CONDITION | USAGE |
|---|---|---|
| THROTTLE SENSOR ADJUSTMENT | CHECK THE THROTTLE SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS.<br>• IGN SW "ON"<br>• ENG NOT RUNNING<br>• 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.<br>• ENGINE WARMED UP<br>• NO-LOAD | When adjusting idle speed, |
| FUEL PRESSURE RELEASE | • FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line, |

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

## Consult (Cont'd)

### SELF-DIAGNOSTIC RESULTS MODE

| DIAGNOSTIC ITEM | DIAGNOSTIC ITEM IS DETECTED WHEN .... | CHECK ITEM (REMEDY) |
|---|---|---|
| CRANK ANGLE SENSOR* | • Either 1° or 120° signal is not entered for the first few seconds during engine cranking.<br>• 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<br>• Engine temperature sensor |
| CAR SPEED SENSOR | • The vehicle speed sensor circuit is open or shorted. | • Harness and connector<br>• 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<br>• Power transistor unit |
| 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<br>• E.G.R. control solenoid valve |
| EXH GAS SENSOR<br>EXH GAS SENSOR-R | • The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) | • Harness and connector<br>• Exhaust gas sensor<br>• Fuel pressure<br>• Injectors<br>• Intake air leaks |
| DETONATION SENSOR | • The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.) | • Harness and connector<br>• 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<br>• 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<br>• Fuel temperature sensor |
| THROTTLE SENSOR | • The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) | • Harness and connector<br>• Throttle sensor |

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

## Consult (Cont'd)

| DIAGNOSTIC ITEM | DIAGNOSTIC ITEM IS DETECTED WHEN.... | CHECK ITEM (REMEDY) |
|---|---|---|
| INJECTOR FUEL LEAK** | • Fuel leaks from injector. | • Injector |
| INJECTOR OPEN** | • The injector circuit is open. | • Injector |
| A/T COMM LINE | • The A/T communication line is open or shorted. | • Harness and connector |

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

## Consult (Cont'd)

### DATA MONITOR MODE

Remarks;
- The monitor item marked "*" is applicable to vehicles for California only.
- Specification data are reference values.
- Specification data are out-put/in-put values which are detected or supplied by E.C.U. at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  ie. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing being not adjusted to the specification data. This IGN TIMING monitors the calculated data by E.C.U. according to the input signals from crank angle sensor and other ignition timing related sensors.

| MONITOR ITEM | CONDITION | | SPECIFICATION | | CHECK ITEM WHEN OUTSIDE SPEC. |
|---|---|---|---|---|---|
| | | | Non-turbo | Turbo | |
| CAS·RPM (POS)<br>CAS·RPM (REF) | • Tachometer: Connect<br>• Run engine and compare tachometer indication with the CONSULT value. | | Almost the same speed as the CONSULT value. | | • Harness and connector<br>• Crank angle sensor |
| AIR FLOW MTR | • Engine: After warming up, idle the engine<br>• A/C switch "OFF"<br>• Shift lever "N"<br>• No-load | Idle | 0.8 - 1.5V | 0.9 - 1.4V | • Harness and connector<br>• Air flow meter |
| | | 2,000 rpm | 1.4 - 1.8V | 1.4 - 1.8V | |
| ENG TEMP SEN | • Engine: After warming up | | More than 70°C (158°F) | | • Harness and connector<br>• Engine temperature sensor |
| EXH GAS SEN<br>EXH GAS SEN-R<br>M/R F/C MNT<br>M/R F/C MNT-R | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ 0.6 - 1.0V | | • Harness and connector<br>• Exhaust gas sensor<br>• Intake air leaks<br>• Injectors |
| | | | LEAN ↔ RICH<br>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<br>• Vehicle speed sensor |
| BATTERY VOLT | • Ignition switch: ON (Engine stopped) | | 11 - 14V | | • Battery<br>• E.C.U. power supply circuit |
| THROTTLE SEN | • Ignition switch: ON (Engine stopped) | Throttle valve fully closed | 0.4 - 0.5V | | • Harness and connector<br>• Throttle sensor<br>• 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<br>• Fuel temp. sensor |
| EGR TEMP SEN* | • Engine: After warming up | | Less than 4.5V | | • Harness and connector<br>• Exhaust gas temperature sensor |
| START SIGNAL | • Ignition switch: ON → START | | OFF → ON | | • Harness and connector<br>• Starter switch |
| IDLE POSITION | • Ignition switch: ON (Engine stopped) | Throttle valve: Idle position | ON | | • Harness and connector<br>• Throttle sensor<br>• 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<br>• Air conditioner switch |
| | | A/C switch "ON" | ON | | |
| NEUTRAL SW | • Ignition switch: ON | Shift lever "P" or "N" | ON | | • Harness and connector<br>• Neutral switch |
| | | Except above | OFF | | |

## Consult (Cont'd)

| MONITOR ITEM | CONDITION | | | SPECIFICATION | | CHECK ITEM WHEN OUTSIDE SPEC. |
|---|---|---|---|---|---|---|
| | | | | Non-turbo | Turbo | |
| PW/ST SIGNAL | • Engine: After warming up, idle the engine | Steering wheel in neutral (forward direction) | | OFF | | • Harness and connector<br>• Power steering oil pressure switch |
| | | The steering wheel is turned | | ON | | |
| INJ PULSE | • Engine: After warming up<br>• A/C switch "OFF"<br>• Shift lever "N"<br>• No-load | | Idle | 2.0 - 3.0 msec. | 1.8 - 2.5 msec. | • Harness and connector<br>• Injector<br>• Air flow meter<br>• Intake air system |
| INJ PULSE-R | | | 2,000 rpm | 2.0 - 3.0 msec. | 1.8 - 2.2 msec. | |
| IGN TIMING | ditto | | Idle | 15° B.T.D.C. | 15° B.T.D.C. | • Harness and connector<br>• Crank angle sensor |
| | | | 2,000 rpm | More than 25° B.T.D.C. | More than 25° B.T.D.C. | |
| AAC VALVE | ditto | | Idle | 15 - 40% | 15 - 35% | • Harness and connector<br>• A.A.C. valve |
| | | | 2,000 rpm | — | — | |

## Consult (Cont'd)

### ACTIVE TEST MODE

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

## Consult (Cont'd)

### FUNCTION TEST MODE

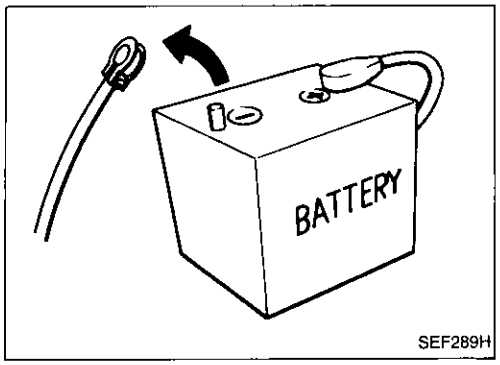
| TEST ITEM | CONDITION | JUDGEMENT | | CHECK ITEM (REMEDY) |
|---|---|---|---|---|
| SELF-DIAG RESULTS | • Ignition switch: ON (Engine stopped)<br>• Displays the results of self-diagnosis. | – | | Objective system |
| IDLE POSITION (IDLE SWITCH CIRCUIT) | • Ignition switch: ON (Engine stopped)<br>• 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<br>• Throttle sensor (Idle switch)<br>• Throttle sensor (Idle switch) adjustment<br>• Throttle linkage<br>• Verify operation in DATA MONITOR mode. |
| | | Throttle valve: closed | ON | |
| THROTTLE SENSOR CKT | • Ignition switch: ON (Engine stopped)<br>• 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<br>• Throttle sensor<br>• Throttle sensor adjustment<br>• Throttle linkage<br>• Verify operation in DATA MONITOR mode. |
| NEUTRAL SW CIRCUIT | • Ignition switch: ON (Engine stopped)<br>• Neutral switch circuit is tested when shift lever is manipulated. | OUT OF N/P-RANGE | OFF | • Harness and connector<br>• Neutral switch/Inhibitor switch<br>• Linkage + Inhibitor switch adjustment |
| | | IN N-RANGE | ON | |
| FUEL PUMP CIRCUIT | • Ignition switch: ON (Engine stopped)<br>• Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched. | There is pressure pulsation on the fuel feed hose. | | • Harness and connector<br>• Fuel pump<br>• Fuel pump relay<br>• Fuel filter clogging<br>• Fuel level |
| EGR CONT S/V CIRCUIT | • Ignition switch: ON (Engine stopped)<br>• 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<br>• EGR control solenoid valve |
| PRVR CONT S/V CIRCUIT | • Ignition switch: ON (Engine stopped)<br>• 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<br>• PRVR control solenoid valve |
| VALVE TIMING S/V CKT | • Ignition switch: ON (Engine stopped)<br>• Valve timing S/V circuit is tested by checking solenoid valve operating noise. | The solenoid valve makes an operating sound every 3 seconds. | | • Harness and connector<br>• Valve timing solenoid valve |
| RADIATOR FAN CIRCUIT | • Ignition switch: ON (Engine stopped)<br>• Radiator fan circuit is tested by checking radiator fan operation | • The radiator fan rotates and stops every 3 seconds. | | • Harness and connector<br>• Radiator fan motor<br>• Radiator fan relay |

## Consult (Cont'd)

| TEST ITEM | CONDITION | JUDGEMENT | | CHECK ITEM (REMEDY) |
|---|---|---|---|---|
| START SIGNAL CIRCUIT | • Ignition switch: ON → START<br>• 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<br>• Ignition switch |
| PW/ST SIGNAL CIRCUIT | • Ignition switch: ON (Engine running)<br>• Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position. | Locked position | ON | • Harness and connector<br>• Power steering oil pressure switch<br>• Power steering oil pump |
| | | Neutral | OFF | |
| CAR SPEED SEN CIRCUIT | • Car speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 mph) or higher. | Car speed sensor input signal is greater than 4 km/h (2 MPH) | | • Harness and connector<br>• Car speed sensor<br>• Electric speedometer |
| IGN TIMING ADJ | • After warming up, idle the engine.<br>• 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)<br>• 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 $O_2$ sensor output at 2,000 rpm under non-loaded state. | • $O_2$ SEN COUNT: More than 5 times during 10 seconds ($O_2$ SEN-R COUNT: More than 5 times during 10 seconds) | | • INJECTION SYS (Injector, fuel pressure regulator, harness or connector)<br>• IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector)<br>• VACUUM SYS (Intake air leaks)<br>• $O_2$ sensor circuit<br>• $O_2$ sensor operation<br>• Fuel pressure high or low<br>• Air flow meter |
| POWER BALANCE | • After warming up, idle the engine.<br>• 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)<br>• Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector)<br>• Compression<br>• Valve timing |
| AAC VALVE SYSTEM | • After warming up, idle the engine.<br>• 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<br>• AAC valve<br>• Air passage restriction between air inlet and AAC valve<br>• IAS (Idle adjusting screw) adjustment |

## Consult (Cont'd)

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

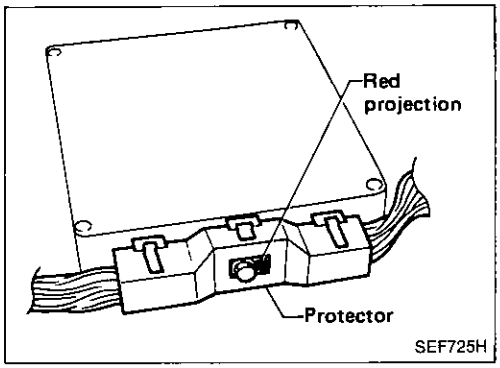


SEF289H

## Diagnostic Procedure

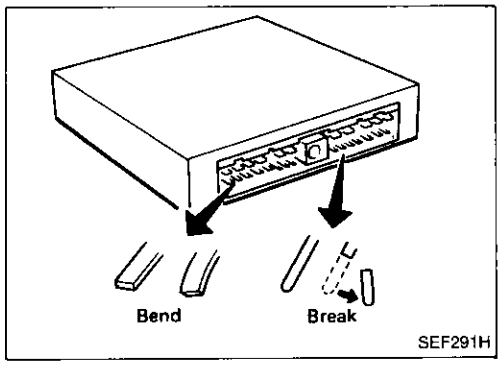
**CAUTION:**

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.**



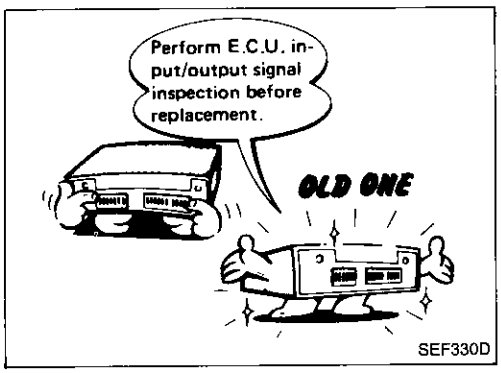
SEF725H

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



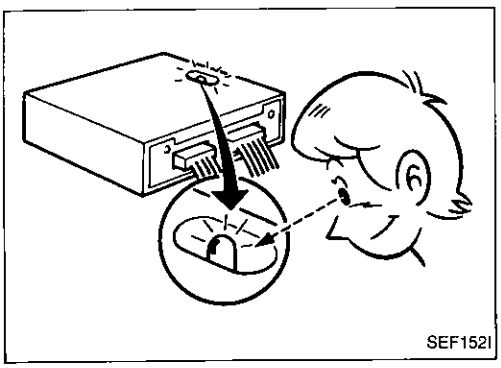
SEF291H

3. **When connecting or disconnecting pin connectors into or from 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.**



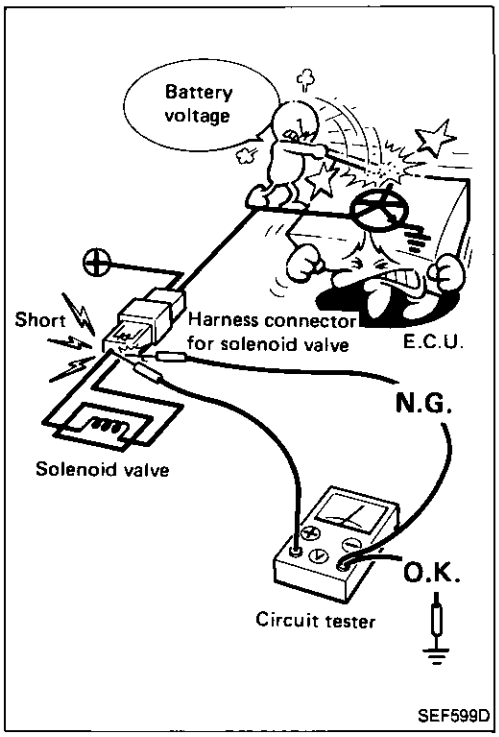
SEF330D

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-175.)**


SEF152I

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

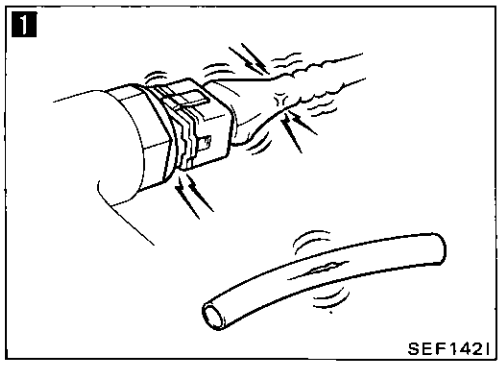
## Diagnostic Procedure (Cont'd)




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

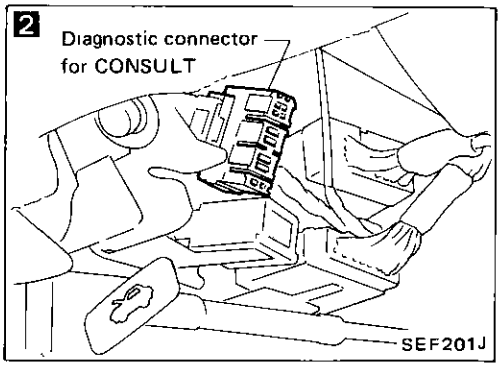

SEF142I

**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

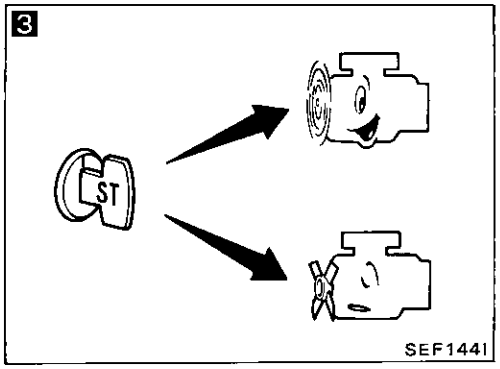


SEF201J

**CONNECT CONSULT TO THE VEHICLE**

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-55.)

3



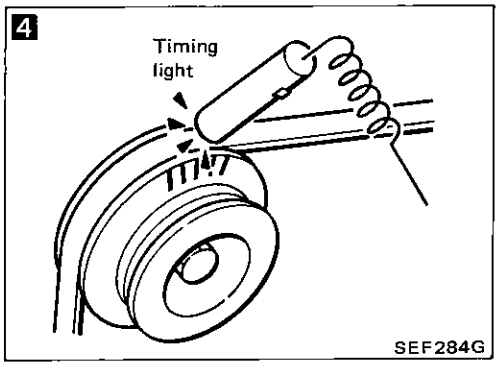
SEF144I

**DOES ENGINE START?**

No → GO TO 6

Yes

4



SEF284G

**CHECK IGNITION TIMING.**

Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-35.)

**Ignition timing: 15° ± 2° B.T.D.C.**

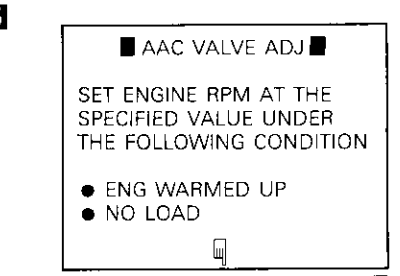
N.G. → Adjust ignition timing by turning crank angle sensor.

O.K.

(Go to Ⓐ on next page.)

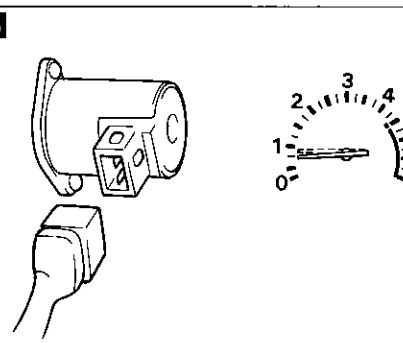
## Basic Inspection (Cont'd)

5



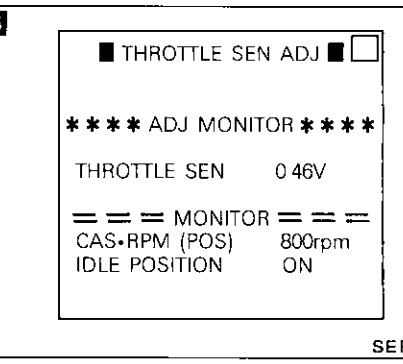

SEF372I

5



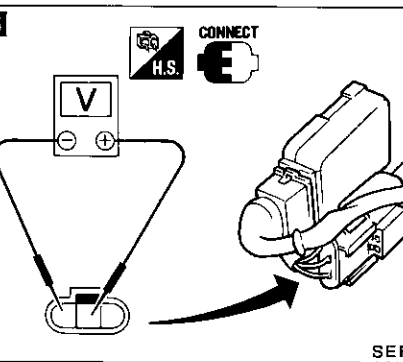

SEF146I

6




SEF147I

6




SEF148I

Ⓐ

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;
   M/T: 650 ± 50 rpm
   A/T: 720 ± 50 rpm (Non-turbo)
   700 ± 50 rpm (Turbo)
   [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;
M/T: 650 ± 50 rpm
A/T: 720 ± 50 rpm (Non-turbo)
700 ± 50 rpm (Turbo)
[in "N" position]?

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".

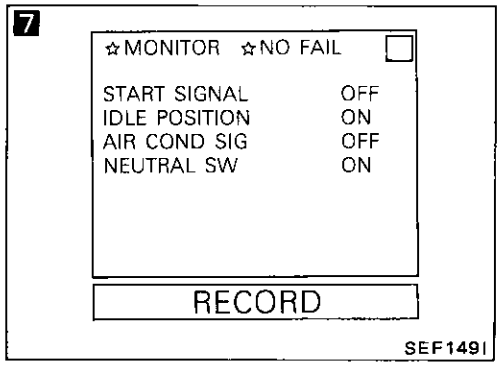
OR

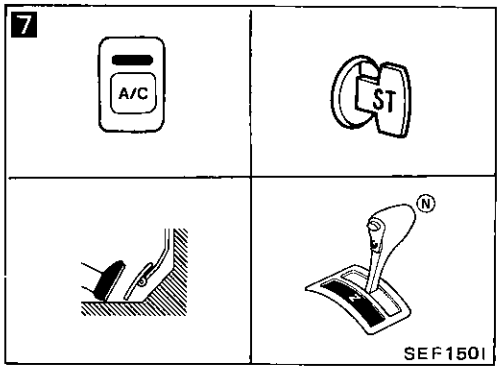
Measure output voltage of throttle sensor using voltmeter, and check that it is 0.4 to 0.5V. (Throttle valve fully closed.)

O.K.

(Go to Ⓑ on next page.)

## Basic Inspection (Cont'd)




Ⓑ

**7**

**CHECK SWITCH INPUT SIGNAL.**

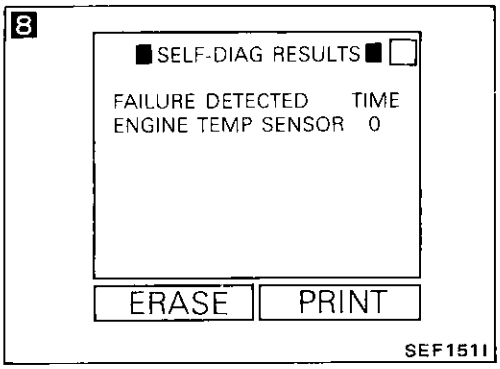
Select the following switches in "DATA MONITOR" mode,
a) Start signal,
b) Idle position,
c) Air conditioner signal,
d) Neutral (Parking) switch,
and check the switches' ON-OFF operation.

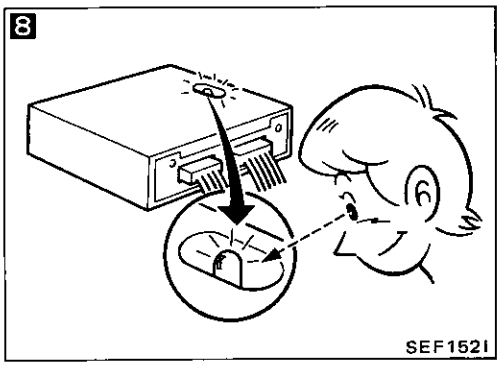
N.G. → Repair or replace the malfunctioning switch or its circuit.

OR

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

| Switch | Condition | Voltage (V) |
|---|---|---|
| Start signal | IGN → IGN ON → START | 0 → Battery voltage |
| Idle position | – | – |
| A/C signal | A/C → A/C OFF → 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 |




**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

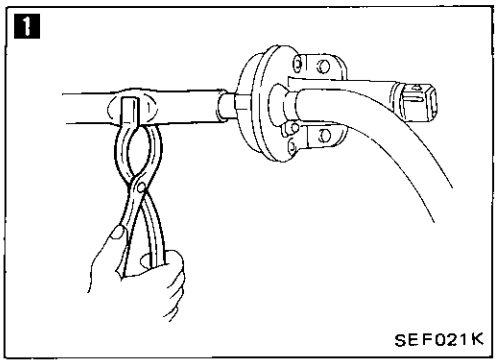
1. Set "Self-diagnostic results mode" in Mode Ⅱ. (Refer to page EF & EC-49.)
2. Count the number of RED L.E.D. flashes and read out the codes.
3. Are the codes being output?

No

INSPECTION END

## Diagnostic Procedure 1 — High Idling after Warm-up

1

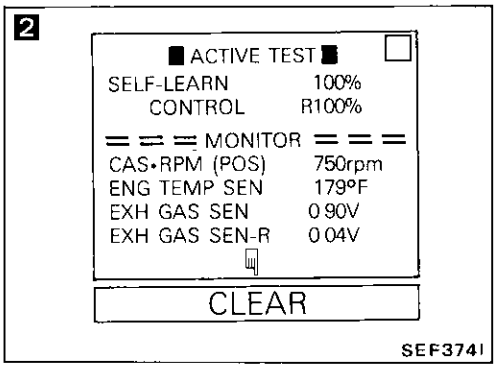

SEF021K

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

Yes → Check air regulator and circuit.

No ↓

2



SEF374I

**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?

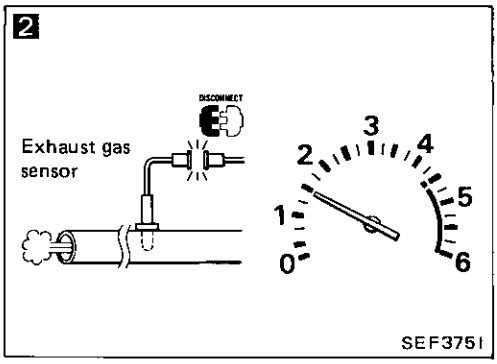
Yes → Discover air leak location and repair.

OR

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

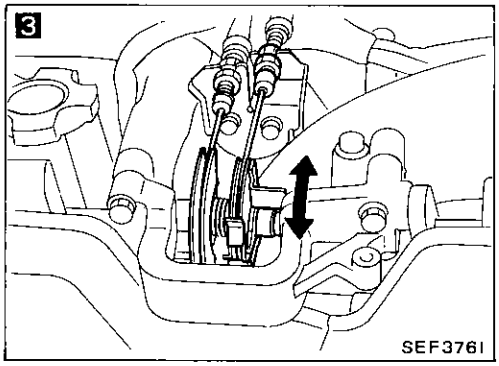
No ↓

2



SEF375I

3


SEF376I

**CHECK THROTTLE LINKAGE.**

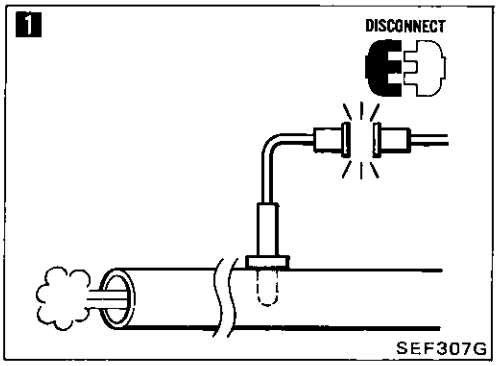
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

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

O.K. ↓

INSPECTION END

## Diagnostic Procedure 2 — Hunting

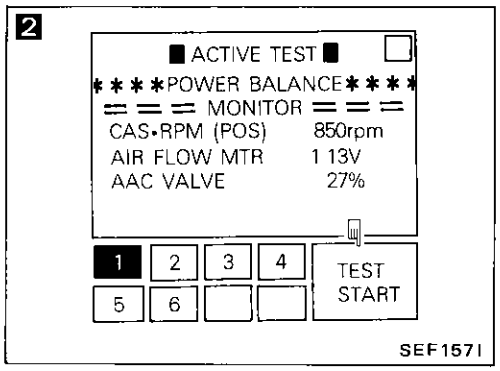



**1**

**CHECK EXHAUST GAS SENSORS.**
When disconnecting exhaust gas sensor harness connectors, is the hunting fixed?

→ Check exhaust gas sensor(s). (See page EF & EC-130.)

No ↓




**2**

**PERFORM POWER BALANCE TEST.**

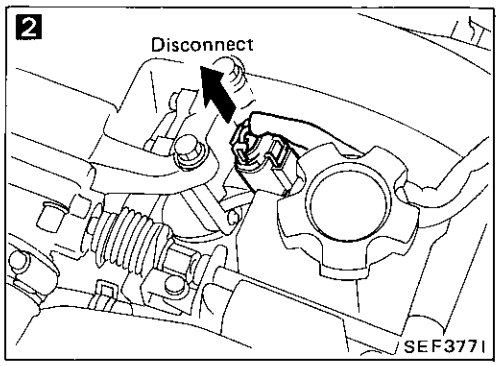
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

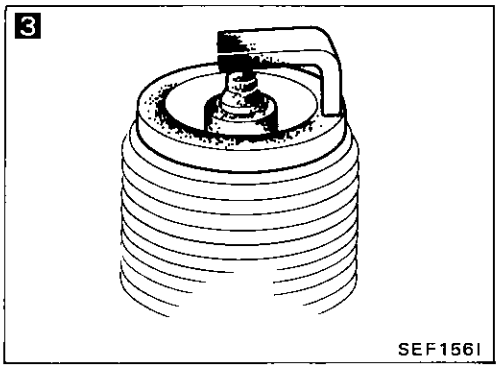
No → Go to **4**.

OR

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

Yes ↓




**3**

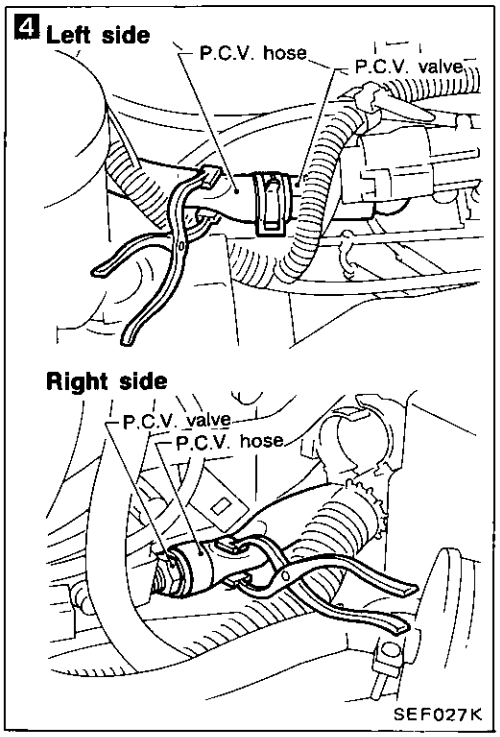
**CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.

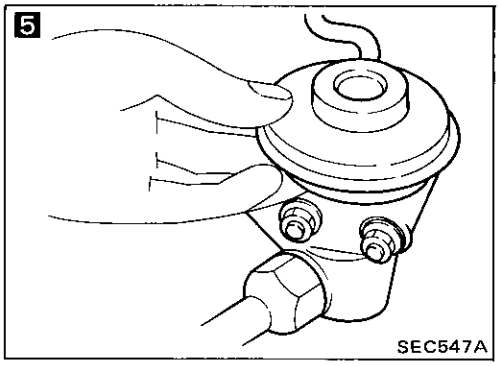
N.G. → Repair or replace spark plug(s).

O.K. ↓

(Go to Ⓐ on next page.)

## 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**

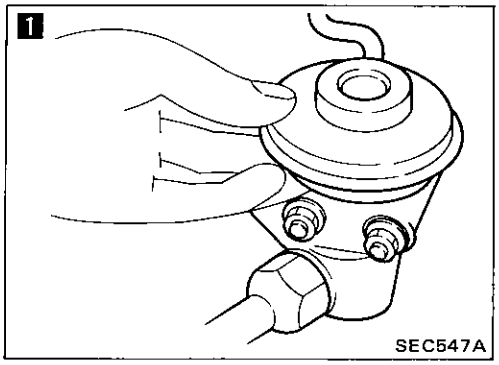
**CHECK E.G.R. CONTROL VALVE.**
Check E.G.R. control valve for sticking.

N.G. → Repair or replace.

O.K.

INSPECTION END

## Diagnostic Procedure 3 — Unstable Idle

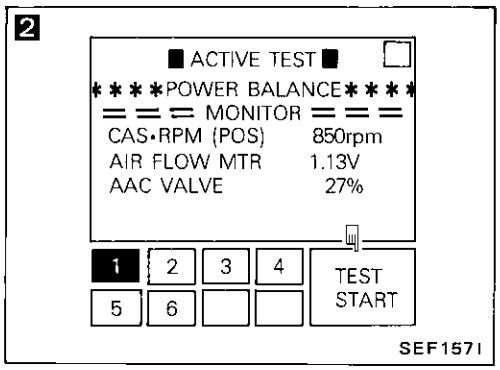

SEC547A

**1**

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

N.G. → Repair or replace.

O.K. ↓



SEF157I

**2**

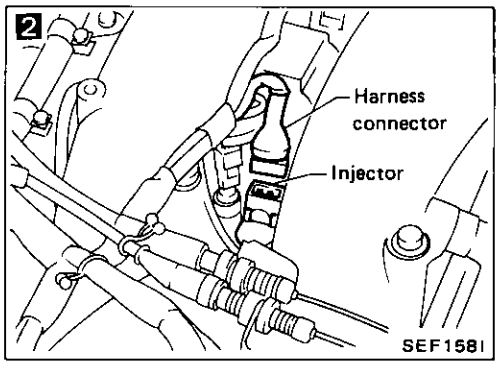
**PERFORM POWER BALANCE TEST.**

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

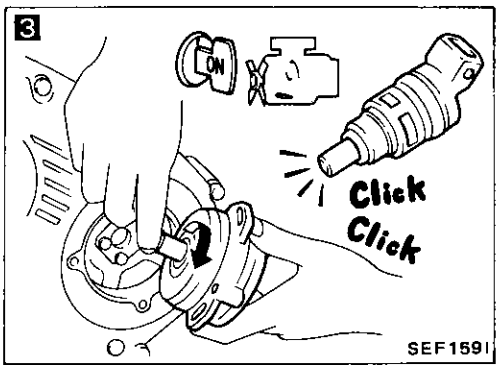
OR

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



SEF158I

Yes ↓



SEF159I

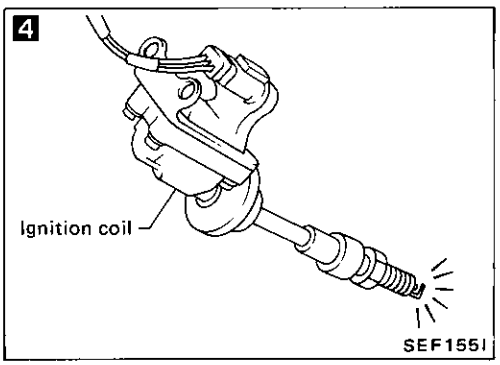
**3**

**CHECK INJECTOR.**

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

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

Yes ↓



SEF155I

**4**

**CHECK IGNITION SPARK.**

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

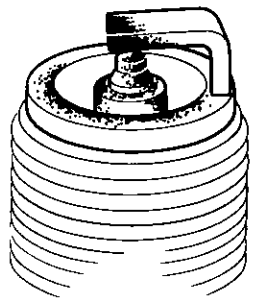
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-123.)

O.K. ↓

(Go to Ⓐ on next page.)

## Diagnostic Procedure 3 — Unstable Idle (Cont'd)

5



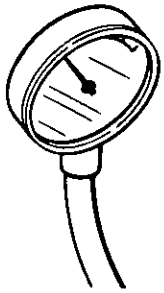
SEF156I

6

■ FUEL PRES RELEASE ■

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

START



SEF204J

Ⓐ

5

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

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

O.K.

6

**CHECK FUEL PRESSURE.**

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

N.G. → Check fuel pump and circuit.

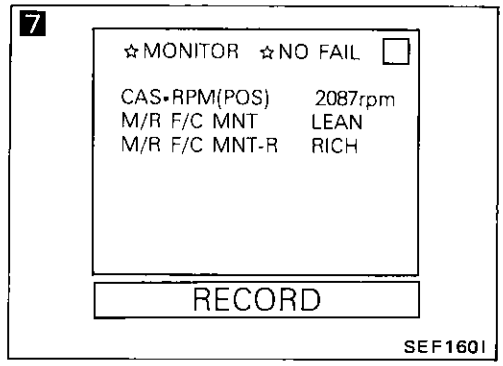
OR

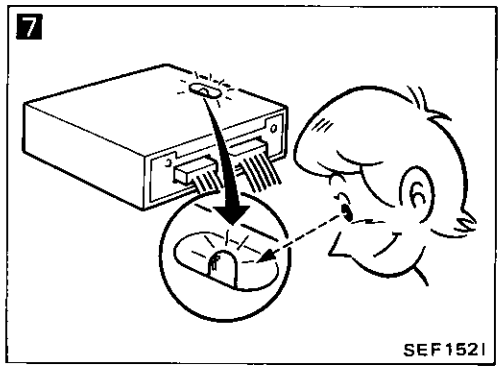
1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

(Go to Ⓑ on next page.)

## Diagnostic Procedure 3 — Unstable Idle (Cont'd)




Ⓑ

**7**

**CHECK EXHAUST GAS SENSOR.**

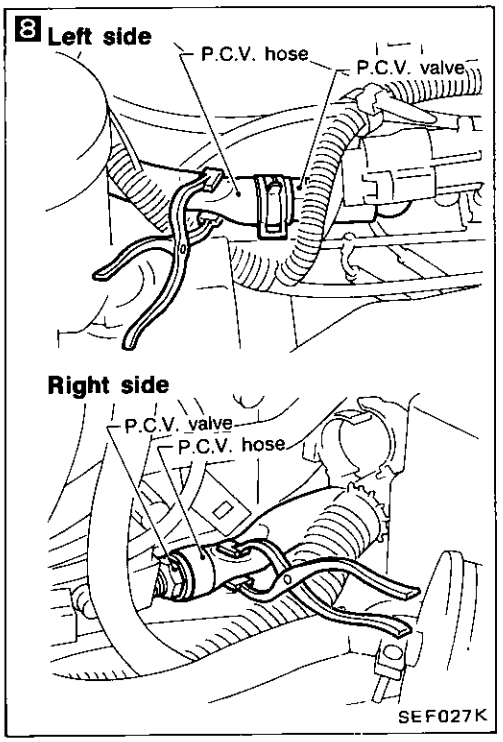
1. See "M/R F/C MNT (right and left sides)" in "Data monitor" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   **RICH→LEAN→RICH→ LEAN→RICH.....**
   **1 time**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

N.G. → Replace exhaust gas sensor(s).

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-54.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED LED on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

O.K.




**8**

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

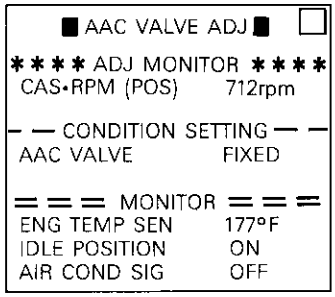
Yes → Discover air leak location and repair.

No

(Go to Ⓒ on next page.)

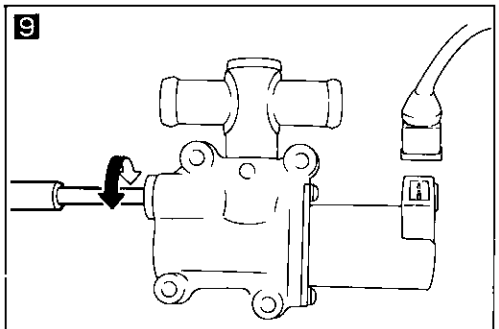
## Diagnostic Procedure 3 — Unstable Idle (Cont'd)

9




SEF145I

9



SEF161I

10

SEF309G

Ⓒ

9

**CHECK IDLE ADJ. SCREW CLOGGING.**

1. Perform "AAC VALVE ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm as follows by turning idle adjusting screw?
   M/T: 650 ± 50 rpm
   A/T: 720 ± 50 rpm (Non-turbo)
   700 ± 50 rpm (Turbo)
   [in "N" position]

No → Check for IAS clogging or throttle valve clogging.

OR

1. Disconnect A.A.C. valve harness connector.
2. Can you set engine rpm as follows by turning idle adjusting screw?
   M/T: 650 ± 50 rpm
   A/T: 720 ± 50 rpm (Non-turbo)
   700 ± 50 rpm (Turbo)
   [in "N" position]

Yes ↓

10

**CHECK COMPRESSION PRESSURE.**

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

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. ↓

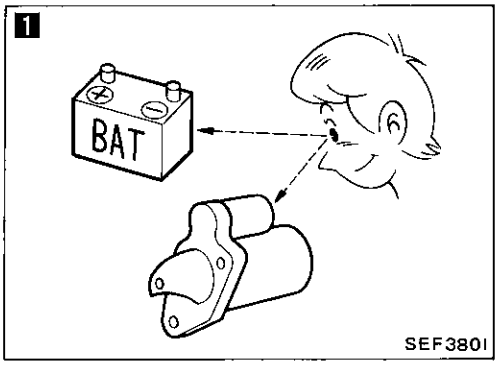
12

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

O.K. ↓

INSPECTION END

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

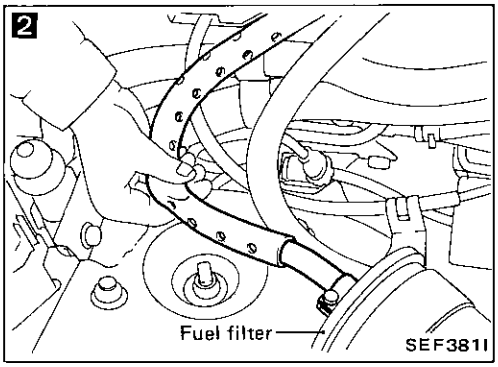



**1**

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

N.G. → Repair or replace.

O.K. ↓

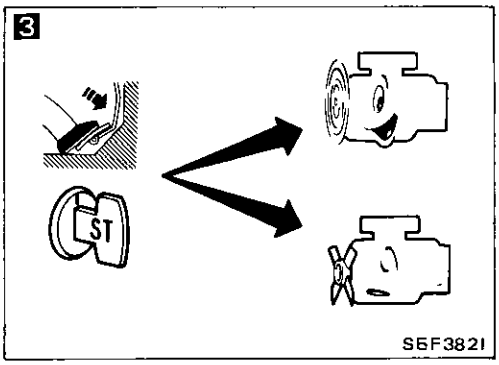



**2**

**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-154.)

Yes ↓

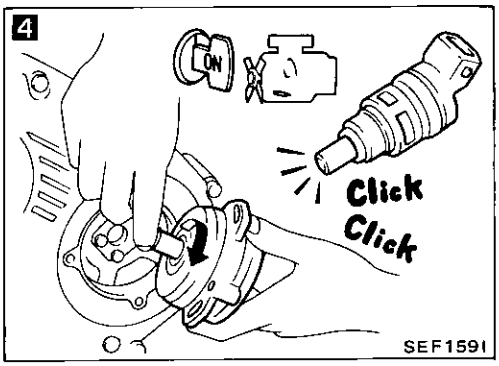



**3**

**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-157 - 160.)

No ↓

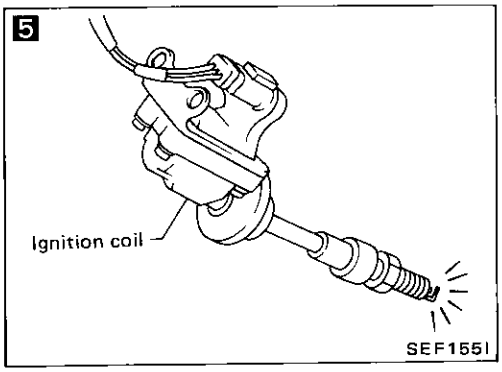



**4**

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

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

Yes ↓




**5**

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

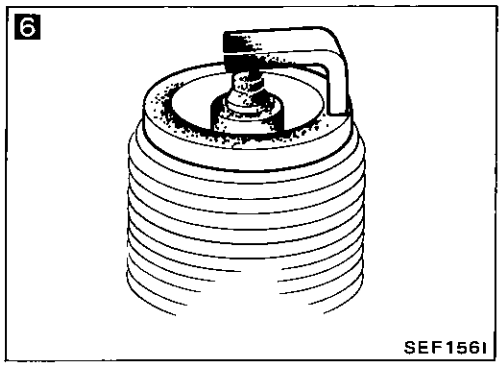
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-123.)

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




Ⓐ

**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 termials 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-111.

N.G. → Repair or replace.

O.K. ↓

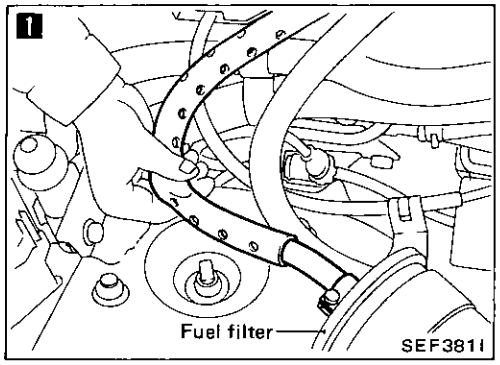
**9**

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

↓

INSPECTION END

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

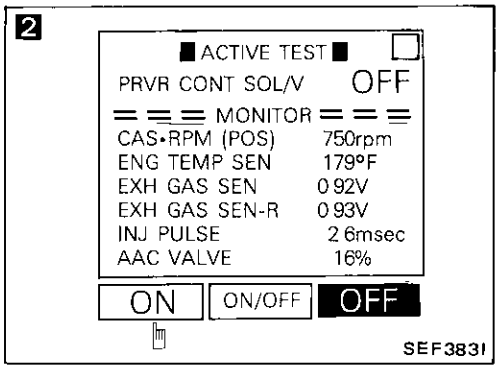



**1**

**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-154.)

Yes ↓




**2**

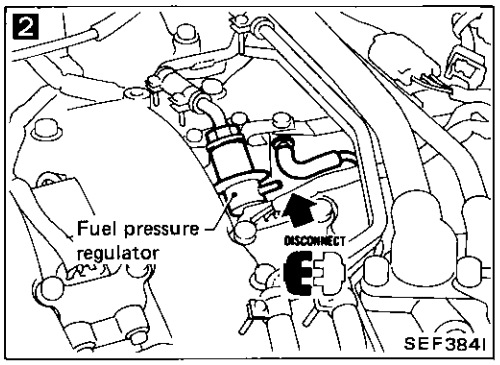
**CHECK FUEL VAPOR.**
1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", can you start the engine?

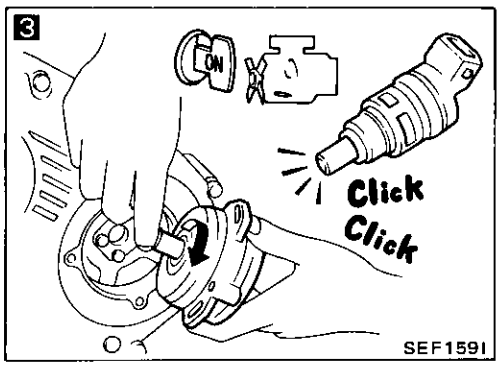
Yes → Check fuel properties.

OR

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

No ↓



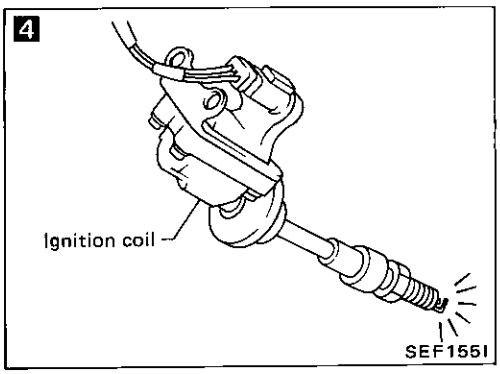




**3**

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

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

Yes ↓




**4**

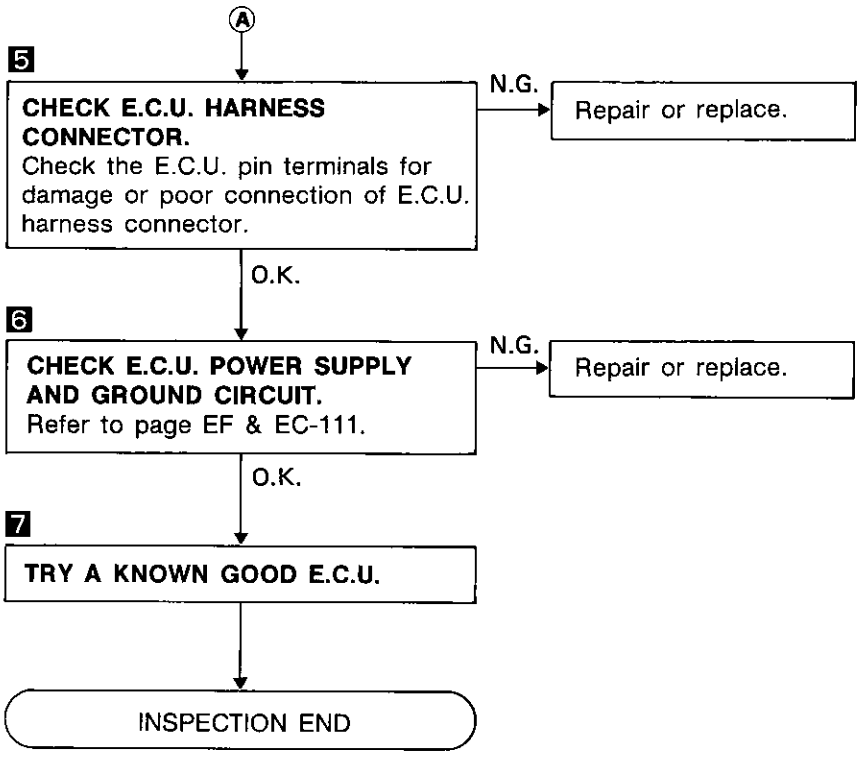
**CHECK IGNITION SPARK.**
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-123.)

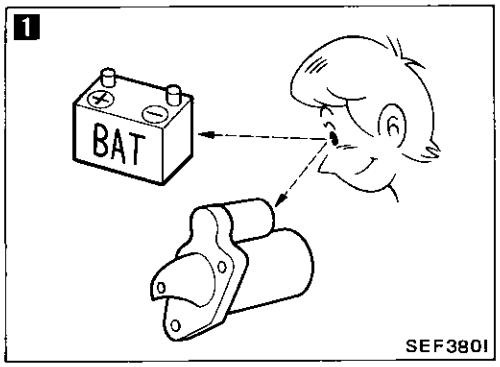
O.K. ↓

(Go to Ⓐ on next page.)

## 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

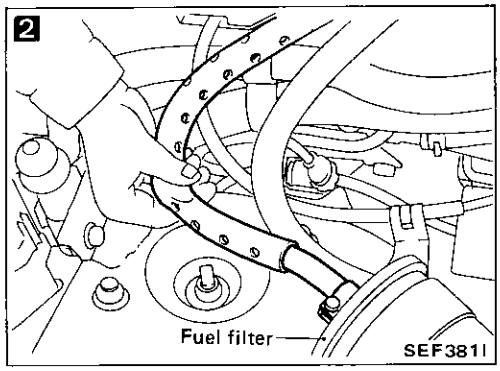



**1**

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

N.G. → Repair or replace.

O.K. ↓

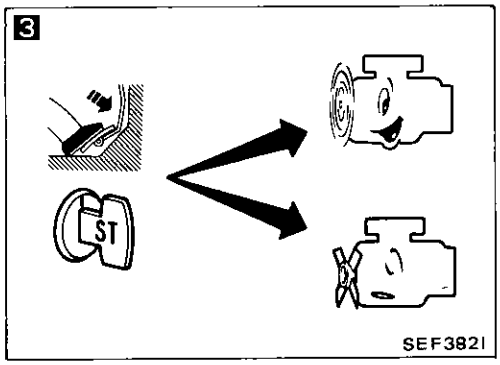



**2**

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

No → Check fuel pump and circuit. (See page EF & EC-154.)

Yes ↓

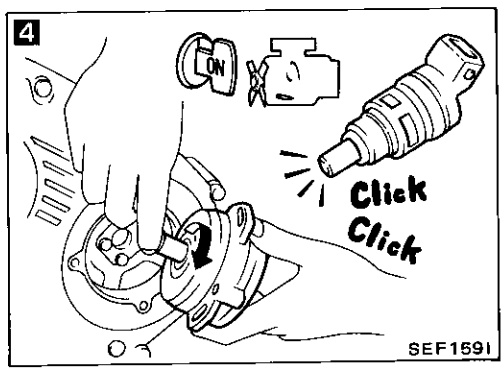



**3**

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

Yes → Check injector(s) for leakage.

No ↓

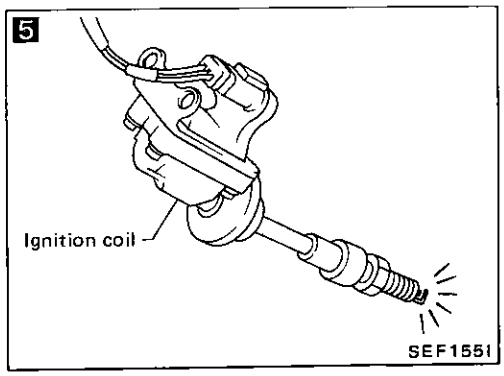



**4**

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

No → Check injectors and circuits.

Yes ↓




**5**

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

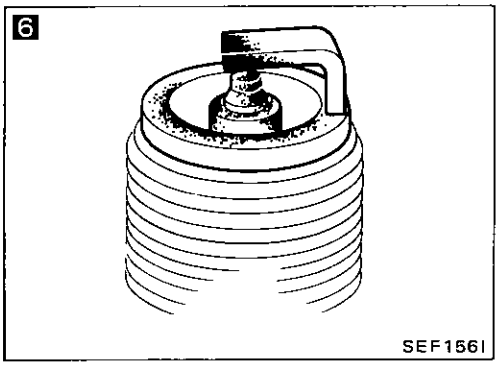
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-123.)

O.K. ↓

(Go to Ⓐ on next page.)

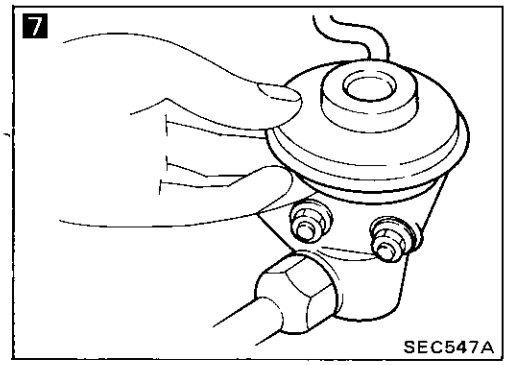
## Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

6



SEF156I

7



SEC547A

Ⓐ

**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. ↓

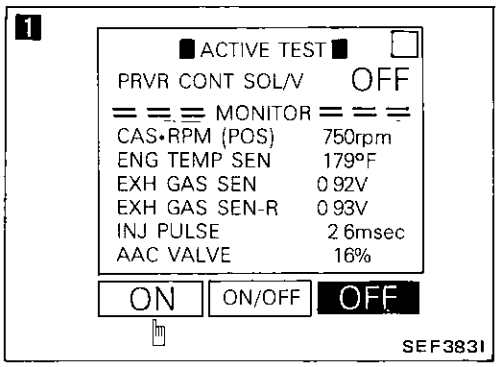
**8** **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
- N.G. → Repair or replace.
- O.K. ↓

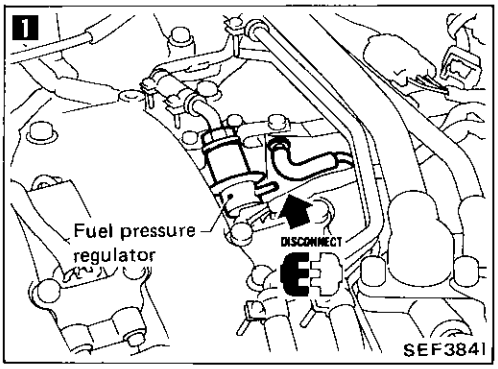
**9** **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-111.
- N.G. → Repair or replace.
- O.K. ↓

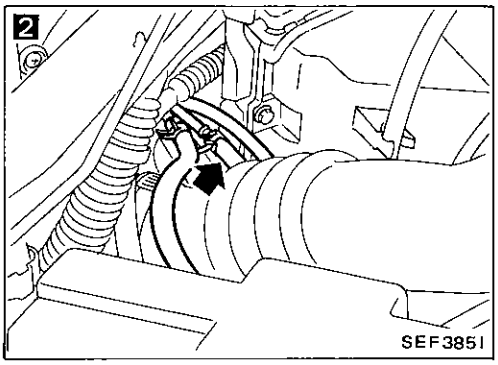
**10** **TRY A KNOWN GOOD E.C.U.**
- Trouble is fixed. → Replace E.C.U.
- Trouble is not fixed. ↓

**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.**

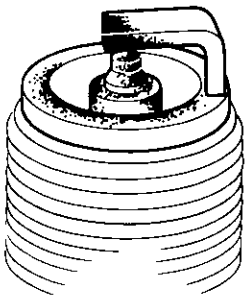
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum lines.

No ↓

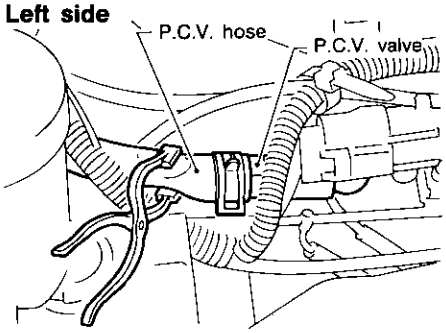
INSPECTION END

1

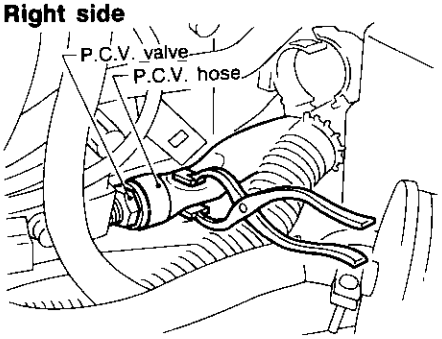


SEF156I

2 Left side




Right side




SEF027K

## 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.

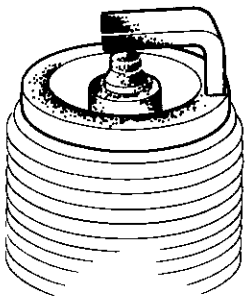
4

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

INSPECTION END

## Diagnostic Procedure 9 — Hesitation under Normal Conditions

1



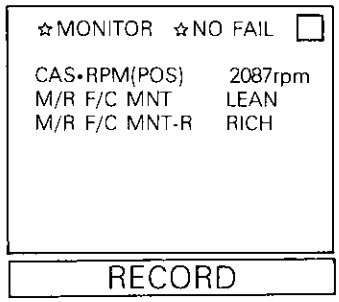
SEF156I

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

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

O.K.

2




SEF160I

**CHECK EXHAUST GAS SENSOR.**

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

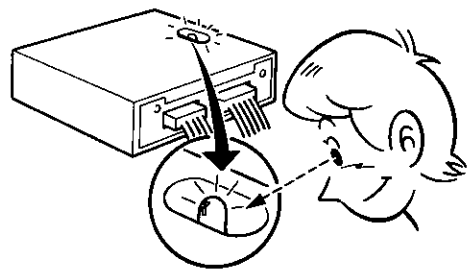
**RICH→LEAN→RICH→ LEAN→RICH.....**
(1 time, 2 times)

Yes → Replace exhaust gas sensor(s).

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-54.)
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.

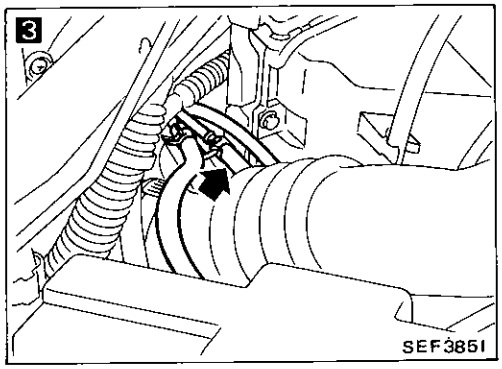
2



SEF152I

No

3



SEF385I

**CHECK CANISTER PURGE.**

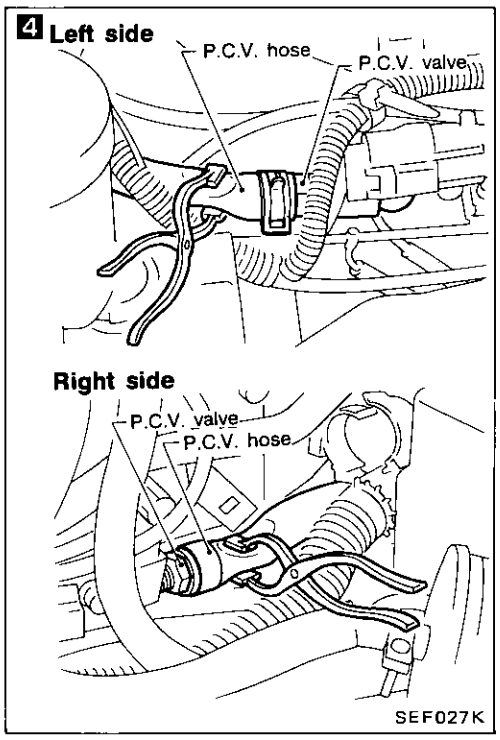
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum lines.

No

(Go to Ⓐ on next page.)

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




Ⓐ

4

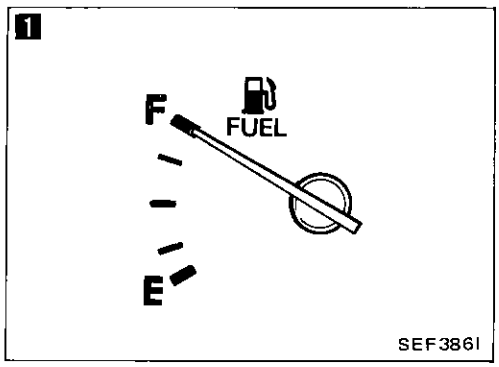
**CHECK FOR INTAKE AIR LEAK.**
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

INSPECTION END

## Diagnostic Procedure 10 — Engine Stalls when Turning

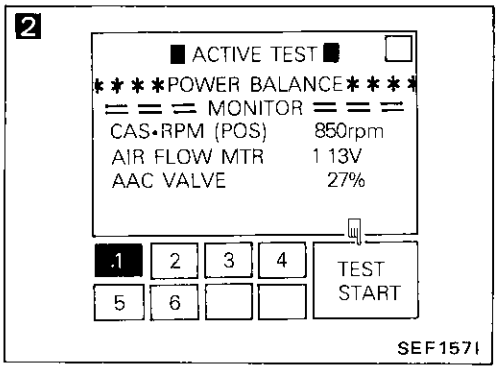



**1**

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

N.G. → Fill fuel tank with fuel.

O.K. ↓




**2**

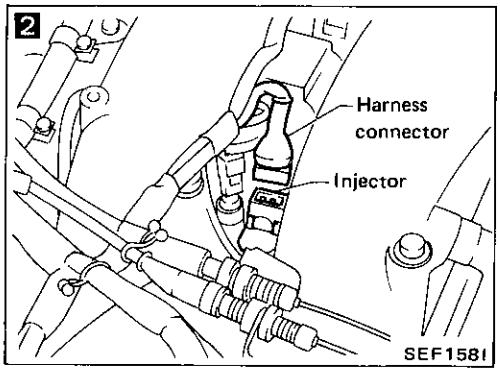
**PERFORM POWER BALANCE TEST.**

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

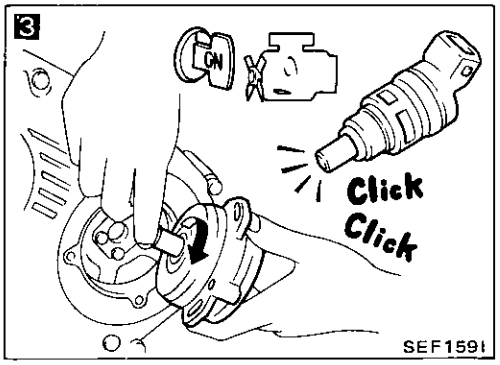
No → Go to **5**

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 ↓



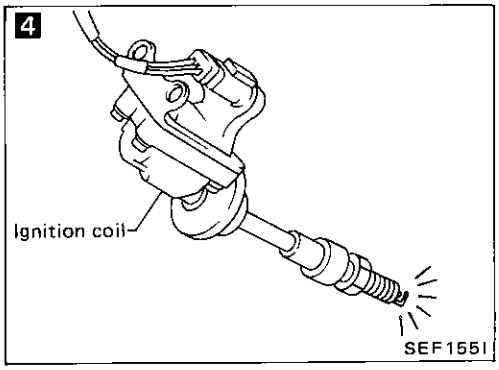

**3**

**CHECK INJECTOR.**

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

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

Yes ↓




**4**

**CHECK IGNITION SPARK.**

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

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-123.)

O.K. ↓

(Go to Ⓐ on next page.)

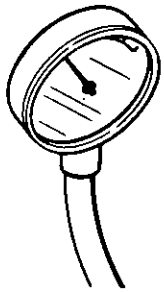
## Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)

5

■ FUEL PRES RELEASE ■

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

START



SEF204J

Ⓐ

5

**CHECK FUEL PRESSURE.**

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

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

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-111.

N.G. → Repair or replace.

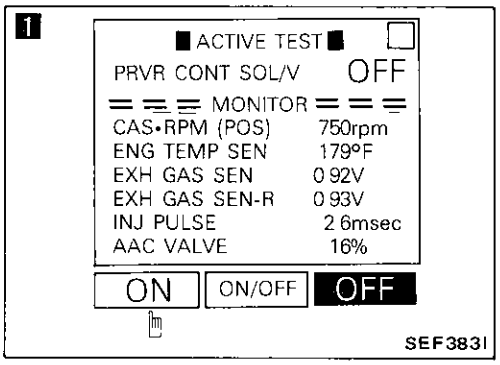
O.K.

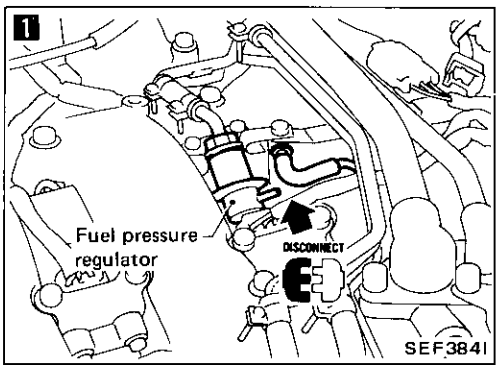
8

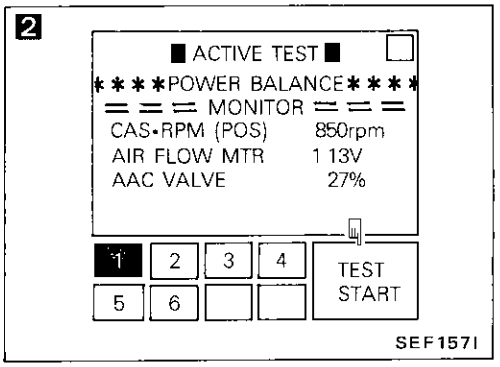
**TRY A KNOWN GOOD E.C.U.**

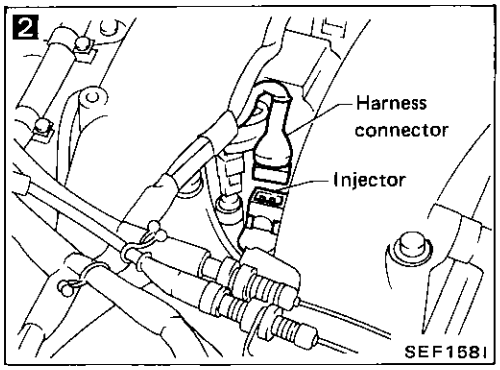
INSPECTION END

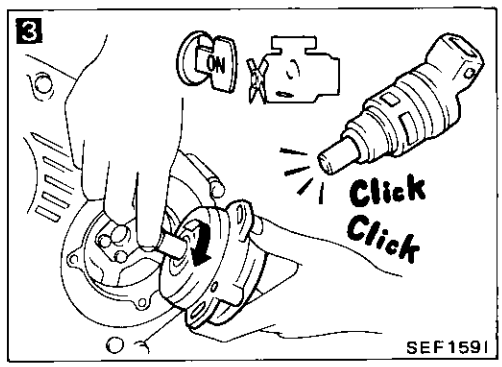
## Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot




**1**

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

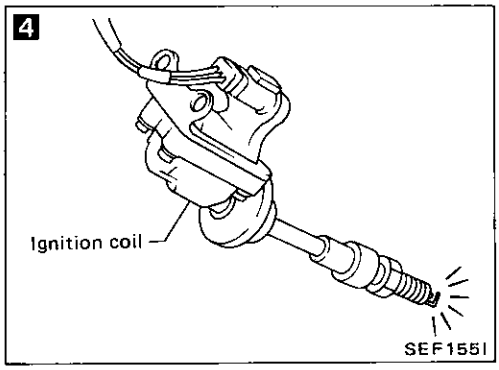
No → Check injector(s) and circuit(s).

Yes

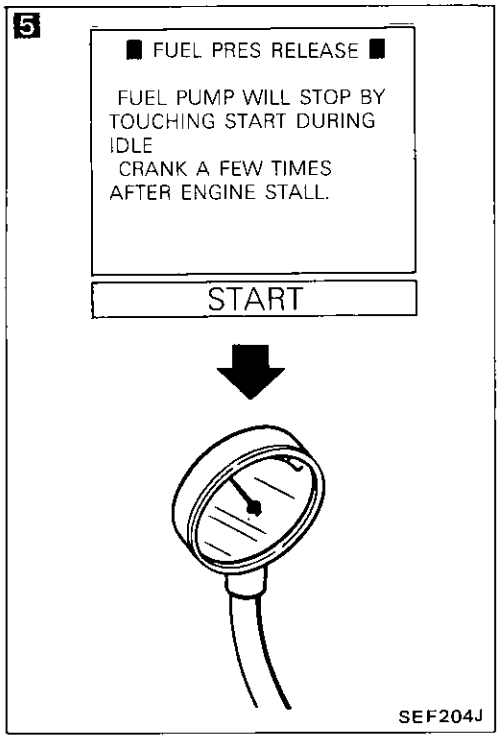
(Go to Ⓐ on next page.)

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

4




5




Ⓐ

**4** **CHECK IGNITION SPARK.**

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

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-123.)

O.K. ↓

**5** **CHECK FUEL PRESSURE.**

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

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

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-111.

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. ↓

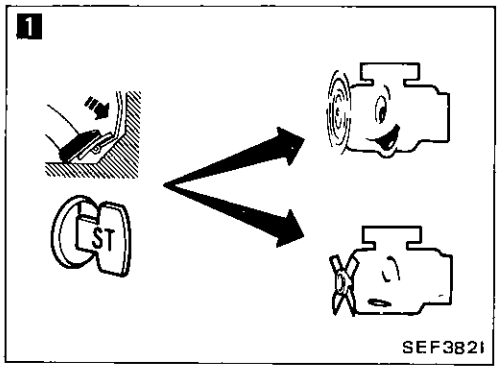
**9** **CHECK TIMING BELT FOR PROPER INSTALLATION.**

N.G. → Replace timing belt.

O.K. ↓

INSPECTION END

## Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

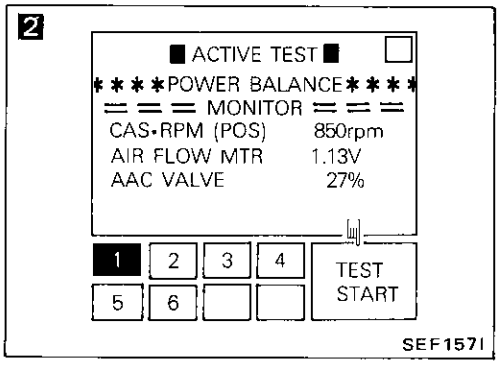



**1**

**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-157 - 160.)

O.K. ↓




**2**

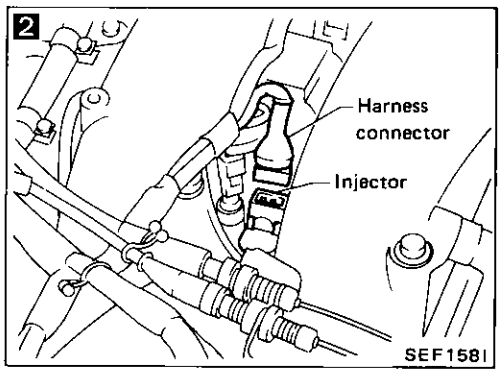
**PERFORM POWER BALANCE TEST.**

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

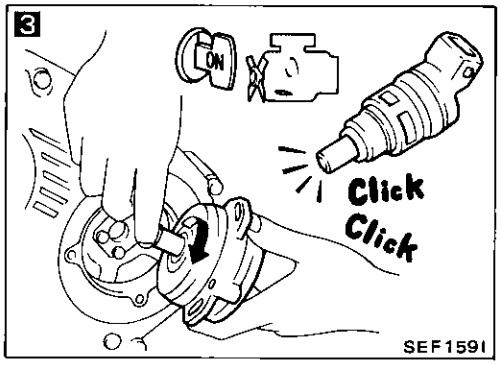
N.G. → Go to 6

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. ↓



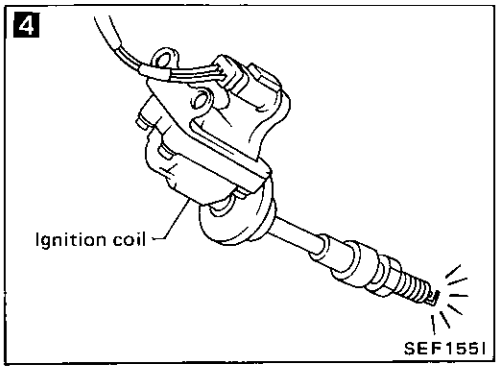

**3**

**CHECK INJECTOR.**

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

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

O.K. ↓




**4**

**CHECK IGNITION SPARK.**

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

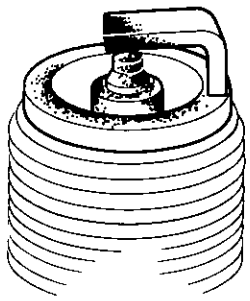
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-123.)

O.K. ↓

(Go to Ⓐ on next page.)

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

5



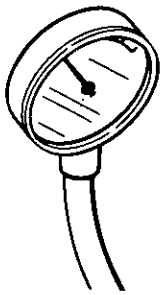
SEF156I

6

■ FUEL PRES RELEASE ■

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

START



SEF204J

Ⓐ

**5**

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

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

O.K.

**6**

**CHECK FUEL PRESSURE.**

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

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

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-111.

N.G. → Repair or replace.

O.K.

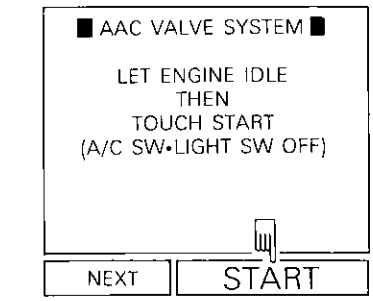
**9**

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

INSPECTION END

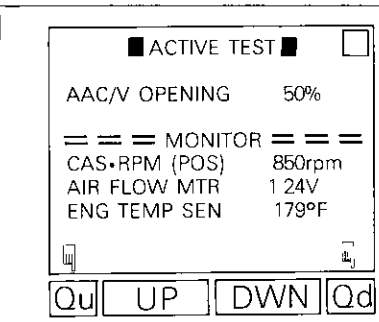
## Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1



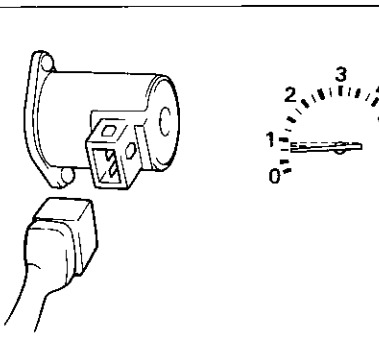
SEF196L

1



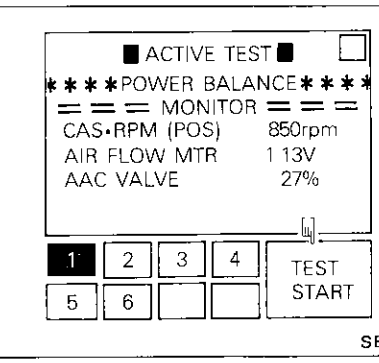
SEF162I

1



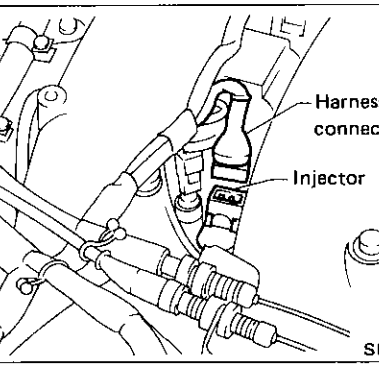
SEF146I

2



SEF157I

2



SEF158I

1

**CHECK OVERALL FUNCTION.**

1. Start engine and warm it up sufficiently.
2. Check idle speed.
   **A/T: 770 ± 50 rpm**
   **(Non-turbo)**
   **750 ± 50 rpm (Turbo)**
   **[in "N" position]**
   **M/T: 700 ± 50 rpm**

3. Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

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?

OR

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

No → Check A.A.C. valve and circuit. (See page EF & EC-160.)

Yes

2

**PERFORM POWER BALANCE TEST.**

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

OR

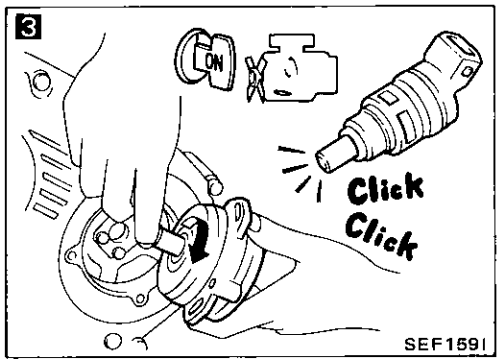
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

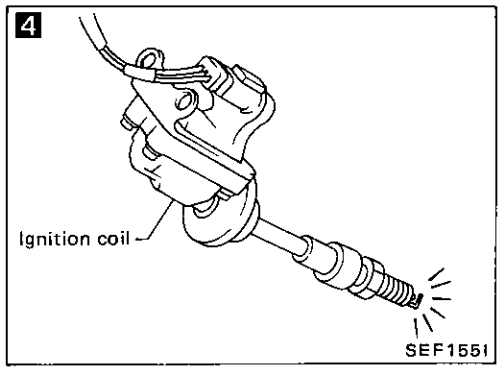
No → Go to 5

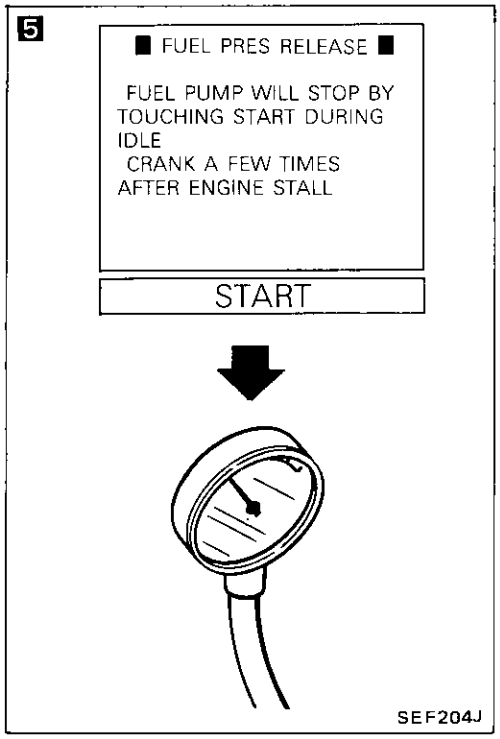
Yes

(Go to Ⓐ on next page.)

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




Ⓐ

**3**

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

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

Yes ↓

**4**

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

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-123.)

O.K. ↓

**5**

**CHECK FUEL PRESSURE.**

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

OR

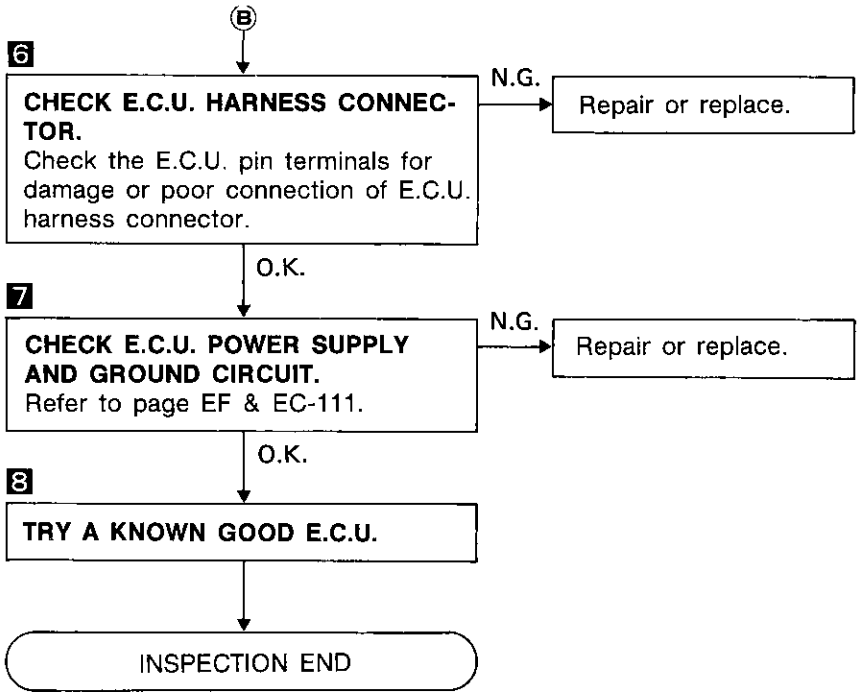
1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

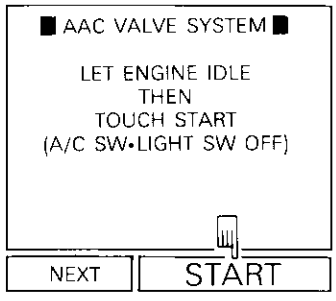
O.K. ↓

(Go to Ⓑ on next page.)

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

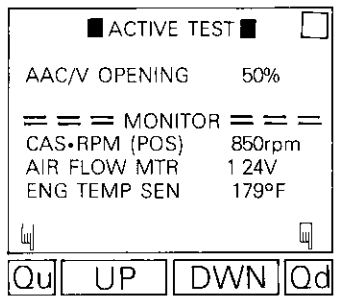


1



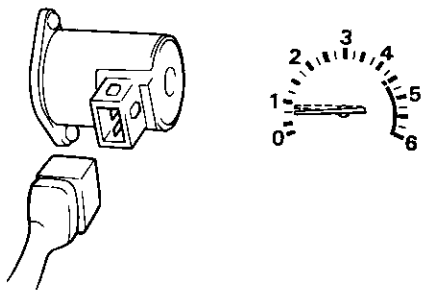

SEF196L

1



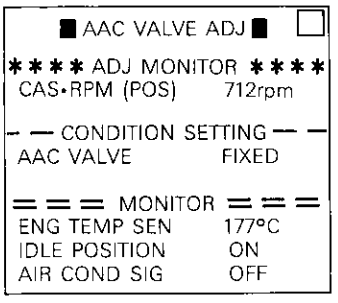

SEF162I

1



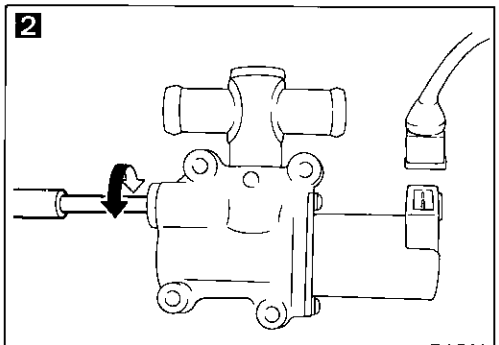

SEF146I

2




SEF145I

2



SEF161I

## Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

**CHECK OVERALL FUNCTION.**

1. Start engine and warm it up sufficiently.
2. Check idle speed.
   **A/T: 770 ± 50 rpm**
   **(Non-turbo)**
   **750 ± 50 rpm (Turbo)**
   **[in "N" position]**
   **M/T: 700 ± 50 rpm**

3. Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

No → Check A.A.C. valve and circuit. (See page EF & EC-160.)

OR

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?

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 as follows by turning idle adjusting screw?
   M/T: 650 ± 50 rpm
   A/T: 720 ± 50 rpm
   (Non-turbo)
   700 ± 50 rpm (Turbo)
   [in "N" position]

No → Check for IAS clogging or throttle chamber clogging.

OR

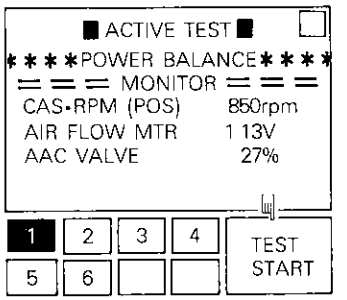
1. Disconnect A.A.C. valve harness connector
2. Can you set engine rpm as follows by turning idle adjusting screw?
   M/T: 650 ± 50 rpm
   A/T: 720 ± 50 rpm
   (Non-turbo)
   700 ± 50 rpm (Turbo)
   [in "N" position]

Yes →

(Go to Ⓐ on next page.)

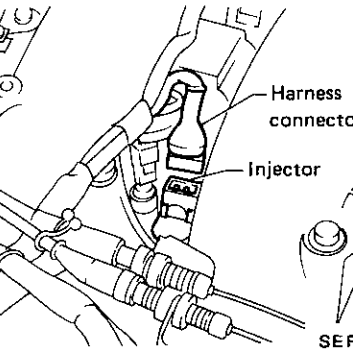
## Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

3



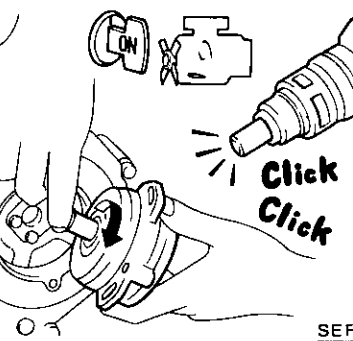
SEF157I

3



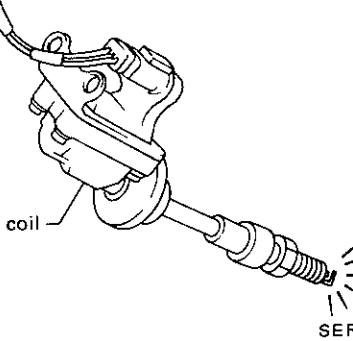
SEF158I

4



SEF159I

5



SEF155I

Ⓐ

**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?

OR

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

No → Go to **6**

Yes

**4**

**CHECK INJECTOR.**

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

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

Yes

**5**

**CHECK IGNITION SPARK.**

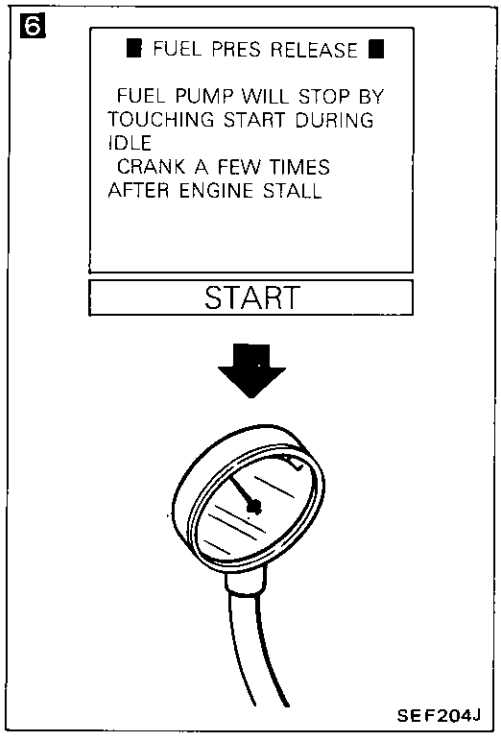
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

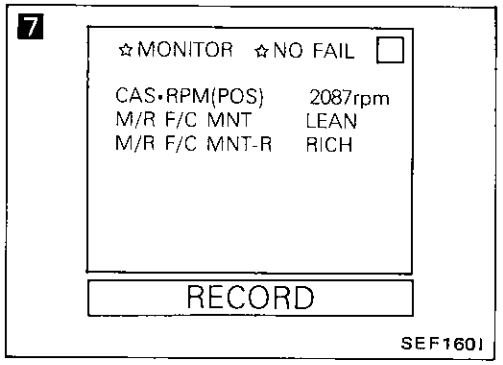
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-123.)

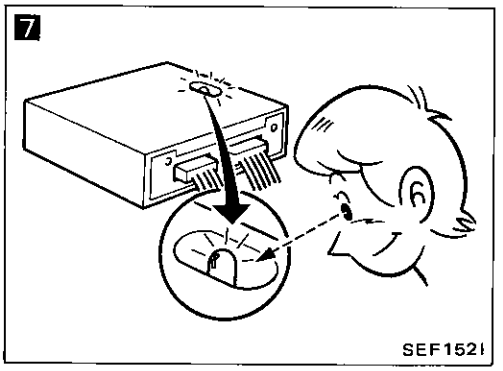
O.K.

(Go to Ⓑ on next page.)

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




Ⓑ

**6**

**CHECK FUEL PRESSURE.**

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

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

**7**

**CHECK EXHAUST GAS SENSOR.**

1. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently.), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   **RICH→LEAN→RICH→ (1 time) (2 times) LEAN→RICH.....**

OR

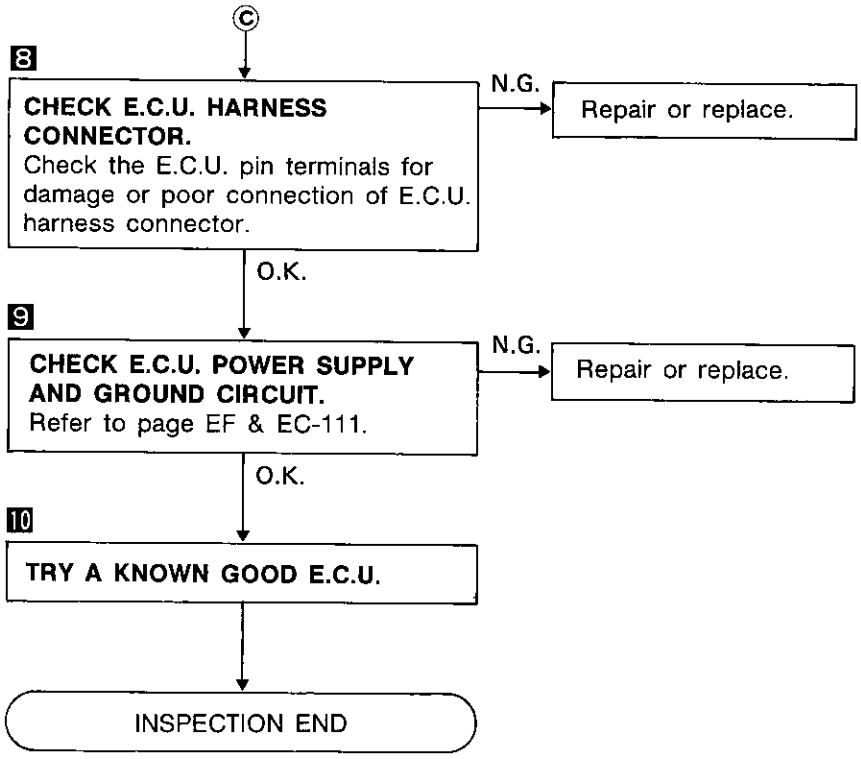
1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-54.)
2. Maintaining engine at 2,000 rpm under no load, check that RED LED on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

N.G. → Replace exhaust gas sensor(s).

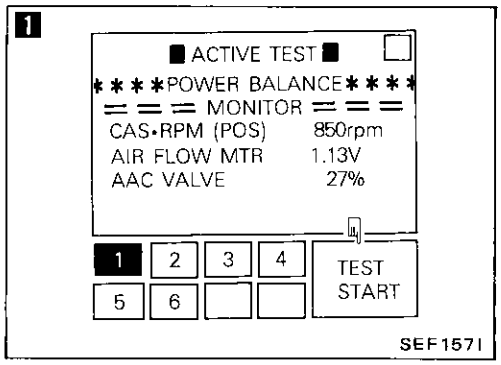
O.K. ↓

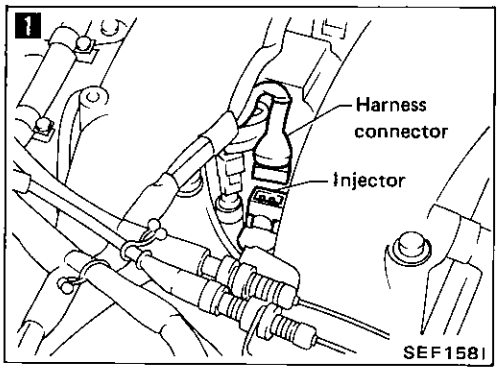
(Go to Ⓒ on next page.)

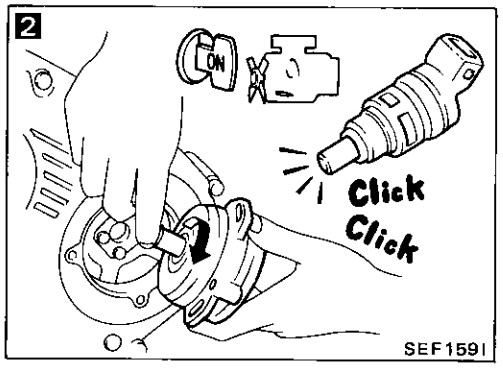
## Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

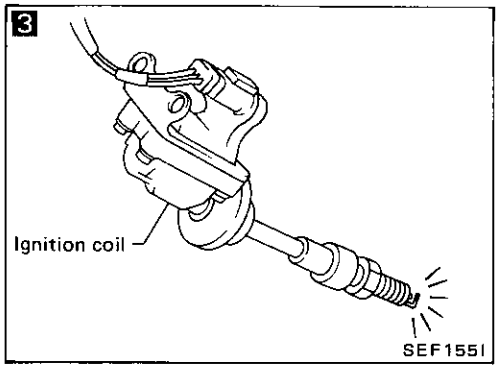


## Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising




**1**

**PERFORM POWER BALANCE TEST.**

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

OR

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

No → Go to **4**

Yes ↓

**2**

**CHECK INJECTOR.**

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

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

Yes ↓

**3**

**CHECK IGNITION SPARK.**

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

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-123.)

O.K. ↓

(Go to Ⓐ on next page.)

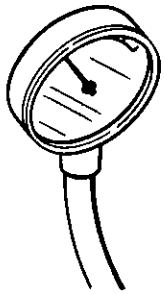
## Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising (Cont'd)

4

■ FUEL PRES RELEASE ■

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

START



SEF204J

Ⓐ

4

**CHECK FUEL PRESSURE.**

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

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

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

O.K.

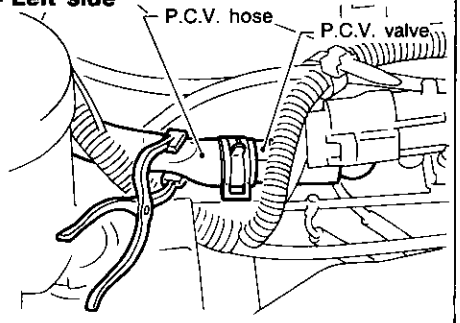
5

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

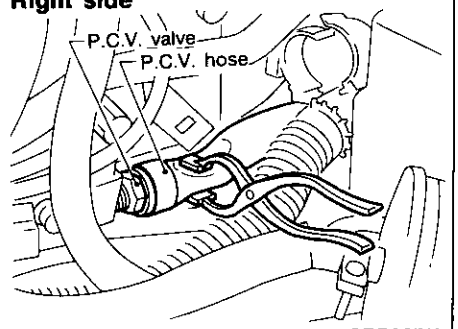
Yes → Discover air leak location and repair.

No

5 **Left side**



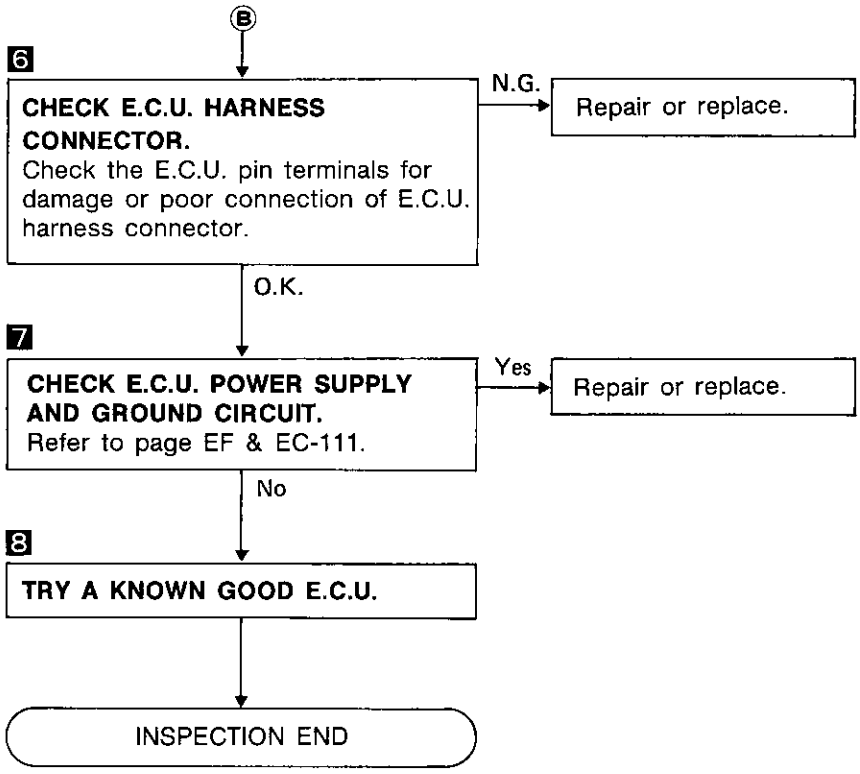

**Right side**



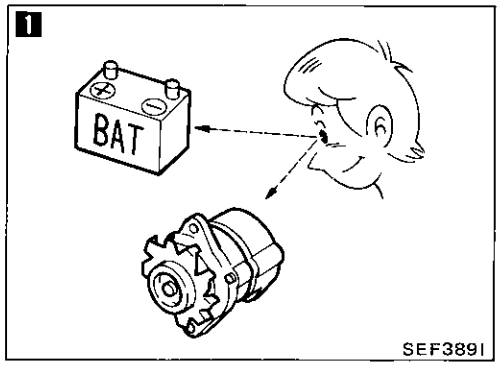

SEF027K

(Go to Ⓑ on next page.)

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



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

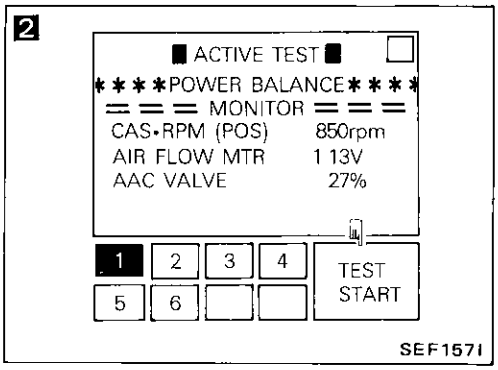



**1**

**CHECK BATTERY AND ALTERNATOR.**
Check battery and alternator condition. (Refer to EL section.)

N.G. → Repair or replace.

O.K. ↓




**2**

**PERFORM POWER BALANCE TEST.**

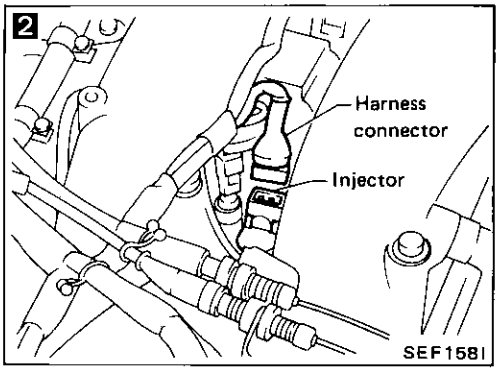
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **5**

OR

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

Yes ↓



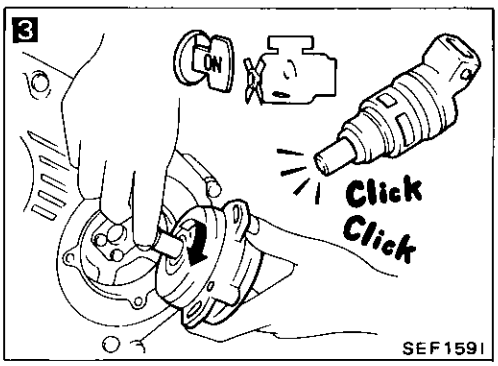

**3**

**CHECK INJECTOR.**

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

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

Yes ↓




**4**

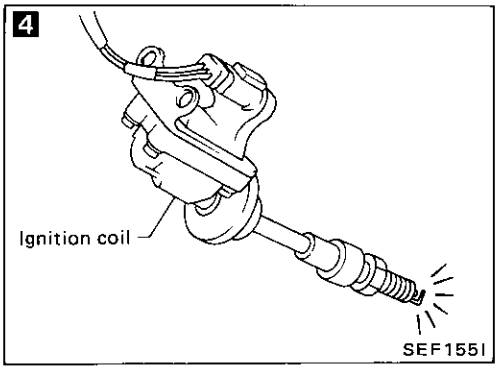
**CHECK IGNITION SPARK.**

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

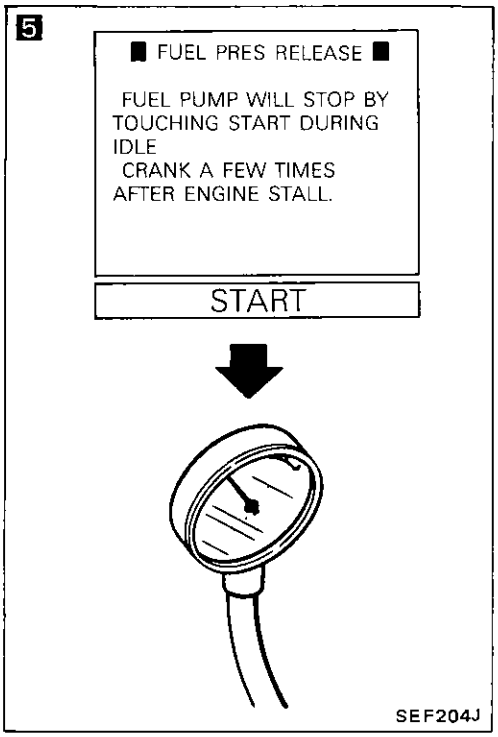
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-123.)

O.K. ↓

(Go to Ⓐ on next page.)



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




Ⓐ

**5**

**CHECK FUEL PRESSURE.**

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

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

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-111.

N.G. → Repair or replace.

O.K. ↓

**8**

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

↓

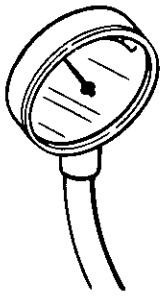
INSPECTION END

1

■ FUEL PRES RELEASE ■

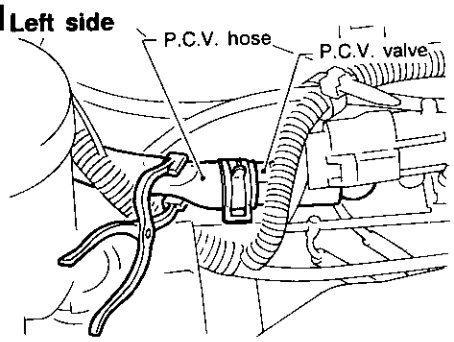
FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL

START

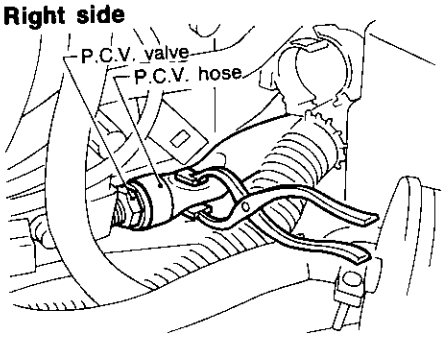


SEF204J

2 Left side




Right side




SEF027K

## Diagnostic Procedure 17 — Lack of Power and Stumble

1

**CHECK FUEL PRESSURE.**

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

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-188.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

2

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

Yes → Discover air leak location and repair.

No

**CHECK TIMING BELT FOR PROPER INSTALLATION.**

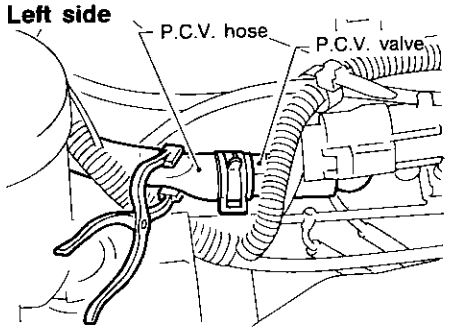
N.G. → Replace timing belt.

O.K.

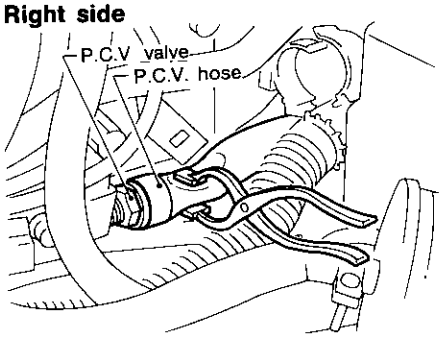
INSPECTION END

## Diagnostic Procedure 18 — Detonation

**1** Left side




Right side




SEF027K

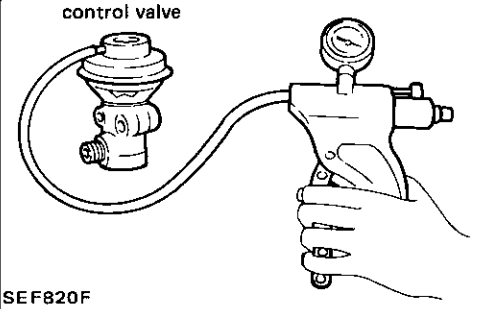
**1**

**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** E.G.R. control valve



SEF820F

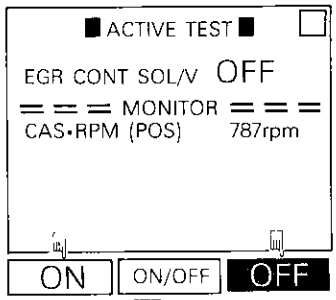
**2**

**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**




SEF390I

**3**

**CHECK E.G.R. CONTROL SOLENOID VALVE.**

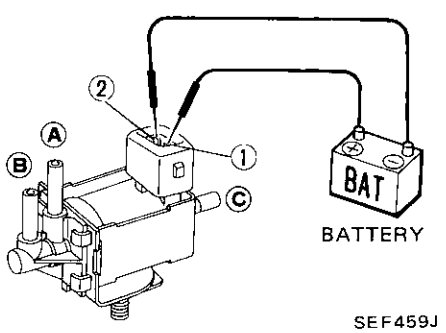
1. Select "E.G.R. CONT SOL VALVE" in "ACTIVE TEST" mode.
2. Turn E.G.R. control solenoid valve ON and OFF.
3. Check operating sound.

N.G. → Check solenoid valve and circuit.

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.

**3**




SEF459J

O.K. ↓

(Go to Ⓐ on next page.)

## Diagnostic Procedure 18 — Detonation (Cont'd)

Ⓐ

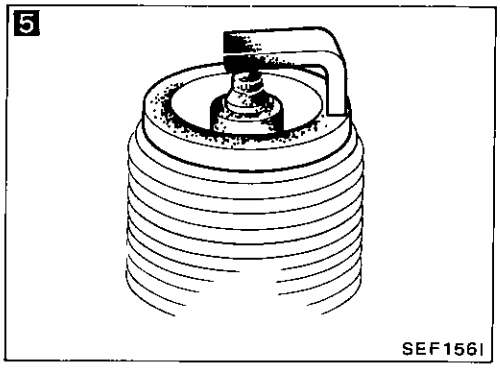
4

**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.
c) Vacuum hose between E.G.R. control solenoid valve and air duct.

N.G. → Repair or replace.

O.K. ↓

5


SEF156I

5

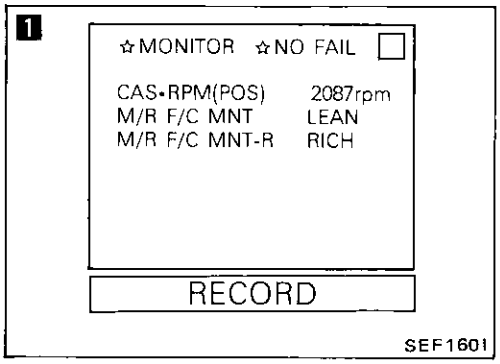
**CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.**
Remove spark plugs and check for fouling with oil.

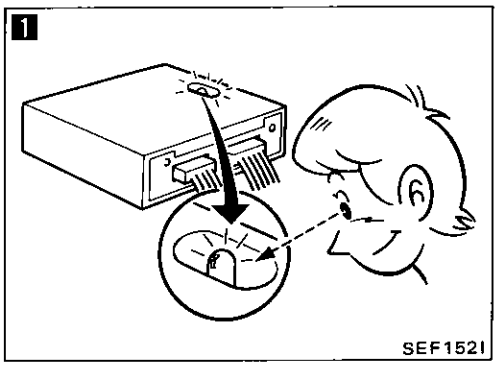
Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No ↓

INSPECTION END

## Diagnostic Procedure 19 — Surge




**1**

**CHECK EXHAUST GAS SENSOR.**

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

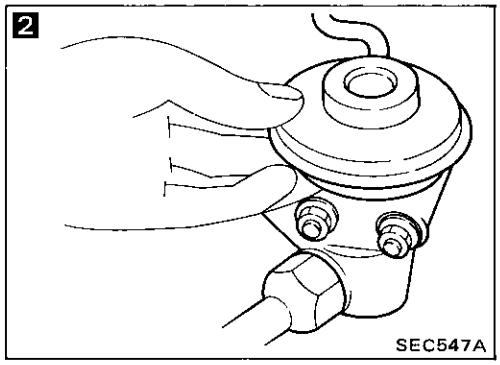
**RICH→LEAN→RICH→** (**1 time**, **2 times**) **LEAN→RICH.....**

N.G. → Replace exhaust gas sensor(s).

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-54.)
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. ↓




**2**

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

N.G. → Repair or replace.

O.K. ↓

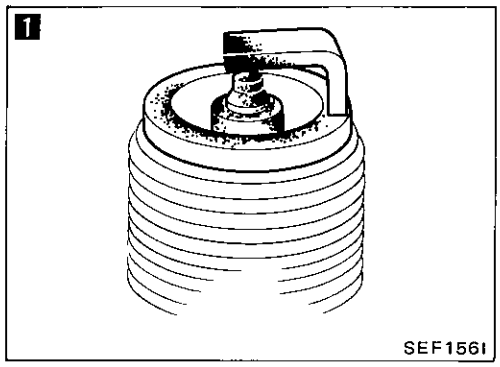
**3**

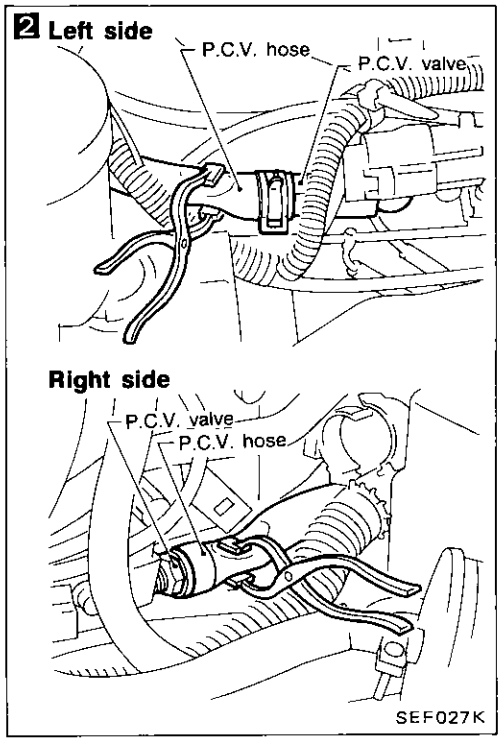
**TRY A KNOWN GOOD E.C.U.**

O.K. ↓

INSPECTION END

## 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-119.)

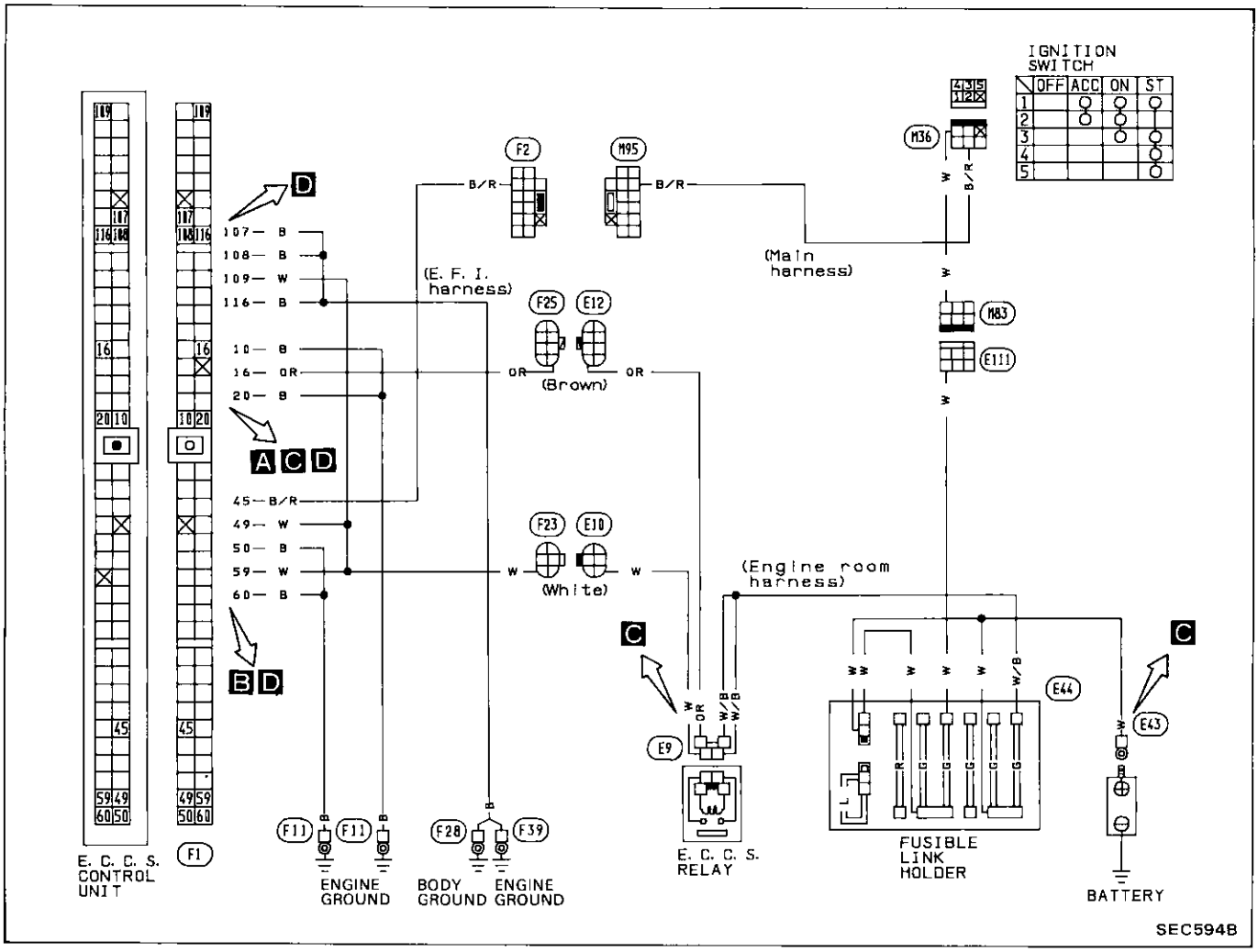
N.G. → Replace or repair.

O.K. ↓

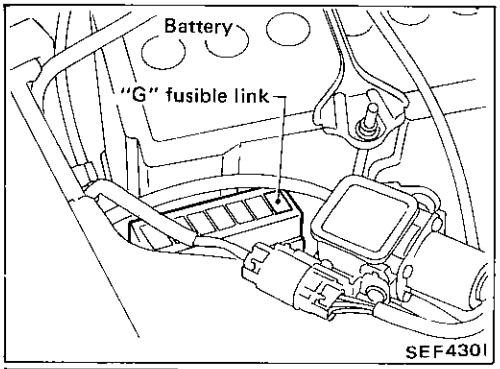
INSPECTION END

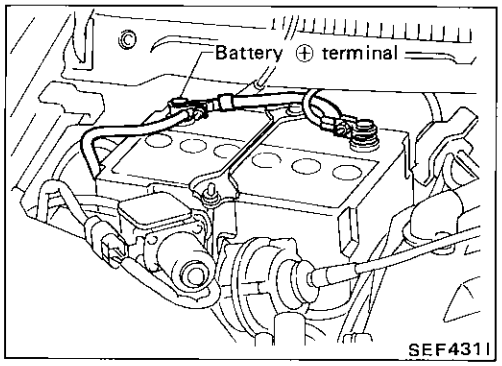
## Diagnostic Procedure 22

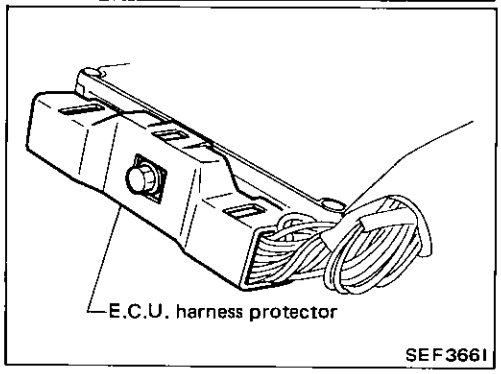
### MAIN POWER SUPPLY AND GROUND CIRCUIT



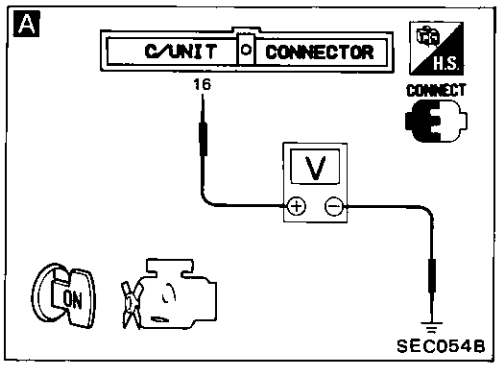

### Harness layout

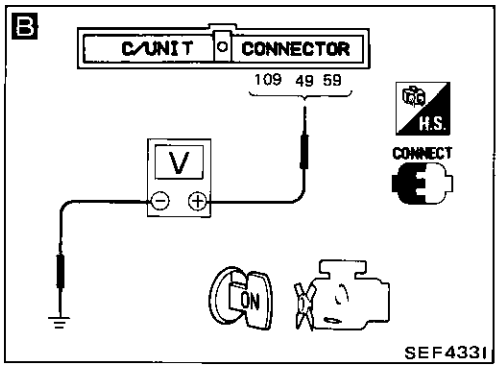


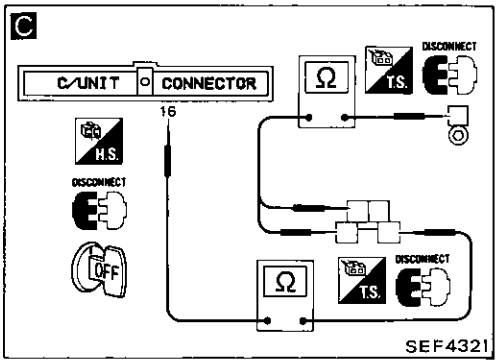



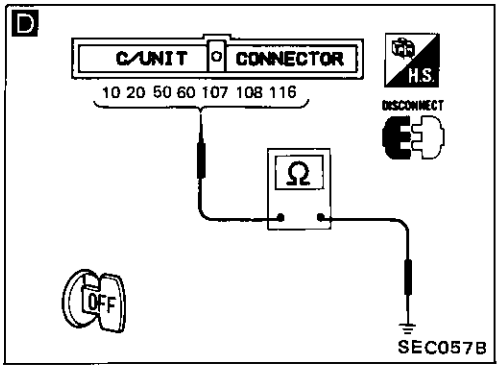



## Diagnostic Procedure 22 (Cont'd)




INSPECTION START

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

N.G. → C

C
Check the following items.
1) E.C.C.S. relay
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)
2) "G" fusible link
3) Harness continuity between E.C.C.S. relay and battery ⊕ terminal
**Continuity should exist.**
4) Harness continuity between E.C.C.S. relay and E.C.U. pin terminal ⑯
**Continuity should exist.**

O.K.

D

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

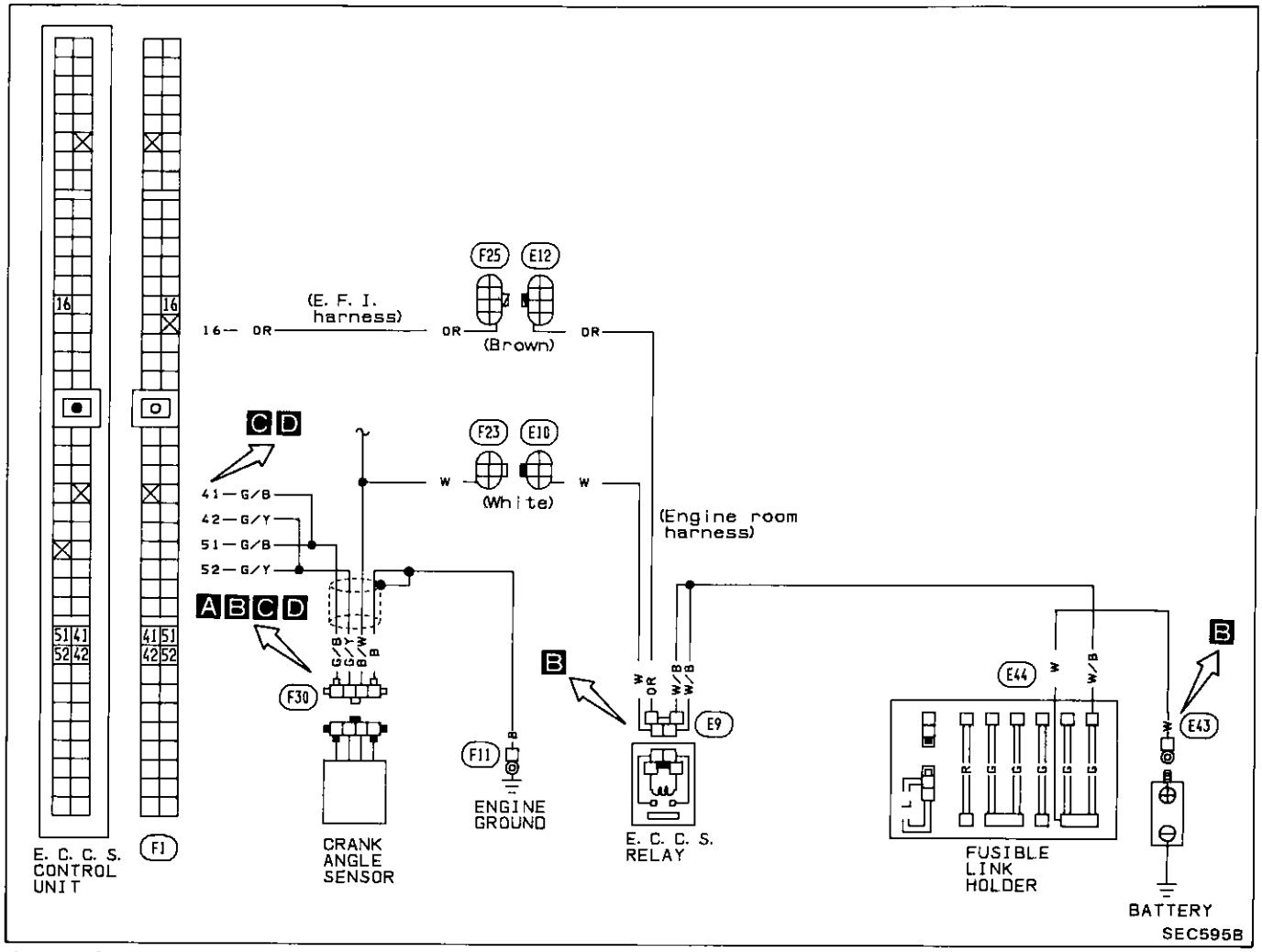
N.G. →
1) Check if engine ground terminal connectors F28, F11 and F39 make contact with engine body properly.
2) Repair harness or connectors.

O.K.

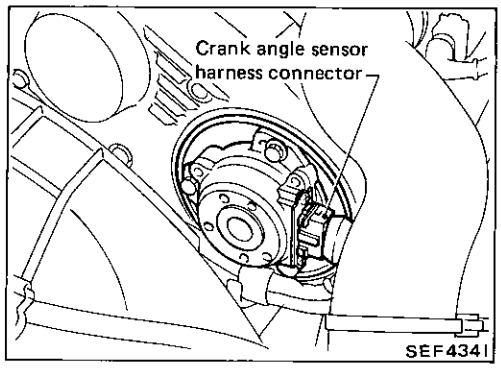
INSPECTION END

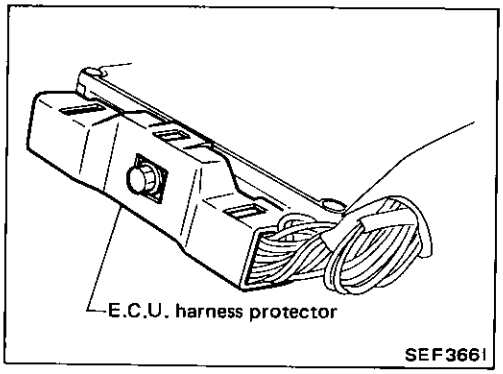
## Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)

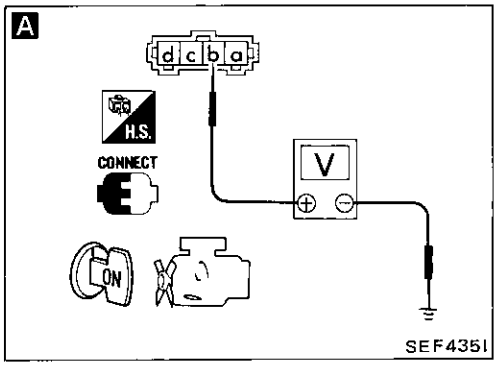


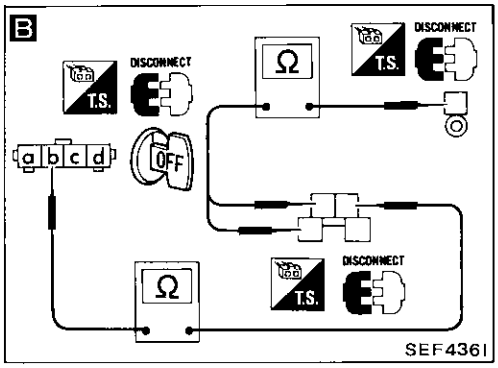

### Harness layout

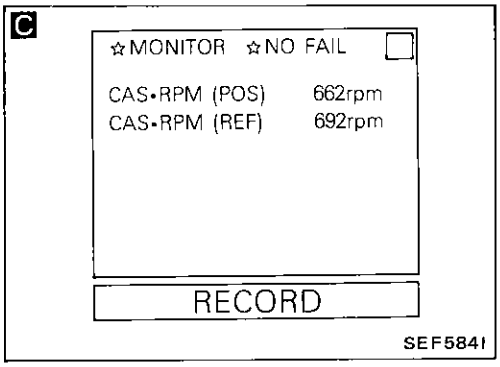


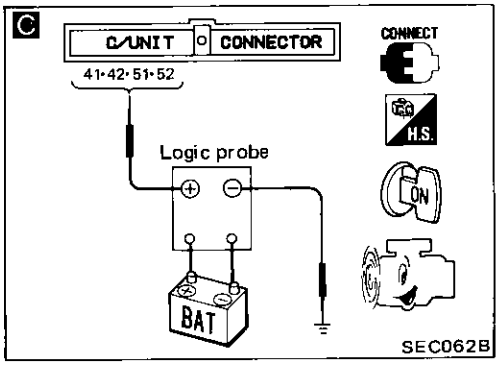



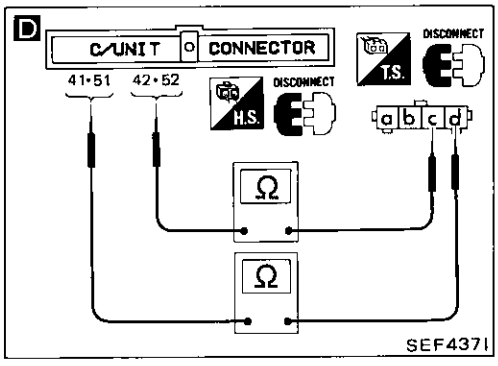
## Diagnostic Procedure 23 (Cont'd)




INSPECTION START

**A**

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

N.G. → **B**

Check the following items.
1) E.C.C.S. relay
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)
2) "G" fusible link
3) Harness continuity between E.C.C.S. relay and battery ⊕ terminal
**Continuity should exist.**
4) Harness continuity between E.C.C.S. relay and crank angle sensor terminal ⓑ
**Continuity should exist.**

O.K.

**C**

CHECK INPUT SIGNAL.
1) Start engine.
2) Read crank angle sensor signals in "DATA MONITOR" mode with CONSULT.
**rpm: M/T 700±50**
**A/T 770±50**
**[Non-turbo]**
**750±50**
**[Turbo]**

OR

2) Check that pulse signals exist in E.C.U. terminals ㊶, ㊿ and ㊷, ㊷ with logic probe.
**Pulse signal should exist.**
**㊶, ㊿: 120° signal**
**㊷, ㊷: 1° signal**

N.G. → **D**

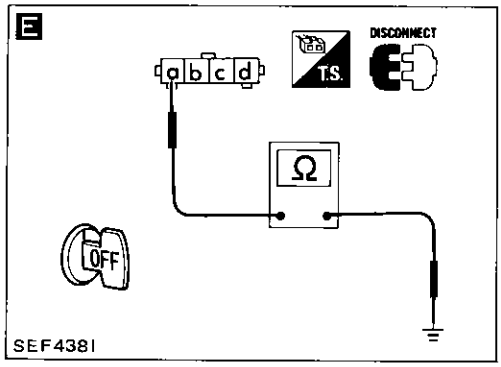
CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND CRANK ANGLE SENSOR.
1) Stop engine.
2) Disconnect crank angle sensor harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminals ㊶, ㊿ and terminal ⓓ, E.C.U. terminals ㊷, ㊷ and terminal ⓒ.
**Continuity should exist.**
If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT (Crank angle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-181.)

O.K.

## Diagnostic Procedure 23 (Cont'd)




E

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

N.G. → Repair harness or connectors.

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

Perform driving test and then perform self-diagnosis (Mode II) again.

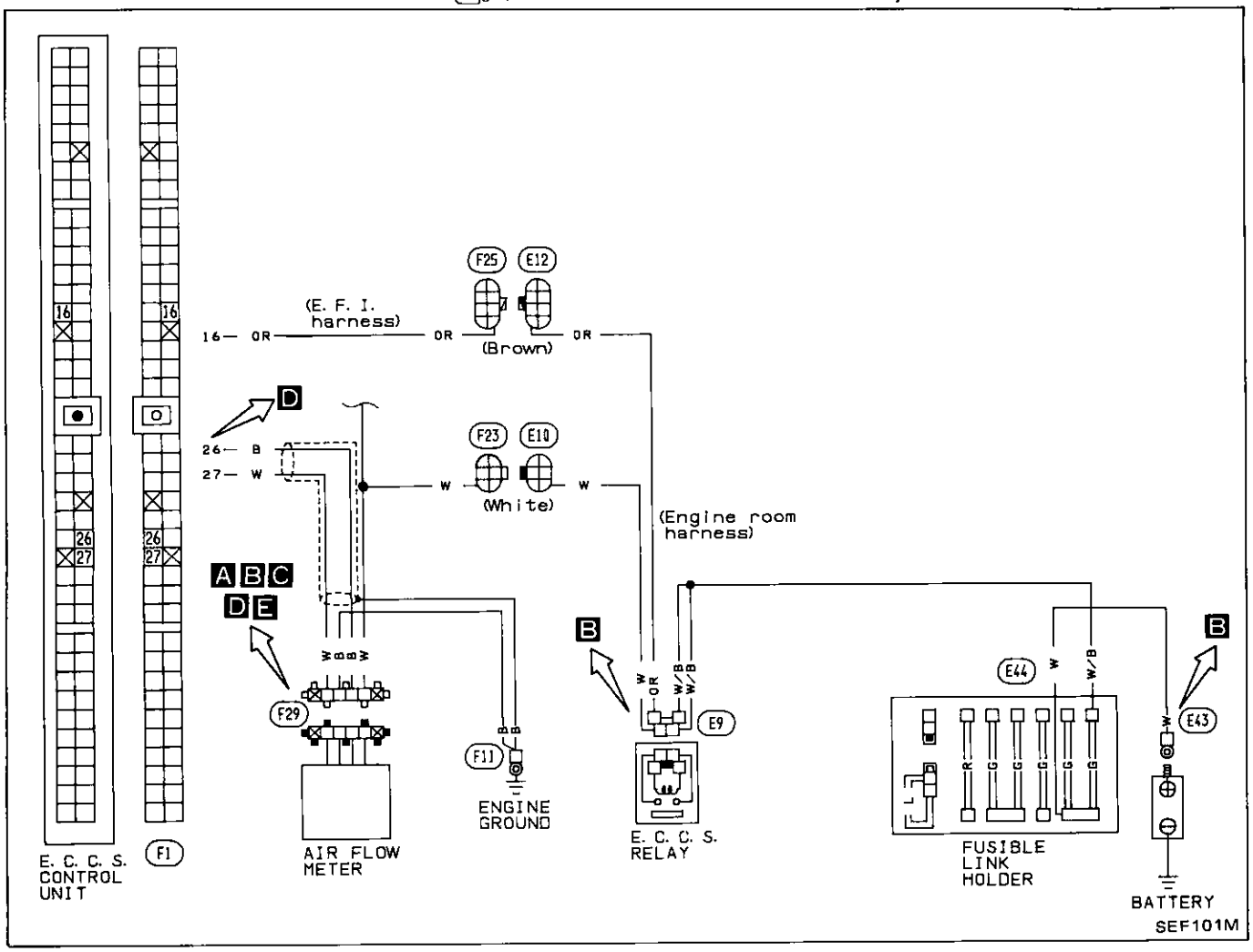
N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals for damage. Check the connection at the E.C.U. harness connector.

O.K. ↓

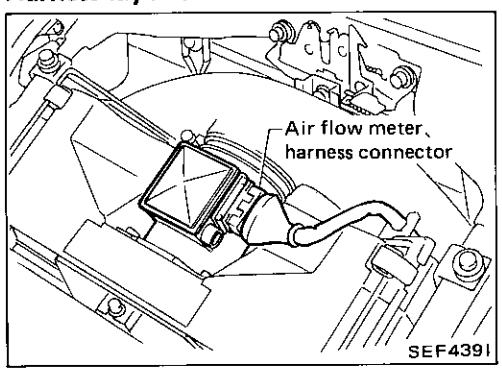
INSPECTION END

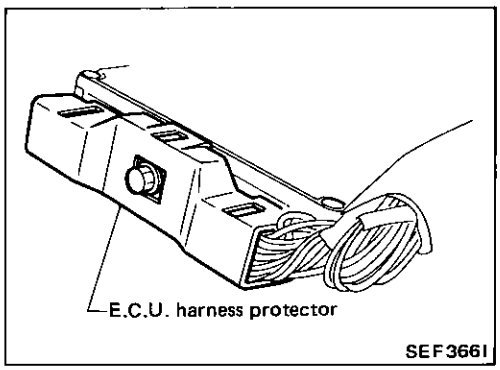
## Diagnostic Procedure 24

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



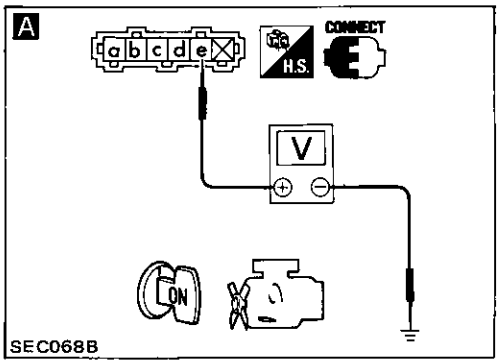

### Harness layout



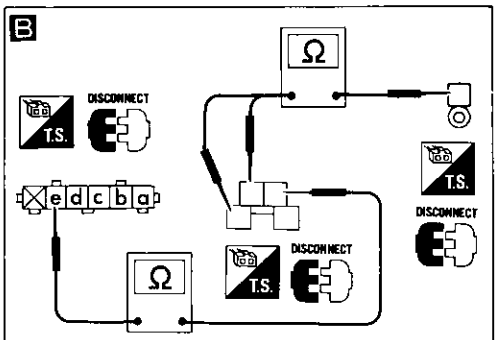
## Diagnostic Procedure 24 (Cont'd)

A



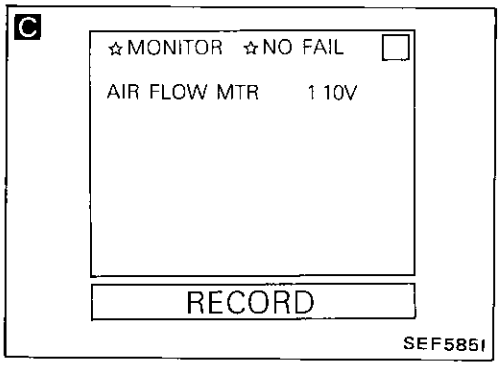

SEC068B

B



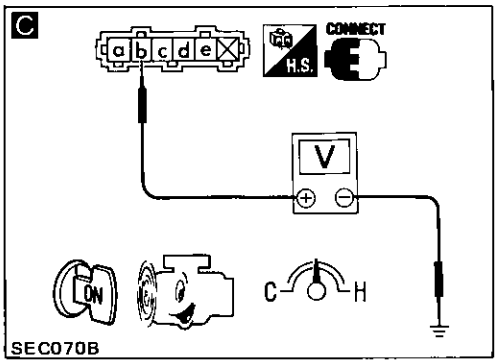

SEF440I

C



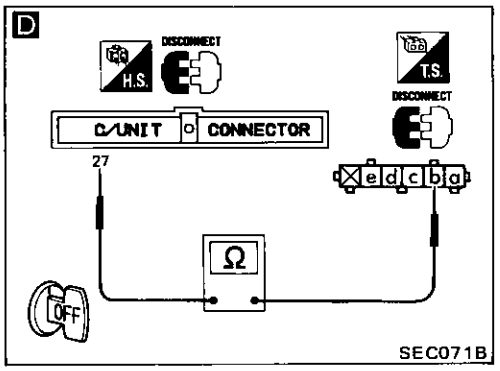

SEF585I

C




SEC070B

D




SEC071B

INSPECTION START

**A**

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

N.G. → **B**

Check the following items.
1) E.C.C.S. relay
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)
2) "G" fusible link
3) Harness continuity between E.C.C.S. relay and battery ⊕ terminal
**Continuity should exist.**
4) Harness continuity between E.C.C.S. relay and air flow meter terminal ⓔ.
**Continuity should exist.**

O.K. ↓

**C**

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

OR

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

N.G. → **D**

CHECK HARNESS CONTINUITY BETWEEN AIR FLOW METER AND E.C.U.
1) Stop engine.
2) Disconnect air flow meter harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminal ㉗ and terminal ⓑ.
**Continuity should exist.**
If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Air flow meter).
Refer to "Electrical Components Inspection".
(See page EF & EC-181.)

**E**

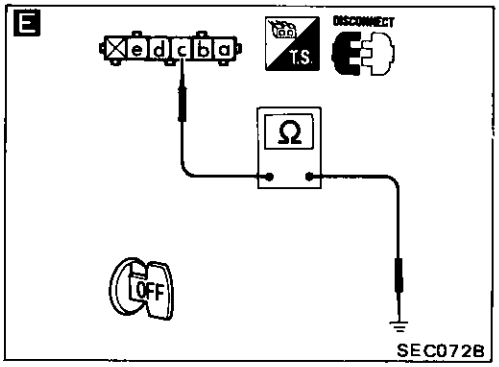
CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect air flow meter harness connector.
3) Check harness continuity between terminal ⓒ and ground.
**Continuity should exist.**

N.G. → Repair harness or connectors.

O.K. ↓

⊕

## Diagnostic Procedure 24 (Cont'd)




Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode II) again.

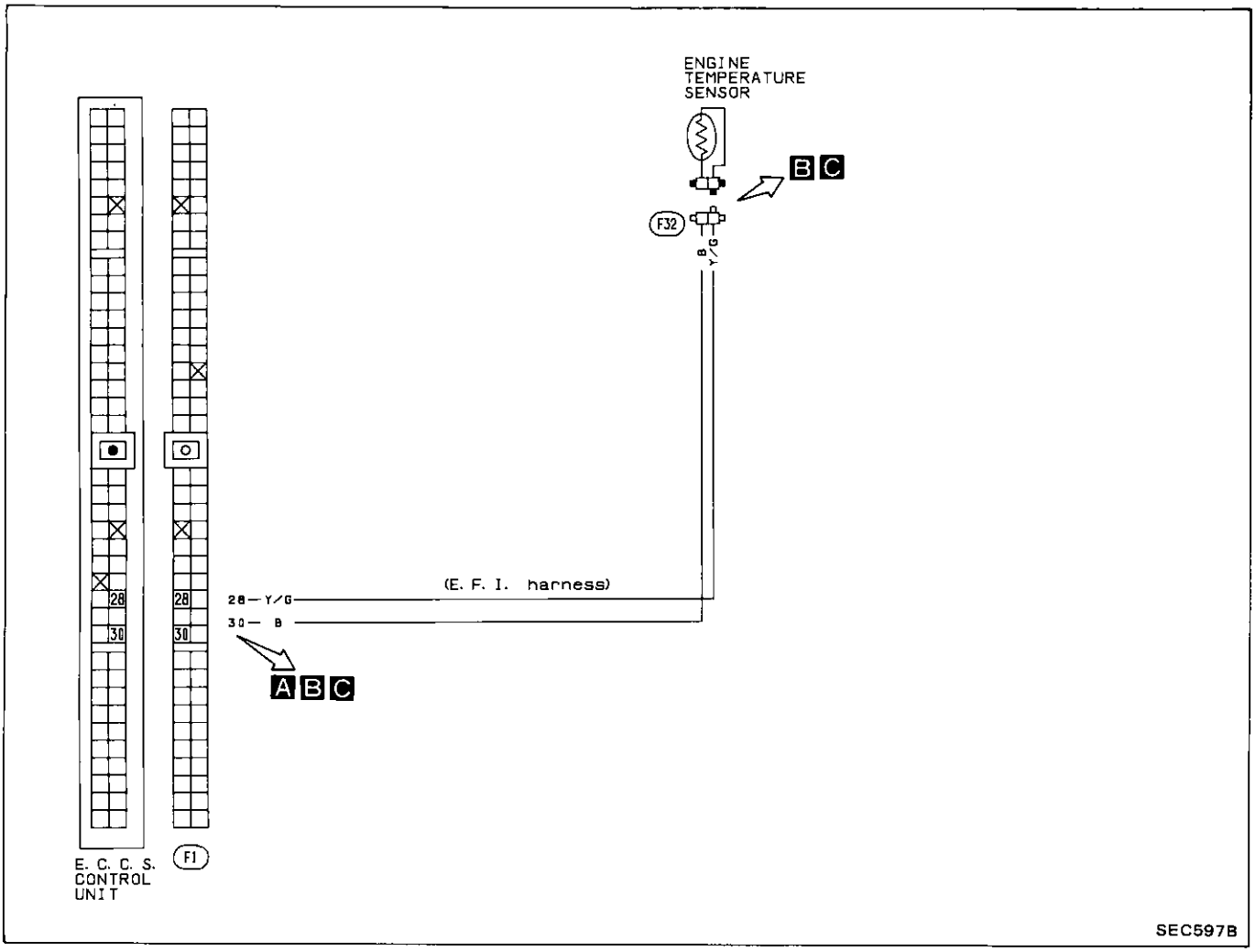
N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals for damage. Check the connection at the E.C.U. harness connector.

O.K.

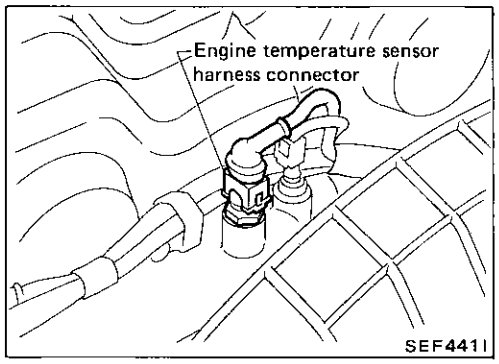
INSPECTION END

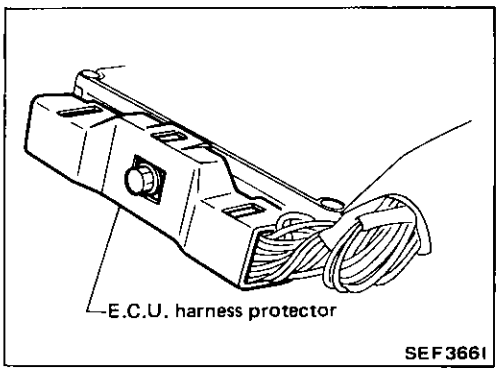
## Diagnostic Procedure 25

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

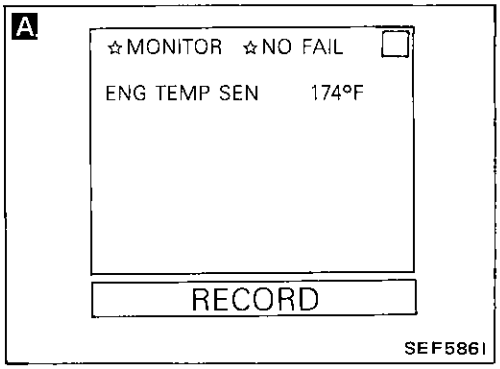


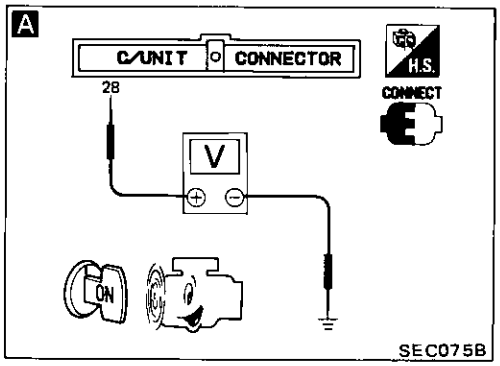

**Harness layout**

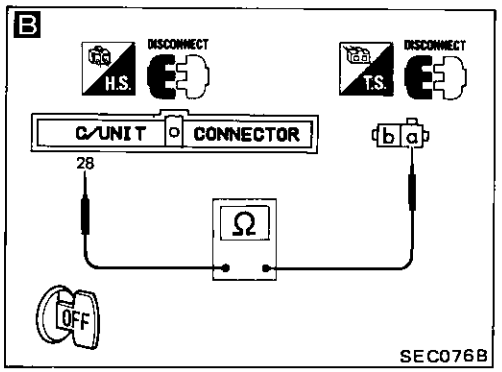


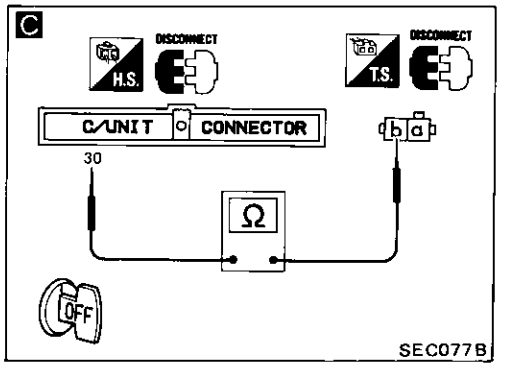



## Diagnostic Procedure 25 (Cont'd)




INSPECTION START

**A**

CHECK INPUT SIGNAL.
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.

OR

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

N.G. → **B**

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

O.K. ↓

CHECK COMPONENT (Engine temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-181.)

O.K. ↓

**C**

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

N.G. → Repair harness or connectors.

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

Perform driving test and then perform self-diagnosis (Mode II) again.

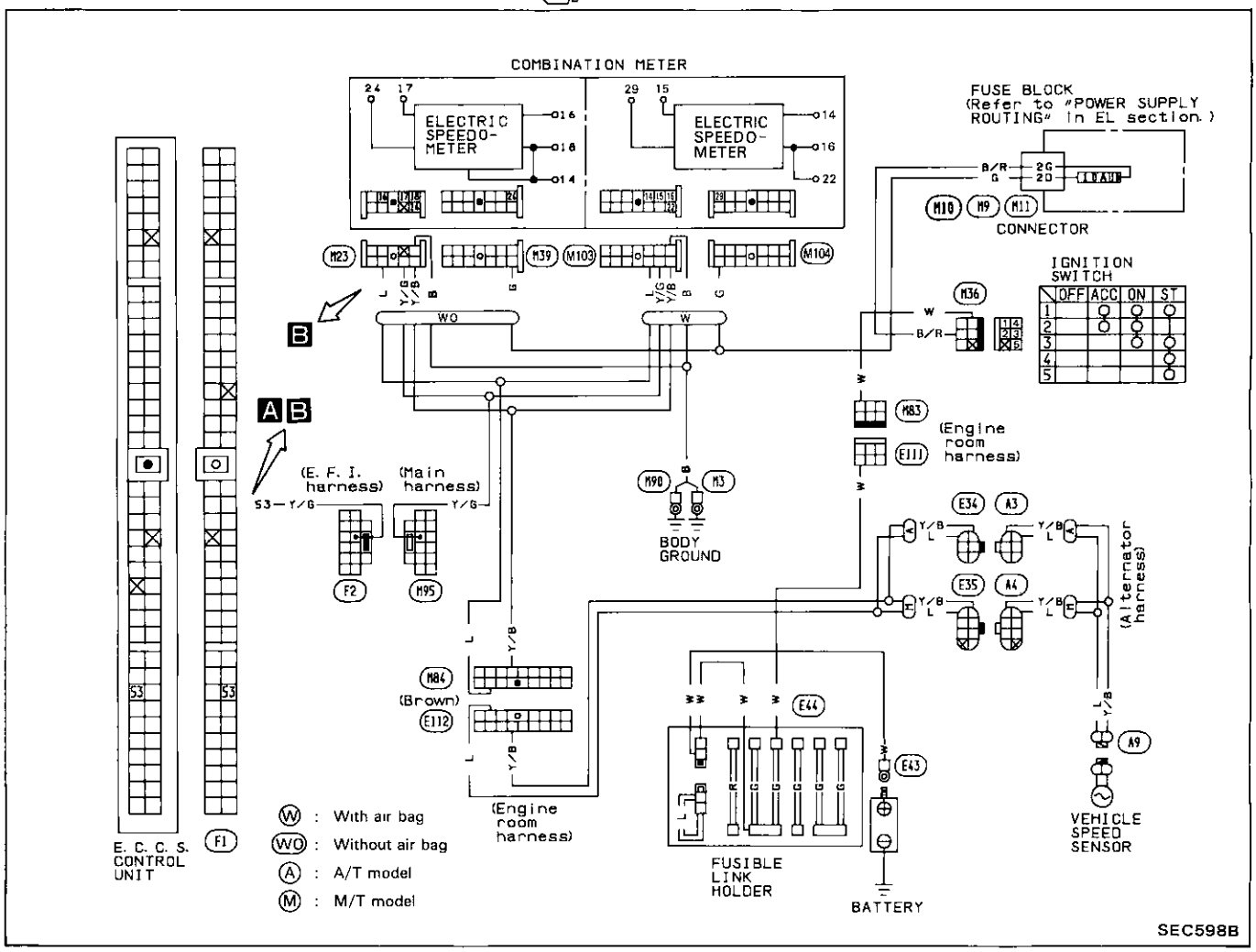
N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals for damage. Check the connection at the E.C.U. harness connector.

O.K. ↓

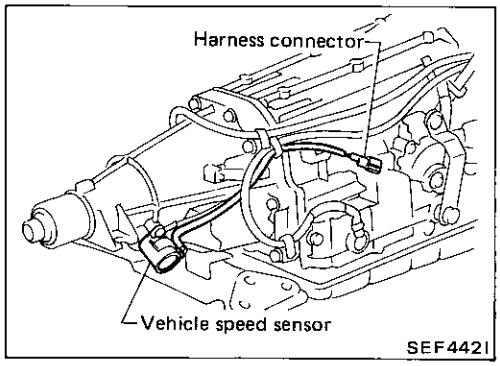
INSPECTION END

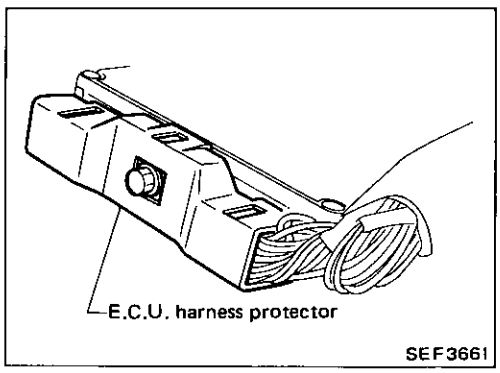
## Diagnostic Procedure 26

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

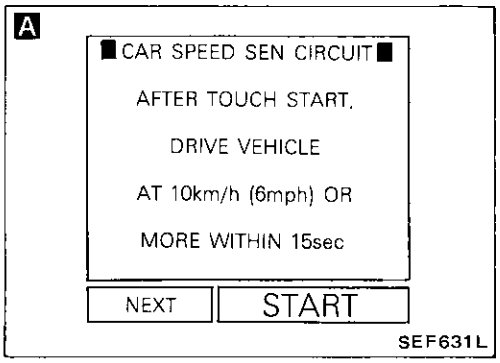


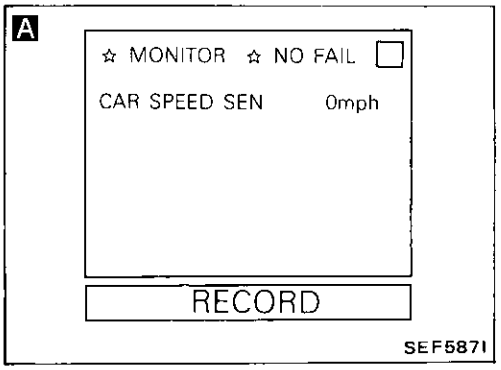

### Harness layout

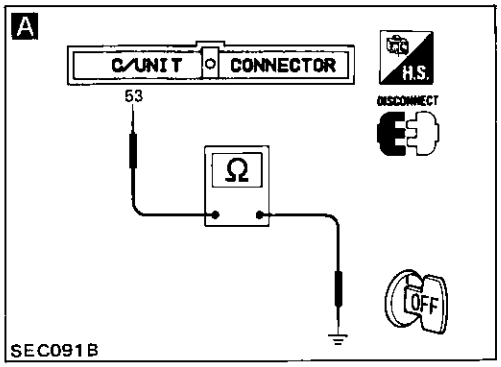


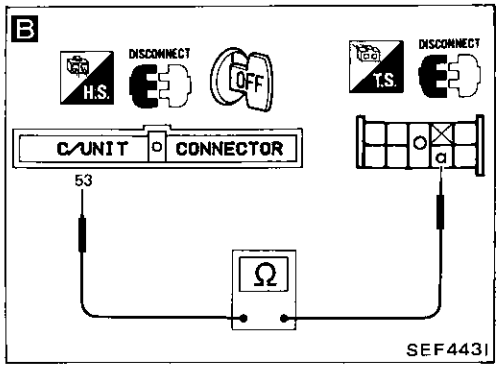



## Diagnostic Procedure 26 (Cont'd)




INSPECTION START

Make sure that speedometer in combination meter operates properly.

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

O.K.

CHECK COMPONENT (Vehicle speed sensor). Refer to "Electrical Components Inspection". (See page EF & EC-182.)

A

CHECK INPUT SIGNAL CIRCUIT.

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

N.G. → B

OR

1) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.

**CONSULT value should be the same as the speedometer indication**

OR

1) Jack up rear wheels.
2) Disconnect E.C.U. harness connector.
3) Check resistance between E.C.U. terminal ⑤③ and ground. With transmission in neutral, turn both rear wheels.

**Continuity should be intermittent.**

B

CHECK HARNESS CONTINUITY BETWEEN COMBINATION METER AND E.C.U.

1) Remove combination meter from instrument panel.
2) Disconnect combination meter harness connector ⑯.
3) Check harness continuity between E.C.U. terminal ⑤③ and terminal ⓐ.

**Continuity should exist.**

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform self-diagnosis (Mode II). N.G. →

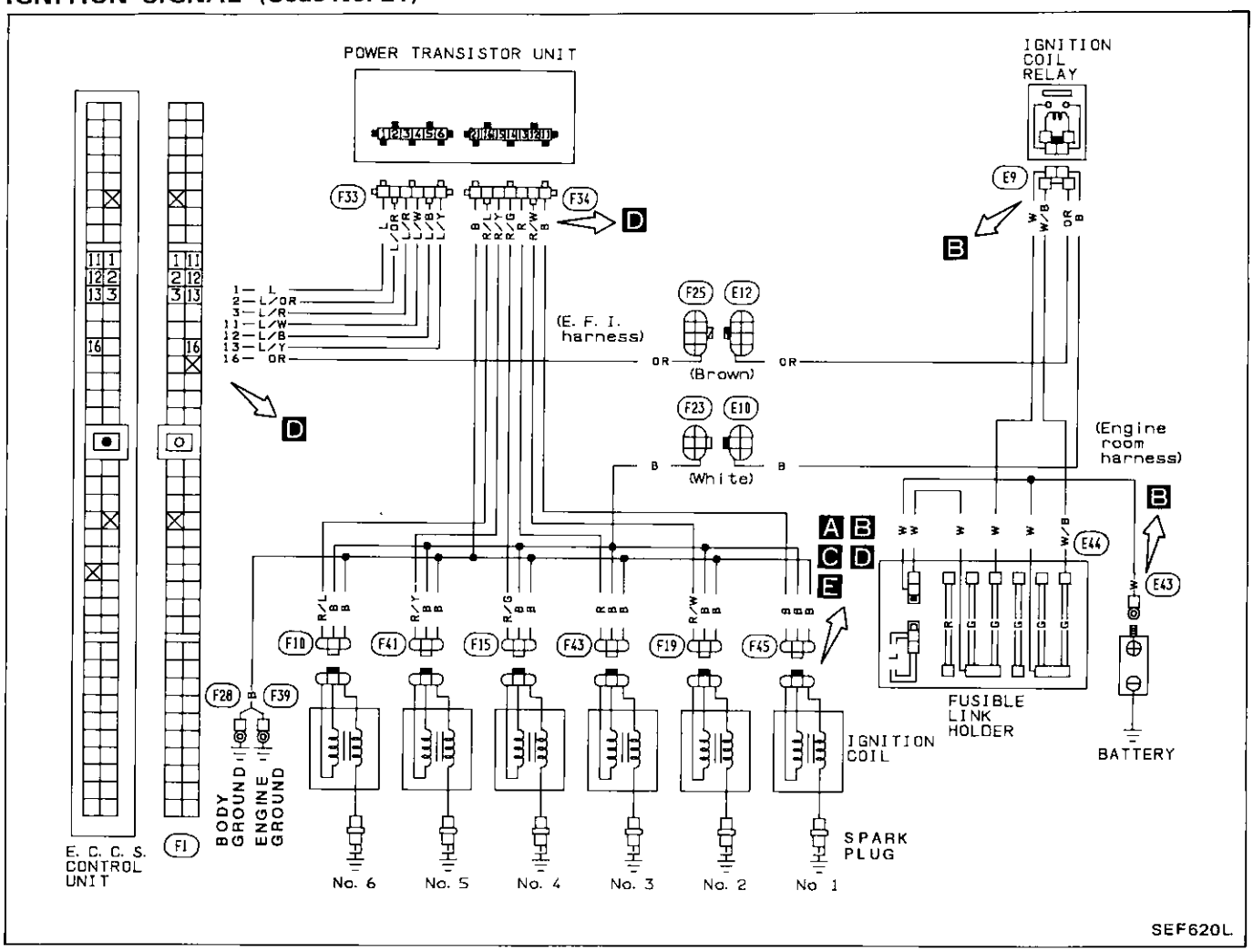
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals for damage. Check the connection at the E.C.U. harness connector.

O.K.

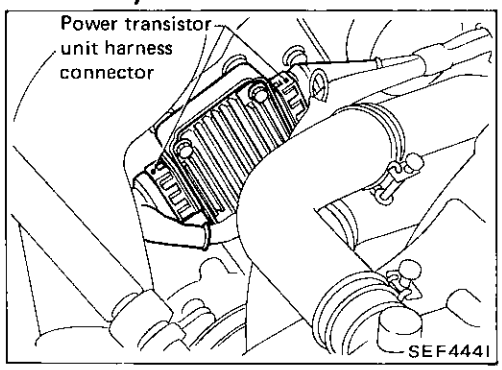
INSPECTION END

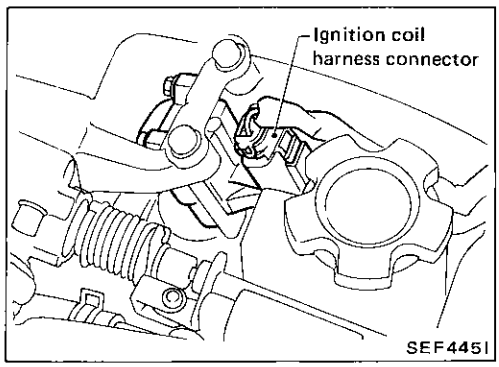
## Diagnostic Procedure 27

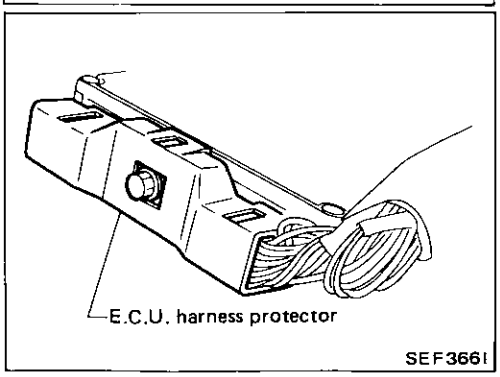
### IGNITION SIGNAL (Code No. 21)




### Harness layout

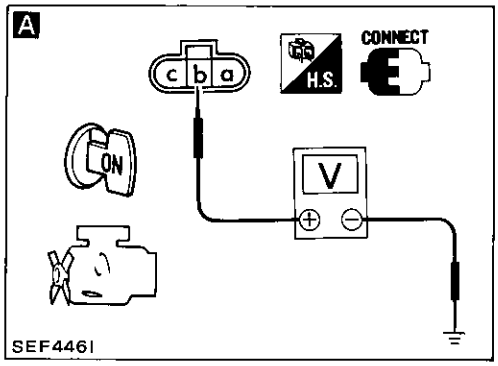


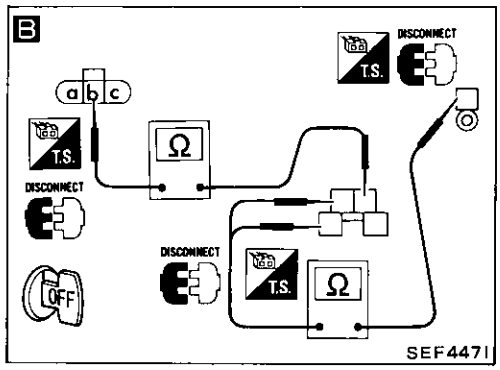



## Diagnostic Procedure 27 (Cont'd)

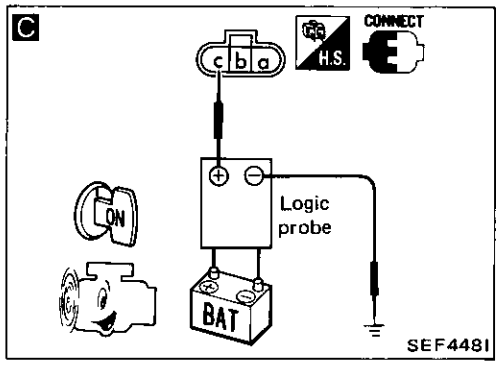
A



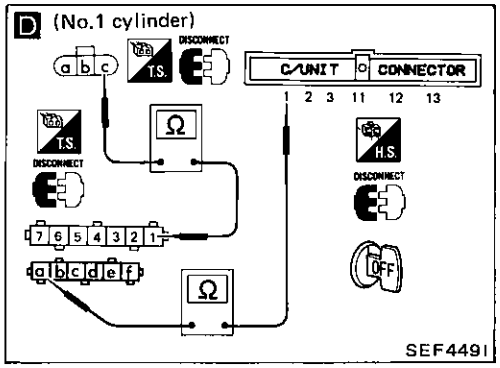

B



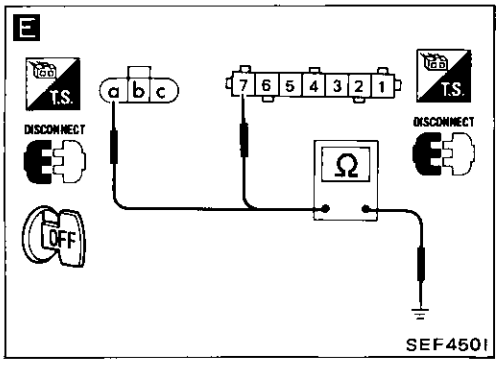

C




D (No.1 cylinder)




E




INSPECTION START

**A**

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

N.G. → **B**

Check the following items.
1) Ignition coil relay
Refer to "Electrical Components Inspection". (See page EF & EC-187.)
2) "G" fusible link
3) Harness continuity between ignition coil relay and ignition coils.
**Continuity should exist.**
4) Harness continuity between ignition coil relay and battery ⊕ terminal.
**Continuity should exist.**

O.K. ↓

**C**

CHECK OUTPUT SIGNAL.
1) Start engine.
2) With logic probe make sure that pulse signal exists between terminal ⓒ and ground.
**Pulse signal should exist.**

N.G. → **D**

Check the following items.
1) Power transistor unit
Refer to "Electrical Components Inspection". (See page EF & EC-182.)
2) Harness continuity between terminal ⓒ and power transistor terminals ① (No. 1 cylinder), ② (No. 2 cylinder), ..... ⑥ (No. 6 cylinder).
**Continuity should exist.**
3) Harness continuity between power transistor terminals and E.C.U. terminals.
① - ⓐ ⑪ - ⓓ
② - ⓑ ⑫ - ⓔ
③ - ⓒ ⑬ - ⓕ
**Continuity should exist.**

O.K. ↓

**E**

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect ignition coil and power transistor harness connectors.
3) Check harness continuity between terminal ⓐ (⑦) and ground.
**Continuity should exist.**

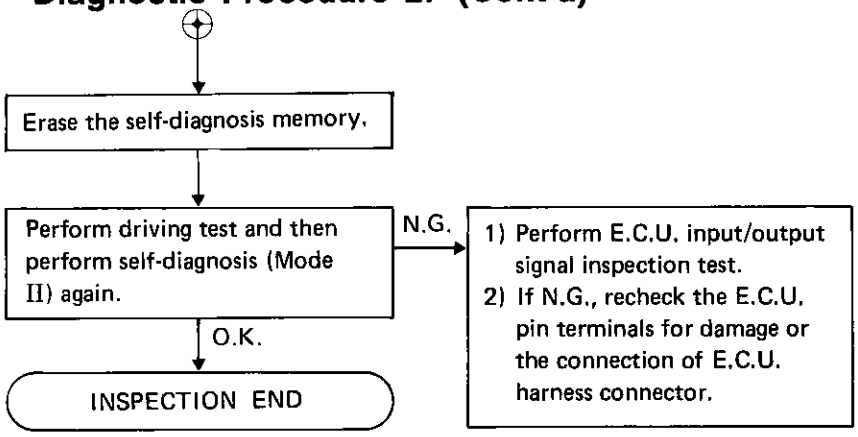
N.G. → Repair or replace harness.

O.K. ↓

Reinstall any part removed.

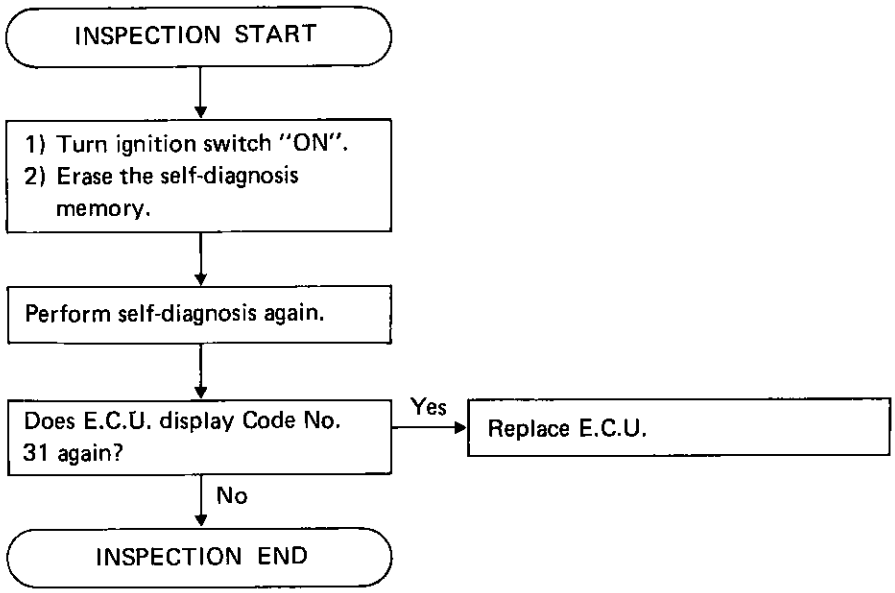
⊕

## Diagnostic Procedure 27 (Cont'd)



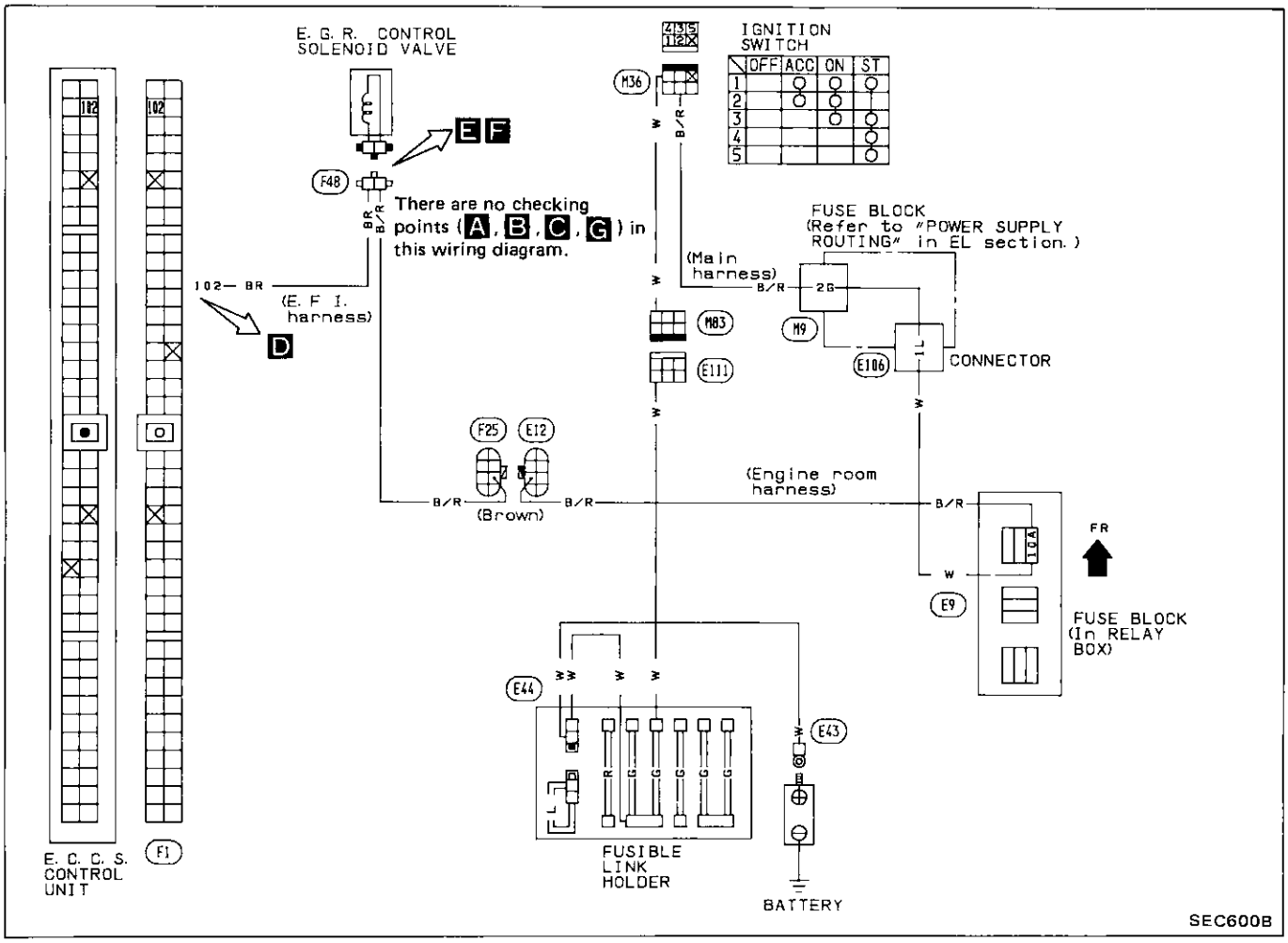

## Diagnostic Procedure 28

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

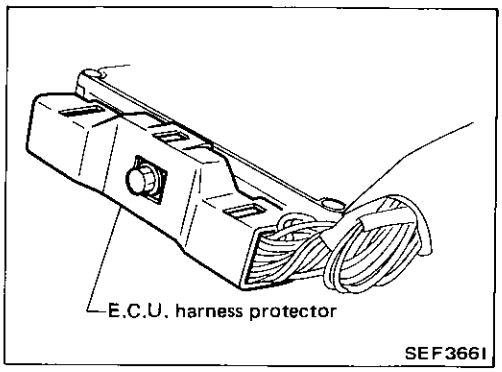


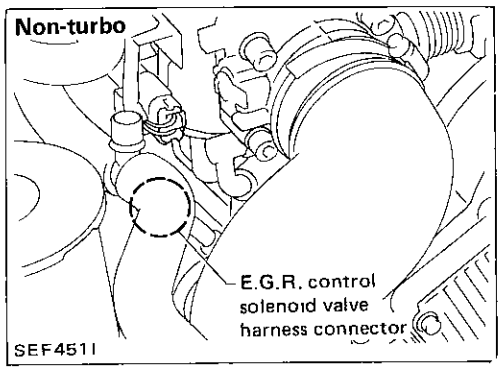
## Diagnostic Procedure 29

**E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California model**
**(Not self-diagnostic item): For Non-California model**

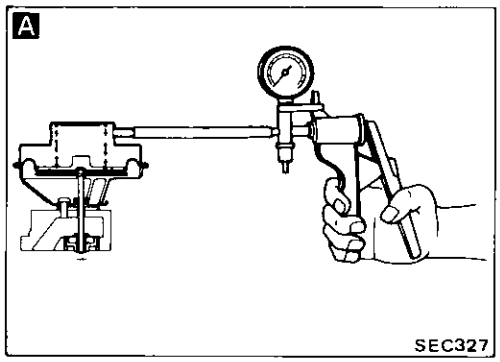


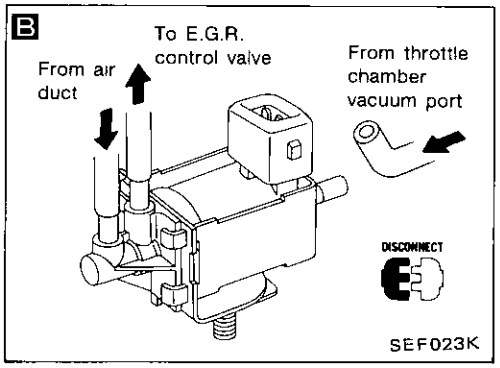

**Harness layout**

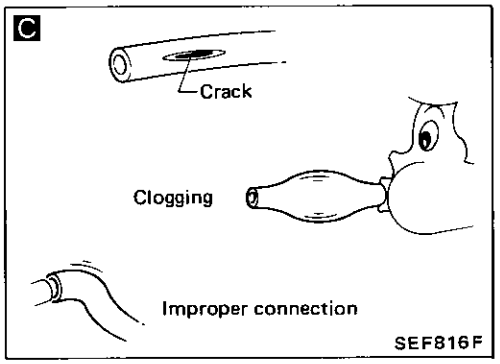


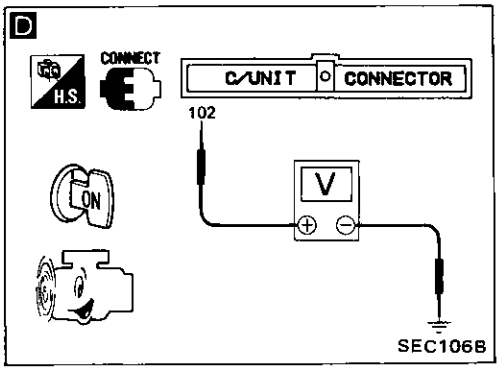



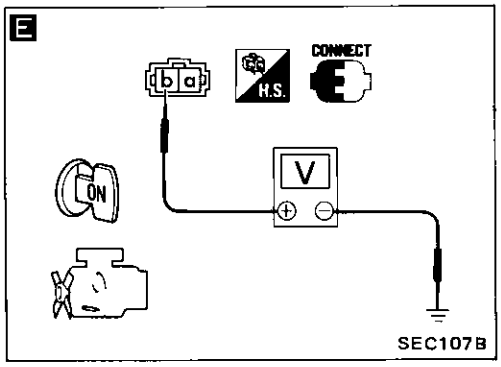
## Diagnostic Procedure 29 (Cont'd)




INSPECTION START

**A** CHECK E.G.R. CONTROL VALVE OPERATION.
Make sure that E.G.R. control valve lifts up when applying vacuum.

N.G. → Replace or repair E.G.R. control valve.

O.K.

**B** CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Disconnect vacuum hose connected to E.G.R. control solenoid valve.
2) Make sure vacuum exists when racing engine.

N.G. → CHECK THROTTLE CHAMBER VACUUM PORT FOR CLOGGING.

O.K.

**C** CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connections.

N.G. → If necessary, replace vacuum hose or reconnect vacuum hose firmly.

O.K.

**D** CHECK E.C.U. OUTPUT SIGNAL.
1) Check voltage between E.C.U. terminal (102) and ground under the following conditions:

| Engine condition | Voltage |
|---|---|
| Idle | 0.7 - 0.8V |
| Racing (Less than approx. 3,000 rpm) | Battery voltage |

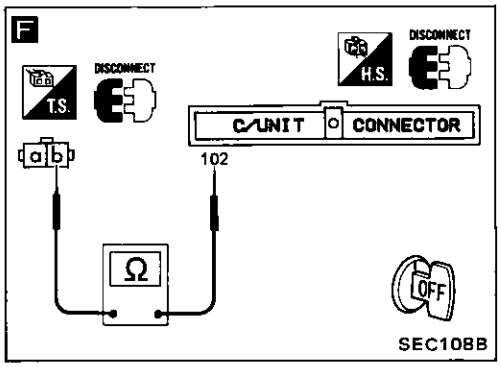
N.G. → **E** CHECK POWER SOURCE TO E.G.R. CONTROL SOLENOID VALVE.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal (b) and ground.
**Voltage: Battery voltage**

**F** CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.G.R. control solenoid valve harness connector.
4) Check resistance between E.C.U. terminal (102) and terminal (b).
**Resistance:**
**Approximately 0Ω**
If N.G., repair or replace harness.

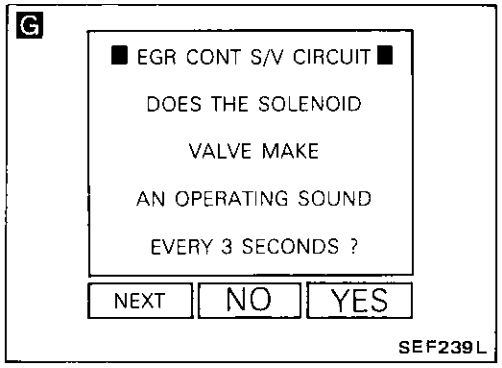
O.K. ⊕

## Diagnostic Procedure 29 (Cont'd)

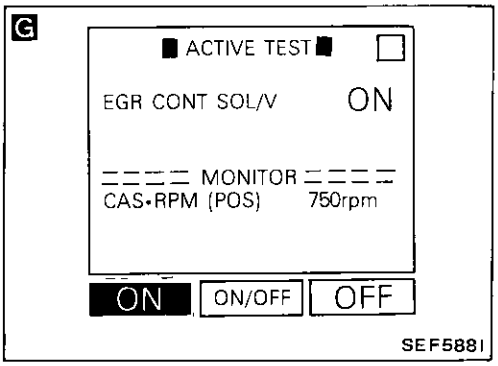
F




G




G




G

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-183.)

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

O.K. ↓

Check resistance of exhaust gas temperature sensor. (See page EF & EC-184.)

↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode II.

## Diagnostic Procedure 29 (Cont'd)

**H** ROAD TEST

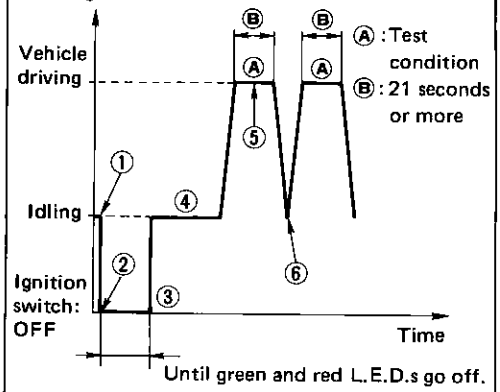
**Test condition**

**Drive vehicle under the following conditions with a suitable shift position.**

(1) Engine speed:
2,200±200 rpm

(2) Intake manifold vacuum:
−30.0±10.0 kPa
(−225±75 mmHg, −8.86±2.95 inHg)

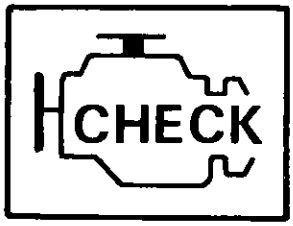
**Driving mode**




① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until red L.E.D. goes off.
③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
④ Keep engine running for at least 3 minutes.
⑤ Shift to suitable gear position and drive in "Test condition" for at least 21 seconds.
⑥ Decrease engine revolutions to less than 2,000 rpm.
⑦ Repeat steps ⑤ through ⑥ at lest 1 more time.

SEF302H

**I**




CHECK ENGINE LIGHT

SEF924F

⊕⊕

**H**

Perform driving test under the following conditions:
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure **H**.

**I**

Make sure check engine light does not come "ON" during driving test.

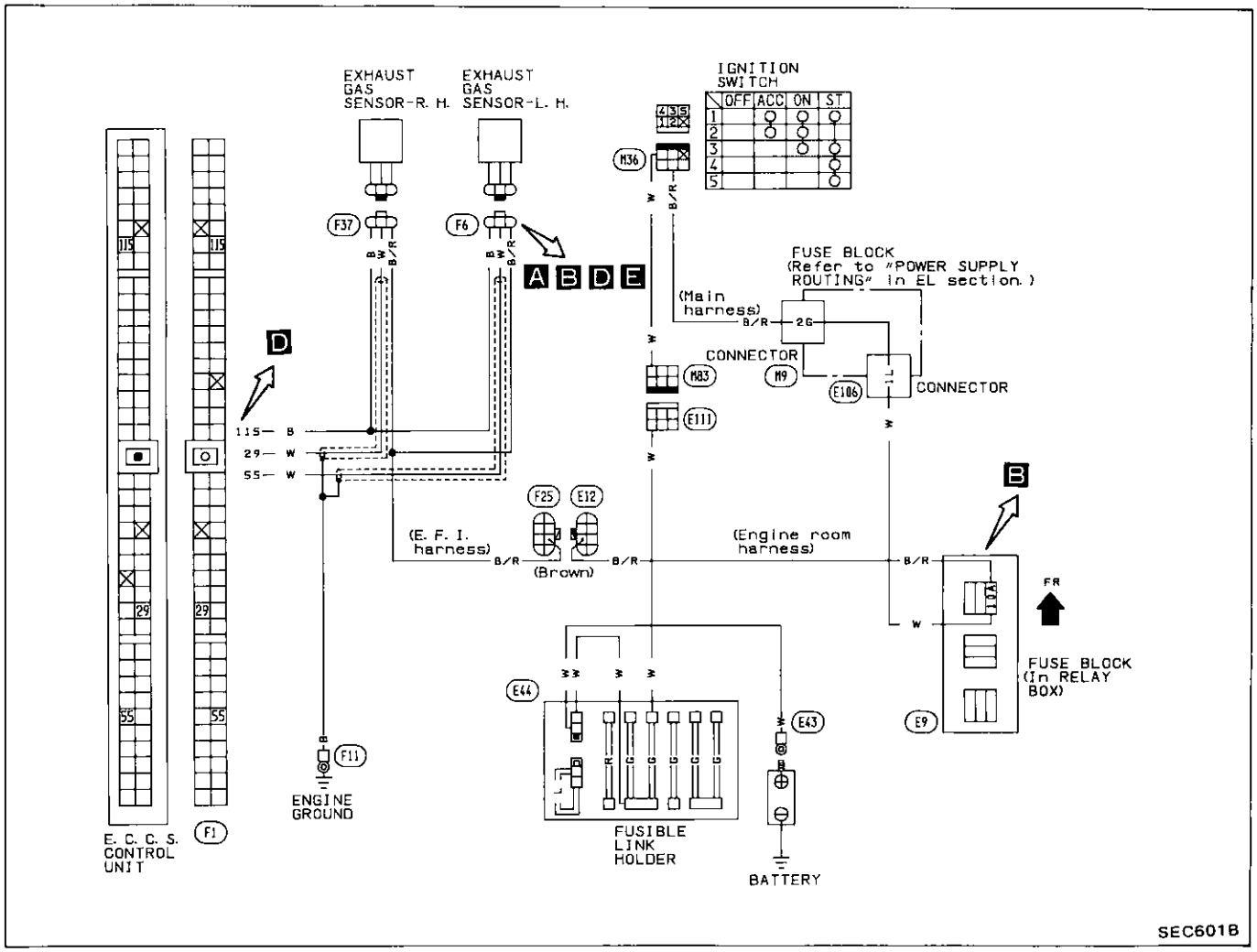
Comes "ON" → Perform self-diagnosis and find malfunction code. According to displayed Code No., perform electronic control system inspection.

Does not come "ON"

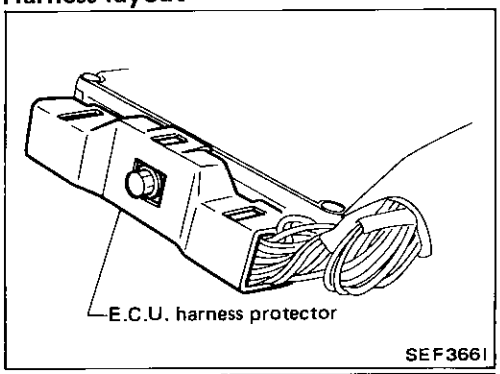
INSPECTION END

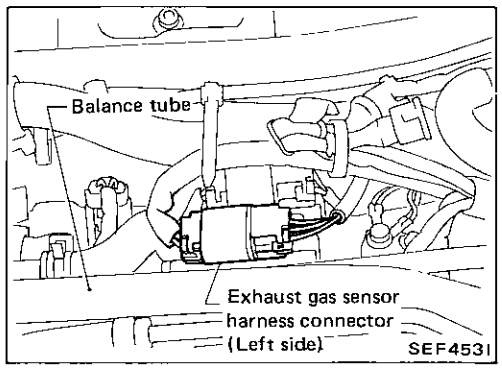
## Diagnostic Procedure 30

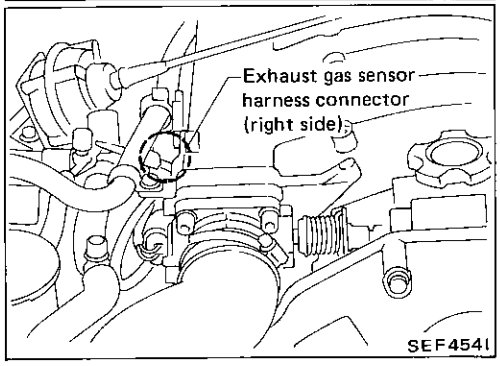
### EXHAUST GAS SENSOR (Code No. 33 and 53) (CHECK ENGINE LIGHT ITEM)




### Harness layout

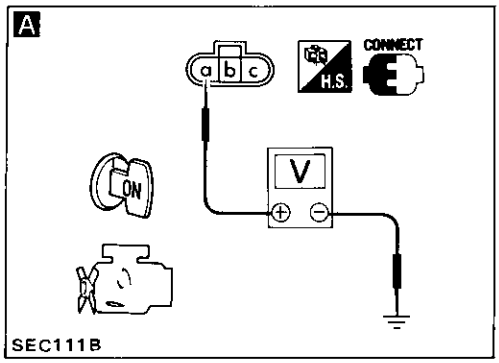


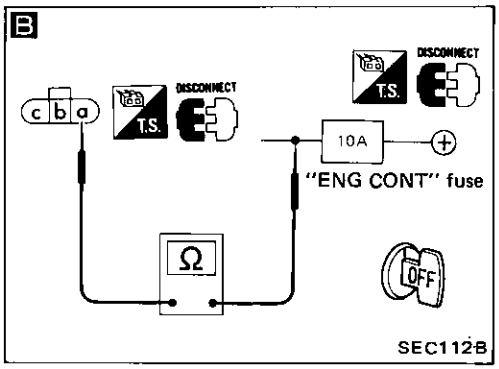
## Diagnostic Procedure 30 (Cont'd)

A



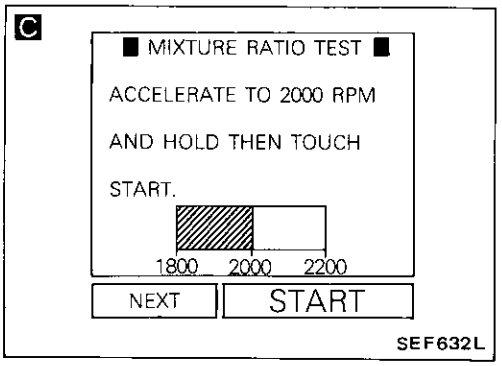

SEC111B

B



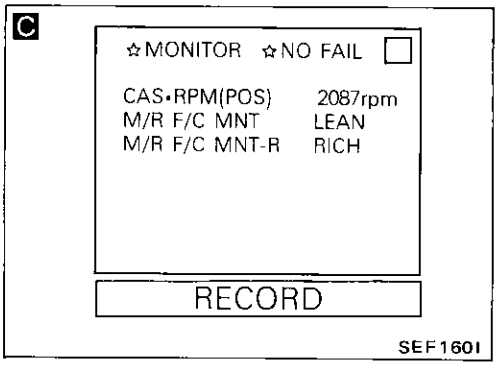

SEC112B

C



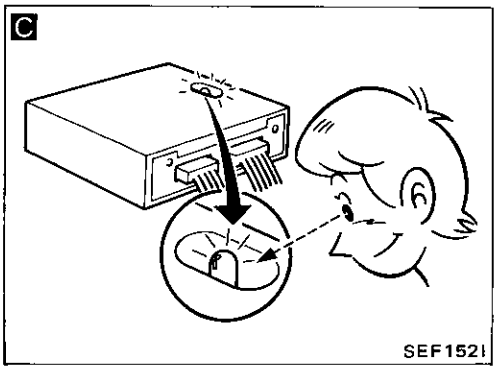

SEF632L

C




SEF160I

C



SEF152I

INSPECTION START

A

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

N.G. → B

O.K. ↓

C

CHECK OVERALL FUNCTION.
Perform "MIXTURE RATIO TEST" in "FUNCTION-TEST" mode with CONSULT

OR

1) Start engine and warm it up sufficiently.
2) Make sure that "M/R F/C MNT(R)" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

OR

2) Make sure that red L.E.D. on E.C.U. goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm in self-diagnosis Mode II.

N.G. → D

O.K. ↓

⊕

B

CHECK HARNESS CONTINUITY BETWEEN EXHAUST GAS SENSOR AND FUSE.
1) Turn ignition switch "OFF".
2) Disconnect exhaust gas sensor harness connector.
3) Disconnect "ENG CONT" fuse.
4) Check harness continuity between terminal ⓐ and the fuse.
**Continuity should exist.**
If N.G., repair harness or connectors.

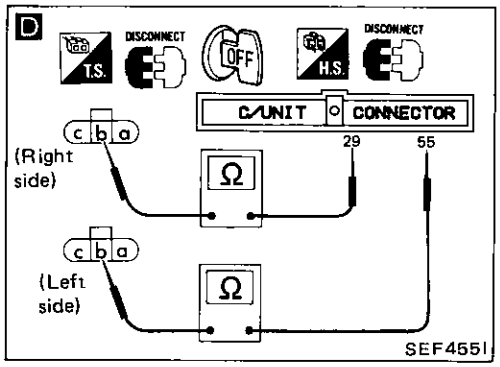
D

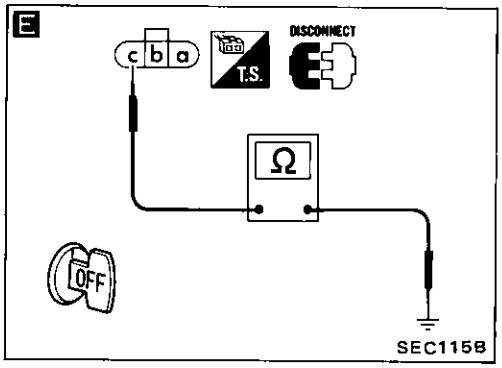
CHECK HARNESS CONTINUITY BETWEEN EXHAUST GAS SENSOR AND E.C.U.
1) Stop engine.
2) Disconnect exhaust gas sensor harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U.terminals and exhaust gas sensor terminals.
Right side: ㉙ - ⓑ
Left side: ㊺ - ⓑ
**Continuity should exist.**
If N.G., repair harness or connectors.

O.K. ↓

Replace exhaust gas sensor.

## Diagnostic Procedure 30 (Cont'd)




E

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect exhaust gas sensor harness connector.
3) Check harness continuity between terminal Ⓒ and ground.
**Continuity should exist.**

N.G. → Repair harness or connectors.

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

Perform driving test and then perform self-diagnosis (Mode II) again.

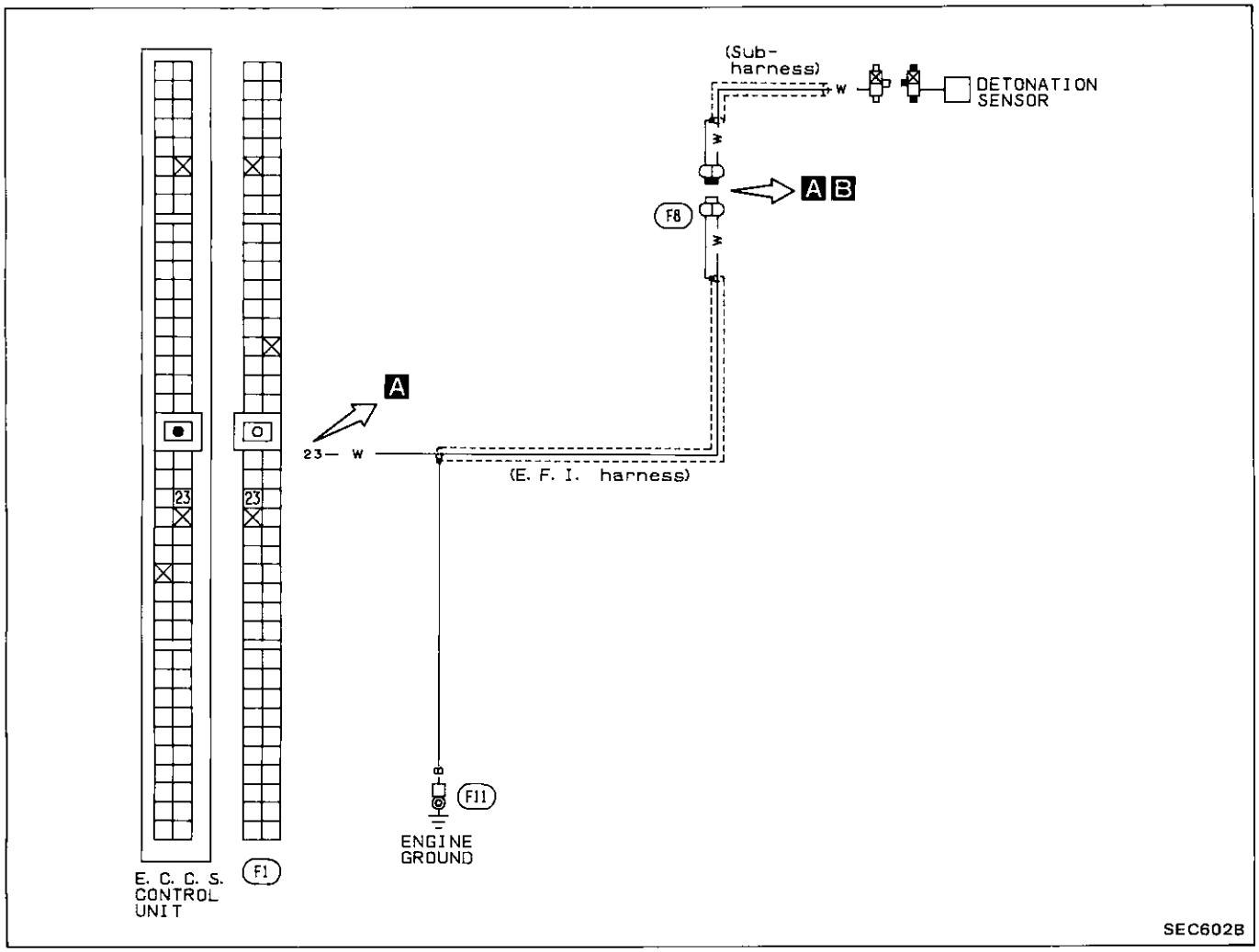
N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

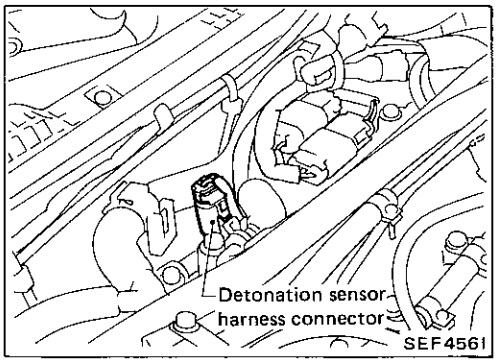
INSPECTION END

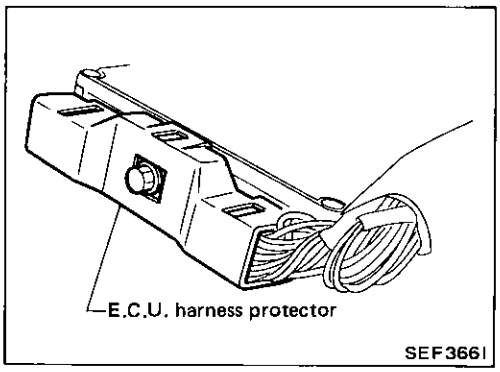
## Diagnostic Procedure 31

### DETONATION SENSOR (Code No. 34)

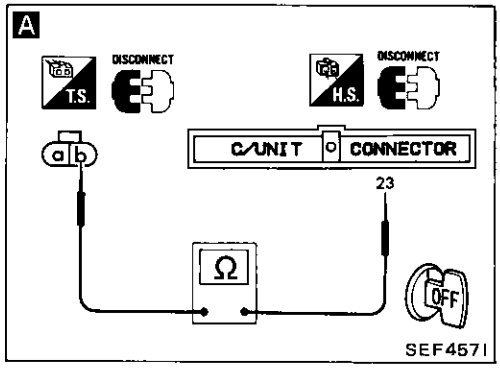


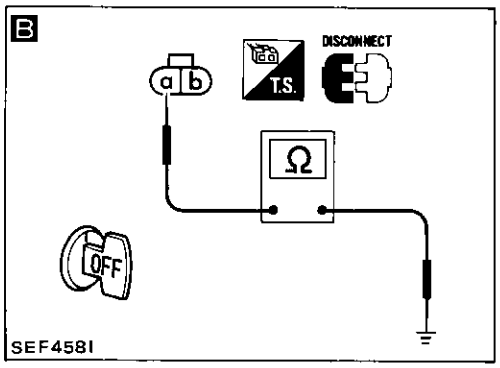

### Harness layout



## Diagnostic Procedure 31 (Cont'd)




INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Make sure that ignition switch is in "OFF" position.
2) Disconnect detonation sensor sub-harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminal ㉓ and terminal ⓑ.
**Continuity should exist.**

N.G. → Repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.
1) Check harness continuity between terminal ⓐ and ground.
**Continuity should exist.**

N.G. → Repair harness or connectors.

O.K.

CHECK COMPONENT (Detonation sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode II) again.

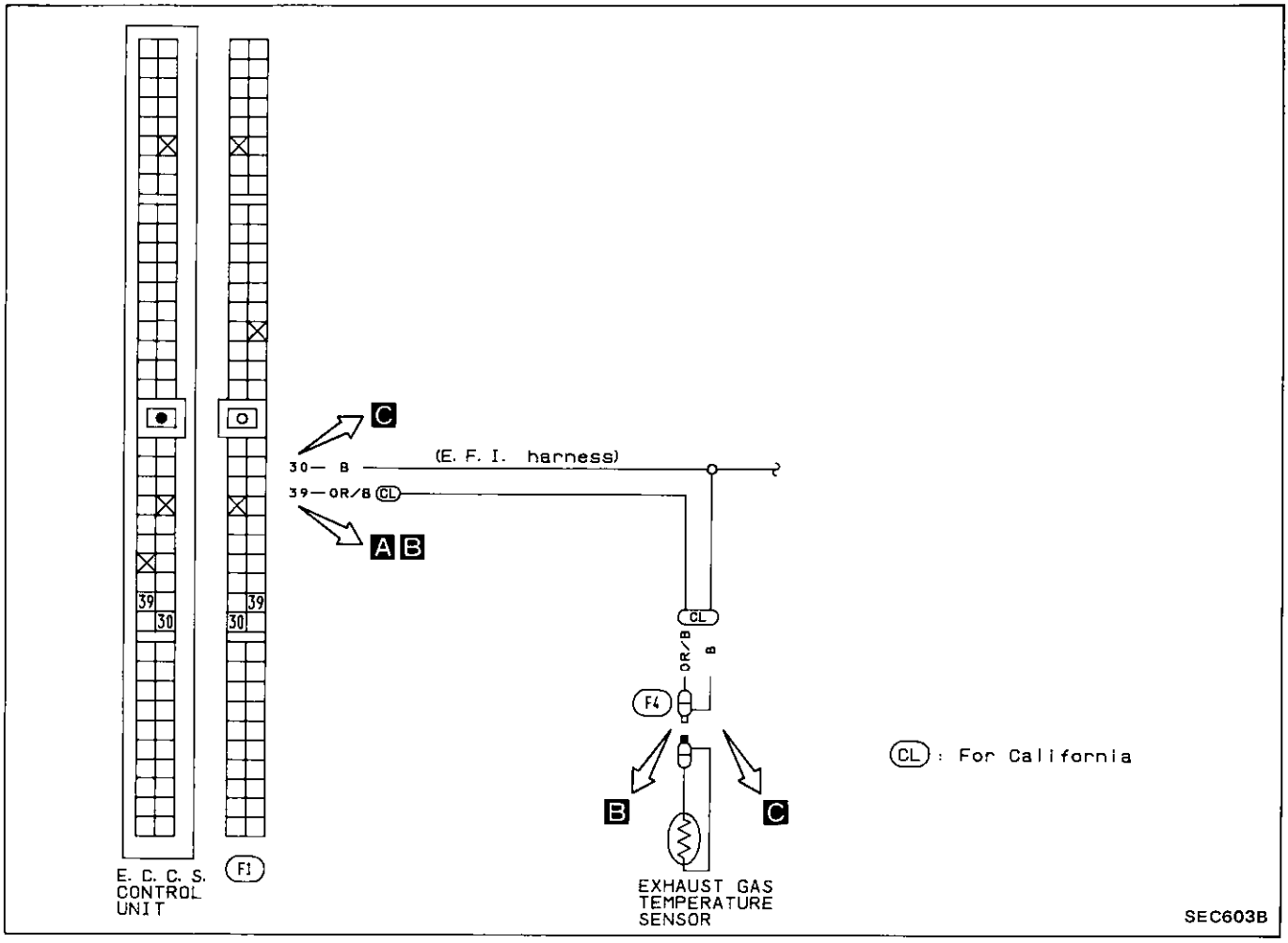
N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

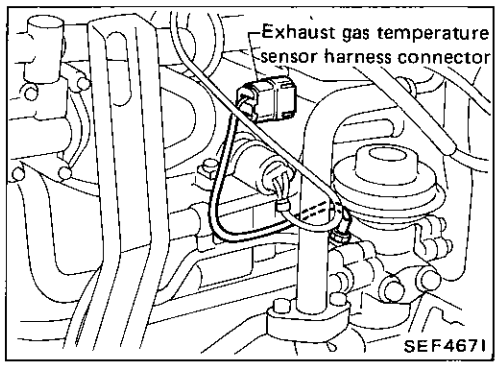
INSPECTION END

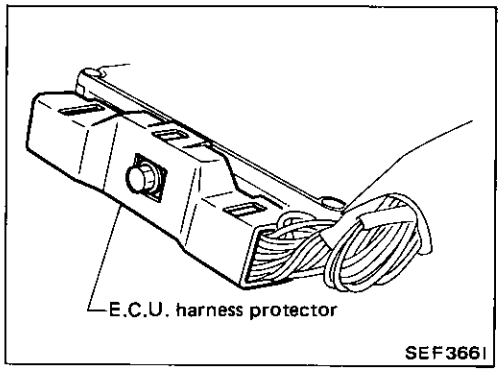
## Diagnostic Procedure 32

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

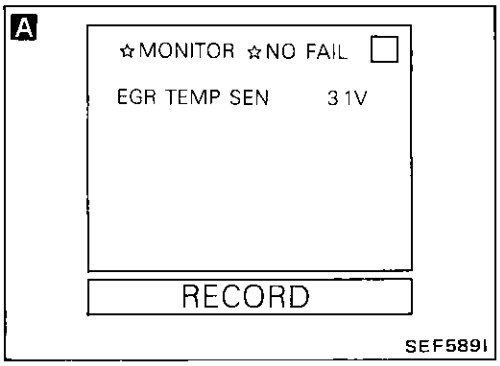


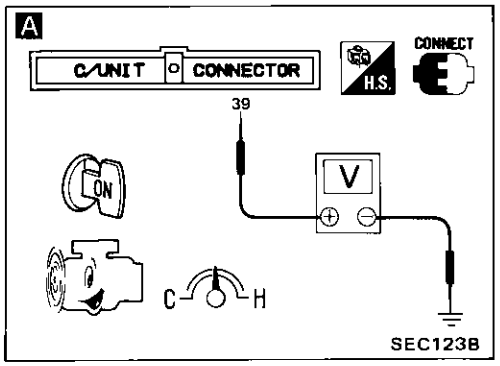

### Harness layout

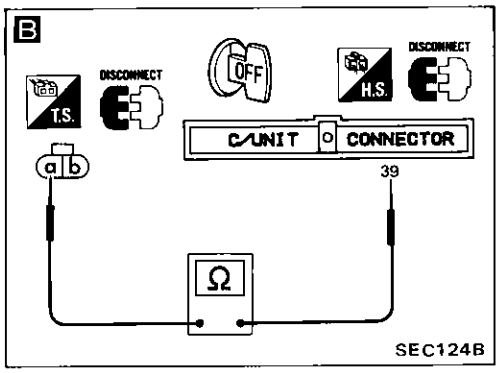


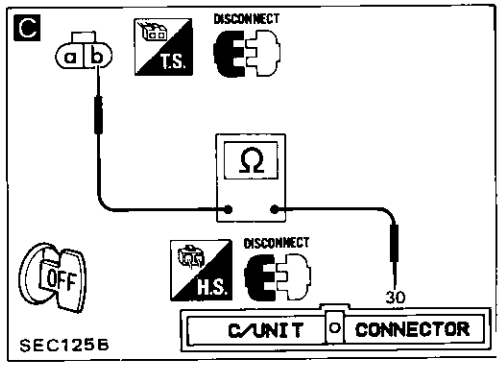



## Diagnostic Procedure 32 (Cont'd)




INSPECTION START

**A**

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Read exhaust gas temperature sensor signal in "DATA MONITOR" mode with CONSULT.
**Voltage:**
**Less than 4.5V**

OR

2) Check voltage between E.C.U. terminal ㊴ and ground.
**Voltage:**
**Less than 4.5V**

N.G. → **B**

**B**

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND EXHAUST GAS TEMPERATURE SENSOR.
1) Stop engine.
2) Disconnect E.C.U. harness connector.
3) Disconnect exhaust gas temperature sensor harness connector.
4) Check continuity between E.C.U. terminal ㊴ and terminal ⓐ.
**Continuity should exist.**

O.K. ↓

CHECK COMPONENT (Exhaust gas temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-184.)

O.K. ↓

**C**

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect E.C.U. harness connector.
3) Disconnect exhaust gas temperature sensor harness connector.
4) Check harness continuity between E.C.U. terminal ㉚ and terminal ⓑ.

N.G. → Repair harness or connectors.

O.K. ↓

Reinstall any part removed. ↓

Erase the self-diagnosis memory. ↓

Perform driving test and then perform self-diagnosis (Mode II) again.

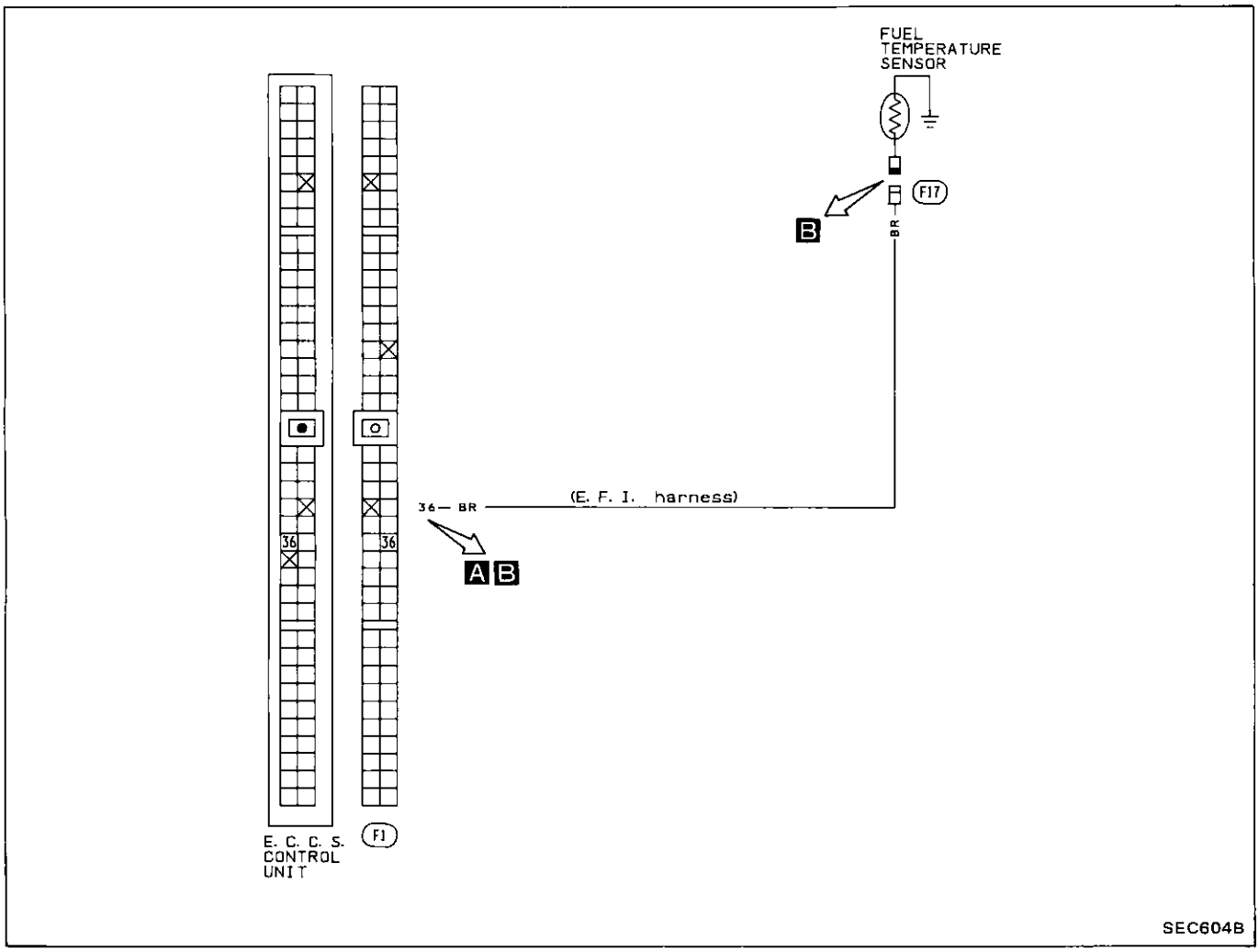
N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

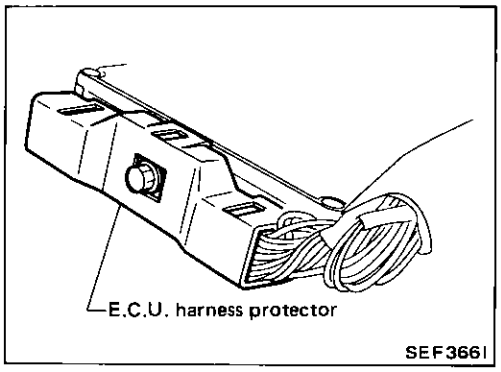
INSPECTION END

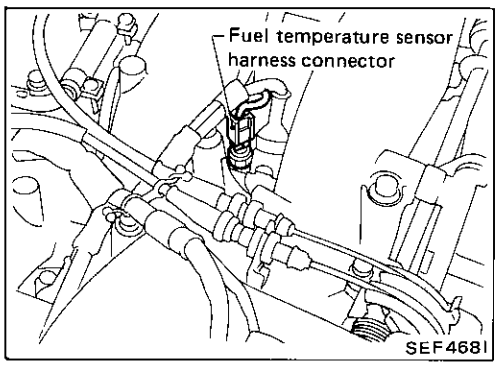
## Diagnostic Procedure 33

FUEL TEMPERATURE SENSOR (Code No. 42)

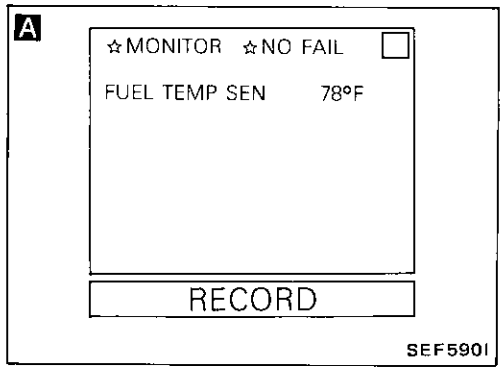


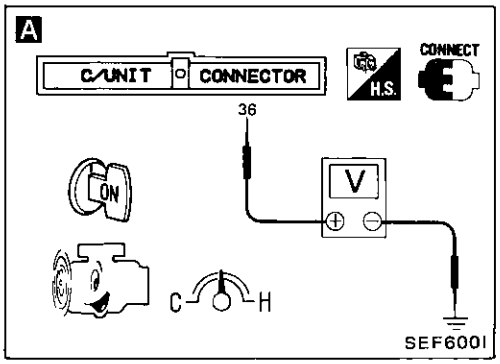

### Harness layout

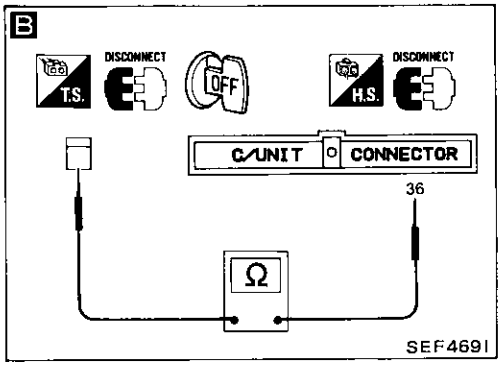


## Diagnostic Procedure 33 (Cont'd)




INSPECTION START

A

CHECK INPUT SIGNAL.

Read fuel temperature sensor signal in "DATA MONITOR" mode with CONSULT after engine warm-up.

**Fuel temperature:**
**20 - 60°C (68 - 140°F)**

OR

Check voltage between E.C.U. terminal ㊱ and ground after engine warm-up.

**Voltage: 0 - 5.0V**

N.G. →

B

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND FUEL TEMPERATURE SENSOR.

1) Stop engine.
2) Disconnect E.C.U. harness connector.
3) Disconnect exhaust gas temperature sensor harness connector.
4) Check continuity between E.C.U. terminal ㊱ and fuel temperature terminal.

**Continuity should exist.**

O.K. ↓

CHECK COMPONENT
(Fuel temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

Perform driving test and then perform self-diagnosis (Mode II) again.

N.G. →

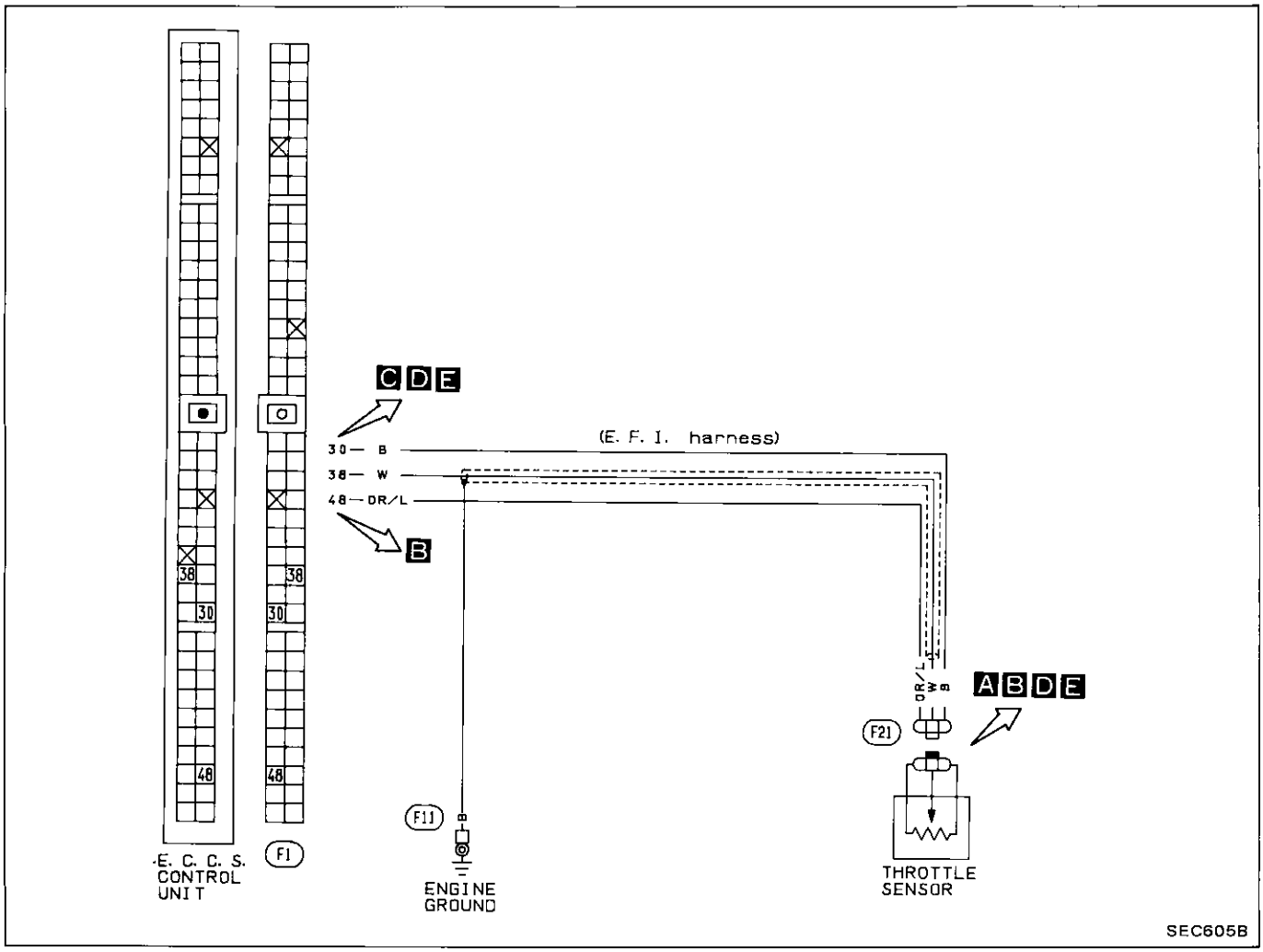
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

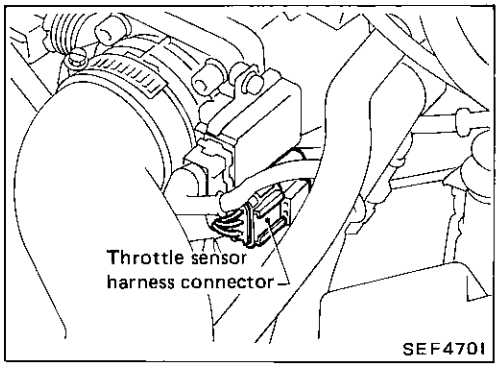
INSPECTION END

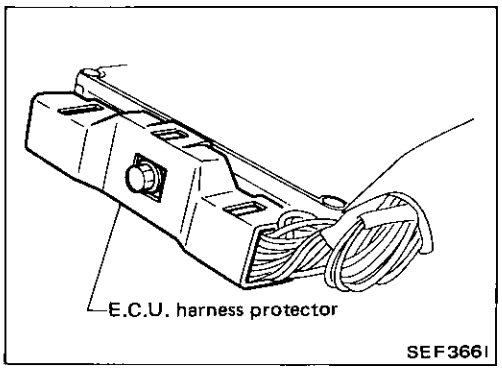
## Diagnostic Procedure 34

THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)

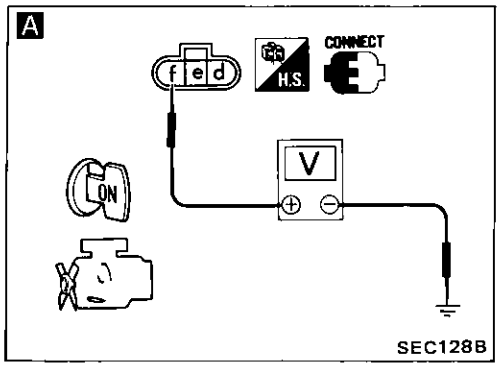


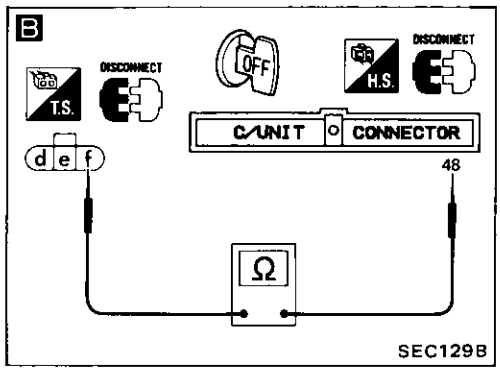

### Harness layout

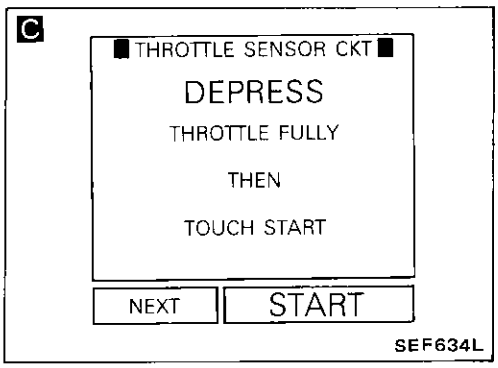


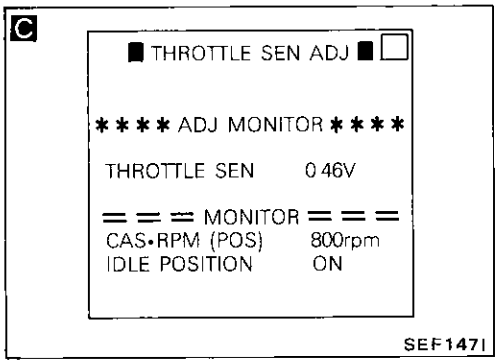



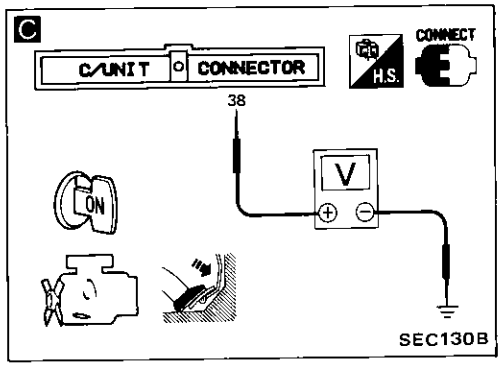
## Diagnostic Procedure 34 (Cont'd)




INSPECTION START

**A**

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓕ and ground.
**Voltage:**
**Approximately 5.0V**

N.G. → **B**

CHECK HARNESS CONTINUITY BETWEEN THROTTLE SENSOR AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect throttle sensor harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminal ㊽ and terminal ⓕ.
**Continuity should exist.**
If N.G., repair harness or connectors.

O.K.

**C**

CHECK INPUT SIGNAL.
Perform "THROTTLE SENSOR CKT" in "FUNCTION TEST" mode with CONSULT

OR

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

Make sure that voltage between E.C.U. terminal ㊳ and ground changes when accelerator pedal is depressed.
**Voltage:**
**Throttle valve fully closed:**
**0.4 - 0.5V**
**Throttle valve fully open:**
**Approx. 4.0V**

N.G. → ADJUST THROTTLE SENSOR INITIAL POSITION.
(See page EF & EC-184.)

**D**

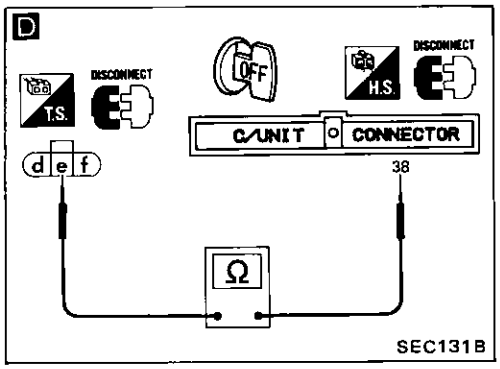
CHECK HARNESS CONTINUITY BETWEEN THROTTLE SENSOR AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect throttle sensor harness connector.
3) Disconnect E.C.U.harness connector.
4) Check harness continuity between E.C.U. terminal ㊳ and terminal ⓔ.
**Continuity should exist.**
If N.G., repair harness or connectors.

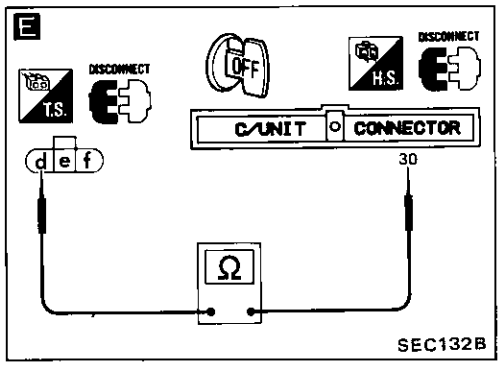
O.K.

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

O.K.

## Diagnostic Procedure 34 (Cont'd)




E

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect throttle sensor harness connector.
4) Check resistance between E.C.U. terminal ㉚ and terminal ⓓ.
**Continuity should exist.**

N.G. → 1) Check harness continuity between throttle sensor and ground.
2) E.C.U. ground circuit.

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

Perform driving test and then perform self-diagnosis (Mode II) again.

N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

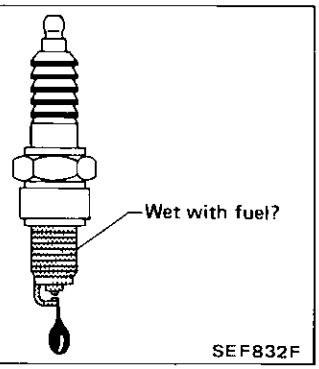
O.K. ↓

INSPECTION END

## Diagnostic Procedure 35

**INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY**

A




SEF832F

B **ROAD TEST**

**Test condition**

**Drive vehicle under the following conditions with a suitable shift position.**

**(1) Engine speed: 2,200±200rpm**

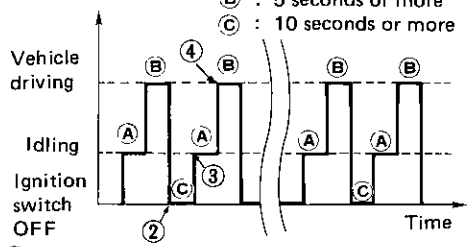
**(2) Intake manifold vacuum:**

**−38.7±9.3 kPa**

**(−290±70 mmHg, −11.42±2.76 inHg)**

**Driving mode**

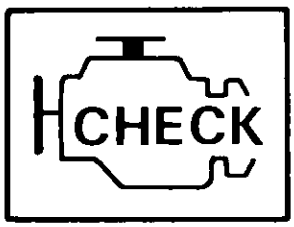
Ⓐ : 40 seconds or more
Ⓑ : 5 seconds or more
Ⓒ : 10 seconds or more




① Start engine and warm it up sufficiently.
② Turn ignition switch OFF and wait for at least 10 seconds.
③ Start engine and keep it at idle speed for at least 40 seconds.
④ Shift to a suitable gear position and drive in "Test condition" for at least 5 seconds.
⑤ Repeat steps ② through ④ at least 5 times.

SEF583I

C




CHECK ENGINE LIGHT

SEF924F

INSPECTION START

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warm-up.

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

Does not run smoothly → Set the diagnosis mode selector of E.C.U. to Mode II.

**These inspections should be performed on both exhaust gas sensors by changing monitor from left side to right side. (Refer to EF & EC-54.)**
Check if the red L.E.D. on E.C.U. stays off during 10 seconds at 1,000 rpm under no-load.

Stays off

Does not stay off → Check mixture ratio feedback system. (See page EF & EC-37.)

**These inspections should be performed on both exhaust gas sensors by changing monitor from left side to right side. (Refer to EF & EC-54.)**
Set diagnosis to Mode II and check that red L.E.D. on E.C.U. blinks at 2,000 rpm under no-load.

Does not blink → Check idle CO%. (See page EF & EC-37.)

Blinks

INSPECTION END

A

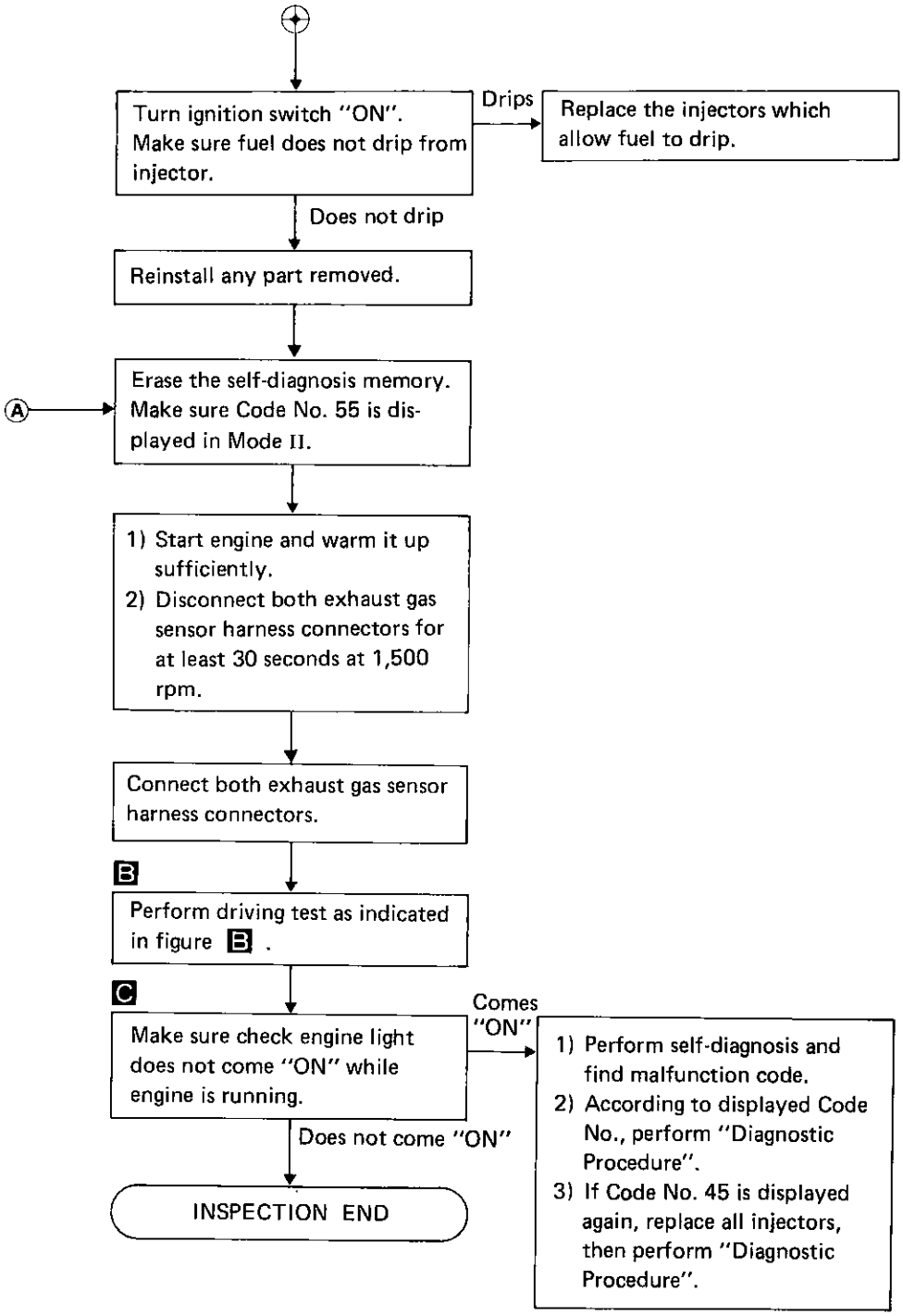
Remove all spark plugs from intake manifold. Are plugs wet with fuel?

Yes → Replace the injector in which cylinder spark plug is wet with fuel.

No → Remove injector assembly. (See page EF & EC-189.) Keep fuel hose and all injectors connected to injector gallery.

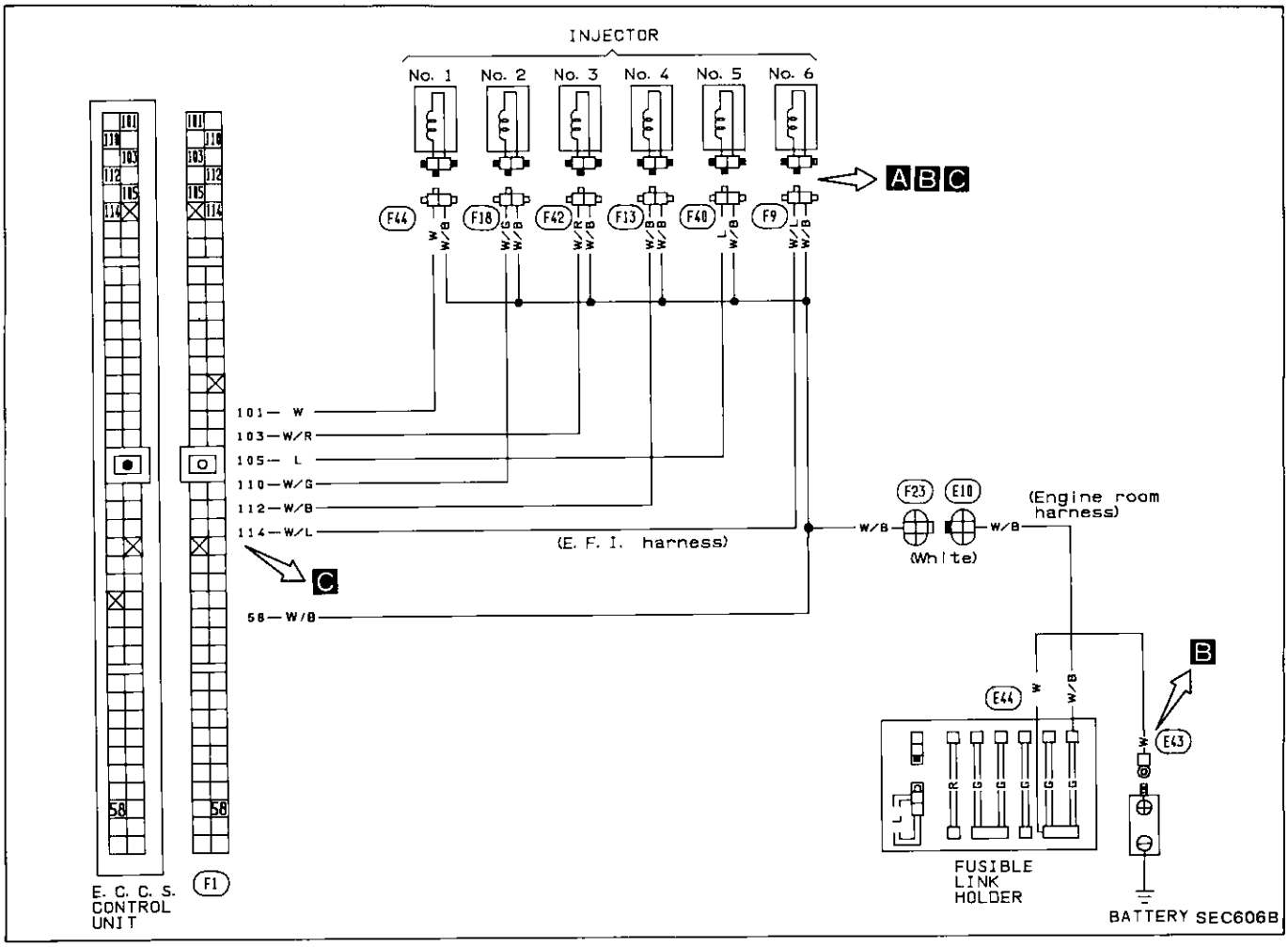
(Go to Ⓐ on next page.)

## Diagnostic Procedure 35 (Cont'd)

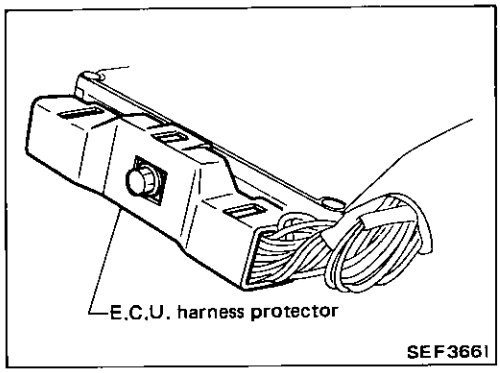


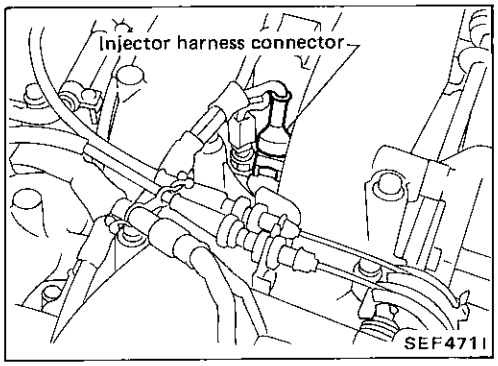
## Diagnostic Procedure 36

**INJECTOR CIRCUIT (Code No. 51) (CHECK ENGINE LIGHT ITEM): For California model**
**(Not self-diagnostic item): For Non-California model**

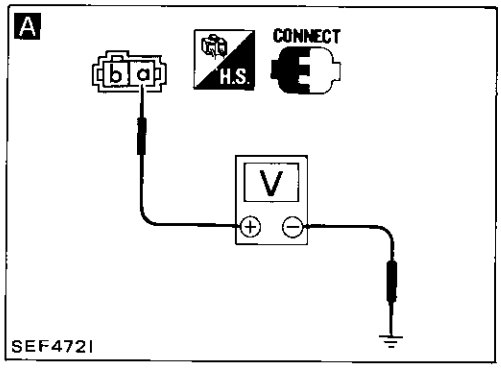


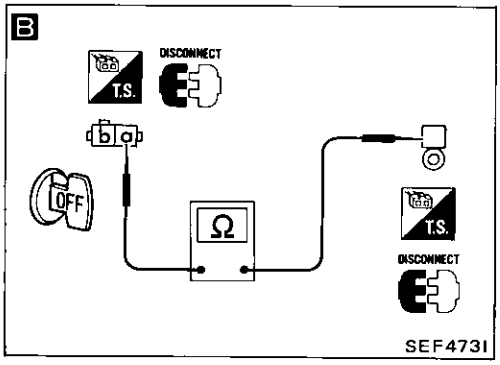

**Harness layout**

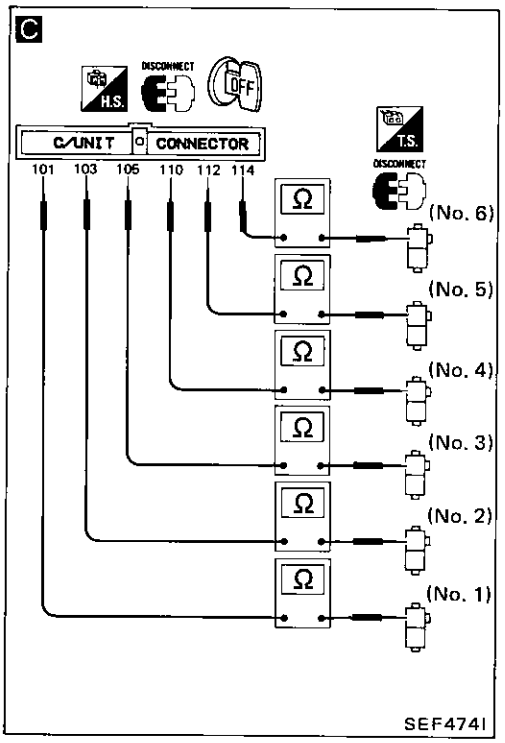


## Diagnostic Procedure 36 (Cont'd)




INSPECTION START

**A**

CHECK POWER SUPPLY.
Check voltage between terminal ⓐ and ground.
**Voltage: Battery voltage**

N.G. → **B**

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND BATTERY.
1) Turn ignition switch "OFF".
2) Disconnect injector harness connector.
3) Disconnect battery ⊕ terminal.
4) Check harness continuity between terminal ⓐ and battery ⊕ terminal.
**Continuity should exist.**
5) Check "G" fusible link.
If N.G., replace harness, connector or fusible link.

O.K. ↓

**C**

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND E.C.U.
1) Disconnect battery ⊕ terminal.
2) Disconnect injector harness connectors and E.C.U. harness connector.
3) Check harness continuity, following figure **C** .
**Continuity should exist.**

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

N.G. → Repair or replace injector.

O.K. ↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory.

↓

Perform driving test and then perform self-diagnosis (Mode II) again.

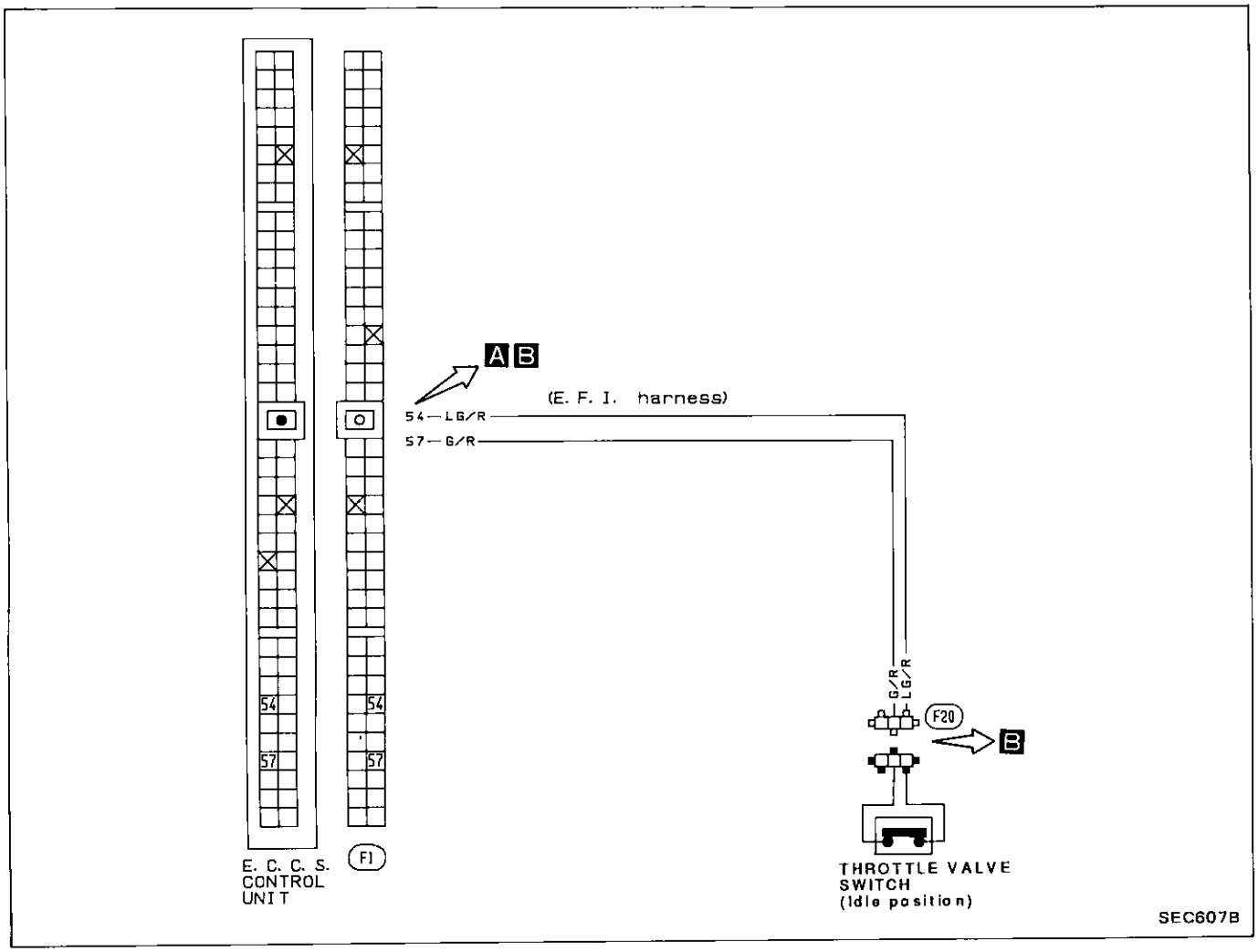
N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

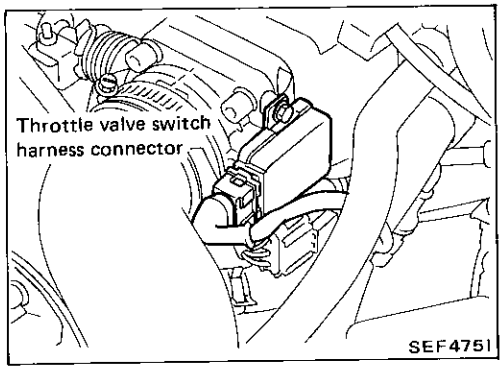
INSPECTION END

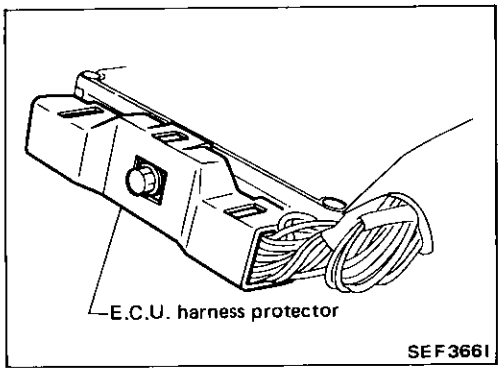
## Diagnostic Procedure 37

THROTTLE VALVE SWITCH (Idle position) (Not self-diagnostic item)

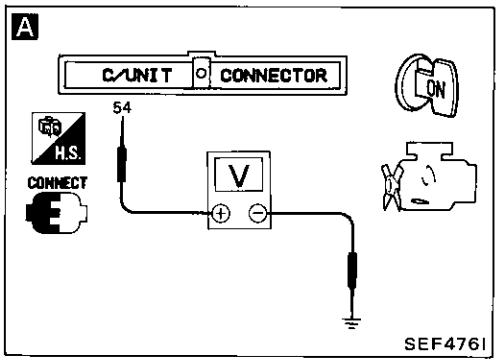


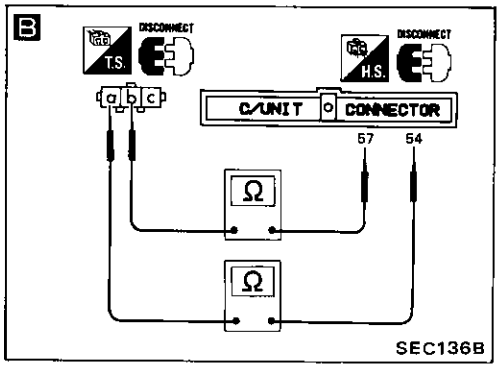

### Harness layout



## Diagnostic Procedure 37 (Cont'd)




INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ⑤④ and ground.
**Voltage:**
**Throttle valve fully closed:**
**9.0 - 10.0V**
**Throttle valve fully open:**
**0V**

N.G.

B

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND THROTTLE VALVE SWITCH.
1) Turn ignition switch "OFF".
2) Disconnect throttle valve switch harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminals ⑤④, ⑤⑦ and terminals ⓐ, ⓑ.
**Continuity should exist.**
If N.G., repair harness or connectors.

O.K.

Check if throttle valve switch (throttle sensor body) is installed in proper position.
(See page EF & EC-184.)

O.K.

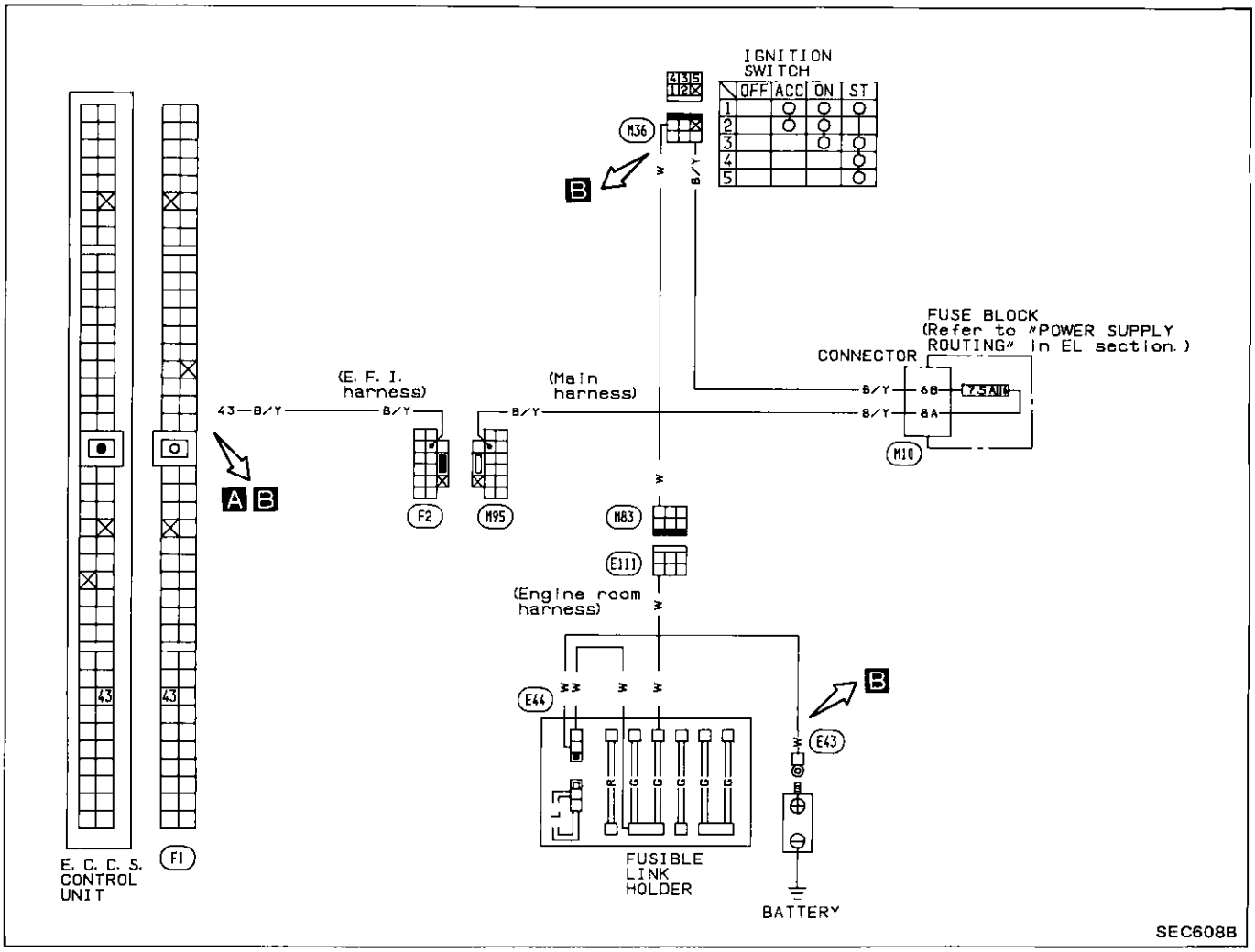
CHECK COMPONENT (throttle valve switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

O.K.

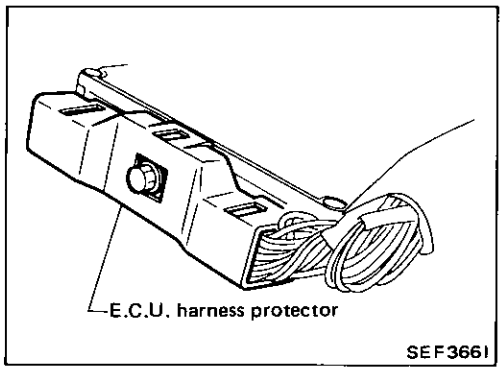
INSPECTION END

## Diagnostic Procedure 38

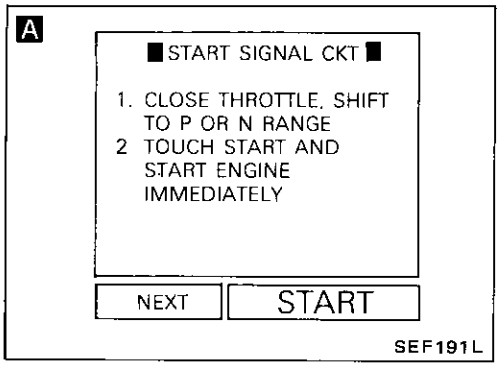
**START SIGNAL (Not self-diagnosfic item)**

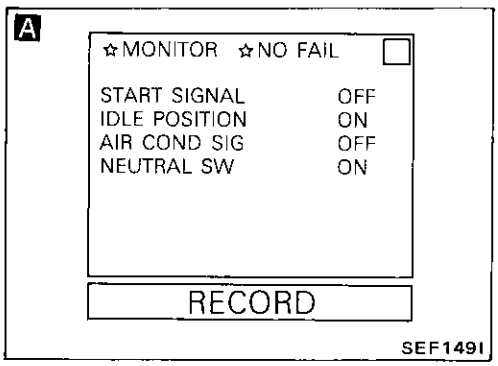


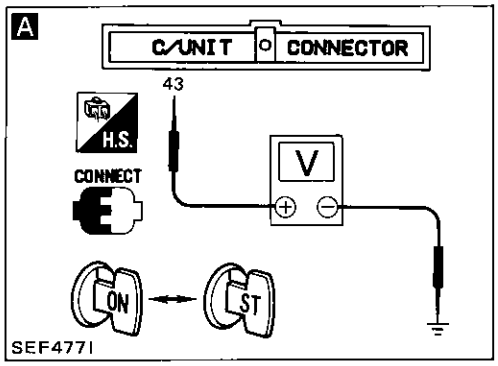

**Harness layout**

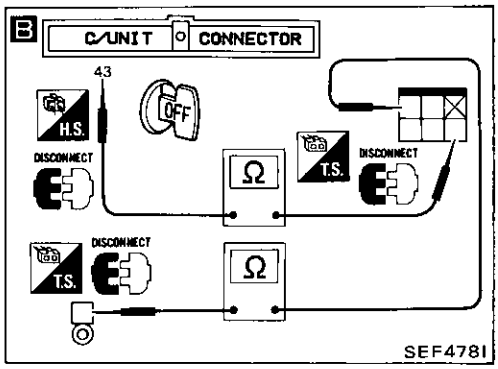


## Diagnostic Procedure 38 (Cont'd)




INSPECTION START

**A**

CHECK OVERALL FUNCTION.

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

OR

1) Turn ignition switch "ON".
2) Check start signal in "DATA MONITOR" mode with CONSULT.

| | |
|---|---|
| IGN "ON" | OFF |
| IGN "START" | ON |

OR

2) Check voltage between E.C.U. terminal ㊸ and ground.
**When cranking:**
**Battery voltage**
**Except above:**
**0V**

N.G. → **B**

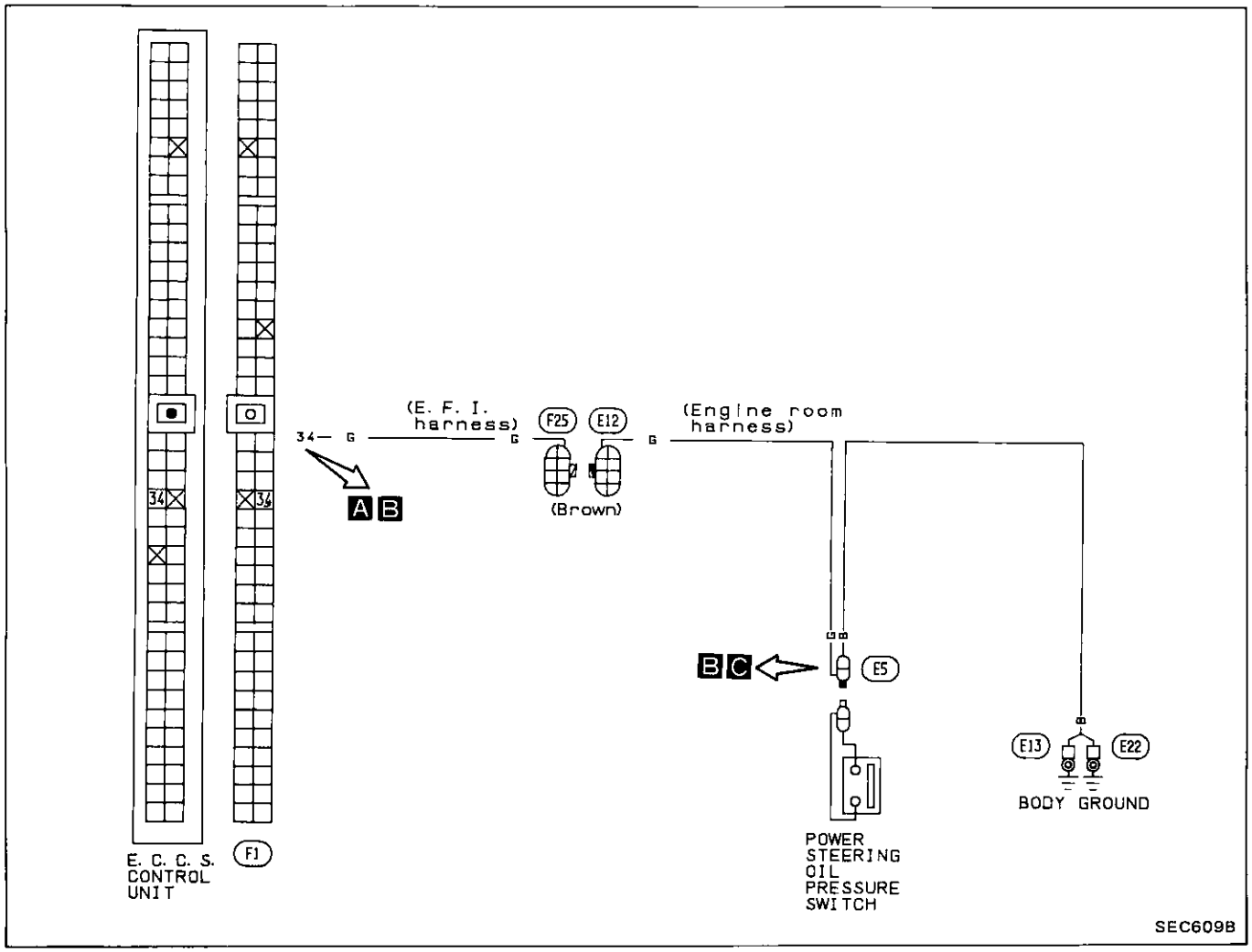
Check the following items.
1) "G" fusible link
2) "7.5A" fuse
3) Ignition switch
4) Harness continuity between E.C.U. and ignition switch
**Continuity should exist.**
5) Harness continuity between battery ⊕ terminal and ignition switch
**Continuity should exist.**

O.K.

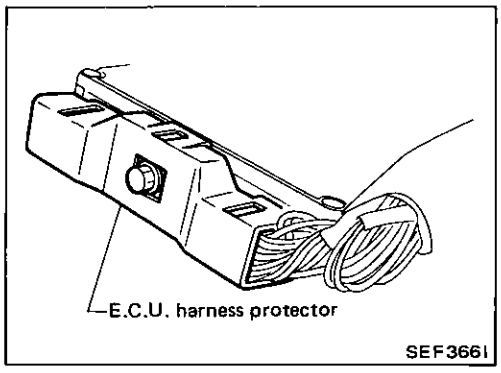
INSPECTION END

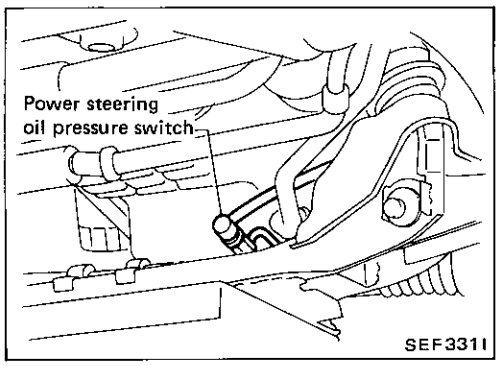
## Diagnostic Procedure 39

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

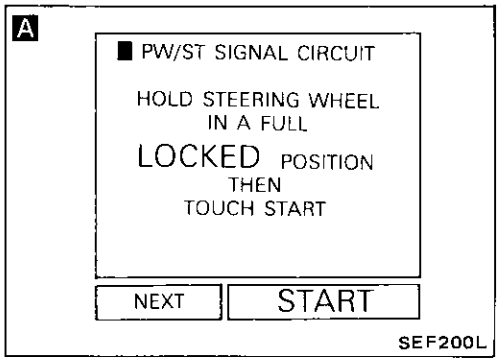


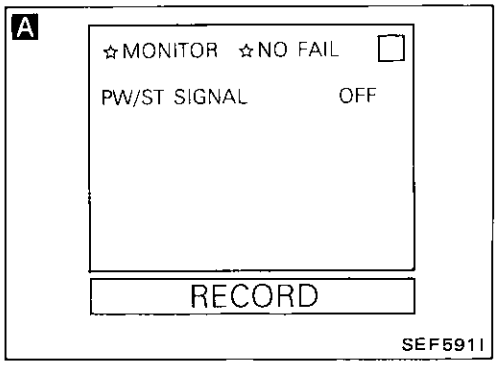

**Harness layout**

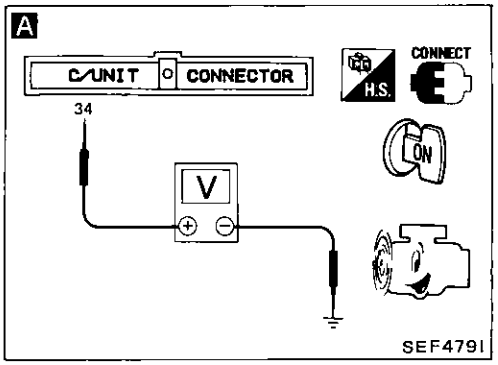


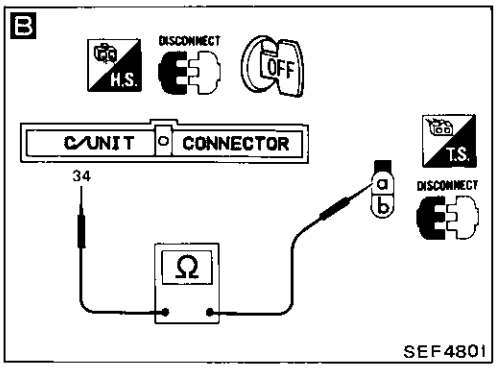



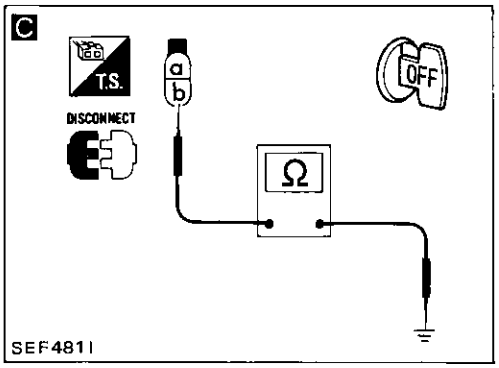
## Diagnostic Procedure 39 (Cont'd)




INSPECTION START

**A**

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

— OR —

1) Start engine.
2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.

**Steering is neutral: OFF**
**Steering is turned: ON**

— OR —

1) Start engine.
2) Check voltage between E.C.U. terminal ㉞ and ground with CONSULT or tester.

**Voltage:**
**Steering is neutral:**
**Approx. 8 - 9V**
**Steering is turned:**
**Approx. 0V**

O.K. → INSPECTION END

N.G.

**B**

CHECK HARNESS CONTINUITY BETWEEN POWER STEERING OIL PRESSURE SWITCH AND E.C.U.

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and power steering oil pressure switch harness connector.
3) Check harness continuity between E.C.U. terminal ㉞ and ⓐ.

**Continuity should exist.**

N.G. → Repair or replace harness or connectors.

O.K.

**C**

CHECK GROUND CIRCUIT

Check harness continuity between terminal ⓑ and ground

**Continuity should exist.**

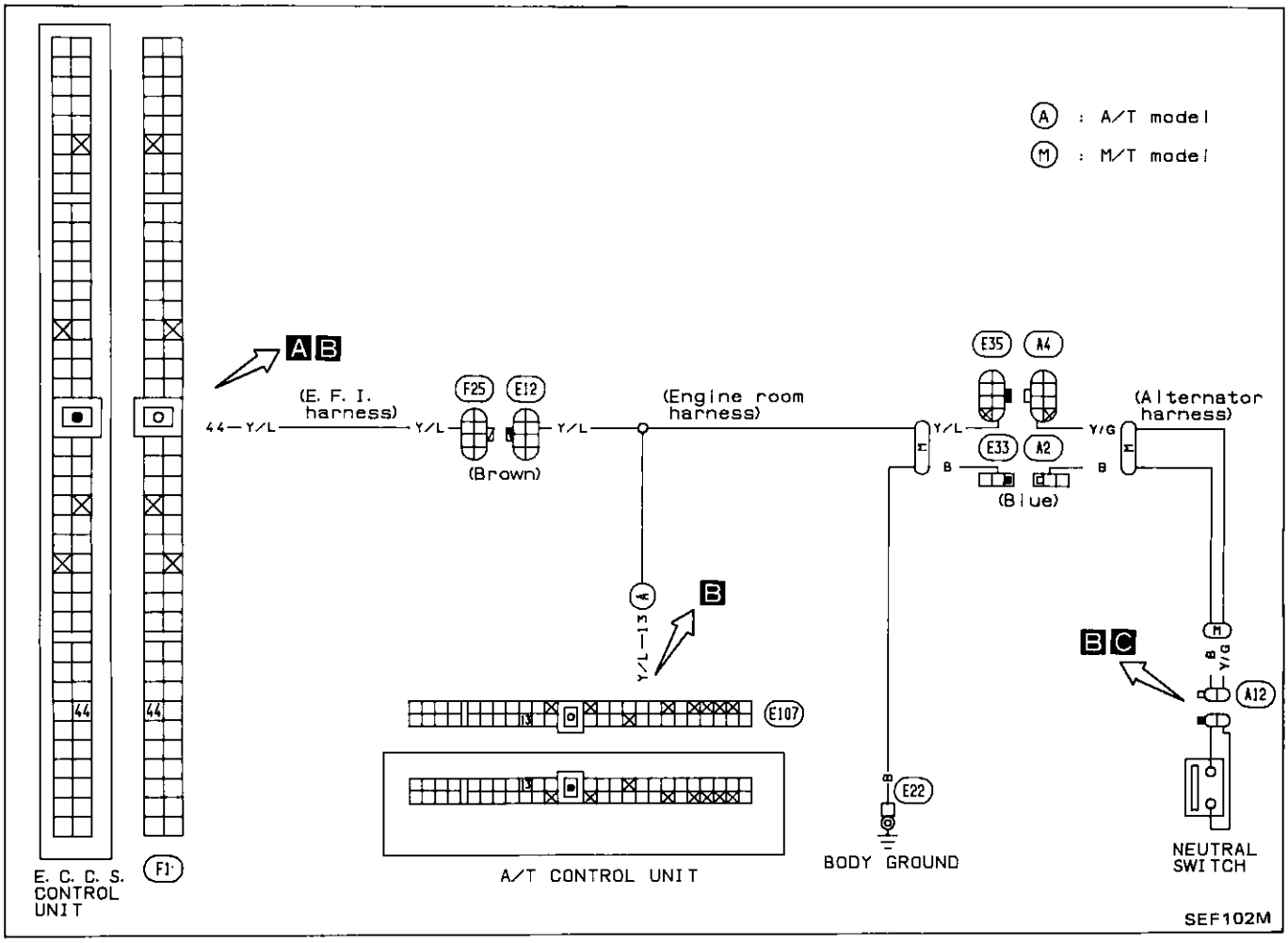
N.G. → CHECK COMPONENT.
(Power steering oil pressure switch)
Refer to "Electrical Components Inspection". (See page EF & EC-187.)

O.K.

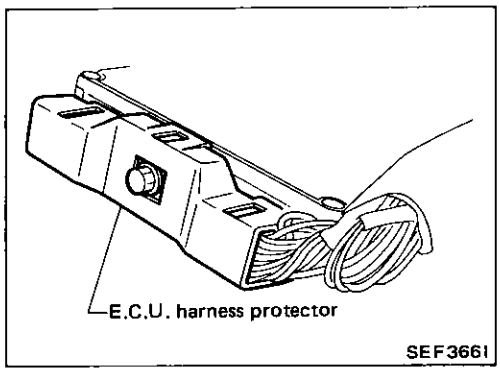
## Diagnostic Procedure 40

NEUTRAL SWITCH & A/T CONTROL UNIT (NEUTRAL SIGNAL) CIRCUIT

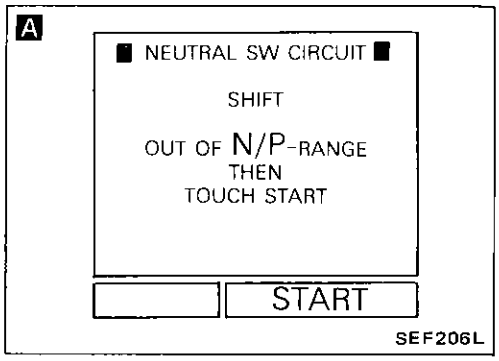
(Not self-diagnostic item)

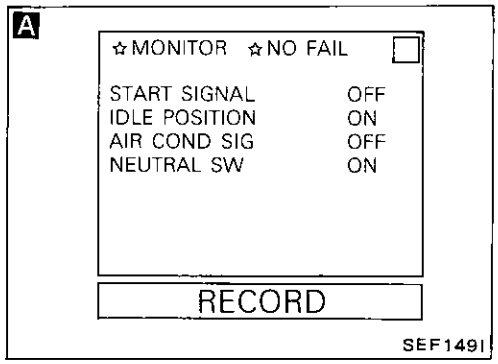


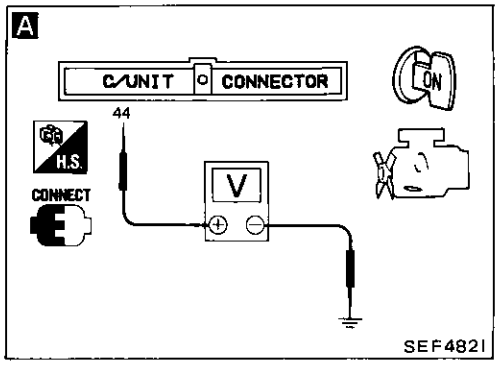

Harness layout

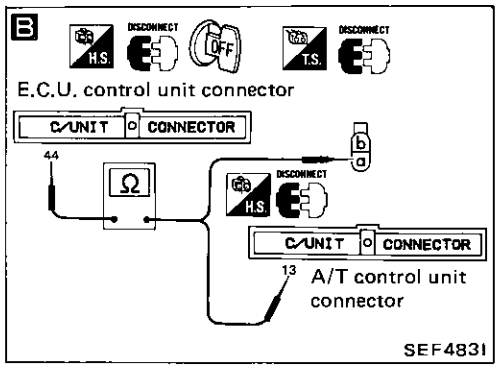


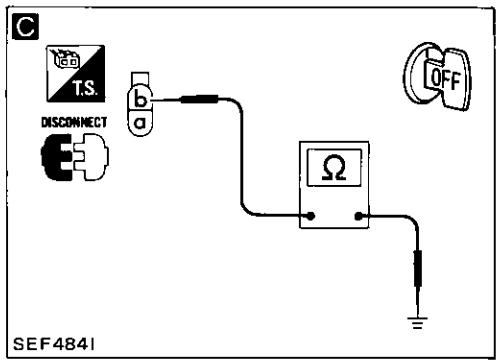
## Diagnostic Procedure 40 (Cont'd)




INSPECTION START

**A**

CHECK OVERALL FUNCTION.

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

O.K. → INSPECTION END

OR

1) Turn ignition switch "ON".
2) Perform "NEUTRAL SW" in "DATA MONITOR" mode with CONSULT.
**"N" or "P": ON**
**Except above: OFF**

OR

2) Check voltage between E.C.U. terminal ㊹ and ground.
**"N" or "P": Approx. 0V**
**Except above: 8 - 9V**

N.G.

**B**

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND NEUTRAL SWITCH (A/T CONTROL UNIT)

1) Turn the ignition switch "OFF".
2) Disconnect E.C.U. harness connector and neutral switch harness connector (A/T control unit harness connector.)
3) Check harness continuity between E.C.U. terminal ㊹ and ⓐ (⑬).
**Continuity should exist.**

N.G. → Repair or replace harness or connectors.

O.K.

**C**

CHECK GROUND CIRCUIT (M/T only)

Check harness continuity between terminal ⓑ and ground.
**Continuity should exist.**

N.G.

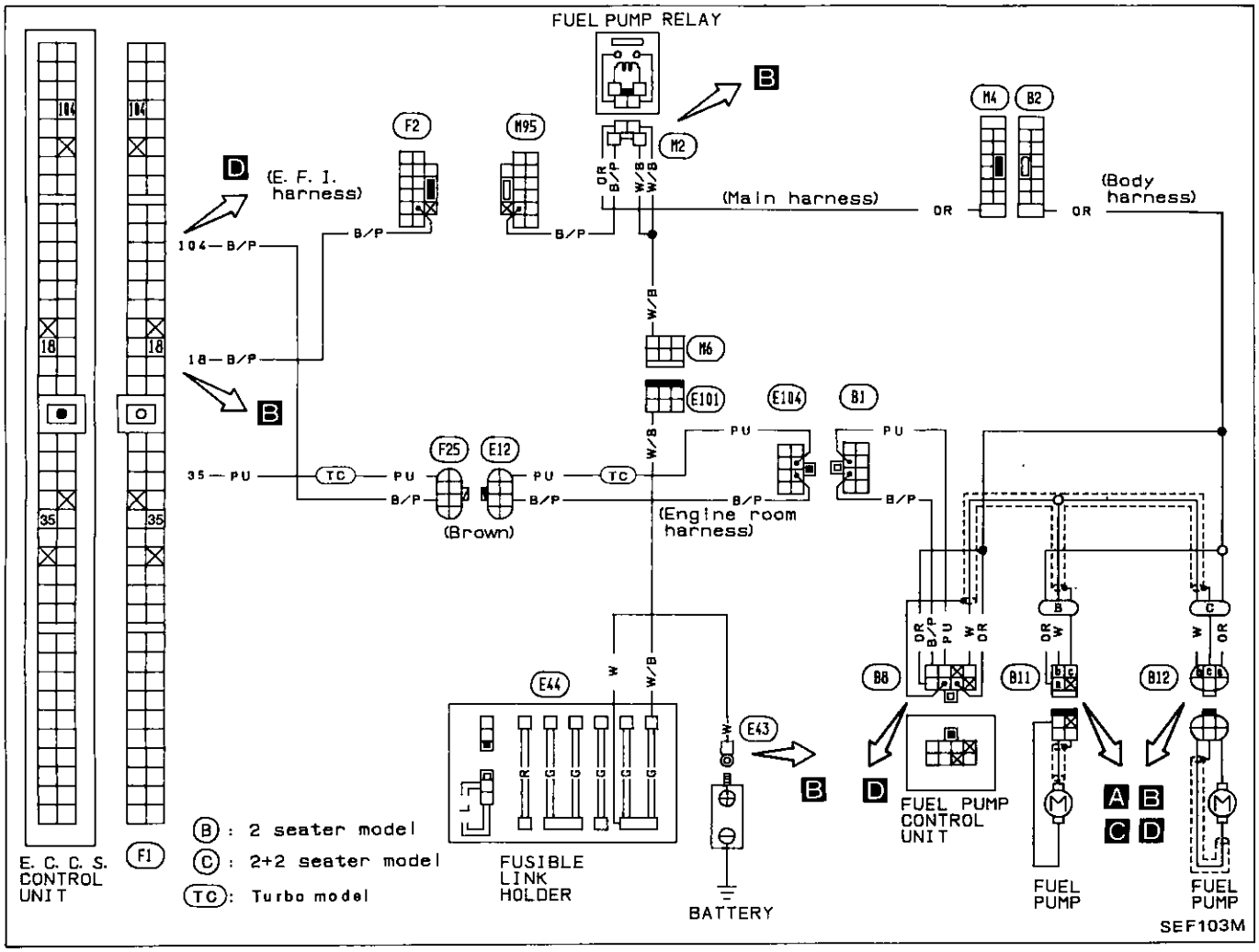
O.K.

CHECK COMPONENT.

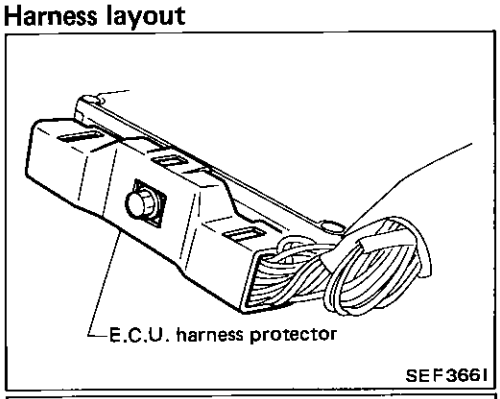
- (Neutral switch)
  Refer to "Electrical Components Inspection".
  (See page EF & EC-186.)
- (A/T control unit)
  See A/T section.
- (Inhibitor switch)
  Refer to "Electrical Components Inspection"
  (See page EF & EC-187.)

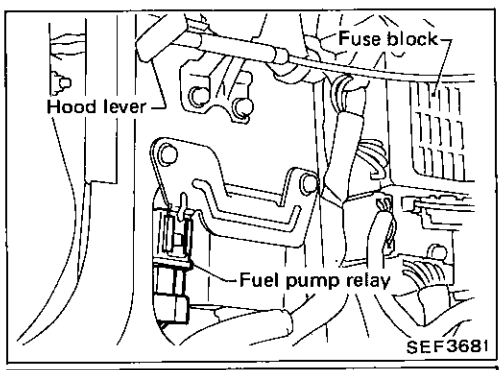
## Diagnostic Procedure 41

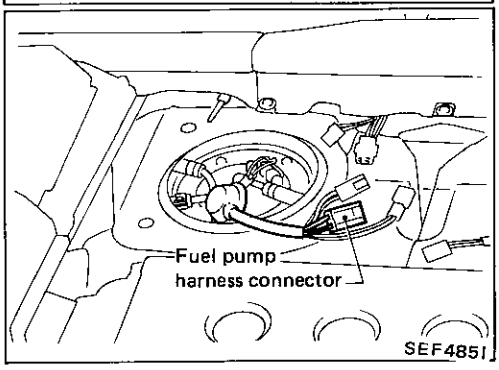
### FUEL PUMP (Not self-diagnostic item)

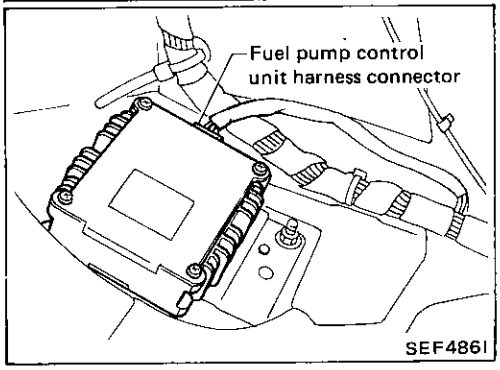



### Harness layout



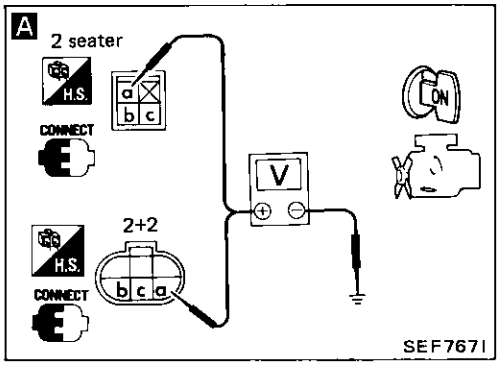



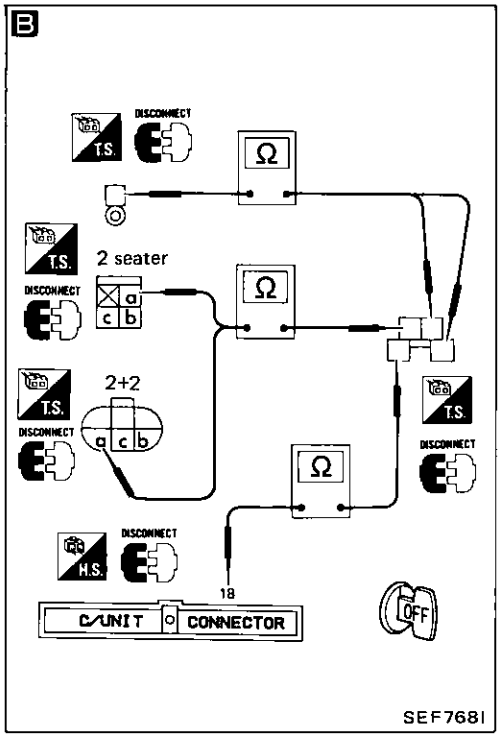



## Diagnostic Procedure 41 (Cont'd)

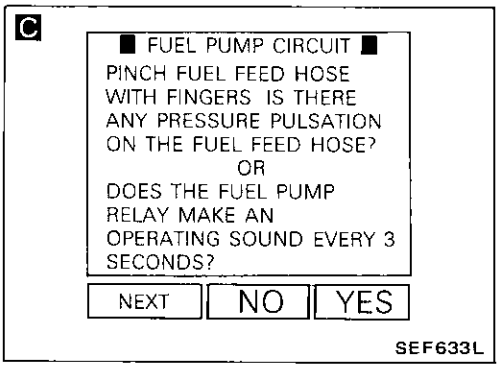
A



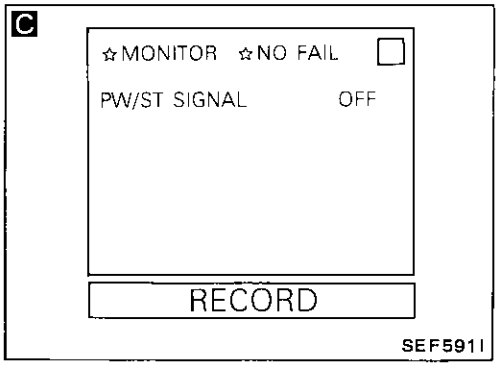

B




C




C




INSPECTION START

**A**

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between fuel pump connector terminal ⓐ and ground.
**Battery voltage indication should appear for 1 second after turning ignition switch "ON".**

N.G. →

**B**

Check the following items.
1) "G" fusible link
2) Harness continuity between
- battery ⊕ terminal and fuel pump relay
- fuel pump relay and fuel pump
- fuel pump relay and E.C.U. terminal ⑱

**Continuity should exist.**

O.K. ↓

**C**

CHECK COMPONENT.
(Fuel pump relay).

Perform "FUEL PUMP CIRCUIT" in "FUNCTION-TEST" mode with CONSULT.

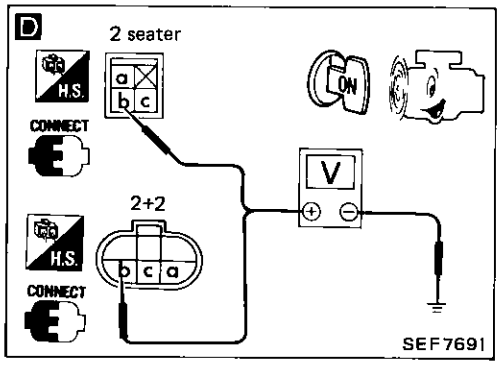
— OR —

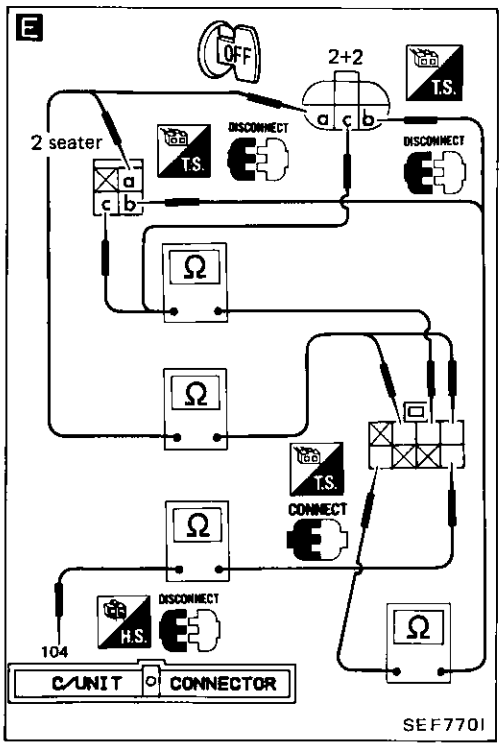
Perform "FUEL PUMP RELAY TEST" in "ACTIVE TEST" mode with CONSULT.

— OR —

Refer to "Electrical Components Inspection". (See page EF & EC-187.)

## Diagnostic Procedure 41 (Cont'd)




D

CHECK GROUND CIRCUIT.
Check voltage betweeen fuel pump terminal ⓑ and ground under the following conditions.

| | |
|---|---|
| Idling | Approx. 3 - 6V |
| For 30 seconds after starting engine | Battery voltage |

N.G. → E

Check the following items.
Harness continuity between
- fuel pump and fuel pump control unit
- fuel pump control unit and E.C.U. terminal (104)

**Continuity should exist.**

O.K. ↓

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

N.G. ↓

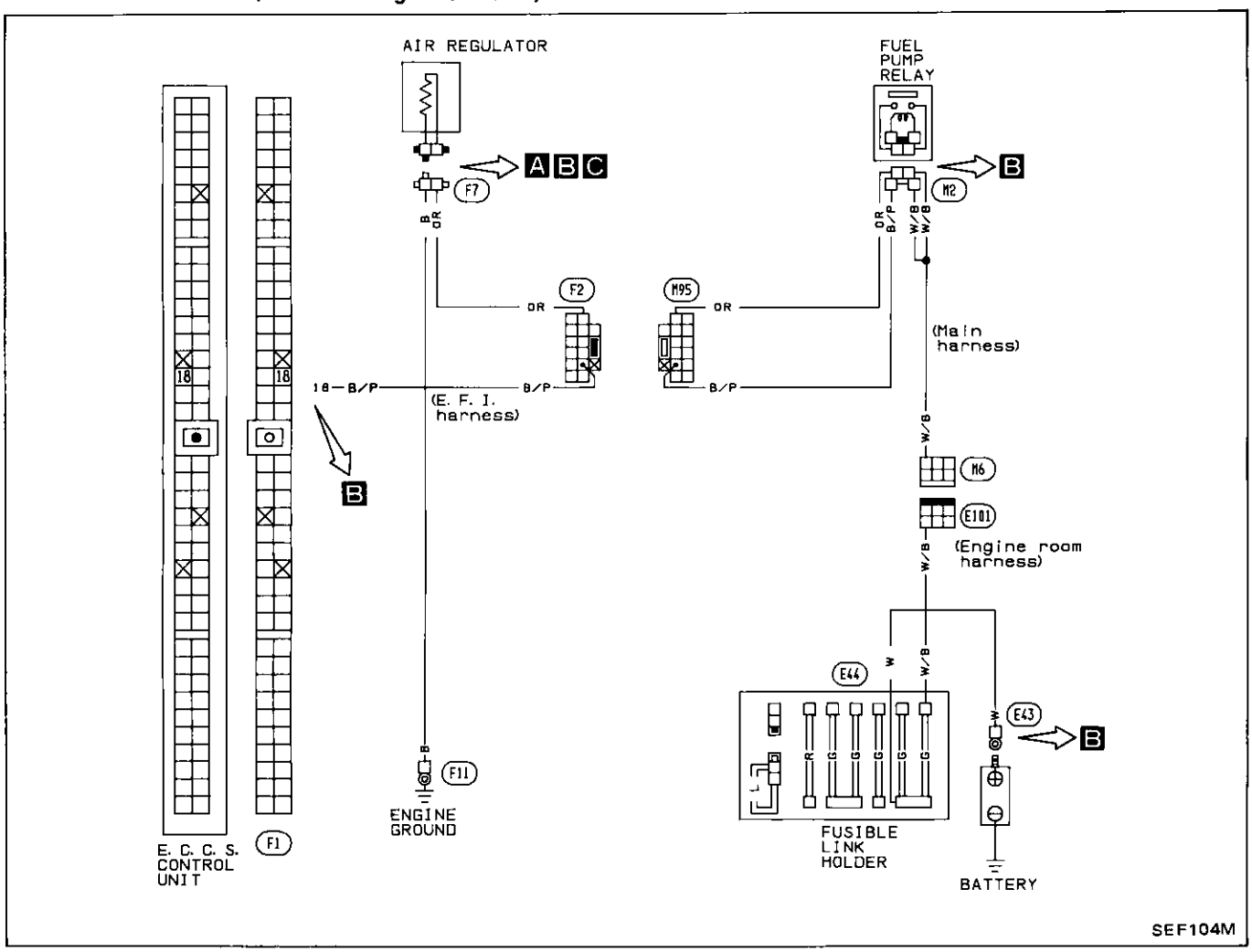
Replace fuel pump control unit.

O.K. ↓

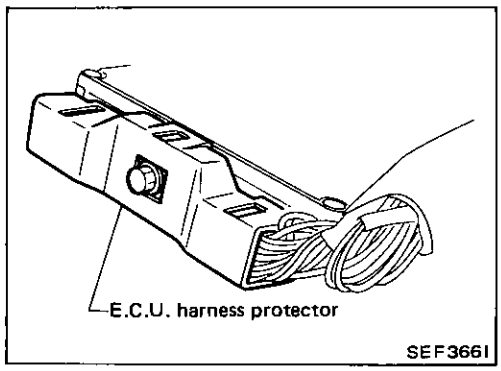
INSPECTION END

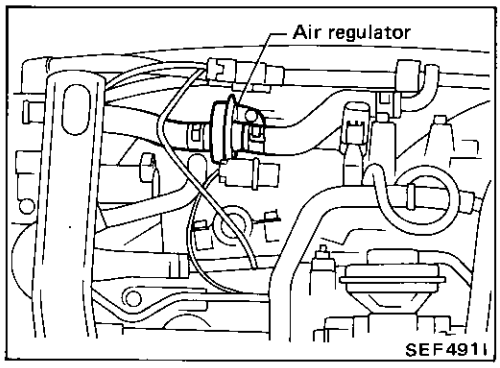
## Diagnostic Procedure 42

### AIR REGULATOR (Not self-diagnostic item)

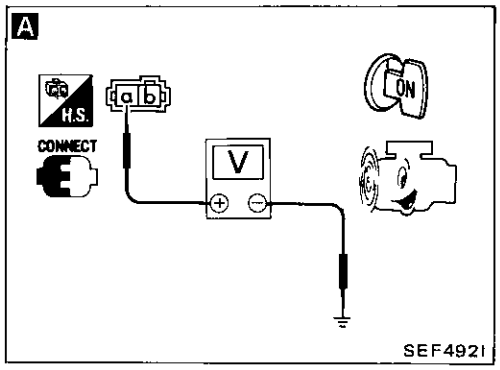


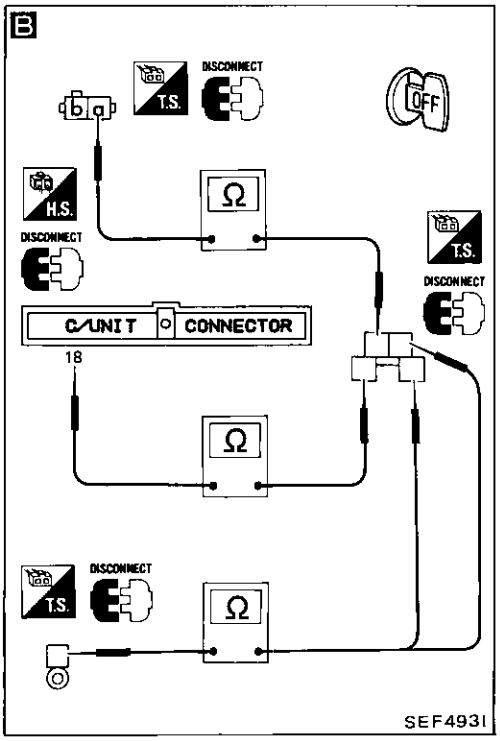

### Harness layout

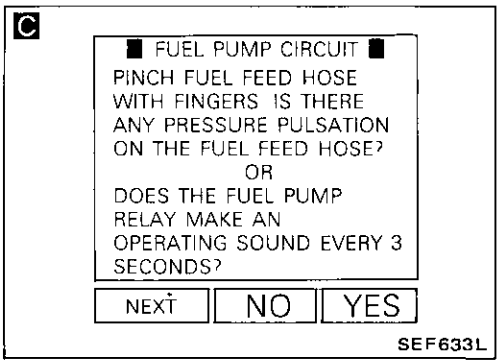


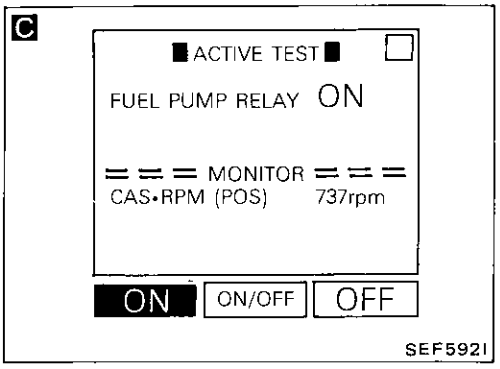



## Diagnostic Procedure 42 (Cont'd)




INSPECTION START

**A**

CHECK POWER SUPPLY.
1) Start engine.
2) Check voltage between air regulator terminal ⓐ and ground.
**Voltage: Battery voltage**

N.G. → **B**

Check the following items.
1) Harness continuity between
- air regulator and fuel pump relay
- fuel pump relay and battery ⊕ terminal
- fuel pump relay and E.C.U. terminal ⑱

**Continuity should exist.**
2) "G" fusible link

O.K. ↓

**C**

CHECK COMPONENT.
Perform "FUEL PUMP CIRCUIT" in "FUNCTION-TEST" mode with CONSULT.

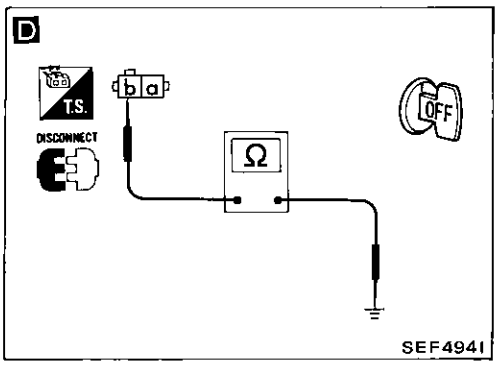
—OR—

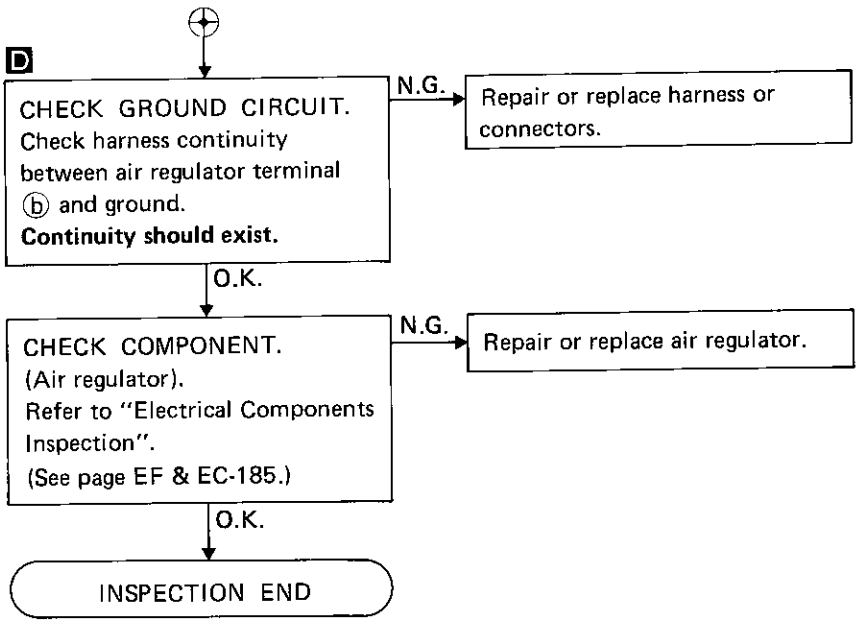
(Fuel pump relay).
Perform "FUEL PUMP RELAY TEST" in "ACTIVE TEST" mode with CONSULT.

—OR—

Refer to "Electrical Components Inspection". (See page EF & EC-187.)

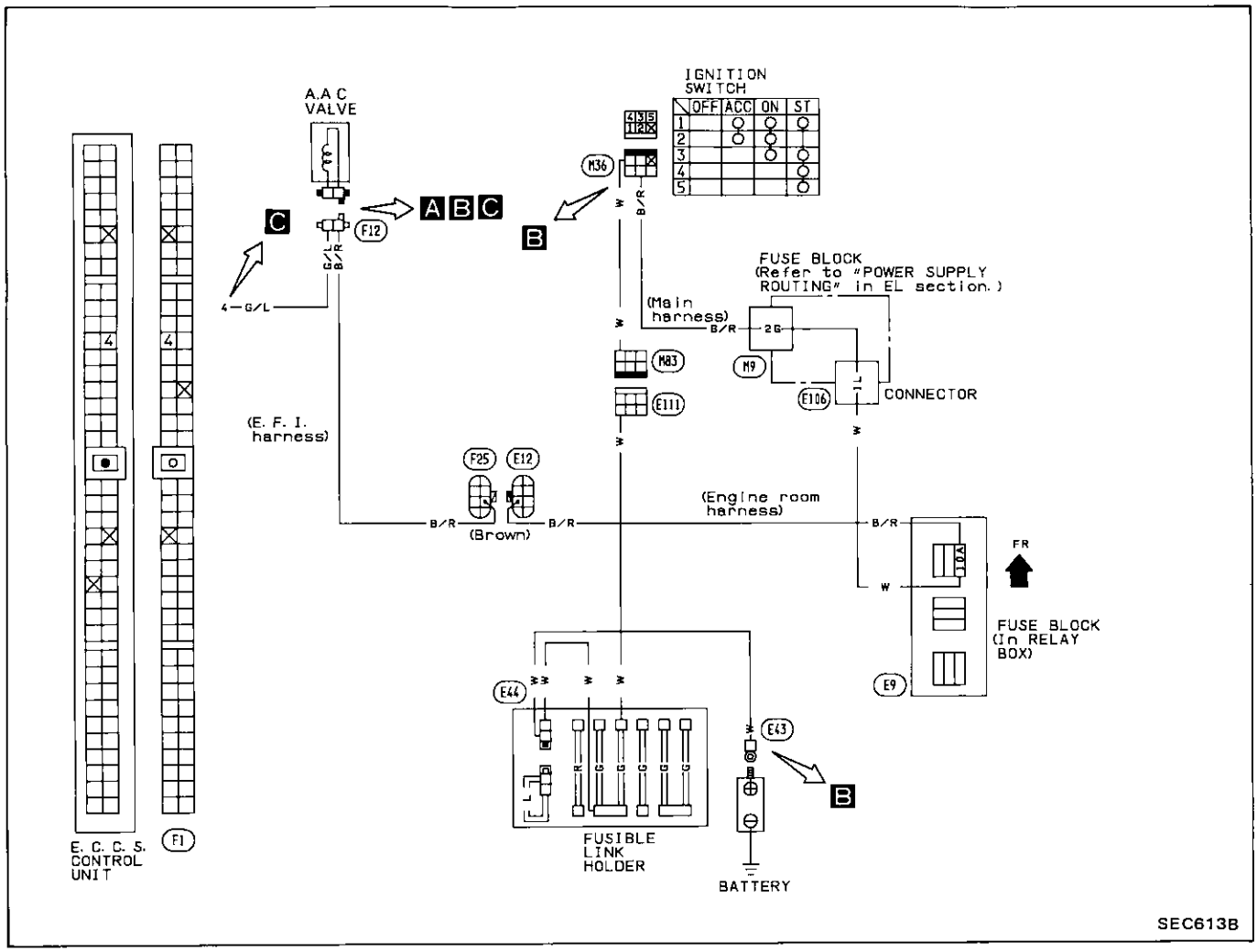
## Diagnostic Procedure 42 (Cont'd)



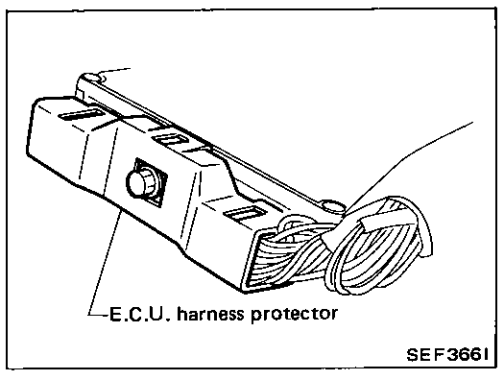



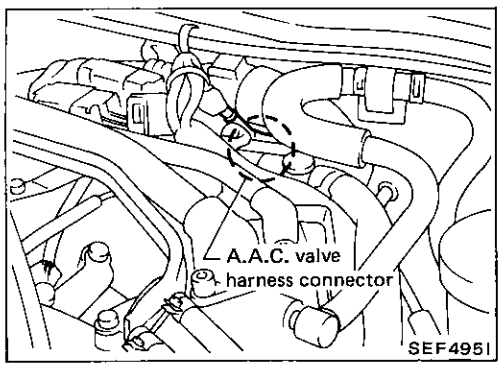
## Diagnostic Procedure 43

### A.A.C. VALVE (Not self-diagnostic item)

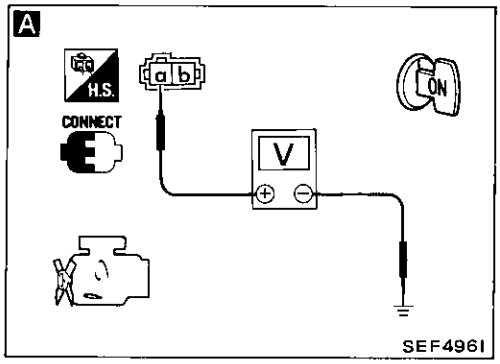


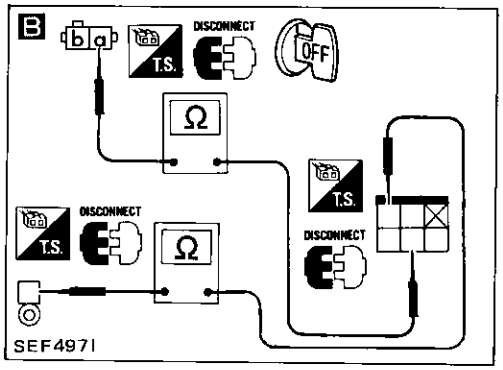

### Harness layout

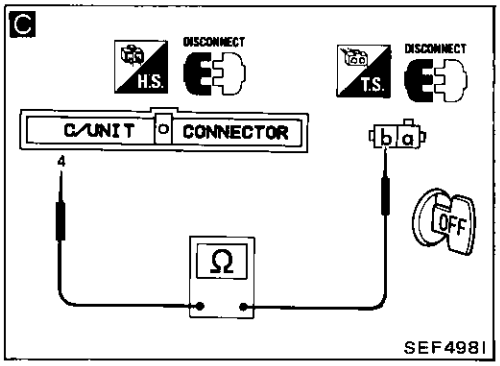


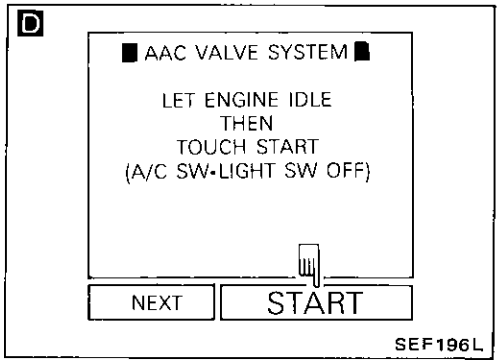



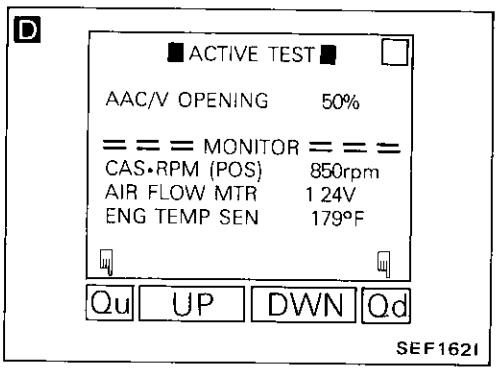
## Diagnostic Procedure 43 (Cont'd)




INSPECTION START

**A**

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between A.A.C. valve terminal ⓐ and ground.
**Voltage: Battery voltage.**

N.G. → **B**

Check the following items.
1) "G" fusible link
2) Ignition switch
3) "10A" fuses
4) Harness continuity between terminals:
- A.A.C. valve and ignition switch
- Ignition switch and battery ⊕ terminal.

O.K. ↓

**C**

CHECK HARNESS CONTINUITY BETWEEN A.A.C. VALVE AND E.C.U.
Check harness continuity between A.A.C. valve terminal ⓑ and E.C.U. terminal ④.
**Continuity should exist.**

N.G. → Repair or replace harness or connectors.

O.K. ↓

**D**

CHECK COMPONENT

1) Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

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

OR

3) Disconnect A.A.C. valve harness connector.
4) Make sure that idle speed drops.

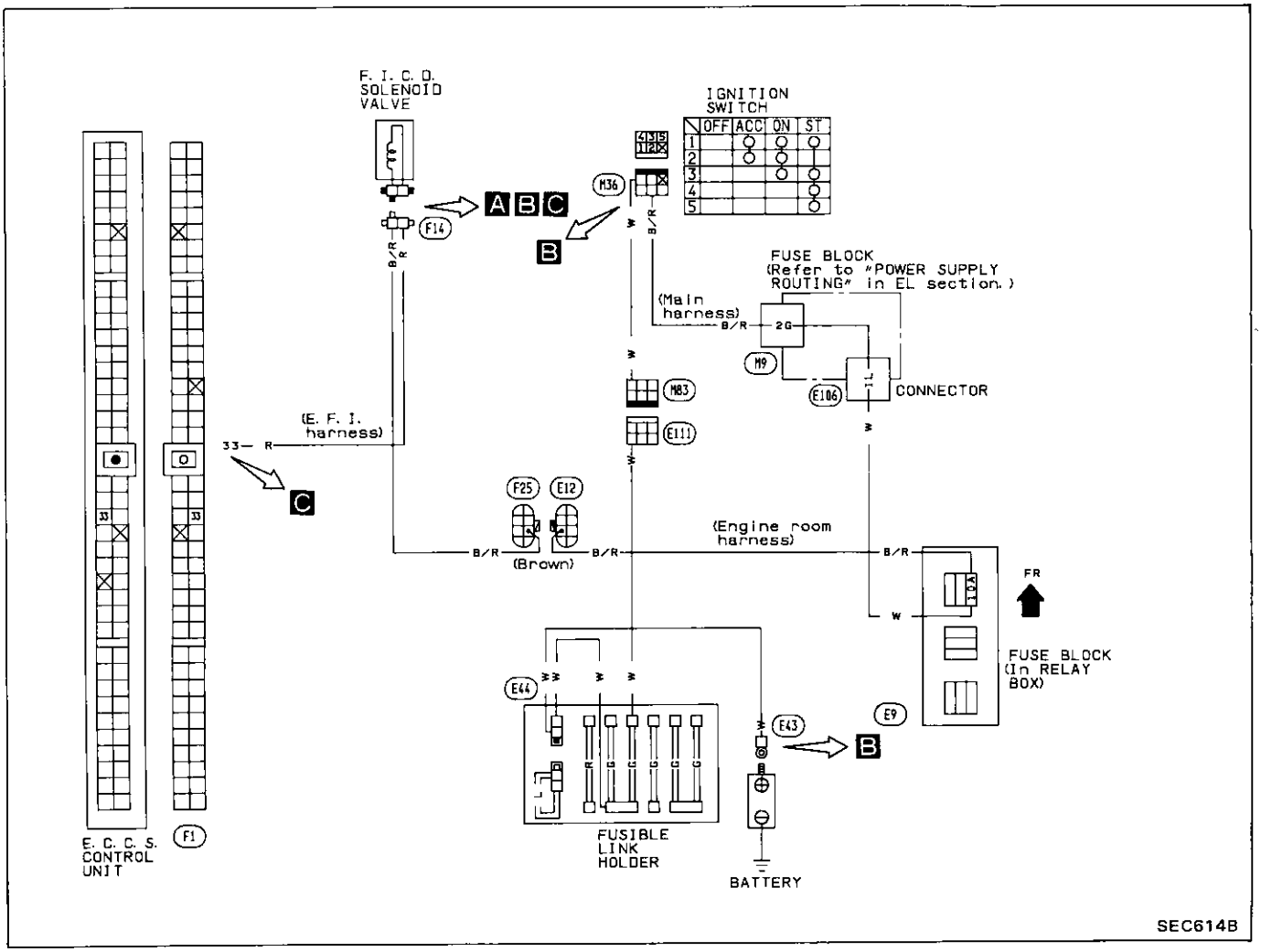
N.G. → Repair or replace A.A.C. valve.

O.K. ↓

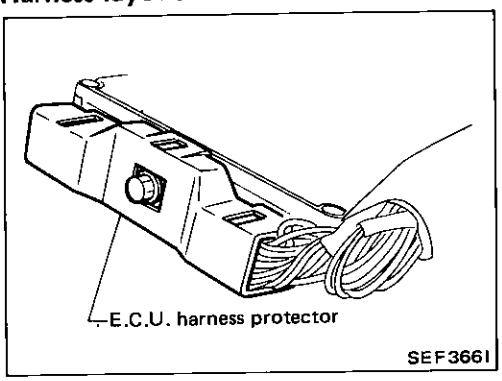
INSPECTION END

## Diagnostic Procedure 44

F.I.C.D. SOLENOID VALVE

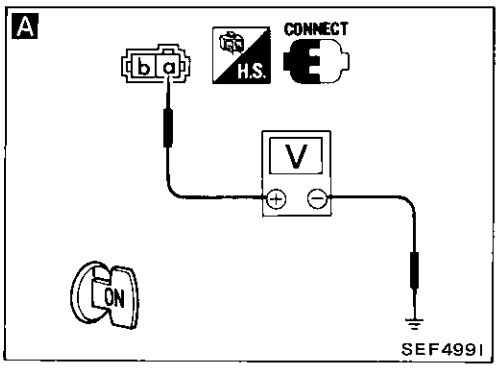


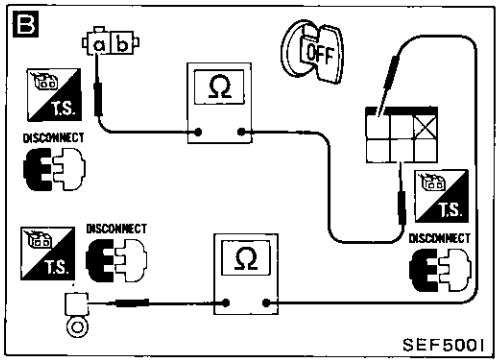

**Harness layout**

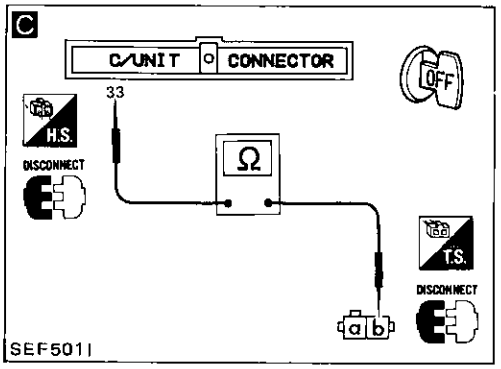


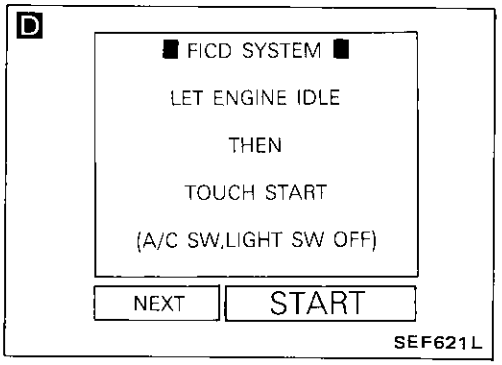

**F.I.C.D. solenoid valve harness connector is located near A.A.C. valve harness connector.**

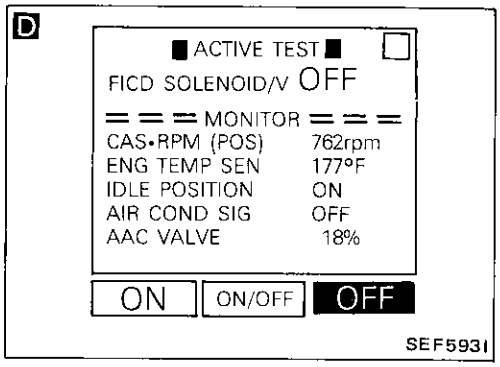
## Diagnostic Procedure 44 (Cont'd)




INSPECTION START

**A** CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between F.I.C.D. solenoid valve terminal ⓐ and ground.
**Voltage: Battery voltage.**

N.G. → **B** Check the following items.
1) "G" fusible link.
2) "10A" fuses.
3) Ignition switch.
4) Harness continuity between terminals:
- F.I.C.D. solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

**Continuity should exist.**

O.K. ↓

**C** CHECK HARNESS CONTINUITY BETWEEN F.I.C.D. SOLENOID VALVE AND E.C.U.
Check harness continuity between F.I.C.D. solenoid valve terminal ⓑ and E.C.U. terminal ㉝.
**Continuity should exist.**

N.G. → Repair or replace harness or connectors.

O.K. ↓

**D** CHECK COMPONENT.
(F.I.C.D. solenoid valve).
Perform "F.I.C.D. SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

Perform "F.I.C.D. SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-185.)

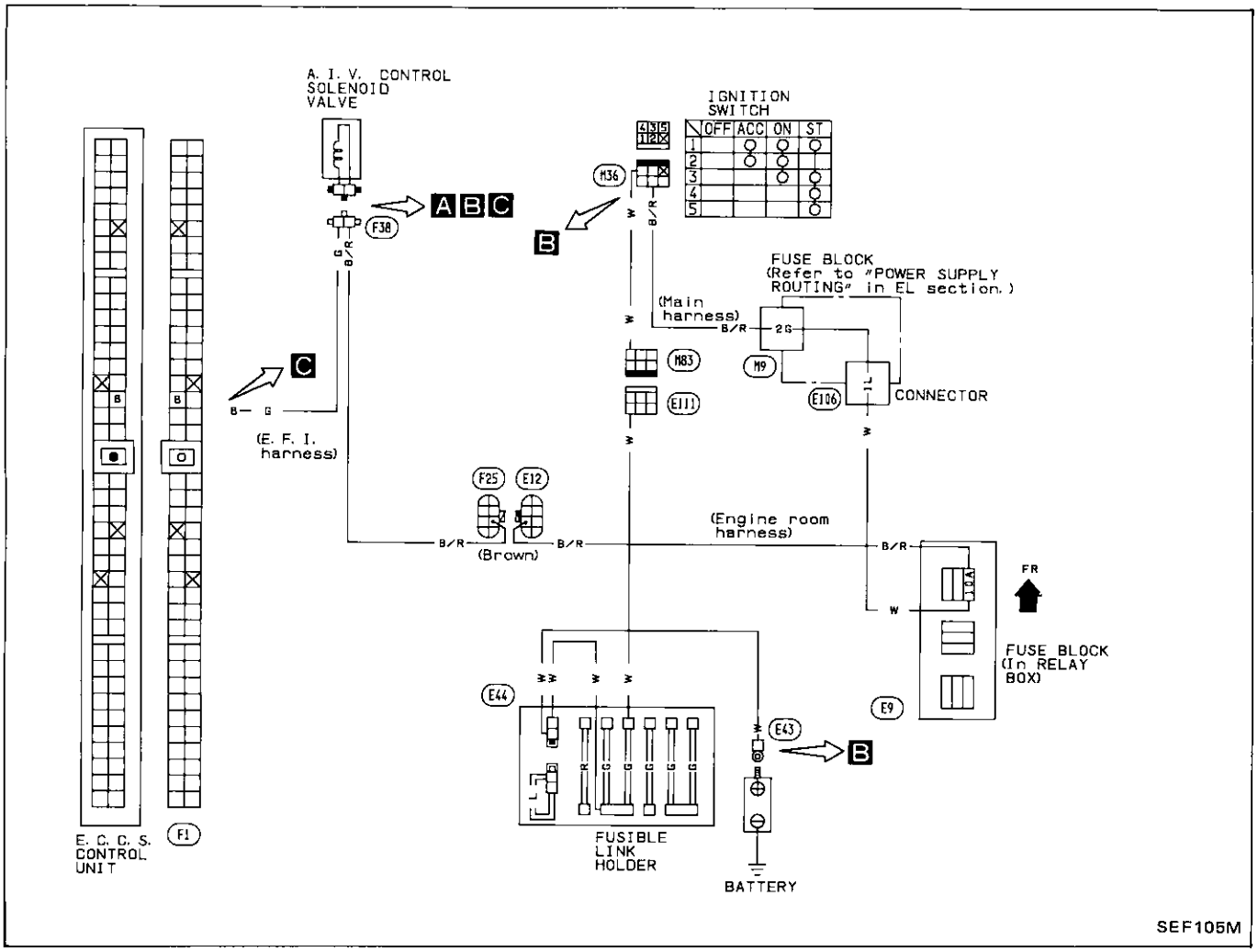
N.G. → Repair or replace F.I.C.D. solenoid valve.

O.K. ↓

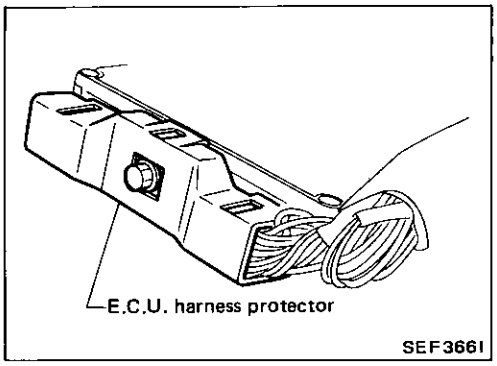
INSPECTION END

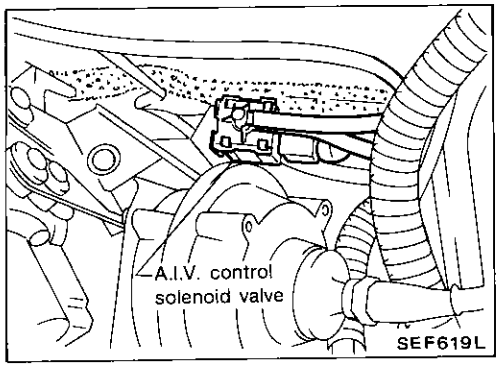
## Diagnostic Procedure 45

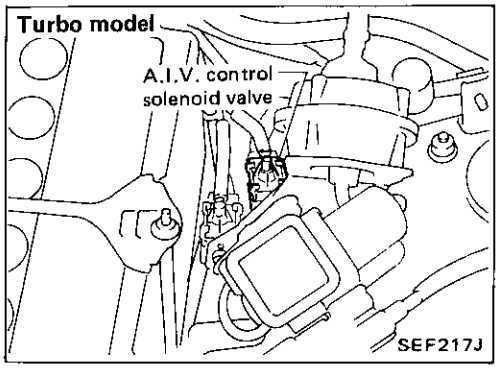
### A.I.V. CONTROL SOLENOID VALVE (Not self-diagnostic item)



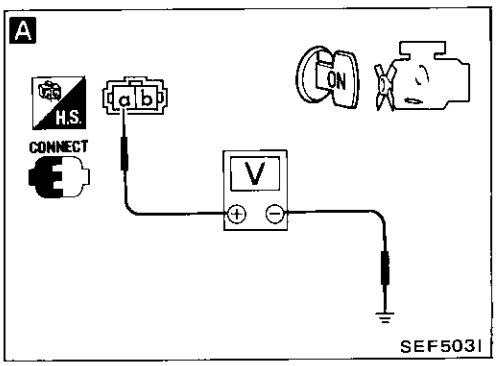

### Harness layout

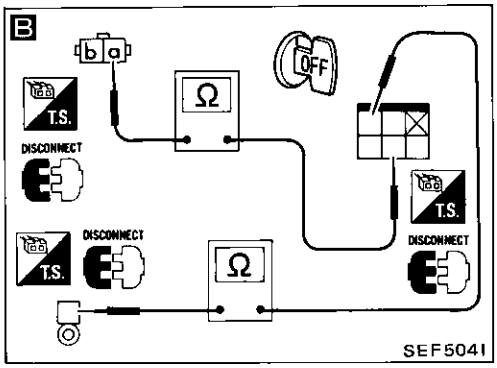


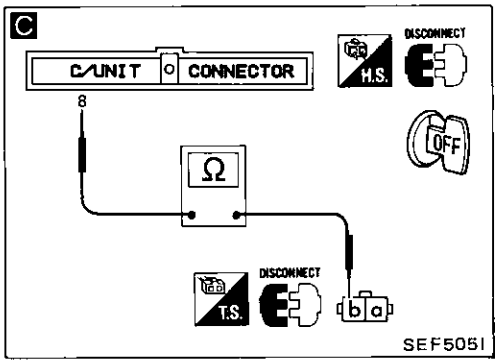



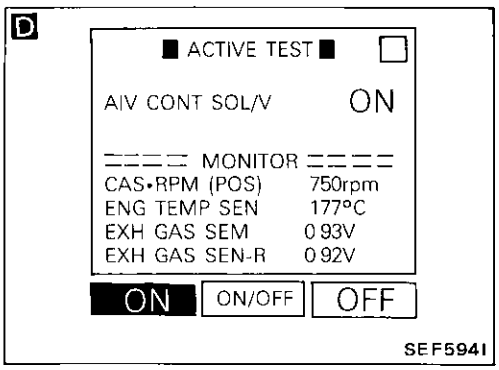



## Diagnostic Procedure 45 (Cont'd)




INSPECTION START

**A**

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between A.I.V. control solenoid valve terminal ⓐ and ground.
**Voltage: Battery voltage.**

N.G. → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- A.I.V. control solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

**Continuity should exist.**

O.K. ↓

**C**

CHECK HARNESS CONTINUITY BETWEEN A.I.V. CONTROL SOLENOID VALVE AND E.C.U.
Check harness continuity between A.I.V. control solenoid valve terminal ⓑ and E.C.U. terminal ⑧.
**Continuity should exist.**

N.G. → Repair or replace harness or connectors.

O.K. ↓

**D**

CHECK COMPONENT (A.I.V. control solenoid valve).
Perform "A.I.V. CONTROL SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-183.)

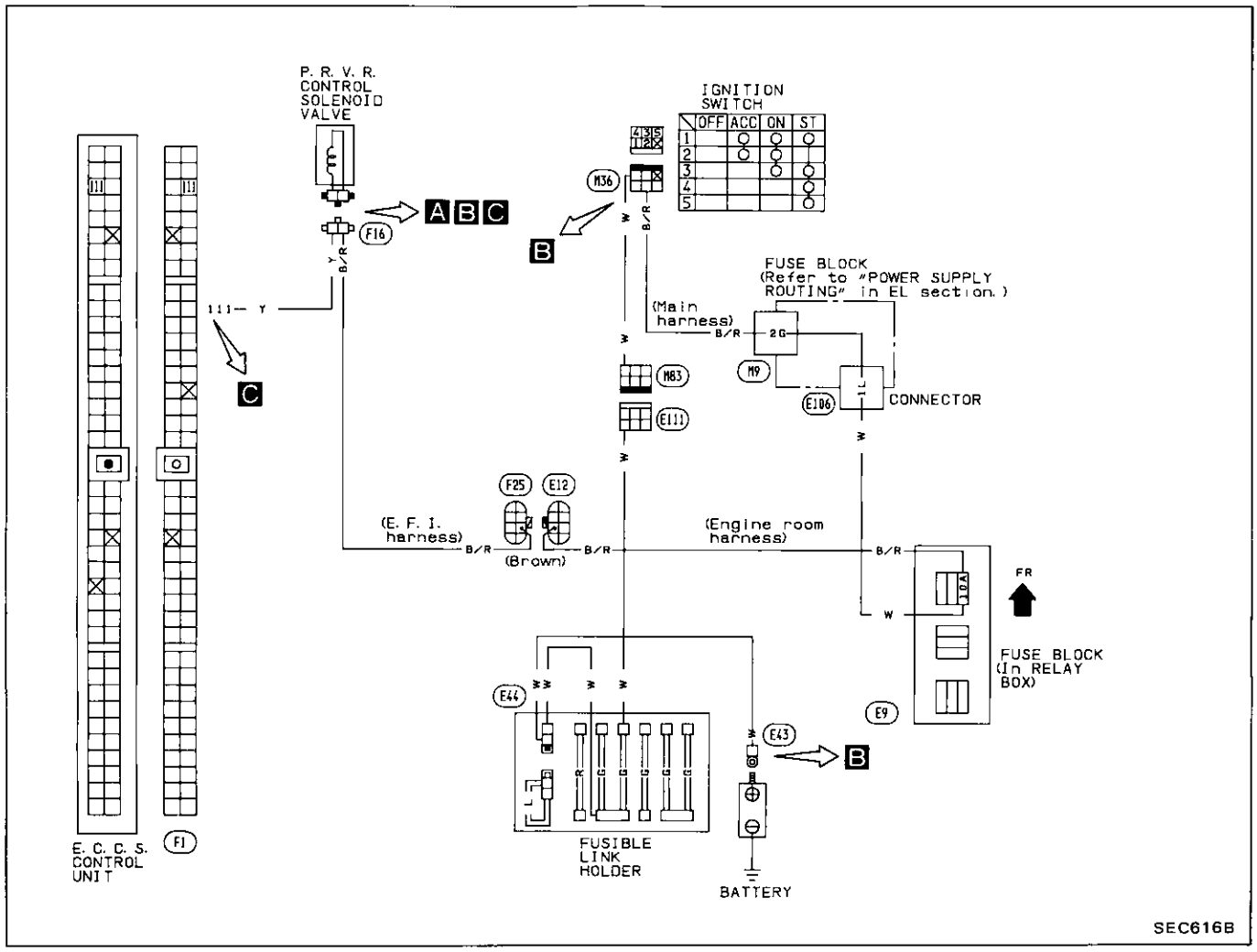
N.G. → Repair or replace A.I.V. control solenoid valve.

O.K. ↓

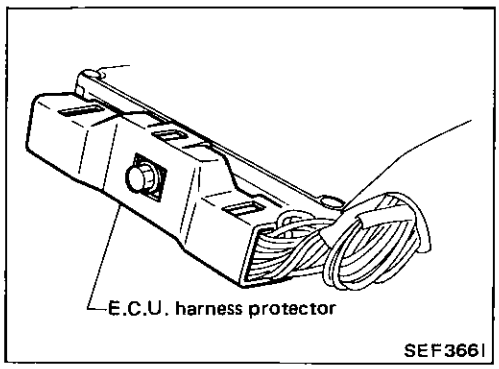
INSPECTION END

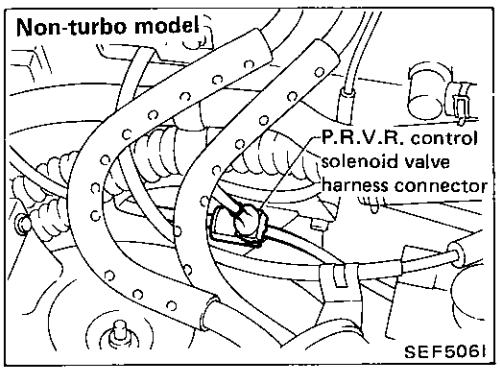
## Diagnostic Procedure 46

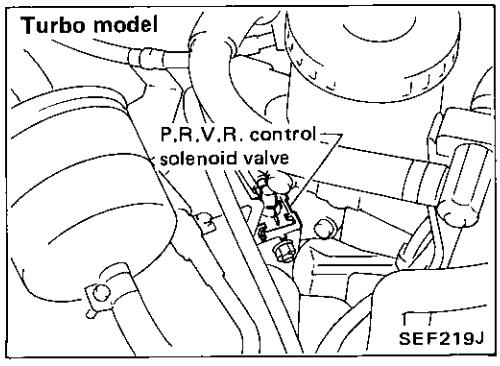
### P.R.V.R. CONTROL SOLENOID VALVE (Not self-diagnostic item)



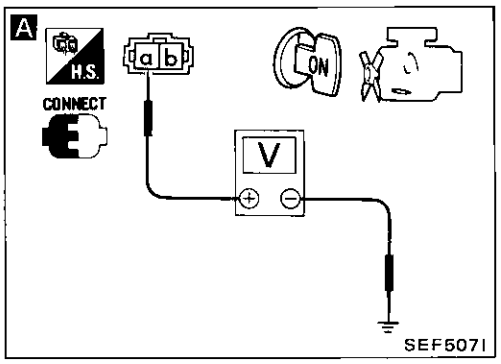

### Harness layout

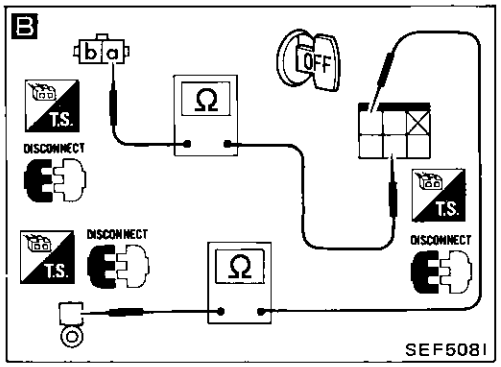


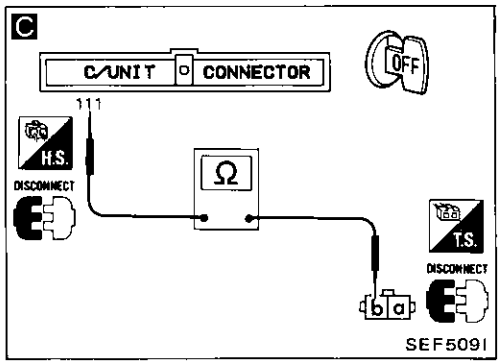



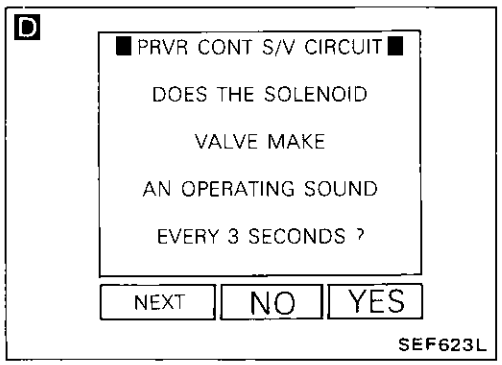



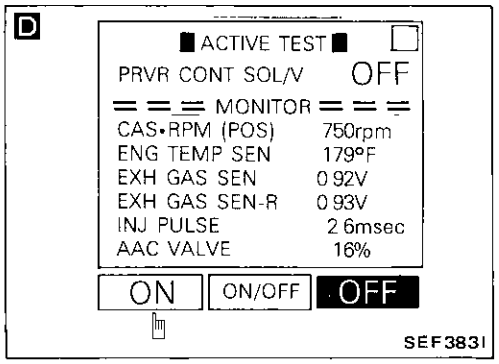
## Diagnostic Procedure 46 (Cont'd)




INSPECTION START

**A**

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between P.R.V.R. control solenoid valve terminal ⓐ and ground.
**Voltage: Battery voltage.**

N.G. → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- P.R.V.R. control solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

**Continuity should exist.**

O.K. ↓

**C**

CHECK HARNESS CONTINUITY BETWEEN P.R.V.R. CONTROL SOLENOID VALVE AND E.C.U.
Check harness continuity between P.R.V.R. control solenoid valve terminal ⓑ and E.C.U. terminal (111).
**Continuity should exist.**

N.G. → Repair or replace harness or connectors.

O.K. ↓

**D**

CHECK COMPONENT (P.R.V.R. control solenoid valve).

Perform "PRVR CONT S/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

— OR —

Perform "P.R.V.R. CONTROL SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.

— OR —

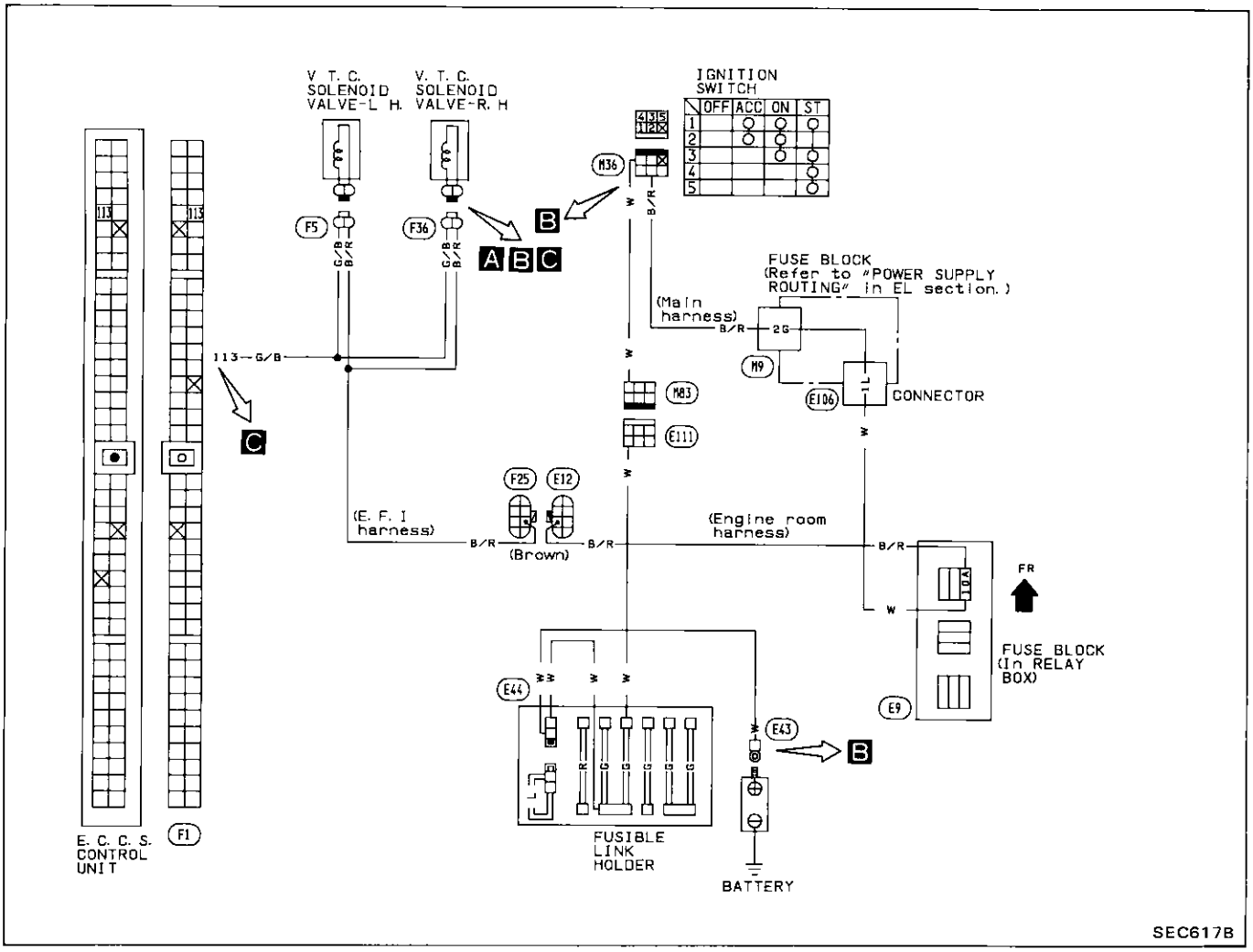
Refer to "Electrical Components Inspection". (See page EF & EC-183.)

N.G. → Repair or replace P.R.V.R. control solenoid valve.

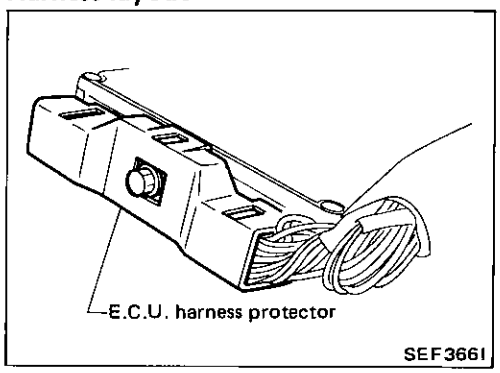
INSPECTION END

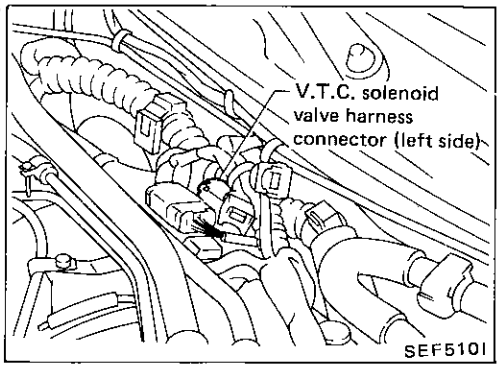
## Diagnostic Procedure 47

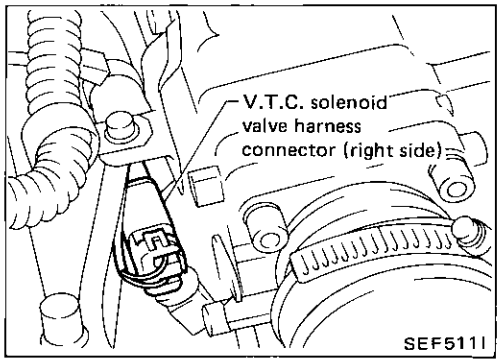
### V.T.C. SOLENOID VALVE (Not self-diagnostic item)



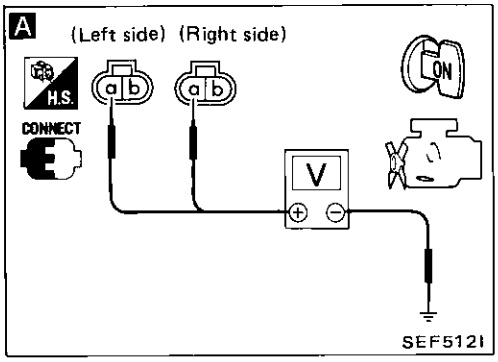

### Harness layout

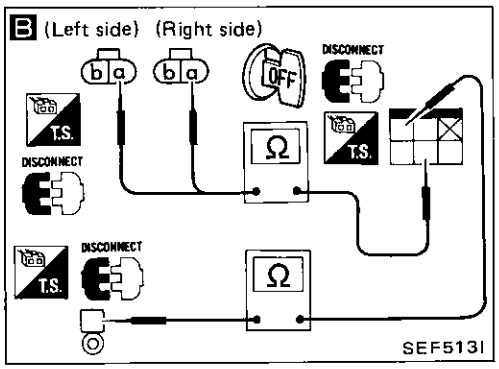


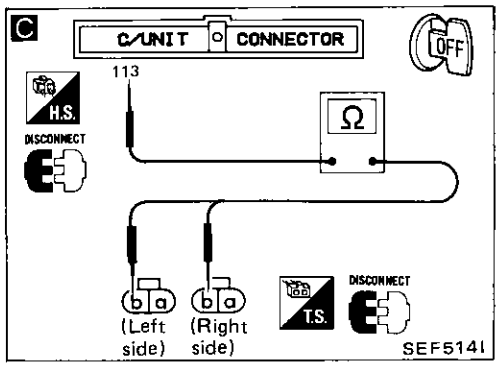



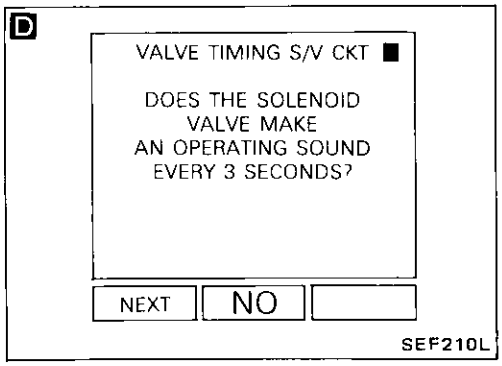



## Diagnostic Procedure 47 (Cont'd)




INSPECTION START

**A**

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between V.T.C. solenoid valve terminal ⓐ and ground.
**Voltage: Battery voltage.**

N.G. → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
   - V.T.C. solenoid valve and ignition switch
   - Ignition switch and battery ⊕ terminal

**Continuity should exist.**

O.K.

**C**

CHECK HARNESS CONTINUITY BETWEEN V.T.C. SOLENOID VALVE AND E.C.U.
Check harness continuity between V.T.C. solenoid valve terminal ⓑ and E.C.U. terminal (113)
**Continuity should exist.**

N.G. → Repair or replace harness or connectors.

O.K.

**D**

CHECK COMPONENT (V.T.C. solenoid valve).
Perform "VALVE TIMING S/V CKT" in "FUNCTION TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-186.)

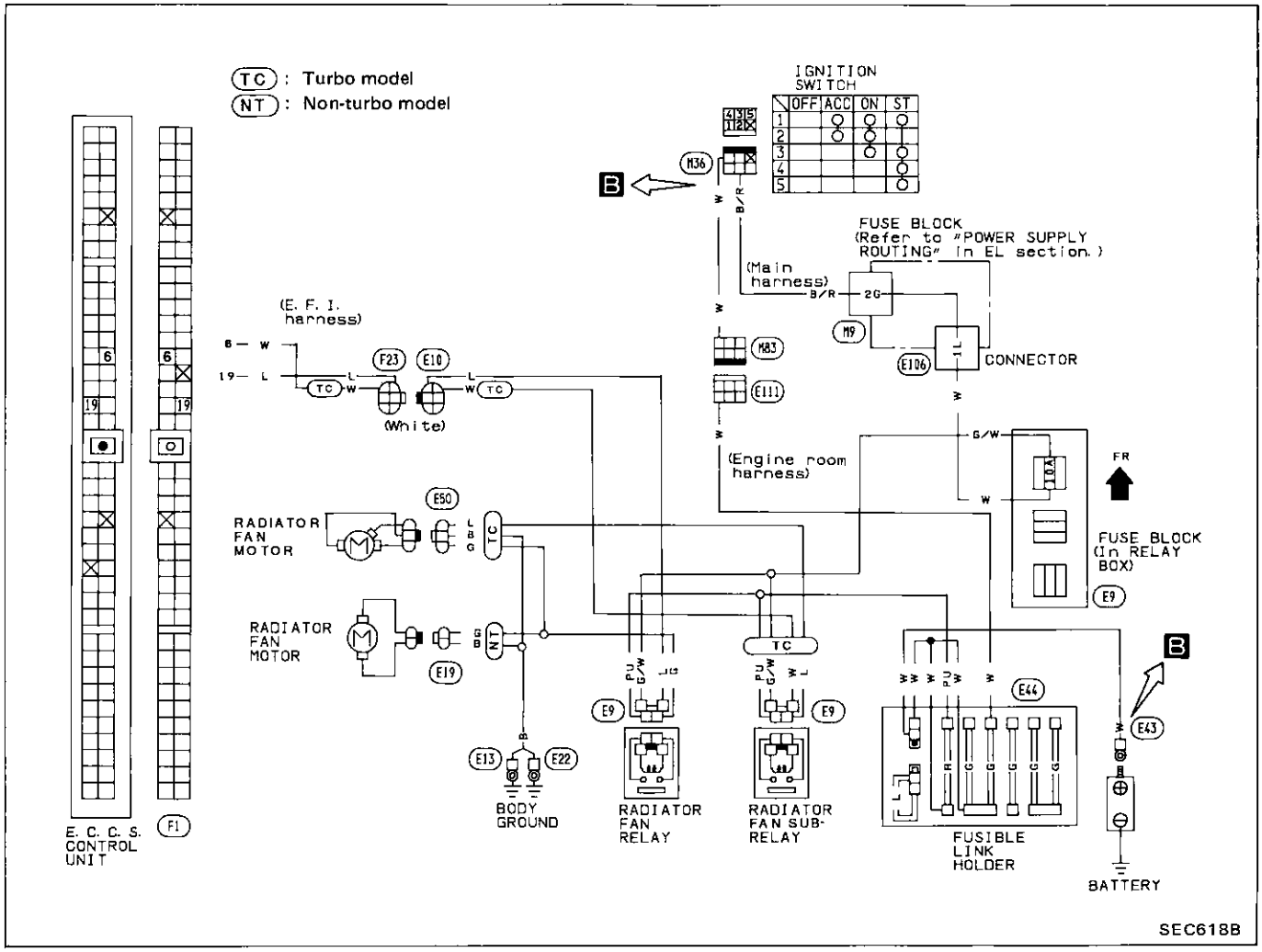
N.G. → Repair or replace V.T.C. solenoid valve.

O.K.

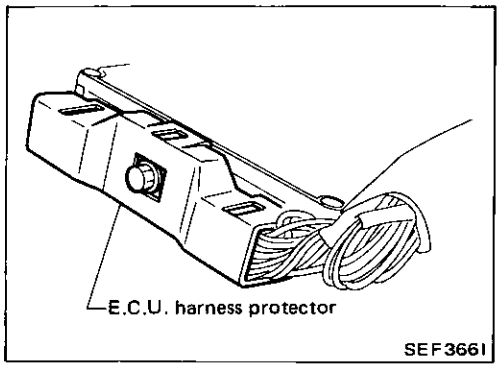
INSPECTION END

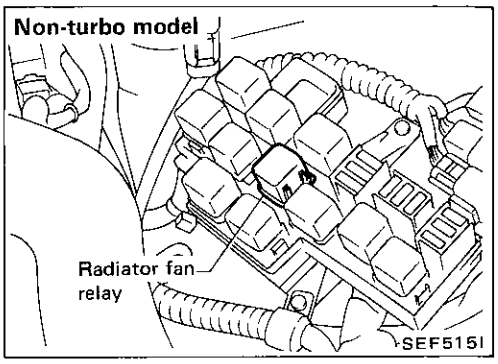
## Diagnostic Procedure 48

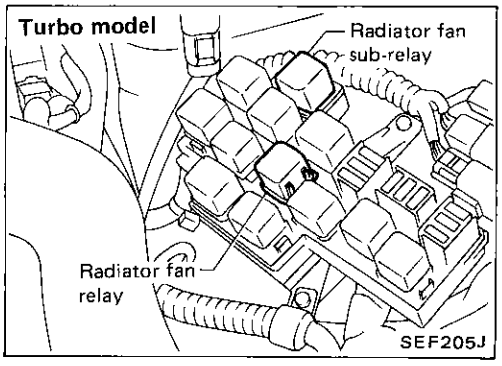
### RADIATOR FAN CONTROL (Not self-diagnostic item)




### Harness layout

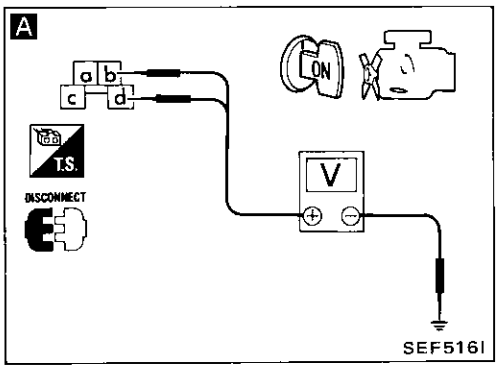


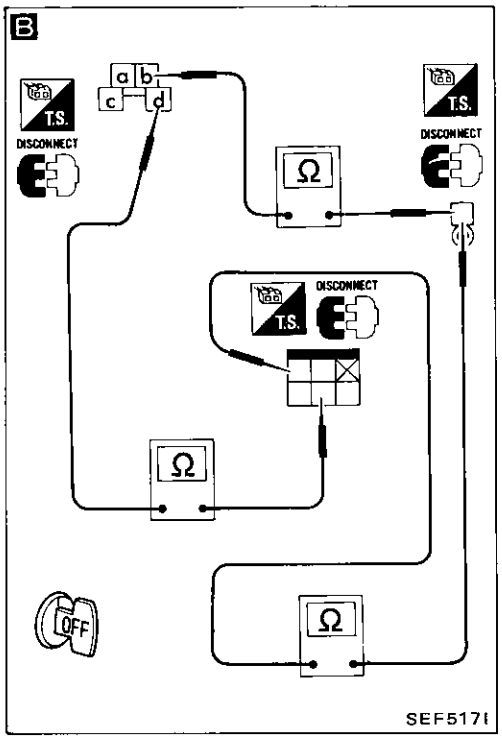



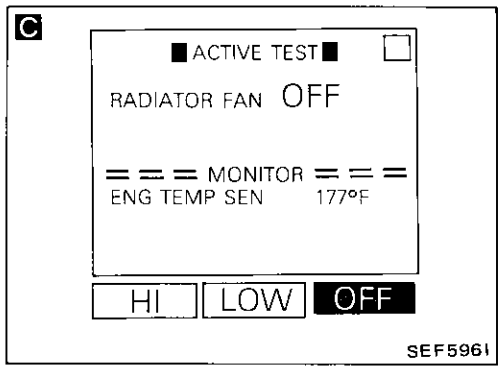



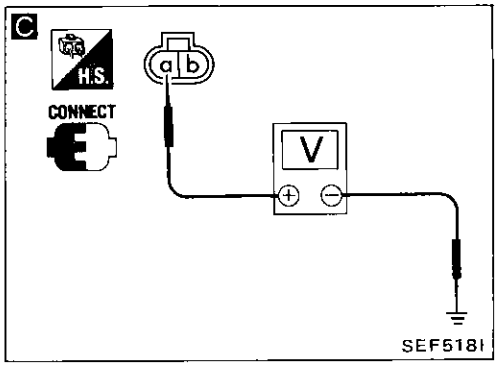

**For radiator fan motor harness connector, see "HARNESS LAYOUT" in EL section.**

## Diagnostic Procedure 48 (Cont'd)




INSPECTION START

**A**

CHECK POWER SUPPLY (1).
1) Turn ignition switch "ON".
2) Check voltage between radiator fan relay terminals ⓑ, ⓓ and ground.
**Voltage: Battery voltage.**

N.G. → **B**

Check the following items.
1) "G", "R" and "L" fusible links.
2) "10A" fuses
3) Ignition switch
4) Harness continuity between
- radiator fan relay terminal ⓑ and battery ⊕ terminal
- radiator fan relay terminal ⓓ and ignition switch
- ignition switch and battery ⊕ terminal

**Continuity should exist.**

O.K.

**C**

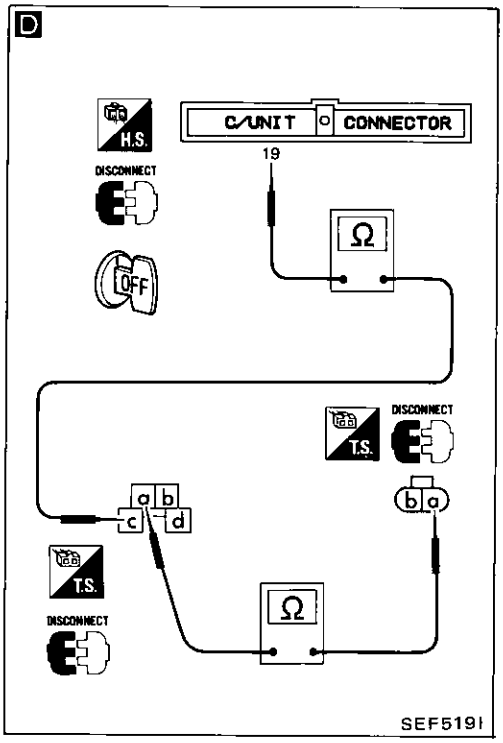
CHECK POWER SUPPLY (2).
1) Turn radiator fan relay "ON" in "ACTIVE TEST" mode with CONSULT.
2) Check voltage between radiator fan motor terminal ⓐ and ground.
**Voltage: Battery voltage.**

N.G. → ⊕⊕

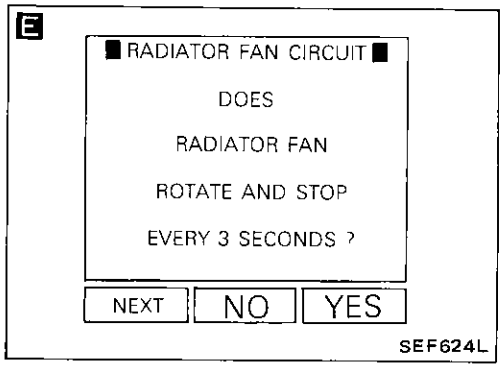
O.K. → ⊕

## Diagnostic Procedure 48 (Cont'd)

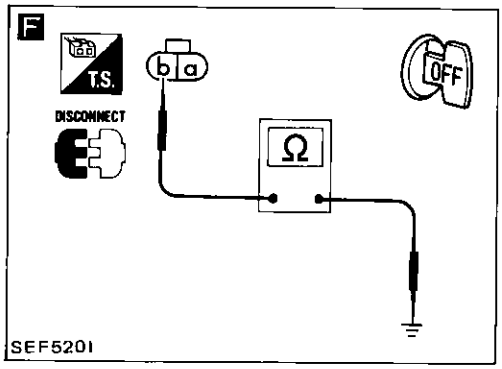
D



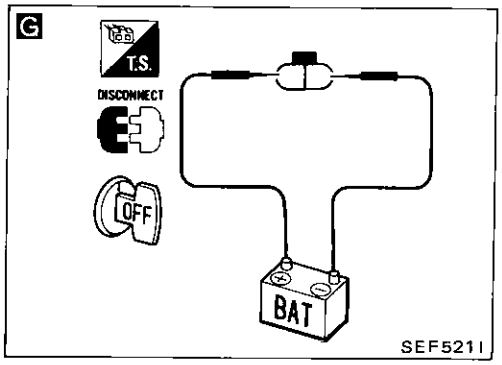

E




F




G




F

CHECK GROUND CIRCUIT.
Check harness continuity between radiator fan motor terminal ⓑ and ground.
**Continuity should exist.**

N.G. → D

O.K. ↓

G

CHECK RADIATOR FAN MOTOR.
Supply radiator fan motor terminals with battery voltage and check operation.
**Radiator fan motor should operate.**

N.G. → Repair or replace radiator fan motor.

O.K. ↓

INSPECTION END

D

Check the following items.
Harness continuity between
- radiator fan motor and radiator fan relay
- radiator fan relay and E.C.U. terminal ⑲

N.G. → Repair or replace harness or connectors.

O.K. ↓

E

CHECK COMPONENT (Radiator fan relay).

Perform "RADIATOR FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

— OR —

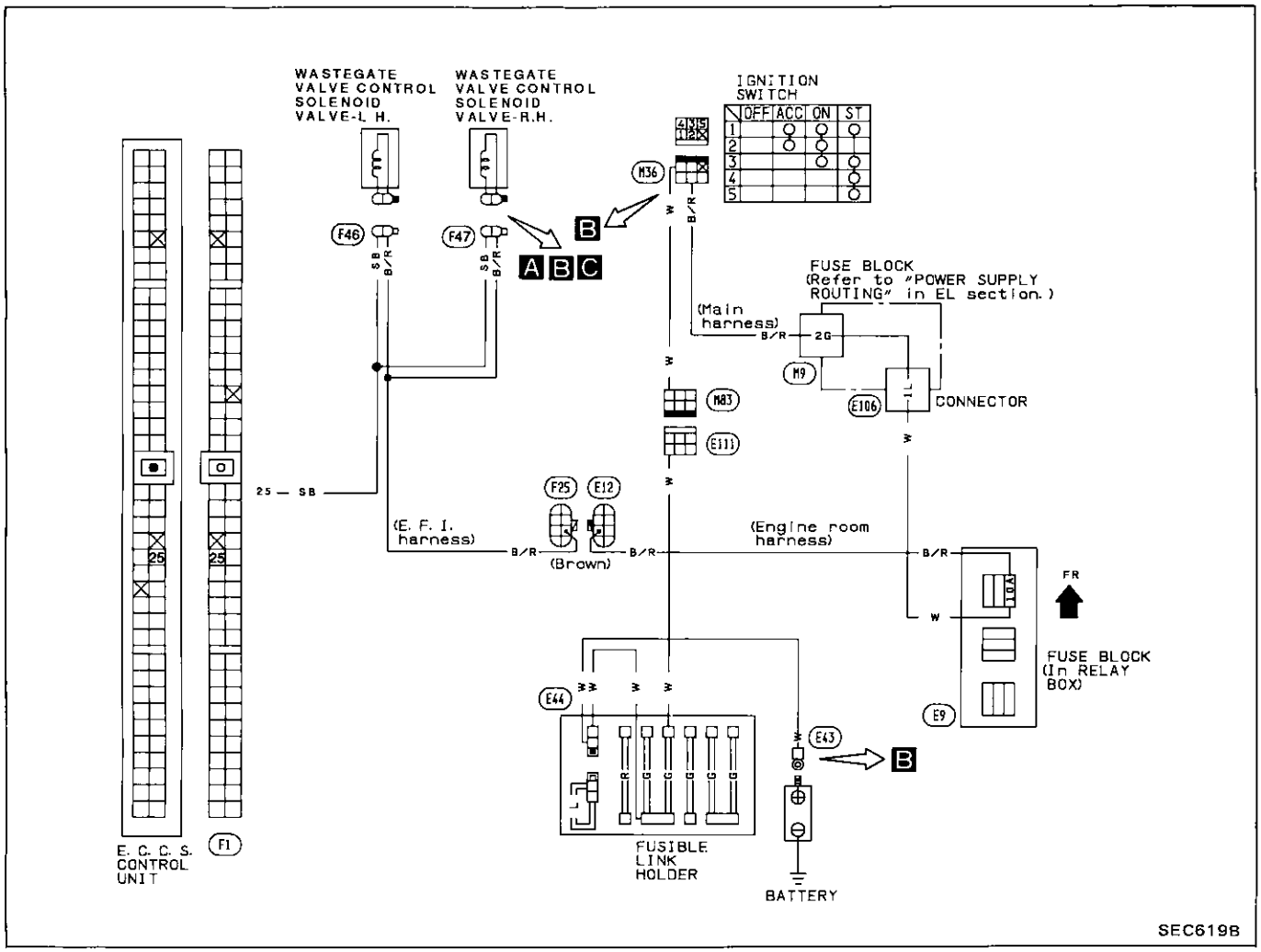
Perform "RADIATOR FAN TEST" in ACTIVE TEST" mode with CONSULT.

— OR —

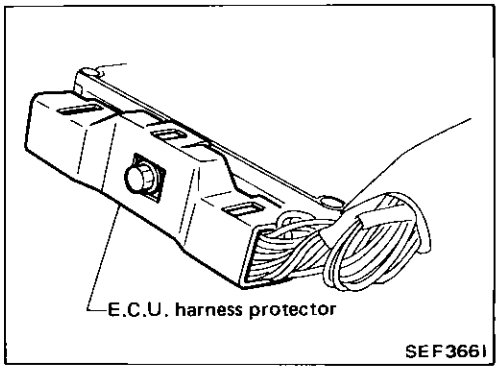
Refer to "Electrical Components Inspection". (See page EF & EC-187.)

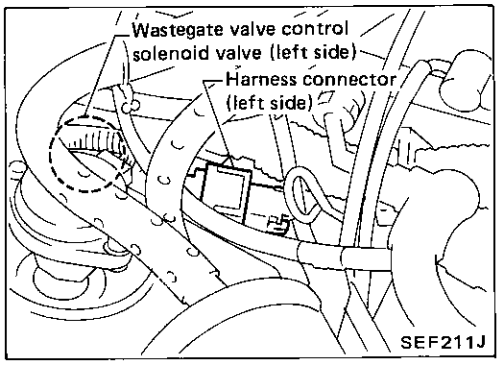
## Diagnostic Procedure 49

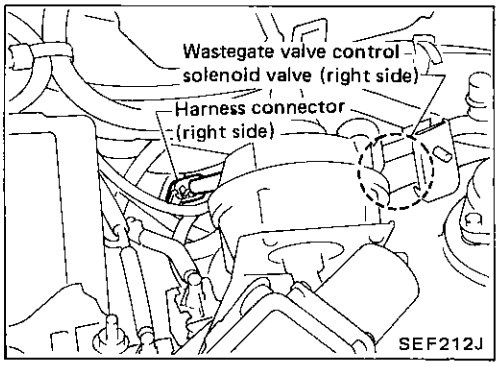
### WASTEGATE VALVE CONTROL SOLENOID VALVE (Not self-diagnostic item):Turbo model only



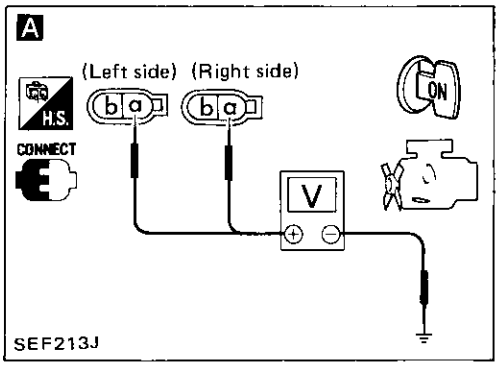

### Harness layout

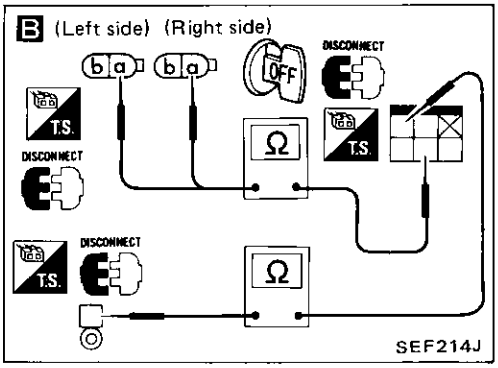


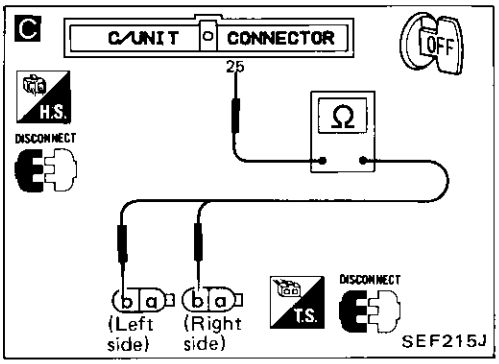



## Diagnostic Procedure 49 (Cont'd)




INSPECTION START

**A**

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between wastegate valve control solenoid valve terminal ⓐ and ground.
**Voltage: Battery voltage.**

N.G. → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
   - Wastegate valve control solenoid valve and ignition switch
   - Ignition switch and battery ⊕ terminal

**Continuity should exist.**

O.K. ↓

**C**

CHECK HARNESS CONTINUITY BETWEEN WASTEGATE VALVE CONTROL SOLENOID VALVE AND E.C.U.
Check harness continuity between wastegate valve control solenoid valve terminal ⓑ and E.C.U. terminal ㉕.
**Continuity should exist.**

N.G. → Repair or replace harness or connectors.

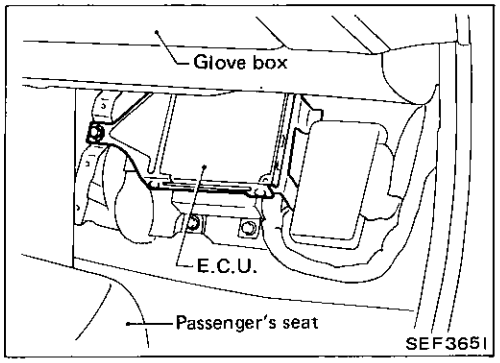
O.K. ↓

CHECK COMPONENT
(Wastegate valve control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-183.)

N.G. → Repair or replace wastegate valve control solenoid valve.

O.K. ↓

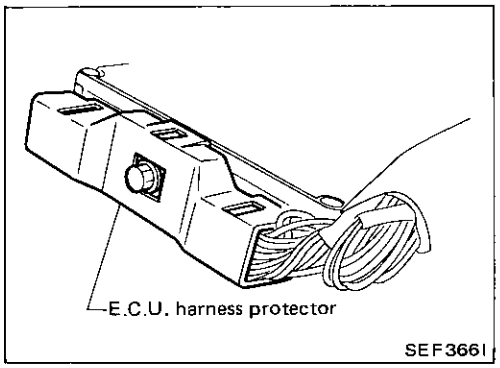
INSPECTION END



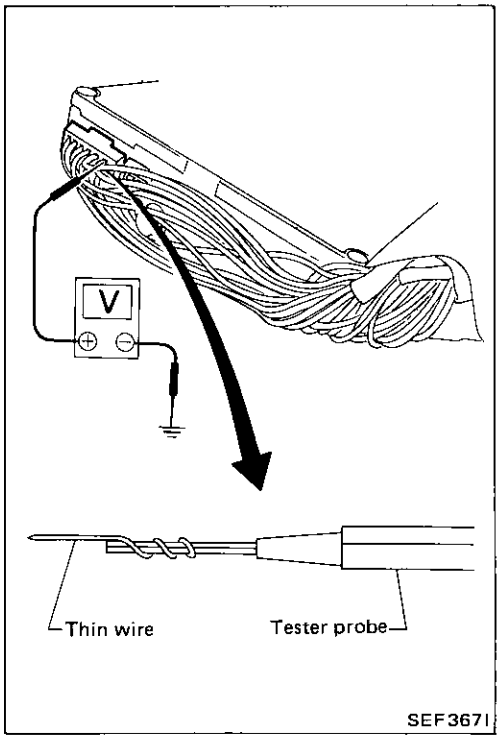

## Electrical Components Inspection

### E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

1. E.C.U. is located behind front passenger side floor board. For this inspection, remove the front passenger side floor board.




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.

| TERMINAL NO. | ITEM | CONDITION | *DATA |
|---|---|---|---|
| 1<br>2<br>3<br>11<br>12<br>13 | Ignition signal | Engine is running.<br>└ Idle speed | Approx. 0.1V |
| | | Engine is running.<br>└ Engine speed is 2,000 rpm. | Approx. 0.14V |
| 4 | A.A.C. valve | Engine is running.<br>└ Racing condition | Voltage briefly decreases from battery voltage (11 - 14V). |
| 6 | Radiator fan sub-relay (Turbo model) | Engine is running.<br>└ Radiator fan is not operating. | BATTERY BOLTAGE (11 - 14V) |
| | | Engine is running.<br>└ Radiator fan is operating. | 0.1 - 0.3V |
| 7 | Tachometer | Engine is running.<br>└ Idle speed | Approx. 0.7V |
| | | Engine is running.<br>└ Engine speed is 2,000 rpm. | Approx. 1.2V |
| 8 | A.I.V. control solenoid valve | Engine is running.<br>└ Idle speed | Approx. 0V |
| | | Engine is running.<br>└ Engine speed is 2,000 rpm. | BATTERY VOLTAGE (11 - 14V) |
| 9 | Air conditioner relay | Engine is running.<br>└ Air conditioner switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| | | Engine is running.<br>└ Air conditioner switch "ON" | Approx. 0V |
| 16 | E.C.U. power source (Self-shutoff) | Engine is running.<br>└ Idle speed | 0.8 - 1.0V |
| | | Engine is not running.<br>└ For a few seconds after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |

## Electrical Components Inspection (Cont'd)

*Data are reference values.

| TERMINAL NO. | ITEM | CONDITION | *DATA |
|---|---|---|---|
| 18 | Fuel pump relay | Ignition switch "ON"<br>└For 5 seconds after turning ignition switch "ON"<br>Engine is running. | 0.7 - 0.9V |
| | | Ignition switch "ON"<br>└In 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 19 | Radiator fan relay | Engine is running.<br>└Radiator fan is not operating. | BATTERY VOLTAGE (11 - 14V) |
| | | Engine is running.<br>└Radiator fan is operating. | 0.1 - 0.3V |
| 23 | Detonation sensor | Engine is running.<br>└Idle speed | Approx. 2.5V |
| 25 | Wastegate valve control solenoid valves (Turbo model) | Ignition switch "ON"<br>Engine is running. | BATTERY VOLTAGE (11 - 14V) |
| | | Engine is racing.<br>└Engine speed is up to 2,000 rpm | Approx. 0.2V |
| 27 | Air flow meter | Engine is running. (Warm-up condition)<br>└Idle speed | 0.8 - 1.5V |
| | | Engine is running. (Warm-up condition)<br>└Engine speed is 2,000 rpm. | 1.0 - 1.6V |
| 28 | Engine temperature sensor | Engine is running. | 0 - 5.0V<br>Output voltage varies with engine temperature. |
| 29<br>55 | Right side exhaust gas sensor<br>Left side exhaust gas sensor | Engine is running.<br>└After warming up sufficiently and engine speed is 2,000 rpm. | 0 ↔ Approx. 1.0V |
| 33 | F.I.C.D. solenoid valve | Engine is running.<br>└A/C compressor is not operating. | BATTERY VOLTAGE (11 - 14V) |
| | | Engine is running.<br>└A/C compressor is operating. | 0.7 - 0.8V |

## Electrical Components Inspection (Cont'd)

*Data are reference values.

| TERMINAL NO. | ITEM | CONDITION | *DATA |
|---|---|---|---|
| 34 | Power steering oil pressure switch | Engine is running.<br>└ Steering wheel is in the "straight ahead" position. | 8.0 - 9.0V |
| | | Engine is running.<br>└ Steering wheel is turned. | Approx. 0V |
| 36 | Fuel temperature sensor | Engine is running. | 0 - 5.0V<br>Output voltage varies with fuel temperature. |
| 38 | Throttle sensor | Ignition switch "ON" | 0.4 - 4.0V<br>Output voltage varies with throttle valve opening angle. |
| 39 | Exhaust gas temperature sensor | Engine is running. (Warm-up condition)<br>└ Idle speed | Less than 4.5V |
| | | Engine is running. (Warm-up condition)<br>└ E.G.R. system is operating. | 0 - 1.0V |
| 41<br>51 | Crank angle sensor (Reference signal) | Engine is running.<br>**Do not run engine at high speed under no-load.** | 1.2 - 1.4V<br>Output voltage varies slightly with engine speed. |
| 42<br>52 | Crank angle sensor (Position signal) | Engine is running.<br>**Do not run engine at high speed under no-load.** | 2.5 - 2.7V<br>Output voltage varies slightly with engine speed. |
| 43 | Start signal | Ignition switch "ON" | Approx. 0V |
| | | Ignition switch "START" | BATTERY VOLTAGE (11 - 14V) |
| 44 | Neutral switch (M/T model)<br>A/T control unit (A/T model) | Ignition switch "ON"<br>├ Gear position is "Neutral" (M/T model).<br>└ Gear position is "N" or "P" (A/T model). | Approx. 0V |
| | | Ignition switch "ON"<br>└ Except the above conditions | 8.0 - 9.0V |
| 45 | Ignition switch | Ignition switch "ON"<br>└ Engine stopped | BATTERY VOLTAGE (11 - 14V) |

## Electrical Components Inspection (Cont'd)

*Data are reference values.

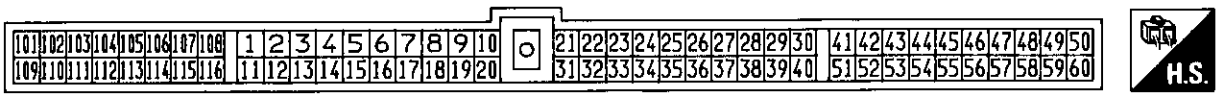
| TERMINAL NO. | ITEM | CONDITION | *DATA |
|---|---|---|---|
| 46 | Air conditioner switch | Engine is running.<br>└ Air conditioner switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| | | Engine is running.<br>└ Air conditioner switch "ON" | 0.5 - 0.7V |
| 48 | Power source for sensors | Ignition switch "ON"<br>└ Engine stopped | Approximately 5.0V |
| 49 | Battery source | Ignition switch "ON"<br>└ Engine stopped | BATTERY VOLTAGE (11 - 14V) |
| 54 | Throttle valve switch (Idle position) | Ignition switch "ON"<br>└ Accelerator pedal is fully released (engine running). | 9.0 - 10.0V |
| | | Ignition switch "ON"<br>└ Accelerator pedal is depressed (engine running). | 0V |
| 57 | Power source for throttle valve switch | Ignition switch "ON"<br>└ Engine running | BATTERY VOLTAGE (11 - 14V) |
| 59 | Power supply | Ignition switch "ON"<br>└ Engine running | BATTERY VOLTAGE (11 - 14V) |
| 101<br>103<br>105<br>110<br>112<br>114 | Injectors | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 102 | E.G.R. control solenoid valve | Engine is running. (Warm-up condition)<br>└ Idle speed | 0.7 - 0.8V |
| | | Engine is running. (Warm-up condition)<br>└ Engine speed is 2,000 rpm. | BATTERY VOLTAGE (11 - 14V) |

## Electrical Components Inspection (Cont'd)

*Data are reference values.

| TERMINAL NO. | ITEM | CONDITION | *DATA |
|---|---|---|---|
| 35<br>104 | Fuel pump voltage control<br>(35: Turbo model) | Ignition switch "ON"<br>└ Engine stopped | BATTERY VOLTAGE<br>(11 - 14V) |
| | | Engine is running. (Warm-up condition)<br>└ Idle speed | Approx. 0V |
| 111 | P.R.V.R. control solenoid valve | Stop and restart engine after warming it up.<br>└ Fuel temperature is above 75°C (167°F) | 0 - 1.0V<br>(for 30 seconds after ignition switch is turned off.) |
| | | | BATTERY VOLTAGE<br>(After 30 seconds) |
| | | Stop and restart engine after warming it up.<br>└ Fuel temperature is below 75°C (167°F) | BATTERY VOLTAGE<br>(11 - 14V) |
| 113 | Valve timing control solenoid valves | Engine is running.<br>└ Idle speed | BATTERY VOLTAGE<br>(11 - 14V) |
| | | Engine is running.<br>└ Engine speed is 3,000 rpm. | 0.2 - 0.5V |

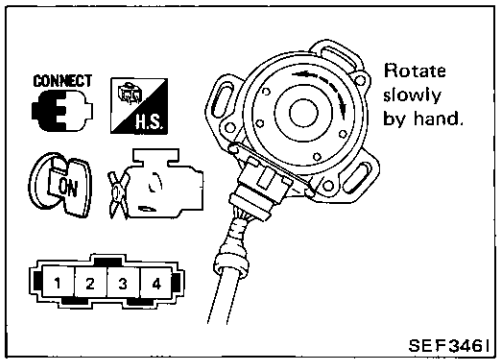
### E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT




SEC250B

## Electrical Components Inspection (Cont'd)

### CRANK ANGLE SENSOR



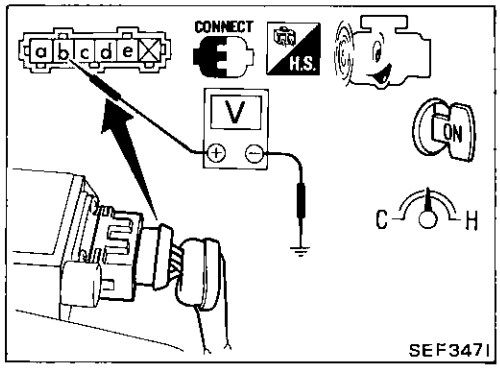

1. Remove crank angle sensor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch "ON".
3. Rotate crank angle sensor shaft slowly by hand and check voltage between terminals ①, ② and ground.

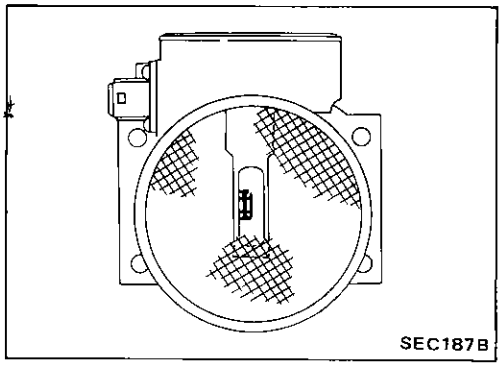
| Terminal | Voltage |
|---|---|
| ② (120° signal) | Voltage fluctuates between 5V and 0V. |
| ① (1° signal) | |

If N.G., replace crank angle sensor.

**After this inspection, malfunction code No. 11 might be displayed though the crank angle sensor is functioning properly. In this case erase the stored memory.**

### AIR FLOW METER



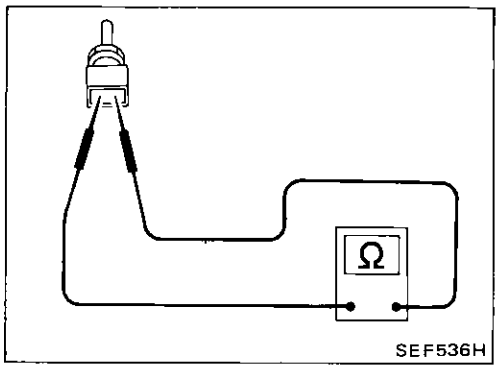




1. Fold back air flow meter harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ⓑ and ground.

| Conditions | Voltage V |
|---|---|
| Ignition switch "ON" (Engine stopped.) | Approximately 0.8 |
| Idle (Engine is warm-up sufficiently.) | Approximately 0.8 - 1.5 |

5. If N.G., remove air flow meter from air duct. Check hot wire for damage or dust.

### ENGINE TEMPERATURE SENSOR

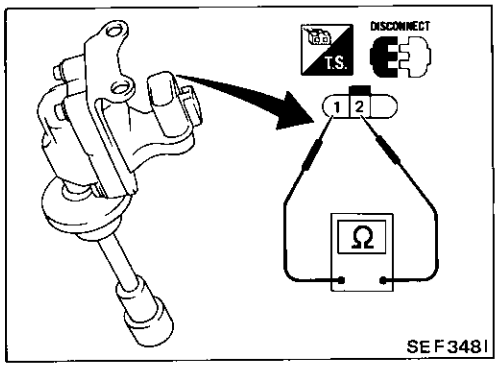



1. Disconnect engine temperature sensor harness connector.
2. Check resistance as shown in the figure.

| Temperature °C (°F) | Resistance kΩ |
|---|---|
| 20 (68) | 2.1 - 2.9 |
| 50 (122) | 0.68 - 1.00 |
| 80 (176) | 0.30 - 0.33 |

If N.G., replace engine temperature sensor.

## Electrical Components Inspection (Cont'd)

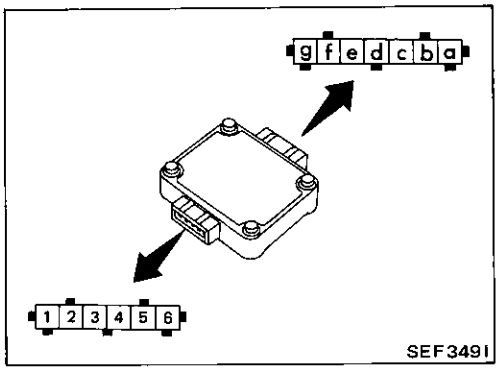



### IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

| Terminal | Resistance |
|---|---|
| ① - ② | Approximately 0.7Ω |

If N.G., replace ignition coil.

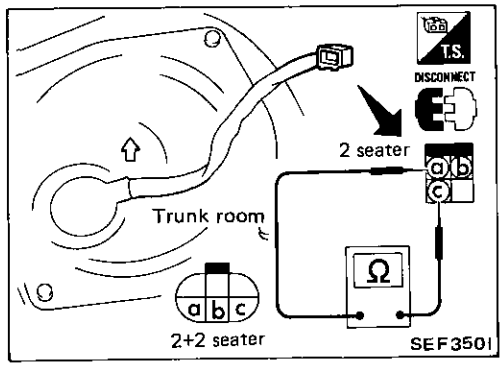



### POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals as shown in the figure.

| Terminal combination | | | | | | Tester polarity | Continuity | Tester polarity | Continuity |
|---|---|---|---|---|---|---|---|---|---|
| g | g | g | g | g | g | ⊕ | No | ⊖ | Yes |
| a | b | c | d | e | f | ⊖ | | ⊕ | |
| g | g | g | g | g | g | ⊕ | Yes | ⊖ | Yes |
| 1 | 2 | 3 | 4 | 5 | 6 | ⊖ | | ⊕ | |
| a | b | c | d | e | f | ⊕ | Yes | ⊖ | No |
| 1 | 2 | 3 | 4 | 5 | 6 | ⊖ | | ⊕ | |

If N.G., replace power transistor.

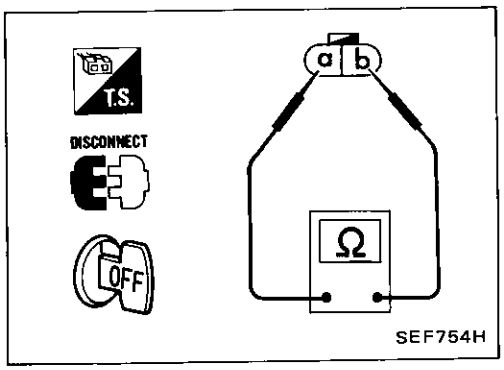



### FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓐ and ⓒ.

**Resistance: Approximately 0.5Ω**

If N.G., replace fuel pump.




### VEHICLE SPEED SENSOR

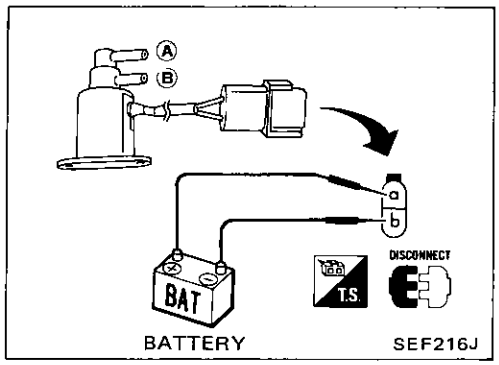
1. Jack up rear wheels. Use stands to support vehicle.
2. Disconnect vehicle speed sensor harness connector.
3. Check continuity between terminals ⓐ and ⓑ while rotating rear wheel by hand.

**Continuity should come and go.**

If N.G. replace vehicle speed sensor.

## Electrical Components Inspection (Cont'd)

### WASTEGATE VALVE CONTROL SOLENOID VALVE

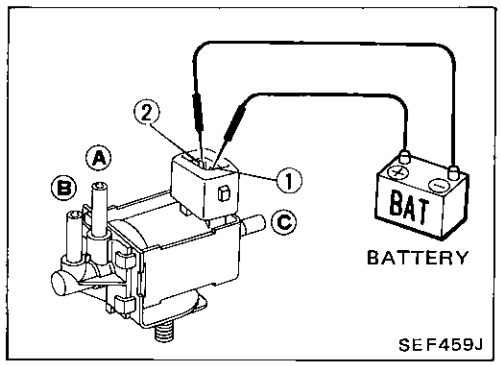



Check air passage continuity.

| Condition | Air passage continuity between Ⓐ and Ⓑ |
|---|---|
| 12V direct current supply between terminals ⓐ and ⓑ | Yes |
| No supply | No |

If N.G., replace solenoid valve.

### E.G.R. CONTROL SOLENOID VALVE
### A.I.V. CONTROL SOLENOID VALVE
### P.R.V.R. CONTROL SOLENOID VALVE

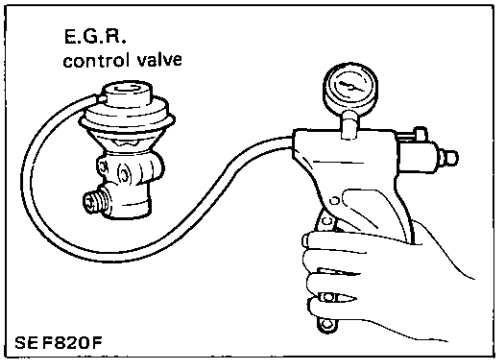



Check air passage continuity.

| Condition | Air passage continuity between Ⓐ and Ⓑ | Air passage continuity between Ⓐ and Ⓒ |
|---|---|---|
| 12V direct current supply between terminals ① and ② | Yes | No |
| No supply | No | Yes |

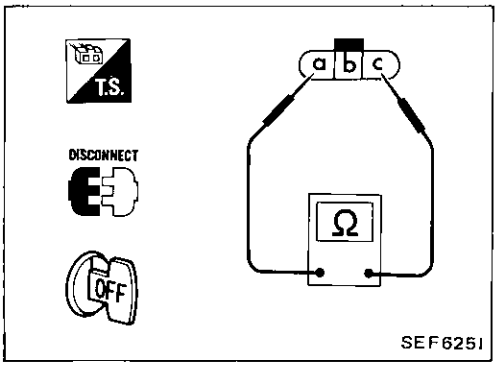
If N.G., replace solenoid valve.

### 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



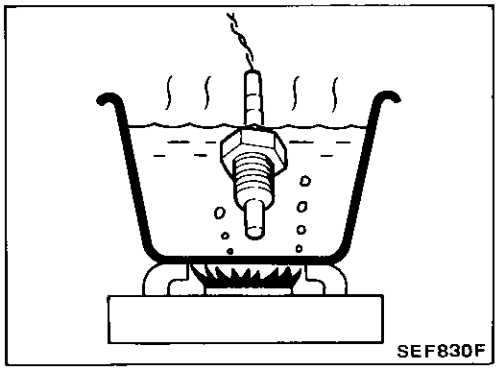

Refer to "Diagnostic Procedure 30".
(See page EF & EC-130.)

### EXHAUST GAS SENSOR HEATER

Check resistance between terminals ⓐ and ⓒ.
**Resistance: 3 - 1,000Ω**
If N.G., replace exhaust gas sensor.

## Electrical Components Inspection (Cont'd)

### EXHAUST GAS TEMPERATURE SENSOR


SEF830F

Check resistance change and resistance value at 100°C (212°F).

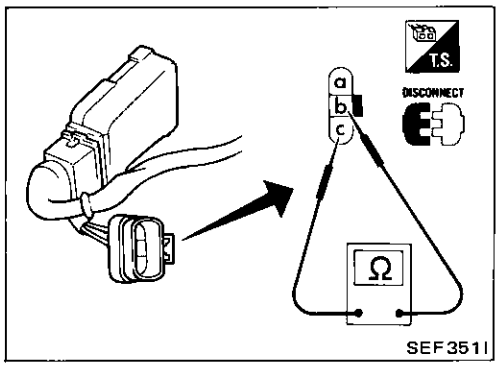
- **Resistance should decrease in response to temperature increase.**

  **Resistance: 100°C (212°F)**

  **85.3 ± 8.53 kΩ**

If N.G., replace exhaust gas temperature sensor.

### THROTTLE SENSOR



SEF351I

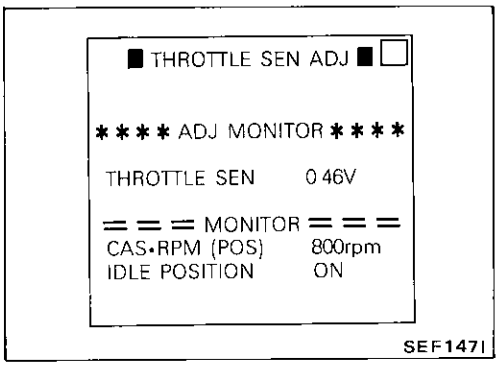
1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals ⓑ and ⓒ changes when opening throttle valve manually.

| Accelerator pedal conditions | Resistance kΩ |
|---|---|
| Completely released | Approximately 1 |
| Partially released | 1 - 9 |
| Completely depressed | Approximately 9 |

If N.G., replace throttle sensor.

**Adjustment**

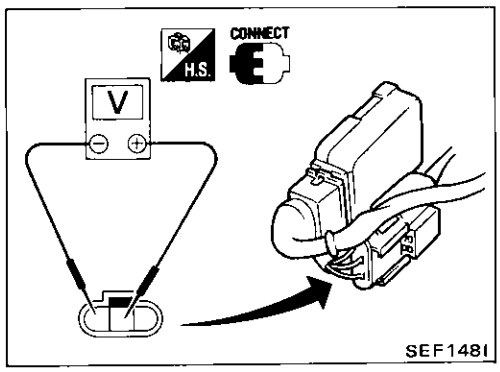
If throttle sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:



SEF147I

1. Install throttle sensor body in throttle chamber. Do not tighten bolts.
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.

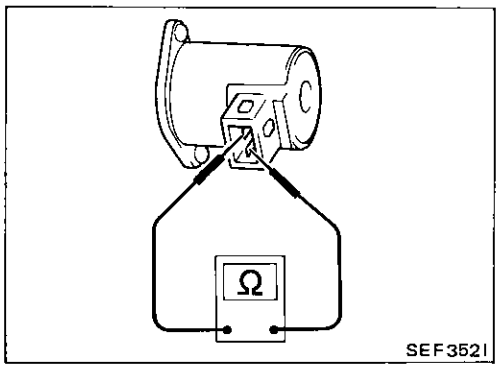


SEF148I

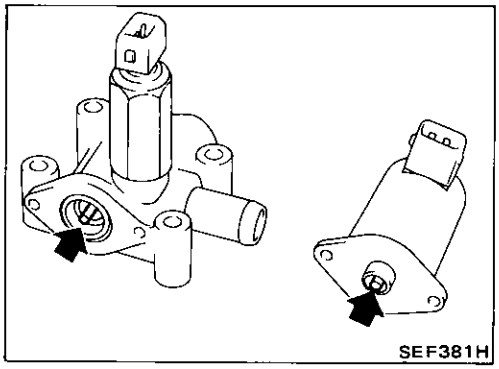
5. Adjust by rotating throttle sensor body so that output voltage is 0.4 to 0.5V.
6. Tighten mounting bolts.
7. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.

## Electrical Components Inspection (Cont'd)

### A.A.C. VALVE

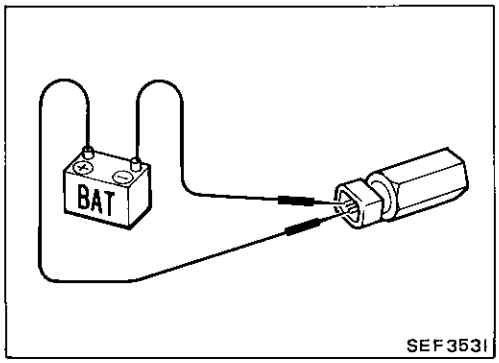



- Check A.A.C. valve resistance.
  **Resistance:**
  **Approximately 10Ω**

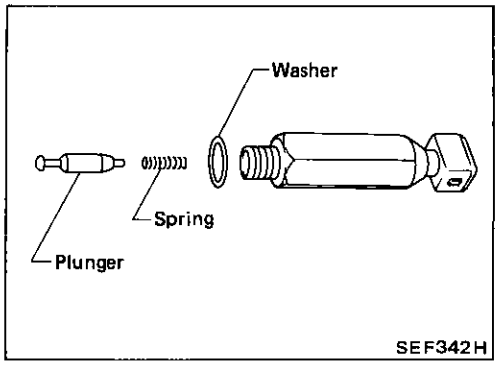



- Check plunger for seizing or sticking.
- Check for broken spring.

### F.I.C.D. SOLENOID VALVE

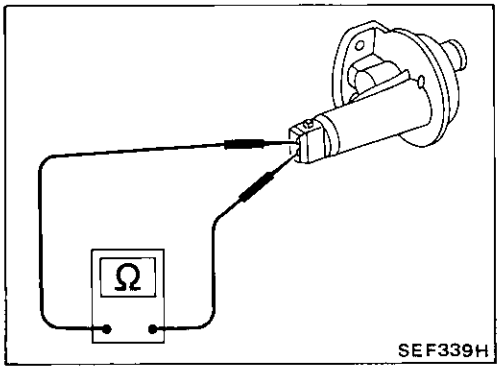



- Check for clicking sound when applying 12V direct current to terminals.



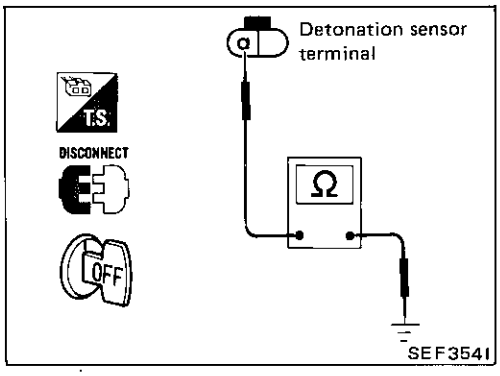

- Check plunger for seizing or sticking.
- Check for broken spring.

### AIR REGULATOR




- Check air regulator resistance.
  **Resistance:**
  **Approximately 70 - 80Ω**
- Check air regulator for clogging.

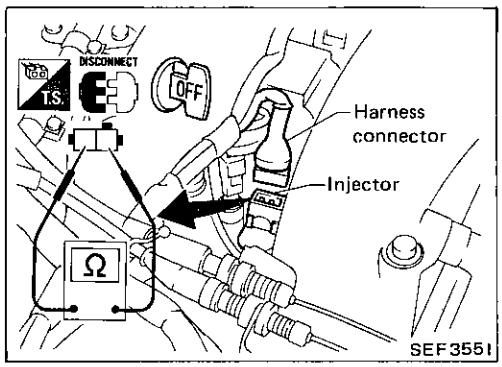
## Electrical Components Inspection (Cont'd)




### DETONATION SENSOR

1. Disconnect detonation sensor sub-harness connector.
2. Check continuity between terminal ⓐ and ground.

**Continuity should exist.**

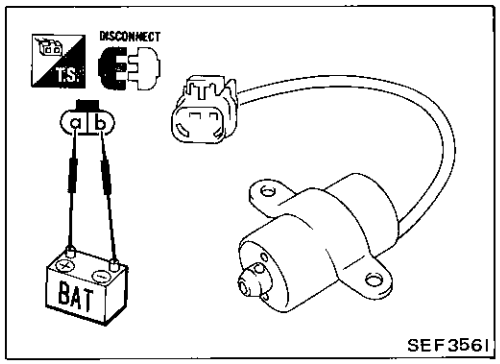



### INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

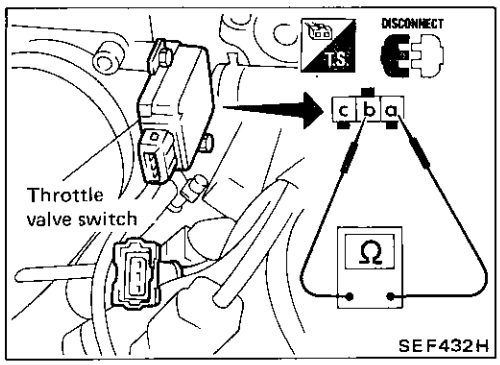
   **Resistance: 10 - 14Ω**

   If N.G., replace injector.




### VALVE TIMING CONTROL SOLENOID VALVE

Check valve timing control solenoid valve for normal operation by supplying it with battery voltage between terminals ⓐ and ⓑ.
If N.G., replace solenoid valve.

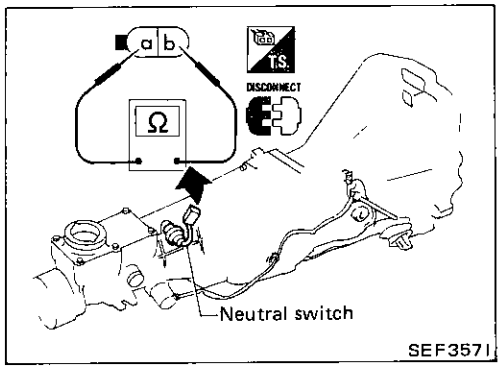



### THROTTLE VALVE SWITCH (Idle position)

1. Disconnect idle switch harness connector.
2. Check continuity between terminals ⓐ and ⓑ.

| Accelerator pedal condition | Continuity |
|---|---|
| Released | Yes |
| Depressed | No |

If N.G., replace throttle valve switch.



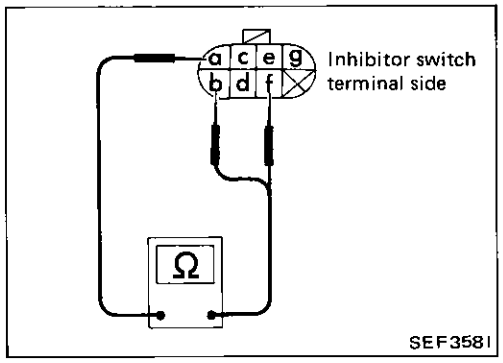

### NEUTRAL SWITCH

Check continuity between terminals ⓐ and ⓑ.

| Conditions | Continuity |
|---|---|
| Shift to Neutral | Yes |
| Shift to other position | No |

If N.G., replace neutral switch.

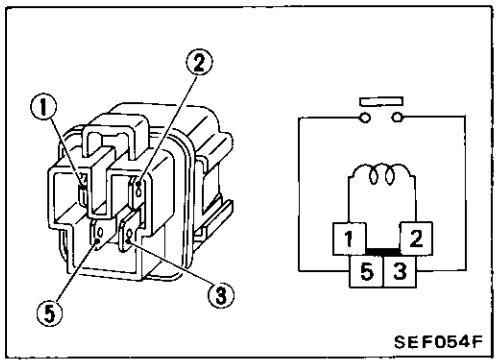
## Electrical Components Inspection (Cont'd)




### INHIBITOR SWITCH

Check continuity between terminals ⓐ and ⓑ, ⓕ.

| Conditions | Continuity between terminals ⓐ and ⓑ | Continuity between terminals ⓐ and ⓕ |
|---|---|---|
| Shift to "P" position | Yes | No |
| Shift to "N" position | No | Yes |
| Shift to positions other than "P" and "N" | No | No |




### E.C.C.S. RELAY, FUEL PUMP RELAY, RADIATOR FAN RELAY AND IGNITION COIL RELAY

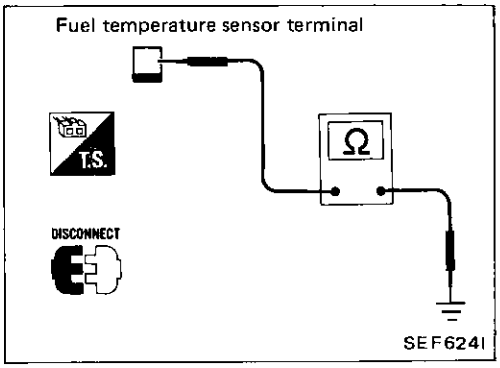
Check continuity between terminals ③ and ⑤.

| Conditions | Continuity |
|---|---|
| 12V direct current supply between terminals ① and ② | Yes |
| No current supply | No |

If N.G., replace relay.

### POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check resistance between teminals.
   **Resistance: Approximately 2 - 3Ω**

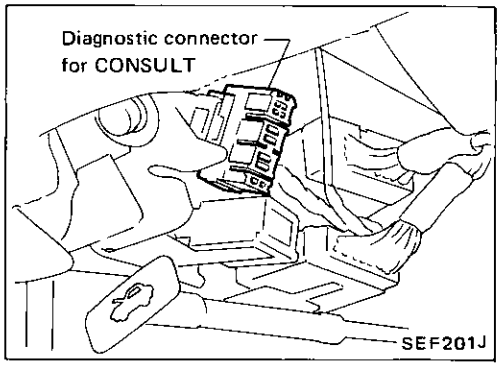



### FUEL TEMPERATURE SENSOR

1. Disconnect fuel temperature sensor harness connector.
2. Check resistance between teminal and ground as shown in the figure.

| Temperature °C (°F) | Resistance kΩ |
|---|---|
| 20 (68) | 2.1 - 2.9 |
| 50 (122) | 0.68 - 1.00 |
| 80 (176) | 0.30 - 0.33 |

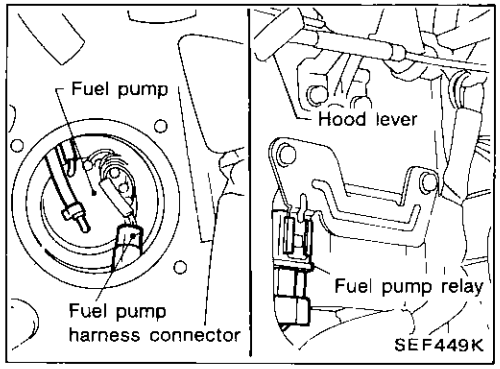
If N.G., replace fuel inhibitor switch.




## Releasing Fuel Pressure

**Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.**

Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.

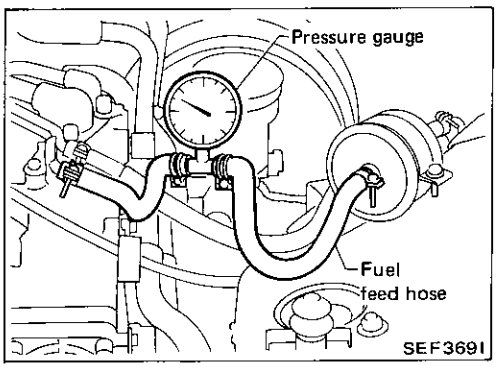



1. Remove fuel pump relay or disconnect fuel pump connector.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay or fuel pump connector.

## Fuel Pressure Check

**a. When reconnecting fuel line, always use new clamps.**
**b. Make sure that clamp screw does not contact adjacent parts.**
**c. Use a torque driver to tighten clamps.**
**d. Use Pressure Gauge to check fuel pressure.**
**e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.**

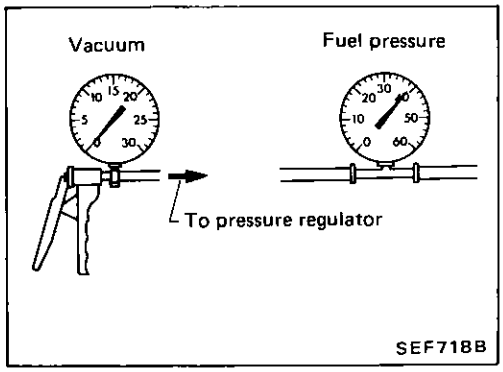
1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.




5. Read the indication of fuel pressure gauge.
   **At idling:**
   **When fuel pressure regulator valve vacuum hose is connected.**
   **Approximately 250.1 kPa (2.55 kg/cm$^2$, 36.3 psi)**
   **When fuel pressure regulator valve vacuum hose is disconnected.**
   **Approximately 299.1 kPa (3.05 kg/cm$^2$, 43.4 psi)**

## Fuel Pressure Check (Cont'd)

6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.




9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

**Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.**

## Injector Removal and Installation

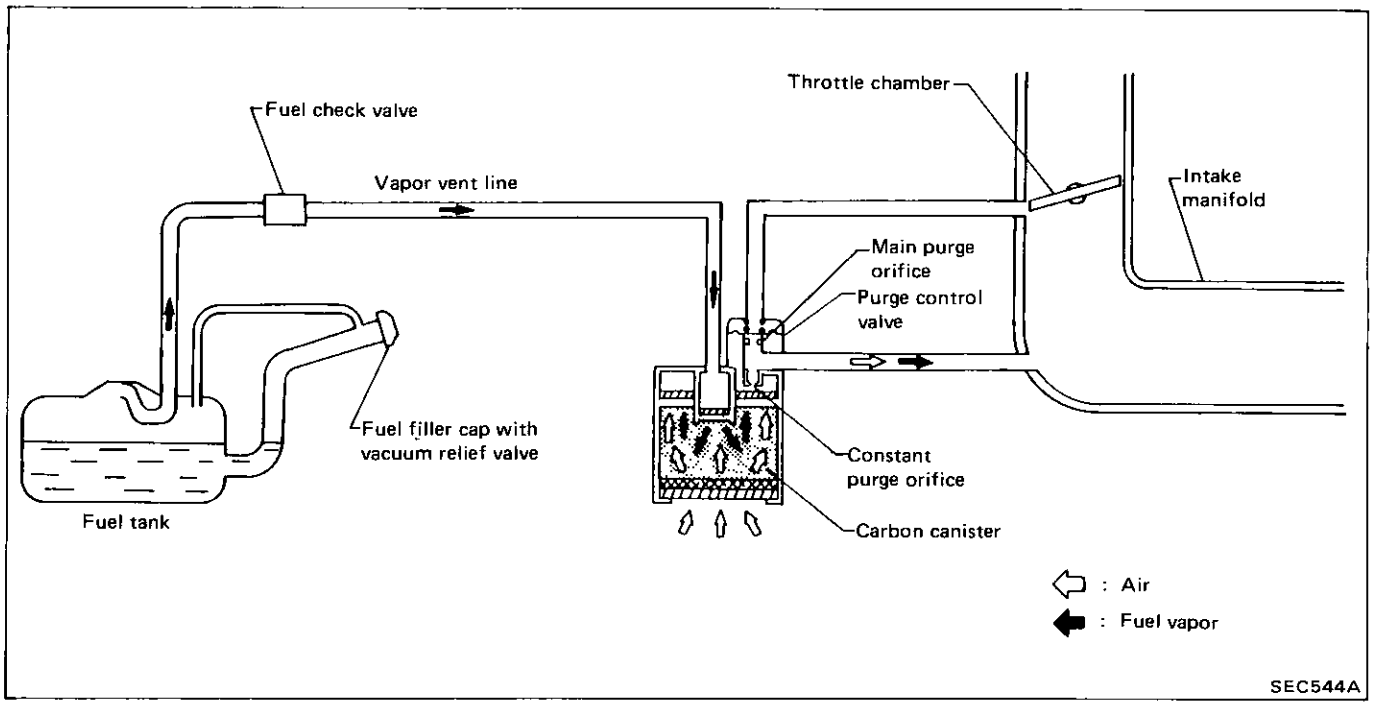
1. Release fuel pressure to zero.
2. Drain coolant from radiator drain cock.
3. Remove or disconnect the following:
- Related harnesses, wires and tubes
- Intake manifold collector
  For details, refer to EM section.
4. Remove injectors with fuel tube assembly.
5. Remove injectors from fuel tube assembly.
6. Install injectors as follows:
1) Clean exterior of injector tail piece.
2) Use new O-rings.

**CAUTION:**

**After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.**

7. Assemble injectors with fuel tube assembly to intake manifold.

## Description

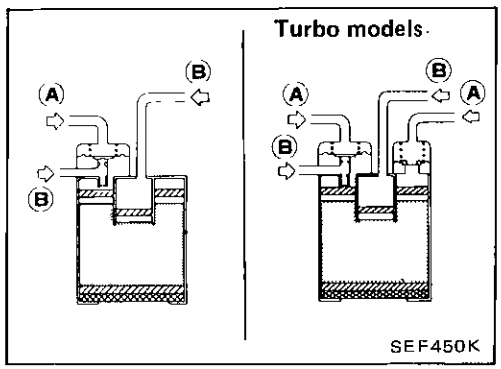



The evaporative emission control system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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.

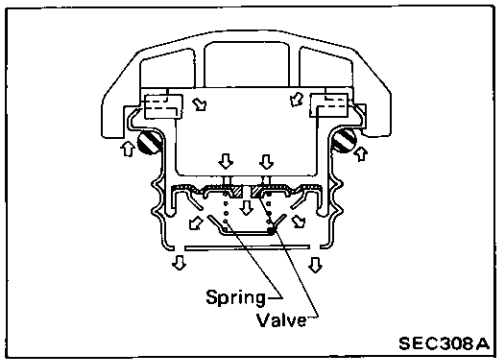


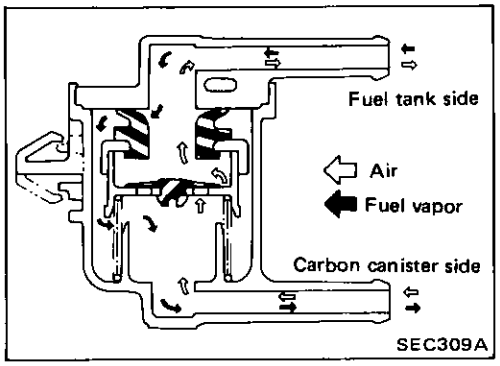

## Inspection

### 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

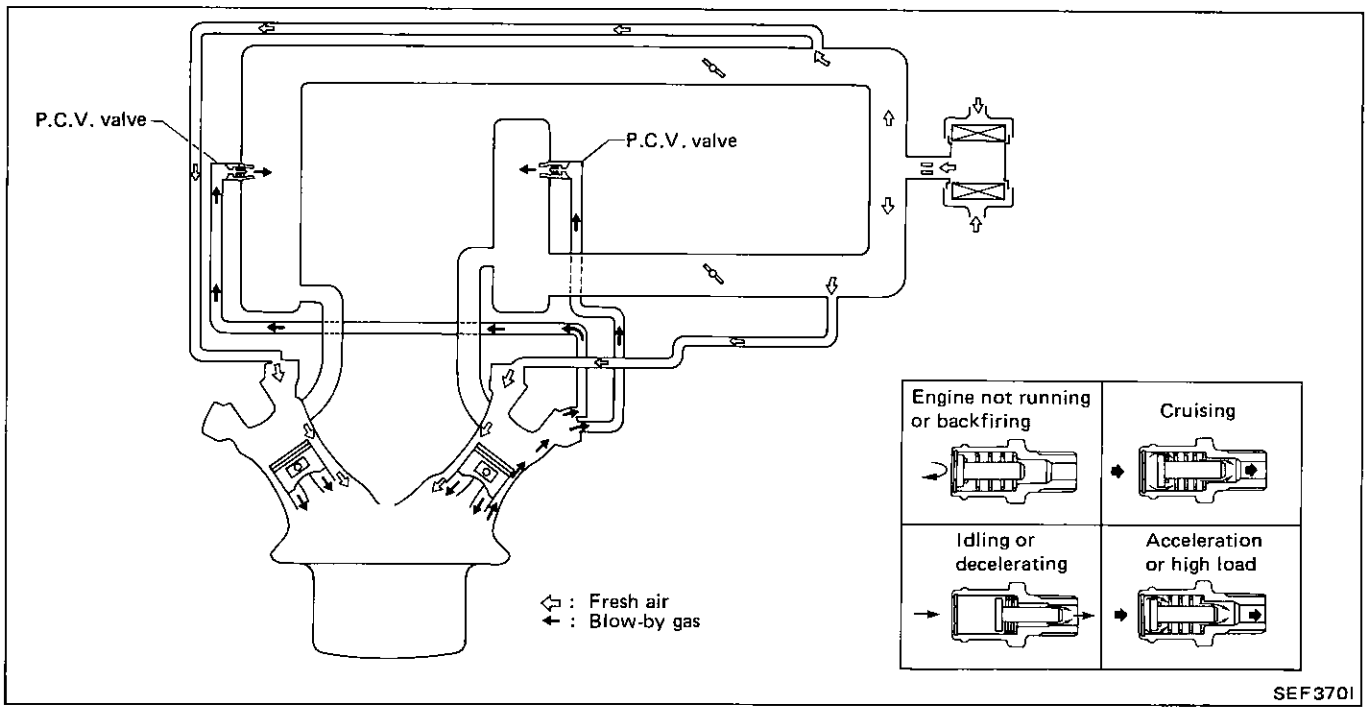
1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.

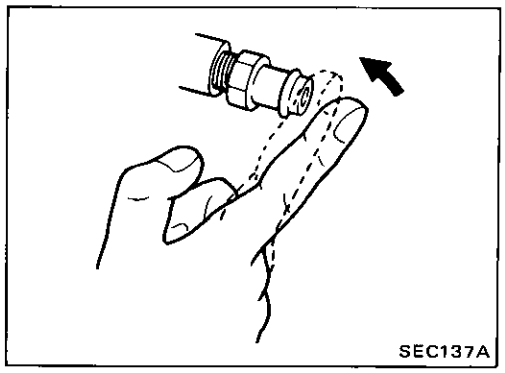
### FUEL CHECK VALVE

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the canister.
2. Blow air through connector on canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.

## Description

This system returns blow-by gas to both the intake manifold and air inlet tubes.
The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air inlet tubes, through the hose connecting air inlet tubes to rocker cover, into the crankcase.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air inlet tubes under all conditions.

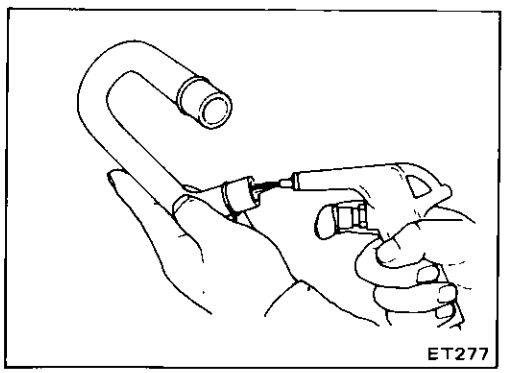



## Inspection

### P.C.V. (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from P.C.V. valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.




### VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

## General Specifications

| | |
|---|---|
| PRESSURE REGULATOR | |
| Regulated pressure kPa (kg/cm², psi) | 299.1 (3.05, 43.4) |

## Inspection and Adjustment

| | |
|---|---|
| Idle speed*1 rpm | |
| No-load*2 | |
| M/T | 700±50 |
| A/T (in "N" position) | |
| Non-turbo | 770±50 |
| Turbo | 750±50 |
| Air conditioner: ON | |
| Non-turbo | 800±50 |
| Turbo | 850±50 |
| Ignition timing degree | 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
- Steering wheel: Kept straight
- Electric load: OFF (Lights, heater, fan & rear defogger)
- Radiator fan: OFF

### IGNITION COIL

| | | |
|---|---|---|
| Primary voltage | V | 12 |
| Primary resistance [at 20°C (68°F)] | Ω | Approximately 0.7 |
| Secondary resistance [at 20°C (68°F)] | kΩ | Approximately 8 |

### ENGINE 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 |

### EXHAUST GAS SENSOR HEATER

| | | |
|---|---|---|
| Resistance | Ω | 3 - 1,000 |

### A.A.C. VALVE

| | | |
|---|---|---|
| Resistance | Ω | Approximately 10 |

### INJECTOR

| | | |
|---|---|---|
| Resistance | Ω | 10 - 14 |

### THROTTLE SENSOR

| Accelerator pedal conditions | Resistance kΩ |
|---|---|
| Completely released | Approximately 1 |
| Partially released | 1 - 9 |
| Completely depressed | Approximately 9 |

### AIR REGULATOR

| | | |
|---|---|---|
| Resistance | Ω | 70 - 80 |

### POWER STEERING OIL PRESSURE SWITCH

| | | |
|---|---|---|
| Resistance | Ω | Approximately 2 - 3 |

# ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

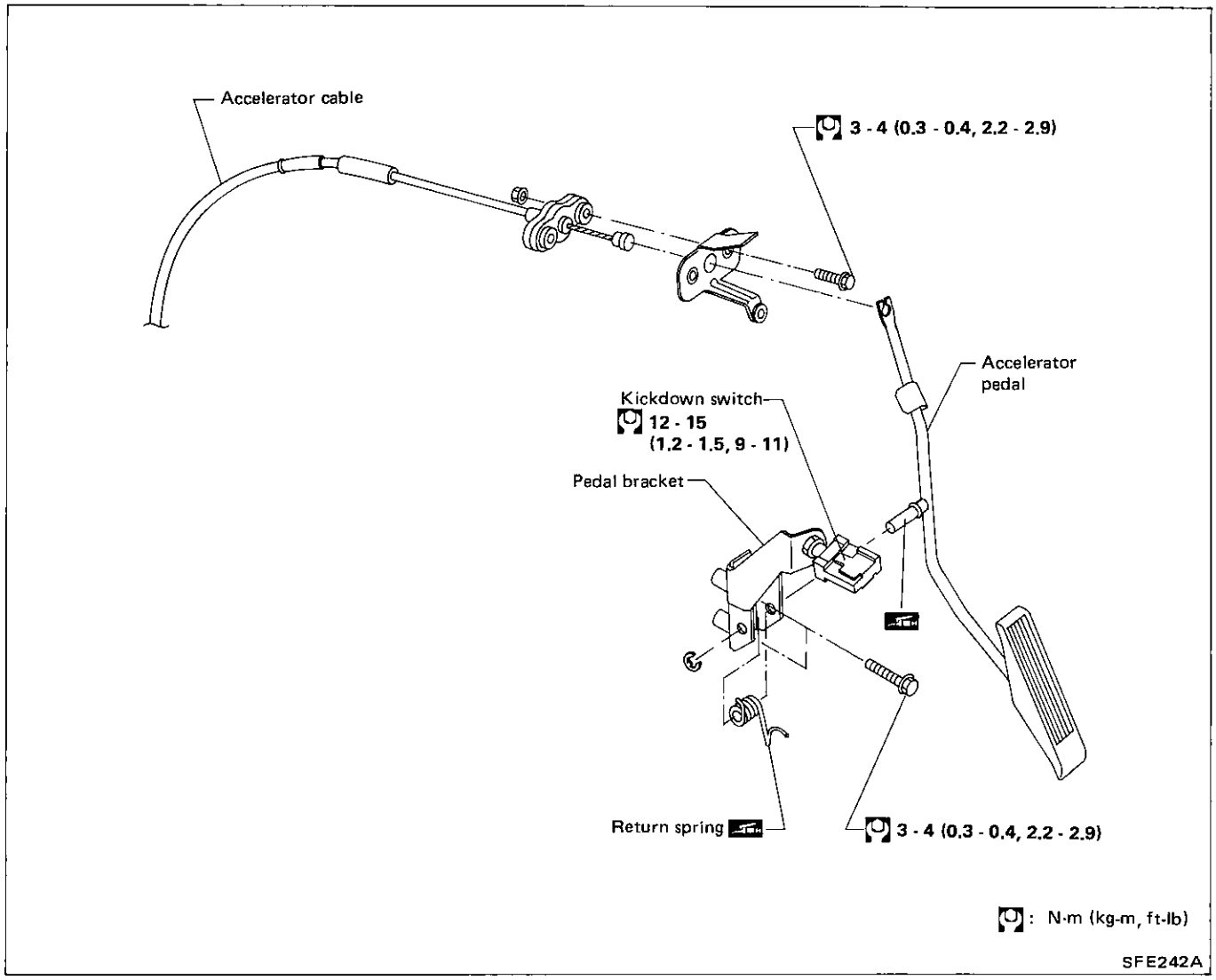
SECTION FE

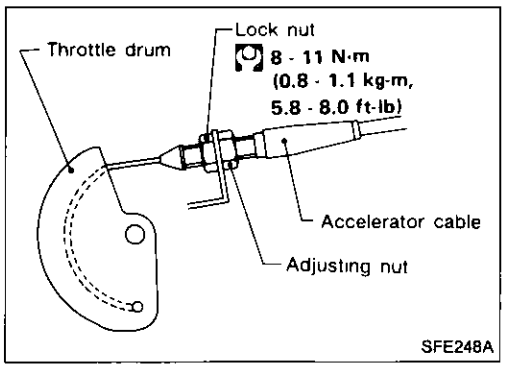
## CONTENTS


ACCELERATOR CONTROL SYSTEM ..... FE-2
FUEL SYSTEM ..... FE-3
EXHAUST SYSTEM ..... FE-5

**CAUTION:**

- **When removing accelerator cable, make a mark to indicate lock nut's initial position.**
- **Check that throttle valve opens fully when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.**
- **Check accelerator control parts for improper contact with any adjacent parts.**
- **When connecting accelerator cable, be careful not to twist or scratch its inner wire.**
- **Refer to EL section for A.S.C.D. cable adjustment.**
- **For Kickdown switch adjustment, refer to "ON-VEHICLE SERVICE" in AT section.**




## Adjusting Accelerator Cable

1. Loosen lock nut, and tighten adjusting nut until throttle drum starts to move.
2. From that position turn back adjusting nut 1.5 to 2 turns, and fasten it with lock nut.

**WARNING:**

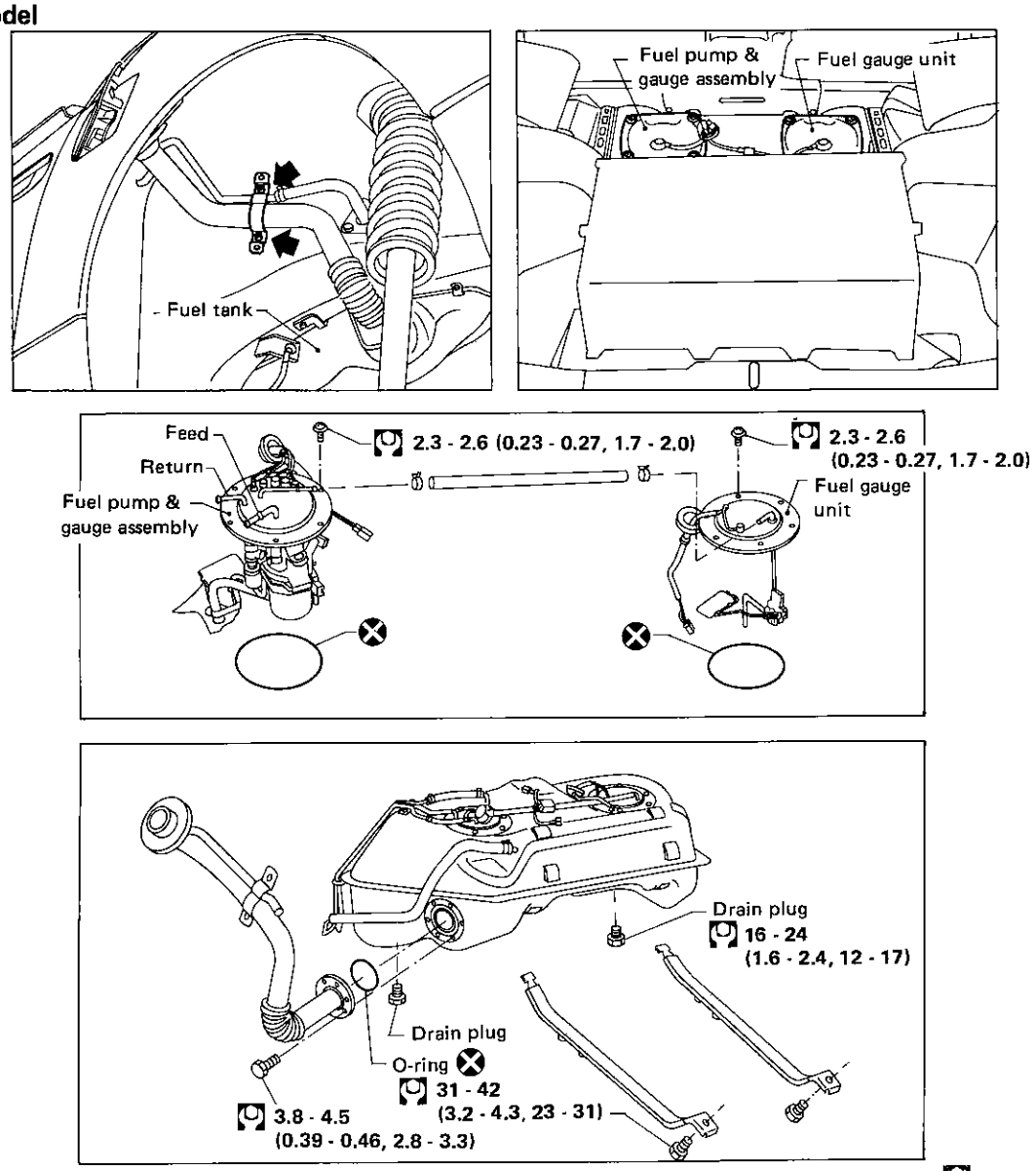
**When replacing fuel line parts, be sure to observe the following:**

- **Put a "CAUTION: INFLAMMABLE" sign in workshop.**
- **Be sure to furnish workshop with a $CO_2$ fire extinguisher.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to disconnect battery ground cable before conducting operations.**
- **Drain fuel from Fuel Tank and put drained fuel in an explosion-proof container and put lid on securely.**

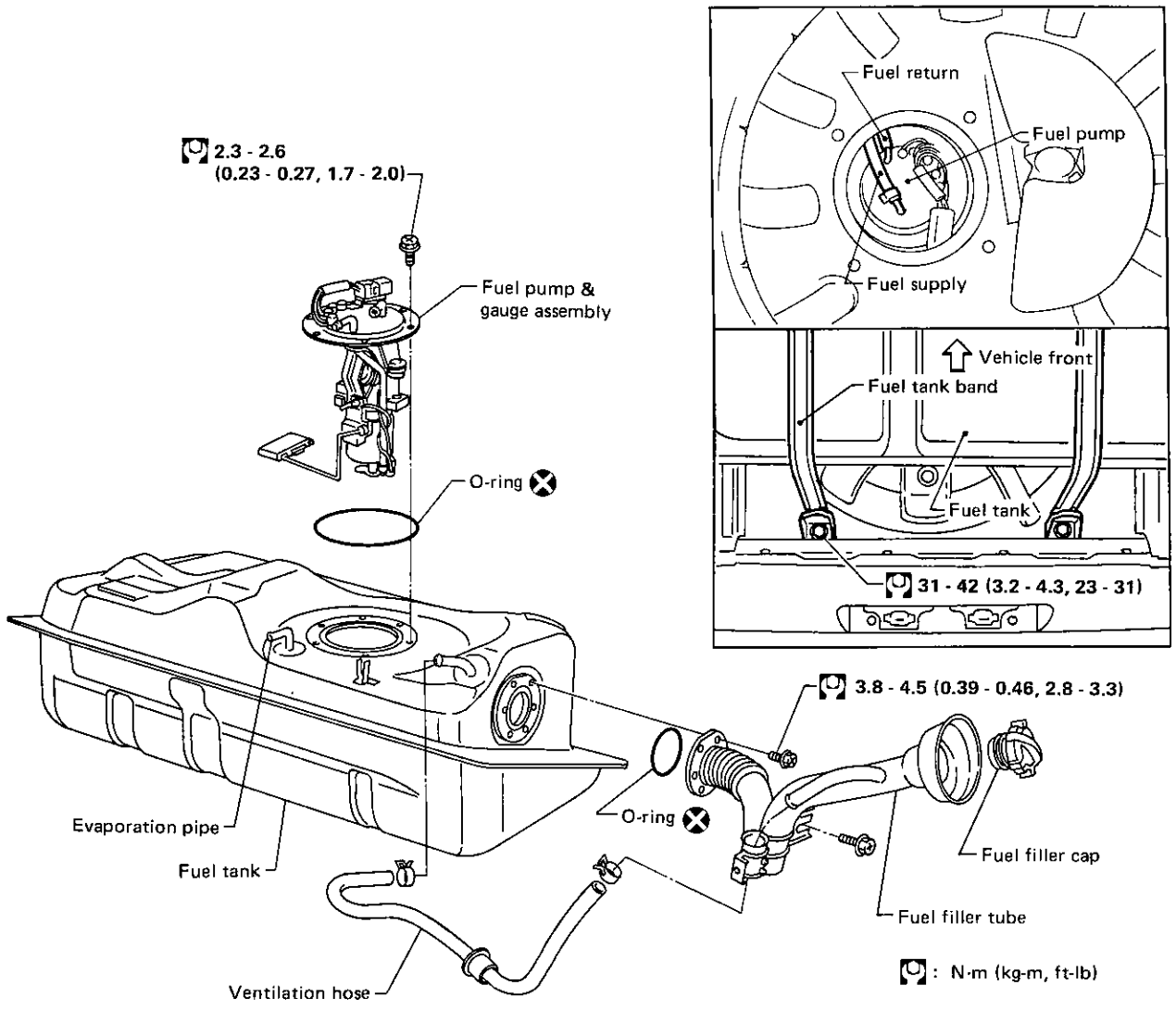
**CAUTION:**

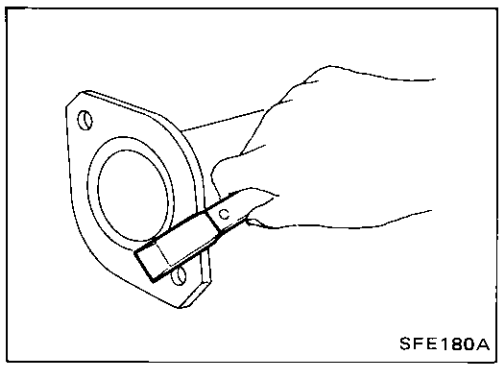
- **Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.**
- **Do not disconnect any fuel line unless absolutely necessary.**
- **Plug hose and pipe openings to prevent entry of dust or dirt.**
- **Always replace O-ring and clamps with new ones.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose clamps excessively to avoid damaging hoses.**
- **When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)**
- **Tighten bolts to specified torque.**
- **After installation, run engine and check for fuel leaks at connections.**

2 seater model



2 + 2 seater model

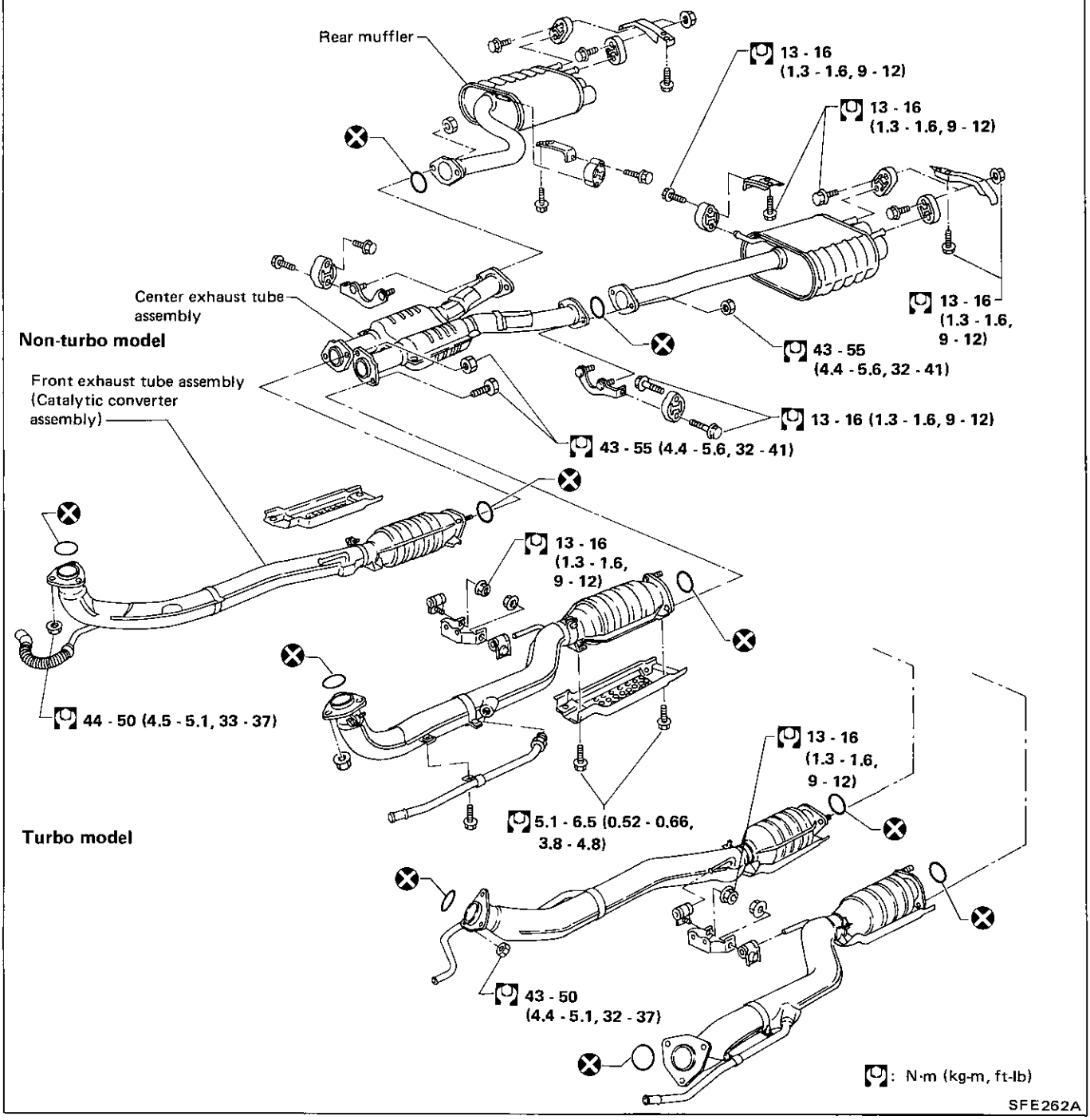




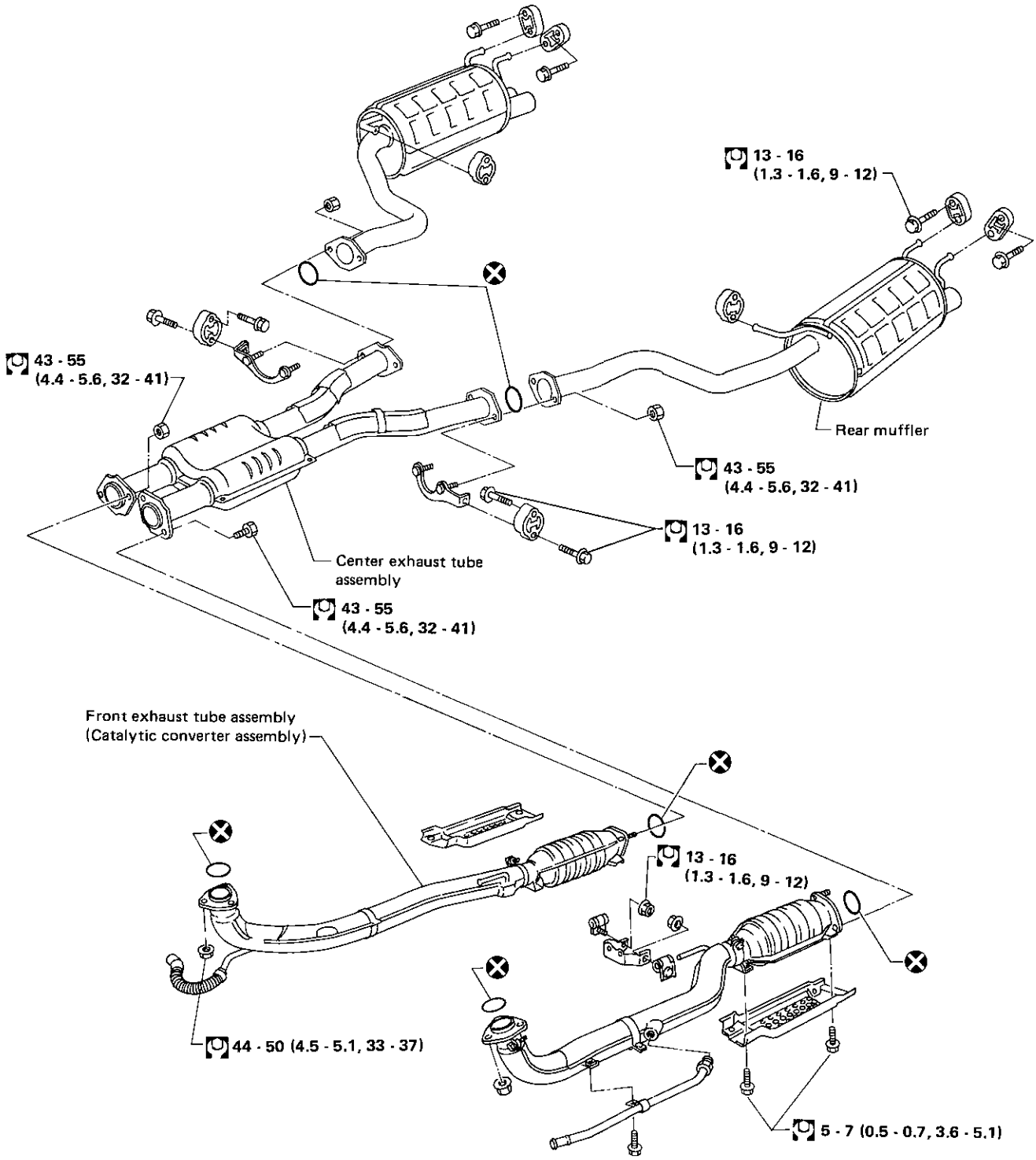

**CAUTION:**

- **Always replace exhaust gaskets with new ones when reassembling.**
  **If gasket is left on flange surface, scrape off completely as shown at left.**
- **With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.**
- **After installation, check to ensure that mounting brackets and mounting insulators are free from undue stress. If any of the above parts are not installed properly, excessive noise or vibration may be transmitted to the vehicle body.**

2 seater model



2 + 2 seater model



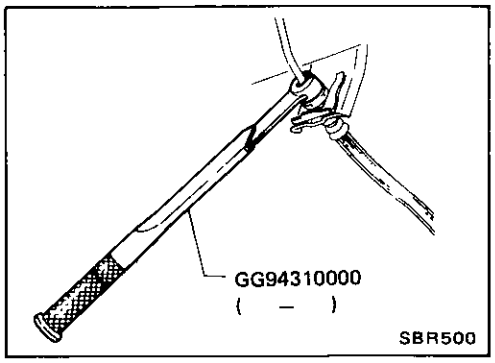

: N·m (kg-m, ft-lb)

SFE263A

# SECTION CL

## CONTENTS

PRECAUTIONS AND PREPARATION ..... CL- 2
CLUTCH SYSTEM ..... CL- 4
INSPECTION AND ADJUSTMENT ..... CL- 6
HYDRAULIC CLUTCH CONTROL ..... CL- 8
CLUTCH RELEASE MECHANISM ..... CL-11
CLUTCH DISC AND CLUTCH COVER ..... CL-13
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... CL-15



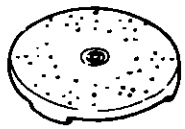
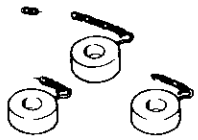
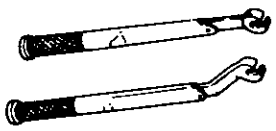
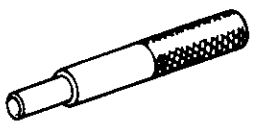
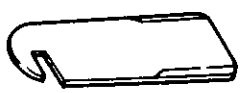

## Precautions

- **Recommended fluid is brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **When removing and installing clutch piping, use Tool.**
- **Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.**
- **Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.**

**WARNING:**
**After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.**

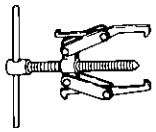
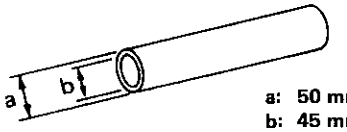
## Preparation

### SPECIAL SERVICE TOOLS

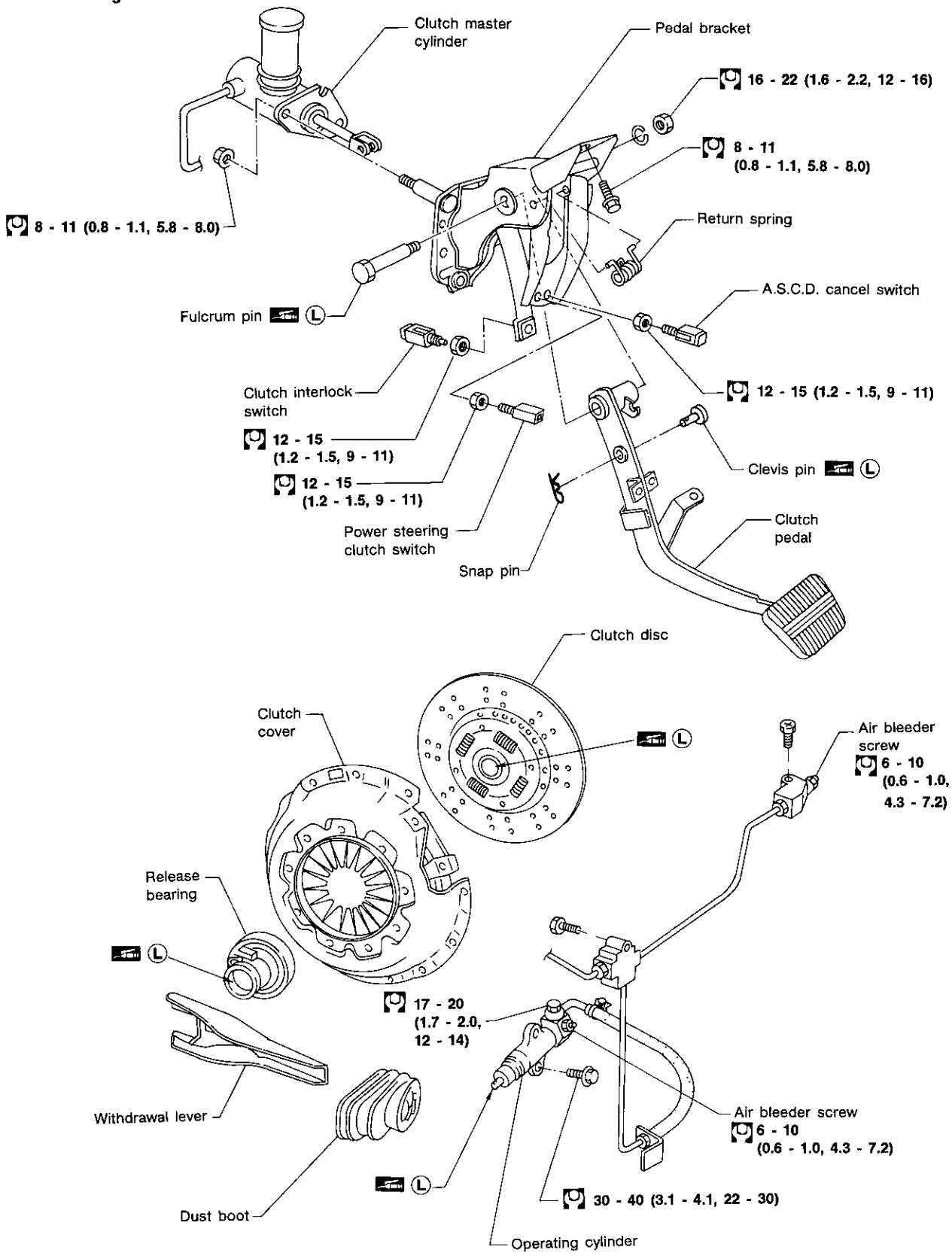
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| ST20050010<br>( – )<br>Base plate |  | Inspecting diaphragm spring of clutch cover |
| ST20050100<br>( – )<br>Distance piece |  | Inspecting diaphragm spring of clutch cover |
| GG94310000<br>( – )<br>Flare nut torque wrench |  | Removing and installing each clutch piping |
| ST20600000<br>(J26366)<br>Clutch aligning bar |  | Installing clutch cover and clutch disc |
| ST20050240<br>( – )<br>Diaphragm spring adjusting wrench |  | Adjusting unevenness of diaphragm spring of clutch cover |

## Preparation (Cont'd)

### COMMERCIAL SERVICE TOOLS

| Tool name | Description | |
|---|---|---|
| Bearing puller |  | Removing release bearing |
| Bearing drift |  a: 50 mm (1.97 in) dia.<br>b: 45 mm (1.77 in) dia. | Installing release bearing |

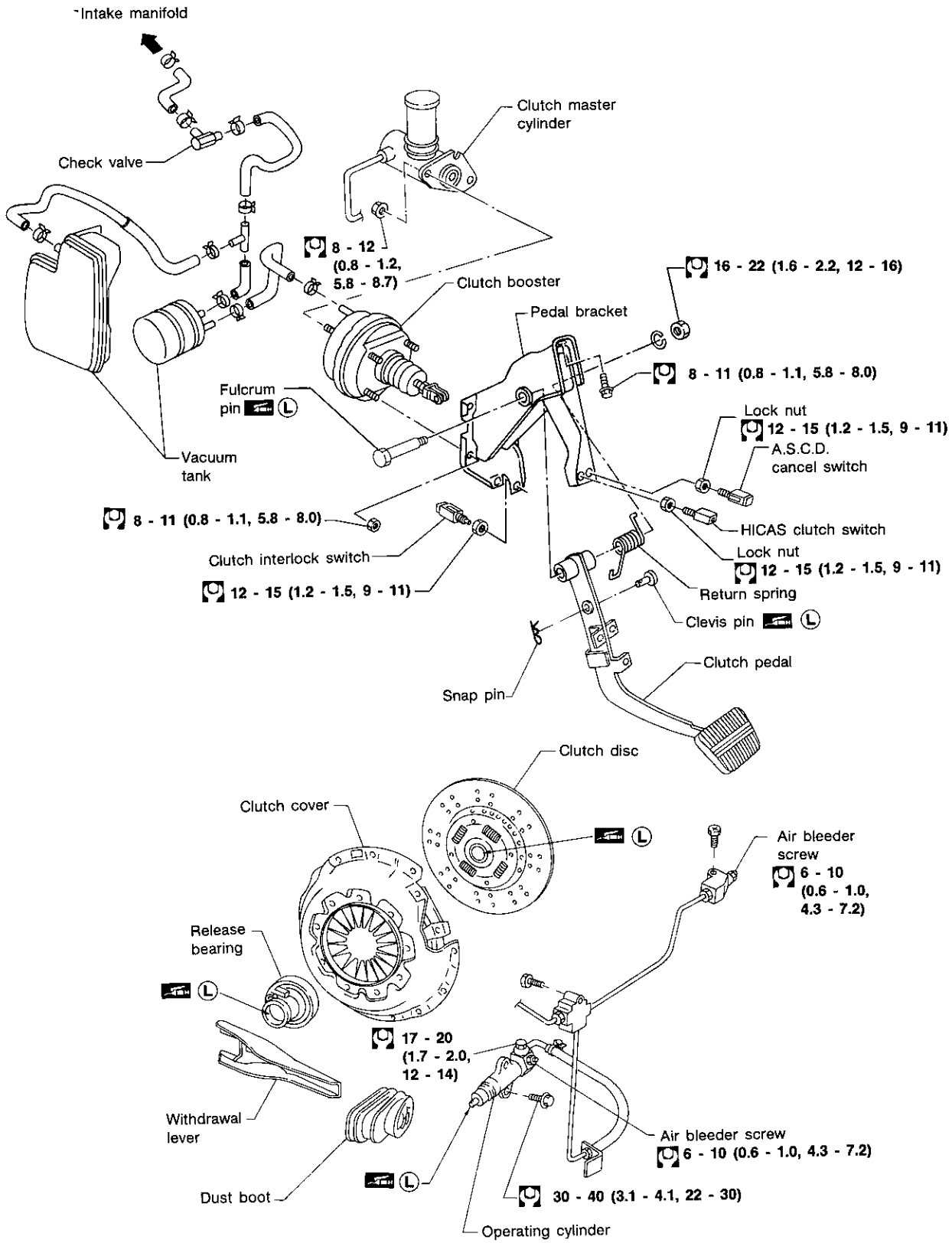
## VG30DE engine model




: N•m (kg-m, ft-lb)
(L) : Apply lithium-based grease including molybdenum disulphide.

SCL436

## VG30DETT engine model




: N•m (kg-m, ft-lb)
(L) : Apply lithium-based grease including molybdenum disulphide.

SCL437

## Adjusting Clutch Pedal

1. Adjust pedal height with A.S.C.D. cancel switch and HICAS clutch switch or power steering clutch switch.

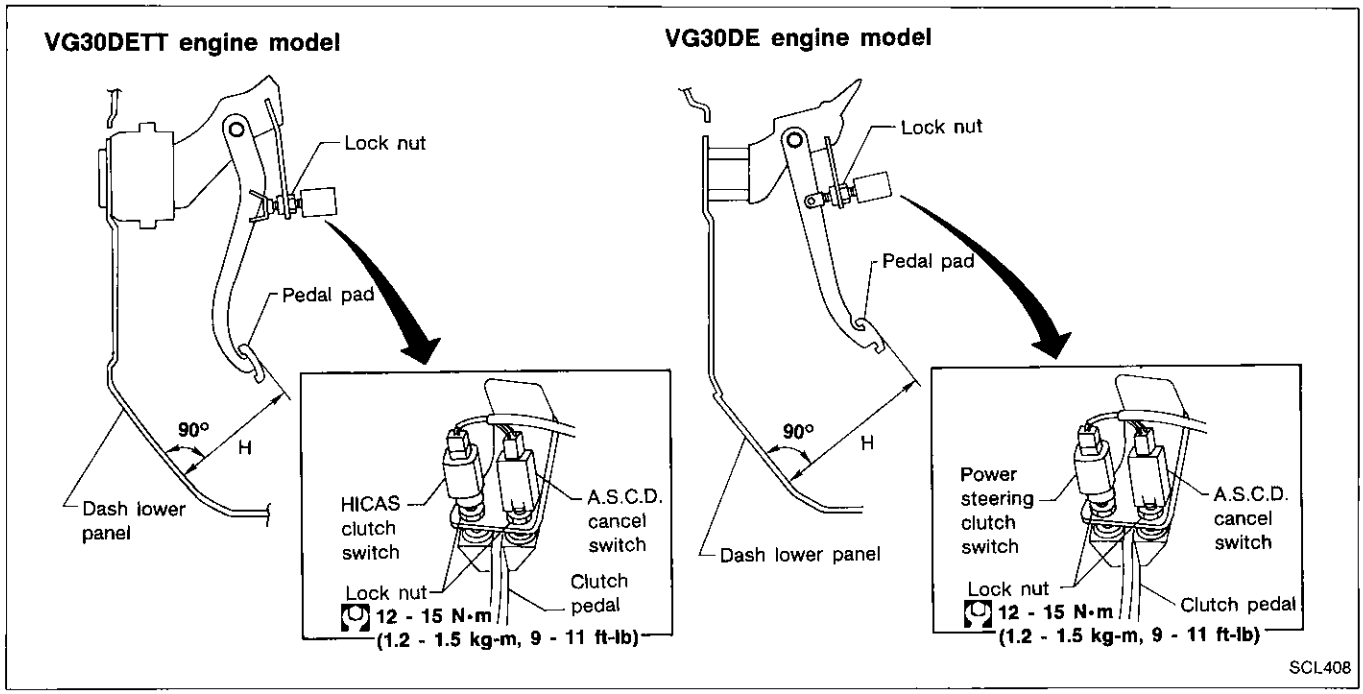
**Pedal height "H":**

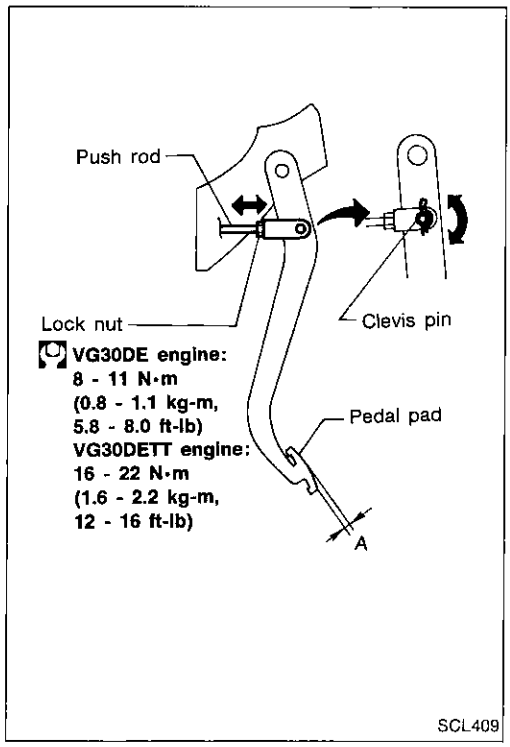
**VG30DE engine**

**197 - 207 mm (7.76 - 8.15 in)**

**VG30DETT engine**

**183 - 193 mm (7.20 - 7.60 in)**




2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.

**Pedal free play "A":**

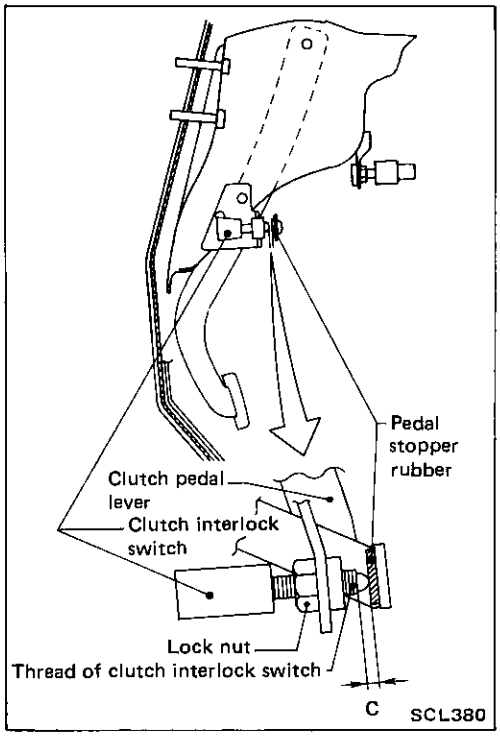
**1.0 - 3.0 mm (0.039 - 0.118 in)**

**Pedal free play means the following measured at position of pedal pad:**

- **Play due to clevis pin and clevis pin hole in clutch pedal.**

3. Make sure that clevis pin can be rotated smoothly.
   If not, readjust pedal free play with master cylinder push rod.

## Adjusting Clutch Pedal (Cont'd)

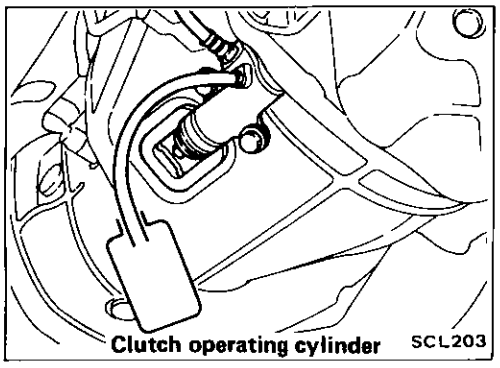


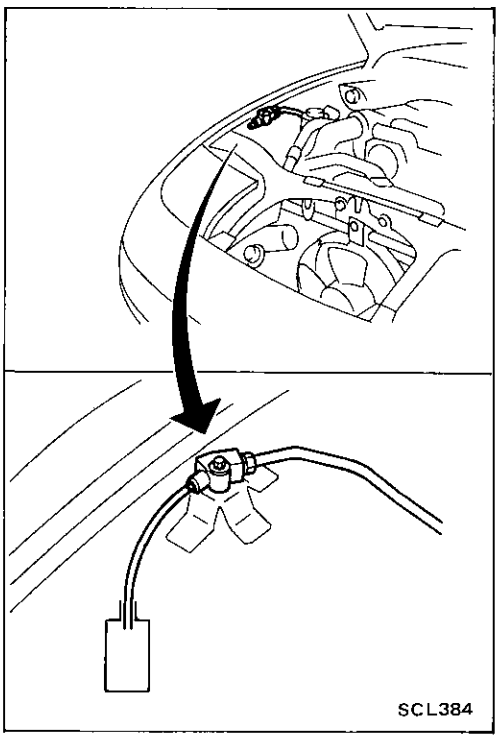

**— U.S.A. model only —**

4. Adjust clearance "C" between pedal stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.

   **Clearance C:**

   **1.0 - 2.0 mm (0.039 - 0.079 in)**




## Bleeding Procedure

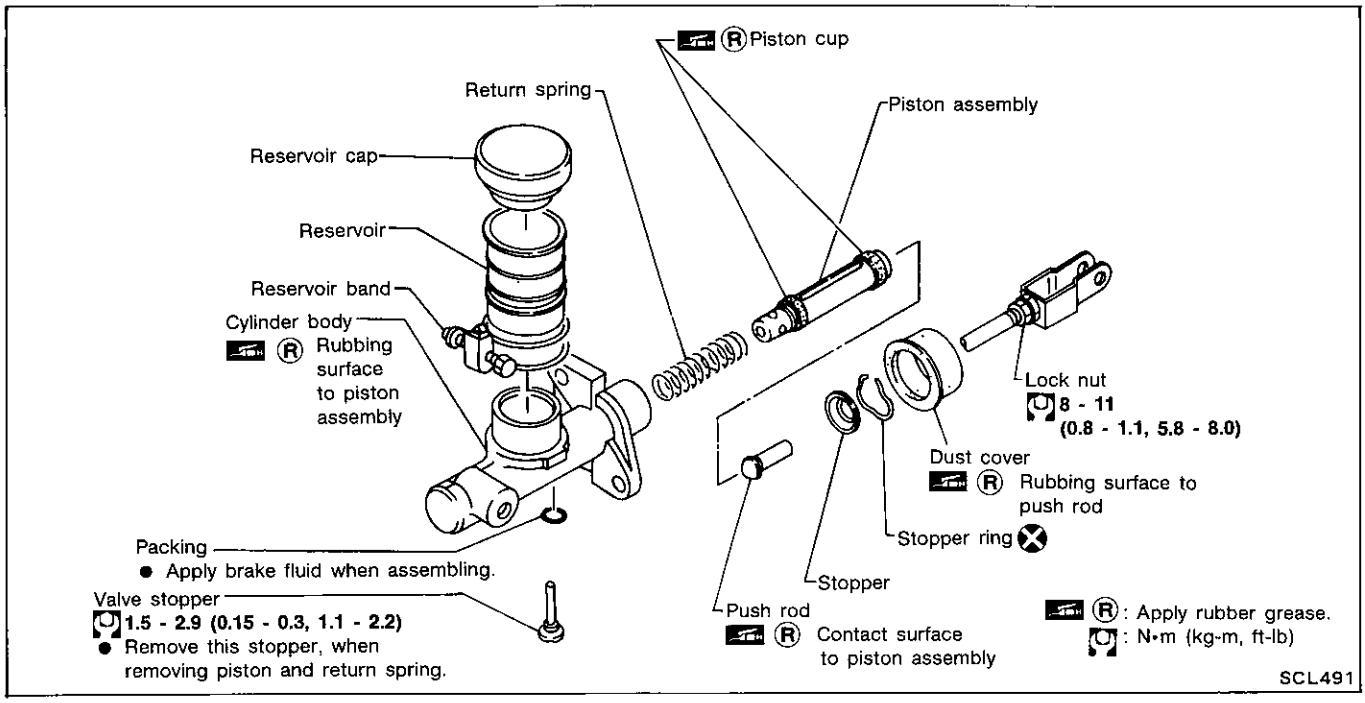
1. Bleed air from clutch operating cylinder according to the following procedure.

**Carefully monitor fluid level at master cylinder during bleeding operation.**

a. Top up reservoir with recommended brake fluid.
b. Connect a transparent vinyl tube to air bleeder valve.
c. Fully depress clutch pedal several times.
d. With clutch pedal depressed, open bleeder valve to release air.
e. Close bleeder valve.
f. Repeat steps c through e above until brake fluid flows from air bleeder valve without air bubbles.

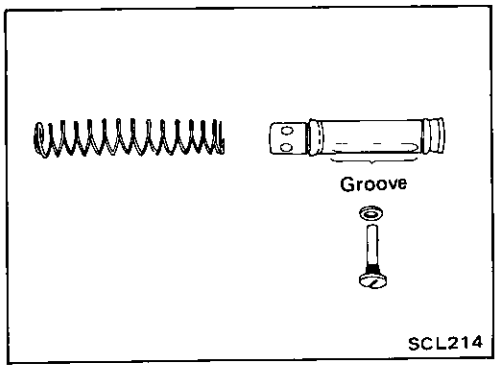
2. Bleed air from clutch piping connector according to the above same procedure.
3. Repeat the above bleeding procedures 1 and 2 several times.

## Clutch Master Cylinder




### DISASSEMBLY AND ASSEMBLY

- Push piston into cylinder body with screwdriver when removing and installing valve stopper.

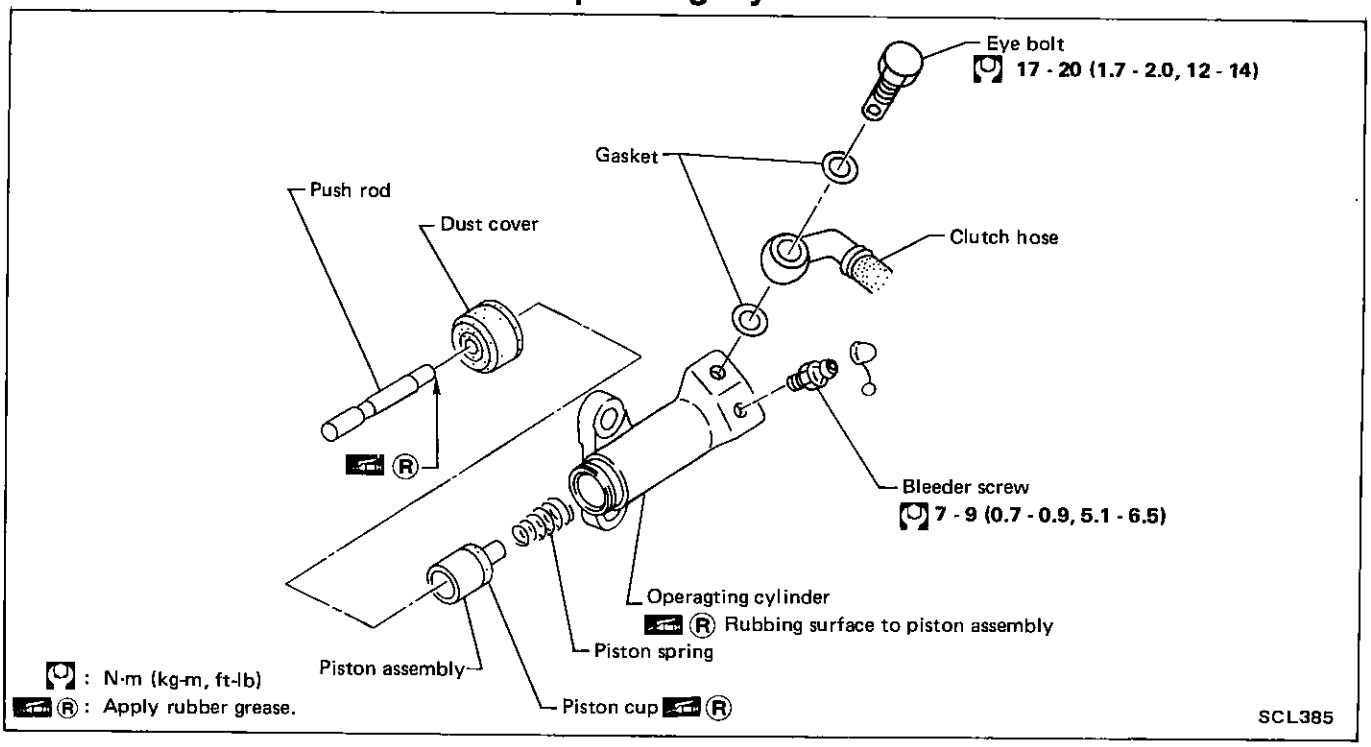



- Align groove of piston assembly and valve stopper when installing valve stopper.
- Check direction of piston cups.

### INSPECTION

- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

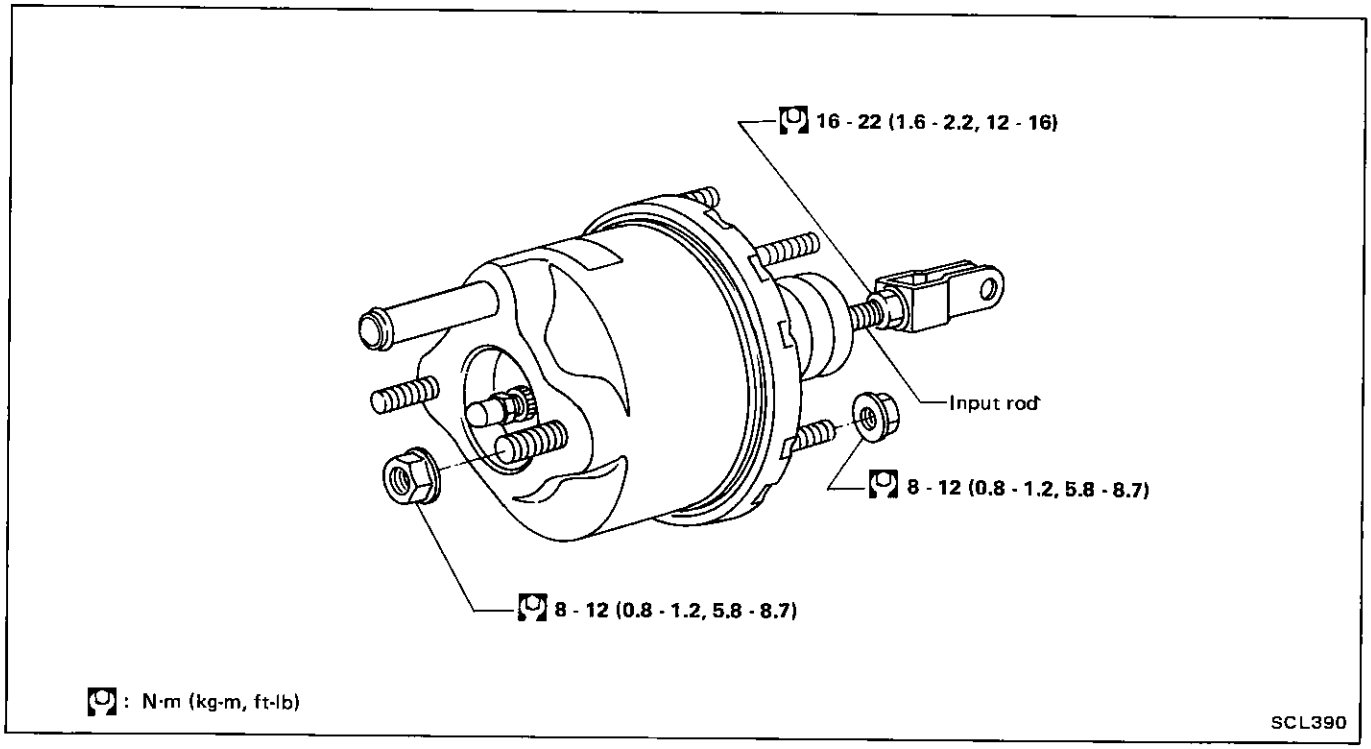
## Operating Cylinder




### INSPECTION

- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check piston spring for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

## Clutch Booster

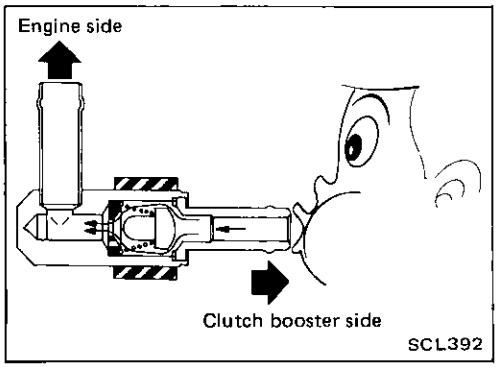


## Clutch Booster (Cont'd)

### INSPECTION

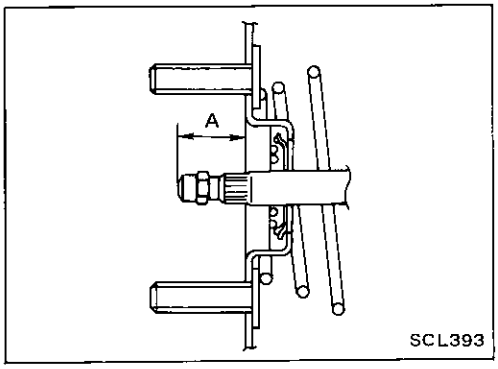
**Hoses and connectors**

- Check condition of vacuum hoses and connections.
- Check vacuum hoses and check valve for air tightness.



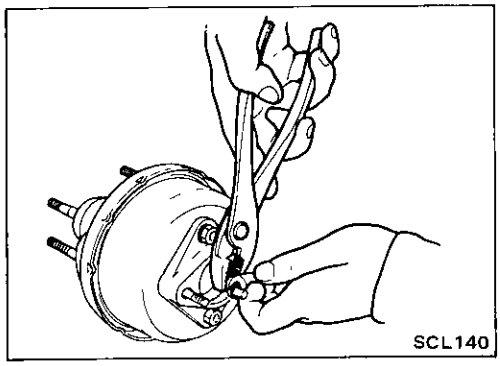

**Check valve**

- Install check valve properly paying attention to its direction.
- When pressure is applied to the clutch booster side of check valve and valve does not open, replace check valve with a new one.

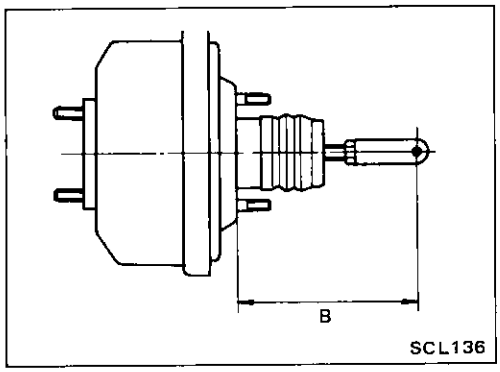



### ADJUSTMENT

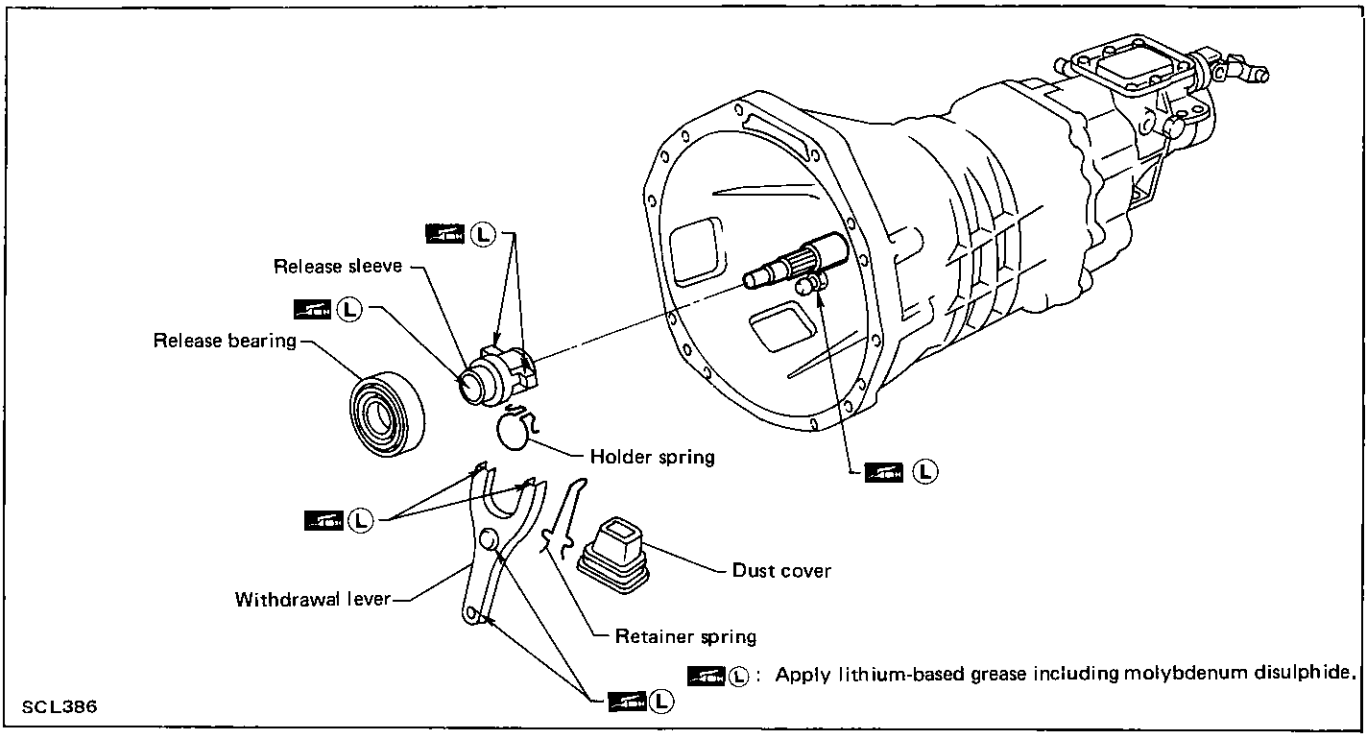
**Output rod length "A":**
**13.35 - 13.60 mm (0.5256 - 0.5354 in)**

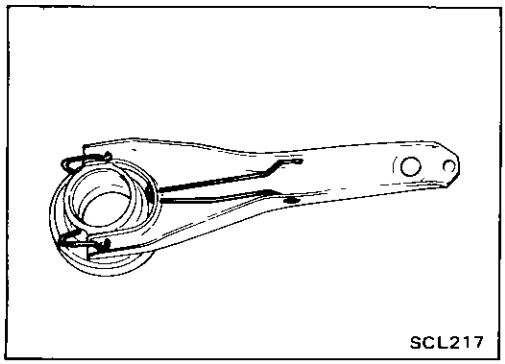



**If amount of adjustment required exceeds 0.5 mm (0.020 in), reaction disc may have either been dislocated or fallen off. Replace clutch booster assembly.**



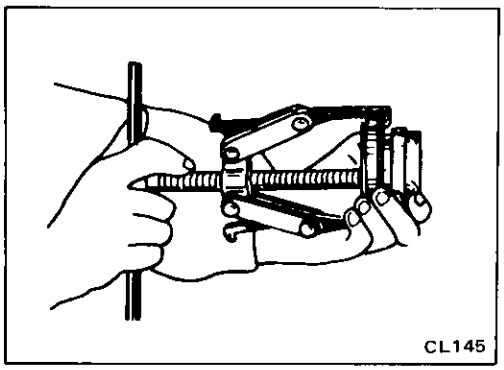

**Input rod length "B":**
**113 mm (4.45 in)**



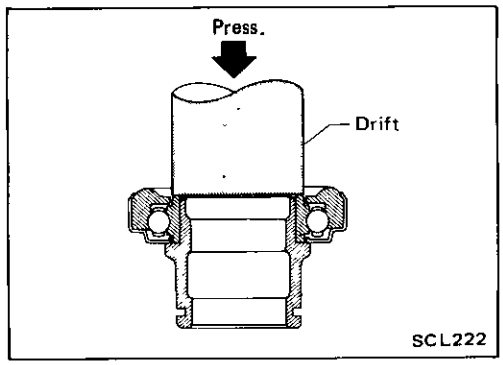




## REMOVAL AND INSTALLATION

- Install retainer spring and holder spring.



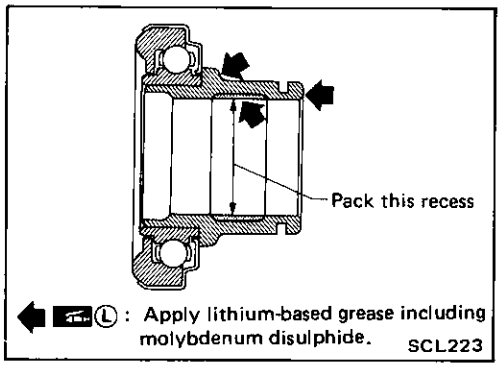

- Remove release bearing.




- Install release bearing with suitable drift.

## INSPECTION

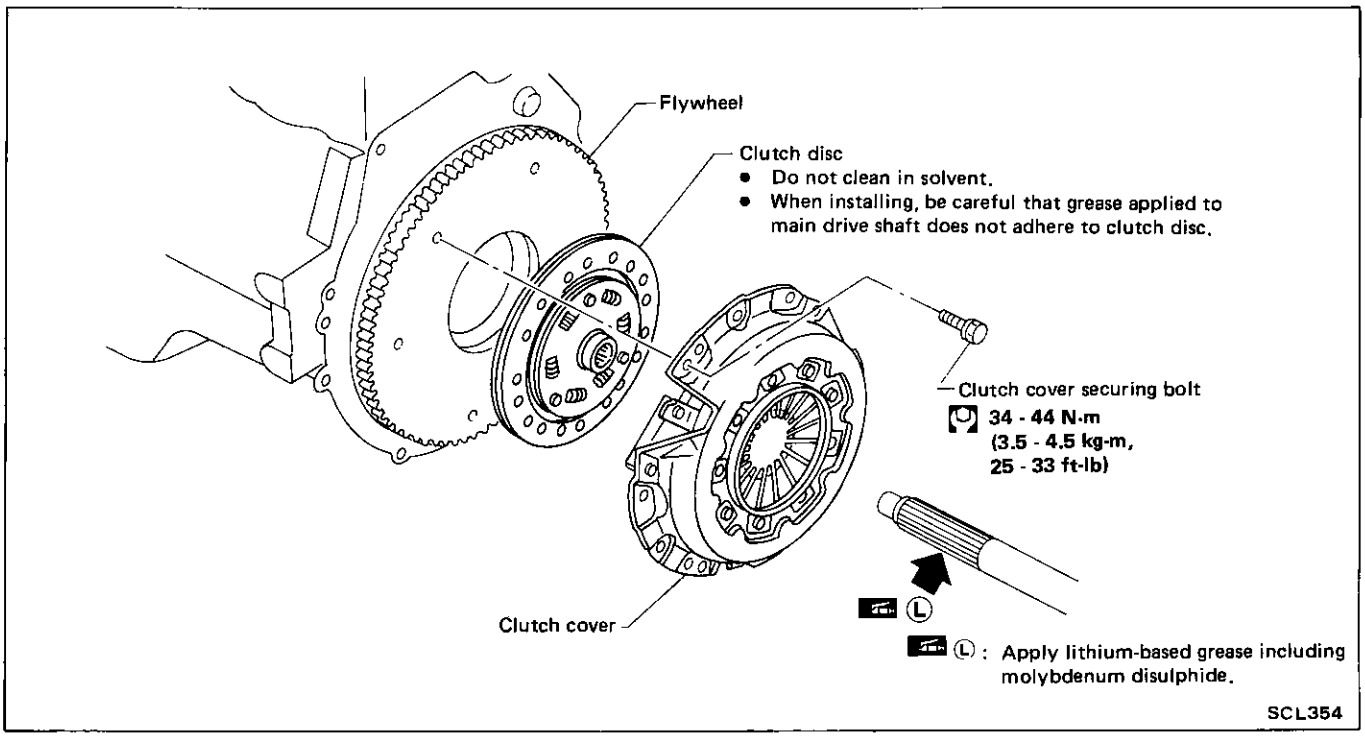
- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.

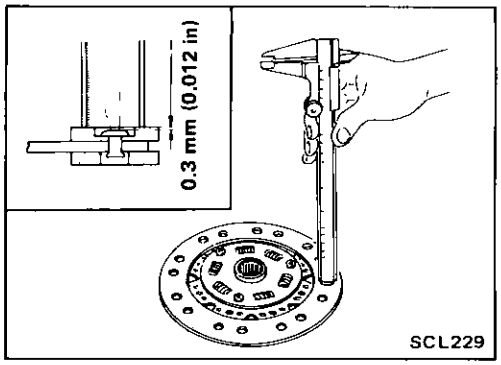


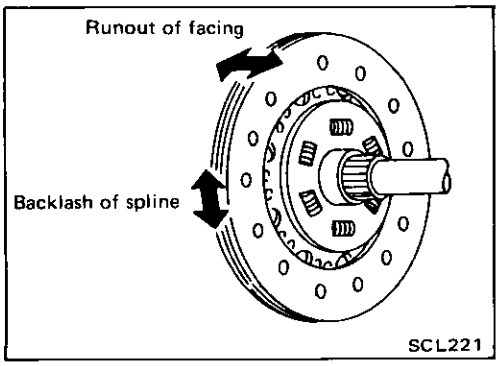

## LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

**Too much lubricant might damage clutch disc facing.**




## Clutch Disc

### INSPECTION

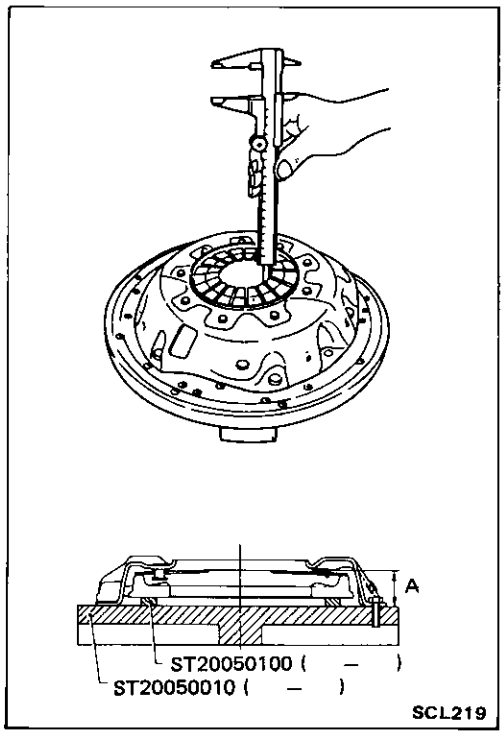
- Check clutch disc for wear of facing.
  **Wear limit of facing surface to rivet head:**
  **0.3 mm (0.012 in)**

- Check clutch disc for backlash of spline and runout of facing.
  **Maximum backlash of spline (at outer edge of disc):**
  **1.0 mm (0.039 in)**
  **Runout limit:**
  **1.0 mm (0.039 in)**
  **Distance of runout check point (from hub center):**
  **VG30DE engine**
  **115 mm (4.53 in)**
  **VG30DETT engine**
  **120 mm (4.72 in)**
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.

### INSTALLATION

- Apply recommended grease to contact surface of spring portion.

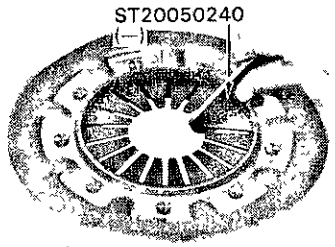
**Too much lubricant might damage clutch disc facing.**



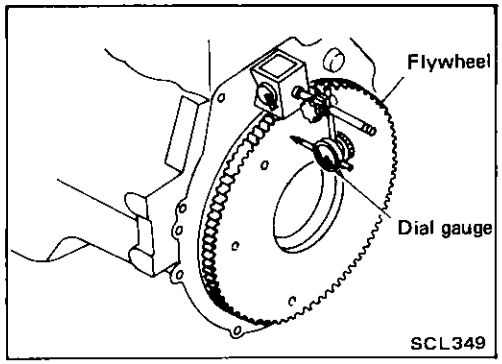

## Clutch Cover and Flywheel

### INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.
  **Diaphragm spring height "A":**
  **VG30DE engine**
  **37.5 - 39.5 mm (1.476 - 1.555 in)**
  **VG30DETT engine**
  **36.5 - 38.5 mm (1.437 - 1.516 in)**
- **Set 0.5 mm (0.020 in) feeler gauges on distance pieces (ST20050100) when checking diaphragm spring height.**
- Check thrust rings for wear or damage by shaking cover assembly and listening for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.

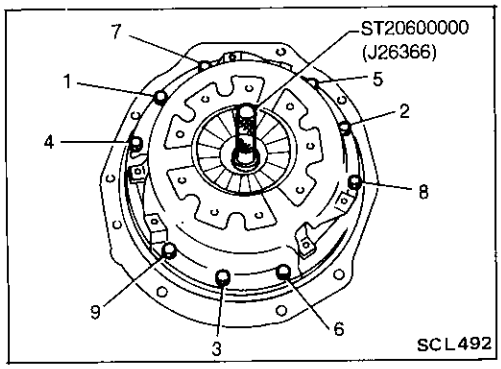



- Adjust unevenness of diaphragm spring with Tool.
  **Uneven limit:**
  **0.5 mm (0.020 in)**




### FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.
  **Runout (Total indicator reading):**
  **Less than 0.15 mm (0.0059 in)**




### INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.
- Tighten bolts in numerical order.
- Be careful not to allow grease to contaminate clutch facing.

# General Specifications

## CLUTCH CONTROL SYSTEM

| | |
|---|---|
| Type of clutch control | Hydraulic |

## CLUTCH MASTER CYLINDER

| | | |
|---|---|---|
| Inner diameter | mm (in) | 15.87 (5/8) |

## CLUTCH OPERATING CYLINDER

| | | |
|---|---|---|
| Inner diameter | mm (in) | 19.05 (3/4) |

## CLUTCH DISC

| Model | 240TBL | 250TBL |
|---|---|---|
| Engine | VG30DE | VG30DETT |
| Facing size (Outer dia. x inner dia. x thickness) mm (in) | 240 x 160 x 3.5 (9.45 x 6.30 x 0.138) | 250 x 160 x 3.5 (9.84 x 6.30 x 0.138) |
| Thickness of disc assembly With load mm (in) | 8.1 - 8.5 (0.319 - 0.335) with 4,904 N (500 kg, 1,103 lb) | |

## CLUTCH COVER

| Model | | C240S | C250S |
|---|---|---|---|
| Engine | | VG30DE | VG30DETT |
| Full load | N (kg, lb) | 5,688 (580, 1,279) | 7,846 (800, 1,764) |

## CLUTCH BOOSTER (VG30DETT engine model)

| Model | | M45 |
|---|---|---|
| Diaphragm diameter | mm (in) | 114.3 (4.50) |

# Inspection and Adjustment

## CLUTCH PEDAL

Unit: mm (in)

| Engine | VG30DE | VG30DETT |
|---|---|---|
| Pedal height "H*" | 197 - 207 (7.76 - 8.15) | 183 - 193 (7.20 - 7.60) |
| Pedal free play (Backlash at clevis) | 1.0 - 3.0 (0.039 - 0.118) | |
| Clearance between pedal stopper rubber and threaded end of clutch interlock | 1.0 - 2.0 (0.039 - 0.079) | |

*: Measured from surface of dash lower panel to pedal pad

## CLUTCH DISC

Unit: mm (in)

| Model | 240TBL | 250TBL |
|---|---|---|
| Wear limit of facing surface to rivet head | 0.3 (0.012) | |
| Runout limit of facing | 1.0 (0.039) | |
| Distance of runout check point (from the hub center) | 115 (4.53) | 120 (4.72) |
| Maximum backlash of spline (at outer edge of disc) | 1.0 (0.039) | |

## CLUTCH COVER

Unit: mm (in)

| Model | C240S | C250S |
|---|---|---|
| Diaphragm spring height | 37.5 - 39.5 (1.476 - 1.555) | 36.5 - 38.5 (1.437 - 1.516) |
| Uneven limit of diaphragm spring toe height | 0.5 (0.020) | |

## CLUTCH BOOSTER

Unit: mm (in)

| | |
|---|---|
| Output rod length "A" | 13.35 - 13.60 (0.5256 - 0.5354) |
| Input rod length "B" | 113 (4.45) |

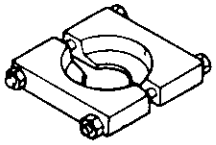
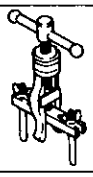
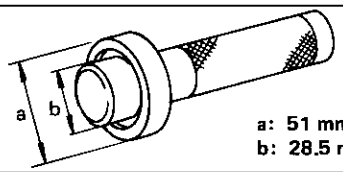
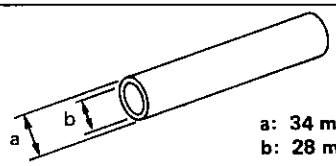
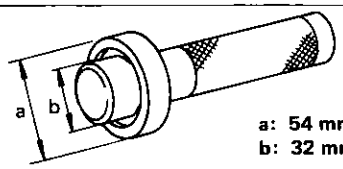
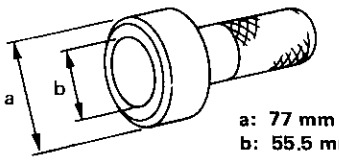
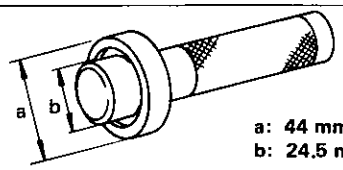
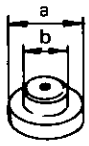
# MANUAL TRANSMISSION

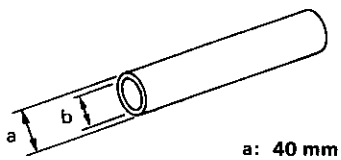
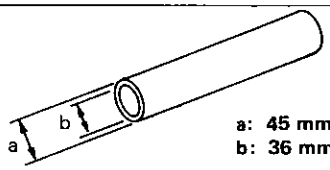
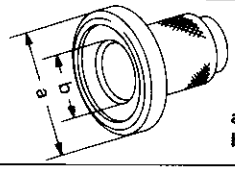
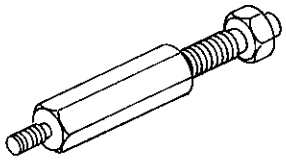
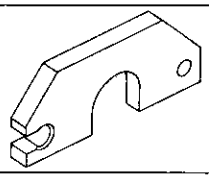
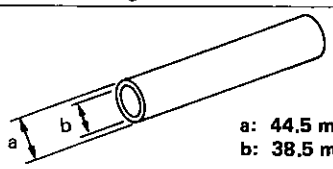
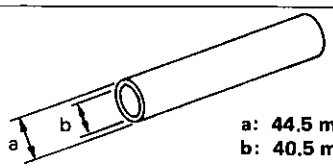
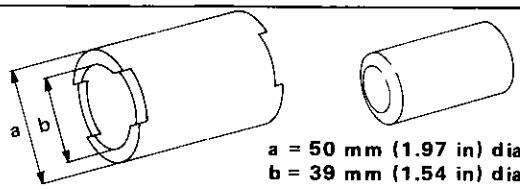
# SECTION MT

## CONTENTS

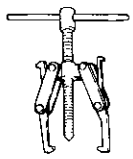

PREPARATION ..... MT- 2
ON-VEHICLE SERVICE ..... MT- 4
REMOVAL AND INSTALLATION ..... MT- 5
MAJOR OVERHAUL ..... MT- 6
DISASSEMBLY ..... MT-11
INSPECTION ..... MT-18
ASSEMBLY ..... MT-20
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... MT-31

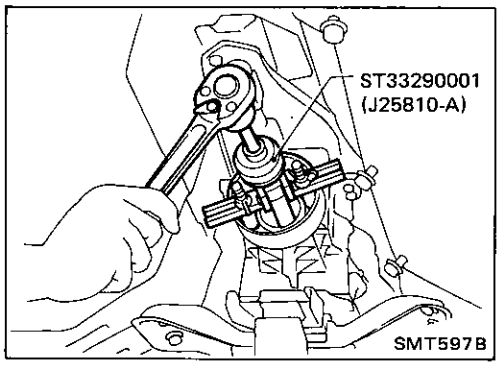
## SPECIAL SERVICE TOOLS — for FS5R30A

| Tool number (Kent-Moore No.) Tool name | Description | |
|---|---|---|
| ST23540000 (J25689-A) Pin punch | | Removing and installing retaining pin |
| ST30031000 (J22912-01) Puller |  | Removing 1st & 2nd synchronizer assembly<br>Removing counter gear rear thrust bearing<br>Removing main drive bearing<br>Measuring 2nd & 3rd inner baulk ring |
| ST33290001 (J25810-A) Puller |  | Removing rear oil seal |
| ST33230000 ( — ) Drift |  a: 51 mm (2.01 in) dia.<br>b: 28.5 mm (1.122 in) dia. | Removing mainshaft and counter gear |
| ST22350000 (J25678-01) Drift |  a: 34 mm (1.34 in) dia.<br>b: 28 mm (1.10 in) dia. | Removing counter gear front bearing<br>(Use with KV38100300) |
| KV38100300 (J25523) Drift |  a: 54 mm (2.13 in) dia.<br>b: 32 mm (1.26 in) dia. | Removing counter gear front bearing<br>(Use with ST22350000)<br>Installing counter gear rear bearing |
| ST30720000 ① (J34286) ② (J34331) Drift |  a: 77 mm (3.03 in) dia.<br>b: 55.5 mm (2.185 in) dia. | ① Removing mainshaft front bearing<br>② Installing mainshaft front bearing |
| ST33210000 ① (J25523) ② (J25803-01) Drift |  a: 44 mm (1.73 in) dia.<br>b: 24.5 mm (0.965 in) dia. | ① Installing counter gear front bearing<br>② Installing front cover oil seal |
| ST30613000 (J25742-3) Drift |  a: 72 mm (2.83 in) dia.<br>b: 48 mm (1.89 in) dia. | Installing main drive gear bearing |

| Tool number (Kent-Moore No.) Tool name | Description | |
|---|---|---|
| ST37750000<br>① (J34286)<br>② (J34332)<br>③ (J34334)<br>④ (J25679-01)<br>Drift |  <br>**a: 40 mm (1.57 in) dia.**<br>**b: 31 mm (1.22 in) dia.** | ① Removing counter gear rear bearing<br>② Installing O.D. gear bushing<br>② Installing reverse cone<br>③ Installing reverse counter gear<br>④ Installing counter gear rear end bearing |
| ST22452000<br>(J34337)<br>Drift |  <br>**a: 45 mm (1.77 in) dia.**<br>**b: 36 mm (1.42 in) dia.** | Installing reverse hub<br>Installing mainshaft rear bearing |
| ST33400001<br>(J26082)<br>Drift |  <br>**a: 60 mm (2.36 in) dia.**<br>**b: 47 mm (1.85 in) dia.** | Installing rear oil seal |
| (J26349-3)<br>Puller leg |  | Installing mainshaft and counter gear<br>(Use with J34328) |
| (J34328)<br>Puller |  | Installing mainshaft and counter gear<br>(Use with J26349-3) |
| (J26092)<br>Drift |  <br>**a: 44.5 mm (1.752 in) dia.**<br>**b: 38.5 mm (1.516 in) dia.** | Installing sub-gear snap ring |
| (J34342)<br>Drift |  <br>**a: 44.5 mm (1.752 in) dia.**<br>**b: 40.5 mm (1.594 in) dia.** | Installing O.D. main gear<br>Installing reverse gear bushing |
| ST36730000<br>( — )<br>Drift |  <br>**a = 50 mm (1.97 in) dia.**<br>**b = 39 mm (1.54 in) dia.** | Installing sub-gear on reverse idler gear |

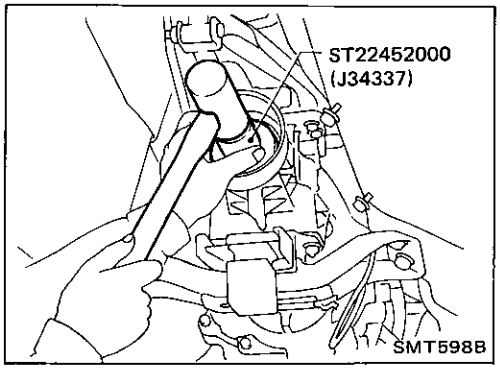
## COMMERCIAL SERVICE TOOL — for FS5R30A

| Tool name | Description | |
|---|---|---|
| Puller |  | Removing counter gear rear end bearing<br>Removing mainshaft rear bearing<br>Removing reverse synchronizer hub<br>Removing reverse counter gear |

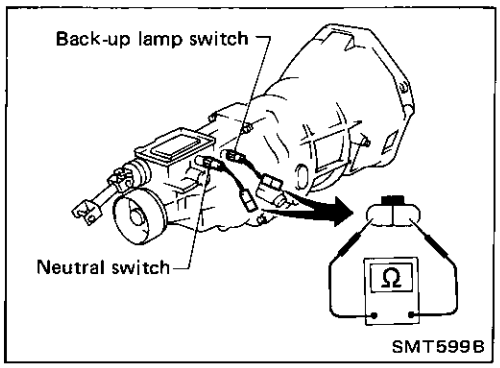



## Replacing Rear Oil Seal

### REMOVAL




### INSTALLATION




## Position Switch Check

### BACK-UP LAMP SWITCH

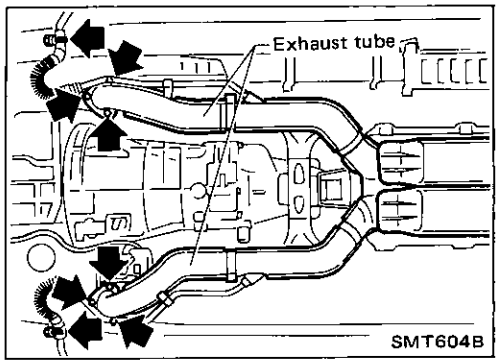
- Check continuity.

| Gear position | Continuity |
|---|---|
| Reverse | Yes |
| Except reverse | No |

### NEUTRAL SWITCH

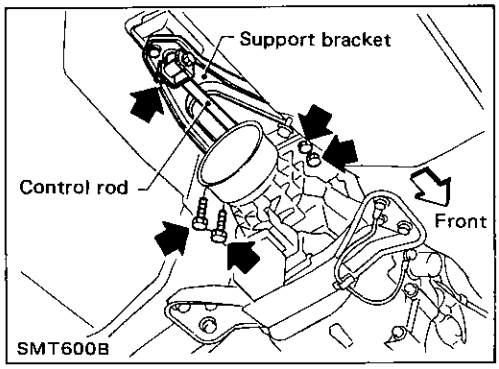
- Check continuity.

| Gear position | Continuity |
|---|---|
| Neutral | Yes |
| Except neutral | No |

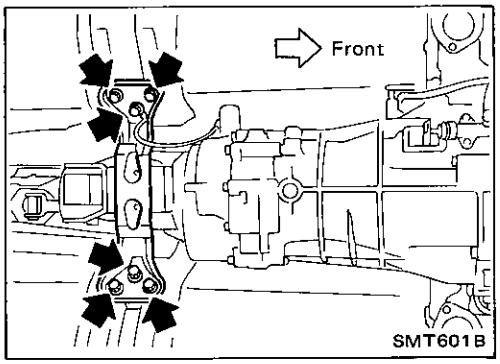



## Removal

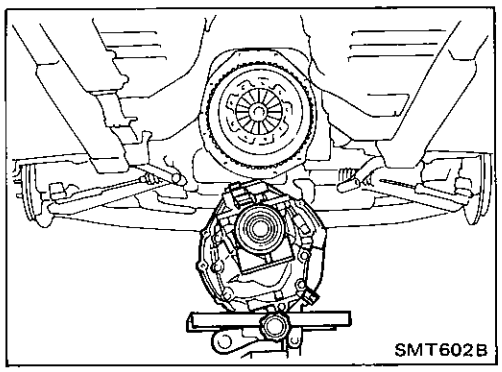
- Remove exhaust tube.



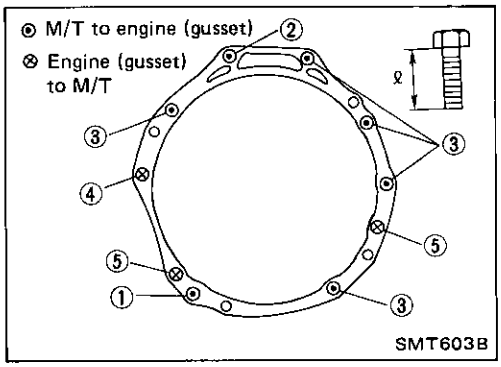

- Remove support bracket from M/T assembly.
- Remove control rod from shift lever.




- Remove propeller shaft — Refer to section PD.
- **Insert plug into rear oil seal after removing propeller shaft.**
- **Be careful not to damage spline, sleeve yoke and rear oil seal when removing propeller shaft.**
- Disconnect back-up lamp switch and neutral switch harness connectors.
- Support manual transmission with a jack.
- Remove rear mounting.




- Lower manual transmission.

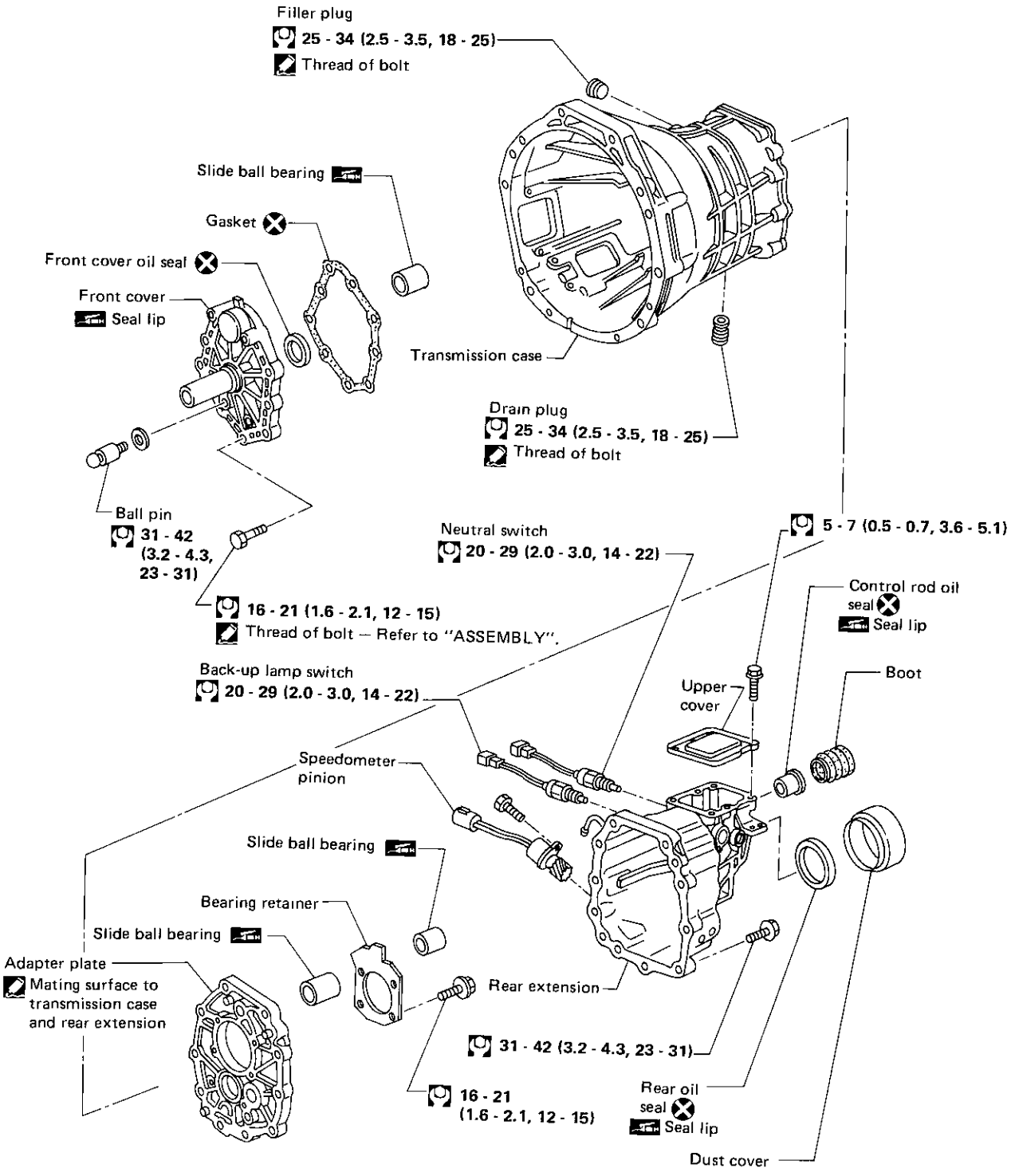



## Installation

- Tighten all transmission bolts.

| Bolt No. | Tightening torque N·m (kg-m, ft-lb) | ℓ mm (in) |
|---|---|---|
| ① | 39 - 49 (4.0 - 5.0, 29 - 36) | 100 (3.94) |
| ② | 39 - 49 (4.0 - 5.0, 29 - 36) | 65 (2.56) |
| ③ | 39 - 49 (4.0 - 5.0, 29 - 36) | 60 (2.36) |
| ④ | 29 - 39 (3.0 - 4.0, 22 - 29) | 55 (2.17) |
| ⑤ | 29 - 39 (3.0 - 4.0, 22 - 29) | 25 (0.98) |

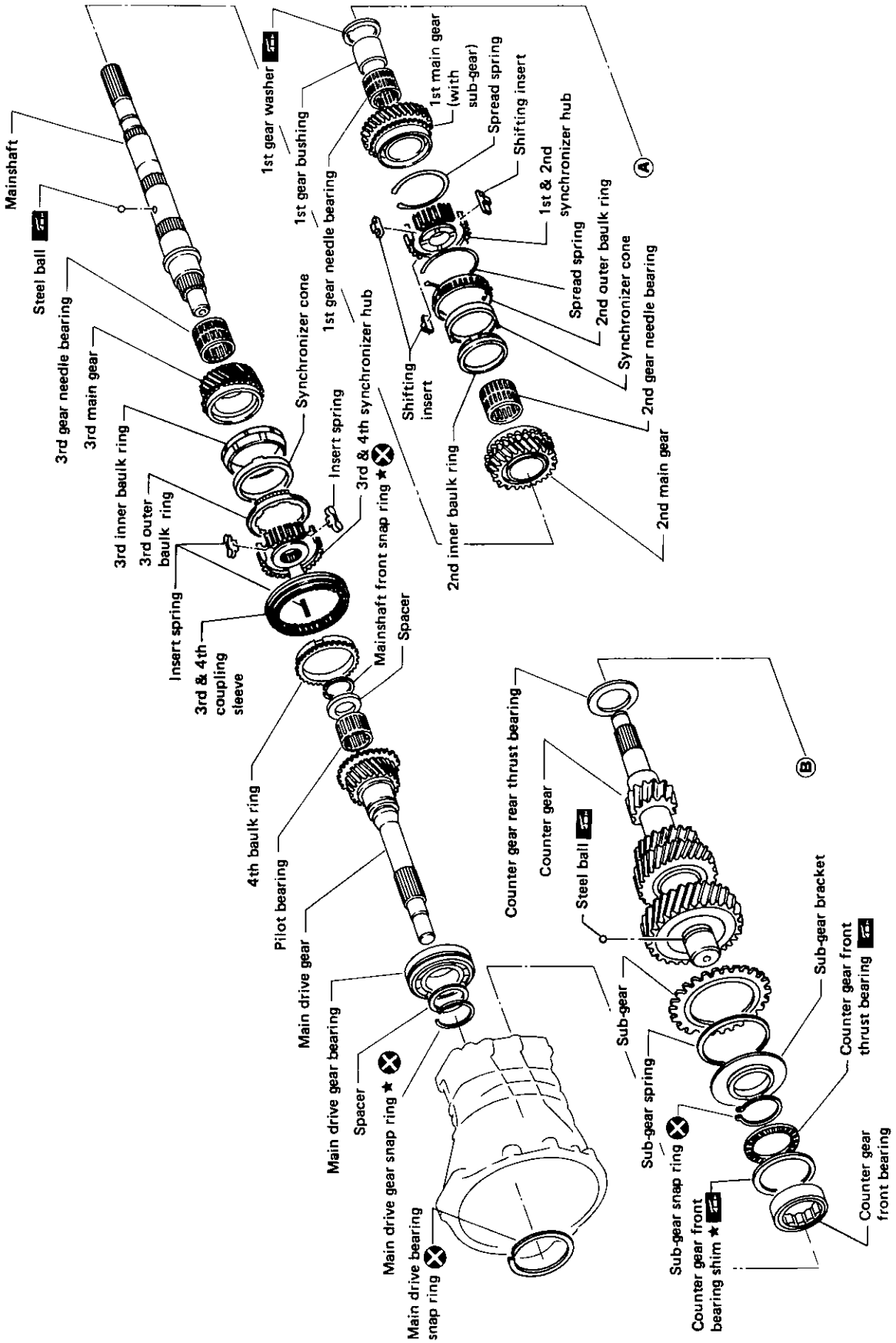
## Case Components



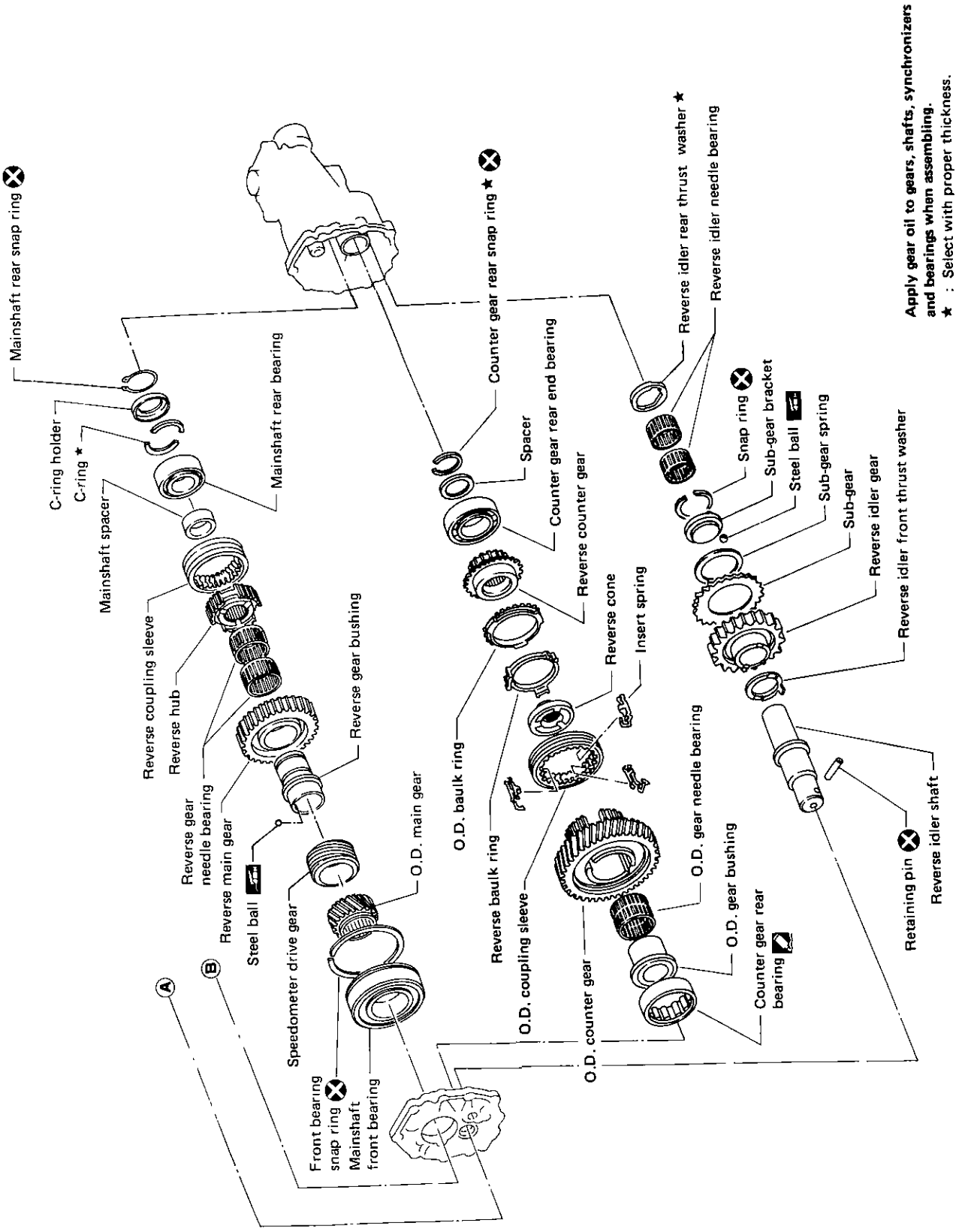

: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine Part: KP610-00250) or equivalent.

SMT606B

## Gear Components

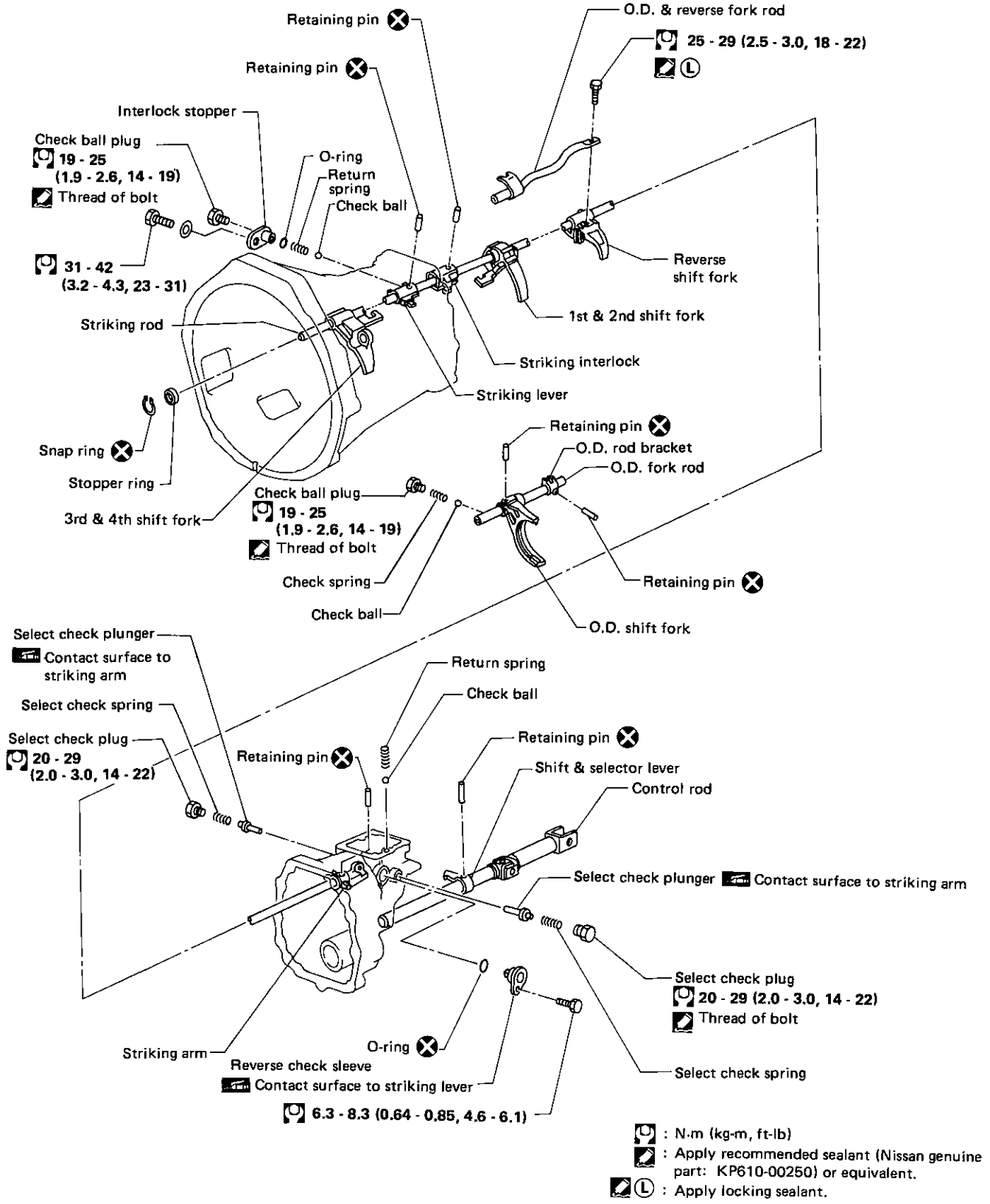


## Gear Components (Cont'd)



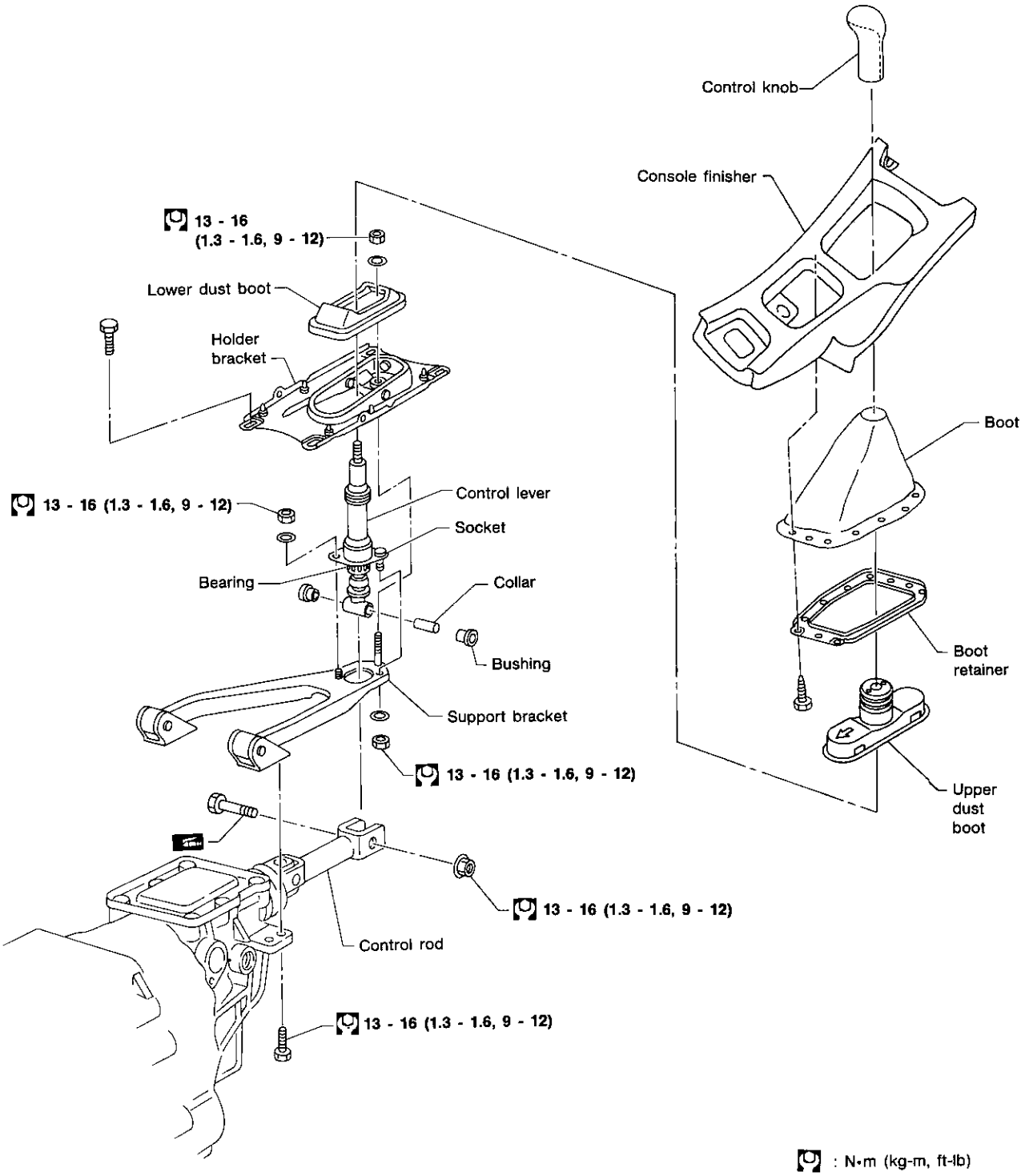

SMT718B

## Shift Control Components



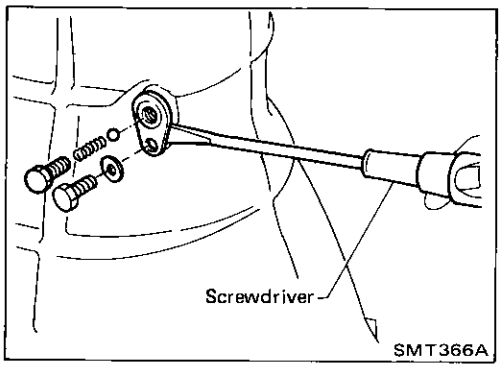

SMT607B

## Shift Control Components (Cont'd)



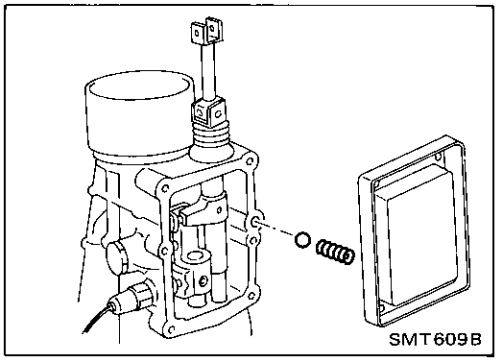

: N•m (kg-m, ft-lb)

SMT651B

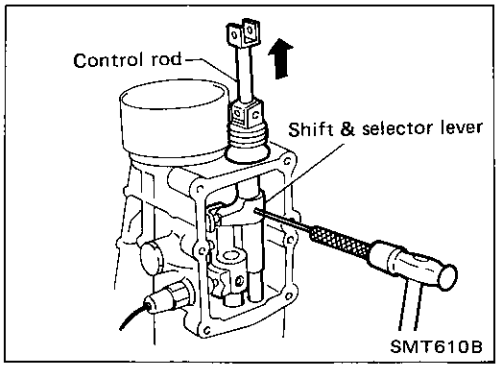



## Case Components

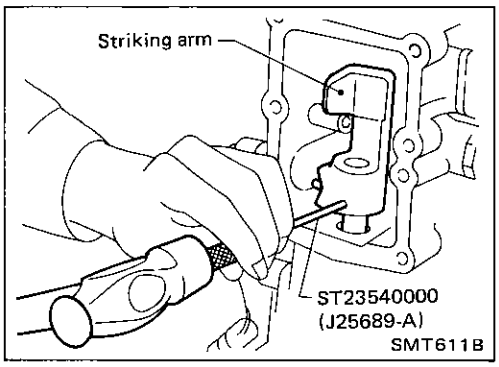
1. Remove check ball plug, check spring and check ball. Then remove interlock stopper.
   **If interlock assembly is removed as a unit, the check ball can fall into transmission case.**




2. Remove upper cover, return spring and check ball.



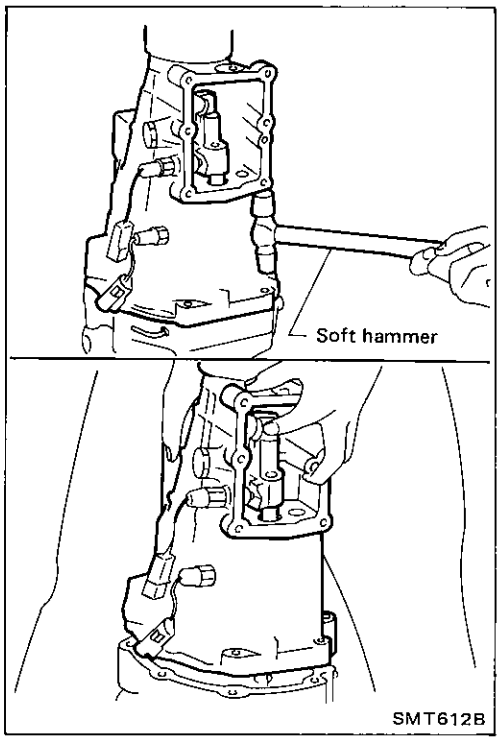

3. Drive out retaining pin from shift & selector lever.
4. Remove control rod from M/T assembly.
   **Be careful not to damage control rod oil seal and dust cover.**



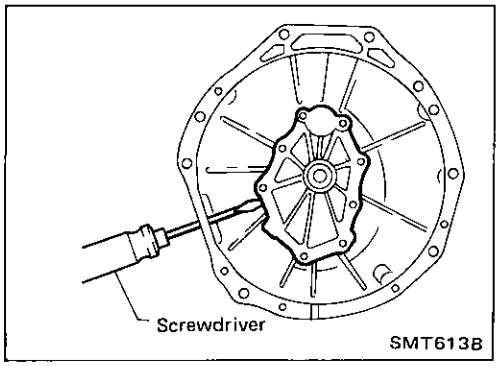

5. Drive out retaining pin from striking arm.

## Case Components (Cont'd)

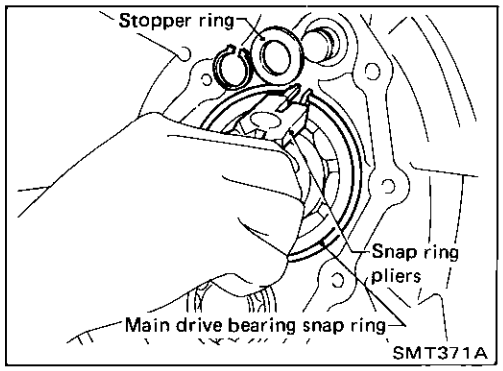
6. Remove rear extension together with striking arm by tapping lightly.



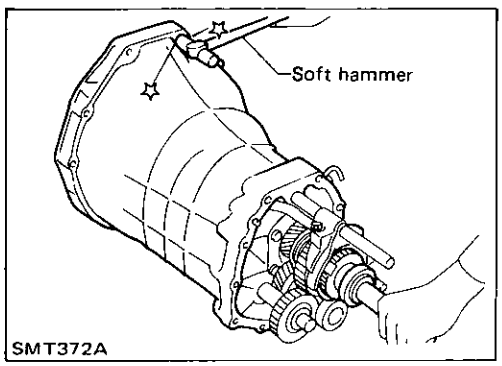

7. Remove front cover and gasket.




8. Remove stopper ring and main drive bearing snap ring.

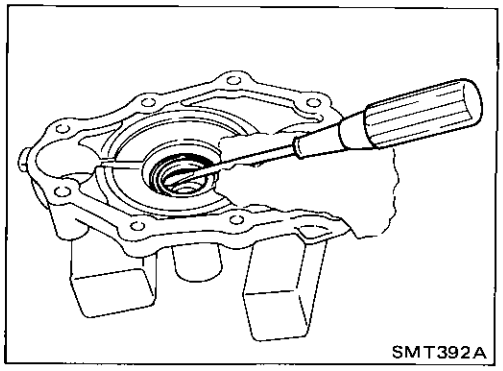



9. Remove transmission case by tapping lightly.



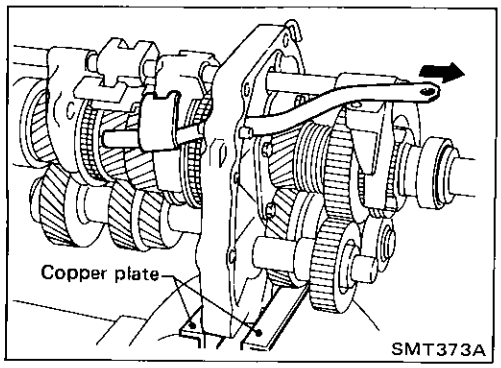
## Case Components (Cont'd)

10. Remove front cover oil seal.

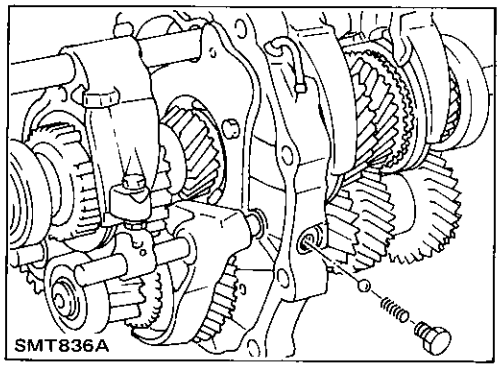



## Shift Control Components

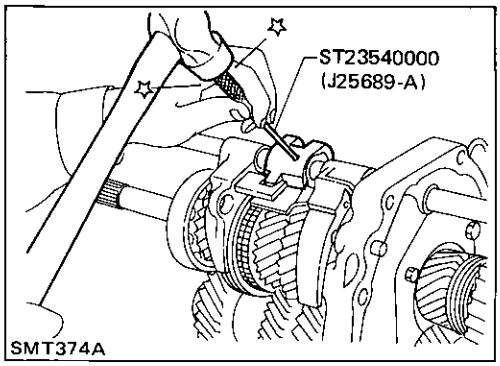
1. Mount adapter plate on vise.
2. Remove O.D. & reverse fork rod.



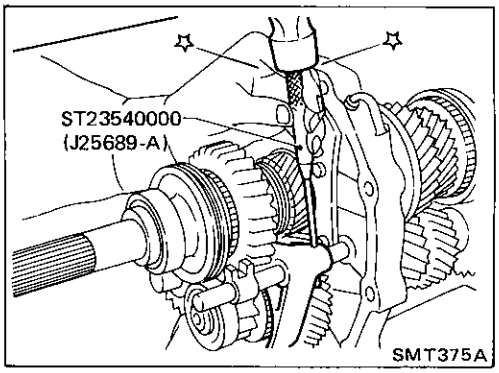

3. Remove check ball plug, check ball and return spring.

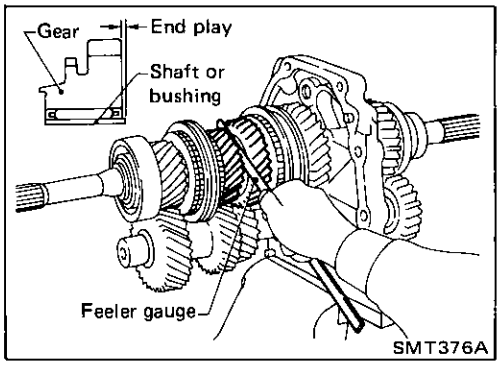



4. Drive out retaining pin from striking lever.
5. While pulling out striking rod, remove striking lever and striking interlock. Then remove 1st & 2nd, 3rd & 4th and reverse shift forks.




6. Drive out retaining pin from O.D. shift fork.
7. Pull out O.D. fork rod and then remove O.D. shift fork.

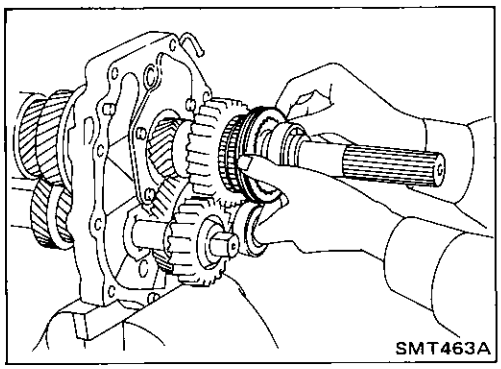




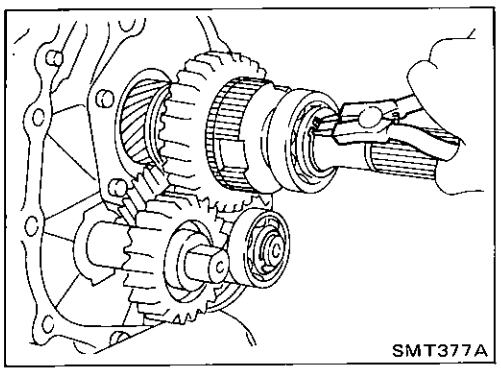

## Gear Components

1. Before removing gears and shafts, measure each gear end play.
   **Gear end play:**
   **1st, 2nd, 3rd main gear**
   **0.23 - 0.33 mm (0.0091 - 0.0130 in)**
   **O.D. counter gear 0.23 - 0.33 mm (0.0091 - 0.0130 in)**
   **Reverse main gaer 0.33 - 0.43 mm (0.0130 - 0.0169 in)**

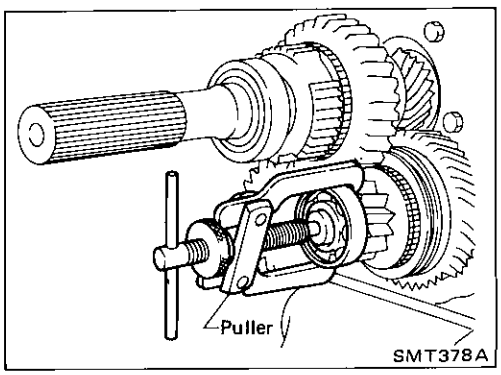
- If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.



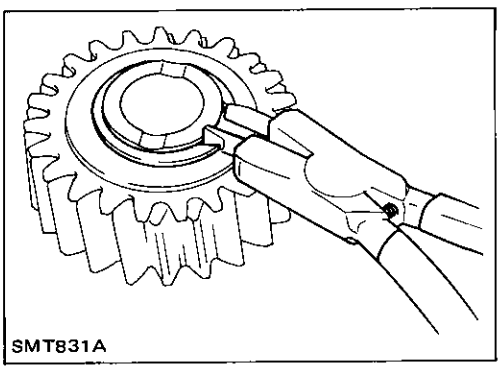

2. Remove rear side components on mainshaft and counter gear.
a. Remove snap ring, speedometer drive gear and steel ball.
b. Remove reverse coupling sleeve.




c. Remove mainshaft rear snap ring and counter gear rear snap ring.
d. Remove C-ring holder and mainshaft C-rings from mainshaft. Use punch and hammer to remove C-rings.

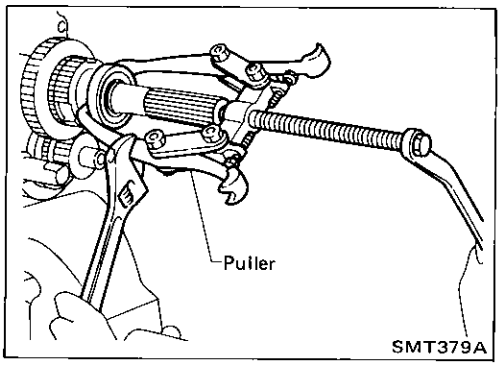



e. Pull out counter gear rear end bearing.
f. Remove reverse idler gear and reverse idler thrust washers.

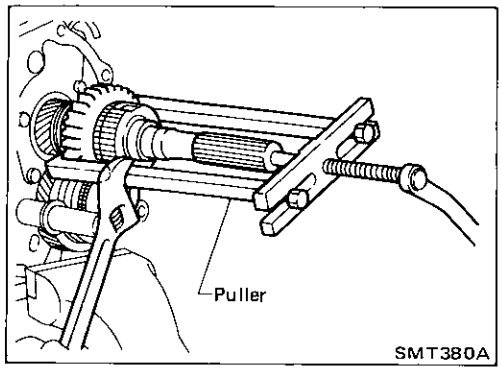



g. Remove sub-gear from reverse idler gear.

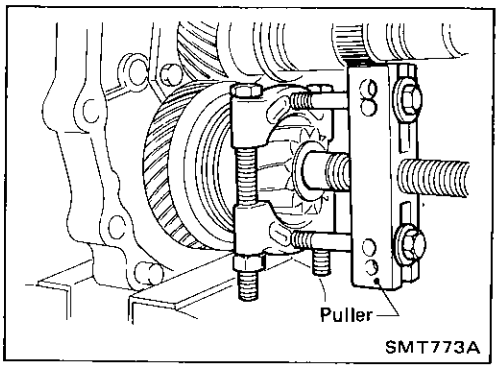
## Gear Components (Cont'd)



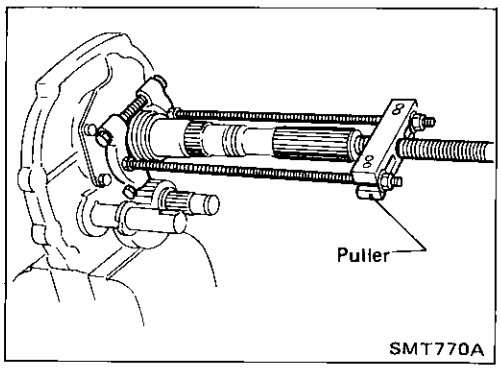

h. Pull out mainshaft rear bearing.



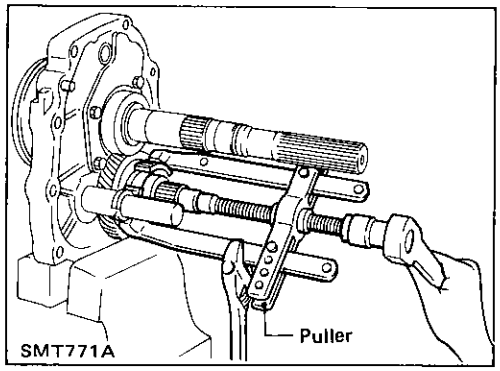

i. Pull out reverse main gear together with mainshaft spacer and reverse synchronizer hub. Then remove reverse gear needle bearings.




j. Pull out reverse counter gear.
k. Remove O.D. coupling sleeve together with O.D. baulk ring, reverse baulk ring and spring inserts.



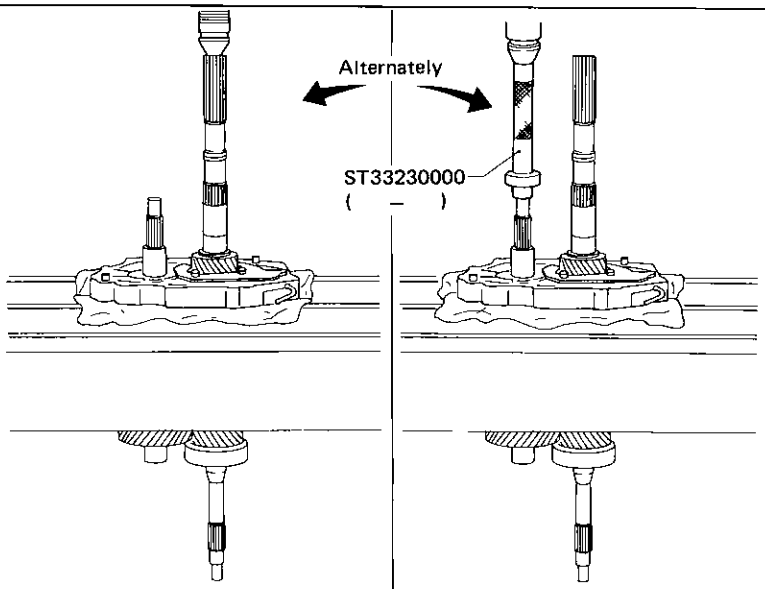

l Pull out reverse gear bushing.




m. Pull out O.D. counter gear together with reverse cone.

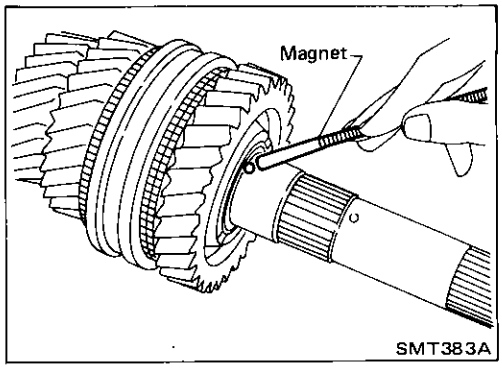
## Gear Components (Cont'd)

3. Press out mainshaft and counter gear alternately.

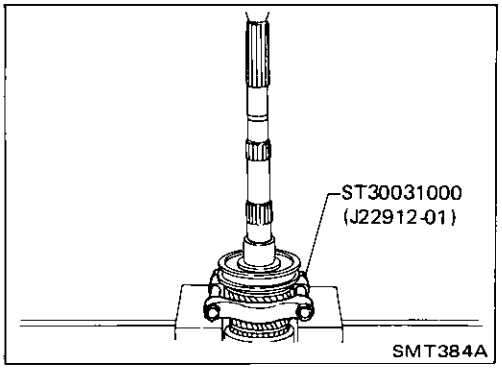



**Be sure to press mainshaft and counter gear alternately so as not to allow the front surface of one to contact the rear surface of the other.**

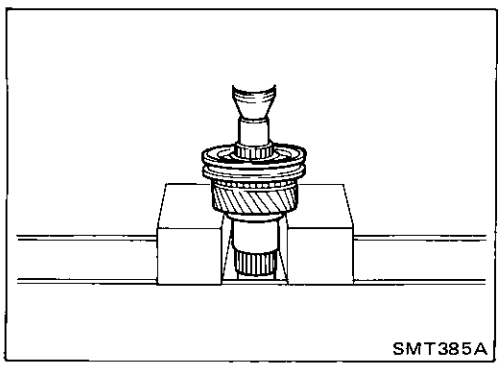
SMT772A




4. Remove front side components on mainshaft.
a. Remove 1st gear washer and steel ball.
b. Remove 1st main gear and 1st gear needle bearing.

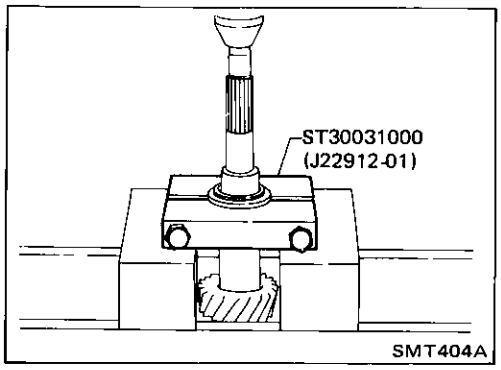



c. Press out 2nd main gear together with 1st gear bushing and 1st & 2nd synchronizer assembly.
d. Remove mainshaft front snap ring.

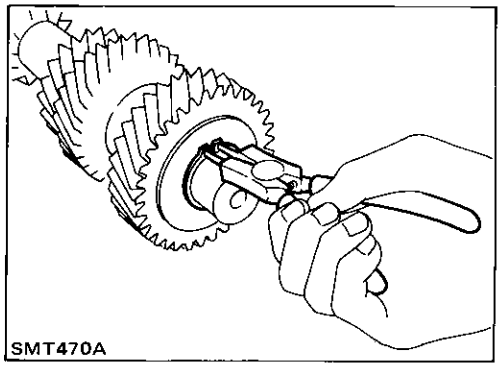



e. Press out 3rd main gear together with 3rd & 4th synchronizer assembly and 3rd gear needle bearing.

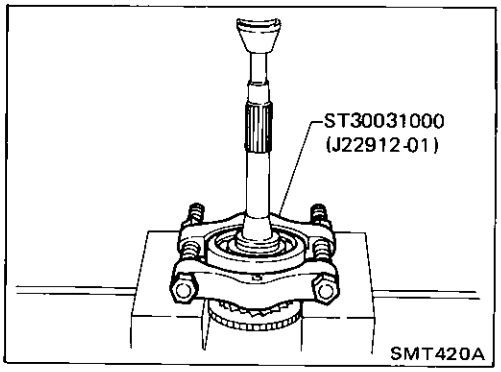
## Gear Components (Cont'd)




5. Remove front side components on counter gear.
a. Remove counter gear rear thrust bearing.



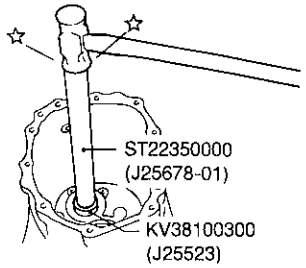

b. Remove sub-gear components.



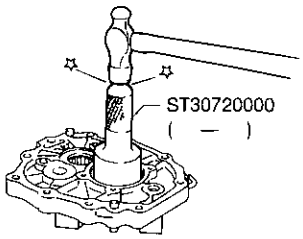

6. Remove main drive gear bearing.
a. Remove main drive gear snap ring and spacer.
b. Press out main drive gear bearing.

7. Remove bearings from case components.

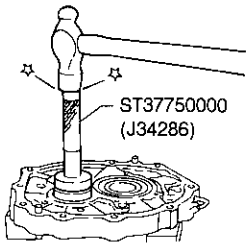
**Counter gear front bearing in transmission case**



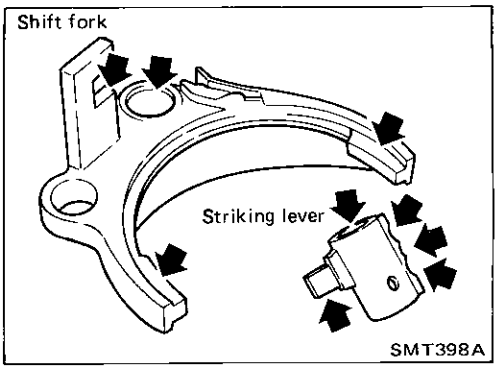

**Mainshaft front bearing in adapter plate**




**Counter gear rear bearing in adapter plate**

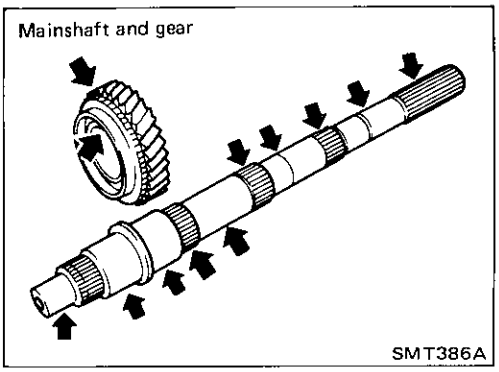



SMT136C




## Shift Control Components

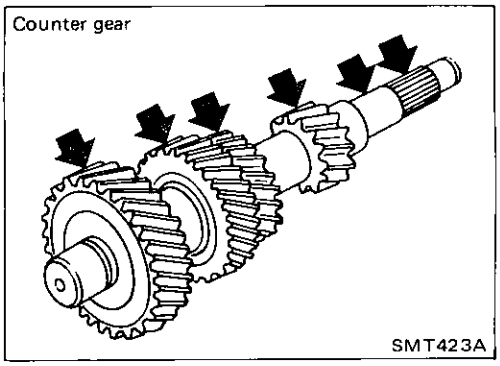
- Check contact surface and sliding surface for wear, scratches, projections or other damage.

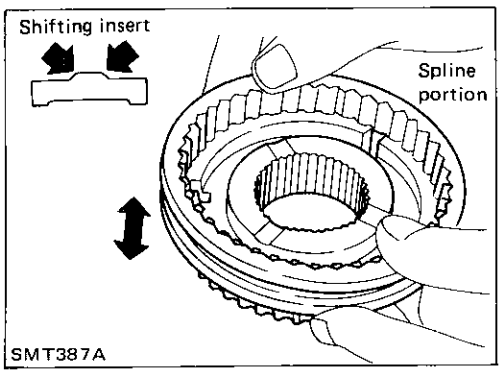



## Gear Components

### GEARS AND SHAFTS

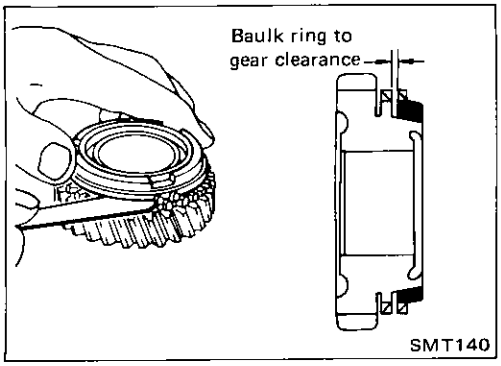
- Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.




### SYNCHRONIZERS

- Check spline portion of coupling sleeves, hubs, and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.
- Check insert springs for deformation.




**Clearance between baulk ring and gear**

- Measure wear of main drive, 1st and O.D. baulk rings.

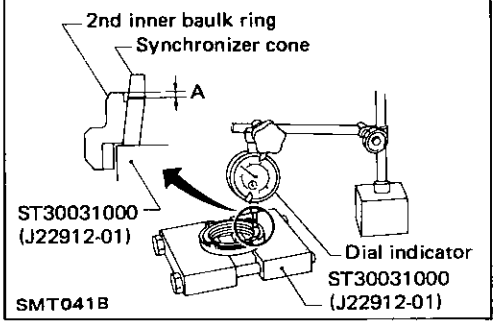
Unit: mm (in)

| | Standard | Wear limit |
|---|---|---|
| 1st | 1.05 - 1.3 (0.0413 - 0.0512) | 0.7 (0.028) |
| Main drive | 1.05 - 1.3 (0.0413 - 0.0512) | 0.7 (0.028) |
| O.D. | 1.05 - 1.3 (0.0413 - 0.0512) | 0.7 (0.028) |

If the clearance is smaller than the wear limit, replace baulk ring.

## Gear Components (Cont'd)

**Inner baulk ring**




- Measure wear of 2nd and 3rd baulk rings.

a. Place baulk rings in position on synchronizer cone.

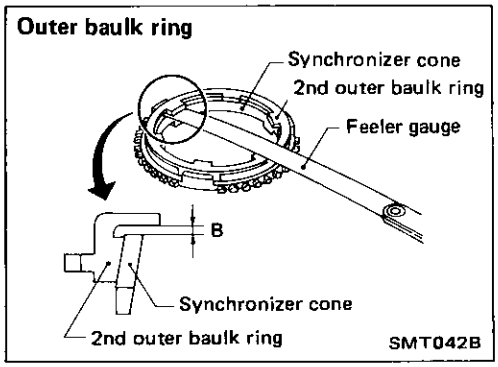
b. While holding baulk rings against synchronizer cone as far as it will go, measure dimensions "A" and "B".

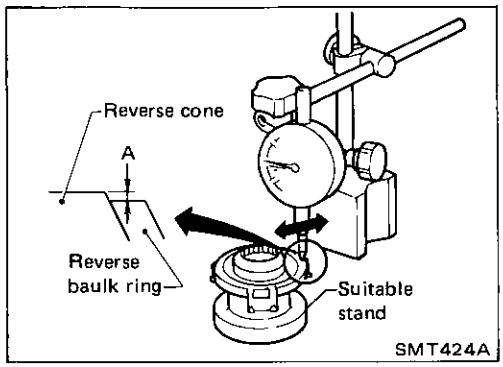
Unit: mm (in)

| Dimension | Standard | Wear limit |
|---|---|---|
| A | 0.6 - 1.1 (0.024 - 0.043) | 0.2 (0.008) |
| B | 0.7 - 0.9 (0.028 - 0.035) | |

c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.

**Outer baulk ring**




- Measure wear of reverse baulk ring.

a. Place baulk ring in position on reverse cone.

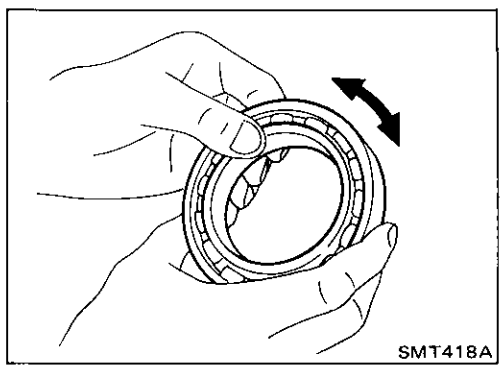
b. While holding baulk ring against reverse cone as far as it will go, measure dimension "A" with dial indicator.

**Dimension "A":**

**Standard –0.1 to 0.35 mm (–0.0039 to 0.0138 in)**

**Wear limit 0.7 mm (0.028 in)**

c. If dimension "A" is larger than the wear limit, replace baulk ring.

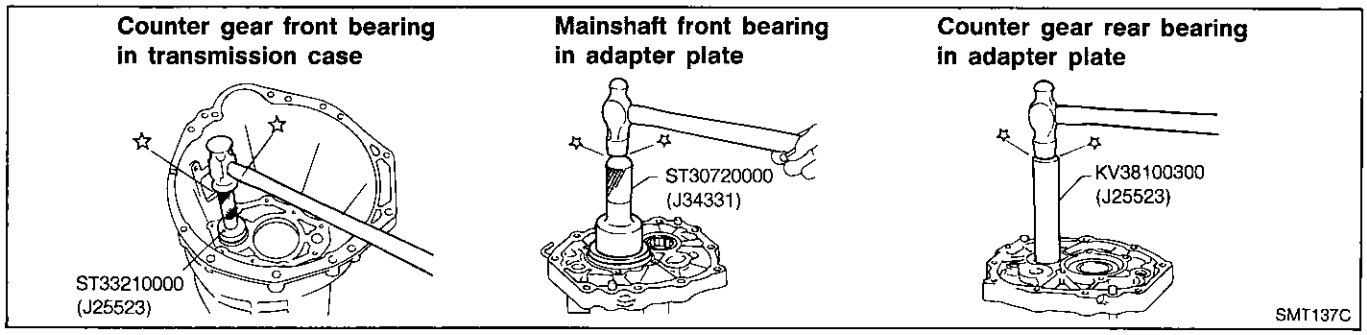


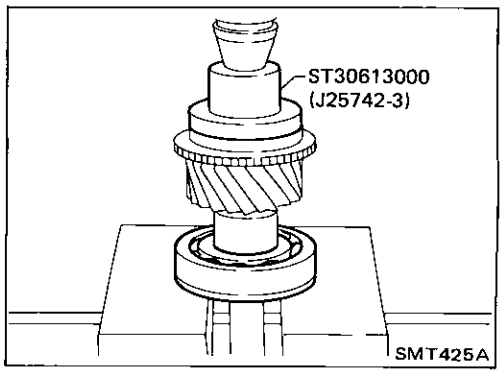

### BEARINGS

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

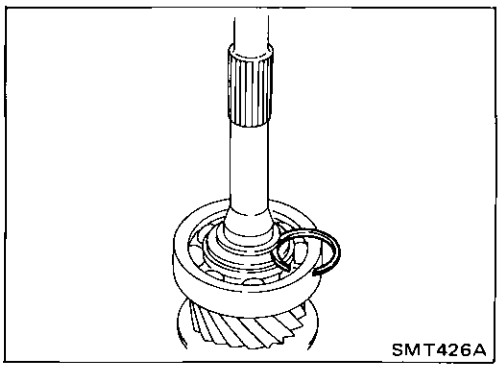
## Gear Components

1. Install bearings into case components.

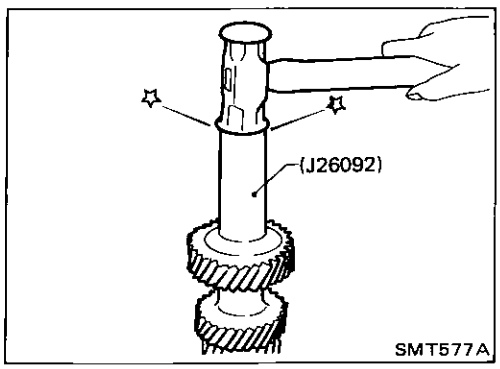



2. Install main drive gear bearing.
a. Press main drive gear bearing.
b. Install main drive gear spacer.

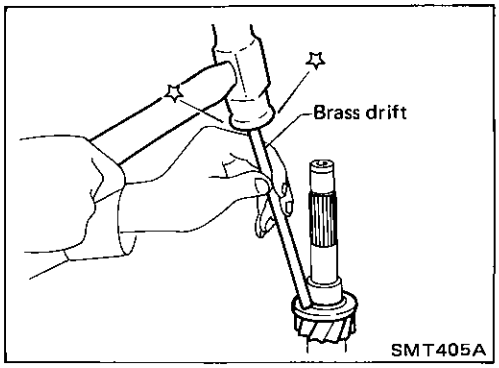



c. Select proper main drive gear snap ring to minimize clearance of groove.
**Allowable clearance of groove:**
**0 - 0.1 mm (0 - 0.004 in)**
**Main drive gear snap ring**
**Refer to S.D.S.**
d. Install selected snap ring on main drive gear.

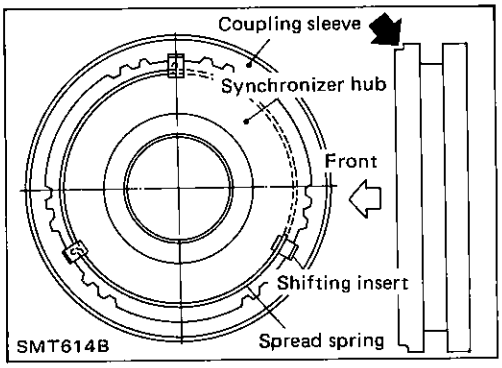



3. Install components on counter gear.
a. Install sub-gear components.
**When installing sub-gear snap ring, tap sub-gear snap ring into position on counter gear.**

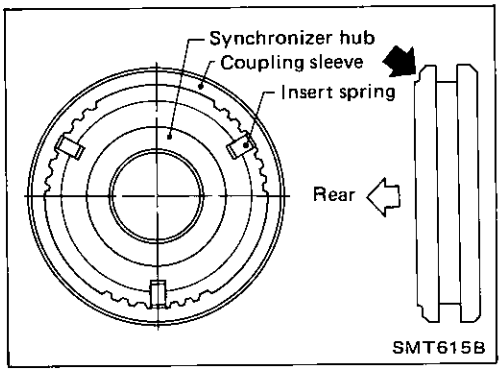
## Gear Components (Cont'd)



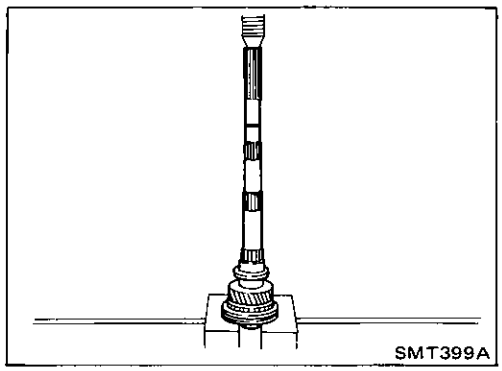

b. Install counter gear rear thrust bearing.



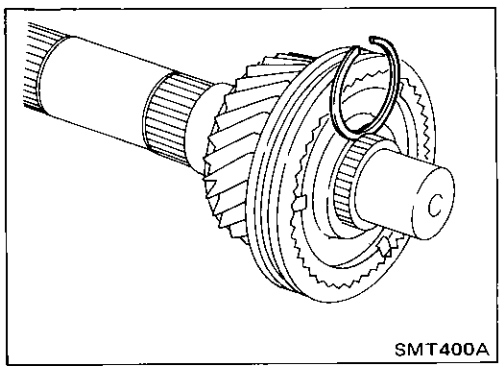

4. Install front side components on mainshaft.
a. Assemble 1st & 2nd synchronizer.




b. Assemble 3rd & 4th synchronizer.

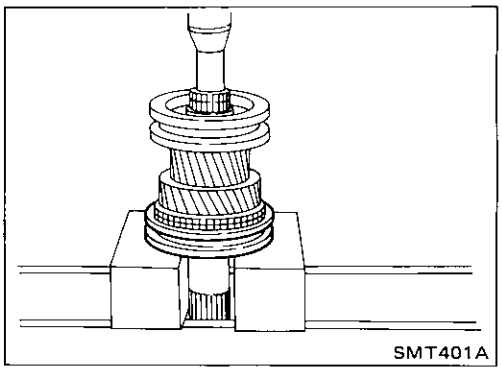



c. Press on 3rd & 4th synchronizer assembly together with 3rd main gear and 3rd gear needle bearing.
**Pay attention to direction of synchronizer assembly.**

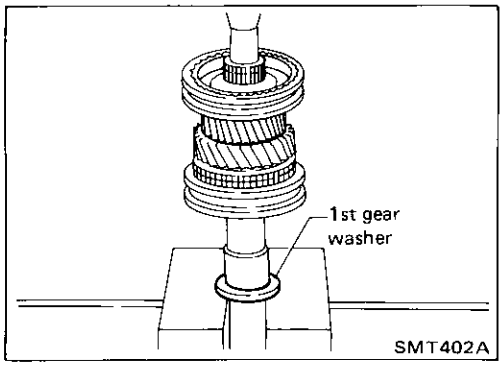



d. Select proper snap ring to minimize clearance of groove.
**Allowable clearance of groove:**
**0 - 0.1 mm (0 - 0.004 in)**
**Mainshaft front snap ring:**
**Refer to S.D.S.**
e. Install selected snap ring on mainshaft.

## Gear Components (Cont'd)

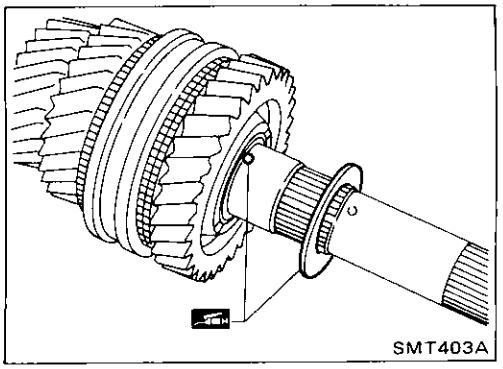

SMT401A

f. Press on 1st & 2nd synchronizer assembly together with 2nd main gear and 2nd gear needle bearing.

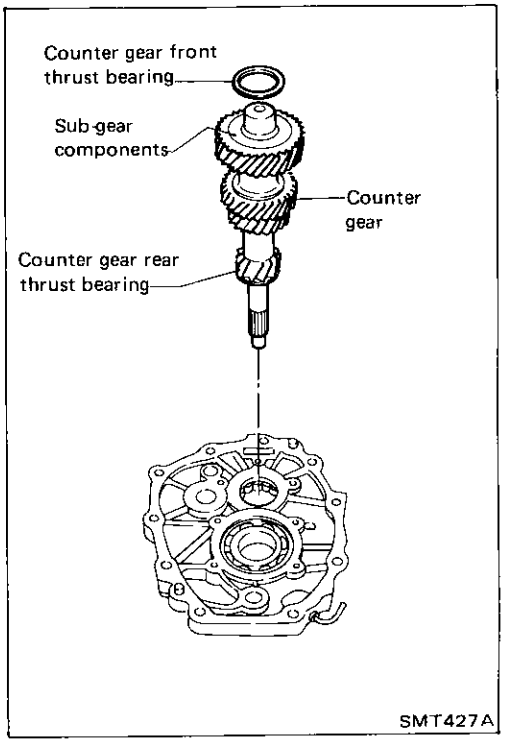


SMT402A

g. Press on 1st gear bushing using 1st gear washer.
h. Install 1st main gear and needle bearing.


SMT403A

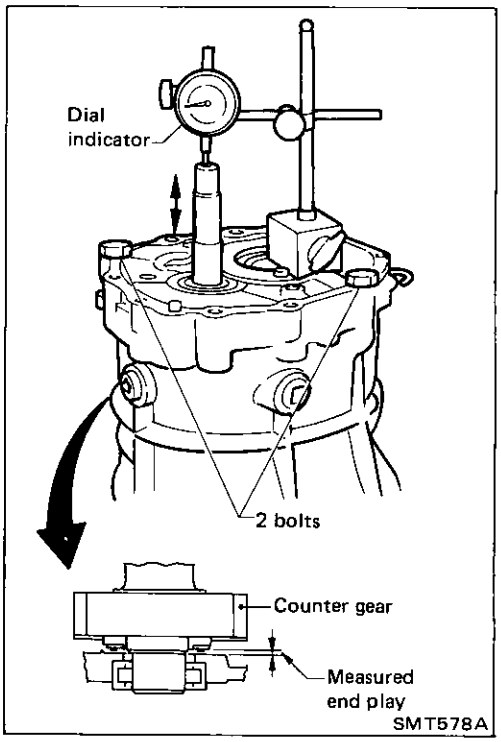
i. Install steel ball and 1st gear washer.
**Apply multi-purpose grease to steel ball and 1st gear washer before installing.**



SMT427A

5. Select proper counter gear front bearing shim when replacing transmission case, counter gear, counter gear thrust bearing or sub-gear components.
a. Install counter gear with sub-gear components, counter gear front and rear thrust bearing on adapter plate.
b. Remove counter gear front bearing shim from transmission case.
c. Place adapter plate and counter gear assembly in transmission case (case inverted).

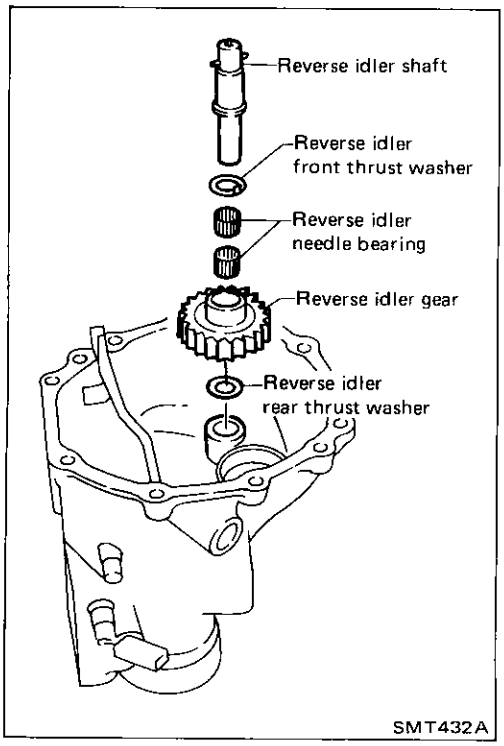
## Gear Components (Cont'd)




d. Tighten adapter plate to transmission case using 2 bolts.
e. Place dial indicator on rear end of counter gear.
f. Move counter gear up and down and measure dial indicator deflection.
g. Select proper shim using table in S.D.S. as a guide.

**Counter gear end play:**
**0.10 - 0.25 mm (0.0039 - 0.0098 in)**

**Table for selecting proper counter gear front bearing shim:**
**Refer to S.D.S.**



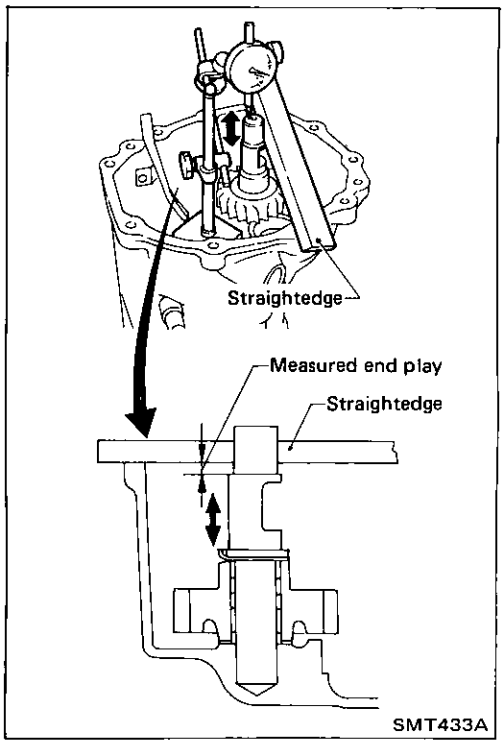

6. Select proper reverse idler rear thrust washer when replacing rear extension, reverse idler gear, reverse idler shaft or reverse idler thrust washer.
a. Install reverse idler gear, reverse idler needle bearings, reverse idler thrust washers and reverse idler shaft into rear extension.

**When replacing reverse idler rear washer, install either A or B.**

**Reverse idler rear thrust washer**

| | Thickness mm (in) | Part number |
|---|---|---|
| A | 1.97 (0.0776) | 32284-01G10 |
| B | 2.07 (0.0815) | 32284-01G11 |

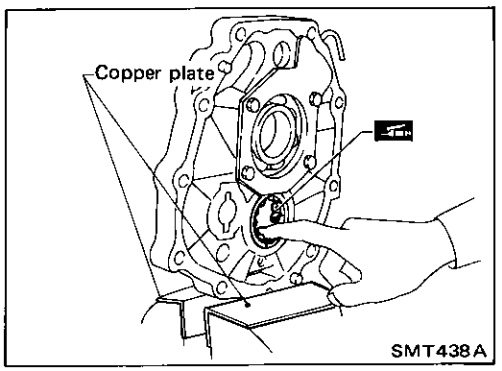
## Gear Components (Cont'd)



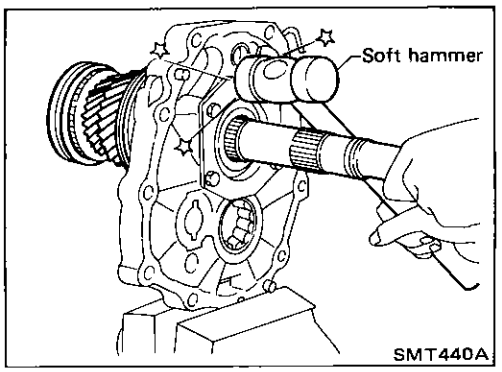

b. Place dial indicator on front end of reverse idler shaft.
c. Put straightedge on front surface of rear extension as a stopper of reverse idler shaft.
d. Move reverse idler shaft up and down and measure reverse idler gear end play.

**Reverse idler gear end play:**
**0.30 - 0.53 mm (0.0118 - 0.0209 in)**

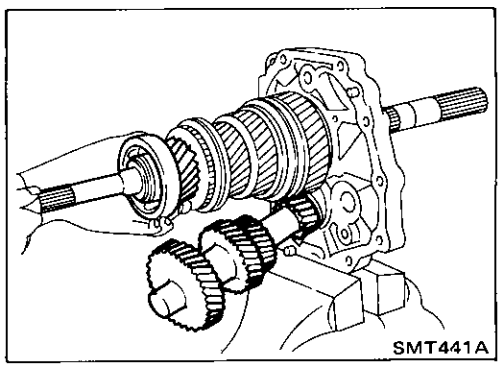
e. If not within specification, replace reverse idler rear thrust washer with the other (A or B) and check again.




7. Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft.
a. Mount adapter plate on vise and apply multi-purpose grease to counter gear rear bearing.

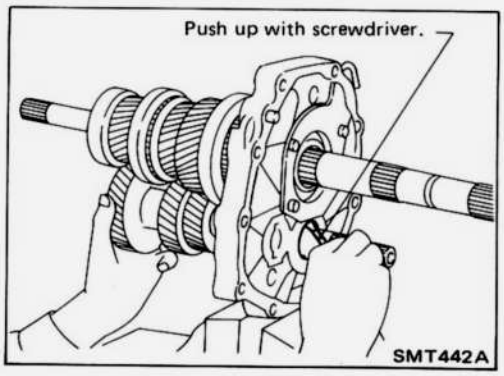



b. Install mainshaft a little on mainshaft front bearing.
**To allow for installation of counter gear, do not install mainshaft completely.**

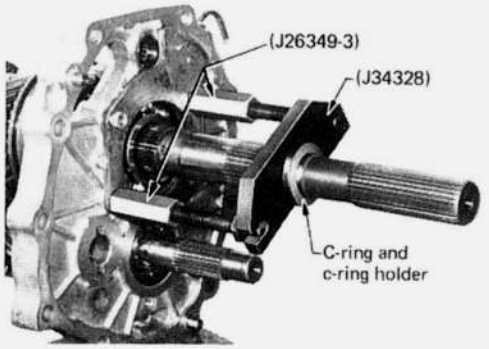



c. Install counter gear on counter gear rear bearing and install main drive gear, pilot bearing and spacer on mainshaft.

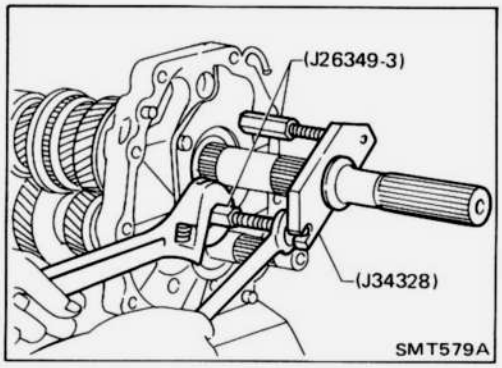
## Gear Components (Cont'd)



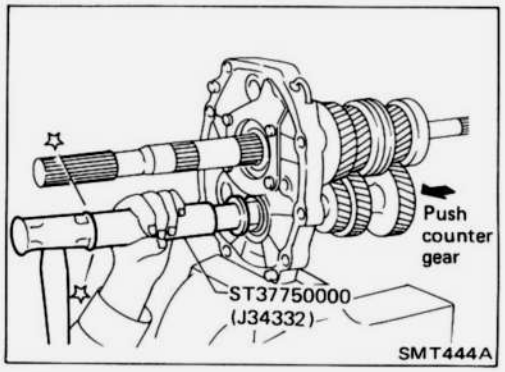

**When installing counter gear into counter gear rear bearing, push up on upper roller of counter gear rear bearing with screwdriver.**



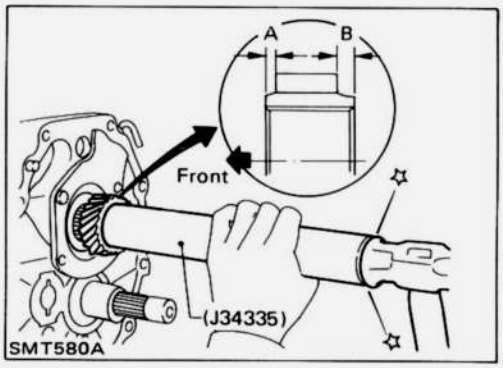

d. Install Tools (J26349-3) onto adapter plate and C-ring and C-ring holder on mainshaft.
e. Install Tool (J34328) on mainshaft.




f. Install mainshaft and counter gear completely by extending length of J26349-3.

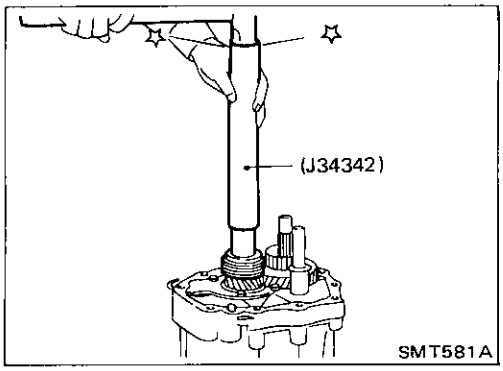



8. Install rear side components on mainshaft and counter gear.
a. Install O.D. gear bushing while pushing on the front of counter gear.

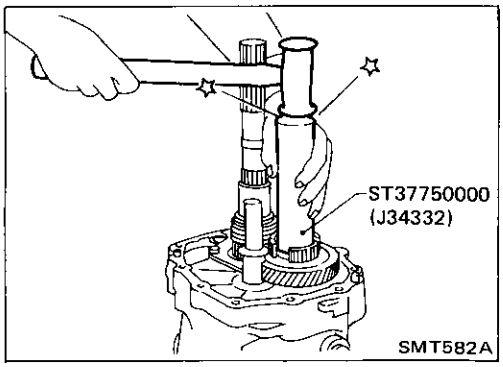



b. Install O.D. main gear.
**Pay attention to direction of O.D. main gear. (B is wider than A as shown at left.)**
c. Install adapter plate with gear assembly onto transmission case.
d. Install O.D. gear needle bearing and then install O.D. counter gear and reverse idler shaft.

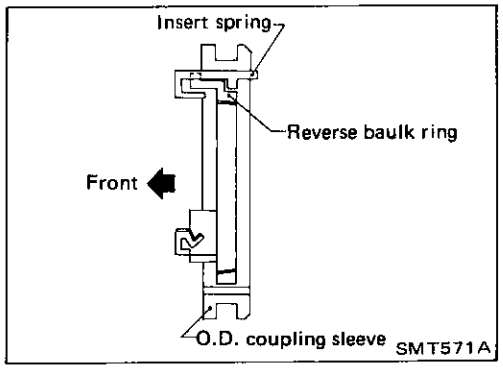
## Gear Components (Cont'd)



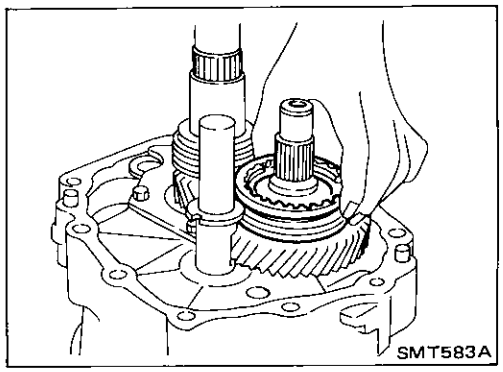

e. Install reverse gear bushing.

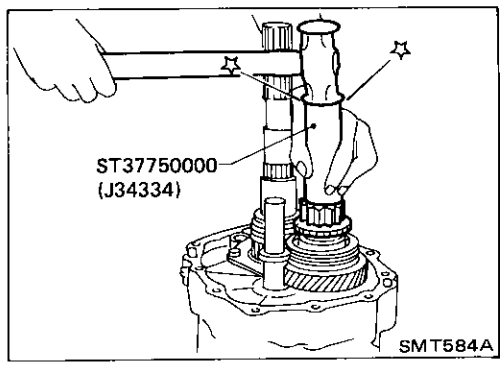



f. Install reverse cone.



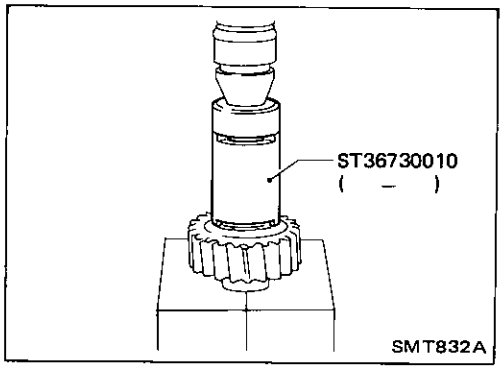

g. Install insert springs and reverse baulk ring on O.D. coupling sleeve. Then install them and O.D. baulk ring on O.D. counter gear.
**Pay attention to direction of O.D. coupling sleeve.**



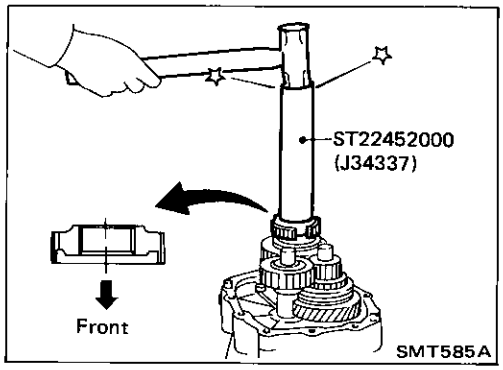




h. Install reverse counter gear.

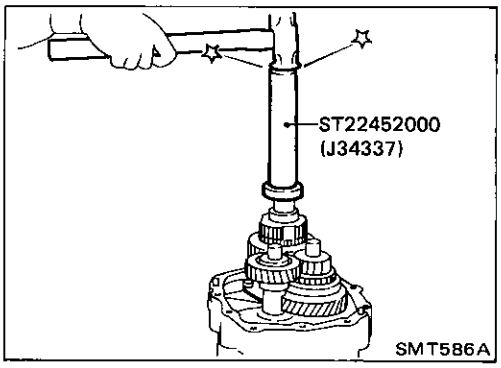
## Gear Components (Cont'd)



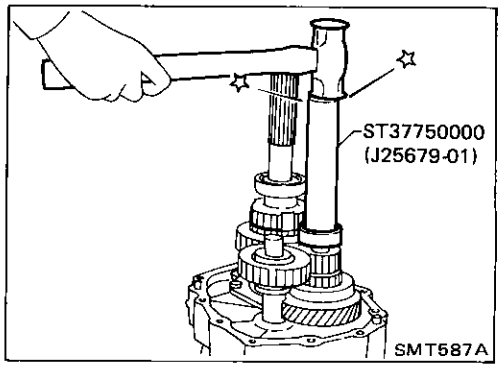

i. Install sub-gear on reverse idler gear.
j. Install reverse gear needle bearing and then install reverse main gear, reverse idler gear and reverse idler thrust washers.



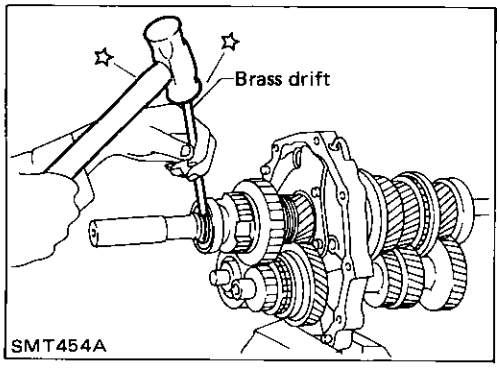

k. Install reverse hub.
**Pay attention to its direction.**




l. Install mainshaft spacer and mainshaft rear bearing.
m. Install speedometer drive gear.

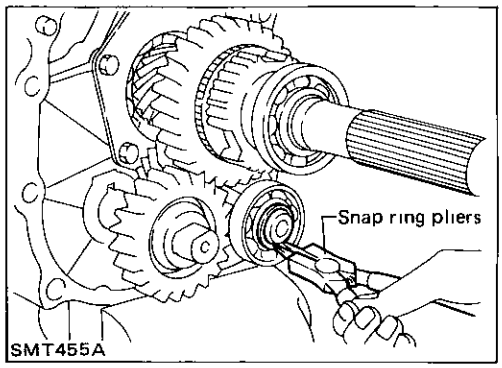



n. Install counter gear rear end bearing.
o. Separate adapter plate from transmission case and Mount adapter plate on vise again.



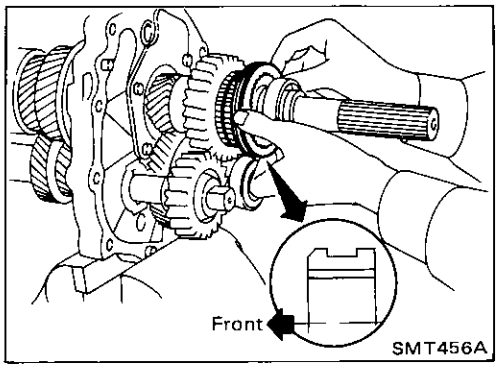

p. Select proper mainshaft C-ring to minimize clearance of groove.
**Allowable clearance of groove:**
**0 - 0.1 mm (0 - 0.004 in)**
**Mainshaft C-ring:**
**Refer to S.D.S.**
q. Install selected C-ring, C-ring holder and mainshaft rear snap ring.

## Gear Components (Cont'd)




r. Install spacer and then select proper counter gear rear snap ring to minimize clearance of groove.
**Allowable clearance of groove:**
**0 - 0.1 mm (0 - 0.004 in)**
**Counter gear rear snap ring:**
**Refer to S.D.S.**

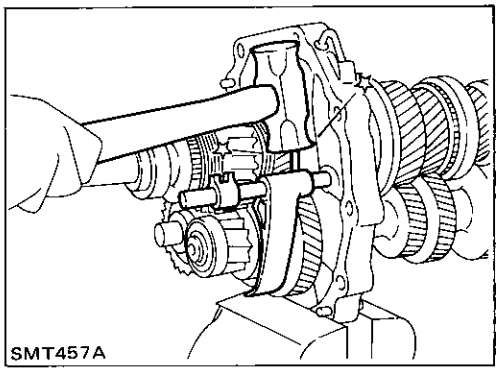
s. Install selected counter gear rear snap ring.



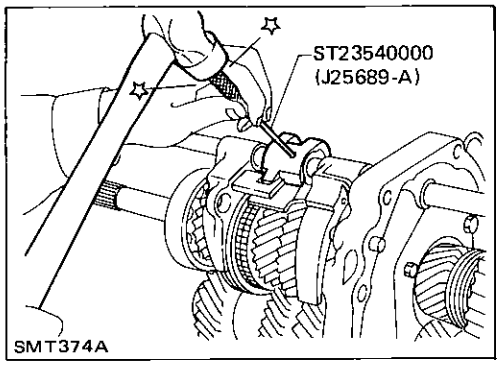

t. Install reverse coupling sleeve.
**Pay attention to its direction.**

u. Measure each gear end play as a final check — Refer to "DISASSEMBLY".

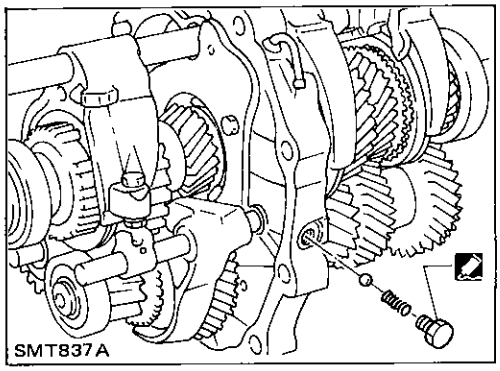
## Shift Control Components



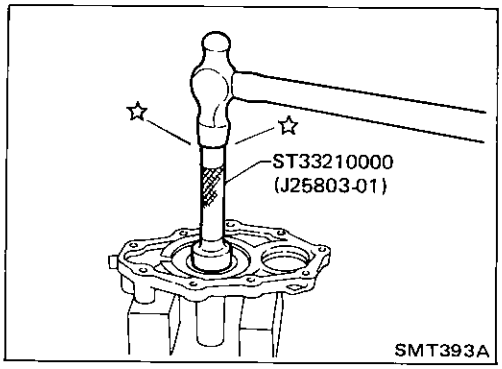

1. Install O.D. fork rod and O.D. shift fork. Then install retaining pin into O.D. shift fork.
2. Install 1st & 2nd, 3rd & 4th and reverse shift forks onto coupling sleeve.




3. Install striking rod into hole of shift forks, striking lever and interlock and then install retaining pin into striking lever.
**Make sure that striking rod moves smoothly.**

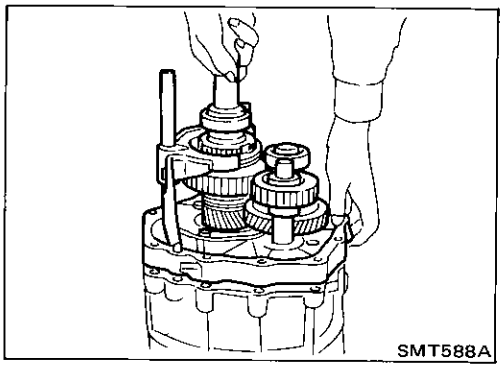



4. Install check ball, return spring and check ball plug.
**Apply sealant to thread of check ball plug.**

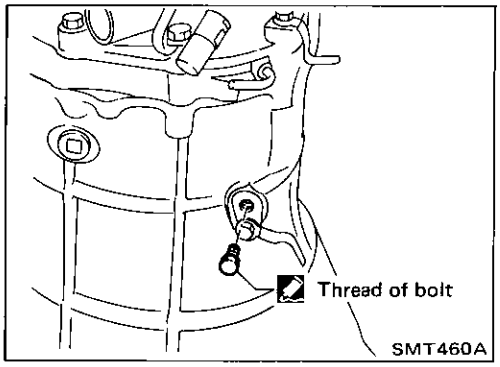



## Case Components

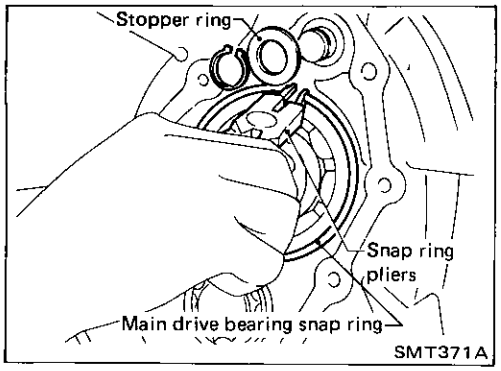
1. Install front cover oil seal.
   **Apply multi-purpose grease to seal lip.**
2. Install selected counter gear front bearing shim onto transmission case.
   **Apply multi-purpose grease.**
3. Apply sealant to mating surface of transmission case.



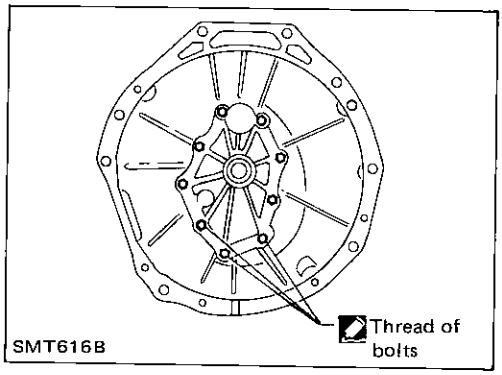

4. Install gear assembly onto transmission case.
5. Install check spring and check ball into interlock stopper.
   **Apply multi-purpose grease to check ball.**




6. Install interlock stopper assembly and then tighten check ball plug.
   **Apply sealant to thread of check ball plug.**

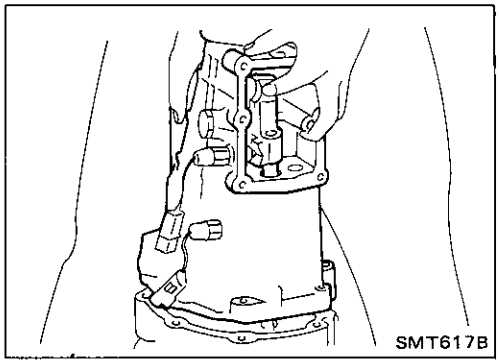



7. Install stopper ring and main drive bearing snap ring.

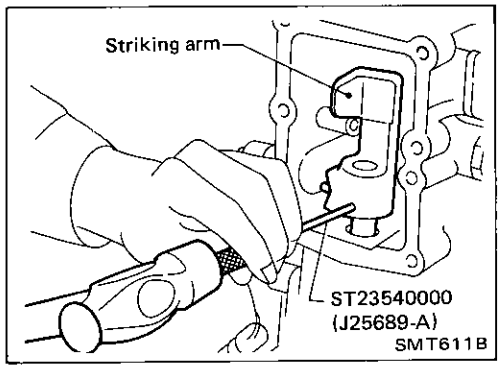



8. Install front cover and gasket.
   **Apply sealant to thread of 3 bolts shown left.**
9. Apply sealant to mating surface of adapter plate.

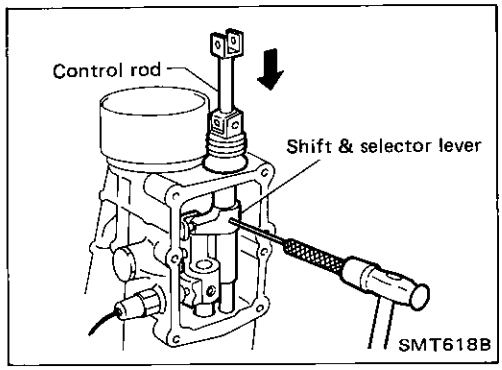
## Case Components (Cont'd)



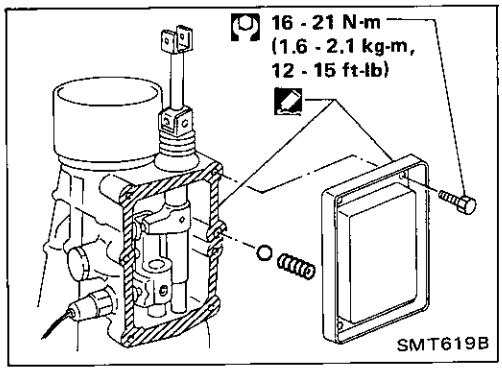

10. Install rear extension together with striking arm.




11. Install retaining pin into striking arm.




12. Install control rod.
    **Be careful not to damage control rod oil seal and dust cover.**
13. Install retaining pin into shift & selector lever.




14. Install return spring and check ball and then install control housing.
    **Apply sealant to mating surface of rear extension.**
15. Tighten control housing bolts.

## General Specifications

| | |
|---|---|
| Engine | VG30DE, VG30DETT |
| Transmission model | RS5R30A |
| Shift pattern | |
| Synchromesh type | Warner |

| Gear ratio | |
|---|---|
| 1st | 3.214 |
| 2nd | 1.925 |
| 3rd | 1.302 |
| 4th | 1.000 |
| O.D. | 0.752 |
| Reverse | 3.369 |

| Number of teeth | | |
|---|---|---|
| Main drive gear | | 23 |
| Main gear | 1st | 31 |
| | 2nd | 30 |
| | 3rd | 29 |
| | O.D. | 24 |
| | Reverse | 30 |
| Counter drive gear | | 31 |
| Counter gear | 1st | 13 |
| | 2nd | 21 |
| | 3rd | 30 |
| | O.D. | 43 |
| | Reverse | 12 |
| Reverse idler gear | | 22 |

| | | |
|---|---|---|
| Oil capacity | liter (US pt, Imp pt) | 2.8 (5-7/8, 4-7/8) |

## Inspection and Adjustment

### GEAR END PLAY

| Gear | End play mm (in) |
|---|---|
| 1st main gear | 0.23 - 0.33 (0.0091 - 0.0130) |
| 2nd main gear | 0.23 - 0.33 (0.0091 - 0.0130) |
| 3rd main gear | 0.23 - 0.33 (0.0091 - 0.0130) |
| O.D. counter gear | 0.23 - 0.33 (0.0091 - 0.0130) |
| Reverse main gear | 0.33 - 0.43 (0.0130 - 0.0169) |
| Counter gear | 0.10 - 0.25 (0.0039 - 0.0098) |
| Reverse idler gear | 0.30 - 0.53 (0.0118 - 0.0209) |

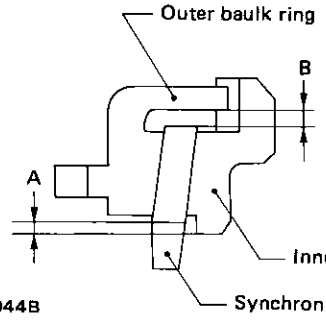
### CLEARANCE BETWEEN BAULK RING AND GEAR

#### 1st, main drive and O.D. baulk ring

Unit: mm (in)

| | Standard | Wear limit |
|---|---|---|
| 1st | 1.05 - 1.3 (0.0413 - 0.0512) | 0.7 (0.028) |
| Main drive | 1.05 - 1.3 (0.0413 - 0.0512) | 0.7 (0.028) |
| O.D. | 1.05 - 1.3 (0.0413 - 0.0512) | 0.7 (0.028) |

#### 2nd and 3rd baulk ring



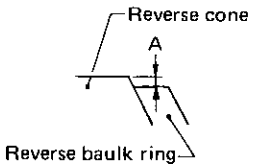

SMT044B

Unit: mm (in)

| Dimension | Standard | Wear limit |
|---|---|---|
| A | 0.6 - 1.1 (0.024 - 0.043) | 0.2 (0.008) |
| B | 0.7 - 0.9 (0.028 - 0.035) | 0.2 (0.008) |

## Inspection and Adjustment (Cont'd)

### DISTANCE BETWEEN REAR SURFACE OF REVERSE CONE AND REVERSE BAULK RING




Unit: mm (in)

| | Standard | Wear limit |
|---|---|---|
| Dimension "A" | −0.1 to 0.35 (−0.0039 to 0.0138) | 0.7 (0.028) |

### AVAILABLE SNAP RING

#### Main drive gear snap ring

| Allowable clearance | 0 - 0.1 mm (0 - 0.004 in) |
|---|---|
| Thickness mm (in) | Part number |
| 1.89 (0.0744) | 32204-01G00 |
| 1.98 (0.0780) | 32204-01G01 |
| 2.05 (0.0807) | 32204-01G02 |
| 2.12 (0.0835) | 32204-01G03 |
| 2.19 (0.0862) | 32204-01G04 |

#### Mainshaft front snap ring

| Allowable clearance | 0 - 0.1 mm (0 - 0.004 in) |
|---|---|
| Thickness mm (in) | Part number |
| 1.89 (0.0744) | 32204-01G00 |
| 1.98 (0.0780) | 32204-01G01 |
| 2.05 (0.0807) | 32204-01G02 |
| 2.12 (0.0835) | 32204-01G03 |
| 2.19 (0.0862) | 32204-01G04 |

#### Counter gear rear snap ring

| Allowable clearance | 0 - 0.1 mm (0 - 0.004 in) |
|---|---|
| Thickness mm (in) | Part number |
| 1.26 (0.0496) | 32236-01G08 |
| 1.32 (0.0520) | 32236-01G00 |
| 1.38 (0.0543) | 32236-01G01 |
| 1.44 (0.0567) | 32236-01G02 |
| 1.50 (0.0591) | 32236-01G03 |
| 1.56 (0.0614) | 32236-01G04 |
| 1.62 (0.0638) | 32236-01G05 |
| 1.68 (0.0661) | 32236-01G06 |
| 1.74 (0.0685) | 32236-01G07 |

### AVAILABLE C-RING

#### Mainshaft C-ring

| Allowable clearance | | 0 - 0.1 mm (0 - 0.004 in) | |
|---|---|---|---|
| Thickness mm (in) | Part number | Thickness mm (in) | Part number |
| 2.63 (0.1035) | 32348-01G15 | 3.19 (0.1256) | 32348-01G07 |
| 2.70 (0.1063) | 32348-01G00 | 3.26 (0.1283) | 32348-01G08 |
| 2.77 (0.1091) | 32348-01G01 | 3.33 (0.1311) | 32348-01G09 |
| 2.84 (0.1118) | 32348-01G02 | 3.40 (0.1339) | 32348-01G10 |
| 2.91 (0.1146) | 32348-01G03 | 3.47 (0.1366) | 32348-01G11 |
| 2.98 (0.1173) | 32348-01G04 | 3.54 (0.1394) | 32348-01G12 |
| 3.05 (0.1201) | 32348-01G05 | 3.61 (0.1421) | 32348-01G13 |
| 3.12 (0.1228) | 32348-01G06 | 3.68 (0.1449) | 32348-01G14 |

### AVAILABLE SHIM AND WASHER

#### Table for selecting proper counter gear front bearing shim

| Dial indicator deflection mm (in) | Thickness of proper washer mm (in) | Part number |
|---|---|---|
| 0.93 - 1.02 (0.0366 - 0.0402) | 0.8 (0.031) | 32218-01G00 |
| 1.03 - 1.12 (0.0406 - 0.0441) | 0.9 (0.035) | 32218-01G01 |
| 1.13 - 1.22 (0.0445 - 0.0480) | 1.0 (0.039) | 32218-01G02 |
| 1.23 - 1.32 (0.0484 - 0.0520) | 1.1 (0.043) | 32218-01G03 |
| 1.33 - 1.42 (0.0524 - 0.0559) | 1.2 (0.047) | 32218-01G04 |
| 1.43 - 1.52 (0.0563 - 0.0598) | 1.3 (0.051) | 32218-01G05 |
| 1.53 - 1.62 (0.0602 - 0.0638) | 1.4 (0.055) | 32218-01G06 |

#### Reverse idler rear thrust washer

| Thickness mm (in) | Part number |
|---|---|
| 1.97 (0.0776) | 32284-01G10 |
| 2.07 (0.0815) | 32284-01G11 |

# AUTOMATIC TRANSMISSION

# SECTION AT

## CONTENTS


PREPARATION AND PRECAUTIONS ..... AT- 2
A/T CONTROL DIAGRAM ..... AT- 4
ON-VEHICLE SERVICE ..... AT- 7
TROUBLE DIAGNOSES ..... AT- 11
REMOVAL AND INSTALLATON ..... AT-100
MAJOR OVERHAUL ..... AT-102
DISASSEMBLY ..... AT-110
REPAIR FOR COMPONENT PARTS ..... AT-122
ASSEMBLY ..... AT-170
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... AT-189

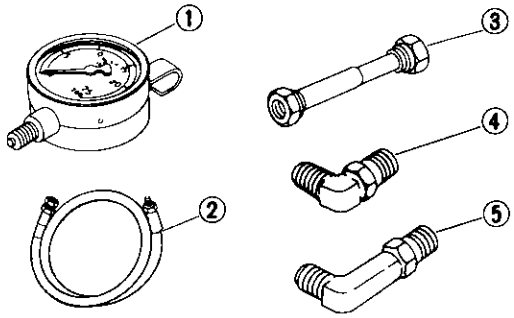
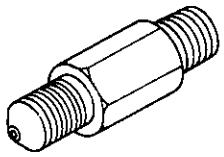
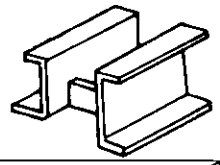
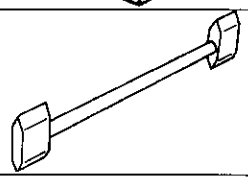
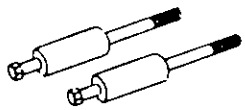
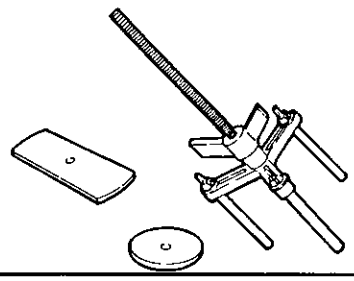
**When you read wiring diagrams:**

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

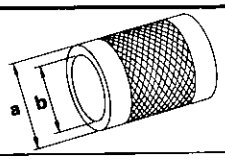
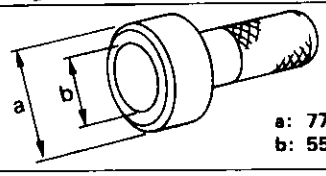
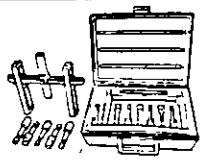
**When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".**

## Preparation

### SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| ST2505S001<br>(J25695-A)<br>Oil pressure gauge set<br>① ST25051001<br>( – )<br>Oil pressure gauge<br>② ST25052000<br>( – )<br>Hose<br>③ ST25053000<br>( – )<br>Joint pipe<br>④ ST25054000<br>( – )<br>Adapter<br>⑤ ST25055000<br>( – )<br>Adapter |  | Measuring line pressure |
| KV31101201<br>( – )<br>Oil pressure gauge adapter |  | Measuring line pressure |
| ST07870000<br>(J37068)<br>Transmission case stand |  | Disassembling and assembling A/T |
| KV31102100<br>(J37065)<br>Torque converter one-way clutch check tool |  | Checking one-way clutch in torque converter |
| ST25850000<br>(J25721-A)<br>Sliding hammer |  | Removing oil pump assembly |
| KV31102400<br>(J34285 and J34285-87)<br>Clutch spring compressor |  | Removing and installing clutch return springs |

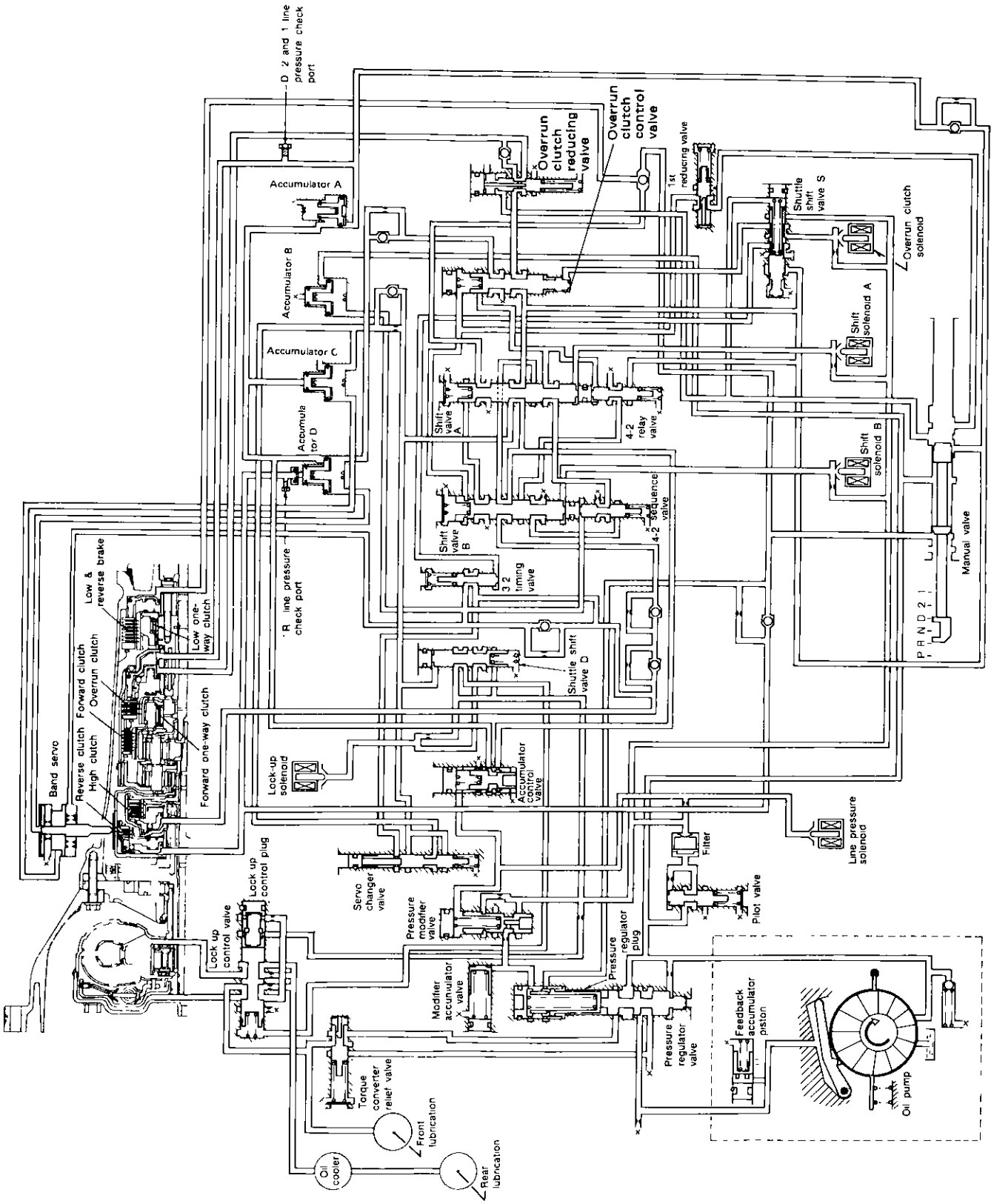
## Preparation (Cont'd)

| Tool number (Kent-Moore No.) Tool name | Description | |
|---|---|---|
| ST33200000 (J26082) Drift |  a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia. | Installing oil pump housing oil seal Installing rear oil seal |
| ST30720000 (J34331) Drift |  a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia. | Installing rear oil seal |
| (J34291) Shim setting gauge set |  | Selecting oil pump cover bearing race and oil pump thrust washer |

## Precautions

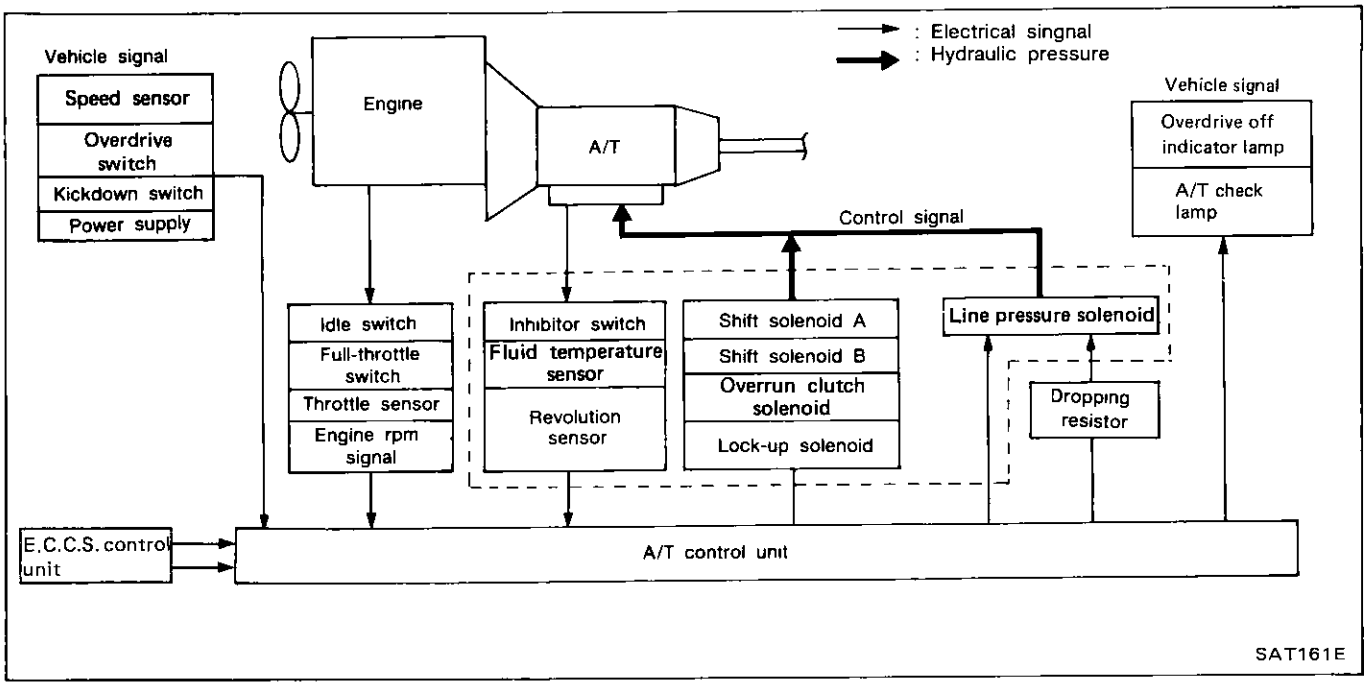
- Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transmission.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transmission is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during reassembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transmission with new A.T.F.

## Hydraulic Control Circuits




SAT123B

## Electrical Control Chart

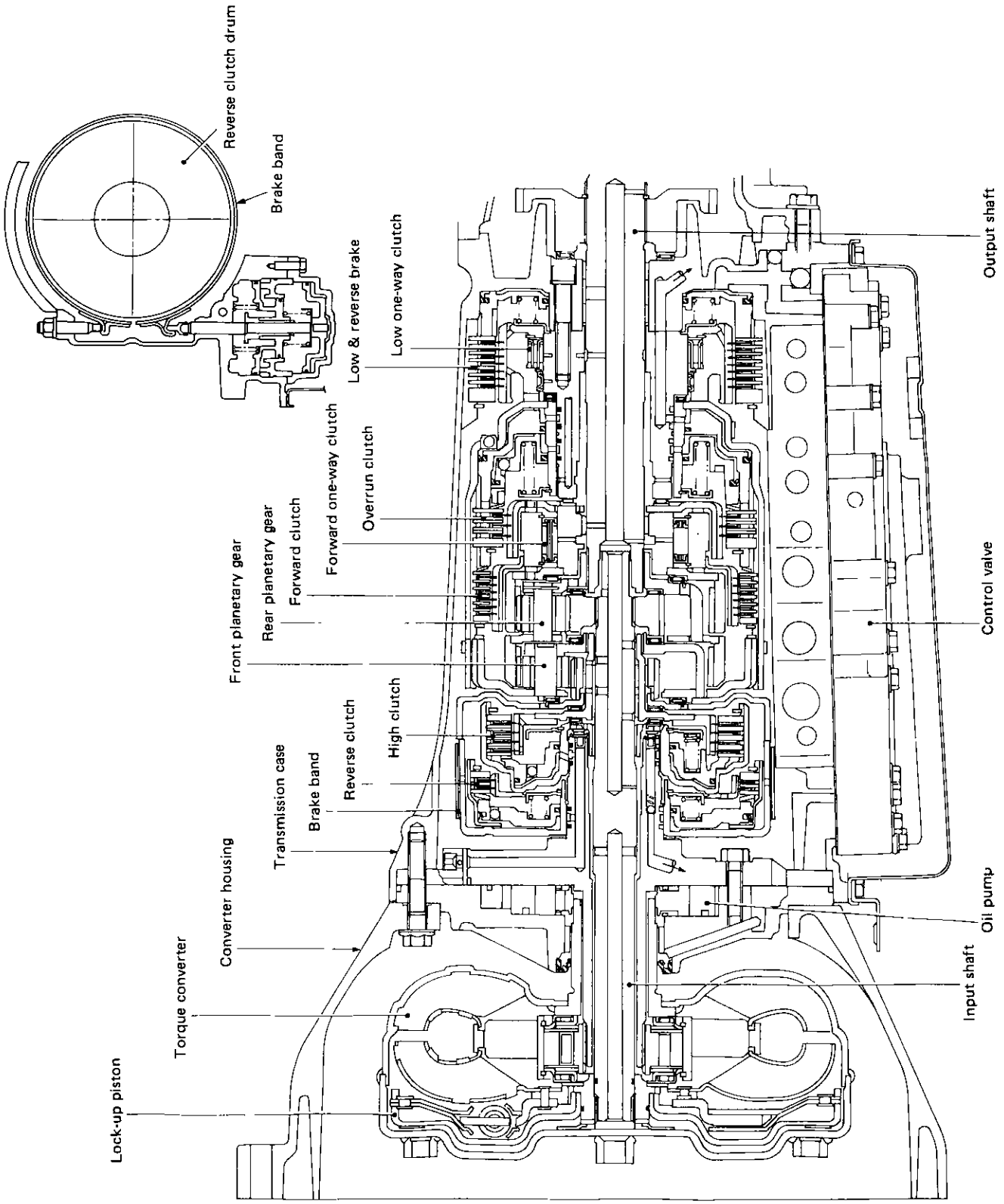



## Mechanical Operation

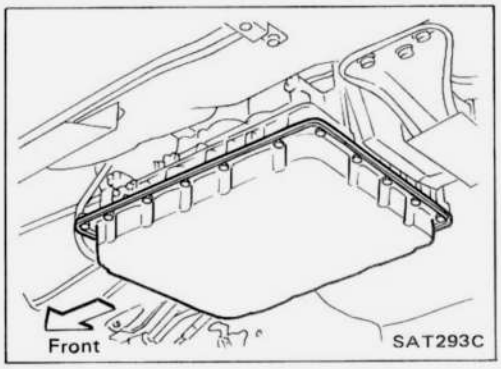
| Shift position | | Reverse clutch | High clutch | Forward clutch | Overrun clutch | Band servo 2nd apply | Band servo 3rd release | Band servo 4th apply | Forward one-way clutch | Low one-way clutch | Low & reverse brake | Lock-up | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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



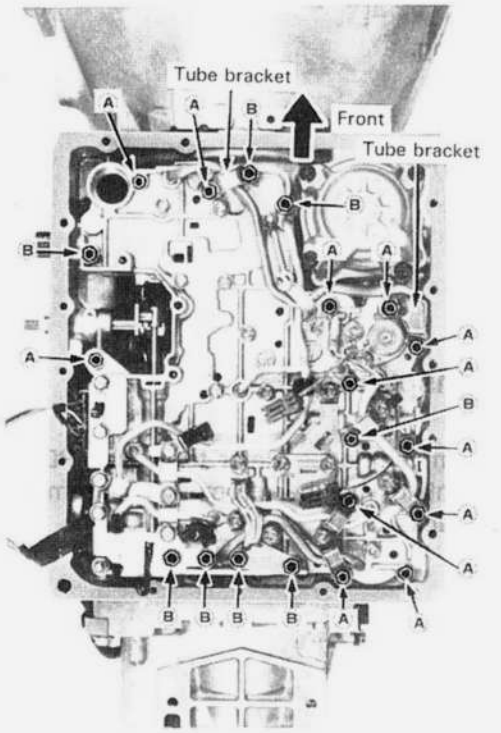

SAT125B




## Control Valve Assembly and Accumulators Inspection

1. Remove oil pan and gasket and drain A.T.F.

2. Remove oil strainer.

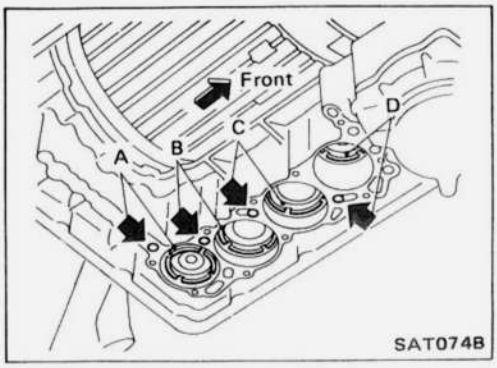



3. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

**Bolt length and location**

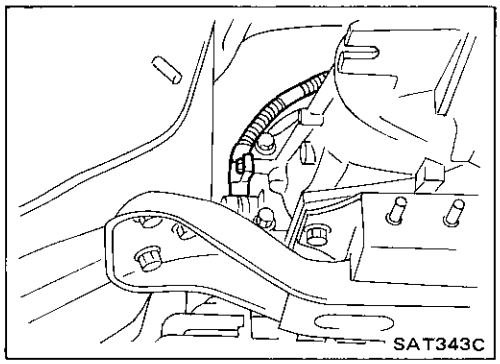
| Bolt symbol | ℓ mm (in) |
|---|---|
| Ⓐ | 33 (1.30) |
| Ⓑ | 45 (1.77) |

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.**

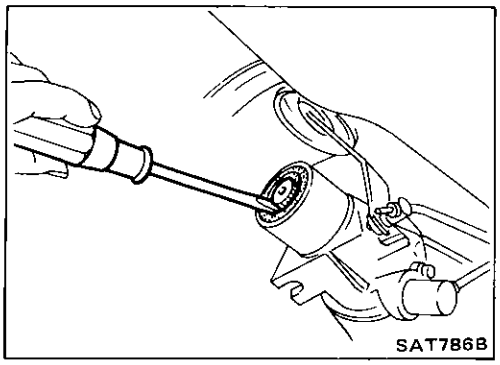
7. Reinstall any part removed.
- **Always use new sealing parts.**




## Revolution Sensor Replacement

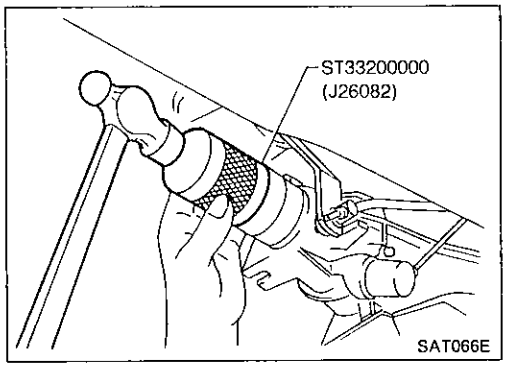
1. Remove exhaust tube.
2. Remove revolution sensor from A/T assembly.
3. Reinstall any part removed.

- **Always use new sealing parts.**




## Rear Oil Seal Replacement

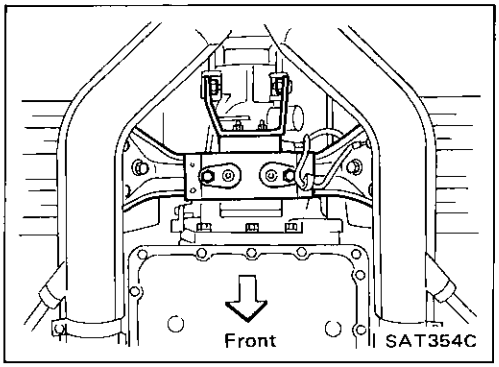
1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear oil seal.




3. Install rear oil seal.

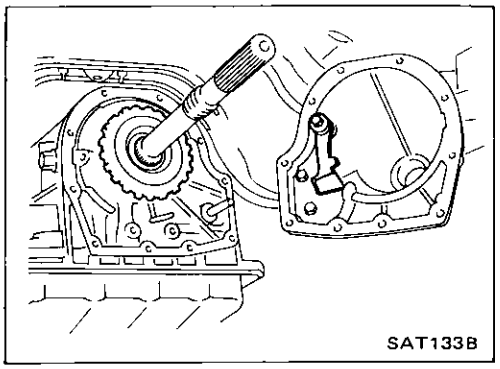
- **Apply A.T.F. before installing.**

4. Reinstall any part removed.



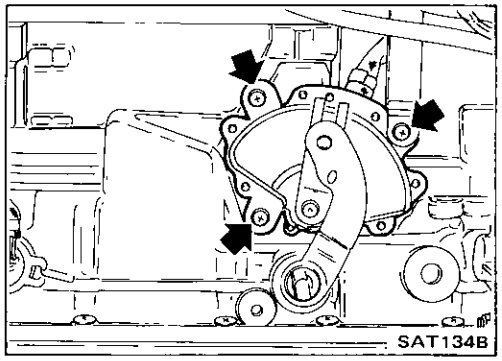

## Parking Components Inspection

1. Remove exhaust tube.
2. Remove propeller shaft from vehicle. — Refer to section PD.
3. Remove rear engine mounting member from A/T assembly while supporting A/T with jack.



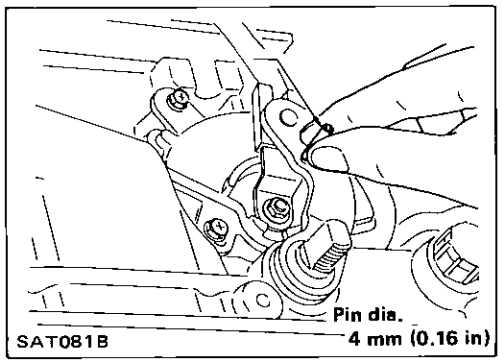

4. Remove rear extension from transmission case.
5. Replace parking components if necessary.
6. Reinstall any part removed.

- **Always use new sealing parts.**

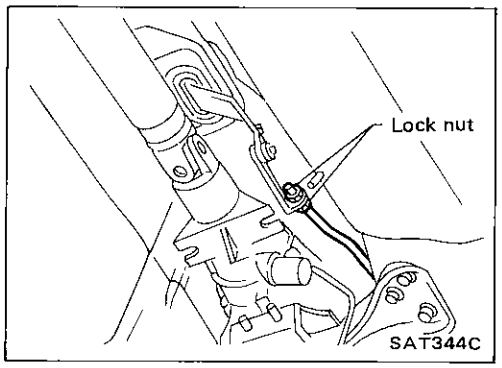



## Inhibitor Switch Adjustment

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.



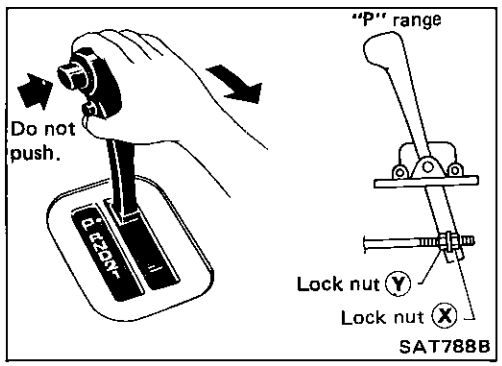

4. Insert pin into adjustment holes in both inhibitor switch and manual shaft of A/T assembly as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".



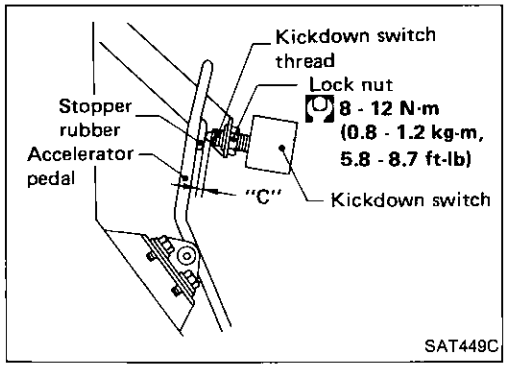

## Manual Control Linkage Adjustment

Move selector lever from "P" 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.




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.




## Kickdown Switch Adjustment

1. Adjust accelerator cable — Refer to section FE.
2. Adjust clearance "C" between stopper rubber and end of kickdown switch thread while depressing accelerator pedal fully.
   **Clearance "C": 0.3 - 1.0 mm (0.012 - 0.039 in)**

NOTE

## Contents

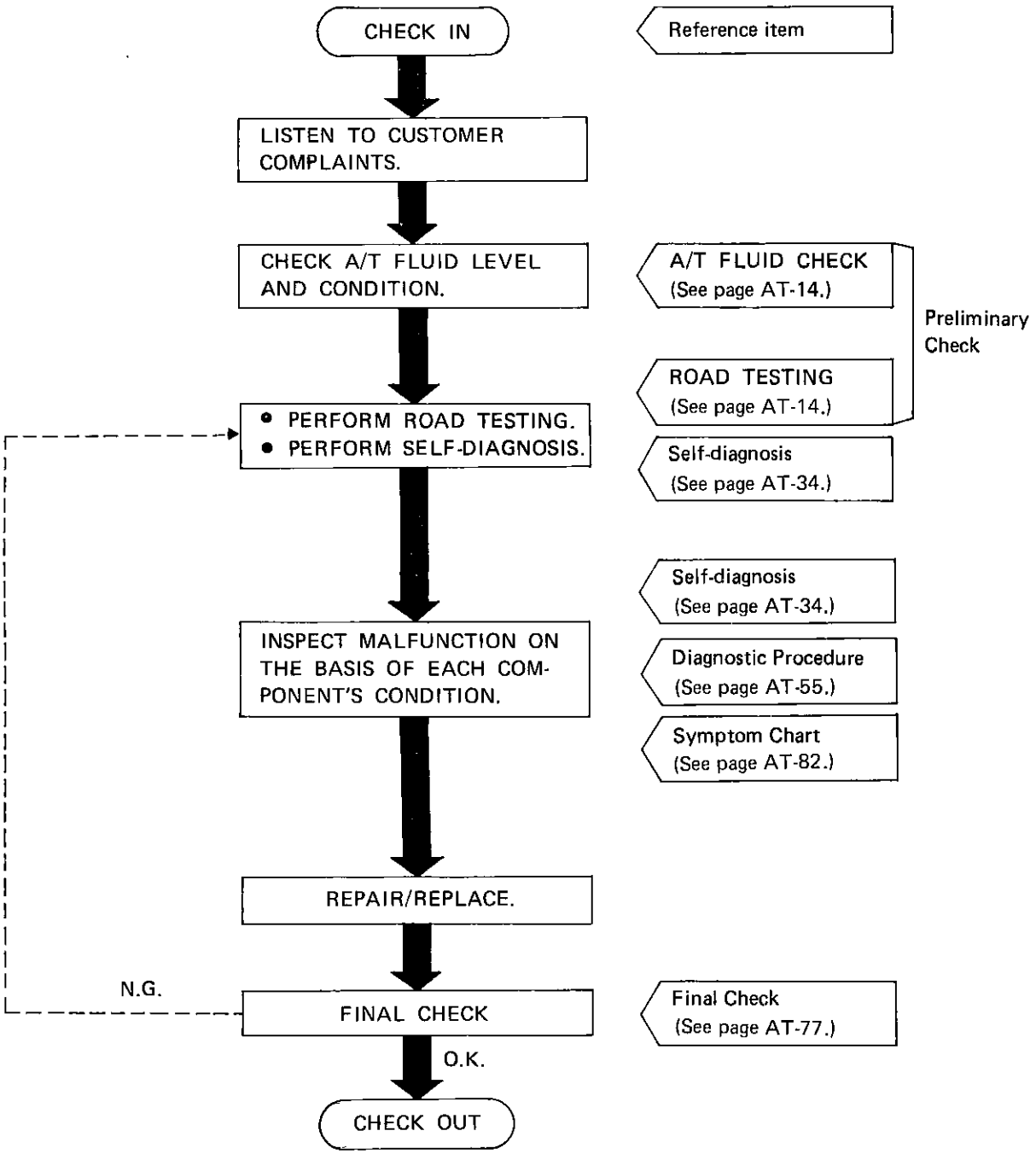
**How to Perform Trouble Diagnoses for Quick and Accurate Repair** ..... AT- 13
**Preliminary Check** ..... AT- 14
**Diagnosis by CONSULT** ..... AT- 29
**A/T Electrical Parts Location** ..... AT- 30
**Circuit Diagram for Quick Pinpoint Check** ..... AT- 31
**Wiring Diagram** ..... AT- 32
**Self-diagnosis** ..... AT- 34
SELF-DIAGNOSTIC PROCEDURE (With CONSULT) ..... AT- 34
SELF-DIAGNOSTIC PROCEDURE (Without CONSULT) ..... AT- 34
JUDGEMENT OF SELF-DIAGNOSIS CODE ..... AT- 36
REVOLUTION SENSOR CIRCUIT CHECK ..... AT- 40
SPEED SENSOR CIRCUIT CHECK ..... AT- 41
THROTTLE SENSOR CIRCUIT CHECK ..... AT- 42
SHIFT SOLENOID A CIRCUIT CHECK ..... AT- 43
SHIFT SOLENOID B CIRCUIT CHECK ..... AT- 44
OVERRUN CLUTCH SOLENOID CIRCUIT CHECK ..... AT- 45
LOCK-UP SOLENOID CIRCUIT CHECK ..... AT- 46
FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS ..... AT- 47
ENGINE REVOLUTION SIGNAL CIRCUIT CHECK ..... AT- 49
LINE PRESSURE SOLENOID CIRCUIT CHECK ..... AT- 50
INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS ..... AT- 51
**Diagnostic Procedure 1**
(SYMPTOM: A/T CHECK lamp does not come on for about 2 seconds when turning ignition switch to "ON".) ..... AT- 55
**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.) ..... AT- 56
**Diagnostic Procedure 3**
(SYMPTOM: Vehicle moves when it is pushed forward or backward with selector lever in "P" range.) ..... AT- 56
**Diagnostic Procedure 4**
(SYMPTOM: Vehicle moves forward or backward when selecting "N" range.) ..... AT- 57
**Diagnostic Procedure 5**
(SYMPTOM: There is large shock when changing from "N" to "R" range.) ..... AT- 58
**Diagnostic Procedure 6**
(SYMPTOM: Vehicle does not creep backward when selecting "R" range.) ..... AT- 59
**Diagnostic Procedure 7**
(SYMPTOM: Vehicle does not creep forward when selecting "D" , "2" or "1" range.) ..... AT- 60
**Diagnostic Procedure 8**
(SYMPTOM: Vehicle cannot be started from $D_1$ on Cruise test — Part 1.) ..... AT- 61
**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.) ..... AT- 62
**Diagnostic Procedure 10**
(SYMPTOM: A/T does not shift from $D_2$ to $D_3$ at the specified speed.) ..... AT- 63
**Diagnostic Procedure 11**
(SYMPTOM: A/T does not shift from $D_3$ to $D_4$ at the specified speed.) ..... AT- 64
**Diagnostic Procedure 12**
(SYMPTOM: A/T does not perform lock-up at the specified speed.) ..... AT- 65
**Diagnostic Procedure 13**
(SYMPTOM: A/T does not hold lock-up condition for more than 30 seconds.) ..... AT- 66
**Diagnostic Procedure 14**
(SYMPTOM: Lock-up is not released when accelerator pedal is released.) ..... AT- 66

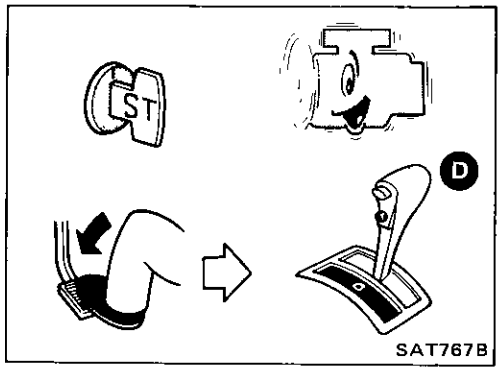
## Contents (Cont'd)

**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.) ..... AT- 67
**Diagnostic Procedure 16**
(SYMPTOM: Vehicle does not start from $D_1$ on Cruise test — Part 2.) ..... AT- 68
**Diagnostic Procedure 17**
(SYMPTOM: A/T does not shift from $D_4$ on $D_3$ when changing overdrive switch to "OFF" position.) ..... AT- 68
**Diagnostic Procedure 18**
(SYMPTOM: A/T does not shift from $D_3$ on $2_2$ when changing selector lever from "D" to "2" range.) ..... AT- 69
**Diagnostic Procedure 19**
(SYMPTOM: A/T does not shift from $2_2$ to $1_1$ when changing selector lever from "2" to "1" range.) ..... AT- 69
**Diagnostic Procedure 20**
(SYMPTOM: Vehicle does not decelerate by enigne brake when shifting from $2_2$ ($1_2$) to $1_1$.) ..... AT- 69
**Electrical Components Inspection** ..... AT- 70
**Final Check** ..... AT- 77
**Symptom Chart** ..... AT- 82
**A/T Shift Lock System** ..... AT- 85

## How to Perform Trouble Diagnoses for Quick and Accurate Repair

### WORK FLOW



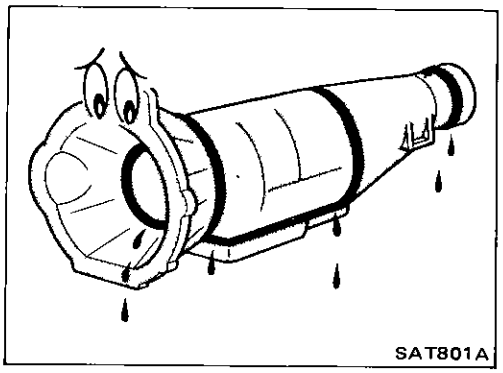



## Preliminary Check

### 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.

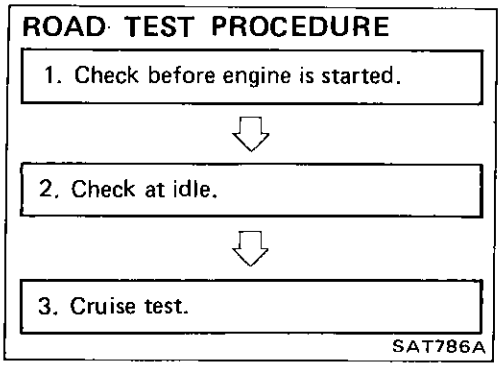



4. Check for fresh leakage.

**Fluid condition check**

| Fluid color | Suspected problem |
|---|---|
| Dark or black with burned odor | Wear of frictional material |
| Milky pink | Water contamination — Road water entering through filler tube or breather |
| Varnished fluid, light to dark brown and tacky | Oxidation — Over or under filling, Overheating |

**Fluid level check — Refer to section MA.**

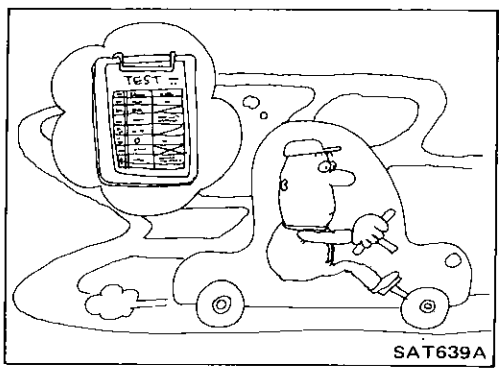



### ROAD TESTING

**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:

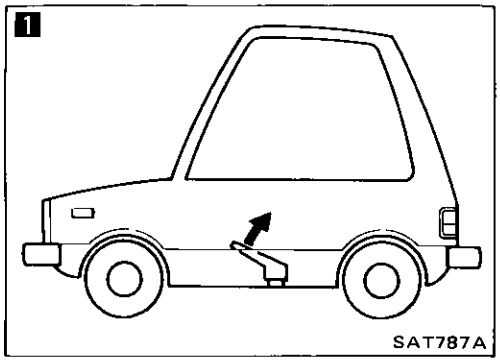
1. Check before engine is started
2. Check at idle
3. Cruise test

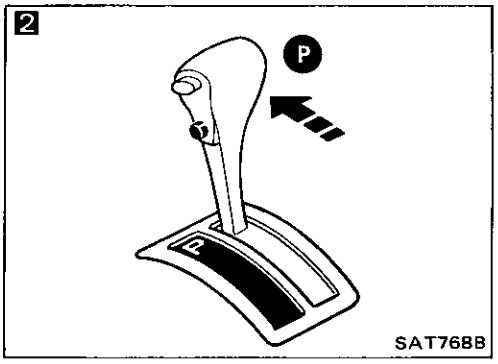


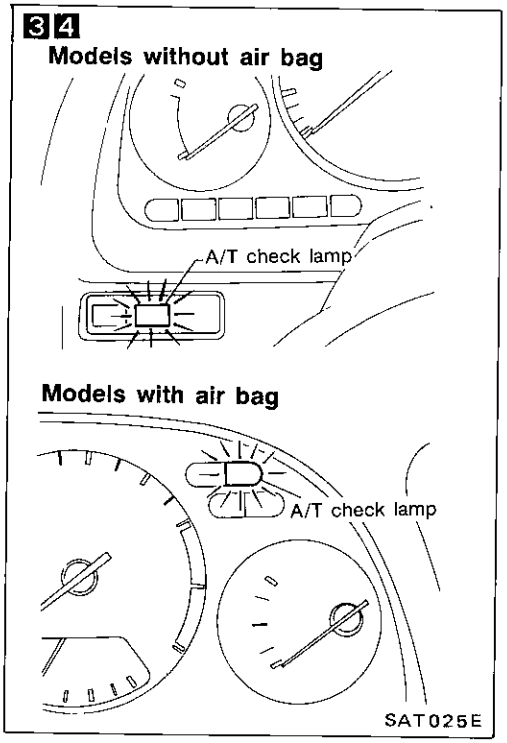

- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis" and "Diagnostic Procedure".

## 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 A/T check lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

Yes ↓

4

Does A/T check lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis. – Refer to SELF-DIAGNOSIS PROCEDURE.

No ↓

↓

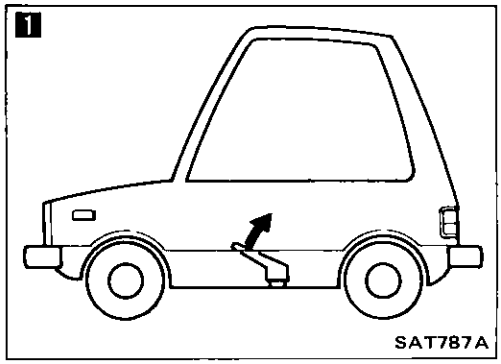
Perform self-diagnosis. – Refer to SELF-DIAGNOSIS PROCEDURE and note N.G. items.

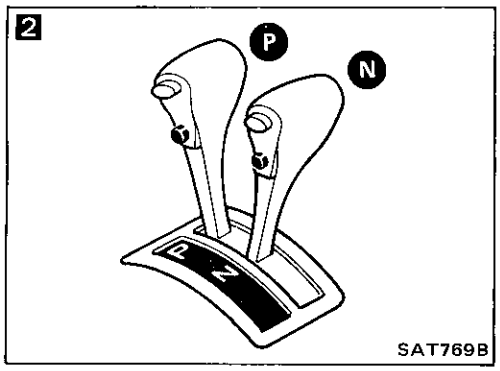
↓

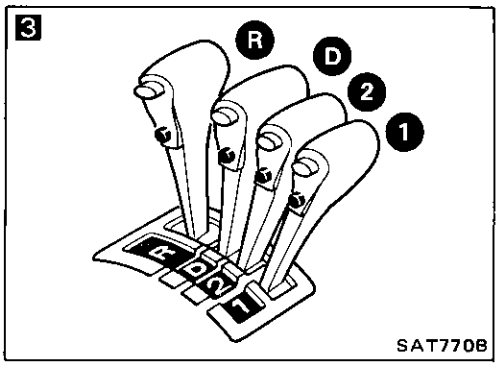
Go to "ROAD TESTING – 2. Check at idle".

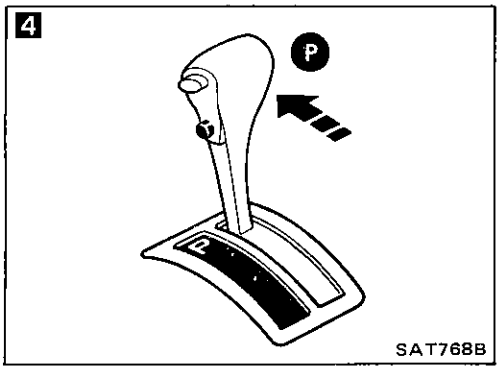
## Preliminary Check (Cont'd)

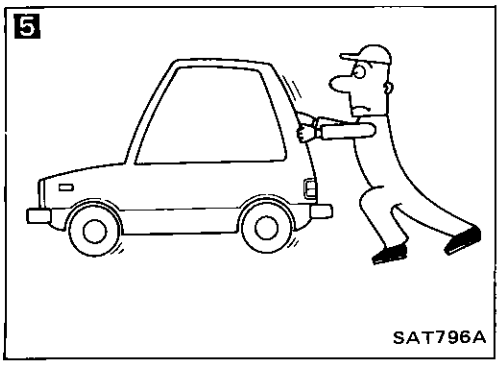
**2. Check at idle**




1 Park vehicle on flat surface.

2 Move selector lever to "P" or "N" range.

Is engine started? — No → Go to Diagnostic Procedure 2.

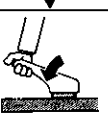
Yes

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.

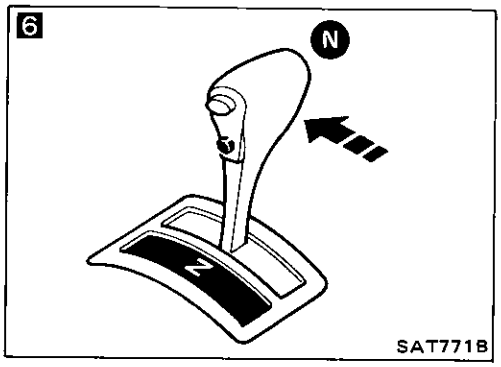
Does vehicle move when it is pushed forward or backward? — Yes → Go to Diagnostic Procedure 3.

No

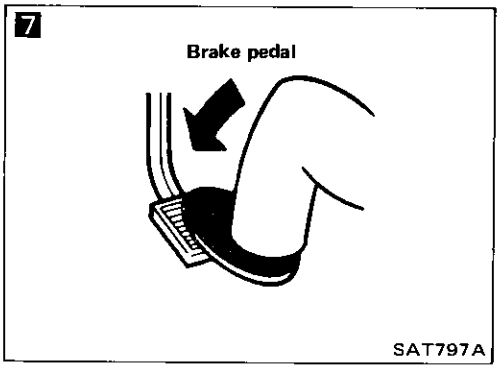
Ⓐ

## Preliminary Check (Cont'd)

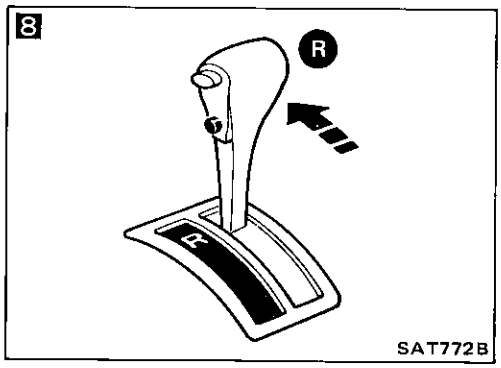
6



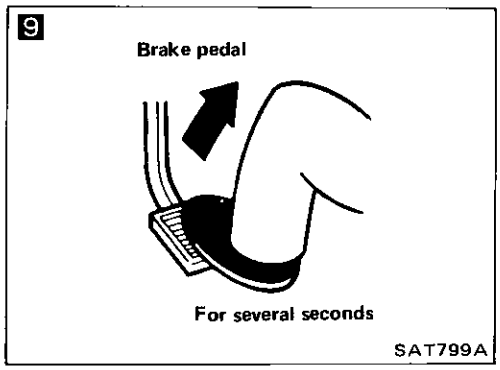

7



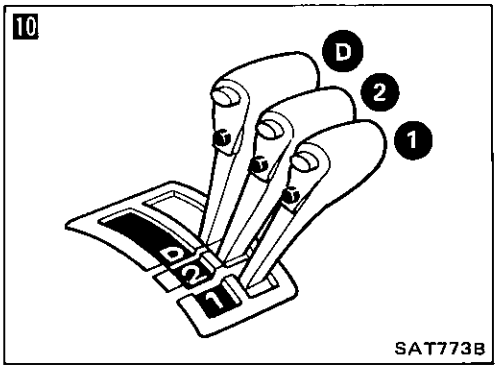

8

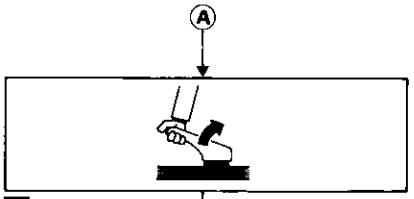



9

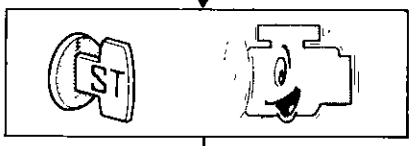


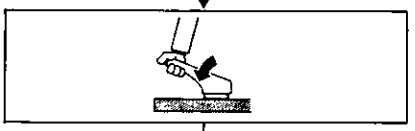

10



6 Move selector lever to "N" range.



Does vehicle move forward or backward? — Yes → Go to Diagnostic Procedure 4.

7 No

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.

9 No

Release foot brake for several seconds.

Does vehicle creep backward when foot brake is released? — No → Go to Diagnostic Procedure 6.

10 Yes

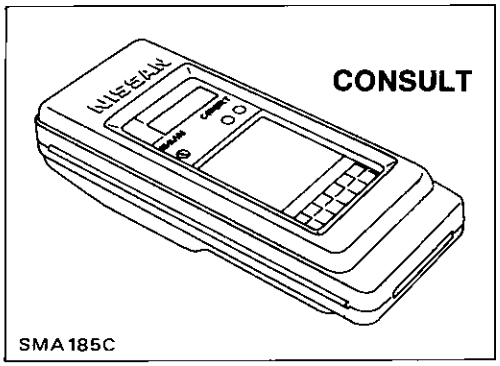
Move selector lever to "D", "1" and "2" ranges and check if vehicle creeps forward.

Does vehicle creep forward in all three ranges? — Yes → Go to Cruise test.

No

Go to Diagnostic Procedure 7.

## Preliminary Check (Cont'd)



SMA185C

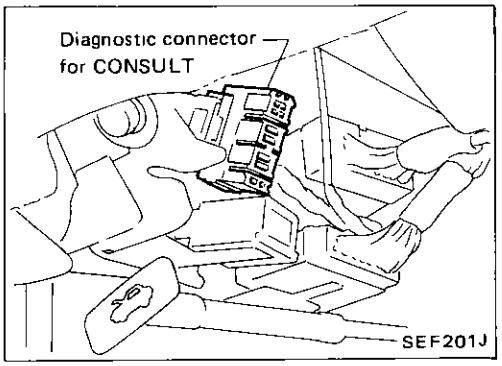
### 3. Cruise test

**With CONSULT**

- Using CONSULT, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule."
- Check all items listed in Parts 1 through 3.

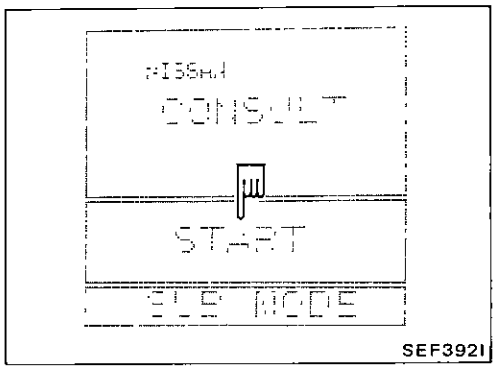
**CONSULT setting procedure**

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



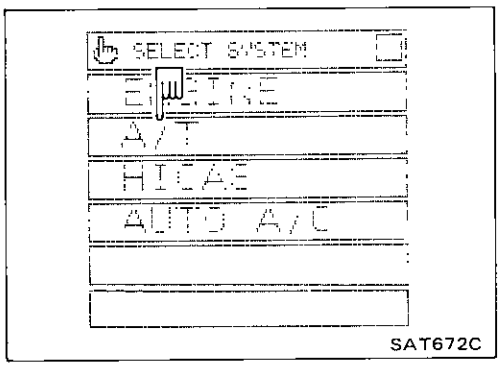
SEF201J

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



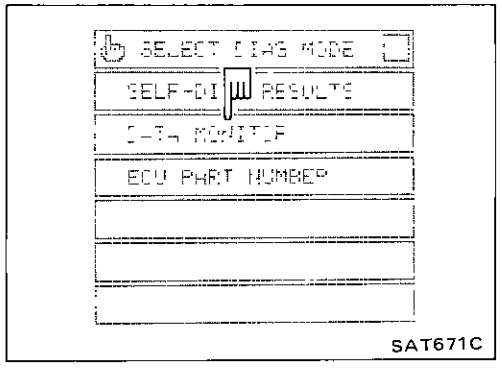
SEF392I

5. Touch "A/T".



SAT672C

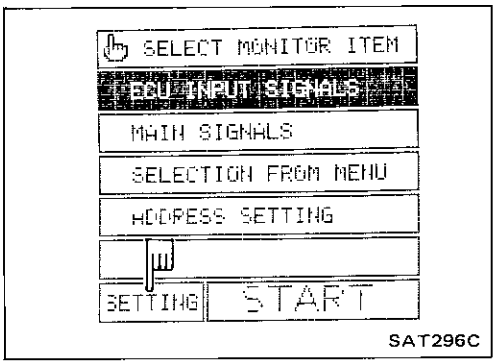
6. Touch "DATA MONITOR".



SAT671C

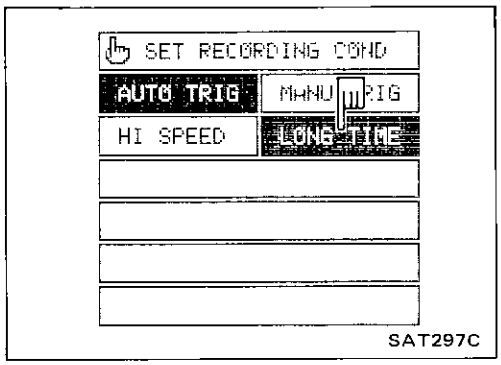
## Preliminary Check (Cont'd)

7. Touch "SETTING" to set recording condition.



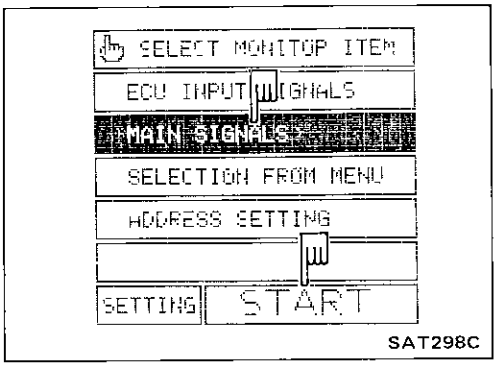
SAT296C

8. Touch "LONG TIME" and "ENTER" key.



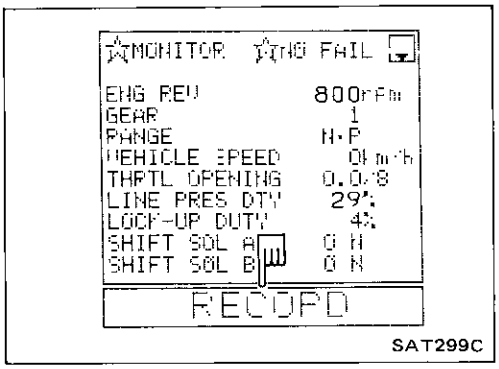
SAT297C

9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".
10. Touch "START".



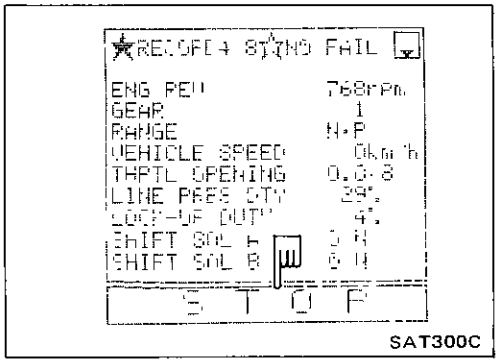
SAT298C

11. When performing cruise test, touch "RECORD".



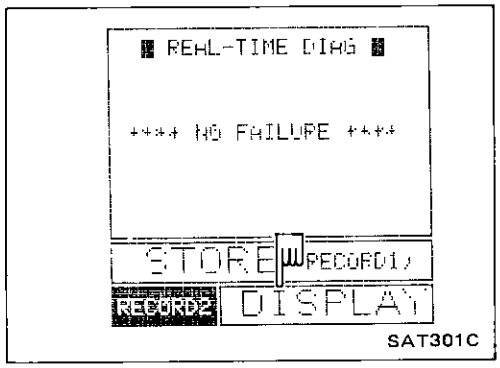
SAT299C

12. After finishing cruise test part 1, touch "STOP".



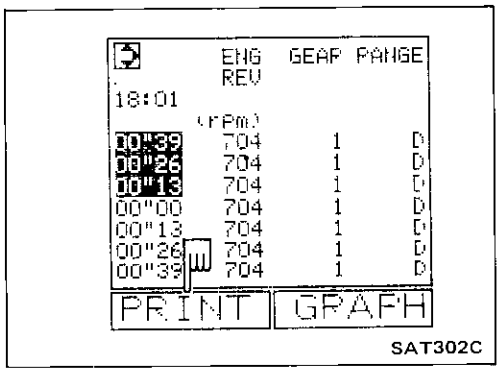
SAT300C

## Preliminary Check (Cont'd)



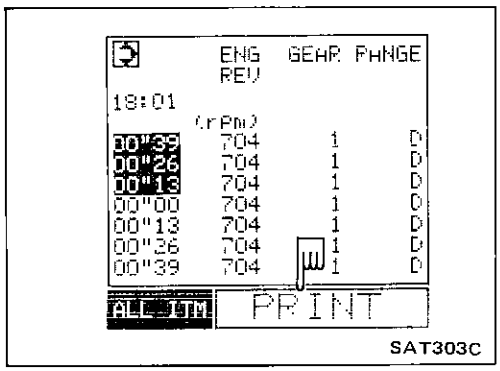
SAT301C

13. Touch "DISPLAY".



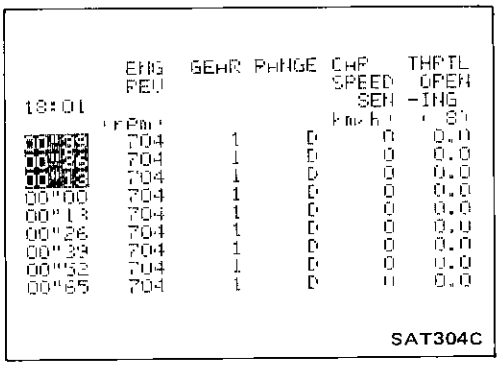
SAT302C

14. Touch "PRINT".



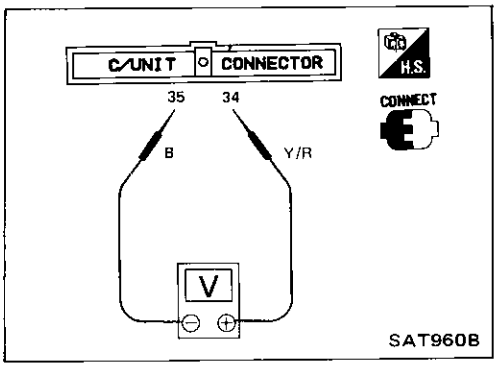
SAT303C

15. Touch "PRINT" again.



SAT304C

16. Check the monitor data printed out.
17. Continue cruise test part 2 and 3.

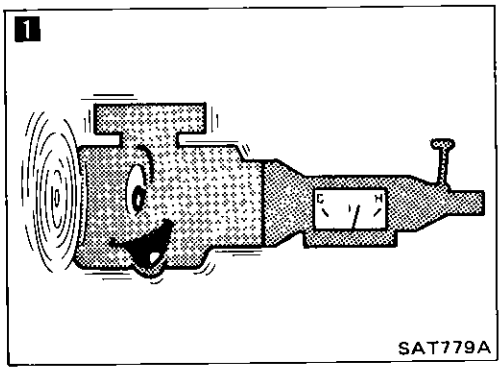


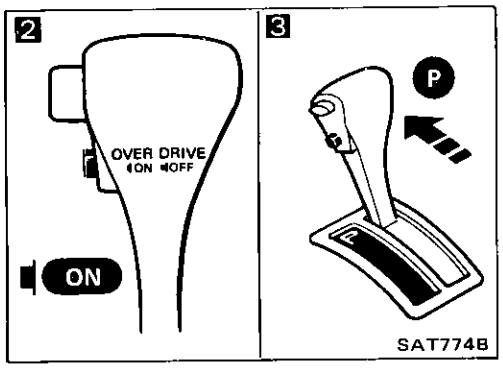
SAT960B

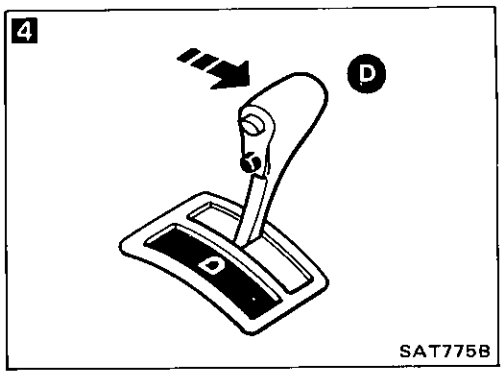
**Without CONSULT**

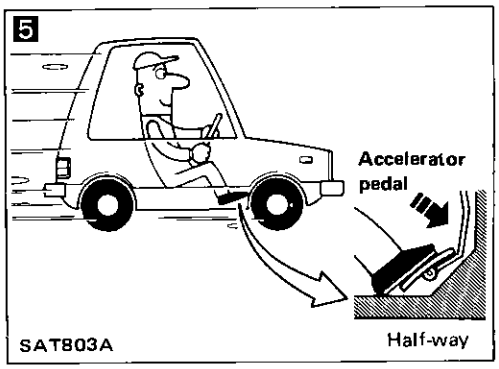
- Throttle position can be controlled by voltage across terminals ㉞ and ㉟ of A/T control unit.

## 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**

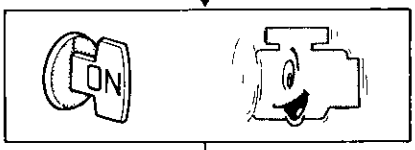
Set overdrive switch in "ON" position.

↓

**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.**

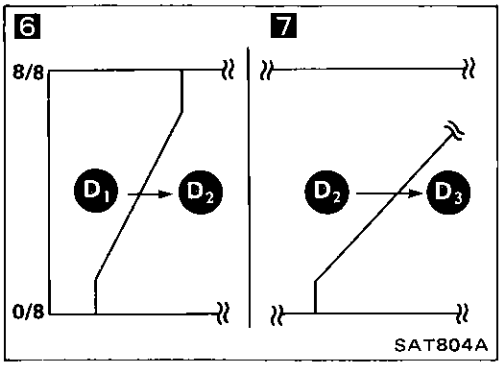
No → Go to Diagnostic Procedure 8.

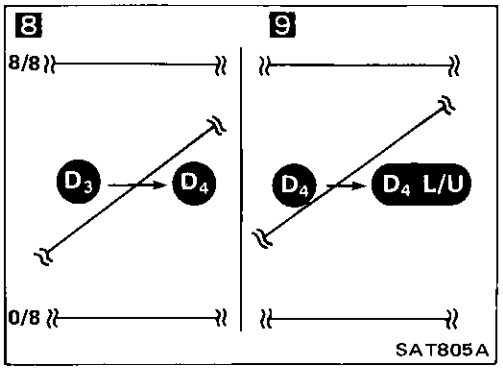
Yes

↓

Ⓐ

## Preliminary Check (Cont'd)




Ⓐ

**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 ↓

**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 ↓

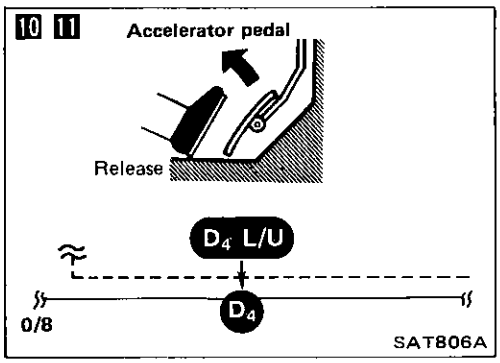
Does A/T hold lock-up condition for more than 30 seconds?

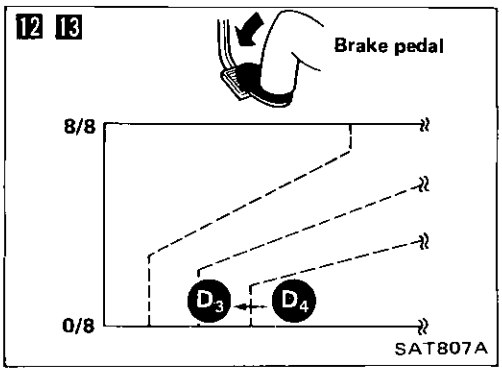
No → Go to Diagnostic Procedure 13.

Yes ↓

Ⓑ

## Preliminary Check (Cont'd)




Ⓑ

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.

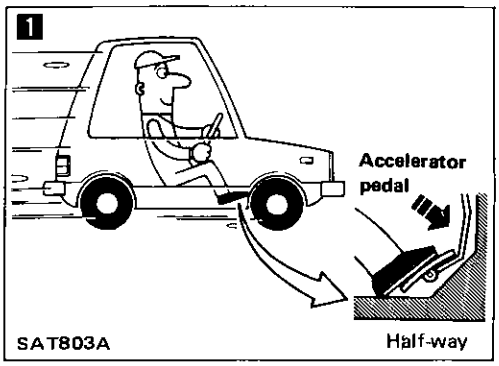
13 Does engine speed return to idle smoothly when A/T is shifted from $D_4$ to $D_3$? — No → Go to Diagnostic Procedure 15.

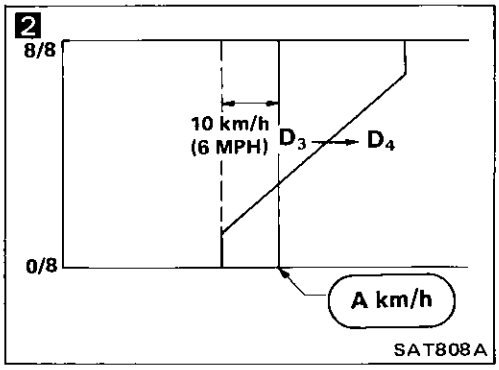
**Read gear position and engine speed.**

Yes

Stop vehicle.

Go to "Cruise test – Part 2".




## 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 $D_1$? — No → Go to Diagnostic Procedure 16.

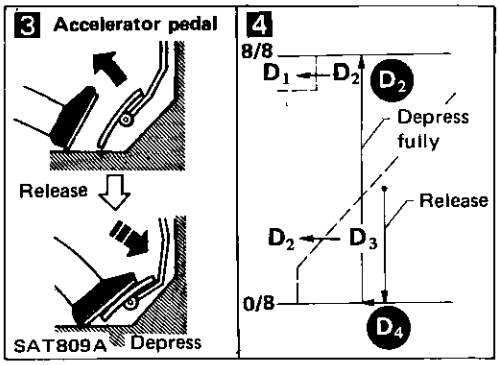
**Read gear position.**

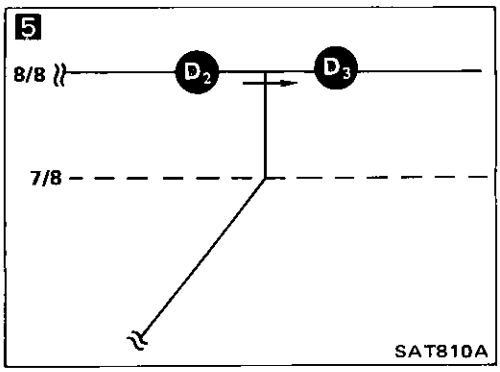
Yes

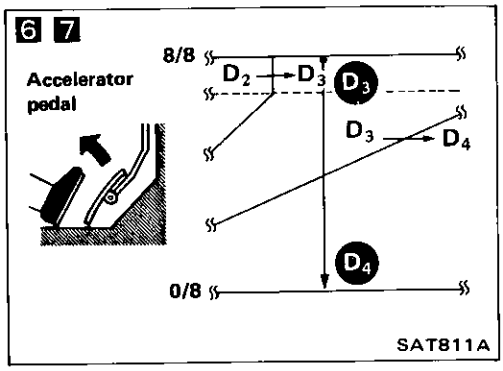
2 Accelerate vehicle to A km/h as shown in illustration.

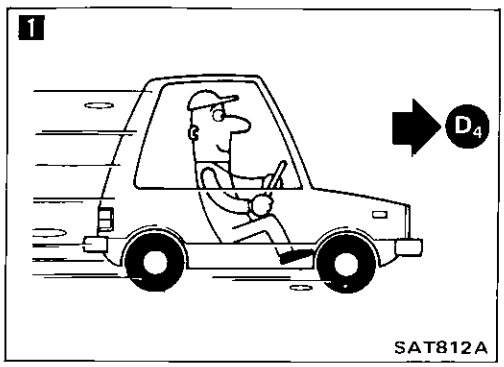
Ⓐ

## Preliminary Check (Cont'd)




Ⓐ

**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".

### Cruise test — Part 3

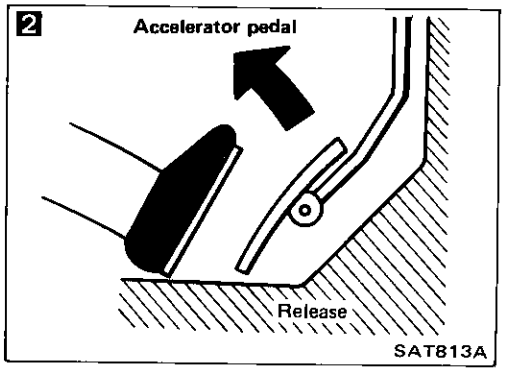
Confirm overdrive switch is in "ON" position.

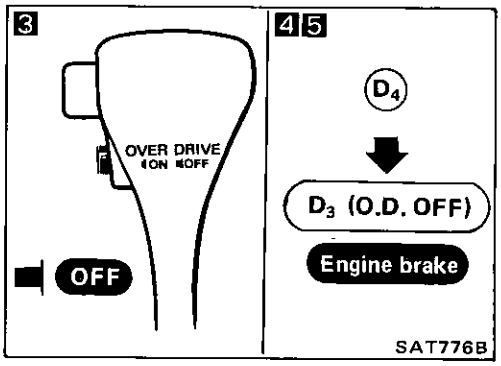
Confirm selector lever is in "D" range.

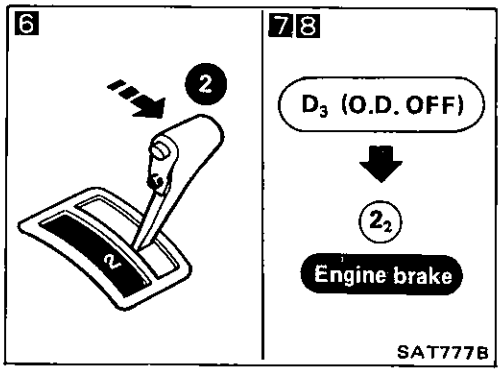
**1** Accelerate vehicle, using half-throttle, to $D_4$.

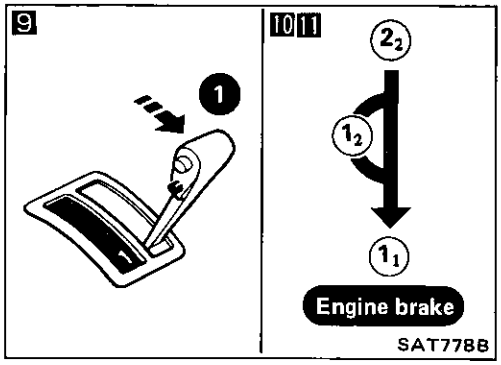
Ⓑ

## Preliminary Check (Cont'd)




(B)

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 $D_3$? — No → Go to Diagnostic Procedure 17.
**Read gear position and vehicle speed.**

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 $2_2$? — No → Go to Diagnostic Procedure 18.
**Read gear position.**

Yes

8 Does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 15.

Yes

9 Move selector lever from "2" to "1" range while driving in $2_2$.

10 Does A/T shift from $2_2$ to $1_1$ range? — No → Go to Diagnostic Procedure 19.
**Read gear position.**

Yes

11 Does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 20.

Yes

Stop vehicle.

Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.

## Preliminary Check (Cont'd)

### Vehicle speed when shifting gears

**RE4R01A**

| Throttle position | Vehicle speed km/h (MPH) | | | | | |
|---|---|---|---|---|---|---|
| | $D_1 \rightarrow D_2$ | $D_2 \rightarrow D_3$ | $D_3 \rightarrow D_4$ | $D_4 \rightarrow D_3$ | $D_3 \rightarrow D_2$ | $D_2 \rightarrow D_1$ |
| Full throttle | 60 - 64 (37 - 40) | 107 - 115 (66 - 71) | 166 - 176 (103 - 109) | 161 - 169 (100 - 105) | 96 - 104 (60 - 65) | 44 - 48 (27 - 30) |
| Half throttle | 45 - 49 (28 - 30) | 83 - 89 (52 - 55) | 119 - 127 (74 - 79) | 80 - 88 (50 - 55) | 33 - 39 (21 - 24) | 10 - 14 (6 - 9) |

**RE4R03A**

| Throttle position | Vehicle speed km/h (MPH) | | | | | |
|---|---|---|---|---|---|---|
| | $D_1 \rightarrow D_2$ | $D_2 \rightarrow D_3$ | $D_3 \rightarrow D_4$ | $D_4 \rightarrow D_3$ | $D_3 \rightarrow D_2$ | $D_2 \rightarrow D_1$ |
| Full throttle | 68 - 72 (42 - 45) | 120 - 128 (75 - 80) | 183 - 193 (114 - 120) | 177 - 187 (110 - 116) | 109 - 117 (68 - 73) | 33 - 37 (21 - 23) |
| Half throttle | 47 - 51 (29 - 32) | 89 - 95 (55 - 59) | 136 - 144 (85 - 89) | 78 - 86 (48 - 53) | 28 - 34 (17 - 21) | 10 - 14 (6 - 9) |

### Vehicle speed when performing and releasing lock-up

**RE4R01A**

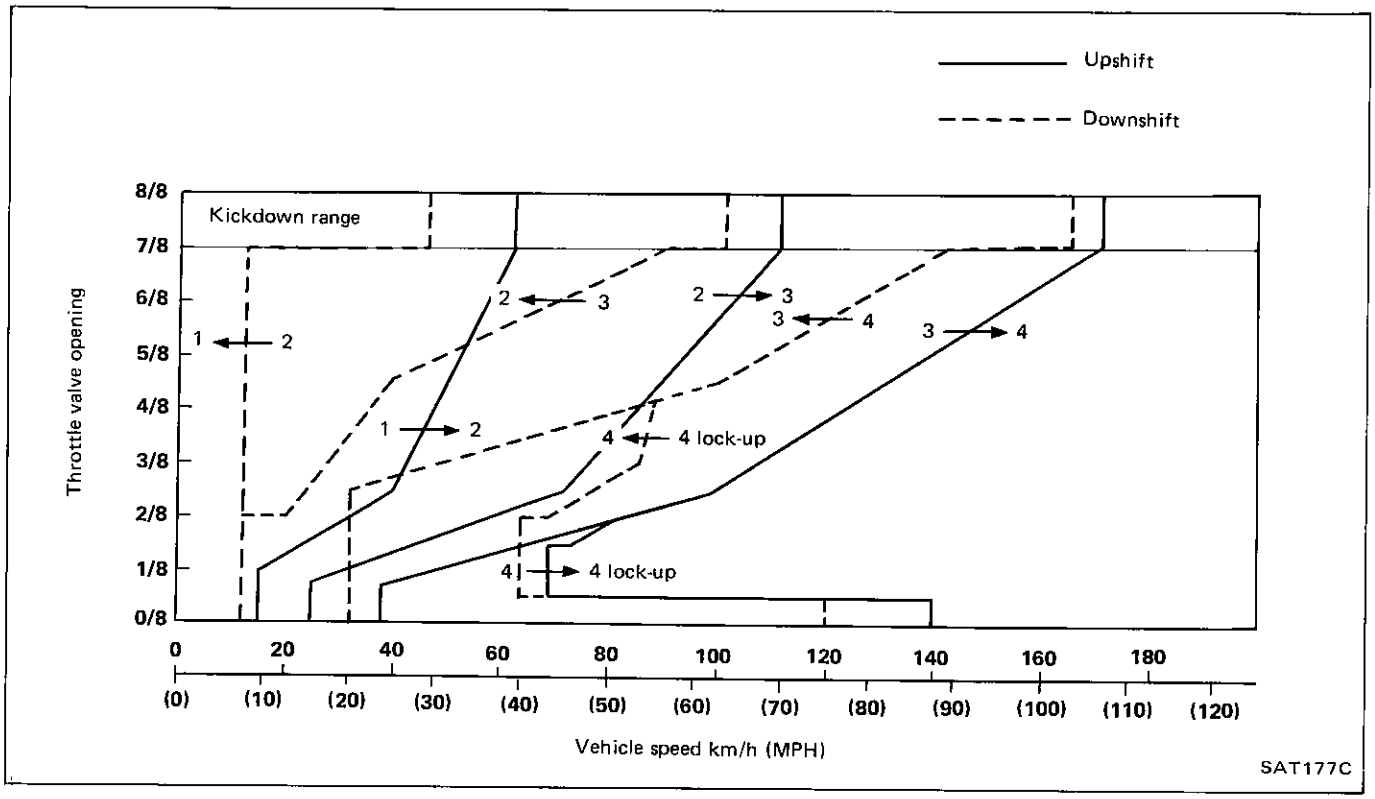
| Throttle position | O.D. switch [Shift range] | Vehicle speed km/h (MPH) | |
|---|---|---|---|
| | | Lock-up "ON" | Lock-up "OFF" |
| Full throttle | ON [$D_4$] | 167 - 175 (104 - 109) | 161 - 169 (100 - 105) |
| | OFF [$D_3$] | 107 - 115 (66 - 71) | 96 - 104 (60 - 65) |
| Half throttle | ON [$D_4$] | 120 - 128 (75 - 80) | 84 - 92 (52 - 57) |
| | OFF [$D_3$] | 91 - 99 (57 - 62) | 86 - 94 (53 - 58) |

**RE4R03A**

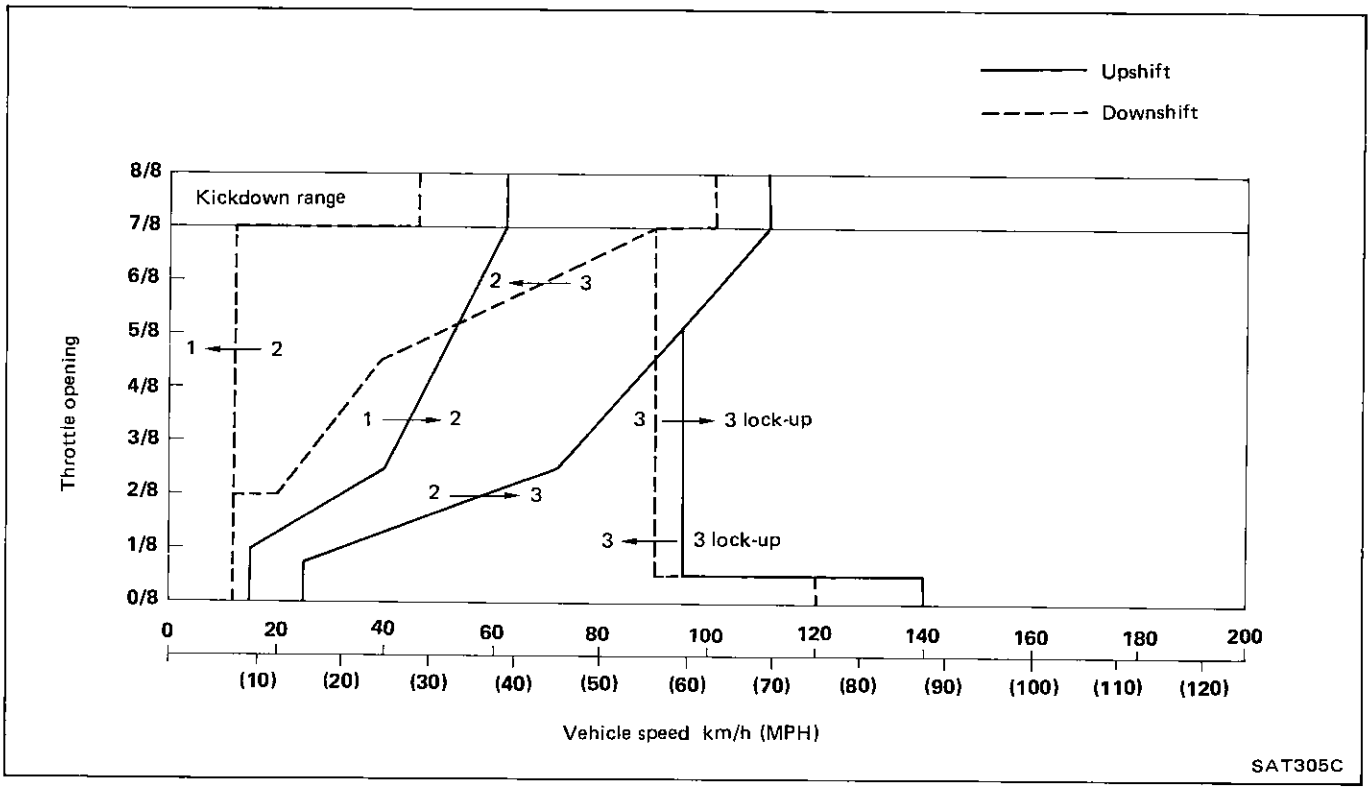
| Throttle position | O.D. switch (Shift range) | Vehicle speed km/h (MPH) | |
|---|---|---|---|
| | | Lock-up "ON" | Lock-up "OFF" |
| Full throttle | ON [$D_4$] | 184 - 192 (114 - 119) | 178 - 186 (111 - 116) |
| | OFF [$D_3$] | 120 - 128 (75 - 80) | 109 - 117 (68 - 73) |
| Half throttle | ON [$D_4$] | 184 - 192 (114 - 119) | 117 - 125 (73 - 78) |
| | OFF [$D_3$] | 88 - 96 (55 - 60) | 74 - 82 (46 - 51) |

## Preliminary Check (Cont'd)

**Shift schedule (Overdrive ON) — RE4R01A**

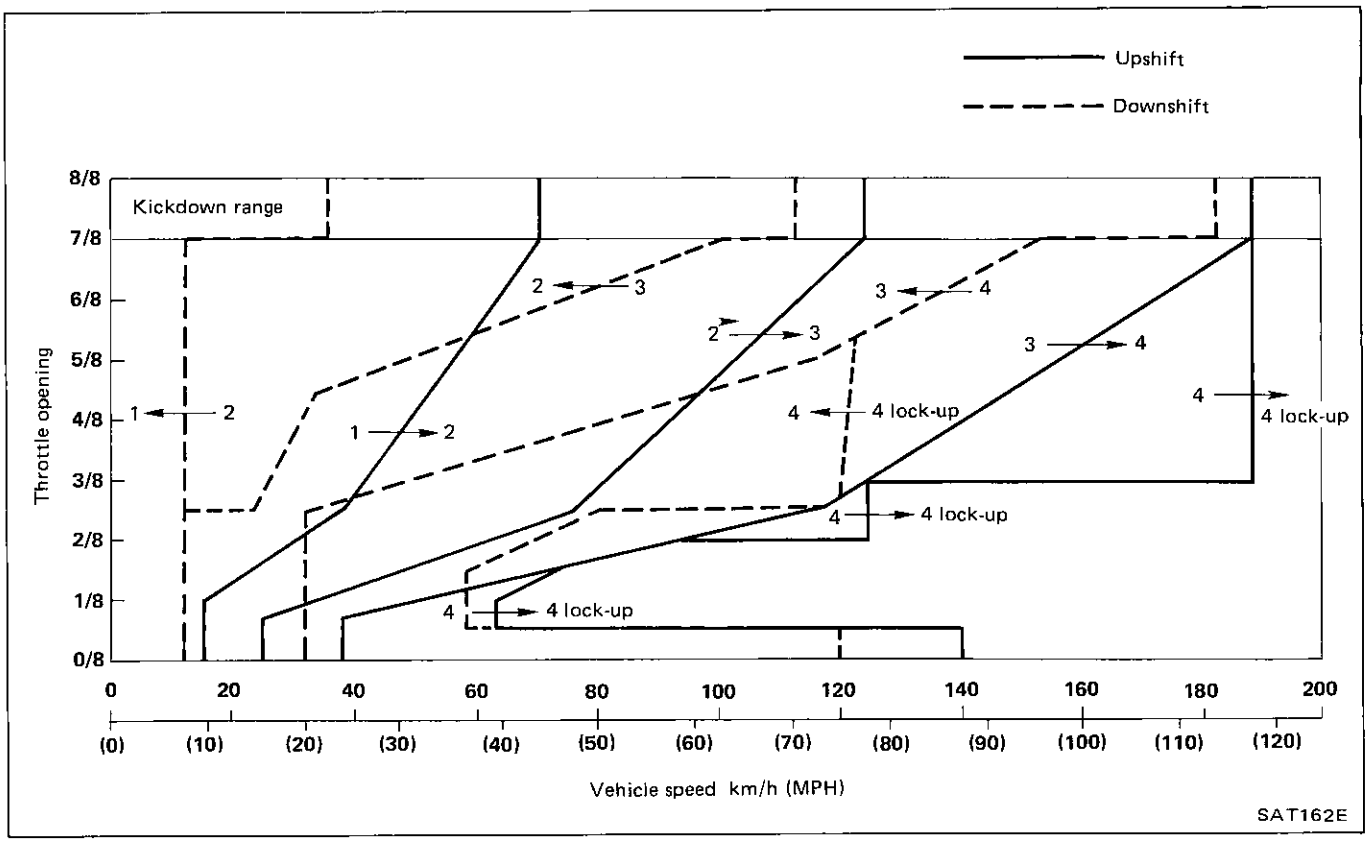



**Shift schedule (Overdrive OFF) — RE4R01A**

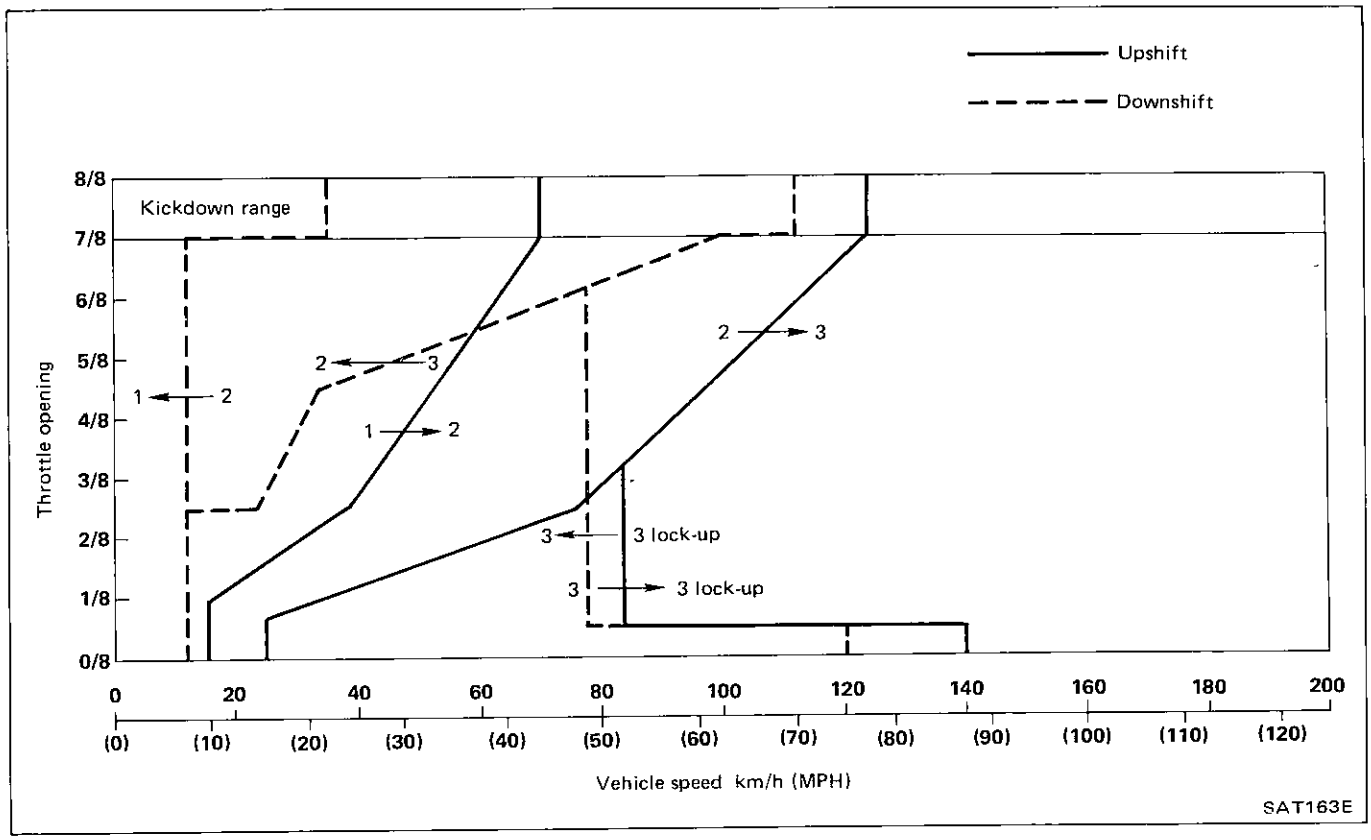


## Preliminary Check (Cont'd)

**Shift schedule (Overdrive ON) — RE4R03A**




**Shift schedule (Overdrive OFF) — RE4R03A**



## Diagnosis by CONSULT

### NOTICE

1. The CONSULT electrically displays shift timing and lock-up timing (that is, operation timing of each solenoid). When a noticeable time difference occurs between shift timing which is manifested by shift shock and the CONSULT display, mechanical parts (except solenoids, sensors, etc.) are considered to be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
2. Shift schedule (which implies gear position) displayed on CONSULT and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:
   - Actual shift schedule has more or less tolerance or allowance,
   - Shift schedule indicated in Service Manual refers to the point where shifts starts, and
   - Gear position displayed on CONSULT indicates the point where shifts are completed.
3. Shift solenoid "A" or "B" is displayed on CONSULT at the start of shifting while gear position is displayed upon completion of shifting (which is computed by A/T control unit).

### DATA MONITOR APPLICATION

| Item | Application |
|---|---|
| Vehicle speed sensor 1 (A/T) | X |
| Vehicle speed sensor 2 (meter) | X |
| Throttle 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 |

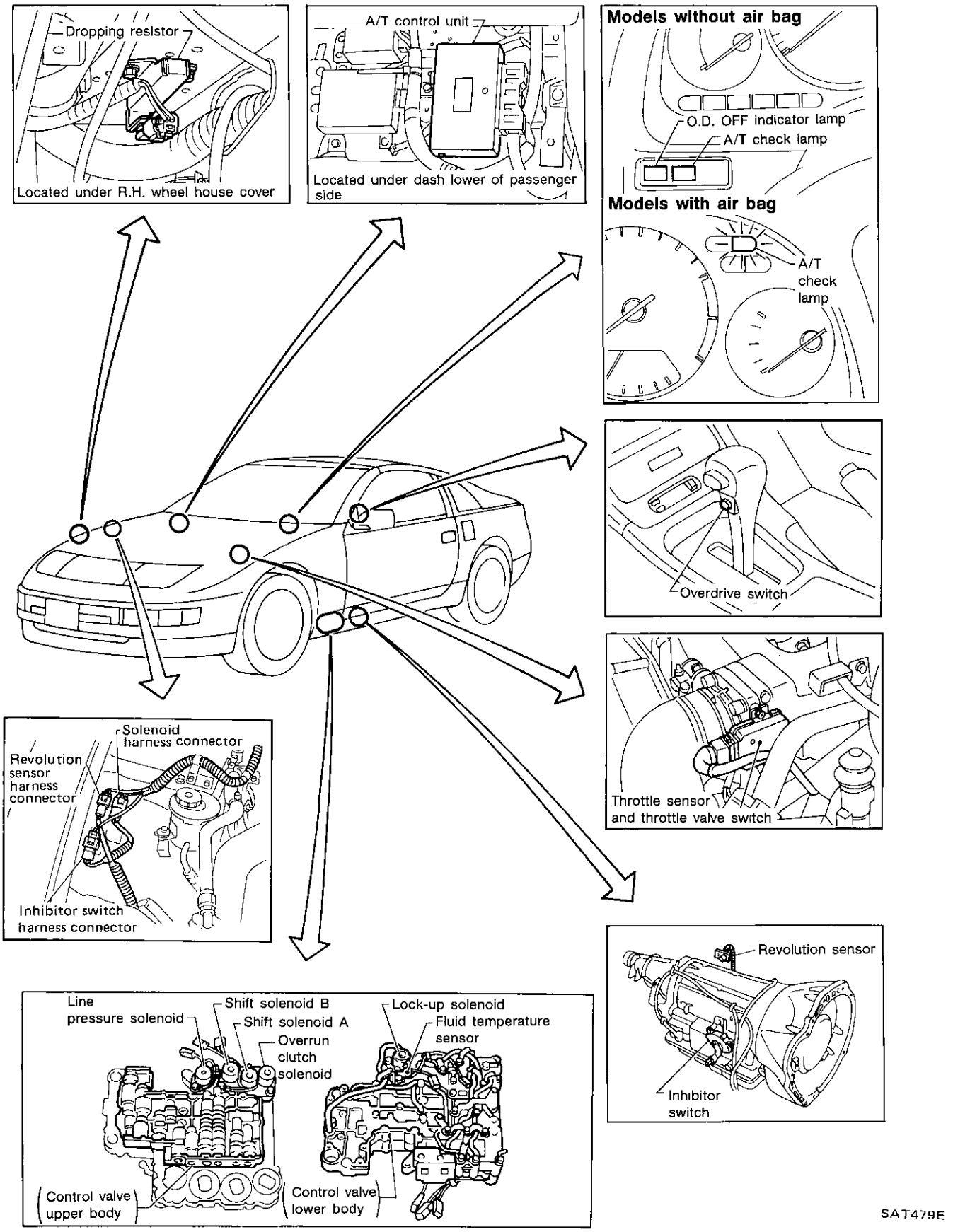
X: Applicable —: Not applicable

### DATA ANALYSIS

| Item | Display | Condition |
|---|---|---|
| Lock-up duty | Approximately 4%<br>↓<br>Approximately 94% | Lock-up "OFF"<br>↓<br>Lock-up "ON" |
| Line pressure duty | Approximately 29%<br>↓<br>Approximately 94% | Low line-pressure<br>(Small throttle opening)<br>↓<br>High line-pressure<br>(Large throttle opening) |
| Throttle sensor | Approximately 0.5V | Fully-closed throttle |
| | Approximately 4V | Fully-open throttle |
| Fluid temperature sensor | Approximately 1.5V<br>↓<br>Approximately 0.5V | Cold [20°C (68°F)]<br>↓<br>Hot [80°C (176°F)] |

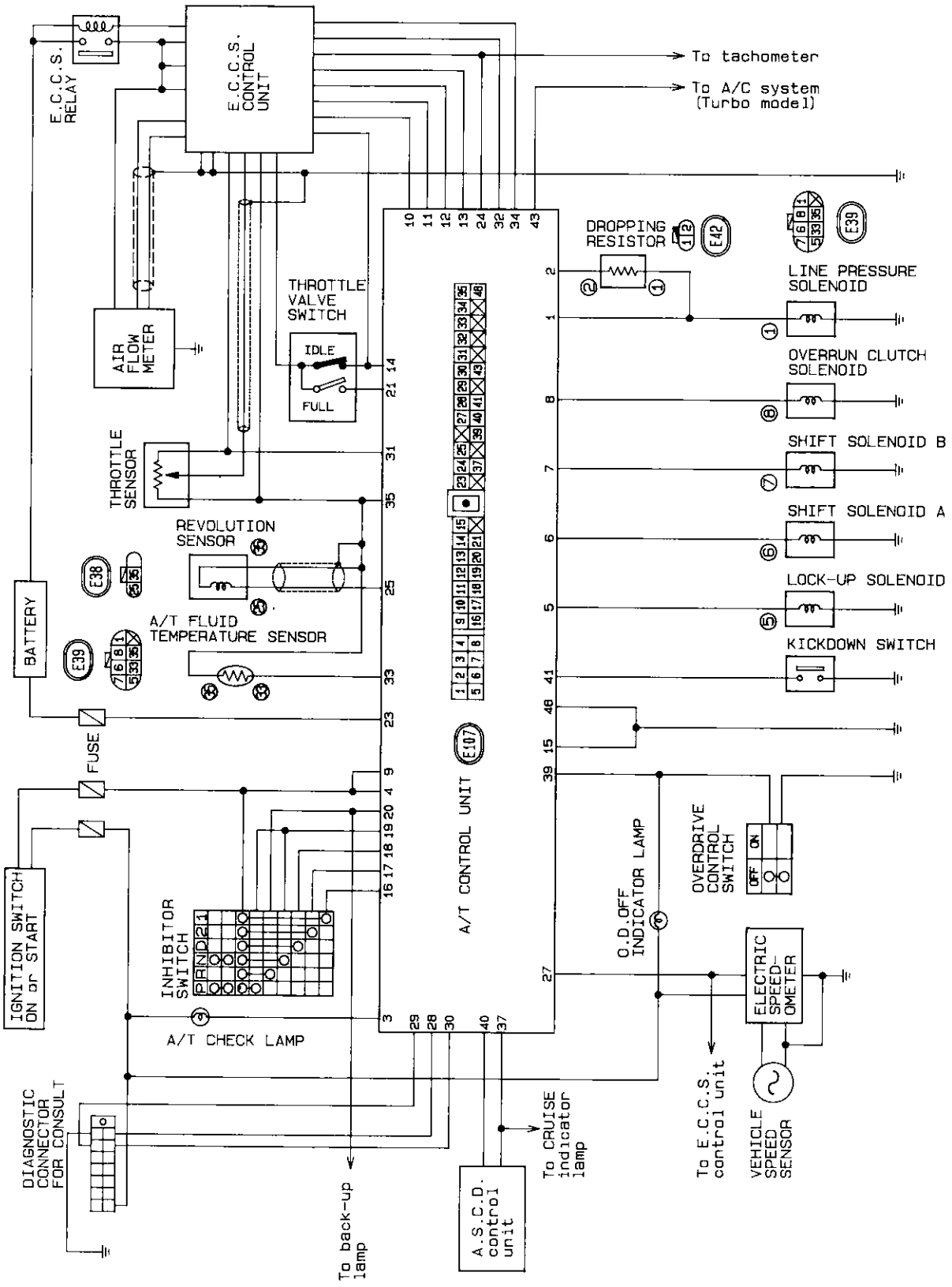
| Gear position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Shift solenoid A | ON | OFF | OFF | ON |
| Shift solenoid B | ON | ON | OFF | OFF |

## A/T Electrical Parts Location



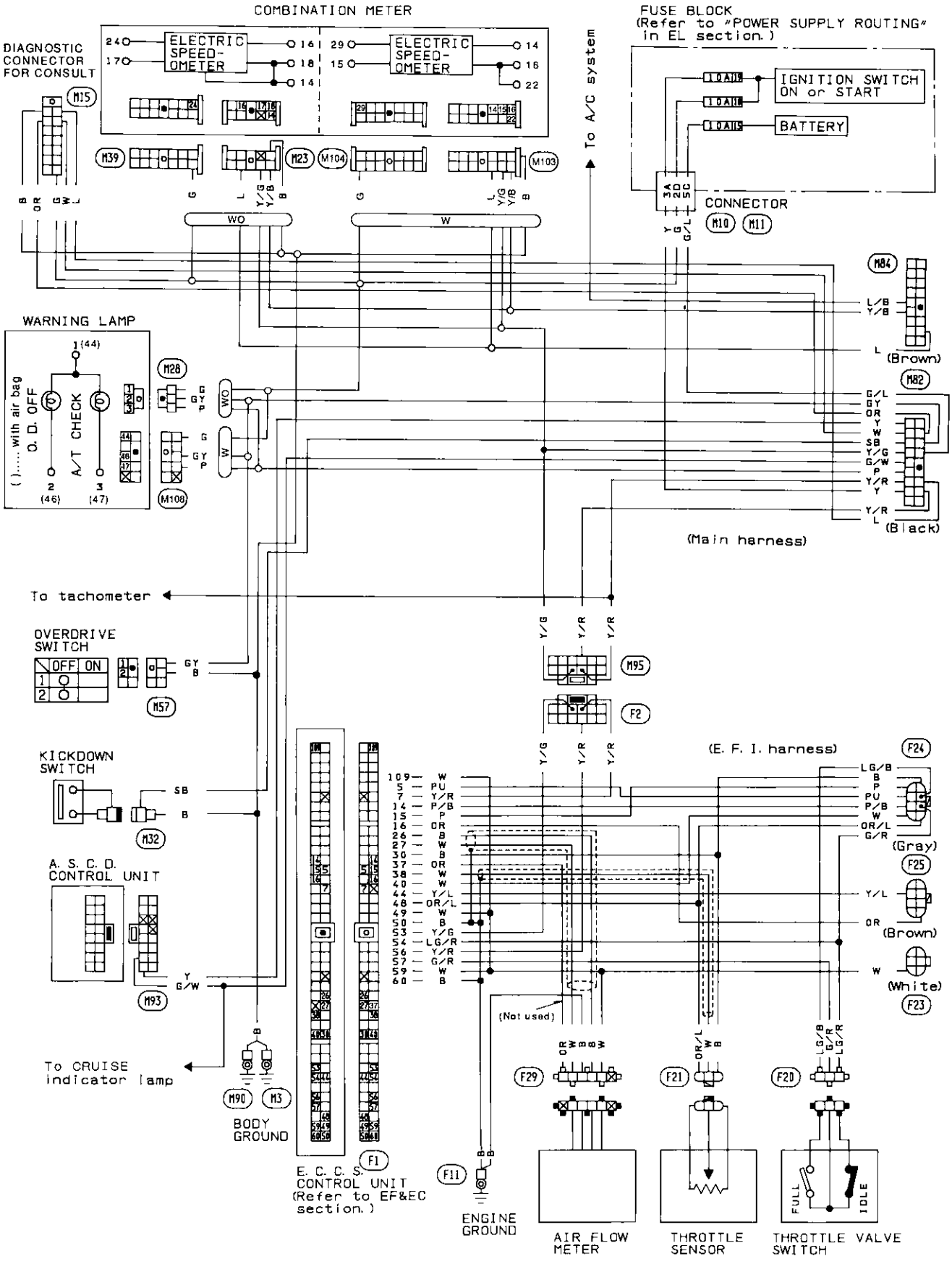

SAT479E

## Circuit Diagram for Quick Pinpoint Check

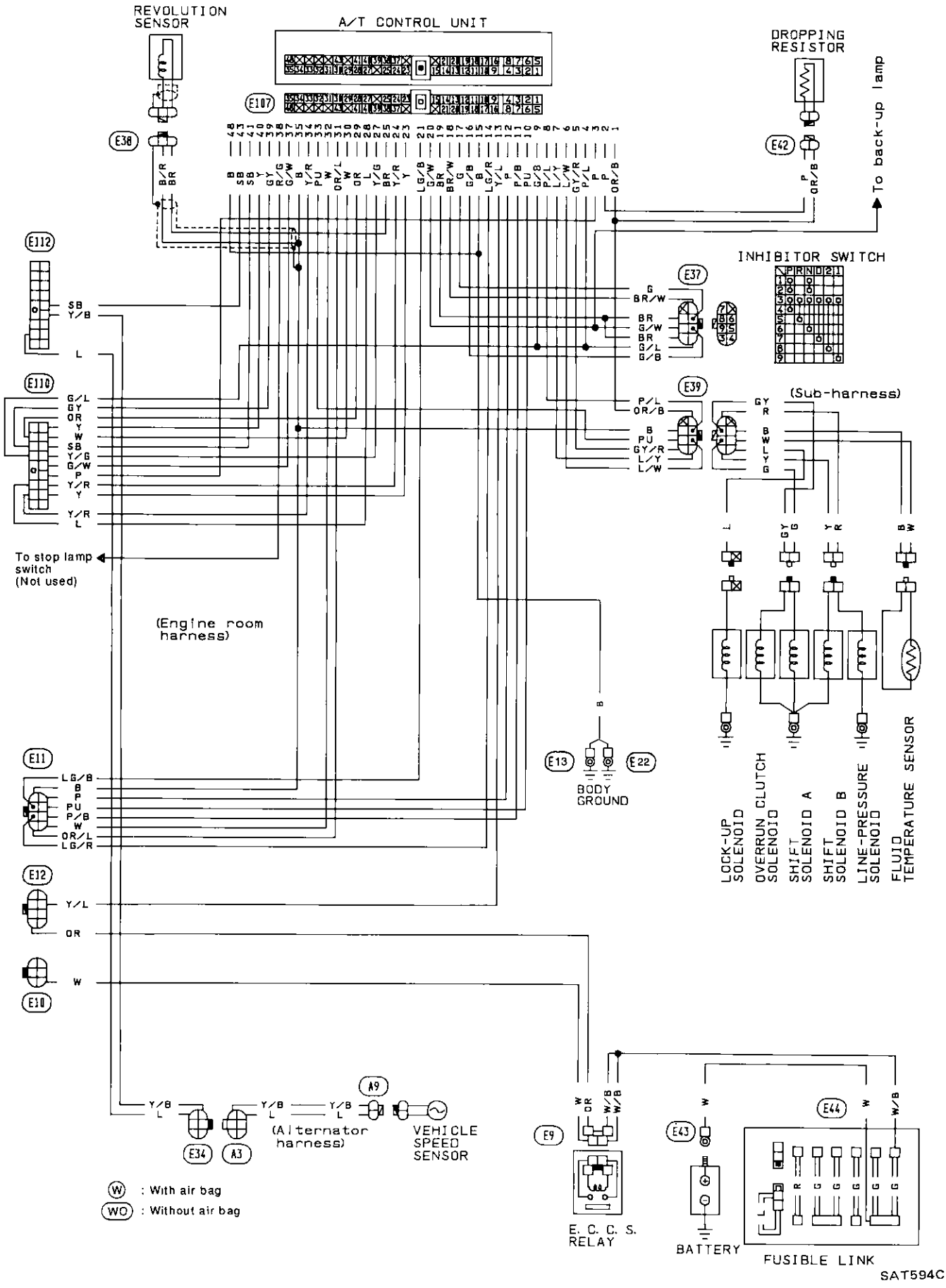


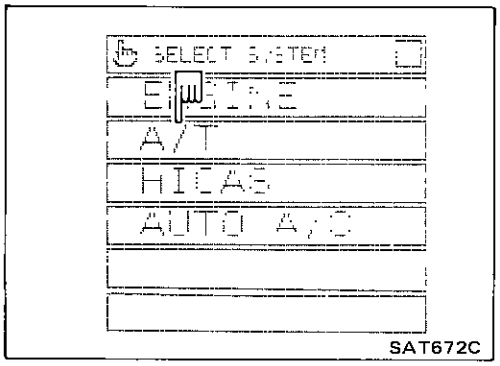

SAT078E

## Wiring Diagram



## Wiring Diagram (Cont'd)

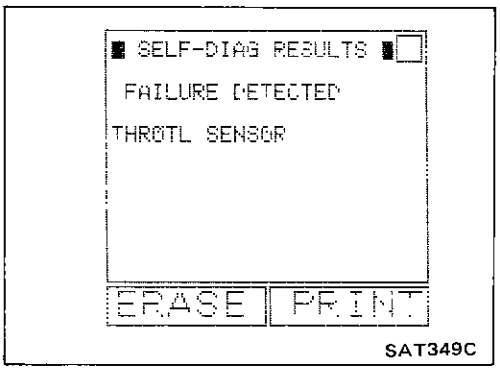




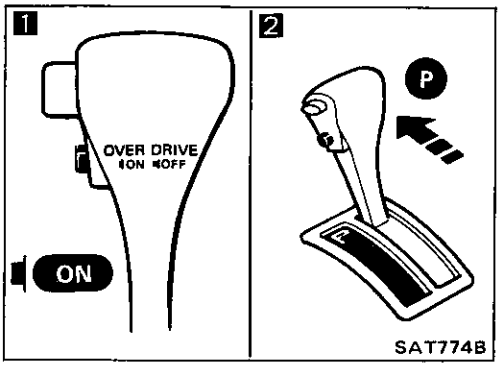

## Self-diagnosis

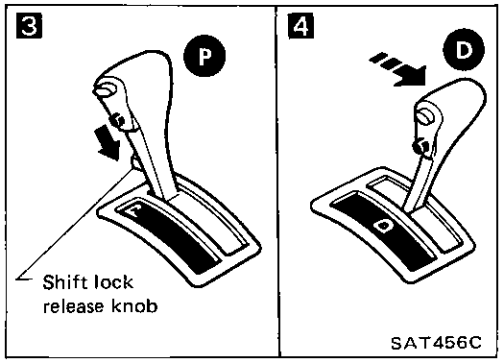
### SELF-DIAGNOSTIC PROCEDURE ( With CONSULT)

1. Turn on CONSULT.
2. Touch "A/T".

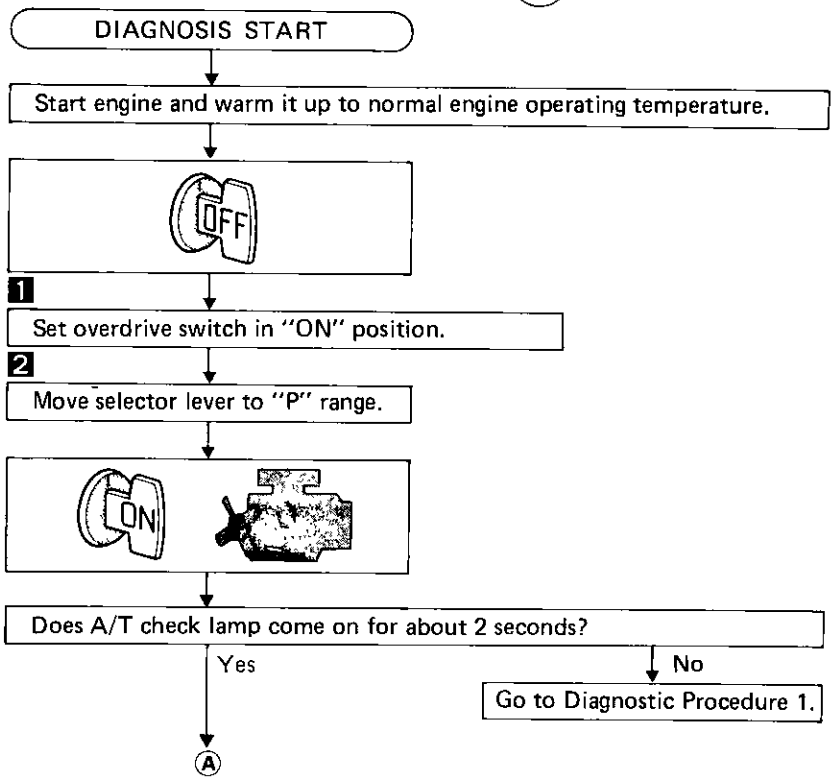



3. Touch "SELF-DIAGNOSIS".
   CONSULT performs REAL-TIME SELF-DIAGNOSIS.

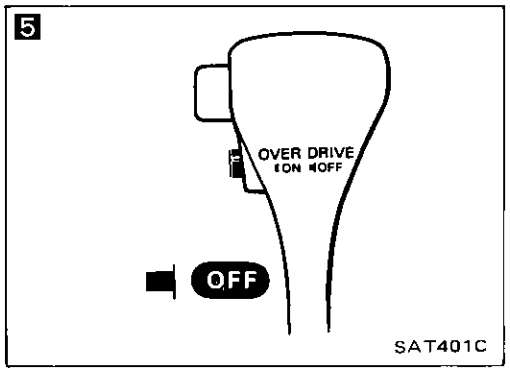


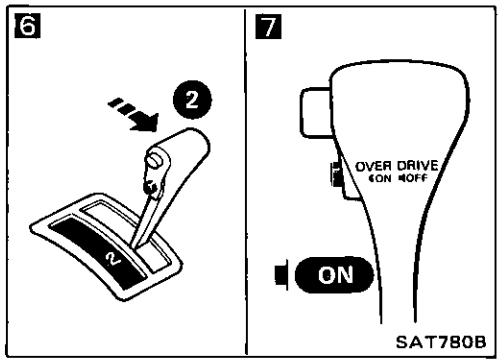



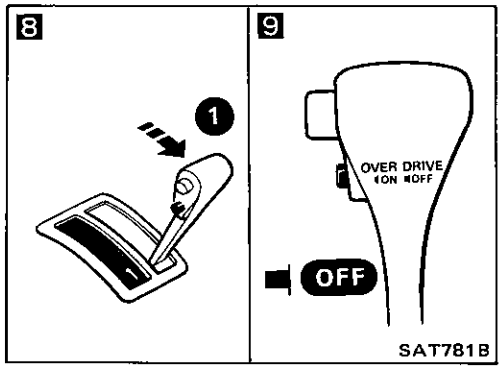

### SELF-DIAGNOSTIC PROCEDURE ( Without CONSULT)

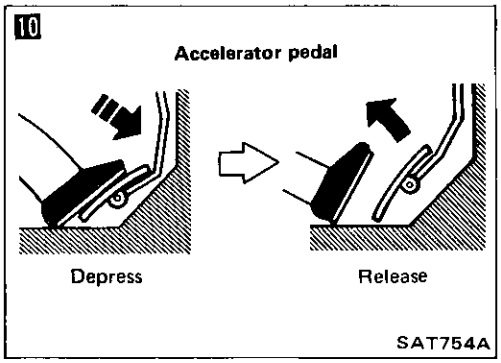


## Self-diagnosis (Cont'd)

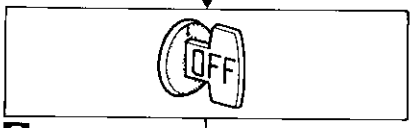



Ⓐ




3 Push shift lock release knob (if equipped).

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.

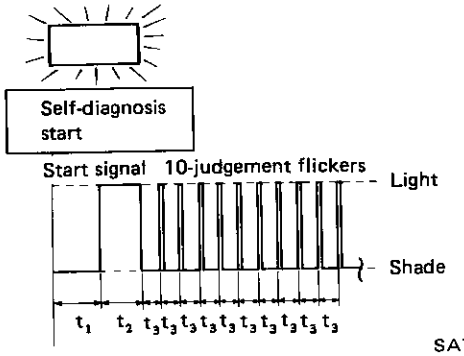
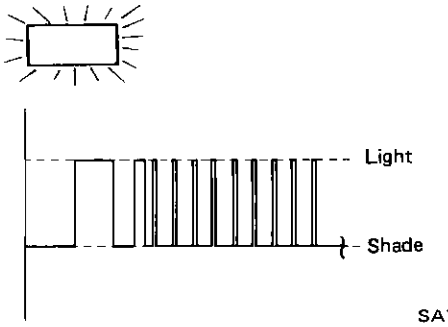
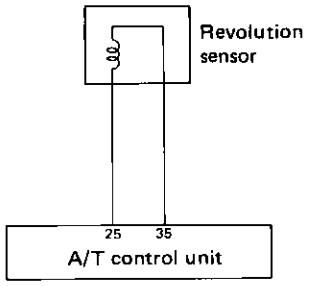
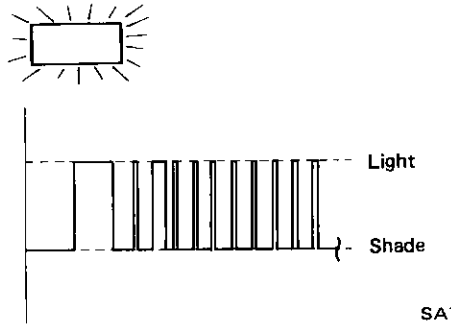
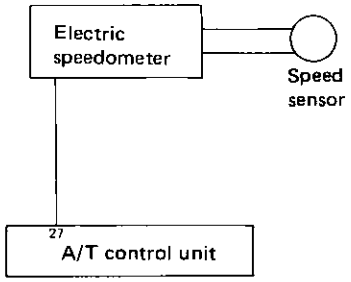
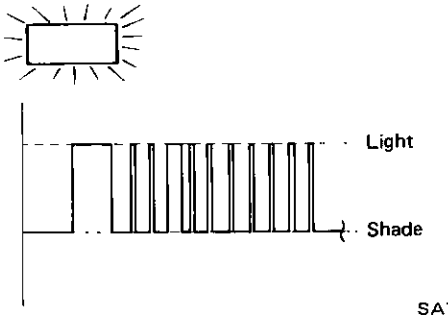
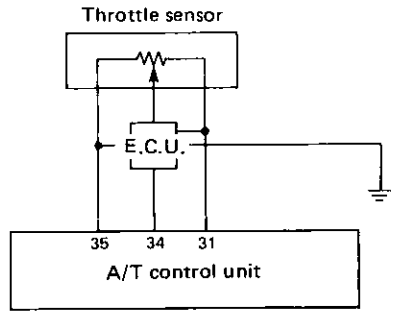
9 Set overdrive switch in "OFF" position.

10 Depress accelerator pedal fully and release it.

Check A/T check lamp.
Refer to JUDGEMENT OF SELF-DIAGNOSIS CODE on next page.

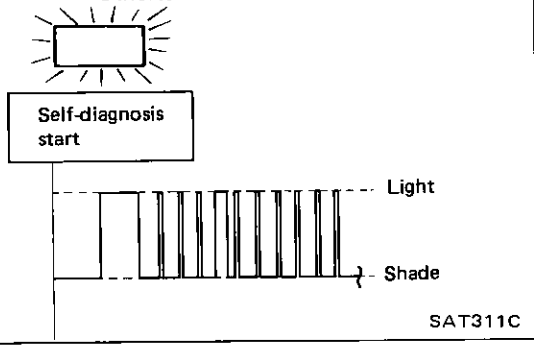
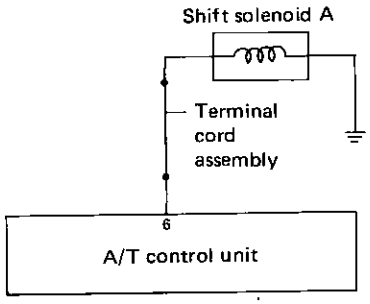
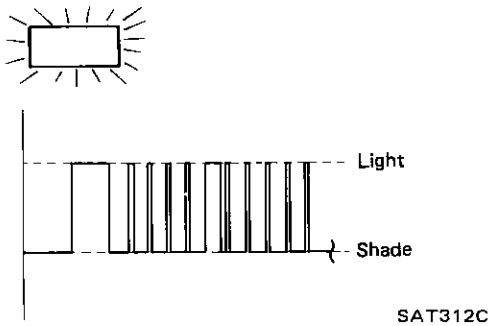
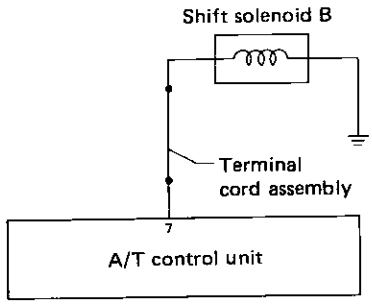
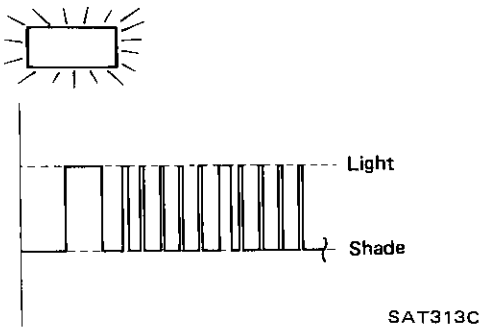
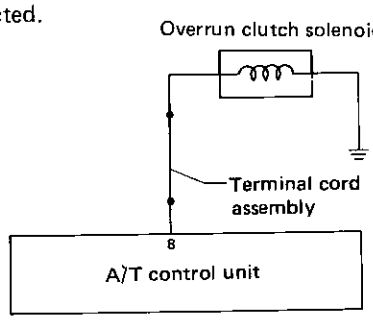
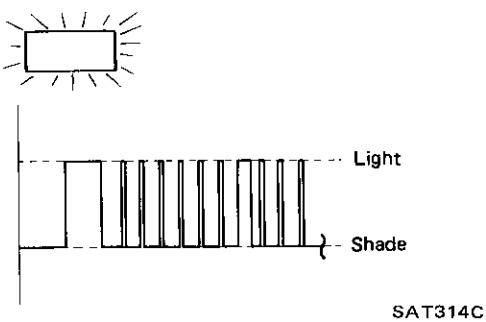
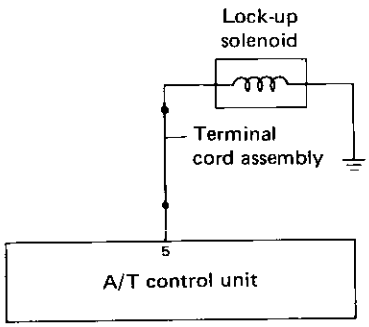
DIAGNOSIS END

## JUDGEMENT OF SELF-DIAGNOSIS CODE

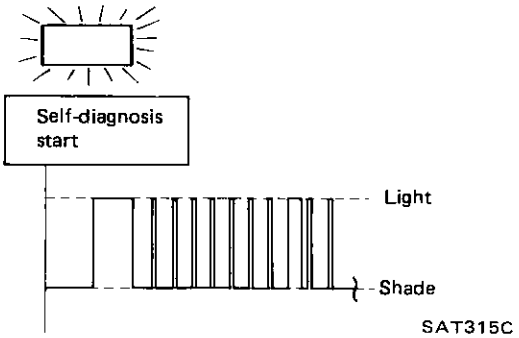
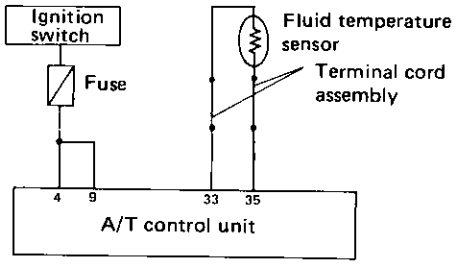
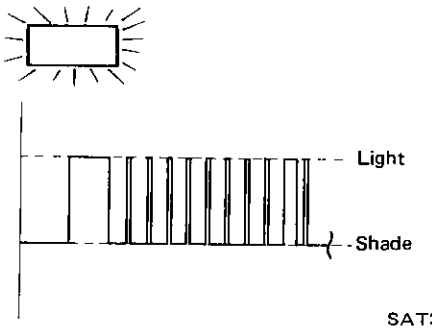
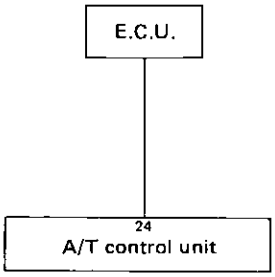
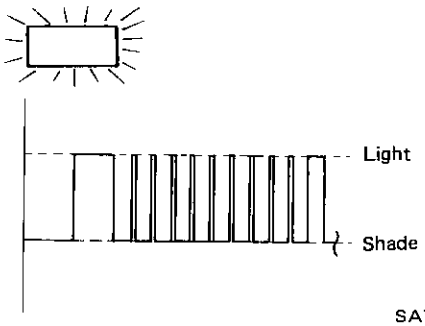
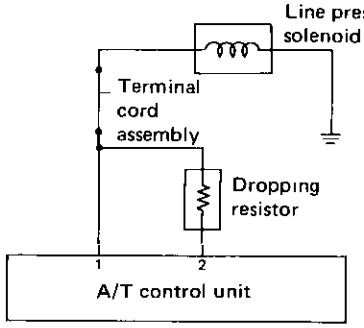
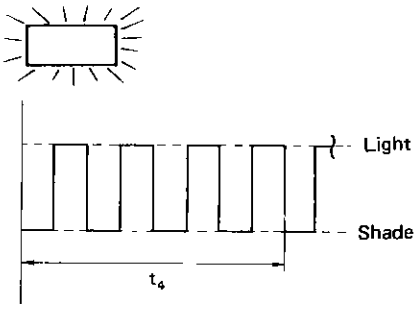
| A/T check lamp | Damaged circuit |
|---|---|
| All judgement flickers are same.<br>  <br>SAT307C | All circuits that can be confirmed by self-diagnosis are O.K. |
| 1st judgement flicker is longer than others.<br>  <br>SAT308C | Revolution sensor circuit is short-circuited or disconnected.<br>  <br>➡ **Go to revolution sensor circuit check.** SAT965B |
| 2nd judgement flicker is longer than others.<br>  <br>SAT309C | Speed sensor circuit is short-circuited or disconnected.<br>  <br>➡ **Go to speed sensor circuit check.** SAT029E |
| 3rd judgement flicker is longer than others.<br>  <br>SAT310C | Throttle sensor circuit is short-circuited or disconnected.<br>  <br>➡ **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)

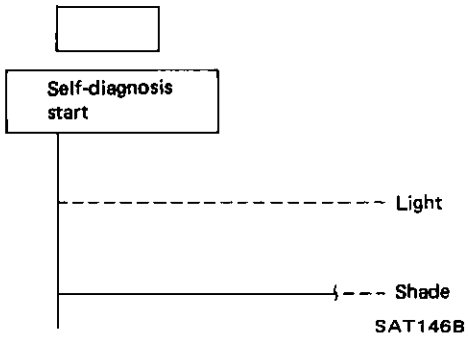
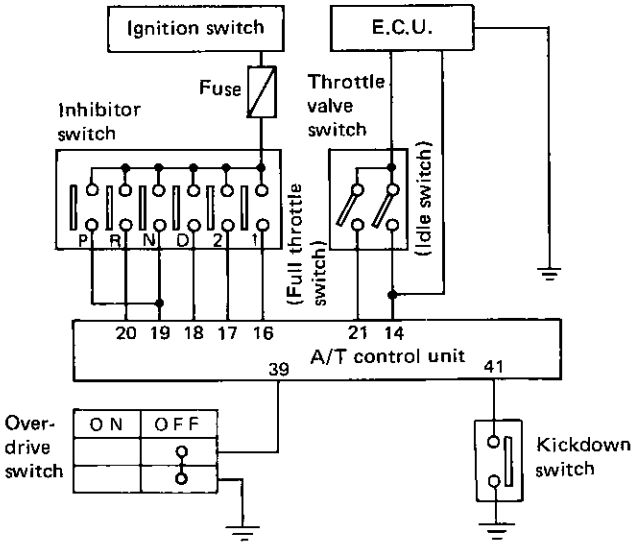
| A/T check lamp | Damaged circuit |
|---|---|
| 4th judgement flicker is longer than others.<br>  <br>SAT311C | Shift solenoid A circuit is short-circuited or disconnected.<br>  <br>➡ **Go to shift solenoid A circuit check.** SAT968B |
| 5th judgement flicker is longer than others.<br>  <br>SAT312C | Shift solenoid B circuit is short-circuited or disconnected.<br>  <br>➡ **Go to shift solenoid B circuit check.** SAT969B |
| 6th judgement flicker is longer than others.<br>  <br>SAT313C | Overrun clutch solenoid circuit is short-circuited or disconnected.<br>  <br>➡ **Go to overrun clutch solenoid circuit check.** SAT970B |
| 7th judgement flicker is longer than others.<br>  <br>SAT314C | Lock-up solenoid circuit is short-circuited or disconnected.<br>  <br>➡ **Go to lock-up solenoid circuit check.** SAT971B |

## Self-diagnosis (Cont'd)

| A/T check lamp | Damaged circuit |
|---|---|
| 8th judgement flicker is longer than others.<br>  <br>SAT315C | Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.<br>  <br>➡ **Go to fluid temperature sensor and A/T control unit power source circuit check.** SAT972B |
| 9th judgement flicker is longer than others.<br>  <br>SAT316C | Engine revolution signal circuit is short-circuited or disconnected.<br>  <br>➡ **Go to engine revolution signal circuit check.** SAT973B |
| 10th judgement flicker is longer than others.<br>  <br>SAT317C | Line pressure solenoid circuit is short-circuited or disconnected.<br>  <br>➡ **Go to line pressure solenoid circuit check.** SAT974B |
| Flickers as shown below.<br>  <br>SAT318C | Battery power is low.<br>Battery has been disconnected for a long time.<br>Battery is connected conversely.<br>(When reconnecting A/T control unit connectors. – This is not a problem.) |

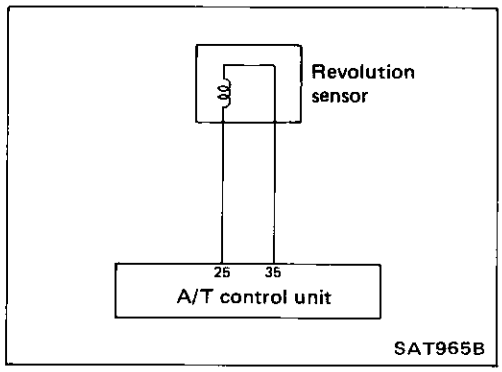
$t_4$ = 1.0 second

## Self-diagnosis (Cont'd)

| A/T check lamp | Damaged circuit |
|---|---|
| Does not come on.<br>  <br> | Inhibitor switch, overdrive switch, kickdown switch or idle switch circuit is disconnected or A/T control unit is damaged.<br>  <br><br>➡ **Go to inhibitor, overdrive, kickdown and idle switch circuit checks.**<br>SAT319C |

## Self-diagnosis (Cont'd)

### REVOLUTION SENSOR CIRCUIT CHECK




**CHECK REVOLUTION SENSOR.** – Refer to "Electrical Components Inspection".

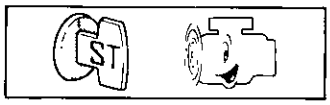
N.G. → Repair or replace revolution sensor.

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. ↓

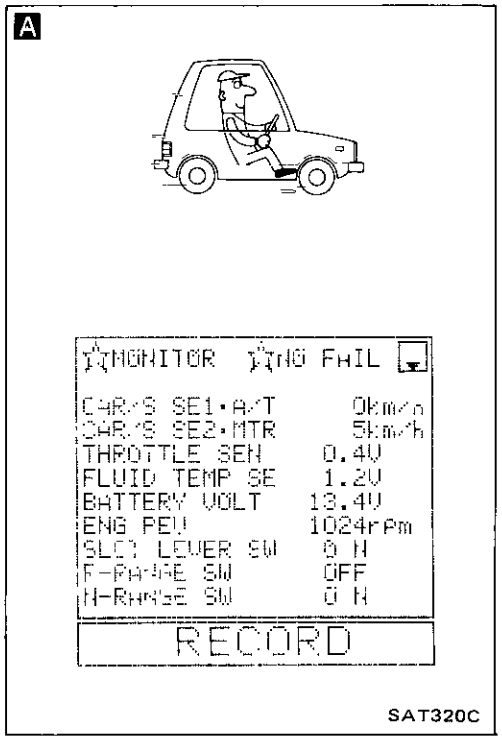
Perform self-diagnosis again after driving for a while.

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.

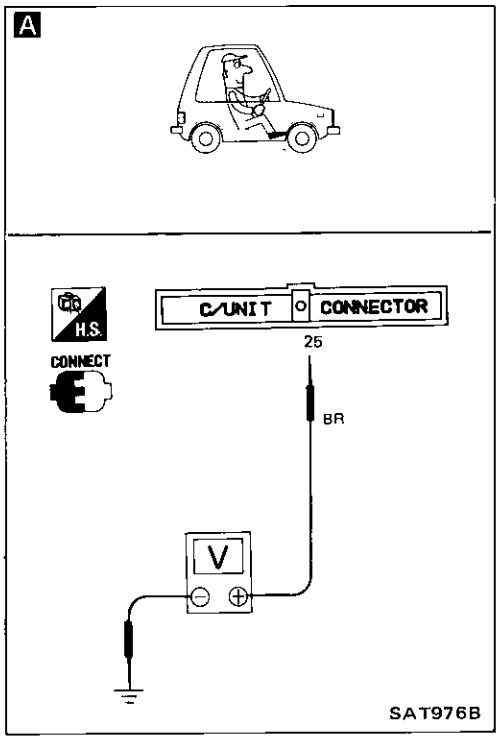
O.K. ↓

**INSPECTION END**

A



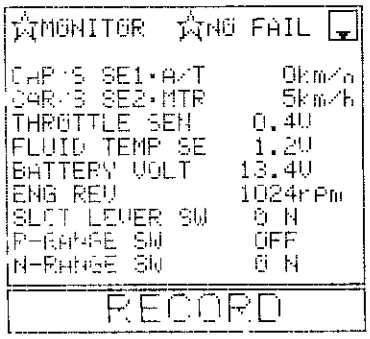

A



## Self-diagnosis (Cont'd)

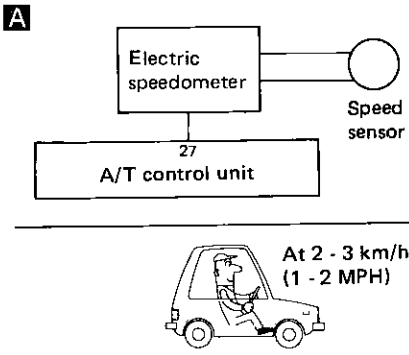
### SPEED SENSOR CIRCUIT CHECK

A



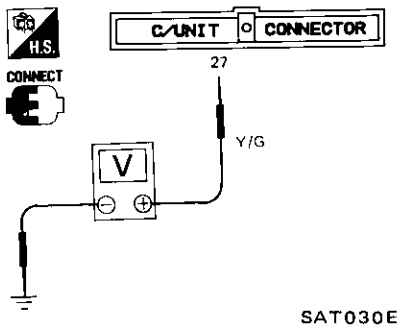

SAT320C

A





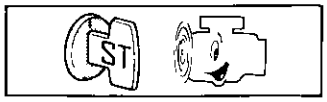





SAT030E

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.

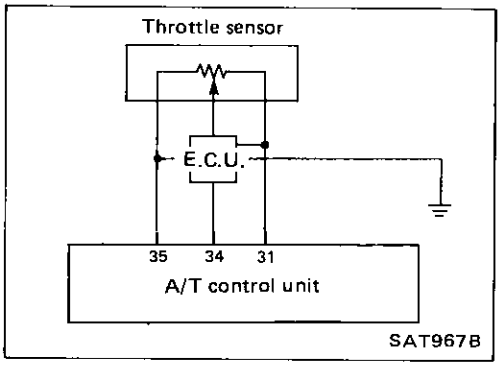
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

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.

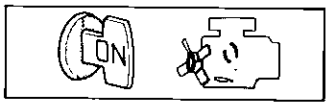
O.K. ↓

A

**CHECK INPUT SIGNAL.**

N.G. → Check harness continuity between E.C.U. and A/T control unit regarding throttle sensor circuit.

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**

— 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.

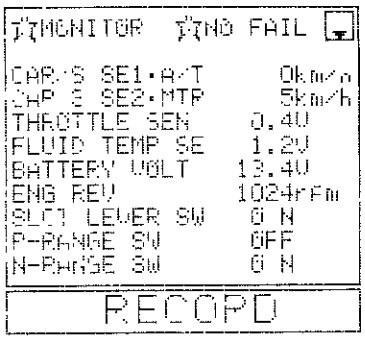
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

**INSPECTION END**

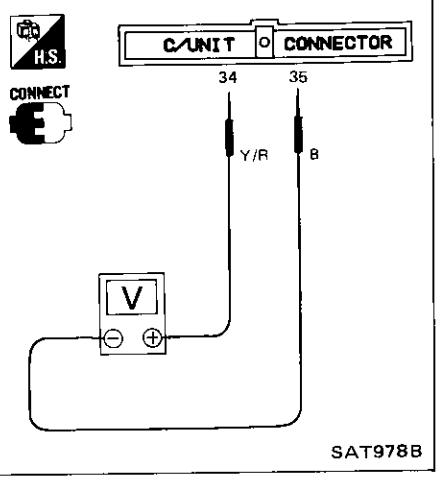
A

Depress slowly.



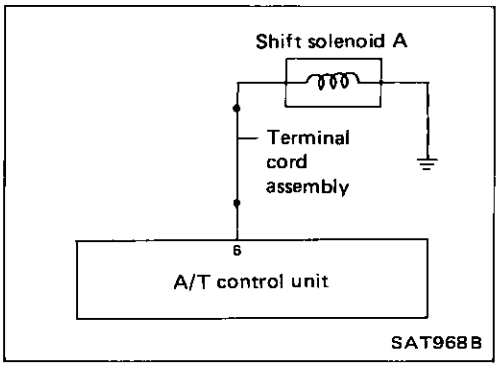

A

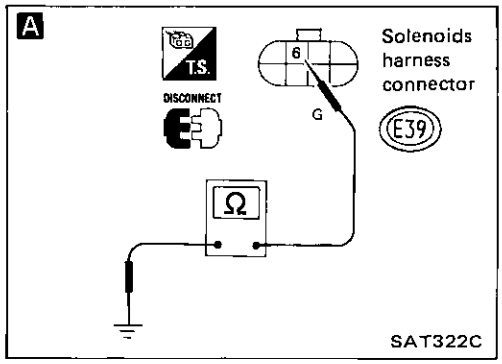
Depress slowly.

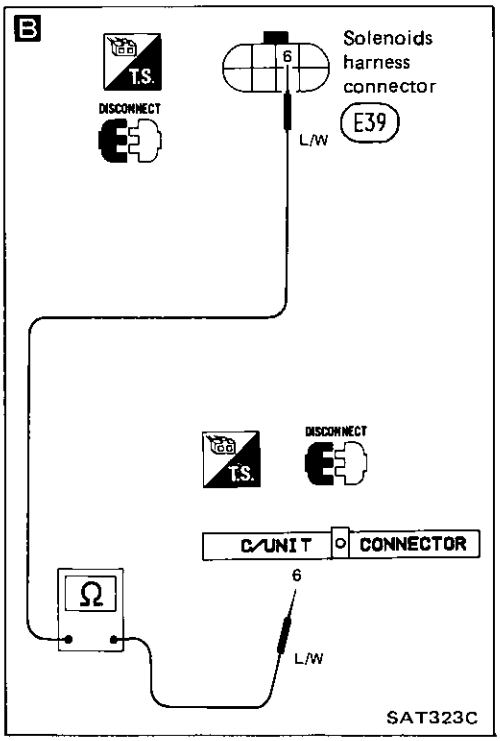


## Self-diagnosis (Cont'd)

### SHIFT SOLENOID A CIRCUIT CHECK




A

**CHECK GROUND CIRCUIT.**

1.

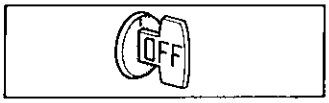
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑥ and ground.
   **Resistance: 20 - 40Ω**

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.

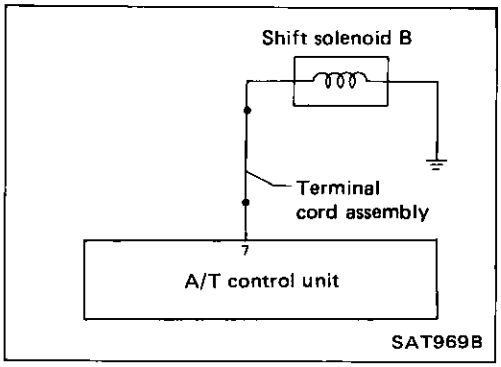
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

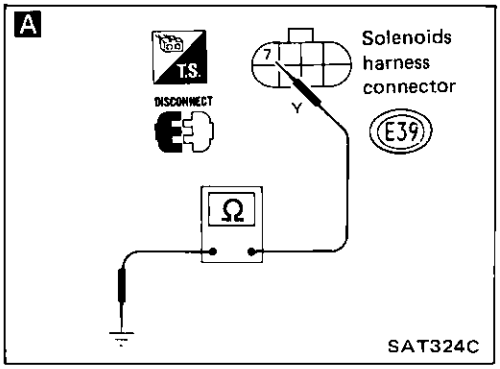
O.K. ↓

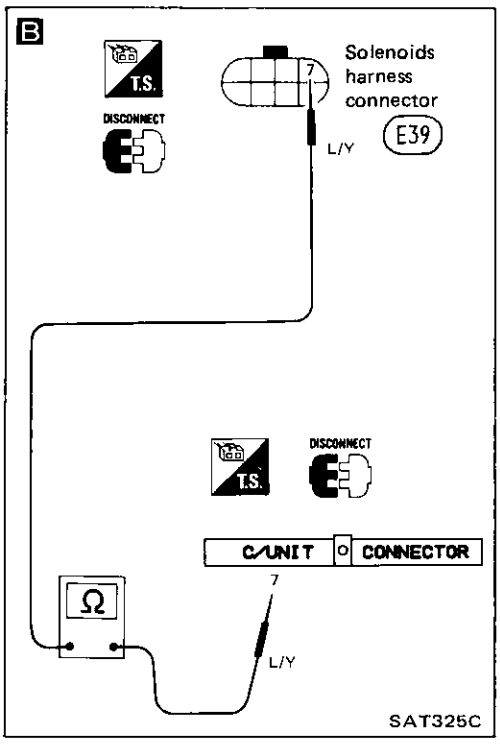
**INSPECTION END**

## Self-diagnosis (Cont'd)

### SHIFT SOLENOID B CIRCUIT CHECK

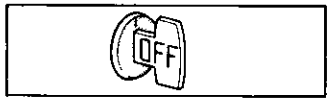



A

**CHECK GROUND CIRCUIT.**

1. 

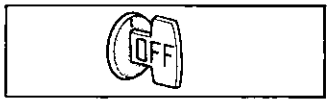
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑦ and ground.
   **Resistance: 20 - 40Ω**

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.

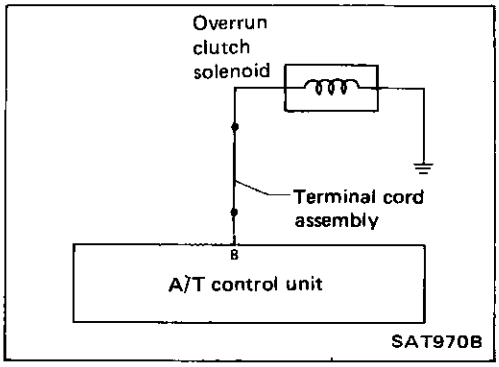
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

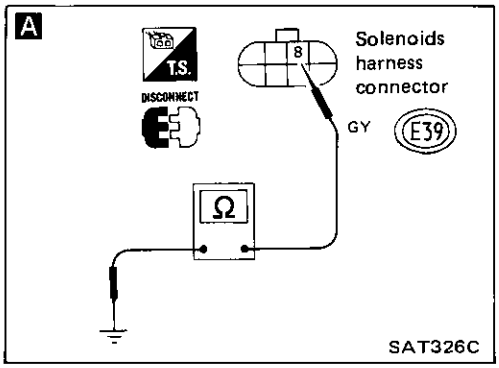
O.K. ↓

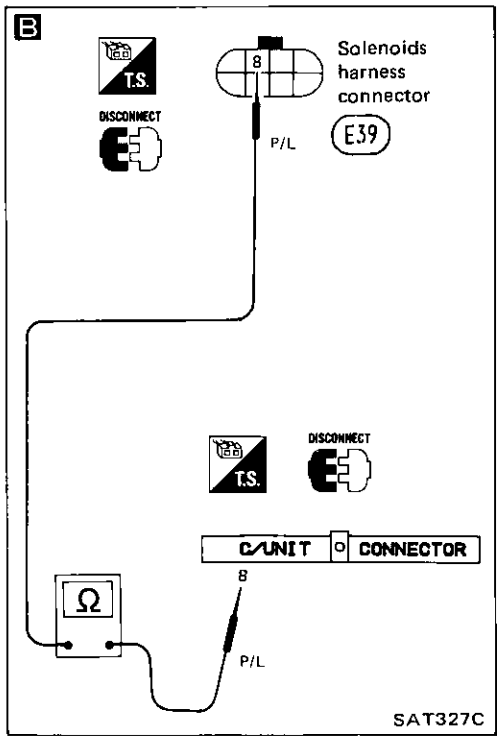
**INSPECTION END**

## Self-diagnosis (Cont'd)

### OVERRUN CLUTCH SOLENOID CIRCUIT CHECK

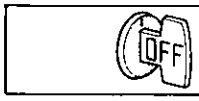



A

**CHECK GROUND CIRCUIT.**

1. 

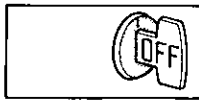
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑧ and ground.
   **Resistance: 20 - 40Ω**

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.

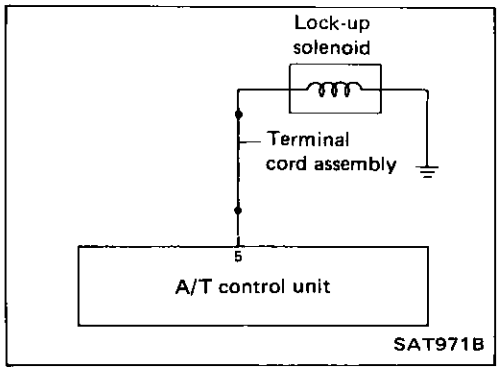
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

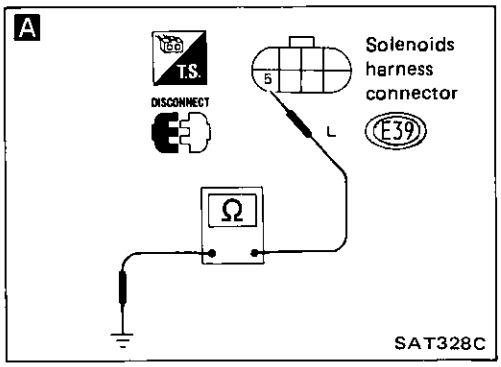
O.K. ↓

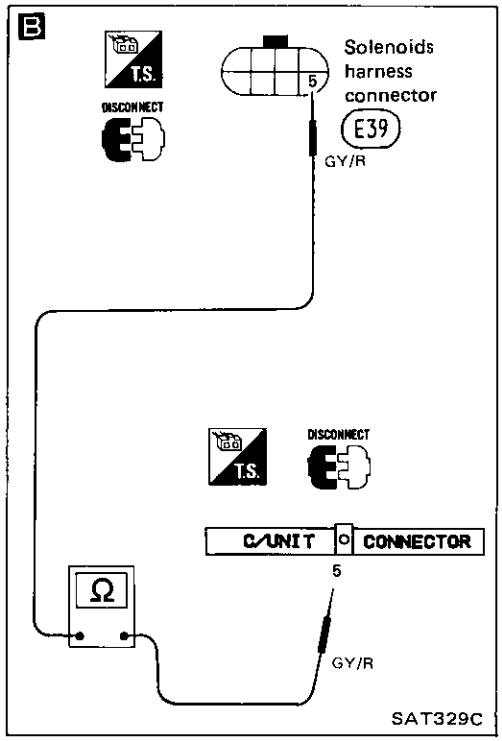
**INSPECTION END**

## Self-diagnosis (Cont'd)

### LOCK-UP SOLENOID CIRCUIT CHECK

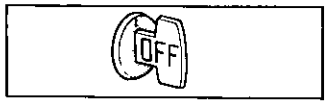



A

**CHECK GROUND CIRCUIT.**

1. 

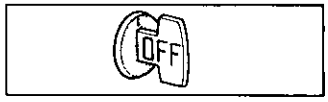
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑤ and ground.
   **Resistance: 10 - 20Ω**

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.

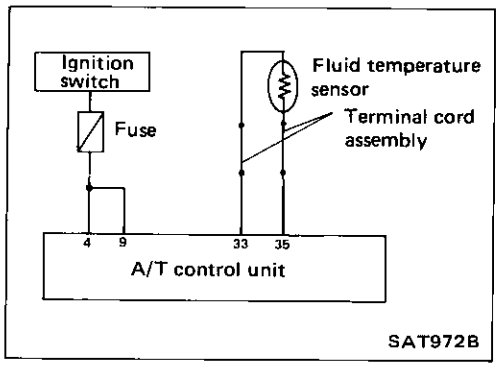
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

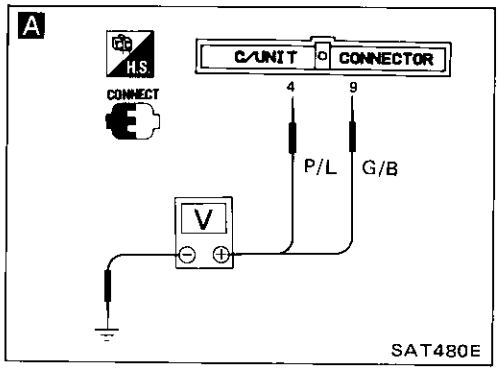
O.K. ↓

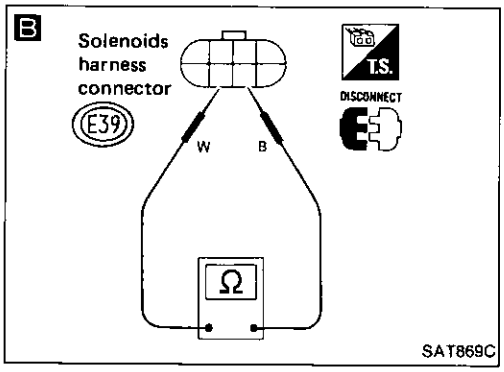
**INSPECTION END**

## 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.

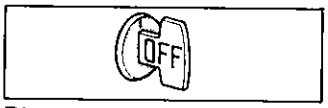
2. Check voltage between A/T control unit terminals ④, ⑨ and ground.
   **Battery voltage should exist.**

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.

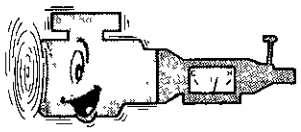
N.G. →
1. Remove control valve cover.
2. Check the following items.
- Fluid temperature sensor
  – Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

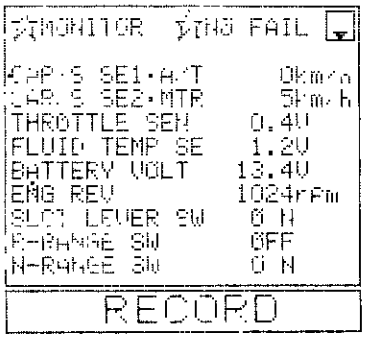
O.K. ↓

Ⓐ

## Self-diagnosis (Cont'd)

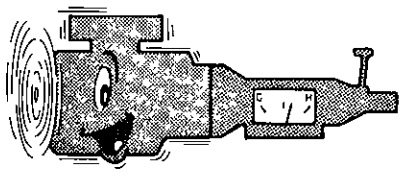
C

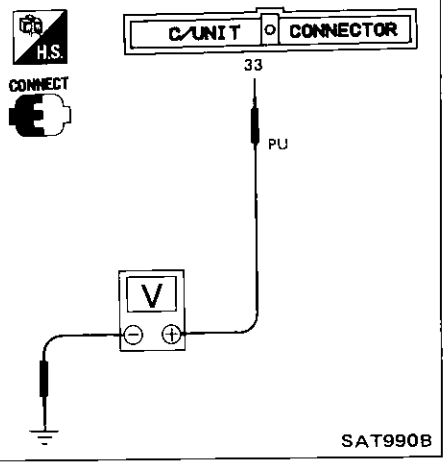





SAT330C

C





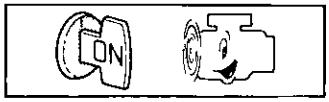

SAT990B

Ⓐ

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.

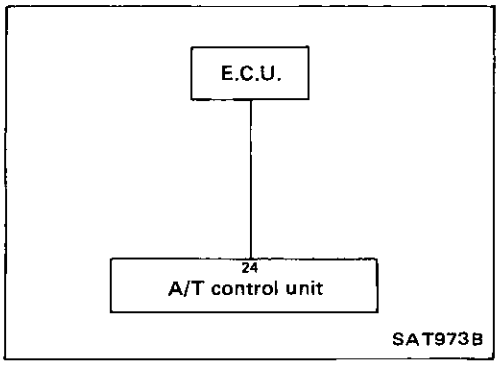
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

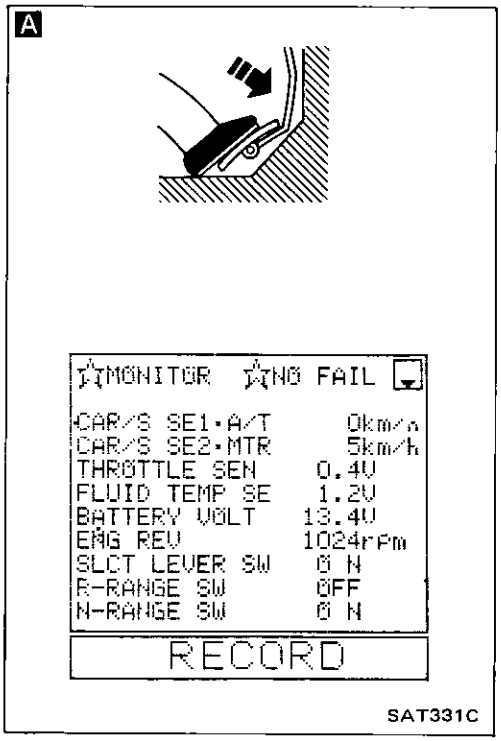
O.K.

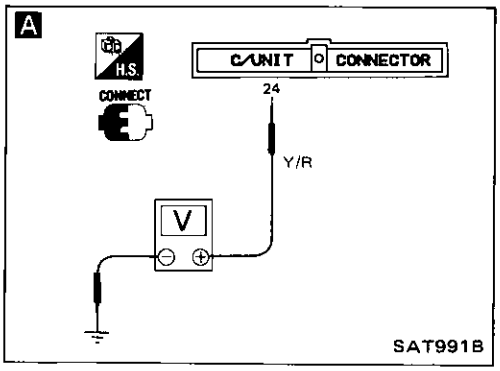
**INSPECTION END**

## Self-diagnosis (Cont'd)

### ENGINE REVOLUTION SIGNAL CIRCUIT CHECK



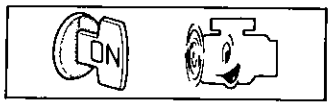




Check ignition circuit condition for engine. — N.G. → Repair or replace. — Refer to section EF & EC.

O.K. ↓

A

**CHECK INPUT SIGNAL.** — N.G. → Check harness continuity between A/T control unit and E.C.C.S. control unit.

1. 


2.
- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "ENGINE REVOLUTION".
- Check engine revolution changes according to throttle opening.

OR

- Check voltage between A/T control unit terminal ㉔ and ground.
  **Voltage: 0.9 - 4.5V**

O.K. ↓

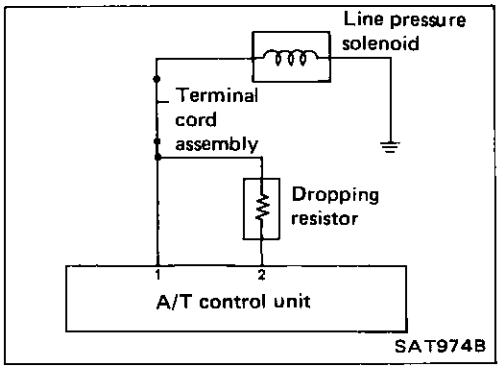
Perform self-diagnosis again after driving for a while. — N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

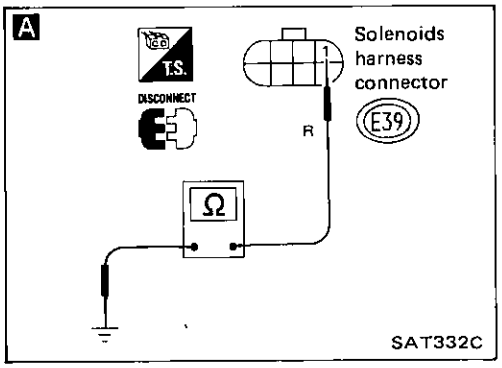
O.K. ↓

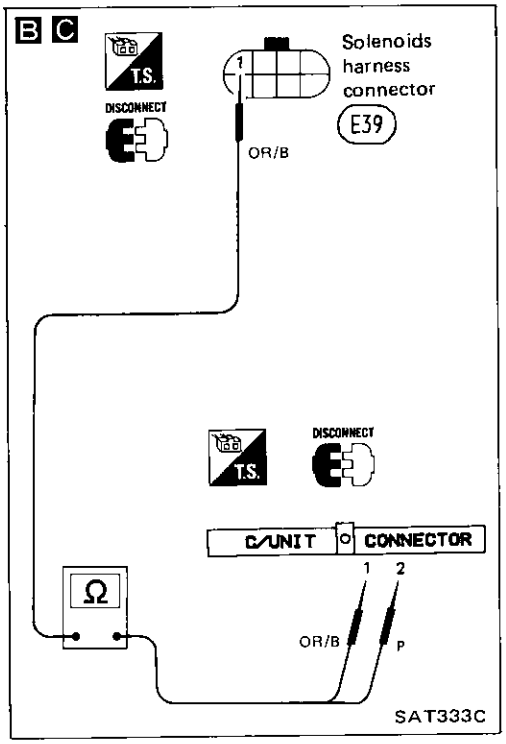
**INSPECTION END**

## Self-diagnosis (Cont'd)

### LINE PRESSURE SOLENOID CIRCUIT CHECK

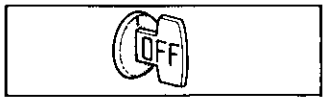



**A**

**CHECK GROUND CIRCUIT.**

1. 

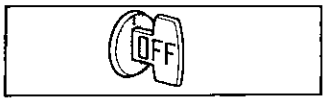
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ① and ground.
   **Resistance: 2.5 - 5Ω**

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.

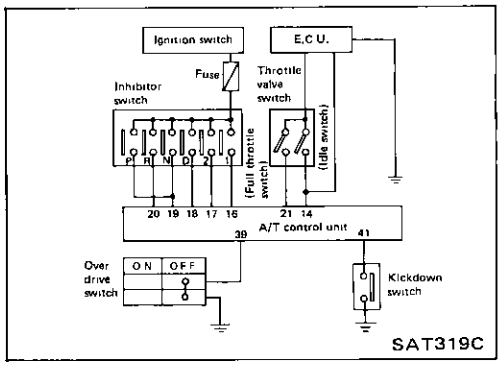
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

**INSPECTION END**

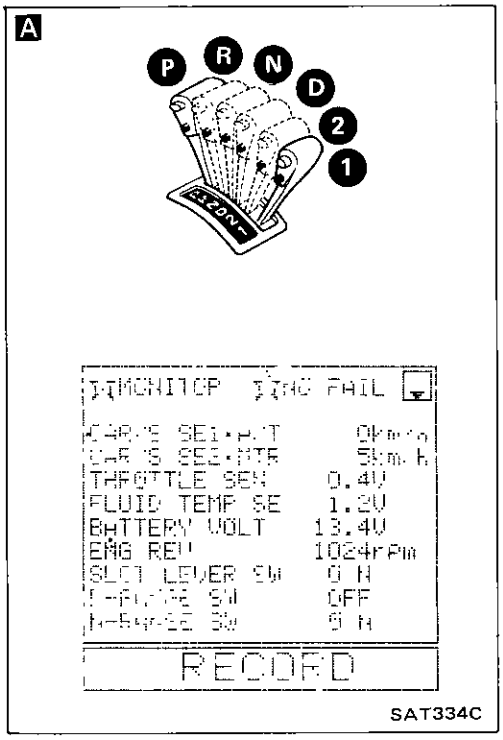
## Self-diagnosis (Cont'd)

### INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS



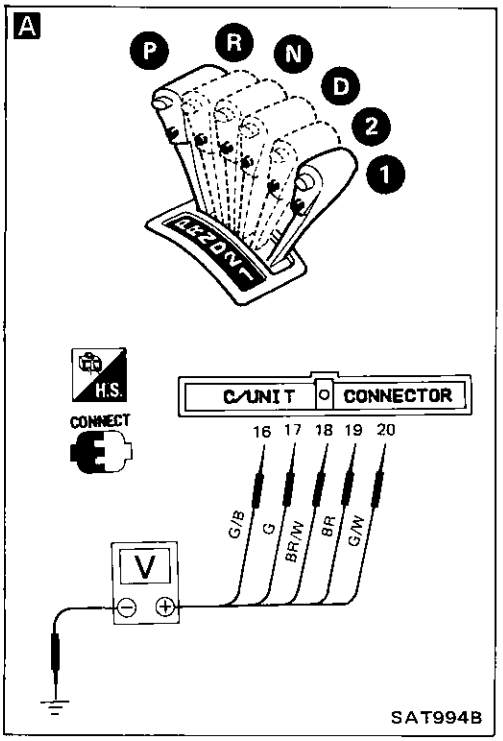

SAT319C

A




SAT334C

A

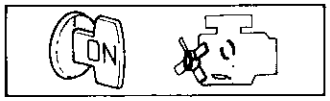



SAT994B

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.

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

OR

Check voltage between A/T control unit terminals ⑯, ⑰, ⑱, ⑲, ⑳ and ground while moving selector lever through each range.

**Voltage:**

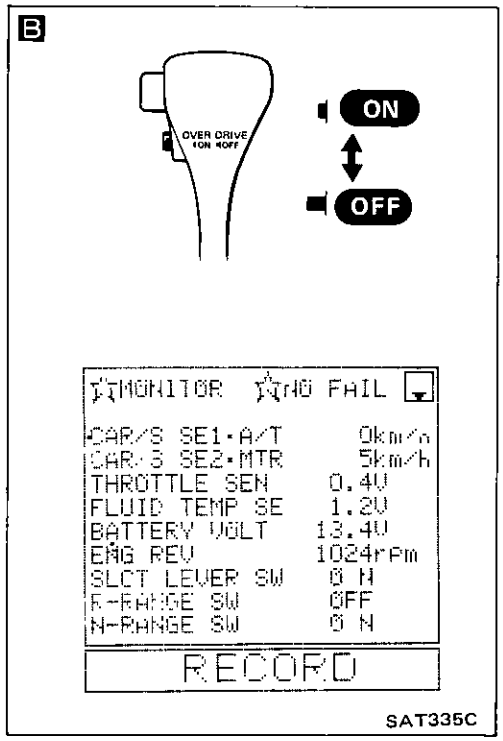
**B: Battery voltage**

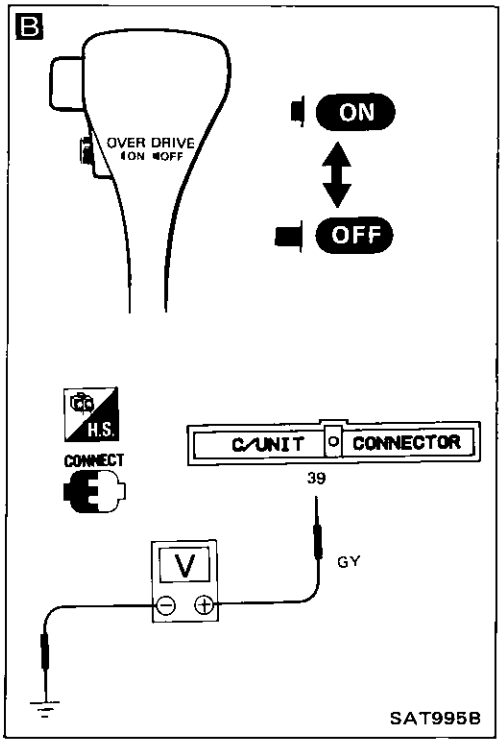
**0: 0V**

| 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 |

O.K. → Ⓐ

## Self-diagnosis (Cont'd)

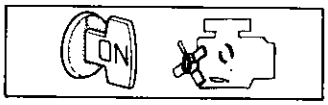



Ⓐ

**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 |

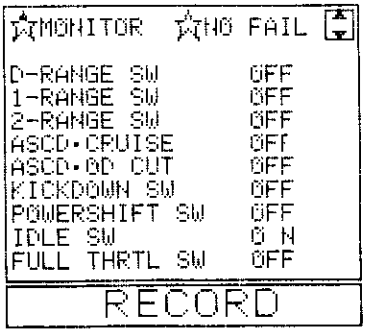
N.G. → Check the following items.
- Overdrive switch – Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit and overdrive switch
- Harness continuity of ground circuit for overdrive switch

O.K.

Ⓑ

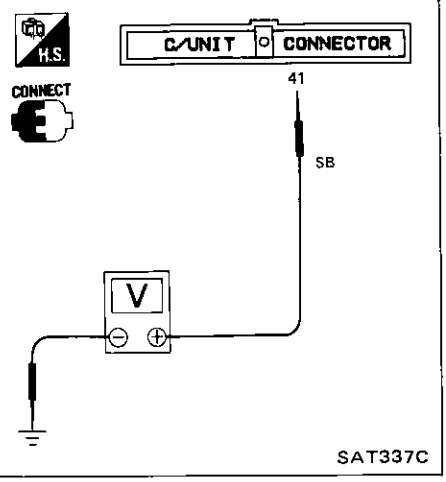
## Self-diagnosis (Cont'd)

C




SAT336C

C



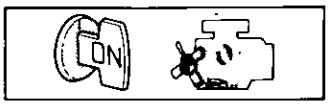

SAT337C

Ⓑ

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
- Adjust kickdown switch — Refer to "ON-VEHICLE SERVICE".

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**

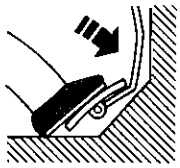
**When depressing accelerator pedal fully: 1V or less**

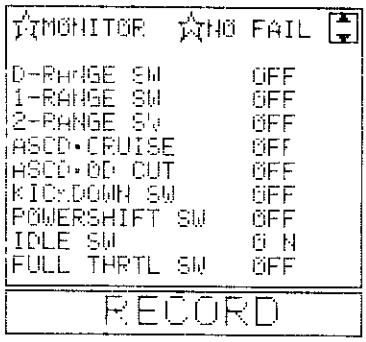
O.K.

Ⓒ

## Self-diagnosis (Cont'd)

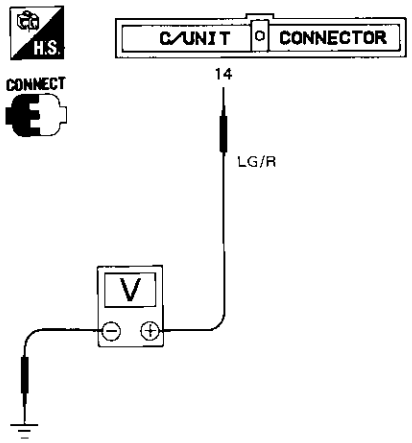
D






SAT338C

D



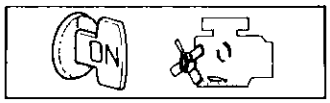

SAT339C

Ⓒ

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:**

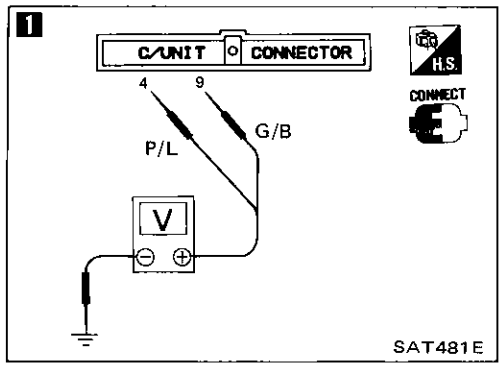
**When releasing accelerator pedal:**
**8 - 15V**

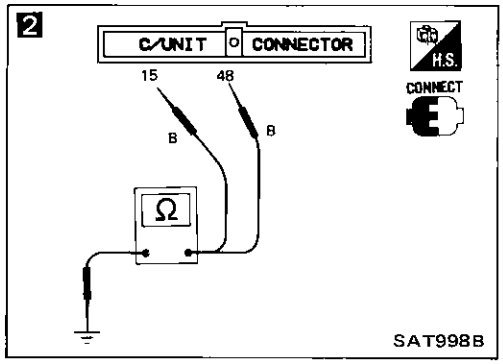
**When depressing accelerator pedal fully:**
**1V or less**

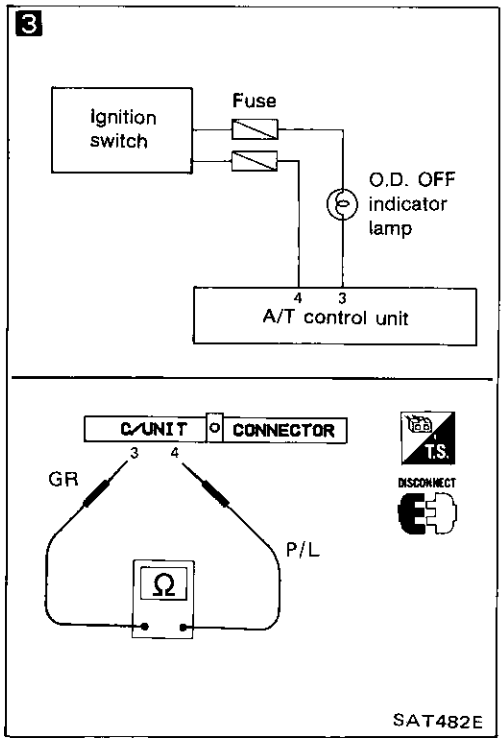
O.K. → Perform self-diagnosis again after driving for a while.

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**



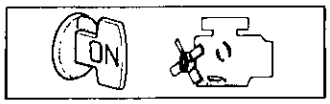




## Diagnostic Procedure 1

**SYMPTOM: A/T CHECK lamp does not come on for about 2 seconds when turning ignition switch to "ON".**

**1**

**CHECK A/T CONTROL UNIT POWER SOURCE.**

1. 

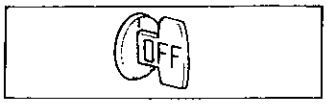
2. Check voltage between A/T control unit terminals ④, ⑨ and ground.
   **Battery voltage should exist.**

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.
- A/T check lamp
- Harness continuity between ignition switch and A/T check lamp
- Harness continuity between A/T check lamp and A/T control unit

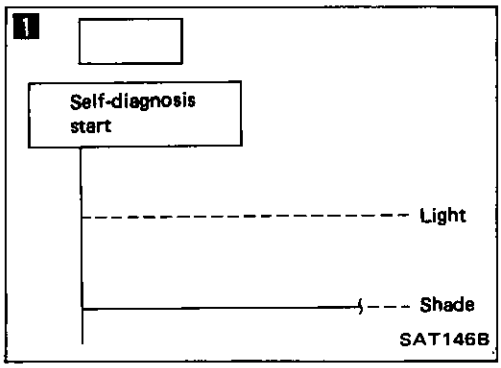
O.K. ↓

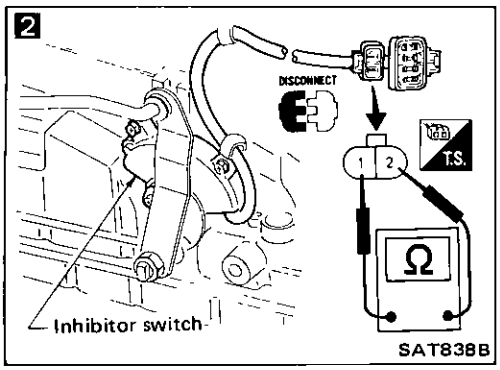
Check again.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

**INSPECTION END**




## Diagnostic Procedure 2

**SYMPTOM: Engine cannot be started with selector lever in "P" or "N" 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

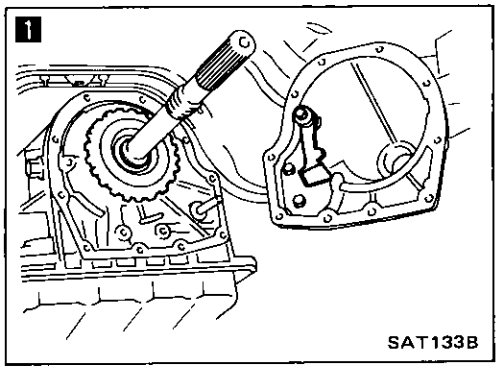
2 Check continuity of inhibitor switch 2-pin connector. — Refer to "Electrical Components Inspection". — N.G. → Repair or replace inhibitor switch.

O.K.

Check starting system. — Refer to section EL. — N.G. → Repair or replace damaged parts.

O.K.

INSPECTION END



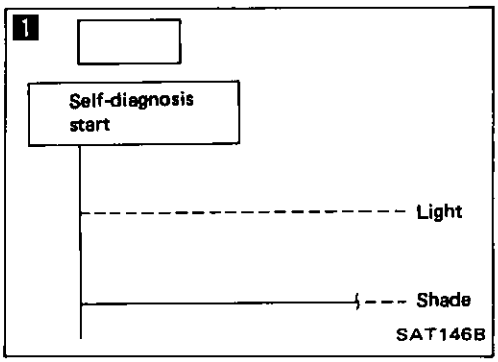

## Diagnostic Procedure 3

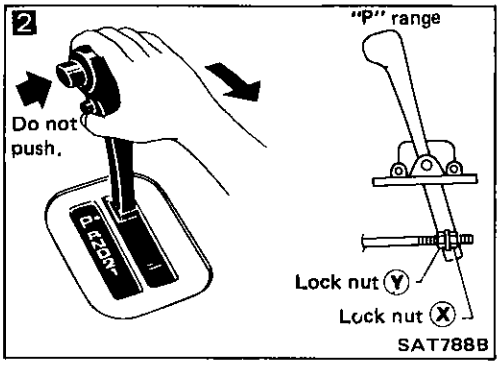
**SYMPTOM: Vehicle moves when it is pushed forward or backward with selector lever in "P" range.**

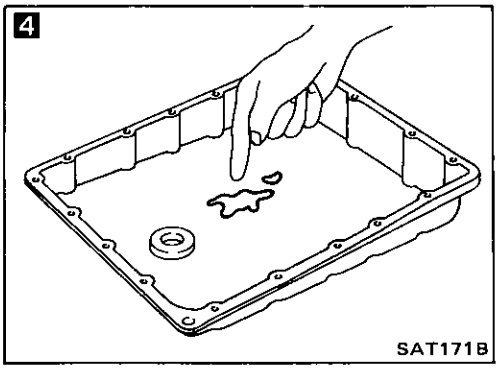
1 Check parking components. — Refer to "ON-VEHICLE SERVICE". — N.G. → Repair or replace damaged parts.

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

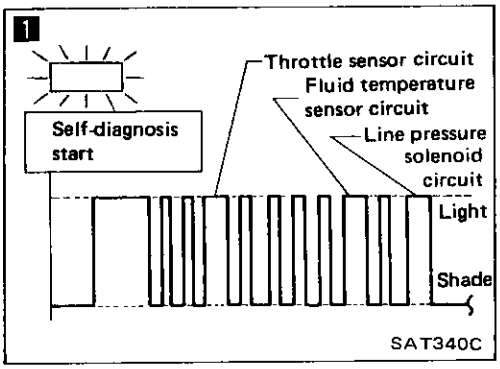
O.K. ↓

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.

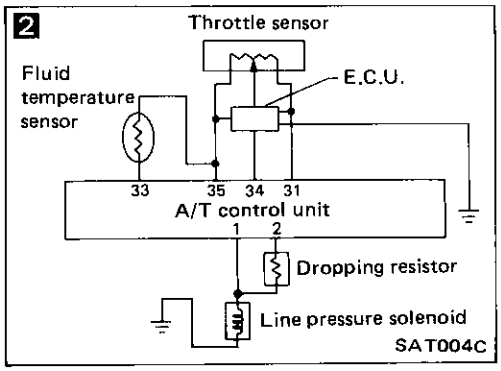
O.K. ↓

**INSPECTION END**

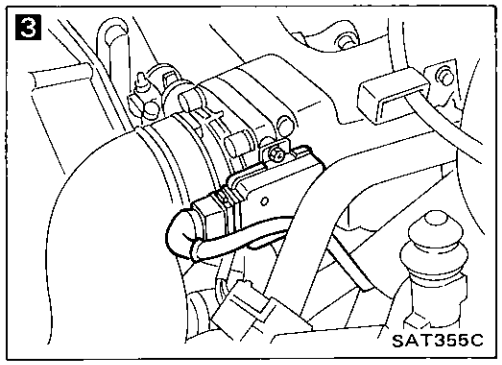
1



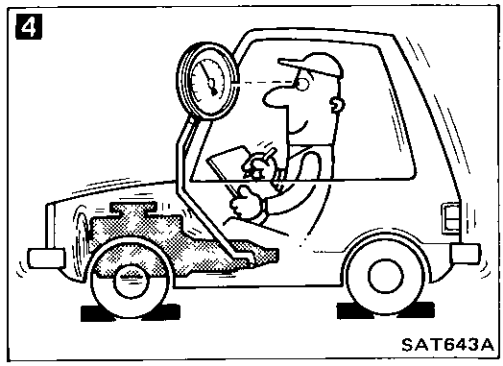

2




3




4




## 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

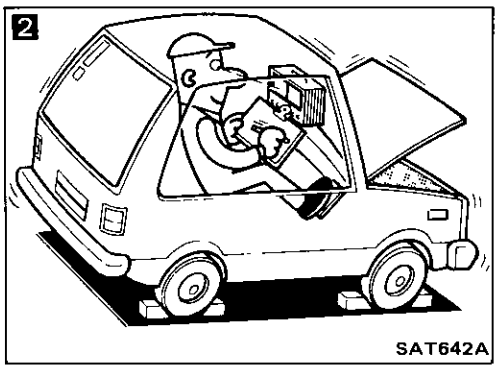
O.K. ↓

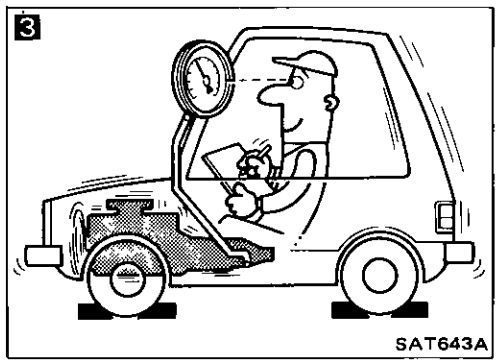
Check again.

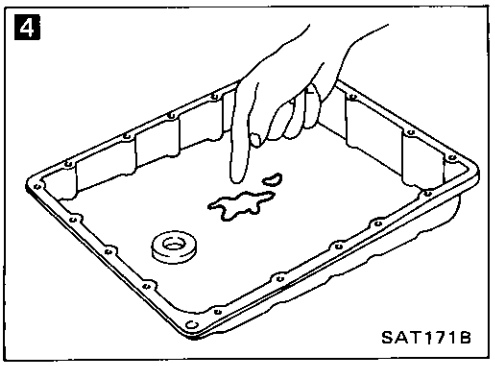
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

**INSPECTION END**




## Diagnostic Procedure 6

**SYMPTOM: Vehicle does not creep backward when selecting "R" range.**

**1** Check A/T fluid level again. — N.G. → Refill A.T.F.

O.K.

**2** Check stall revolution with selector lever in "1" and "R" range.

N.G. in both "1" and "R" range

O.K.

O.K. in "1" range
N.G. in "R" range.

**3** Check line pressure at idle with selector lever in "R" 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, 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

O.K.

**4** 1. Remove oil pan. 2. Check fluid condition. — N.G. →

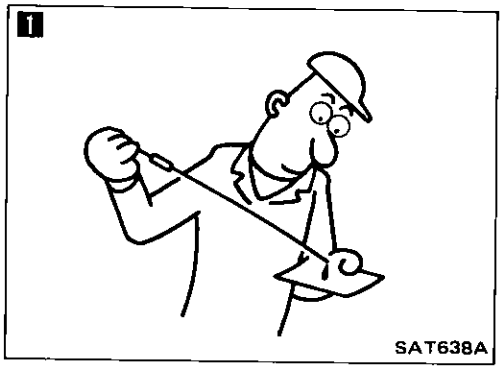
O.K.

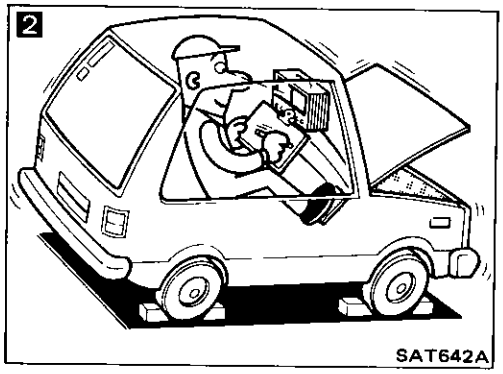
Check again. — N.G. →

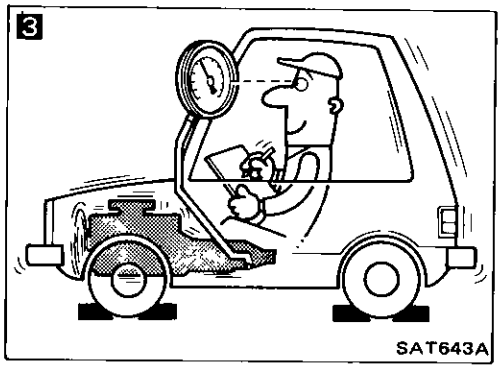
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

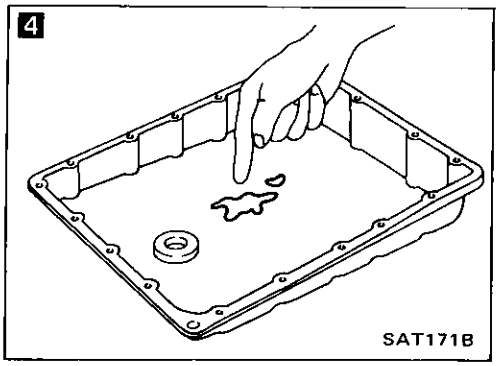
O.K.

**INSPECTION END**




## Diagnostic Procedure 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. ↓

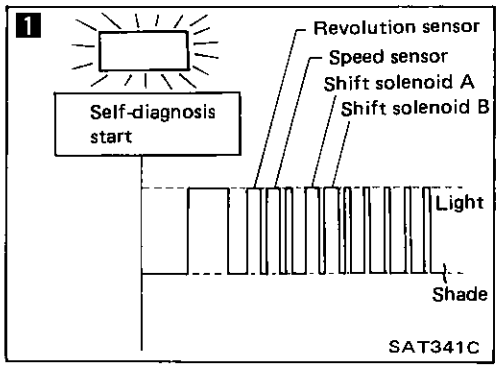
**2** Check stall revolution with selector lever in "D" range. – Refer to "STALL TESTING".
- N.G. →
  1. Remove control valve assembly. – Refer to "ON-VEHICLE SERVICE".
  2. Check the following items.
  - Valves to control line pressure (Pressure regulator valve, modifier valve, pilot valve and pilot 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. ↓

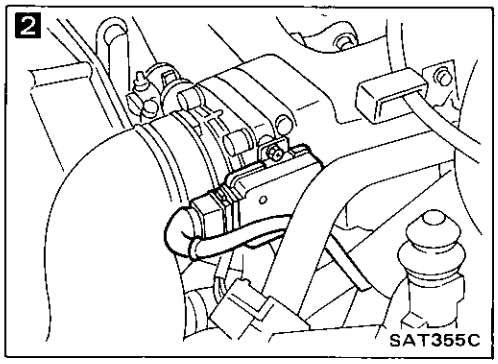
**3** Check line pressure at idle with selector lever in "D" range. – Refer to "PRESSURE TESTING".
- N.G. → (same as above)
- O.K. ↓

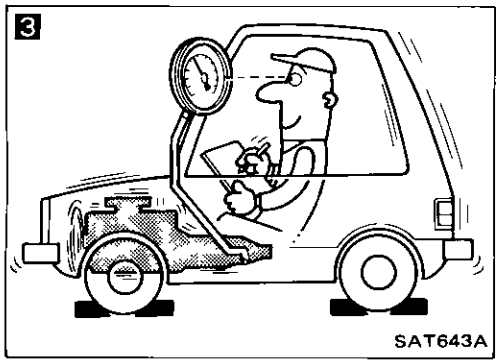
**4**
1. Remove oil pan.
2. Check A/T fluid condition.
- N.G. → (same as above)
- O.K. ↓

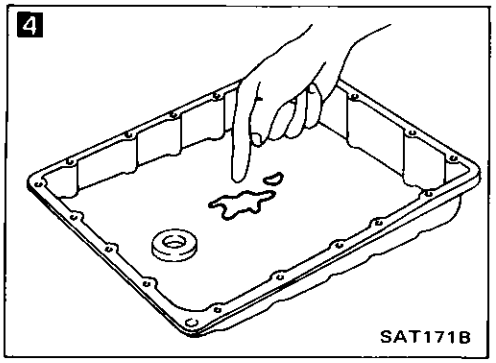
Check again.
- N.G. →
  1. Perform A/T control unit input/output signal inspection.
  2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

**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

O.K. ↓

**4**
1. Remove oil pan.
2. Check A/T fluid condition.

O.K. → (1. 2.)

N.G. →

1. Disassemble A/T.
2. Check the following items.
   - Forward clutch assembly
   - Forward one-way clutch
   - Low one-way clutch
   - High clutch assembly
   - Torque converter
   - Oil pump assembly

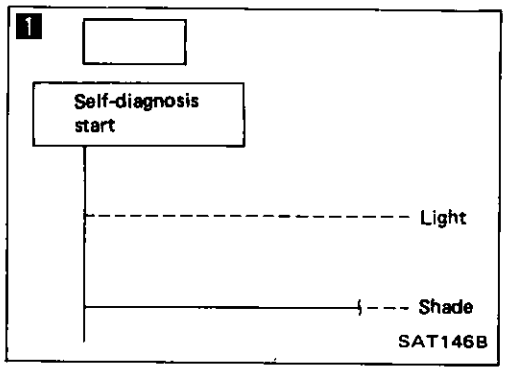
O.K. ↓

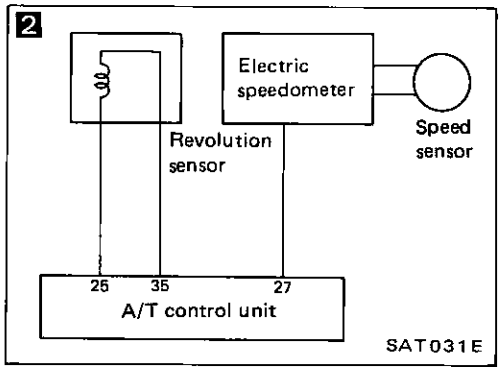
Check again. — N.G. →

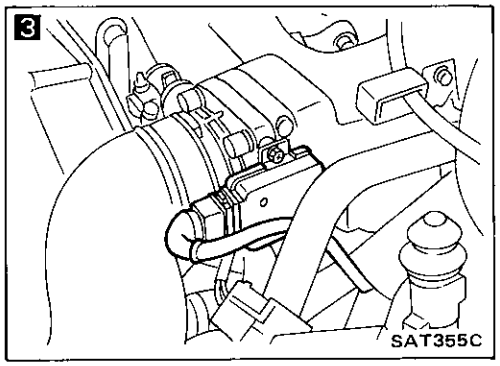
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

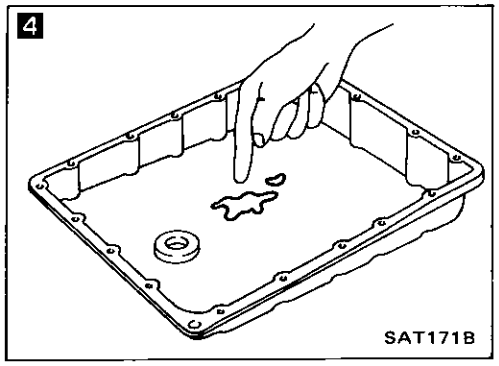
O.K. ↓

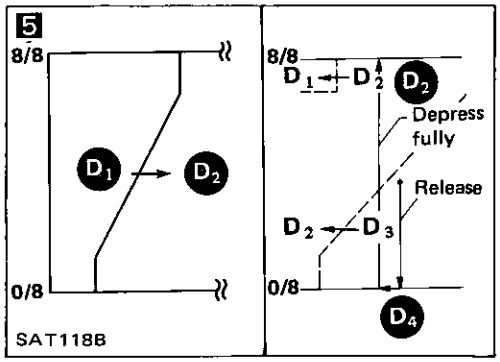
**INSPECTION END**




## 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. ↓ (O.K. ← from 1.)

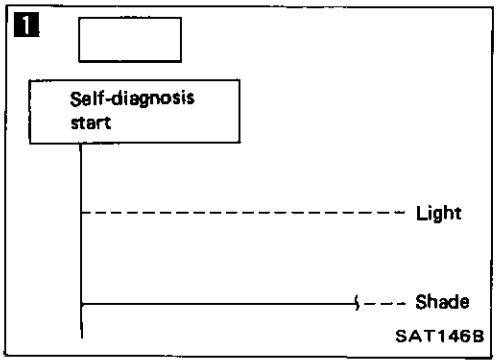
O.K. ← from 2.

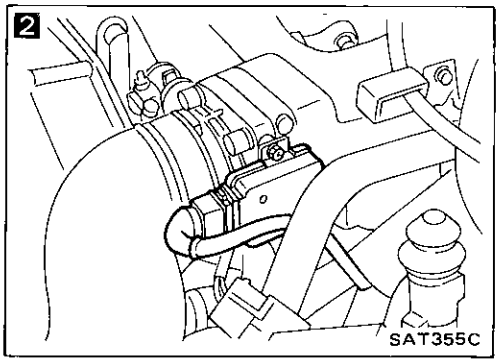
3. Disassemble A/T.
4. Check the following items.
- Servo piston assembly
- Brake band
- Oil pump assembly

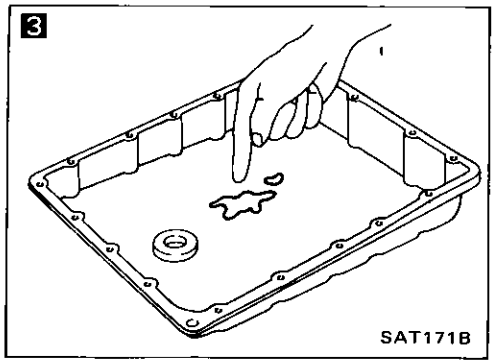
5 Check again. — N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

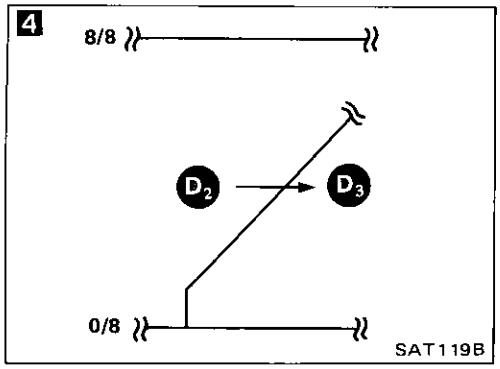
O.K. ↓

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. (from 2) ↑ / O.K. (from 3) ↓

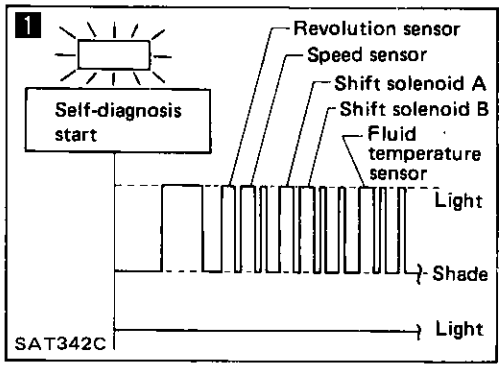
3. Disassemble A/T.
4. Check the following items.
- Servo piston assembly
- High clutch assembly
- Oil pump assembly

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.

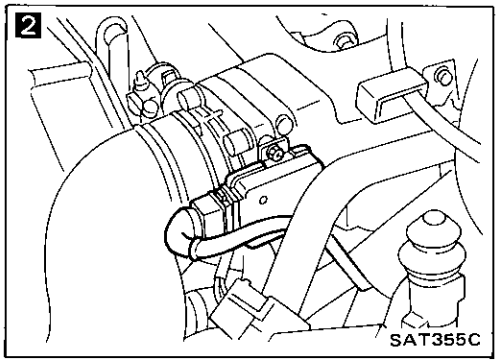
O.K. ↓

INSPECTION END

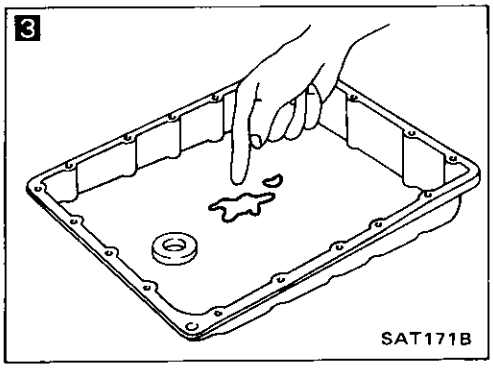
1



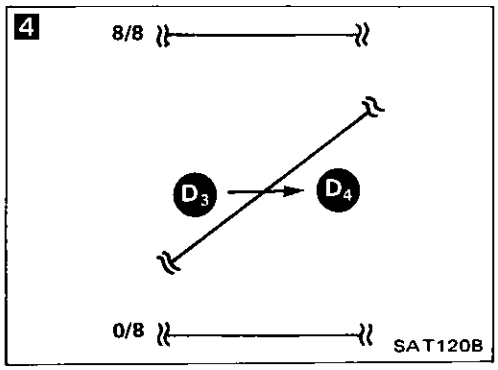

2




3




4




## 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

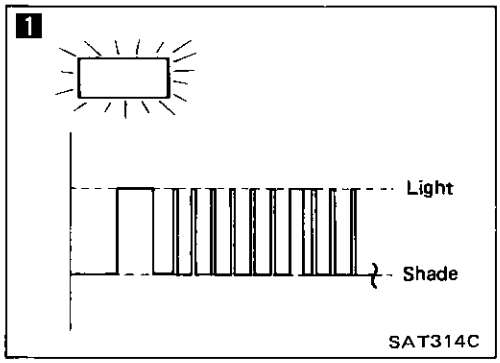
O.K. ↓ / O.K. ←

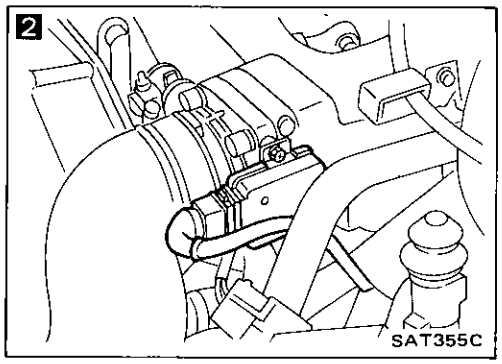
3. Disassemble A/T.
4. Check the following items.
   - Servo piston assembly
   - Brake band
   - Torque converter
   - Oil pump assembly

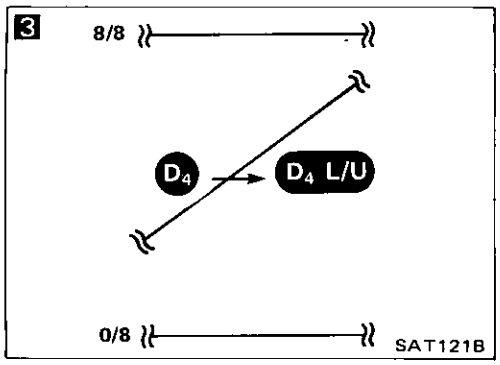
**4** Check again. — N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

**INSPECTION END**




## Diagnostic Procedure 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 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.

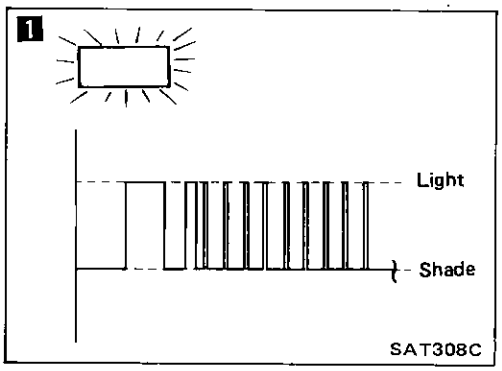
**3**

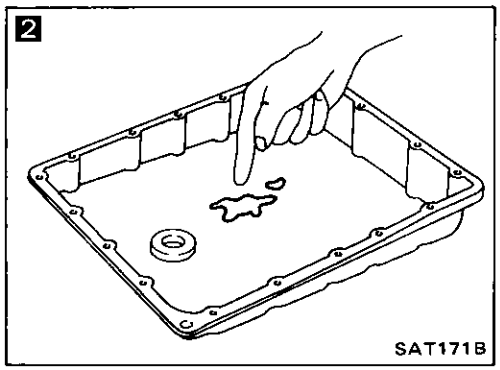
Check again.

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.

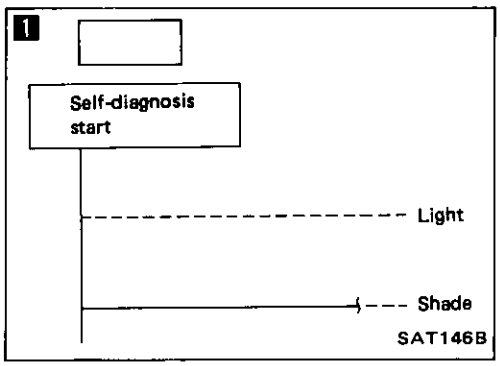
O.K.

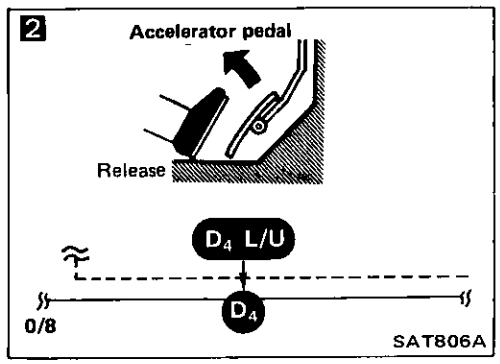
Check again.

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

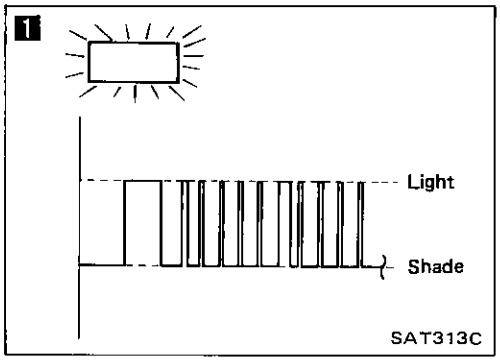
2

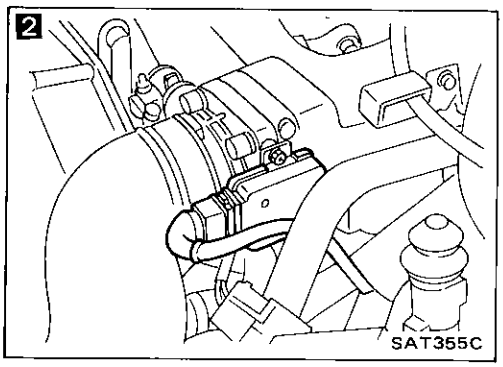
Check again.

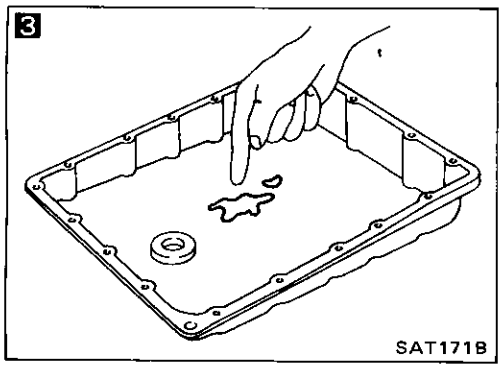
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

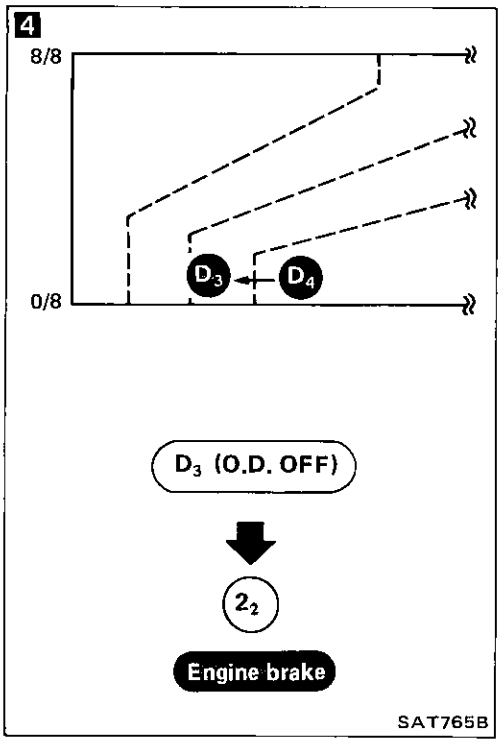
O.K.

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** Does self-diagnosis show damage to overrun clutch solenoid circuit after cruise test?
- Yes → Check overrun clutch solenoid circuit. – Refer to "Self-diagnosis".
- No ↓

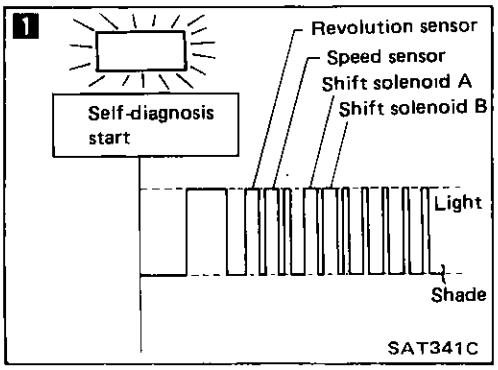
**2** Check throttle sensor. – Refer to section EF & EC.
- N.G. → Repair or replace throttle sensor.
- O.K. ↓

**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 2. Check A/T fluid condition.)
- O.K. ↓ (from 2. Check the following items.)

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".

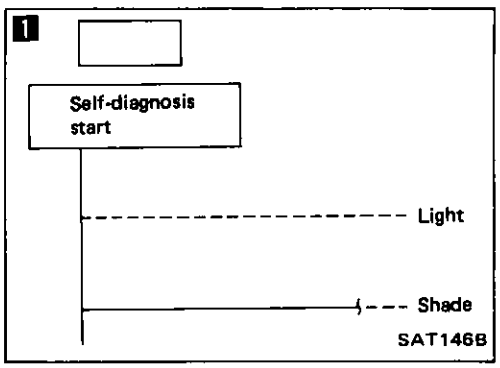
No ↓

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".

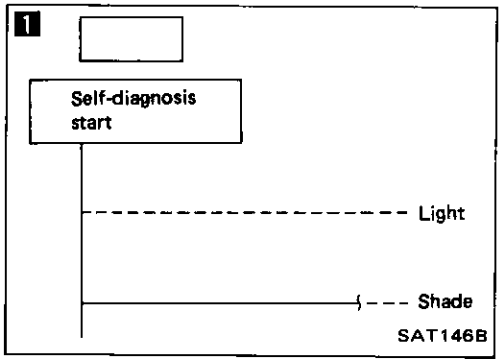
— OR —

1

Does self-diagnosis show damage to overdrive switch circuit?

No ↓

Go to Diagnostic Procedure 10.




## Diagnostic Procedure 18

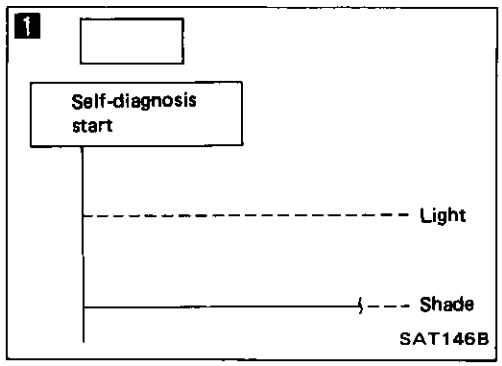
**SYMPTOM: A/T does not shift from $D_3$ to $2_2$ when changing selector lever from "D" to "2" range.**

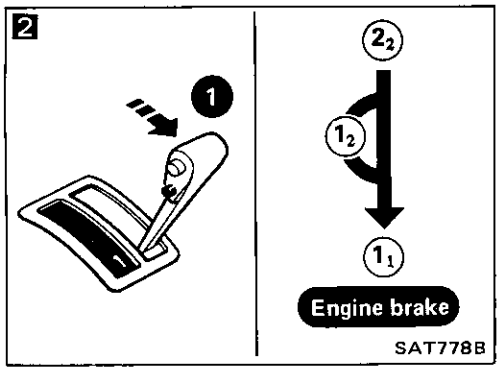
Does "E.C.U. INPUT SIGNALS" show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

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.

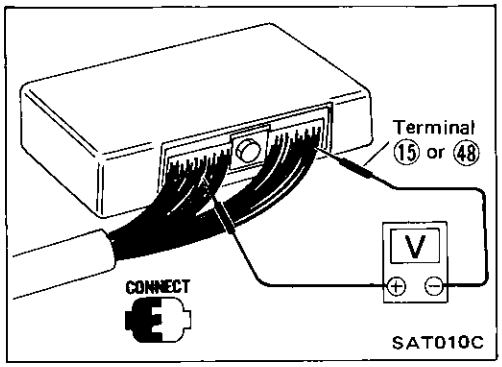
O.K. → INSPECTION END

## 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.

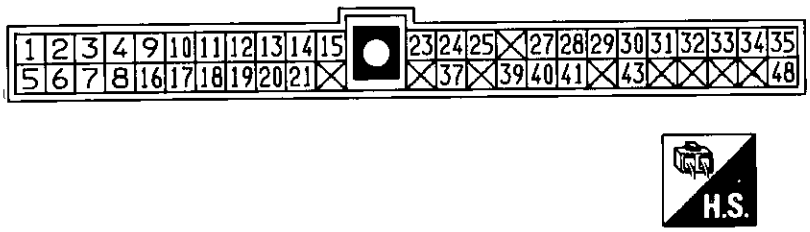



## Electrical Components Inspection

### 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.







SAT032E

## Electrical Components Inspection (Cont'd)

### A/T CONTROL UNIT INSPECTION TABLE
**(Data are reference values.)**

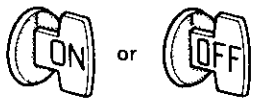
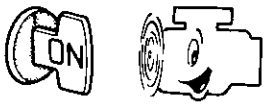
| Terminal No. | Item | Condition | | Judgement standard |
|---|---|---|---|---|
| 1 | Line pressure solenoid | | When accelerator pedal is released after warming up engine. | 1.5 - 2.5V |
| | | | When accelerator pedal is depressed fully after warming up engine. | 0.5V or less |
| 2 | Line pressure 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 |
| 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 |

## Electrical Components Inspection (Cont'd)

| Terminal No. | Item | Condition | Judgement standard |
|---|---|---|---|
| 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 (in throttle valve switch) | When accelerator pedal is depressed more than half-way after warming up engine. | 8 - 15V |
| | | When accelerator pedal is released after warming up engine. | 1V or less |
| 22 | – | – | – |

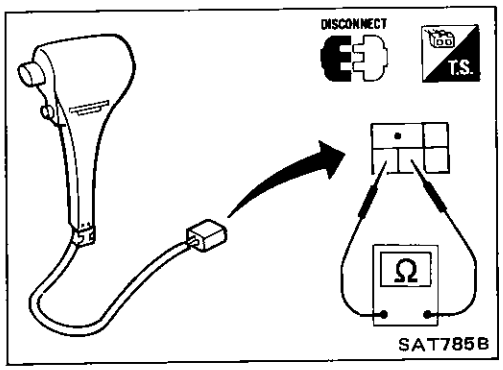
*: This terminal is connected to terminal No. 36 of E.C.C.S. control unit.
When code No. 54 appears during engine self-diagnosis, check line between above terminals for proper continuity.

## Electrical Components Inspection (Cont'd)

| Terminal No. | Item | Condition | | Judgement standard |
|---|---|---|---|---|
| 23 | Power source (Back-up) |   | When ignition switch is turned to "OFF". | Battery voltage |
| | | | When ignition switch is turned to "ON". | Battery voltage |
| 24 | Engine 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. Voltage rises gradually in response to throttle opening angle. | Fully-closed throttle: Approximately 0.5V 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 | A/C switch (Turbo model) | | When A/C switch is set in "ON" position. | 8 - 16V |
| | | | When A/C switch is set in "OFF" position. | 2V or less |
| 44 | – | | – | – |
| 45 | – | | – | – |
| 46 | – | | – | – |
| 47 | – | | – | – |
| 48 | Ground | | – | – |



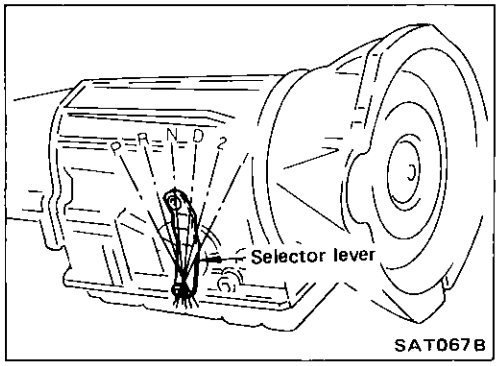

### OVERDRIVE SWITCH

- Check continuity between two terminals.

| O.D. switch position | Continuity |
|---|---|
| ON | No |
| OFF | Yes |

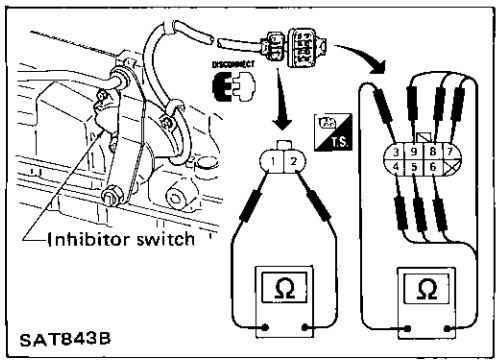
## Electrical Components Inspection (Cont'd)

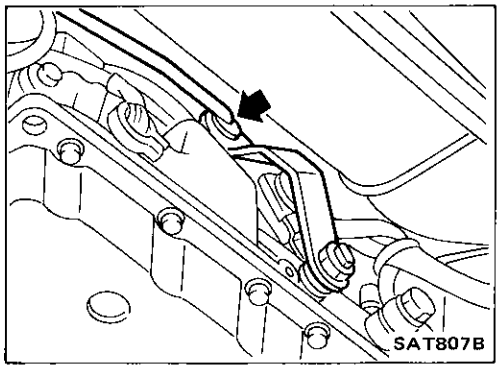
### INHIBITOR SWITCH



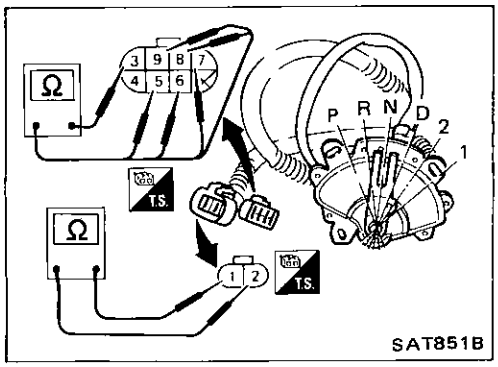

1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each range.

| Lever position \ Terminal No. | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |
|---|---|---|---|---|---|---|---|---|---|
| P | ○ | ○ | ○ | ○ | | | | | |
| R | | | ○ | | ○ | | | | |
| N | ○ | ○ | ○ | | | ○ | | | |
| D | | | ○ | | | | ○ | | |
| 2 | | | ○ | | | | | ○ | |
| 1 | | | ○ | | | | | | ○ |

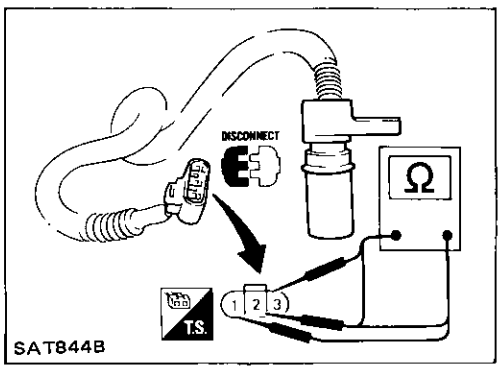



2. If N.G., check again with manual control linkage disconnected from manual shaft of A/T assembly. — Refer to step 1.
3. If O.K. on step 2, adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".




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.



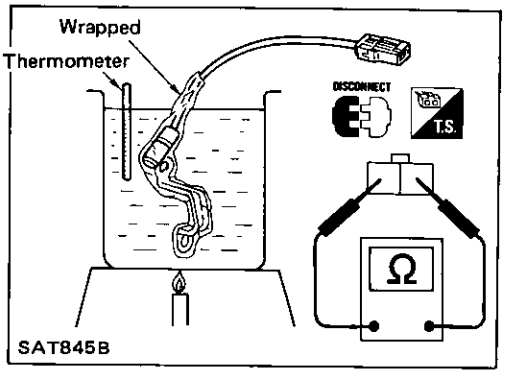

### REVOLUTION SENSOR

- 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)

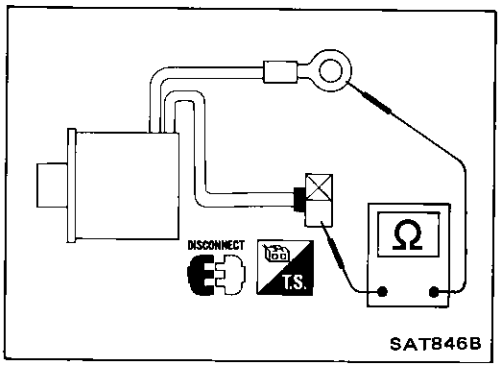
### FLUID TEMPERATURE SENSOR




- 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

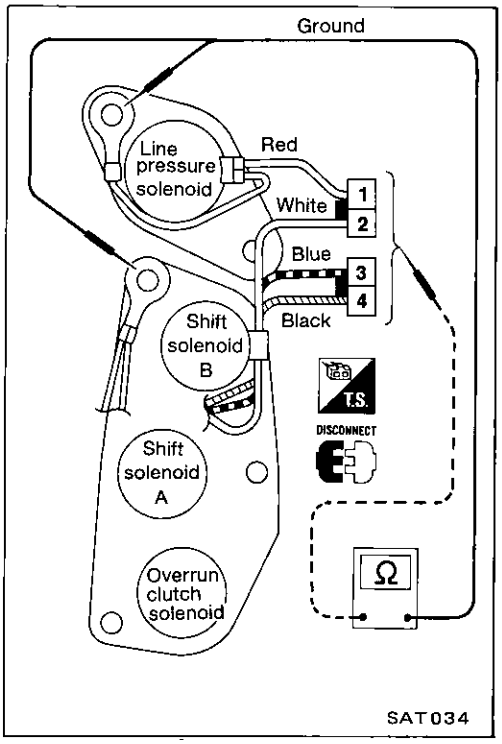



- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

**Resistance:**

**Lock-up solenoid 10 - 20Ω**

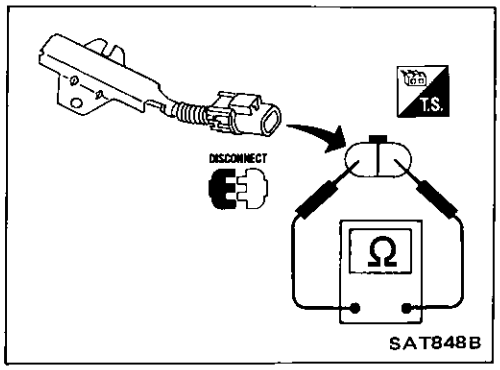
### 3-UNIT SOLENOID ASSEMBLY (Shift solenoids A, B and overrun clutch solenoid) AND LINE PRESSURE SOLENOID




- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.

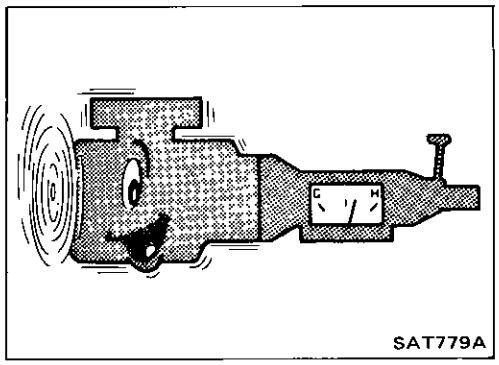
| Solenoid | Terminal No. | | Resistance |
|---|---|---|---|
| Shift solenoid A | ③ | Ground terminal | 20 - 40Ω |
| Shift solenoid B | ② | | |
| Overrun clutch solenoid | ④ | | |
| Line pressure solenoid | ① | | 2.5 - 5Ω |

### DROPPING RESISTOR




- Check resistance between two terminals.

**Resistance: 11.2 - 12.8Ω**



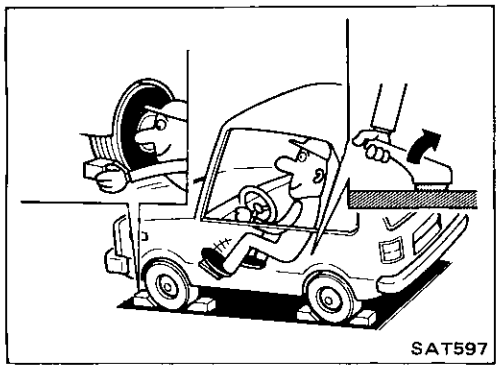

## Final Check

### STALL TESTING

**Stall test procedure**

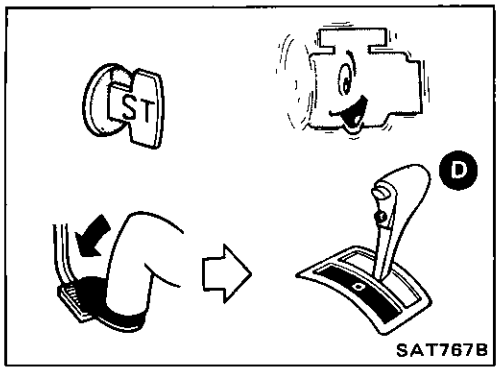
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

   **A.T.F. operating temperature:**
   **50 - 80°C (122 - 176°F)**

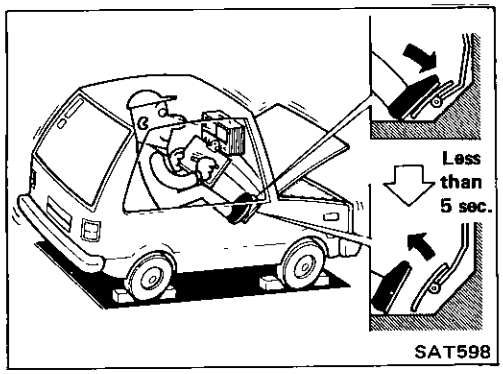



3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark on point of specified engine rpm on indicator.**



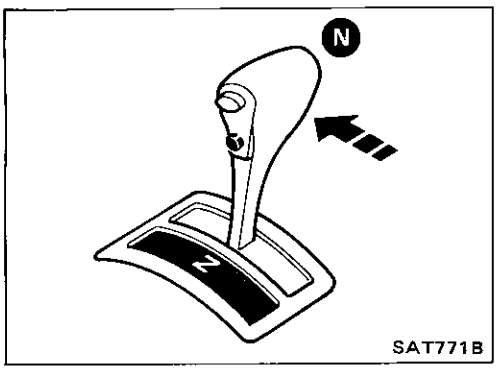

5. Start engine, apply foot brake, and place selector lever in "D" range.




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:**
  **2,450 - 2,650 rpm (RE4R01A)**
  **2,950 - 3,200 rpm (RE4R03A)**




8. Shift selector lever to "N".
9. Cool off A.T.F.

- **Run engine at idle for at least one minute.**

10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

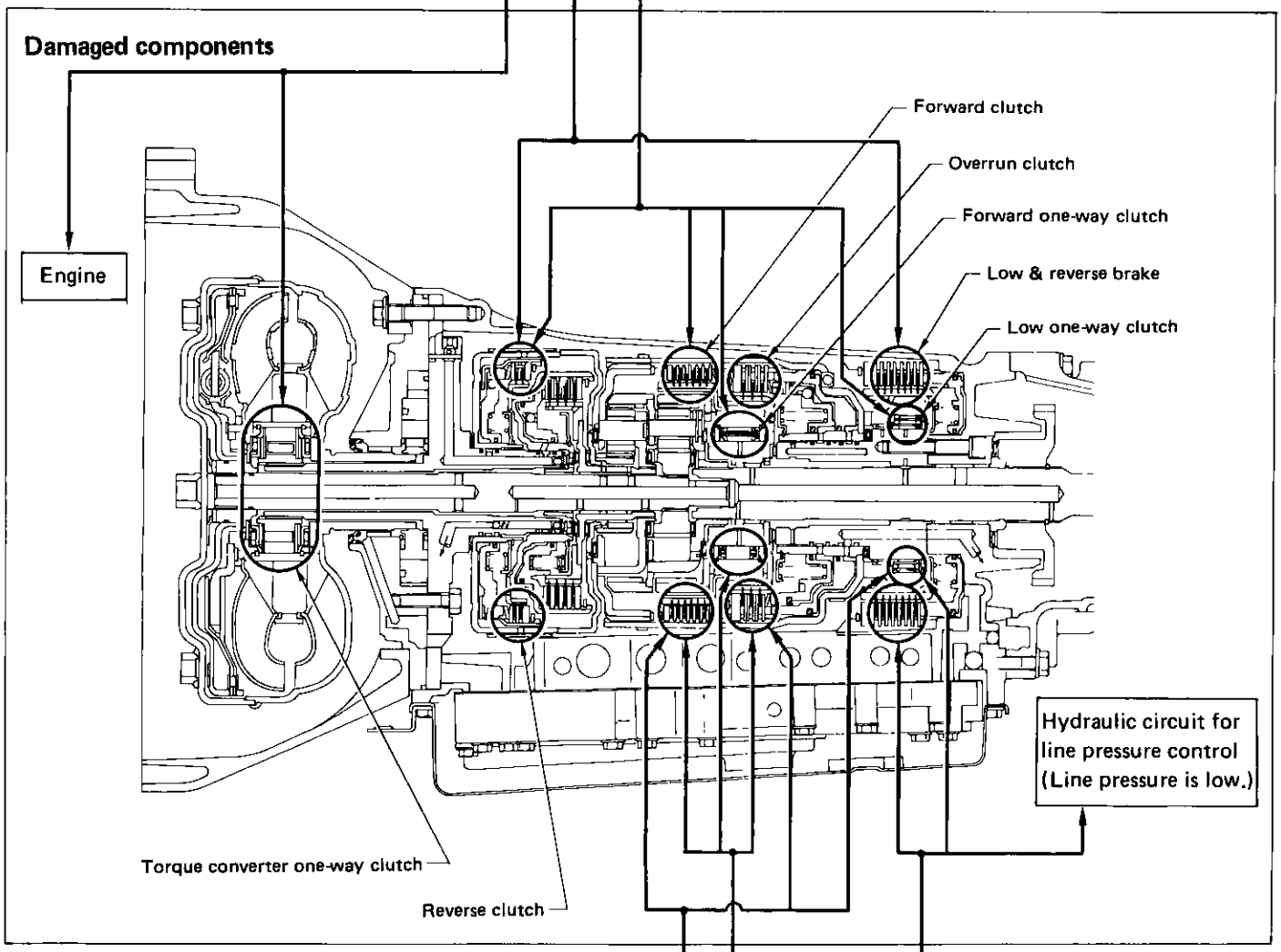
## Final Check (Cont'd)

**Judgement of stall test**

| Selector lever position | Judgement | | |
|---|---|---|---|
| D | L | O | H |
| 2 | L | O | H |
| 1 | L | O | O |
| R | L | H | H |

O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.

**Damaged components**




Clutches and brakes except high clutch and brake band are O.K. (Condition of high clutch and brake band cannot be confirmed by stall test.)

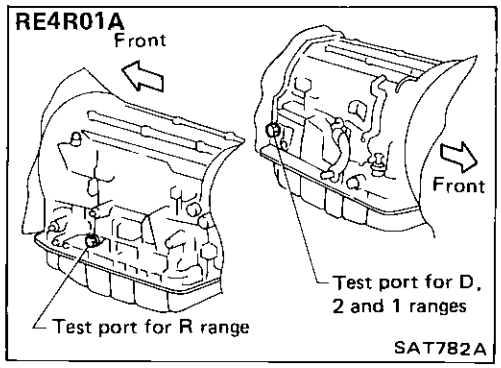
| | | | | |
|---|---|---|---|---|
| D | H | H | H | O |
| 2 | H | H | H | O |
| 1 | O | H | H | O |
| R | O | O | H | O |
| Selector lever position | Judgement | | | |

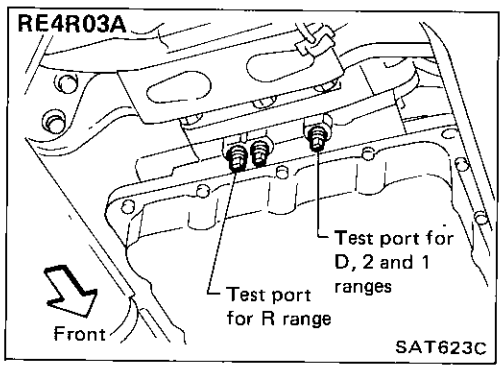
SAT107B

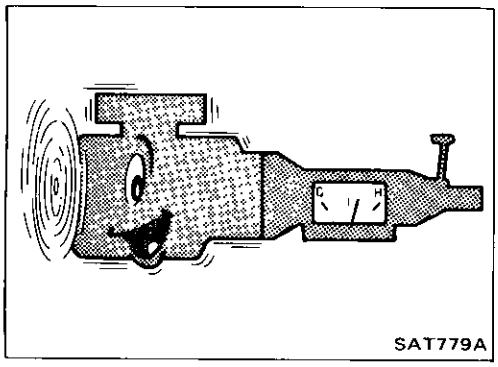
## Final Check (Cont'd)

### 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.**



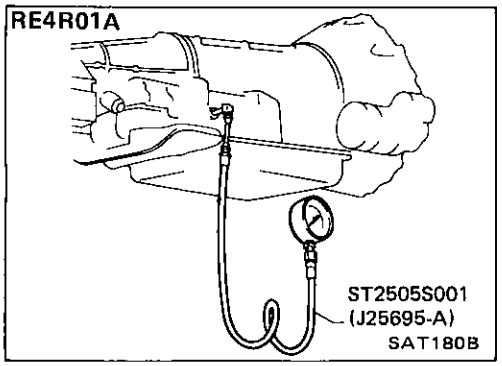




**Line pressure test procedure**

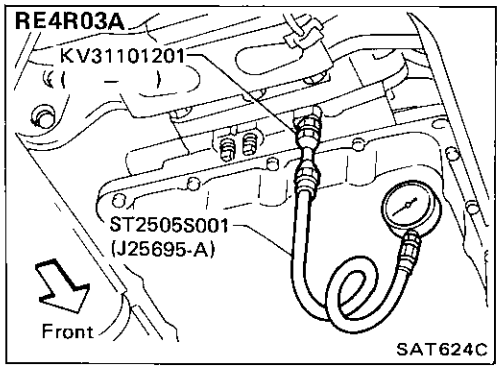
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

   **A.T.F. operating temperature:**
   **50 - 80°C (122 - 176°F)**



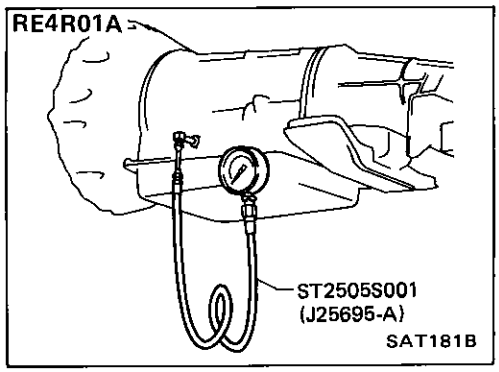

3. Install pressure gauge to line pressure port.

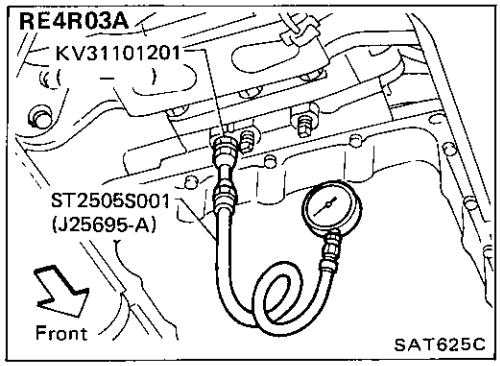
— **D, 2 and 1 ranges** —

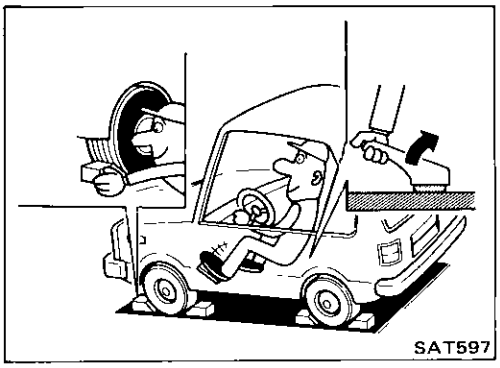


## Final Check (Cont'd)

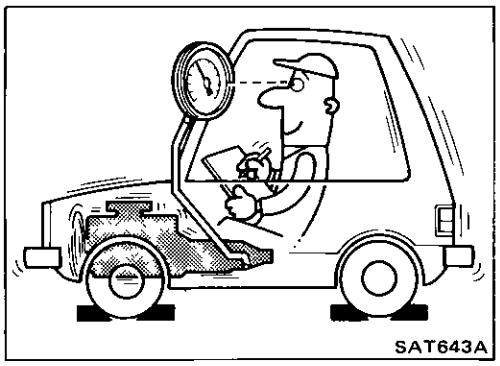
— R range —




4. Set parking brake and block wheels.
- **Continue to depress brake pedal fully while line pressure test at stall speed is performed.**




5. Start engine and measure line pressure at idle and stall speed.
- **When measuring line pressure at stall speed, follow the stall test procedure.**

**Line pressure:**

| Engine speed rpm | Line pressure kPa (kg/cm$^2$, psi) | |
|---|---|---|
| | D, 2 and 1 ranges | R range |
| Idle | 422 - 461 (4.3 - 4.7, 61 - 67) | 667 - 706 (6.8 - 7.2, 97 - 102) |
| Stall | 1,020 - 1,098 (10.4 - 11.2, 148 - 159) | 1,422 - 1,500 (14.5 - 15.3, 206 - 218) |

## Final Check (Cont'd)

### JUDGEMENT OF LINE PRESSURE TEST

| Judgement | | Suspected parts |
|---|---|---|
| At idle | Line pressure is low in all ranges. | • Oil pump wear<br>• Control piston damage<br>• Pressure regulator valve or plug sticking<br>• Spring for pressure regulator valve damaged<br>• 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.<br>• For example;<br>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<br>• Fluid temperature sensor damaged<br>• Line pressure solenoid sticking<br>• Short circuit of line pressure solenoid circuit<br>• Pressure modifier valve sticking<br>• Pressure regulator valve or plug sticking |
| At stall speed | Line pressure is low. | • Mal-adjustment of throttle sensor<br>• Control piston damaged<br>• Line pressure solenoid sticking<br>• Short circuit of line pressure solenoid circuit<br>• Pressure regulator valve or plug sticking<br>• Pressure modifier valve sticking<br>• Pilot valve sticking |

# Symptom Chart

| Reference page (AT- ) | | ON vehicle | | | | | | | | | | OFF vehicle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Reference page (AT- ) | 9, 14 | 75 | 75 | 79 | 76, 126 | 76 | 76 | 7, 76 | 7 | 7 | 110, 122 | 140, 144 | 146, 161 | 146 | 150 | 168 |
| Reference page (AT- ) | Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle. | Fluid level<br>Control linkage | Inhibitor switch<br>Throttle sensor (Adjustment) | Revolution sensor and speed sensor<br>Engine revolution signal | Engine idling rpm<br>Line pressure | Control valve assembly<br>Shift solenoid A | Shift solenoid B<br>Line pressure solenoid | Lock-up solenoid<br>Overrun clutch solenoid | Fluid temperature sensor<br>Accumulator N-D | Accumulator 1-2<br>Accumulator 2-3 | Accumulator 3-4 (N-R)<br>Ignition switch and starter | Torque converter<br>Oil pump | Reverse clutch<br>High clutch | Forward clutch<br>Forward one-way clutch | Overrun clutch<br>Low one-way clutch | Low & reverse brake<br>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 | | | | ⑥ ⑦ | ⑧ ⑨ | ⑩ | | |
| – | Clutches or brakes slip somewhat in starting. | 1 2 | 3 | | 4 | 6 | 5 | | 7 | | 8 | ⑬ ⑫ | ⑩ | ⑨ | | ⑪ | |
| – | Excessive creep. | | | | 1 | | | | | | | | | | | | |
| 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)

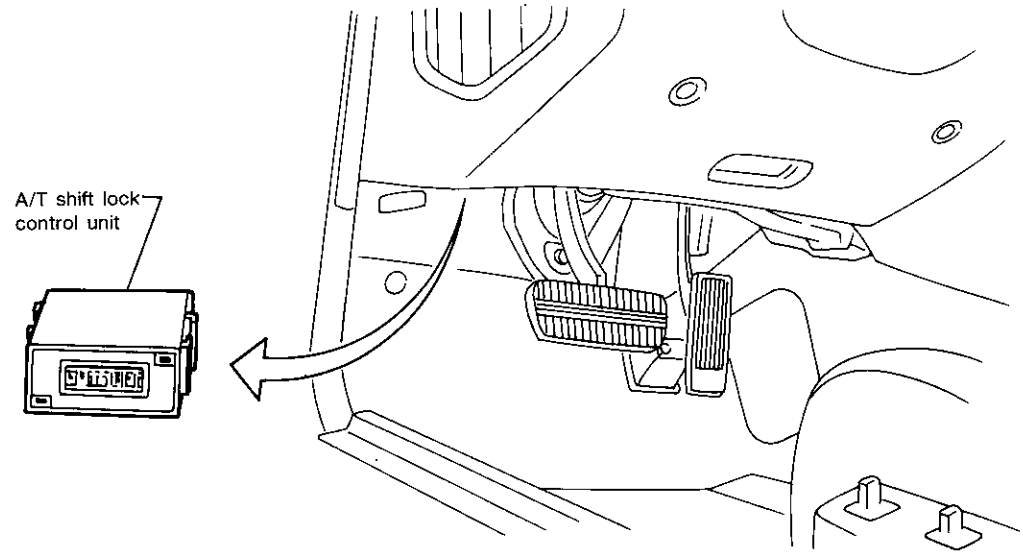
| Reference page (AT- ) | | ON vehicle | | | | | | | | | | OFF vehicle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Reference page (AT- ) | 9, 14 | 75 | 75 | 79 | 76, 126 | 76 | 76 | 7, 76 | 7 | 7 | 110, 122 | 140, 144 | 146, 161 | 146 | 150 | 168 |
| Reference page (AT- ) | Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle. | Fluid level<br>Control linkage | Inhibitor switch<br>Throttle sensor (Adjustment) | Revolution sensor and speed sensor<br>Engine revolution signal | Engine idling rpm<br>Line pressure | Control valve assembly<br>Shift solenoid A | Shift solenoid B<br>Line pressure solenoid | Lock-up solenoid<br>Overrun clutch solenoid | Fluid temperature sensor<br>Accumulator N-D | Accumulator 1-2<br>Accumulator 2-3 | Accumulator 3-4 (N-R)<br>Ignition switch and starter | Torque converter<br>Oil pump | Reverse clutch<br>High clutch | Forward clutch<br>Forward one-way clutch | Overrun clutch<br>Low one-way clutch | Low & reverse brake<br>Brake band | Parking components |
| — | Too sharp a shock in change from "$D_3$" to "$D_4$". | . . | . 1 | . . | . 2 | 4 . | . . | . . | . . | . . | 3 . | . . | . . | . . | ⑥ . | . ⑤ | . |
| — | Almost no shock or clutches slipping in change from "$D_1$" to "$D_2$". | 1 . | . 2 | . . | . 3 | 5 . | . . | . . | . . | 4 . | . . | . . | . . | . . | . . | . ⑥ | . |
| — | Almost no shock or slipping in change from "$D_2$" to "$D_3$". | 1 . | . 2 | . . | . 3 | 5 . | . . | . . | . . | . 4 | . . | . . | . ⑥ | . . | . . | . ⑦ | . |
| — | Almost no shock or slipping in change from "$D_3$" to "$D_4$". | 1 . | . 2 | . . | . 3 | 5 . | . . | . . | . . | . . | 4 . | . . | . ⑥ | . . | . . | . ⑦ | . |
| — | Vehicle braked by gear change from "$D_1$" to "$D_2$". | 1 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | (2) ④ | . . | . ⑤ | ③ . | . |
| — | Vehicle braked by gear change from "$D_2$" to "$D_3$". | 1 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . ② | . |
| — | Vehicle braked by gear change from "$D_3$" to "$D_4$". | 1 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | (4) . | . (3) | (2) . | . . | . |
| — | Maximum speed not attained. Acceleration poor. | 1 . | 2 . | . . | . . | 5 3 | 4 . | . . | . . | . . | . . | ⑪ ⑩ | (6) (7) | . . | . . | (9) (8) | . |
| — | Failure to change gear from "$D_4$" to "$D_3$". | 1 . | . 2 | . . | . . | 6 4 | . 5 | . 3 | . . | . . | . . | . . | . . | . . | (8) . | (7) . | . |
| — | Failure to change gear from "$D_3$" to "$D_2$" or from "$D_4$" to "$D_3$". | 1 . | . 2 | . . | . . | 5 3 | 4 . | . . | . . | . . | . . | . . | . ⑥ | . . | . . | . ⑦ | . |
| — | Failure to change gear from "$D_2$" to "$D_1$" or from "$D_3$" to "$D_1$". | 1 . | . 2 | . . | . . | 5 3 | 4 . | . . | . . | . . | . . | . . | . ⑦ | . . | . ⑥ | . ⑧ | . |
| — | Gear change shock felt during deceleration by releasing accelerator pedal. | . . | . 1 | . . | . 2 | 4 . | . . | . 3 | . . | . . | . . | . . | . . | . . | . . | . . | . |
| — | Too high a change point from "$D_4$" to "$D_3$", from "$D_3$" to "$D_2$", from "$D_2$" to "$D_1$". | . . | . 1 | 2 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . |
| — | Kickdown does not operate when depressing pedal in "$D_4$" within kickdown vehicle speed. | . . | . 1 | 2 . | . . | . 3 | 4 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . |
| — | Kickdown operates or engine overruns when depressing pedal in "$D_4$" beyond kickdown vehicle speed limit. | . . | . 2 | 1 . | . . | . 3 | 4 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . |
| — | Races extremely fast or slips in changing from "$D_4$" to "$D_3$" when depressing pedal. | 1 . | . 2 | . . | . 3 | 5 . | . 4 | . . | . . | . . | . . | . . | . ⑥ | ⑦ . | . . | . . | . |
| — | Races extremely fast or slips in changing from "$D_4$" to "$D_2$" when depressing pedal. | 1 . | . 2 | . . | . 3 | 6 5 | . 4 | . . | . . | . . | . . | . . | . . | ⑧ . | . . | . ⑦ | . |
| — | Races extremely fast or slips in changing from "$D_3$" to "$D_2$" when depressing pedal. | 1 . | . 2 | . . | . 3 | 5 . | . 4 | . . | 8 . | . 10 | . . | . . | . ⑨ | ⑦ . | . . | . ⑥ | . |
| — | Races extremely fast or slips in changing from "$D_4$" or "$D_3$" to "$D_1$" when depressing pedal. | 1 . | . 2 | . . | . 3 | 5 . | . 4 | . . | . . | . . | . . | . . | . . | ⑥ ⑦ | . ⑧ | . . | . |
| — | Vehicle will not run in any range. | 1 2 | . . | . . | . 3 | . . | . 4 | . . | . . | . . | . . | ⑨ ⑤ | . ⑥ | . . | . . | ⑧ ⑦ | ⑩ |
| — | Transmission noise in "D", "2", "1" and "R" ranges. | 1 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | ② . | . . | . . | . . | . . | . |

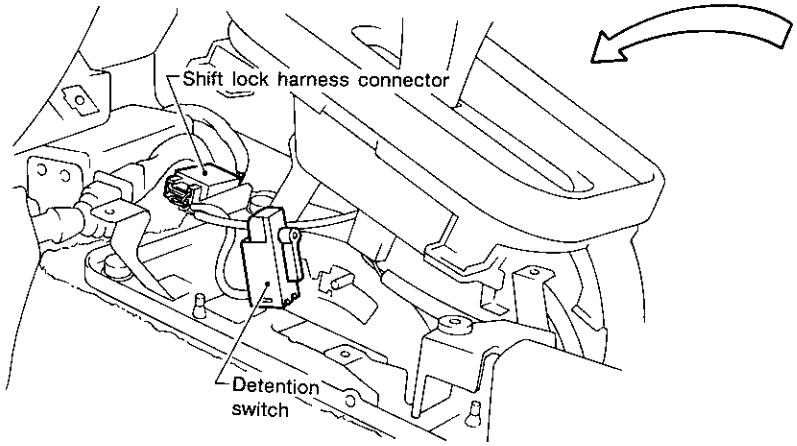
## Symptom Chart (Cont'd)

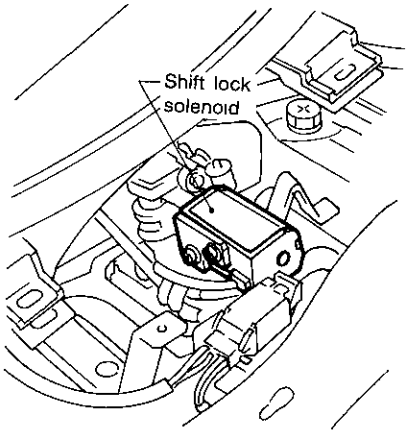
| Reference page (AT- ) | | ON vehicle | | | | | | | | | | OFF vehicle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Reference page (AT- ) | 9, 14 | 75 | 75 | 79 | 76, 126 | 76 | 76 | 7, 76 | 7 | 7 | 110, 122 | 140, 144 | 146, 161 | 146 | 150 | 168 |
| | Numbers 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<br>Control linkage | Inhibitor switch<br>Throttle sensor (Adjustment) | Revolution sensor and speed sensor<br>Engine revolution signal | Engine idling rpm<br>Line pressure | Control valve assembly<br>Shift solenoid A | Shift solenoid B<br>Line pressure solenoid | Lock-up solenoid<br>Overrun clutch solenoid | Fluid temperature sensor<br>Accumulator N-D | Accumulator 1-2<br>Accumulator 2-3 | Accumulator 3-4 (N-R)<br>Ignition switch and starter | Torque converter<br>Oil pump | Reverse clutch<br>High clutch | Forward clutch<br>Forward one-way clutch | Overrun clutch<br>Low one-way clutch | Low & reverse brake<br>Brake band | Parking components |
| 69 | Failure to change from "$D_3$" to "$2_2$" 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 "$1_3$" to "$1_2$" 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.<br>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 . | . . | . . | . . | . . | . . | . . | . . | . . | . |

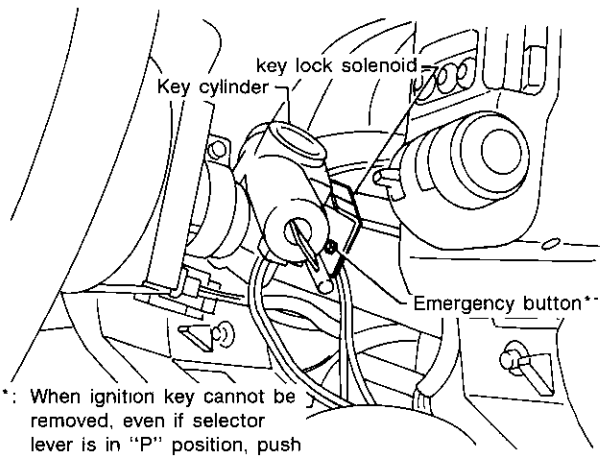
# A/T Shift Lock System

## SHIFT LOCK SYSTEM ELECTRICAL PARTS LOCATION

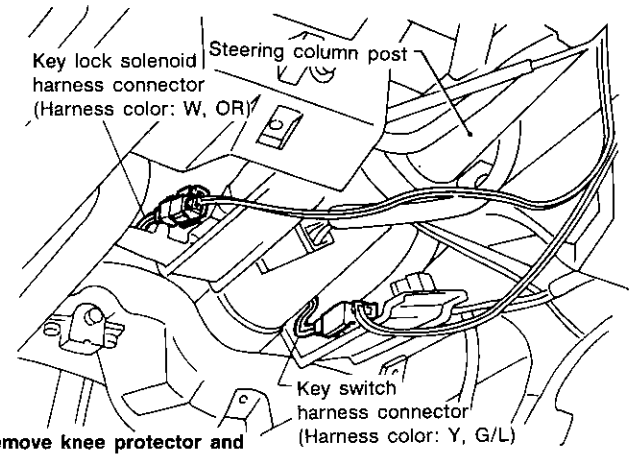



*: When ignition key cannot be removed, even if selector lever is in "P" position, push emergency button and remove ignition key.

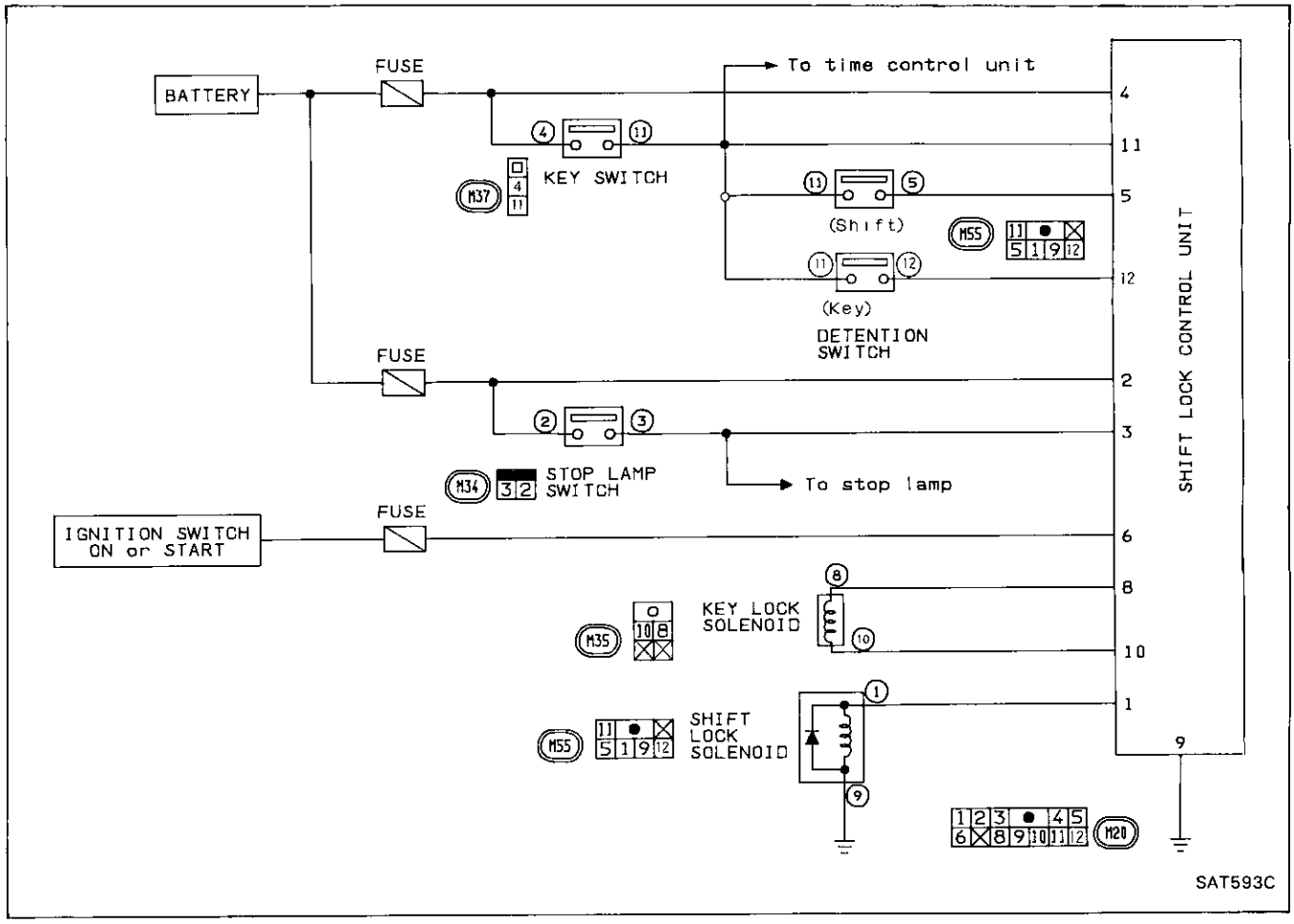



**Remove knee protector and air duct on driver's side.**

SAT033E

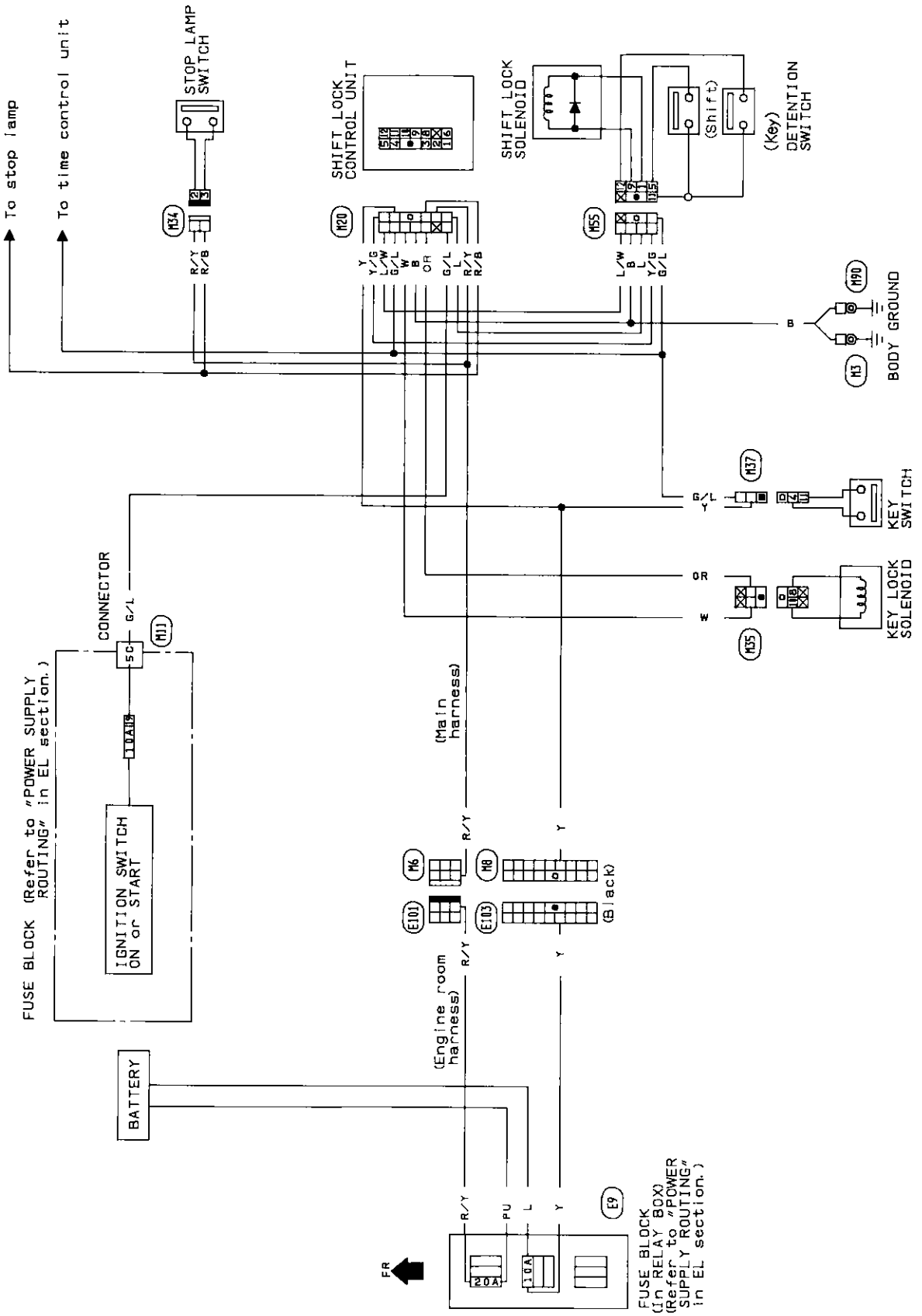
## A/T Shift Lock System (Cont'd)

### CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



## A/T Shift Lock System (Cont'd)

### WIRING DIAGRAM



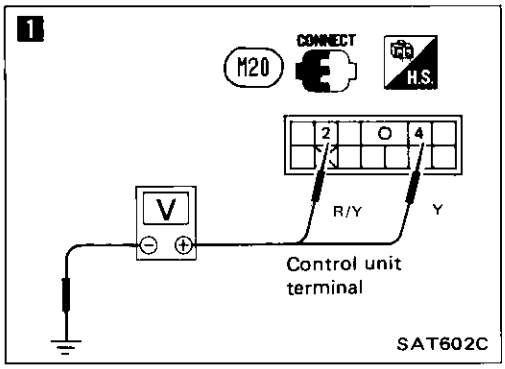

SAT594C

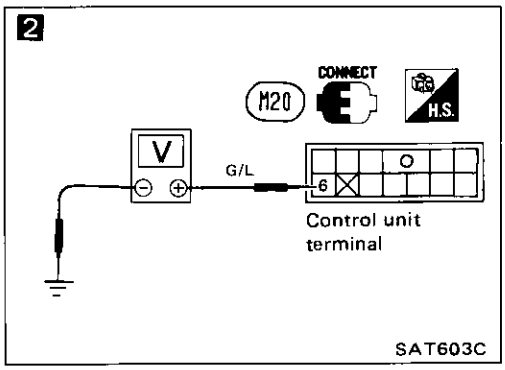
## A/T Shift Lock System (Cont'd)

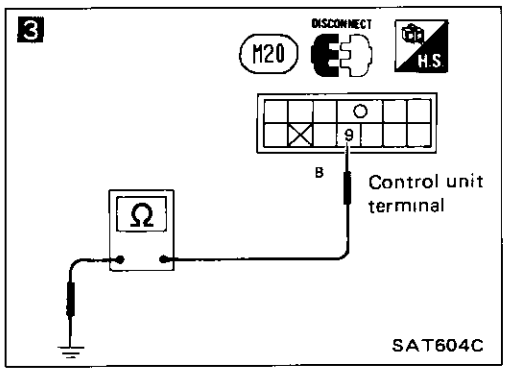
### DIAGNOSTIC PROCEDURE 1

**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.**

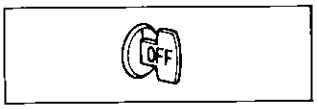



**1**

**CHECK POWER SOURCE.**

1. 

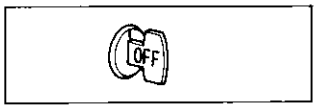
2. Check voltage between control unit harness terminals ②, ④ and ground.
   **Battery voltage should exist.**

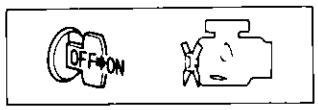
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

**2**

**CHECK IGNITION SIGNAL.**

1. 

2. Check voltage between control unit harness terminal ⑥ and ground.
   **0V**
3. 

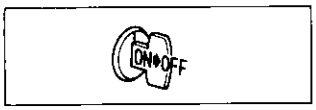
4. Check voltage between control unit harness terminal ⑥ and ground.
   **Battery voltage should exist.**

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. 

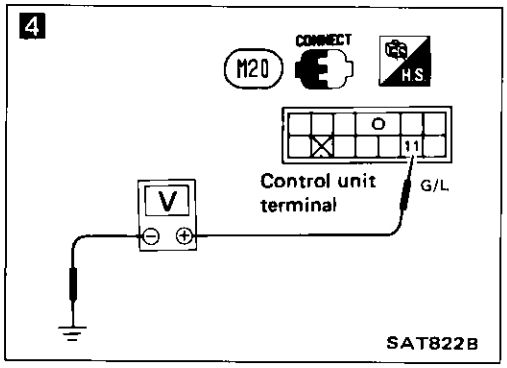
2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
   **Continuity should exist.**

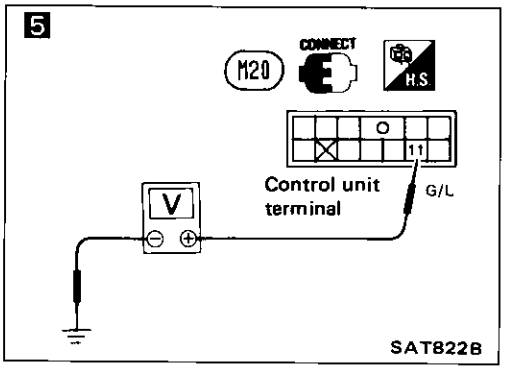
N.G. → Repair harness or connector.

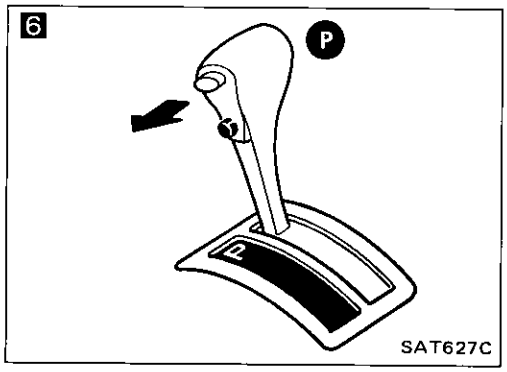
O.K. ↓

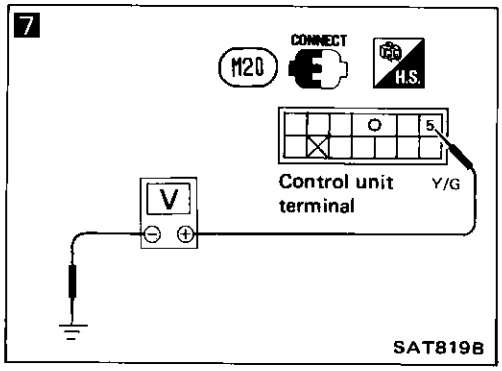
Ⓐ

## A/T Shift Lock System (Cont'd)



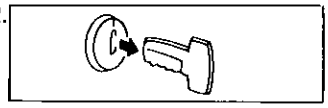




Ⓐ

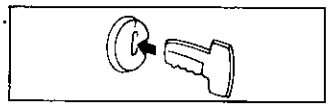
**4** **CHECK INPUT SIGNAL (KEY SWITCH).**

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. ↓

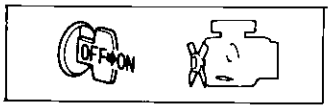
**5**

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**

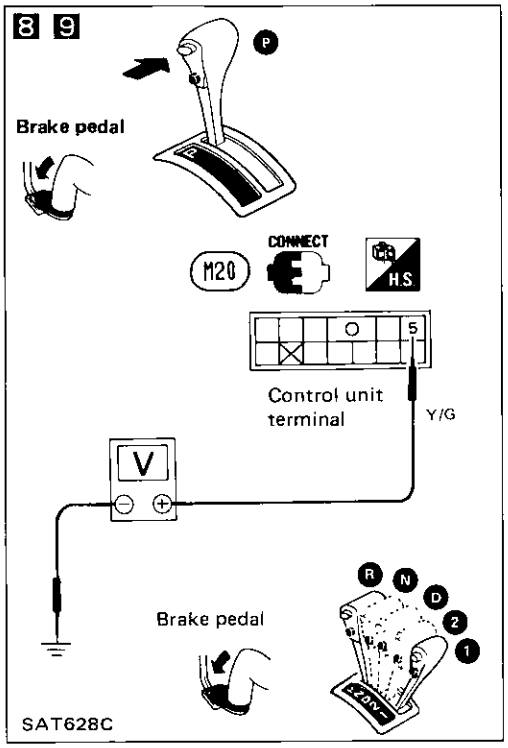
N.G. → Check detention switch–shift. (Refer to "COMPONENT CHECK".)

O.K. ↓

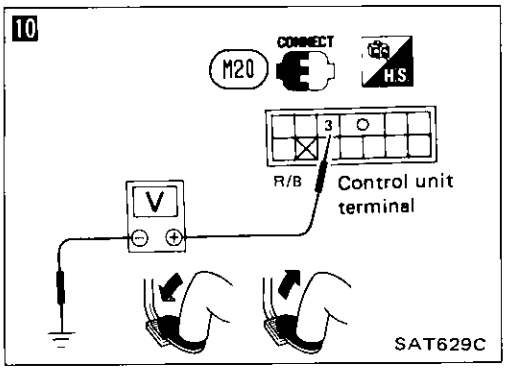
Ⓑ

## A/T Shift Lock System (Cont'd)

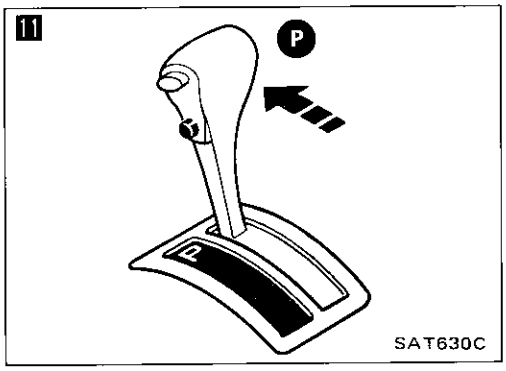
8 9




10



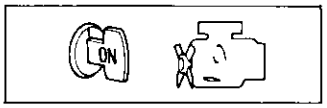

11




Ⓑ

**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.**

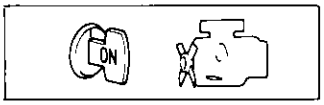
N.G. →

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. ↓

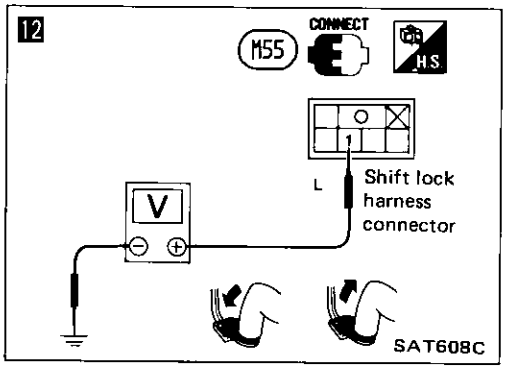
11

Set selector lever in "P" position.

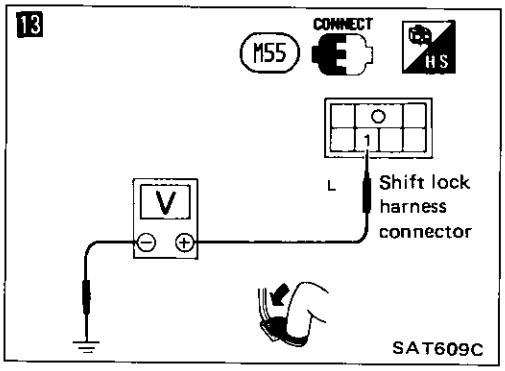
Ⓒ

## A/T Shift Lock System (Cont'd)

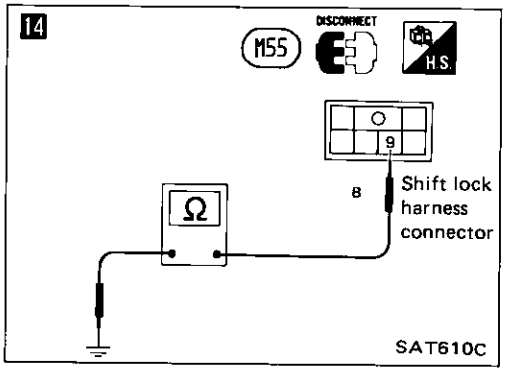
12




13



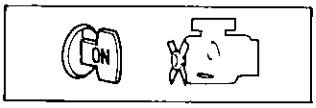

14




Ⓒ

**CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).**

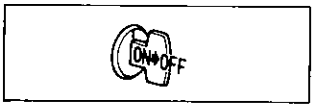
1.




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. ↓

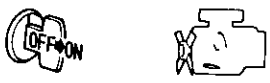
Check shift lock solenoid. (Refer to "COMPONENT CHECK".)

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. ↓

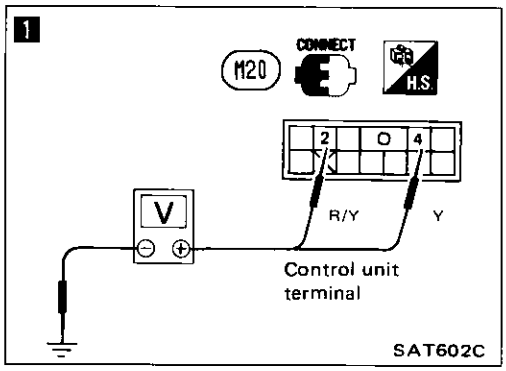
INSPECTION END

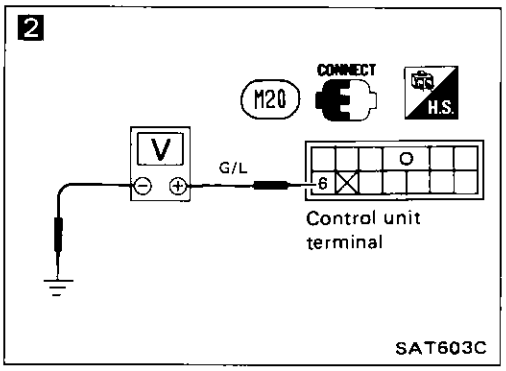
## A/T Shift Lock System (Cont'd)

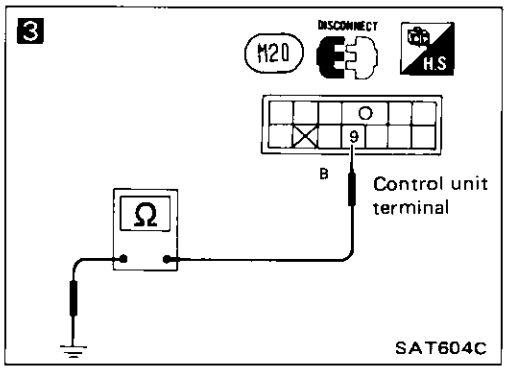
### DIAGNOSTIC PROCEDURE 2

**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".**

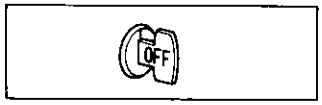



**1**

**CHECK POWER SOURCE.**

1. 

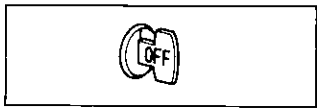
2. Check voltage between control unit harness terminals ②, ④ and ground.
   **Battery voltage should exist.**

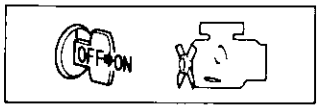
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

**2**

**CHECK IGNITION SIGNAL.**

1. 

2. Check voltage between control unit harness terminal ⑥ and ground.
   **0V**
3. 

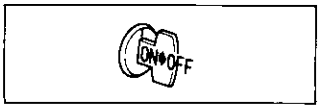
4. Check voltage between control unit harness terminal ⑥ and ground.
   **Battery voltage should exist.**

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.**

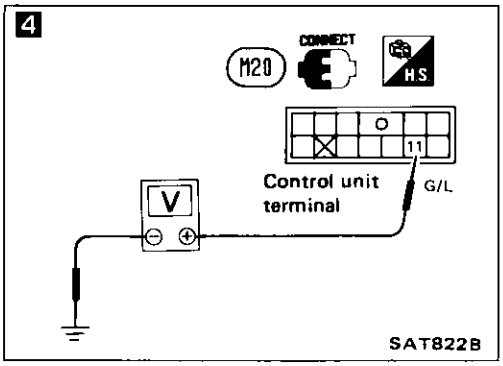
N.G. → Repair harness or connector.

O.K. ↓

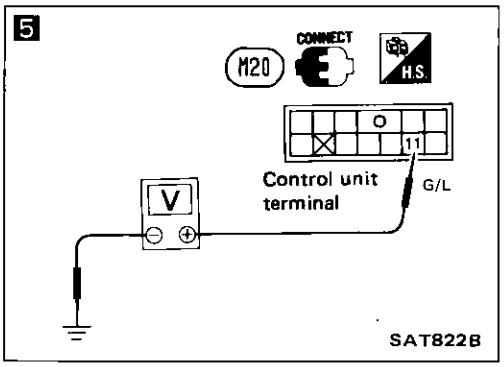
Ⓐ

## A/T Shift Lock System (Cont'd)

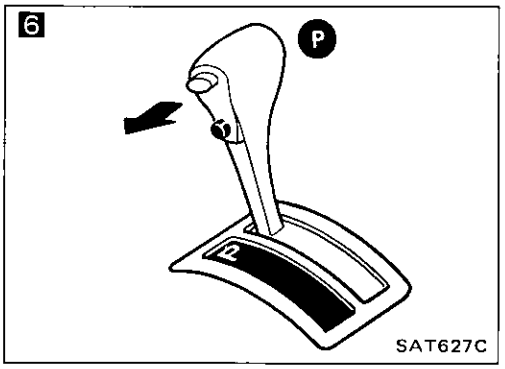
4



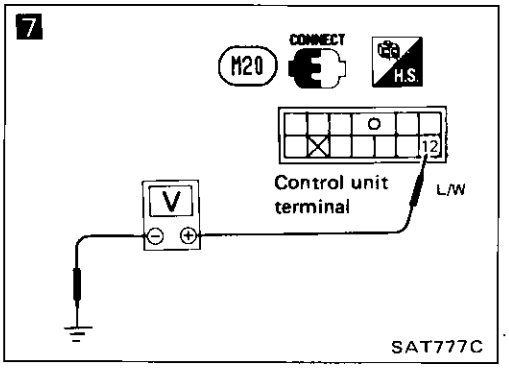

5




6



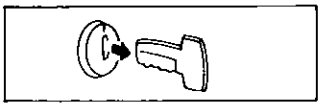

7




Ⓐ

**4**

**CHECK INPUT SIGNAL (KEY SWITCH).**

1. Reconnect control unit harness connector.
2. 

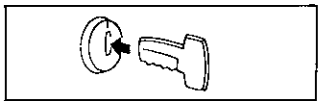
   **When ignition key cannot be removed, even if selector lever is in "P" position, use emergency button.**
3. Check voltage between control unit terminal ⑪ and ground.

   **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.

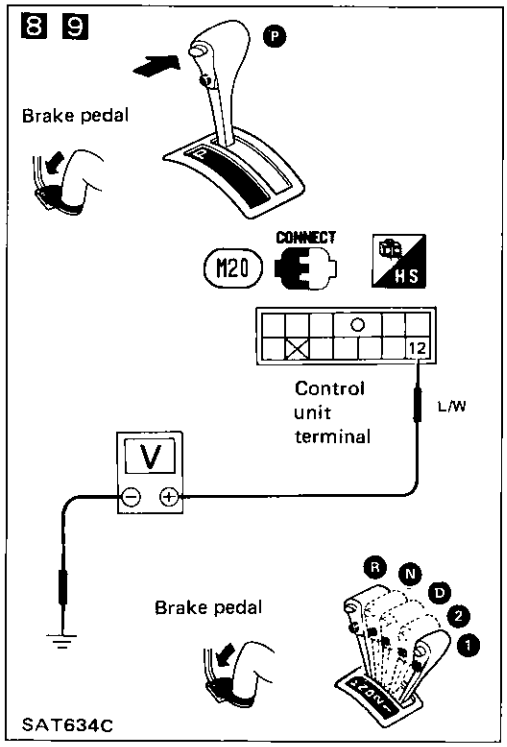
**0V**

N.G. → Check detention switch–key. (Refer to "COMPONENT CHECK".)

O.K. ↓

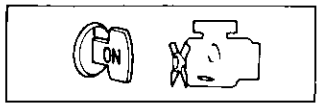
Ⓑ

## A/T Shift Lock System (Cont'd)




Ⓑ

**CHECK INPUT SIGNAL (DETENTION SWITCH–KEY).**



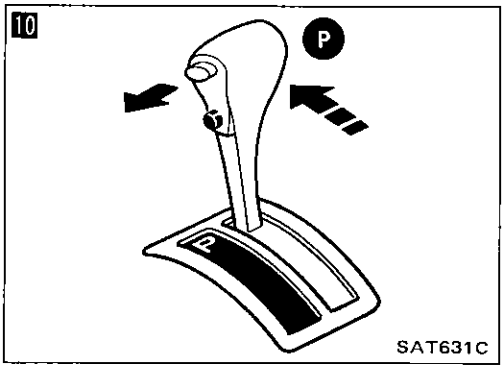

8 1. Check voltage between control unit harness terminal ⑫ and ground with brake pedal depressed and selector lever button pushed.
**Battery voltage should exist.,**

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.**

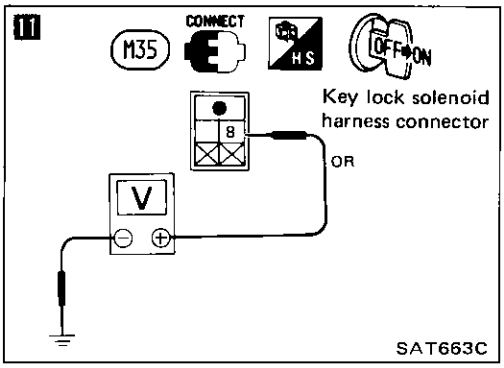
N.G. →

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. ↓

N.G. →

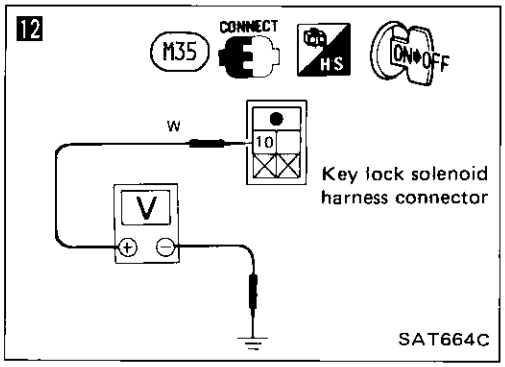
Repair harness or connector.

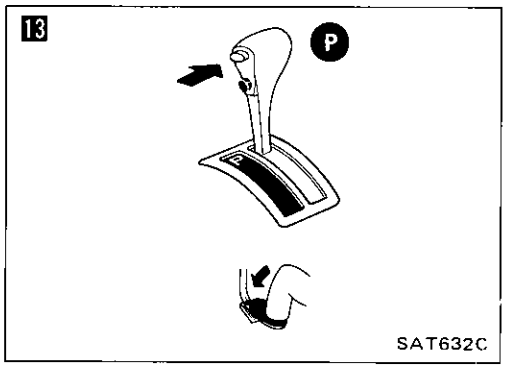
Replace control unit.

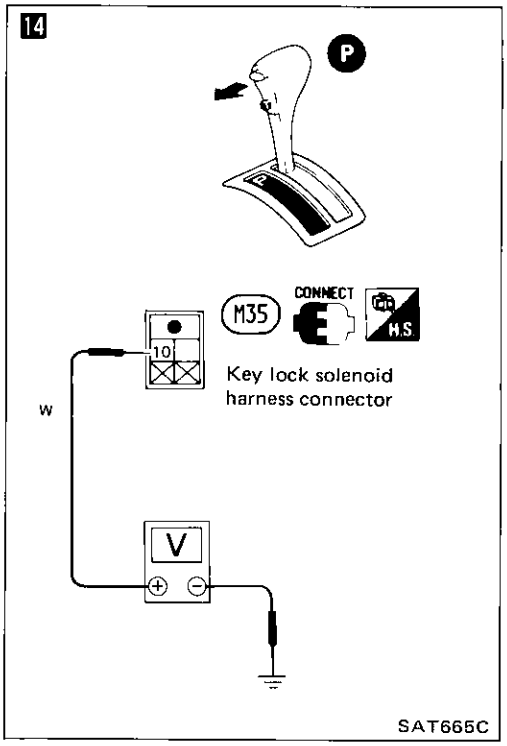
O.K. ↓

Ⓒ

## A/T Shift Lock System (Cont'd)



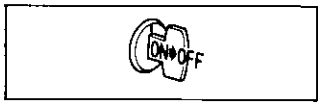




Ⓒ

**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.

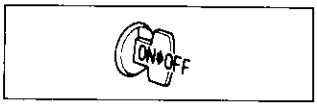
**Battery voltage should exist for approximately 0.1 seconds.**

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.

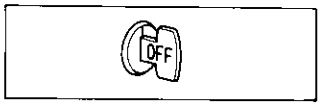
**13**

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.

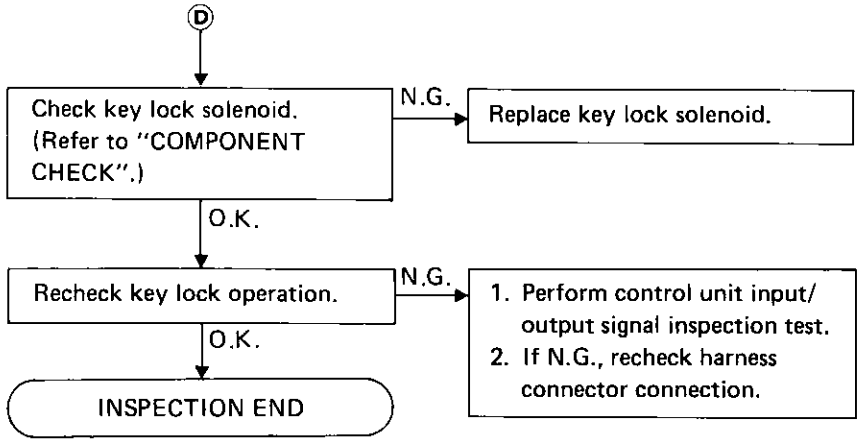
**Battery voltage should exist for approximately 0.1 seconds.**

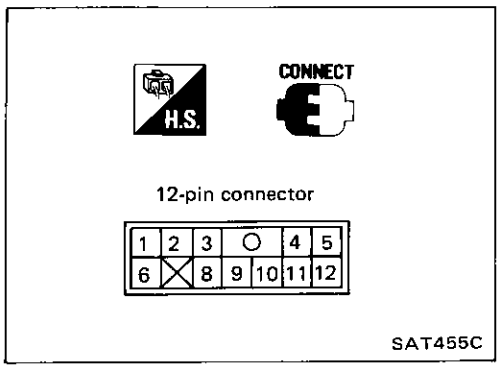
N.G. → Replace control unit.

O.K.

Ⓓ

## 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.)

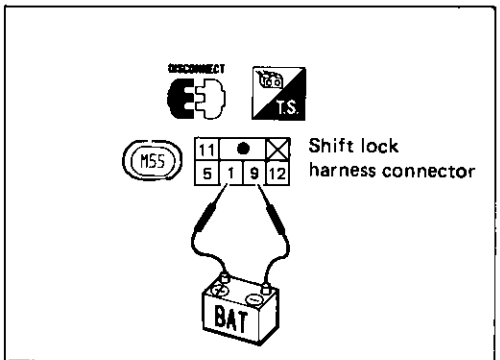
| Terminal No. ⊕ | Terminal No. ⊖ | Item | Condition | Judgement standard |
|---|---|---|---|---|
| 1 | 9 | Shift lock signal | When selector lever is set in "P" position and brake pedal is depressed | Battery voltage |
| | | | Except above | 0V |
| 2 | | Power source | | Battery voltage |
| 3 | | Stop 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 |

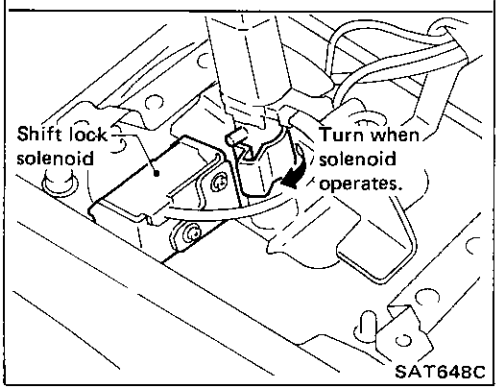
## A/T Shift Lock System (Cont'd)

### COMPONENT CHECK

**Shift lock solenoid**

- Check operation by applying battery voltage to shift lock harness connector.

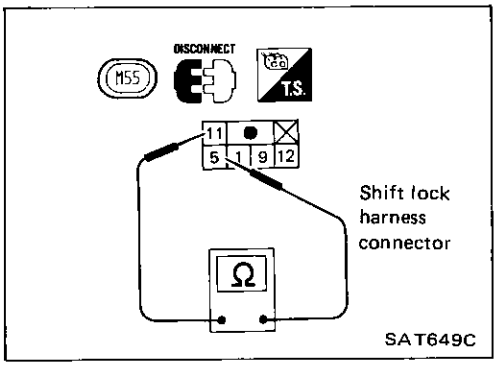



**Detention switch — shift**

- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.

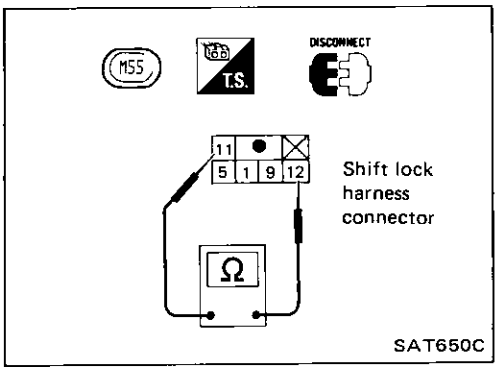
| Condition | Continuity |
|---|---|
| When selector lever is set in "P" position and selector lever button is released | No |
| Except the above | Yes |




**Detention switch — key**

- Check continuity between terminals ⑪ and ⑫ of shift lock harness connector.

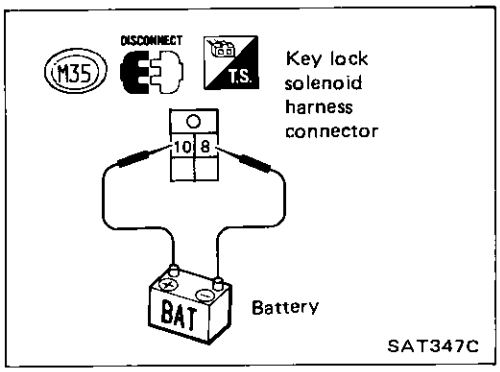
| Condition | Continuity |
|---|---|
| When selector lever is set in "P" position and selector lever button is released | No |
| Except the above | Yes |



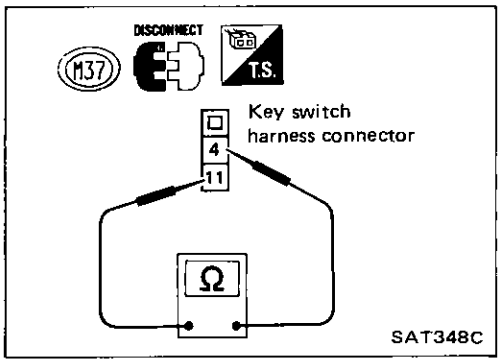

**Key lock solenoid**

- Check operation by applying battery voltage to key lock solenoid harness connector.

**Operating sound must be emitted.**



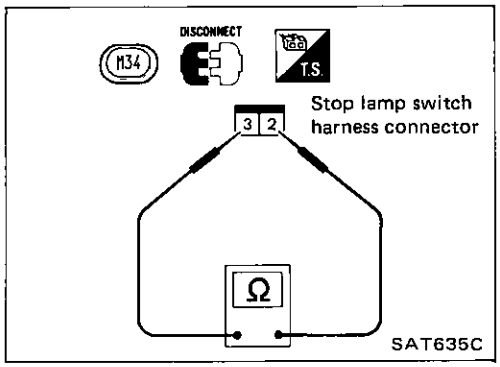
## A/T Shift Lock System (Cont'd)




**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 |

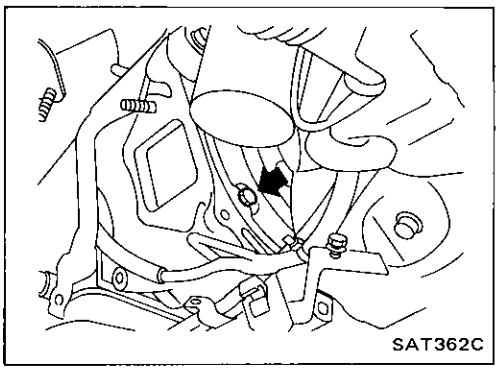


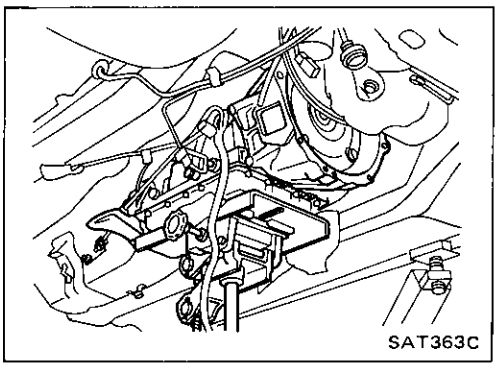

**Stop lamp switch**

- Check continuity between terminals ② and ③ of stop lamp switch harness connector.

| Condition | Continuity |
|---|---|
| When brake pedal is depressed | Yes |
| When brake pedal is released | No |

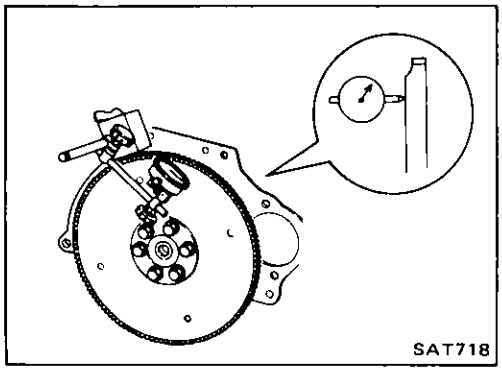
**Check stop lamp switch after adjusting brake pedal — refer to section BR.**


SAT362C


SAT363C

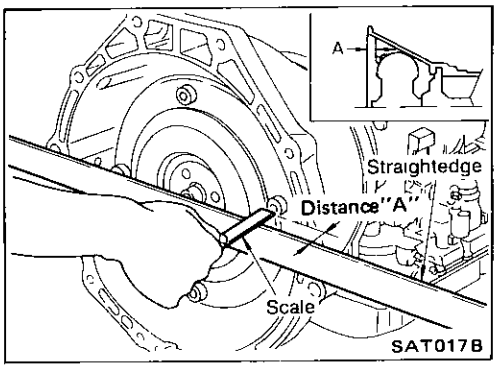
## Removal

- 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.**


SAT718

## Installation

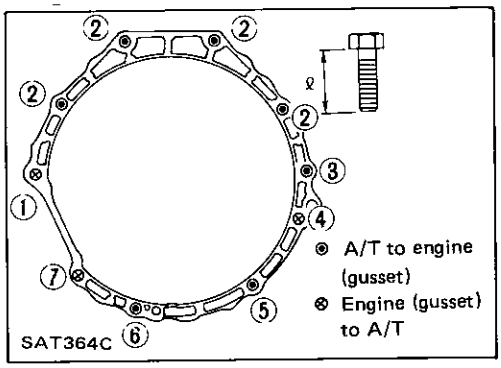
- Drive plate runout
  **Maximum allowable runout:**
  **0.5 mm (0.020 in)**
  If this runout is out of allowance, replace drive plate with ring gear.



SAT017B

- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.
  **Distance "A":**
  **RE4R01A**
  **26 mm (1.02 in) or more**
  **RE4R03A**
  **25 mm (0.98 in) or more**
- Install converter to drive plate.
- Reinstall any part removed.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.**

## Installation (Cont'd)




- Tighten bolts securing transmission.

**RE4R01A**

| Bolt No. | Tightening torque N·m (kg-m, ft-lb) | Bolt length "ℓ" mm (in) |
|---|---|---|
| 1 | 39 - 49 (4.0 - 5.0, 29 - 36) | 60 (2.36) |
| 2 | 39 - 49 (4.0 - 5.0, 29 - 36) | 50 (1.97) |
| 3 | 39 - 49 (4.0 - 5.0, 29 - 36) | 45 (1.77) |
| 4 | 29 - 39 (3.0 - 4.0, 22 - 29) | 25 (0.98) |
| 5 | 29 - 39 (3.0 - 4.0, 22 - 29) | 60 (2.36) |
| 6 | 39 - 49 (4.0 - 5.0, 29 - 36) | 65 (2.56) |
| 7 | 39 - 49 (4.0 - 5.0, 29 - 36) | 25 (0.98) |
| Gusset to engine | 29 - 39 (3.0 - 4.0, 22 - 29) | 20 (0.98) |

**RE4R03A**

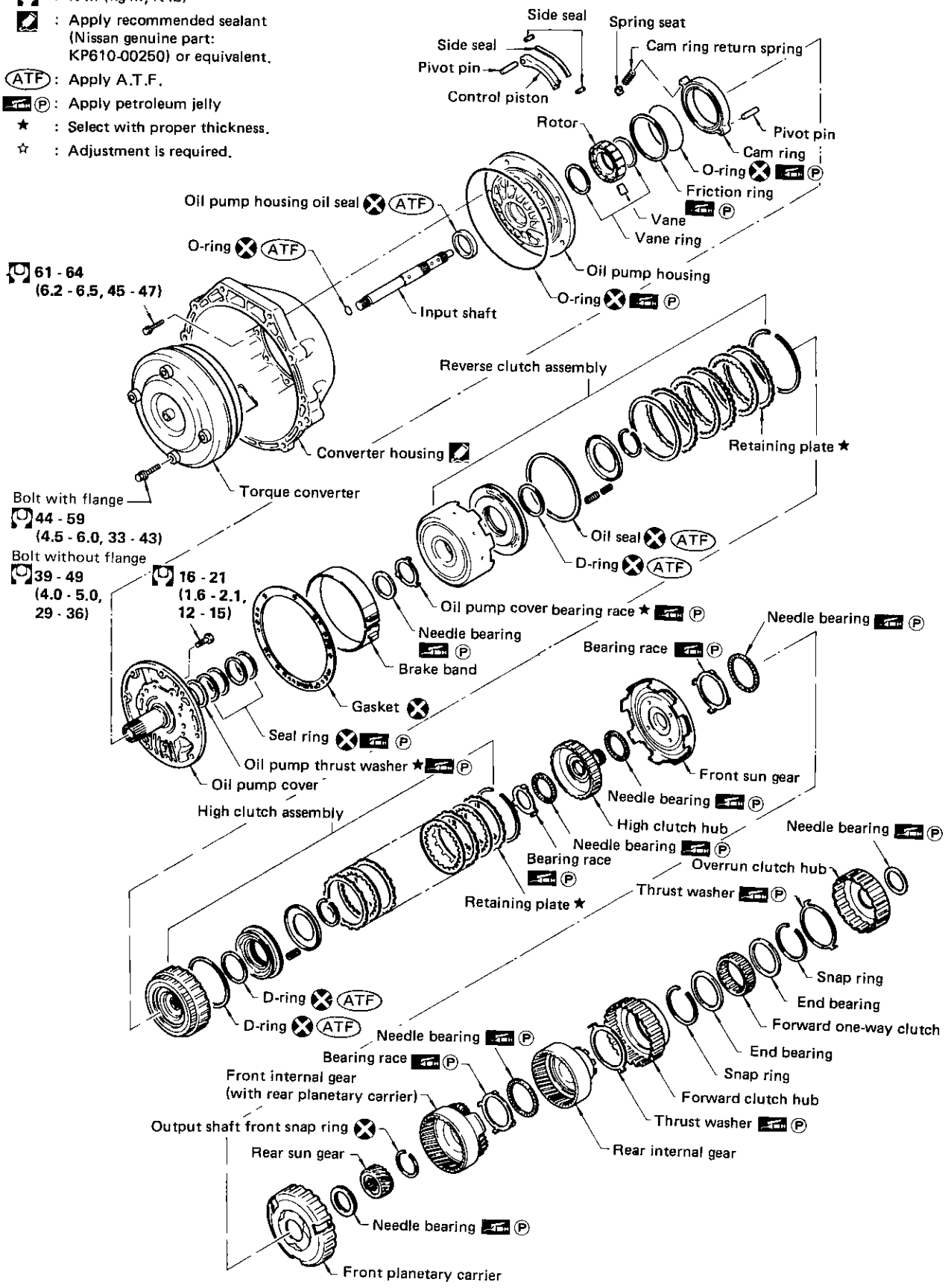
| Bolt No. | Tightening torque N·m (kg-m, ft-lb) | Bolt length "ℓ" mm (in) |
|---|---|---|
| 1 | 39 - 49 (4.0 - 5.0, 29 - 36) | 60 (2.36) |
| 2 | 39 - 49 (4.0 - 5.0, 29 - 36) | 60 (2.36) |
| 3 | 39 - 49 (4.0 - 5.0, 29 - 36) | 65 (2.56) |
| 4 | 29 - 39 (3.0 - 4.0, 22 - 29) | 25 (0.98) |
| 5 | 29 - 39 (3.0 - 4.0, 22 - 29) | 60 (2.36) |
| 6 | 39 - 49 (4.0 - 5.0, 29 - 36) | 65 (2.56) |
| 7 | 39 - 49 (4.0 - 5.0, 29 - 36) | 25 (0.98) |
| Gusset to engine | 29 - 39 (3.0 - 4.0, 22 - 29) | 20 (0.98) |

- Reinstall any part removed.

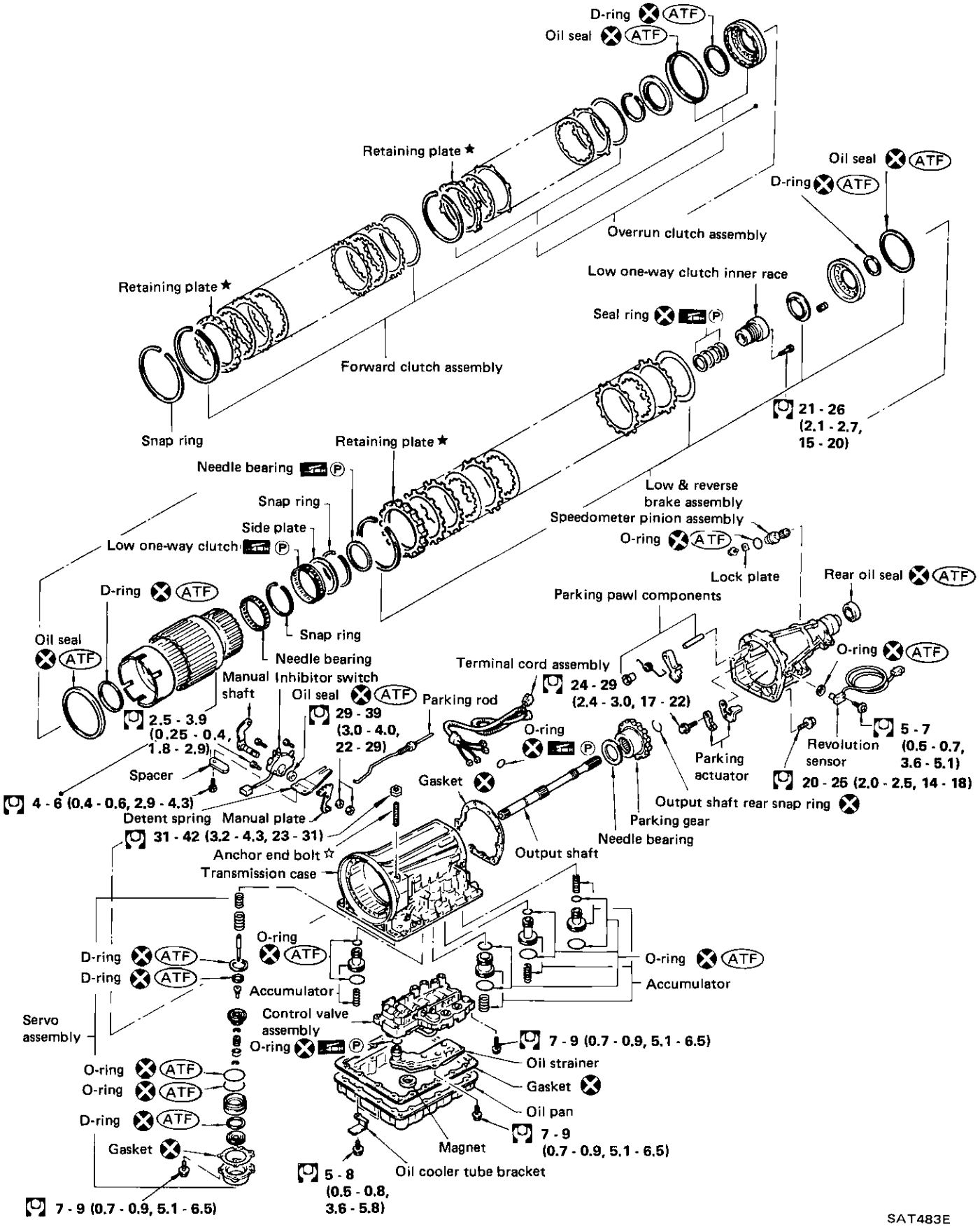
- Check fluid level in transmission.
- Move selector lever through all positions to be sure that transmission operates correctly.
  With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. — Refer to "ROAD TESTING".

## RE4R01A

: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.
(ATF): Apply A.T.F.
Ⓟ: Apply petroleum jelly
★ : Select with proper thickness.
☆ : Adjustment is required.



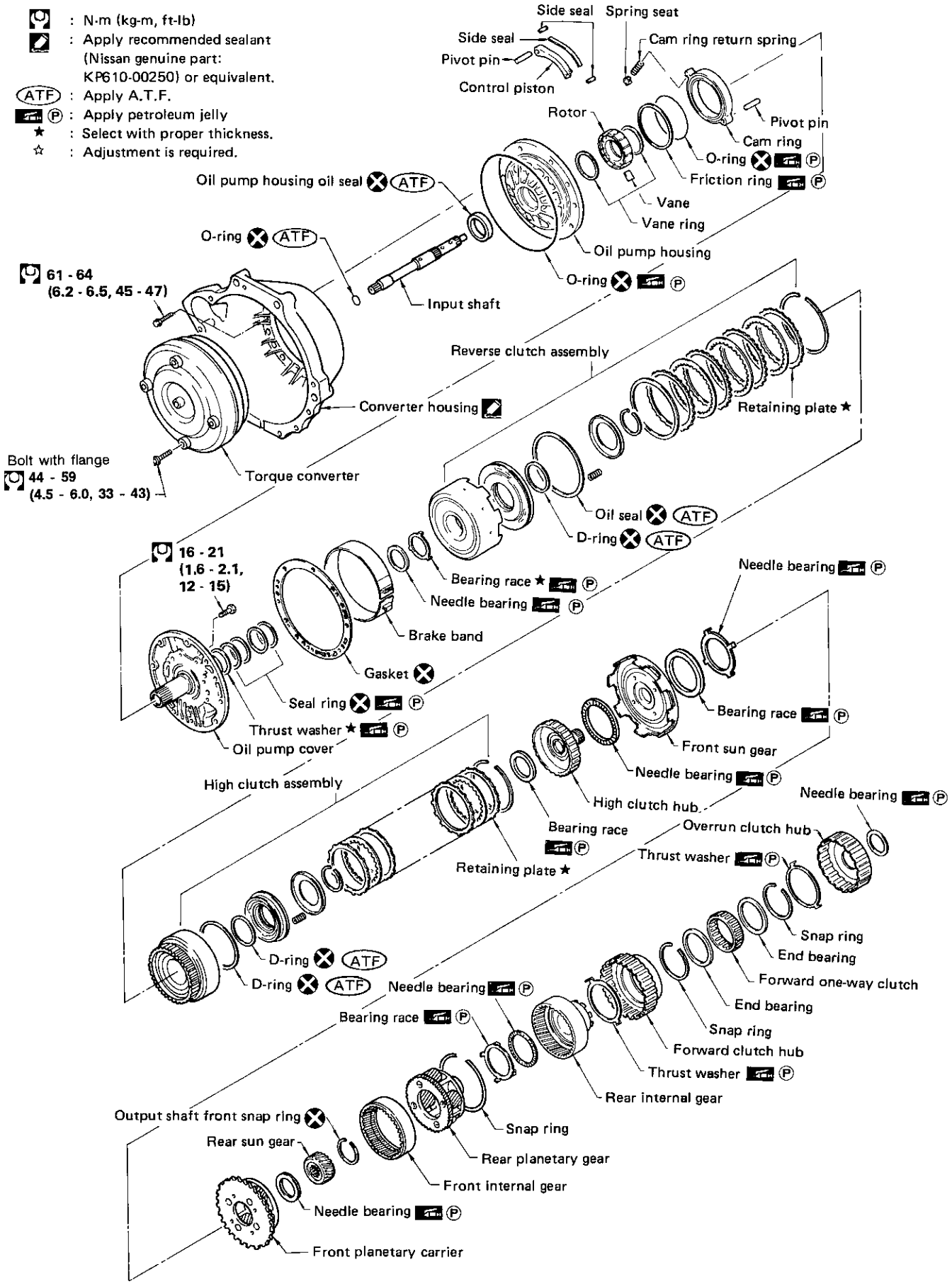
## RE4R01A (Cont'd)



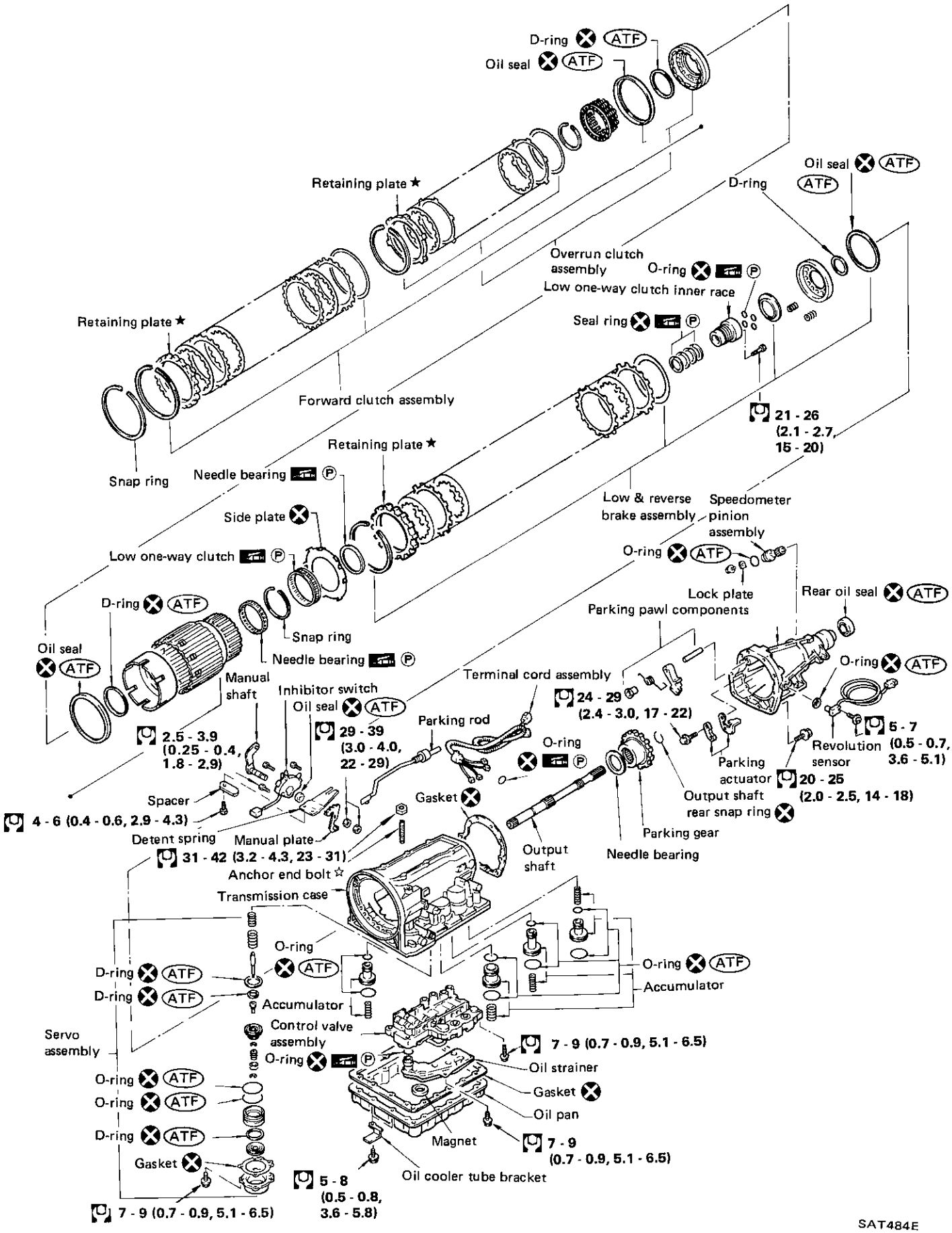

SAT483E

## RE4R03A

: 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.

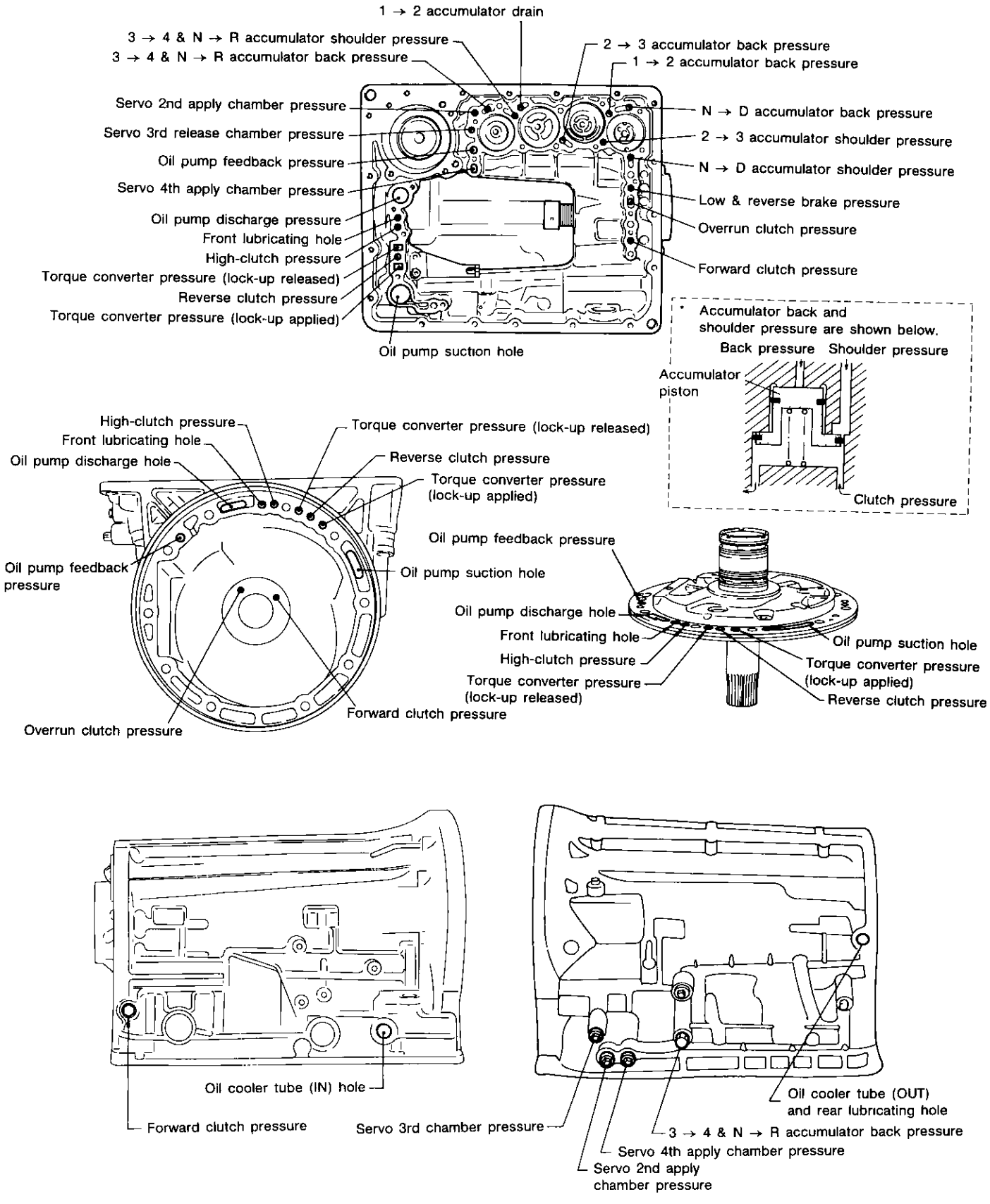


## RE4R03A (Cont'd)



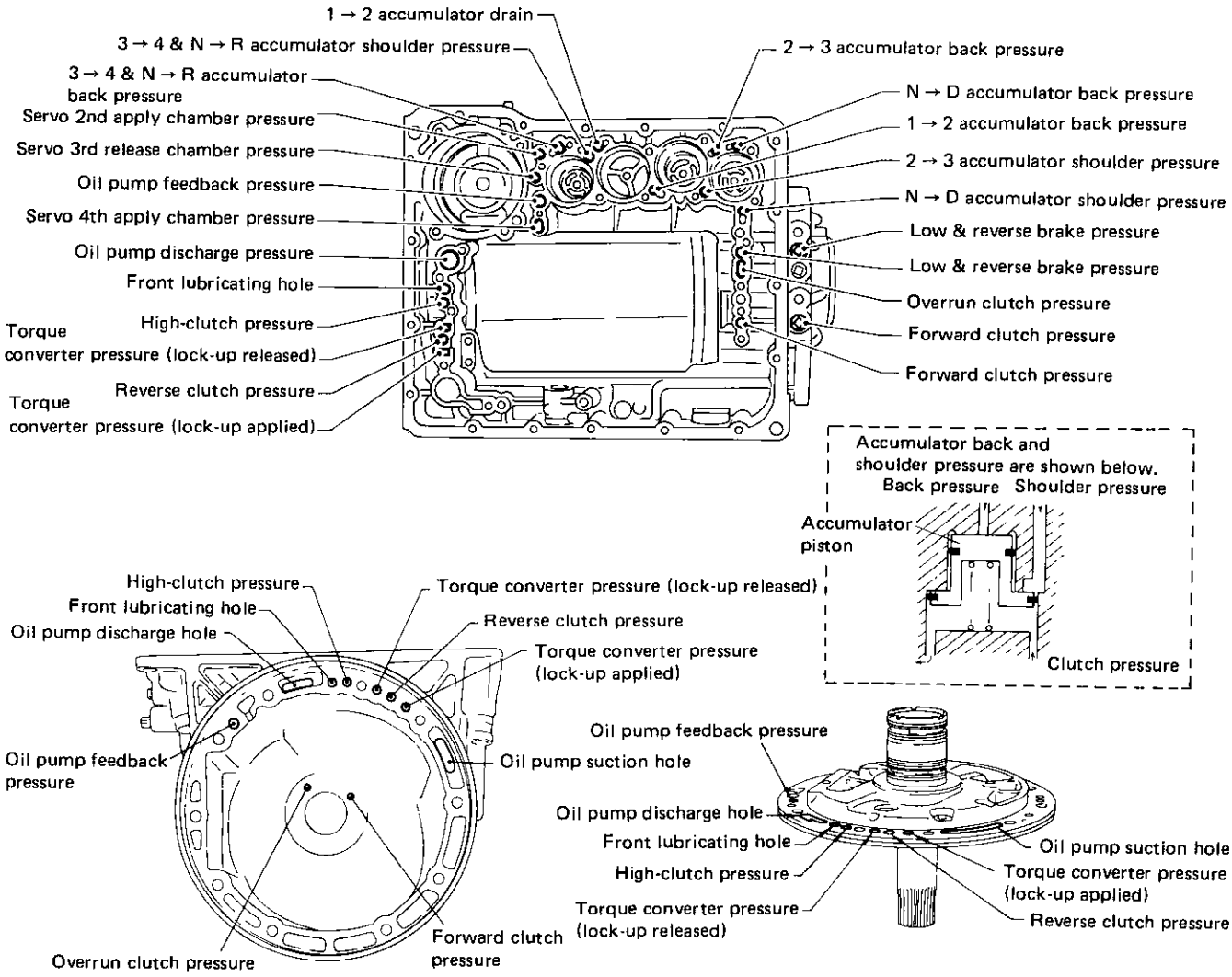

SAT484E

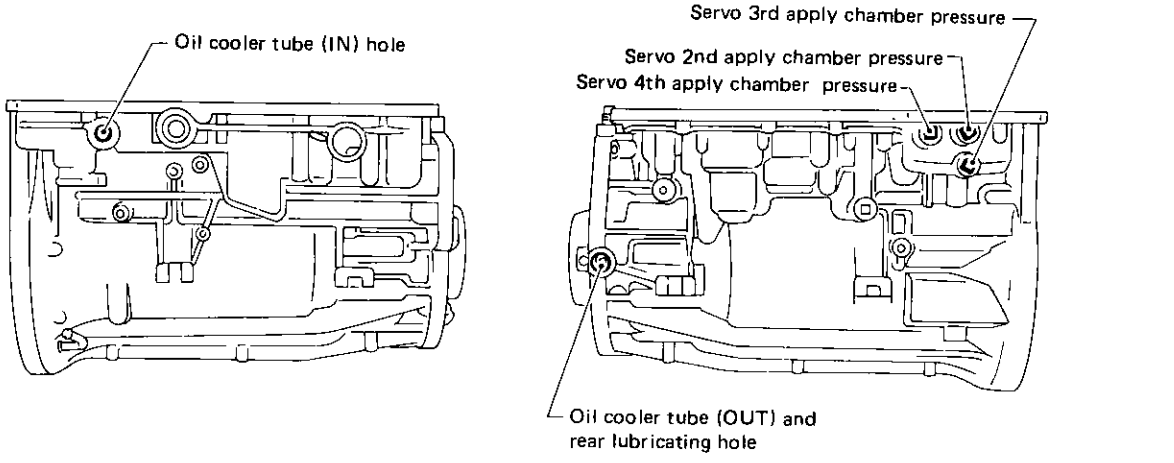
## Oil Channel — RE4R01A




SAT185B

## Oil Channel — RE4R03A




SAT611B

## Locations of Needle Bearings, Thrust Washers and Snap Rings — RE4R01A

Outer diameter of snap rings

| Item number | Outer diameter mm (in) |
|---|---|
| ② | 161.0 (6.34) |
| ③ | 140.1 (5.52) |
| ④ | 156.4 (6.16) |
| ⑥ | 142.0 (5.59) |
| ⑦ | 159.2 (6.27) |

Thrust washers

| Item number | Color |
|---|---|
| ① | Black |
| ⑤ | White |

Outer diameter of needle bearings

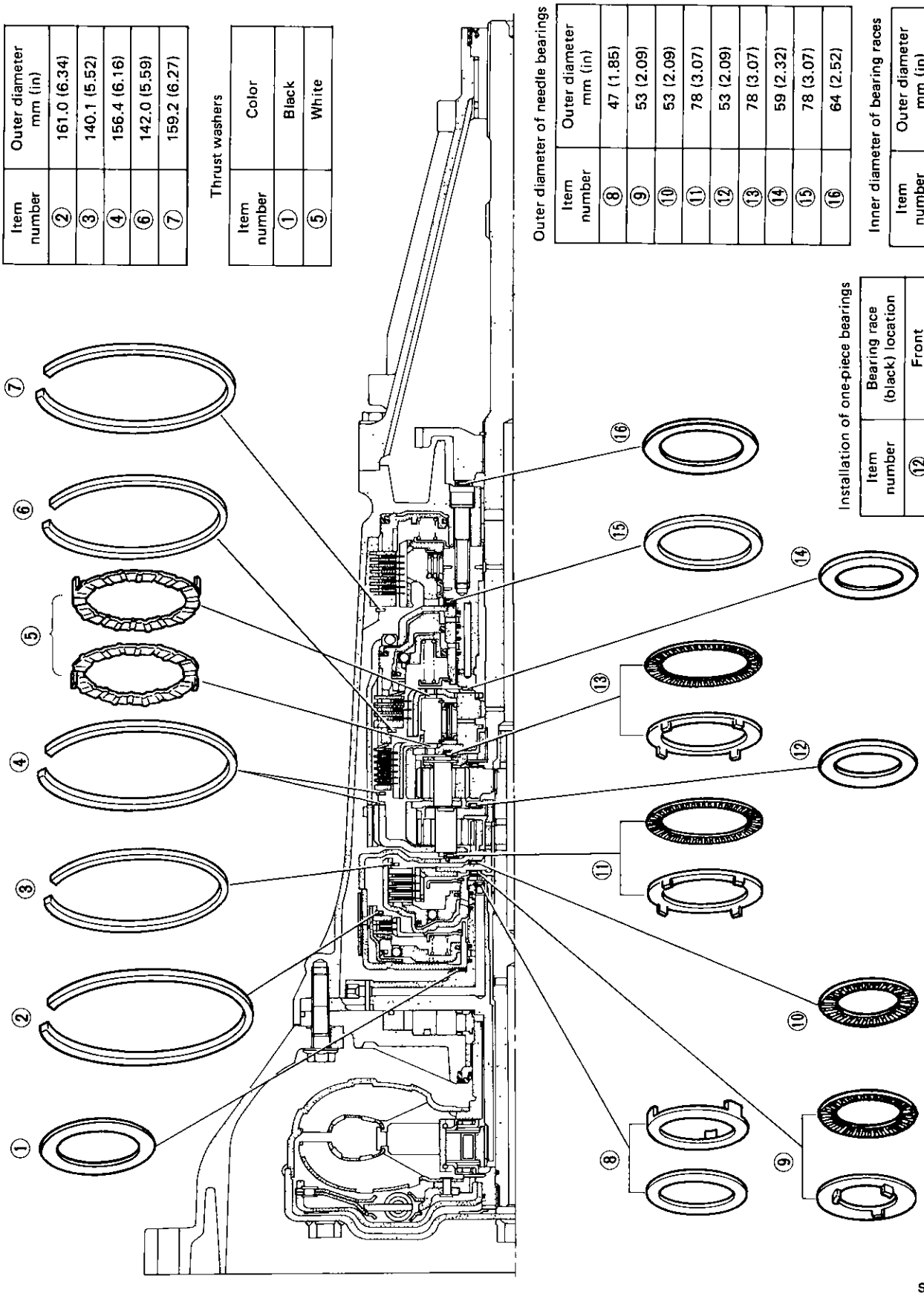
| Item number | Outer diameter mm (in) |
|---|---|
| ⑧ | 47 (1.85) |
| ⑨ | 53 (2.09) |
| ⑩ | 53 (2.09) |
| ⑪ | 78 (3.07) |
| ⑫ | 53 (2.09) |
| ⑬ | 78 (3.07) |
| ⑭ | 59 (2.32) |
| ⑮ | 78 (3.07) |
| ⑯ | 64 (2.52) |

Inner diameter of bearing races

| Item number | Outer diameter mm (in) |
|---|---|
| ⑪ | 58 (2.28) |
| ⑬ | 58.8 (2.315) |

Installation of one-piece bearings

| Item number | Bearing race (black) location |
|---|---|
| ⑫ | Front |
| ⑮ | Rear side |
| ⑯ | Rear side |




SAT647A

## Locations of Needle Bearings, Thrust Washers and Snap Rings — RE4R03A

Outer diameter of snap rings

| Item number | Outer diameter mm (in) |
|---|---|
| ②, ⑤ | 164.0 (6.46) |
| ③ | 176.0 (6.93) |
| ⑥ | 172.0 (6.77) |

Thrust washers

| Item number | Color |
|---|---|
| ① | Black |
| ④ | White |

Outer diameter of bearing races

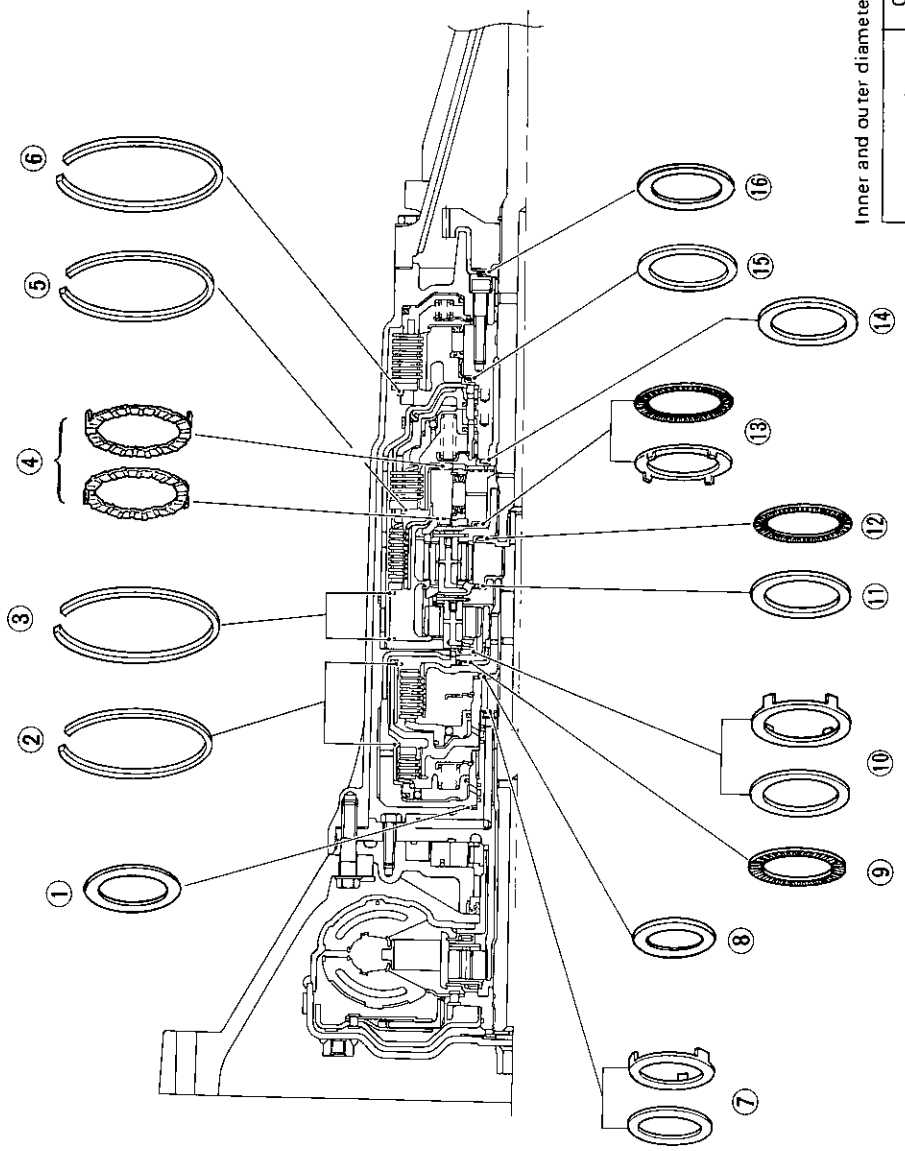
| Item number | Outer diameter mm (in) |
|---|---|
| ⑦ | 43.5 (1.713) |
| ⑩ | 82.0 (3.228) |
| ⑬ | 63.2 (2.488) |

Installation of one-piece bearings

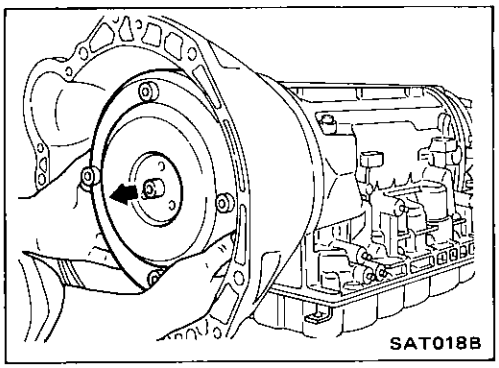
| Item number | Bearing race (black) location |
|---|---|
| ⑮ | Rear side |
| ⑯ | Rear side |

Inner and outer diameter of needle bearings

| Item number | Outer diameter mm (in) | Inner diameter mm (in) | Number of needles |
|---|---|---|---|
| ⑦ | 47.0 (1.850) | 30.0 (1.181) | – |
| ⑧ | 53.0 (2.087) | 35.1 (1.382) | – |
| ⑨, ⑩ | 85.0 (3.346) | 62.7 (2.468) | – |
| ⑪, ⑫ | 64.0 (2.520) | 45.0 (1.772) | 52 |
| ⑬ | 64.0 (2.520) | 45.0 (1.772) | 50 |
| ⑭ | 64.0 (2.520) | 44.0 (1.732) | 34 |
| ⑮ | 78.1 (3.075) | – | – |
| ⑯ | 64.0 (2.520) | – | – |

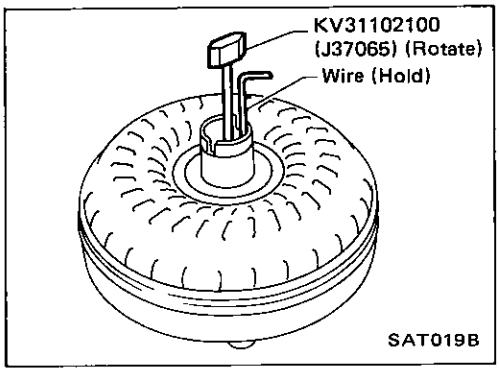



SAT636C

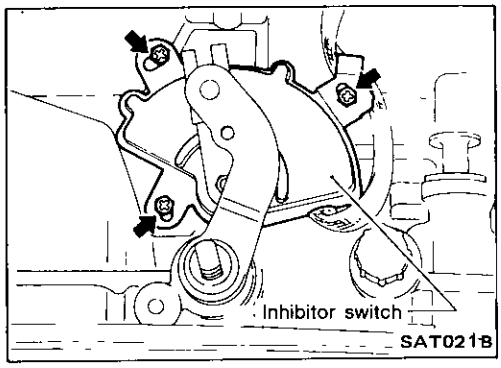



## Disassembly

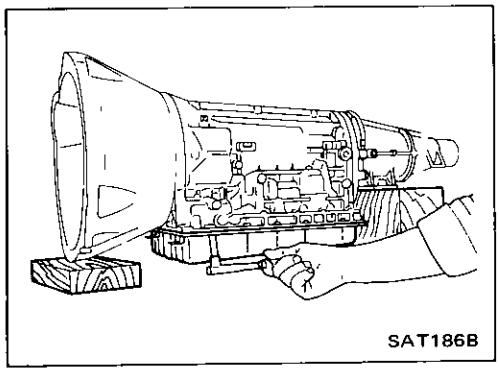
1. Remove torque converter by holding it firmly and turning while pulling straight out.



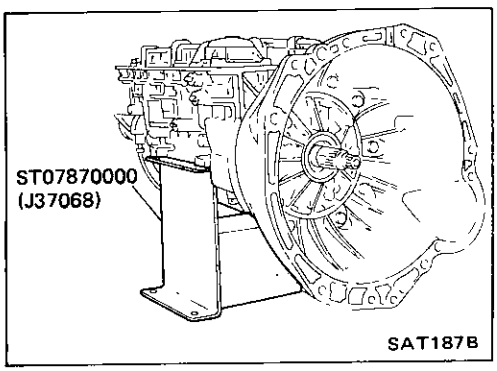

2. Check torque converter one-way clutch.
a. Insert Tool into spline of one-way clutch inner race.
b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.




3. Remove inhibitor switch from transmission case.

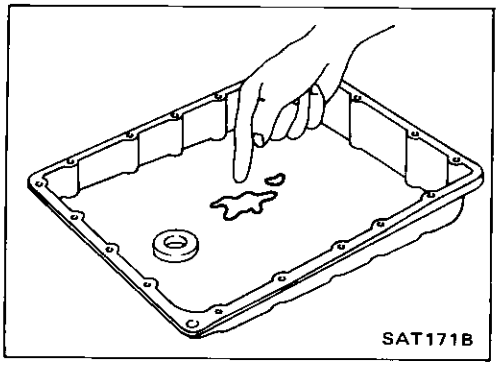



4. Remove oil pan.
a. Drain A.T.F. from rear extension.
b. Raise oil pan by placing wooden blocks under converter housing and rear extension.
c. Separate the oil pan and transmission case.
- **Always place oil pan straight down so that foreign particles inside will not move.**



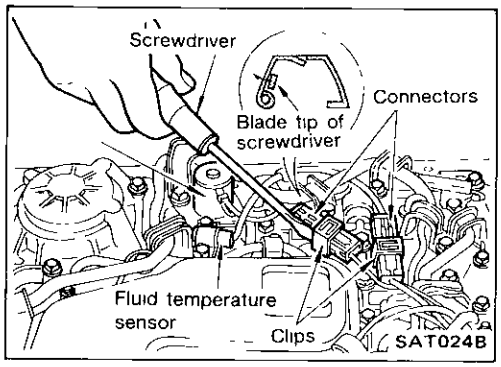

5. Place transmission into Tool with the control valve facing up.

## Disassembly (Cont'd)

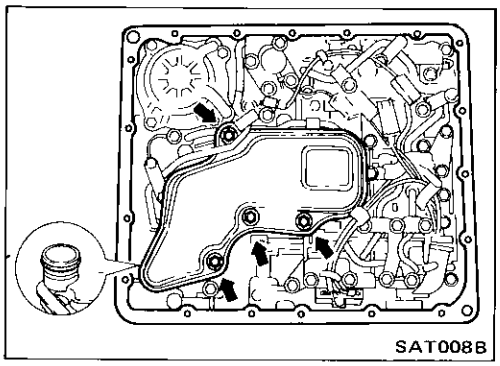



6. Check oil pan and oil strainer for accumulation of foreign particles.
- If materials of clutch facing are found, clutch plates may be worn.
- If metal filings are found, clutch plates, brake bands, etc. may be worn.
- If aluminum filings are found, bushings or aluminum cast parts may be worn.

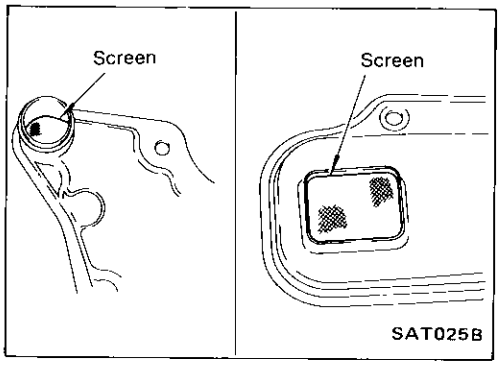
In above cases, replace torque converter and check unit for cause of particle accumulation.



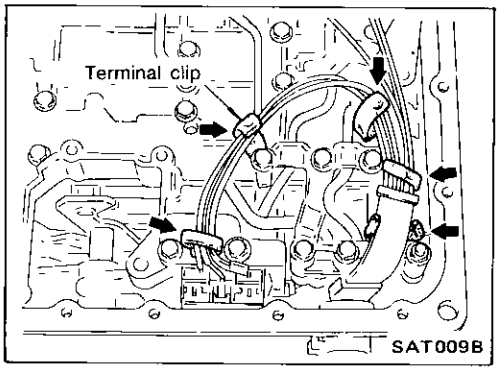

7. Remove lock-up solenoid and fluid temperature sensor connectors.
- **Be careful not to damage connector.**




8. Remove oil strainer.
a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.

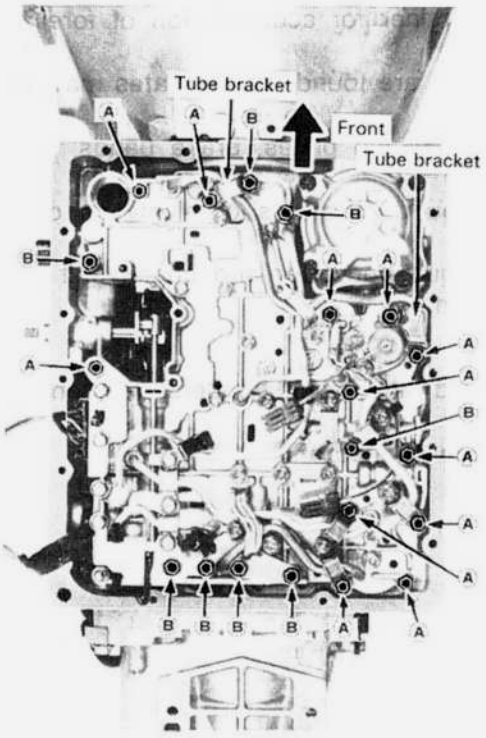



b. Check oil strainer screen for damage.



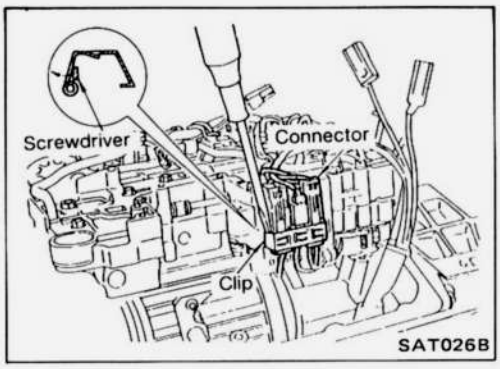

9. Remove control valve assembly.
a. Straighten terminal clips to free terminal cords then remove terminal clips.

## Disassembly (Cont'd)



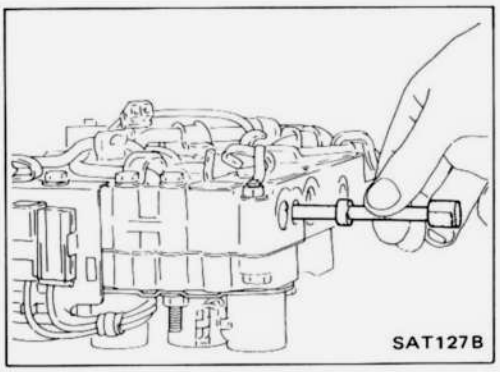

b. Remove bolts Ⓐ and Ⓑ, and remove control valve assembly from transmission.

| Bolt symbol | ℓ mm (in) |
|---|---|
| Ⓐ | 33 (1.30) |
| Ⓑ | 45 (1.77) |

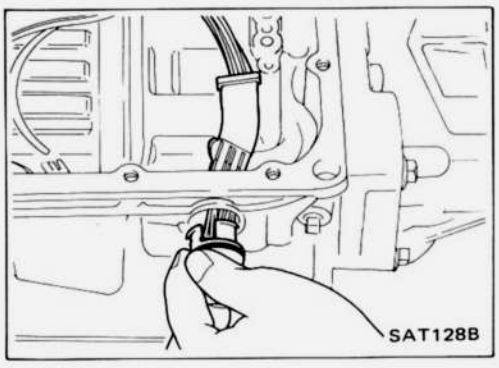



c. Remove solenoid connector.

- **Be careful not to damage connector.**



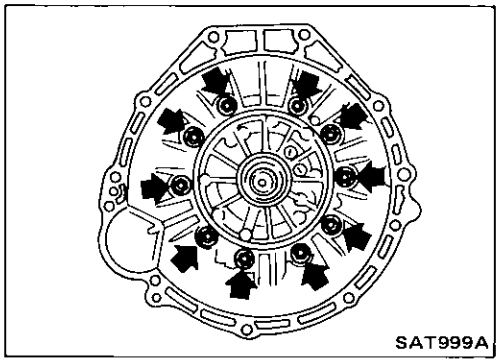

d. Remove manual valve from control valve assembly.



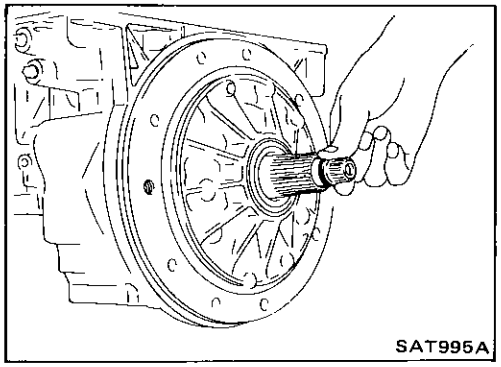

10. Remove terminal cord assembly from transmission case while pushing on stopper.

- **Be careful not to damage cord.**
- **Do not remove terminal cord assembly unless it is damaged.**

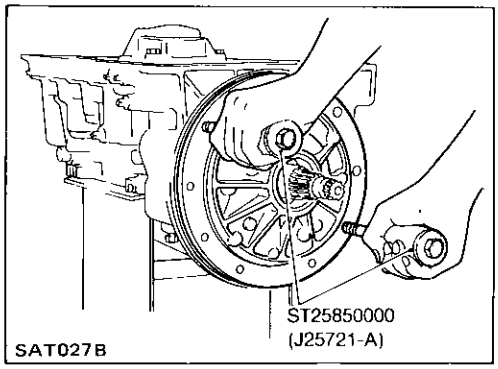
## Disassembly (Cont'd)



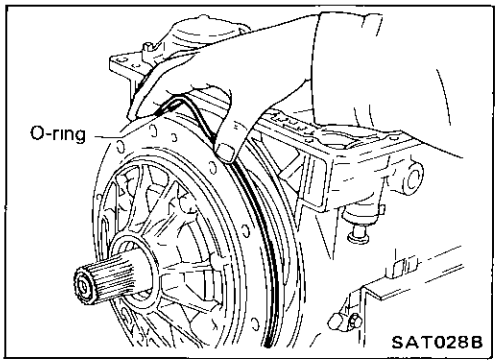

11. Remove converter housing from transmission case.



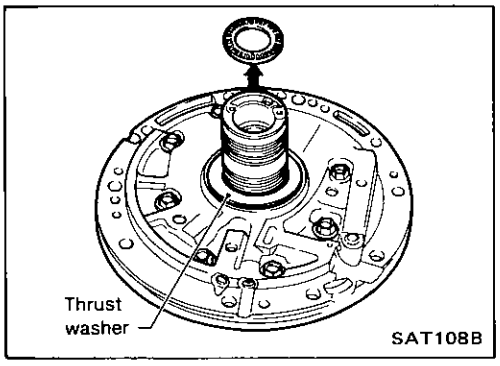

12. Remove O-ring from input shaft.




13. Remove oil pump assembly.
a. Attach Tool to oil pump assembly and extract it evenly from transmission case.

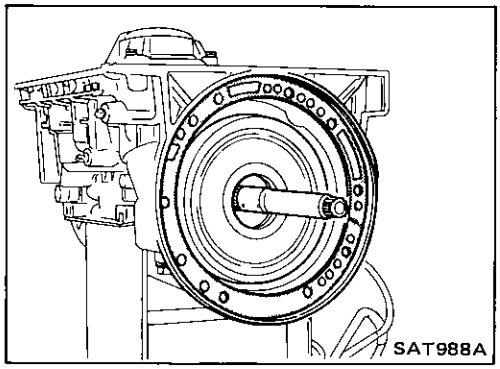



b. Remove O-ring from oil pump assembly.
c. Remove traces of sealant from oil pump housing.
- **Be careful not to scratch pump housing.**

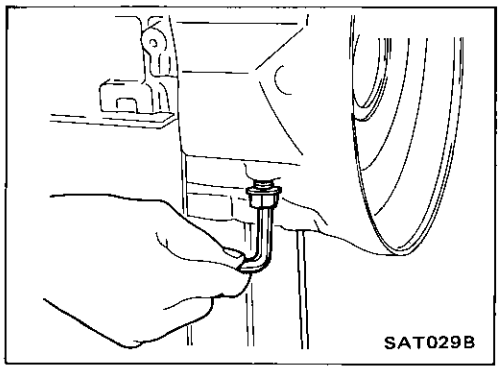



d. Remove needle bearing and thrust washer from oil pump assembly.

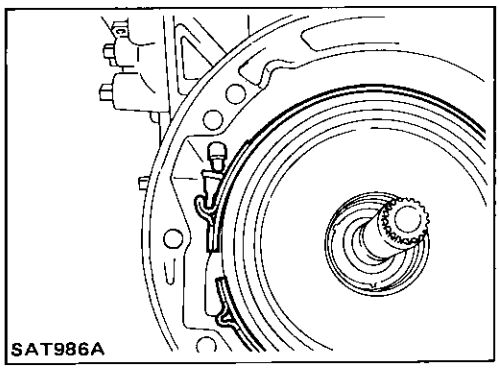
## Disassembly (Cont'd)



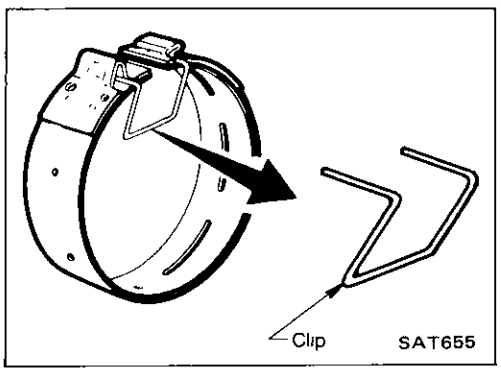

14. Remove input shaft and oil pump gasket.



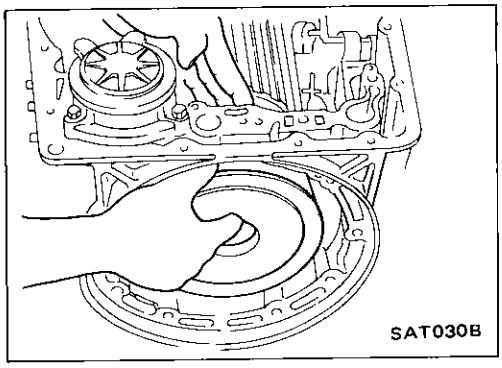

15. Remove brake band and band strut.
a. Loosen lock nut and remove band servo anchor end pin from transmission case.




b. Remove brake band and band strut from transmission case.



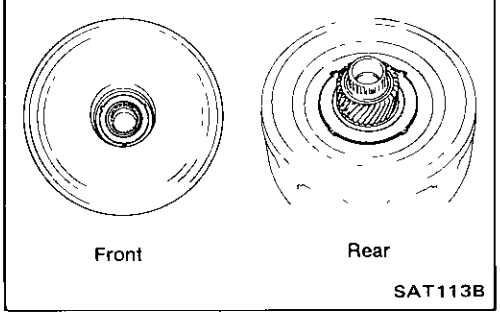

c. Hold brake band in a circular shape with clip.




16. Remove front side clutch and gear components.
a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

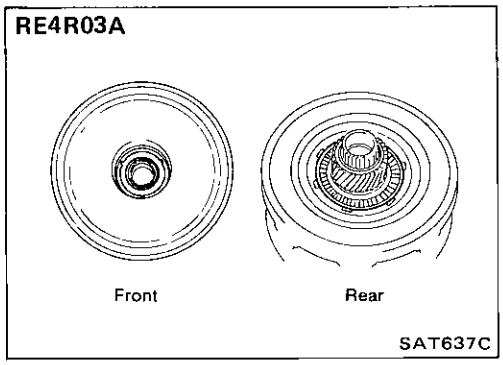
## Disassembly (Cont'd)

RE4R01A

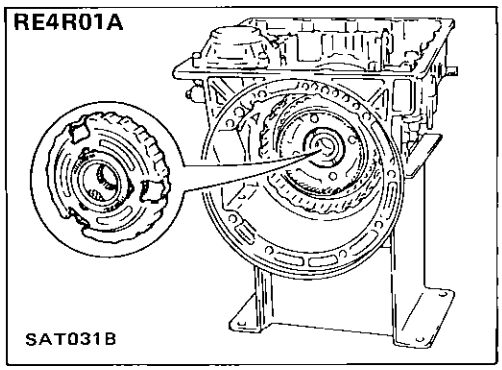



b. Remove front bearing race from clutch pack.
c. Remove rear bearing race or front needle bearing from clutch pack.

RE4R03A

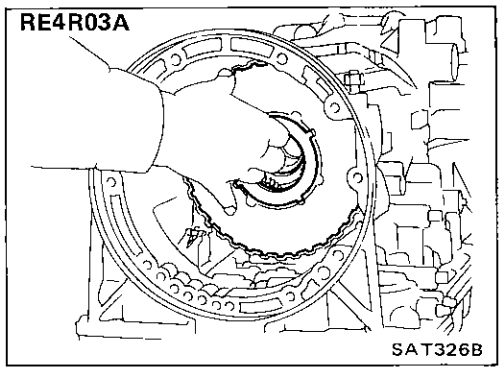



RE4R01A

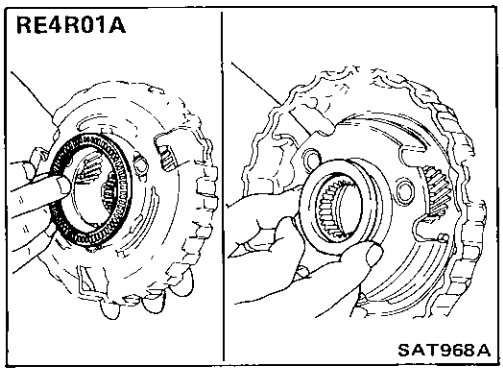



d. Remove front planetary carrier from transmission case.

RE4R03A

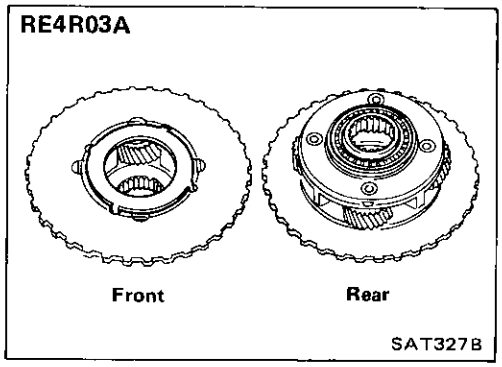


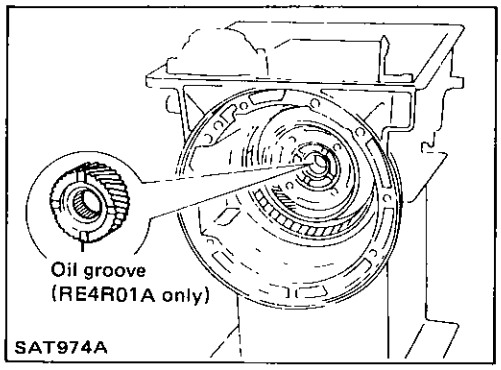

RE4R01A



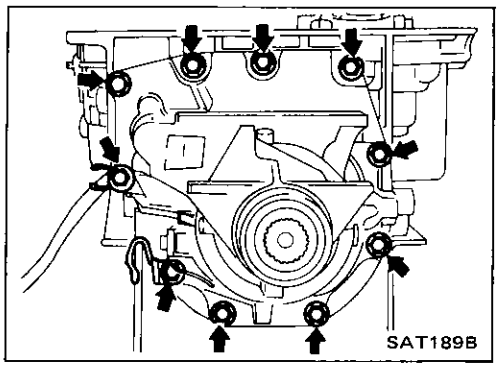

e. Remove front needle bearing or front bearing race from front planetary carrier.
f. Remove rear needle bearing from front planetary carrier.

## Disassembly (Cont'd)

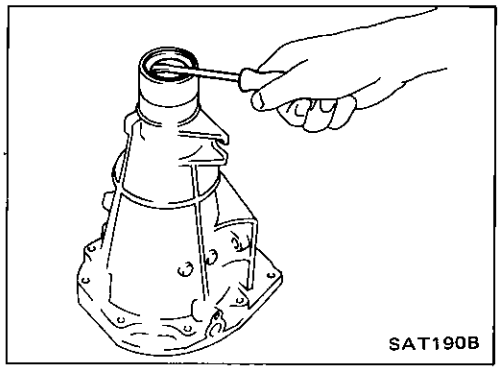


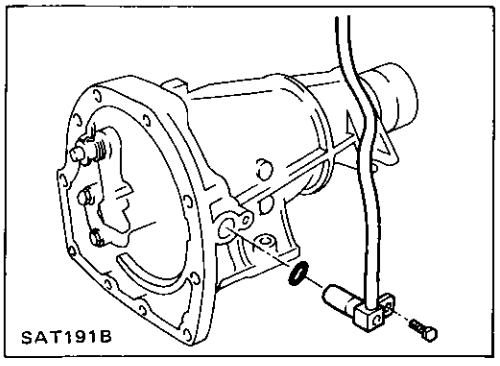

g. Remove rear sun gear from transmission case.




17. Remove rear extension.
a. Remove rear extension from transmission case.
b. Remove rear extension gasket from transmission case.

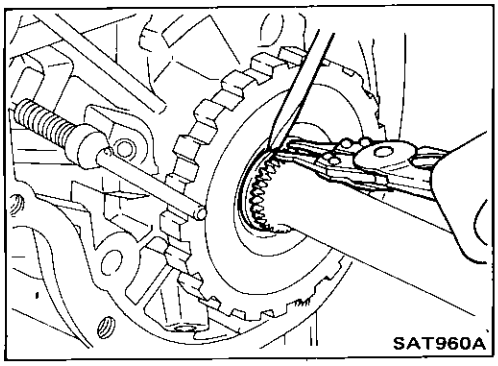



c. Remove oil seal from rear extension.
- **Do not remove oil seal unless it is to be replaced.**

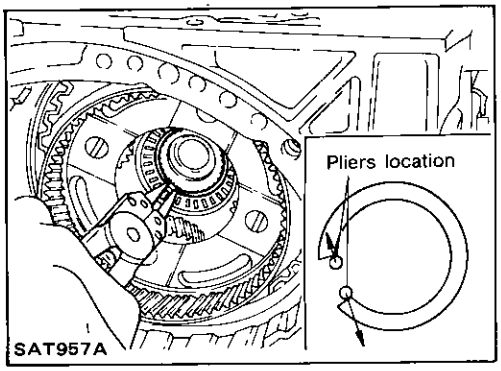



d. Remove revolution sensor from rear extension.
e. Remove O-ring from revolution sensor.

## Disassembly (Cont'd)

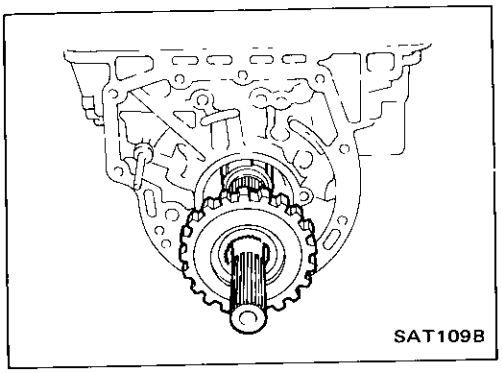



18. Remove output shaft and parking gear.
a. Remove rear snap ring from output shaft.

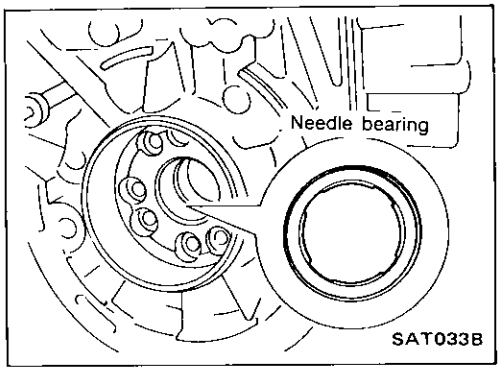



b. Slowly push output shaft all the way forward.
- **Do not use excessive force.**

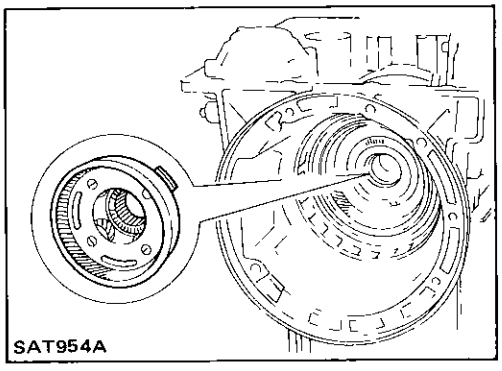
c. Remove snap ring from output shaft.




d. Remove output shaft and parking gear as a unit from transmission case.
e. Remove parking gear from output shaft.

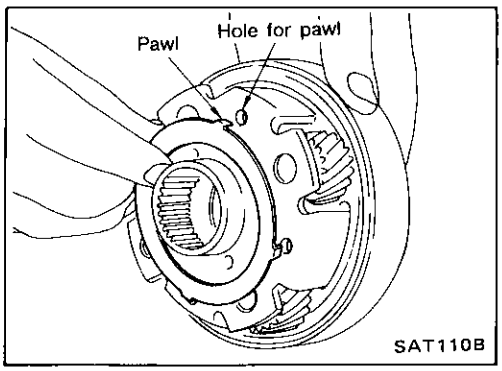



f. Remove needle bearing from transmission case.

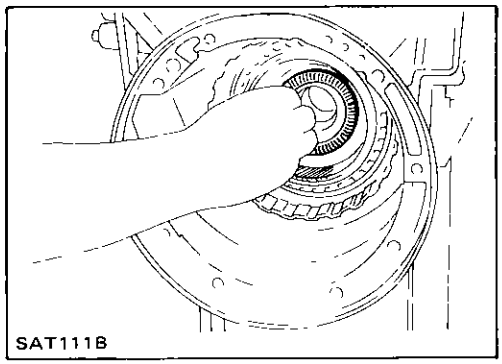



19. Remove rear side clutch and gear components.
a. Remove front internal gear.

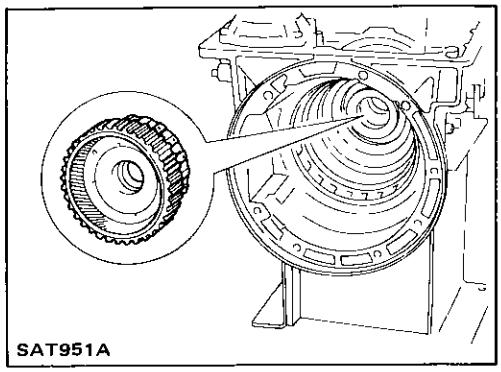
## Disassembly (Cont'd)



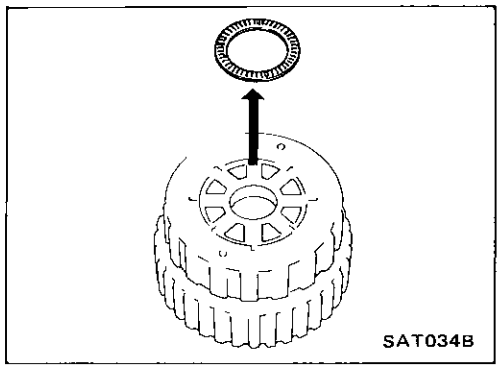

b. Remove bearing race from front internal gear.



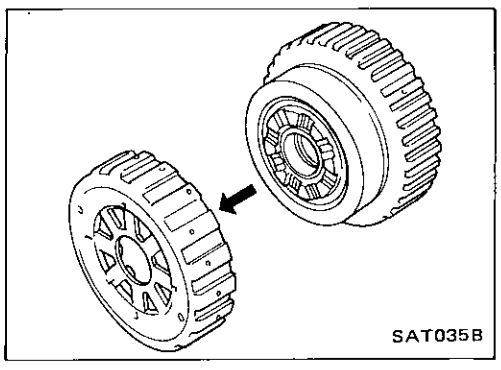

c. Remove needle bearing from rear internal gear.




d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.

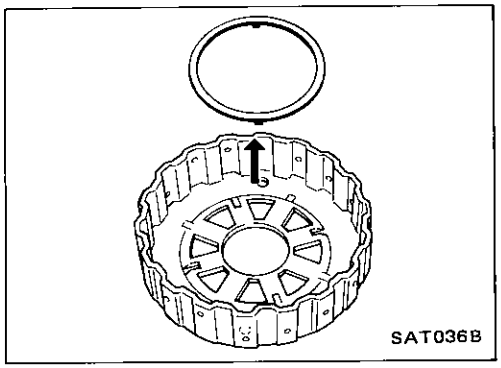



e. Remove needle bearing from overrun clutch hub.

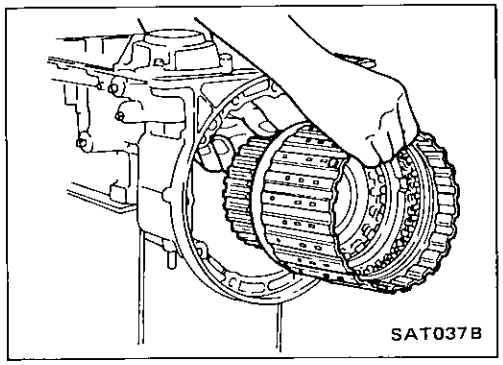



f. Remove overrun clutch hub from rear internal gear and forward clutch hub.

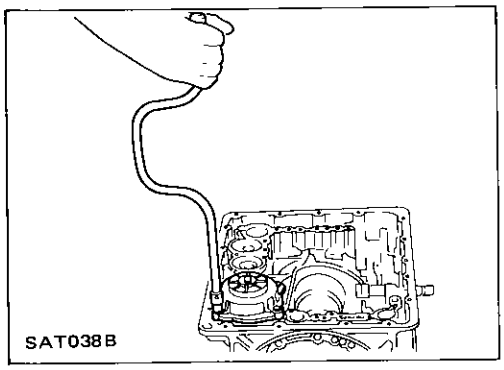
## Disassembly (Cont'd)



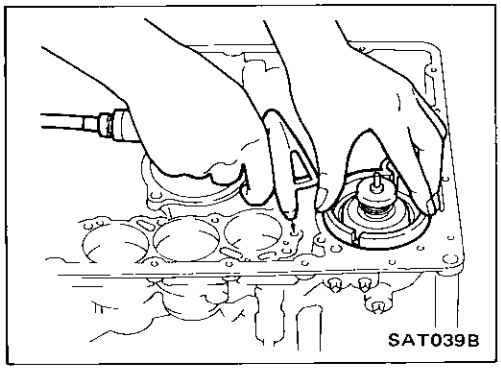

g. Remove thrust washer from overrun clutch hub.




h. Remove forward clutch assembly from transmission case.

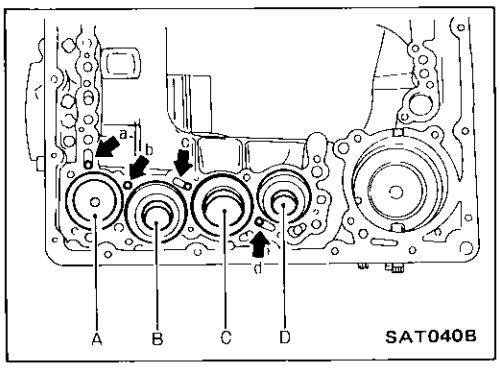



20. Remove band servo and accumulator components.
a. Remove band servo retainer from transmission case.




b. Apply compressed air to oil hole until band servo piston comes out of transmission case.
- **Hold piston with a rag and gradually direct air to oil hole.**

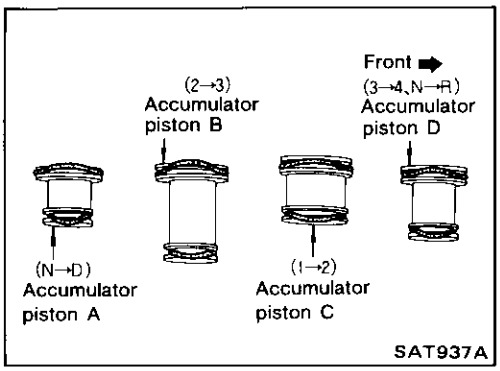
c. Remove return springs.



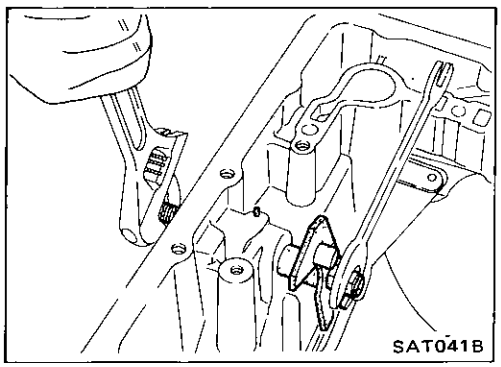

d. Remove springs from accumulator pistons B, C and D.
e. Apply compressed air to each oil hole until piston comes out.
- **Hold piston with a rag and gradually direct air to oil hole.**

| Identification of accumulator pistons | A | B | C | D |
|---|---|---|---|---|
| Identification of oil holes | a | b | c | d |

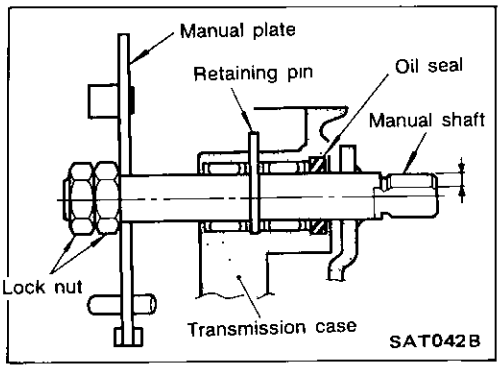
## Disassembly (Cont'd)



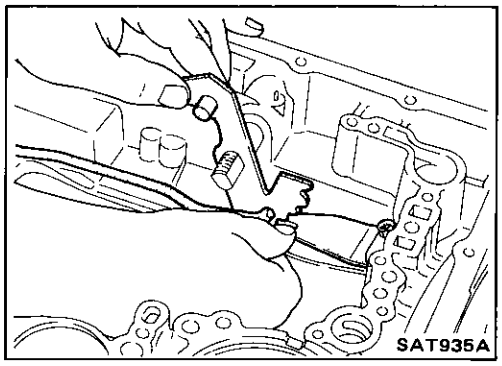

f. Remove O-ring from each piston.



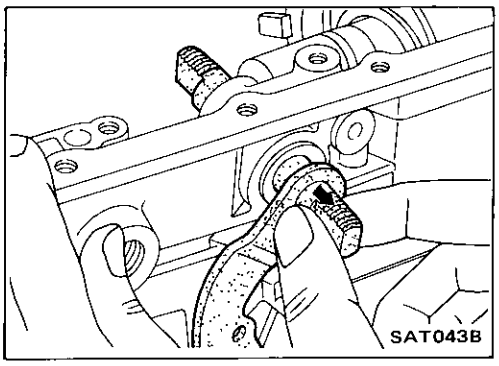

21. Remove manual shaft components, if necessary.
a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.




b. Remove retaining pin from transmission case.

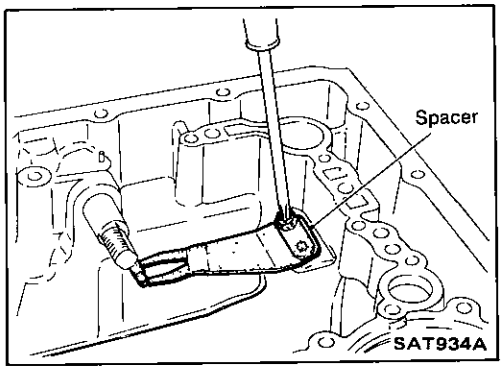



c. While pushing detent spring down, remove manual plate and parking rod from transmission case.

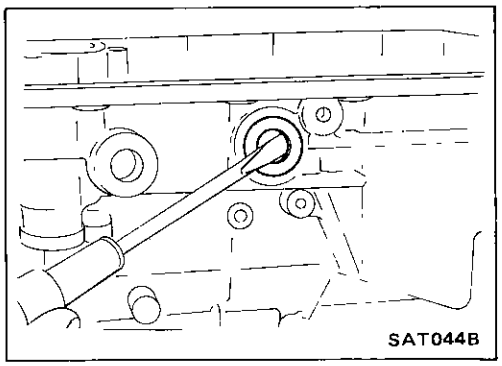



d. Remove manual shaft from transmission case.

## Disassembly (Cont'd)

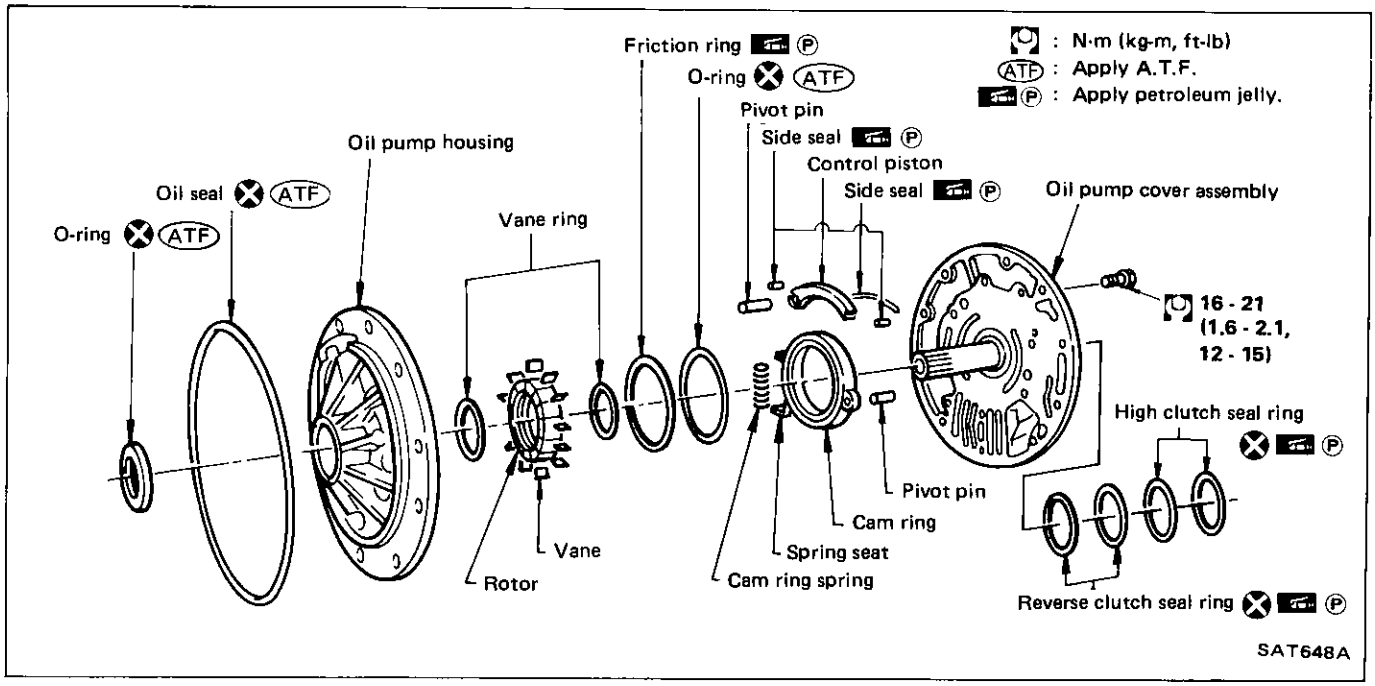


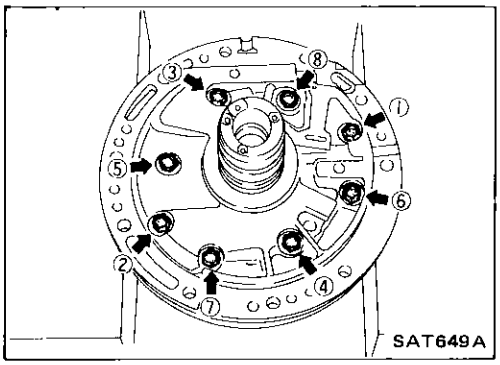

e. Remove spacer and detent spring from transmission case.




f. Remove oil seal from transmission case.

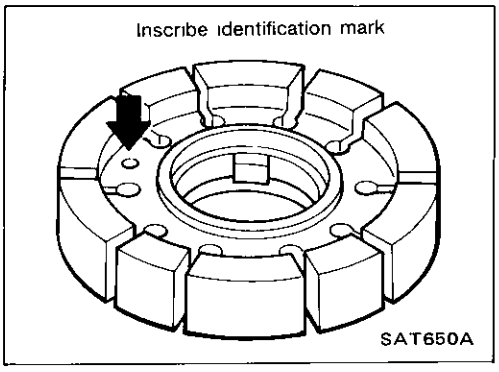
## Oil Pump



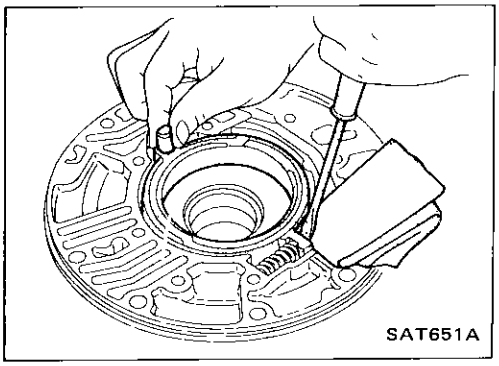




### DISASSEMBLY

1. Loosen bolts in numerical order and remove oil pump cover.

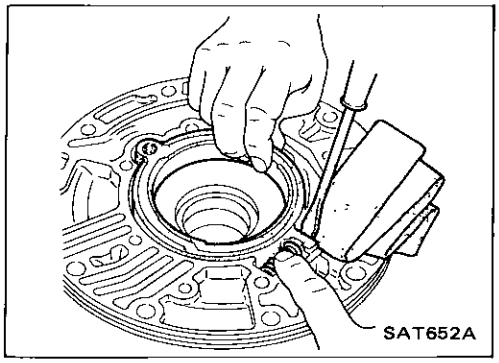



2. Remove rotor, vane rings and vanes.
   - **Inscribe a mark on back of rotor for identification of fore-aft direction when reassembling rotor. Then remove rotor.**

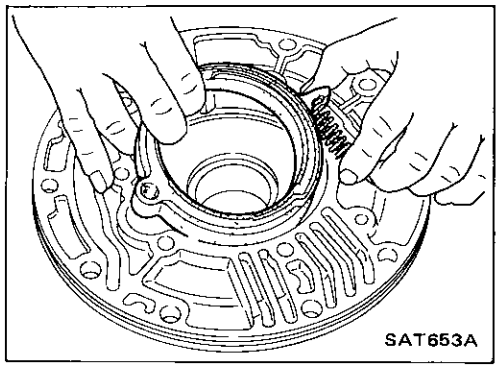



3. While pushing on cam ring remove pivot pin.
   - **Be careful not to scratch oil pump housing.**

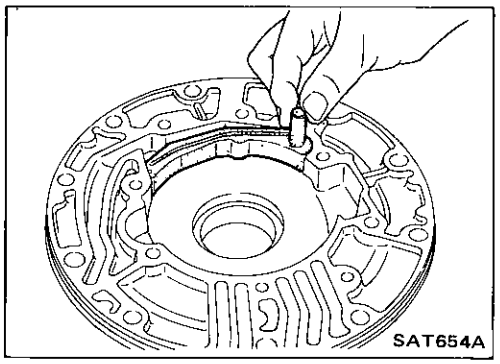
## Oil Pump (Cont'd)



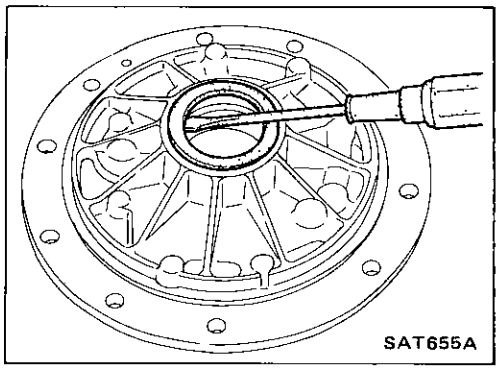

4. While holding cam ring and spring lift out cam ring spring.
- **Be careful not to damage oil pump housing.**
- **Hold cam ring spring to prevent it from jumping.**



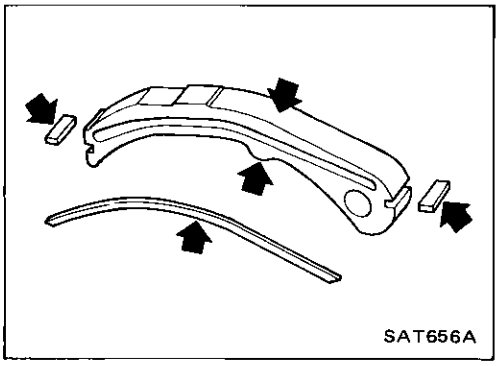

5. Remove cam ring and cam ring spring from oil pump housing.




6. Remove pivot pin from control piston and remove control piston assembly.




7. Remove oil seal from oil pump housing.
- **Be careful not to scratch oil pump housing.**

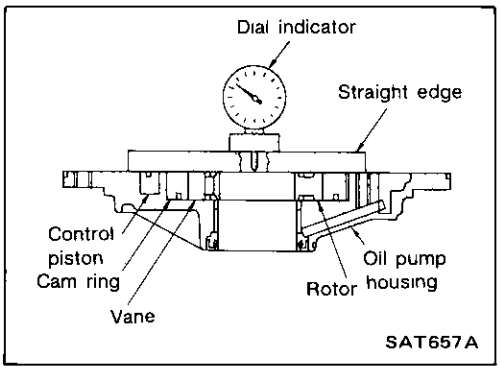



### INSPECTION

**Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring**

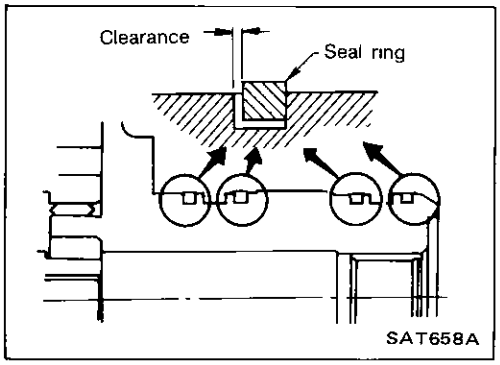
- Check for wear or damage.

## Oil Pump (Cont'd)



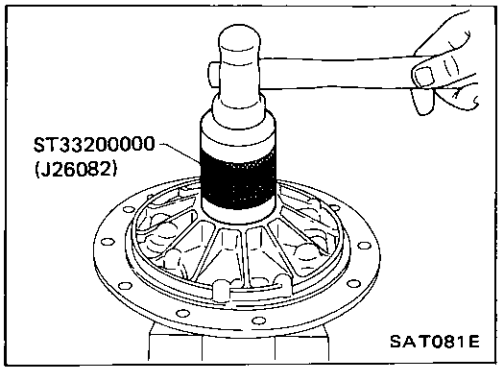

**Side clearances**

- 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.



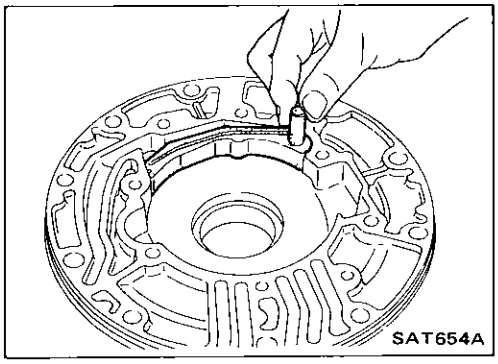

**Seal ring clearance**

- 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**

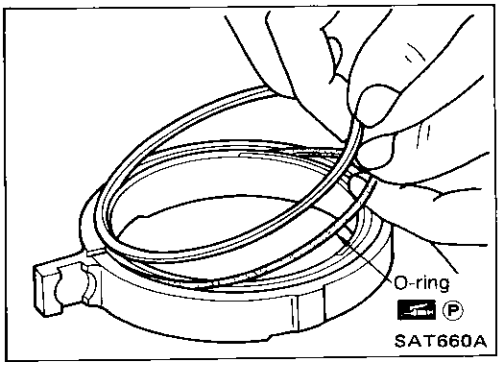
1. Drive oil seal into oil pump housing.
- **Apply A.T.F. to outer periphery and lip surface.**




2. Install cam ring in oil pump housing by the following steps.

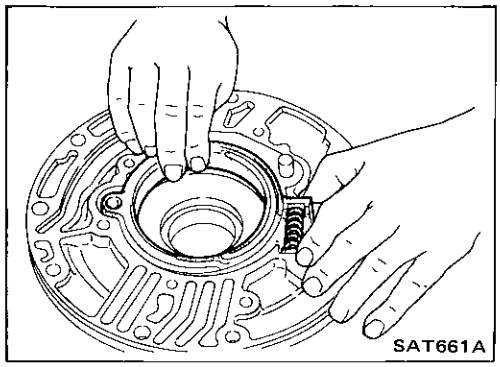
a. Install side seal on control piston.
- **Pay attention to its direction — Black surface goes toward control piston.**
- **Apply petroleum jelly to side seal.**

b. Install control piston on oil pump.

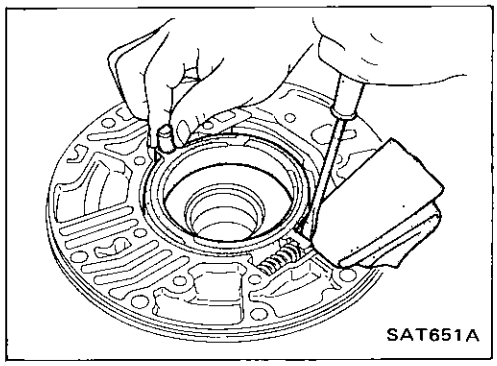



c. Install O-ring and friction ring on cam ring.
- **Apply petroleum jelly to O-ring.**

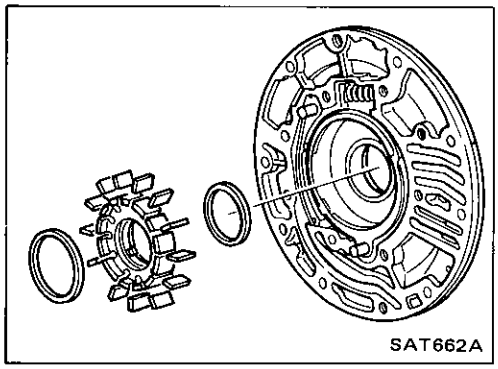
## Oil Pump (Cont'd)


SAT661A

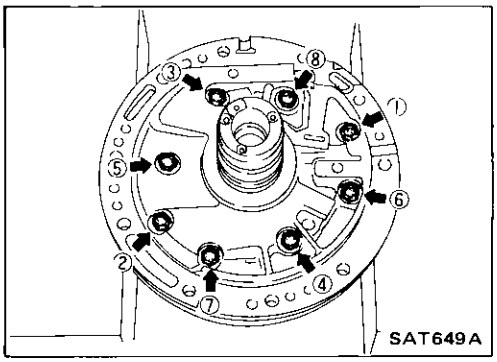
d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.


SAT651A

e. While pushing on cam ring install pivot pin.

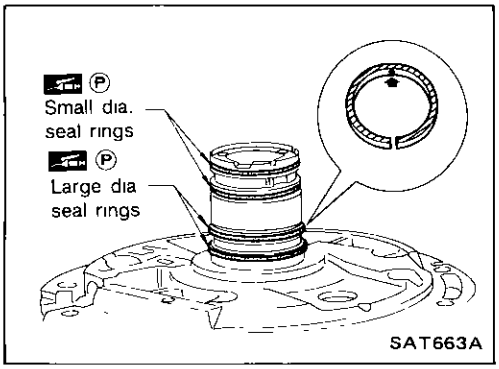

SAT662A

3. Install rotor, vanes and vane rings.
- **Pay attention to direction of rotor.**



SAT649A

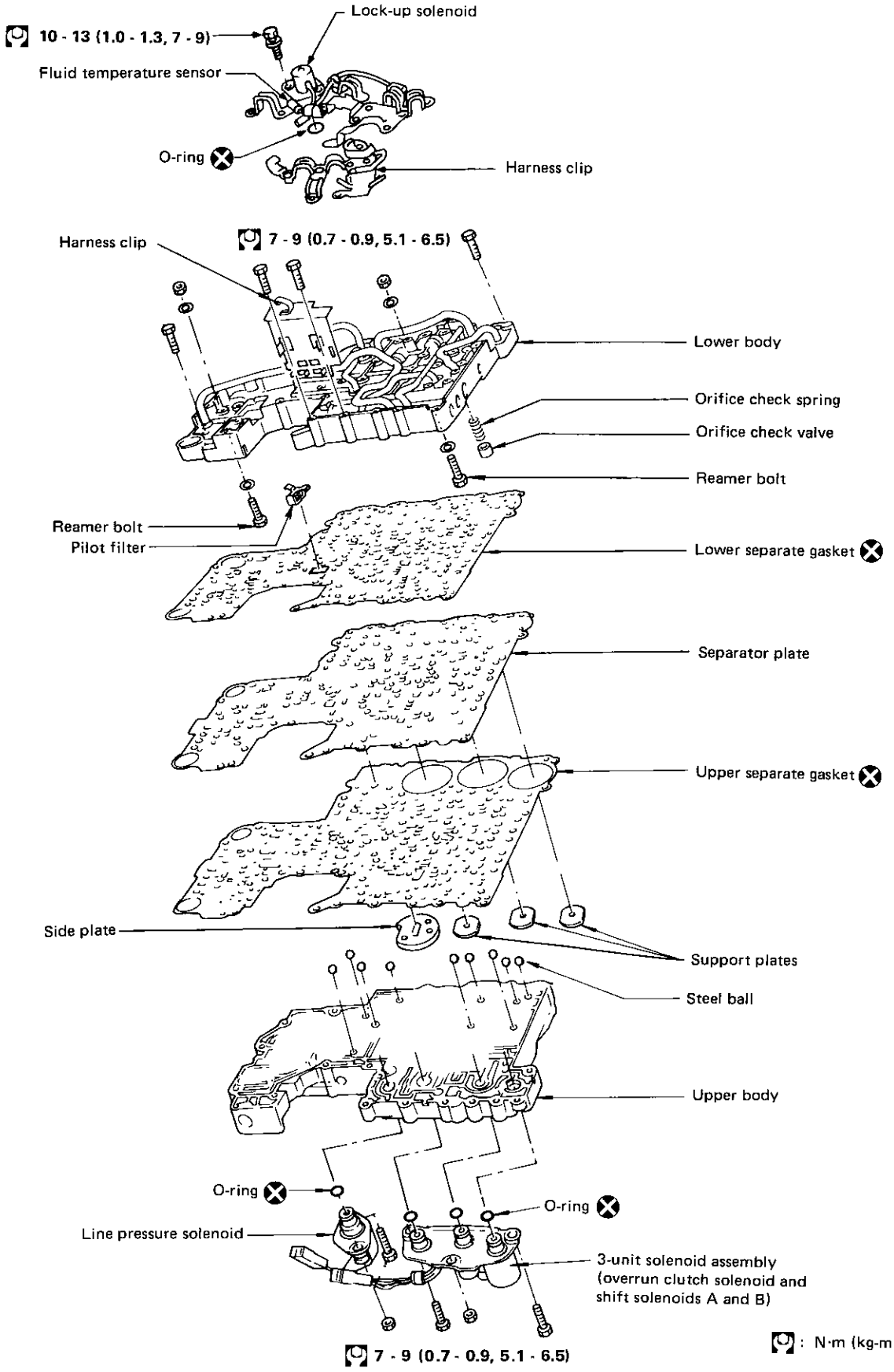
4. Install oil pump housing and oil pump cover.
a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.
b. Tighten bolts in a criss-cross pattern.



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.**

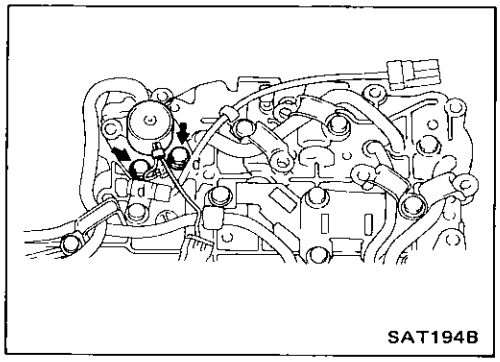
## Control Valve Assembly



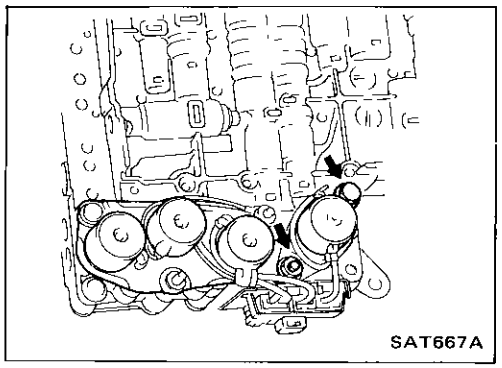

SAT638C

## Control Valve Assembly (Cont'd)

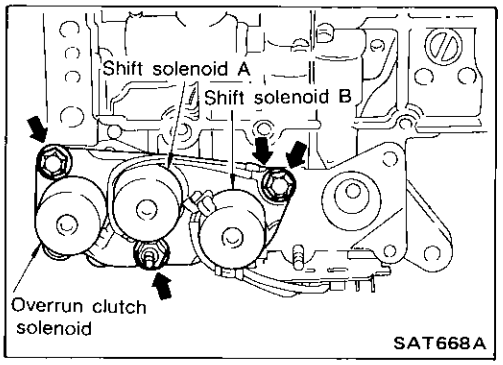
### DISASSEMBLY


SAT194B

1. Remove solenoids.
a. Remove lock-up solenoid and side plate from lower body.
b. Remove O-ring from solenoid.

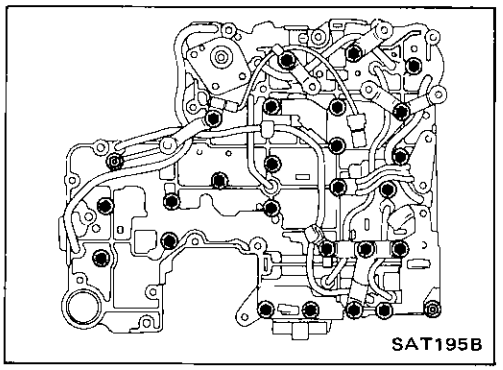

SAT667A

c. Remove line pressure solenoid from upper body.
d. Remove O-ring from solenoid.



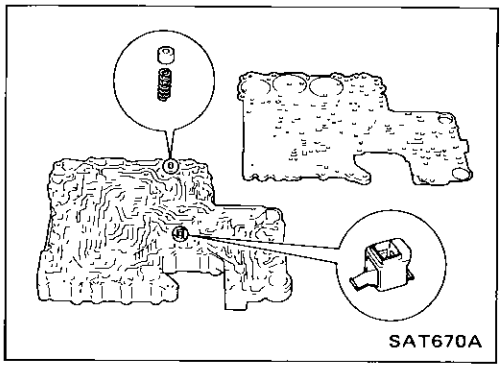
SAT668A

e. Remove 3-unit solenoid assembly from upper body.
f. Remove O-rings from solenoids.


SAT195B

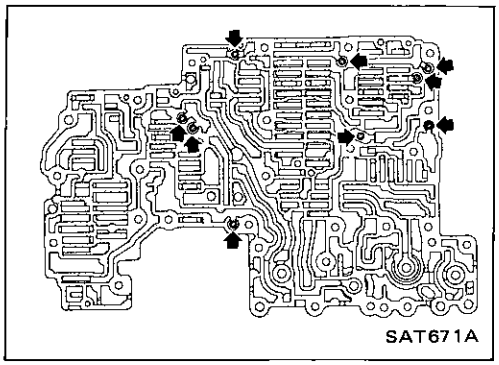
2. Disassemble upper and lower bodies.
a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
b. Remove lower body, separator plate and separate gasket as a unit from upper body.

- **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)

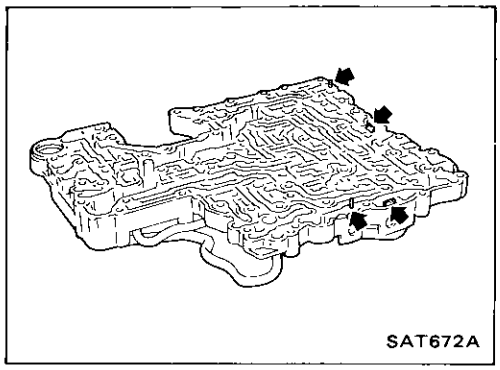

SAT671A

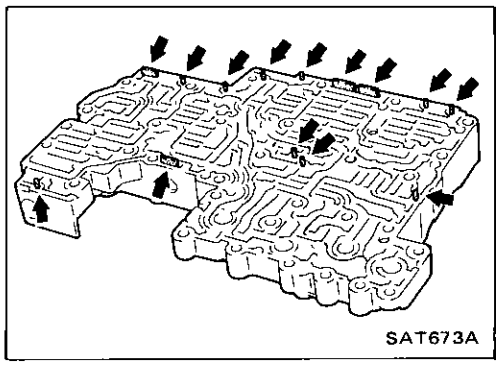
e. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.

### INSPECTION

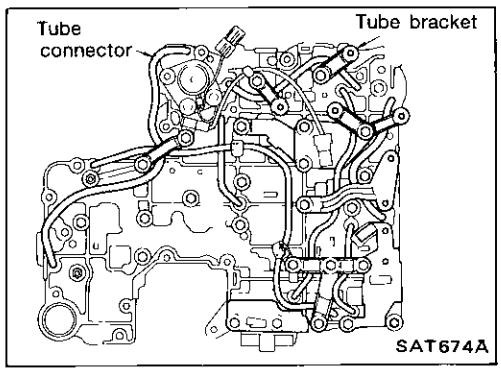
**Lower and upper bodies**

- Check to see that there are pins and retainer plates in lower body.


SAT672A

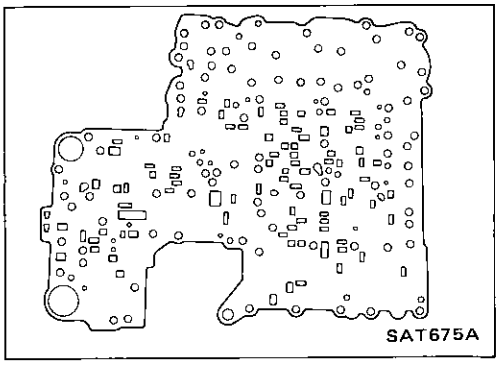

SAT673A

- Check to see that there are pins and retainer plates in upper body.
- **Be careful not to lose these parts.**



SAT674A

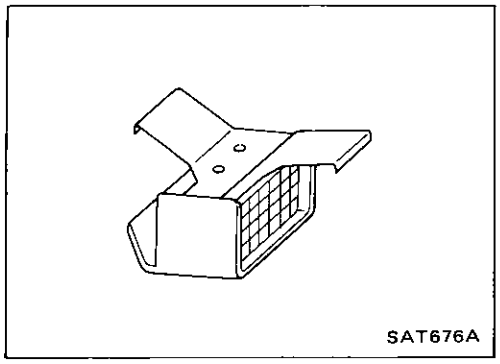
- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.


SAT675A

**Separator plates**

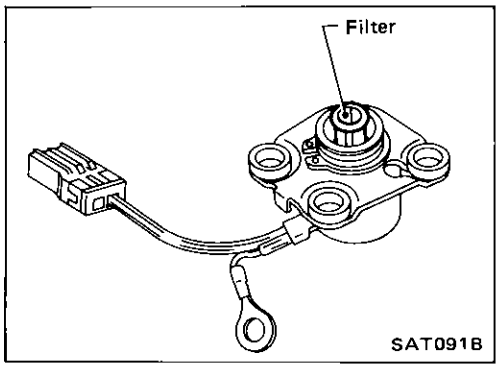
- Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.

## Control Valve Assembly (Cont'd)


SAT676A

**Pilot filter**

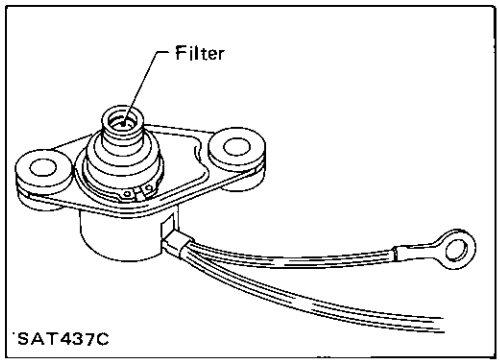
- Check to make sure that filter is not clogged or damaged.



SAT091B

**Lock-up solenoid**

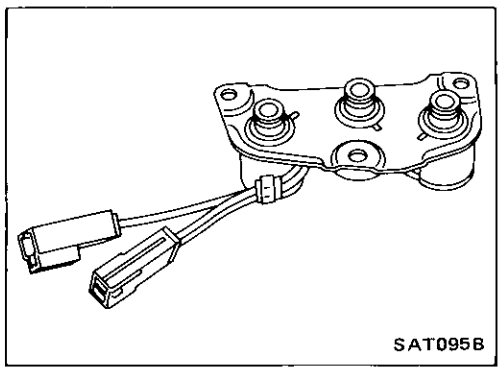
- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



SAT437C

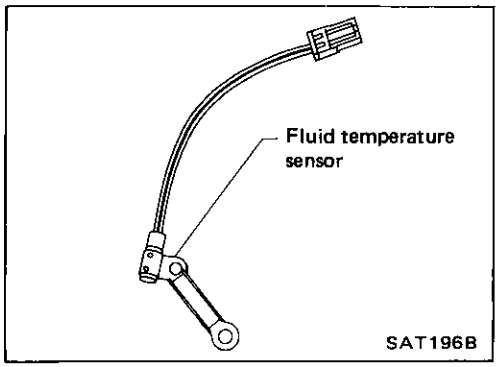
**Line pressure solenoid**

- 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**

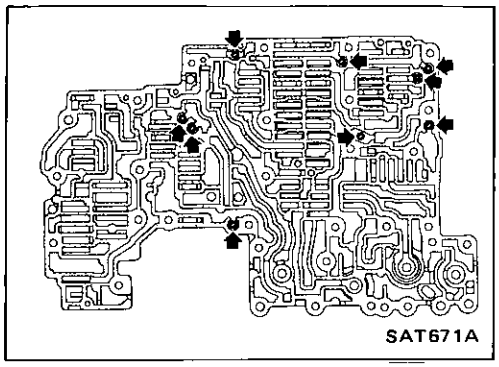
- Measure resistance. — Refer to "Electrical Components Inspection".

## Control Valve Assembly (Cont'd)

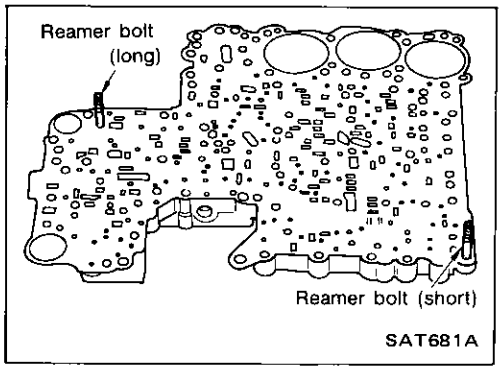
### ASSEMBLY

1. Install upper and lower bodies.

a. Place oil circuit of upper body face up. Install steel balls in their proper positions.

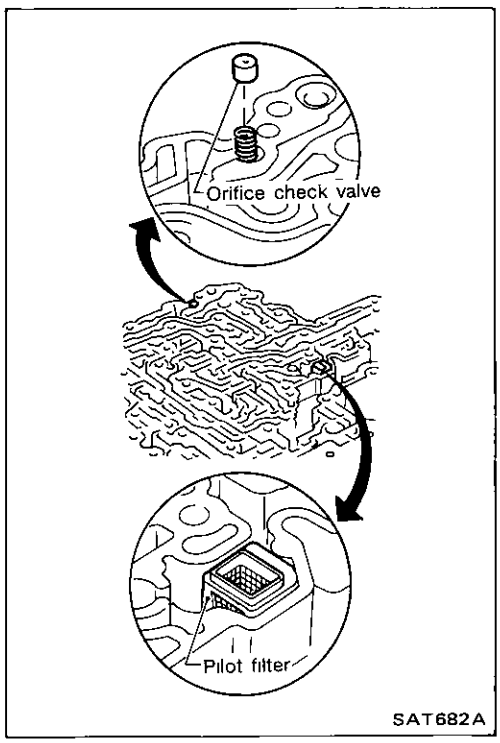

SAT671A

b. Install reamer bolts from bottom of upper body and install separate gaskets.



SAT681A

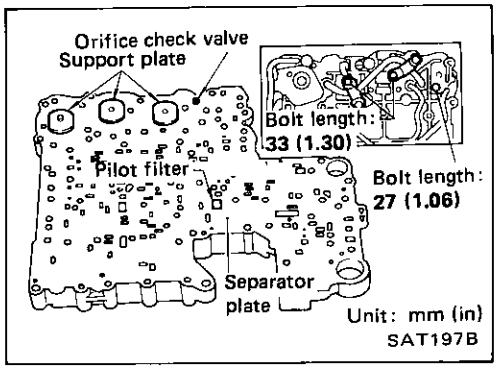
c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.



SAT682A

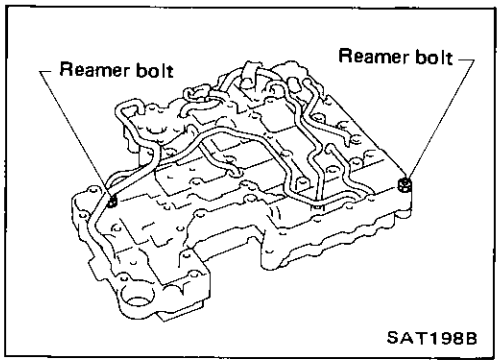
d. Install lower separate gaskets and separator plates on lower body.

e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.



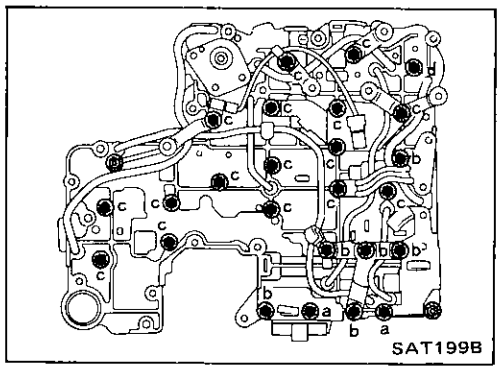
SAT197B

## Control Valve Assembly (Cont'd)




f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

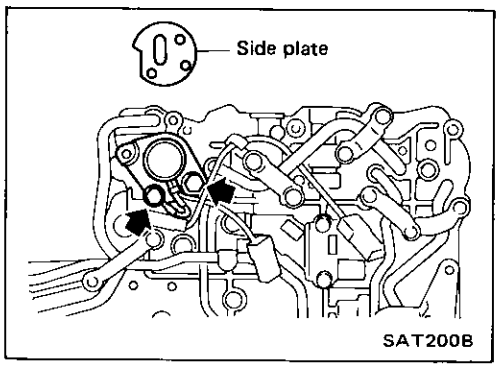
- **Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.**




g. Install and temporarily tighten bolts and tube brackets in their proper locations.

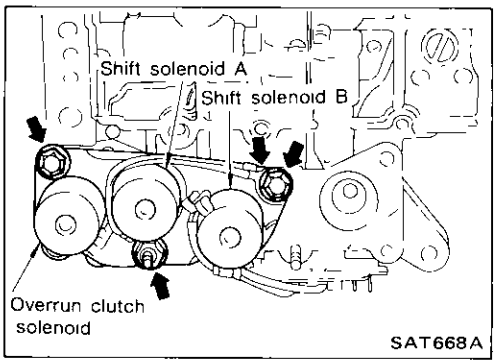
**Bolt length and location:**

| Item \ Bolt symbol | | a | b | c | d |
|---|---|---|---|---|---|
| Bolt length | mm (in) | 70 (2.76) | 50 (1.97) | 33 (1.30) | 27 (1.06) |

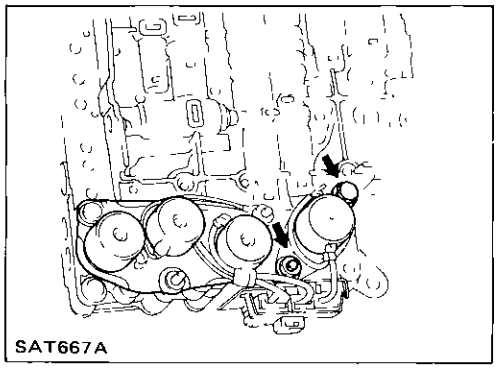



2. Install solenoids.

a. Attach O-ring and install lock-up solenoid and side plates onto lower body.



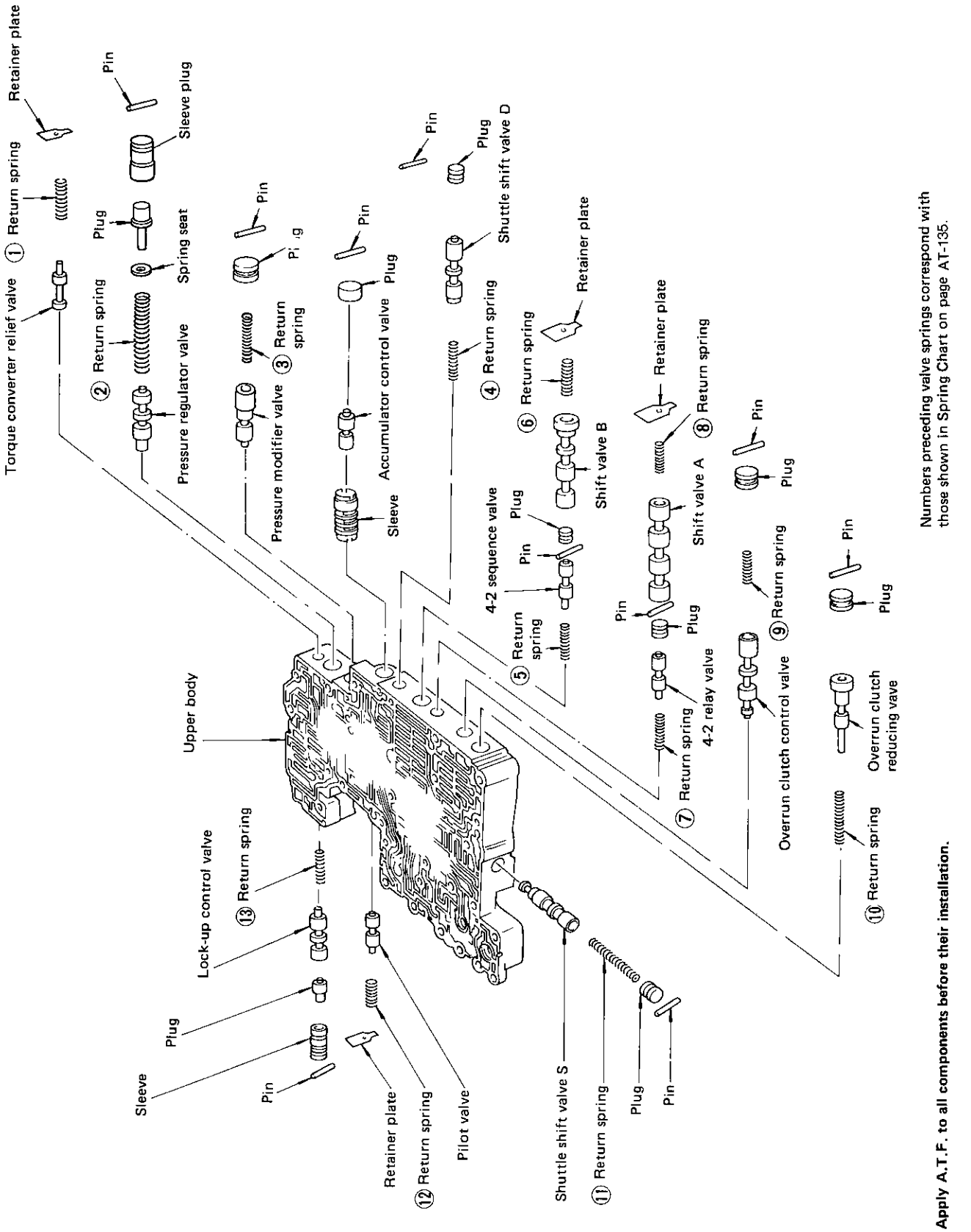

b. Attach O-rings and install 3-unit solenoids assembly onto upper body.




c. Attach O-ring and install line pressure solenoid onto upper body.

3. Tighten all bolts.

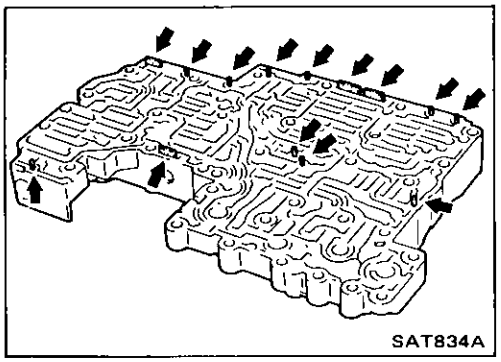
## Control Valve Upper Body



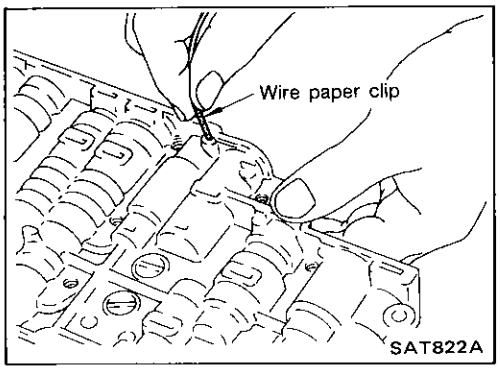

SAT639C

## Control Valve Upper Body (Cont'd)

### DISASSEMBLY

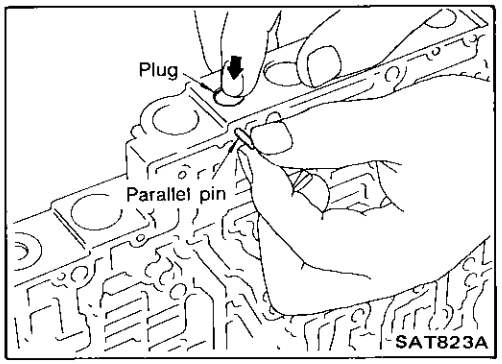

SAT834A

1. Remove valves at parallel pins.
- **Do not use a magnetic hand.**



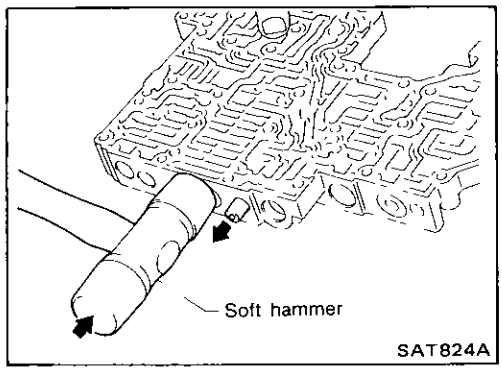
SAT822A

a. Use a wire paper clip to push out parallel pins.



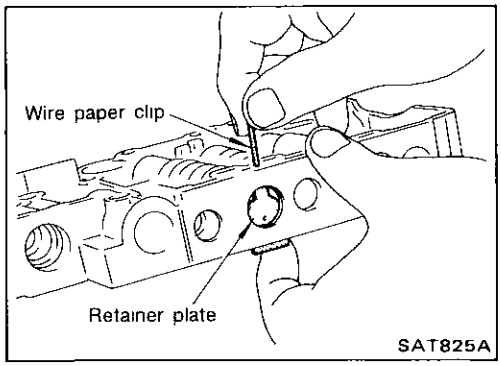
SAT823A

b. Remove parallel pins while pressing their corresponding plugs and sleeves.
- **Remove plug slowly to prevent internal parts from jumping out.**



SAT824A

c. Place mating surface of valve facedown, and remove internal parts.
- **If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**

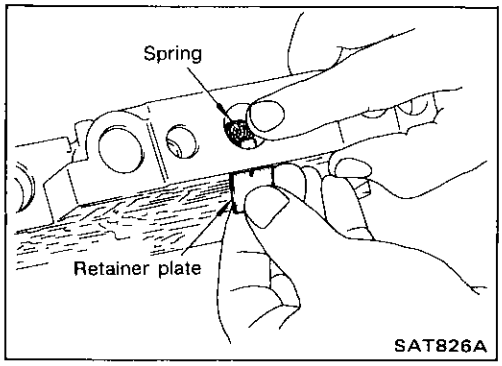


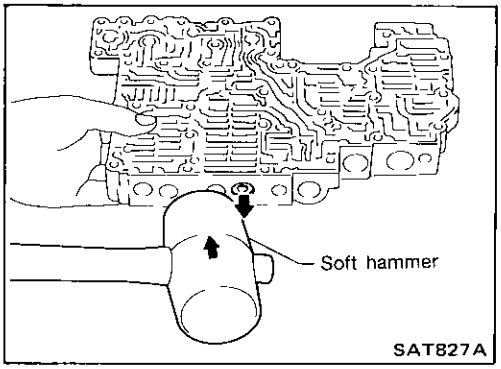
SAT825A

2. Remove valves at retainer plates.
a. Pry out retainer plate with wire paper clip.

## Control Valve Upper Body (Cont'd)

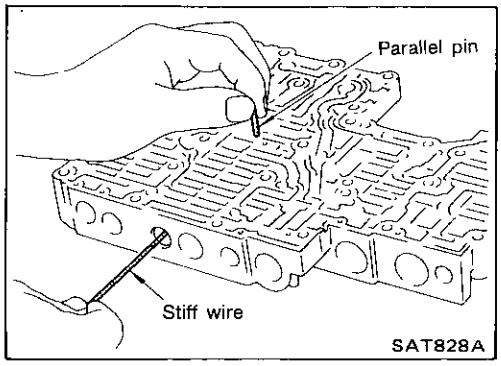
b. Remove retainer plates while holding spring.



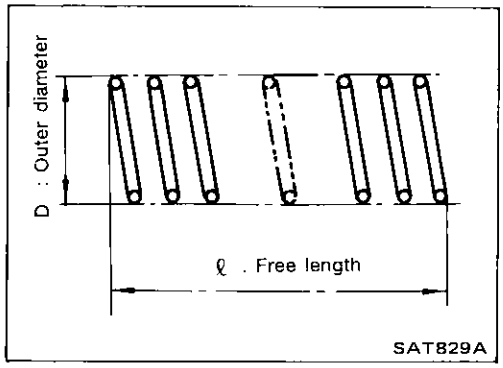

c. Place mating surface of valve facedown, and remove internal parts.

- **If a valve is hard to remove, lightly tap valve body with a soft hammer.**
- **Be careful not to drop or damage valves, sleeves, etc.**




- 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.
- **Be careful not to scratch sliding surface of valve with wire.**

## Control Valve Upper Body (Cont'd)




### INSPECTION

**Valve springs**

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-132.

**Inspection standard**

Unit: mm (in)

| Parts / Item | | Part No. | ℓ | D |
|---|---|---|---|---|
| ① | Torque converter relief valve spring | 31742-41X23 | 38.0 (1.496) | 9.0 (0.354) |
| ② | Pressure regulator valve spring | 31742-41X24 | 44.02 (1.7331) | 14.0 (0.551) |
| ③ | Pressure modifier valve spring | 31742-41X19 | 31.95 (1.2579) | 6.8 (0.268) |
| ④ | Shuttle shift valve D spring | 31762-41X00 | 26.5 (1.043) | 6.0 (0.236) |
| ⑤ | 4-2 sequence valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| ⑥ | Shift valve B spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| ⑦ | 4-2 relay valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| ⑧ | Shift valve A spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| ⑨ | Overrun clutch control valve spring | 31762-41X03 | 23.6 (0.929) | 7.0 (0.276) |
| ⑩ | Overrun clutch reducing valve spring | 31742-41X20 | 32.5 (1.280) | 7.0 (0.276) |
| ⑪ | Shuttle shift valve S spring | 31762-41X04 | 51.0 (2.008) | 5.65 (0.2224) |
| ⑫ | Pilot valve spring | 31742-41X13 | 25.7 (1.012) | 9.1 (0.358) |
| ⑬ | Lock-up control valve spring | 31742-41X22 | 18.5 (0.728) | 13.0 (0.512) |

- Replace valve springs if deformed or fatigued.

**Control valves**

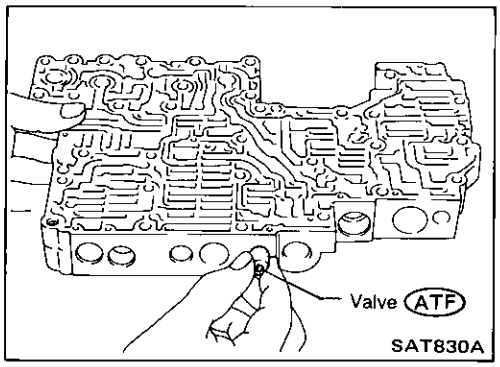
- Check sliding surfaces of valves, sleeves and plugs.

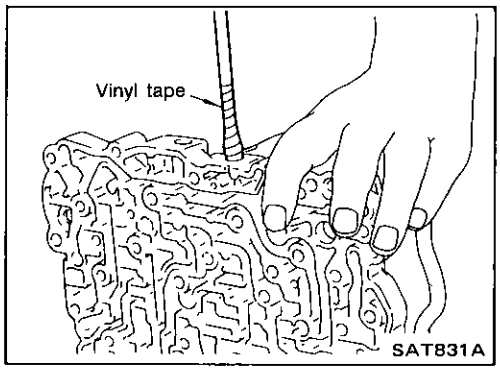
## Control Valve Upper Body (Cont'd)

### 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.**

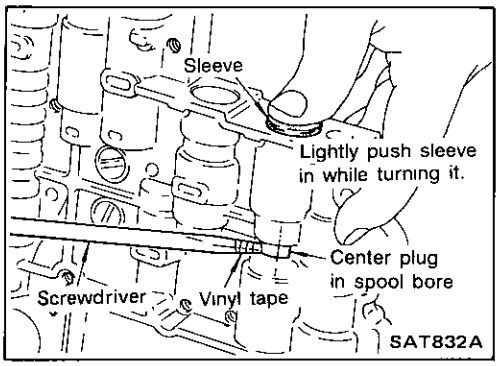



- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.

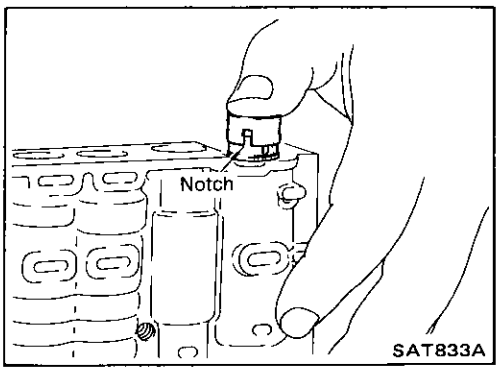
**Pressure regulator valve**

- 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.

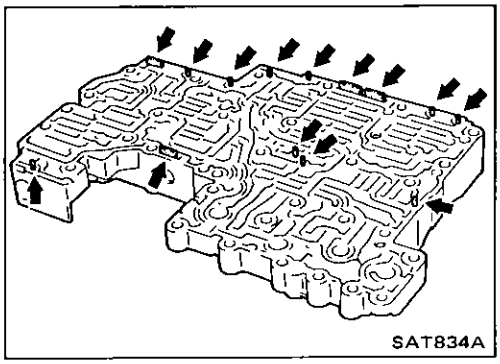



**Accumulator control plug**

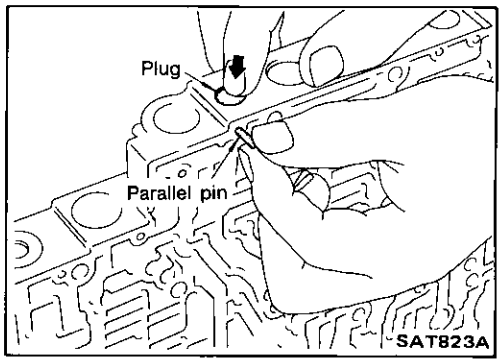
- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



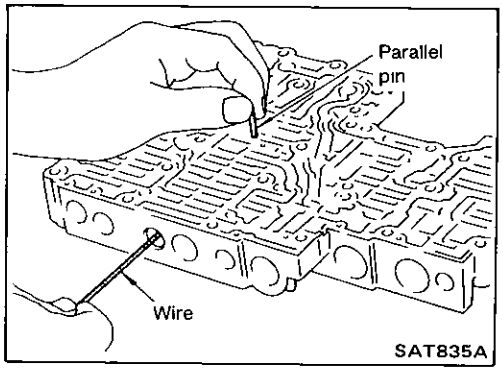

2. Install parallel pins and retainer plates.



## Control Valve Upper Body (Cont'd)

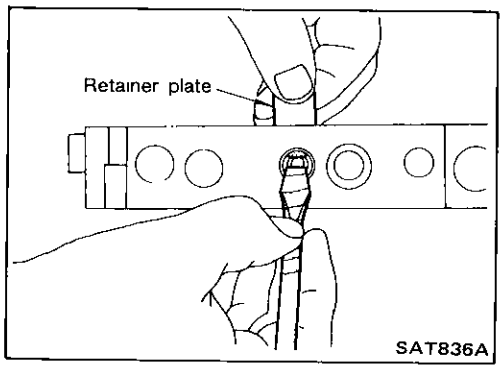



- **While pushing plug, install parallel pin.**



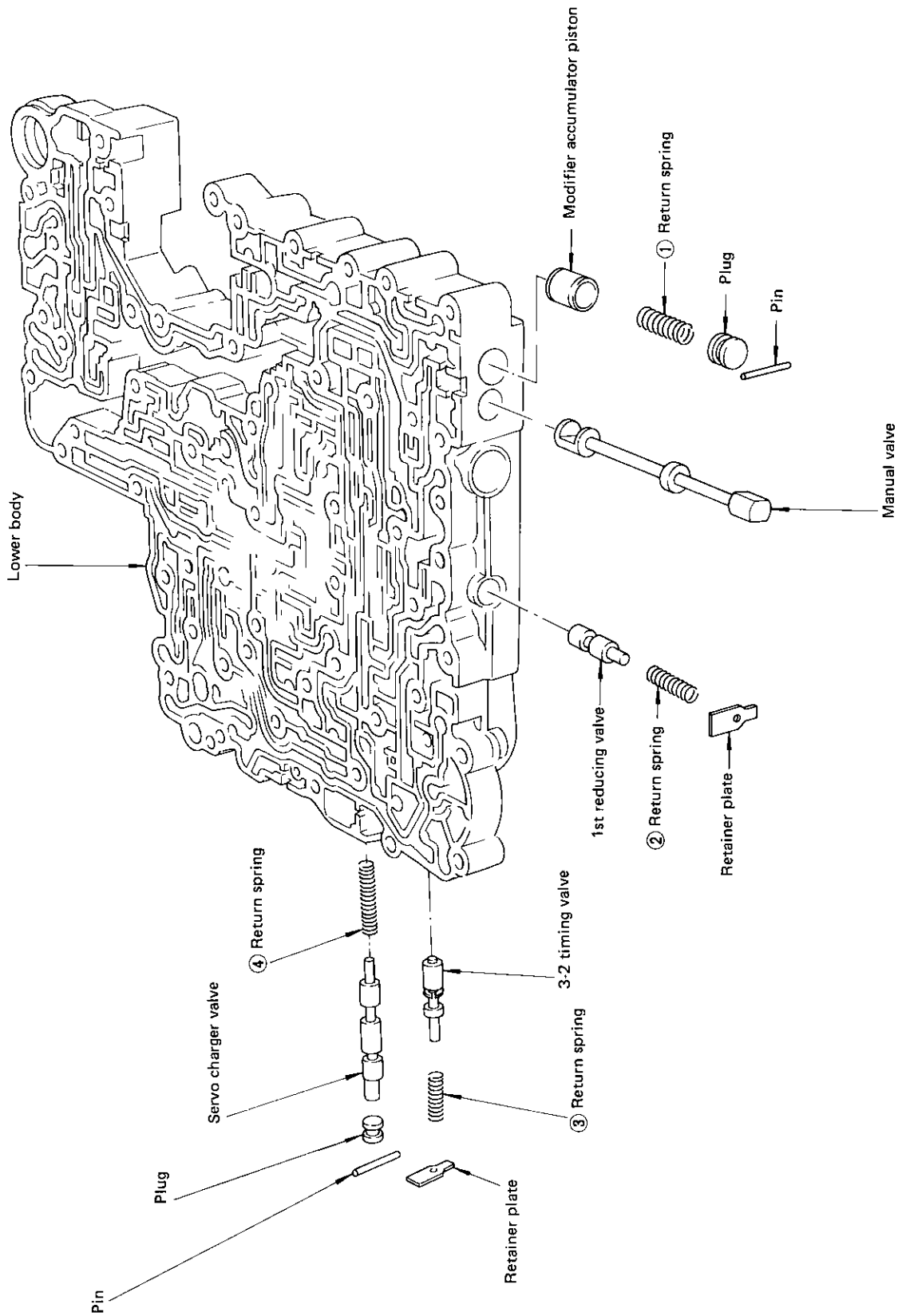

**4-2 sequence valve and relay valve**

- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.




- Insert retainer plate while pushing spring.

## Control Valve Lower Body

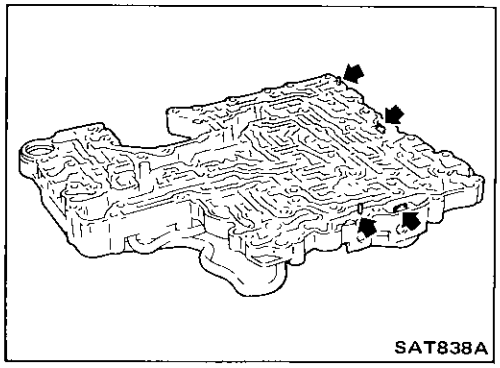



Numbers preceding valve springs correspond with those shown in Spring Chart on the next page.

**Apply A.T.F. to all components before their installation.**

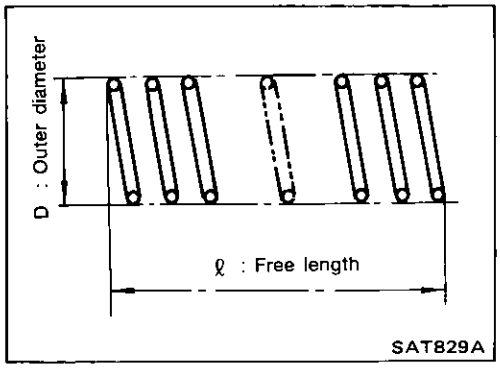
SAT640C

## Control Valve Lower Body (Cont'd)


SAT838A

### DISASSEMBLY

1. Remove valves at parallel pins.
2. Remove valves at retainer plates.
   For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



SAT829A

### INSPECTION

**Valve springs**

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-138.

**Inspection standard:**

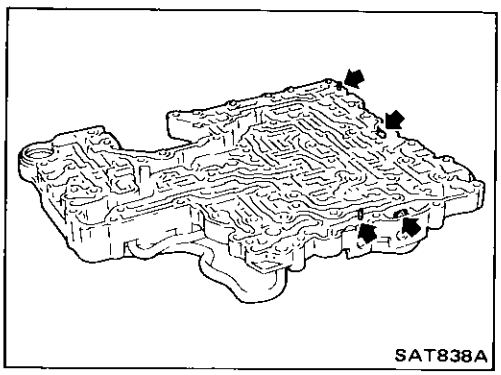
Unit: mm (in)

| Parts / Item | | Part No. | ℓ | D |
|---|---|---|---|---|
| ① | Modifier accumulator piston 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**

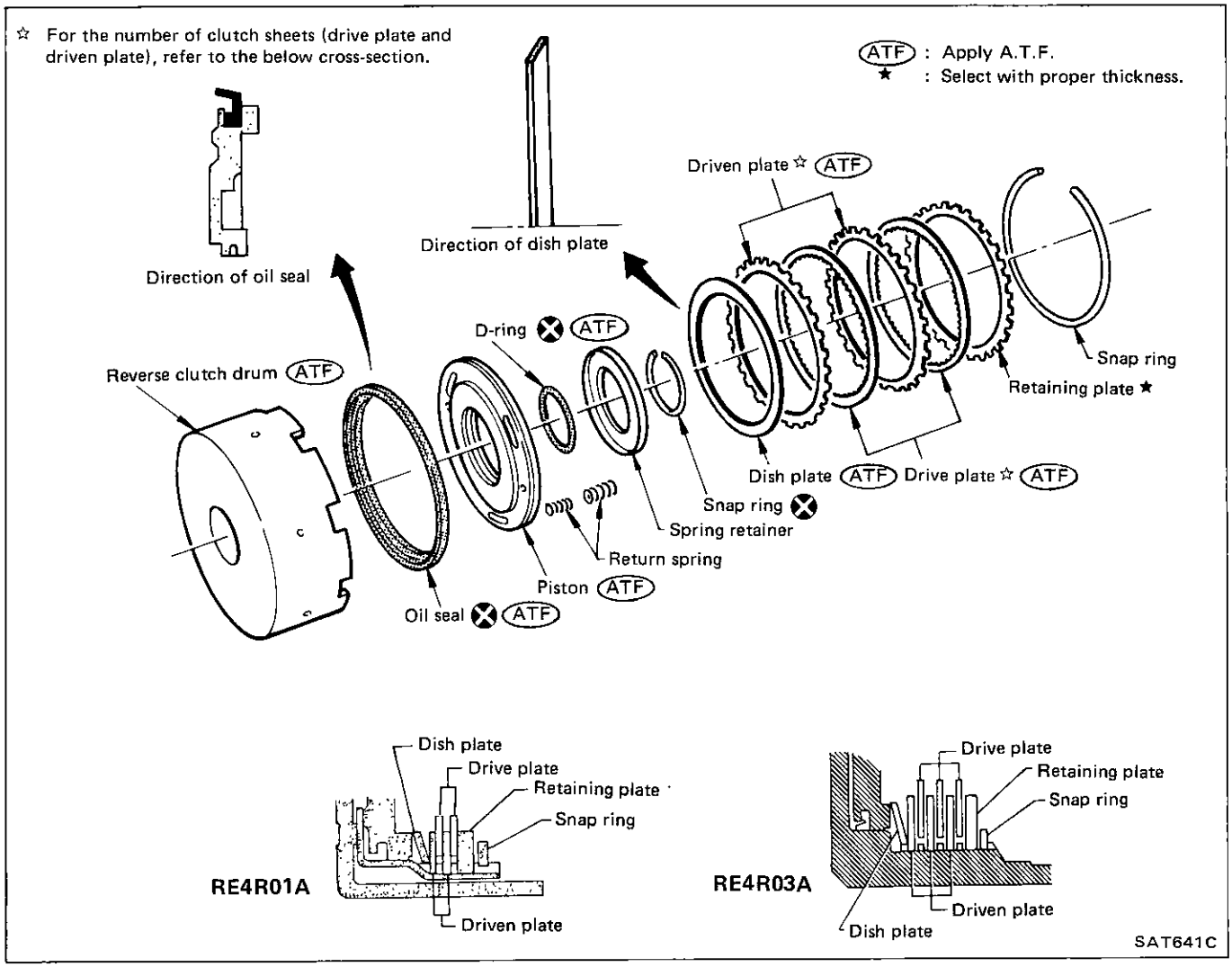
- Check sliding surfaces of control valves, sleeves and plugs for damage.

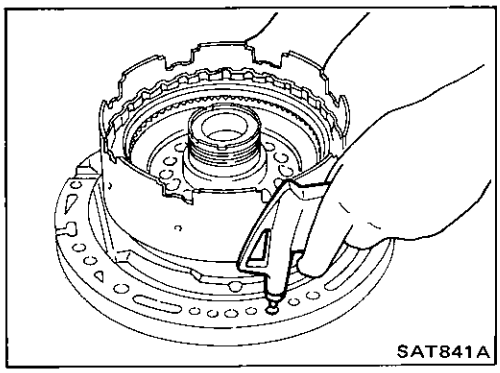

SAT838A

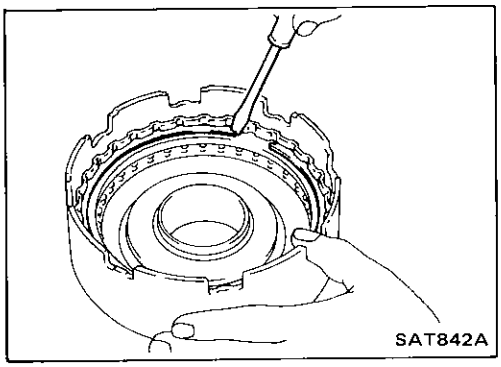
### ASSEMBLY

- Install control valves.
  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.

## Reverse Clutch



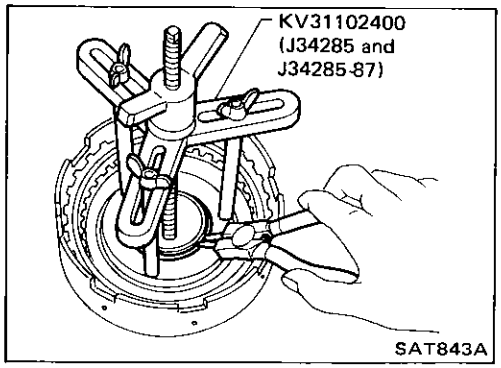




### DISASSEMBLY

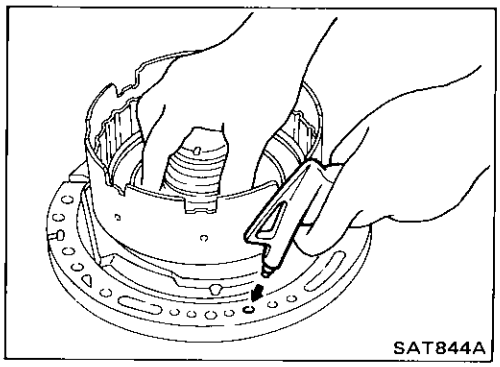
1. Check operation of reverse clutch.
   a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
   b. Check to see that retaining plate moves to snap ring.
   c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

2. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.

## Reverse Clutch (Cont'd)




3. Remove snap ring from clutch drum while compressing clutch springs.
- **Do not expand snap ring excessively.**
4. Remove spring retainer and return spring.

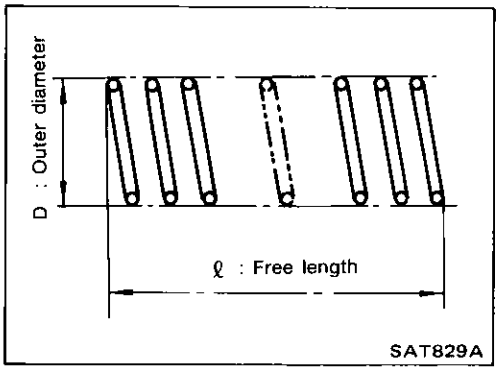



5. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
- **Do not apply compressed air abruptly.**
6. Remove D-ring and oil seal from piston.

### INSPECTION

**Reverse clutch snap ring and spring retainer**

- Check for deformation, fatigue or damage.



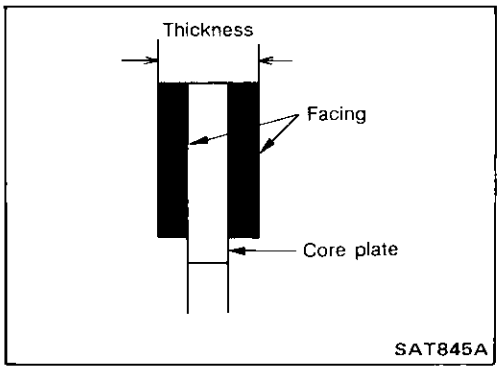

**Reverse clutch return springs**

- Check for deformation or damage. Also measure free length and outside diameter.

**Inspection standard:**

Unit: mm (in)

| Model | Part No. | ℓ | D |
|---|---|---|---|
| RE4R01A | 31505-41X02 | 19.69 (0.7752) | 11.6 (0.457) |
| RE4R03A | 31505-51X00 | 37.8 (1.488) | 14.8 (0.583) |

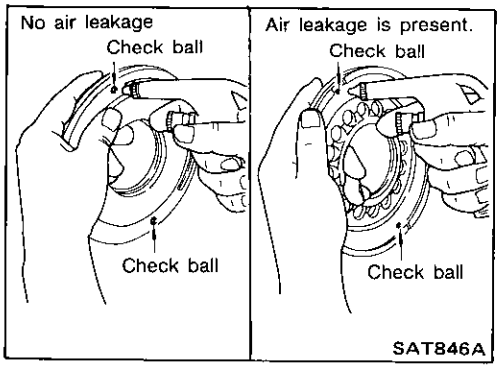



**Reverse clutch drive plates**

- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  **Thickness of drive plate:**
  **Standard value: 2.0 mm (0.079 in)**
  **Wear limit: 1.8 mm (0.071 in)**
- If not within wear limit, replace.

**Reverse clutch dish plate**

- Check for deformation or damage.

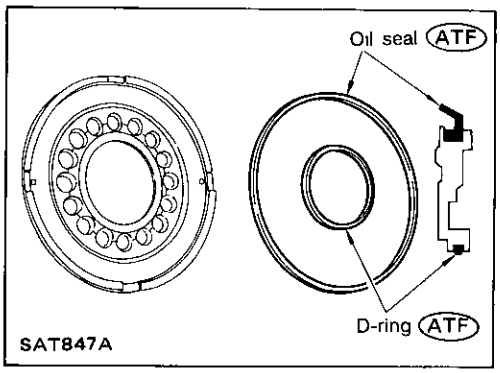



**Reverse clutch piston**

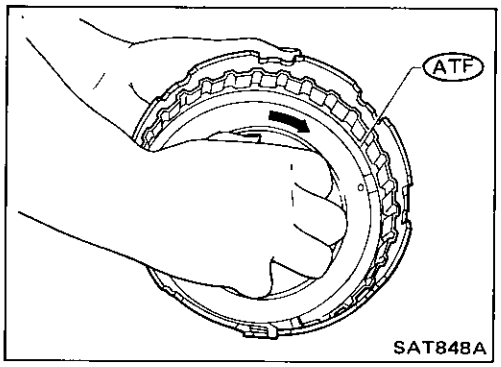
- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring to assure that there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

## Reverse Clutch (Cont'd)

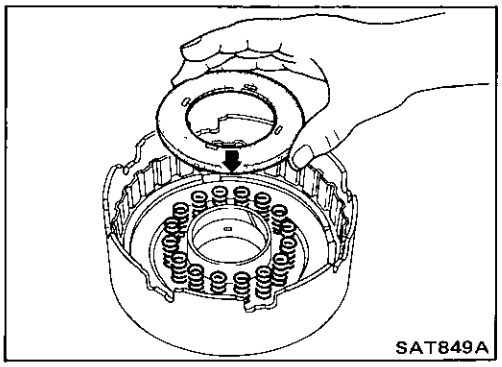
### ASSEMBLY



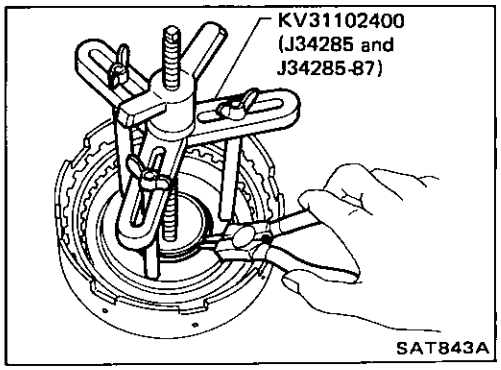

1. Install D-ring and oil seal on piston.
   - **Apply A.T.F. to both parts.**



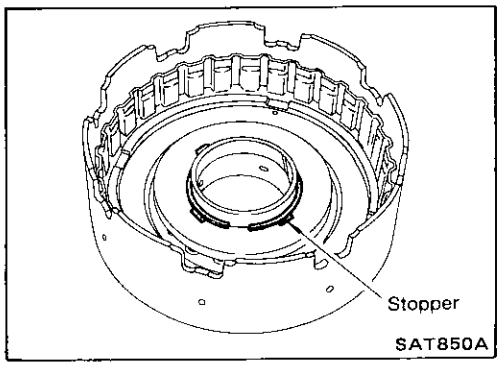

2. Install piston assembly by turning it slowly and evenly.
   - **Apply A.T.F. to inner surface of drum.**



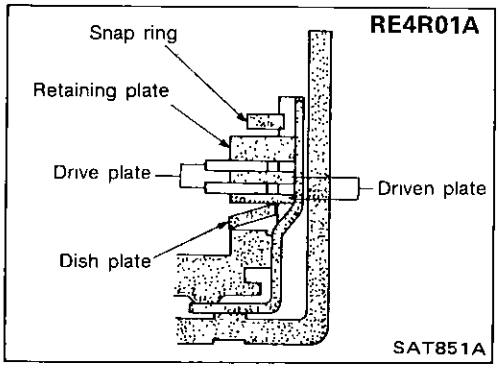

3. Install return springs and spring retainer.



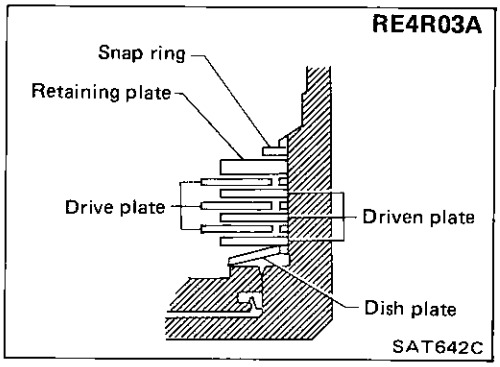

4. Install snap ring while compressing clutch springs.
   - **Do not align snap ring gap with spring retainer stopper.**

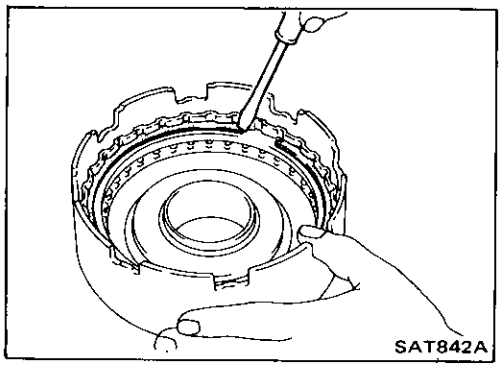


## Reverse Clutch (Cont'd)

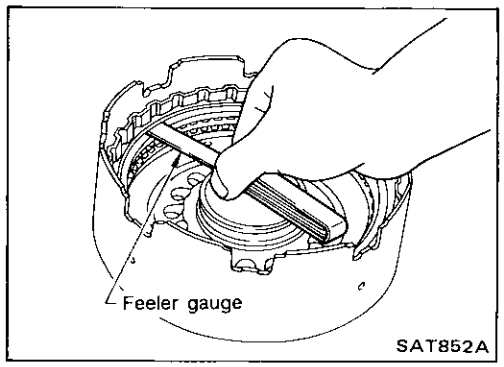



5. Install drive plates, driven plates, retaining plate and dish plate.

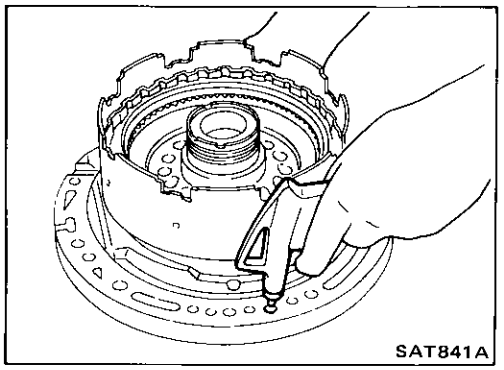



6. Install snap ring.



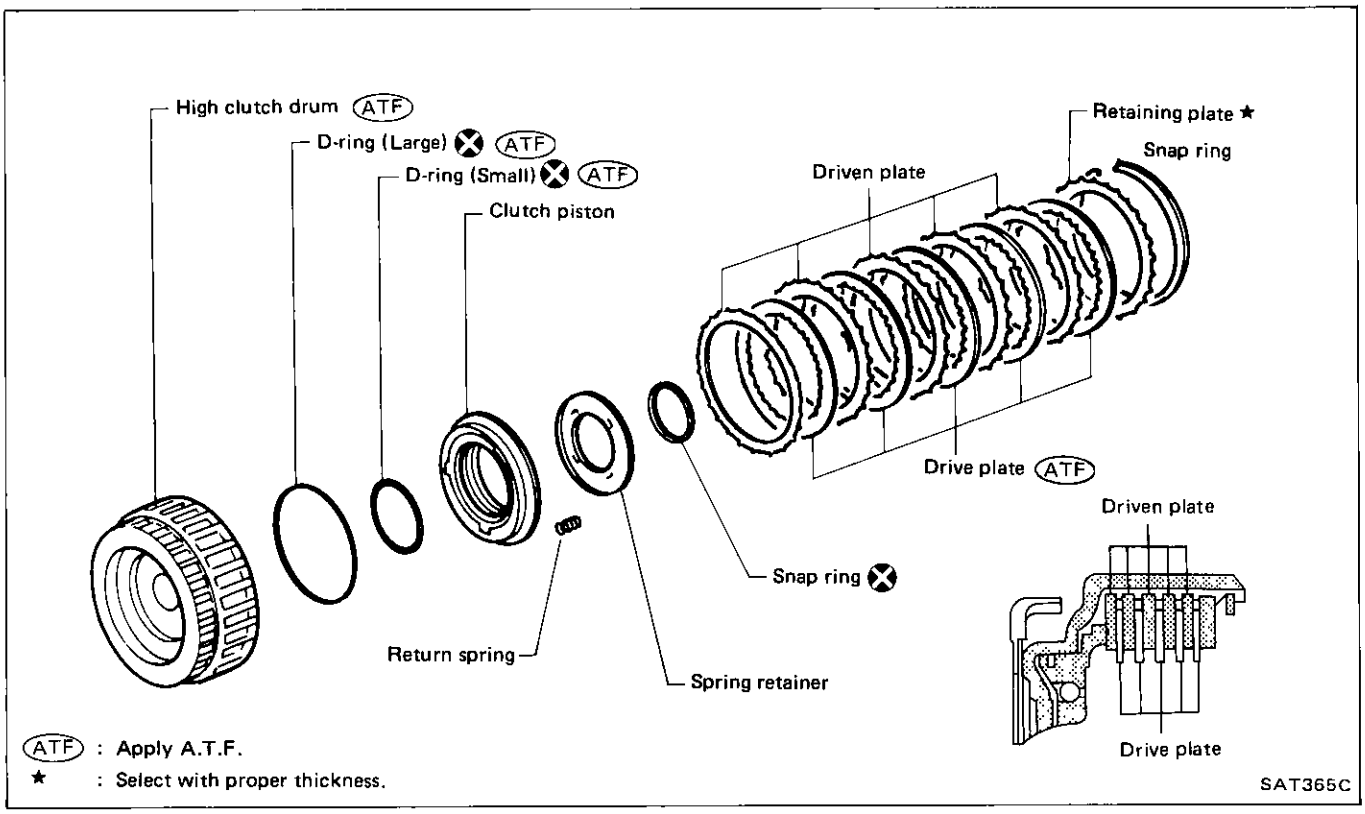

7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   **Specified clearance:**
   **Standard**
   **0.5 - 0.8 mm (0.020 - 0.031 in)**
   **Allowable limit**
   **1.2 mm (0.047 in) (RE4R01A)**
   **1.4 mm (0.055 in) (RE4R03A)**
   **Retaining plate:**
   **Refer to S.D.S.**



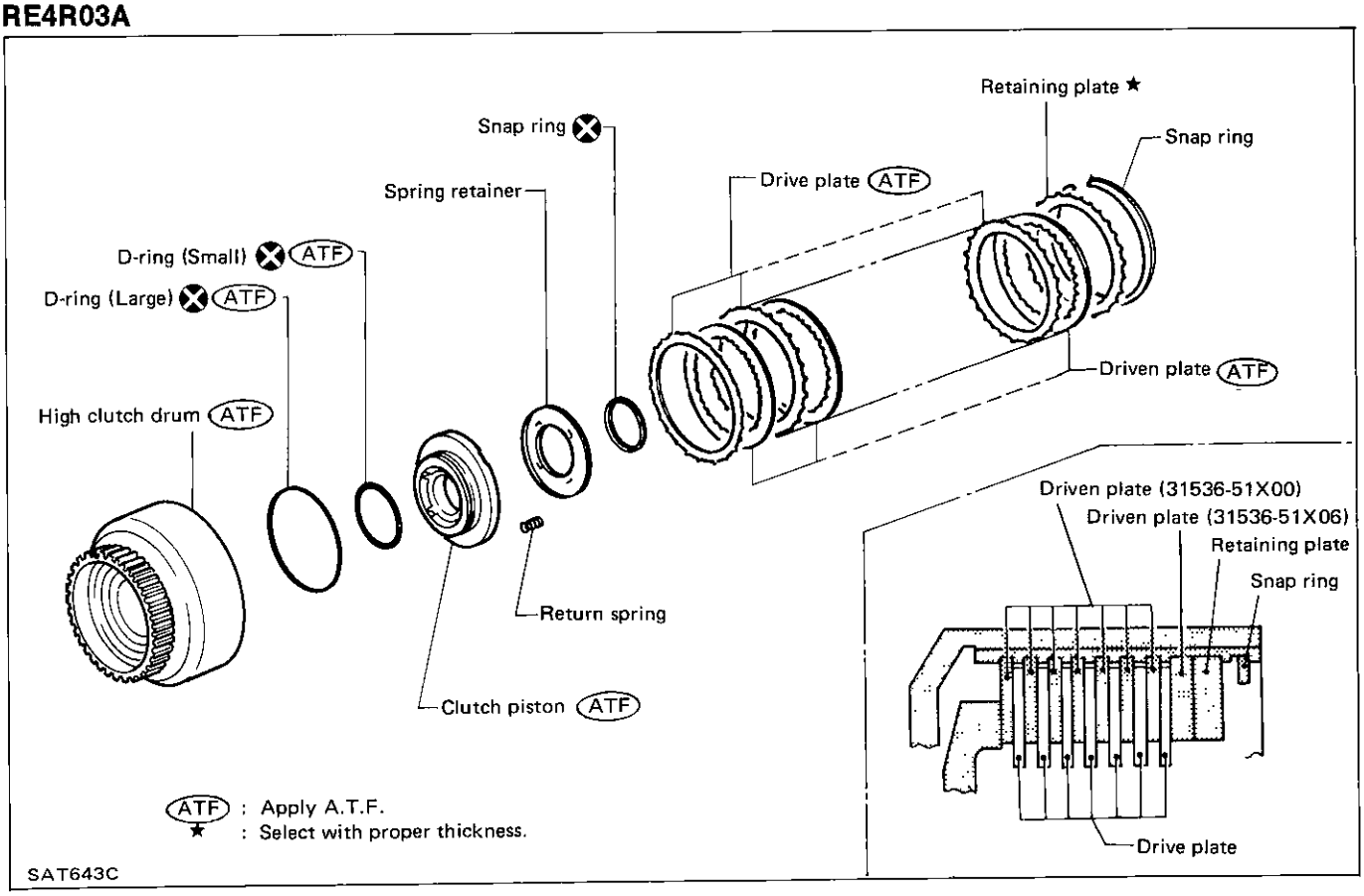

8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch.

## High Clutch

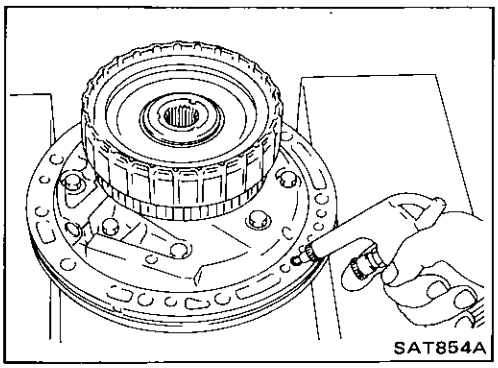
### RE4R01A




### RE4R03A

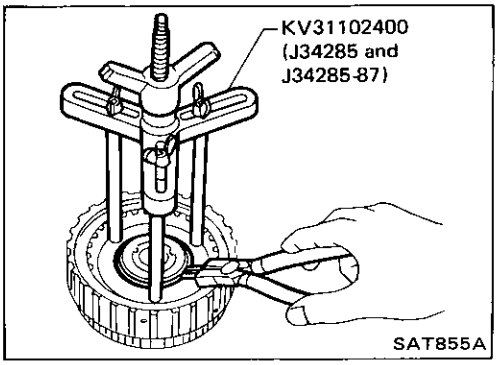


## High Clutch (Cont'd)


SAT854A

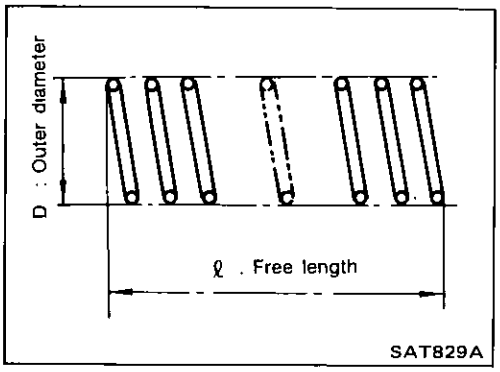
Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

- Check of high clutch operation



SAT855A

- Removal and installation of return spring

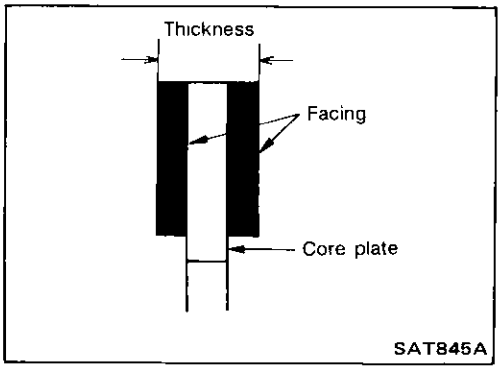


SAT829A

- Inspection of high clutch return springs

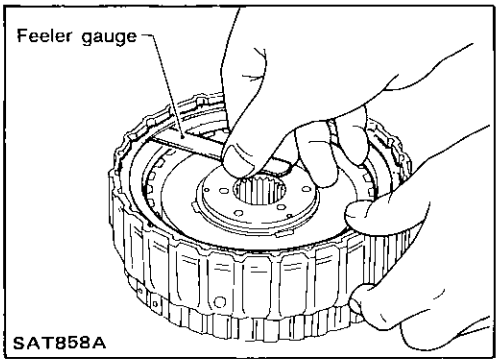
**Inspection standard:** Unit: mm (in)

| Part No. | ℓ | D |
|---|---|---|
| 31505-21X03 | 22.06 (0.8685) | 11.6 (0.457) |



SAT845A

- Inspection of high clutch drive plate
  **Thickness of drive plate:**
  **Standard**
  **1.6 mm (0.063 in)**
  **Wear limit**
  **1.4 mm (0.055 in)**

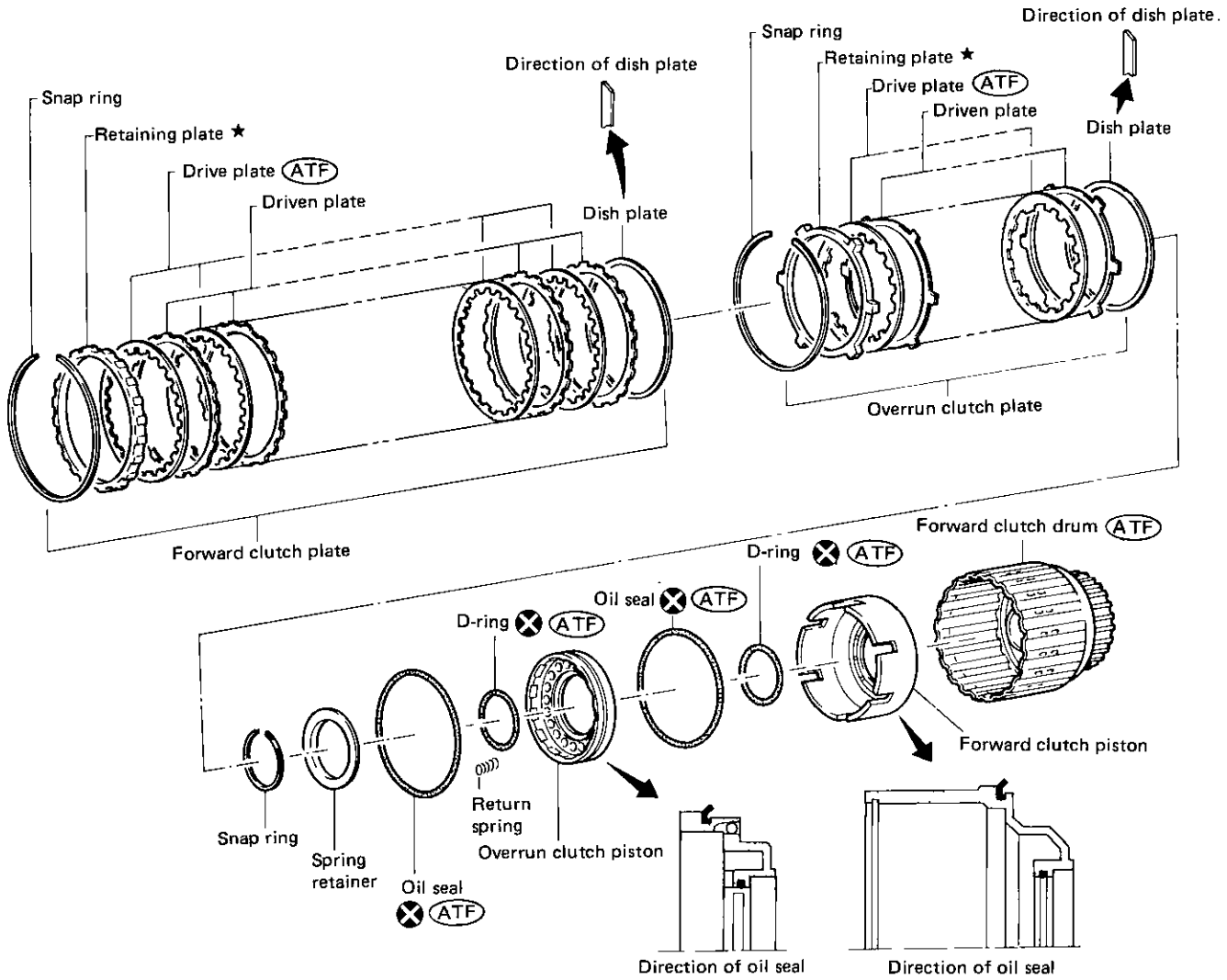


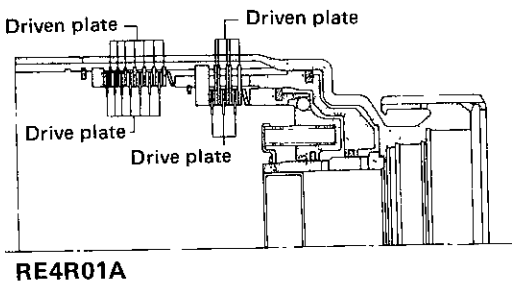
SAT858A

- Measurement of clearance between retaining plate and snap ring
  **Specified clearance:**
  **Standard**
  **1.8 - 2.2 mm (0.071 - 0.087 in)**
  **Allowable limit**
  **3.2 mm (0.126 in) (RE4R01A)**
  **3.0 mm (0.118 in) (RE4R03A)**
  **Retaining plate:**
  **Refer to S.D.S.**

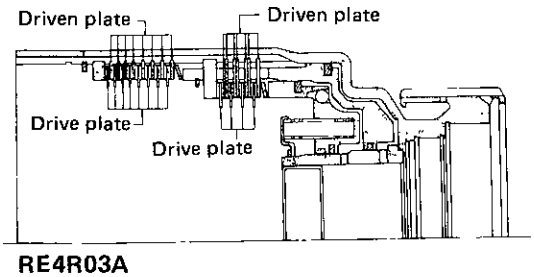
## Forward and Overrun Clutches

**For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.**




RE4R01A

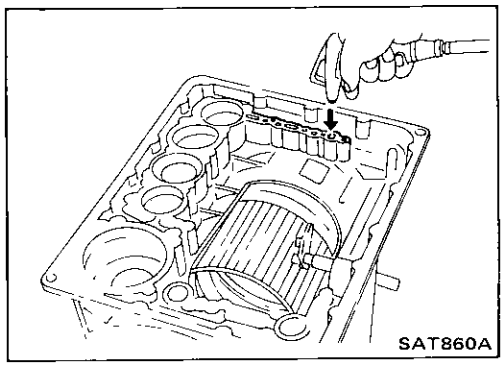



RE4R03A

(ATF): Apply A.T.F.
★ : Select with proper thickness.

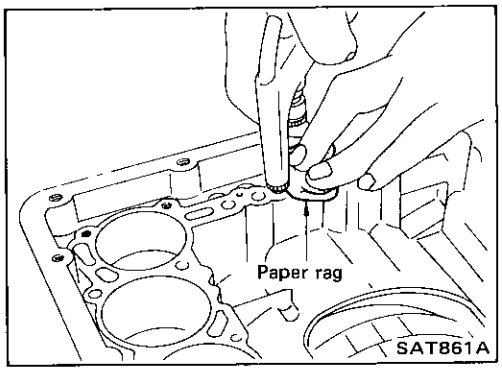
SAT644C

## Forward and Overrun Clutches (Cont'd)


SAT860A

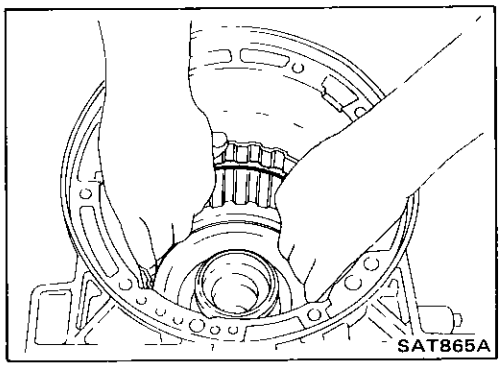
Service procedures for forward and overrun clutches are essentially the same as those for reverse clutch, with the following exception:

- Check of forward clutch operation.

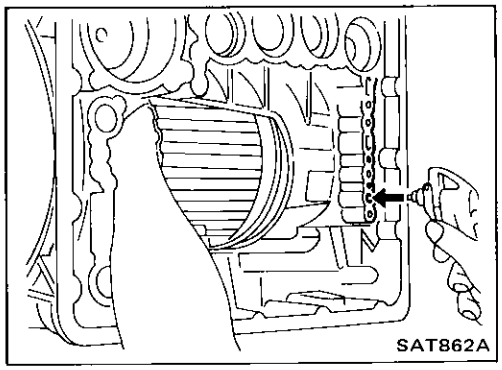


SAT861A

- Check of overrun clutch operation.

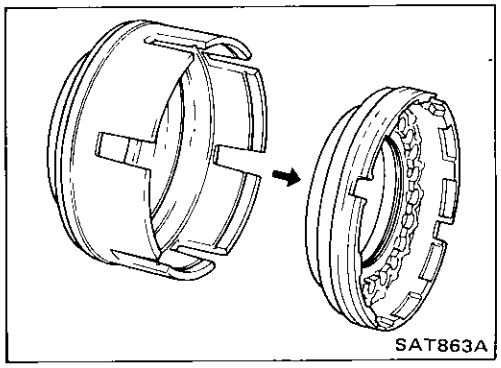

SAT865A

- Removal of forward clutch drum
  Remove forward clutch drum from transmission case by holding snap ring.


SAT862A

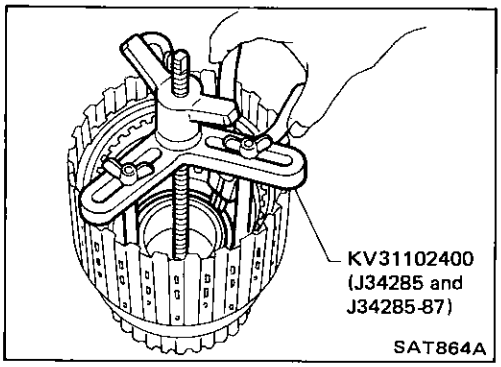
- Removal of forward clutch and overrun clutch pistons

1. While holding overrun clutch piston, gradually apply compressed air to oil hole.

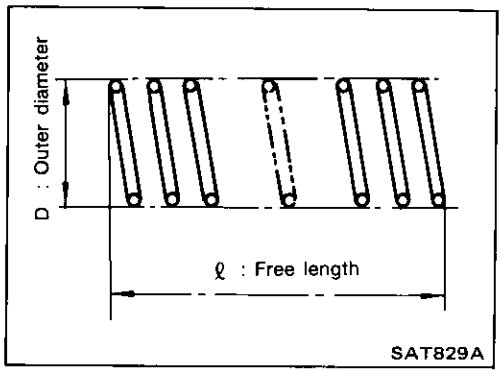

SAT863A

2. Remove overrun clutch from forward clutch.

## Forward and Overrun Clutches (Cont'd)




- Removal and installation of return springs

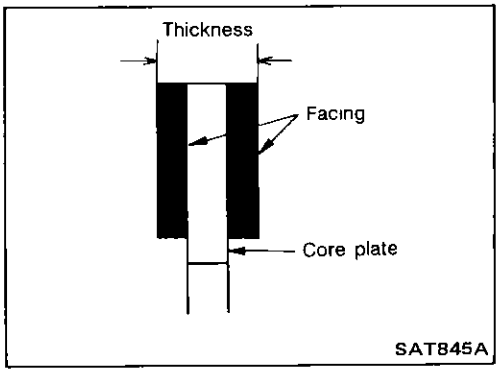



- Inspection of forward clutch and overrun clutch return springs

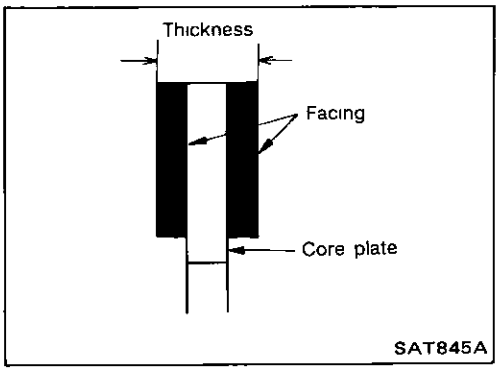
**Inspection standard:**

Unit: mm (in)

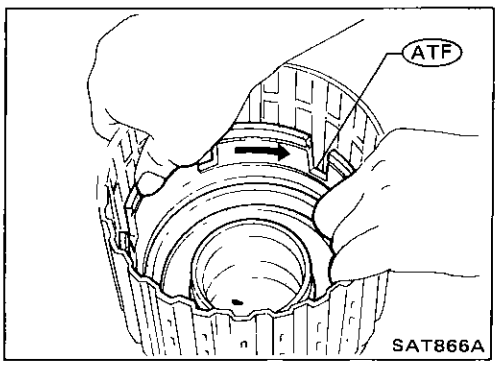
| Model | Part No. | ℓ | D |
|---|---|---|---|
| RE4R01A | 31505-41X01 | 35.77 (1.4083) | 9.7 (0.382) |
| RE4R03A | 31505-51X04 | 36.8 (1.449) | 9.8 (0.386) |




- Inspection of forward clutch drive plates
  - **Thickness of drive plate:**
    - **Standard**
      - **1.6 mm (0.063 in) (RE4R01A)**
      - **2.0 mm (0.079 in) (RE4R03A)**
    - **Wear limit**
      - **1.4 mm (0.055 in) (RE4R01A)**
      - **1.8 mm (0.071 in) (RE4R03A)**




- Inspection of overrun clutch drive plates
  - **Thickness of drive plate:**
    - **Standard**
      - **2.0 mm (0.079 in) (RE4R01A)**
      - **1.6 mm (0.063 in) (RE4R03A)**
    - **Wear limit**
      - **1.8 mm (0.071 in) (RE4R01A)**
      - **1.4 mm (0.055 in) (RE4R03A)**

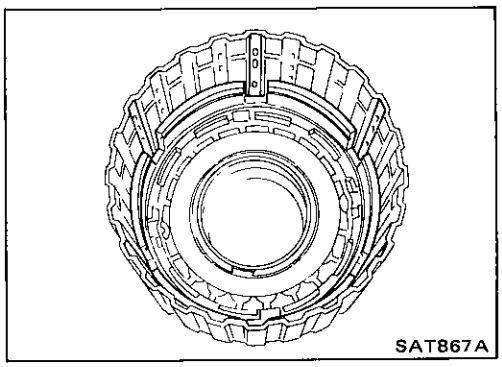



- Installation of forward clutch piston and overrun clutch piston

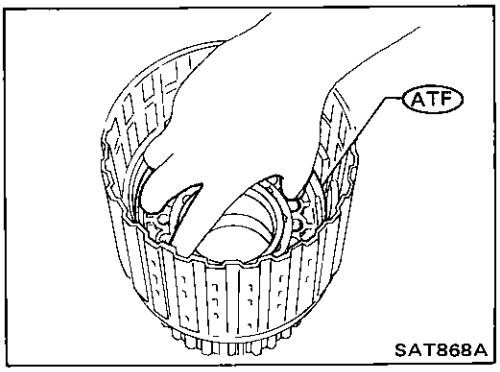
1. Install forward clutch piston by turning it slowly and evenly.

- **Apply A.T.F. to inner surface of clutch drum.**

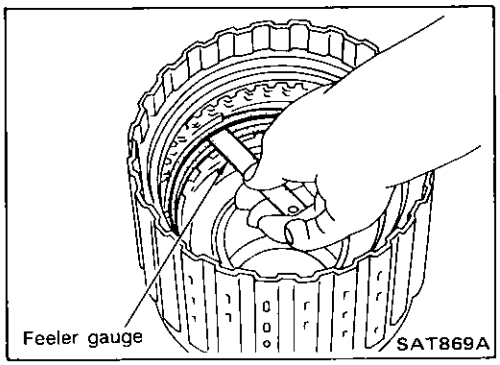
## Forward and Overrun Clutches (Cont'd)




- **Align notch in forward clutch piston with groove in forward clutch drum.**

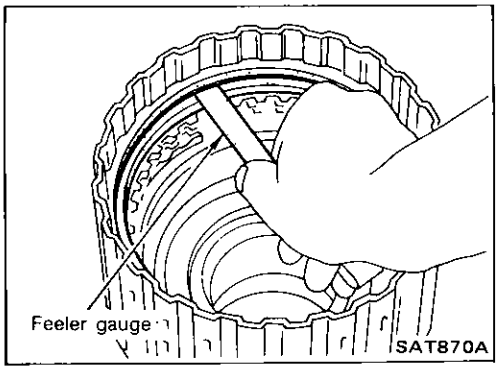



2. Install overrun clutch by turning it slowly and evenly.
- **Apply A.T.F. to inner surface of forward clutch piston.**




- Measurement of clearance between retaining plate and snap ring of overrun clutch

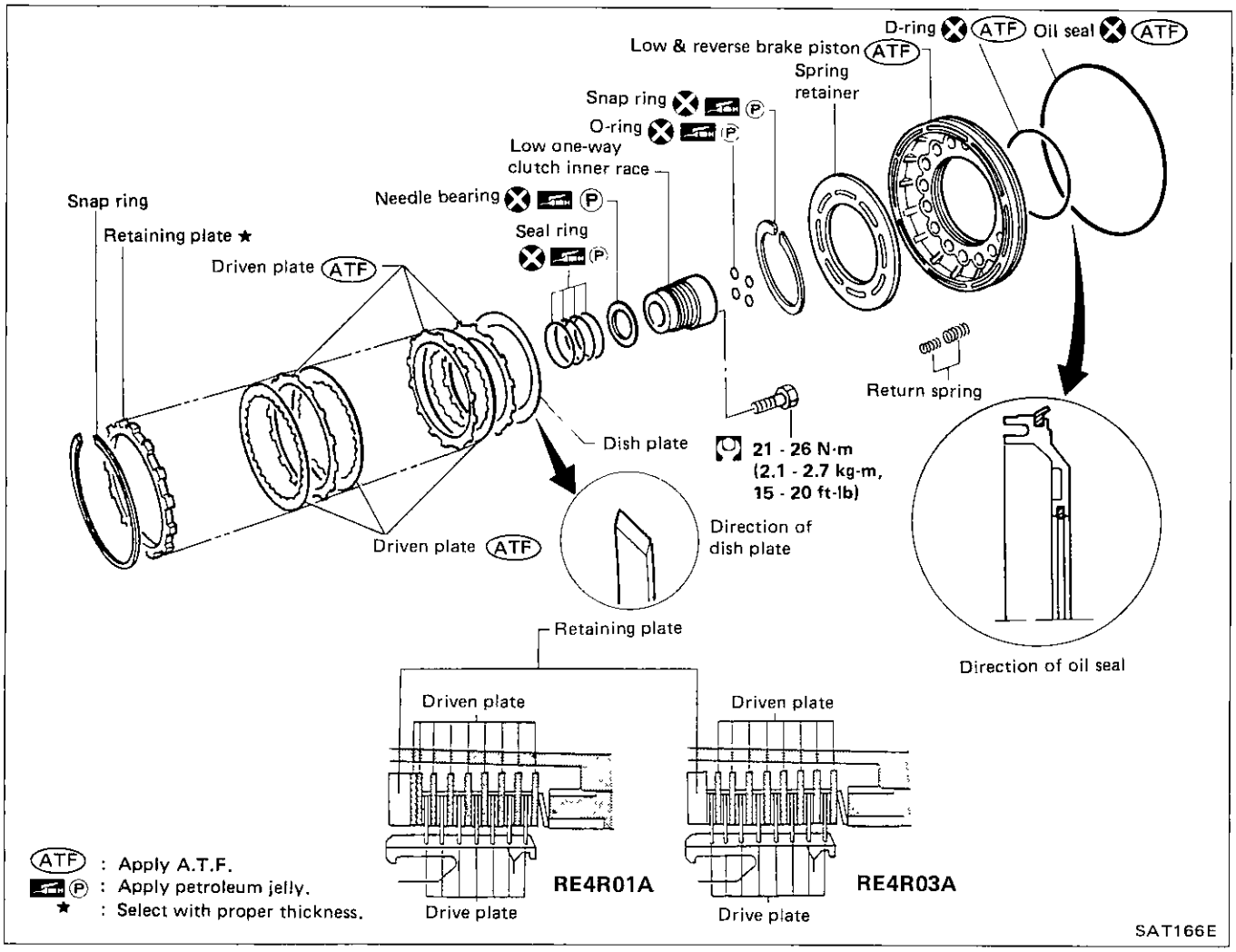
**Specified clearance:**
**Standard**
**1.0 - 1.4 mm (0.039 - 0.055 in)**
**Allowable limit**
**2.0 mm (0.079 in) (RE4R01A)**
**2.2 mm (0.087 in) (RE4R03A)**
**Retaining plate:**
**Refer to S.D.S.**

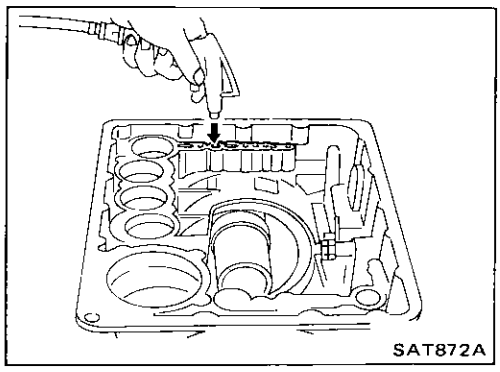


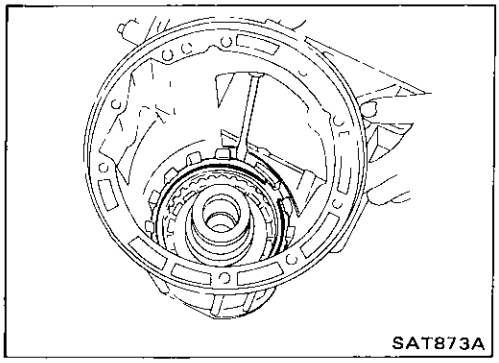

- Measurement of clearance between retaining plate and snap ring of forward clutch

**Specified clearance:**
**Standard**
**0.45 - 0.85 mm (0.0177 - 0.0335 in)**
**Allowable limit**
**2.25 mm (0.0886 in) (RE4R01A)**
**2.45 mm (0.0965 in) (RE4R03A)**
**Retaining plate:**
**Refer to S.D.S.**

## Low & Reverse Brake



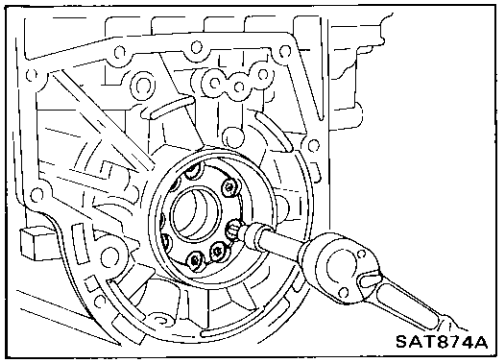




### DISASSEMBLY

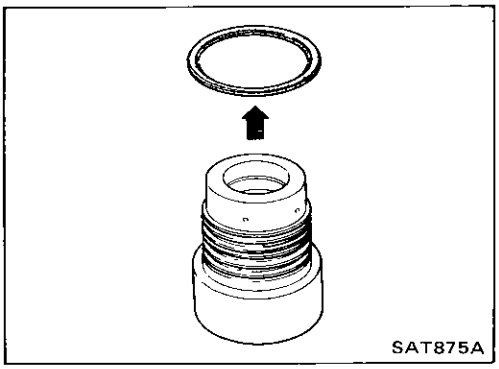
1. Check operation of low and reverse brake.
a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

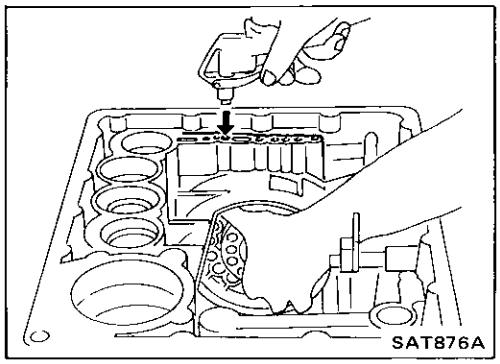
## Low & Reverse Brake (Cont'd)




3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.




4. Remove seal rings from low one-way clutch inner race.
5. Remove needle bearing from low one-way clutch inner race.

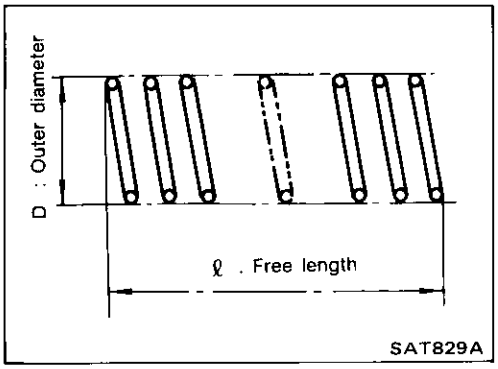



6. Remove low and reverse brake piston using compressed air.
7. Remove oil seal and D-ring from piston.

### INSPECTION

**Low and reverse brake snap ring and spring retainer**

- Check for deformation, or damage.



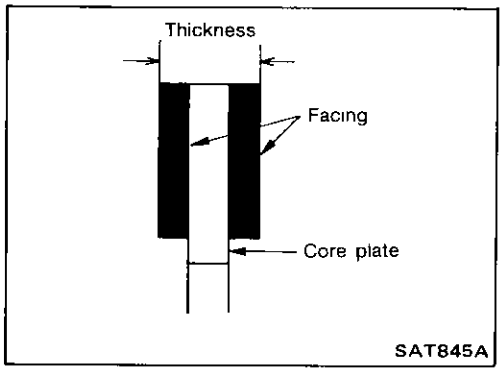

**Low and reverse brake return springs**

- Check for deformation or damage. Also measure free length and outside diameter.

**Inspection standard:** Unit: mm (in)

| Model | Part No. | ℓ | D |
|---|---|---|---|
| RE4R01A | 31521-21X00 | 23.7 (0.933) | 11.6 (0.457) |
| RE4R03A | 31505-51X06 (Inner) | 20.43 (0.8043) | 10.3 (0.406) |
| | 31505-51X05 (Outer) | 20.35 (0.8012) | 13.0 (0.512) |

## Low & Reverse Brake (Cont'd)

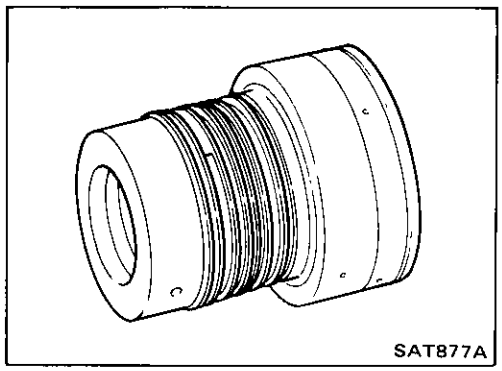



**Low and reverse brake drive plates**

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

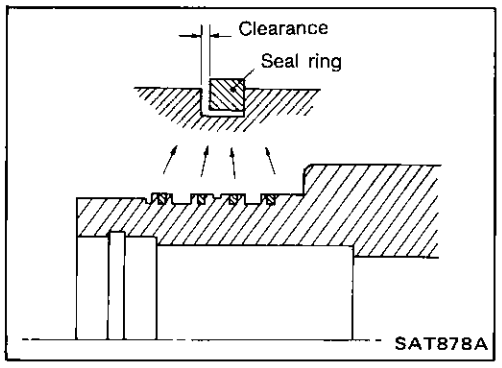
**Thickness of drive plate:**
**Standard value**
**2.0 mm (0.079 in) (RE4R01A)**
**1.6 mm (0.063 in) (RE4R03A)**
**Wear limit**
**1.8 mm (0.071 in) (RE4R01A)**
**1.4 mm (0.055 in) (RE4R03A)**

- If not within wear limit, replace.




**Low one-way clutch inner race**

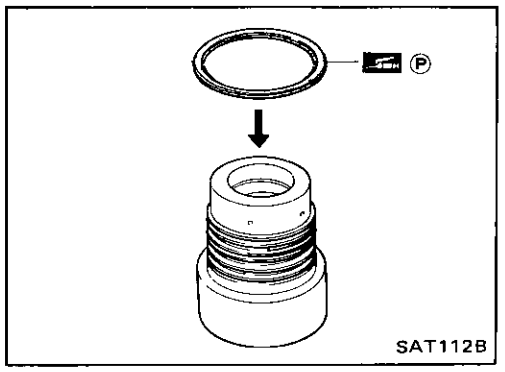
- Check frictional surface of inner race for wear or damage.




- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.

**Inspection standard:**
**Standard value: 0.10 - 0.25 mm (0.0039 - 0.0098 in)**
**Allowable limit: 0.25 mm (0.0098 in)**

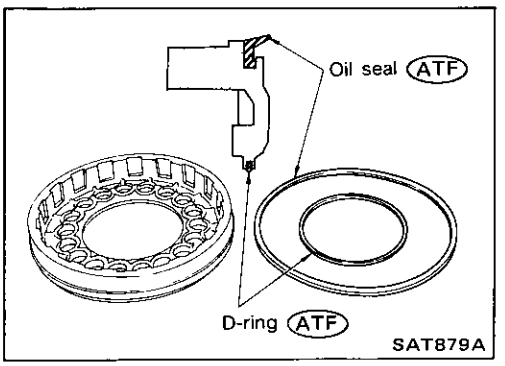
- If not within allowable limit, replace low one-way clutch inner race.




### ASSEMBLY

1. Install bearing onto one-way clutch inner race.

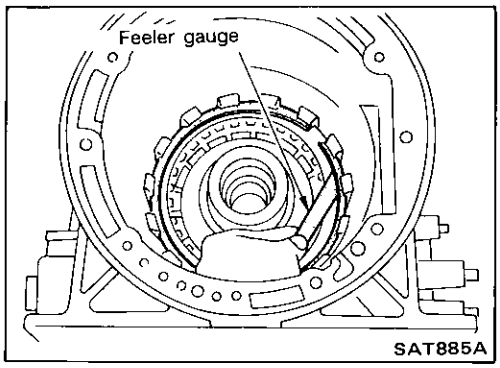
- **Pay attention to its direction — Black surface goes to rear side.**
- **Apply petroleum jelly to needle bearing.**




2. Install oil seal and D-ring onto piston.

- **Apply A.T.F. to oil seal and D-ring.**

## Low & Reverse Brake (Cont'd)




8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

**Specified clearance:**

**Standard**

**1.1 - 1.5 mm (0.043 - 0.059 in)**

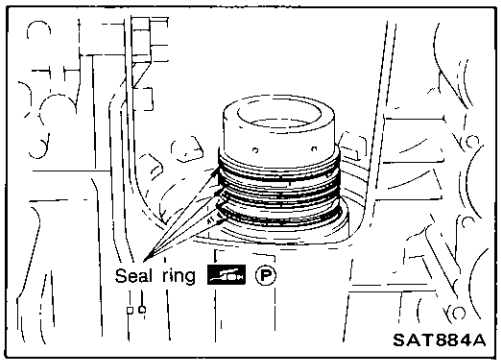
**Allowable limit**

**2.9 mm (0.114 in) (RE4R01A)**

**3.1 mm (0.122 in) (RE4R03A)**

**Retaining plate:**

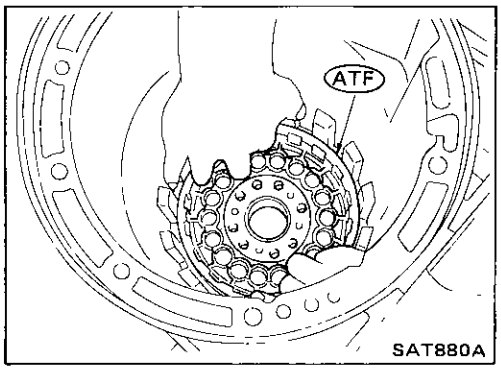
**Refer to S.D.S.**



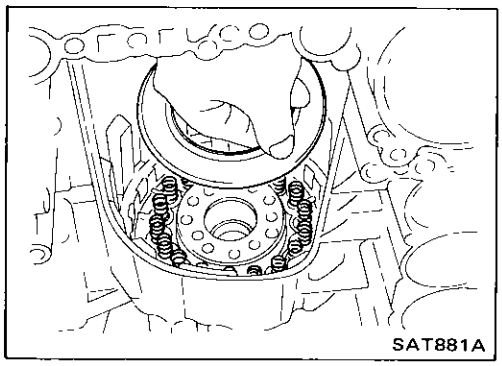

9. Install low one-way clutch inner race seal ring.

- **Apply petroleum jelly to seal ring.**
- **Make sure seal rings are pressed firmly into place and held by petroleum jelly.**

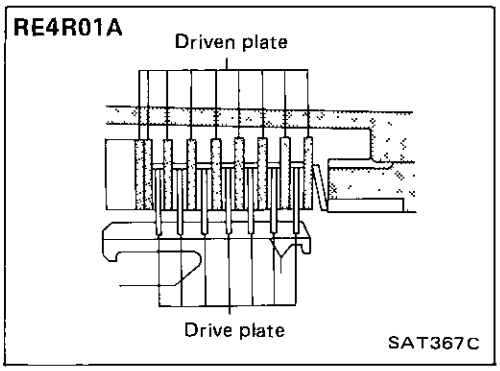
## Low & Reverse Brake (Cont'd)



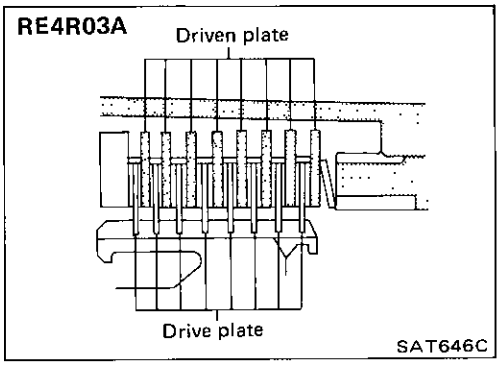

3. Install piston by rotating it slowly and evenly.
- **Apply A.T.F. to inner surface of transmission case.**

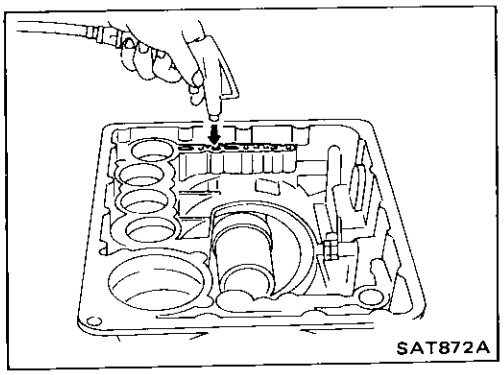



4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.



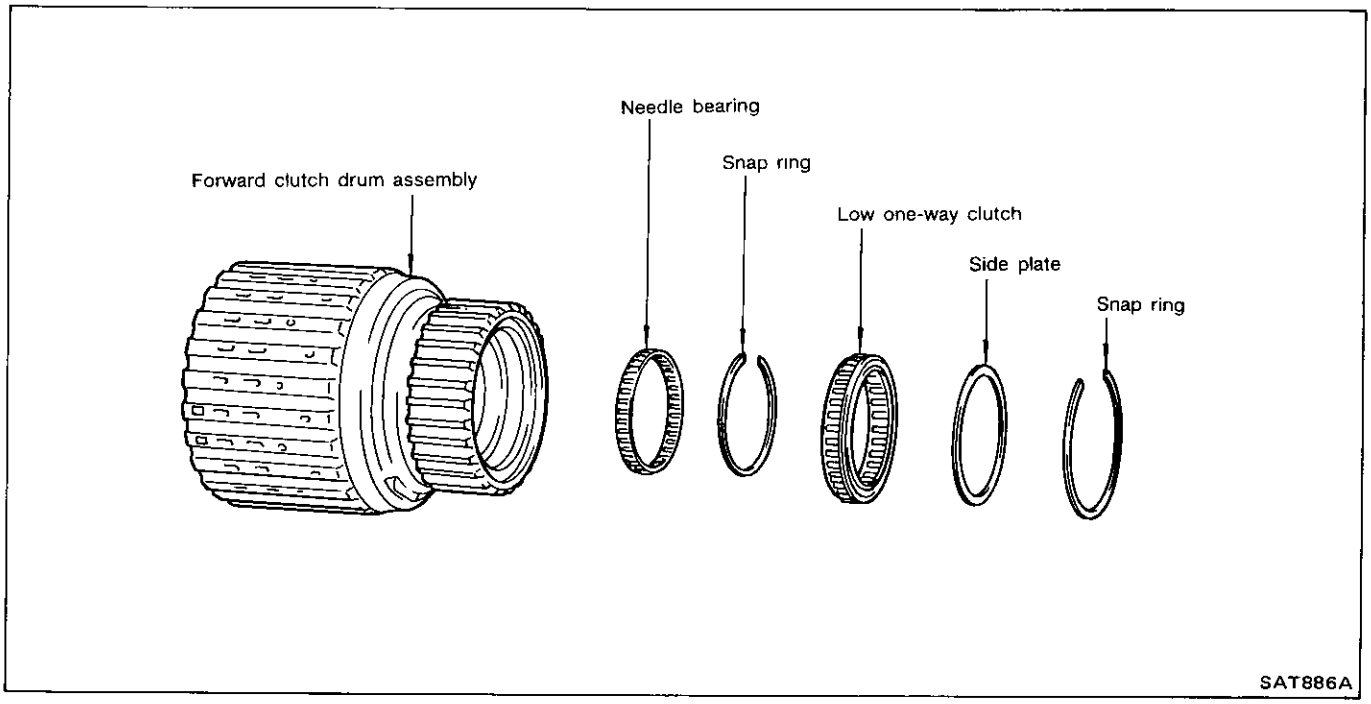

5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.
- **Two types of drive plates are used on the RE4R03A transmission. One type uses a "waving" design and the other type uses a "flat" design. Either one can be installed first since they are interchangeable.**
6. Install snap ring on transmission case.

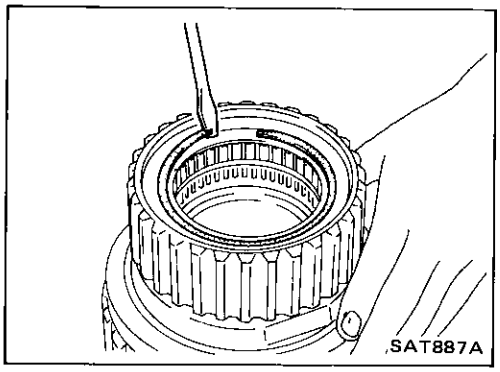



7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY".

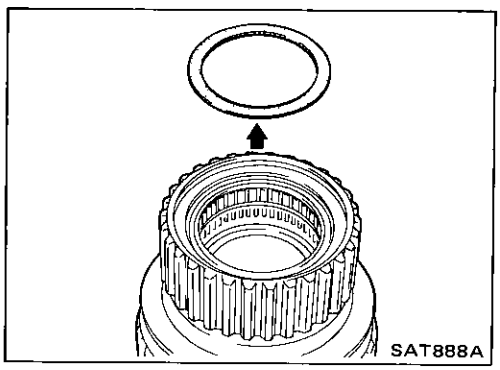
## Forward Clutch Drum Assembly — RE4R01A



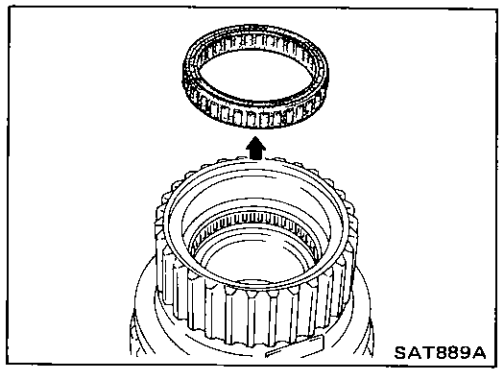




### DISASSEMBLY

1. Remove snap ring from forward clutch drum.

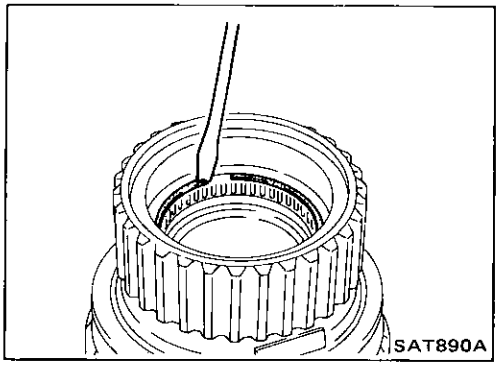



2. Remove side plate from forward clutch drum.

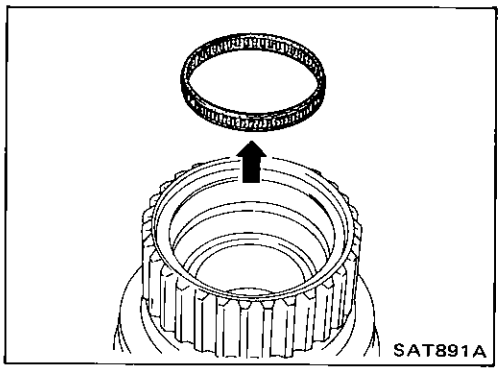



3. Remove low one-way clutch from forward clutch drum.

## Forward Clutch Drum Assembly — RE4R01A (Cont'd)


SAT890A

4. Remove snap ring from forward clutch drum.

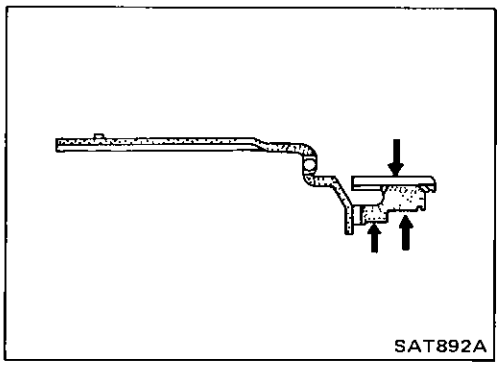

SAT891A

5. Remove needle bearing from forward clutch drum.

### INSPECTION

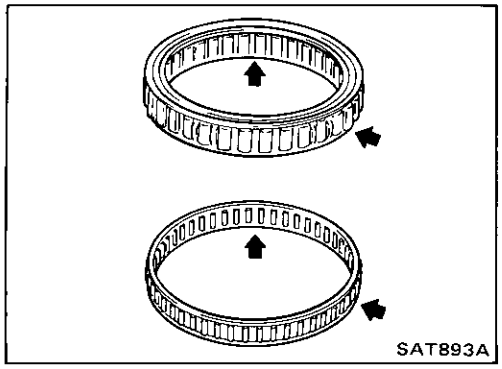
**Forward clutch drum**

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.


SAT892A

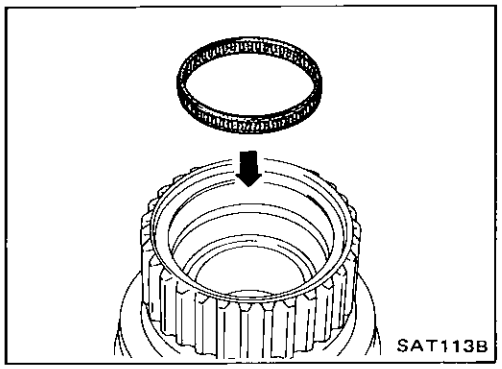
**Needle bearing and low one-way clutch**

- Check frictional surface for wear or damage.

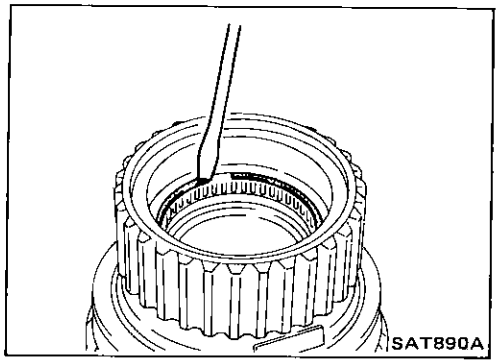

SAT893A

### ASSEMBLY

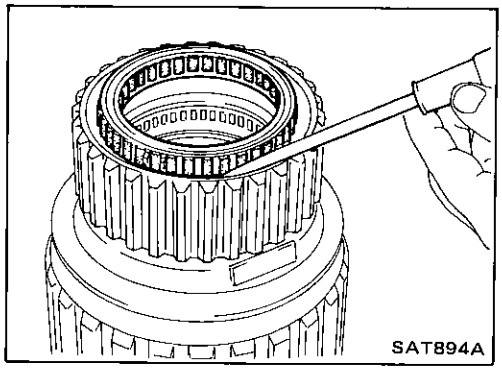
1. Install needle bearing in forward clutch drum.


SAT113B

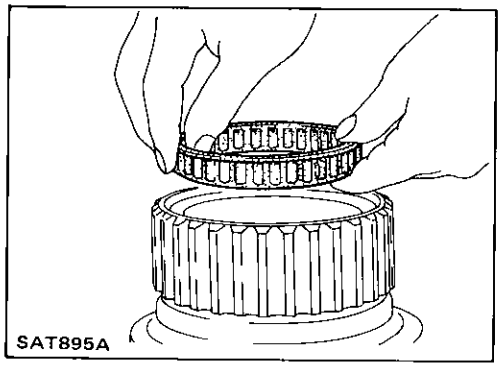
## Forward Clutch Drum Assembly — RE4R01A (Cont'd)


SAT890A

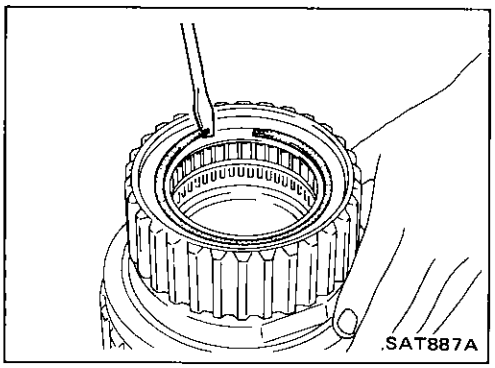
2. Install snap ring onto forward clutch drum.


SAT894A

3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.

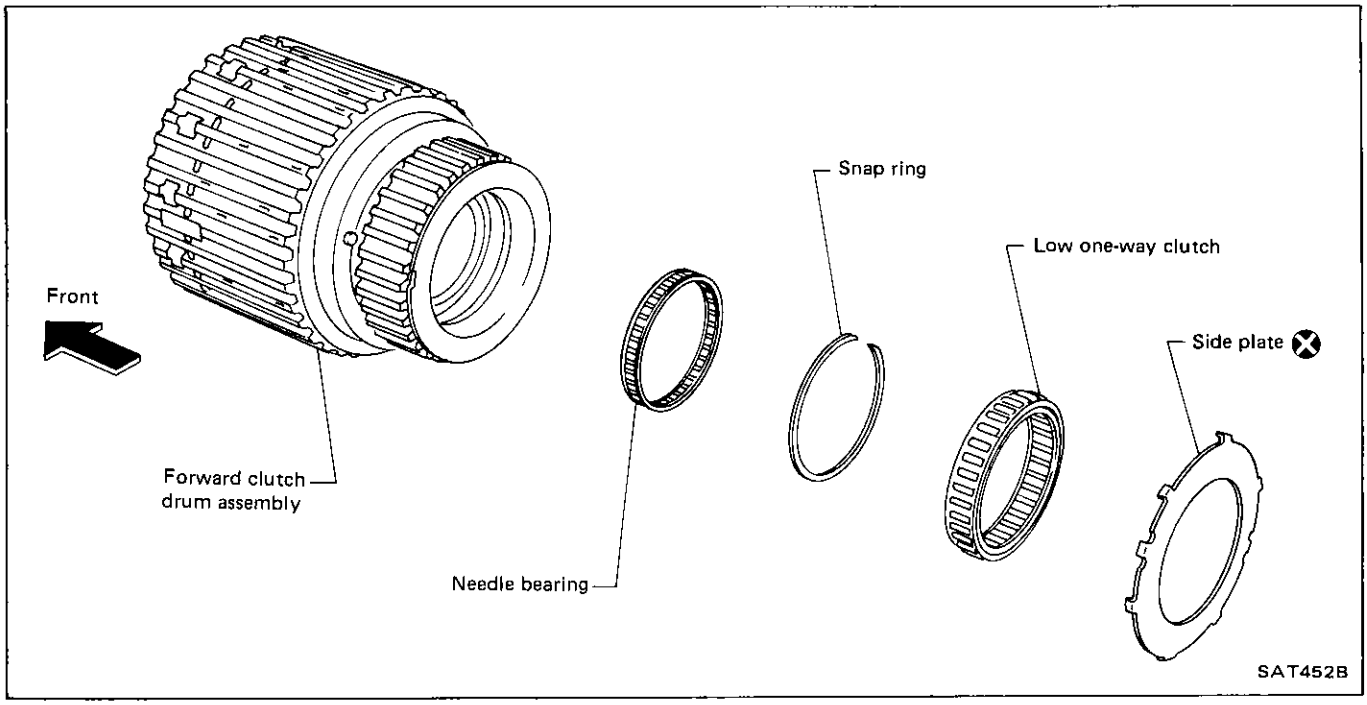

SAT895A

- **Install low one-way clutch with flange facing rearward.**


SAT887A

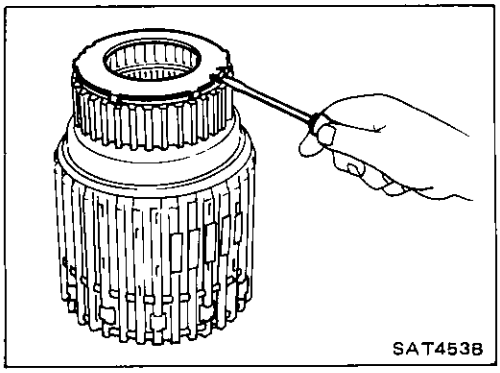
4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

## Forward Clutch Drum Assembly — RE4R03A

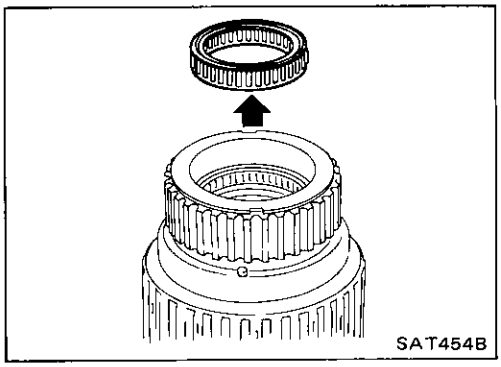



### DISASSEMBLY

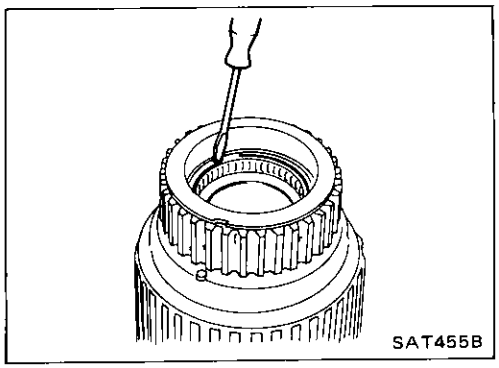
1. Remove side plate from forward clutch drum.



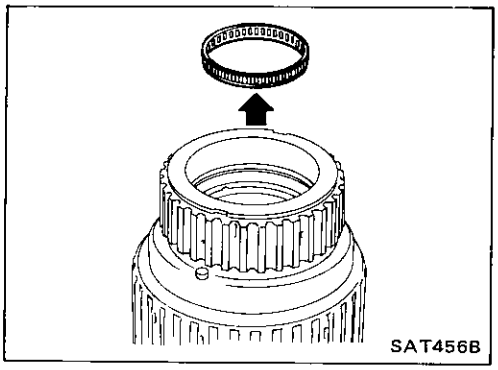

2. Remove low one-way clutch from forward clutch drum.




3. Remove snap ring from forward clutch drum.



## Forward Clutch Drum Assembly — RE4R03A (Cont'd)

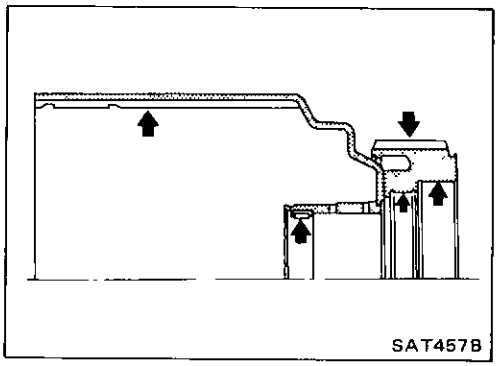

SAT456B

4. Remove needle bearing from forward clutch drum.

### INSPECTION

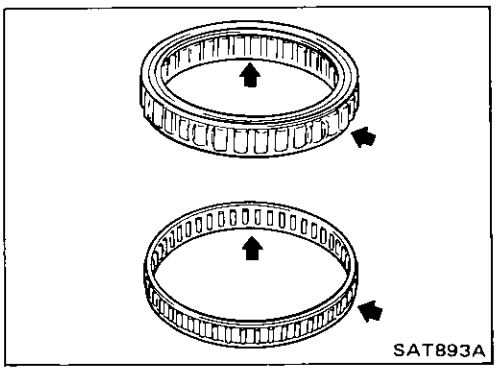
**Forward clutch drum**

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.


SAT457B

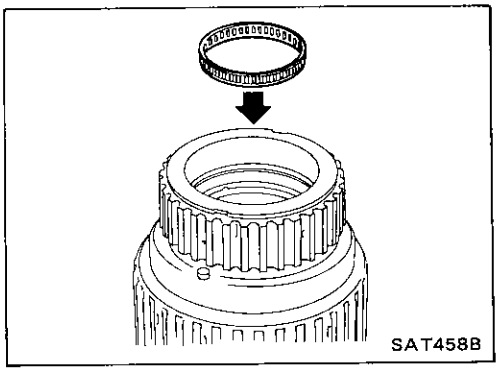
**Needle bearing and low one-way clutch**

- Check frictional surface for wear or damage.

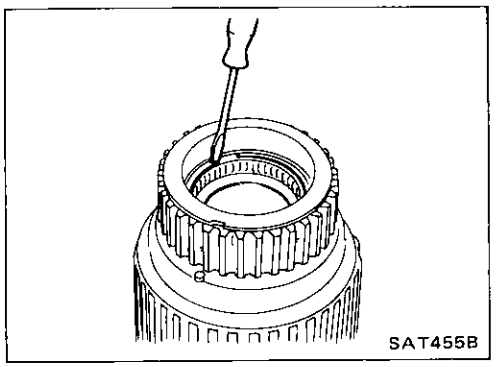

SAT893A

### ASSEMBLY

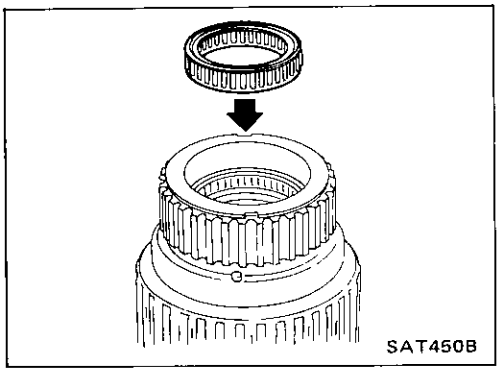
1. Install needle bearing in forward clutch drum.


SAT458B

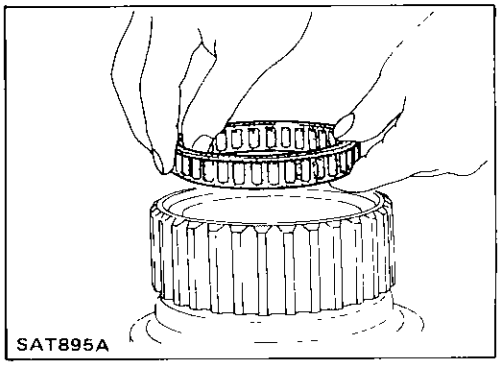
2. Install snap ring onto forward clutch drum.


SAT455B

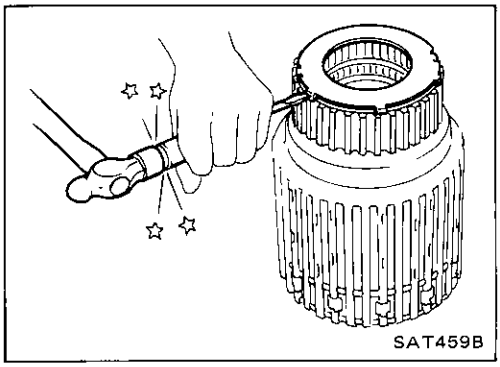
## Forward Clutch Drum Assembly — RE4R03A (Cont'd)




3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.

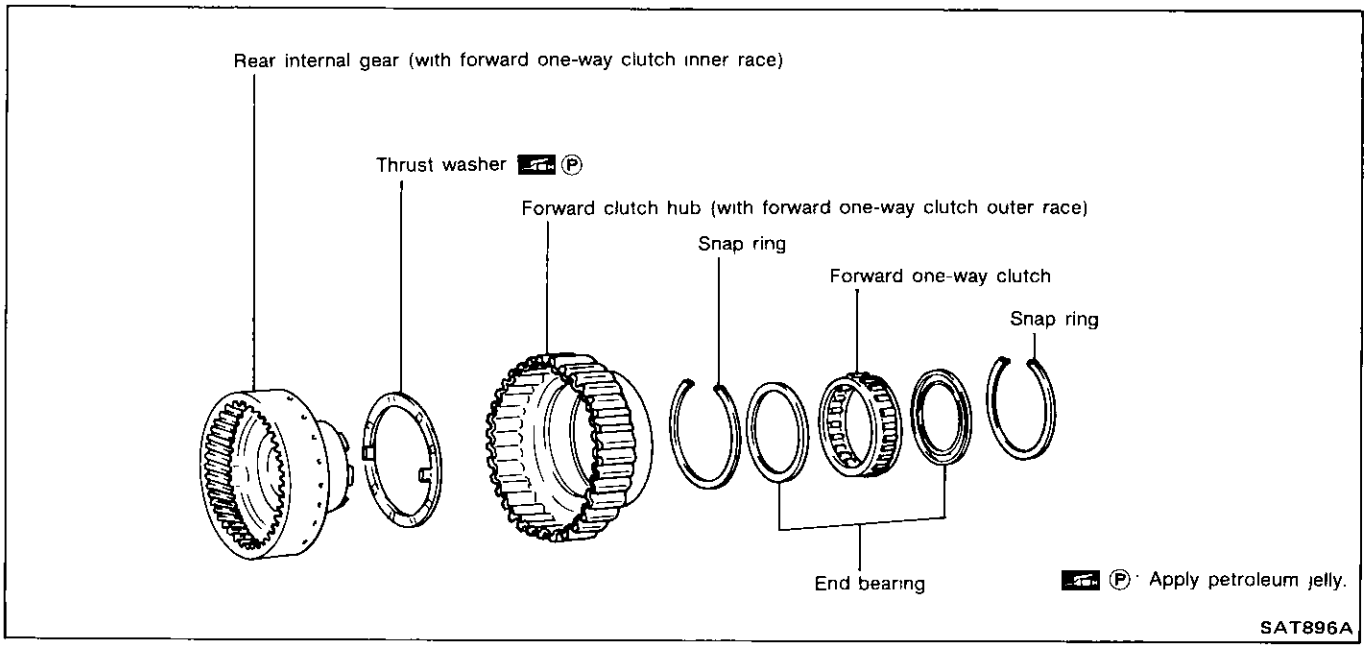


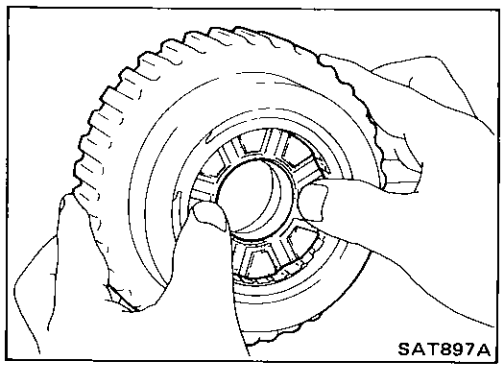

- **Install low one-way clutch with flange facing rearward.**




4. Install side plate onto forward clutch drum.

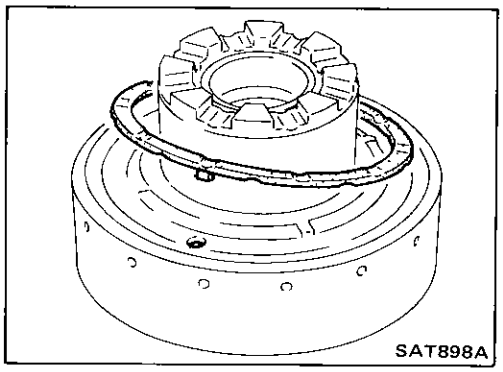
## Rear Internal Gear and Forward Clutch Hub



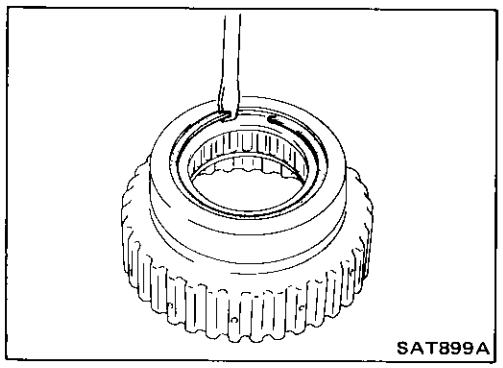




### DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.

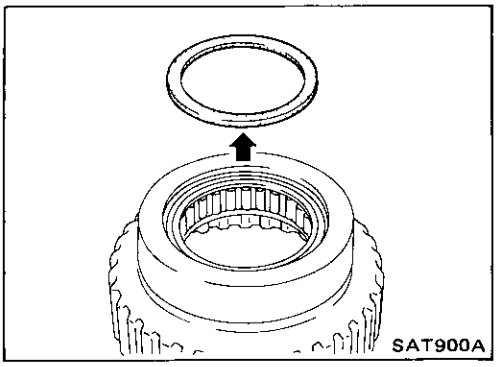



2. Remove thrust washer from rear internal gear.

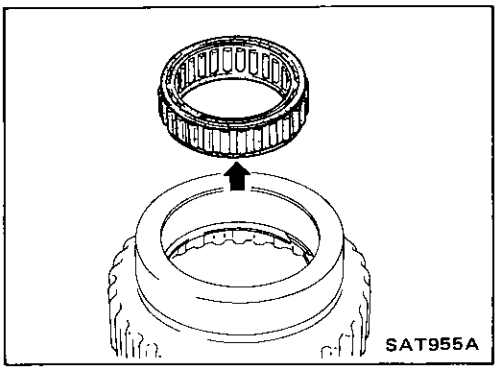



3. Remove snap ring from forward clutch hub.

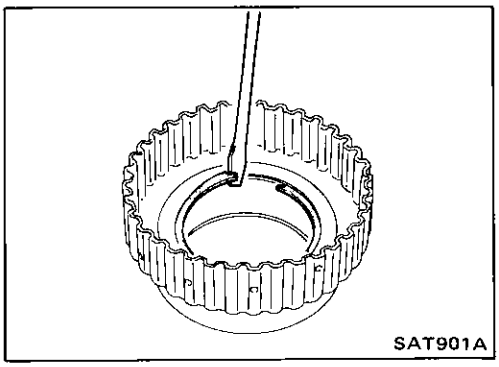
## Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT900A

4. Remove end bearing.


SAT955A

5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.

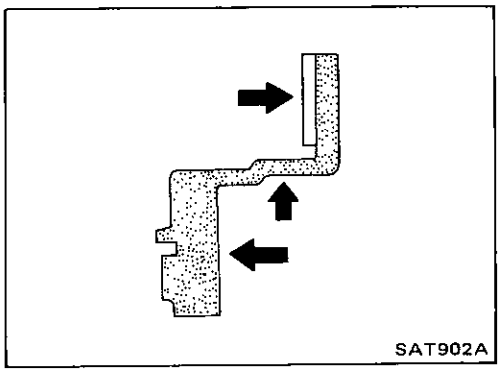

SAT901A

6. Remove snap ring from forward clutch hub.

### INSPECTION

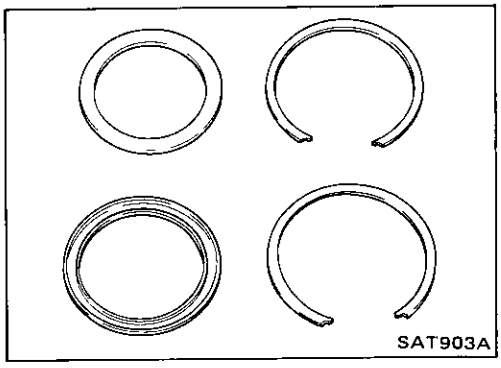
**Rear internal gear and forward clutch hub**

- 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**

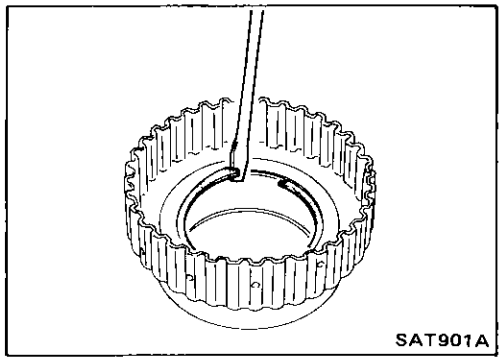
- Check for deformation or damage.


SAT903A

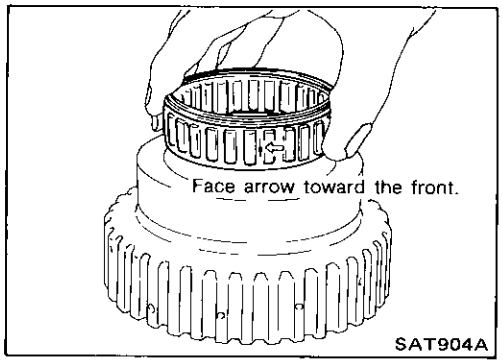
## Rear Internal Gear and Forward Clutch Hub (Cont'd)

### ASSEMBLY

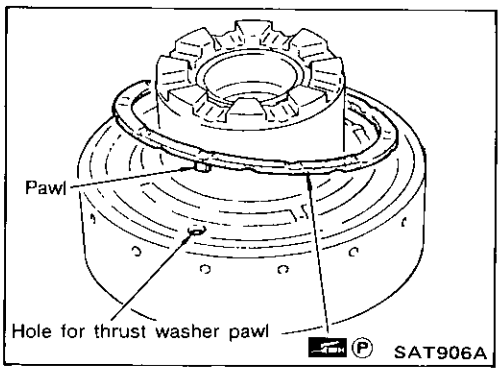
1. Install snap ring onto forward clutch hub.
2. Install end bearing.



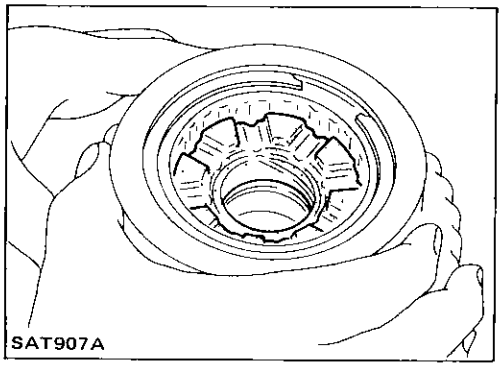

3. Install forward one-way clutch onto clutch hub.
- **Install forward one-way clutch with flange facing rearward.**
4. Install end bearing.
5. Install snap ring onto forward clutch hub.



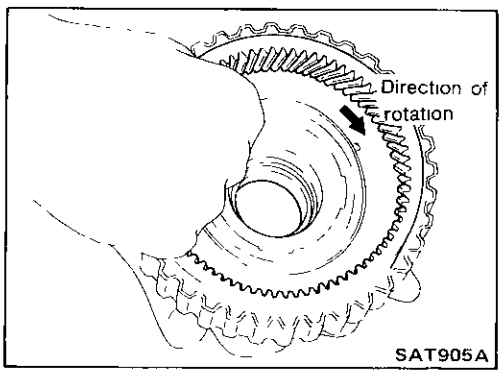

6. Install thrust washer onto rear internal gear.
- **Apply petroleum jelly to thrust washer.**
- **Securely insert pawls of thrust washer into holes in rear internal gear.**



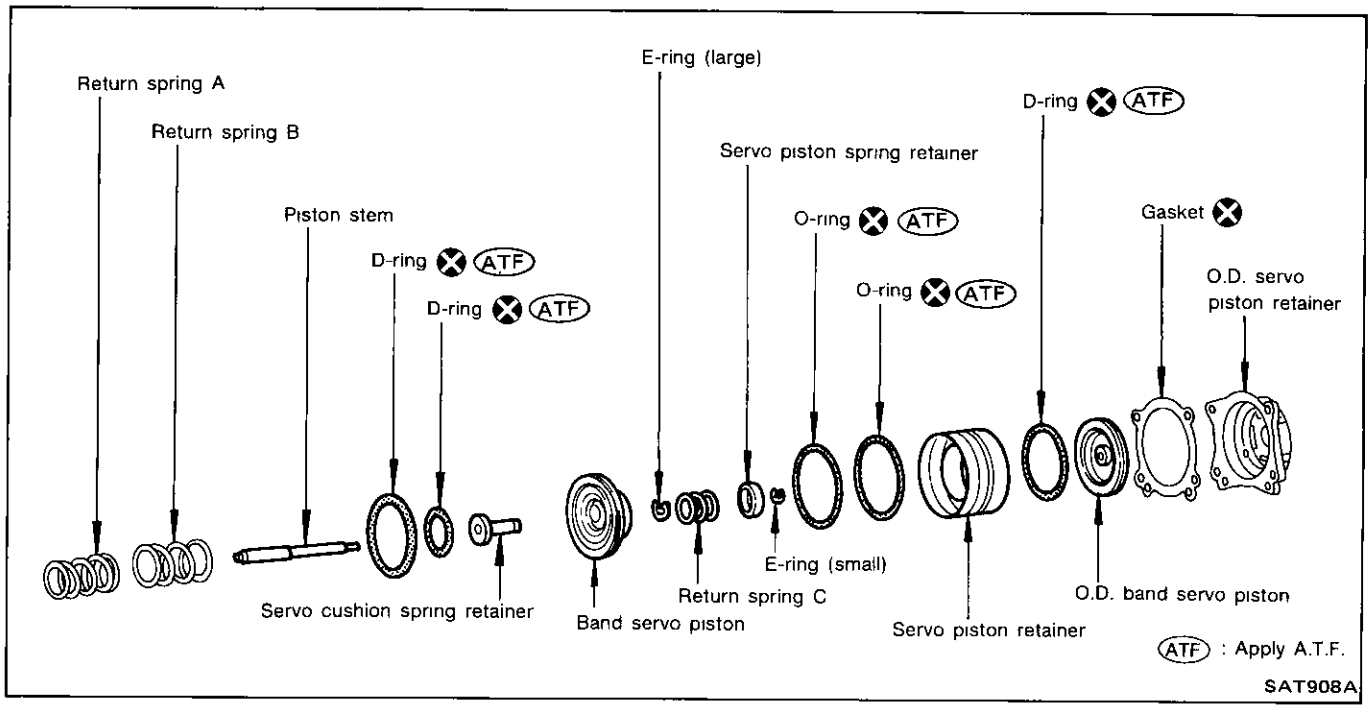

7. Position forward clutch hub in rear internal gear.

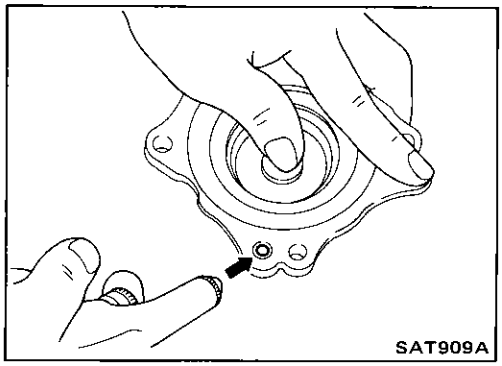



8. After installing, check to assure that forward clutch hub rotates clockwise.



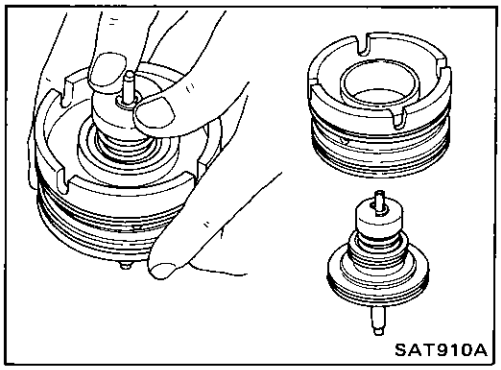
## Band Servo Piston Assembly



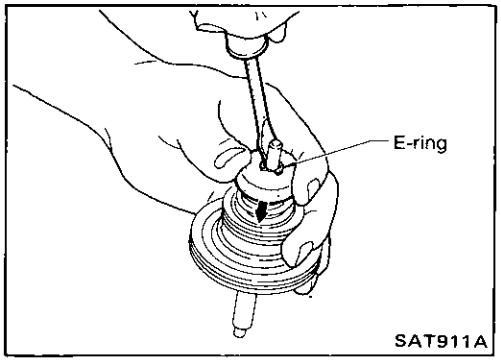




### DISASSEMBLY

1. Block one oil hole in O.D. servo piston retainer and the center hole in O.D. band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove O.D. band servo piston from retainer.
3. Remove D-ring from O.D. band servo piston.

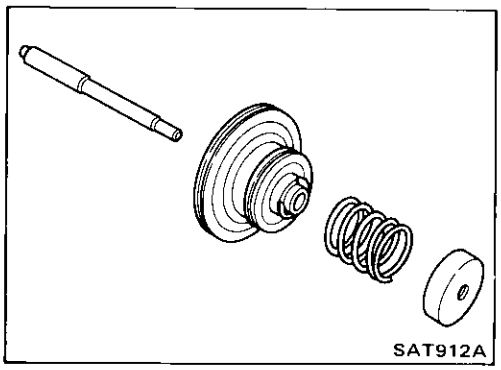



4. Remove band servo piston assembly from servo piston retainer by pushing it forward.

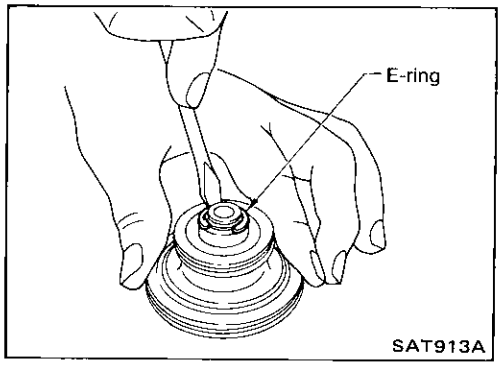



5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

## Band Servo Piston Assembly (Cont'd)

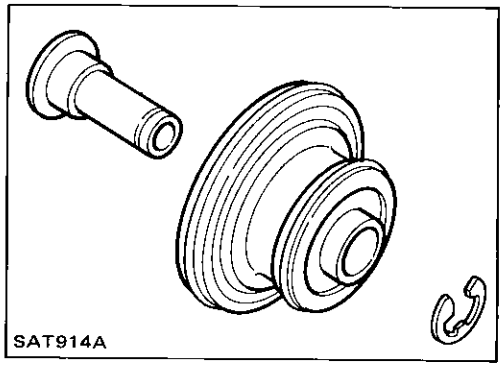

SAT912A

6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.

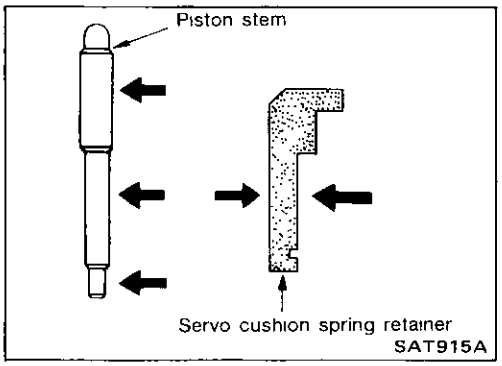


SAT913A

7. Remove E-ring from band servo piston.


SAT914A

8. Remove servo cushion spring retainer from band servo piston.
9. Remove D-rings from band servo piston.
10. Remove O-rings from servo piston retainer.

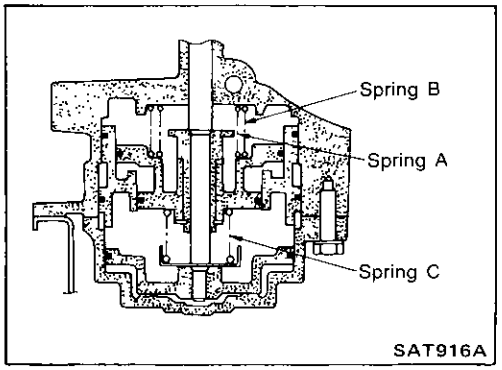


SAT915A

### INSPECTION

**Pistons, retainers and piston stem**

- Check frictional surfaces for abnormal wear or damage.



SAT916A

**Return springs**

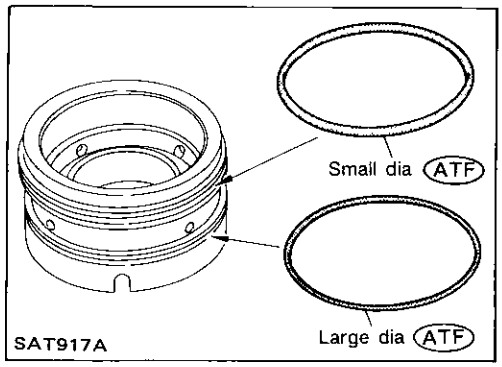
- Check for deformation or damage. Measure free length and outer diameter.

**Inspection standard:** Unit: mm (in)

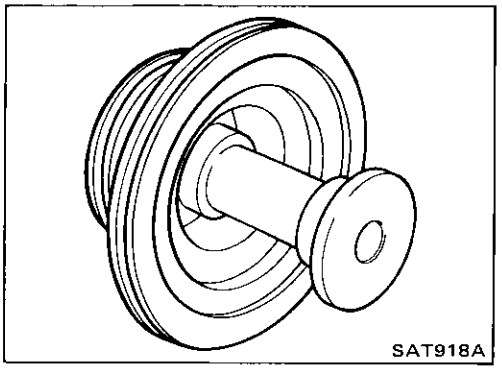
| Parts | Free length | Outer diameter |
|---|---|---|
| Spring A | 45.6 (1.795) | 34.3 (1.350) |
| Spring B | 53.8 (2.118) | 40.3 (1.587) |
| Spring C | 29.7 (1.169) | 27.6 (1.087) |

## Band Servo Piston Assembly (Cont'd)

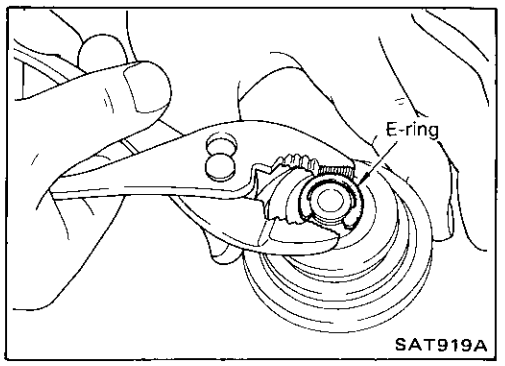
### ASSEMBLY



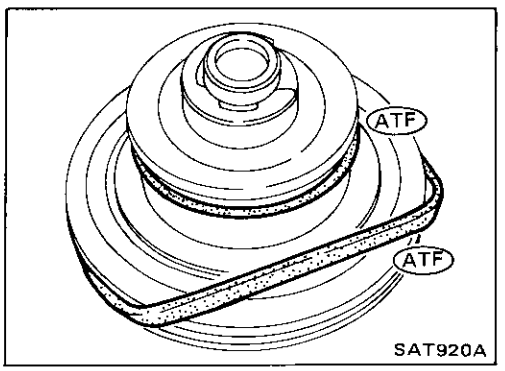

1. Install O-rings onto servo piston retainer.
   - **Apply A.T.F. to O-rings.**
   - **Pay attention to position of each O-ring.**



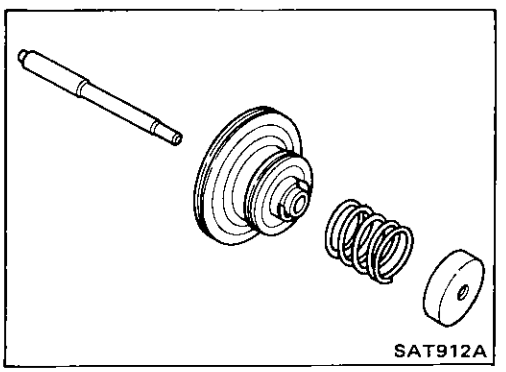

2. Install servo cushion spring retainer onto band servo piston.




3. Install E-ring onto servo cushion spring retainer.

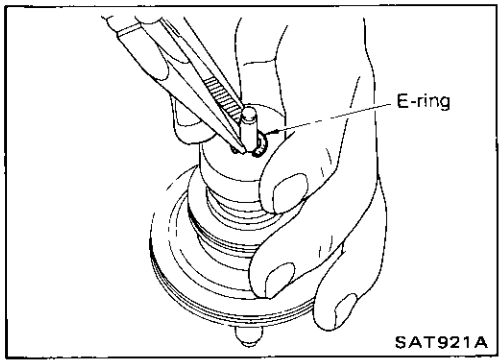



4. Install D-rings onto band servo piston.
   - **Apply A.T.F. to D-rings.**

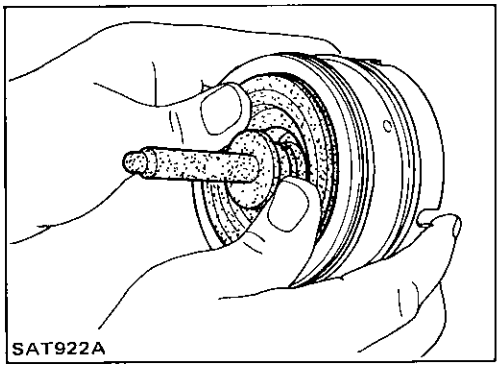



5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.

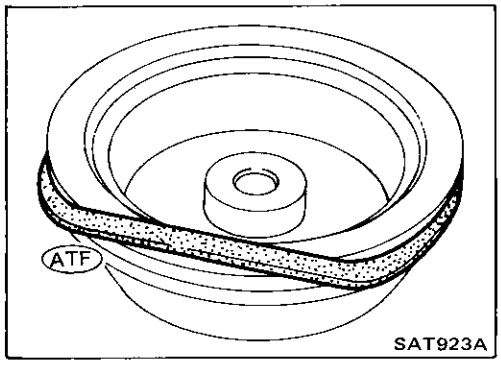
## Band Servo Piston Assembly (Cont'd)



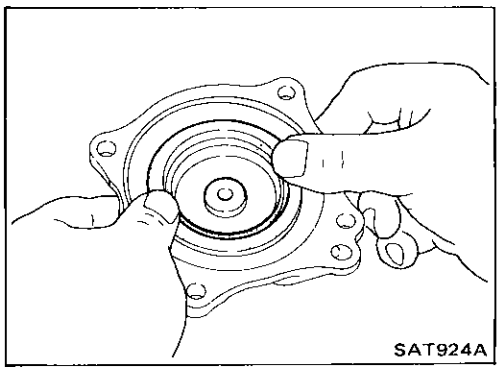

6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.




7. Install band servo piston assembly onto servo piston retainer by pushing it inward.

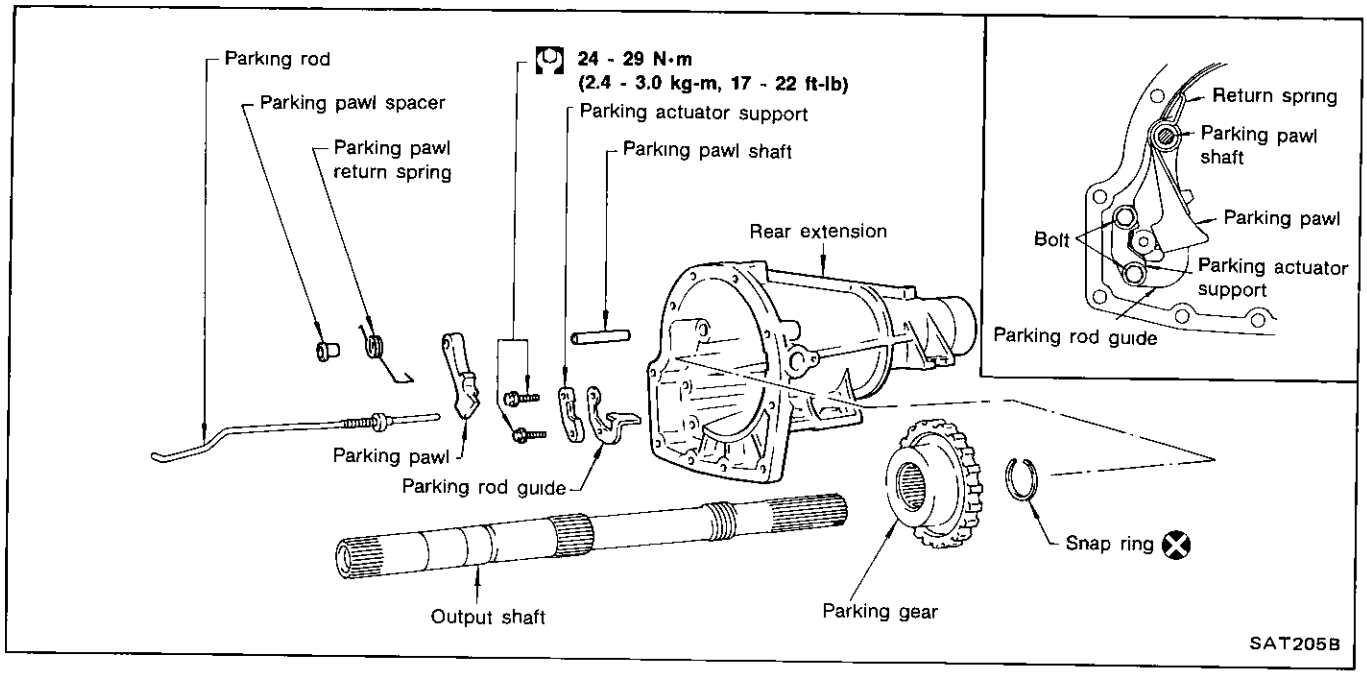


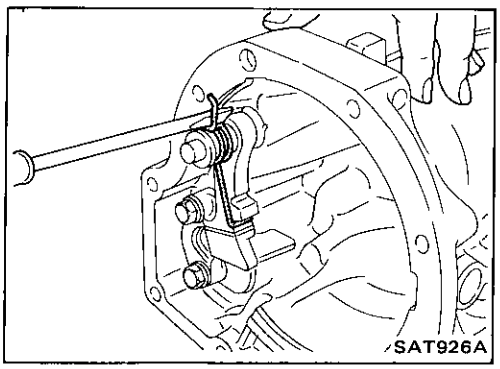

8. Install D-ring on O.D. band servo piston.
- **Apply A.T.F. to D-ring.**




9. Install O.D. band servo piston onto servo piston retainer by pushing it inward.

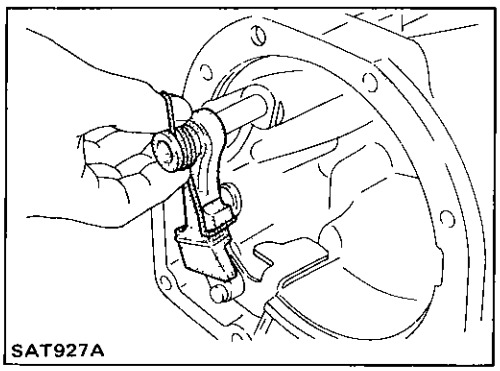
## Parking Pawl Components



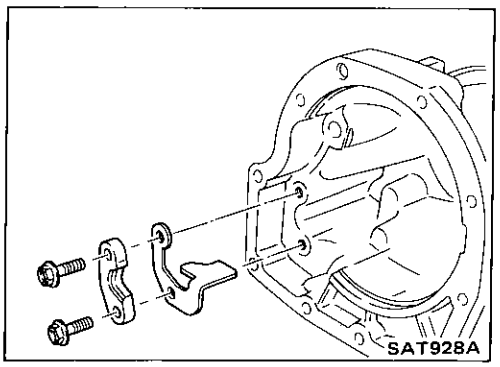




### DISASSEMBLY

1. Slide return spring to the front of rear extension flange.




2. Remove return spring, pawl spacer and parking pawl from rear extension.
3. Remove parking pawl shaft from rear extension.



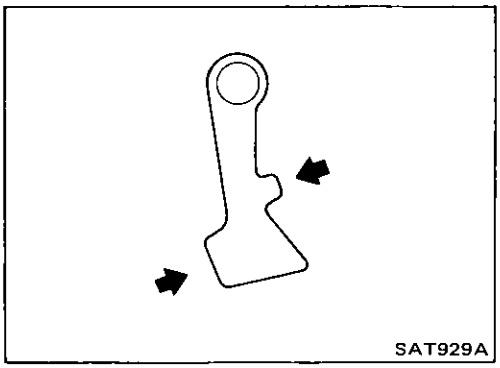

4. Remove parking actuator support and rod guide from rear extension.

## Parking Pawl Components (Cont'd)

### INSPECTION

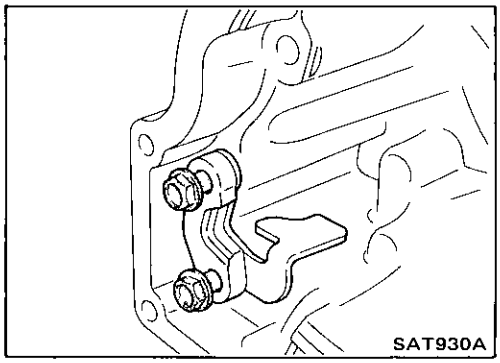
**Parking pawl and parking actuator support**

- Check contact surface of parking rod for wear.

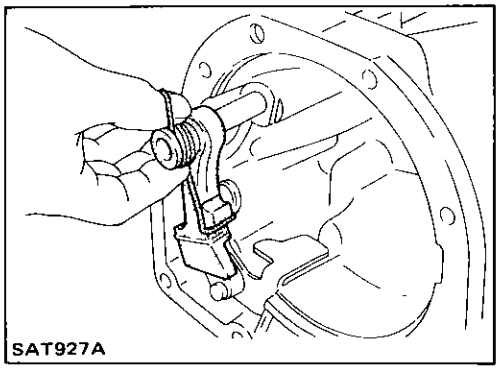

SAT929A

### ASSEMBLY

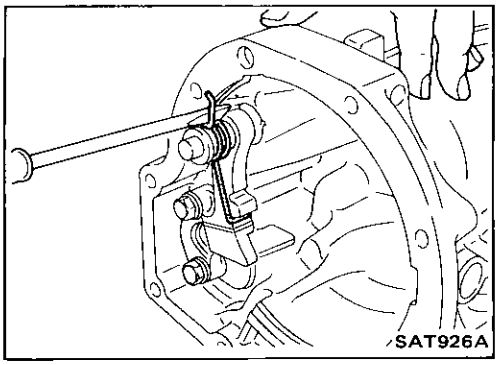
1. Install rod guide and parking actuator support onto rear extension.
2. Insert parking pawl shaft into rear extension.

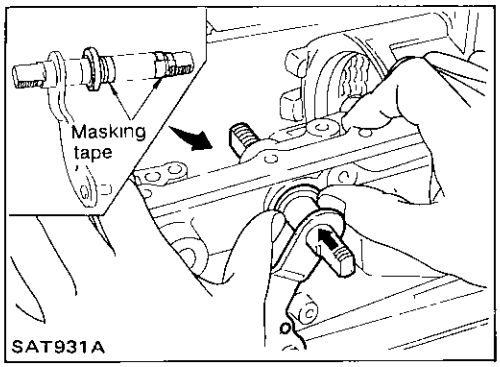

SAT930A

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

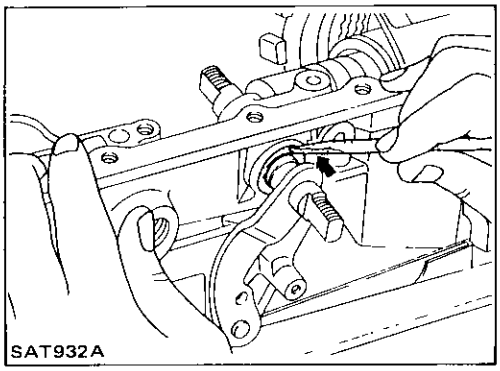
1. Install manual shaft components.

a. Install oil seal onto manual shaft.

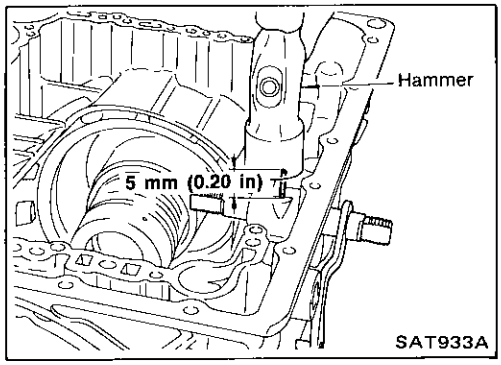
- **Apply A.T.F. to oil seal.**
- **Wrap threads of manual shaft with masking tape.**

b. Insert manual shaft and oil seal as a unit into transmission case.

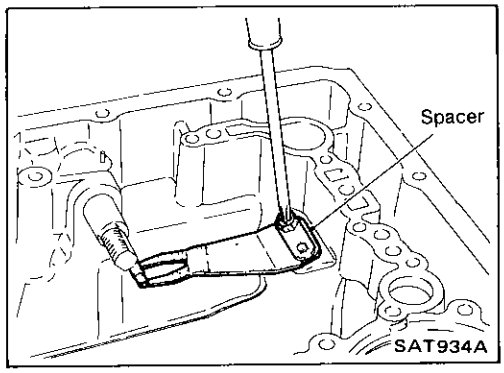
c. Remove masking tape.



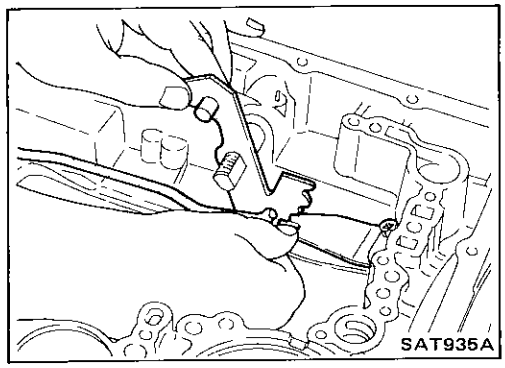

d. Push oil seal evenly and install it onto transmission case.




e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.

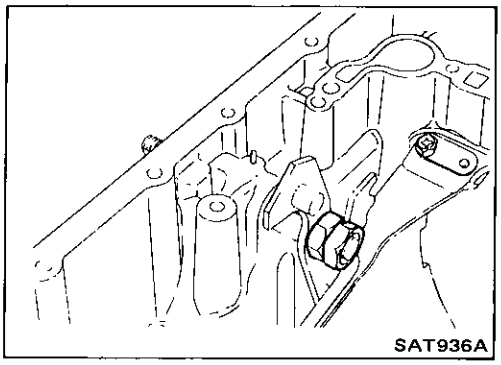



f. Install detent spring and spacer.

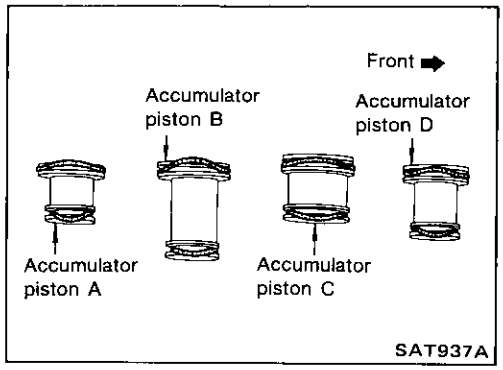



g. While pushing detent spring down, install manual plate onto manual shaft.

## Assembly (Cont'd)


SAT936A

h. Install lock nuts onto manual shaft.

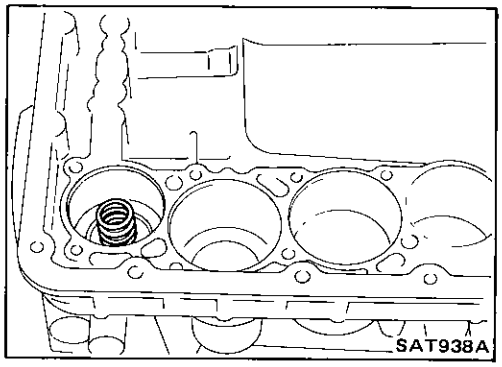


SAT937A

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)

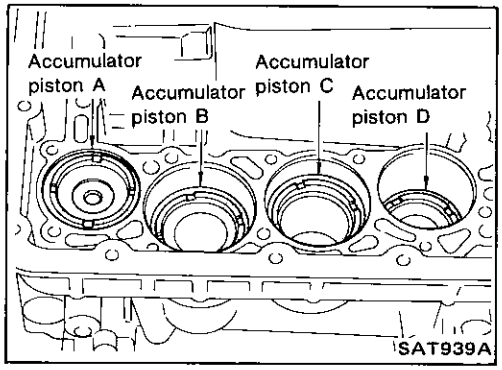
| Accumulator | A | B | C | D |
|---|---|---|---|---|
| Small diameter end | 29 (1.14) | 32 (1.26) | 45 (1.77) | 29 (1.14) |
| Large diameter end | 45 (1.77) | 50 (1.97) | 50 (1.97) | 45 (1.77) |


SAT938A

b. Install return spring for accumutator A onto transmission case.

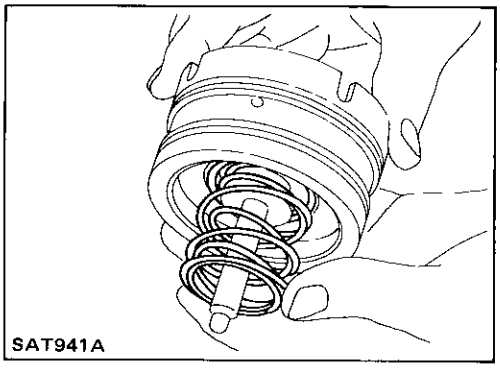
**Free length of return spring:** Unit: mm (in)

| Accumulator | A |
|---|---|
| Free length | 43 (1.69) |



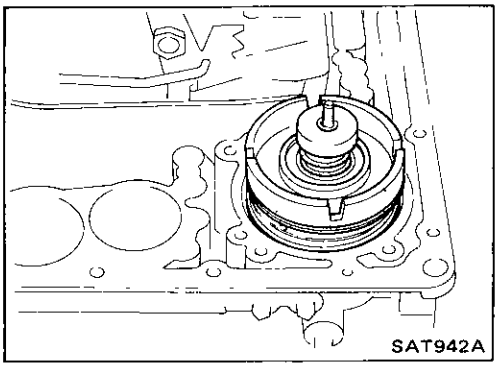
SAT939A

c. Install accumulator pistons A, B, C and D.
- **Apply A.T.F. to transmission case.**


SAT941A

3. Install band servo piston.
a. Install return springs onto servo piston.

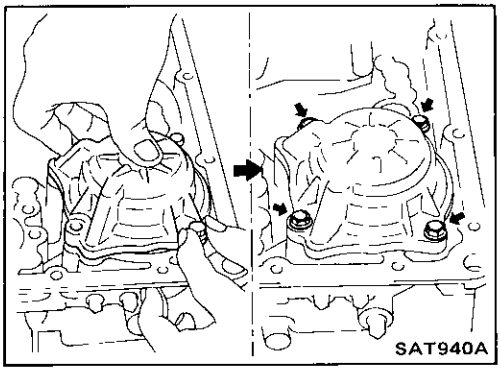
## Assembly (Cont'd)



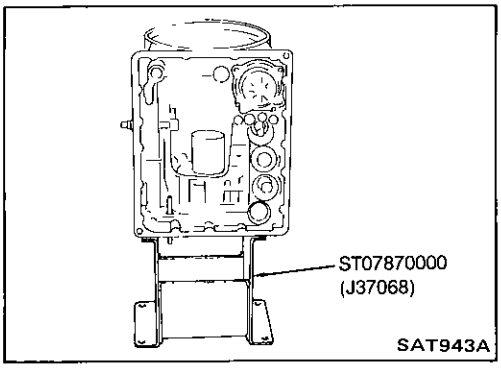

b. Install band servo piston onto transmission case.

- **Apply A.T.F. to O-ring of band servo piston and transmission case.**

c. Install gasket for band servo onto transmission case.

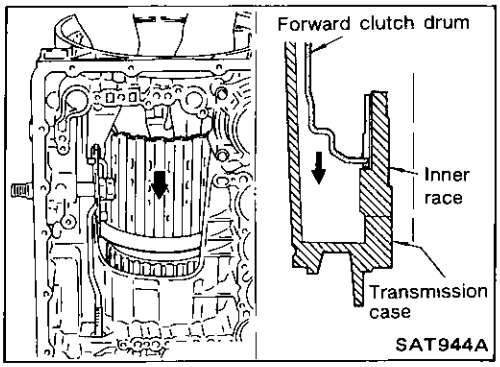



d. Install band servo retainer onto transmission case.

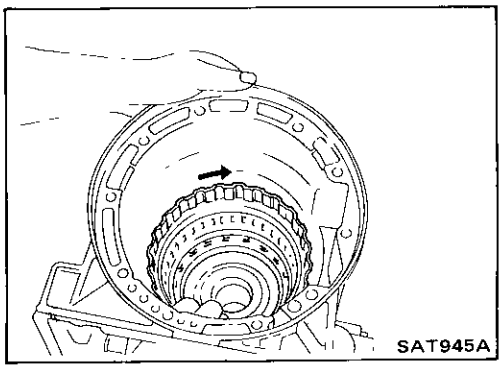



4. Install rear side clutch and gear components.

a. Place transmission case in vertical position.

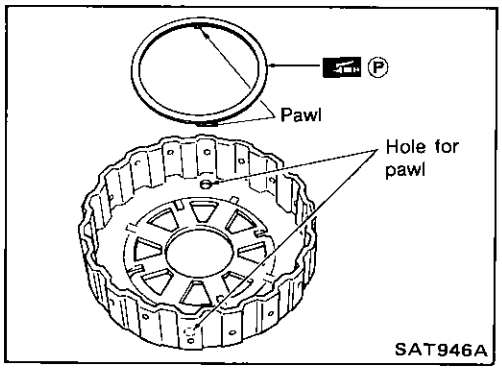



b. Slightly lift forward clutch drum assembly and slowly rotate it clockwise until its hub passes fully over the clutch inner race inside transmission case.

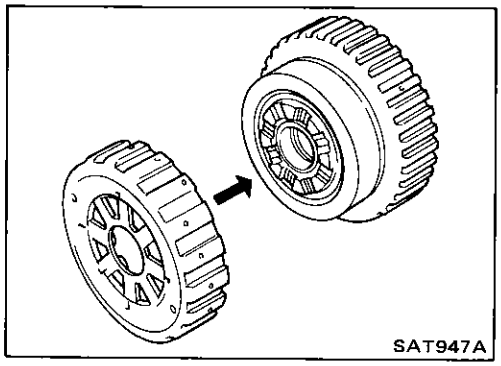



c. Check to be sure that rotation direction of forward clutch assembly is correct.

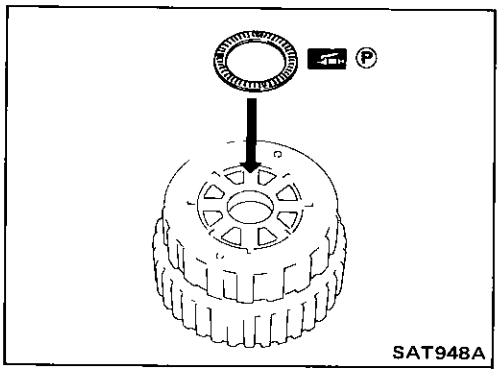
## Assembly (Cont'd)



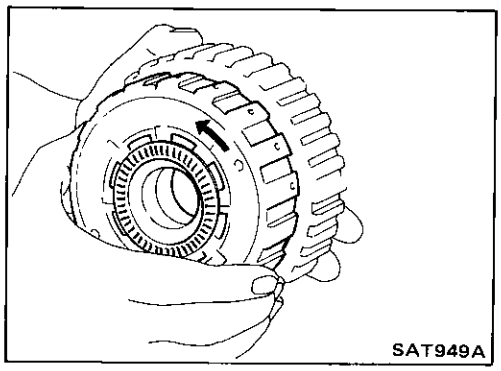

d. Install thrust washer onto front of overrun clutch hub.
- **Apply petroleum jelly to the thrust washer.**
- **Insert pawls of thrust washer securely into holes in overrun clutch hub.**



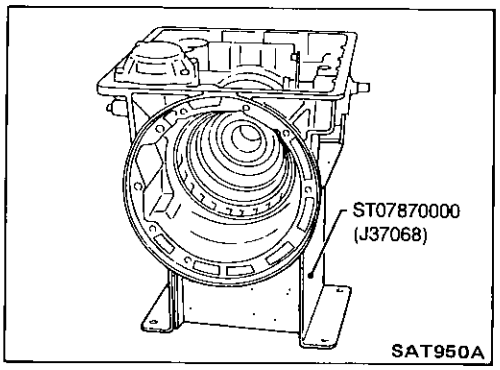

e. Install overrun clutch hub onto rear internal gear assembly.




f. Install needle bearing onto rear of overrun clutch hub.
- **Apply petroleum jelly to needle bearing.**

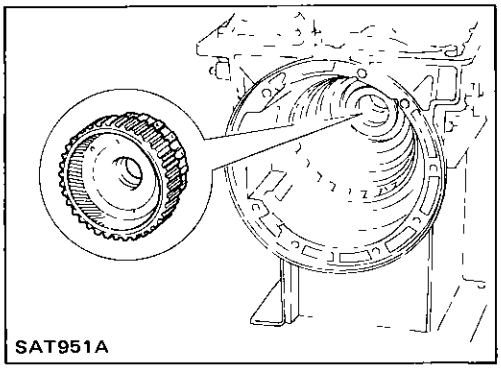



g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.

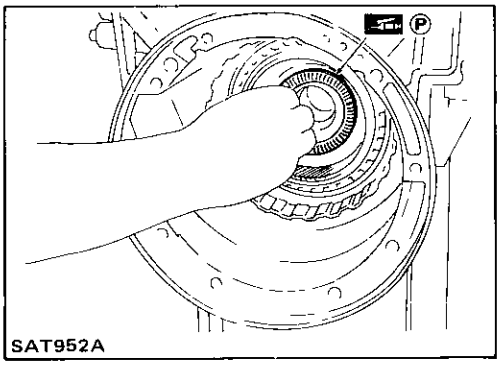



h. Place transmission case into horizontal position.

## Assembly (Cont'd)

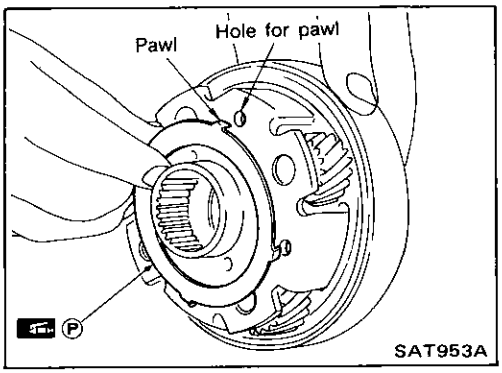

SAT951A

i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.



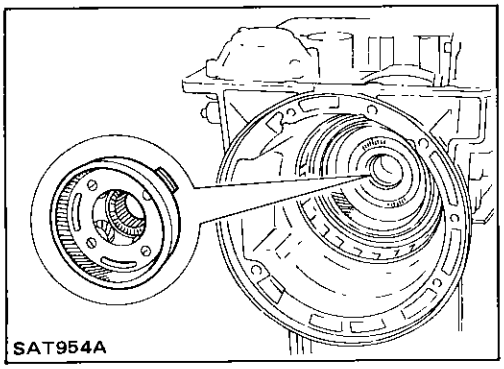
SAT952A

j. Install needle bearing onto rear internal gear.
- **Apply petroleum jelly to needle bearing.**



SAT953A

k. Install bearing race onto rear of front internal gear.
- **Apply petroleum jelly to bearing race.**
- **Securely engage pawls of bearing race with holes in front internal gear.**

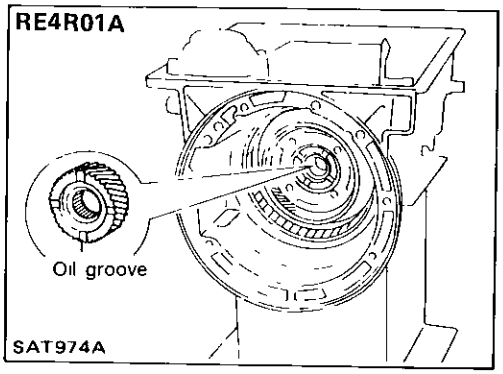

SAT954A

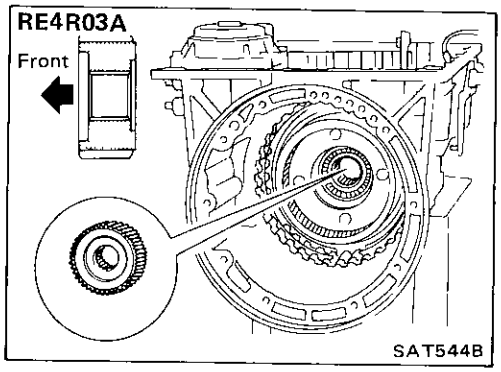
l. Install front internal gear on transmission case.

## Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

| Part name \ Item | 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 | – | ● |



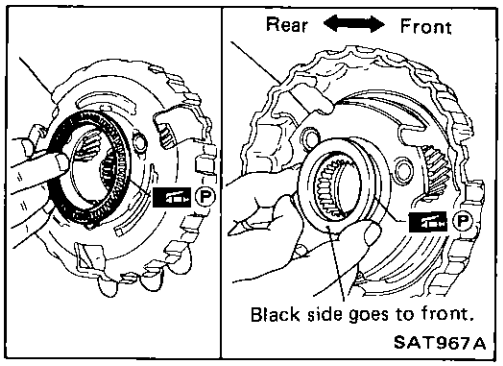




1. Install front side clutch and gear components.

a. Install rear sun gear on transmission case.

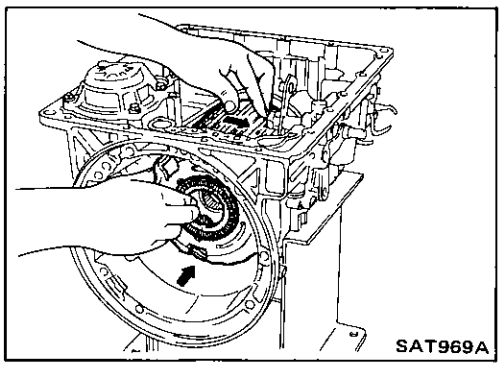
● **Pay attention to its direction.**

## Adjustment (Cont'd)

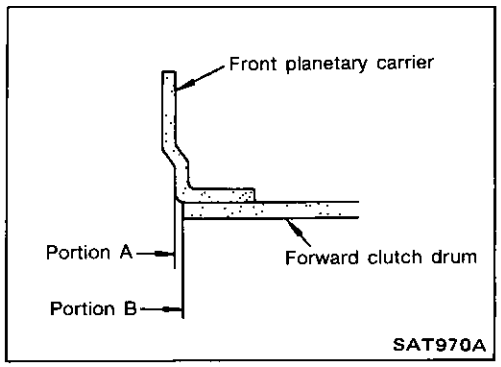



b. Install needle bearing on front of front planetary carrier.
- **Apply petroleum jelly to needle bearing.**

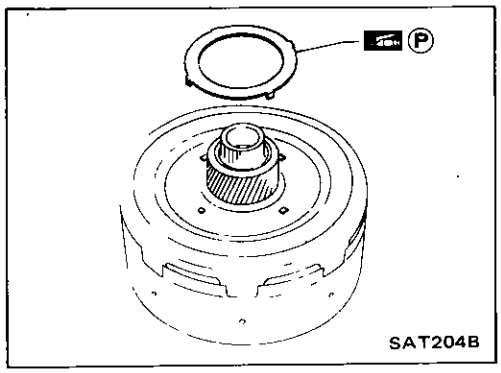
c. Install needle bearing on rear of front planetary carrier.
- **Apply petroleum jelly to bearing.**
- **Pay attention to its direction — Black side goes to front.**



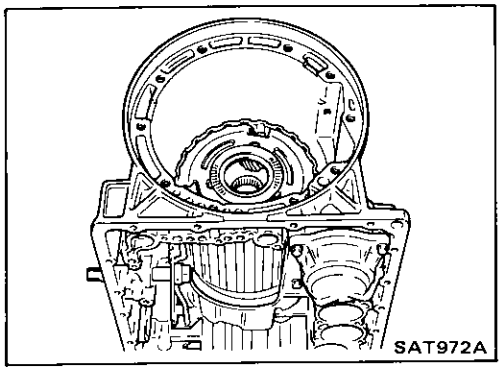

d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.




- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly. (RE4R01A only)**

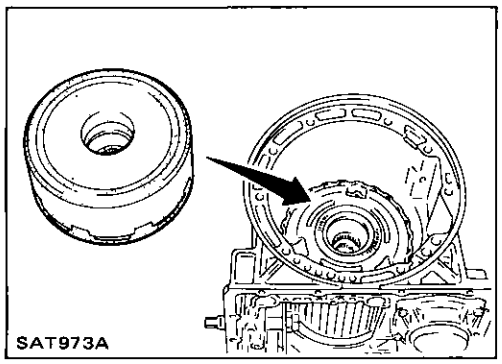



e. Install bearing race (RE4R01A) or needle bearing (RE4R03A) on rear of clutch pack.
- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing race with hole in clutch pack.**

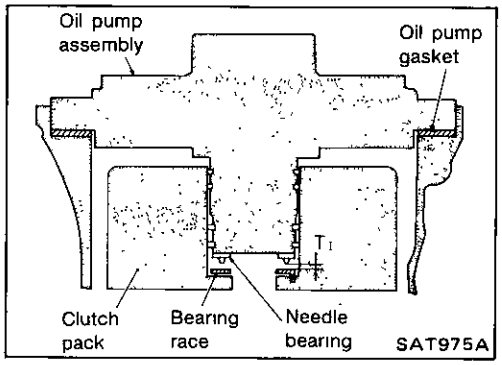



f. Place transmission case in vertical position.

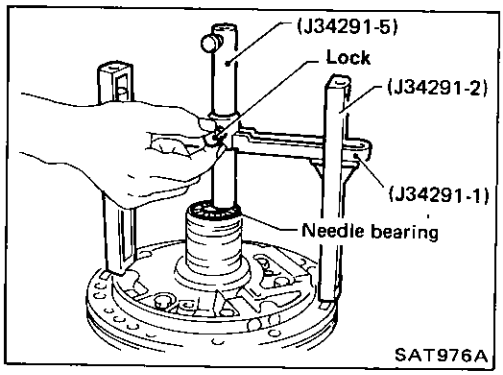
## Adjustment (Cont'd)



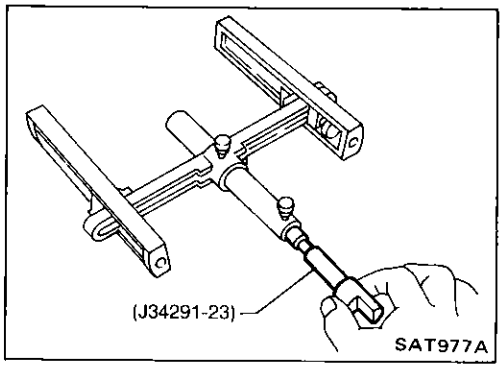

g. Install clutch pack into transmission case.



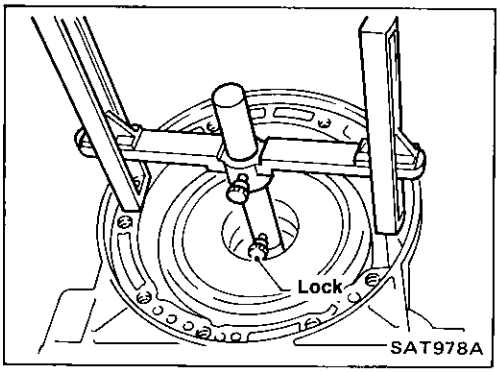

2. Adjust total end play.
   **Total end play "$T_1$":**
   **0.25 - 0.55 mm (0.0098 - 0.0217 in)**




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.

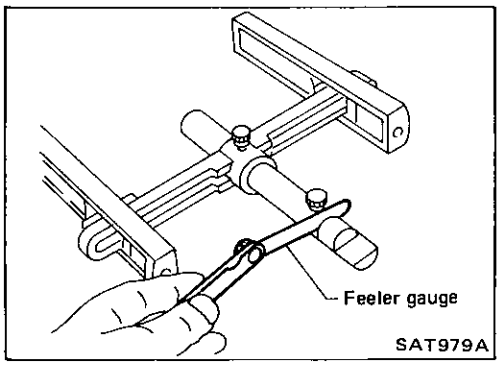



b. Install J34291-23 (gauging plunger) into gauging cylinder.




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.

## Adjustment (Cont'd)

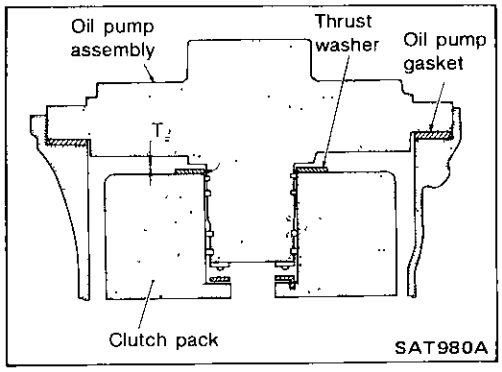



d. Remove Tool and use feeler gauge to measure gap between gauging cylinder and gauging plunger. This measurement should give exact total end play.

**Total end play "$T_1$":**
**0.25 - 0.55 mm (0.0098 - 0.0217 in)**

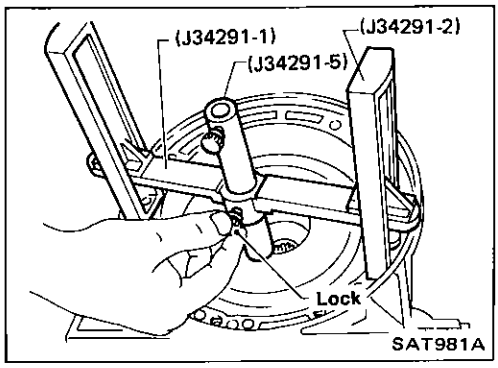
- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

**Available oil pump cover bearing race:**
**Refer to S.D.S.**

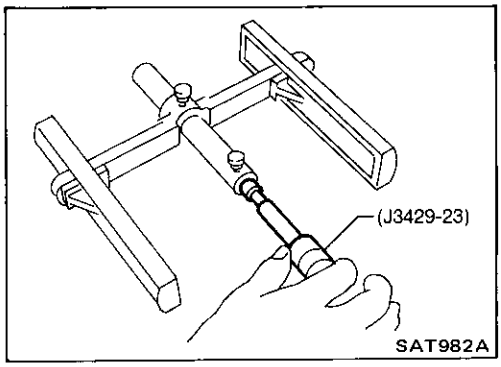



3. Adjust reverse clutch drum end play.

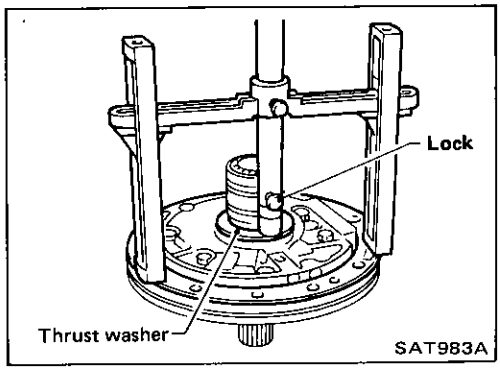
**Reverse clutch drum end play "$T_2$":**
**0.55 - 0.90 mm (0.0217 - 0.0354 in)**




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.

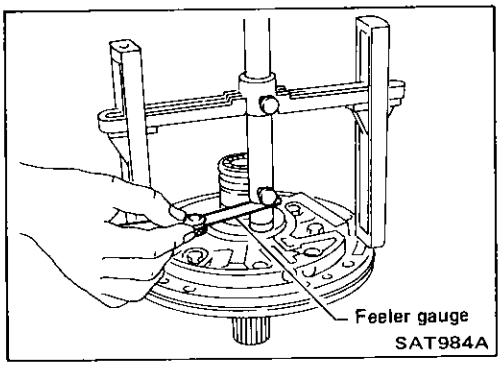



b. Install J34291-23 (gauging plunger) into gauging cylinder.




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.

## Adjustment (Cont'd)




d. Use feeler gauge to measure gap between gauging plunger and gauging cylinder. This measurement should give you exact reverse clutch drum and play.

**Reverse clutch drum end play "$T_2$":**
**0.55 - 0.90 mm (0.0217 - 0.0354 in)**

- If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.

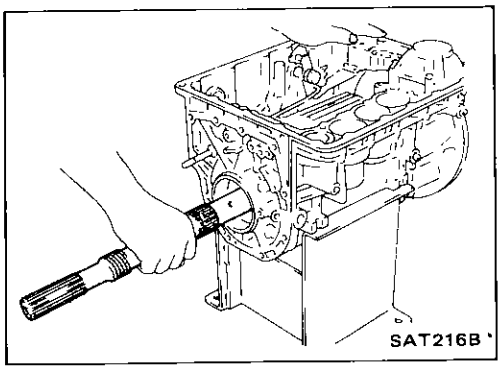
**Available oil pump thrust washer:**
**Refer to S.D.S.**

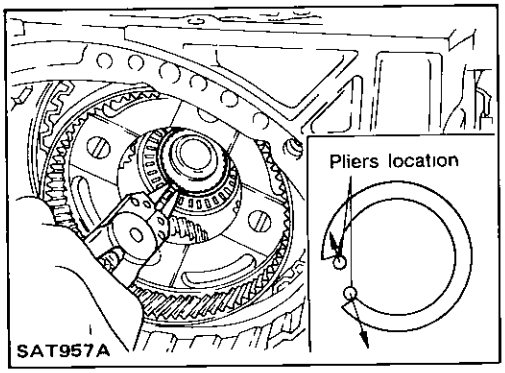
## Assembly

1. Install output shaft and parking gear.

a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.

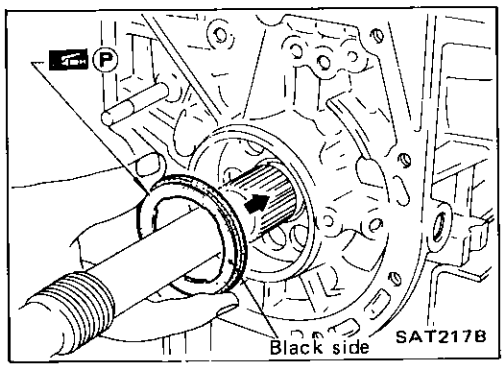
- **Do not force output shaft against front of transmission case.**



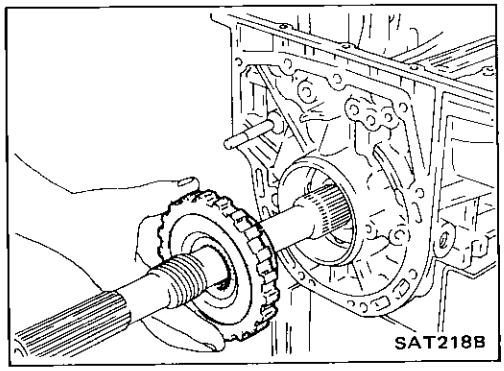

b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.

- **Check to be sure output shaft cannot be removed in rear direction.**



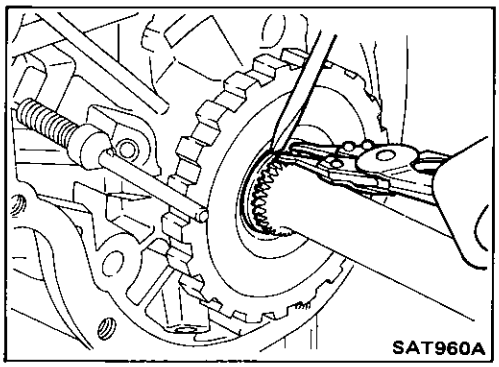

c. Install needle bearing on transmission case.

- **Pay attention to its direction — Black side goes to rear.**
- **Apply petroleum jelly to needle bearing.**

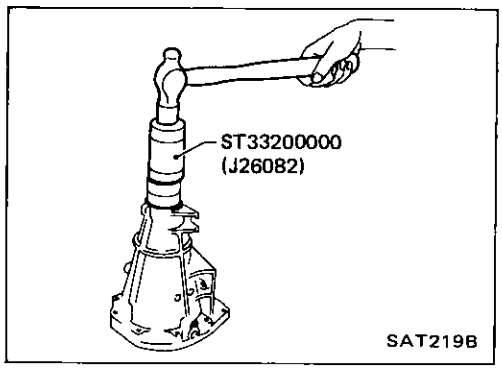



d. Install parking gear on transmission case.

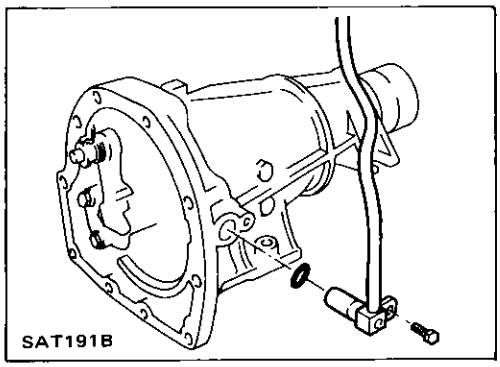
## Assembly (Cont'd)




e. Install snap ring on rear of output shaft.
- **Check to be sure output shaft cannot be removed in forward direciton.**

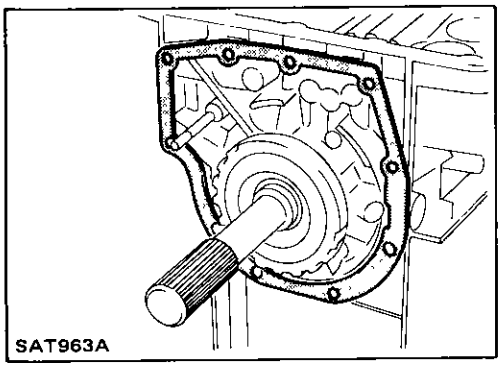



2. Install rear extension.
a. Install oil seal on rear extension.
- **Apply A.T.F. to oil seal.**

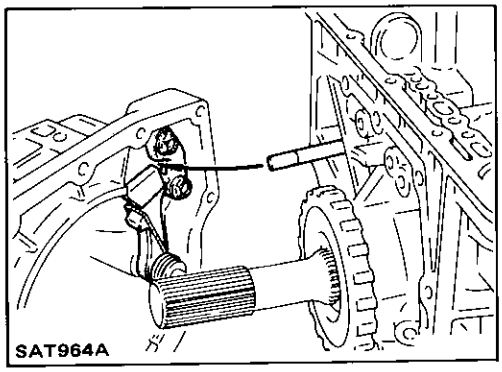



b. Install O-ring on revolution sensor.
- **Apply A.T.F. to O-ring.**

c. Install revolution sensor on rear extension.

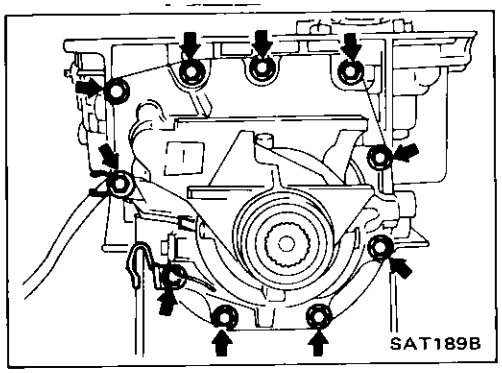



d. Install rear extension gasket on transmission case.

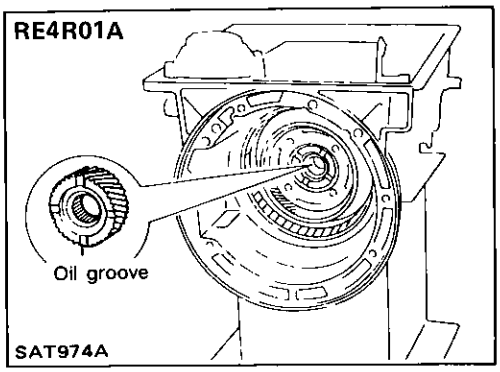



e. Install parking rod on transmission case.

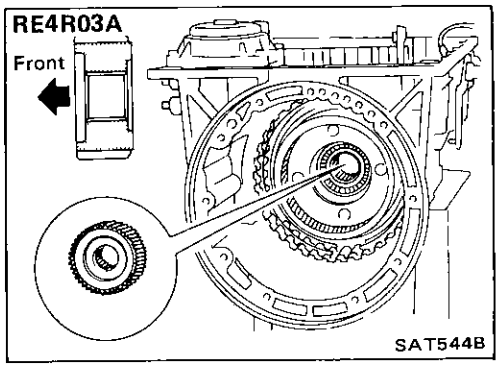
## Assembly (Cont'd)

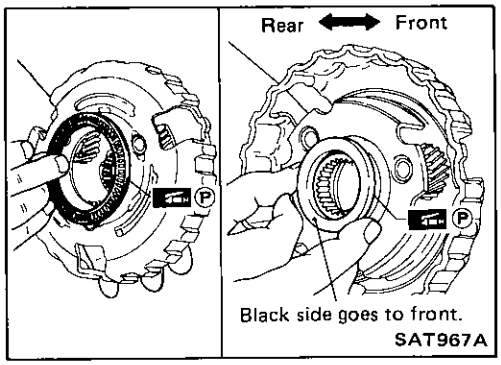



f. Install rear extension on transmission case.



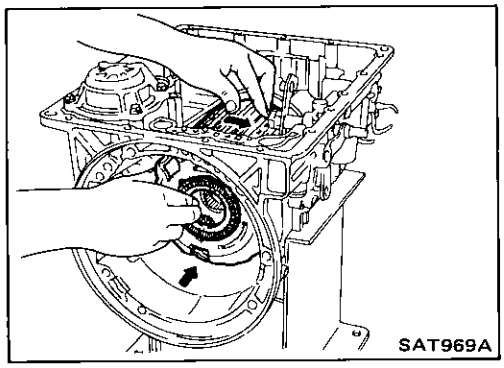

3. Install front side clutch and gear components.
a. Install rear sun gear on transmission case.
- **Pay attention to its direction.**



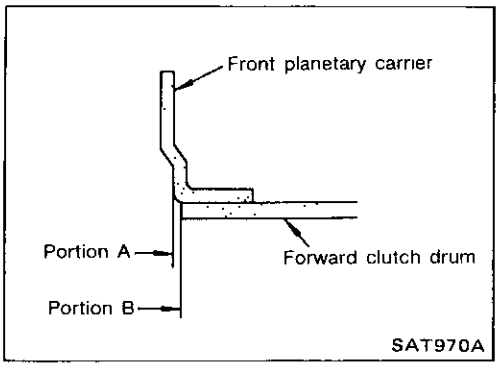

b. Make sure needle bearing is on front of front planetary carrier.
- **Apply petroleum jelly to needle bearing.**

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.**

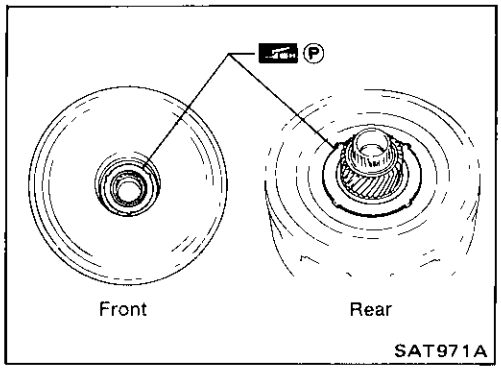



d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.

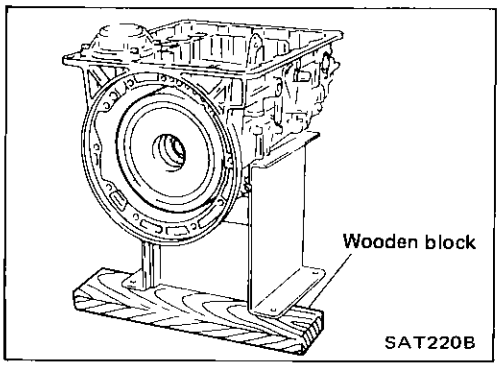
## Assembly (Cont'd)



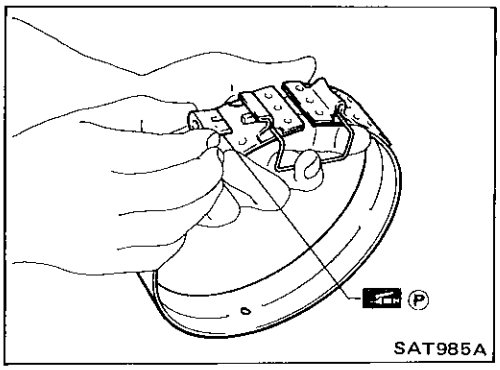

- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly. (RE4R01A only)**



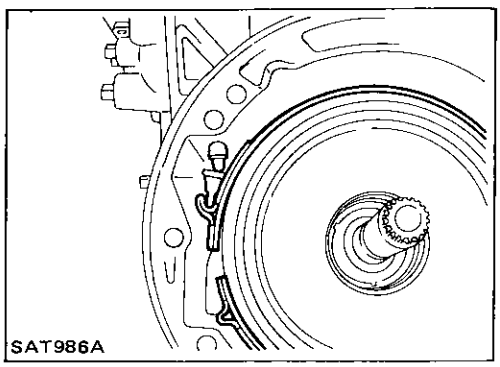

e. Make sure bearing race (RE4R01A) or needle bearing (RE4R03A) are on front and rear of clutch pack.
- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing races with holes in clutch pack.**




f. Install clutch pack into transmission case.

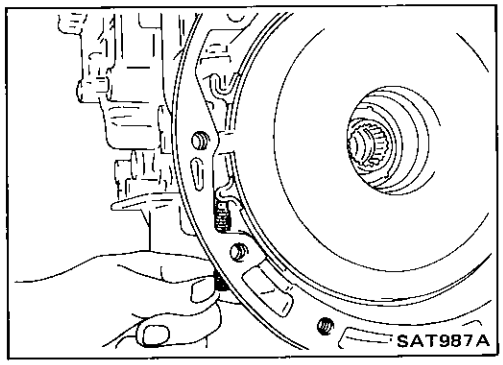



4. Install brake band and band strut.
a. Install band strut on brake band.
- **Apply petroleum jelly to band strut.**

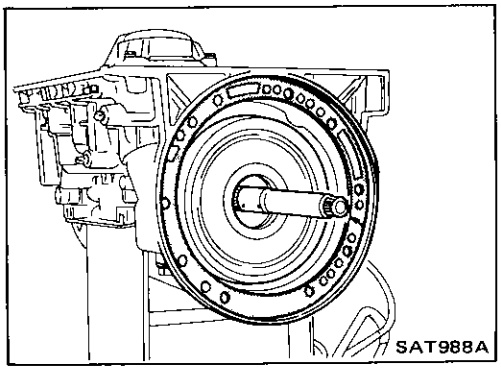



b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.

## Assembly (Cont'd)

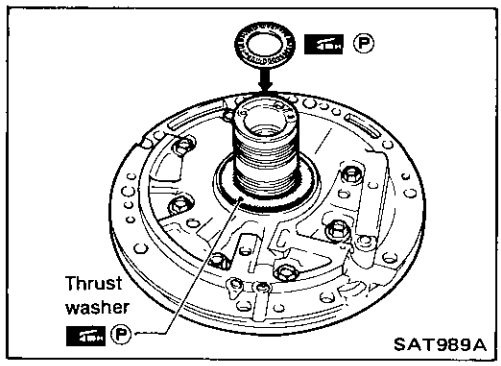



c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.




5. Install input shaft on transmission case.
- **Pay attention to its direction — O-ring groove side is front.**

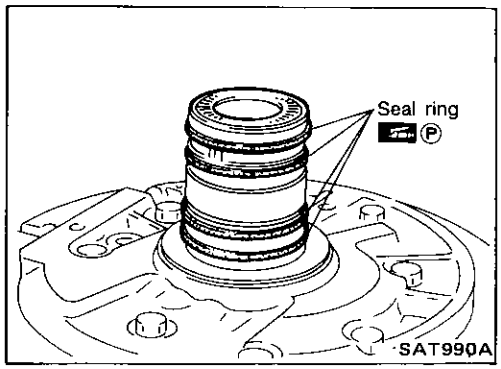
6. Install gasket on transmission case.



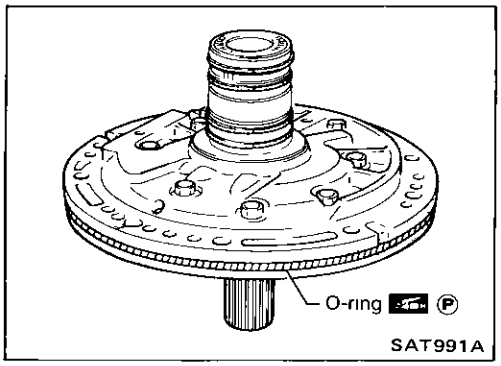

7. Install oil pump assembly.

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.**

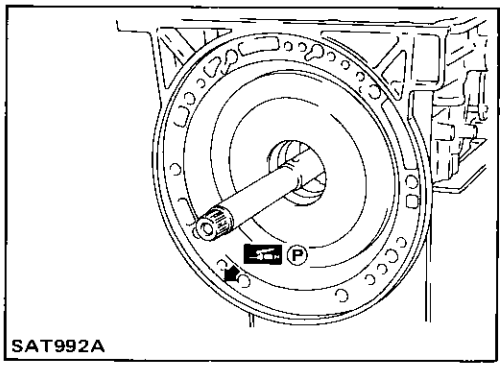



c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.

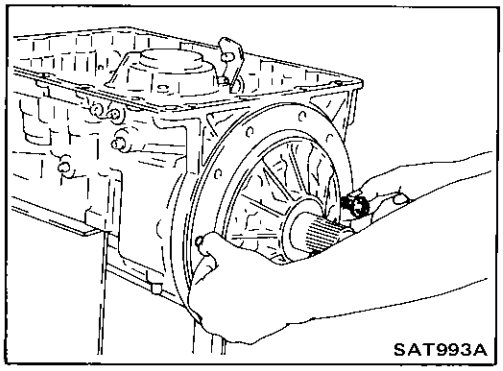



d. Install O-ring on oil pump assembly.
- **Apply petroleum jelly to O-ring.**

## Assembly (Cont'd)

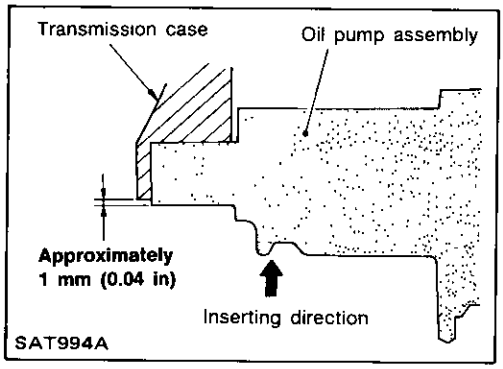



e. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.

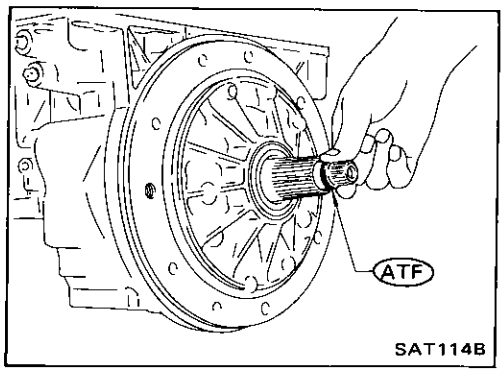



f. Install oil pump assembly.

- **Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.**

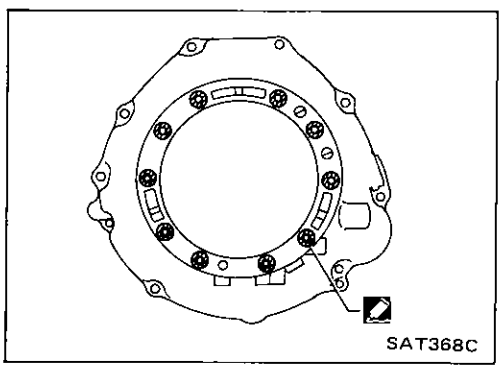



- **Insert oil pump assembly to the specified position in transmission, as shown at left.**




8. Install O-ring on input shaft.

- **Apply A.T.F. to O-rings.**

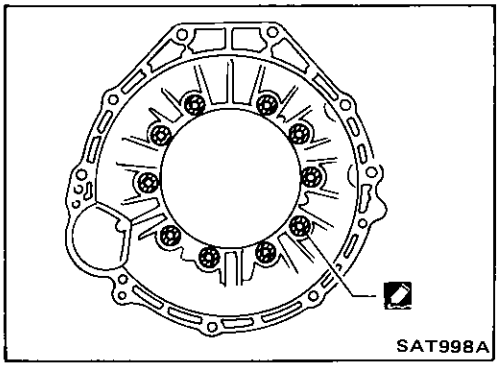



9. Install converter housing.

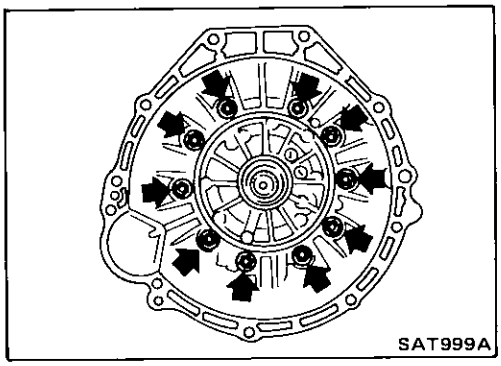
a. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.

- **Do not apply too much sealant.**

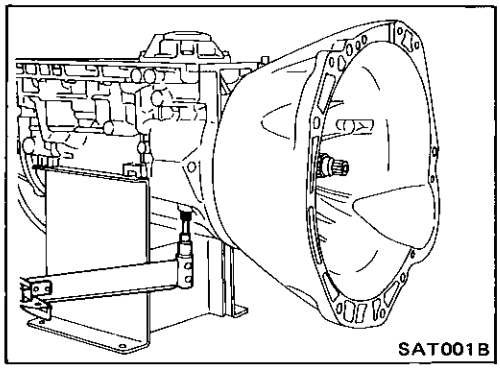
## Assembly (Cont'd)



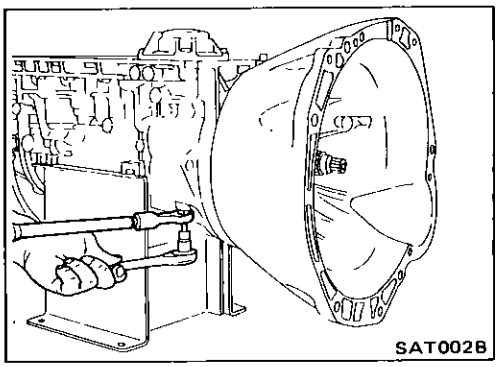

b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.



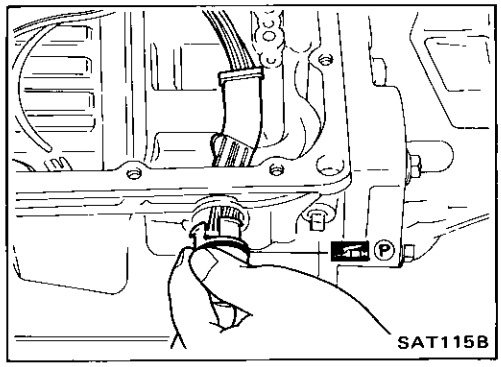

c. Install converter housing on transmission case.




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.




c. While holding anchor end pin, tighten lock nut.



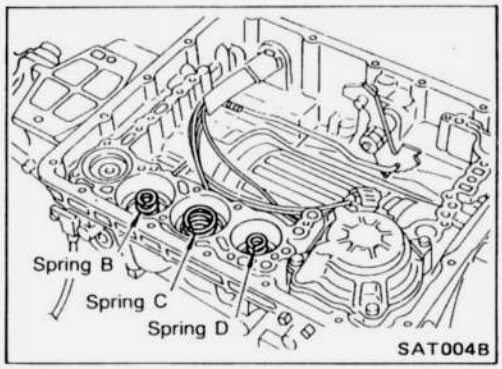

11. Install terminal cord assembly.
a. Install O-ring on terminal cord assembly.
- **Apply petroleum jelly to O-ring.**

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.

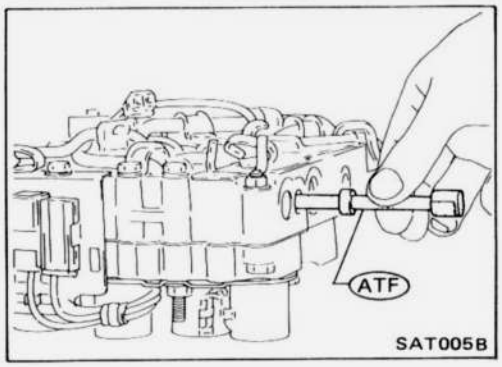



**Free length of return springs:** Unit: mm (in)

| Item \ Accumulator | B | C | D |
|---|---|---|---|
| Free length | 66 (2.60) | 45 (1.77) | 58.4 (2.299) |

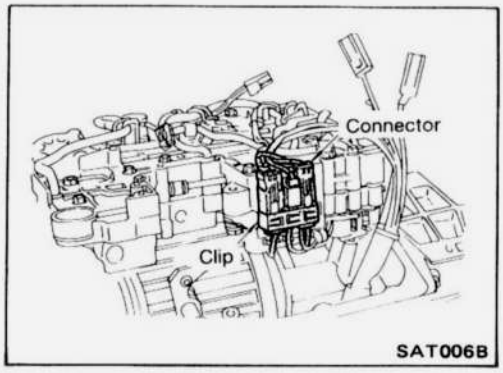
b. Install manual valve on control valve.

- **Apply A.T.F. to manual valve.**




c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.

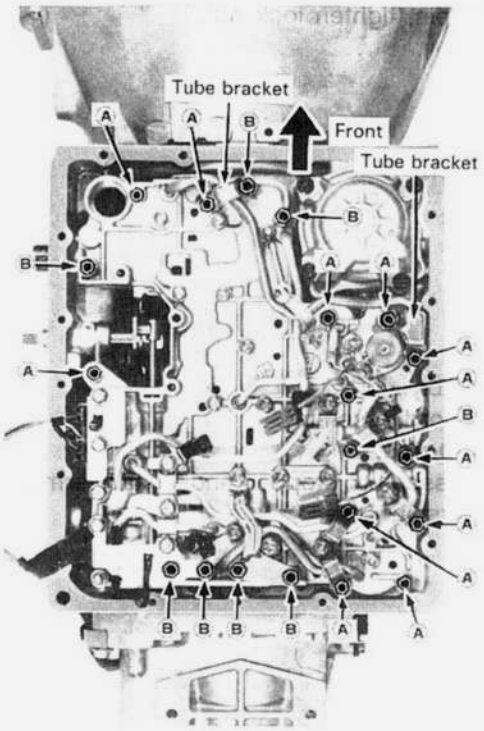
d. Install connector clip.




e. Install control valve assembly on transmission case.

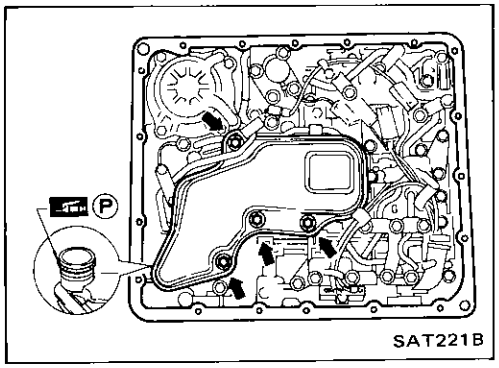
f. Install connector tube brackets and tighten bolts Ⓐ and Ⓑ.

- **Check that terminal assembly harness does not catch.**



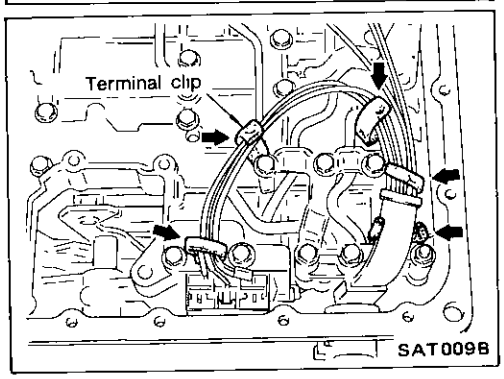

| Bolt symbol | ℓ mm (in) |
|---|---|
| Ⓐ | 33 (1.30) |
| Ⓑ | 45 (1.77) |

## Assembly (Cont'd)

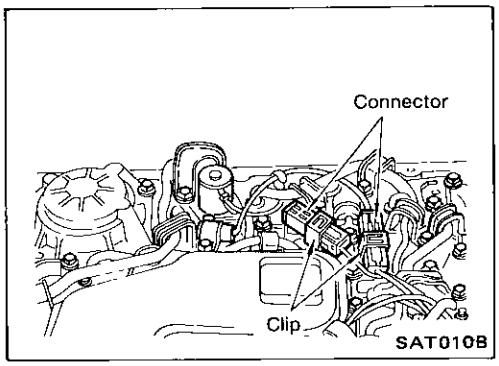



g. Install O-ring on oil strainer.
- **Apply petroleum jelly to O-ring.**

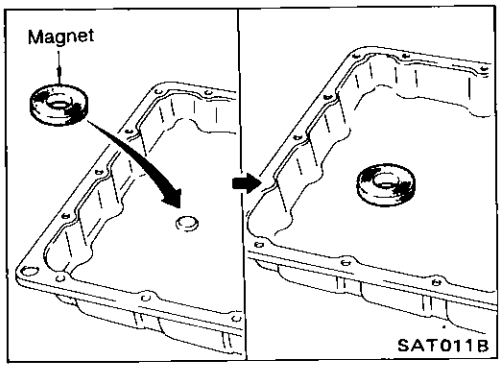
h. Install oil strainer on control valve.




i. Securely fasten terminal harness with clips.

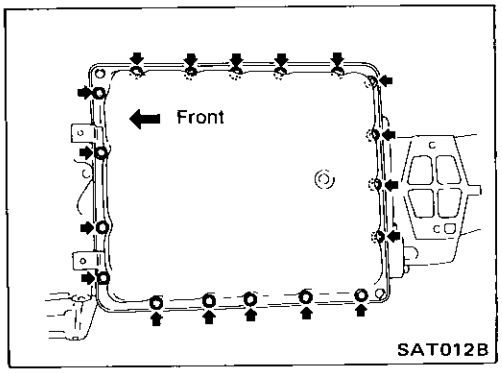



j. Install lock-up solenoid and fluid temperature sensor connectors.




13. Install oil pan.

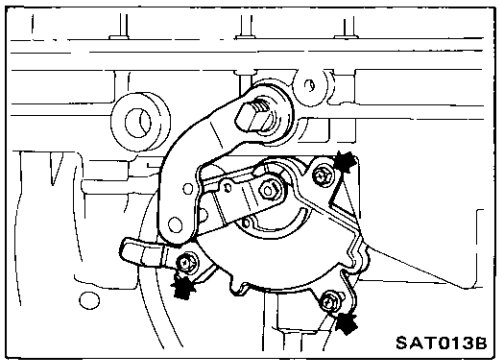
a. Attach a magnet to oil pan.



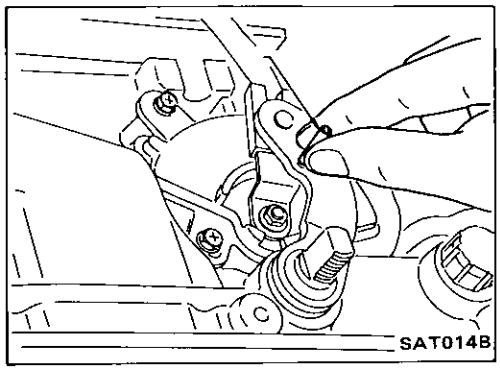

b. Install oil pan gasket on transmission case.

c. Install oil pan and bracket on transmission case.
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

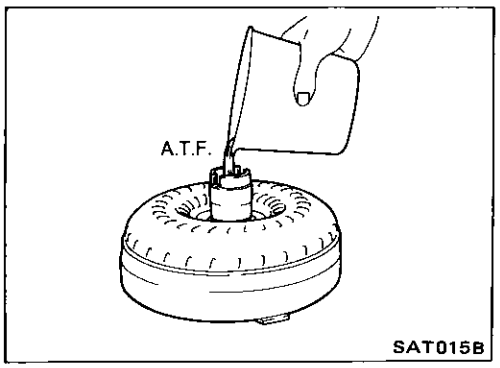
## Assembly (Cont'd)



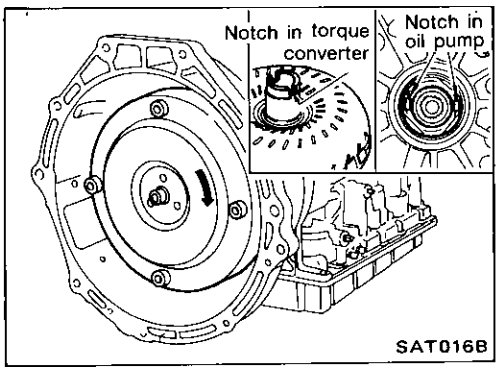

14. Install inhibitor switch.
a. Check that manual shaft is in "1" range.
b. Temporarily install inhibitor switch on manual shaft.
c. Move manual shaft to "N".



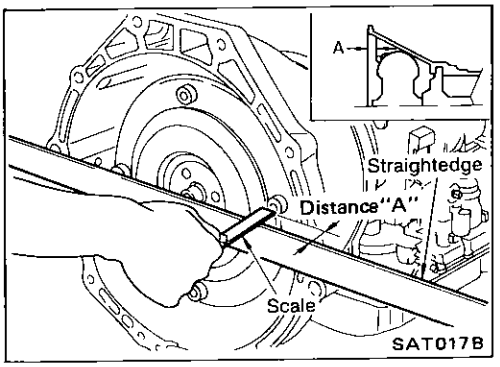

d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.




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":**

**RE4R01A**

**26 mm (1.02 in) or more**

**RE4R03A**

**25 mm (0.98 in) or more**

## General Specifications

| Engine | VG30DE | VG30DETT |
|---|---|---|
| Automatic transmission model | RE4R01A | RE4R03A |
| Transmission model code number | 45 x 65 | 51 x 08 |
| Stall torque ratio | 2.0 : 1 | |
| Transmission gear ratio | | |
| 1st | 2.785 | 2.784 |
| 2nd | 1.545 | 1.544 |
| Top | 1.000 | 1.000 |
| O.D. | 0.694 | 0.694 |
| Reverse | 2.272 | 2.275 |
| Recommended oil | Automatic transmission fluid Type DEXRON™ | |
| Oil capacity ℓ (US qt, Imp qt) | 8.3 (8-3/4, 7-1/4) | 8.2 (8-5/8, 7-1/4) |

## Specifications and Adjustment — RE4R01A

### VEHICLE SPEED WHEN SHIFTING GEARS

| Throttle position | Vehicle speed km/h (MPH) | | | | | |
|---|---|---|---|---|---|---|
| | $D_1 \rightarrow D_2$ | $D_2 \rightarrow D_3$ | $D_3 \rightarrow D_4$ | $D_4 \rightarrow D_3$ | $D_3 \rightarrow D_2$ | $D_2 \rightarrow D_1$ |
| Full throttle | 60 - 64 (37 - 40) | 107 - 115 (66 - 71) | 166 - 176 (103 - 109) | 161 - 169 (100 - 105) | 96 - 104 (60 - 65) | 44 - 48 (27 - 30) |
| Half throttle | 45 - 49 (28 - 30) | 83 - 89 (52 - 55) | 119 - 127 (74 - 79) | 80 - 88 (50 - 55) | 33 - 39 (21 - 24) | 10 - 14 (6 - 9) |

### VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

| Throttle position | O.D. switch [Shift range] | Vehicle speed km/h (MPH) | |
|---|---|---|---|
| | | Lock-up "ON" | Lock-up "OFF" |
| Full throttle | ON [$D_4$] | 167 - 175 (104 - 109) | 161 - 169 (100 - 105) |
| | OFF [$D_3$] | 107 - 115 (66 - 71) | 96 - 104 (60 - 65) |
| Half throttle | ON [$D_4$] | 120 - 128 (75 - 80) | 84 - 92 (52 - 57) |
| | OFF [$D_3$] | 91 - 99 (57 - 62) | 86 - 94 (53 - 58) |

### STALL REVOLUTION

| Stall revolution rpm |
|---|
| 2,450 - 2,650 |

### LINE PRESSURE

| Engine speed rpm | Line pressure kPa (kg/cm², psi) | |
|---|---|---|
| | D, 2 and 1 ranges | R range |
| Idle | 422 - 461 (4.3 - 4.7, 61 - 67) | 667 - 706 (6.8 - 7.2, 97 - 102) |
| Stall | 1,020 - 1,098 (10.4 - 11.2, 148 - 159) | 1,422 - 1,500 (14.5 - 15.3, 206 - 218) |

## Specifications and Adjustment — RE4R01A (Cont'd)

### RETURN SPRINGS

Unit: mm (in)

| Parts | | 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) |
| | | 4-2 sequence valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| | | Shift valve B spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | 4-2 relay valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| | | Shift valve A spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | Overrun clutch control valve spring | 31762-41X03 | 23.6 (0.929) | 7.0 (0.276) |
| | | Overrun clutch reducing valve spring | 31742-41X20 | 32.5 (1.280) | 7.0 (0.276) |
| | | Shuttle shift valve S spring | 31762-41X04 | 51.0 (2.008) | 5.65 (0.2224) |
| | | Pilot valve spring | 31742-41X13 | 25.7 (1.012) | 9.1 (0.358) |
| | | Lock-up control valve spring | 31742-41X22 | 18.5 (0.728) | 13.0 (0.512) |
| | Lower body | Modifier accumulator piston spring | 31742-41X15 | 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 (0.382) |
| Low & reverse brake | | 18 pcs | 31521-21X00 | 23.7 (0.933) | 11.6 (0.457) |
| Band servo | | Spring A | 31605-41X05 | 45.6 (1.795) | 34.3 (1.350) |
| | | Spring B | 31605-41X00 | 53.8 (2.118) | 40.3 (1.587) |
| | | Spring C | 31605-41X01 | 29.7 (1.169) | 27.6 (1.087) |
| Accumulator | | Accumulator A | 31605-41X02 | 43.0 (1.693) | |
| | | Accumulator B | 31605-41X10 | 66.0 (2.598) | |
| | | Accumulator C | 31605-41X09 | 45.0 (1.772) | |
| | | Accumulator D | 31605-41X06 | 58.4 (2.299) | |

## Specifications and Adjustment — RE4R01A (Cont'd)

### ACCUMULATOR O-RING

| | Diameter 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) |

### CLUTCHES AND BRAKES

| | | |
|---|---|---|
| Reverse clutch | | |
| Number of drive plates | 2 | |
| Number of driven plates | 2 | |
| Thickness of drive plate mm (in) | | |
| Standard | 2.0 (0.079) | |
| Wear limit | 1.8 (0.071) | |
| Clearance mm (in) | | |
| Standard | 0.5 - 0.8 (0.020 - 0.031) | |
| Allowable limit | 1.2 (0.047) | |
| | Thickness mm (in) | Part number |
| Thickness of retaining plate | 4.6 (0.181) | 31537-21X00 |
| | 4.8 (0.189) | 31537-21X01 |
| | 5.0 (0.197) | 31537-21X02 |
| | 5.2 (0.205) | 31537-21X03 |
| | 5.4 (0.213) | 31537-21X04 |
| | 5.6 (0.220) | 31567-21X13 |
| | 5.8 (0.228) | 31567-21X14 |
| High clutch | | |
| Number of drive plates | 5 | |
| Number of driven plates | 5 | |
| Thickness of drive plate mm (in) | | |
| Standard | 1.6 (0.063) | |
| Wear limit | 1.4 (0.055) | |
| Clearance mm (in) | | |
| Standard | 1.8 - 2.2 (0.071 - 0.087) | |
| Allowable limit | 3.2 (0.126) | |
| | Thickness mm (in) | Part number |
| Thickness of retaining plate | 3.4 (0.134) | 31537-41X71 |
| | 3.6 (0.142) | 31537-41X61 |
| | 3.8 (0.150) | 31537-41X62 |
| | 4.0 (0.157) | 31537-41X63 |
| | 4.2 (0.165) | 31537-41X64 |
| | 4.4 (0.173) | 31537-41X65 |
| | 4.6 (0.181) | 31537-41X66 |
| | 4.8 (0.189) | 31537-41X67 |

| | | |
|---|---|---|
| Forward clutch | | |
| Number of drive plates | 7 | |
| Number of driven plates | 7 | |
| Thickness of drive plate mm (in) | | |
| Standard | 1.6 (0.063) | |
| Wear limit | 1.4 (0.055) | |
| Clearance mm (in) | | |
| Standard | 0.45 - 0.85 (0.0177 - 0.0335) | |
| Allowable limit | 2.25 (0.0886) | |
| | Thickness mm (in) | Part number |
| Thickness of retaining plate | 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 mm (in) | Part number |
| Thickness of retaining plate | 4.0 (0.157) | 31537-41X79 |
| | 4.2 (0.165) | 31537-41X80 |
| | 4.4 (0.173) | 31537-41X81 |
| | 4.6 (0.181) | 31537-41X82 |
| | 4.8 (0.189) | 31537-41X83 |
| | 5.0 (0.197) | 31537-41X84 |
| | 5.2 (0.205) | 31537-41X20 |

## Specifications and Adjustment — RE4R01A (Cont'd)

| | |
|---|---|
| Low & reverse brake | |
| Number of drive plates | 7 |
| Number of driven plates | 9 |
| Thickness of drive plate mm (in) | |
| Standard | 2.0 (0.079) |
| Wear limit | 1.8 (0.071) |
| Clearance mm (in) | |
| Standard | 0.7 - 1.1 (0.028 - 0.043) |
| Allowable limit | 2.9 (0.114) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 7.2 (0.283) | 31667-41X13 |
| | 7.4 (0.291) | 31667-41X14 |
| | 7.6 (0.299) | 31667-41X07 |
| | 7.8 (0.307) | 31667-41X08 |
| | 8.0 (0.315) | 31667-41X00 |
| | 8.2 (0.323) | 31667-41X01 |

| | |
|---|---|
| Brake band | |
| Anchor end bolt tightening torque N·m (kg-m, ft-lb) | 4 - 6 (0.4 - 0.6, 2.9 - 4.3) |
| Number of returning revolutions for anchor end bolt | 2.5 |

### OIL PUMP AND LOW ONE-WAY CLUTCH

| | |
|---|---|
| Oil pump clearance mm (in) | |
| Cam ring — oil pump housing | |
| Standard | 0.01 - 0.024 (0.0004 - 0.0009) |
| Rotor, vanes and control piston — oil pump housing | |
| Standard | 0.03 - 0.044 (0.0012 - 0.0017) |
| Seal ring clearance mm (in) | |
| Standard | 0.10 - 0.25 (0.0039 - 0.0098) |
| Allowable limit | 0.25 (0.0098) |

### TOTAL END PLAY

| Total end play "$T_1$" | 0.25 - 0.55 mm (0.0098 - 0.0217 in) |
|---|---|

| Thickness of oil pump cover bearing race | Thickness mm (in) | Part number |
|---|---|---|
| | 0.8 (0.031) | 31429-21X00 |
| | 1.0 (0.039) | 31429-21X01 |
| | 1.2 (0.047) | 31429-21X02 |
| | 1.4 (0.055) | 31429-21X03 |
| | 1.6 (0.063) | 31429-21X04 |
| | 1.8 (0.071) | 31429-21X05 |
| | 2.0 (0.079) | 31429-21X06 |

### REVERSE CLUTCH DRUM END PLAY

| Reverse clutch drum end play "$T_2$" | 0.55 - 0.90 mm (0.0217 - 0.0354 in) |
|---|---|

| Thickness of oil pump thrust washer | Thickness mm (in) | Part number |
|---|---|---|
| | 0.7 (0.028) | 31528-21X00 |
| | 0.9 (0.035) | 31528-21X01 |
| | 1.1 (0.043) | 31528-21X02 |
| | 1.3 (0.051) | 31528-21X03 |
| | 1.5 (0.059) | 31528-21X04 |
| | 1.7 (0.067) | 31528-21X05 |
| | 1.9 (0.075) | 31528-21X06 |

### REMOVAL AND INSTALLATION

| | |
|---|---|
| Manual control linkage Number of returning revolutions for lock nut | 1 |
| Lock nut tightening torque | 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb) |
| Distance between end of converter housing and torque converter | 26.0 mm (1.024 in) or more |
| Drive plate runout limit | 0.5 mm (0.020 in) |

## Specifications and Adjustment — RE4R03A

### VEHICLE SPEED WHEN SHIFTING GEARS

| Throttle position | Vehicle speed km/h (MPH) | | | | | |
|---|---|---|---|---|---|---|
| | $D_1 \rightarrow D_2$ | $D_2 \rightarrow D_3$ | $D_3 \rightarrow D_4$ | $D_4 \rightarrow D_3$ | $D_3 \rightarrow D_2$ | $D_2 \rightarrow D_1$ |
| Full throttle | 68 - 72 (42 - 45) | 120 - 128 (75 - 80) | 183 - 193 (114 - 120) | 177 - 187 (110 - 116) | 109 - 117 (68 - 73) | 33 - 37 (21 - 23) |
| Half throttle | 47 - 51 (29 - 32) | 89 - 95 (55 - 59) | 136 - 144 (85 - 89) | 78 - 86 (48 - 53) | 28 - 34 (17 - 21) | 10 - 14 (6 - 9) |

### VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

| Throttle position | O.D. switch [Shift range] | Vehicle speed km/h (MPH) | |
|---|---|---|---|
| | | Lock-up "ON" | Lock-up "OFF" |
| Full throttle | ON [$D_4$] | 184 - 192 (114 - 119) | 178 - 186 (111 - 116) |
| | OFF [$D_3$] | 120 - 128 (75 - 80) | 109 - 117 (68 - 73) |
| Half throttle | ON [$D_4$] | 184 - 192 (114 - 119) | 117 - 125 (73 - 78) |
| | OFF [$D_3$] | 88 - 96 (55 - 60) | 74 - 82 (46 - 51) |

### STALL REVOLUTION

| Stall revolution rpm |
|---|
| 2,950 - 3,200 |

### LINE PRESSURE

| Engine speed rpm | Line pressure kPa (kg/cm², psi) | |
|---|---|---|
| | D, 2 and 1 ranges | R range |
| Idle | 422 - 461 (4.3 - 4.7, 61 - 67) | 667 - 706 (6.8 - 7.2, 97 - 102) |
| Stall | 1,020 - 1,098 (10.4 - 11.2, 148 - 159) | 1,422 - 1,500 (14.5 - 15.3, 206 - 218) |

## Specifications and Adjustment — RE4R03A (Cont'd)

### RETURN SPRINGS

Unit: mm (in)

| Parts | | 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) |
| | | 4-2 sequence valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| | | Shift valve B spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | 4-2 relay valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| | | Shift valve A spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | Overrun clutch control valve spring | 31762-41X03 | 23.6 (0.929) | 7.0 (0.276) |
| | | Overrun clutch reducing valve spring | 31742-41X20 | 32.5 (1.280) | 7.0 (0.276) |
| | | Shuttle shift valve S spring | 31762-41X04 | 51.0 (2.008) | 5.65 (0.2224) |
| | | Pilot valve spring | 31742-41X13 | 25.7 (1.012) | 9.1 (0.358) |
| | | Lock-up control valve spring | 31742-41X22 | 18.5 (0.728) | 13.0 (0.512) |
| | Lower body | Modifier accumulator piston spring | 31742-41X15 | 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 | 31505-51X00 | 37.8 (1.488) | 14.8 (0.583) |
| High clutch | | 16 pcs | 31505-21X03 | 22.06 (0.8685) | 11.6 (0.457) |
| Forward clutch (Overrun clutch) | | 20 pcs | 31505-51X04 | 36.8 (1.449) | 9.8 (0.386) |
| Low & reverse brake | | Inner 16 pcs | 31505-51X06 | 20.43 (0.8043) | 10.3 (0.406) |
| | | Outer 16 pcs | 31505-51X05 | 20.35 (0.8012) | 13.0 (0.512) |
| Band servo | | Spring A | 31605-41X05 | 45.6 (1.795) | 34.3 (1.350) |
| | | Spring B | 31605-41X00 | 53.8 (2.118) | 40.3 (1.587) |
| | | Spring C | 31605-41X01 | 29.7 (1.169) | 27.6 (1.087) |
| Accumulator | | Accumulator A | 31605-41X02 | 43.0 (1.693) | |
| | | Accumulator B | 31605-41X10 | 66.0 (2.598) | |
| | | Accumulator C | 31605-41X09 | 45.0 (1.772) | |
| | | Accumulator D | 31605-41X06 | 58.4 (2.299) | |

## Specifications and Adjustment — RE4R03A (Cont'd)

### ACCUMULATOR O-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 | 3 |
| Number of driven plates | 3 |
| Thickness of drive plate mm (in) | |
| Standard | 2.0 (0.079) |
| Wear limit | 1.8 (0.071) |
| Clearance mm (in) | |
| Standard | 0.5 - 0.8 (0.020 - 0.031) |
| Allowable limit | 1.4 (0.055) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 4.4 (0.173) | 31537-57X61 |
| | 4.6 (0.181) | 31537-51X00 |
| | 4.8 (0.189) | 31537-51X01 |
| | 5.0 (0.197) | 31537-51X02 |

| High clutch | |
|---|---|
| Number of drive plates | 7 |
| Number of driven plates | 7 + 1 |
| Thickness of drive plate mm (in) | |
| Standard | 1.6 (0.063) |
| Wear limit | 1.4 (0.055) |
| Clearance mm (in) | |
| Standard | 1.8 - 2.2 (0.071 - 0.087) |
| Allowable limit | 3.0 (0.118) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 4.0 (0.157) | 31537-51X19 |
| | 4.2 (0.165) | 31537-51X60 |
| | 4.4 (0.173) | 31537-51X61 |
| | 4.6 (0.181) | 31537-51X00 |
| | 4.8 (0.189) | 31537-51X01 |
| | 5.0 (0.197) | 31537-51X02 |

| Forward clutch | |
|---|---|
| Number of drive plates | 8 |
| Number of driven plates | 8 |
| Thickness of drive plate mm (in) | |
| Standard | 2.0 (0.079) |
| Wear limit | 1.8 (0.071) |
| Clearance mm (in) | |
| Standard | 0.45 - 0.85 (0.0177 - 0.0335) |
| Allowable limit | 2.45 (0.0965) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 4.2 (0.165) | 31537-51X67 |
| | 4.4 (0.173) | 31537-51X05 |
| | 4.6 (0.181) | 31537-51X06 |
| | 4.8 (0.189) | 31537-51X07 |
| | 5.0 (0.197) | 31537-51X08 |
| | 5.2 (0.205) | 31537-51X09 |

| Overrun clutch | |
|---|---|
| Number of drive plates | 4 |
| Number of driven plates | 7 |
| Thickness of drive plate mm (in) | |
| Standard | 1.6 (0.063) |
| Wear limit | 1.4 (0.055) |
| Clearance mm (in) | |
| Standard | 1.0 - 1.4 (0.039 - 0.055) |
| Allowable limit | 2.2 (0.087) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 3.8 (0.150) | 31537-51X11 |
| | 4.0 (0.157) | 31537-51X12 |
| | 4.2 (0.165) | 31537-51X13 |
| | 4.4 (0.173) | 31537-51X14 |
| | 4.6 (0.181) | 31537-51X15 |
| | 4.8 (0.189) | 31537-51X64 |

## Specifications and Adjustment — RE4R03A (Cont'd)

| | | |
|---|---|---|
| Low & reverse brake<br>Number of drive plates | 2 + 6 | |
| Number of driven plates | 8 | |
| Thickness of drive plate mm (in)<br>Standard<br>Wear limit | 1.6 (0.063)<br>1.4 (0.055) | |
| Clearance mm (in)<br>Standard<br>Allowable limit | 0.9 - 1.2 (0.035 - 0.047)<br>3.1 (0.122) | |
| Thickness of retaining plate | Thickness mm (in) | Part number |
| | 4.2 (0.165) | 31667-51X10 |
| | 4.4 (0.173) | 31667-51X00 |
| | 4.6 (0.181) | 31667-51X01 |
| | 4.8 (0.189) | 31667-51X02 |
| | 5.0 (0.197) | 31667-51X03 |
| Brake band<br>Anchor end bolt tightening torque N·m (kg-m, ft-lb) | 4 - 6<br>(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)<br>Cam ring — oil pump housing<br>Standard | 0.01 - 0.024 (0.0004 - 0.0009) |
| Rotor, vanes and control piston — oil pump housing<br>Standard | 0.03 - 0.044 (0.0012 - 0.0017) |
| Seal ring clearance mm (in)<br>Standard<br>Allowable limit | 0.10 - 0.25 (0.0039 - 0.0098)<br>0.25 (0.0098) |

### TOTAL END PLAY

| | | |
|---|---|---|
| Total end play "$T_1$" | 0.25 - 0.55 mm<br>(0.0098 - 0.0217 in) | |
| Thickness of oil pump cover bearing race | Thickness mm (in) | Part number |
| | 0.8 (0.031) | 31429-21X00 |
| | 1.0 (0.039) | 31429-21X01 |
| | 1.2 (0.047) | 31429-21X02 |
| | 1.4 (0.055) | 31429-21X03 |
| | 1.6 (0.063) | 31429-21X04 |
| | 1.8 (0.071) | 31429-21X05 |
| | 2.0 (0.079) | 31429-21X06 |

### REVERSE CLUTCH DRUM END PLAY

| | | |
|---|---|---|
| Reverse clutch drum end play "$T_2$" | 0.55 - 0.90 mm<br>(0.0217 - 0.0354 in) | |
| Thickness of oil pump thrust washer | Thickness mm (in) | Part number |
| | 0.7 (0.028) | 31528-21X00 |
| | 0.9 (0.035) | 31528-21X01 |
| | 1.1 (0.043) | 31528-21X02 |
| | 1.3 (0.051) | 31528-21X03 |
| | 1.5 (0.059) | 31528-21X04 |
| | 1.7 (0.067) | 31528-21X05 |
| | 1.9 (0.075) | 31528-21X06 |

### REMOVAL AND INSTALLATION

| | |
|---|---|
| Manual control linkage<br>Number of returning revolutions for lock nut | 1 |
| Lock nut tightening torque | 29 - 39 N·m<br>(3.0 - 4.0 kg-m, 22 - 29 ft-lb) |
| Distance between end of clutch housing and torque converter | 25.0 mm (0.984 in) or more |
| Drive plate runout limit | 0.5 mm (0.020 in) |

# PROPELLER SHAFT & DIFFERENTIAL CARRIER

# SECTION PD

## CONTENTS


PREPARATION ..... PD- 2

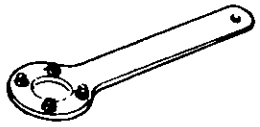
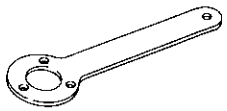
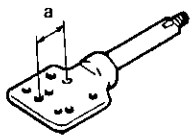
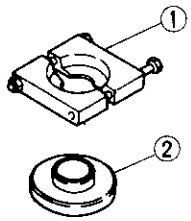
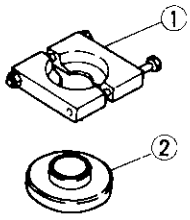
**PROPELLER SHAFT**

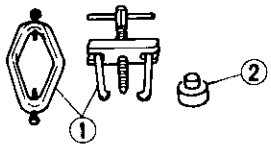
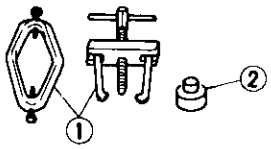
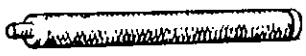
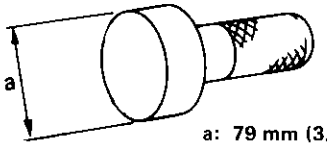
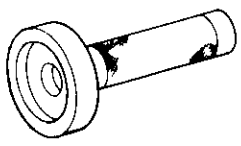
PROPELLER SHAFT ..... PD- 7

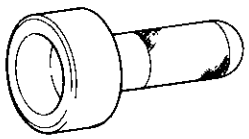
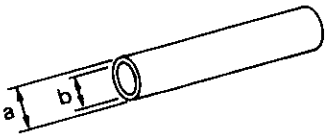
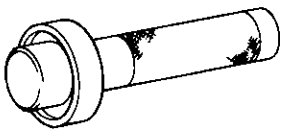
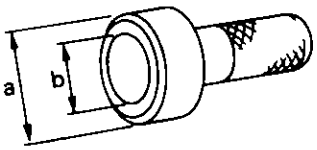
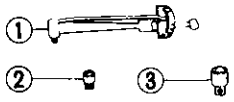
**FINAL DRIVE**

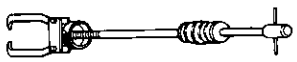
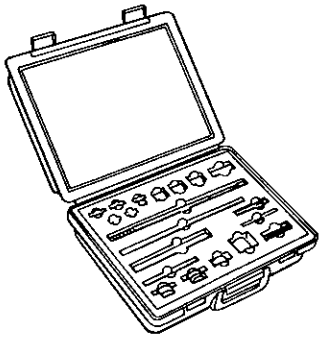
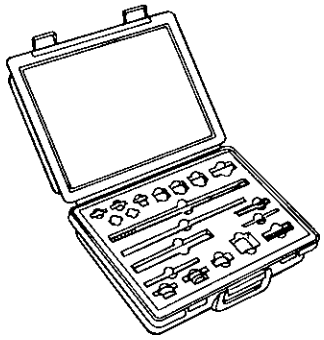
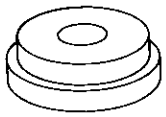
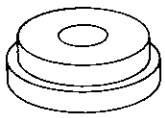
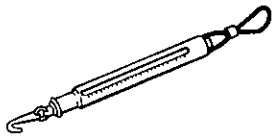
ON-VEHICLE SERVICE/REMOVAL AND INSTALLATION ..... PD-12
FINAL DRIVE ..... PD-14
DISASSEMBLY ..... PD-16
INSPECTION ..... PD-21
ADJUSTMENT (R200V) ..... PD-22
ADJUSTMENT (R230V) ..... PD-29
ASSEMBLY ..... PD-34
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... PD-40

## SPECIAL SERVICE TOOLS

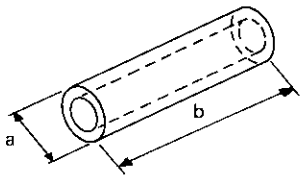
| Tool number (Kent-Moore No.) Tool name | Description | Unit application R200V | Unit application R230V |
|---|---|---|---|
| ST38060002 (J34311) Drive pinion flange wrench |  Removing and installing propeller shaft lock nut, and drive pinion lock nut. **Use two holes and propeller shaft connecting bolt to hold companion flange** | X | – |
| xxxxxxxxxx ( – ) Drive pinion flange wrench |  Removing and installing propeller shaft lock nut, and drive pinion lock nut | – | X |
| KV38100800 ( – ) Equivalent tool (J25604-01) Differential attachment |   Mounting final drive (To use, make a new hole.) **a: 156 mm (6.14 in) – R200V 178 mm (7.01 in) – R230V** | X | X |
| ST3090S000 ( – ) Drive pinion rear inner race puller set ① ST30031000 (J22912-01) Puller ② ST30901000 ( – ) Equivalent tool (J26010-01) Base |   Removing and installing drive pinion rear cone | X | – |
| ST3002S000 ( – ) Drive pinion rear inner race puller set ① ST30021000 ( – ) Puller ② ST30022000 ( – ) Base |   Removing and installing drive pinion rear cone | – | X |

| Tool number (Kent-Moore No.) Tool name | Description | | Unit application | |
|---|---|---|---|---|
| | | | R200V | R230V |
| ST3306S001<br>( – )<br>Differential side bearing puller set<br>① ST33051001<br>( – )<br>Equivalent tool (J22888)<br>Body<br>② ST33061000<br>(J8107-2)<br>Equivalent tool (J26010-01)<br>Adapter |  | Removing and installing differential side bearing inner cone | X | – |
| ST3306S001<br>( – )<br>Differential side bearing puller set<br>① ST33051001<br>( – )<br>Equivalent tool (J22888)<br>Body<br>② xxxxxxxxxx<br>( – )<br>Adapter |  | Removing and installing differential side bearing inner cone | – | X |
| ST30611000<br>(J25742-1)<br>Drift |  | Installing pinion rear bearing outer race | X | X |
| ST30613000<br>(J25742-3)<br>Drift | | Installing pinion front bearing outer race | X | – |
| xxxxxxxxxx<br>( – )<br>Drift |  | Installing pinion front bearing outer race<br>a: 79 mm (3.11 in) dia. | – | X |
| KV38100200<br>(J26233)<br>Oil seal drift |  | Installing side oil seal | X | – |

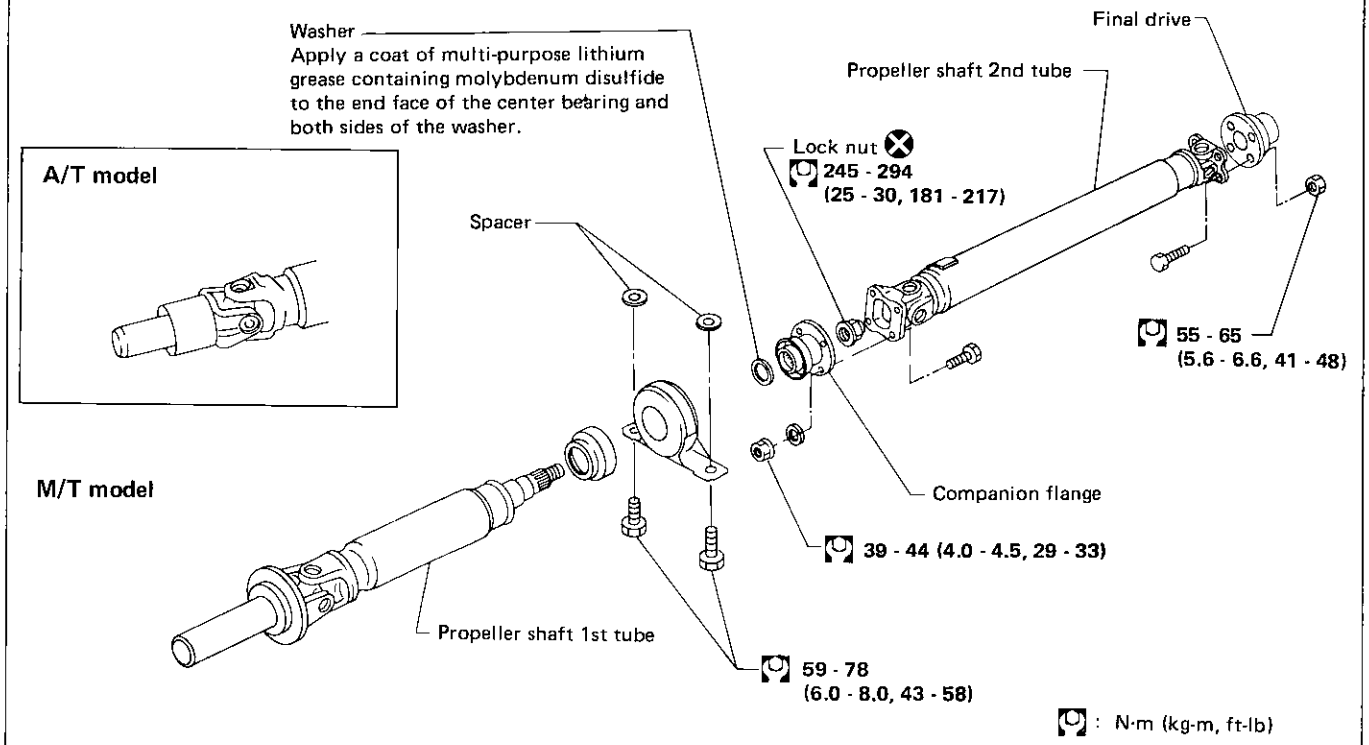
| Tool number (Kent-Moore No.) Tool name | Description | | Unit application | |
|---|---|---|---|---|
| | | | R200V | R230V |
| KV38102510 ( – ) Oil seal drift | | Installing side oil seal | – | X |
| KV38100500 ( – ) Oil seal drift |  | Installing front oil seal | X | – |
| xxxxxxxxxx ( – ) Oil seal drift |   | Installing front oil seal<br>**a: 85 mm (3.35 in) dia.**<br>**b: 69 mm (2.72 in) dia.** | – | X |
| KV38100300 (J25523) Drift |  | Installing side bearing inner cone | X | – |
| xxxxxxxxxx ( – ) Drift |   | Installing side bearing inner cone<br>**a: 64 mm (2.52 in) dia.**<br>**b: 55.5 mm (2.185 in) dia.** | – | X |
| KV38100600 (J25267) Side bearing spacer drift | | Installing side bearing spacer | X | – |
| xxxxxxxxxx ( – ) Side bearing spacer drift | | Installing side bearing spacer | – | X |
| ST3127S000 (See J5765-A) Preload gauge<br>① GG91030000 (J25765) Torque wrench<br>② HT62940000 ( – ) Socket adapter<br>③ HT62900000 ( – ) Socket adapter |   | Measuring pinion bearing preload and total preload | X | X |

| Tool number (Kent-Moore No.) Tool name | Description | | Unit application | |
|---|---|---|---|---|
| | | | R200V | R230V |
| HT72400000 ( – ) Slide hammer |  | Removing differential case assembly | X | X |
| (J34309) Differential shim selector |  | Adjusting bearing preload and gear height | X | – |
| (xxxxxx) Differential shim selector |  | Adjusting bearing preload and gear height | – | X |
| (J25269-4) Side bearing discs (2 Req'd) |  | Selecting pinion height adjusting washer | X | – |
| (xxxxxxx) Side bearing discs (2 Req'd) |  | Selecting pinion height adjusting washer | – | X |
| (J8129) Spring gauge |  | Measuring carrier turning torque | X | X |

## COMMERCIAL SERVICE TOOL

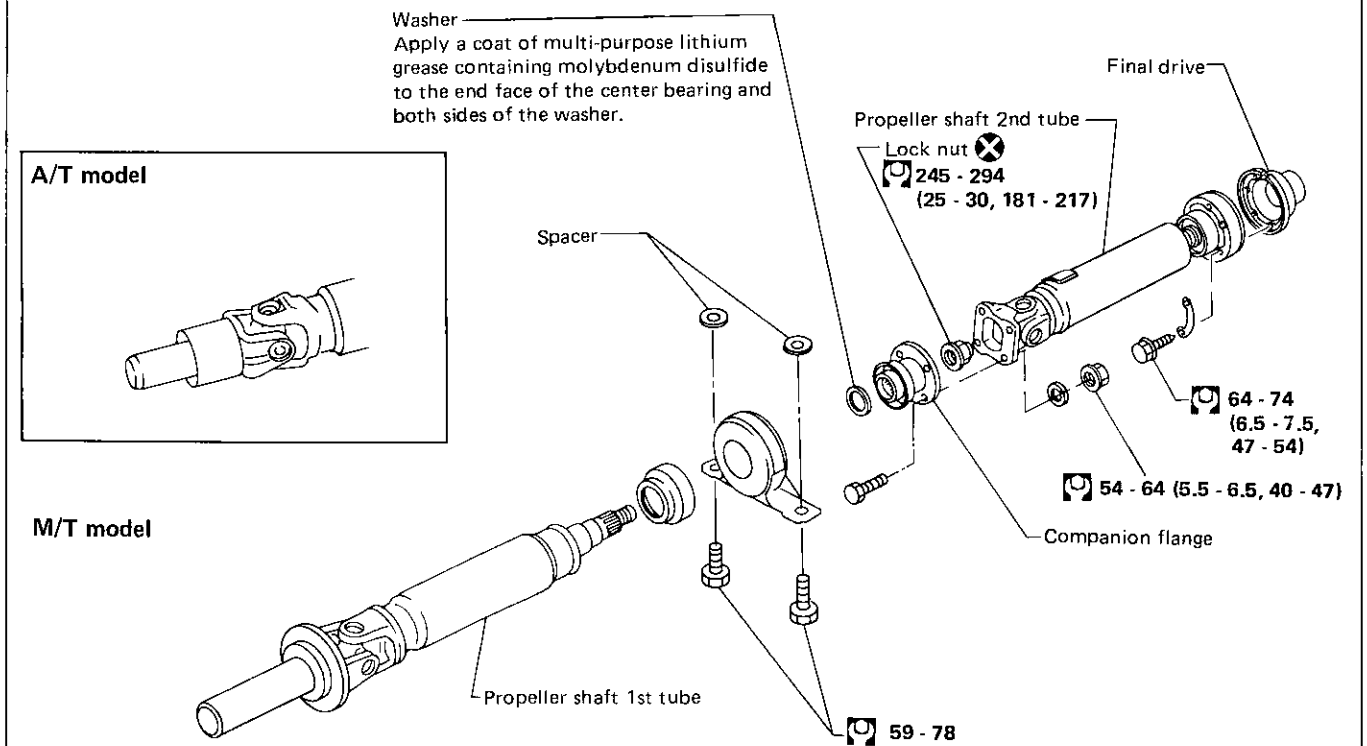
| Tool name | Description | Unit application | |
|---|---|---|---|
| | | R200V | R230V |
| Drift |  Installing pinion rear bearing outer race<br>**a: 89 mm (3.50 in) dia. – R200V**<br>**99 mm (3.90 in) dia. – R230V**<br>**b: 200 mm (7.87 in)** | X | X |

3S71A

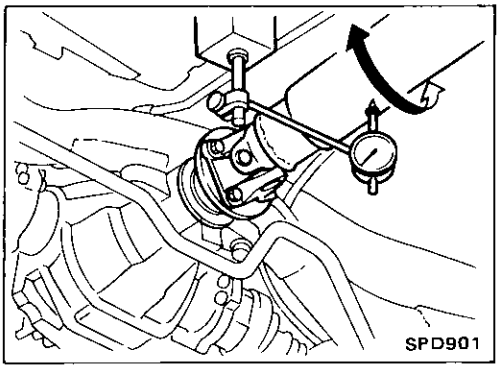



SPD107A

3S80A-VL107




SPD109A

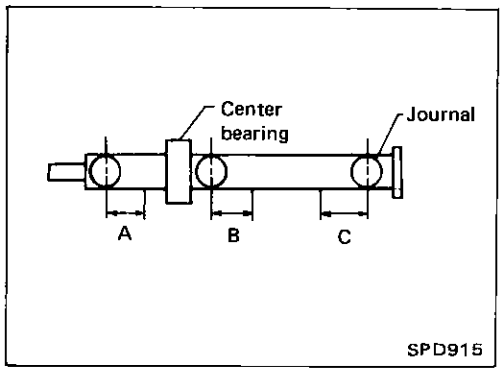



## On-vehicle Service

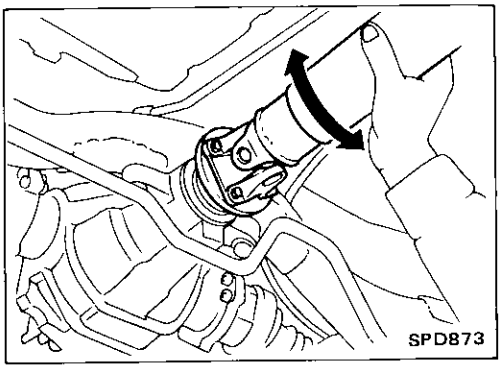
### PROPELLER SHAFT VIBRATION

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)**



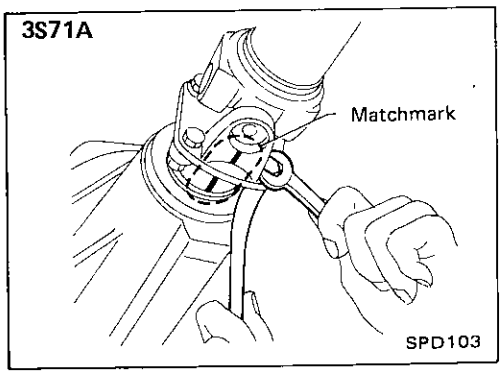

**Propeller shaft runout measuring points:**
**Distance "A":**
**162 mm (6.38 in)**
**Distance "B":**
**3S71A: 172 mm (6.77 in)**
**3S80A-VL107: 200 mm (7.87 in)**
**Distance "C":**
**3S71A: 192 mm (7.56 in)**
**3S80A-VL107: 200 mm (7.87 in)**




3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange. Rotate companion flange 90° (3S71A) or 60° (3S80A-VL107), and reconnect propeller shaft and check runout.
   Repeat above operation when companion flange is rotated 180° (3S71A) or 120° (3S80A-VL107) and 270° (3S71A) or 180° (3S80A-VL107), respectively. Also, for 3S80A-VL107, the operation should be repeated at 240° and 300°. Securely connect propeller shaft at the point where the smallest runout of the three measurements occurs.
   **Runout limit: 0.6 mm (0.024 in)**
4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.

### APPEARANCE CHECKING

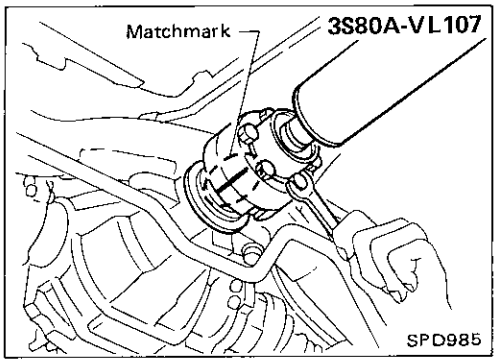
- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.

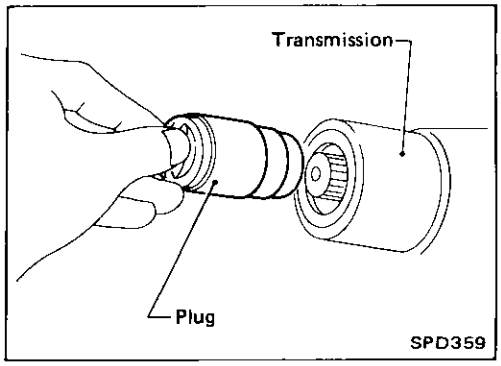



## Removal

- Put matchmarks on flanges and separate propeller shaft from final drive.

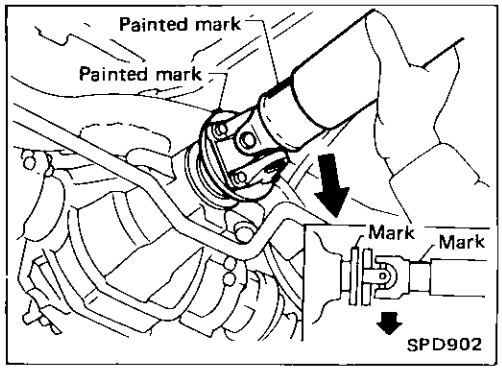
## Removal (Cont'd)



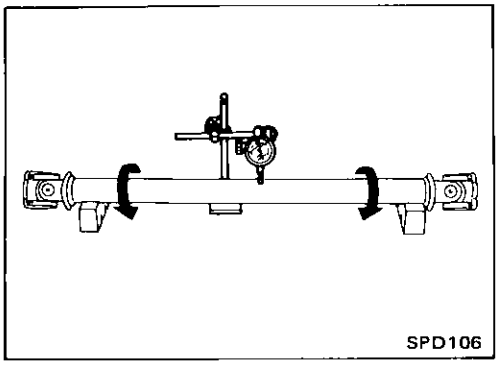

- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.

## Installation

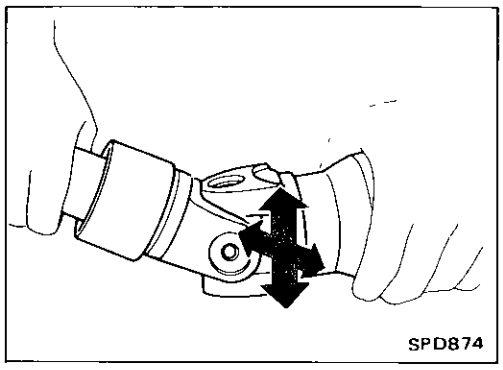



- Temporarily install differential companion flange and flange yoke so that their alignment marks (original marks) are located as close to each other as possible.
- Turn propeller shaft until alignment marks face straight upward. Securely fasten propeller shaft so that lower side wall of concave flange yoke will touch lower side wall of convex companion flange.

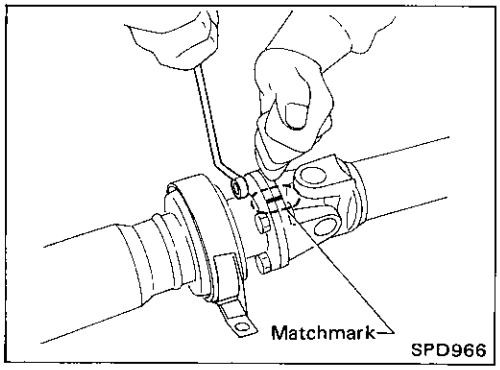
## Inspection




- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.
  **Runout limit: 0.6 mm (0.024 in)**



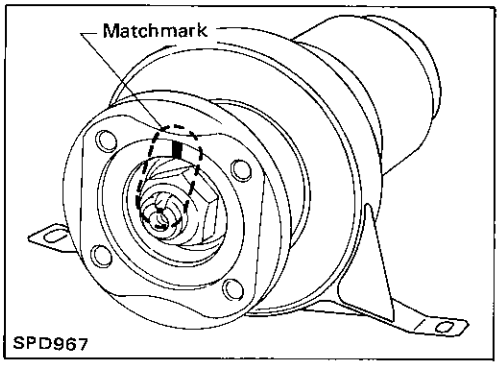

- Inspect journal axial play.
  If the play exceeds specifications, replace propeller shaft assembly.
  **Journal axial play:**
  **0 mm (0 in)**



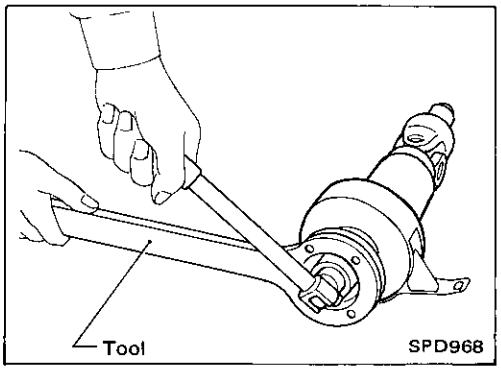

## Disassembly

### CENTER BEARING

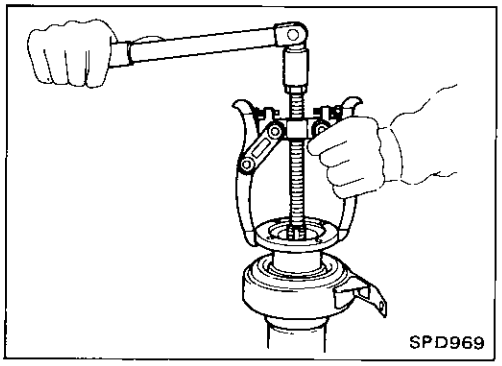
1. Put matchmarks on flanges, and separate 2nd tube from 1st tube.



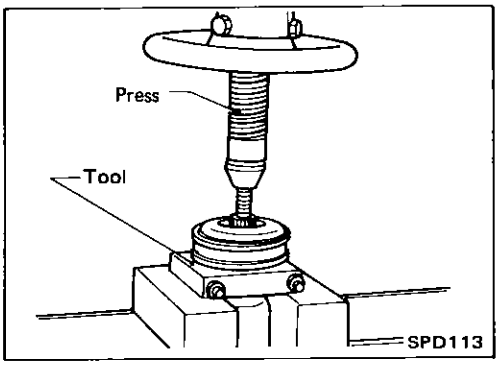

2. Put matchmarks on the flange and shaft.



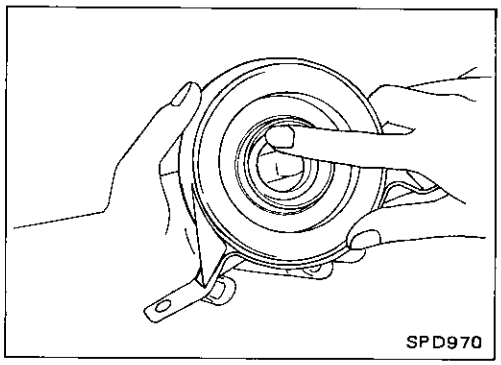

3. Remove locking nut with Tool.
   **Tool number:**
   **ST38060002 (J34311)**




4. Remove companion flange with puller.



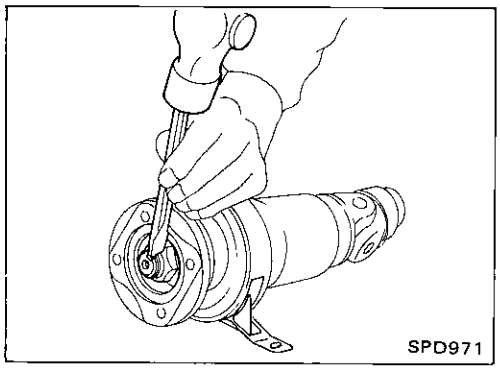

5. Remove center bearing with Tool and press.
   **Tool number: ST30031000 (J22912-01)**


SPD970

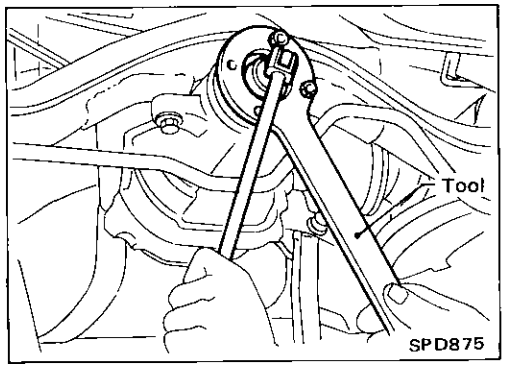
## Assembly

### CENTER BEARING

- Install center bearing with insulator's protrusion side facing front of vehicle.
- **Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.**


SPD971

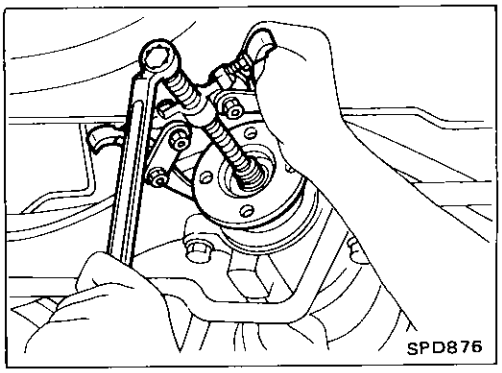
- Stake the nut. Always use new one.
- Align matchmarks when assembling tubes.



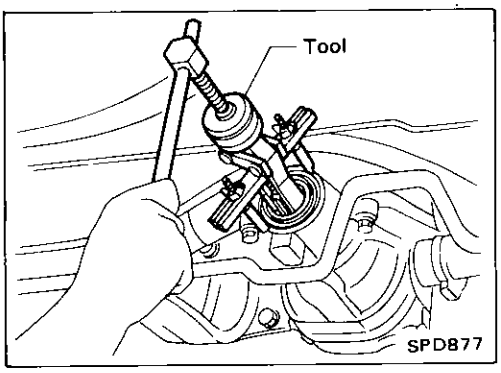

## Front Oil Seal Replacement (R200V)

**CAUTION:**
**For final drive models using collapsible spacer (R230V), bearing preload must be adjusted whenever companion flange is removed. In order to do this adjustment correctly, final drive overhaul is required.**

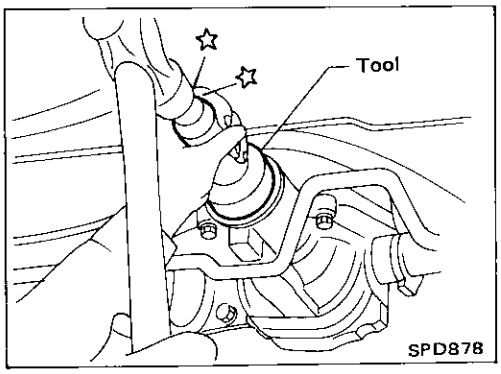
1. Remove propeller shaft.
2. Loosen drive pinion nut with Tool.
   **Tool number: ST38060002 (J34311)**



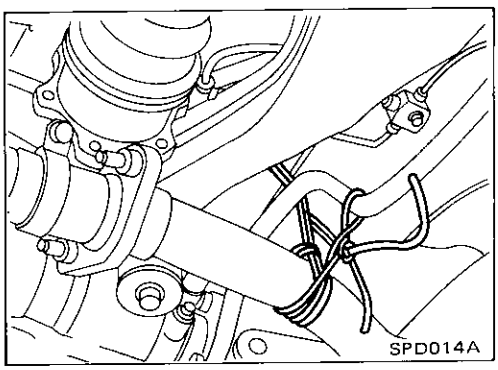

3. Remove companion flange.




4. Remove front oil seal.



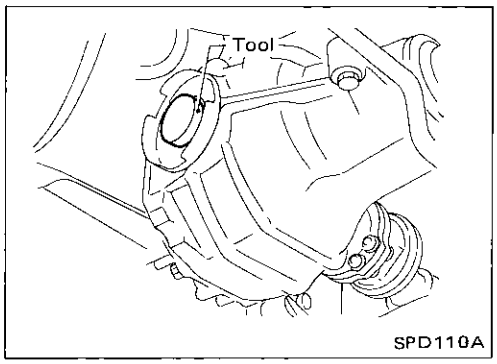

5. Apply multi-purpose grease to sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.




## Side Oil Seal Replacement

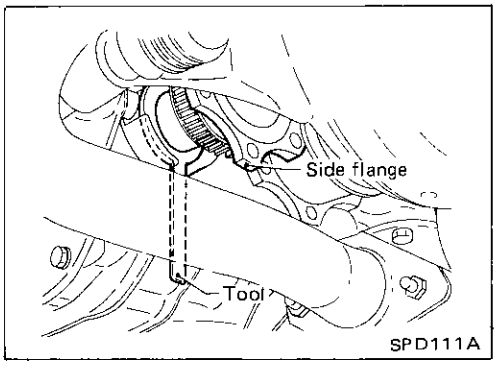
1. For L.H. side, remove drive shaft. For details, refer to section RA. For R.H. side, disconnect final drive side flange and drive shaft flange, and suspend drive shaft flange with wire.
2. Remove final drive side flange.
3. Remove oil seal.

## Side Oil Seal Replacement (Cont'd)




4. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.

**Tool number:**
**KV38100200 (J26233) — R200V —**
**xxxxxxxxxx ( — ) — R230V —**

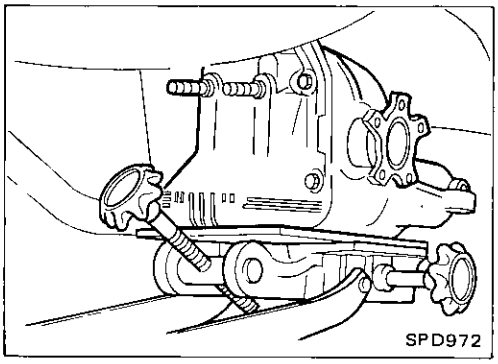



5. Install final drive side flange.

**Use Tool to prevent side oil seal from being damaged by spline portion of side flange.**

**Tool number:**
**KV38107900 (J39352) — R200V —**
**KV38108000 (J39351) — R230V —**

6. Install drive shaft.




## Removal

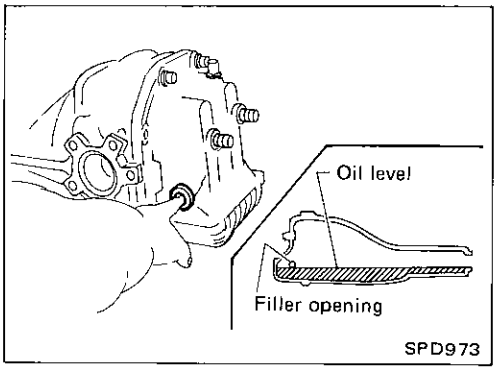
- Remove exhaust tube.
- Remove propeller shaft.

**Plug up rear end of transmission rear extension housing.**

- Remove drive shafts.
  Refer to RA section.
- Remove nuts securing final drive rear cover to suspension member.
- Support weight of final drive using jack.
- Remove final drive mounting member from front of final drive.
- Move final drive forward together with jack. Remove rear cover stud bolts from suspension member.
- Lower final drive using jack. Remove jack from rear of vehicle.

**CAUTION:**

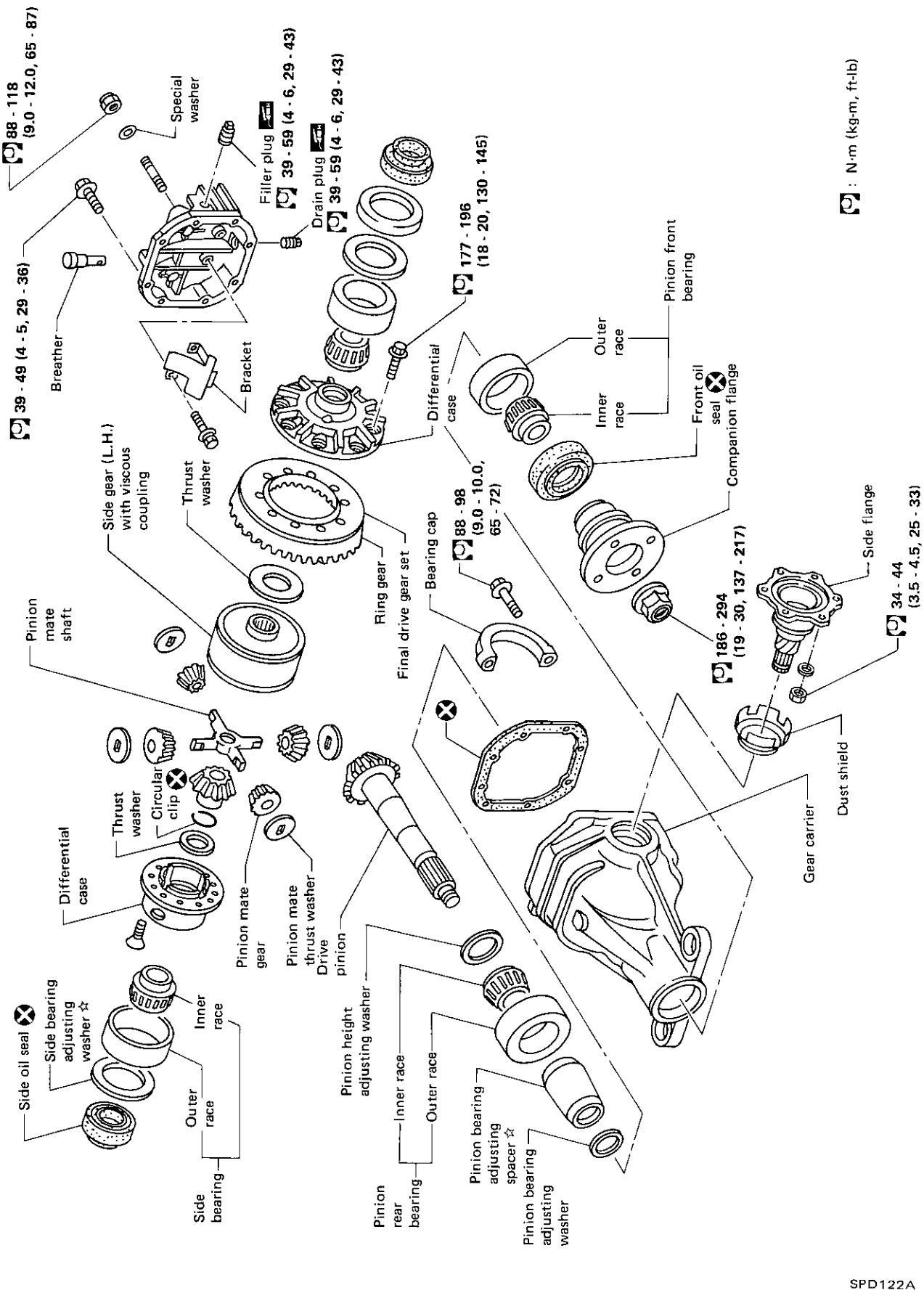
- **Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.**
- **After final drive is removed, support suspension member on a stand to prevent its insulators from being twisted or damaged.**




## Installation

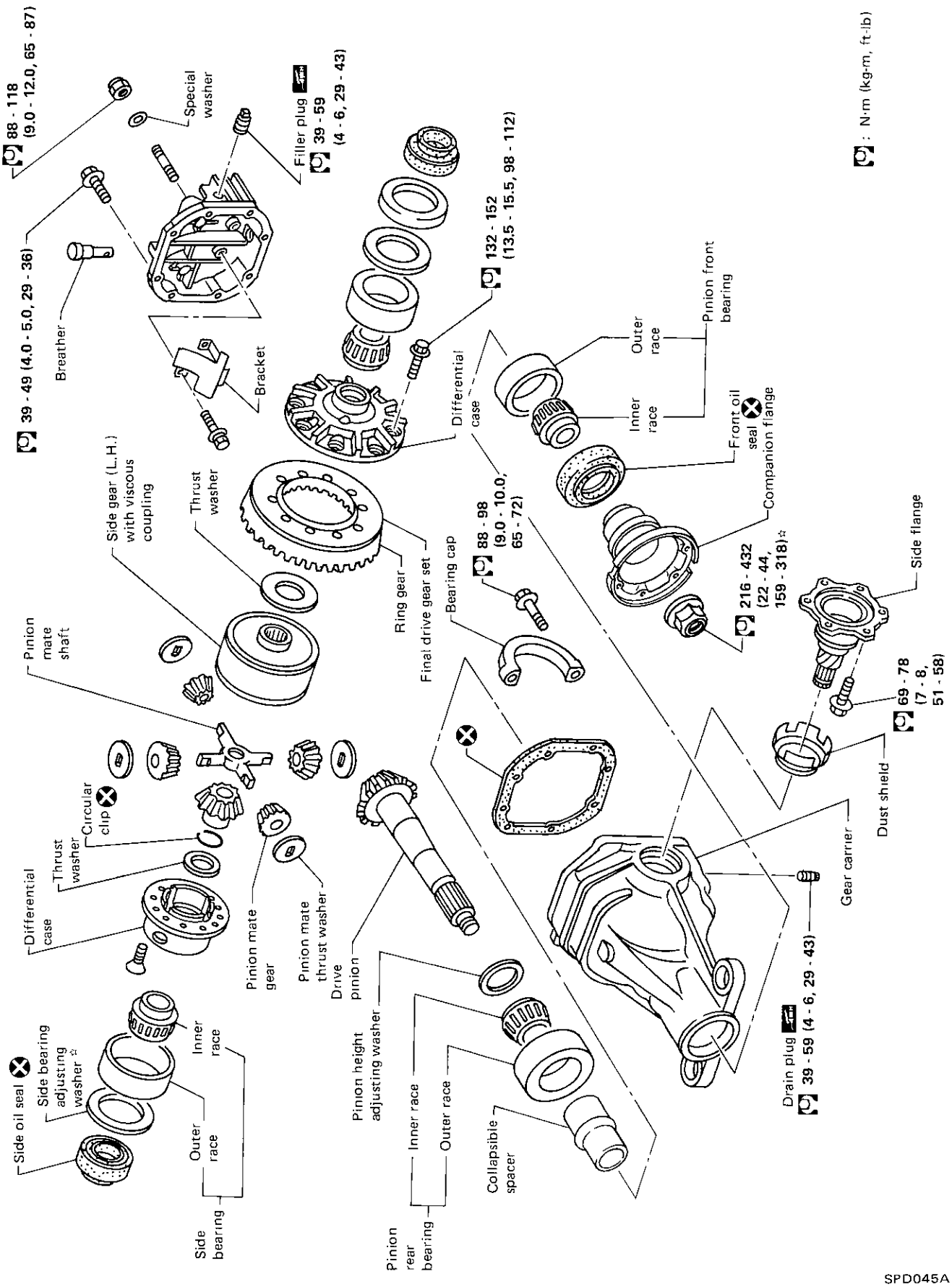
- Fill final drive with recommended gear oil.

## Model R200V

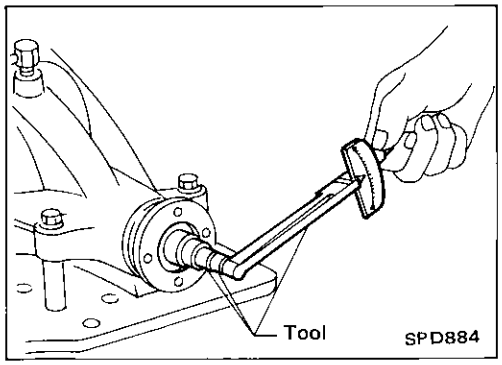



SPD122A

## Model R230V




SPD045A



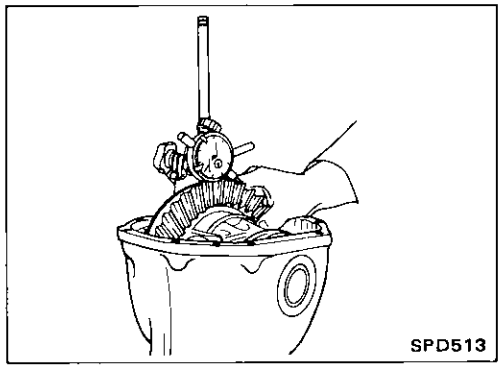

## Pre-inspection

Before disassembling final drive, perform the following inspection.

- Total preload

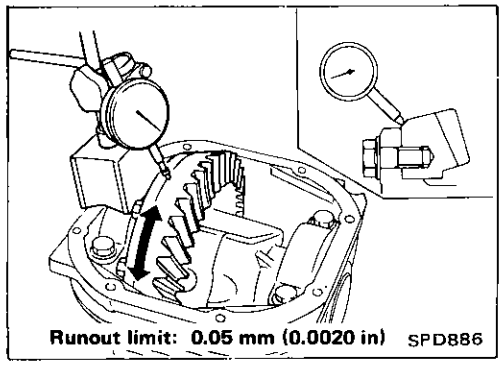
1) Turn drive pinion in both directions several times to set bearing rollers.
2) Check total preload with Tool.

**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.

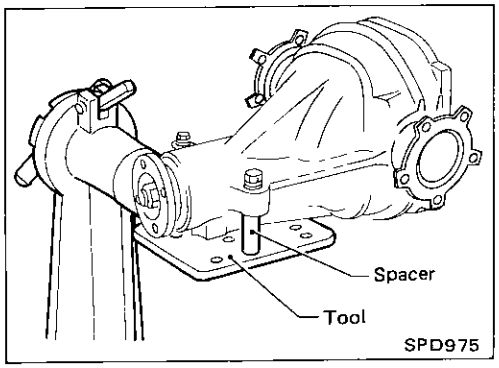
**Runout limit:**
**0.05 mm (0.0020 in)**

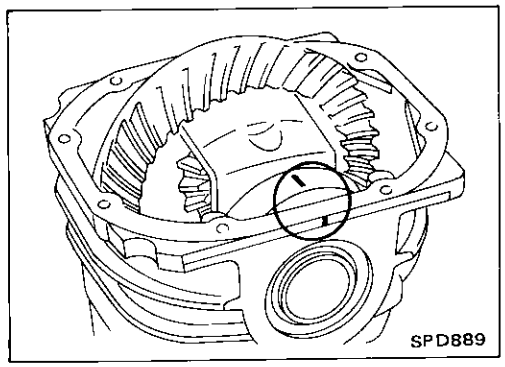
- Tooth contact
  Check tooth contact. (Refer to Adjustment.)

## Differential Carrier

1. Using two 45 mm (1.77 in) spacers, mount carrier on Tool.

**Tool number: KV38100800 ( — )**

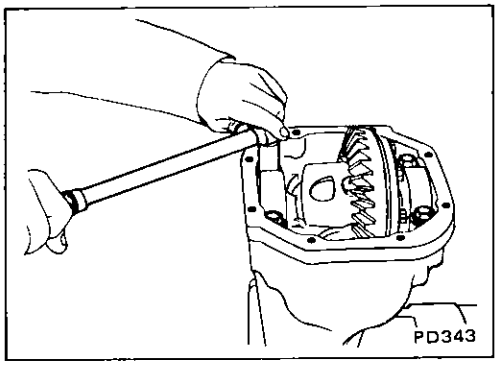


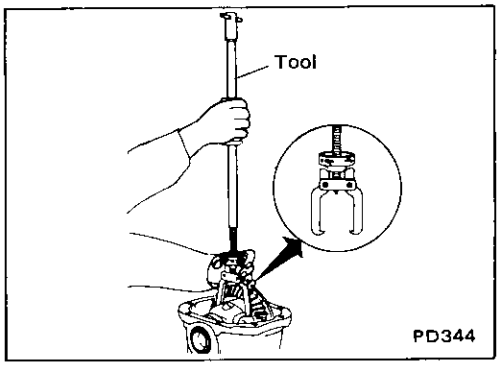

2. Paint or punch matchmarks on one side of the side bearing cap so it can be properly reinstalled.

**Bearing caps are line-bored during manufacture. Replace them in their proper positions.**

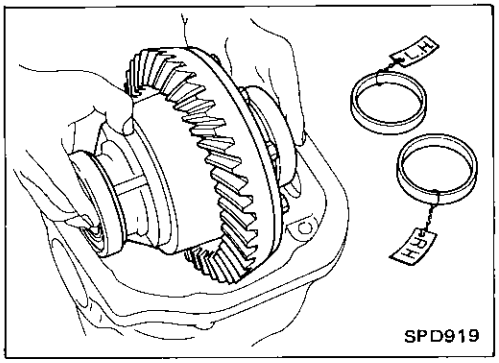
## Differential Carrier (Cont'd)



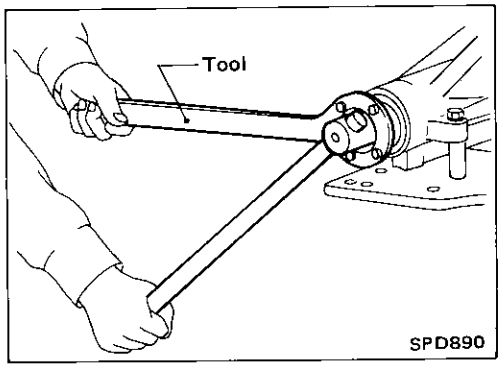

3. Remove side bearing caps.



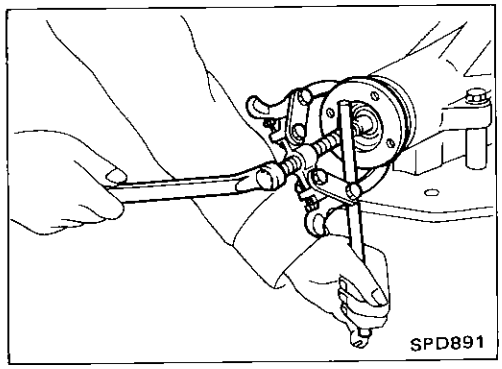

4. Lift differential case assembly out with Tool.
   **Tool number: HT72400000 ( — )**



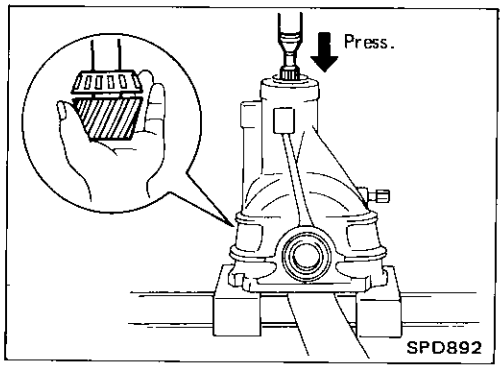

**Keep the side bearing outer races together with inner cone — do not mix them up.**
**Also, keep side bearing spacer and adjusting shims together with bearings.**



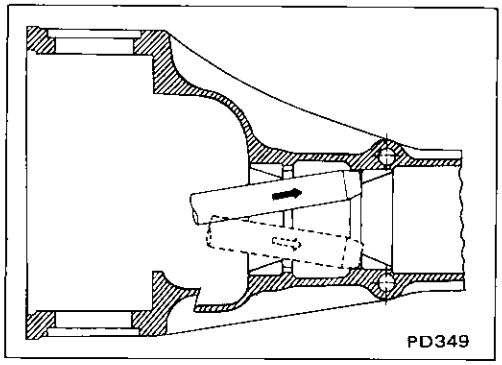

5. Loosen drive pinion nut and pull off companion flange.
   **Tool number:**
   **ST38060002 (J34311) — R200V —**
   **xxxxxxxxxx ( — ) — R230V —**



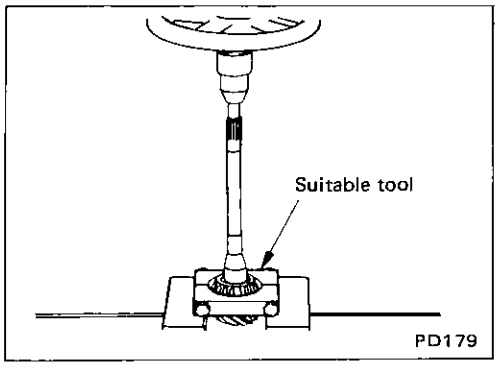
## Differential Carrier (Cont'd)




6. Take out drive pinion (together with rear bearing inner race, bearing spacer and adjusting washer).
7. Remove oil seal.
8. Remove front bearing inner race.
9. Remove side oil seal.

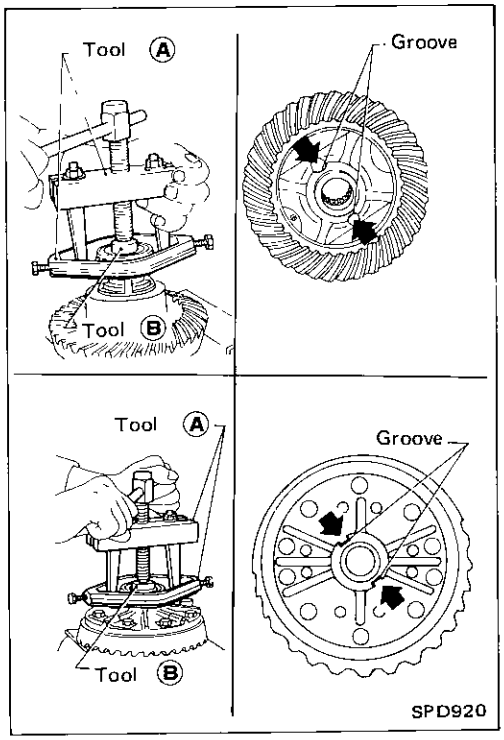



10. Remove pinion bearing outer races with a brass drift.




11. Remove pinion rear bearing inner race and drive pinion height adjusting washer with suitable tool.

## Differential Case




1. Remove side bearing inner cones.

**To prevent damage to bearing, engage puller jaws in groove.**

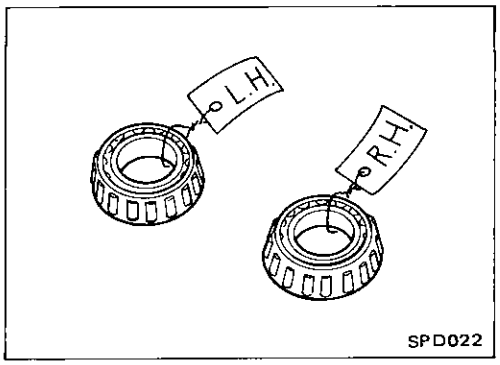
**Tool number:**

**Ⓐ ST33051001 ( — )**

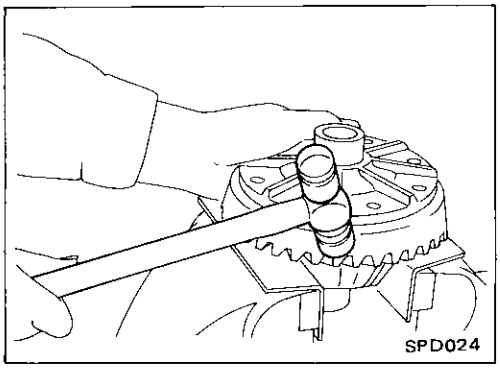
**Ⓑ ST33061000 (J8107-2) — R200V —**

**xxxxxxxxxx ( — ) — R230V —**

## Differential Case (Cont'd)

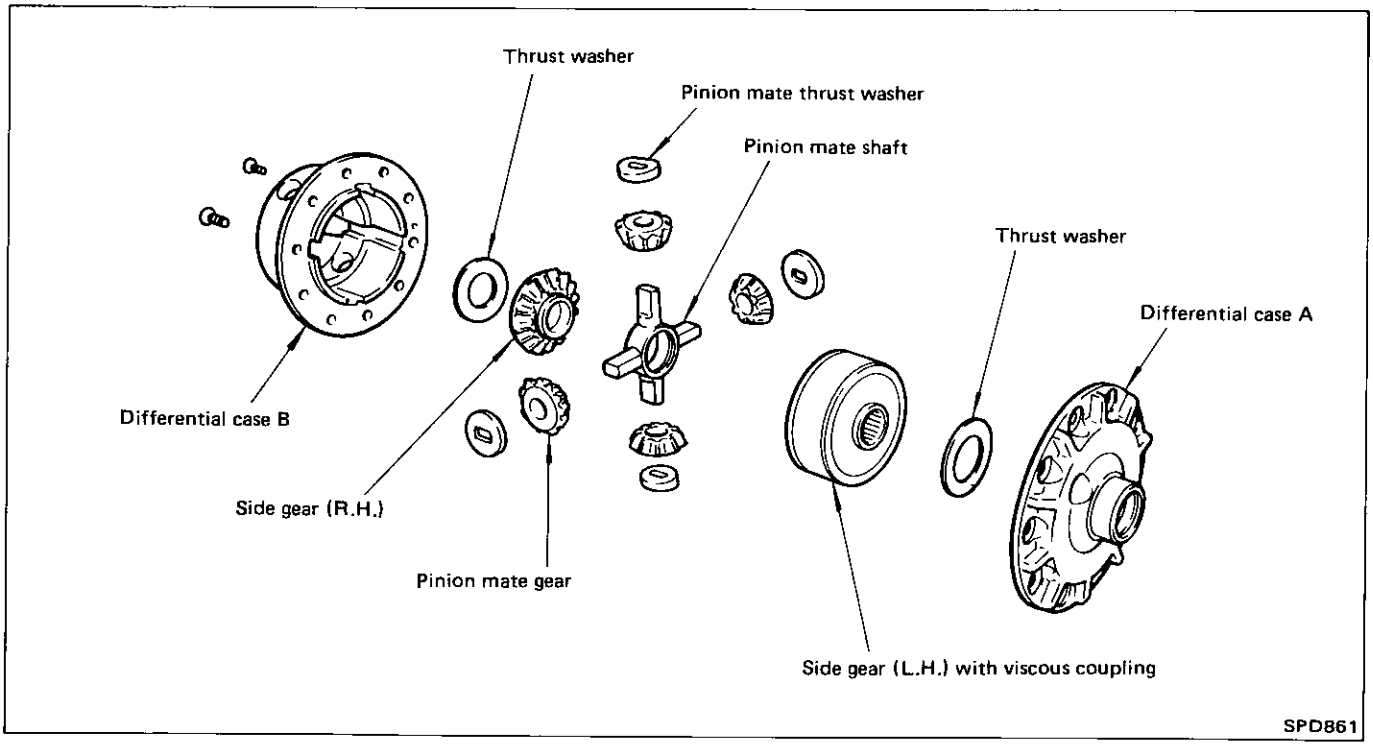



**Be careful not to confuse left- and right-hand parts.**

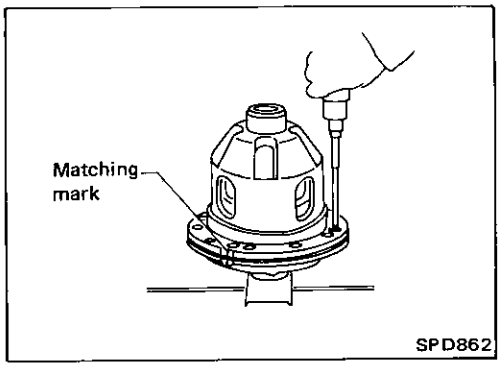



2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off the differential case with a soft hammer.

**Tap evenly all around to keep ring gear from binding.**



## Differential Case (Cont'd)



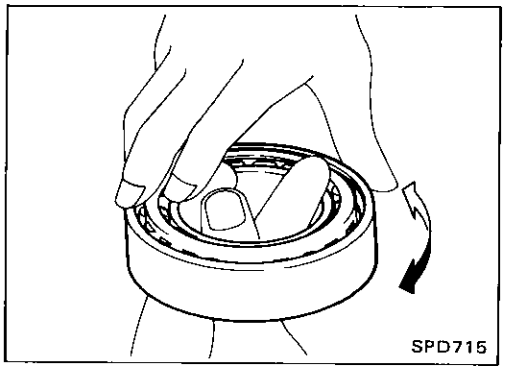

4. Loosen screws on differential cases A and B.
5. Separate differential cases A and B.

**CAUTION:**

**Assemble differential case firmly.**

## Contact Surfaces

1. Clean the disassembled parts in suitable solvent and blow dry with compressed air.
2. If following surfaces are found to be burred or scratched, smooth with oil stone.
- Differential case A
- Differential case B
- Side gear
- Pinion mate gear
- Pinion mate shaft
3. Check viscous coupling for oil leakage. If necessary, replace it with new one.




## Bearing

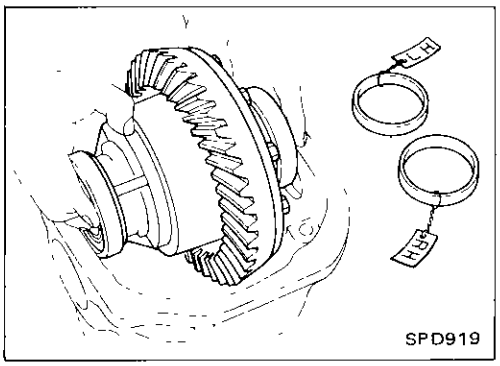
1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking.
   Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

For quiet and reliable final drive operation, the following five adjustments must be made correctly.

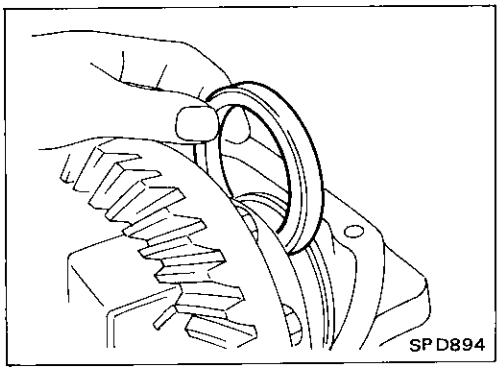
1. Side bearing preload
2. Pinion gear height
3. Pinion bearing preload
4. Ring gear-to-pinion backlash (Refer to ASSEMBLY.)
5. Ring and pinion gear tooth contact pattern

## Side Bearing Preload

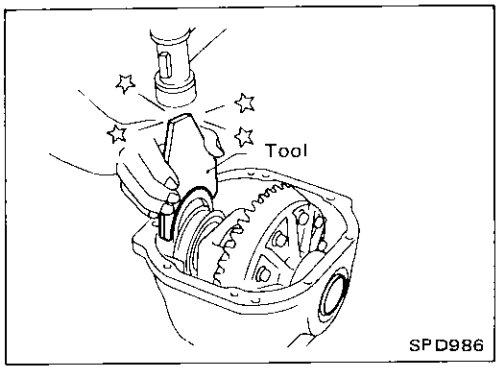
**A selection of carrier side bearing preload shims is required for successful completion of this procedure.**




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.

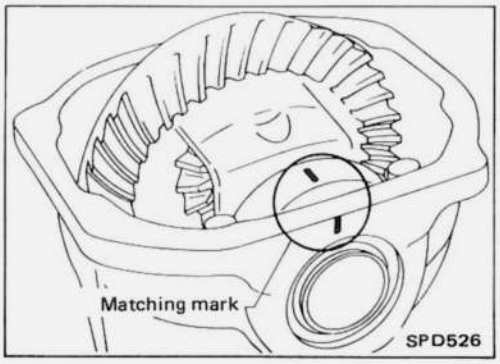



3. Put the side bearing spacer in place on the ring gear end of the carrier.

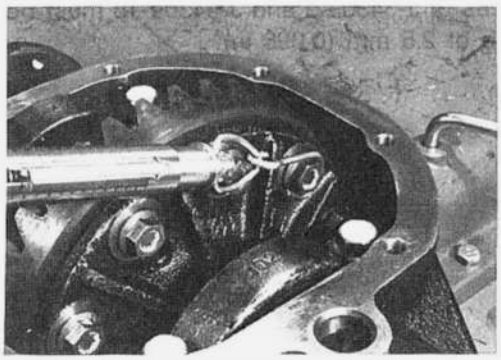



4. Using the J-25267 side bearing spacer drift, place both of the original carrier side bearing preload shims on the carrier end, opposite the ring gear.

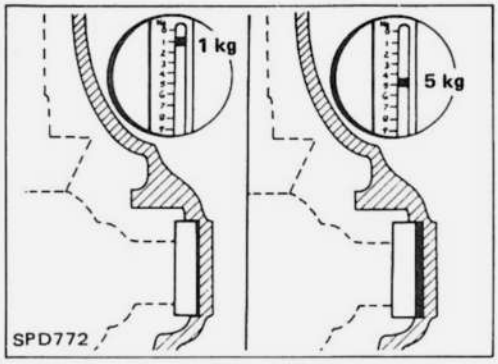
## Side Bearing Preload (Cont'd)



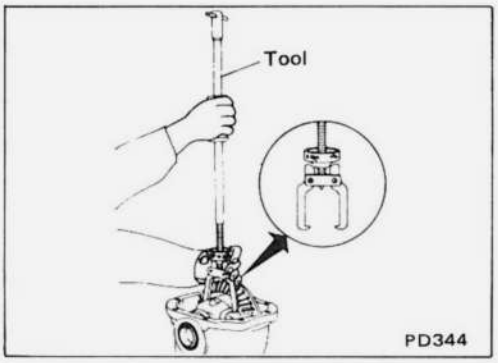

5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.
   **Specification:**
   **88 - 98 N·m**
   **(9 - 10 kg-m, 65 - 72 ft-lb)**
6. Turn the carrier several times to seat the bearings.



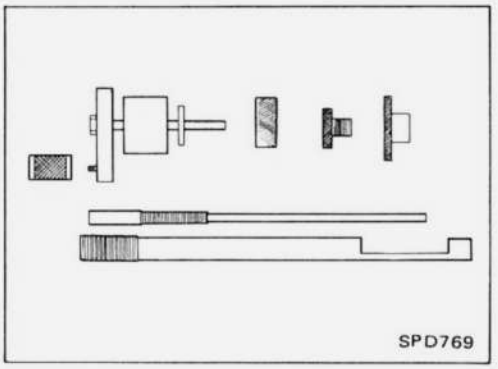
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J-8129.
   **Specification:**
   **34.3 - 39.2 N**
   **(3.5 - 4 kg, 7.7 - 8.8 lb)**
   **of pulling force at the ring gear bolt.**




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.



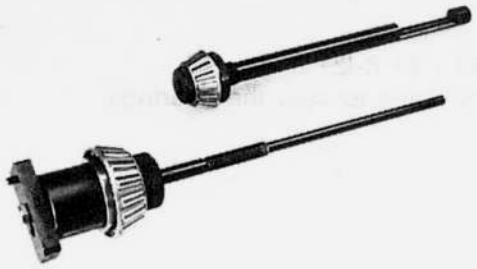

10. Remove the carrier from the final drive housing, saving the selected preload washers for later use during the assembly of the final drive unit.



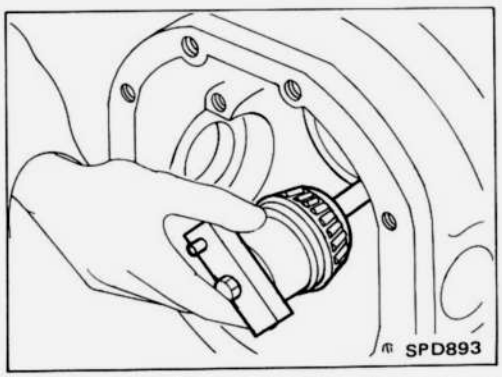

## Pinion Gear Height and Pinion Bearing Preload

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)

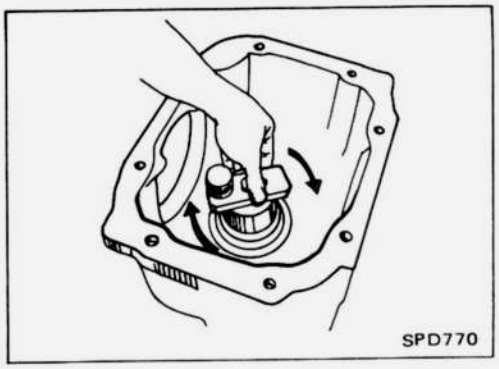


- **Front pinion bearing** — make sure the J-34309-3 front pinion bearing seat is secured tightly against the J-34309-2 gauge anvil. Then turn the front pinion bearing pilot, J-34309-5, to secure the bearing in its proper position.
- **Rear pinion bearing** — the rear pinion bearing pilot, J-34309-8, 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.
- **Installation of J-34309-9 and J-34309-16** — place a suitable 2.5 mm (0.098 in) thick plain washer between J-34309-9 and J-34309-16. Both surfaces of J-34309-9 and J-34309-16 must be parallel with a clearance of 2.5 mm (0.098 in).




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.

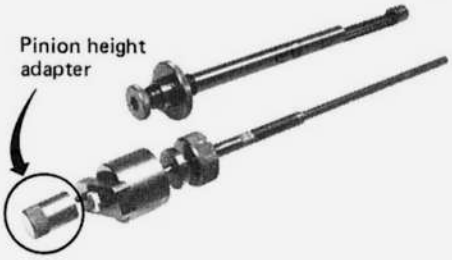
4. Assemble the front pinion bearing inner cone and the J-34309-2 gauge anvil together with the J-34309-1 gauge screw in the final drive housing. Make sure that the pinion height gauge plate, J-34309-16, will turn a full 360 degrees, and tighten the two sections together by hand.




5. Turn the assembly several times to seat the bearings.

## Pinion Gear Height and Pinion Bearing Preload (Cont'd)

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)**

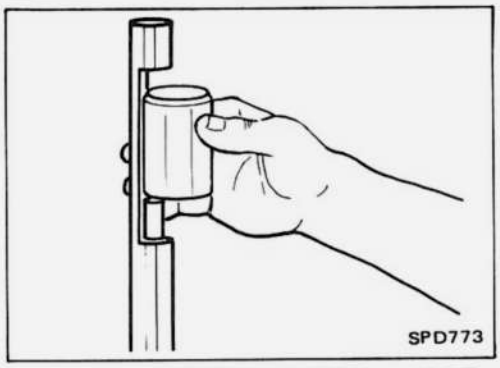



7. Place the J-34309-11 "R200A" pinion height adapter onto the gauge plate and tighten it by hand.

**CAUTION:**
**Make sure all machined surfaces are clean.**

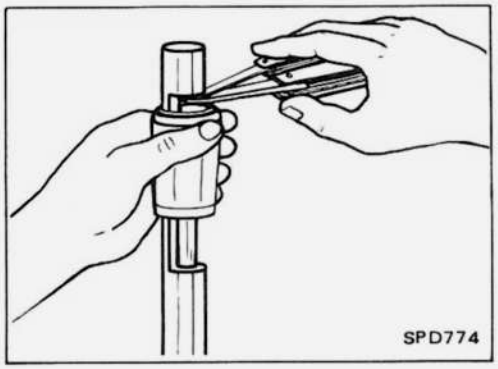
**— PINION BEARING PRELOAD WASHER SELECTION —**

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.

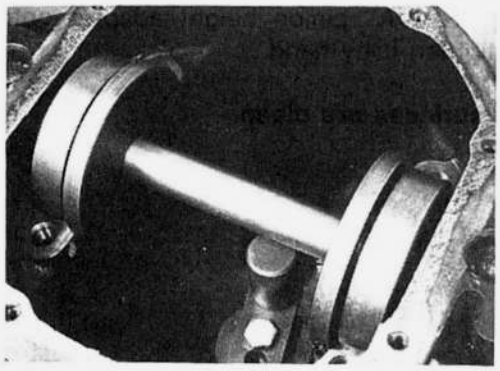


9. Select the correct thickness of pinion bearing preload adjusting washer using a standard gauge of 3.5 mm (0.138 in) and your J-34309-101 feeler gauge. *The exact measurement you get with your gauges is the thickness of the adjusting washer required.* Select the correct washer.
   **Drive pinion bearing preload adjusting washer:**
   **Refer to S.D.S.**

## Pinion Gear Height and Pinion Bearing Preload (Cont'd)

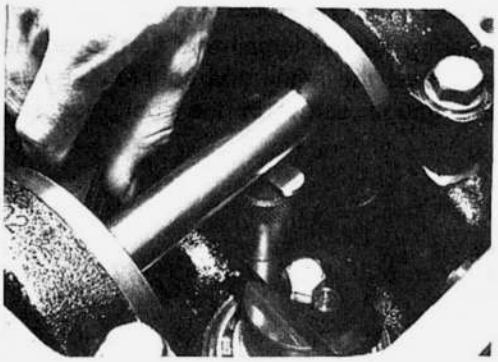

SPD774

10. Set your selected, correct pinion bearing preload adjusting washer aside for use when assembling the pinion gear and bearings into the final drive.

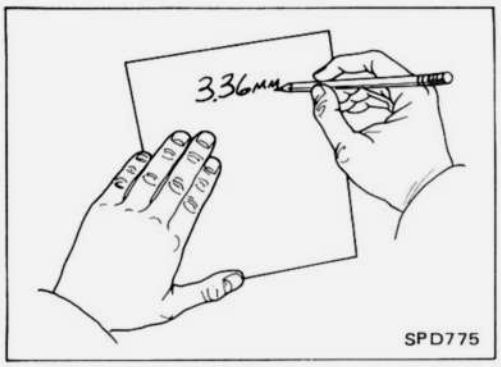


**— PINION HEIGHT ADJUSTING WASHER SELECTION —**

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 to proper torque.

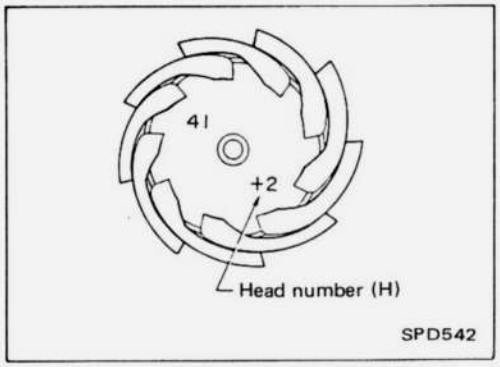


12. Select the correct *standard* pinion height adjusting washer thickness using a standard gauge of 3 mm (0.12 in) and your J-34309-101 feeler gauge. Measure the distance between the J-34309-11 pinion height adapter including the standard gauge and the arbor.



SPD775

13. Write down your exact measurement (the value of feeler gauge).



SPD542

14. Correct the pinion height washer size by referring to the "pinion head number."

**There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number," and it refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.**

## Pinion Gear Height and Pinion Bearing Preload (Cont'd)

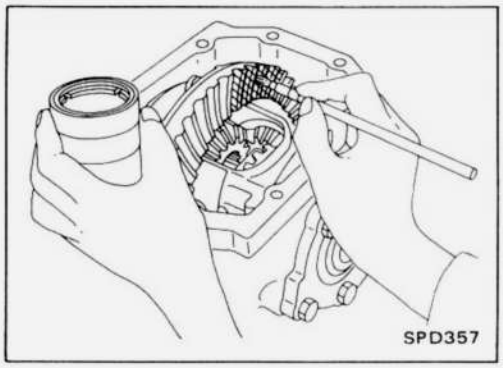
| Pinion head height number | Add or remove from the standard pinion height washer thickness measurement |
|---|---|
| −6 | Add 0.06 mm (0.0024 in) |
| −5 | Add 0.05 mm (0.0020 in) |
| −4 | Add 0.04 mm (0.0016 in) |
| −3 | Add 0.03 mm (0.0012 in) |
| −2 | Add 0.02 mm (0.0008 in) |
| −1 | Add 0.01 mm (0.0004 in) |
| 0 | Use the selected washer thickness |
| +1 | Subtract 0.01 mm (0.0004 in) |
| +2 | Subtract 0.02 mm (0.0008 in) |
| +3 | Subtract 0.03 mm (0.0012 in) |
| +4 | Subtract 0.04 mm (0.0016 in) |
| +5 | Subtract 0.05 mm (0.0020 in) |
| +6 | Subtract 0.06 mm (0.0024 in) |

15. Select the correct pinion height washer from the following chart.
    **Drive pinion height adjusting washer:**
    **Refer to S.D.S.**

16. Remove the J-34309 pinion preload shim selector Tool from the final drive housing and disassemble to retrieve the pinion bearings.

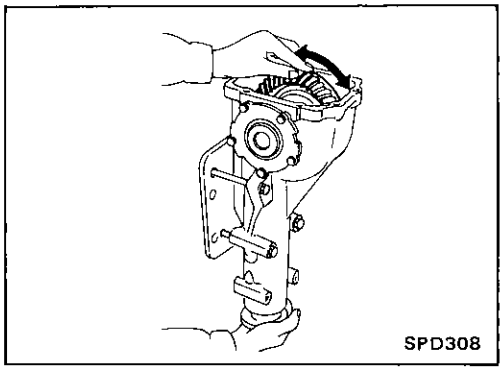
## Tooth Contact

Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gears which are not positioned properly in relation to one another may be noisy, or have short life or both. With the checking of gear tooth contact pattern, the most desirable contact for low noise level and long life can be assured.



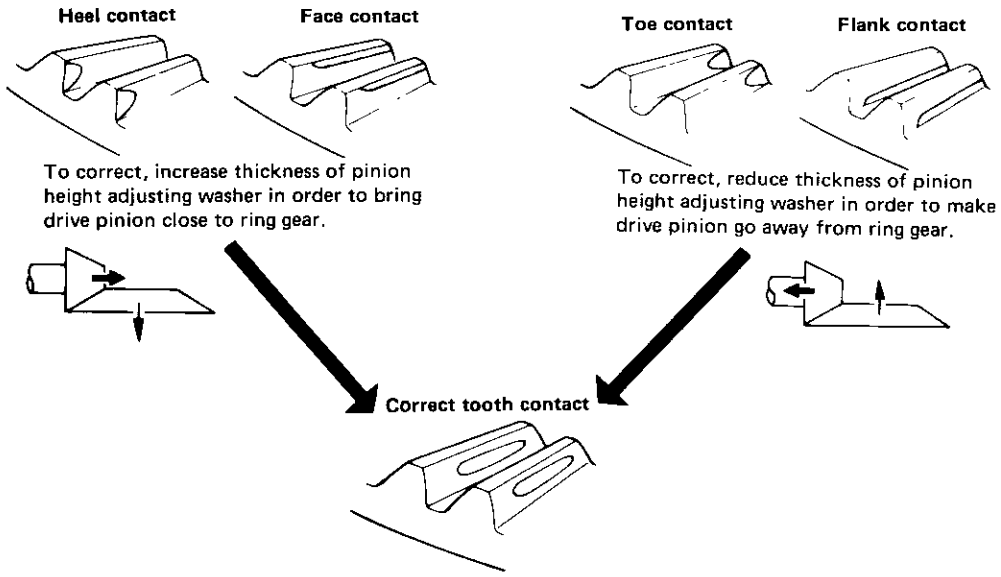

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered titanium oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.

## Tooth Contact (Cont'd)




3. Hold companion flange steady by hand and rotate the ring gear in both directions.

**Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.**
**However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern.**
**The tooth pattern is the best indication of how well the final drive has been set up.**

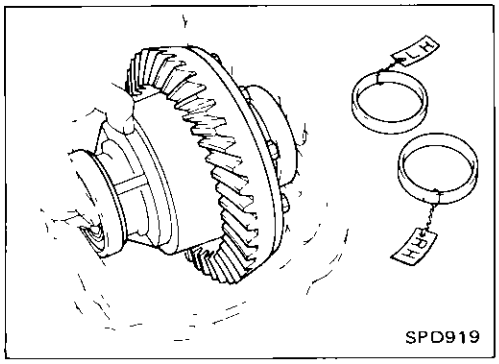


For quiet and reliable final drive operation, the following five adjustments must be made correctly.

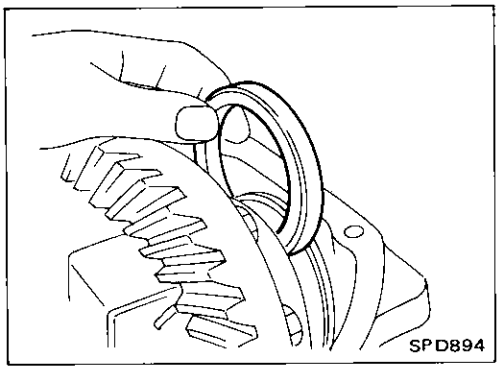
1. Side bearing preload
2. Pinion gear height
3. Ring gear-to-pinion backlash (Refer to ASSEMBLY.)
4. Ring and pinion gear tooth contact pattern

## Side Bearing Preload

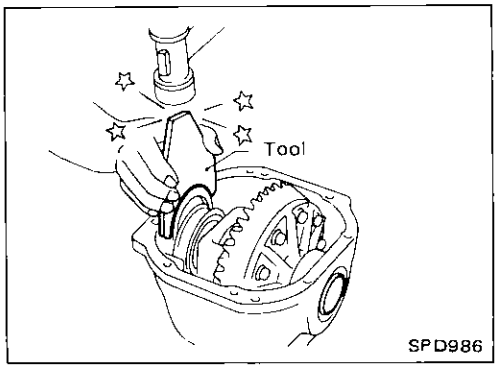
**A selection of carrier side bearing preload shims is required for successful completion of this procedure.**




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.

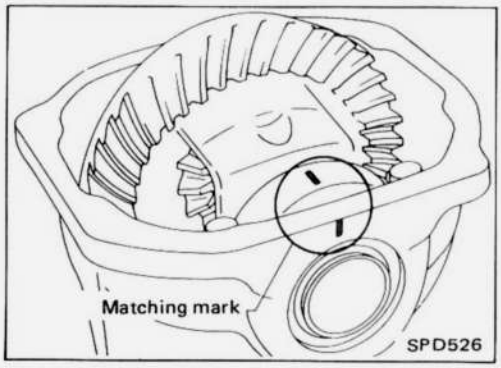



3. Put the side bearing spacer in place on the ring gear end of the carrier.

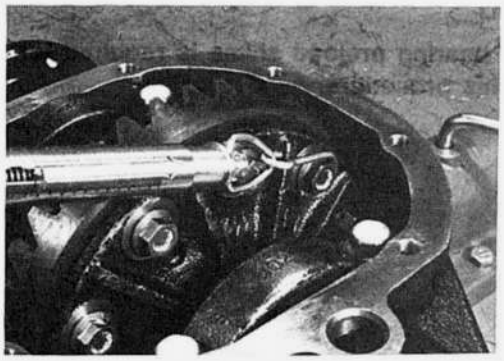



4. Using the xxxxxx side bearing spacer drift, place both of the original carrier side bearing preload shims on the carrier end, opposite the ring gear.

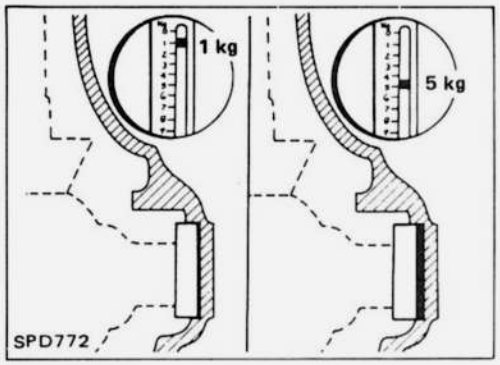
## Side Bearing Preload (Cont'd)



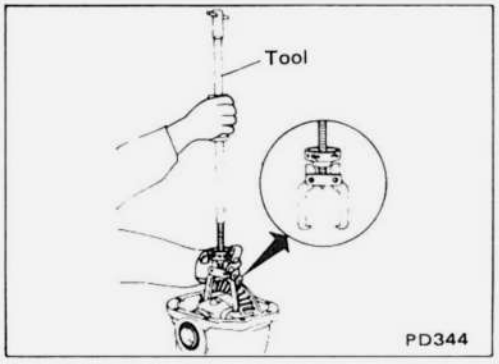

5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.
   **Specification:**
   **88 - 98 N·m**
   **(9 - 10 kg-m, 65 - 72 ft-lb)**
6. Turn the carrier several times to seat the bearings.



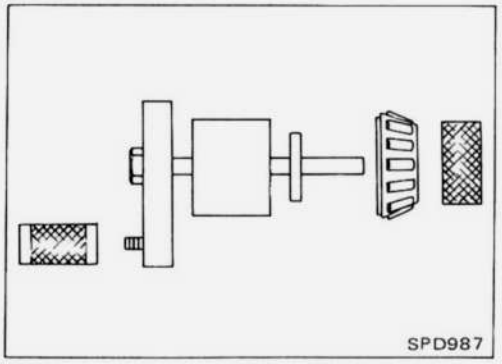
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J-8129.
   **Specification:**
   **34.3 - 39.2 N**
   **(3.5 - 4 kg, 7.7 - 8.8 lb)**
   **of pulling force at the ring gear bolt.**




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.



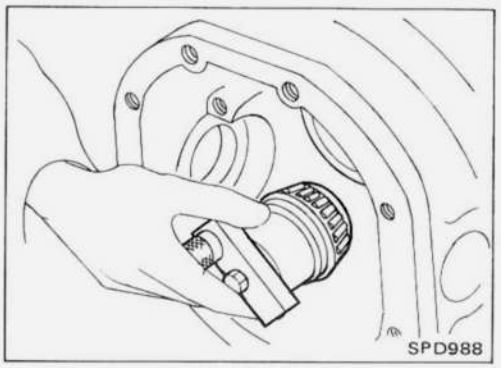

10. Remove the carrier from the final drive housing, saving the selected preload washers for later use during the assembly of the final drive unit.



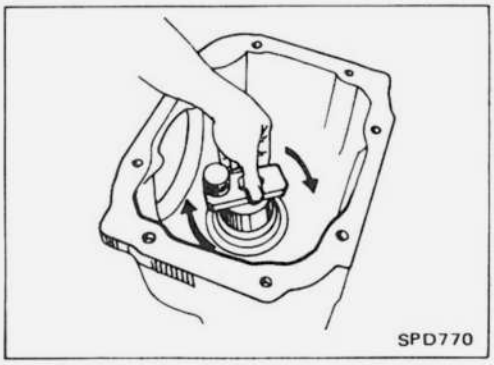

## Pinion Gear Height

1. Make sure all parts are clean and that the bearings are well lubricated.
2. Assemble the pinion gear bearings into the pinion preload shim selector Tool, xxxxxx.

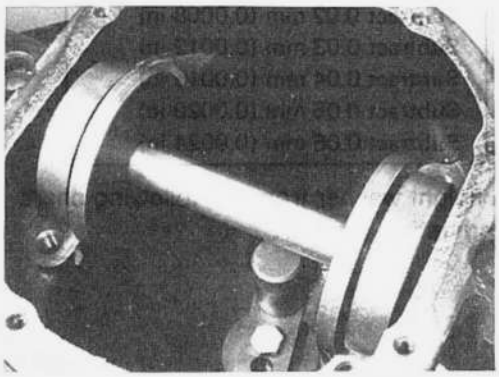
## Pinion Gear Height (Cont'd)



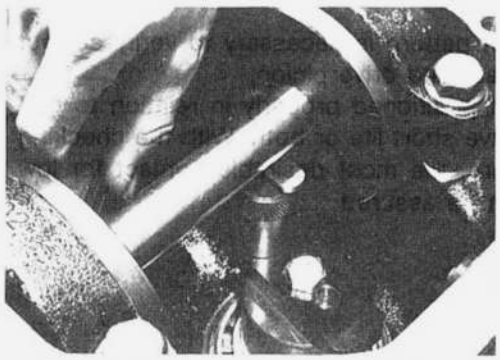

3. Place the pinion preload shim selector Tool, xxxxxxx, gauge screw assembly with the pinion rear bearing inner cone installed into the final drive housing.



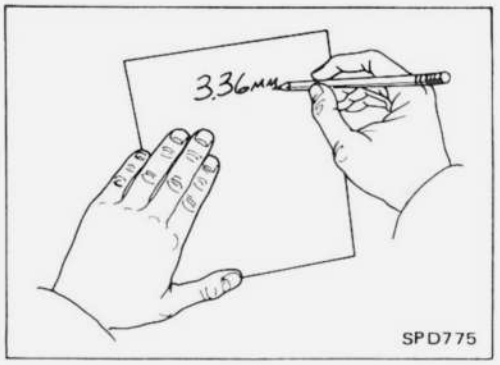

4. Turn the assembly several times to seat the bearings.



5. Now, position the side bearing discs, xxxxxxx, and arbor firmly into the side bearing bores.
   Install the side bearing caps and tighten the cap bolts to proper torque.

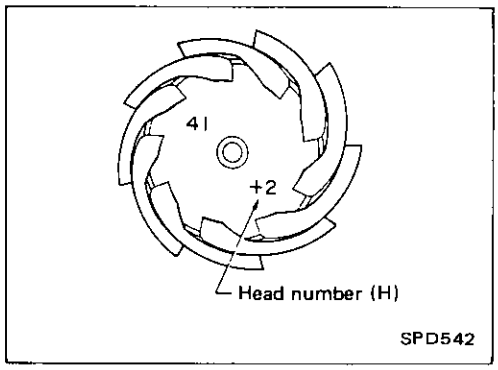


6. Select the correct *standard* pinion height adjusting washer thickness using a standard gauge of 3 mm (0.12 in) and your xxxxxxxxx feeler gauge. Measure the distance between the xxxxxxxx pinion height adapter including the standard gauge and the arbor.




7. Write down your exact measurement (the value of feeler gauge).

## Pinion Gear Height (Cont'd)




8. Correct the pinion height washer size by referring to the "pinion head number."

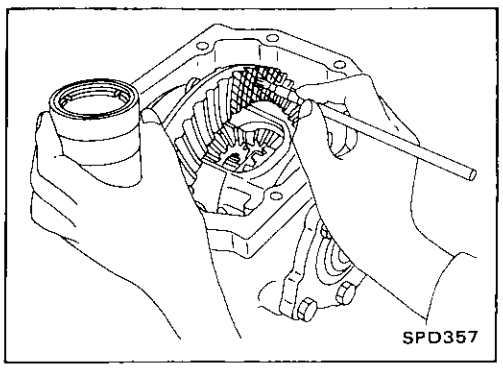
**There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number," and it refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.**

| Pinion head height number | Add or remove from the standard pinion height washer thickness measurement |
|---|---|
| −6 | Add 0.06 mm (0.0024 in) |
| −5 | Add 0.05 mm (0.0020 in) |
| −4 | Add 0.04 mm (0.0016 in) |
| −3 | Add 0.03 mm (0.0012 in) |
| −2 | Add 0.02 mm (0.0008 in) |
| −1 | Add 0.01 mm (0.0004 in) |
| 0 | Use the selected washer thickness |
| +1 | Subtract 0.01 mm (0.0004 in) |
| +2 | Subtract 0.02 mm (0.0008 in) |
| +3 | Subtract 0.03 mm (0.0012 in) |
| +4 | Subtract 0.04 mm (0.0016 in) |
| +5 | Subtract 0.05 mm (0.0020 in) |
| +6 | Subtract 0.06 mm (0.0024 in) |

9. Select the correct pinion height washer from the following chart.
   **Drive pinion height adjusting washer:**
   **Refer to S.D.S.**

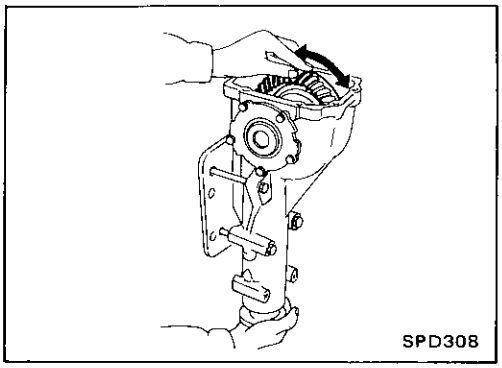
## Tooth Contact

Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gears which are not positioned properly in relation to one another may be noisy, or have short life or both. With the checking of gear tooth contact pattern, the most desirable contact for low noise level and long life can be assured.



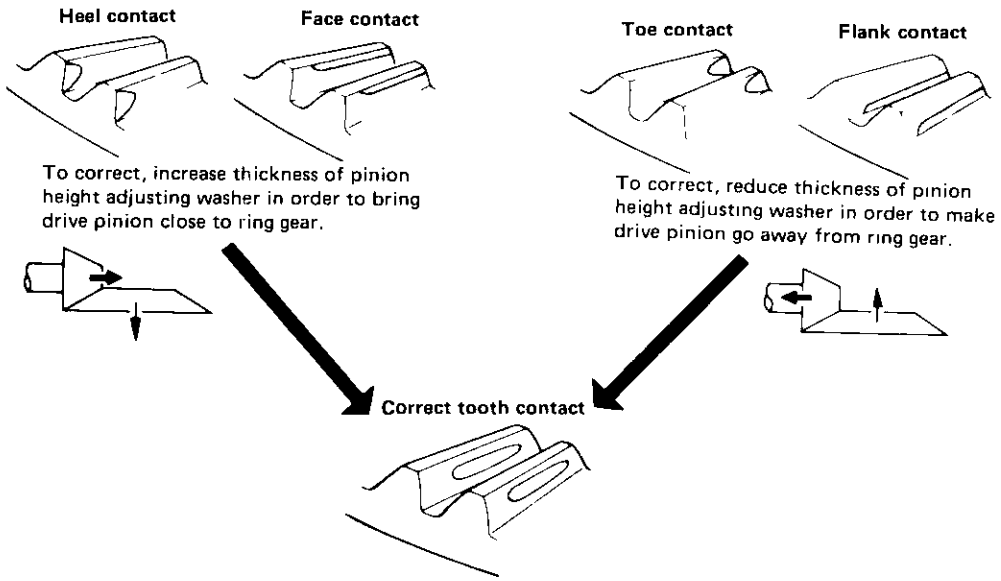

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered titanium oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.

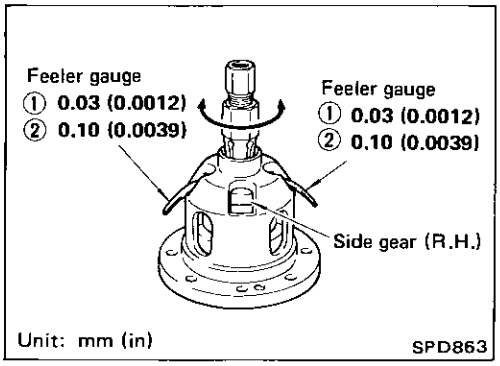
## Tooth Contact (Cont'd)




3. Hold companion flange steady by hand and rotate the ring gear in both directions.

**Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.**
**However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern.**
**The tooth pattern is the best indication of how well the final drive has been set up.**






## Differential Case

### THRUST WASHER SELECTION

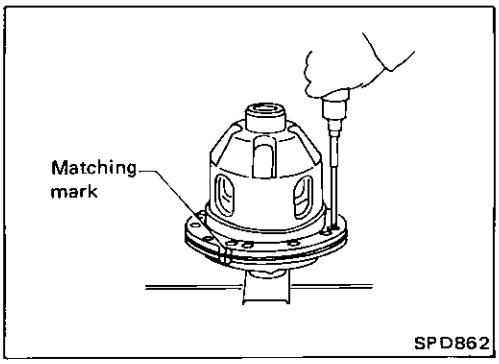
Whenever side gears or pinion mate gears are replaced, select suitable thrust washers as follows:

1. Clean side gears and pinion mate gears using white gasoline.
2. Before assembling gears, apply hypoid gear oil to frictional surfaces.
3. Install the previously removed thrust washer on right side gear. On left side gear, install a suitable thrust washer.
   Temporarily tighten differential cases using two screws.
4. Position differential assembly so that right side gear is on the upper side. Place a 0.03 mm (0.0012 in) feeler gauge (for example) between right side gear and thrust washer.

**Do not insert feeler gauge in oil groove portion of differential case.**

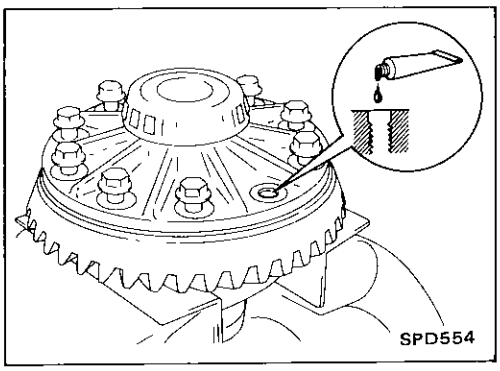
5. Also place a 0.03 mm (0.0012 in) additional feeler gauge between right side gear and thrust washer so that it is positioned diagonal to (180° apart from) the feeler gauge described previously.
6. Rotate right side gear with a suitable tool attached to splines. If right side gear cannot be rotated, replace thrust washer used on left side gear with a thinner one.
7. Replace both 0.03 mm (0.0012 in) feeler gauges with 0.10 mm (0.0039 in) gauges. At this point, make sure right side gear does not rotate. If it does, replace thrust washer on left side gear with a thicker one so that right side gear does not rotate.
8. As explained in above example, select suitable thrust washers to ensure that:

a) Both side gears rotate. [0.03 mm (0.0012 in) feeler gauges are used in this case.]
b) Side gear is held stationary. [0.10 mm (0.0039 in) feeler gauges are used in this case.]
   (Refer to S.D.S.)




### ASSEMBLY

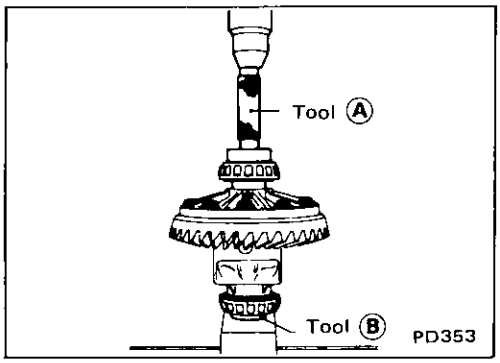
1. Install differential case A and B.




2. Place differential case on ring gear.
3. Apply locking sealant to ring gear bolts, and install them.

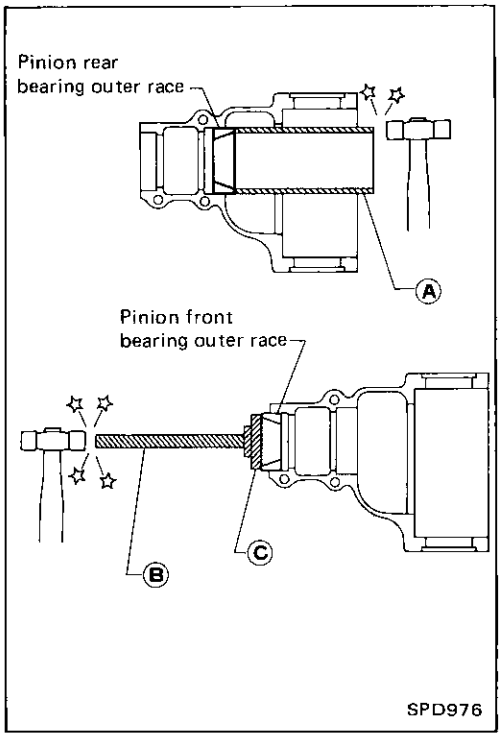
**Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.**

## Differential Case (Cont'd)

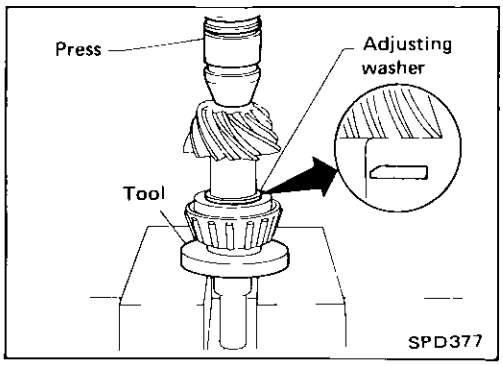



4. Press-fit side bearing inner cones on differential case with Tool.
   **Tool number:**
   **Ⓐ KV38100300 (J25523) — R200V —**
   **xxxxxxxxxx ( — ) — R230V —**
   **Ⓑ ST33061000 (J8107-2) — R200V —**
   **xxxxxxxxxx ( — ) — R230V —**

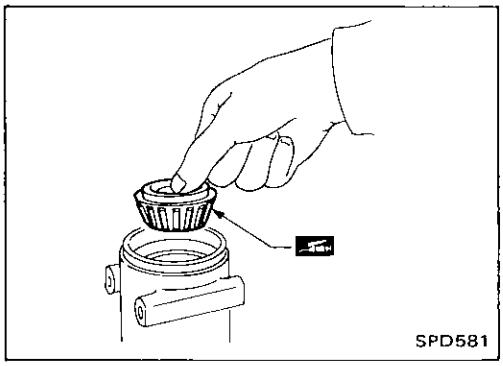
## Differential Carrier




1. Press-fit front and rear bearing outer races with Tools.
   **Tool number:**
   **Ⓐ suitable tool**
   **Ⓑ ST30611000 (J25742-1)**
   **Ⓒ ST30613000 (J25742-3) — R200V —**
   **xxxxxxxxxx ( — ) — R230V —**
2. Select pinion bearing adjusting washer and drive pinion bearing spacer, referring to ADJUSTMENT.

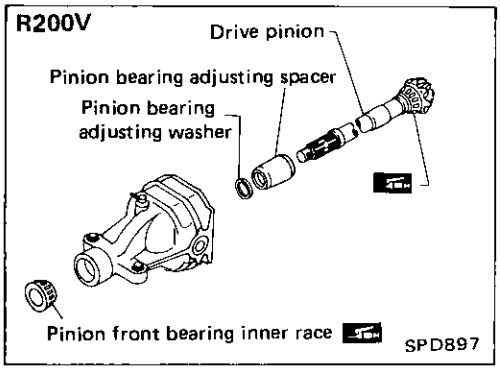


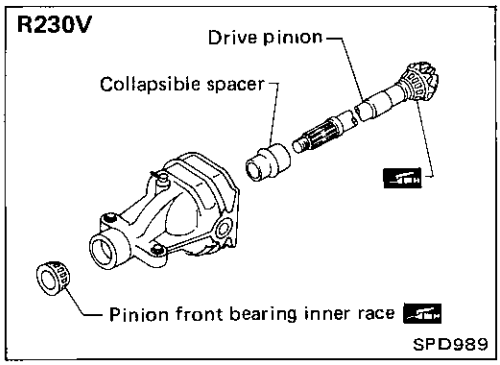

3. Install selected drive pinion height adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, using press and Tool.
   **Tool number:**
   **ST30901000 ( — ) — R200V —**
   **ST30022000 ( — ) — R230V —**




4. Place pinion front bearing inner cone in final drive housing.

## Differential Carrier (Cont'd)

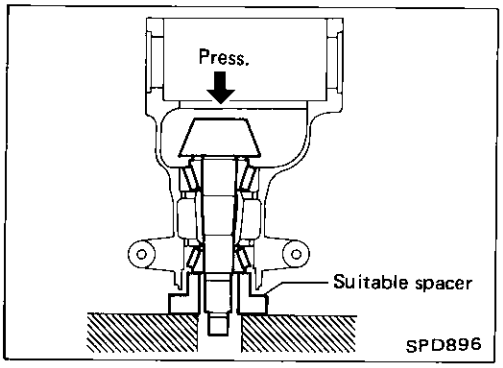


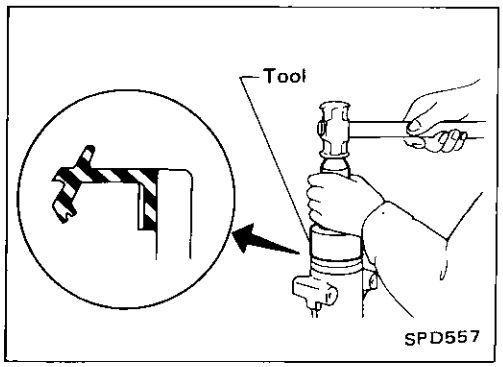




5. Set drive pinion assembly (as shown in figure at left) in differential carrier and install drive pinion, with press and suitable tool.

**Stop when drive pinion touches bearing.**

**Apply multi-purpose grease to pinion rear bearing inner race, pinion front bearing inner race and front pilot bearing.**

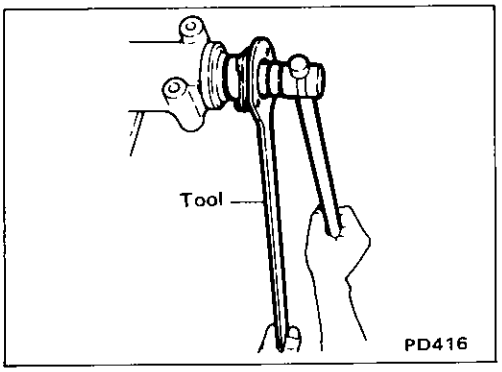



6. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal with Tool.

**Tool number:**

**KV38100500 ( — ) — R200V —**
**xxxxxxxxxx ( — ) — R230V —**




7. Install companion flange.

**— R200V —**

Tighten pinion nut to specified torque with Tool.

**— R230V —**

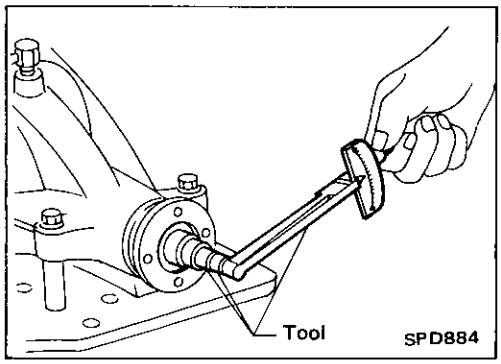
Tighten pinion nut to 127 N•m (13 kg-m, 94 ft-lb).

**Make sure that threaded portion of drive pinion and pinion nut are free from oil or grease.**

**Tool number:**

**ST38060002 (J34311) — R200V —**
**xxxxxxxxxx ( — ) — R230V —**

## Differential Carrier (Cont'd)




8.

— **R200V** —

Turn drive pinion in both directions several times, and measure pinion bearing preload.

**Pinion bearing preload:**

**1.1 - 1.4 N·m**

**(11 - 14 kg-cm, 9.5 - 12.2 in-lb)**

**When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.**

— **R230V** —

Tighten the pinion nut by very small degrees until the specified preload is achieved. When checking the preload, turn the drive pinion in both directions several times to set the bearing rollers.

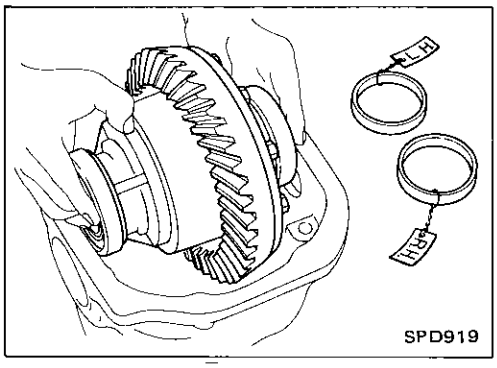
**Pinion bearing preload:**

**1.8 - 2.6 N·m**

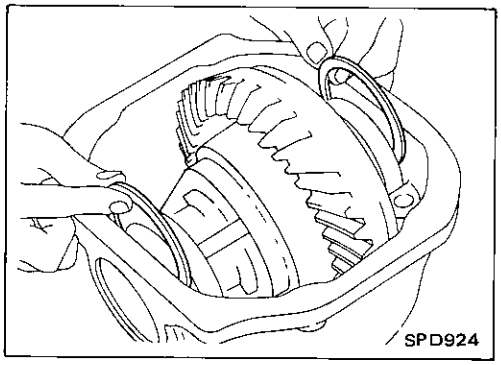
**(18 - 27 kg-cm, 16 - 23 in-lb)**

**This procedure will have to be repeated if:**

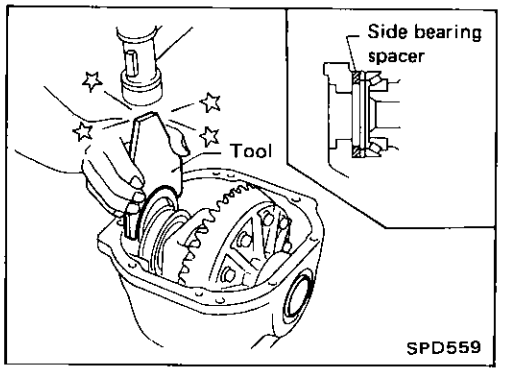
- **Maximum preload is achieved before the minimum pinion nut torque is reached.**
- **Minimum preload is not achieved before maximum pinion nut torque is reached.**




9. Install differential case assembly with side bearing outer races into gear carrier.




10. Insert left and right side bearing adjusting washers in place between side bearings and carrier.



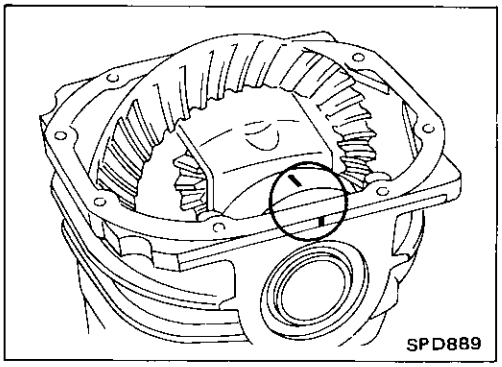

11. Drive in side bearing spacer with Tool.

**Tool number:**

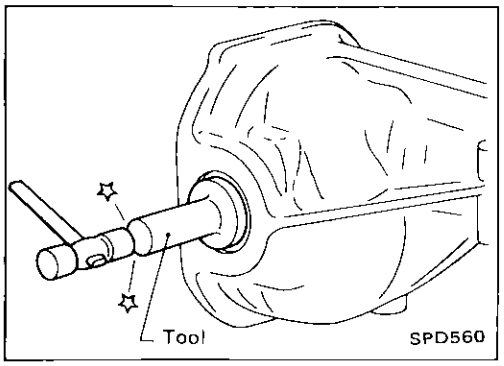
**KV38100600 (J25267) — R200V —**

**xxxxxxxxxx ( — ) — R230V —**

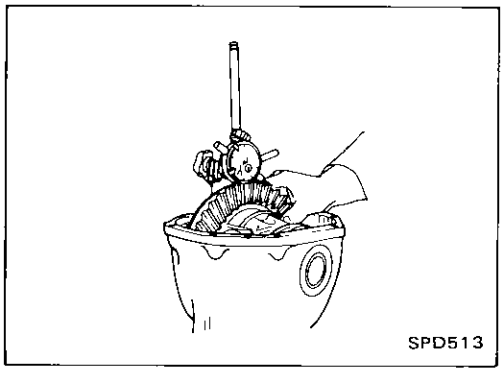
## Differential Carrier (Cont'd)




12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.



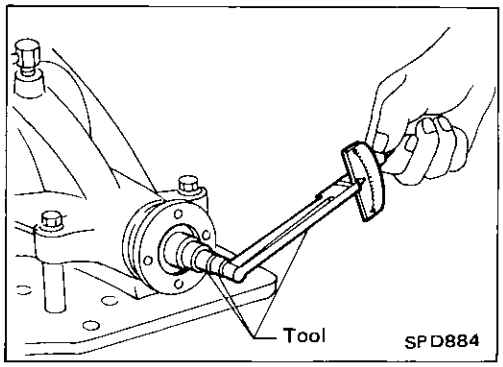

13. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.
    **Tool number:**
    **KV38100200 (J26233) — R200V —**
    **KV38102510 ( — ) — R230V —**




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.**




15. Check total preload with Tool.

**When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.**

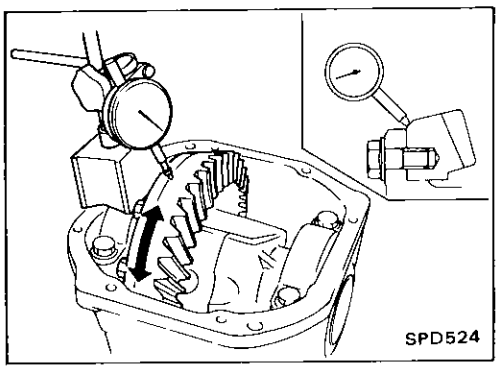
**Total preload:**
**Value more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on measured value of drive pinion preload**

- If preload is too great, remove the same amount of shim from each side.
- If preload is too small, add the same amount of shim to each side.

**Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.**

16. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.

## Differential Carrier (Cont'd)




17. Check runout of ring gear with a dial indicator.
    **Runout limit:**
    **0.05 mm (0.0020 in)**
- If backlash varies excessively in different places, foreign matter may be caught between the ring gear and the differential case.
- If the backlash varies greatly when the ring gear runout is within a specified range, replace the hypoid gear set or differential case.

18. Check tooth contact.
    Refer to ADJUSTMENT.
19. Install rear cover and gasket.

# Propeller Shaft

## GENERAL SPECIFICATIONS

| Vehicle model | | 2 seater | | | | 2+2 seater | |
|---|---|---|---|---|---|---|---|
| Engine | | VG30DETT | | VG30DE | | | |
| Transmission | | M/T | A/T | M/T | A/T | M/T | A/T |
| Propeller shaft model | | 3S80A-VL107 | | 3S71A | | | |
| Number of joints | | 3 | | | | | |
| Coupling method with transmission | | Sleeve type | | | | | |
| Types of journal bearings | | Shell type (non-disassembly type) x 2, CVJ* x 1 | | Shell type (non-disassembly type) | | | |
| Distance between yokes | mm (in) | 80.0 (3.150) | | 71.0 (2.795) | | | |
| Shaft length (Spider to spider) | mm (in) | | | | | | |
| 1st | | 606 (23.86) | 489 (19.25) | 606 (23.86) | 510 (20.08) | 606 (23.86) | 510 (20.08) |
| 2nd | | 388 (15.28) | | 419 (16.50) | | 539 (21.22) | |
| Shaft outer diameter | mm (in) | | | | | | |
| 1st | | 82.6 (3.252) | | 75 (2.95) | | | |
| 2nd | | 75.2 (2.961) | | 75 (2.95) | | | |

*: Constant velocity joint

## INSPECTION AND ADJUSTMENT

Unit: mm (in)

| Propeller shaft model | 3S71A | 3S80A-VL107 |
|---|---|---|
| Journal axial play | 0 (0) | |
| Propeller shaft runout limit | 0.6 (0.024) | |

# Final Drive

## GENERAL SPECIFICATIONS

| Final drive model | R200V | R230V |
|---|---|---|
| Ring gear pitch diameter mm (in) | 205 (8.07) | 230 (9.06) |
| Gear ratio | 4.083 | 3.692 |
| Number of teeth (Ring gear/Drive pinion) | 49/12 | 48/13 |
| Oil capacity (approx.) ℓ (US pt, Imp pt) | 1.5 (3-1/8, 2-5/8) | 1.8 (3-7/8, 3-1/8) |

## INSPECTION AND ADJUSTMENT (R200V)

### Ring gear runout

| | |
|---|---|
| Ring gear runout limit mm (in) | 0.05 (0.0020) |

### Side gear adjustment

| | |
|---|---|
| Side gear backlash (Clearance between side gear and differential case) mm (in) | 0.03 - 0.09 (0.0012 - 0.0035) |

**Available side gear thrust washers**

| Thickness mm (in) | Part number |
|---|---|
| 0.80 (0.0315) | 38424-40F60 |
| 0.83 (0.0327) | 38424-40F61 |
| 0.86 (0.0339) | 38424-40F62 |
| 0.89 (0.0350) | 38424-40F63 |
| 0.92 (0.0362) | 38424-40F64 |
| 0.95 (0.0374) | 38424-40F65 |
| 0.98 (0.0386) | 38424-40F66 |
| 1.01 (0.0398) | 38424-40F67 |
| 1.04 (0.0409) | 38424-40F68 |
| 1.07 (0.0421) | 38424-40F69 |
| 1.10 (0.0433) | 38424-40F70 |
| 1.13 (0.0445) | 38424-40F71 |
| 1.16 (0.0457) | 38424-40F72 |
| 1.19 (0.0469) | 38424-40F73 |
| 1.22 (0.0480) | 38424-40F74 |
| 1.25 (0.0492) | 38424-40F75 |
| 1.28 (0.0504) | 38424-40F76 |
| 1.31 (0.0516) | 38424-40F77 |
| 1.34 (0.0528) | 38424-40F78 |
| 1.37 (0.0539) | 38424-40F79 |
| 1.40 (0.0551) | 38424-40F80 |
| 1.43 (0.0563) | 38424-40F81 |
| 1.46 (0.0575) | 38424-40F82 |
| 1.49 (0.0587) | 38424-40F83 |

### Side bearing adjustment

| | |
|---|---|
| Side bearing preload measured at ring gear retaining bolt N (kg, lb) | 34.3 - 39.2 (3.5 - 4.0, 7.7 - 8.8) |

**Available side bearing adjusting washers**

| Thickness mm (in) | Part number |
|---|---|
| 2.00 (0.0787) | 38453-N3100 |
| 2.05 (0.0807) | 38453-N3101 |
| 2.10 (0.0827) | 38453-N3102 |
| 2.15 (0.0846) | 38453-N3103 |
| 2.20 (0.0866) | 38453-N3104 |
| 2.25 (0.0886) | 38453-N3105 |
| 2.30 (0.0906) | 38453-N3106 |
| 2.35 (0.0925) | 38453-N3107 |
| 2.40 (0.0945) | 38453-N3108 |
| 2.45 (0.0965) | 38453-N3109 |
| 2.50 (0.0984) | 38453-N3110 |
| 2.55 (0.1004) | 38453-N3111 |
| 2.60 (0.1024) | 38453-N3112 |
| 2.65 (0.1043) | 38453-N3133 |

### Drive pinion height adjustment

**Available pinion height adjusting washers**

| Thickness mm (in) | Part number |
|---|---|
| 3.09 (0.1217) | 38154-P6017 |
| 3.12 (0.1228) | 38154-P6018 |
| 3.15 (0.1240) | 38154-P6019 |
| 3.18 (0.1252) | 38154-P6020 |
| 3.21 (0.1264) | 38154-P6021 |
| 3.24 (0.1276) | 38154-P6022 |
| 3.27 (0.1287) | 38154-P6023 |
| 3.30 (0.1299) | 38154-P6024 |
| 3.33 (0.1311) | 38154-P6025 |
| 3.36 (0.1323) | 38154-P6026 |
| 3.39 (0.1335) | 38154-P6027 |
| 3.42 (0.1346) | 38154-P6028 |
| 3.45 (0.1358) | 38154-P6029 |
| 3.48 (0.1370) | 38154-P6030 |
| 3.51 (0.1382) | 38154-P6031 |
| 3.54 (0.1394) | 38154-P6032 |
| 3.57 (0.1406) | 38154-P6033 |
| 3.60 (0.1417) | 38154-P6034 |
| 3.63 (0.1429) | 38154-P6035 |
| 3.66 (0.1441) | 38154-P6036 |

### Drive pinion preload adjustment

| | |
|---|---|
| Drive pinion preload with front oil seal N·m (kg-cm, in-lb) | 1.1 - 1.4 (11 - 14, 9.5 - 12.2) |

## Final Drive (Cont'd)

**Available drive pinion bearing preload adjusting washers**

| Thickness mm (in) | Part number |
|---|---|
| 3.80 - 3.82 (0.1496 - 0.1504) | 38125-61001 |
| 3.82 - 3.84 (0.1504 - 0.1512) | 38126-61001 |
| 3.84 - 3.86 (0.1512 - 0.1520) | 38127 61001 |
| 3.86 - 3.88 (0.1520 - 0.1528) | 38128-61001 |
| 3.88 - 3.90 (0.1528 - 0.1535) | 38129-61001 |
| 3.90 - 3.92 (0.1535 - 0.1543) | 38130-61001 |
| 3.92 - 3.94 (0.1543 - 0.1551) | 38131-61001 |
| 3.94 - 3.96 (0.1551 - 0.1559) | 38132-61001 |
| 3.96 - 3.98 (0.1559 - 0.1567) | 38133-61001 |
| 3.98 - 4.00 (0.1567 - 0.1575) | 38134-61001 |
| 4.00 - 4.02 (0.1575 - 0.1583) | 38135-61001 |
| 4.02 - 4.04 (0.1583 - 0.1591) | 38136-61001 |
| 4.04 - 4.06 (0.1591 - 0.1598) | 38137-61001 |
| 4.06 - 4.08 (0.1598 - 0.1606) | 38138-61001 |
| 4.08 - 4.10 (0.1606 - 0.1614) | 38139-61001 |

**Available drive pinion bearing preload adjusting spacers**

| Length mm (in) | Part number |
|---|---|
| 45.60 (1.7953) | 38165-10V05 |
| 45.90 (1.8071) | 38165-10V06 |
| 46.20 (1.8189) | 38165-10V07 |
| 46.50 (1.8307) | 38165-10V00 |
| 46.80 (1.8425) | 38165-10V01 |

### Total preload

| | |
|---|---|
| Total preload | Value of more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on to measured value of drive pinion preload |
| Ring gear backlash mm (in) | 0.10 - 0.15 (0.0039 - 0.0059) |

## INSPECTION AND ADJUSTMENT (R230V)

### Ring gear runout

| | |
|---|---|
| Ring gear runout limit mm (in) | 0.05 (0.0020) |

### Side gear adjustment

| | |
|---|---|
| Side gear backlash (Clearance between side gear and differential case) mm (in) | 0.03 - 0.09 (0.0012 - 0.0035) |

**Available side gear thrust washers**

| Thickness mm (in) | Part number |
|---|---|
| 0.85 (0.0335) | 38424-40F08 |
| 0.90 (0.0354) | 38424-40F01 |
| 0.95 (0.0374) | 38424-40F09 |
| 1.00 (0.0394) | 38424-40F02 |
| 1.05 (0.0413) | 38424-40F10 |
| 1.10 (0.0433) | 38424-40F03 |
| 1.15 (0.0453) | 38424-40F11 |
| 1.20 (0.0472) | 38424-40F04 |
| 1.25 (0.0492) | 38424-40F12 |
| 1.30 (0.0512) | 38424-40F05 |
| 1.35 (0.0531) | 38424-40F13 |
| 1.40 (0.0551) | 38424-40F06 |
| 1.45 (0.0571) | 38424-40F14 |
| 1.50 (0.0591) | 38424-40F07 |

### Side bearing adjustment

| | |
|---|---|
| Side bearing preload measured at ring gear retaining bolt N (kg, lb) | 34.3 - 39.2 (3.5 - 4.0, 7.7 - 8.8) |

**Available side bearing adjusting washers**

| Thickness mm (in) | Part number |
|---|---|
| 2.00 (0.0787) | 38453-40P00 |
| 2.05 (0.0807) | 38453-40P01 |
| 2.10 (0.0827) | 38453-40P02 |
| 2.15 (0.0846) | 38453-40P03 |
| 2.20 (0.0866) | 38453-40P04 |
| 2.25 (0.0886) | 38453-40P05 |
| 2.30 (0.0906) | 38453-40P06 |
| 2.35 (0.0925) | 38453-40P07 |
| 2.40 (0.0945) | 38453-40P08 |
| 2.45 (0.0965) | 38453-40P09 |
| 2.50 (0.0984) | 38453-40P10 |
| 2.55 (0.1004) | 38453-40P11 |
| 2.60 (0.1024) | 38453-40P12 |

## Final Drive (Cont'd)

### Drive pinion height adjustment

**Available pinion height adjusting washers**

| Thickness mm (in) | Part number |
|---|---|
| 2.59 (0.1020) | 38154-40P00 |
| 2.61 (0.1028) | 38154-40P01 |
| 2.63 (0.1035) | 38154-40P02 |
| 2.65 (0.1043) | 38154-40P03 |
| 2.67 (0.1051) | 38154-40P04 |
| 2.69 (0.1059) | 38154-40P05 |
| 2.71 (0.1067) | 38154-40P06 |
| 2.73 (0.1075) | 38154-40P07 |
| 2.75 (0.1083) | 38154-40P08 |
| 2.77 (0.1091) | 38154-40P09 |
| 2.79 (0.1098) | 38154-40P10 |
| 2.81 (0.1106) | 38154-40P11 |
| 2.83 (0.1114) | 38154-40P12 |
| 2.85 (0.1122) | 38154-40P13 |
| 2.87 (0.1130) | 38154-40P14 |
| 2.89 (0.1138) | 38154-40P15 |
| 2.91 (0.1146) | 38154-40P16 |
| 2.93 (0.1154) | 38154-40P17 |
| 2.95 (0.1161) | 38154-40P18 |
| 2.97 (0.1169) | 38154-40P19 |

### Drive pinion preload adjustment

| | |
|---|---|
| Drive pinion preload with front oil seal N·m (kg-cm, in-lb) | 1.8 - 2.6 (18 - 27, 16 - 23) |

### Total preload adjustments

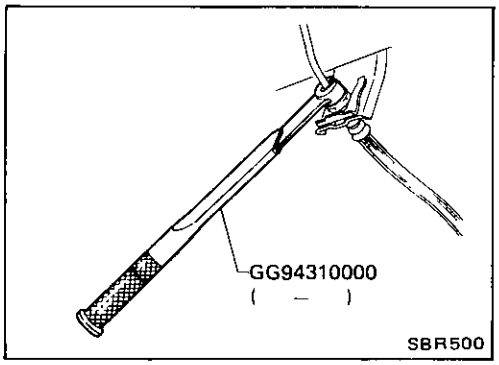
| | |
|---|---|
| Total preload | Value of more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on to measured value of drive pinion preload |
| Ring gear backlash mm (in) | 0.13 - 0.18 (0.0051 - 0.0071) |

# FRONT AXLE & FRONT SUSPENSION

# SECTION FA

## CONTENTS


PRECAUTIONS AND PREPARATION ..... FA- 2
FRONT AXLE AND FRONT SUSPENSION ..... FA- 4
ON-VEHICLE SERVICE ..... FA- 5
FRONT AXLE ..... FA-11
FRONT AXLE — Wheel Hub and Steering Knuckle ..... FA-12
FRONT SUSPENSION ..... FA-16
FRONT SUSPENSION — Coil Spring and Shock Absorber ..... FA-17
FRONT SUSPENSION — Third Link and Upper Link ..... FA-19
FRONT SUSPENSION — Transverse Link and Lower Ball Joint ..... FA-22
FRONT SUSPENSION — Tension Rod and Stabilizer Bar ..... FA-23
ADJUSTABLE SHOCK ABSORBER ..... FA-24
ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses ..... FA-25
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... FA-31

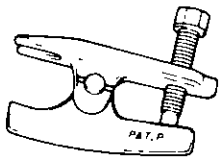
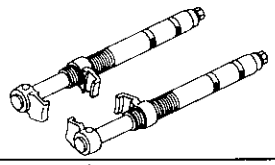
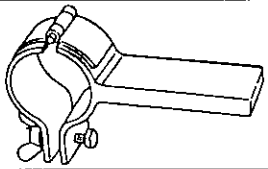
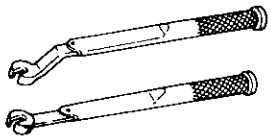
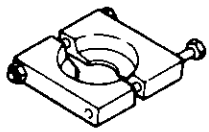



## Precautions

- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  - *** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Use Tool when removing or installing brake lines.**

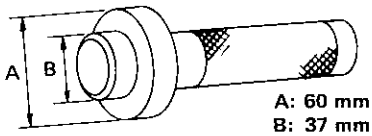
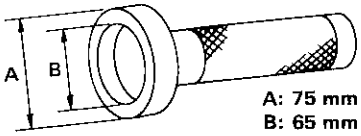
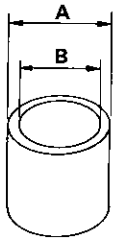
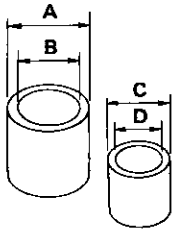
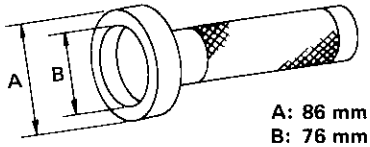
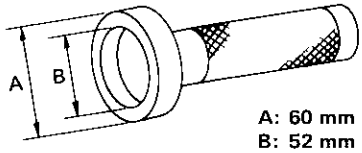
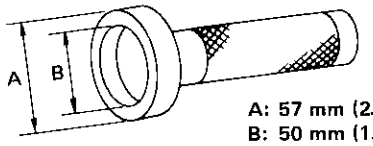
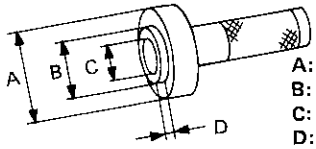
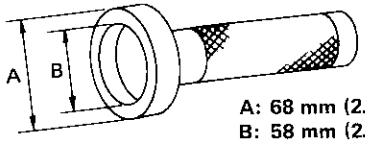
## Preparation

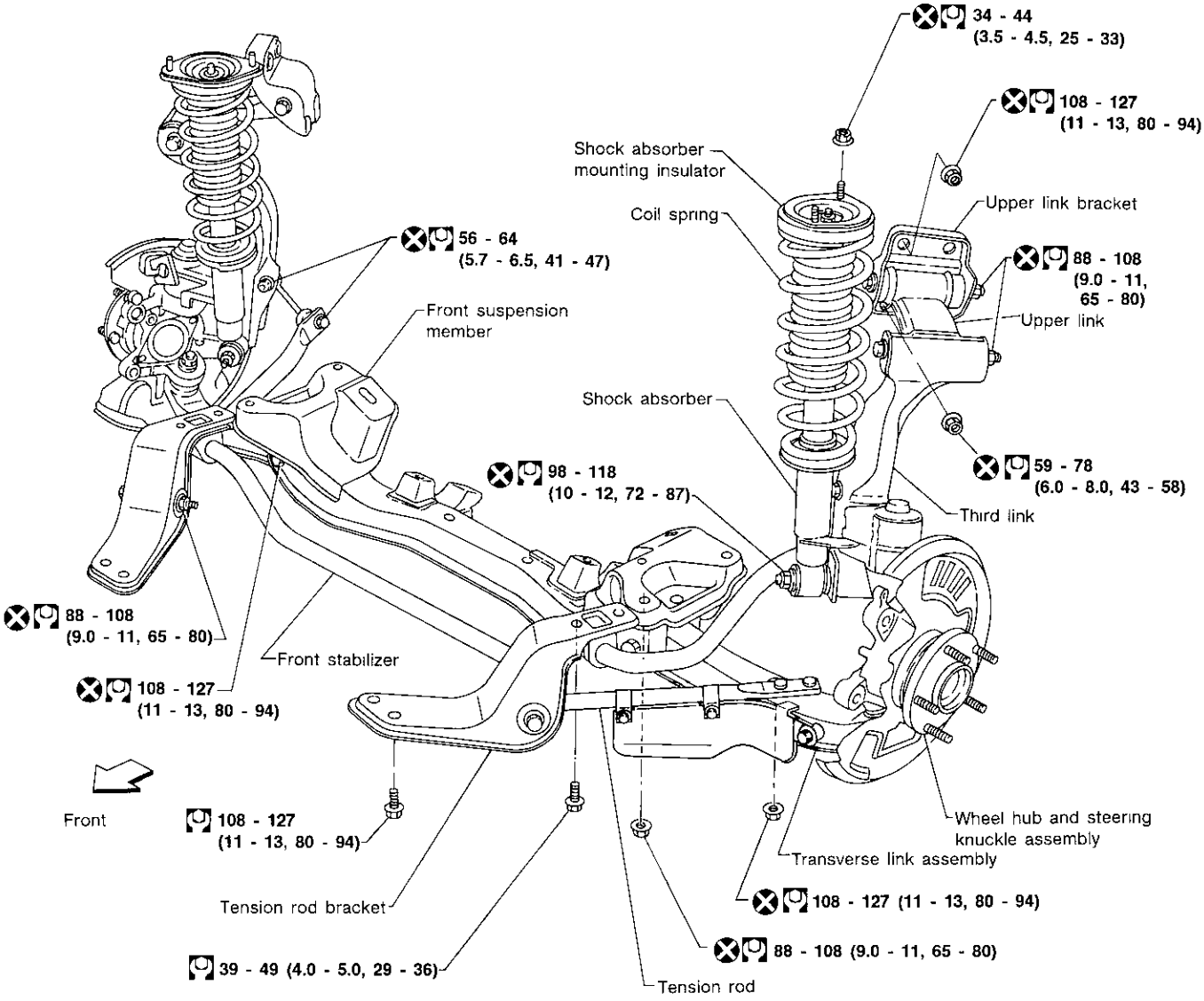
### SPECIAL SERVICE TOOLS

| Tool number (Kent-Moore No.) Tool name | Description | |
|---|---|---|
| HT72750000 (J24319-01) Ball joint remover |  | Removing tie-rod outer end and lower ball joint |
| HT71780000 ( – ) Spring compressor |  | Removing and installing coil spring |
| ST35652000 ( – ) Shock absorber attachment |  | Fixing shock absorber |
| GG94310000 ( – ) Flare nut torque wrench |  | Removing and installing brake piping |
| ST30031000 (J22912-01) Bearing inner race puller |  | Removing bearing inner race |

## Preparation (Cont'd)

### COMMERCIAL SERVICE TOOLS

| Tool name | Description | |
|---|---|---|
| Wheel bearing drift |  A: 60 mm (2.36 in) dia.<br>B: 37 mm (1.46 in) dia. | Removing wheel bearing |
| Wheel bearing drift |  A: 75 mm (2.95 in) dia.<br>B: 65 mm (2.56 in) dia. | Installing wheel bearing |
| Baffle plate drift |  A: 125 mm (4.92 in) dia.<br>B: 106 mm (4.17 in) dia. | Installing baffle plate |
| Tension rod bushing drift |  A: 78 mm (3.07 in) dia.<br>B: 66 mm (2,60 in) dia.<br>C: 62 mm (2.44 in) dia.<br>D: 25 - 55 mm (0.98 - 2.17 in) dia. | Removing and installing tension rod bushing |
| Grease seal drift |  A: 86 mm (3.39 in) dia.<br>B: 76 mm (2.99 in) dia. | Installing wheel hub grease seal |
| Cap drift |  A: 60 mm (2.36 in) dia.<br>B: 52 mm (2.05 in) dia. | Installing king pin cap |
| Bearing drift |  A: 57 mm (2.24 in) dia.<br>B: 50 mm (1.97 in) dia. | Installing king pin lower bearing |
| Bearing drift |  A: 57 mm (2.24 in) dia.<br>B: 46 mm (1.81 in) dia.<br>C: 40 mm (1.57 in) dia.<br>D: 2.5 mm (0.098 in) | Installing king pin upper bearing |
| Grease seal drift |  A: 68 mm (2.68 in) dia.<br>B: 58 mm (2.28 in) dia. | Installing king pin grease seal |

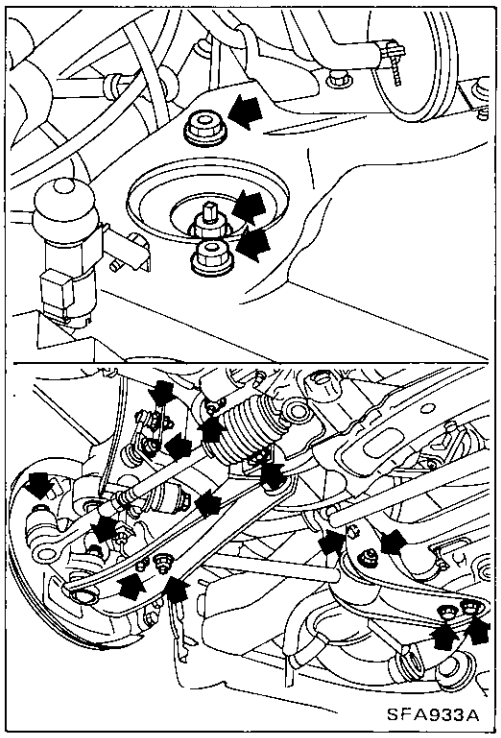



When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

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

: N·m (kg-m, ft-lb)

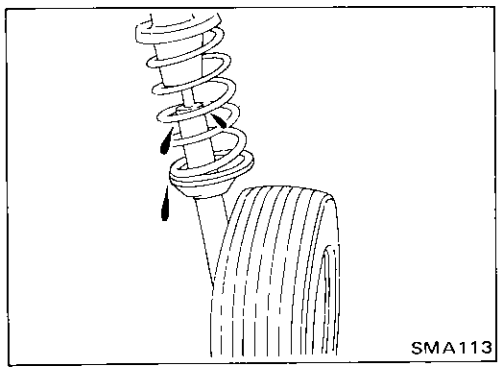
SFA250B



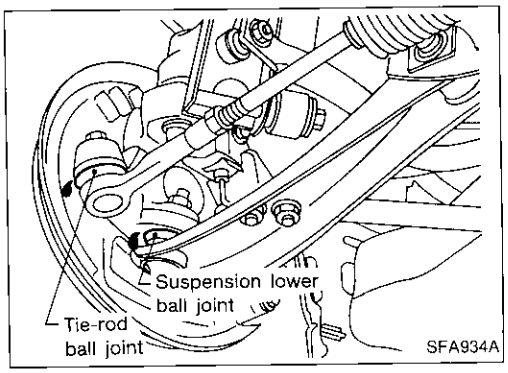

## Front Axle and Front Suspension Parts

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

- Retighten all nuts and bolts to the specified torque.
  **Tightening torque: Refer to FRONT SUSPENSION.**
- Make sure that cotter pin is inserted.

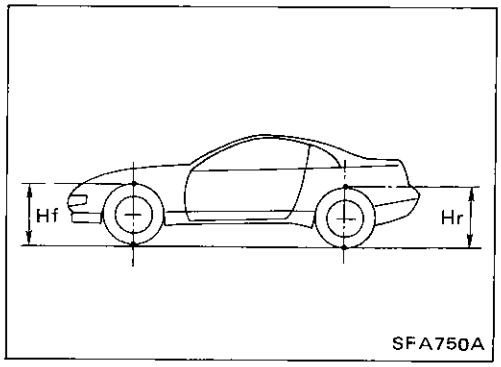



- Check shock absorber for oil leakage or other damage.




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

## Front Axle and Front Suspension Parts (Cont'd)

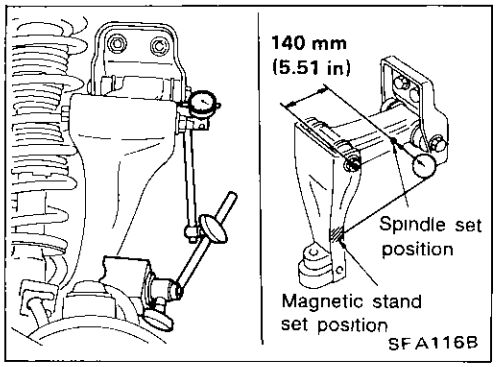



- Check spring height from top of wheelarch to ground.

(1) Vehicle must be unladen*, parked on a level surface, and tires checked for proper inflation and wear (tread wear indicator must not be showing).
   * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

(2) Bounce vehicle up and down several times before measuring.
   **Standard height:**
   **Refer to S.D.S.**

(3) Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.

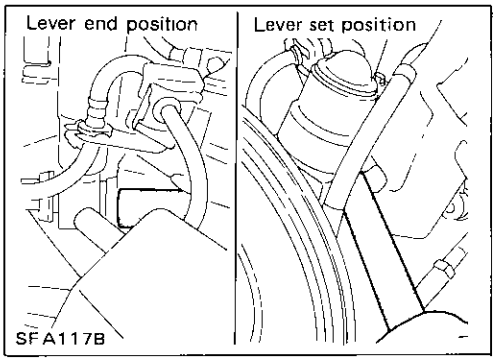



- Check upper link free play.

(1) Jack up front of vehicle and set stands.
(2) Set steering wheel in the straight-forward direction and lock it using key lock.
(3) Remove front wheels.

**On axle side**

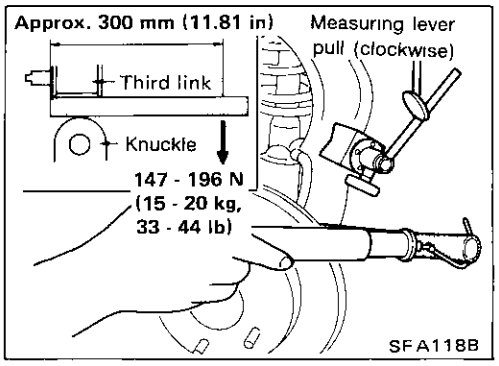
(4) Install dial gauge.
a. Install magnet stand on third link.
b. Set dial gauge in position.
   Set dial gauge spindle in contact with flat surface of upper link at 140 mm (5.51 in) measured directly from center of upper link retaining bolt on third link side.
   (Reset dial gauge.)




(5) Install lever.
   Insert lever [30 mm (1.18 in) outside dia., 350 mm (13.78 in) long, approx.] between lower end of third link and kingpin location.

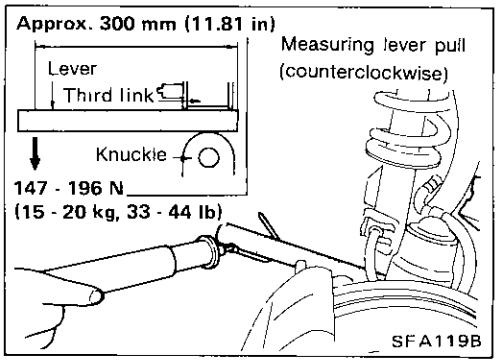
**Make sure lever does not interfere with splash guard, brake hoses, etc., when set in position.**

## Front Axle and Front Suspension Parts (Cont'd)




**— Free play in direction "A" —**

Attach spring scale to lever tip. Pull spring scale with a force of 147 to 196 N (15 to 20 kg, 33 to 44 lb) and then read dial gauge indication.

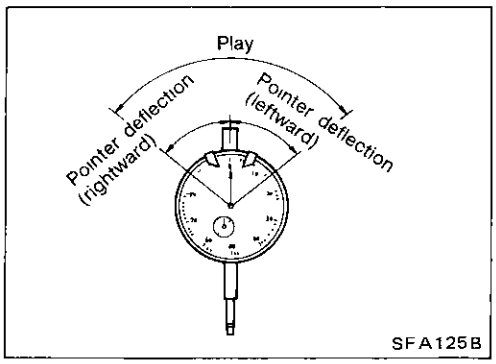


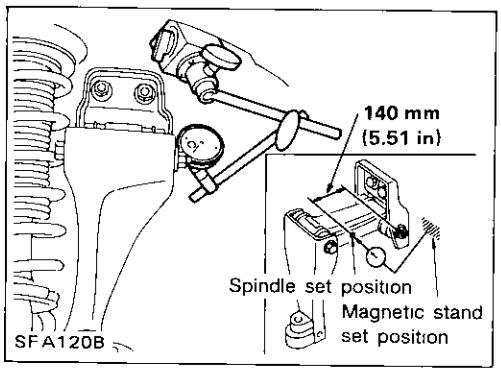

**— Free play in direction "B" —**

With dial gauge held in position, invert lever. Attach spring scale to lever tip. Pull spring scale with a force of 147 to 196 N (15 to 20 kg, 33 to 44 lb) and then read dial gauge indication.

Free play = (Gauge pointer deflection in direction "A") + (Gauge pointer deflection in direction "B")

**Allowable free play range:**
**5.0 mm (0.197 in), max.**




**On body side**

(6) Install dial gauge.

a. Install magnet stand on hoodledge wheelhouse side.

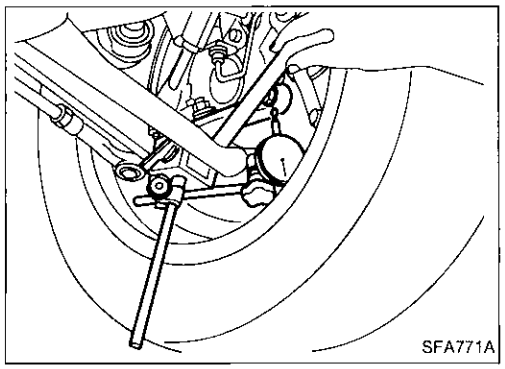
b. Set dial gauge in position.
Set dial gauge spindle in contact with flat surface of upper link at 140 mm (5.51 in) measured directly from center of the retaining bolt on bracket side. (Reset dial gauge.)

(7) Follow the same procedures for setting lever and measuring the free play as those outlined under "On axle side" above.

**Allowable free play range:**
**5.0 mm (0.197 in), max.**

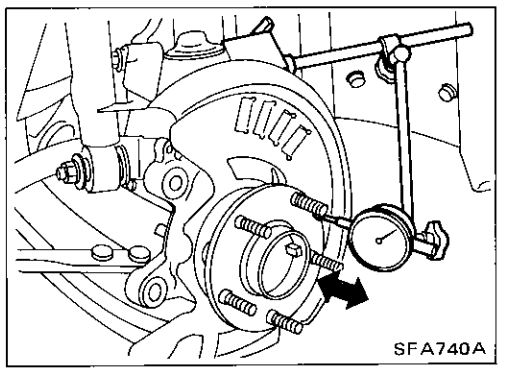
(8) If free play exceeds specifications, replace upper link assembly.

## Front Axle and Front Suspension Parts (Cont'd)


SFA771A

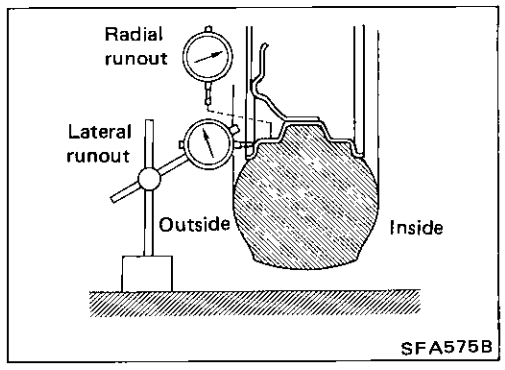
- Check suspension ball joint end play.

(1) Jack up front of vehicle and set the stands.
(2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
(3) Make sure front wheels are straight and brake pedal is depressed.
(4) Place a pry bar between transverse link and inner rim of road wheel.
(5) While pushing and releasing pry bar, observe maximum dial indicator value.
**Vertical end play: 0 mm (0 in)**
(6) If not to above specification, remove and recheck it.


SFA740A

## Front Wheel Bearing

- Check tightening torque of wheel bearing lock nut.
**: 206 - 284 N·m**
**(21 - 29 kg-m, 152 - 210 ft-lb)**
- Check wheel bearings for smooth operation.
- Check axial end play.
**Axial end play: 0.05 mm (0.0020 in) or less**
- If axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly.
Refer to FRONT AXLE — Wheel Hub and Knuckle.



SFA575B

## Front Wheel Alignment

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

### PRELIMINARY INSPECTION

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

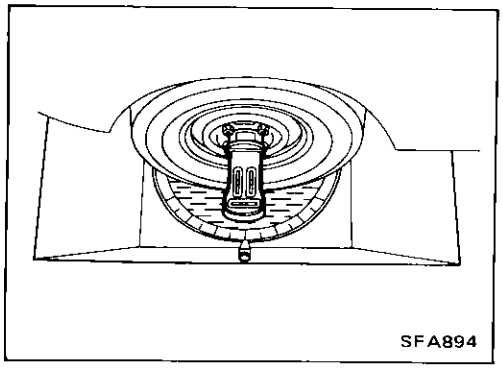
- Check tires for wear and improper inflation.
- Check front wheel bearings for looseness.
- Check wheel runout.

**Refer to S.D.S.**

- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen).
("Unladen": Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.)

## Front Wheel Alignment (Cont'd)

### CAMBER, CASTER AND KINGPIN INCLINATION


SFA894

**Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.**

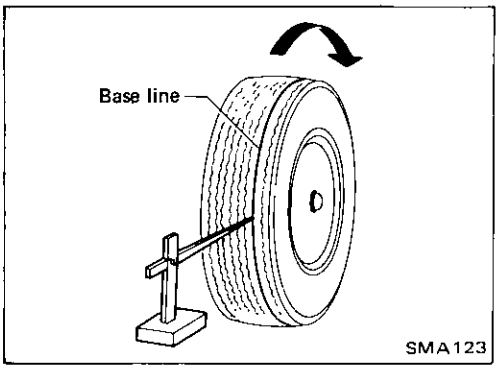
**(1) Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.**

**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.**

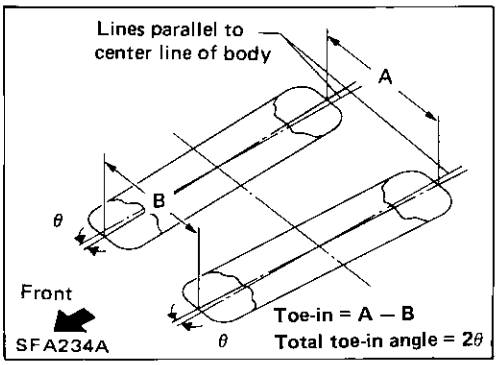
### TOE-IN



SMA123

1. Draw a base line on tread surface of tires.

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



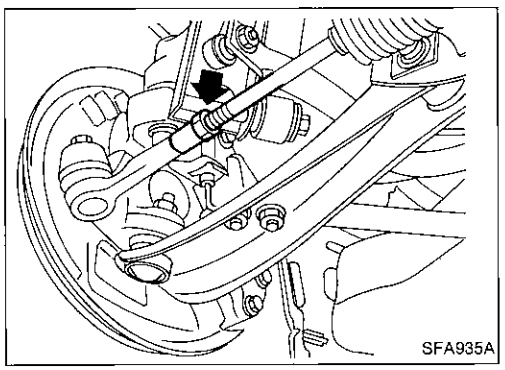
SFA234A

2. Measure toe-in.

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

**Toe-in:**

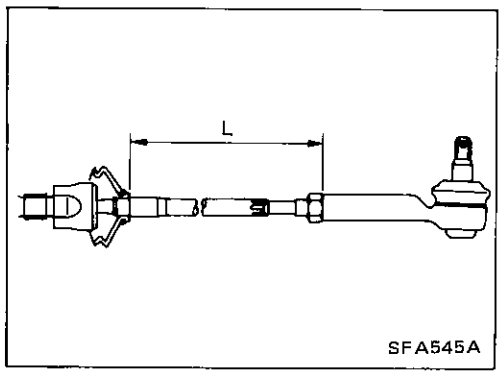
**Refer to S.D.S.**


SFA935A

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

(1) Loosen lock nuts.

(2) Adjust toe-in by turning tie-rod forward or backward.



SFA545A

**Make sure both tie-rods are the same length.**

**Standard length "L":**

**155 mm (6.10 in)**

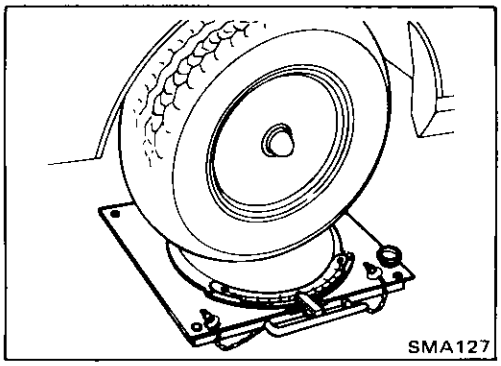
(3) Tighten lock nuts to the specified torque.

**㊀: 78 - 98 N·m**

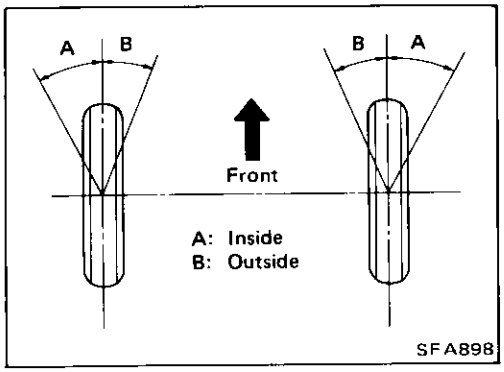
**(8.0 - 10.0 kg-m, 58 - 72 ft-lb)**

## Front Wheel Alignment (Cont'd)

### FRONT WHEEL TURNING ANGLE


SMA127

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

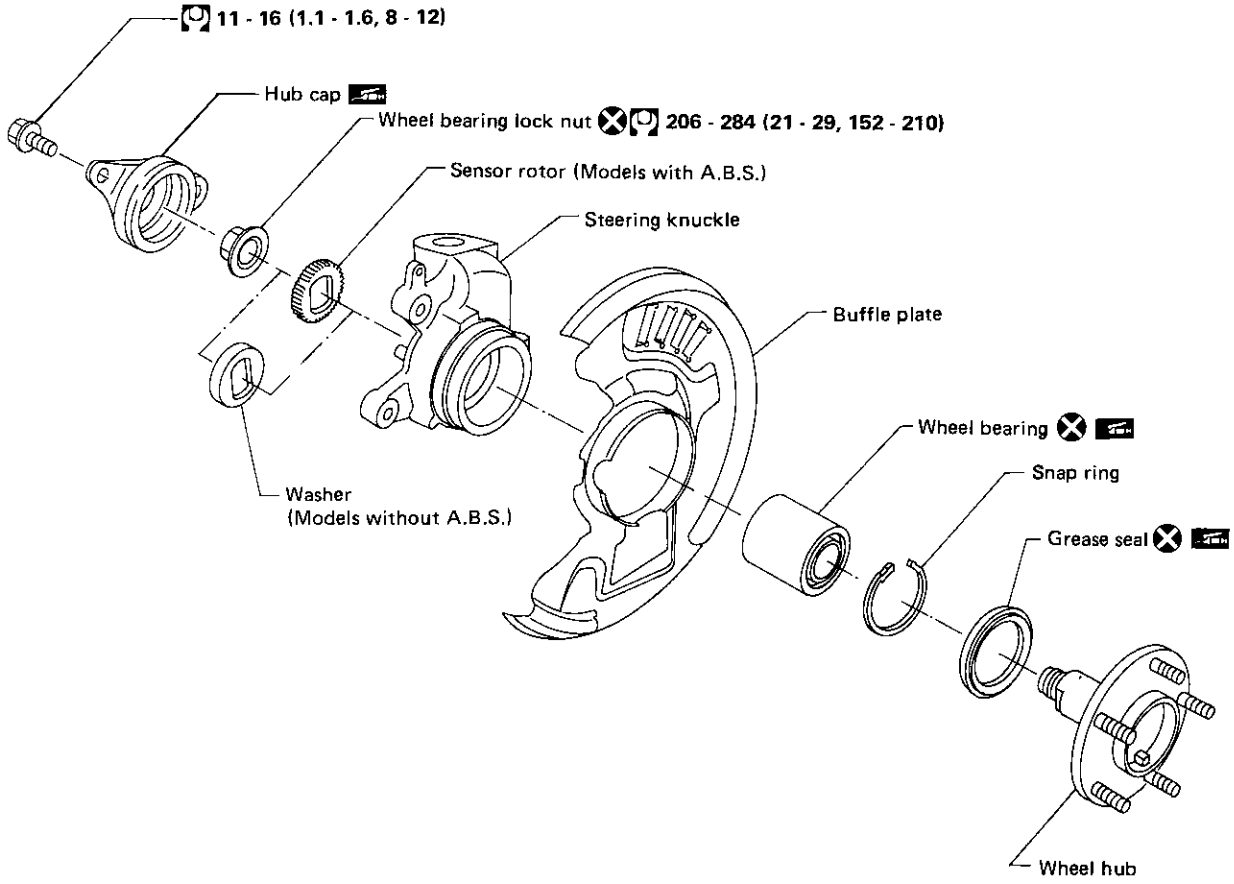


SFA898

2. Rotate steering wheel fully to the right or left; measure turning angle.

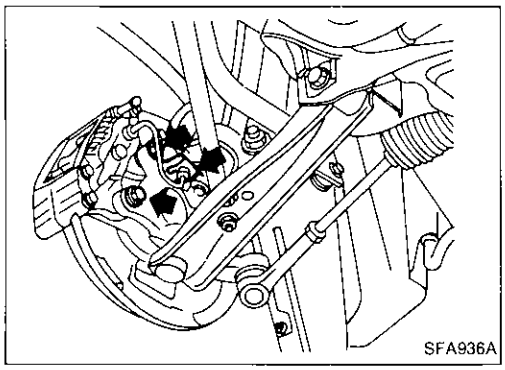
**Wheel turning angle:**

| | | |
|---|---|---|
| Full turn | Inside wheel: A | 32°30′ - 36°30′ |
| | Outside wheel: B | 26°30′ - 30°30′ |




: N·m (kg-m, ft-lb)

SFA743A



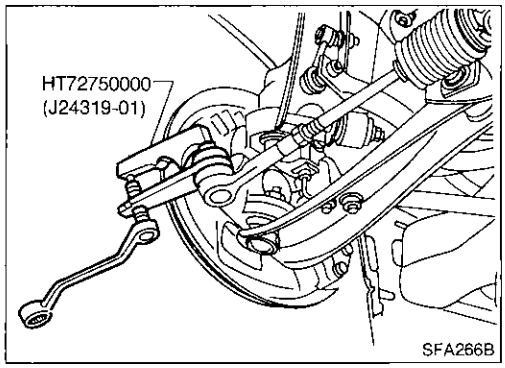

## Removal

**CAUTION:**

**Wheel bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly.**

- **Growling noise is emitted from wheel bearing during operation.**
- **Wheel bearing drags or turns roughly when hub is turned by hand.**
- Remove brake caliper assembly and rotor.

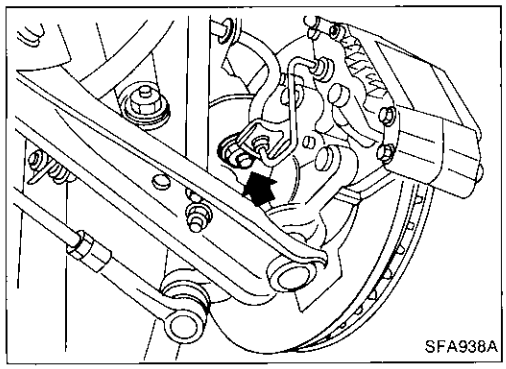
**Brake line need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out.**
**Make sure brake line is not twisted.**



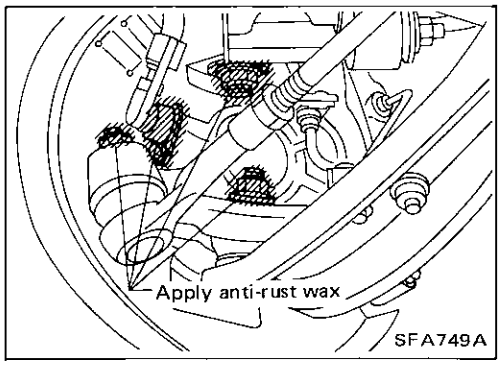

- Remove tie-rod ball joint and lower ball joint with Tool.

**CAUTION:**

**Steering knuckle is made from aluminum alloy.**
**Be careful not to hit steering knuckle.**




- Remove kingpin lower nut then remove steering knuckle assembly.

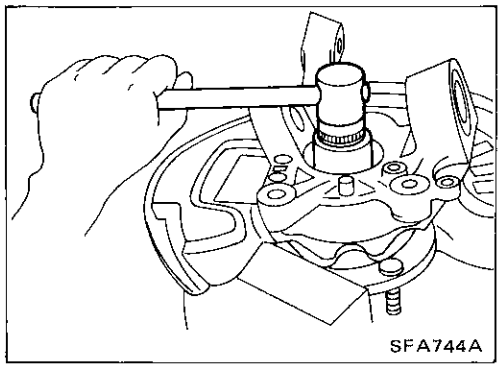



## Installation

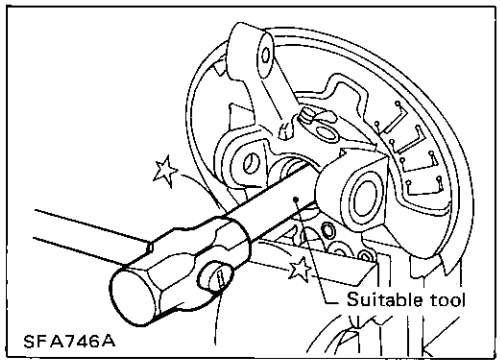
- Install steering knuckle assembly.
- Apply anti-rust wax as follows:
  - Portions around lower ball joint connections
  - Portions around tie-rod ball joint connections
  - Portions around kingpin lower nut location
  - Portions around ABS sensor connection

## Disassembly

**CAUTION:**
**When removing wheel bearing from steering knuckle, replace wheel bearing assembly (outer race, inner races and grease seal) with a new one.**

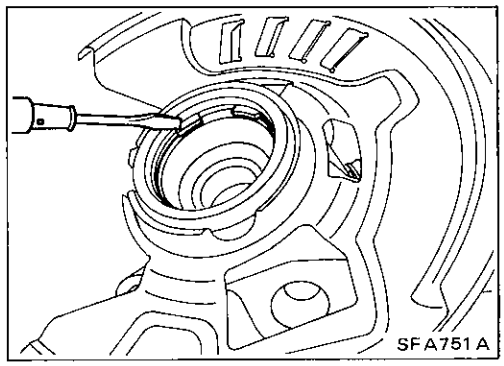

SFA744A

- Remove hub cap and wheel bearing lock nut.

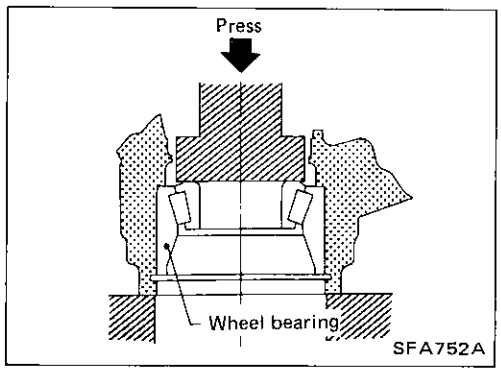


SFA746A

- Remove wheel hub with a suitable tool.


SFA751A

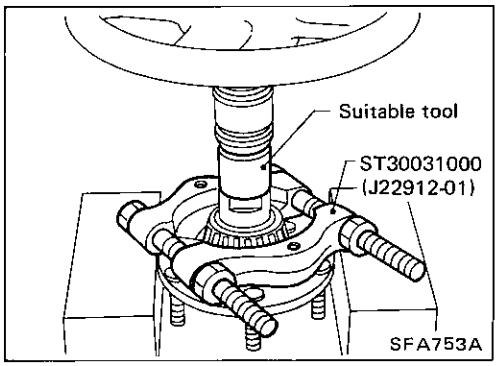
- Remove circular clip with a suitable tool.



SFA752A

- Press out wheel bearing assembly from steering knuckle.

## Disassembly (Cont'd)




- Drive out wheel bearing inner race (to outside) from wheel hub, then remove grease seal.

## Inspection

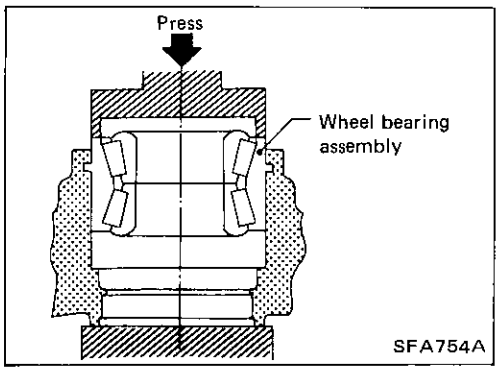
### WHEEL HUB AND STEERING KNUCKLE

- Check wheel hub and steering knuckle for any cracks.

### CIRCULAR CLIP

- Check circular clip for wear or cracks.
  Replace if necessary.

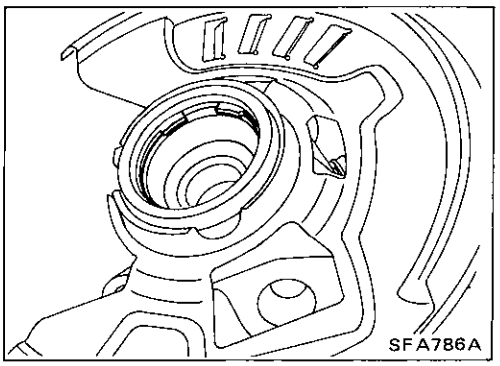
## Assembly



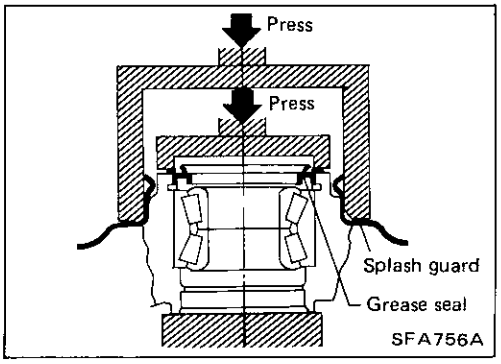

1. Press new wheel bearing assembly into steering knuckle from outside of steering knuckle.
   **Maximum load P:**
   **34.3 kN (3.5 ton, 3.9 US ton, 3.44 Imp ton)**

**CAUTION:**

- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and wheel hub.**

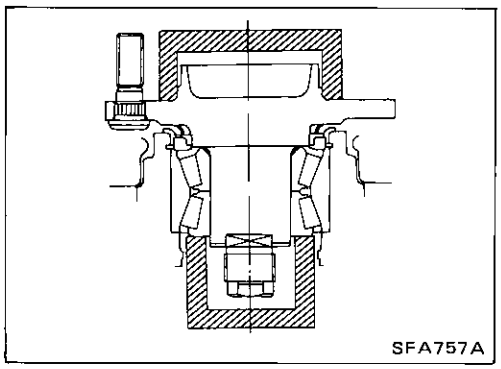



2. Install circular clip into groove of steering knuckle.

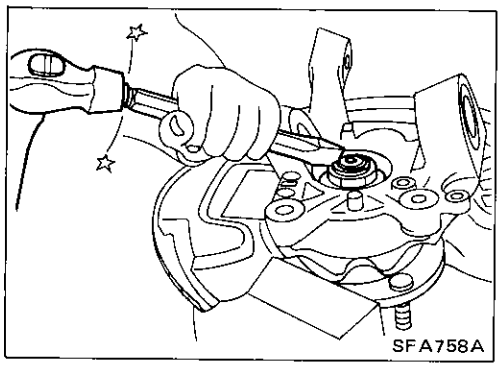



3. Apply multi-purpose grease to sealing lip.
4. Install grease seal.
   **Maximum load P:**
   **10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)**
5. Install splash guard.

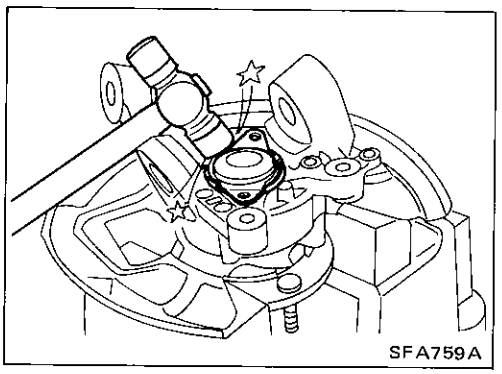
## Assembly (Cont'd)


SFA757A

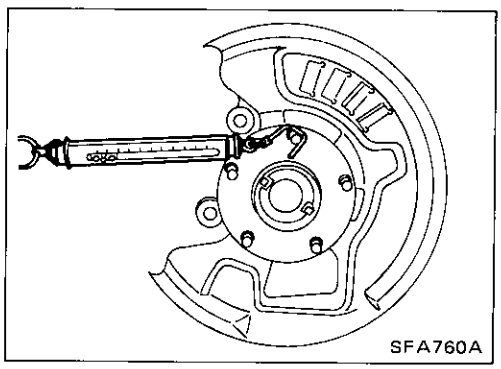
6. Press wheel hub into steering knuckle.
   **Maximum load P:**
   **29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)**
7. Tighten wheel bearing lock nut to the specified torque.
   **: 206 - 284 N·m (21 - 29 kg-m, 152 - 210 ft-lb)**


SFA758A

8. Stake wheel bearing lock nut.


SFA759A

9. Install hub cap.
   Apply multi-purpose grease to packing surface of hub cap.
   Drive hub cap onto steering knuckle by lightly tapping with a plastic hammer. After hub cap is in close contact with steering knuckle, tighten bolts.

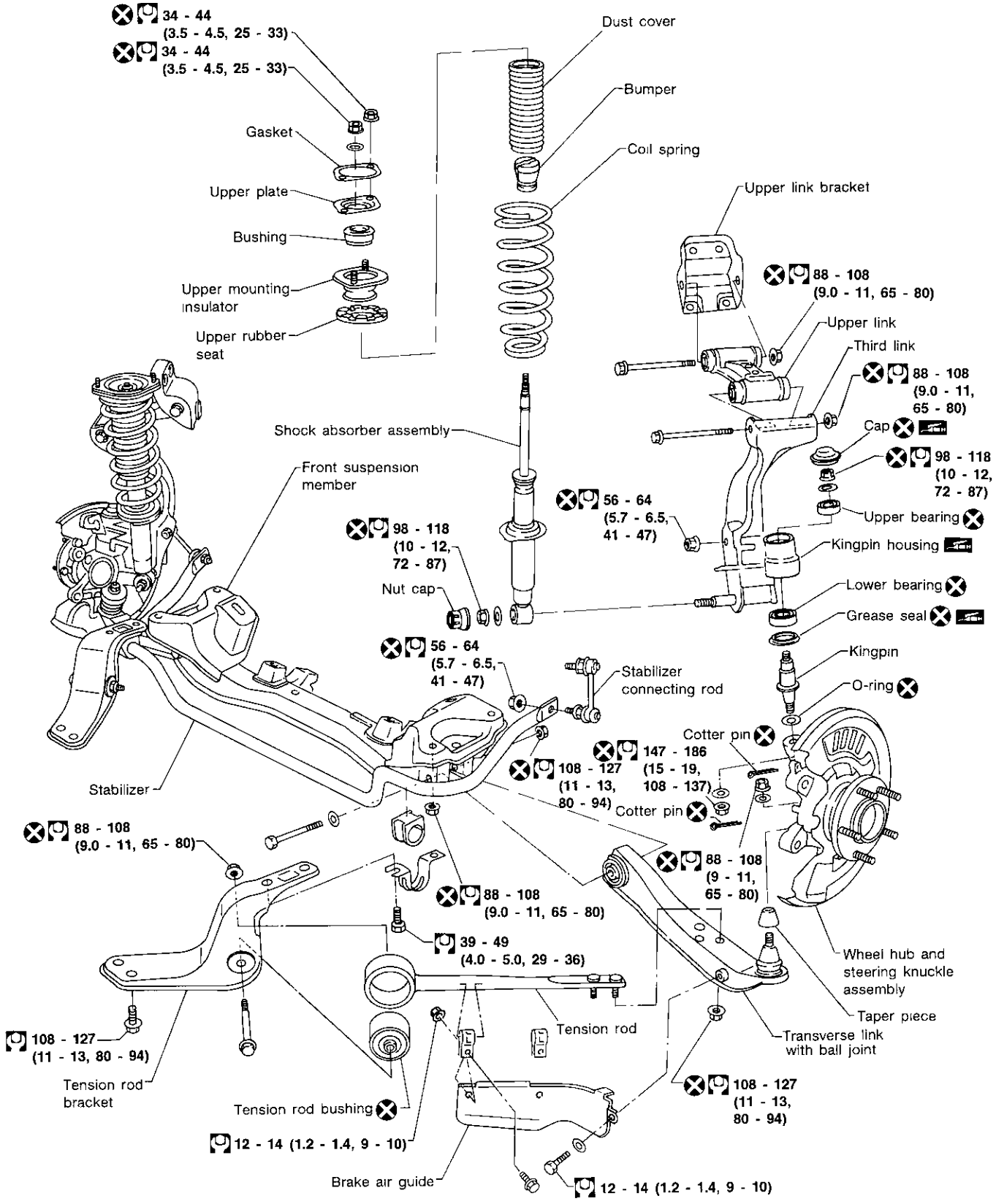

SFA760A

10. Check wheel bearing preload and axial end play.
**Before checking, spin wheel hub at least 10 revolutions in both directions.**

**Turning torque:**
**0.34 - 2.16 N·m (3.5 - 22.0 kg-cm, 3.0 - 19.1 in-lb)**
**(NSK bearing)**
**0.44 - 3.33 N·m (4.5 - 34.0 kg-cm, 3.9 - 29.5 in-lb)**
**(NTN bearing)**

**As measured at wheel hub bolt:**
**5.9 - 37.3 N (0.6 - 3.8 kg, 1.3 - 8.4 lb)**
**(NSK bearing)**
**7.8 - 57.9 N (0.8 - 5.9 kg, 1.8 - 13.0 lb)**
**(NTN bearing)**

**Axial end play:**
**0.05 mm (0.0020 in) or less**

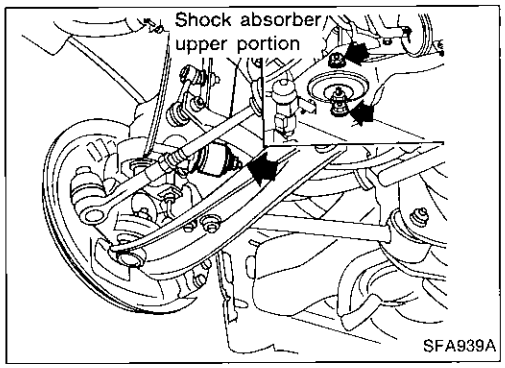



**When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**

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

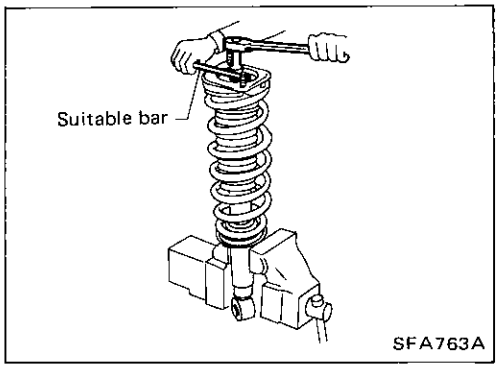
: N·m (kg-m, ft-lb)

SFA251B




## Removal

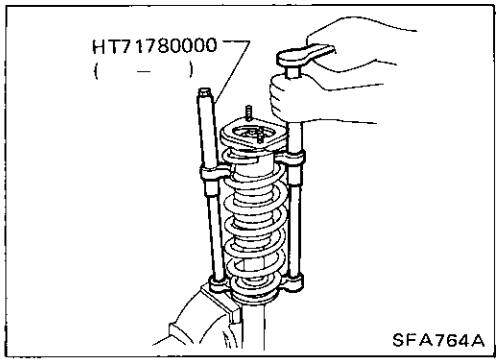
- Remove shock absorber fixing bolt and nut (to hoodledge).
- **Do not remove piston rod lock nut.**



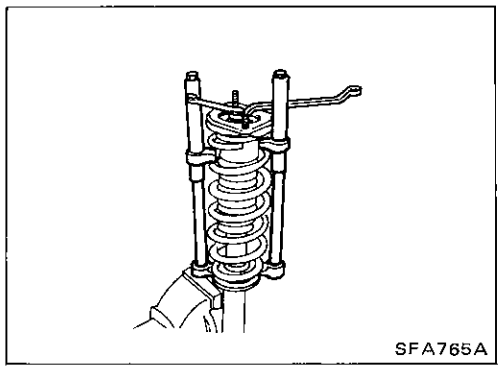

## Disassembly

1. Set shock absorber on vise with Tool, then loosen piston rod lock nut.

- **Do not remove piston rod lock nut.**




2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.




3. Remove piston rod lock nut.

## Inspection

### SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occuring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

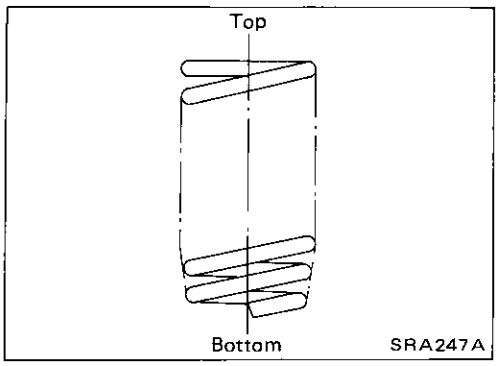
## Inspection (Cont'd)

### MOUNTING INSULATOR AND RUBBER PARTS

- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration.
  Replace if necessary.

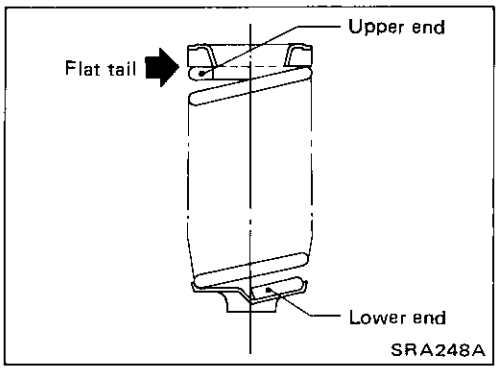
### COIL SPRING

- Check for cracks, deformation or other damage. Replace if necessary.




## Assembly

- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)

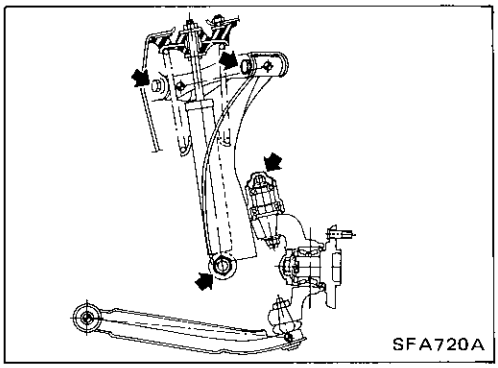



- When installing coil spring on shock absorber, it must be positioned as shown in figure at left.

## Removal

**CAUTION:**
**Kingpin bearing usually does not require maintenance. If any of the following symptoms are noted, replace kingpin bearing assembly.**

- **Growling noise is emitted from kingpin bearing during operation.**
- **Kingpin bearing drags or turns roughly when steering knuckle is turned by hand.**


SFA720A

1. Remove cap and kingpin upper nut.
- **Do not remove kingpin lower nut.**
2. Remove shock absorber fixing nut and upper link fixing bolts.
3. Remove third link and upper link.

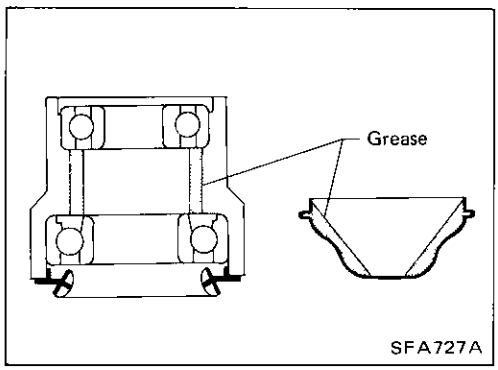
## Installation

### THIRD LINK

- Pack kingpin housing and cap with multi-purpose grease.

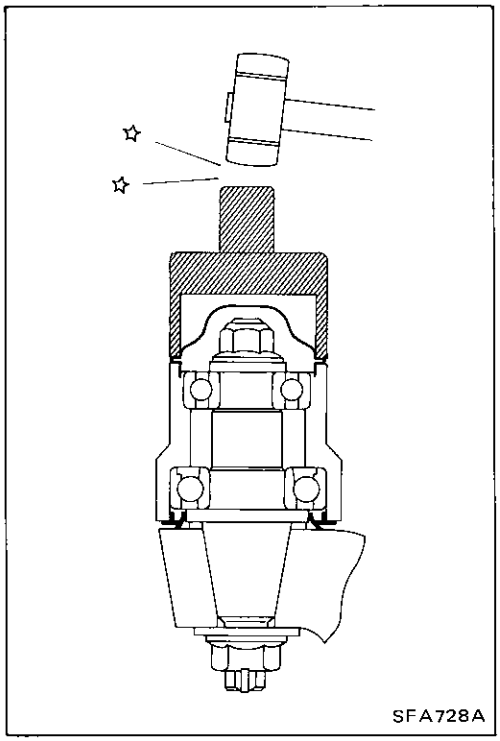
**Grease capacity:**

| | |
|---|---|
| **Kingpin housing** | **10 g (0.35 oz)** |
| **Cap** | **5 g (0.18 oz)** |



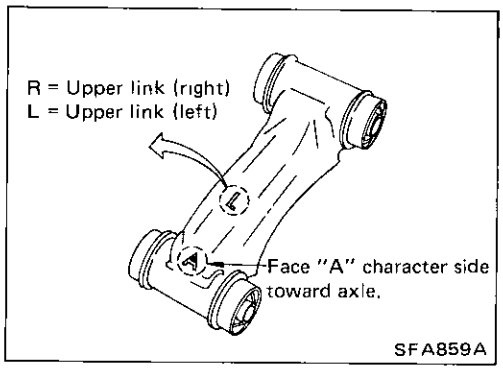
SFA727A

- Install third link and cap.


SFA728A

## Installation (Cont'd)

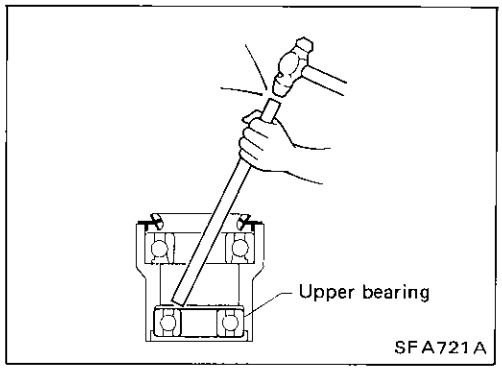
### UPPER LINK



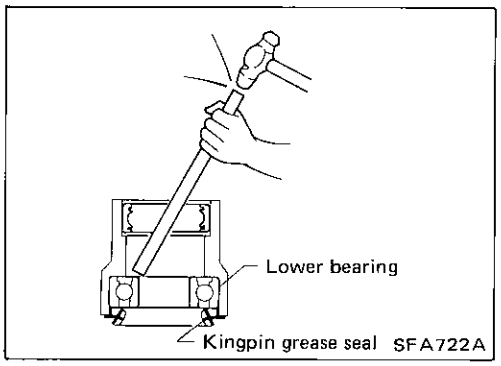

- Upper link has characters "A" and "L" (or "R") on it as shown. Always install upper link with "A" side facing axle and side without a character facing vehicle body.

**Upper link bushings cannot be disassembled.**

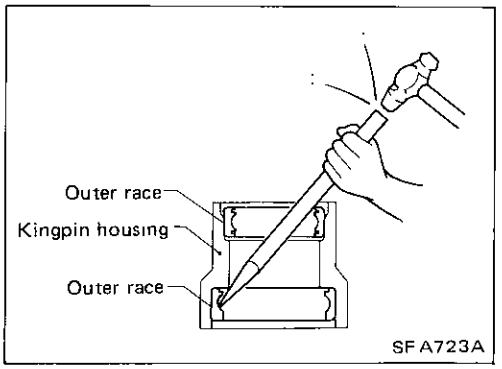
## Disassembly




- Remove upper bearing (inner race and ball).

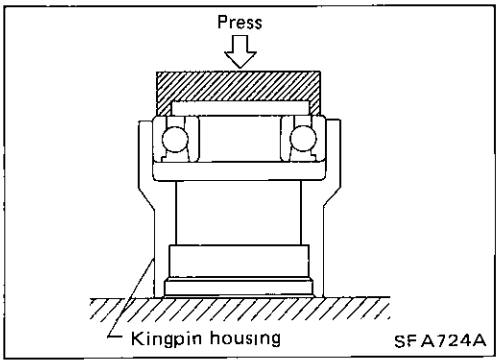



- Remove kingpin grease seal.
- Remove lower bearing (inner race and ball).



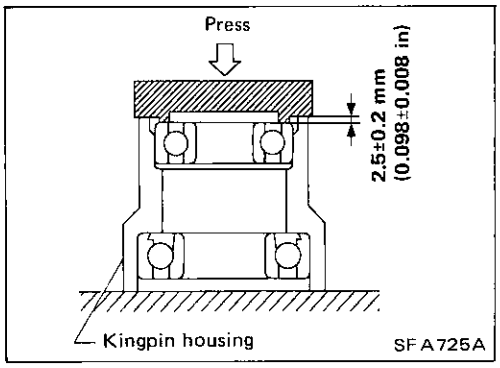

- Remove upper and lower outer race.
- **Be careful not to damage kingpin housing.**

## Assembly

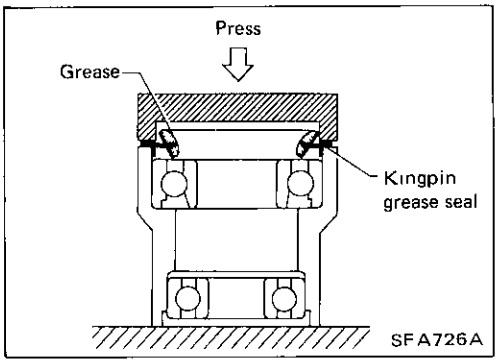



- Install lower bearing.

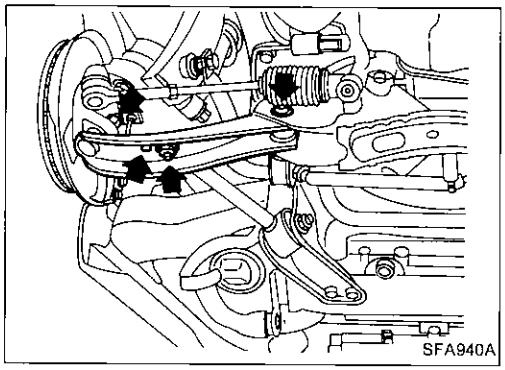
## Assembly (Cont'd)




- Install upper bearing.




- Install lower oil seal.
- Apply multi-purpose grease to oil seal lip.


SFA940A

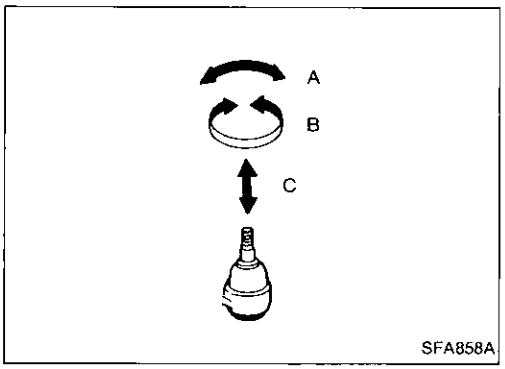
## Removal and Installation

- Remove tension rod, ball joint and transverse link assembly.
- During installation, final tightening must be done at curb weight with tires on ground.
- After installation, check wheel alignment.
  Refer to "Front Wheel Alignment" of ON-VEHICLE SERVICE.

## Inspection

### TRANSVERSE LINK

- Check transverse link for damage, cracks or deformation.
  Replace it if necessary.
- Check rubber bushing for damage, cracks and deformation.
  Replace transverse link if necessary.



SFA858A

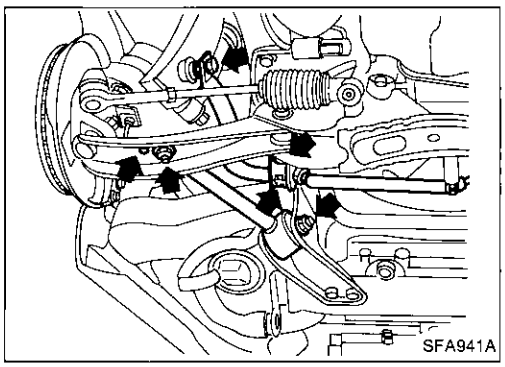
### LOWER BALL JOINT

Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link assembly.

**Swing force, turning torque and vertical end play**

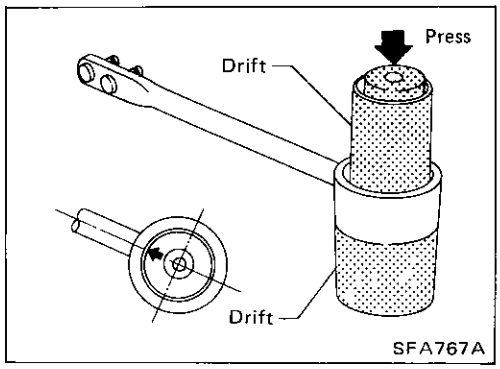
Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

**Swing force "A":**
**(measuring point: cotter pin hole of ball stud)**
**7.8 - 53.0 N (0.8 - 5.4 kg, 1.8 - 11.9 lb)**
**Turning torque "B":**
**0.49 - 3.43 N•m (5.0 - 35 kg-cm, 4.3 - 30.4 in-lb)**
**Vertical end play limit "C":**
**0 mm (0 in)**

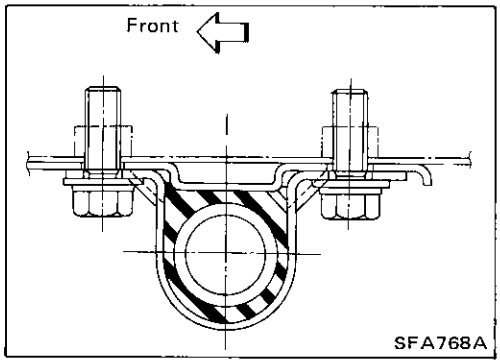



## Removal and Installation

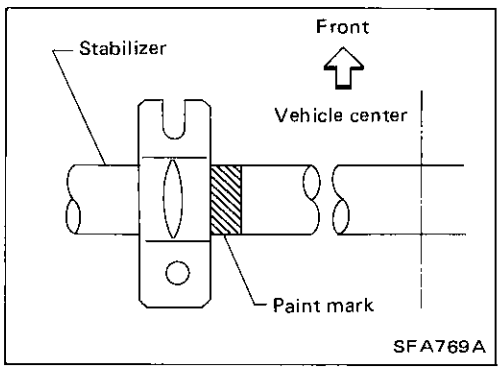
- Remove tension rod and stabilizer bar.

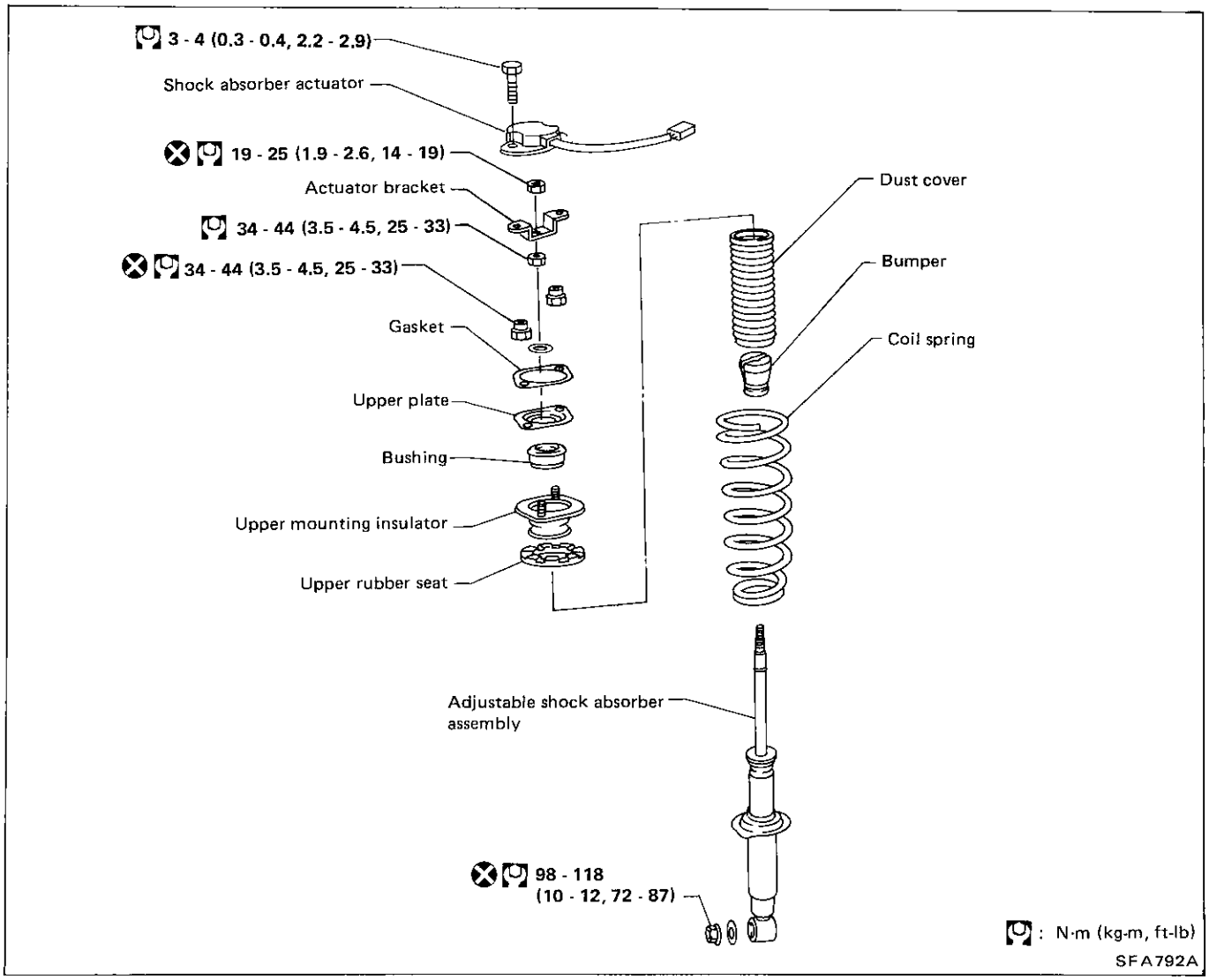


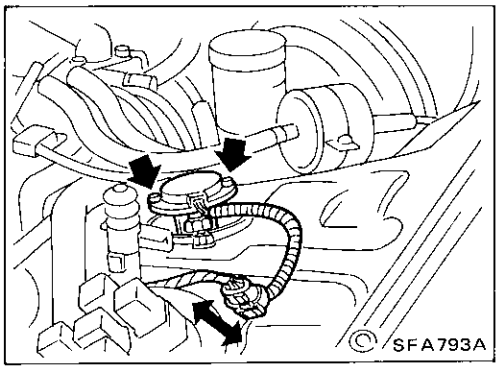

- When removing tension rod bushing, place one drift on lower side of bushing and the other on upper side, and press bushing out.
- Place arrow mark on bushing facing tension rod before installing bushing.




- When installing stabilizer, make sure that paint mark and clamp face in the correct direction.

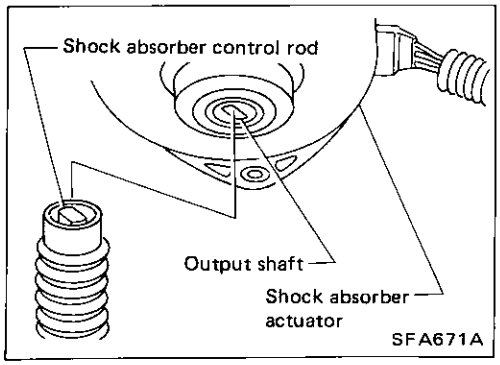





## Removal and Installation

- Disconnect sub-harness connector.
- Remove shock absorber actuator fixing bolts.

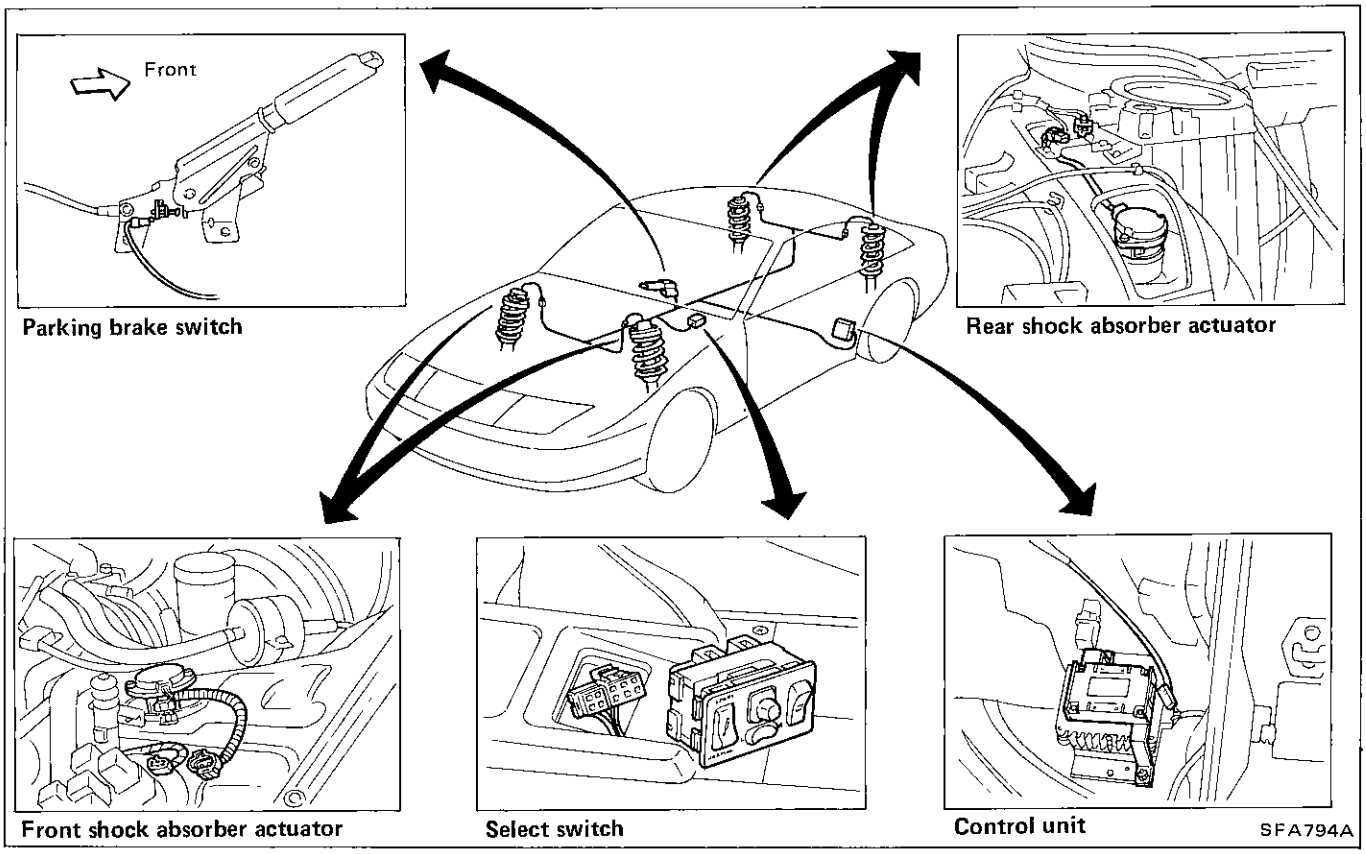



- **Before installing actuator, ensure shock absorber control rod is aligned with actuator output shaft. Otherwise, actuator may be damaged.**
- Refer to FRONT SUSPENSION for other procedures.

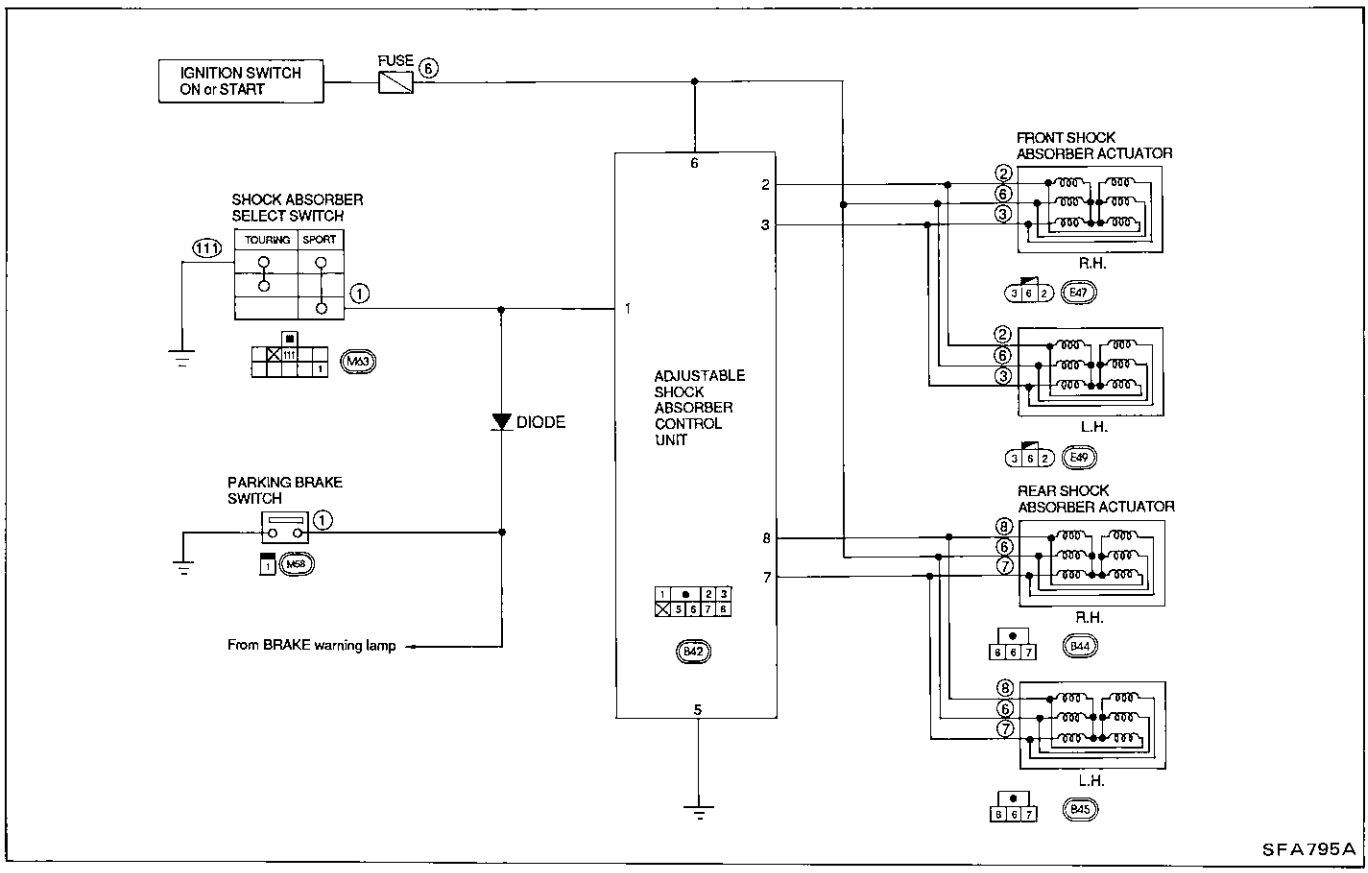
## Inspection

- Replace shock absorber assembly if it is damaged. Refer to FRONT SUSPENSION — Coil Spring and Shock Absorber.

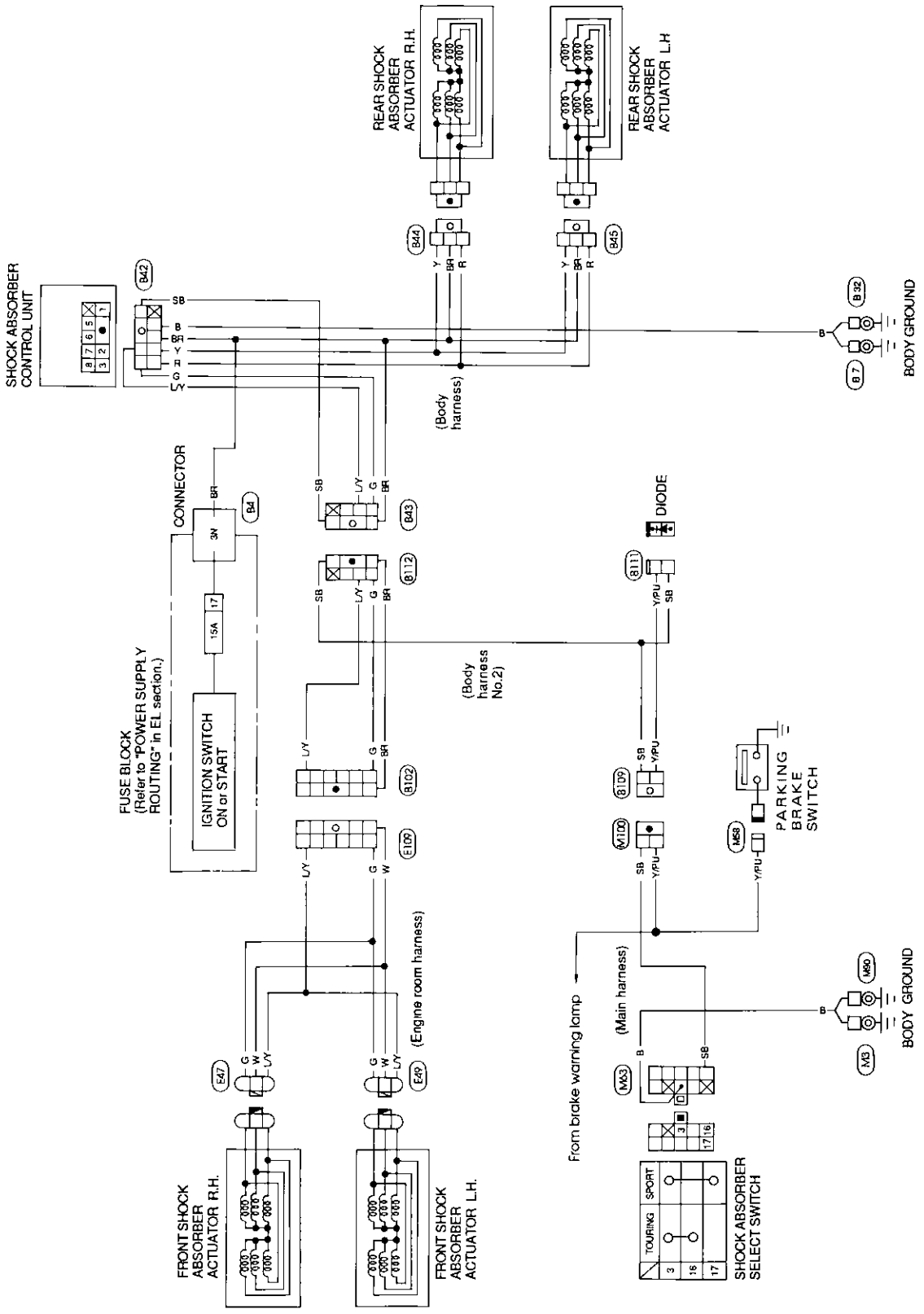
## Component Parts and Harness Connector Location




## Circuit Diagram for Quick Pinpoint Check

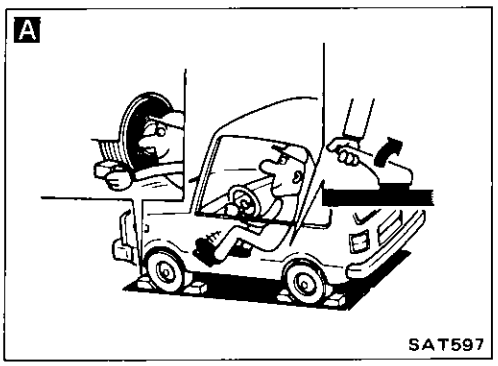


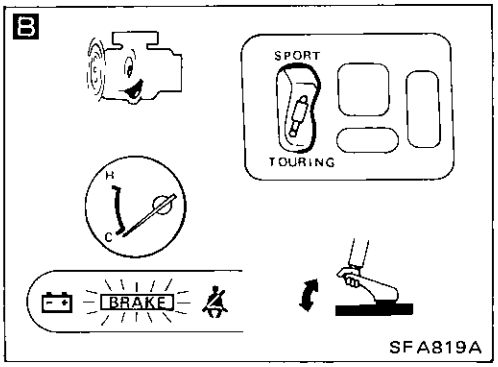
## Wiring Diagram

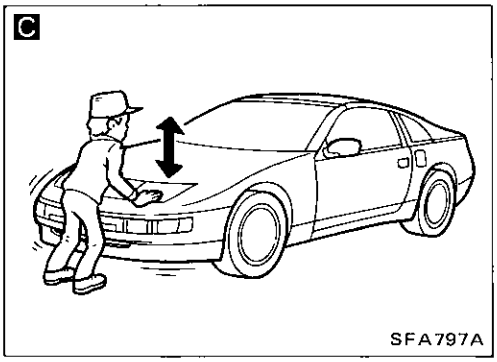


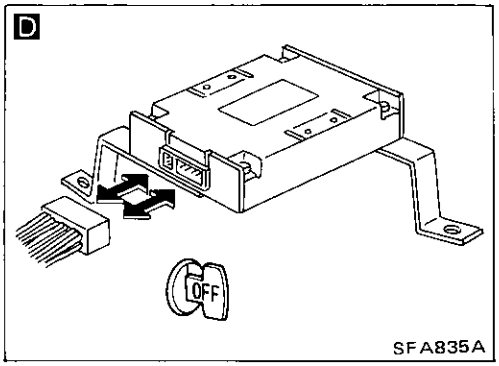

SFA107B

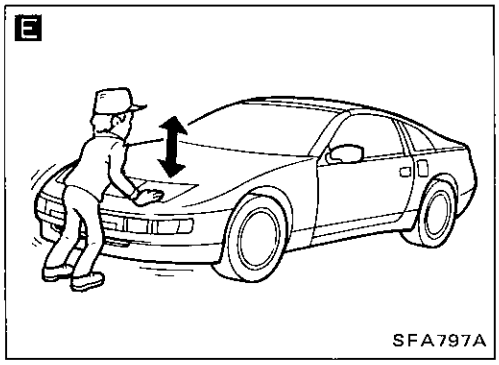
## Diagnostic Procedure




START

A

Engage parking brake and chock all four wheels.

B

CHECK PARKING BRAKE WARNING LAMP.
1) Set shift lever to "P" (A/T model) or "N" (M/T model).
2) Set select switch to "TOURING".
3) Start engine.
4) Check that parking brake warning lamp comes on when engine starts.

No → Repair or replace parking brake switch, warning lamp or harness.

Yes

C

CHECK SWITCHING OF SHOCK ABSORBER ACTUATOR.
- Release and engage parking brake.
- Push down on body above each wheel with your hand to check damping force of shock absorber.
- Release parking brake. Push down on body above each wheel to check if damping force of shock absorber changes.

Damping force of all shock absorber does not change.

D

CHECK CONNECTOR CONTINUITY.
Disconnect control unit and select switch connectors and reconnect them firmly.

→ Ⓐ

Damping force of one or more shock absorbers changes.

E

CHECK SWITCHING OF SHOCK ABSORBER ACTUATOR.
- Release parking brake.
- Move select switch from "TOURING" to "SPORT".
- Push down on body above each wheel with your hand to see if damping force of each shock absorber changes.

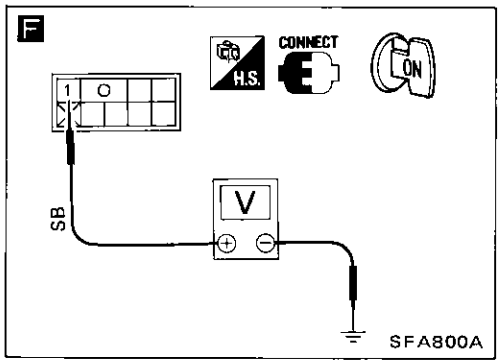
→ Ⓑ Damping force of all shock absorbers does not change.

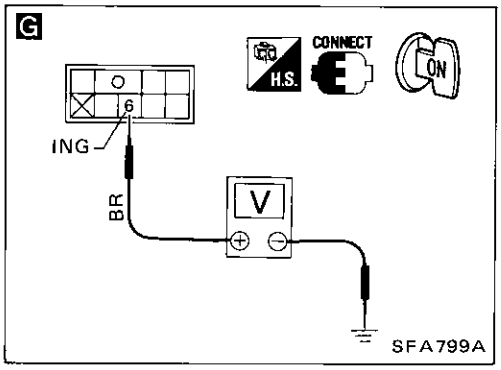
→ Ⓒ Damping force of some shock absorbers does not change.

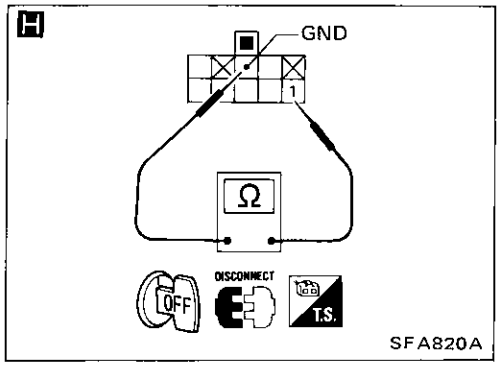
Damping force of all shock absorbers changes.

END

## Diagnostic Procedure (Cont'd)




Ⓐ

**F**

CHECK CONTROL UNIT INPUT SIGNAL.
Check control unit input signal at terminal ①.
- Set select switch to "TOURING".
- Parking brake lever:
  Released ... Approx. 12V
  Engaged ... 0V
  } O.K.

12V are indicated regardless of parking brake lever position.
→ Repair or replace harness between control unit and parking brake switch.

0V are indicated regardless of parking lever position.

O.K.

**G**

CHECK CONTROL UNIT POWER SUPPLY.
1) Turn ignition switch "ON".
2) Measure voltage across control unit terminals IGN and ground.
**Voltage:**
**Approximately 12V ... O.K.**

O.K. → Replace control unit.

N.G. → Check and repair fuse and power supply harness.

**H**

CHECK SELECT SWITCH CONTINUITY.
1) Disconnect select switch connector.
2) Check continuity between select switch terminal ① and GND.
**Continuity should exist.**

O.K. → Repair or replace harness between control unit and parking brake switch.

N.G. → Replace select switch.

Ⓑ

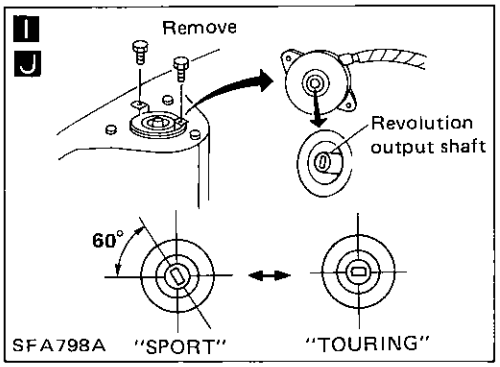
**H**

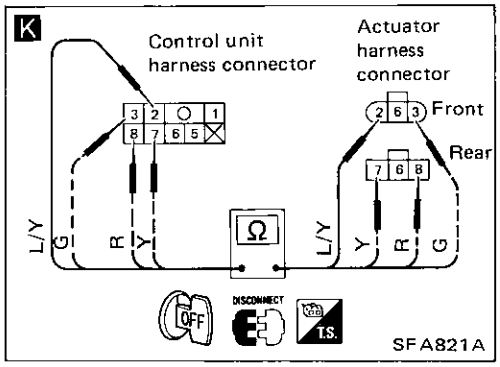
CHECK SELECT SWITCH CONTINUITY.
1) Disconnect select switch connector.
2) Check continuity between select switch terminal ① and GND.
**Continuity should exist.**

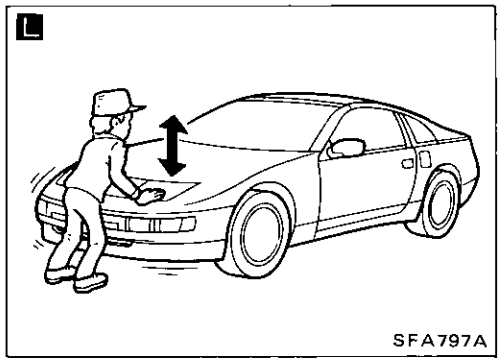
N.G. → Replace select switch.

O.K. → Repair or replace harness between control unit and select switch.

## Diagnostic Procedure (Cont'd)




Ⓒ

I CHECK ACTUATOR.
Remove actuator from shock absorber (for those shock absorbers in which damping force does not change). Switch select switch to check if actuator output shaft rotates.

- Rubbing noise is emitted from actuator. → Replace actuator.
- Output shaft rotates. → Ⓓ
- Output shaft does not rotate. ↓

J Interchange left and right actuators and check that output shafts rotate.

- Yes → Old actuator malfunctions. Replace.
- No ↓

K CHECK HARNESS CONTINUITY BETWEEN CONTROL UNIT AND ACTUATOR.
1) Disconnect control unit connector and actuator connector.
2) Check continuity between control unit harness connector terminals and corresponding terminals of actuator harness connector.
**Continuity should exist.**

- N.G. → Repair or replace harness between control unit and actuator.
- O.K. ↓

Replace control unit.

Ⓓ

Visually check bracket for deformities.

- N.G. → Replace bracket.
- O.K. ↓

L CHECK SWITCHING OF SHOCK ABSORBER ACTUATOR.
After checking that output shafts rotate with left and right actuators interchanged, install actuator on shock absorber for which damping force does not change, and check that damping force changes properly.

- N.G. → Replace shock absorber.
- O.K. ↓

Old actuator malfunctions. Replace.

## Diagnostic Procedure (Cont'd)

### CONTROL AND OPERATION OF SHOCK ABSORBER DAMPING FORCE

| Select switch | TOURING | SPORT |
|---|---|---|
| Parking brake lever released | Soft | Firm |
| Parking brake lever engaged | Firm | Firm |

### CONTROL UNIT INSPECTION TABLE

| Terminal No. | Connected to | Standard value |
|---|---|---|
| ① | Select switch and parking brake switch | 0V ("SPORT"); 12V ("TOURING") *1 |
| | | 0V (parking brake lever released); 12V (parking brake lever engaged) *2 |
| ② | Front actuator "Firm" | When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V. *1 |
| ③ | Front actuator "Soft" | When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V. *1 |
| ⑤ | GND | 0V |
| ⑥ | IGN | Approx. 12V |
| ⑦ | Rear actuator "Firm" | When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V. *1 |
| ⑧ | Rear actuator "Soft" | When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V. *1 |

*1: Measure with parking brake released.
*2: Measure with select switch set to "TOURING".

# General Specifications

## COIL SPRING

| Item \ Engine | | VG30DE | | VG30DETT |
|---|---|---|---|---|
| | | 2 seater | 2+2 seater | |
| Wire diameter | mm (in) | 12.1 (0.476) | 11.9 (0.469) | 12.1 (0.476) |
| Coil diameter | mm (in) | 100.1 (3.94) | 99.9 (3.933) | 100.1 (3.94) |
| Free length | mm (in) | 360 (14.17) | 370 (14.57) | |
| Spring constant | N/mm (kg/mm, lb/in) | 29.4 (3.0, 168) | 27.5 (2.8, 157) | 29.4 (3.0, 168) |
| Identification color | | Light blue x 1, Pink x 1 | Light blue x 2 | Light blue x 1, Orange 1 |

## SHOCK ABSORBER

| Item \ Engine | | VG30DE | VG30DETT | |
|---|---|---|---|---|
| Shock absorber type | | Double acting gas type | | |
| Piston rod diameter | mm (in) | 12.5 (0.492) | 14.0 (0.551) | |
| Inner cylinder bore diameter | mm (in) | 25.0 (0.984) | 30.0 (1.181) | |
| Damping force [at 0.3 m (1.0 ft)/sec.] | N (kg, lb) | | Firm | Soft |
| Expansion | | 1,177 - 1,569 (120 - 160, 265 - 353) | 1,608 - 2,118 (164 - 216, 362 - 476) | 1,138 - 1,510 (116 - 154, 256 - 340) |
| Compression | | 559 - 814 (57 - 83, 126 - 183) | 971 - 1,383 (99 - 141, 218 - 311) | 686 - 981 (70 - 100, 154 - 221) |

## FRONT STABILIZER BAR

| Applied model | | 2 seater | 2+2 seater |
|---|---|---|---|
| Stabilizer diameter | mm (in) | 27.2 (1.071) | 28.6 (1.126) |
| Identification color | | White | Purple |

## TENSION ROD

| Item \ Engine | | VG30DE | VG30DETT |
|---|---|---|---|
| Rod diameter | mm (in) | 20.0 (0.787) | |

## Inspection and Adjustment

### WHEEL ALIGNMENT (Unladen*1)

| | | |
|---|---|---|
| Camber | degree | −1°35′ to −0°05′ |
| Caster | degree | 8°55′ - 10°25′ |
| Toe-in<br>A − B | mm (in) | 0 - 2 (0 - 0.08) |
| Total angle 2θ | degree | 0′ - 11′ |
| Kingpin inclination | degree | 12°10′ - 13°40′ |
| Front wheel turning angle<br>Full turn*2<br>inside/outside | degree | 32°30′ - 36°30′/26°30′ - 30°30′ |

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

### WHEEL BEARING

| | |
|---|---|
| Wheel bearing axial end play<br>mm (in) | 0.05 (0.0020) or less |
| Wheel bearing lock nut<br>Tightening torque<br>N·m (kg-m, ft-lb) | 206 - 284 (21 - 29, 152 - 210) |
| Wheel bearing turning resistance<br>N·m (kg-cm, in-lb)<br>NSK bearing | 0.34 - 2.16<br>(3.5 - 22.0, 3.0 - 19.1) |
| NTN bearing | 0.44 - 3.33<br>(4.5 - 34.0, 3.9 - 29.5) |
| At wheel hub bolt<br>N (kg, lb)<br>NSK bearing | 5.9 - 37.3 (0.6 - 3.8, 1.3 - 8.4) |
| NTN bearing | 7.8 - 57.9 (0.8 - 5.9, 1.8 - 13.0) |

### LOWER BALL JOINT

| | |
|---|---|
| Swing force<br>(Measuring point: cotter pin hole of ball stud)<br>N (kg, lb) | 7.8 - 53.0<br>(0.8 - 5.4, 1.8 - 11.9) |
| Turning torque<br>N·m (kg-cm, in-lb) | 0.49 - 3.43<br>(5.0 - 35, 4.3 - 30.4) |
| Vertical end play<br>mm (in) | 0 (0) |

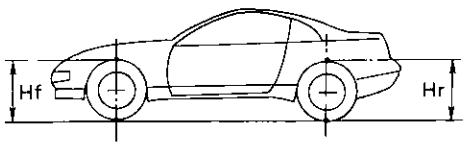
### WHEEL RUNOUT (Radial and lateral)

| Wheel type | Radial runout | Lateral runout |
|---|---|---|
| Aluminum wheel<br>mm (in) | 0.3 (0.012) or less | |

### WHEELARCH HEIGHT

Unit: mm (in)

| | Standard height | | |
|---|---|---|---|
| | VG30DE | | VG30DETT |
| | 2 seater | 2+2 seater | 2 seater |
| Front (Hf) | 675 (26.57) | 677 (26.65) | 675 (26.57) |
| Rear (Hf) | 676 (26.61) | 675 (26.57) | 675 (26.57) |



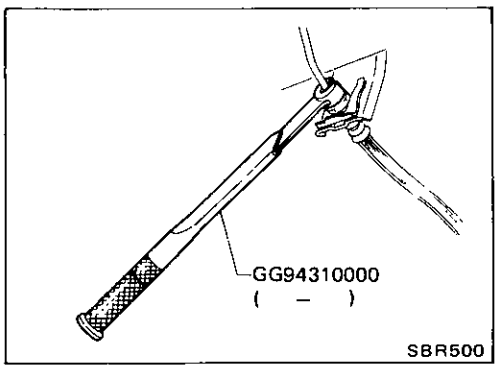

SFA750A

# 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 AND REAR SUSPENSION ASSEMBLY ..... RA- 8
REAR AXLE — Wheel Hub and Axle Housing ..... RA- 9
REAR AXLE — Drive Shaft ..... RA-13
REAR SUSPENSION ..... RA-18
REAR SUSPENSION — Coil Spring and Shock Absorber ..... RA-19
REAR SUSPENSION — Multi-link and Lower Ball Joint ..... RA-21
REAR SUSPENSION — Stabilizer Bar ..... RA-22
ADJUSTABLE SHOCK ABSORBER ..... RA-23
SUPER HICAS ..... RA-25
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... RA-27

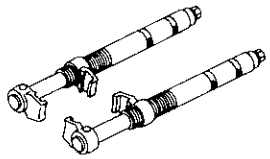
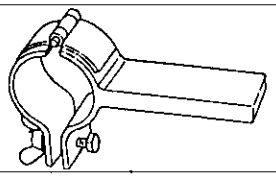
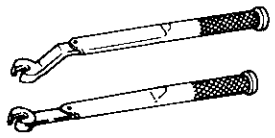
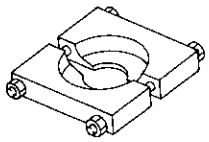
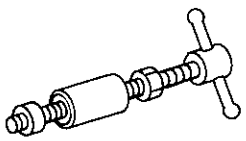
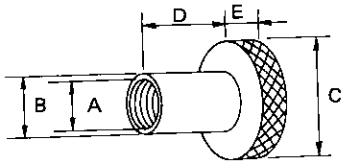



## Precautions

- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  * **Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **Use Tool when removing or installing brake lines.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Do not jack up at the lower arm.**

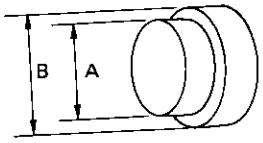
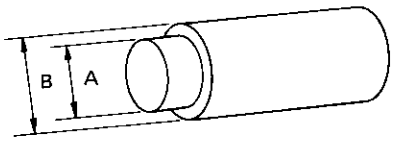
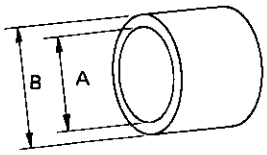
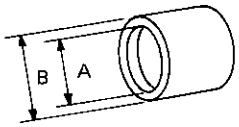
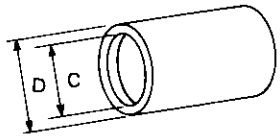
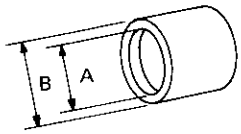
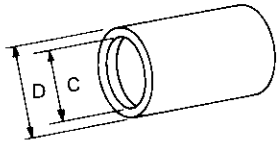
## Preparation

### SPECIAL SERVICE TOOLS

| Tool number (Kent-Moore No.) Tool name | Description | |
|---|---|---|
| HT71780000 ( – ) Spring compressor |  | Removing and installing coil spring |
| ST35652000 ( – ) Shock absorber attachment |  | Fixing strut assembly |
| GG94310000 ( – ) Flare nut torque wrench |  | Removing and installing brake piping |
| ST30031000 (J22912-01) Bearing puller |  | Removing inner race of wheel bearing |
| ST38280000 ( – ) Arm bushing remover |  | Removing and installing bushing of rear axle housing |
| IM23600800 ( – ) Attachment Wheel alignment |  | Measure rear wheel alignment<br>**A: Screw M24 x 1.5**<br>**B: 35 (1.38) dia.**<br>**C: 65 (2.56) dia.**<br>**D: 56 (2.20)**<br>**E: 12 (0.47)** Unit: mm (in) |

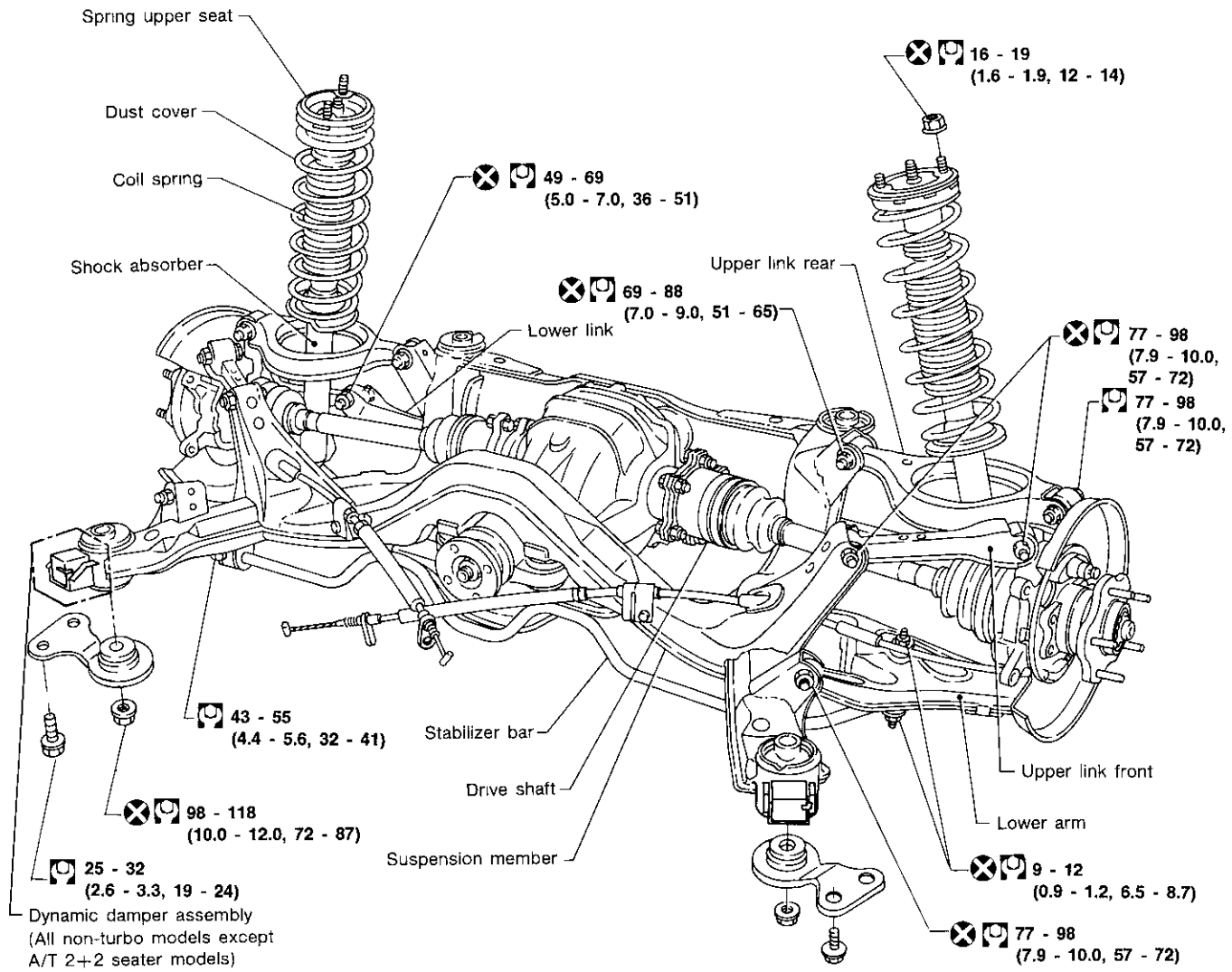
## Preparation (Cont'd)

### COMMERCIAL SERVICE TOOLS

| Tool name | Description |
|---|---|
| Rear wheel hub drift |  Installing wheel bearing<br>**A: 41 mm (1.61 in) dia.**<br>**B: 49 mm (1.93 in) dia.** |
| Wheel bearing drift |  Removing rear wheel hub<br>**A: 26 mm (1.02 in) dia.**<br>**B: 40 mm (1.57 in) dia.** |
| Rear drive shaft plug seal drift |  Installing rear drive shaft plug seal<br>**A: 67 mm (2.64 in) dia.**<br>**B: 85 mm (3.35 in) dia.** |
| Rear axle housing ball joint drift |  <br>  Removing ball joint<br>**A: 20 (0.79) dia.**<br>**B: 28 (1.10) dia.**<br>**C: 40 (1.57) dia.**<br>**D: 43 (1.69) dia.**<br>Unit: mm (in) |
| Rear axle housing ball joint drift |  <br>  Installing ball joint<br>**A: 33 (1.30) dia.**<br>**B: 43 (1.69) dia.**<br>**C: 30 (1.18) dia.**<br>**D: 40 (1.57) dia.**<br>Unit: mm (in) |

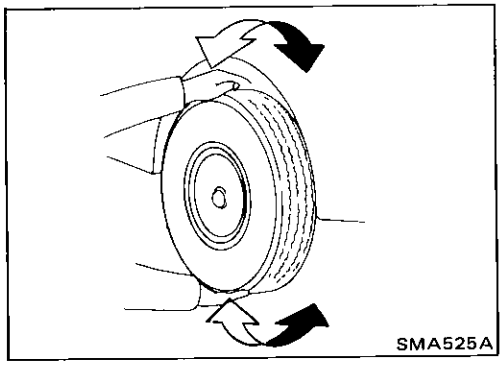
**When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**

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




: N·m (kg-m, ft-lb)

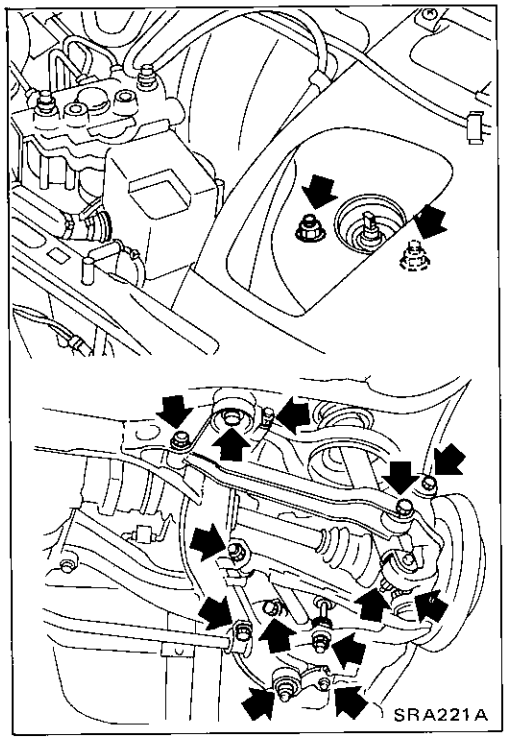
SRA220A


SMA525A

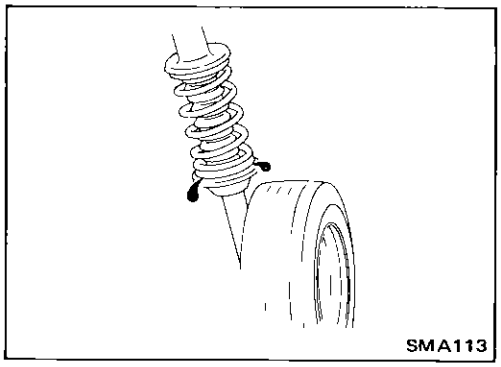
## Rear Axle and Rear Suspension Parts

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

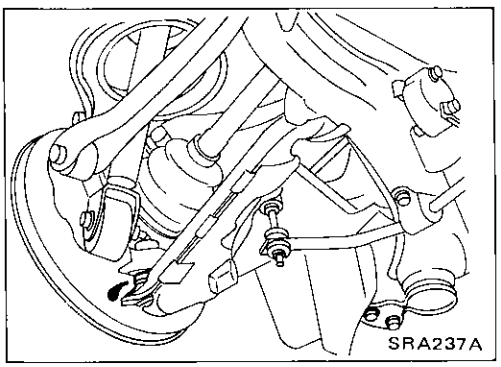
- Shake each rear wheel to check for excessive play.


SRA221A

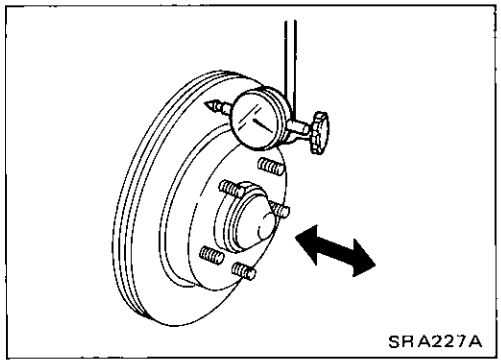
- Retighten all nuts and bolts to the specified torque.
  **Tightening torque:**
  **Refer to REAR SUSPENSION.**
- Make sure that cotter pin is inserted.
- Check rear axle and rear suspension parts for wear, cracks or other damage.


SMA113

- Check shock absorber for oil leakage or other damage.
- Check wheelarch height. Refer to section FA.


SRA237A

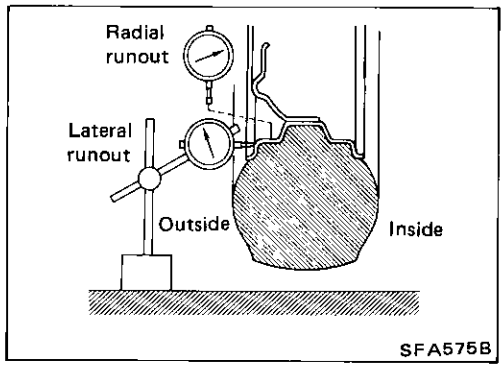
- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.


SRA227A

## Rear Wheel Bearing

- Check tightening torque of wheel bearing lock nut.
  **: 206 - 275 N·m**
  **(21 - 28 kg-m, 152 - 203 ft-lb)**
- Check wheel bearings for smooth operation.
- Check axial end play.
  **Axial end play:**
  **0.05 mm (0.0020 in) or less**

If axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly.
Refer to REAR AXLE — Wheel Hub and Axle Housing.



SFA575B

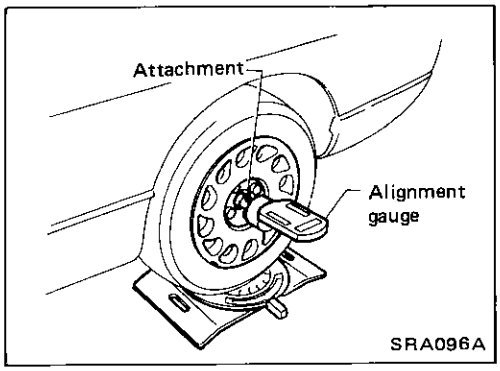
## Rear Wheel Alignment

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

### PRELIMINARY INSPECTION

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

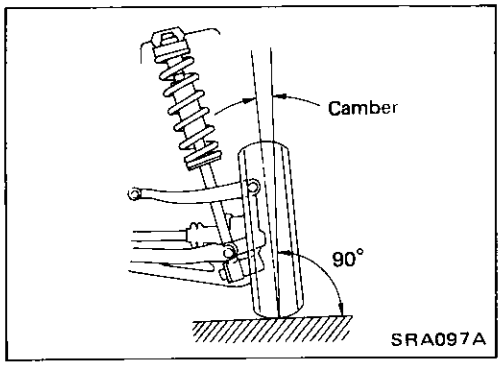
- Check tires for wear and for improper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.
  **Refer to S.D.S.**
- Check that rear shock absorber works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen).
  ("Unladen": Fuel tank, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.)



SRA096A

### CAMBER

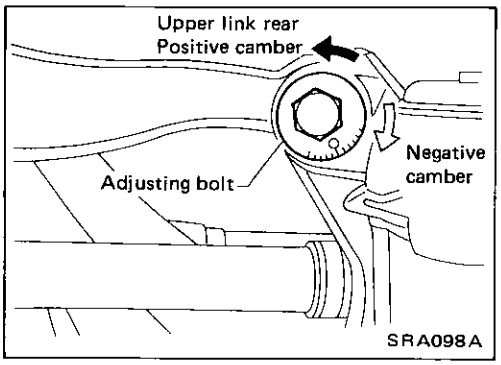
- **Measure camber of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.**



SRA097A

**Camber:**
**Refer to S.D.S.**

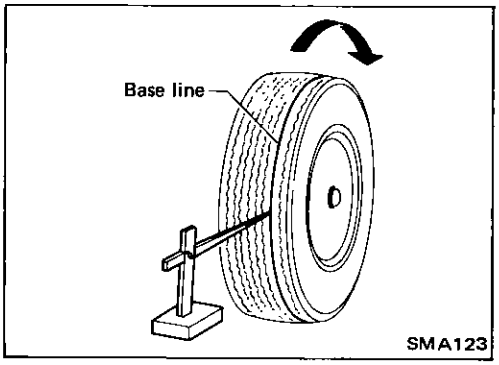
## Rear Wheel Alignment (Cont'd)




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

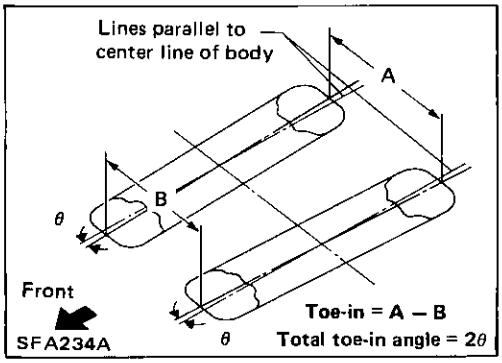
(1) Turn the adjusting bolt to adjust.
**Camber changes about 5′ with each graduation of the adjusting bolt.**

(2) Tighten to the specified torque.
**: 69 - 88 N·m**
**(7.0 - 9.0 kg-m, 51 - 65 ft-lb)**

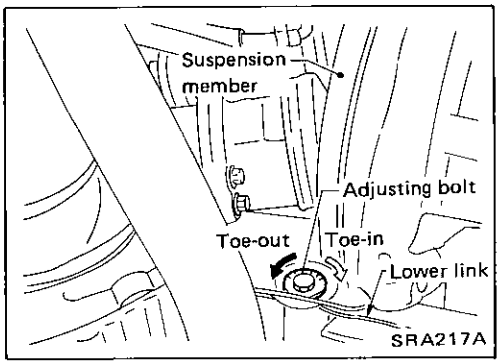



### TOE-IN

1. Draw a base line across the tread.
**After lowering rear of vehicle, move it up and down to eliminate friction.**

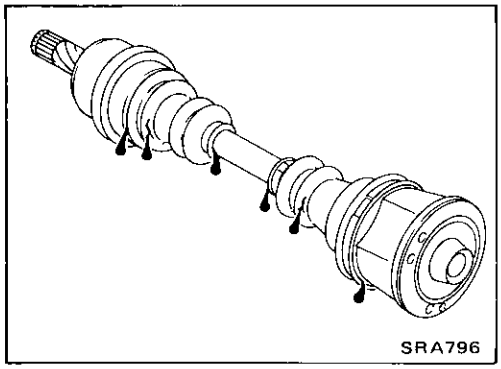



2. Measure toe-in.
**Measure distance "A" and "B" at the same height as hub center.**
**Toe-in:**
**Refer to S.D.S.**




3. Adjust toe-in by turning adjusting bolts.
**Toe changes about 1.5 mm (0.059 in) [One side] with each graduation of the adjusting bolt.**

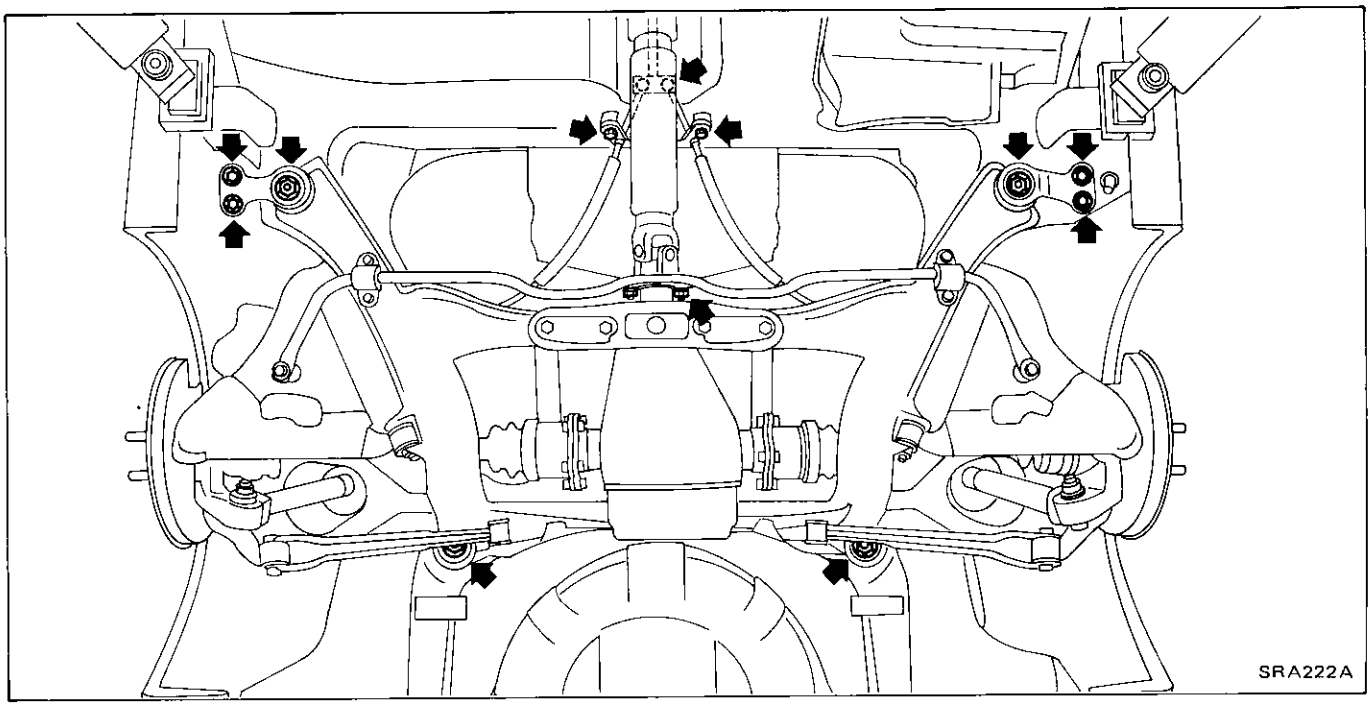
4. Tighten to the specified torque.
**: 69 - 88 N·m**
**(7.0 - 9.0 kg-m, 51 - 65 ft-lb)**



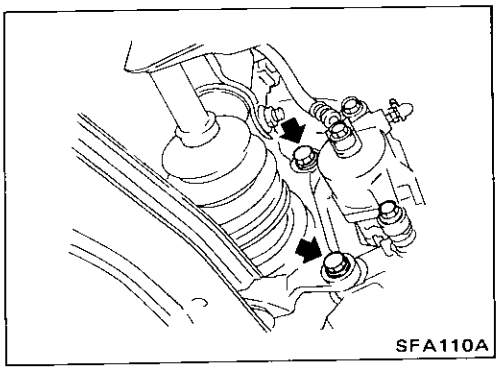

## Drive Shaft

Check boot and drive shaft for cracks, wear, damage or grease leakage.

## Removal and Installation

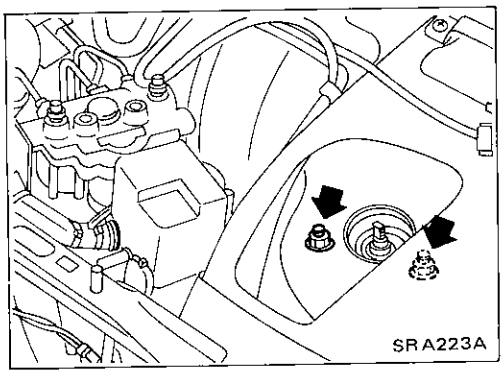



- Remove exhaust tube.
- Disconnect propeller shaft rear end.
- Disconnect hand brake wire front end.




- Remove brake caliper assembly.

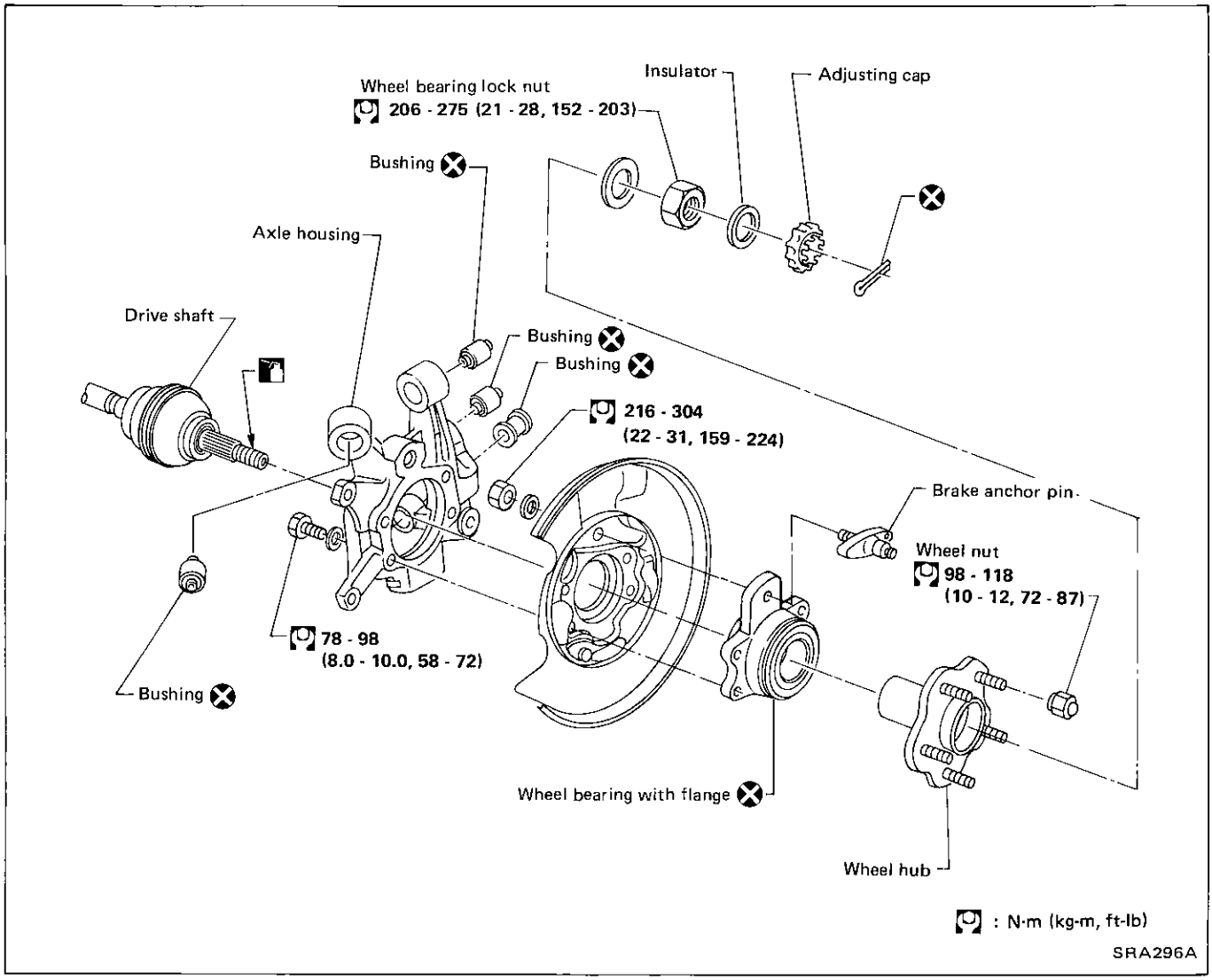
**Brake line need not be disconnected from brake caliper.**
**Be careful not to depress brake pedal, or piston will pop out.**
**Make sure brake line is not twisted.**




- Remove upper end nuts of shock absorber.

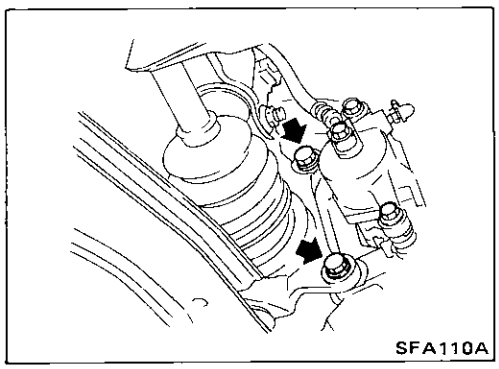
**Do not remove piston rod lock nut.**

- Remove suspension member fixing nuts. Then draw out rear axle and rear suspension assembly.




## Removal

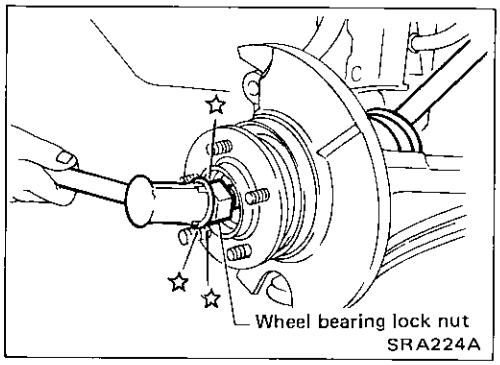
- Remove wheel bearing lock nut.




- Remove brake caliper assembly and rotor.

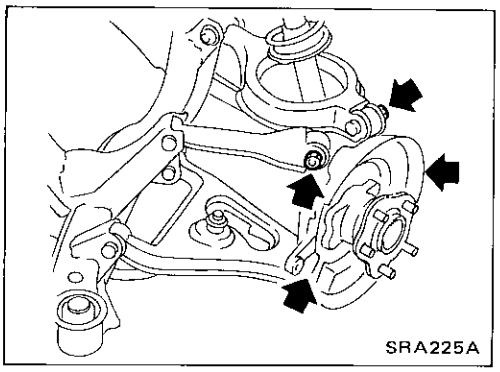
**Brake line need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake line is not twisted.**

## Removal (Cont'd)

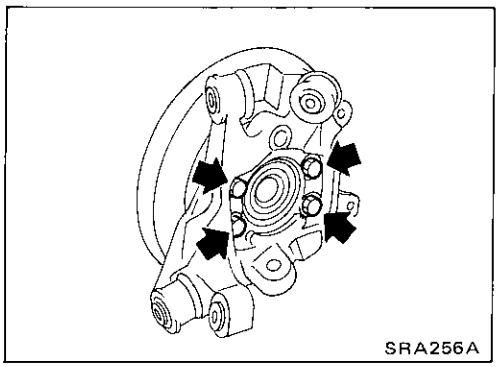



- Separate drive shaft from axle housing by slightly tapping it.

**When removing drive shaft, cover boots with shop towel to prevent them from being damaged.**

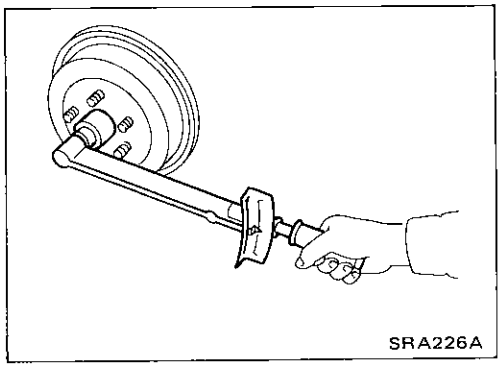



- Remove axle housing.



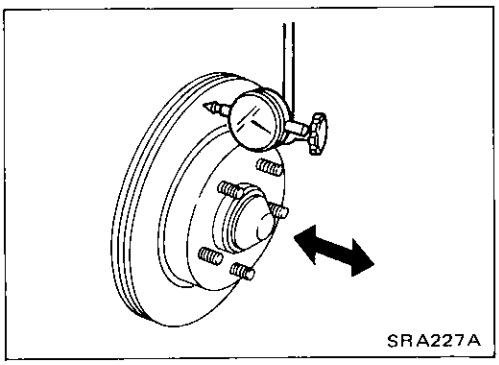

- Remove wheel bearing with flange, and wheel hub from axle housing.

## Installation



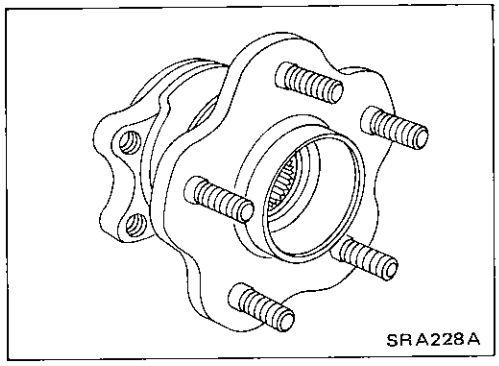

- Install axle housing with wheel hub.
- Tighten wheel bearing lock nut.

**: 206 - 275 N·m**
**(21 - 28 kg-m, 152 - 203 ft-lb)**




- Check wheel bearing axial end play.

**Axial end play: 0.05 mm (0.0020 in) or less**



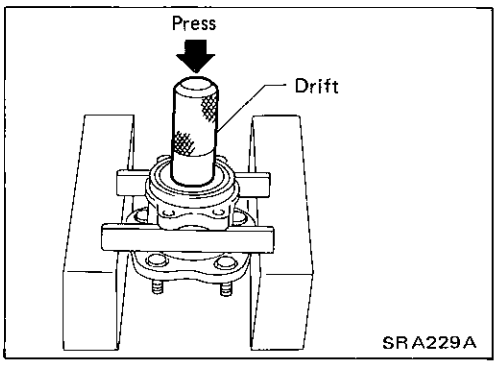

## Disassembly

**CAUTION:**
**Wheel bearing with flange usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly (including flange, and inner and outer seals).**

- **Growling noise is emitted from wheel bearing during operation.**
- **Wheel bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.**
- **After wheel bearing is removed from hub.**

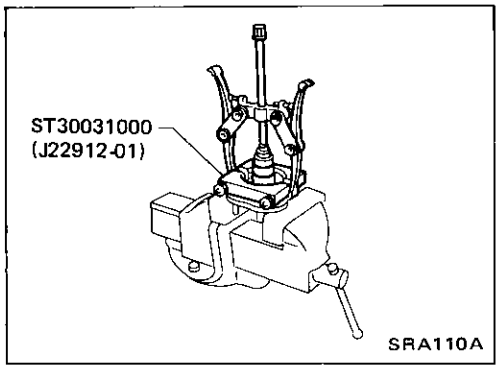
### WHEEL HUB

- Remove wheel bearing (with flange) and wheel hub as one unit from axle housing before disassembling.




### WHEEL BEARING

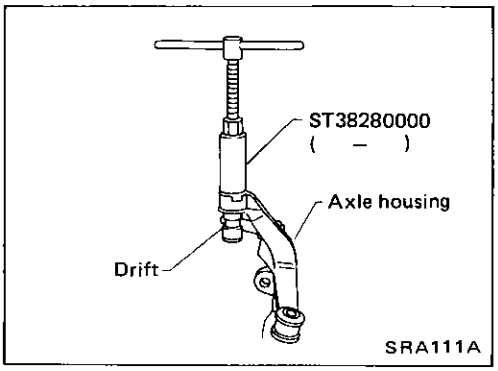
- Using a press and drift as shown in figure at left, press wheel bearing out.
- Discard old wheel bearing assembly. Replace with a new wheel assembly.




- Remove inner race from hub using a bearing replacer/puller.

**CAUTION:**

**a. Do not reuse old inner race although it is of the same brand as the bearing assembly.**
**b. Do not replace grease seals as single parts.**

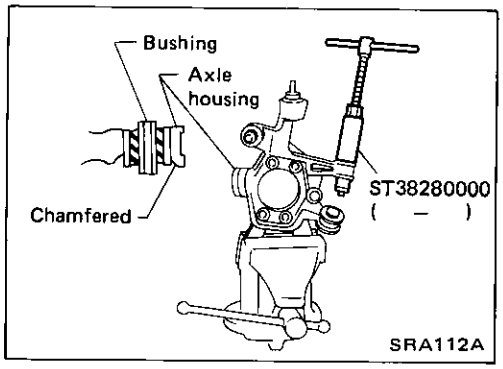



### AXLE HOUSING

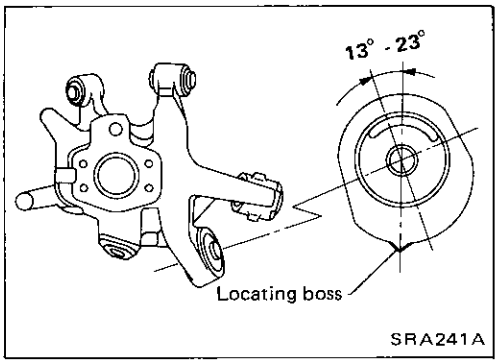
- Attach a drift on outer shell of bushing as shown in figure at left, remove bushing using arm bushing remover.

**When placing axle housing in a vise, use wooden blocks or copper plates as pads.**

## Disassembly (Cont'd)




- Ensure axle housing bore is free from scratches or deformities before pressing bushing into it.
- Attach bushing to chamfered bore end of axle housing and press it until it is flush with end face of axle housing.



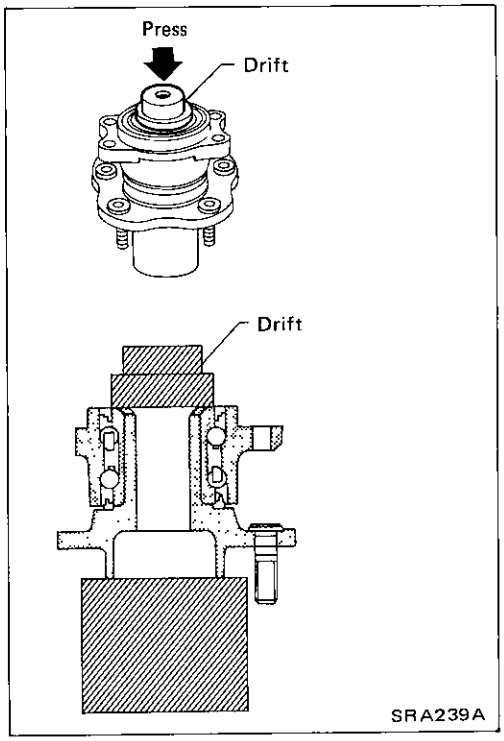

- When installing shock absorber bushing, make sure that it is positioned as shown.

## Inspection

### WHEEL HUB AND AXLE HOUSING

- Check wheel hub and axle housing for cracks by using a magnetic exploration or dyeing test.
- Check wheel bearing for damage, seizure, rust or rough operation.
- Check rubber bushing for wear or other damage.

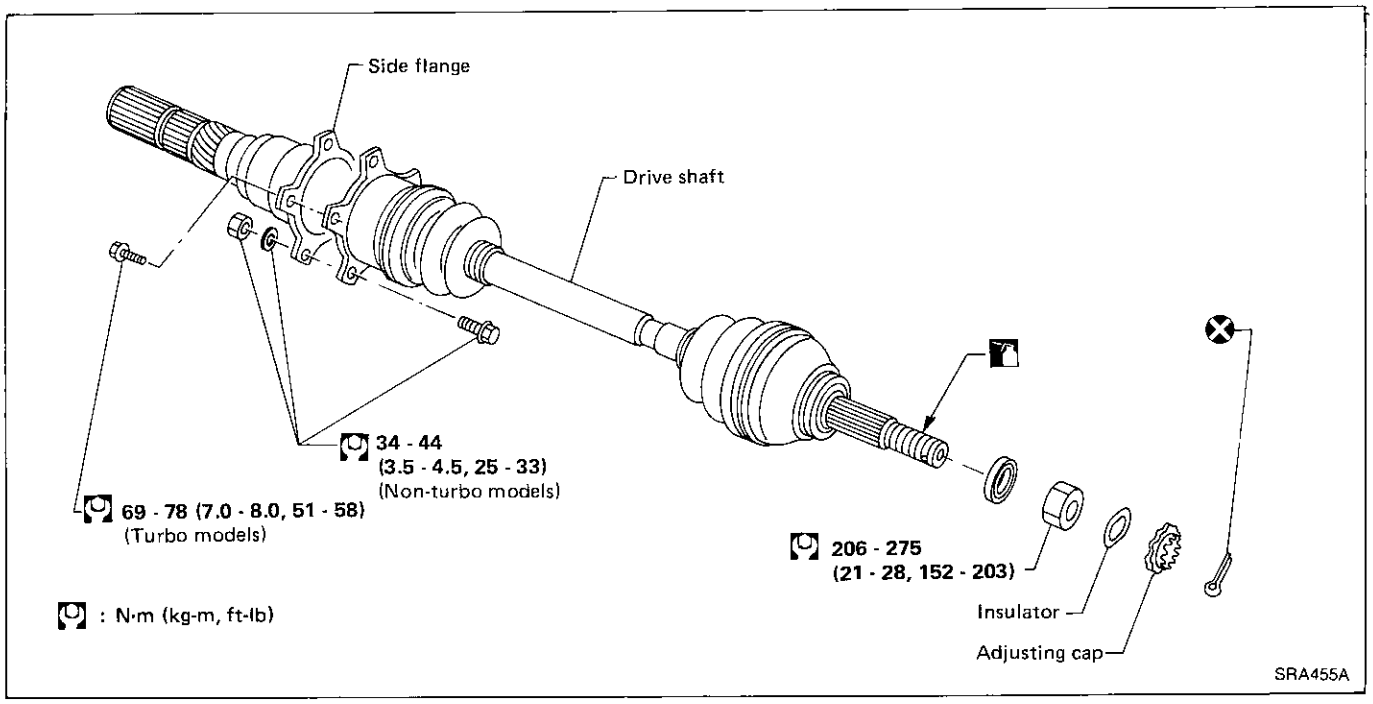
**Replace if necessary.**

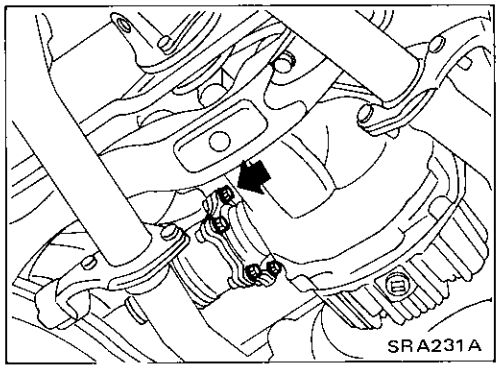


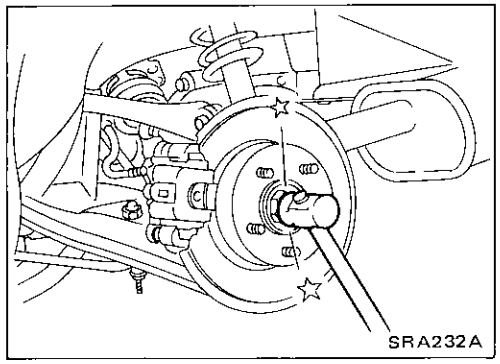

## Assembly

- Place hub on a block. Attach a drift to inner race of wheel bearing and press it into hub as shown in figure at left.

**Be careful not to damage grease seal.**




## Removal

**When removing drive shaft, cover boots with shop towel to prevent damage to them.**

### FINAL DRIVE SIDE

- Remove side flange mounting bolt and separate shaft.

### WHEEL SIDE

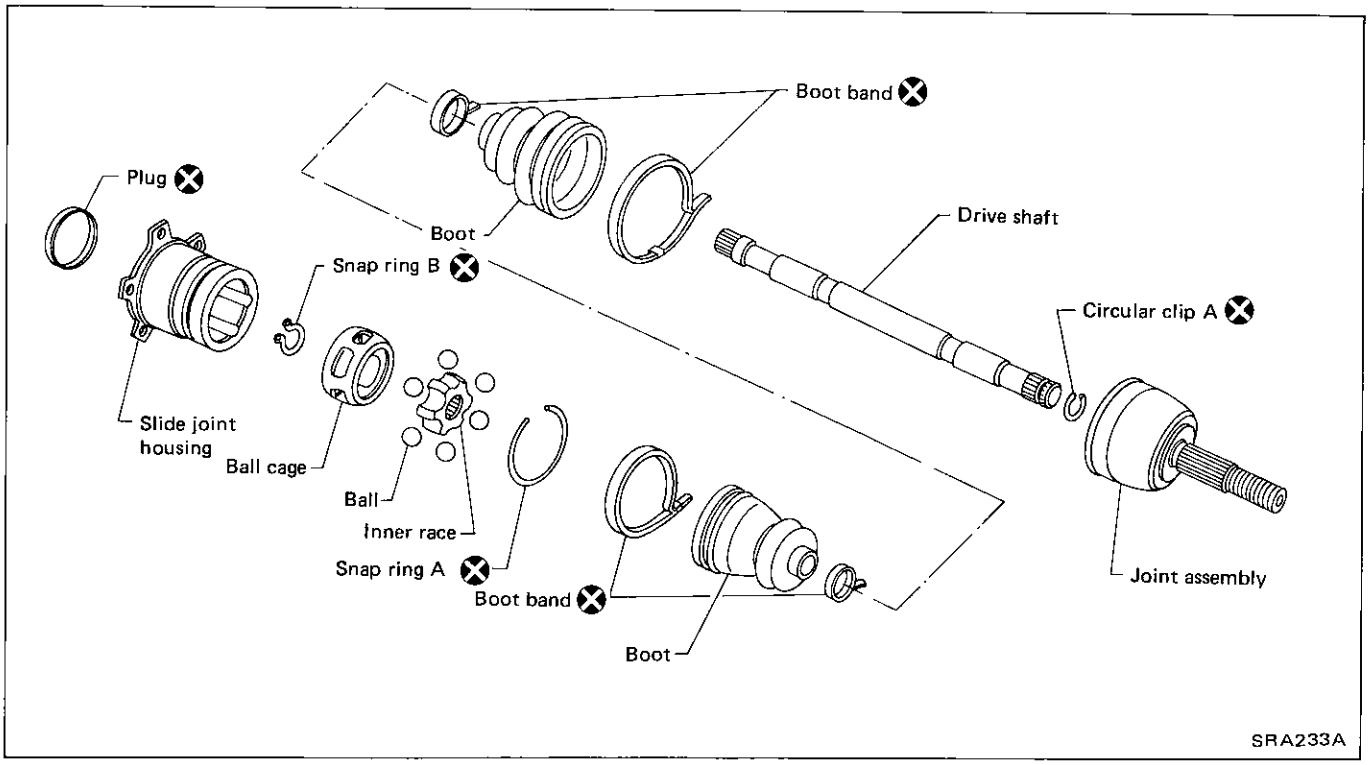
- Remove drive shaft by lightly tapping it with a copper hammer.

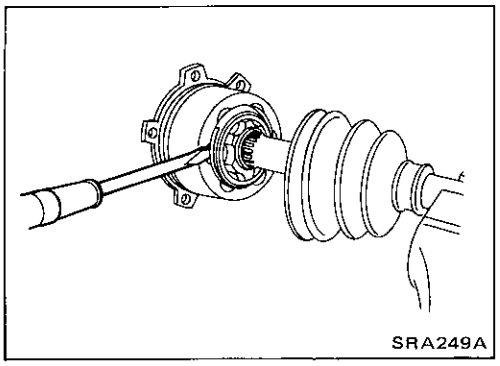
**To avoid damaging threads of drive shaft, install a nut while removing drive shaft.**

## Installation

- Insert drive shaft from wheel hub and temporarily tighten wheel bearing lock nut.
- Tighten side flange mounting bolts to specified torque.
- Tighten wheel bearing lock nut to specified torque.

## Components

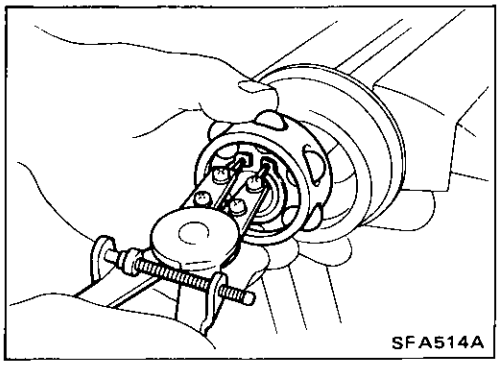



## Disassembly

### FINAL DRIVE SIDE

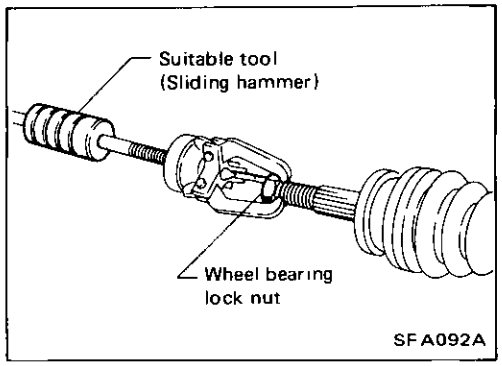
1. Remove boot bands.
2. Put matchmarks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.




4. Put matchmarks on inner race and drive shaft.
5. Pry off snap ring "B", then remove ball cage, inner race and balls as a unit.
6. Draw out boot.

**Cover drive shaft serration with tape so as not to damage the boot.**

## Disassembly (Cont'd)




### WHEEL SIDE

**CAUTION:**

**The joint on the wheel side cannot be disassembled.**

- Before separating joint assembly, put matchmarks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

**Be careful not to damage threads on drive shaft.**

- Remove boot bands.

## Inspection

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

### DRIVE SHAFT

Replace drive shaft if it is twisted or cracked.

### BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

### JOINT ASSEMBLY (Final drive side)

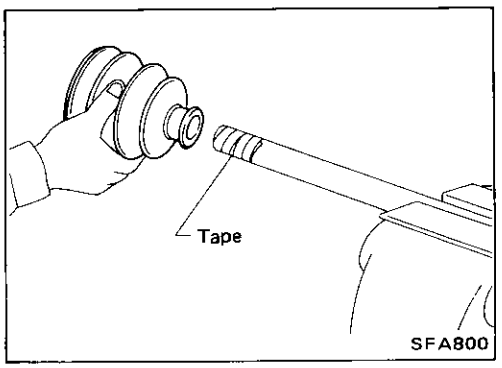
- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

### JOINT ASSEMBLY (Wheel side)

Replace joint assembly if it is deformed or damaged.

## Assembly

- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use NISSAN GENUINE GREASE or equivalent after every overhaul.**

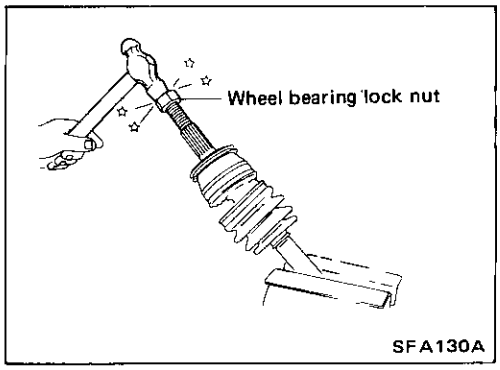



### WHEEL SIDE

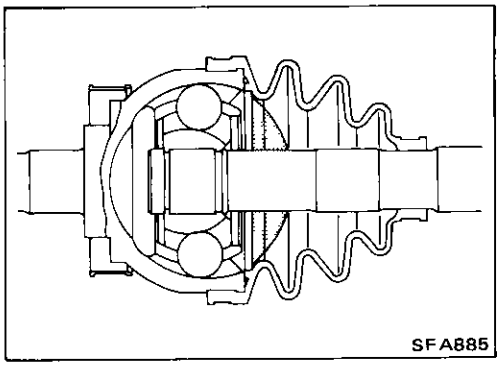
1. Install boot and new small boot band on drive shaft.

**Cover drive shaft serration with tape so as not to damage boot during installation.**

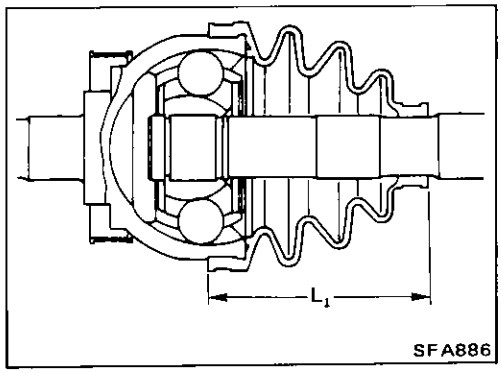
## Assembly (Cont'd)




2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



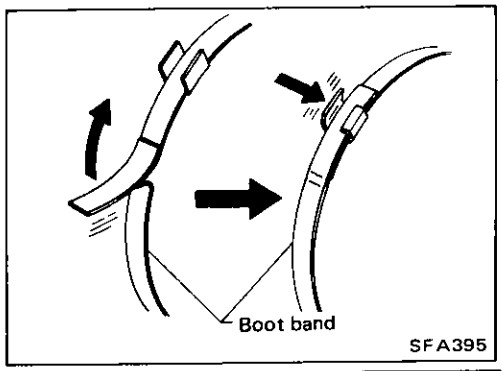

3. Pack drive shaft with specified amount of grease.
   **Specified amount of grease:**
   **Without turbo**
   **165 - 175 g (5.82 - 6.17 oz)**
   **With turbo**
   **170 - 190 g (6.00 - 6.70 oz)**



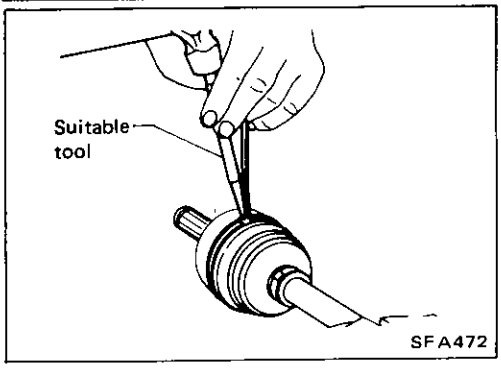

4. Set boot so that it does not swell and deform when its length is "$L_1$".

**Make sure that boot is properly installed on the drive shaft groove.**

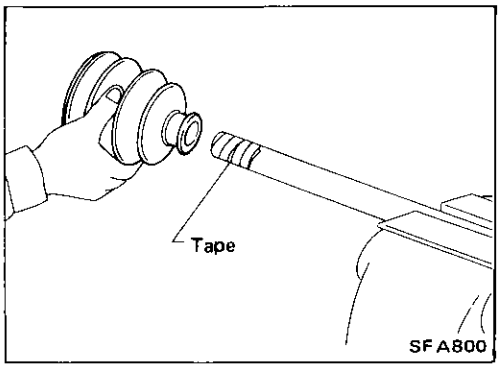
**Length "$L_1$":**
**Without turbo**
**96 - 98 mm (3.78 - 3.86 in)**
**With turbo**
**101 - 103 mm (3.98 - 4.06 in)**




5. Lock new larger and smaller boot bands securely with a suitable tool.



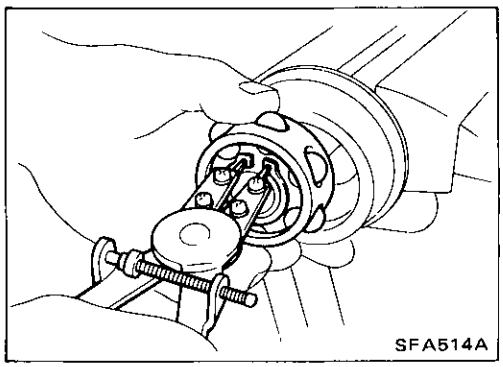
## Assembly (Cont'd)



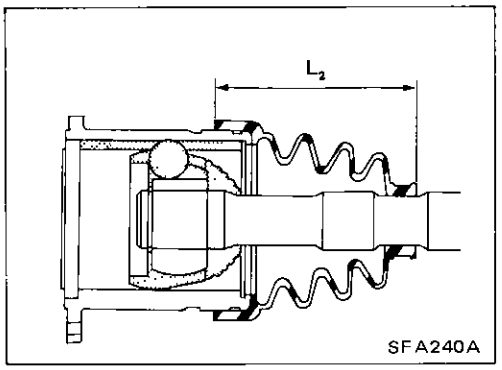

### FINAL DRIVE SIDE

1. Install boot and new small boot band on drive shaft.

**Cover drive shaft serration with tape so as not to damage boot during installation.**




2. Securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "B".



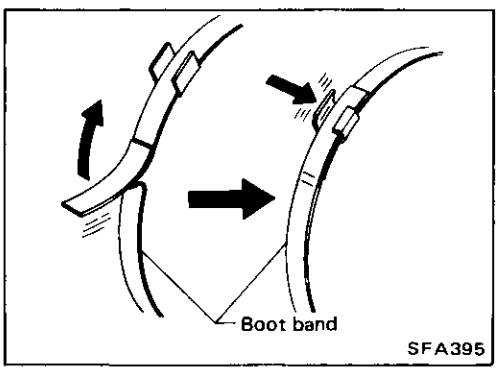

4. Pack drive shaft with specified amount of grease.

**Specified amount of grease:**
**Without turbo**
**165 - 175 g (5.82 - 6.17 oz)**
**With turbo**
**180 - 200 g (6.35 - 7.05 oz)**

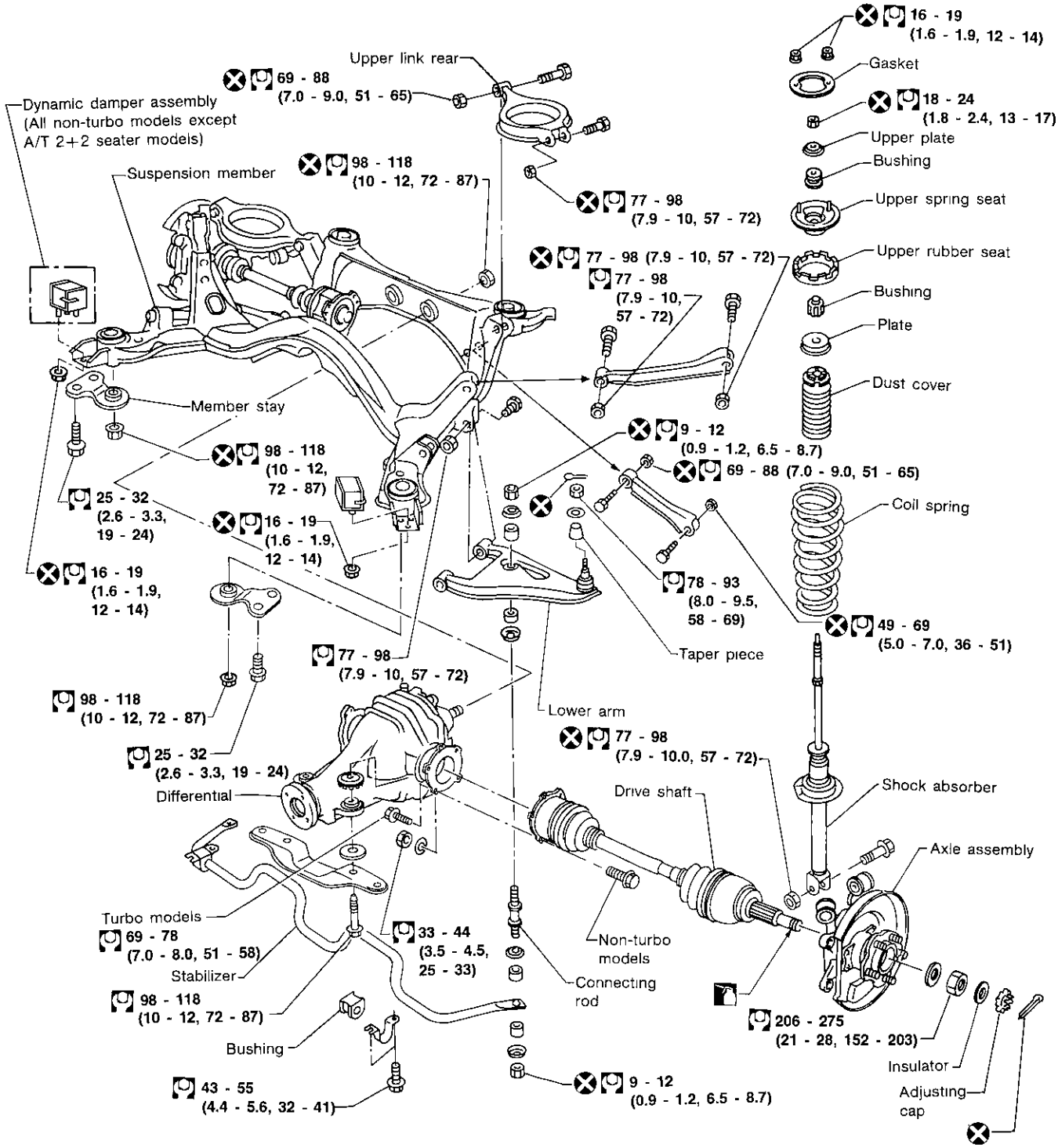
5. Install slide joint housing, then install new snap ring "A".
6. Set boot so that it does not swell and deform when its length is "$L_2$".

**Make sure that boot is properly installed on the drive shaft groove.**

**Length "$L_2$":**
**Without turbo**
**93 - 95 mm (3.66 - 3.74 in)**
**With turbo**
**102.5 - 104.5 mm (4.04 - 4.11 in)**




7. Lock new larger and smaller boot bands securely with a suitable tool.



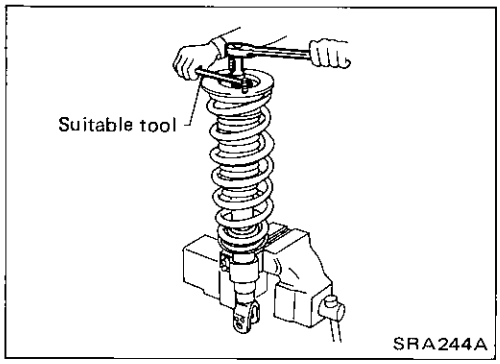

**CAUTION:**
**Do not jack up lower arm.**
**When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
*** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**

: N•m (kg-m, ft-lb)

SRA456A

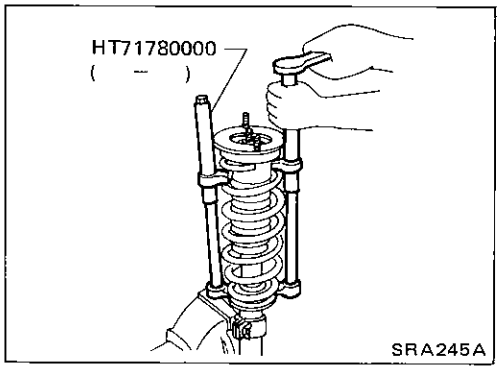
## Removal

- Remove shock absorber upper and lower fixing nuts.
- **Do not remove piston rod lock nut on vehicle.**

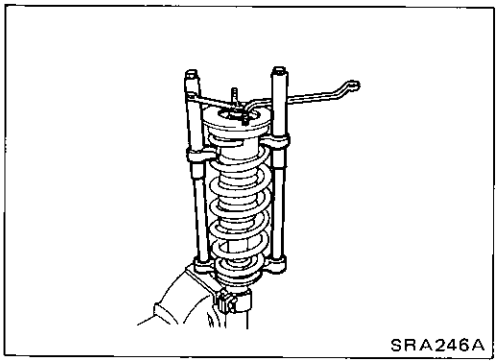



## Disassembly

1. Set shock absorber on vise with attachment, then loosen piston rod lock nut.
- **Do not remove piston rod lock nut.**




2. Compress spring with Tool so that the strut upper spring seat can be turned by hand.




3. Remove piston rod lock nut.

## Inspection

### SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

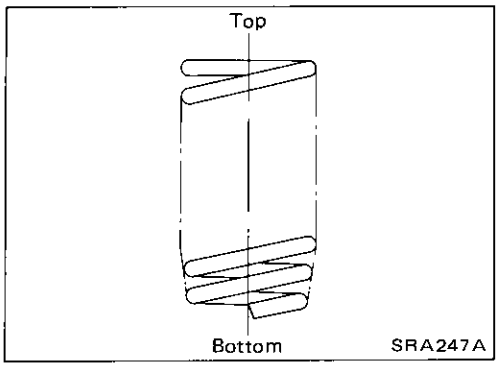
### UPPER RUBBER SEAT AND BUSHING

- Check rubber parts for deterioration or cracks. Replace if necessary.

## Inspection (Cont'd)

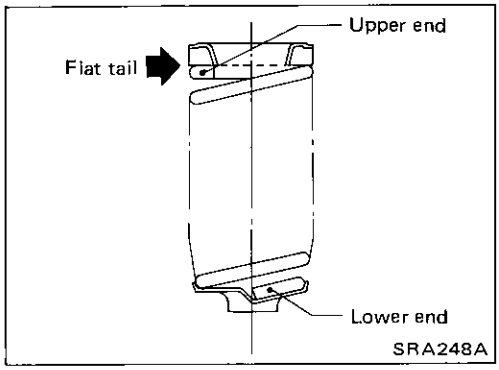
### COIL SPRING

- Check for cracks, deformation or other damage. Replace if necessary.




## Assembly

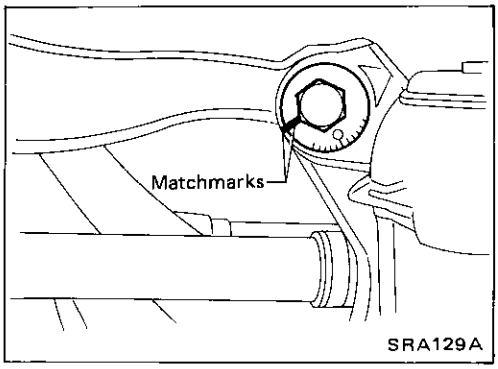
- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)

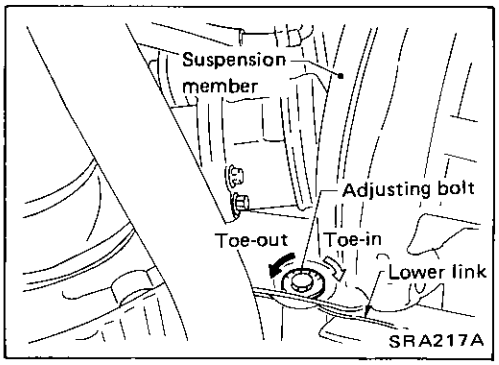



- When installing coil spring on strut, it must be positioned as shown in figure at left.

## Removal and Installation

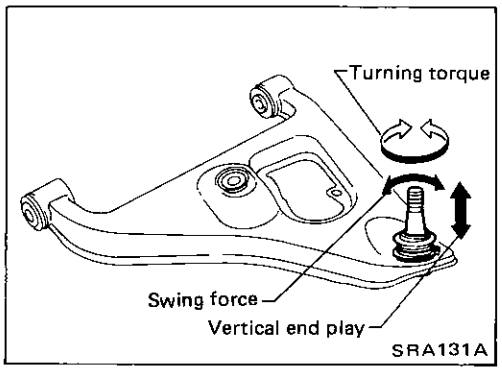
- Refer to "Removal and Installation" of REAR AXLE AND REAR SUSPENSION ASSEMBLY.




**Before removing, put matchmarks on adjusting bolt.**

- When installing, final tightening must be done at curb weight with tires on ground.
- After installation, check wheel alignment.
  Refer to "Rear Wheel Alignment" of ON-VEHICLE SERVICE.




## Inspection

### REAR SUSPENSION MEMBER

- Replace suspension member assembly if cracked or deformed or if any part (insulator, for example) is damaged.

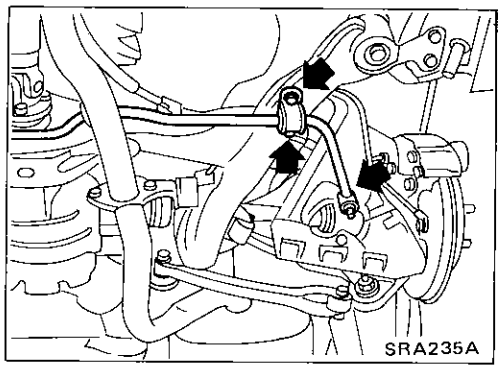
### UPPER AND LOWER LINKS

- Replace upper or lower link as required if cracked or deformed or if bushing is damaged.

### SUSPENSION LOWER BALL JOINT

- Measure swing force, turning torque and vertical end play in axial direction. (Use same measurement procedures as that of FA section.)
- If ball stud is worn, play in axial direction is excessive, or joint is hard to swing, replace lower arm.

| | | |
|---|---|---|
| Ball joint specifications | Swing force | 7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb) |
| | Turning torque | 0.5 - 3.4 N·m (5 - 35 kg-cm, 4.3 - 30.4 in-lb) |
| | Vertical end play | 0 mm (0 in) |

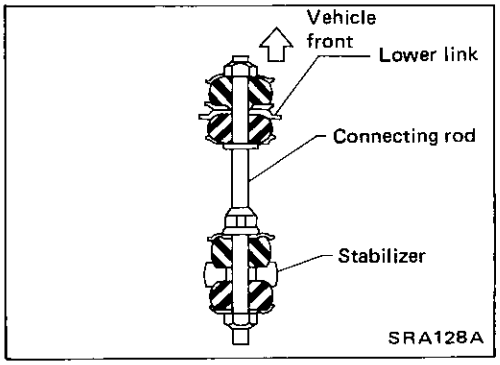



## Removal

- Remove connecting rod and clamp.

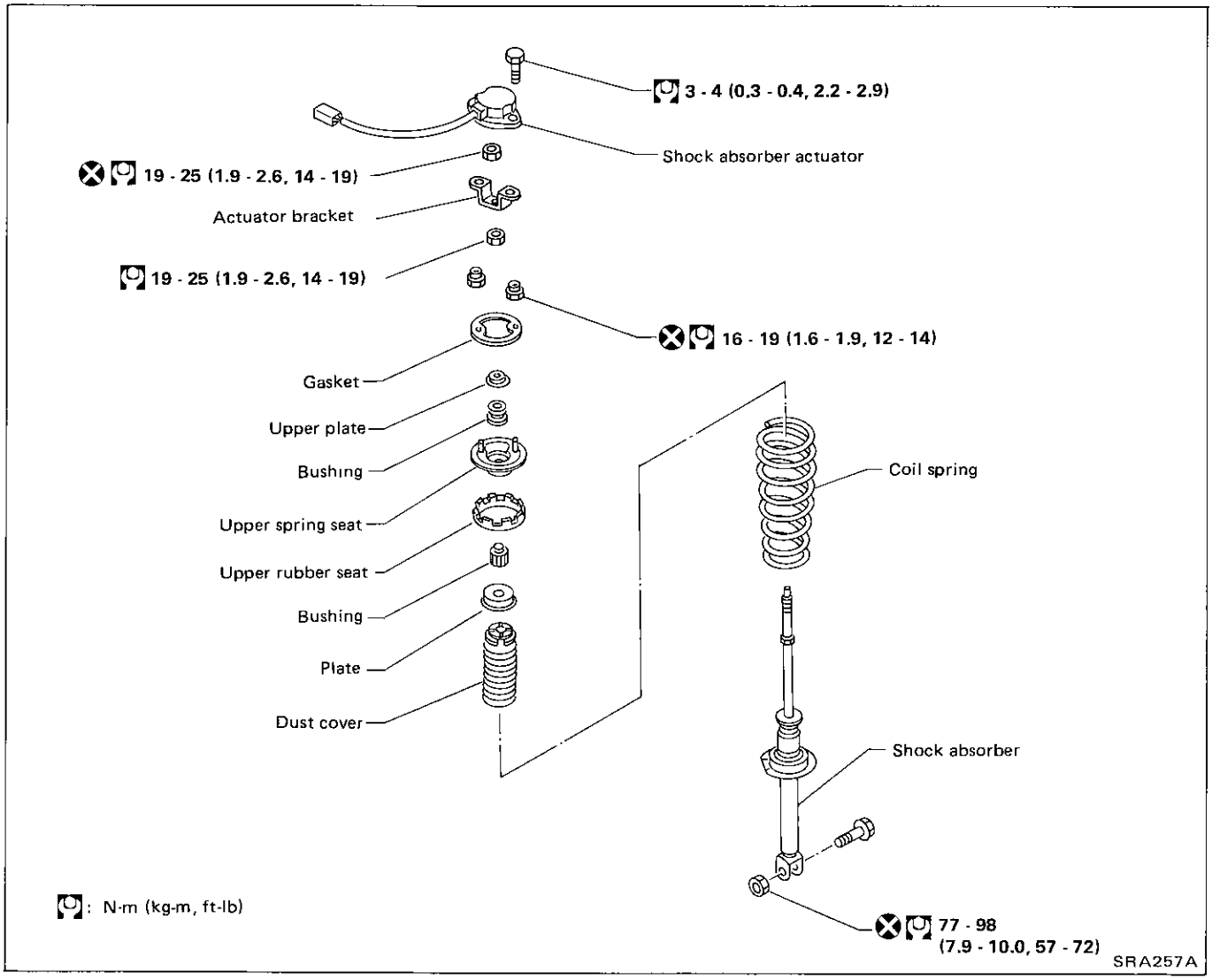
## Inspection

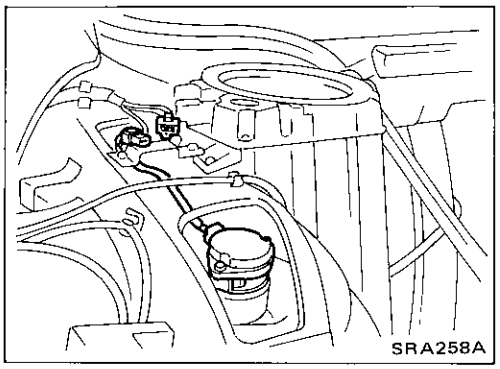
- Check stabilizer bar for deformation or cracks. Replace if necessary.
- Check rubber bushings for deterioration or cracks. Replace if necessary.




## Installation

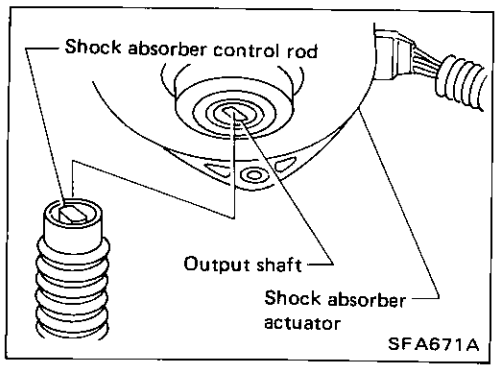
- When installing connecting rod, make sure direction is correct (as shown at left).




## Removal and Installation

- Remove room trim. Refer to section BF.
- Disconnect sub-harness connector.
- Remove shock absorber actuator fixing bolts.



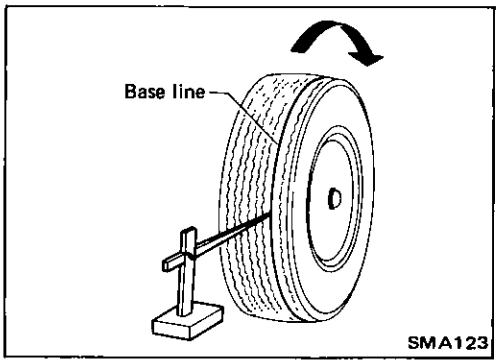

- **Before installing actuator, ensure angle of shock absorber control rod is aligned with that of actuator output shaft. Otherwise, actuator may be damaged.**
- Refer to REAR SUSPENSION for other procedures.

## Inspection

- Replace shock absorber assembly if it is damaged.
  Refer to REAR SUSPENSION — Coil Spring and Shock Absorber.

## Trouble Diagnosis

Refer to ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses in section FA.

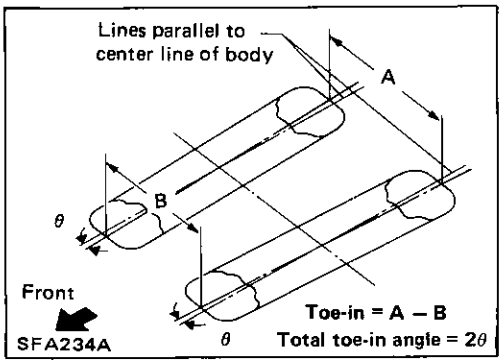



## Rear Wheel Alignment

### TOE-IN

1. Draw a base line across the tread.

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

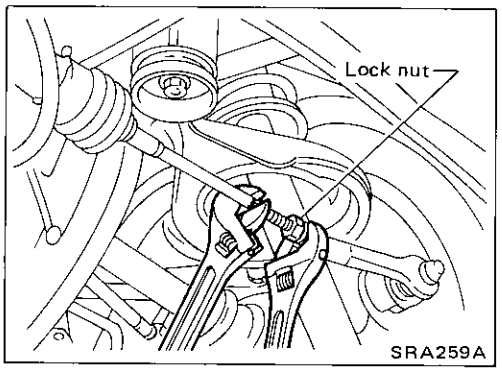



2. Measure toe-in.

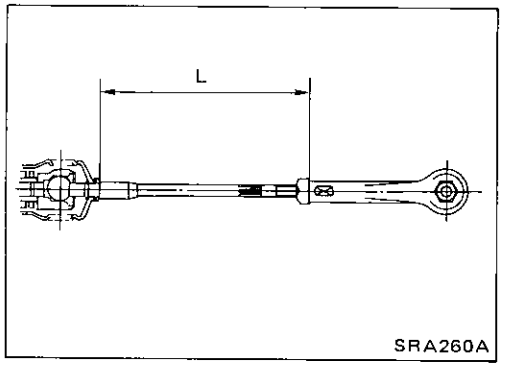
**Measure distance "A" and "B" at the same height as hub center.**

**Toe-in:**

**Refer to S.D.S.**




3. Adjust toe-in by varying length of power cylinder lower links.
(1) Loosen lock nuts.
(2) Adjust toe-in by turning lower links forward or backward.




**Make sure both lower links are the same length.**

**Standard length "L":**

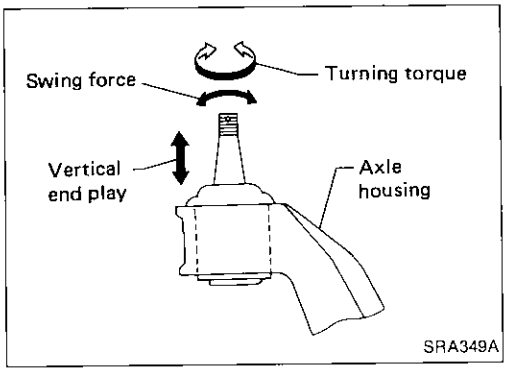
**185.5 mm (7.30 in)**

(3) Tighten lock nuts to the specified torque.

**: 37 - 46 N·m**

**(3.8 - 4.7 kg-m, 27 - 34 ft-lb)**

- Refer to ON-VEHICLE SERVICE for other procedures.

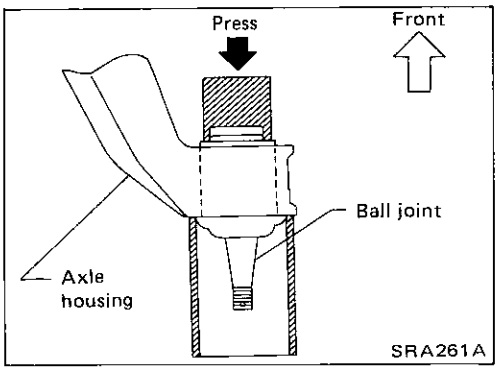



## Rear Axle Housing Ball Joint

### INSPECTION

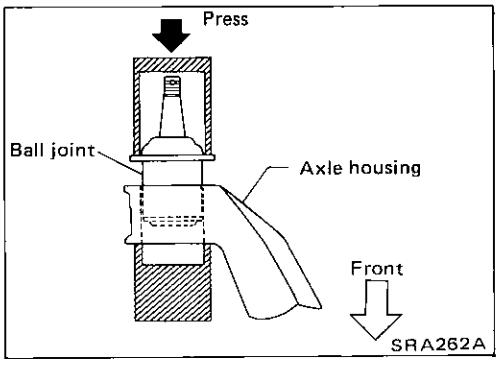
- Measure swing force, turning torque and vertical end play in axial direction.
- If ball joint is worn, play in axial direction is excessive, or joint is hard to swing, replace ball joint.

| | | |
|---|---|---|
| Ball joint specifications | Swing force | 6.9 - 68.6 N (0.7 - 7.0 kg, 1.5 - 15.4 lb) |
| | Turning torque | 0.3 - 2.9 N·m (3 - 30 kg-cm, 2.6 - 26.0 in-lb) |
| | Vertical end play | 0 mm (0 in) |




### REMOVAL

- Remove ball joint snap ring.
- Press out ball joint from axle housing.




### ASSEMBLY

- Press new ball joint assembly into axle housing.
- Install snap ring into groove of ball joint.
- Refer to REAR AXLE — Wheel Hub and Axle Housing for other procedures.
- Refer to ST section for power cylinder and SUPER HICAS — Trouble Diagnoses.

## General Specifications

### COIL SPRING

| Item \ Model | VG30DE | | VG30DETT |
|---|---|---|---|
| | 2 seater | 2+2 seater | 2 seater |
| Wire diameter mm (in) | 11.4 (0.449) | | 11.2 (0.441) |
| Coil diameter mm (in) | 99.9 (3.933) | | 99.2 (3.906) |
| Free length mm (in) | 371.5 (14.63) | 380 (14.96) | 370 (14.57) |
| Spring constant N/mm (kg/mm, lb/in) | 21.6 (2.2, 123) | | 23.5 (2.4, 134) |
| Identification color | White x 1, Yellow x 1 | Purple x 1, Pink x 1 | Purple x 1, Light green x 1 |

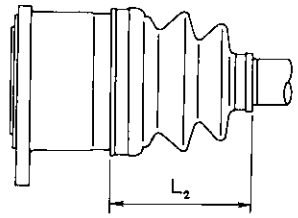
### SHOCK ABSORBER

| Item \ Engine | VG30DE | VG30DETT | |
|---|---|---|---|
| Piston rod diameter mm (in) | 12.5 (0.492) | 14.0 (0.551) | |
| Damping force N (kg, lb) [at 0.3 m (1.0 ft)/sec.] | | Firm | Soft |
| Expansion | 873 - 1,187 (89 - 121, 196 - 267) | 1,304 - 1,730 (133 - 177, 293 - 390) | 834 - 1,128 (85 - 115, 187 - 254) |
| Compression | 520 - 755 (53 - 77, 117 - 170) | 971 - 1,383 (99 - 141, 218 - 311) | 481 - 696 (49 - 71, 108 - 157) |

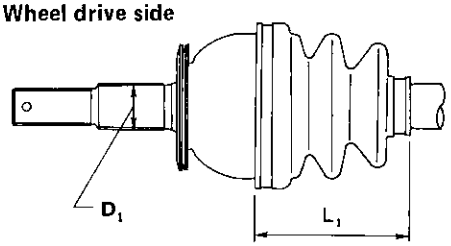
### DRIVE SHAFT

| Item \ Engine | VG30DE | VG30DETT |
|---|---|---|
| Joint type | | |
| Final drive side | DS90 | DS100 |
| Wheel side | ZF100 | BF100 |
| Diameter mm (in) | | |
| Wheel side $D_1$ | 30 (1.18) | 33 (1.30) |
| Grease | Nissan genuine grease or equivalent | |
| Specified amount of grease g (oz) | | |
| Final drive side | 165 - 175 (5.82 - 6.17) | 180 - 200 (6.35 - 7.05) |
| Wheel side | 165 - 175 (5.82 - 6.17) | 170 - 190 (6.00 - 6.70) |
| Boot length mm (in) | | |
| Final drive side ($L_2$) | 93 - 95 (3.66 - 3.74) | 102.5 - 104.5 (4.04 - 4.11) |
| Wheel side ($L_1$) | 96 - 98 (3.78 - 3.86) | 101 - 103 (3.98 - 4.06) |

**Final drive side**




**Wheel drive side**




SRA236A

## General Specifications (Cont'd)

### REAR STABILIZER BAR

| Item \ Engine | VG30DE | | VG30DETT |
|---|---|---|---|
| | 2 seater | 2+2 seater | |
| Stabilizer diameter mm (in) | | | |
| Outer | 15.9 (0.626) | 21.0 (0.827) | 25.4 (1.000) |
| Inner | 12.3 (0.484) | 15.8 (0.622) | 19.4 (0.764) |

## Inspection and Adjustment

### WHEEL ALIGNMENT (Unladen*)

| | | |
|---|---|---|
| Camber | degree | −1°36′ to −0°36′ |
| Toe-in | | |
| A − B | mm (in) | 0.4 - 4.4 (0.016 - 0.173) |
| Total angle 2θ | degree | 1′ - 24′ |

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

### WHEEL BEARING

| | |
|---|---|
| Wheel bearing axial end play mm (in) | 0.05 (0.0020) or less |
| Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb) | 206 - 275 (21 - 28, 152 - 203) |

### WHEEL RUNOUT (Radial and lateral)

| Wheel type | | Radial runout | Lateral runout |
|---|---|---|---|
| Aluminum wheel | mm (in) | 0.3 (0.012) or less | |

### LOWER BALL JOINT

| | |
|---|---|
| Swing force (Measuring point: cotter pin hole of ball stud) N (kg, lb) | 7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3) |
| Turning torque N·m (kg-cm, in-lb) | 0.5 - 3.4 (5 - 35, 4.3 - 30.4) |
| Vertical end play mm (in) | 0 (0) |

### LOWER LINK BALL JOINT (SUPER HICAS)

| | |
|---|---|
| Swing force (at cotter pin hole) N (kg, lb) | 6.9 - 68.6 (0.7 - 7.0, 1.5 - 15.4) |
| Turning torque N·m (kg-cm, in-lb) | 0.3 - 2.9 (3 - 30, 2.6 - 26.0) |
| Vertical end play mm (in) | 0 (0) |

# BRAKE SYSTEM

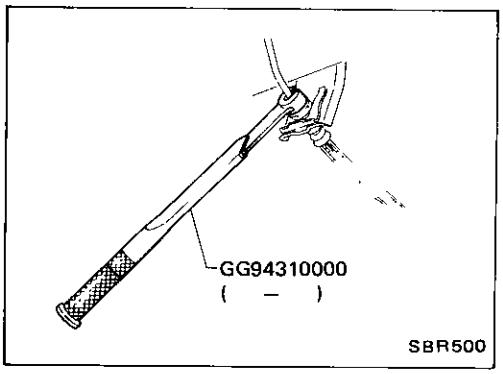
# SECTION BR

## CONTENTS


PRECAUTIONS AND PREPARATION ..... BR- 2
CHECK AND ADJUSTMENT ..... BR- 3
BRAKE HYDRAULIC LINE ..... BR- 4
BRAKE PEDAL AND BRACKET ..... BR- 6
BRAKE BOOSTER ..... BR- 8
VACUUM PIPING ..... BR- 9
MASTER CYLINDER ..... BR-10
FRONT DISC BRAKE (OPZ25VA) ..... BR-11
REAR DISC BRAKE (OPZ11VB) ..... BR-15
PARKING BRAKE CONTROL ..... BR-19
PARKING DRUM BRAKE (DS17HD) ..... BR-21
ANTI-LOCK BRAKING SYSTEM ..... BR-23
TROUBLE DIAGNOSES ..... BR-27
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... BR-48

## Precautions

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.



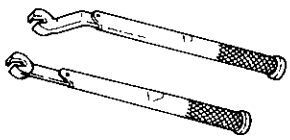
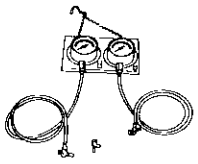
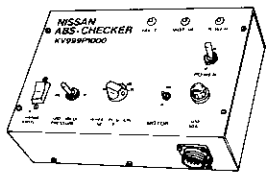
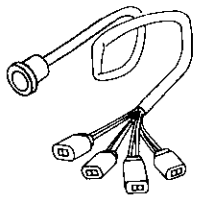

- Use Tool when removing and installing brake tube.

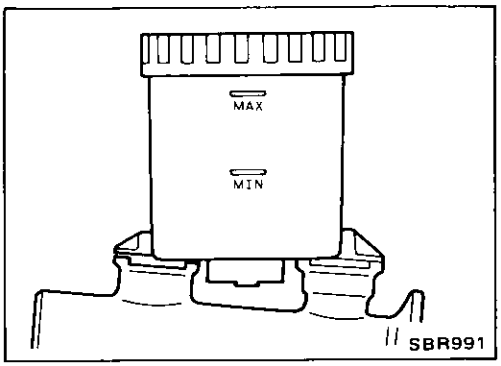
**WARNING:**

- Clean brake pads and shoes with a waste cloth, then collect dust with a dust collector.

## 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 |
| KV999P1020 ( – ) ABS checker adapter harness |  | Checking brake fluid pressure of ABS actuator |

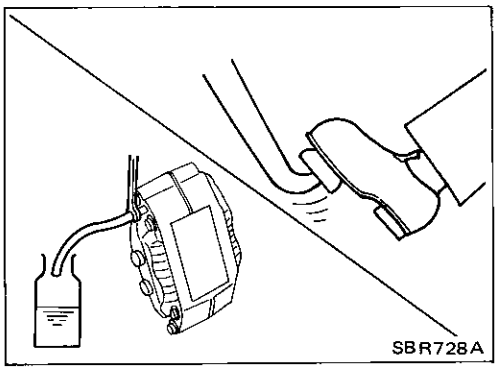



## Checking Brake Fluid Level

- 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.

## Checking Brake System

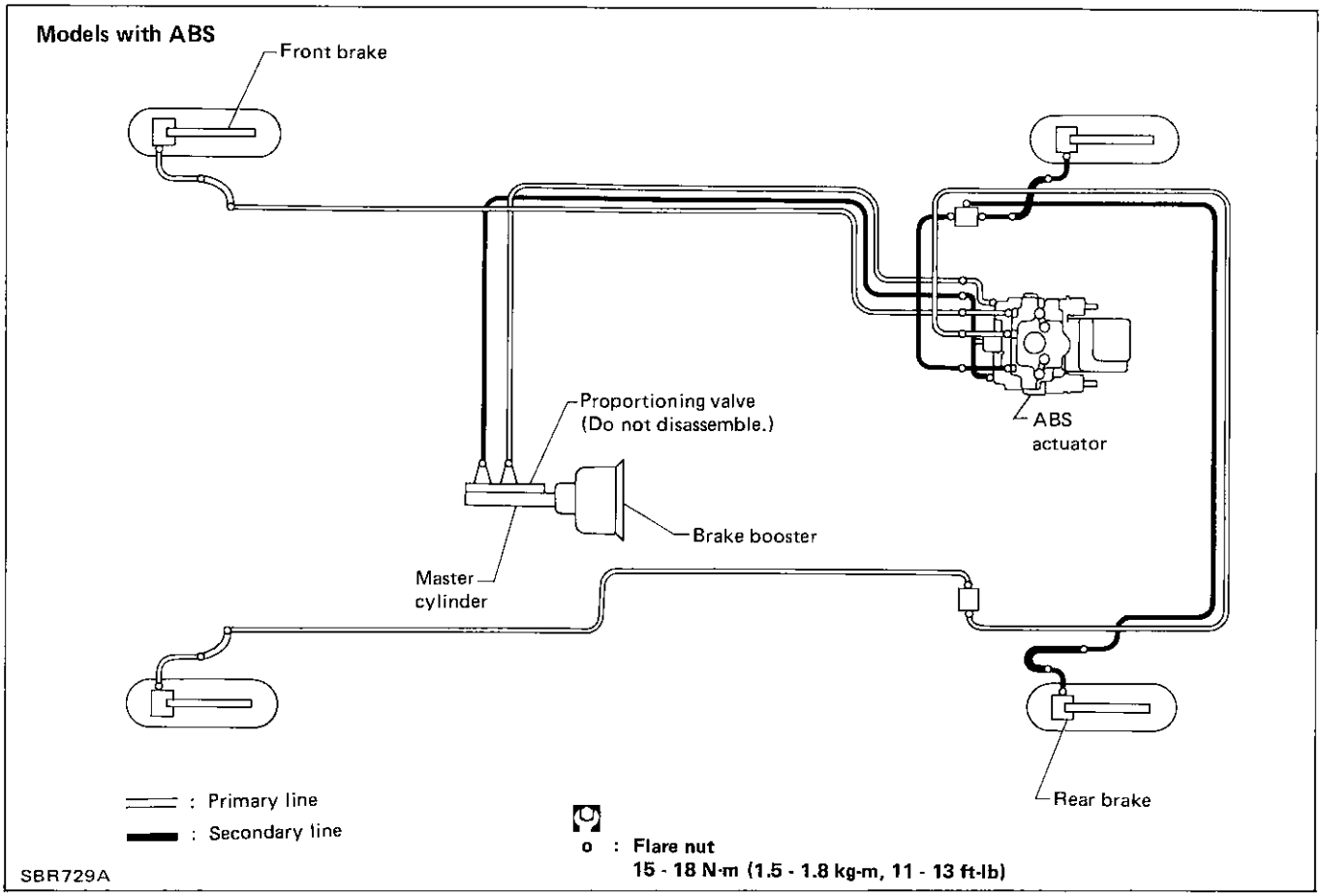
- Check brake lines (lines and flexible hoses) for cracks, deterioration or other damage. Replace any damaged parts.
  If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Check for oil leakage by fully depressing brake pedal.

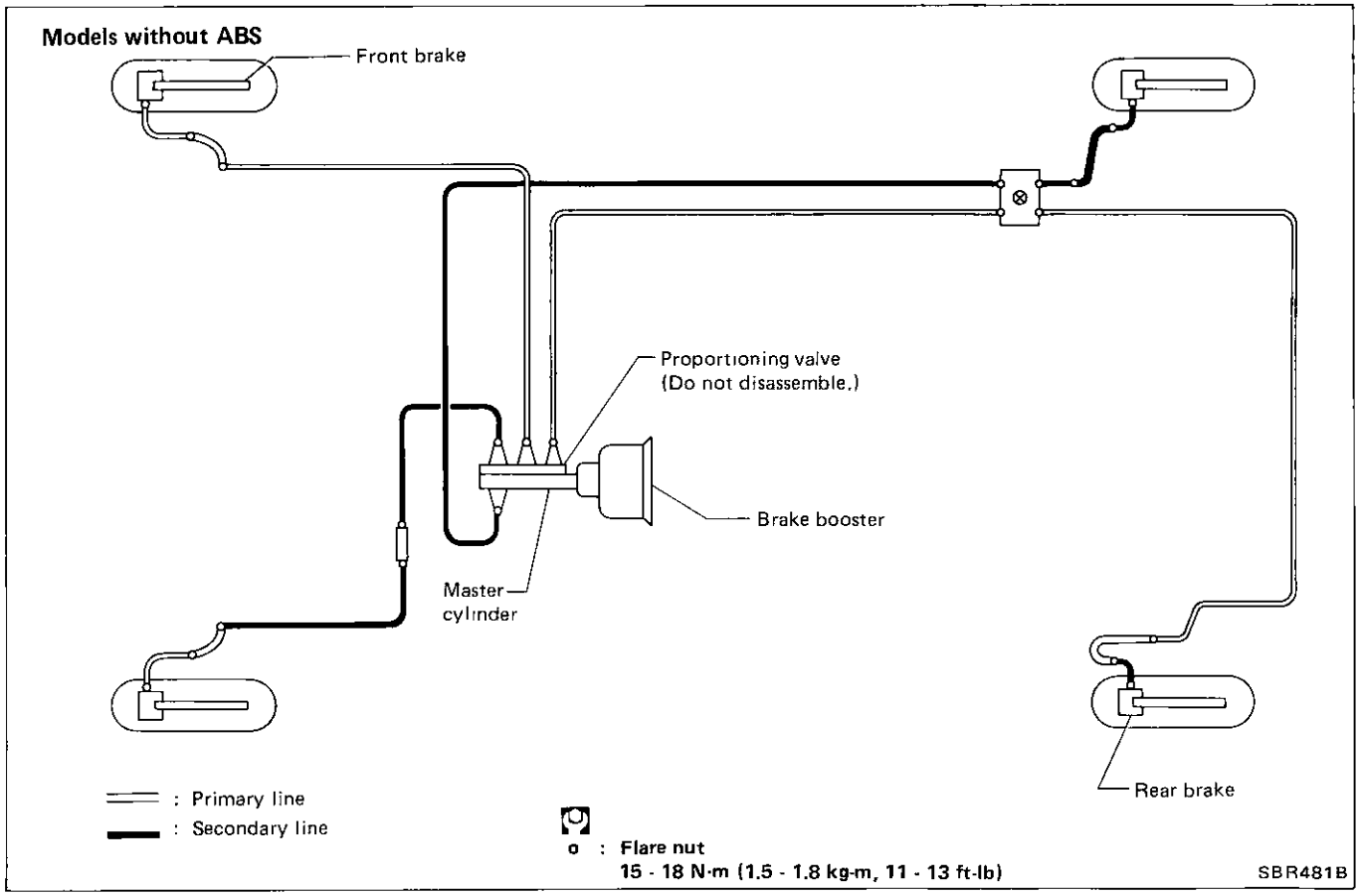


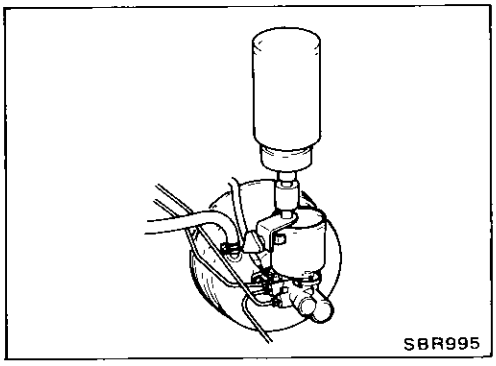

## Changing Brake Fluid

1. Drain brake fluid in each air bleeder valve.
2. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to Bleeding Procedure.

- **Refill with recommended brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**


Models with ABS
Front brake
Proportioning valve
(Do not disassemble.)
ABS
actuator
Brake booster
Master
cylinder
Rear brake
: Primary line
: Secondary line
o : Flare nut
15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
SBR729A

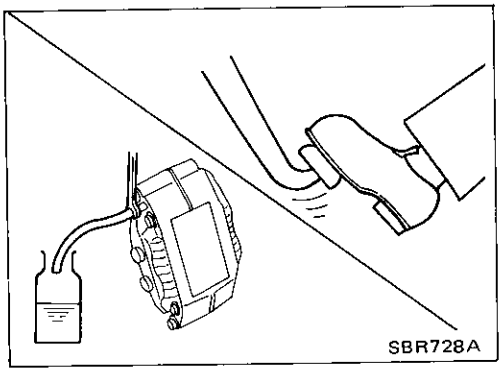

Models without ABS
Front brake
Proportioning valve
(Do not disassemble.)
Brake booster
Master
cylinder
Rear brake
: Primary line
: Secondary line
o : Flare nut
15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
SBR481B


SBR995

## Bleeding Procedure

**CAUTION:**

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with recommended brake fluid. Make sure it is full at all times while bleeding air out of system.**
- **Place a container beneath master cylinder to avoid spillage of brake fluid.**

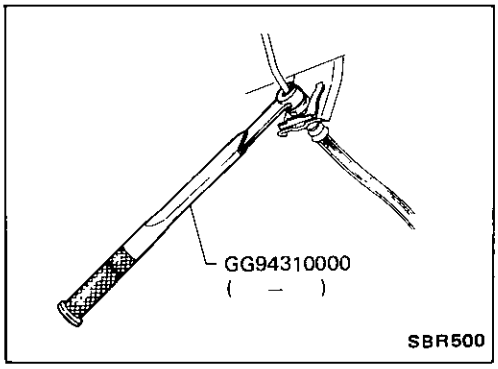

SBR728A

- Bleed air according to the following procedure.

  Left rear caliper
  ↓
  Right rear caliper
  ↓
  Left front caliper
  ↓
  Right front caliper
  ↓
  Front side air bleeder on ABS actuator (Models with ABS)
  ↓
  Rear side air bleeder on ABS actuator (Models with ABS)

- **To bleed air out of lines, wheel cylinders and calipers, use the following procedure.**

1) Connect a transparent vinyl tube to air bleeder valve.
2) Fully depress brake pedal several times.
3) With brake pedal depressed, open air bleeder valve to release air.
4) Close air bleeder valve.
5) Release brake pedal slowly.
6) Repeat steps 2) through 5) until clear brake fluid comes out of air bleeder valve.



SBR500

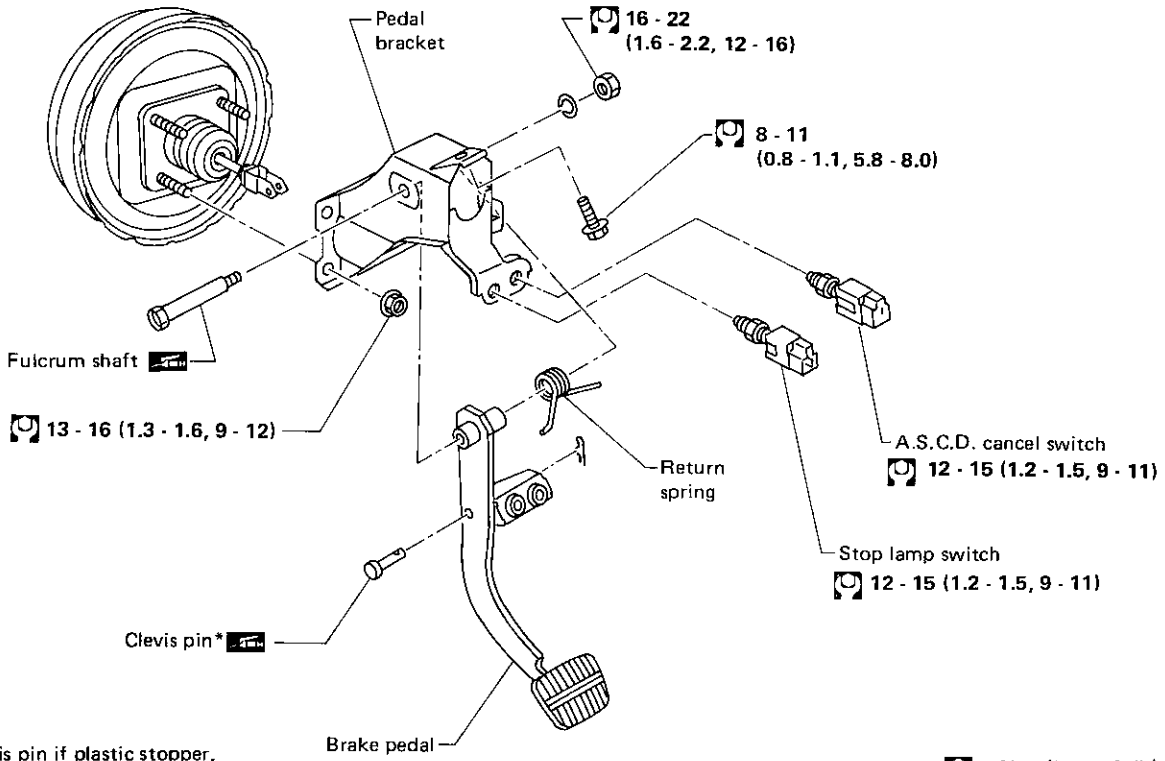
## Removal and Installation

1. To remove brake flexible hose, first remove flare nut securing brake line to hose, then withdraw lock spring.
2. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.
3. All hoses must be free from excessive bending, twisting and pulling.
4. After installing brake lines, check for oil leakage by fully depressing brake pedal.

## Inspection

Check brake lines (lines and flexible hoses) for cracks, deterioration or other damage. Replace any damaged parts.
If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

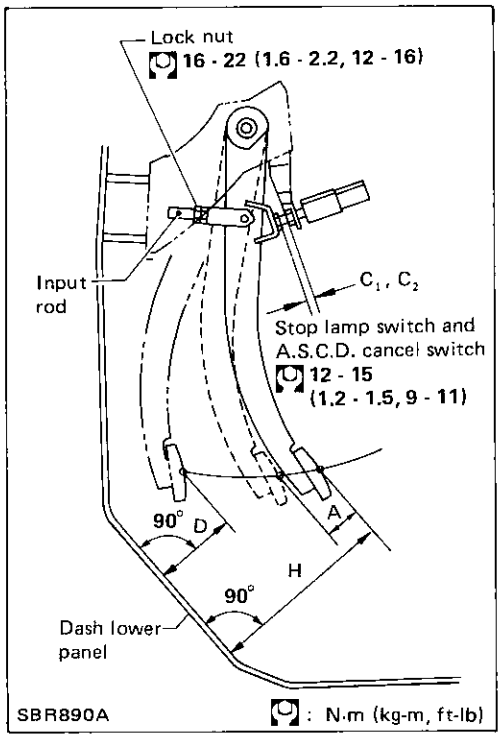
## Removal and Installation

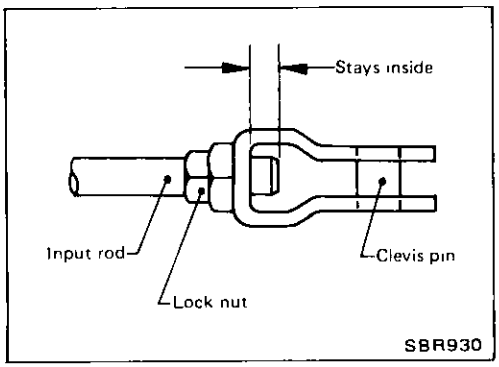



## Inspection

Check brake pedal for following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion




## Adjustment

Check brake pedal free height from dash reinforcement panel. Adjust if necessary.

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

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

**$C_1$:** **Clearance between pedal stopper and threaded end of stop lamp switch**
**0.3 - 1.0 mm (0.012 - 0.039 in)**

**$C_2$:** **Clearance between pedal stopper and threaded end of A.S.C.D. switch**
**0.3 - 1.0 mm (0.012 - 0.039 in)**

**A:** **Pedal free play**
**1 - 3 mm (0.04 - 0.12 in)**

1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

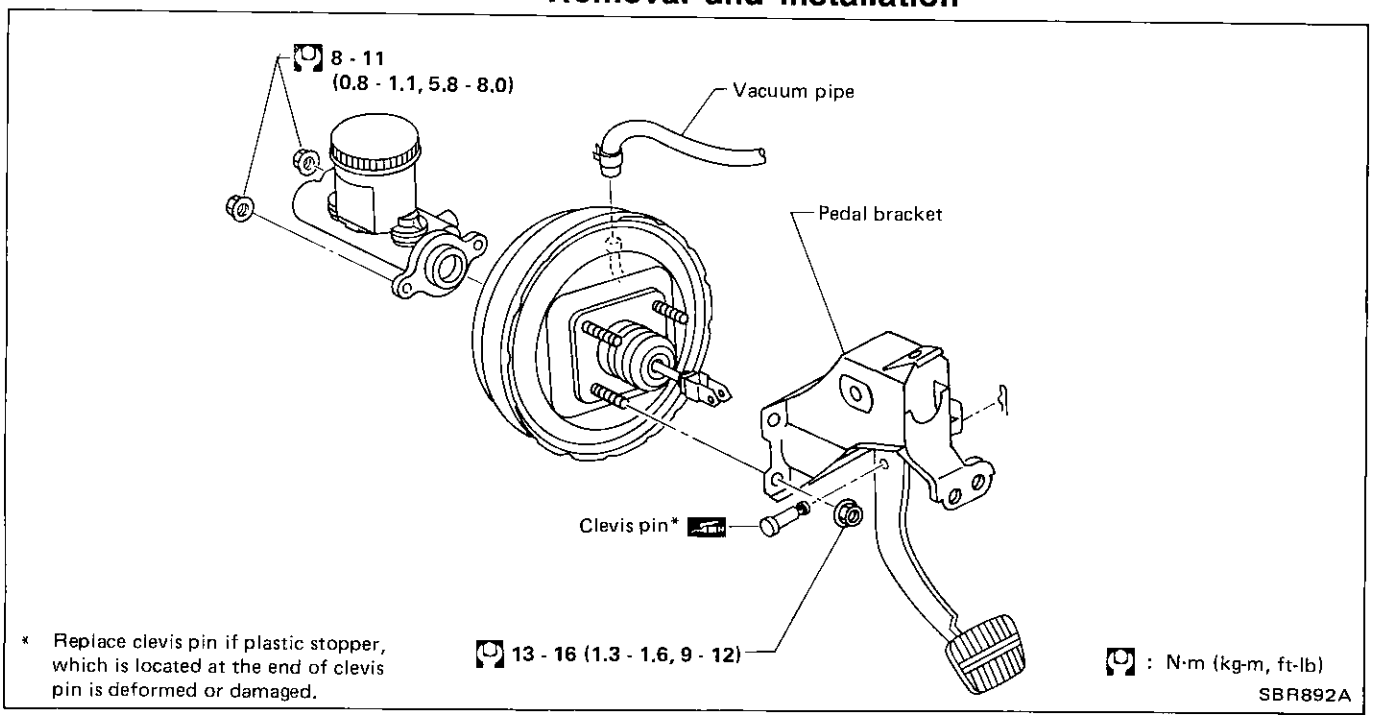
**Make sure that tip of input rod stays inside.**

2. Adjust clearance "$C_1$" and "$C_2$" with stop lamp switch and A.S.C.D. switch respectively. Then tighten lock nuts.
3. Check pedal free play.

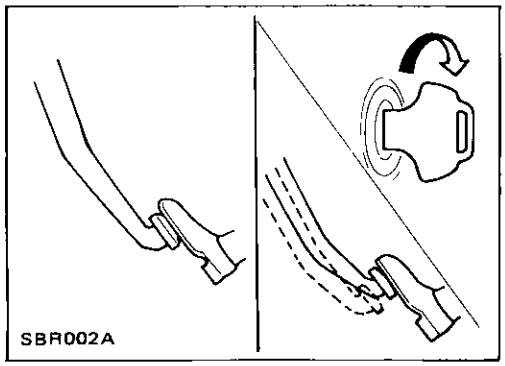
**Make sure that stop lamp is off when pedal is released.**

4. Check brake pedal's depressed height while engine is running.
   If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.

## Removal and Installation



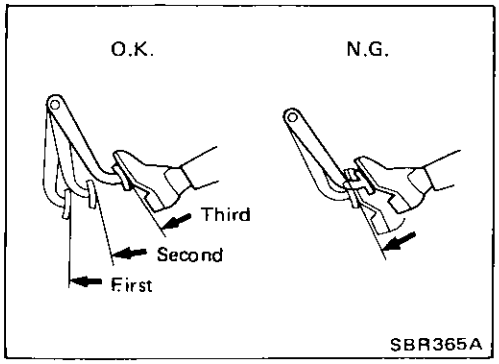

* Replace clevis pin if plastic stopper, which is located at the end of clevis pin is deformed or damaged.




## Inspection

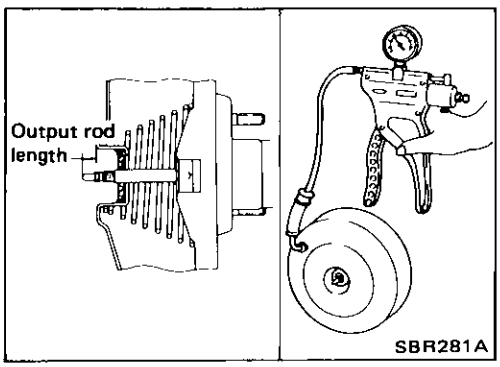
### OPERATING CHECK

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



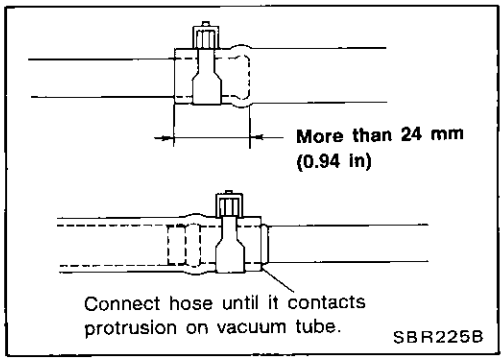

### AIRTIGHT CHECK

- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down **30 seconds**, brake booster is airtight.




### OUTPUT ROD LENGTH CHECK

1. Apply vacuum of –66.7 kPa (–500 mmHg, –19.69 inHg) to brake booster with a handy vacuum pump.
2. Check output rod length.
   **Specified length:**
   **10.275 - 10.525 mm (0.4045 - 0.4144 in)**
3. Adjust rod length if necessary.
4. If rod length is without specification, replace brake booster.

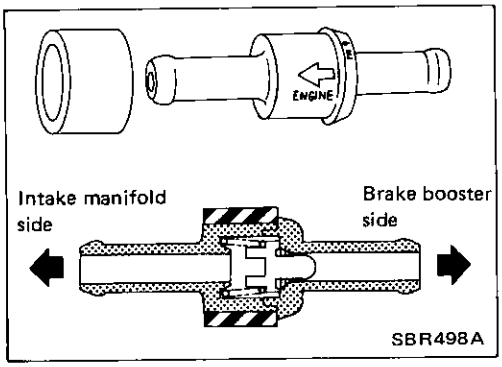



## Removal and Installation

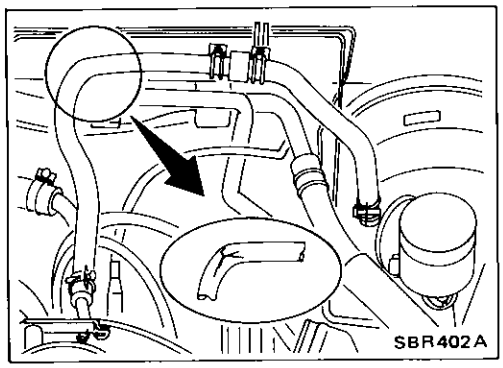
**CAUTION:**

**When installing vacuum hoses, pay attention to the following points.**

- **Do not apply any oil or lubricants to vacuum hose and check valve.**
- **Insert vacuum tube into vacuum hoses as shown.**




- Install check valve, paying attention to its direction.




## Inspection

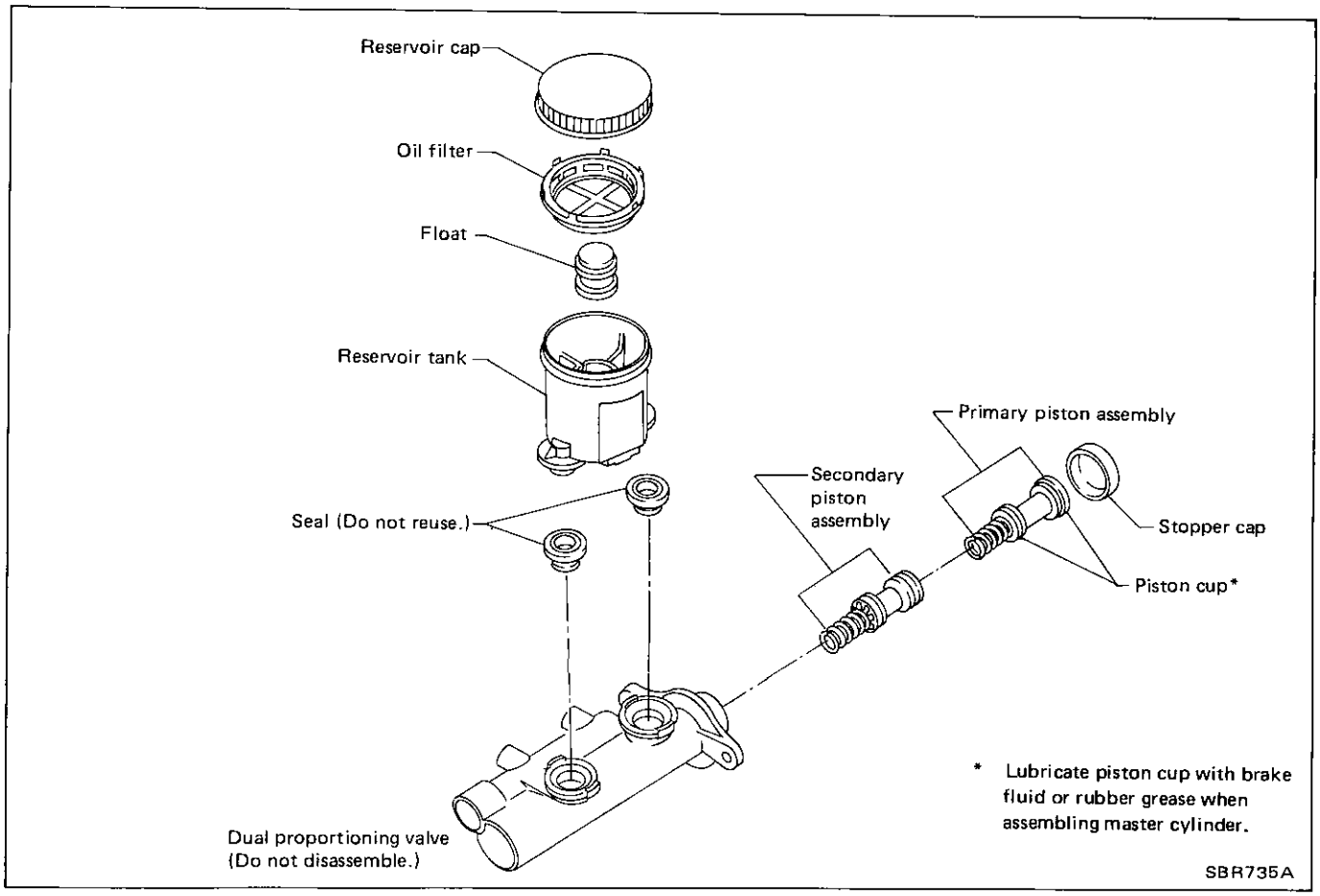
### HOSES AND CONNECTORS

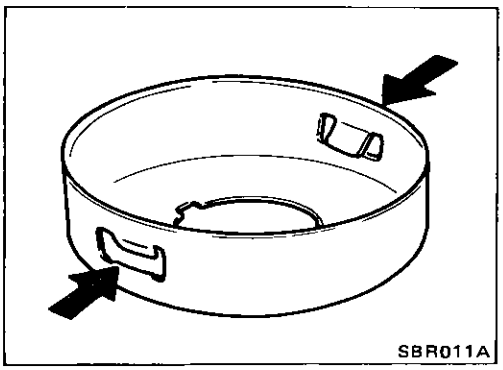
- Check vacuum lines, connections and check valve for airtightness, improper attachment chafing and deterioration.

### CHECK VALVE

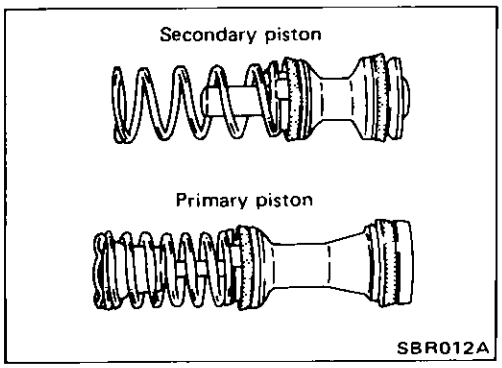
- When pressure is applied to brake booster side of check valve and valve does not open, replace check valve with a new one.

## Removal and Installation

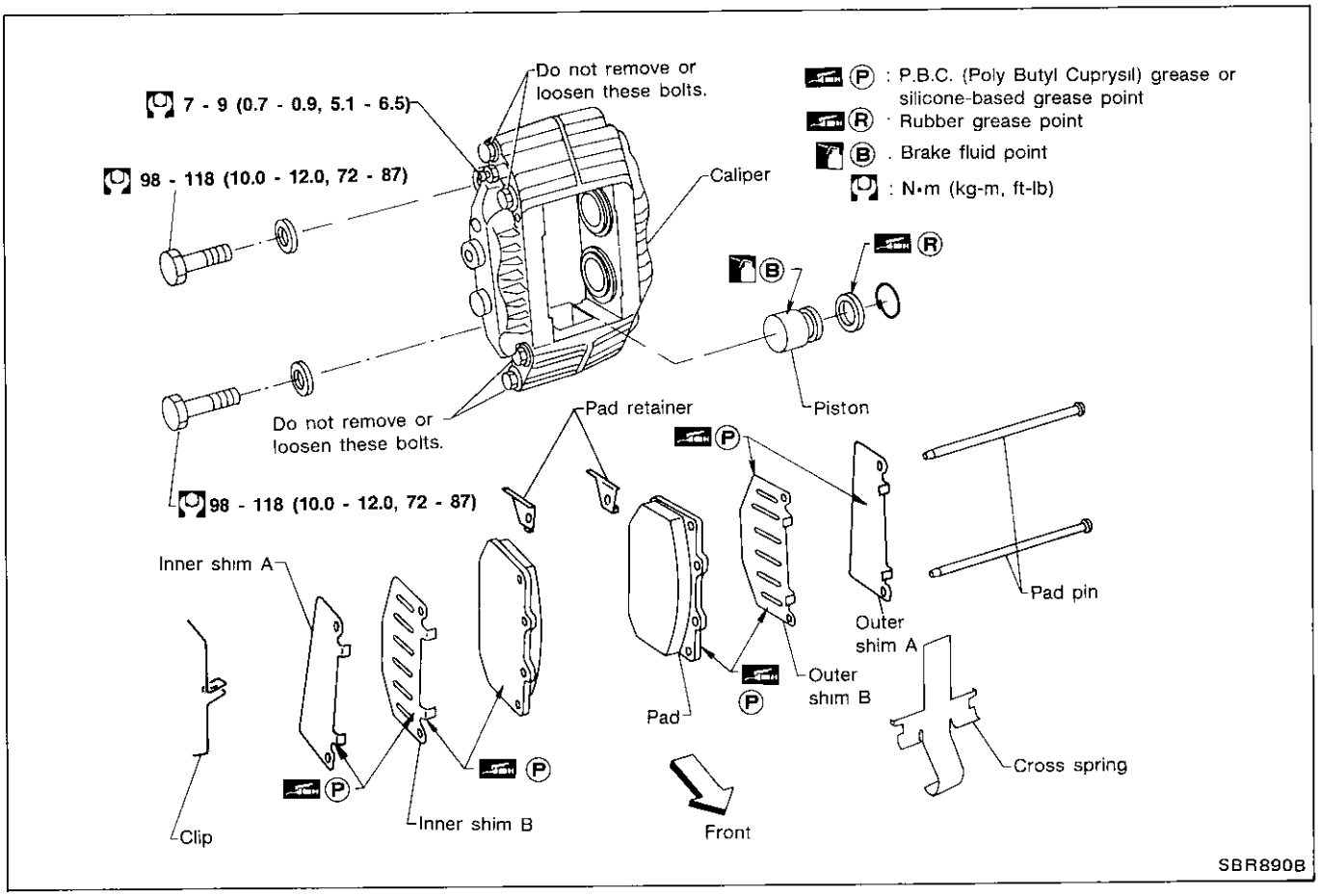


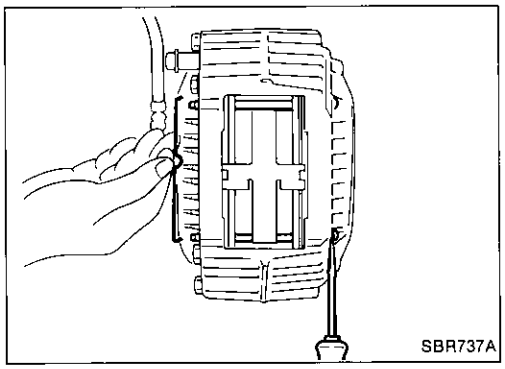




- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.




- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.



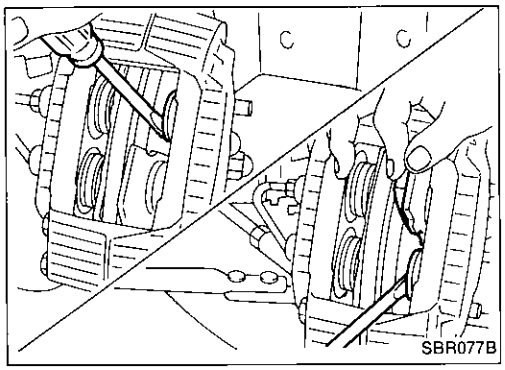




## Pad Replacement

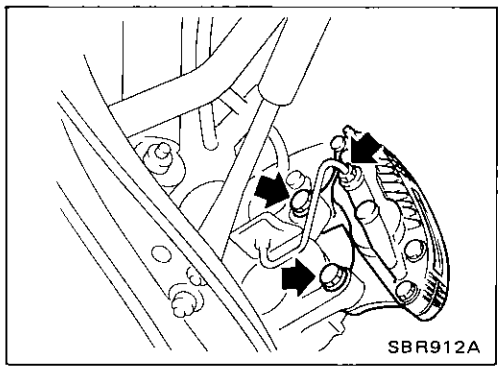
**CAUTION:**

- **When pads are removed, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.**

1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.

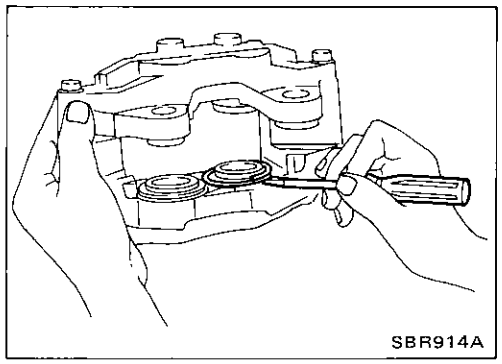



3. Pull out outer pad and insert it temporarily between lower piston and rotor as shown.
4. Push back upper piston with a suitable tool and insert new pad so it contacts upper piston as shown.
5. Pull out old pad.
6. Push back lower piston with a suitable tool.
7. Pull out new pad and reinstall it in the proper position.
8. Repeat step 3 to 7 for inner pad.
9. Install cross spring, pad pin and clip.


SBR912A

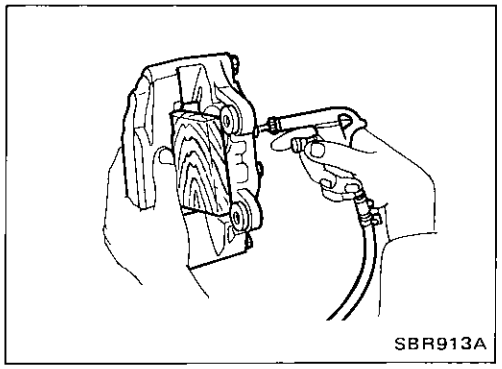
## Removal and Installation

1. Disconnect brake tube.
2. Remove brake pad.
3. Remove brake caliper mounting bolts.

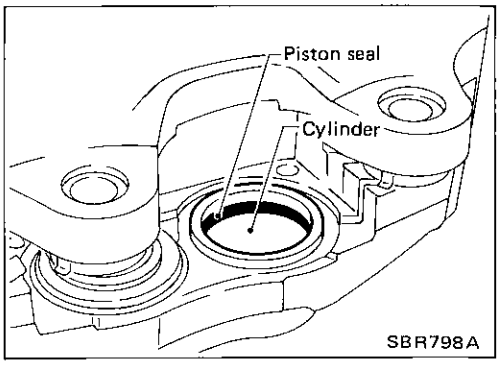

SBR914A

## Disassembly

1. Remove retaining ring.

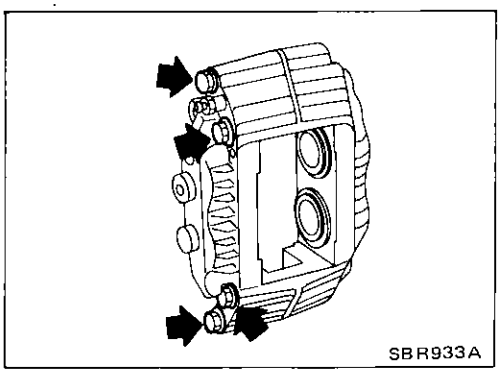

SBR913A

2. Push out piston with dust seal using compressed air.



SBR798A

3. Remove piston seal.


SBR933A

**CAUTION:**
**Be careful not to loosen or remove bolts joining both sides of caliper.**
**If there is any fluid leakage, replace caliper assembly.**

## Inspection

### CALIPER

- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for scoring, rust, wear, damage or foreign materials. Replace if any such condition exists.
- Eliminate minor damage from rust or foreign materials by polishing surface with fine emery paper.

**CAUTION:**

**Use brake fluid to clean.**

### PISTON

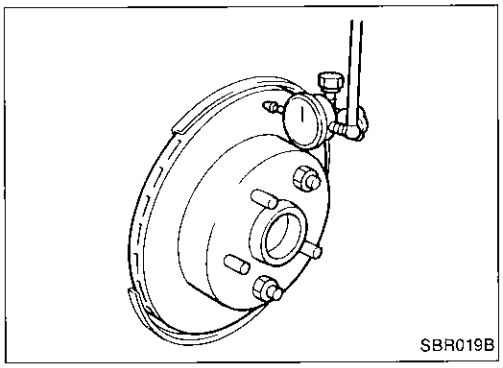
Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

**CAUTION:**

**Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.**

### PAD PIN AND CLIPS

Check for wear, cracks deformation, deterioration, rust or other damage. Replace if any such condition exists.


SBR019B

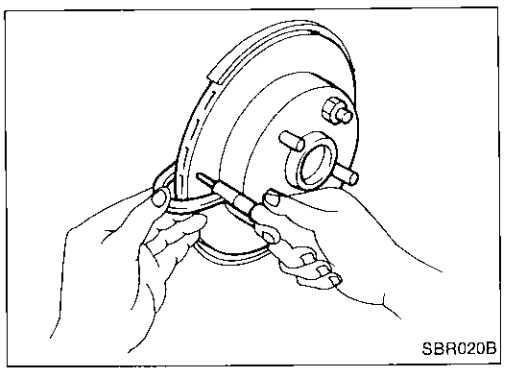
### RUNOUT

1. Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

**Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to section FA.**

**Maximum runout:**
**0.05 mm (0.0020 in)**

3. If the runout is out of specification, find minimum runout position as follows:
   a. Remove nuts and rotor from wheel hub.
   b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
   c. Measure runout.
   d. Repeat steps a. to c. so that minimum runout position can be found.
4. If the runout is still out of specification, turn rotor with on-car brake lathe ("MAD, DL-8700", "AMMCO 700 and 705" or equivalent).

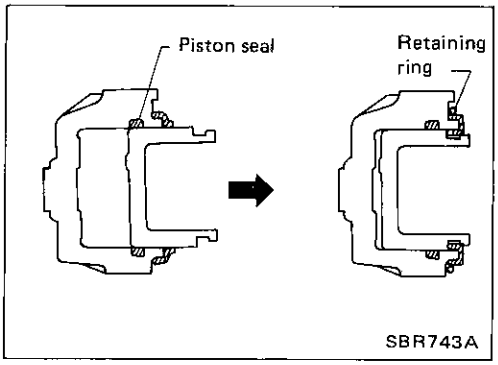

SBR020B

### THICKNESS

**Thickness variation (At least 8 positions):**
**Maximum 0.01 mm (0.0004 in)**

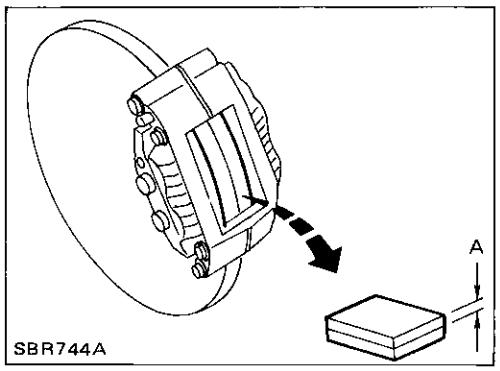
If thickness variation exceeds the specification, turn rotor with on-car brake lathe.

**Rotor repair limit:**
**28.0 mm (1.102 in)**




## Assembly

1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.

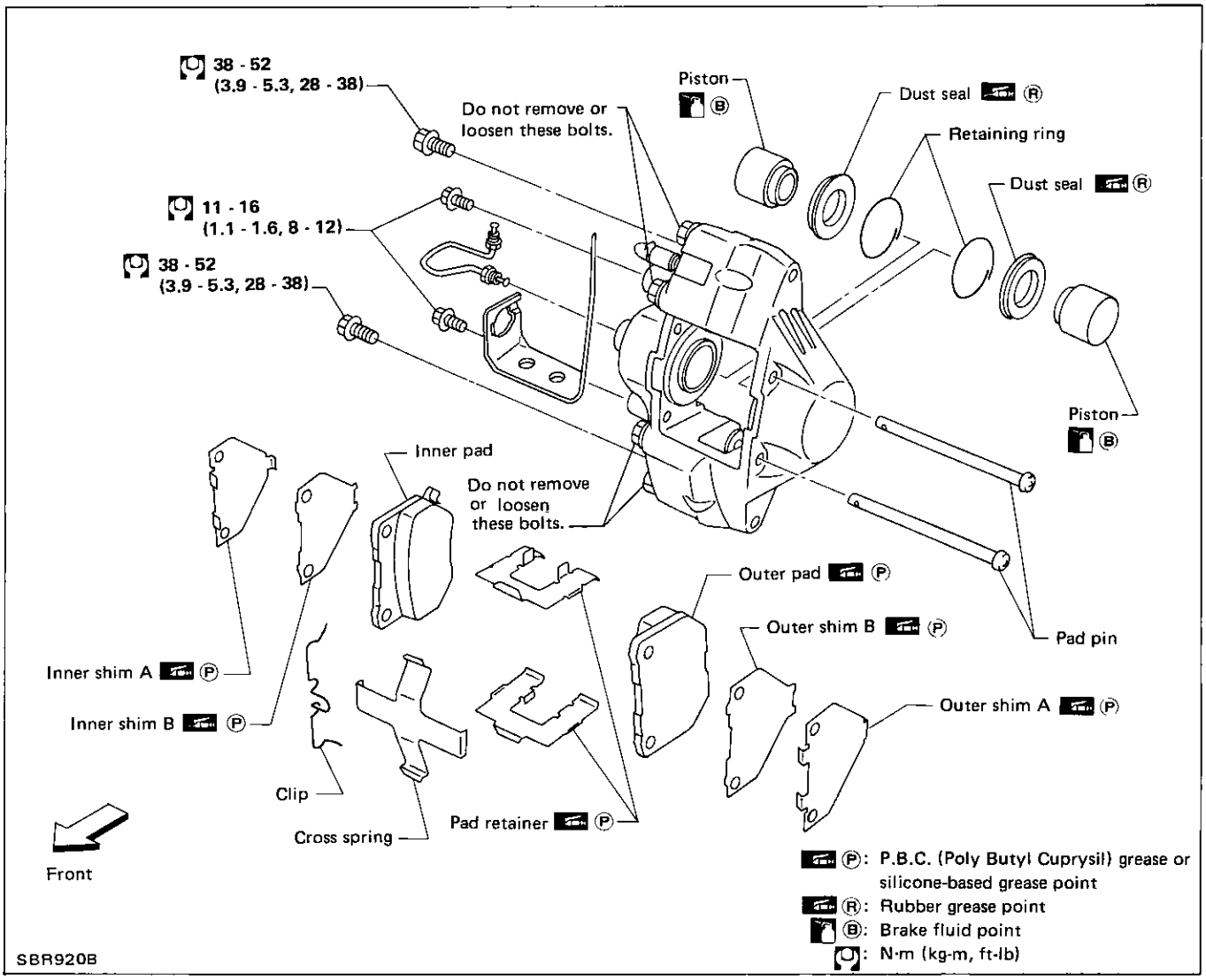


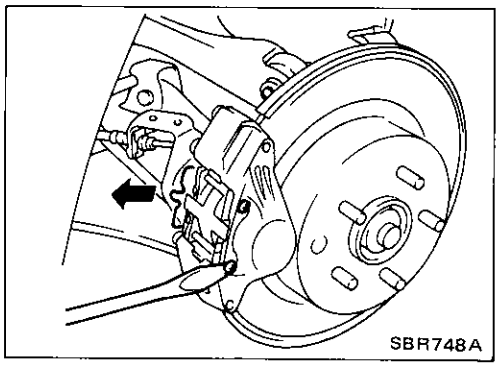

## Inspection (On-vehicle)

### DISC PAD

- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.

**Pad standard thickness (A):**
**10.0 mm (0.394 in)**
**Pad wear limit (A):**
**2.0 mm (0.079 in)**

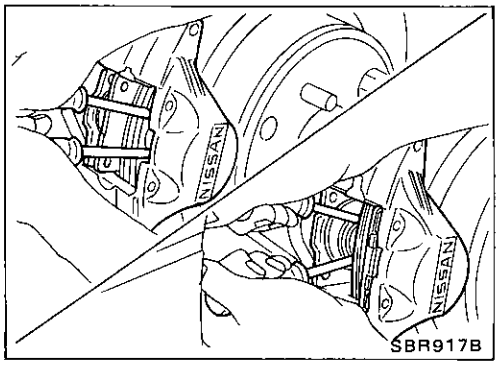


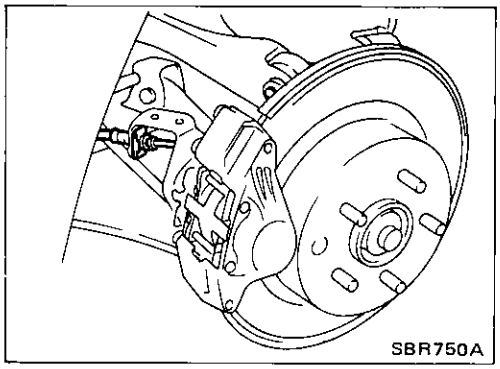

## Pad Replacement

1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.

**Standard pad thickness:**
**10 mm (0.39 in)**
**Pad wear limit:**
**2.0 mm (0.079 in)**

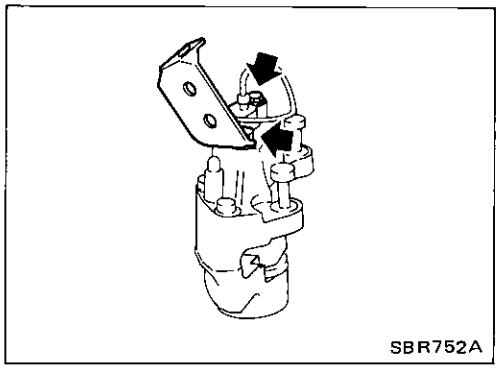



3. Pull out outer pad.
4. Push back outer piston with a suitable tool and install new pad.
5. Pull out inner pad.
6. Push back inner piston with a suitable tool and install new pad.
7. Install cross spring, pad pin and clip.

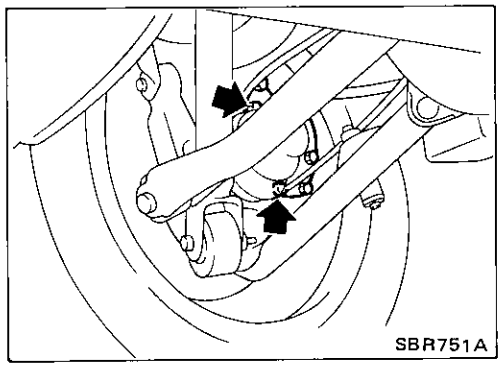

SBR750A

## Removal and Installation

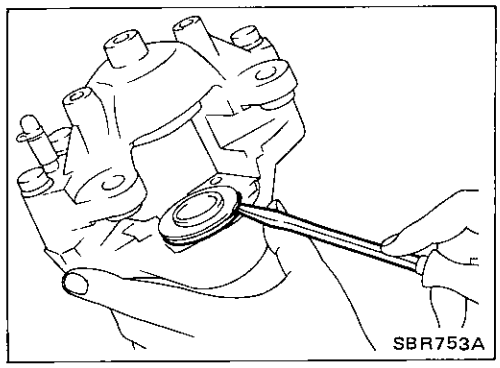
1. Disconnect brake tube.
2. Remove brake pad.


SBR752A

3. Remove brake cable and bracket.

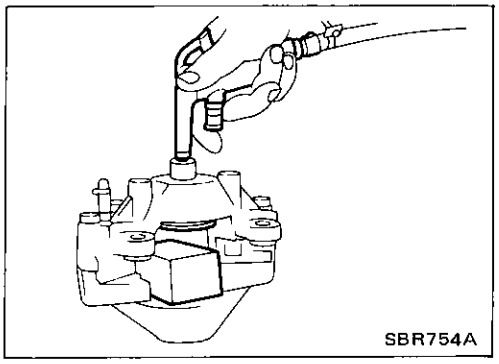

SBR751A

4. Remove axle housing fixing bolts.


SBR753A

## Disassembly

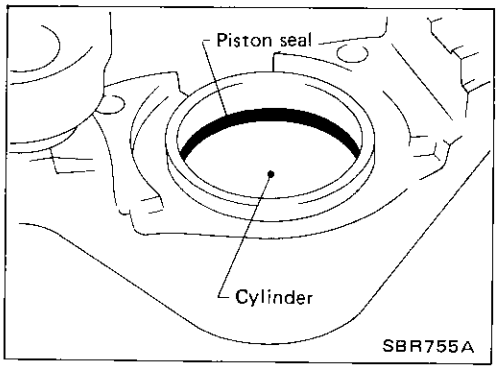
1. Remove retaining ring.

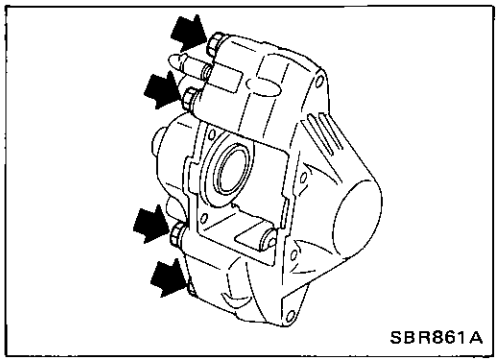

SBR754A

2. Push out piston with dust seal using compressed air.

## Disassembly (Cont'd)

3. Remove piston seal.




**CAUTION:**
**Be careful not to loosen or remove bolts joining both sides of caliper.**
**If there is any fluid leakage, replace caliper assembly.**

## Inspection

### CALIPER

- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for score, rust, wear or other damage.
- Minor damage from rust of foreign materials may be eliminated by polishing surface with a fine emery paper. Replace if necessary.

**CAUTION:**
**Use brake fluid to clean.**

### PISTON

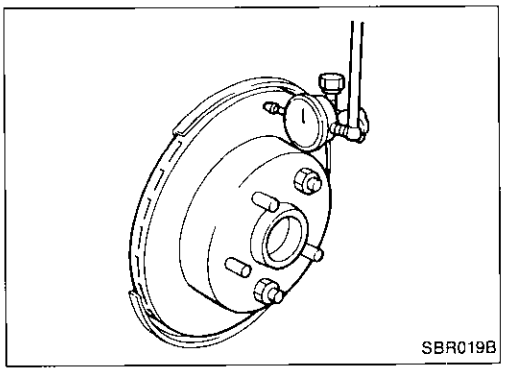
Check piston for score, rust, wear or other damage. Replace if necessary.

**CAUTION:**
**Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.**

### PAD PIN AND CLIP

Check for wear, cracks deformation, deterioration, rust or other damage. Replace if necessary.

### RUNOUT

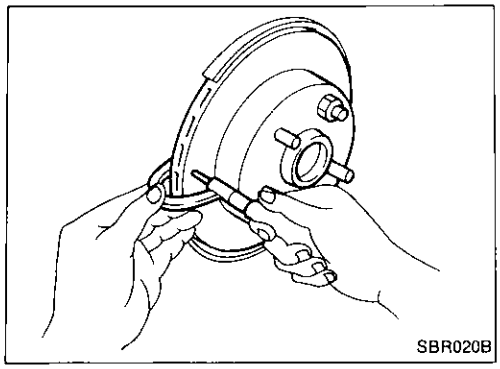



- Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
- Make sure that axial end play is within the specifications before measuring. Refer to section RA.

**Rotor repair limit:**
**Maximum runout**
**(Total indicator reading at center of rotor pad contact surface)**
**0.07 mm (0.0028 in)**

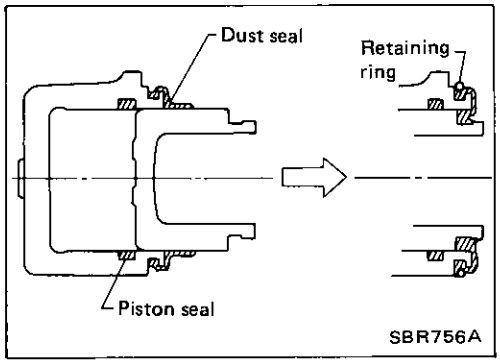
## Inspection (Cont'd)

### THICKNESS


SBR020B

**Standard thickness:**
**18.0 mm (0.709 in)**
**Minimum thickness:**
**16.0 mm (0.630 in)**

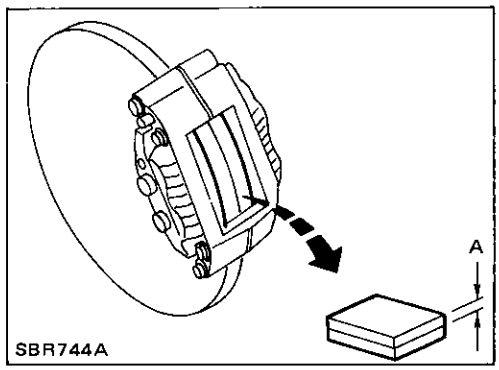
## Assembly




1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.

## Inspection (On-vehicle)

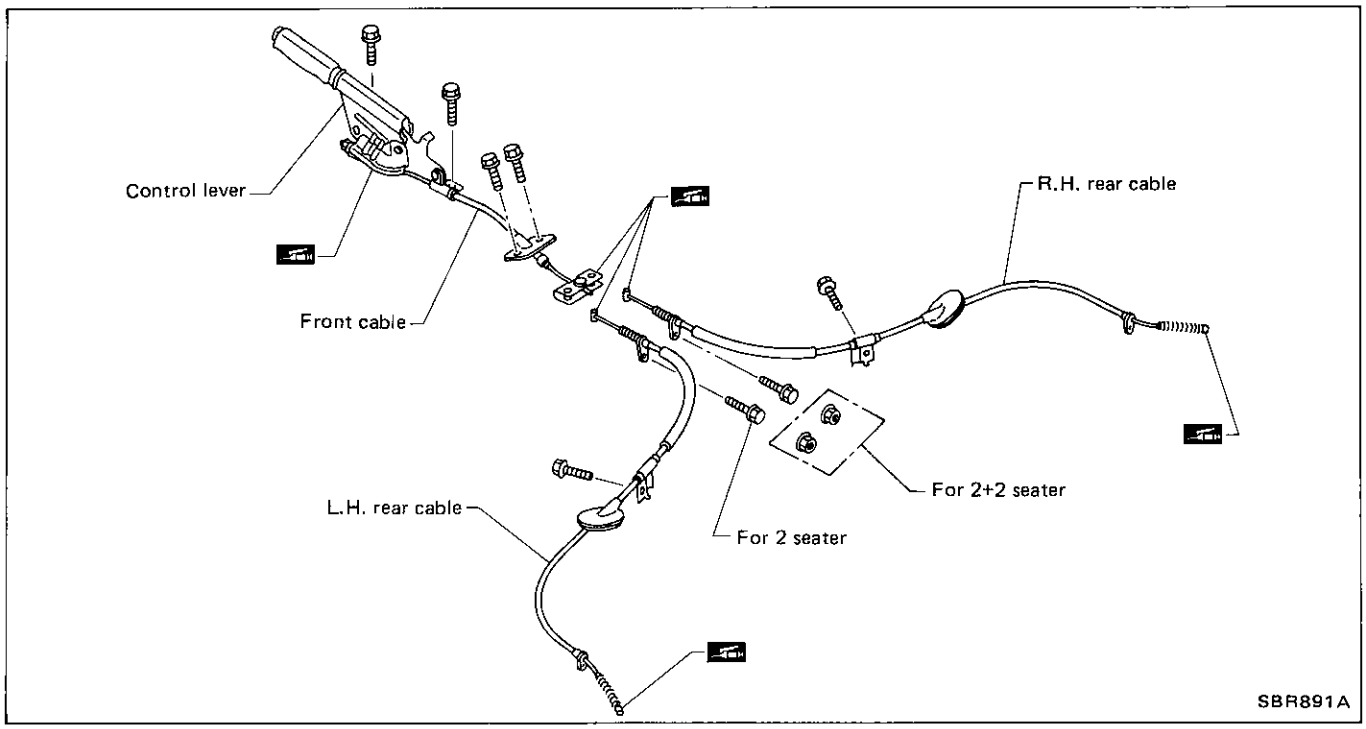
### DISC PAD




- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.

**Standard thickness (A):**
**11.5 mm (0.453 in)**
**Pad wear limit (A):**
**2.0 mm (0.079 in)**

## Removal and Installation



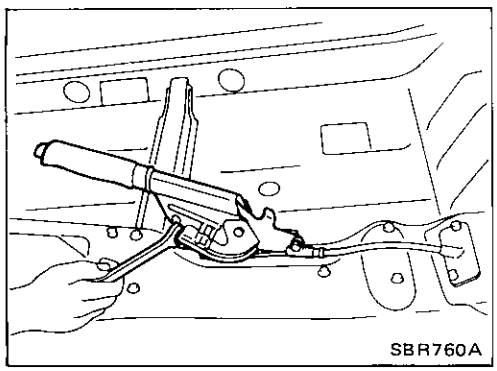

- Before removing parking brake control, remove console box.
- Loosen cable using control lever adjuster, and separate front and rear cables.

**Apply multi-purpose grease to areas between control lever drum and cables.**

**Be careful not to damage boot and inner cable.**

## Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables, lamp and switch. Replace if necessary.
3. Check parts at each connecting portion for deformation or damage. If found, replace.

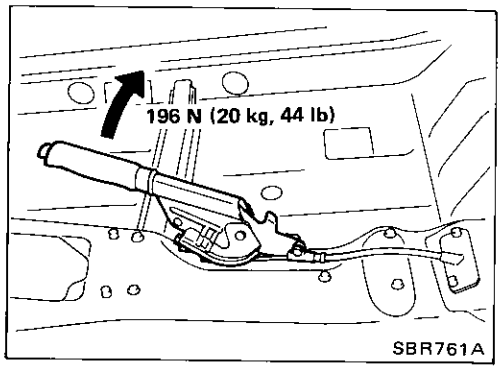



## Adjustment

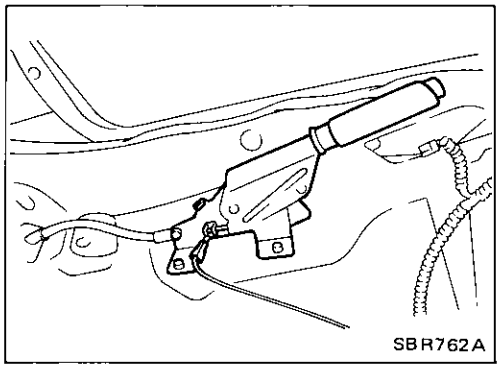
Perform shoe clearance adjustment before adjusting control lever stroke.

1. Turn adjusting nut.

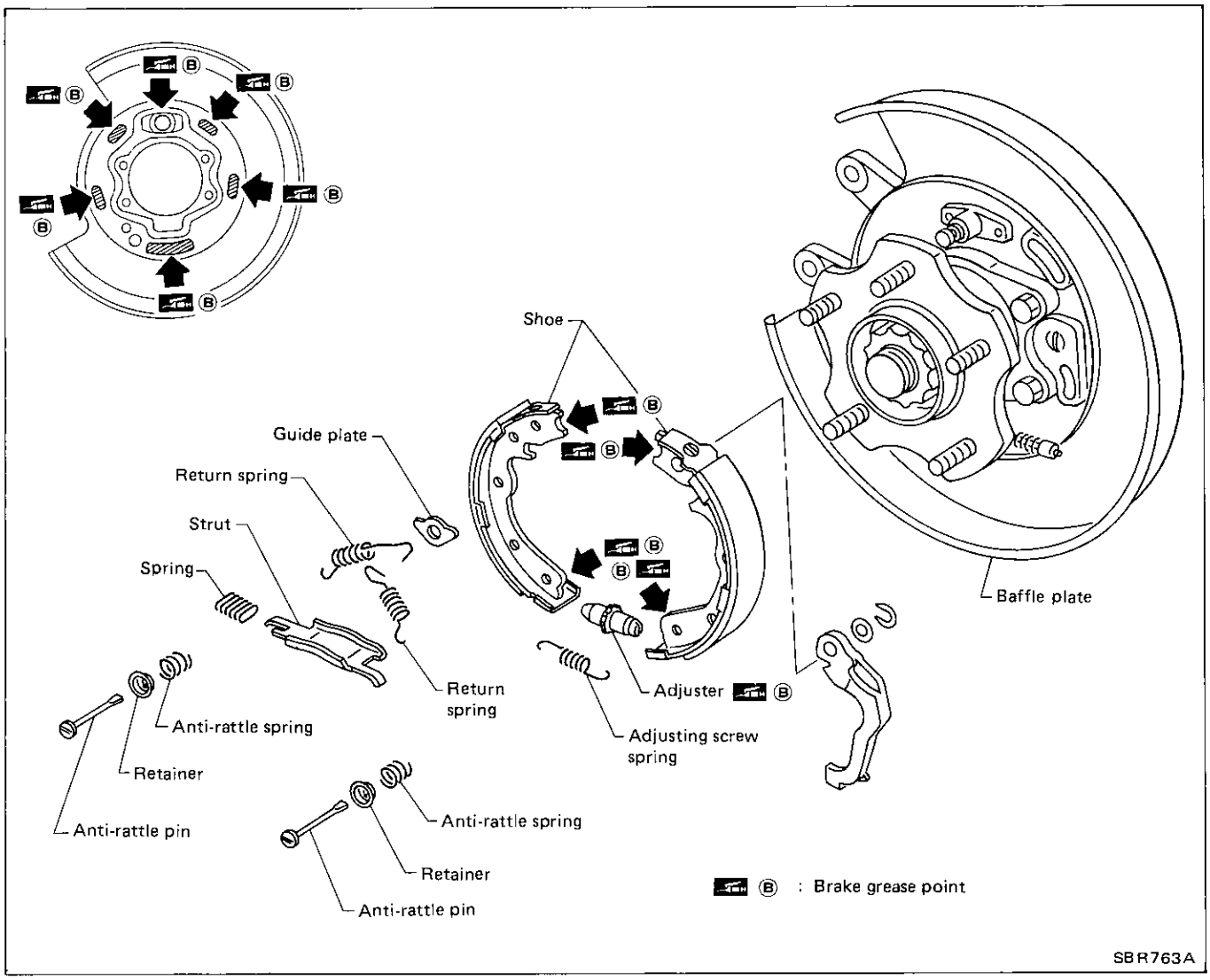
## Adjustment (Cont'd)

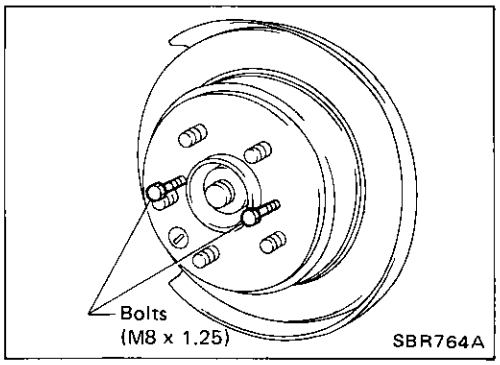



2. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   **Number of notches: 6 - 7**



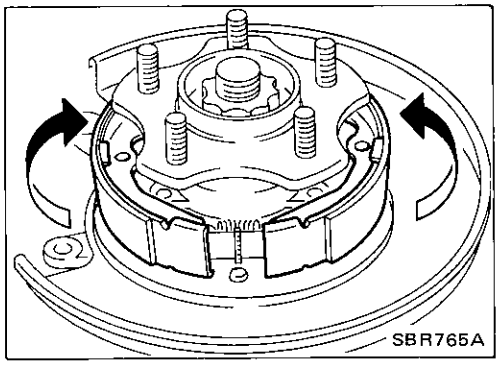

3. Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.
   **Number of notches "A": 1**



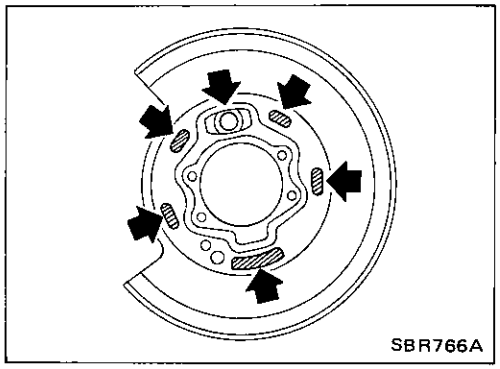

## Shoe Replacement

1. Remove disc rotor (With parking drum brake).
   Tighten two bolts gradually if disc rotor is hard to remove.



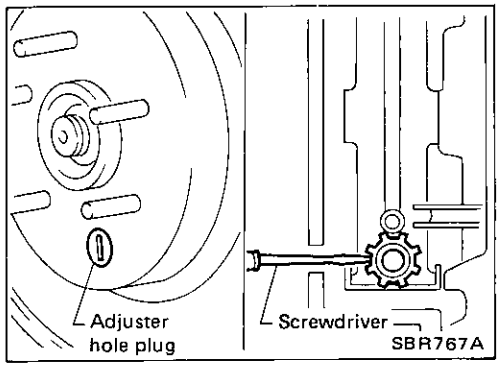

2. After removing anti-rattle pin, remove spring by rotating shoes.
   **Be careful not to damage parking brake cable when separating it.**

## Shoe Replacement (Cont'd)




3. Apply brake grease to the contact areas shown at left.

## Shoe Clearance Adjustment




1. Remove adjuster hole plug, and turn adjuster wheel with a screwdriver until shoe touches brake drum.

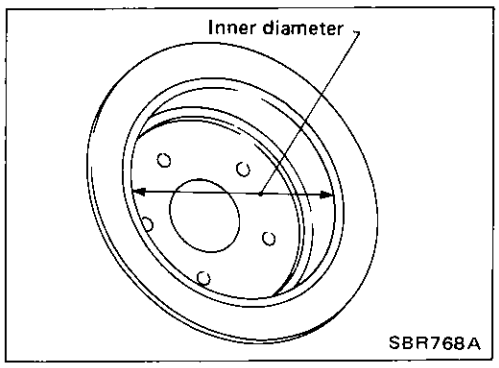
**Make sure that parking control lever is released completely.**

2. Return adjuster wheel 5 to 6 latches.
3. Install adjuster hole plug, and make sure that there is no drag between shoes and brake drum when rotating disc rotor.

## Breaking in Drum and Lining

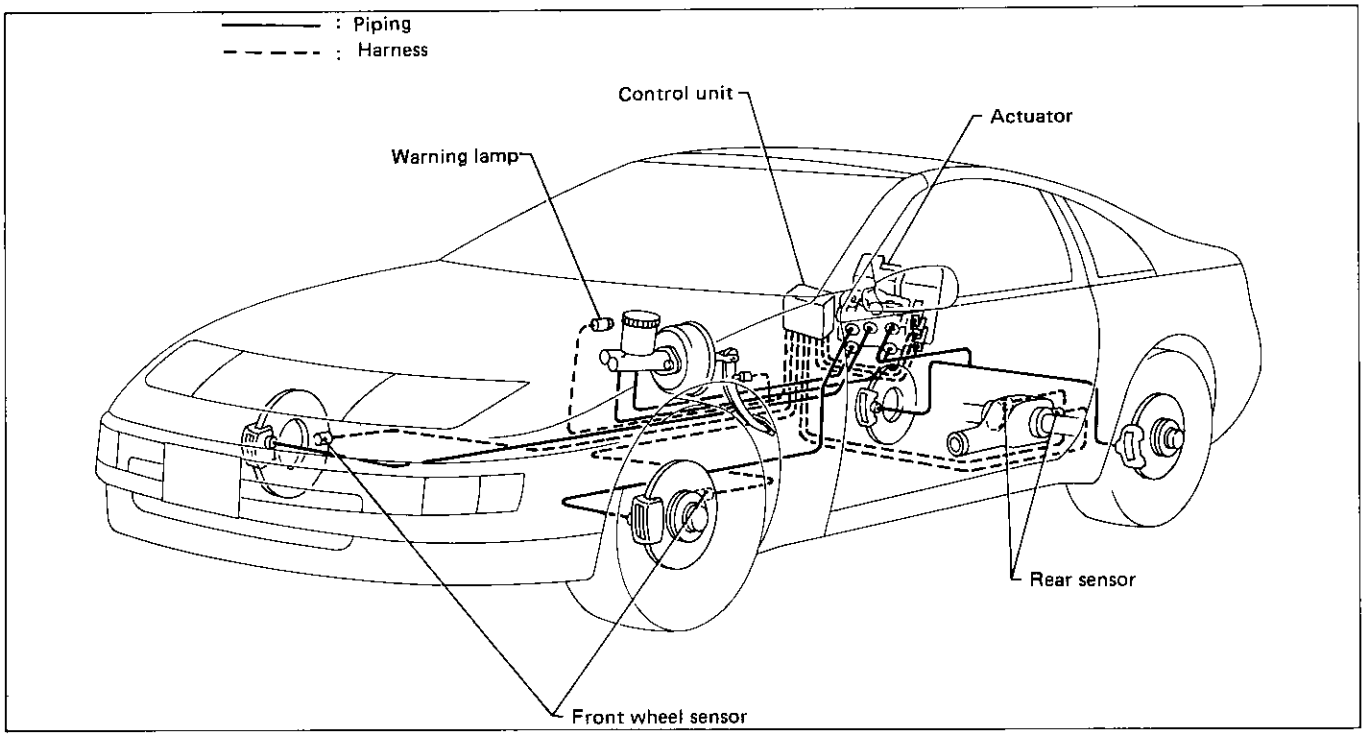
1. Using either low or 2nd transmission speed, drive the unloaded vehicle on a safe, level and dry road.
2. Depress the release button of parking brake lever, then pull the lever with a force of 98 N (10 kg, 22 lb).
3. While holding the lever, continue to drive the vehicle forward 100 m (328 ft) at approximately 35 km/h (22 MPH).
4. While holding the lever, drive the vehicle in reverse 10 m (33 ft) at approximately 10 km/h (6 MPH).
5. Repeat steps 1 through three times and then repeat only step 4 one more time.

## Drum Inspection

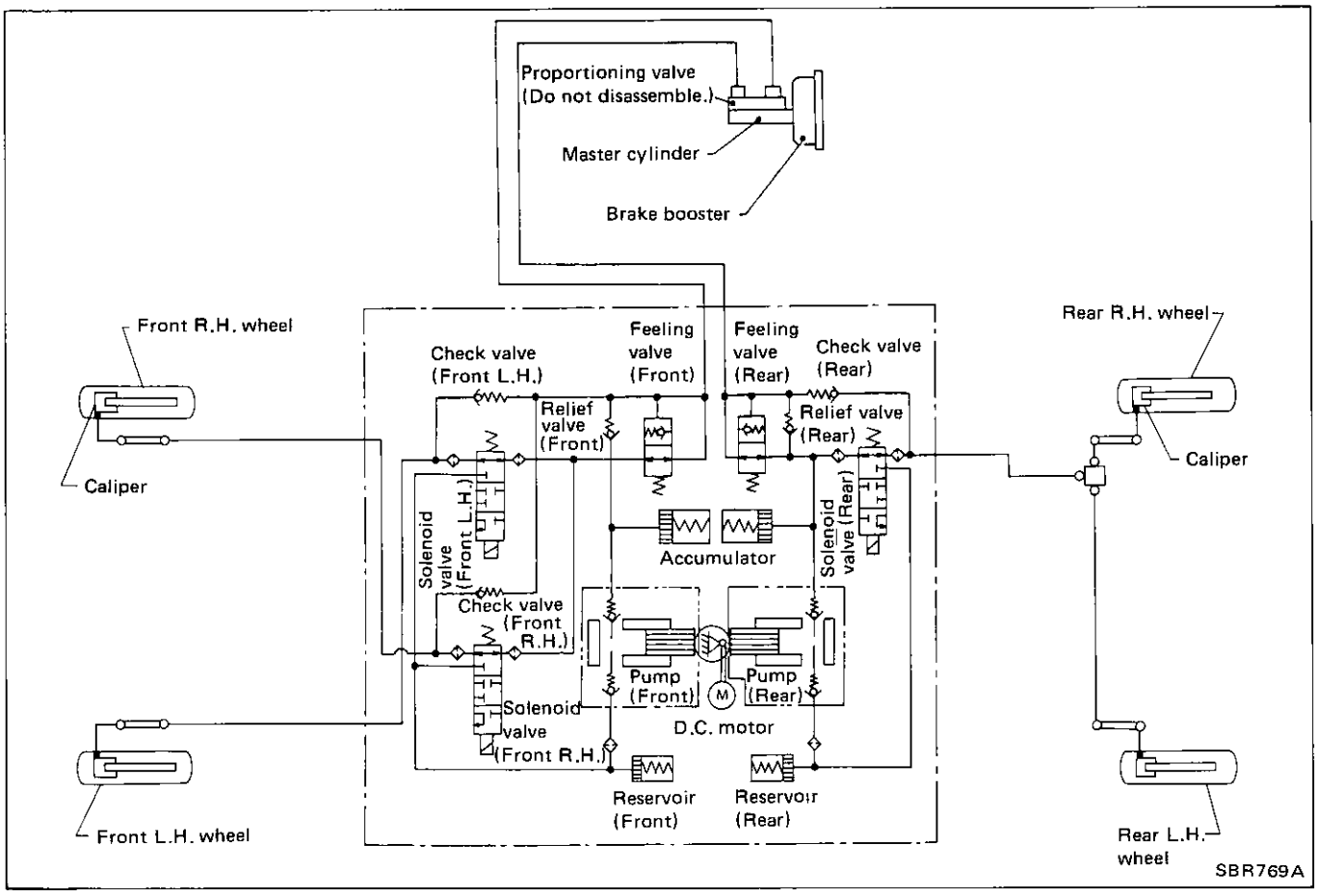



**Standard inner diameter:**
**172.0 mm (6.77 in)**
**Maximum inner diameter:**
**173.0 mm (6.81 in)**

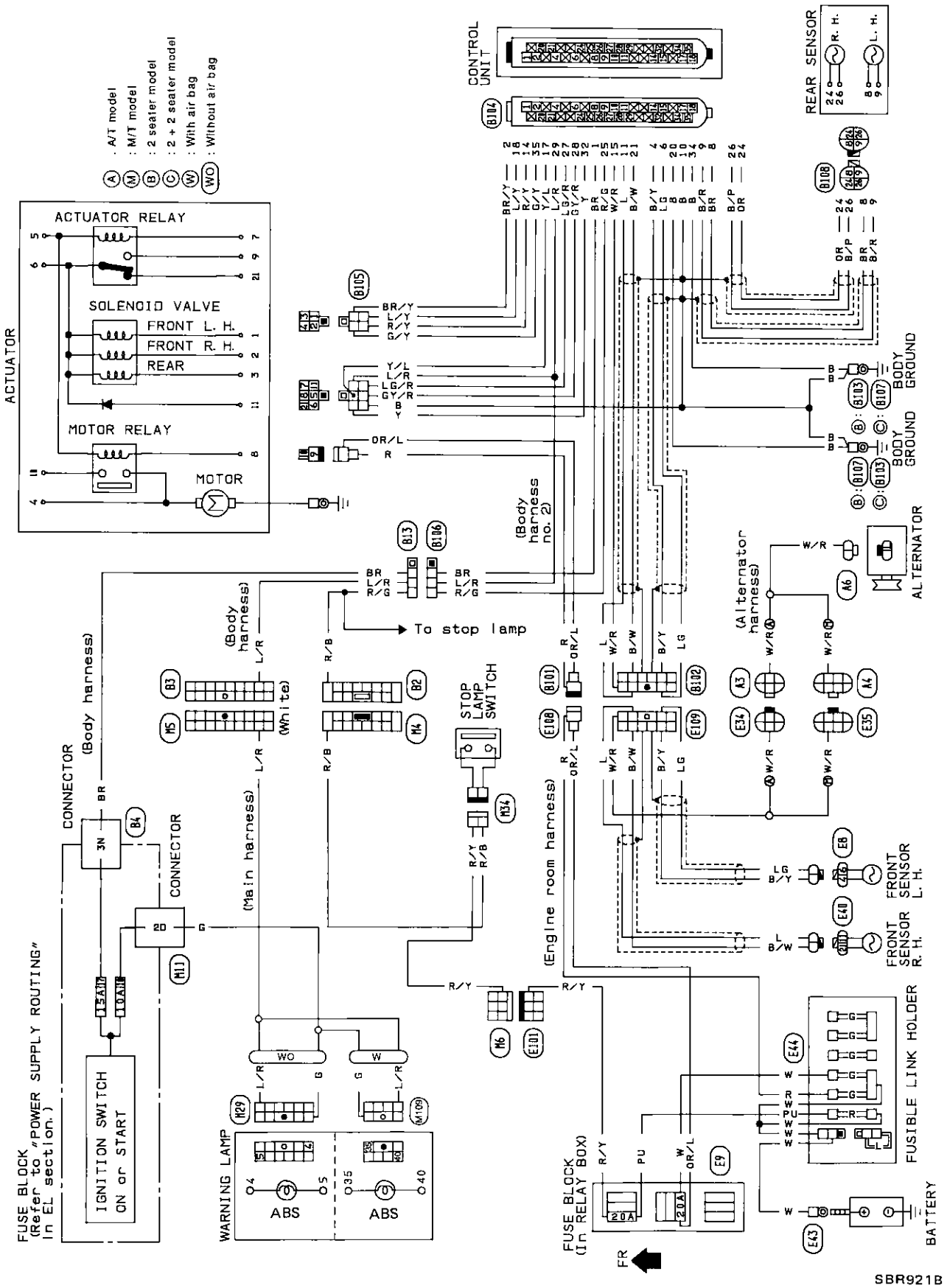
## System Components




## Hydraulic Circuit



## Wiring Diagram

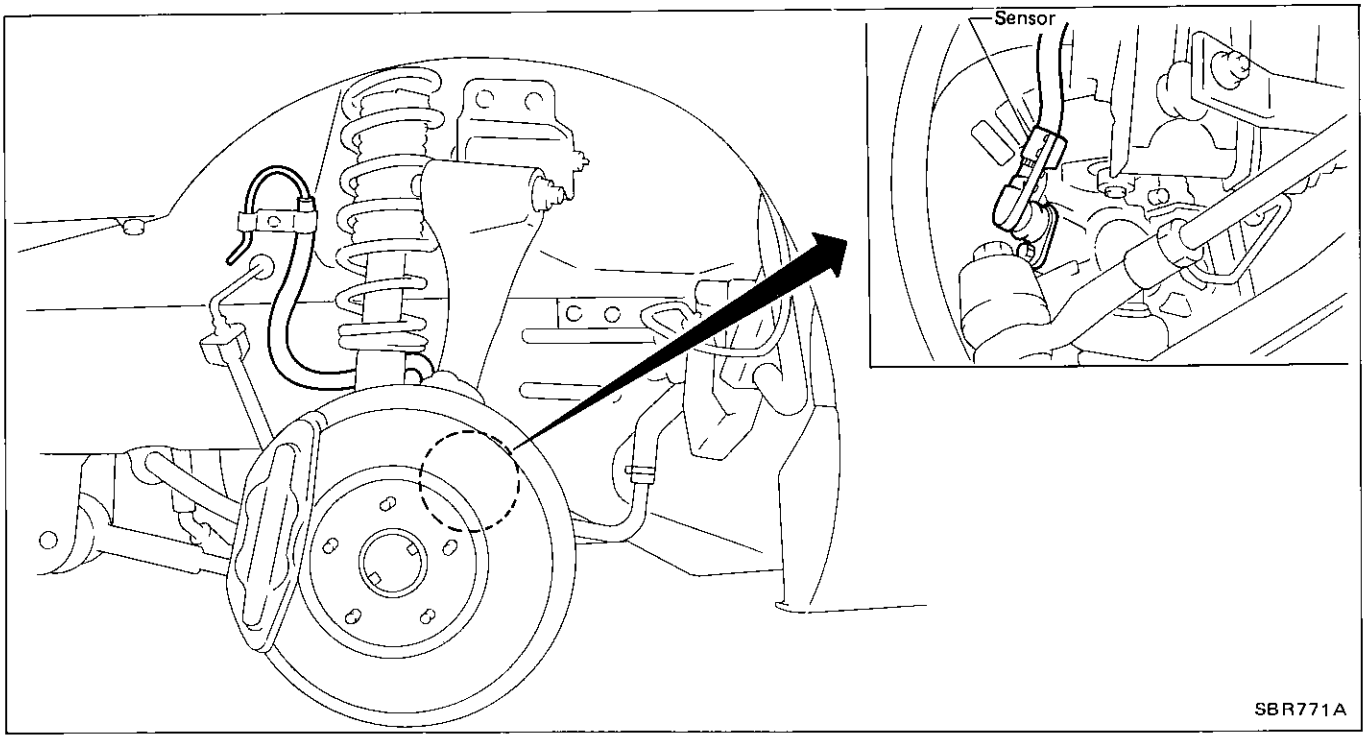



SBR921B

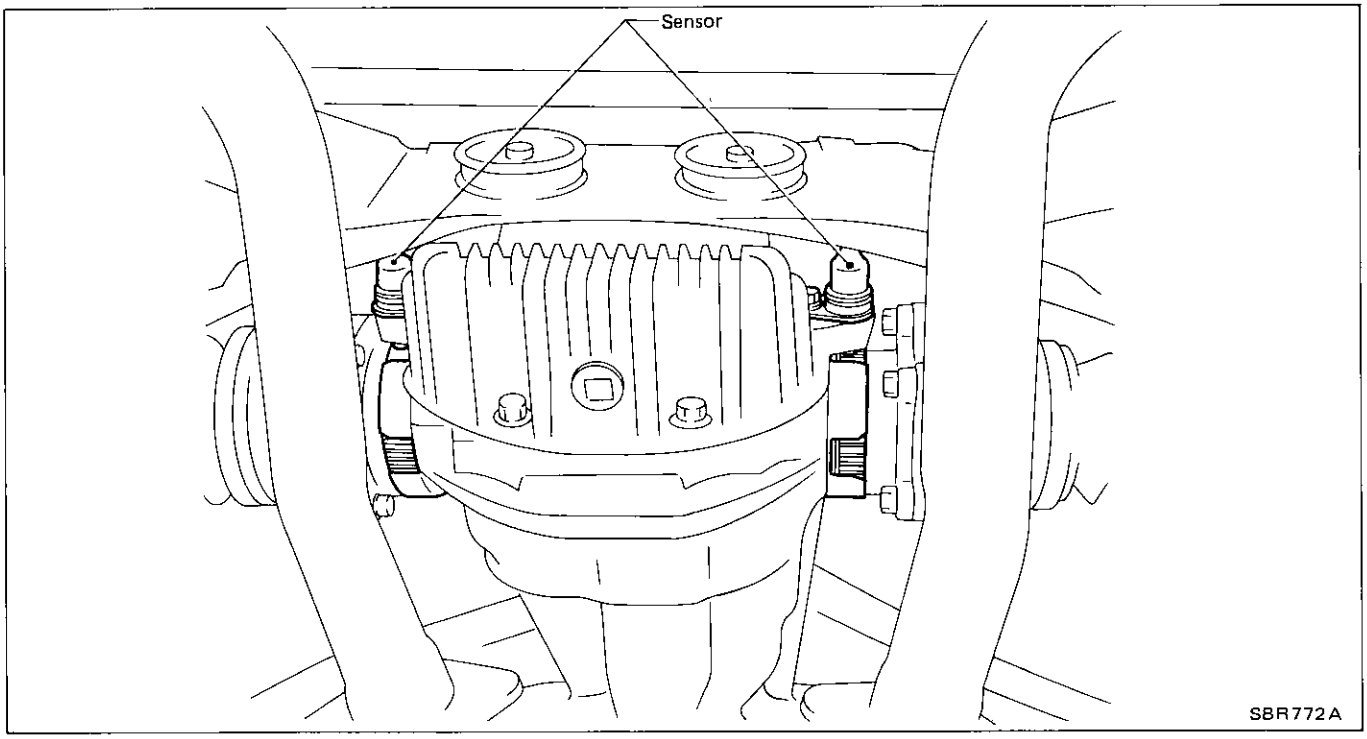
## Removal and Installation

**CAUTION:**
**Be careful not to damage sensor edge and sensor rotor teeth.**

**FRONT WHEEL SENSOR**



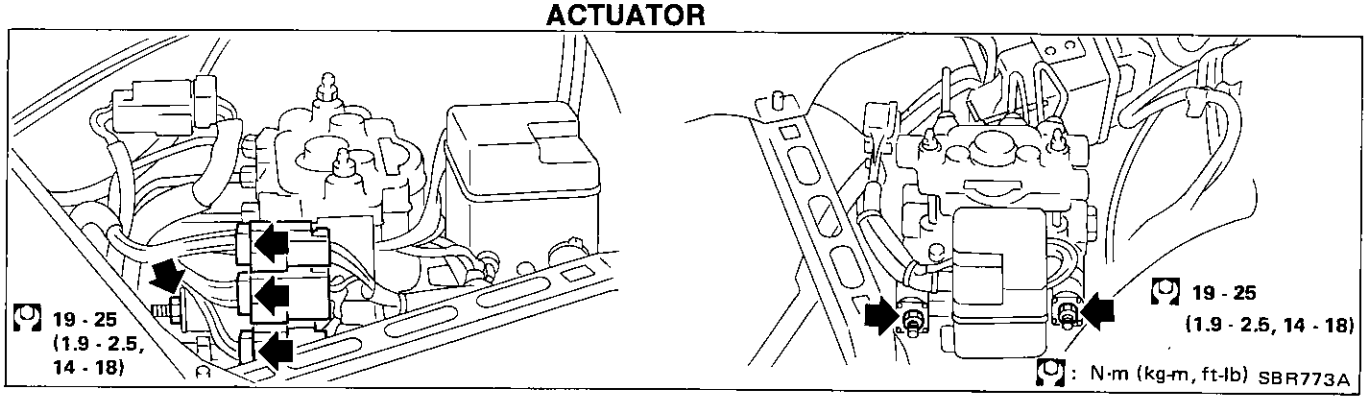

**REAR SENSOR**




- Remove rear sensor rotor with differential side flange after drive shaft removal.
  Refer to RA section.

## Removal and Installation (Cont'd)

### ACTUATOR



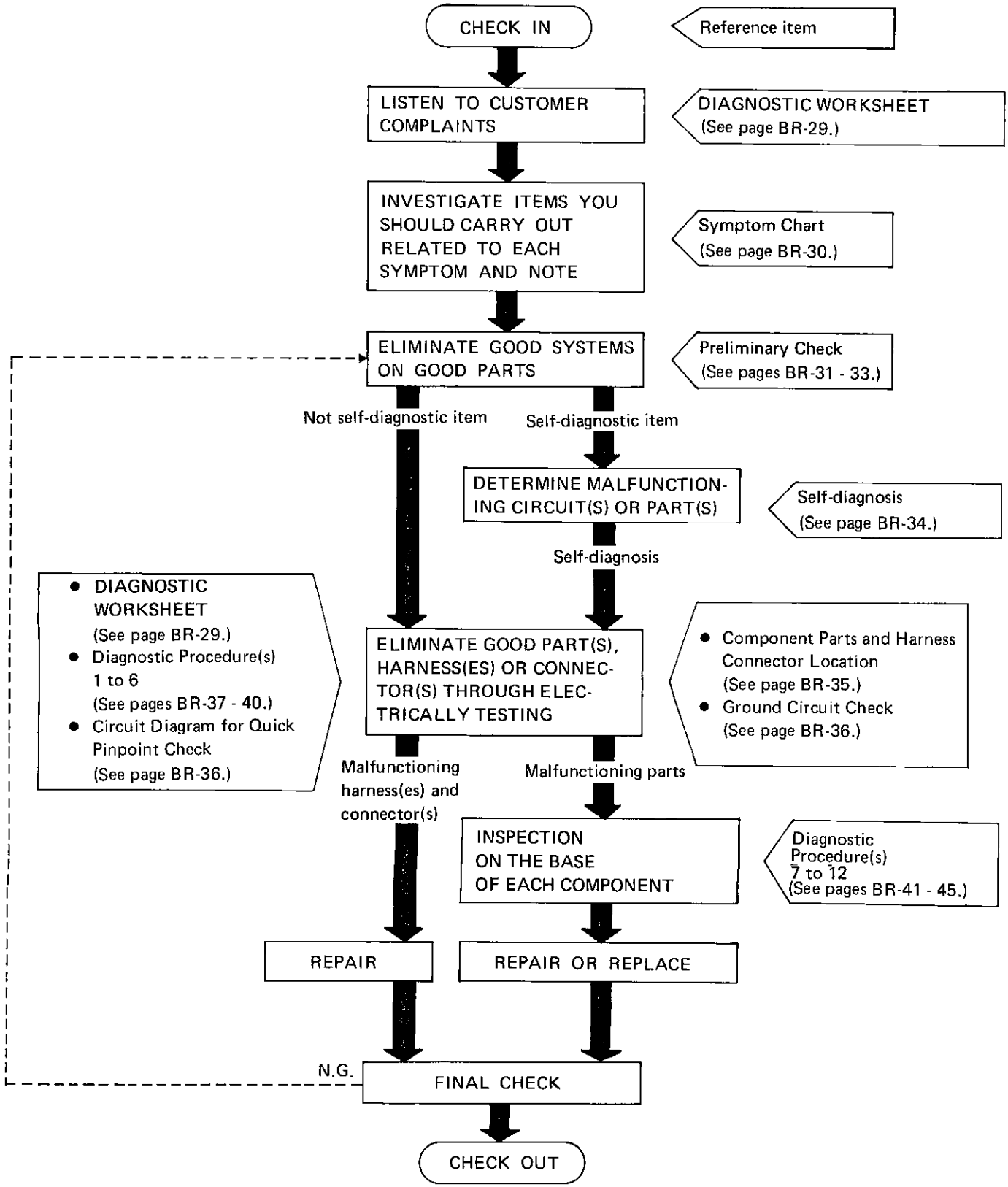

- Disconnect 3 connectors and brake tubes.
- Remove 3 nuts fixing actuator to bracket.

## Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair ..... BR-28
Symptom Chart ..... BR-30
Preliminary Check 1 ..... BR-31
Preliminary Check 2 ..... BR-32
Preliminary Check 3, 4 ..... BR-33
Self-diagnosis ..... BR-34
Component Parts and Harness Connector Location ..... BR-35
Ground Circuit Check ..... BR-36
Circuit Diagram for Quick Pinpoint Check ..... BR-36
Diagnostic Procedure 1 ..... BR-37
Diagnostic Procedure 2 ..... BR-38
Diagnostic Procedure 3 ..... BR-39
Diagnostic Procedure 4 ..... BR-39
Diagnostic Procedure 5 ..... BR-40
Diagnostic Procedure 6 ..... BR-40
Diagnostic Procedure 7 ..... BR-41
Diagnostic Procedure 8 ..... BR-42
Diagnostic Procedure 9 ..... BR-43
Diagnostic Procedure 10 ..... BR-44
Diagnostic Procedure 11 ..... BR-45
Diagnostic Procedure 12 ..... BR-45
Electrical Components Inspection ..... BR-46

## 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**

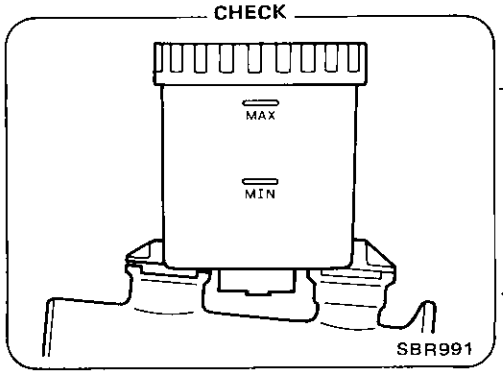
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Customer name MR/MS | | Model & Year | | | VIN | | |
| Engine # | | Trans. | | | Mileage | | |
| Incident Date | | Manuf. Date | | | In Service Date | | |
| Symptoms | ☐ Pedal vibration and noise | ☐ Warning activates | ☐ Long stopping distance | ☐ Unexpected pedal action | ☐ ABS doesn't work | ☐ ABS works but warning activates | ☐ ABS works frequently |
| Engine conditions | | ☐ When starting<br>☐ Engine speed: 5,000 rpm or more | | | ☐ After starting | | |
| Road conditions | | ☐ Low friction road (☐ Snow ☐ Gravel ☐ Other)<br>☐ Protrusion | | | | | |
| Driving conditions | | ☐ High speed cornering<br>☐ Vehicle speed: Greater than 10 km/h (6 MPH)<br>☐ Vehicle speed: 10 km/h (6 MPH) or less<br>☐ Vehicle is stopped | | | | | |
| Applying brake conditions | | ☐ Suddenly<br>☐ Gradually | | | | | |
| Other conditions | | ☐ Operation of electrical equipment<br>☐ Large pedal stroke<br>☐ 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 | ABS works frequently |
|---|---|---|---|---|---|---|---|---|---|
| Electrical Components Inspection | BR-46 | Actuator inspection | | | | | ○ | | |
| Ground Circuit Check | BR-36 | Motor ground | | | | | ○ | | |
| Diagnostic Procedure (Select inspection with L.E.D. flashing No.) | BR-45 | L.E.D. comes off | ○ | ○ | ○ | ○ | ○ | ○ | |
| | BR-45 | L.E.D. flashing 16 | ○ | ○ | ○ | ○ | ○ | ○ | |
| | BR-44 | L.E.D. flashing 10 | ○ | ○ | ○ | ○ | ○ | ○ | |
| | BR-43 | L.E.D. flashing 9 | ○ | ○ | ○ | ○ | ○ | ○ | |
| | BR-42 | L.E.D. flashing 5 - 8 | ○ | ○ | ○ | ○ | ○ | ○ | |
| | BR-41 | L.E.D. flashing 1 - 4 | ○ | ○ | ○ | ○ | ○ | ○ | |
| Diagnostic Procedure | BR-40 | Diagnostic Procedure 6 | | | | | | | ○ |
| | BR-40 | Diagnostic Procedure 5 | | | | | | ○ | |
| | BR-39 | Diagnostic Procedure 4 | | | | | ○ | | |
| | BR-39 | Diagnostic Procedure 3 | | | | ○ | | | |
| | BR-38 | Diagnostic Procedure 2 | | | ○ | | | | |
| | BR-37 | Diagnostic Procedure 1 | ○ | | | | | | |
| Preliminary Check | BR-33 | Preliminary Check 4 | ○ | ○ | ○ | ○ | ○ | ○ | |
| | BR-33 | Preliminary Check 3 | ○ | ○ | | | | | |
| | BR-32 | Preliminary Check 2 | | ○ | | | ○ | | ○ |
| | BR-31 | Preliminary Check 1 | | | ○ | ○ | | | ○ |

## Preliminary Check 1

CHECK

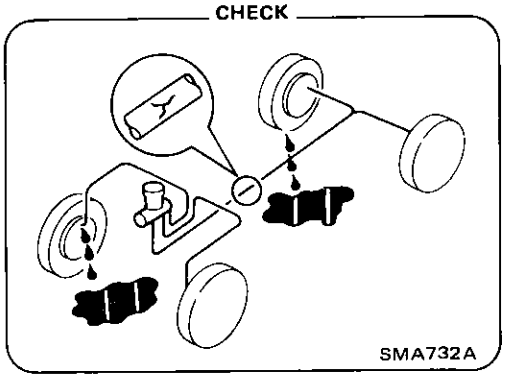



Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

O.K. →

CHECK

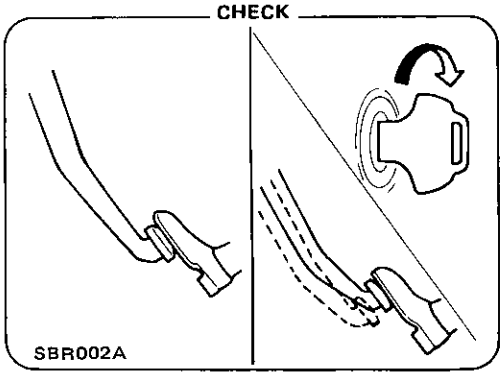



Check brake system.
Refer to CHECK AND ADJUSTMENT.

← N.G. Repair brake system.

O.K. ↓

CHECK

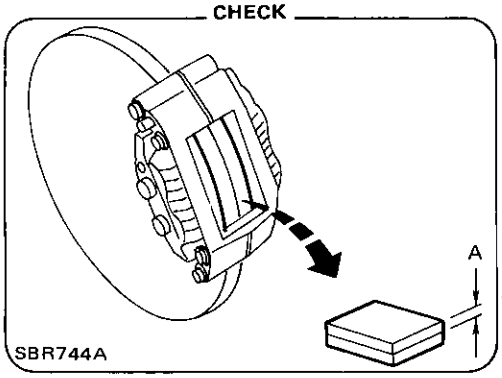



Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

← N.G. Repair or replace booster system.

O.K. ←

CHECK

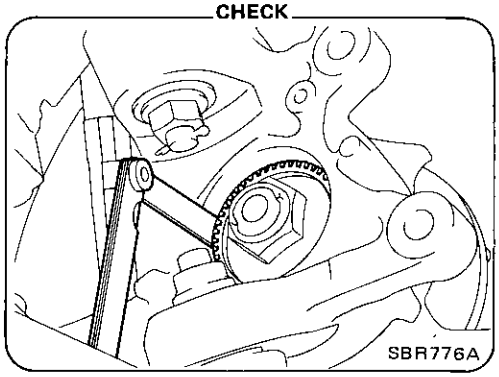


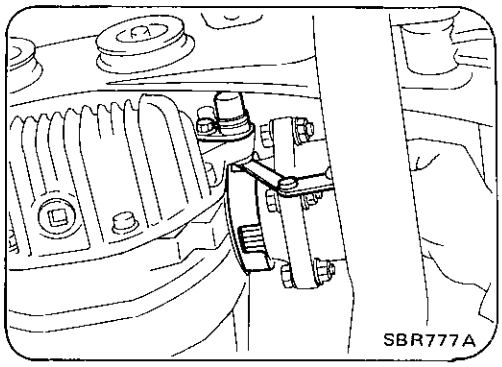

Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

N.G. → Replace malfunctioning parts.

## Preliminary Check 2

CHECK



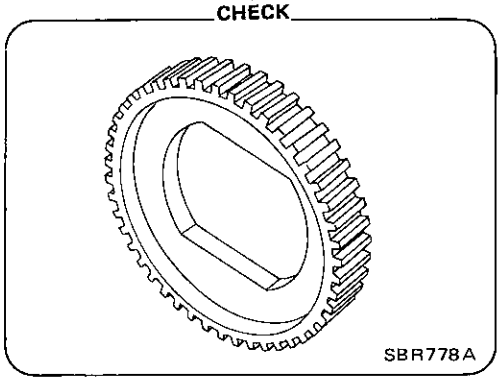

Check sensor clearance.

| | Clearance mm (in) |
|---|---|
| Front wheel sensor | 0.22 - 0.71 (0.0087 - 0.0280) |
| Rear sensor | 0.06 - 0.93 (0.0024 - 0.0366) |

N.G. → Check sensor for the following items:
- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K. → CHECK

N.G. → Repair or replace malfunctioning sensor.




N.G. → Replace sensor rotor.

Check sensor rotor for teeth damage.

**Number of teeth:**

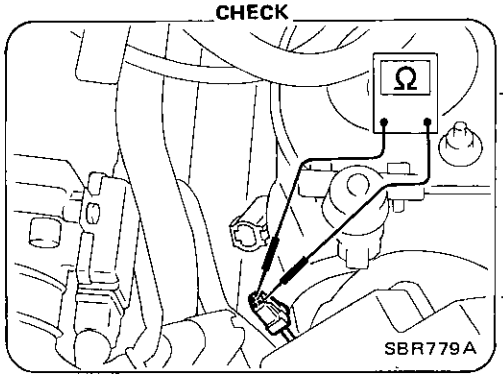
**Front: 46**

**Rear: 46**

## Preliminary Check 3, 4

### Preliminary Check 3

CHECK



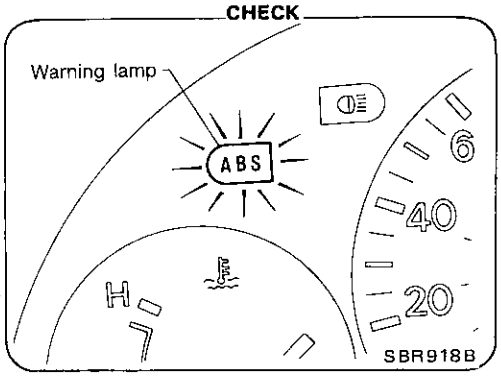

N.G. → Replace.

O.K.

Measure each sensor resistance.
**0.8 - 1.2 kΩ**

### Preliminary Check 4

CHECK



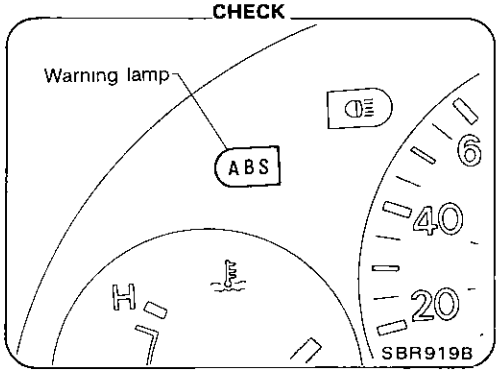

Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K.

N.G.

Check fuse.
Check bulb condition and remedy.

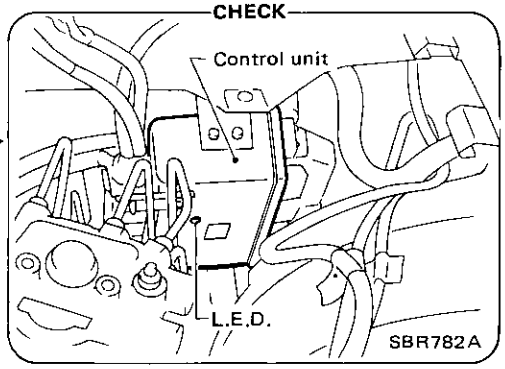
CHECK




Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

N.G.

CHECK

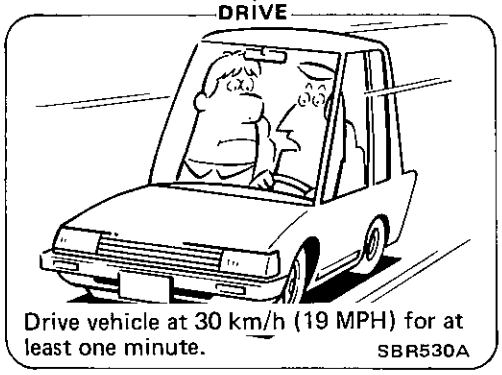



- Keep engine on and running.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

Go to Self-diagnosis.
(See next page.)

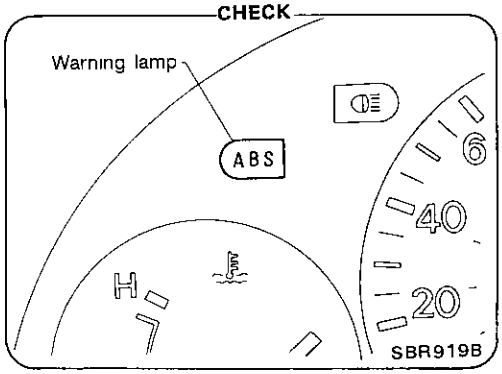
O.K.

DRIVE




Drive vehicle at 30 km/h (19 MPH) for at least one minute.

CHECK




N.G.

O.K. → If Preliminary Check 2 is not performed and there is abnormal ABS operation, perform Preliminary Check 2.

Ensure warning lamp remains off while driving.

## Self-diagnosis

### CHECKING THE NUMBER OF L.E.D. FLASHES

When a problem occurs in the ABS, the warning light on the instrument panel comes on. As shown in the Table, the control unit performs self-diagnosis.

To obtain satisfactory self-diagnosing results, the vehicle must be driven above 30 km/h (19 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle is stopped, the number of L.E.D. flashes is counted while the engine is running.

The L.E.D. is located on the control unit, identifying a malfunctioning part or unit by the number of flashes.

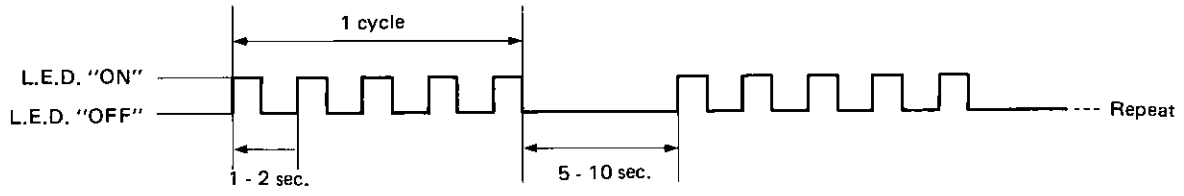
Both the warning light and the L.E.D. persistently activate, even after a malfunctioning part or unit has been repaired, unless the ignition switch is turned "OFF". After repairs, turn the ignition switch "OFF". Then start the engine and drive the vehicle over 30 km/h (19 MPH) for at least one minute to ensure that the malfunctioning part or unit has been repaired properly.

If more than two circuits malfunction at the same time, the L.E.D. will flash to indicate one of the malfunctioning circuits. After the circuit has been repaired, the L.E.D. will then flash to indicate that the other circuit is malfunctioning.

| No. of L.E.D. flashes | Malfunctioning part or unit |
|---|---|
| 1 | Left front actuator solenoid circuit |
| 2 | Right front actuator solenoid circuit |
| 3 or 4 | Rear actuator solenoid circuit |
| 5 | Left front rotor sensor circuit |
| 6 | Right front rotor sensor circuit |
| 7 | Right rear rotor sensor circuit |
| 8 | Left rear wheel sensor circuit |
| 9 | Actuator motor, motor relay circuit |
| 10 | Actuator solenoid valve relay |
| 16 | Control unit |
| Warning activates and L.E.D. "OFF" | Power supply or ground circuit for control unit |

**Example**

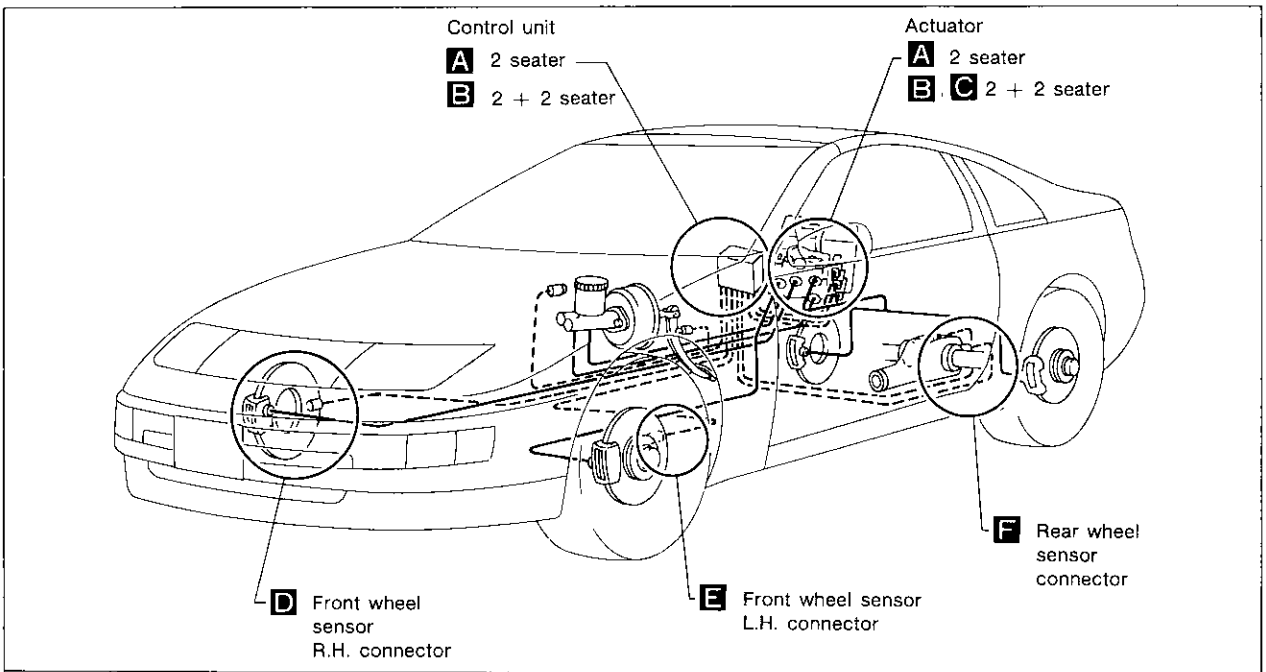
Improper operation of left front rotor sensor circuit

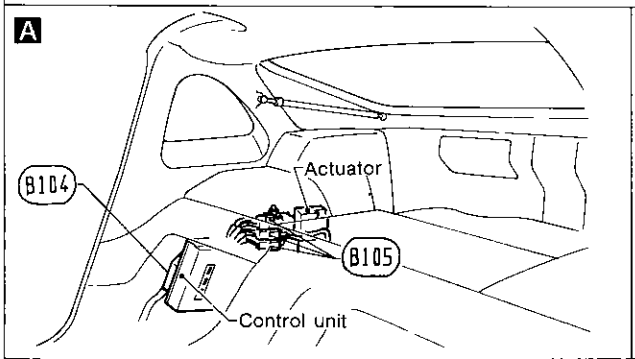


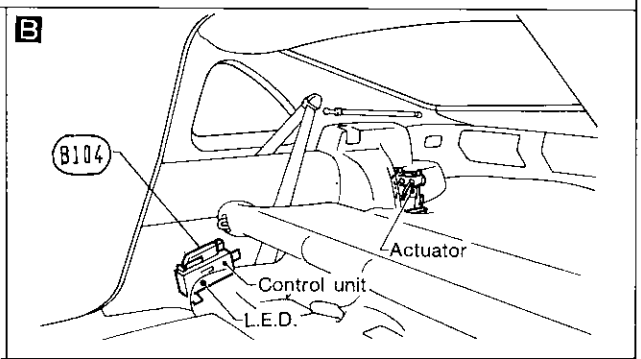

SBR531A

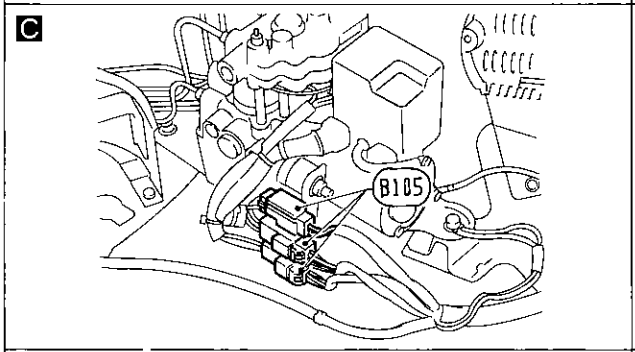
Go to Diagnostic Procedure from 7 to 10, where malfunction portion is concerned.

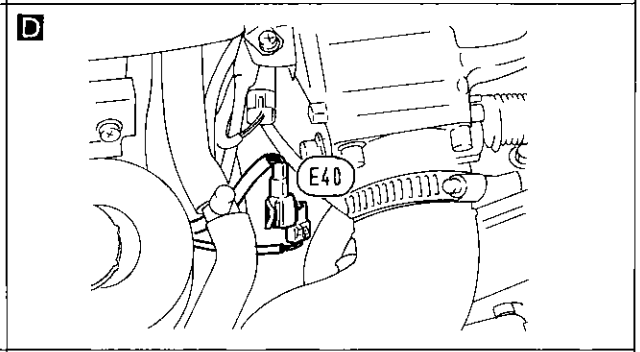
## Component Parts and Harness Connector Location

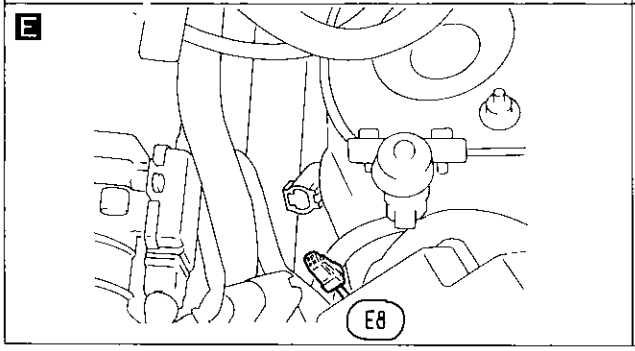


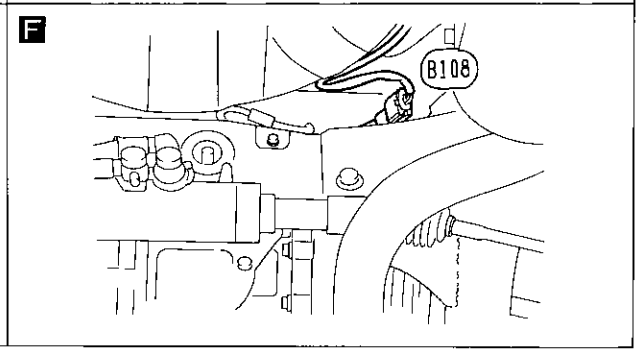



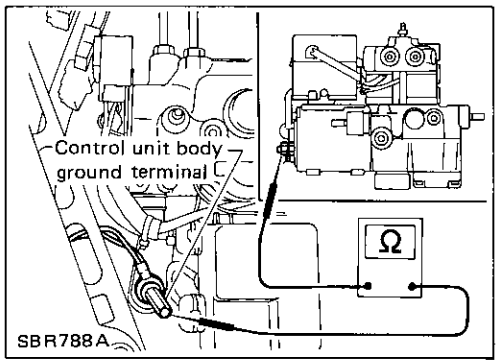




SBR892B



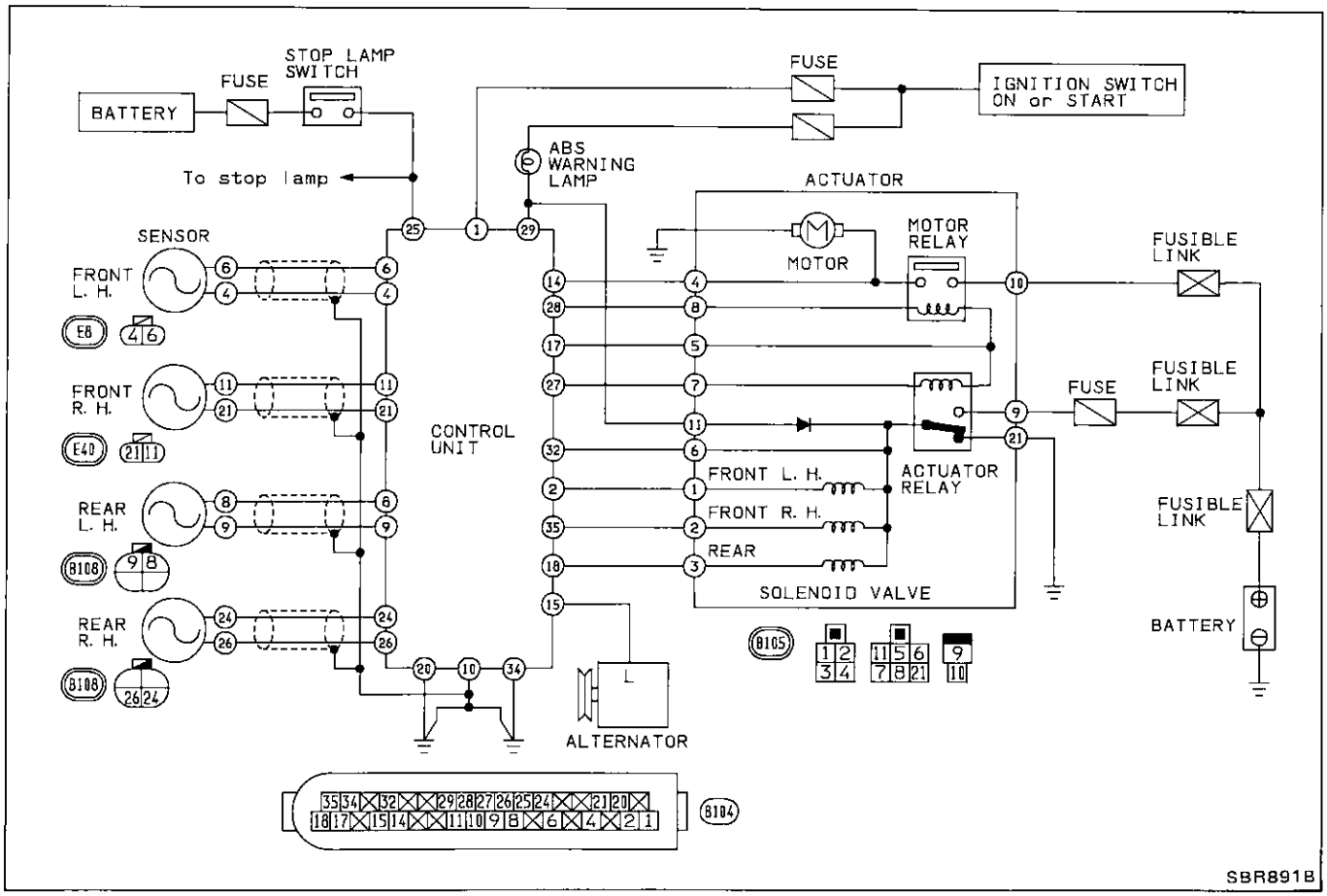

## Ground Circuit Check

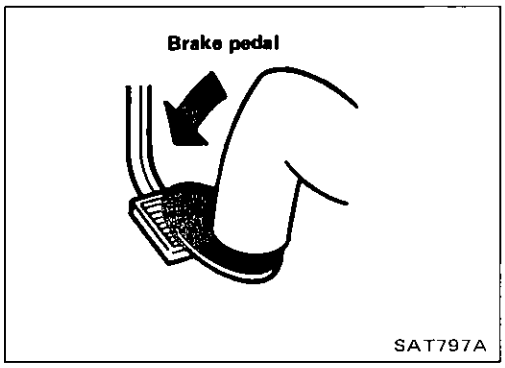
### ACTUATOR MOTOR GROUND

- Check resistance between both terminals.
  **Resistance: approx. 0Ω**

## Circuit Diagram for Quick Pinpoint Check

- The unit side connectors with a double circle "◯" are connected to the harness side connectors shown in the "Component Parts and Harness Connector Location". (See page BR-35.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".






## Diagnostic Procedure 1

### SYMPTOM: Pedal vibration and noise

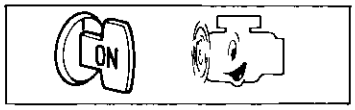
**Refer to worksheet result.**

Check whether the symptom appears only when brake is applied suddenly.

Yes → When brake is applied suddenly, ABS works and produces pedal vibration or noise.

No ↓

Check whether the symptom appears only when engine is started.




Yes → Refer to Preliminary Check 4 result.

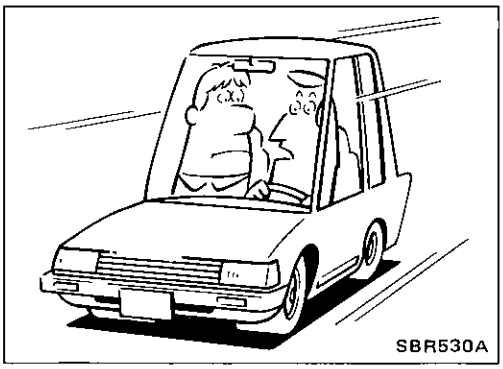
No ↓

Check whether the symptom appears only when the vehicle speed is within 10 km/h (6 MPH) after starting engine.

Yes → Check whether the symptom disappears within 5 seconds.

- No → Ⓐ
- Yes → Control unit activates ABS actuator to carry out self-diagnosis.

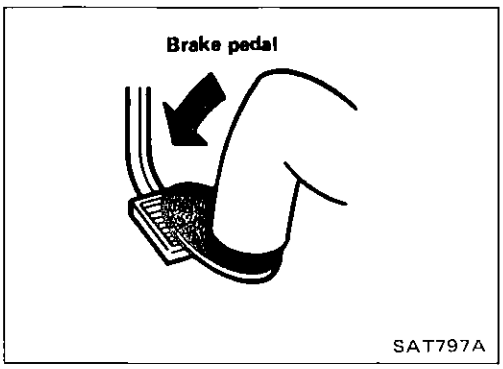
No ↓




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.

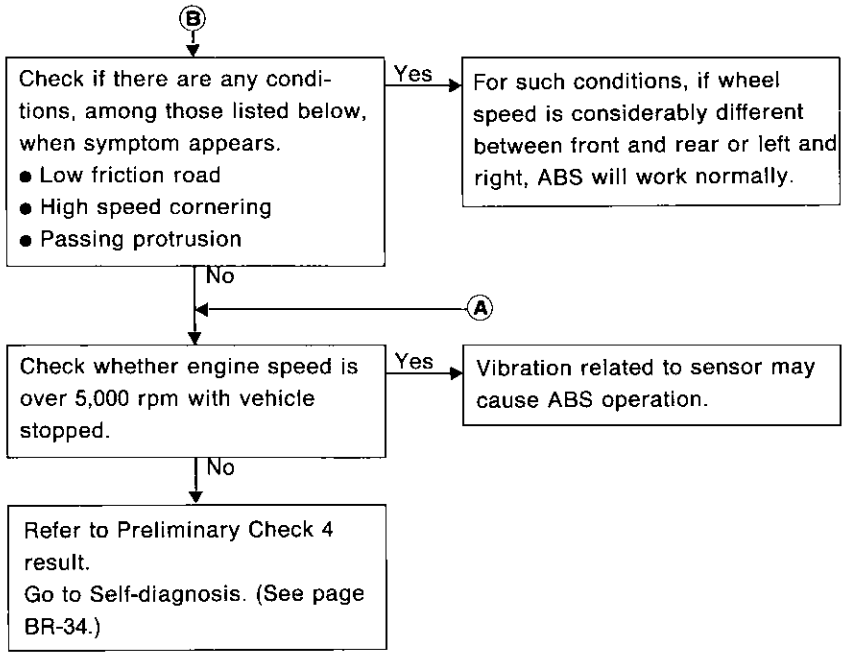
- Shifting
- Operating clutch
- Passing protrusion

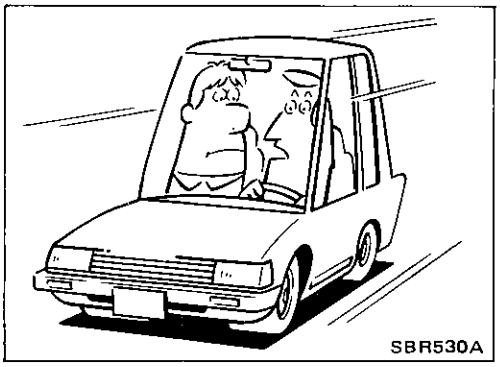
- No → Ⓑ
- Yes → Under these conditions individual wheel speed can change suddenly. This may sometimes cause the ABS to operate.

Yes ↓

Ⓑ

## Diagnostic Procedure 1 (Cont'd)

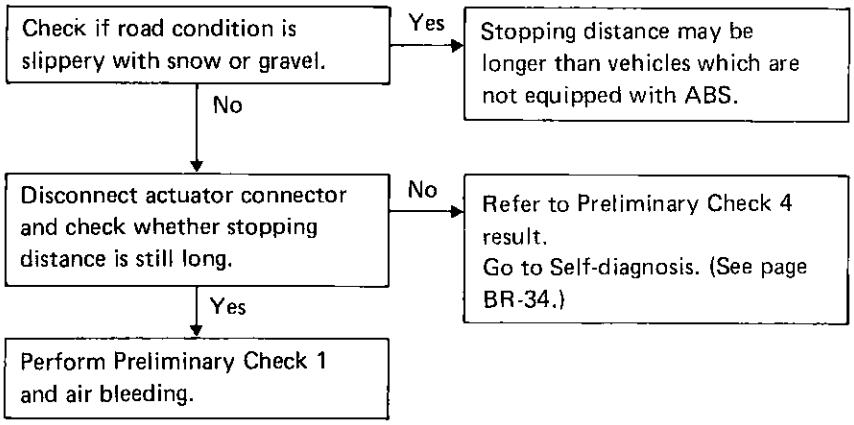


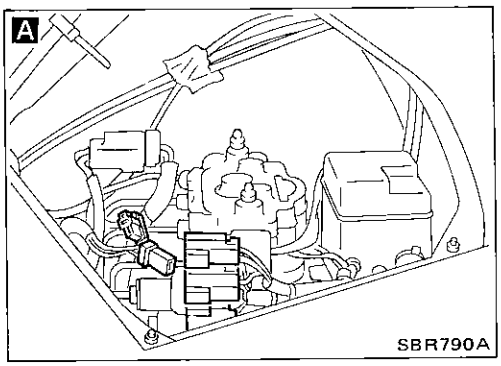




## Diagnostic Procedure 2

**SYMPTOM: Long stopping distance**

**Refer to worksheet results.**






## Diagnostic Procedure 3

**SYMPTOM: Unexpected pedal action**

**Refer to worksheet results.**

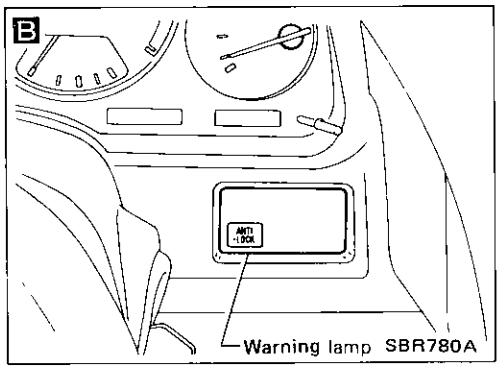
Check whether brake pedal stroke is large.
- Yes → Vehicle equipped with ABS may have a tendency for large pedal strokes.
- No ↓

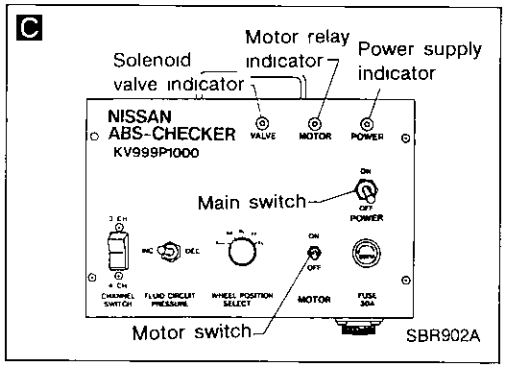
Check that brake pedal force is firm but brake is effective.
- Yes → Normal condition.
- No ↓

A

Disconnect actuator connector and check whether brake is effective.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-34.)
- No ↓

Perform Preliminary Check 1.




## Diagnostic Procedure 4

**SYMPTOM: ABS doesn't work.**

**Refer to worksheet results.**

B

Check whether warning activates.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-34.)
- No ↓

Check whether vehicle speed is under 10 km/h (6 MPH).
- Yes → ABS doesn't work in this condition.
- No ↓

Refer to Preliminary Check 2 result.

O.K. but ABS still doesn't work. ↓

C

Check actuator by referring to Electrical Components Inspection – ACTUATOR. (See page BR-46.)

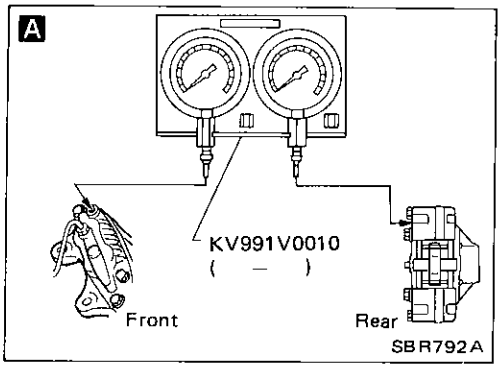
## Diagnostic Procedure 5

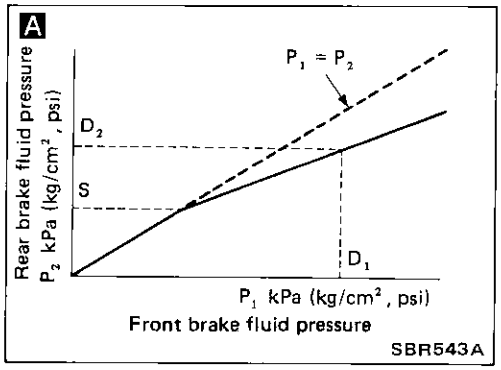
**SYMPTOM: ABS works but warning activates.**

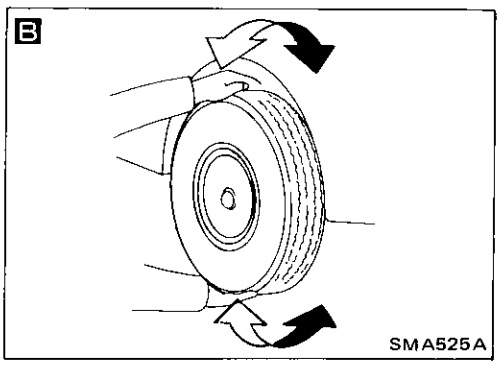
Check whether alternator produces proper output. Refer to EL section.
→ No → Remedy.
↓ Yes

Check whether battery has enough voltage. Refer to EL section.
→ No → Remedy.
↓ Yes

Refer to Preliminary Check 4 result.
Go to Self-diagnosis. (See page BR-34.)




## Diagnostic Procedure 6

**SYMPTOM: ABS works frequently.**

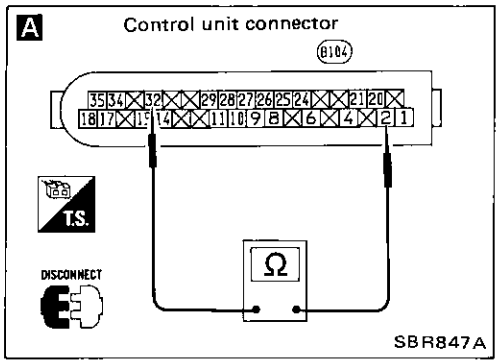
A

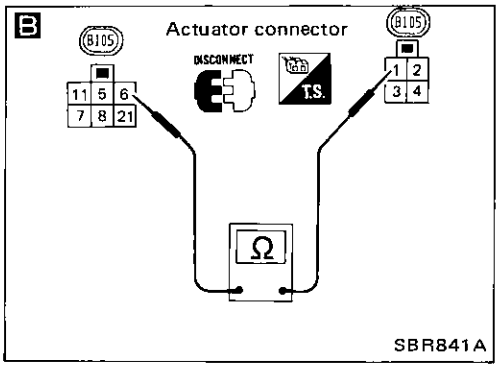
CHECK BRAKE FLUID PRESSURE.
Check whether brake fluid pressure distribution is normal.
**D2/D1:**
**4,609 - 5,002 kPa**
**(47 - 51 kg/cm², 668 - 725 psi)/6,865 kPa**
**(70 kg/cm², 995 psi)**
→ N.G. → Perform Preliminary Check 1.
↓ O.K.

B

Check whether front axles have excessive looseness.
→ Yes → Remedy.
↓ No

Perform Preliminary Check 2 and Ground Circuit Check.




## Diagnostic Procedure 7

### ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

INSPECTION START
Remove battery negative terminal connector.

**A**

CHECK SOLENOID VALVE RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 1:
Terminals ㉜ and ②
Flashing number 2:
Terminals ㉜ and ㉟
Flashing number 3 or 4:
Terminals ㉜ and ⑱
**Resistance: 0.7 - 1.6Ω**

O.K. → Replace control unit.

N.G.

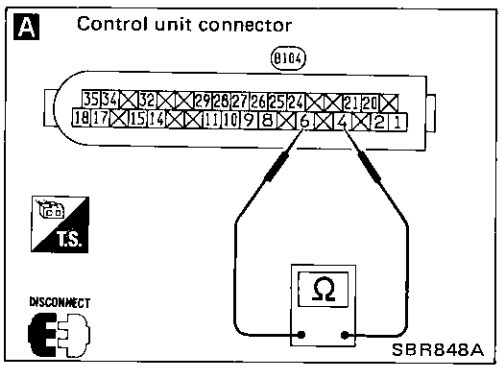
**B**

Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals.
Flashing number 1:
Terminals ⑥ and ①
Flashing number 2:
Terminals ⑥ and ②
Flashing number 3 or 4:
Terminals ⑥ and ③
**Resistance: 0.7 - 1.6Ω**

O.K. → Repair harness between actuator connector and control unit connector.

N.G.

Replace actuator.




## Diagnostic Procedure 8

### WHEEL SPEED SENSOR (L.E.D. flashing number 5 - 8)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK SPEED SENSOR RESISTANCE
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 5 (Fr, L.H.):
Terminals ④ and ⑥
Flashing number 6 (Fr, R.H.):
Terminals ⑪ and ㉑
Flashing number 7 (Rr, R.H.):
Terminals ㉔ and ㉖
Flashing number 8 (Rr, L.H.):
Terminals ⑧ and ⑨
**Resistance: 0.8 - 1.2 kΩ**

O.K. → Replace control unit.

O.K.

Refer to Preliminary Check 3 result.
Check whether sensor has 0.8 - 1.2 kΩ resistance.

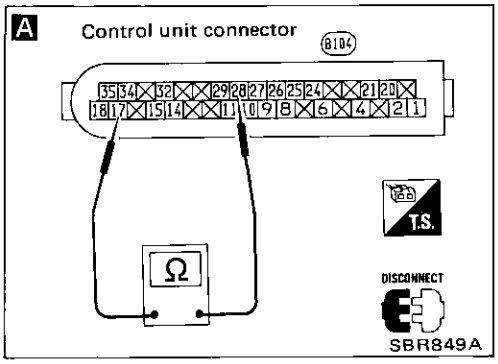
N.G. → Replace sensor.

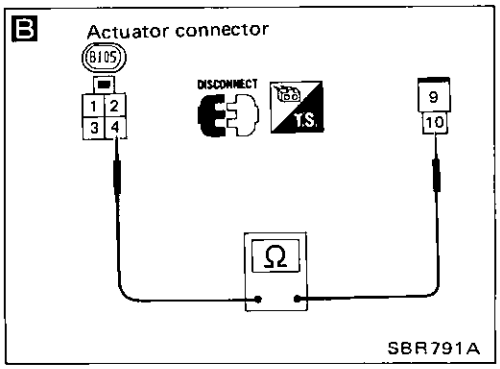
O.K.

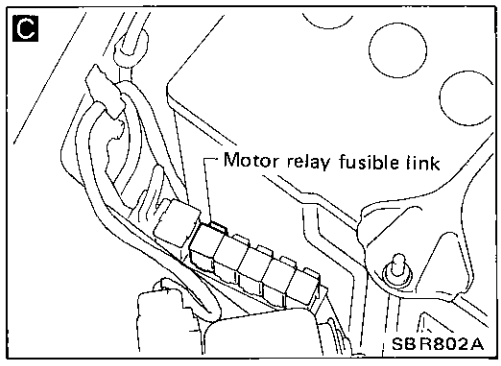
Repair harness between sensor connector and control unit connector.

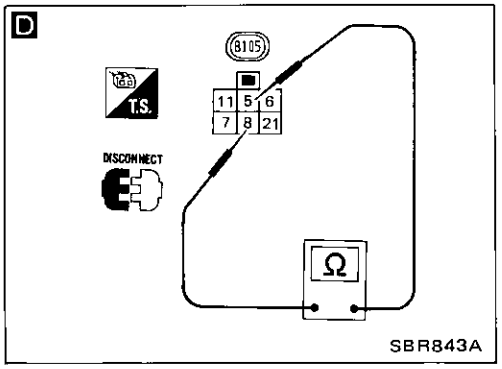
## Diagnostic Procedure 9

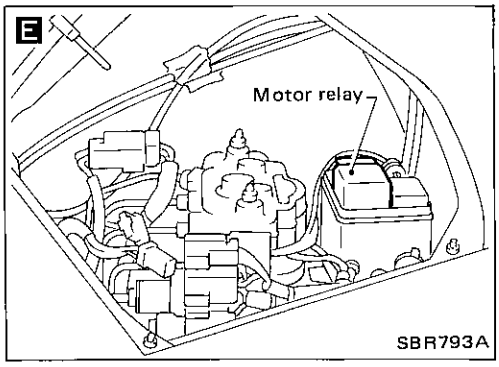
### ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)




INSPECTION START
Remove battery negative terminal connector.

**A**
CHECK MOTOR RELAY SOLENOID RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals ⑰ and ㉘.
**Resistance: 45 - 55Ω**

N.G. → **D**
Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals ⑧ and ⑤.
**Resistance: 45 - 55Ω**

O.K. → Repair harness between actuator and control unit.

N.G. → **E** Replace motor relay.

O.K. ↓

**B**
CHECK MOTOR RELAY DEACTIVATION.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals ④ and ⑩.

Yes → **E** Replace motor relay.

No ↓

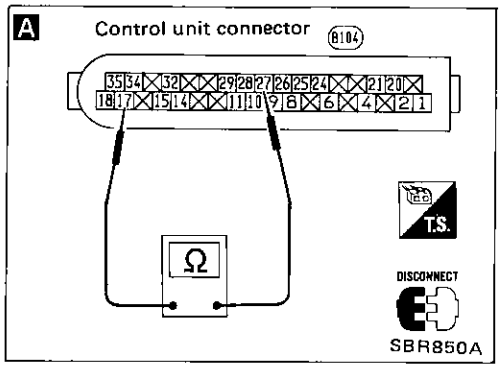
**C**
Check visually if motor's fusible link is blown.
**Resistance:**
**Approximately 0Ω**

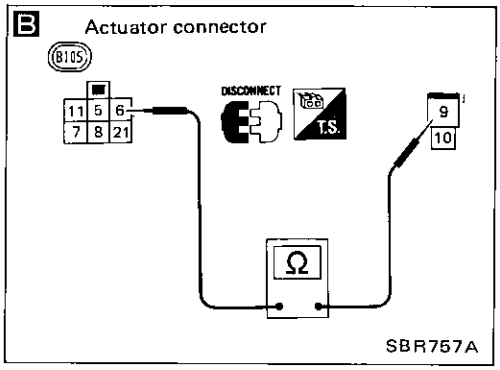
No → Perform Electrical Components Inspection – ACTUATOR. (See page BR-46.)
O.K. → Replace control unit.
N.G. → Replace actuator.

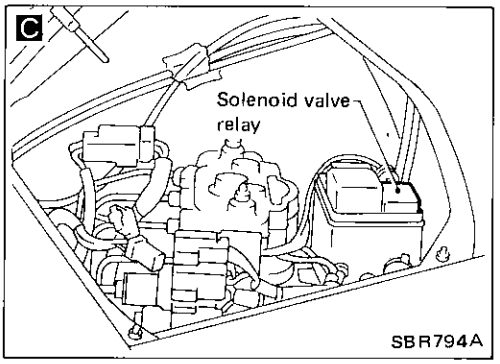
Yes ↓
Replace fusible link.

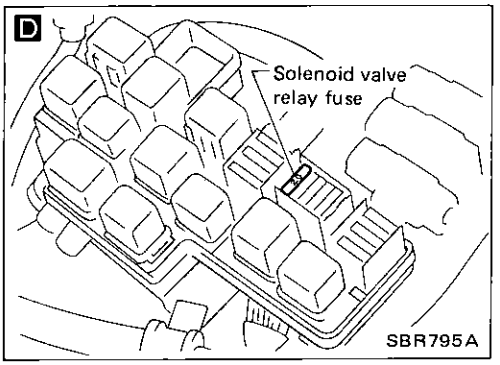
## Diagnostic Procedure 10

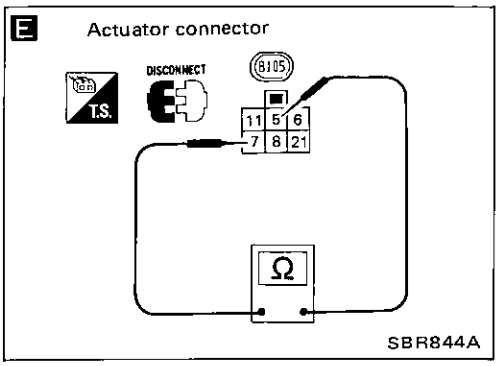
### ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)




INSPECTION START
Remove battery negative terminal connector.

**A**

CHECK SOLENOID VALVE RELAY RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals ㉗ and ⑰.
**Resistance. 80 - 90Ω**

N.G. → **E**

Check resistance between actuator connector (actuator side) terminals ⑦ and ⑤.
**Resistance: 80 - 90Ω**

O.K. → Repair harness between actuator and control unit.

N.G. → **C** Replace solenoid valve relay.

O.K.

**B**

CHECK SOLENOID VALVE RELAY MOVEMENT.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals ⑥ and ⑨.

Yes → **C** Replace solenoid valve relay.

No

**D**

Check visually if solenoid valve relay fuse is blown.

No → Perform Electrical Components Inspection – ACTUATOR. (See page BR-46.)

N.G. → Replace actuator.

O.K. → Replace control unit.

Yes → Replace fuse.

## Diagnostic Procedure 11

**CONTROL UNIT (L.E.D. flashing number 16)**

INSPECTION START

↓

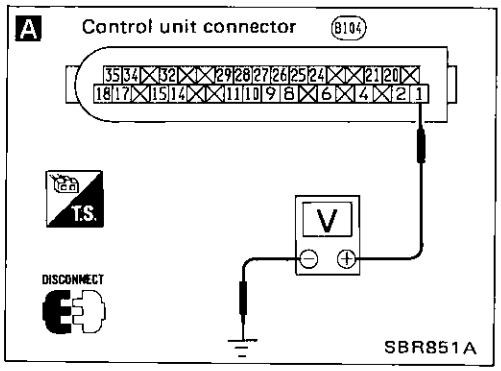
Control unit malfunction.

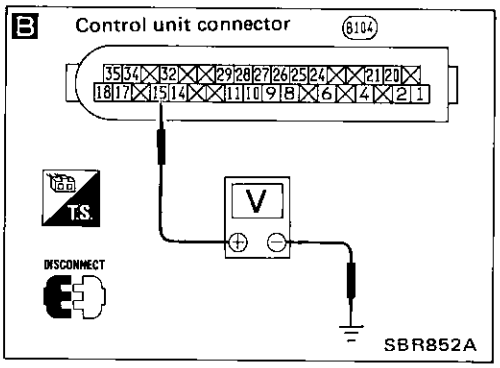
↓

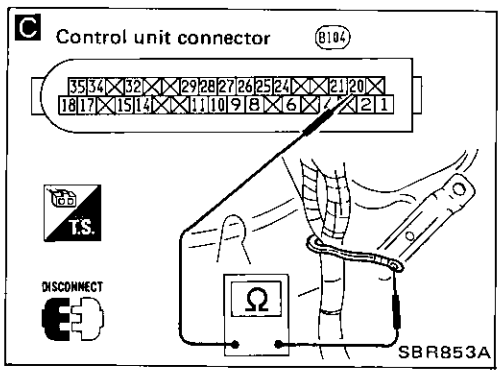
Replace control unit.

## Diagnostic Procedure 12

**CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)**




INSPECTION START

↓

**A**

CHECK CONTROL UNIT POWER SUPPLY.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal ① and body ground with ignition switch turned on.

N.G. → Check if control unit "10A" fuse is blown.
- Yes → Replace fuse.
- No → Repair power supply harness.

O.K. ↓

**B**

CHECK ALTERNATOR L TERMINAL VOLTAGE.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal ⑮ and body ground after engine starting.
**Voltage: 6V or more**

N.G. → Check if other warnings activate.
- Yes → Repair harness between alternator and control unit.
- No → Malfunctioning alternator.

O.K. ↓

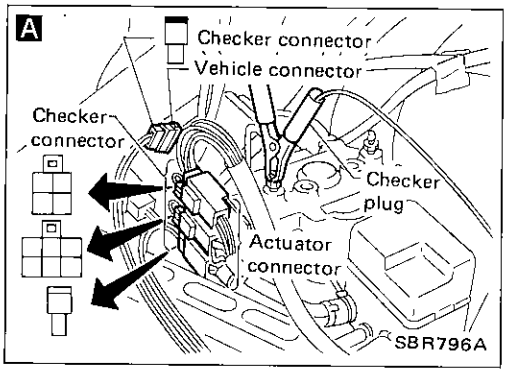
**C**

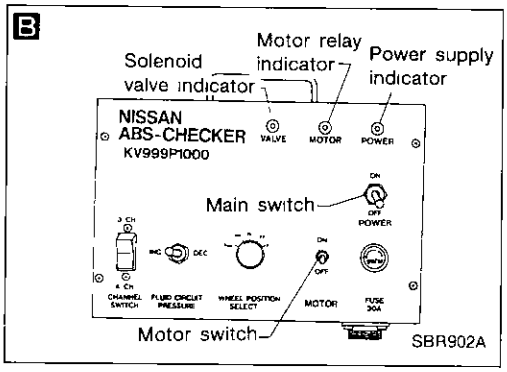
Check continuity between control unit connector (vehicle side) terminal ⑳ and body ground with ignition switch "OFF".

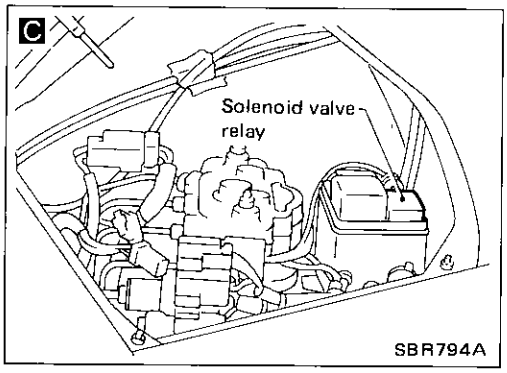
N.G. → Repair ground harness.

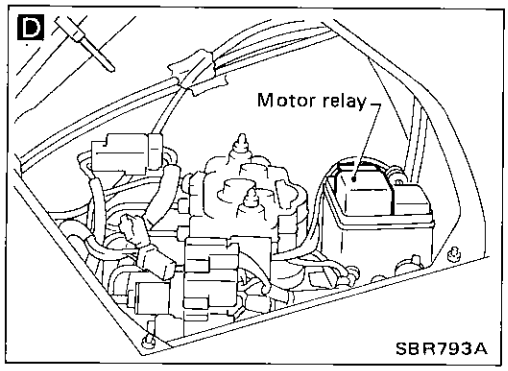
O.K. ↓

Replace control unit.




## Electrical Components Inspection

### ACTUATOR (Not self-diagnostic item)

INSPECTION START

A

Connect ABS checker to actuator connector and vehicle harness with battery terminal connected and all checker switches turned off.
Use harness for 3 channel.
Set channel select switch to 3 channel.

B

Turn checker main switch on. Check power supply indicator for coming on.

No → Replace battery with fully charged new one, if checker connection is correct.

Yes

B

Check checker valve relay indicator for coming on.

No → C Replace solenoid valve relay, if checker connection is correct.

Yes

B step Ⓐ

Select one valve — FL, FR or RR. (valves corresponding to each wheel position.)
Select brake circuit pressure decreasing position by switch then turn motor switch on.
Select pressure increasing position.

B

Check motor relay indicator for coming on while motor switch is turned on.

No → D Replace motor relay, if checker connection is correct.

Yes

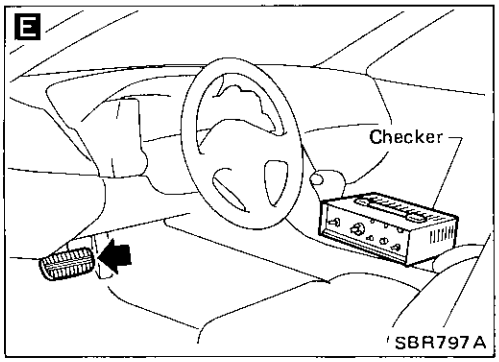
Check motor for operational sound beside the actuator in a quiet place.

No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.

Yes

Ⓑ

## Electrical Components Inspection (Cont'd)




E

Ⓑ

Bring checker in the vehicle and depress the brake pedal.

Check brake pedal for vibration when motor switch is turned on or while operating solenoid valve selecting switch with motor switch turned on.
N.G.: No vibration
O.K.: Vibration

N.G. → Replace actuator as assembly.

O.K.

Check brake pedal for depression when select pressure increases.

N.G. → Replace actuator as assembly.

O.K.

Have all wheel positions been checked?

No → Repeat from step Ⓐ.

Yes

Actuator works normally.

**CAUTION:**
**Do not set checker at pressure decrease position for more than 5 seconds at a time. Actuator solenoid valve may be damaged.**

## General Specifications

| Applied model | VG30DE | | VG30DETT |
|---|---|---|---|
| | Without ABS | With ABS | – |
| Front brake<br>Brake model | OPZ25VA | | |
| Cylinder bore diameter mm (in) | 40.45 (1.5925) x 4 | | |
| Pad length x width x thickness mm (in) | 116 x 50 x 10<br>(4.57 x 1.97 x 0.39) | | |
| Rotor outer diameter x thickness mm (in) | 280 x 30<br>(11.02 x 1.18) | | |
| Rear brake<br>Brake model | OPZ11VB | | |
| Cylinder bore diameter mm (in) | 38.1 (1.500) x 2 | | |
| Pad length x width x thickness mm (in) | 71.8 x 36.5 x 11.5<br>(2.827 x 1.437 x 0.453) | | |
| Rotor outer diameter x thickness mm (in) | 297 x 18<br>(11.69 x 0.71) | | |
| Master cylinder<br>Cylinder bore diameter mm (in) | 23.81<br>(15/16) | 25.40<br>(1) | |

| Applied model | VG30DE | | VG30DETT |
|---|---|---|---|
| | Without ABS | With ABS | – |
| Control valve<br>Valve model | Proportioning valve<br>(within master cylinder) | | |
| Split point x reducing ratio<br>kPa (kg/cm², psi) | 3,432<br>(35, 498)<br>x 0.4 | 2,452<br>(25, 356)<br>x 0.4 | |
| Brake booster<br>Booster model | M215T | | |
| Diaphragm diameter mm (in) | Primary: 230 (9.06)<br>Secondary: 205 (8.07) | | |
| Brake fluid<br>Recommended brake fluid | DOT 3 | | |
| Parking drum brake<br>Brake model | DS17HD | | |
| Lining<br>Width x thickness x length mm (in) | 154.1 x 25.0 x 3.0<br>(6.07 x 0.984 x 0.118) | | |
| Drum inner diameter mm (in) | 172.0 (6.77) | | |

## Inspection and Adjustment

### DISC BRAKE

Unit: mm (in)

| | Front | Rear |
|---|---|---|
| Pad wear limit<br>Minimum thickness | 2.0 (0.079) | |
| Rotor repair limit<br>Minimum thickness | 28.0 (1.102) | 16.0 (0.630) |

### PARKING DRUM BRAKE

Unit: mm (in)

| | |
|---|---|
| Lining replacement limit<br>Minimum thickness | 1.5 (0.059) |
| Drum repair limit<br>Maximum inner diameter | 173.0 (6.81) |

### BRAKE PEDAL

Unit: mm (in)

| Applied model | M/T | A/T |
|---|---|---|
| Free height | 186 - 196<br>(7.32 - 7.72) | 195 - 205<br>(7.68 - 8.07) |
| Depressed height<br>[under force of 490 N (50 kg, 110 lb) with engine running] | | |
| With ABS | 100 (3.94) | 105 (4.13) |
| Without ABS | 95 (3.74) | 105 (4.13) |
| Clearance between pedal stopper and threaded end of switches | 0.3 - 1.0 (0.012 - 0.039) | |
| Pedal free play at clevis | 1 - 3 (0.04 - 0.12) | |

### PARKING BRAKE

| | |
|---|---|
| Number of notches [under force of 196 N (20 kg, 44 lb)] | 6 - 7 |
| Number of notches (when warning switch comes on) | 1 |

# STEERING SYSTEM

# SECTION ST

## CONTENTS


PRECAUTIONS AND PREPARATION ..... ST- 2
ON-VEHICLE SERVICE ..... ST- 4
STEERING WHEEL AND STEERING COLUMN ..... ST- 9
POWER STEERING GEAR AND LINKAGE (Model PR26SE) ..... ST-13
POWER STEERING OIL PUMP ..... ST-25
TWIN ORIFICE POWER STEERING SYSTEM ..... ST-28
TWIN ORIFICE POWER STEERING SYSTEM — Trouble Diagnoses ..... ST-30
SUPER HICAS SYSTEM ..... ST-41
SUPER HICAS SYSTEM — On-vehicle Service ..... ST-42
SUPER HICAS SYSTEM — Repair of Component Parts ..... ST-46
SUPER HICAS SYSTEM — Trouble Diagnoses ..... ST-57
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... ST-89

## Precautions

### SUPPLEMENTAL RESTRAINT SYSTEM "AIR BAG"

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

**WARNING:**

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

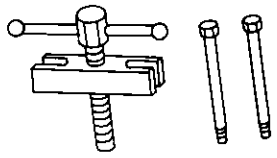
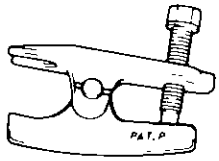
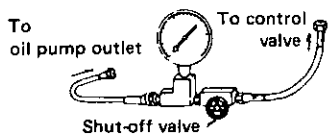
### STEERING SYSTEM

- **Before disassembly, thoroughly clean the outside of the unit.**
- **Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.**
- **When disassembling parts, be sure to place them in order in a parts rack so they can be reinstalled in their proper positions.**
- **Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.**
- **Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.**
- **Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.**
- **Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.**

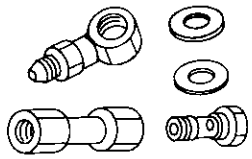
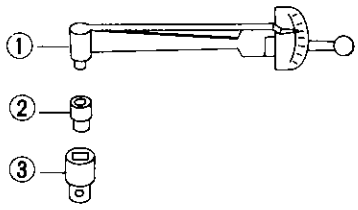
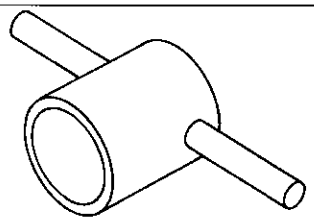
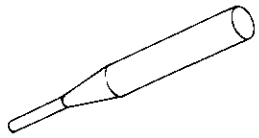
*: **Automatic transmission fluid**

## Preparation

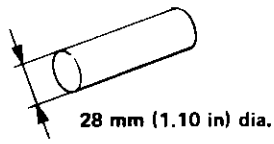
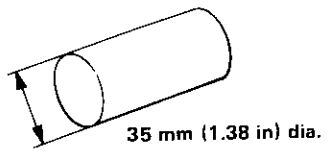
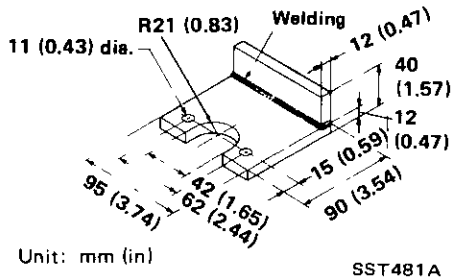
### SPECIAL SERVICE TOOLS

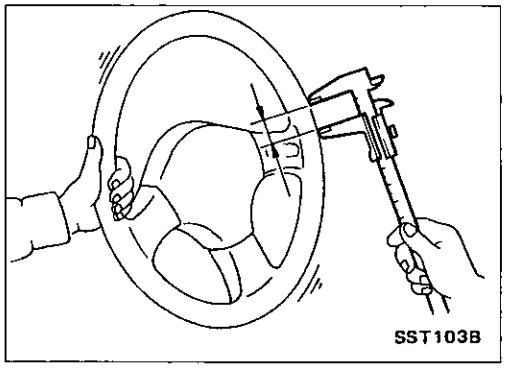
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| KV48100700<br>(J26364)<br>Torque adapter | | Measuring pinion rotating torque |
| ST27180001<br>(J25726-A)<br>Steering wheel puller |  | Removing steering wheel |
| HT72750000<br>(J24319-01)<br>Ball joint remover |  | Removing ball joint |
| ST27091000<br>(J26357)<br>Pressure gauge |  | Measuring oil pressure |

## Preparation (Cont'd)

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| KV48102500<br>( — )<br>Pressure gauge adapter |  | Measuring oil pressure |
| ST3127S000<br>(See J25765-A)<br>① GG91030000<br>(J25765-A)<br>Torque wrench<br>② HT6294000<br>( — )<br>Socket adapter<br>③ HT62900000<br>( — )<br>Socket adapter |  | Measuring turning torque |
| KV48104400<br>( — )<br>Rack seal ring reformer |  | Reforming teflon ring |
| KV32101100<br>( — )<br>Pin punch |  | Removing and installing tube seat |

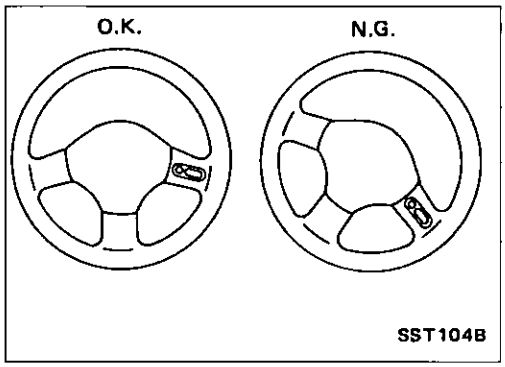
## COMMERCIAL SERVICE TOOLS

| Tool name | Description | |
|---|---|---|
| Rear oil seal drift |  | Installing rear oil seal |
| Pinion oil seal drift |  | Installing pinion oil seal |
| Oil pump attachment |  | Disassembling and assembling oil pump |




## Checking Steering Wheel Play

- With wheels in a straight-ahead position, check steering wheel play.
  **Steering wheel play:**
  **35 mm (1.38 in) or less**
- If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.



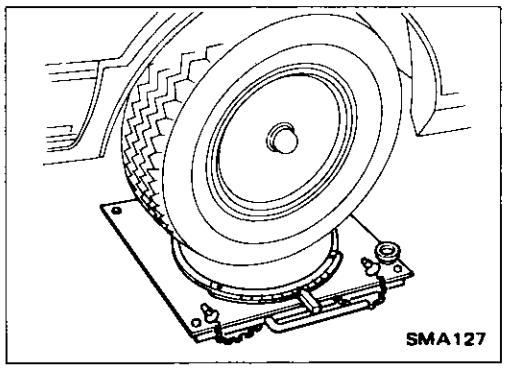

## Checking Neutral Position on Steering Wheel

### 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.

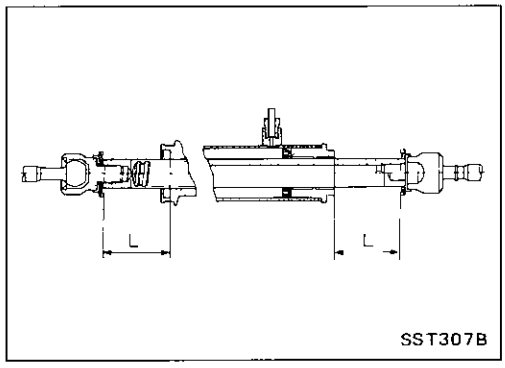
### Checking

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.

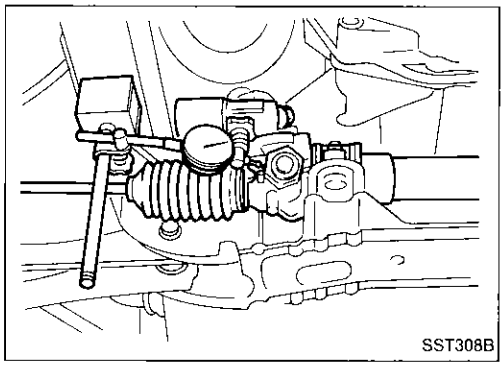



## Front Wheel Turning Angle

1. Rotate steering wheel all the way right and left; measure turning angle.
   **Turning angle of full turns:**
   **Refer to section FA for S.D.S.**

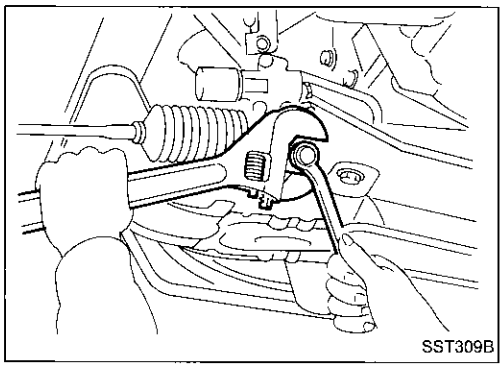



2. If it is not within specification, check rack stroke.
   **Rack stroke "L":**
   **Refer to S.D.S.**


SST308B

## Checking Gear Housing Movement

1. Check the movement of steering gear housing during stationary steering on a dry paved surface.
- Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.
  Turn off ignition key while checking.
  **Movement of gear housing:**
  **±2 mm (±0.08 in) or less**
2. If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.

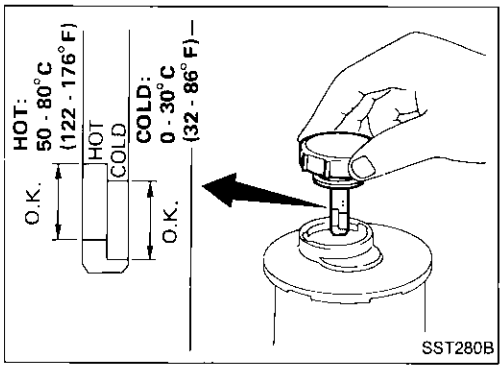

SST309B

## Adjusting Rack Retainer

- Perform this driving test on a flat road.
1. Check whether vehicle moves in a straight line when steering wheel is released.
2. Check whether steering wheel returns to neutral position when steering wheel is released from a slightly turned (approx. 20°) position.
- If any abnormality is found, correct it by resetting adjusting screw.

## Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.

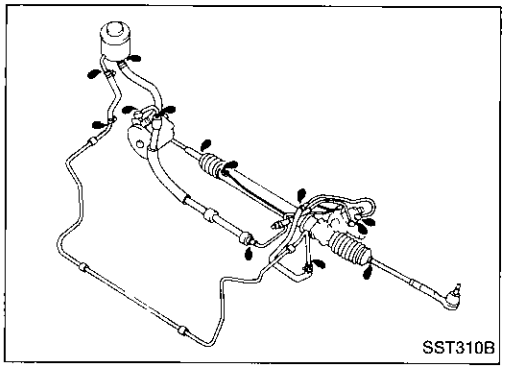


SST280B

## Checking Fluid Level

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

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




## 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.

**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.**

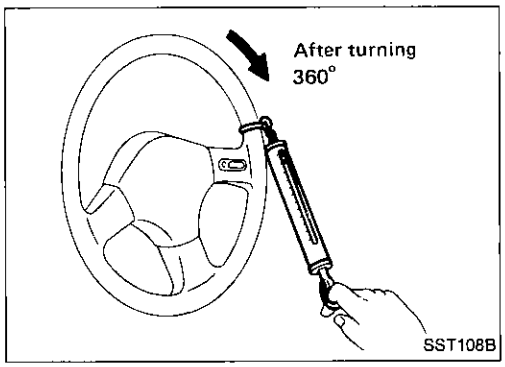
## Bleeding Hydraulic System

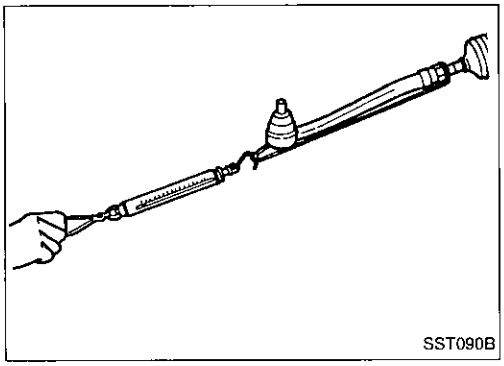
1. Raise front end of vehicle until wheels clear ground.
2. Add fluid into oil tank to specified level. Meanwhile, quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   Repeat step 2 above.

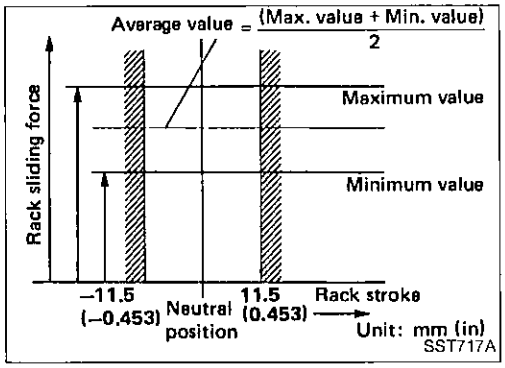
- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

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.




## Checking Steering Wheel Turning Force

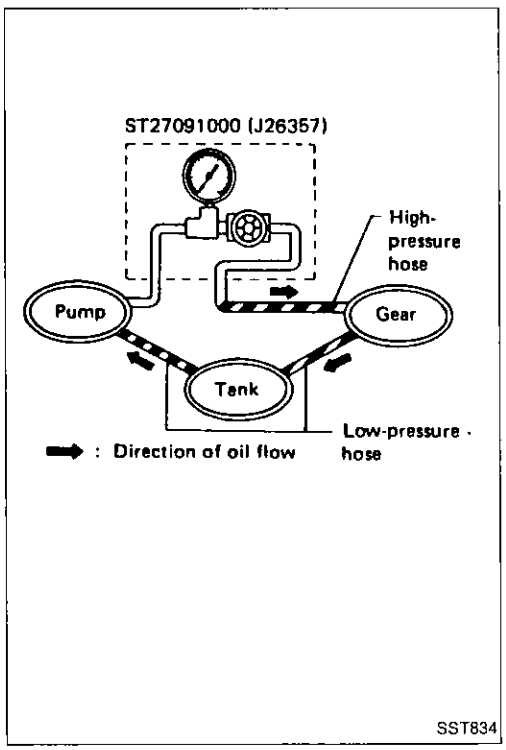
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

**Tires need to be inflated to normal pressure.**

4. Check steering wheel turning force when steering wheel has been turned 360° from the neutral position.
   **Steering wheel turning force:**
   **39 N (4 kg, 9 lb) or less**
5. If steering wheel turning force is out of specifications, check rack sliding force to detect condition of steering gear assembly.

a. Disconnect steering column lower joint and knuckle arms from the gear.
b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
c. While pulling tie-rod slowly in the ±11.5 mm (±0.453 in) range from the neutral position, make sure rack sliding force is within specification.
   **Average rack sliding force:**
   **Without HICAS**
   **206 - 265 N (21 - 27 kg, 46 - 60 lb)**
   **With HICAS**
   **201.0 - 250.1 N (20.5 - 25.5 kg, 45.2 - 26.2 lb)**
d. Check sliding force outside above range.
   **Maximum rack sliding force:**
   **Not more than 39 N (4 kg, 9 lb) beyond above value**

6. If rack sliding force is not within specification, overhaul steering gear assembly.




## Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.

**Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).**

**WARNING:**

**Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.**

3. Check pressure with steering wheel fully turned to left and right positions with engine idling at 1,000 rpm.

**CAUTION:**

**Do not hold the steering wheel in a locked position for more than 15 seconds.**

**Oil pump maximum standard pressure:**
**7,649 - 8,238 kPa (78 - 84 kg/cm$^2$, 1,109 - 1,194 psi)**

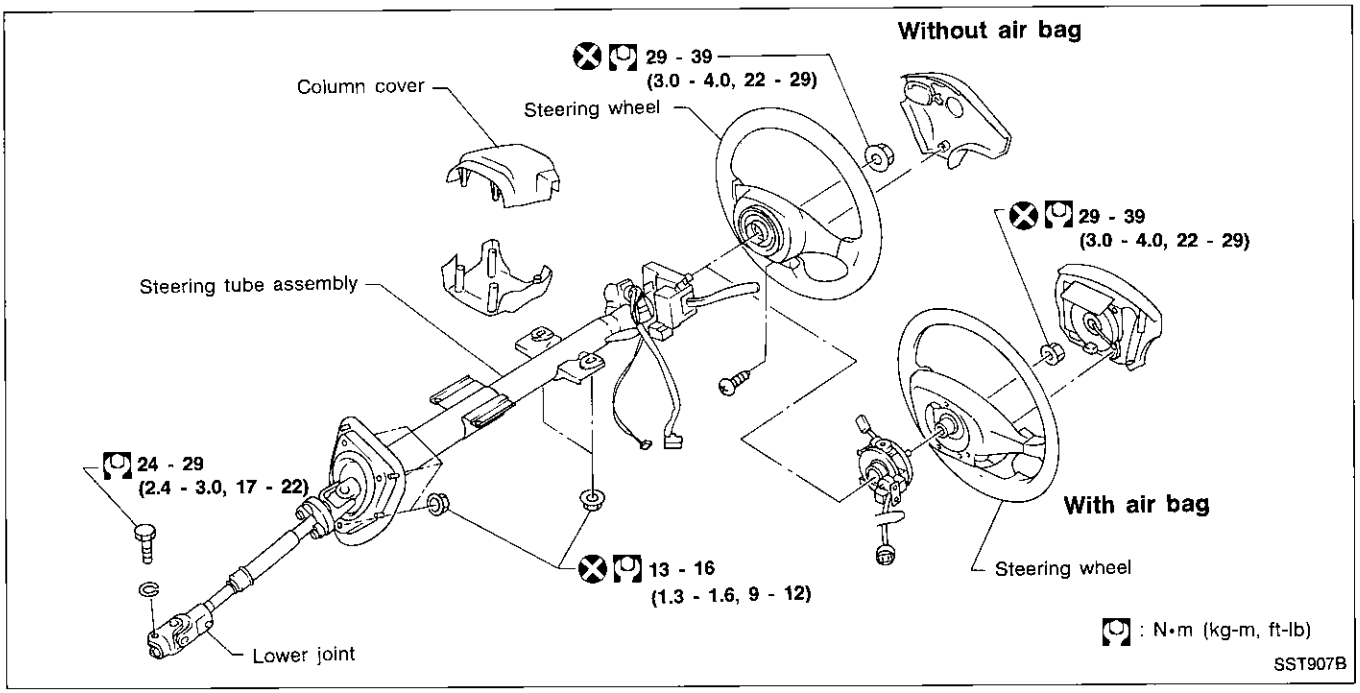
## Checking Hydraulic System (Cont'd)

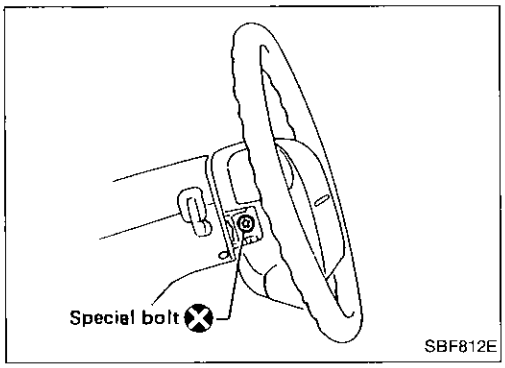
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.
- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

**CAUTION:**

**Do not close shut-off valve for more than 15 seconds.**

5. If oil pressure is higher than standard pressure, check oil pump flow control valve.
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

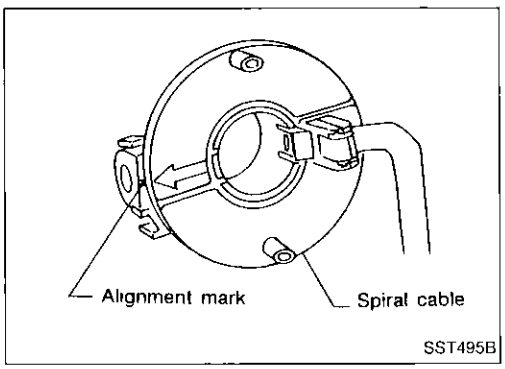



## Removal

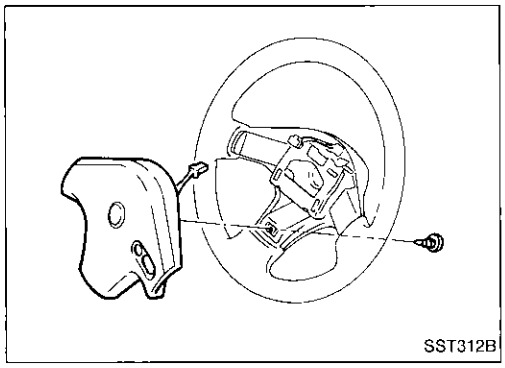
### STEERING WHEEL (With air bag)

- Remove screws from both sides of steering wheel and pull out horn pad. Refer to section BF for Air Bag Module and Spiral Cable Removal.



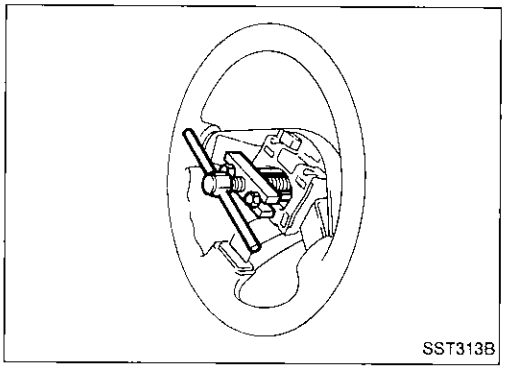

- Align spiral cable correctly when installing steering wheel.

### STEERING WHEEL (Without air bag)

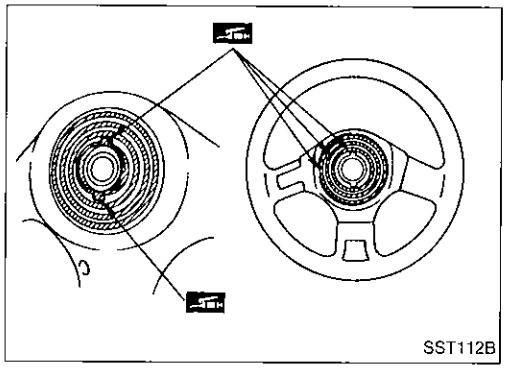



- Remove screw from rear of steering wheel and pull out horn pad.

## Removal (Cont'd)


SST313B

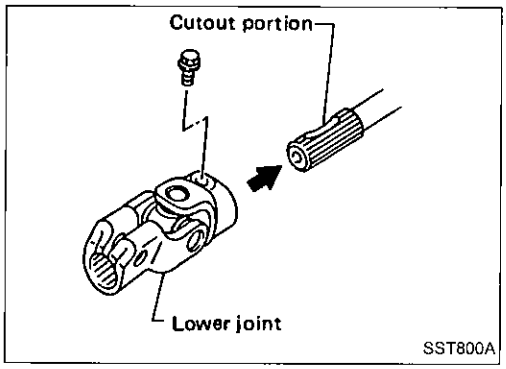
- Remove steering wheel with Tool.


SST112B

## Installation

### STEERING WHEEL

**When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.**



SST800A

### STEERING COLUMN

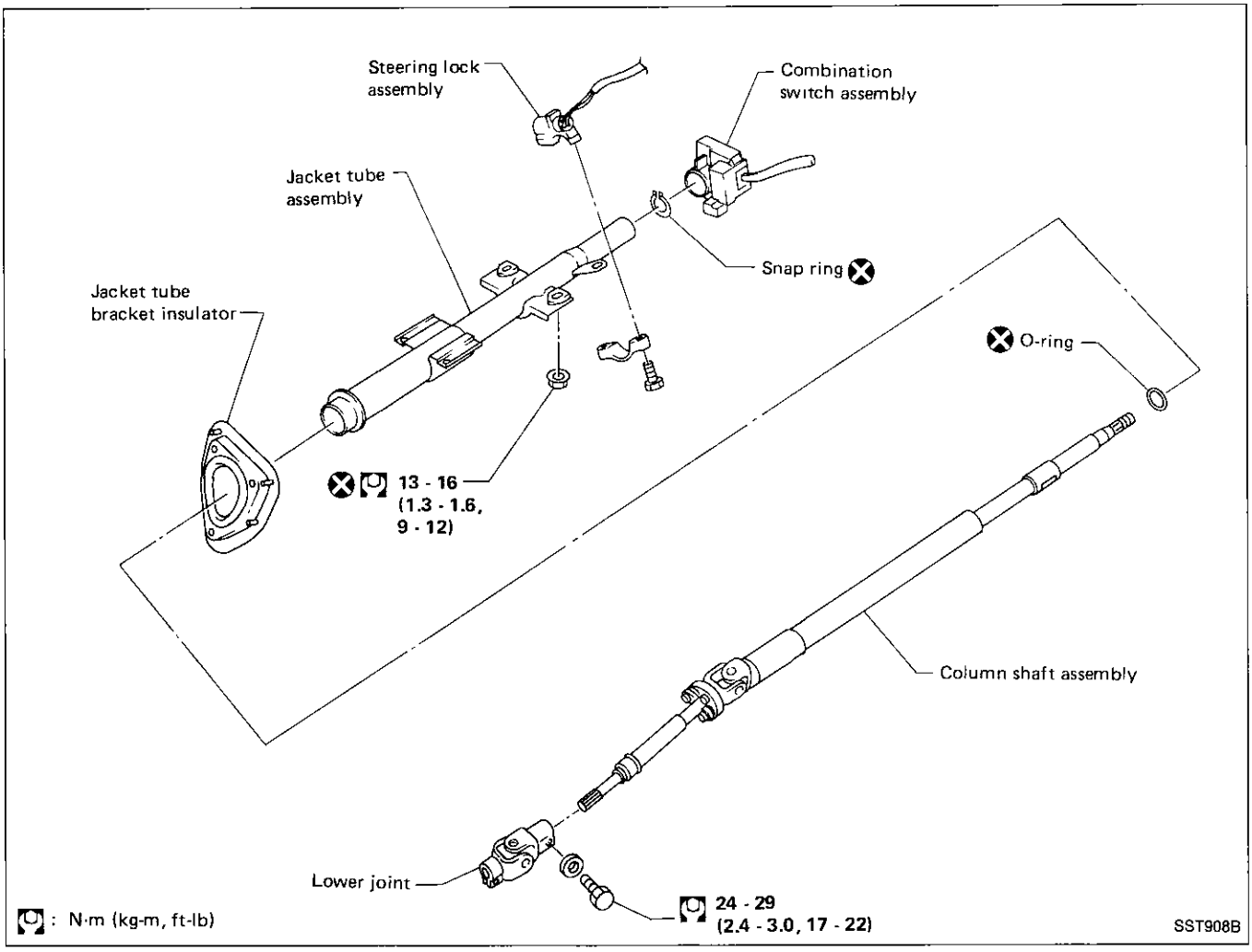
- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching coupling joint, be sure tightening bolt faces cutout portion.

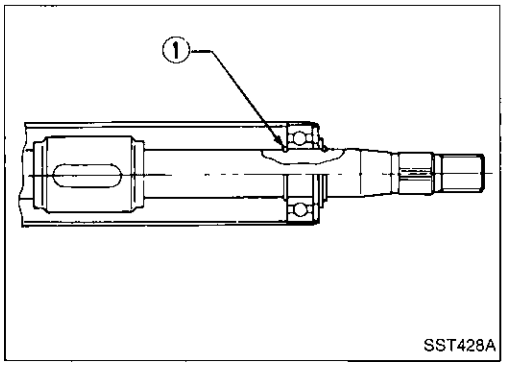
**CAUTION:**

**After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.**

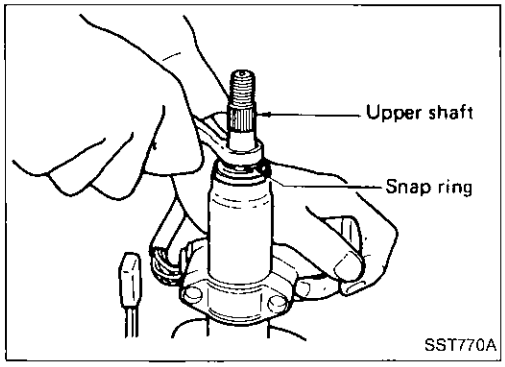
**Be sure that the steering wheel is in a neutral position when driving straight ahead.**

## Disassembly and Assembly



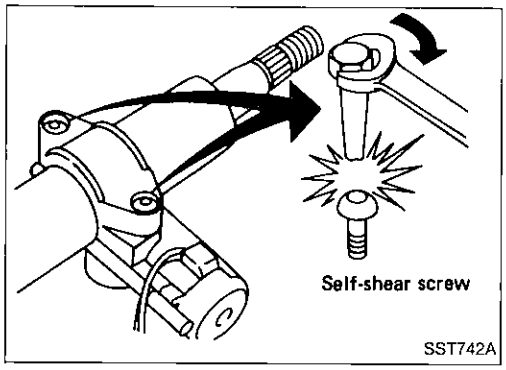




- When disassembling and assembling, unlock steering lock with key.
- Install O-ring ① before inserting shaft into jacket tube. Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.




- Install snap ring on upper shaft with box wrench.

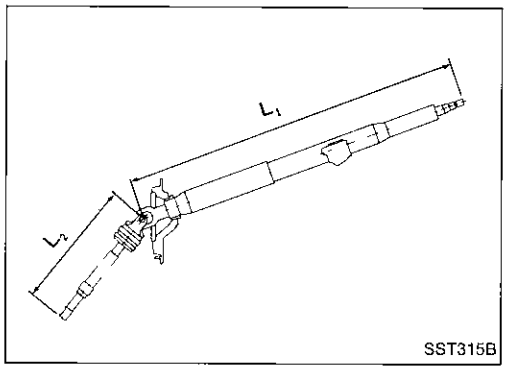
## Disassembly and Assembly (Cont'd)




- Steering lock

a) Break self-shear type screws with a drill or other appropriate tool.

b) Install self-shear type screws and then cut off self-shear type screw heads.




## Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

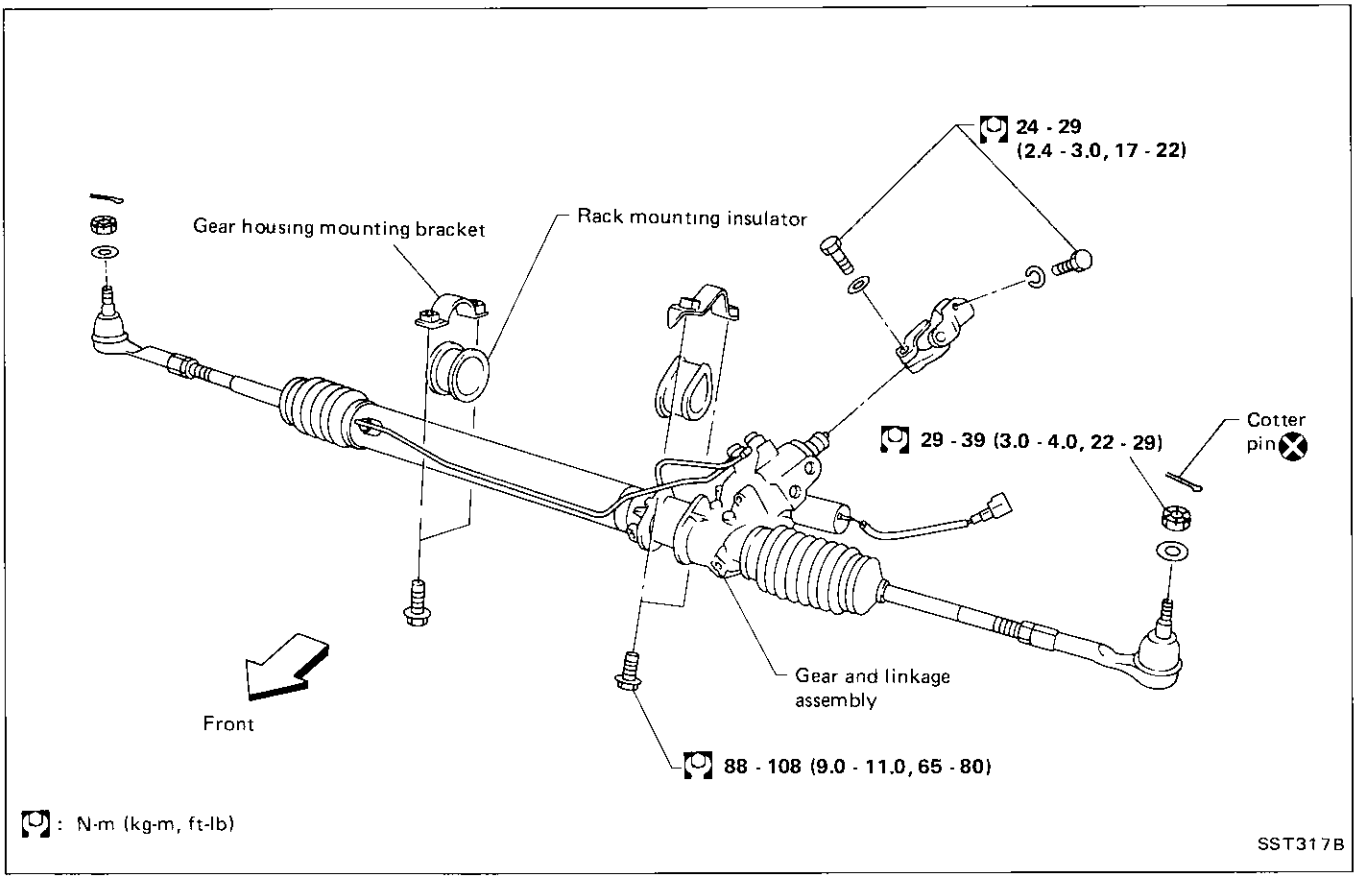
a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

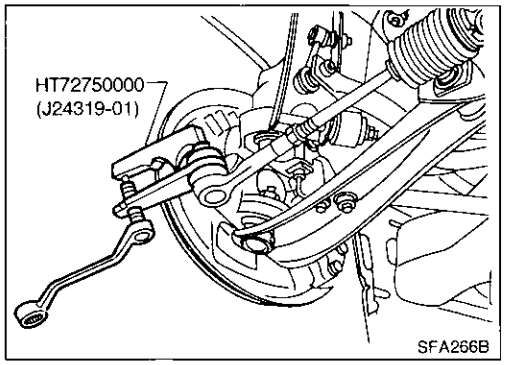
b. Check steering column lower shaft for deformation or breakage. Replace if necessary.

- When the vehicle is involved in a light collision, check steering column length "$L_1$" and steering column lower shaft length "$L_2$". If it is not within specifications, replace steering column as an assembly.

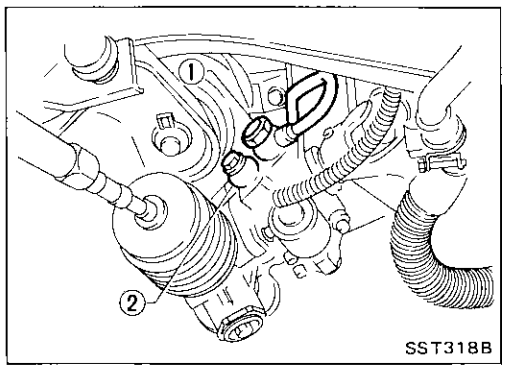
**Steering column length "$L_1$":**
**Without air bag**
**745.9 - 747.5 mm (29.37 - 29.43 in)**
**With air bag**
**749.4 - 751.0 mm (29.50 - 29.57 in)**
**Steering column lower shaft length "$L_2$":**
**280.6 - 282.2 mm (11.05 - 11.11 in)**

## Removal and Installation



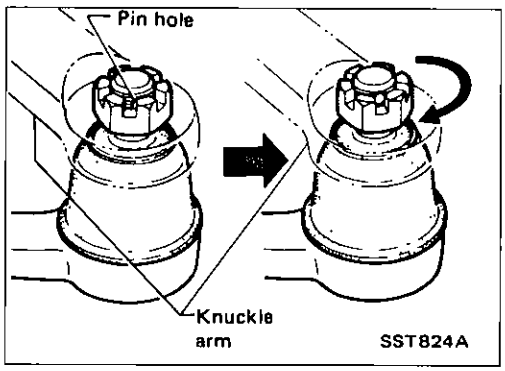

- Detach tie-rod outer sockets from knuckle arms with Tool.




- Install pipe connector.
  - ① Low-pressure side
    **: 36 - 40 N·m (3.7 - 4.1 kg-m, 27 - 30 ft-lb)**
  - ② High-pressure side
    **: 30 - 35 N·m (3.1 - 3.6 kg-m, 22 - 26 ft-lb)**

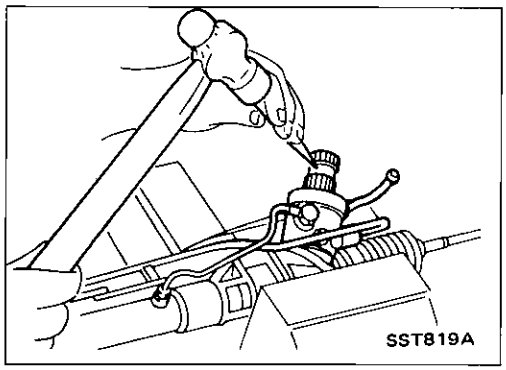
## Removal and Installation (Cont'd)

- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.



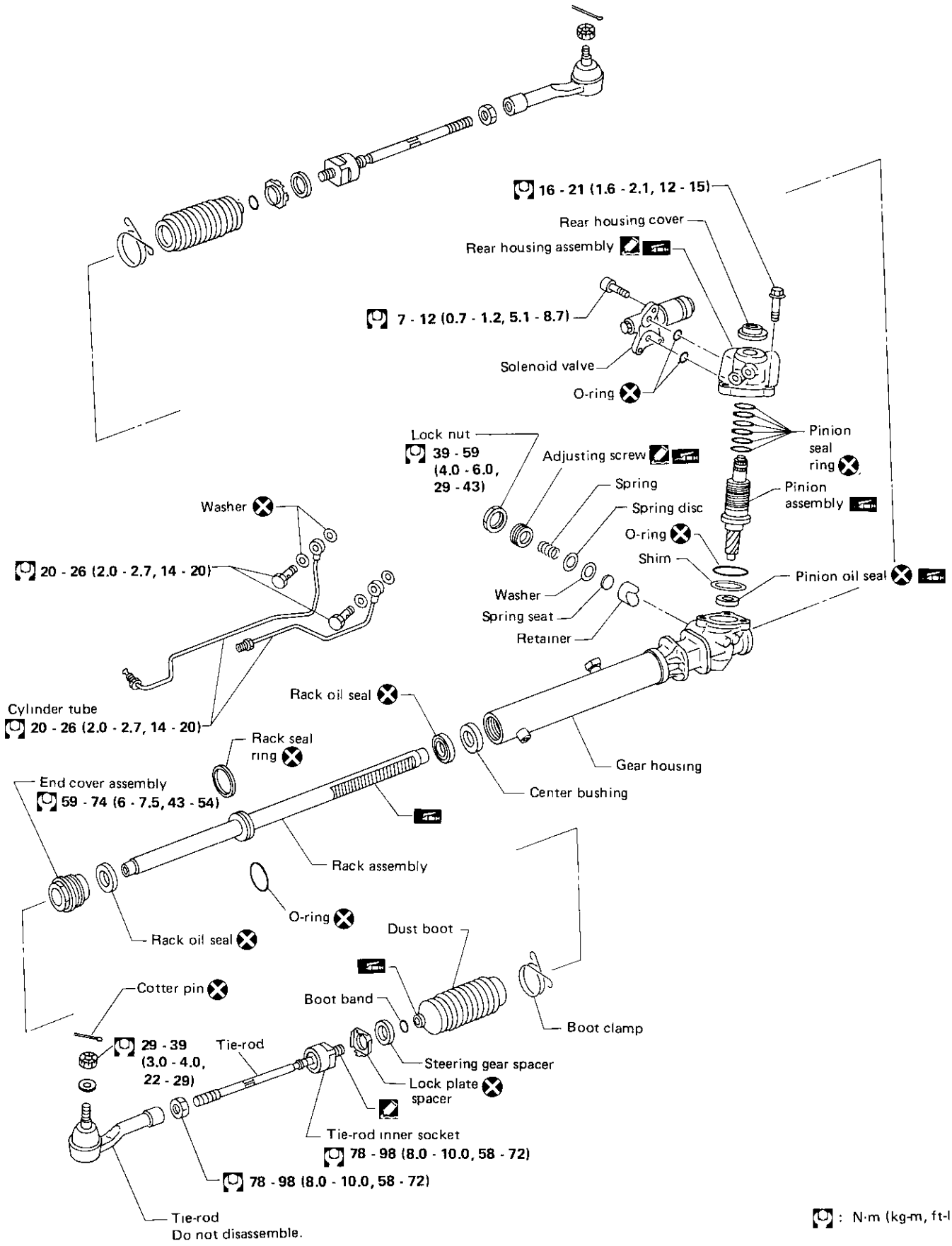

- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

**CAUTION:**
**Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).**



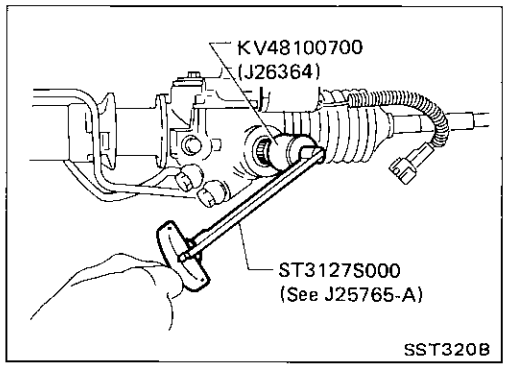

- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matchmarks on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matchmarks of pinion shaft and pinion housing.

# POWER STEERING GEAR AND LINKAGE (Model PR26SE)




: N·m (kg-m, ft-lb)

SST319B



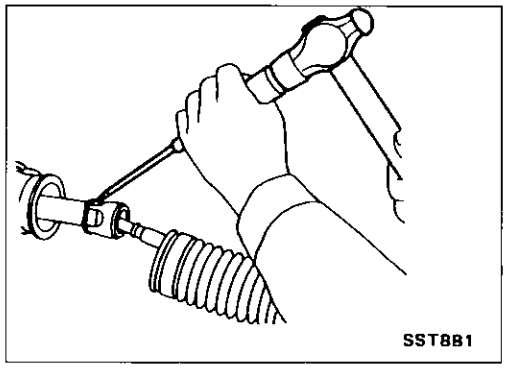

## Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

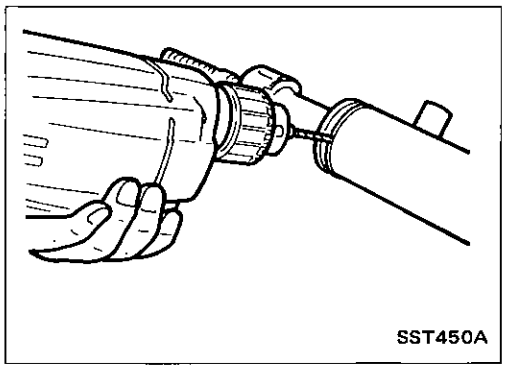
- **Before measuring, disconnect cylinder tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.**

2. Remove pinion gear.

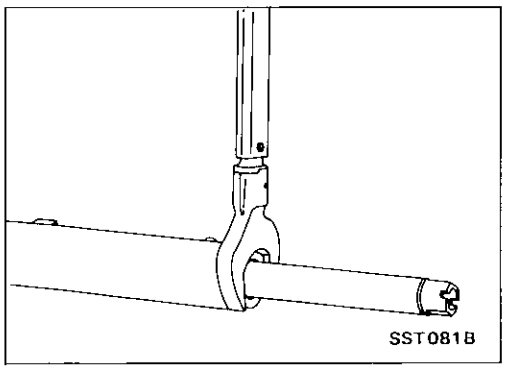
- **Be careful not to damage pinion gear when removing pinion seal ring.**



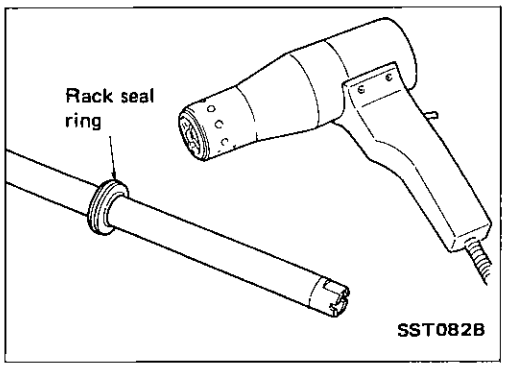

3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.




7. Drill staked portion of cylinder end cover with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.




8. Remove gear housing end cover assembly with Tool.
9. Draw out rack assembly.

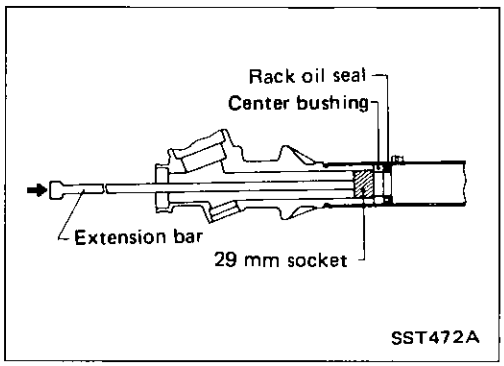



10. Remove rack seal ring.

- Using a heat gun, heat rack seal to approximately 40°C (104°F).
- Remove rack seal ring.
- Replace rack seal ring and O-ring with new ones.

**Be careful not to damage rack.**

## Disassembly (Cont'd)




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

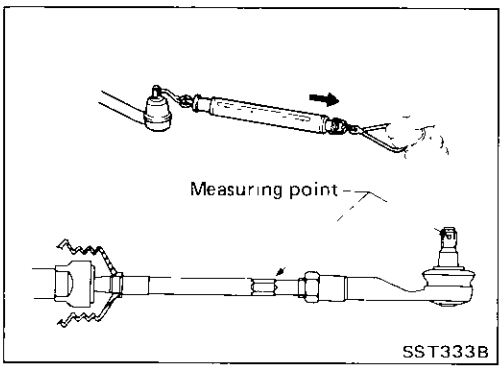
Check condition of boot. If cracked excessively, replace it.

### RACK

Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

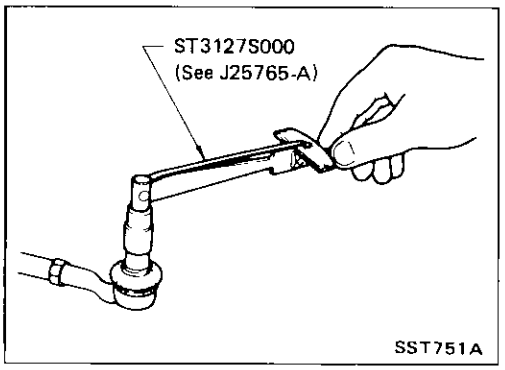
### PINION ASSEMBLY

- 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.



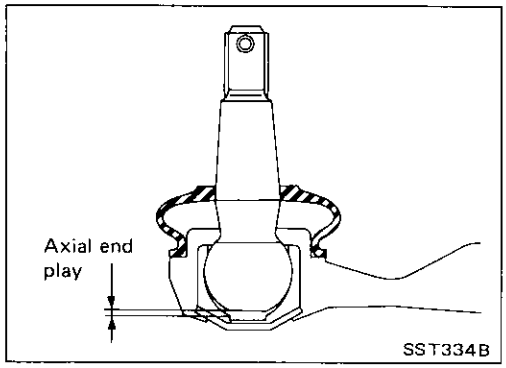

### TIE-ROD OUTER AND INNER SOCKET

- Check ball joint for swinging force.
  **Tie-rod outer ball joint:**
  **4.61 - 46.1 N**
  **(0.47 - 4.7 kg, 1.04 - 10.4 lb)**
  **Tie-rod inner ball joint:**
  **8.8 - 78.5 N**
  **(0.9 - 8.0 kg, 2.0 - 17.6 lb)**




- Check ball joint for rotating torque.
  **Tie-rod outer ball joint:**
  **0.29 - 2.94 N·m**
  **(3.0 - 30.0 kg-cm, 2.6 - 26.0 in-lb)**
  **Tie-rod inner ball joint:**
  **1.0 - 8.8 N·m (10 - 90 kg-cm, 8.7 - 78.1 in-lb)**

## Inspection (Cont'd)

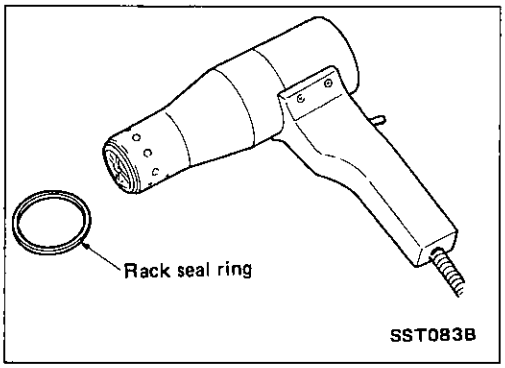



- Check ball joint for axial end play.
  **Tie-rod outer ball joint:**
  **0 mm (0 in)**
  **Tie-rod inner ball joint:**
  **0 mm (0 in)**
- Check condition of dust cover. If cracked excessively, replace it.

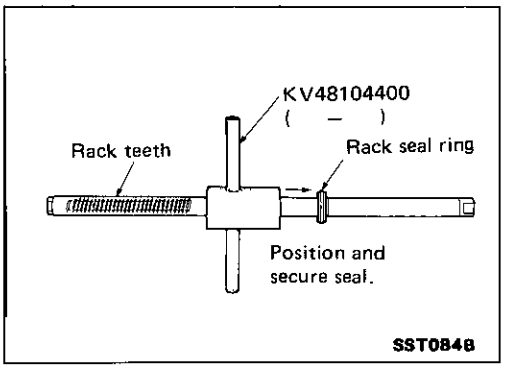
### CYLINDER TUBES

Check cylinder tubes for scratches or other damage. Replace if necessary.

## Assembly

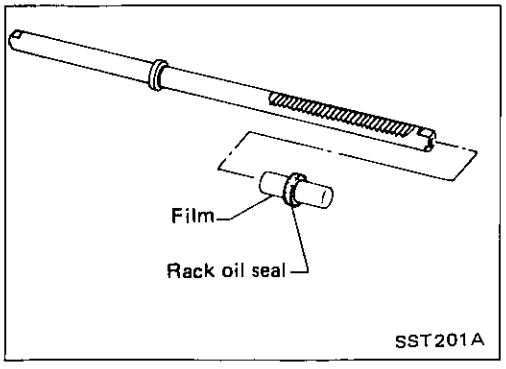



1. Using a heat gun, heat rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.




- Using Tool, compress periphery of rack seal ring (made of Teflon) to position and secure it on rack.

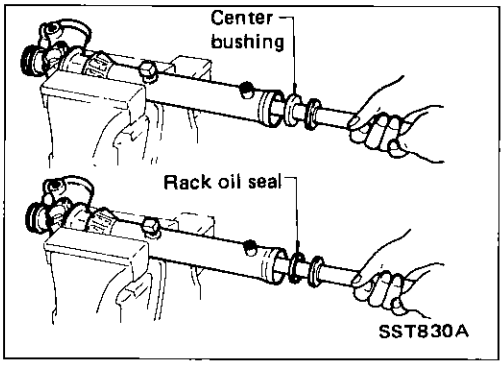
**Always insert the tool from the rack gear side.**



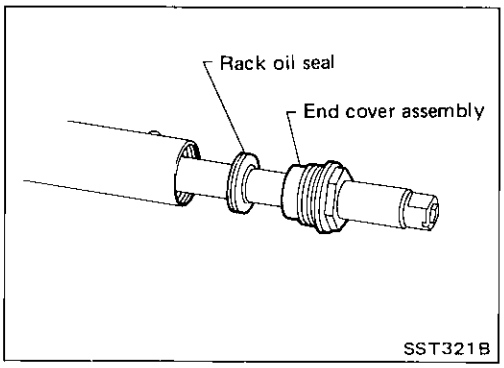

2. Insert rack oil seal.

- **Place plastic film into rack oil seal to prevent damage by rack teeth.**
- **Always remove plastic film after rack oil seal is positioned properly.**
- **Make sure lips of rack oil seal face each other.**

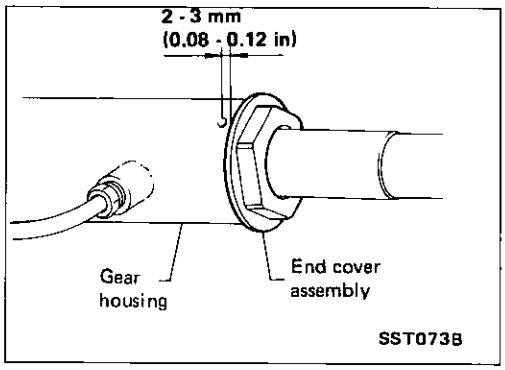
## Assembly (Cont'd)



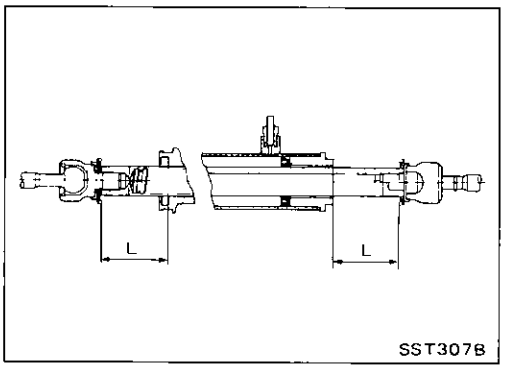

3. Install center bushing and rack oil seal with rack assembly.



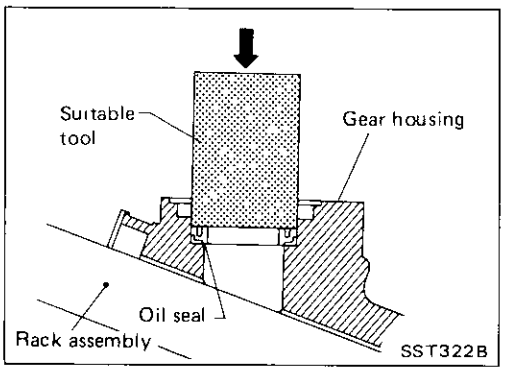

4. Insert rack oil seal and end cover assembly to rack then tighten end cover assembly.




5. Fasten cylinder end cover assembly to gear housing by staking.

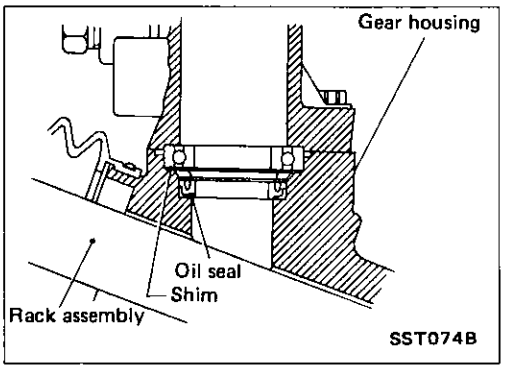



6. Set rack gear in neutral position.
   **Rack stroke "L":**
   **Refer to S.D.S.**

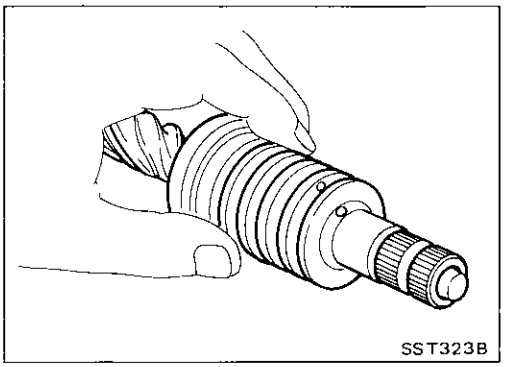



7. Coat seal lip of oil seal with multi-purpose grease and install new pinion oil seal to pinion housing with a suitable tool.
   - Make sure lip of oil seal faces up when installed.

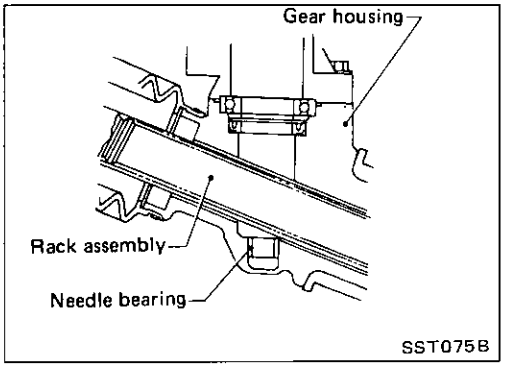
## Assembly (Cont'd)



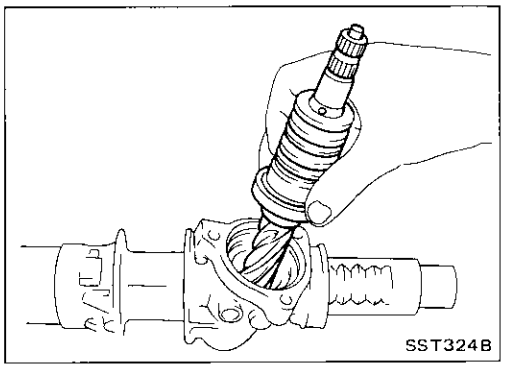

8. Install pinion bearing adjusting shim(s).
- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.




9. Install pinion seal ring on pinion gear assembly.
- Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
- Make sure pinion seal ring is properly settled in valve groove.

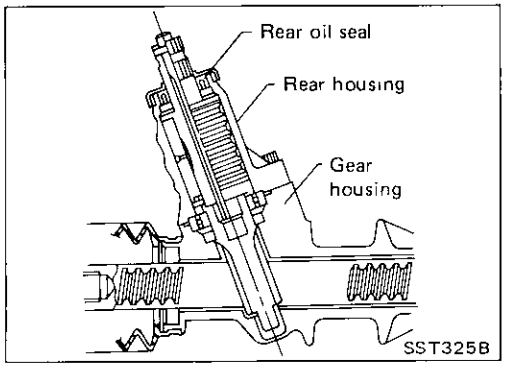



10. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



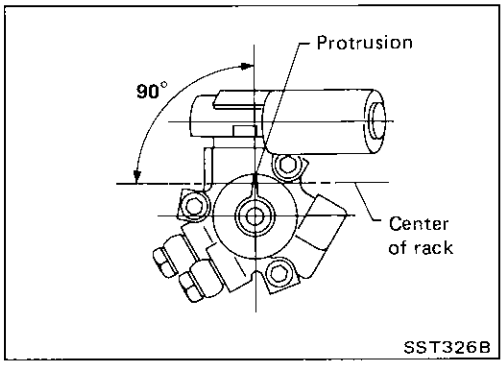

11. Install pinion assembly to pinion housing.

**Be careful not to damage pinion oil seal.**



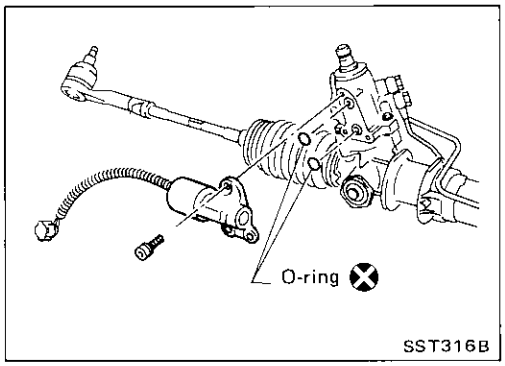

12. Apply a coat of multi-purpose grease to rear oil seal lip before installing rear housing.

## Assembly (Cont'd)

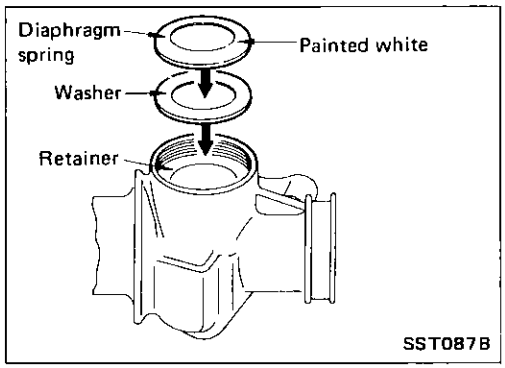



13. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left.

**Be careful not to damage worm ring and oil seal.**

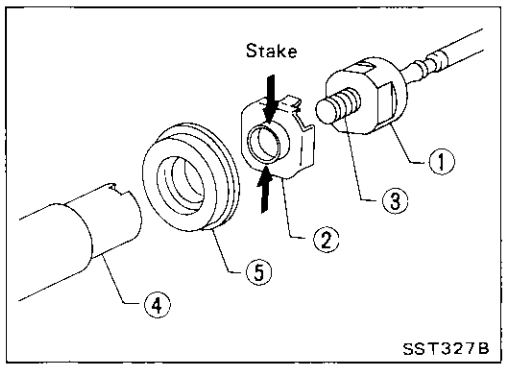



14. Install solenoid valve.



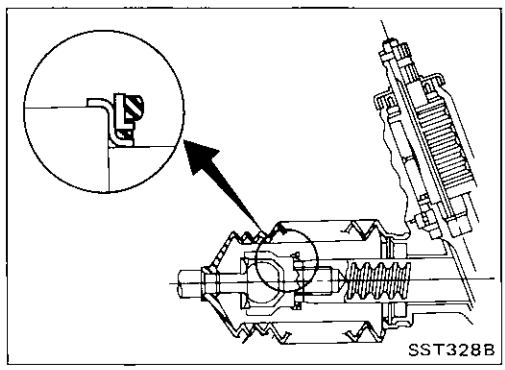

15. Install diaphragm spring at retainer.
- Always install retainer, spring washer and diaphragm spring in that order.
- Make sure convex end (painted white) of diaphragm spring faces outward when installing.

16. Install retainer spring and adjusting screw temporarily.



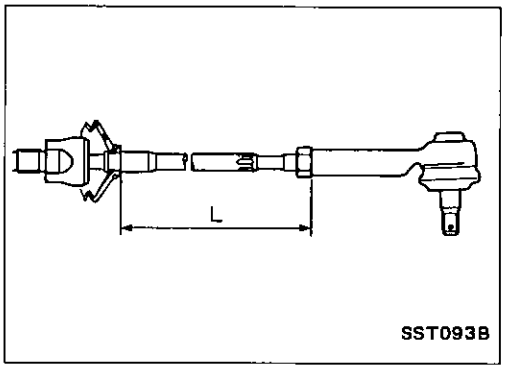

**CAUTION:**
**Ensure steering gear spacer is installed with rubber side facing rack.**

- Attach lock plate ② to side rod inner socket ①.
- Insert steering gear spacer ⑤ to rack ④.
- Apply locking sealant to inner socket threads ③. Screw inner socket into rack ④ and tighten to specified torque.
- Stake lock plate at two places.

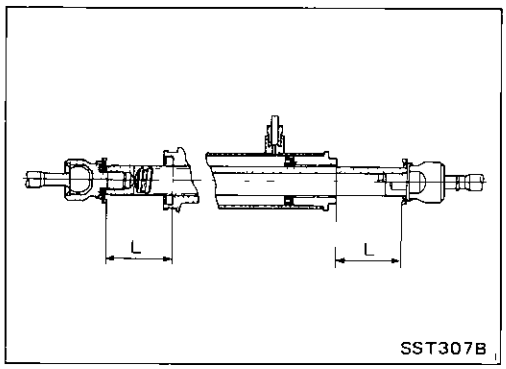



17. Install steering gear spacer ⑤ to lock plate ②.

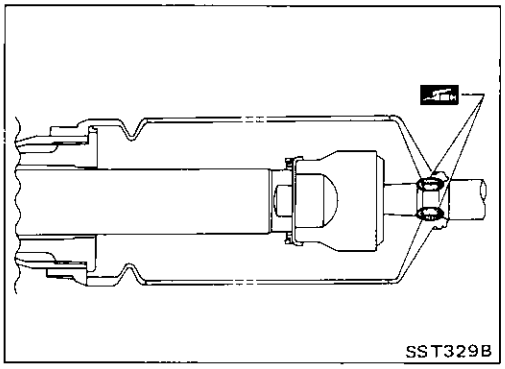
## Assembly (Cont'd)



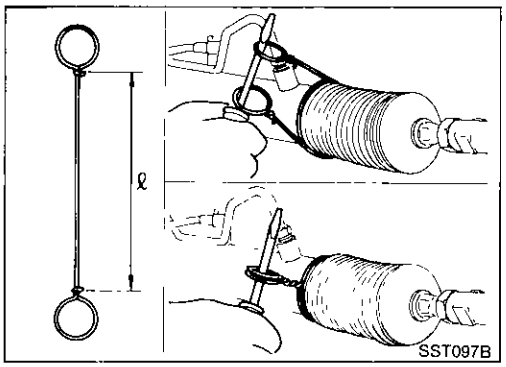

18. Tighten outer socket lock nut.
    **Tie-rod length "L":**
    **Refer to S.D.S.**



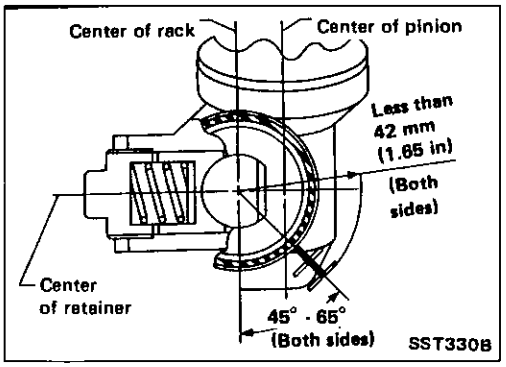

19. Measure rack stroke.
    **Rack stroke "L":**
    **Refer to S.D.S.**




20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

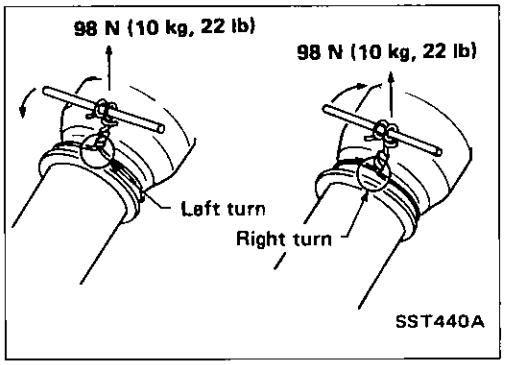



21. Install boot clamps.
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).

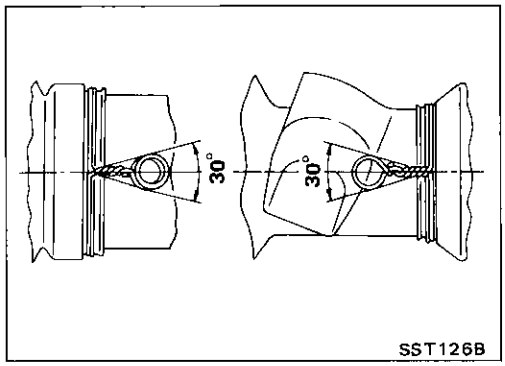



- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will prevent interference with other parts.)

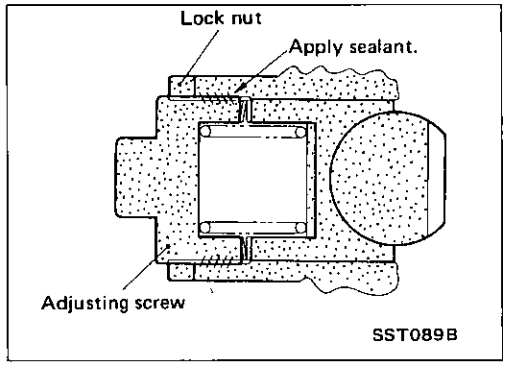
## Assembly (Cont'd)




- Twist boot clamp in the direction shown in figure at left.



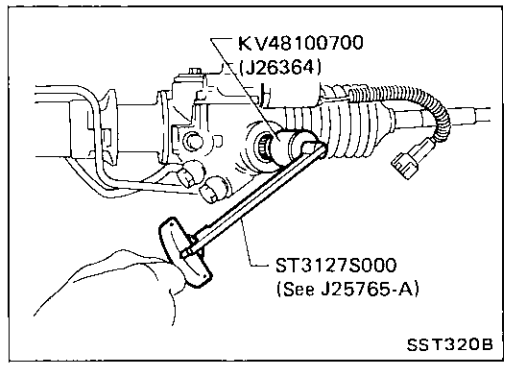

- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.

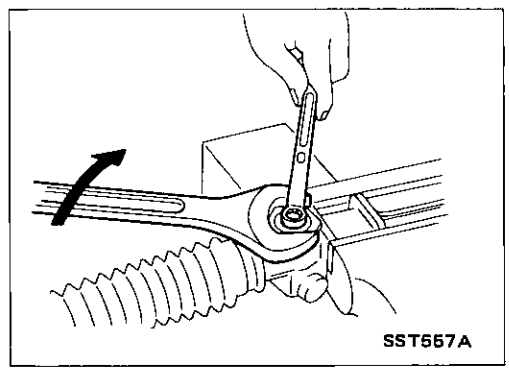



## Adjustment

Adjust pinion rotating torque as follows:

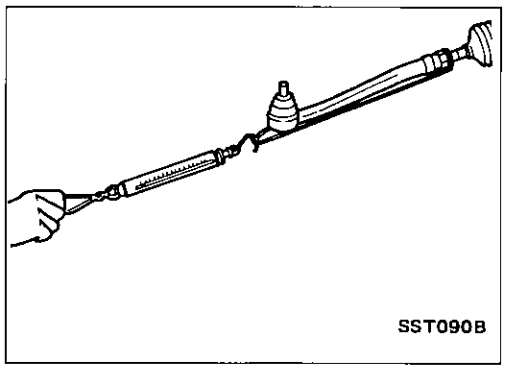
1. Set gears to Neutral without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.05 to 0.20 N·m (0.5 to 2 kg-cm, 0.43 to 1.74 in-lb).
6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of 180° from neutral position.
   Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 N·m (50 kg-cm, 43 in-lb).
9. Loosen adjusting screw by 60° to 100°.



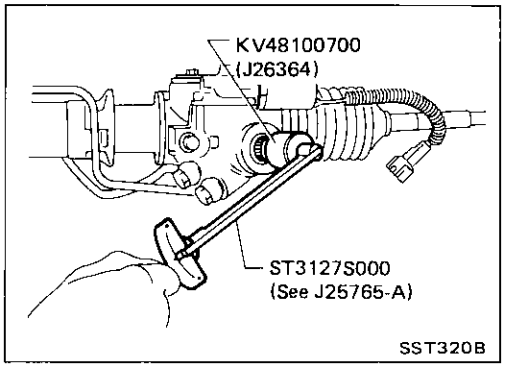




10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

## Adjustment (Cont'd)

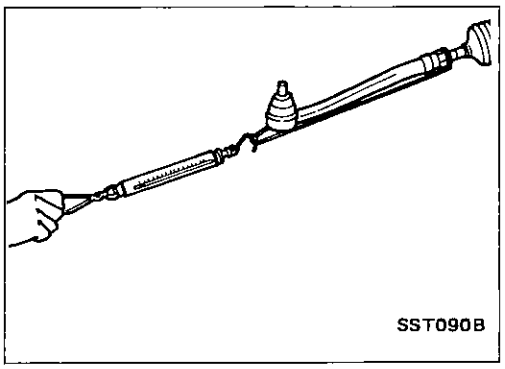

SST090B

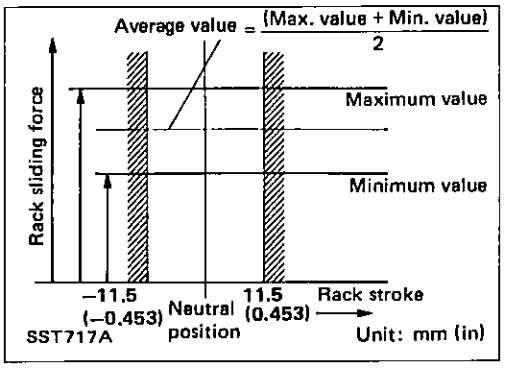
11. Check steering gear for rack sliding frictional force.
    **Around neutral point of rack stroke**
    **±5.5 mm (±0.217 in):**
    **122.6 - 166.7 N (12.5 - 17 kg, 27.6 - 37.5 lb)**
    **Except for neutral point:**
    **122.6 - 186.3 N (12.5 - 19 kg, 27.6 - 41.9 lb)**
- If sliding frictional force is out of specification, repeat the adjustment procedure, starting from No. 4.
- After the readjustment, if sliding force is still out of specification, steering gear is damaged.



SST320B

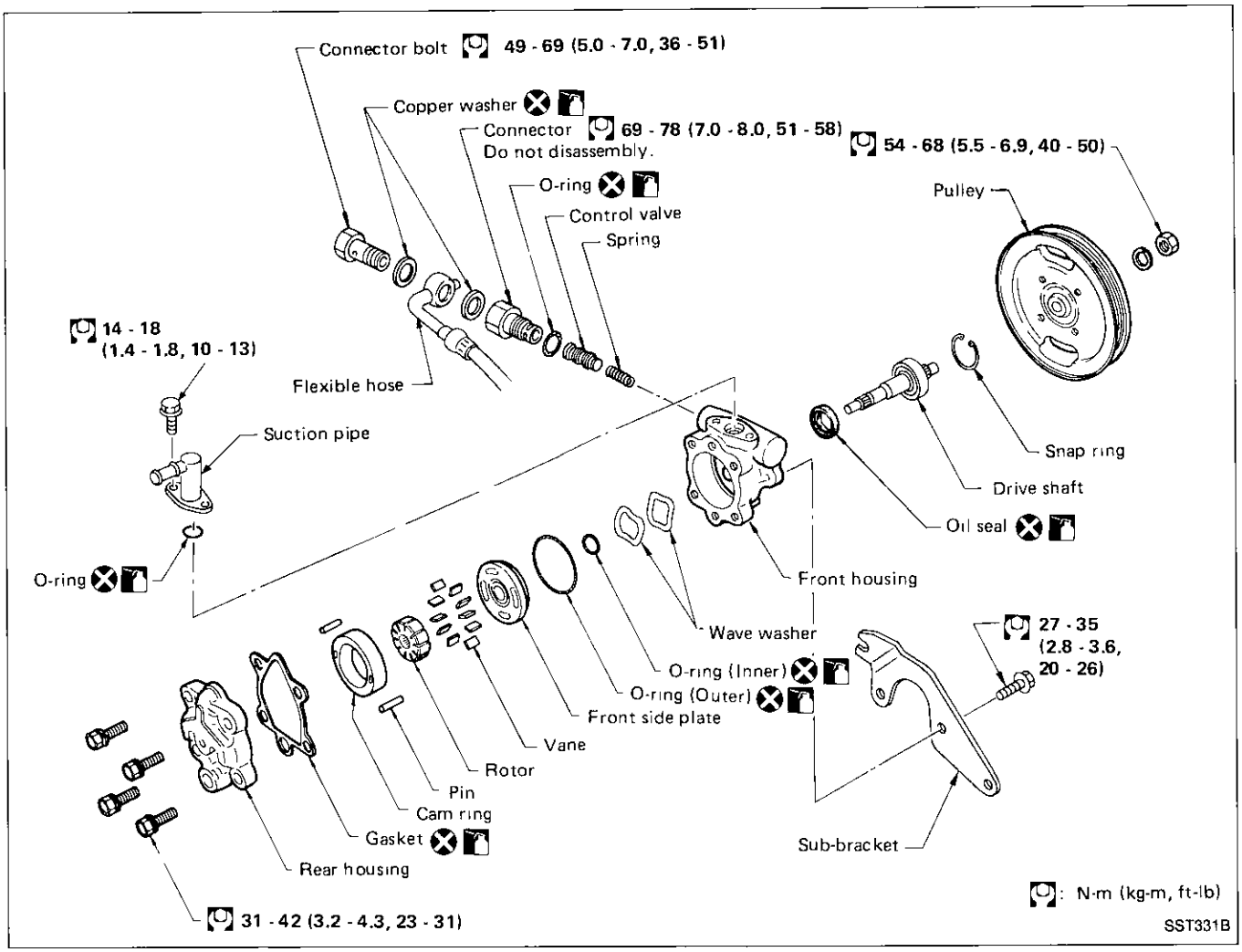
12. Measure pinion rotating torque within the range of ±100° from the neutral point.
    **Average rotating torque**
    **[(Max. measured value + Min. measured value) x 0.5]:**
    **0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)**
    **Maximum torque increment:**
    **Less than 0.4 N·m (4 kg-cm, 3.5 in-lb)**
    **Except for above mentioned measuring range:**
    **Maximum rotating torque**
    **1.9 N·m (19 kg-cm, 16 in-lb)**
    **Maximum torque increment**
    **Less than 0.6 N·m (6 kg-cm, 5.2 in-lb)**
- If pinion rotating torque is not within specification, readjust it.
- After the readjustment, if pinion rotating torque is still out of specification, steering gear is damaged.

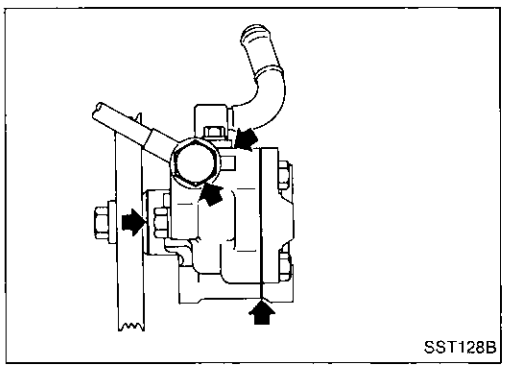

SST090B



SST717A

13. Check rack sliding force on vehicle as follows:
a. Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
b. Connect all piping and fill with steering fluid.
c. Start engine and bleed air completely.
d. Disconnect steering column lower joint from the gear.
e. Keep engine at idle and make sure steering fluid has reached normal operating temperature.
f. While pulling tie-rod slowly in the ±11.5 mm (±0.453 in) range from the neutral position, make sure rack sliding force is within specification.
    **Average rack sliding force:**
    **Without HICAS**
    **206 - 265 N (21 - 27 kg, 46 - 60 lb)**
    **With HICAS**
    **201.0 - 250.1 N (20.5 - 25.5 kg, 45.2 - 56.2 lb)**
g. Check sliding force outside above range.
    **Maximum rack sliding force:**
    **Not more than 39 N (4 kg, 9 lb) beyond above value**
- If rack sliding force is not within specification, readjust by repeating adjustment procedure from the beginning.
- If rack sliding force is still out of specification after readjustment, gear assembly needs to be replaced.




## Pre-disassembly Inspection

Disassemble the power steering oil pump only if the following items are found.

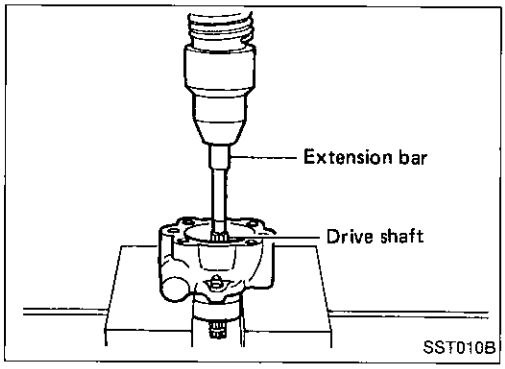
- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance

## Disassembly

**CAUTION:**

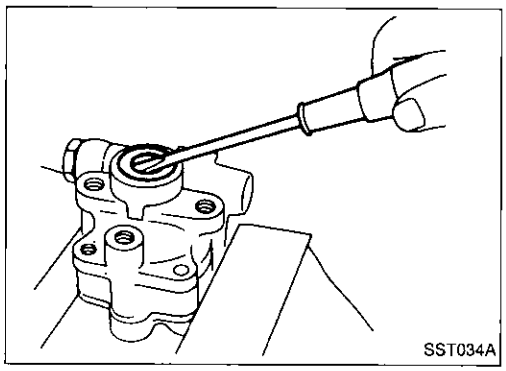
- **Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.**
- **Disassemble in as clean a place as possible.**
- **Clean your hands before disassembly.**
- **Do not use rags; use nylon cloths or paper towels.**
- **Follow the procedures and cautions in the Service Manual.**
- **When disassembling and reassembling, do not let foreign matter enter or contact the parts.**

## Disassembly (Cont'd)



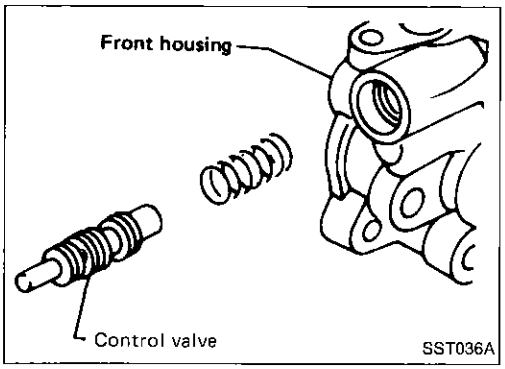

- Remove snap ring, then draw drive shaft out.

**Be careful not to drop drive shaft.**




- Remove oil seal.

**Be careful not to damage front housing.**

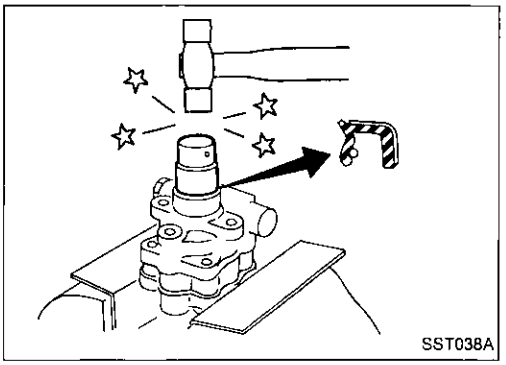



- Remove connector.

**Be careful not to drop control valve.**

## Inspection

Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.

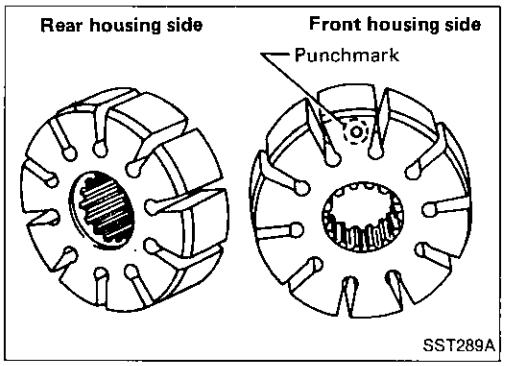



## Assembly

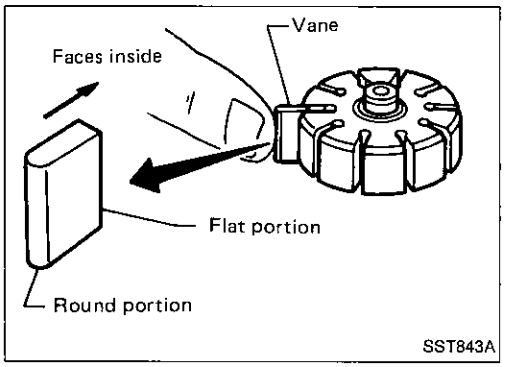
Assemble oil pump, noting the following instructions.

- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- Coat each part with A.T.F. when assembling.

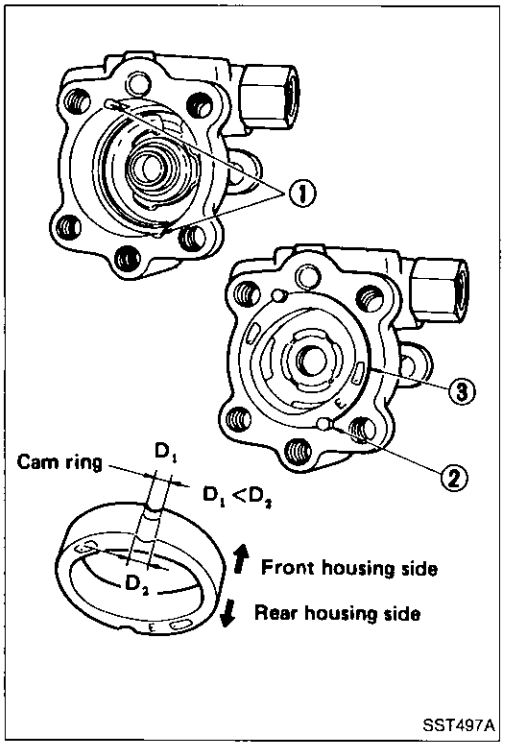
## Assembly (Cont'd)




- Pay attention to rotor direction.

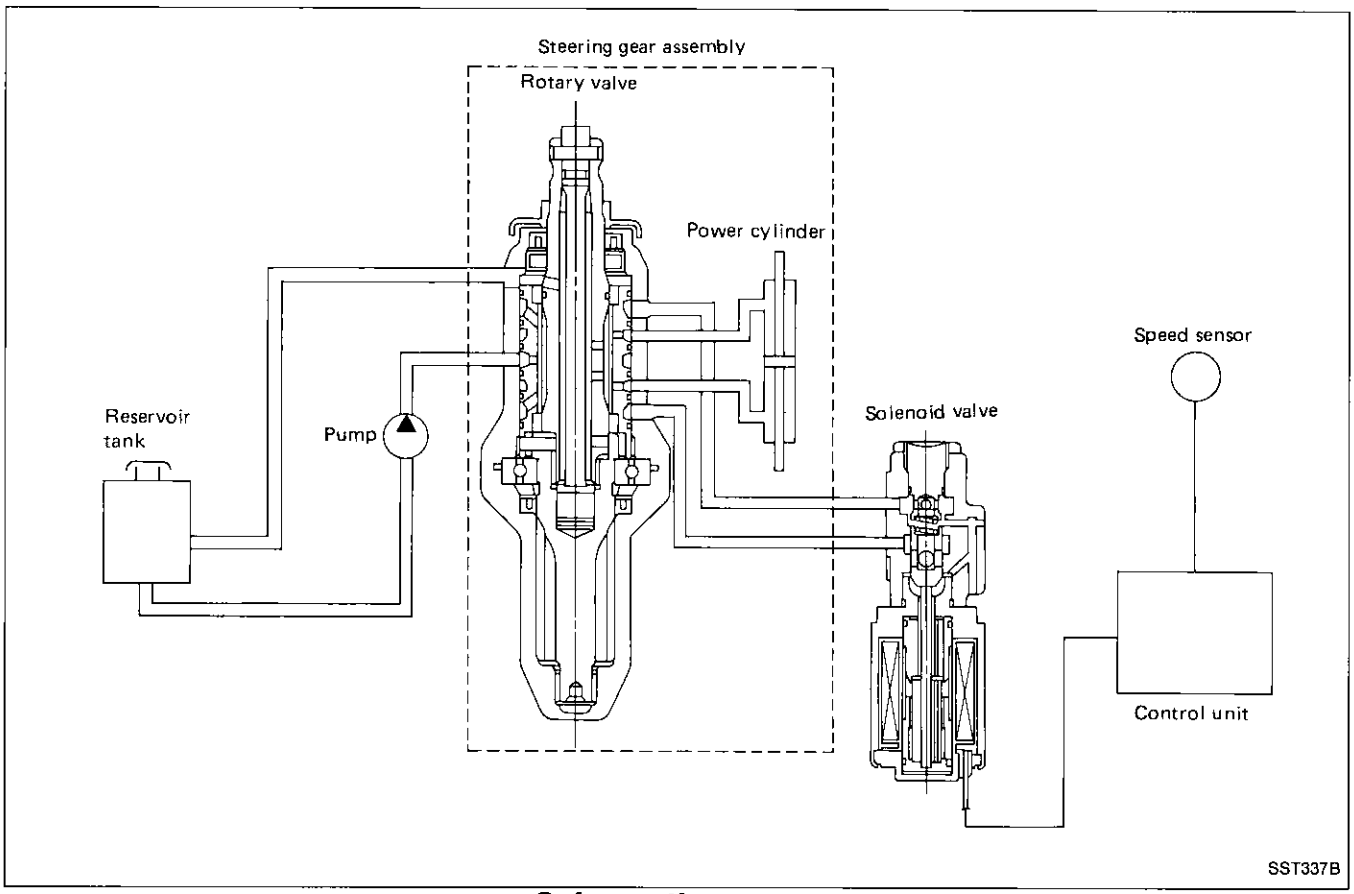



- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.

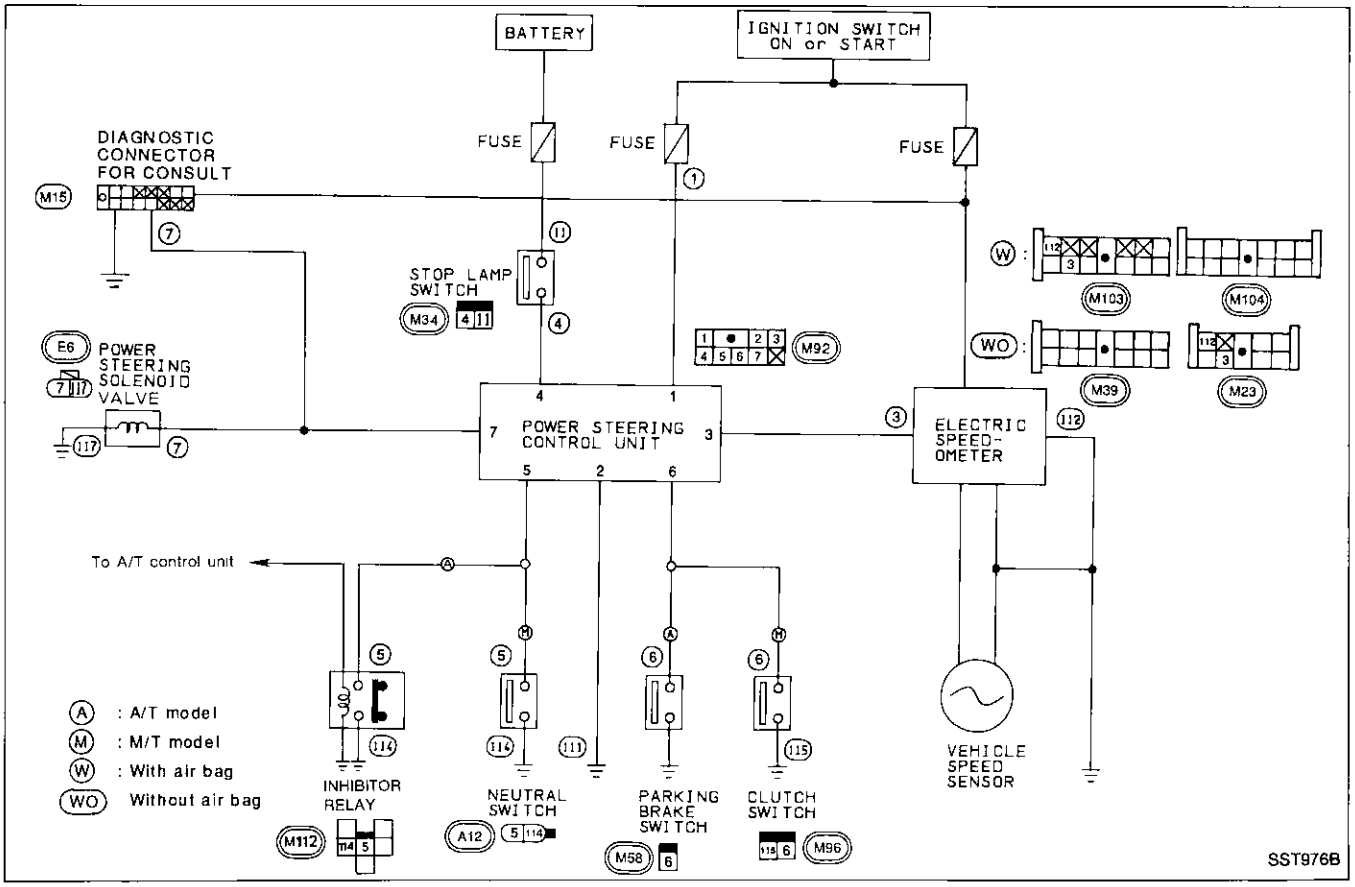



- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

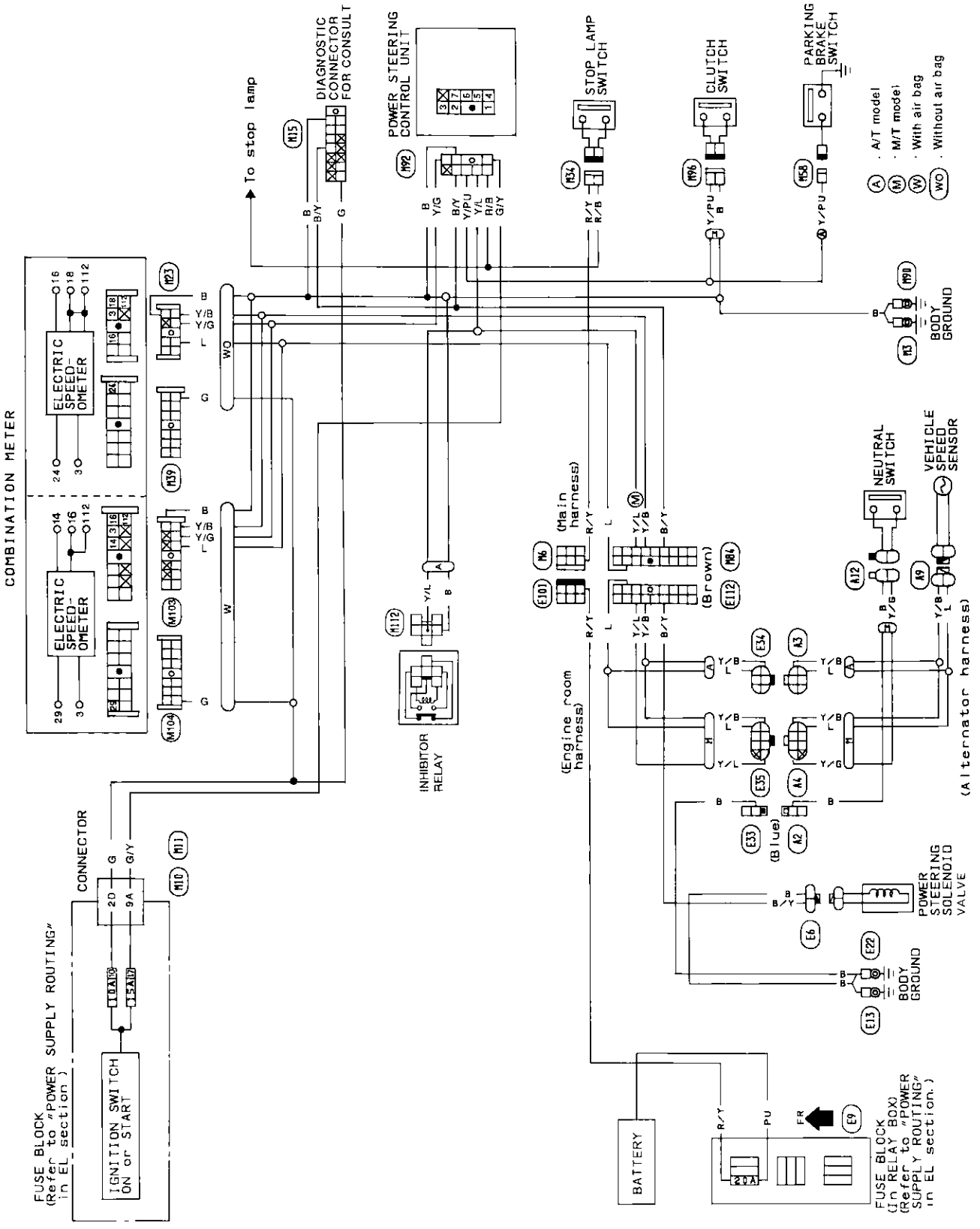
## Hydraulic Circuit




## Schematic



## Wiring Diagram




SST977B

## Precautions

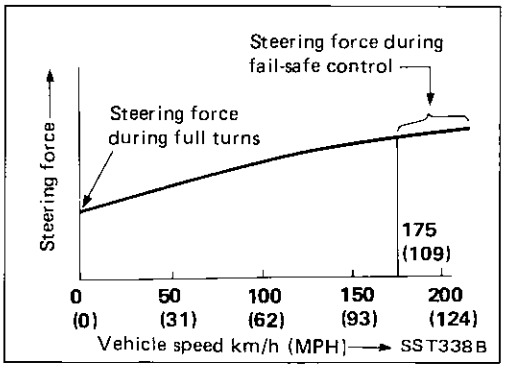
**BEFORE DIAGNOSING THE POWER STEERING SYSTEM, ENSURE THAT:**

### Vehicle stopped

a. **Power steering components (gears, oil pump, pipes, etc.) are free from leakage, and that oil level is correct.**
b. **Tires are inflated to specified pressure and are of specified size, and that steering wheel is a genuine Nissan part.**
c. **Wheel alignment is adjusted properly.**
d. **Suspension utilizes the original design, and is free of modifications which increase vehicle weight.**

### Vehicle in operation

a. **Understand the trouble symptoms.**
b. **Engine is operating properly.**




## PRELIMINARY KNOWLEDGE HELPFUL IN CONDUCTING DIAGNOSES

The power steering system is a twin orifice type, which uses a vehicle-speed sensing, electronic control design. Valve sensitivity is controlled in response to vehicle speed to achieve optimum steering effort. When a vehicle-speed signal is not entered into the power steering control unit for approximately 10 seconds during normal operation (see NOTE below), a fail-safe system activates to maintain the steering effort at a level similar to that experienced during high-speed operation. More precisely, if a foot-brake signal, parking-brake signal and/or transmission position signal (N or P-range signal on automatic transmission models and a neutral or clutch signal on manual transmission models) are not entered, the power steering system is held in a "fail-safe" control state. When this happens, a symptom referred to as "heavy steering during stationary turns" sometimes occurs.

**NOTE:**
**Normal operation refers to a driving condition in which the foot brake pedal and parking brake lever are released, the shift lever is in any position other than "P" or "N" (automatic transmission models), the shift lever set in any position except "N" (manual transmission models) and the clutch pedal is not depressed.**

## Diagnostic Procedure 1

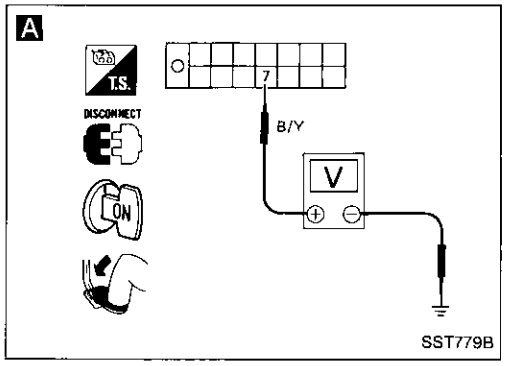
**SYMPTOM:**

**Heavy steering operation during stationary turns**

START

1) CHECK STOP LAMP SIGNAL.
Turn ignition switch "ON" (with engine OFF), release foot brake pedal and parking brake lever. Set shift lever to any position except "P" and "N" on automatic transmission models or set shift lever to any position except "N" on manual transmission models, and ensure clutch pedal is released.

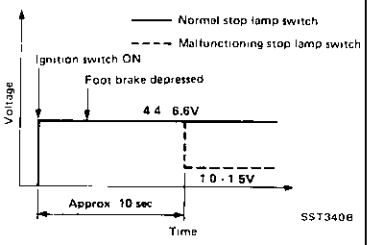
A




A

Depress brake pedal and measure voltage between solenoid valve terminals of diagnostic connector for CONSULT.

O.K. → Go to 2).




**Voltage:**
**4.4 - 6.6 volts (constant) ... O.K.**
**Outside the above range or voltage fluctuations ... N.G.**

N.G.

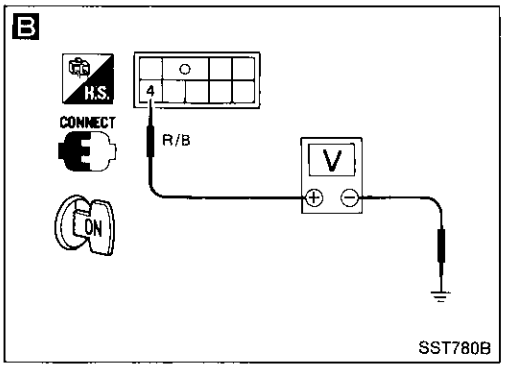
Check if terminal voltage drops to 1 - 1.5V range approx. 10 seconds after ignition switch is turned ON.
**No change (outside 4.4 - 6.6V range) ... O.K.**
**Voltage drop ... N.G.**

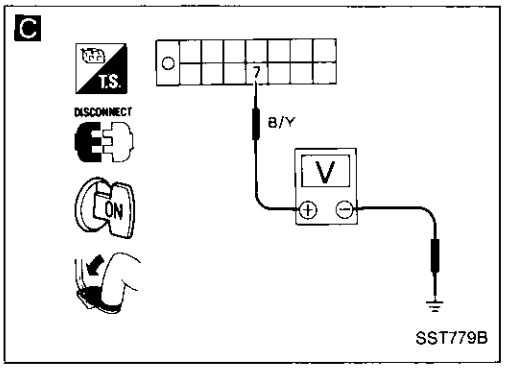
O.K. → Go to 5).

N.G.

Ⓐ

## Diagnostic Procedure 1 (Cont'd)




Ⓐ

**B**

Check if stop lamp switch signal is present at power steering control unit.
**YES (12 volts — Brake pedal depressed.) ... O.K.**
**NO (0 volts) ... N.G.**

N.G. → Malfunctioning stop lamp switch system

O.K. ↓

Ensure that power steering control unit connector is connected properly.

**C**

After ignition switch is turned "ON", depress brake pedal and measure voltage between solenoid valve terminals of diagnostic connector for CONSULT.
**4.4 - 6.6 volts (constant) ... O.K.**
**Voltage fluctuations ... N.G.**

N.G. → Malfunctioning power steering control unit.

O.K. ↓

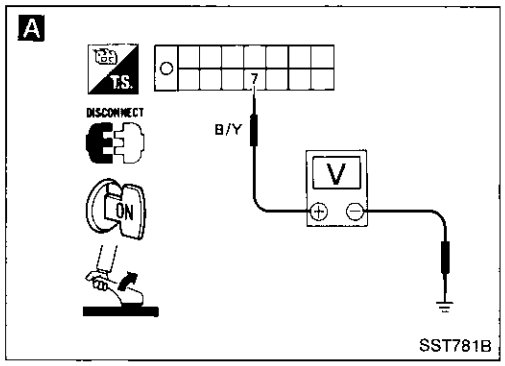
Check if heavy steering operation occurs during stationary turns.
**YES ... N.G.**
**NO (Lighter steering operation) ... O.K.**

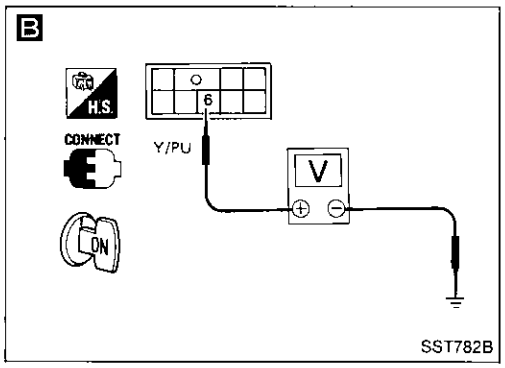
N.G. → Go to 4).

O.K. ↓

END

## Diagnostic Procedure 1 (Cont'd)



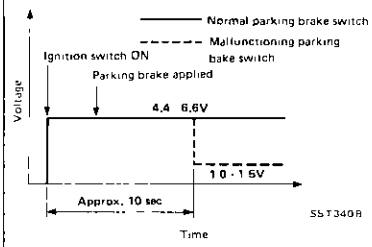




A

2) CHECK PARKING BRAKE SIGNAL.

Release foot brake pedal and apply parking brake lever.

Measure voltage between solenoid valve terminals of diagnostic connector for CONSULT.




**Voltage:**

**4.4 - 6.6V (constant)**
**... O.K.**
**Outside the above range or voltage fluctuations**
**... N.G.**

O.K. → Go to 3).

N.G. ↓

Check if terminal voltage drops to 1.0 - 1.5V range approx. 10 seconds after ignition switch is turned ON.

**No change (outside 4.4 - 6.6V range) ... O.K.**
**Voltage drop ... N.G.**

O.K. → Go to 5).

N.G. ↓

B

Check if parking brake switch signal is present at power steering control unit.

**YES (0 volts — Parking brake applied.)**
**NO (12 volts) ... N.G.**

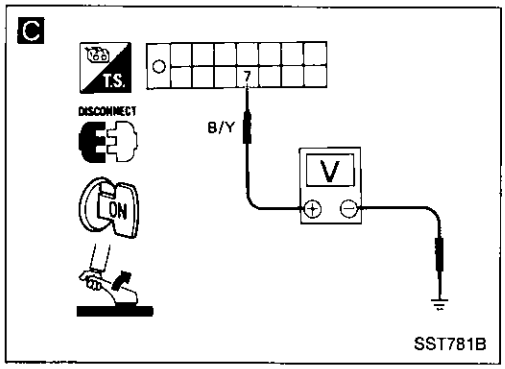
N.G. → Malfunctioning parking brake system

O.K. ↓

Ensure that power steering control unit connector is connected properly.

Ⓑ

## Diagnostic Procedure 1 (Cont'd)




C

Ⓑ

Turn ignition switch ON and apply parking brake lever.
Measure voltage between solenoid valve terminals of diagnostic connector for CONSULT.
**Voltage:**
**4.4 - 6.6 volts (constant) ... O.K.**
**Voltage fluctuations ... N.G.**

N.G. → Malfunctioning power steering control unit

O.K. ↓

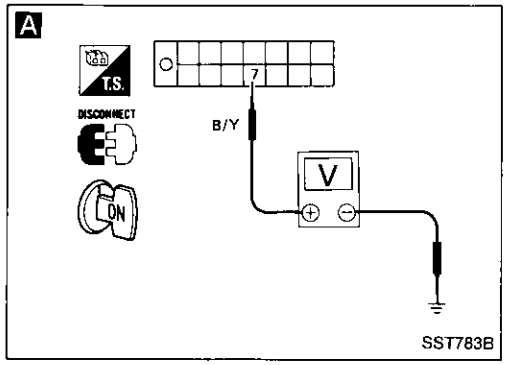
Check if heavy steering operation occurs during stationary turns.
**YES ... N.G.**
**NO (lighter steering operation) ... O.K.**

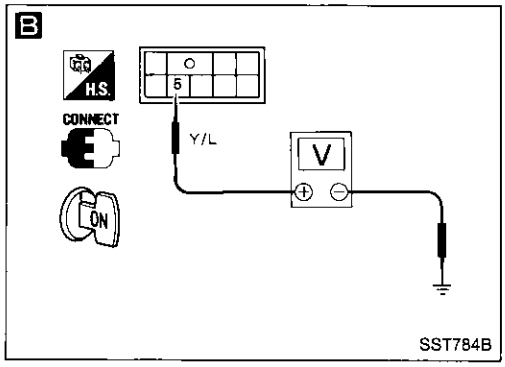
N.G. → Go to 4).

O.K. ↓

END

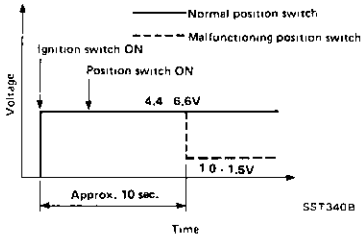
## Diagnostic Procedure 1 (Cont'd)




A

3) CHECK NEUTRAL POSITION SIGNAL.
Release parking brake lever. Move shift lever to Neutral (A/T and M/T models). Measure voltage between solenoid valve terminals of diagnostic connector for CONSULT.




**Voltage:**
**4.4 - 6.6V (constant) ... O.K.**
**Outside the 4.4 - 6.6V range or Voltage fluctuations ... N.G.**

O.K. → Depress clutch pedal (M/T model) and move shift lever to "P" (A/T model).
Measure voltage between solenoid valve terminals at diagnostic connector for CONSULT.
**Voltage:**
**4.4 - 6.6V (constant) ... O.K.**
**Outside the above range or voltage fluctuations ... N.G.**

O.K. → Go to 4).

N.G. → Check if terminal voltage drops to 1.0 - 1.5V range approx. 10 seconds after ignition switch is turned ON.
**No change (outside 4.4 - 6.6V range) ... O.K.**
**Voltage drop ... N.G.**

O.K. → Go to 5).

N.G. →

B

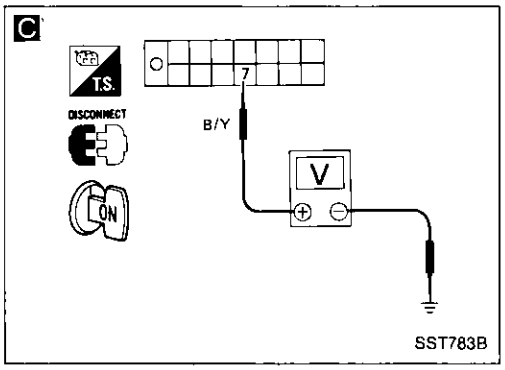
Check if position switch signal is present at power steering control unit.
**YES (0 volts, when position switch is ON) ... O.K.**
**NO (4 - 5 volts) ... N.G.**

N.G. → Malfunctioning position switch system

O.K. → Ensure that power steering control unit connector is connected properly.

Ⓒ

## Diagnostic Procedure 1 (Cont'd)




C

Ⓒ

Turn ignition switch ON, depress clutch pedal (M/T model) and move shift lever to "P" (A/T model).
Measure voltage between solenoid valve terminals of diagnostic connector for CONSULT.
**Voltage:**
**4.4 - 6. 6V (constant) ... O.K.**
**Voltage fluctuations ... N.G.**

N.G. → Malfunctioning power steering control unit

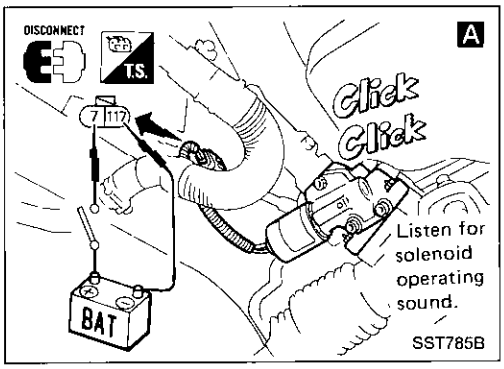
O.K. ↓

Check if heavy steering operation occurs during stationary turns.
**YES ... N.G.**
**NO (Lighter steering operation) ... O.K.**

N.G. → Go to 1).

O.K. ↓

END




A

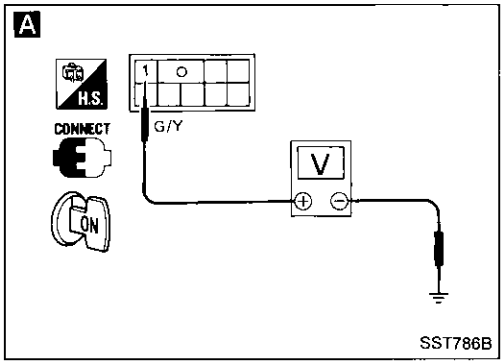
4) CHECK POWER STEERING SOLENOID VALVE FOR PROPER OPERATION.
Disconnect solenoid valve connector. Check if plunger clicks when voltage is applied between connector terminals (on solenoid valve side).
**Clicks ... O.K.**
**NO clicks ... N.G.**

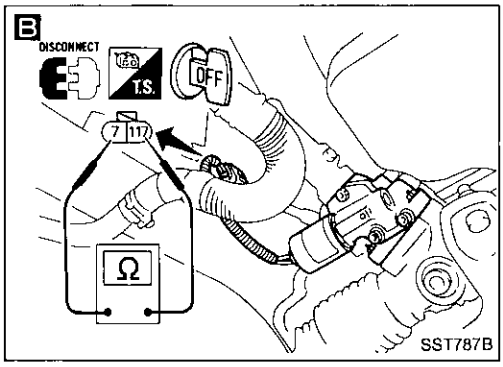
N.G. → Malfunctioning power steering solenoid valve

O.K. ↓

- Malfunctioning steering gear assembly
- Malfunctioning oil pump

## Diagnostic Procedure 1 (Cont'd)




A

5) CHECK POWER STEERING CONTROL UNIT FOR PROPER OPERATION.
Check if power voltage is present at power steering control unit.
**YES (12V) ... O.K.**
**NO (0V) ... N.G.**

N.G. → Malfunctioning ignition power circuit

O.K. ↓

B

Measure solenoid valve resistance.
Disconnect solenoid valve connector, and measure resistance between connector terminals (on solenoid valve side.)
**Resistance:**
**4 - 6 ohms ... O.K.**
**0 ohms or infinite ... N.G.**

N.G. → Malfunctioning solenoid valve system

O.K. ↓

Ensure that power steering control unit connector is connected properly.

↓

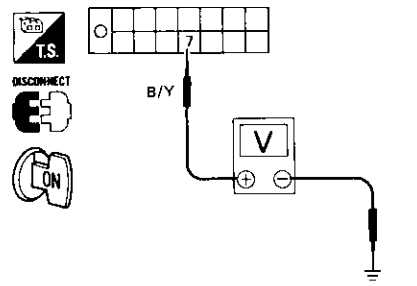
Check if heavy steering operation occurs during stationary turns.
**YES ... N.G.**
**NO (Lighter steering operation) ... O.K.**

N.G. → Malfunctioning power steering control unit

O.K. ↓

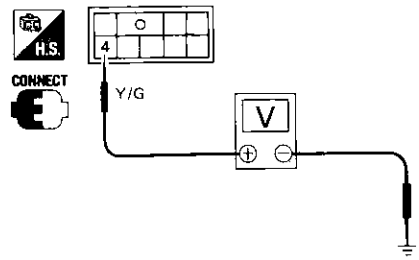
END

A



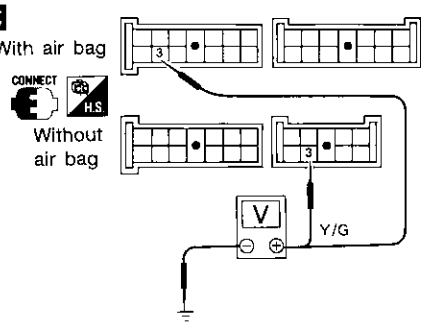

SST783B

B




SST788B

C




SST789B

## Diagnostic Procedure 2

**SYMPTOM:**

**Light steering operation during high-speed driving**

Raise rear wheels off ground and start engine.

A

Measure voltage between solenoid valve terminals of diagnostic connector for CONSULT while driving vehicle from 0 to 100 km/h (0 to 62 MPH).

**Voltage:**

**0 km/h (0 MPH):**

**4.4 - 6.6V ... O.K.**

**100 km/h (62 MPH):**

**1.8 - 2.8V ... O.K.**

**Constant voltage ... N.G.**

O.K. → Ⓒ

N.G.

Check speedometer for proper operation.

**YES ... O.K.**

**NO ... N.G.**

N.G. → Malfunctioning vehicle speed sensor or speedometer

O.K.

Check A.S.C.D. and vehicle speed-sensing door lock for proper operation.

**YES ... O.K.**

**NO ... N.G.**

N.G.

C

Check if vehicle speed signal is present at speedometer. Disconnect speedometer from vehicle to facilitate work. Reconnect wiring. Measure voltage between speedometer terminals while driving vehicle at very slow speeds.

**1 volt (Min.) and 5 volts (Max.) are alternately repeated ... O.K.**

**No voltage is present ... N.G.**

O.K. → B

N.G. → Malfunctioning speedometer

O.K.

B

Check if vehicle speed signal is present at power steering control unit.

While driving at very slow speeds, connect power steering unit connector. Measure terminal voltage.

**1 volt (Min.) and 5 volts (Max.) are alternately repeated ... O.K.**

**No voltage is present ... N.G.**

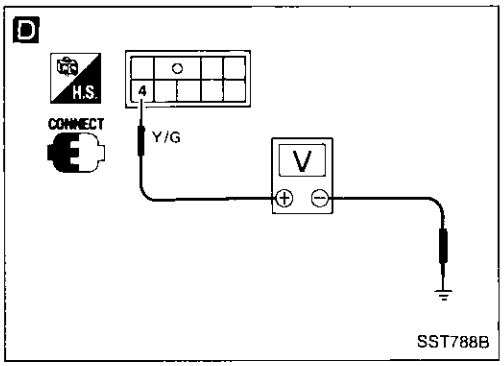
N.G. → Improper connection between speedometer and power steering control unit

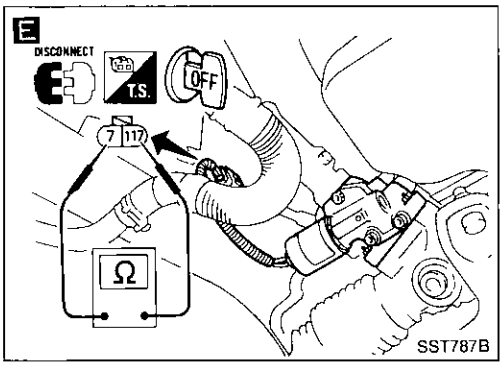
O.K.

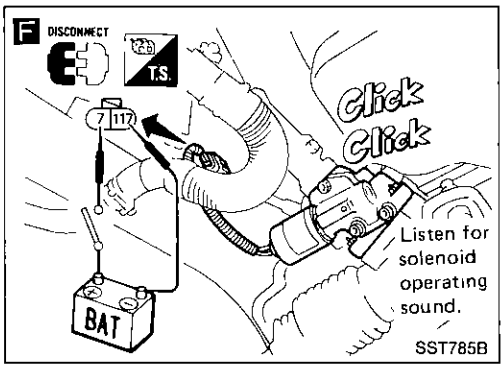
Ensure that power steering control unit connector is connected properly.

Ⓐ

## Diagnostic Procedure 2 (Cont'd)




Ⓐ

**D**

Measure voltage between solenoid valve connector terminals of diagnostic connector for CONSULT while driving vehicle from 0 to 100 km/h (0 to 62 MPH).

**Voltage:**

**0 km/h (0 MPH):**

**4.4 - 6.6V ... O.K.**

**100 km/h (62 MPH):**

**1.8 - 2.8V ... O.K.**

**No voltage variations ... N.G.**

O.K. → Check if steering operation is heavy during high-speed driving.

**YES ... O.K.**

**NO ... N.G.**

N.G. → O.K. → END

N.G. → Ⓒ

**E**

Measure solenoid valve resistance.

Disconnect solenoid valve connector, and measure resistance between connector terminals (on solenoid valve side).

**Resistance:**

**4 - 6 ohms ... O.K.**

**0 ohms or infinite ... N.G.**

N.G. → Malfunctioning power steering control unit

O.K. → **F**

Disconnect solenoid valve connector.

Apply voltage between connector terminals (on solenoid valve side) and listen for clicks (which indicate operation).

**Clicks ... O.K.**

**No clicks ... N.G.**

N.G. → Malfunctioning solenoid valve

O.K. →

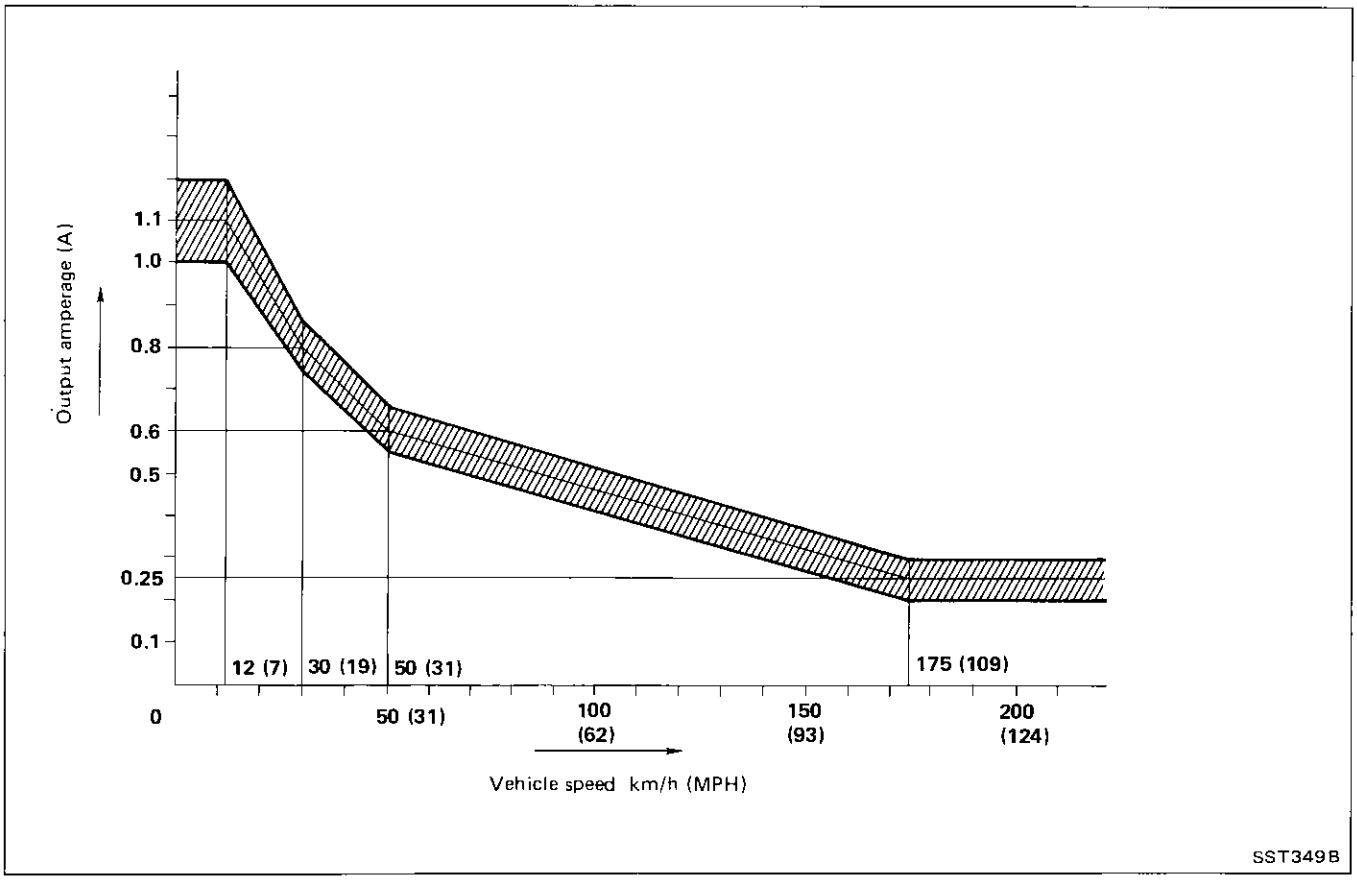
- Malfunctioning steering gear assembly
- Malfunctioning oil pump

## Control Unit Inspection Table

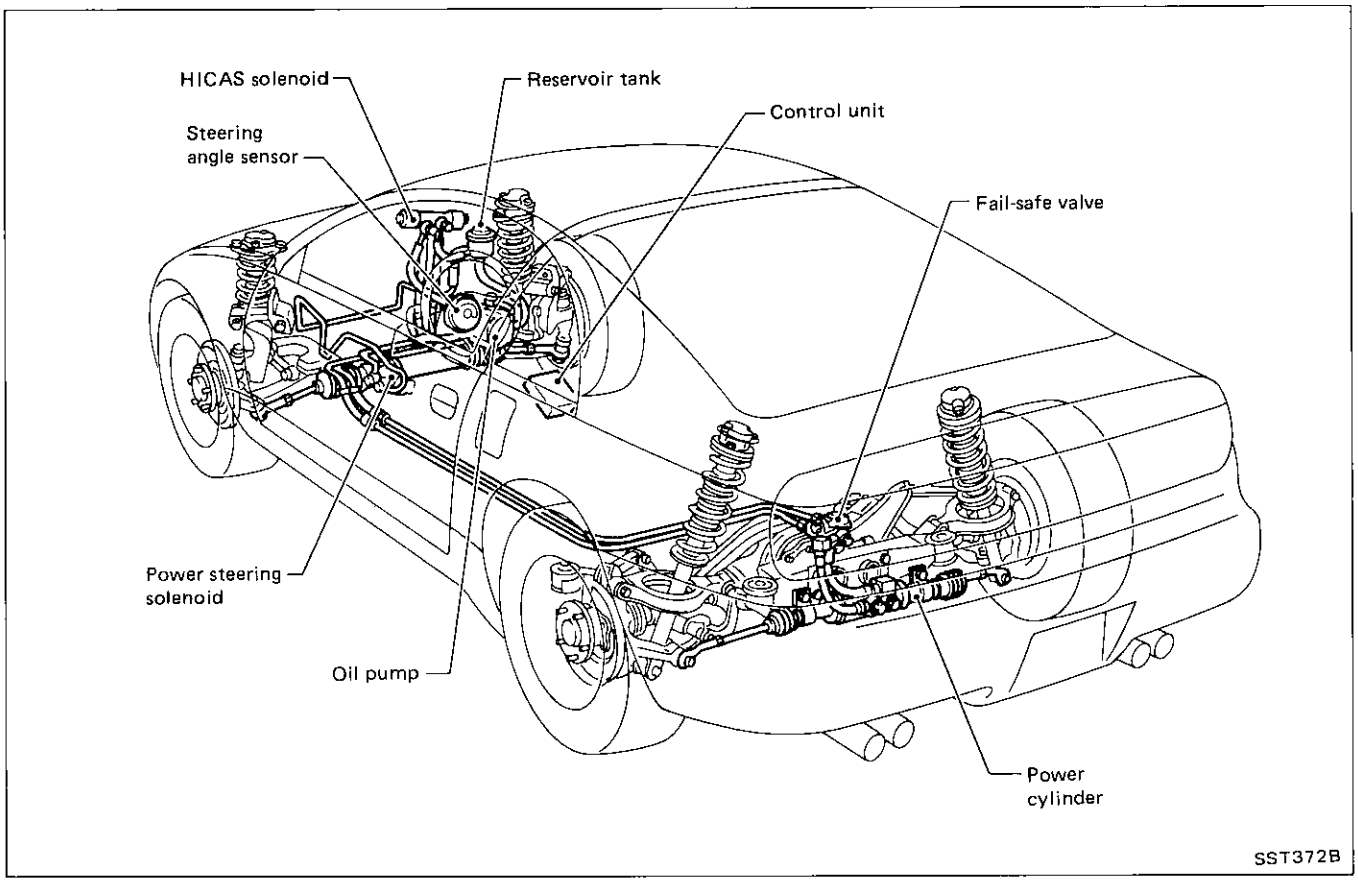
The standard values (voltage), measured with an analog tester in contact with the control unit terminal, are shown below:

| Terminal No. | Application | Standard value |
|---|---|---|
| 1 | Power | Approx. 12V |
| 2 | Ground | 0V |
| 3 | Vehicle speed sensor input | 1 volt (min.) and 5 volts (max.) are alternately repeated when vehicle is driven at very slow speeds. |
| 4 | Stop lamp switch input | Pressed: Approx. 12V<br>Released: 0V |
| 5 | Neutral switch input | 0V (clutch engaged and shift lever in "N") ... M/T models<br>0V (selector lever in "N" or "P") ... A/T models<br>4 - 5V (except for the above) |
| 6 | Parking brake switch input | Applied: 0V<br>Released: Approx. 12V |
| 7 | Power steering solenoid valve output | 0 km/h 4.4 - 6.6V<br>100 km/h 1.8 - 2.8V<br>Fail-safe 1.0 - 1.5V |

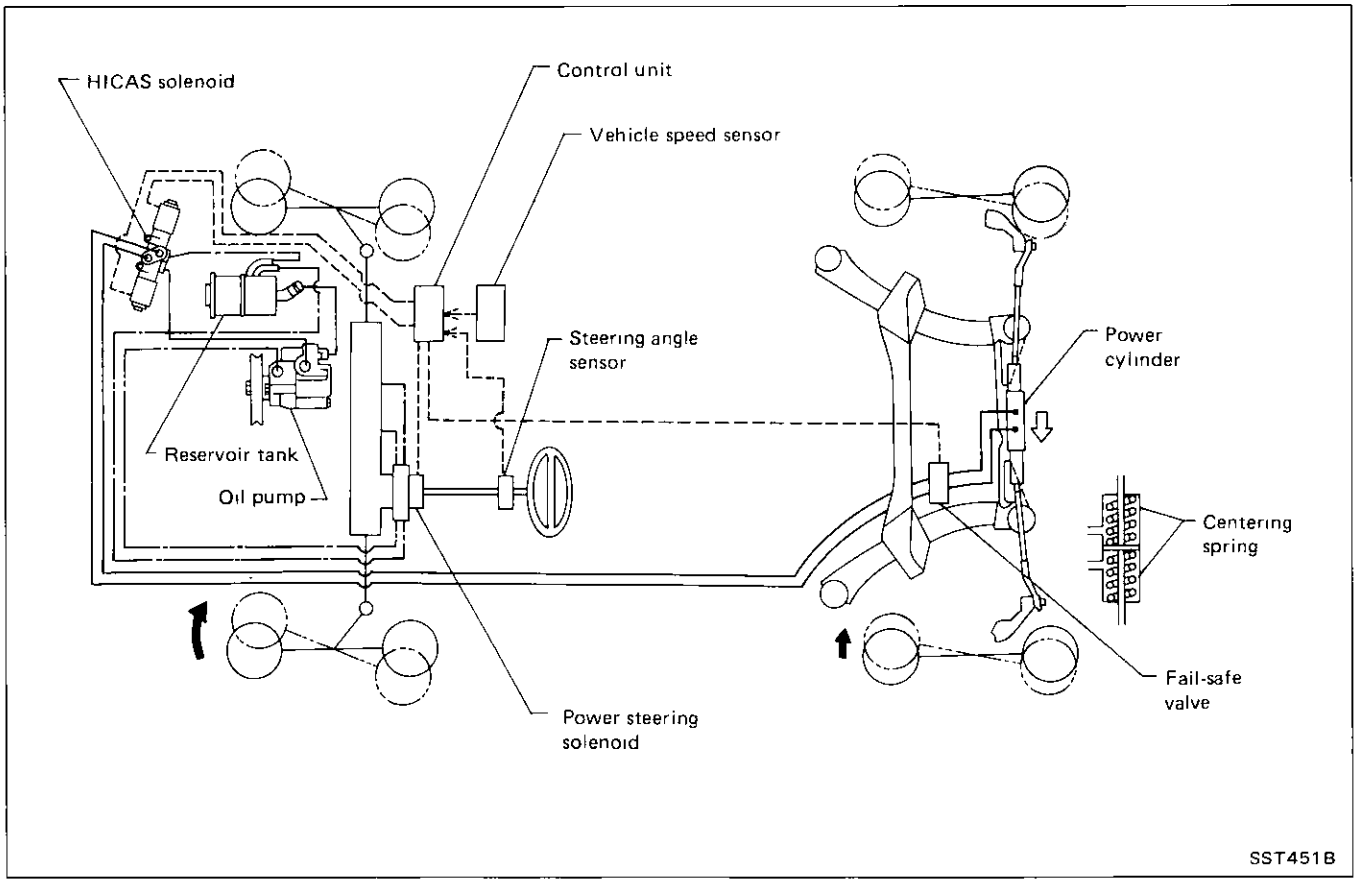
## Performance of Controller

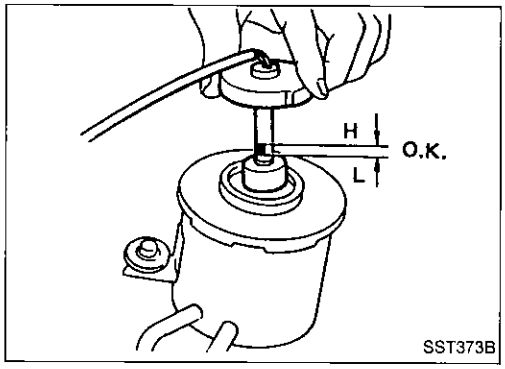


## HICAS Component Parts Location




## System Diagram






## Checking Fluid Level

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

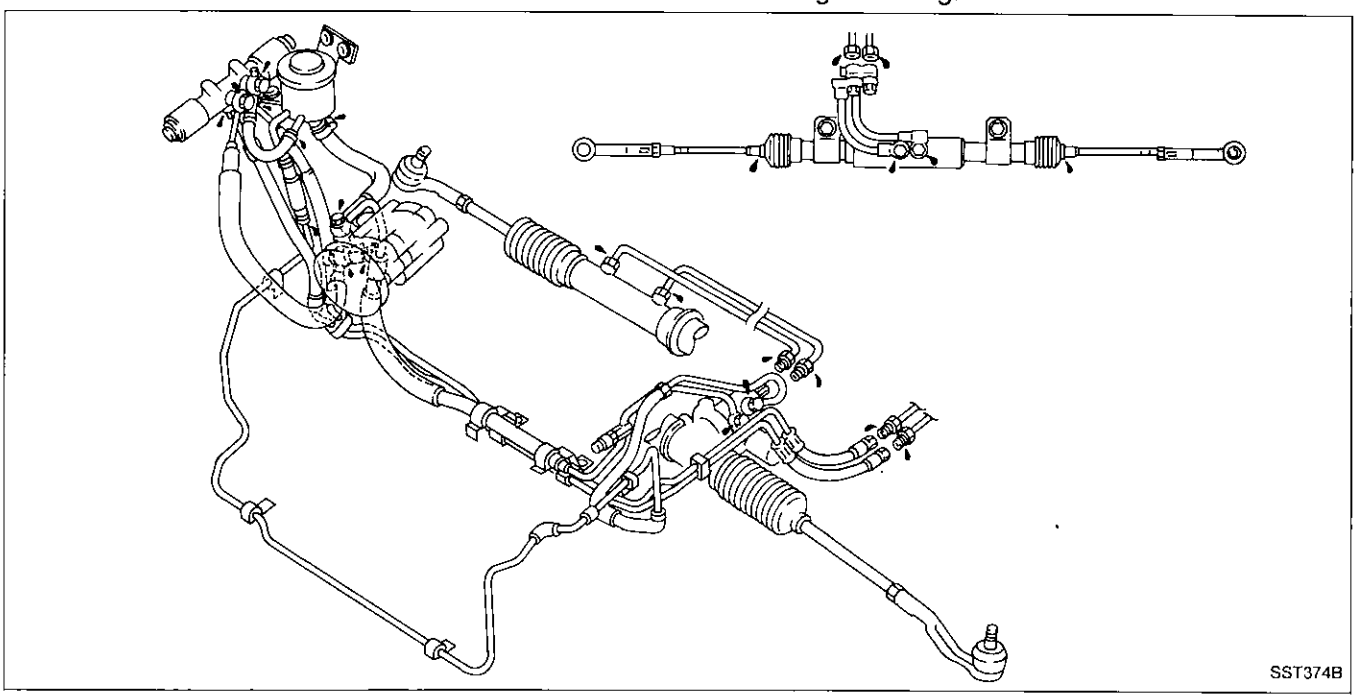
**CAUTION:**

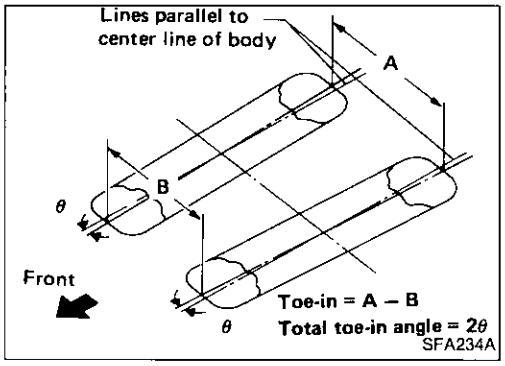
- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "Dexron™" type.**
- **Note that fluid level will vary with fluid temperature by approx. 1 mm/5°C (0.04 in/9°F) due to changes in fluid volume.**

## Checking Fluid Leakage

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

Fluid leakage should be checked for when the oil temperature is normal with the engine idling.






## Measuring Rear Toe-in

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

**Toe-in:**

**Refer to S.D.S. in RA section.**

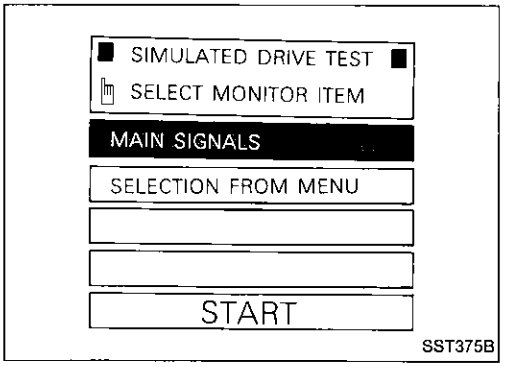
## Inspection of HICAS System Operation

**CAUTION:**

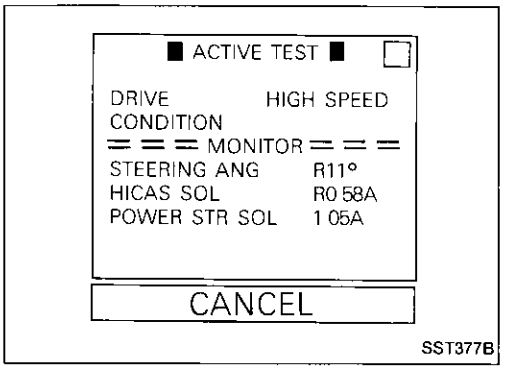
**Ensure that shift lever is set to "P" (A/T model) or "Neutral" (M/T model) before checking HICAS system operation.**

**When CONSULT is used:**

1. Have a helper sit in the driver's compartment and raise vehicle.
   (Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Connect CONSULT unit to diagnostic connector and start engine.
3. Touch "START" on CONSULT display.
4. Touch "HICAS", "ACTIVE TEST" and "SIMULATED DRIVE" in that order.



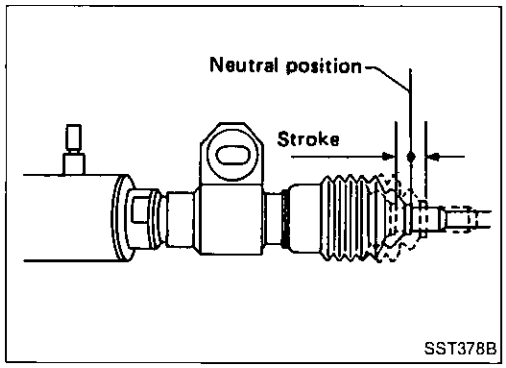

5. Touch "START" when MAIN SIGNALS display is reversed.




6. Touch "START."

**After simulated drive condition has continued for 5 minutes, it will automatically cancel and CONSULT unit will then show "TEST IS INTERRUPTED TO AVOID OIL TEMP. RISE" display. To cancel this mode during self-diagnosis, simply touch "CANCEL".**

## Inspection of HICAS System Operation (Cont'd)

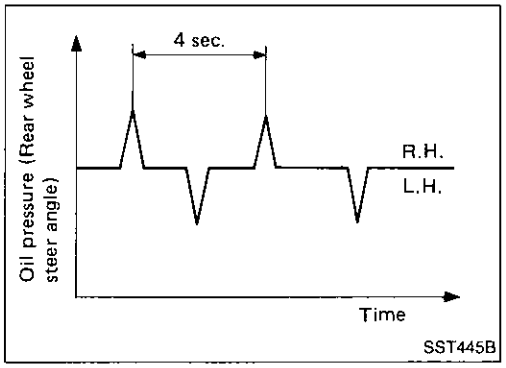



7. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° in one direction from the neutral position. Measure extension value of one power cylinder rod and retraction value of the other. Then, turn steering wheel 180° in the other direction from the neutral position, and measure extension value of one cylinder rod and retraction value of the other. Determine strokes of respective power cylinders by adding (measured) extension and retraction values.

**Measure rod strokes in as short a period of time as possible.**

**Specifications:**

**When turned to the right**
**3 mm (0.12 in)**
**When turned to the left**
**3 mm (0.12 in)**
**Total stroke**
**6 mm (0.24 in)**



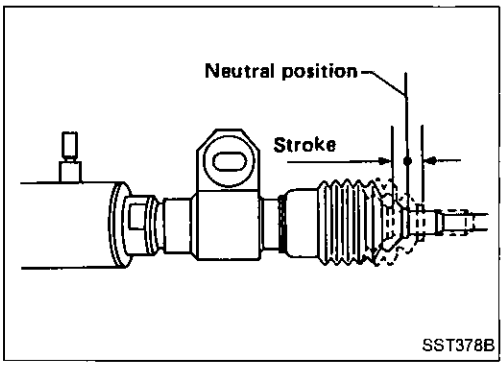

**When CONSULT is not used:**

1. Have a helper sit in the driver's compartment and raise vehicle.
   (Use a 2-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Set HICAS system in self-diagnosis mode.

(1) Turn ignition switch "OFF".
(2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
(3) Turn ignition switch "ON".
(4) Immediately start engine.
(5) Turn steering wheel from left to right (at least 20° from the neutral position ) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".

3. Set steering wheel to a point approximately 10° from the neutral position and check to ensure that rear wheels turn to the left and right alternately.

## Inspection of HICAS System Operation (Cont'd)



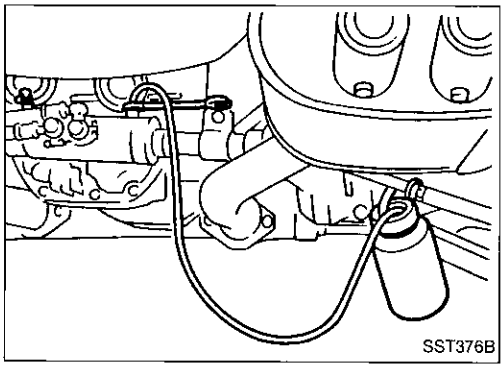

4. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° in one direction from the neutral position. Measure extension value of one power cylinder rod and retraction value of the other. Then, turn steering wheel 180° in the other direction from the neutral position, and measure extension value of one cylinder rod and retraction value of the other. Determine strokes of respective power cylinder rods by adding (measured) extension and retraction values.

**Measure rod strokes in as short a period of time as possible.**

**Specifications:**

**When turned to the right**
**3 mm (0.12 in)**
**When turned to the left**
**3 mm (0.12 in)**
**Total stroke**
**6 mm (0.24 in)**

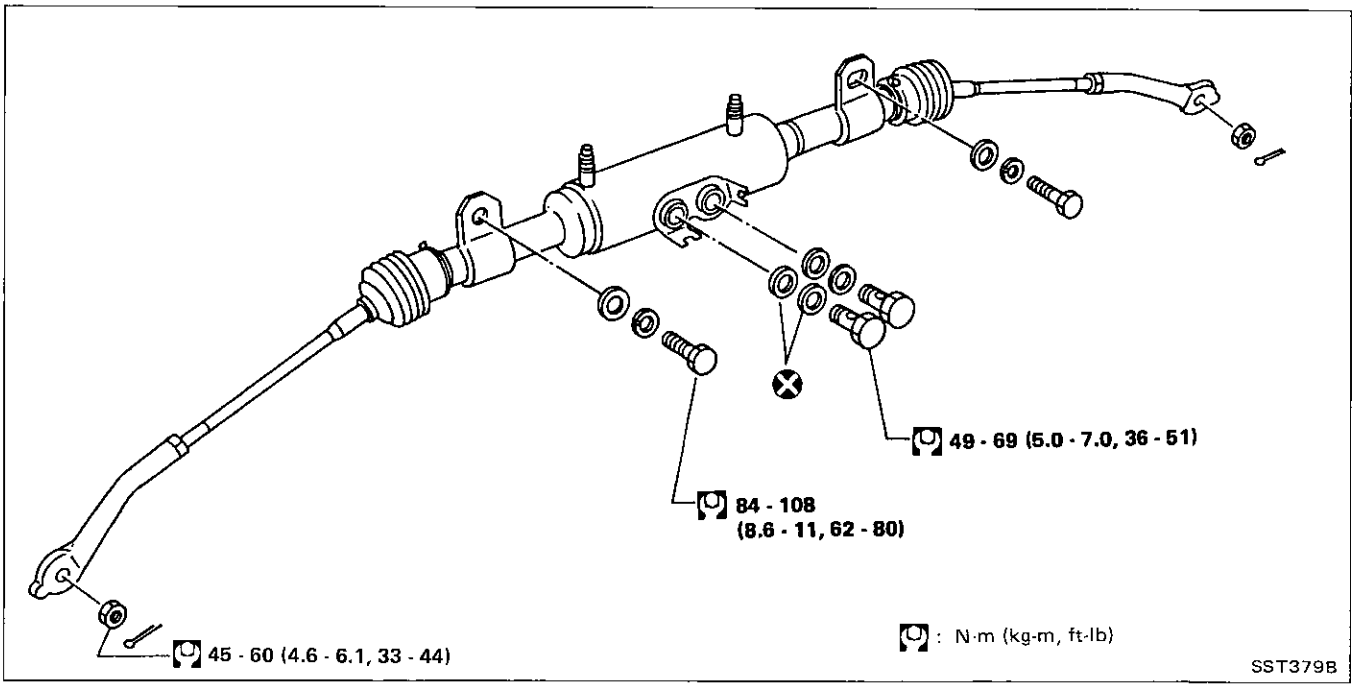
**Do not depress foot brake pedal during operation check, otherwise the operation will be stopped.**

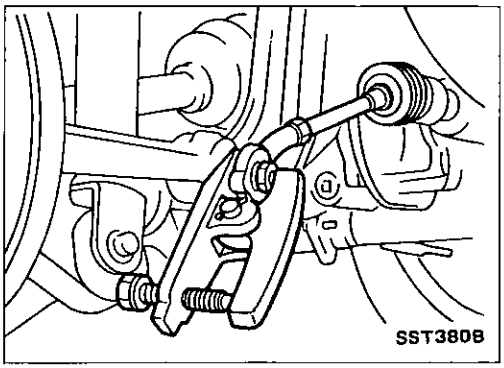



## Bleeding Hydraulic System

Before bleeding air from the HICAS system, be sure to bleed air from the power steering system.
Refer to "SUPER HICAS SYSTEM — Repair of Component Parts".

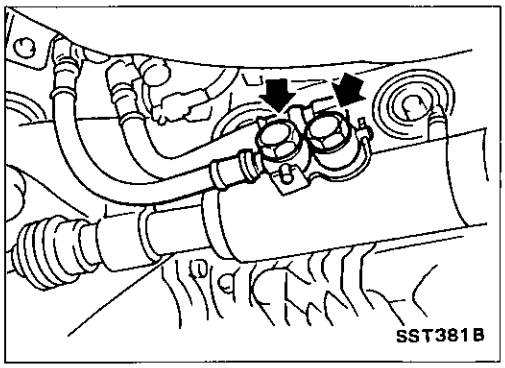
## Power Cylinder



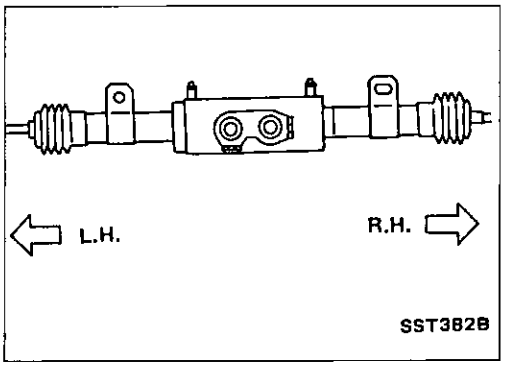

### REMOVAL

- Detach power cylinder lower links from axle housing sockets with Tool.




- Disconnect oil pipes from power cylinders and remove power cylinders.

**CAUTION:**
**Plug openings of oil pipes and power cylinders to prevent entry of foreign particles after removal.**

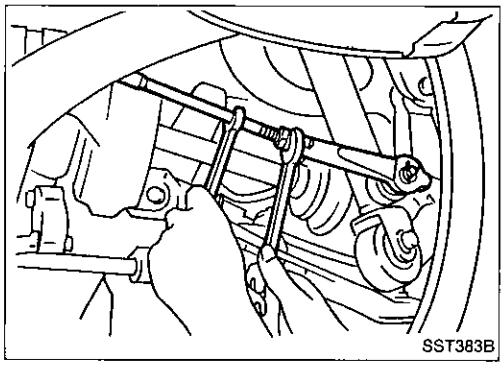



### INSTALLATION

1. Before installing power cylinder on suspension member, wipe power cylinder bracket and mating surface of suspension member. Using the left side of the bracket as a reference point, locate the right side (oblong hole side) and install power cylinder.

**CAUTION:**
**a. To prevent entry of foreign particles, clean oil pipes and connectors using dry compressed air.**
**b. Ensure that your hands are clean and free from foreign particles when connecting oil pipes.**

## Power Cylinder (Cont'd)


SST383B

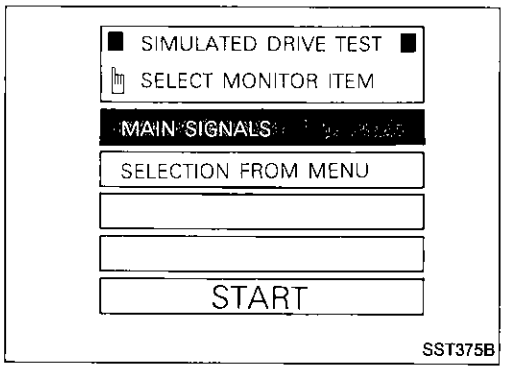
2. Install power cylinders and oil pipes.
3. After installing lower link assemblies, check toe-in to ensure that it is within specifications. If it is not within specifications, perform proper adjustments.
   Refer to "SUPER HICAS" in section RA.

### BLEEDING HYDRAULIC SYSTEM

Before bleeding air from the HICAS system, be sure to bleed air from the power steering system.

**CAUTION:**

**Ensure that shift lever is set to "P" (A/T model) or "Neutral" (M/T model).**



SST375B

**When CONSULT is used:**

1. Connect CONSULT unit to diagnosis connector on body side.
2. Have a helper sit in the driver's compartment and raise vehicle.

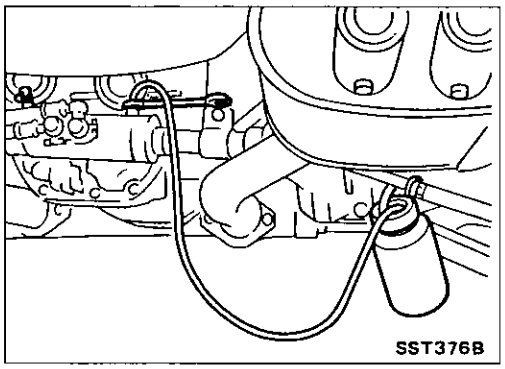
**Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.**

3. Start engine.
4. Touch "START" on CONSULT display. (Display will then change.)
5. Touch "HICAS", "ACTIVE TEST", "SIMULATED DRIVE" and "START" in that order.

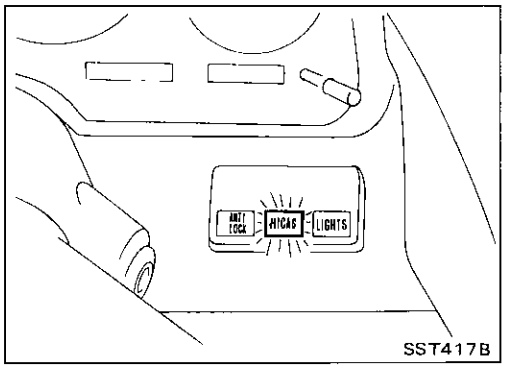
**Before touching "START", ensure that MAIN SIGNALS display is reversed.**

6. Touch "START".

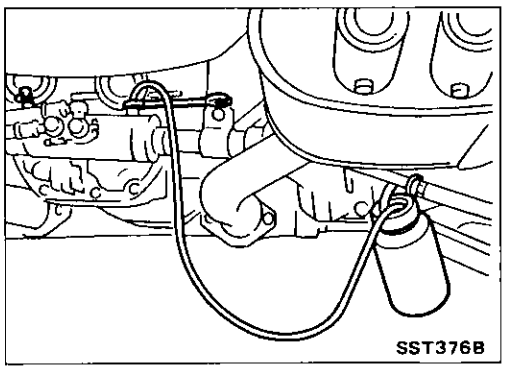
## Power Cylinder (Cont'd)


SST376B

7. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° to the right from the neutral position. Loosen right power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
8. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° to the left from the neutral position. Loosen left power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
9. Repeat steps 7. and 8. until there are no air bubbles in fluid. While bleeding air from power cylinders, never allow fluid level to drop below inlet port of reservoir tank (by adding fluid as required).
10. Touch "CANCEL" on CONSULT display and turn ignition switch OFF.



SST417B


SST376B

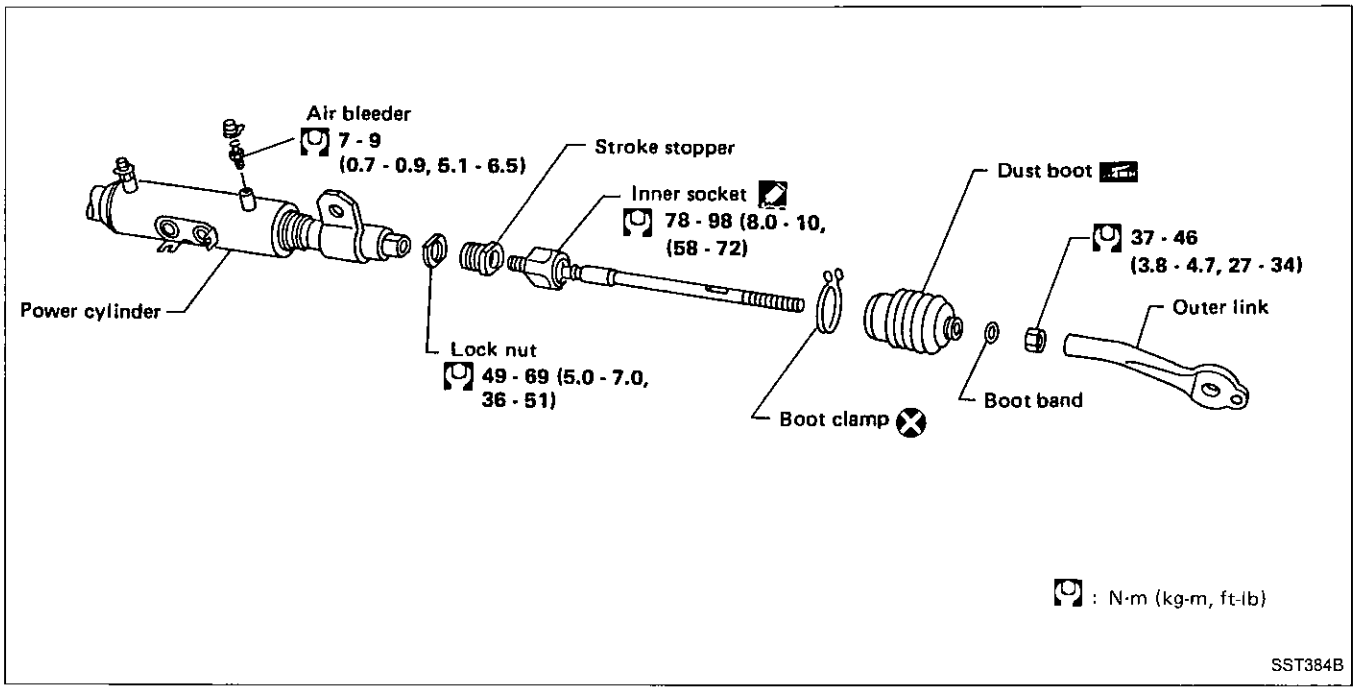
**When CONSULT is not used:**

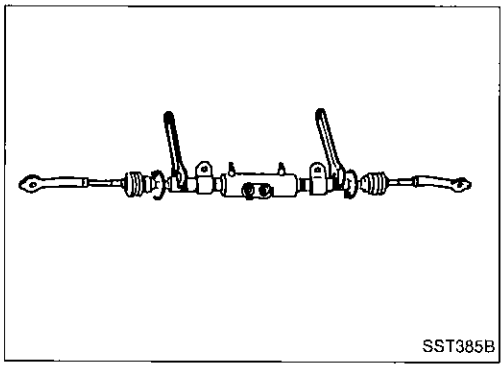
1. Have a helper sit in the driver's compartment, and raise vehicle.

**Use a two-pole lift or center pole lift so that the four wheels are free to rotate.**

2. Set HICAS system in self-diagnosis mode.
(1) Turn ignition switch "OFF".
(2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
(3) Turn ignition switch "ON".
(4) Immediately start engine.
(5) Turn steering wheel from left to right (at least 20° from the neutral position ) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
3. Set steering wheel within 10° from the neutral position. Ensure that rear wheels turn to the left and right alternately.
4. Operate engine at idling speed, and turn steering wheel 180° to the right from the neutral position. Loosen right power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
5. Operate engine at idling speed, and turn steering wheel 180° to the left from the neutral position. Loosen left power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
6. Repeat steps 4. and 5. above until there are no air bubbles in fluid. While bleeding air from power cylinders, never allow fluid level to drop below inlet port of reservoir tank (by adding fluid as required).
7. Turn ignition switch OFF to complete self-diagnosis operation.

## Power Cylinder (Cont'd)

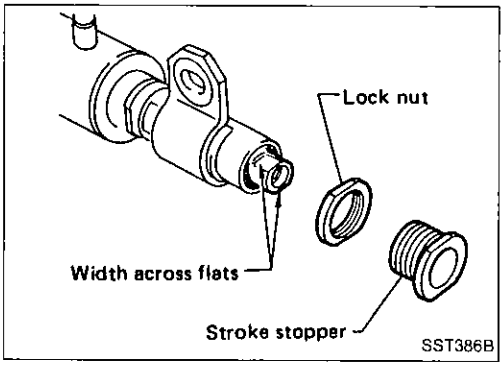


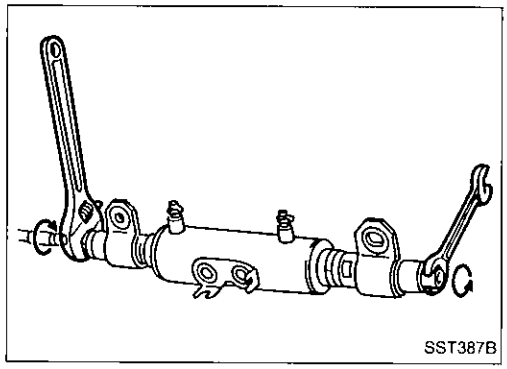

Power cylinder assembly cannot be disassembled. When it is malfunctioning, replace power cylinder as an assembly.

### DISASSEMBLY

1. Remove clamps from left and right dust boots, and move dust boots toward outer links.
2. Attach wrenches to left and right ball joint sockets, and turn in directions that loosen lower links. Remove one of loosened lower link assemblies.



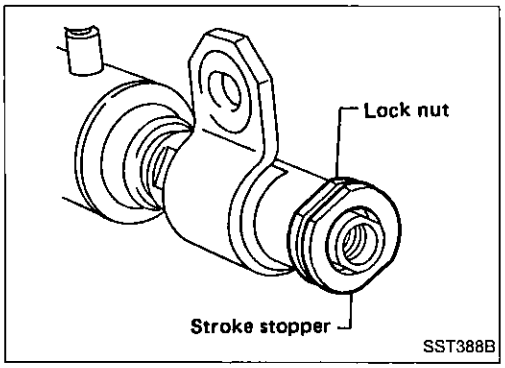

3. Loosen stroke stopper lock nut from which lower link assembly was removed, and remove stroke stopper.



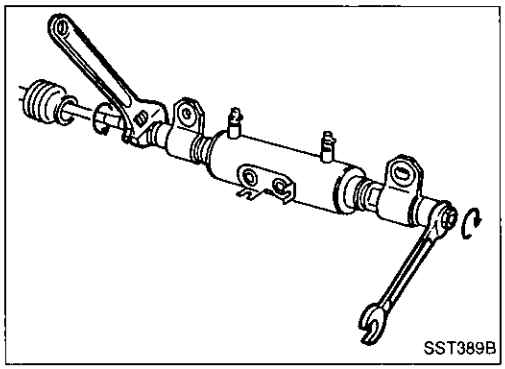

- While attaching a wrench to "width across flats" section of rod end from which stroke stopper was removed, remove the other lower link assembly.

## Power Cylinder (Cont'd)

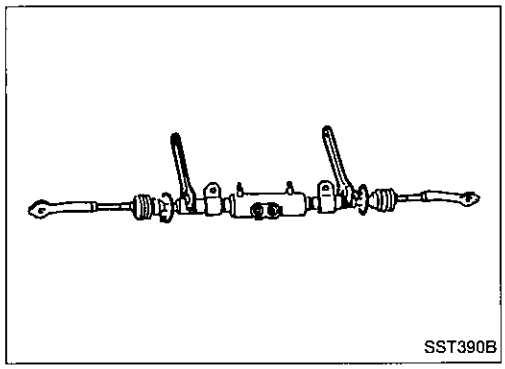
### ASSEMBLY




1. Install stroke stopper and lock nut on the lower link assembly to be assembled.



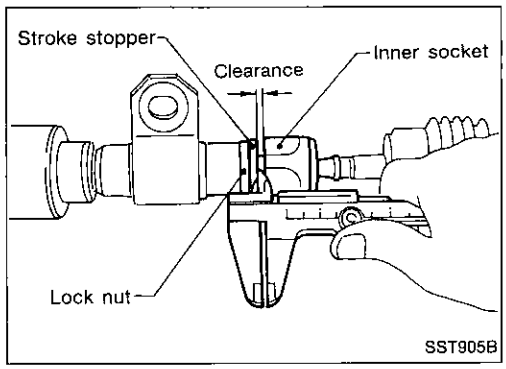

2. Apply Locktite to inner ball joint thread. Attach a wrench to "width across flats" section of piston rod (located on the other side) to prevent rod from turning. Install lower link assembly.




3. After installing stroke stopper and lock nut on the other lower link assembly, install lower link assembly. Attach a wrench to inner ball joint (to prevent it from turning), tighten inner socket to specified torque.

   **Inner socket:**

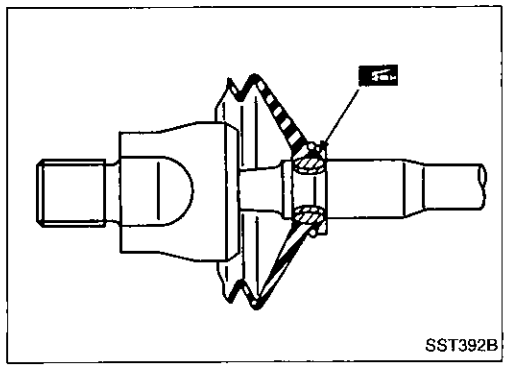
   **: 78 - 98 N·m (8 - 10 kg-m, 58 - 72 ft-lb)**




4. Adjust clearance between inner socket and stroke stopper by turning stroke stopper, then tighten lock nuts to the specified torque.

   **Clearance:**

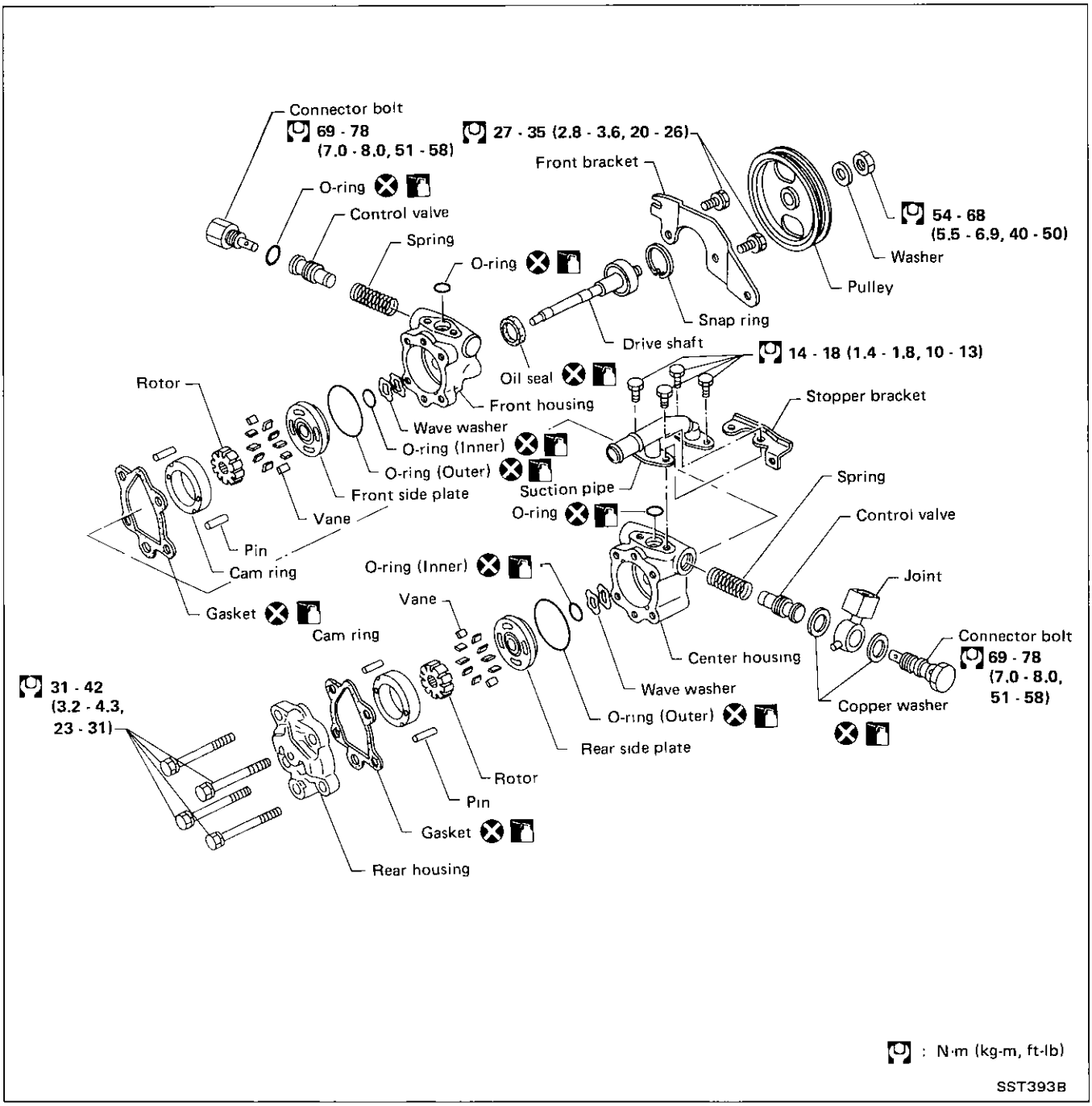
   **2.9 - 3.1 mm (0.114 - 0.122 in)**

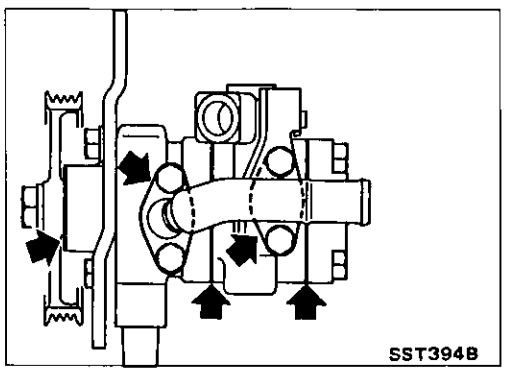



5. Install dust boot using new boot band and clamp.

- **Apply a coat of grease to grooves at boot location.**

## Oil Pump




### PRE-DISASSEMBLY INSPECTION

Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.

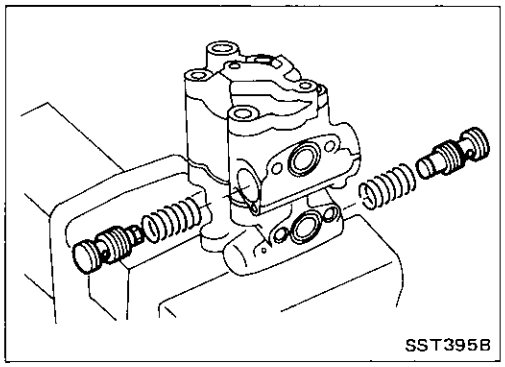
Procedures for disassembly and assembly are the same as those for the power steering oil pump.

## Oil Pump (Cont'd)

### Disassembly

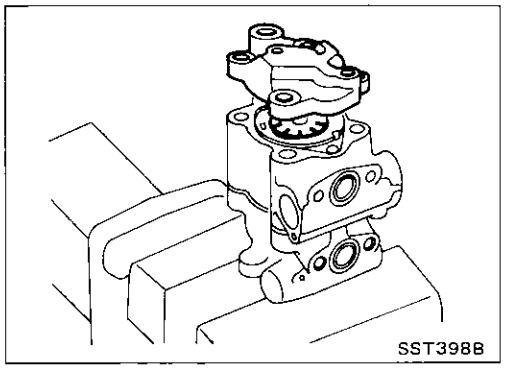
**CAUTION:**

- **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.**

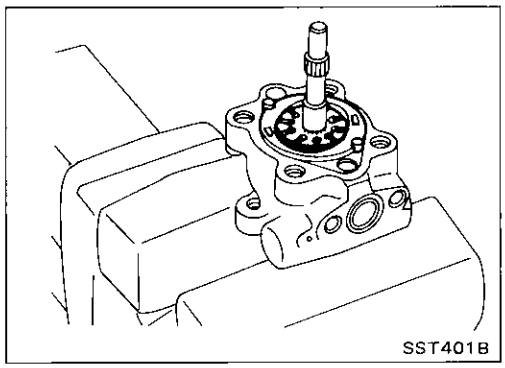



1. Remove connector.

**Be careful not to drop control valve.**
**Be careful not to confuse main side with sub side.**

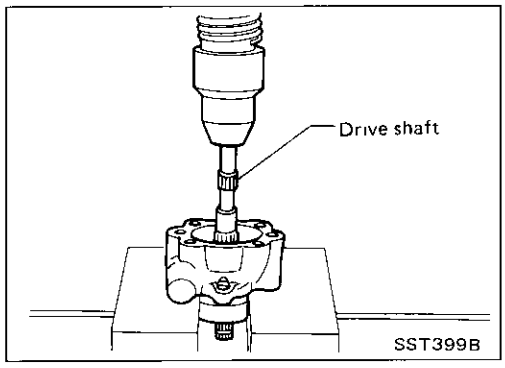



2. Remove rear housing.
3. Remove center housing.
4. Remove cam ring, rotor and other parts from center housing (sub side).




5. Remove cam ring, rotor and other parts from front housing (main side).

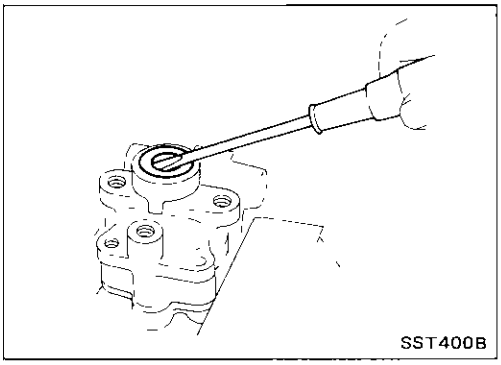
**Be careful not to confuse main side with sub side.**




6. Remove snap ring, then draw drive shaft out.

**Be careful not to drop drive shaft.**

## Disassembly (Cont'd)


SST400B

7. Remove oil seal.

**Be careful not to damage front housing.**

## Inspection

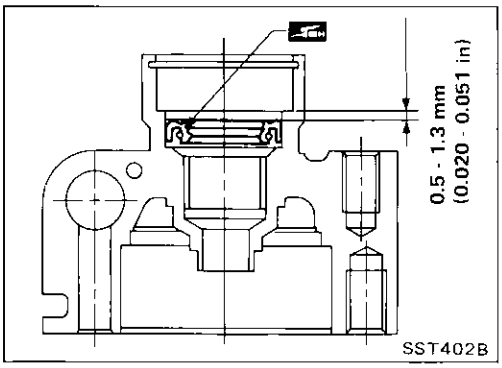
If any of the following parts are scratched or damaged, replace oil pump assembly.

- Mating surfaces of front housing and cam center housing
- Mating surfaces of rear housing and cam center housing
- Front housing bushing (at drive shaft support location)
- Flow control valve
- Drive shaft
- Rotor

## Assembly

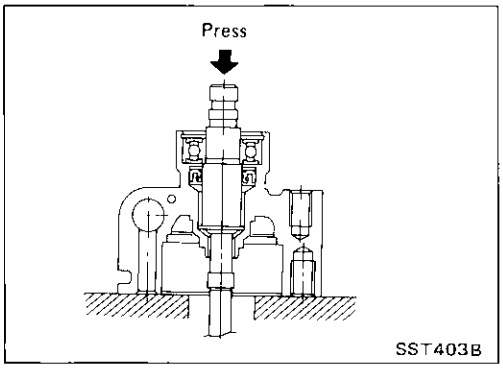
Assemble oil pump in the reverse order of disassembly, noting the following instructions.

- Before installation, coat the O-rings and oil seal with A.T.F.
- Make sure O-rings and oil seal are properly installed.
- When assembling vanes to rotor, rounded surfaces of vanes must face cam case side.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.



SST402B

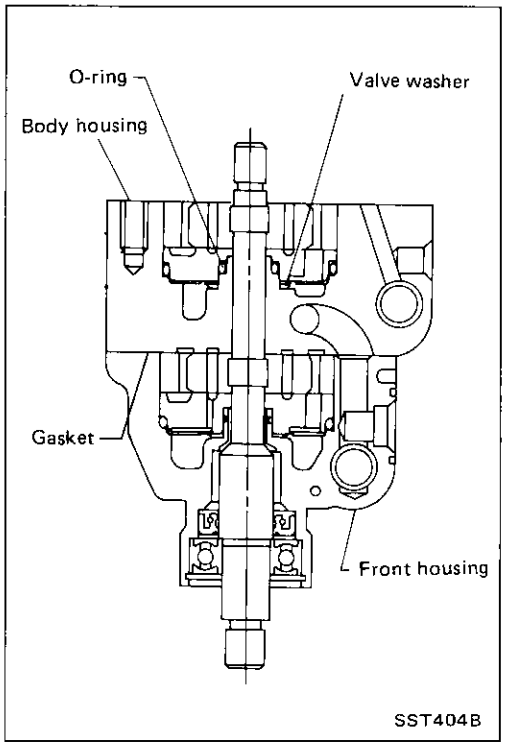
1. Press oil seal into front housing and apply grease to sealing lips.



SST403B

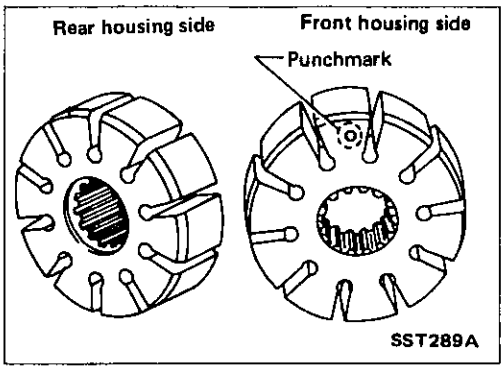
2. Press shaft assembly into front housing and install snap ring.

## Assembly (Cont'd)

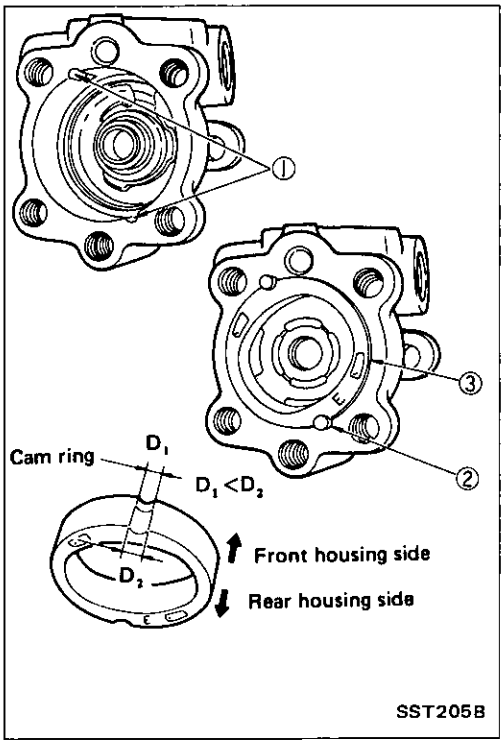



3. Install component parts on front housing in the order indicated below:
1) O-ring x 2
2) Wave washer
3) Side plate
4) Rotor [thickness: 16.25 mm (0.6398 in) (main side); 13 mm (0.51 in) (sub side)]
5) Vane
6) Pin
7) Cam ring [thickness: 16.25 mm (0.6398 in) (main side); 13 mm (0.51 in) (sub side)]
4. Place packing on front housing and position center housing on the packing. In the manner similar to step 3. above, install component parts on front housing (sub side).

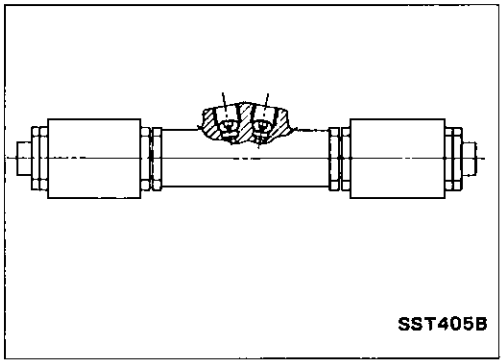
**CAUTION:**
- **Ensure that O-rings are positioned properly.**
- **Ensure that vane is installed with curved side facing cam ring.**
- **Use cam, rotor vane as original single unit.**
- **Ensure that control valve moves smoothly.**




- Pay attention to rotor direction.

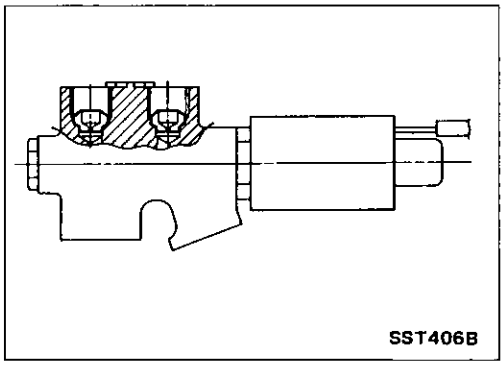


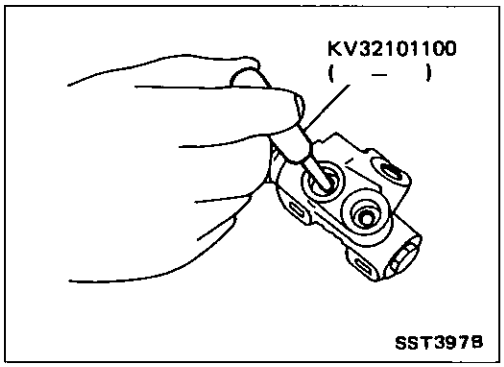

- Pay attention to cam ring direction.


SST405B

## HICAS Solenoid and Fail-safe Valve

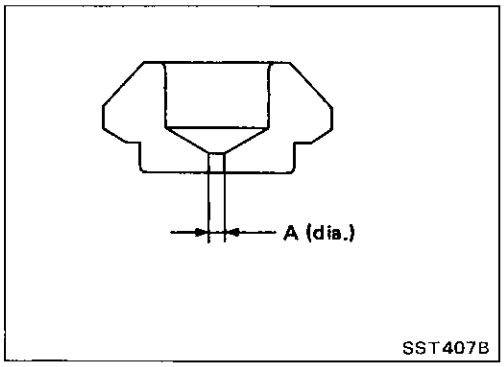
- Do not loosen lock nut which secures solenoid since HICAS solenoid fail-safe valves are of types that should not be disassembled.
- If any part is found to be malfunctioning, always replace as a valve assembly.


SST406B



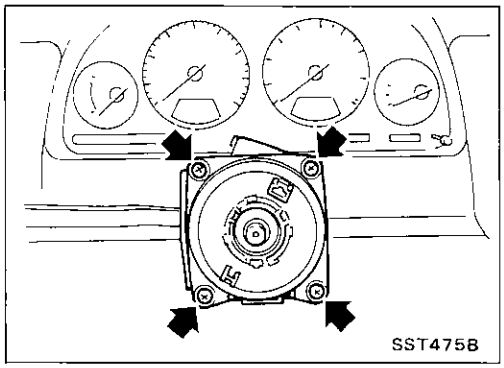
SST397B

- Whenever tubes are disconnected, check tube seat for scratches or damage. A scratched or cracked tube seat may cause oil leakage. Replace it using pin punch.



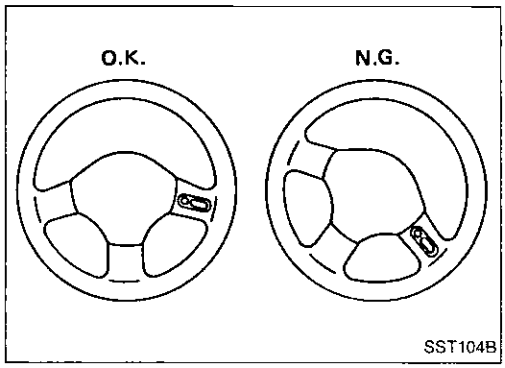
SST407B

| | | Control valve | Cut-off valve |
|---|---|---|---|
| Part No. | | 49528-31P10 | 49528-52L10 |
| A (dia.) | mm (in) | 1.5 (0.059) | 6.5 (0.256) |


SST475B

## Steering Angle Sensor

- Ensure that steering angle sensor bolts are secure and tight.
- If any part of steering angle sensor is malfunctioning, replace steering angle sensor assembly.




## Steering Wheel

### CHECKING NEUTRAL POSITION

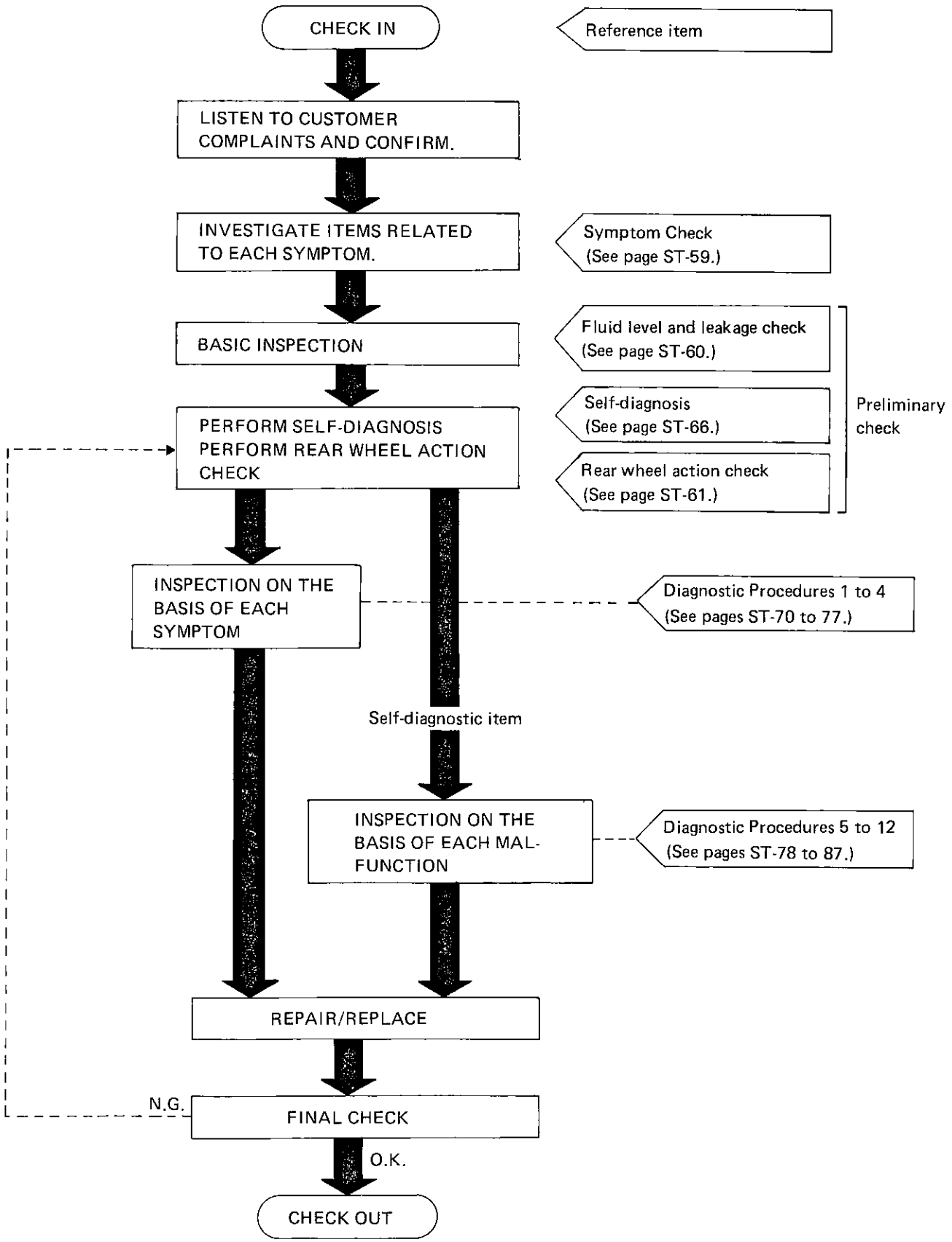
- Check that steering wheel is in neutral position when driving straight ahead at a speed of at least 70 km/h (43 MPH).
- If it is not in neutral position, remove steering wheel and reinstall it correctly.
- If neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in neutral position.

## Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair ..... ST-58
Symptom Chart ..... ST-59
Preliminary Check ..... ST-60
Component Parts and Harness Connector Locations ..... ST-63
Circuit Diagram for Quick Pinpoint Check ..... ST-64
Wiring Diagram ..... ST-65
Self-diagnosis ..... ST-66
Diagnostic Procedure 1 ..... ST-70
Diagnostic Procedure 2 ..... ST-70
Diagnostic Procedure 3 ..... ST-72
Diagnostic Procedure 4 ..... ST-73
Diagnostic Procedure 5 ..... ST-78
Diagnostic Procedure 6 ..... ST-80
Diagnostic Procedure 7 ..... ST-81
Diagnostic Procedure 8 ..... ST-82
Diagnostic Procedure 9 ..... ST-83
Diagnostic Procedure 10 ..... ST-84
Diagnostic Procedure 11 ..... ST-86
Diagnostic Procedure 12 ..... ST-87
Control Unit Inspection Table ..... ST-88

## How to Perform Trouble Diagnoses for Quick and Accurate Repair

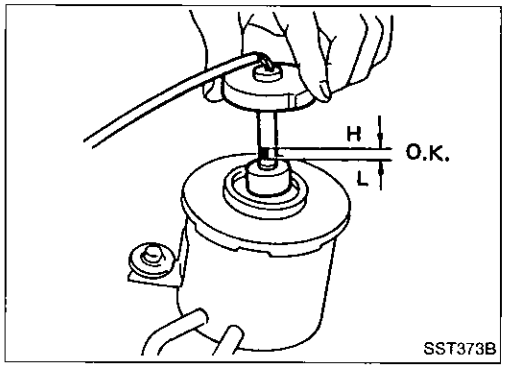
### WORK FLOW



# Symptom Chart

## DIAGNOSTIC TABLE

| PROCEDURE | | | | Preliminary Check | | | Diagnostic Procedure | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REFERENCE PAGE (ST-) | | | | 60 | 60 | 61 | 70 | 70 | 72 | 73 | 78 | 80 | 81 | 82 | 83 | 84 | 86 | 87 |
| SYMPTOM | | | | Preliminary check 1 | Preliminary check 2 | Preliminary check 3 | Diagnostic procedure 1 | Diagnostic procedure 2 | Diagnostic procedure 3 | Diagnostic procedure 4 | Diagnostic procedure 5 | Diagnostic procedure 6 | Diagnostic procedure 7 | Diagnostic procedure 8 | Diagnostic procedure 9 | Diagnostic procedure 10 | Diagnostic procedure 11 | Diagnostic procedure 12 |
| No warning lamp comes on when ignition switch is turned "ON" | | | | ○ | | | ○ | | | | | | | | | | | |
| Warning lamp comes on when engine is running | | | | ○ | ○ | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Abnormal noise is emitted. | | | | ○ | ○ | ○ | | | ○ | | | | | | | | | |
| Vehicle behavior is unusual (due to malfunctioning HICAS system.) | | | | ○ | ○ | ○ | | | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Self-diagnostic results | System is not set in self-diagnosis mode. | | | | | | | | | | ○ | | | | | | | |
| | Self-diagnosis code No. | Diagnosed part | CONSULT indication | | | | | | | | | | | | | | | |
| | 1 | HICAS solenoid (RH) output is not present. | HICAS SOLENOID-R [ABNORMAL SIGNAL] | | | | | | | | | ○ | | | | | | |
| | 2 | HICAS solenoid (LH) output is not present. | HICAS SOLENOID-L [ABNORMAL SIGNAL] | | | | | | | | | ○ | | | | | | |
| | 3 | Fail-safe valve output is not present. | FAIL-SAFE VALVE [ABNORMAL SIGNAL] | | | | | | | | | | ○ | | | | | |
| | 4 | Power steering solenoid output is not present | POWER STEERING SOL [ABNORMAL SIGNAL] | | | | | | | | | | | ○ | | | | |
| | 5 | Vehicle speed signal is not present. | VEHICLE SPEED SENSOR [NO SIGNAL] (-a) CAR SPEED SENSOR [SIG-SUDDEN TURN] (-b) | | | | | | | | | | | | ○ | | | |
| | 6 | Steering angle sensor input is not present | STEERING ANGLE SEN [NO ANG SIGNAL] (-a) STEERING ANGLE SEN [NO NEUT SIGNAL] (-b) STEERING ANGLE SEN [NEUT SIG-360° OFF] (-c) STEERING ANGLE SEN [NEUT SIG-30° ON] (-d) | | | | | | | | | | | | | ○ | | |
| | 7 | | | | | | | | | | | | | | | | | |
| | 8 | Parking brake (AT) or clutch switch (MT) input is not present. | — | | | | | | | | | | | | | | ○ | |
| | 9 | Inhibitor switch (AT) or neutral switch (MT) input is not present | — | | | | | | | | | | | | | | | ○ |

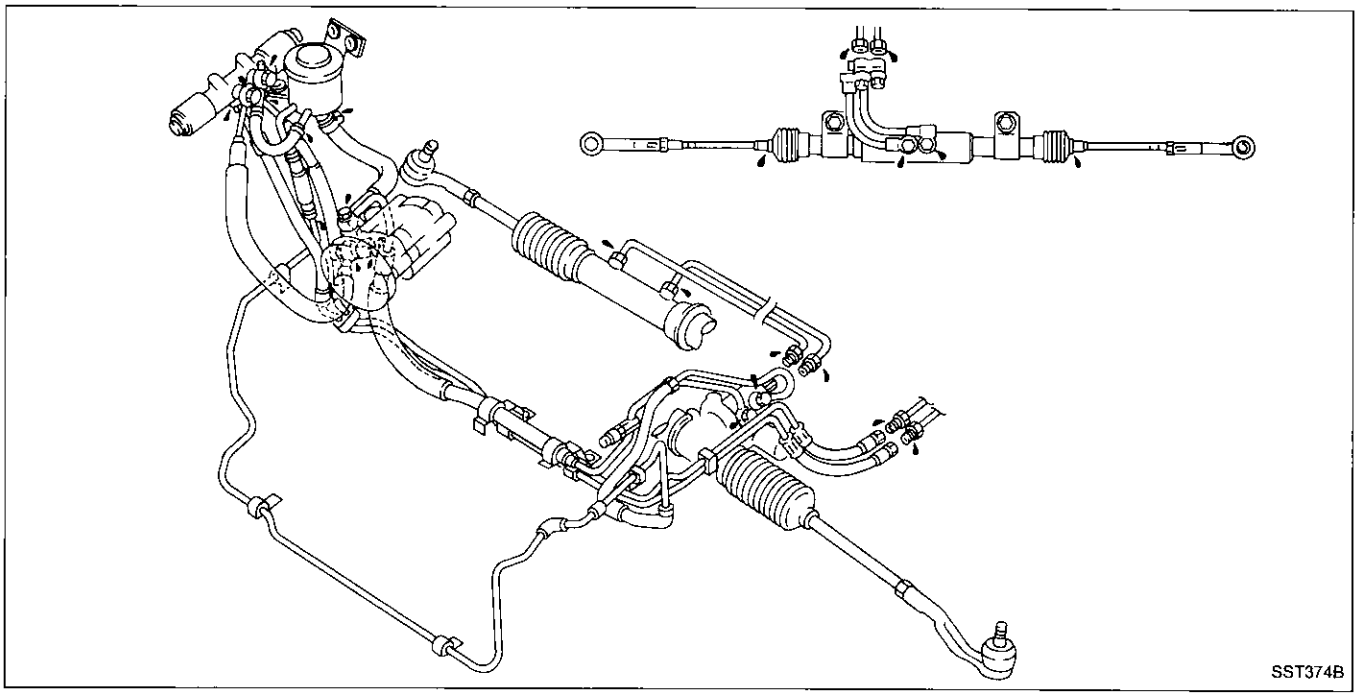


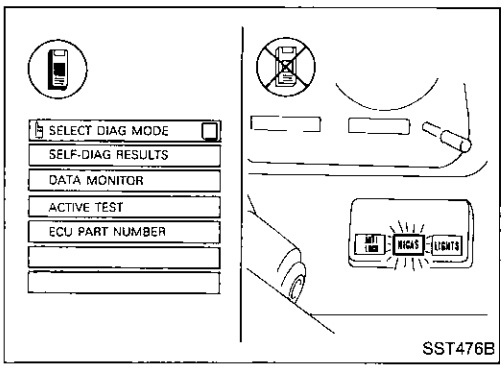

## Preliminary Check

### CHECK 1

**Checking fluid level and fluid leakage**

Refer to "SUPER HICAS SYSTEM — On-vehicle Service" on page ST-42.



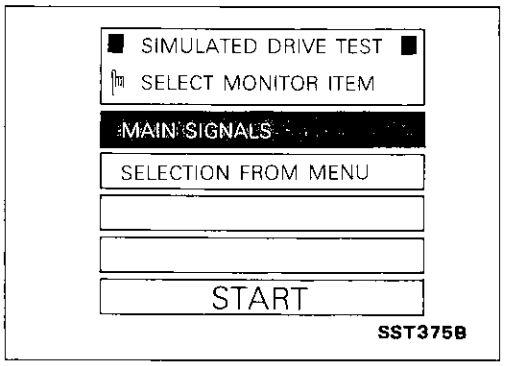




### CHECK 2

**Perform self-diagnosis.**

Refer to "Self-diagnosis" on page ST-66.

## Preliminary Check (Cont'd)

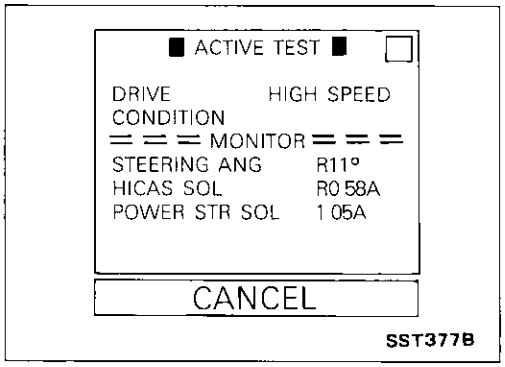



### CHECK 3

**Perform rear wheel action check.**

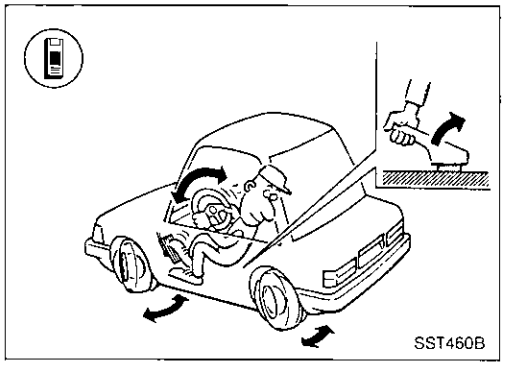
**When CONSULT is used:**

1. Have a helper sit in the driver's compartment, and raise vehicle.
   (Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Connect CONSULT unit to diagnosis connector and start engine.
3. Touch "START" on CONSULT display.
4. Touch "HICAS", "ACTIVE TEST" and "SIMULATED DRIVE" in that order.
5. Touch "START" when "MAIN SIGNALS" display is reversed.



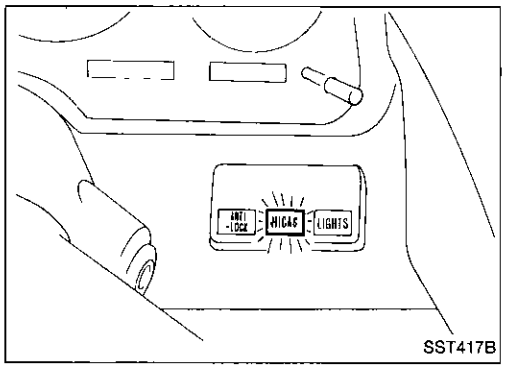

6. Touch "START."

**After simulated drive condition has continued for 5 minutes, it will automatically cancel and CONSULT unit will then show "TEST IS INTERRUPTED TO AVOID OIL TEMP RISE" display. To cancel this mode during self-diagnosis, simply touch "CANCEL".**

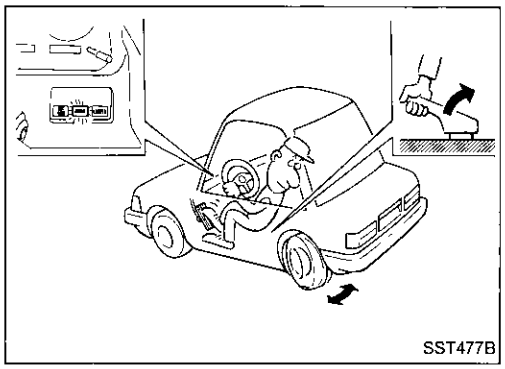



7. While running engine at speeds greater than 2,000 rpm, turn steering wheel 180° to the left and right from the neutral position. Ensure that rear wheels steer in response to rotation of steering wheel.

## Preliminary Check (Cont'd)



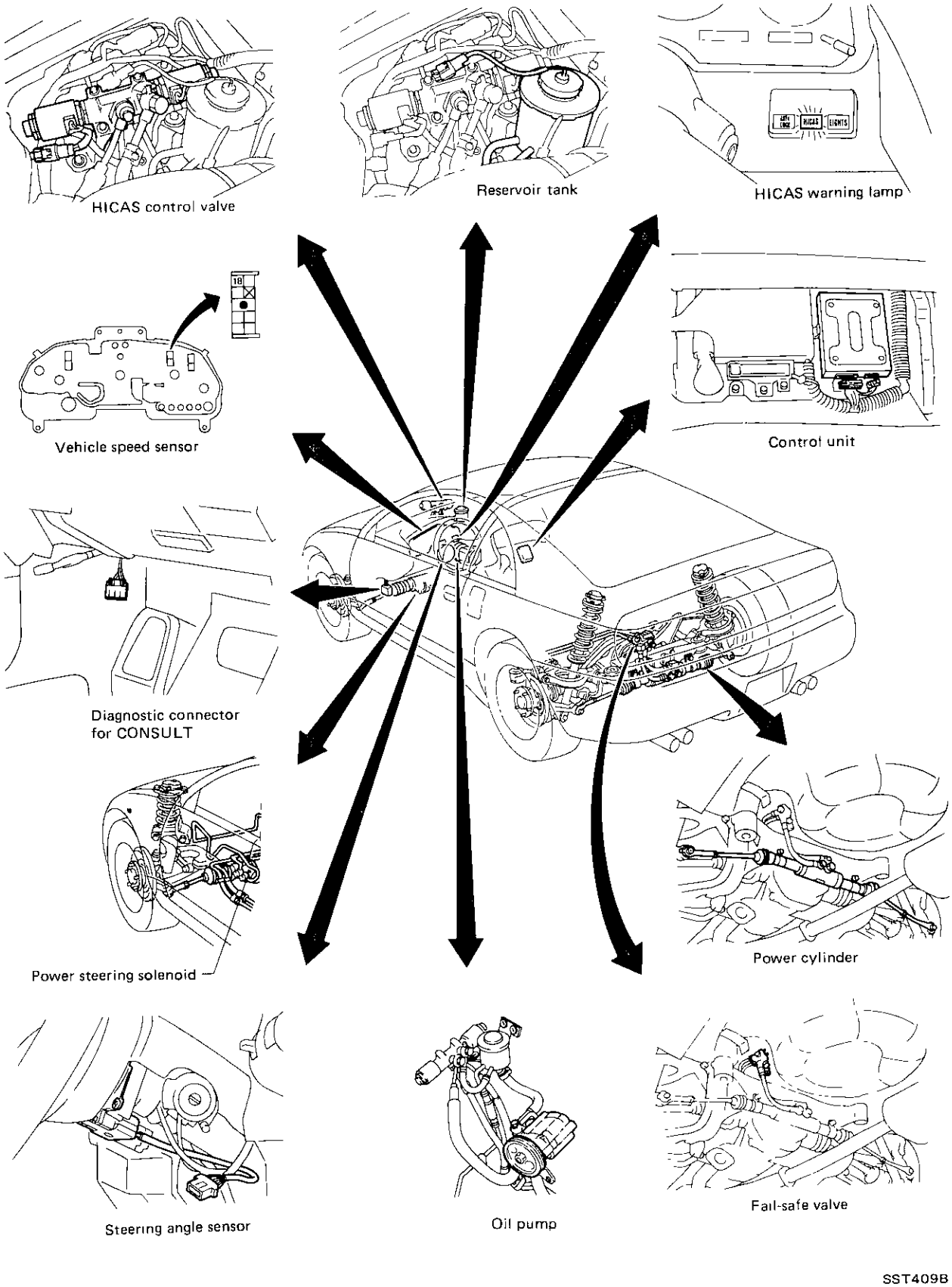
SST417B


SST477B

**When CONSULT is not used:**

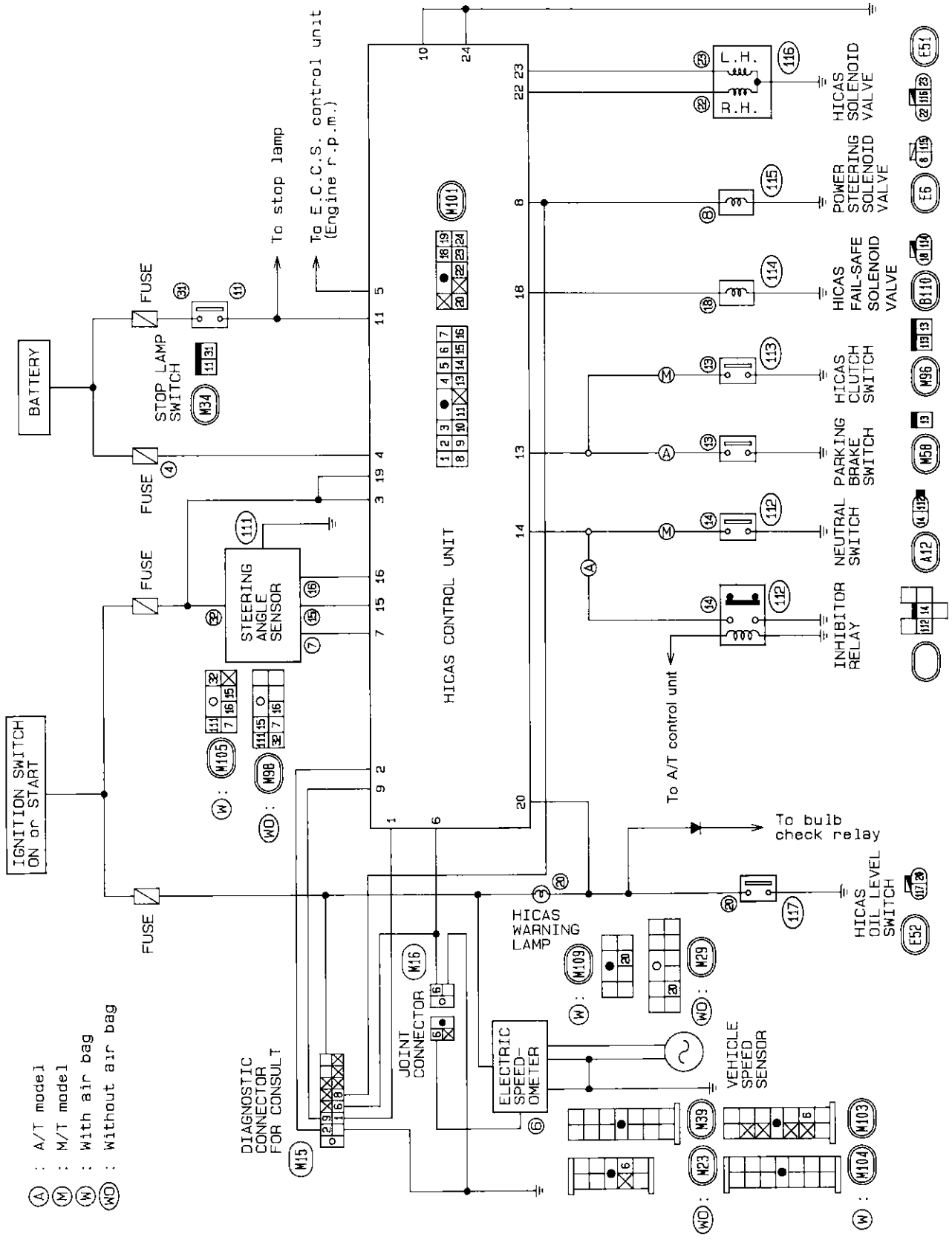
1. Turn key switch "OFF".
2. Set HICAS system in self-diagnosis mode.
(1) Turn ignition switch "OFF".
(2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
(3) Turn ignition switch "ON".
(4) Immediately start engine.
(5) Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
3. Set steering wheel to a point approximately 10° from the neutral position and check to ensure that rear wheels turn to the left and right alternately.

## Component Parts and Harness Connector Locations



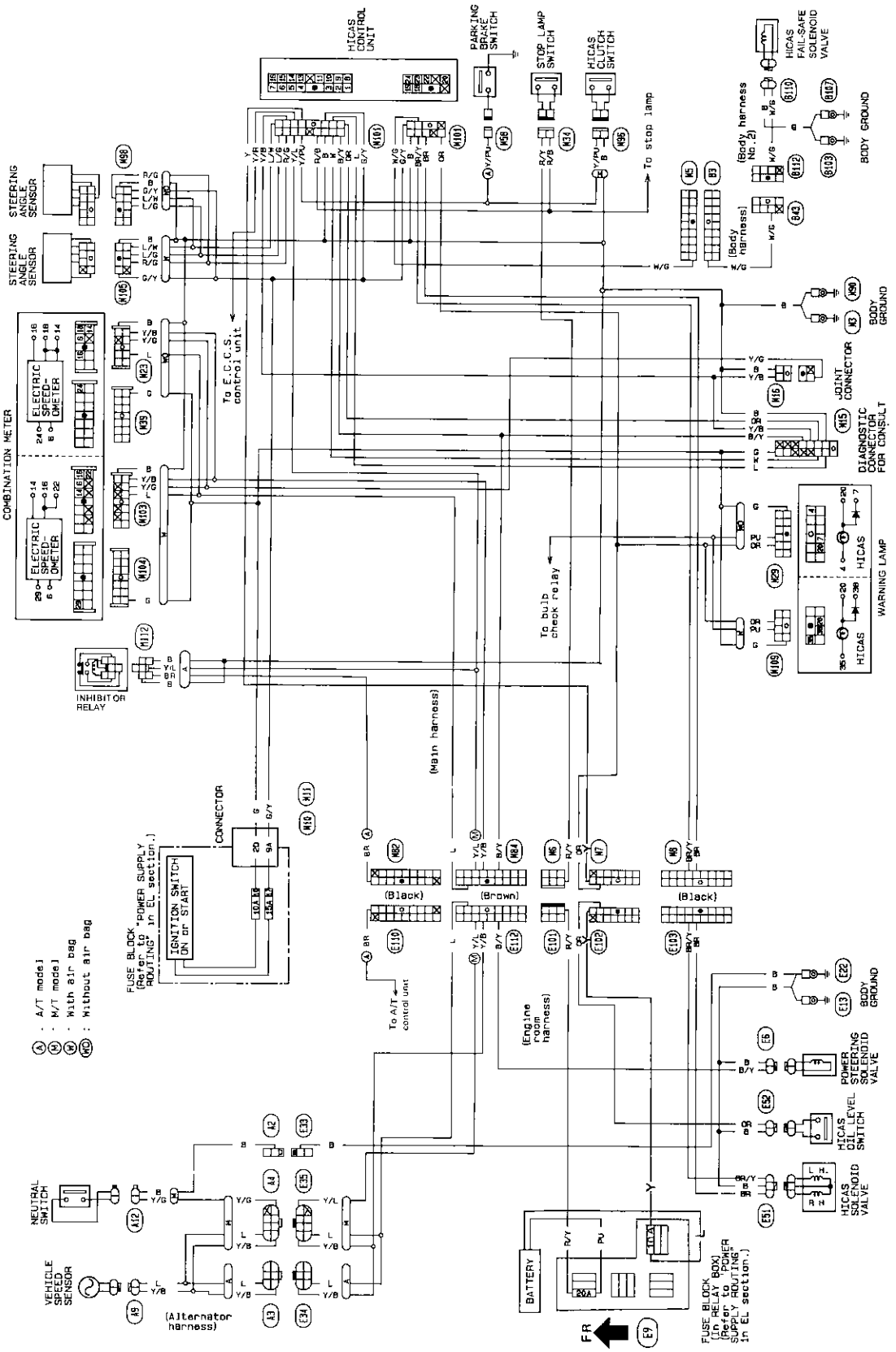

SST409B

## Circuit Diagram for Quick Pinpoint Check

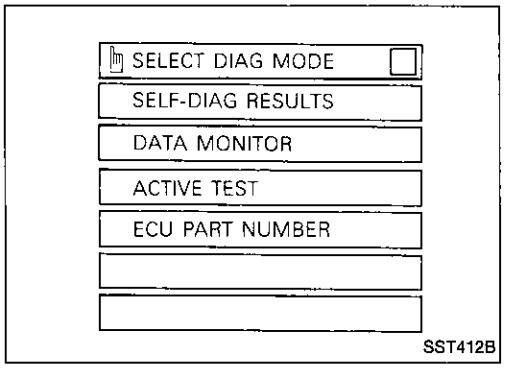



SST978B

## Wiring Diagram



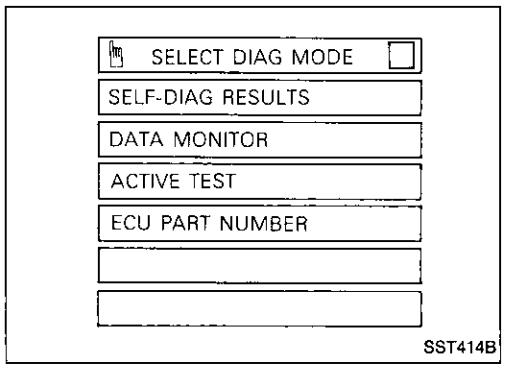

SST979B




## Self-diagnosis (When CONSULT is used)

- Start engine.
- Touch START (on CONSULT display).
- Touch HICAS.
- Touch SELF-DIAG RESULTS.

Refer to CONSULT operation manual "HICAS" for details.




**For reference:**

**Recording input/output signals using data monitor function**

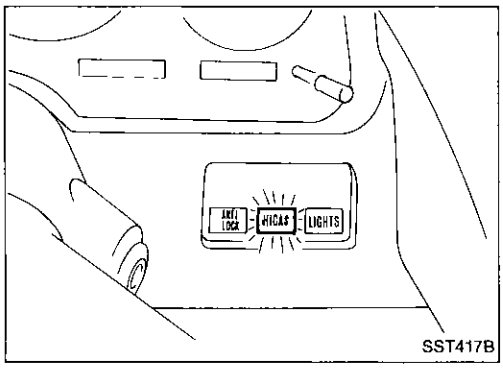
- Start engine.
- Touch START (on CONSULT display).
- Touch HICAS.
- Touch DATA MONITOR.

Refer to CONSULT operation manual "HICAS" for details.

## Self-diagnosis (When CONSULT is not used)

### SELF-DIAGNOSIS PROCEDURES

1. Input starting conditions for self-diagnosis.
(1) Turn ignition switch "OFF".
(2) Set shift lever to "P" or "N" position (A/T model),or "Neutral" position (M/T model).
(3) Turn ignition switch "ON".
(4) Immediately start engine.
(5) Turn steering wheel from left to right (at least 20° from the neutral position ) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
2. Input self-diagnosis item.
(1) Depress and release foot brake pedal.
(2) Turn steering wheel from left to right (at least 20°) from the neutral position.
(3) (M/T model)
Depress clutch pedal and move gear shift lever to any position other than Neutral land return to Neutral. Release clutch pedal.
(A/T model)
Disengage and engage parking brake lever. Move shift lever to any position other than Neutral or Parking and return to Parking.
(4) Move car at least 3 meters (10 ft) forward and proceed at an indicated speed of at least 2 km/h (1 MPH) in self-diagnosis mode.




3. The self-diagnosis mode will then appear in the "HICAS" warning lamp.

**When all systems are normal:**

HICAS warning lamp flashes at 0.25-second intervals.

## Self-diagnosis (When CONSULT is not used) (Cont'd)

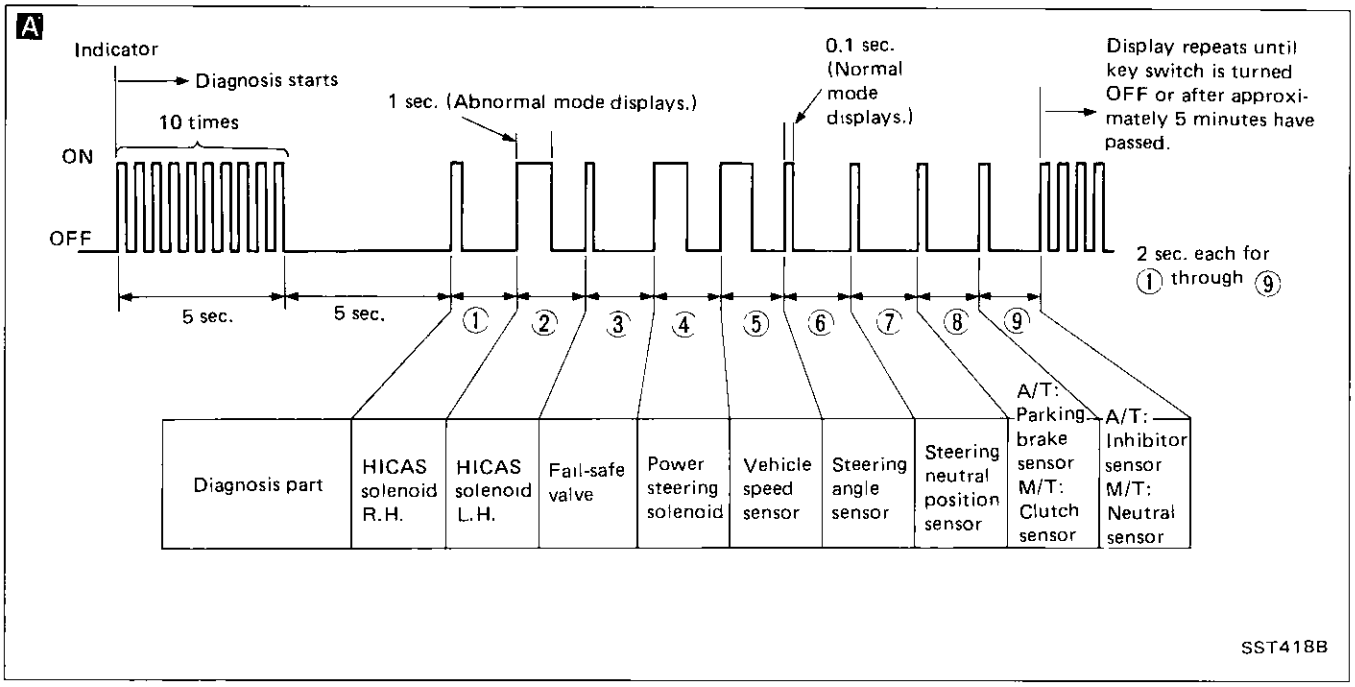
**When there is a system malfunction:**

Example: When ② HICAS solenoid LH, ④ power steering solenoid and ⑤ vehicle speed sensor have experienced a malfunction.

The warning lamp displays abnormal mode (1 sec. ON).

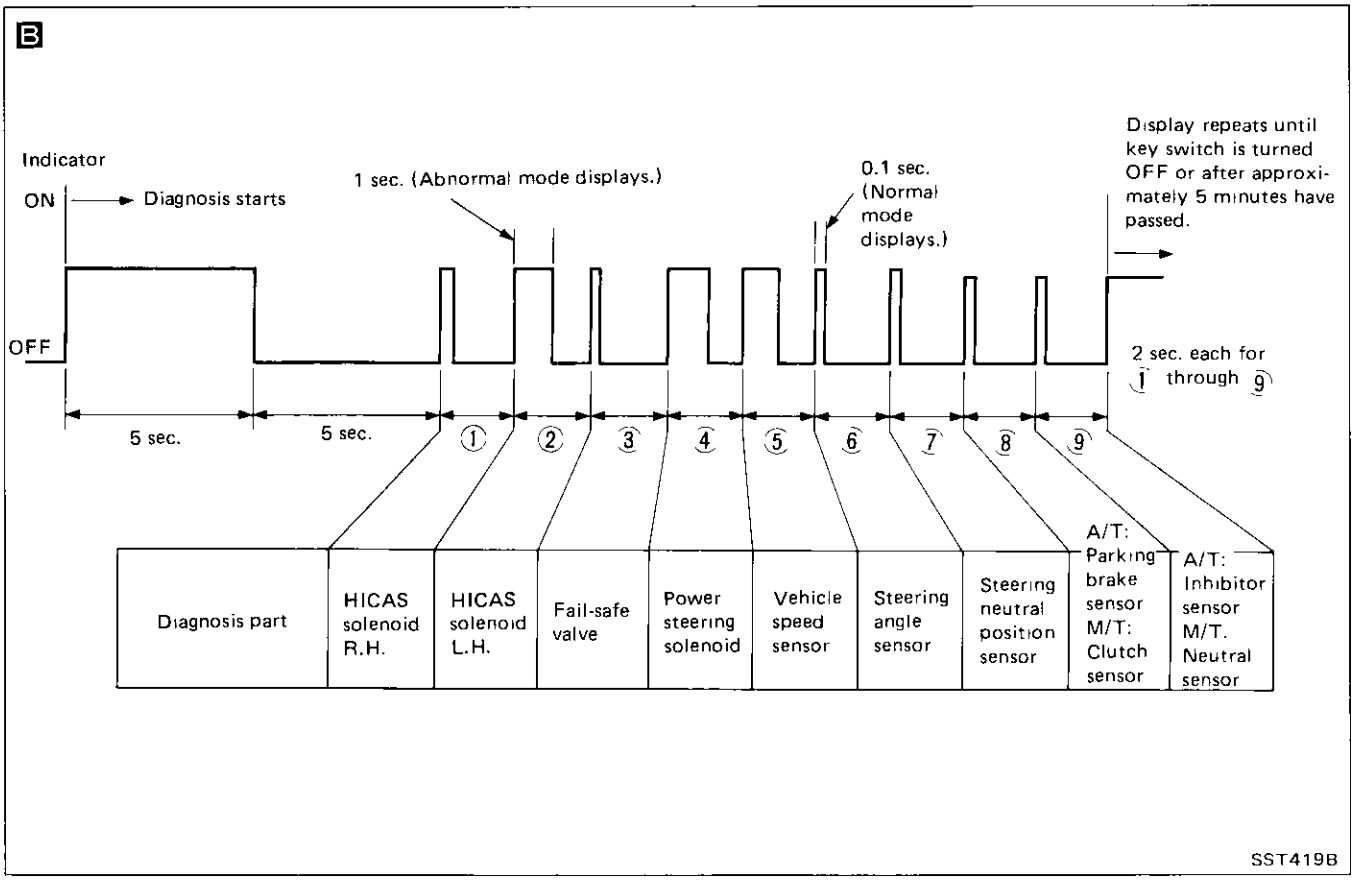
**A** If fail-safe system was operated (fail-safe valve is operating) when ignition switch was turned OFF for the last time, fail-safe items will be displayed in numerical order in modes indicated. After all items are displayed, display is repeated again.

- **To change the display mode to A, turn OFF ignition switch after mode B is displayed.**
- **When battery charge is insufficient, mode B is displayed.**



## Self-diagnosis (When CONSULT is not used) (Cont'd)

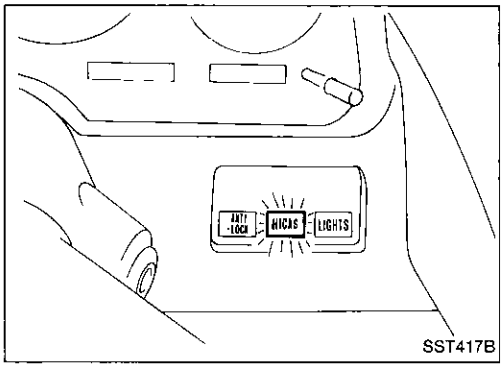
B If fail-safe system was not operated when ignition switch was turned OFF for the last time, display will show self-diagnosis results in numerical sequence in modes indicated below. After all self-diagnosis results are shown, display is repeated again.

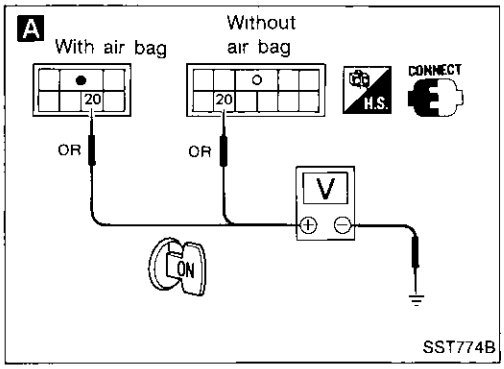



### CANCELING THE SELF-DIAGNOSIS FUNCTION

There are three methods for canceling the self-diagnosis function, as described below:

- The self-diagnosis system is canceled by the turning ignition switch "OFF".
- After self-diagnosing has been operated for approximately 5 minutes, the self-diagnosis system will be automatically canceled.
- The self-diagnosis system is canceled by a vehicle speed of 30 km/h (19 MPH) or over.




## Diagnostic Procedure 1

**SYMPTOM:**

**No warning lamp comes on when ignition switch is turned "ON".**

START

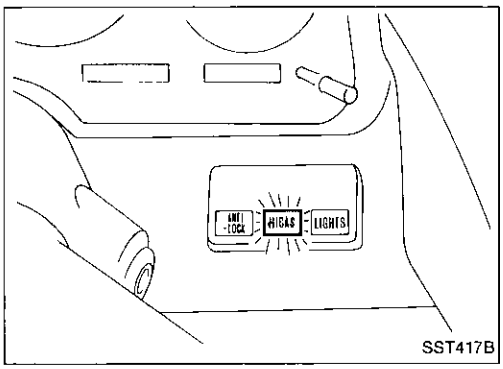
A

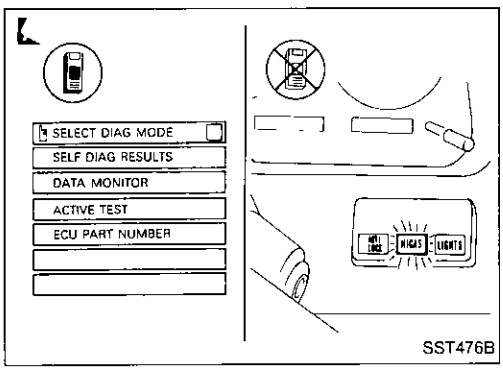
CHECK WARNING LAMP POWER SUPPLY.
1) Turn ignition switch "ON".
2) Measure voltage across warning lamp connector terminal ⑳ and ground.
**Voltage:**
**Approximately 12V**

N.G. → Check and repair wiring.

O.K.

Replace warning lamp.




## Diagnostic Procedure 2

**SYMPTOM (A):**

**Warning lamp comes on during operation.**

START

A

Check in self-diagnosis mode.
Refer to page ST-66.

Repair malfunctioning part detected by self-diagnosis.
Refer to Diagnostic Procedures 5 to 12.

O.K. → END

N.G.

Check connectors for improper contact.

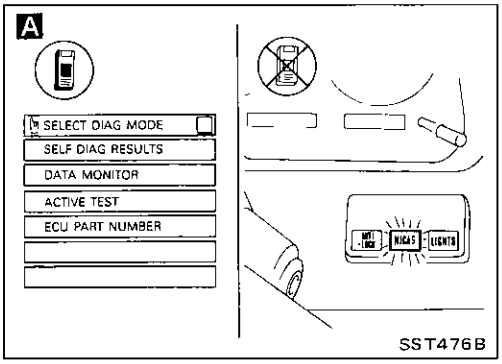
O.K. → END

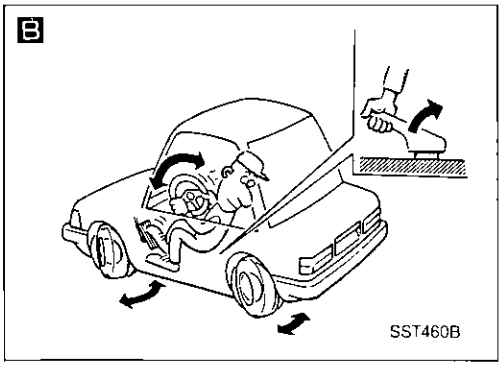
N.G.

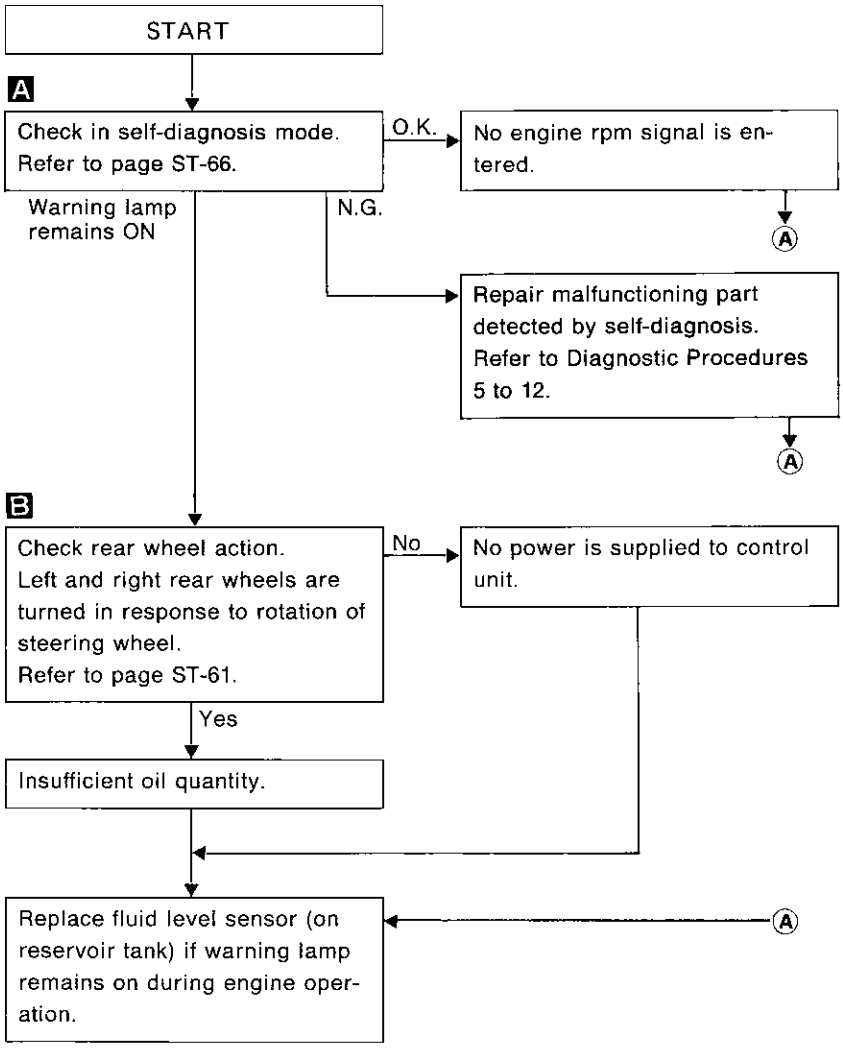
Check steering neutral position.
Refer to page ST-56.

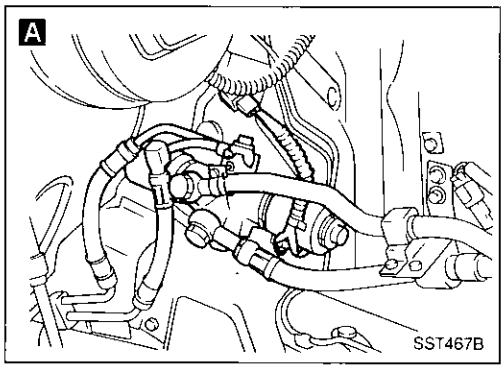
## Diagnostic Procedure 2 (Cont'd)

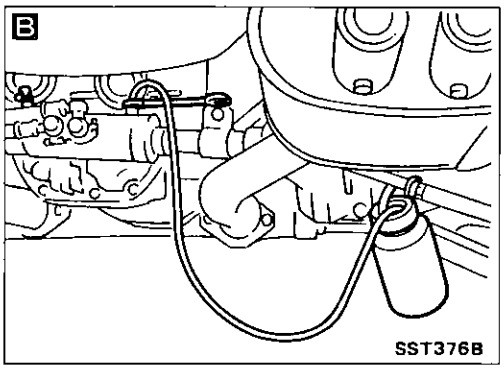
**SYMPTOM (B):**
**Warning lamp comes on when ignition switch is turned ON; however, it does not go out after engine start.**

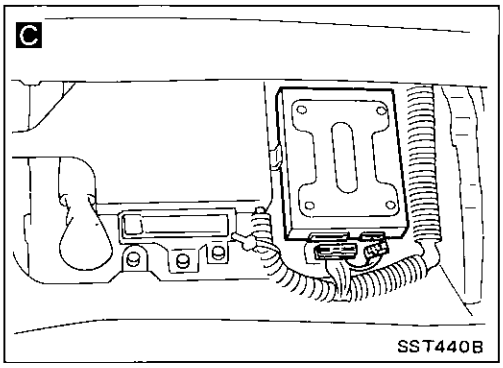


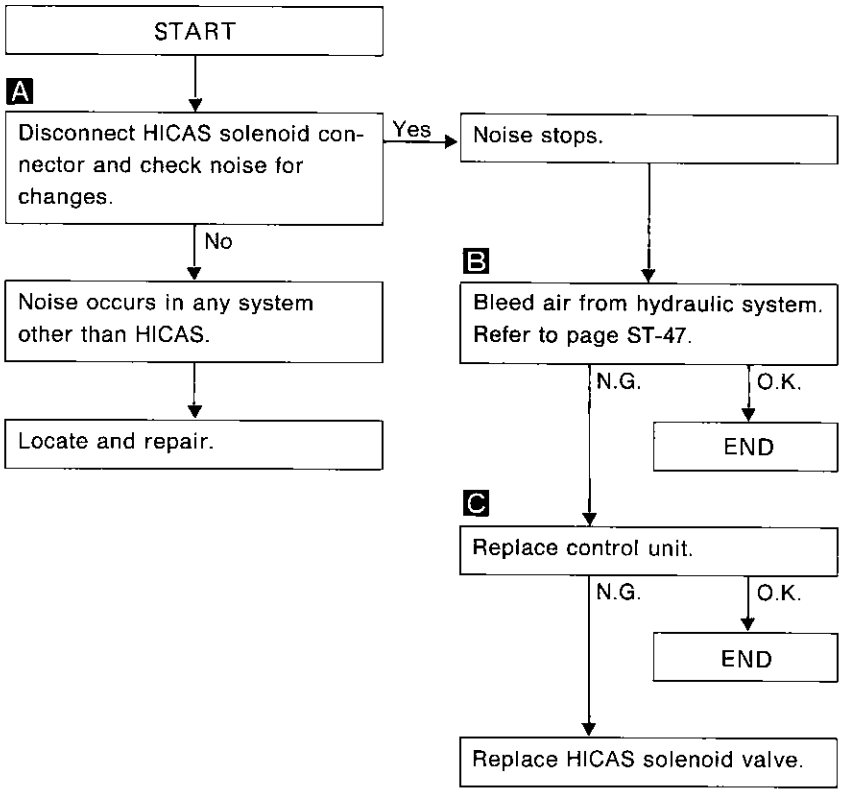


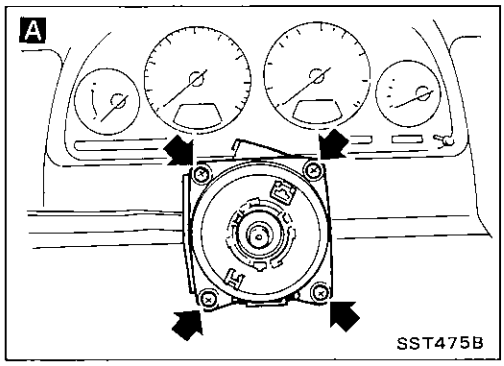



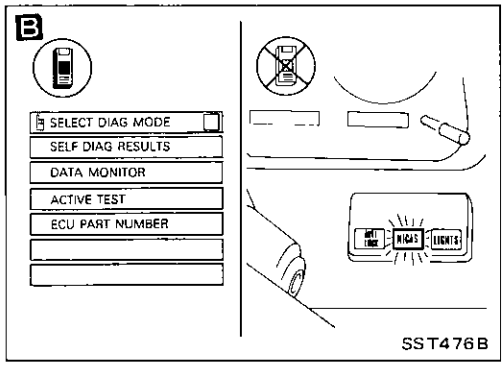




## Diagnostic Procedure 3

**SYMPTOM:**
**Abnormal noise occurs.**






## Diagnostic Procedure 4

**SYMPTOM:**
**Vehicle behavior is abnormal. (Vehicle sways or jerks.)**

START

A

Check steering wheel neutral position for misalignment and steering angle sensors for looseness.
Refer to page ST-56.

O.K. → END

N.G.

B

Check in self-diagnosis mode.
Refer to page ST-66.

N.G. → Repair malfunctioning system detected by self-diagnosis.
Refer to Diagnostic Procedures 5 to 12.

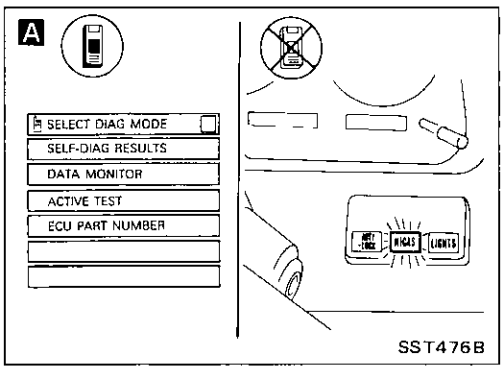
O.K.

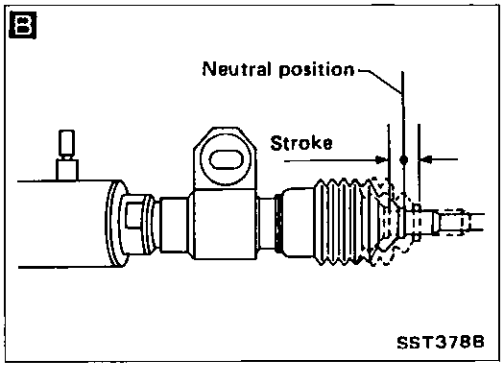
Check static HICAS characteristic performance.
Refer to flow chart A or page ST-74.

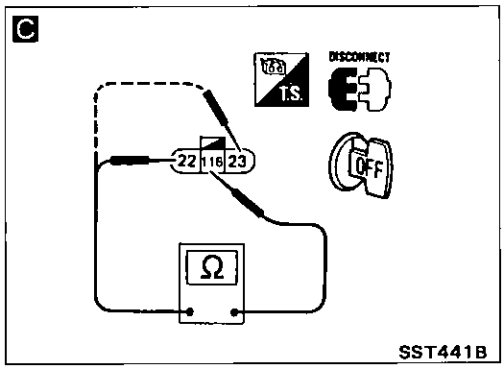
Check dynamic HICAS characteristic performance.
Refer to flow chart B on page ST-76.

## Diagnostic Procedure 4 (Cont'd)

### A. Static HICAS characteristic performance check




START

A

Set CONSULT in ACTIVE TEST mode.

OR

Set self-diagnosis mode. Refer to page ST-66.

B

- Run engine at a speed or less than 2,000 rpm.
- Turn steering wheel approximately 180° to the left or right.

CHECK POWER CYLINDER STROKES.

**Each stroke from neutral position:**
**2.9 - 3.1 mm**
**(0.114 - 0.122 in)**

Refer to page ST-43.

O.K. → END

Ⓑ

N.G.

C

CHECK RESISTANCE OF HICAS SOLENOID VALVE.

Stop engine and disconnect HICAS solenoid valve.

Measure resistance between HICAS solenoid connector terminals ㉒ and ㉓, and ⑯ .

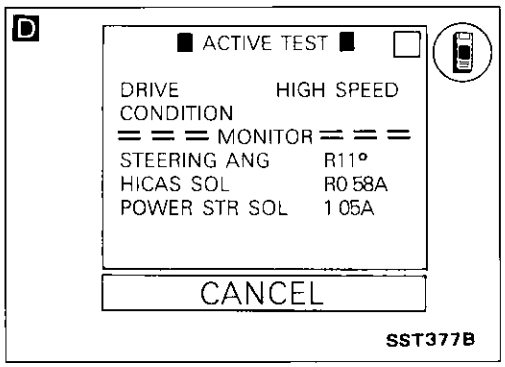
**Resistance:**
**4 - 6Ω**

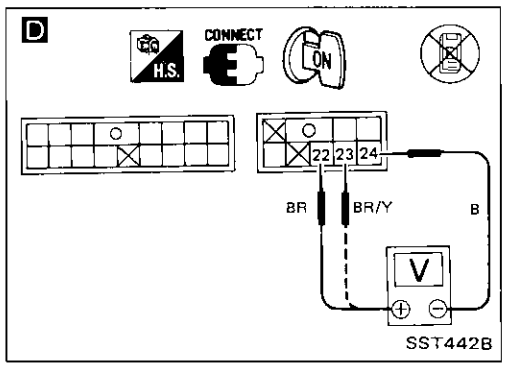
N.G. → Replace HICAS solenoid valve.

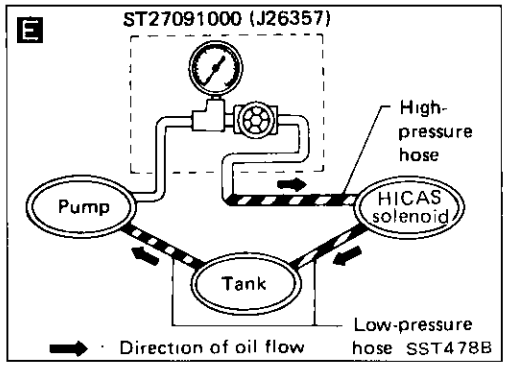
O.K.

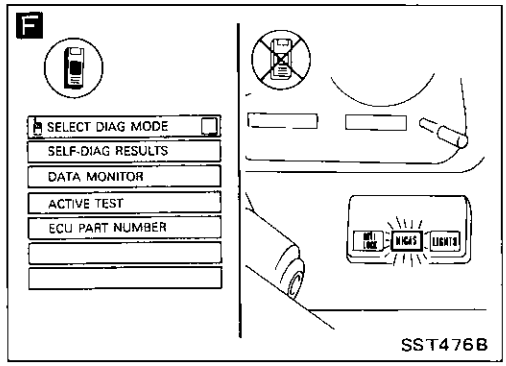
Ⓐ

## Diagnostic Procedure 4 (Cont'd)




Ⓐ

**D** CHECK CONTROL UNIT OUTPUT VOLTAGE.
Set CONSULT in ACTIVE TEST mode.
**HICAS solenoid valve output amperes:**
**1.1 - 1.2A**

— OR —

Set self-diagnosis mode.
- Run engine at a speed of more than 2,000 rpm.
- Turn steering wheel approximately 180°.
- Measure voltage across control unit connector terminals (22) and (23), and (24).

**Output voltage:**
**More than 4.4V**

N.G. → Replace control unit. → Ⓑ

O.K.

**E** CHECK HICAS OIL PUMP RELIEF PRESSURE.
- Cancel self-diagnosis mode.
- Check HICAS oil pump relief pressure with engine running at a speed of more than 2,000 rpm.

**Relief pressure:**
**More than 5,884 kPa (60 kg/cm², 853 psi)**

N.G. → Replace oil pump. → Ⓑ

O.K.

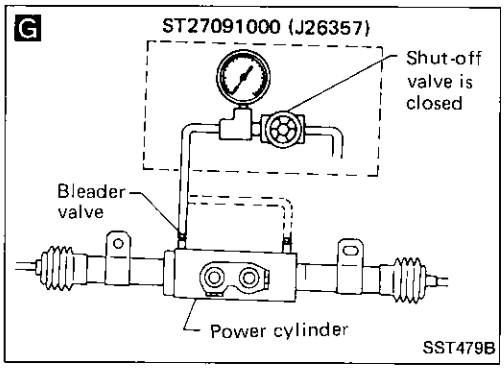
**F** CHECK OIL PRESSURE AT FAIL-SAFE VALVE.
Set CONSULT in ACTIVE TEST mode.

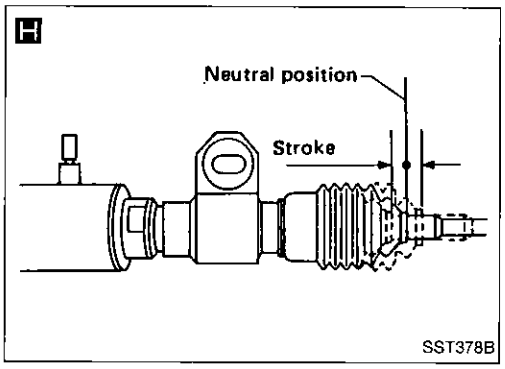
— OR —

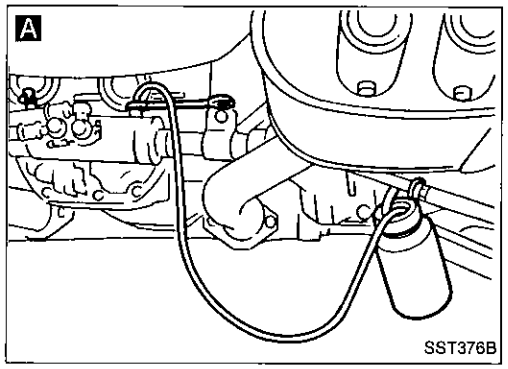
Set self-diagnosis mode.

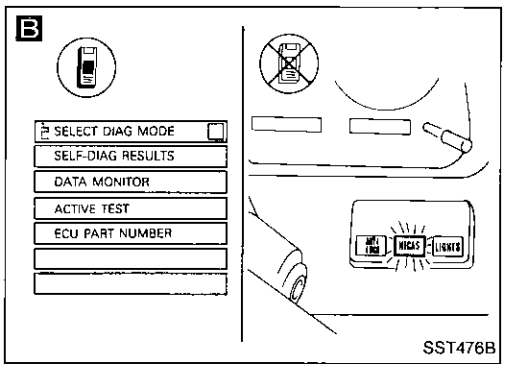
→ Ⓒ

## Diagnostic Procedure 4 (Cont'd)




Ⓒ

**G**

- Run engine at a speed of more than 2,000 rpm and turn steering wheel approximately 180° to the left and right.
- Check oil pressure at bleeder valve of power cylinder.

**Oil pressure:**
**More than 5,394 kPa (55 kg/cm², 782 psi)**

N.G. → Replace HICAS solenoid valve.

O.K. ↓

Replace power cylinder.

**H**

CHECK POWER CYLINDER STROKE.
**Each stroke from neutral position:**
**2.9 - 3.1 mm (0.114 - 0.122 in)**
Refer to page ST-43.

N.G. → Replace fail-safe valve.

O.K. → Ⓑ

### B. Dynamic HICAS characteristic performance check

START

**A**

CHECK PIPING AND CONNECTIONS. ALSO BLEED AIR FROM HYDRAULIC SYSTEM.
- Replace piping or connectors which are found to be damaged.
- Bleed air from hydraulic system.
  Refer to page ST-47.

**B**

Set CONSULT in ACTIVE TEST mode.

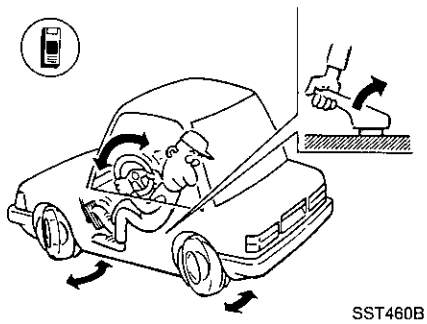
—OR—

Set in self-diagnosis mode.
Refer to page ST-66.

Ⓐ

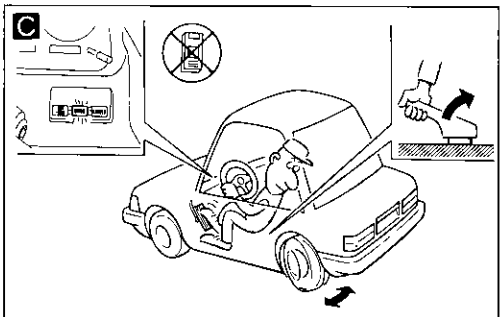
## Diagnostic Procedure 4 (Cont'd)

C



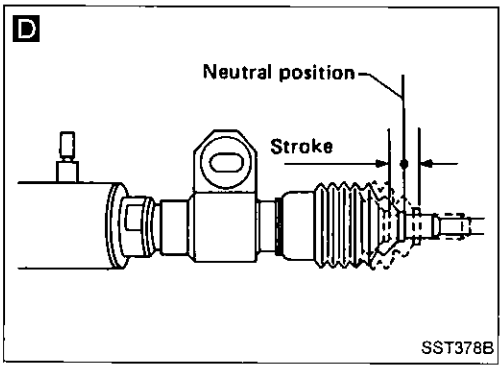
SST460B

C



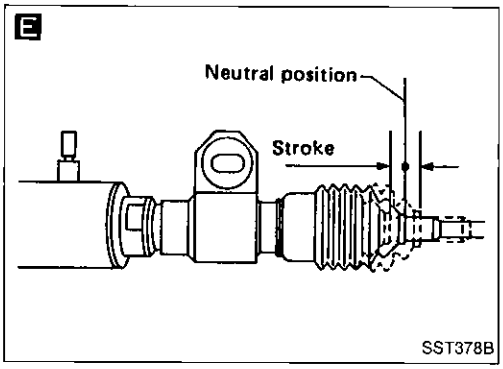
SST477B

D




SST378B

E




SST378B

Ⓐ

Run engine at a speed of more than 2,000 rpm.

C

CHECK REAR WHEELS FOR PROPER MOVEMENT.

Ensure that rear wheel turns to the left or right when steering wheel is turned to the left or right.

—OR—

Ensure that rear wheels intermittently turn to the left and right when steering wheel is set to the neutral position.

D

CHECK POWER CYLINDER STROKES.

**Each stroke from neutral position:**

**More than 2.0 mm (0.079 in)**

O.K. → END

N.G.

Replace HICAS solenoid valve.

E

CHECK POWER CYLINDER STROKE.

- After replacing HICAS solenoid valve, check power cylinder stroke.

**Each stroke from neutral position:**

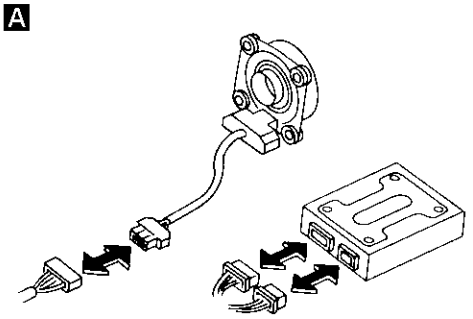
**More than 2.0 mm (0.079 in)**

O.K. → END

N.G.

Replace power cylinder.

A



SST446B

B
C

| ☆MONITOR ☆NO FAIL | |
|---|---|
| CAR SPEED (REF) | 0km/h |
| STEERING ANG | L8° |
| NEUTRAL SIG | ON |
| STOP LAMP SW | OFF |
| PKB/CLUTCH SW | ON |
| NEUTRAL SW | ON |
| ENG REV | UNDER 1500 |
| HICAS SOL | R0.00A |
| POWER STR SOL | 1.05A |

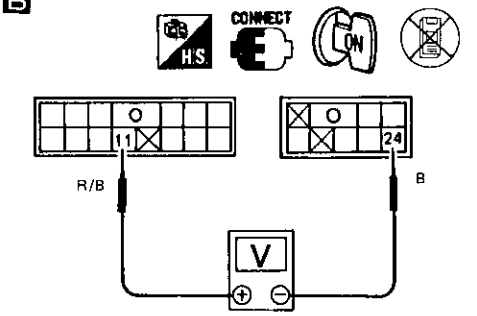
RECORD

| ☆MONITOR ☆NO FAIL | |
|---|---|
| FAILSAFE/V | OFF |
| FAILSAFE | NON |
| WARNING LAMP | OFF |

RECORD

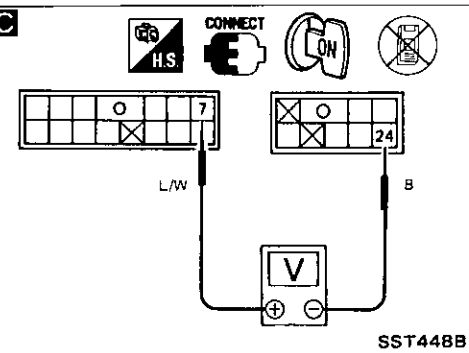
SST416B

B




SST447B

C




SST448B

## Diagnostic Procedure 5

**SYMPTOM:**

**System is not set in self-diagnosis mode.**

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect steering angle sensor connector and control unit connector, and reconnect them firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK STOP LAMP INPUT SIGNAL.
Set CONSULT in DATA MONITOR mode.
ON-OFF display

OR

Check that stop lamp input is present at control unit.
**Brake ON:**
**Approximately 12V**
**Brake OFF:**
**0V**

N.G. → Malfunctioning stop lamp switch system

O.K.

C

CHECK STEERING NEUTRAL POSITION SENSOR INPUT SIGNAL.
Set CONSULT in DATA MONITOR mode.
ON-OFF display

OR

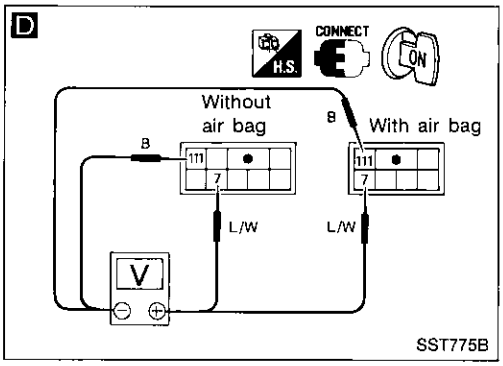
Check that steering neutral input is present at control unit when steering wheel is turned to the left and right at least 20° from the neutral position.
**Neutral position:**
**Approximately 5V**
**When turned at least 20°:**
**0V**

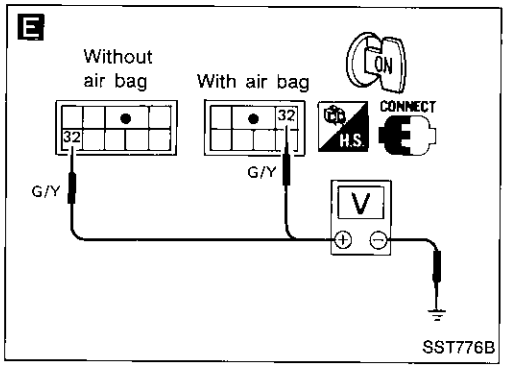
O.K. → Replace control unit.

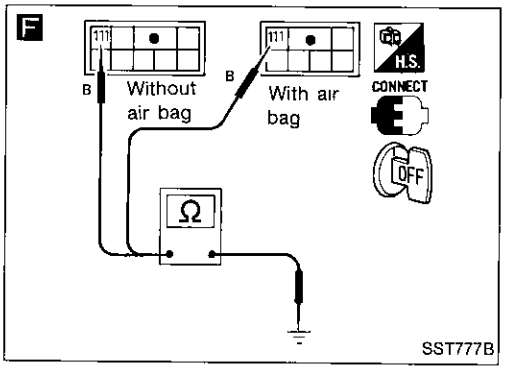
N.G.

Ⓐ

## Diagnostic Procedure 5 (Cont'd)




Ⓐ

**D** CHECK STEERING NEUTRAL POSITION SENSOR OUTPUT SIGNAL.

Check that steering neutral output is present when steering wheel is turned to the left and right at least 20° from the neutral position.

**Neutral position:**
**Approximately 5V**
**When turned at least 20°:**
**0V**

O.K. → Repair or replace harness between control unit and steering angle sensor.

N.G. ↓

**E** CHECK STEERING ANGLE SENSOR POWER SUPPLY.

1) Turn ignition switch "ON".
2) Measure voltage across steering angle sensor connector terminal IGN and ground.

**Voltage:**
**Approximately 12V**

O.K. → Replace steering angle sensor.

**F** CHECK STEERING ANGLE SENSOR GROUND CIRCUIT.

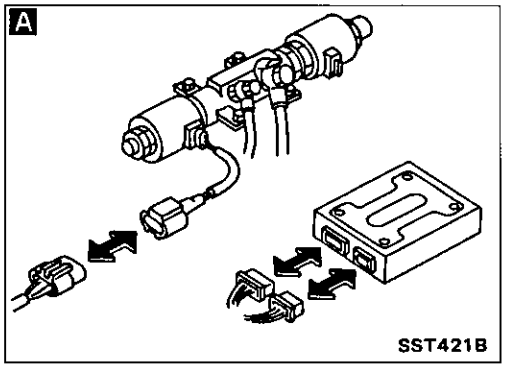
Check continuity between steering angle sensor terminal GND and body metal (ground).

**Continuity should exist.**

N.G. ↓

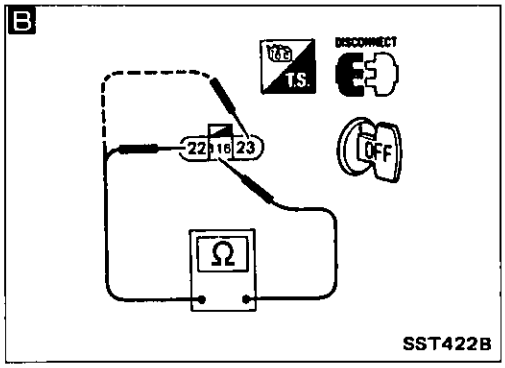
Check and repair power supply harness or ground harness.

A



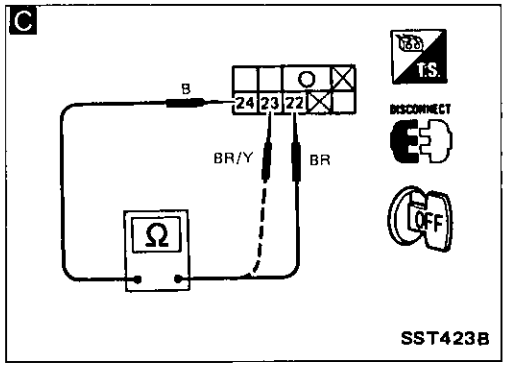
SST421B

B




SST422B

C




SST423B

## Diagnostic Procedure 6

**SYMPTOM:**
**HICAS solenoid (left and right) output is not present.**

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect HICAS solenoid connector and control unit connector, and reconnect them firmly.
Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK RESISTANCE OF LEFT AND RIGHT HICAS SOLENOIDS (on solenoid side).
1) Disconnect HICAS solenoid connector.
2) Measure resistance between HICAS solenoid connector terminals ㉒ and ㉓, and (116).
**Resistance:**
**4 - 6Ω**

N.G. → Replace HICAS solenoid

O.K.

C

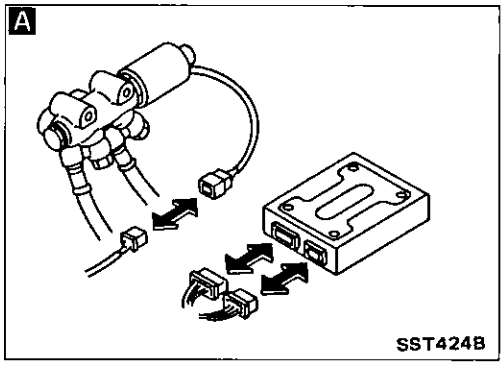
CHECK RESISTANCE OF LEFT AND RIGHT HICAS SOLENOIDS (on control unit side).
1) Disconnect control unit connector.
2) Measure resistance between body connector terminals ㉒ and ㉓, and ㉔.
**Resistance:**
**4 - 6Ω**

O.K. → Replace control unit.

N.G.

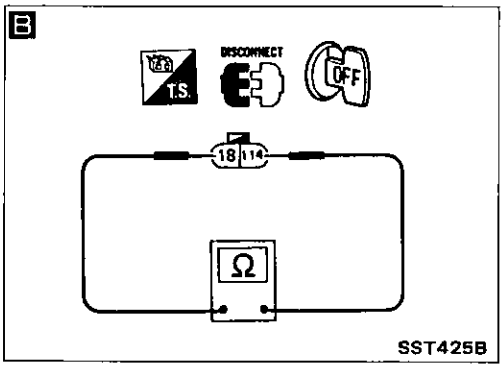
Repair or replace harness between control unit and HICAS solenoid.

A



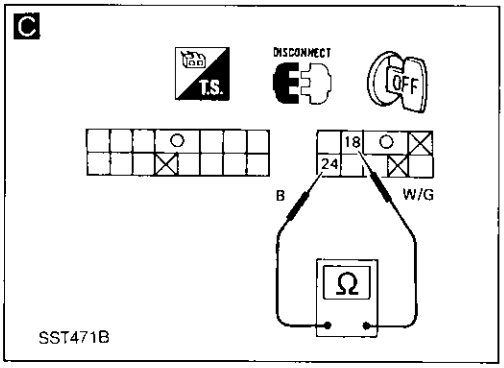
SST424B

B




SST425B

C




SST471B

## Diagnostic Procedure 7

**SYMPTOM:**

**Fail-safe valve output is not present.**

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect fail-safe valve connector and control unit connector, and reconnect them firmly.
Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK RESISTANCE OF FAIL-SAFE VALVE (on fail-safe valve side).
1) Disconnect fail-safe valve connector.
2) Measure resistance between connector terminals ⑱ and ⑭.
**Resistance:**
**13 - 17Ω**

N.G. → Replace fail-safe valve.

O.K.

C

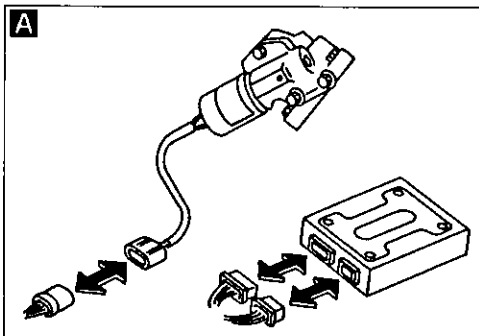
CHECK RESISTANCE OF FAIL-SAFE VALVE (on control unit side).
1) Disconnect control unit connector.
2) Measure resistance between body connector terminals ⑱ and ㉔.
**Resistance:**
**13 - 17Ω**

O.K. → Replace control unit.

N.G.

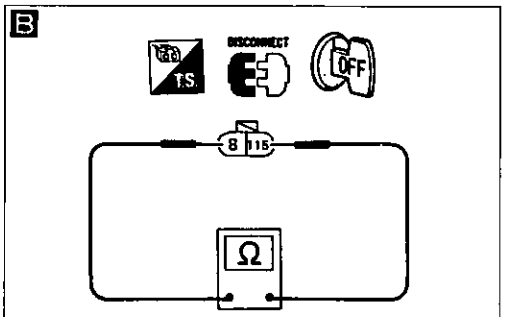
Repair or replace harness between control unit and fail-safe valve.

A



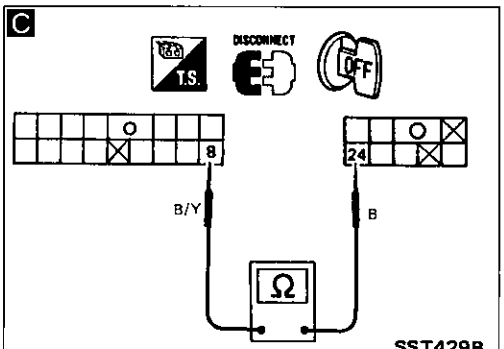
SST427B

B




SST428B

C




SST429B

## Diagnostic Procedure 8

**SYMPTOM:**

**Power steering solenoid output is not present.**

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect power steering solenoid connector and control unit connector, and reconnect them firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK RESISTANCE OF POWER STEERING SOLENOID (on solenoid side).
1) Disconnect power steering solenoid connector.
2) Measure resistance between solenoid connector terminals ⑧ and (115).
**Resistance:**
**4 - 6Ω**

N.G. → Replace power steering solenoid.

O.K.

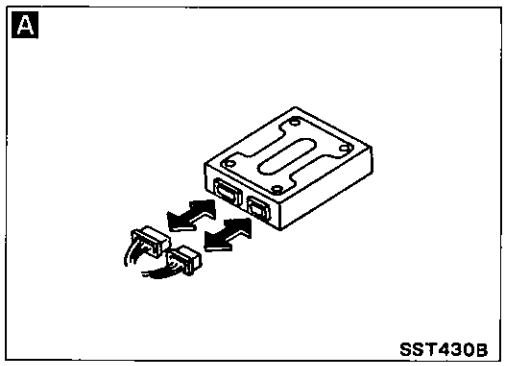
C

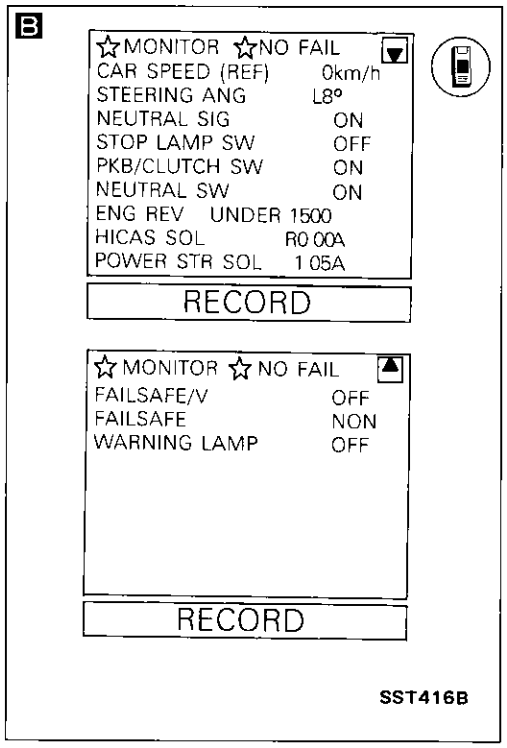
CHECK RESISTANCE OF POWER STEERING SOLENOID (on control unit side).
1) Disconnect control unit connector.
2) Measure resistance between body connector terminals ⑧ and ㉔.
**Resistance:**
**4 - 6Ω**

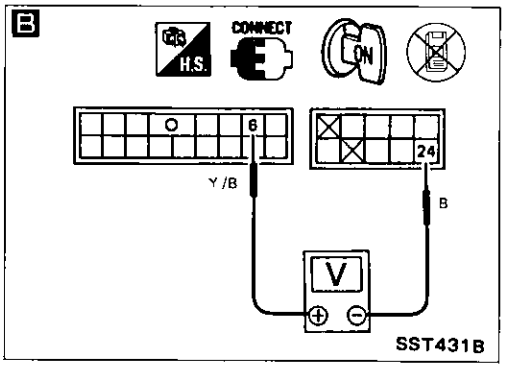
O.K. → Replace control unit.

N.G.

Repair or replace harness between control unit and power steering solenoid.




## Diagnostic Procedure 9

**SYMPTOM:**
**Vehicle speed signal is not present.**

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.
1) Raise rear end of vehicle so that rear wheels rotate freely.
2) Set CONSULT in DATA MONITOR mode.
Vehicle speed display (km/h)

OR

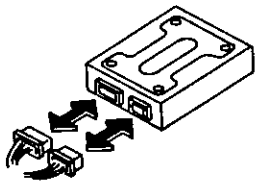
Measure voltage variations between control unit connector terminals ⑥ and ㉔ while slowly rotating rear wheels by hand.
**Voltage must change between 0 and 5V.**

O.K. → Replace control unit.

N.G.

Repair or replace harness between speed sensor or control unit and speedometer.

A



SST430B

B

| ☆MONITOR ☆NO FAIL | |
|---|---|
| CAR SPEED (REF) | 0km/h |
| STEERING ANG | L8° |
| NEUTRAL SIG | ON |
| STOP LAMP SW | OFF |
| PKB/CLUTCH SW | ON |
| NEUTRAL SW | ON |
| ENG REV | UNDER 1500 |
| HICAS SOL | R0.00A |
| POWER STR SOL | 1.05A |

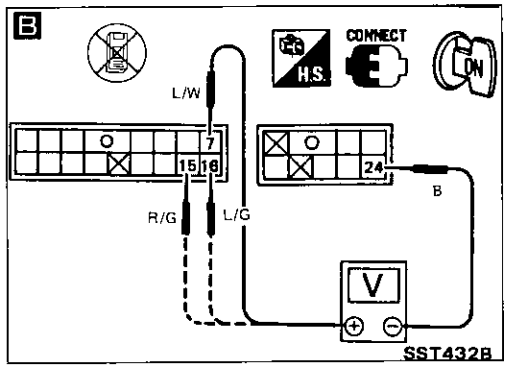
RECORD

| ☆MONITOR ☆NO FAIL | |
|---|---|
| FAILSAFE/V | OFF |
| FAILSAFE | NON |
| WARNING LAMP | OFF |

RECORD

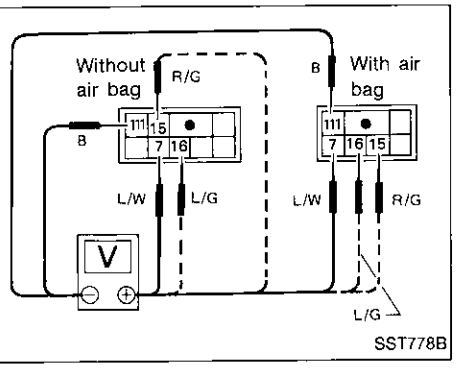
SST416B

B




SST432B

C




SST778B

## Diagnostic Procedure 10

**SYMPTOM:**

**Steering angle sensor input is not present.**

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Set CONSULT in DATA MONITOR mode.
Steering angle deg.
Neutral signal ON-OFF

O.K. → Replace control unit.

OR

Measure voltage variations between control unit terminals ⑦, ⑮ and ⑯, and ㉔ when steering wheel is slowly turned to the left and right at least 20° from the neutral position.
**Do not turn steering wheel quickly.**
**Voltage must change from 0 to at least 5V.**

N.G.

C

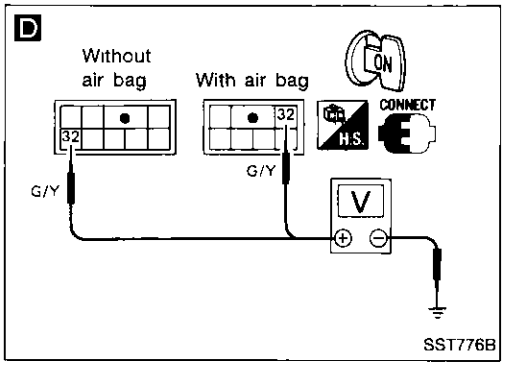
CHECK STEERING ANGLE SENSOR OUTPUT SIGNAL.
1) Turn signal switch "ON".
2) Measure voltage variations between steering angle sensor connector terminals ⑦, ⑮ and ⑯, and (111).
**Voltage must change from 0 to at least 5V.**

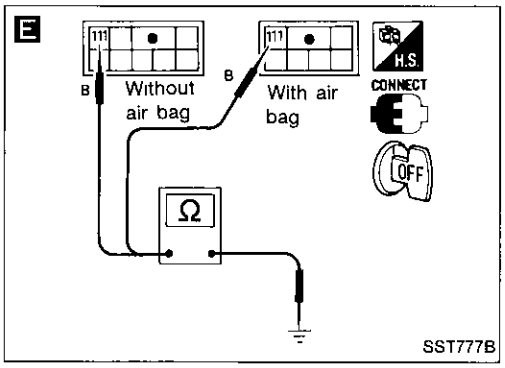
O.K. → Repair or replace harness between control unit and steering angle sensor.

N.G.

Ⓐ

## Diagnostic Procedure 10 (Cont'd)




Ⓐ

**D** CHECK STEERING ANGLE SENSOR POWER SUPPLY.

1) Turn ignition switch "ON".
2) Measure voltage across steering angle sensor connector terminal ㉜ and ground.

**Voltage:**
**Approximately 12V**

O.K. → Replace steering angle sensor.

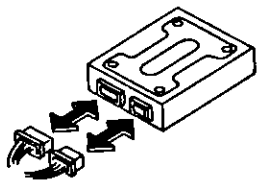
**E** CHECK STEERING ANGLE SENSOR GROUND CIRCUIT.

Check continuity between steering angle sensor terminal (111) and body metal (ground).

**Continuity should exist.**

N.G. → Repair or replace power supply harness or ground harness.

A



SST430B

B

| ☆MONITOR ☆NO FAIL | |
|---|---|
| CAR SPEED (REF) | 0km/h |
| STEERING ANG | L8° |
| NEUTRAL SIG | ON |
| STOP LAMP SW | OFF |
| PKB/CLUTCH SW | ON |
| NEUTRAL SW | ON |
| ENG REV | UNDER 1500 |
| HICAS SOL | R0.00A |
| POWER STR SOL | 1.05A |

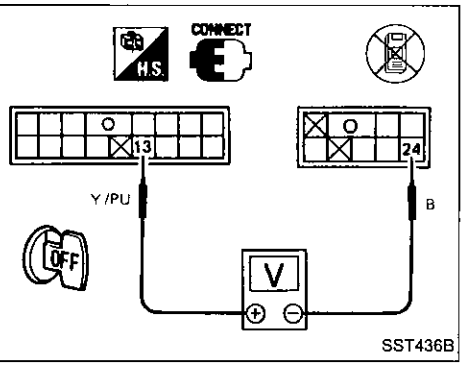
RECORD

| ☆MONITOR ☆NO FAIL | |
|---|---|
| FAILSAFE/V | OFF |
| FAILSAFE | NON |
| WARNING LAMP | OFF |

RECORD

SST416B

B




SST436B

## Diagnostic Procedure 11

**SYMPTOM:**

**Parking brake (A/T) or clutch switch (M/T) input is not present.**

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.
Set CONSULT in DATA MONITOR mode.
ON-OFF display

O.K. → Replace control unit.

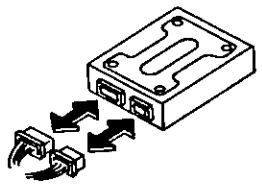
— OR —

Measure voltage variations between control unit terminals ⑬ and ㉔ when parking brake is pulled (A/T) or clutch is depressed (M/T).
**Voltage:**
**0V → Approximately 12V**

N.G.

Check parking brake switch or clutch switch and harness.

A



SST430B

B

| ☆MONITOR ☆NO FAIL | |
|---|---|
| CAR SPEED (REF) | 0km/h |
| STEERING ANG | L8° |
| NEUTRAL SIG | ON |
| STOP LAMP SW | OFF |
| PKB/CLUTCH SW | ON |
| NEUTRAL SW | ON |
| ENG REV | UNDER 1500 |
| HICAS SOL | R0.00A |
| POWER STR SOL | 1.05A |

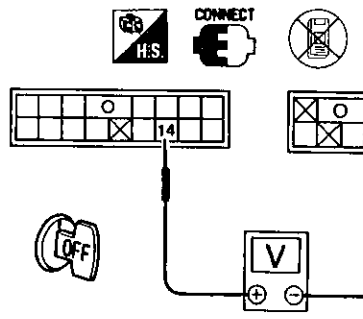
RECORD

| ☆MONITOR ☆NO FAIL | |
|---|---|
| FAILSAFE/V | OFF |
| FAILSAFE | NON |
| WARNING LAMP | OFF |

RECORD

SST416B

B




SST437B

## Diagnostic Procedure 12

**SYMPTOM:**

**Inhibitor switch (A/T) or neutral switch (M/T) input is not present.**

START

A

CHECK CONNECTOR CONTINUITY.
Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G.

B

CHECK CONTROL UNIT INPUT SIGNAL.
Set CONSULT in DATA MONITOR mode.
ON-OFF display

OR

Measure voltage variations between control unit terminals 14 and 24 when shift lever is moved from P to any other position (A/T) or shift lever is moved from neutral to any other position (M/T).
**Voltage:**
**0V → Approximately 12V**

O.K. → Replace control unit.

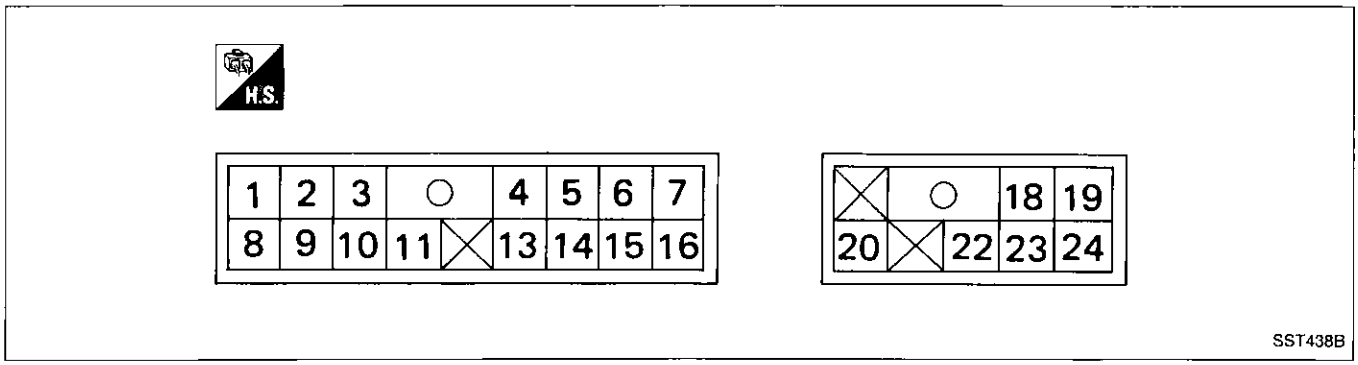
N.G.

Check inhibitor switch or neutral switch and harness.

## Control Unit Inspection Table

The standard values (voltage) measured with an analog tester, in contact with the control unit terminal, are shown below:

| Terminal No. | Application | Standard value |
|---|---|---|
| 1 | Service support CLK input | Pulse wave (153.6 kHz Approximately 7V) |
| 2 | Service support RX output (Reception from CONSULT) | (Not specified serial pulse data) |
| 3 | IGN power supply | Key switch ON: Approximately 12V<br>Key switch in other position: 0V |
| 4 | Battery | Approximately 12V |
| 5 | E.C.C.S. revolution signal | Refer to "Electrical Components Inspection" in "TROUBLE DIAGNOSES" section of EF & EC. |
| 6 | Vehicle speed signal | Rear wheel rotating<br>0V ←→ greater than 5V (approx.), intermittent |
| 7 | Steering neutral position sensor | Approximately 5V (Neutral position) |
| 8 | Resistance of power steering solenoid | 4 - 6Ω |
| 9 | Service support TX output (Transmission for CONSULT) | (Not specified serial pulse data) |
| 10 | Ground | 0V |
| 11 | Stop lamp switch signal | Brake ON: Approximately 12V<br>Brake OFF: 0V |
| 13 | Parking brake signal (A/T), Clutch signal (M/T) | Parking brake engaged (A/T)/<br>clutch disengaged (M/T): Approximately 12V |
| 14 | Inhibitor signal (A/T), Neutral signal (M/T) | Shift lever in any position other than<br>Parking (A/T) or neutral (M/T): Approximately 12V |
| 15 | Steering angle sensor-1 signal | Steering wheel turned<br>0 ←→ Approximately 5V, intermittent |
| 16 | Steering angle sensor-2 signal | Steering wheel turned<br>0 ←→ Approximately 5V, intermittent |
| 18 | Resistance of fail-safe valve | 13 - 17Ω |
| 19 | IGN power supply | Ignition switch ON: Approximately 12V<br>Ignition switch in other position: 0V |
| 20 | HICAS warning lamp | Lamp ON: 0V<br>Lamp OFF: Approximately 12V |
| 22 | Resistance of HICAS solenoid (R.H.) | 4 - 6Ω (Voltage varies with steering operation.) |
| 23 | Resistance of HICAS solenoid (L.H.) | 4 - 6Ω (Voltage varies with steering operation.) |
| 24 | Ground | 0V |



## General Specifications

| | Without SUPER HICAS | With SUPER HICAS |
|---|---|---|
| Steering model | Power steering | |
| Steering gear type | PR26SE | |
| Steering overall gear ratio | 16.9 | 14.8 |
| Turn of steering wheel (Lock to lock) | 2.7 | 2.4 |
| Steering column type | Collapsible | |

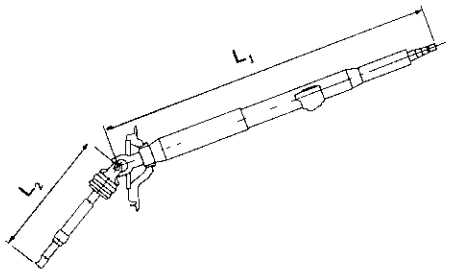
## Inspection and Adjustment

### STEERING WHEEL

| | |
|---|---|
| Steering wheel axial play mm (in) | 0 (0) |
| Steering wheel play mm (in) | 0 - 35 (0 - 1.38) |

### STEERING COLUMN

| | Without air bag | With air bag |
|---|---|---|
| Steering column length "$L_1$" mm (in) | 745.9 - 747.5 (29.37 - 29.43) | 749.4 - 751.0 (29.50 - 29.57) |
| Steering column lower shaft length "$L_2$" mm (in) | 280.6 - 282.2 (11.05 - 11.11) | |

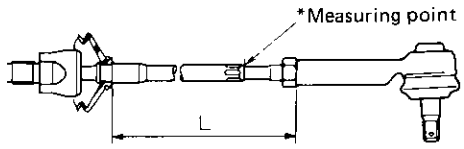



SST315B

### STEERING GEAR AND LINKAGE

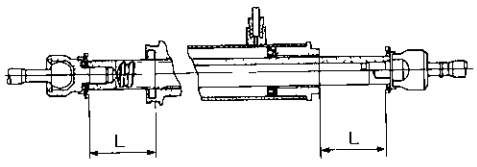
| Item \ Steering gear type | PR26SE |
|---|---|
| Tie-rod outer ball joint | |
| Swinging force (at cotter pin hole) N (kg, lb) | 4.61 - 46.09 (0.47 - 4.7, 1.04 - 10.36) |
| Rotating torque N·m (kg-cm, in-lb) | 0.29 - 2.94 (3.0 - 30.0, 2.6 - 26.0) |
| Axial end play mm (in) | 0 (0) |
| Tie-rod inner ball joint | |
| Swinging force* N (kg, lb) | 8.8 - 78.5 (0.9 - 8.0, 2.0 - 17.6) |
| 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) |
| Tie-rod standard length "L" mm (in) | 155 (6.10) |

*: Measuring point




SST304B

| | |
|---|---|
| Rack stroke "L" mm (in) | 59.5 (2.343) |




SST307B

## Inspection and Adjustment (Cont'd)

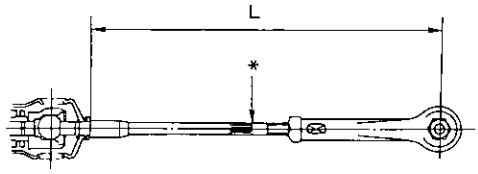
### POWER STEERING

| | Without SUPER HICAS | With SUPER HICAS |
|---|---|---|
| Rack sliding force N (kg, lb) | | |
| Under normal operating oil pressure | | |
| Range within ±11.5 mm (±0.453 in) from the neutral position | 206 - 265 (21 - 27, 46 - 60) | 201.0 - 250.1 (20.5 - 25.5, 45.2 - 56.2) |
| Except above range | Not more than 39 (4, 9) beyond above value | |
| Retainer adjustment | | |
| Adjusting screw | | |
| Initial tightening torque N·m (kg-cm, in-lb) | 4.9 - 5.9 (50 - 60, 43 - 52) | |
| Retightening torque after loosening | 0.2 (2, 1.7) | |
| Tightening torque after gear has settled | 4.9 (50, 43) | |
| Returning angle degree | 60° - 100° | |
| Steering wheel turning force (Measured at one full turn from the neutral position) N (kg, lb) | 39 (4, 9) or less | |
| Fluid capacity (Approximate) ℓ (US qt, Imp qt) | 1.3 (1-3/8, 1-1/8) | 2.0 (2-1/8, 1-3/4) |
| Oil pump maximum pressure kPa (kg/cm², psi) | 7,649 - 8,238 (78 - 84, 1,109 - 1,194) | Main: 7,649 - 8,238 (78 - 84, 1,109 - 1,194) Sub: 6,375 - 6,865 (65 - 70, 924 - 995) |

### POWER CYLINDER LOWER LINK (SUPER HICAS)

| | | |
|---|---|---|
| Power cylinder lower link ball joint | | |
| Swinging force* | N (kg, lb) | 2.9 - 41.2 (0.3 - 4.2, 0.7 - 9.3) |
| Axial end play | mm (in) | 0 (0) |
| Power cylinder lower link standard length "L" | mm (in) | 309.5 (12.19) |
| Stroke | mm (in) | 3.0 (0.118) |

*: Measuring point




SST486B

# SECTION BF

## CONTENTS

GENERAL SERVICING
(Including all clips & fasteners) ..... BF- 2
BODY END ..... BF- 5
DOOR
(Including "Power Window" & "Power Door Lock") ..... BF- 9
INSTRUMENT PANEL ..... BF-16
INTERIOR AND EXTERIOR
(In EXTERIOR, including "Weatherstrips") ..... BF-18
T-BAR ROOF ..... BF-29
SEAT ..... BF-31
WINDSHIELD AND WINDOWS ..... BF-34
AUTOMATIC SEAT BELT SYSTEM ..... BF-37
REAR AIR SPOILER ..... BF-42
MIRROR ..... BF-43
BODY ALIGNMENT ..... BF-44
SUPPLEMENTAL RESTRAINT SYSTEM (SRS) ..... BF-51
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.**

BF

★ **For conventional seat belt, refer to MA section.**

## Precautions

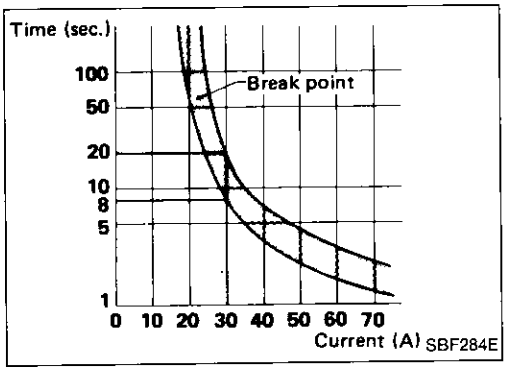
- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

## Supplemental Restraint System "AIR BAG"

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

**WARNING:**

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




## Circuit Breaker Inspection

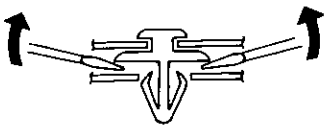
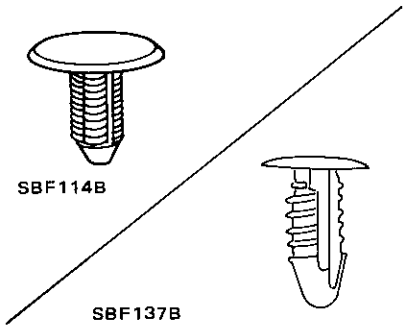
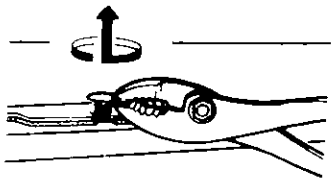
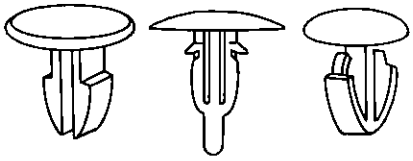
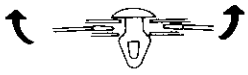
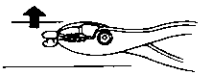
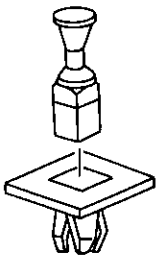
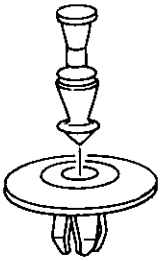
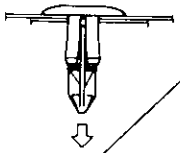
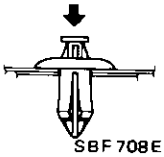
For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

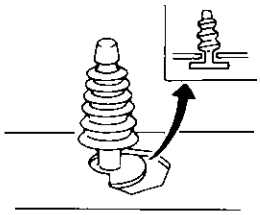
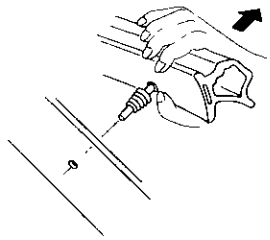
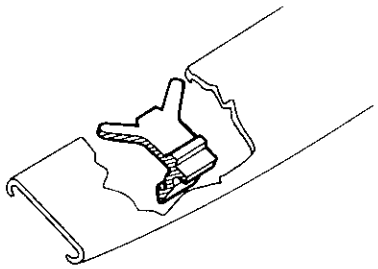
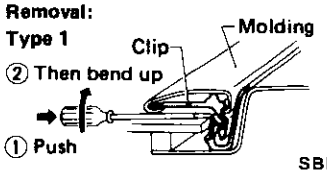
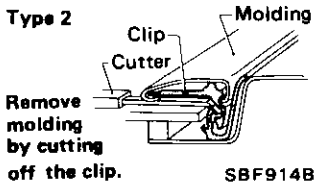
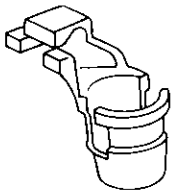
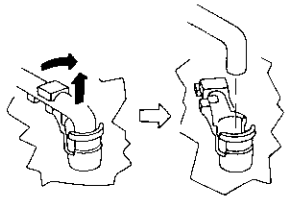
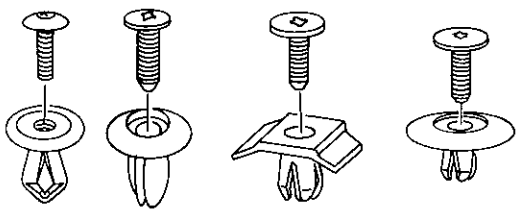
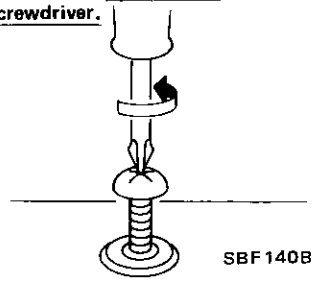
- Power window & power door lock
- Power seat

## Clip and Fastener

- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

| Symbol No. | Shapes | Removal & Installation |
|---|---|---|
| C101 | SBF256G | **Removal:** **Remove by bending up with flat-bladed screwdrivers.**  SBF367B |
| C102 |  SBF114B  SBF137B |  **Removal:** **Pull up by rotating.** SBF115B |
| C103 |  SBF257G | **Removal:** **Remove with a flat-bladed screwdriver or pliers.**   SBF292C |
| C203 |   SBF258G | **Push center pin to catching position.** **(Do not remove center pin by hitting it.)** Push  Push  **Installation:** SBF708E |

## Clip and Fastener (Cont'd)

| Symbol No. | Shapes | Removal & Installation |
|---|---|---|
| CE103 |  SBF104B | **Removal:**  SBF147B |
| CE106 |  SBF653B | **Removal:**<br>**Type 1**<br>② Then bend up<br>① Push  SBF654B<br><br>**Type 2**<br>**Remove molding by cutting off the clip.**  SBF914B |
| CR103 |  SBF768B | **Removal:**<br>**Holder portion of clip must be spread out to remove rod.**  SBF770B |
| CS101 |  SBF260G | **Removal:**<br>**Screw out with a Phillips screwdriver.**  SBF140B |

## Body Front End

- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood lock engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly.

**Bumper shock absorber inspection**

1. Check shock absorber for oil leakage, cracks or deformation.
2. Function of shock absorber;

(1) Place vehicle in front of a wall.
Apply parking brake and place tire stoppers securely.

(2) Place a jack between bumper and wall; jack is positioned squarely with bumper, directly in line with shock absorber to be checked.

(3) Apply pressure to compress shock absorber at least 10.0 mm (0.394 in).

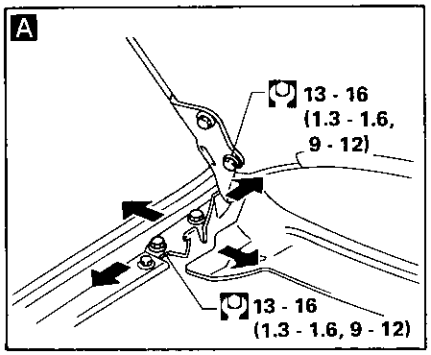
**Use a jack with capacity of more than 600 kg (1,323 lb).**

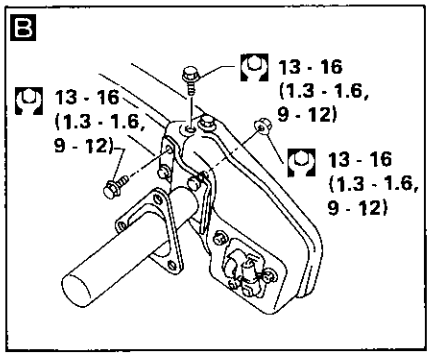
(4) Make sure bumper returns to its original position when jack is retracted. Replace if necessary.

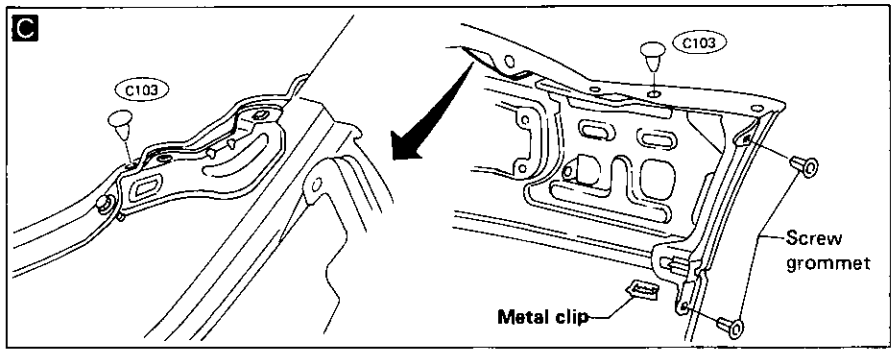
**CAUTION:**

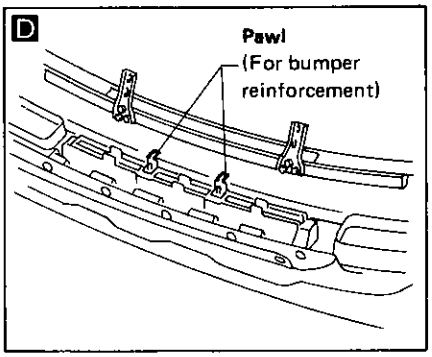
**It is not recommended to confirm proper installation by driving into walls or other barriers as this could cause personal injury or damage to the vehicle.**

When replacing shock absorbers, make sure they are of the same type and rating, and manufactured by the same maker.




**Service Notice**

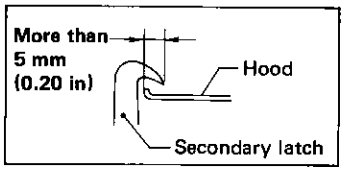
- Be sure to enlarge hood hinge holes (hinge to hood side) less than 10 mm (0.39 in) dia. for easy hood adjustment at hood-hinge portion.
- Be sure to take rust prevention measures after enlargement of holes.

## Body Front End (Cont'd)

**Hood lock adjustment**

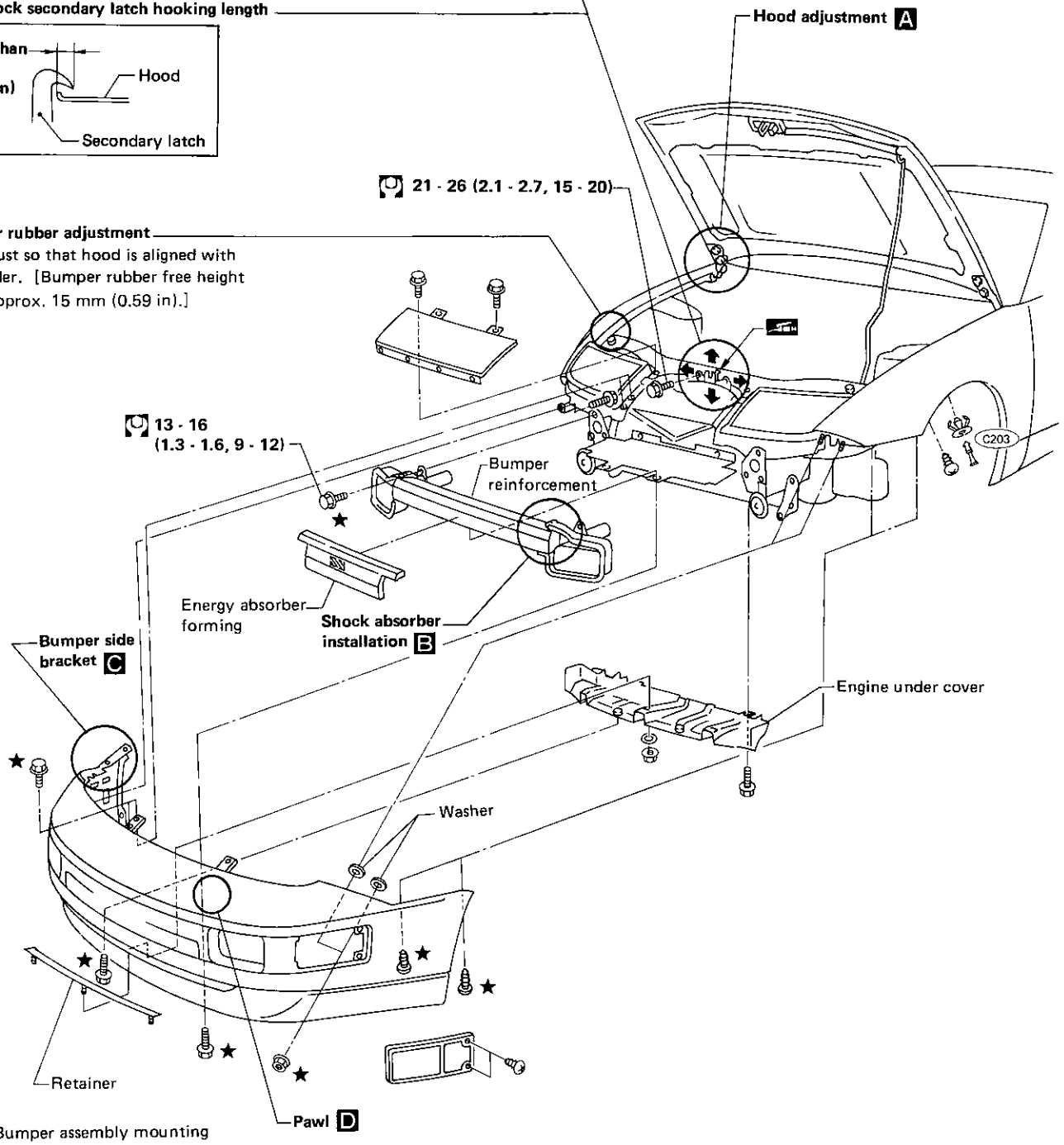
- Adjust lock so that hood primary lock meshes at a position where hood is 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

**Hood lock secondary latch hooking length**




**Bumper rubber adjustment**

- Adjust so that hood is aligned with fender. [Bumper rubber free height is approx. 15 mm (0.59 in).]




★ : Bumper assembly mounting bolts, nuts and screws
: N·m (kg-m, ft-lb)
: Double-faced adhesive tape

MBF512A

## Body Rear End and Opener

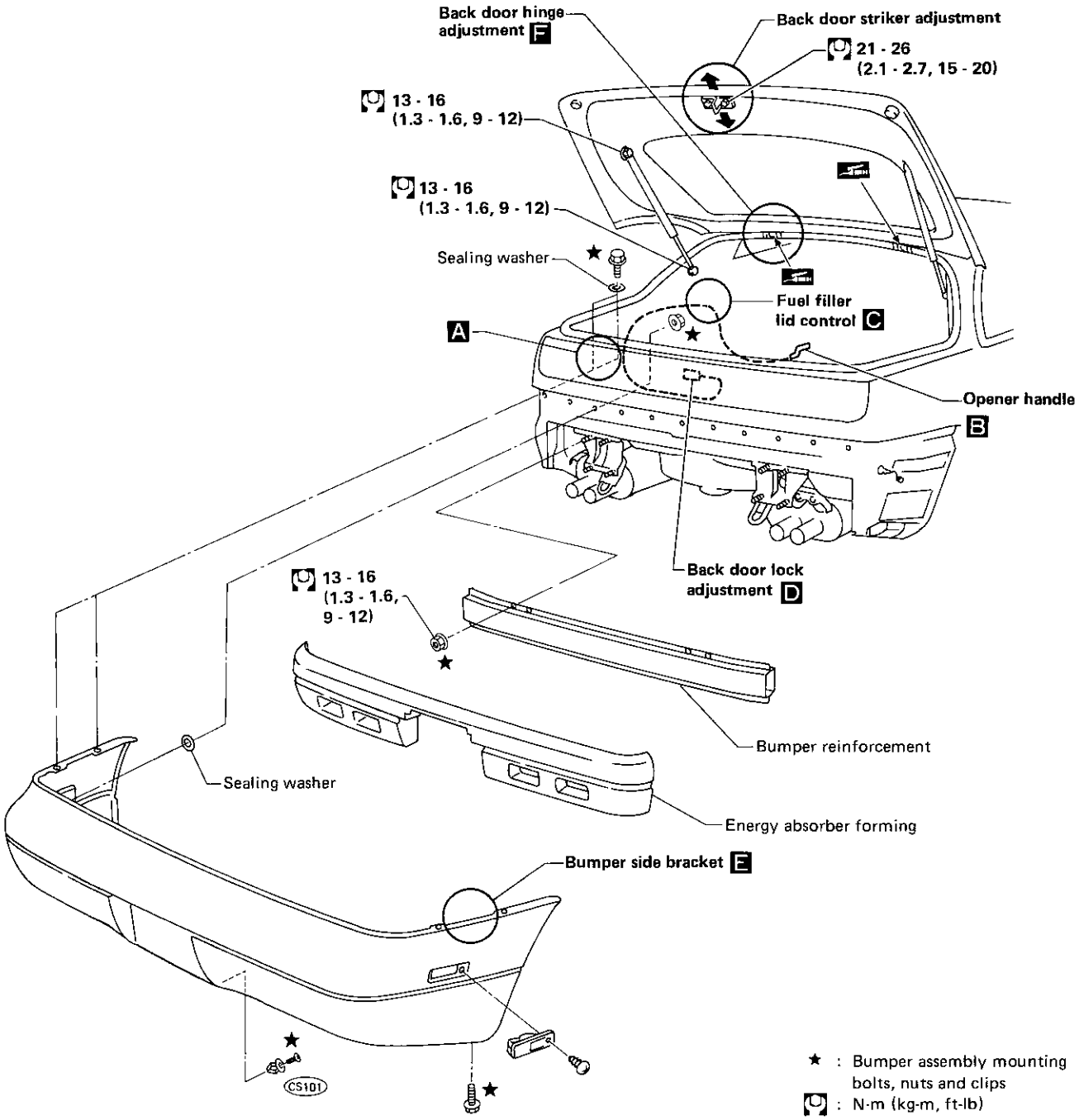
- Back door adjustment: Adjust at hinge-body portion for proper back door fit.
- Back door lock system adjustment: Adjust lock & striker so that they are in the center. After adjustment, check back door lock operation.

**WARNING:**

**a. Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.**

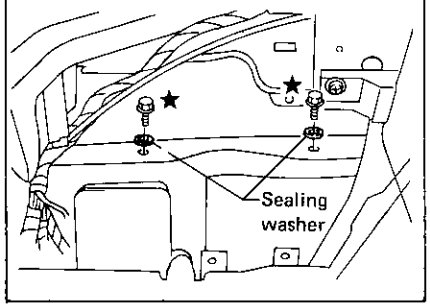
**b. The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.**

- Opener cable: do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid/back door and fuel filler lid open smoothly.
- Remove washer tank (located at left of luggage compartment) before removing or installing bumper.

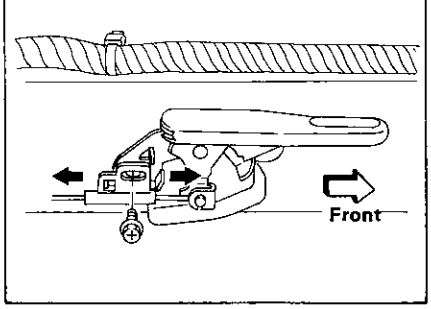


## Body Rear End and Opener (Cont'd)

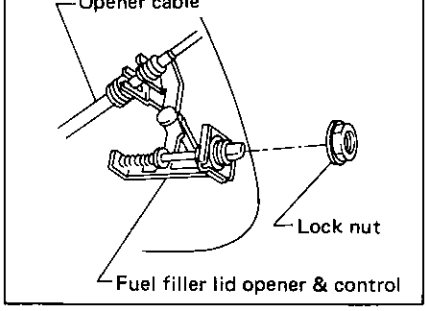
A



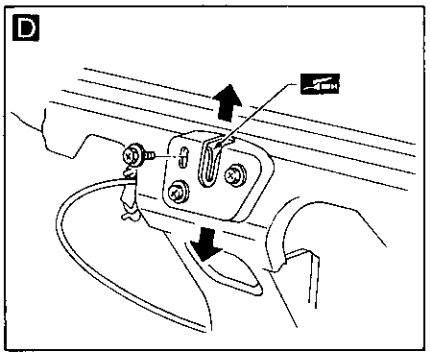

B



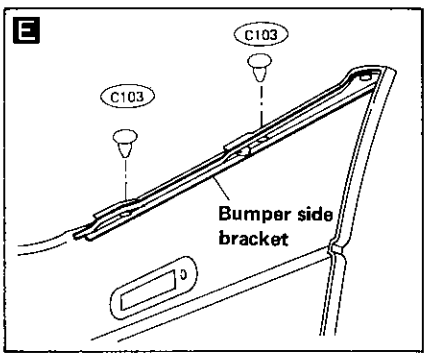

C



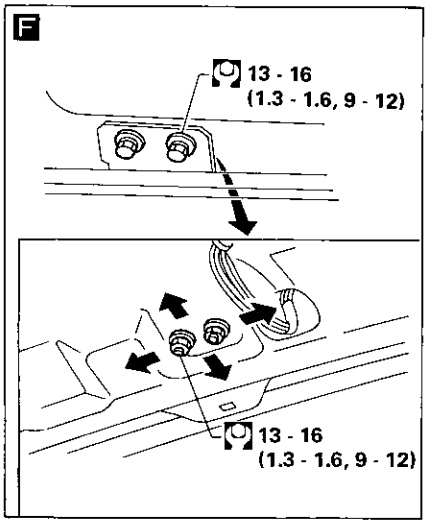

D



E

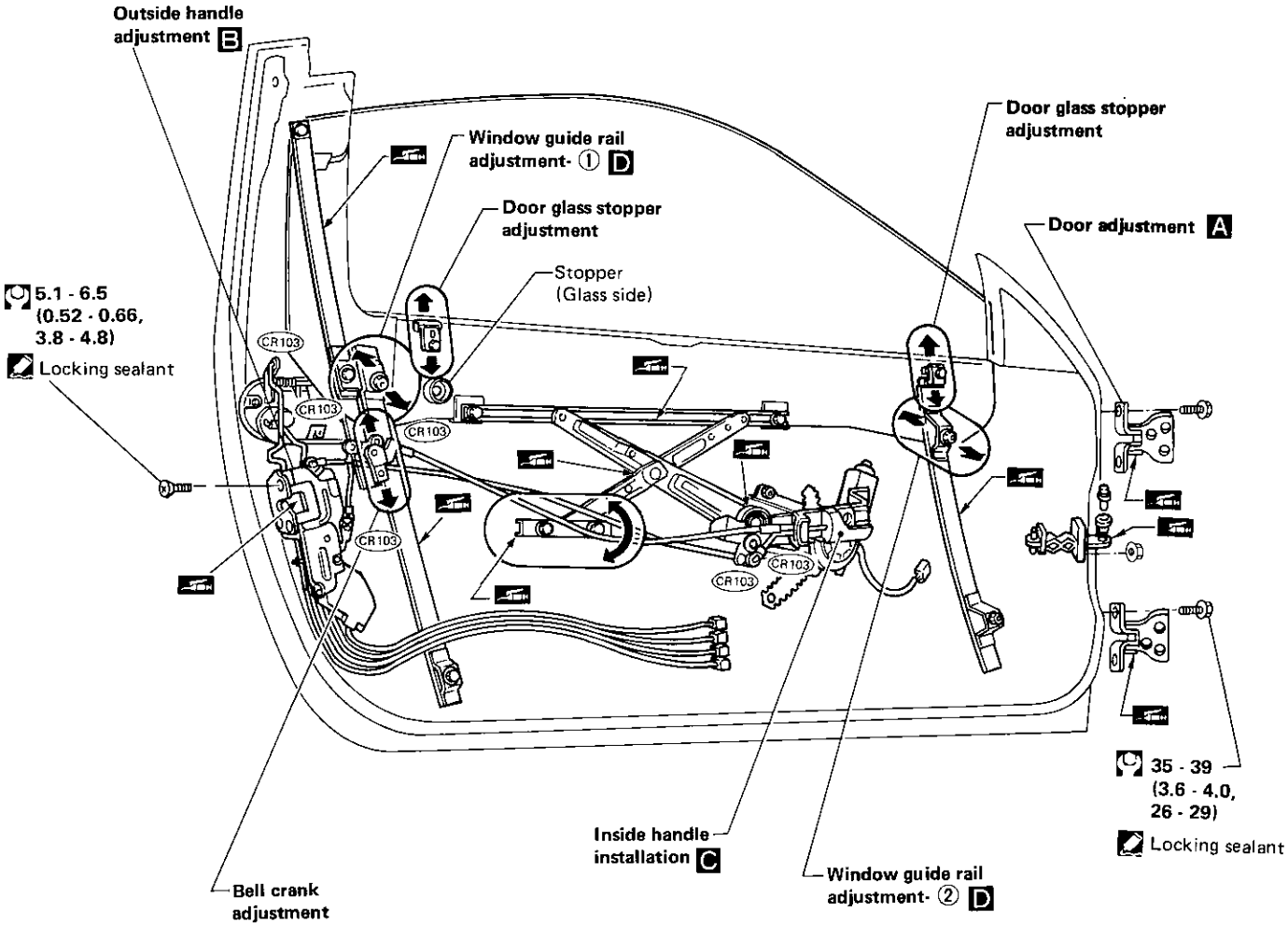



F

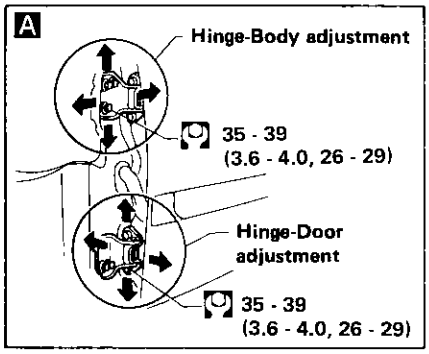


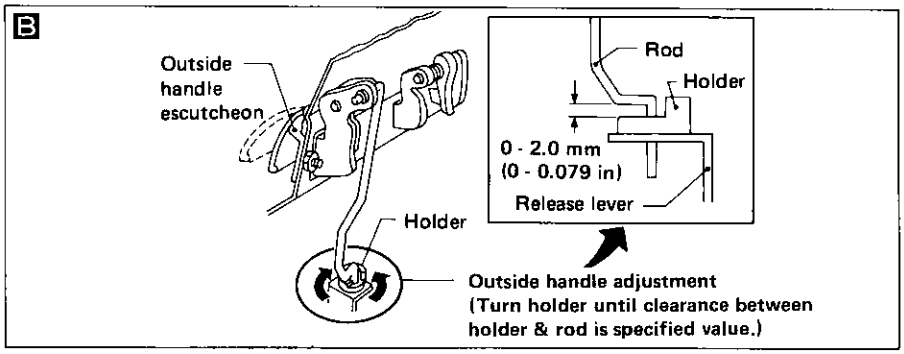

MBF513A

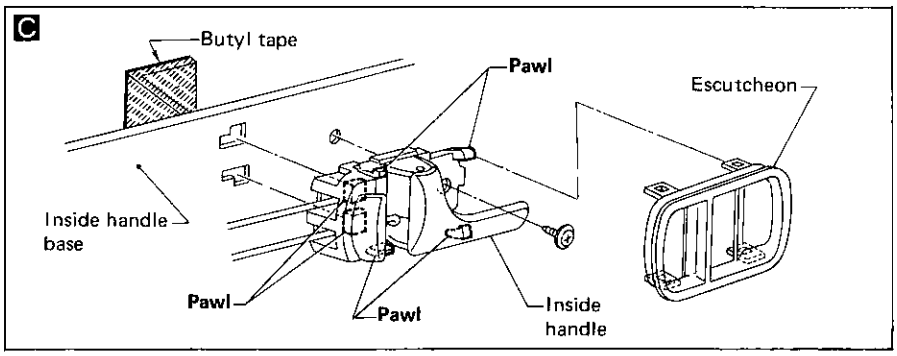
- After adjusting door or door lock, check door lock operation.

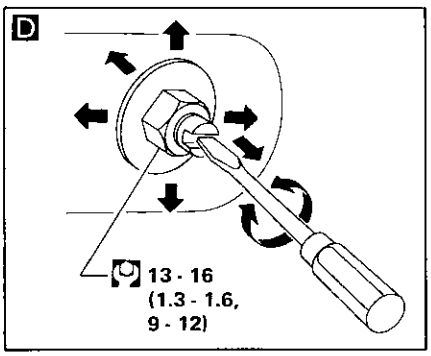



: N·m (kg-m, ft-lb)

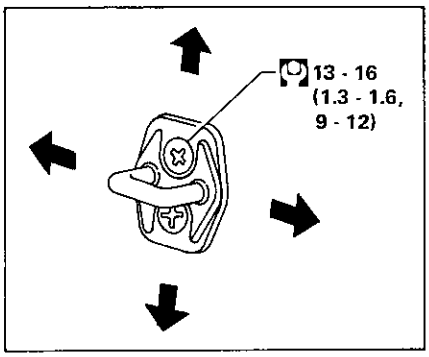


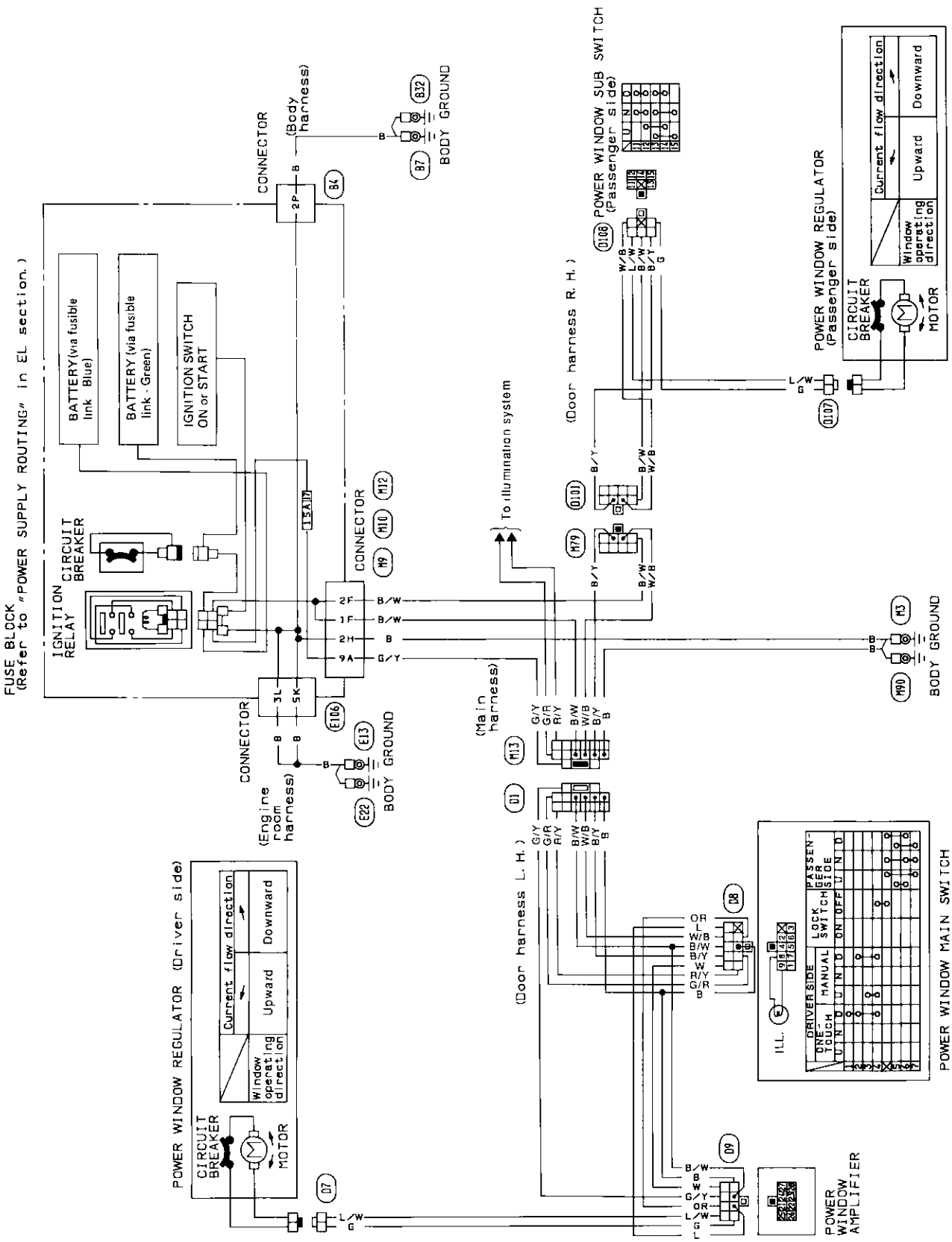

Striker adjustment




SBF858E

# Power Window

## WIRING DIAGRAM



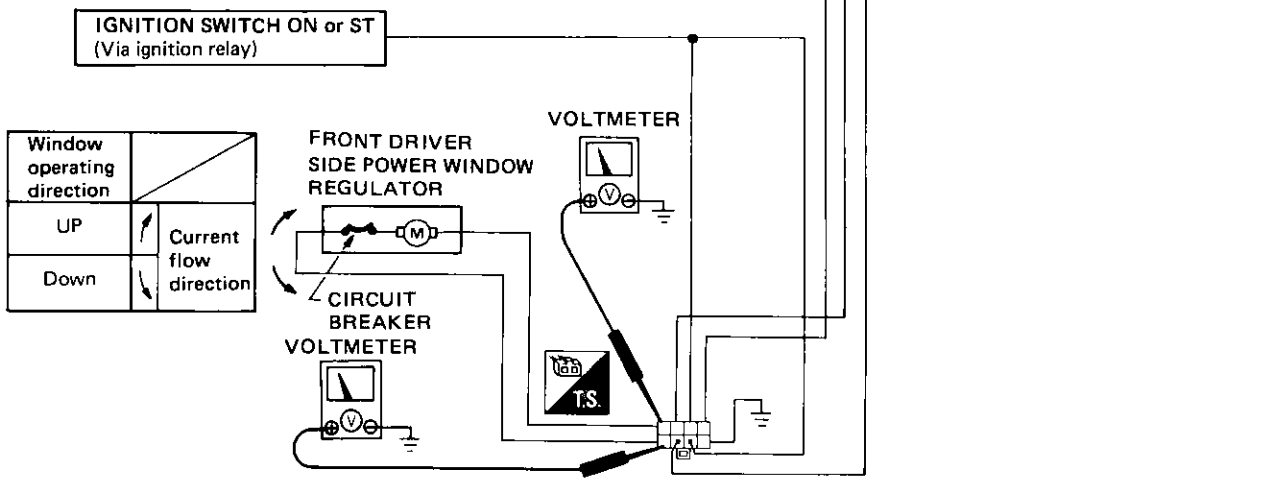

SBF965F

## Power Window (Cont'd)

### POWER WINDOW AMP. INSPECTION

FRONT DRIVER SIDE POWER WINDOW SWITCH

| | FR Drive side | | | | | | Connections |
|---|---|---|---|---|---|---|---|
| | One-touch (Auto) | | | Manual | | | |
| | U | N | D | U | N | D | |
| 1 | | | ○ | | | | From power window AMP (28) |
| 2 | | | ○ | | | ○ | From power window AMP (22) |
| 3 | | | | ○ | | | From power window AMP (21) |
| 4 | | | ○ | ○ | | ○ | Ground |




**AMP. OPERATION**

| | Connections | | Operations | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Manual operation | | | One touch (Auto) Operation | | |
| 24 | Power source (IGN) | | 12V | 12V | 12V | 12V | 12V | 12V |
| 27 | Ground | | Ground | Ground | Ground | Ground | Ground | Ground |
| 23 | Input signal | From ignition SW (ON or ST) | ON or ST | ON or ST | ON or ST | ON or ST | ON or ST | ON or ST |
| 28 | Input signal | To FR driver side power window SW (AUTO) (1) | OFF | OFF | OFF | OFF | ON | OFF |
| 21 | Input signal | To FR driver side power window SW (UP) (3) | OFF | ON | OFF | OFF | OFF | OFF |
| 22 | Input signal | To FR driver side power window SW (DOWN) (2) | OFF | OFF | ON | OFF | ON | OFF |
| 25 | Output signal | FR driver side regulator ("Up" power source) | Approx 0V | Approx. over 9V | Approx 0V | Approx. 0V | Approx. 0V | Approx. 0V |
| 26 | Output signal | FR driver side regulator ("Down" power source) | Approx 0V | Approx. 0V | Approx. over 9V | Approx 0V | Aprrox. over 9V | Approx. over 9V |

| Regulator Operating Condition | Stop | Upward operation | Downward operation | Stop | Starting | Keeps operating until fully open, then stops automatically |
|---|---|---|---|---|---|---|
| | | | | | Downward operation | |

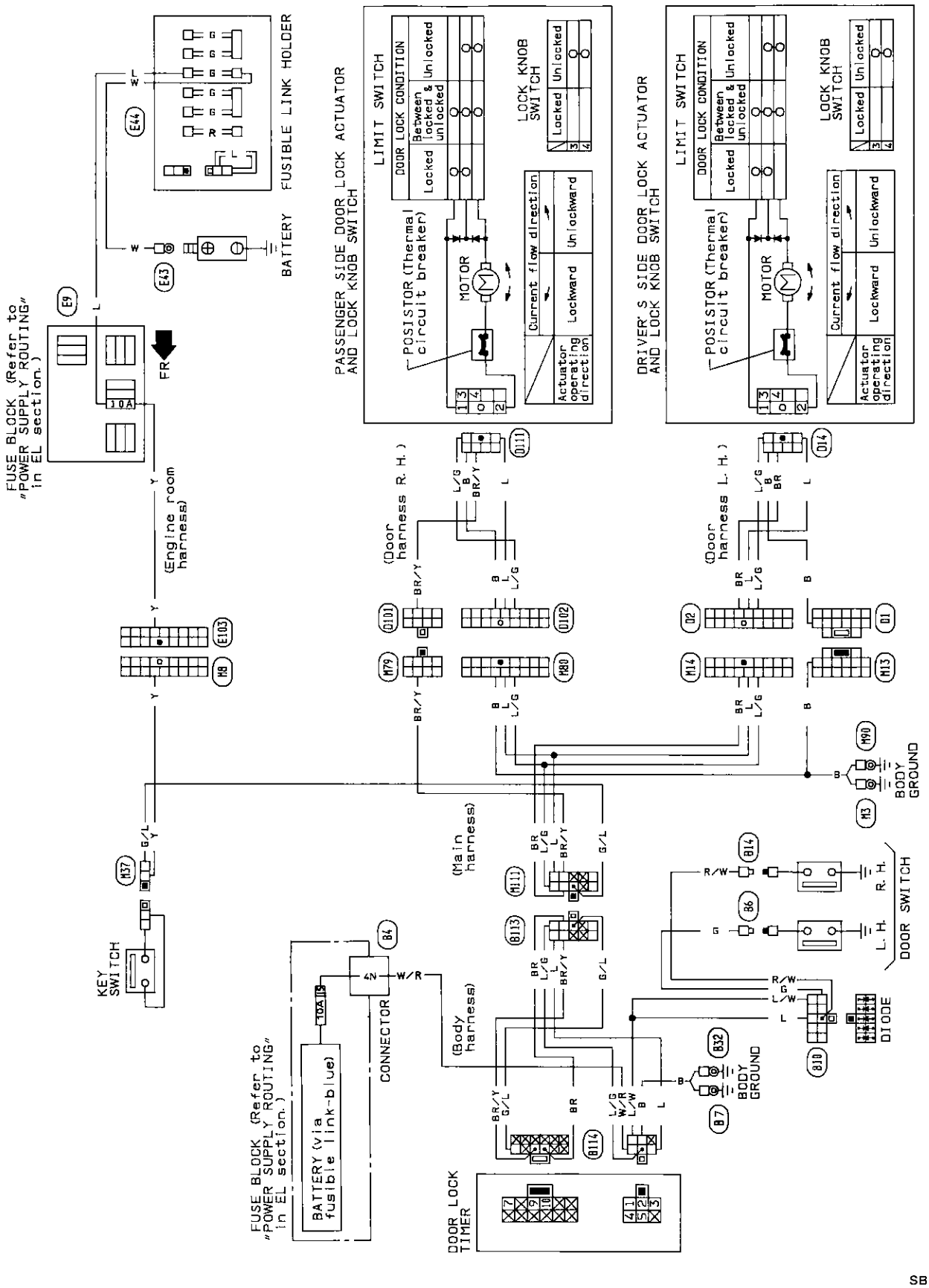
Carry out this operation check in this chart from left to right

POWER WINDOW AMP. – Front driver side door (Behind door trim)

SBF219F

# Power Door Lock

## WIRING DIAGRAM




SBF559G

## Power Door Lock (Cont'd)

### DOOR LOCK TIMER INSPECTION

- Carry out the following inspections:

(1) Check power source and ground.
(2) Check input signals.
If the input signal is N.G., go to ELECTRICAL COMPONENTS INSPECTION.
(3) Check output signals.
If the input signal is O.K. and the output signal is N.G., replace the door lock timer.
If the input signal and output signal are O.K., check door lock actuator in ELECTRICAL COMPONENTS INSPECTION.

### Lock & unlock operation by lock knob or main switch

(The voltages are approximate values.)

| | Connections | | Operations | | | |
|---|---|---|---|---|---|---|
| | | | Lock knob switch L.H. | | Lock knob switch R.H. | |
| | | | Unlock → Lock | Lock → Unlock | Unlock → Lock | Lock → Unlock |
| 1 | Power source | | 12V | 12V | 12V | 12V |
| 5 | Ground | | Ground | Ground | Ground | Ground |
| 7 | Input signals | Key switch | Either key switch or door switches are off. (Key is not in the ignition or all doors are closed.) | | | |
| 4 | Input signals | Door switch | | | | |
| 10 | Input signals | Lock knob switch L.H. | ON (Ground) → OFF (Open) | OFF (Open) → ON (Ground) | – | – |
| 9 | Input signals | Lock knob switch R.H. | – | – | ON (Ground) → OFF (Open) | OFF (Open) → ON (Ground) |
| 2 | Output signals | Door lock actuator (Lock power source) | 0V → 12V → 0V (Approx. 1.0 sec.) | 0V | 0V → 12V → 0V (Approx. 1.0 sec.) | 0V |
| 3 | Output signals | Door lock actuator (Unlock power source) | 0V | 0V → 12V → 0V (Approx. 1.0 sec.) | 0V | 0V → 12V → 0V (Approx. 1.0 sec.) |

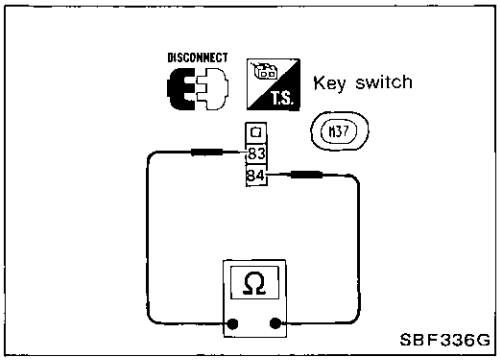
### Key reminder operation

(The voltages are approximate values.)

| | Connections | | Operations | |
|---|---|---|---|---|
| | | | Lock knob switch L.H. | Lock knob switch R.H. |
| | | | Unlock → Lock → Automatically unlocked | Unlock → Lock → Automatically unlocked |
| 1 | Power source | | 12V | 12V |
| 5 | Ground | | 0V | 0V |
| 7 | Input signals | Key switch | ON (12V) – Key is in the ignition. | |
| 4 | Input signals | Door switch | ON (Ground) – Door is open. | |
| 10 | Input signals | Lock knob switch L.H. | ON (Ground) → OFF (Open) → ON (Ground) | – |
| 9 | Input signals | Lock knob switch R.H. | – | ON (Ground) → OFF (Open) → ON (Ground) |
| 2 | Output signals | Door lock actuator (Lock power source) | 0V → 12V → 0V (Approx. 0.3 sec.) | 0V → 12V → 0V (Approx. 0.3 sec.) |
| 3 | Output signals | Door lock actuator (Unlock power source) | 0V → 12V → 0V (Approx. 1.4 sec.) | 0V → 12V → 0V (Approx. 1.4 sec.) |

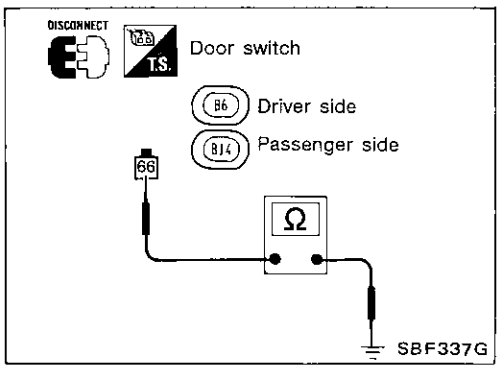
## Power Door Lock (Cont'd)

### ELECTRICAL COMPONENTS INSPECTION



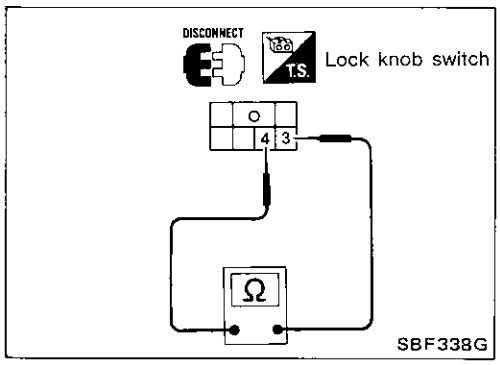

#### Key switch

| Terminals | Condition | Continuity |
|---|---|---|
| ⑧③ - ⑧④ | Key is in the ignition. | Yes |
| | Key is not in the ignition. | No |



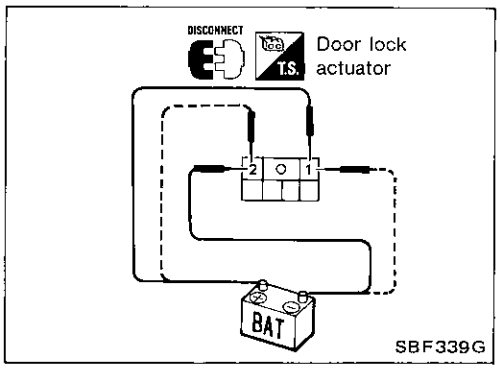

#### Door switch

| Terminals | Condition | Continuity |
|---|---|---|
| ⑥⑥ - Ground | Door is closed. | No |
| | Door is open. | Yes |




#### Lock knob switch (Built-in front door lock actuator)

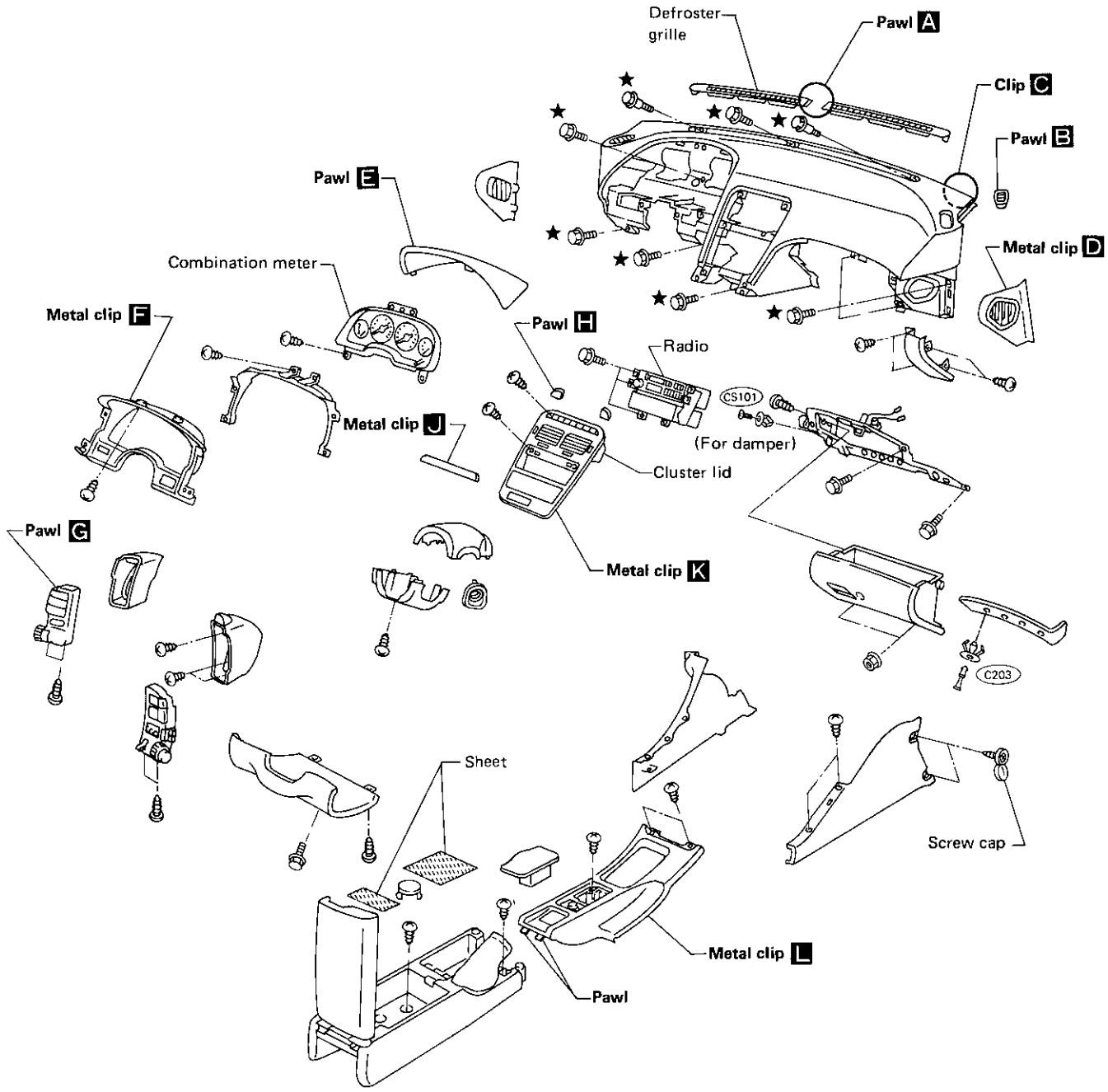
| Terminals | Condition | Continuity |
|---|---|---|
| ③ - ④ | Lock | No |
| | Unlock | Yes |

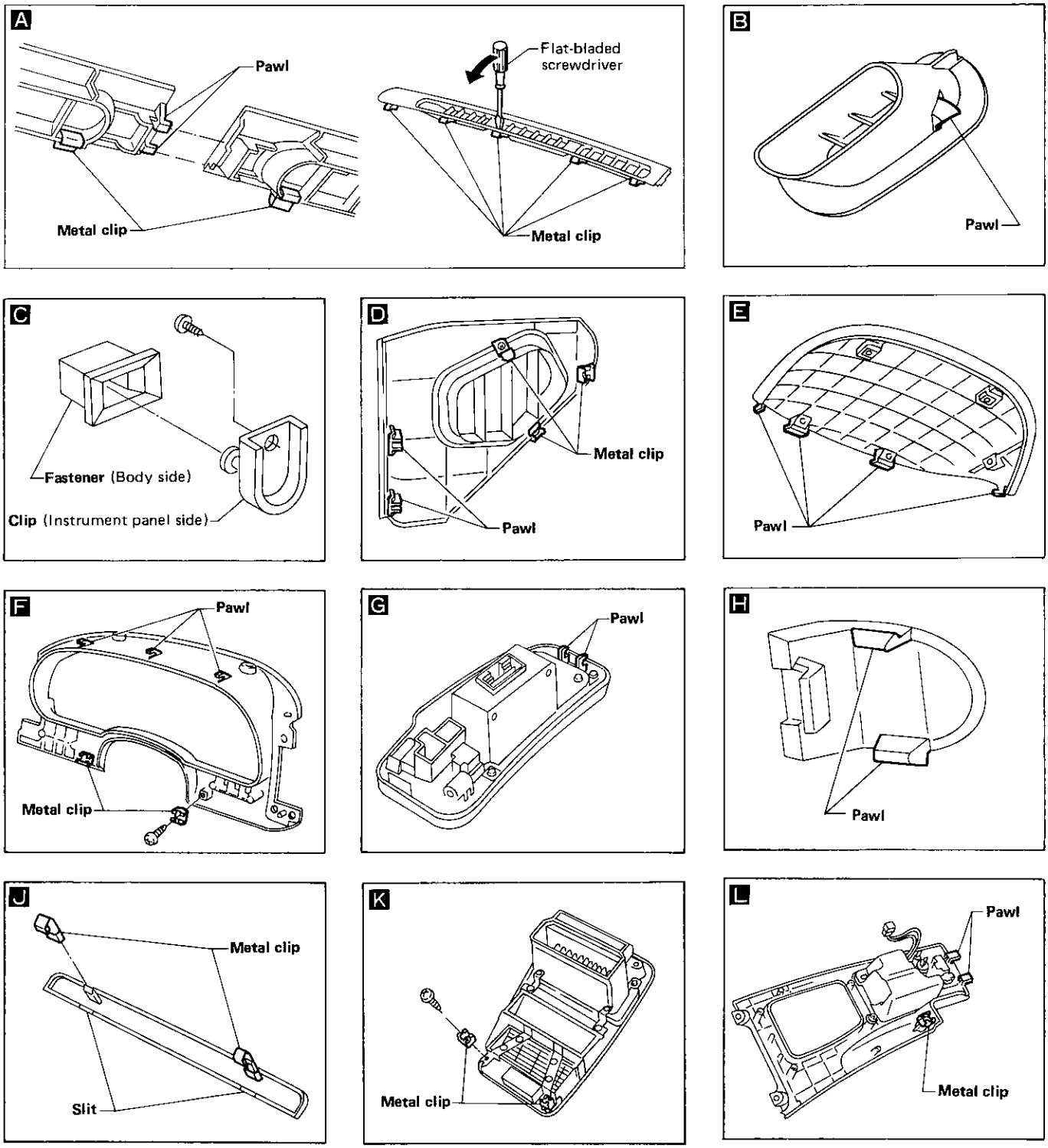



#### Door lock actuator

| Terminals | | Operation |
|---|---|---|
| ⊕ | ⊖ | |
| ① | ② | Lock |
| ② | ① | Unlock |

- When removing instrument panel assembly, remove defroster grille, combination meter, cluster lid and radio first.



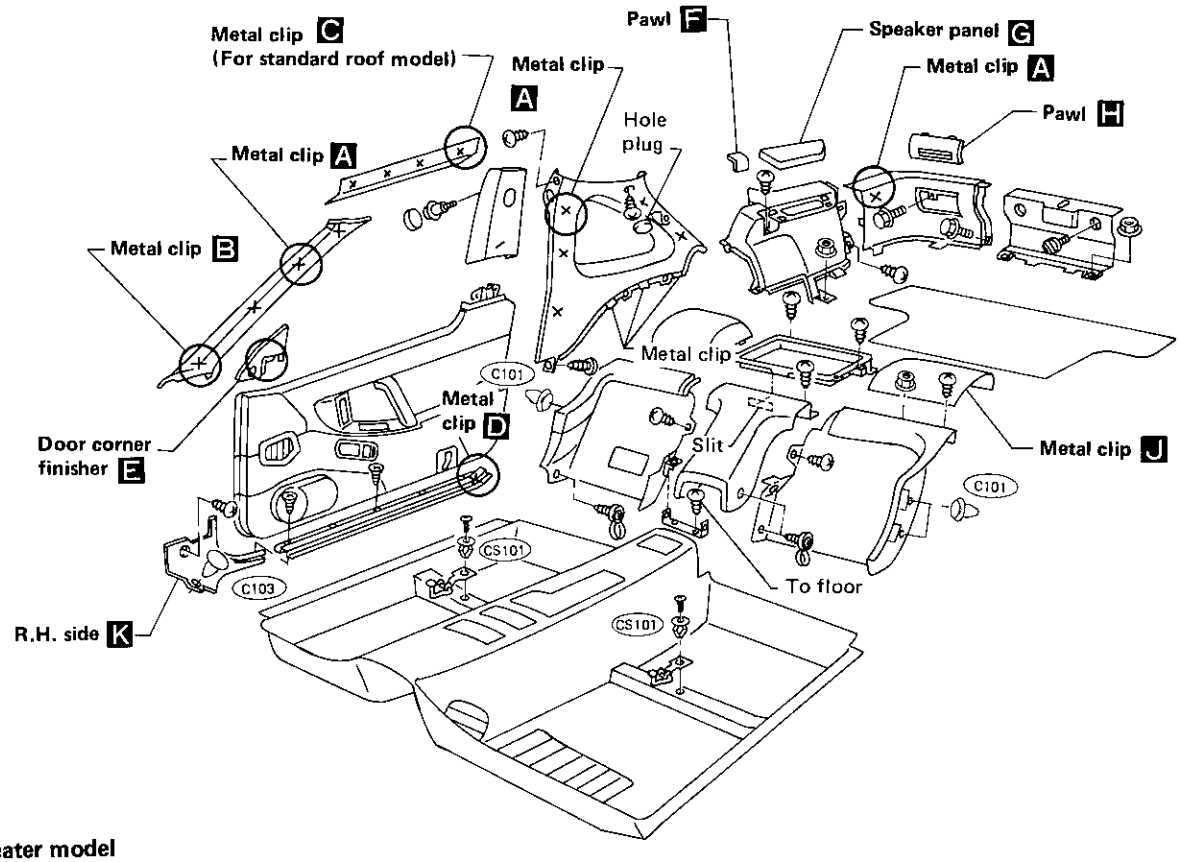

A
Pawl
Metal clip
Flat-bladed screwdriver
Metal clip
B
Pawl
C
Fastener (Body side)
Clip (Instrument panel side)
D
Metal clip
Pawl
E
Pawl
F
Pawl
Metal clip
G
Pawl
H
Pawl
J
Metal clip
Slit
K
Metal clip
L
Pawl
Metal clip

MBF514A

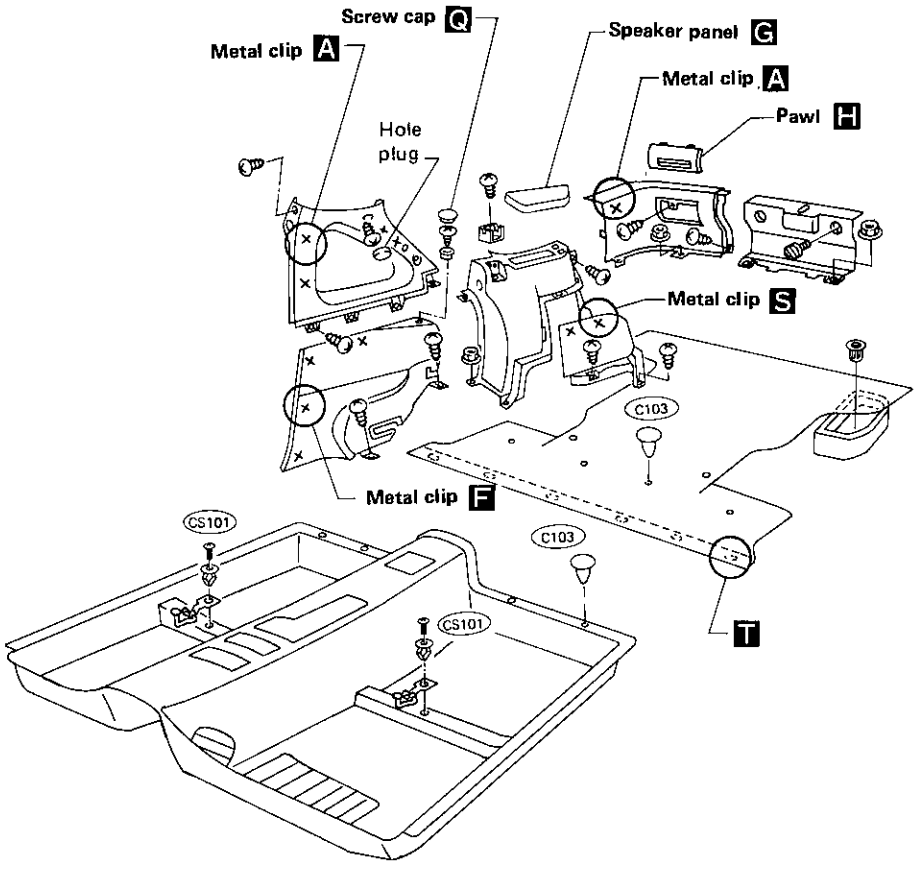
# Interior

## SIDE, LUGGAGE AND FLOOR TRIM

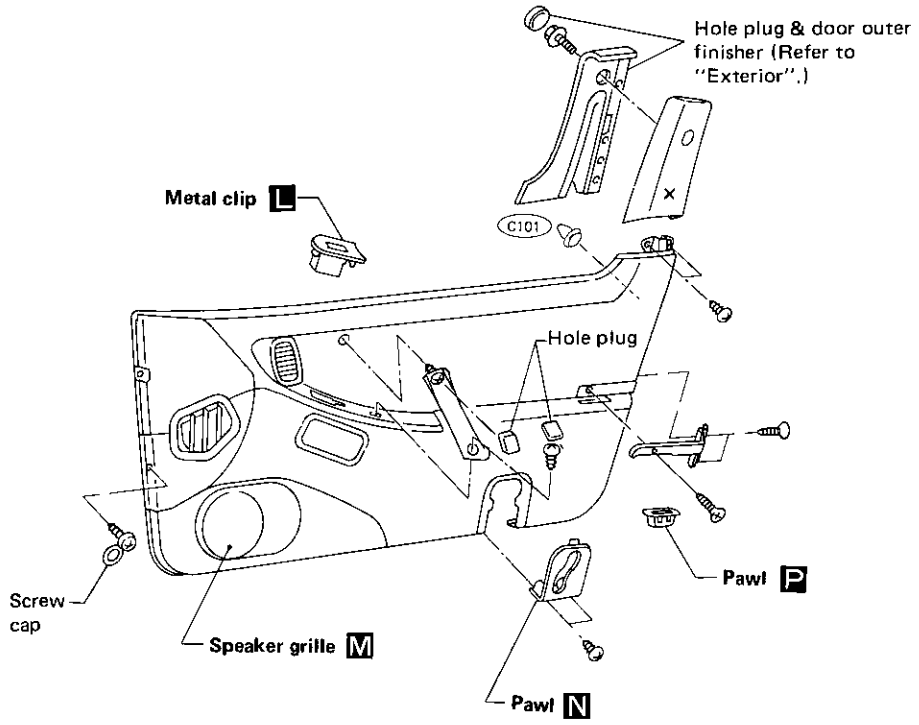
**2 seater model**

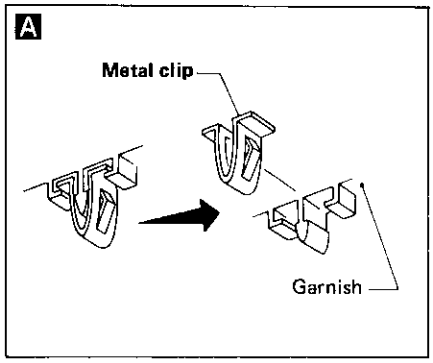


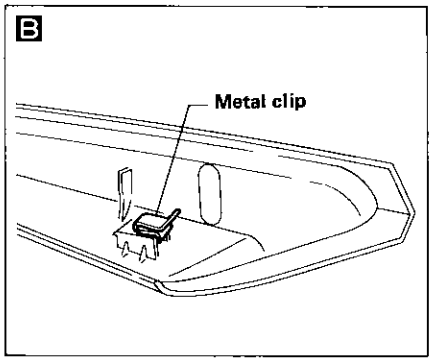

**2+2 seater model**

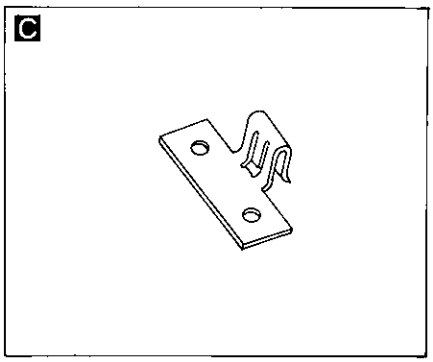


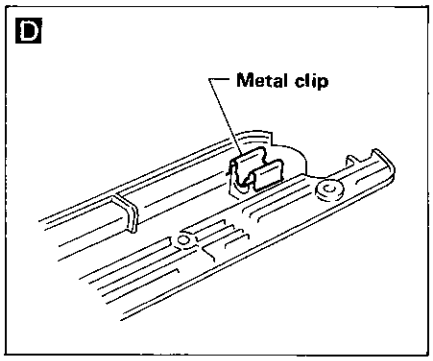
## Interior (Cont'd)

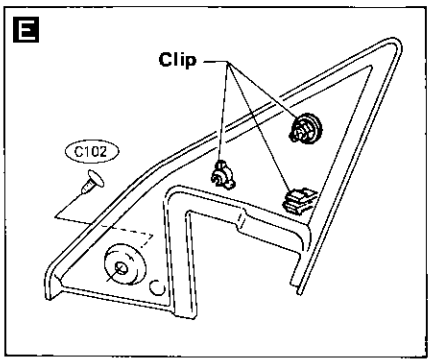


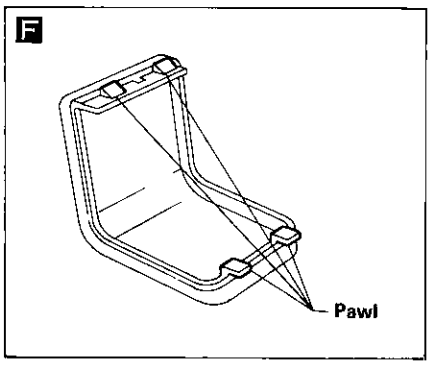



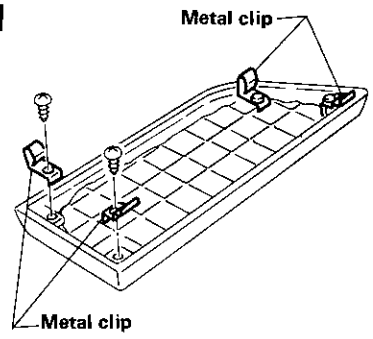



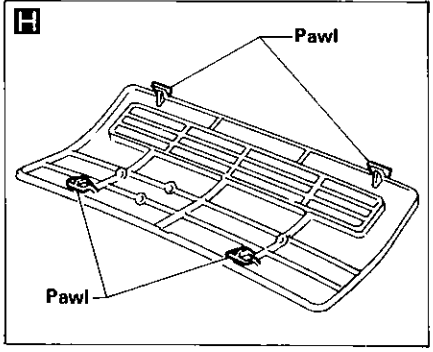



## Interior (Cont'd)

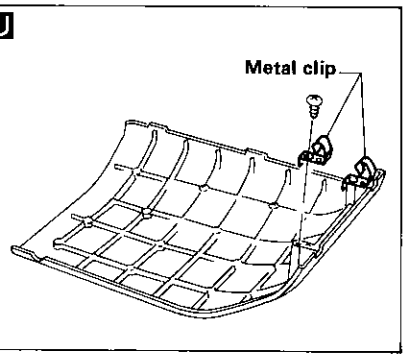
G



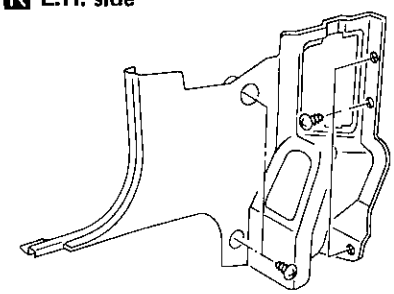

H



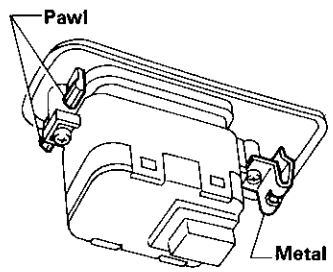

J



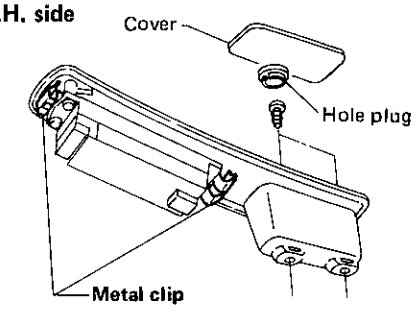

K L.H. side



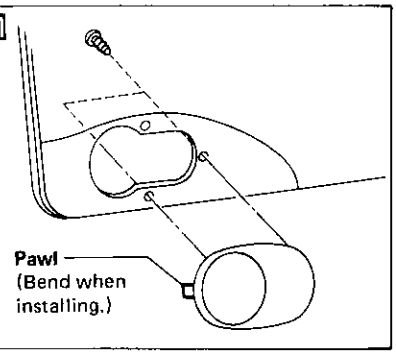
L R.H. side



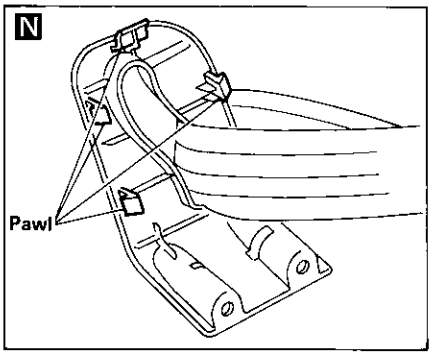

L.H. side



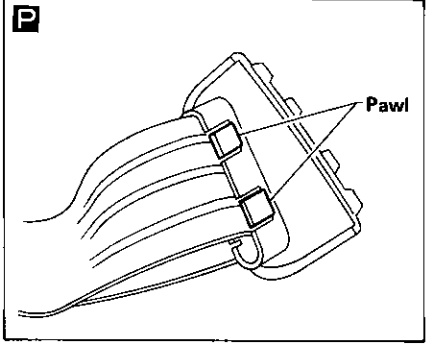

M



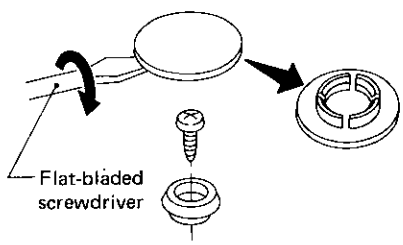

N



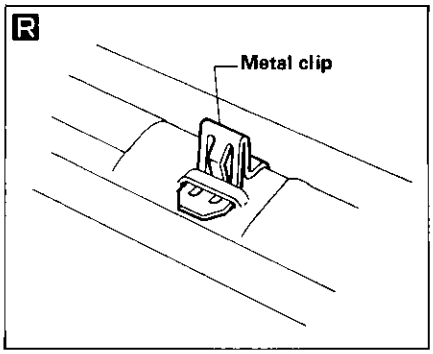

P



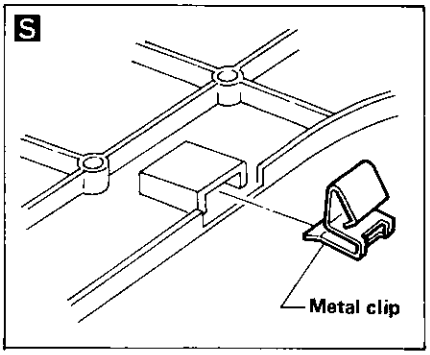

Q



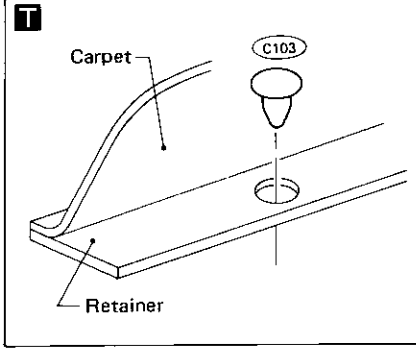

R




S



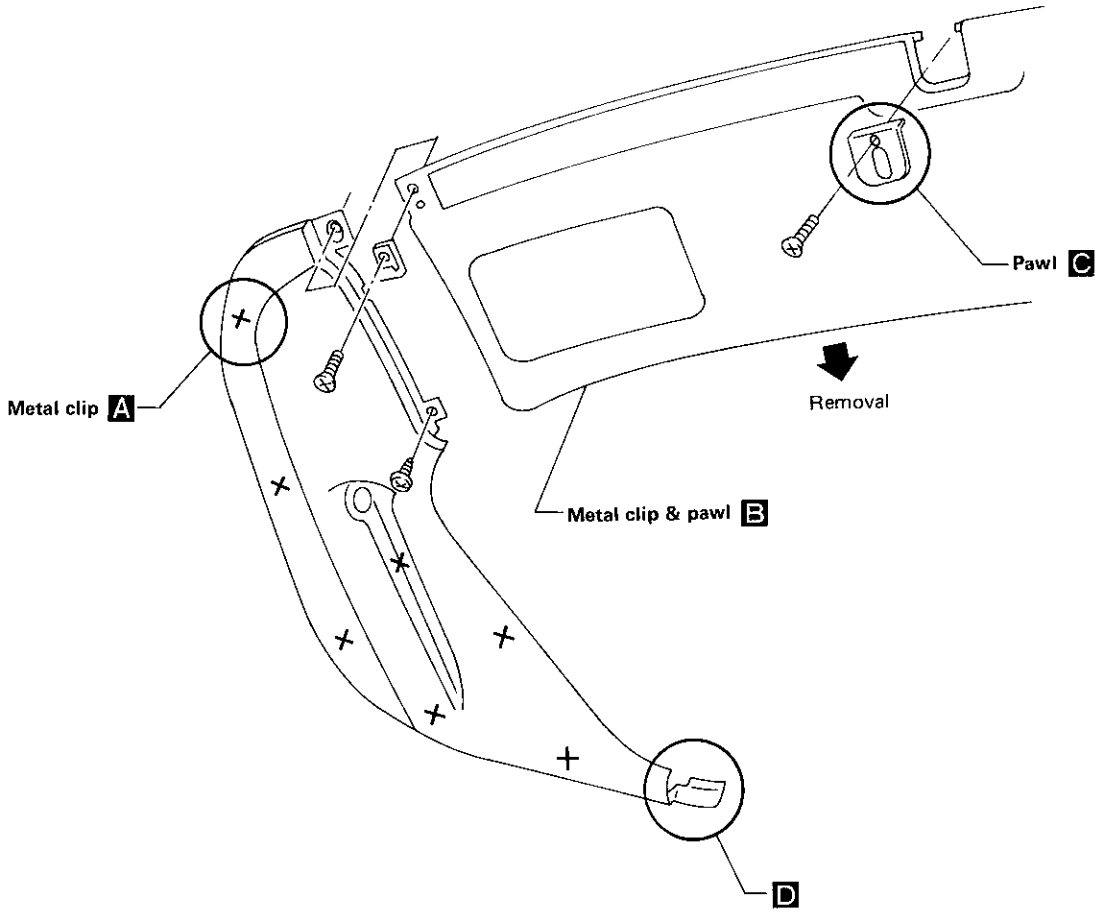

T

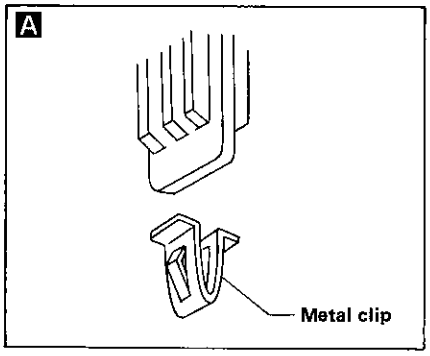


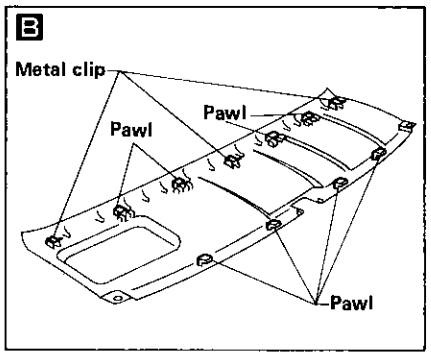

MBF515A

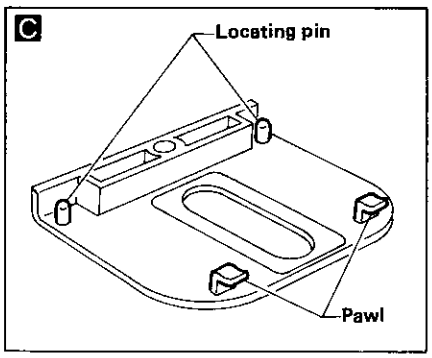
## Interior (Cont'd)

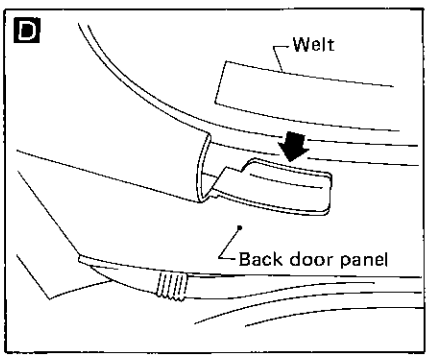
### BACK DOOR TRIM



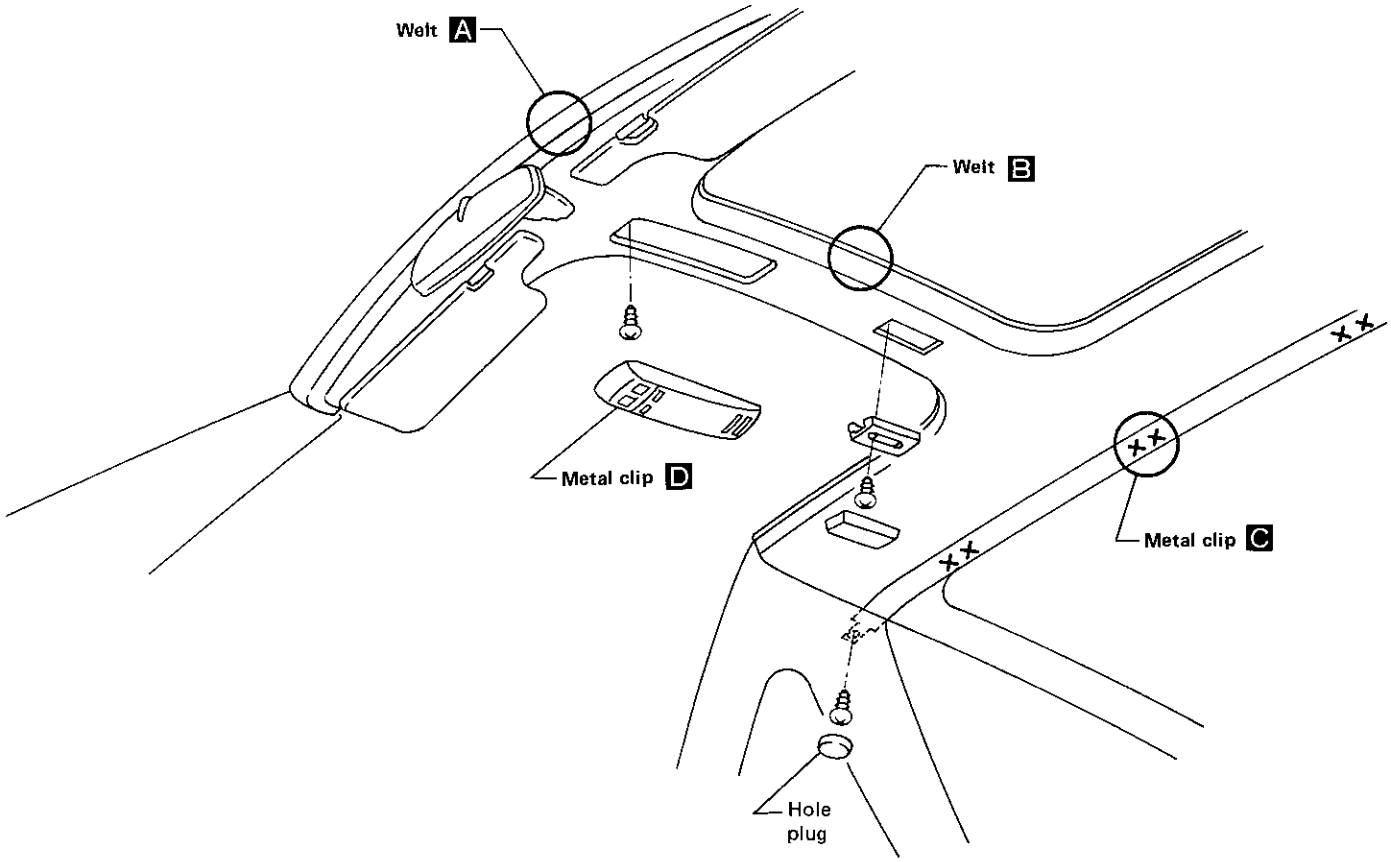



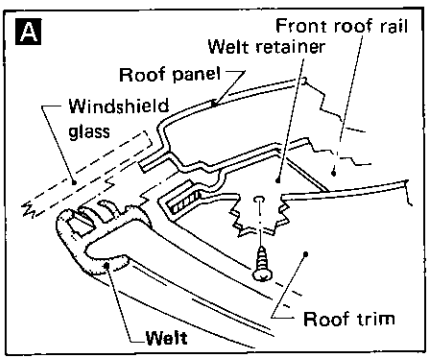



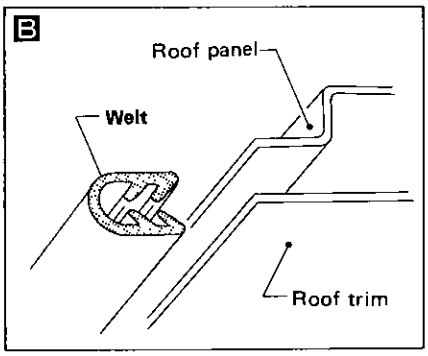

SBF861E

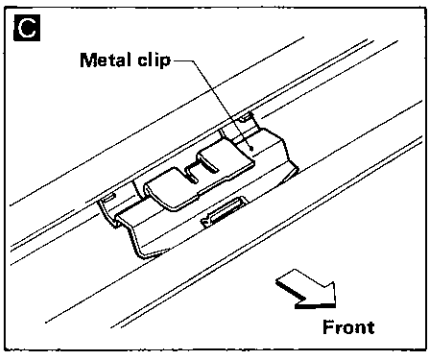
## Interior (Cont'd)

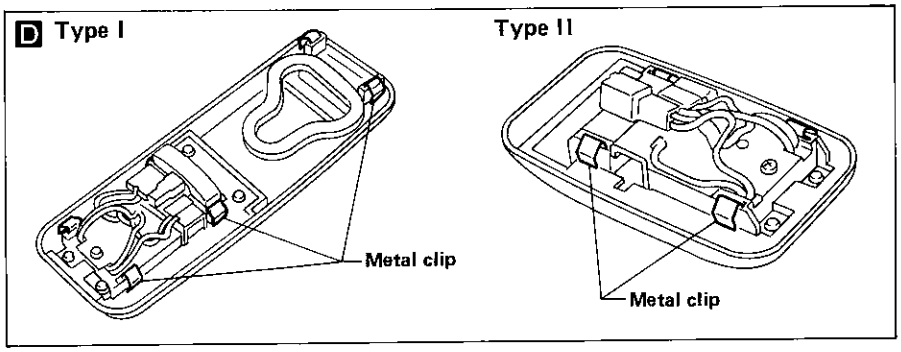
### ROOF TRIM



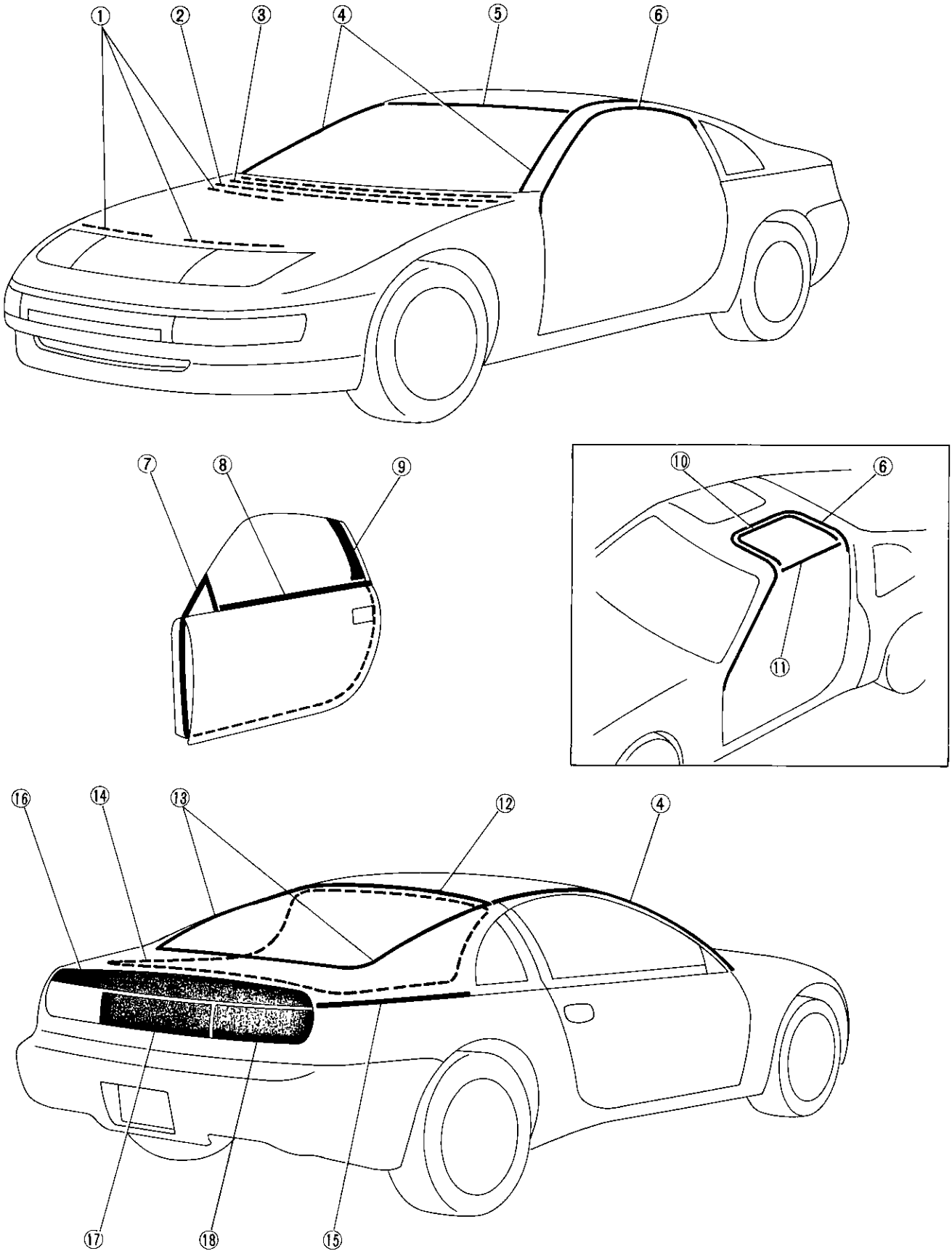




SBF862E

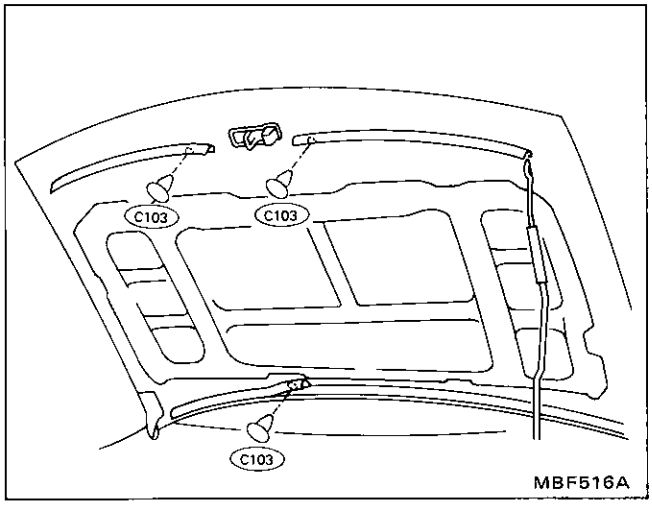
## Exterior



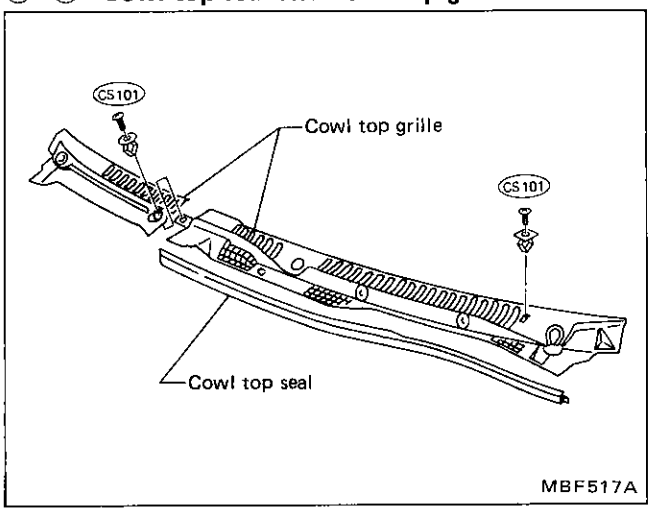

SBF863E

## Exterior (Cont'd)

### ① Hood front and rear seal

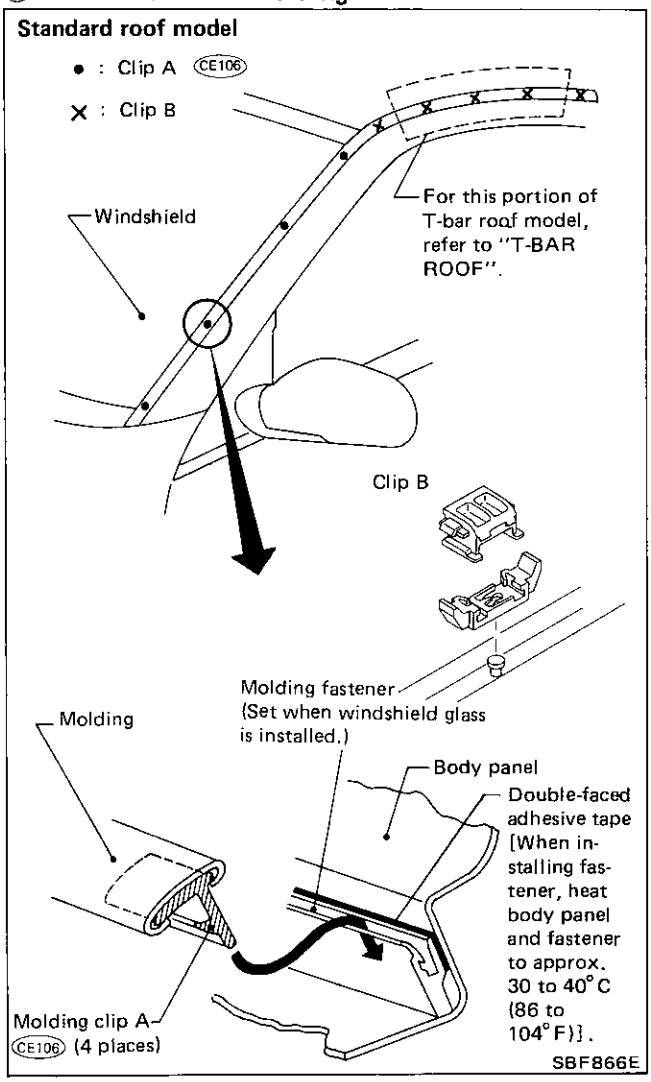



### ② ③ Cowl top seal and cowl top grille




### ④ Windshield side molding

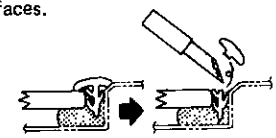
**Standard roof model**



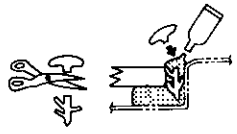

### ⑤ Windshield upper molding

**Method 1**

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.

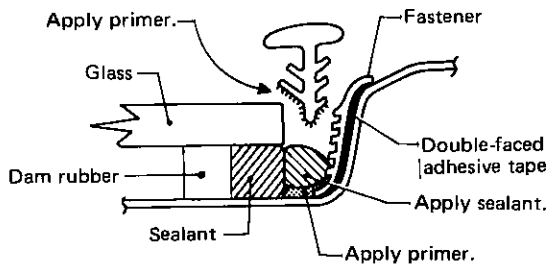


Cut off lower portion of new molding

Finish well to give it a good appearance.

**Method 2**

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant & primer to body panel, and apply primer to molding.




4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

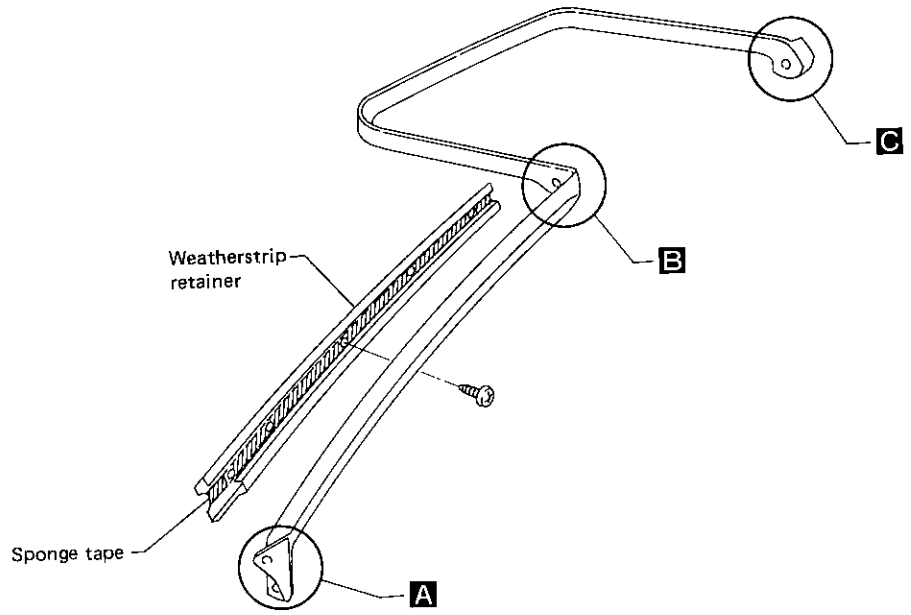
SBF301C

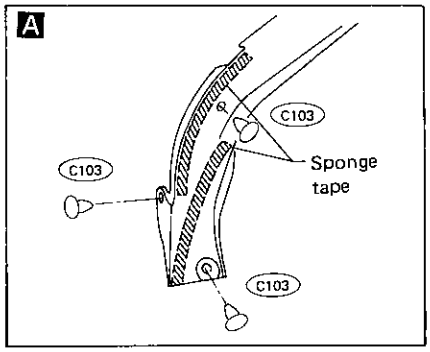
## Exterior (Cont'd)

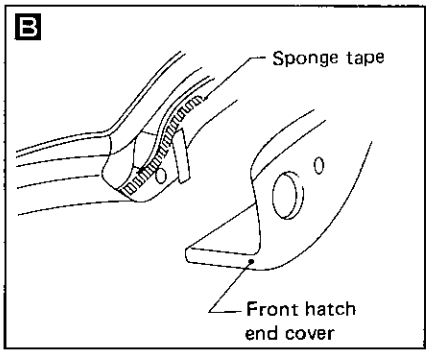
### ⑥ Body side weatherstrip

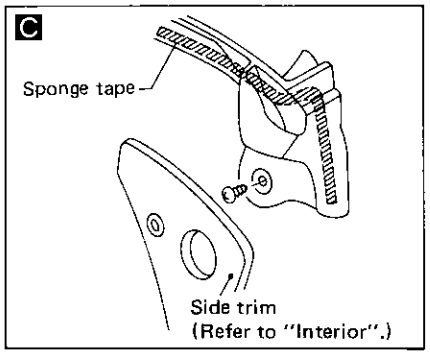
**T-bar roof model**

**Basically the same as the standard roof model**



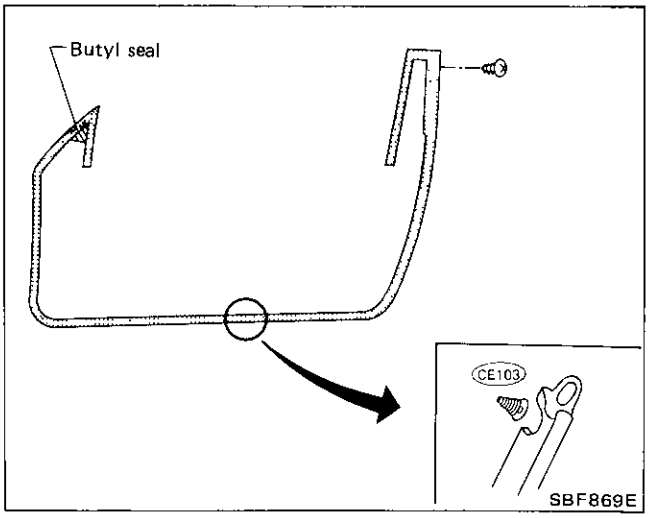




MBF518A

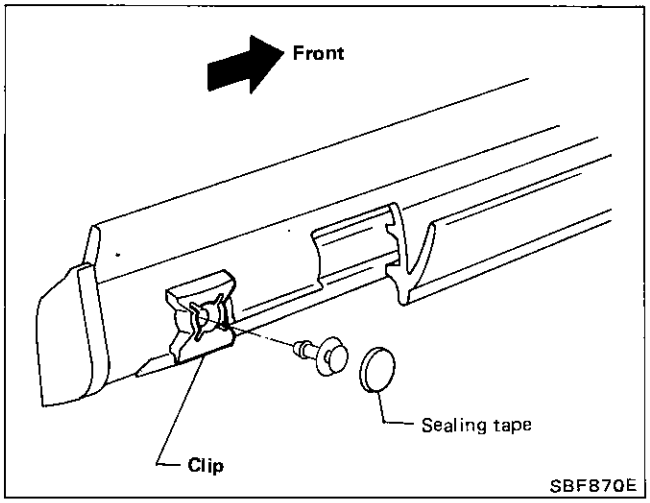
### ⑦ Door weatherstrip



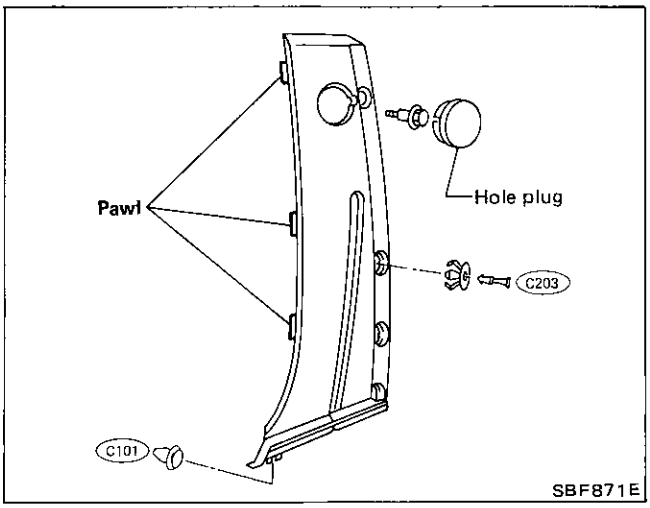

SBF869E

## Exterior (Cont'd)

### ⑧ Door out side molding



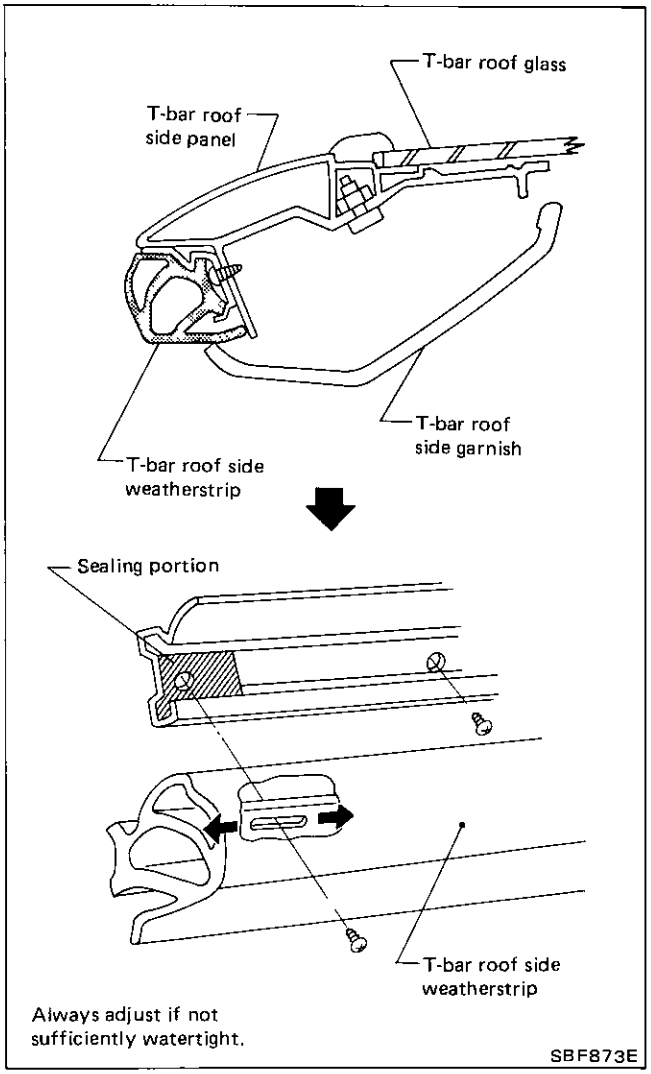

### ⑨ Door outer finisher



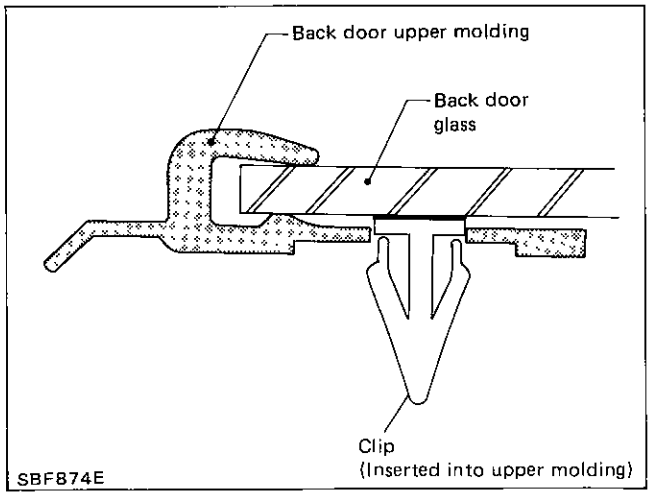

### ⑩ T-bar roof sash and T-bar roof weatherstrip

These are part of the T-bar roof glass and cannot be removed. (Refer to T-BAR ROOF.)
If they are damaged, replace entire T-bar roof glass assembly.

### ⑪ T-bar roof side weatherstrip

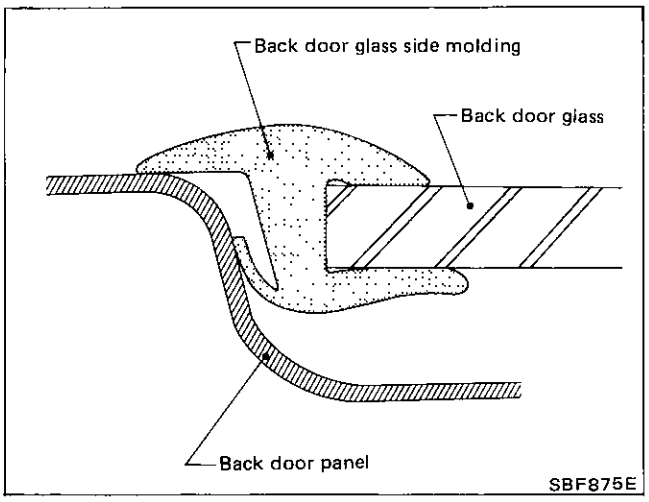



### ⑫ Back door glass upper molding

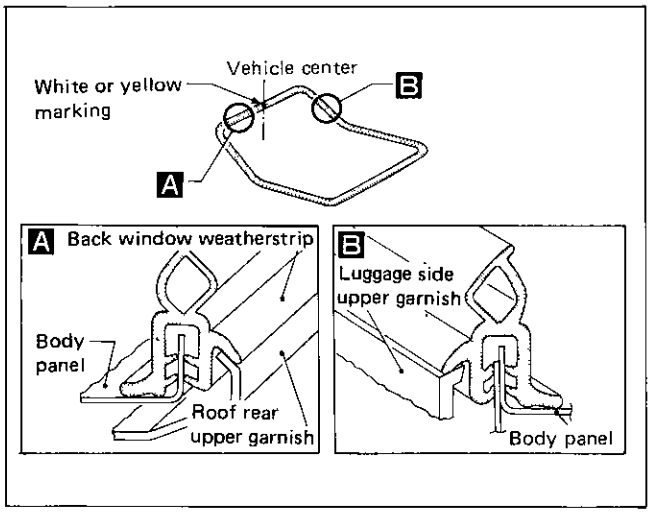


## Exterior (Cont'd)

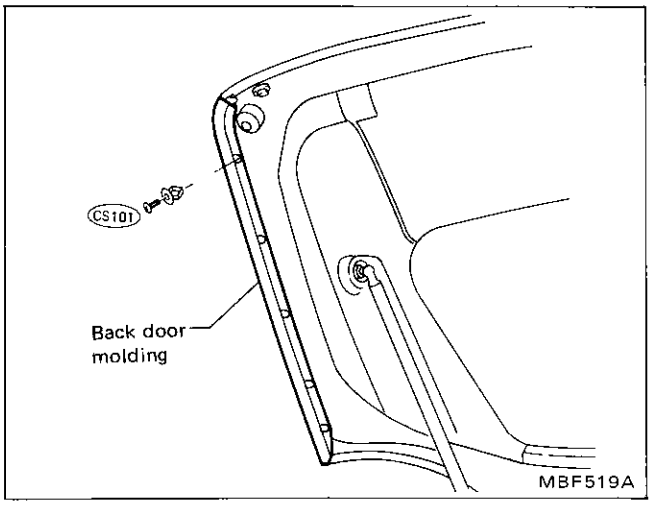
### ⑬ Back door glass side molding



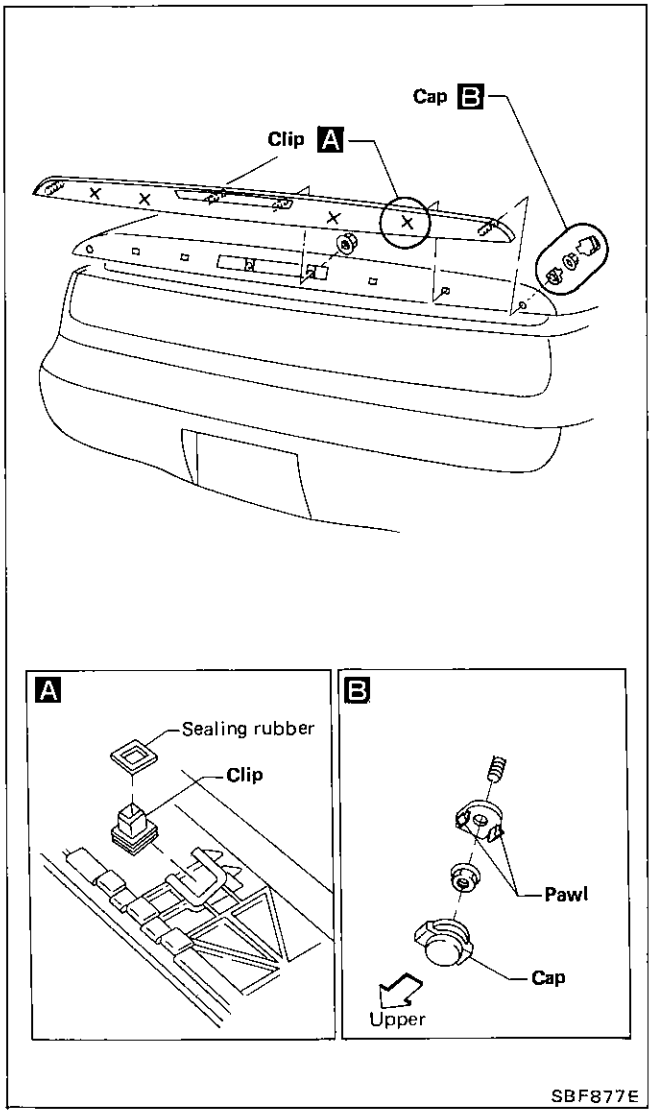

### ⑭ Back door weatherstrip



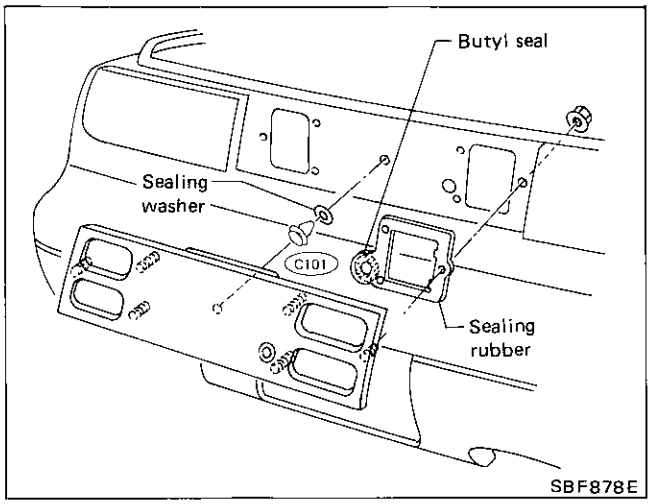

### ⑮ Back door molding




### ⑯ Back door finisher

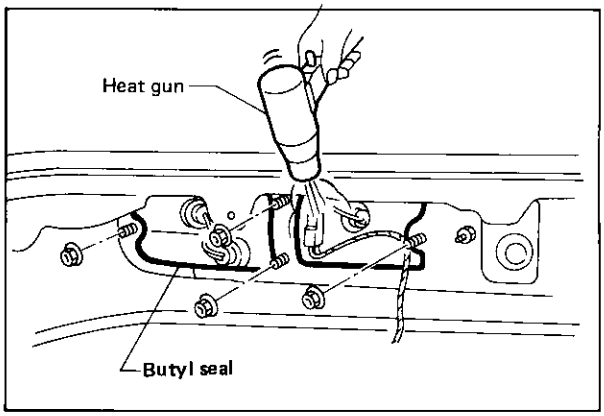



### ⑰ Rear panel finisher

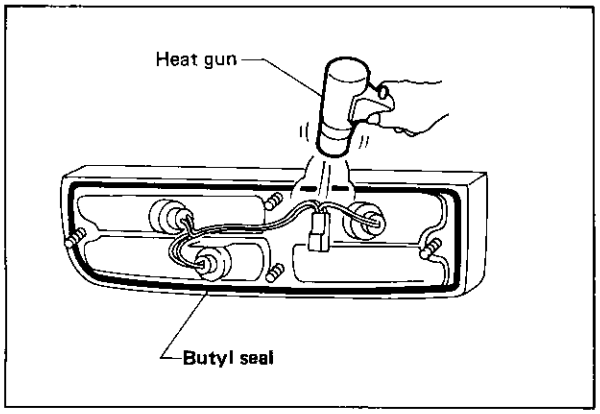


## Exterior (Cont'd)

### ⑱ Rear combination lamp



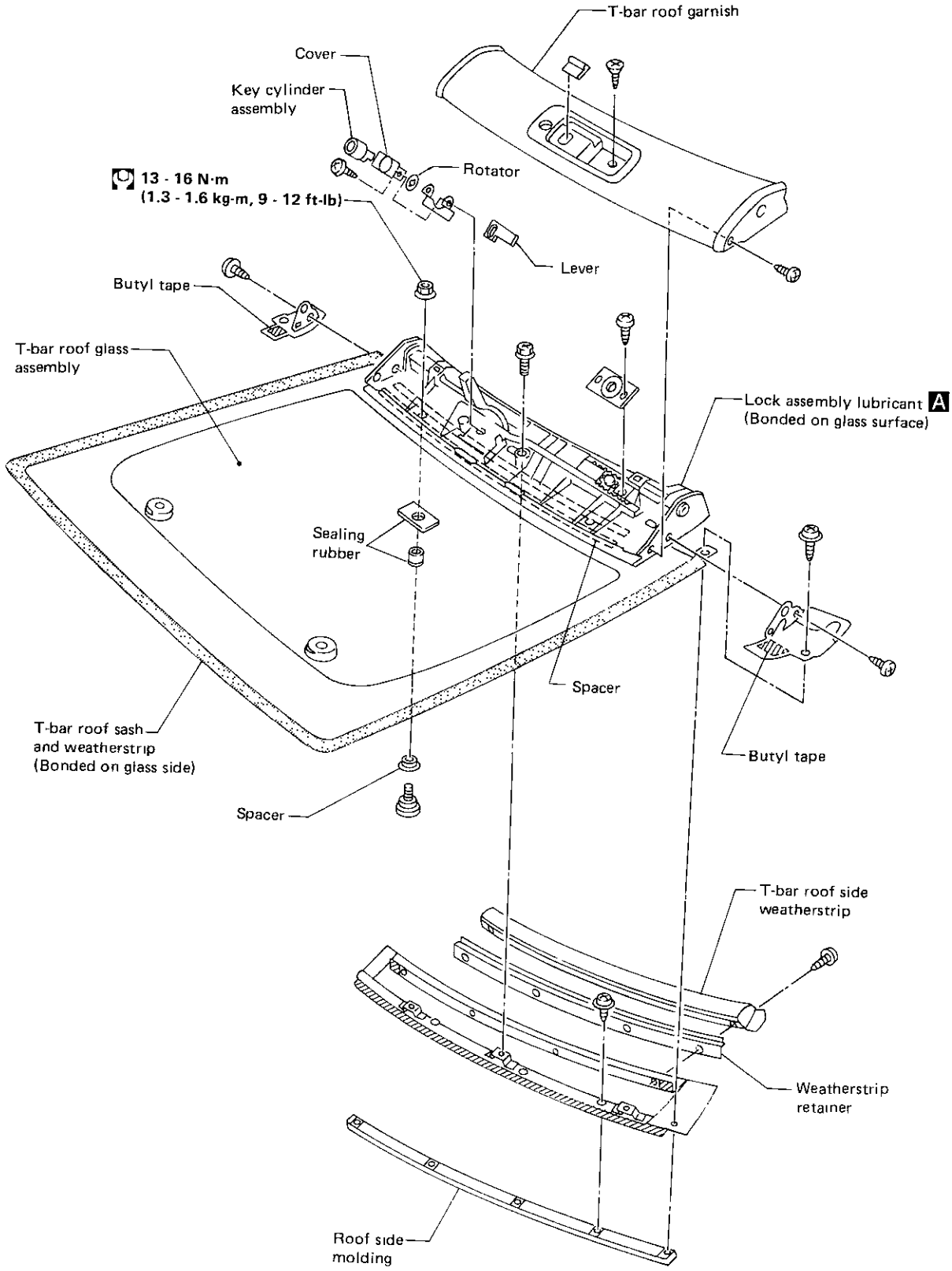

- Warm up lamp assembly area to a temperature a little below 60°C (140°F).

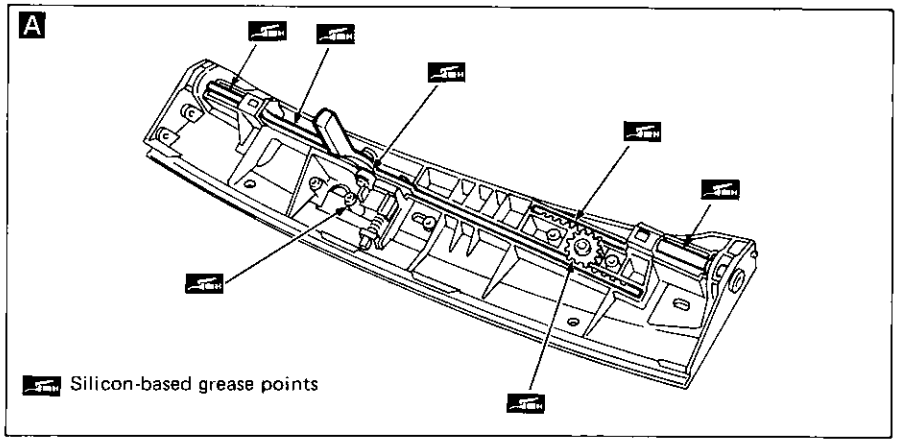



- Apply butyl seal evenly as it tends to become thin in the corners.
- Warm up lamp assembly area to a temperature a little below 60°C (140°F).

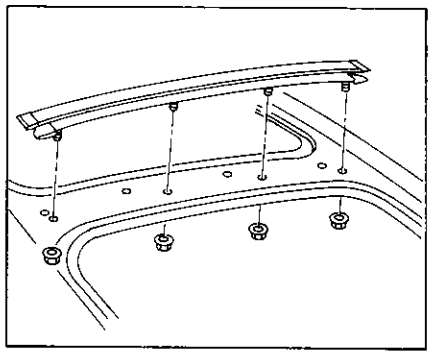
SBF886E

- Handle T-bar roof glass with care so not to damage it.
- Apply sealant to portions susceptible to water leakage if necessary.
- Side molding, sash, lock basement and glass of T-bar roof constitute one unit and cannot be disassembled.

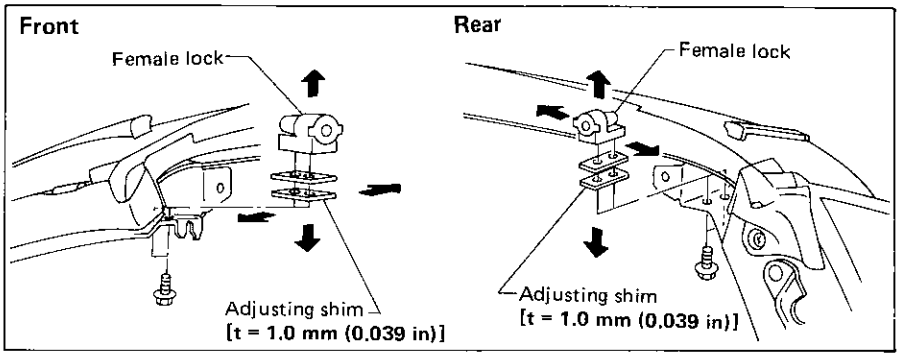





**T-bar roof hook**



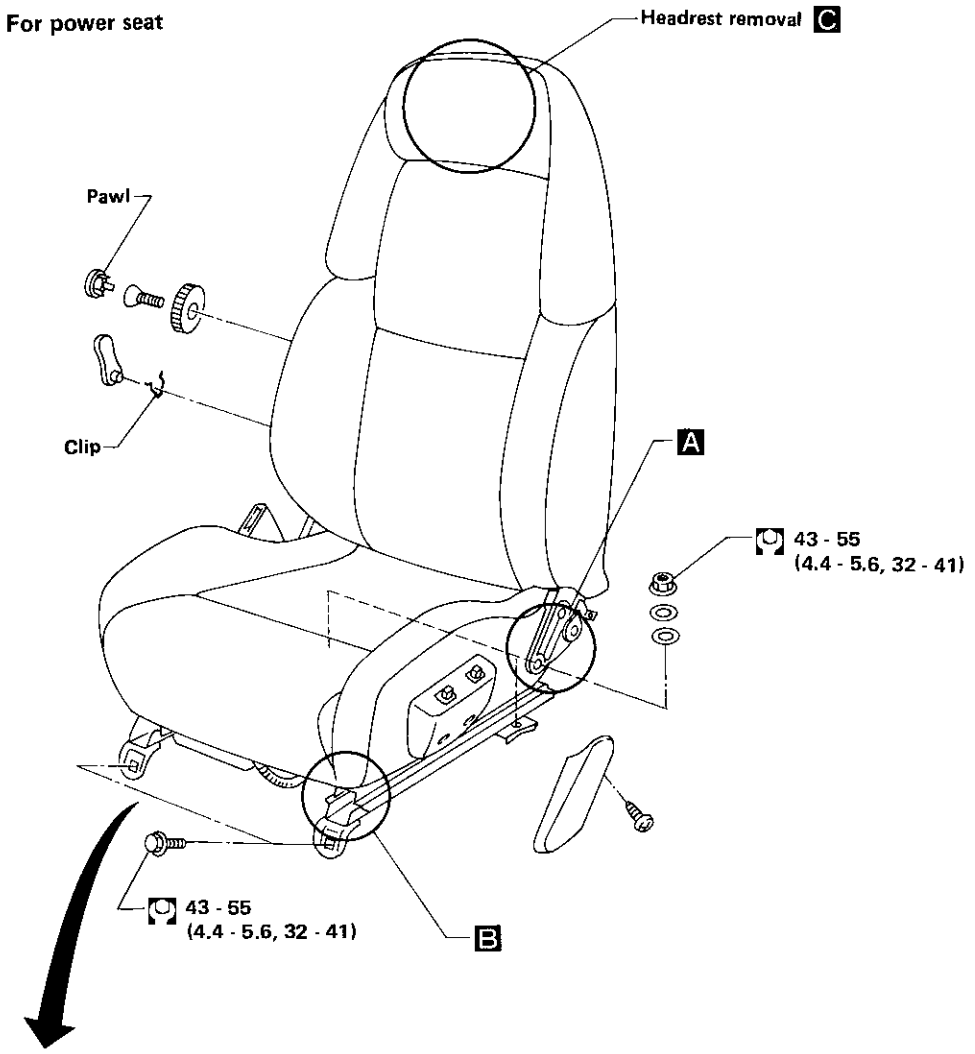
**T-bar roof female lock adjustment**

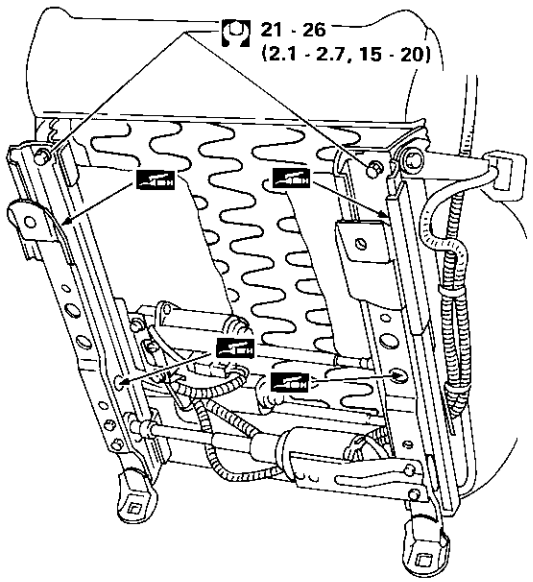



SBF885E

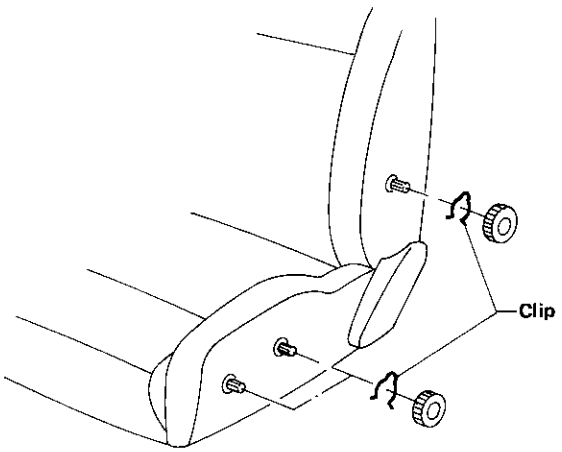
- When removing or installing the seat trim, handle it carefully to keep it from becoming dirty and to avoid damage.

## FRONT SEAT



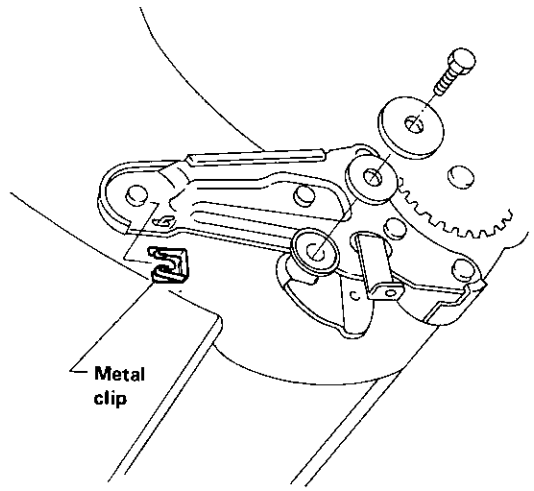




For manual seat



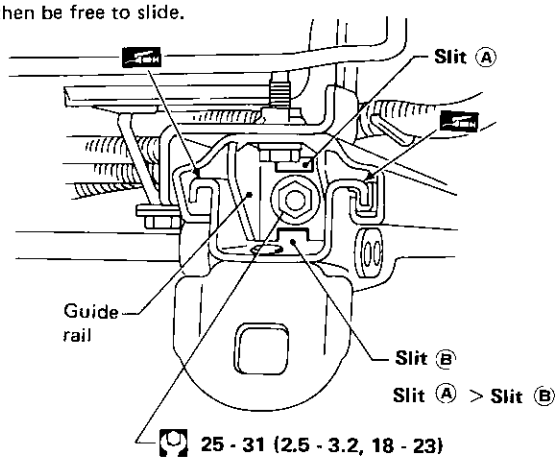

: N·m (kg-m, ft-lb)

A

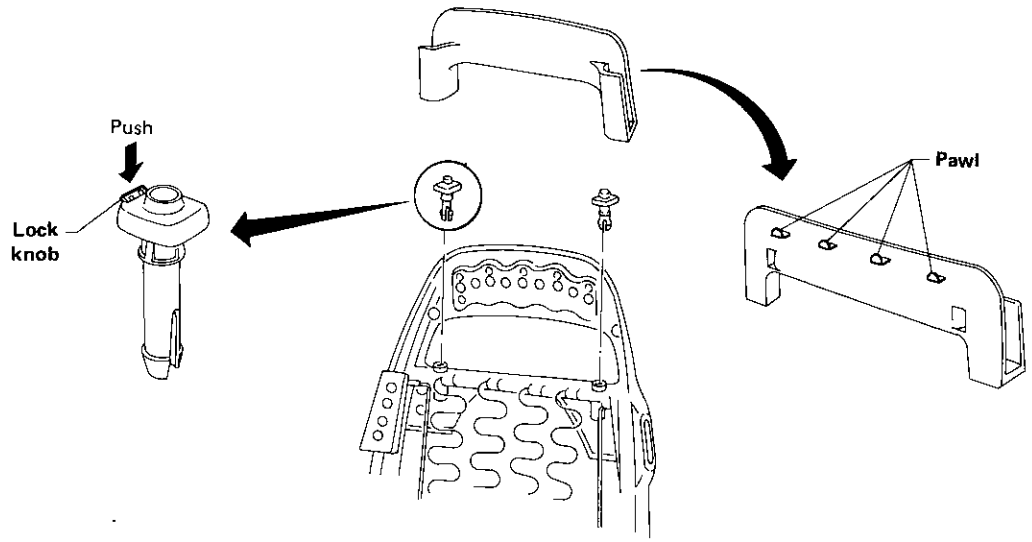



B **For power seat**

Remove nuts from left and right guide rails. Seat will then be free to slide.

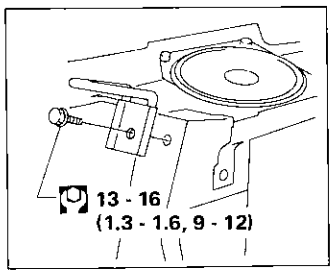


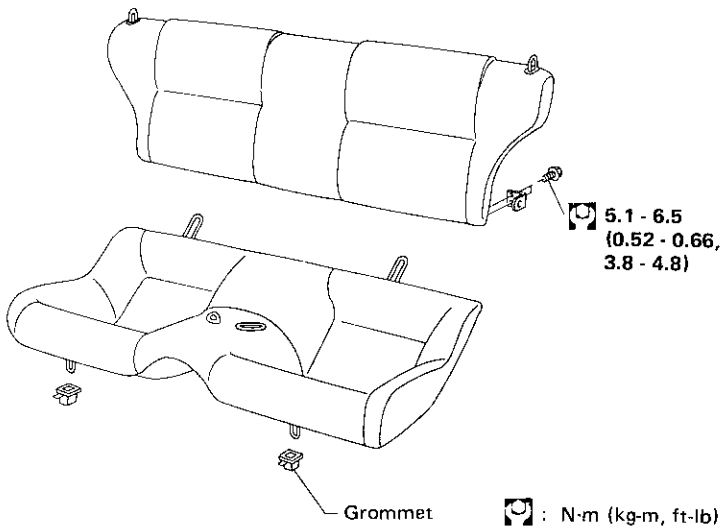

C Push (trim-covered) lock knob to remove headrest.




SBF879E

## REAR SEAT

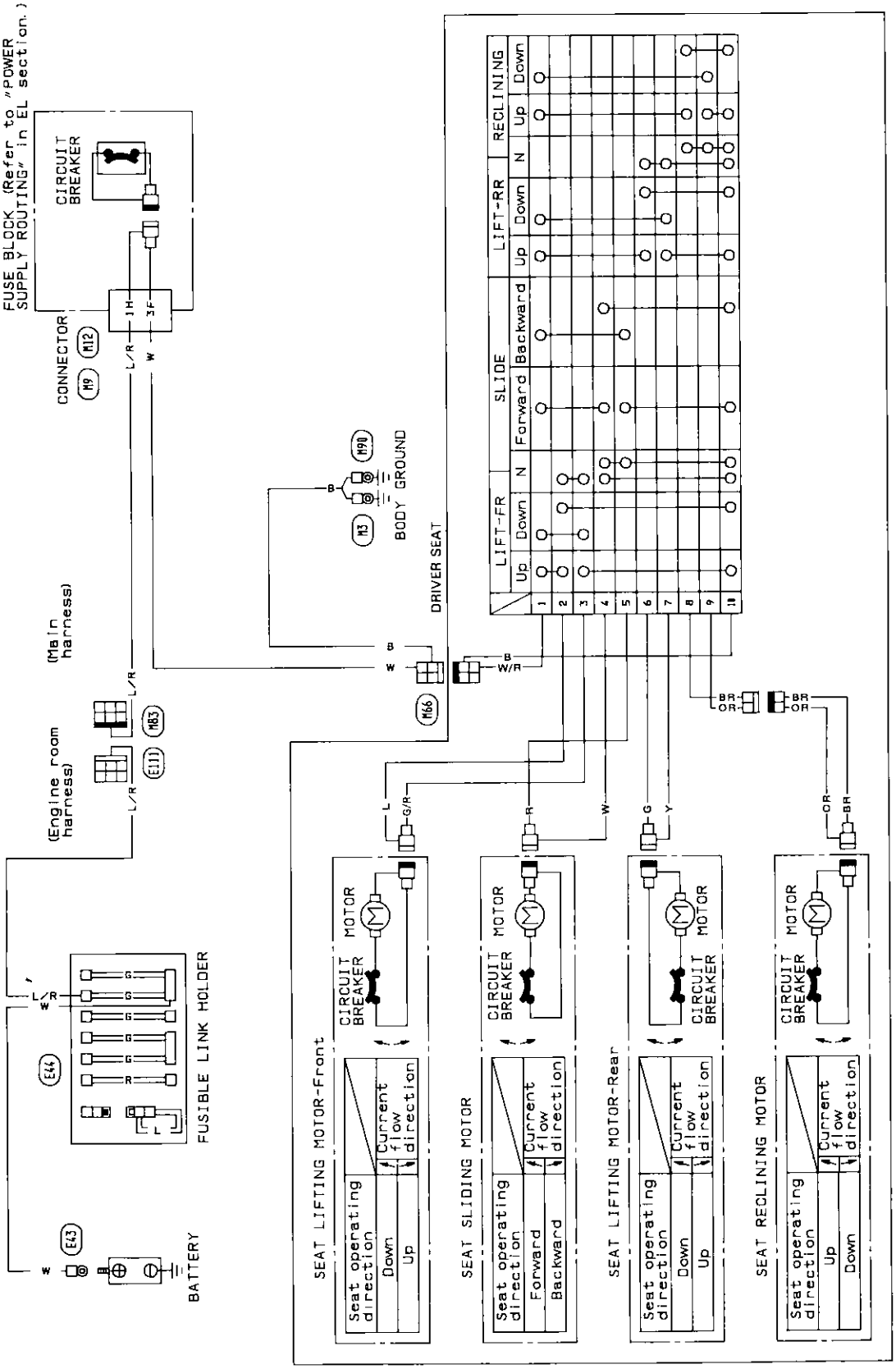



: N·m (kg-m, ft-lb)

SBF954E

## POWER SEAT/WIRING DIAGRAM




SBF560G

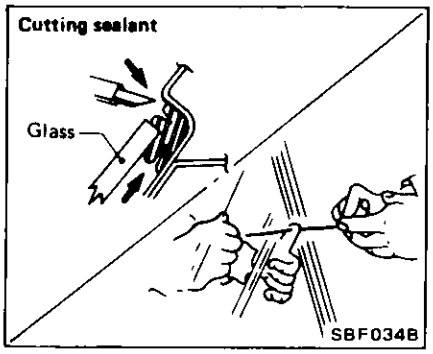
## Windshield

### REMOVAL

After removing moldings, remove glass.

**CAUTION:**

**Be careful not to scratch glass when removing.**




### INSTALLATION

- **Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.**
- **After installation, the vehicle should remain stationary for about 24 hours.**

**WARNING:**

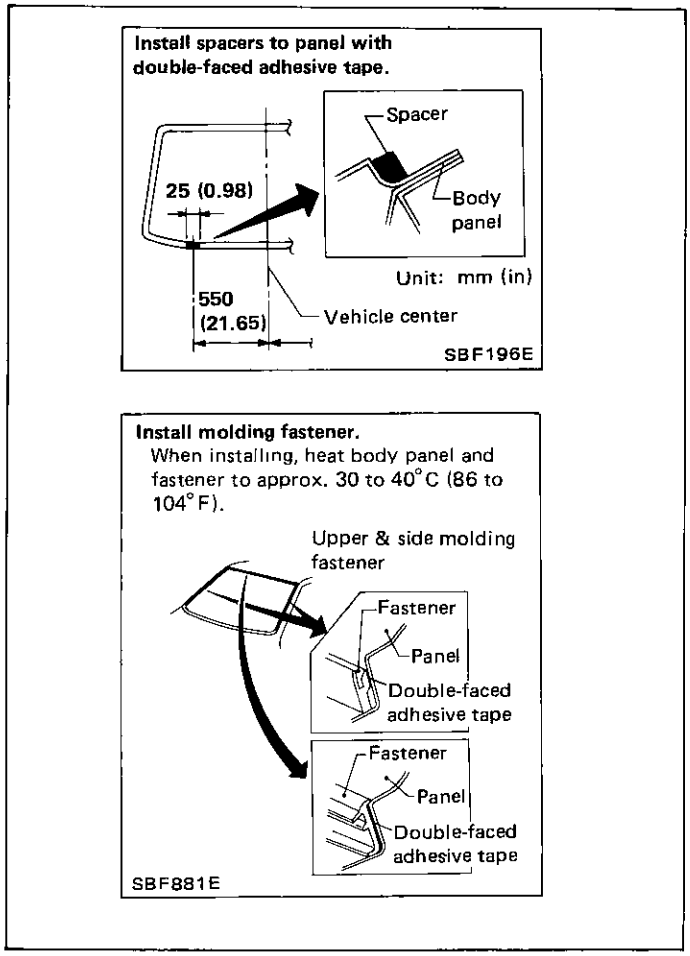
**Keep heat and open flames away as primers are flammable.**

**CAUTION:**

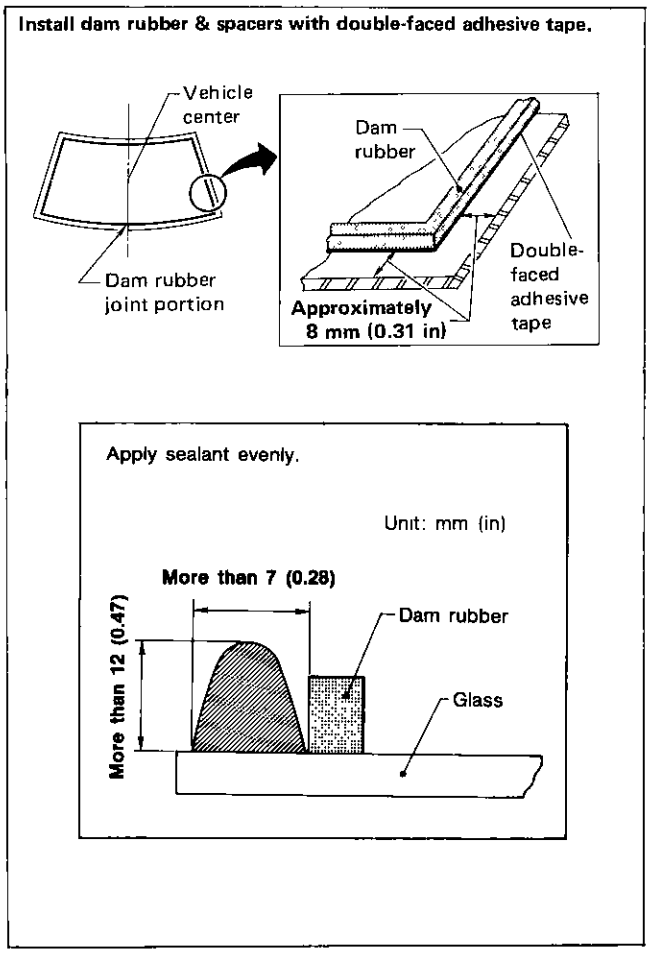
**Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.**

- **Do not use sealant which is past its usable term.**
- **Do not leave cartridge unattended with its cap open.**
- **Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.**
- **Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.**
- **Molding must be installed securely so that it is in position and leaves no gap.**

Body side




Glass side




### REPAIRING WATER LEAKS FOR WINDSHIELD

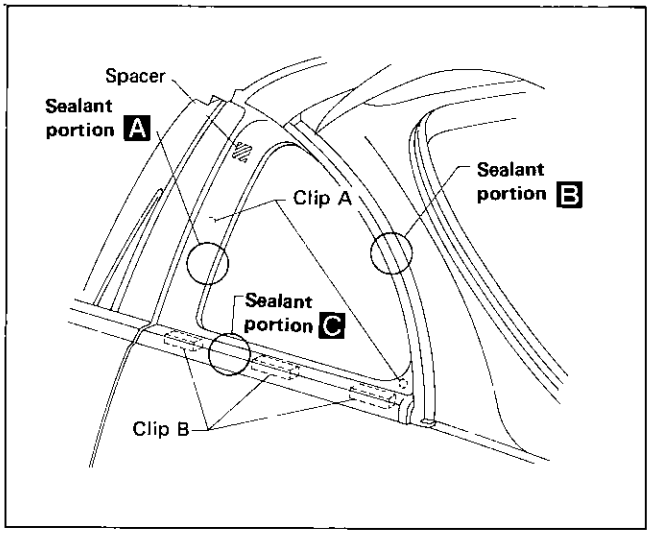
Leaks can be repaired without removing and reinstalling glass.

**If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.**

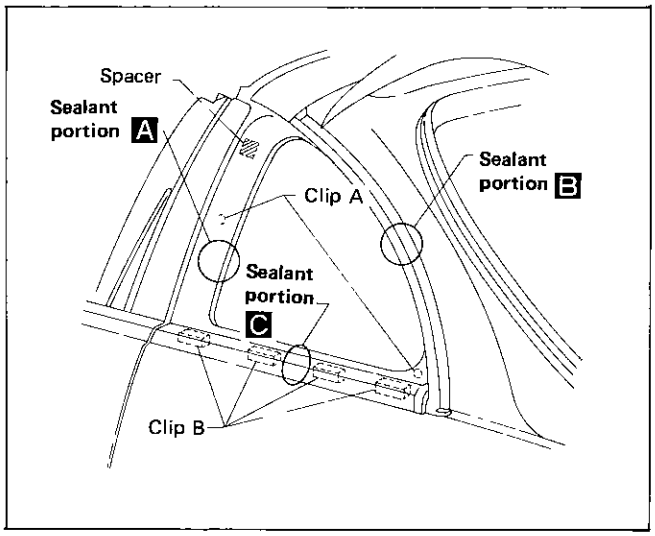
To stop the leak, apply primer (if necessary) and then sealant to the leak point.

## Side Window

2 seater model



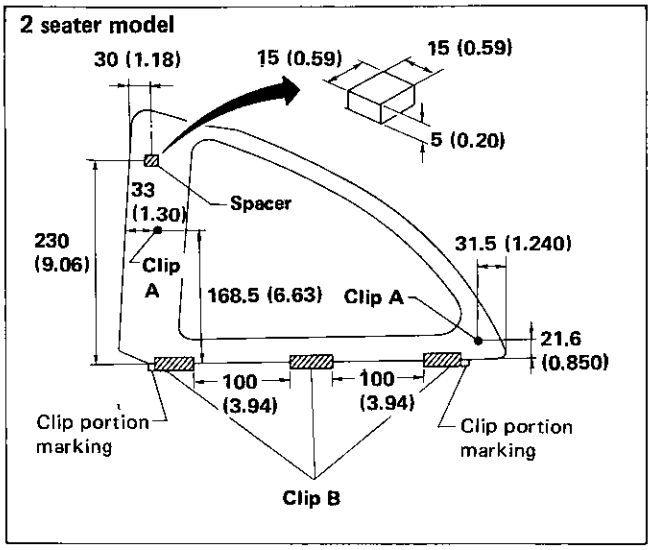

2+2 seater model



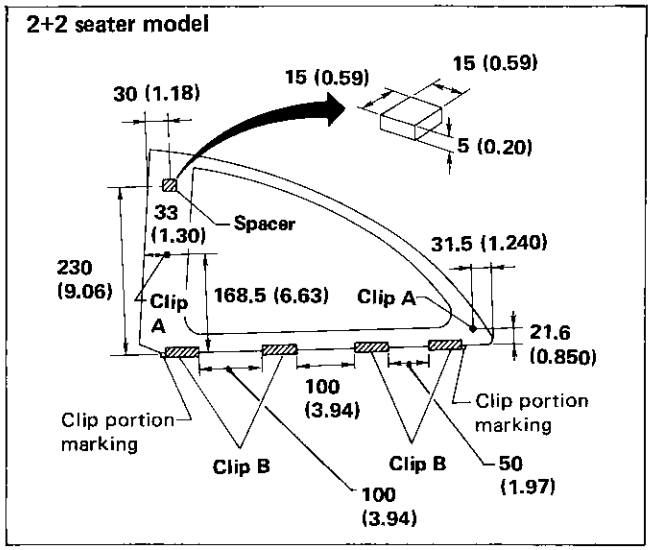

### Spacer and clip portion

Unit: mm (in)

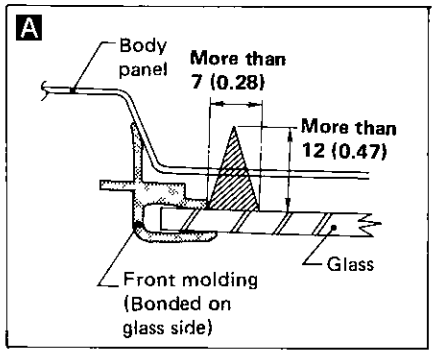
2 seater model



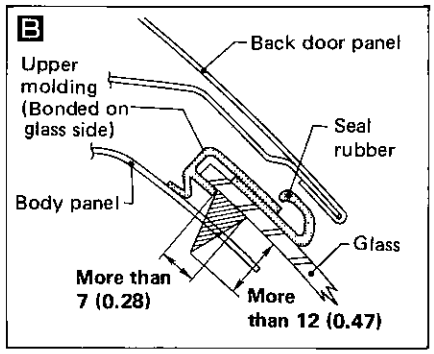

2+2 seater model



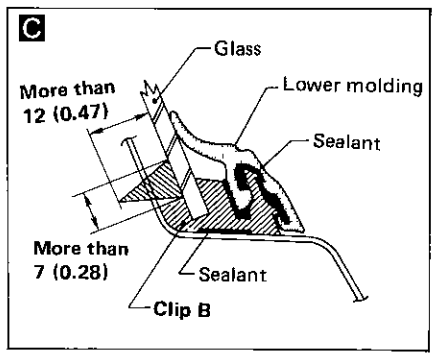

A




B



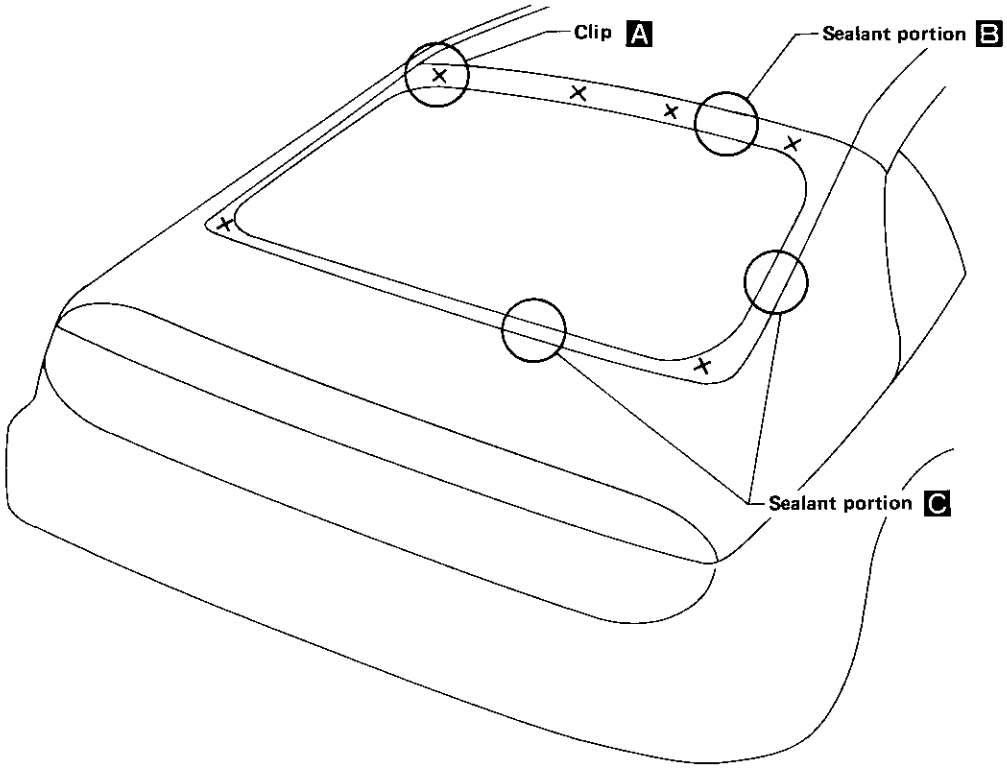

C

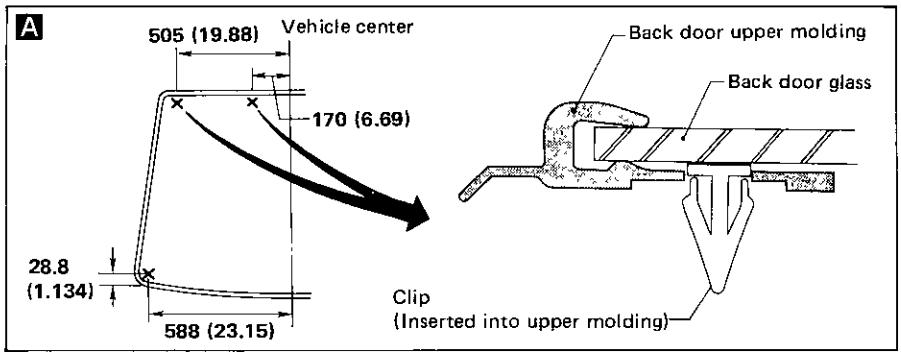


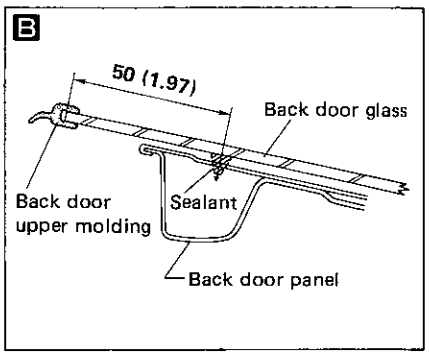

SBF010F

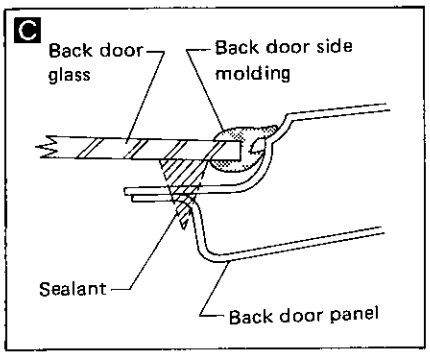
## Back Door Window

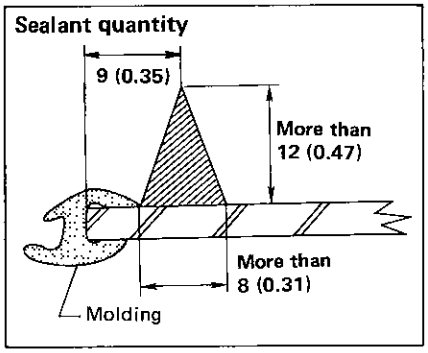
- Construction and removal/reinstallation method of back door window are basically the same as those of windshield.
- For sealant drying time, refer to "Drying Time for Sealant".
- For details of moldings, refer to "Exterior".



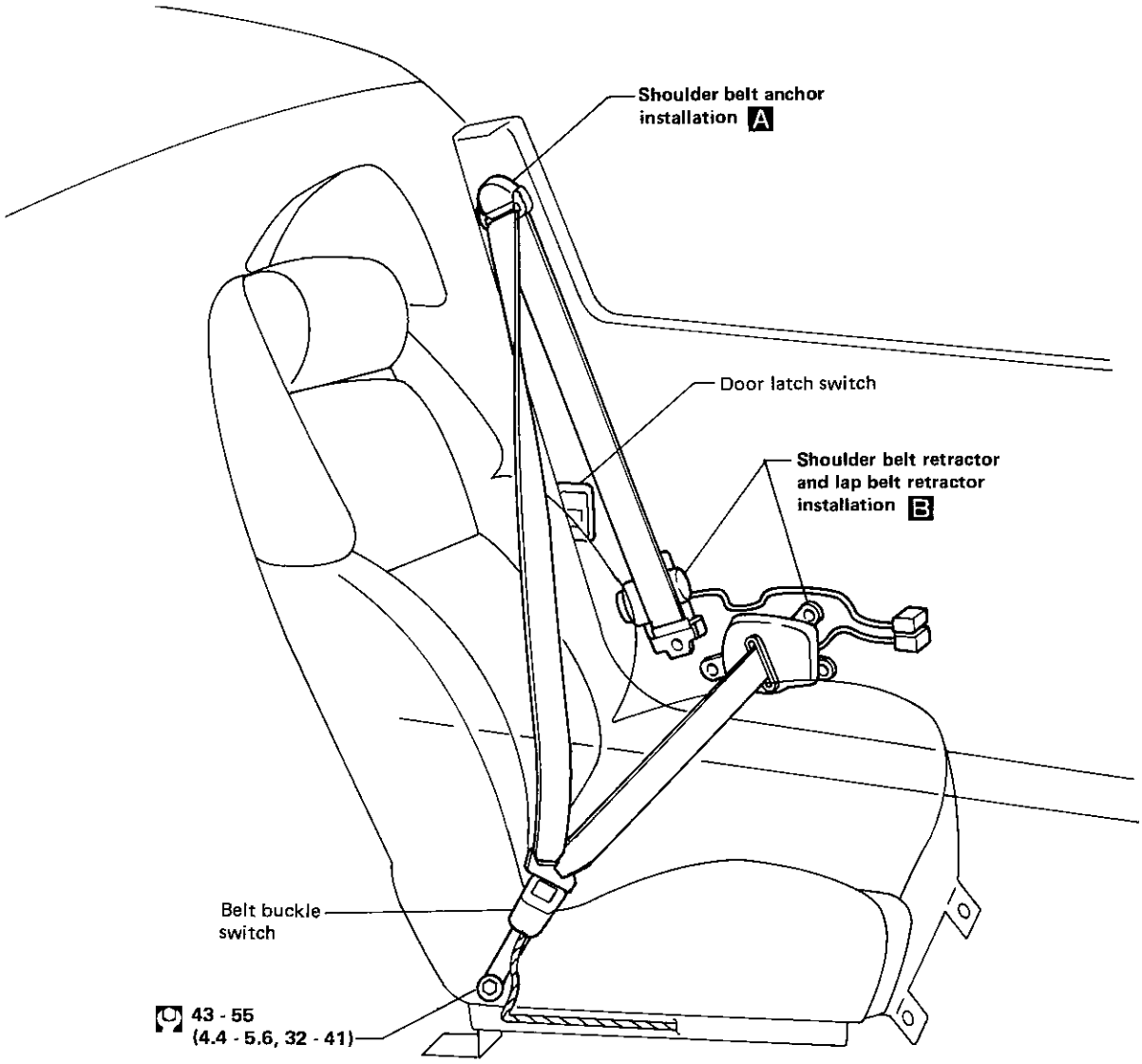



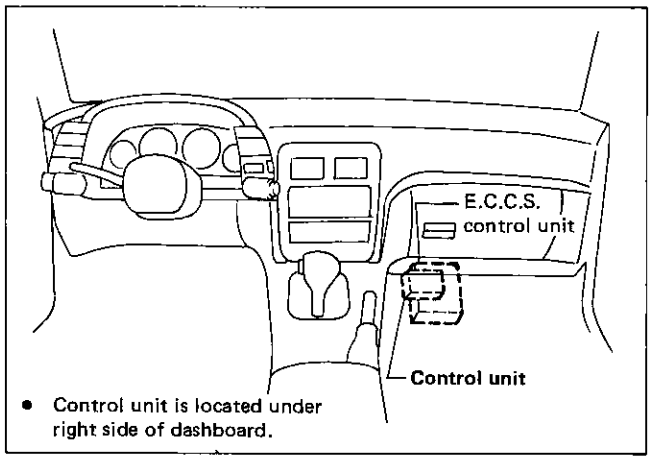

Unit: mm (in)

SBF884E

## Unit Location

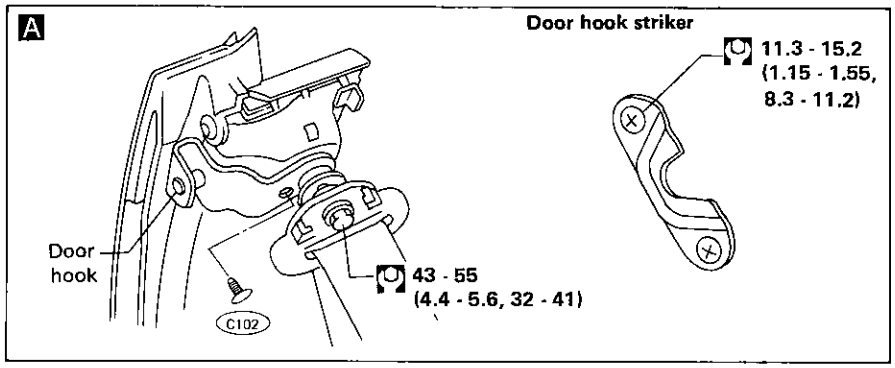


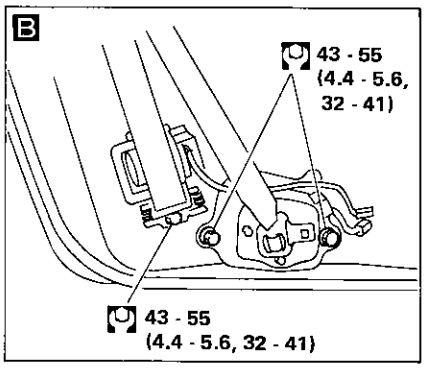

**Control unit**




: N·m (kg-m, ft-lb)

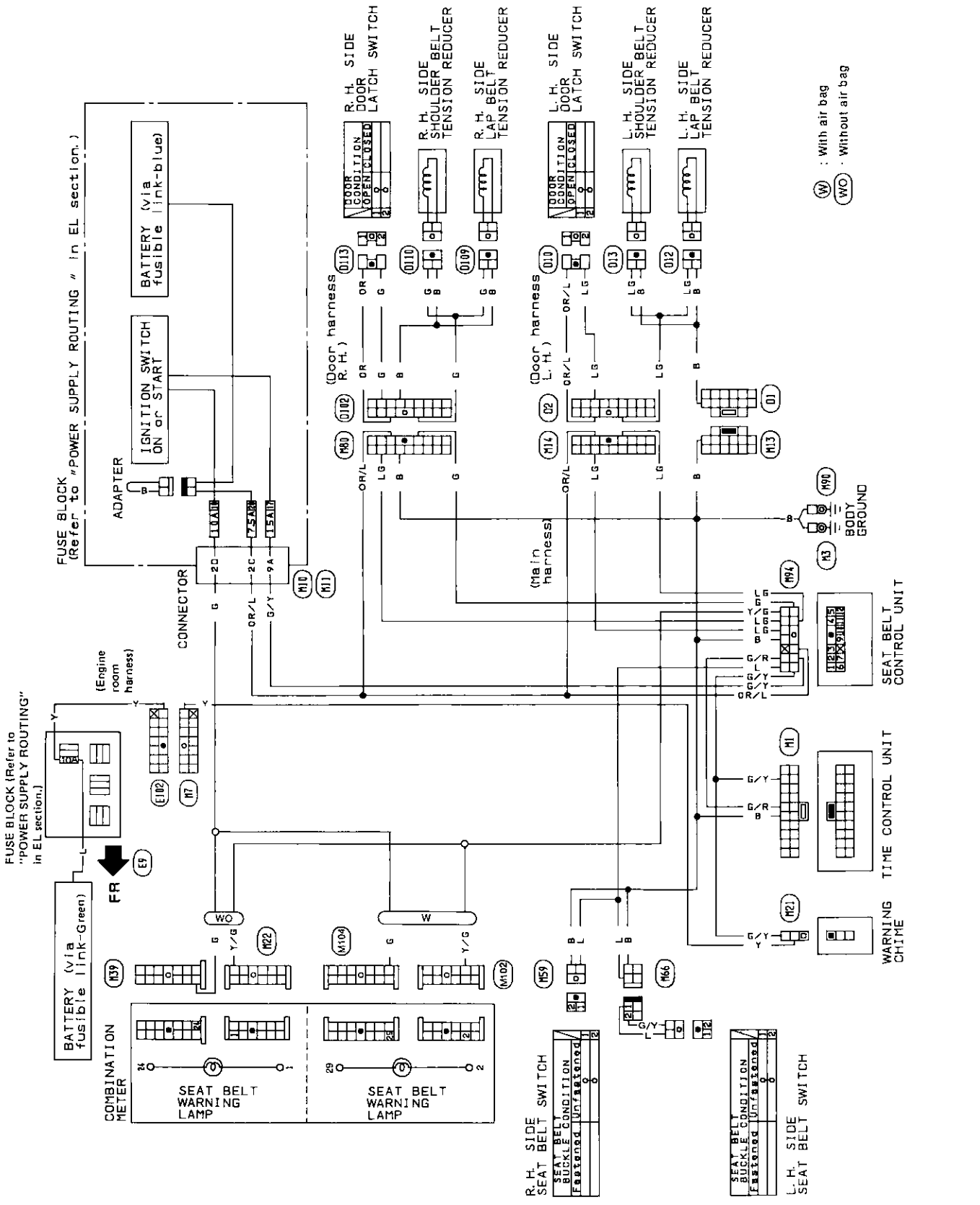
## Unit Location (Cont'd)




SBF880E

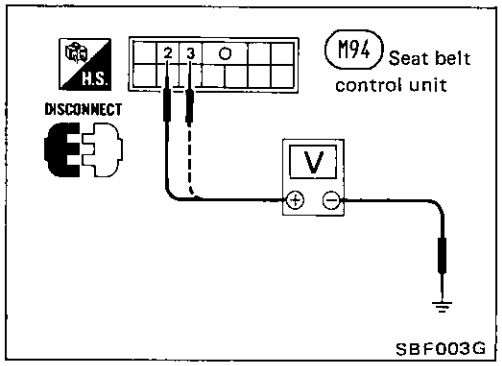
## Wiring Diagram




SBF561G

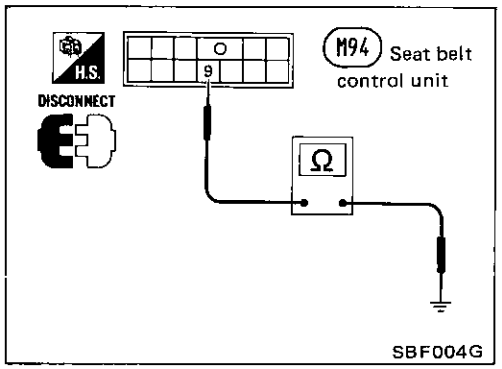
## Preparation for Trouble Diagnoses

1. Remove floor board located in front of passenger leg space.
2. Disconnect harness connector.



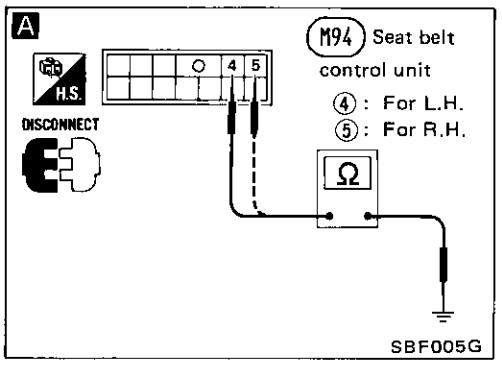

## Power Supply Circuit Check

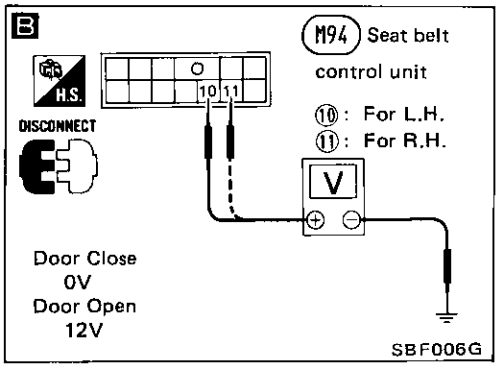
| Terminals | | Ignition switch | |
|---|---|---|---|
| ⊕ | ⊖ | OFF or ACC | ON |
| ② | Ground | 0V | 12V |
| ③ | Ground | 12V | 12V |




## Ground Circuit Check

| Terminals | Continuity |
|---|---|
| ⑨ -Ground | Yes |




## Trouble Diagnoses

**SYMPTOM:**

**Warning lamp flashes continuously.**

A

Does continuity exist between terminal ④ and ground or terminal ⑤ and ground?

Yes → B

No → Repair harness.

B

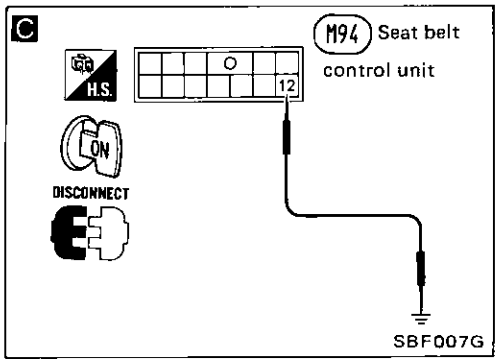
Does door latch switch signal (battery voltage) exist between terminal ⑩ and ground or terminal ⑪ and ground?

Yes → Replace control unit.

No → Replace door lock assembly.

## Trouble Diagnoses (Cont'd)

C




SYMPTOM:

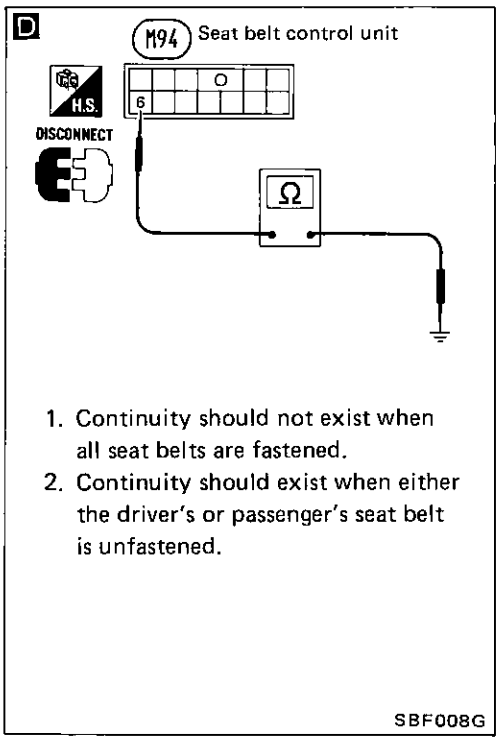
**Warning lamp does not flash when ignition switch is "ON".**

C

Does warning lamp flash if terminal ⑫ is grounded?

- Yes → Replace control unit.
- No →
  - Check harness.
  - Check bulb.

D




1. Continuity should not exist when all seat belts are fastened.
2. Continuity should exist when either the driver's or passenger's seat belt is unfastened.

SYMPTOM:

**Warning chime does not operate for 6 seconds after ignition switch is ON, when releasing belt from buckle.**

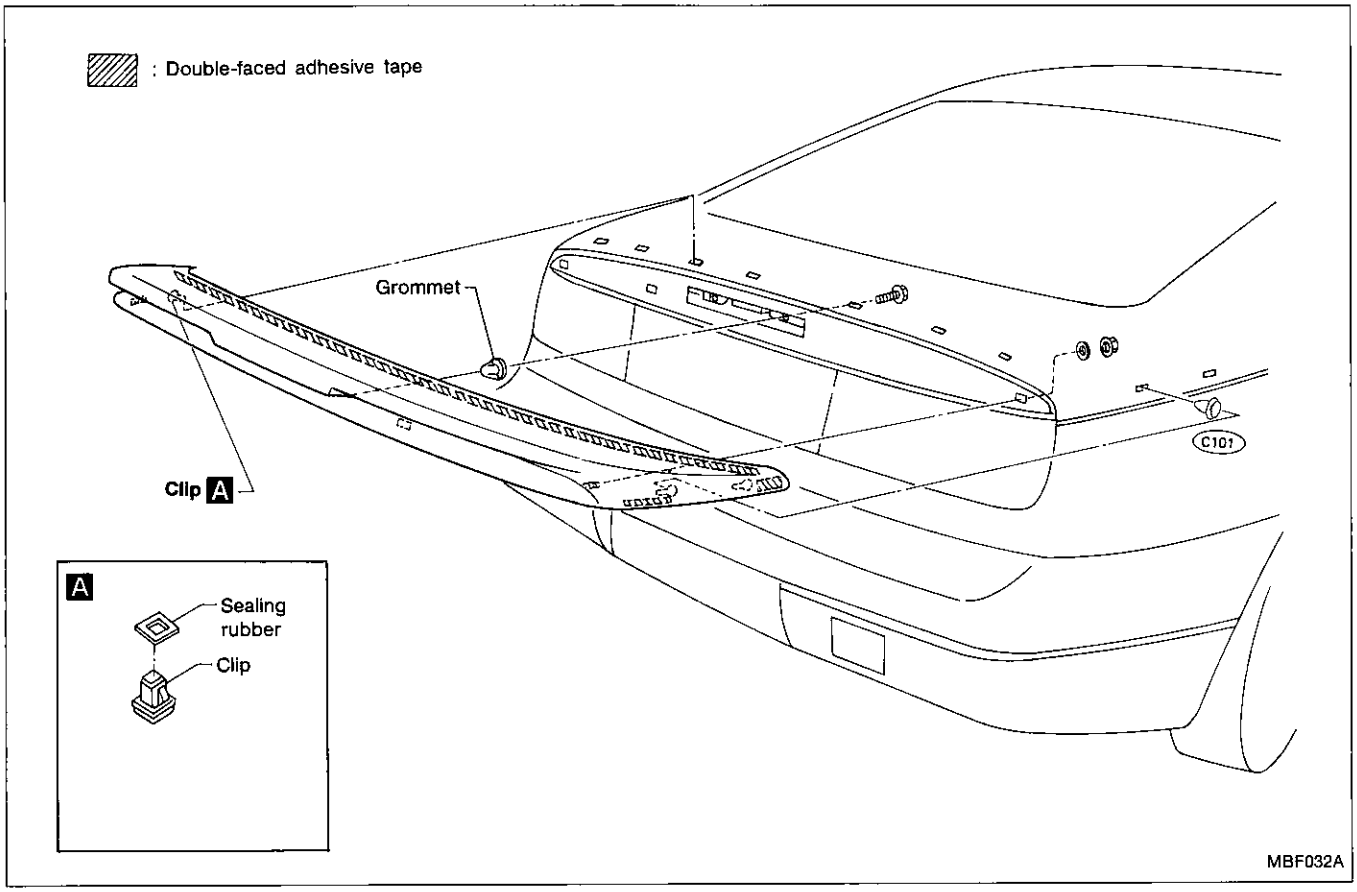
D

Check continuity between terminal ⑥ and ground.

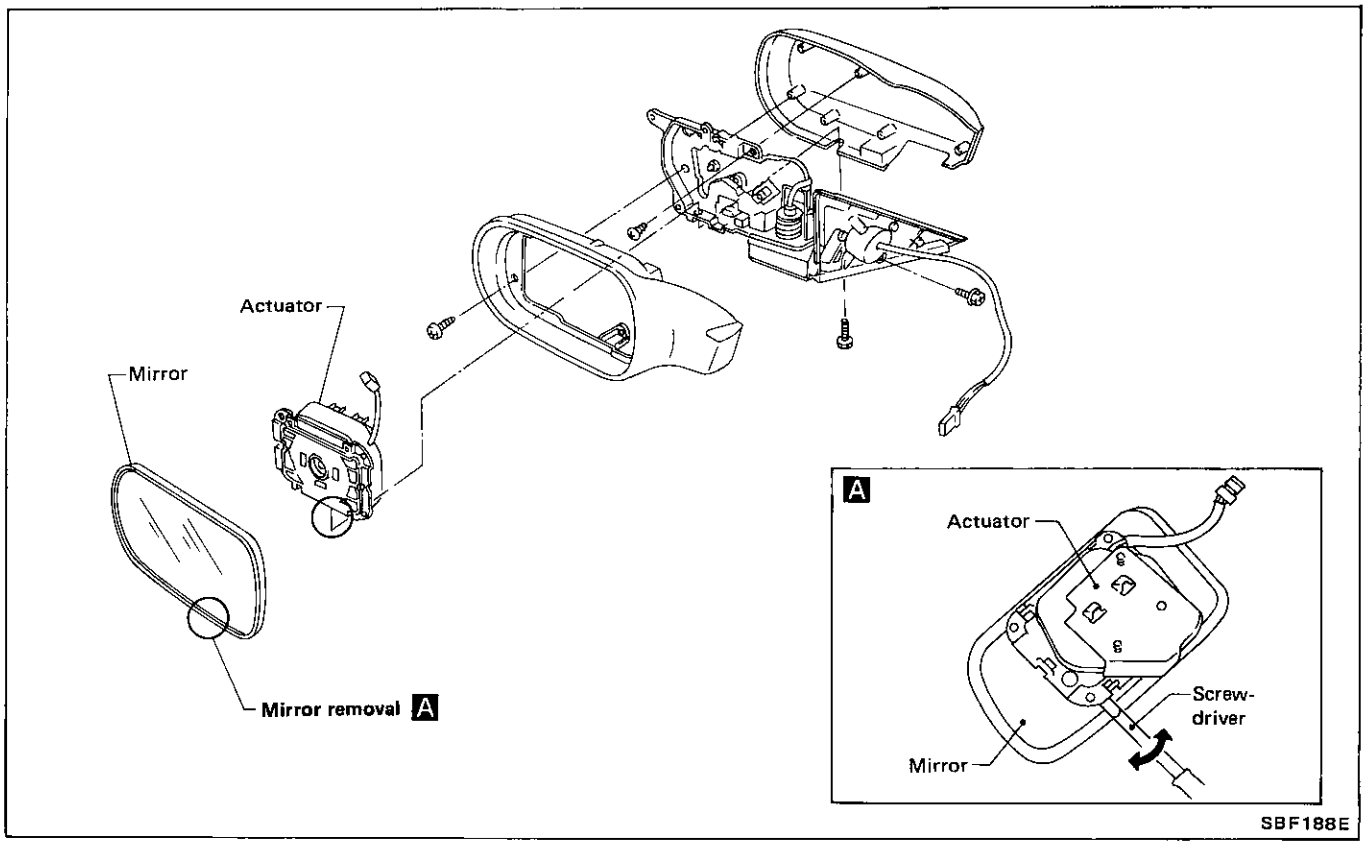
- O.K. →
  - Do other warning chimes such as light warning chime operate?
    - Yes → Check harness between terminal ① and chime.
    - No →
      - Go to "TIME CONTROL SYSTEM" in EL section.
- N.G. →
  - Check harness.
  - Check shoulder belt buckle.

- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

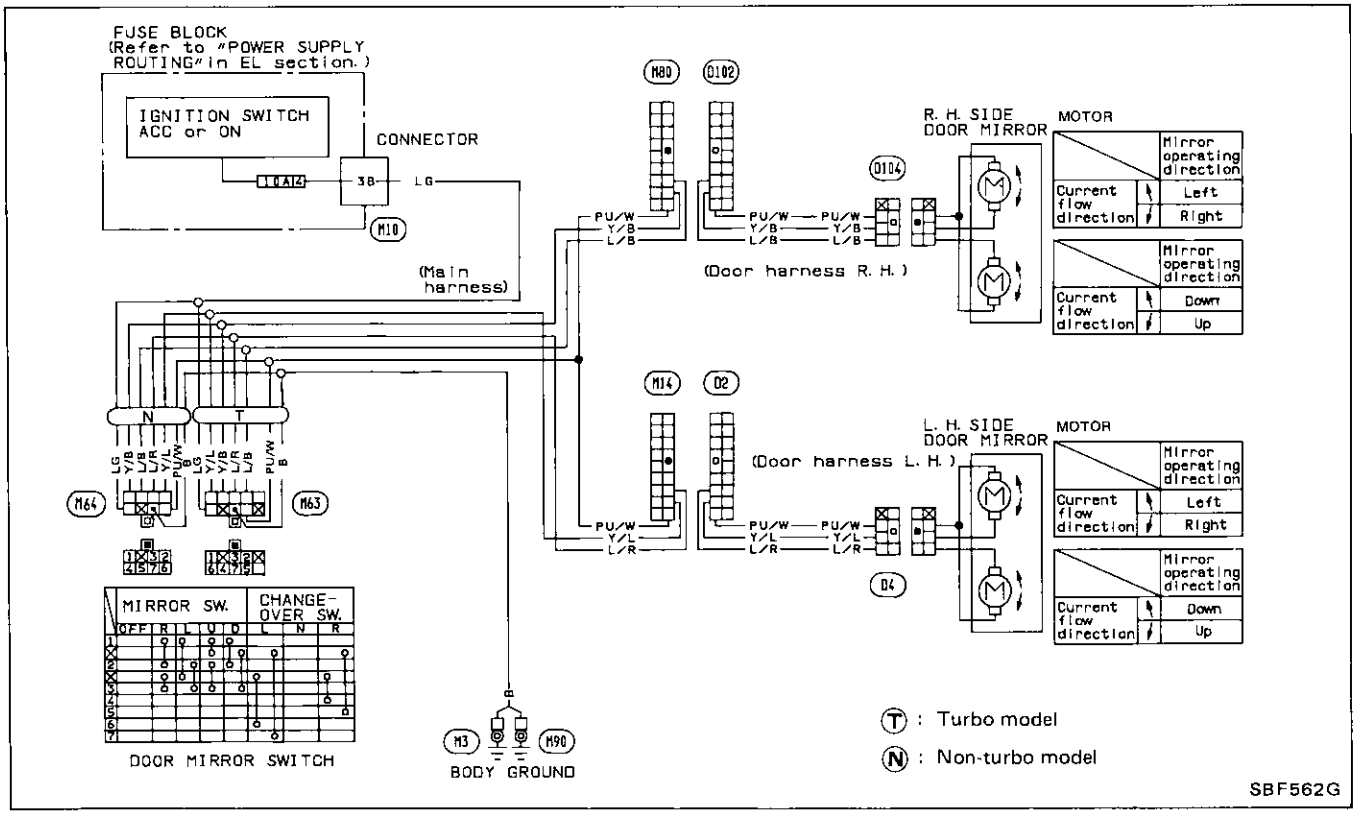
## REAR AIR SPOILER



## Door Mirror

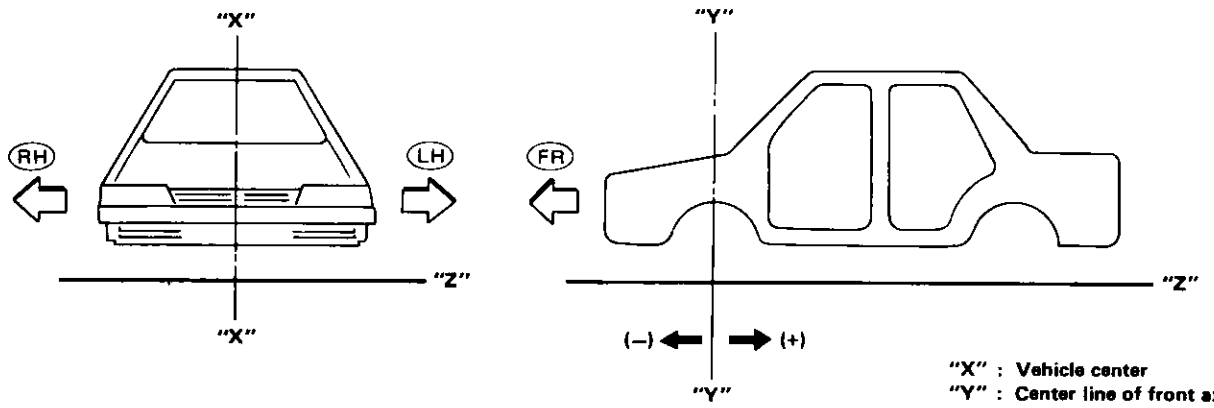



### WIRING DIAGRAM




For door mirror defogger, refer to "REAR WINDOW DEFOGGER & HEATER MIRROR" in **EL** section.

- 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 the same value.
- The coordinates of the measurement points are the distances measured from the standard line of "X", "Y" and "Z".

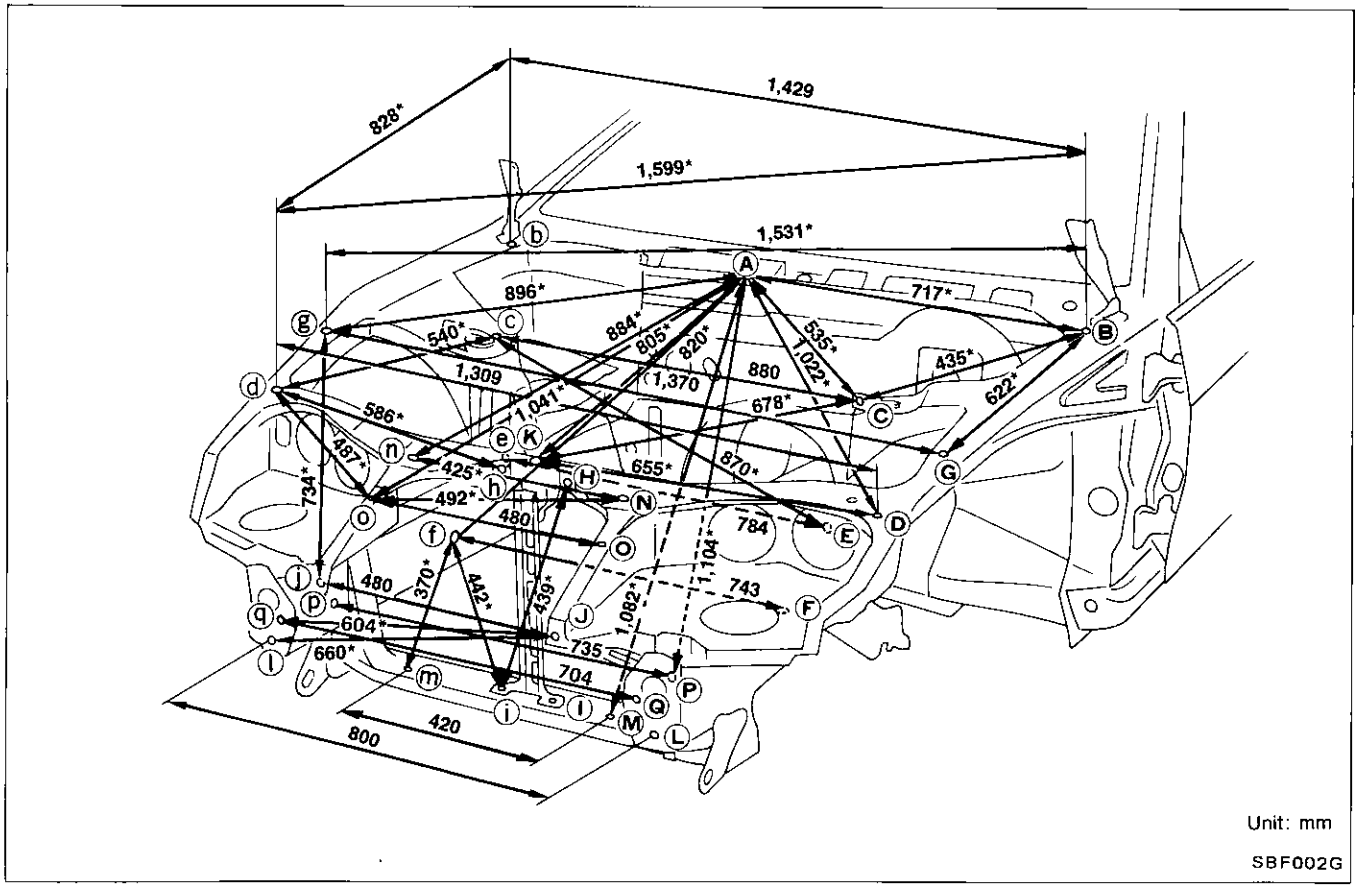



(LH) : L.H. side
(RH) : R.H. side

"X" : Vehicle center
"Y" : Center line of front axle
"Z" : Imaginary base line
[200 mm below datum line ("OZ" at design plan)]

## Engine Compartment

### MEASUREMENT

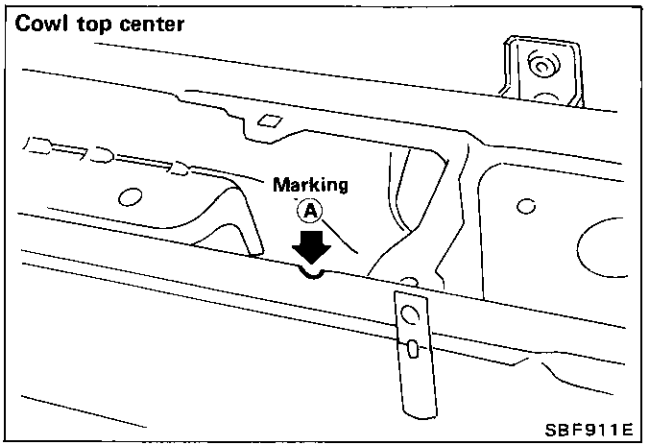


## Engine Compartment (Cont'd)

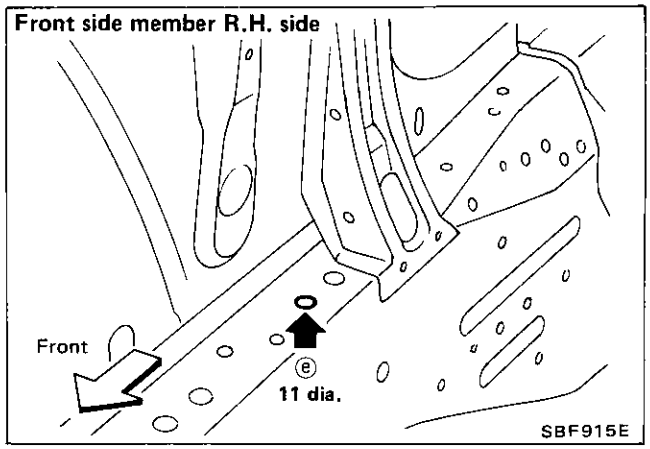
### MEASUREMENT POINTS

Unit: mm

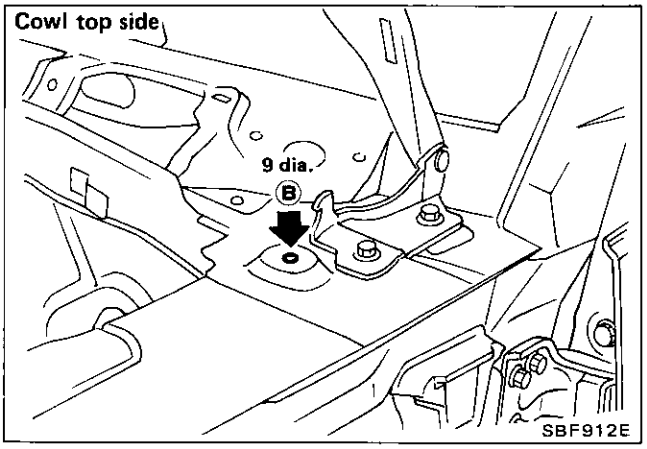
Cowl top center



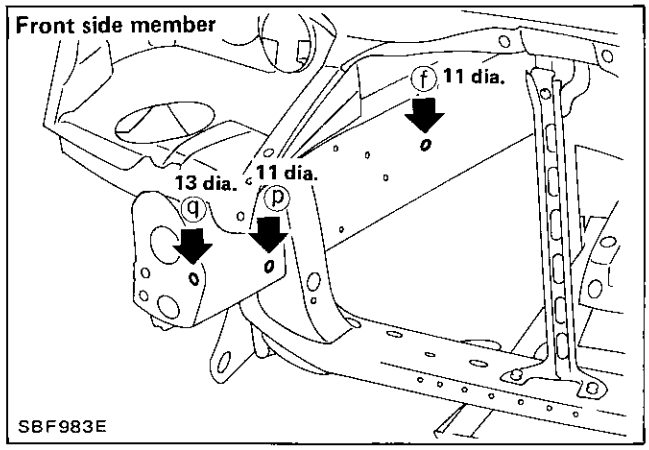

Front side member R.H. side



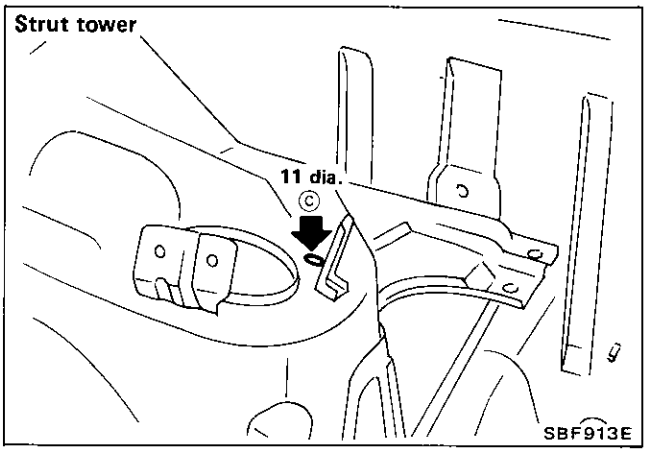

Cowl top side



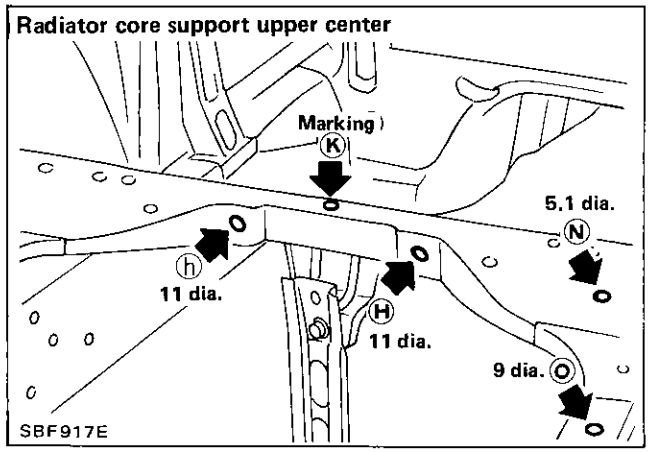

Front side member



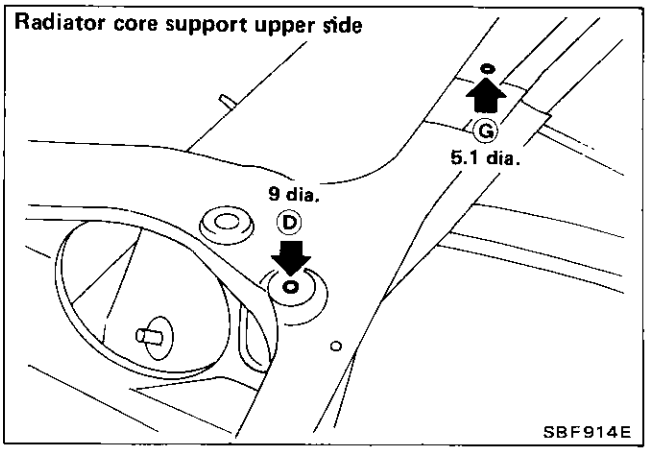

Strut tower



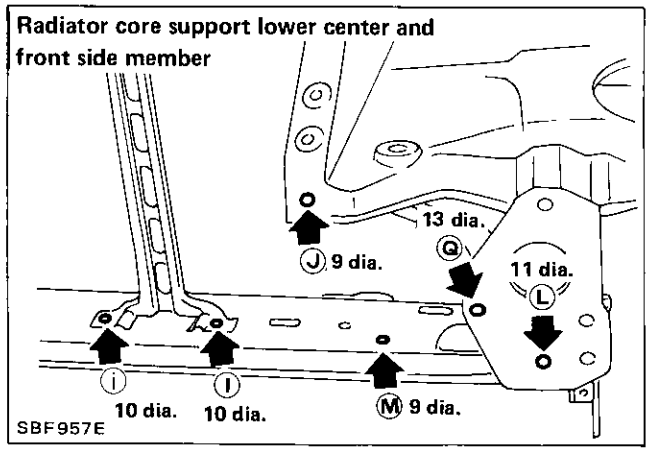

Radiator core support upper center




Radiator core support upper side




Radiator core support lower center and front side member

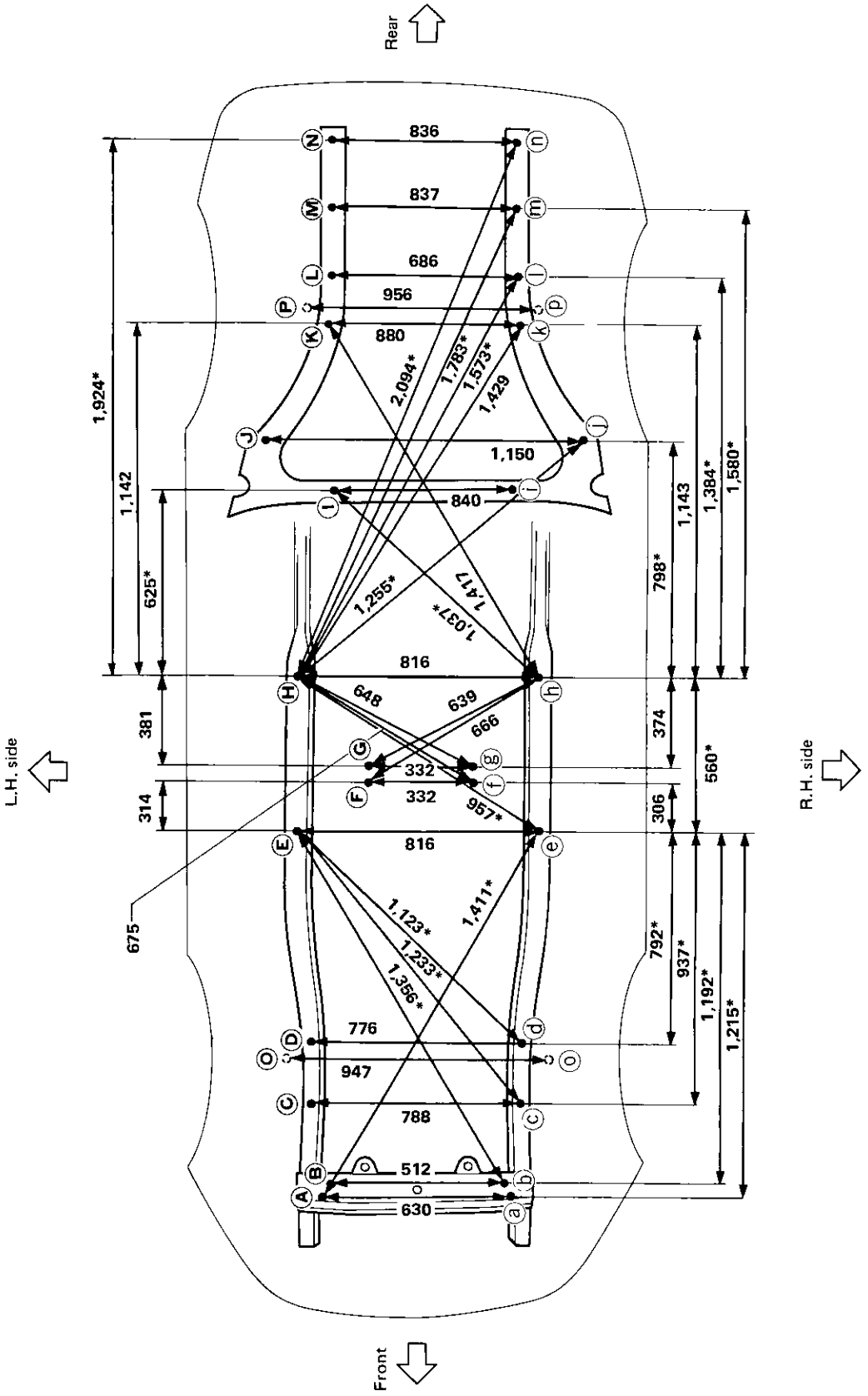


## Underbody

**MEASUREMENT**

**2 seater model**

Unit: mm



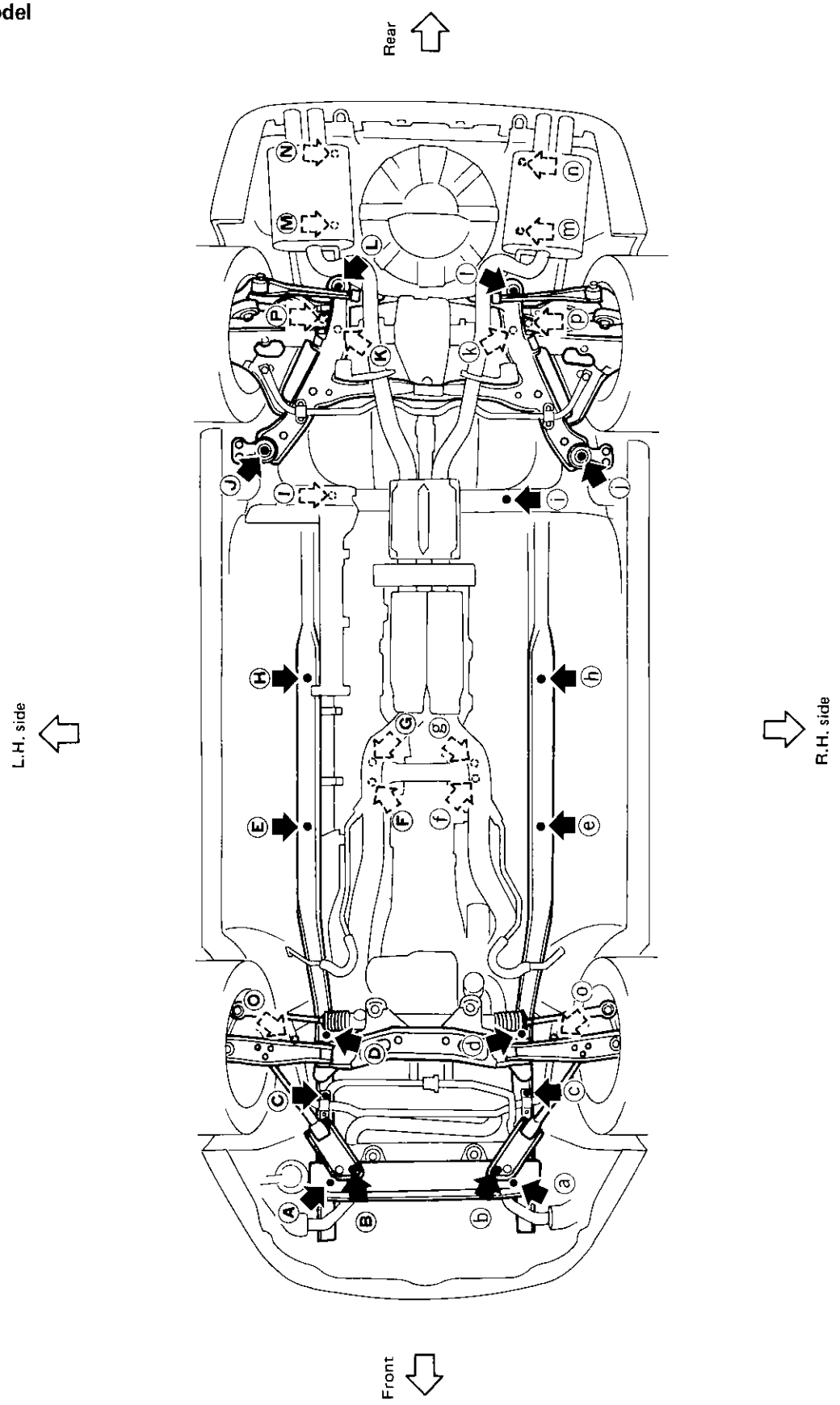

All dimensions indicated in this figure are actual ones.
(There are no projected dimensions.)

SBF958E

## Underbody (Cont'd)

MEASUREMENT POINTS

2 seater model



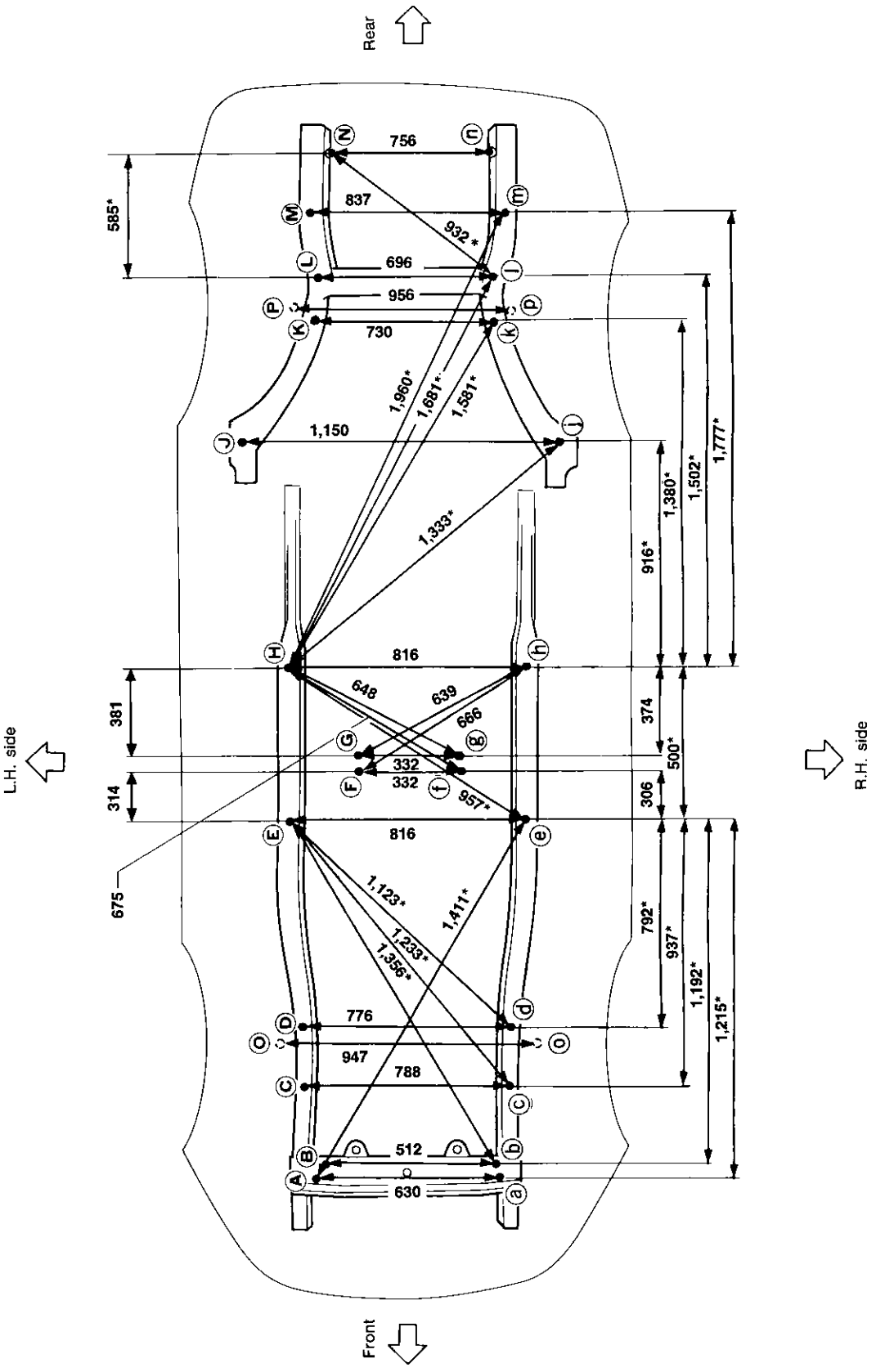

SBF959E

## Underbody (Cont'd)

### MEASUREMENT

**2+2 seater model**

Unit: mm



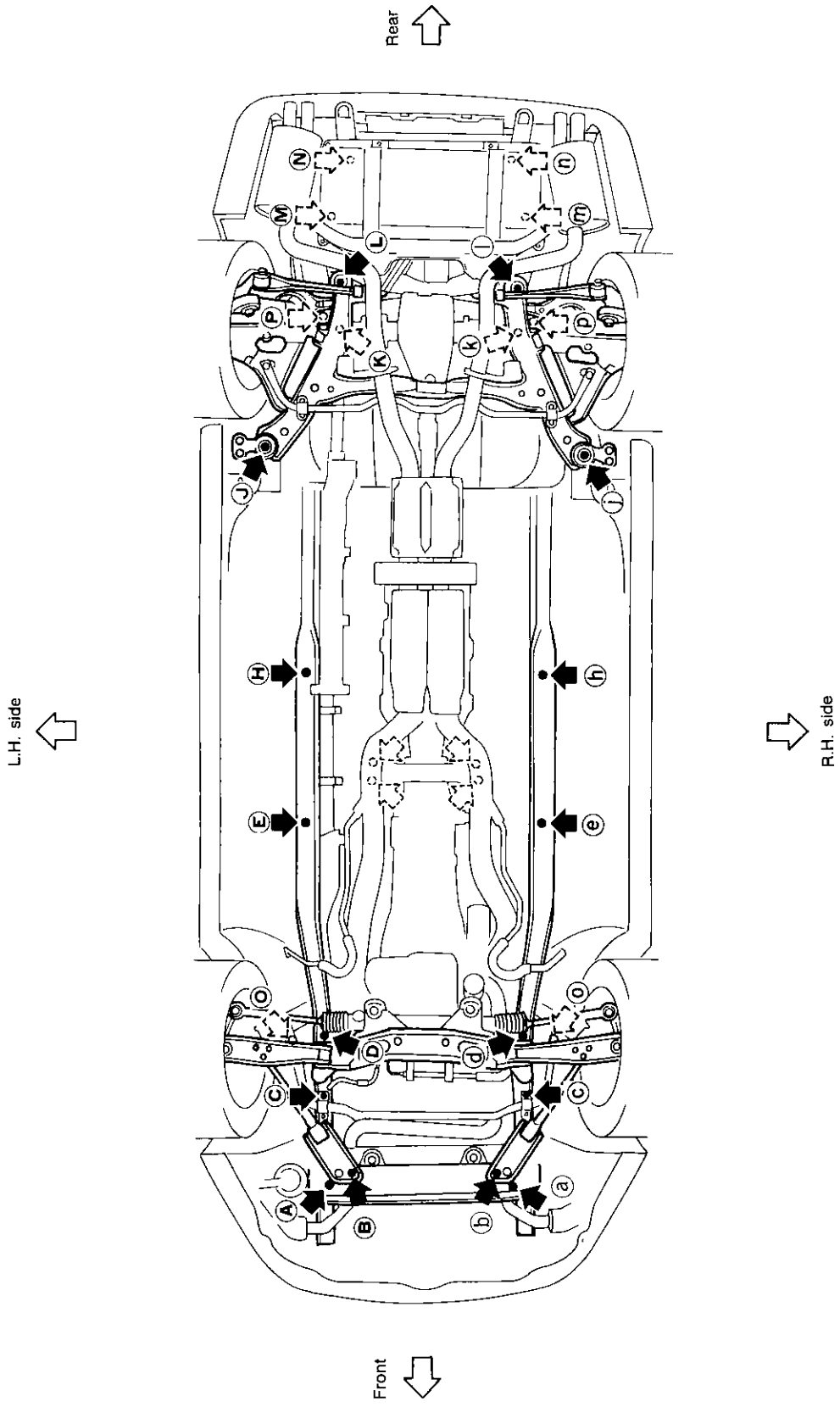

All dimensions indicated in this figure are actual ones.
(There are no projected dimensions.)

SBF563F

## Underbody (Cont'd)

MEASUREMENT POINTS

**2+2 seater model**




SBF564F

## Underbody (Cont'd)

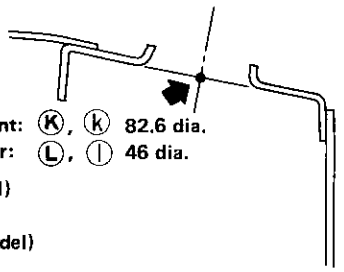
Unit: mm

### Front and rear strut tower centers

Coordinates:

Ⓚ, ⓚ
X: 473.4
Y: 52.3
Z: 727.2

Ⓛ, ⓛ
X: 477.9
Y: 2,489.3
(2 seater model)
2,609.3
(2+2 seater model)
Z: 727.8




MBF052A

### Front side member and front extension

Coordinates:

Ⓐ, ⓐ
X: 315
Y: –460
Z: 205.1

Ⓑ, ⓑ
X: 255.8
Y: –431
Z: 205.1

Ⓒ, ⓒ
X: 394
Y: –170
Z: 330

ⓕ
X: 171
Y: 917
Z: 249

Ⓓ, ⓓ
X: 388
Y: –22
Z: 330

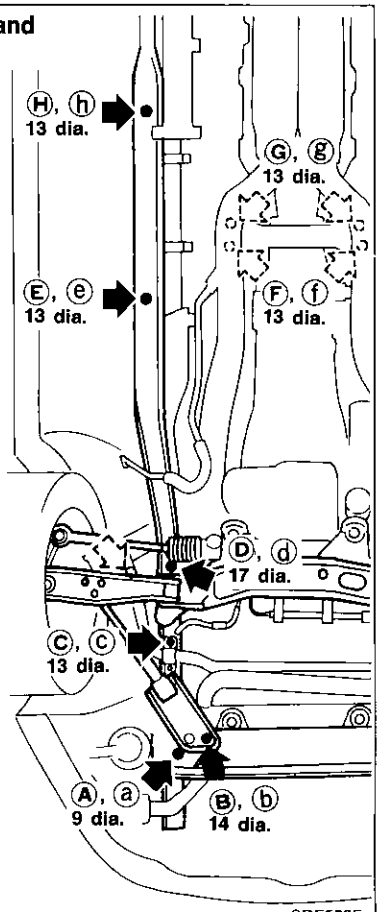
Ⓖ
X: 161
Y: 977
Z: 249

Ⓔ, ⓔ
X: 408.2
Y: 750
Z: 152.6

ⓖ
X: 171
Y: 977
Z: 249

Ⓕ
Y: 161
Y: 917
Z: 249

Ⓗ, ⓗ
X: 408.2
Y: 1,250
Z: 152.6




SBF566F

### Rear side member and rear extension (2 seater model)

Coordinates:

Ⓘ, ⓘ
X: 420
Y: 1,860
Z: 286.1

Ⓙ, ⓙ
X: 575
Y: 2,030
Z: 179.1

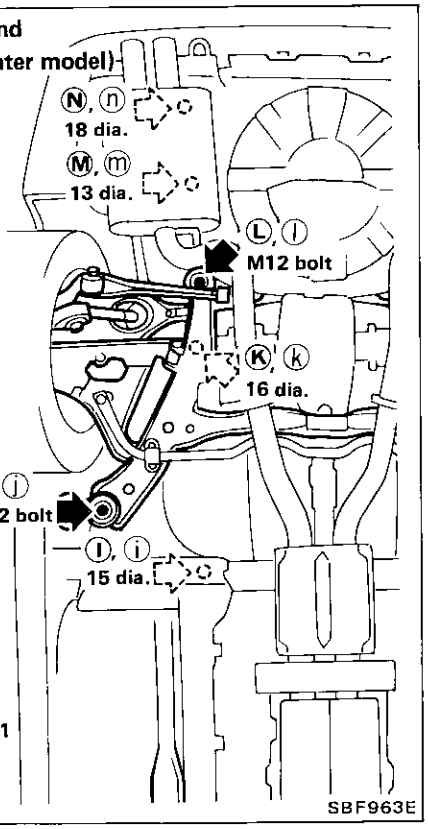
Ⓚ
X: 430
Y: 2,350
Z: 459.6

ⓚ
X: 450
Y: 2,350
Z: 459.6

Ⓜ, ⓜ
X: 418.5
Y: 2,800
Z: 460

Ⓛ, ⓛ
X: 343
Y: 2,620
Z: 334.3

Ⓝ, ⓝ
X: 418
Y: 3,153.1
Z: 434.1




SBF963E

### Rear side member and rear extension (2+2 seater model)

Coordinates:

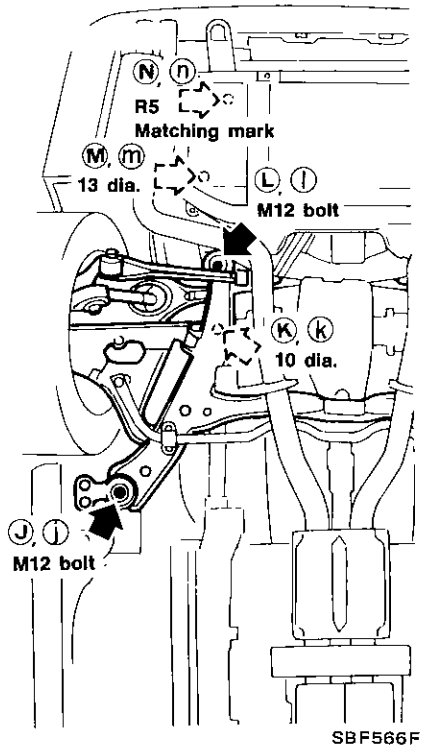
Ⓙ, ⓙ
X: 575
Y: 2,150
Z: 180.7

Ⓚ, ⓚ
X: 365
Y: 2,625
Z: 259.6

Ⓛ, ⓛ
X: 348
Y: 2,740
Z: 334.3

Ⓜ, ⓜ
X: 418.5
Y: 3,000
Z: 459.8

Ⓝ, ⓝ
X: 378
Y: 3,290
Z: 530



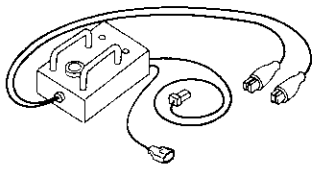

SBF566F

## Precautions for SRS "Air Bag" Service

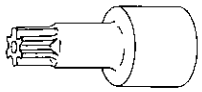
- Do not use a circuit tester to check SRS circuits.
- Before servicing the SRS, turn ignition switch "OFF", disconnect battery ground cable and wait for at least 10 minutes.
  For approximately ten minutes after the cables are removed, it is still possible for the air bag to inflate. Therefore, do not work on any air bag system connectors or wires until at least ten minutes have passed.
- SRS sensors must always be installed with their arrow marks " ⇦ " facing the front of the vehicle for proper operation. Also check sensors for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place it with the pad side facing upward.
- After removing any SRS parts, discard old bolts and replace with new ones. Conduct self-diagnosis to check entire SRS for proper function.
- If front of vehicle is damaged in a collision, always check the three crash zone sensors and the wiring harness.

## Preparation

### SPECIAL SERVICE TOOL

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| (J38381)<br>Deployment tool |  | Disposing of air bag module |

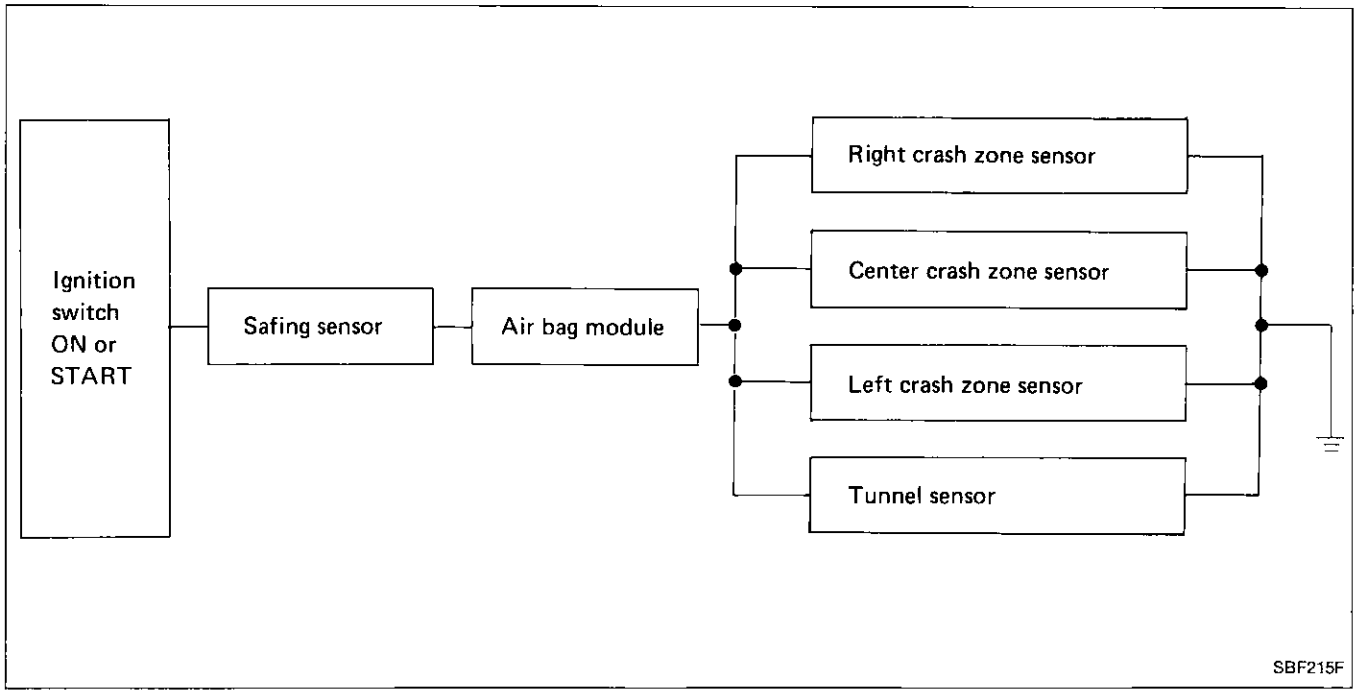
### COMMERCIAL SERVICE TOOLS

| Tool name | Description | |
|---|---|---|
| Special torx bit |  | Use for special bolts<br>(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 |

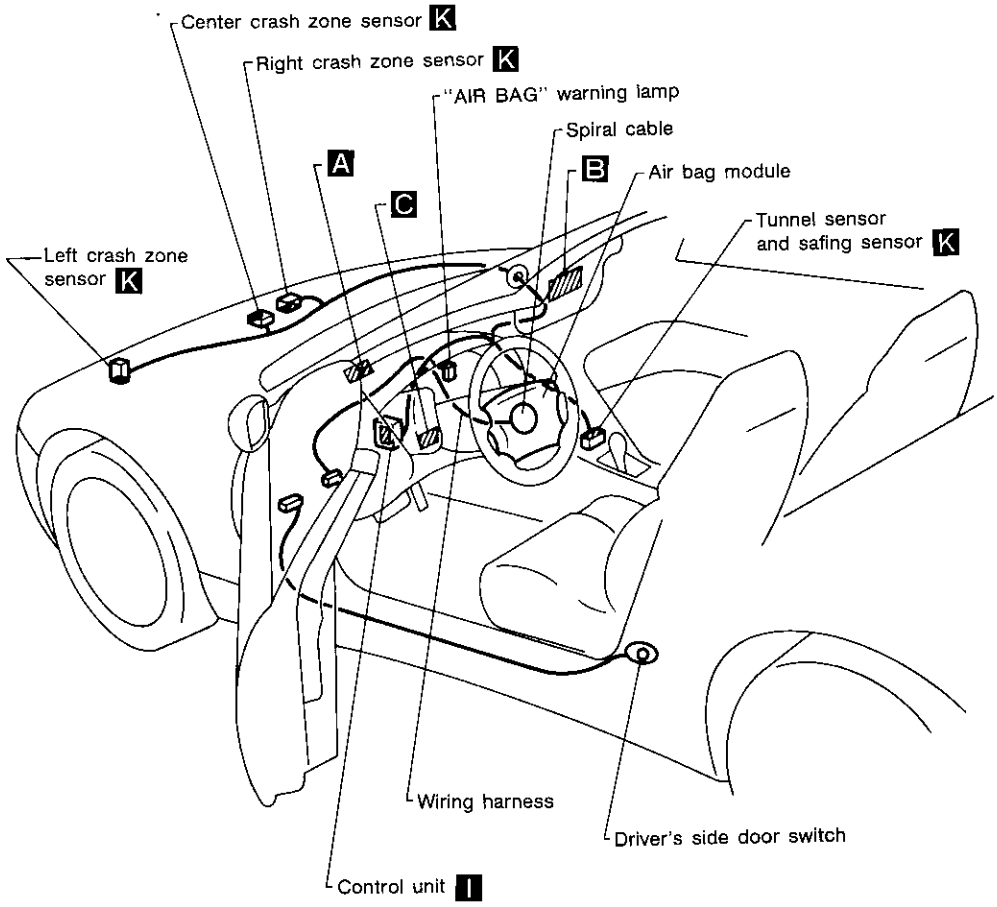


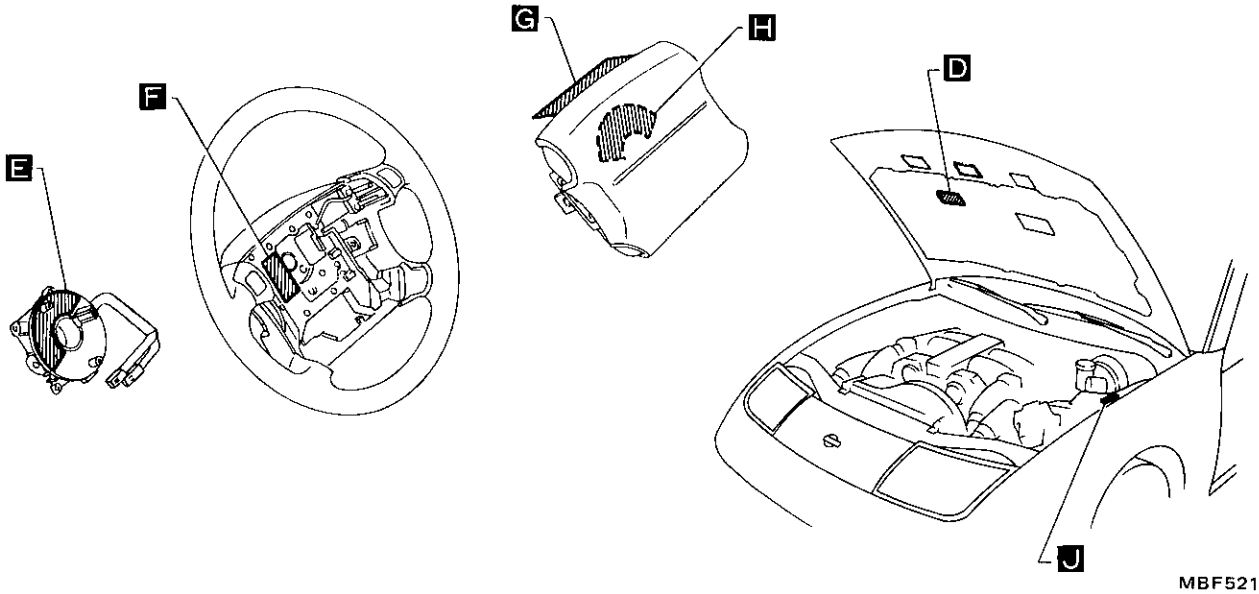

### Self-diagnosis

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.**




MBF521A

## Caution Labels and SRS Component Parts Location (Cont'd)

**A**

DRIVER-AIRBAG

**B**

INFORMATION SRS AIRBAG

- THIS CAR IS EQUIPPED WITH A DRIVER AIR BAG AS A SUPPLEMENTAL RESTRAINT SYSTEM (S.R.S.) TO REDUCE INJURY TO THE DRIVER IN A FRONTAL COLLISION.
- THE SYSTEM IS DESIGNED TO SUPPLEMENT THE ACCIDENT PROTECTION PROVIDED BY THE DRIVER'S SEAT BELT. BUT IT IS NOT A SUBSTITUTE FOR THE BELT SYSTEM.
- ALWAYS WEAR YOUR SEAT BELT WHEN THE CAR IS IN USE.
- THE SYSTEM MUST BE INSPECTED 10 YEARS AFTER DATE OF MANUFACTURE, AS NOTED ON THE CERTIFICATION LABEL LOCATED ON THE LEFT FRONT DOOR.
- THE "AIRBAG" LAMP WILL LIGHT MOMENTARILY WHEN THE IGNITION KEY IS TURNED TO THE "ON" OR "START" POSITION. THIS MEANS THE SYSTEM IS OPERATIONAL.
- HOWEVER, IF ANY OF THE FOLLOWING CONDITIONS OCCUR, THE SYSTEM MUST BE SERVICED:
  1. THE "AIR BAG" LAMP DOES NOT GO ON AS DESCRIBED ABOVE.
  2. THE "AIRBAG" LAMP FLASHES INTERMITTENTLY OR REMAINS ON.
  3. ANY PORTION OF THE FRONT END OF THE CAR IS DAMAGED.
  4. THE AIR BAG HAS DEPLOYED.
- SEE YOUR OWNER'S MANUAL FOR DETAILS ABOUT THE FUNCTIONING, SERVICE, AND DISPOSAL PROCEDURES FOR THE SYSTEM.

**C**

NOTICE SRS AIRBAG

- THIS CAR IS EQUIPPED WITH A DRIVER AIR BAG AS A SUPPLEMENTAL RESTRAINT SYSTEM (S.R.S.)
- IT IS DESIGNED TO SUPPLEMENT THE SEAT BELT.
- ALWAYS WEAR YOUR SEAT BELT.

**D**

WARNING SRS AIRBAG

- THIS CAR IS EQUIPPED WITH A DRIVER AIR BAG AS A SUPPLEMENTAL RESTRAINT SYSTEM (S.R.S.)
- ALL S.R.S. ELECTRICAL WIRING AND CONNECTORS ARE COLORED YELLOW.
- DO NOT USE ELECTRICAL TEST EQUIPMENT ON THESE CIRCUITS.
- TAMPERING WITH OR DISCONNECTING THE S.R.S. WIRING AND CONNECTORS COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIR BAG OR MAKE THE SYSTEM INOPERATIVE, WHICH MAY RESULT IN SERIOUS INJURY.

**E**

CAUTION SRS AIRBAG

- BEFORE ASSEMBLY;
  - — LINE UP THE FRONT WHEELS STRAIGHT AHEAD.
  - — ALIGN THE ARROW WITH THE YELLOW MARK ON THE SIDE GEAR.
  - — READ SERVICE MANUAL.
- NO SERVICEABLE PARTS INSIDE.
- DO NOT DISASSEMBLE OR TAMPER.

**F**

WARNING SRS AIRBAG

BEFORE MOUNTING STEERING WHEEL;

- MAKE SURE THAT THE FRONT WHEELS ARE IN STRAIGHT-AHEAD POSITION.
- ALIGN THE ARROW WITH THE YELLOW MARK ON THE SIDE GEAR. (SPIRAL CABLE)
- READ SERVICE MANUAL.

**I**

CAUTION SRS AIRBAG

- NO SERVICEABLE PARTS INSIDE.
- DO NOT DISASSEMBLE OR TAMPER.
- DO NOT DROP; KEEP DRY.
- WHILE REMOVED, STORE IN A CLEAN AND DRY AREA.
- IF WET CONDITION OCCURS, THIS UNIT MUST BE SERVICED.

## Caution Labels and SRS Component Parts Location (Cont'd)

G

WARNING SRS AIRBAG

- THIS AIRBAG MODULE CANNOT BE REPAIRED.
- USE DIAGNOSTIC INSTRUCTIONS TO DETERMINE IF THE UNIT IS OPERATIONAL.
- IF NOT OPERATIONAL, REPLACE AND DISPOSE OF THE ENTIRE UNIT AS DIRECTED IN THE INSTRUCTIONS.
- UNDER NO CIRCUMSTANCES SHOULD A DIAGNOSIS BE PERFORMED USING ELECTRICALLY POWERED TEST EQUIPMENT OR PROBING DEVICES.
- TAMPERING OR MISHANDLING CAN RESULT IN PERSONAL INJURY.
- STORE THE REMOVED AIRBAG MODULE WITH THE PAD SURFACE UP.
- FOR SPECIAL HANDLING OR STORAGE REFER TO SERVICE MANUAL.

J

CAUTION SRS AIRBAG

- TO AVOID DAMAGING THE S.R.S. SPIRAL CABLE, WHICH COULD MAKE THE SYSTEM INOPERATIVE, REMOVE THE STEERING WHEEL BEFORE REMOVING THE STEERING LOWER JOINT.

H

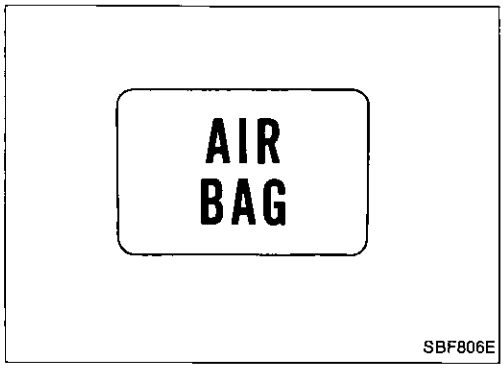
DANGER POISON

- KEEP OUT OF THE REACH OF CHILDREN.
- CONTAINS SODIUM AZIDE AND POTASSIUM NITRATE.
- CONTENTS ARE POISONOUS AND EXTREMELY FLAMMABLE.
- CONTACT WITH ACID, WATER OR HEAVY METALS MAY PRODUCE HARMFUL AND IRRITATING GASES OR EXPLOSIVE COMPOUNDS.
- DO NOT DISMANTLE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY OR STORE AT TEMPERATURES EXCEEDING 200°F.
- FIRST AID: IF CONTENTS ARE SWALLOWED, INDUCE VOMITING;
  - — FOR EYE CONTACT, FLUSH EYES WITH WATER FOR 15 MINUTES
  - — IF GASES FROM ACID OR WATER CONTACT ARE INHALED, SEEK FRESH AIR
  - — IN EVERY CASE, GET PROMPT MEDICAL ATTENTION
- FOR ADDITIONAL INFORMATION, SEE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT.

K

WARNING SRS AIRBAG

- DO NOT DISASSEMBLE OR TAMPER.
- DISMANTLING AND INSTALLATION SHOULD ONLY BE PERFORMED BY TRAINED PERSONNEL.

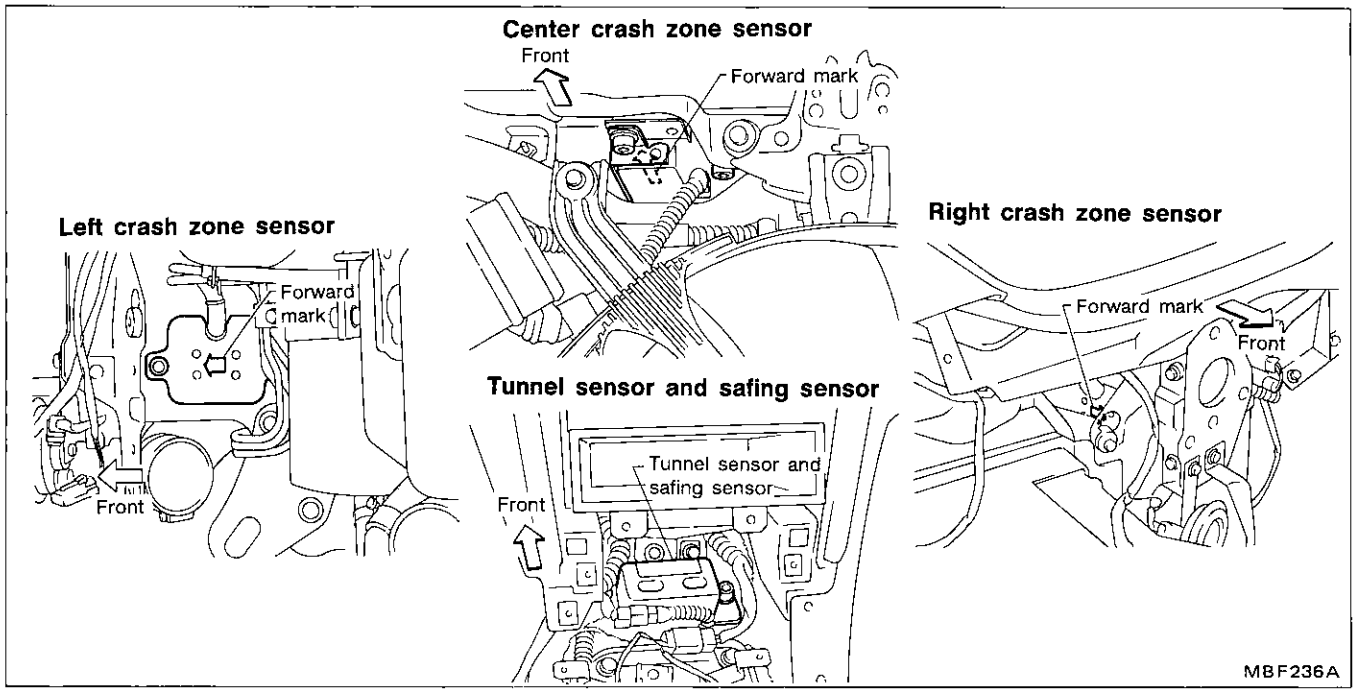


SBF806E

### Maintenance Items

1. Check "AIR BAG" warning lamp
   When the ignition key is in the "ON" or "START" position, the "AIR BAG" warning lamp will illuminate for about 7 seconds and then turn off. This means that the system is operational.

## Maintenance Items (Cont'd)




2. Visually check SRS components

(1) Sensors

- Check sensors to ensure the arrow marks face the front of the vehicle.
- Check body and sensor brackets for deformities or rust.
- Check sensor case for dents, cracks, deformities or rust.
- Check sensor harness for binds, connector for damage, and terminals for deformities.

(2) Control unit — Airbag

- Check connectors for damage, and terminals for 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:**

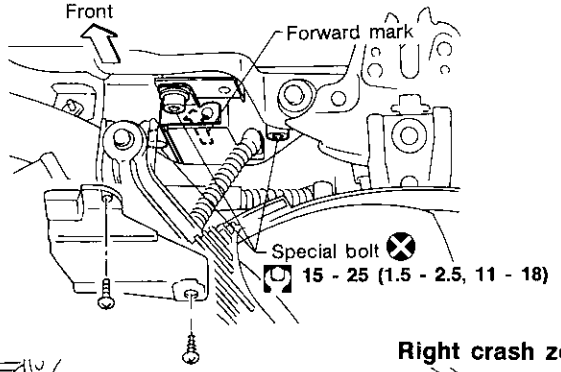
**Replace previously used screws with new ones.**

## Removal and Installation — Control Unit and Sensors

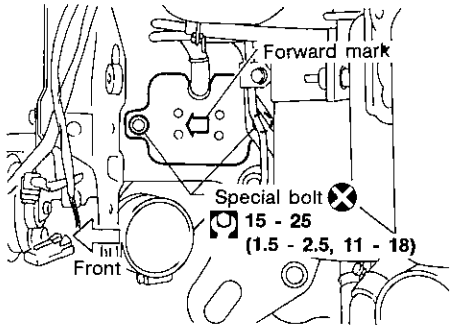
**CAUTION:**

- **Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes.**
- **The special bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.**
- Check all sensors for proper installation.
- Check all sensors to ensure they are free of deformities, dents, cracks or rust. If they show any visible signs of damage, replace them with new ones.
- Check sensor brackets to ensure they are free of deformities or rust.

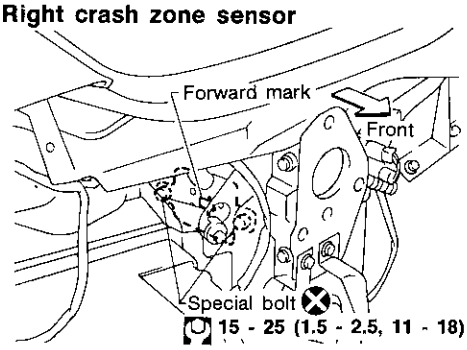
**Center crash zone sensor**



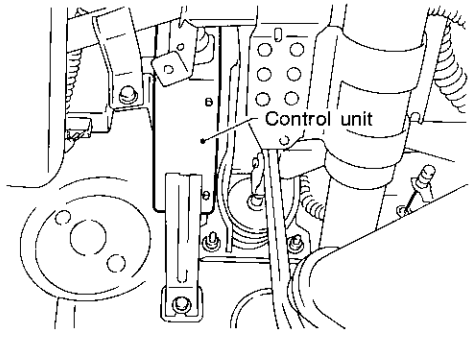

**Left crash zone sensor**



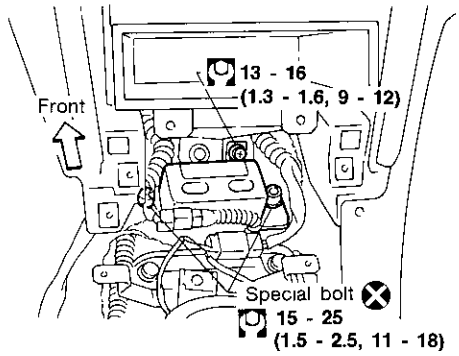

**Right crash zone sensor**




**Control unit**



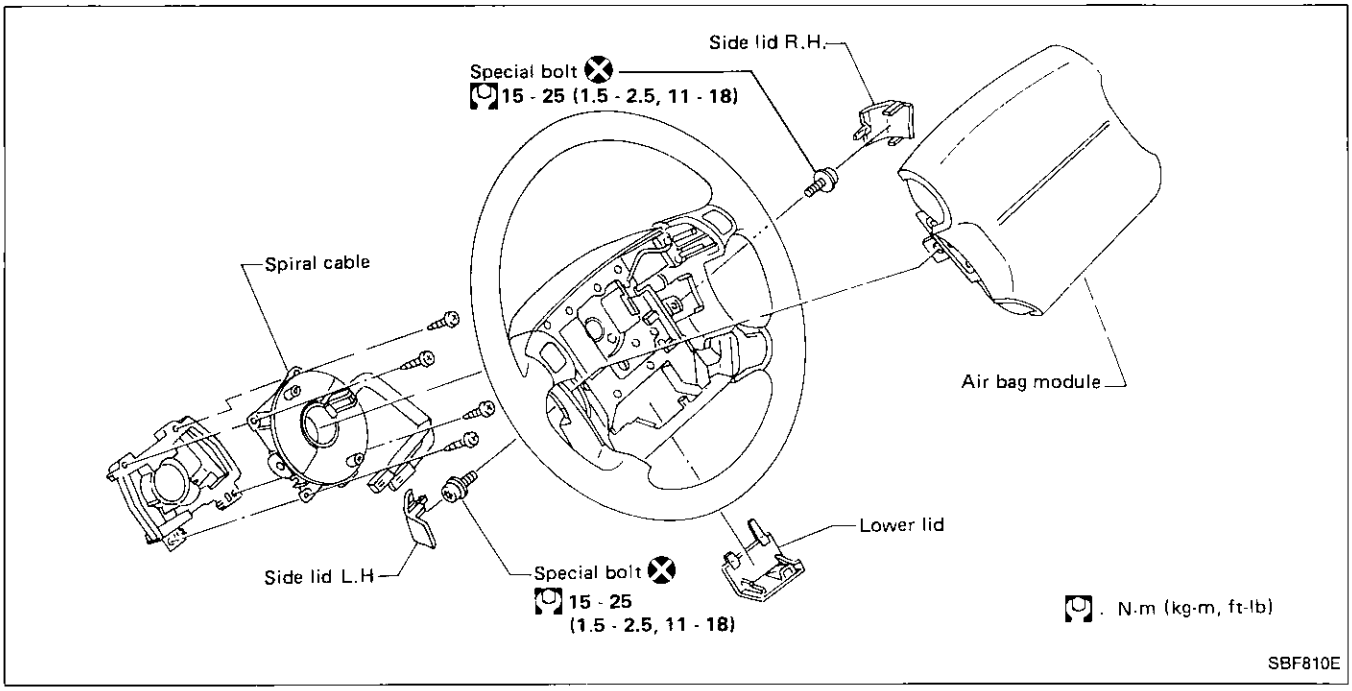

**Tunnel sensor and safing sensor**

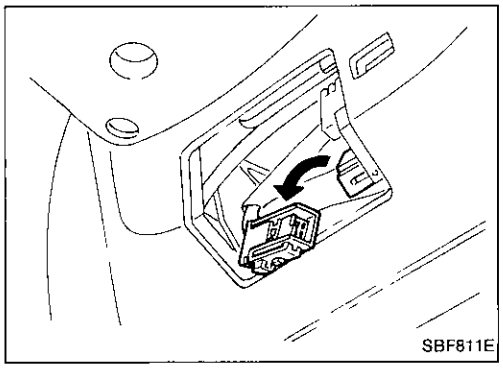



: N•m (kg-m, ft-lb)

MBF237A

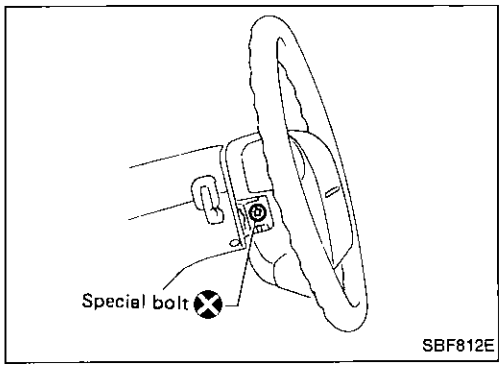
## Removal — Air Bag Module and Spiral Cable



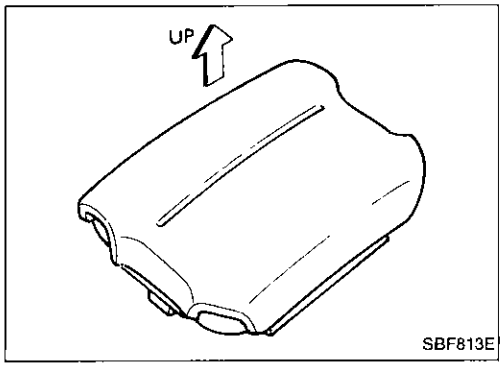




**CAUTION:**
**Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes.**

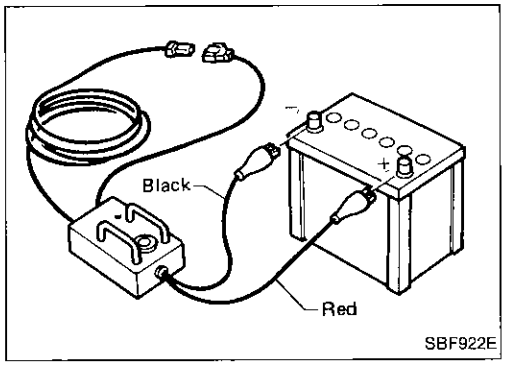
1. Remove lower lid from steering wheel, and disconnect air bag module connector.




2. Remove side lid. Using the T50H torx bit, remove left and right special bolts. Air bag module can then be removed.




**CAUTION:**
- **Always place air bag module with pad side facing upward.**
- **Do not attempt to disassemble air bag module.**
- **The special bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.**

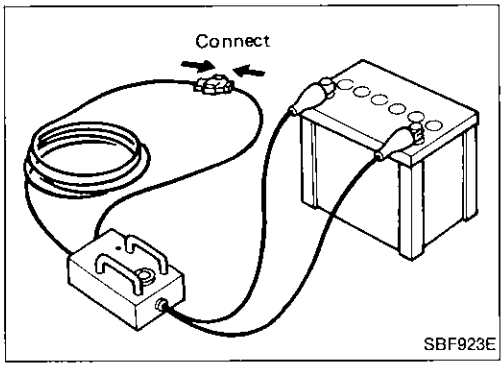



## Scrapping the Air Bag

**Before scrapping an air bag module or a vehicle equipped with an SRS air bag, be sure to deploy air bag.**

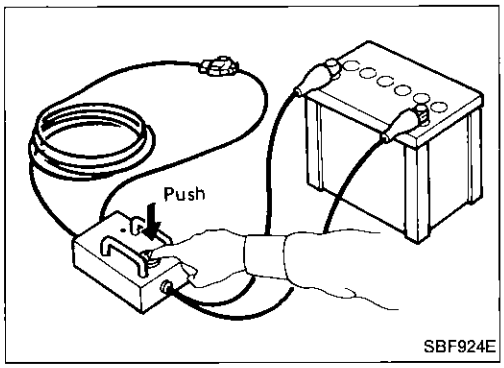
### CONNECTING TO BATTERY

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.

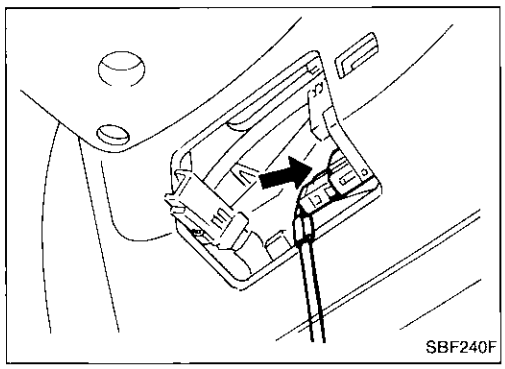



### DEPLOYMENT TOOL CHECK

Connect check connector.

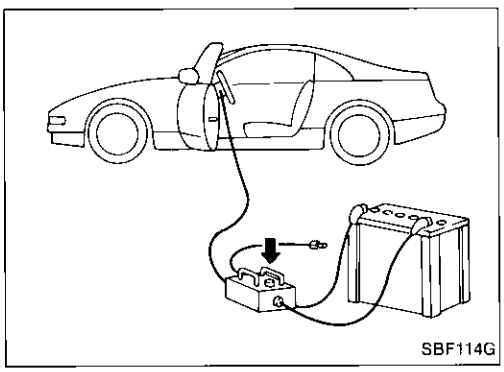



Push deployment tool switch to "ON" to ensure green light illuminates. If it does not, replace the deployment tool.




### 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.



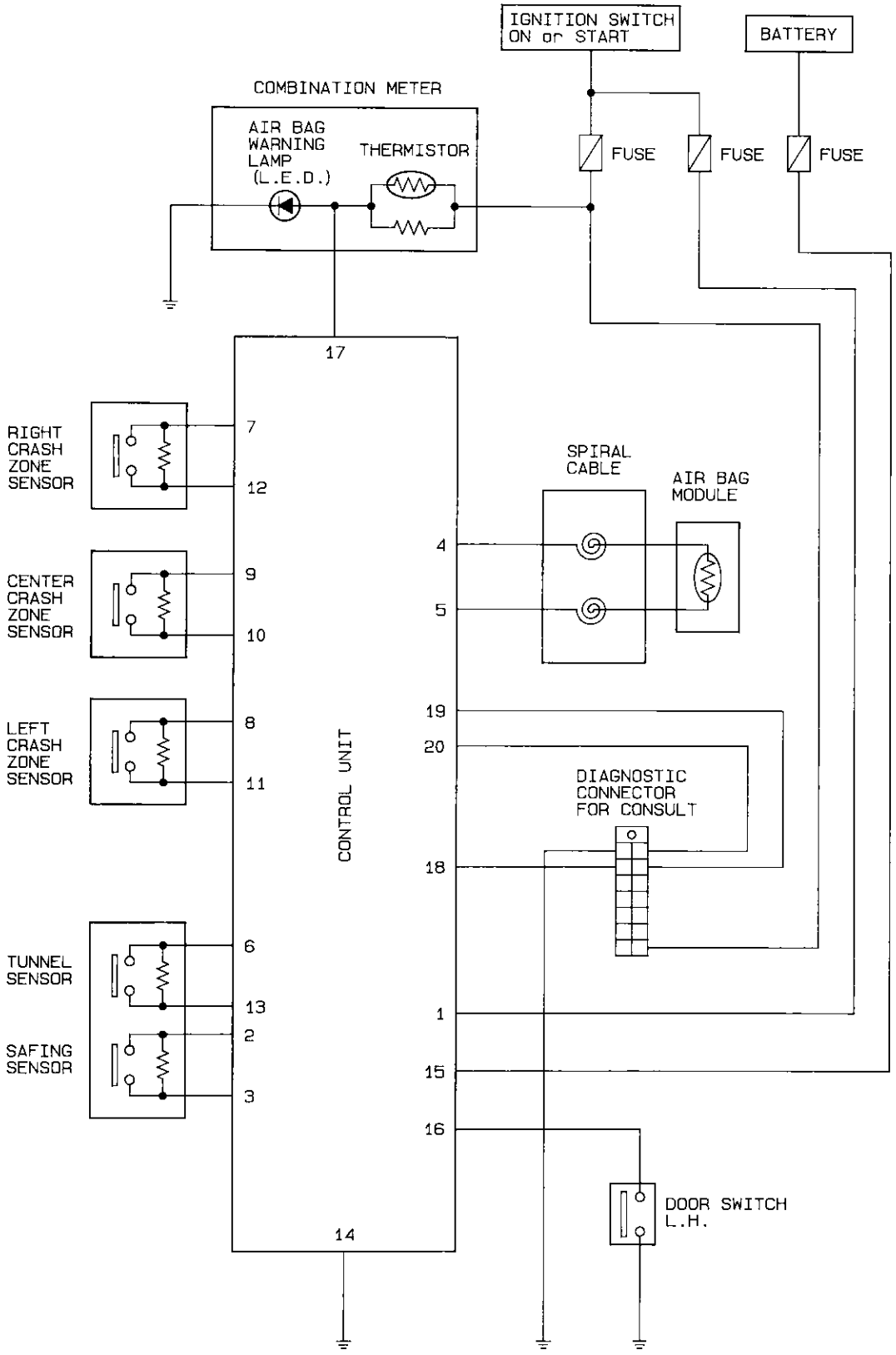

### DEPLOYMENT

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

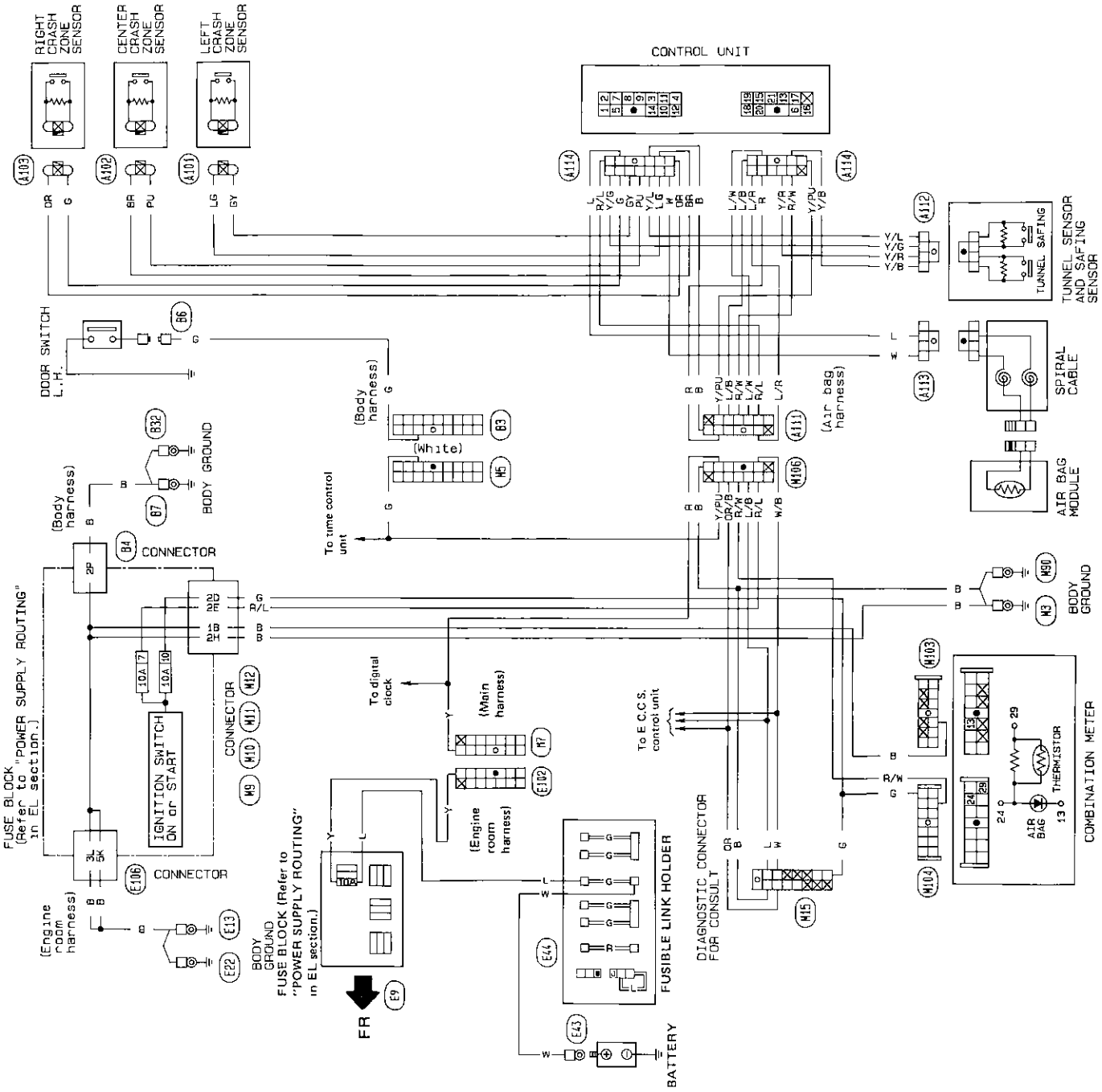



SBF969F

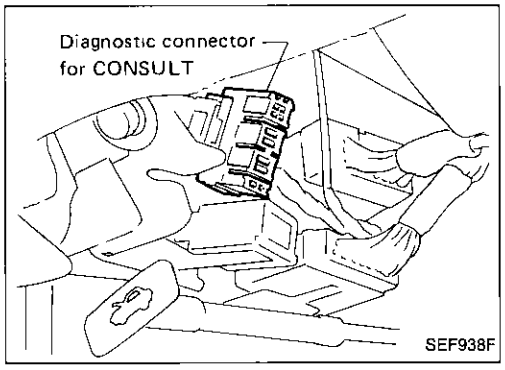
## Wiring Diagram

**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.**




SBF564G




## 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.

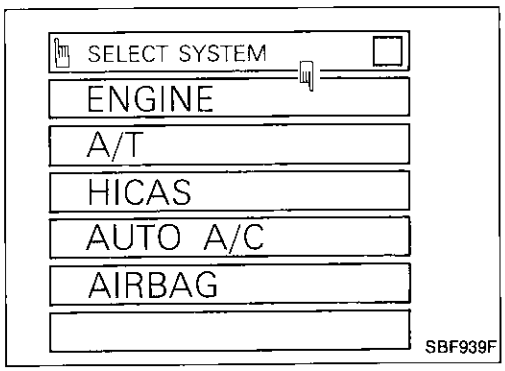
8. After repairing malfunctioning parts, press "ERASE" to clear self-diagnosis results.

- **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.

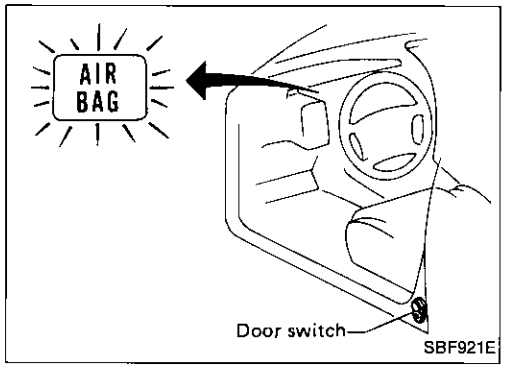


## Self-diagnosis (Cont'd)

### 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.<br>2. Replace the safing sensor. (safing sensor and tunnel sensor unit)<br>3. Replace the control unit.<br>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.<br>2. Replace the spiral cable.<br>3. Replace the air bag module. (Before disposing of it, it must be deployed.)<br>4. Replace the control unit.<br>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.<br>2. Replace the tunnel sensor. (safing sensor and tunnel sensor unit)<br>3. Replace the control unit.<br>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.<br>2. Replace the crash zone sensor.<br>3. Replace the control unit.<br>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.<br>2. Replace the control unit.<br>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.<br>2. Visually check the wiring harness connections.<br>3. Replace the control unit.<br>4. Replace all sensors, spiral cable and air bag module.<br>5. Replace the main harness. |

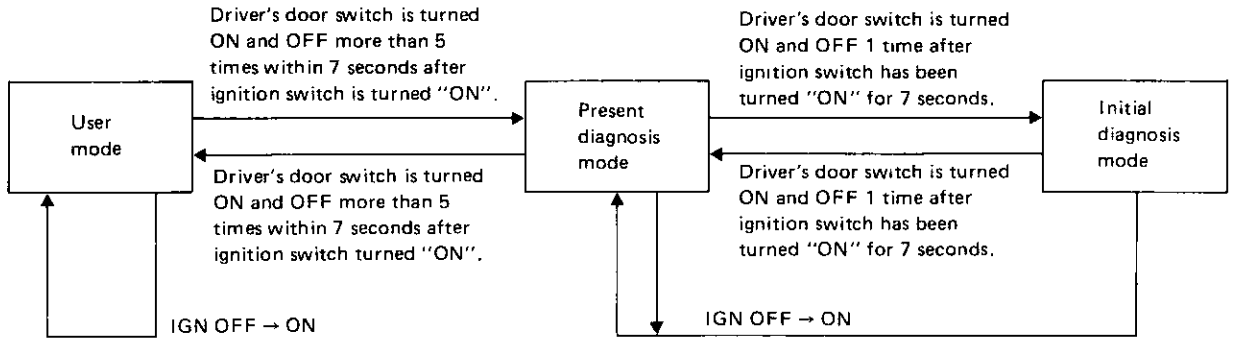
## Self-diagnosis (Cont'd)




### USING THE WARNING LAMP

Self-diagnosis results can be also read by using the "AIR BAG" warning lamp.
The "Air bag" warning lamp operates as shown below:

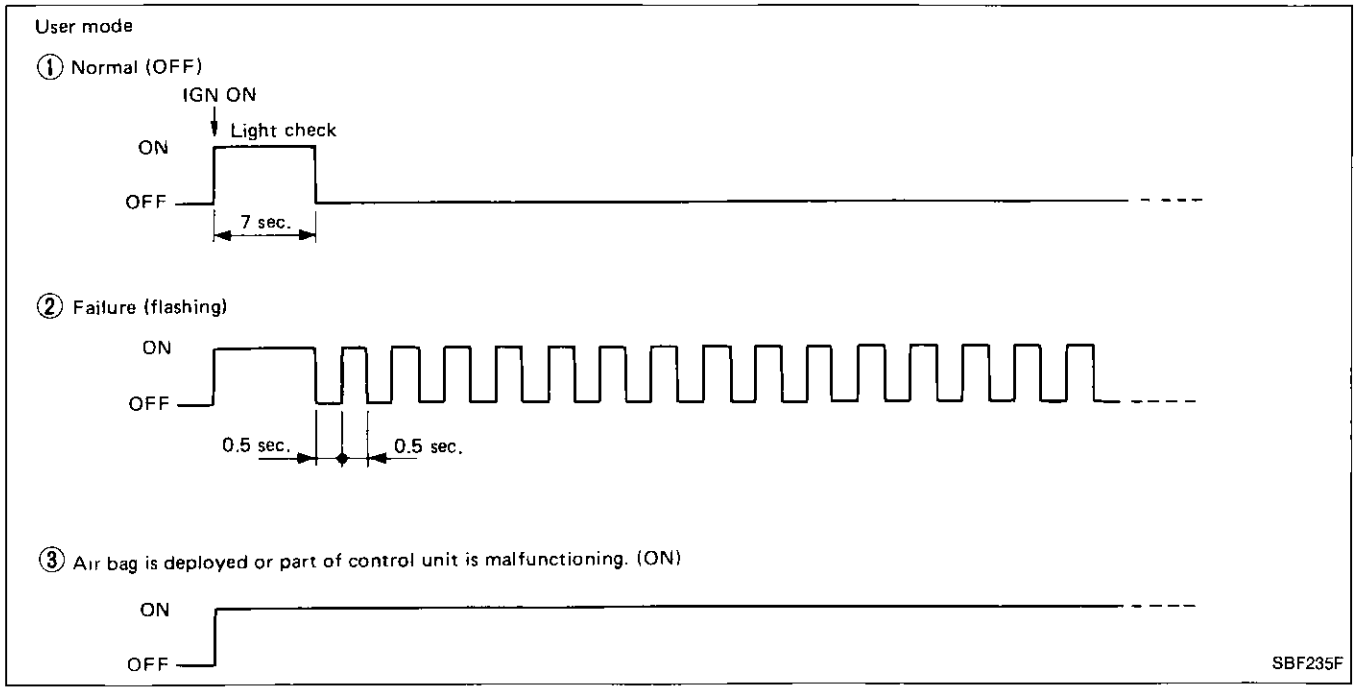
### How to alternate self-diagnosis




Problem codes are displayed in present diagnosis mode (self-diagnosis result 1). The problem code last indicated is displayed in initial diagnosis mode (self-diagnosis result 2).

After the malfunctioning parts have been repaired and the system is returned to the user mode, the present diagnosis mode information, displayed as self-diagnosis results, is automatically cleared from memory.

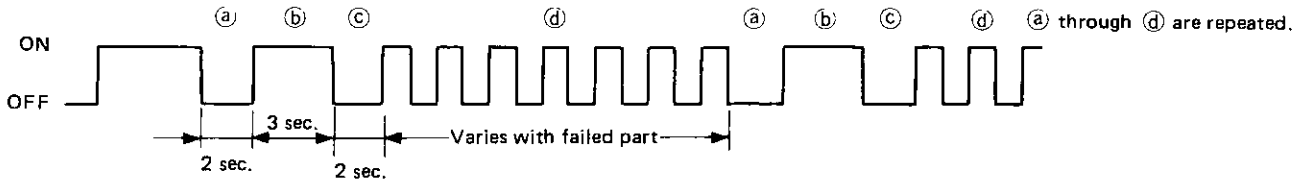
- **After repairing malfunctioning part, attempt to clear self-diagnosis results from memory.**
- **If a malfunctioning part is not completely repaired, information stored in memory will not be cleared.**



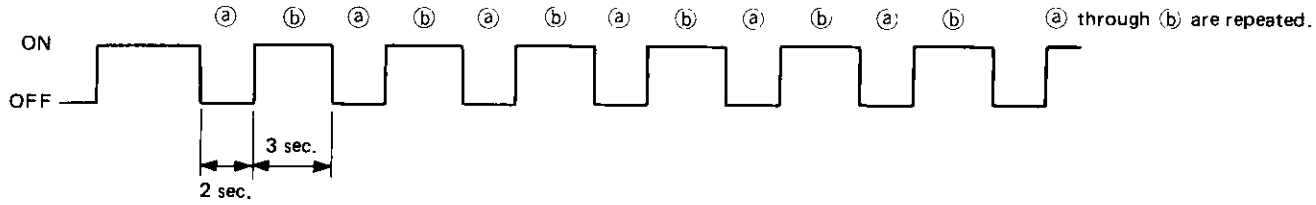
## Self-diagnosis (Cont'd)

Present diagnosis mode (self-diagnosis result 1)

ⓑ Start signal; Start signal identifies display modes.



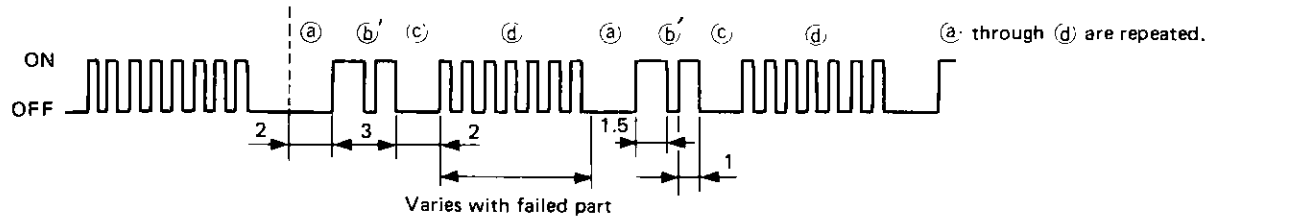

- No failure (or intermittent failure/repair completion)




SBF236F

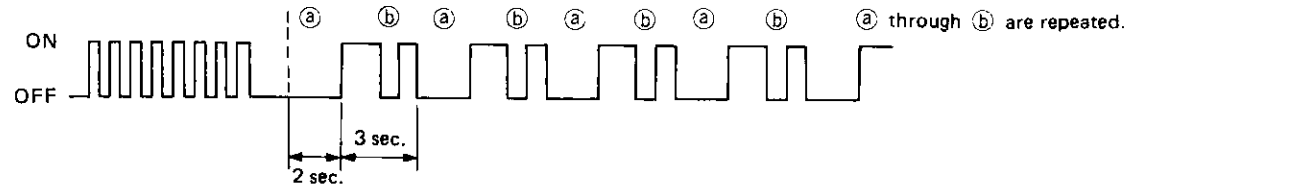
Initial diagnosis mode (self-diagnosis result 2)

b Start signal; Start signal identifies display modes.




Unit: sec.

- No failure



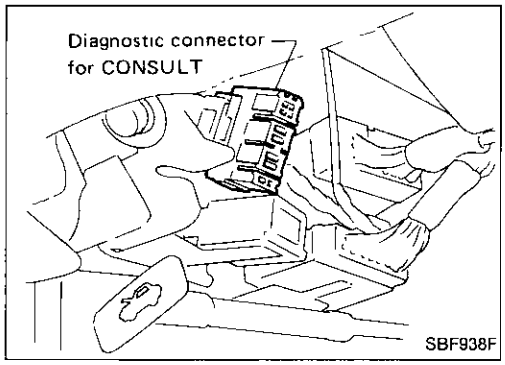

SBF237F

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

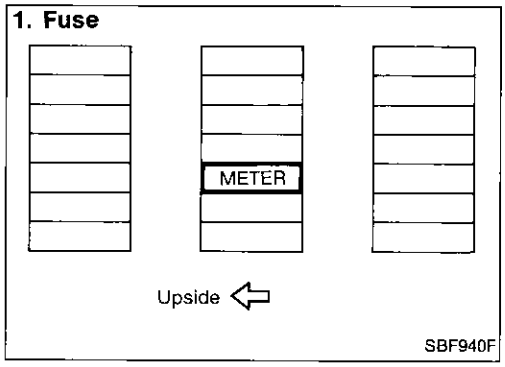
| Flash code ⓓ (# of flashes) | Explanation | Repair order * Recheck SRS at each replacement. |
|---|---|---|
| 0 | Normal. The SRS "Air Bag" is in good order. | — |
| 1 | The circuit for the safing sensor is out of order. | 1. Visually check the wiring harness connections.<br>2. Replace the safing sensor. (safing sensor and tunnel sensor unit)<br>3. Replace the control unit.<br>4. Replace the main harness. |
| 2 | The circuit for the air bag module is out of order. | 1. Visually check the wiring harness connections.<br>2. Replace the spiral cable.<br>3. Replace the air bag module. (Before disposing of it, it must be deployed.)<br>4. Replace the control unit.<br>5. Replace the main harness. |
| 3 | The circuit for the tunnel sensor is out of order. | 1. Visually check the wiring harness connections.<br>2. Replace the tunnel sensor. (safing sensor and tunnel sensor unit)<br>3. Replace the control unit.<br>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.<br>2. Replace the right crash sensor.<br>3. Replace the control unit.<br>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.<br>2. Replace the left crash zone sensor.<br>3. Replace the control unit.<br>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.<br>2. Replace the center crash zone sensor.<br>3. Replace the control unit.<br>4. Replace the main harness. |
| 7 | The control unit (diagnostic unit) is out of order. | 1. Visually check the wiring harness connections.<br>2. Replace the control unit.<br>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.<br>2. Visually check the wiring harness connections.<br>3. Replace the control unit.<br>4. Replace all sensors, spiral cable and air bag module.<br>5. Replace the main harness. |

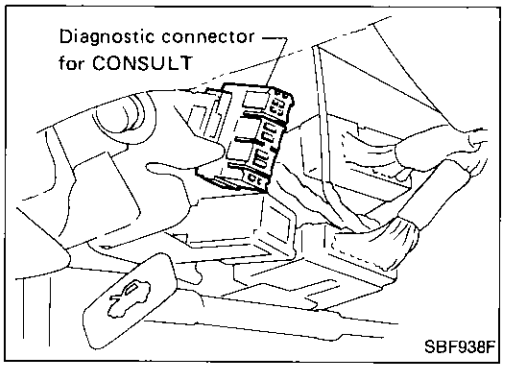



## Diagnostic Procedure 1

**SYMPTOM: Warning lamp flashes.**

| | |
|---|---|
| Connect the CONSULT and operate it. Read the SELF-DIAGNOSIS RESULTS 1 and 2. | → Refer to SELF-DIAGNOSIS RESULTS and repair. |
| OR | |
| Refer to warning lamp self-diagnosis. | → Refer to the number of warning lamp flashes. Repair as necessary. |

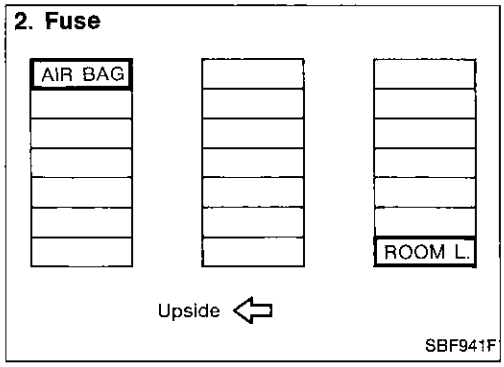


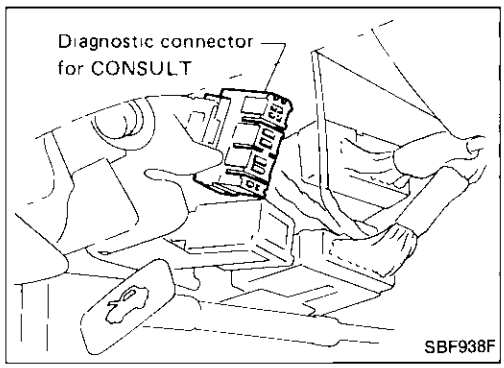




## Diagnostic Procedure 2

**SYMPTOM: Warning lamp does not come on.**

1. Check the warning lamp fuse. — N.G. → Replace the fuse.
   ↓ O.K.
2. Connect the CONSULT unit and begin diagnosis.
   • Is "AIR BAG" displayed on the CONSULT screen? — N.G. → Replace the control unit.
   ↓ O.K.
3. Read the SELF-DIAGNOSIS RESULTS 1 and 2. — N.G. → Refer to SELF-DIAGNOSIS RESULTS and repair.
   ↓ O.K.
4. Check the warning lamp bulb. — N.G. → Replace the warning lamp bulb.
   ↓ O.K.
5. Check the warning lamp harness connection. — N.G. → Replace the harness.
   ↓ O.K.
6. Replace the control unit.




## Diagnostic Procedure 3

**SYMPTOM: Warning lamp does not go off.**

1. Is the air bag module deployed?
   - Yes → Replace the air bag module.
   - No ↓
2. Check the fuses used for the SRS "Air Bag" and "Room Lamp".
   - N.G. → Replace the fuse.
   - O.K. ↓
3. Connect the CONSULT unit and operate it.
   - Is "AIR BAG" displayed on the CONSULT?
   - N.G. → Replace the control unit.
   - O.K. ↓
4. Read the SELF-DIAGNOSIS RESULTS 1 and 2.*
   - N.G. → Refer to SELF-DIAGNOSIS RESULTS and repair.

   OR

   Refer to the warning lamp self-diagnosis.*
   - N.G. → Refer to the warning lamp flashing times and repair as necessary.
   - O.K. ↓
5. Check the harness connection between the warning lamp and the control unit.
   - N.G. → Replace the harness.
   - O.K. ↓
6. Replace the control unit.

* Recheck SRS after each replacement.

## Collision Diagnosis

To repair the SRS "AIR BAG", perform the following steps.

① Check the control unit (diagnostic unit).
- Connect CONSULT and then erase the memory. (However, the memory may not be cleared.)

OR

- Check "AIR BAG" warning lamp and perform the following twice: turn driver's door switch ON and OFF 5 times within 7 seconds after ignition switch turned "ON".

If "AIR BAG" warning lamp comes on continuously.

Replace the control unit.

② Remove the deployed air bag module.

③ Check the SRS components using the table shown below:
- If the SRS components are showing any visible damage such as dents, cracks, or deformation, replace them with new ones.

④ Conduct self-diagnosis using CONSULT or "AIR BAG" warning lamp to ensure entire SRS operates properly except open circuit of air bag module.

⑤ Install new air bag module.

| | Inspection (when air bag deploys in collision) | Inspection (when air bag does not deploy in low-speed collision) |
|---|---|---|
| Steering wheel | (1) Check harness (built into steering wheel) and connectors for damage, and terminals for deformities.<br>(2) Install air bag module to check fit or alignment with steering wheel.<br>(3) Check steering wheel for excessive free play. | |
| In-compartment sensor<br>All sensors (except those affected by collision) | (1) Check body and sensor brackets for deformities or rust.<br>(2) Check sensor case for dents, cracks, deformities or rust.<br>(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.<br>(2) Install air bag module to steering wheel to check fit or alignment with the wheel.<br>(3) Replace screws with new ones. |
| Harness connector (Main and Instrument harness) | (1) Check connectors for poor connections.<br>(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.<br>(2) Check connectors, flat cable and protective tape for damage.<br>(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.<br>(2) Check connectors for damage, and terminals for deformities. |

NOTE

NOTE

# HEATER & AIR CONDITIONER

# SECTION HA

## CONTENTS


PRECAUTIONS ..... HA- 2
DESCRIPTION — Overall System ..... HA- 6
DESCRIPTION — Refrigeration System ..... HA- 12
PREPARATION ..... HA- 13
DISCHARGING, EVACUATING, CHARGING AND CHECKING ..... HA- 19
SERVICE PROCEDURES ..... HA- 30
COMPRESSOR OIL — Checking and Adjusting ..... HA- 34
COMPRESSOR — Model DKS-16H (ZEXEL make) ..... HA- 36
DIAGNOSES — Overall System ..... HA- 38
TROUBLE DIAGNOSES — Manual Air Conditioner ..... HA- 51
TROUBLE DIAGNOSES — Auto Air Conditioner ..... HA- 82
SYSTEM DESCRIPTION — Manual Air Conditioner ..... HA-135
SYSTEM DESCRIPTION — Auto Air Conditioner ..... HA-138
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... HA-147


**When you read wiring diagrams:**
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

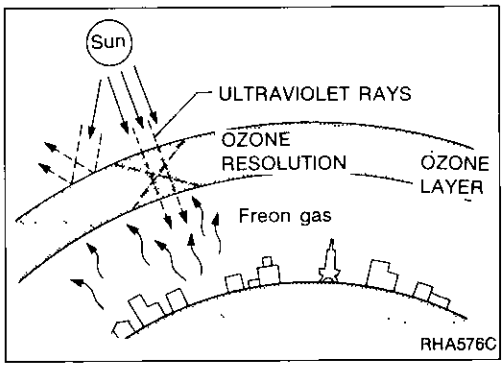
**When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".**

## 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 NISSAN dealer.**
b. **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
c. **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**

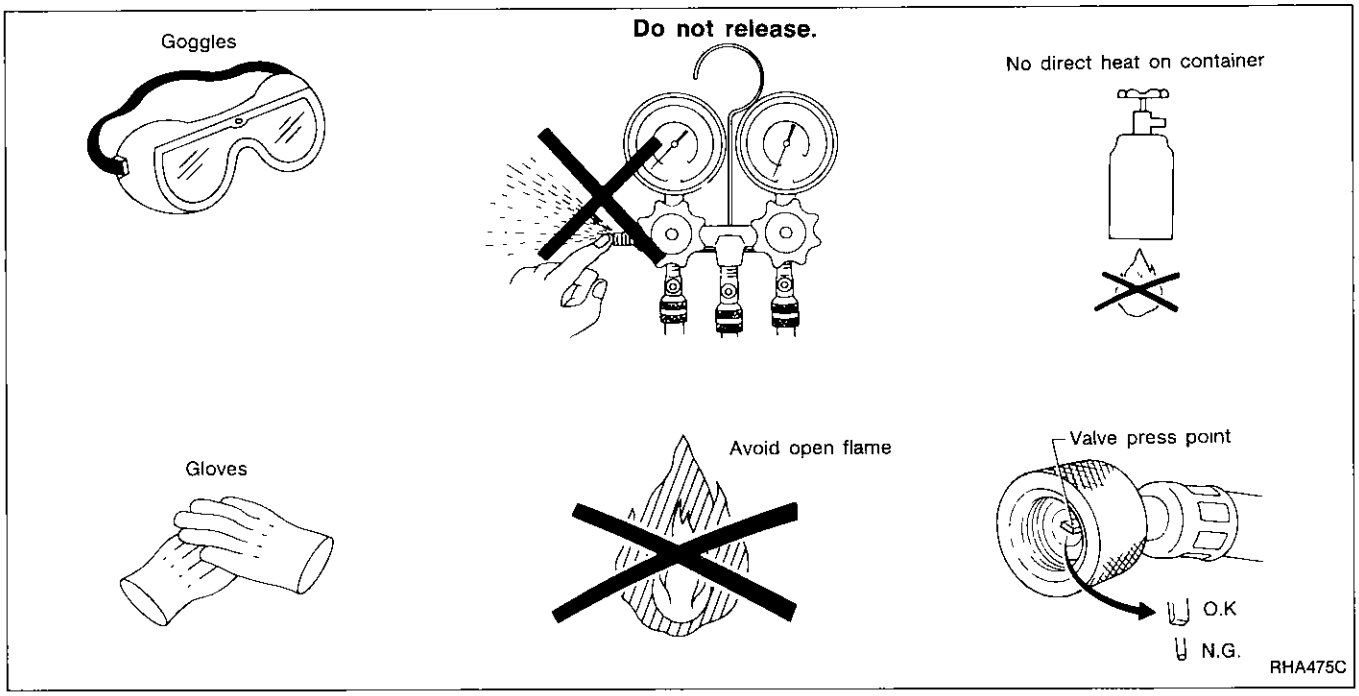



## Precautions for the Handling of Refrigerant

**WARNING:**

- **Do not release refrigerant into the air. Use your refrigerant recycling equipment to capture the refrigerant every time you need to discharge an air conditioning system.**

  **The release of refrigerant into the air can cause damage to the Earth's ozone layer.**




- **Always wear eye protection when working around the system.**
- **Always be careful that refrigerant does not come in contact with your skin.**
- **Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.**
- **Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.**
- **Keep refrigerant away from open flames because poisonous gas will be produced if it burns.**
- **Do not increase can temperature beyond 40°C (104°F) in charging.**
- **Do not heat refrigerant container with an open flame. There is a danger that container will explode.**

**CAUTION:**

- **Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.**
- **Do not use compressed air to clean out a contaminated A/C tube or hose. Shake the line over a clean, white paper towel. If it contains obvious moisture or contaminants, replace it. Do not blow out the line with refrigerant.**
- **Do not use manifold gauge set whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.**
- **Do not over-tighten service valve cap.**
- **Follow the manufacture's instructions for discharging into your refrigerant recycling equipment.**

## Precautions for Refrigerant Connection

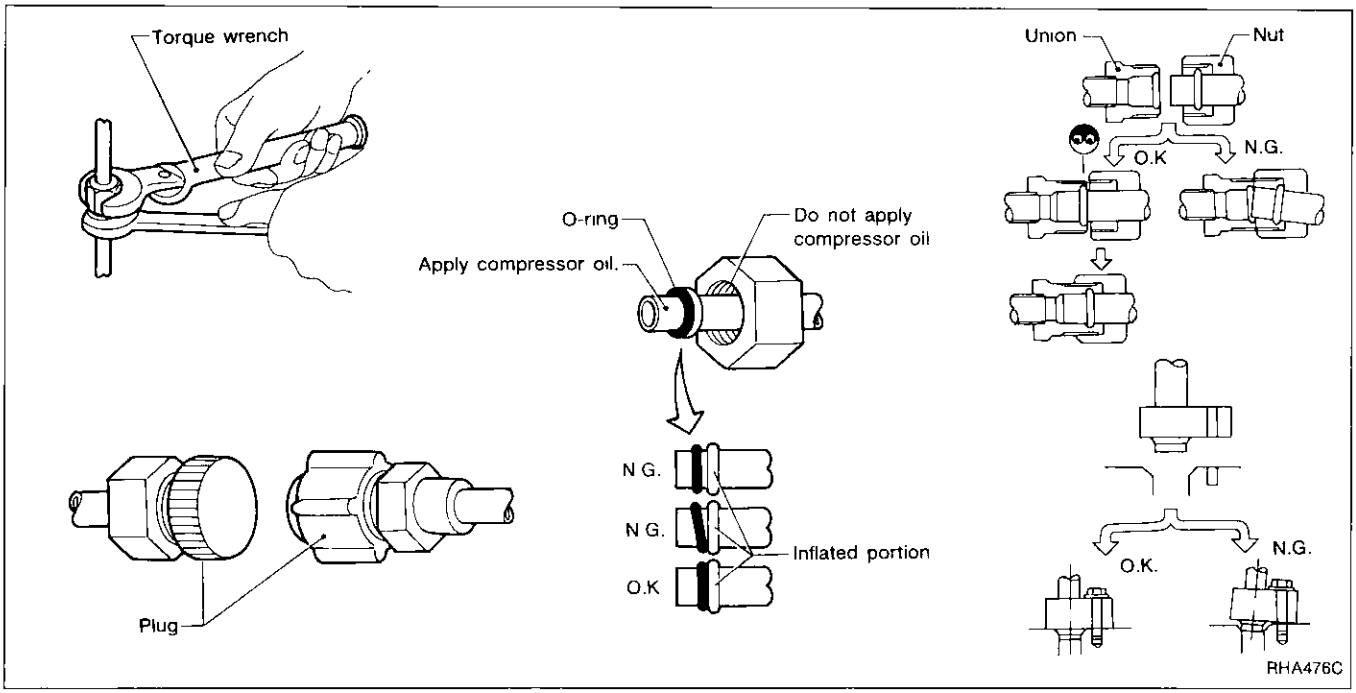
**WARNING:**

**Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric. Then gradually loosen the discharge side hose fitting and remove it.**

**CAUTION:**

**When replacing or cleaning refrigerant cycle components, observe the following.**

- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench and a back-up wrench.**
- **After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.**
- **When installing an air conditioner in the vehicle, the pipes must be connected as the final stage of the operation. The seal caps of the pipes and other components must not be removed until their removal is required for connection.**
- **Before installing any air conditioner component that has been stored in a cool location to a vehicle that has been exposed to the hot sun, leave the component as it is for some time in a hot location with its seal cap unremoved. This step is necessary to prevent condensation of moisture inside the cold component.**
- **Thoroughly remove moisture from the refrigeration system before charging the refrigerant.**
- **Always replace used O-rings.**
- **When connecting tube, apply 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.
- Replace shaft seal, seal seat, oil seal and O-ring as a set.
- When installing shaft seal, seal seat, oil seal, O-ring and gaskets, apply compressor oil sparingly to the contact surface. Do not reuse them.
- After replacement or repairs, conduct a Leak Test.

## Features — Auto Air Conditioner

### OUTLET AIR TEMPERATURE CONTROL (Air mix door control)

When the desired temperature is set on the control panel, the automatic temperature control system determines both the head and foot target temperatures, as well as target upper (VENT and DEF) and lower (FOOT) outlet air temperatures. This computation is accomplished in relation to the desired temperature, and outside conditions (ambient temperature and sunload). The automatic temperature control system then controls the air mix door position so that the outlet air temperatures meet target* outlet air temperatures.

A summary of the automatic temperature control system is as follows:

1. The upper and lower air temperatures are independently controlled to provide a comfortable ride.
2. Optimum outlet air temperatures can be set to the passenger's preference.
3. Outlet air temperature feedback control through duct sensors permits a "potentiometerless" air mix door design. It requires no adjustment, increases service life and improves performance reliability.

### FAN SPEED CONTROL

The A.T.C. system continuously regulates fan speed according to the difference between the target temperature and the temperatures detected at the upper and lower in-vehicle sensors. The greater the difference between the temperatures the higher the blower speed. If the cabin sunload or ambient temperature is high, fan speed will be increased.

### INTAKE DOOR CONTROL

The A.T.C. system adjusts the intake door position once every thirty seconds. The system is programmed to take in outside air as much as possible.

### OUTLET DOOR CONTROL

The A.T.C. system controls distribution of air through the VENT, DEF and FOOT outlets based on the cabin sunload, ambient temperature and the set temperature.

### COMPRESSOR MAGNET CLUTCH CONTROL

The A.T.C. system automatically shuts off the compressor at temperatures lower than 0°C (32°F).

### SELF-DIAGNOSTIC SYSTEM

The A.T.C. system contains an on-board diagnostic system which can be used to check the A.T.C. system sensors and motors and any trouble data stored in the memory.

Pushing the "AUTO" and "OFF" switches at the same time for more than 5 seconds will give the self-diagnostic mode. There are 4 kinds of self-diagnostic systems (STEP 1 to STEP 4). Each step can be accessed by pushing the "AUTO" switch. The functions of each step are as follows:

- STEP 1 — Monitor diagnosis
- STEP 2 — Actuator test
- STEP 3 — Change of difference between upper and lower target temperature
- STEP 4 — Readout of trouble data memory

***: Target temperature**

When a temperature for the cabin is set using the TEMP. SET switch, the A.T.C. system calculates an initial target temperature based on information from the various A.T.C. system sensors. This target temperature is continuously updated to bring the cabin temperature to the set temperature in the most comfortable way possible for the occupants. (The program for this was made after careful study of comfort levels related to car interiors).

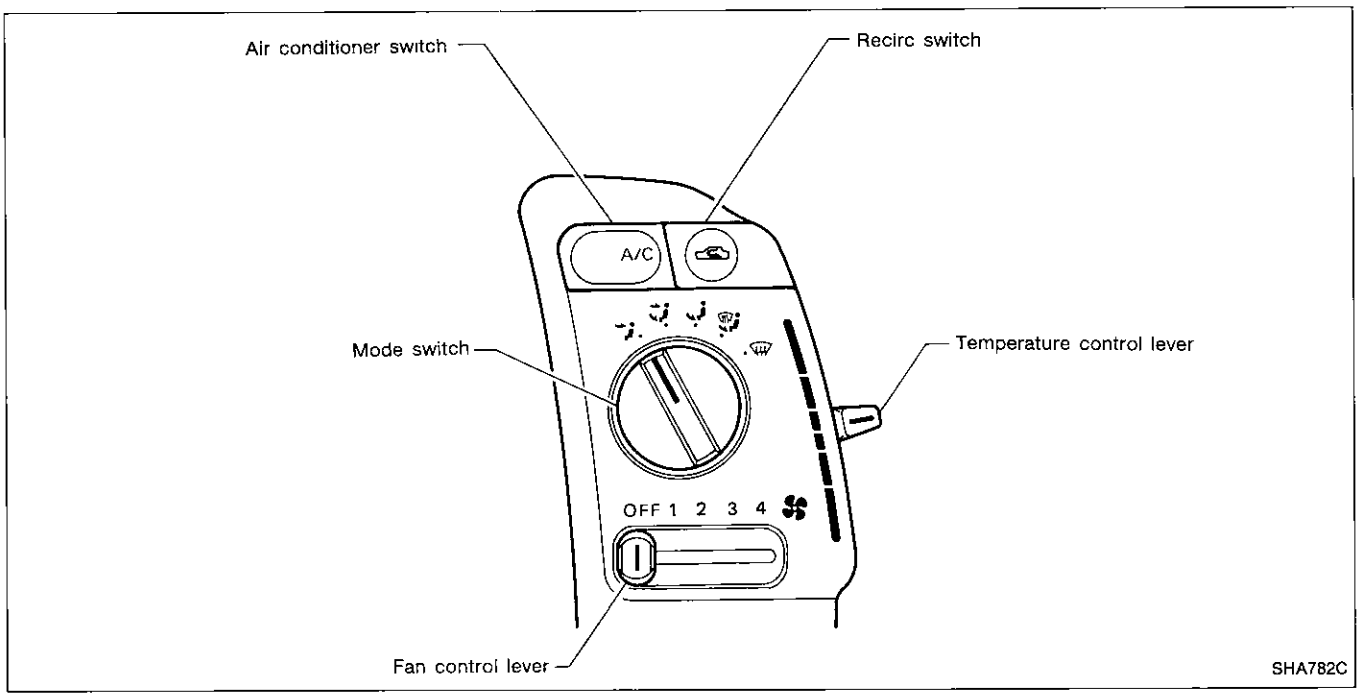
## Acceleration Cut System

This system is controlled by the E.C.C.S. control unit.
When the engine is heavily overloaded, the compressor is turned off for several seconds to reduce overloading.

## Water Cock Control System

The water cock is connected to the air mix doors with a cable. When the air mix doors are at the full-cold position, the water cock is fully closed, and when the air mix doors are at the full-hot position, the water cock is fully opened.

## Control Operation — Manual Air Conditioner




### FAN CONTROL LEVER

This lever turns the fan ON and OFF, and controls fan speed.

### MODE SWITCH

This switch allows you to select the outlet air flow.
In the "DEF" mode, the intake door is set to "FRE". The compressor turns on in "DEF" or "F/D" mode.

### TEMPERATURE CONTROL LEVER

This lever allows you to adjust the temperature of the outlet air.

### RECIRC SWITCH

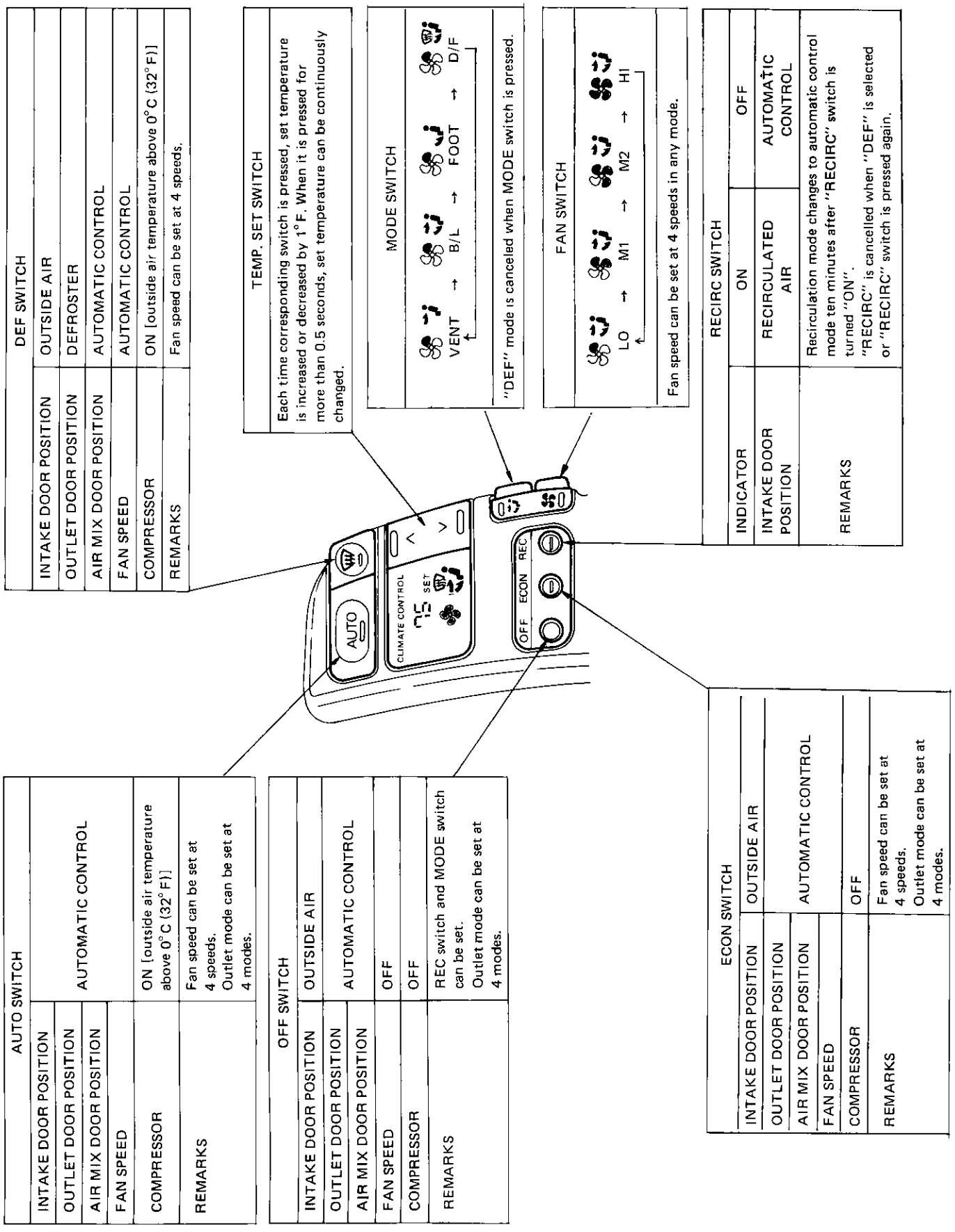
OFF position:
Outside air is drawn into the passenger compartment when this switch is OFF.
ON position:
Interior air is recirculated inside the vehicle.
"RECIRC" is cancelled when "DEF" is selected.

### AIR CONDITIONER SWITCH

Start the engine, move the fan control lever to the desired (1 to 4) position and push the air conditioner switch to turn ON the air conditioner. The indicator light will come on when the air conditioner is ON. To stop the air conditioner, push the switch again to return it to the original position.

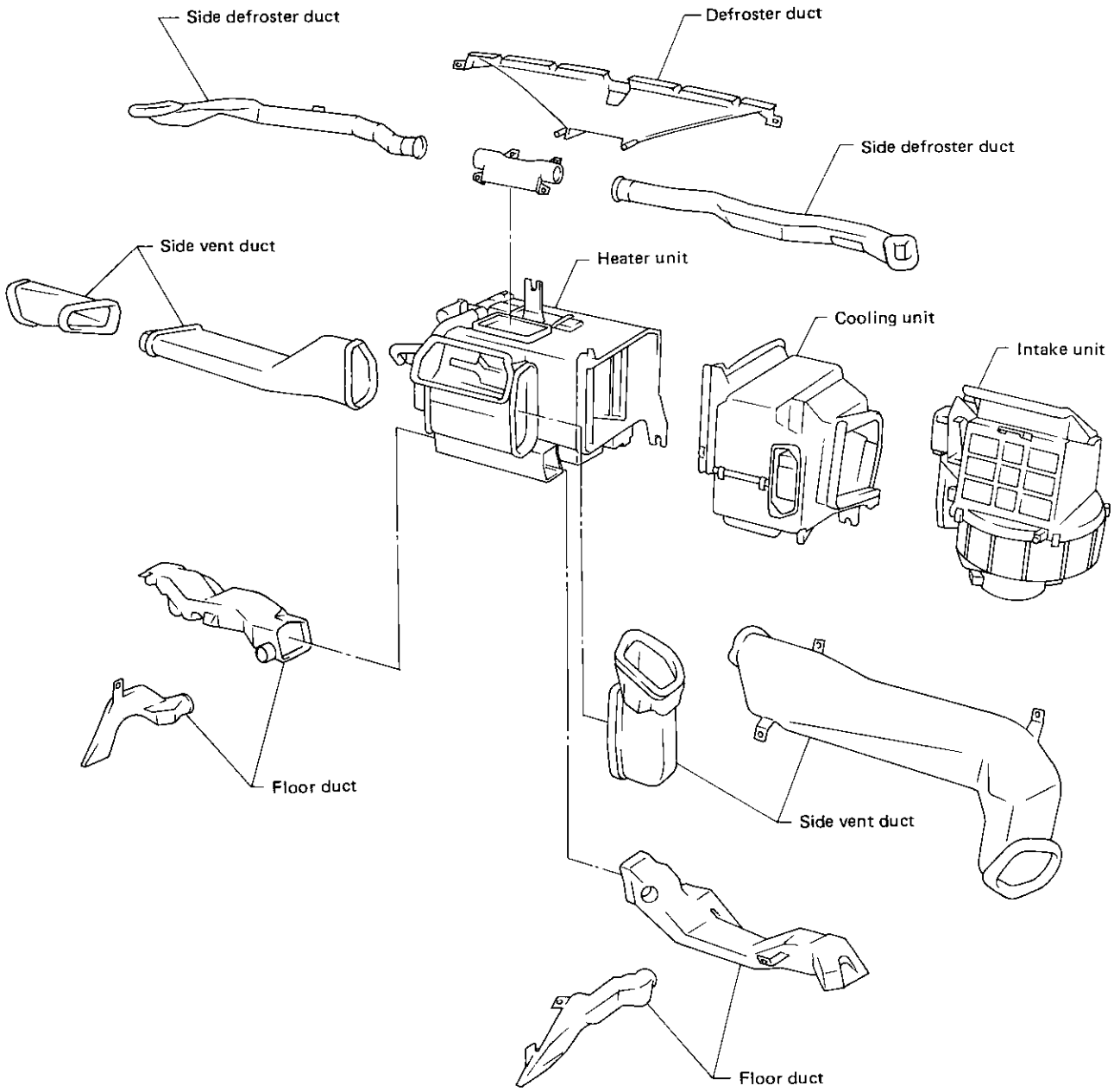
**The air conditioner cooling function operates only when the engine is running.**

## Control Operation — Auto Air Conditioner



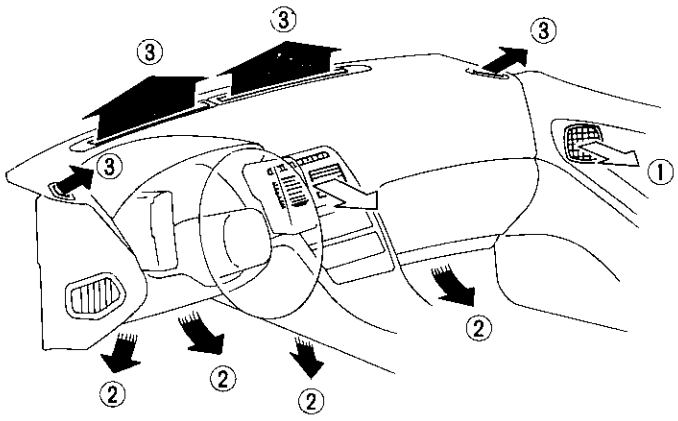

SHA757C

## Component Layout

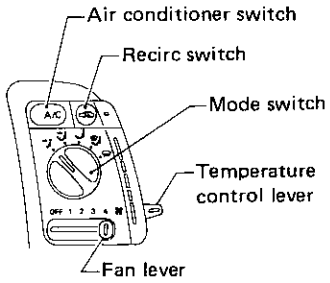



SHA306C

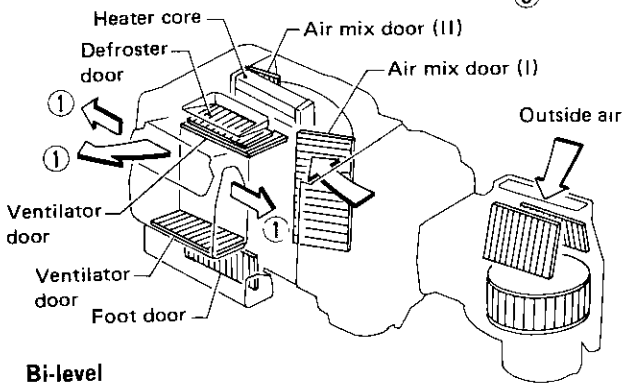
## Air Flow



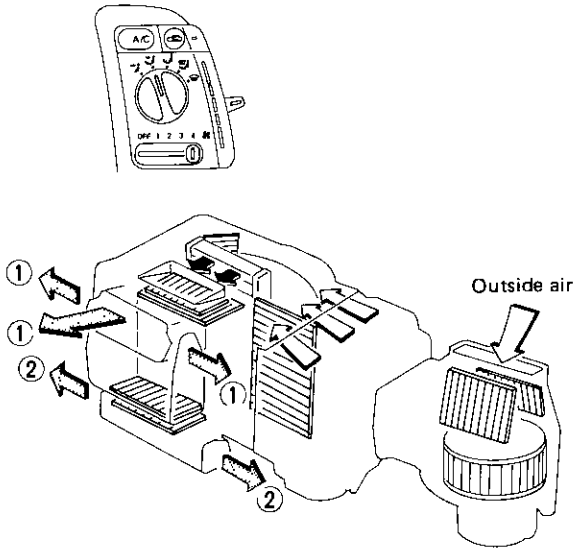

**Ventilation**



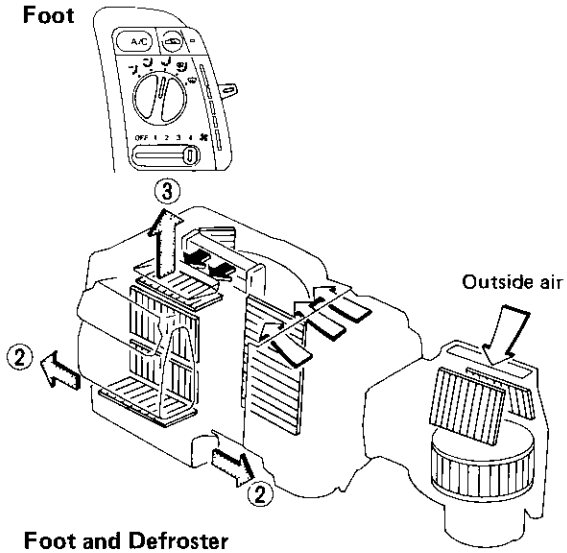

① ... To ventilator
② ... To floor
③ ... To defroster



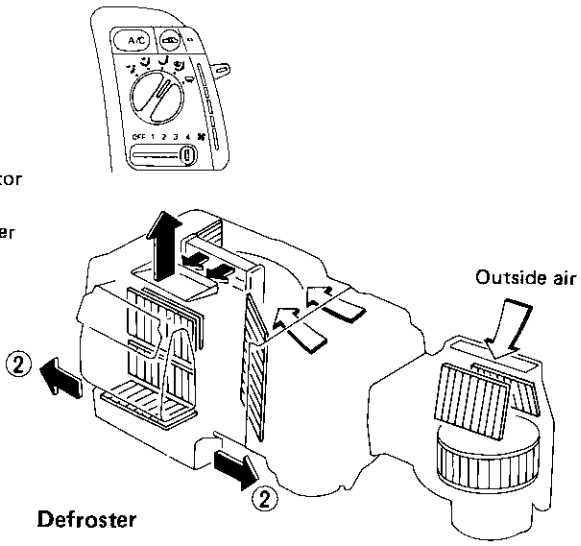

**Bi-level**



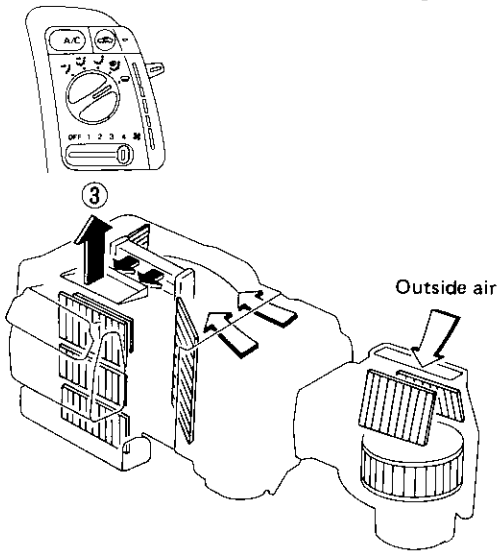

**Foot**




**Foot and Defroster**




**Defroster**

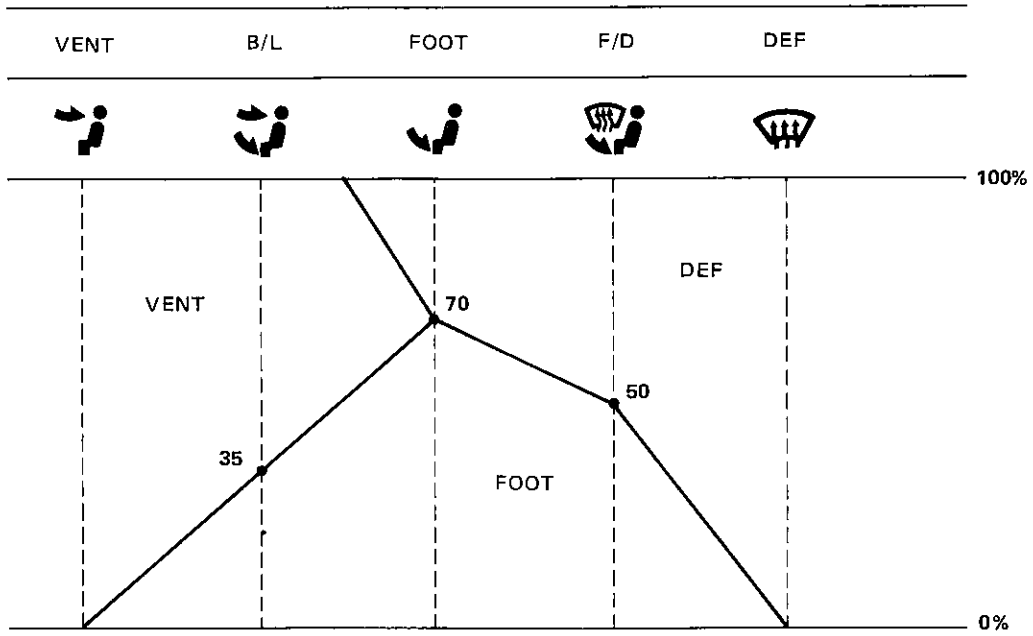



: Air passed through heater core
: Mixed air
: Air not passed through heater core

SHA305C

## Air Flow (Cont'd)

### AIR DISTRIBUTION RATIOS




SHA266C

## Refrigeration Cycle

### REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the liquid tank, through the evaporator, and back to the compressor.
Refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

### FREEZE PROTECTION (For manual air conditioner)

If evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts compressor operation. When evaporator coil temperature rises above the specification, compressor operation will resume. This condition (compressor cycling) indicates a malfunction in the system.

### FREEZE PROTECTION (For auto air conditioner)

When the A/C is switched on, the compressor runs continuously, and the evaporator pressure, and therefore the temperature, is controlled by a suction throttle valve (S.T.V.) to prevent freeze up.

### REFRIGERANT SYSTEM PROTECTION

#### Low-pressure switch

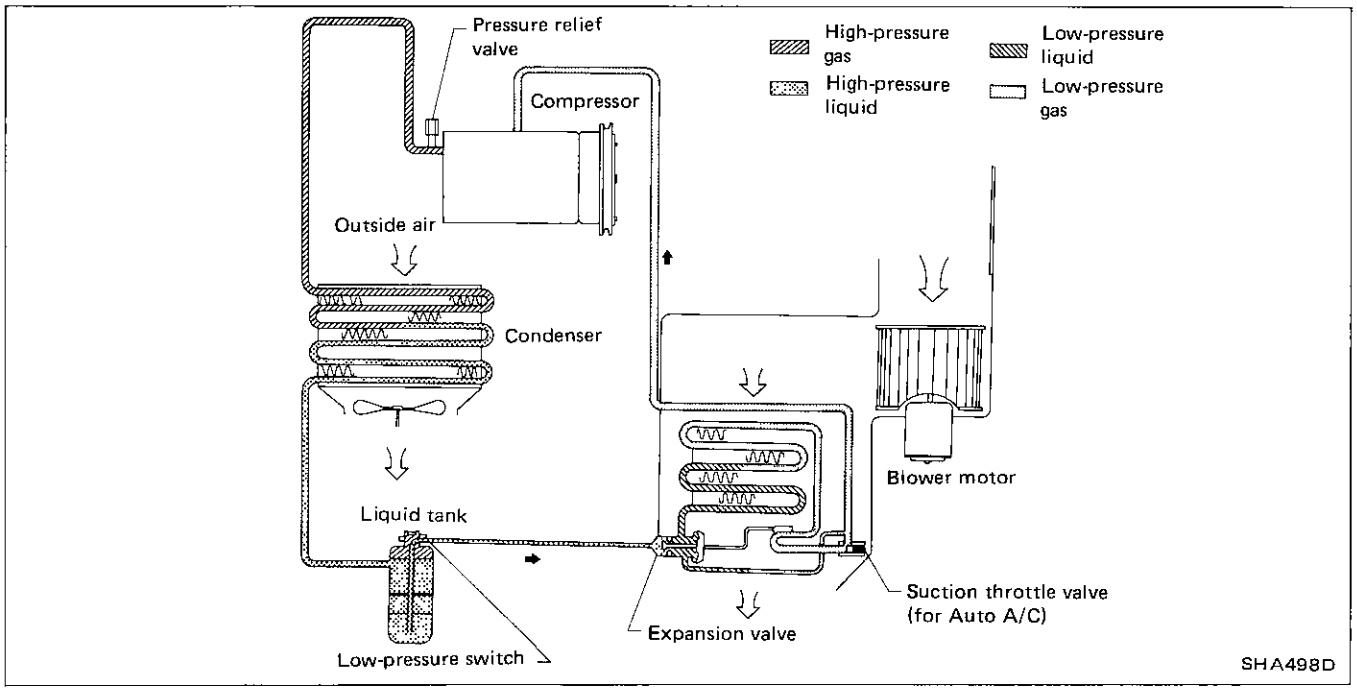
The refrigerant system is protected against excessively low pressures by the low-pressure switch, located on the liquid tank. If the system pressure falls below the specifications, the low-pressure switch opens to interrupt compressor operation.

#### Fusible plug

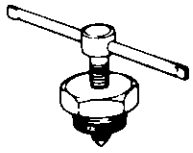
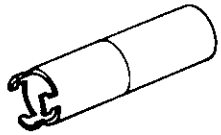
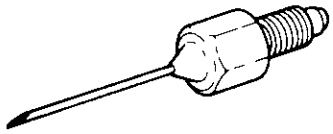
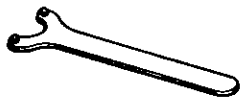
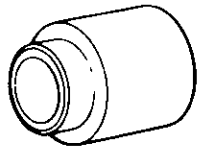
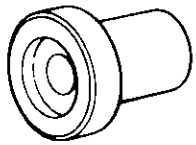
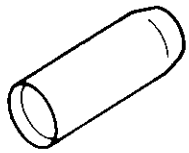
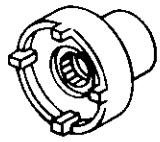
Opens at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace the liquid tank.

#### Pressure relief valve

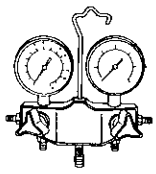
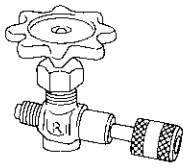
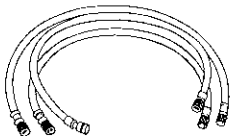
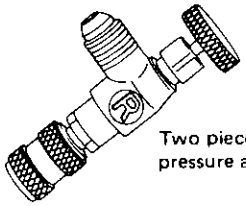
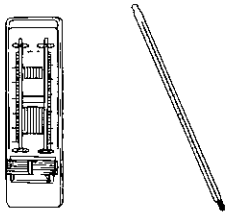
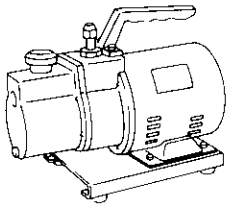
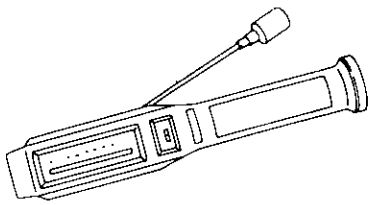
The refrigerant system is also protected by a pressure relief valve, located on the end of the high pressure flexible hose near the compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm$^2$, 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



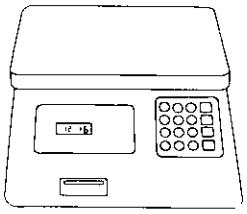
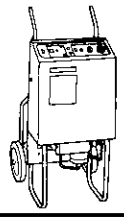
## SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| KV99232022<br>(J26571-A)<br>Clutch disc puller |  | Removing clutch disc |
| KV99235140<br>(J37876)<br>Shaft seal remover and installer |  | Removing and installing shaft seal |
| KV994C1552<br>(J37880)<br>Charge nozzle |  | Charging refrigerant |
| KV99231010<br>(J37877)<br>Clutch disc wrench |  | Removing shaft nut and clutch disc |
| KV99233040<br>(J26720-A)<br>Puller pilot |  | Removing pulley |
| KV99234160<br>(J37879)<br>Pulley installer |  | Installing pulley |
| KV99267420<br>(J37878)<br>Shaft seal guide |  | Installing shaft seal |
| KV99235160<br>(J37882)<br>Nut wrench |  | Removing lock nut |

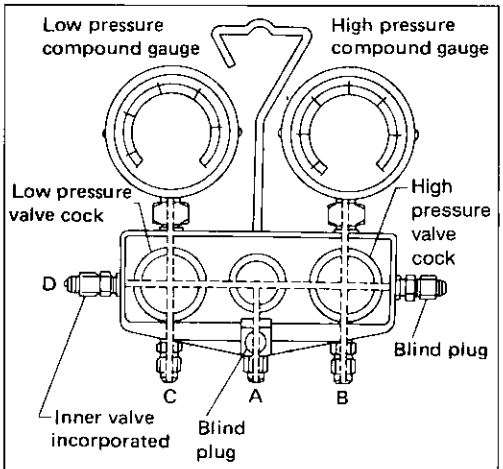
## Service Tools

| 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.**




Center joint (A):
Use for evacuating.
High pressure side joint (B):
Connect to high pressure side service valve of refrigerating system.
Low pressure side joint (C):
Connect to low pressure side service valve of refrigerating system.
Refrigerant joint (D):
Use for charging refrigerant.
SHA044D

### HANDLING METHOD AND STRUCTURE

#### Manifold gauge

The manifold gauge is used to measure the operating pressure accurately in the high pressure and low pressure lines of the refrigerating system. The high pressure gauge measures from –101.3 kPa (–760 mmHg, –29.92 inHg) to 2,942 kPa (30 kg/cm$^2$, 427 psi), and the low pressure gauge measures generally from –101.3 kPa (–760 mmHg, –29.92 inHg) to 1,471 kPa (15 kg/cm$^2$, 213 psi).

**CAUTION:**

- **When installing the gauge to the refrigerating system, use utmost care not to mistake high pressure and low pressure line connections. (Wrong connections will lead to a damaged gauge.)**
- **Before evacuating, confirm that the gauge has a negative pressure scale. (If not, the gauge will be damaged.)**

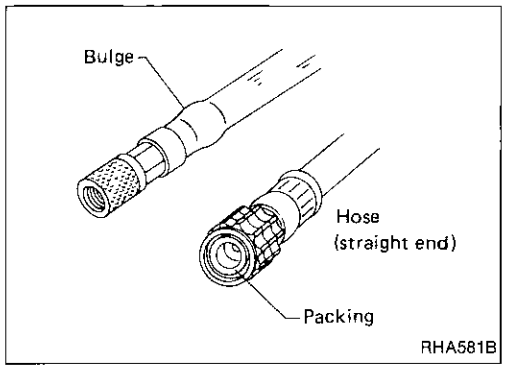
## Service Tools (Cont'd)

### Charging hose

1. Completely tighten the high pressure valve, low pressure valve and vacuum pump valve cocks of the gauge manifold.
2. Connect the charging hoses to the high and low pressure lines.
3. Connect the charging hose fitted with a valve core to the charging cylinder.
4. Connect the vacuum pump hose to the vacuum pump.

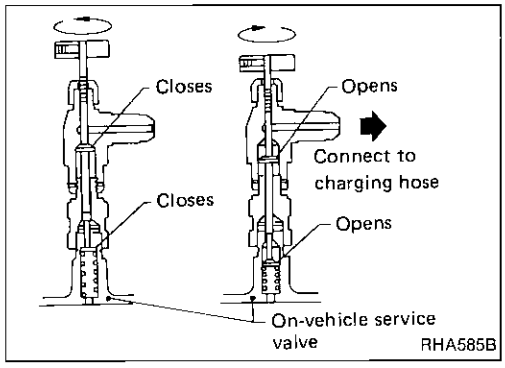
**The high and low pressure hoses are color coded to prevent wrong connection.**

| | |
|---|---|
| High pressure line hose | Red |
| Low pressure line hose | Yellow |
| Charging hose | Blue or green (with valve core) |
| Vacuum pump hose | Blue or green |




**CAUTION:**

- **Check each hose for cracks. If found, discard the hose.**
- **Do not use any hose if bulges are found.**
- **Check the rubber packing. If any deterioration or cracks are found, replace it with a new one.**




### Installing the adapter valve

Install the adapter valve to each of the high pressure and low pressure service valves so that air purging from the charging hose can be omitted. This also ensures that refrigerant leakage upon disconnection of the hose can be prevented.

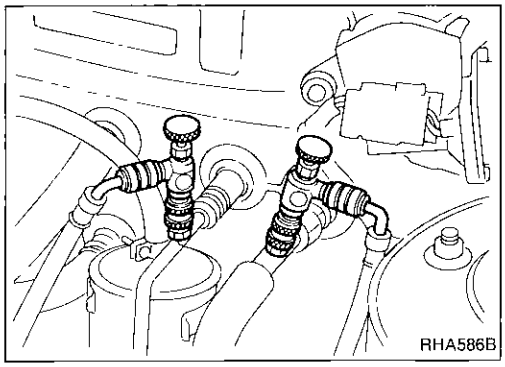
1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

**CAUTION:**

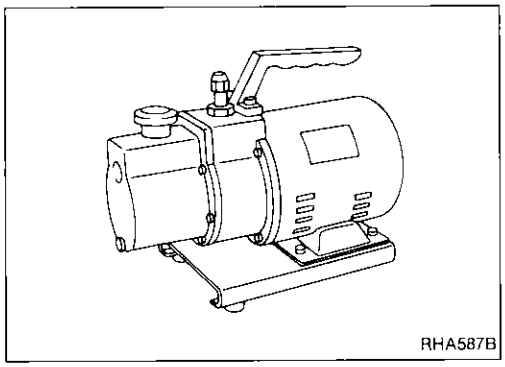
**Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace the packing with new.**

2. Connect the high and low pressure hoses to the adapter valves.

**Turning the handle clockwise will cause the on-vehicle service valve pin to be pushed open by the adapter valve pin, thus opening the refrigerant passage. Turning the handle counterclockwise will close the passage. Before removing the adapter valve from the on-vehicle service valve, be sure to fully turn the handle counterclockwise to shut off the refrigerant passage.**



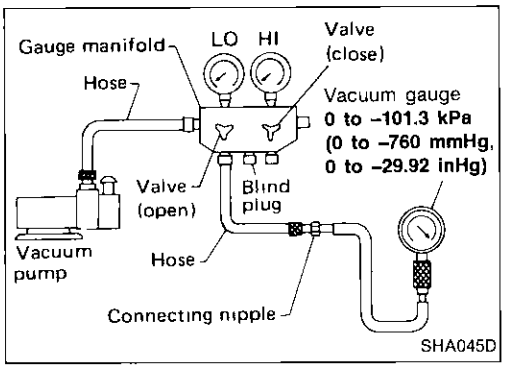
## Service Tools (Cont'd)


RHA587B

### Vacuum pump

The vacuum pump is used to purge air and moisture from the inside of the refrigeration system by evacuation, thereby ensuring proper functioning of the air conditioner system.

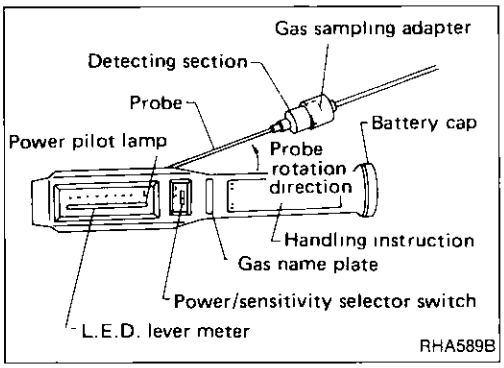
**Check the vacuum pump to see that the vacuum pump capacity is greater than –100.0 kPa (–750 mmHg, –29.53 inHg).**



SHA045D

### Vacuum pump performance check procedure

1. Connect the vacuum gauge to the system.
2. Run the vacuum pump, and check to see that the needle pointers of the gauge manifold and vacuum gauge move smoothly, indicating a similar value.
3. After running the vacuum pump for two or three minutes, read the vacuum gauge. The measured value indicates the capacity of the vacuum pump.



RHA589B

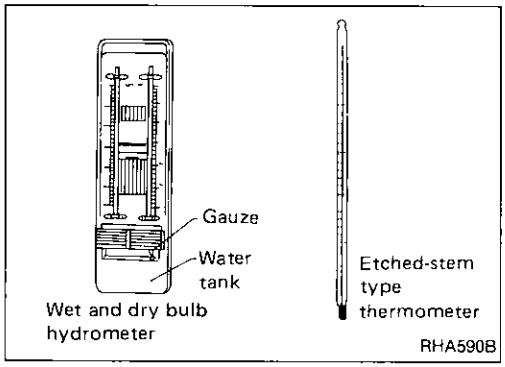
### Gas leak detector

The gas leak detector is used to check whether the refrigeration system is leaking. The detector is an electrical type. The features of this gas leak detector are listed below.

| Type | | Detection ability | Features |
|---|---|---|---|
| Electrical | Discharge type (Suction type) | 3 - 50 g (0.11 - 1.76 oz)/year | • Easy handling<br>• Medium sensitivity<br>• Each point needs tow or more seconds for detection. |
| | Positive ion emission type (Suction type) | 2 g (0.07 oz)/year | • High sensitivity<br>• High price<br>• Warm-up time is needed because a heater is incorporated. |
| Other simple checking method: Changing in vacuum when evacuating | | 1 kg (2 lb)/month; if 13.3 kPa (100 mmHg, 3.94 inHg) change in vacuum is detected in 10 minutes. | • Can be used easily in refrigerant charging operation.<br>• Detection ability is very low with vacuum gauge in gauge manifold. |

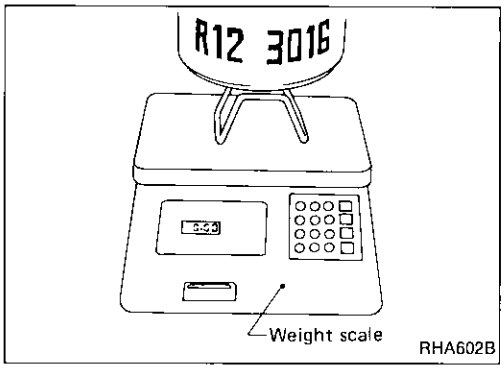
- **Leakage inspection of a refrigeration system needs a sensitivity greater than 20 g (0.71 oz)/year.**
- **The actual amount of leak is estimated at 5 to 10 times the detected amount.**
- **Insufficient cooling may be felt if leakage exceeds 150 to 200 g (5.29 to 7.05 oz).**

## Service Tools (Cont'd)



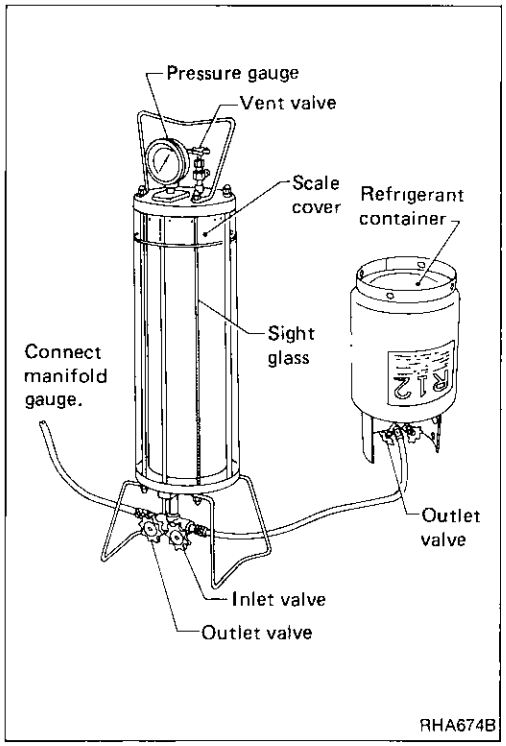

### Temperature gauge

Use to check the air conditioner performance. An etched stem type thermometer may be used. A hydrometer must also be used because the air conditioner performance depends on the humidity.




### Scale

Measure the weight of the refrigerant to determine how much the refrigerant is charged.




### Charging cylinder

The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

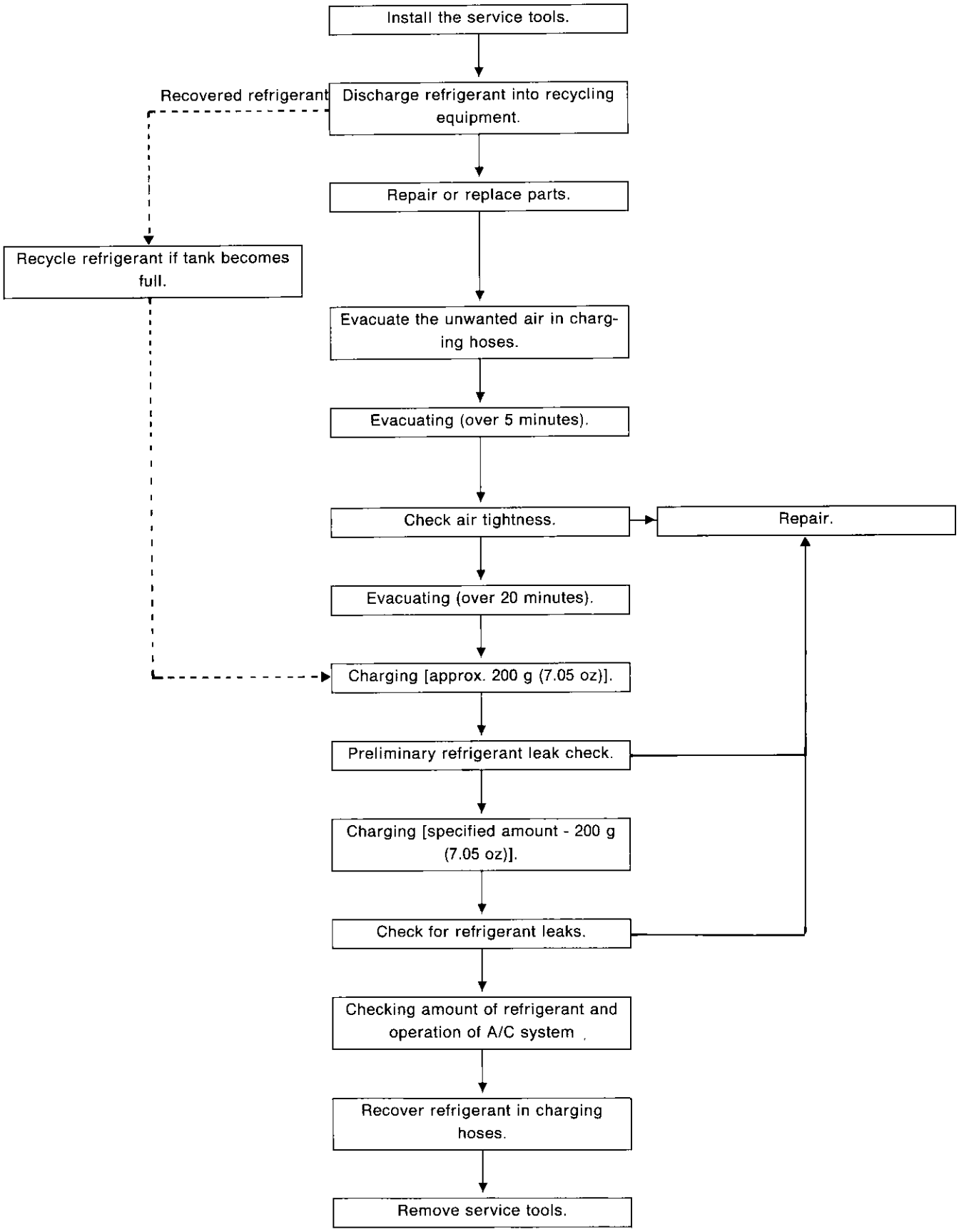
**Features**

- With the charging cylinder, the operator can measure correctly the amount of refrigerant to be charged into the system.
- Change in the refrigerant volume due to a change in temperature and pressure can be supplemented, and this ensures correct charging of refrigerant.

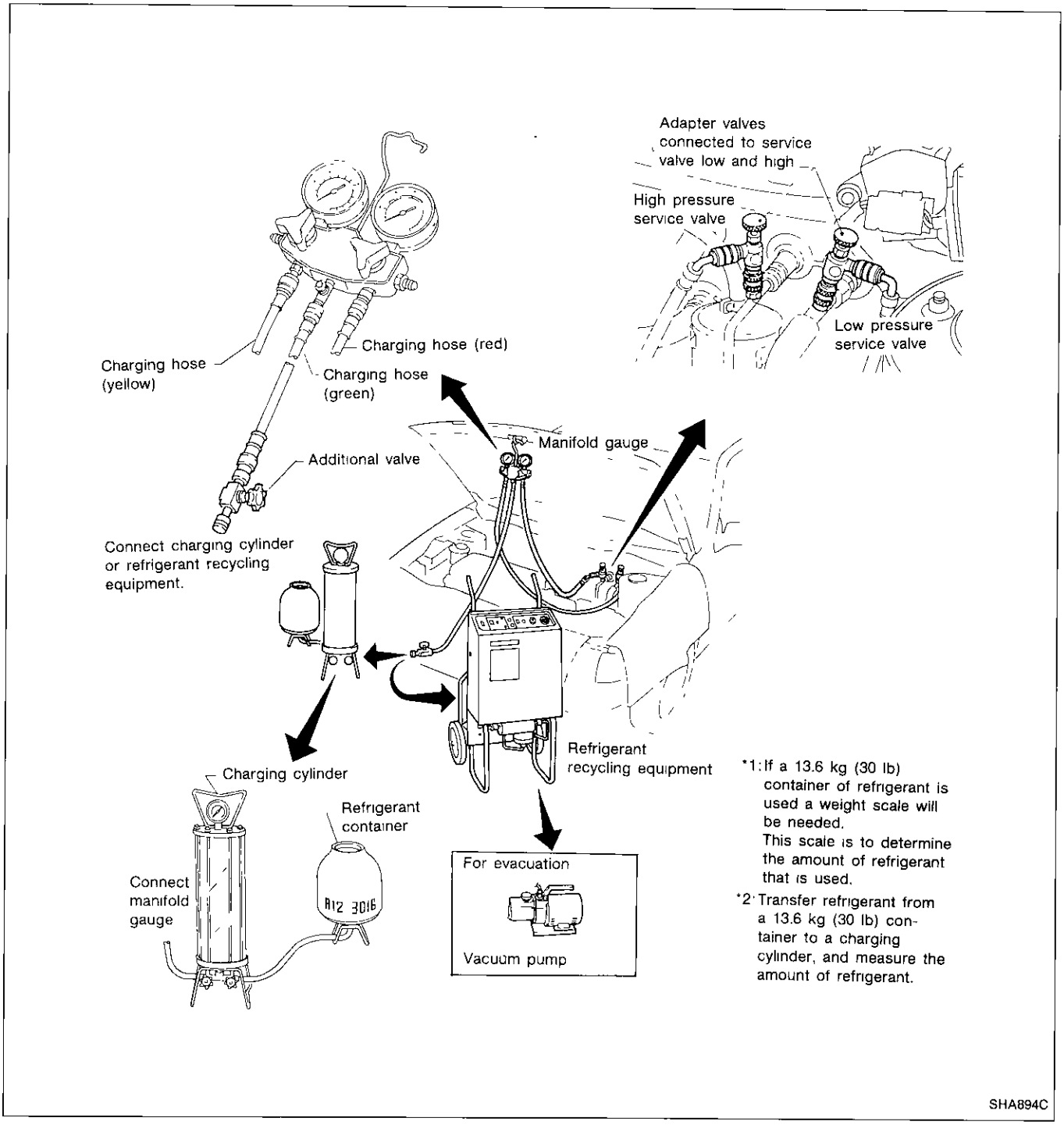
**CAUTION:**

- **Never attempt to carry the charging cylinder containing refrigerant.**
- **Do not put the charging cylinder in a hot place. If the temperature and pressure of the refrigerant in the cylinder increase, the safety valve will be pushed open and the refrigerant will be released into the atmosphere.**
- **Do not expose the cylinder to the direct sunlight.**
- **Do not over-charge the refrigerant so that it exceeds the maximum limit of the cylinder.**
- **Do not charge the cylinder with more refrigerant than is needed.**

## Work Procedure



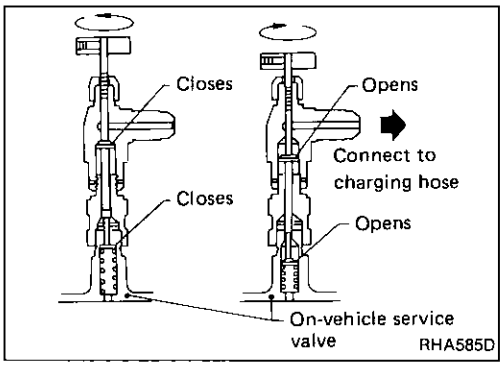
## Setting of Service Tools




**WARNING:**

**Discharge only into your recycling equipment. Do not release refrigerant into the air.**

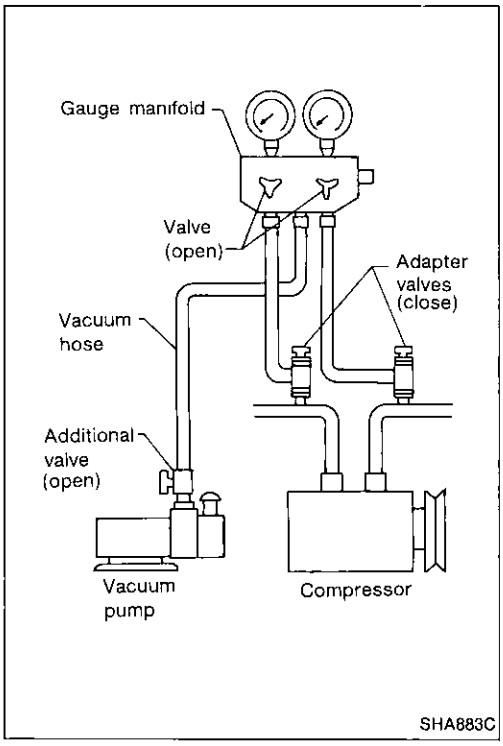
## Setting of Service Tools (Cont'd)

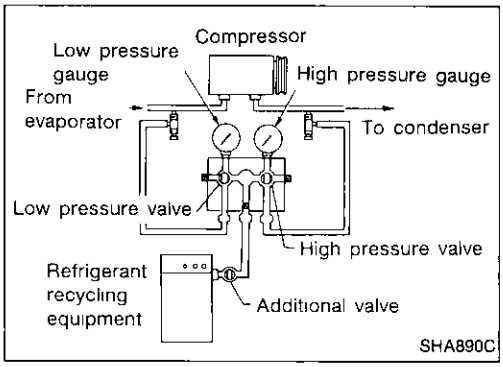


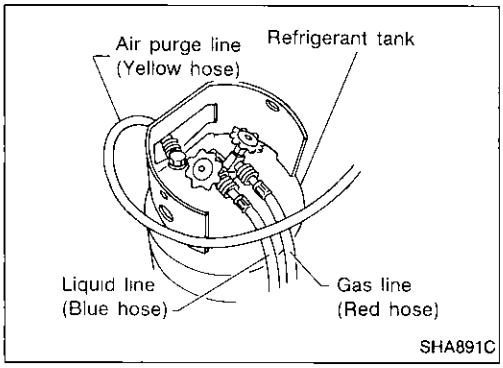

1. Install adapter valve to each of high pressure and low pressure service valves.

**Before connecting adapter valve, turn adapter valve handle fully counterclockwise to retract pin.**

2. Connect charging hoses to adapter valves and connect vacuum hose to vacuum pump.
3. Run vacuum pump and open additional valve and both valves on gauge manifold set.
4. After evacuating unwanted air in gauge set, close additional valve and stop vacuum pump.
5. Disconnect vacuum hose from vacuum pump and connect it to refrigerant recycling equipment.




## Discharging

**WARNING:**

**Discharge only into your recycling equipment.**

Do not release refrigerant into the air.

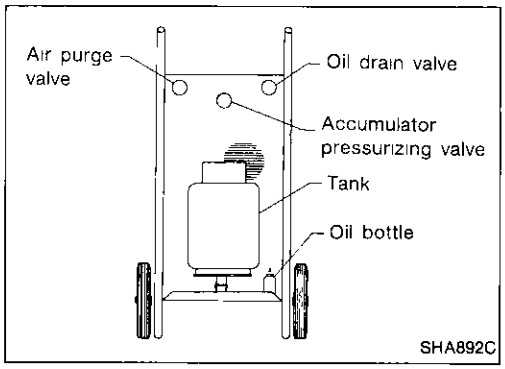
**Use only authorized refillable refrigerant tanks for your recycling equipment.**

Use of other tanks could cause personal injury.

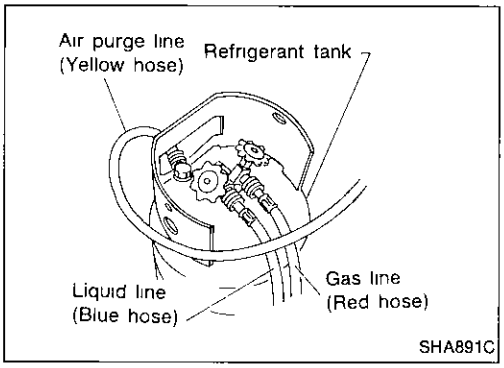
**REFRIGERANT RECOVERY**

1. Connect vacuum hose to refrigerant recycling equipment and open additional valve and adapter valves.
2. Open both valves of manifold gauge set. Make certain refrigerant tank "Gas" and "Liquid" valves are open.
3. Plug unit's power cord into a suitable AC outlet and turn on "Main Power" switch.
4. Turn on "Recovery" switch.
5. Depress "Start" switch. Compressor will start. Compressor will shut off automatically when recovery is complete. Watch for pressure rise to above 0 kPa (0 kg/cm$^2$, 0 psi) within two minutes. If this occurs, repeat this step.

## Discharging (Cont'd)




6. To drain A/C system oil accumulator, open "Accumulator Pressurizing" valve for approximately 15 seconds to allow some compressor discharge pressure back into accumulator. Close "Accumulator Pressurizing" valve and open "Oil Drain" valve slowly and drain accumulator. Do not allow accumulator to completely depressurize. When oil stops draining, close "Oil Drain" valve. Be sure to replace oil in A/C system before servicing.
7. Turn off "Recovery" switch.
8. When recovery tank is full, trip switch at the bottom of weight platform will de-energize compressor and "Tank Full" light will come on. Recycle refrigerant in tank before removing.

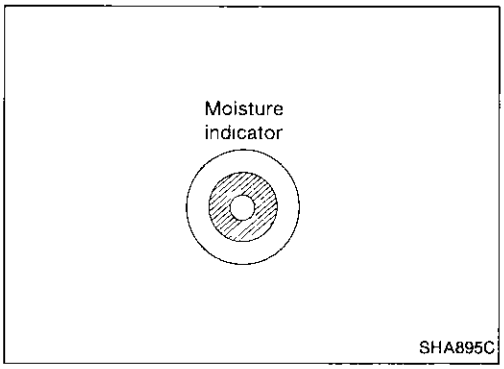



### REFRIGERANT RECYCLING

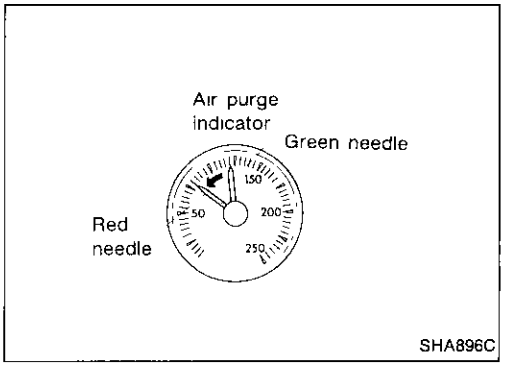
**The recycling of reclaimed refrigerant is essential in order to assure that the refrigerant which meets the standards is re-used.**

For maximum efficiency, full tanks of recovered refrigerant should be recycled. As required, tanks containing a minimum of 3.6 kg (8 lb) of refrigerant can be recycled.

**For greatest efficiency, recycling full tanks of refrigerant is recommended.**

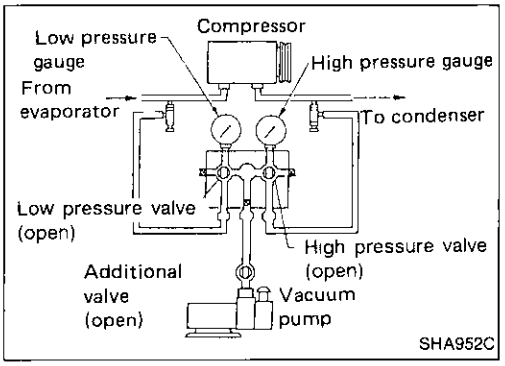



1. Make certain both valves on recovery tank are open.
2. Turn on "Recycling" switch. Recycling solenoid will be energized.
3. Depress start switch. Compressor will start, and "Recycling On" light will come. Refrigerant will be seen going through moisture indicator at start up. The sightglass will not completely fill with refrigerant.
4. Allow the station to operate until moisture indicator turns green. If moisture indicator does not turn green after 40 minutes, remove and replace filter.
5. After recycling for approximately 5 minutes, check air purge indicator. If green pointer on air purge indicator leads red pointer by more than 10 psi (2 small divisions), bleed tank through air purge valve on the back of unit until both pointers are equal. Repeat as necessary.



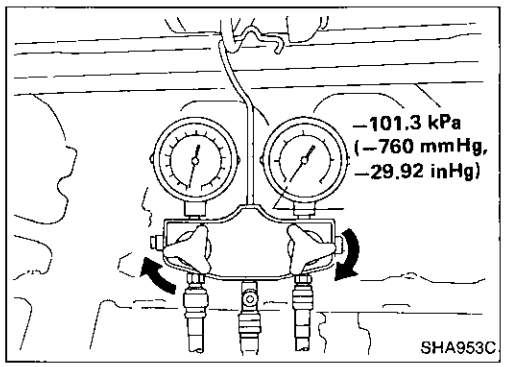

## Evacuation

### EVACUATION PROCEDURE

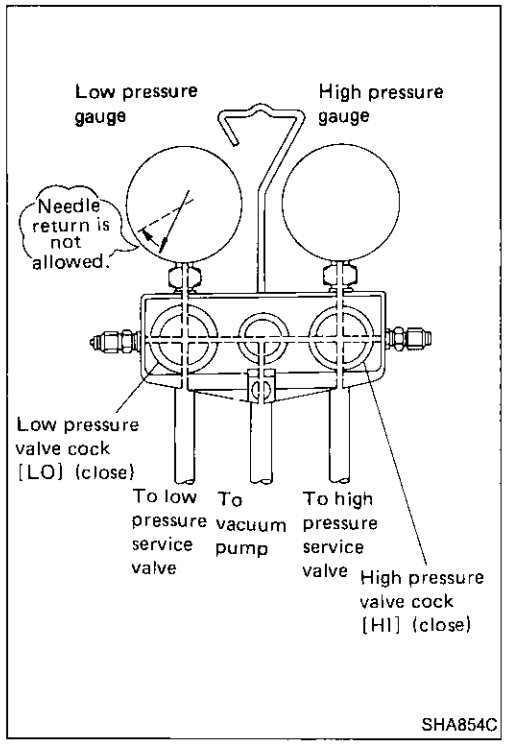



1. Connect vacuum hose to vacuum pump.
2. Open high and low pressure valves of manifold gauge set and additional valve.
3. Run vacuum pump.

## Evacuation (Cont'd)




4. Perform evacuation for more than five minutes to stabilize the vacuum inside the system. Check to ensure that the low pressure gauge indicates –98.6 to –101.3 kPa (–740 to –760 mmHg, –29.13 to –29.92 inHg).
5. Shut off the high and low pressure valves and additional valve.




### CHECKING AIRTIGHTNESS

1. Shut off high and low pressure valves and additional valve, and leave the system as it is for 5 to 10 minutes.
2. Make sure that the needle of low pressure gauge will not move back toward the atmospheric pressure side (gauge pressure 0).

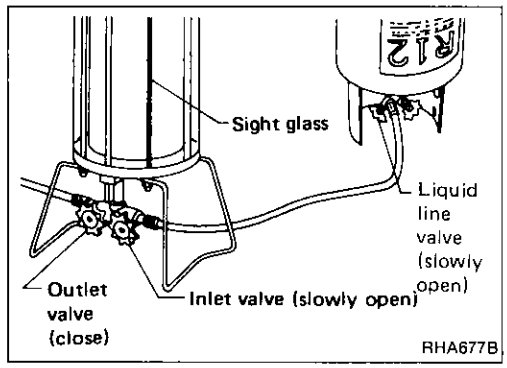
**If any reverse movement is noted, it indicates poor system airtightness. Service the system until airtightness is complete. If pressure changes approx. 13.3 kPa (100 mmHg, 3.94 inHg) in 10 minutes, the refrigerant in the system will be exhausted in about one month.**

### EVACUATION

If no abnormality is found during airtightness check, perform evacuation again for more than 20 minutes.

1. Run vacuum pump.
2. Open high and low pressure valve and additional valve.
3. Evacuate for more than 20 minutes.
4. Close high and low pressure valves and additional valve.

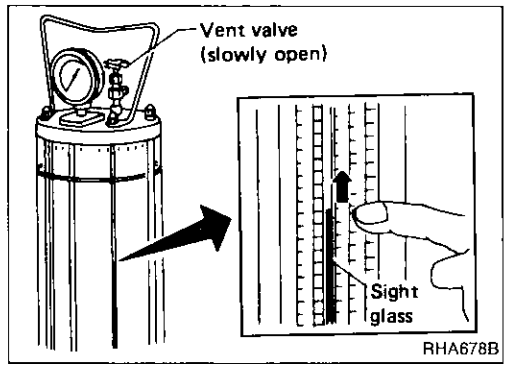
## Charging Refrigerant




### SETTING OF CHARGING CYLINDER

1. Make sure that inlet and outlet valves of charging cylinder are closed.
2. Slowly open liquid line valve of refrigerant tank.
3. Slowly open inlet valve of charging cylinder.

**The refrigerant will flow into the sight glass of charging cylinder as inlet valve is opened.**

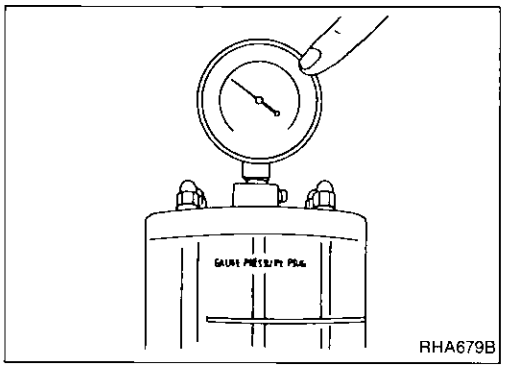



4. Slowly open upper vent valve to release pressure from charging cylinder. While doing so, continue charging until required amount of refrigerant is reached.

**The refrigerant volume changes with temperature and pressure. It is necessary to charge refrigerant with a little more than required amount (indicated on sight glass).**

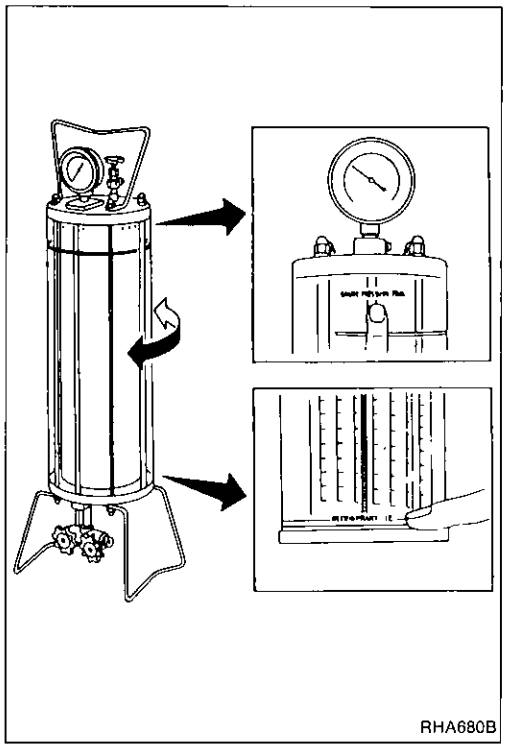
5. Close inlet valve and upper vent valve of charging cylinder.

## Charging Refrigerant (Cont'd)


RHA679B

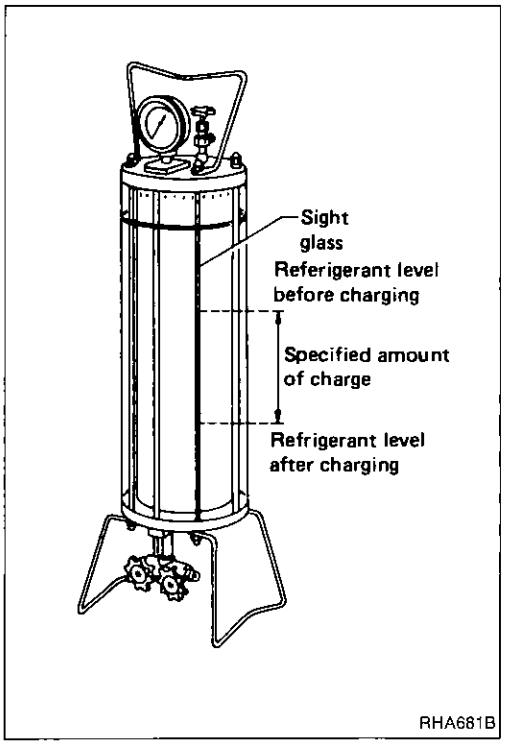
6. Turn on heater switch (charging cylinder is provided with a heater.)

**The refrigerant charging time can be reduced by heating refrigerant to increase its pressure. In this case, do not allow the pressure in cylinder to rise higher than 1,030 kPa (10.5 kg/cm$^2$, 150 psi). (If pressure rises above this level, turn off the heater.) The pressure in the charging cylinder can be measured by upper pressure gauge.**


RHA680B

### SETTING OF FLOW METER

1. Rotate charging cylinder main body until scale for R12 is at the correct position on sight glass.
2. Read charging cylinder pressure gauge.
3. Rotate charging cylinder so that scale of charging cylinder agrees with pressure value indicated on pressure gauge.



RHA681B

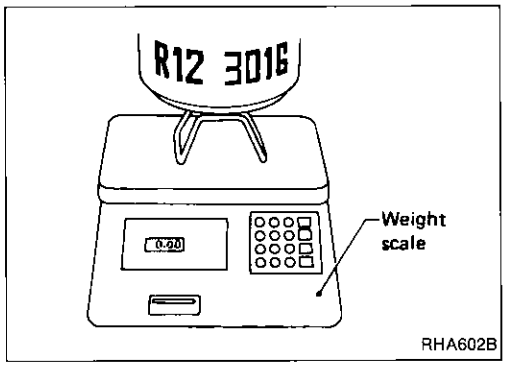
### CALCULATING CHARGING AMOUNT OF REFRIGERANT

1. Record the amount of refrigerant in the sight glass before charging.
2. Subtract the required amount of refrigerant (charge quantity specified for the vehicle) from the amount of refrigerant recorded in step 1. Charge refrigerant into the system until the remaining value equals to the value indicated on the sight glass.

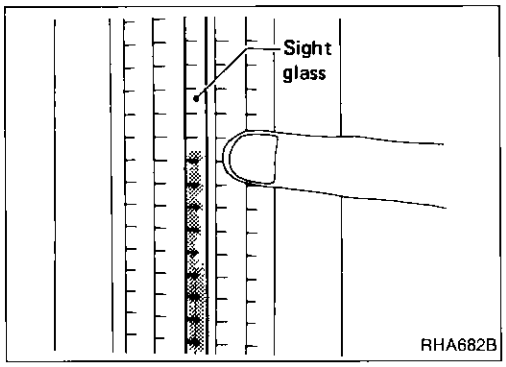
**Example:**

Level in sight glass: 3 lb 8 oz
Charge specification (from Service Manual) 2.0 - 2.4 lb.
Calculate charge quantity into lb and oz as follows: 1 lb = 16 oz, and 0.1 lb = 1.6 oz, so that 2.0 lb = 32 oz, 2.4 lb = 32 + (4 x 1.6) = 32 + 6.4 = 38.4, round off to 38. Therefore our charge quantity will be between 32 and 38 oz, or 2 lb 0 oz to 2 lb 6 oz.
Subtract 2 lb 6 oz from level in sight glass (3 lb 8 oz) = 1 lb 2 oz.
This will be our ending point.

## Charging Refrigerant (Cont'd)




If a flow meter is not available, the amount of charged refrigerant also can be determined by subtracting the weight of the container measured after charging from its weight measured before charging.

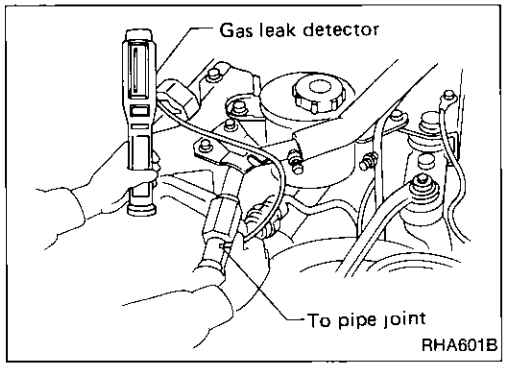



### PRELIMINARY CHARGING OF REFRIGERANT

1. Open outlet valve of charging cylinder.
2. Slowly open high pressure side valve of manifold gauge to charge refrigerant from the high pressure side.
3. Close high pressure valve after charging approx. 200 g (7.05 oz) refrigerant.

**CAUTION:**

**The refrigerant in charging cylinder is kept in liquid state, so the refrigerant should be charged from high pressure side. Do not start engine with high pressure valve kept open.**




### PRELIMINARY CHECK FOR REFRIGERANT LEAKS

1. Make sure that the gauge manifold valve is closed.
2. Check for refrigerant leak from each connector in the system using the leak detector.

**At this point, the pressure in the system is not high. Only large amounts of refrigerant leak due to loose pipe joints, etc. can be detected.**

### CHARGING REFRIGERANT

1. Slowly open high pressure valve of manifold gauge, and charge calculated amount of refrigerant in "CALCULATING CHARGING AMOUNT OF REFRIGERANT".

**CAUTION:**

**The refrigerant in charging cylinder is kept in liquid state, so the refrigerant should be charged from high pressure side. Do not start engine with high pressure valve kept open.**

2. Close high pressure valve of manifold gauge.
3. Make sure that the calculated amount of refrigerant remains in sight glass.
4. Close charging cylinder outlet valve.
5. Turn off heater if it is on (when using heater equipped type).

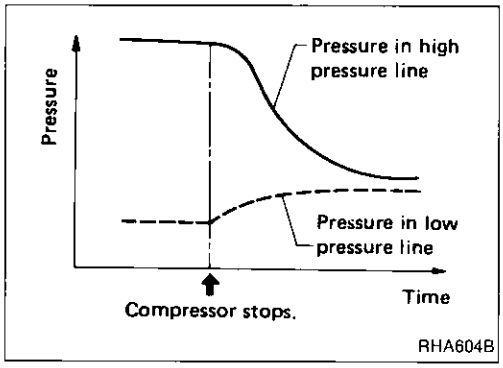
## Inspection for Refrigerant Leaks

### WORK PROCEDURE

To facilitate inspection for refrigerant leaks, establish the following conditions:

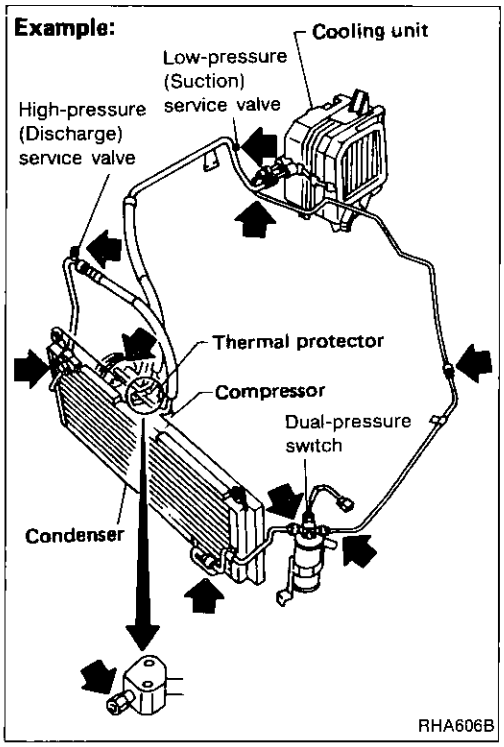
- Start engine.
- Run air conditioner.
- Set blower fan control to MAX.
- Set temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate refrigerant through the system).

## Inspection for Refrigerant Leaks (Cont'd)




**Refrigerant leaks should be checked immediately after stopping engine, beginning with high pressure line, using a gas leak detector. This is because the pressure in high pressure line drops gradually after refrigerant circulation stops while the pressure in low pressure line rises gradually as shown in the graph at left. Leaks can be detected easily when pressure is high.**

**To prevent detecting errors, make sure that there is no refrigerant vapor or tobacco smoke in the vicinity of vehicle. It is also necessary to shield vehicle from wind so that leaking refrigerant is not blown away.**




### INSPECTION POINTS

Check carefully each of tube joints. To check, wipe the portion to be checked with waste cloth, and move tester probe all around the joint.

**Compressor**

Check shaft seals and bolt holes, and also around magnet clutch.

**Liquid tank**

Check pressure valve, safety valve and fusible plug mounts.

**Service valve**

Check all around service valves.
Ensure that valve core is not loose.
Service valve caps must be attached to valves (to prevent leak).
Also check that there are no foreign objects inside the cap.

**Inside of cooling unit**

To check, insert leak tester probe into drain hose immediately after stopping engine. (Keep probe inserted for more than 10 seconds.)

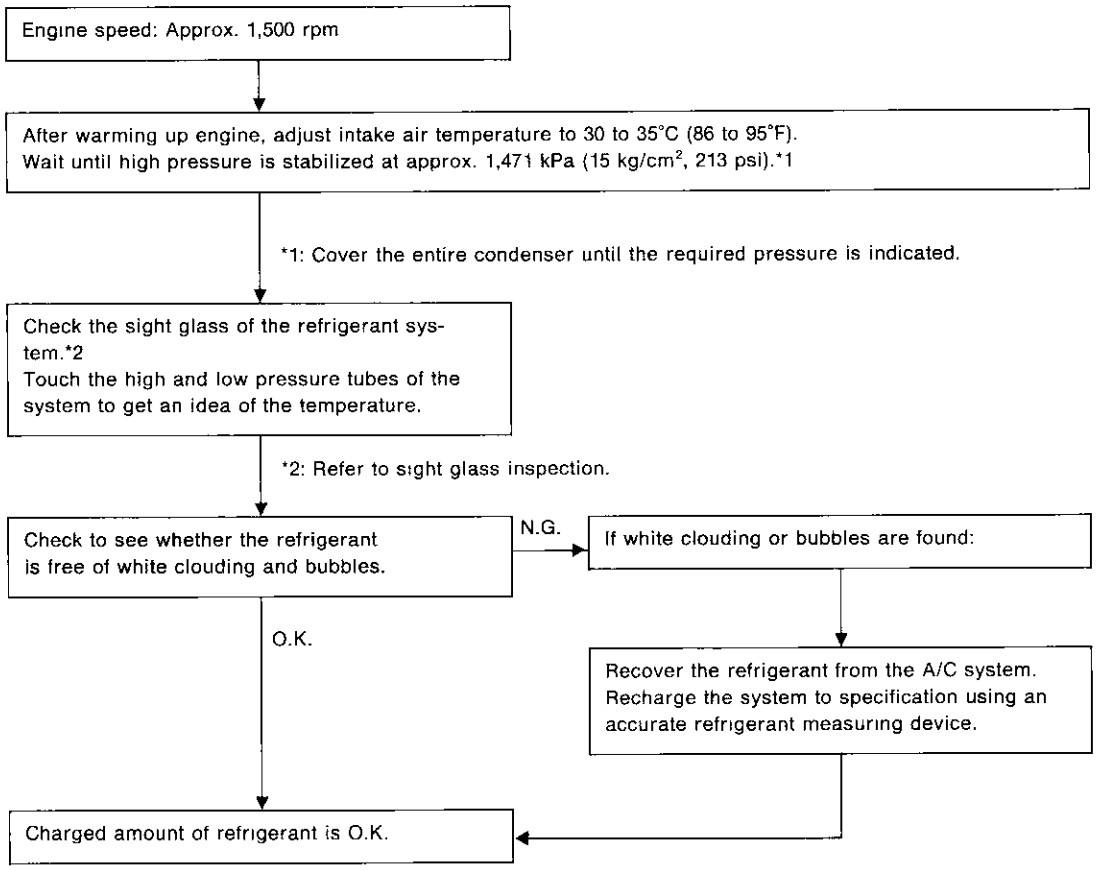
## Confirmation of Amount of Charged Refrigerant

The amount of refrigerant charged into the system can be observed through the sight glass by watching the flow of the refrigerant and by reading the high pressure and low pressure manifold gauges under the following conditions:

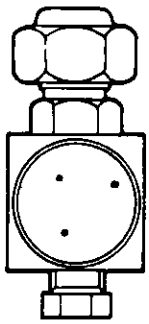
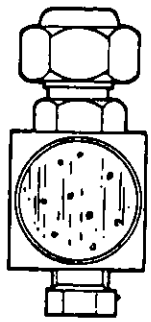
**CONDITIONS**

- Doors:
  Close completely.
- Window glasses:
  Close completely.
- Intake door position:
  RECIRC
- Mode door position:
  VENT
- Blower fan:
  HI
- TEMP control:
  Optional (Set so that intake air temperature is 30 to 35°C (86 to 95°F).
- AUTO switch:
  ON
- Engine speed:
  Approx. 1,500 rpm

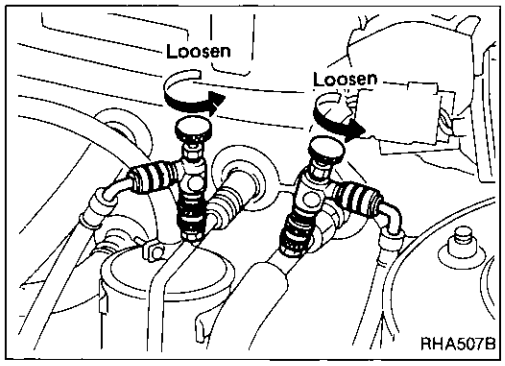
**WORK PROCEDURE**

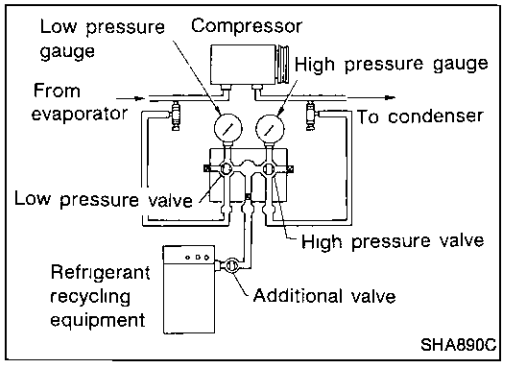


## Confirmation of Amount of Charged Refrigerant (Cont'd)

| Amount of charge / Check item | Appropriate | Refrigerant is insufficient | Almost no refrigerant | Overcharged, or air in system |
|---|---|---|---|---|
| Temperature of high and low pressure pipes | High pressure side is hot while low pressure side is cold. | High pressure side is warm and low pressure side is somewhat cold. | No difference is felt between high and low presser sides. | High pressure side is very hot. |
| Flow of refrigerant viewed through sight glass | Mostly transparent. Occasionally some bubbles are seen when engine 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 liquid tank strainer is clogged, or when the expansion valve is opened excessively. | Add refrigerant after checking for leaks. | Check the refrigerant system. | Stop the compressor and extract excessive refrigerant. If air is found, perform evacuation, then charge the specified amount of refrigerant. |

**CAUTION:**
**The condition of bubbles seen through the sight glass as well as the intake and discharge pressures are influenced by the ambient temperature, wind velocity, weather, and by the air temperature in front of the condenser, etc.**



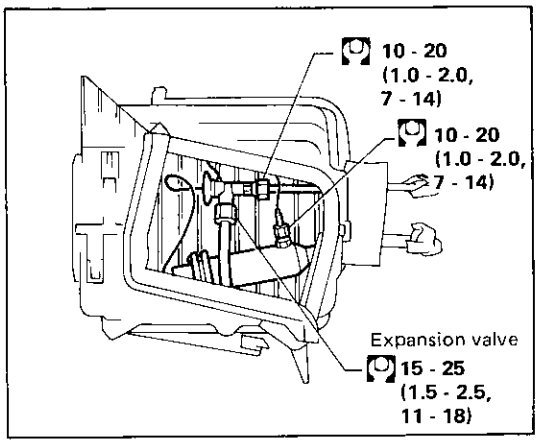

## Removal of Service Tools

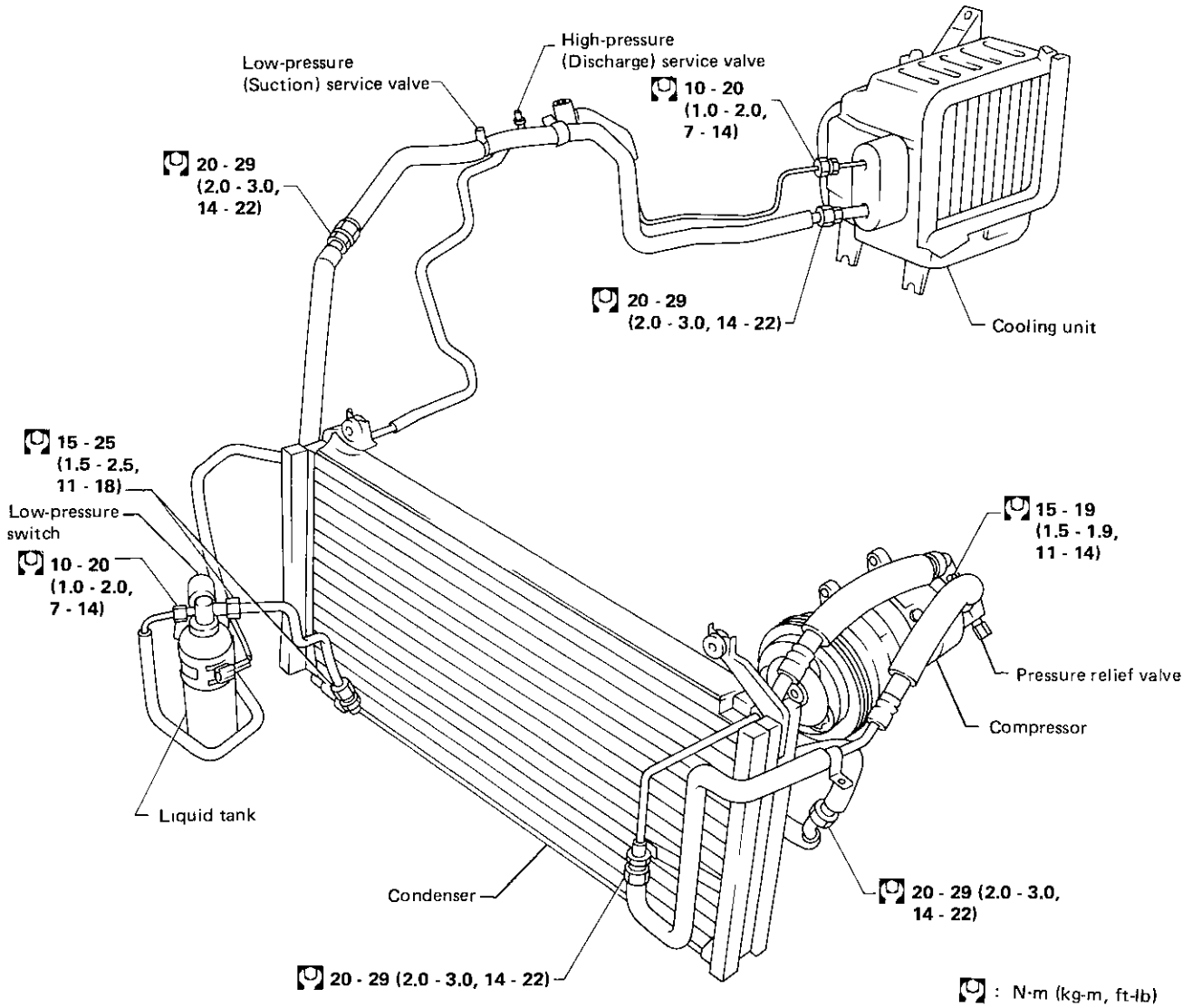
1. Completely loosen adapter valves of low pressure and high pressure lines.
2. Close additional valve and remove center hose from charging cylinder.
3. Connect center hose to refrigerant recycling equipment.
4. Open additional valve and both valves on gauge manifold.
5. Capture refrigerant in charging system.
6. After recovering refrigerant, remove adapter valves from on-car service valves.

## Refrigerant Lines

**Refer to "Precautions for Refrigerant Connection" on page HA-4.**

### VG30DE ENGINE MODEL



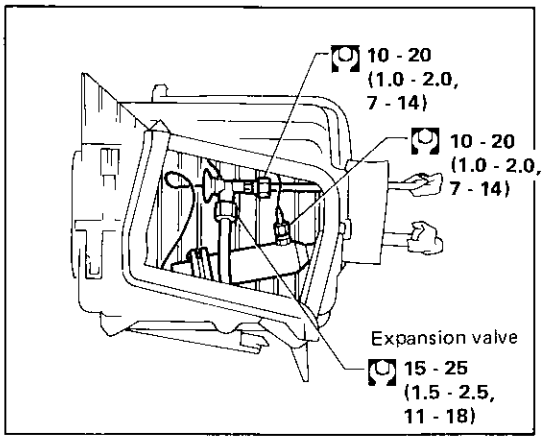



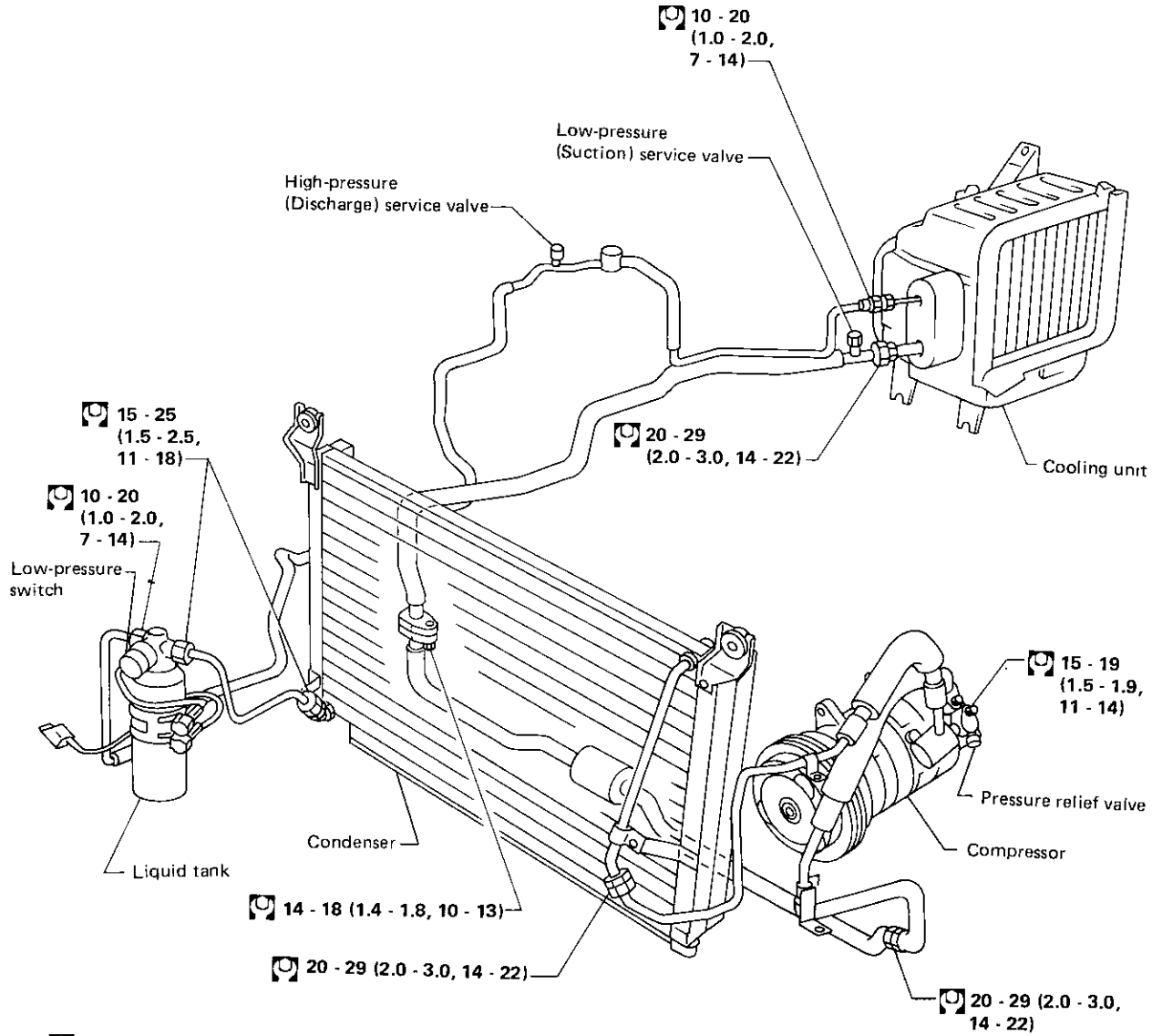

SHA499D

## Refrigerant Lines (Cont'd)

**Refer to "Precautions for Refrigerant Connection" on page HA-4.**

### VG30DETT ENGINE MODEL

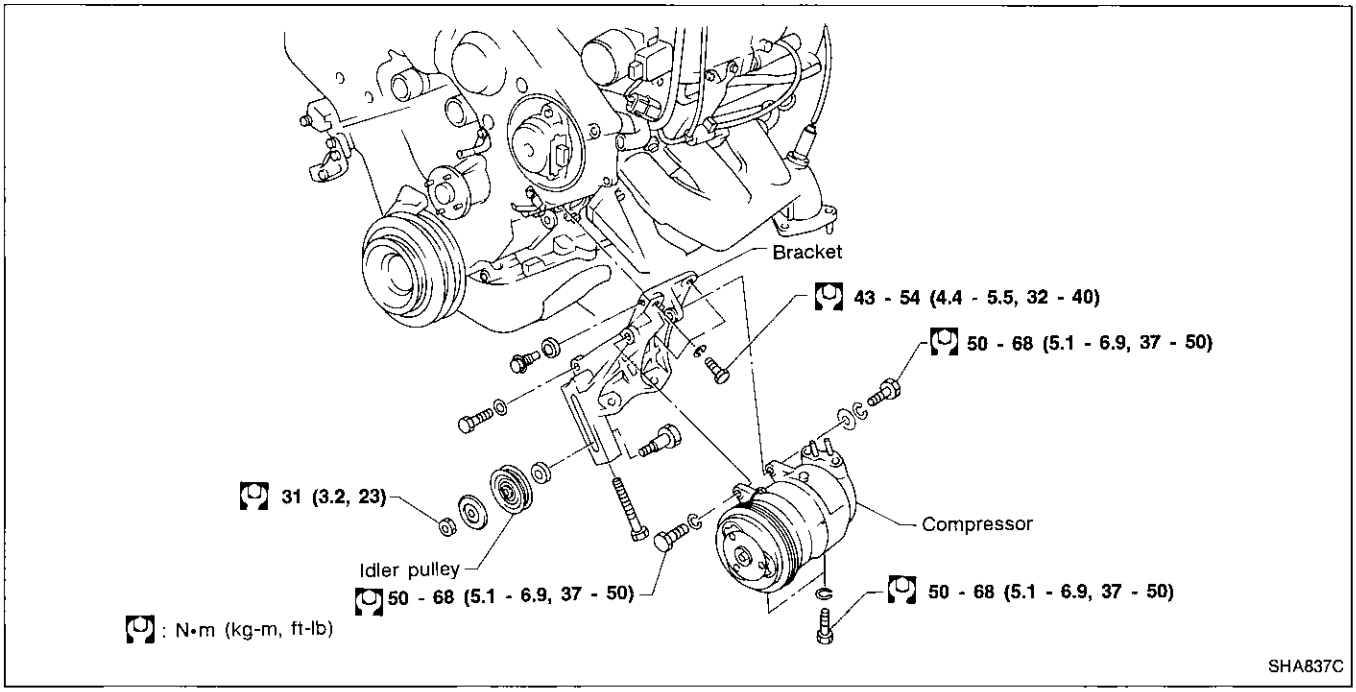



: N·m (kg-m, ft-lb)

SHA500D

## Compressor Mounting




## Belt Tension

- Refer to section MA.

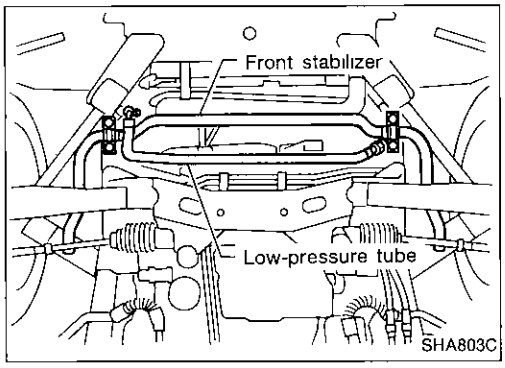
## Fast Idle Control Device (F.I.C.D.)

- Refer to section EF & EC.

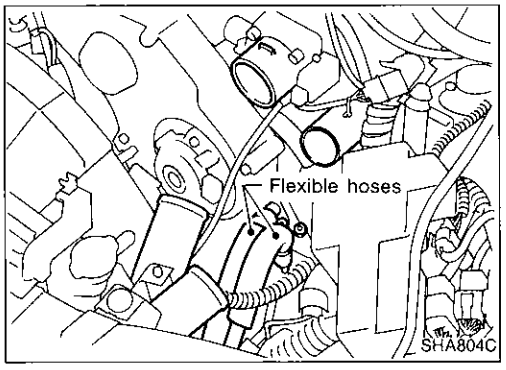
## Removal and Installation — Compressor

### REMOVAL

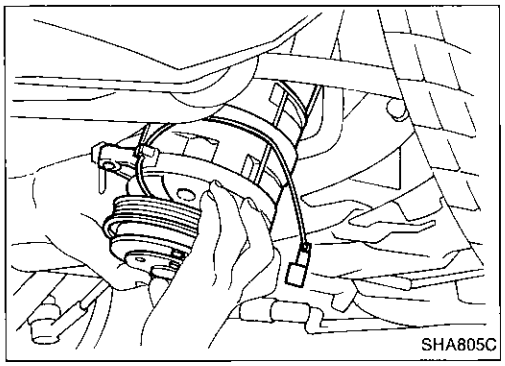
1. Disconnect battery cable.
2. Discharge refrigerant into your refrigerant recycling equipment.
3. Remove under cover.




4. Remove low pressure tube, front stabilizer bar and its clamps.
5. Loosen idler pulley nut and adjusting bolt.
   Remove idler pulley.




6. Remove air pipes and hoses to make room.
7. Remove two nuts to separate high and low pressure flexible hoses from compressor.
8. Disconnect compressor harness connector.
9. Remove two compressor fixing bolts (upper).




10. Remove two compressor fixing bolts (lower).
11. Remove the compressor as shown in the left-hand figure.

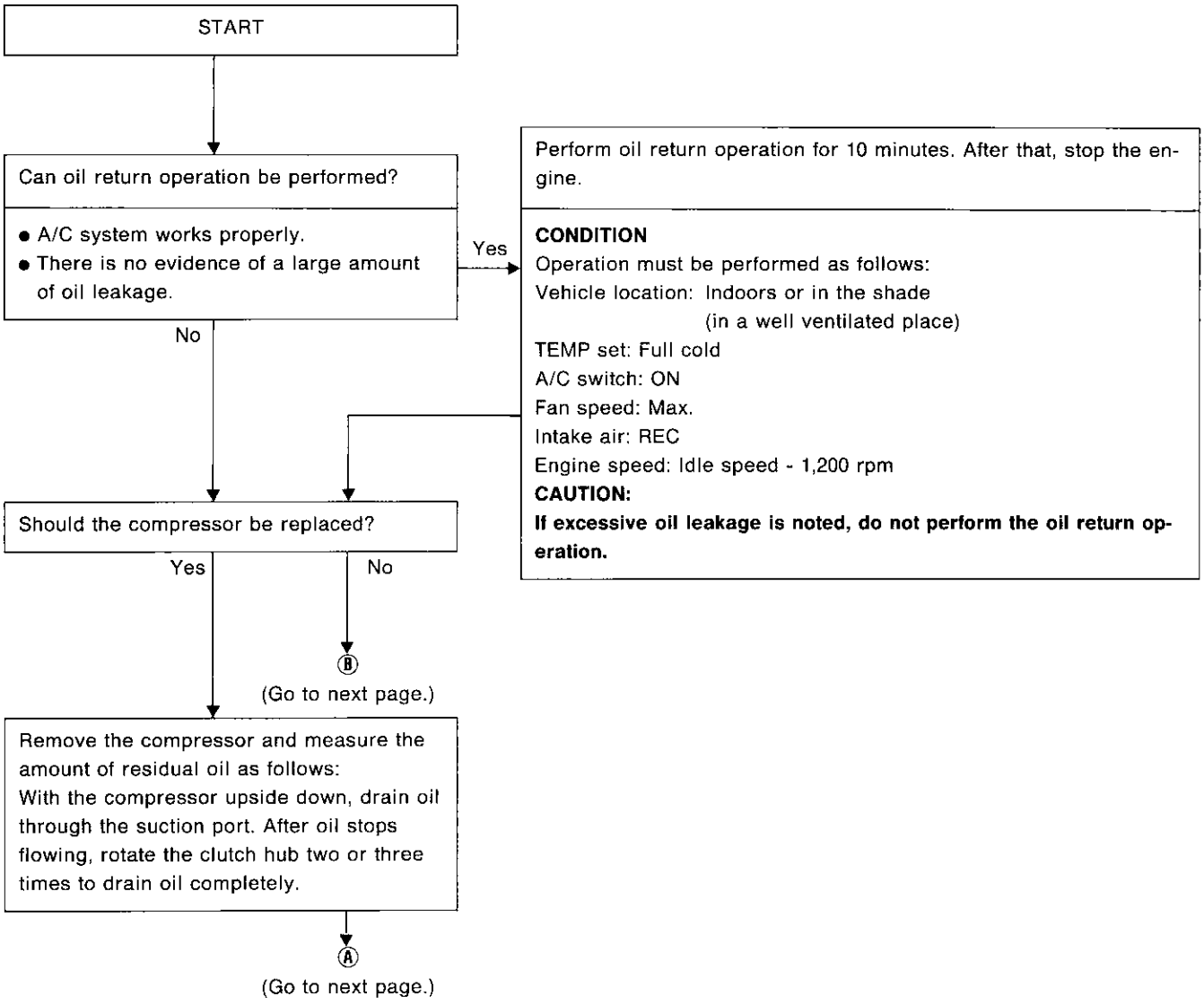
### INSTALLATION

Installation is the reverse order of removal. Tightening torque related to front stabilizer: refer to FA section.

## Maintenance of Oil Quantity in Compressor

The oil used to lubricate the compressor circulates through the system with the refrigerant. Whenever any component of the system is replaced or a large amount of gas leakage occurs, add oil to the compressor to maintain the specified amount.
If oil quantity is not maintained properly, the following malfunctions may result:

- Lack of oil: May lead to a seized compressor
- Excessive oil: Inadequate cooling (thermal exchange impeded)



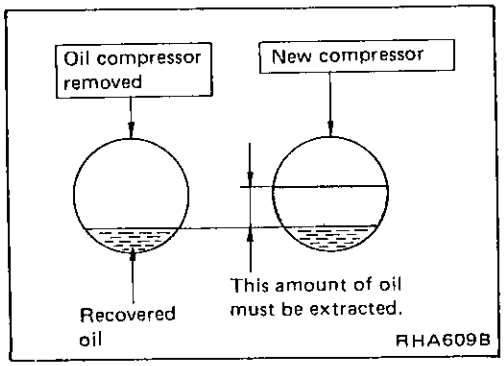
## Maintenance of Oil Quantity in Compressor (Cont'd)

Ⓐ

Decide on the amount of oil to be drained from the new compressor in accordance with the table on the right.

Extract as much oil as necessary from the new compressor.
(refer to the table at right.)

Ⓑ




A new compressor is charged with the specified amount of oil (the overall amount needed in the system). So some oil needs to be drained from a new compressor to ensure that the amount of oil in the compressor is the same as was in the old compressor.

**Amount of oil to be extracted from new compressor**

Unit: mℓ (US fl oz, Imp fl oz)

| Type | Pre-charged amount of oil in new compressor | Recovered amount of oil from old compressor | Amount of oil to be drained from new compressor |
|---|---|---|---|
| DKV14B<br>DKV14C | 200 (6.8, 7.0) | Less than 70 (2.4, 2.5) | 110 (3.7, 3.9) |
| | | Greater than 70 (2.4, 2.5) | 200 (6.8, 7.0) – [Recovered amount + 20 (0.7, 0.7)] |
| NVR140<br>NVR140S | 200 (6.8, 7.0) | Less than 90 (3.0, 3.2) | 90 (3.0, 3.2) |
| | | Greater than 90 (3.0, 3.2) | 200 (6.8, 7.0) – [Recovered amount + 20 (0.7, 0.7)] |
| DKS16H<br>DKS16N | 250 (8.5, 8.8) | Less than 190 (6.4, 6.7) | 60 (2.0, 2.1) |
| | | Greater than 190 (6.4, 6.7) | 250 (8.5, 8.8) – [Recovered amount + 20 (0.7, 0.7)] |
| MJS130<br>MJS170 | 150 (5.1, 5.3) | — | 80 (2.7, 2.8) |

**Precharged amount of oil for some models differs from figures listed above. Refer to S.D.S. of each model when servicing compressor oil.**

Ⓑ

Is there any part to be replaced?
(Evaporator, condenser, liquid tank or in case there is evidence of a large amount of oil leakage.)

Yes

No

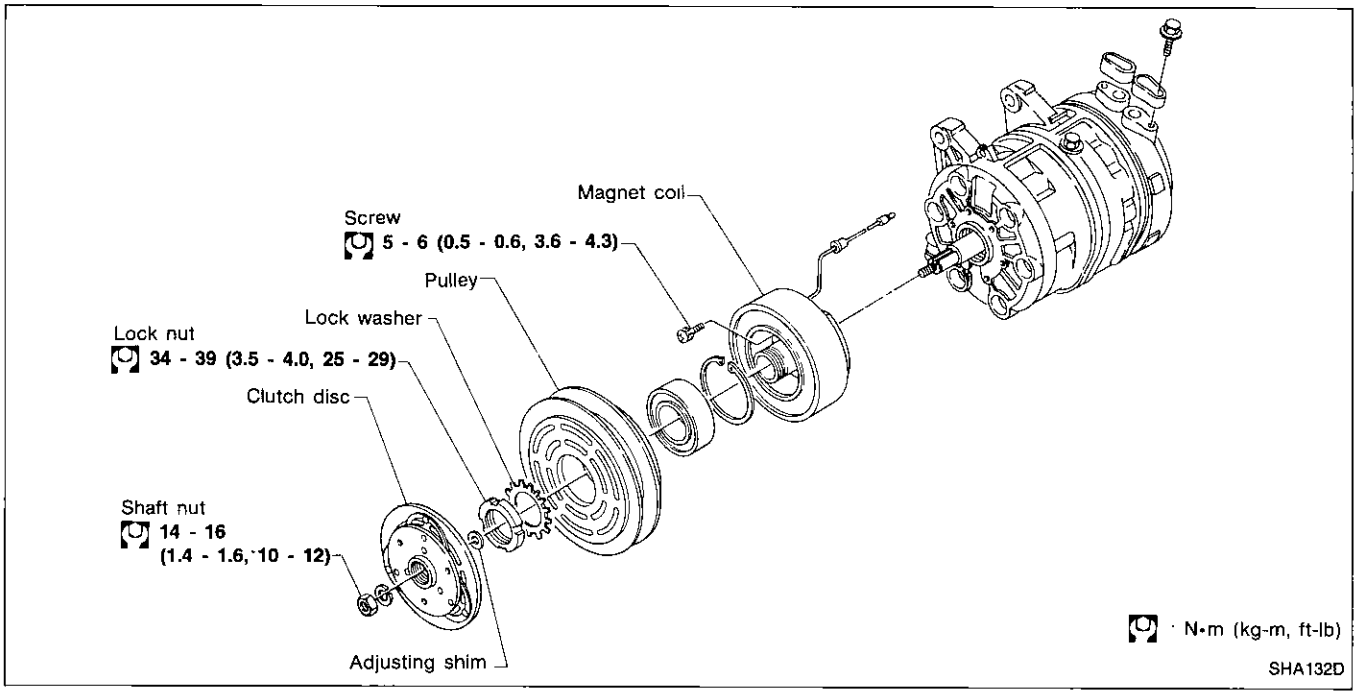
Carry out the A/C performance test.

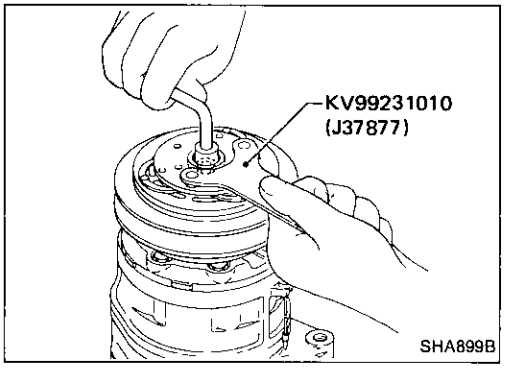
After replacing any of the following major components of the system, be sure to add the correct amount of oil to the system.

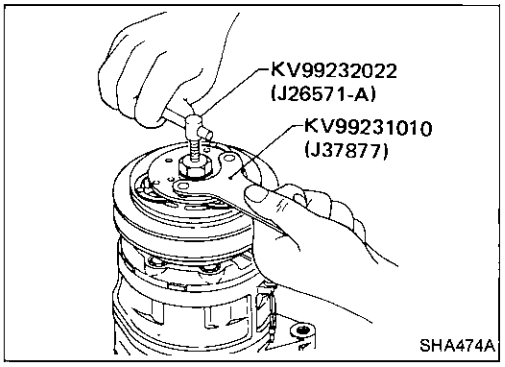
**Amount of oil to be added**

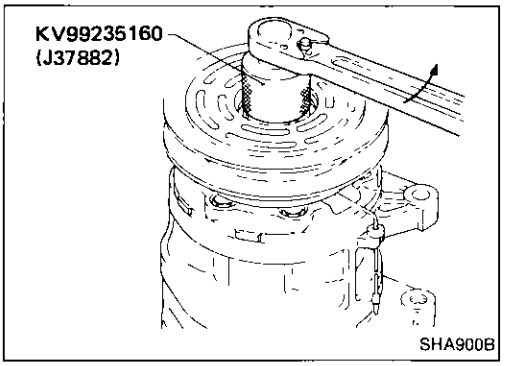
| Part replaced | Oil to be added to system | | Remarks |
|---|---|---|---|
| | Amount of oil mℓ (US fl oz, Imp fl oz) | Ratio (%) | |
| Evaporator | 45 - 75 (1.5 - 2.5, 1.6 - 2.6) | 30 | — |
| Condenser | 30 - 50 (1.0 - 1.7, 1.1 - 1.8) | 20 | — |
| Liquid tank | 15 - 25 (0.5 - 0.8, 0.5 - 0.9) | 10 | — |
| In case of refrigerant leak | 30 - 50 (1.0 - 1.7, 1.1 - 1.8) | — | Large leak |
| | — | — | Small leak* |

*: If refrigerant leak is small, no addition of oil is needed.
"Ratio" in this table indicates the ratio of added oil to the overall amount of oil needed in the system.



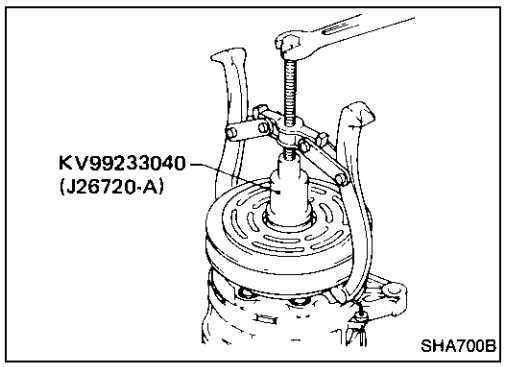




## Compressor Clutch

### REMOVAL

- When removing shaft nut, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed easily.
- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

## Compressor Clutch (Cont'd)




- Remove the pulley by hand. If difficult, use puller pilot.

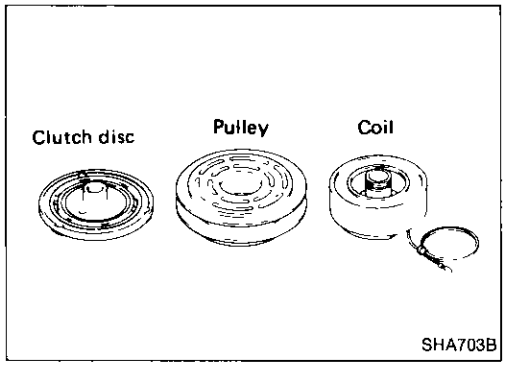
### INSPECTION

#### Clutch disc

If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

#### Pulley

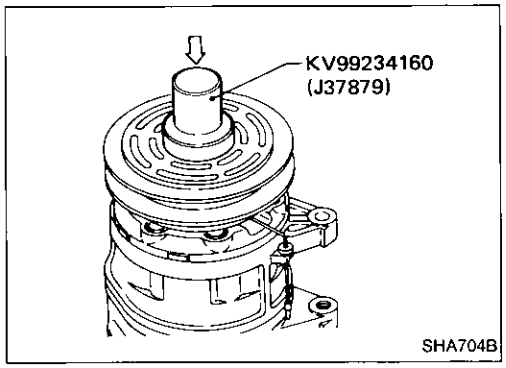
Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.



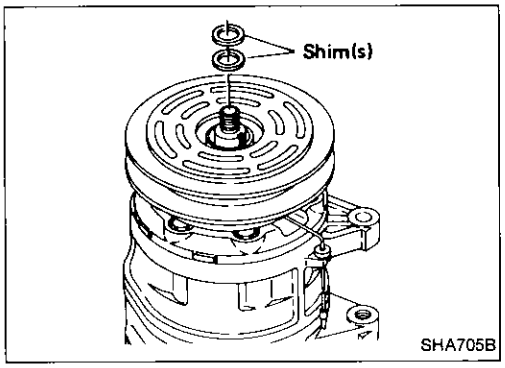

#### Coil

Check coil for loose connection or cracked insulation.

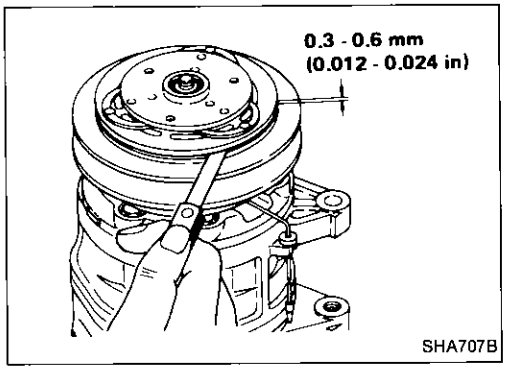
### INSTALLATION




- Install the key in the keyway on the compressor drive shaft.
- Install the coil to compressor (lead wire up) and tighten the mounting screws.
- Install the lead wire into the holder correctly.




- Install lock washer and nut with nut wrench.
- Bend one pawl of the lock washer up against the nut to prevent the nut from loosening.



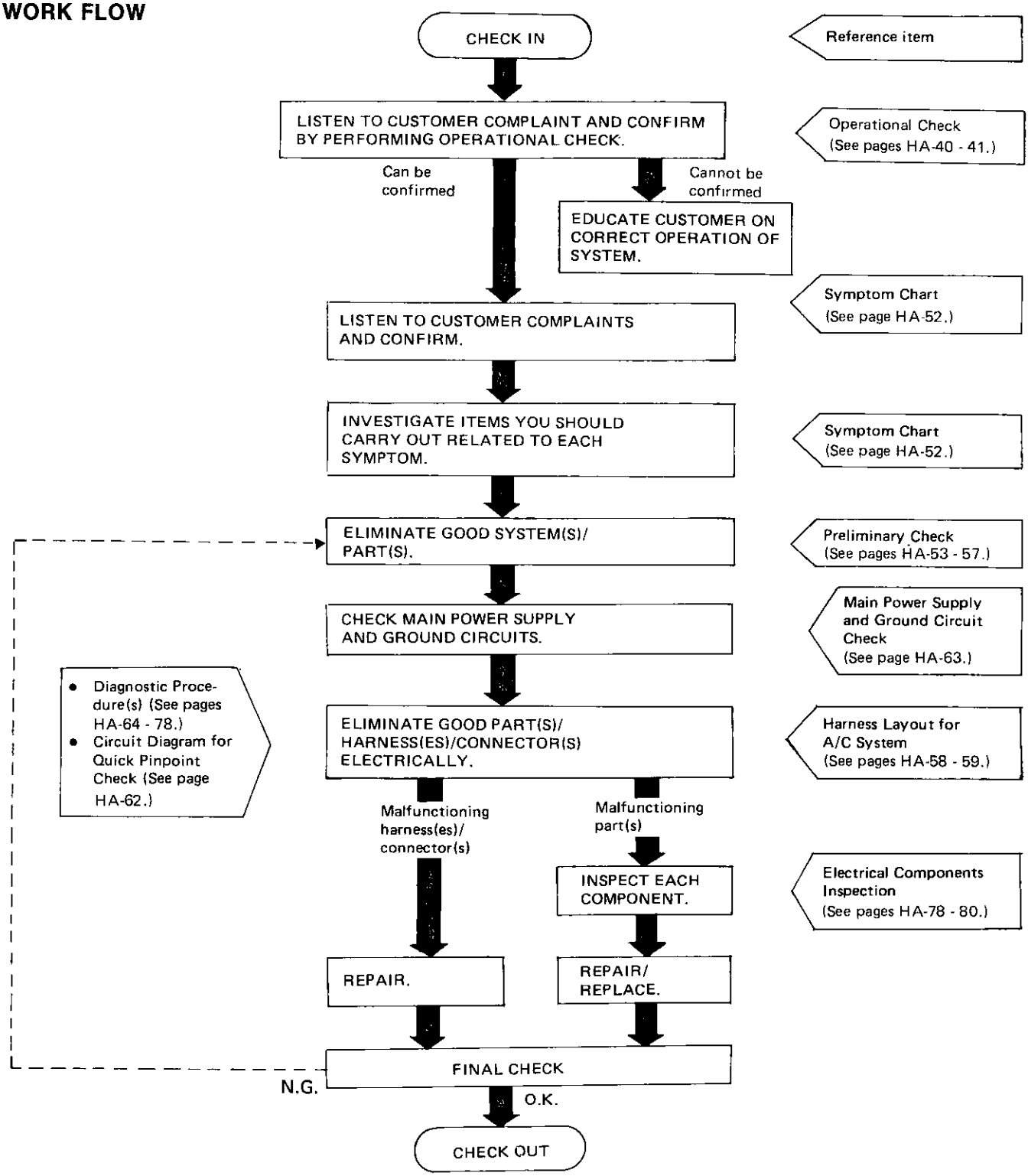

- Check to ensure that the clutch clearance is between 0.3 to 0.6 mm (0.012 to 0.024 in). Adjust the clearance using shim(s) as necessary.

### BREAK-IN OPERATION

When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times.
Break-in operation raises the level of transmitted torque.

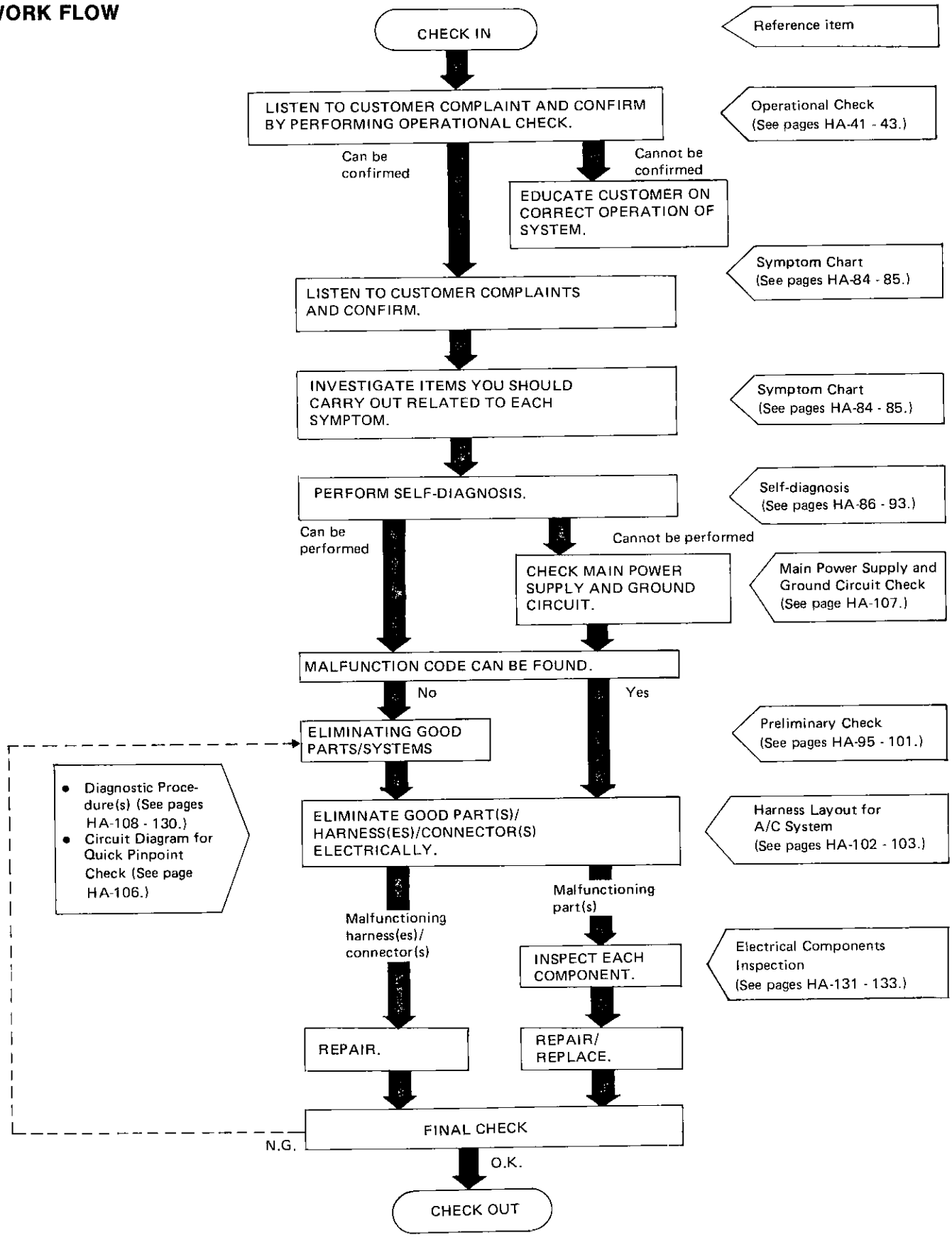
## How to Perform Trouble Diagnoses for Quick and Accurate Repair — Manual Air Conditioner

### WORK FLOW



## How to Perform Trouble Diagnoses for Quick and Accurate Repair — Auto Air Conditioner

### WORK FLOW

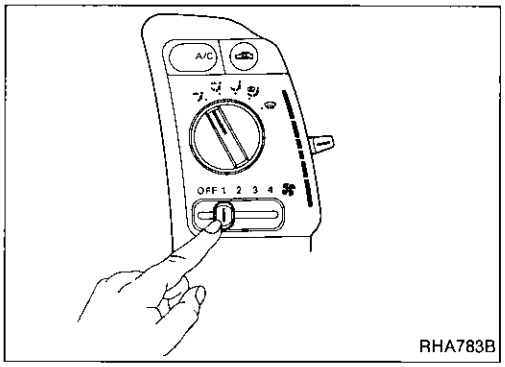


## Operational Check — Manual Air Conditioner

The purpose of the operational check is to confirm that the system operates as it should. The systems which are checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase.

**CONDITIONS:**

**Engine running at normal operating temperature.**

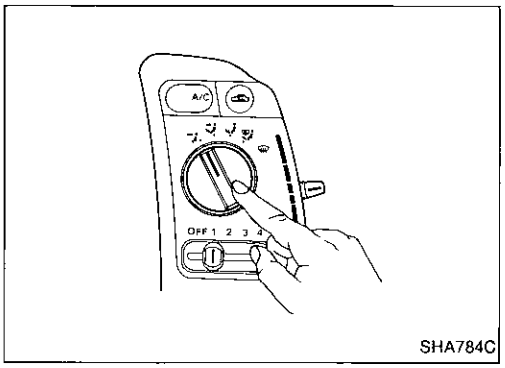


RHA783B

**PROCEDURE:**

### 1. Check blower

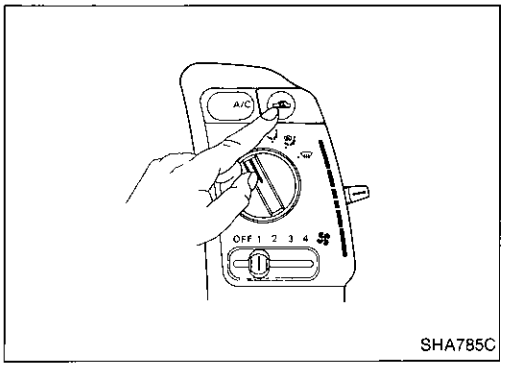
1) Slide Fan lever to 1-speed.
   Blower should operate on 1-speed.
2) Then slide Fan Lever to 2-speed.
3) Continue checking blower speed until all four speeds are checked.
4) Leave blower on 4-speed.



SHA784C

### 2. Check discharge air

1) Set Mode switch at VENT position.
2) Confirm that all discharge air comes out of face vents.
3) Set Mode switch at B/L position.
4) Confirm that discharge air comes out of face vents and foot vents.
5) Set Mode switch at FOOT position.
6) Confirm that discharge air comes out of foot vents, with some air from defroster vents.
7) Set Mode switch at F/D position.
8) Confirm that discharge air comes out of foot vents and defroster vents, and that compressor turns ON.
9) Set Mode switch at DEF position.
10) The discharge air should be coming only from defroster vents. At the same time intake door position should be at FRE.

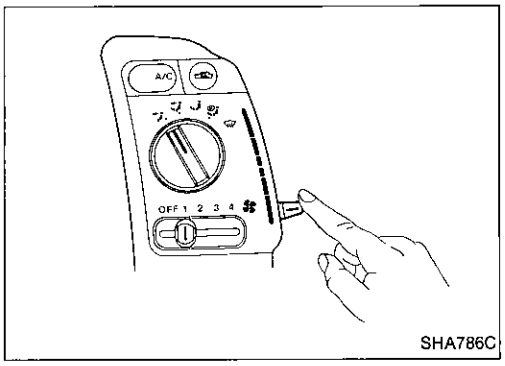


SHA785C

### 3. Check recirc

1) Press RECIRC button.
   RECIRC indicator should light.
2) Listen for intake door position change (you should hear blower sound change slightly).

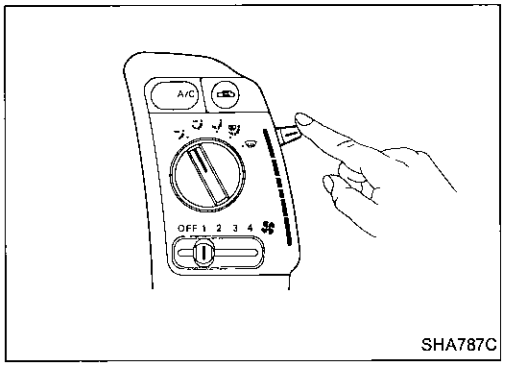
## Operational Check — Manual Air Conditioner (Cont'd)



SHA786C

**4. Check temperature decrease**

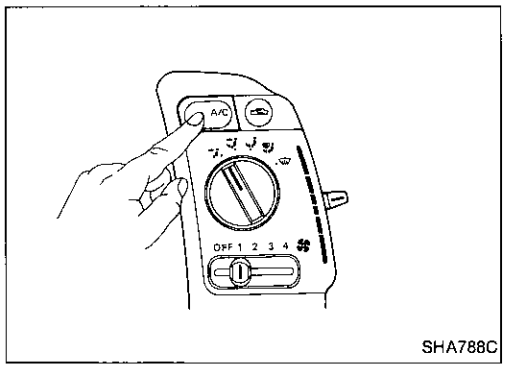
1) Slide temperature control lever to full cold.
2) Check for cold air at discharge air outlets.



SHA787C

**5. Check temperature increase**

1) Slide temperature control lever to full hot.
2) Check for hot air at discharge air outlets.



SHA788C

**6. Check air conditioner switch**

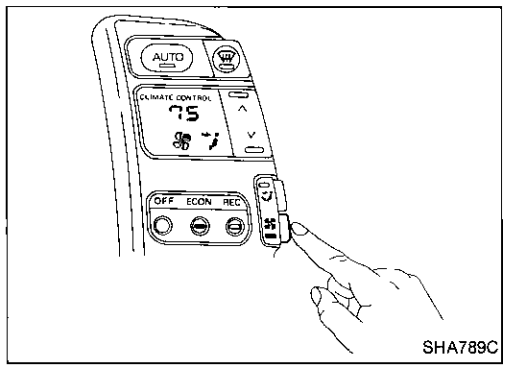
Move fan control lever to the desired (1 to 4-speed) position and push the air conditioner button to turn ON the air conditioner.
The indicator light should come on when air conditioner is ON.

## Operational Check — Auto Air Conditioner

The purpose of the operational check is to confirm that the system operates as it should. The systems which will be checked are the blower, mode (discharge air), ambient display, intake air, defrost, econ, auto, temperature decrease, temperature increase, and the memory function.

**CONDITIONS:**

**Engine running at normal operating temperature.**



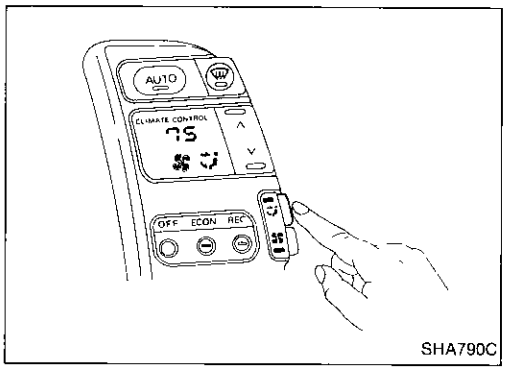
SHA789C

**PROCEDURE:**

**1. Check blower**

1) Press FAN switch one time.
ECON indicator should light.
Blower should operate on low speed, and the fan symbol should have one blade lit ( ).
2) Press FAN switch one more time.
3) Continue checking blower speed and fan symbol until all four speeds have been checked.
4) Leave blower on high speed.

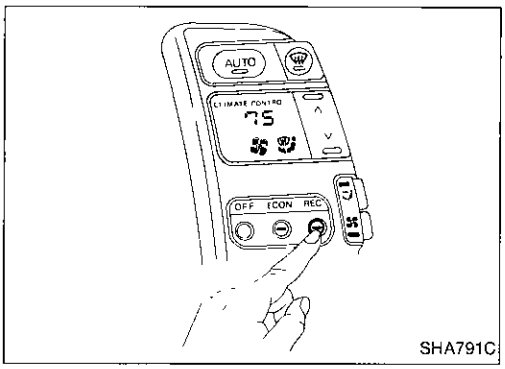
## Operational Check — Auto Air Conditioner (Cont'd)



SHA790C

### 2. Check discharge air

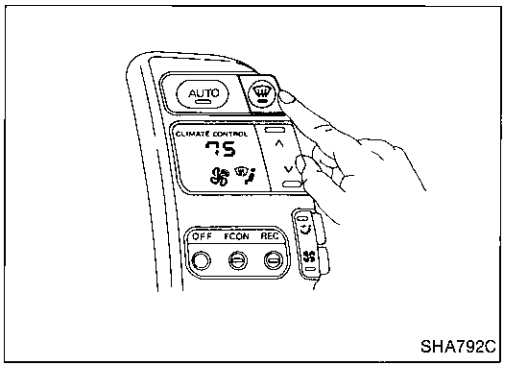
1) Press MODE switch one time.
   Display should show air to face ( ).
2) Confirm that all discharge air comes out of face vents.
3) Press MODE switch one more time.
   Display should show air to face and foot (bi-level) ( )
4) Confirm that discharge air comes out of face and foot vents.
5) Press MODE switch one more time.
   Display should show air to foot ( ).
6) Confirm that discharge air comes mostly from foot outlets, with some air from defroster outlets.
7) Press MODE switch one more time.
   Display should show air to foot and defroster ( ).
8) Confirm that discharge air comes out of foot vents and defroster vents.
9) Leave system in F/D mode.



SHA791C

### 3. Check recirc

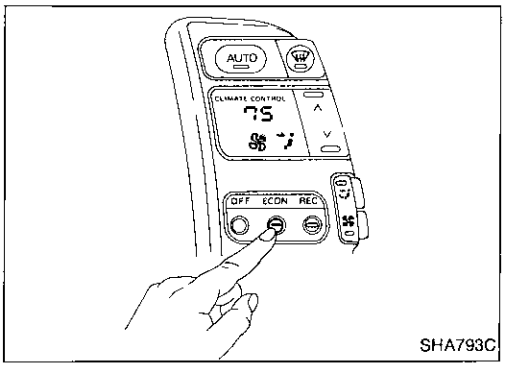
1) Press RECIRC switch.
   RECIRC indicator should light.
2) Listen for intake door position change (you should hear blower sound change slightly).



SHA792C

### 4. Check defrost

1) Press DEF switch.
2) Check that RECIRC, ECON, MODE and Fan are canceled. The discharge air should be coming only from defrost vents.
3) Confirm that compressor clutch is engaged (visual inspection).
   Display should show air to defroster ( ).

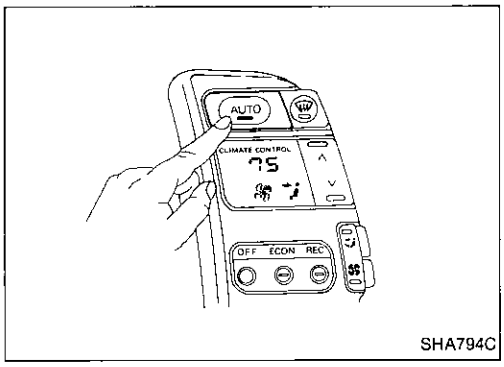


SHA793C

### 5. Check ECON mode

1) Press ECON switch.
   Defrost should be canceled.
   Discharge air outlet will depend on ambient, in-vehicle, and set temperatures.
2) Confirm that the compressor clutch is not engaged (visual inspection).

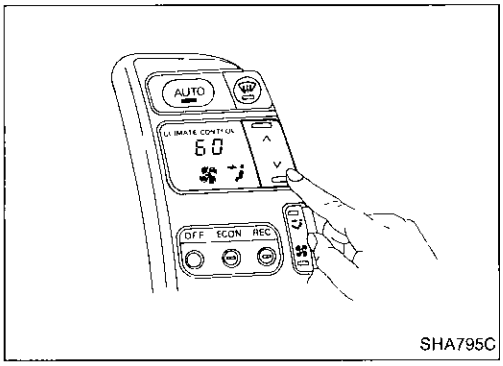
## Operational Check — Auto Air Conditioner (Cont'd)



SHA794C

### 6. Check AUTO mode

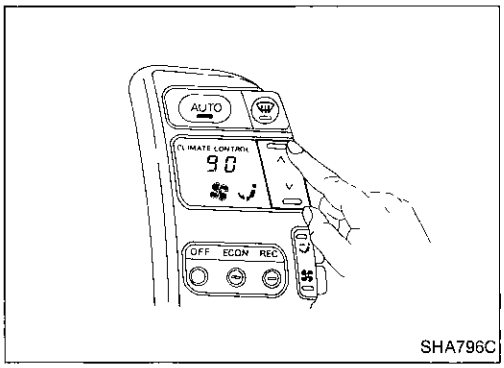
1) Press AUTO switch.
2) Confirm that compressor clutch engages (audio or visual inspection).
   Discharge air will depend on ambient, in-vehicle, and set temperatures.



SHA795C

### 7. Check temperature decrease

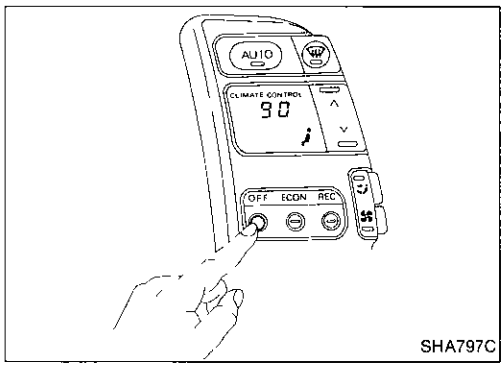
1) Press temperature set switch until 10°C (60°F) is displayed.
2) Listen for changes in blower speed as set temperature changes.
3) Check for cold air at discharge air outlets.



SHA796C

### 8. Check temperature increase

1) Press temperature set switch until 40°C (90°F) is displayed.
2) Listen for changes in blower speed as set temperature changes.
3) Check for hot air at discharge air outlets.



SHA797C

### 9. Check memory function

1) Press off button.
2) Turn ignition off.
3) Wait 15 seconds.
4) Turn ignition on.
5) Press AUTO button.
6) Confirm that the set temperature remained at 40°C (90°F).

## Performance Chart

### TEST CONDITION — For Manual Air Conditioner

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)
Doors: Closed
Door windows: Open
Hood: Open
TEMP. lever position: Max. COLD
Mode switch: (Ventilation) set
REC switch: (Recirculation) set
FAN level position: Max. position
Engine speed: 1,500 rpm
Time required before starting testing after air conditioner starts operating: More than 10 minutes

### TEST CONDITION — For Auto Air Conditioner

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)
Doors: Closed
Door windows: Open
Hood: Open

Set up ACTIVE-TEST with CONSULT and set each component as follows:
Mode door: VENT
Intake door: REC
Air mix door: Full-cold
Compressor: ON
Blower motor: 12V

Set up self-diagnosis STEP 2 and set code .

## Performance Chart (Cont'd)

### TEST READING

**Recirculating-to-discharge air temperature table**

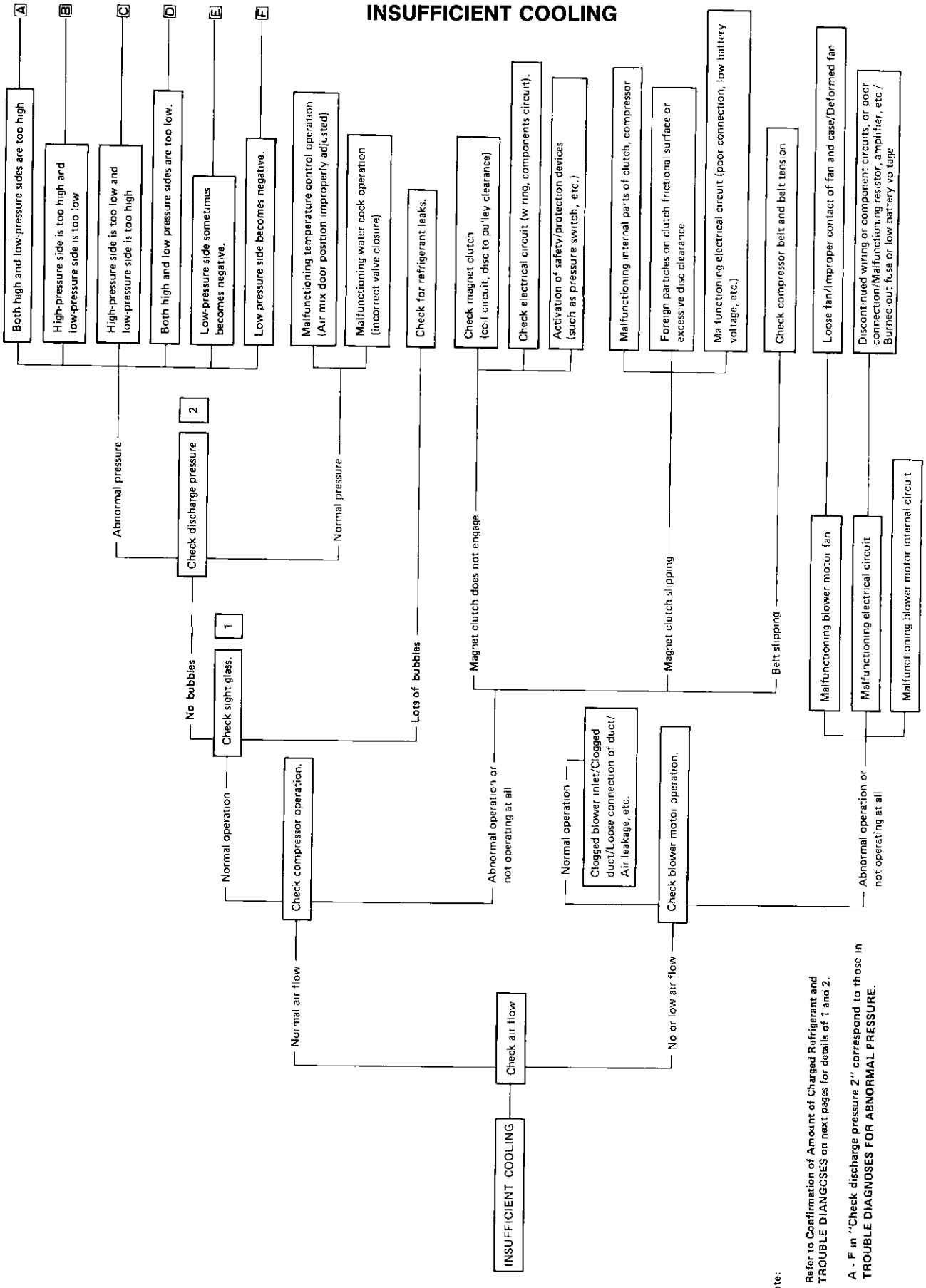
| Inside air (Recirculating air) at blower assembly inlet | | Discharge air temperature at center ventilator °C (°F) |
|---|---|---|
| Relative humidity % | Air temperature °C (°F) | |
| 50 - 60 | 20 (68) | 5.9 - 7.8 (43 - 46) |
| | 25 (77) | 8.0 - 10.7 (46 - 51) |
| | 30 (86) | 11.0 - 14.4 (52 - 58) |
| | 35 (95) | 14.8 - 19.4 (59 - 67) |
| 60 - 70 | 20 (68) | 7.8 - 9.9 (46 - 50) |
| | 25 (77) | 10.7 - 13.6 (51 - 56) |
| | 30 (86) | 14.4 - 18.2 (58 - 65) |
| | 35 (95) | 19.4 - 24.8 (67 - 77) |

**Ambient air temperature-to-compressor pressure table**

| Ambient air | | High-pressure (Discharge side) kPa (kg/cm$^2$, psi) | Low-pressure (Suction side) kPa (kg/cm$^2$, psi) |
|---|---|---|---|
| Relative humidity % | Air temperature °C (°F) | | |
| 50 - 70 | 20 (68) | 608 - 912 (6.2 - 9.3, 88 - 132) | 177 - 245 (1.8 - 2.5, 26 - 36) |
| | 25 (77) | 814 - 1,147 (8.3 - 11.7, 118 - 166) | 186 - 255 (1.9 - 2.6, 27 - 37) |
| | 30 (86) | 1,020 - 1,402 (10.4 - 14.3, 148 - 203) | 196 - 265 (2.0 - 2.7, 28 - 38) |
| | 35 (95) | 1,236 - 1,638 (12.6 - 16.7, 179 - 237) | 226 - 314 (2.3 - 3.2, 33 - 46) |

## Performance Test Diagnoses

### INSUFFICIENT COOLING




Note:

1) Refer to Confirmation of Amount of Charged Refrigerant and TROUBLE DIANGOSES on next pages for details of 1 and 2.

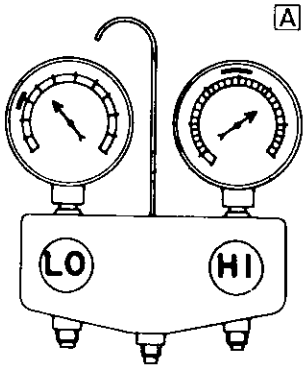
2) A - F in "Check discharge pressure 2" correspond to those in TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE.

## Performance Test Diagnoses (Cont'd)

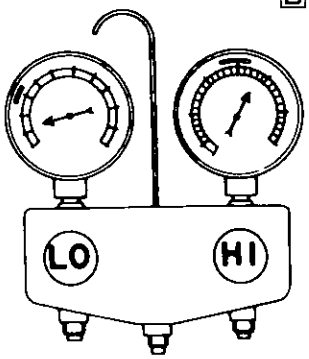
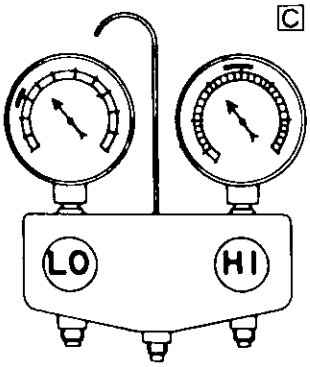
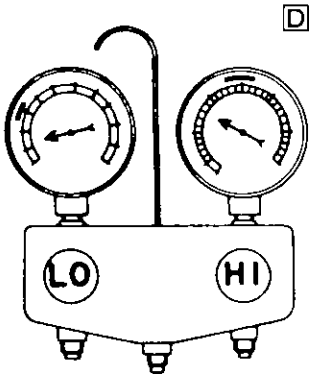
### TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE

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.

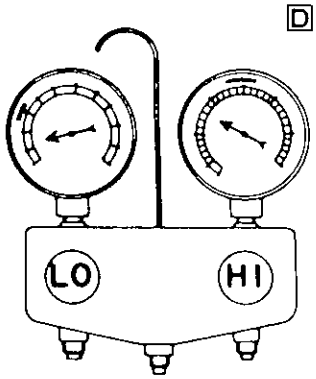
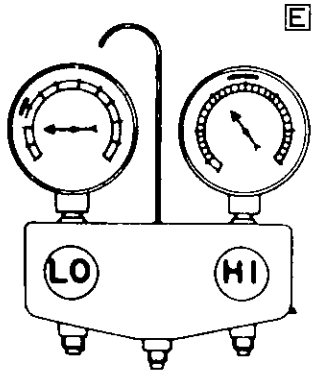
**Pressure measurements are effective only when ambient temperature is in the range indicated under the heading "INSPECTION DATA (2) Measurement of compressor's high and low pressures".**

| Gauge indication | Refrigerant cycle | Probable cause | Corrective action |
|---|---|---|---|
| Both high and low-pressure sides are too high.<br>  <br><br>AC359A | • Pressure is reduced soon after water is splashed on condenser.<br>• No air bubbles appear in sight glass when pressure is reduced. | Excessive refrigerant charge in refrigeration cycle | Reduce refrigerant until specified pressure is obtained. |
| | Air suction by radiator or condenser fan is insufficient. | Insufficient condenser cooling performance<br>↓<br>① Condenser fan are clogged.<br>② Improper rotation of radiator fan or condenser fan | • Clean condenser.<br>• Check and repair radiator or condenser fan as necessary. |
| | • Low-pressure pipe is not cold.<br>• 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<br>(After compressor operation stops, high pressure decreases too slowly.)<br>↓<br>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.<br>• Plates are sometimes covered with frost. | • Excessive liquid refrigerant on low-pressure side<br>• Excessive refrigerant discharge flow<br>• Expansion valve is open a little compared with the specification.<br>↓<br>① Improper thermal valve installation<br>② Improper expansion valve adjustment | Replace expansion valve. |

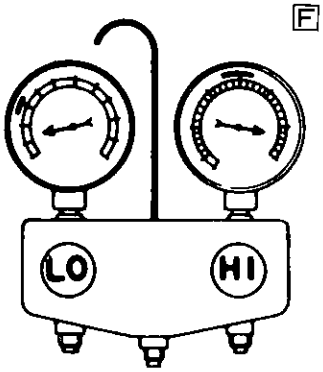
## Performance Test Diagnoses (Cont'd)

| Gauge indication | Refrigerant cycle | Probable cause | Corrective action |
|---|---|---|---|
| High-pressure side is too high and low-pressure side is too low.<br>B<br>  <br><br>AC360A | Upper side of condenser and high-pressure side are hot, however, liquid tank is not so hot. | High-pressure tube or parts located between compressor and condenser are clogged or crushed. | • Check and repair or replace malfunctioning parts.<br>• Check compressor oil for contamination. |
| High-pressure side is too low and low-pressure side is too high.<br>C<br>  <br><br>AC356A | High and low-pressure sides become equal soon after compressor operation stops. | Compressor pressure operation is improper.<br>↓<br>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.<br>D<br>  <br><br>AC353A | • There is a big temperature difference between liquid tank outlet and inlet. Outlet temperature is extremely low.<br>• Liquid tank inlet and expansion valve are frosted. | Liquid tank inside is clogged a little. | • Replace liquid tank<br>• Check compressor oil for contamination. |
| | • Temperature of expansion valve inlet is extremely low as compared with areas near liquid tank.<br>• Expansion valve inlet may be frosted.<br>• Temperature difference occurs somewhere in high-pressure side | High-pressure pipe located between liquid tank and expansion valve is clogged. | • Check and repair malfunctioning parts.<br>• 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.<br>D<br>  <br><br>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.<br>↓<br>① Improper expansion valve adjustment<br>② Malfunctioning thermal valve<br>③ Outlet and inlet may be clogged. | • Remove foreign particles by using compressed air.<br>• 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.<br>• Check compressor oil for contamination. |
| | Air flow volume is not enough or is too low. | Evaporator is frozen.<br>↓<br>Compressor discharge capacity does not change. (Compressor stroke is set at maximum length.) | Replace compressor. |
| Low-pressure side sometimes becomes negative.<br>E<br>  <br><br>AC354A | • Air conditioning system does not function and does not cyclically cool the compartment air.<br>• The system constantly functions for a certain period of time after compressor is stopped and restarted. | Refrigerant does not discharge cyclically.<br>↓<br>Moisture is frozen at expansion valve outlet and inlet.<br>↓<br>Water is mixed with refrigerant. | • Drain water from refrigerant or replace refrigerant.<br>• Replace liquid tank. |

## Performance Test Diagnoses (Cont'd)

| Gauge indication | Refrigerant cycle | Probable cause | Corrective action |
|---|---|---|---|
| Low-pressure side becomes negative.<br>F<br>  <br><br>AC362A | Liquid tank or front/rear side of expansion valve's pipe is frosted or dewed. | High-pressure side is closed and refrigerant does not flow.<br>↓<br>Expansion valve or liquid tank is frosted. | After the system is left at rest, start it again in order to confirm whether or not problem is caused by water or foreign particles.<br>● If the problem is due to water, drain water from refrigerant or replace refrigerant.<br>● If it is due to foreign particles, remove expansion valve and remove them with dry and compressed air.<br>● If either of the above methods cannot correct the problem, replace expansion valve.<br>● Replace liquid tank.<br>● Check compressor oil for contamination. |

## Contents

**Symptom Chart** ..... HA-52
**Preliminary Check** ..... HA-53
PRELIMINARY CHECK 1
(Intake door is not set at "FRESH" in DEF mode) ..... HA-53
PRELIMINARY CHECK 2
(A/C does not blow cold air) ..... HA-54
PRELIMINARY CHECK 3
(Magnet clutch does not engage in FOOT & DEF or DEF modes) ..... HA-55
PRELIMINARY CHECK 4
(Air outlet does not change) ..... HA-56
PRELIMINARY CHECK 5
(Noise) ..... HA-57
PRELIMINARY CHECK 6
(Insufficient heating) ..... HA-57
**Harness Layout for A/C system** ..... HA-58
**Wiring Diagram** ..... HA-60
**Circuit Diagram for Quick Pinpoint Check** ..... HA-62
**Main Power Supply and Ground Circuit check** ..... HA-63
**Diagnostic Procedure 1**
(Blower motor does not rotate) ..... HA-64
**Diagnostic Procedure 2**
(Air outlet does not change) ..... HA-66
**Diagnostic Procedure 3**
(Intake door does not charge in VENT, B/L or FOOT modes) ..... HA-68
**Diagnostic Procedure 4**
(Magnet clutch does not engage when A/C switch and fan switch are ON) ..... HA-69
**Diagnostic Procedure 5**
(Illumination or control panel indicators do not come on) ..... HA-73
**Diagnostic Procedure 6**
(Temperature of air outlet does not change) ..... HA-77
**Electrical Component Inspection** ..... HA-78
**Control Linkage Adjustment** ..... HA-80

## Symptom Chart

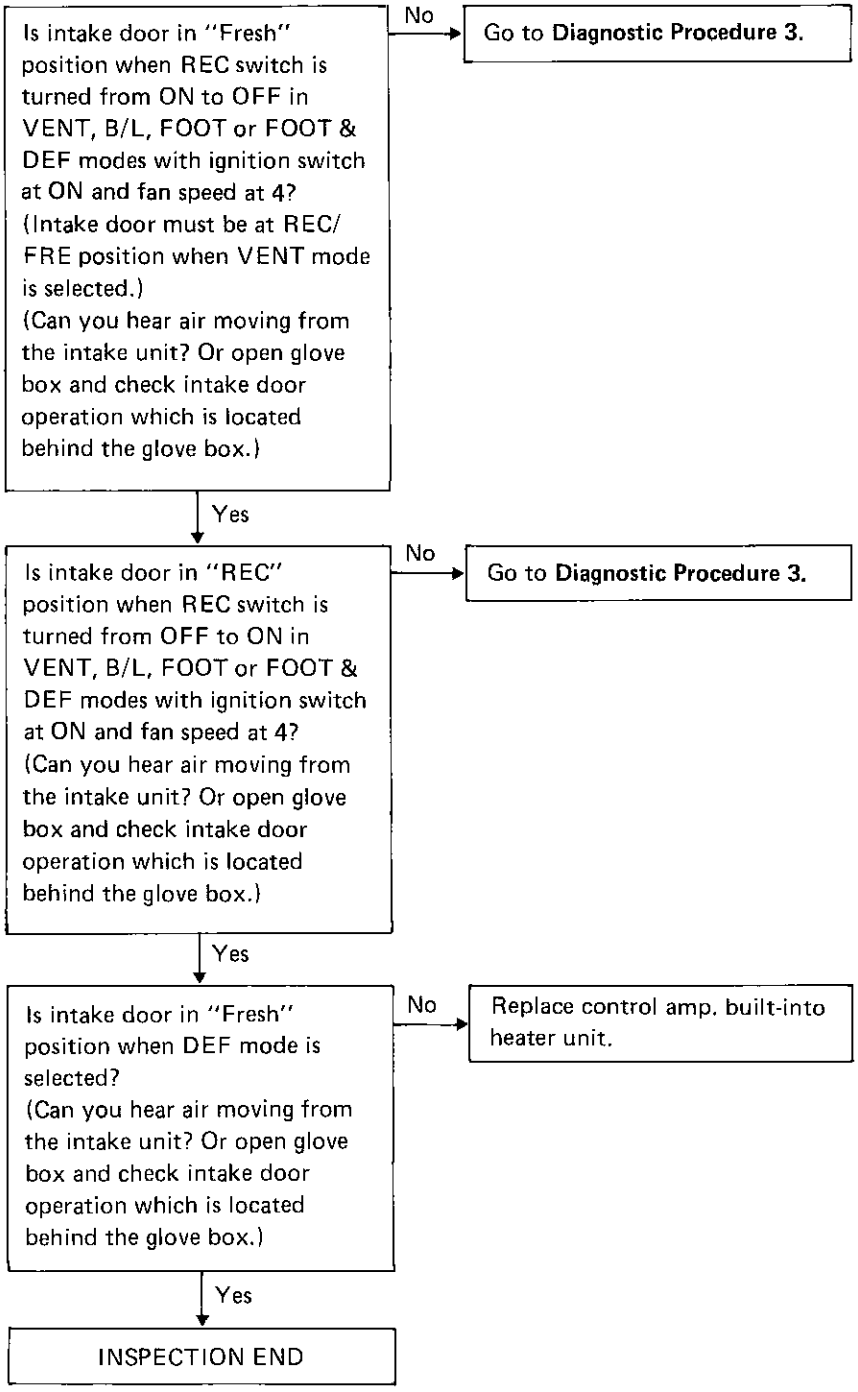
### DIAGNOSTIC TABLE

| PROCEDURE | Preliminary check | | | | | | Diagnostic Procedure | | | | | | Main power supply and Ground circuit check | | Electrical components inspection | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REFERENCE PAGE | HA 53 | HA-54 | HA 55 | HA 56 | HA-57 | HA-57 | HA-64 - 65 | HA-66 - 67 | HA-68 | HA 69 72 | HA-73 76 | HA-77 - 78 | HA-63 | HA-63 | HA-78 | HA-78 | HA-78 | HA-79 | HA-79 | HA-79 | HA-80 | HA 80 | — | — | — | — | — |
| SYMPTOM | Preliminary check 1 | Preliminary check 2 | Preliminary check 3 | Preliminary check 4 | Preliminary check 5 | Preliminary check 6 | Diagnostic procedure 1 | Diagnostic procedure 2 | Diagnostic procedure 3 | Diagnostic procedure 4 | Diagnostic procedure 5 | Diagnostic procedure 6 | Control amp. | Fuses | Fan switch | Blower motor | Blower resistor | A/C switch | Low pressure switch | RELAYS | MODE switch | THERMO CONTROL AMP. | Air mix door motor | Mode door motor | Intake door motor | Compressor | Harness |
| A/C does not blow cold air. | | ❶ | | | | | ○ | | | ○ | | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | | | | | | ○ | ○ |
| Insufficient heating | | | | | | ❶ | ○ | | | | | ○ | ○ | | | ○ | ○ | | | | | | ○ | | | | ○ |
| Blower motor does not rotate. | | ❶ | | | | | ❷ | | | | | | ○ | ○ | | ○ | ○ | | | | | | | | | | |
| Air outlet does not change. | | | | ❶ | | | | ❷ | | | | | ○ | ○ | | | | | | | ○ | | | ○ | | | ○ |
| Intake door does not change in VENT, B/L or FOOT modes. | | | | | | | | | ❶ | | | | ○ | ○ | | | | | | | | | | | ○ | | ○ |
| Intake door is not set at "FRESH" in DEF mode. | ❶ | | | | | | | | ○ | | | | ○ | ○ | | | | | | | | | | | ○ | | ○ |
| Magnet clutch does not engage when A/C switch and fan switch are ON. | | ❶ | | | | | | | | ❷ | | | | | | | | | ○ | ○ | | ○ | | | | ○ | |
| Magnet clutch does not engage in FOOT & DEF or DEF mode. | | ❶ | ❷ | | | | | | | ○ | | | | ○ | ○ | | | ○ | ○ | ○ | | | | | | ○ | ○ |
| Illumination or indicators on switch panel do not come on. | | | | | | | | | | | ❶ | | | ○ | | | | | | | | | | | | | ○ |
| Noise | | | | | ❶ | | | | | | | | | | | | | | | | | | | | | | |

## Preliminary Check

### PRELIMINARY CHECK 1

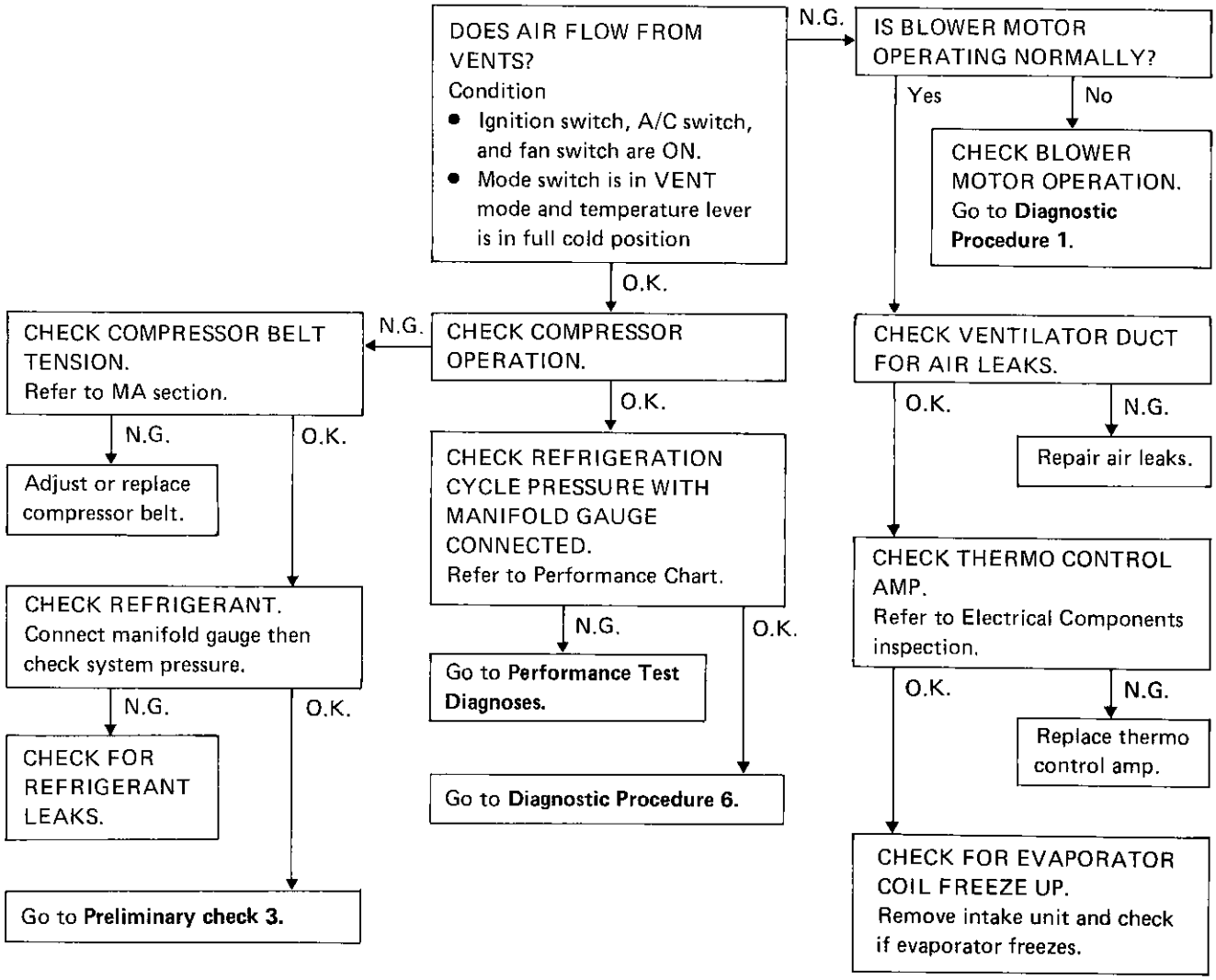
**Intake door is not set at "FRESH" in DEF mode.**



## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 2

**A/C does not blow cold air.**

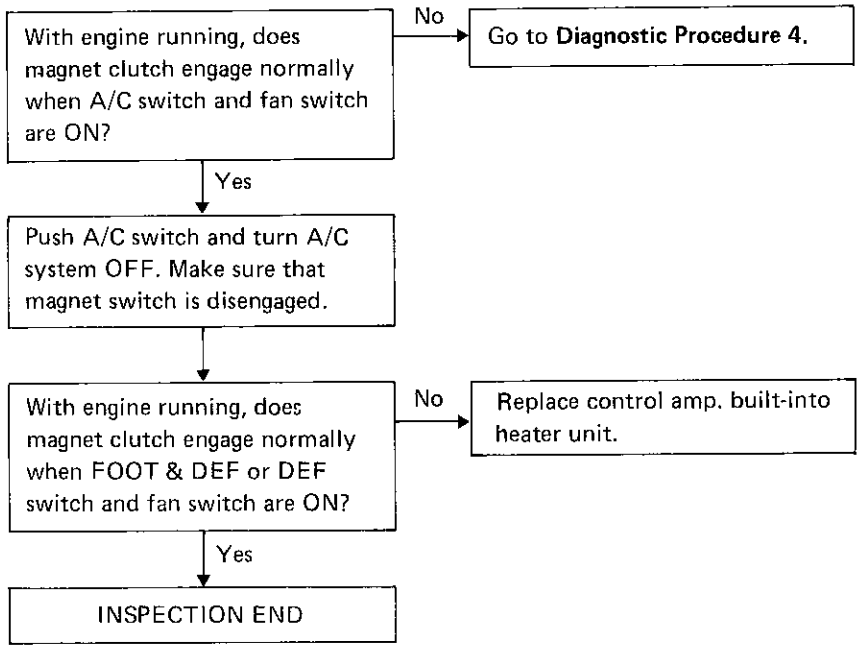


## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 3

**Magnet clutch does not engage in FOOT & DEF or DEF modes.**

- **Perform PRELIMINARY CHECK 2 and 4 before referring to the following flow chart.**



## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 4

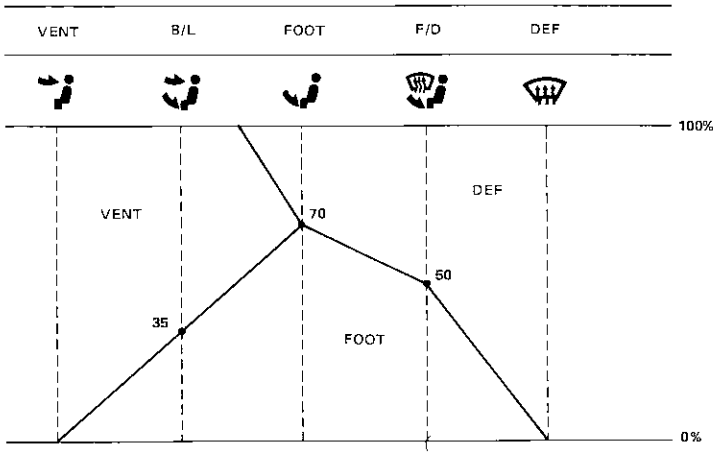
**Air outlet does not change.**

DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS SELECTED WITH IGNITION SWITCH AT ON?

No → **Go to Diagnostic Procedure 2 .**

| Switch | Air outlet |
|---|---|
| Mode | VENT |
| | FOOT & VENT |
| | FOOT & DEF |
| | FOOT & DEF |
| | DEF |

**AIR DISTRIBUTION RATIOS**



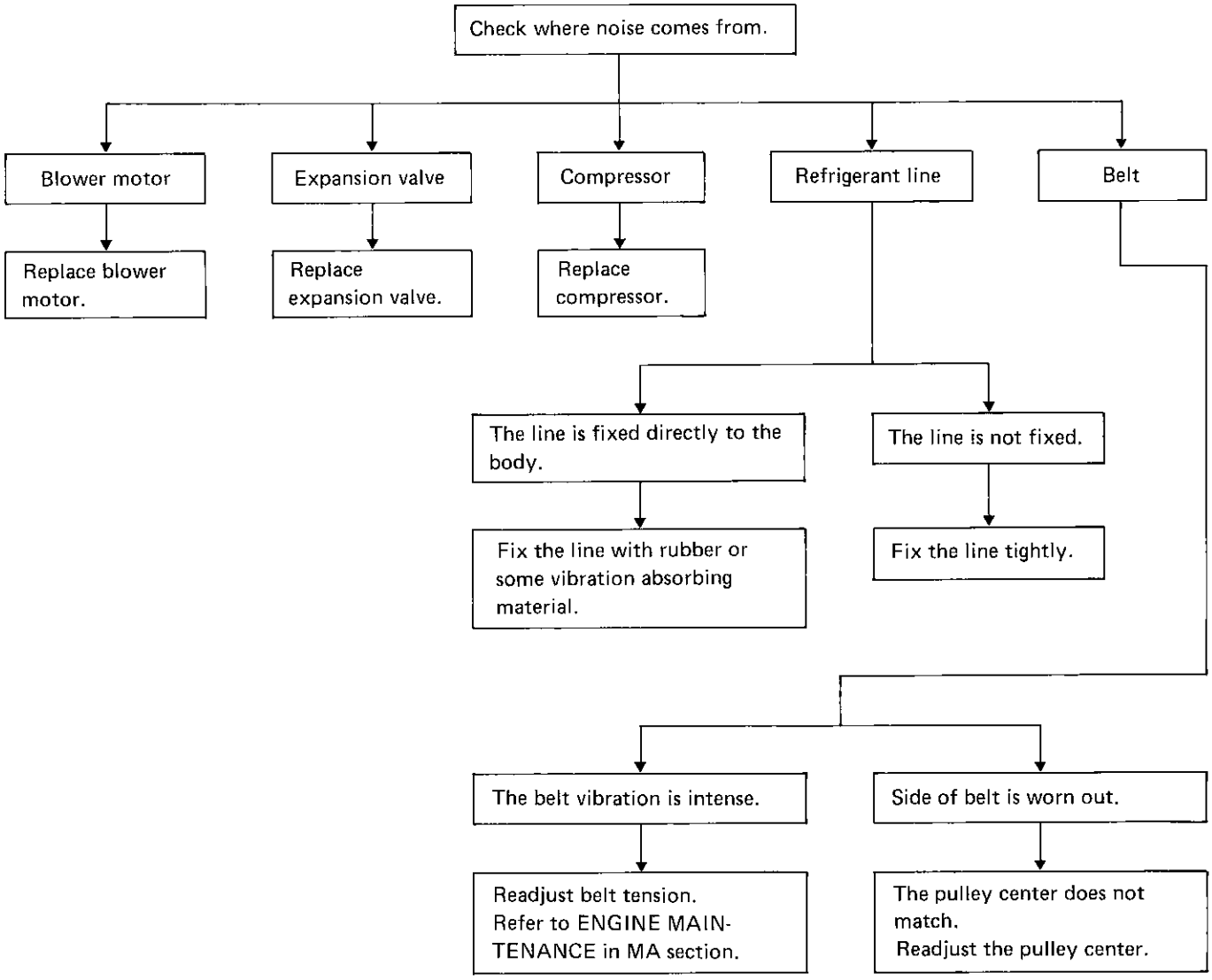

Yes

INSPECTION END

## Preliminary Check (Cont'd)

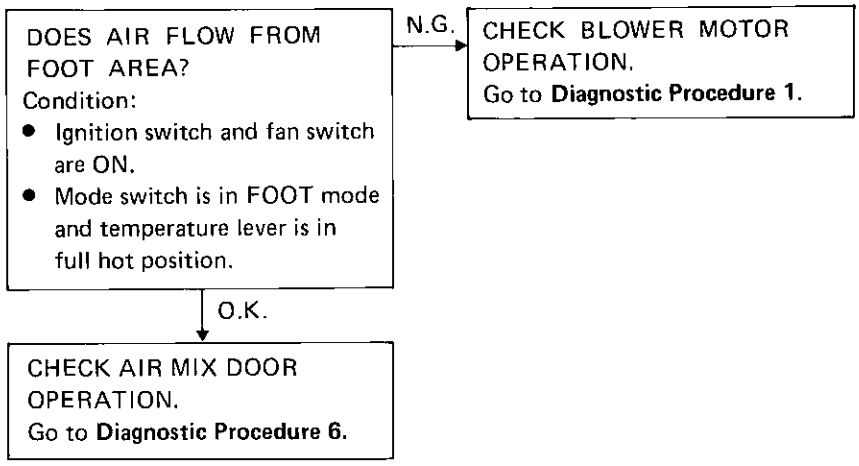
### PRELIMINARY CHECK 5

**Noise**



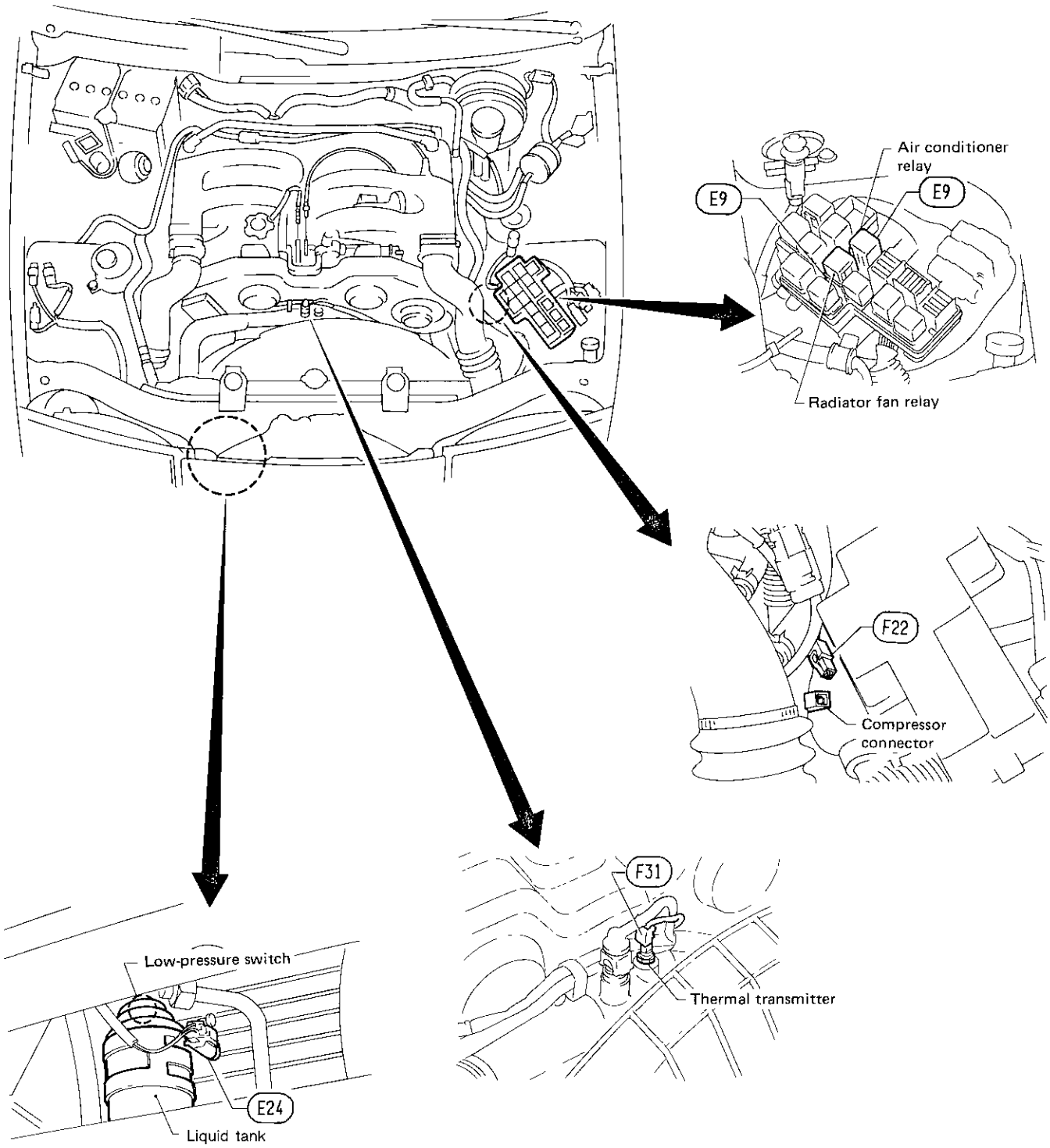

### PRELIMINARY CHECK 6

**Insufficient heating**



## Harness Layout for A/C System

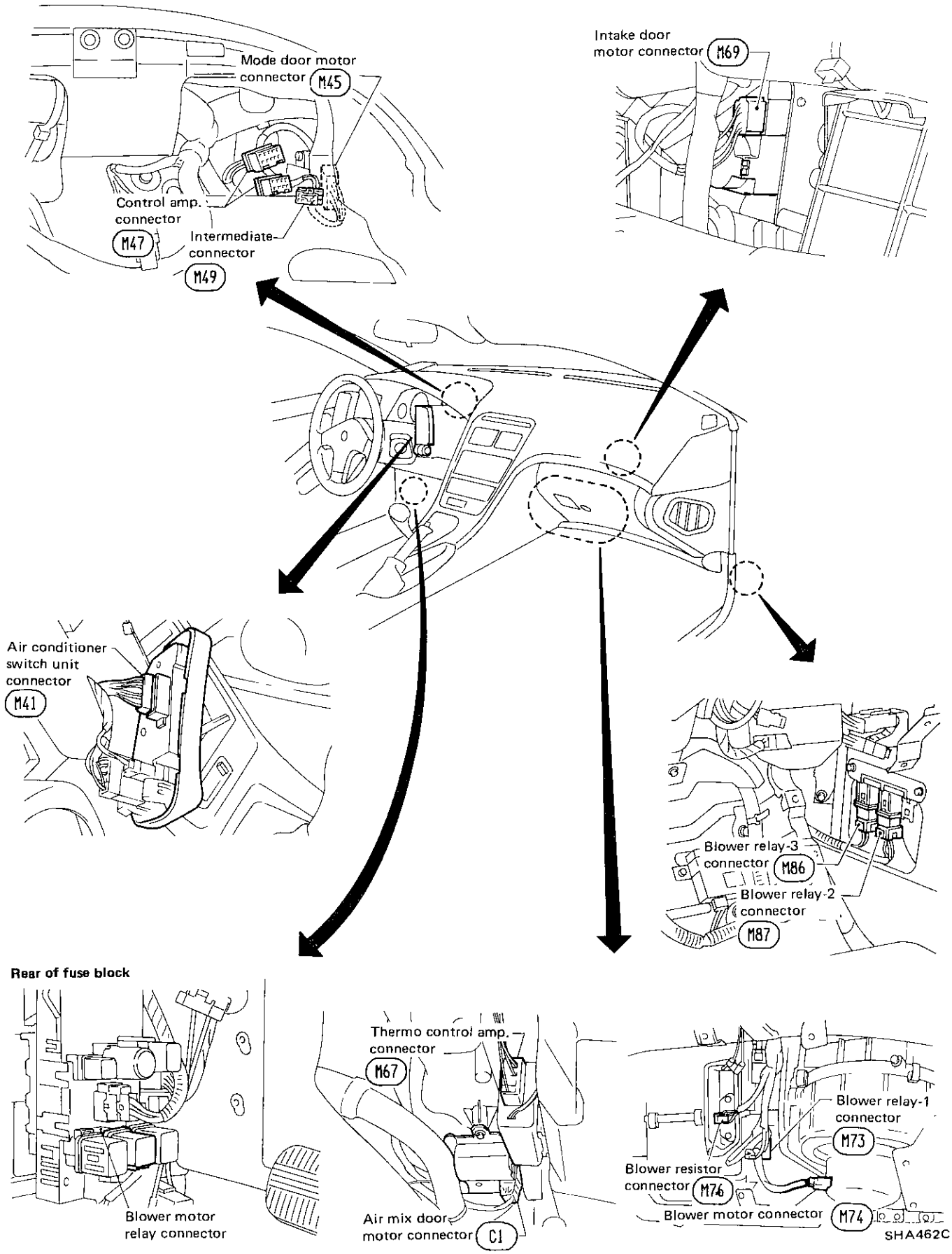
**ENGINE COMPARTMENT**



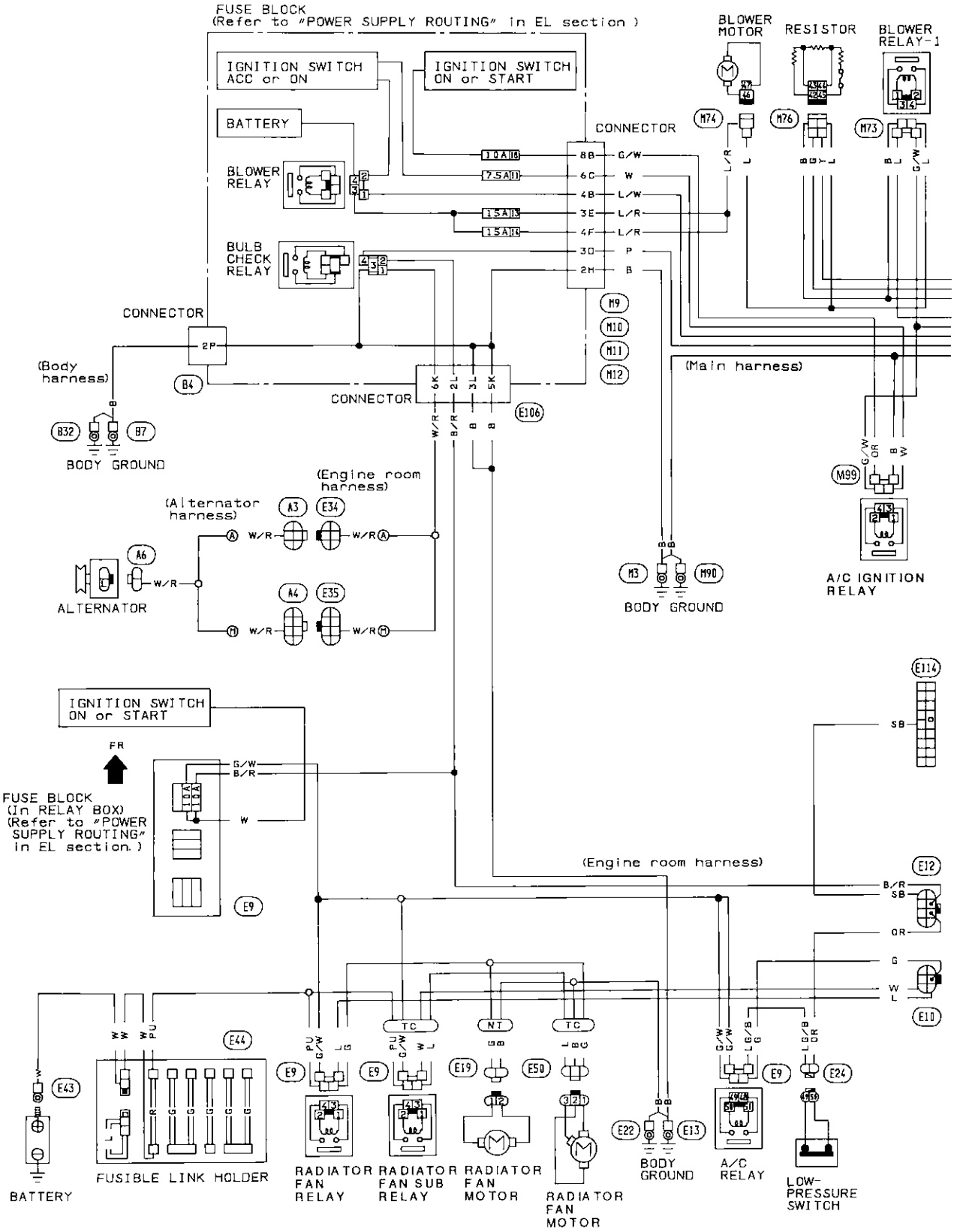

SHA523D

## Harness Layout for A/C System (Cont'd)

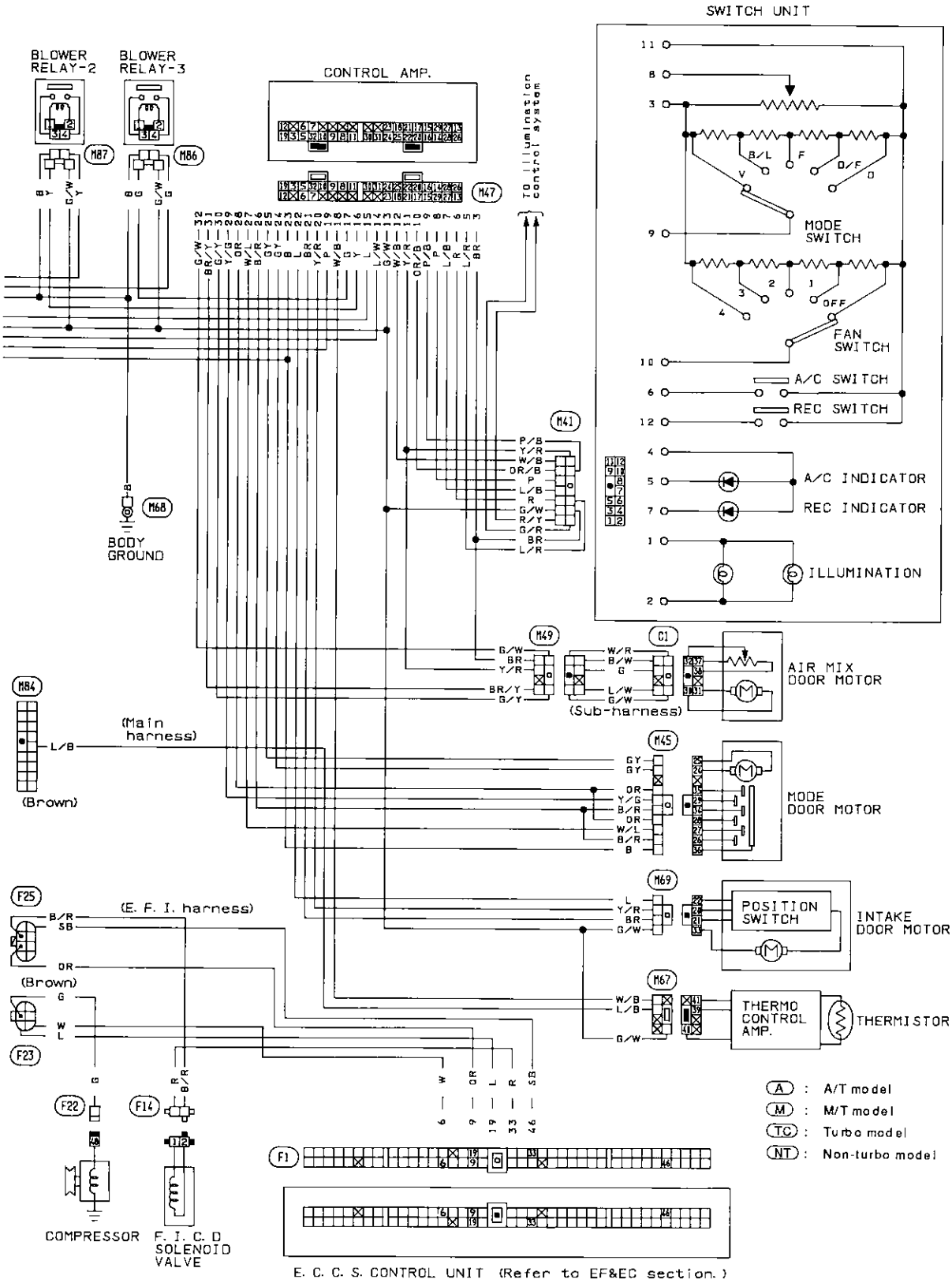
### PASSENGER COMPARTMENT



## Wiring Diagram

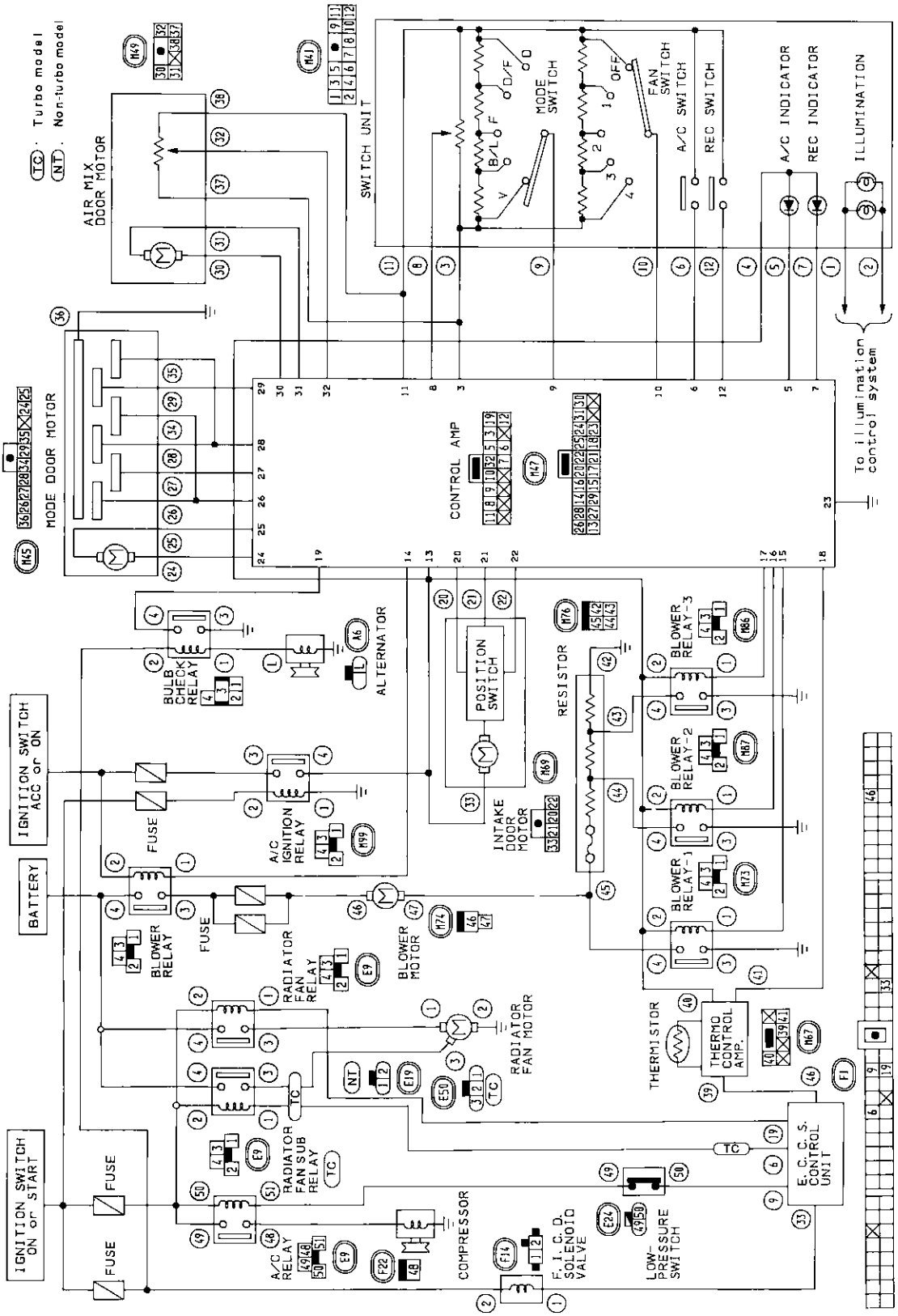


## Wiring Diagram (Cont'd)




SHA800C

## Circuit Diagram for Quick Pinpoint Check




- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◎ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-58, HA-59.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

SHA799C

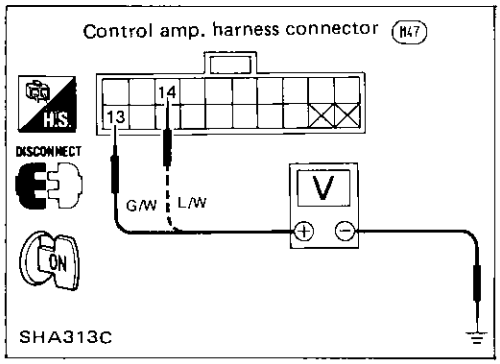
## Main Power Supply and Ground Circuit Check

### POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.
**Refer to "POWER SUPPLY ROUTING" in section EL and Wiring Diagram.**

### CONTROL AMP. REMOVAL

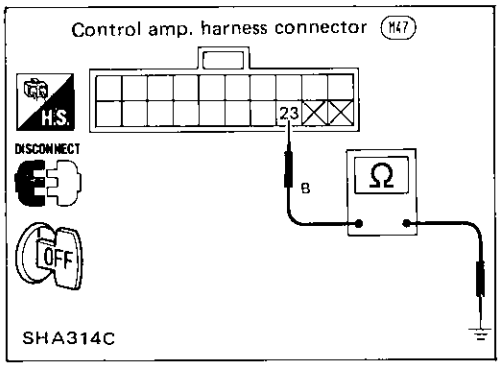
1. Remove driver side instrument lower lid.
2. Remove vent duct.
3. Remove control amp. with harness connected.




### CONTROL AMP. CHECK

1. Disconnect control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑬ or No. ⑭ and body ground.

| Voltmeter terminal | | Voltage |
|---|---|---|
| ⊕ | ⊖ | |
| ⑬ | Body ground | Approximately 12V |
| ⑭ | | |




Check body ground circuit for control amp. with ignition switch OFF.

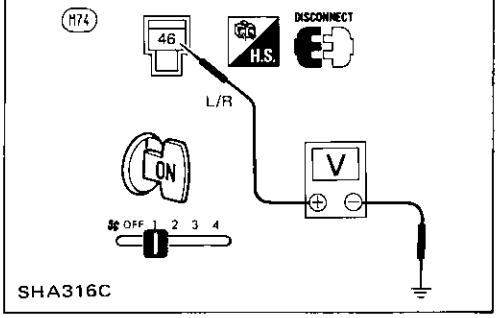
1. Disconnect control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check continuity between terminal No. ㉓ and body ground.

| Ohmmeter terminal | | Continuity |
|---|---|---|
| ⊕ | ⊖ | |
| ㉓ | Body ground | Yes |

| | INCIDENT | Flow chart No. |
|---|---|---|
| 1 | Fan fails to rotate | 1 |
| 2 | Fan does not rotate at speed 1. | 2 |
| 3 | Fan does not rotate at speed 2. | 3 |
| 4 | Fan does not rotate at speed 3. | 4 |
| 5 | Fan does not rotate at speed 4. | 5 |

A

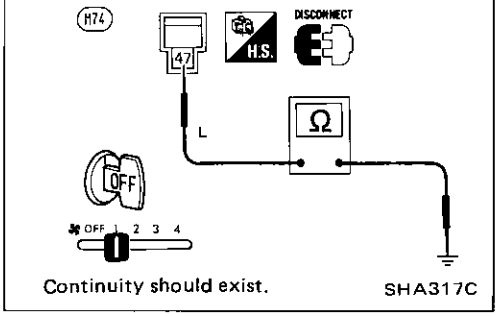
Blower motor harness connector




SHA316C

B

Blower motor harness connector

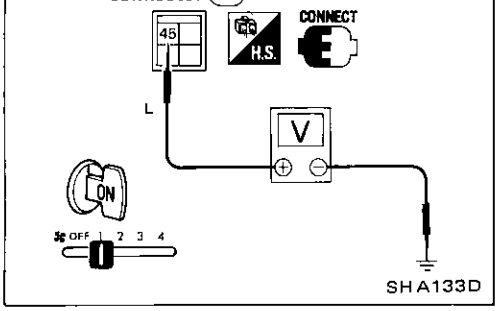



Continuity should exist.

SHA317C

C

Resistor harness connector M76

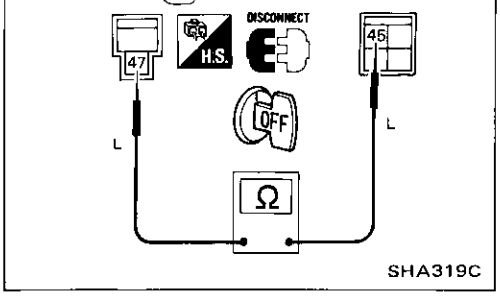



SHA133D

D

Blower motor harness connector M74

Resistor harness connector M76




SHA319C

## Diagnostic Procedure 1

**SYMPTOM: Blower motor does not rotate.**

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

Check if blower motor rotates properly at each fan speed. Conduct checks as per flow chart.

1 → A

2 → B, 3 → C, 4 → D, 5 → E

(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. 46 and body ground?

N.G. → Check fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓

B

Check circuit continuity between blower motor harness terminal No. 47 and body ground.

N.G. → Reconnect blower motor harness connector.

O.K. ↓

CHECK BLOWER MOTOR. (Refer to Electrical Components Inspection.)

N.G. ↓

Replace blower motor.

C

CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
Do approx. 12 volts exist between resistor harness terminal No. 45 and body ground?

N.G. → Disconnect blower motor and resistor harness connectors.

D

Check circuit continuity between blower motor harness terminal No. 47 and resistor terminal No. 45.

Note

O.K. ↓

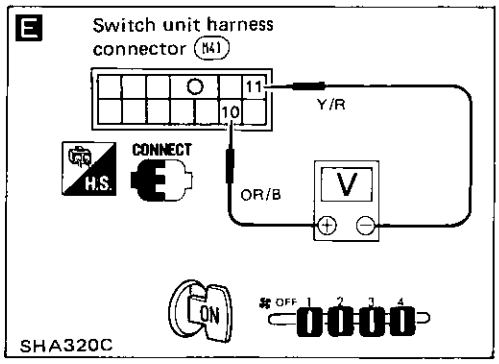
A

(Go to next page.)

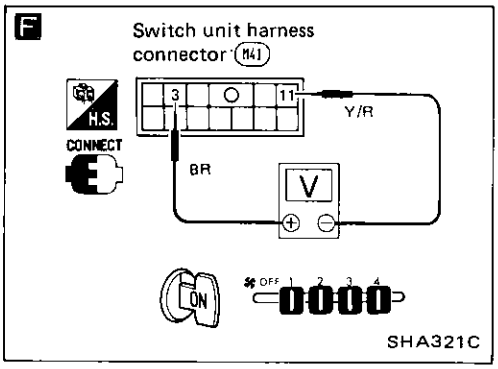
**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**

## Diagnostic Procedure 1 (Cont'd)

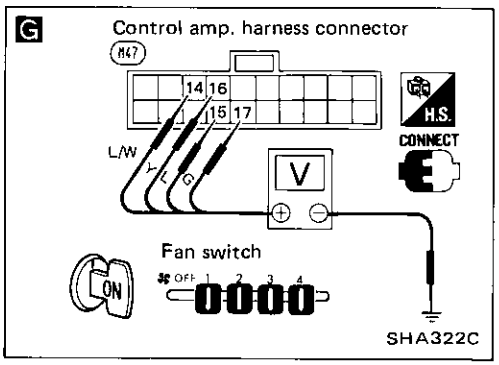
E




F




G




Ⓐ 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.

E

2 3 4

CHECK FAN SWITCH CIRCUIT.
Do normal volts exist between switch unit harness connector terminals?

| Flow chart No. (Fan SW position) | Terminal No. ⊕ | Terminal No. ⊖ | Normal voltage (Approx.) |
|---|---|---|---|
| 2 (1) | ⑩ | ⑪ | 2V |
| 3 (2) | | | 3V |
| 4 (3) | | | 4V |
| 5 (4) | | | 5V |

5

N.G. → F

Do approx. 5 volts exist between control panel terminal No. ③ and No. ⑪?

O.K. → Replace fan switch.

O.K.

G

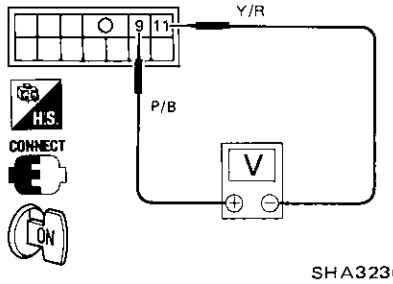
CHECK CONTROL AMP. HARNESS TERMINAL VOLTAGE.
Do approx. 12 volts or 0 volts exist between control amp. harness terminal No. ⑭, ⑮, ⑯ or ⑰ and body ground?

| Flow chart No. | Terminal No. | Fan SW operation ON | Fan SW operation OFF |
|---|---|---|---|
| 2 | ⑭ | 0V | Approx. 12V |
| 3 | ⑰ | 0V | Approx. 12V |
| 4 | ⑯ | 0V | Approx. 12V |
| 5 | ⑮ | 0V | Approx. 12V |

N.G. → Replace control amp.

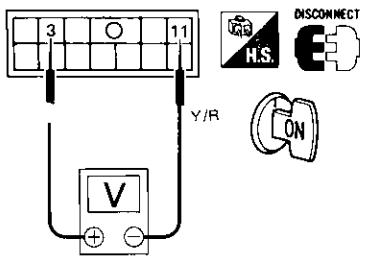
O.K. → Replace blower motor.

A Switch unit harness connector (M41)



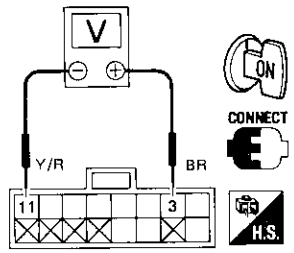

SHA323C

B Switch unit harness connector (M41)




SHA324C

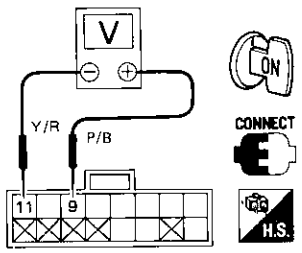
C




Control amp. harness connector (M47)

SHA325C

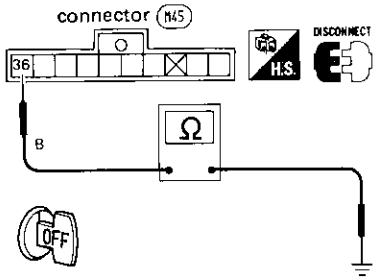
D




Control amp. harness connector (M47)

SHA326C

E Mode door motor harness connector (M45)




SHA327C

## Diagnostic Procedure 2

**SYMPTOM: Air outlet does not change.**

- **Perform PRELIMINARY CHECK 4 and Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

**A**

CHECK MODE DOOR MOTOR POSITION SWITCH.
Measure voltage between switch unit harness connector terminal No. ⑨ and ⑪.

| Mode switch | Terminal No. ⊕ | Terminal No. ⊖ | Voltage (Approx.) |
|---|---|---|---|
| VENT | ⑨ | ⑪ | 5V |
| B/L | | | 4V |
| FOOT | | | 3V |
| F/D | | | 2V |
| DEF | | | 0V |

N.G. → Disconnect switch unit harness connector.

**B**

Do approx. 5 volts exist between switch unit harness connector terminal No. ③ and ⑪.

N.G. → Replace switch unit.

O.K. →

**C**

Do approx. 5 volts exist between control amp. harness connector No. ③ and ⑪.

N.G. → Repair harness or connector.

O.K. → Replace control amp.

O.K. ↓

**D**

Measure voltage between control amp. harness connector terminal No. ⑨ and ⑪.

| Mode switch | Terminal No. ⊕ | Terminal No. ⊖ | Voltage (Approx.) |
|---|---|---|---|
| VENT | ⑨ | ⑪ | 5V |
| B/L | | | 4V |
| FOOT | | | 3V |
| F/D | | | 2V |
| DEF | | | 0V |

N.G. → Repair harness or connector.

O.K. ↓

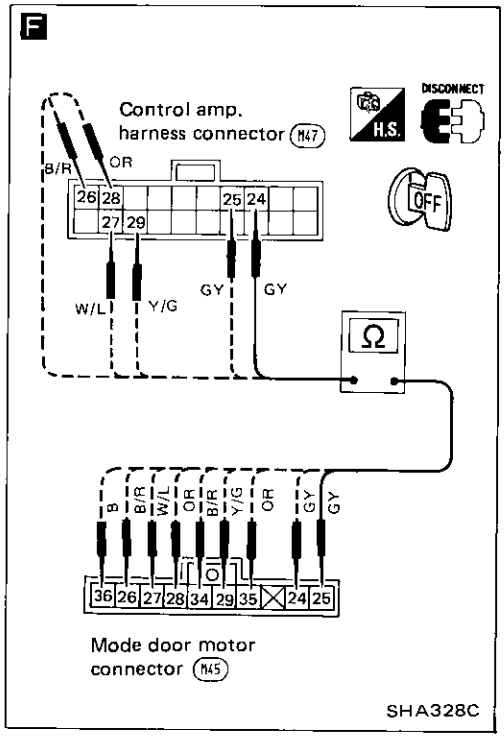
**E**

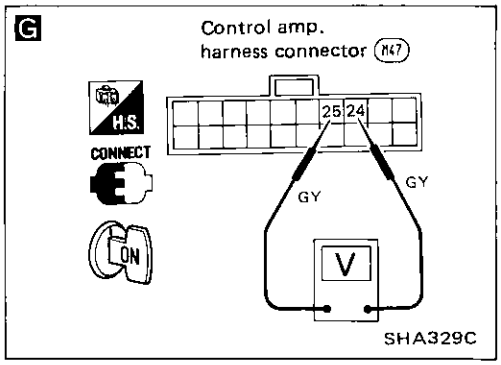
CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness connector terminal No. ㊱ and body ground?

N.G. → Repair harness or connector.

O.K. → Ⓐ

## Diagnostic Procedure 2 (Cont'd)




Ⓐ

**F**

Check circuit continuity between each terminal on control amp. and mode door motor.

N.G. → Repair harness or connector.

| Terminal No. | | Continuity |
|---|---|---|
| Control amp. | Mode door motor | |
| ㉔ | ㉔ | Yes |
| ㉕ | ㉕ | |
| ㉖ | ㉖ and ㉞ | |
| ㉗ | ㉗ | |
| ㉘ | ㉘ and ㉟ | |
| ㉙ | ㉙ | |

O.K.

**G**

CHECK FOR OUTPUT OF CONTROL AMP.

Do approx. 12 volts exist between control amp. harness terminal No. ㉔ and ㉕ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

N.G. → Replace control amp.

| Terminal No. | | Mode door motor | |
|---|---|---|---|
| ㉔ | ㉕ | Mode door operation | Direction of linkage rotation |
| ⊖ | ⊖ | Stop | Stop |
| ⊖ | ⊕ | VENT → DEF | Clockwise |
| ⊕ | ⊖ | DEF → VENT | Counter-clockwise |

O.K.

Replace mode door motor.

## Diagnostic Procedure 3

**SYMPTOM: Intake door does not change in VENT, B/L, or FOOT mode.**

- **Perform PRELIMINARY CHECK 1, and Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

**A**

CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR.
Disconnect intake door motor harness connector.
Do approx. 12 volts exist between intake door motor harness terminal No. ㉝ and body ground?

N.G. → Check intake door motor power supply circuit continuity.

O.K. ↓

**B**

Select VENT mode and check the voltage between intake door motor harness terminal No. ⑳, ㉑, ㉒ and body ground.

| A/C switch | REC switch | Mode | Terminal voltage (Approx.) ⑳ | ㉑ | ㉒ |
|---|---|---|---|---|---|
| ON | ON | REC | 12V | 12V | 0V |
| ON | OFF | REC/FRE | 12V | 0V | 12V |
| OFF | OFF | FRE | 0V | 12V | 12V |

N.G. → **C**

Check the voltage between control panel harness connector terminal No. ⑫ and ⑪.

| A/C switch | Terminal No. ⑥ (⊕) | ⑪ (⊖) | Voltage (Approx.) |
|---|---|---|---|
| Switch pressed | ⊕ | ⊖ | 0V |
| Switch free | | | 5V |

N.G. → Replace control amp.

O.K. → Disconnect control panel connector.

O.K. ↓

Replace intake door motor.

**D**

Check circuit continuity between control panel terminal No. ⑫ and ⑪.

| REC switch | Continuity between terminal No. ⑫ and ⑪ |
|---|---|
| Switch pressed | Yes |
| Switch free | No |

N.G. → Replace control panel.

O.K. ↓

**E**

Check circuit continuity between control panel harness terminal No. ⑫ (⑪) and control amp. harness terminal No. ⑫ (⑪).

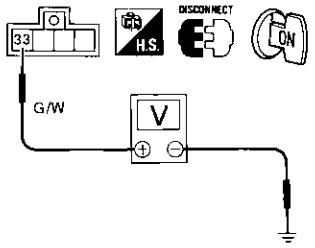
N.G. → Repair harness or connector.

O.K. ↓

Replace control amp.

**A**

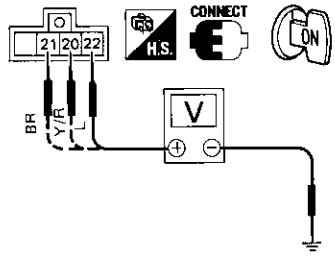
Intake door motor harness connector (M69)




SHA330C

**B**

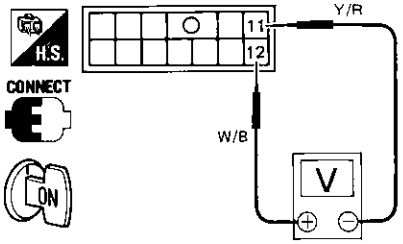
Intake door motor harness connector (M69)




SHA331C

**C**

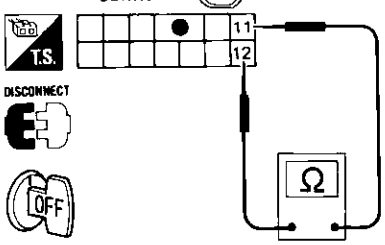
Switch unit harness connector (M41)




SHA332C

**D**

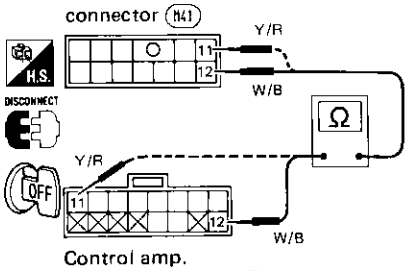
Switch unit connector (M41)



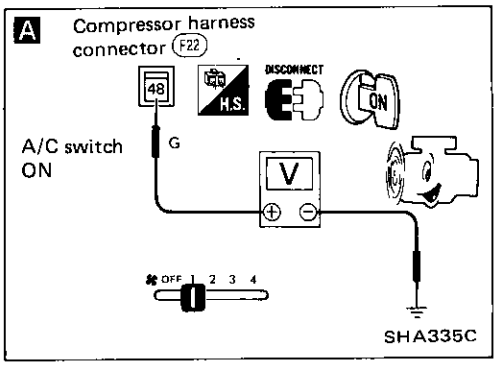

SHA333C

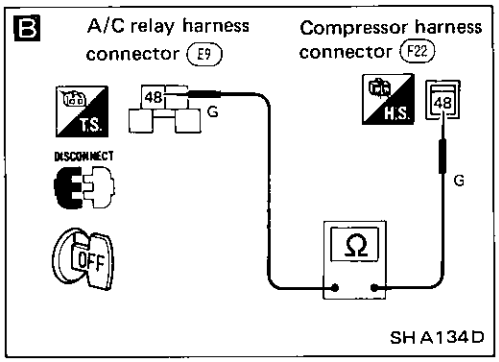
**E**

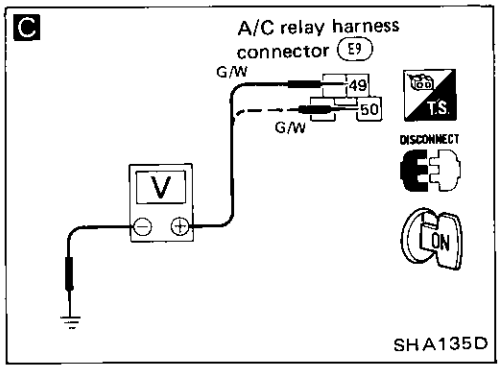
Switch unit harness connector (M41)




SHA334C




## Diagnostic Procedure 4

**SYMPTOM: Magnet clutch does not engage with A/C switch and fan switch ON.**

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
Do approx. 12 volts exist between compressor harness connector terminal No. (48) and body ground?

O.K. → Check magnet clutch coil.

N.G. → Replace magnet clutch. Refer to COMPRESSOR — Model DKS-16H (ZEXEL make).

N.G. → Disconnect A/C relay harness connector.

B

Check circuit continuity between A/C relay harness connector terminal No. (48) and compressor harness connector terminal No. (48).

Note

O.K. → C

C

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminal No. (49), (50) and body ground?

O.K. → CHECK A/C RELAY AFTER DISCONNECTING IT. (Refer to Electrical Components Inspection.)

N.G. → CHECK POWER SUPPLY CIRCUIT AND FUSE AT FUSE BLOCK. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

CHECK A/C RELAY AFTER DISCONNECTING IT. (Refer to Electrical Components Inspection.)

N.G. → Replace A/C relay.

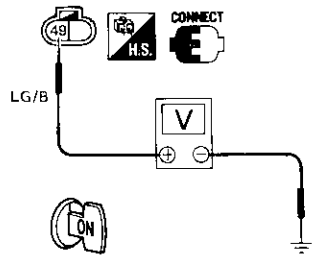
O.K. → Reconnect A/C relay.

→ (A)

**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**

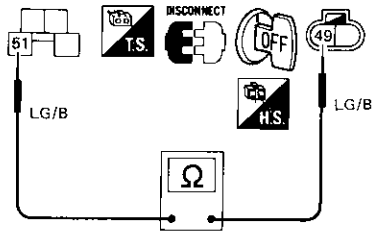
## Diagnostic Procedure 4 (Cont'd)

D Low-pressure switch harness connector (E24)



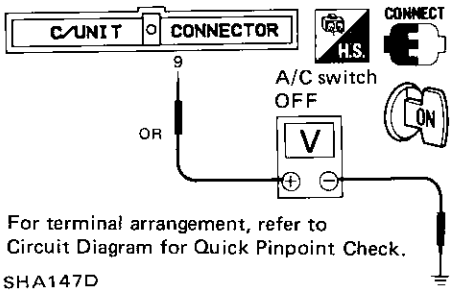

SHA136D

E A/C relay harness connector (E9) Low-pressure switch harness connector (E24)




SHA137D

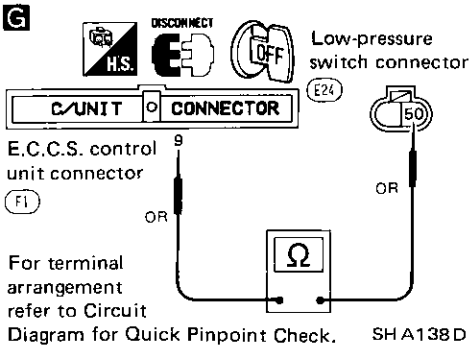
F E.C.C.S. control unit connector (F1)




For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.

SHA147D

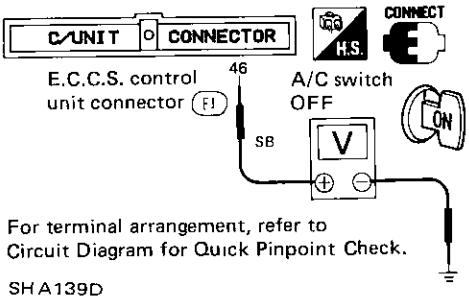
G




For terminal arrangement refer to Circuit Diagram for Quick Pinpoint Check.

SHA138D

H




For terminal arrangement, refer to Circuit Diagram for Quick Pinpoint Check.

SHA139D

Ⓐ

**D** CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between low-pressure switch harness connector terminal No. ㊾ and body ground?

N.G. → **E** Check circuit continuity between A/C relay harness connector terminal No. ㊶ and low-pressure switch harness connector terminal No. ㊾.

O.K. ↓

**F** Do approximately 12 volts exist between E.C.C.S. control unit harness terminal No. ⑨ and body ground?

N.G. → **G** Check circuit continuity between low-pressure switch harness connector terminal No. ㊿ and E.C.C.S. control unit harness connector terminal No. ⑨. Note

O.K. ↓

CHECK LOW-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.) Note

N.G. ↓

Replace low-pressure switch.

O.K. ↓

**H** Do more than 8 volts exist between E.C.C.S. control unit harness connector terminal No. ㊻ and body ground?

N.G. → CHECK E.C.C.S. CONTROL UNIT.
(Refer to EF & EC section.)

O.K. ↓

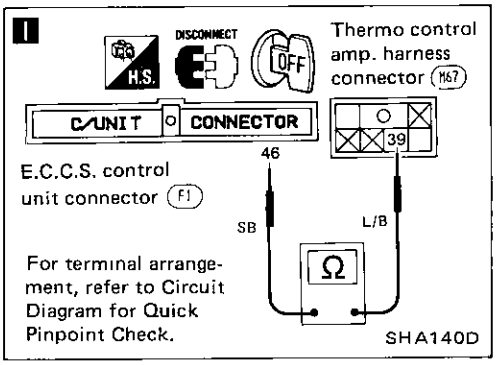
Disconnect thermo. amp. harness connector.

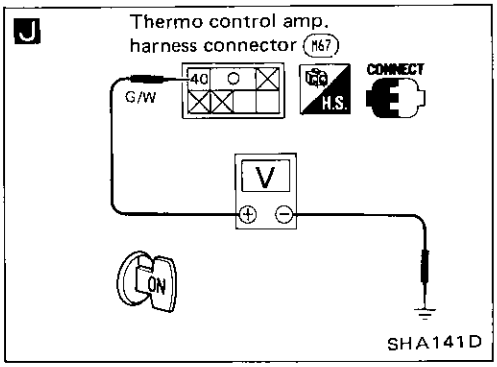
O.K. ↓

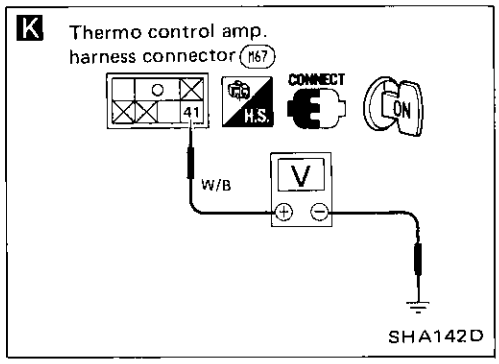
Ⓑ

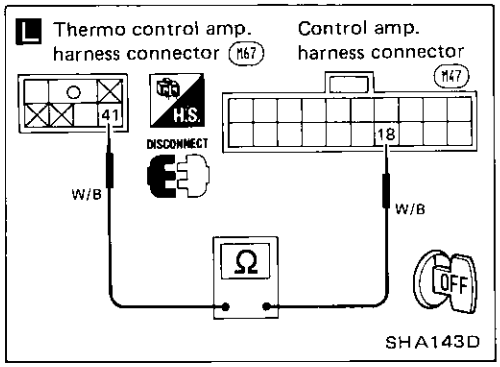
**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**

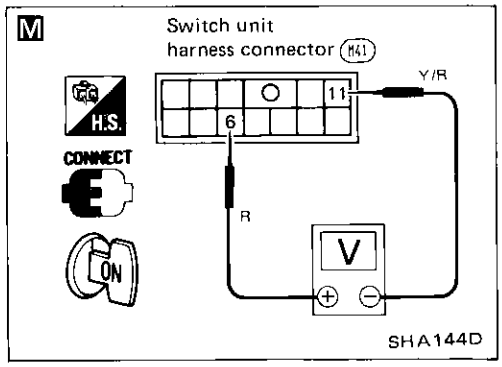
## Diagnostic Procedure 4 (Cont'd)




Ⓑ

**I** Note

Check circuit continuity between thermo. control amp. harness connector terminal No. ㊴ and E.C.C.S. control unit harness connector terminal No. ㊻.

O.K.

**J**

CHECK POWER SUPPLY FOR THERMO. AMP.
Do approx. 12 volts exist between thermo. amp. harness connector terminal No. ㊵ and body ground?

N.G. → CHECK POWER SUPPLY CIRCUIT AND FUSE AT FUSE BLOCK. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K.

**K**

Is the voltage between thermo. amp. harness connector terminal No. ㊶ and body ground less than 1V?

N.G. → Replace thermo. control amp.

O.K.

**L** Note

Check continuity between thermo. control amp. harness connector terminal No. ㊶ and control amp. harness connector terminal No. ⑱.

O.K.

**M**

CHECK A/C SWITCH OF SWITCH UNIT.
Check the voltage between switch unit harness connector terminal No. ⑥ and ⑪.

| REC switch | Terminal No. ⑫ | Terminal No. ⑪ | Voltage (Approx.) |
|---|---|---|---|
| Switch pressed | ⊕ | ⊖ | 0V |
| Switch free | | | 5V |

N.G. → Disconnect switch unit connector.

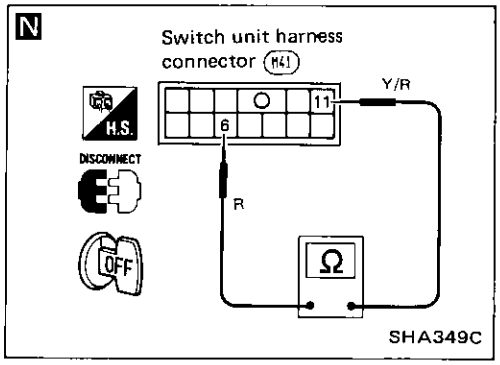
O.K.

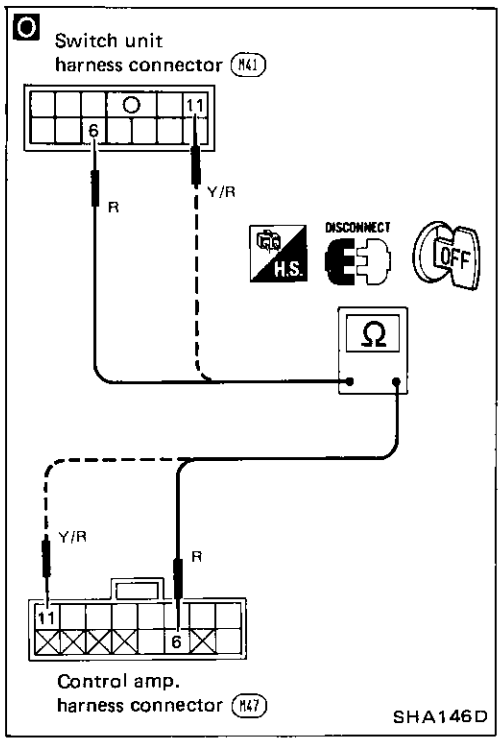
Replace control amp.

Ⓒ

**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**

## Diagnostic Procedure 4 (Cont'd)




Ⓒ

**N**

Check circuit continuity between switch unit harness connector terminal No. ⑥ and ⑪.

| A/C switch | Continuity between terminal No. ⑥ and ⑪ |
|---|---|
| Switch pressed | Yes |
| Switch free | No |

N.G. → Replace switch unit.

O.K. ↓

**O** Note

Check circuit continuity between switch unit harness connector terminal No. ⑥ (⑪) and control amp. harness connector terminal No. ⑥ (⑪).

O.K. ↓

Replace control amp.

**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**

## Diagnostic Procedure 5

**SYMPTOM: Illumination or control panel indicators do not come on.**

- **Perform Main Power Supply and Ground Circuit check before referring to the following flow chart.**

Turn ignition switch and lighting switch ON.

↓

CHECK ILLUMINATION AND INDICATORS.

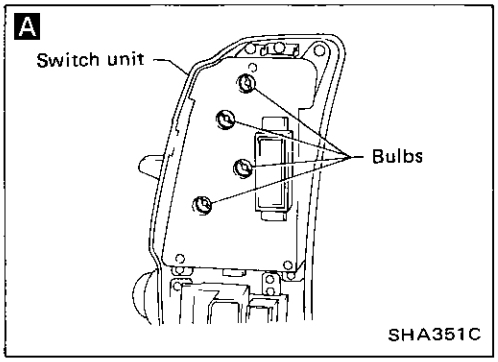
- Turn A/C, REC and fan ON.
- Rotary VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown.

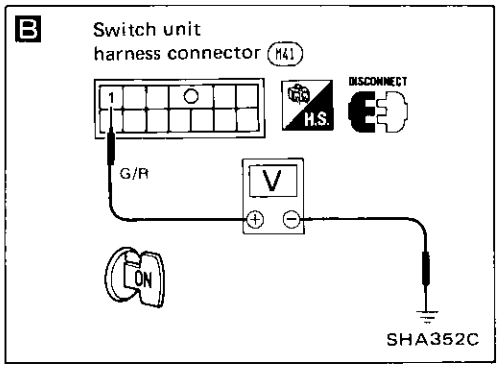
| INCIDENT | | | How to repair |
|---|---|---|---|
| ILL Control panel | A/C | REC | |
| X | O | O | Go to DIAGNOSTIC PROCEDURE 5-1. |
| O | X | O | Go to DIAGNOSTIC PROCEDURE 5-2. |
| O | O | X | Go to DIAGNOSTIC PROCEDURE 5-3. |
| O | X | X | Go to DIAGNOSTIC PROCEDURE 5-4. |

O: Illumination or indicator comes on.
X: Illumination or indicator does not come on.

## Diagnostic Procedure 5 (Cont'd)

### DIAGNOSTIC PROCEDURE 5-1




CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illuminations come on with ignition switch and lighting switch ON?

N.G. → CHECK ILLUMINATION SYSTEM.
Refer to Illumination/Wiring Diagram in EL section.

O.K. ↓

Turn ignition switch and lighting switch OFF.

A

CHECK ILLUMINATION BULB.
Remove switch unit and disconnect harness connectors.
Remove illumination bulb(s) and check them.

N.G. → Replace illumination bulb(s).

O.K. ↓

B

CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.
Do approx. 12 volts exist between switch unit connector harness terminal No. ① and body ground?

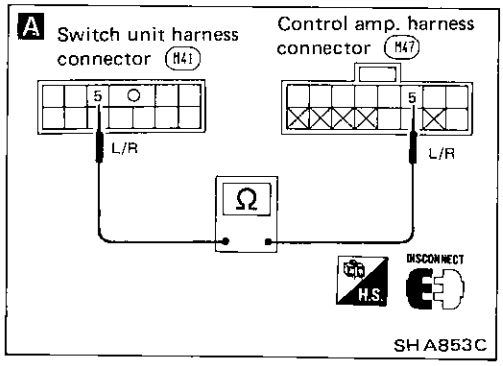
N.G. → CHECK POWER SUPPLY FOR ILLUMINATION SYSTEM.
Refer to Illumination/Wiring Diagram in EL section.

O.K. ↓

CHECK TIME CONTROL SYSTEM.
Refer to TIME CONTROL SYSTEM in EL section.

## Diagnostic Procedure 5 (Cont'd)

### DIAGNOSTIC PROCEDURE 5-2




CHECK MAGNET CLUTCH OPERATION.
Does magnet clutch operate normally when engine is ON and A/C switch, fan switch are ON?

N.G. → Go to **Diagnostic Procedure 4.**

O.K. ↓

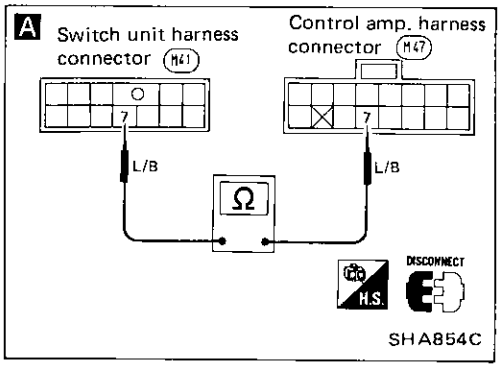
A

Check continuity between switch unit harness connector terminal No. ⑤ and control amp. harness connector terminal No. ⑤ .

N.G. ↓

Replace switch unit.

### DIAGNOSTIC PROCEDURE 5-3




CHECK INTAKE DOOR OPERATION.
Does intake door operate normally when engine is ON and A/C switch, fan switch are ON?

N.G. → Do to **Diagnostic Procedure 3.**

O.K. ↓

A

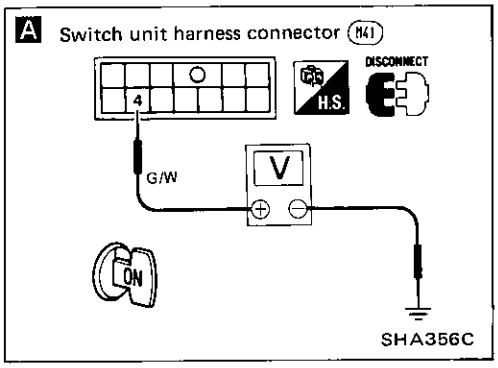
Check continuity between switch unit harness connector terminal No. ⑦ and control amp. harness connector terminal No. ⑦ .

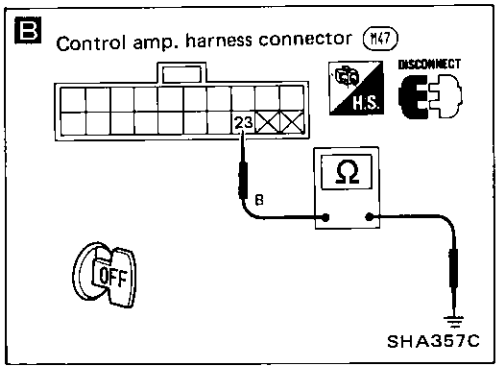
N.G. ↓

Replace switch unit.

## Diagnostic Procedure 5 (Cont'd)

### DIAGNOSTIC PROCEDURE 5-4




Turn ignition switch and lighting switch OFF.

↓

Disconnect switch unit harness connector.

↓

A

CHECK POWER SUPPLY FOR SWITCH UNIT
Do approx. 12 volts exist between switch unit harness connector terminal No. ④ and body ground?

N.G. → Check harness of switch unit power supply circuit. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K. ↓

B

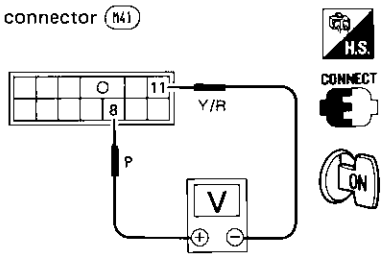
CHECK BODY GROUND CIRCUIT FOR CONTROL AMP.
Does continuity exist between control amp. harness connector terminal No. ㉓ and body ground?

O.K. ↓

Replace control amp.

A

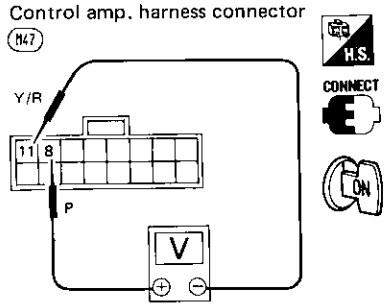
Switch unit harness connector (M41)




SHA521C

B

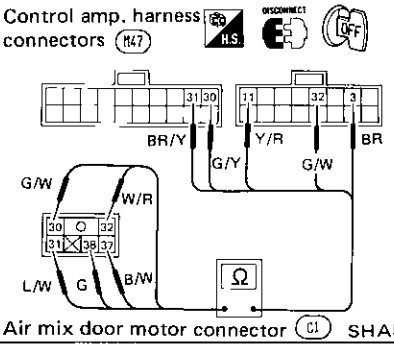
Control amp. harness connector (M47)




SHA522C

C

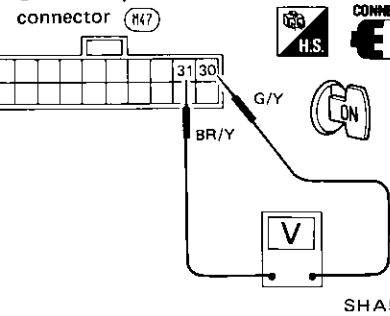
Control amp. harness connectors (M47)




Air mix door motor connector (C1) SHA523C

D

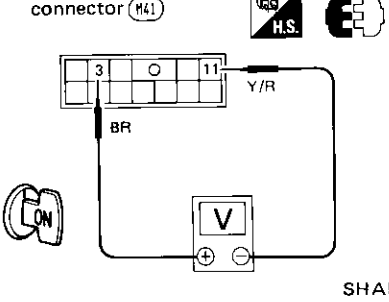
Control amp. harness connector (M47)




SHA524C

E

Switch unit harness connector (M41)




SHA525C

## Diagnostic Procedure 6

**SYMPTOM: Temperature of air outlet does not change.**

A

CHECK TEMPERATURE CONTROL LEVER.
Measure voltage between control panel harness connector terminals No. ⑧ and ⑪.

| Temp. control lever | Terminal No. ⊕ | Terminal No. ⊖ | Voltage (approx.) |
|---|---|---|---|
| Full hot | ⑧ | ⑪ | 5V |
| Full cold | ⑧ | ⑪ | 0V |

N.G. → Disconnect control amp. harness connector.

E

Check if approx. 5 volts exist between control panel harness connector terminals No. ③ and ⑪.

N.G. → Ⓐ (Go to next page.)

O.K. → Replace control amp.

O.K. ↓

B

Measure voltage between control amp. harness connector terminals No. ⑧ and ⑪.

| Temp control lever | Terminal No. ⊕ | Terminal No. ⊖ | Voltage (approx.) |
|---|---|---|---|
| Full hot | ⑧ | ⑪ | 5V |
| Full cold | ⑧ | ⑪ | 0V |

O.K. ↓

C

Check continuity between each terminal of control amp. and air mix door motor.

| Terminal No. Control amp. | Terminal No. Air mix door motor | Continuity |
|---|---|---|
| ㉚ | ㉚ | Yes |
| ㉛ | ㉛ | |
| ③ | ㊲ | |
| ㉜ | ㉜ | |
| ⑪ | ㊳ | |

N.G. → Repair harness or connector.

O.K. ↓

D

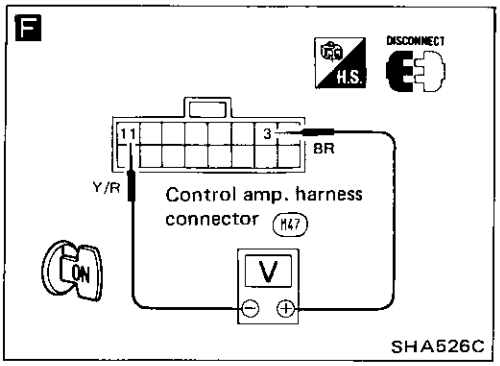
CHECK FOR CONTROL AMP. OUTPUT.
Check if 12 volts exist between control amp. harness connector terminals No. ㉚ and ㉛ when temp. control lever is moved.

| Terminal No. ㉚ | Terminal No. ㉛ | Air mix door motor: Air mix door operation | Direction of linkage rotation |
|---|---|---|---|
| ⊖ | ⊖ | Stop | Stop |
| ⊖ | ⊕ | Cold→Hot | Clockwise |
| ⊕ | ⊖ | Hot→Cold | Counter-clockwise |

N.G. → Replace control amp.

O.K. → Replace air mix door motor.

## Diagnostic Procedure 6 (Cont'd)




Ⓐ

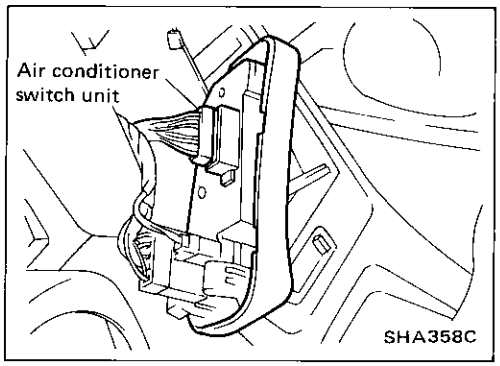
F

Check if approx. 5 volts exist between control amp. harness connector terminals No. ③ and ⑪ .

N.G. → Replace control amp.

O.K. ↓

Repair harness or connector.

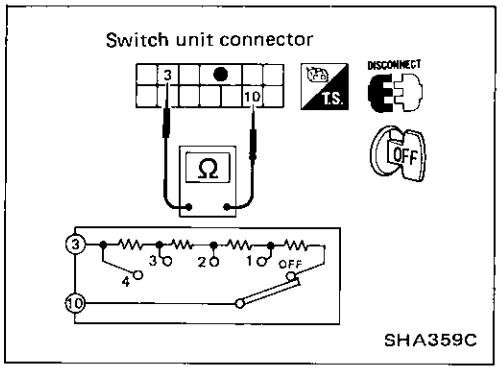



## Electrical Components Inspection

### FAN SWITCH

Check resistance between terminals at each switch position.

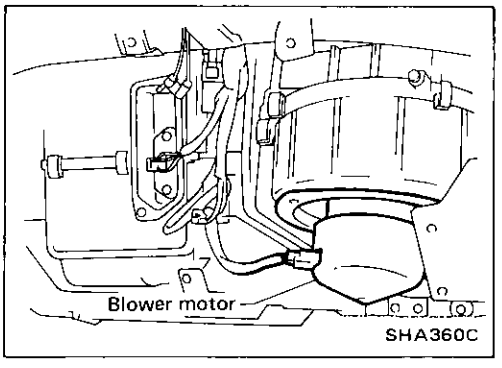
| Switch position | Resistance between terminals No. ③ and ⑩ (Approx. Ω) |
|---|---|
| OFF | 710 |
| 1 | 1,140 |
| 2 | 460 |
| 3 | 270 |
| 4 | 0 |




### BLOWER MOTOR

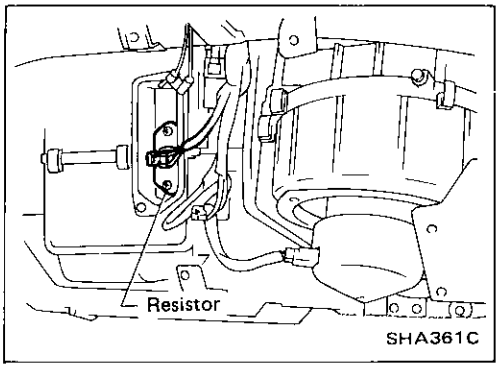
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.




### BLOWER RESISTOR

Check continuity between terminals.

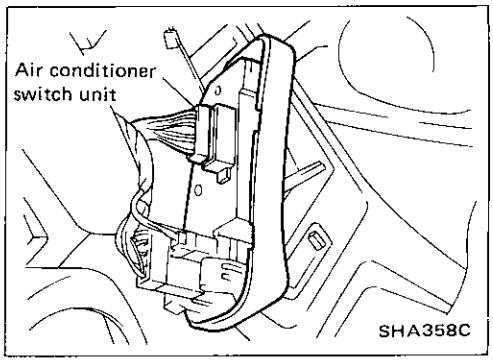


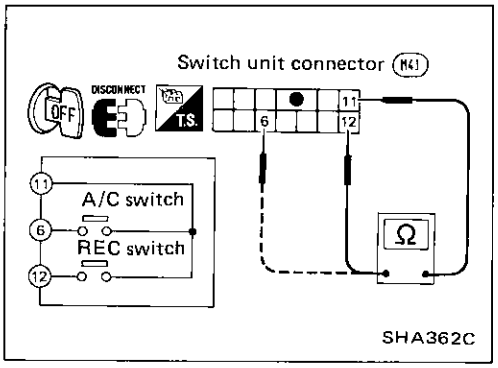
## Electrical Components Inspection (Cont'd)

### A/C SWITCH

Check continuity between terminals at each switch position.

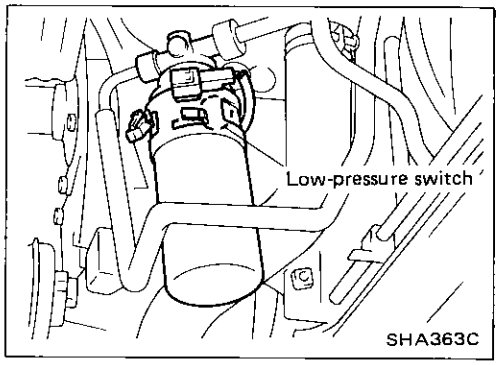
| Switch condition | Terminal No. | | Continuity |
|---|---|---|---|
| While A/C switch is pushed | ⑥ | ⑪ | Yes |
| While REC switch is pushed | ⑫ | ⑪ | Yes |



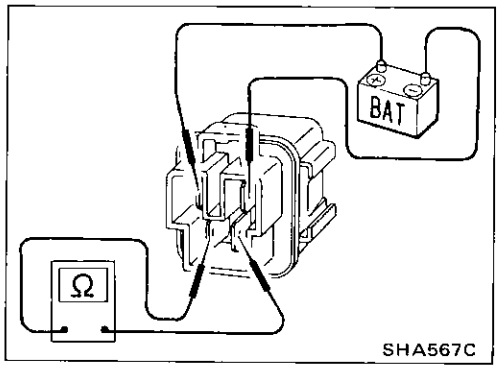

### LOW-PRESSURE SWITCH

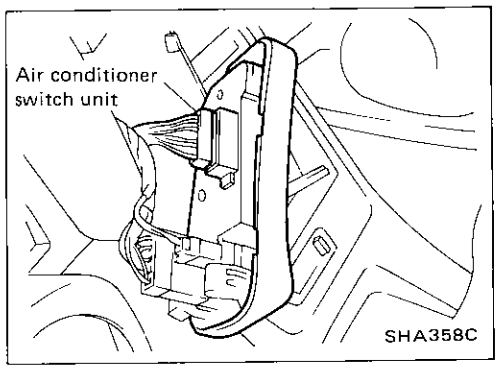
| High-pressure side line pressure kPa (kg/cm$^2$, psi) | Operation | Continuity |
|---|---|---|
| 196 (2.0, 28) | Turn OFF | Does not exist |
| 206 (2.1, 30) | Turn ON | Exist |

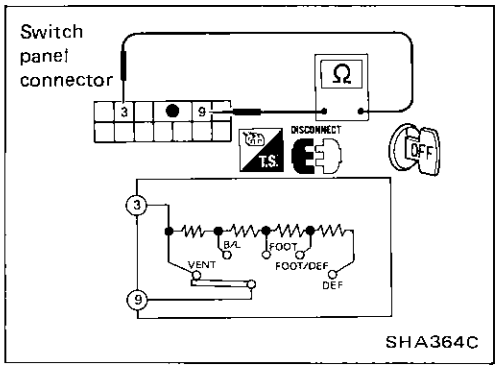


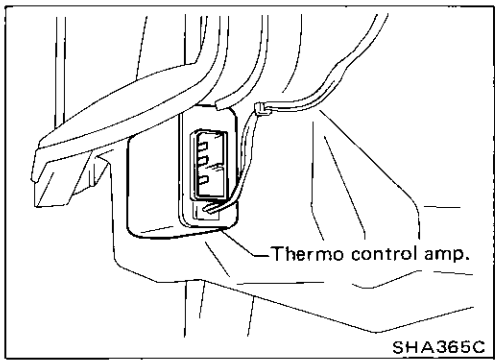

### RELAYS

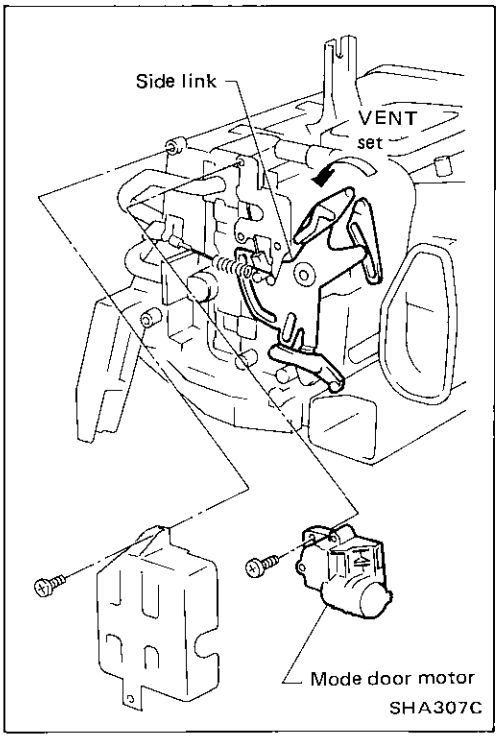
Check circuit continuity between terminals by supplying 12 volts to coil side terminal of relay.






## Electrical Components Inspection (Cont'd)

### MODE SWITCH

Check resistance between terminals at each switch position.

| Switch position | Resistance between terminals No. ⑨ and No. ③ (Ω) |
|---|---|
| VENT | 0 |
| B/L | 270 |
| FOOT | 460 |
| FOOT/DEF | 1,140 |
| DEF | 710 |

### THERMO CONTROL AMP.

1. Run engine and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

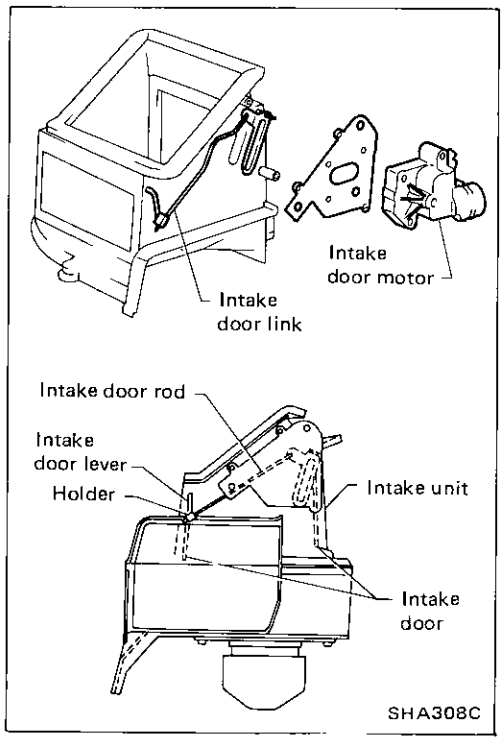
| Evaporator outlet air temperature °C (°F) | Thermo amp. operation | Voltage (Approx.) |
|---|---|---|
| Decreasing to 3.0 (37) | Turn OFF | 12V |
| Increasing to 4.5 (40) | Turn ON | 0V |

## Control Linkage Adjustment

### MODE DOOR

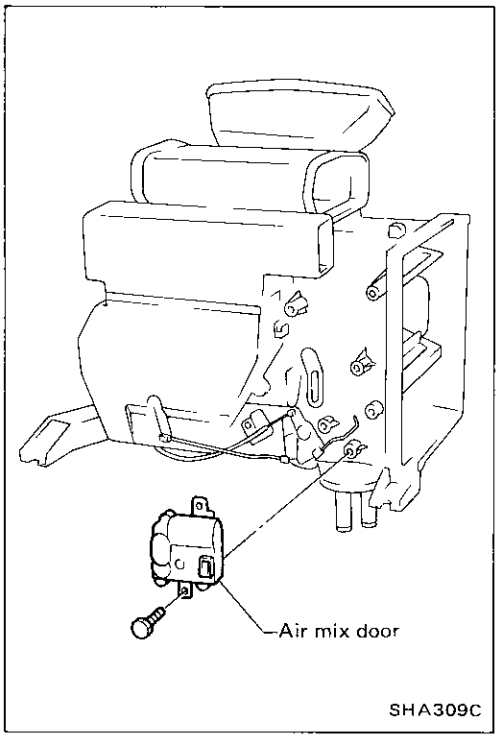
1. Move side link by hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to harness.
3. Turn ignition switch to ON.
4. Turn VENT switch ON.
5. Attach mode door rod to side link rod holder.
6. Check that when DEF position is selected, only DEF door is at full-open position, and when VENT position is selected, only VENT door is at full-open position.

## Control Linkage Adjustment (Cont'd)




### INTAKE DOOR

1. Install intake door motor on intake unit.
2. Connect intake door motor harness connector.
3. Turn ignition switch to ON.
4. Turn REC switch ON.
5. Install intake door lever.
6. Set intake door rod in REC position and fasten intake door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.




### AIR MIX DOOR

1. Connect harness to air mix door motor and set temperature control lever at full-cold position.
2. Set air mix doors I and II at full-cold position and fasten door rod.
3. Check that when temperature control lever is at full-cold, both doors are at full-cold position, and when temperature control lever is at full-hot, both doors are at full-hot position.

### WATER COCK CONTROL CABLE

Clamp cable at full-close position when air mix doors I and II are at full-cold position, and full-open position when air mix doors I and II are at full-hot position.

## Contents

**Symptom Chart** ..... HA- 84
**Self-diagnosis** ..... HA- 86
CHECKING PROCEDURE ..... HA- 88
STEP 1: MONITOR DIAGNOSIS ..... HA- 90
STEP 2: ACTUATOR TEST ..... HA- 91
STEP 3: AUXILIARY MECHANISM ..... HA- 92
STEP 4: READOUT OF TROUBLE DATA STORED IN MEMORY ..... HA- 93
**Consult** ..... HA- 94
**Preliminary Check** ..... HA- 95
PRELIMINARY CHECK 1
(Air outlet does not change) ..... HA- 95
PRELIMINARY CHECK 2
(Intake door does not change) ..... HA- 96
PRELIMINARY CHECK 3
(Insufficient cooling) ..... HA- 97
PRELIMINARY CHECK 4
(Insufficient heating) ..... HA- 98
PRELIMINARY CHECK 5
(Blower motor operation is malfunctioning) ..... HA- 99
PRELIMINARY CHECK 6
(Magnet clutch does not engage) ..... HA-100
PRELIMINARY CHECK 7
(Discharged air temperature does not change) ..... HA-101
PRELIMINARY CHECK 8
(Noise) ..... HA-101
**Harness Layout for A/C System** ..... HA-102
**Wiring Diagram** ..... HA-104
**Circuit Diagram for Quick Pinpoint Check** ..... HA-106
**Main Power Supply and Ground Circuit Check** ..... HA-107
**Diagnostic Procedure 1**
(SYMPTOM: Self-diagnosis detects intermittent short or open circuit in each sensor circuit) ..... HA-108
**Diagnostic Procedure 2**
(SYMPTOM: Ambient sensor circuit is open) ..... HA-108
**Diagnostic Procedure 3**
(SYMPTOM: Ambient sensor circuit is shorted) ..... HA-109
**Diagnostic Procedure 4**
(SYMPTOM: Upper in-vehicle sensor circuit is open) ..... HA-110
**Diagnostic Procedure 5**
(SYMPTOM: Upper in-vehicle sensor circuit is shorted) ..... HA-111
**Diagnostic Procedure 6**
(SYMPTOM: Lower in-vehicle sensor circuit is open) ..... HA-112
**Diagnostic Procedure 7**
(SYMPTOM: Lower in-vehicle sensor circuit is shorted) ..... HA-113
**Diagnostic Procedure 8**
(SYMPTOM: Def. duct sensor circuit is open) ..... HA-114
**Diagnostic Procedure 9**
(SYMPTOM: Def. duct sensor circuit is shorted) ..... HA-115
**Diagnostic Procedure 10**
(SYMPTOM: Vent duct sensor circuit is open) ..... HA-116
**Diagnostic Procedure 11**
(SYMPTOM: Vent duct sensor circuit is shorted) ..... HA-117
**Diagnostic Procedure 12**
(SYMPTOM: Floor duct sensor circuit is open) ..... HA-117
**Diagnostic Procedure 13**
(SYMPTOM: Floor duct sensor circuit is shorted) ..... HA-118

## Contents (Cont'd)

**Diagnostic Procedure 14**
(SYMPTOM: Sunload sensor circuit is shorted) ..... HA-118
**Diagnostic Procedure 15**
(SYMPTOM: Air mix door does not operate normally) ..... HA-119
**Diagnostic Procedure 16**
(SYMPTOM: Intake door does not operate normally) ..... HA-120
**Diagnostic Procedure 17**
(SYMPTOM: Mode door does not operate normally) ..... HA-121
**Diagnostic Procedure 18**
(SYMPTOM: Mode door does not move at all) ..... HA-122
**Diagnostic Procedure 19**
(SYMPTOM: Magnet clutch does not engage) ..... HA-123
**Diagnostic Procedure 20**
(SYMPTOM: Air conditioner control switch panel illumination does not come on) ..... HA-125
**Diagnostic Procedure 21**
(SYMPTOM: Set temperature and mode display do not appear on display window) ..... HA-125
**Diagnostic Procedure 22**
(SYMPTOM: When air conditioner switch is operated it does not beep) ..... HA-126
**Diagnostic Procedure 23**
(SYMPTOM: Figures of set temperature do not appear on the display window and indicator lamp (L.E.D.) does not come on) ..... HA-127
**Diagnostic Procedure 24**
(SYMPTOM: Switches do not work) ..... HA-128
**Diagnostic Procedure 25**
(SYMPTOM: Blower motor operation is malfunctioning) ..... HA-128
**Electrical Components Inspection** ..... HA-131
**Control Linkage Adjustment** ..... HA-133

## Symptom Chart

### DIAGNOSTIC TABLE

| Symptom | Possible cause | Diagnostic procedure |
|---|---|---|
| Air outlet does not change | • Mode door motor not operating correctly<br>• Inaccurate sensor input<br>• No output to mode door motor from auto amplifier | Proceed to Preliminary check 1, then to Diagnostic procedures 17 and 18 if air mix door is malfunctioning. |
| Intake door does not change | • Intake door motor or mechanism malfunctioning<br>• Inaccurate sensor input<br>• No output to intake door motor from auto amplifier | Proceed to Preliminary check 2. If intake door is at fault, go to Diagnostic procedure 16. |
| Insufficient cooling | • Compressor clutch not engaged<br>• Air mix door motors not working properly<br>• Condenser fan inoperative<br>• Low freon level | Proceed to Preliminary check 3. If air mix doors do not operate properly, go to Diagnostic procedure 15.<br>Check compressor clutch operation and freon level of system. |
| Discharged air temperature does not change | • Air mix doors do not operate correctly<br>• Incorrect sensor input | Proceed to Preliminary check 7. |
| Noise | • Compressor belt tension<br>• Compressor component malfunction<br>• Blower motor interference<br>• Radiator cooling fan interference | Proceed to Preliminary check 8. |
| Air conditioner control switch panel illumination does not come on | • Blown fuse<br>• Loose or open in harness<br>• Blown bulb | Proceed to Diagnostic procedure 20. |
| Insufficient heating | • Coolant temperature is low<br>• Air mix doors not in correct position<br>• Incorrect sensor input | Proceed to Preliminary check 4. If air mix doors do not operate correctly, go to Diagnostic procedure 15. |
| Blower motor operation is malfunctioning | • Blower motor is not receiving power<br>• Vents may be obstructed<br>• Motor does not spin freely<br>• Air intake obstructed<br>• Blown fuse<br>• Malfunctioning blower relay | Proceed to Preliminary check 5. If blower motor is malfunctioning, go to Diagnostic procedure 25. |
| Magnet clutch does not engage | • Blown fuse<br>• A/C relay inoperative<br>• Open in wiring<br>• Open ambient sensor circuit<br>• Low freon level<br>• Malfunctioning clutch assembly | Proceed to Preliminary check 6, then Diagnostic procedure 19 if clutch is at fault. |

## Symptom Chart (Cont'd)

| Symptom | Possible cause | Diagnostic procedure |
|---|---|---|
| No display on A/C switch panel | • Blown fuse<br>• Malfunctioning bulb | Proceed to Diagnostic procedure 20. |
| Set temperature and mode indication do not appear on display window | • Malfunctioning switch unit<br>• Open in circuit<br>• Malfunctioning auto amplifier | Proceed to Diagnostic procedure 21. |
| When air conditioner switch is operated, if does not beep | • Malfunctioning A/C switch<br>• Open in harness or connector<br>• Malfunctioning auto amplifier | Proceed to Diagnostic procedure 22. |
| Set temperature and mode indication do not appear in display and indicator lamp (L.E.D.) does not come on | • Open in harness<br>• Malfunctioning switch panel<br>• Malfunctioning auto amplifier | Proceed to Diagnostic procedure 23. |
| Switches do not work | • Malfunctioning switch panel<br>• Open in harness<br>• Malfunctioning auto amplifier | Proceed to Diagnostic procedure 24. |

## Self-diagnosis

### CONSULT AND ONBOARD SELF-DIAGNOSTIC SYSTEM

Function of CONSULT and ONBOARD SELF-DIAGNOSTIC SYSTEM are as follows:

| ITEM | MONITOR | | CHANGE PARAMETER | | READOUT OF TROUBLE DATA STORED IN MEMORY | |
|---|---|---|---|---|---|---|
| | CONSULT | ONBOARD | CONSULT | ONBOARD | CONSULT | ONBOARD |
| Ambient temp. | ○ | ○ | | | ○ | ○ |
| In-vehicle temp. (Upper) | ○ | ○ | | | ○ | ○ |
| In-vehicle temp. (Lower) | ○ | ○ | | | ○ | ○ |
| Duct temp. (Defroster) | ○ | ○ | | | ○ | ○ |
| Duct temp. (Ventilator) | ○ | ○ | | | ○ | ○ |
| Duct temp. (Floor) | ○ | ○ | | | ○ | ○ |
| Sunload | ○ | ○ | | | ○ | ○ |
| Water temp. | ○ | ○ | | | | |
| Mode door P.B.R. | ○ | ○ | | | | |
| In-vehicle target temp. (Upper) | ○ | | | | | |
| In-vehicle target temp. (Lower) | ○ | | | | | |
| Outlet air target temp. (Upper) | ○ | | ○ | *○ | | |
| Outlet air target temp. (Lower) | ○ | | ○ | *○ | | |
| Mode door target position | ○ | | ○ | *○ | | |
| Intake door target position | ○ | | ○ | *○ | | |
| Blower motor target voltage | ○ | | ○ | *○ | | |
| Difference between upper and lower target temp. | ○ | | ○ | *○ | | |
| Output signal to compressor | ○ | | ○ | *○ | | |
| Set temp. | ○ | | | | | |
| Selected mode | ○ | | | | | |
| Operated switches status | ○ | | | | | |
| Manual select status | ○ | | | | | |

*: These can be set by self-diagnosis step II; their combinations are as follows:

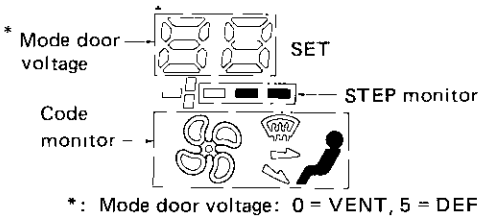
Actuator test

Press MODE SW

| Code | Intake | Outlet | A/M door | Comp. |
|---|---|---|---|---|
| | Outside air | DEF | Full Hot | OFF |
| | Outside air | FOOT | Full Hot | OFF |
| | Partial outside air | B/L | 30°C (86°F) | ON |
| | Recirculation air | VENT | Full Cool | ON |

Press FAN SW

| Code | Voltage |
|---|---|
| | 4V |
| | 6V |
| | 9V |
| | 12V |

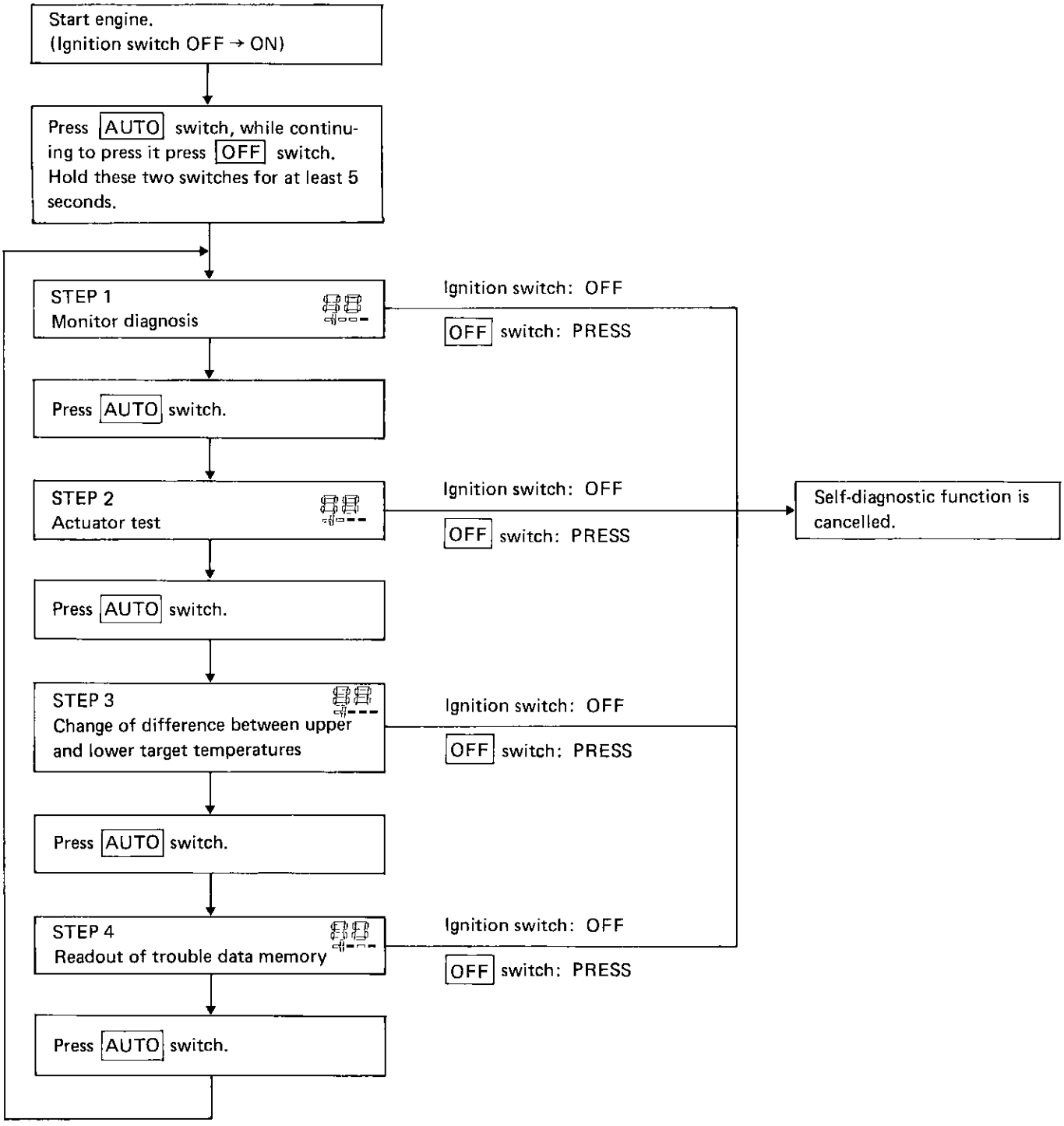



*: Mode door voltage: 0 = VENT, 5 = DEF
Ten times the value in V.

SHA755C

## Self-diagnosis (Cont'd)

The self-diagnostic system diagnoses the sensors, door motors, blower motor, etc. by system line. Refer to applicable sections (items) for details. Shifting from normal control to the self-diagnostic system is accomplished by starting the engine (turning ignition switch from "OFF" to "ON"), and pressing both the (AUTO) and (OFF) switch for at least 5 seconds.
This system will be cancelled by either pressing the (OFF) switch or turning the ignition switch "OFF". Shifting from one step to another is accomplished by means of pushing the (AUTO) switch, as required.



## Self-diagnosis (Cont'd)

### CHECKING PROCEDURE

Note

Start engine.

Check if SET and Mode data (VFD display) illuminate.

No → Faulty wiring or VFD

Yes

Set in self-diagnostic mode.
(Press AUTO switch, while continuing to press it press OFF switch. Hold these two switches for at least 5 seconds.)

Yes

Check if air conditioner operates and appears.

No → Faulty "AUTO" or "OFF" switch

STEP 1
**SENSOR MONITOR**

Identification data of each sensor is shown.

Press MODE switch or FAN switch.

Press AUTO switch.

STEP 2
**ACTUATOR TEST**

Code No. of actuators test pattern is indicated on display.

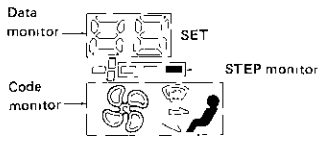
Press MODE switch or FAN switch.

Ⓐ

Sensor monitor

| Code | Item | Unit | Code | Item | Unit |
|---|---|---|---|---|---|
| | Ambient temperature | °C (°F) | | Internal data | - |
| | Upper compartment temperature | | | | - |
| | Lower compartment temperature | | | | - |
| Press FAN SW | DEF outlet air temperature | | | | - |
| | VENT outlet air temperature | | | | - |
| Press MODE SW | FOOT outlet air temperature | | | | - |
| | Sunload | *1 | | Difference between upper and lower target temperatures | °C (°F) |
| | Water temperature *3 | °C (°F) | | Internal data | - |
| | Mode door voltage *4 | *2 | | | |

*1 One tenth of the value in kcal/h m² unit
*2 Ten times of the value in V
*3 When coolant temperature is below 40°C (104°F) indicates 20°C (68°F)
When coolant temperature is above 40°C (104°F), indicates 80°C (176°F)
*4 Mode door voltage 0 = VENT, 5 = DEF

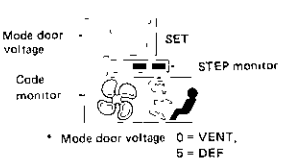



SHA754C

Actuator test

| Code | Intake | Outlet | A/M door | Comp. |
|---|---|---|---|---|
| Press MODE SW | Outside air | DEF | Full Hot | OFF |
| | Outside air | FOOT | Full Hot | OFF |
| | Partial outside air | B/L | 30°C (86°F) | ON |
| | Recirculation air | VENT | Full Cool | ON |

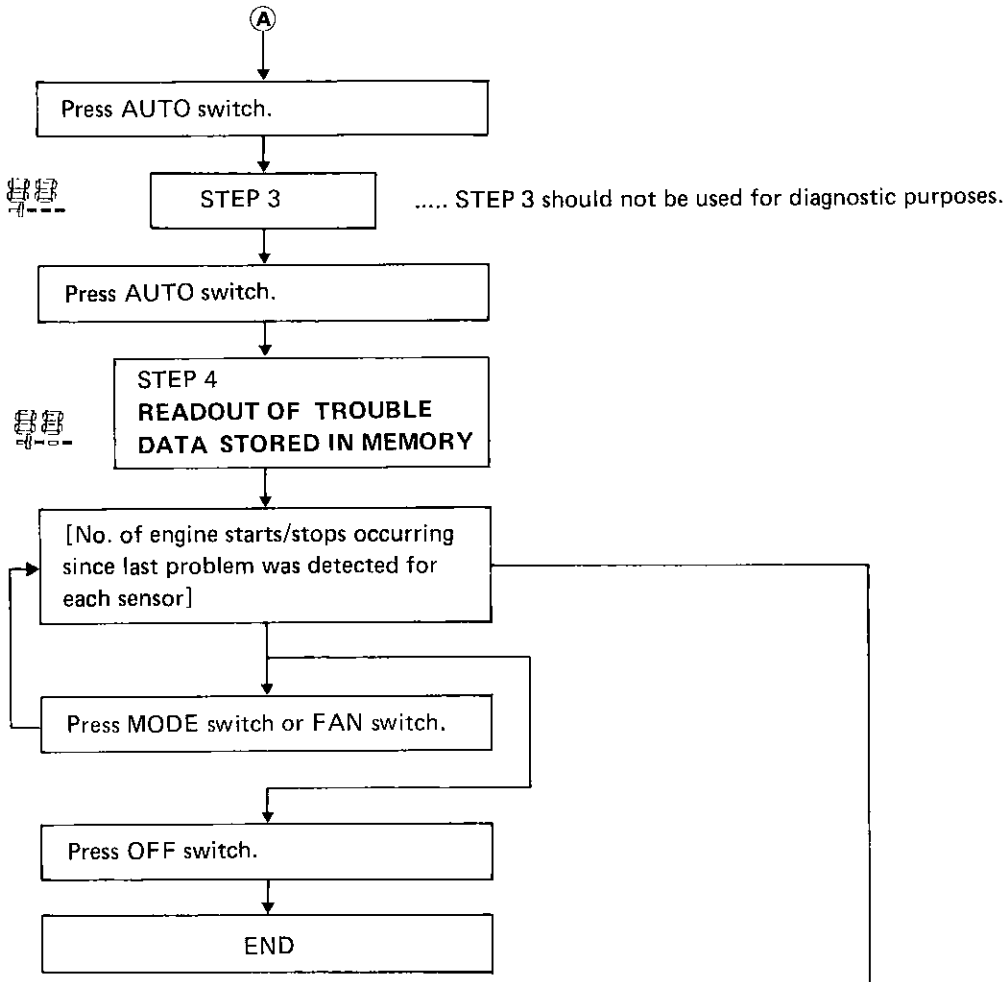
| Code | Voltage |
|---|---|
| Press FAN SW | 4V |
| | 6V |
| | 9V |
| | 12V |




SHA755C

Note:
1. Without engine running, STEP 1 and 2 are not useful for some case because compressor not operate.

## Self-diagnosis (Cont'd)

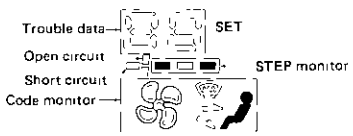



Readout of trouble data stored in memory

Press FAN SW.

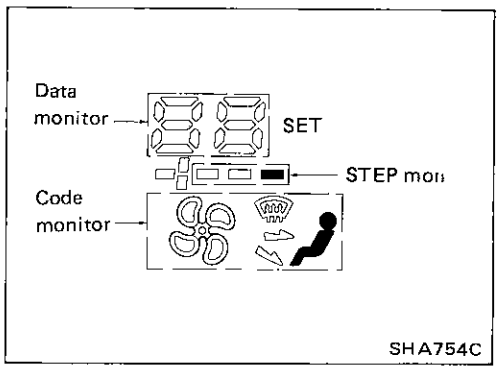
Press MODE SW.

| Code | Item | Trouble diagnosis criteria | Remarks |
|---|---|---|---|
| | Ambient sensor trouble data | Less than −70°C (−94°F)<br>Greater than 141°C (286°F) | |
| | Upper in-vehicle sensor trouble data | Less than −38°C (−36°F)<br>Greater than 141°C (286°F) | |
| | Lower in-vehicle sensor trouble data | | |
| | DEF Duct sensor trouble data | | |
| | VENT Duct sensor trouble data | | |
| | FOOT Duct sensor trouble data | | |
| | Sunload sensor trouble data | — | Detects only short circuit |




Trouble data
No. of IGN ON/OFF operations since last trouble was detected.
50: No problem
49 - 01: Problem existed
0: Problem exists

SHA756C




## Self-diagnosis (Cont'd)

### STEP 1: MONITOR DIAGNOSIS

By setting in self-diagnostic mode, VFD display shows that Step 1 mode has begun.
In this mode, each time the FAN or MODE SW is pressed, the code monitor changes in turn, and data corresponding with each code appears in the data monitor.

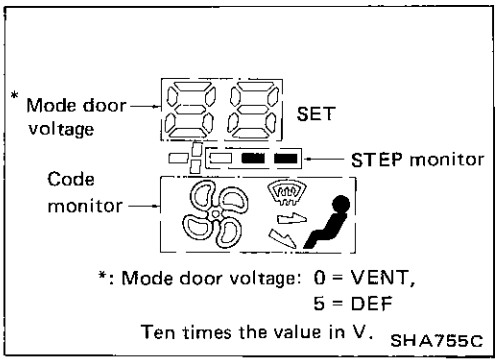
If the temperature shown on the display greatly differs from the actual temperature, check the sensor circuit first, then inspect the sensor itself according to the procedures described in Electrical Components Inspection.

* For cross-reference of code and corresponding data, refer to "Sensor monitor" in "Checking procedure".

Press FAN SW. ↑ / Press MODE SW. ↓

| Code | Item | Unit | Code | Item | Unit |
|---|---|---|---|---|---|
| | Ambient temperature | °C (°F) | | Internal data | – |
| | Upper compartment temperature | | | | – |
| | Lower compartment temperature | | | | – |
| | DEF outlet air temperature | | | | – |
| | VENT outlet air temperature | | | | – |
| | FOOT outlet air temperature | | | | – |
| | Sunload | *1 | | Difference between upper and lower target temperatures | °C (°F) |
| | Water temperature *3 | °C (°F) | | Internal data | – |
| | Mode door voltage*4 | *2 | | | |

*1: One tenth of the value in kcal/h·m² unit
*2: Ten times of the value in V
*3: When coolant temperature is below 40°C (104°F), indicates 20°C (68°F)
When coolant temperature is avove 40°C (104°F), indicates 80°C (176°F)
*4: Mode door voltage: 0 = VENT, 5 = DEF




## Self-diagnosis (Cont'd)

### STEP 2: ACTUATOR TEST

By pushing the AUTO SW once, self-diagnosis is changed from step 1 to step 2.

During inspection in STEP 2 mode, the auto amplifier will forcefully transmit an output to the affected actuators in response to the code shown on the display, as indicated in the table below. Each operating condition can be set in turn by pressing FAN or MODE SW.

Checks must be made for improper operation visually, by listening to any noise, or by touching air outlets with your hand, etc.

Press MODE SW. →

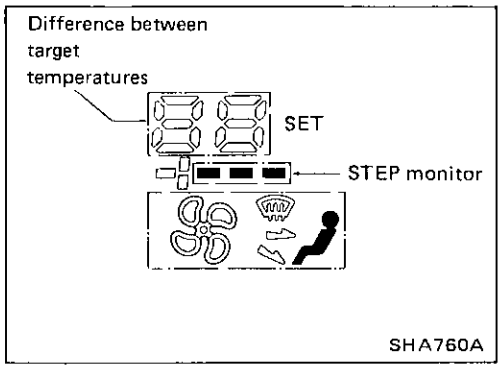
| Actuator \ Display | | | | |
|---|---|---|---|---|
| Mode door | DEF | D/FOOT | B/L | VENT |
| Intake door | FRE | FRE | 50% FRE | REC |
| Air mix door | Full Hot | Full Hot | 30°C (86°F) | Full Cold |
| Compressor | OFF | OFF | ON | ON |

Press FAN SW. →

| Blower motor \ Display | | | | |
|---|---|---|---|---|
| Voltage | 4V | 6V | 9V | 12V |

Operating condition of each actuator cannot be checked by indicators.

* 1) Mode and fan speed can be set independently.
2) When appears, air mix door activates.
A stabilized outlet temperature 30°C (86°F) is reached after air mix door has been operating for approximately one minute.




## Self-diagnosis (Cont'd)

### STEP 3: AUXILIARY MECHANISM

Changes of difference between upper and lower target temperatures.

* Figures in parentheses "( )" refer to values for "°F" specifications.

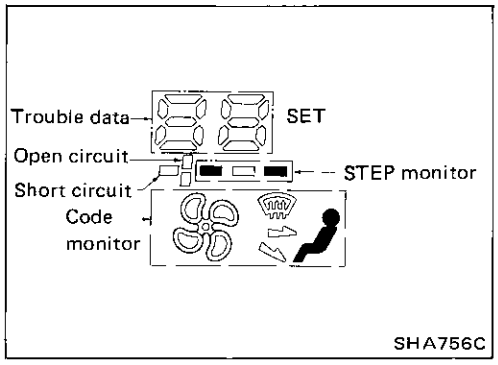
Each time the "MODE" switch is pressed, the number in the SET section advances. This number will increase up to 20 for °C specifications and 36 for °F specifications. Each time the "FAN" switch is pressed, the number decreases. This number decreases to –20 for °C specifications and –36 for °F specifications.

For °C specifications, pressing the "MODE" or "FAN" switch each time increases or decreases the data number by "1" degree (and by "1" through "3" degrees for °F specifications).

← Press FAN SW.  Press MODE SW. →

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| °C specifications | Data | –20 | – – – – | –1 | 0 | 1 | – – – – | 20 |
| | Difference between upper and lower target temperatures | –2.0°C | – – – – | –1°C | 0°C | 0.1°C | – – – – | 2.0°C |
| °F specifications | Data | –36 | – – – – | –2 | 0 | 2°C | – – – – | 36 |
| | Difference between upper and lower target temperatures | –3.6°F | – – – – | –0.2°F | 0°F | 0.2°F | – – – – | 3.6°F |

Difference between upper and lower target temperatures changed in the preceding procedure is kept until the next change is done or the battery cable is removed.




## Self-diagnosis (Cont'd)

### STEP 4: READOUT OF TROUBLE DATA STORED IN MEMORY

By pushing the AUTO SW once in step 3, self-diagnosis is changed to step 4.

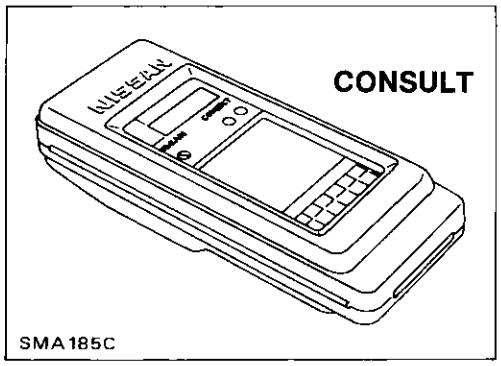
In this mode, each time the FAN or MODE SW is pressed, the code monitor changes in turn, and data or status of each sensor appears in the data monitor.

When the sensor becomes inoperative, the number of IGN ON/OFF operations occurring since the last trouble was detected appears in the SET section.

Open circuit or short circuit is indicated by "□" or "▭".

**Conditions for open or short circuit**

| Code | Sensor | Open circuit | Short circuit |
|---|---|---|---|
| | Ambient sensor | Less than −70°C (−94°F) | Greater than 141°C (286°F) |
| | Room upper sensor | Less than −38°C (−36°F) | Greater than 141°C (286°F) |
| | Room lower sensor | Less than −38°C (−36°F) | Greater than 141°C (286°F) |
| | DEF duct sensor | Less than −38°C (−36°F) | Greater than 141°C (286°F) |
| | VENT duct sensor | Less than −38°C (−36°F) | Greater than 141°C (286°F) |
| | Floor duct sensor | Less than −38°C (−36°F) | Greater than 141°C (286°F) |
| | Sunloaded sensor | Open circuit can not be detected by self-diagnosis. | Greater than 1.784 kW (1,534 kcal/h, 6,087 BTU/h)/$m^2$ [0.1657 kW (142.51 kcal/h, 565.5 BTU/h)/sq ft] |

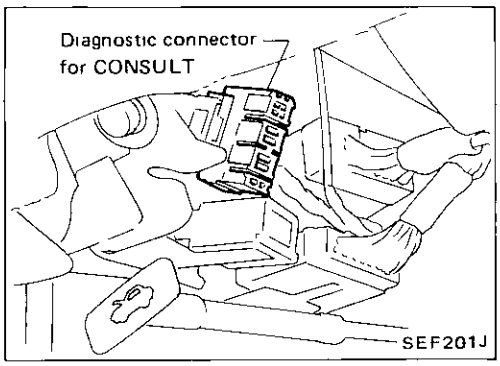


SMA185C

## Consult

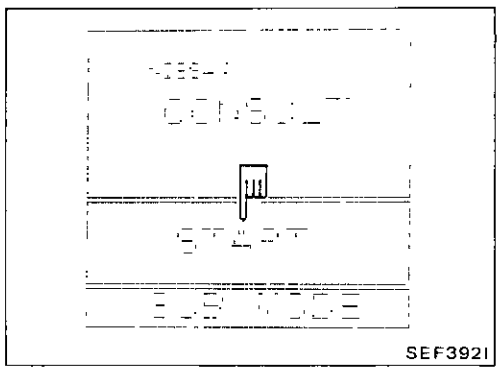
### CONSULT INSPECTION PROCEDURE

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

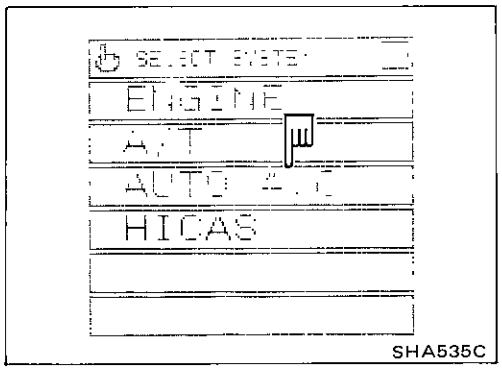


SEF201J

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


SEF392I

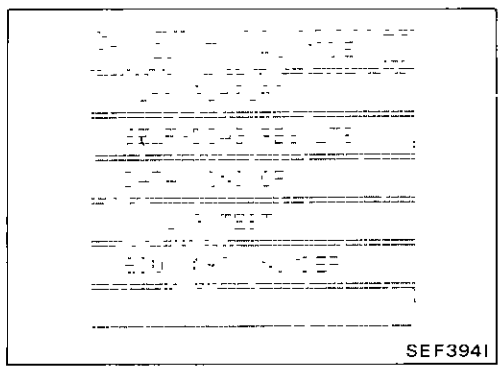
5. Touch "AUTO A/C".



SHA535C

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

**For further information, read the CONSULT Operation Manual.**


SEF394I

## Preliminary Check

### PRELIMINARY CHECK 1

**Air outlet does not change.**

Does this incident occur only in Manual Select Mode?

Yes → **Go to Diagnostic Procedure 24.**

No ↓

CHECK SENSOR CIRCUIT.

Read out trouble data with CONSULT.

or

Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

| CONSULT indication | Self-diagnosis code No. | Self-diagnosis data | How to repair | Reference page |
|---|---|---|---|---|
| Ambient sensor circuit is open | | 0 | Go to Diagnostic procedure 2. | HA-108 |
| Ambient sensor circuit is shorted | | — | Go to Diagnostic procedure 3. | HA-109 |
| Upper in vehicle sensor circuit is open. | | 0 | Go to Diagnostic procedure 4. | HA-110 |
| Upper in-vehicle sensor circuit is shorted. | | — | Go to Diagnostic procedure 5. | HA-111 |
| Lower in-vehicle sensor circuit is open. | | 0 | Go to Diagnostic procedure 6. | HA-112 |
| Lower in vehicle sensor circuit is shorted. | | — | Go to Diagnostic procedure 7. | HA-113 |
| Defroster (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 8. | HA-114 |
| Defroster (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 9. | HA-115 |
| Vent (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 10. | HA-116 |
| Vent (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 11. | HA-117 |
| Floor (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 12. | HA-117 |
| Floor (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 13. | HA-118 |
| Sunload sensor circuit is shorted. | | — | Go to Diagnostic procedure 14. | HA-118 |

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK MODE DOOR OPERATION.

Set up "ACTIVE TEST" mode with CONSULT.

or

Set up self-diagnosis STEP 2.

Does air outlet change according to each mode?

| Set mode | DEF | HEAT | B/L | VENT |
|---|---|---|---|---|
| Code No. | | | | |
| Air outlet | DEF | FOOT/ DEF | FOOT/ VENT | VENT |

Refer to **AIR DISTRIBUTION.**

O.K. ↓

Air outlet control system is normal.
Refer to **Specifications.**

N.G. →

CHECK SIDE LINK MECHANISM.

Refer to **Control Linkage Adjustment.**

N.G. → Repair or adjust.

O.K. ↓

Go to **Diagnostic Procedure 17 or 18.**

## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 2

**Intake door does not change.**

CHECK SENSOR CIRCUIT.

Read out trouble data with CONSULT.

or

Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G.

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

| CONSULT indication | Self-diagnosis code No. | Self-diagnosis data | How to repair | Reference page |
|---|---|---|---|---|
| Ambient sensor circuit is open | | 0 | Go to Diagnostic procedure 2. | HA-108 |
| Ambient sensor circuit is shorted. | | — | Go to Diagnostic procedure 3. | HA-109 |
| Upper in vehicle sensor circuit is open. | | 0 | Go to Diagnostic procedure 4. | HA-110 |
| Upper in-vehicle sensor circuit is shorted. | | — | Go to Diagnostic procedure 5. | HA-111 |
| Lower in vehicle sensor circuit is open. | | 0 | Go to Diagnostic procedure 6. | HA-112 |
| Lower in-vehicle sensor circuit is shorted. | | — | Go to Diagnostic procedure 7. | HA-113 |
| Defroster (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 8. | HA-114 |
| Defroster (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 9. | HA-115 |
| Vent (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 10. | HA-116 |
| Vent (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 11. | HA-117 |
| Floor (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 12. | HA-117 |
| Floor (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 13. | HA-118 |
| Sunload sensor circuit is shorted. | | — | Go to Diagnostic procedure 14. | HA-118 |

When malfunctioning sensor circuit, ambient sensor, in vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K.

CHECK INTAKE DOOR MOTOR.

Set up "ACTIVE TEST" mode with CONSULT.

or

Set up self-diagnosis STEP 2.

Does intake air change according to each ordered position?

| Set position | FRE | | FRE/REC | REC |
|---|---|---|---|---|
| Code No. | | | | |
| Air intake | FRE | | FRE/REC | REC |

O.K.

Intake door control system is normal.
Refer to **Specifications.**

N.G.

CHECK INTAKE DOOR ROD or LEVER MECHANISM.
Refer to **Control Linkage Adjustment.**

N.G.

Repair or adjust.

O.K.

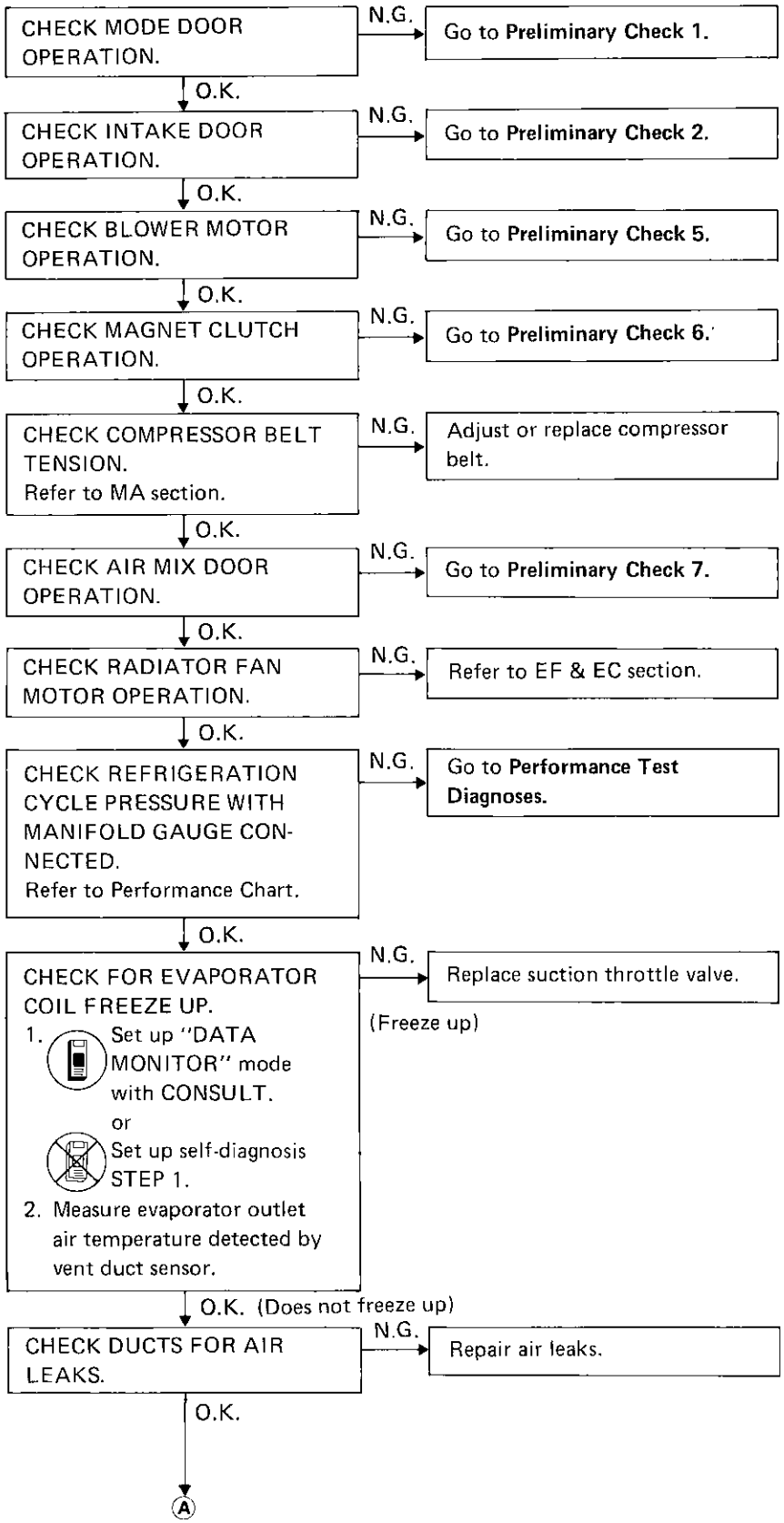
Go to **Diagnostic Procedure 16.**

## Preliminary Check (Cont'd)

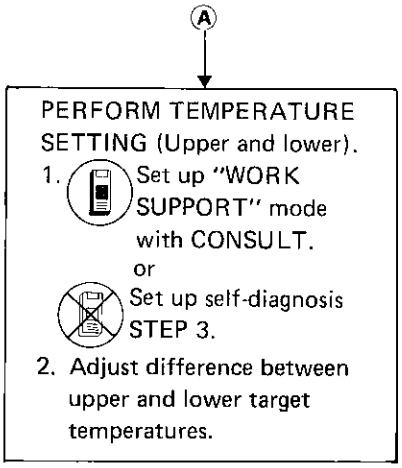
### PRELIMINARY CHECK 3

**Insufficient cooling**

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



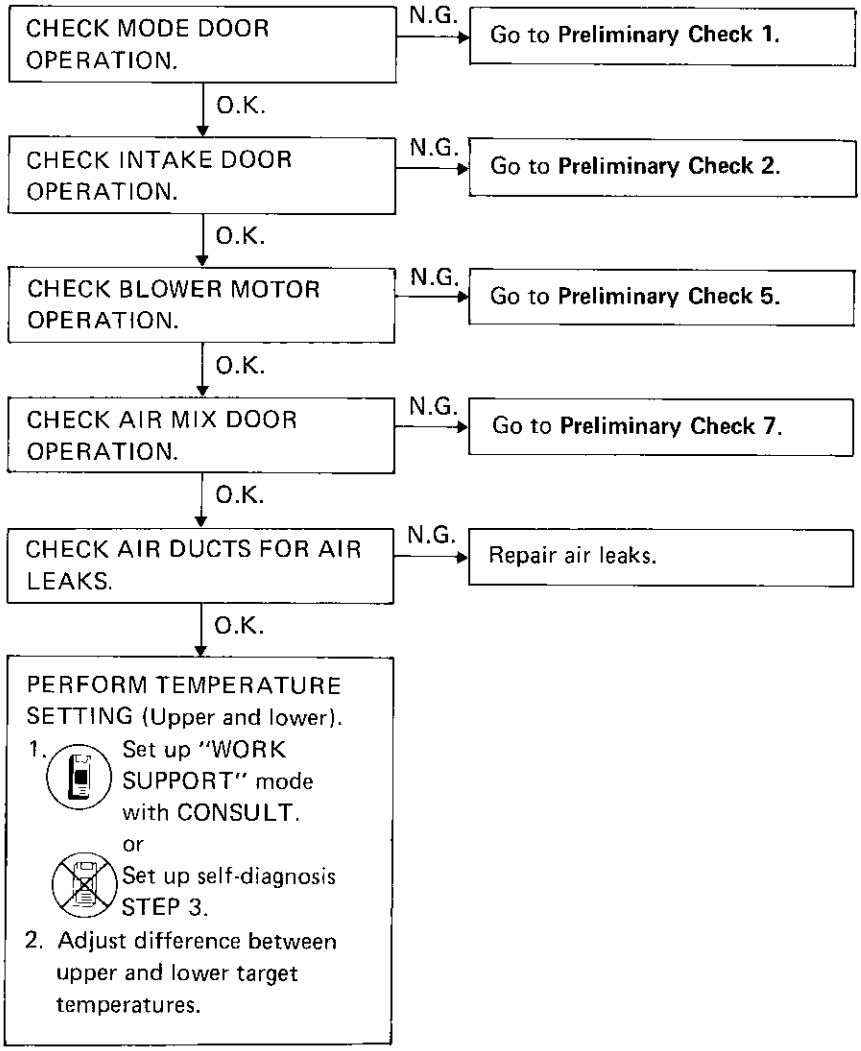
## Preliminary Check (Cont'd)




### PRELIMINARY CHECK 4

**Insufficient heating**

- Check coolant level, engine temperature and heater hoses, and read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 5

**Blower motor operation is malfunctioning.**

Does this incident occur only in Manual Select Mode?

Yes → **Go to Diagnostic Procedure 24.**

No ↓

CHECK SENSOR CIRCUIT.

Read out trouble data with CONSULT.

or

Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

| CONSULT indication | Self-diagnosis code No. | Self-diagnosis data | How to repair | Reference page |
|---|---|---|---|---|
| Ambient sensor circuit is open | | 0 | Go to Diagnostic procedure 2. | HA-108 |
| Ambient sensor circuit is shorted. | | - | Go to Diagnostic procedure 3. | HA-109 |
| Upper in vehicle sensor circuit is open. | | 0 | Go to Diagnostic procedure 4. | HA-110 |
| Upper in-vehicle sensor circuit is shorted. | | - | Go to Diagnostic procedure 5. | HA-111 |
| Lower in vehicle sensor circuit is open. | | 0 | Go to Diagnostic procedure 6. | HA-112 |
| Lower in-vehicle sensor circuit is shorted. | | - | Go to Diagnostic procedure 7. | HA-113 |
| Defroster (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 8. | HA-114 |
| Defroster (duct) sensor circuit is shorted. | | - | Go to Diagnostic procedure 9. | HA-115 |
| Vent (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 10. | HA-116 |
| Vent (duct) sensor circuit is shorted. | | - | Go to Diagnostic procedure 11. | HA-117 |
| Floor (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 12. | HA-117 |
| Floor (duct) sensor circuit is shorted. | | - | Go to Diagnostic procedure 13. | HA-118 |
| Sunload sensor circuit is shorted | | | Go to Diagnostic procedure 14. | HA-118 |

When malfunctioning sensor circuit, ambient sensor, in vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK BLOWER MOTOR OPERATION.

Set up "ACTIVE TEST" mode with CONSULT.

or

Set up self-diagnosis STEP 2.

Does blower motor speed change according to each ordered fan speed?

| Set fan speed | 4V | 6V | 9V | 12V |
|---|---|---|---|---|
| Code No. | | | | |
| Fan speed | | | | |

O.K. ↓

N.G. → **Go to Diagnostic Procedure 25.**

Is engine coolant temperature below 40°C (104°F) and foot duct temperature below 30°C (86°F)?

N.G. → Blower motor operation is normal. Refer to **Fan speed control specification.**

O.K. ↓

IS BLOWER MOTOR CONTROLLED UNDER FAN STARTING SPEED CONTROL? Refer to **Starting fan speed control specification.**

No → Check engine temperature sensor control circuit. Refer to EF & EC section.

Yes ↓

Blower motor operation is normal.

## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 6

**Magnet clutch does not engage.**

CHECK SENSOR CIRCUIT.
Read out trouble data with CONSULT.
or
Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

| CONSULT indication | Self-diagnosis code No. | Self-diagnosis data | How to repair | Reference page |
|---|---|---|---|---|
| Ambient sensor circuit is open | | | Go to Diagnostic procedure 2. | HA 108 |
| Ambient sensor circuit is shorted. | | | Go to Diagnostic procedure 3. | HA-109 |
| Upper in-vehicle sensor circuit is open. | | | Go to Diagnostic procedure 4. | HA 110 |
| Upper in-vehicle sensor circuit is shorted. | | | Go to Diagnostic procedure 5. | HA 111 |
| Lower in-vehicle sensor circuit is open. | | | Go to Diagnostic procedure 6. | HA-112 |
| Lower in-vehicle sensor circuit is shorted. | | | Go to Diagnostic procedure 7. | HA-113 |
| Defroster (duct) sensor circuit is open. | | | Go to Diagnostic procedure 8. | HA-114 |
| Defroster (duct) sensor circuit is shorted. | | | Go to Diagnostic procedure 9. | HA 115 |
| Vent (duct) sensor circuit is open. | | | Go to Diagnostic procedure 10. | HA-116 |
| Vent (duct) sensor circuit is shorted. | | | Go to Diagnostic procedure 11. | HA-117 |
| Floor (duct) sensor circuit is open. | | | Go to Diagnostic procedure 12. | HA 117 |
| Floor (duct) sensor circuit is shorted. | | | Go to Diagnostic procedure 13. | HA-118 |
| Sunload sensor circuit is shorted. | | | Go to Diagnostic procedure 14. | HA-118 |

When malfunction sensor circuit, ambient sensor, in vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is with normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK MAGNET CLUTCH OPERATION.
Set up "ACTIVE TEST" mode with CONSULT.
or
Set up self-diagnosis STEP 2.
Check if magnet clutch engages according to order from CONSULT or each code No.

| Set magnet clutch operation | OFF | | ON | |
|---|---|---|---|---|
| Code No. | | | | |
| Magnet clutch operation | OFF | | ON | |

O.K. ↓

Magnet clutch control system is normal.
Refer to **MAGNET CLUTCH CONTROL.**

N.G. →

CHECK REFRIGERANT.
Connect manifold gauge then check system pressure.

N.G. → Check for refrigerant leaks.

O.K. ↓

Go to **Diagnostic Procedure 19.**

## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 7

**Discharged air temperature does not change.**

CHECK SENSOR CIRCUIT.
Read out trouble data with CONSULT.
or
Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G. →

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

| CONSULT indication | Self-diagnosis code No. | Self-diagnosis data | How to repair | Reference page |
|---|---|---|---|---|
| Ambient sensor circuit is open | | 0 | Go to Diagnostic procedure 2. | HA 108 |
| Ambient sensor circuit is shorted. | | — | Go to Diagnostic procedure 3. | HA-109 |
| Upper in-vehicle sensor circuit is open. | | 0 | Go to Diagnostic procedure 4. | HA-110 |
| Upper in-vehicle sensor circuit is shorted. | | — | Go to Diagnostic procedure 5. | HA-111 |
| Lower in-vehicle sensor circuit is open. | | 0 | Go to Diagnostic procedure 6. | HA 112 |
| Lower in-vehicle sensor circuit is shorted. | | — | Go to Diagnostic procedure 7. | HA 113 |
| Defroster (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 8. | HA-114 |
| Defroster (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 9. | HA 115 |
| Vent (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 10. | HA 116 |
| Vent (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 11. | HA 117 |
| Floor (duct) sensor circuit is open. | | 0 | Go to Diagnostic procedure 12. | HA 117 |
| Floor (duct) sensor circuit is shorted. | | — | Go to Diagnostic procedure 13. | HA-118 |
| Sunload sensor circuit is shorted. | | — | Go to Diagnostic procedure 14. | HA-118 |

When malfunction sensor circuit, ambient sensor, in vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is with normal range before performing Diagnostic Procedures.

O.K. ↓

CHECK AIR MIX DOOR OPERATION.
Set up "ACTIVE TEST" mode with CONSULT.
or
Set up self-diagnosis STEP 2.

Check if discharge air temperature changes as in following chart.

| | | | | |
|---|---|---|---|---|
| Set discharge air temperature | Full Hot | | 30°C (86°F) | Full Cool |
| Code No. | | | | |
| Discharge air temperature | Full Hot | | 30°C (86°F) | Full Cool |

O.K. ↓

Air mix door control system is normal.
Refer to **Specification of air mix door control.**

N.G. ↓

CHECK AIR MIX DOOR MECHANISM.
Refer to **Control Linkage Adjustment.**

N.G. → Repair or adjust.

O.K. ↓

Go to **Diagnostic Procedure 15.**

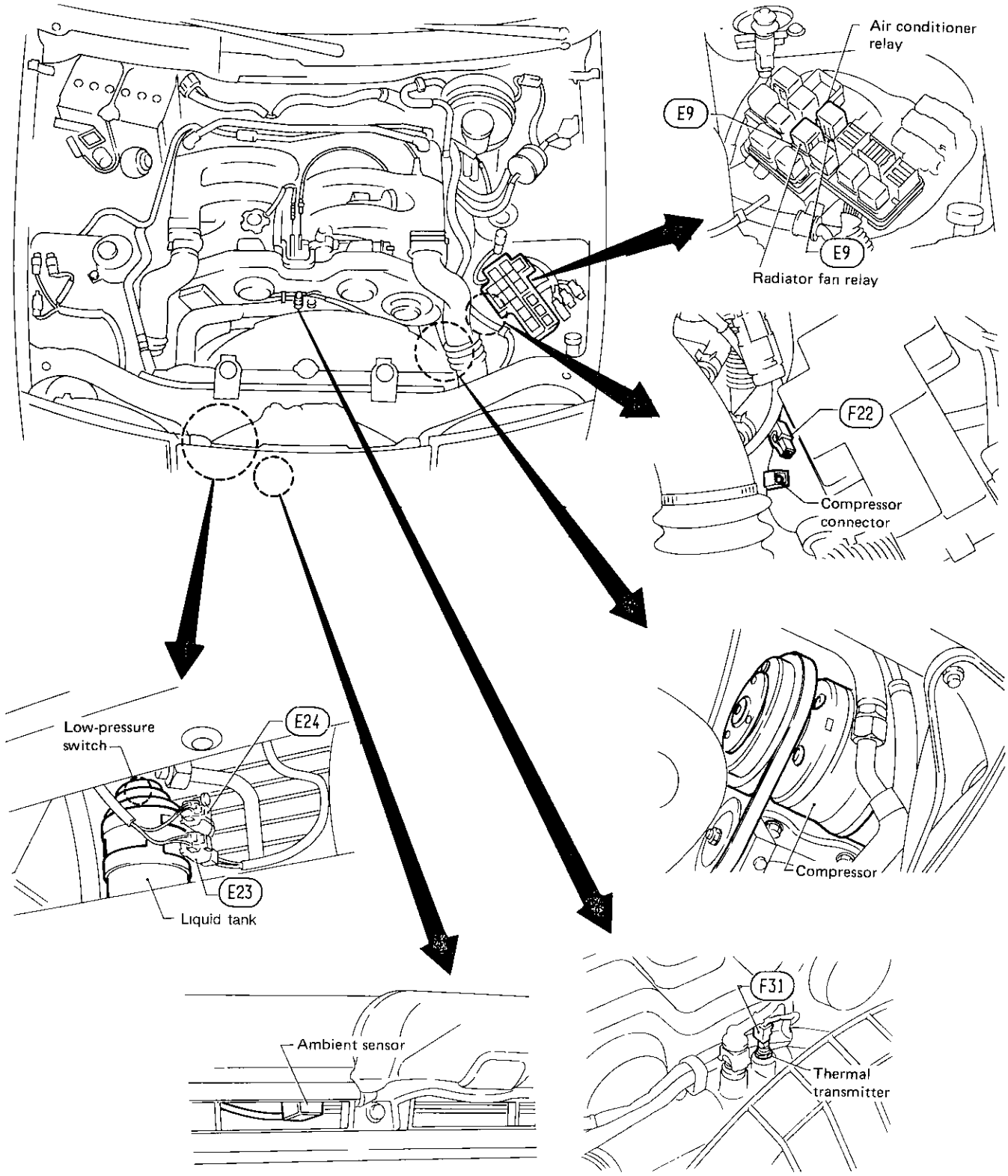
### PRELIMINARY CHECK 8

**Noise**

Refer to page HA-57.

Engine compartment

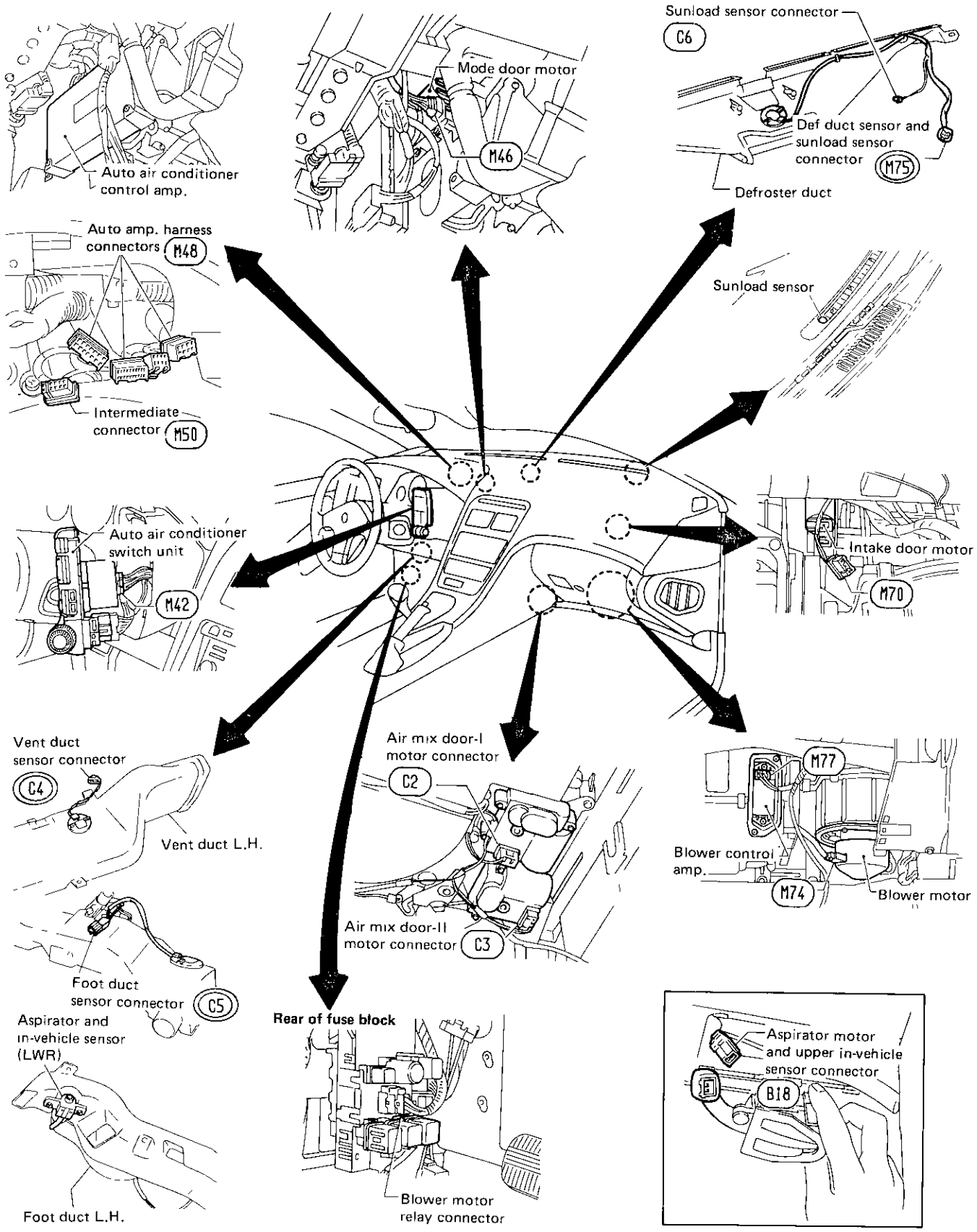
## Harness Layout for A/C System




SHA524D

## Harness Layout for A/C System (Cont'd)

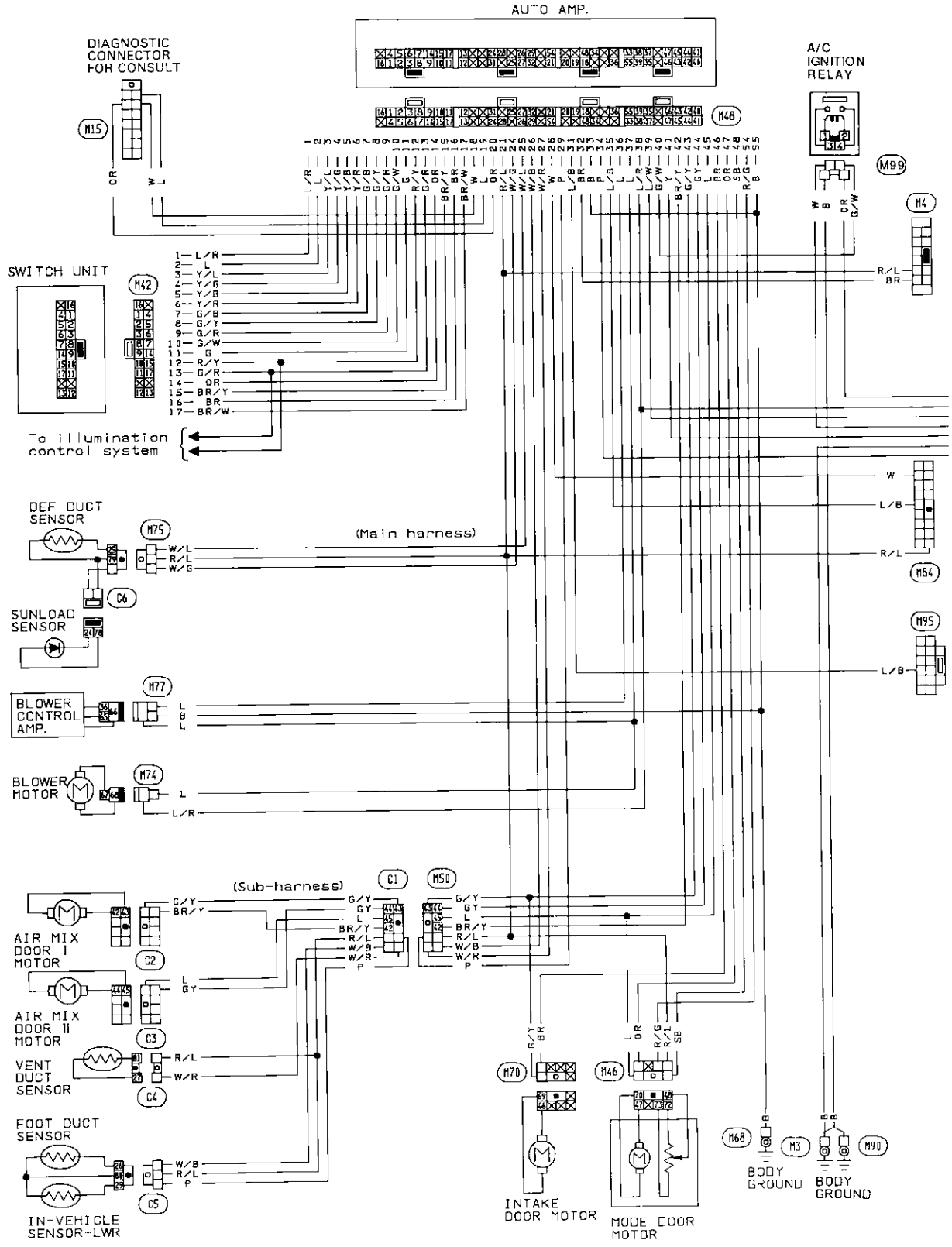
**Passenger compartment**



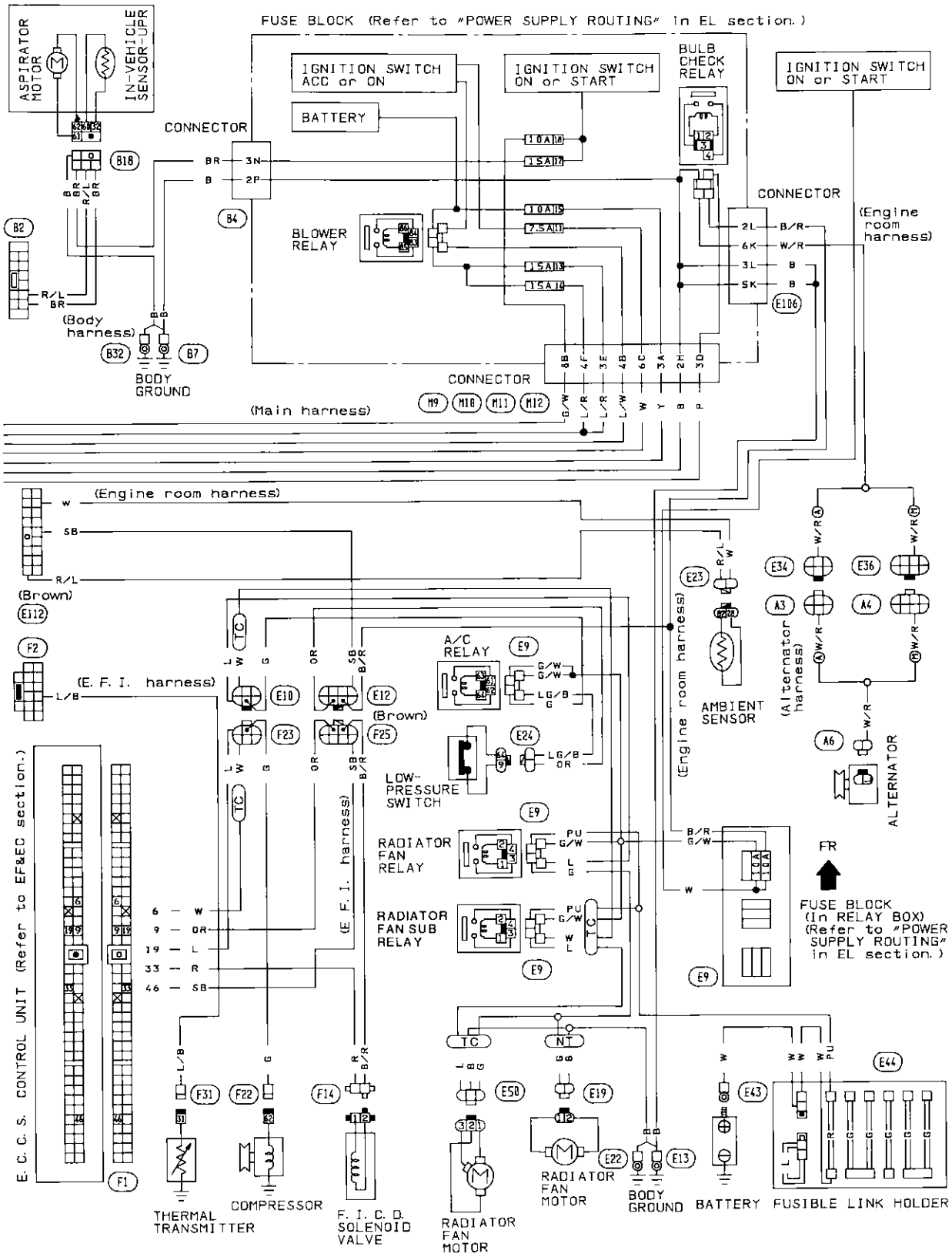

SHA543C

## Wiring Diagram

(TC) Turbo model
(NT): Non-turbo model

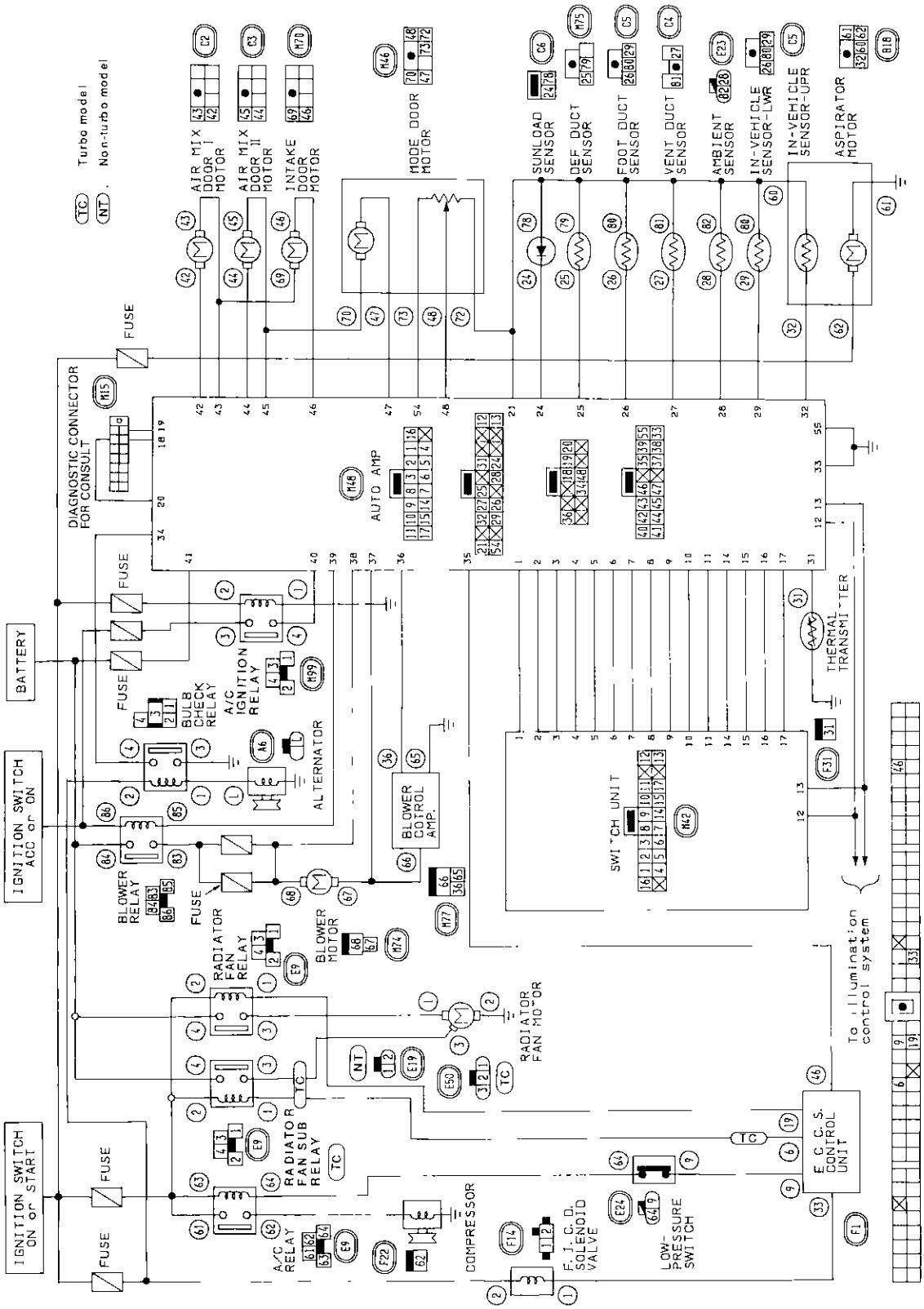


## Wiring Diagram (Cont'd)




SHA802C

## Circuit Diagram for Quick Pinpoint Check




- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◎ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-102 - HA-103.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

SHA801C

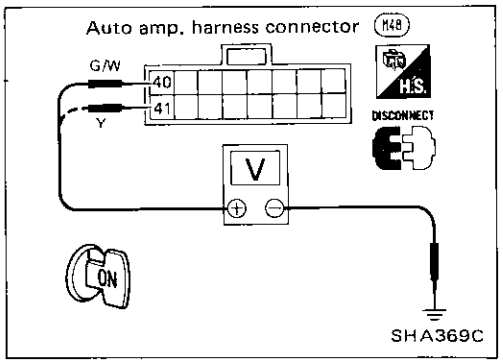
## Main Power Supply and Ground Circuit Check

### POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.
**Refer to "POWER SUPPLY ROUTING" in section EL and Wiring Diagram — Auto Air Conditioner.**

### AUTO AMP. REMOVAL

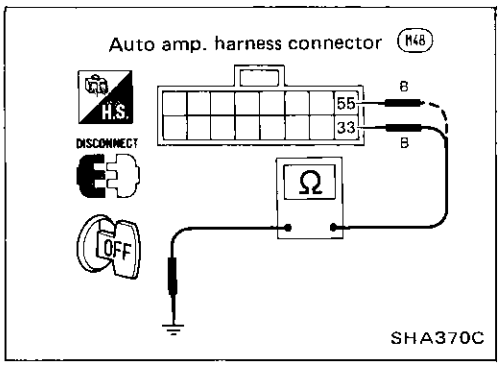
1. Remove driver side instrument lower lid.
2. Remove vent duct.
3. Remove auto amp. with harness connected.




### AUTO AMP. CHECK

1. Disconnect auto amp. harness connectors.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ㊵ or No. ㊶ and body ground.

| Voltmeter terminal | | Voltage (Approx.) |
|---|---|---|
| ⊕ | ⊖ | |
| ㊵ | Body ground | 12V |
| ㊶ | | |




Check body ground circuit for control unit with ignition switch OFF

1. Disconnect auto amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check continuity between terminal No. ㉝ or ㊺ and body ground.

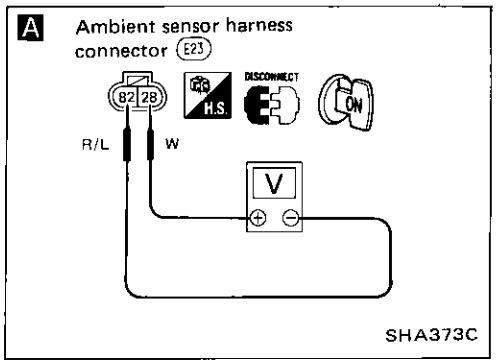
| Ohmmeter terminal | | Continuity |
|---|---|---|
| ⊕ | ⊖ | |
| ㉝ | Body ground | Yes |
| ㊺ | | |

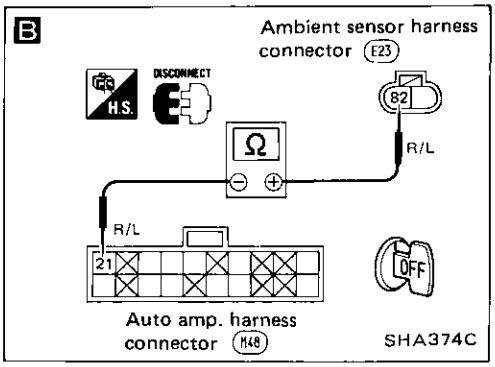
## Diagnostic Procedure 1

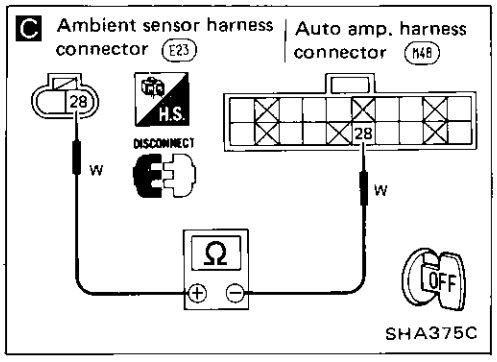
**SYMPTOM: Self-diagnosis detects intermittent short or open circuit in each sensor circuit.**

Check each connector connection as shown in the following table, and check each line's condition.

| Malfunctioning circuit | Connector No. to be checked | | | | |
|---|---|---|---|---|---|
| | Main harness | | Engine room harness | Body harness | A/C sub-harness |
| Ambient sensor | M48 | | E23 E112 | | |
| Upper in-vehicle sensor | M4 M48 | | | B2 B18 | |
| Lower in-vehicle sensor | M48 | M50 | | | C5 C1 |
| DEF duct sensor | M48 | M75 | | | |
| VENT duct sensor | M48 | M50 | | | C1 C4 |
| Floor duct sensor | M48 | M50 | | | C5 C1 |
| Sunload sensor | M48 | M75 | | | C6 |




## Diagnostic Procedure 2

**SYMPTOM: Ambient sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)**

**A**

CHECK AMBIENT SENSOR CIRCUIT BETWEEN AMBIENT SENSOR AND AUTO AMP.
Disconnect ambient sensor harness connector.
Do approx. 5 volts exist between ambient sensor harness connector terminal No. ㉘ and ㉜ ?

N.G. → Disconnect auto amp. harness connector.

**B**

Note: Check circuit continuity between ambient sensor harness connector terminal No. ㉜ and auto amp. harness connector terminal No. ㉑ .

O.K. → **C**

Note: Check circuit continuity between ambient sensor harness connector terminal No. ㉘ and auto amp. harness connector terminal No. ㉘ .

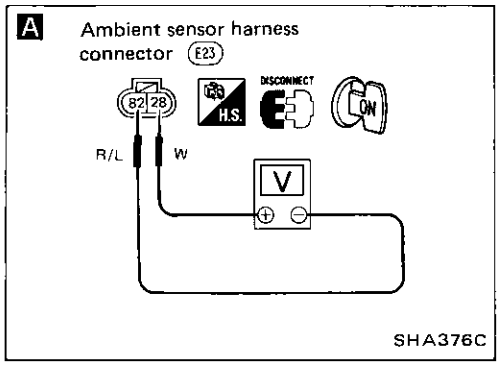
O.K. → Replace auto amp.

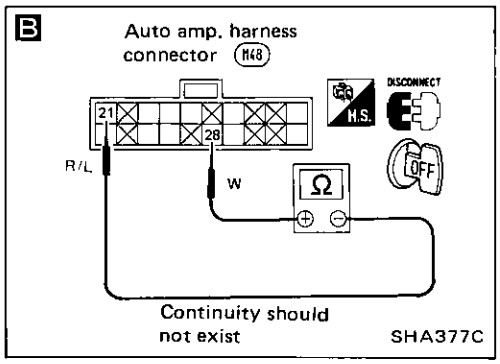
O.K. (from A) → CHECK AMBIENT SENSOR. (Refer to Electrical Components Inspection.)

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.**




## Diagnostic Procedure 3

**SYMPTOM: Ambient sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK AMBIENT SENSOR CIRCUIT BETWEEN AMBIENT SENSOR AND AUTO AMP.
Disconnect ambient sensor harness connector.
Do approx. 5 volts exist between ambient sensor harness connector terminal No. ㉘ and ㉜ ?

N.G. → Disconnect auto amp. harness connector.

B

Note

Check the circuit between auto amp. harness connector terminal No. ㉘ and ㉑ is not shorted.

O.K. → Replace auto amp.

O.K. ↓

CHECK AMBIENT SENSOR.
(Refer to Electrical Components Inspection.)

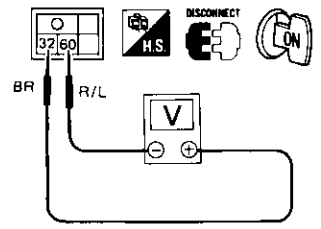
N.G. → Replace ambient sensor.

O.K. ↓

Replace auto amp.

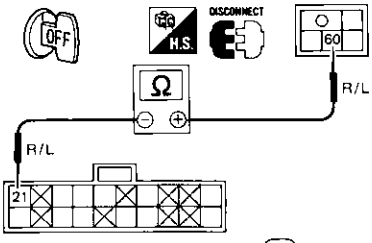
Note:
**If the result is N.G. after checking insulation of each terminal, repair harness or connector.**

A In-vehicle upper sensor harness connector (B18)




SHA378C

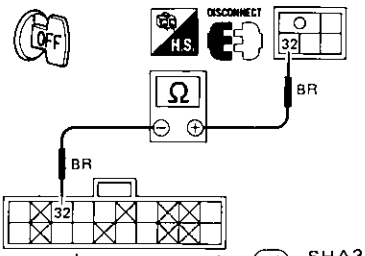
B In-vehicle upper sensor harness connector (B18)




Auto amp. harness connector (M48)

SHA148D

C In-vehicle upper sensor harness connector (B18)




Auto amp. harness connector (M48) SHA380C

## Diagnostic Procedure 4

**SYMPTOM: Upper in-vehicle sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK IN-VEHICLE UPPER SENSOR CIRCUIT BETWEEN IN-VEHICLE UPPER SENSOR AND AUTO AMP.
Disconnect in-vehicle upper sensor harness connector.
Do approx. 5 volts exist between in-vehicle upper sensor harness connector terminal No. ㉜ and ㊿ ?

N.G. → Disconnect auto amp. harness connector.

B Note

Check circuit continuity between in-vehicle upper sensor harness connector terminal No. ㊿ and auto amp. harness connector terminal No. ㉑.

O.K. →

C Note

Check circuit continuity between in-vehicle upper sensor harness connector terminal No. ㉜ and auto amp. harness connector terminal No. ㉜.

O.K. →

Replace auto amp.

O.K. ↓

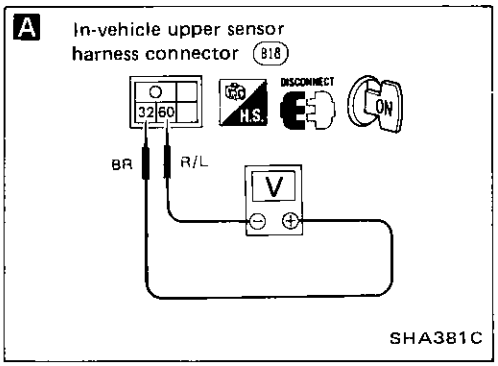
CHECK IN-VEHICLE UPPER SENSOR.
(Refer to Electrical Components Inspection.)

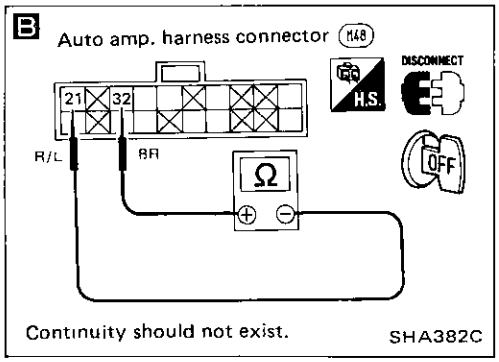
N.G. → Replace in-vehicle upper sensor.

O.K. ↓

Replace auto amp.

**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**




## Diagnostic Procedure 5

**SYMPTOM: Upper in-vehicle sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK IN-VEHICLE UPPER SENSOR BETWEEN IN-VEHICLE UPPER SENSOR AND AUTO AMP.
Disconnect in-vehicle upper sensor harness connector.
Do approx. 5 volts exist between in-vehicle upper sensor harness connector terminal No. ㉜ and ㊿ ?

N.G. → Disconnect auto amp. harness connector.

B

Note

Check the circuit between auto amp. harness connector terminal No. ㉜ and ㉑ is not shorted.

O.K. → Replace auto amp.

O.K. ↓

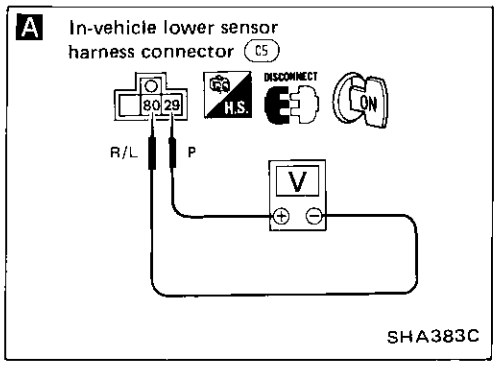
CHECK IN-VEHICLE UPPER SENSOR.
(Refer to Electrical Components Inspection.)

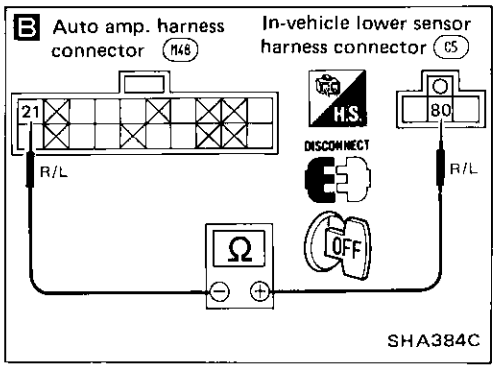
N.G. → Replace in-vehicle upper sensor.

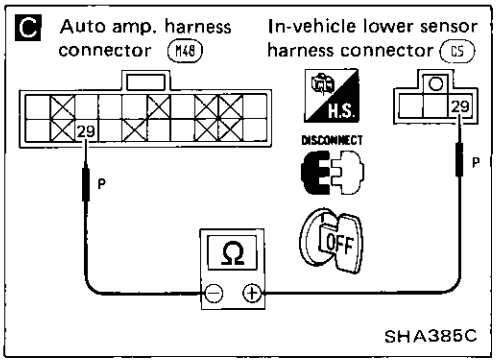
O.K. ↓

Replace auto amp.

**Note:**
**If the result is N.G. after checking insulation of each terminal, repair harness or connector.**




## Diagnostic Procedure 6

**SYMPTOM: Lower in-vehicle sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)**

**A**

CHECK IN-VEHICLE LOWER SENSOR CIRCUIT BETWEEN IN-VEHICLE LOWER SENSOR AND AUTO AMP.
Disconnect in-vehicle lower sensor harness connector.
Do approx. 5 volts exist between in-vehicle lower sensor harness connector terminal No. ㉙ and ㉚ ?

N.G. → Disconnect auto amp. harness connector.

**B** Note

Check circuit continuity between in-vehicle lower sensor harness connector terminal No. ㉚ and auto amp. harness connector terminal No. ㉑.

O.K.

**C** Note

Check circuit continuity between in-vehicle lower sensor harness connector terminal No. ㉙ and auto amp. harness connector terminal No. ㉙.

O.K.

Replace auto amp.

O.K.

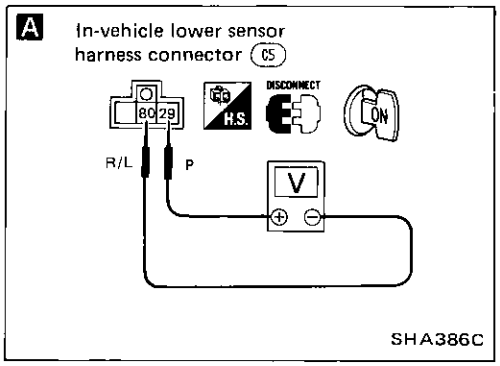
CHECK IN-VEHICLE LOWER SENSOR.
(Refer to Electrical Components Inspection.)

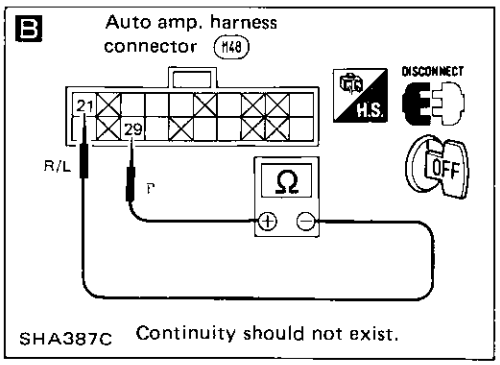
N.G. → Replace in-vehicle lower sensor.

O.K.

Replace auto amp.

**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**




## Diagnostic Procedure 7

**SYMPTOM:** **Lower in-vehicle sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK IN-VEHICLE LOWER SENSOR CIRCUIT BETWEEN IN-VEHICLE LOWER SENSOR AND AUTO AMP.
Disconnect in-vehicle lower sensor harness connector.
Do approx. 5 volts exist between in-vehicle lower sensor harness connector terminal No. (29) and (80) ?

N.G. → Disconnect auto amp. harness connector.

B

Note

Check the circuit between auto amp. harness connector terminal No. (29) and (21) is not shorted.

O.K. → Replace auto amp.

O.K. →

CHECK IN-VEHICLE UPPER SENSOR.
(Refer to Electrical Components Inspection.)

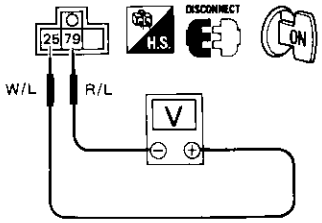
N.G. → Replace in-vehicle lower sensor.

O.K. →

Replace auto amp.

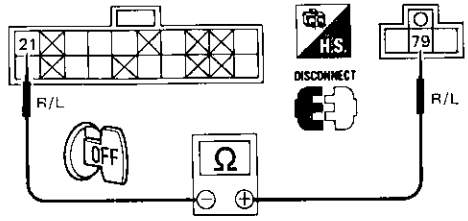
Note:
If the result is N.G. after checking insulation of each terminal, repair harness or connector.

A Def. duct sensor harness connector (M75)



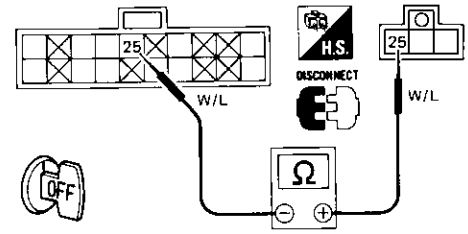

SHA388C

B Auto amp. harness connector (M40) Def. duct sensor harness connector (M75)




SHA389C

C Auto amp. harness connector (M48) Def. duct sensor harness connector (M75)




SHA390C

## Diagnostic Procedure 8

**SYMPTOM: Def. duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK DEF. DUCT SENSOR CIRCUIT BETWEEN DEF. DUCT SENSOR AND AUTO AMP.
Disconnect def. duct sensor harness connector.
Do approx. 5 volts exist between def. duct sensor harness connector terminal No. ㉕ and ㊾ ?

N.G. → Disconnect auto amp. harness connector.

B

Check circuit continuity between def. duct sensor harness connector terminal No. ㊾ and auto amp. harness connector terminal No. ㉑.

Note

O.K. →

C

Check circuit continuity between def. duct sensor harness connector terminal No. ㉕ and auto amp. harness terminal No. ㉕.

Note

O.K. →

Replace auto amp.

O.K. ↓

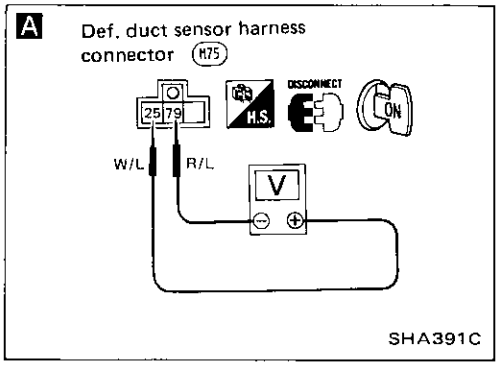
CHECK DEF. DUCT SENSOR. (Refer to Electrical Components Inspection.)

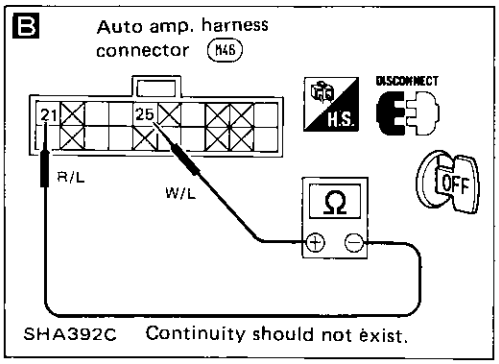
N.G. → Replace def. duct sensor.

O.K. ↓

Replace auto amp.

**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**




## Diagnostic Procedure 9

**SYMPTOM:** **Def. duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK DEF. DUCT SENSOR BETWEEN DEF. DUCT SENSOR AND AUTO AMP.
Disconnect def. duct sensor harness connector.
Do approx. 5 volts exist between def. duct sensor harness connector terminal No. ㉕ and ㊼ ?

N.G. → Disconnect auto amp. harness connector.

B → Check the circuit between auto amp. harness connector terminal No. ㉕ and ㉑ is not shorted.

Note

O.K. → Replace auto amp.

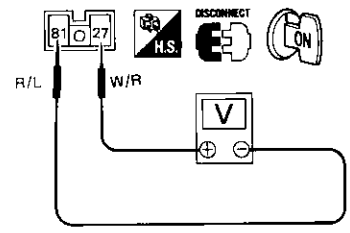
O.K. → CHECK DEF. DUCT SENSOR. (Refer to Electrical Components Inspection.)

N.G. → Replace def. duct sensor.

O.K. → Replace auto amp.

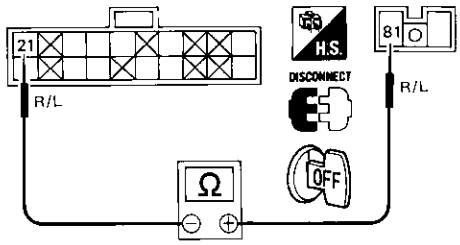
**Note:**
**If the result is N.G. after checking insulation of each terminal, repair harness or connector.**

A Vent duct sensor harness connector (C4)



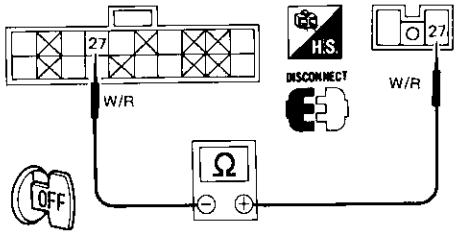

SHA393C

B Auto amp. harness connector (M48) Vent duct sensor harness connector (C4)




SHA394C

C Auto amp. harness connector (M48) Vent duct sensor harness connector (C4)




SHA395C

## Diagnostic Procedure 10

**SYMPTOM: Vent duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK VENT DUCT SENSOR CIRCUIT BETWEEN VENT DUCT SENSOR AND AUTO AMP.
Disconnect vent duct sensor harness connector.
Do approx. 5 volts exist between vent duct sensor harness connector terminal No. ㉗ and ㊶ ?

N.G. → Disconnect auto amp. harness connector.

B Note

Check circuit continuity between vent duct sensor harness connector terminal No. ㊶ and auto amp. harness connector terminal No. ㉑ .

O.K. ↓

C Note

Check circuit continuity between vent duct sensor harness connector terminal No. ㉗ and auto amp. harness connector terminal No. ㉗ .

O.K. ↓

Replace auto amp.

O.K. ↓

CHECK VENT DUCT SENSOR. (Refer to Electrical Components Inspection.)

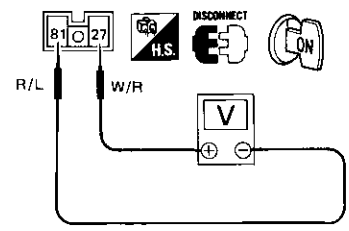
N.G. → Replace def. duct sensor.

O.K. ↓

Replace auto amp.

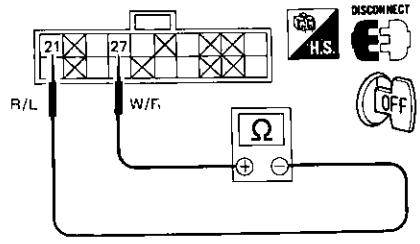
**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**

A Vent duct sensor harness connector (C4)




SHA396C

B Auto amp. harness connector (M48)




Continuity should not exist.

SHA397C

## Diagnostic Procedure 11

**SYMPTOM: Vent duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK VENT DUCT SENSOR BETWEEN VENT DUCT SENSOR AND AUTO AMP.
Disconnect vent duct sensor harness connector.
Do approx. 5 volts exist between vent duct sensor harness connector terminal No. (27) and (81) ?

N.G. → Disconnect auto amp. harness connector.

B Note

Check the circuit between auto amp. harness connector terminal No. (27) and (21) is not shorted.

O.K. → Replace auto amp.

O.K. ↓

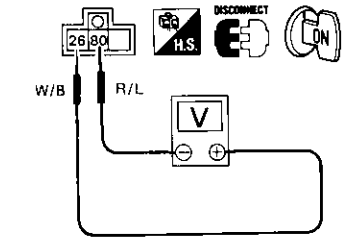
CHECK VENT DUCT SENSOR. (Refer to Electrical Components Inspection.)

N.G. → Replace vent duct sensor.

O.K. ↓

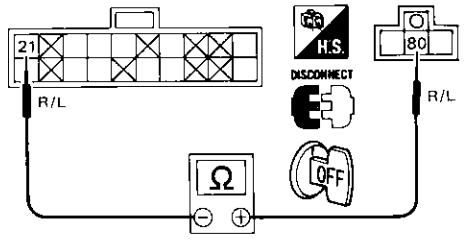
Replace auto amp.

A Foot duct sensor harness connector (C5)



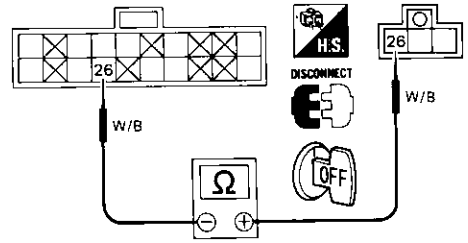

SHA398C

B Auto amp. harness connector (M48) Foot duct sensor harness connector (C5)




SHA399C

C Auto amp. harness connector (M48) Foot duct sensor harness connector (C5)




SHA400C

## Diagnostic Procedure 12

**SYMPTOM: Floor duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK FOOT DUCT SENSOR CIRCUIT BETWEEN FOOT DUCT SENSOR AND AUTO AMP.
Disconnect foot duct sensor harness connector.
Do approx. 5 volts exist between foot duct sensor harness connector terminal No. (26) and (80) ?

N.G. → Disconnect auto amp. harness connector.

B Note

Check circuit continuity between foot duct sensor harness connector terminal No. (80) and auto amp. harness connector terminal No. (21).

O.K.

C Note

Check circuit continuity between foot duct sensor harness connector terminal No. (26) and auto amp. harness connector terminal No. (26).

O.K. → Replace auto amp.

O.K. ↓

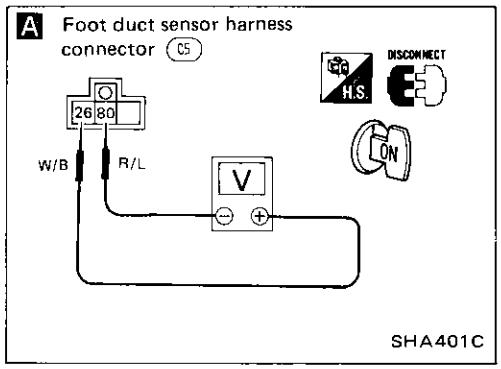
CHECK FOOT DUCT SENSOR. (Refer to Electrical Components Inspection.)

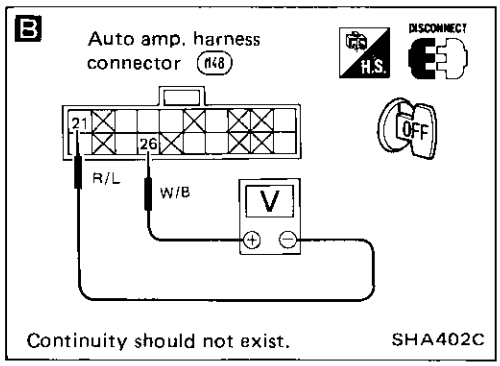
N.G. → Replace foot duct sensor.

O.K. ↓

Replace auto amp.

**Note:**
**If the result is N.G. after checking insulation of each terminal, repair harness or connector.**




## Diagnostic Procedure 13

**SYMPTOM: Floor duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK FOOT DUCT SENSOR BETWEEN FOOT DUCT SENSOR AND AUTO AMP.
Disconnect foot duct sensor harness connector.
Do approx. 5 volts exist between foot duct sensor harness connector terminal No. 26 and 80 ?

N.G. → Disconnect auto amp. harness connector.

B → Note: Check the circuit between auto amp. harness connector terminal No. 26 and 21 is not shorted.

O.K. → Replace auto amp.

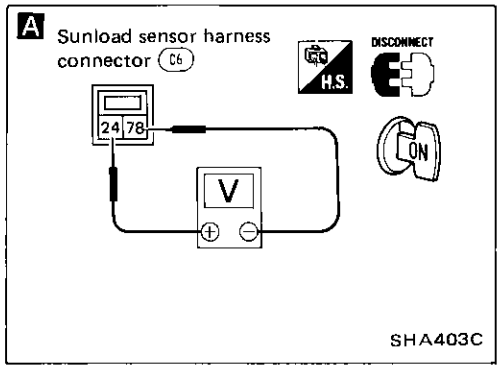
O.K. ↓

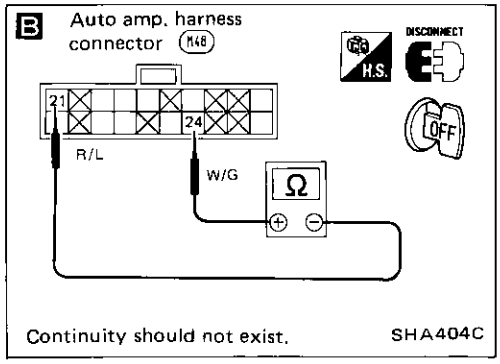
CHECK FOOT DUCT SENSOR. (Refer to Electrical Components Inspection.)

N.G. → Replace vent duct sensor.

O.K. ↓

Replace auto amp.




## Diagnostic Procedure 14

**SYMPTOM: Sunload sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)**

A

CHECK SUNLOAD SENSOR BETWEEN SUNLOAD SENSOR AND AUTO AMP.
Disconnect sunload sensor harness connector.
Do approx. 5 volts exist between sunload sensor harness connector terminal No. 24 and 78 ?

N.G. → Disconnect auto amp. harness connector.

B → Note: Check the circuit between auto amp. harness connector terminal No. 24 and 21 is not shorted.

O.K. → Replace auto amp.

O.K. ↓

CHECK SUNLOAD SENSOR. (Refer to Electrical Components Inspection.)

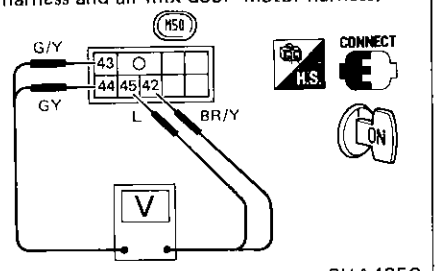
N.G. → Replace sunload sensor.

O.K. ↓

Replace auto amp.

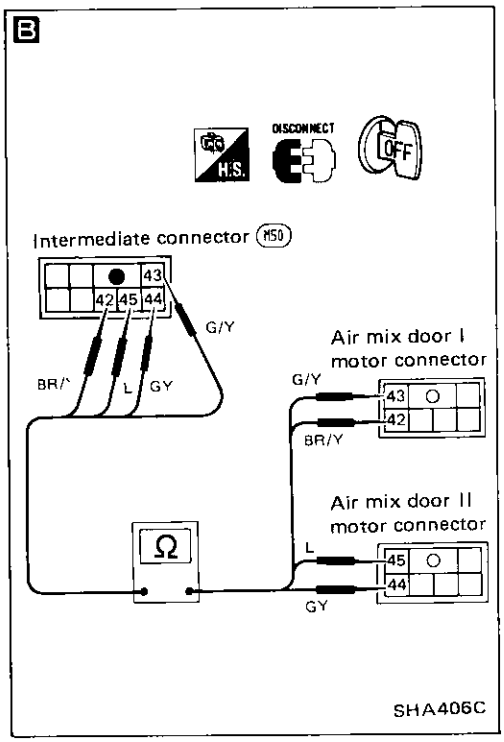
**Note:**
**If the result is N.G. after checking insulation of each terminal, repair harness or connector.**

A Intermediate connector between auto amp. harness and air mix door motor harness.



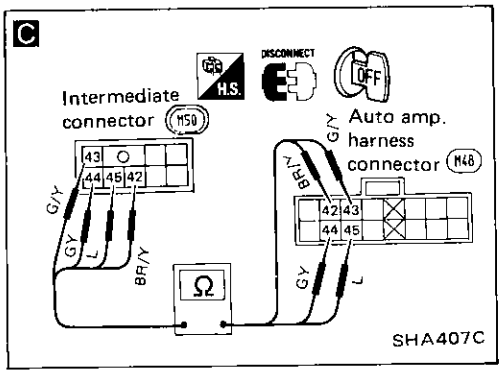

SHA405C

B




SHA406C

C




SHA407C

## Diagnostic Procedure 15

**SYMPTOM: Air mix door does not operate normally.**

- **Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.**
- **Remove combination meter assembly to make working space and reconnect air conditioner switch connector.**

**A**

CHECK FOR SIGNALS TO AIR MIX DOOR MOTOR.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set air mix door position as shown in the following chart.

Check if approx. 10V exists for 3 seconds every 10 seconds between each terminal.*

| Air mix door position | Code No. | Terminal No. Air mix door I ⊕ | Air mix door I ⊖ | Air mix door II ⊕ | Air mix door II ⊖ |
|---|---|---|---|---|---|
| Full-Hot | | ㊸ | ㊷ | ㊺ | ㊹ |
| Full-Cool | | ㊷ | ㊸ | ㊹ | ㊺ |

N.G. → **C**

**C**

Check circuit continuity between auto amp. harness connector terminals and intermediate connector terminals.

| Intermediate connector | Auto amp. connector | Continuity |
|---|---|---|
| ㊷ | ㊷ | Yes |
| ㊸ | ㊸ | Yes |
| ㊹ | ㊹ | Yes |
| ㊺ | ㊺ | Yes |

O.K. → Replace auto amp.

N.G. → Repair harness or connector.

O.K.

*: After two minutes power supply is automatically cut off.

Remove heater unit assembly.

**B**

Check continuity between intermediate connector terminal and each air mix door motor harness connector terminal.

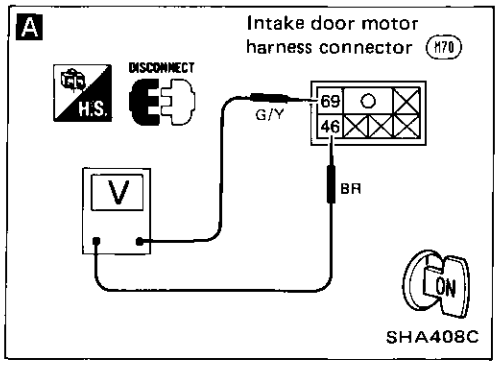
| Intermediate connector | Air mix door I motor connector | Continuity |
|---|---|---|
| ㊷ | ㊷ | Yes |
| ㊸ | ㊸ | Yes |

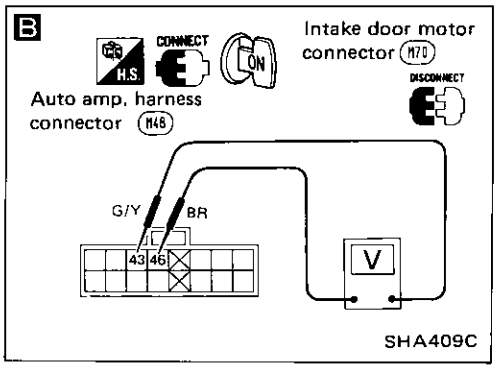
| Intermediate connector | Air mix door II motor connector | Continuity |
|---|---|---|
| ㊹ | ㊹ | Yes |
| ㊺ | ㊺ | Yes |

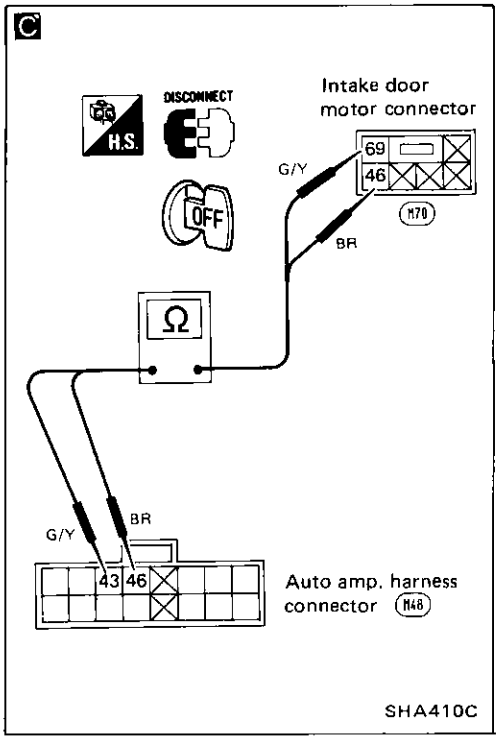
N.G. → Repair harness or connector.

O.K.

Replace air mix door motor.




## Diagnostic Procedure 16

**SYMPTOM: Intake door does not operate normally.**

- **Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.**

**A**

CHECK FOR SIGNALS TO INTAKE DOOR MOTOR.

Disconnect intake door motor harness connector.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set intake door position as shown in the following chart.

Check if approx. 10V exists for 2.5 seconds between each terminnal.

| Intake door position | Code No. | Terminal No. ⊕ | Terminal No. ⊖ |
|---|---|---|---|
| FRE/REC → REC | ⇆ → ⇆ | 46 | 69 |
| REC → FRE | ⇆ → ⇆ | 69 | 46 |

O.K. → Replace intake door motor.

N.G. → **B**

**B**

CHECK OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set intake door position as shown in the following chart.

Check if approx. 10V exists for 2.5 seconds between each terminal.

| Intake door position | Code No. | Terminal No. ⊕ | Terminal No. ⊖ |
|---|---|---|---|
| FRE/REC → REC | ⇆ → ⇆ | 46 | 43 |
| REC → FRE | ⇆ → ⇆ | 43 | 46 |

O.K. → **C**

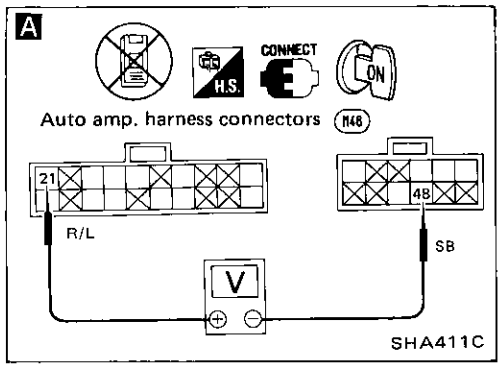
N.G. → Replace auto amp.

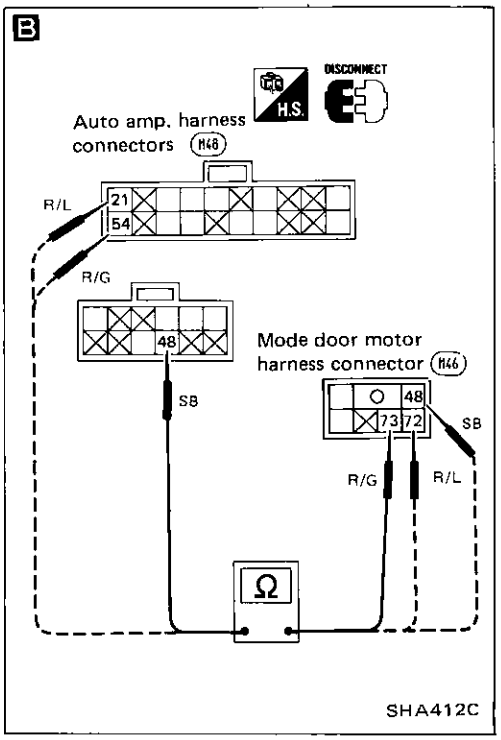
**C**

Check continuity between auto amp. harness connector terminal No. 46 and intake door motor harness connector terminal No. 46.

Check auto amp. harness connector terminal No. 43 and intake door motor harness connector terminal No. 69.

N.G. → Repair harness or connector.




## Diagnostic Procedure 17

**SYMPTOM: Mode door does not operate normally.**

- **Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.**

A

CHECK P.B.R. CIRCUIT

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set mode door motor as shown in the following chart.

Check P.B.R. voltage with data monitor function in "ACTIVE TEST" mode.

| Mode door position | P.B.R. voltage (approx.) |
|---|---|
| DEF | 4.8V |
| FOOT/DEF | 2.5V |
| B/L | 1.1V |
| VENT | 0V |

Check if voltage between auto amp. harness connecor terminals (48) and (21) varies from approx. 5V to approx. 0V according to mode door position varies.

| Code No. | Voltage (48) ⊖ | Voltage (21) ⊕ |
|---|---|---|
| | 4.8V | |
| | 2.5V | |
| | 1.1V | |
| | 0V | |

N.G. → CHECK MODE DOOR MOTOR. Refer to Electrical Components Inspection.

O.K. → B

N.G. → Replace mode door motor.

B

CHECK HARNESS BETWEEN AUTO AMP. AND MODE DOOR MOTOR.

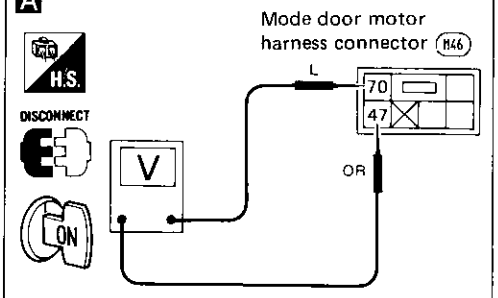
| Auto amp. harness connector terminal | Mode door motor harness connector terminal | Continuity |
|---|---|---|
| (21) | (48) | No |
| | (72) | Yes |
| | (73) | No |
| (48) | (48) | Yes |
| | (72) | No |
| | (73) | No |
| (54) | (48) | No |
| | (72) | No |
| | (73) | Yes |

O.K. → A

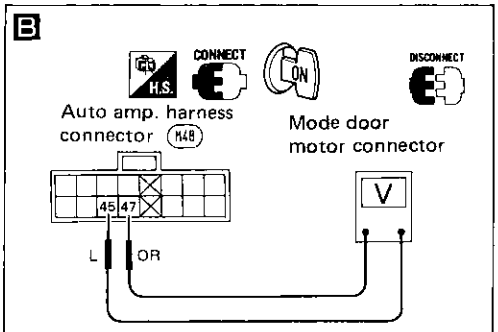
O.K. → Go to diagnostic procedure 18.

N.G. → Repair harness or connector.

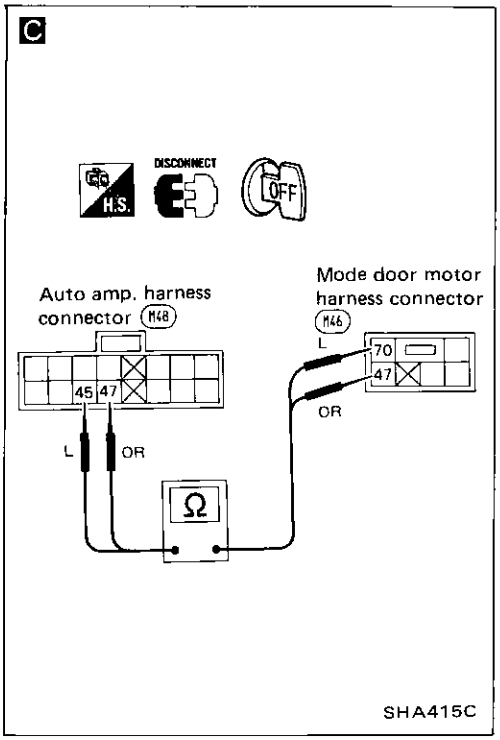
A




B




C




## Diagnostic Procedure 18

**SYMPTOM: Mode door does not move at all.**

- **Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.**

**A**

CHECK FOR SIGNALS TO MODE DOOR MOTOR.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set mode door position as shown in the following chart. Check if approx. 10V exists between mode door motor harness connector terminals ㊼ and ㊿ for approx. 1.3 second every 10 seconds.

| Mode door position | Code No. | Terminal No. ⊕ | Terminal No. ⊖ |
|---|---|---|---|
| DEF | 31 | ㊿ | ㊼ |
| VENT | 32 | ㊼ | ㊿ |

N.G. → **B**

O.K. ↓

Replace mode door motor.

**B**

CHECK OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set mode door position as shown in the following chart. Check if approx. 10V exists between mode door motor harness connector terminals ㊼ and ㊺ for approx. 1.3 second every 10 seconds.

| Mode door position | Code No. | Terminal No. ⊕ | Terminal No. ⊖ |
|---|---|---|---|
| DEF | 31 | ㊺ | ㊼ |
| VENT | 32 | ㊼ | ㊺ |

O.K. ↓

N.G. → Replace auto amp.

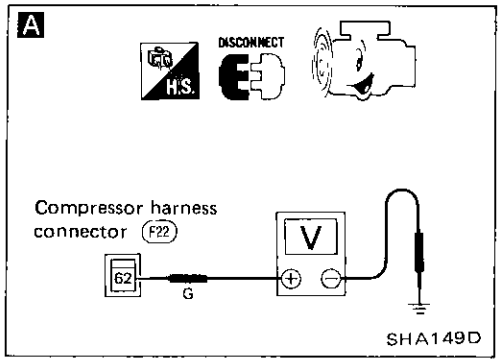
**C**

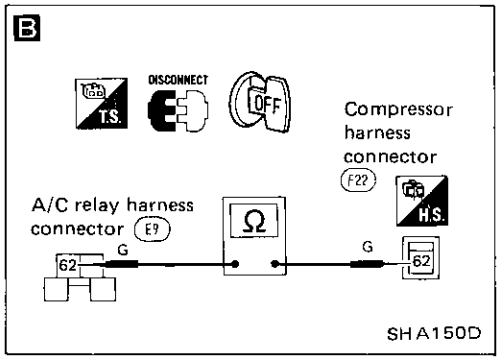
Check continuity between auto amp. harness connector terminal No. ㊼, ㊺ and mode door motor harness connector terminal No. ㊼, ㊿ respectively.

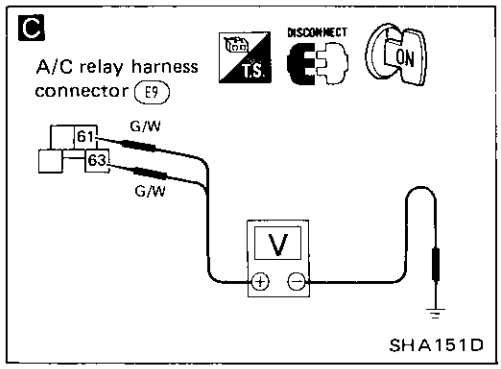
O.K. ↓

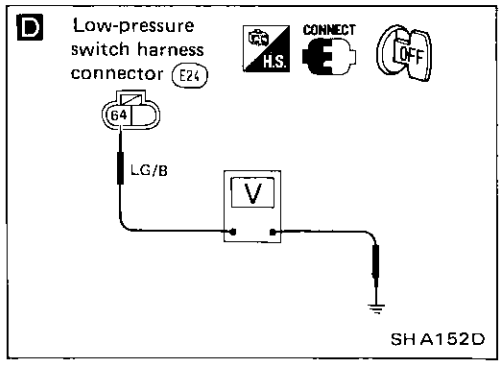
N.G. → Repair harness or connector.

INSPECTION END




## Diagnostic Procedure 19

**SYMPTOM: Magnet clutch does not engage.**

- **Perform Preliminary check 6 before referring to the following flow chart.**

**A**

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
Set up "ACTIVE TEST" mode with CONSULT.
Set up self-diagnosis STEP 2.
Set compressor as shown in the following chart.
Check if approx. 12V exists between compressor harness connector terminal and body ground.

| Compressor | Code No. | Terminal No. | |
|---|---|---|---|
| ON | → | 62 | Body ground |

N.G. → Disconnect A/C relay harness connector.

**B**

Check circuit continuity between A/C relay harness connector terminal No. 62 and compressor harness connector terminal No. 62.

Note

O.K.

O.K. → Check magnet clutch.

N.G. → Replace magnet clutch. Refer to COMPRESSOR — Model DKS-16H (ZEXEL make).

**C**

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay ahrness connector terminal No. 61, 63 and body ground respectively?

N.G. → CHECK POWER SUPPLY CIRCUIT. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K.

CHECK A/C RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C relay.

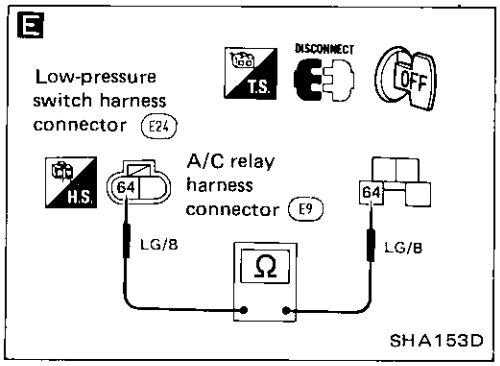
O.K.

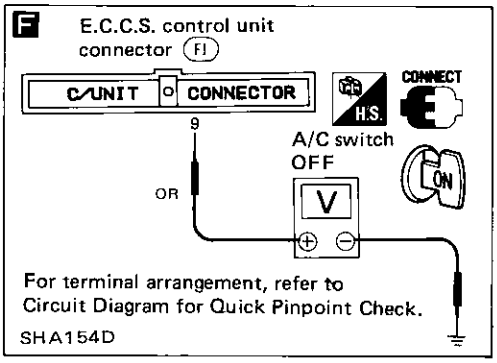
Reconnect A/C relay.

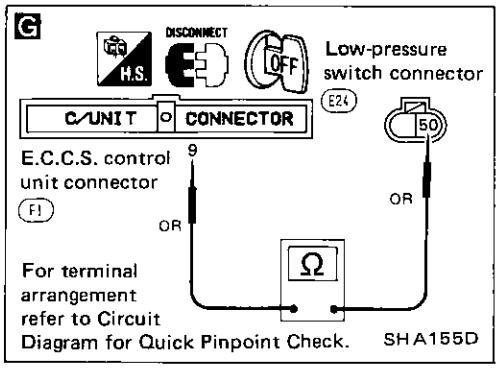
Ⓐ (Go to next page.)

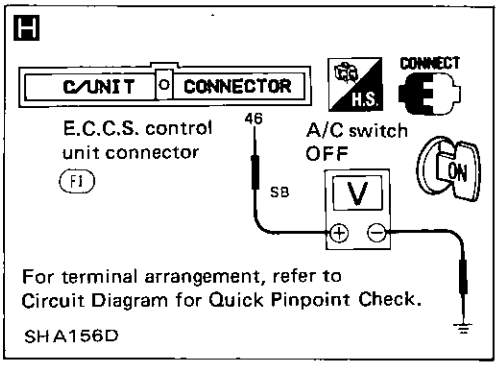
**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**

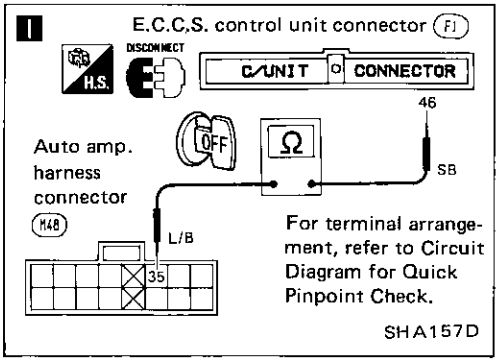
## Diagnostic Procedure 19 (Cont'd)




Ⓐ

Turn ignition switch ON and press OFF switch.

**D**

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between low-pressure switch harness connector terminal No. 64 and body ground?

N.G. →

**E**

Note: Check circuit continuity between A/C relay harness connector terminal No. 64 and low-pressure harness connector terminal No. 64.

O.K. ↓

**F**

Do approx. 12 volts exist between E.C.C.S. control unit harness connector terminal No. 9 and body ground?

N.G. →

**G**

Note: Check circuit continuity between low-pressure switch harness connector terminal No. 50 and E.C.C.S. control unit harness connector terminal No. 9.

O.K. ↓

CHECK LOW-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

N.G. ↓

Replace low-pressure switch.

O.K. ↓

**H**

Do more than 8 volts exist between E.C.C.S. control unit harness connector terminal No. 46 and body ground?

N.G. →

CHECK E.C.C.S. CONTROL UNIT.
(Refer to EF & EC section.)

O.K. ↓

Disconnect auto amp. harness connector.

O.K. ↓

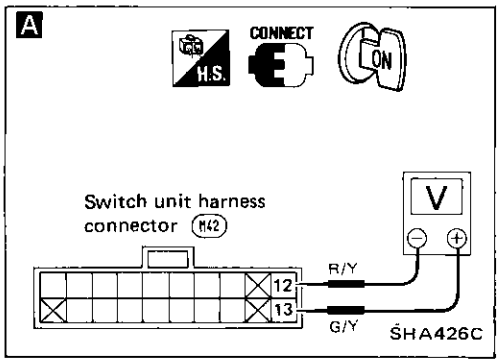
**I**

Check circuit continuity between auto amp. harness connector terminal No. 35 and E.C.C.S. control unit harness connector terminal No. 46.

O.K. ↓

Replace auto amp.

**Note:**
**If the result is N.G. after checking circuit continuity, repair harness or connector.**




## Diagnostic Procedure 20

**SYMPTOM:** **Air conditioner control switch panel illumination does not come on.**

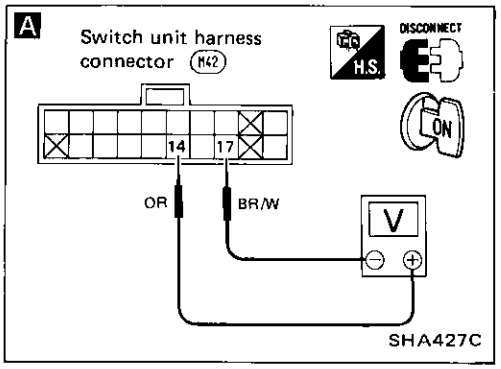
A

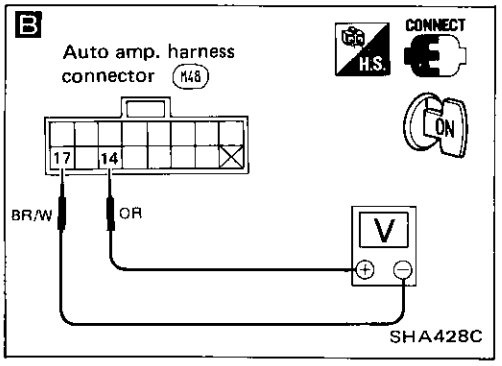
Turn on light switch.
Set illumination control switch at brightest position.
Check if approx. 12V exists between switch panel harness connector terminal No. ⑫ and ⑬ .

N.G. → Check illumination control system. Refer to section EL.

O.K. ↓

Replace bulb.




## Diagnostic Procedure 21

**SYMPTOM:** **Set temperature and mode display do not appear on display window.**

A

Check if approx. 0.5 to 2V exist between switch unit harness connector terminals No. ⑭ and ⑰.

N.G. → B

Check if approx. 0.5 to 2V exist between auto amp. harness connector terminals ⑭ and ⑰.

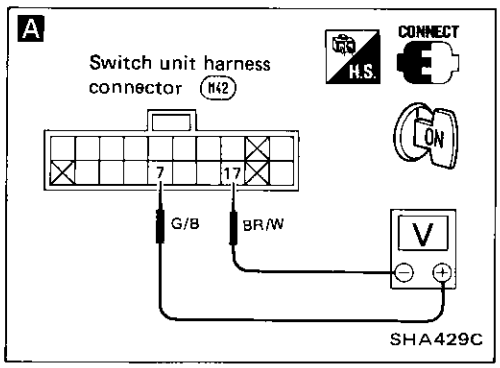
O.K. ↓

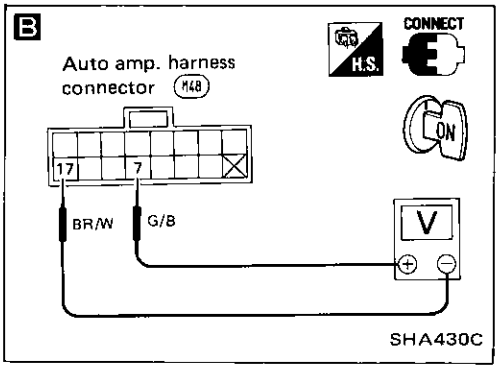
Replace switch unit.

O.K. ↓

Repair harness or connector (terminal No. ⑭, ⑰).

N.G. → Replace auto amp.




## Diagnostic Procedure 22

**SYMPTOM:** **When air conditioner switch is operated it does not beep.**

A

Do approx. 12 volts exist between air conditioner switch unit harness connector terminal No. ⑦ and ⑰ ?

N.G. → Replace air conditioner switch.

O.K. ↓

B

Do approx. 12 volts exist between auto amp. harness connector terminal No. ⑦ and ⑰ ?

N.G. → Repair harness or connector (terminal No. ⑰).

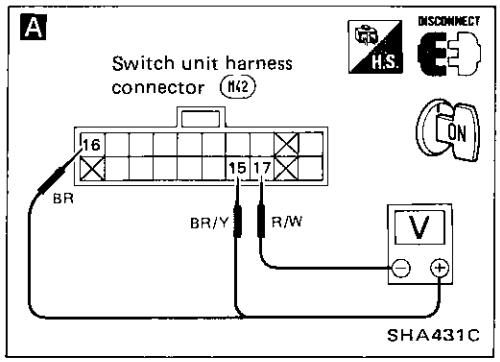
O.K. ↓

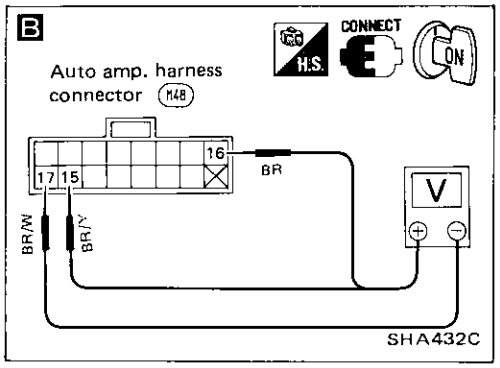
Check switch panel. Refer to Electrical Components Inspection.

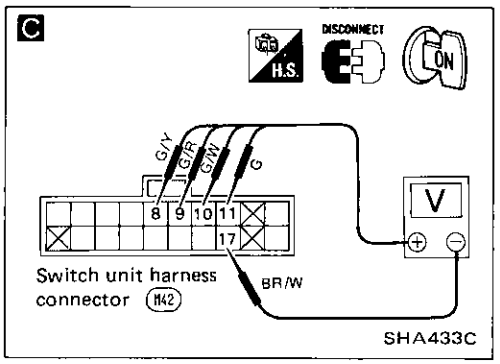
N.G. → Replace auto amp.

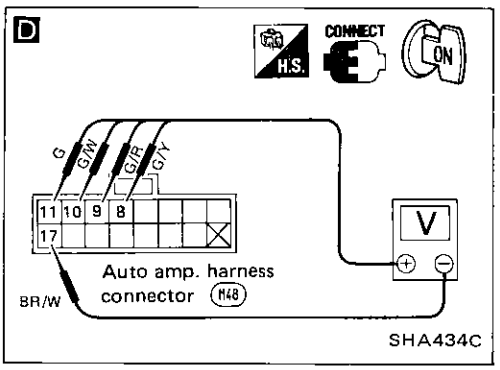
O.K. ↓

Replace switch panel.




## Diagnostic Procedure 23

**SYMPTOM:** **Figures of set temperature do not appear on the display window and Indicator lamp (L.E.D.) does not come on.**

**A**

Do approx. 12 volts exist between switch unit harness connector terminal No. ⑮, ⑯ and ⑰ ?

N.G. → **B**

**B**

Do approx. 12 volts exist between auto amp. harness connector terminal No. ⑮, ⑯ and ⑰ ?

O.K. → Repair harness or connector (Terminal No. ⑮, ⑯ and ⑰).

N.G. → Replace auto amp.

O.K. ↓

**C**

Check switch unit.
Refer to Electrical Components Inspection.

N.G. → **D**

O.K. ↓

Replace switch panel.

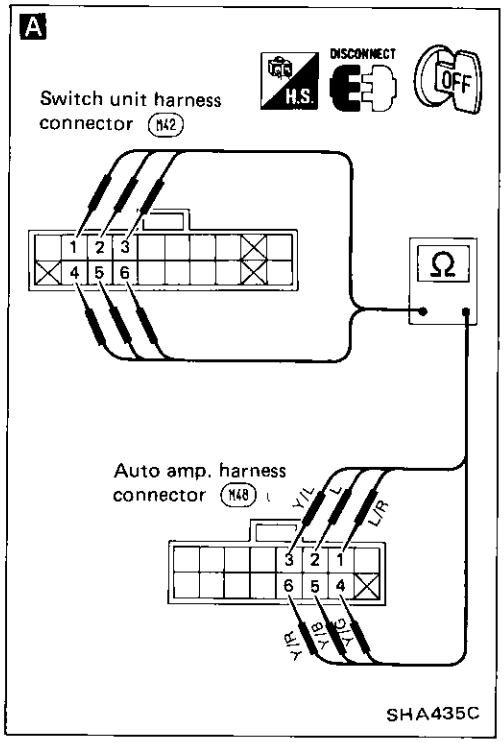
**D**

Measure voltage between auto amp. harness connector terminal No. ⑧, ⑨, ⑩, ⑪ and ⑰.

| Terminal No. ⊕ | Terminal No. ⊖ | Voltage (approx.) |
|---|---|---|
| ⑧ | ⑰ | 1.0V |
| ⑨ | ⑰ | 0.65V |
| ⑩ | ⑰ | 0.8V |
| ⑪ | ⑰ | 0V (Light OFF) 12V (Light ON) |

O.K. → Repair harness or connector (Terminal No. ⑧, ⑨, ⑩, ⑪ and ⑰).

N.G. → Replace auto amp.




## Diagnostic Procedure 24

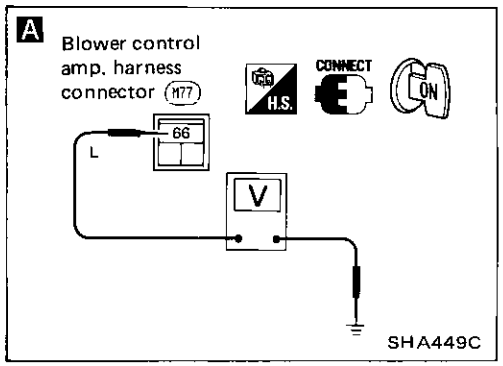
**SYMPTOM: Switches do not work.**

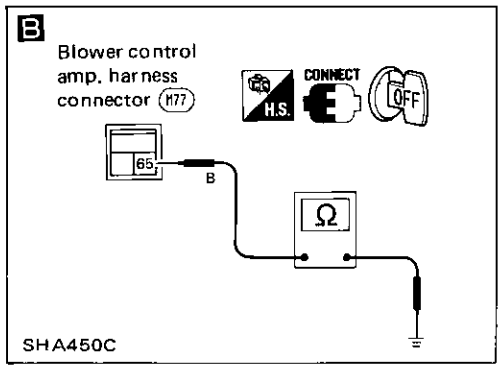
Check switch panel. Refer to Electrical Components Inspection.
→ N.G. → Replace switch panel.
↓ O.K.

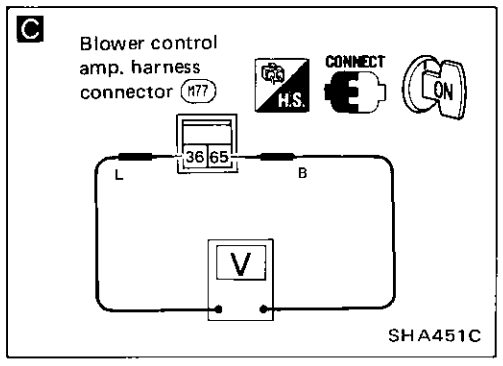
A

Check continuity between auto amp. harness connector terminal No. ① ~ ⑥ and switch panel harness terminal No. ① ~ ⑥ respectively.
→ N.G. → Repair harness or connector.
↓ O.K.

Replace auto amp.




## Diagnostic Procedure 25

**SYMPTOM: Blower motor operation is malfunctioning.**

- **Perform Preliminary check 5 before referring to the of flowing flow chart.**

A

CHECK POWER SUPPLY FOR FAN CONTROL AMP.
Do approx. 12 volts exist between fan control amp. harness connector terminal No. ⑯ and body ground?
→ N.G. → D

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Do approx. 12 volts exist between blower motor harness connector terminal No. ⑱ and body gorund?
O.K. ↓ / N.G. → Ⓑ

↓ O.K.

B Note

CHECK BODY GROUND CIRCUIT FOR FAN CONTROL AMP.
Does continuity exsit between fan control amp. harness connector terminal No. ⑮ and body ground?
↓ O.K.

Ⓐ

E Note

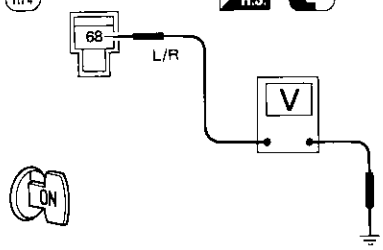
Check circuit continuity between blower motor harness connector terminal No. ⑰ and fan control amp. harness connector terminal No. ⑯.
↓ O.K.

CHECK BLOWER MOTOR (Refer to Electrical Components inspection.)
→ N.G. → Replace blower motor

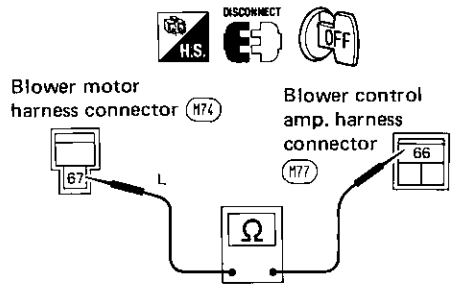
## Diagnostic Procedure 25 (Cont'd)

**D**

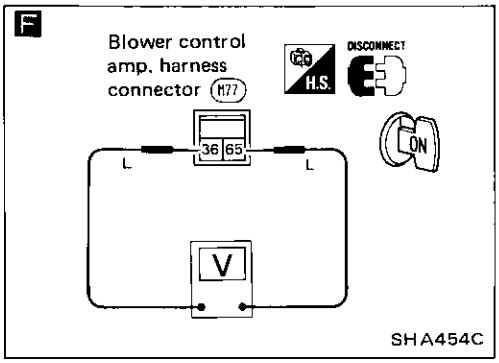
Blower motor harness connector (M74)



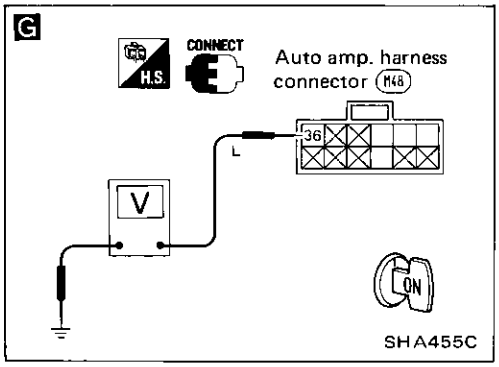

**E**



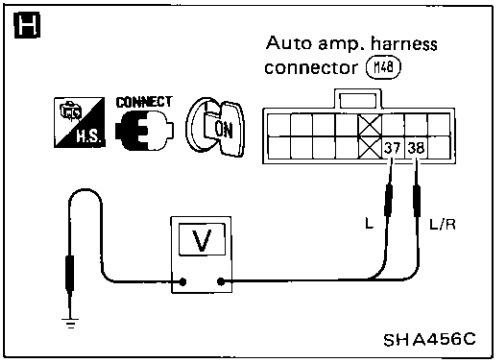

**F**




**G**




**H**




**C**

(A)

CHECK OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Measure voltage across fan control amp. harness connector terminals No. (36) and (65).

| Blower motor voltage (V) | Code No. | Terminal No. ⊕ | Terminal No. ⊖ | Voltage (Approx.) (V) |
|---|---|---|---|---|
| 4 | | (36) | (65) | 1.2 |
| 6 | | | | 1.3 |
| 9 | | | | 1.4 |
| 12 | | | | 1.6 |

O.K. → Replace fan control amp.

N.G. →

**F**

Set up "ACTIVE TEST" mode with CONSULT. Set blower motor voltage at 9 volts

Set up self-diagnosis STEP 2. Set code No. in .

Do approx. 12 volts exist between fan control amp. harness connector terminal No. (36) and (65)?

O.K. → Replace fan control amp.

N.G. →

**G**

CHECK FOR OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT. Set blower motor voltage at 9 volts

Set up self-diagnosis STEP 2. Set code No. in .

Do approx. 12 volts exist between auto amp. harness connector terminal No. (36) and body ground?

N.G. → O.K. → Repair harness o connector

**H**

CHECK FOR FEEDBACK SIGNAL TO AUTO AMP.

Disconnect fan control amp. connector only.

Do approx. 12 volts exist between auto amp. harness connector terminal No. (37), (38) and body ground?

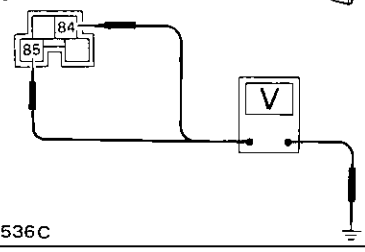
N.G. → Repair harenss or connector

O.K. → Replace auto amp.

## Diagnostic Procedure 25 (Cont'd)

**I**

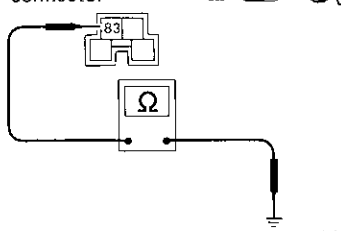
Blower relay harness connector




SHA536C

**J**

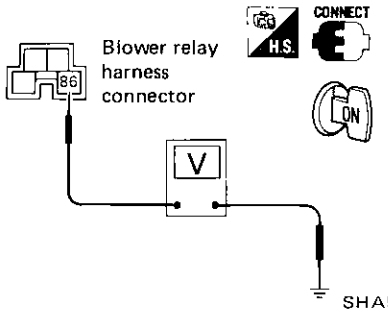
Blower relay harness connector




SHA458C

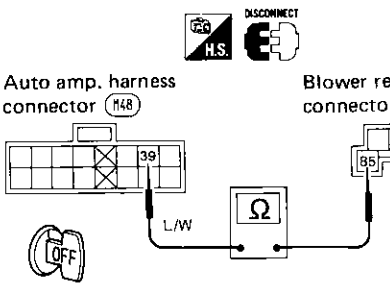
**K**

Blower relay harness connector




SHA537C

**L**




SHA460C

Ⓑ

**I**

CHECK POWER SUPPLY FOR BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness connector terminal No. ⑧④, ⑧⑤ and body ground?

N.G. → Check power supply circuit. (Refer to "POWER SUPPLY ROUTING" in EL section.)

O.K. ↓

**J**

Do approx. 12 volts exist between blower relay harness connector terminal No. ⑧③ and body ground?

N.G. → **K**

Check voltage between blower relay harness connector terminal No. ⑧⑥ and body ground is less than 1.5 volt.

O.K. → Replace blower relay

N.G. → Note

**L**

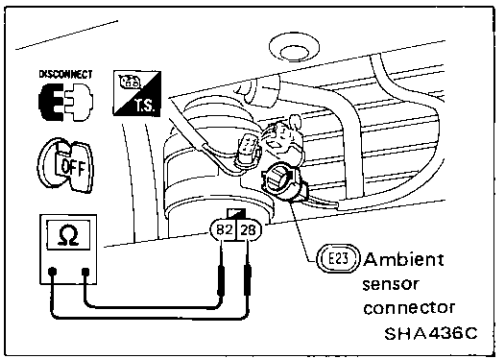
Does continuity exist between blower relay harness connector teminal No. ⑧⑤ and auto amp. harness connector terminal No. ③⑨.

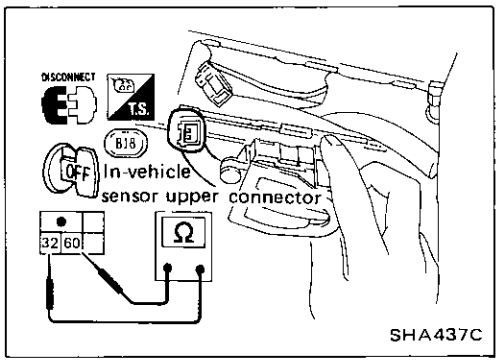
→ Replace auto amp.

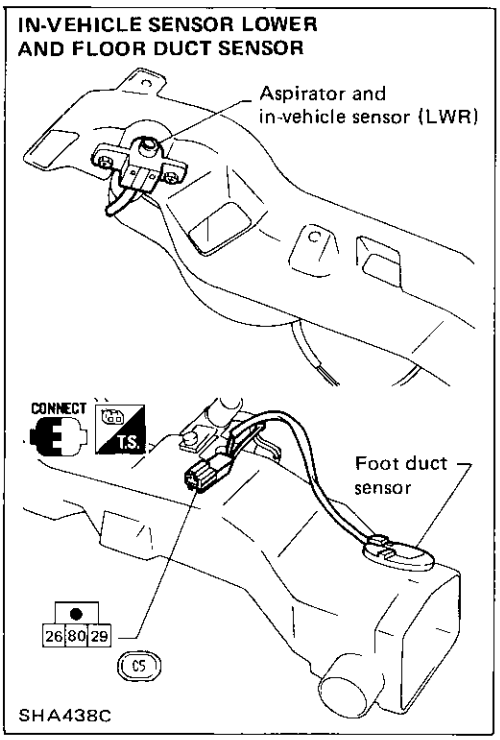
O.K. ↓

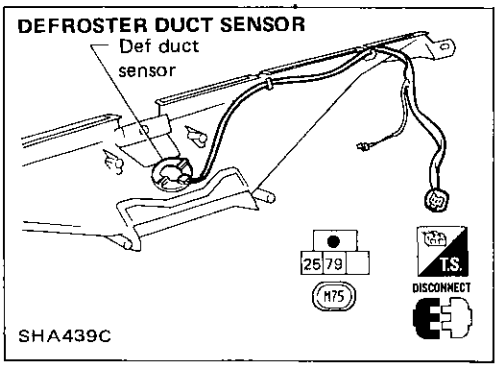
Check 12A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

**Note:**
**If the result is N.G. after checking circuit continuity, repair harness on connector.**



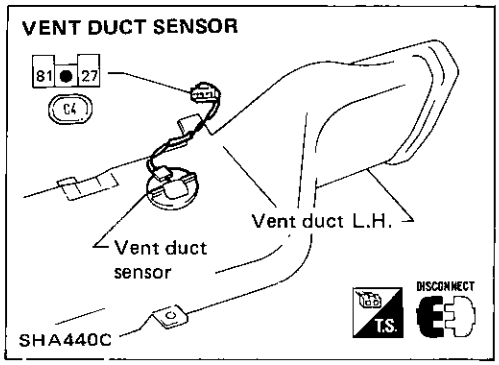

## Electrical Components Inspection

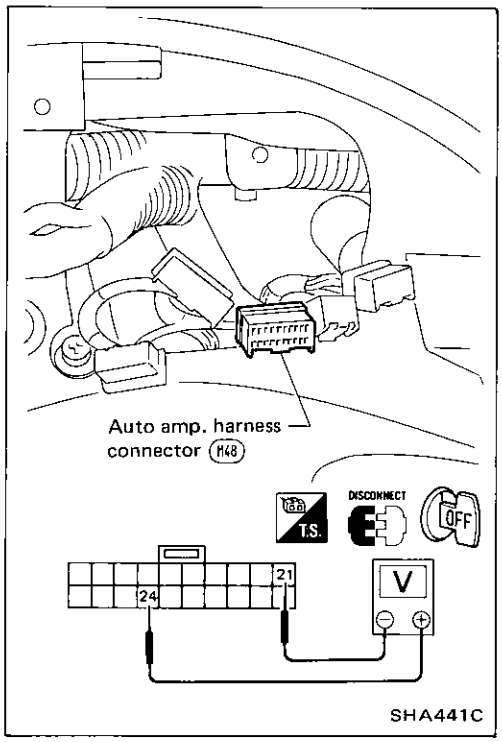
### TEMPERATURE SENSORS

After disconnecting temperature sensors harness connector measure resistance between terminals of each sensor, using the table below.

| Temperature °C (°F) | Resistance kΩ |
|---|---|
| −40 (−40) | 210.55 |
| −35 (−31) | 146.86 |
| −30 (−22) | 103.97 |
| −25 (−13) | 74.63 |
| −20 (−4) | 54.28 |
| −15 (5) | 39.97 |
| −10 (14) | 29.77 |
| −5 (23) | 22.43 |
| 0 (32) | 17.07 |
| 5 (41) | 13.11 |
| 10 (50) | 10.18 |
| 15 (59) | 7.96 |
| 20 (68) | 6.29 |
| 25 (77) | 5.00 |
| 30 (86) | 4.01 |
| 35 (95) | 3.24 |
| 40 (104) | 2.63 |
| 45 (113) | 2.15 |
| 50 (122) | 1.77 |
| 55 (131) | 1.47 |
| 60 (140) | 1.22 |
| 65 (149) | 1.02 |
| 70 (158) | 0.86 |
| 75 (167) | 0.73 |
| 80 (176) | 0.62 |

## Electrical Components Inspection (Cont'd)




### SUNLOAD SENSOR

Measure voltage between terminals ㉑ and ㉔ at vehicle harness side using the table below.

| Input current mA | Output voltage (V) |
|---|---|
| 0 | 5 |
| 0.1 | 4 |
| 0.2 | 3 |
| 0.3 | 2 |
| 0.4 | 1 |
| 0.5 | 0 |

- When checking sunload sensor, select a place where sun shines on it directly.

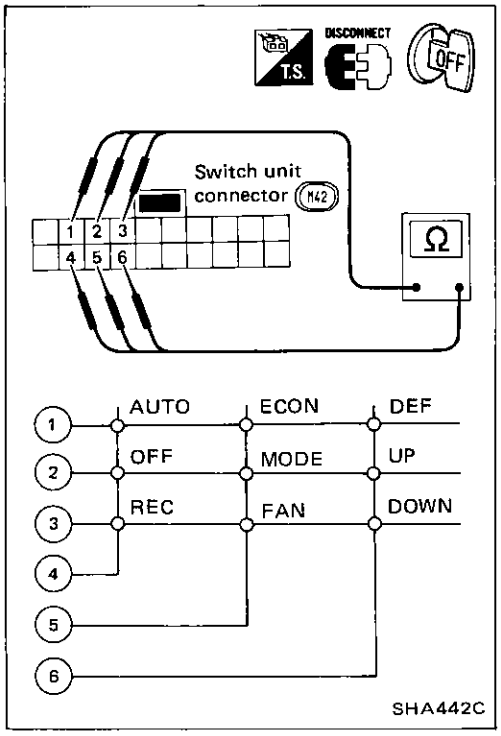
### MODE DOOR MOTOR

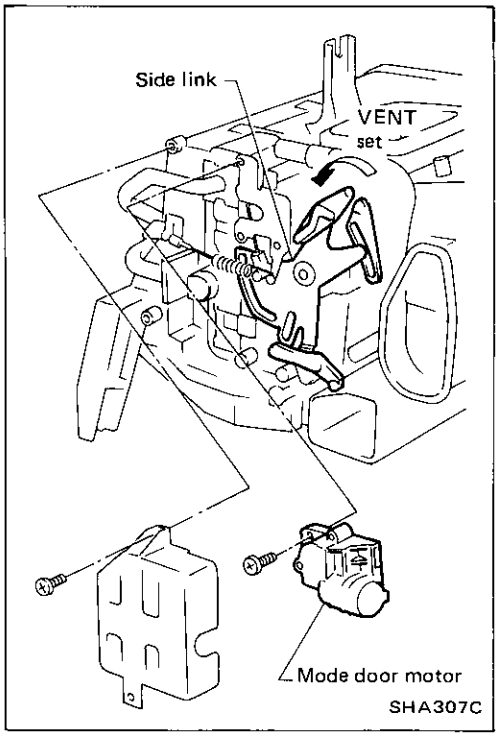
Check to see if motor rotates when 12V is applied across mode door motor connector terminals No. ㊼ and No. ㊿.

| Terminal No. | | Mode door operation |
|---|---|---|
| ㊼ | ㊿ | |
| ⊖ | ⊕ | VENT → DEF |
| ⊖ | ⊖ | STOP |
| ⊕ | ⊖ | DEF → VENT |

Check to see if mode door P.B.R. resistance is varied according to mode door position, as shown in the following table.

| Mode door position | Resistance between terminal No. ㊽ and ㊷ |
|---|---|
| DEF | 3 kΩ |
| FOOT/DEF | 1.6 kΩ |
| B/L | 0.7 kΩ |
| VENT | 0Ω |




## Electrical Components Inspection (Cont'd)

### AIR CONDITIONER SWITCH UNIT

Check the resistance between switch unit connector terminals as follows:

| Switch condition | Resistance |
|---|---|
| Press | Less than 500Ω |
| Free | ∞ |

Example:
When Auto switch is pressed, the resistance between terminal No. ① and ④ is less than 500Ω.

### BLOWER MOTOR

- Refer to page HA-78.

### RELAY

- Refer to page HA-79.

### LOW-PRESSURE SWITCH

- Refer to page HA-79.

## Control Linkage Adjustment

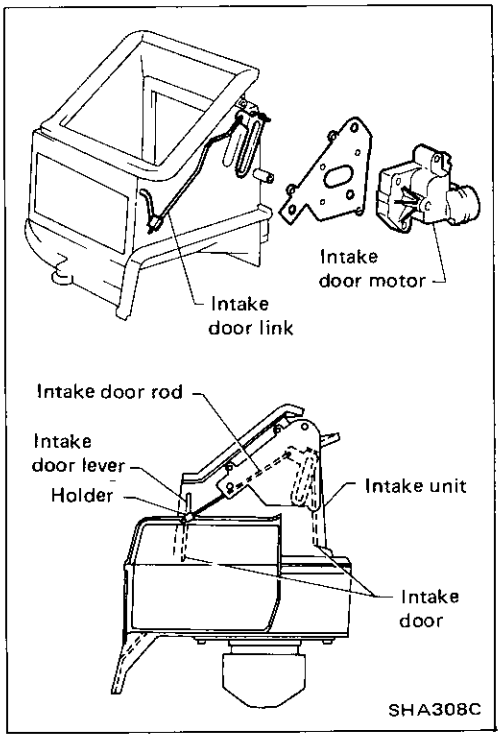
### MODE DOOR

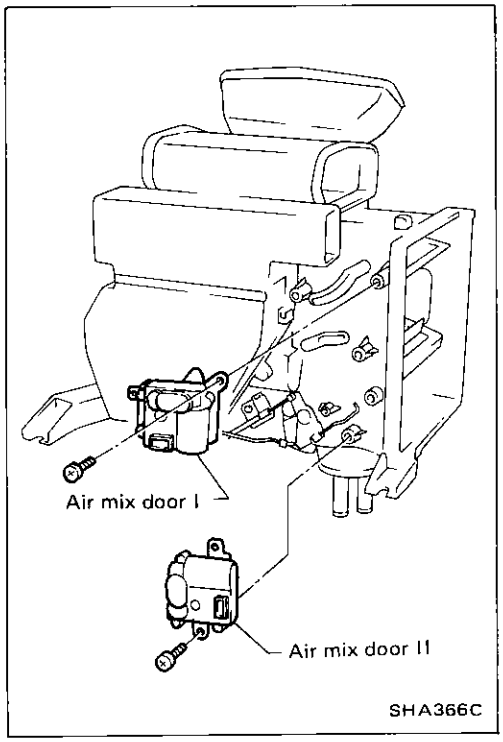
1. Move side link by hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to harness.
3. Turn ignition switch to ON.
4. Set up "ACTIVE TEST" mode with CONSULT or set up self-diagnosis STEP 2.
5. Set MODE DOOR position as in the following table.

| MODE DOOR POSITION | Code No. |
|---|---|
| VENT | |

6. Attach mode door rod to side link rod holder.
7. Check mode door operates when position is changed with CONSULT or when code No. is changed to others.

| Code No. | | | | |
|---|---|---|---|---|
| Mode door position | DEF | HEAT | B/L | VENT |




## Control Linkage Adjustment (Cont'd)

### INTAKE DOOR

1. Install intake door motor on intake unit.
2. Connect intake door motor to harness.
3. Turn ignition switch to ON.
4. Set up "ACTIVE TEST" mode with CONSULT or set up self-diagnosis STEP 2.
5. Set INTAKE DOOR position as in the following table.

| INTAKE DOOR POSITION | Code No. |
|---|---|
| REC | |

6. Install intake door lever.
7. Set intake door rod in REC position and fasten intake door rod to holder intake door lever.
8. Check intake door operates properly when position is changed with CONSULT or when code No. is changed to others.

| Code No. | | | | |
|---|---|---|---|---|
| Intake door position | Outside air | | Partial outside air | Recir-culation |

### AIR MIX DOOR

1. Connect harness to air mix door motors I and II and set temperature control lever at full-cold position.
2. Set air mix doors I and II at full-cold position and fasten door rod.
3. Check that when temperature control lever is at full-cold, both doors are at full-cold position, and when temperature control lever is at full-hot, both doors are at full-hot position.

### WATER COCK CONTROL CABLE

Clamp cable at full-close position when air mix door II is at full-cold position, and full-open position when air mix door II is at full-hot position.

## Control Switches

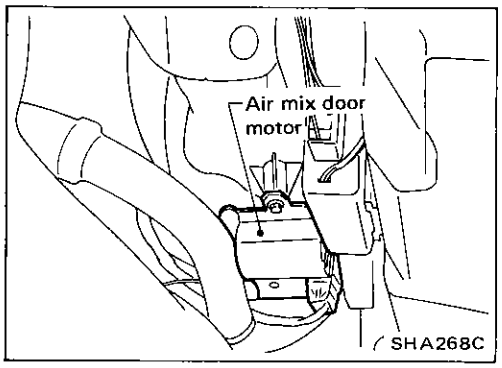
### SWITCHES AND THEIR CONTROL FUNCTIONS

| Switch | | Indicator illuminates: A/C | Indicator illuminates: REC | Air outlet | Intake air | Compressor |
|---|---|---|---|---|---|---|
| A/C | | ○ | | | | ON*1 |
| Mode | | | | VENT | *3 | *1*4 |
| | | | | B/L | *5 | *1*4 |
| | | | | FOOT | *5 | *1*4 |
| | | | | F/D | *5 | ON*1 |
| | | | | DEF | FRE | ON*1 |
| | | | ○ | | REC*2 | ON*1 |

*1: Compressor is operated by thermo control amp. and E.C.C.S. control unit.
*2: Depending on mode switch position.
*3: When vent mode is selected, REC switch function is as in the following chart:
*4: Depending on A/C switch position.
*5: Depending on REC switch position.

| | | REC: ON | REC: OFF |
|---|---|---|---|
| A/C SW | ON | REC | REC/FRE |
| | OFF | REC | FRE |

SHA267C



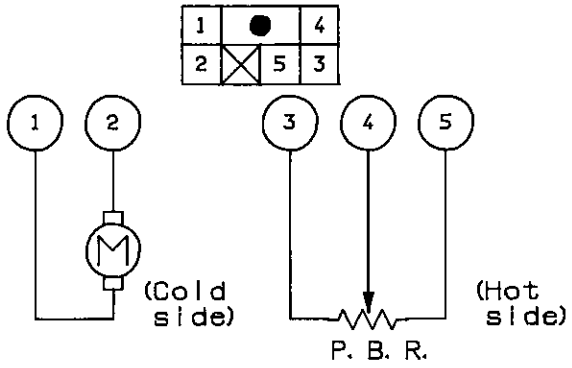

## Specifications

### AIR MIX DOOR MOTOR

The air mix door motor is attached to the heater unit. It rotates, opening the air mix door to the position set by the temperature control lever.

Motor rotation is conveyed through shafts and linkages. The air mix door position is fed back to the control amplifier by the Potentio Balance Resistor (P.B.R.) built into the air mix door motor.

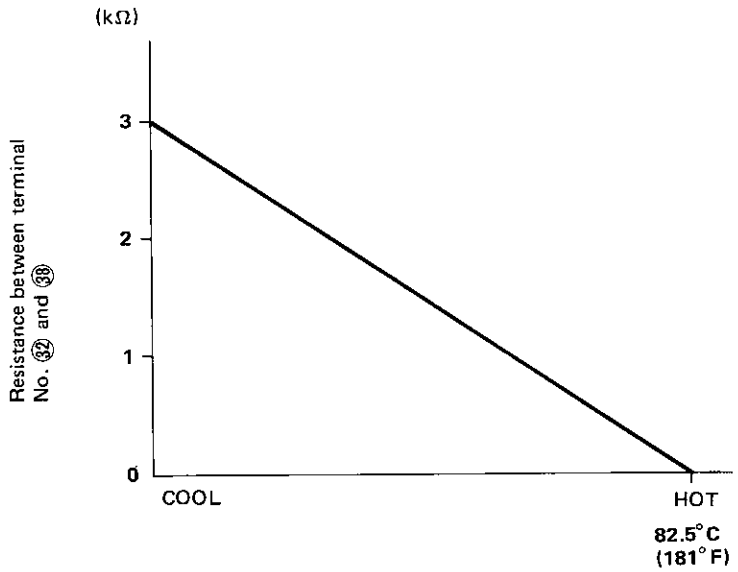
**Air mix door motor operation**




| 1 | 2 | Air mix door operation | Direction of lever movement |
|---|---|---|---|
| ⊕ | ⊖ | COLD → HOT | Clockwise (Toward passenger compartment) |
| ⊖ | ⊖ | STOP | STOP |
| ⊖ | ⊕ | HOT → COLD | Counterclockwise (Toward engine compartment) |

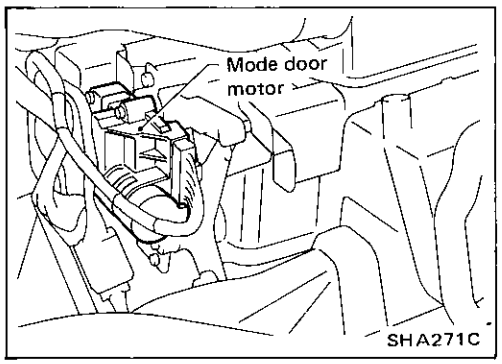
SHA269C

**Characteristics of P.B.R.**



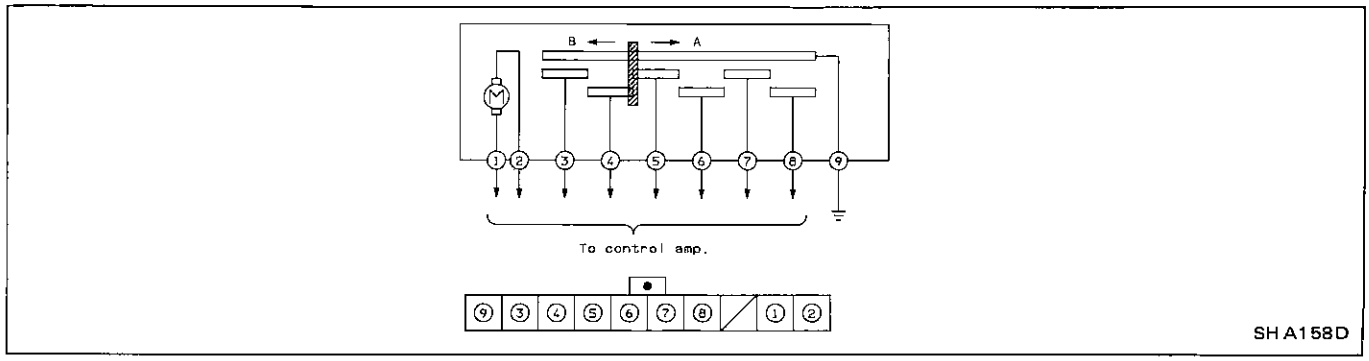

SHA270C

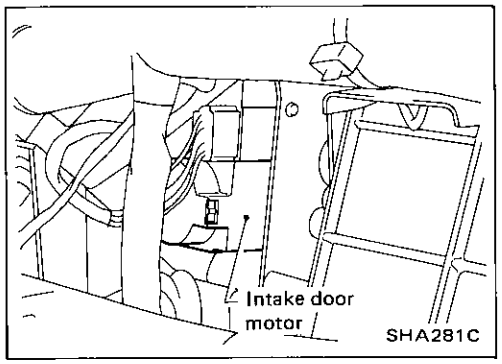
## Specifications (Cont'd)




### MODE DOOR MOTOR

When a mode switch is selected, the position switch built into it reads the corresponding mode to determine the direction of motor rotation. As soon as the desired mode is set, the position switch stops the motor.

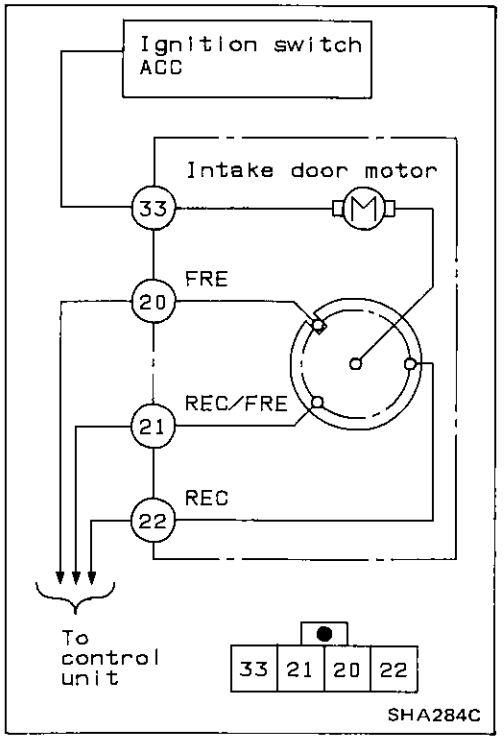



### INTAKE DOOR MOTOR

The intake door motor is installed on the side portion of the intake unit. Using a rod and link it opens and closes the intake door. When the REC switch is ON (OFF), the ground line of the intake door motor is switched from terminal ⑳ to ㉒ (㉒ to ⑳). This causes the motor to start because the position switch contacts built into it are now set to the current flow position.

The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop. The motor always turns in the same direction. (FRE→REC→REC/FREC)

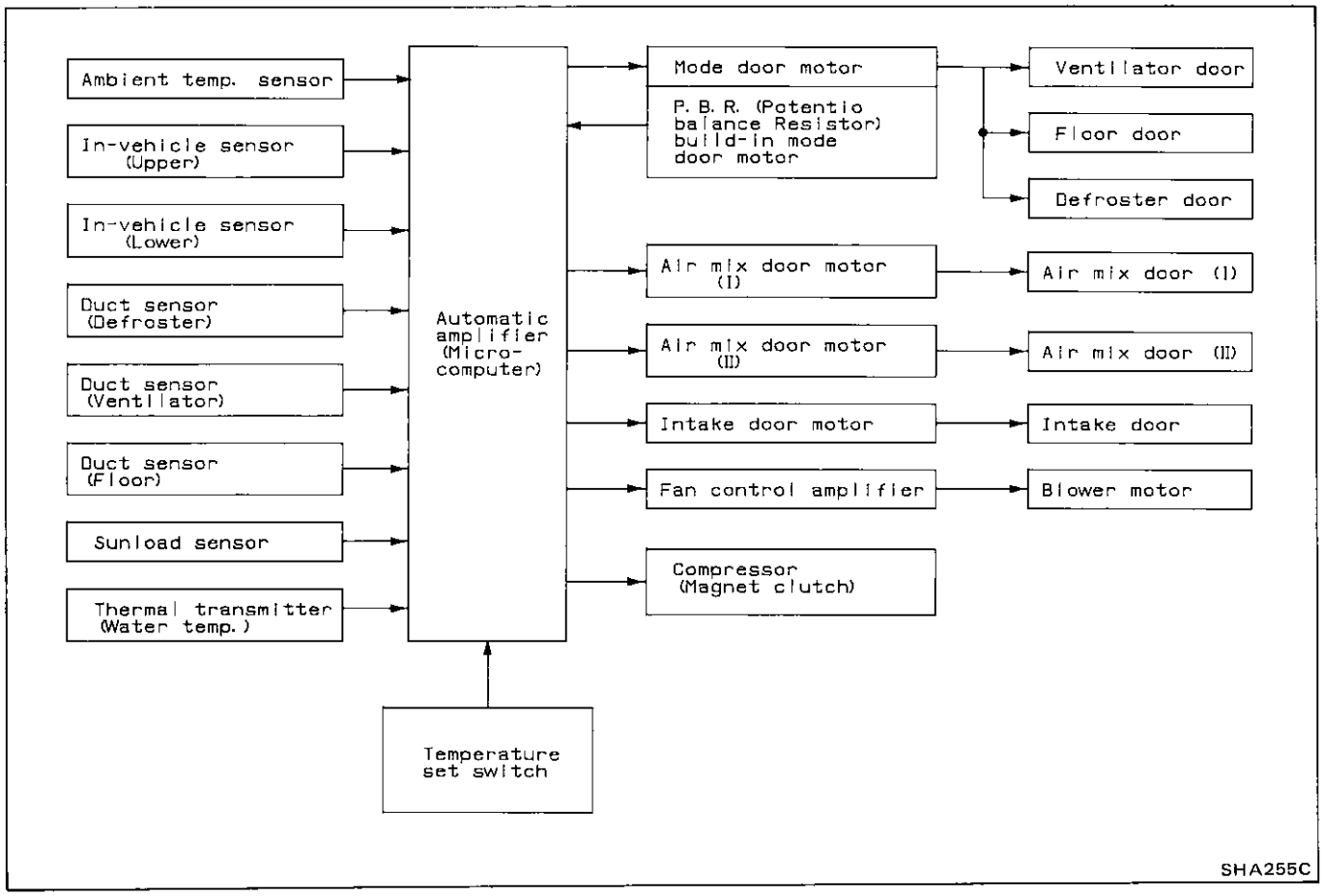


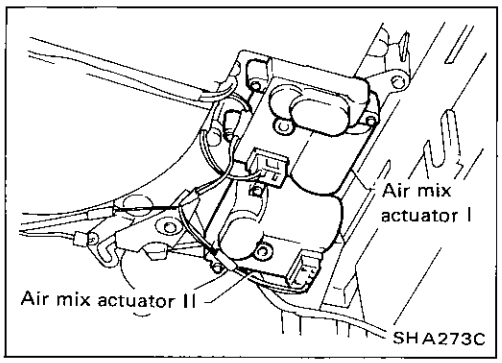
## Specifications

### AUTO AMPLIFIER

The auto amplifier has a built-in microcomputer which processes information from the A.T.C. system sensors. Signals are sent from the auto amplifier to activate the A.T.C. system depending upon the information sent by these sensors and the set temperature selected on the switch panel.

The A.T.C. system's self-diagnostic capabilities are built into the auto amplifier.





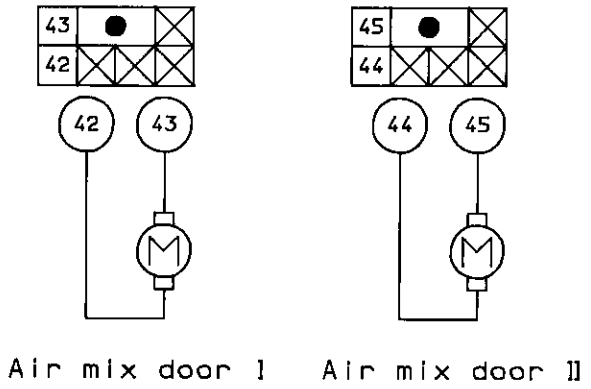

## Specifications (Cont'd)

### AIR MIX DOOR I and II MOTORS

**Component and related parts**

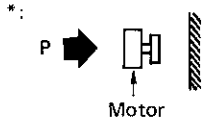
- Auto amplifier
- Air mix door motors
- In-vehicle sensors (upper and lower)
- Duct sensors (vent, floor, defroster)
- Ambient sensor
- sunload sensor

**Operation of air mix door I and II motors**




| ㊷ ㊹ | ㊸ ㊺ | Air mix door I and II operation | Direction of lever movement |
|---|---|---|---|
| ⊖ | ⊕ | COLD → HOT | *Clockwise |
| ⊖ | ⊖ | STOP | STOP |
| ⊕ | ⊖ | HOT → COLD | *Counterclockwise |

*:



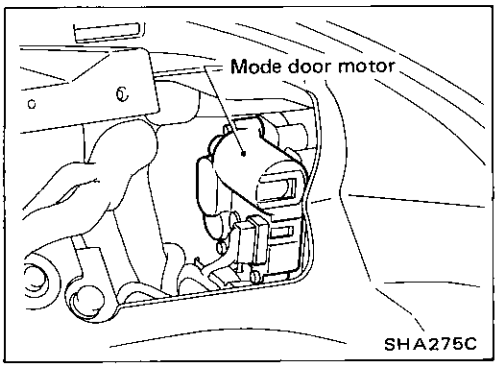

"Direction of lever movement" is as viewed from arrow P

SHA274C

**System operation**

The air mix door motors are attached to the bottom of the heater unit. The motors rotate, moving a lever system which varies the air mix door position to heat or cool the inlet air. Outlet air temperature is measured by the duct sensors, signals from which are sent to the auto amplifier which uses them to modify the air mix door position to achieve the current target temperature.

- **It takes about 1 minute to stabilize duct air temperature.**
- **When ambient temperature is below 5°C (41°F) or above 60°C (140°F), air mix door position is fixed.**



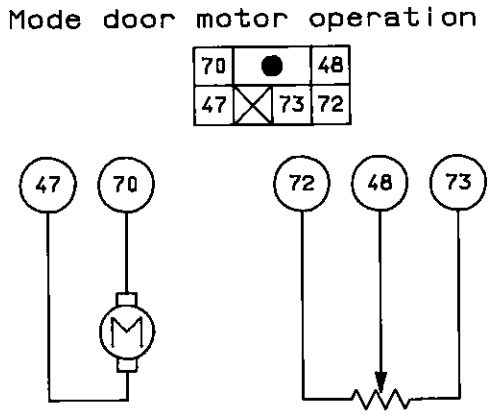

## Specifications (Cont'd)

### MODE DOOR MOTOR

**Component and related parts**

- Auto amplifier
- Mode door motor with potential ballast resister (P.B.R.)
- Lower in-vehicle sensor
- Ambient sensor
- Sunload sensor

**Mode door motor operation**




| ⑰ | ⑳ | Mode door operation | Direction of side link rotation |
|---|---|---|---|
| ⊖ | ⊕ | VENT → DEF | Clockwise |
| ⊖ | ⊖ | STOP | STOP |
| ⊕ | ⊖ | DEF → VENT | Counterclockwise |

SHA276C

**System operation**

The mode door motor is attached to the heater unit. The motor operates a cam assembly which moves the air outlet doors. The auto amplifier controls air distribution to the VENT, DEF and FOOT outlets. Outlet door position is conveyed to the auto amplifier by the P.B.R. built into the mode door motor.

The auto amplifier computes air outlet conditions according to ambient temperature, set temperature and sunload. When thermal loads are great, the air outlet computation is additionally influenced by the foot area temperature. The air outlet positions are smoothly adjusted in response to changes in ambient temperatures.

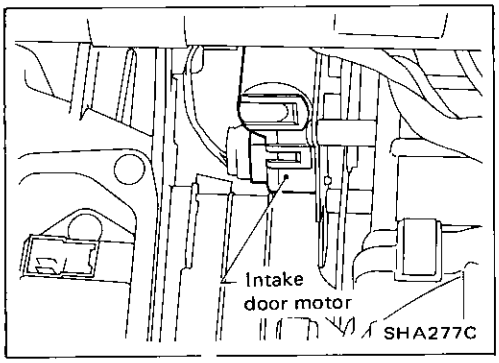
When the set temperature is decreased or when the sunload is increased, the air flow volume from the vent outlets is increased.

## Specifications (Cont'd)

### INTAKE DOOR MOTOR

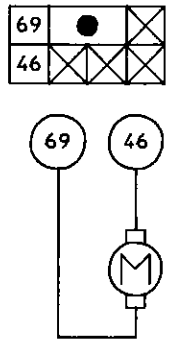
**Component and related parts**

- Auto amplifier
- Intake door motor
- Upper in-vehicle sensor
- Vent duct sensor
- Ambient sensor
- Sunload sensor




**Intake door operation**

Intake door operation




| ㊻ | ㊾ | Intake door operation | Direction of lever rotation |
|---|---|---|---|
| ⊖ | ⊕ | REC → FRE | Counterclockwise |
| ⊖ | ⊖ | STOP | STOP |
| ⊕ | ⊖ | FRE → REC | Clockwise |

SHA278C

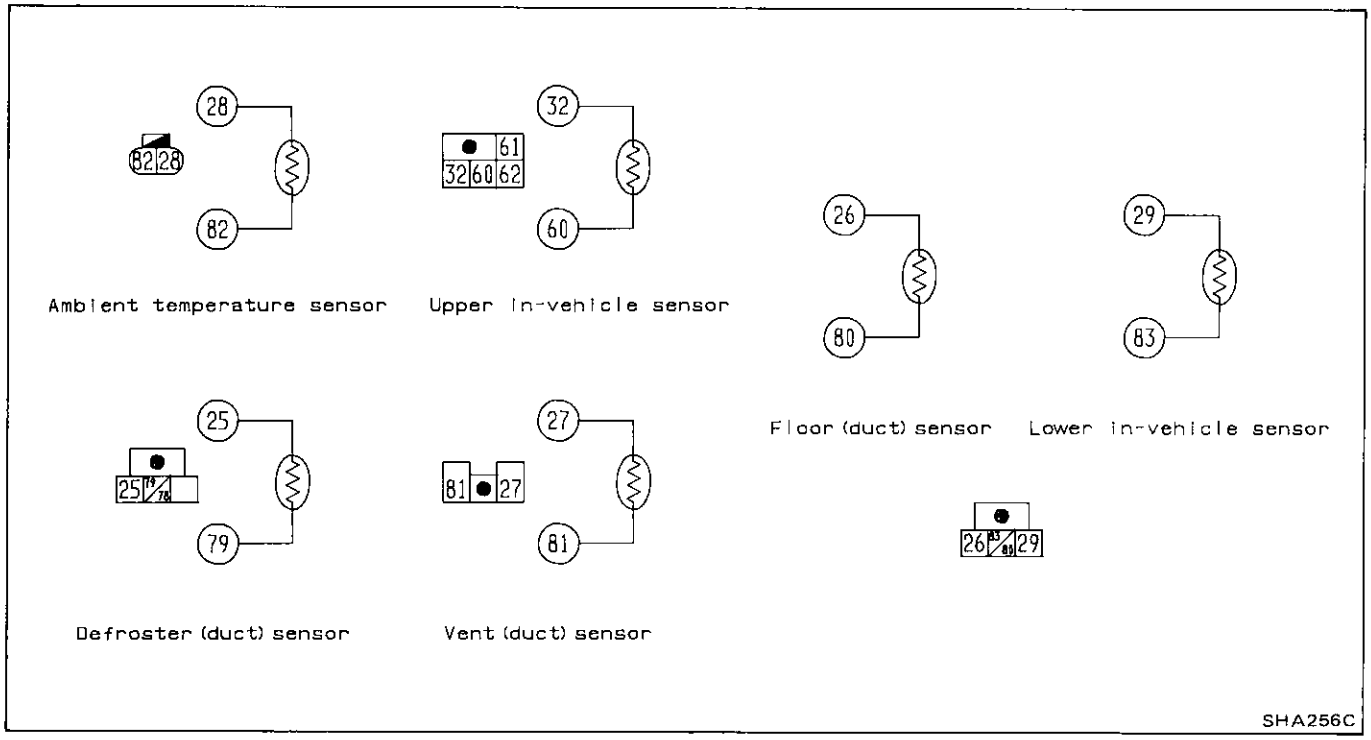
**System operation**

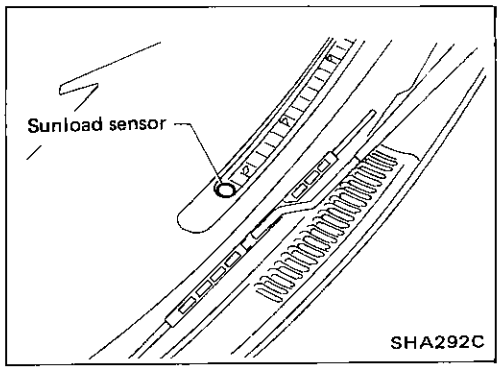
The intake door motor is attached to the air intake unit. Intake door position is controlled approximately once every thirty seconds, according to the difference between target and actual vent air temperatures. When the actual outlet air temperature is higher than the target vent air temperature, the intake door will gradually shift toward the recirculation-air side. When the outlet air temperature reaches the target outlet air temperature, the intake door will gradually shift toward the fresh air side. However, when the ambient temperature is lower than 20°C (68°F), 100% fresh air is taken is regardless of outlet air temperatures.

When the compressor is "OFF" the auto amplifier sets the intake door at the "FRESH" position except when the "RECIRC" switch is "ON".

## Specifications (Cont'd)

### TEMPERATURE SENSORS



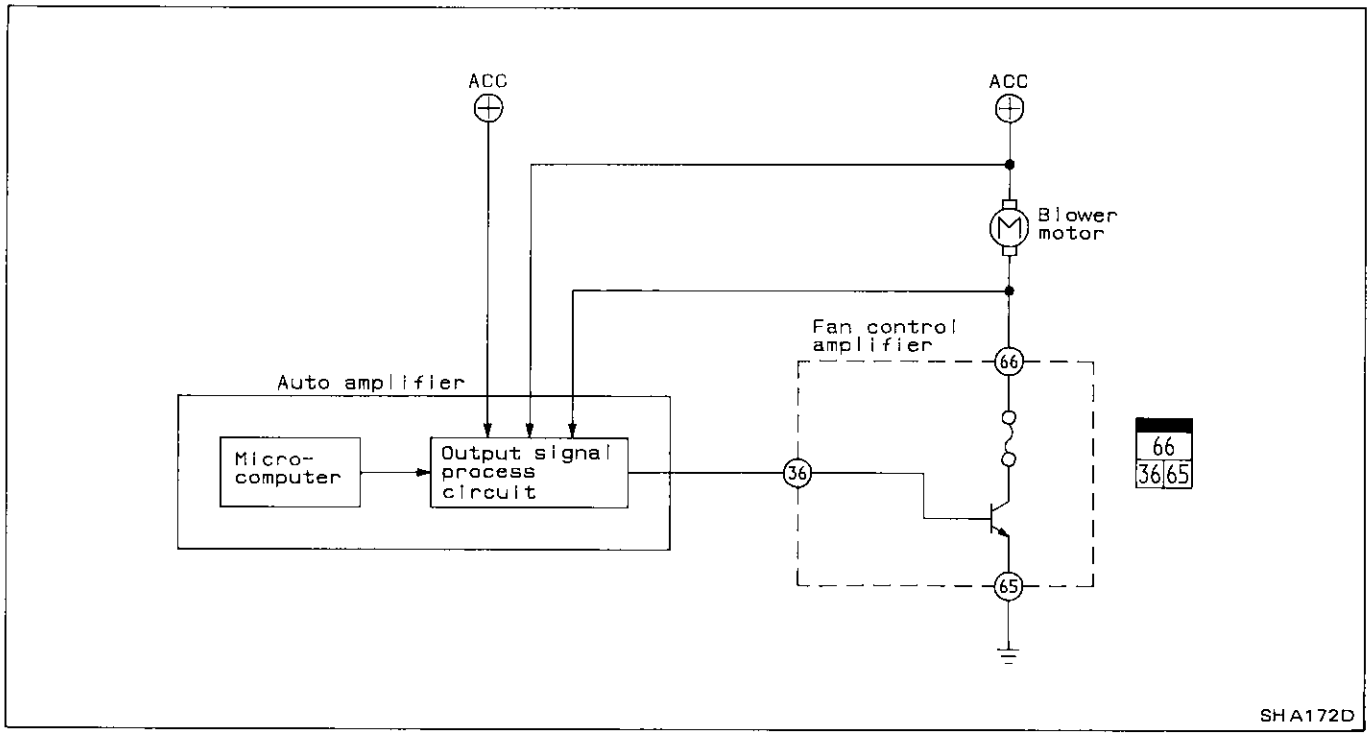

### SUNLOAD SENSOR

The sunload sensor is located on the right defroster grille. It detects sunload entering through the windshield by means of a photo diode and converts it into a current value which is then input into the auto amplifier.

## Specifications (Cont'd)

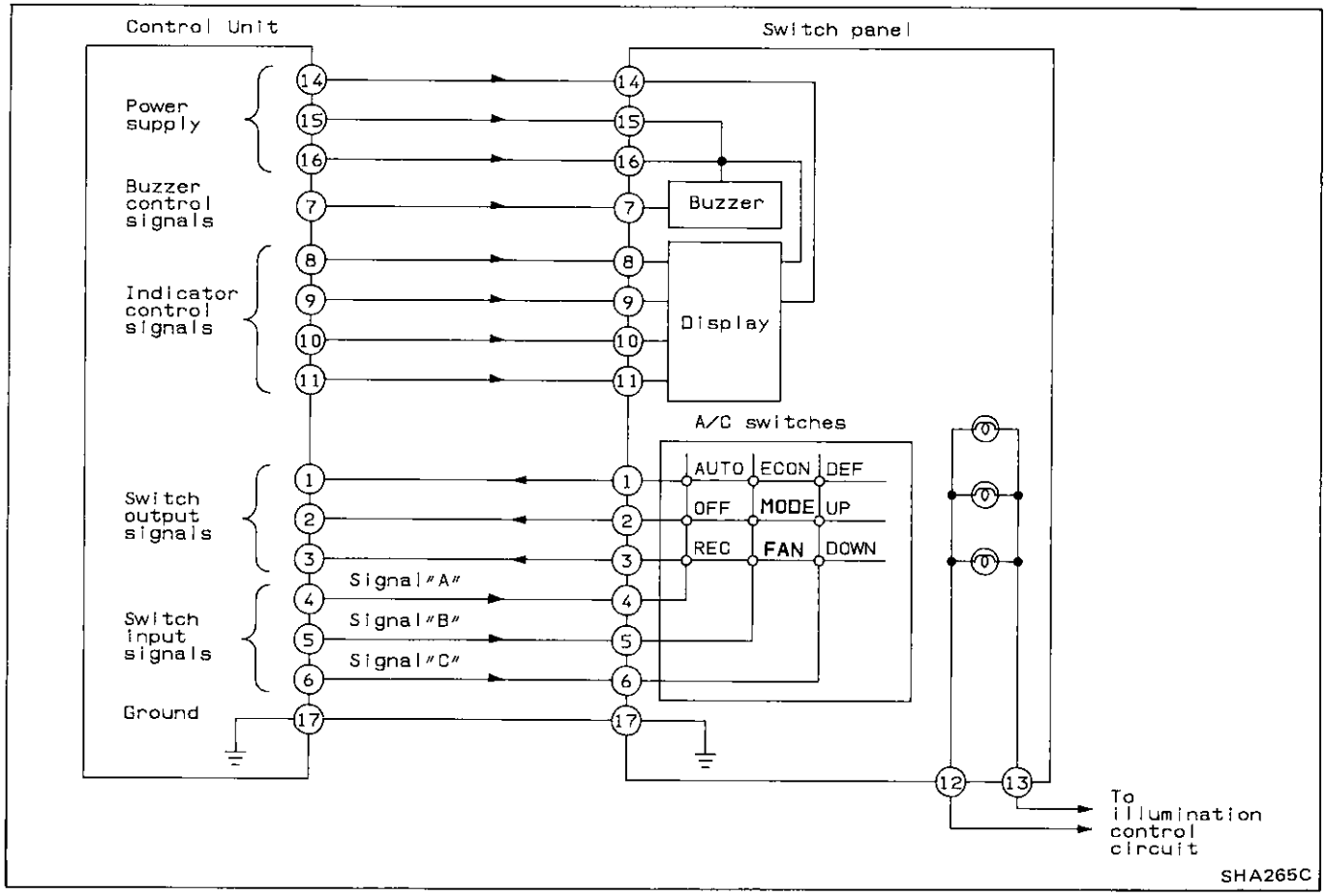
### FAN CONTROL AMPLIFIER

The fan control amplifier is located on the cooling unit. It amplifies the base current flowing from the auto amplifier to change the blower speed.




## System Operation

### SWITCH PANEL



## System Operation (Cont'd)

**System operation**

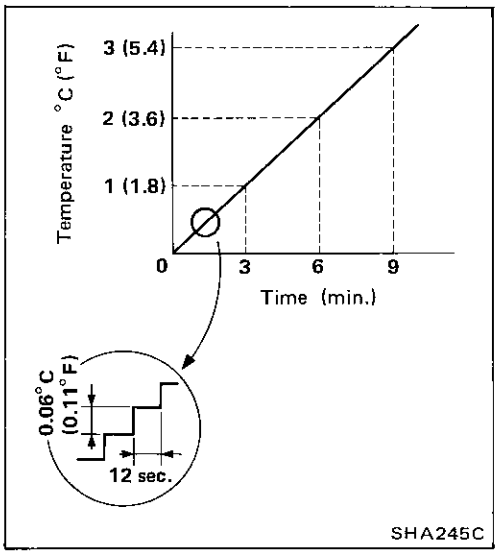
Except for illumination lamp terminals ⑫ and ⑬, the switch panel is operated by signals emitted from the control unit. There are three categories of signals.

1) Power and ground signals
2) Indicators (VFD and LED) and buzzer control signals
3) Switch input and output signals

The control unit always sends three different signals to the switch panel on three lines ④, ⑤, and ⑥.

For example, when the "Auto" switch is pushed, signal "A" returns to the control unit on line No. ①. And when the "Econ" switch is pushed, signal "B" returns to the control unit on line No. ①.

Similarly for the other switches; the control unit recognizes which signal returns on which line, and then identifies which switch is pushed.




### AMBIENT TEMPERATURE INPUT PROCESS

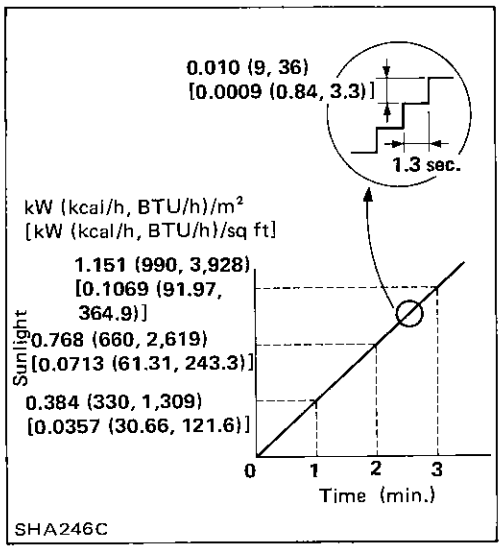
For A.T.C. system operation an accurate ambient sensor signal is necessary. The auto amplifier contains a circuit to ensure accurate measurement of increases in ambient temperature. Sudden increase in temperature of 16°C (61°F) or more, which may be detected after encountering heavy traffic after a period of high speed cruising, are processed through a delay circuit. The delay circuit processes any temperature increase in increments of 0.06°C (0.11°F) every 12 seconds and, in this way, the A.T.C. system is protected from any sudden changes in ambient sensor signal due to low air flow around the sensor.

**Temperature decreases are not processed through the time delay circuit.**

**Example:**

In the case of a signal stop after high-speed cruising, the ambient temperature will rises suddenly.

The ambient temperature input process functions at this time to prevent unpleasant air conditioning system changes.




### SUNLOAD INPUT PROCESS

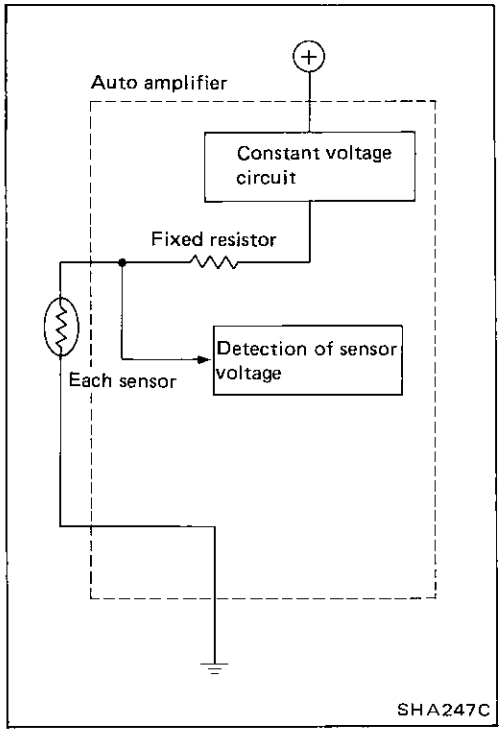
The sunload input circuit in the auto amplifier also features a time delay to prevent abrupt A.T.C. system changes. This feature operates under rapid increases and decreases in sunload.

**Example:**

When entering a tunnel the sunload will change suddenly. The sunload input process system functions at this time to prevent unpleasant air conditioning system changes.

## System Operation (Cont'd)

### SENSOR INPUT PROCESS




A fixed resistor is built into the auto amplifier. 12V DC is converted to 5V DC by the constant voltage circuit where it is then applied to the ground line of the auto amplifier by the fixed resistor and sensors. The auto amplifier monitors the voltage between each sensor and the fixed resistor. The resistance of each sensor varies according to temperature.

Accordingly, the voltage at each sensor varies according to the temperature. The voltage signal is processed by the auto amplifier for A.T.C. system operation.

### STARTING FAN SPEED AND OUTLET DOOR CONTROL

**Component parts**

Starting fan speed control components are:

- Auto amplifier
- Fan control amplifier
- In-vehicle sensors (Upper and Lower)
- Duct sensor (Defroster, Ventilator and Floor)
- Ambient sensor
- sunload sensor
- Thermal transmitter (Engine coolant temperature sensor)

**System operation**

- Fan speed control

  At a set temperature of 25°C (77°F), when the upper compartment temperature is below 21°C (70°F) and the outlet duct temperature is lower than 35°C (95°F), the fan starts at minimum flow rate. As the discharge air temperature increases, the air flow rate increases to bring the compartment temperature to the target level as quickly as possible.

  When the ambient temperature is above 40°C (104°F), fan air flow rate is at full volume.

  As interior temperature begins to reach the target temperature, fan speed decreases.

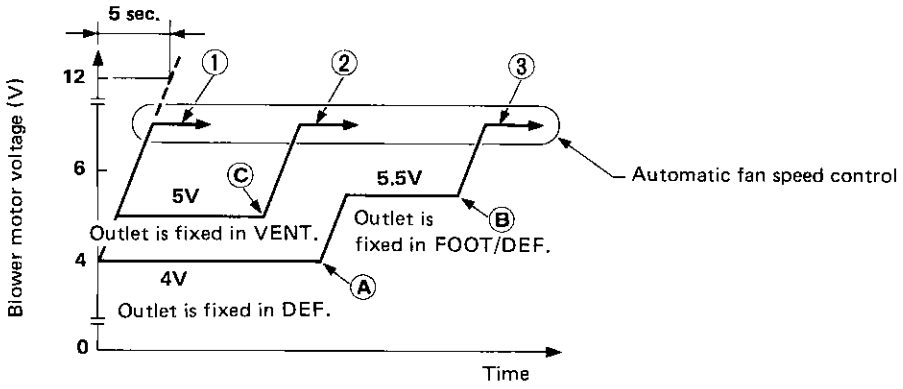
  Under heavy sunload conditions, fan speed is increased to maintain uniform interior temperature. Fan speed also increases if the set temperature is decreased.

- Outlet door control

  At a set temperature of 25°C (77°F), when the upper in-vehicle temperature is lower than 21°C (70°F) and all of the outlet air temperatures are lower than 24°C (75°F), the system starts with the minimum airflow rate in the defroster mode. When defroster duct temperature rises above 24°C (75°F), the air outlet mode changes from the defroster mode to the DEF/FOOT mode. When floor duct temperature exceeds 39°C (102°F), the starting fan speed control and outlet door control mode is replaced by the normal automatic control mode. When the upper in-vehicle temperature is far greater than the lower in-vehicle temperature because of a large sunload, the system starts with the ventilator mode, which is replaced by the automatic control mode as the coolant temperature and outlet air temperature increases.

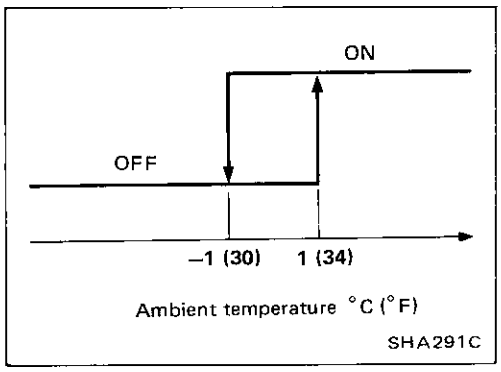
## System Operation (Cont'd)

### Starting fan speed and outlet door control specifications




① : When both upper and lower in-vehicle temperatures are much higher than set temperature.
② : When upper in-vehicle temperature is higher than set temperature.
③ : When upper in-vehicle temperature is lower than set temperature.
Ⓐ : When DEF duct temperature rises above 24°C (75°F)
(Exact temperature depends on ambient temperature.)
Ⓑ : When FLOOR duct temperature rises above 39°C (102°F)
(Exact temperature depends on ambient temperature.)
Ⓒ : When water temperature rises above 40°C (104°F) and difference between outlet air temperature and target temperature is lower than 5°C (9°F).

SHA290C




SHA291C

### MAGNET CLUTCH CONTROL

The auto amplifier controls compressor operation by the ambient temperature and signals from the E.C.C.S. unit.
The auto amplifier will turn the compressor "ON" or "OFF" as determined by a signal detected by the ambient temperature sensor.

## General Specifications

### COMPRESSOR

| | |
|---|---|
| Model | ZEXEL make<br>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<br>(1.457 x 1.016) |
| Direction of rotation | Clockwise<br>(viewed from drive end) |
| Drive belt | Poly V |

### LUBRICATION OIL

| | |
|---|---|
| Model | ZEXEL make<br>DKS-16H |
| Type | SUNISO 5GS |
| Capacity mℓ (US fl oz, Imp fl oz)<br>Total in system | 200 (6.8, 7.0) |
| Compressor (Service parts) charging amount | 200 (6.8, 7.0) |

### REFRIGERANT

| | | |
|---|---|---|
| Type | | R12 |
| Capacity | kg (lb) | 0.75 - 0.85 (1.65 - 1.87) |

## Inspection and Adjustment

### ENGINE IDLING SPEED (When A/C is ON.)

- **Refer to EF & EC section.**

### BELT TENSION

- **Refer to Checking Drive Belts (MA section).**

### COMPRESSOR

| | |
|---|---|
| Model | DKS-16H |
| Clutch disc-pulley clearance mm (in) | 0.3 - 0.6 (0.012 - 0.024) |

# ELECTRICAL SYSTEM

# SECTION EL

**When you read wiring diagrams:**
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**

# CONTENTS


PRECAUTIONS AND PREPARATION ..... EL- 2
HARNESS CONNECTOR ..... EL- 3
STANDARDIZED RELAY ..... EL- 4
POWER SUPPLY ROUTING ..... EL- 6
BATTERY ..... EL- 10
STARTING SYSTEM ..... EL- 18
STARTING SYSTEM — Starter — ..... EL- 20
CHARGING SYSTEM ..... EL- 25
CHARGING SYSTEM — Alternator — ..... EL- 27
COMBINATION SWITCH ..... EL- 35
INSTRUMENT SWITCH ..... EL- 38
HEADLAMP ..... EL- 40
EXTERIOR LAMP ..... EL- 47
INTERIOR LAMP ..... EL- 52
METER AND GAUGES ..... EL- 55
WARNING LAMPS AND CHIME ..... EL- 61
TIME CONTROL SYSTEM ..... EL- 66
WIPER AND WASHER ..... EL- 81
HORN, CIGARETTE LIGHTER, CLOCK ..... EL- 86
REAR WINDOW DEFOGGER & HEATER MIRROR ..... EL- 87
AUDIO AND POWER ANTENNA ..... EL- 90
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.) ..... EL- 96
THEFT WARNING SYSTEM ..... EL-117
LOCATION OF ELECTRICAL UNITS ..... EL-137
HARNESS LAYOUT ..... EL-141


**WIRING DIAGRAM REFERENCE CHART**


E.C.C.S. ..... EF & EC SECTION
AT CONTROL, SHIFT LOCK ..... AT SECTION
ADJUSTABLE SHOCK ABSORBER ..... FA SECTION
ANTI-LOCK BRAKING SYSTEM ..... BR SECTION
POWER STEERING, SUPER HICAS ..... ST SECTION
HEATER AND AIR CONDITIONER ..... HA SECTION
POWER WINDOW, POWER DOOR LOCK, DOOR MIRROR, POWER SEAT, AUTOMATIC SEAT BELT AND SRS "AIR BAG" ..... BF SECTION

## Precautions

### SUPPLEMENTAL RESTRAINT SYSTEM "AIR BAG"

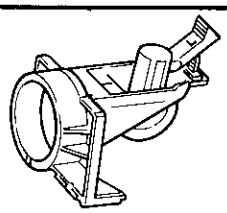
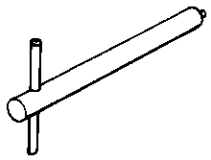
The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a control unit, warning lamp, wiring harness and spiral cable.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

**WARNING:**

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

## Preparation

### SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| 26081 30P00 (right)<br>26086 30P00 (left)<br>Headlamp aimer adapter |  | Attaching headlamp aimer |
| (J36126)<br>Washer nozzle adjusting tool |  | Adjusting washer nozzle |

## Description

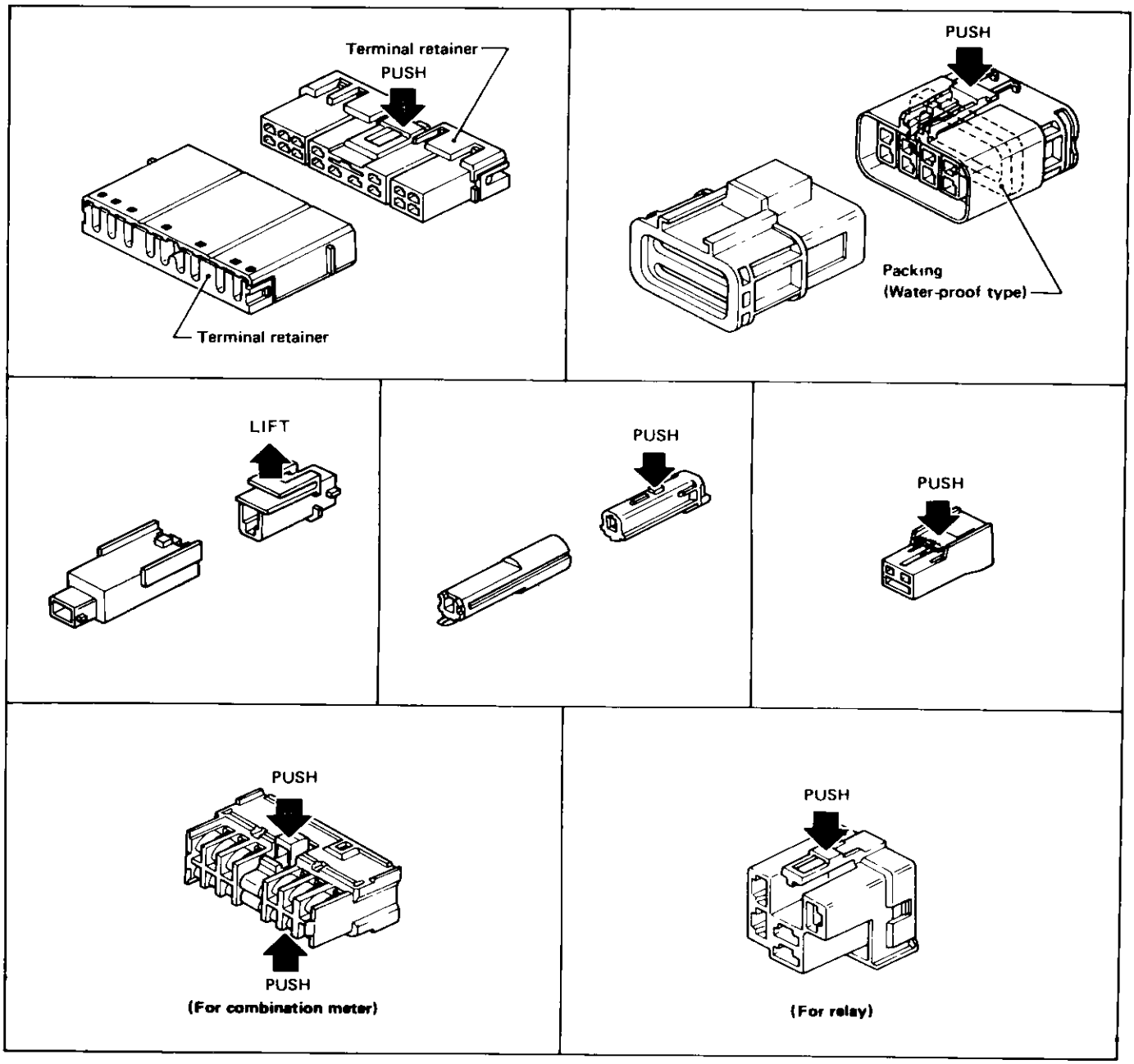
### HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental looseness or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

**CAUTION:**

**Do not pull the harness when disconnecting the connector.**

[Example]

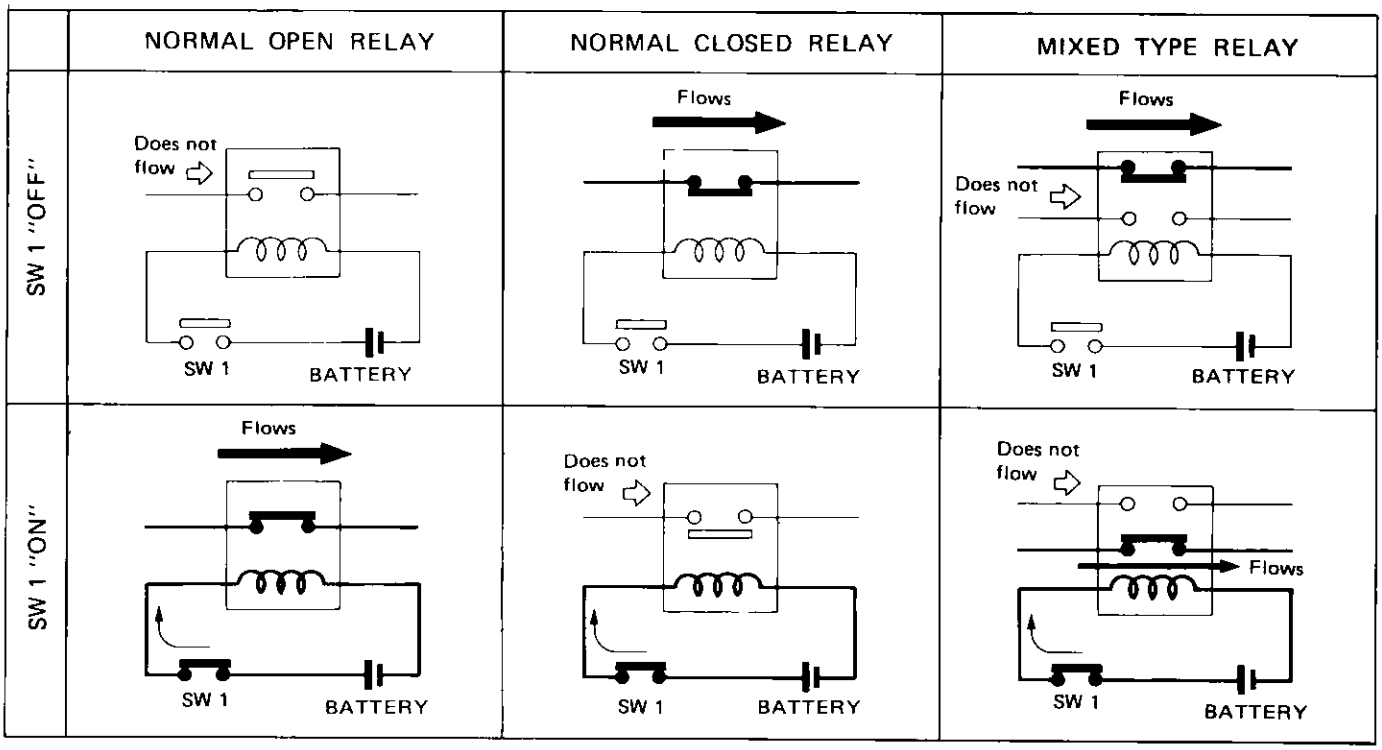



SEL769D

## Description

### NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

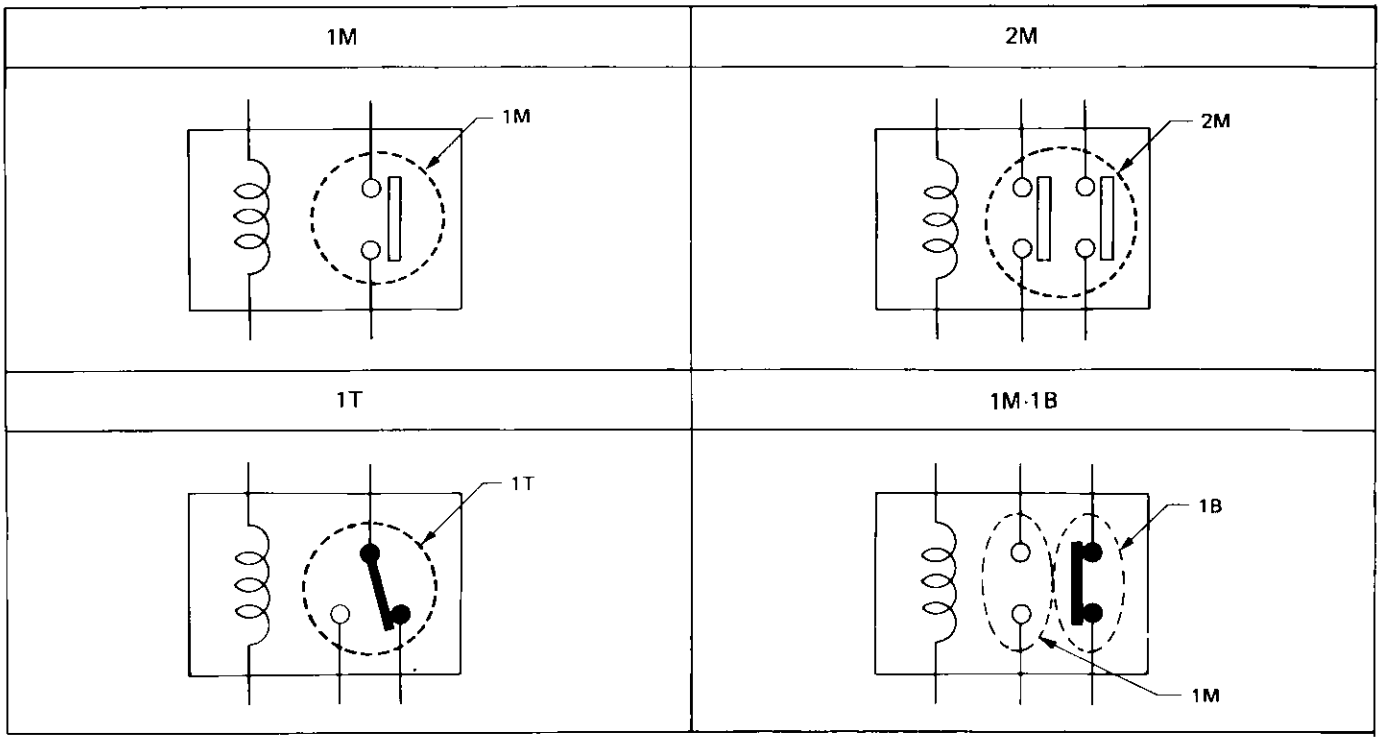
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



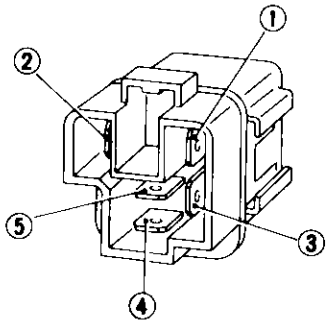
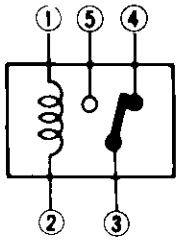
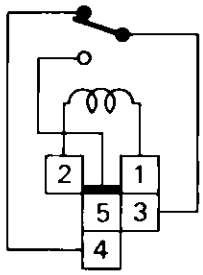
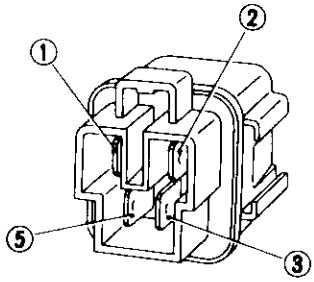
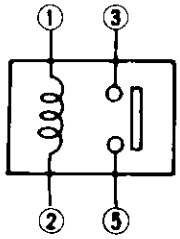
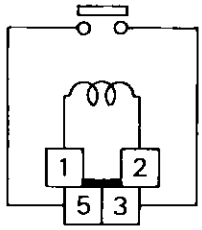
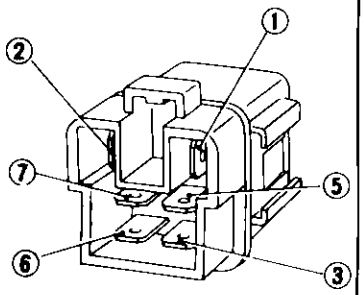
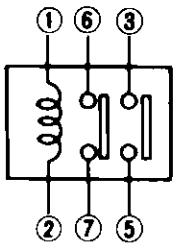
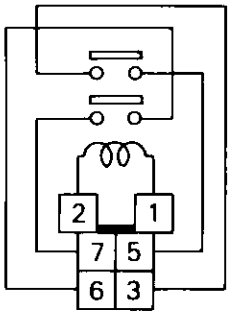
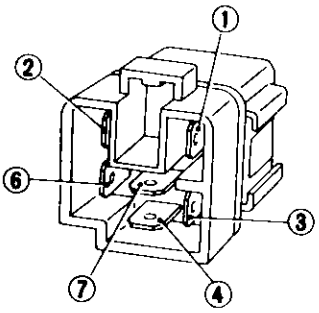
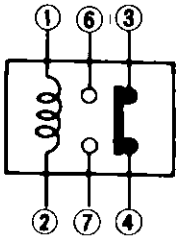
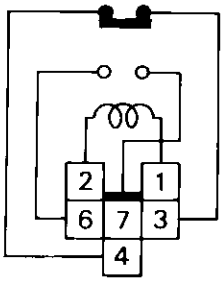

SEL881H

### TYPE OF STANDARDIZED RELAYS

1M ..... 1 Make
1T ..... 1 Transfer
2M ..... 2 Make
1M·1B ..... 1 Make 1 Break

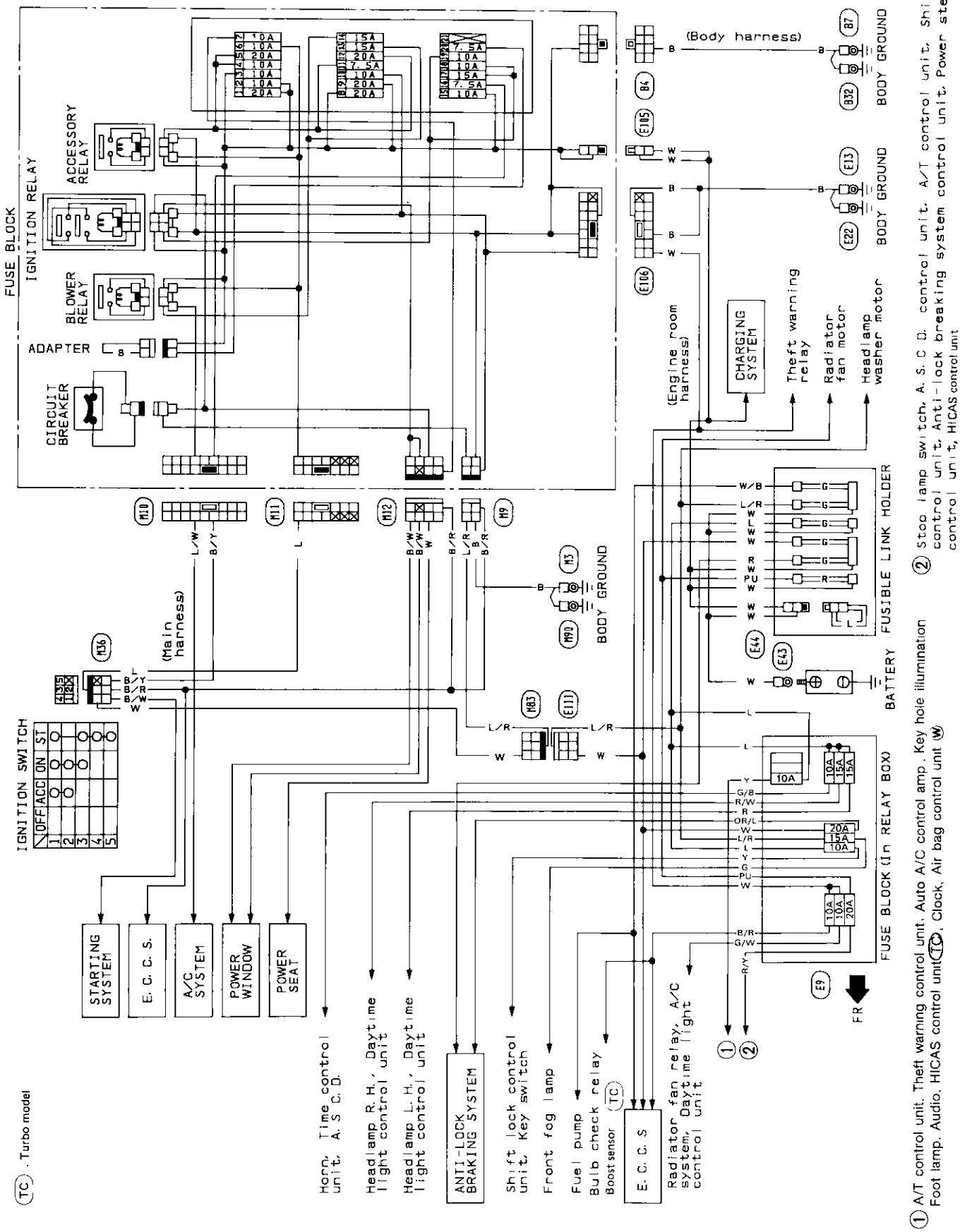



SEL882H

| Type | Outer view | Circuit | Connector symbol and connection | Case color |
|---|---|---|---|---|
| 1T |  |  |  | BLACK |
| 1M |  |  |  | BLUE or GREEN |
| 2M |  |  |  | BROWN |
| 1M·1B |  |  |  | GRAY |

SEL883H

## Wiring Diagram

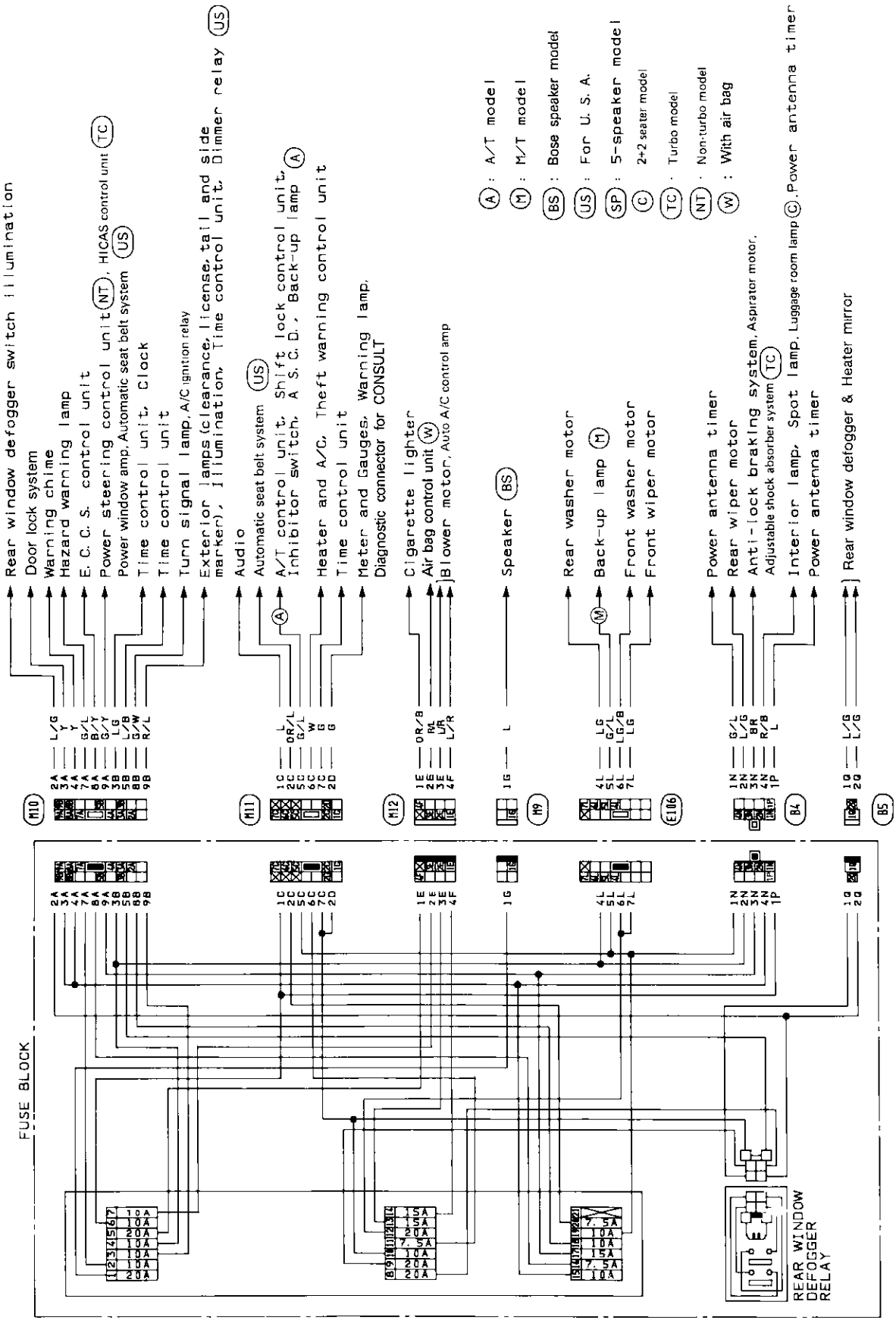



(TC) : Turbo model

① A/T control unit, Theft warning control unit, Auto A/C control amp., Key hole illumination Foot lamp, Audio, HICAS control unit (TC), Clock, Air bag control unit (W)

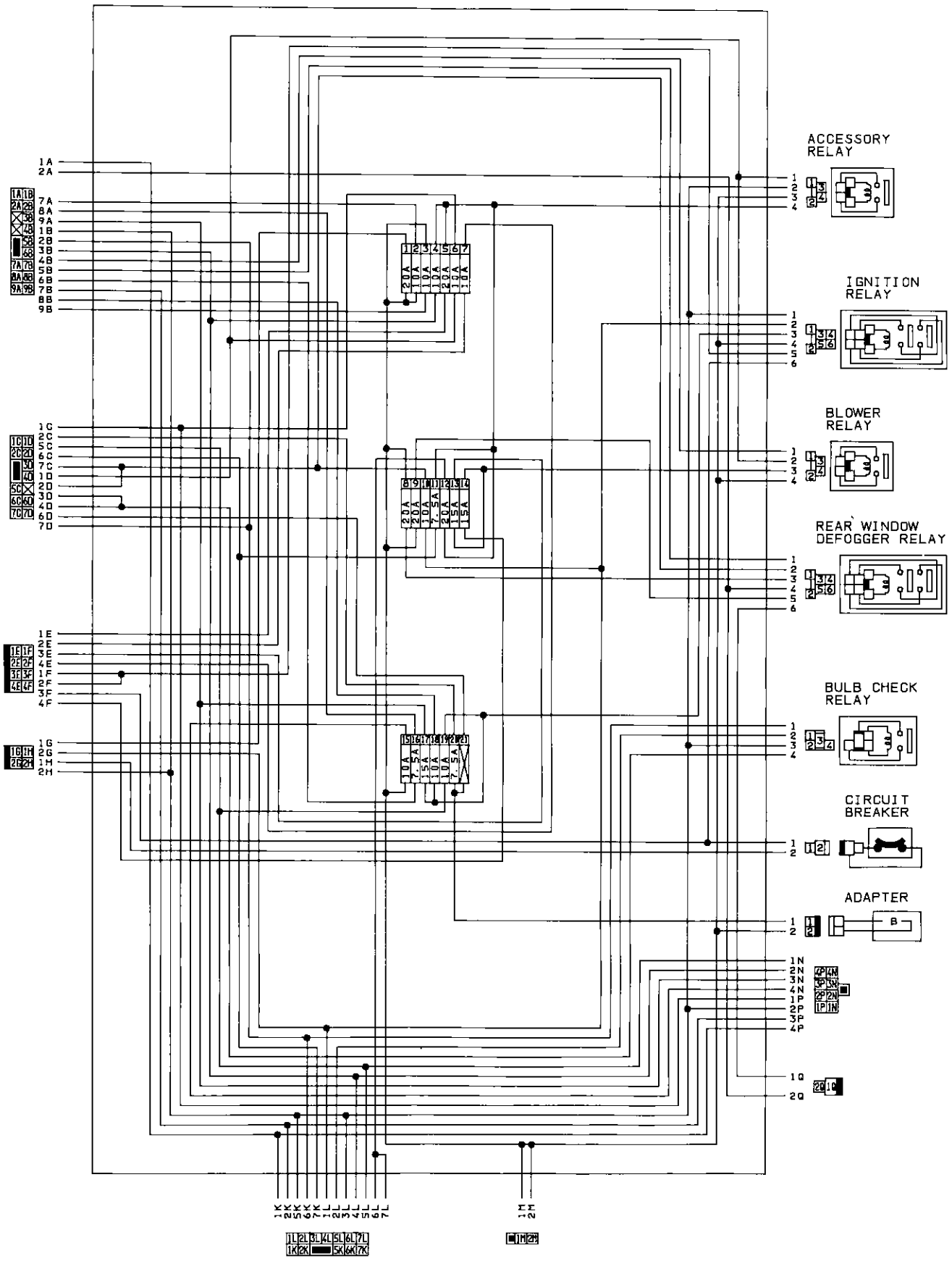
② Stop lamp switch, A. S. C. D. control unit, A/T control unit, Shift lock control unit, Anti-lock breaking system control unit, Power steering control unit, HICAS control unit

## Wiring Diagram (Cont'd)

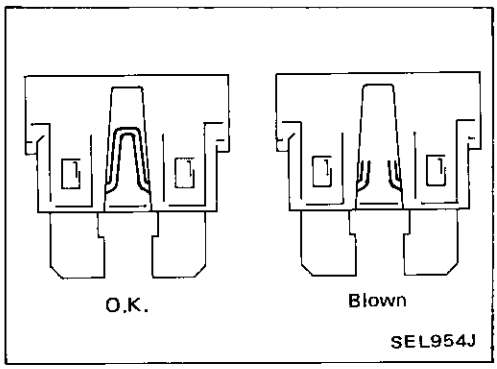



SEL677Q

## Fuse Block Internal Circuit

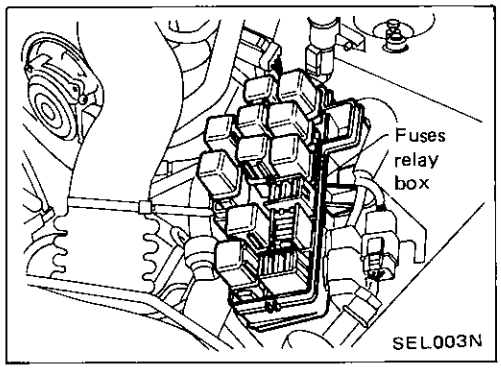


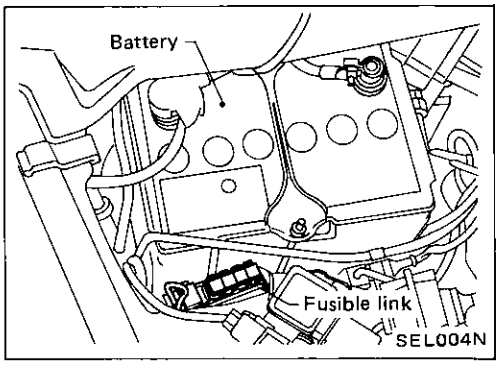

SEL678Q




## Fuse

a. **If fuse is blown, be sure to eliminate cause of problem before installing new fuse.**
b. **Use fuse of specified rating. Never use fuse of more than specified rating.**
c. **Do not install fuse in oblique direction; always insert it into fuse holder properly.**
d. **Remove fuse for clock if vehicle is not used for a long period of time.**




## Fusible Link

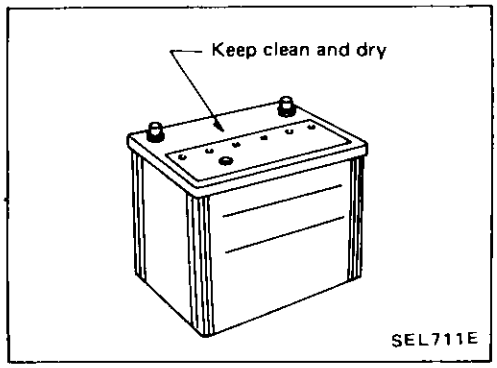
A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

**CAUTION:**

a. **If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.**
b. **Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.**

CAUTION:

a. **If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.**
b. **After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.**
c. **Never add distilled water through the hole used to check specific gravity.**

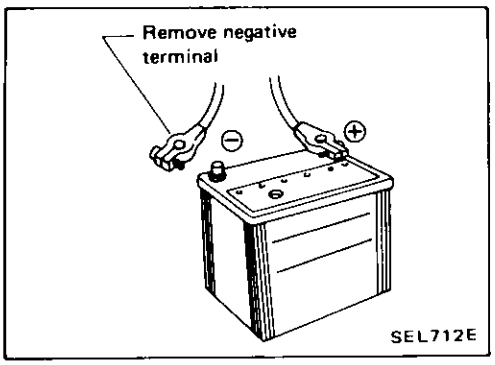



## How to Handle Battery

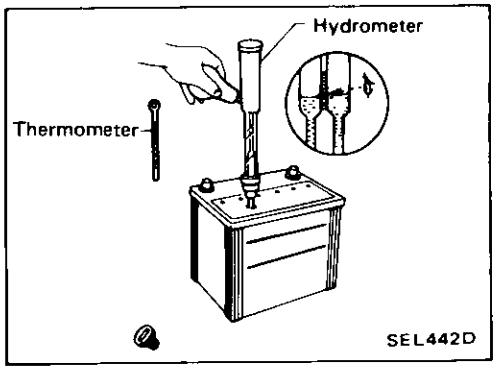
### METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
  If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.




- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)




- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

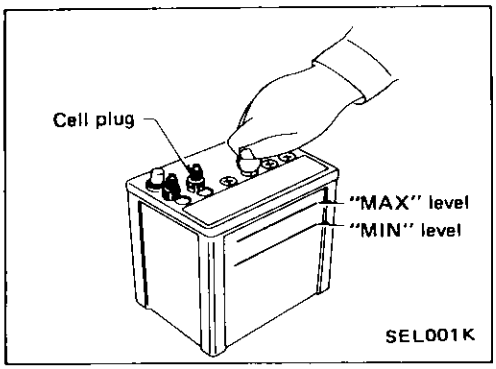
## How to Handle Battery (Cont'd)

### CHECKING ELECTROLYTE LEVEL

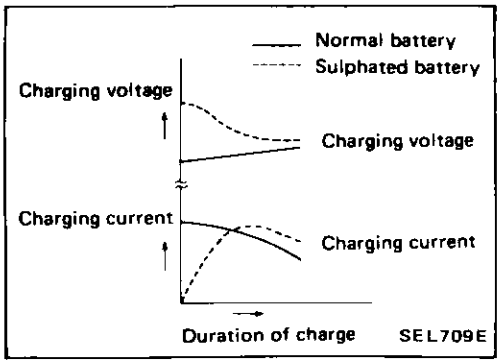
**WARNING:**

**Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.**

Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.



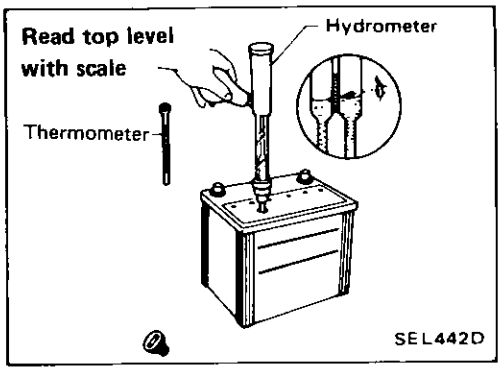

- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.




### SULPHATION

When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

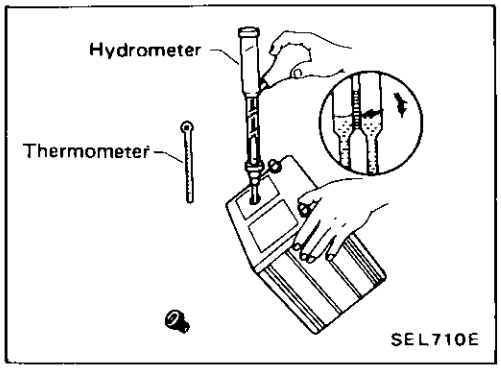
Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.




### SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.

## How to Handle Battery (Cont'd)

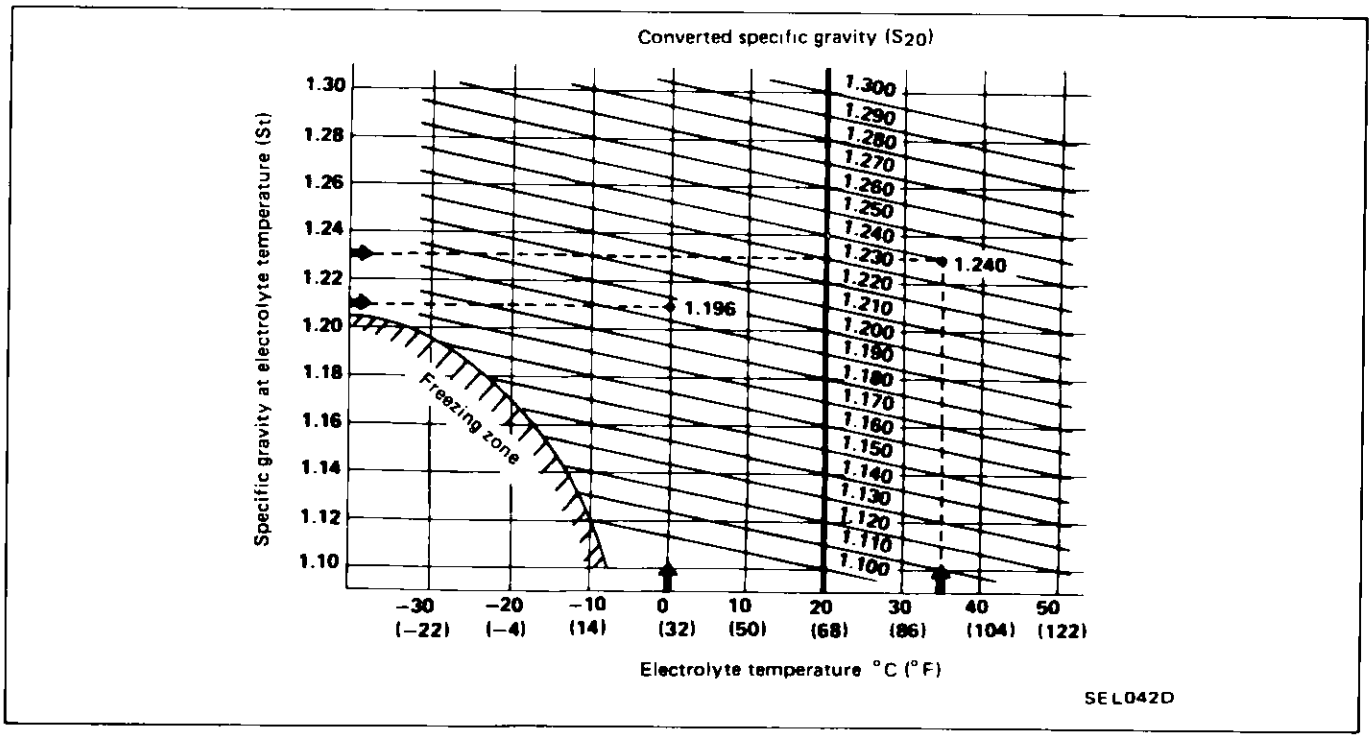



- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

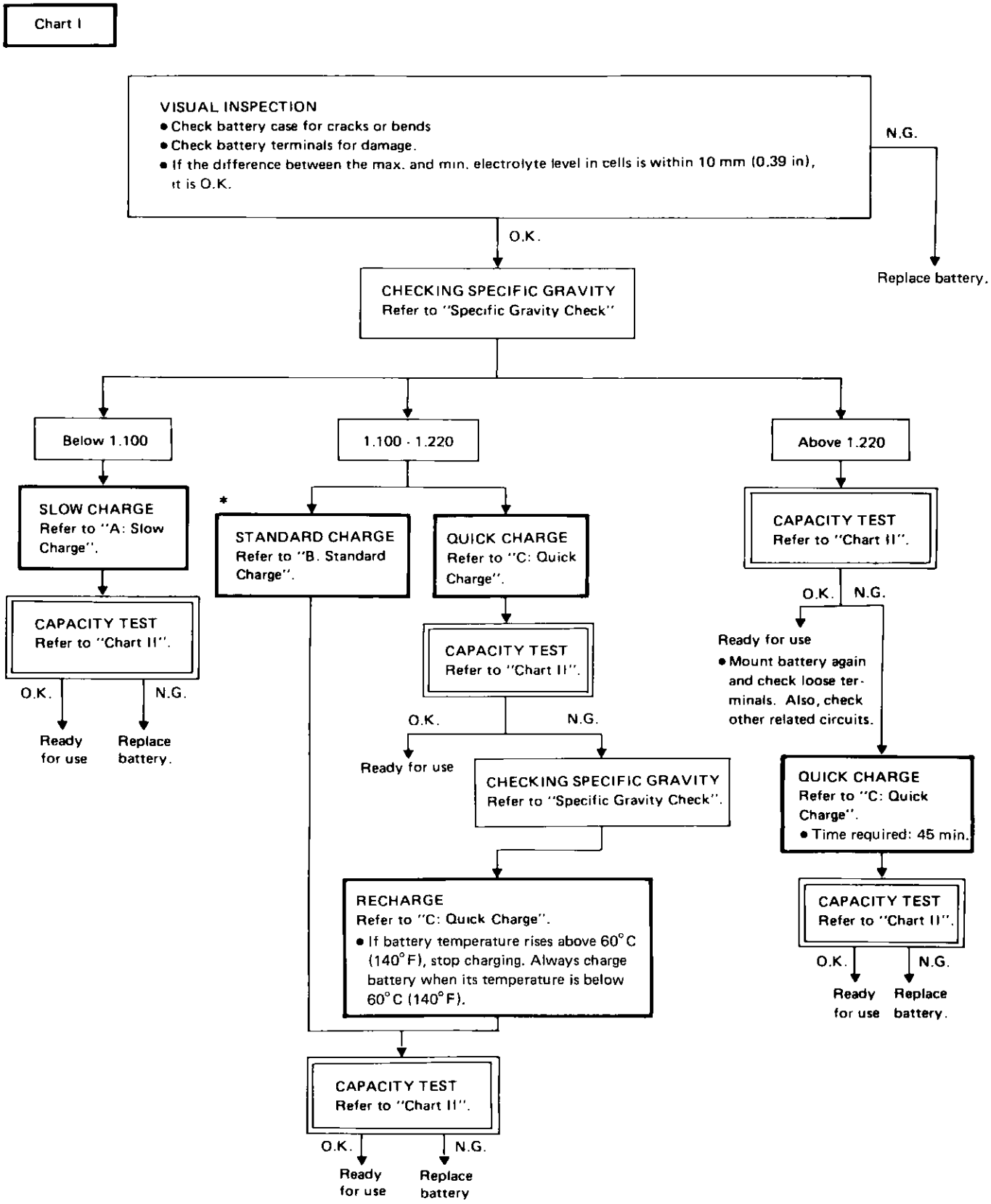
2. Convert into specific gravity at 20°C (68°F).

Example:

- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



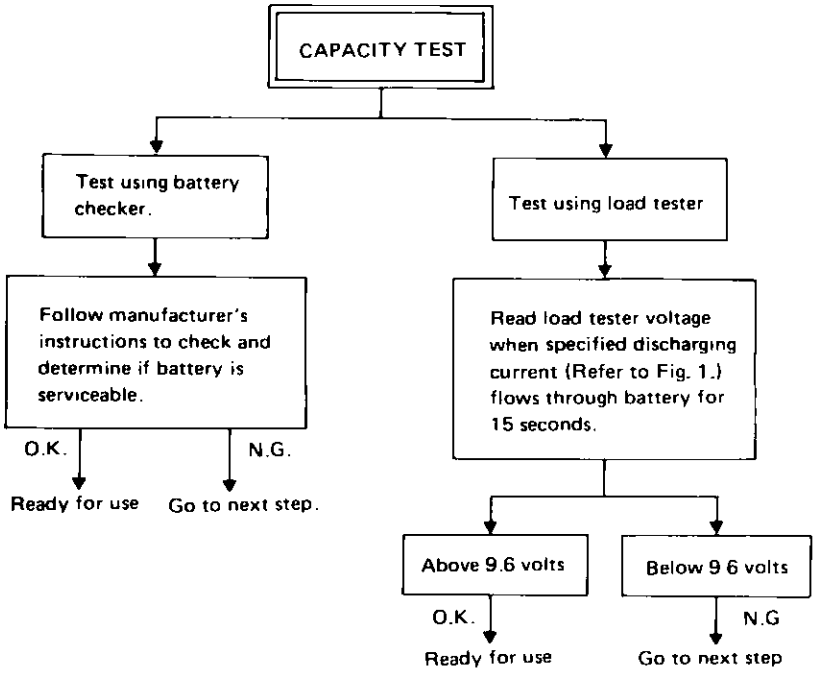
## Battery Test and Charging Chart




* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

## Battery Test and Charging Chart (Cont'd)

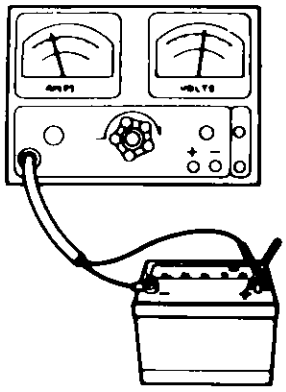
Chart II




- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

| Type | Current (A) |
|---|---|
| 28B19R(L) | 90 |
| 34B19R(L) | 99 |
| 46B24R(L) | 135 |
| 55B24R(L) | 135 |
| 50D23R(L) | 150 |
| 55D23R(L) | 180 |
| 65D26R(L) | 195 |
| 80D26R(L) | 195 |
| 75D31R(L) | 210 |
| 95D31R(L) | 240 |
| 95E41R(L) | 300 |
| 130E41R(L) | 330 |



SEL697B

## Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

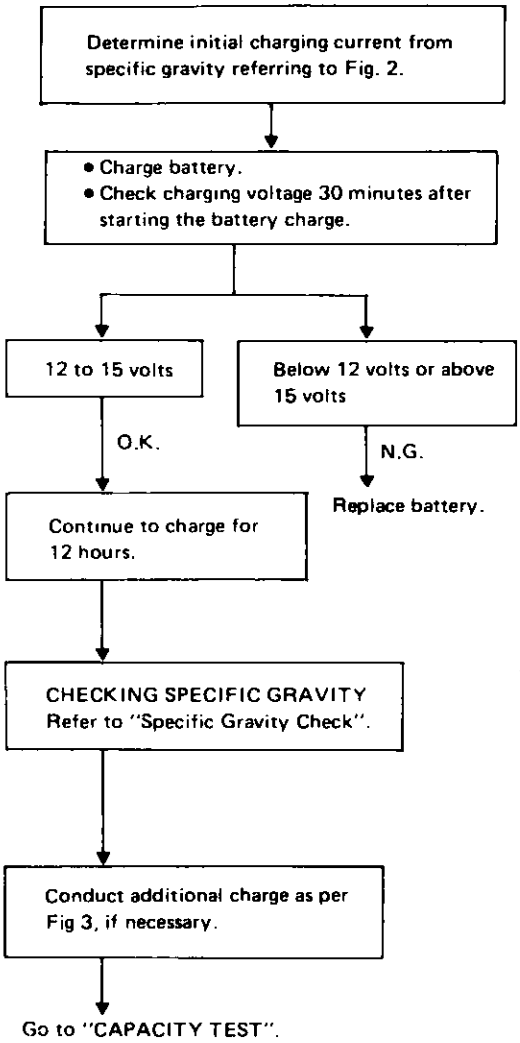
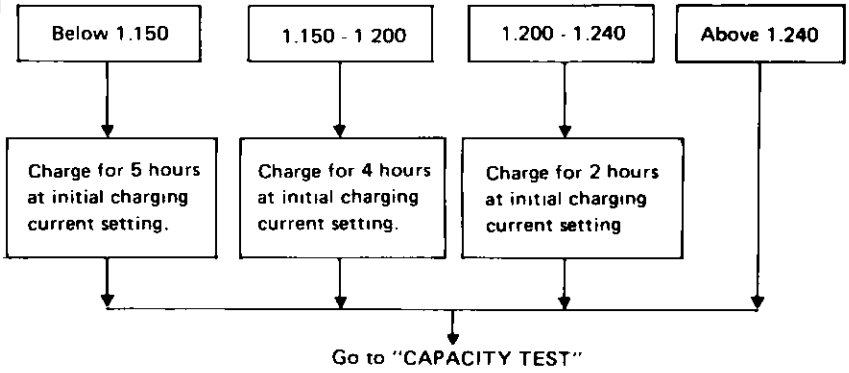



Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

| 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)




**CAUTION:**

a. **Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
b. **Keep battery away from open flame while it is being charged.**
c. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
d. **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

## Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

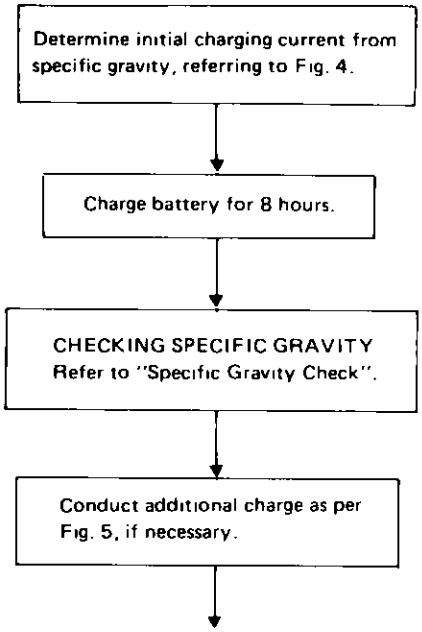
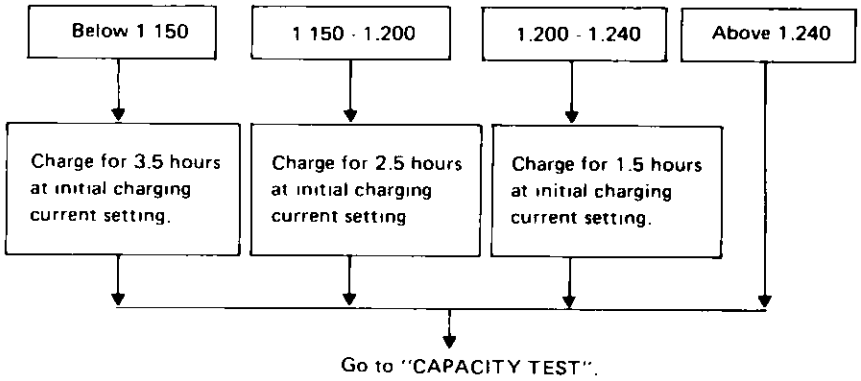



Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

| BATTERY TYPE / CONVERTED SPECIFIC GRAVITY | 28B19R(L) 34B19R(L) | 46B24R(L) 55B24R(L) | 50D23R(L) 55D23R(L) | 65D26R(L) 80D26R(L) | 75D31R(L) | 95D31R(L) 95E41R(L) | 130E41R(L) |
|---|---|---|---|---|---|---|---|
| 1.100 - 1.130 | 4.0 (A) | 5.0 (A) | 6.0 (A) | 7.0 (A) | 8.0 (A) | 9.0 (A) | 13.0 (A) |
| 1.130 - 1.160 | 3.0 (A) | 4.0 (A) | 5.0 (A) | 6.0 (A) | 7.0 (A) | 8.0 (A) | 11.0 (A) |
| 1.160 - 1.190 | 2.0 (A) | 3.0 (A) | 4.0 (A) | 5.0 (A) | 6.0 (A) | 7.0 (A) | 9.0 (A) |
| 1.190 - 1.220 | 2.0 (A) | 2.0 (A) | 3.0 (A) | 4.0 (A) | 5.0 (A) | 5.0 (A) | 7.0 (A) |

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 ADDITIONAL CHARGE (Standard charge)




**CAUTION:**

a. **Do not use standard charge method on a battery whose specific gravity is less than 1.100.**
b. **Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
c. **Keep battery away from open flame while it is being charged.**
d. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
e. **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

## Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

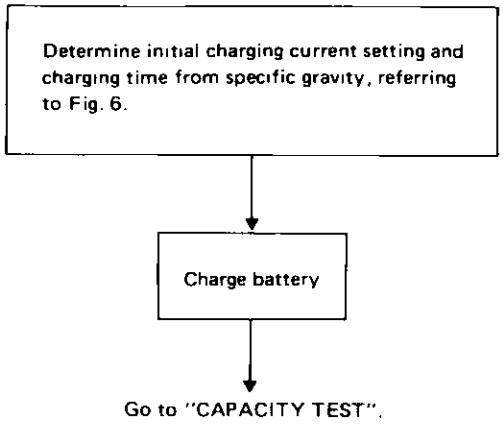



Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

| CONVERTED SPECIFIC GRAVITY \ BATTERY TYPE / CURRENT [A] | 28B19R(L) 34B19R(L) | 46B24R(L) 55B24R(L) 50D23R(L) | 55D23R(L) 65D26R(L) 80D26R(L) | 75D31R(L) 95D31R(L) 95E41R(L) | 130E41R(L) |
|---|---|---|---|---|---|
| | 10 (A) | 15 (A) | 20 (A) | 30 (A) | 40 (A) |
| 1.100 - 1.130 | 2.5 hours | | | | |
| 1.130 - 1.160 | 2.0 hours | | | | |
| 1.160 - 1.190 | 1.5 hours | | | | |
| 1.190 - 1.220 | 1.0 hours | | | | |
| Above 1.220 | 0.75 hours (45 min.) | | | | |

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

**CAUTION:**

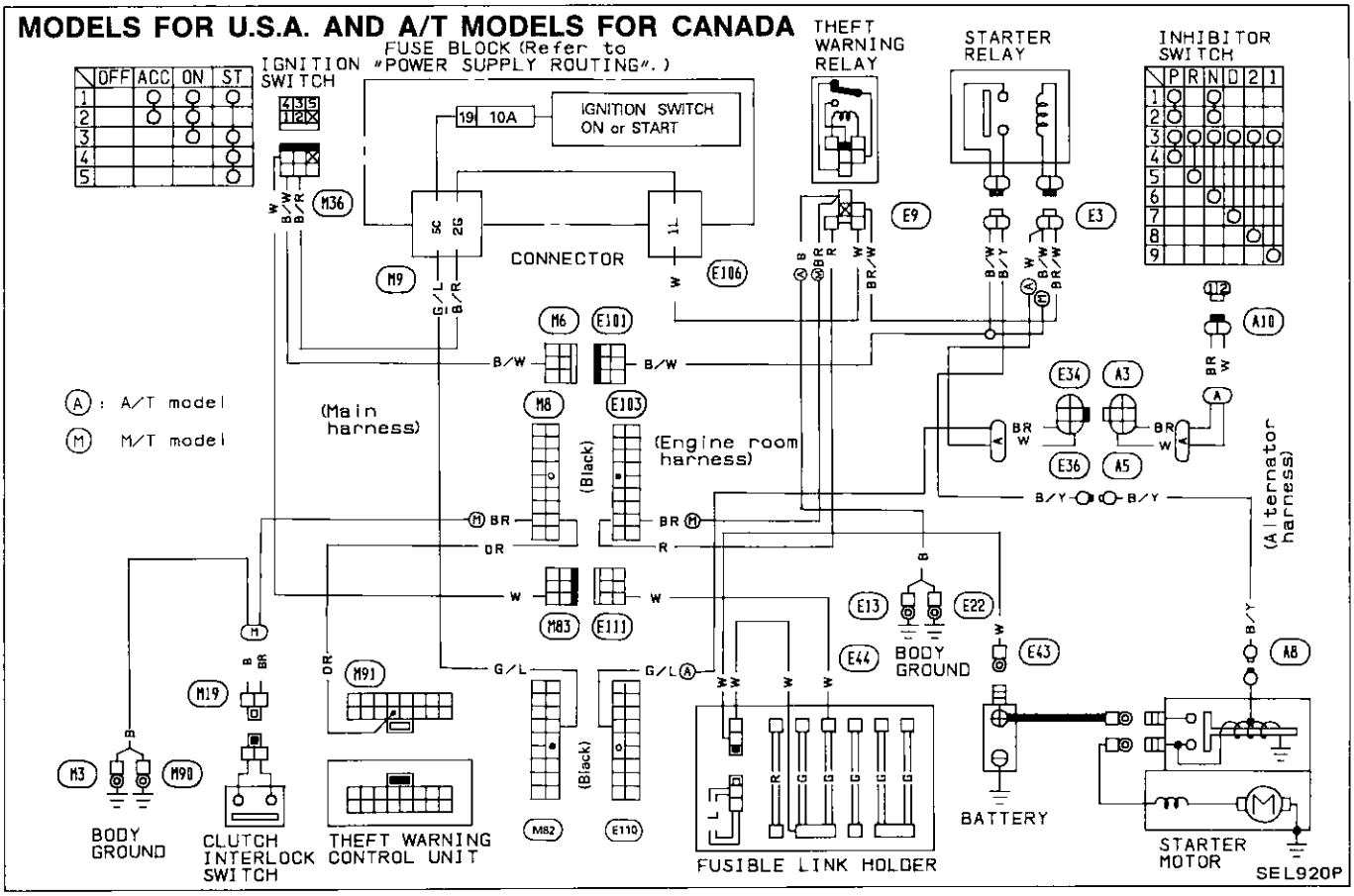
a. **Do not use quick charge method on a battery whose specific gravity is less than 1.100.**
b. **Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
c. **Keep battery away from open flame while it is being charged.**
d. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
e. **Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.**
   **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**
f. **Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.**

## Service Data and Specifications (S.D.S.)

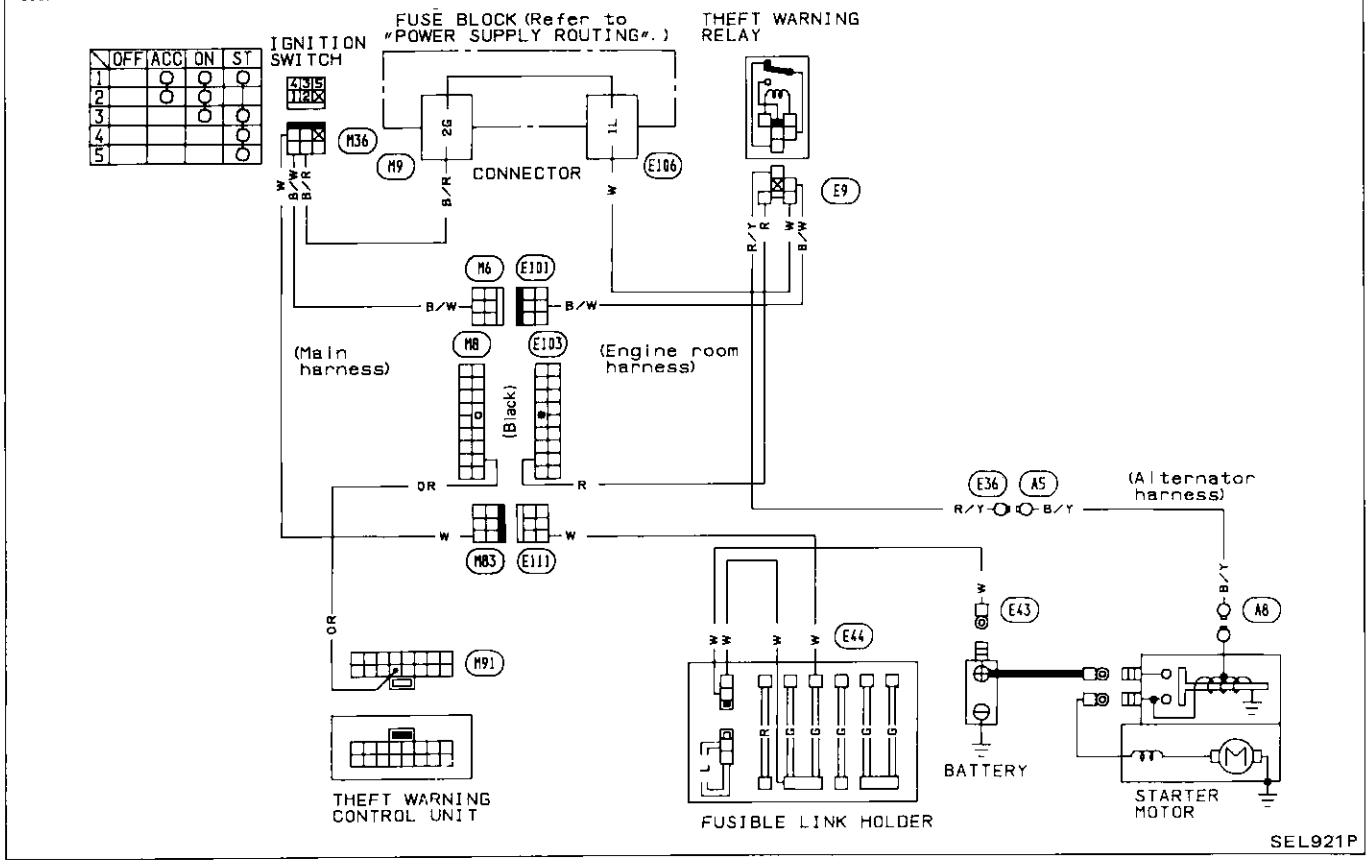
| Applied model | M/T | A/T |
|---|---|---|
| Type | 65D26L | 80D26L |
| Capacity V-AH | 12-65 | |

## Wiring Diagram

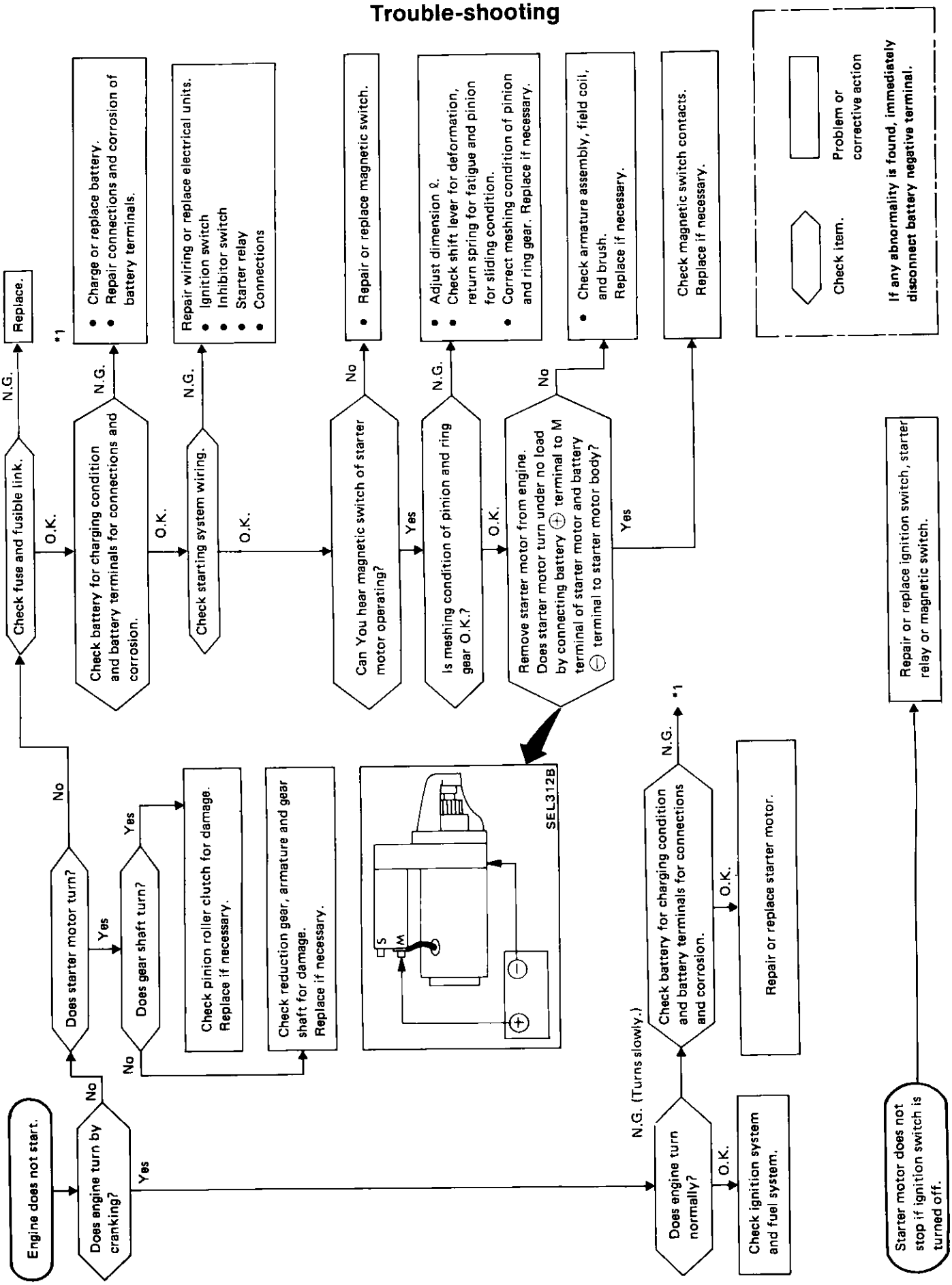
### MODELS FOR U.S.A. AND A/T MODELS FOR CANADA




### M/T MODELS FOR CANADA

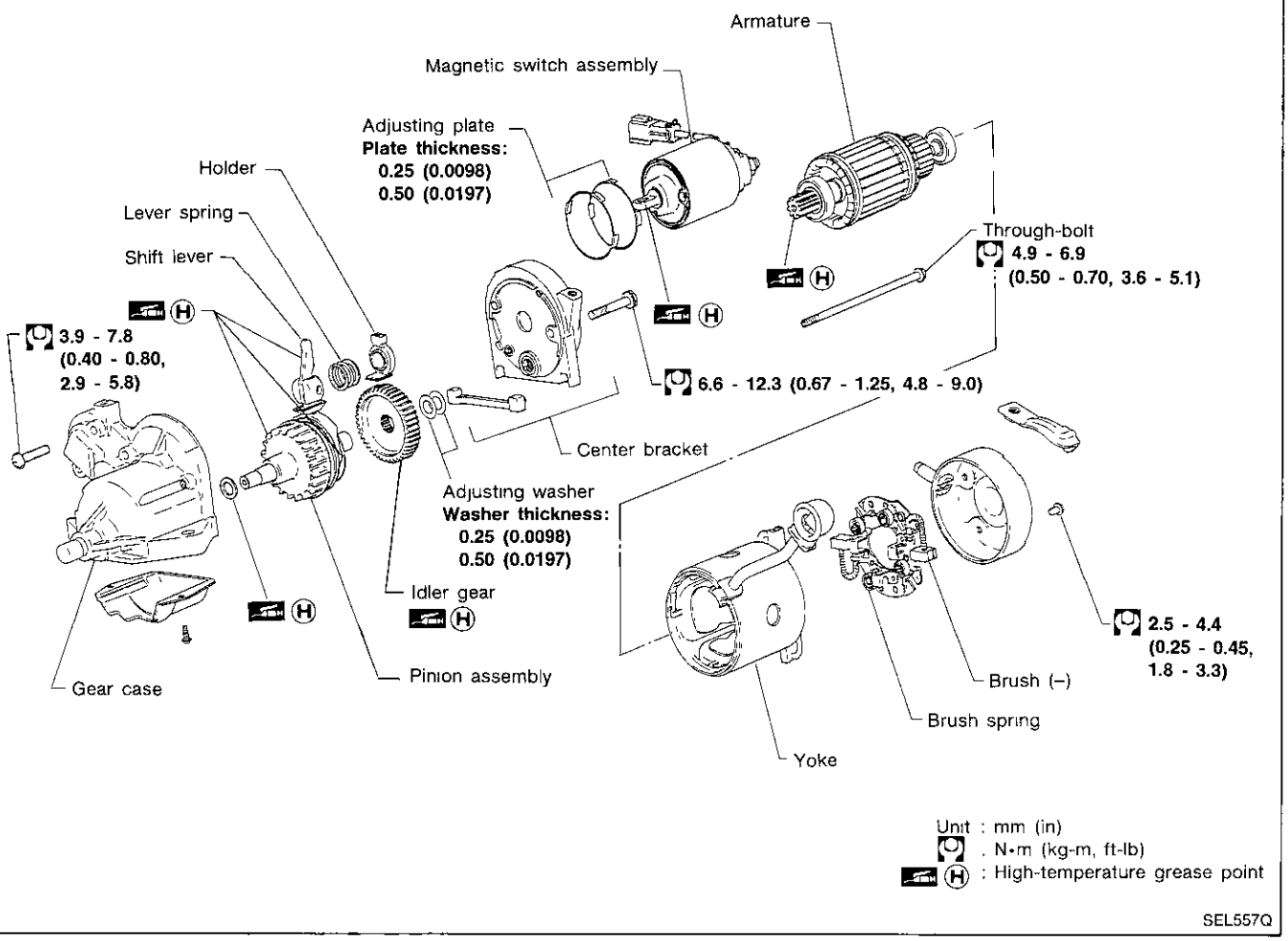


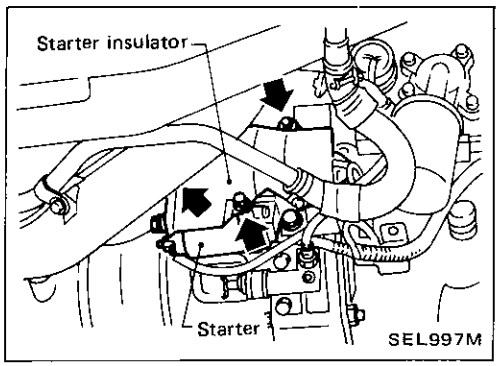
## Trouble-shooting



## Construction

M2T25281



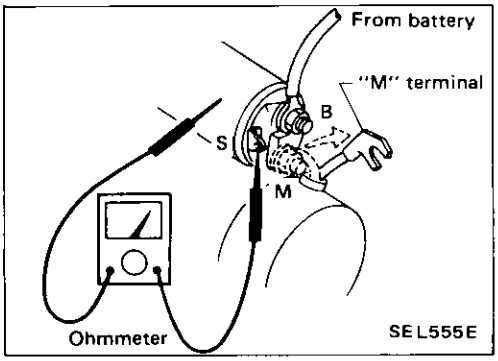

## Removal and Installation

### REMOVAL

1. Remove starter insulator.
2. Remove starter harness connector and cable.
3. Remove starter fixing bolt and nut and remove starter.

### INSTALLATION

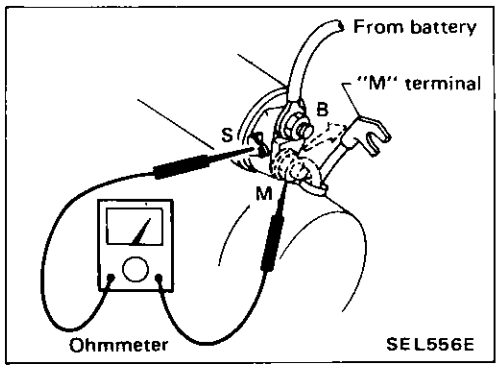
- Installation procedure is in reverse order of removal.



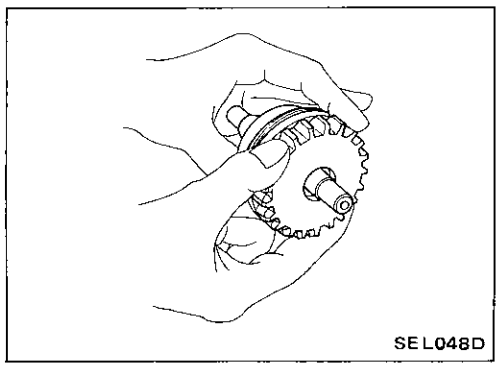

## Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

1. Continuity test (between "S" terminal and switch body).
- No continuity ... Replace.




2. Continuity test (between "S" terminal and "M" terminal).
- No continuity ... Replace.

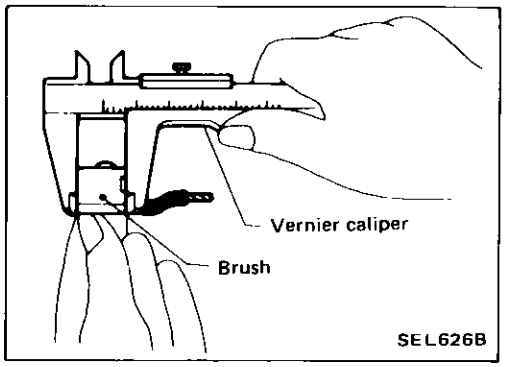



## Pinion/Clutch Check

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.

3. Inspect reduction gear teeth.
- Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)



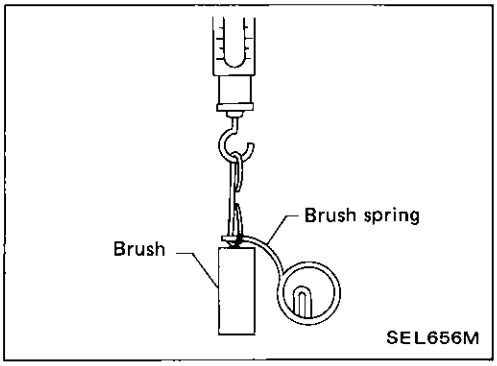

## Brush Check

### BRUSH

Check brush for wear.

**Wear limit length:**
**Refer to S.D.S.**

- Excessive wear ... Replace.




### BRUSH SPRING PRESSURE

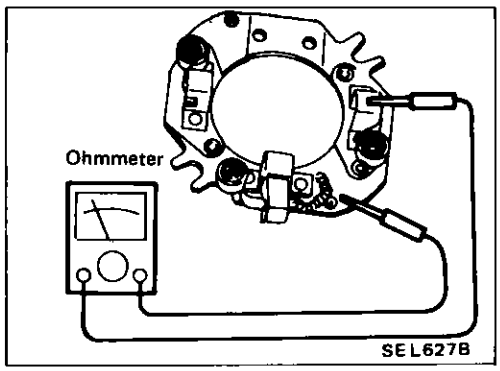
Check brush spring pressure with brush spring detached from brush.

**Spring pressure (with new brush):**
**Refer to S.D.S.**

- Not within the specified values ... Replace.

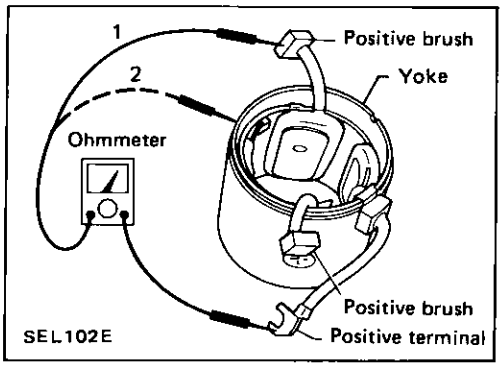
## Brush Check (Cont'd)

### BRUSH HOLDER



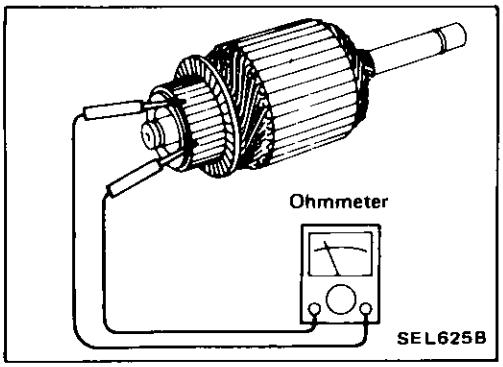

1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Continuity exists. ... Replace.
2. Check brushes to see if they move smoothly.
- If brush holder is bent, replace it; if surfaces of brush holder and base are dirty, clean them.

## Field Coil Check

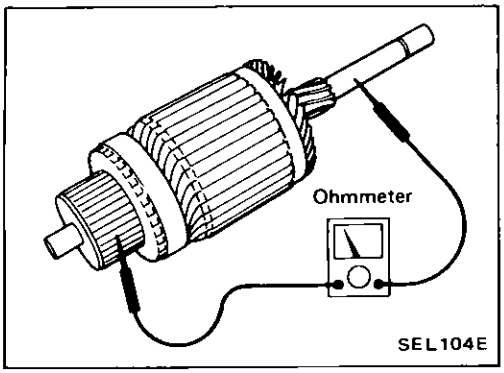



1. Continuity test (between field coil positive terminal and positive brushes).
- No continuity ... Replace yoke.
2. Insulation test (between field coil positive terminal and yoke).
- Continuity exists. ... Replace yoke.

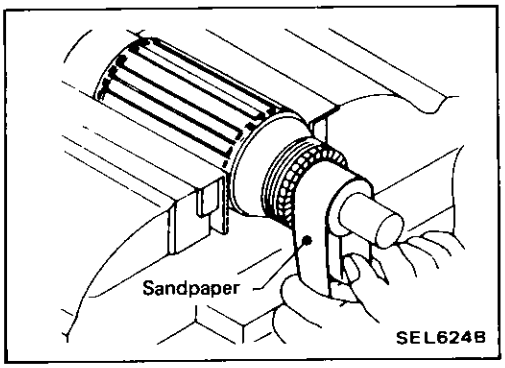
## Armature Check




1. Continuity test (between two segments side by side).
- No continuity ... Replace.

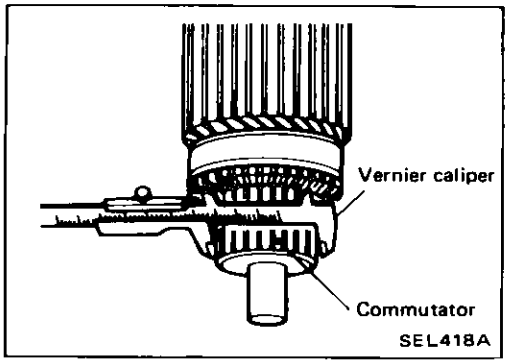



2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.

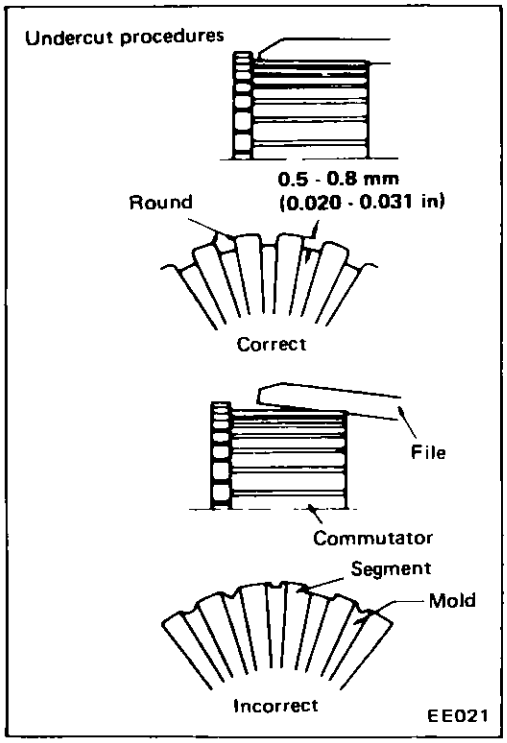



3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 sandpaper.

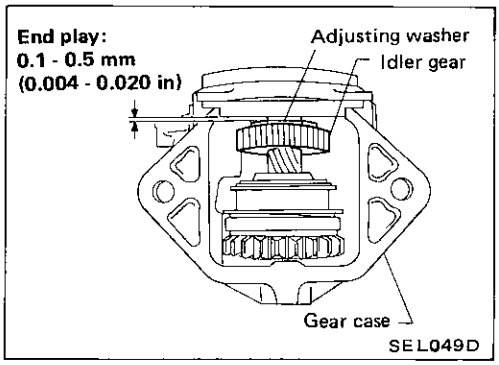
## Armature Check (Cont'd)




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)



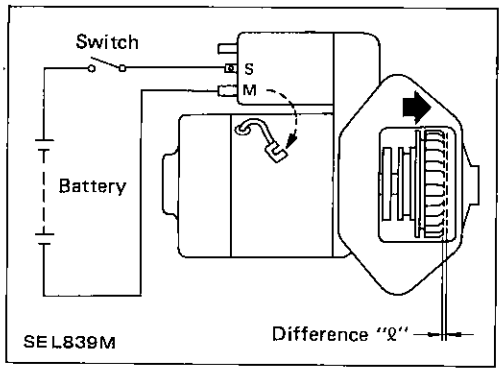

## Reassembly

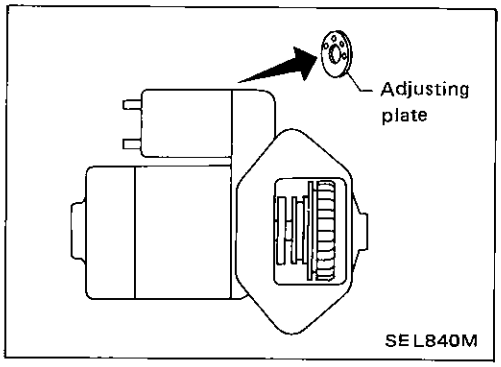
Carefully observe the following instructions.

a. **Apply grease to:**
   - Rear cover metal
   - Gear case metal
   - Frictional surface of pinion
   - Moving portion of shift lever
   - Plunger of magnetic switch

b. **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).**

c. **Check pinion to see if its engagement length is correct.**




## Reassembly (Cont'd)

Measure difference in height "ℓ" of pinion assembly front edge when pinion assembly is forced out by the magnetic switch and then when it is pulled out by hand.

**Difference "ℓ": 0.3 - 2.0 mm (0.012 - 0.079 in)**

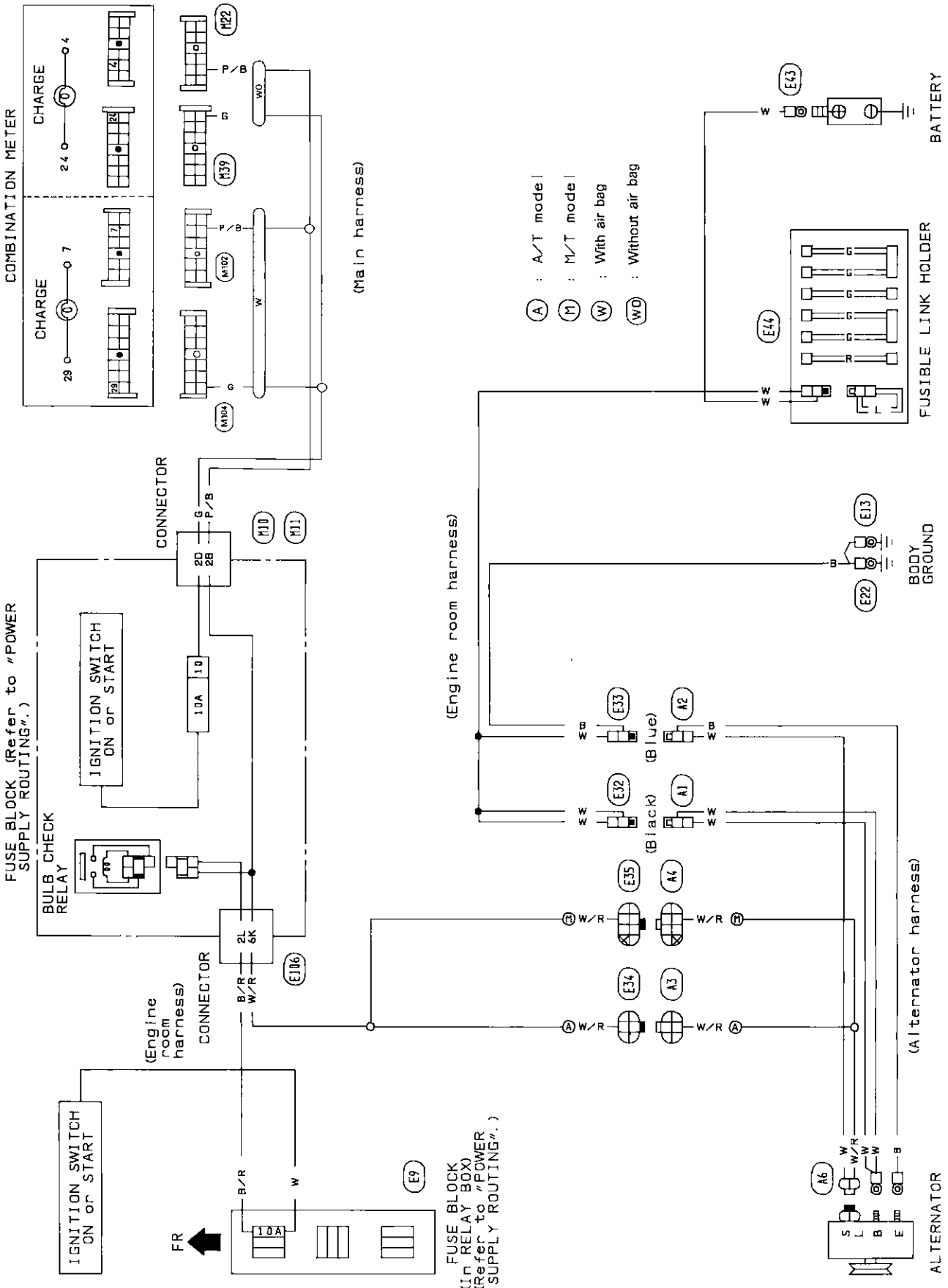
- Not in the specified value ... Adjust by adjusting plate.

## Service Data and Specifications (S.D.S.)

### STARTER

| | | | |
|---|---|---|---|
| Type | | | M2T25281 |
| | | | Reduction gear |
| System voltage | | V | 12 |
| No-load | Terminal voltage | V | 11.0 |
| | Current | A | 70 |
| | Revolution | rpm | More than 2,000 |
| Minimum length of brush | | mm (in) | 11.5 (0.453) |
| Brush spring tension (With new brush) | | N (kg, lb) | 13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7) |
| Minimum diameter of commutator | | mm (in) | 31.4 (1.236) |
| Difference "ℓ" in height of pinion assembly | | mm (in) | 0.3 - 2.0 (0.012 - 0.079) |

## Wiring Diagram



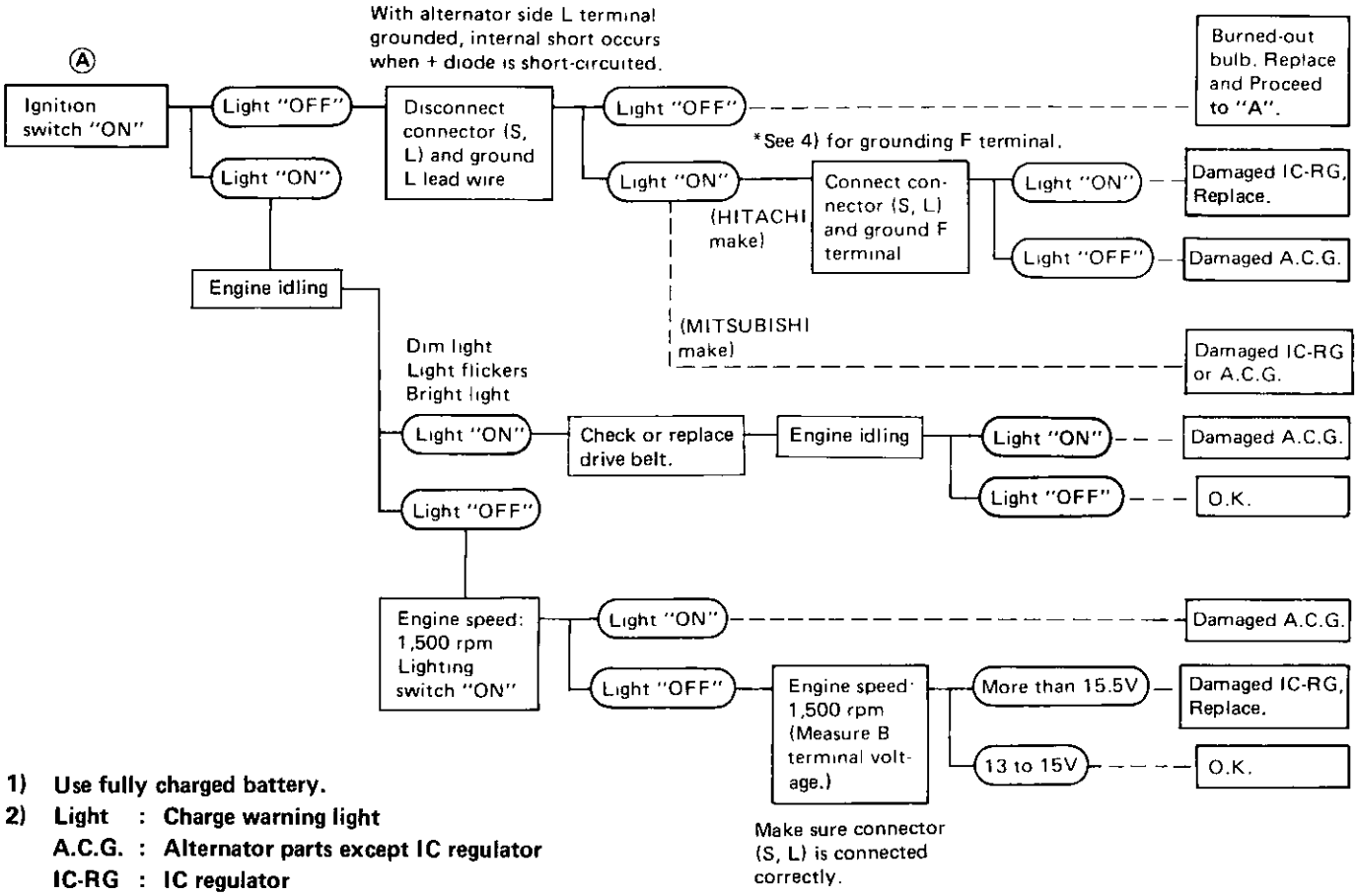

SEL922P

## 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.**

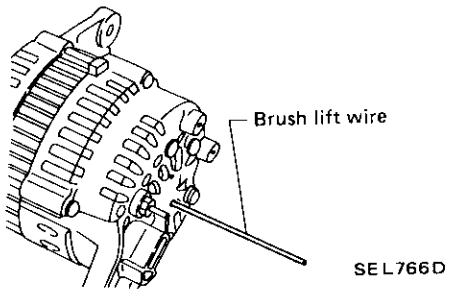
### WITH IC REGULATOR




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**

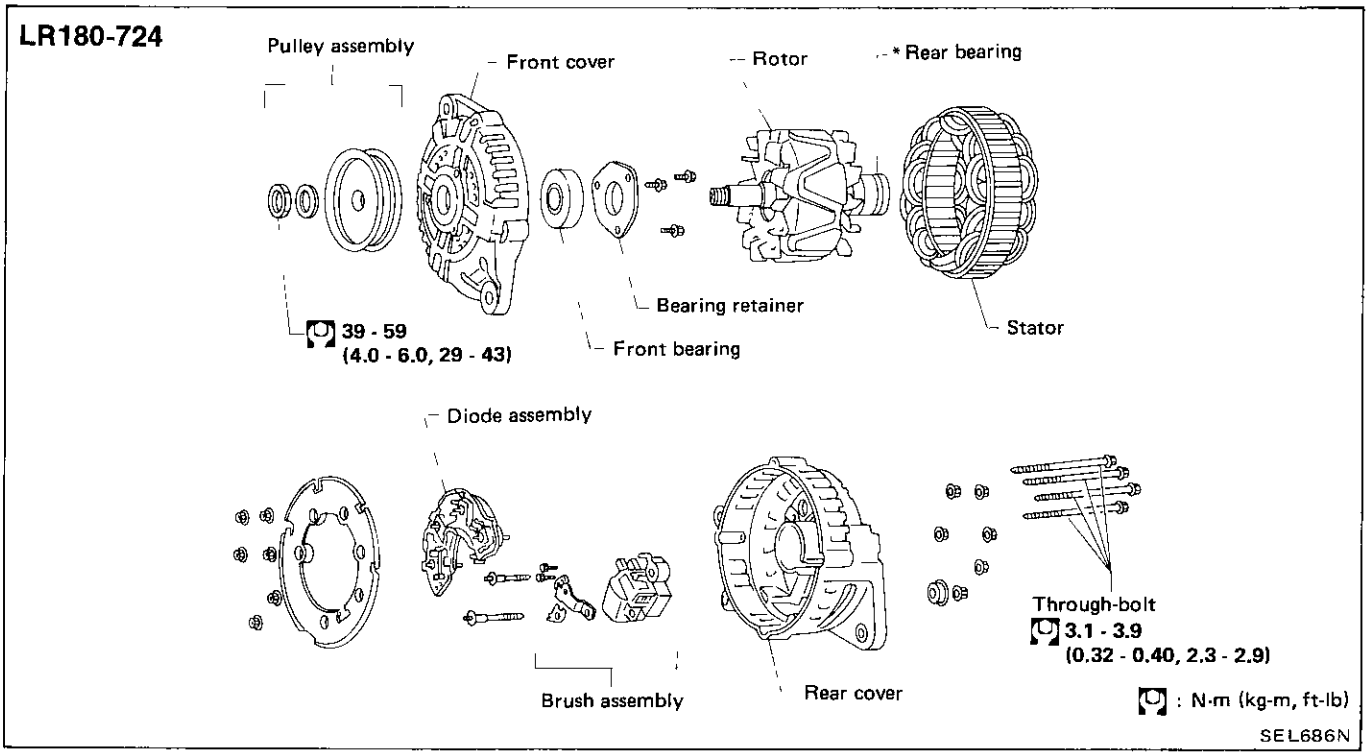
**Contact tip of wire with brush and attach wire to alternator body.**



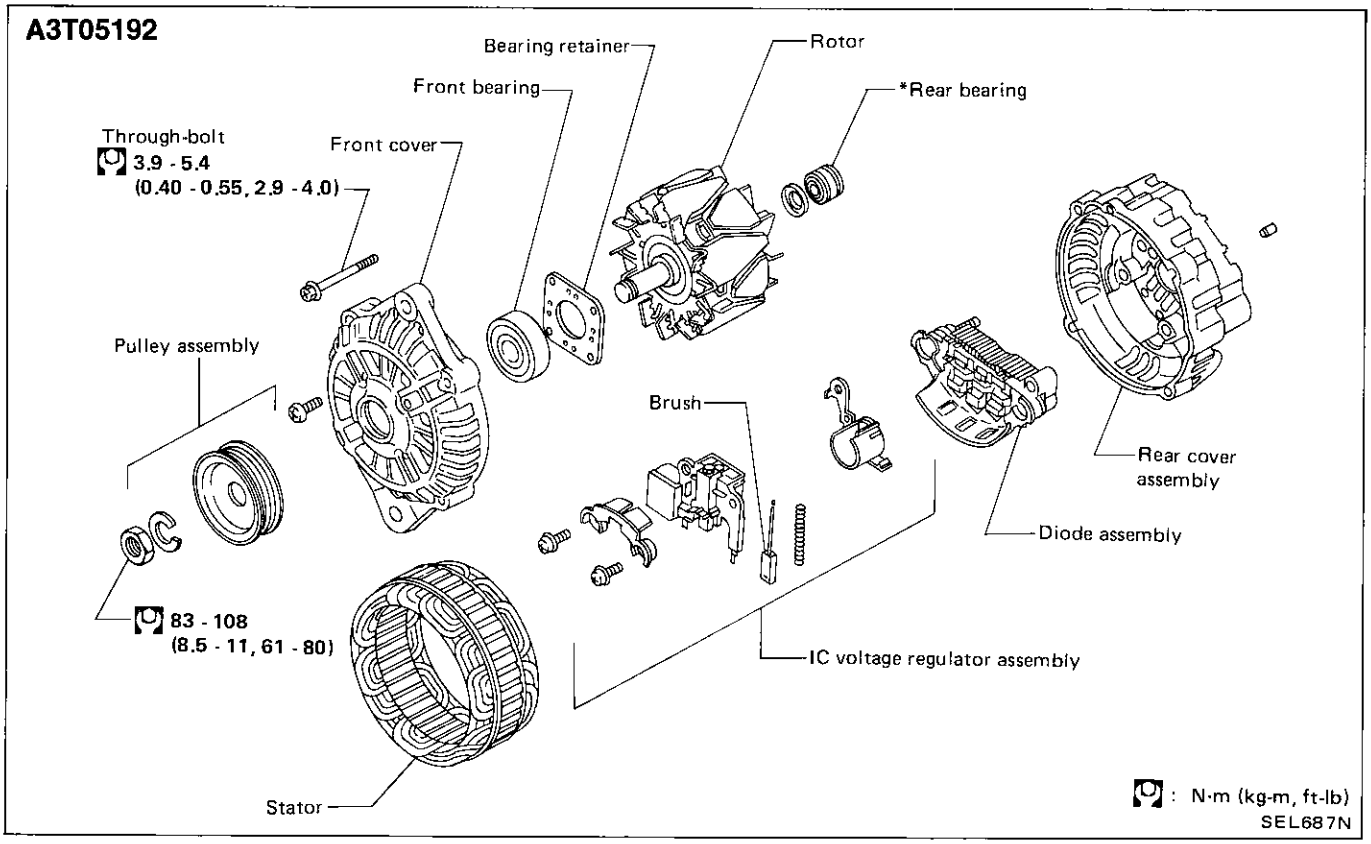

5) **Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.**

## Construction

**LR180-724**




**A3T05192**




***Rear bearing**

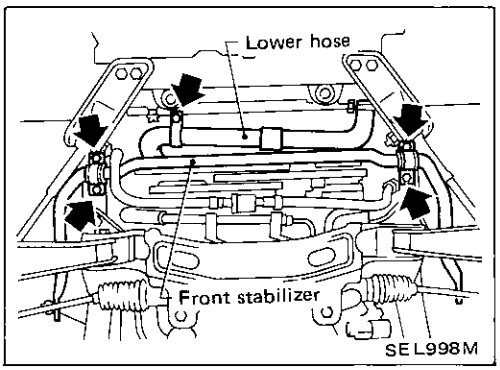
**CAUTION:**

**Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.**

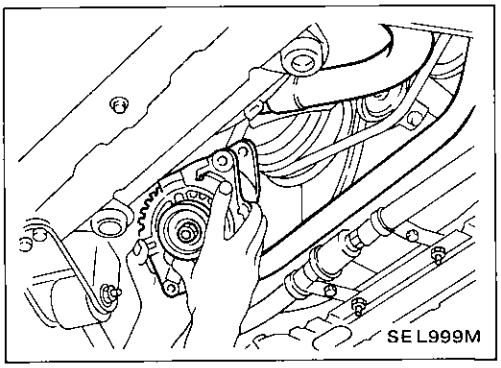
## Removal and Installation

### REMOVAL

1. Loosen alternator belt.
2. Remove alternator adjusting bar.
3. Remove harness connector and cable from alternator.



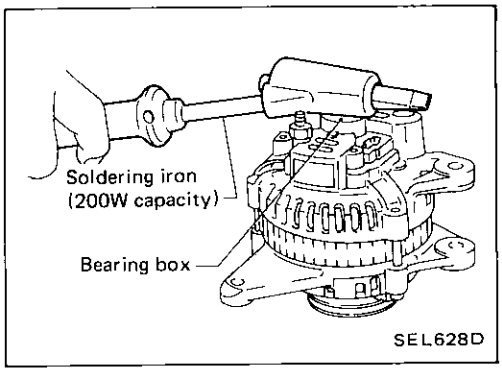

4. Remove stabilizer bracket fixing bolts.
5. Remove radiator lower hose bracket and push lower hose upward to make room.




6. Remove alternator fixing bolt and take out alternator as shown in the figure.

### INSTALLATION

- Installation procedure is in reverse order of removal.



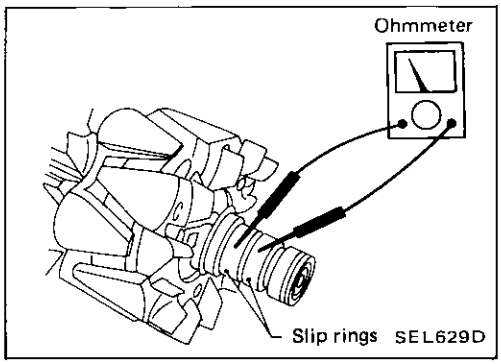

## Disassembly

### REAR COVER REMOVAL

**CAUTION:**

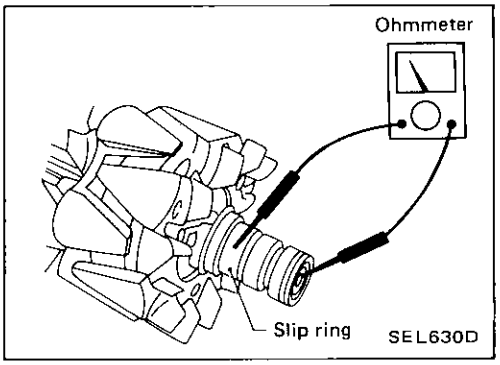
**Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron.**

**Do not use a heat gun, as it can damage diode assembly.**




## Rotor Slip Ring Check

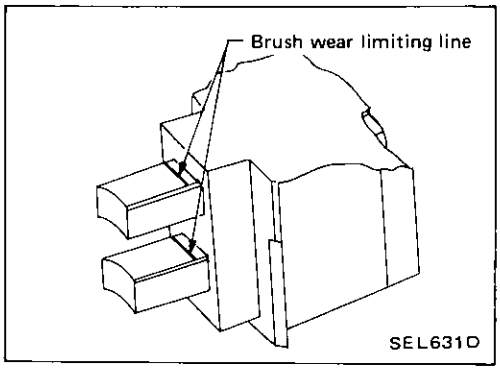
1. Continuity test
   - No continuity ... Replace rotor.




2. Insulator test
   - Continuity exists ... Replace rotor.
3. Check slip ring for wear.

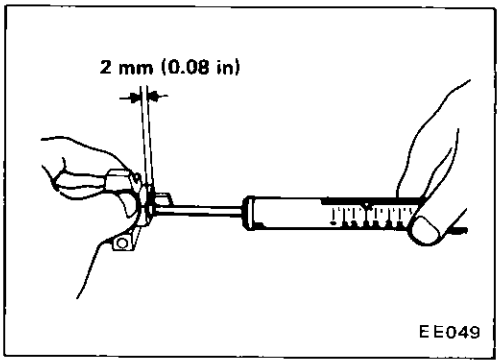
   **Slip ring minimum outer diameter:**

   **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.

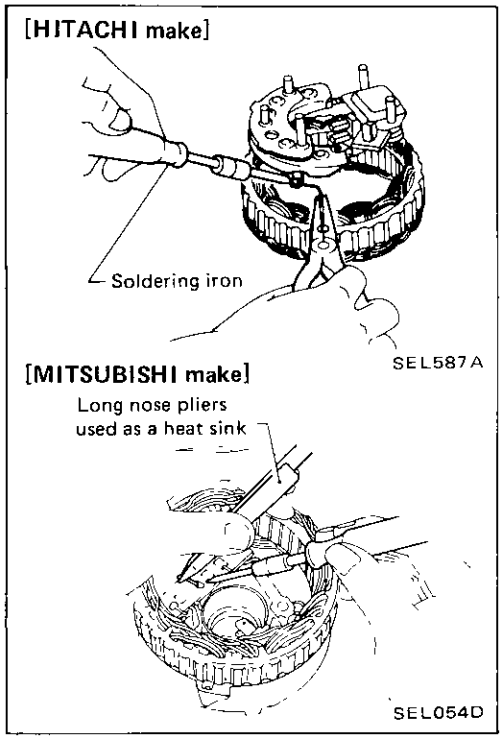



3. Check brush lead wire for damage.
   - Damaged ... Replace.
4. Check brush spring pressure.

   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.

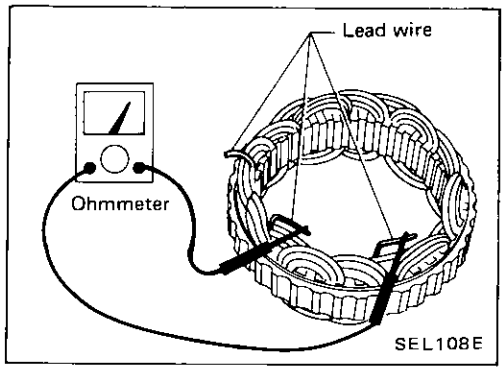



## Stator Check

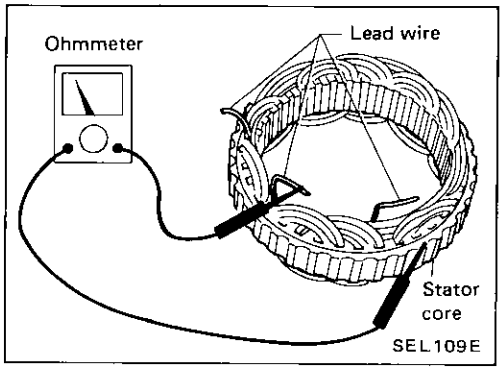
**To test the stator or diode, you must separate them by unsoldering the connecting wires.**

**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.

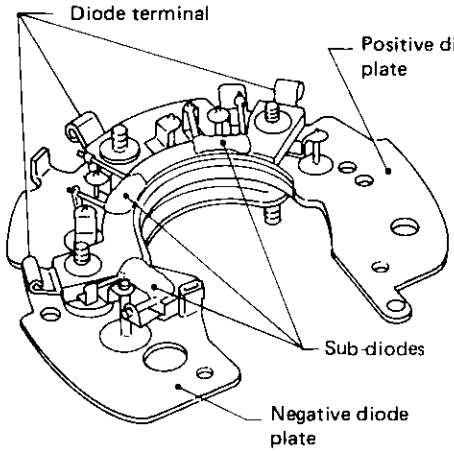
## Diode Check

### 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.

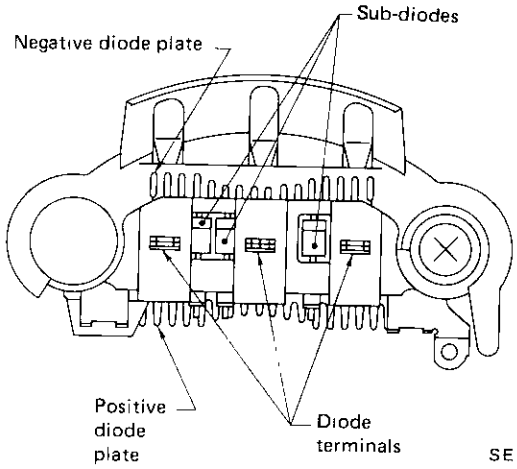
| | Ohmmeter probes | | Continuity |
|---|---|---|---|
| | Positive ⊕ | Negative ⊖ | |
| Diodes check (Positive side) | Positive diode plate | Diode terminals | Yes |
| | Diode terminals | Positive diode plate | No |
| Diodes check (Negative side) | Negative diode plate | Diode terminals | No |
| | Diode terminals | Negative diode plate | Yes |

[HITACHI make]



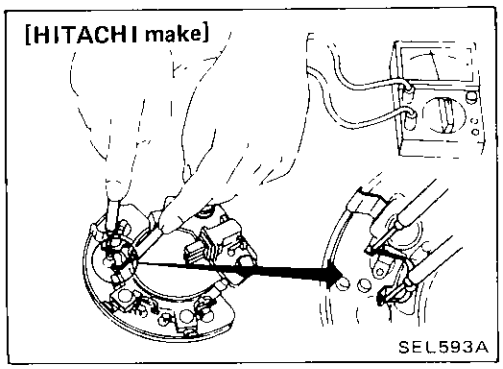

SEL768D

[MITSUBISHI make]



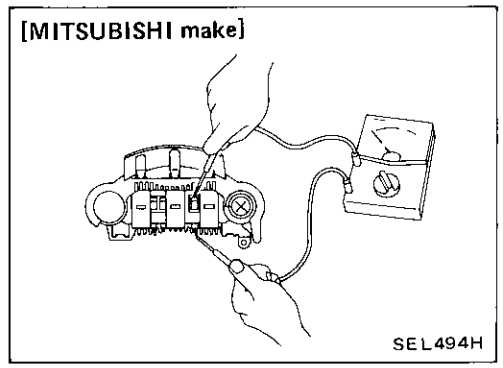

SEL493H

[HITACHI make]



SEL593A

[MITSUBISHI make]



SEL494H

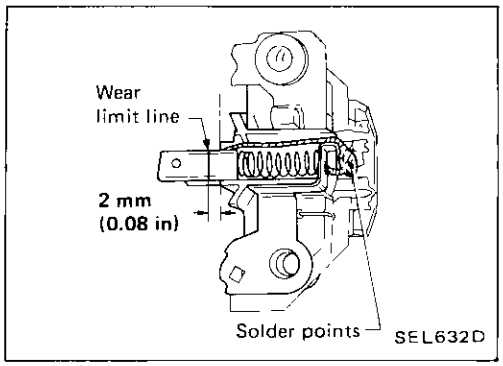
### SUB-DIODES

- 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.

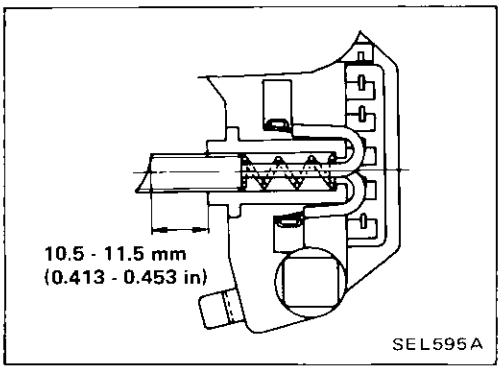
- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.




WHEN SOLDERING BRUSH LEAD WIRE

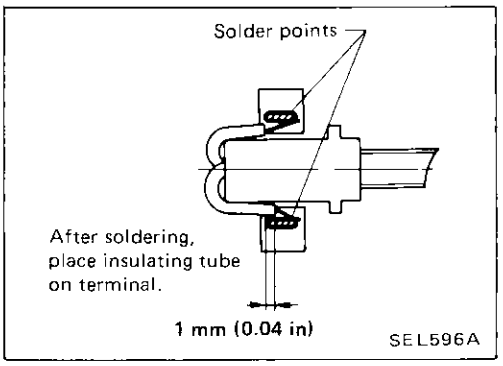
**[MITSUBISHI make]**

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.



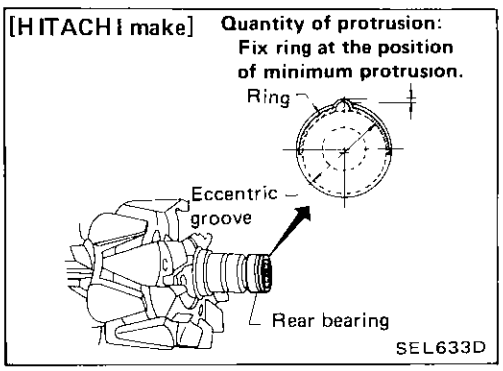

**[HITACHI make]**

(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.**



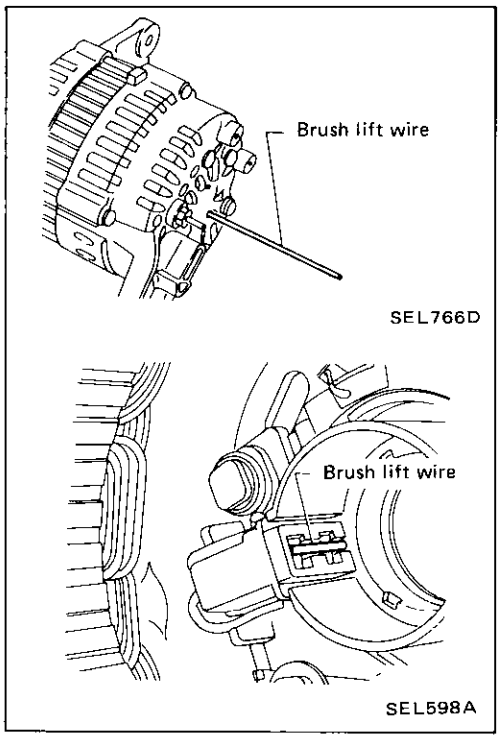

### RING FITTING IN REAR BEARING

**[HITACHI make]**

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

**[MITSUBISHI make]**

- Always press new bearing into place with ring groove toward slip ring.




## Assembly (Cont'd)

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.

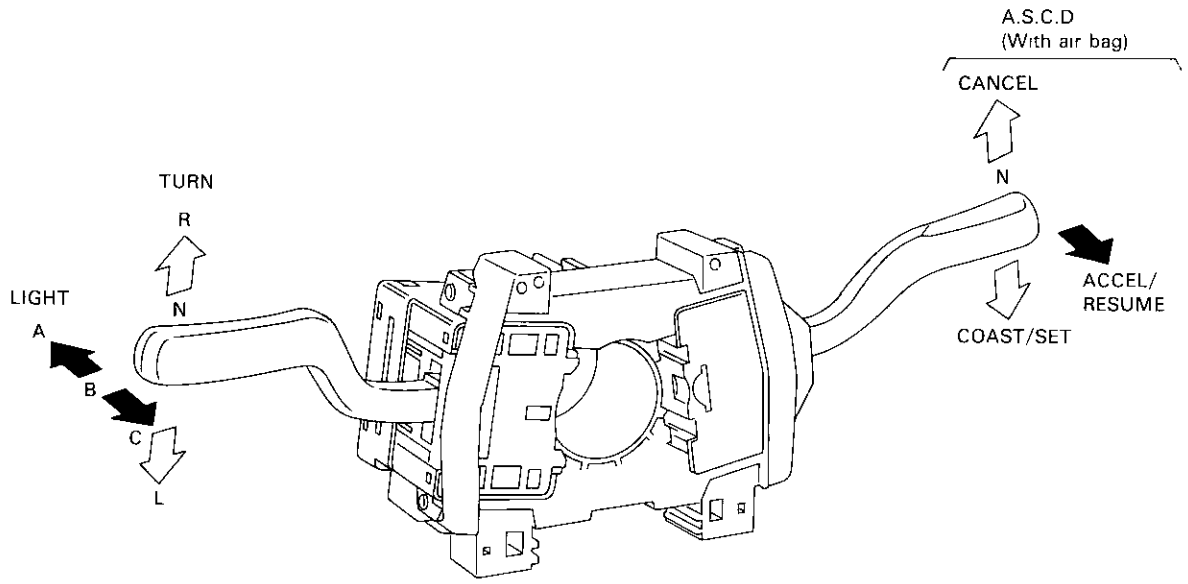
(2) After installing front and rear sides of alternator, pull out brush lift wire.

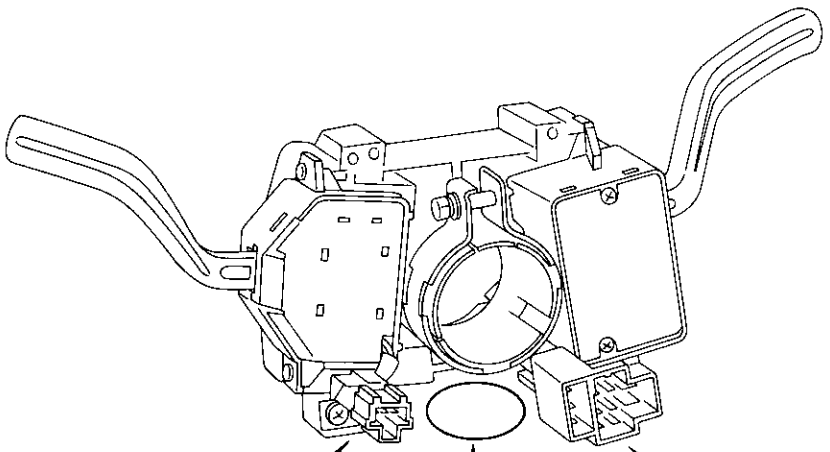
## Service Data and Specifications (S.D.S.)

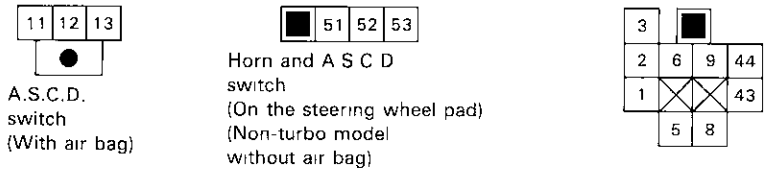
### ALTERNATOR

| Type | | LR180-724 | A3T05192 |
|---|---|---|---|
| | | HITACHI make | MITSUBISHI make |
| Applied engine | | VG30DE | VG30DETT |
| Nominal rating | V-A | 12-80 | 12-90 |
| Ground polarity | | Negative | |
| Minimum revolution under-no-load (when 13.5 volts is applied) | rpm | Less than 950 | Less than 1,300 |
| Hot output current | A/rpm | More than 65/2,500<br>More than 80/5,000 | More than 65/2,500<br>More than 90/5,000 |
| Regulated output voltage | V | 14.1 - 14.7 | |
| Minimum length of brush | mm (in) | More than 7.0 (0.276) | More than 8.0 (0.315) |
| Brush spring pressure | N (g, oz) | 1.863 - 3.040 (190 - 310, 6.70 - 10.93) | 3.040 - 4.217 (310 - 430, 10.93 - 15.17) |
| Slip ring minimum outer diameter | mm (in) | More than 30.6 (1.205) | More than 22.1 (0.870) |

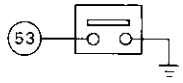
## Combination Switch/Check






HORN SWITCH




A.S C.D. SWITCH

| | RESUME ACCEL | N | SET COAST | OFF | CANCEL |
|---|---|---|---|---|---|
| 13 or 53 | ○ | | ○ | | ○ |
| 12 or 52 | | | ○ | | ○ |
| 11 or 51 | ○ | | | | ○ |

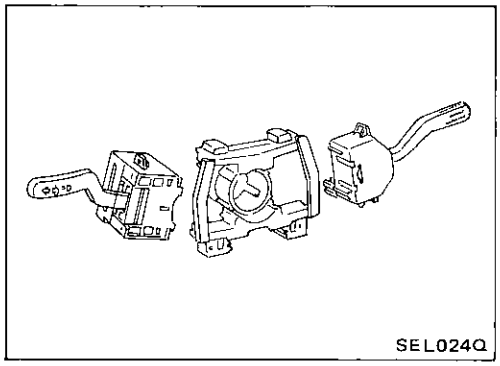
DIMMER SWITCH

| | A | B | C |
|---|---|---|---|
| 5 | | | ○ |
| 6 | | | ○ |
| 8 | | | ○ |
| 9 | | | ○ |
| 43 | | ○ | |
| 44 | | ○ | |

TURN SIGNAL SWITCH

| | R | N | L |
|---|---|---|---|
| 1 | ○ | | ○ |
| 2 | ○ | | |
| 3 | | | ○ |

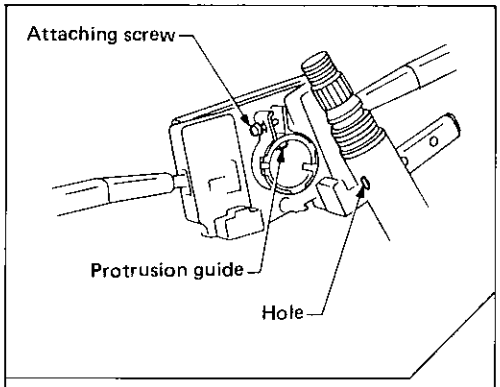
SEL011Q


SEL024Q

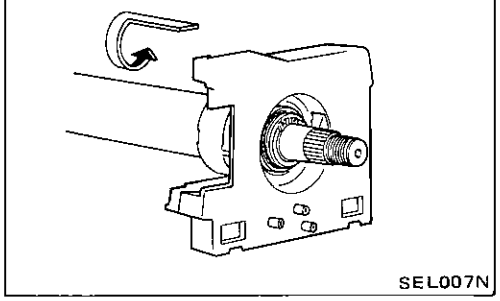
## Combination Switch/Replacement

**For removing/installing air bag module and spiral cable, refer to BF section.**

- Each switch can be replaced without removing combination switch base.

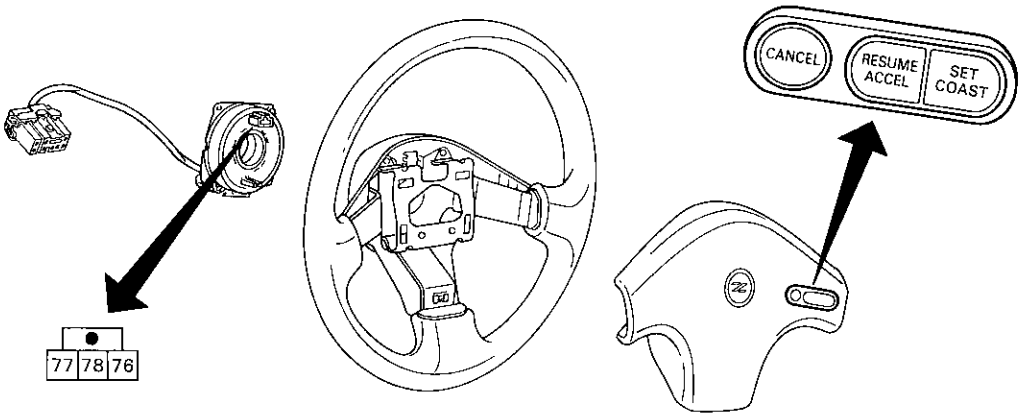


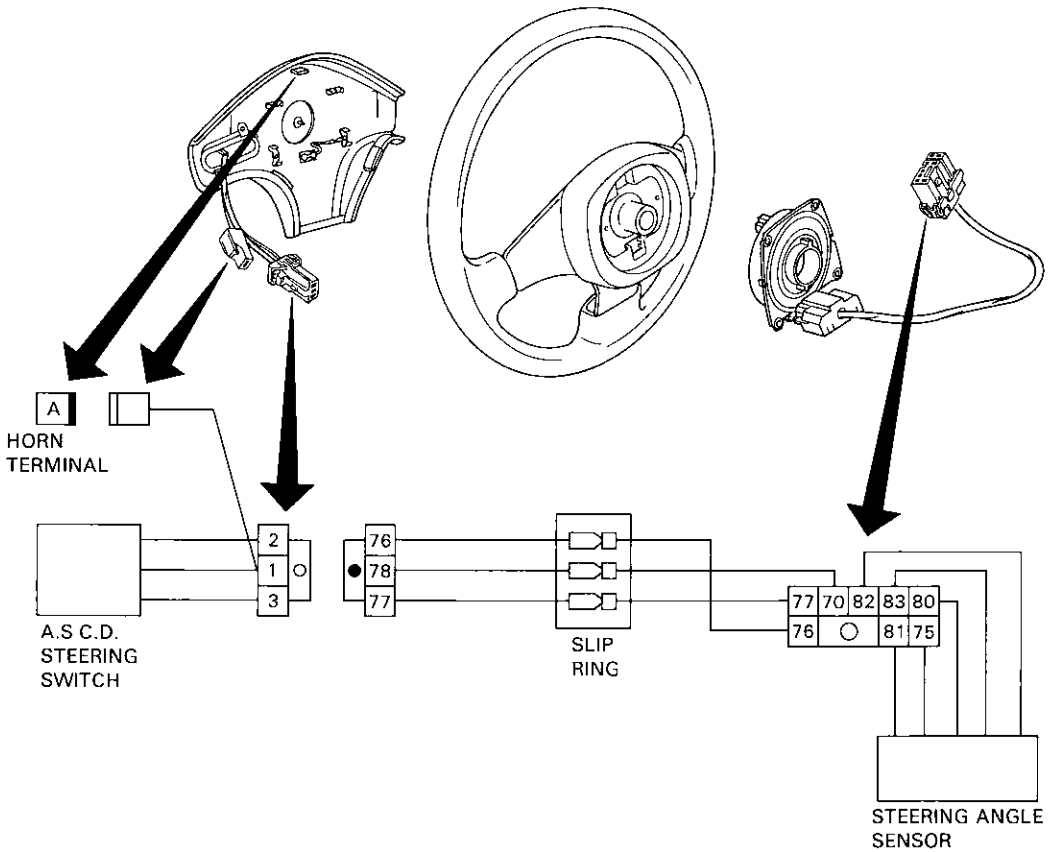

- To remove combination switch base, remove base attaching screw and turn after pushing on it.


SEL007N

## Steering Switch/Check

### TURBO MODELS WITHOUT AIR BAG

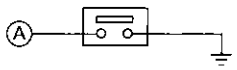



A.S.C.D. STEERING SWITCH

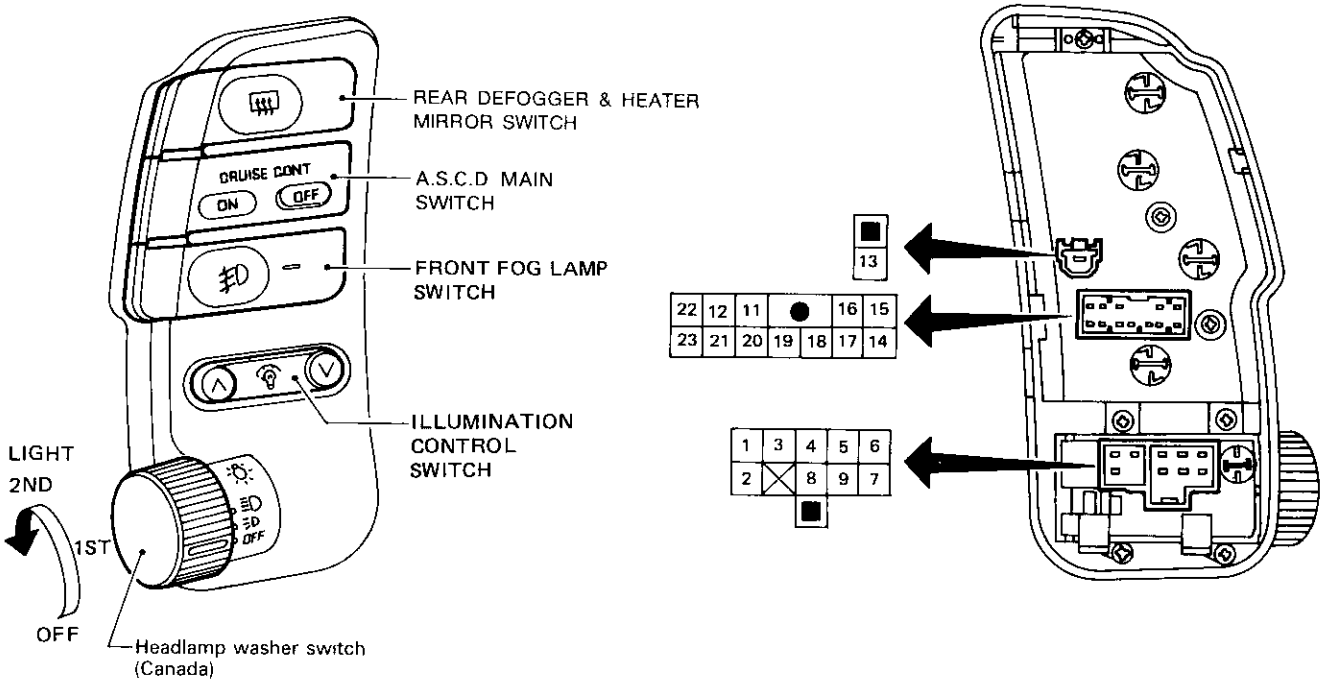
| | RESUME ACCEL | N | SET COAST | OFF | CANCEL |
|---|---|---|---|---|---|
| 1 | ○ | | ○ | | ○ |
| 2 | | | ○ | | ○ |
| 3 | ○ | | | | ○ |

HORN SWITCH




SEL528N

## Check




LIGHTING SWITCH

| | OFF | 1ST | 2ND |
|---|---|---|---|
| 1 | | | ○ |
| 2 | | | ○ |
| 3 | | | ○ |
| 4 | | | ○ |
| 5 | | ○ | ○ |
| 6 | | ○ | ○ |
| ⊠ | | ○ | |
| E | | ○ | |
| 7 | | ○ | |

REAR DEFOGGER & HEATER MIRROR SWITCH

| | OFF | ON |
|---|---|---|
| 11 | | ○ |
| 12 | | ○ |
| ⊠ | | E |
| 13 | | ○ |

A.S.C.D. MAIN SWITCH

| | OFF | N | ON |
|---|---|---|---|
| 14 | | | ○ |
| 15 | | ○ | ○ |
| 16 | | ○ | ○ |

FRONT FOG LAMP SWITCH

| | OFF | ON |
|---|---|---|
| 17 | | ○ |
| 18 | | ○ |
| ⊠ | | E |
| 19 | | ○ |

HEADLAMP WASHER SWITCH

| | OFF | ON |
|---|---|---|
| 8 | | ○ |
| 9 | | ○ |

ILLUMINATION CONTROL SWITCH

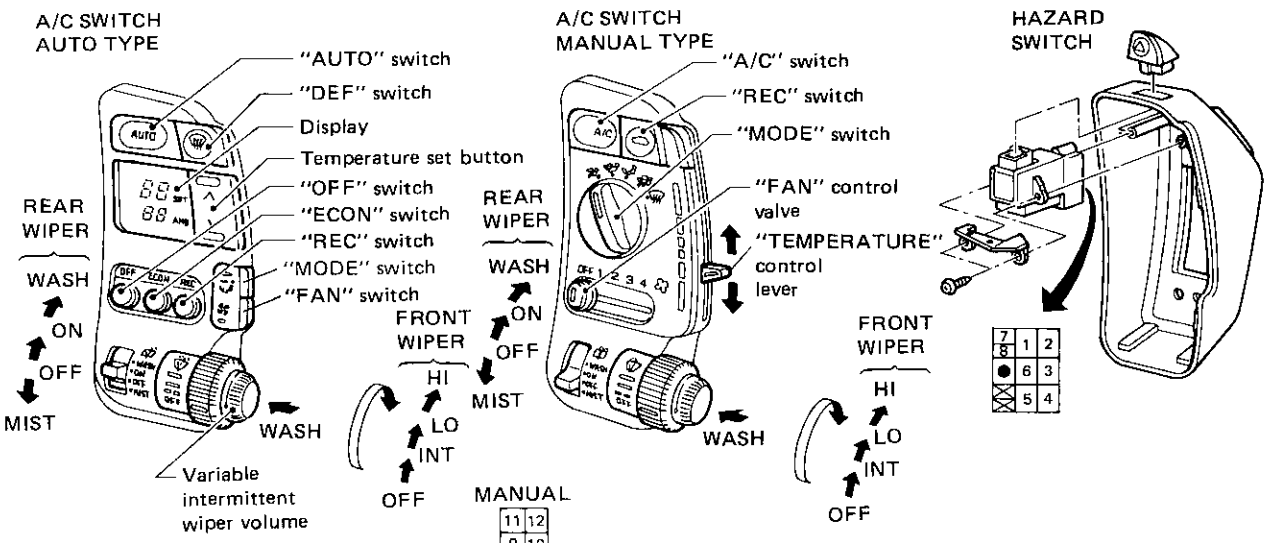
| | V | N | ∧ |
|---|---|---|---|
| 20 | | | ○ |
| 21 | ○ | | |
| 12 | ○ | | ○ |

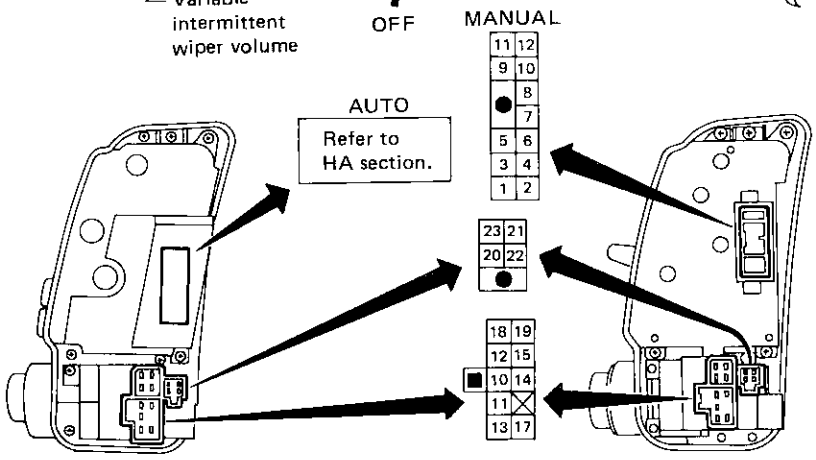
CLUSTER ILLUMINATION

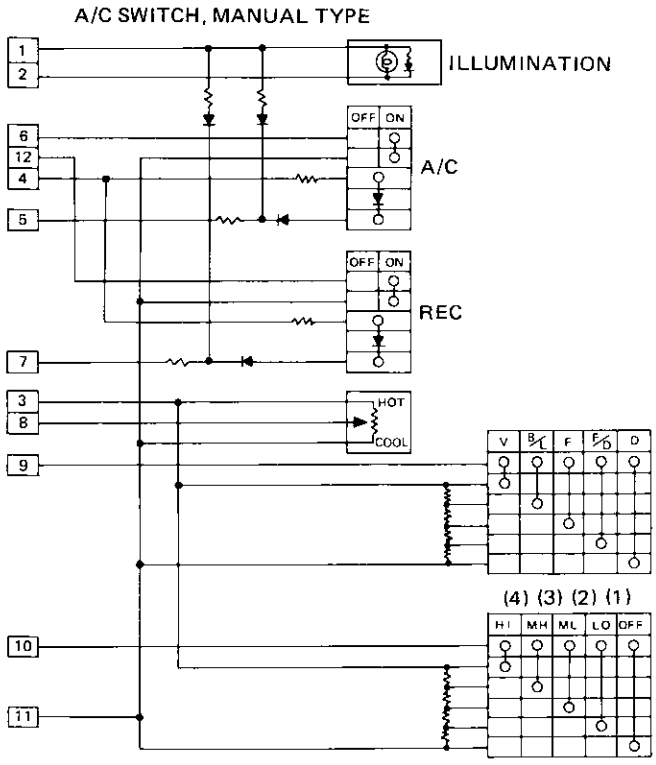
| | |
|---|---|
| 22 | ○ |
| ⊠ | E |
| 23 | ○ |

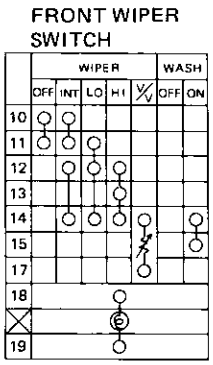
SEL785Q

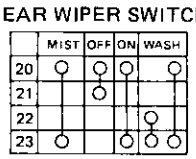
## Check (Cont'd)

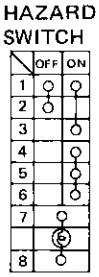



SEL529N

## Operation (Daytime light system equipped model)

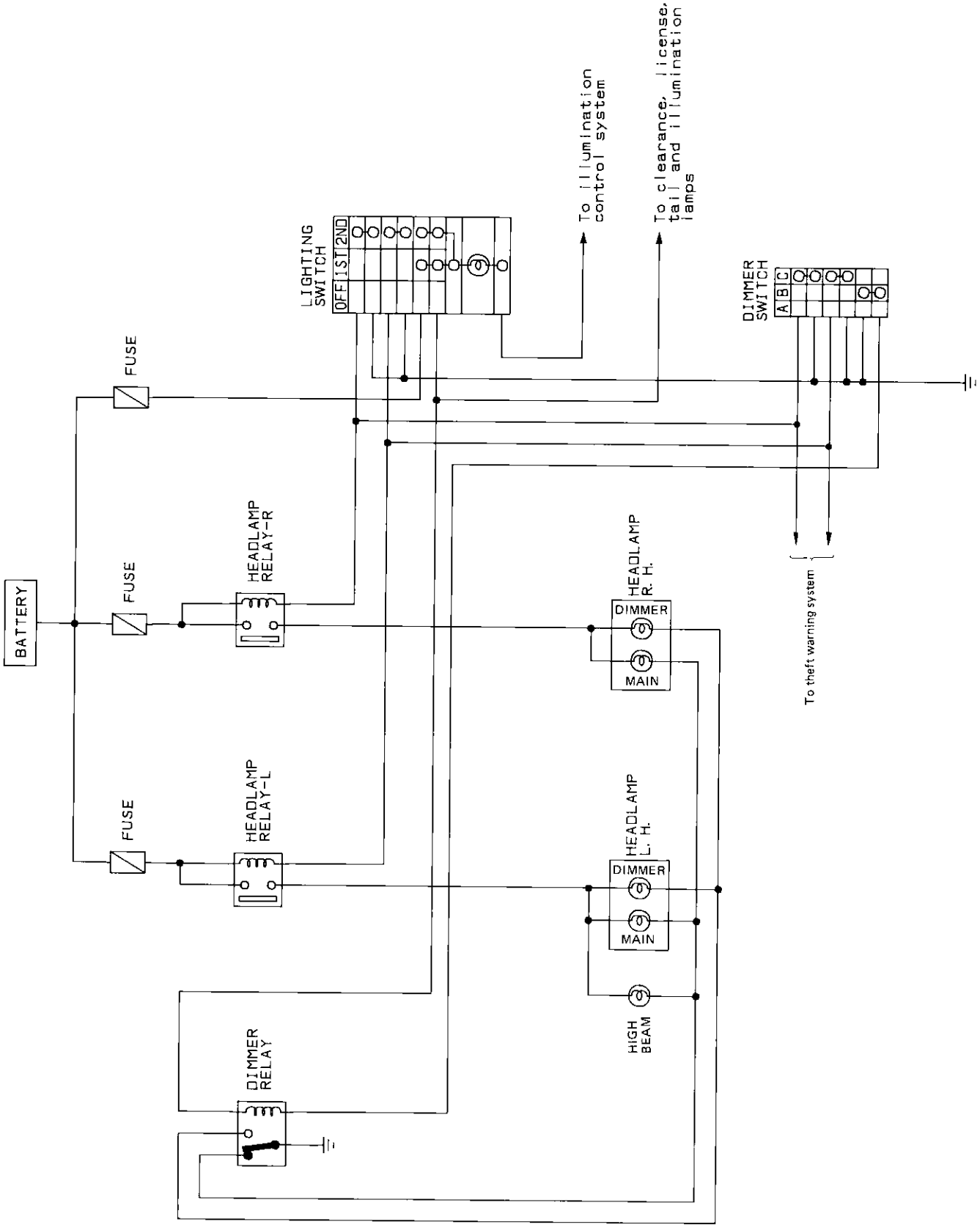
After starting the engine with the lighting switch in the "OFF" position, the headlamp high beam automatically turns on. Lighting switch operations other than the above are the same as conventional light systems.

| Engine | | With engine stopped | | | | | | | | | With engine running | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lighting switch | | OFF | | | 1ST | | | 2ND | | | OFF | | | 1ST | | | 2ND | | |
| | | A | B | C | A | B | C | A | B | C | A | B | C | A | B | C | A | B | C |
| Headlamp | High beam | X | X | O | X | X | O | O | X | O | △ | △ | O | △ | △ | O | O | X | O |
| | Low beam | X | X | X | X | X | X | X | O | X | X | X | X | X | X | X | X | O | X |
| Clearance and tail lamp | | X | X | X | O | O | O | O | O | O | X | X | X | O | O | O | O | O | O |
| License and instrument illumination lamp | | X | X | X | O | O | O | O | O | O | X | X | X | O | O | O | O | O | O |

O : Lamp "ON"
X : Lamp "OFF"
△ : Lamp dims.
□ : Added functions

## Schematic

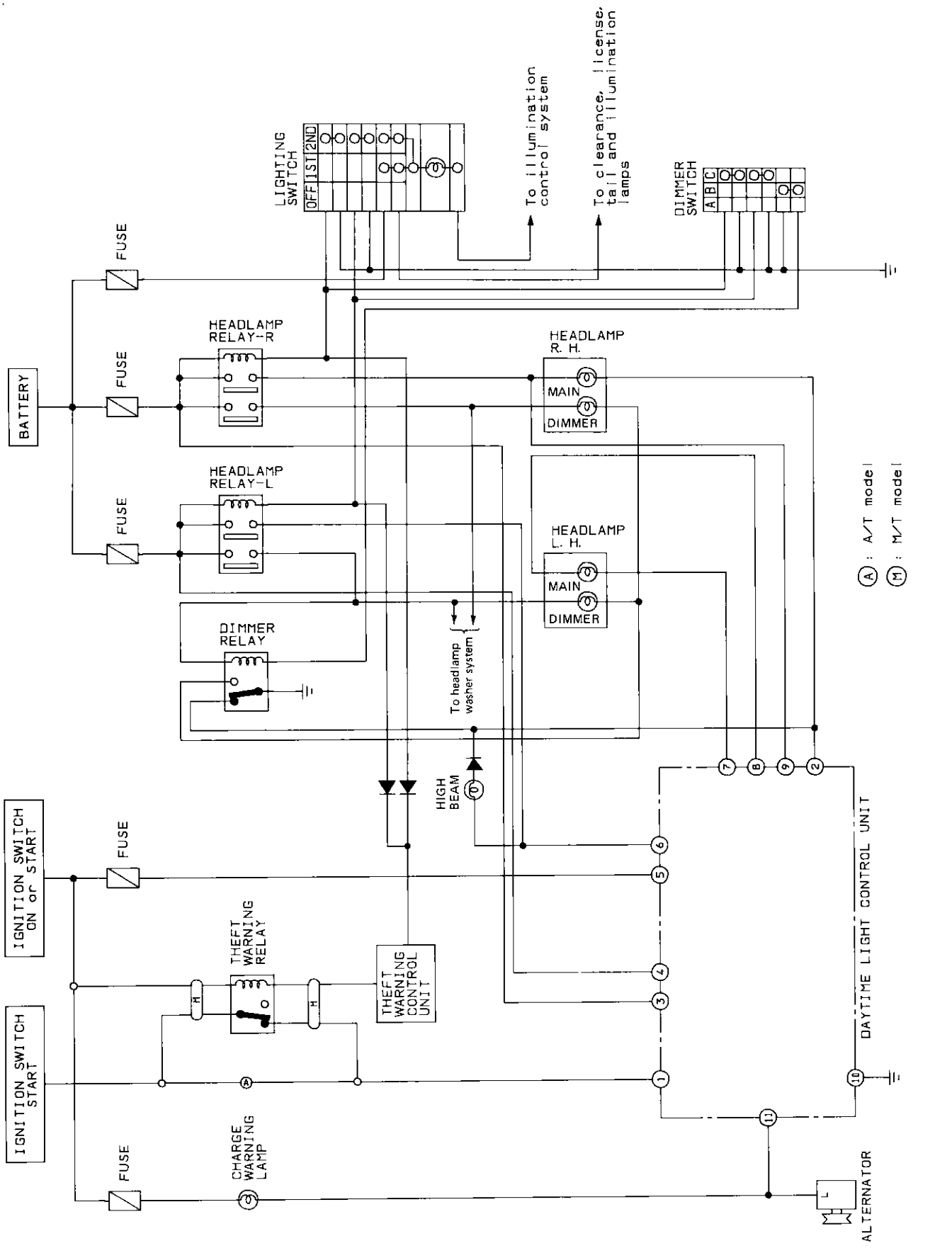
**FOR U.S.A.**




SEL530N

## Schematic (Cont'd)

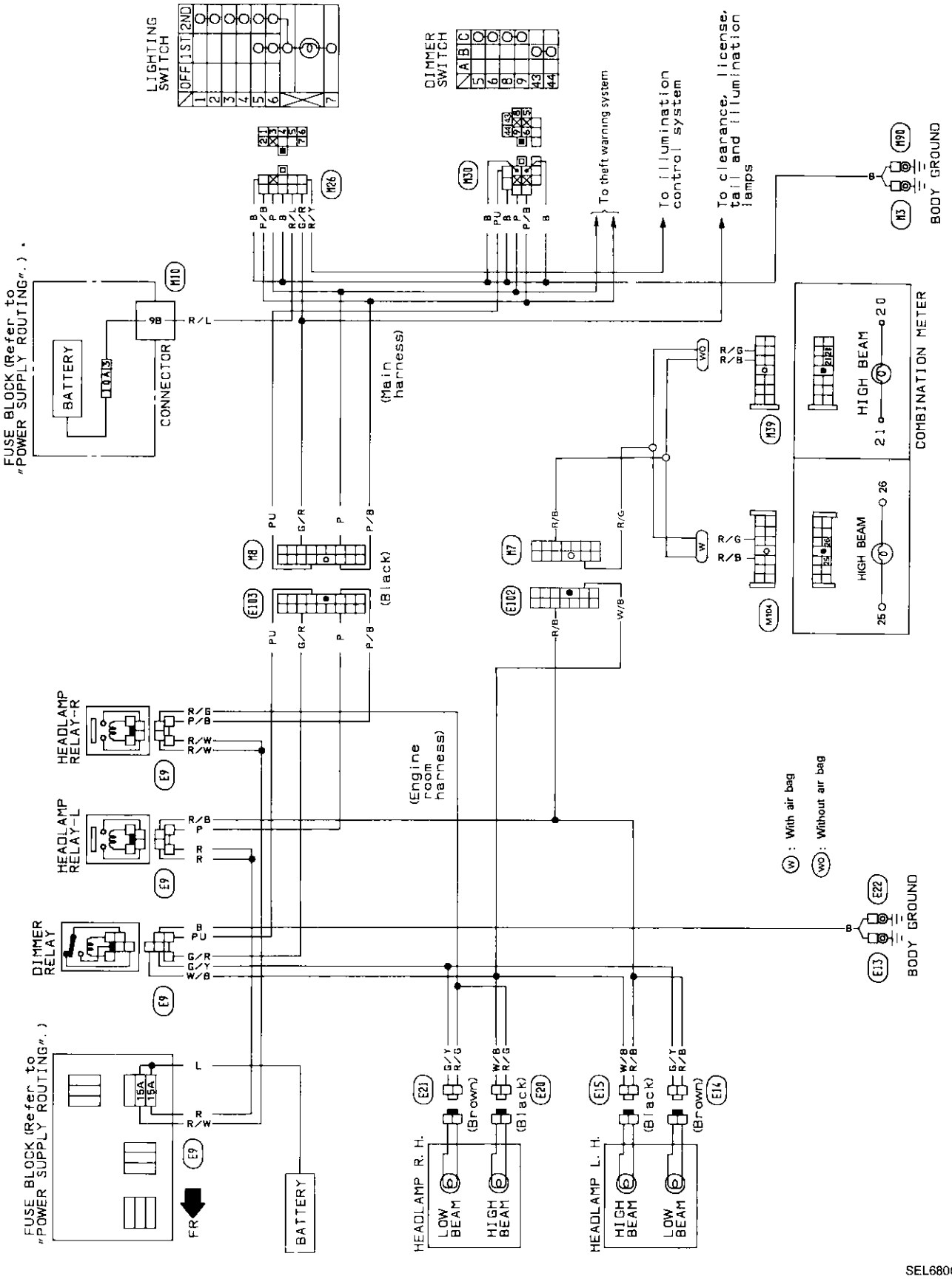
**FOR CANADA**




SEL531N

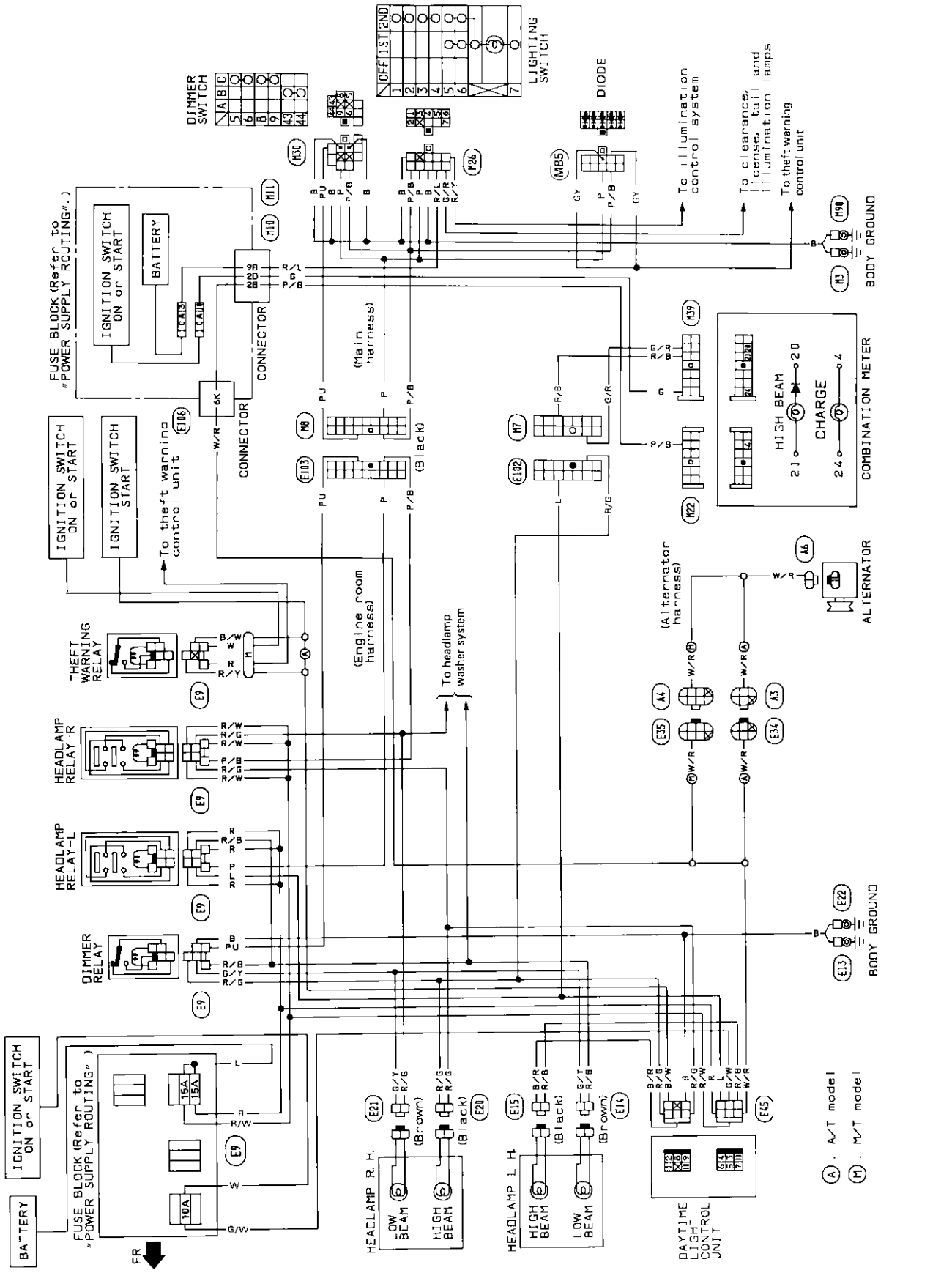
## Wiring Diagram

**FOR U.S.A.**

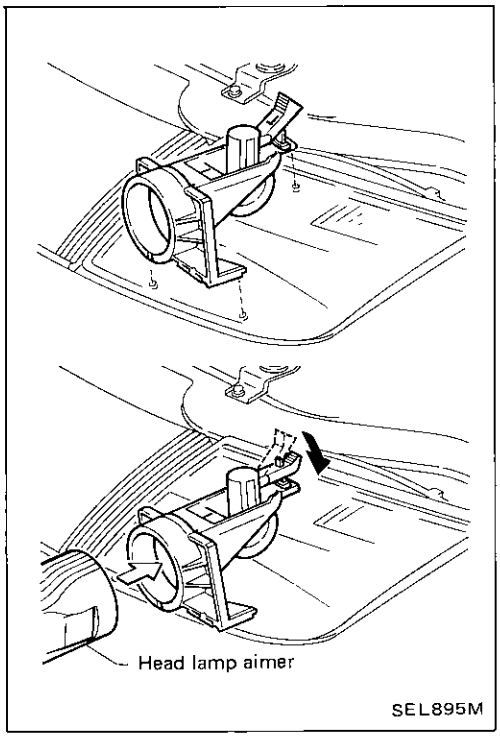


## Wiring Diagram (Cont'd)

**FOR CANADA**




SEL681Q




## Aiming Adjustment

When performing headlamp aiming adjustment, use an aiming machine, aiming wall, screen or headlamp tester. When operating any aimer, it should be in good repair, calibrated and used according to the operation manual supplied with the unit.

### HEADLAMP AIMER ADAPTER

Attach the headlamp aimer using Tool (aimer adapter). Place the aimer adapter on the 3 points of the headlamp, then push the lever down to secure it.

If no aimer is available, aiming adjustment can be done as follows:

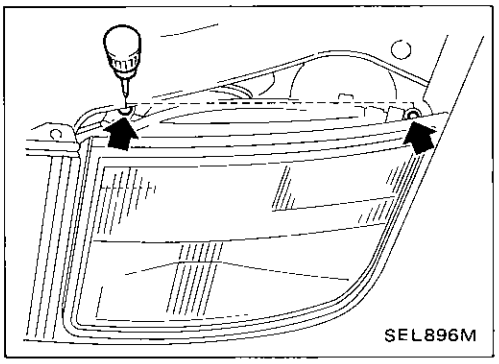
**For details, refer to the regulations in your own country.**

**CAUTION:**

**a. Make sure tires are inflated to correct pressures.**

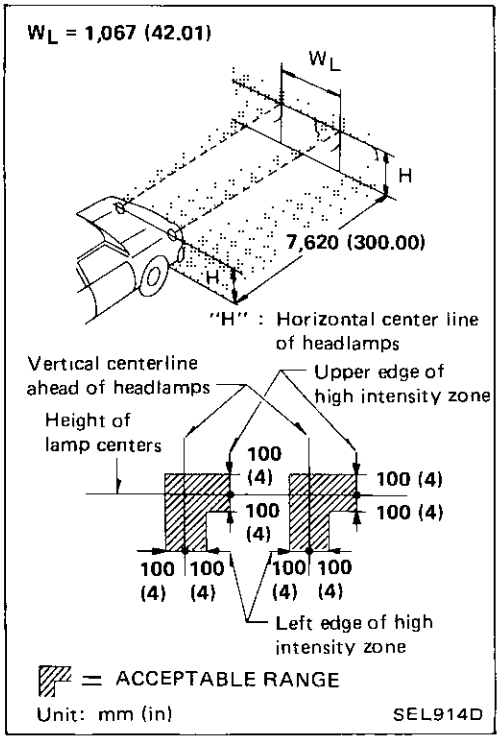
**b. Place vehicle and tester on the same flat surface.**

**c. See that there is no load in the vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).**




1. Turn headlamp low beam on.
2. Use adjusting screws to perform aiming adjustment.

- **First tighten the adjusting screw all the way and then make adjustment by loosening the screw.**

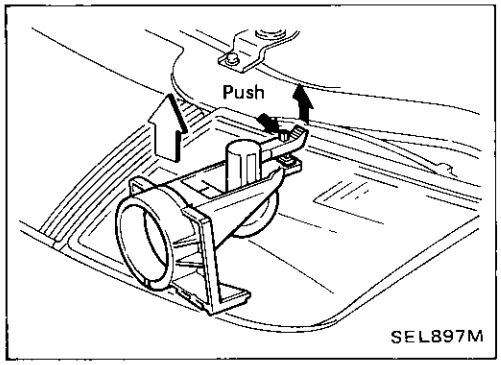



- **Adjust headlamps so that upper edge and left edge of high intensity zone are within the acceptable range as shown at left.**
- **Dotted lines in illustration show center of headlamp.**

"H": Horizontal center line of headlamps

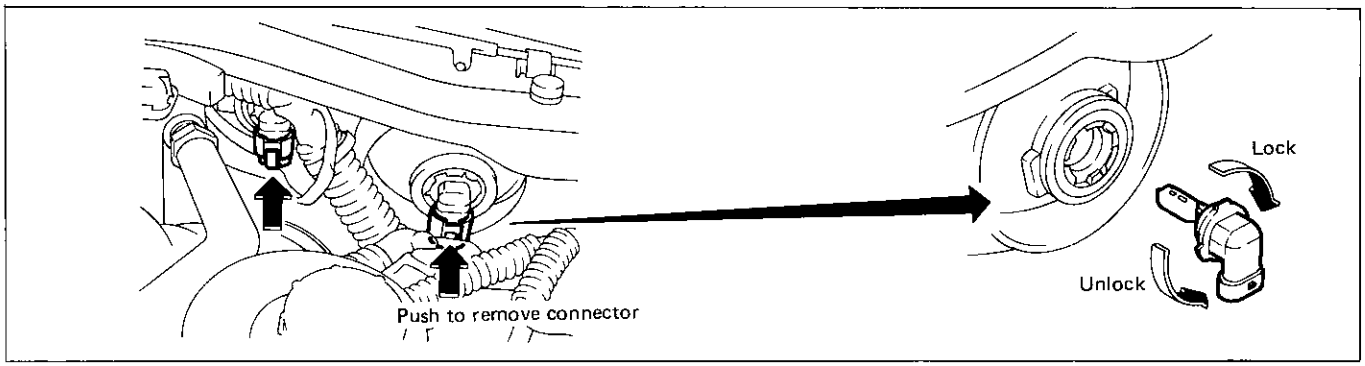
"WL": Distance between each headlamp center

## Aiming Adjustment (Cont'd)




Push the tongue and pull the lever up to remove the adapter.

## Bulb Replacement




The Headlamp is a semi-sealed beam type which uses a replaceable Headlamp (halogen) bulb. A bulb can be replaced from inside the engine compartment without removing the Headlamp assembly.

**CAUTION:**

**High pressure halogen gas is sealed inside the halogen bulb. The bulb may break if the glass envelope is scratched or the bulb is dropped.**

**Hold the plastic base when handling the bulb. Never touch the glass envelope.**

### REMOVING HEADLAMP BULB

1. Disconnect battery negative cable.
2. Disconnect electrical connector from rear end of bulb.
3. Turn plastic base counterclockwise until it is free from headlamp reflector, then remove it.
4. Remove headlamp bulb. Do not shake or rotate bulb when removing it.

### REPLACING HEADLAMP BULB

1. Insert bulb into headlamp reflector with plastic base facing downward and turn it clockwise until it stops.
2. Push electrical connector into bulb plastic base until it snaps and stops.

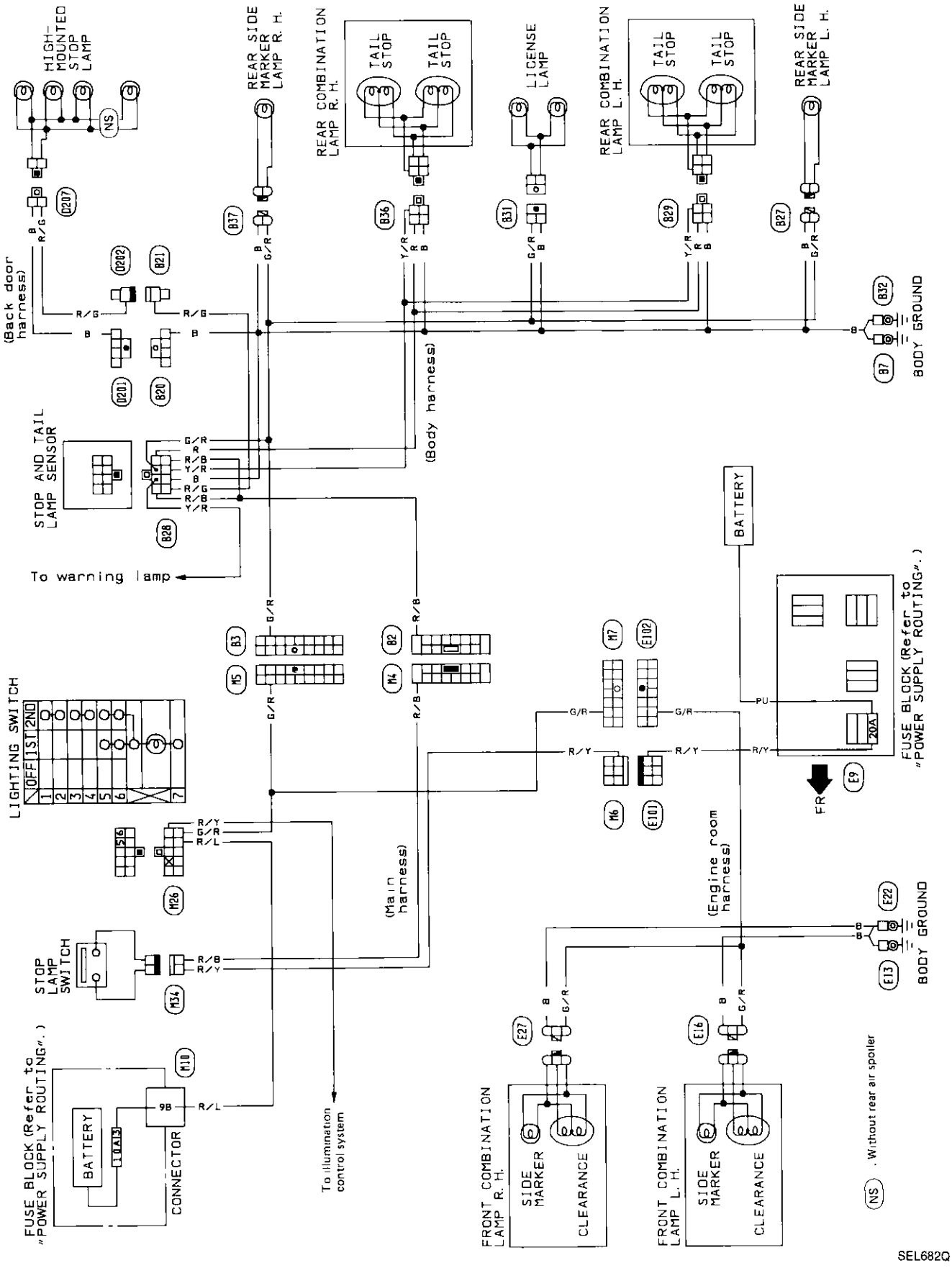
**CAUTION:**

**Do not touch the bulb.**

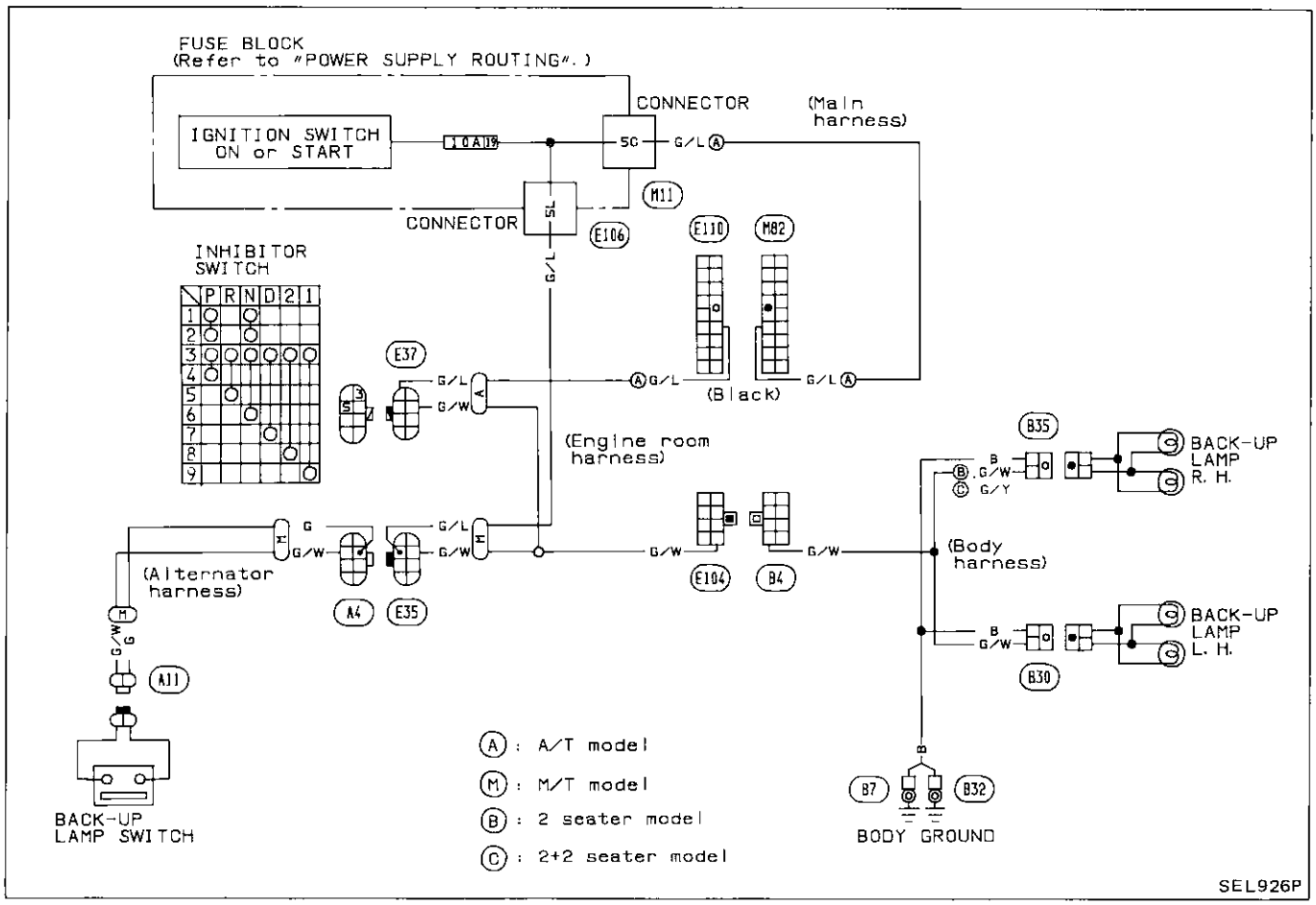
- **Use the same number and wattage as originally installed:**

| | Inside (High beam) | Outside (Low beam) |
|---|---|---|
| Wattage (W) | 65 | 55 |
| Bulb no. | 9005 | 9006 |

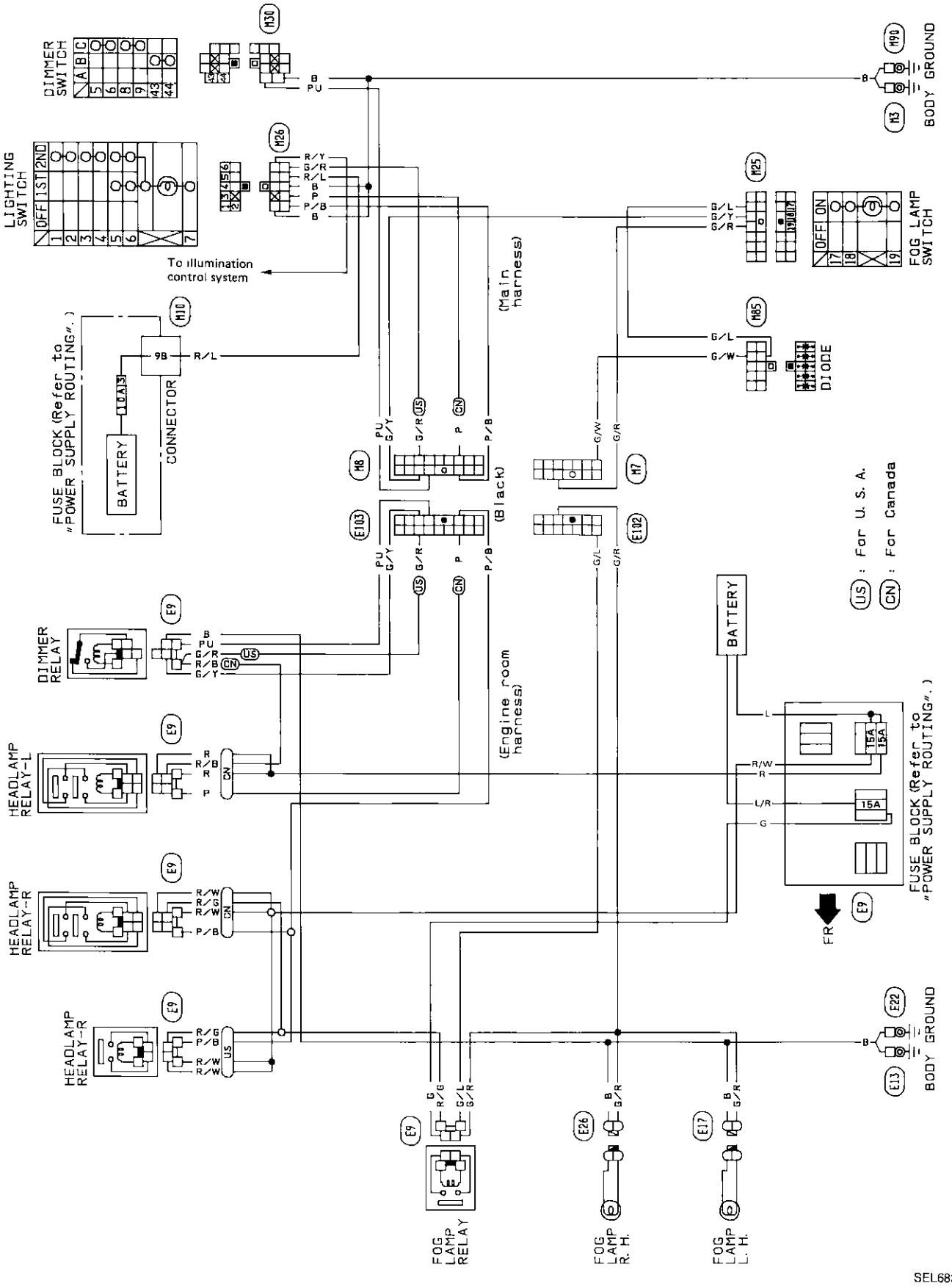
## Clearance, License, Tail and Stop Lamps/Wiring Diagram



## Back-up Lamp/Wiring Diagram

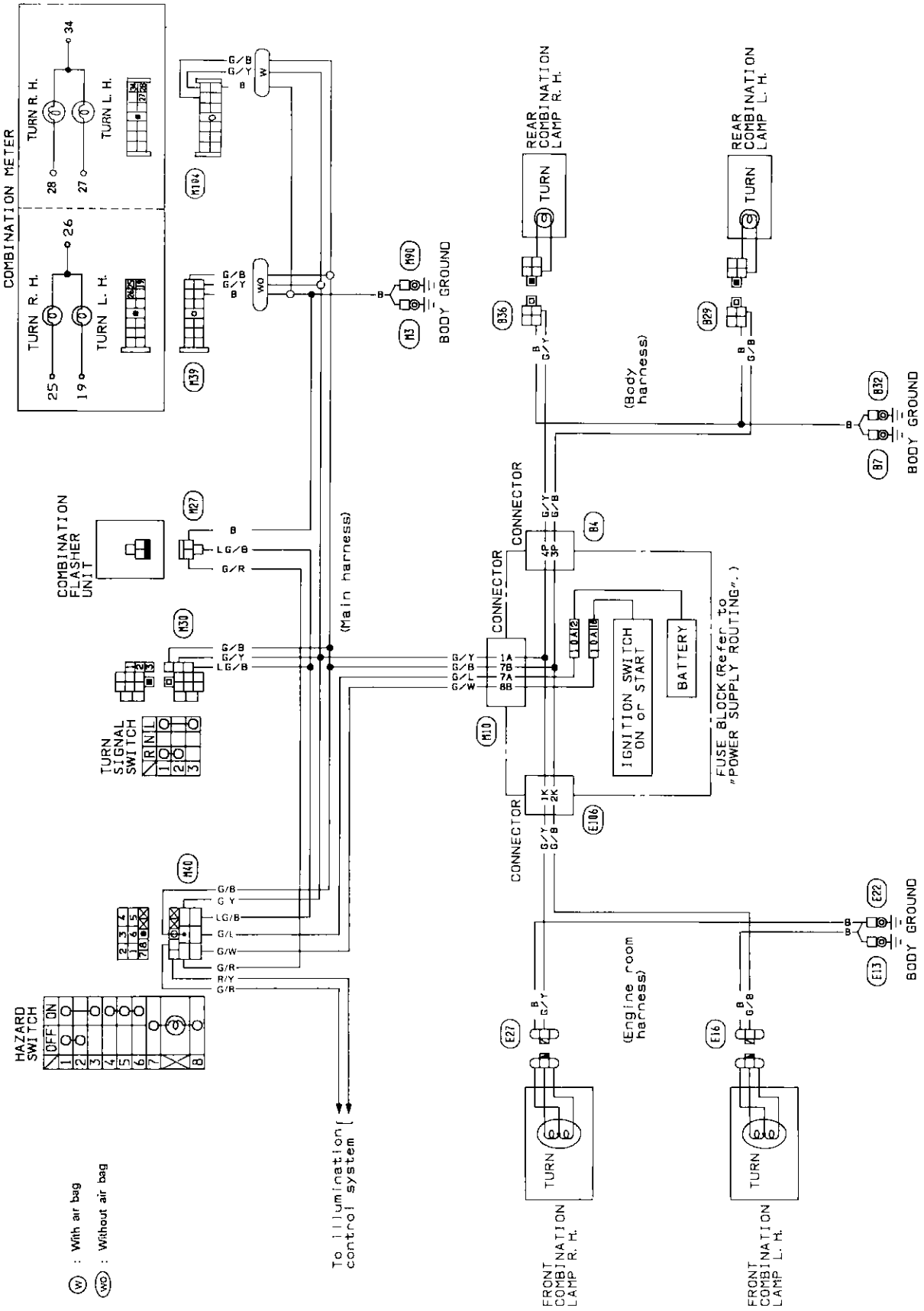


## Front Fog Lamp/Wiring Diagram

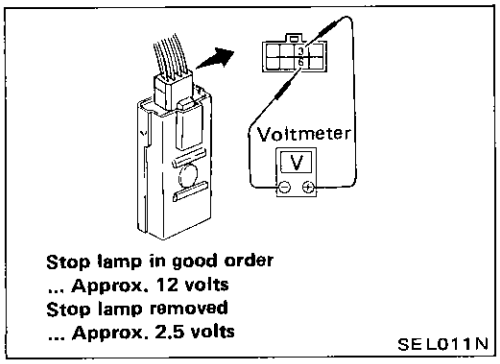



SEL683Q

## Turn Signal and Hazard Warning Lamps/Wiring Diagram




SEL927P




**Stop lamp in good order**
**... Approx. 12 volts**
**Stop lamp removed**
**... Approx. 2.5 volts**

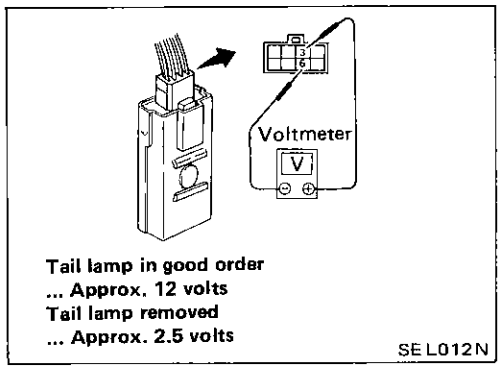
SEL011N

## Stop and Tail Lamp Sensor Check

- Before checking, ensure that bulbs meet specifications.

### STOP LAMP

1. Start engine.
2. Stop lamp switch on.

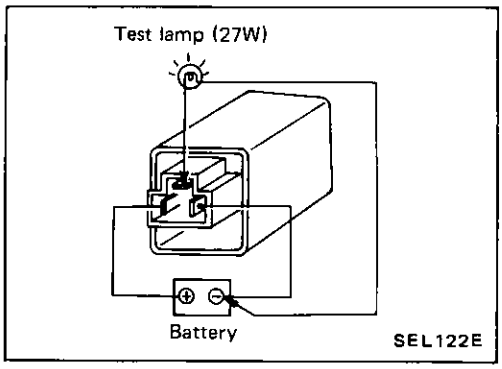



**Tail lamp in good order**
**... Approx. 12 volts**
**Tail lamp removed**
**... Approx. 2.5 volts**

SEL012N

## Tail Lamp

1. Start engine.
2. Lighting switch on.




SEL122E

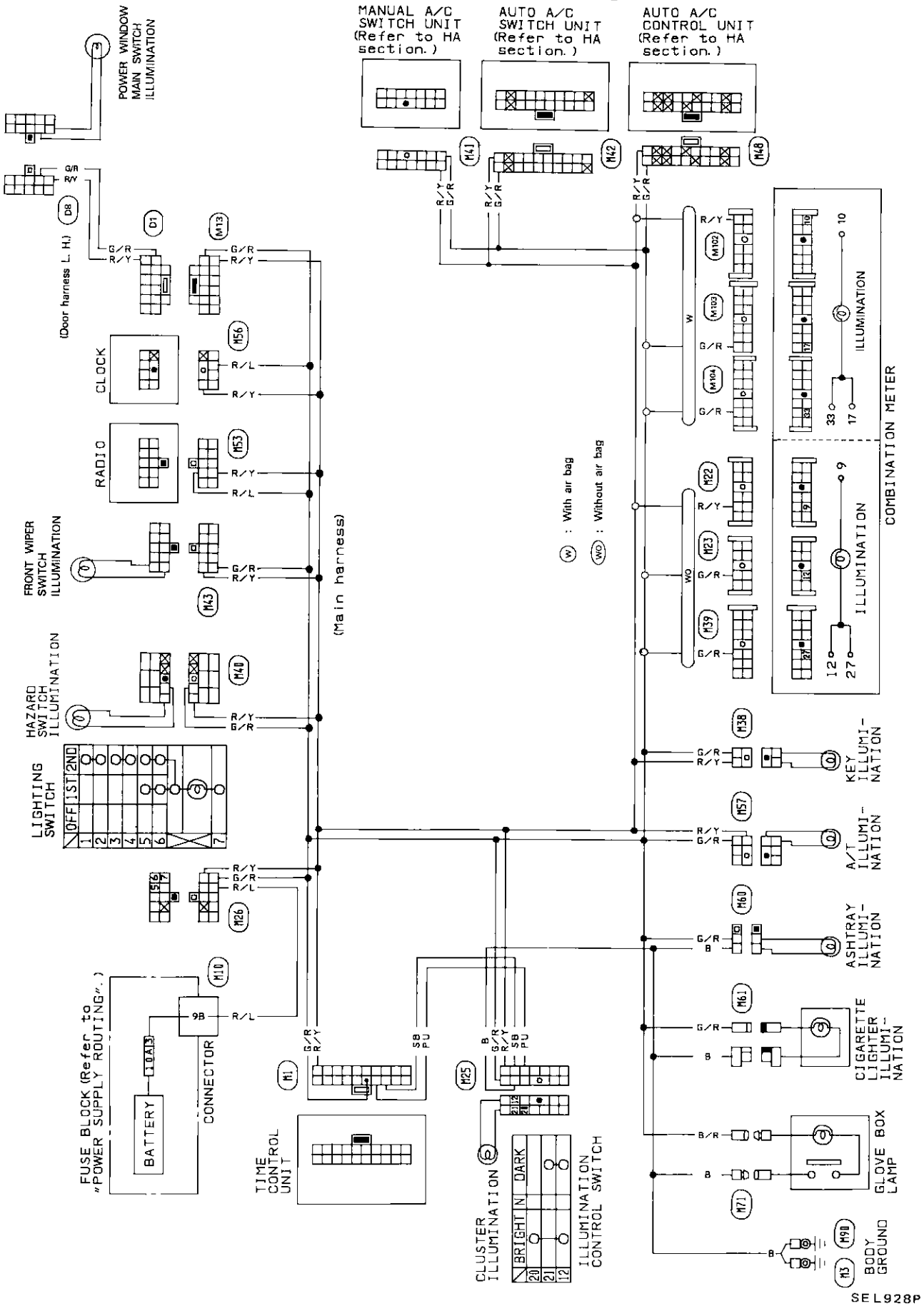
## Combination Flasher Unit Check

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

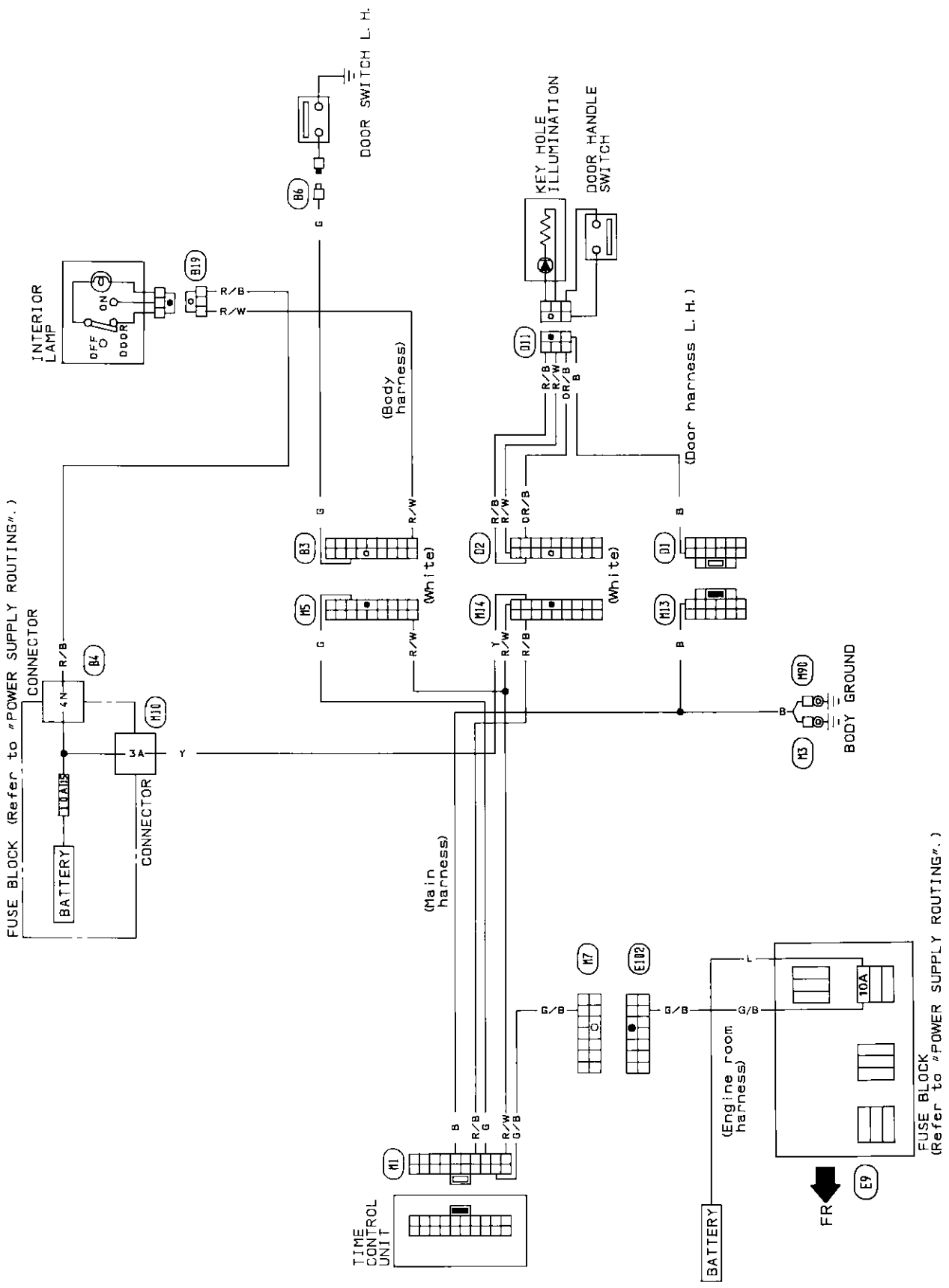
## Bulb Specifications

| | Wattage (W) | Bulb No. |
|---|---|---|
| Front combination lamp | | |
| Turn Signal/Clearance | 27/8 | 1157 |
| Front side marker | 3.8 | 194 |
| Rear combination lamp | | |
| Turn signal | 27 | 1156 |
| Stop/Tail | 27/8 | 1157 |
| Back-up lamp | 27 | 1156 |
| Rear side marker lamp | 3.8 | 194 |
| License plate lamp | 3.8 | 194 |
| Front fog lamp | 35 | |
| High-mounted stop lamp | 13 | |
| Interior lamp | 10 | |
| Spot lamp | 3.6 | |
| Luggage room lamp | 3.4 | |
| Foot lamp | 2 | |

## Illumination/Wiring Diagram

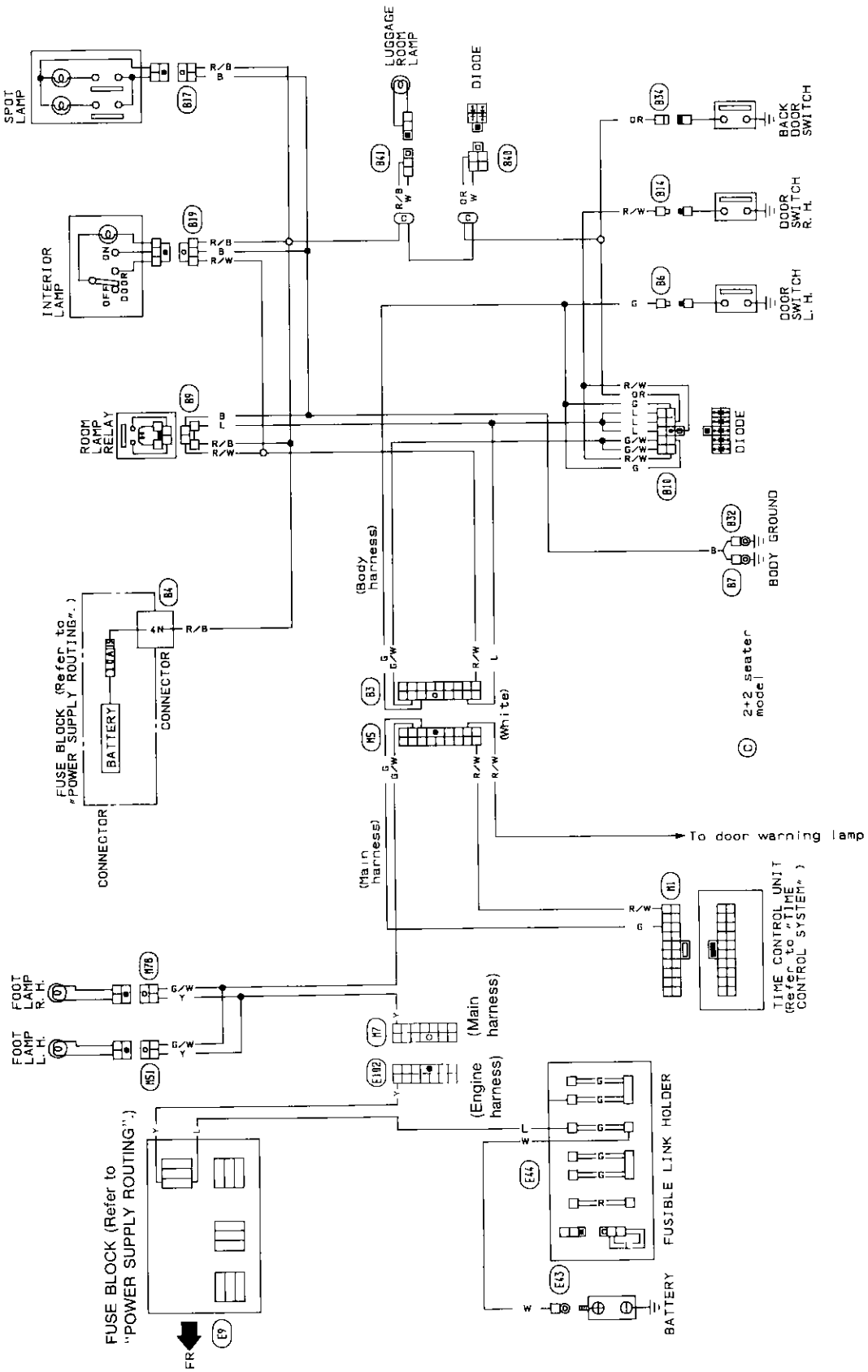


## Illuminated Entry System/Wiring Diagram




SEL684Q

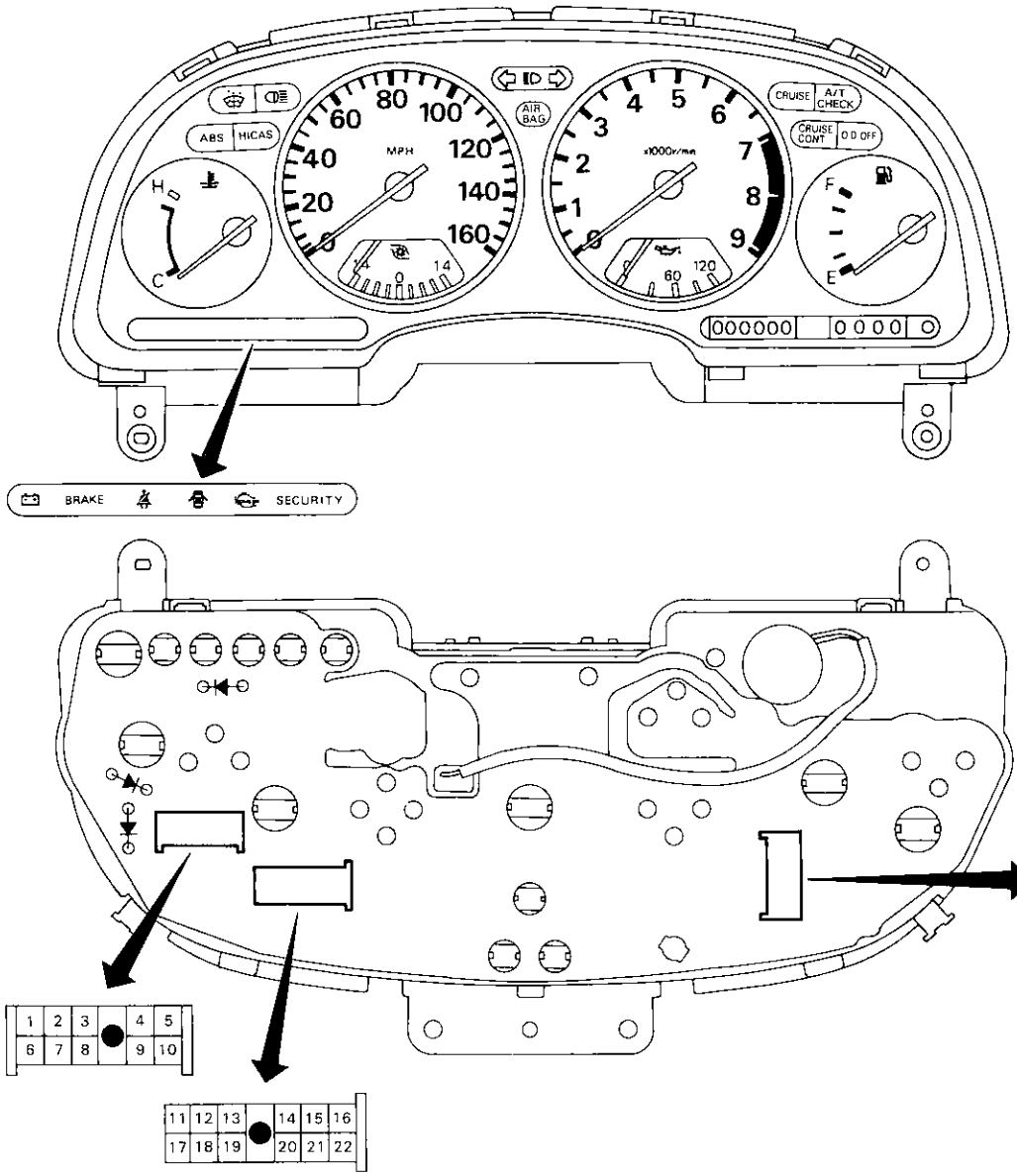
## Interior, Spot, Foot and Luggage Room Lamps/Wiring Diagram

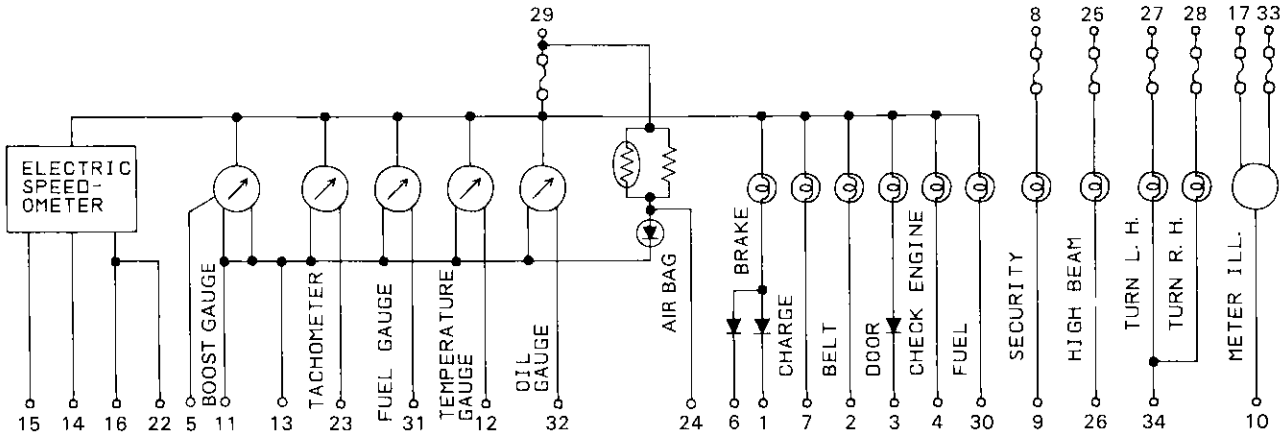



SEL685Q

## Combination Meter

### TYPE A

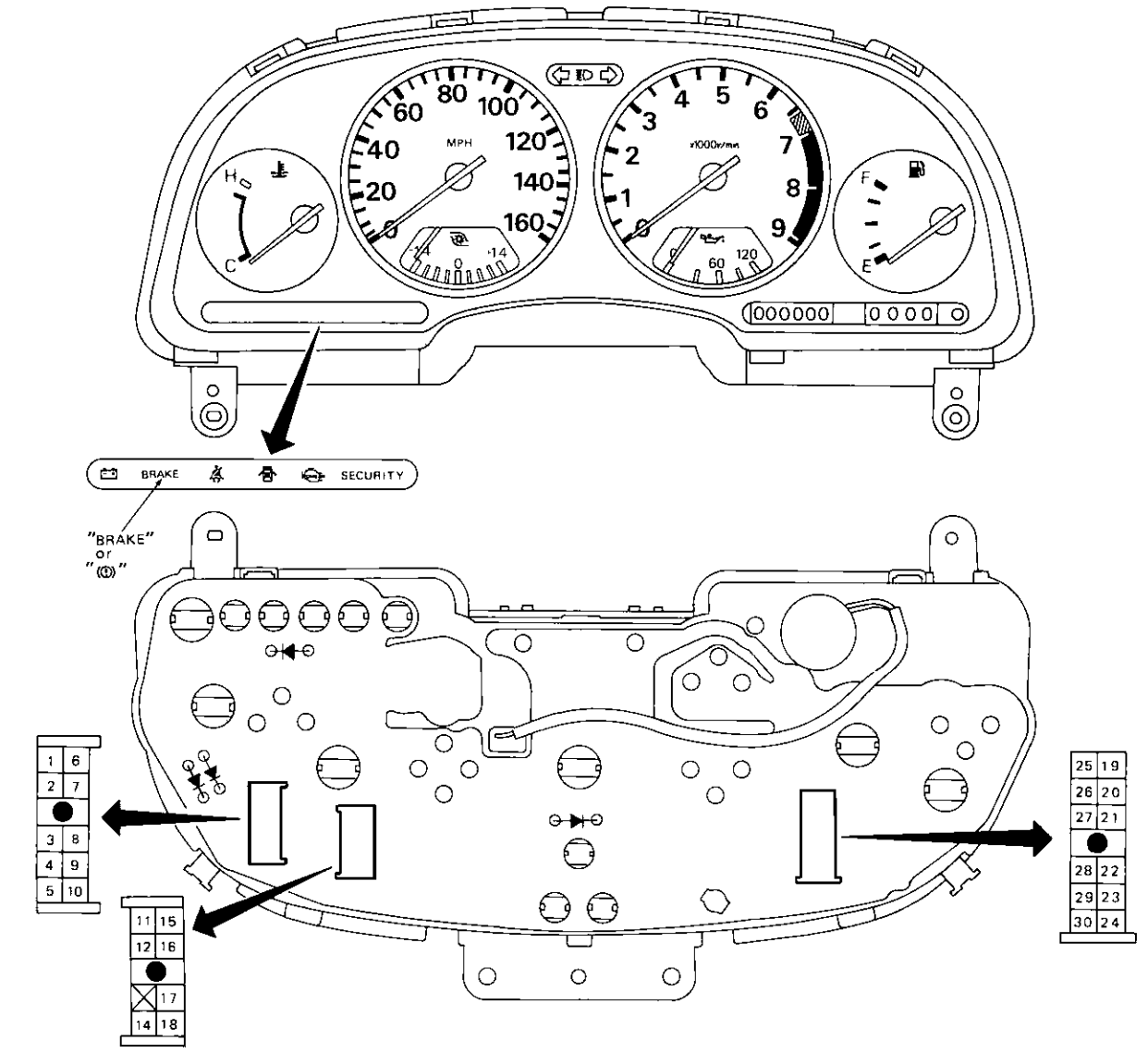


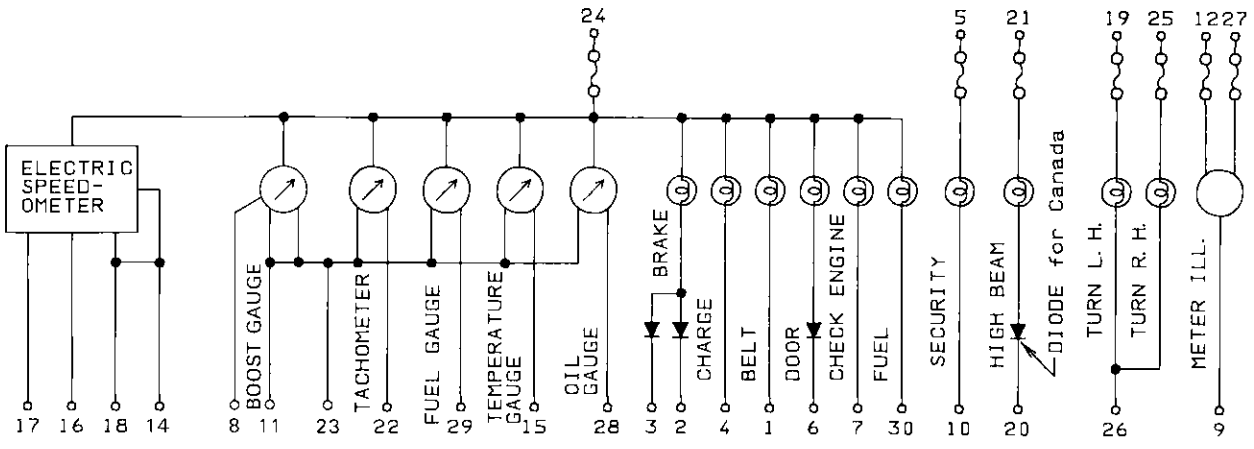




SEL784Q

## Combination Meter (Cont'd)

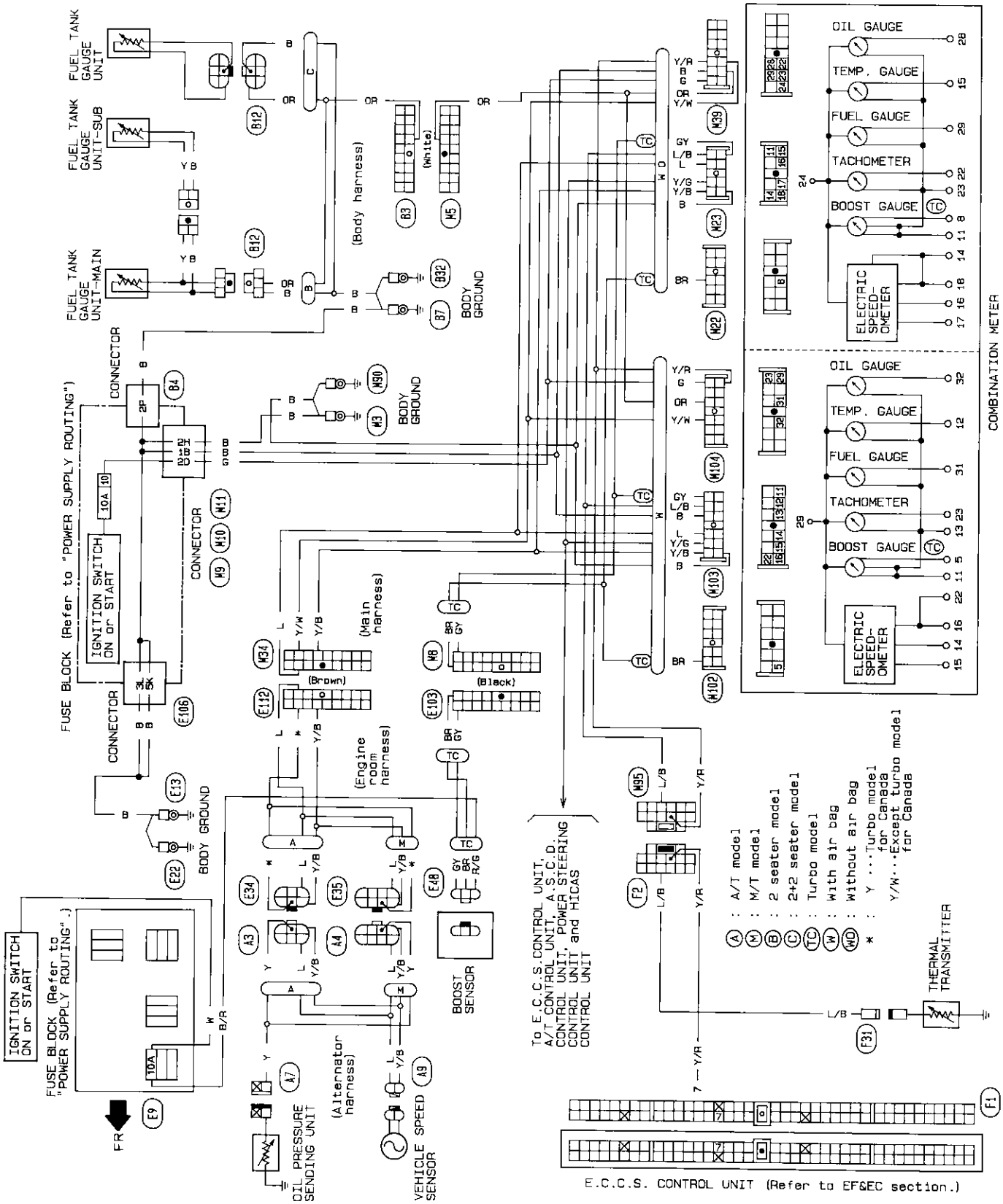
**TYPE B**



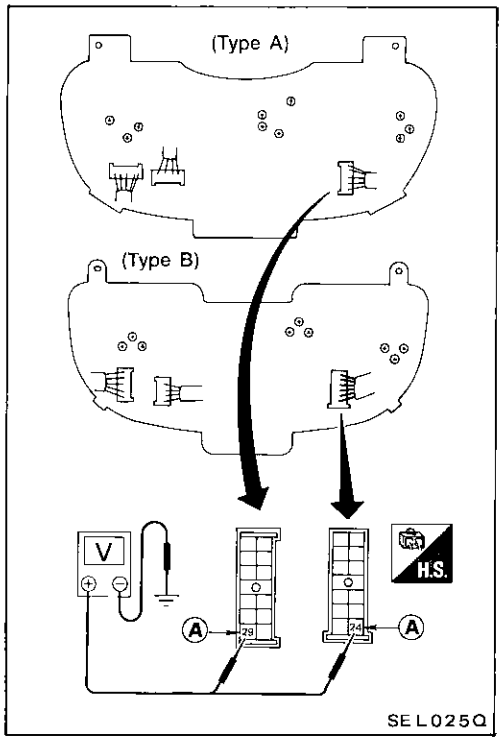



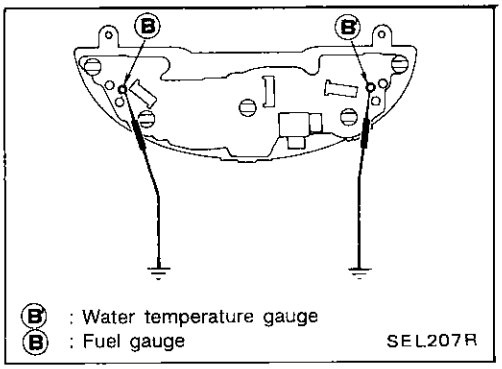

MEL028A

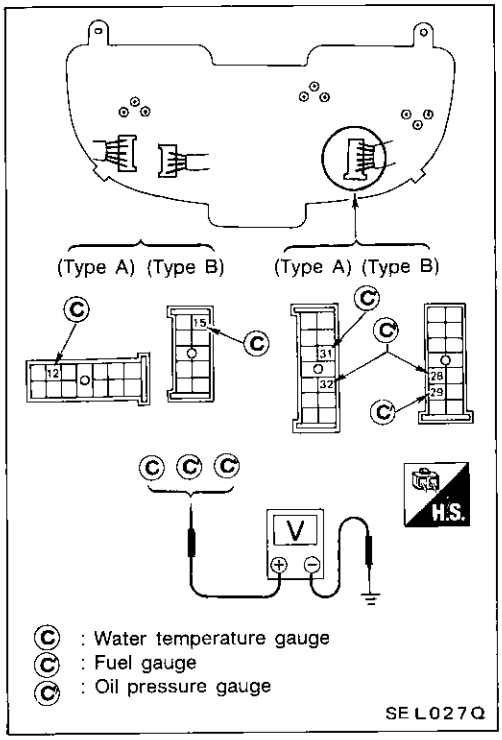
## Speedometer, Tachometer, Temp., Oil, Fuel and Boost Gauges/Wiring Diagram




SEL686Q




## Inspection/Fuel Gauge and Water Temperature Gauge

INSPECTION START

O.K.

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal Ⓐ and ground.
**Battery voltage should exist.**

N.G. → Check the following items.
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and fuse
4) Ignition switch

O.K.

CHECK GAUGE OPERATION
1) Turn ignition switch "ON".
2) Connect terminals Ⓑ, Ⓑ, Ⓑ and ground with wire through 3.4W 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 Ⓒ, Ⓒ and Ⓒ.

N.G. → Repair or replace.

O.K.

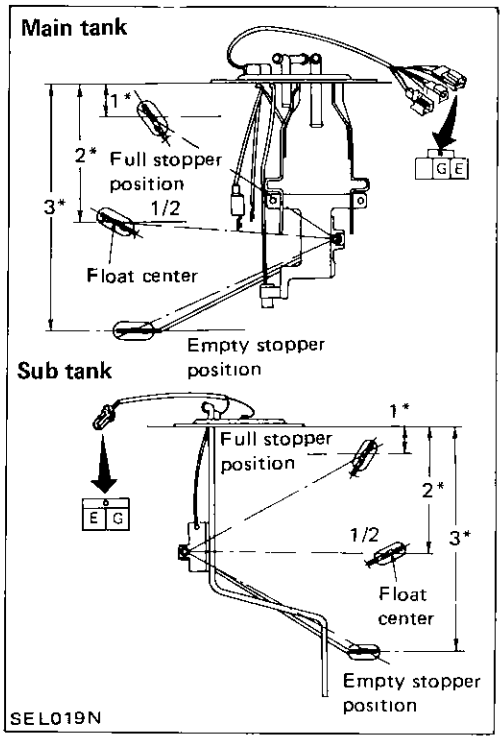
CHECK COMPONENT
Check gauge units and harness.
**Refer to "Fuel Tank Gauge Unit Check", "Thermal Transmitter Check" and "Oil Pressure Sending Unit Check".**

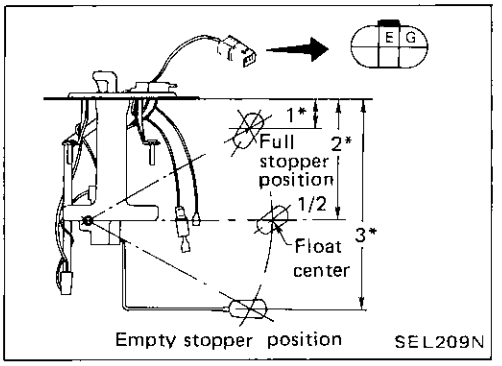
N.G. → Repair or replace.
**Refer to FE section. (Fuel tank gauge unit)**

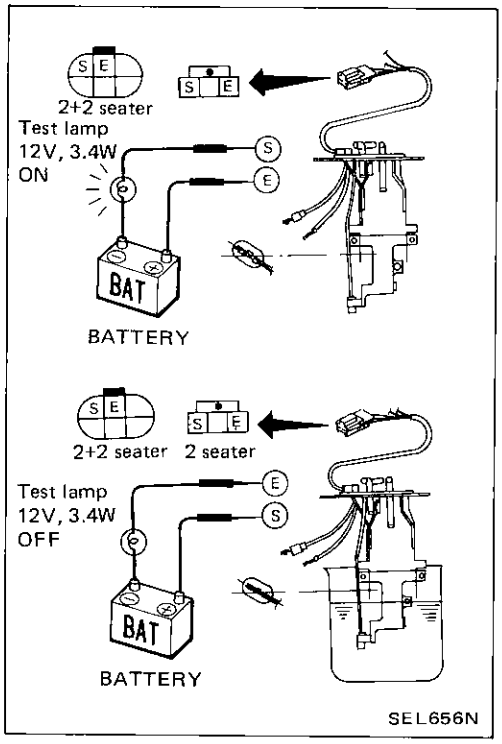
O.K.

Reinstall any part removed.

INSPECTION END




## Fuel Tank Gauge Unit Check

- For removal, refer to FE section.

Check the resistance between terminals Ⓖ and Ⓔ.

### 2 seater model:

| Ohmmeter (+) | Ohmmeter (−) | Float position mm (in) | | | | Resistance value (Ω) |
|---|---|---|---|---|---|---|
| G | E | 1* | Full | Main | 41.0 (1.614) | 8.6 - 11.6 |
| | | | | Sub | 40.0 (1.575) | |
| | | 2* | 1/2 | Main | 137.0 (5.39) | 55.4 - 68.6 |
| | | | | Sub | 139.5 (5.49) | |
| | | 3* | Empty | Main | 232.0 (9.13) | 157.6 - 170.6 |
| | | | | Sub | 261.0 (10.28) | |

1* and 3*: When float rod is in contact with stopper.

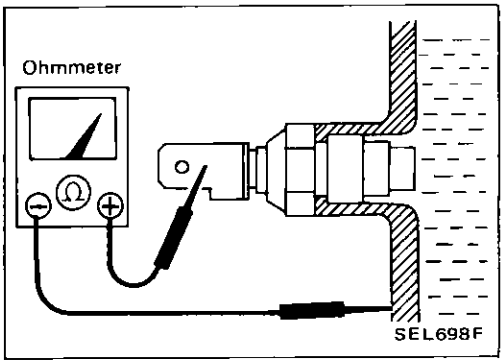
### 2+2 seater model:

| Ohmmeter (+) | Ohmmeter (−) | Float position mm (in). | | | Resistance value (Ω) |
|---|---|---|---|---|---|
| G | E | 1* | Full | 21.0 (0.827) | 4.3 - 5.8 |
| | | 2* | 1/2 | 115.0 (4.53) | 27.7 - 34.3 |
| | | 3* | Empty | 207.0 (8.15) | 78.3 - 84.8 |

1* and 3*: When float rod is in contact with stopper.

## Fuel Warning Lamp Sensor Check

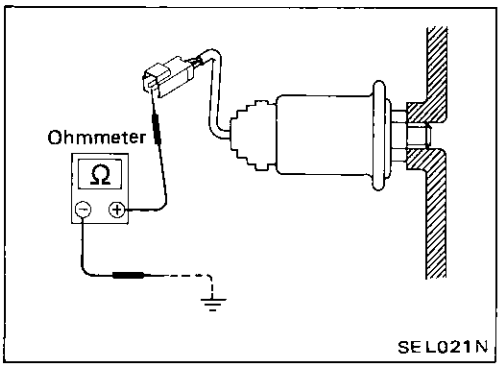
- It will take a short time for the bulb to light.




## Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

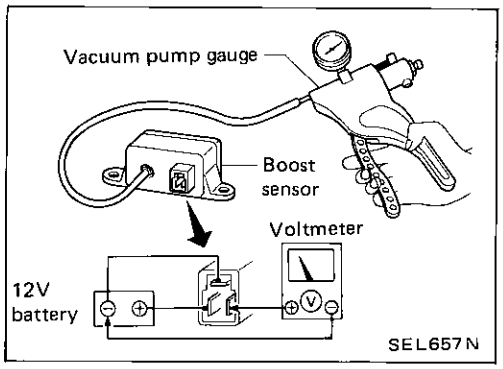
| Water temperature | Resistance |
|---|---|
| 60°C (140°F) | Approx. 70 - 90Ω |
| 100°C (212°F) | Approx. 21 - 24Ω |




## Oil Pressure Sending Unit Check

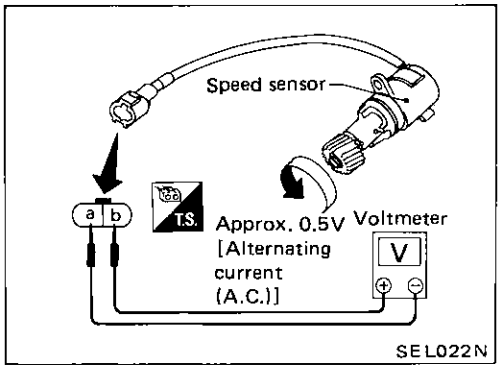
Check the resistance between the terminals of oil pressure sending unit and body ground.

| Oil pressure kPa (kg/cm², psi) | Resistance value (Ω) |
|---|---|
| 0 (0, 0) (Engine is stopped) | More than 83 |
| 392 (4, 57) | Approx. 26 - 37 |
| 588 (6, 85) | Approx. 18 - 26 |




## Boost Sensor Check

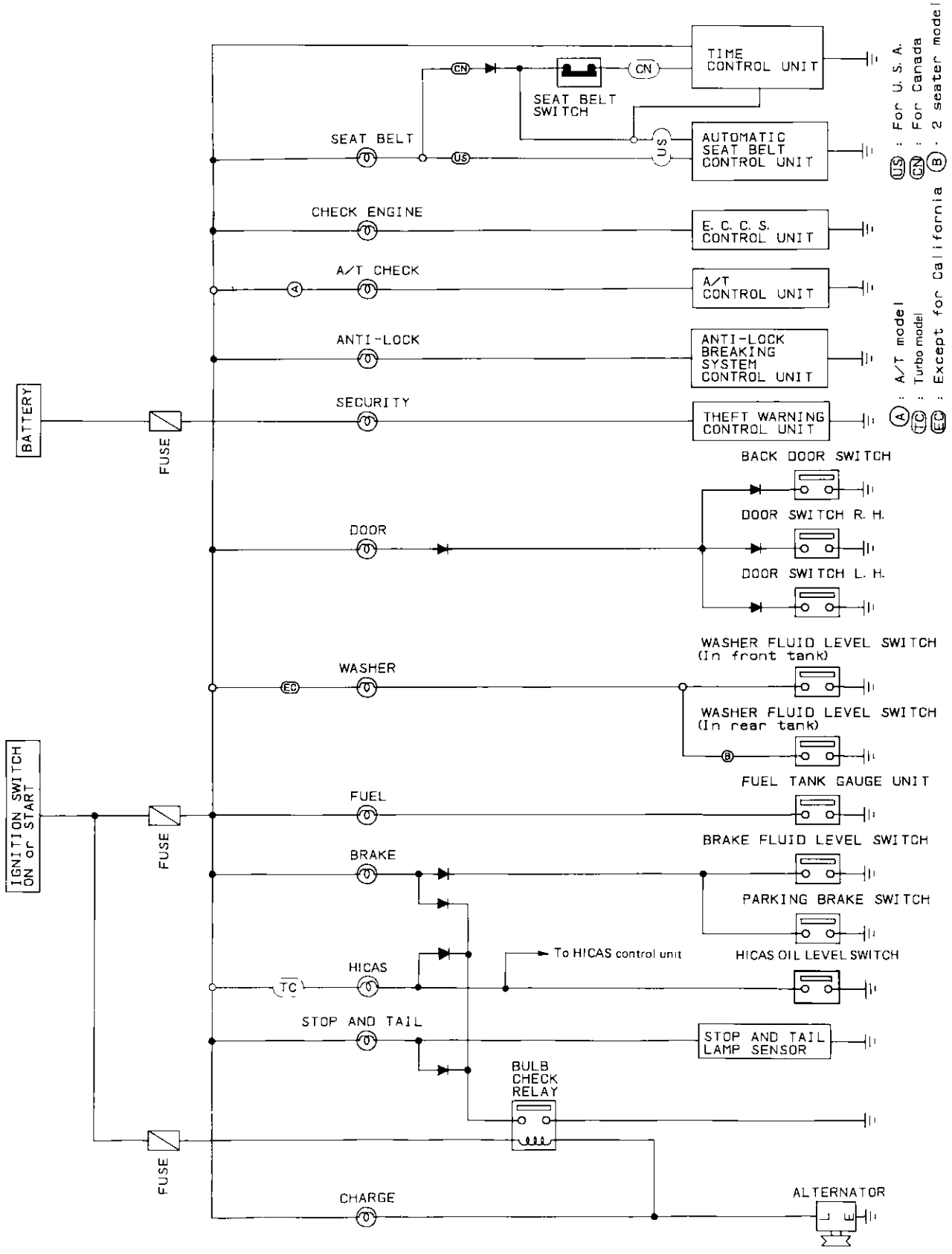
1. Connect vacuum pump gauge to boost sensor vacuum hose.
2. Disconnect harness connector from boost sensor and connect battery and voltmeter as shown.
3. Apply vacuum pressure to boost sensor by vacuum pump gauge and measure voltages.
   **Voltage:**
   **Approx. 2.2V at 0 kPa (0 kg/cm², 0 psi)**
   **(Atmospheric pressure)**
   **Approx. 1.3V at –55 kPa (–0.56 kg/cm², –8 psi)**




## Speed Sensor Signal Check

1. Remove speed sensor from transmission.
   Location: Refer to "LOCATION OF ELECTRICAL UNITS" in Service Manual.
2. Turn speedometer pinion quickly and measure voltage across (a) and (b).

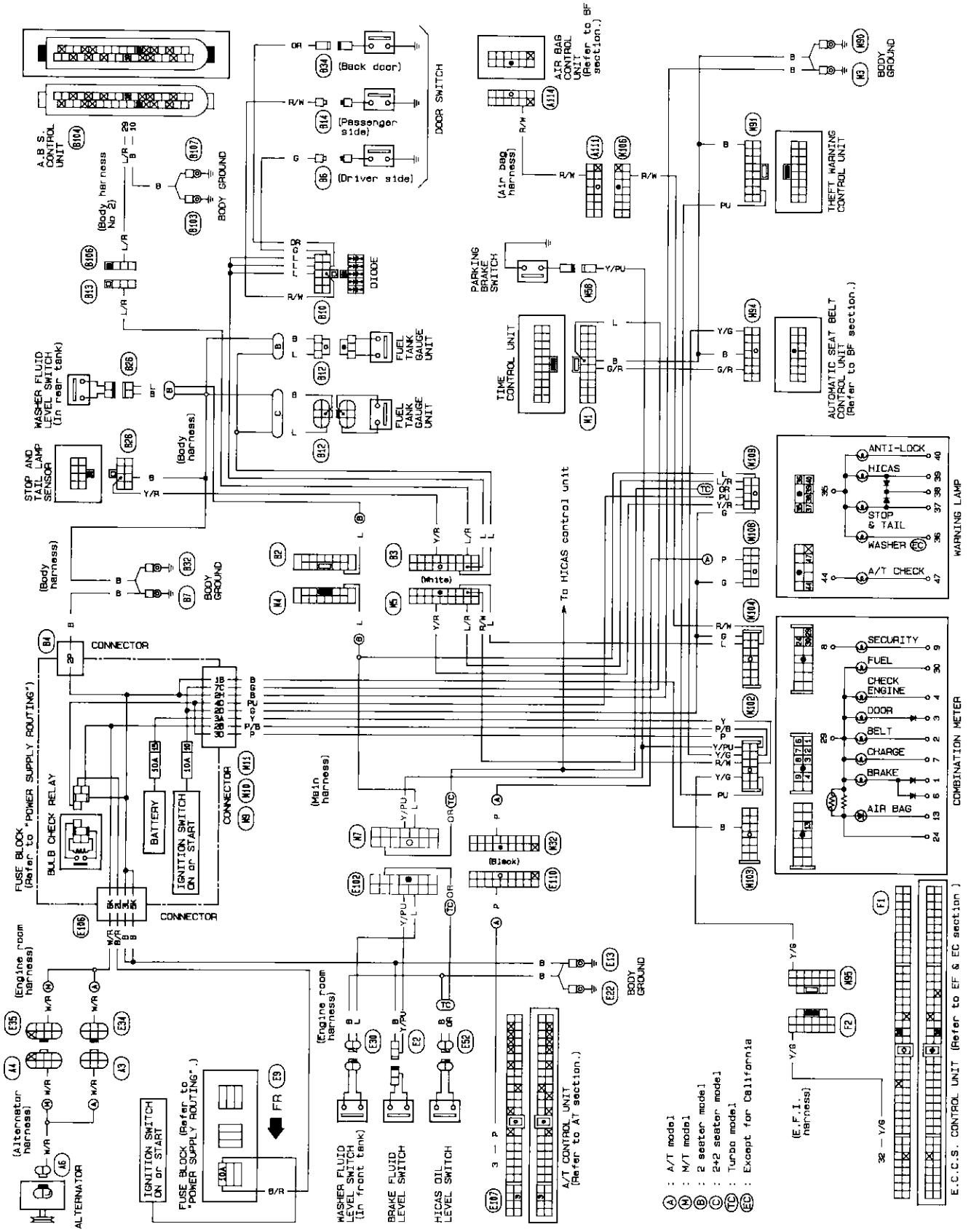
## Warning Lamps/Schematic




SEL687Q

## Warning Lamps/Wiring Diagram

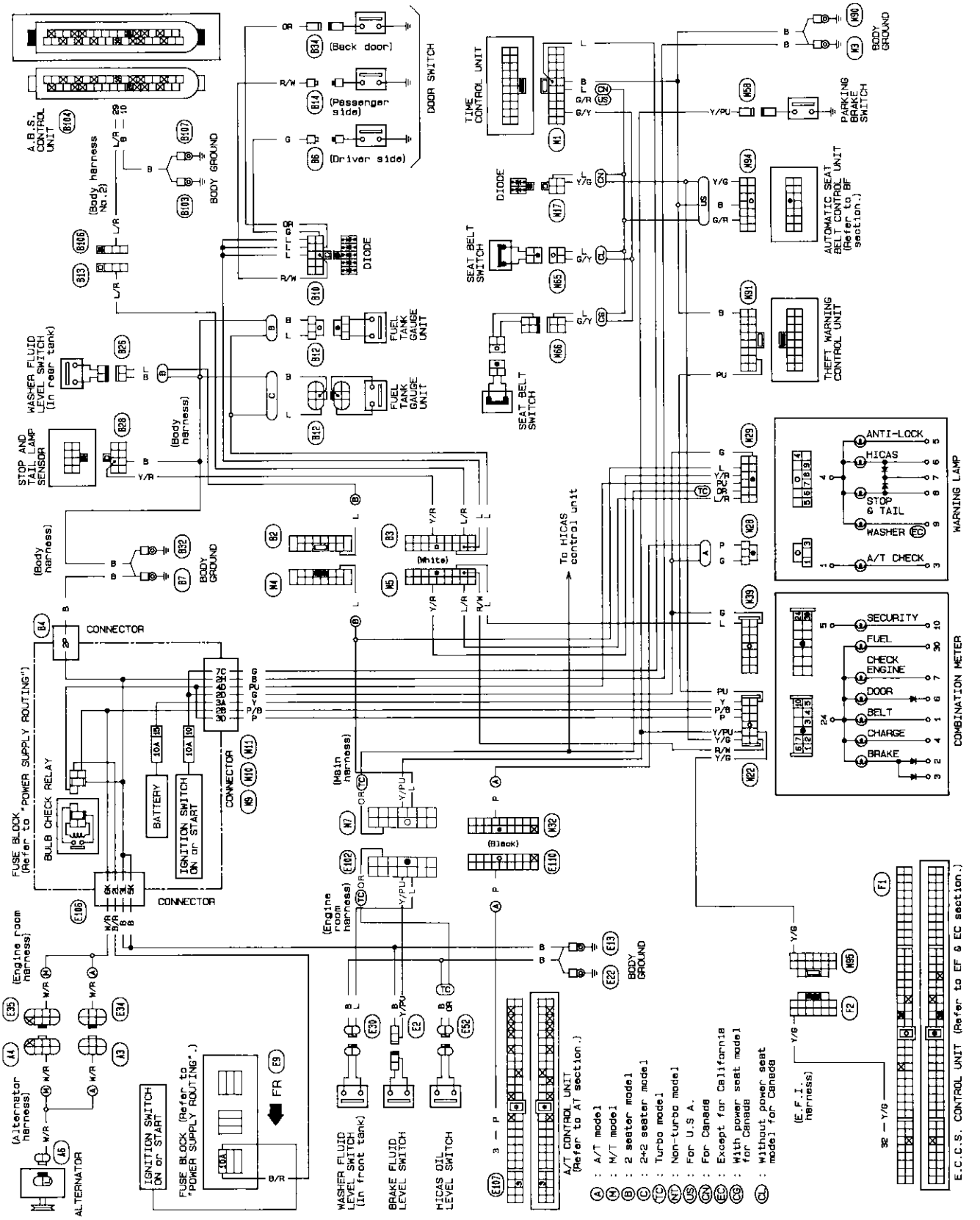
### WITH AIR BAG




SEL688Q

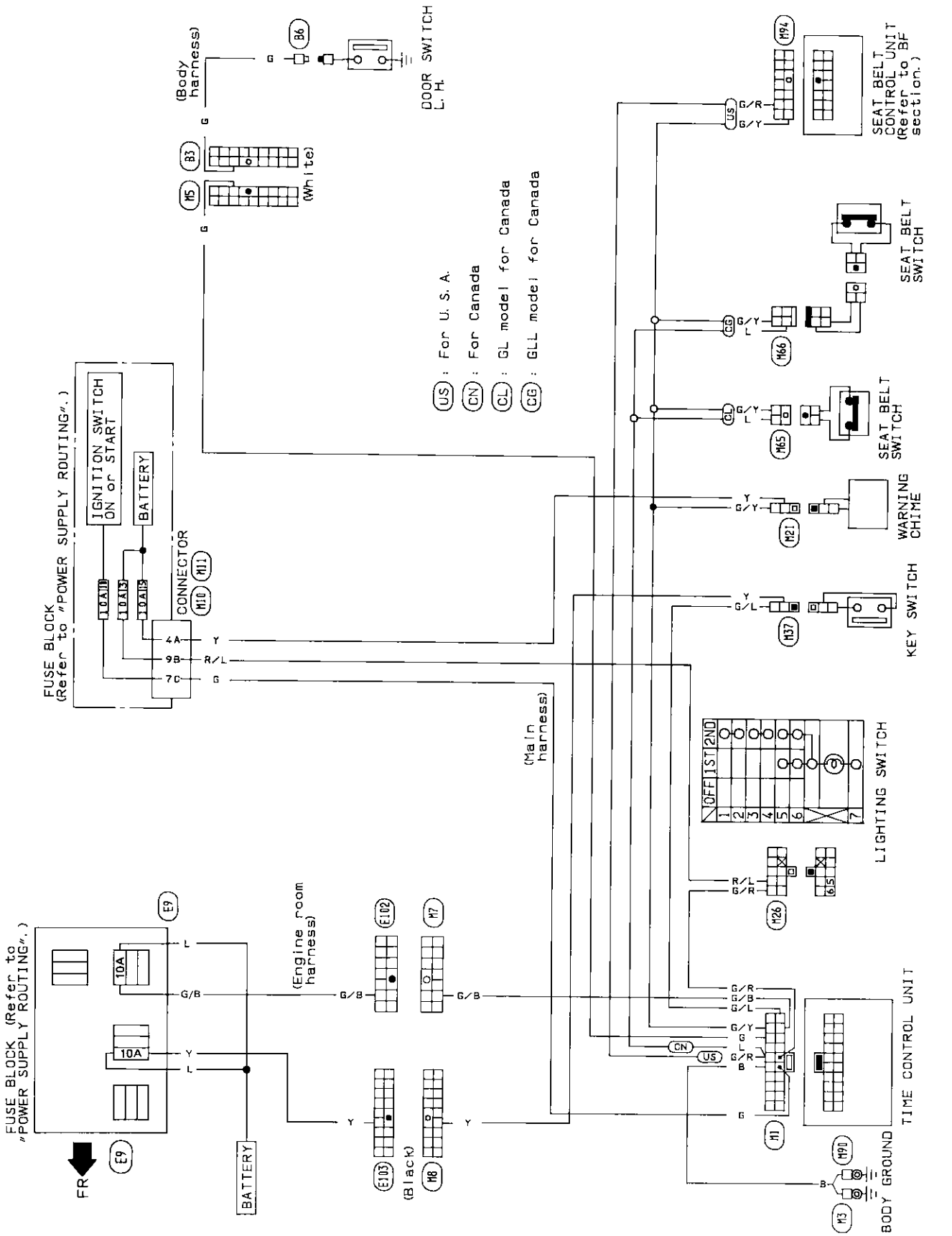
## Warning Lamps/Wiring Diagram (Cont'd)

### WITHOUT AIR BAG

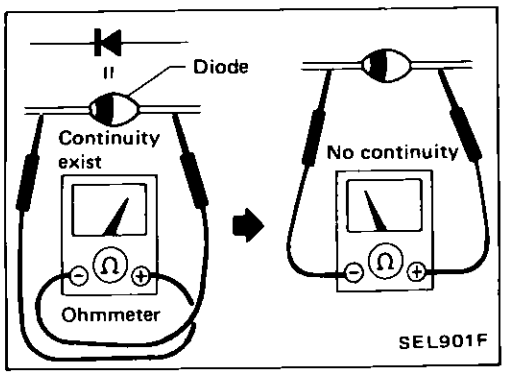



SEL689Q

## Warning Chime/Wiring Diagram

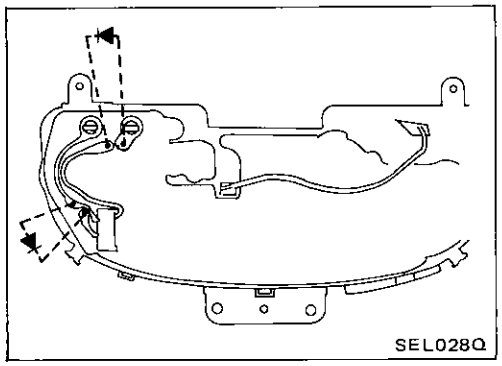



SEL690Q

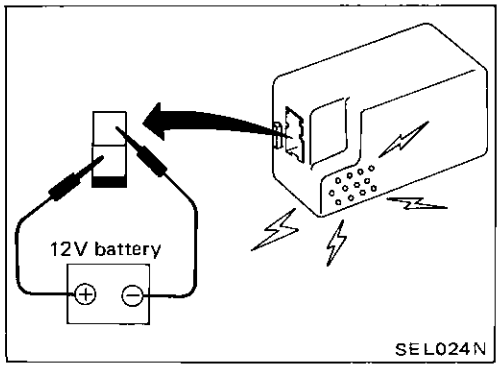



## Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.




- Diodes for warning lamps are built into the combination meter printed circuit.




## Warning Chime Check

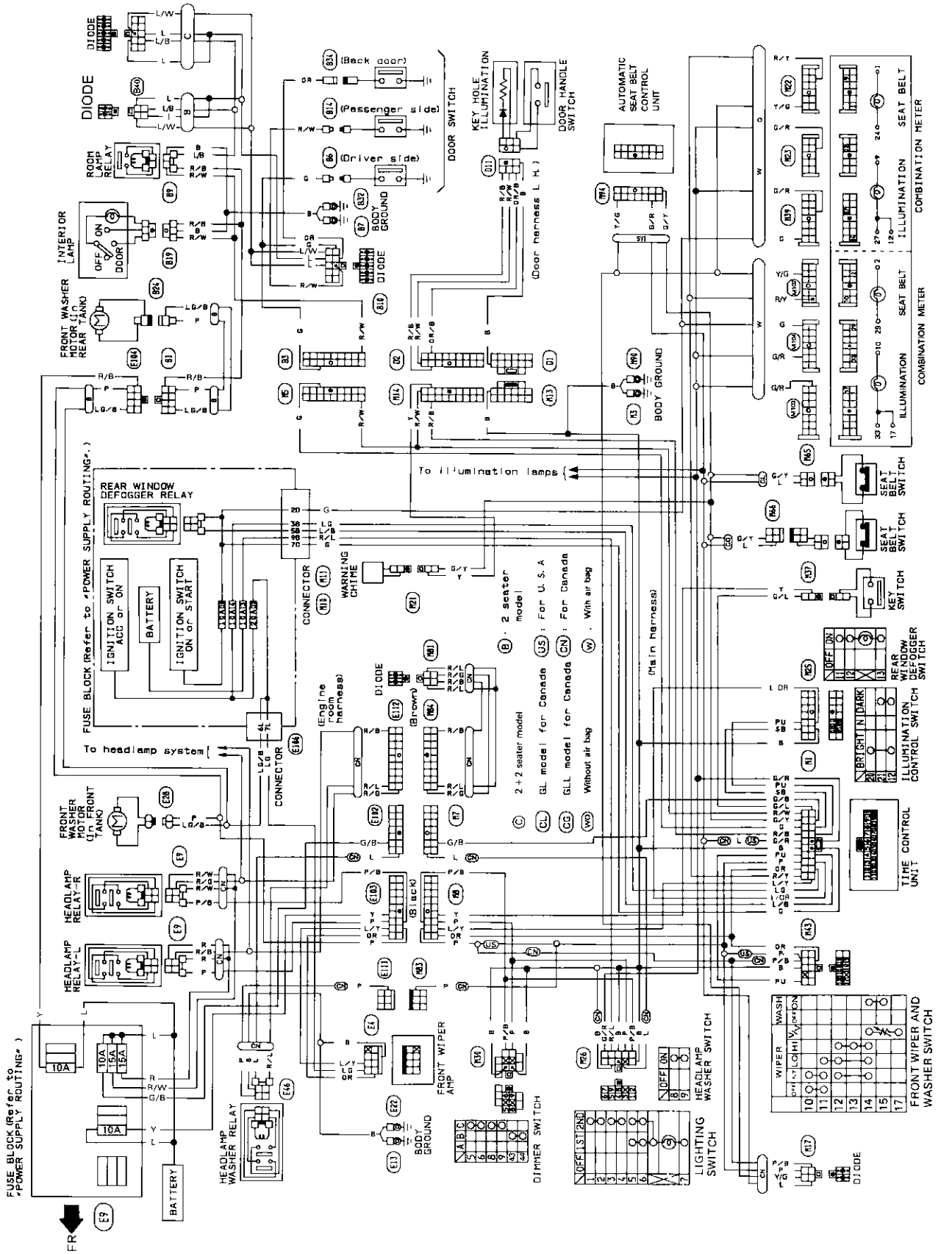
## Description

### FUNCTION

- Time control unit has the following functions.

| Item | | Details of control |
|---|---|---|
| 1, 2 | Intermittent wiper control | Regulates intermittent time from approximately 3 to 23 seconds depending on the intermittent wiper volume setting. |
| 3 | Washer and wiper combination control | Wiper is operated in conjunction with washer switch. |
| 4 | Light warning chime timer | When driver's door is opened with light switch ON and ignition switch OFF, warning chime sounds. |
| 5 | Ignition key warning chime timer | When driver's door is opened with ignition switch OFF, warning chime sounds. |
| 6 | Seat belt warning chime timer | Sounds warning chime for about 7 seconds if ignition switch is turned "ON" when seat belt switch is "ON" (seat belt is unfastened). |
| 7 | Seat belt warning lamp timer | Seat belt warning lamp blinks for about 7 seconds when ignition switch is turned to "ON". |
| 8 | Rear defogger timer | Rear defogger operates for about 15 minutes when defogger switch is ON. |
| 9 | Interior lamp timer | Fades out interior lamp when driver's side door is opened and closed. |
| 10 | Door key hole illumination | Illuminates for about 7 seconds when door outside handle is pulled. |
| 11 | Illumination control | The brightness of the instrument panel light can be adjusted. |

## Wiring Diagram




SEL691Q

## Trouble Diagnoses

### SYMPTOM CHART

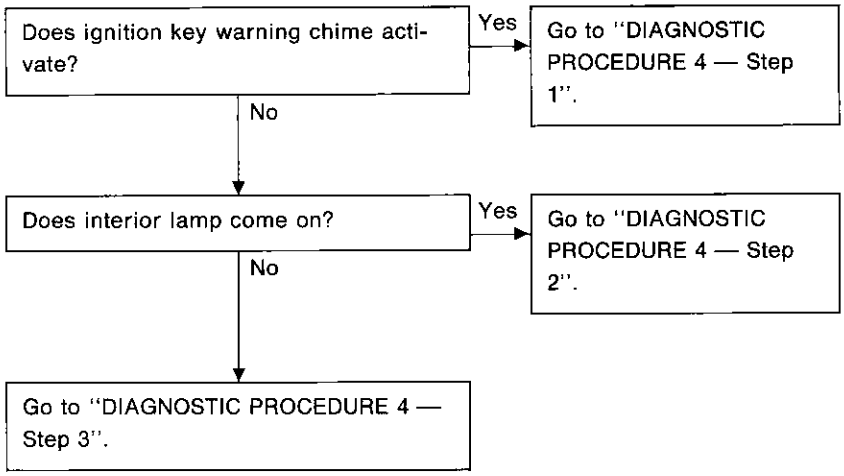
| PROCEDURE | | Preliminary Check | | | Main Power Supply and Ground Circuit Check | Diagnostic Procedure | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REFERENCE PAGE | | EL-69 | EL-69 | EL-69 | EL-70 | EL-72 | EL-73 | EL-73 | EL-74 | EL-75 | EL-76 | EL-77 | EL-77 | EL-78 | EL-79 | EL-80 |
| SYMPTOM | | Preliminary check 1 | Preliminary check 2 | Preliminary check 3 | Main power supply and Ground circuit | Diagnostic Procedure 1 | Diagnostic Procedure 2 | Diagnostic Procedure 3 | Diagnostic Procedure 4 | Diagnostic Procedure 5 | Diagnostic Procedure 6 | Diagnostic Procedure 7 | Diagnostic Procedure 8 | Diagnostic Procedure 9 | Diagnostic Procedure 10 | Diagnostic Procedure 11 |
| Wiper & washer | Intermittent wiper does not operate. | | | | ○ | ○ | | | | | | | | | | |
| | Intermittent time of wiper cannot be adjusted. | | | | | | ○ | | | | | | | | | |
| | Wiper and washer activate individually but not in combination. | | | | | | | ○ | | | | | | | | |
| Warning | Light warning chime does not activate. | ○ | | | ○ | | | | ○ | | | | | | | |
| | Ignition key warning chime does not activate. | | ○ | | ○ | | | | | ○ | | | | | | |
| | Seat belt warning chime does not activate. | | | ○ | ○ | | | | | | ○ | | | | | |
| | Seat belt warning lamp does not come on, or does not go off after coming on. | | | | ○ | | | | | | | ○ | | | | |
| Rear defogger | Rear defogger does not activate, or go off after activating. | | | | ○ | | | | | | | | ○ | | | |
| Illumination | Interior lamp does not fade out after driver's door is closed. | | | | ○ | | | | | | | | | ○ | | |
| | Door key hole illumination does not come on even if door handle is pulled. | | | | ○ | | | | | | | | | | ○ | |
| | Illumination control does not actuate. | | | | | | | | | | | | | | | ○ |

## Trouble Diagnoses (Cont'd)

### PRELIMINARY CHECK

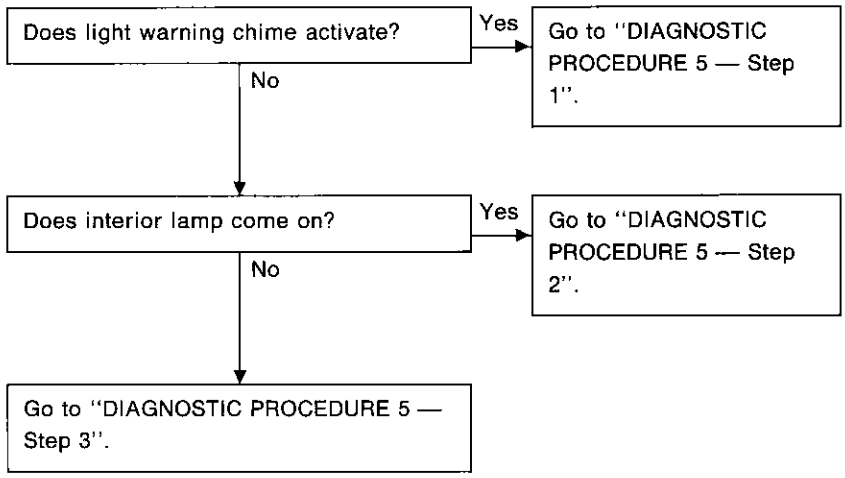
#### Preliminary check 1

- **Light warning chime does not activate.**



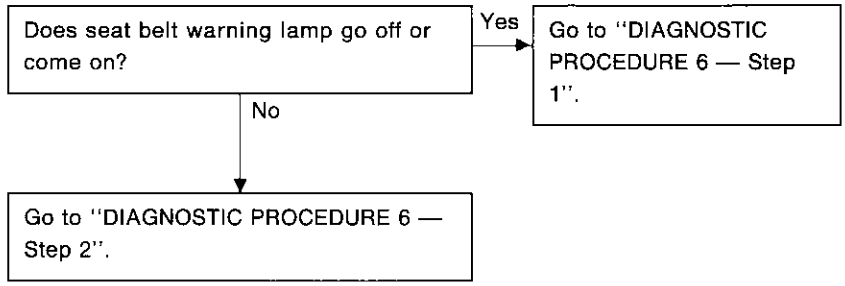

#### Preliminary check 2

- **Ignition key warning chime does not activate.**



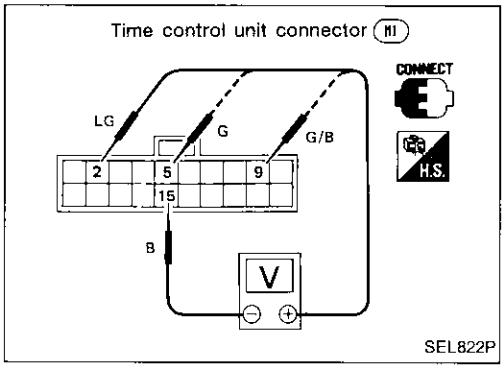

#### Preliminary check 3

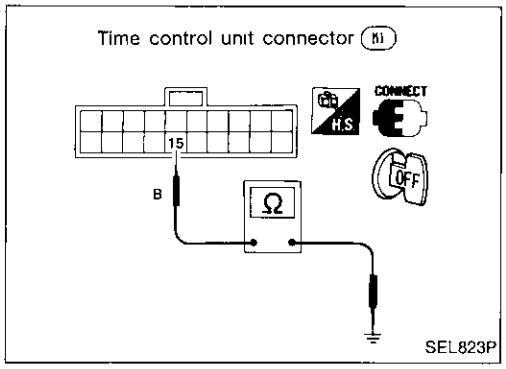
- **Seat belt warning chime does not activate.**



## Trouble Diagnoses (Cont'd)

### MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK




### Main power supply

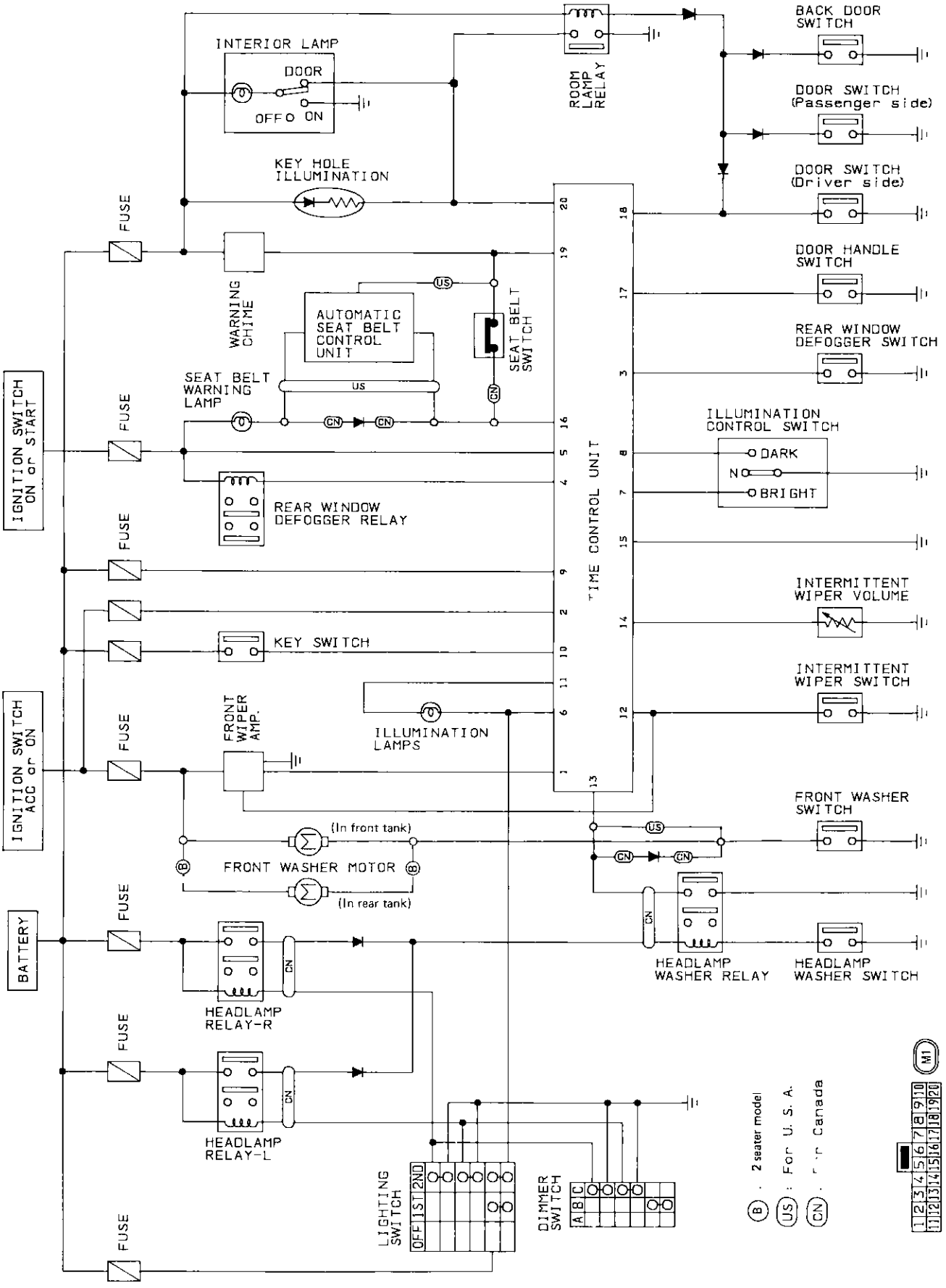
| Terminals | Battery voltage existence condition | | |
|---|---|---|---|
| | Ignition switch position | | |
| | OFF | ACC | ON |
| ⑨ - ⑮ | Yes | Yes | Yes |
| ⑤ - ⑮ | No | No | Yes |
| ② - ⑮ | No | Yes | Yes |

### Ground circuit

| Terminals | Continuity |
|---|---|
| ⑮ - Ground | Yes |

## Trouble Diagnoses (Cont'd)

### CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



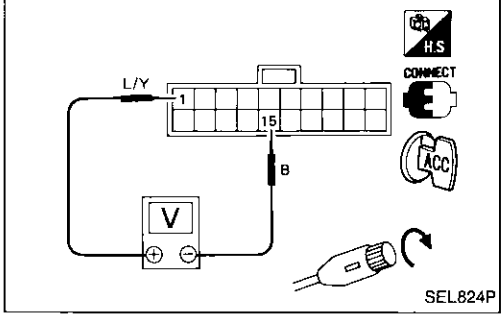

SEL933P

## Trouble Diagnoses (Cont'd)

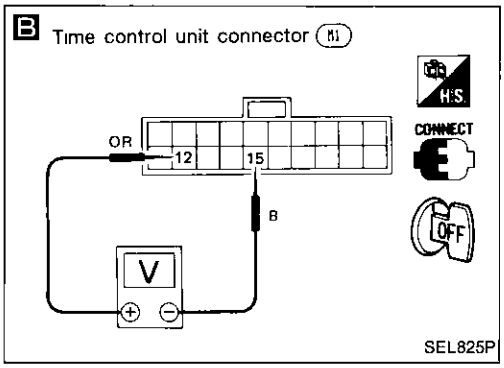
### DIAGNOSTIC PROCEDURE 1

**SYMPTOM: Intermittent wiper does not operate.**

A Time control unit connector (M1)




B Time control unit connector (M1)




A

WIPER RELAY OUTPUT SIGNAL CHECK
1) Turn ignition switch to "ACC".
2) Turn wiper switch to "INT" or "OFF".
3) Measure voltage between control unit harness terminals ① and ⑮.

| Condition of wiper switch | Voltage [V] |
|---|---|
| OFF | Approx. 12 |
| INT | Pointer swings from 0 to 12 every 3 to 23 seconds |

O.K. → Check wiper amp. Refer to "WIPER AND WASHER".
- O.K. → Check wiper amp. circuit.
- N.G. → Replace wiper amp.

N.G. ↓

B

INTERMITTENT SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑫ and ⑮.

| Condition of wiper switch | Voltage [V] |
|---|---|
| OFF | Approx. 12 |
| INT | 0 |

N.G. → Check wiper switch. Check harness continuity between T.C.U. and wiper switch.

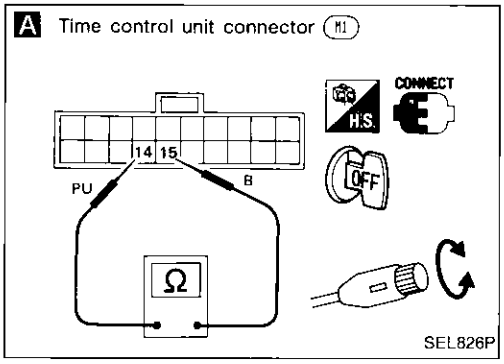
O.K. ↓

Replace control unit.

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 2

**SYMPTOM: Intermittent time of wiper cannot be adjusted.**




A

INTERMITTENT WIPER VOLUME INPUT SIGNAL CHECK

Measure resistance between control unit harness terminals ⑭ and ⑮ while turning intermittent wiper volume.

| Position of wiper knob | Resistance [Ω] |
|---|---|
| S | 0 |
| L | Approx. 1 k |

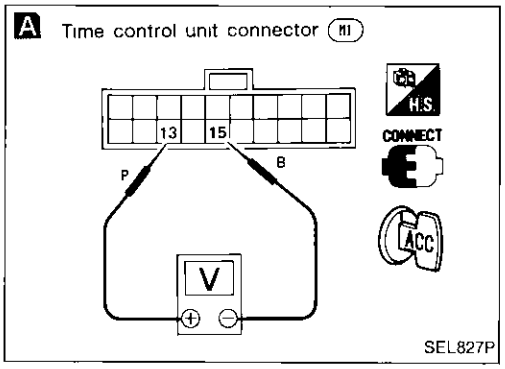
O.K. → Replace control unit.

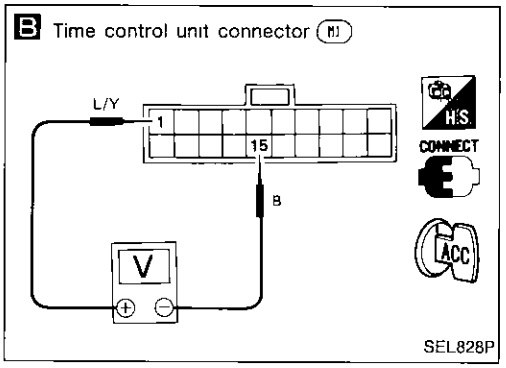
N.G. →

Check intermittent wiper volume.
Check harness continuity between T.C.U. and wiper switch.

### DIAGNOSTIC PROCEDURE 3

**SYMPTOM: Wiper and washer activate individually but not in combination.**




A

WASHER SWITCH INPUT SIGNAL CHECK

1) Turn ignition switch to "ACC".
2) Measure voltage between control unit harness terminals ⑬ and ⑮.

| Condition of washer switch | Voltage [V] |
|---|---|
| OFF | Approx. 12 |
| ON | 0 |

N.G. → Check harness continuity between T.C.U. and washer switch.

O.K. ↓

B

WIPER AMP. OUTPUT SIGNAL CHECK

Measure voltage between control unit harness terminals ① and ⑮ after operating washer switch.

**0V for approx. 3 seconds after washer has operated.**

N.G. → Replace control unit.

O.K. ↓

Replace wiper amp.

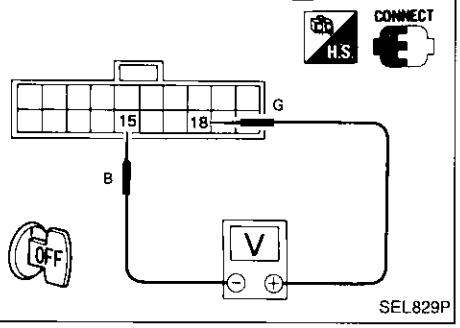
## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 4

**SYMPTOM: Light warning chime does not activate.**

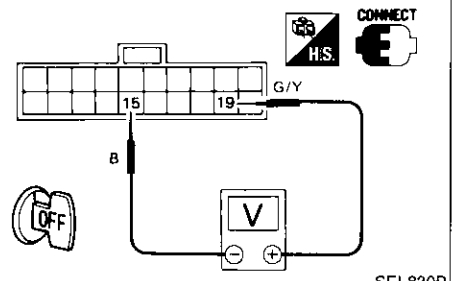
- Perform "PRELIMINARY CHECK — Procedure 1" before referring to the following flow chart.

A Time control unit connector (M1)



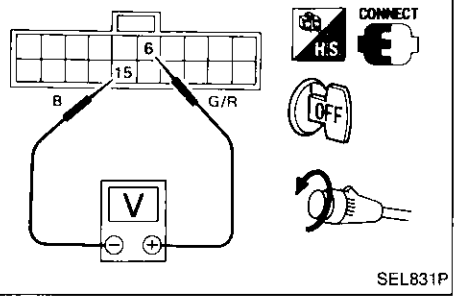

SEL829P

B Time control unit connector (M1)




SEL830P

C Time control unit connector (M1)




SEL831P

**A** Step 3

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑱ and ⑮.

| Condition of driver's door | Voltage [V] |
|---|---|
| Door is closed | Approx. 12 |
| Door is open | 0 |

N.G. → Check door switch. Check harness continuity between T.C.U. and door switch.

O.K. ↓

**B** Step 2

CHIME OUTPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑲ and ⑮.

| Condition of driver's door | Voltage [V] |
|---|---|
| Door is closed | Approx. 12 |
| Door is open | Pointer deflects intermittently |

O.K. → Check chime. Check harness continuity between T.C.U. and chime.

N.G. ↓

**C** Step 1

LIGHT SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑥ and ⑮.

| Condition | Voltage [V] |
|---|---|
| Light switch is ON | Approx. 12 |
| Light switch is OFF | 0 |

N.G. → Check light switch. Check harness continuity between T.C.U. and light switch.

O.K. ↓

Replace control unit.

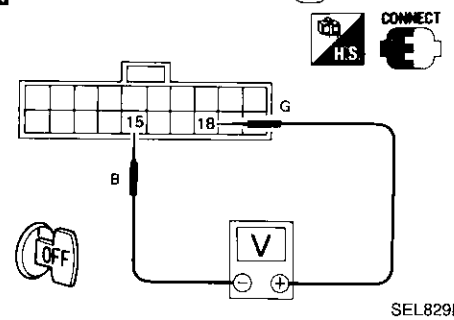
## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 5

**SYMPTOM: Ignition key warning chime does not activate.**

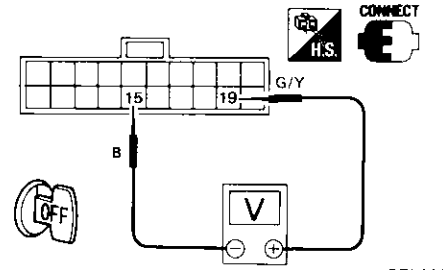
- Perform "PRELIMINARY CHECK — Procedure 2" before referring to the following flow chart.

A Time control unit connector (M1)



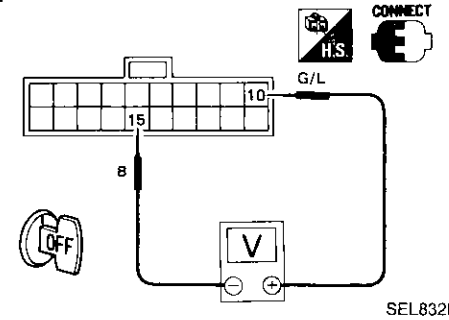

SEL829P

B Time control unit connector (M1)




SEL830P

C Time control unit connector (M1)




SEL832P

A

Step 3

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑱ and ⑮.

| Condition of driver's door | Voltage [V] |
|---|---|
| Door is closed | Approx. 12 |
| Door is open | 0 |

N.G. → Check door switch. Check harness continuity between T.C.U. and door switch.

O.K. ↓

B

Step 2

CHIME OUTPUT SIGNAL CHECK
Measure voltage between control unit harness between ⑲ and ⑮.

| Condition of driver's door | Voltage [V] |
|---|---|
| Door is closed | Approx. 12 |
| Door is open | Pointer deflects intermittently |

N.G. → Check chime. Check harness continuity between T.C.U. and chime.

N.G. ↓

C

Step 1

IGNITION KEY SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑩ and ⑮.

| Condition | Voltage [V] |
|---|---|
| Key is inserted | Approx. 12 |
| Key is pulled | 0 |

N.G. → Check ignition key switch. Check harness continuity between T.C.U. and ignition key switch.

O.K. ↓

Replace control unit.

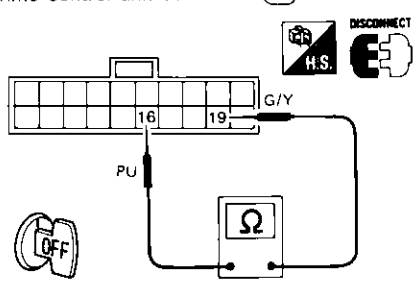
## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 6

**SYMPTOM: Seat belt warning chime does not activate.**

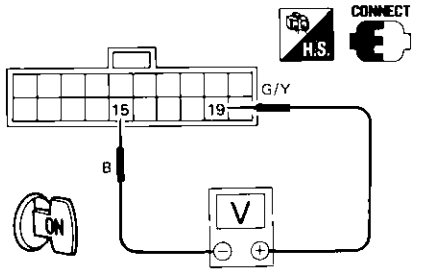
- Perform "PRELIMINARY CHECK — Procedure 3" before referring to the following flow chart.

A Time control unit connector (M1)




SEL833P

B Time control unit connector (M1)




SEL834P

A

Step 2

SEAT BELT SWITCH INPUT SIGNAL CHECK

Check continuity between control unit harness terminals ⑯ and ⑲.

| Condition | Continuity |
|---|---|
| Unfastened | Yes |
| Fastened | No |

N.G. → Check seat belt switch. Check harness continuity between T.C.U. and seat belt switch.

O.K. ↓

B

Step 1

CHIME OUTPUT SIGNAL CHECK

1) Connect T.C.U. harness connector.
2) Turn ignition switch "ON".
3) Measure voltage between control unit harness terminals ⑲ and ⑮.

| Condition of seat belt | Voltage [V] |
|---|---|
| Unfastened | Pointer deflects intermittently |
| Fastened | Approx. 12 |

O.K. → Check chime. Check harness continuity between T.C.U. and chime.

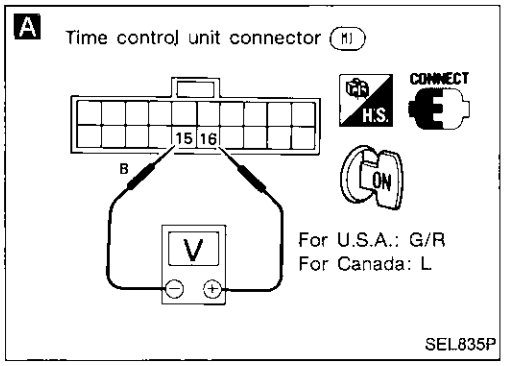
N.G. ↓

Replace control unit.

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 7

**SYMPTOM: Seat belt warning lamp does not come on, or does not go off after coming on.**




A

WARNING LAMP OUTPUT SIGNAL CHECK
1) Connect T.C.U. harness connector.
2) Turn ignition switch "ON", after connecting control unit harness terminals ⑯ and ⑮.
3) Does voltmeter needle keep swinging for about 7 seconds after ignition switch has been turned "ON"?

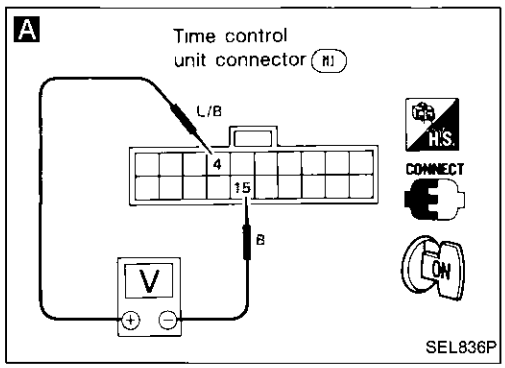
Yes → Check warning lamp. Check harness continuity between T.C.U. and warning lamp.

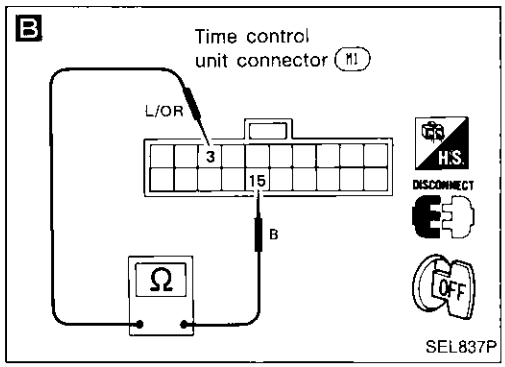
No ↓

Replace control unit.

### DIAGNOSTIC PROCEDURE 8

**SYMPTOM: Rear defogger does not activate, or does not go off after activating.**




A

REAR WINDOW DEFOGGER OUTPUT SIGNAL CHECK
Measure voltage between control unit harness ④ and ⑮.

| Condition of defogger switch | Voltage [V] |
|---|---|
| Defogger switch is "OFF" | Approx. 12 |
| Defogger switch is "ON" | 0 |

O.K. → Check rear window defogger relay. Check rear window defogger circuit.

N.G. ↓

B

REAR WINDOW DEFOGGER SWITCH INPUT SIGNAL CHECK
1) Disconnect T.C.U. harness connector.
2) Check continuity between control unit harness terminals ③ and ⑮.

| Condition of defogger switch | Continuity |
|---|---|
| Defogger switch is "OFF" | No |
| Defogger switch is "ON" | Yes |

N.G. → Check rear window defogger switch. Check harness continuity between T.C.U. and rear window defogger switch.

O.K. ↓

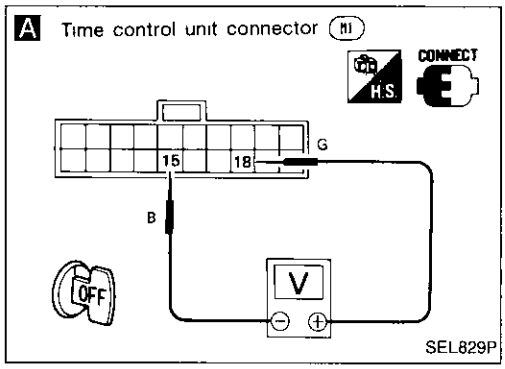
Replace control unit.

## Trouble Diagnoses (Cont'd)

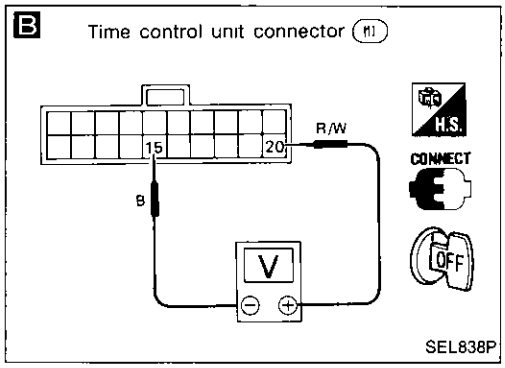
### DIAGNOSTIC PROCEDURE 9

**SYMPTOM: Interior lamp does not fade out after driver's door is closed.**

A Time control unit connector (M1)




B Time control unit connector (M1)




A

DOOR SWITCH INPUT SIGNAL CHECK
Measure voltage between control unit harness terminals ⑱ and ⑮.

| Condition of driver's door | Voltage [V] |
|---|---|
| Door is closed | Approx. 12 |
| Door is open | 0 |

N.G. → Check door switch. Check harness continuity between T.C.U. and door switch.

O.K. ↓

B

INTERIOR LAMP SIGNAL CHECK
Measure voltage between control unit harness terminals ⑳ and ⑮.

| Condition of driver's door | Voltage [V] |
|---|---|
| Door is closed | 0 → Approx. 12 |
| Door is open | 0 |

O.K. → Check interior lamp and harness between T.C.U. and interior lamp.

N.G. ↓

Replace T.C.U.

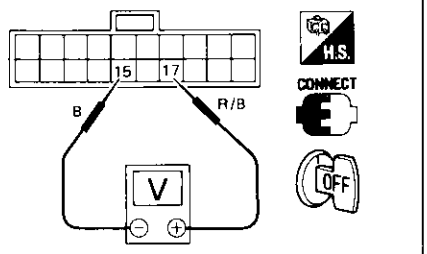
## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 10

**SYMPTOM: Door key hole illumination does not come on even if door handle is pulled.**

A

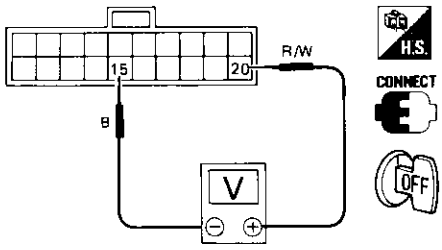
Time control unit connector (M1)




SEL839P

B

Time control unit connector (M1)




SEL838P

A

DOOR SWITCH INPUT SIGNAL CHECK

Measure voltage between control unit harness terminals ⑰ and ⑮.

| Condition of driver's handle | Voltage [V] |
|---|---|
| Handle is pulled | 0 |
| Handle is released | Approx. 12 |

N.G. → Check door handle switch. Check harness continuity between T.C.U. and door handle switch.

O.K. ↓

B

KEY HOLE ILLUMINATION SIGNAL CHECK

Measure voltage between control unit harness terminals ⑳ and ⑮.

| Condition of driver's door | Voltage [V] |
|---|---|
| Door is closed | 0 → Approx. 12 |
| Door is open | 0 |

O.K. → Check key hole illumination and harness between T.C.U. and key hole illumination.

N.G. ↓

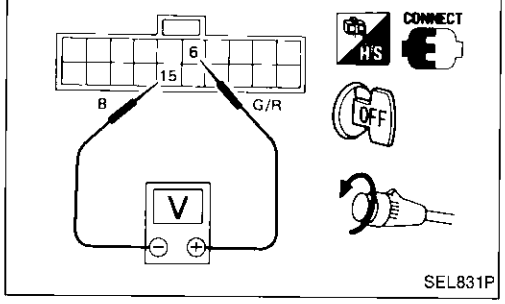
Replace T.C.U.

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 11

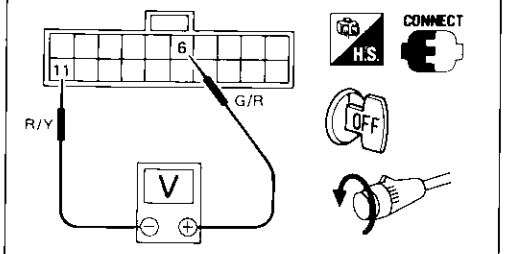
**SYMPTOM: Illumination control does not actuate.**

A Time control unit connector (M1)



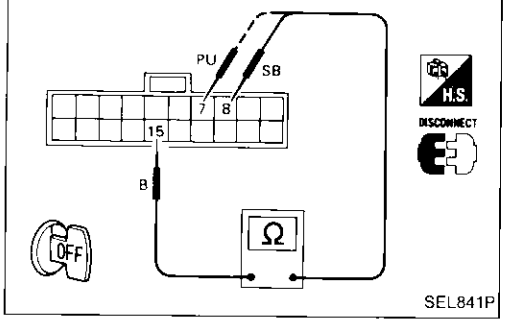

SEL831P

B Time control unit connector (M1)




SEL840P

C Time control unit connector (M1)




SEL841P

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.

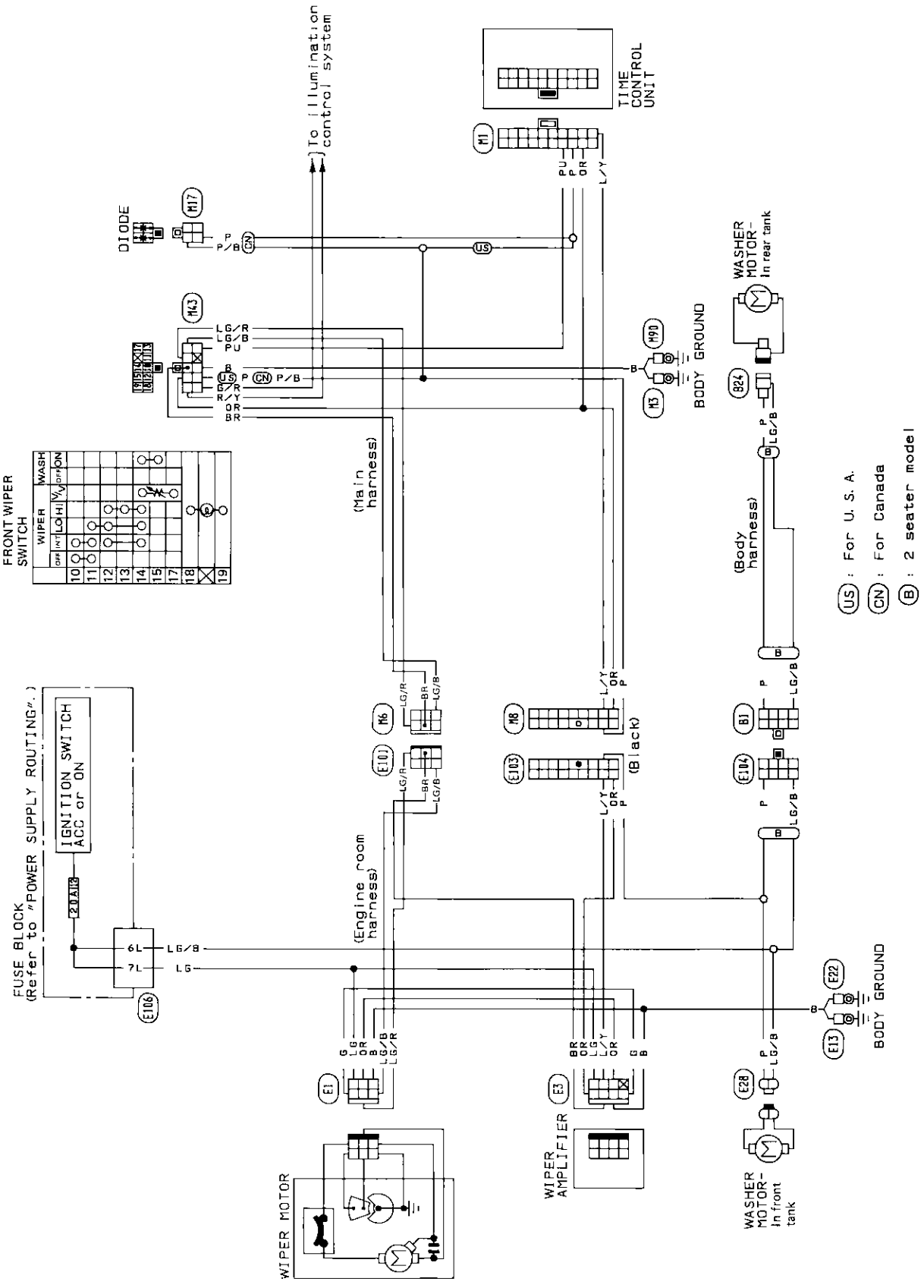
| Terminals | | Illumination control switch condition | Resistance [Ω] |
|---|---|---|---|
| 8 | 15 | DARK | 0 |
| | | BRIGHT | Except 0 |
| 7 | 15 | DARK | Except 0 |
| | | BRIGHT | 0 |

N.G. → Check illumination control switch.
Check harness continuity between T.C.U. and illumination switch.

O.K. ↓

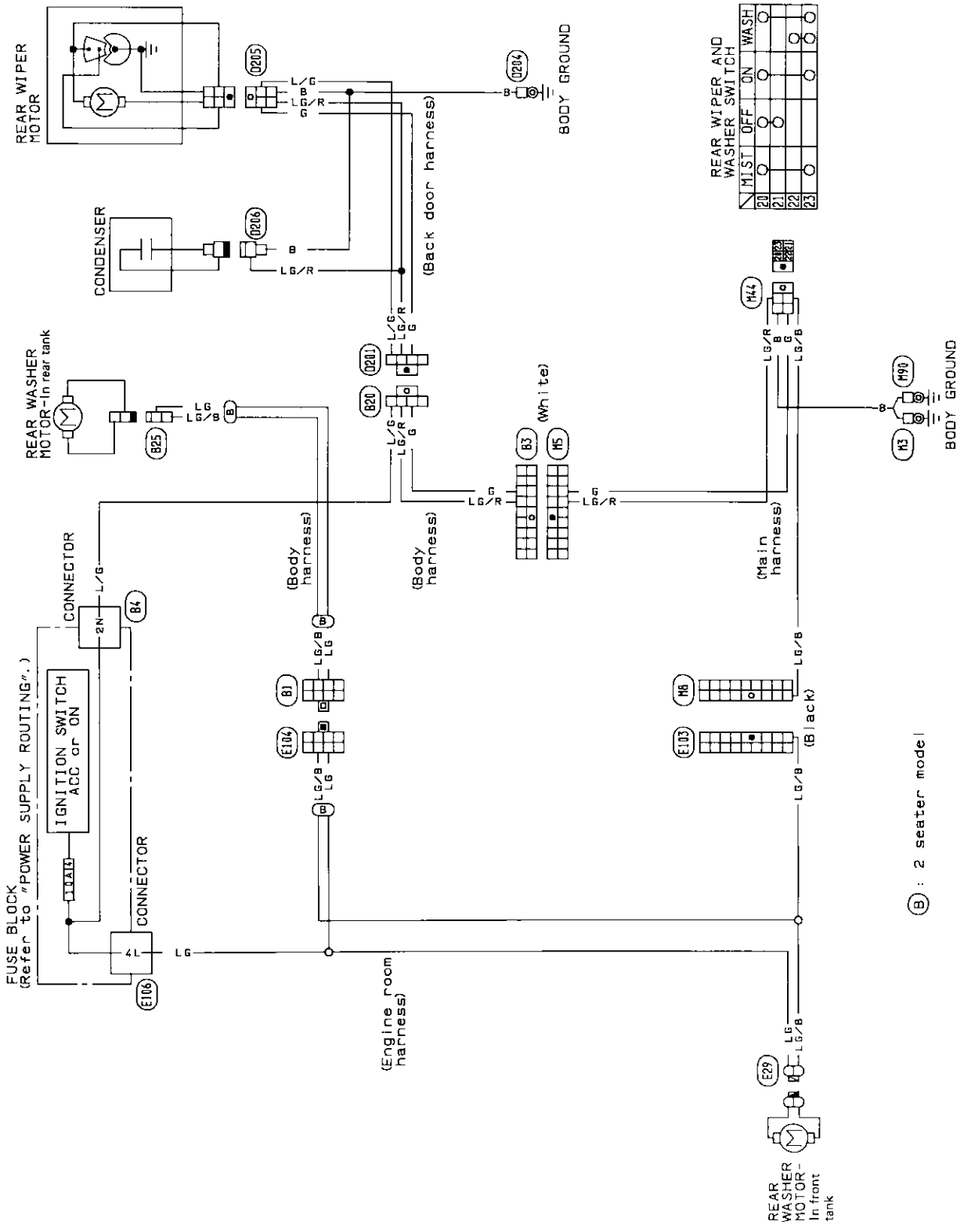
Replace T.C.U.

## Front Wiper and Washer/Wiring Diagram



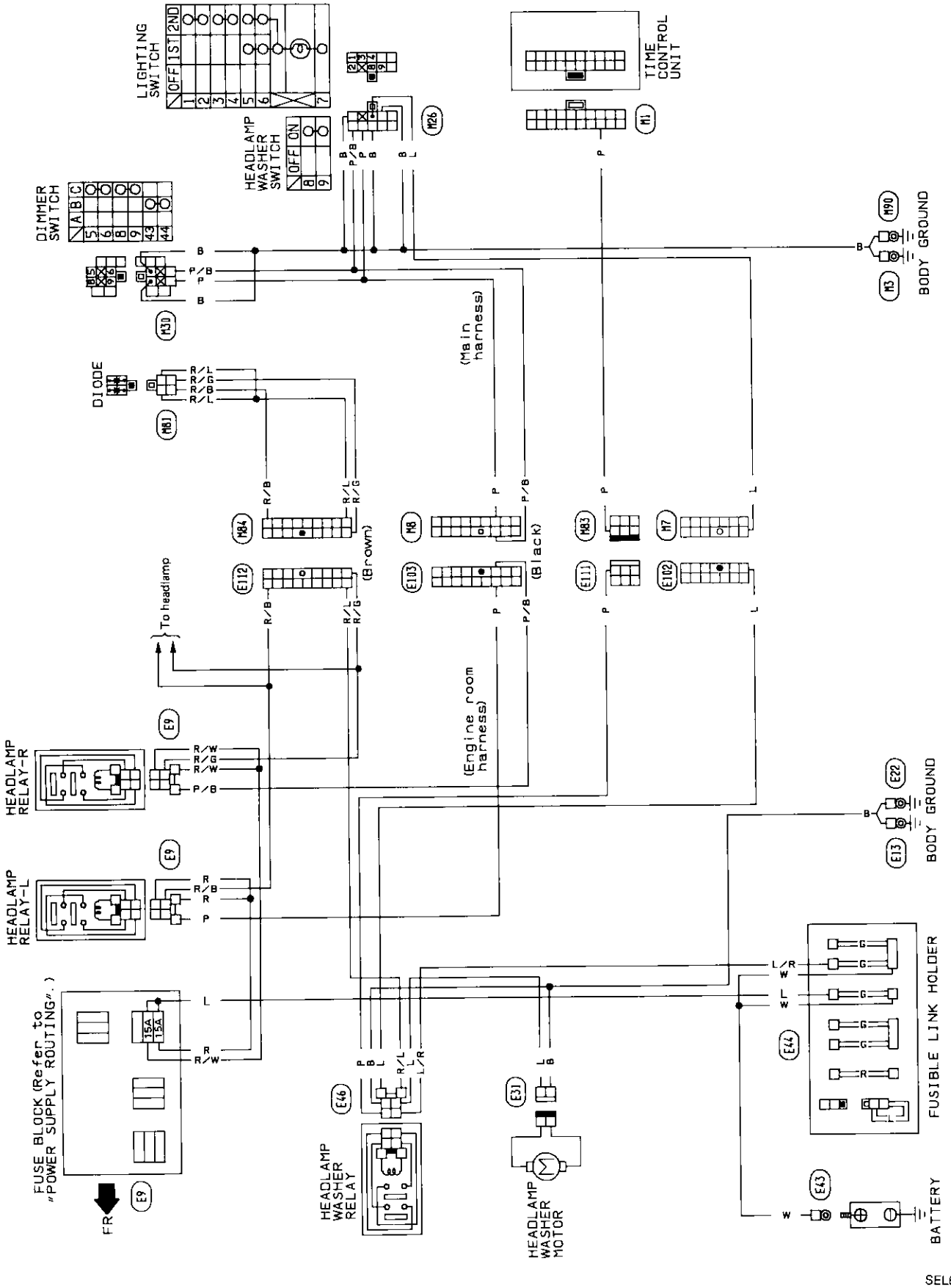

SEL692Q

## Rear Wiper and Washer/Wiring Diagram




SEL546N

## Headlamp Washer/Wiring Diagram



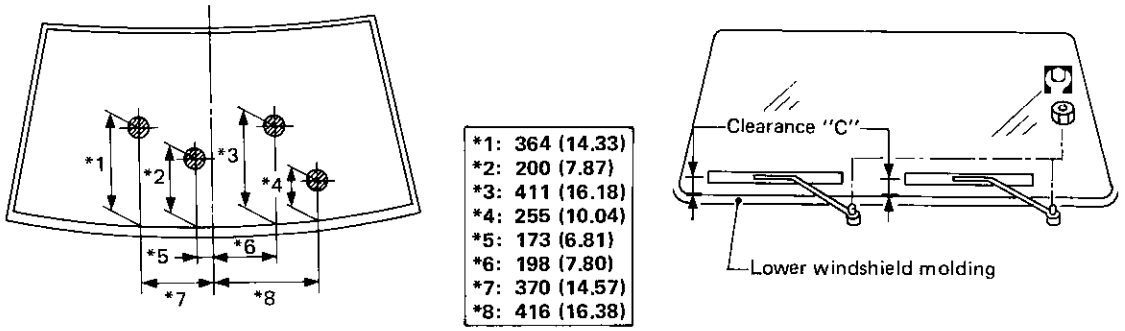

SEL693Q

## Installation

1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance "C" or "D" immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "C" or "D".
   **Clearance "C": 0 - 10 mm (0 - 0.39 in)**
   **Clearance "D": 73 - 88 mm (2.87 - 3.46 in)**

- Tighten windshield wiper arm nuts to specified torque.
  **Front wiper:**
  **: 26 - 32 N·m (2.7 - 3.3 kg-m, 20 - 24 ft-lb)**
  **Rear wiper:**
  **: 13 - 18 N·m (1.3 - 1.8 kg-m, 9 - 13 ft-lb)**

**Front wiper and washer**



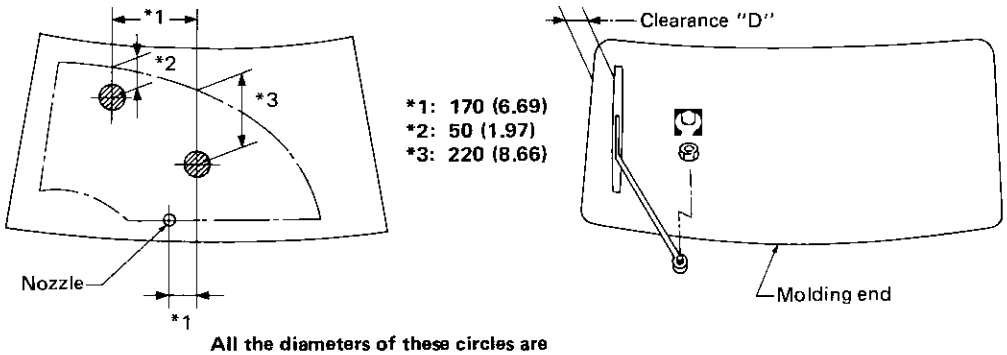

***1: 364 (14.33)**
***2: 200 (7.87)**
***3: 411 (16.18)**
***4: 255 (10.04)**
***5: 173 (6.81)**
***6: 198 (7.80)**
***7: 370 (14.57)**
***8: 416 (16.38)**

**All the diameters of these circles are less than 80 (3.15).**

Unit: mm (in)

SEL025N

**Rear wiper and washer**

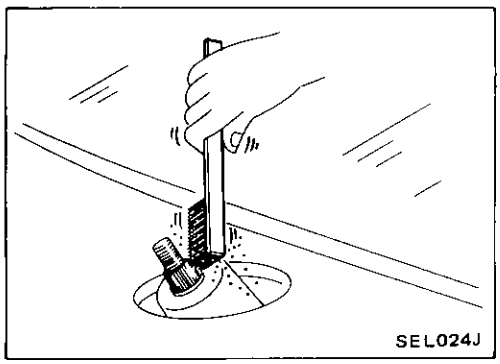



***1: 170 (6.69)**
***2: 50 (1.97)**
***3: 220 (8.66)**

**All the diameters of these circles are less than 80 (3.15).**

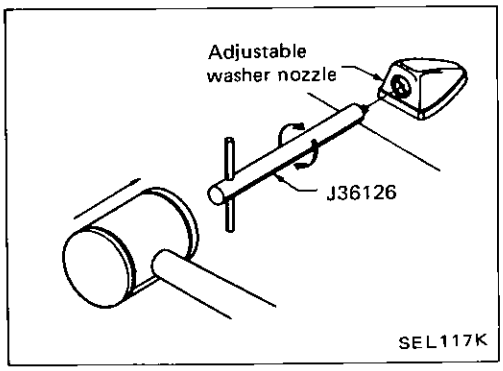
Unit: mm (in)

SEL026N



SEL024J

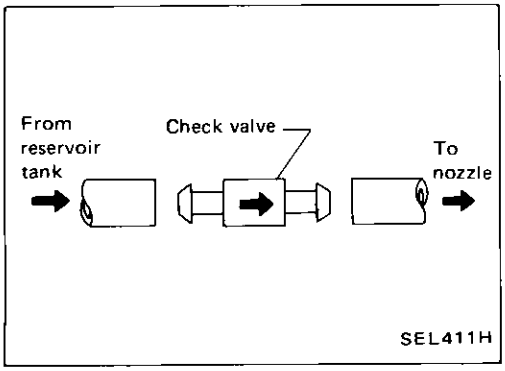
- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**




## Washer Nozzle Adjustment

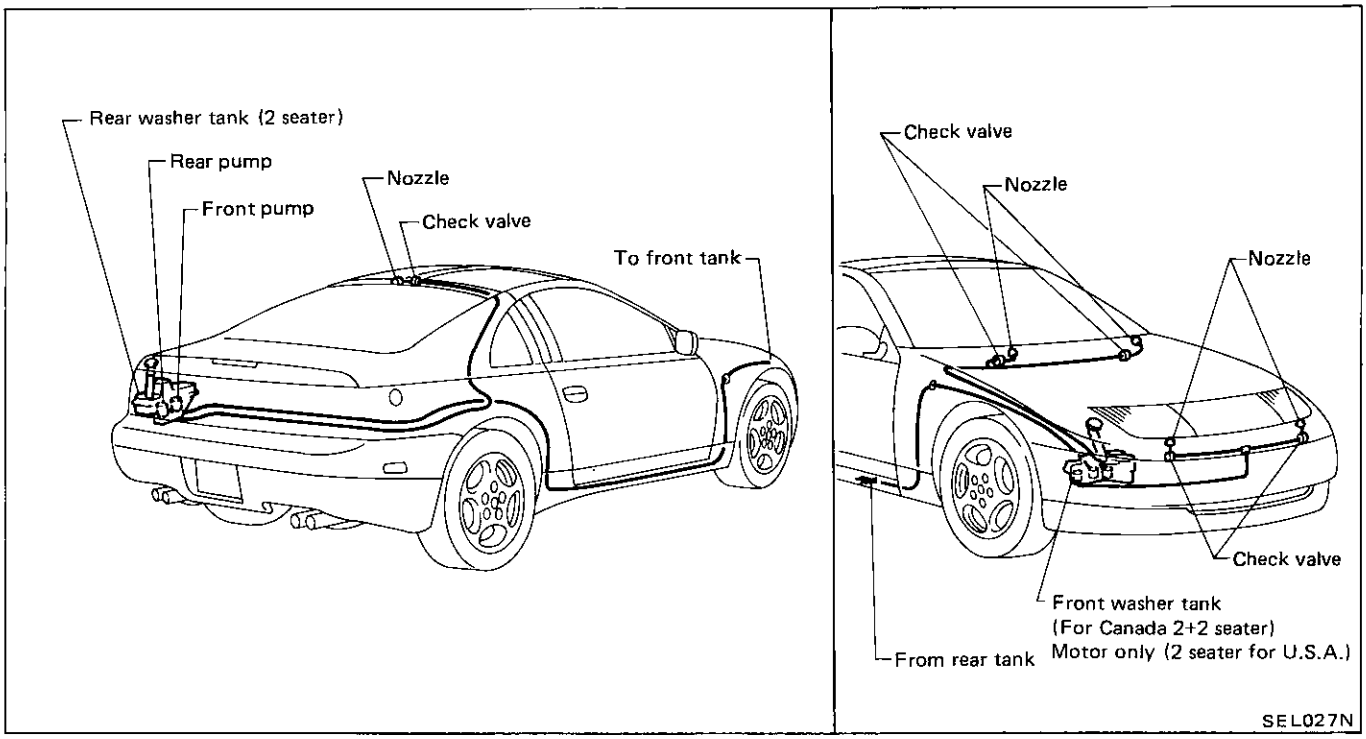
- Adjust washer nozzle with J36126 as shown in the figure at left.

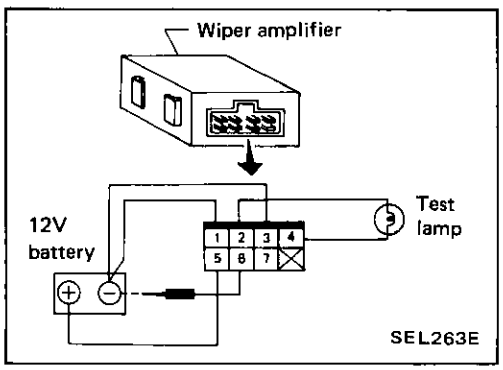
**Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle. This will prevent "rounding out" the small female square in the center of the nozzle.**




## Check Valve

- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

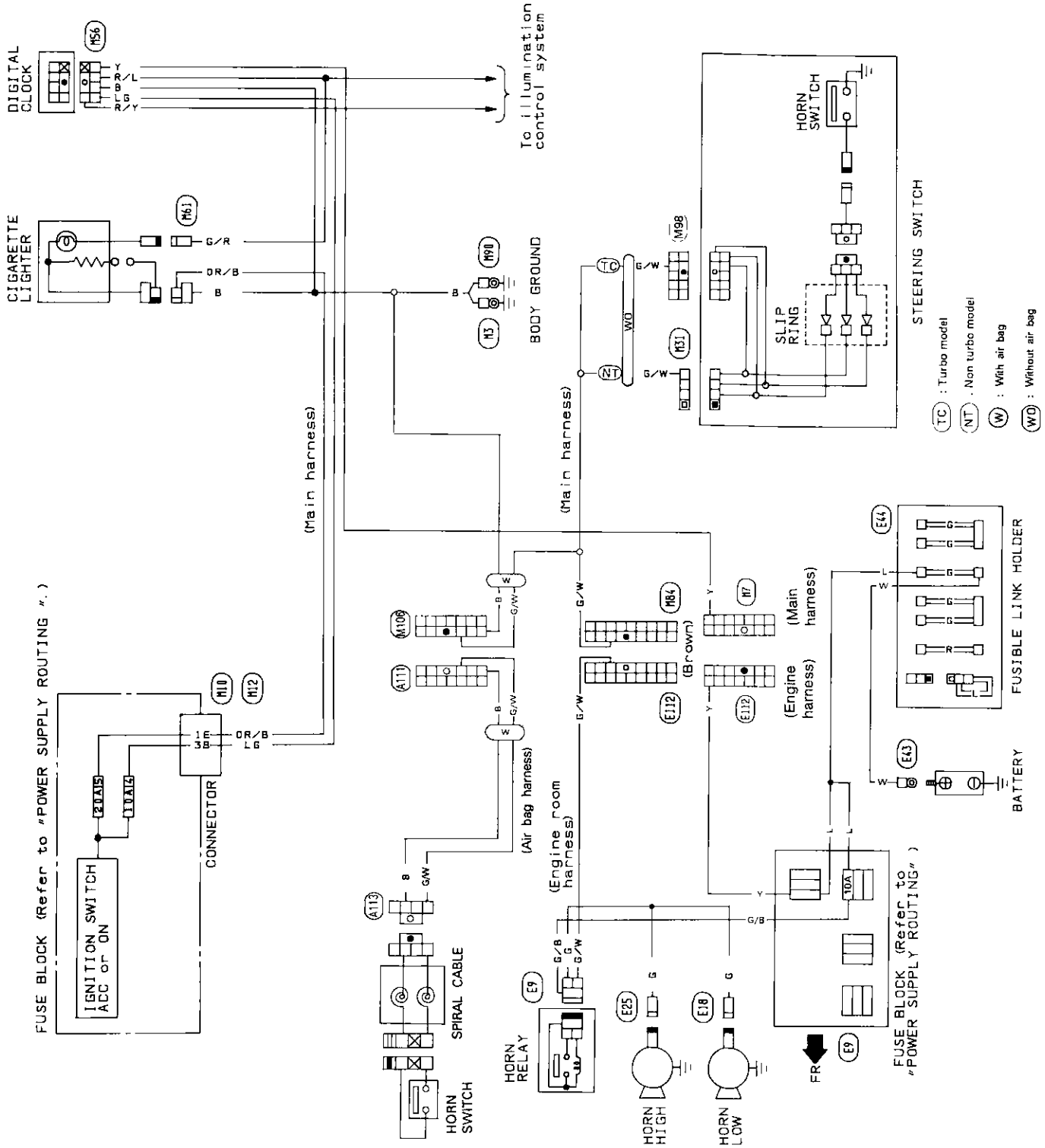



## Wiper Amplifier Check

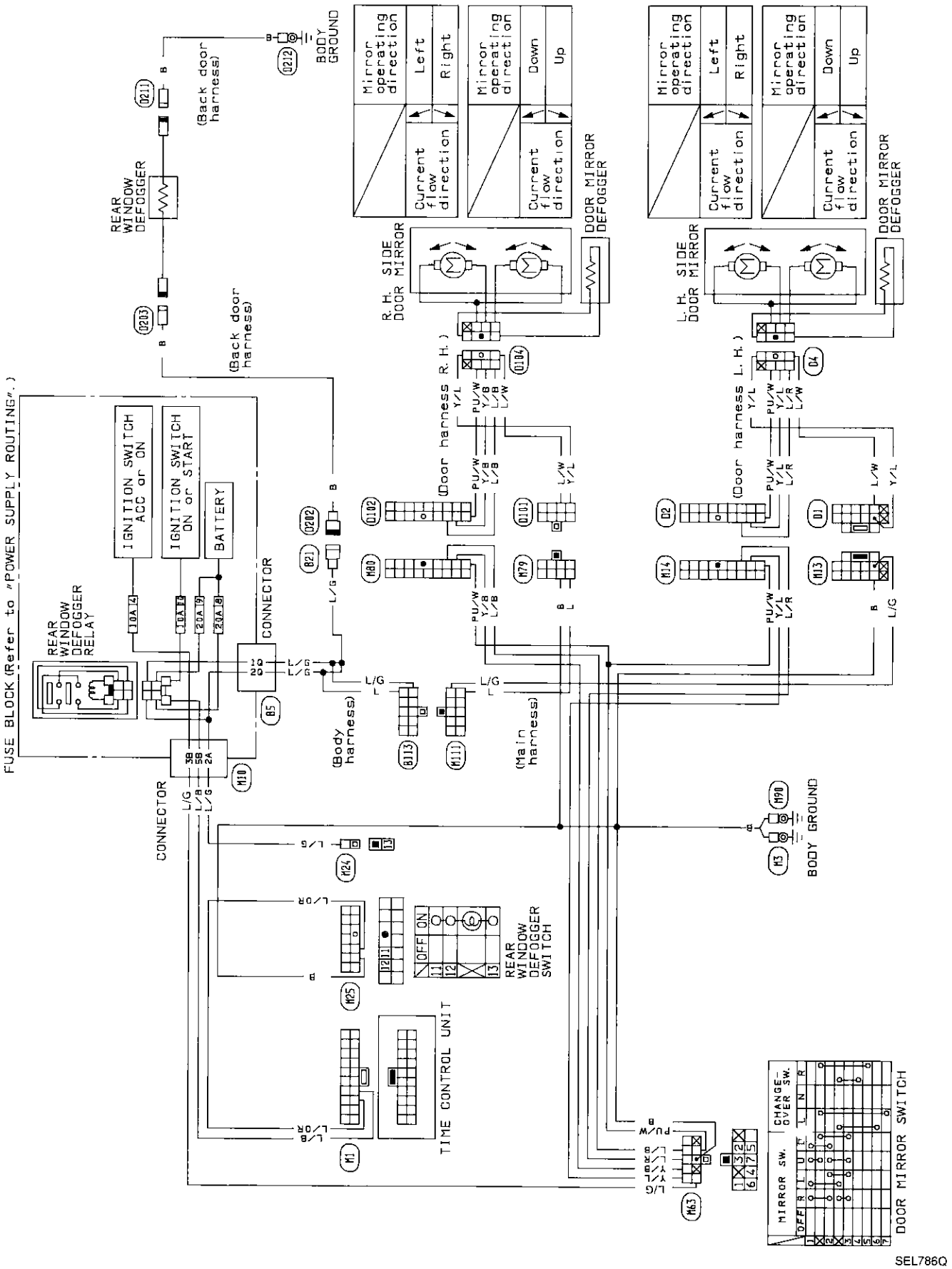
1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ⑥ and battery ground, wiper amplifier is normal.

## Wiring Diagram

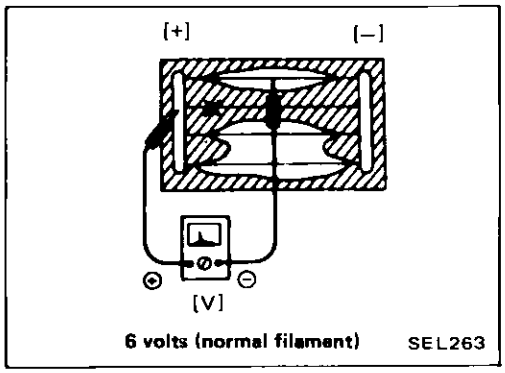



SEL694Q

## Wiring Diagram



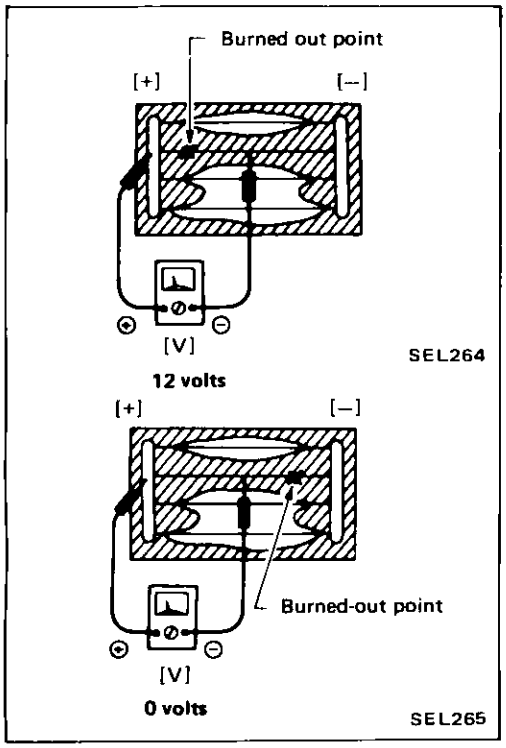

SEL786Q



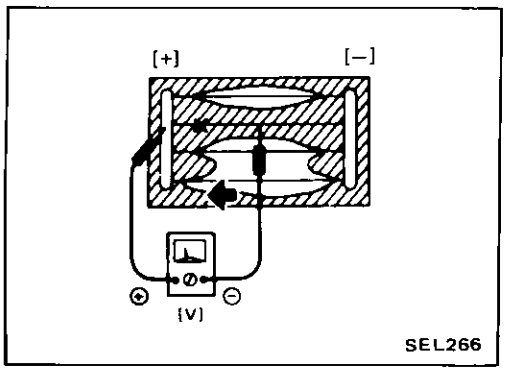

6 volts (normal filament) SEL263

## 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.

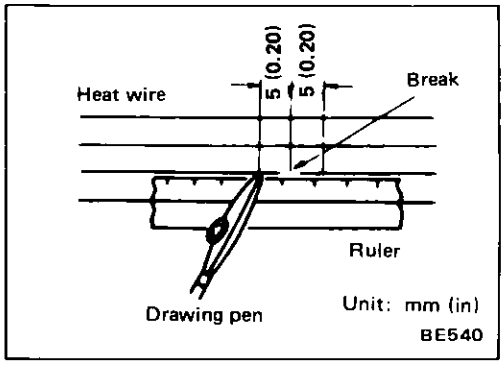



3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

## 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



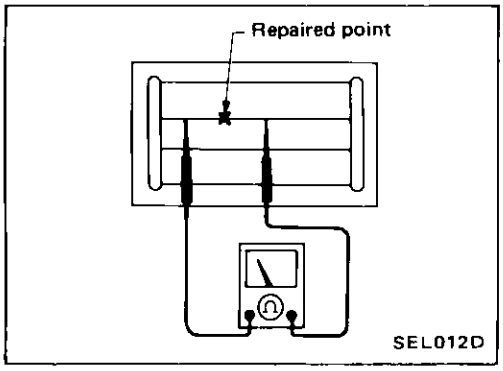

### REPAIRING PROCEDURE

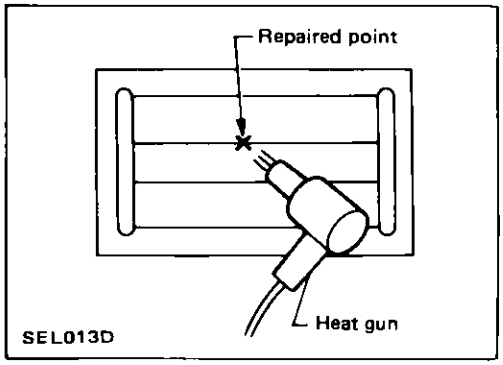
1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

**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.**

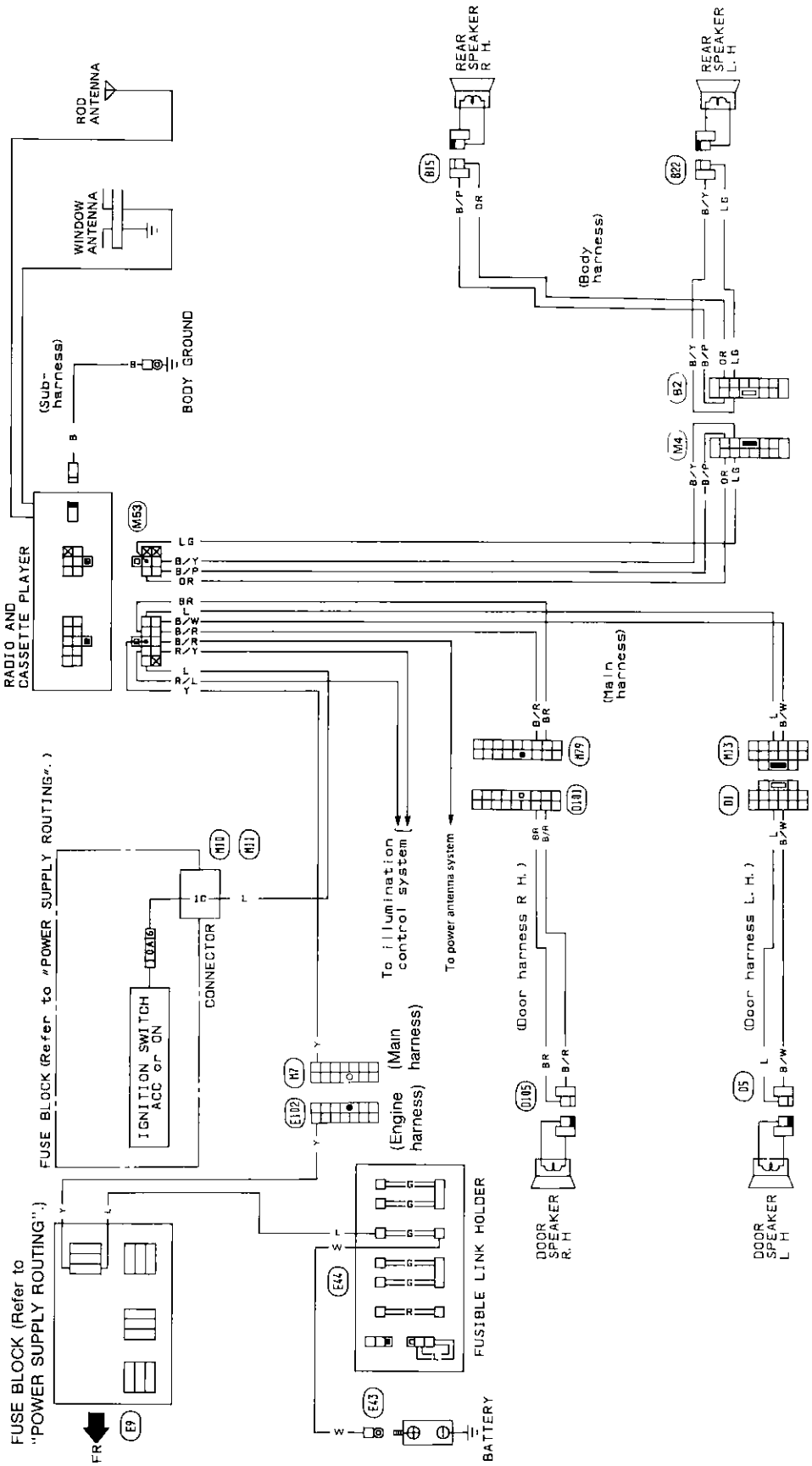



5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the
repaired area dry for 24 hours.

## Audio/Wiring Diagram

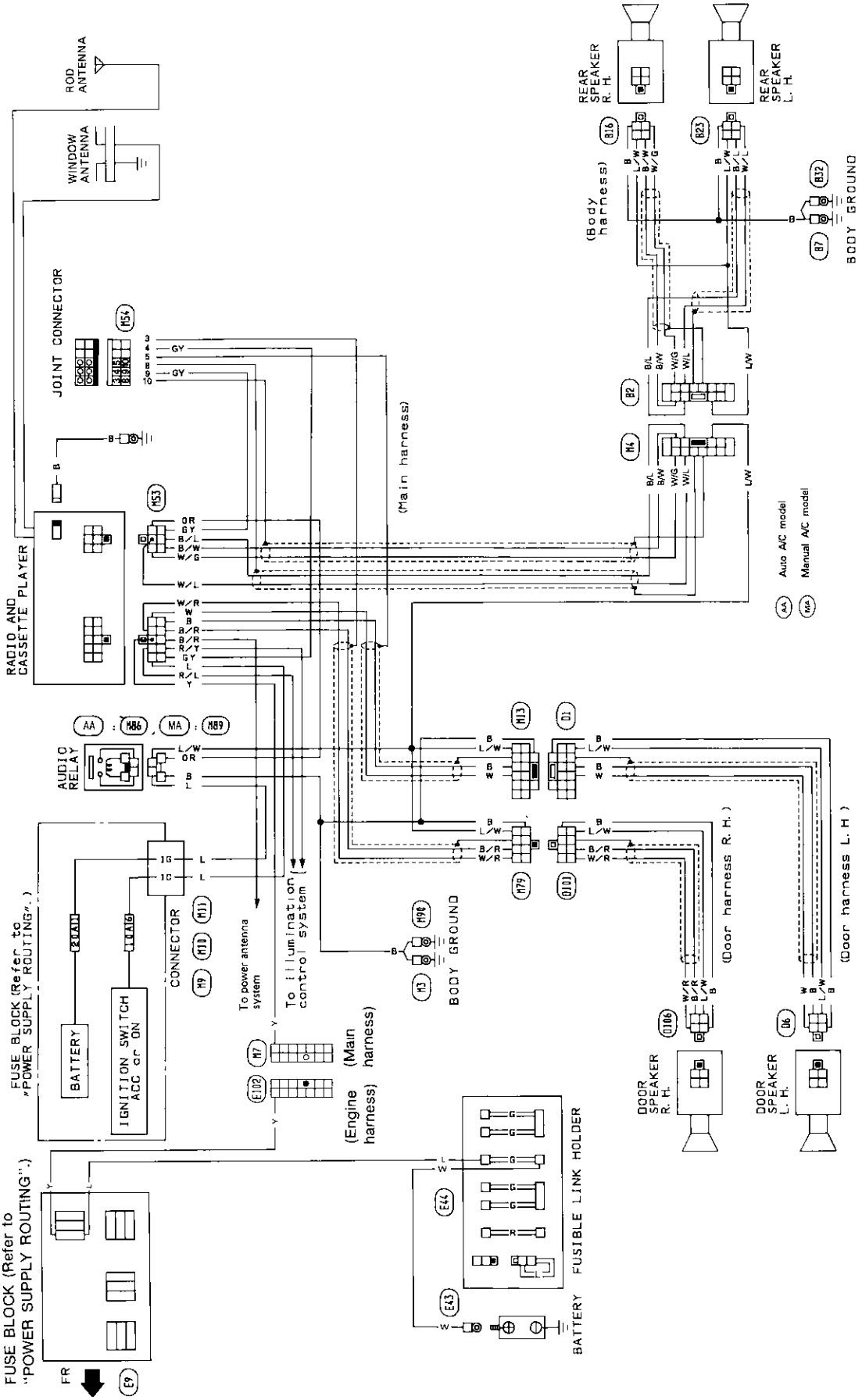
### EXCEPT BOSE SYSTEM




SEL695Q

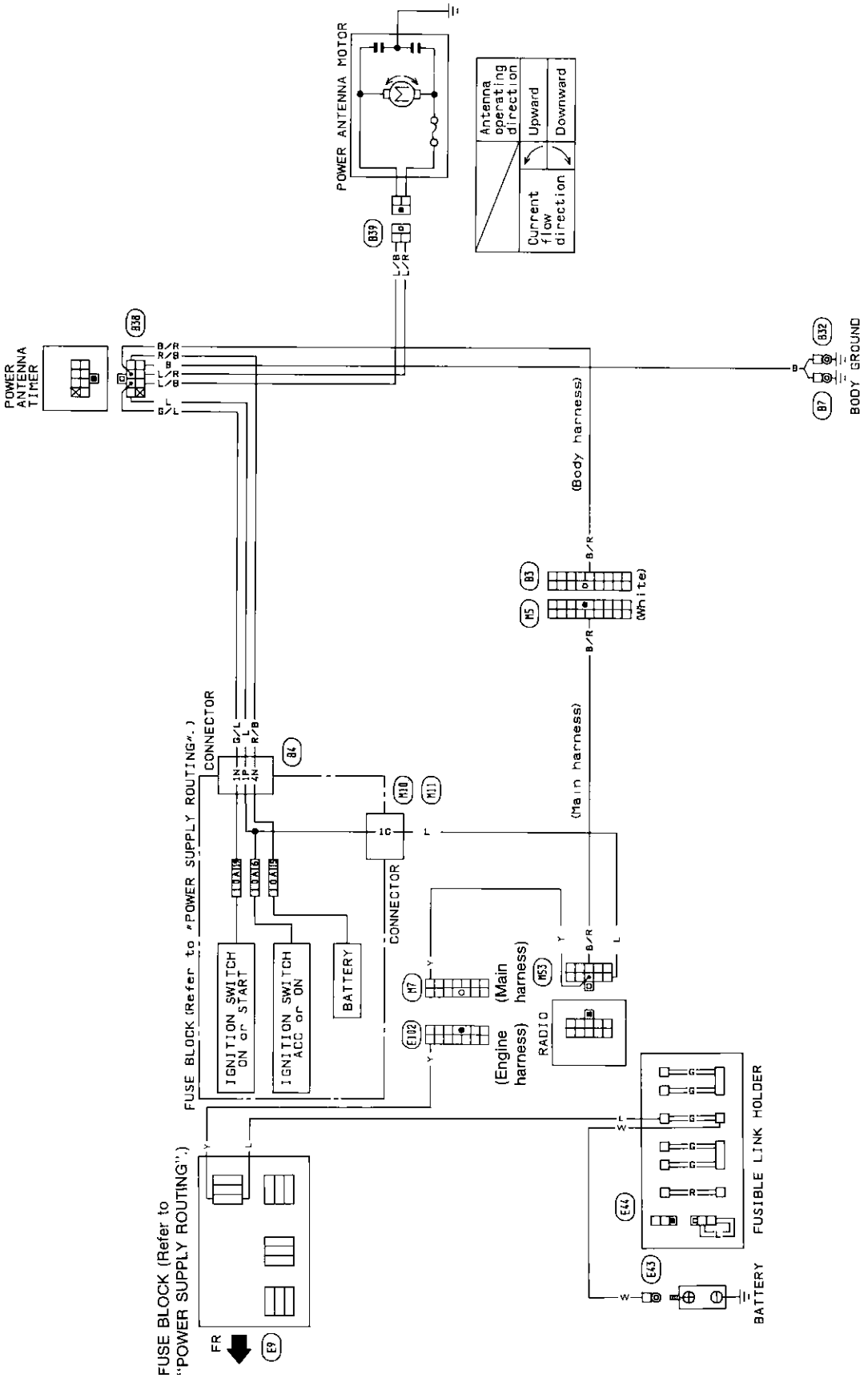
## Audio/Wiring Diagram (Cont'd)

### BOSE SYSTEM



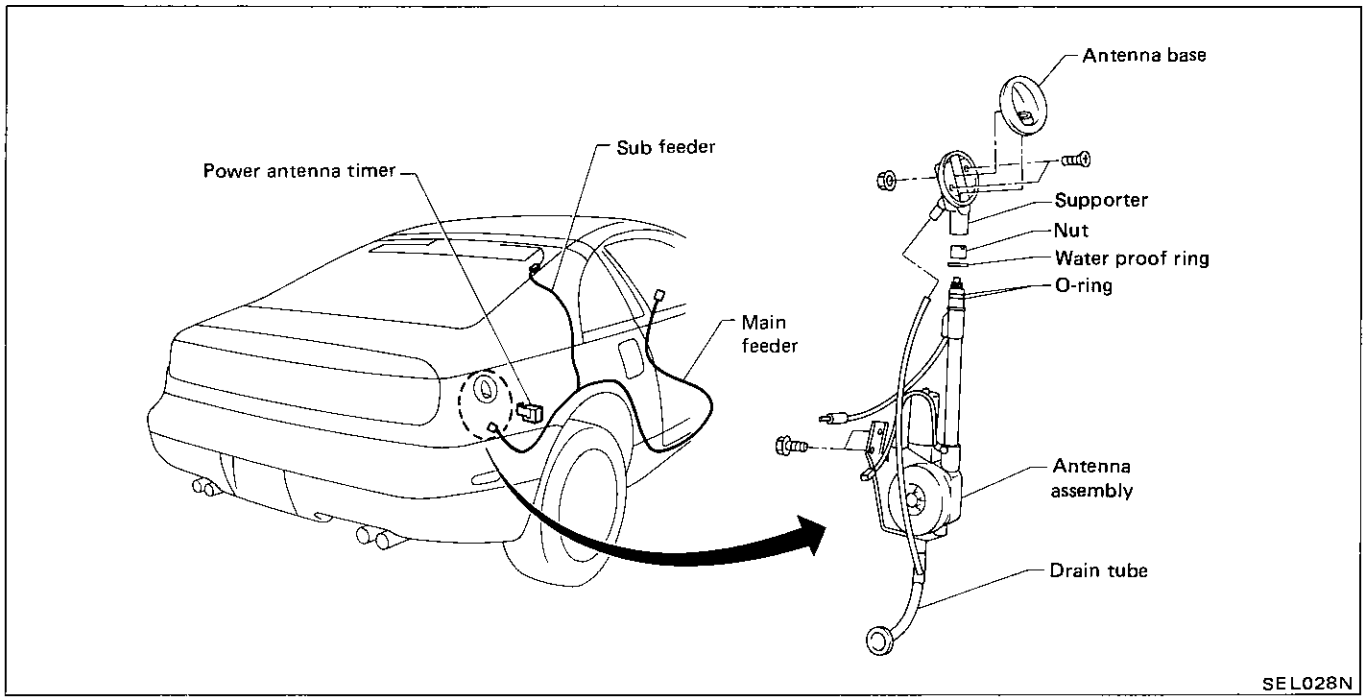

SEL696Q

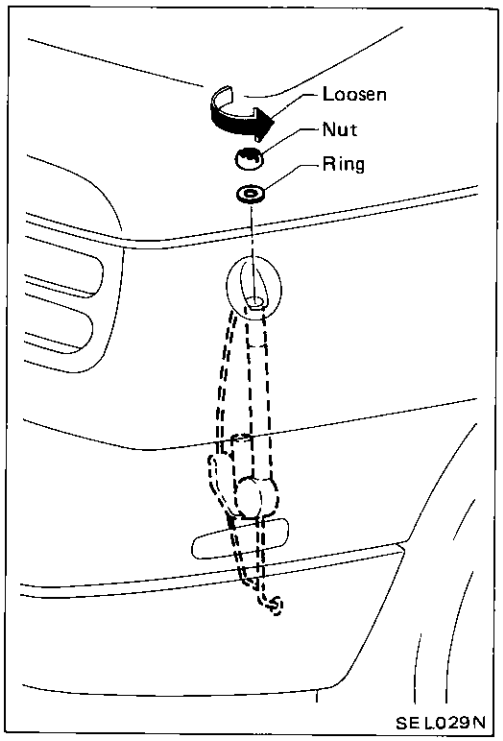
## Power Antenna/Wiring Diagram




SEL697Q

## Location of Antenna

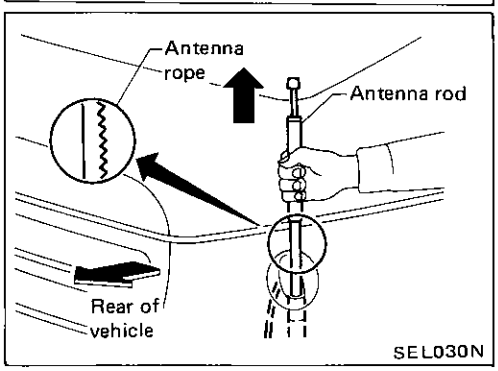



## Antenna Rod Replacement

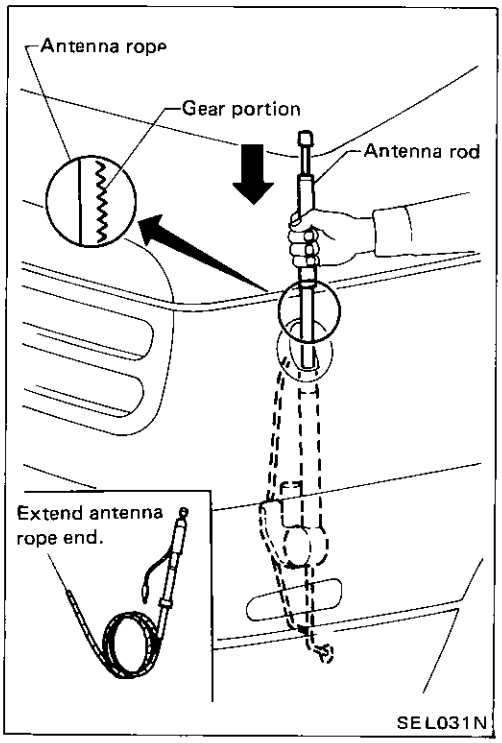
### REMOVAL

1. Remove antenna nut and antenna base.




2. Withdraw antenna rod while raising it by operating antenna motor.

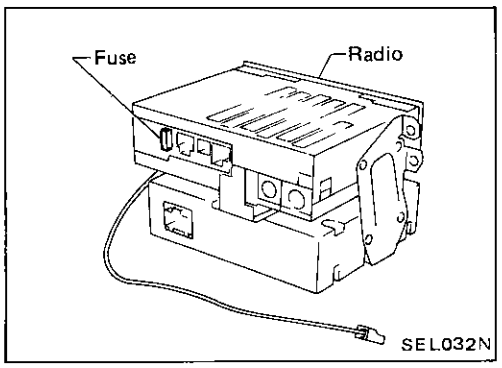
## Antenna Rod Replacement (Cont'd)

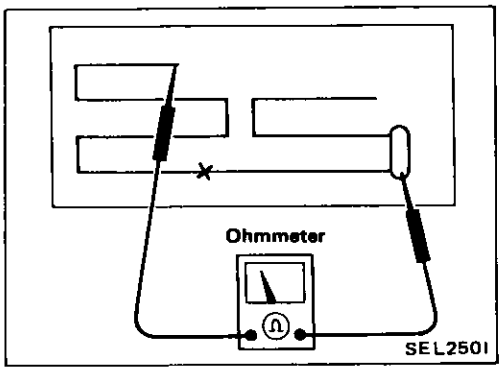



### INSTALLATION

1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.

## Radio Fuse Check

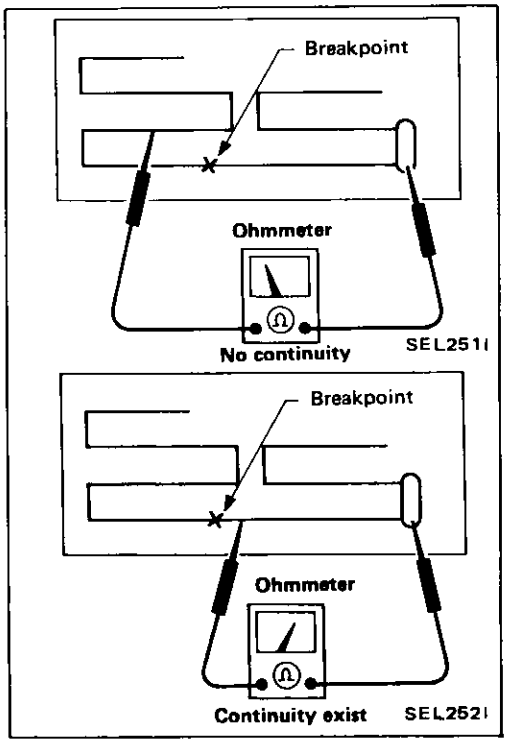




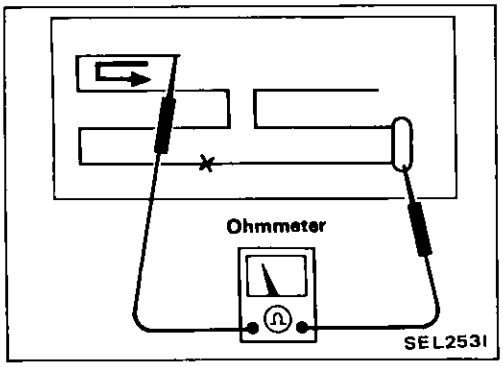

## Window Antenna Repair

### ELEMENT CHECK

1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.




2. If an element is broken, no continuity will exist.

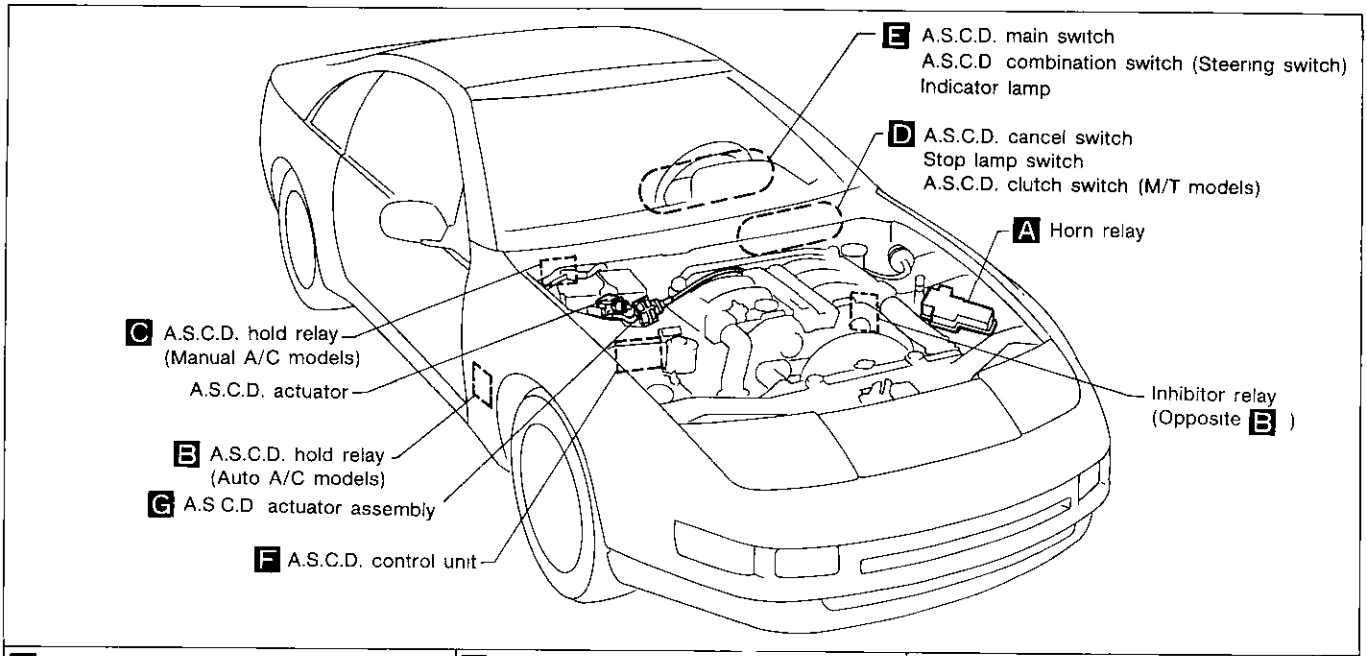


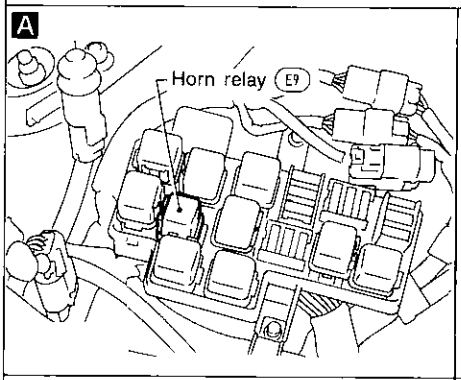

3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

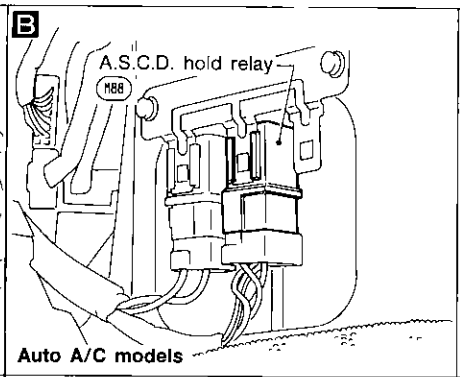
### ELEMENT REPAIR

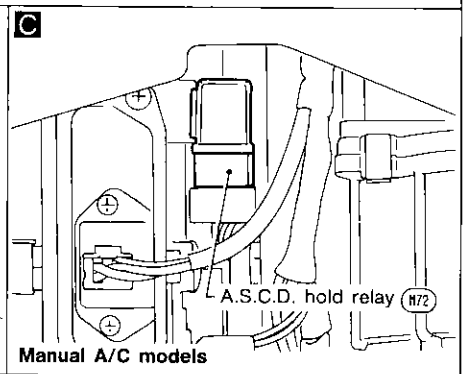
Refer to REAR WINDOW DEFOGGER "Filament Repair".

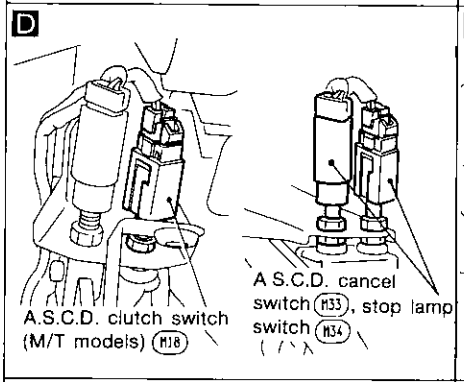
## Component Parts and Harness Connector Location

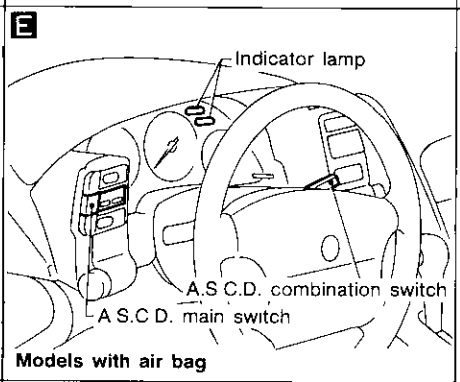


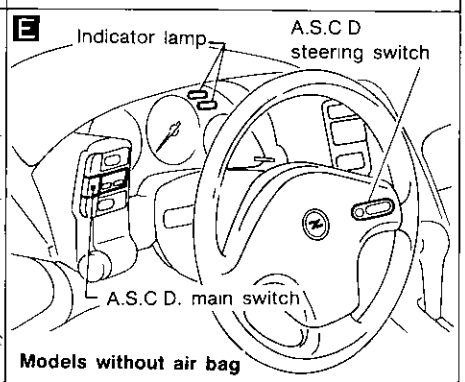



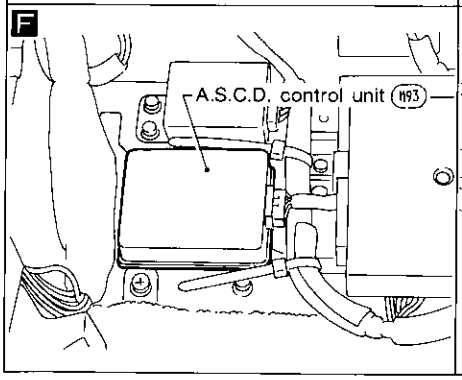



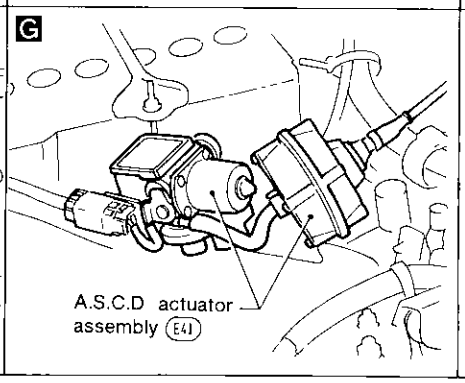



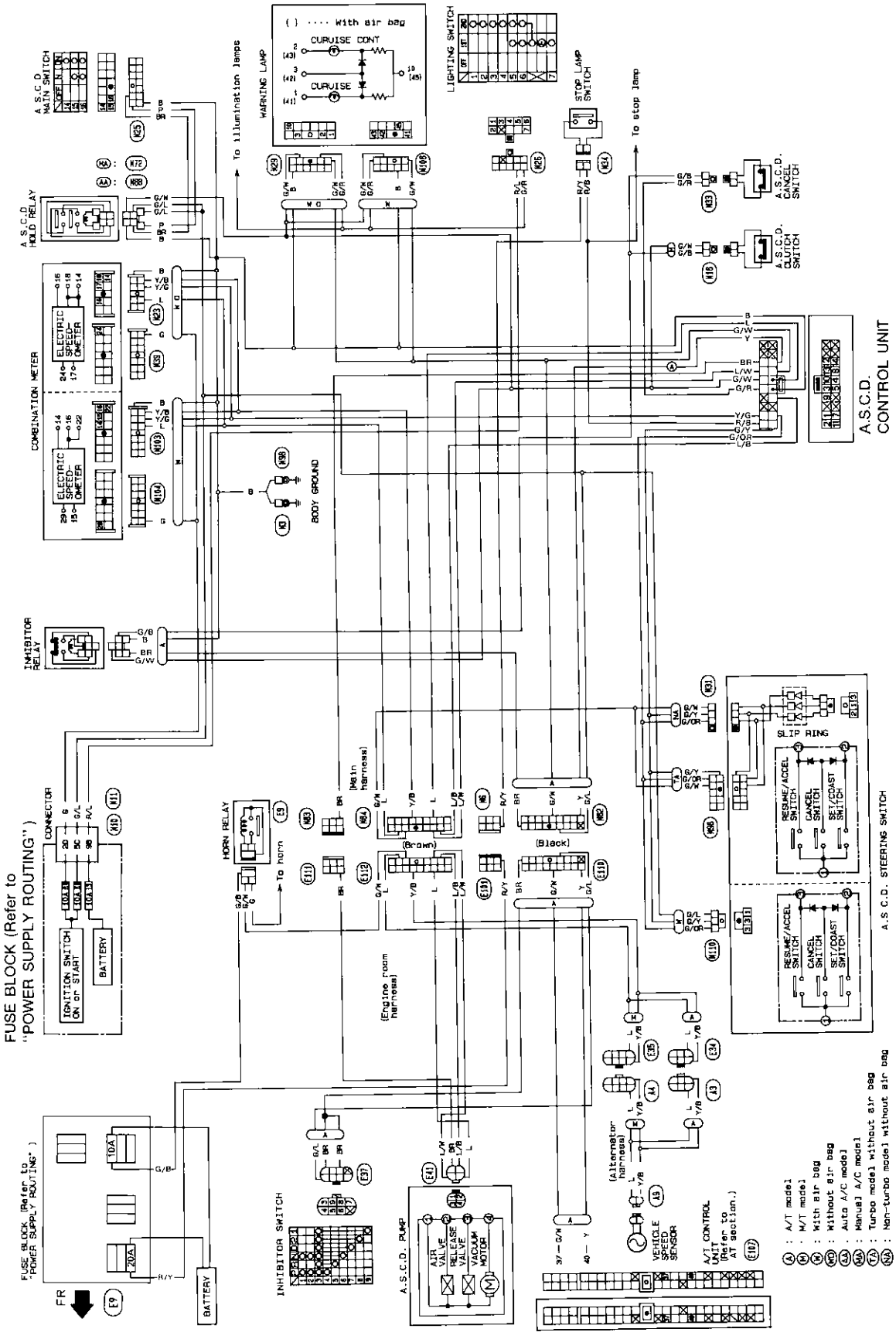



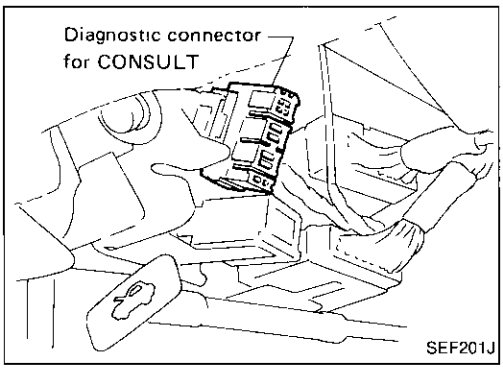




SEL714Q

## Wiring Diagram



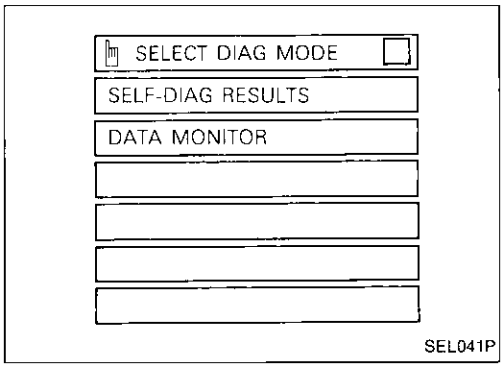

SEL698Q



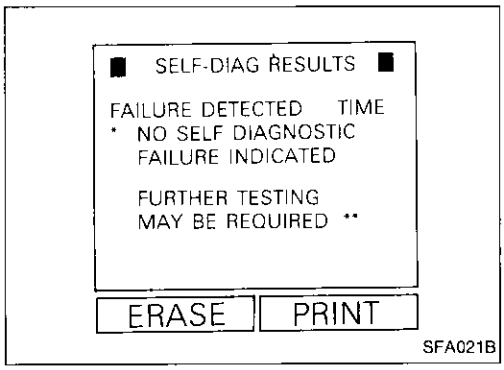

## Trouble Diagnoses

### CONSULT

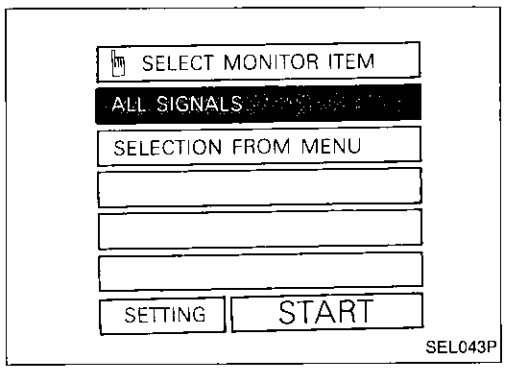
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.



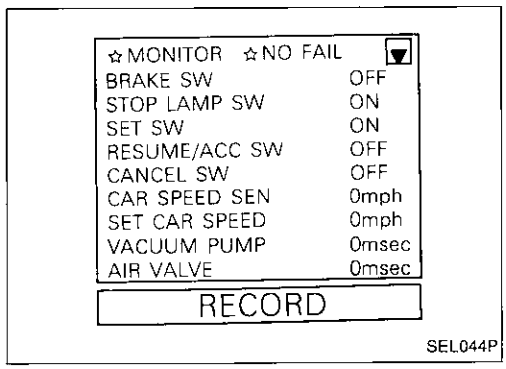

3. Turn on ignition switch.
4. Turn on A.S.C.D. main switch
5. Touch START (on CONSULT display).
6. Touch A.S.C.D.
7. Touch SELF-DIAG RESULTS.




- Self-diagnostic results are shown on display.
  Refer to table on page EL-111.




8. Touch DATA MONITOR.




- Touch START.
- Data monitor results are shown on display.
  Refer to table on page EL-99.

**For further information, read the CONSULT Operation Manual.**

## Trouble Diagnoses (Cont'd)

### Self-diagnostic results

| Diagnostic item | Description |
|---|---|
| * NO SELF DIAGNOSTIC FAILURE INDICATED. FURTHER TESTING MAY BE REQUIRED.** | • Even if no self diagnostic failure is indicated, further testing may be required as far as the customer complains. |
| POWER SUPPLY-VALVE | • The power supply circuit for the valves is open. (An abnormally high voltage is entered.) |
| VACUUM PUMP | • The vacuum pump circuit is open or shorted. (An abnormally high or low voltage is entered. |
| AIR VALVE | • The air valve circuit is open or shorted. (An abnormally high or low voltage is entered.) |
| CAR/S SEN/FAILSAFE | • The vehicle speed sensor or the fail-safe circuit is malfunctioning. |
| CONTROL UNIT | • The A.S.C.D. control unit is malfunctioning. |
| RELEASE VALVE | • The release valve circuit is open or shorted. (An abnormally high or low voltage is entered.) |
| BRAKE SW/STOP/L SW | • The brake switch or stop lamp switch is malfunctioning. |

### Data monitor

| Monitored item | Description |
|---|---|
| BRAKE SW | • Indicates [ON/OFF] condition of the brake switch circuit. |
| STOP LAMP SW | • Indicates [ON/OFF] condition of the stop lamp switch circuit. |
| SET SW | • Indicates [ON/OFF] condition of the set switch circuit. |
| RESUME/ACC SW | • Indicates [ON/OFF] condition of the resume/accelerate switch circuit. |
| CANCEL SW | • Indicates [ON/OFF] condition of the cancel circuit. |
| CAR SPEED SEN | • The present vehicle speed computed from the vehicle speed sensor signal is displayed. |
| SET CAR SPEED | • The preset vehicle speed is displayed. |
| VACUUM PUMP | • The operation time of the vacuum pump is displayed. |
| AIR VALVE | • The operation time of the air valve is displayed. |
| PW SUP-VALVE | • Indicates [ON/OFF] condition of the circuit for the air valve and the release valve. |
| CRUISE LAMP | • Indicates [ON/OFF] condition of the cruise lamp circuit. |
| A/T OD CANCEL | • Indicates [ON/OFF] condition of the OD cancel circuit. |
| FAIL SAFE-LOW | • The fail-safe (LOW) circuit function is displayed. |
| FAIL SAFE-SPD | • The fail-safe (SPEED) circuit function is displayed. |

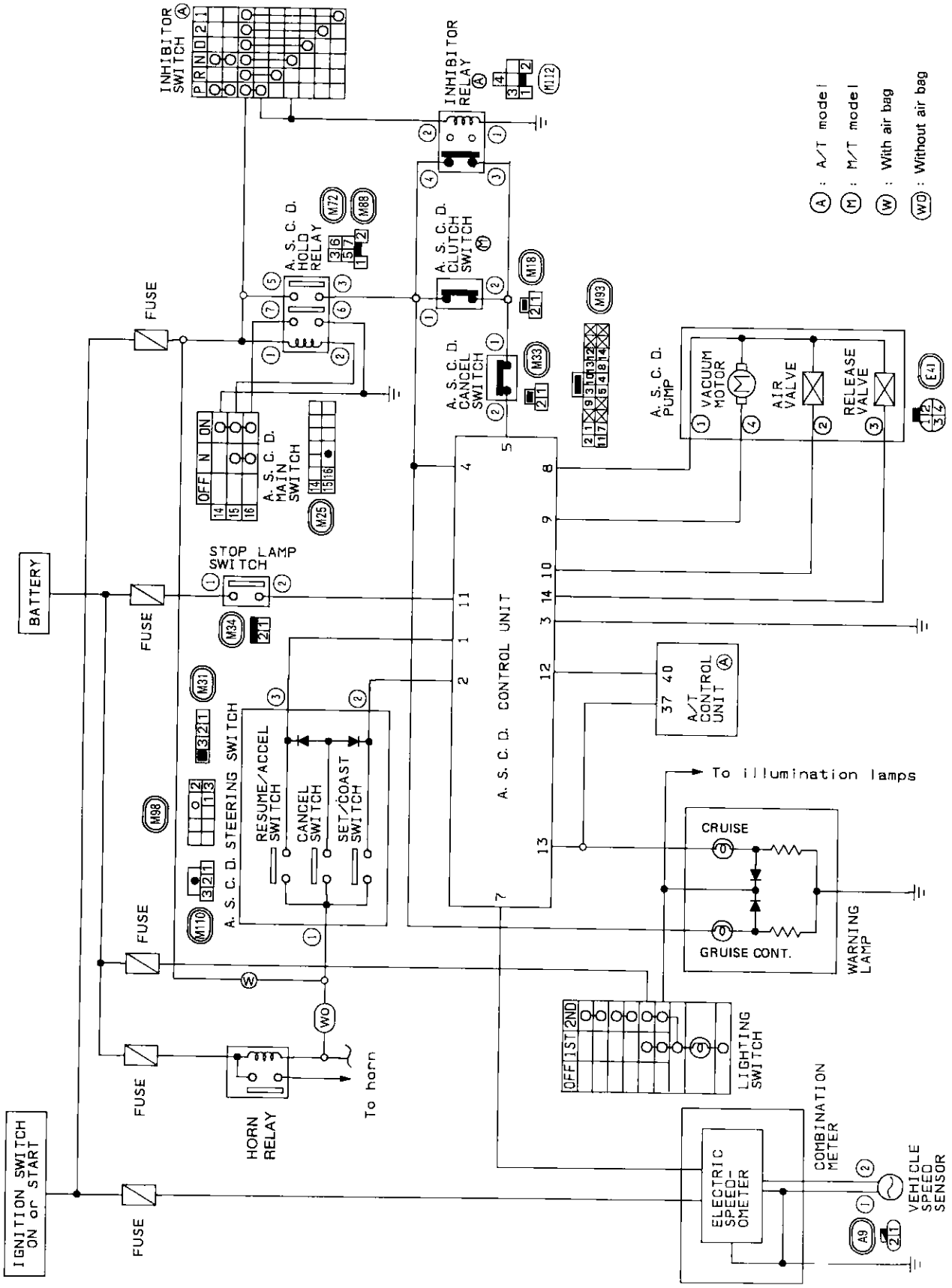
## Trouble Diagnoses (Cont'd)

### SYMPTOM CHART

| PROCEDURE | Diagnostic Procedure | | | | | | | | Electrical Components Inspection | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REFERENCE PAGE | EL-102 | EL-105 | EL-105 | EL-106 | EL-107 | EL-108 | EL-110 | EL-112 | EL-113 | EL-114 | EL-115 | EL-115 | EL-115 | EL-116 | EL-116 |
| 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. brake switch and stop lamp switch | Inhibitor switch | Speed sensor |
| A.S.C.D. control unit cannot be set properly. | ○ | | | | | | | | | ○ | ○ | ○ | ○ | ○ | ○ |
| Engine hunts | | ○ | | | | | | | ○ | ○ | | | | | |
| Large difference between set speed and actual vehicle speed. | | | ○ | | | | | | ○ | ○ | | | | | |
| Deceleration is greatest immediately after A.S.C.D. has been set. | | | | ○ | | | | | ○ | ○ | | | | | |
| ACCEL switch will not operate. | ○ | | | | ○ | | | | | | | ○ | | | |
| RESUME switch will not operate. | ○ | | | | | ○ | | | | | | ○ | ○ | | |
| Set speed cannot be canceled. | | | | | | | ○ | | ○ | ○ | | | ○ | | |
| "CRUISE" indicator lamp blinks. | | | | | | | | ○ | | ○ | | ○ | ○ | | |

## Trouble Diagnoses (Cont'd)

### CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK

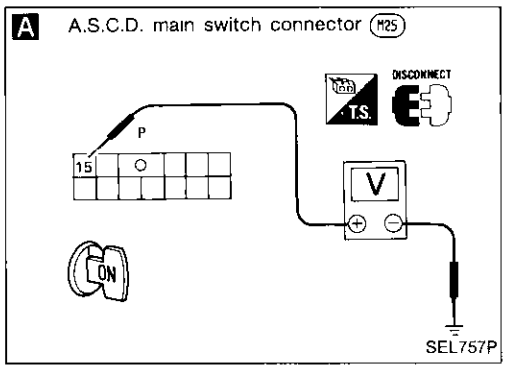


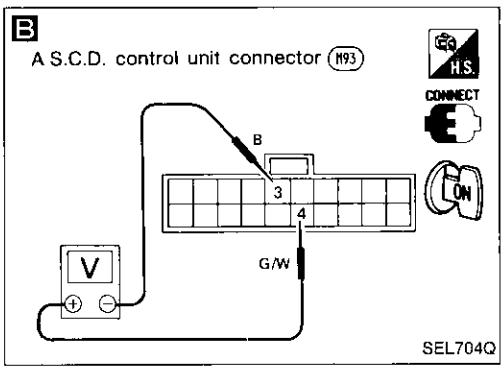

SEL699Q

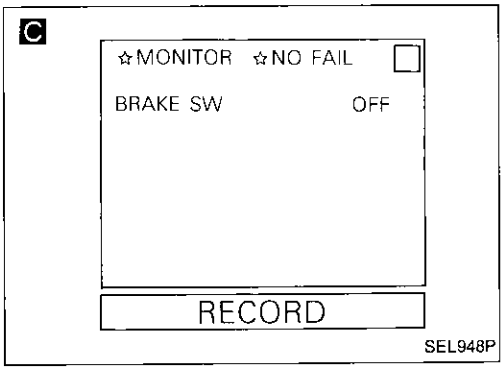
## Trouble Diagnoses (Cont'd)

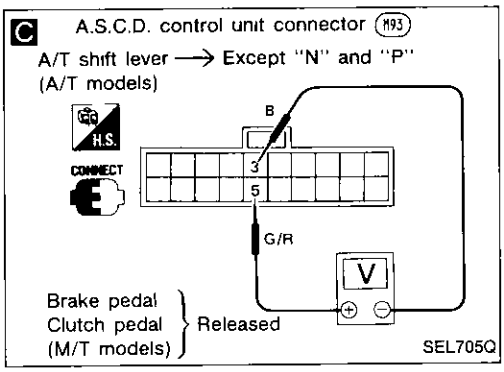
### DIAGNOSTIC PROCEDURE 1

**SYMPTOM: A.S.C.D. control cannot be set.**




A

Turn A.S.C.D. main switch "OFF" and "ON" to make sure indicator illuminates.

N.G. → CHECK POWER SUPPLY FOR A.S.C.D. MAIN SWITCH.
1. Disconnect main switch harness connector.
2. Do approx. 12 volts exist between main switch harness terminal ⑮ and body ground?

No → Check fuse and harness.

Yes → CHECK A.S.C.D. MAIN SWITCH.
Refer to "Electrical Components Inspection".
CHECK A.S.C.D. HOLD RELAY.

O.K.

B

CHECK POWER SUPPLY CIRCUIT FOR A.S.C.D. CONTROL UNIT.
1. Turn A.S.C.D. main switch "ON".
2. Check voltage between control unit harness terminals ④ and ③.
**Battery voltage should exist.**

N.G. → Check continuity between control unit harness terminal ④ and A.S.C.D. hold relay.

O.K.

C

CHECK CUT-OFF CIRCUIT FOR A.S.C.D. CONTROL UNIT.

See "BRAKE SW" in "Data monitor" mode.
**BRAKE SWITCH**
**When switch is depressed: OFF**
**When switch is released: ON**

OR

Check voltage between control unit harness terminals ⑤ and ③.
**Battery voltage should exist.**

N.G. → CHECK A.S.C.D. CANCEL SWITCH, A.S.C.D. CLUTCH SWITCH (M/T models) AND INHIBITOR SWITCH (A/T models).
Refer to "Electrical Components Inspection".
CHECK INHIBITOR RELAY (A/T models).

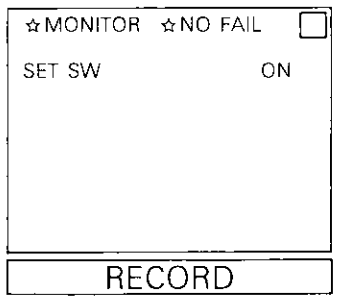
O.K.

Ⓐ

(Next page)

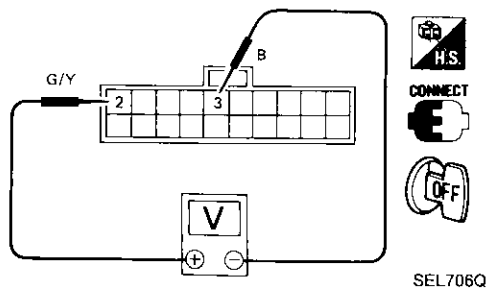
## Trouble Diagnoses (Cont'd)

D



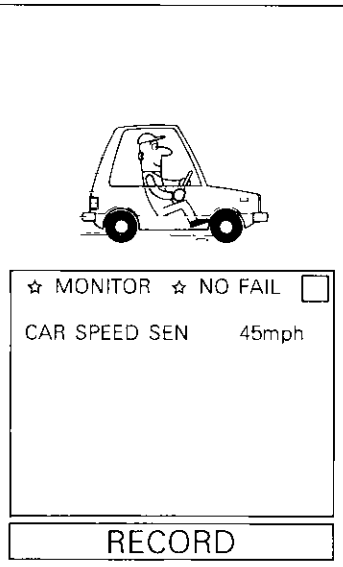

SEL950P

D A.S.C.D. control unit connector M93



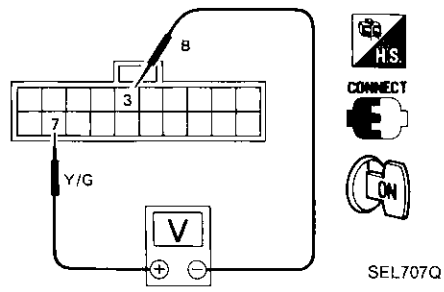

SEL706Q

E




SEL952P

E A.S.C.D control unit connector M93




SEL707Q

Ⓐ

D

CHECK SET/COAST SWITCH CIRCUIT FOR A.S.C.D. CONTROL UNIT.

See "SET SW" in "Data monitor" mode.

**SET SW**
**When switch is pressed: ON**
**When switch is released: OFF**

N.G. → Does horn work?

No → Check fuse and horn relay.

Yes → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

OR

1. Turn and keep on SET/COAST switch of A.S.C.D. combination (steering) switch.
2. Check voltage between control unit harness terminals ② and ③.

**Battery voltage should exist.**

O.K.

E

CHECK SPEED SENSOR CIRCUIT.

See "CAR SPEED SEN" in "Data monitor" mode while driving.

N.G. → CHECK SPEED SENSOR. Refer to "Electrical Components Inspection".

OR

1. Apply wheel chocks and jack up rear of vehicle.
2. Connect voltmeter between control unit harness terminals ⑦ and ③.
3. Slowly turn rear wheel.
4. Check deflection of voltmeter pointer.

O.K.

CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP. Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. actuator assembly.

O.K.

Ⓑ

(Next page)

## Trouble Diagnoses (Cont'd)

F

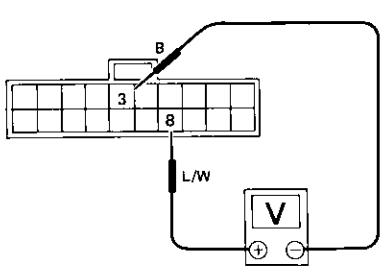
☆ MONITOR ☆ NO FAIL

PW SUP-VALVE ON

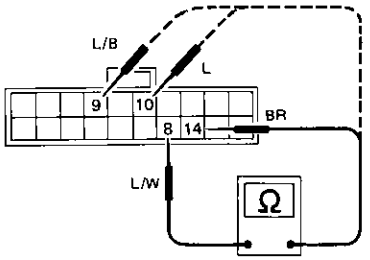
RECORD

SEL954P

F A.S.C.D. control unit connector M93




A.S.C.D. control unit connector M93




SEL708Q

Ⓑ

F

CHECK OUTPUT FOR A.S.C.D. ACTUATOR/A.S.C.D. PUMP.

1. Read out "PW SUP- VALVE" in "Data monitor" mode while driving.

**PW SUP-VALVE:**

ON (When A.S.C.D. is operating.)

OFF (When A.S.C.D. is not operating.)

N.G. → Repair A.S.C.D. control unit.

— OR —

1. Check voltage between control unit harness terminals ⑧ and ③.

**Voltage is 0V.**

O.K.

1. Disconnect A.S.C.D. control unit connector.
2. 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 |

O.K. → Repair A.S.C.D. control unit.

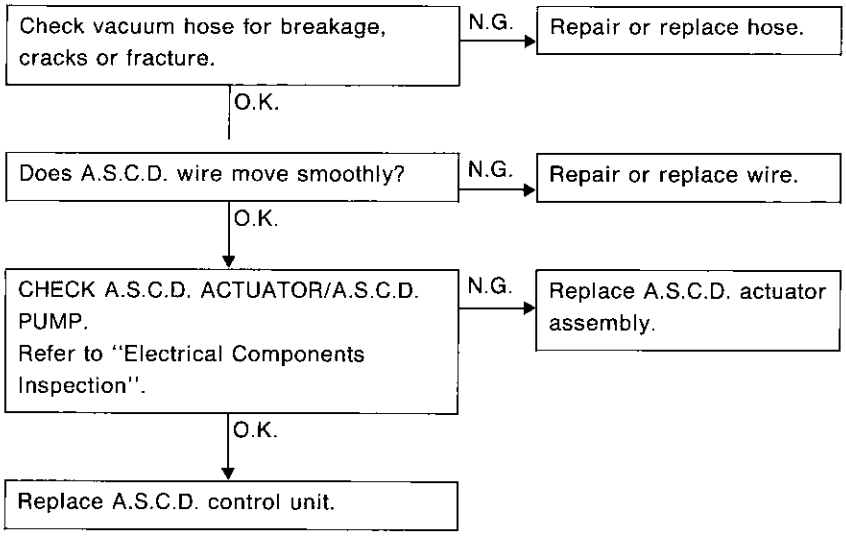
N.G.

Repair short or open circuit in A.S.C.D. actuator assembly.

## Trouble Diagnoses (Cont'd)

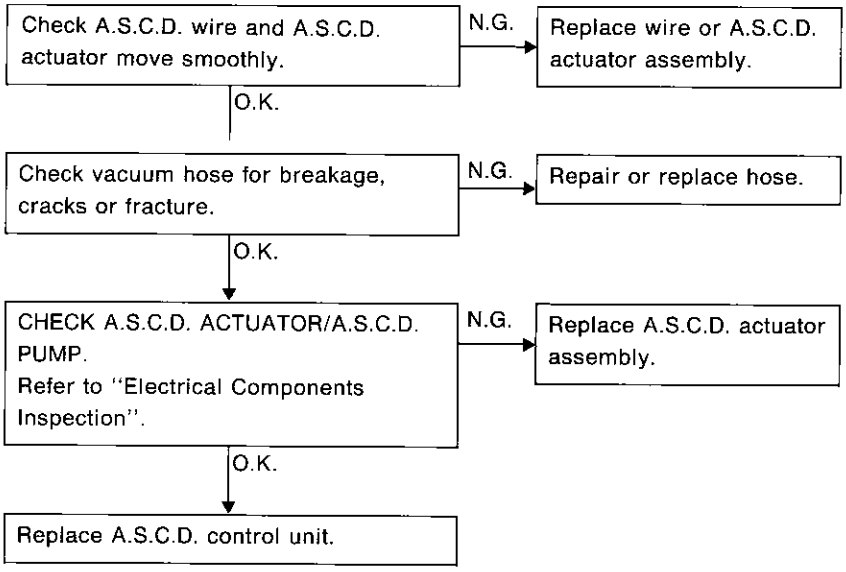
### DIAGNOSTIC PROCEDURE 2

**SYMPTOM: Engine hunts.**




### DIAGNOSTIC PROCEDURE 3

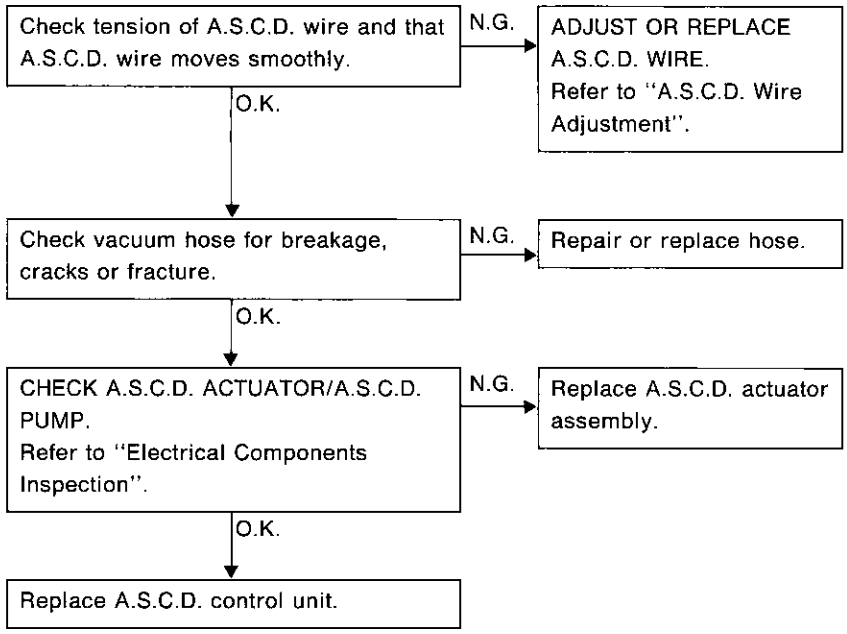
**SYMPTOM: Large difference between set vehicle speed and actual speed.**



## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 4

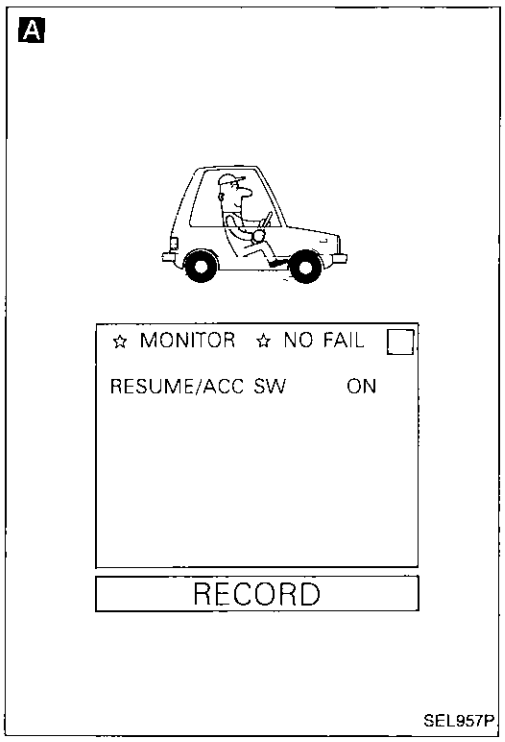
**SYMPTOM: Deceleration is greatest immediately after A.S.C.D. has been set.**

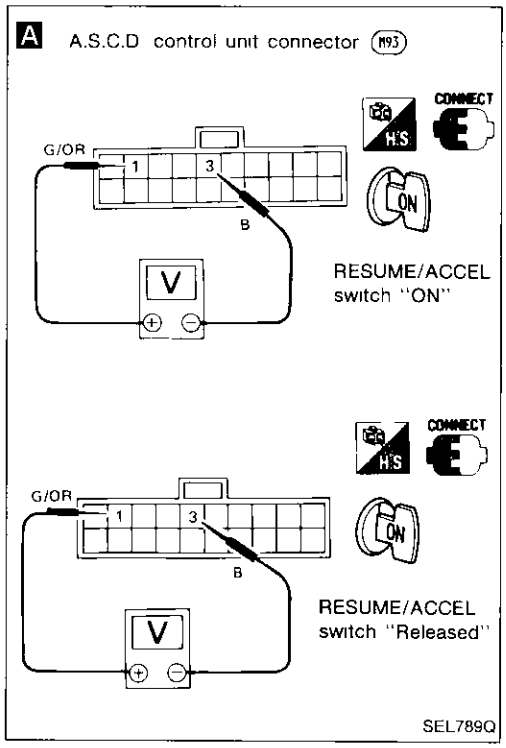


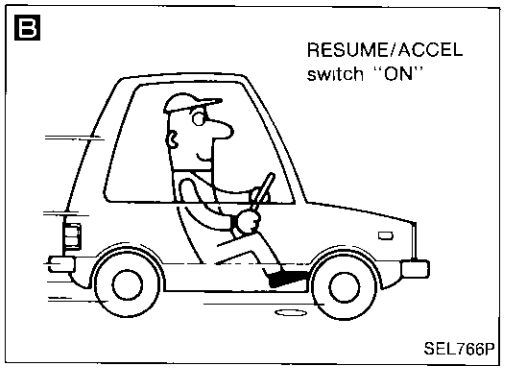
## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 5

**SYMPTOM: ACCEL switch will not operate.**




Check constant-speed function for operating using SET/COAST switch.
N.G. → Go to "DIAGNOSTIC PROCEDURE 1".
O.K. ↓

A

CHECK RESUME/ACCEL SWITCH CIRCUIT.

See "RESUME/ACC SW" in "Data monitor" mode.
**RESUME/ACC SW**
When switch is pressed: ON
When switch is released: OFF

N.G. → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

OR

Check voltage between control unit harness terminals ① and ③ after turning on and holding RESUME/ACCEL switch.
**Battery voltage should exist.**
Check voltage between control unit harness terminals ① and ③ after releasing RESUME/ACCEL switch.
**Voltage is 0V.**
N.G. → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

O.K. ↓

B

Does vehicle accelerate when RESUME/ACCEL switch is turned on?
No → Replace control unit.
Yes ↓

C

Does vehicle maintain the new (faster) speed when RESUME/ACCEL switch is released?
No → Replace control unit.
Yes ↓

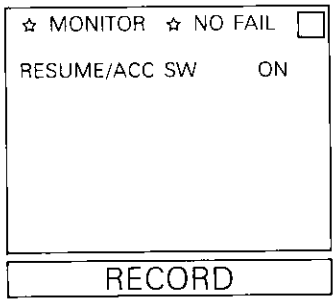
System is O.K.

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 6

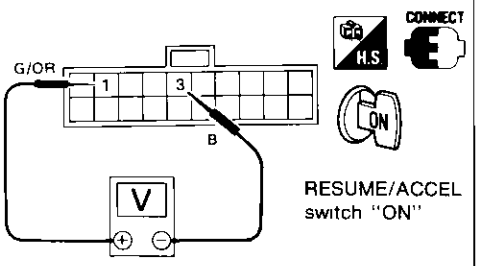
**SYMPTOM: RESUME switch will not operate.**

A

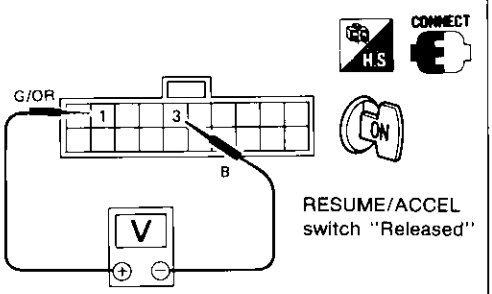



SEL957P

A A.S.C.D control unit connector M93



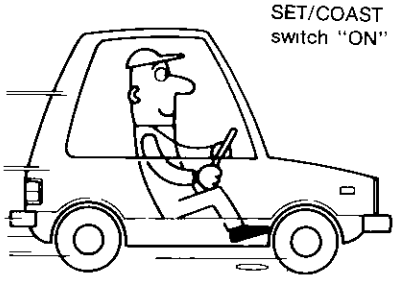

RESUME/ACCEL switch "ON"




RESUME/ACCEL switch "Released"

SEL790Q

B



SET/COAST switch "ON"

SEL767P

Check constant-speed function for operation using SET/COAST switch.

N.G. → Go to "DIAGNOSTIC PROCEDURE 1".

O.K.

A

CHECK RESUME/ACCEL SWITCH CIRCUIT.

N.G. → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

See "RESUME/ACC SW" in "Data monitor" mode.

**RESUME/ACC SW**

When switch is pressed: ON

When switch is released: OFF

OR

Check voltage between control unit harness terminals ① and ③.

- After turning on and holding RESUME/ACC switch.
  **Battery voltage should exist.**
- After releasing RESUME/ACC switch.
  **Voltage is 0V.**

O.K.

B

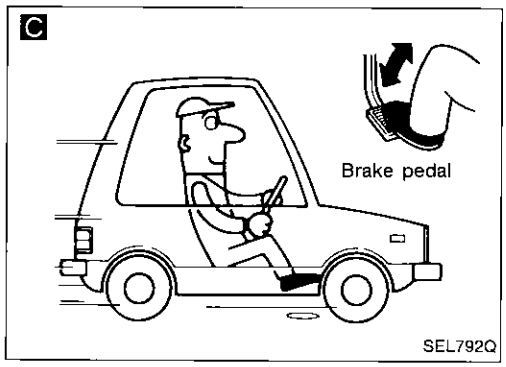
Set vehicle speed at 80 km/h (50 MPH) by turning on SET/COAST switch.

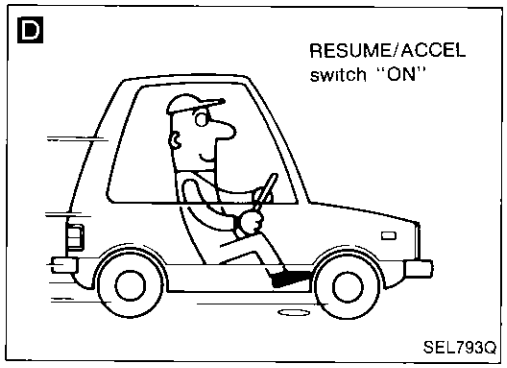
O.K.

Ⓒ

(Next page)

## Trouble Diagnoses (Cont'd)




Ⓒ

C

While cruising at set speed, depress and release brake pedal.

O.K.

Does speed control disengage and "CRUISE" lamp turn off?

No → CHECK STOP LAMP SWITCH, A.S.C.D. CANCEL SWITCH AND A.S.C.D. CLUTCH SWITCH (M/T models). Refer to "Electrical Components Inspection".

Yes

D

Above 48 km/h (30 MPH), press and release "RESUME/ACCEL switch.

O.K.

Does vehicle return to previously set speed [80 km/h (50 MPH)]?

No → Replace control unit.

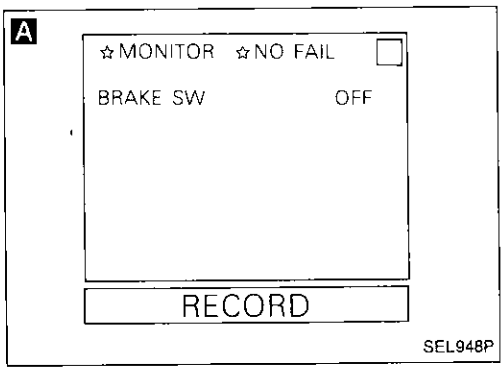
Yes

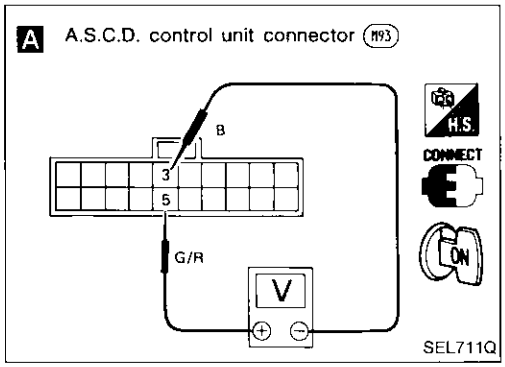
System is O.K.

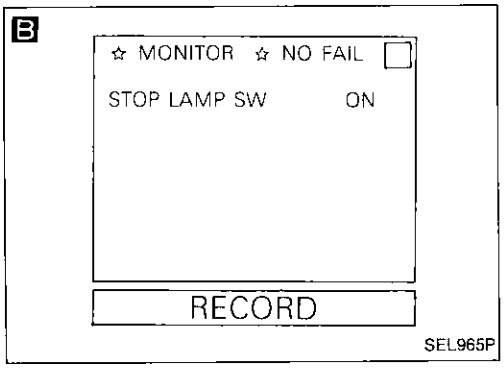
## Trouble Diagnoses (Cont'd)

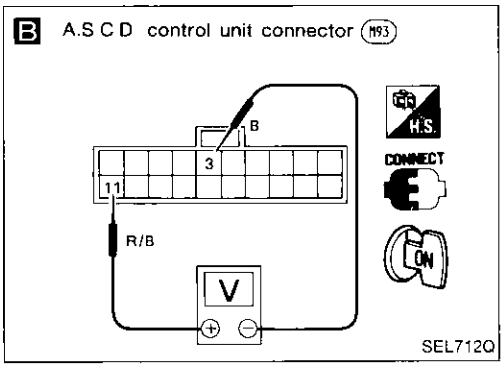
### DIAGNOSTIC PROCEDURE 7

**SYMPTOM: Set speed cannot be cancelled.**




A

CHECK A.S.C.D. BRAKE AND INHIBITOR SWITCH CIRCUIT.

1. Turn A.S.C.D. main switch "ON".
2. See "BRAKE SW" in "Data monitor" mode.

**BRAKE SW**
When brake pedal is released: ON
When brake pedal is depressed: OFF

N.G. → CHECK A.S.C.D. CANCEL, CLUTCH, and INHIBITOR SWITCH. Refer to "Electrical Components Inspection".

OR

2. Check voltage between control unit harness terminals ⑤ and ③.

| Conditions | | | Voltage [V] |
|---|---|---|---|
| M/T | A.S.C.D. cancel switch | Depressed | 0 |
| | | Released | Approx. 12 |
| | A.S.C.D clutch switch | Depressed | 0 |
| | | Released | Approx 12 |
| A/T | A/T shift lever position is at any position except N or P. | | Approx. 12 |
| | A/T shift lever position is at N or P. | | 0 |

O.K.

B

CHECK STOP LAMP SWITCH CIRCUIT.

See "STOP LAMP SW" in "Data monitor" mode.

**STOP LAMP SW**
When brake pedal is released: OFF
When brake pedal is depressed: ON

N.G. → CHECK STOP LAMP SWITCH. Refer to "Electrical Components Inspection.

OR

Check voltage between control unit harness terminals ⑪ and ③.

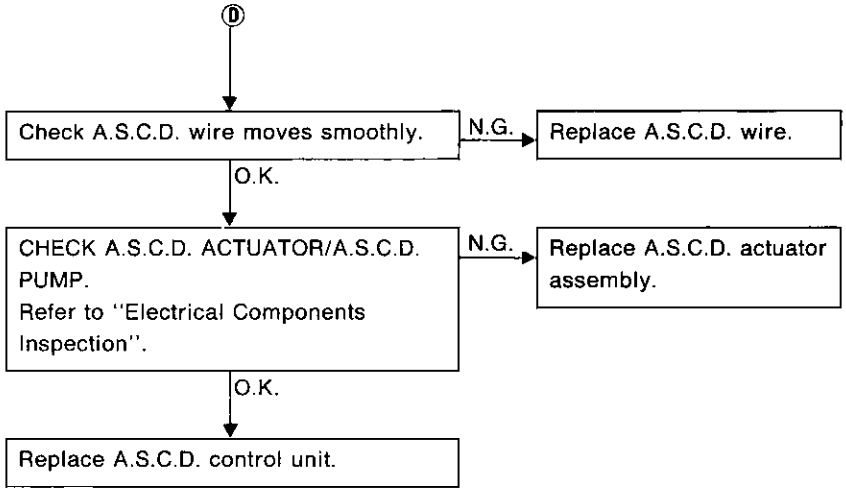
| Condition | | Voltage [V] |
|---|---|---|
| Stop lamp switch | Depressed | Approx. 12 |
| | Released | 0 |

O.K.

Ⓓ

(Next page)

## Trouble Diagnoses (Cont'd)



## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 8

**SYMPTOM: "CRUISE" indicator lamp blinks.**

Does indicator lamp blink when A.S.C.D. main switch is turned to "ON" again?

Yes → Does indicator lamp blink when brake pedal is depressed slowly?

No → CHECK A.S.C.D. ACTUATOR/ A.S.C.D. PUMP. Refer to "Electrical Components Inspection".

Does indicator lamp blink when brake pedal is depressed slowly?

No → Adjust installation of stop lamp switch and A.S.C.D. cancel switch. Refer to BR section.

Yes → CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

CHECK A.S.C.D. COMBINATION (STEERING) SWITCH. Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. combination (steering) switch.

O.K. → Replace control unit.

CHECK A.S.C.D. ACTUATOR/ A.S.C.D. PUMP. Refer to "Electrical Components Inspection".

N.G. → Replace A.S.C.D. actuator assembly.

O.K →

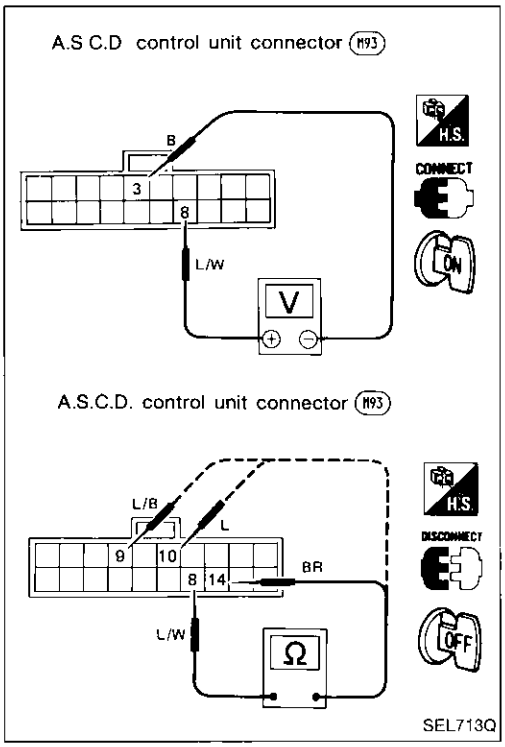
CHECK A.S.C.D. ACTUATOR/ A.S.C.D. PUMP CIRCUIT.

1. Check voltage between control unit harness terminals ⑧ and ③.
   **Voltage is 0V.**
2. Disconnect A.S.C.D. control unit connector.
3. Measure resistance between control unit harness terminals ⑧ and ⑨, ⑩, ⑭.

N.G. → Repair short or open circuit in A.S.C.D. actuator/ A.S.C.D. pump harness.

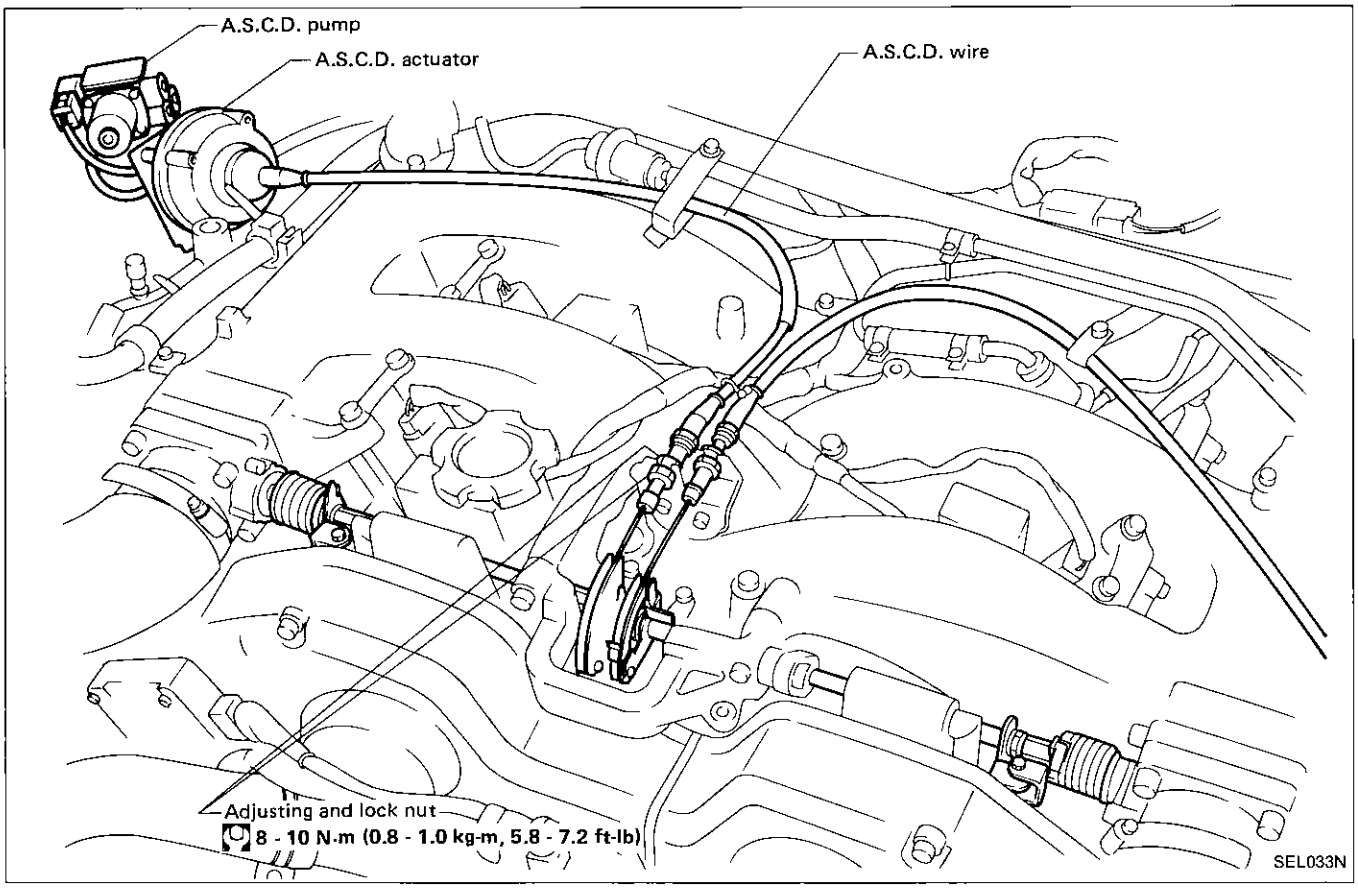
| Terminals | | Resistance [Ω] |
|---|---|---|
| ⑧ | ⑨ | Approx. 8 - 45 |
| | ⑩ | Approx. 65 |
| | ⑭ | Approx. 65 |

O.K. → Replace A.S.C.D. control unit.



## Trouble Diagnoses (Cont'd)

### A.S.C.D. WIRE ADJUSTMENT




**CAUTION:**

- **Be careful not to twist A.S.C.D. wire when removing it.**
- **Do not tense A.S.C.D. wire excessively during adjustment.**

After confirming that accelerator wire is properly adjusted, adjust the tension of A.S.C.D. wire in the following manner.

(1) After adjusting the length of the accelerator wire, turn a securing nut by 1/2 to 1 turn from throttle open starting position to the wire loosening direction to fix. (Must be securing carried out to prevent response delay of operation of the A.S.C.D.)

(2) Securely tighten lock nut to hold adjusting nut in place.

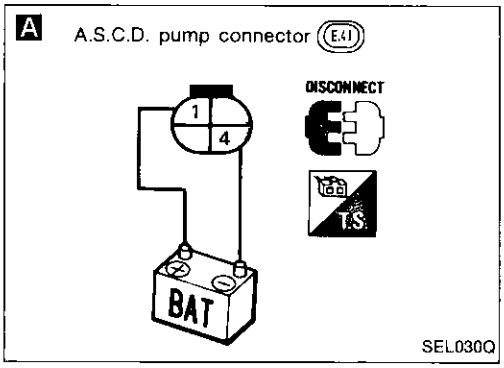
## Trouble Diagnoses (Cont'd)

### ELECTRICAL COMPONENTS INSPECTION

#### A.S.C.D. actuator/A.S.C.D. pump

1. Disconnect A.S.C.D. actuator/A.S.C.D. pump connector.
2. Check A.S.C.D. actuator/A.S.C.D. pump operations as shown.

A

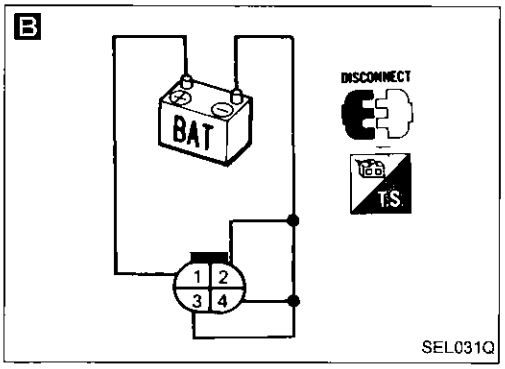



Check to see if motor starts when 12V D.C. is applied across ① and ④.

N.G. → Replace A.S.C.D. actuator assembly.

O.K.

B

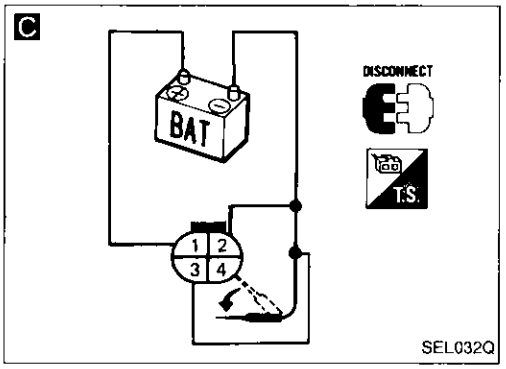



Check to see if A.S.C.D. wire is pulled when 12V D.C. is applied across ①, ②, ③ and ④.

N.G. → Replace A.S.C.D. actuator assembly.

O.K. (Wire is pulled.)

C

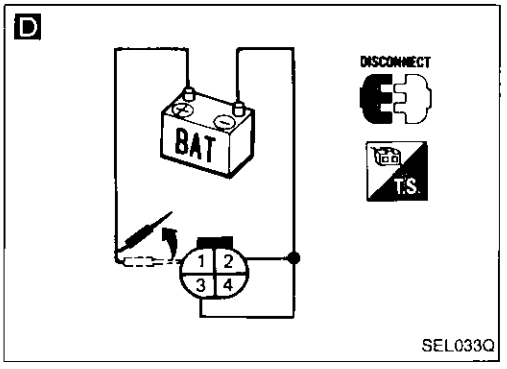



Check to see if A.S.C.D. wire returns to original position 50 to 60 seconds after disconnecting lead from ④.

N.G. → Replace A.S.C.D. actuator assembly.

O.K. (Wire does not return.)

D



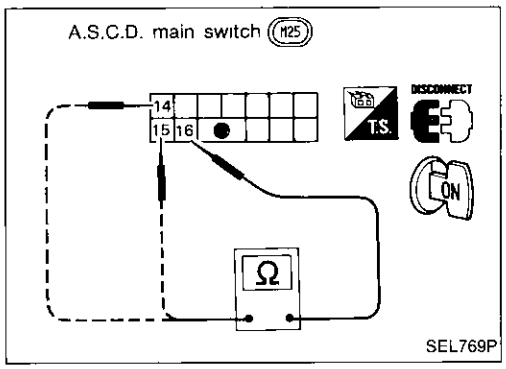

Disconnect lead from ① to see if A.S.C.D. wire returns immediately.

N.G. → Replace A.S.C.D. actuator assembly.

O.K. (Wire returns.)

A.S.C.D. actuator/A.S.C.D. pump are O.K.

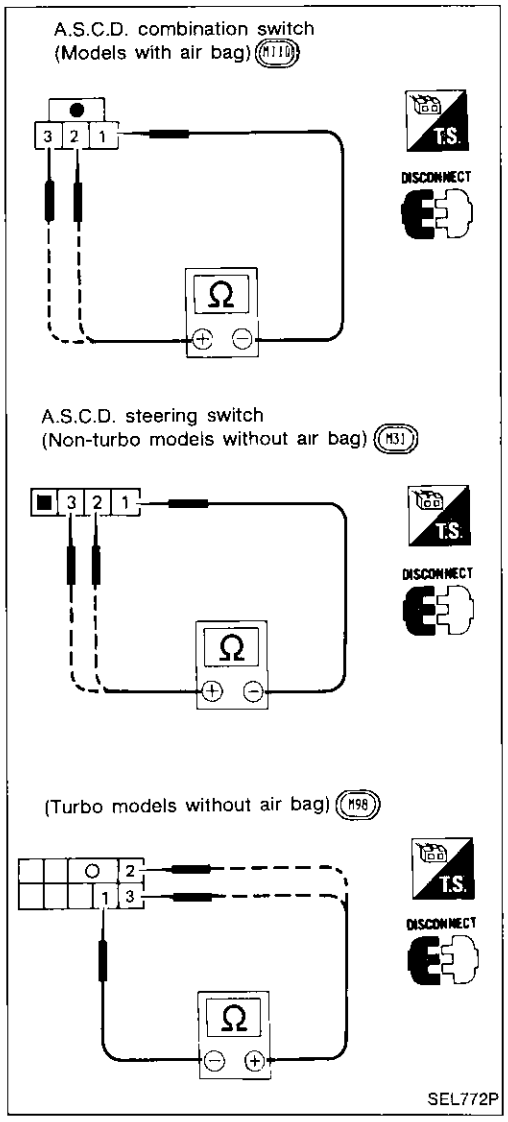
## Trouble Diagnoses (Cont'd)




### A.S.C.D. main switch

Check continuity between terminals by pushing switch to each position.

| Switch position \ Terminals | 14 | 15 | 16 |
|---|---|---|---|
| ON | ○ | ○ | ○ |
| N | | ○ | ○ |
| OFF | | | |




### A.S.C.D. combination switch

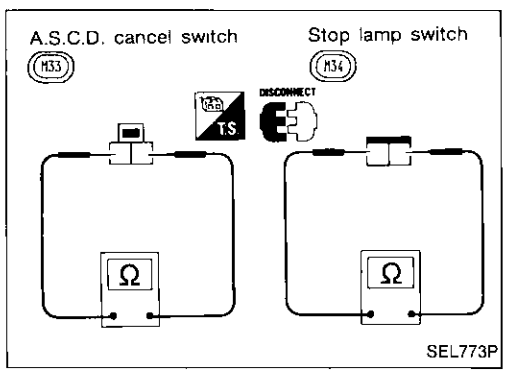
Check continuity between terminals by turning lever.

| Lever \ Terminal | 11 | 12 | 13 |
|---|---|---|---|
| SET/COAST | ○ | ○ | |
| RESUME/ACCEL | ○ | | ○ |
| CANCEL | ○ | ▶ | ○ |
| | ○ | ▶ | ○ |

### A.S.C.D. steering switch

Check continuity between terminals by pushing each button.

| Button \ Terminal | 1 | 2 | 3 |
|---|---|---|---|
| SET/COAST | ○ | ○ | |
| RESUME/ACCEL | ○ | | ○ |
| CANCEL | ○ | ▶ | ○ |
| | ○ | ▶ | ○ |

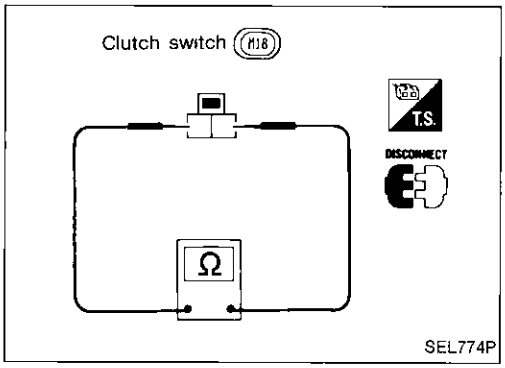



### A.S.C.D. cancel switch and stop lamp switch

| 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.**

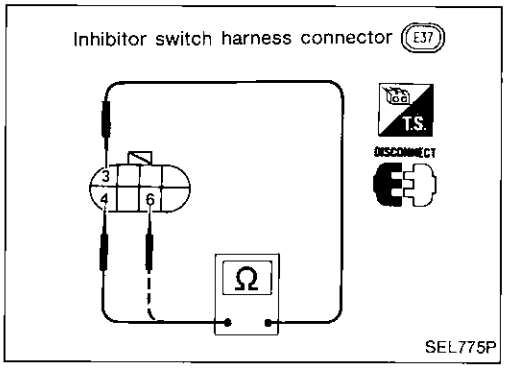
## Trouble Diagnoses (Cont'd)




### Clutch switch (For M/T models)

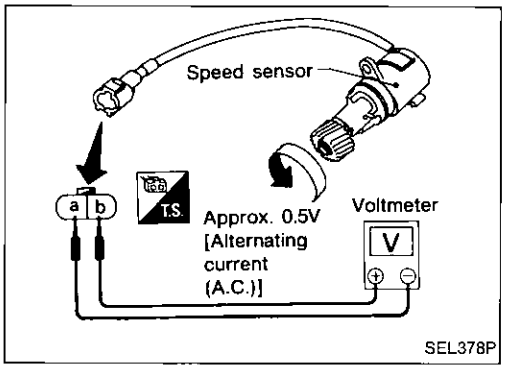
| Condition | Continuity |
|---|---|
| When clutch pedal is depressed | No |
| When clutch pedal is released | Yes |

**Check switch after adjusting clutch pedal—refer to CL section.**




### Inhibitor switch (For A/T models)

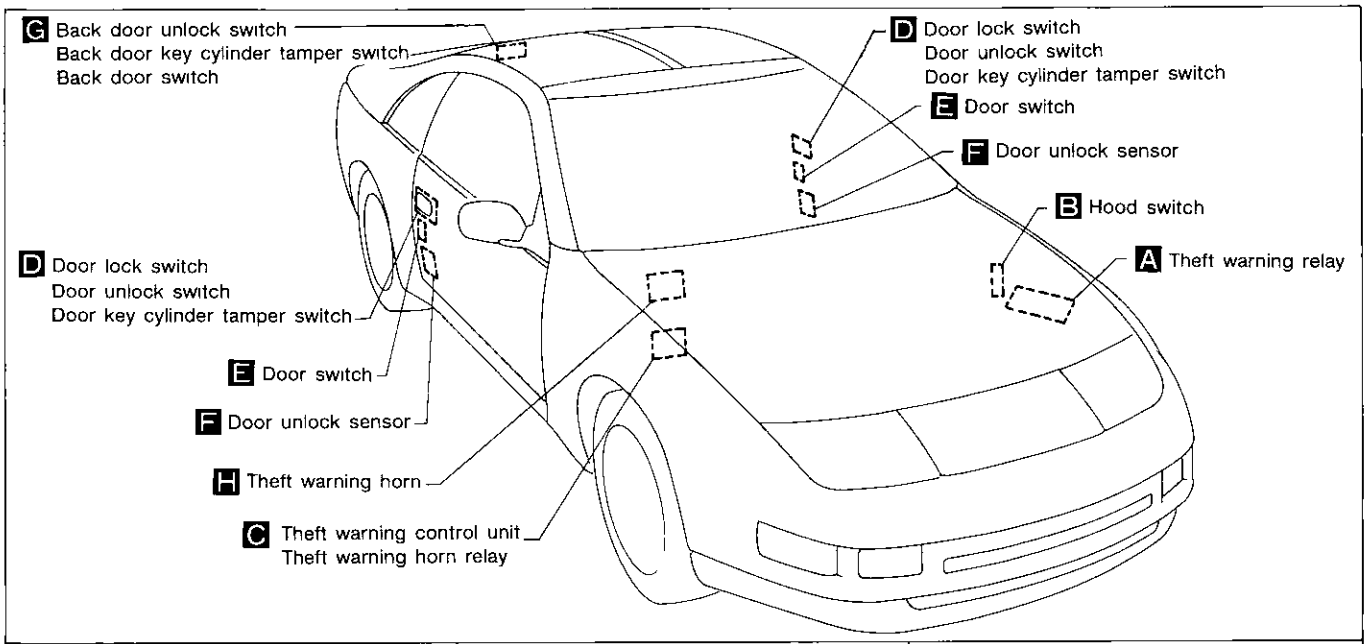
| Shift lever position \ Terminal | 3 | 4 | 6 |
|---|---|---|---|
| "P" | ○ | ○ | |
| "N" | ○ | | ○ |
| Except "N" or "P" | | | |

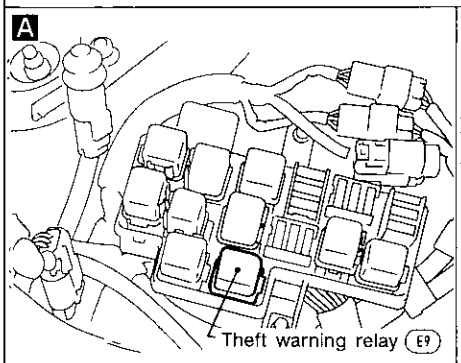


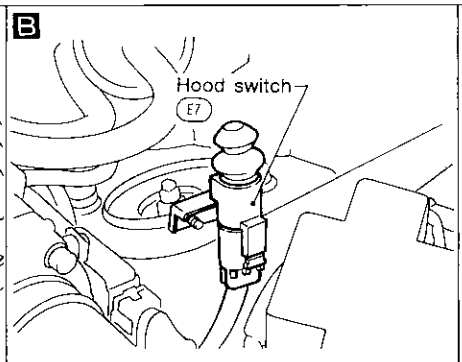

### Speed sensor

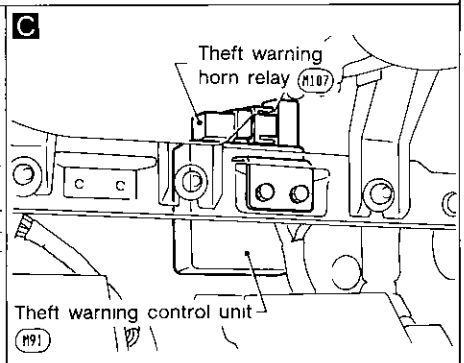
1. Remove speed sensor from transaxle.
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

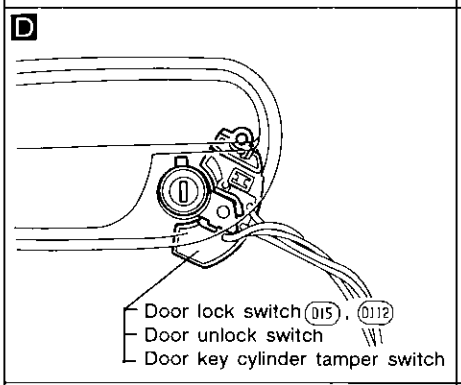
## Component Parts and Harness Connector Location

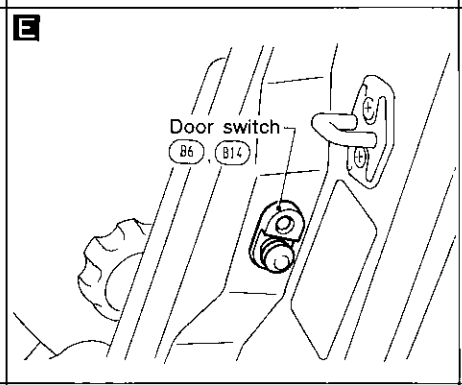


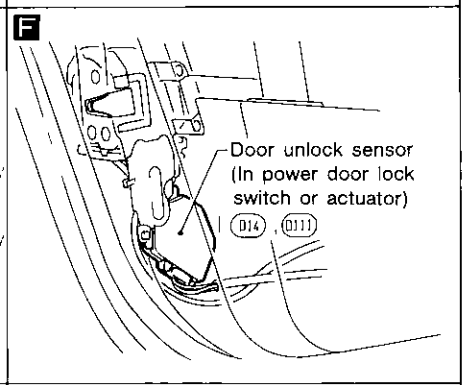



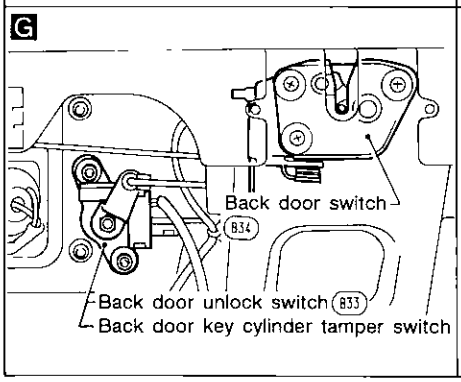



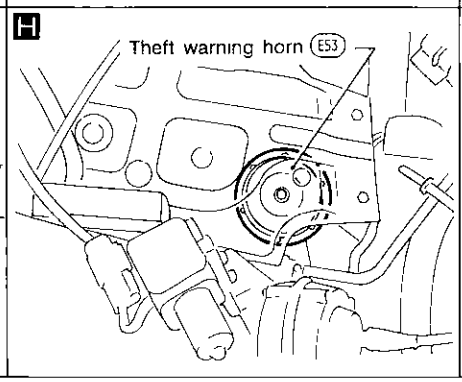



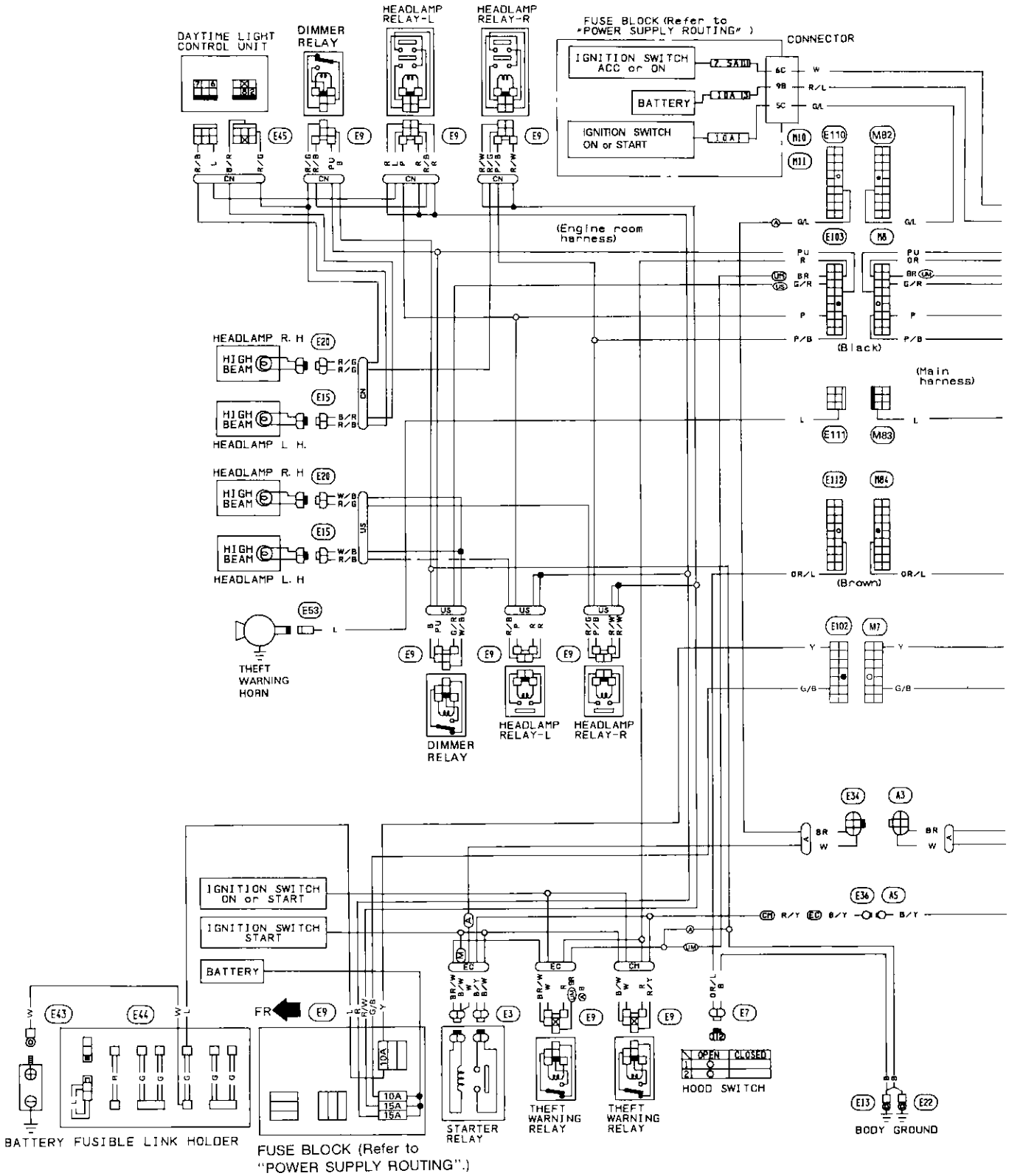



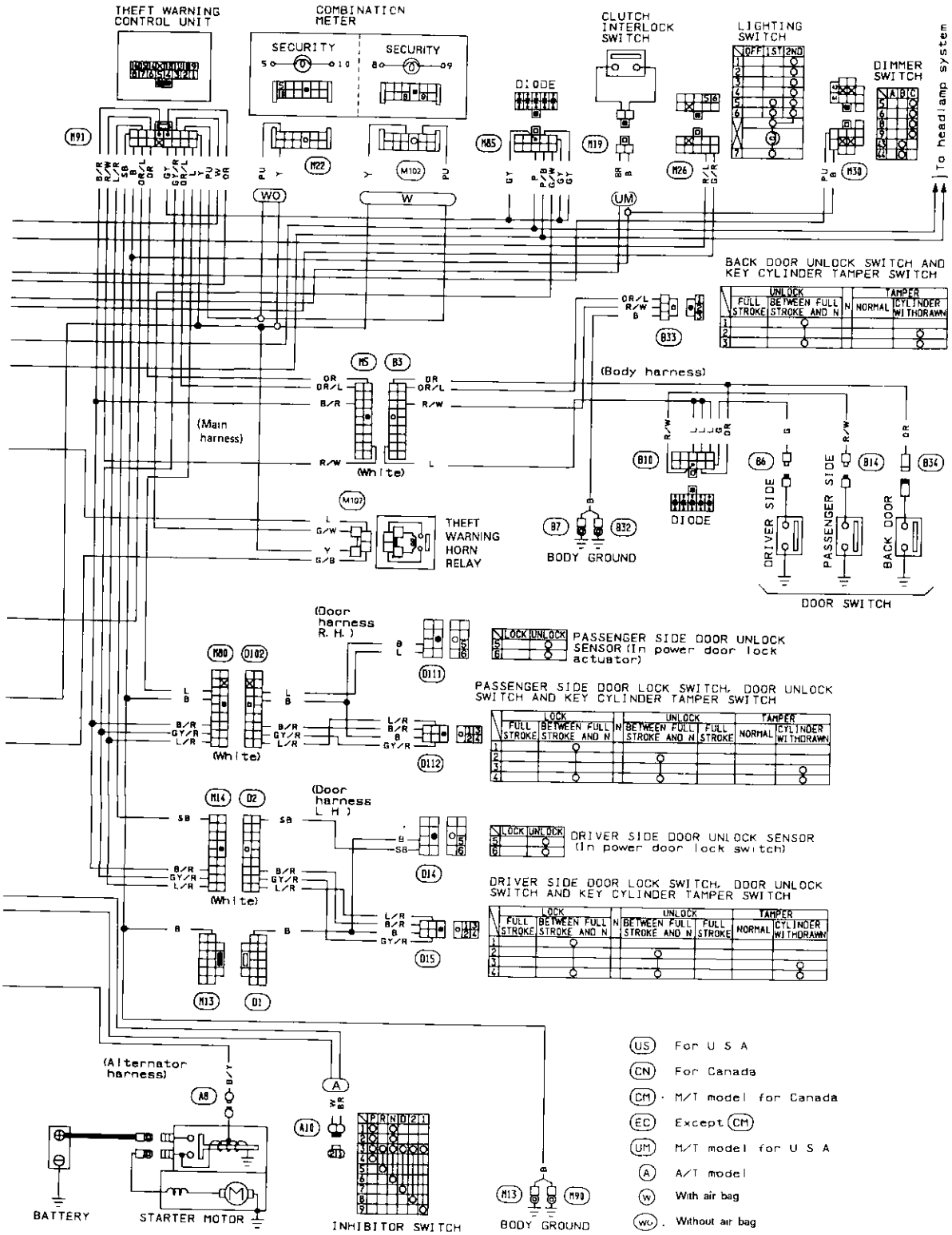




SEL715Q

## Wiring Diagram



## Wiring Diagram (Cont'd)

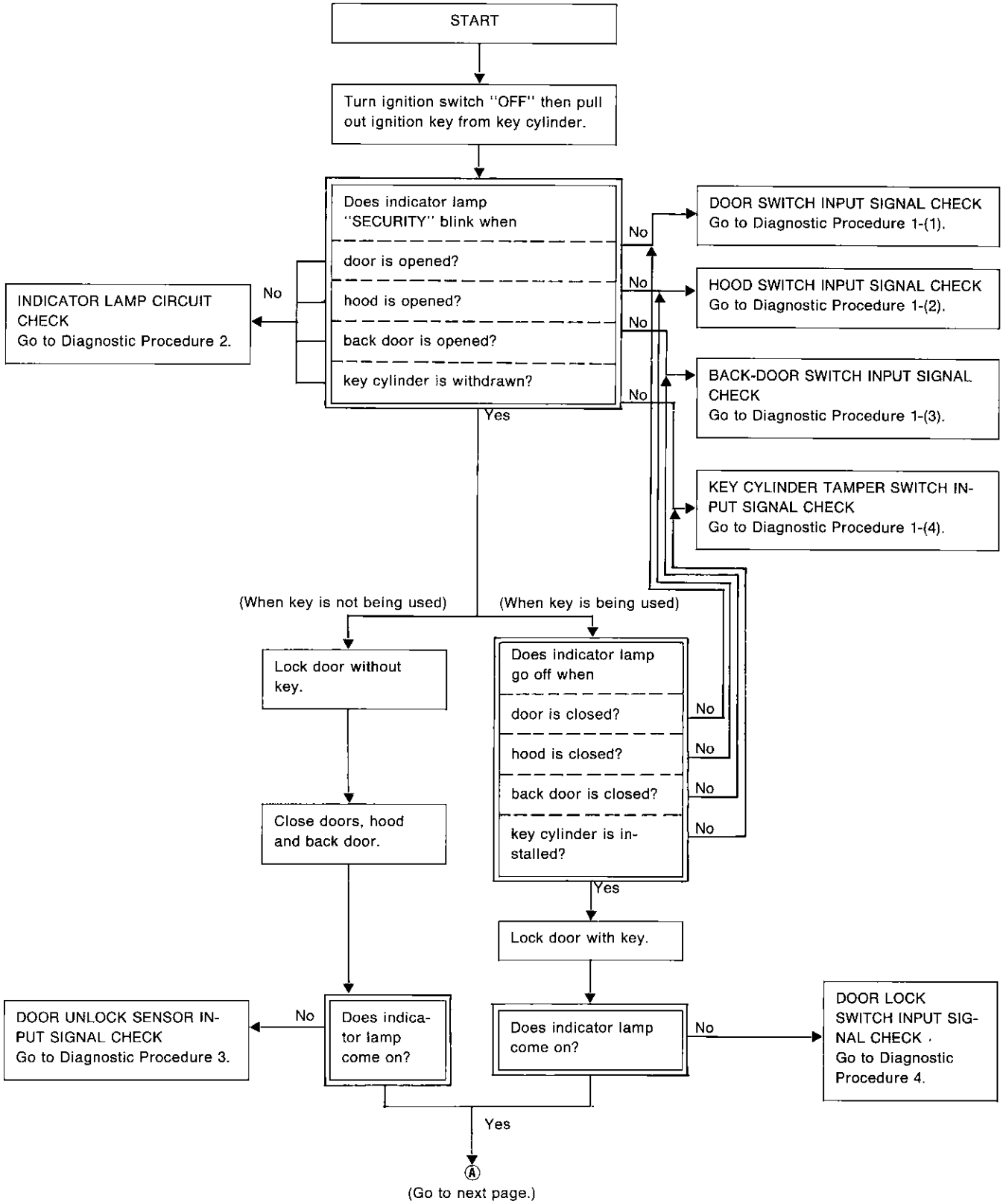



SEL700Q

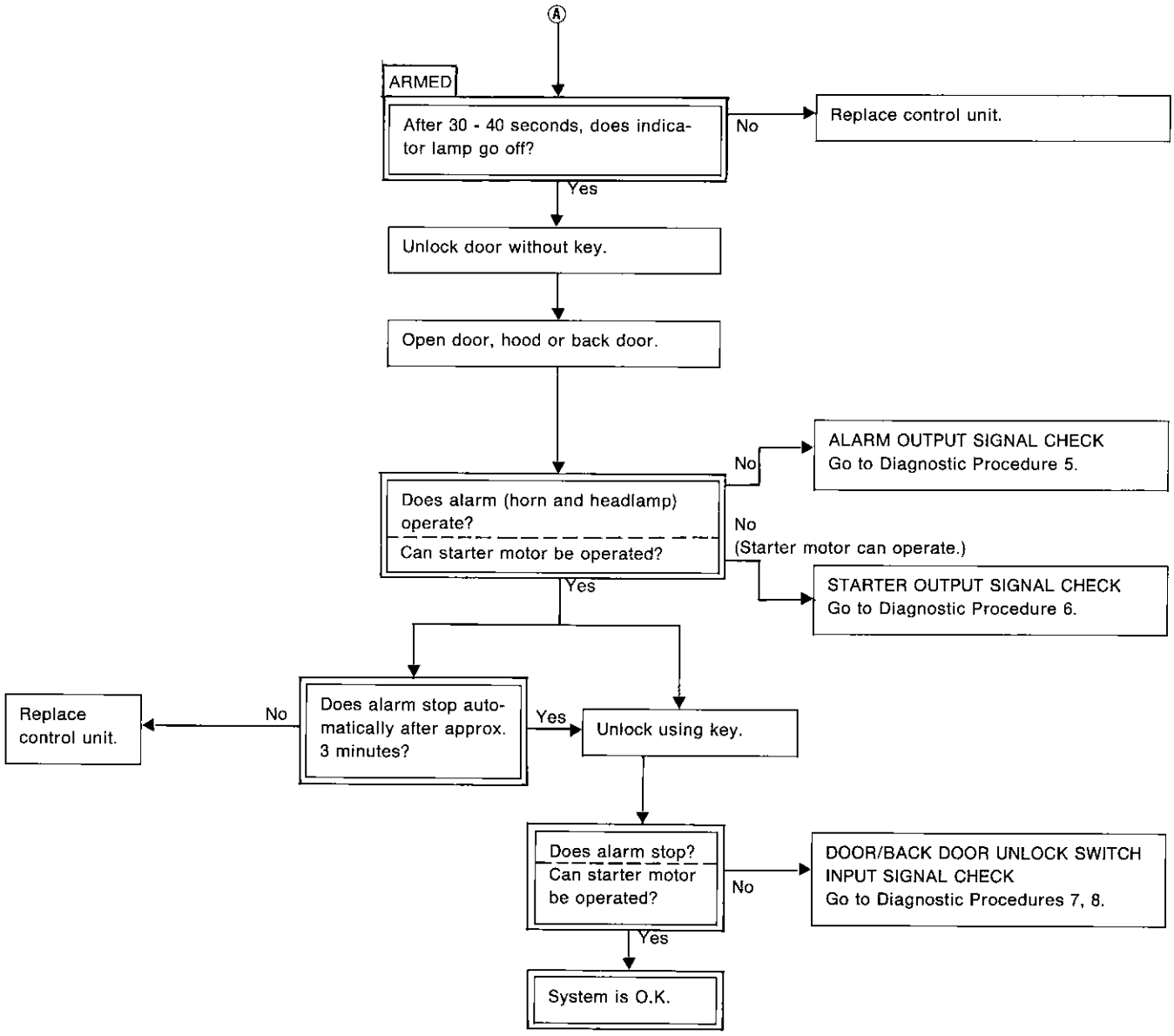
## Trouble Diagnoses

### SYSTEM OPERATION CHECK

If ignition switch is set in the "ACC" position in the step of START to ARMED or in the ARMED state shown in this flow chart, the system operation is canceled.

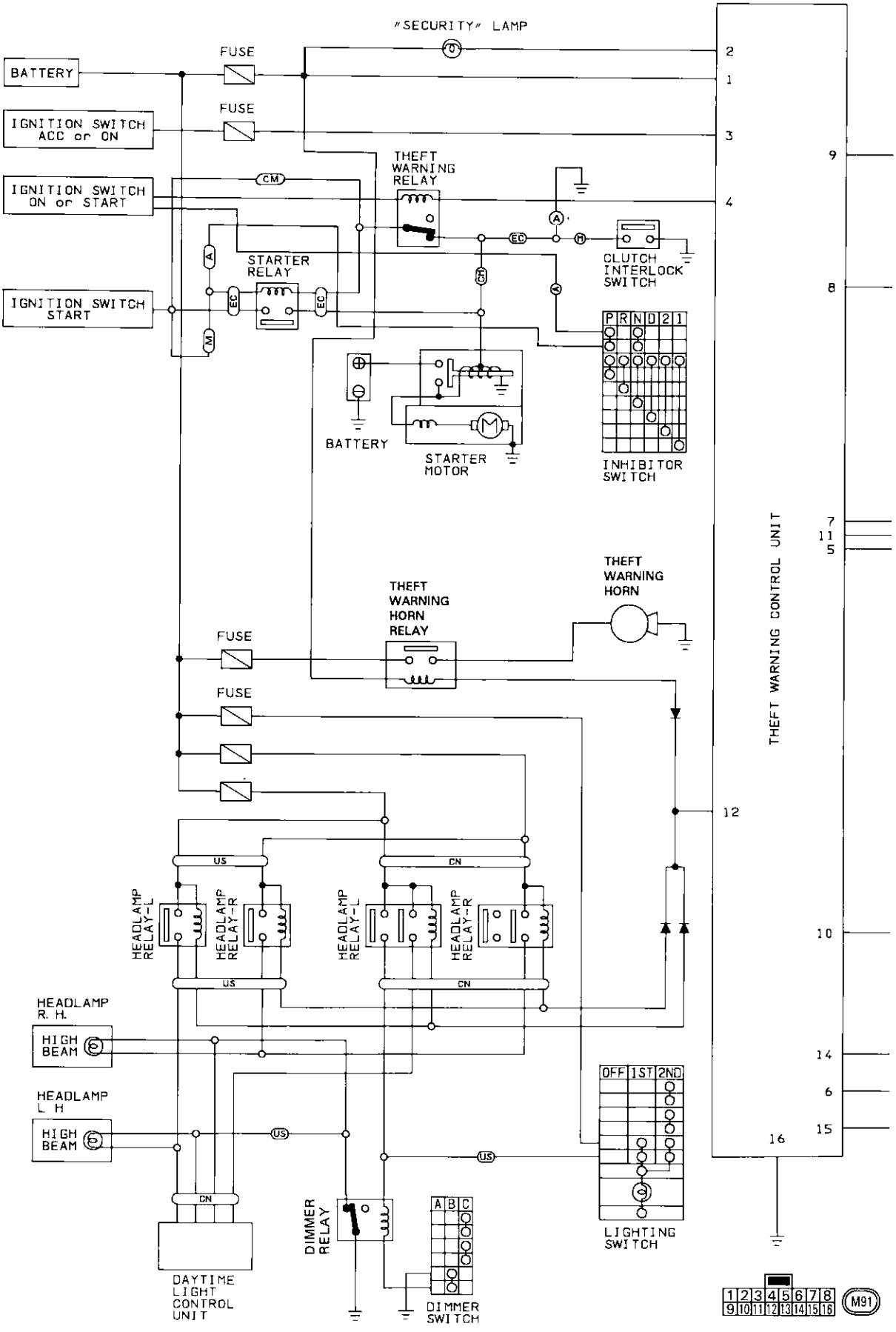


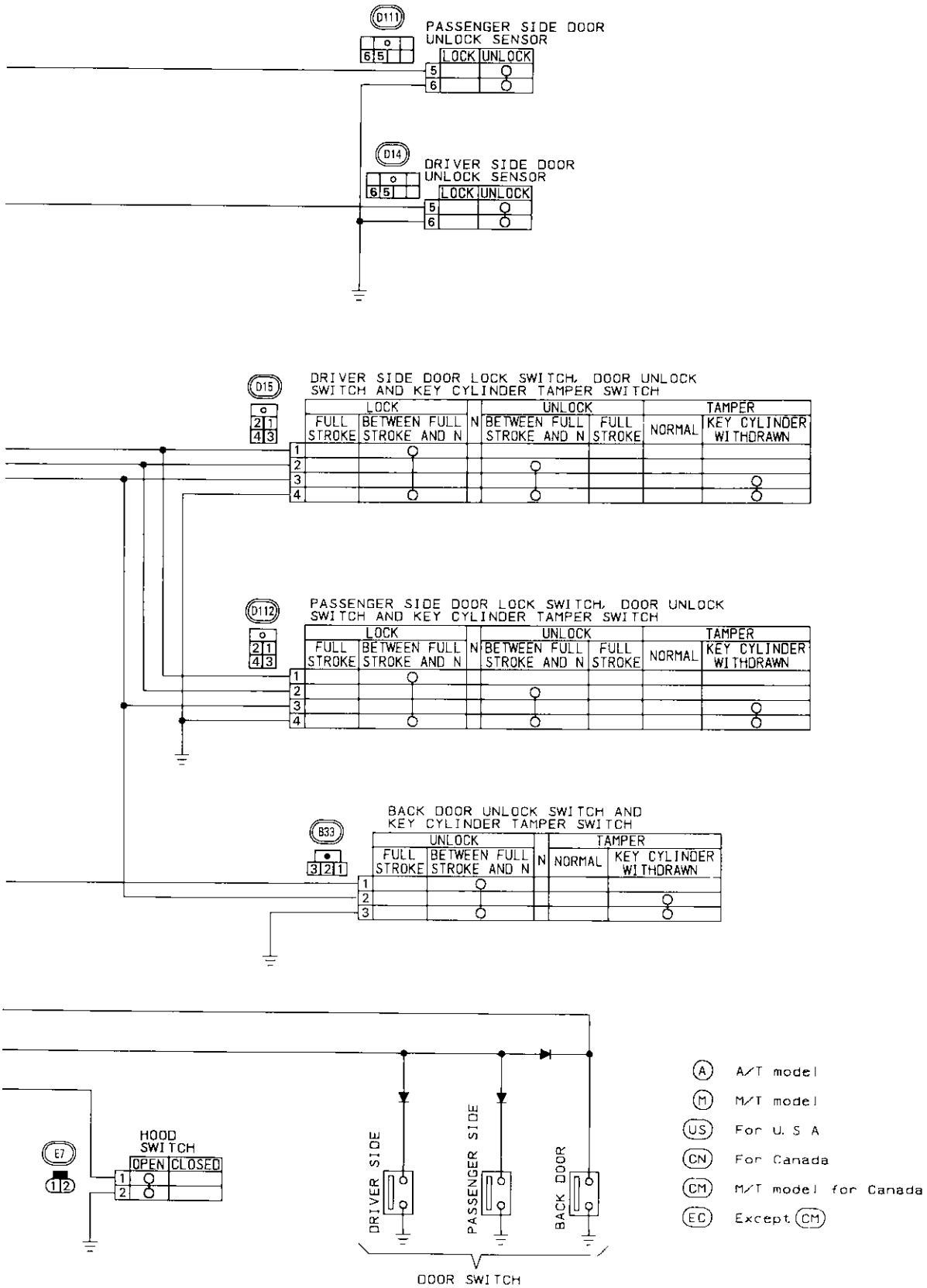
## Trouble Diagnoses (Cont'd)



## Trouble Diagnoses (Cont'd)

### CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK

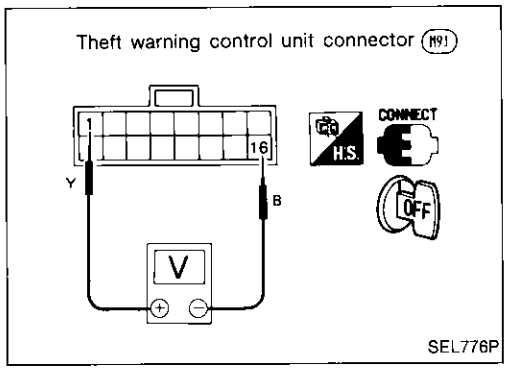



D111
PASSENGER SIDE DOOR UNLOCK SENSOR
LOCK UNLOCK
D14
DRIVER SIDE DOOR UNLOCK SENSOR
LOCK UNLOCK
D15
DRIVER SIDE DOOR LOCK SWITCH, DOOR UNLOCK SWITCH AND KEY CYLINDER TAMPER SWITCH
LOCK
UNLOCK
TAMPER
FULL STROKE
BETWEEN FULL STROKE AND N
N
BETWEEN FULL STROKE AND N
FULL STROKE
NORMAL
KEY CYLINDER WITHDRAWN
D112
PASSENGER SIDE DOOR LOCK SWITCH, DOOR UNLOCK SWITCH AND KEY CYLINDER TAMPER SWITCH
B33
BACK DOOR UNLOCK SWITCH AND KEY CYLINDER TAMPER SWITCH
E7
HOOD SWITCH
OPEN CLOSED
DRIVER SIDE
PASSENGER SIDE
BACK DOOR
DOOR SWITCH
(A) A/T model
(M) M/T model
(US) For U.S.A.
(CN) For Canada
(CM) M/T model for Canada
(EC) Except (CM)

SEL701Q

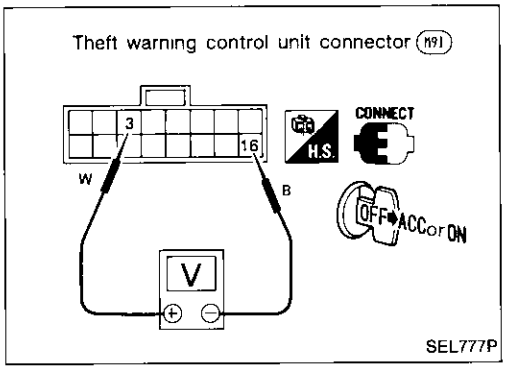
## Trouble Diagnoses (Cont'd)

### POWER SUPPLY AND GROUND CIRCUIT CHECK



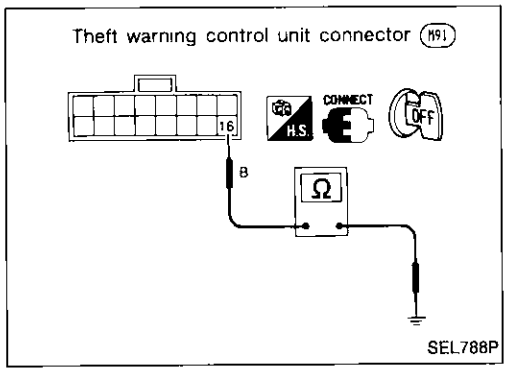

#### Main power supply circuit check

| Terminals | Ignition switch position | | |
|---|---|---|---|
| | OFF | ACC | ON |
| ① - ⑯ | Battery voltage | Battery voltage | Battery voltage |




#### Power supply circuit check for system cancel

| Terminals | Ignition switch position | | |
|---|---|---|---|
| | OFF | ACC | ON |
| ③ - ⑯ | 0V | Battery voltage | Battery voltage |




#### Ground circuit check

| Terminals | Continuity |
|---|---|
| ⑯ - Ground | Yes |

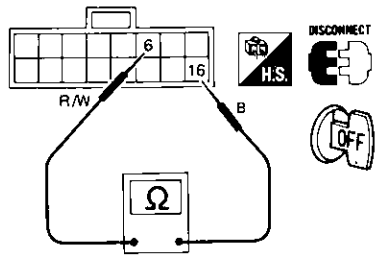
## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 1

**SYMPTOM:**
- **Indicator lamp does not blink.**
- **Indicator lamp remains blinking.**

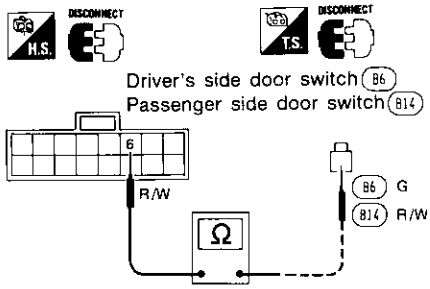
### Diagnostic procedure 1-(1)

A Theft warning control unit connector (M91)




SEL779P

B Theft warning control unit connector (M91)




SEL780P

A

DOOR SWITCH INPUT SIGNAL CHECK
Check voltage between control unit harness terminals ⑥ and ⑯.

| Condition | Voltage |
|---|---|
| All doors are closed | Battery voltage |
| At least one door is open | 0V |

O.K. → Go to Diagnostic Procedure 2.

N.G.

DOOR SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace door switch.

O.K.

B

DOOR SWITCH CIRCUIT CHECK
Check harness continuity between control unit harness terminal ⑥ and door switch harness terminal.
**Continuity should exist.**

N.G. → Repair harness or connectors.

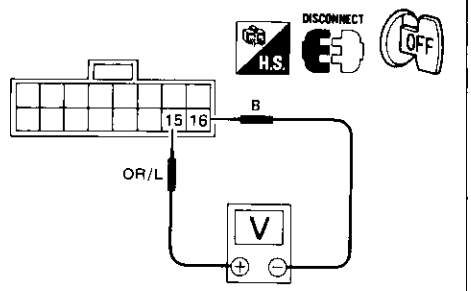
O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

## Trouble Diagnoses (Cont'd)

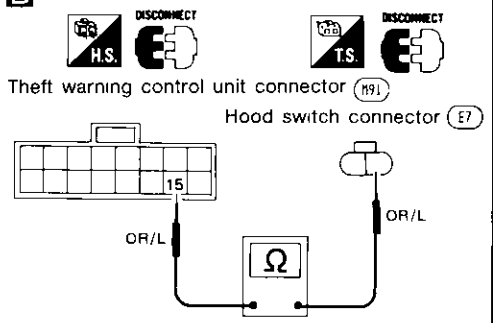
### Diagnostic procedure 1-(2)

A Theft warning control unit connector (M91)

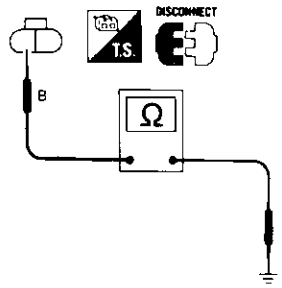



SEL781P

B




Hood switch connector (E7)




SEL782P

A

HOOD SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals (15) and (16).

| Condition | Continuity |
|---|---|
| Hood is open | Yes |
| Hood is closed | No |

O.K. → Go to Diagnostic Procedure 2.

N.G. ↓

Check hood switch and hood fitting condition. — N.G. → Adjust installation of hood switch or hood.

O.K. ↓

HOOD SWITCH CHECK
Refer to "Electrical Components Inspection". — N.G. → Replace hood switch.

O.K. ↓

B

HOOD SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal (15) and hood switch harness terminal.
- Check harness continuity between hood switch terminal and body ground.

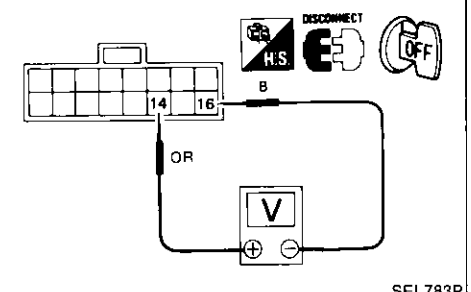
**Continuity should exist.** — N.G. → Repair harness or connectors.

O.K. ↓

CHECK THE CONNECTIONS AT EACH CONNECTOR.

### Diagnostic procedure 1-(3)

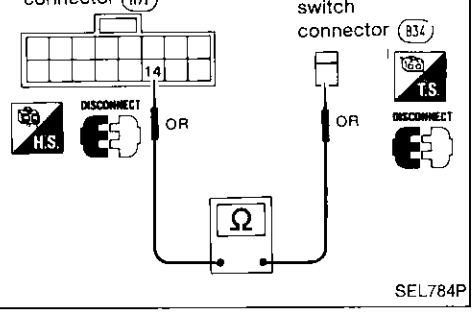
A Theft warning control unit connector (M91)




SEL783P

B Theft warning control unit connector (M91)

Back door switch connector (B34)




SEL784P

A

BACK DOOR SWITCH INPUT SIGNAL CHECK
Check voltage between control unit harness terminals (14) and (16).

| Condition | Voltage |
|---|---|
| Back door is open | Approx. 0V |
| Back door is closed | Approx. 12V |

O.K. → Go to Diagnostic Procedure 2.

N.G. ↓

Does room lamp come on? — Yes → B

No ↓

BACK DOOR SWITCH CHECK
Refer to "Electrical Components Inspection". — O.K. → B

N.G. ↓

Replace back door switch.

B

BACK DOOR SWITCH CIRCUIT CHECK
Check harness continuity between control unit harness terminal (14) and back door switch harness terminal.

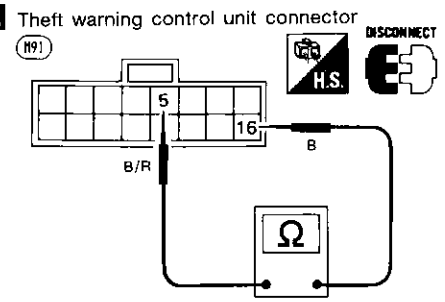
O.K. ↓

CHECK THE CONNECTIONS AT EACH CONNECTOR.

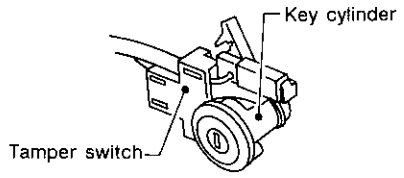
## Trouble Diagnoses (Cont'd)

### Diagnostic procedure 1-(4)

A Theft warning control unit connector (M91)

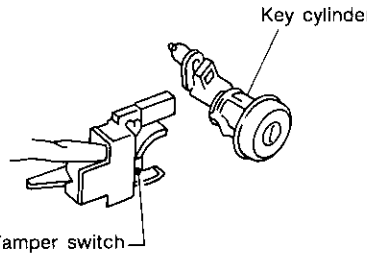



[Example]




No continuity ... O.K.

[Example]

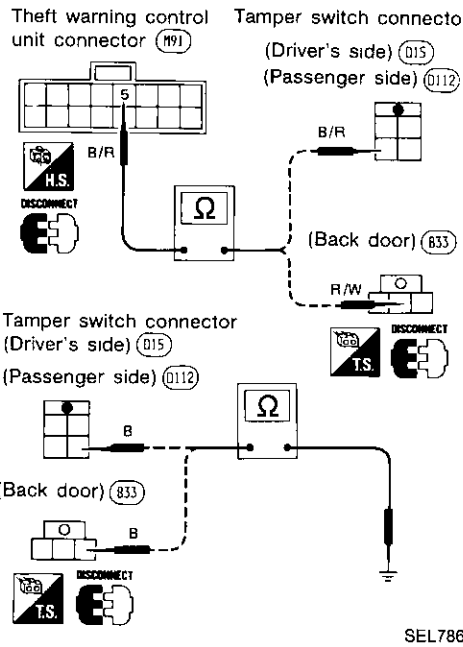



Reed switch turns on when key cylinder is removed.

Continuity exists . . O.K.

SEL785P

B




SEL786P

A

KEY CYLINDER TAMPER SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals (5) and (16).

| Condition | Continuity |
|---|---|
| Tamper switch is | |
| Normal | No |
| Removed | Yes |

O.K. → Go to Diagnostic Procedure 2.

N.G.

KEY CYLINDER TAMPER SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder tamper switch.

O.K.

B

KEY CYLINDER TAMPER SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal (6) and tamper switch harness terminal.
- Check harness continuity between tamper switch terminal and body ground.

**Continuity should exist.**

N.G. → Repair harness and connectors.

O.K.

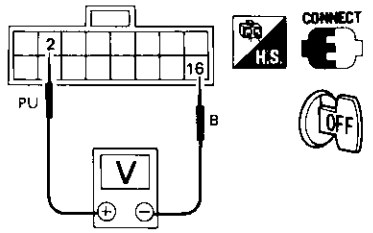
CHECK THE CONNECTIONS AT EACH CONNECTOR.

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 2

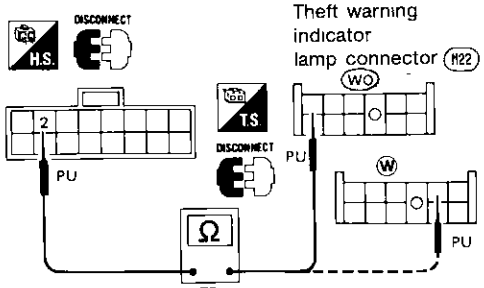
**SYMPTOM: Indicator lamp does not blink.**

A Theft warning control unit connector (M91)




SEL787P

B Theft warning control unit connector (M91)




W : With air bag WO : Without air bag SEL788P

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. ↓

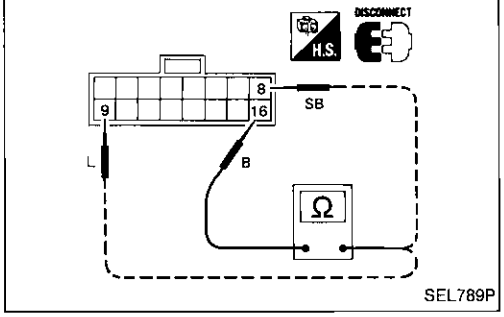
CHECK THE CONNECTIONS AT EACH CONNECTOR.

## Trouble Diagnoses (Cont'd)

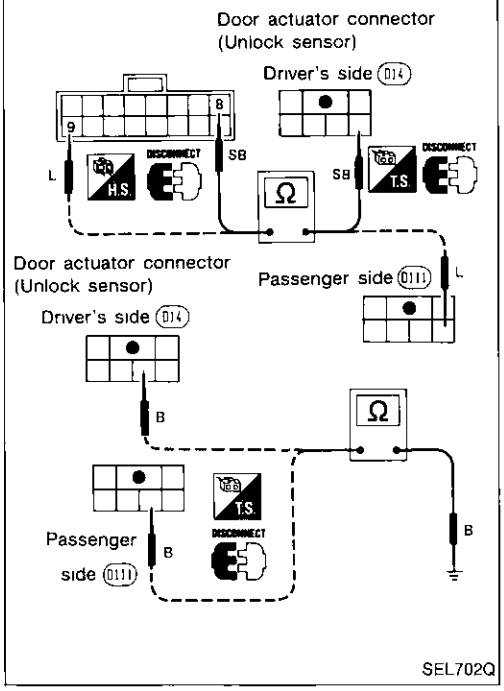
### DIAGNOSTIC PROCEDURE 3

**SYMPTOM: Indicator lamp does not come on.**

A Theft warning control unit connector (M91)




B Theft warning control unit connector (M19)




A

DOOR UNLOCK SENSOR INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑧ (Driver's side) or ⑨ (Passenger side) and ⑯.

| Condition | Continuity |
|---|---|
| Locked | No |
| Unlocked | Yes |

O.K. → Go to Diagnostic Procedure 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 ⑧ (Driver's side) or ⑨ (Passenger side) and door actuator terminal.
- Check harness continuity between door actuator terminal and body ground.

**Continuity should exist.**

N.G. → Repair harness or connectors.

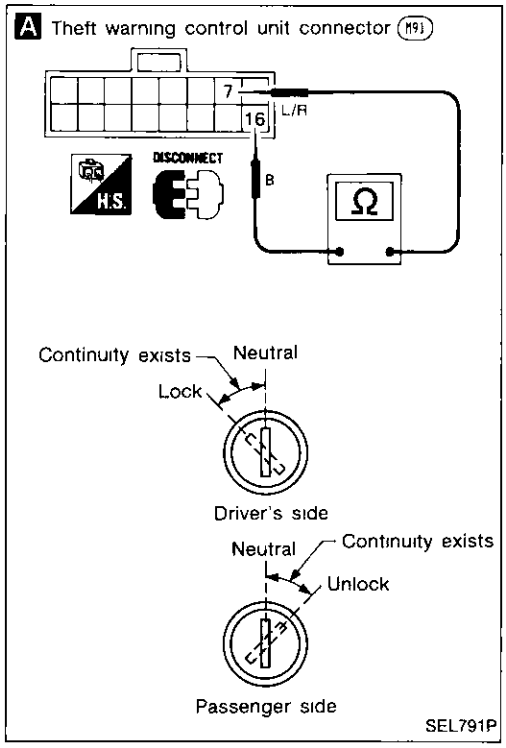
O.K. →

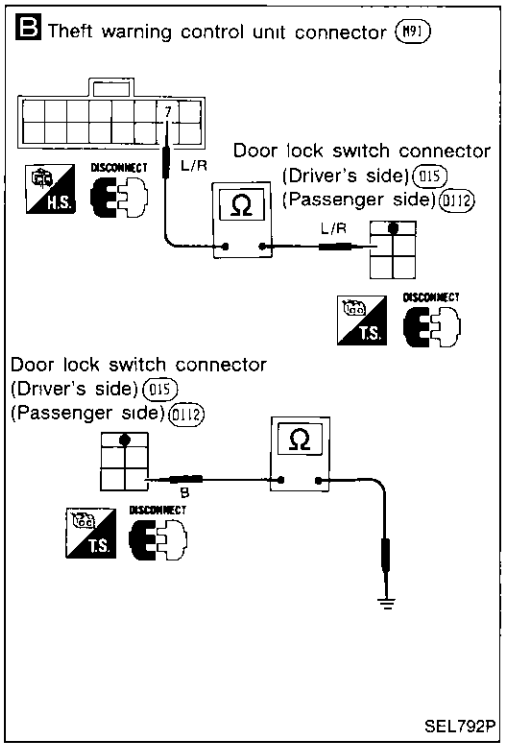
CHECK THE CONNECTIONS AT EACH CONNECTOR.

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 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.

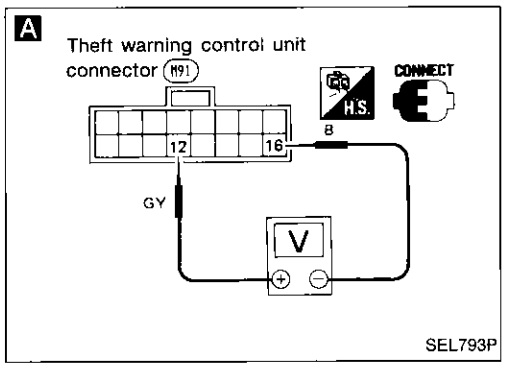
O.K. ↓

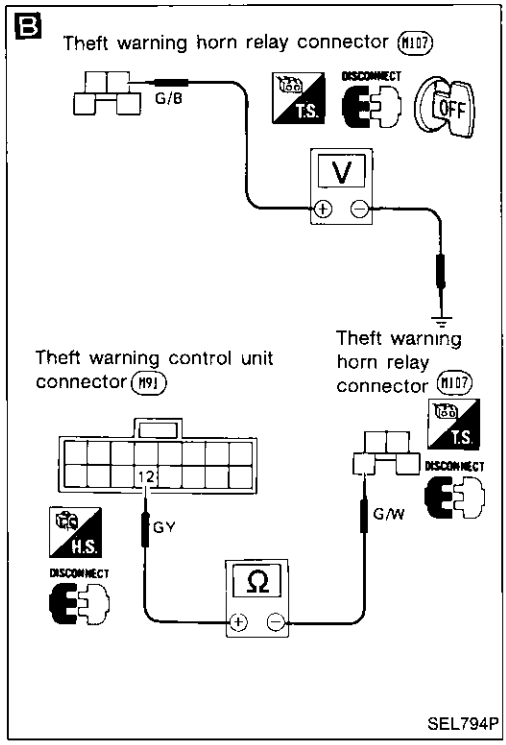
CHECK THE CONNECTIONS AT EACH CONNECTOR.

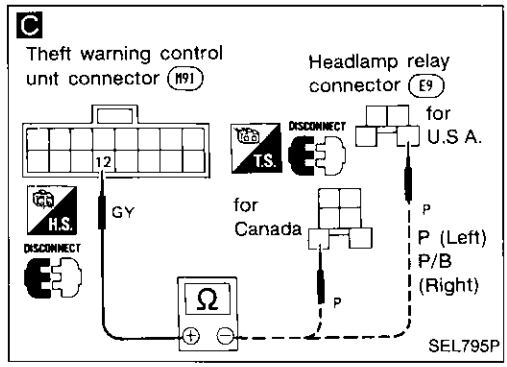
## Trouble Diagnoses (Cont'd)

### 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. ↓

C

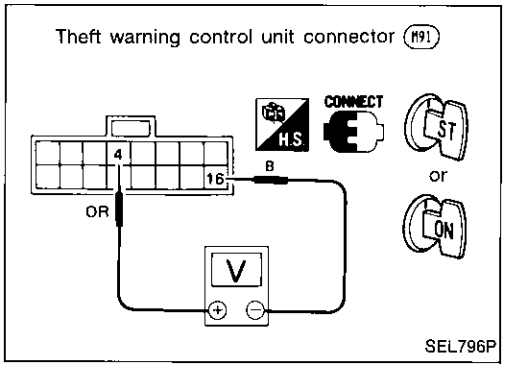
THEFT WARNING HEADLAMP CIRCUIT CHECK
Check continuity between headlamp relay terminal and control unit harness terminal ⑫.

N.G. → Repair harness and connectors.

O.K. ↓

Check headlamp system. Refer to "HEADLAMP".

## Trouble Diagnoses (Cont'd)




### DIAGNOSTIC PROCEDURE 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.

N.G. → Replace theft warning relay.

O.K. ↓

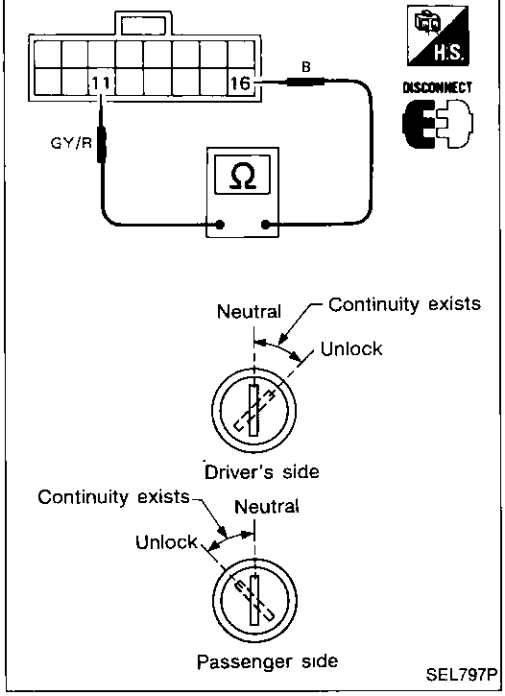
Repair harness between control unit and theft warning relay.

## Trouble Diagnoses (Cont'd)

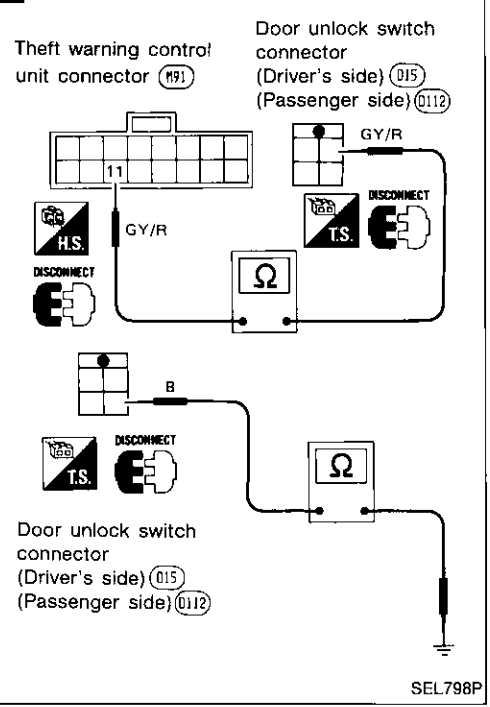
### DIAGNOSTIC PROCEDURE 7

**SYMPTOM: Alarm does not stop even if stop signal is given.**

A Theft warning control unit connector (M91)




B




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.

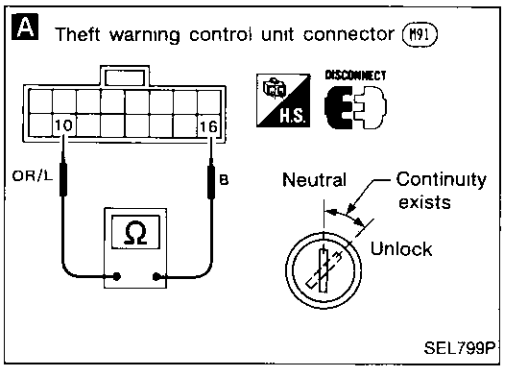
O.K.

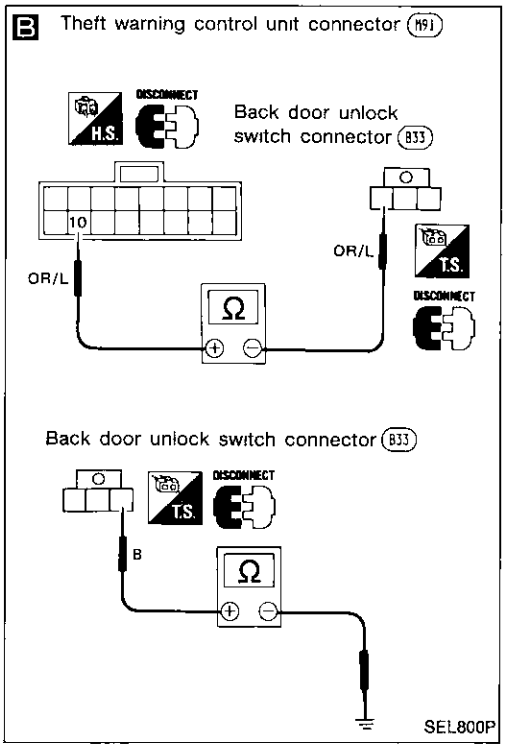
CHECK THE CONNECTIONS AT EACH CONNECTOR.

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 8

**SYMPTOM: Alarm does not stop even if stop signal is given.**




A

BACK DOOR UNLOCK SWITCH INPUT SIGNAL CHECK (UNLOCK SIGNAL)
Check continuity between control unit harness terminals ⑩ and ⑯.

| Key position | Continuity |
|---|---|
| Neutral/Unlock | No |
| Between neutral and unlock | Yes |

O.K. → Replace control unit.

N.G. ↓

BACK DOOR UNLOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. → Replace key cylinder switch.

O.K. ↓

B

BACK DOOR UNLOCK SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑩ and back door unlock switch terminal.
- Check harness continuity between back door unlock switch terminal and body ground.

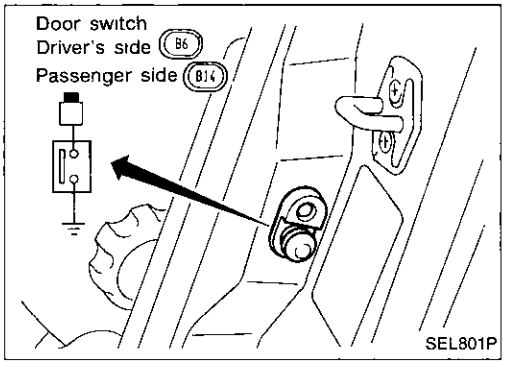
N.G. → Repair harness or connectors.

O.K. ↓

CHECK THE CONNECTIONS AT EACH CONNECTOR.

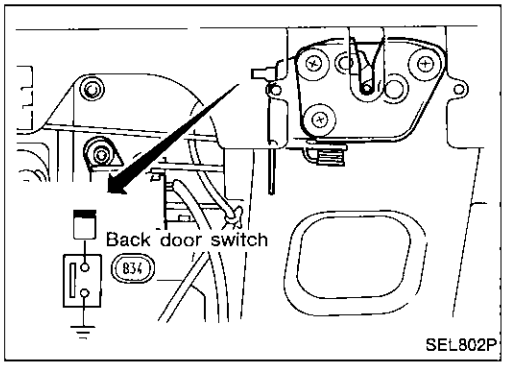
## Trouble Diagnoses (Cont'd)

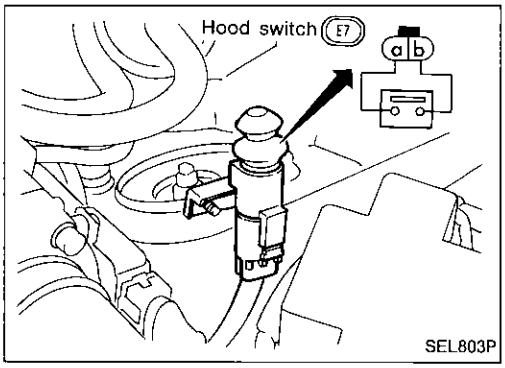
### ELECTRICAL COMPONENTS INSPECTION




### Door switches

Check continuity between terminal and switch body.

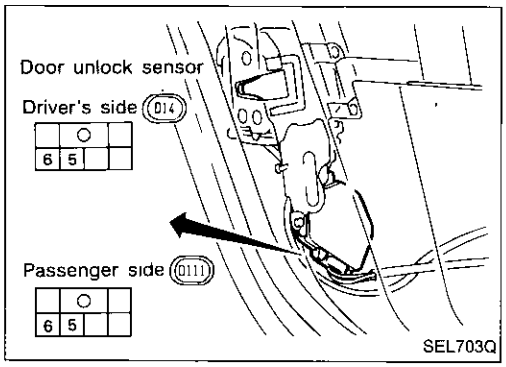



### Hood switch

Check continuity between terminals when hood switch is pushed and released.

| Terminal | Pushed | Released |
|---|---|---|
| a | | ○ |
| b | | ○ |

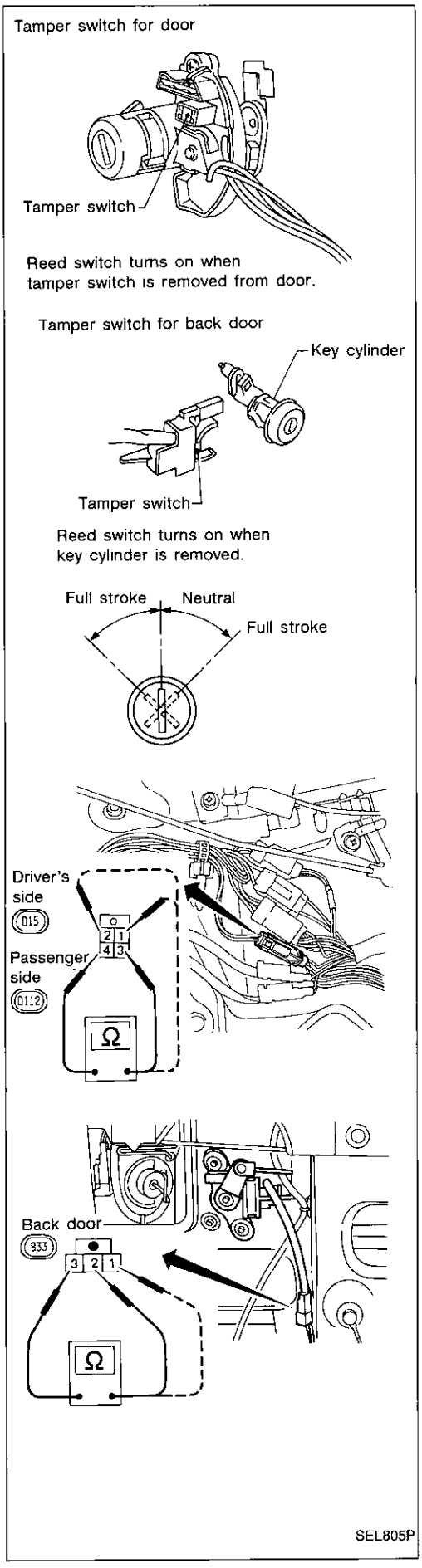



### Door unlock sensor

| | LOCK | UNLOCK |
|---|---|---|
| 5 | | ○ |
| 6 | | ○ |

## Trouble Diagnoses (Cont'd)

### Key cylinder tamper switch, door lock switch and door unlock switch



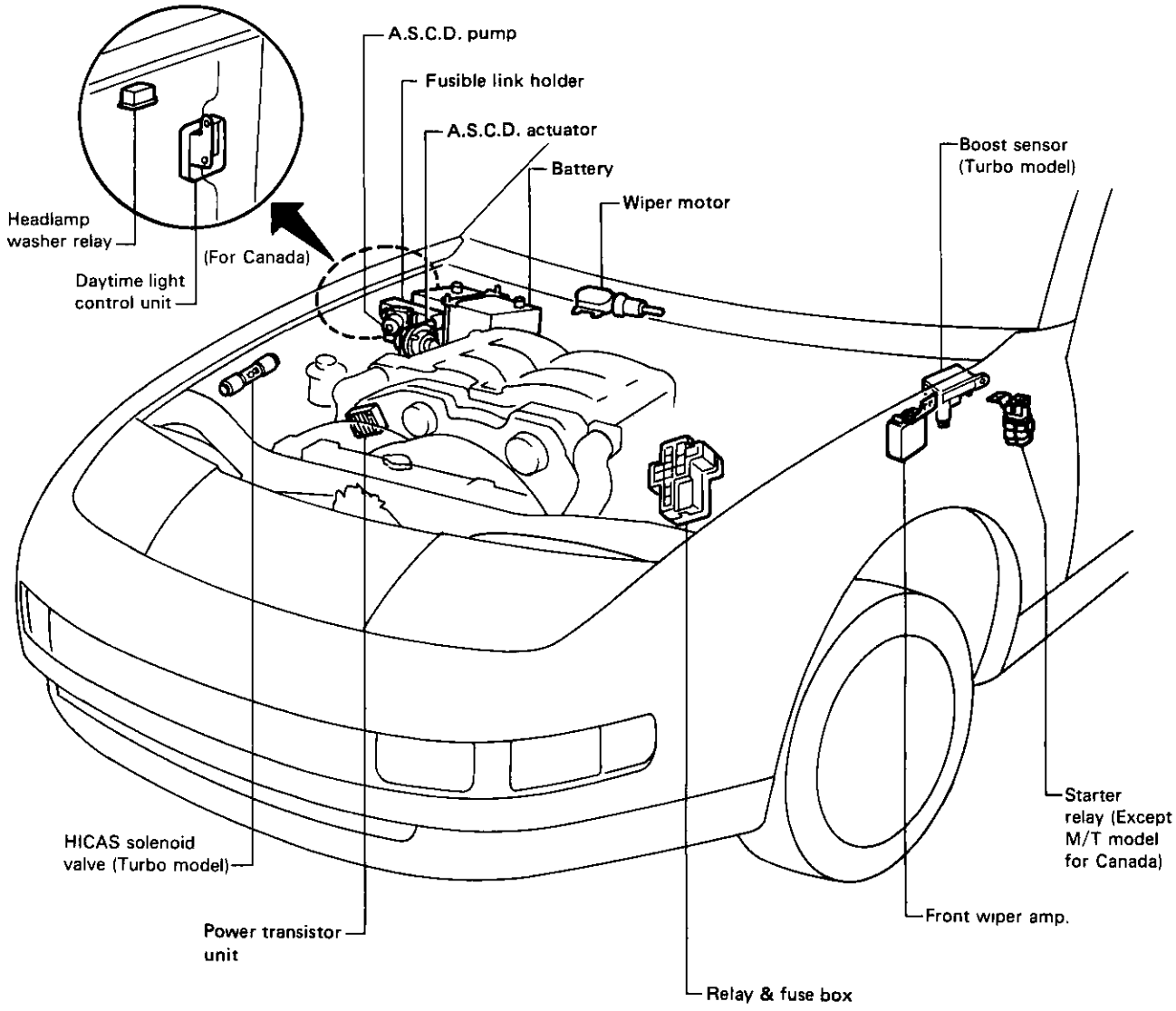

- **Door**

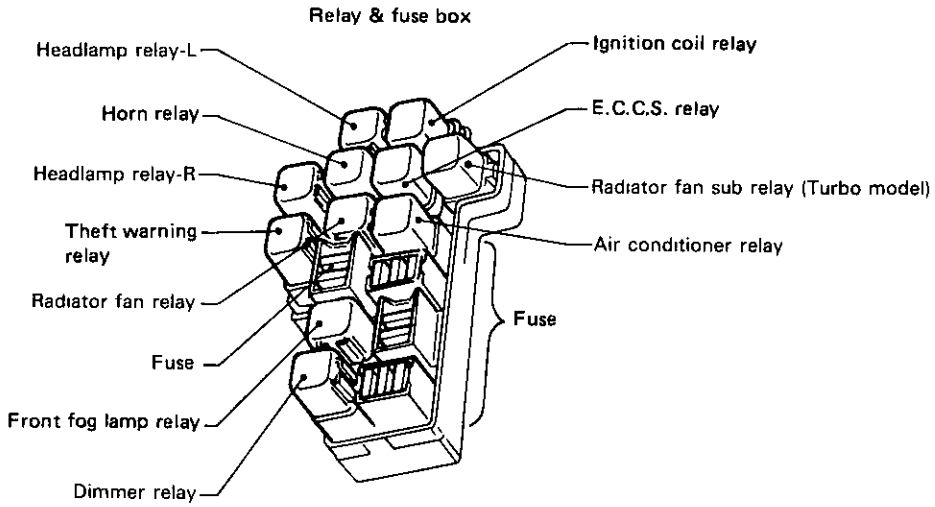
| | TAMPER SWITCH | | DOOR LOCK SWITCH | | | DOOR UNLOCK SWITCH | |
|---|---|---|---|---|---|---|---|
| | Key cylinder is installed | Key cylinder is removed | Full stroke | Between full stroke and neutral | Neutral | Between full stroke and neutral | Full stroke |
| 1 | | | | ○ | | | |
| 2 | | | | \| | | ○ | |
| 3 | | ○ | | \| | | \| | |
| 4 | | ○ | | ○ | | ○ | |

- **Back door**

| | TAMPER SWITCH | | Back door unlock switch | | |
|---|---|---|---|---|---|
| | Key cylinder is installed | Key cylinder is removed | Full stroke | Between full stroke and neutral | Neutral |
| 1 | | | | ○ | |
| 2 | | ○ | | \| | |
| 3 | | ○ | | ○ | |

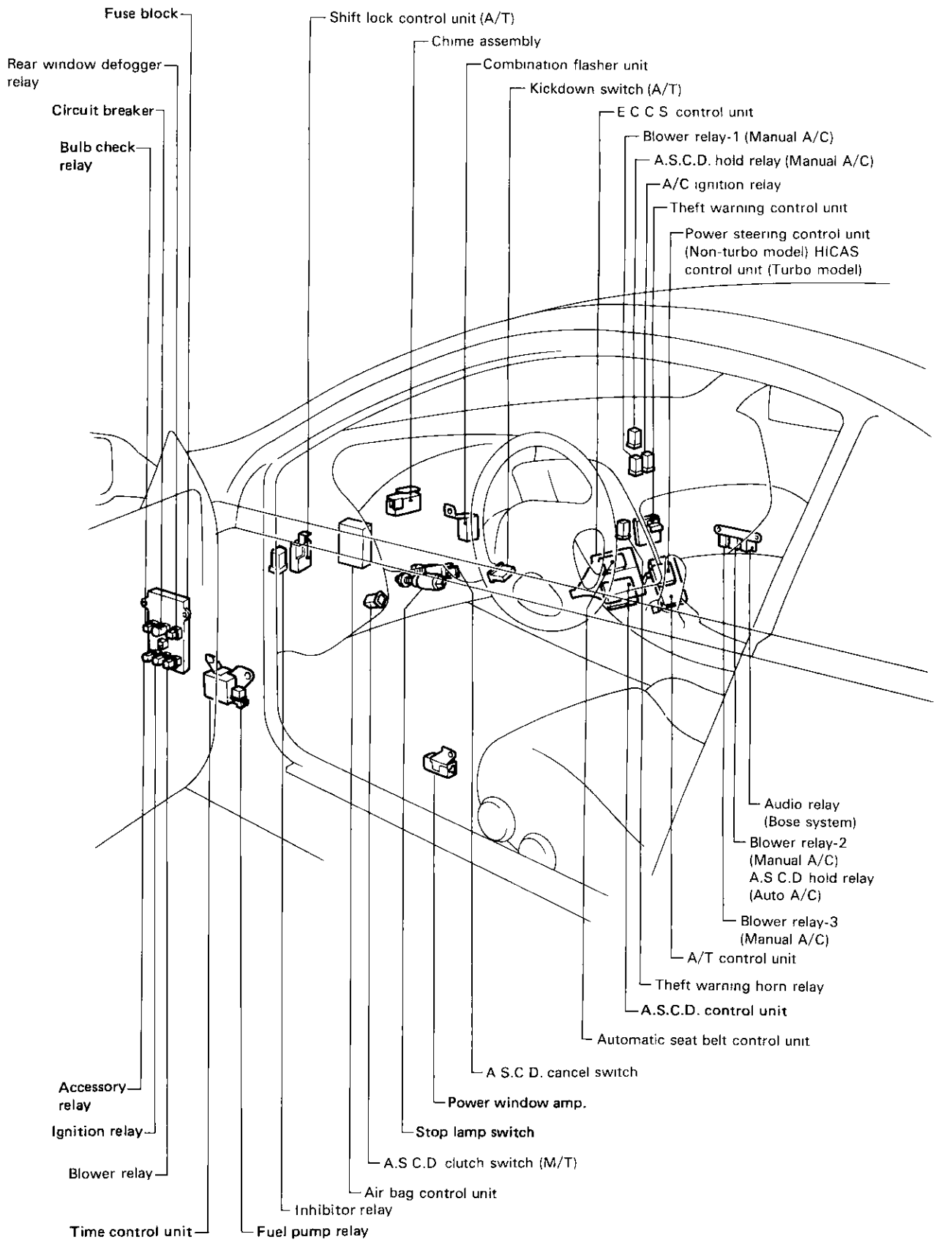
## Engine Compartment




SEL716Q

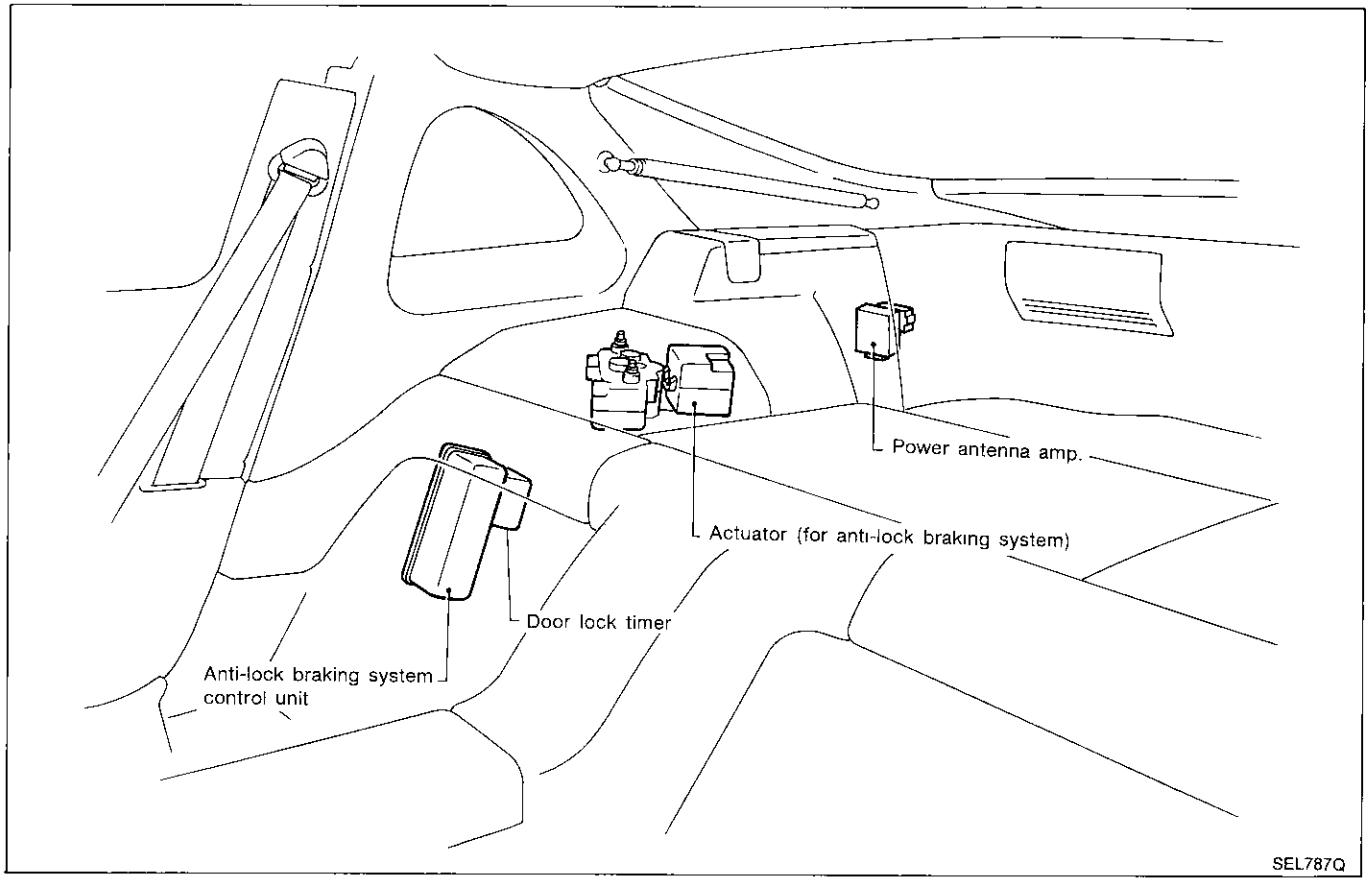
## Passenger Compartment

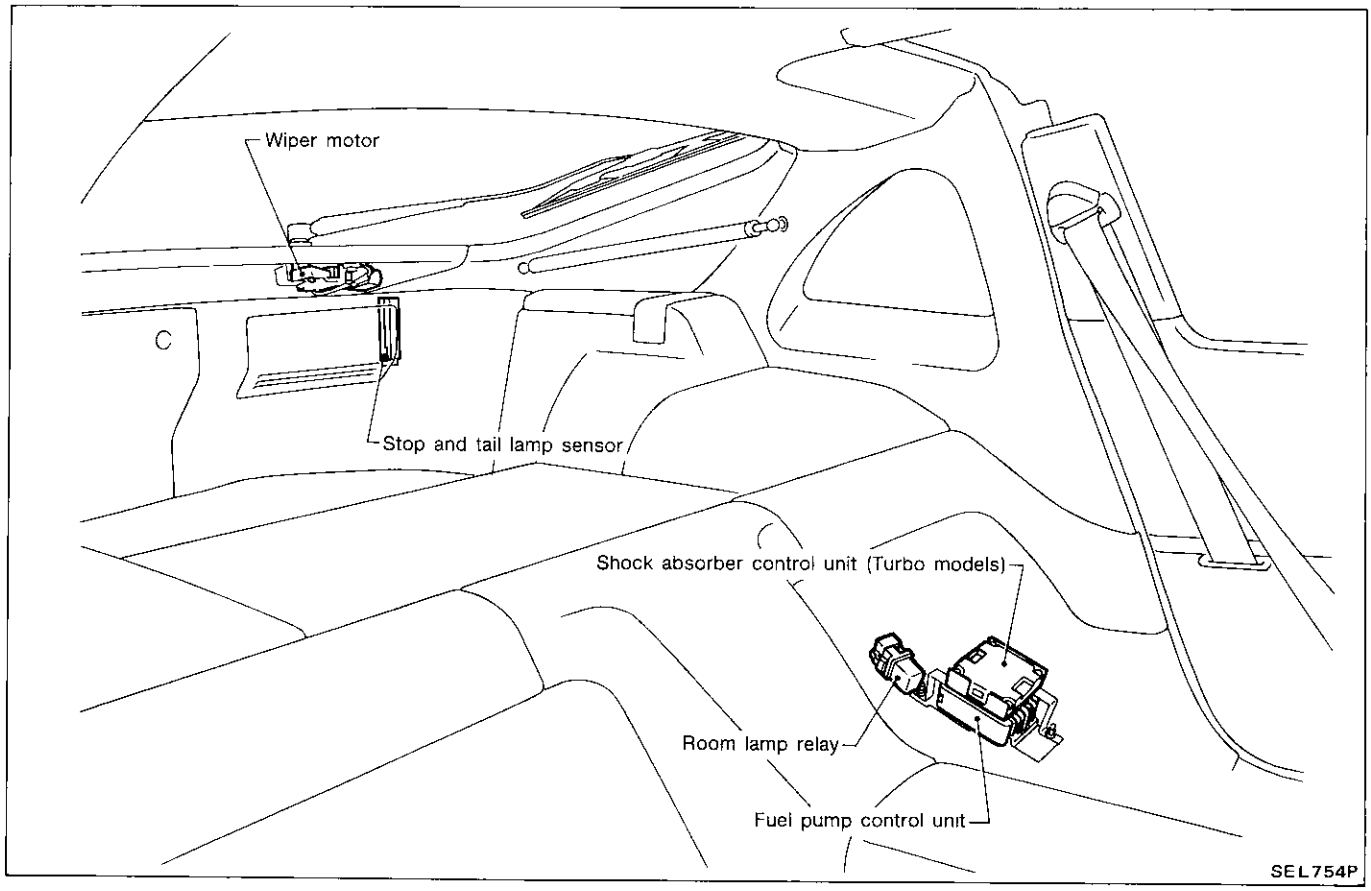



SEL717Q

## Luggage Compartment

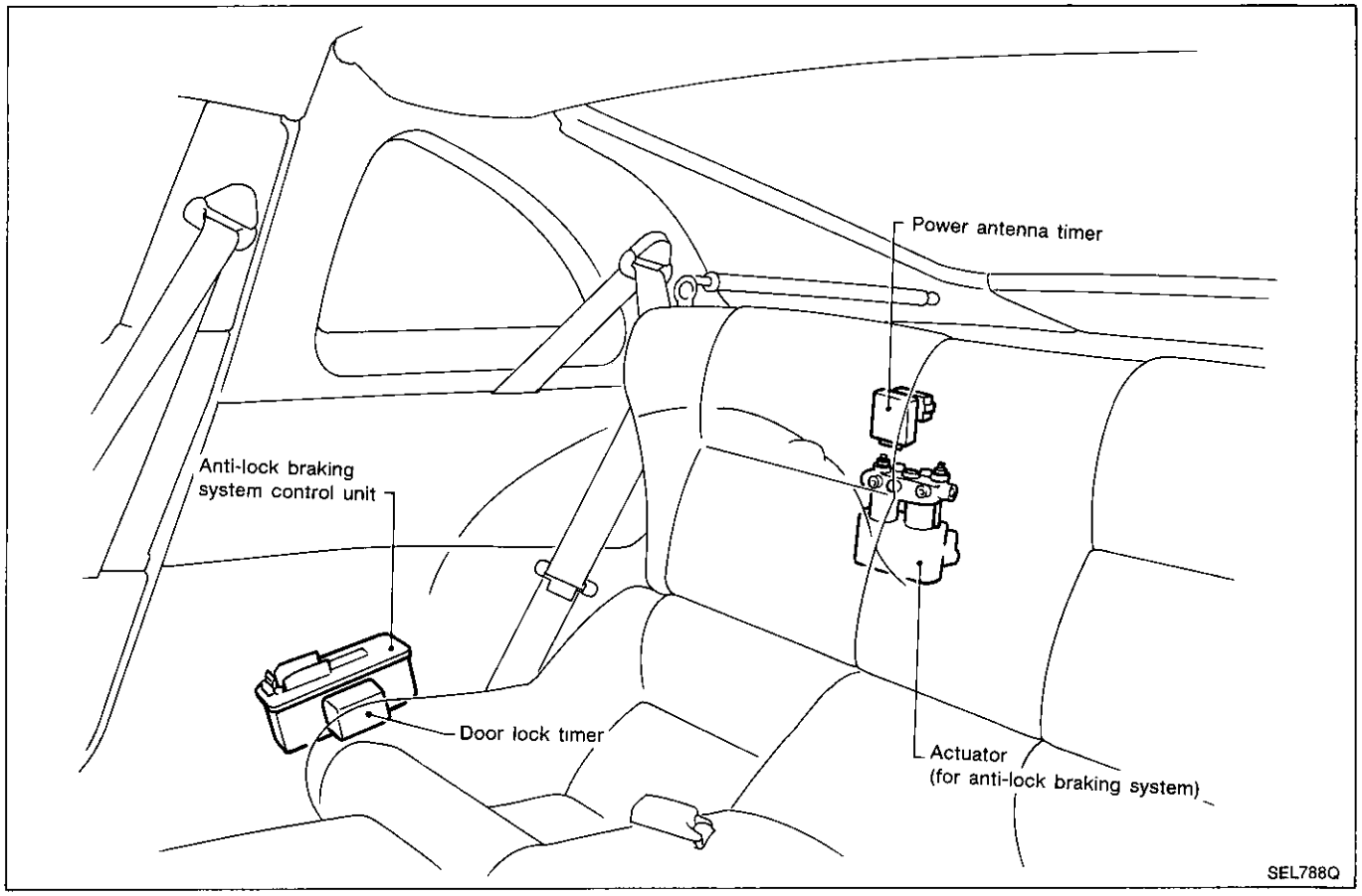
**2 SEATER**

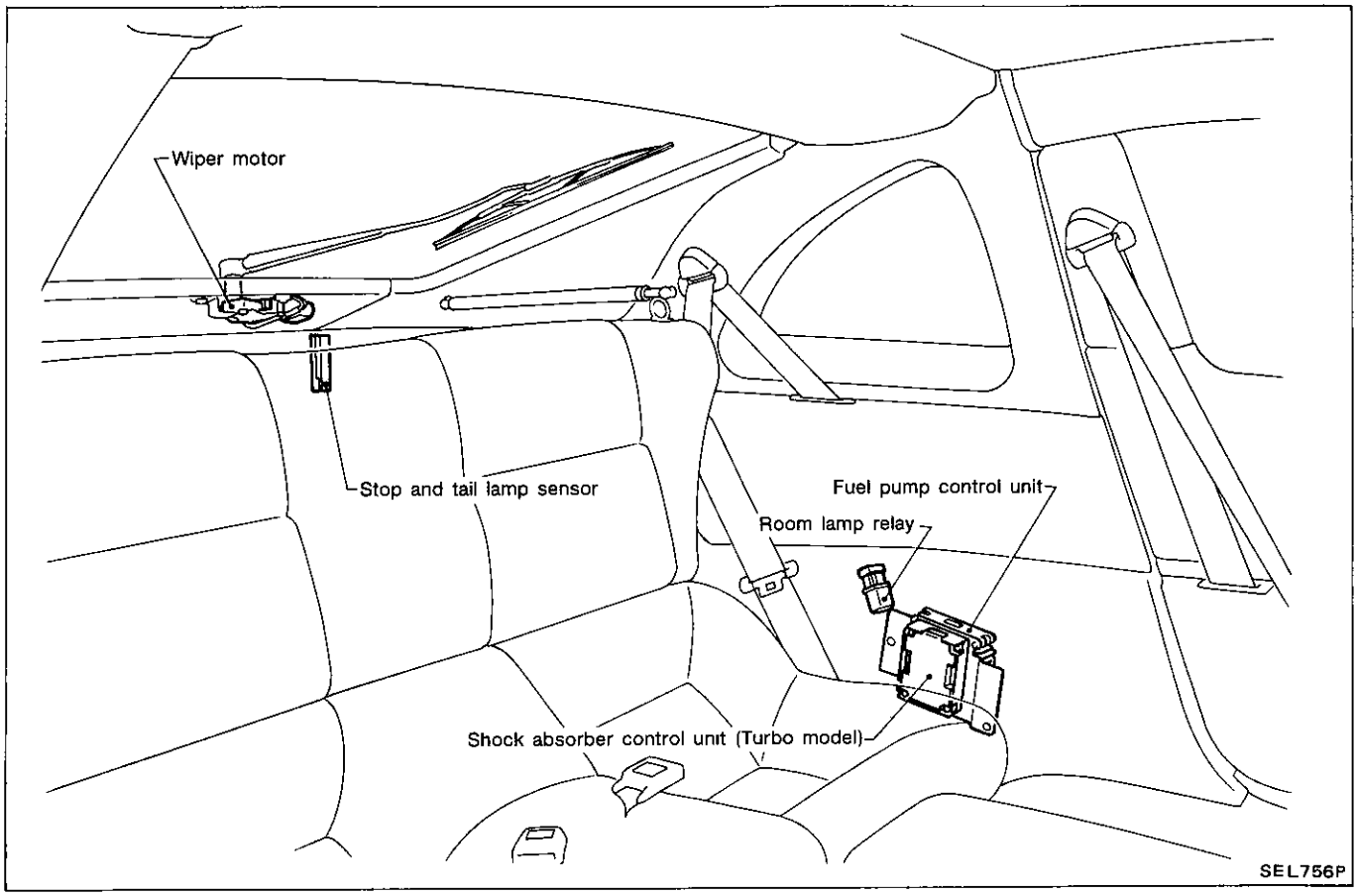


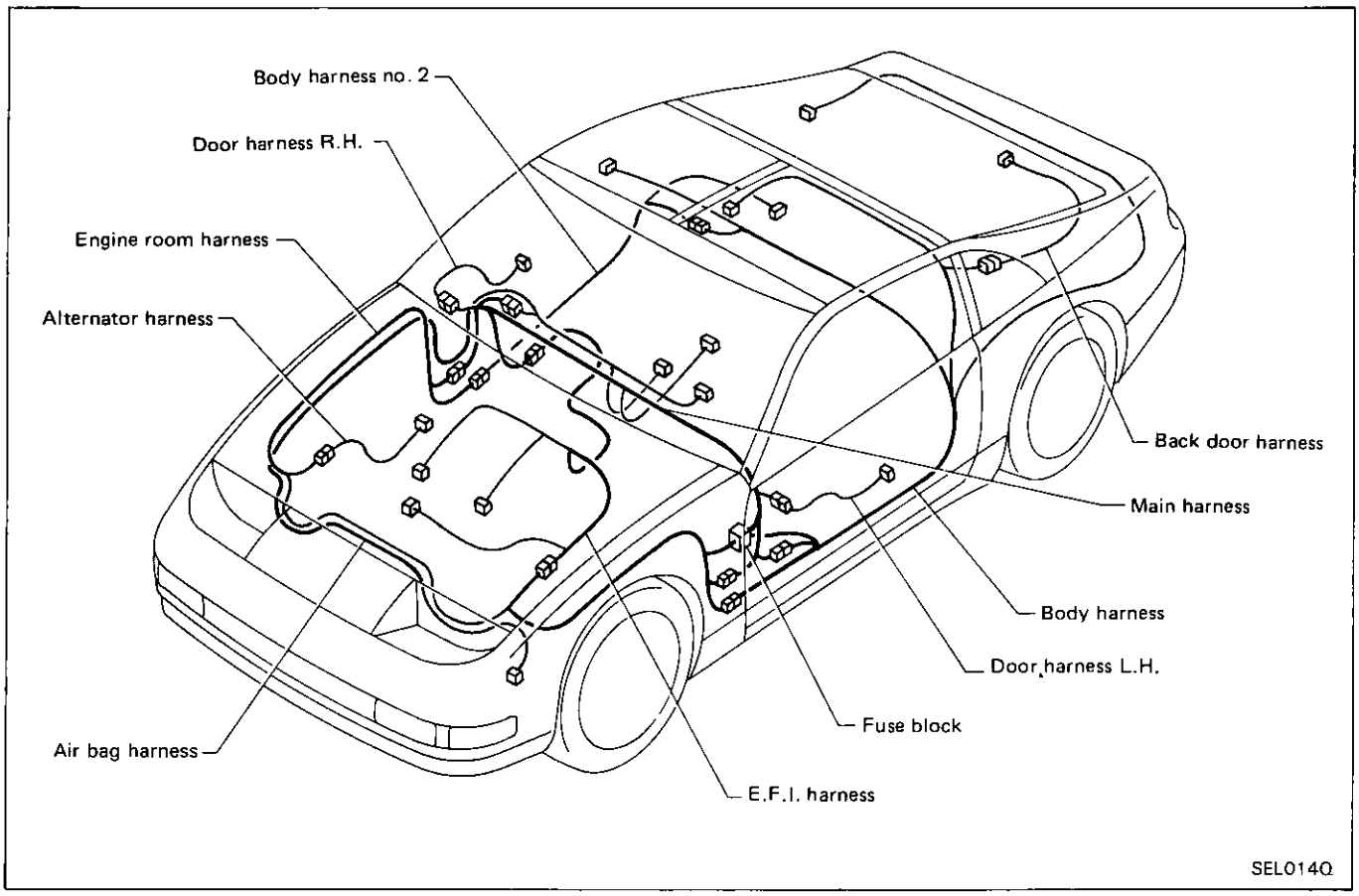
## Luggage Compartment (Cont'd)

**2+2 SEATER**

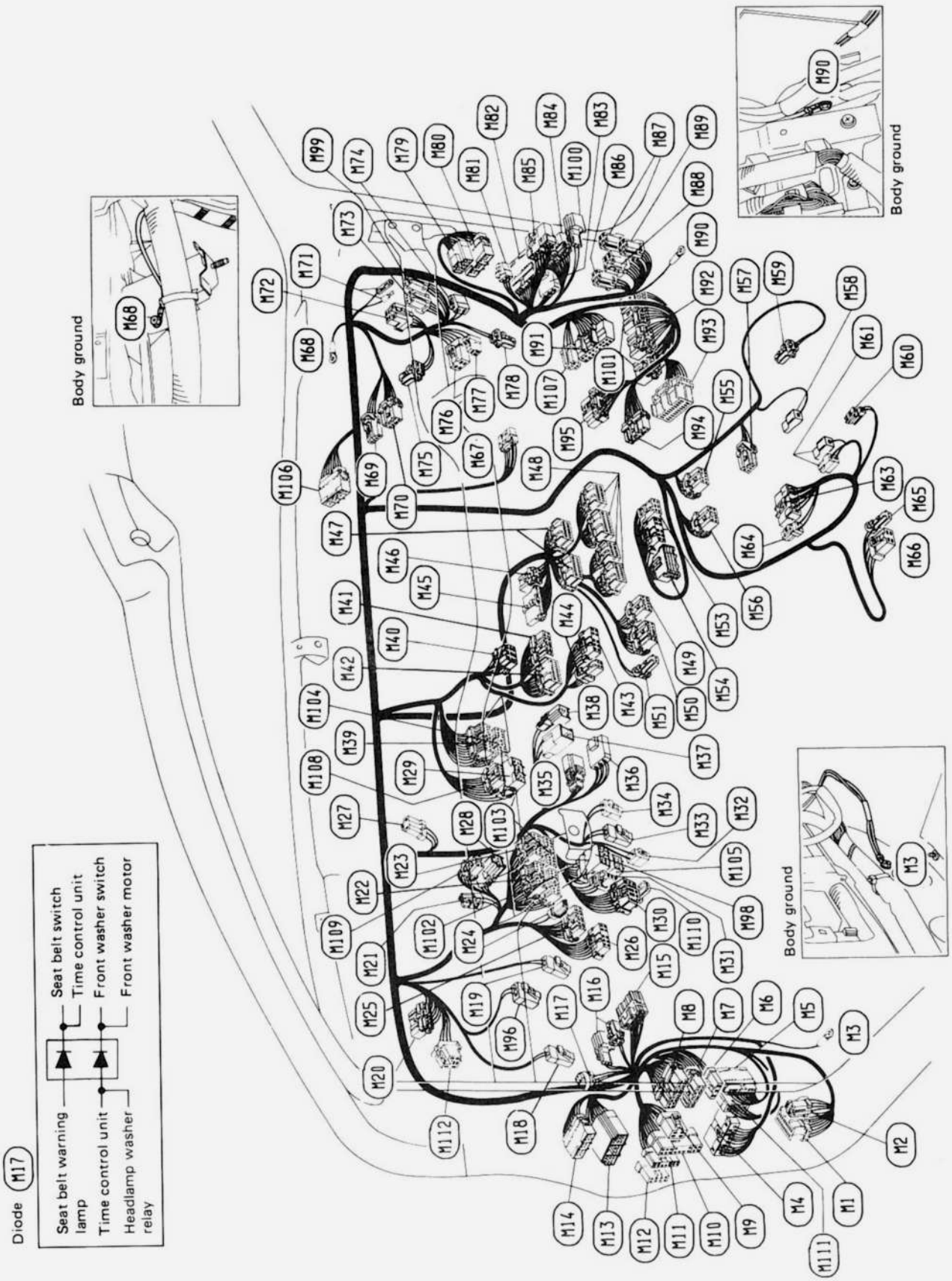


## Outline

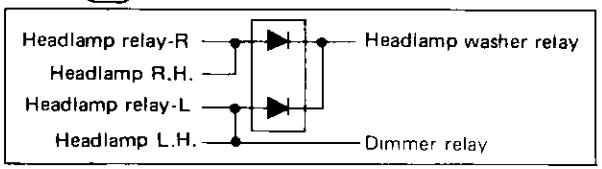

Body harness no. 2
Door harness R.H.
Engine room harness
Alternator harness
Air bag harness
E.F.I. harness
Fuse block
Door harness L.H.
Body harness
Main harness
Back door harness
SEL014Q

## Main Harness

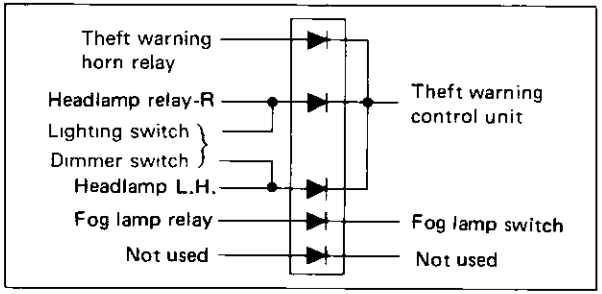


(M1) : Time control unit
(M2) : Fuel pump relay
(M3) : Body ground
(M4) : To body harness (B2)
(M5) : To body harness (B3)
(M6) : To engine room harness (E101)
(M7) : To engine room harness (E102)
(M8) : To engine room harness (E103) (Black)
(M9) : Fuse block
(M10) : Fuse block
(M11) : Fuse block
(M12) : Fuse block
(M13) : To door harness L.H. (D1)
(M14) : To door harness L.H. (D2)
(M15) : Diagnostic connector for CONSULT
(M16) : Joint connector (Turbo model)
(M17) : Diode (For Canada)
(M18) : A.S.C.D clutch switch (Blue) (M/T model)
(M19) : Clutch interlock switch (Blue) (M/T model for U.S.A.)
(M20) : Shift lock control unit (A/T model)
(M21) : Warning chime
(M22) : Combination meter (Black) (Without air bag)
(M23) : Combination meter (White) (Without air bag)
(M24) : Cluster switch
(M25) : Cluster switch
(M26) : Lighting switch·Headlamp washer switch
(M27) : Combination flasher unit
(M28) : Warning lamp (A/T model) (Without air bag)
(M29) : Warning lamp (Without air bag)
(M30) : Dimmer switch
(M31) : Steering switch (Non-turbo model without air bag)
(M32) : Kickdown switch (White) (A/T model)
(M33) : A.S.C.D. cancel switch (Blue)
(M34) : Stop lamp switch (Black)
(M35) : Key lock solenoid (A/T model)
(M36) : Ignition switch
(M37) : Key switch
(M38) : Key hole illumination
(M39) : Combination meter (Without air bag)
(M40) : Hazard warning switch
(M41) : A/C switch unit (Manual A/C model)
(M42) : A/C switch unit (Auto A/C model)
(M43) : Front wiper and washer switch
(M44) : Rear wiper and washer switch
(M45) : Mode door motor (Manual A/C model)
(M46) : Mode door motor (Auto A/C model)
(M47) : A/C control unit (Manual A/C model)
(M48) : A/C control unit (Auto A/C model)
(M49) : Air mix actuator (Manual A/C model)
(M50) : To A/C sub-harness (Auto A/C model)
(M51) : Foot lamp L.H.
(M53) : Radio and cassette player
(M54) : Joint connector (Bose system model)
(M55) : Shift lock solenoid·Detention switch (A/T model)
(M56) : Digital clock
(M57) : O.D. control switch and A/T illumination (A/T model)
(M58) : Parking brake switch
(M59) : Seat belt switch R.H.
(M60) : Ashtray illumination
(M61) : Cigarette lighter
(M63) : Door mirror control switch·Shock absorber select switch
(M64) : Door mirror defogger switch
(M65) : Seat belt switch L.H. (For Canada)
(M66) : To seat sub-harness (With power seat)
(M67) : Thermo control amplifier (Manual A/C model)
(M68) : Body ground
(M69) : Intake door motor (Manual A/C model)
(M70) : Intake door motor (Auto A/C model)
(M71) : Glove box lamp
(M72) : A.S.C.D. hold relay (Manual A/C model)
(M73) : Blower relay-1 (Manual A/C model)
(M74) : Blower motor
(M75) : A/C sensor (Auto A/C model)
(M76) : Heater resistor (Manual A/C model)
(M77) : Blower control amplifier (Auto A/C model)
(M78) : Foot lamp R.H.
(M79) : To door harness R.H. (D101)
(M80) : To door harness R.H. (D102)
(M81) : Diode (For Canada)
(M82) : To engine room harness (E110) (Black)
(M83) : To engine room harness (E111)
(M84) : To engine room harness (E112) (Brown)
(M85) : Diode
(M86) : Blower relay-3 (Manual A/C model)
Audio relay (Auto A/C model)
(M87) : Blower relay-2 (Manual A/C model)
(M88) : A.S.C.D. hold relay (Auto A/C model)
(M89) : Audio relay (Manual A/C model with Bose system)
(M90) : Body ground
(M91) : Theft warning control unit
(M92) : Power steering control unit (Non-turbo model)
(M93) : A.S.C.D. control unit
(M94) : Automatic seat belt control unit (For U.S.A.)
(M95) : To E.F.I. harness (F2)
(M96) : Clutch switch (Black) (M/T)
(M98) : Steering angle sensor·Steering switch (Turbo model without air bag)
(M99) : A/C ignition relay
(M100) : To body harness no 2 (B109) (Turbo model)
(M101) : HICAS control unit (Turbo model)
(M102) : Combination meter (With air bag)
(M103) : Combination meter (With air bag)
(M104) : Combination meter (With air bag)
(M105) : Steering angle sensor (With air bag)
(M106) : To air bag harness (A111)
(M107) : Theft warning horn relay
(M108) : Warning lamp (With air bag)
(M109) : Warning lamp (With air bag)
(M110) : Steering switch (With air bag)
(M111) : To (B113)
(M112) : Inhibitor relay

Diode (M81)




Diode (M85)

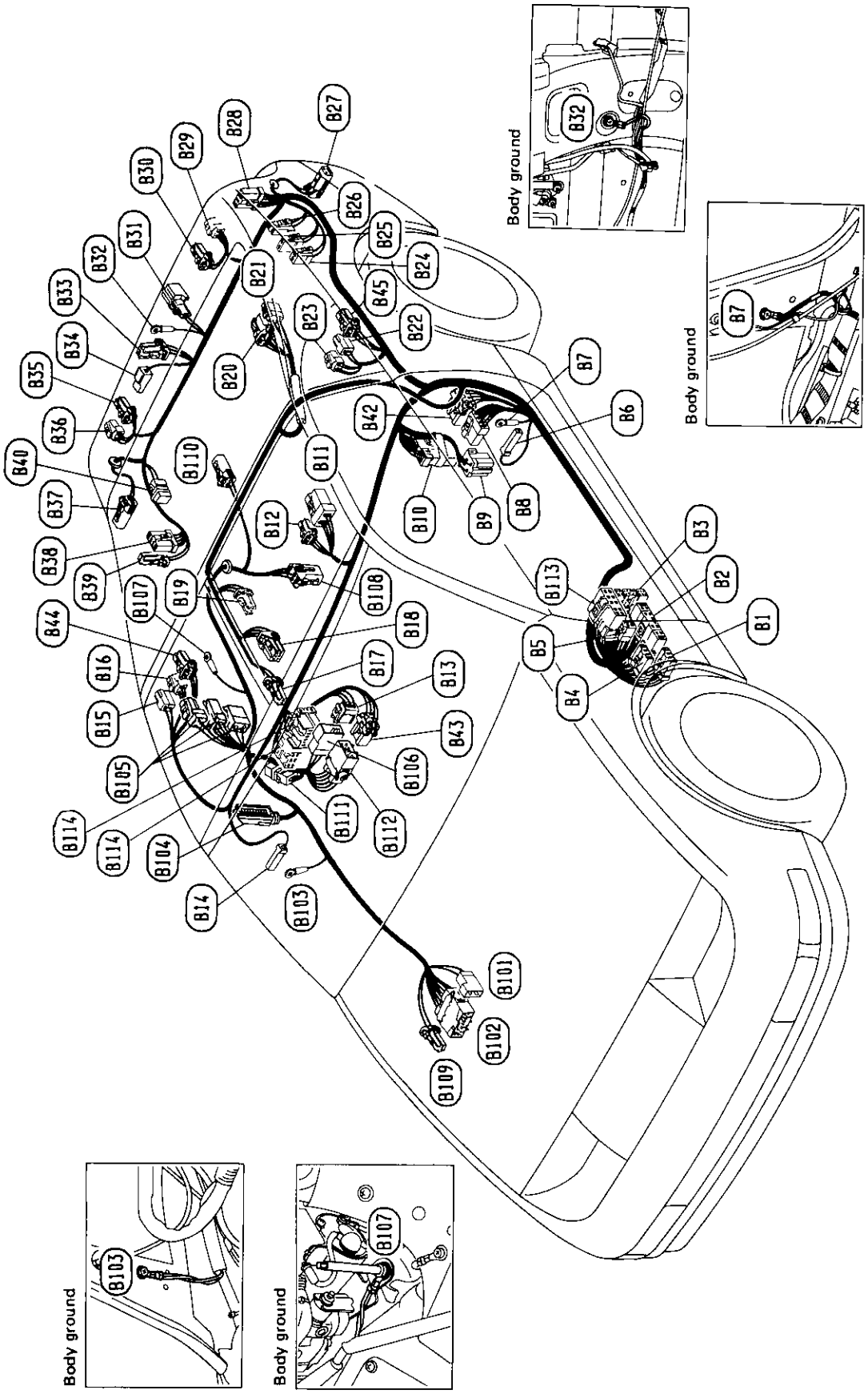




SEL718Q

## Body Harness

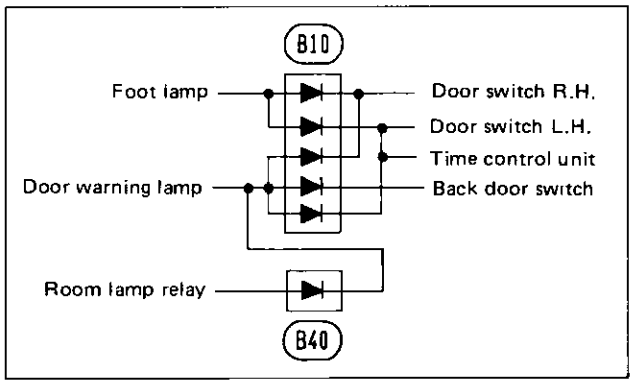
**2 SEATER**



Body harness

(B1) : To engine room harness (E104)
(B2) : To main harness (M4)
(B3) : To main harness (M5)
(B4) : Fuse block
(B5) : Fuse block
(B6) : Door switch L.H.
(B7) : Body ground
(B8) : Fuel pump control unit
(B9) : Room lamp relay
(B10) : Diode
(B11) : Fuel pump
(B12) : Fuel tank gauge unit
(B13) : To body harness no. 2 (B106)
(B14) : Door switch R.H.
(B15) : Rear speaker R.H. (Except Bose system)
(B16) : Rear speaker R.H. (Bose system)
(B17) : Spot lamp
(B18) : In-vehicle sensor upper·Aspirator motor (Auto A/C model)
(B19) : Interior lamp
(B20) : To back door harness (D201)
(B21) : To back door harness (D202)
(B22) : Rear speaker L.H. (Except Bose system)
(B23) : Rear speaker L.H. (Bose system)
(B24) : Front washer motor (White)
(B25) : Rear washer motor (Green)
(B26) : Washer fluid level switch (Black)
(B27) : Rear side marker lamp L.H.
(B28) : Stop and tail lamp sensor
(B29) : Rear combination lamp L.H.
(B30) : Back-up lamp L.H.
(B31) : License lamp
(B32) : Body ground
(B33) : Back door key switch
(B34) : Back door switch
(B35) : Back-up lamp R.H.
(B36) : Rear combination lamp R.H.
(B37) : Rear side marker lamp R.H.
(B38) : Power antenna timer
(B39) : Power antenna motor
(B40) : Diode
(B42) : Shock absorber control unit (Turbo model)
(B43) : To body harness no 2 (B112) (Turbo model)
(B44) : Rear shock absorber actuator R.H (Turbo model)
(B45) : Rear shock absorber actuator L.H. (Turbo model)

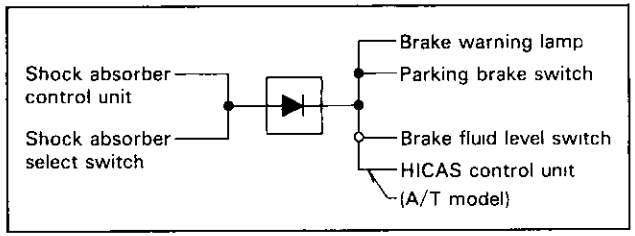
Diode (B10) (B40)




Body harness no. 2

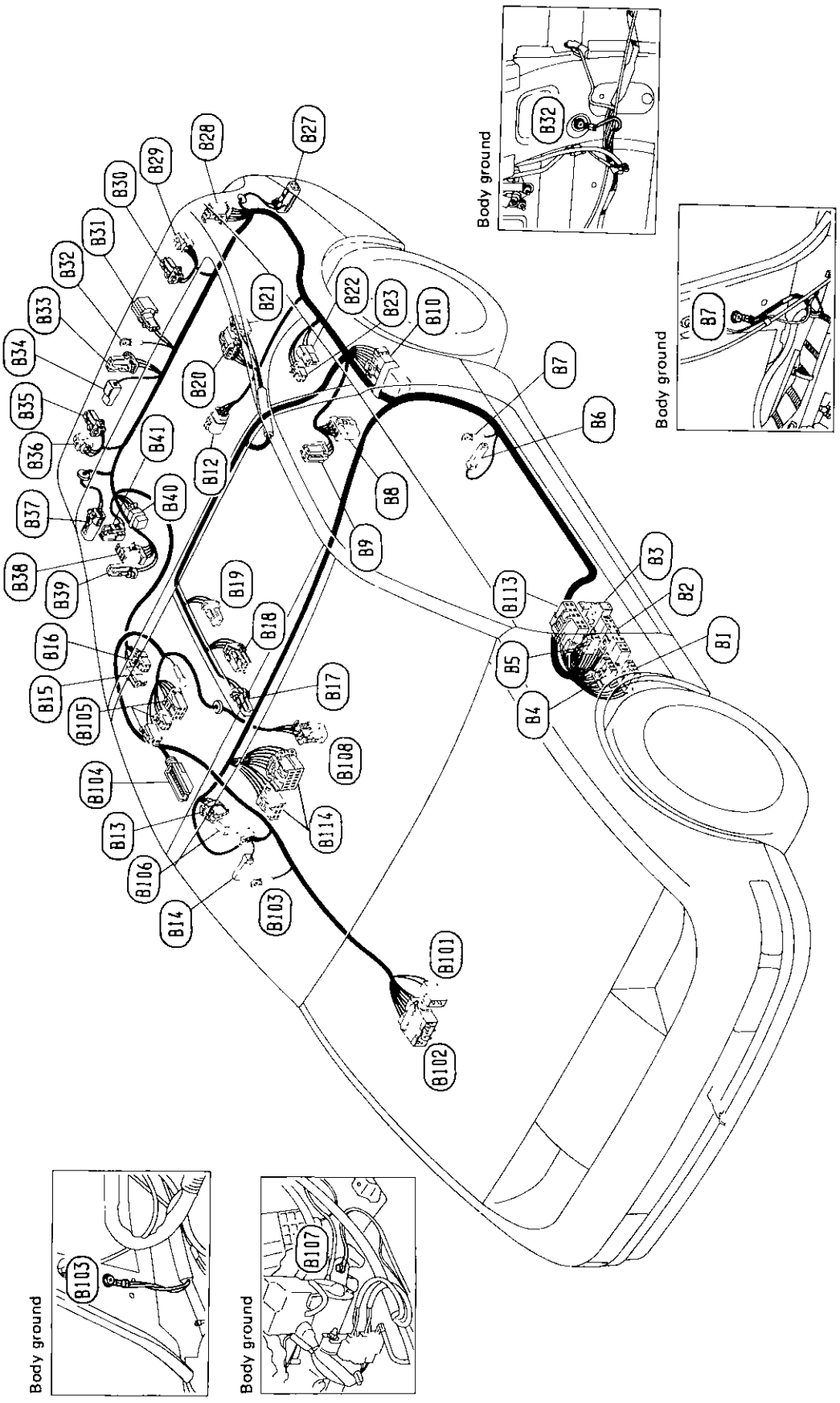
(B101) : To engine room harness (E108)
(B102) : To engine room harness (E109)
(B103) : Body ground
(B104) : Anti-lock braking system control unit
(B105) : Actuator (For anti-lock braking system)
(B106) : To body harness (B13)
(B107) : Body ground
(B108) : Rear sensor (For anti-lock braking system)
(B109) : To main harness (M100) (Turbo model)
(B110) : HICAS fail-safe solenoid valve (Turbo model)
(B111) : Diode (Turbo model)
(B112) : To body harness (B43) (Turbo model)
(B113) : To main harness (M111)
(B114) : Door lock timer

Diode (B111)



## Body Harness (Cont'd)

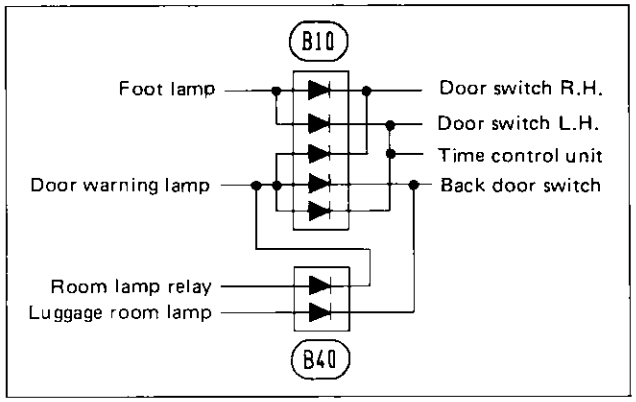
**2+2 SEATER**



Body harness

- (B1) : To engine room harness (E104)
- (B2) : To main harness (M4)
- (B3) : To main harness (M5)
- (B4) : Fuse block
- (B5) : Fuse block
- (B6) : Door switch L.H.
- (B7) : Body ground
- (B8) : Fuel pump control unit
- (B9) : Room lamp relay
- (B10) : Diode
- (B12) : Fuel tank gauge unit
- (B13) : To body harness no. 2 (B106)
- (B14) : Door switch R.H.
- (B15) : Rear speaker R H. (Except Bose system)
- (B16) : Rear speaker R.H.(Bose system)
- (B17) : Spot lamp
- (B18) : In-vehicle sensor upper·Aspirator motor (Auto A/C model)
- (B19) : Interior lamp
- (B20) : To back door harness (D201)
- (B21) : To back door harness (D202)
- (B22) : Rear speaker L.H. (Except Bose system)
- (B23) : Rear speaker L H. (Bose system)
- (B27) : Rear side marker lamp L.H.
- (B28) : Stop and tail lamp sensor
- (B29) : Rear combination lamp L.H.
- (B30) : Back-up lamp L.H.
- (B31) : License lamp
- (B32) : Body ground
- (B33) : Back door key switch
- (B34) : Back door switch
- (B35) : Back-up lamp R.H.
- (B36) : Rear combination lamp R.H.
- (B37) : Rear side marker lamp R.H.
- (B38) : Power antenna timer
- (B39) : Power antenna motor
- (B40) : Diode
- (B41) : Luggage room lamp

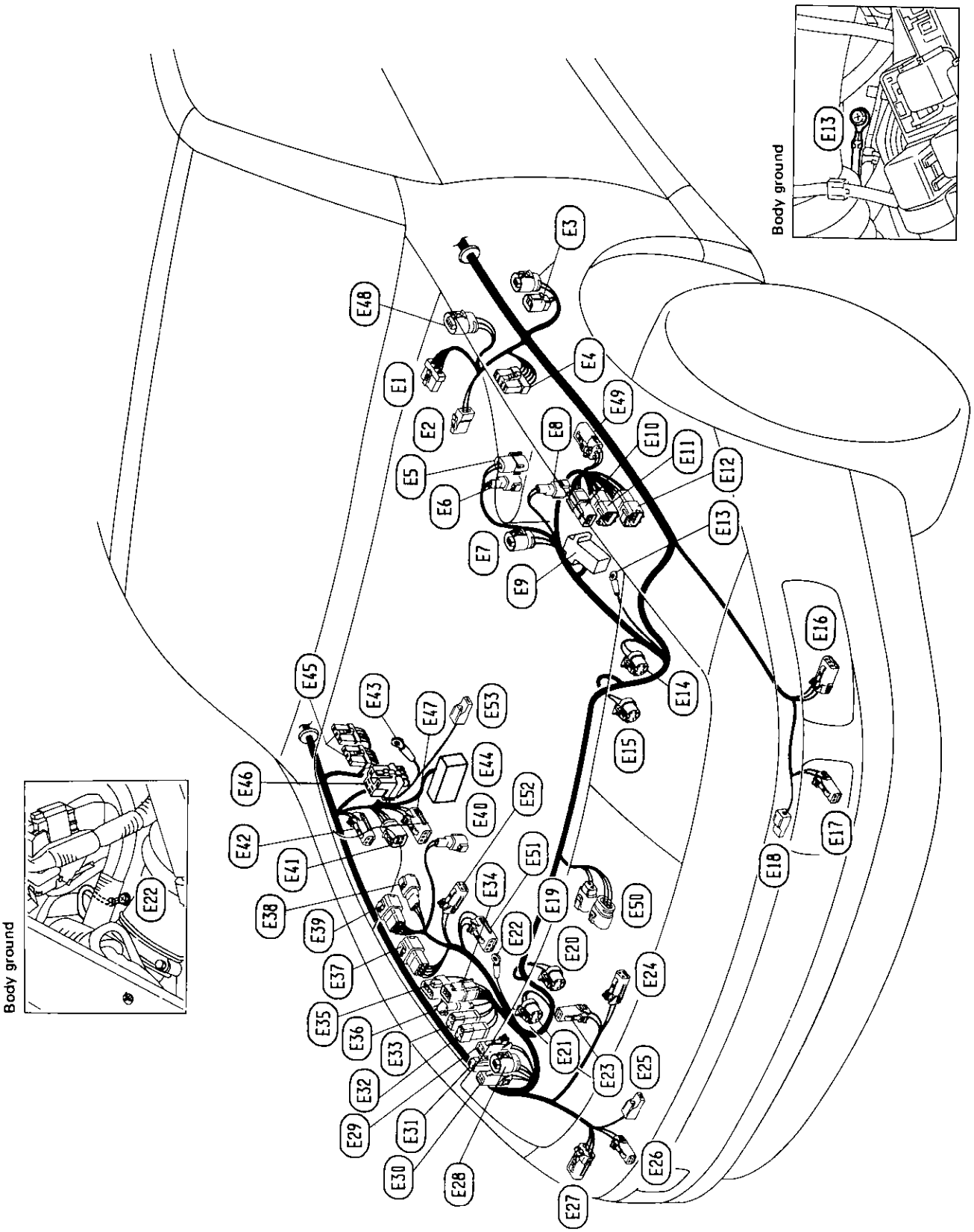
Diode (B10) (B40)




Body harness no. 2

- (B101) : To engine room harness (E108)
- (B102) : To engine room harness (E109)
- (B103) : Body ground
- (B104) : Anti-lock braking system control unit
- (B105) : Actuator (For anti-lock braking system)
- (B106) : To body harness (B13)
- (B107) : Body ground
- (B108) : Rear sensor (For anti-lock braking system)
- (B113) : To main harness (M111)
- (B114) : Door lock timer

## Engine Room Harness

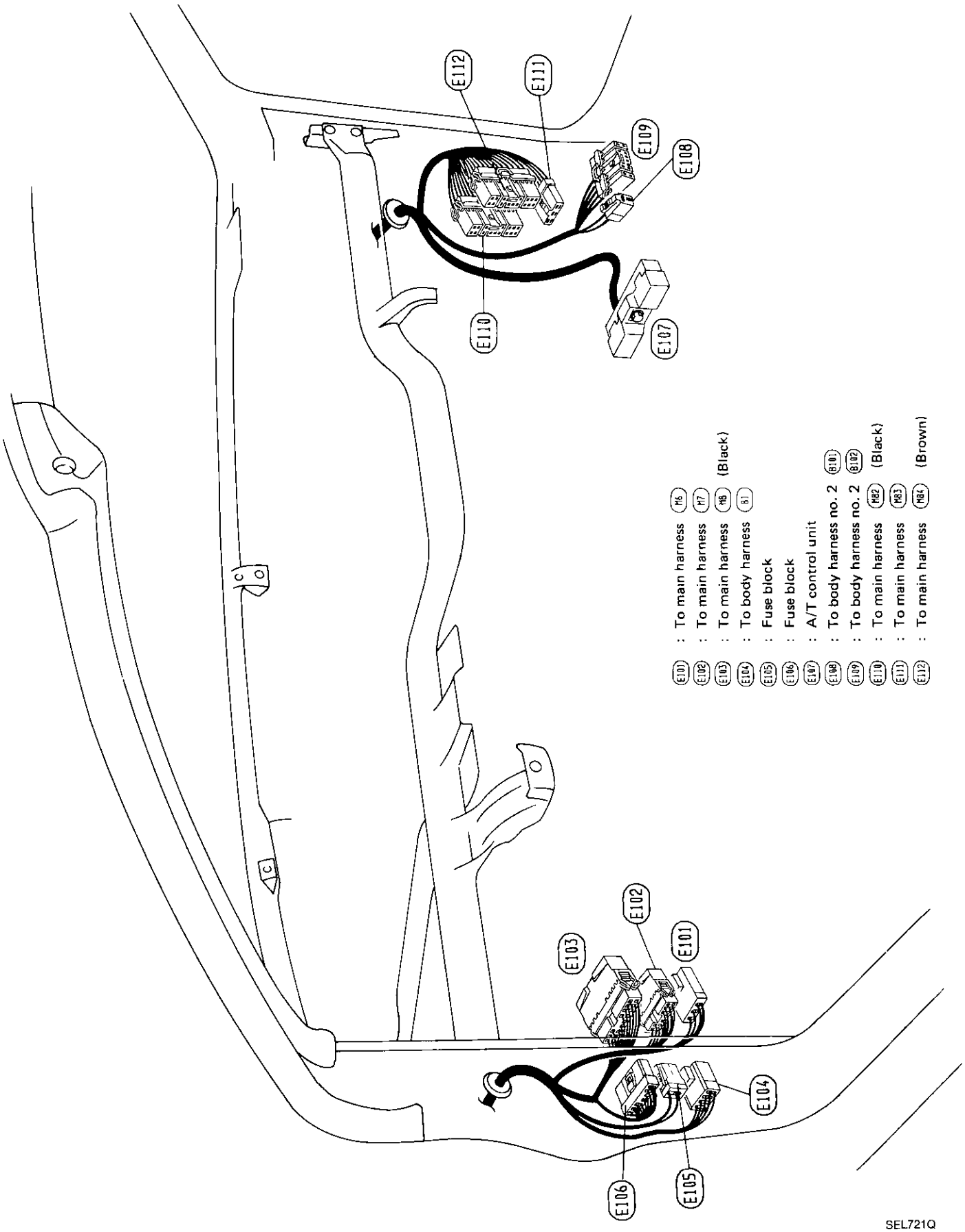


## Engine Room Harness (Cont'd)

(E1) : Front wiper motor
(E2) : Brake fluid level switch
(E3) : Starter relay (Except M/T model for Canada)
(E4) : Front wiper amplifier
(E5) : Power steering oil pressure switch (Black)
(E6) : Power steering solenoid (Gray)
(E7) : Hood switch
(E8) : Front sensor L.H. (For anti-lock braking system)
(E9) : Relay box (Refer to page EL- )
(E10) : To E.F.I. harness (F23) (White)
(E11) : To E.F.I. harness (F24) (Gray)
(E12) : To E.F.I. harness (F25) (Brown)
(E13) : Body ground
(E14) : Headlamp L.H. (Low beam) (Brown)
(E15) : Headlamp L.H. (High beam) (Black)
(E16) : Front combination lamp L.H.
(E17) : Front fog lamp L.H.
(E18) : Horn-low
(E19) : Radiator fan motor (Non-turbo model)
(E20) : Headlamp R.H. (High beam) (Black)
(E21) : Headlamp R.H. (Low beam) (Brown)
(E22) : Body ground
(E23) : Ambient sensor (Auto A/C model)
(E24) : Low-pressure switch
(E25) : Horn-high
(E26) : Front fog lamp R.H.
(E27) : Front combination lamp R.H.
(E28) : Front washer motor (White)
(E29) : Rear washer motor (Gray)
(E30) : Washer fluid level switch (Brown)
(E31) : Headlamp washer motor (Black) (For Canada)
(E32) : To alternator harness (A1) (Black)
(E33) : To alternator harness (A2) (Blue)
(E34) : To alternator harness (A3) (A/Tmodel)
(E35) : To alternator harness (A4) (M/T model)
(E36) : To alternator harness (A5)
(E37) : Inhibitor switch (A/T model)
(E38) : Revolution sensor (A/T model)
(E39) : To A/T solenoid harness (A/T model)
(E40) : Front sensor R.H. (For anti-lock braking system)
(E41) : A.S.C.D. pump
(E42) : Dropping resistor (A/T model)
(E43) : Battery
(E44) : Fusible link holder
(E45) : Daytime light control unit (For Canada)
(E46) : Headlamp washer relay (For Canada)
(E47) : Front shock absorber actuator R.H (Turbo model)
(E48) : Boost sensor (Turbo model)
(E49) : Front shock absorber actuator L H (Turbo model)
(E50) : Radiator fan motor (Turbo model)
(E51) : HICAS solenoid valve (Turbo model)
(E52) : HICAS oil level switch (Turbo model)
(E53) : Theft warning horn

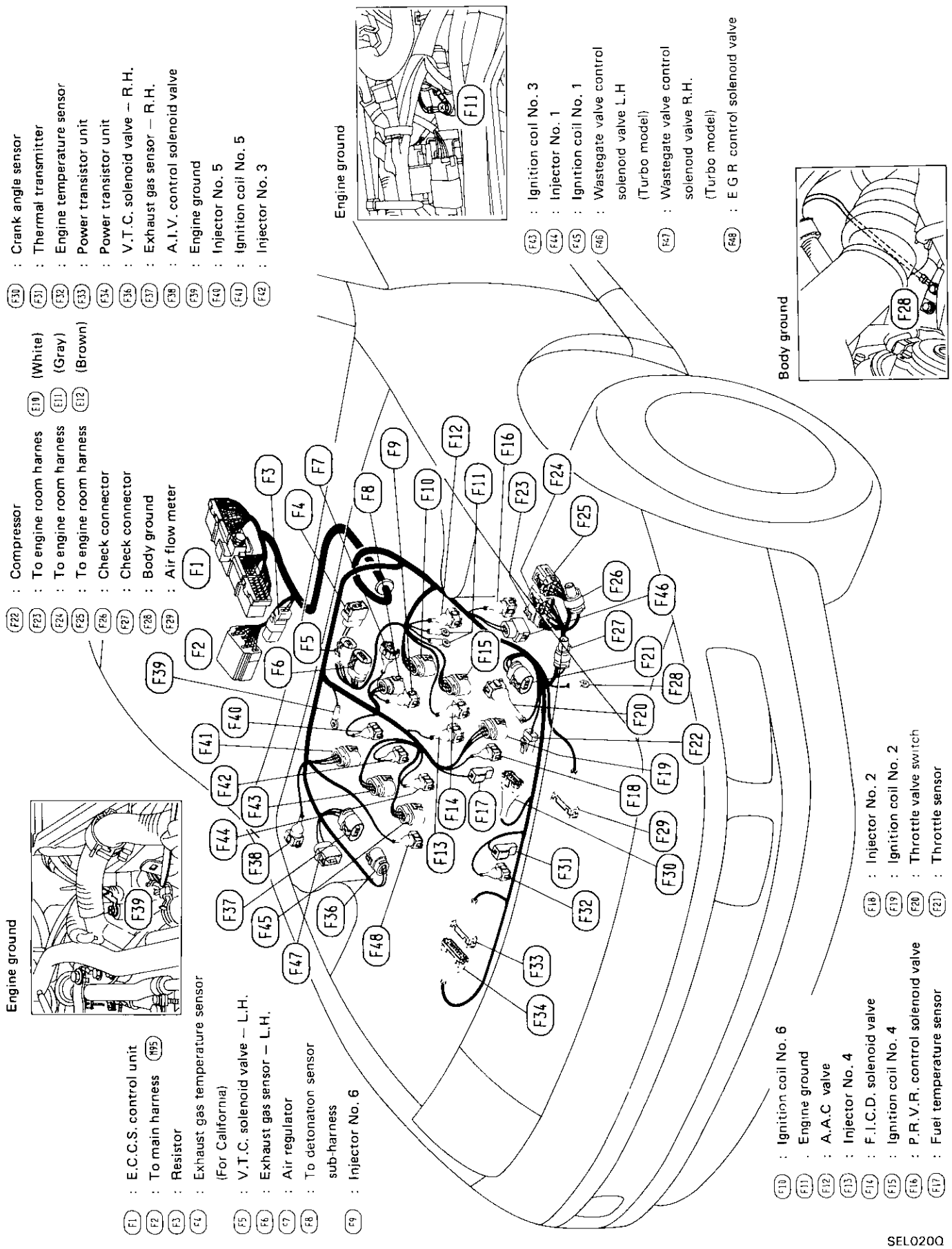
SEL018Q

## Engine Room Harness (Cont'd)



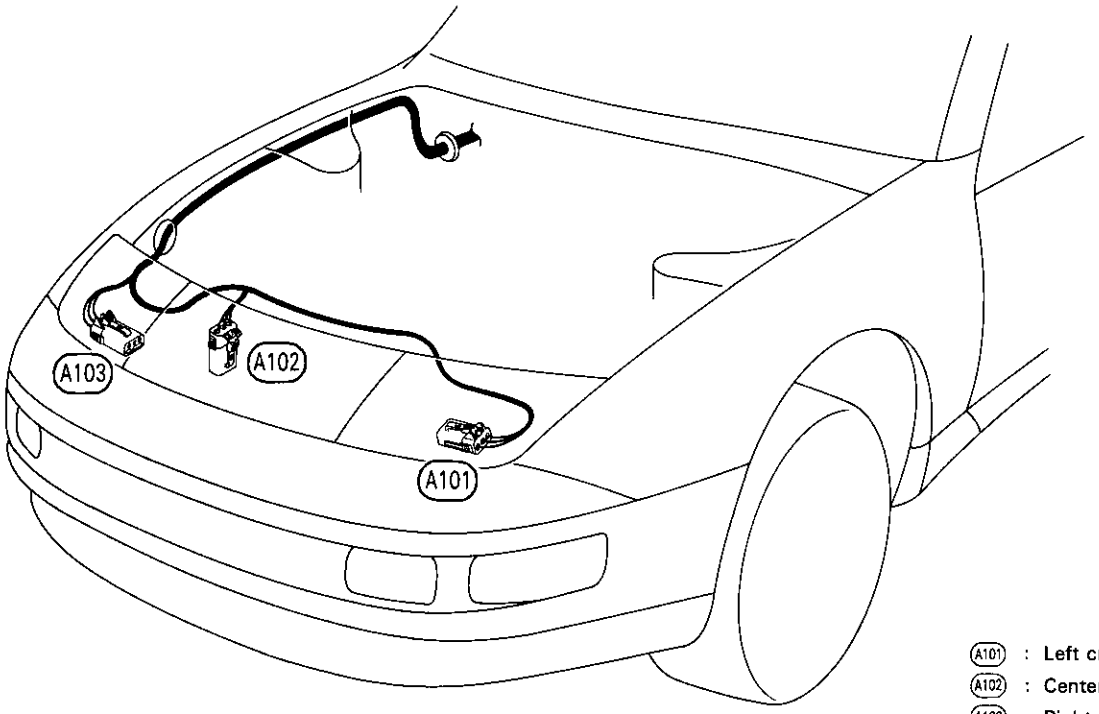

SEL721Q

## E.F.I. Harness

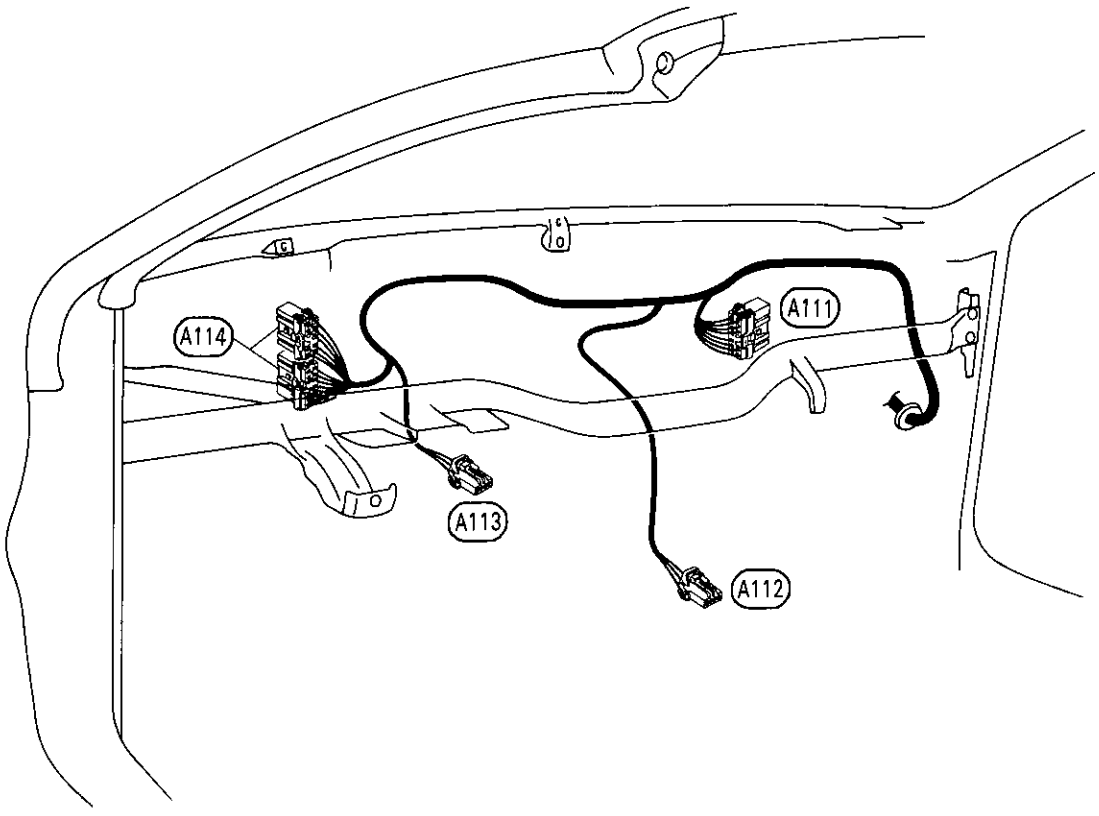



SEL020Q

## Air Bag Harness

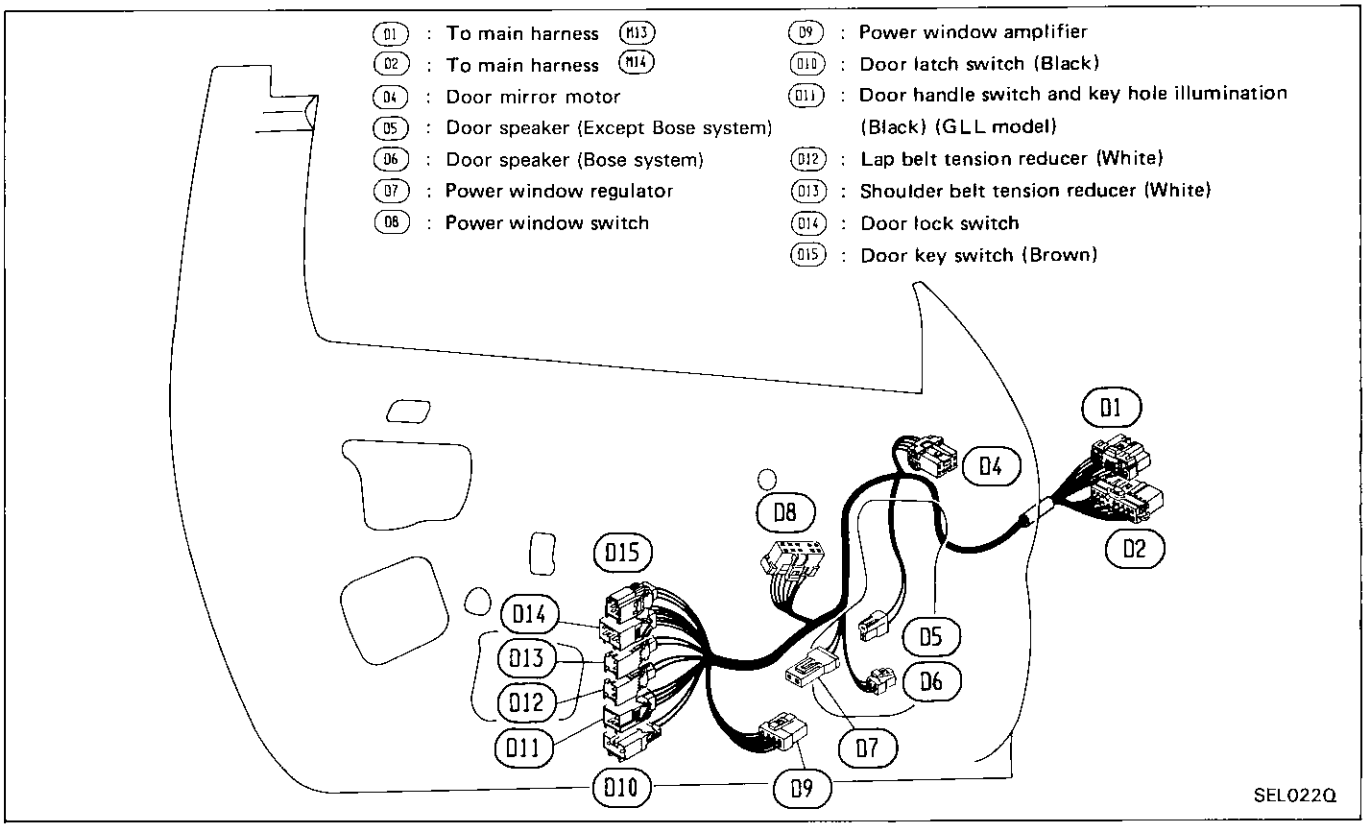



(A101) : Left crash zone sensor
(A102) : Center crash zone sensor
(A103) : Right crash zone sensor
(A111) : To main harness
(A112) : Tunnel and safing sensor
(A113) : Air bag module
(A114) : Air bag control unit

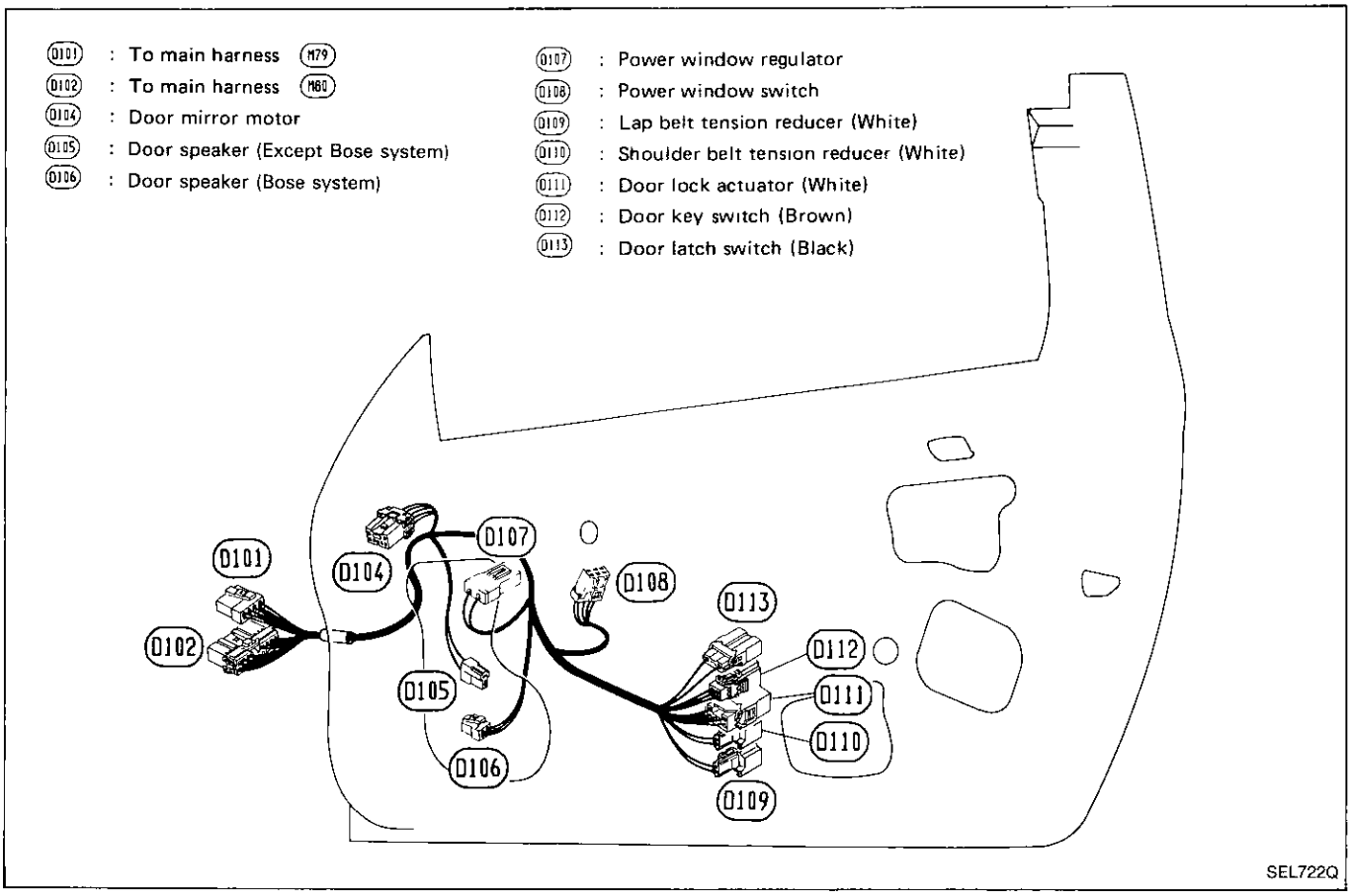



SEL021Q

## Door Harness L.H.

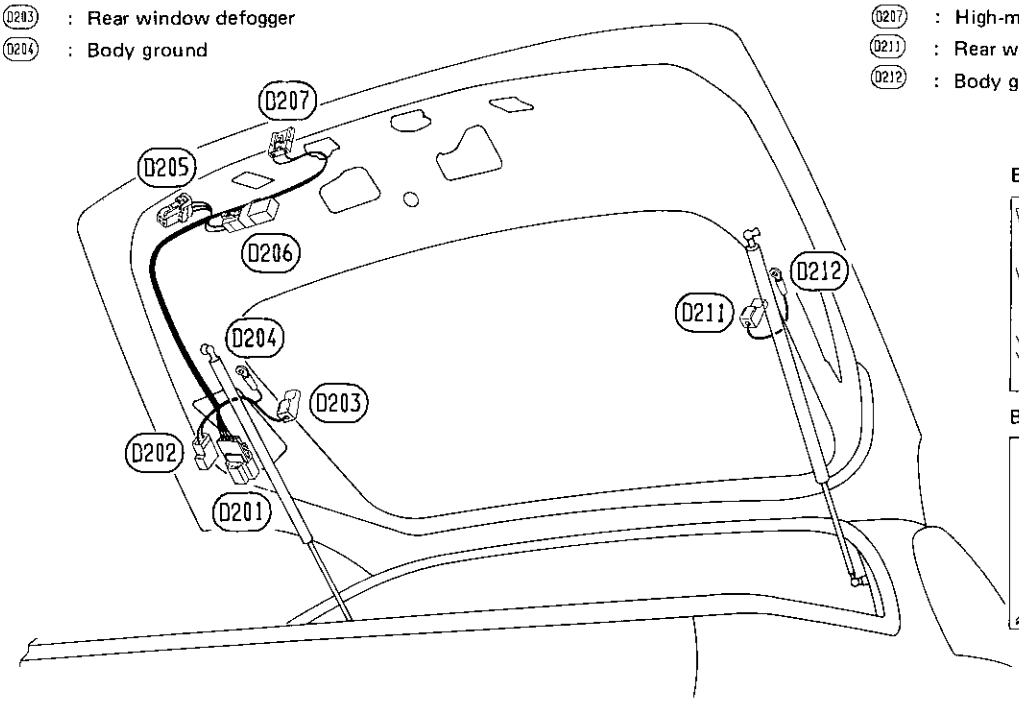



## Door Harness R.H.

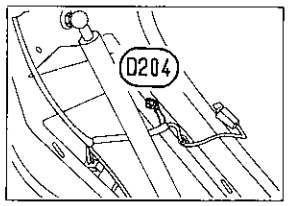


## Back Door Harness

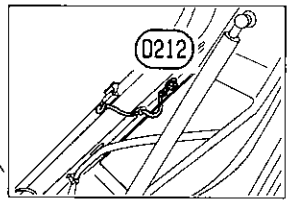
D201 : To body harness B20
D202 : To body harness B21
D203 : Rear window defogger
D204 : Body ground
D205 : Rear wiper motor
D206 : Condenser
D207 : High-mounted stop lamp
D211 : Rear window defogger
D212 : Body ground




Body ground



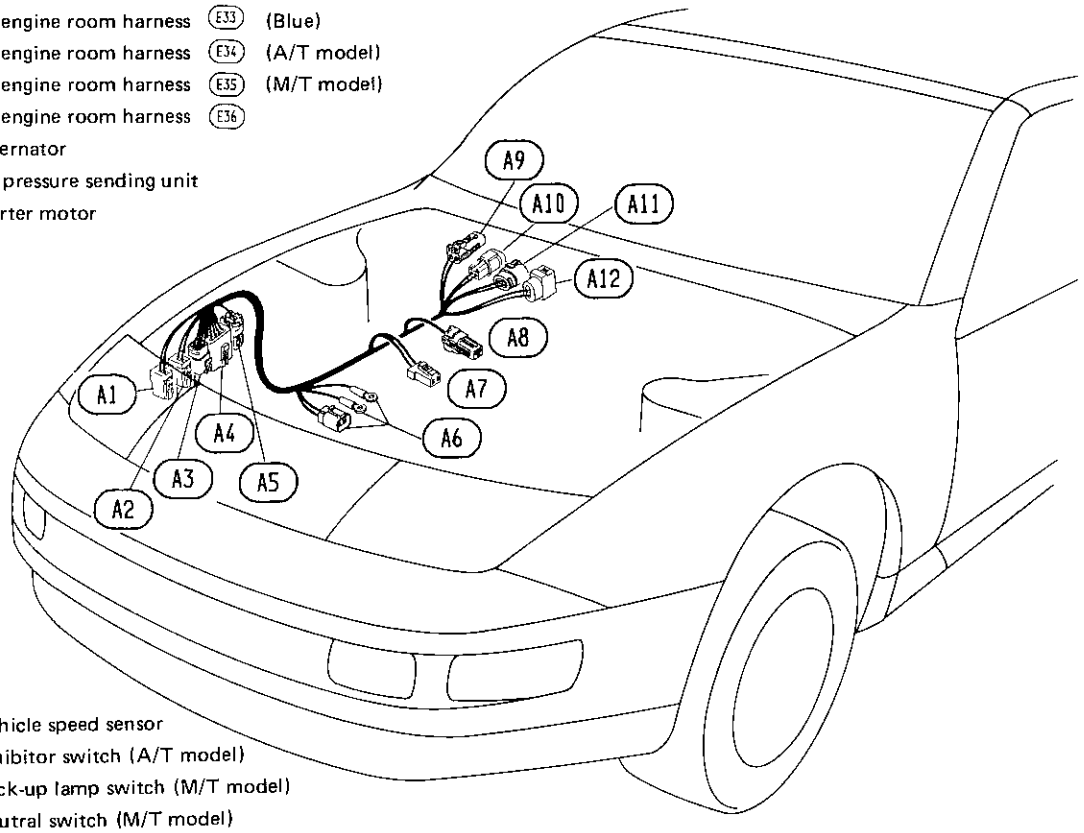

Body ground




SEL995M

## Alternator Harness

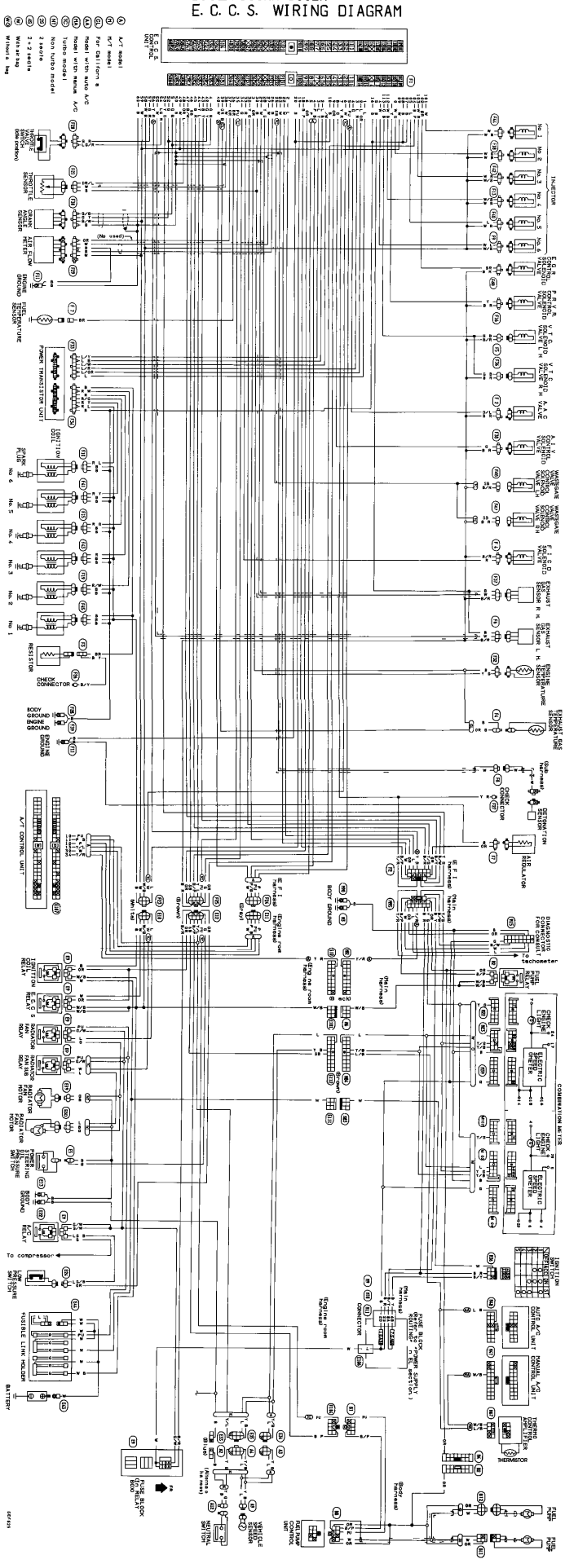
A1 : To engine room harness E32 (Black)
A2 : To engine room harness E33 (Blue)
A3 : To engine room harness E34 (A/T model)
A4 : To engine room harness E35 (M/T model)
A5 : To engine room harness E36
A6 : Alternator
A7 : Oil pressure sending unit
A8 : Starter motor



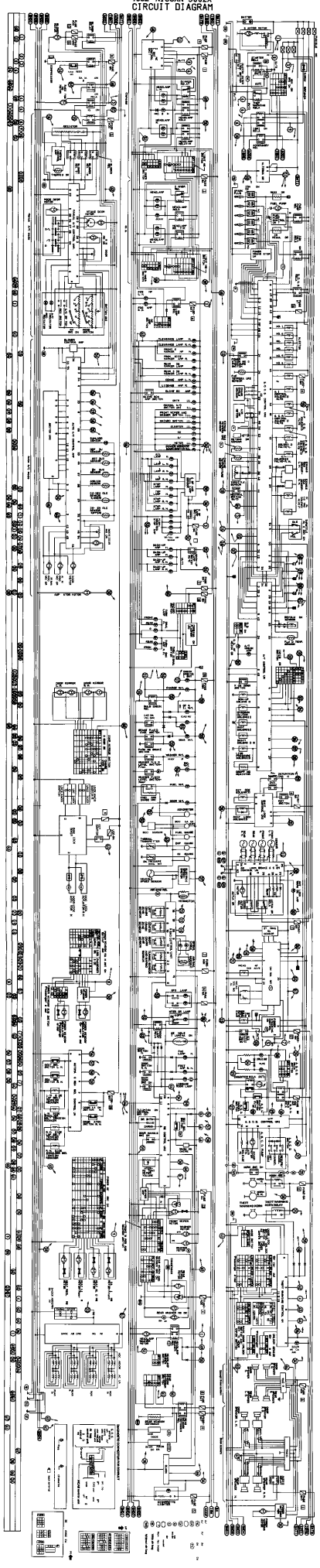

A9 : Vehicle speed sensor
A10 : Inhibitor switch (A/T model)
A11 : Back-up lamp switch (M/T model)
A12 : Neutral switch (M/T model)

SEL996M

# 1992 NISSAN 300ZX
## E. C. C. S. WIRING DIAGRAM



1992 NISSAN 300ZX
CIRCUIT DIAGRAM



# INCH TO METRIC CONVERSION TABLE

**(Rounded-off for automotive use)**

| inches | mm | inches | mm |
|---|---|---|---|
| .100 | 2.54 | .610 | 15.49 |
| .110 | 2.79 | .620 | 15.75 |
| .120 | 3.05 | .630 | 16.00 |
| .130 | 3.30 | .640 | 16.26 |
| .140 | 3.56 | .650 | 16.51 |
| .150 | 3.81 | .660 | 16.76 |
| .160 | 4.06 | .670 | 17.02 |
| .170 | 4.32 | .680 | 17.27 |
| .180 | 4.57 | .690 | 17.53 |
| .190 | 4.83 | .700 | 17.78 |
| .200 | 5.08 | .710 | 18.03 |
| .210 | 5.33 | .720 | 18.29 |
| .220 | 5.59 | .730 | 18.54 |
| .230 | 5.84 | .740 | 18.80 |
| .240 | 6.10 | .750 | 19.05 |
| .250 | 6.35 | .760 | 19.30 |
| .260 | 6.60 | .770 | 19.56 |
| .270 | 6.86 | .780 | 19.81 |
| .280 | 7.11 | .790 | 20.07 |
| .290 | 7.37 | .800 | 20.32 |
| .300 | 7.62 | .810 | 20.57 |
| .310 | 7.87 | .820 | 20.83 |
| .320 | 8.13 | .830 | 21.08 |
| .330 | 8.38 | .840 | 21.34 |
| .340 | 8.64 | .850 | 21.59 |
| .350 | 8.89 | .860 | 21.84 |
| .360 | 9.14 | .870 | 22.10 |
| .370 | 9.40 | .880 | 22.35 |
| .380 | 9.65 | .890 | 22.61 |
| .390 | 9.91 | .900 | 22.86 |
| .400 | 10.16 | .910 | 23.11 |
| .410 | 10.41 | .920 | 23.37 |
| .420 | 10.67 | .930 | 23.62 |
| .430 | 10.92 | .940 | 23.88 |
| .440 | 11.18 | .950 | 24.11 |
| .450 | 11.43 | .960 | 24.38 |
| .460 | 11.68 | .970 | 24.64 |
| .470 | 11.94 | .980 | 24.89 |
| .480 | 12.19 | .990 | 25.15 |
| .490 | 12.45 | 1.000 | 25.40 |
| .500 | 12.70 | 2.000 | 50.80 |
| .510 | 12.95 | 3.000 | 76.20 |
| .520 | 13.21 | 4.000 | 101.60 |
| .530 | 13.46 | 5.000 | 127.00 |
| .540 | 13.72 | 6.000 | 152.40 |
| .550 | 13.97 | 7.000 | 177.80 |
| .560 | 14.22 | 8.000 | 203.20 |
| .570 | 14.48 | 9.000 | 228.60 |
| .580 | 14.73 | 10.000 | 254.00 |
| .590 | 14.99 | 20.000 | 508.00 |
| .600 | 15.24 | | |

# METRIC TO INCH CONVERSION TABLE

**(Rounded-off for automotive use)**

| mm | inches | mm | inches |
|---|---|---|---|
| 1 | .0394 | 51 | 2.008 |
| 2 | .079 | 52 | 2.047 |
| 3 | .118 | 53 | 2.087 |
| 4 | .157 | 54 | 2.126 |
| 5 | .197 | 55 | 2.165 |
| 6 | .236 | 56 | 2.205 |
| 7 | .276 | 57 | 2.244 |
| 8 | .315 | 58 | 2.283 |
| 9 | .354 | 59 | 2.323 |
| 10 | .394 | 60 | 2.362 |
| 11 | .433 | 61 | 2.402 |
| 12 | .472 | 62 | 2.441 |
| 13 | .512 | 63 | 2.480 |
| 14 | .551 | 64 | 2.520 |
| 15 | .591 | 65 | 2.559 |
| 16 | .630 | 66 | 2.598 |
| 17 | .669 | 67 | 2.638 |
| 18 | .709 | 68 | 2.677 |
| 19 | .748 | 69 | 2.717 |
| 20 | .787 | 70 | 2.756 |
| 21 | .827 | 71 | 2.795 |
| 22 | .866 | 72 | 2.835 |
| 23 | .906 | 73 | 2.874 |
| 24 | .945 | 74 | 2.913 |
| 25 | .984 | 75 | 2.953 |
| 26 | 1.024 | 76 | 2.992 |
| 27 | 1.063 | 77 | 3.031 |
| 28 | 1.102 | 78 | 3.071 |
| 29 | 1.142 | 79 | 3.110 |
| 30 | 1.181 | 80 | 3.150 |
| 31 | 1.220 | 81 | 3.189 |
| 32 | 1.260 | 82 | 3.228 |
| 33 | 1.299 | 83 | 3.268 |
| 34 | 1.339 | 84 | 3.307 |
| 35 | 1.378 | 85 | 3.346 |
| 36 | 1.417 | 86 | 3.386 |
| 37 | 1.457 | 87 | 3.425 |
| 38 | 1.496 | 88 | 3.465 |
| 39 | 1.535 | 89 | 3.504 |
| 40 | 1.575 | 90 | 3.543 |
| 41 | 1.614 | 91 | 3.583 |
| 42 | 1.654 | 92 | 3.622 |
| 43 | 1.693 | 93 | 3.661 |
| 44 | 1.732 | 94 | 3.701 |
| 45 | 1.772 | 95 | 3.740 |
| 46 | 1.811 | 96 | 3.780 |
| 47 | 1.850 | 97 | 3.819 |
| 48 | 1.890 | 98 | 3.858 |
| 49 | 1.929 | 99 | 3.898 |
| 50 | 1.969 | 100 | 3.937 |

# QUICK REFERENCE CHART : 300ZX [ ] 1992

## ENGINE TUNE-UP DATA

| Engine model | | VG30DE | VG30DETT |
|---|---|---|---|
| Firing order | | 1-2-3-4-5-6 | |
| Idle speed rpm | M/T | 700±50 | |
| | A/T (in "N" position) | 770±50 | 750±50 |
| Ignition timing (degree B.T.D.C. at idle speed) | | 15±2 | |
| CO% at idle | | Idle mixture screw is preset and sealed at factory. | |

| Drive belt deflection (Cold) mm (in) | Used belt deflection | | Deflection of new belt |
|---|---|---|---|
| | Limit | Deflection after adjustment | |
| Alternator | 11.5 (0.453) | 7 - 8 (0.28 - 0.31) | 6.5 - 7.5 (0.256 - 0.295) |
| Air conditioner compressor | 12.5 (0.492) | 8 - 9 (0.31 - 0.35) | 7 - 8 (0.28 - 0.31) |
| Power steering oil pump | 19 (0.75) | 12 - 13.5 (0.472 - 0.531) | 10.5 - 11.5 (0.413 - 0.453) |
| Applied pressed force N (kg, lb) | 98 (10, 22) | | |

| | | | |
|---|---|---|---|
| Radiator cap relief pressure kPa (kg/cm², psi) | 78 - 98 (0.8 - 1.0, 11 - 14) | | |
| Cooling system leakage testing pressure kPa (kg/cm², psi) | 98 (1.0, 14) | | |
| Compression pressure kPa (kg/cm², psi)/rpm | Standard | 1,285 (13.1, 186)/300 | 1,177 (12.0, 171) |
| | Minimum | 981 (10.0, 142)/300 | 883 (9.0, 128) |
| Spark plug | Type (Standard) | PFR6B-11 | PFR5B-11B |
| | Gap mm (in) | 1.0 - 1.1 (0.039 - 0.043) | |

## CLUTCH PEDAL

Unit: mm (in)

| Engine | VG30DE | VG30DETT |
|---|---|---|
| Pedal height | 197 - 207 (7.76 - 8.15) | 183 - 193 (7.20 - 7.60) |
| Pedal free play | 1 - 3 (0.04 - 0.12) | |

## FRONT WHEEL ALIGNMENT (Unladen*)

| | | |
|---|---|---|
| Camber | degree | −1°35′ to −0°05′ |
| Caster | degree | 8°55′ - 10°25′ |
| Toe-in | | |
| A − B | mm (in) | 0 - 2 (0 - 0.08) |
| Total angle 2θ | degree | 0′ - 11′ |
| Wheel turning angle (Full turn) | degree | |
| Inside | | 32°30′ - 36°30′ |
| Outside | | 26°30′ - 30°30′ |

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

## REAR WHEEL ALIGNMENT (Unladen*)

| | | |
|---|---|---|
| Camber | degree | −1°36′ to −0°36′ |
| Toe-in | | |
| A − B | mm (in) | 0.4 - 4.4 (0.016 - 0.173) |
| Total angle 2θ | degree | 1′ - 24′ |

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

## BRAKE

Unit: mm (in)

| | | | |
|---|---|---|---|
| Front brake | | | |
| Pad wear limit | | | 2.0 (0.079) |
| Rotor repair limit | | | 28.0 (1.102) |
| Rear brake | | | |
| Pad wear limit | | | 2.0 (0.079) |
| Rotor repair limit | | | 16.0 (0.630) |
| Pedal free height | M/T model | | 186 - 196 (7.32 - 7.72) |
| | A/T model | | 195 - 205 (7.68 - 8.07) |
| Pedal depressed height*1 | M/T model | With A.B.S. | 100 (3.94) or more |
| | | Without A.B.S. | 95 (3.74) or more |
| | A/T model | With A.B.S. | 105 (4.13) or more |
| | | Without A.B.S. | 105 (4.13) or more |
| Parking brake | | | |
| Number of notches*2 | | | 6 - 7 |

*1 Under force of 490 N (50 kg, 110 lb) with engine running
*2 At pulling force: 196 N (20 kg, 44 lb)

## REFILL CAPACITIES

| Unit | | | Liter | US measure |
|---|---|---|---|---|
| Fuel tank | | | 72 | 19 gal |
| Coolant | | | 9 | 9-1/2 qt |
| Engine | With oil filter | | 3.4 | 3-5/8 qt |
| | Without oil filter | | 3.0 | 3-1/8 qt |
| Transmission | M/T | | 2.8 | 5-7/8 pt |
| | A/T | Non-turbo | 8.3 | 8-3/4 qt |
| | | Turbo | 8.2 | 8-5/8 qt |
| Differential carrier | Non-turbo | | 1.5 | 3-1/8 pt |
| | Turbo | | 1.8 | 3-7/8 pt |
| Power steering system | Without SUPER HICAS | | 1.3 | 1-3/8 qt |
| | With SUPER HICAS | | 2.0 | 2-1/8 qt |
| Air conditioning system | Compressor oil | | 0.20 | 6.8 fl oz |
| | Refrigerant | | 0.75 - 0.85 kg | 1.65 - 1.87 lb |

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

Edition: August 1991
Printing: January 1992 (07)
Publication No. SM2E-0Z32U0
Printed in Japan