

# NISSAN STANZA

MODEL U12 SERIES

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# FOREWORD

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This manual contains maintenance and repair procedures for the 1991 NISSAN STANZA.

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.

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## IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.

The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.

Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.



**NISSAN MOTOR CO., LTD.**

Overseas Service Department

Tokyo, Japan

# GENERAL INFORMATION

## SECTION **GI**

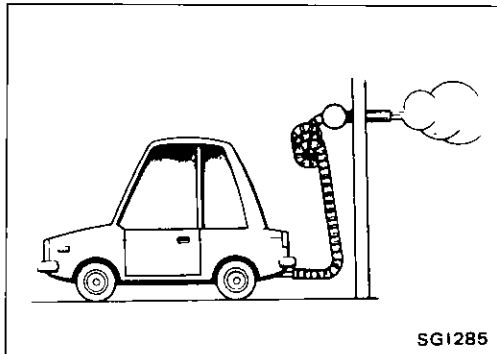


## CONTENTS

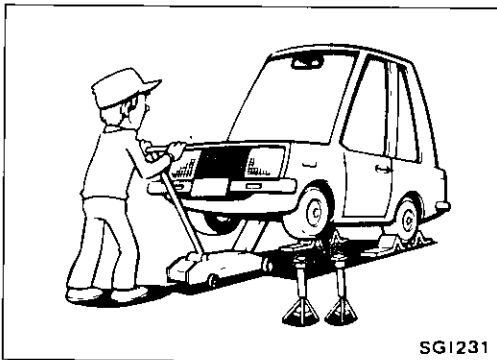
|                                                     |       |
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## PRECAUTIONS

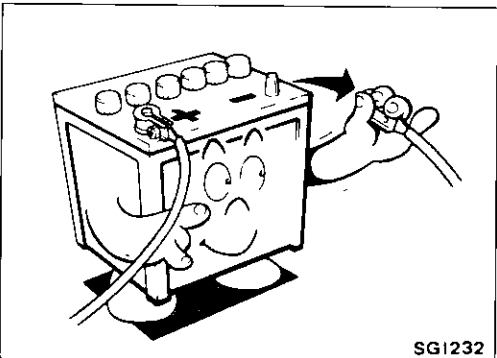
Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.



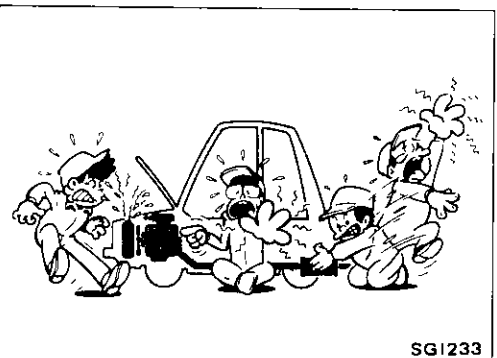
1. Do not operate the engine for an extended period of time without proper exhaust ventilation. Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working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



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



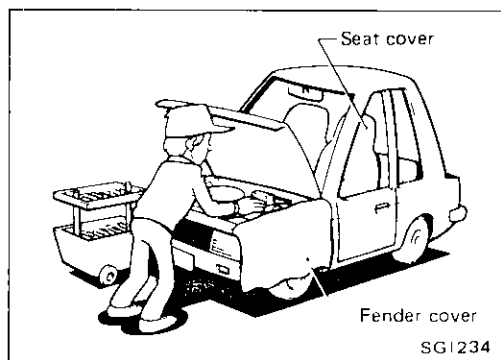
4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.



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

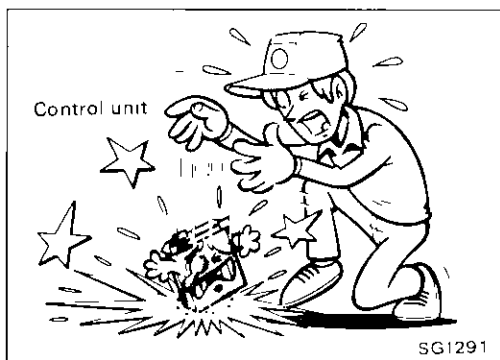


## PRECAUTIONS



6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers. Take care 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.

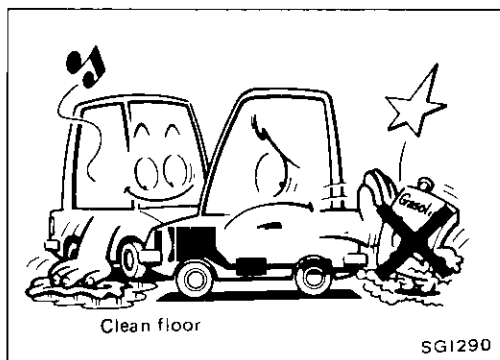


### Precautions for E.F.I. or E.C.C.S. Engine

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

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### Precautions for Catalyst

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

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

### Precautions for Fuel

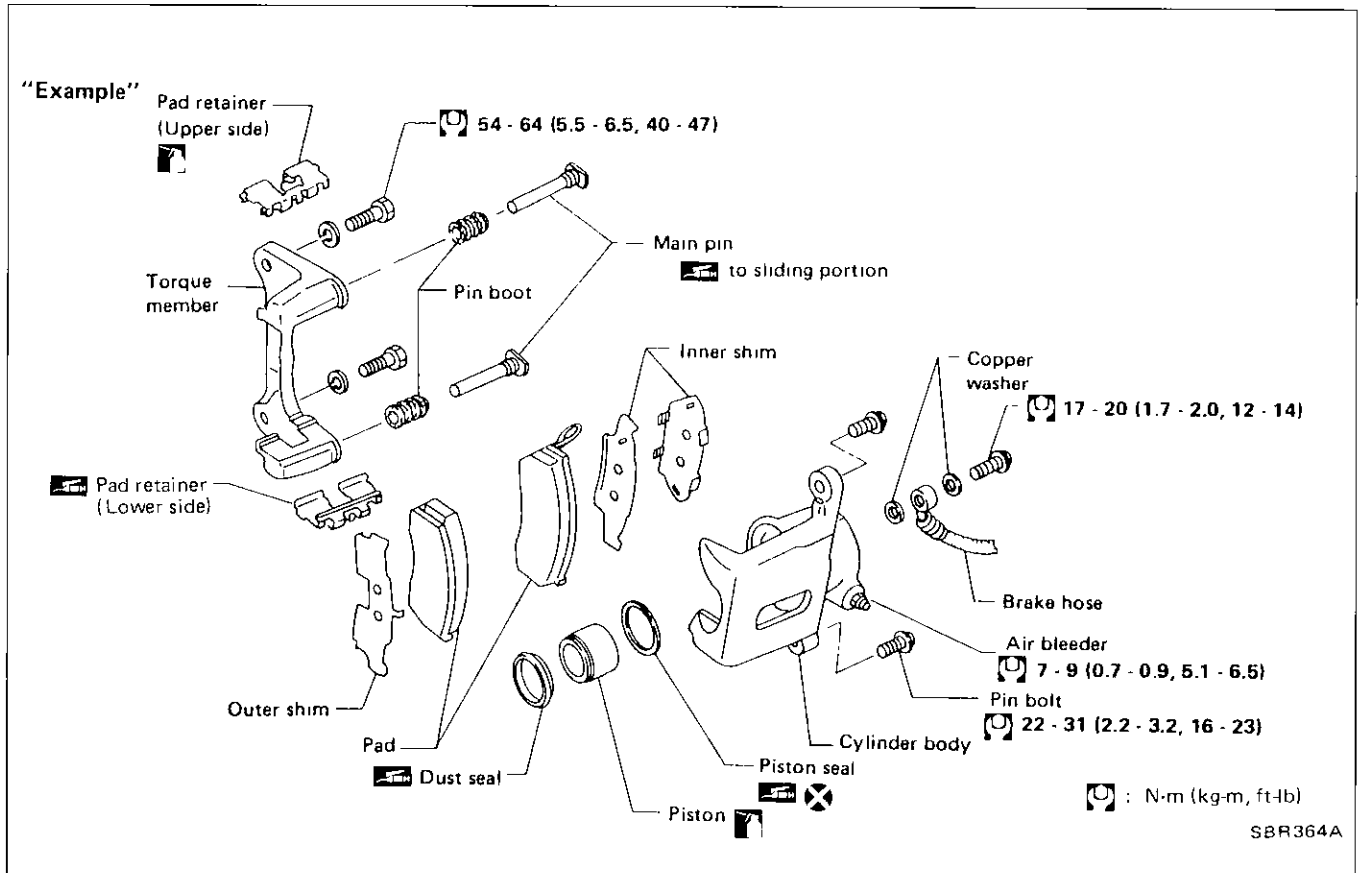
Use unleaded gasoline with an octane rating of at least 87 AKI (Anti-Knock Index) number (research octane number 91).

#### **CAUTION:**

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

## HOW TO USE THIS MANUAL

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



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

## HOW TO USE THIS MANUAL

7. The following **SYMBOLS AND ABBREVIATIONS** are used:

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

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

“Example”

**Tightening torque:**

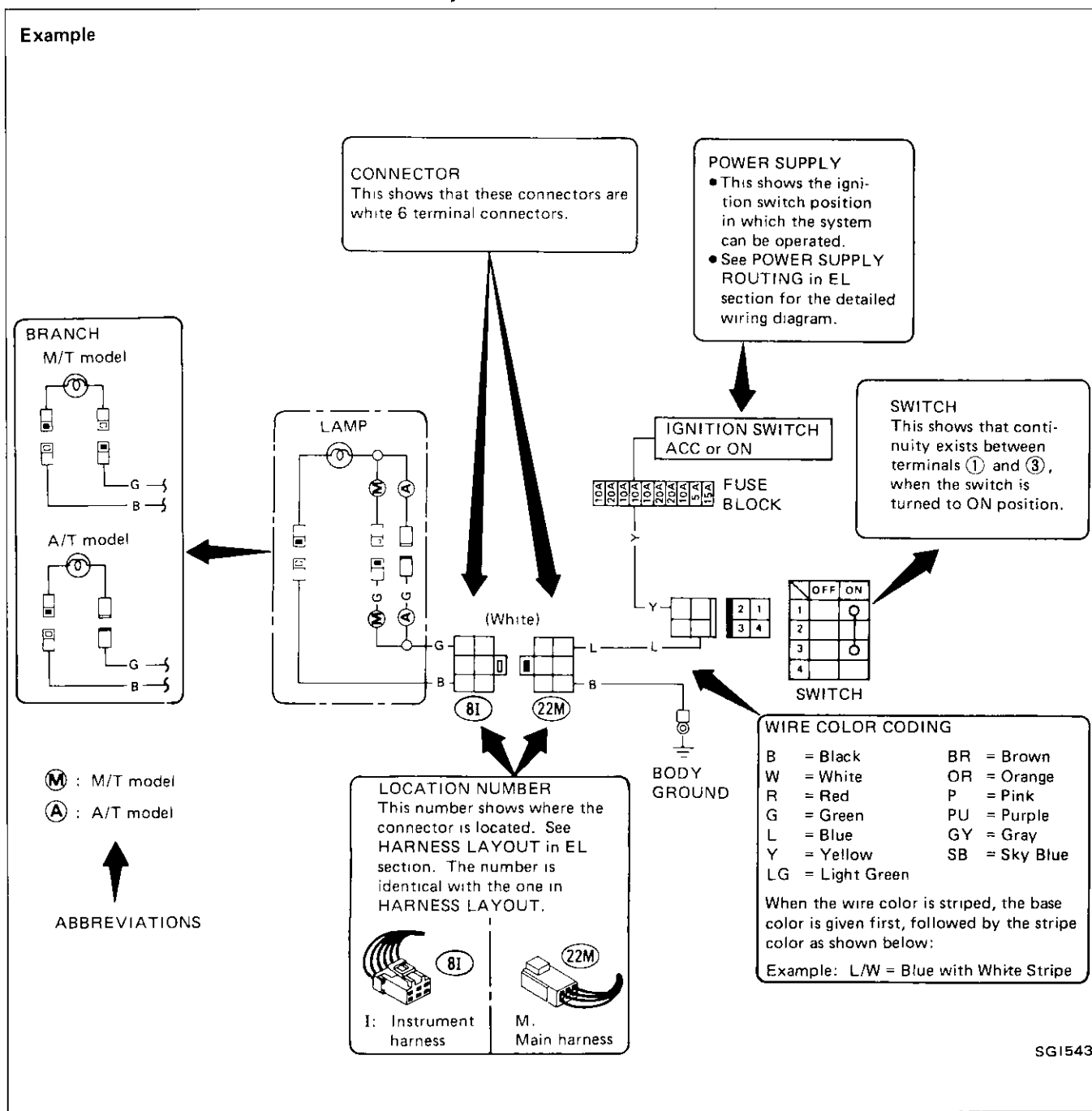
**59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)**

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

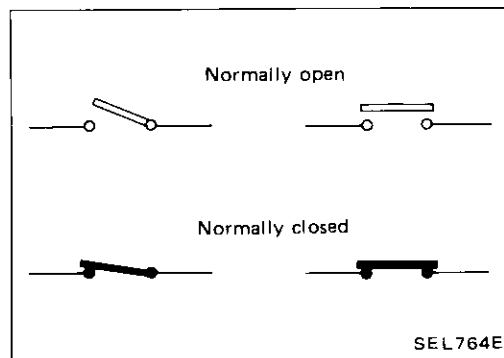
# HOW TO READ WIRING DIAGRAMS

## WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:



SG1543



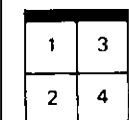
## SWITCH POSITIONS

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

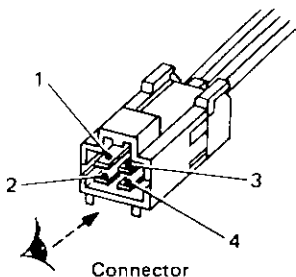
- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.

# HOW TO READ WIRING DIAGRAMS

## Example



Connector symbol



Connector

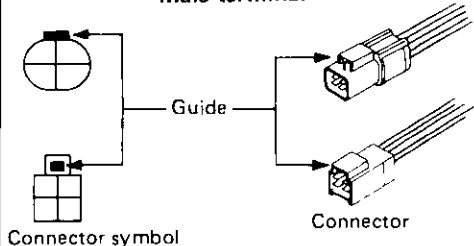
SGI362

## CONNECTOR SYMBOLS

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

## Example

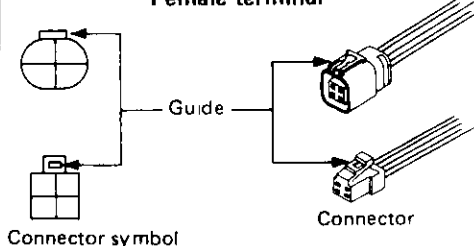
### Male terminal



Connector symbol

Connector

### Female terminal



Connector symbol

Connector

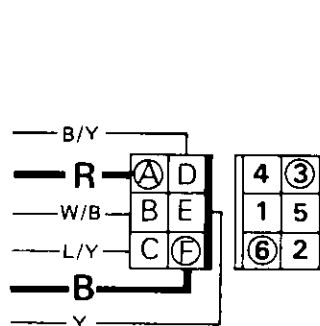
SGI363

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

## MULTIPLE SWITCH

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

## Example



### WIPER SWITCH

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

### Continuity circuit of wiper switch

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

Example: Wiper switch in LO position

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

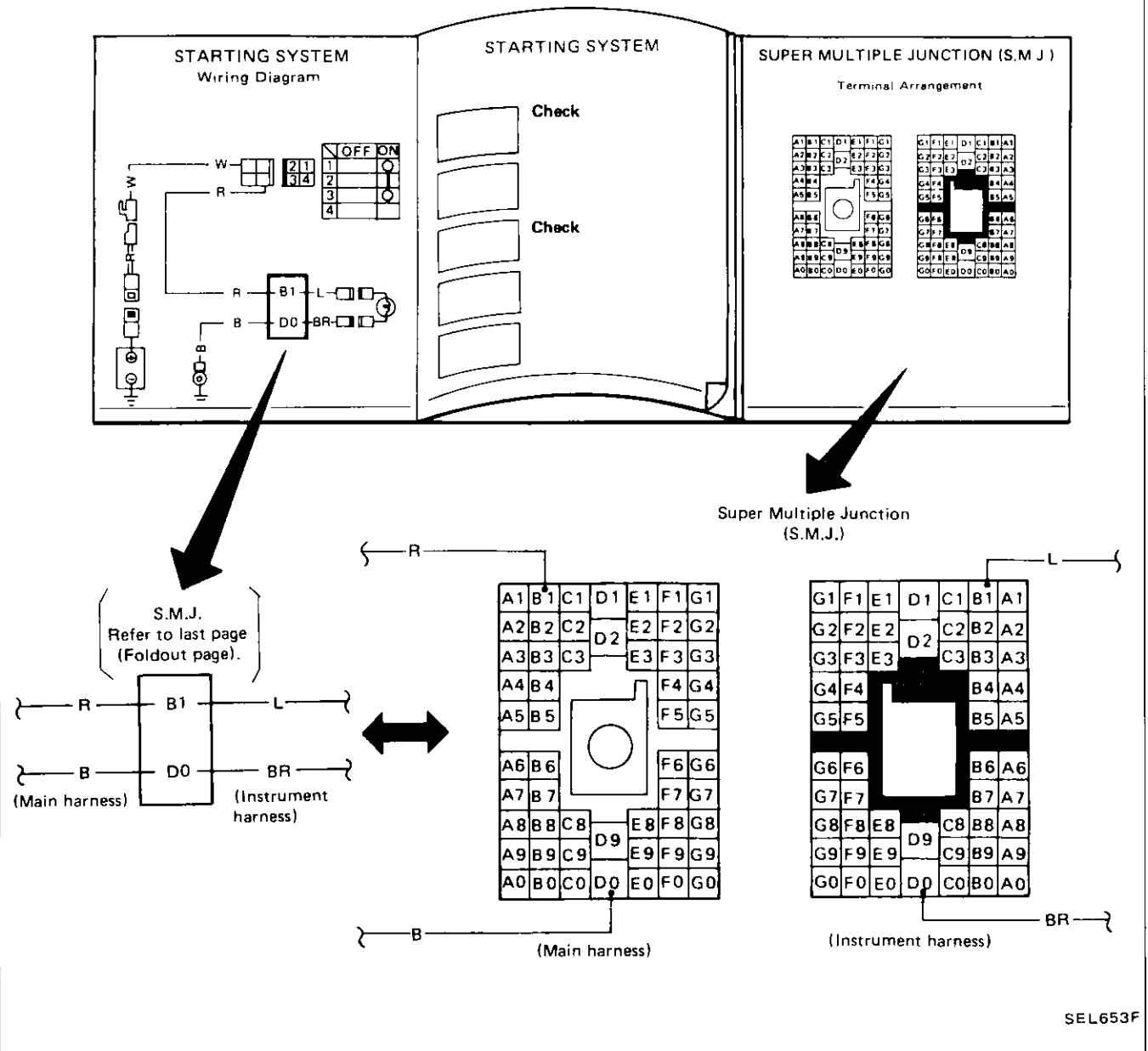
SGI365

# HOW TO READ WIRING DIAGRAMS

## SUPER MULTIPLE JUNCTION (S.M.J.)

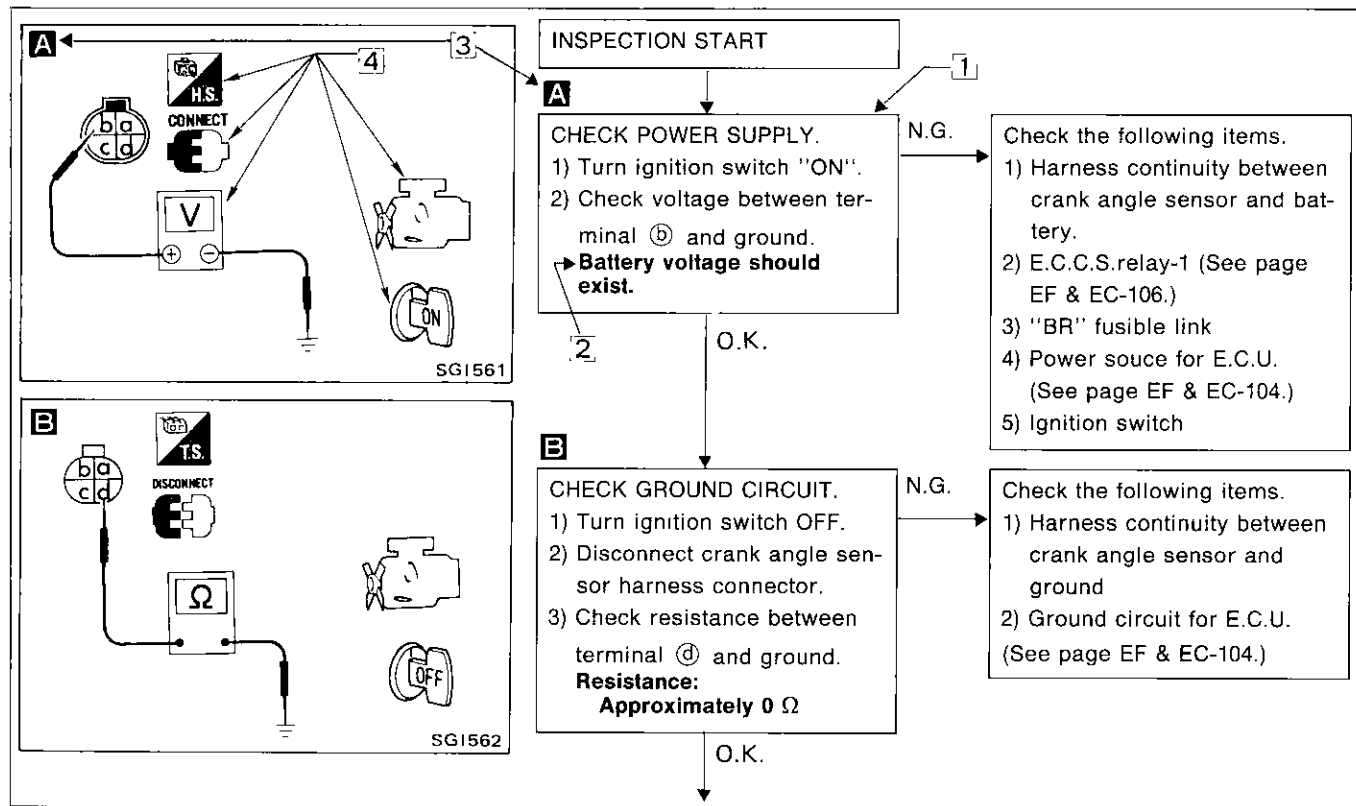
- The "S.M.J." indicated in wiring diagrams is shown in a simplified form. The terminal arrangement should therefore be referred to in the foldout at the end of the Service Manual.
- The foldout should be spread to read the entire wiring diagram.

### Example



# HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

## Example



## NOTICE

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

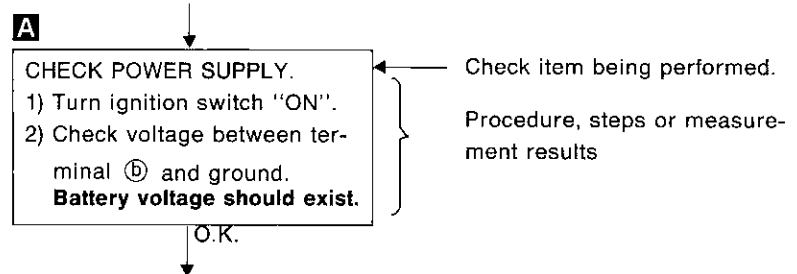
- 1) Use the flow chart after locating probable causes of a problem following the "Preliminary Check" or the "Symptom Chart".
- 2) After repairs, re-check that the problem has been completely eliminated.
- 3) Refer to Component Parts Location and Harness Layout for the Systems described in each section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



## HOW TO FOLLOW THIS FLOW CHART

### [1] Work and diagnostic procedure

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



### [2] Measurement results

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

These have the following meanings:

**Battery voltage → 11 - 14V or approximately 12V**

**Voltage: Approximately 0V → Less than 1V**

### [3] Cross reference of work symbols in the text and illustrations

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

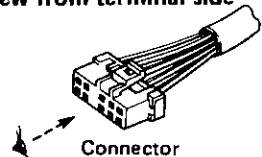
### [4] Symbols used in illustrations

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

## HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

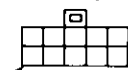
### Example

#### View from terminal side



Connector

#### Connector symbol

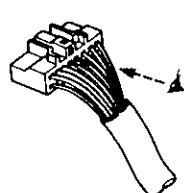


Single line

#### Direction mark

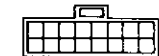


#### View from harness side



Connector

#### Connector symbol



Double lines

#### Direction mark



SGI364

### Direction mark

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

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



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

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



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

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

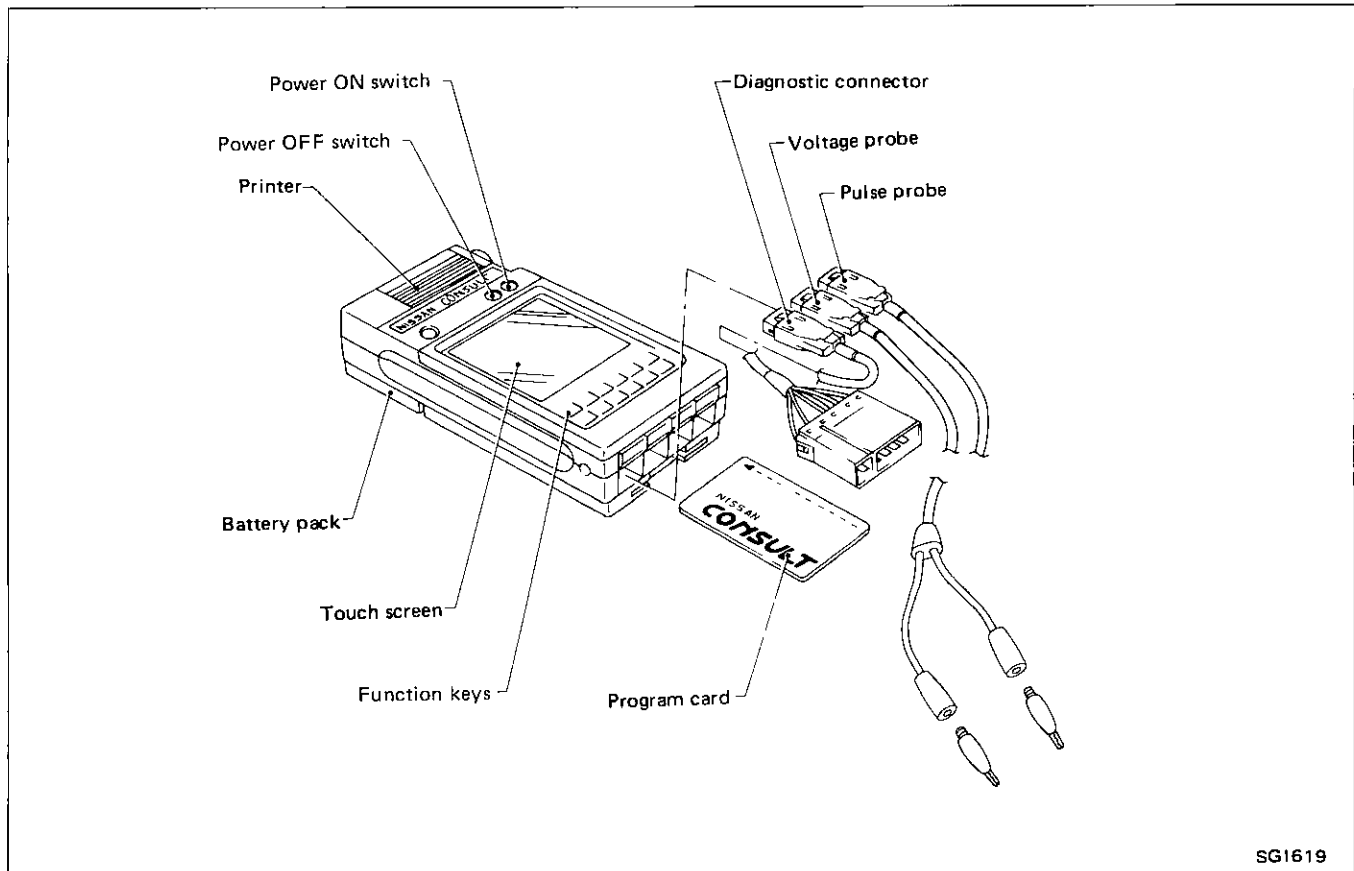
# HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

## Key to symbols signifying measurements or procedures

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

# CONSULT CHECKING SYSTEM

## Outside View



## System Application

| System                  | E.C.C.S. | A/T |
|-------------------------|----------|-----|
| Diagnostic mode         |          |     |
| Work support            | X        | —   |
| Self-diagnostic results | X        | X   |
| Data monitor            | X        | X   |
| Active test             | X        | —   |
| E.C.U. part number      | X        | X   |
| Function test           | X        | —   |

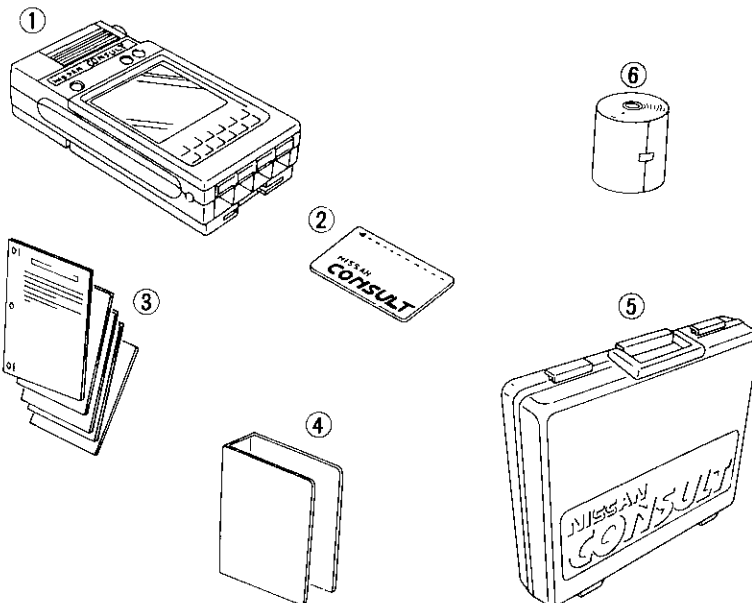
X: Applicable

# CONSULT CHECKING SYSTEM

## Function

| Diagnostic mode         | Function                                                                                                                       |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Work support            | This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT.      |
| 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.                                                                                                |

## Checking Equipment

| Tool name                                                                                                                                                                  | Description                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>NISSAN CONSULT kit</b><br><br>① CONSULT unit and accessories<br>② Program card (UE900)<br>③ Operation manuals<br>④ Binder<br>⑤ Carrying case<br>⑥ Thermal paper (Rolls) |  |

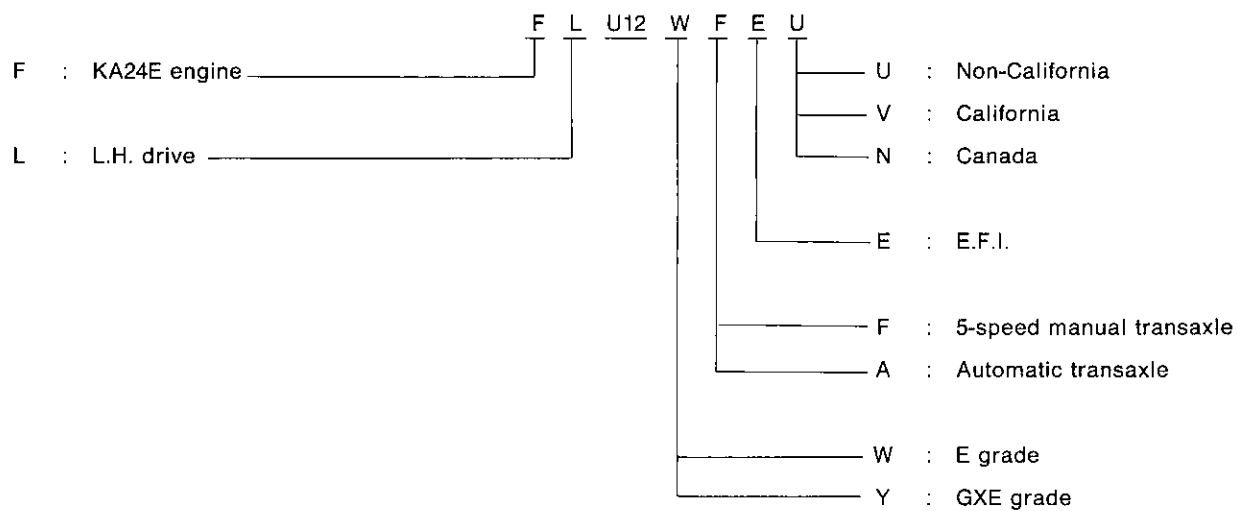
When ordering the above equipment, contact your NISSAN distributor.

# IDENTIFICATION INFORMATION

## Model Variation

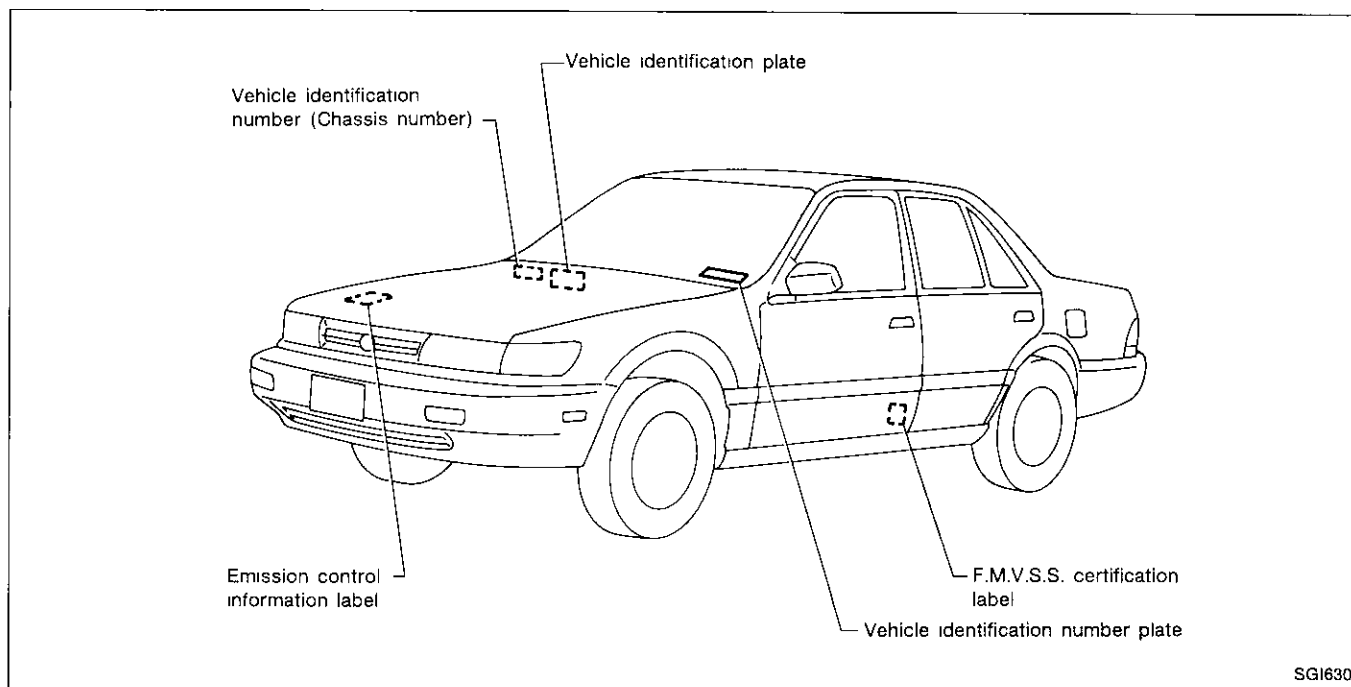
| Destination    | Grade | Model     | Engine | Transaxle |
|----------------|-------|-----------|--------|-----------|
| Non-California | E     | FLU12WFEU | KA24E  | RS5F50A   |
|                |       | FLU12WAEU |        | RE4F02A   |
|                | GXE   | FLU12YFEU |        | RS5F50V   |
|                |       | FLU12YAEU |        | RE4F02V   |
| California     | E     | FLU12WFEV |        | RS5F50A   |
|                |       | FLU12WAEV |        | RE4F02A   |
|                | GXE   | FLU12YFEV |        | RS5F50V   |
|                |       | FLU12YAEV |        | RE4F02V   |
| Canada         | E     | FLU12WFEN |        | RS5F50A   |
|                |       | FLU12WAEN |        | RE4F02A   |
|                | GXE   | FLU12YFEN |        | RS5F50V   |
|                |       | FLU12YAEN |        | RE4F02V   |

## Prefix and suffix designations

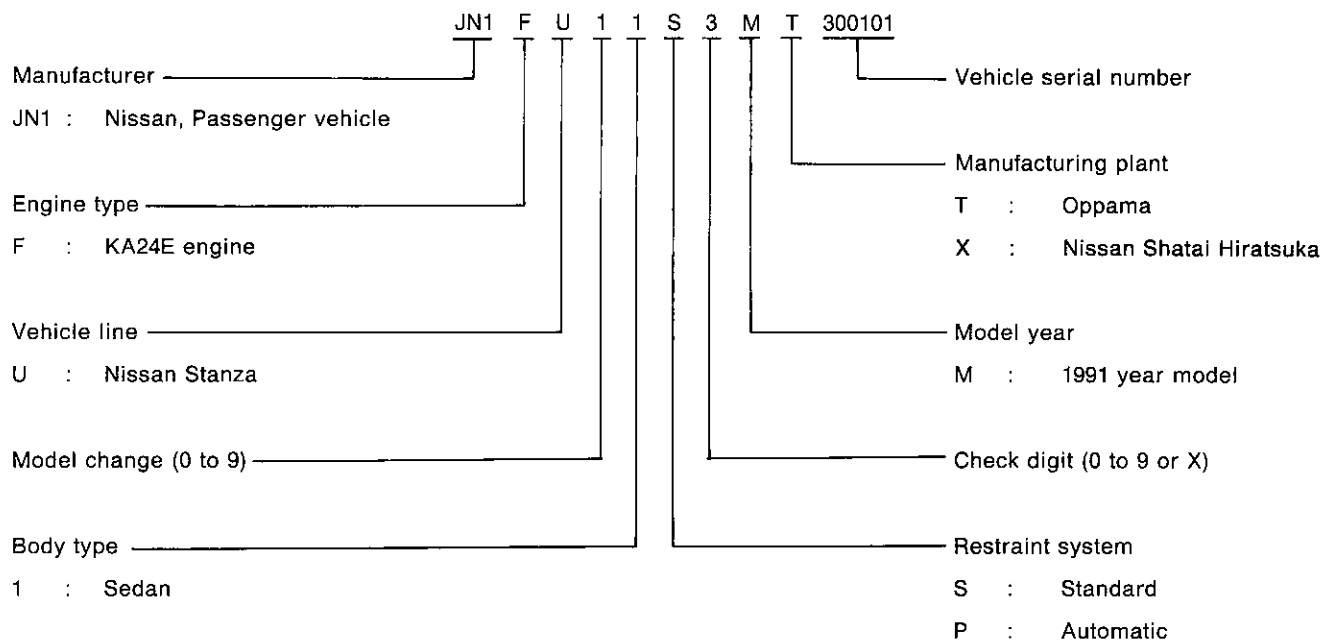


# IDENTIFICATION INFORMATION

## Identification Number



## VEHICLE IDENTIFICATION NUMBER ARRANGEMENT



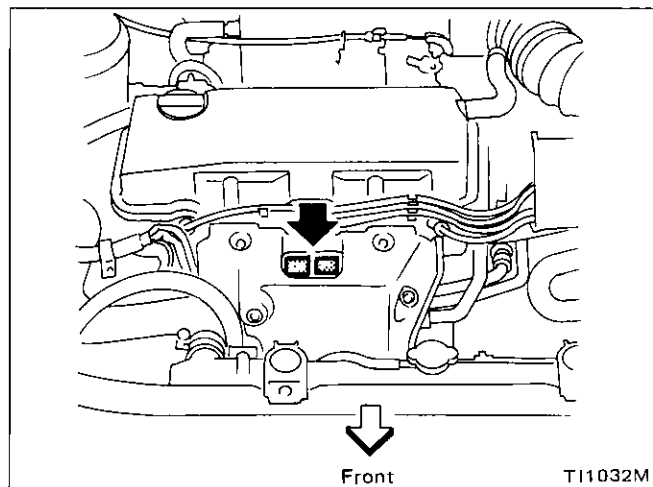
## IDENTIFICATION INFORMATION

### Identification Number (Cont'd) IDENTIFICATION PLATE

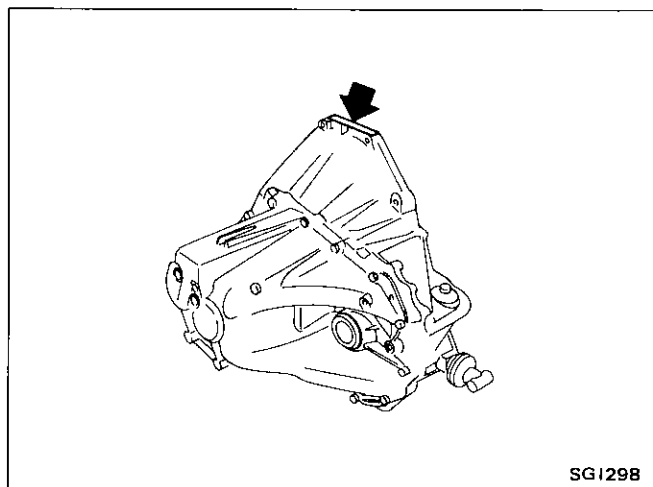
| NISSAN MOTOR CO., LTD. JAPAN           |                    | 型式 TYPE<br>TIPO TIPO |    |
|----------------------------------------|--------------------|----------------------|----|
| CHASSIS NO<br>NO. DE CHASIS<br>MODELO  | △                  | △                    |    |
| カラー COLOR TRIM<br>トリム COLOR GUARNICION | △                  | △                    | △  |
| エンジン ENGINE<br>ジン MOTOR                | △                  | △                    | CC |
| ミッション TRANS AXLE<br>アックスル TRANS EJE    | △                  | △                    |    |
|                                        | 工場 PLANT<br>PLANTA |                      |    |
| 日産自動車株式会社 MADE IN JAPAN                |                    | 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 Transaxle model
- 9 Axle model

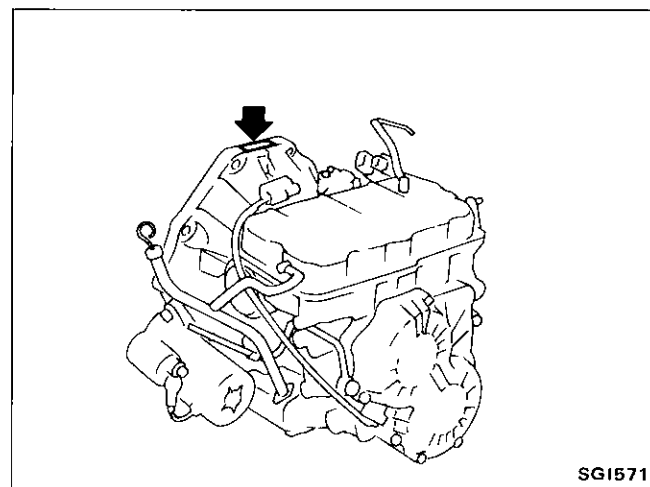
### ENGINE SERIAL NUMBER



### MANUAL TRANSAXLE NUMBER



### AUTOMATIC TRANSAXLE NUMBER





## IDENTIFICATION INFORMATION

### Dimensions

Unit: mm (in)

|                | Sedan         |
|----------------|---------------|
| Overall length | 4,570 (179.9) |
| Overall width  | 1,697 (66.8)  |
| Overall height | 1,375 (54.1)  |
| Front tread    | 1,460 (57.5)  |
| Rear tread     | 1,440 (56.7)  |
| Wheelbase      | 2,525 (99.4)  |

### Wheels and Tires

|            |              |         |                |
|------------|--------------|---------|----------------|
| Road wheel | Conventional |         | 14x5.5JJ       |
|            | Spare        |         | 15x4T*1        |
|            |              |         | 16x5T*2        |
|            | Off set      | mm (in) | 40 (1.57)      |
| Tire size  | Conventional |         | P195/65R14 89H |
|            | Spare        |         | T125/70D15*1   |
|            |              |         | T135/70D16*2   |

\*1: E grade

\*2: GXE grade

## LIFTING POINTS AND TOW TRUCK TOWING

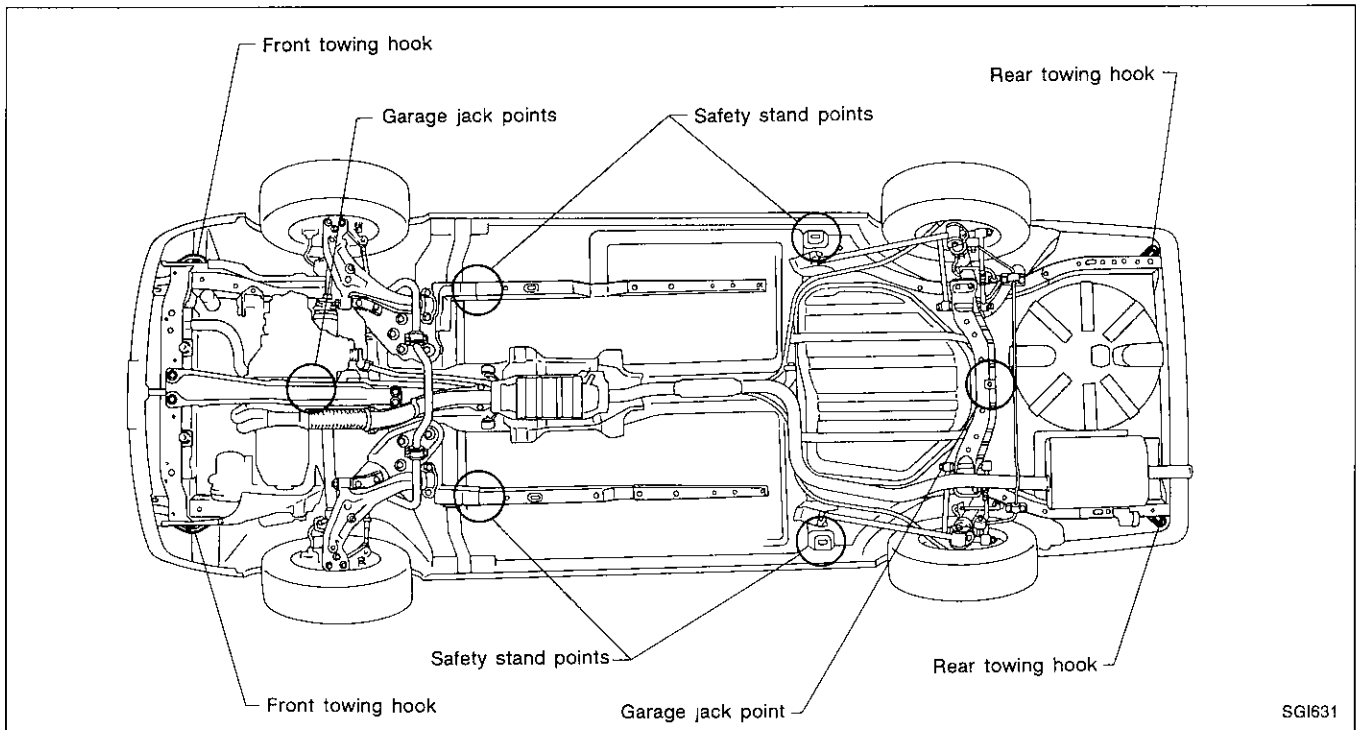
### Garage Jack and Safety Stand

#### 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 the front wheels when the rear wheels are raised and place wheel chocks at the rear wheels when the front wheels are raised.

#### CAUTION:

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



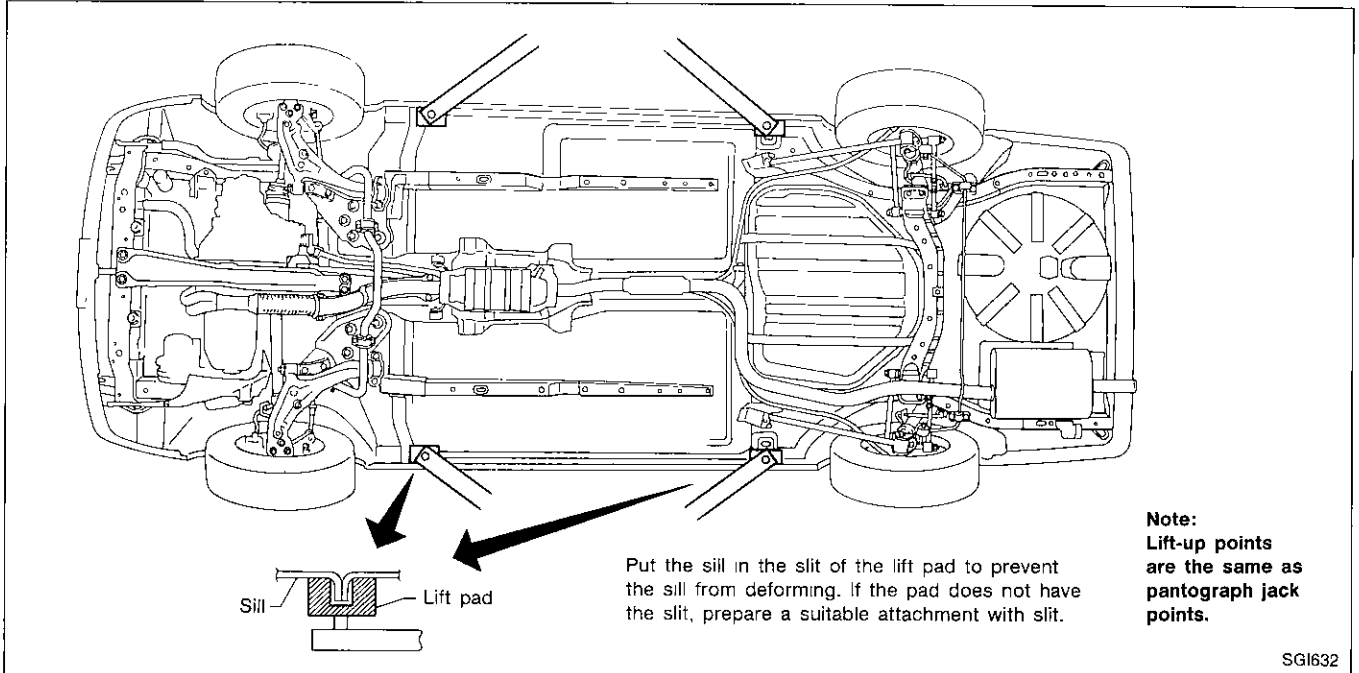
## LIFTING POINTS AND TOW TRUCK TOWING

### 2-pole Lift

#### WARNING:

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

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

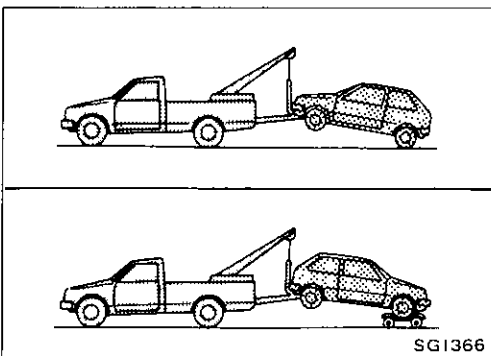


### Tow Truck Towing

#### CAUTION:

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

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



## LIFTING POINTS AND TOW TRUCK TOWING

### Tow Truck Towing (Cont'd)

#### TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

**Speed:**

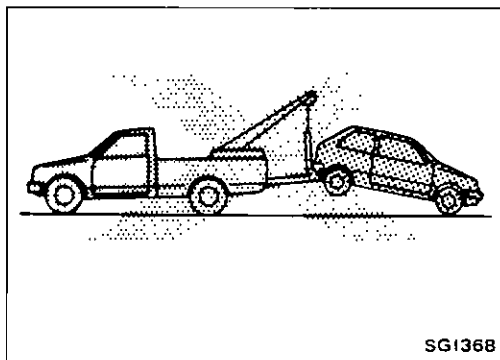
Below 50 km/h (30 MPH)

**Distance:**

Less than 65 km (40 miles)

**CAUTION:**

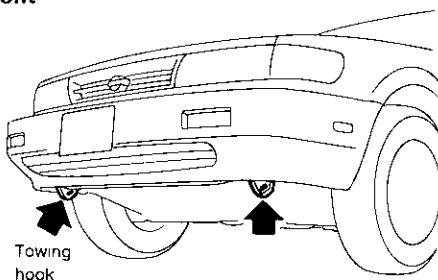
Never tow an automatic transaxle model from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transaxle.



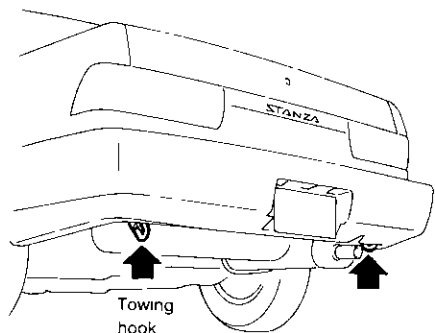
#### TOWING AN AUTOMATIC TRANSAXLE MODEL WITH REAR WHEELS RAISED (With front wheels on ground)

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

#### Front



#### Rear



#### TOWING POINT

Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.

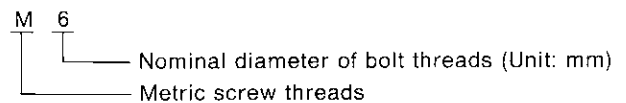
# TIGHTENING TORQUE OF STANDARD BOLTS

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

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

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

\*: Nominal diameter





# MAINTENANCE

## SECTION **MA**

**MA**

### CONTENTS

|                                                |       |
|------------------------------------------------|-------|
| GENERAL MAINTENANCE .....                      | MA- 2 |
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| RECOMMENDED FLUIDS AND LUBRICANTS .....        | MA- 7 |
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## GENERAL MAINTENANCE

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

| Item                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reference page |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>OUTSIDE THE VEHICLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                      |                |
| The maintenance items listed here should be performed from time to time, unless otherwise specified.                                                                                                                                                                                                                                                                                                                                            |                |
| <b>Tires</b> 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.                                                                                                                                                                                                                                | —              |
| <b>Wheel nuts</b> When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.                                                                                                                                                                                                                                                                                                                   | —              |
| <b>Tire rotation</b> Tires should be rotated every 12,000 km (7,500 miles).                                                                                                                                                                                                                                                                                                                                                                     | MA-19          |
| <b>Wheel alignment and balance</b> 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-6  |
| <b>Windshield wiper blades</b> Check for cracks or wear if they do not wipe properly.                                                                                                                                                                                                                                                                                                                                                           | —              |
| <b>Doors and engine hood</b> Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. Also ensure, that all latches lock securely. Lubricate hinges, latches, rollers and links if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released.<br>When driving in areas using road salt or other corrosive materials, check lubrication frequently. | MA-21          |
| <b>INSIDE THE VEHICLE</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |                |
| The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.                                                                                                                                                                                                                                                                                                |                |
| <b>Lights</b> 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.                                                                                                                                                                                                                                                        | —              |
| <b>Warning lights and buzzers/chimes</b> Make sure that all warning lights and buzzers/chimes are operating properly.                                                                                                                                                                                                                                                                                                                           | —              |
| <b>Windshield wiper and washer</b> Check that the wipers and washer operate properly and that the wipers do not streak.                                                                                                                                                                                                                                                                                                                         | —              |
| <b>Windshield defroster</b> Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.                                                                                                                                                                                                                                                                             | —              |
| <b>Steering wheel</b> 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><b>Free play: Less than 35 mm (1.38 in)</b>                                                                                                                                                                                                           | —              |
| <b>Seats</b> Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restraints move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks.                                                      | —              |
| <b>Seat belts</b> 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          |
| <b>Clutch pedal</b> Make sure the pedal operates smoothly and check that it has the proper free travel.                                                                                                                                                                                                                                                                                                                                         | CL-4           |



## GENERAL MAINTENANCE

| Item                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reference page |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Brakes</b> Check that the brake does not pull the vehicle to one side when applied.                                                                                                                                                                                                                                                                                                                                                        | —              |
| <b>Brake pedal</b> Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function. Be certain to keep floor mats away from the pedal.                                                                                                                                                                                                                          | BR-8           |
| <b>Parking brake</b> Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied.                                                                                                                                                                                                                                                                    | BR-27          |
| <b>Automatic transaxle "Park" mechanism</b> 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.                                                                                                                                                                 | —              |
| <b>UNDER THE HOOD AND VEHICLE</b>                                                                                                                                                                                                                                                                                                                                                                                                             |                |
| The maintenance items listed here should be checked periodically (e.g. each time you check the engine oil or refuel).                                                                                                                                                                                                                                                                                                                         |                |
| <b>Windshield washer fluid</b> Check that there is adequate fluid in the tank.                                                                                                                                                                                                                                                                                                                                                                | —              |
| <b>Engine coolant level</b> Check the coolant level when the engine is cold.                                                                                                                                                                                                                                                                                                                                                                  | MA-10          |
| <b>Radiator and hoses</b> 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.                                                                                                                                                                                                                                | —              |
| <b>Brake and clutch fluid levels</b> Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir.                                                                                                                                                                                                                                                                                                 | MA-15, 16      |
| <b>Battery</b> Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.                                                                                                                                                                                                                                                                                                                                            | —              |
| <b>Engine drive belts</b> Make sure that no belt is frayed, worn, cracked or oily.                                                                                                                                                                                                                                                                                                                                                            | MA-9           |
| <b>Engine oil level</b> Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.                                                                                                                                                                                                                                                                                                                 | MA-12          |
| <b>Power steering fluid level and lines</b> 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          |
| <b>Automatic transaxle fluid level</b> Check the level on the dipstick after putting the selector lever in "P" with the engine idling.                                                                                                                                                                                                                                                                                                        | MA-15, 16      |
| <b>Exhaust system</b> 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          |
| <b>Underbody</b> 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. | —              |
| <b>Fluid leaks</b> Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.                                                                                                                                | —              |

## **PERIODIC MAINTENANCE**

---

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

### **SCHEDULE 1**

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

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

### **SCHEDULE 2**

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

## Schedule 1

[ ] At the mileage intervals only

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

| MAINTENANCE OPERATION                                                   |  |                                         |                  | MAINTENANCE INTERVAL |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     |                  |                |
|-------------------------------------------------------------------------|--|-----------------------------------------|------------------|----------------------|--------------------|------------------|---------------------|--------------------|---------------------|------------------|---------------------|--------------------|---------------------|------------------|---------------------|--------------------|---------------------|------------------|----------------|
| Perform at number of miles, kilometers or months, whichever comes first |  | Miles x 1,000<br>(km x 1,000)<br>Months | 3.75<br>(6)<br>3 | 7.5<br>(12)<br>6     | 11 25<br>(18)<br>9 | 15<br>(24)<br>12 | 18.75<br>(30)<br>15 | 22.5<br>(36)<br>18 | 26 25<br>(42)<br>21 | 30<br>(48)<br>24 | 33.75<br>(54)<br>27 | 37.5<br>(60)<br>30 | 41.25<br>(66)<br>33 | 45<br>(72)<br>36 | 48.75<br>(78)<br>39 | 52 5<br>(84)<br>42 | 56.25<br>(90)<br>45 | 60<br>(96)<br>48 | Reference page |
| Emission control system maintenance                                     |  |                                         |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     |                  |                |
| Drive belts                                                             |  | See NOTE (1)                            |                  |                      |                    |                  |                     |                    |                     | [R]              |                     |                    |                     |                  |                     |                    |                     | I*               | MA-9           |
| Air cleaner filter                                                      |  | See NOTE (2)                            |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     | [R]              | MA-12          |
| Vapor lines                                                             |  |                                         |                  |                      |                    |                  |                     |                    |                     | I*               |                     |                    |                     |                  |                     |                    |                     | I*               | MA-14          |
| Fuel lines                                                              |  |                                         |                  |                      |                    |                  |                     |                    |                     | I*               |                     |                    |                     |                  |                     |                    |                     | I*               | MA-11          |
| Fuel filter                                                             |  | See NOTE (3)*                           |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     |                  | MA-11          |
| 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                   | R                | MA-12          |
| Engine oil filter<br>(Use Nissan PREMIUM type or equivalent.)           |  | R                                       | R                | R                    | R                  | R                | R                   | R                  | R                   | R                | R                   | R                  | R                   | R                | R                   | R                  | R                   | R                | MA-13          |
| Spark plugs                                                             |  |                                         |                  |                      |                    |                  |                     |                    |                     | [R]              |                     |                    |                     |                  |                     |                    |                     | [R]              | MA-13          |
| Chassis and body maintenance                                            |  |                                         |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     |                  |                |
| Brake lines & cables                                                    |  |                                         |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     | I                | MA-17          |
| Brake pads, discs, drums & linings                                      |  |                                         |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     | I                | MA-17, 18      |
| Manual & automatic trans-axle oil                                       |  | See NOTE (5)                            |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     | I                | MA-15, 16      |
| Steering gear & linkage, axle & suspension parts                        |  |                                         |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     | I                | MA-19, FA-4    |
| Steering linkage ball joints & front suspension ball joints             |  |                                         |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     | I                | MA-19, FA-4    |
| Exhaust system                                                          |  |                                         |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     | I                | MA-20          |
| Drive shaft boots                                                       |  |                                         |                  |                      |                    |                  |                     |                    |                     |                  |                     |                    |                     |                  |                     |                    |                     | I                | FA-8           |

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

## Schedule 2

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

| MAINTENANCE OPERATION                                                    |  | MAINTENANCE INTERVAL                    |                  |                  |                    |                  |                    |                  |                    |                  |             | Reference page |
|--------------------------------------------------------------------------|--|-----------------------------------------|------------------|------------------|--------------------|------------------|--------------------|------------------|--------------------|------------------|-------------|----------------|
| Perform at number of miles, kilometers or months, whichever comes first. |  | Miles × 1,000<br>(km × 1,000)<br>Months | 7.5<br>(12)<br>6 | 15<br>(24)<br>12 | 22.5<br>(36)<br>18 | 30<br>(48)<br>24 | 37.5<br>(60)<br>30 | 45<br>(72)<br>36 | 52.5<br>(84)<br>42 | 60<br>(96)<br>48 |             |                |
| Emission control system maintenance                                      |  |                                         |                  |                  |                    |                  |                    |                  |                    |                  |             |                |
| Drive belts                                                              |  | See NOTE (1)                            |                  |                  |                    |                  |                    |                  |                    | I*               | MA-9        |                |
| Air cleaner filter                                                       |  |                                         |                  |                  |                    | [R]              |                    |                  |                    | [R]              | MA-12       |                |
| Vapor lines                                                              |  |                                         |                  |                  |                    | I*               |                    |                  |                    | I*               | MA-14       |                |
| Fuel lines                                                               |  |                                         |                  |                  |                    | I*               |                    |                  |                    | I*               | MA-11       |                |
| Fuel filter                                                              |  | See NOTE (2)*                           |                  |                  |                    |                  |                    |                  |                    |                  | MA-11       |                |
| Engine coolant                                                           |  | See NOTE (3)                            |                  |                  |                    |                  |                    |                  |                    | R*               | MA-10       |                |
| Engine oil                                                               |  |                                         | R                | R                | R                  | R                | R                  | R                | R                  | R                | MA-12       |                |
| Engine oil filter (Use Nissan PREMIUM type or equivalent )               |  |                                         | R                |                  | R                  |                  | R                  |                  | R                  |                  | MA-13       |                |
| Spark plugs                                                              |  |                                         |                  |                  |                    | [R]              |                    |                  |                    | [R]              | MA-13       |                |
| Chassis and body maintenance                                             |  |                                         |                  |                  |                    |                  |                    |                  |                    |                  |             |                |
| Brake lines & cables                                                     |  |                                         |                  | I                |                    | I                |                    | I                |                    | I                | MA-17       |                |
| Brake pads, discs, drums & linings                                       |  |                                         |                  | I                |                    | I                |                    | I                |                    | I                | MA-17, 18   |                |
| Manual & automatic transaxle oil                                         |  |                                         |                  | I                |                    | I                |                    | I                |                    | I                | MA-15, 16   |                |
| Steering gear linkage, axle & suspension parts                           |  |                                         |                  |                  |                    | I                |                    |                  |                    | I                | MA-19, FA-4 |                |
| Exhaust system                                                           |  |                                         |                  | I                |                    | I                |                    | I                |                    | I                | MA-20       |                |
| Drive shaft boots                                                        |  |                                         |                  | I                |                    | I                |                    | I                |                    | I                | FA-8        |                |

**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) 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.

## RECOMMENDED FLUIDS AND LUBRICANTS

### Fluids and Lubricants

|                           | Capacity (Approximate) |             |       | Recommended fluids and lubricants                                      |
|---------------------------|------------------------|-------------|-------|------------------------------------------------------------------------|
|                           | US measure             | Imp measure | Liter |                                                                        |
| Engine oil (Refill)       |                        |             |       |                                                                        |
| With oil filter           | 3-3/4 qt               | 3-1/8 qt    | 3.5   | Energy Conserving Oils of API SG *2, *3                                |
| Without oil filter        | 3-3/8 qt               | 2-7/8 qt    | 3.2   |                                                                        |
| Cooling system            | 7-7/8 qt               | 6-1/2 qt    | 7.4   | Anti-freeze coolant (Ethylene glycol base)                             |
| Manual transaxle gear oil | 10 pt                  | 8-1/4 pt    | 4.7   | API GL-4*2                                                             |
| Automatic transaxle fluid | 7-7/8 qt               | 6-1/2 qt    | 7.4   | Genuine Nissan ATF*1 or equivalent<br>Type DEXRON™                     |
| Power steering fluid      | —                      | —           | —     | Type DEXRON™                                                           |
| Brake fluid               | —                      | —           | —     | Genuine Nissan Brake Fluid*1 or equivalent<br>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.

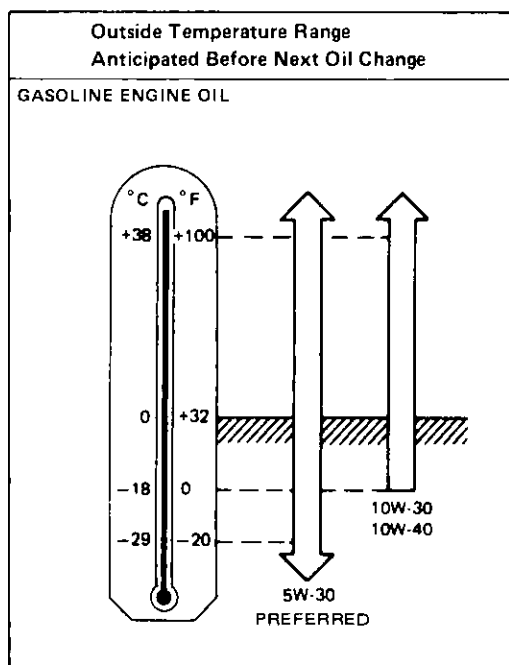
\*2: For further details, see "Recommended SAE viscosity number".

\*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.

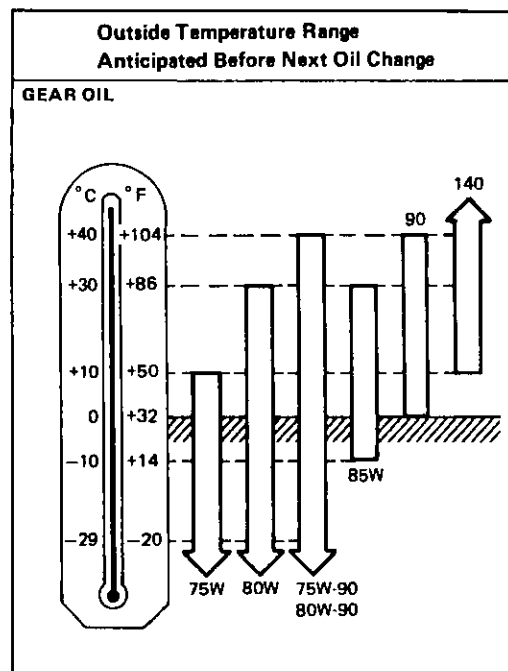
## RECOMMENDED FLUIDS AND LUBRICANTS

### SAE Viscosity Number



T10008

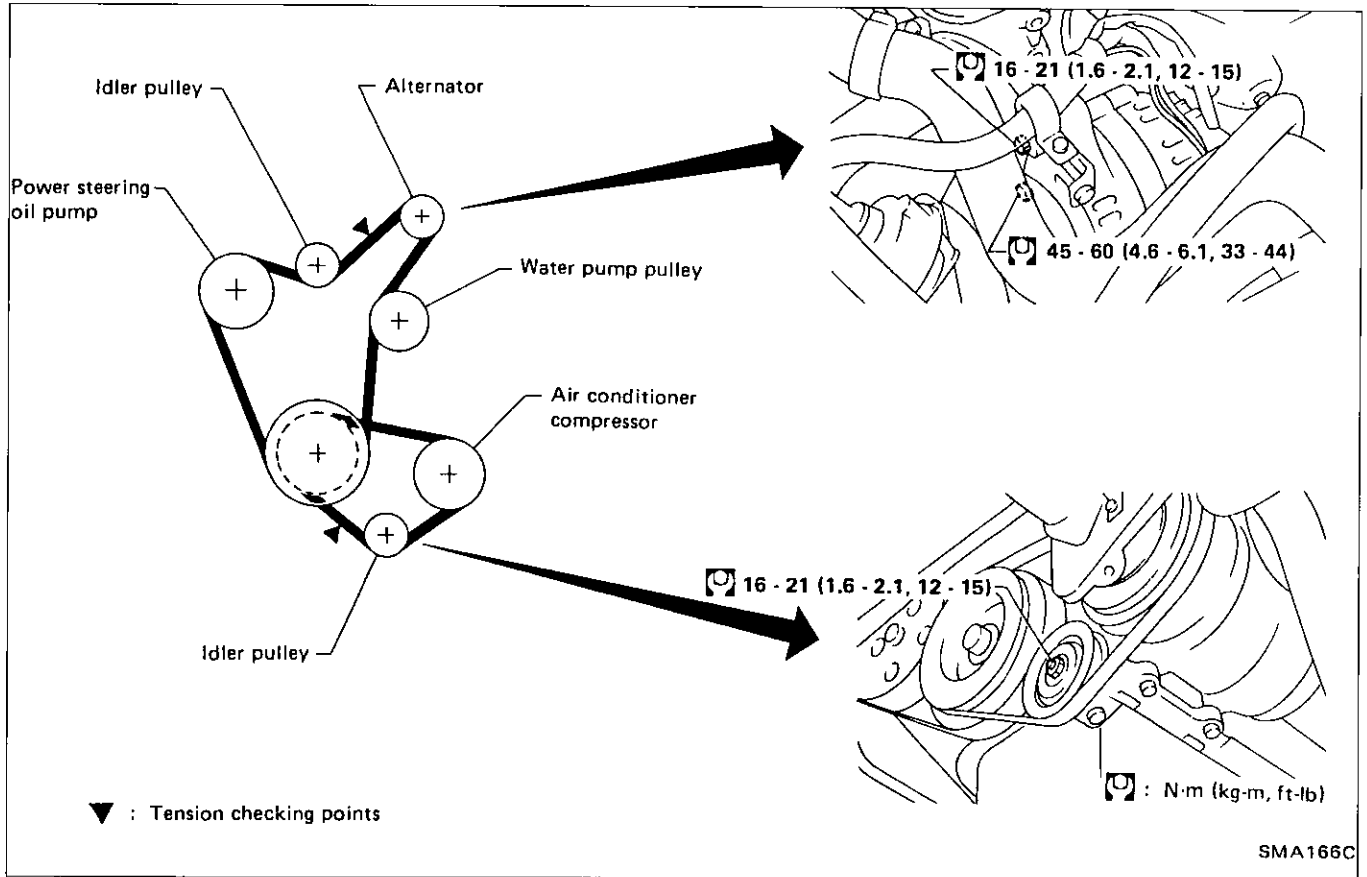
5W-30 is preferable for ambient temperatures above  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ). 20W-40 and 20W-50 are usable for ambient temperatures above  $10^{\circ}\text{C}$  ( $50^{\circ}\text{F}$ ) for all seasons.



T10003

80W-90 is preferable for ambient temperatures below  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ).

## Checking Drive Belts



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

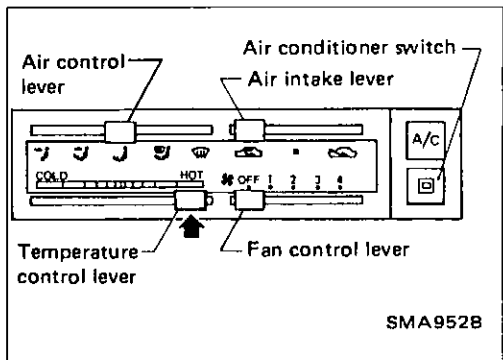
**Adjust if belt deflections exceed the limit.**

**Belt deflection:**

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

Unit: mm (in)

|                                       | Used belt deflection |                             | Deflection of new belt |
|---------------------------------------|----------------------|-----------------------------|------------------------|
|                                       | Limit                | Deflection after adjustment |                        |
| Alternator<br>Power steering oil pump | 8 (0.31)             | 6 - 7<br>(0.24 - 0.28)      | 5 - 6<br>(0.20 - 0.24) |
| Air conditioner compressor            | 8 (0.31)             | 5 - 6<br>(0.20 - 0.24)      | 4 - 5<br>(0.16 - 0.20) |
| Applied pushing force                 | 98 N (10 kg, 22 lb)  |                             |                        |

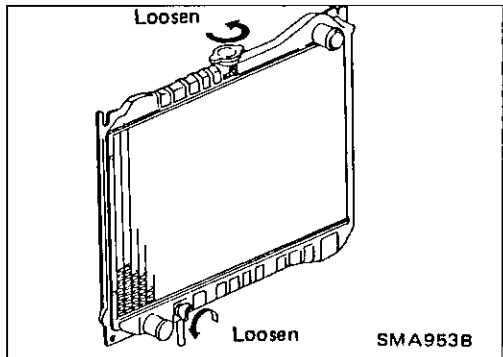


## Changing Engine Coolant

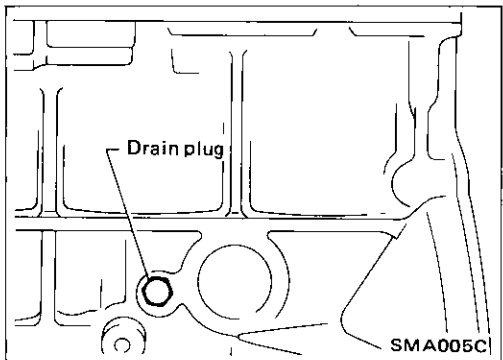
### WARNING:

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

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



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



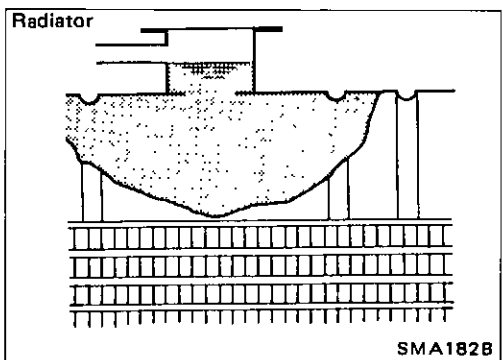
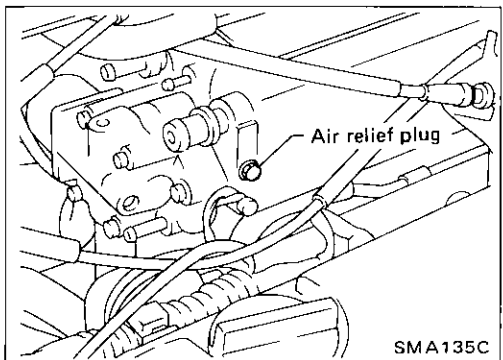
3. Remove cylinder block drain plug.
4. Close drain cock and tighten drain plug securely.

- Apply sealant to the thread of drain plug.

□: 34 - 44 N·m

(3.5 - 4.5 kg-m, 25 - 33 ft-lb)

5. Open air relief plug.
6. Fill radiator with water and close air relief plug and radiator cap.
7. Run engine and warm it up sufficiently.
8. Race engine 2 or 3 times under no-load.
9. Stop engine and wait until it cools down.
10. Drain water.
11. Repeat step 2 through step 10 until clear water begins to drain from radiator.



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

### Coolant capacity (With reservoir tank):

7.4 ℓ (7-7/8 US qt, 6-1/2 Imp qt)

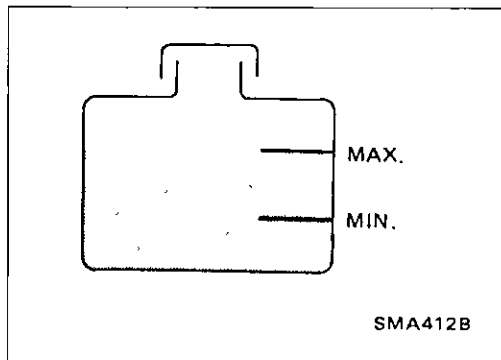


## ENGINE MAINTENANCE

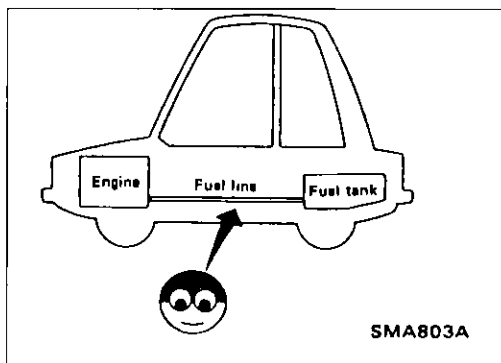
### Changing Engine Coolant (Cont'd)

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

After radiator is filled with coolant, attach radiator cap, and shake radiator upper hose up and down. Open radiator cap, and see if coolant level has dropped. Add coolant if any drop in coolant level is found.



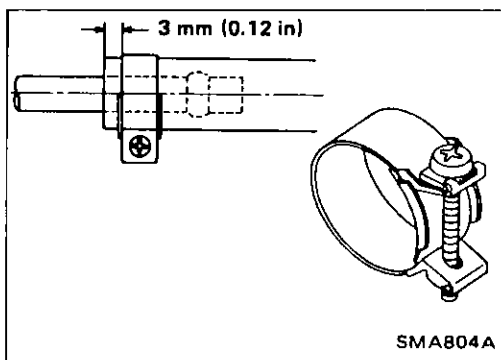
14. Close air relief plug.
15. Remove reservoir tank, drain coolant, then clean reservoir tank.
16. Install reservoir tank and fill it with coolant up to "MAX" level and then install radiator cap.
17. Run engine and warm it up sufficiently.
18. Race engine 2 or 3 times under no-load.
19. Stop engine and cool it down, then add coolant as necessary.



### Checking Fuel Lines

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

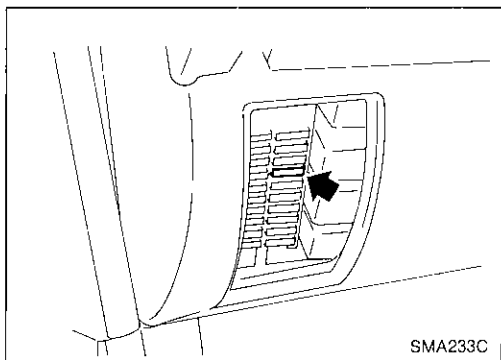
If necessary, repair or replace faulty parts.



#### CAUTION:

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

Ensure that screw does not contact adjacent parts.



### Changing Fuel Filter

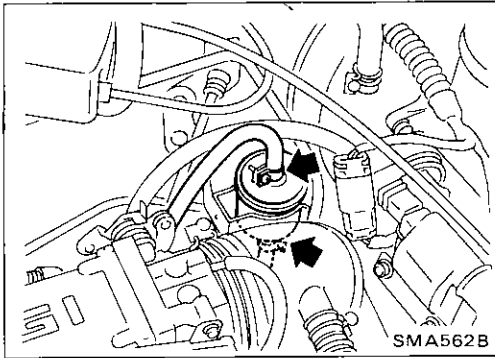
#### WARNING:

Before removing fuel filter, release fuel pressure from fuel line.

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

## ENGINE MAINTENANCE

### Changing Fuel Filter (Cont'd)

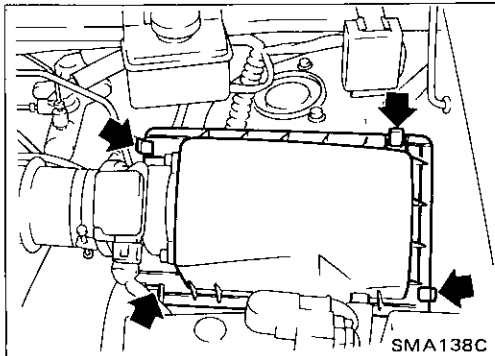


5. Loosen fuel hose clamps.
6. Replace fuel filter.

- 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.
3. Drain oil and refill with new engine oil.

#### Refill oil capacity (Approximate):

Unit: liter (US qt, Imp qt)

|                           |                    |
|---------------------------|--------------------|
| With oil filter change    | 3.5 (3-3/4, 3-1/8) |
| Without oil filter change | 3.2 (3-3/8, 2-7/8) |

#### CAUTION:

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

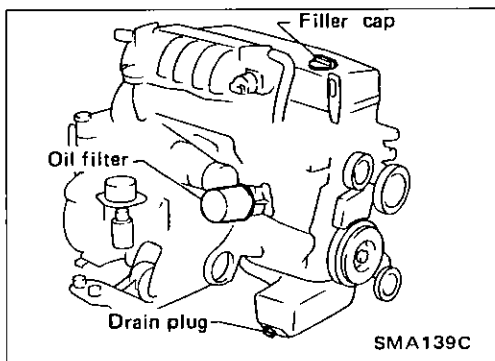
Drain plug:

: 29 - 39 N·m

(3.0 - 4.0 kg-m, 22 - 29 ft-lb)

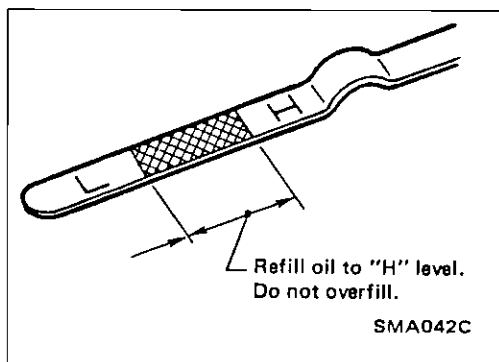
- Use recommended engine oil.

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.



## ENGINE MAINTENANCE

### Changing Engine Oil (Cont'd)



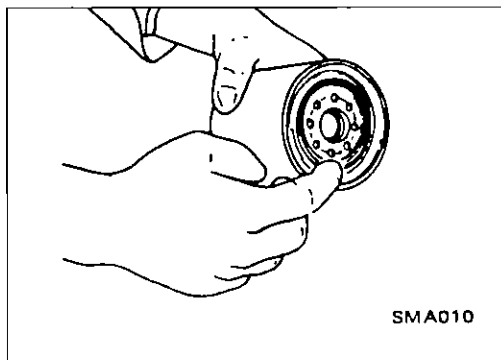
4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

### Changing Oil Filter

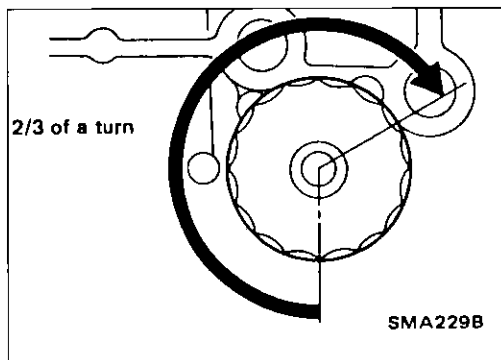
1. Remove oil filter with a suitable tool.

#### **WARNING:**

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

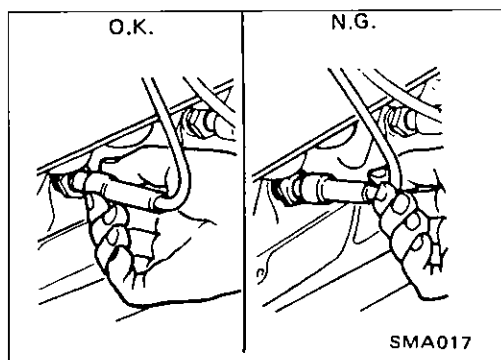


2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



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

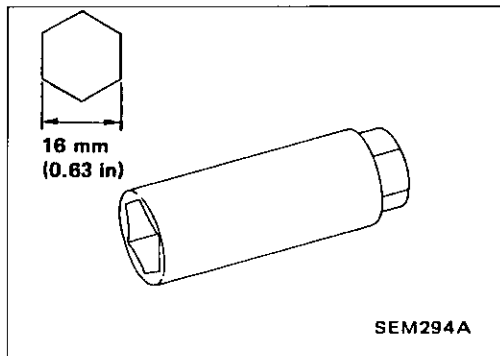
**Refer to Changing Engine Oil.**



### Changing Spark Plugs

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

### Changing Spark Plugs (Cont'd)



2. Remove spark plugs with spark plug wrench.

**Spark plug:**

Standard type

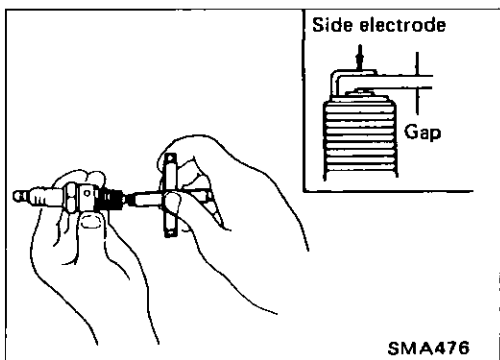
ZFR5E-11

Hot type

ZFR4E-11

Cold type

ZFR6E-11



3. Check plug gap of each new spark plug.

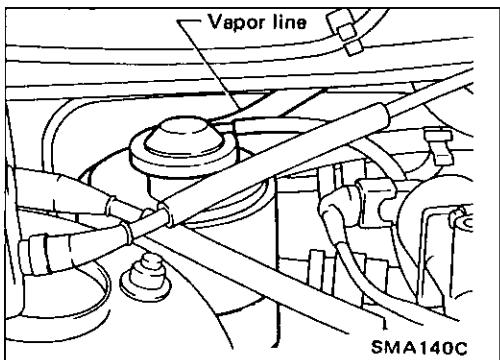
**Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)**

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

**Spark plug:**

: 20 - 29 N·m

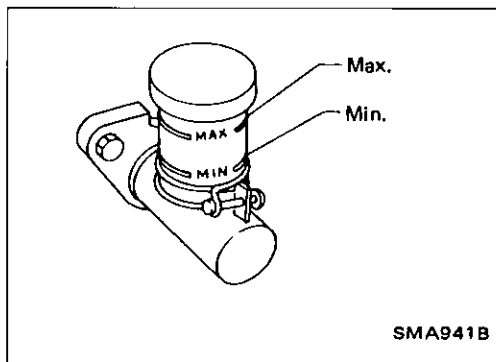
(2.0 - 3.0 kg-m, 14 - 22 ft-lb)



### Checking Vapor Lines

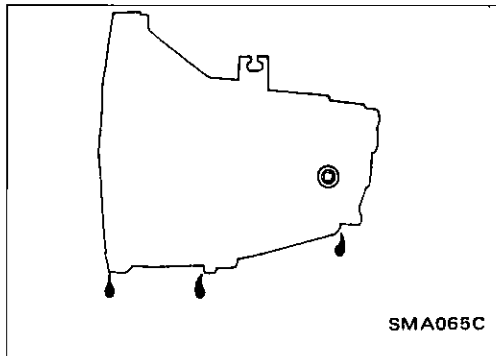
1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

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



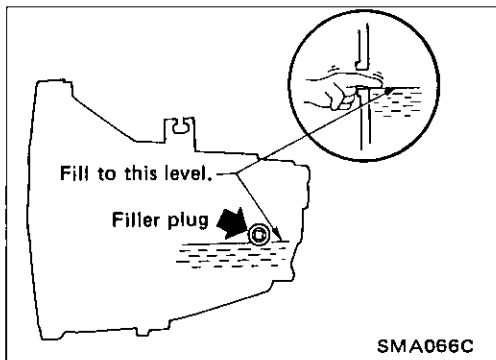
### Checking Clutch Fluid Level and Leaks

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



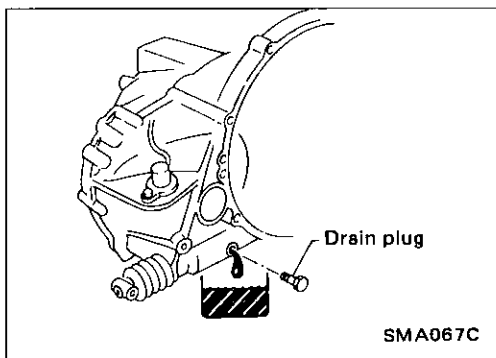
### Checking M/T Oil

1. Check for oil leaks.



2. Check oil level.

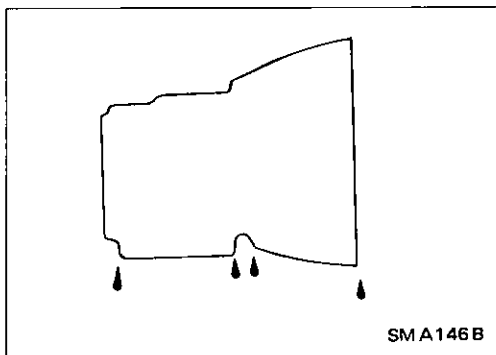
**Never start engine while checking oil level.**



### Changing M/T Oil

Oil capacity:

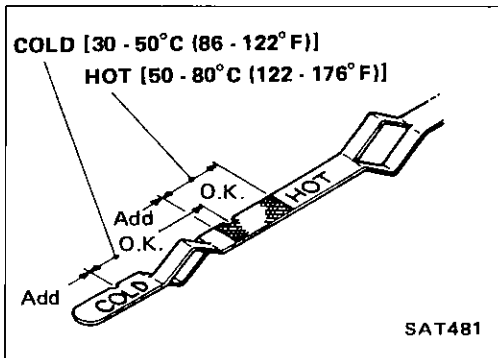
4.7 liters (10 US pt, 8-1/4 Imp pt)



### Checking A/T Fluid Level

1. Check for fluid leakage.

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

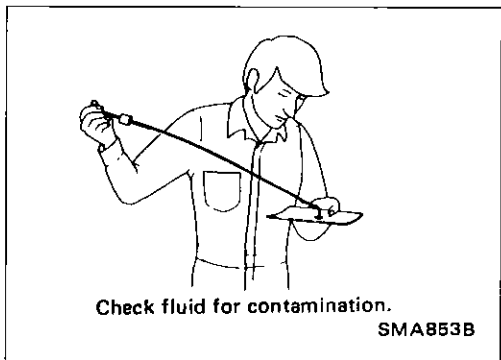


#### 2. Check fluid level.

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) Re-insert dipstick into charging pipe as far as it will go.
- 6) Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

**Do not overfill.**

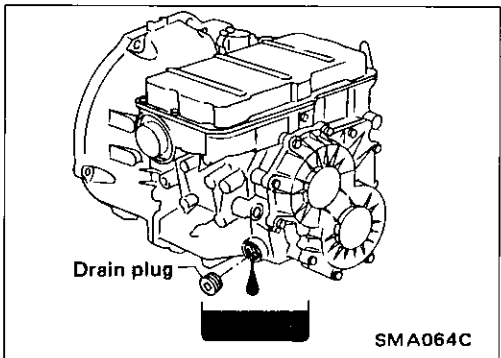


Check fluid for contamination.

#### 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.

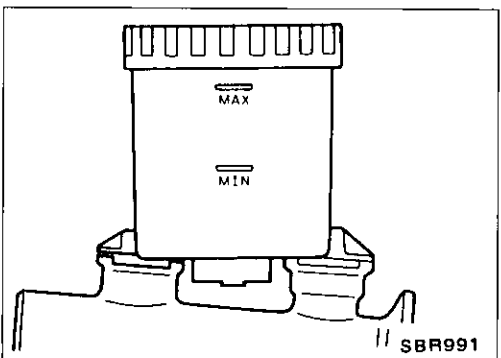
Refer to section AT for checking operation of A/T.



### Changing A/T Fluid

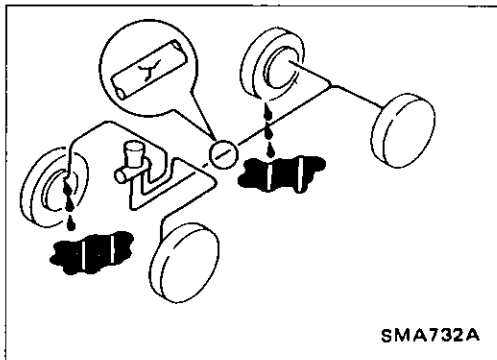
Oil capacity (With torque converter):

7.4 liters (7-7/8 US qt, 6-1/2 Imp qt)



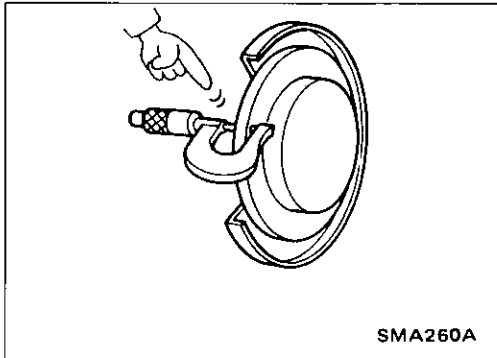
### Checking Brake Fluid Level and Leaks

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

Check condition of disc brake components.

#### ROTOR

Check condition and thickness.

##### CL25VA:

**Standard thickness**

22.0 mm (0.866 in)

**Minimum thickness**

20.0 mm (0.787 in)

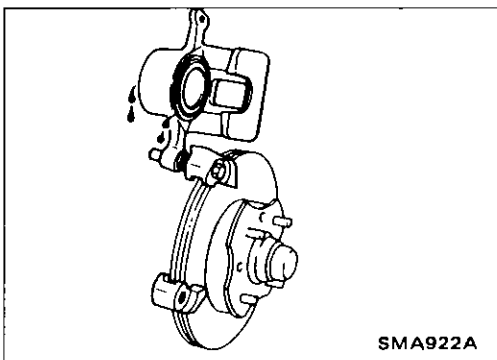
##### CL9H:

**Standard thickness**

10.0 mm (0.394 in)

**Minimum thickness**

9.0 mm (0.354 in)



#### CALIPER

Check operation and for leakage.

## CHASSIS AND BODY MAINTENANCE

### Checking Disc Brake (Cont'd)

#### PAD

Check for wear or damage.

##### CL25VA:

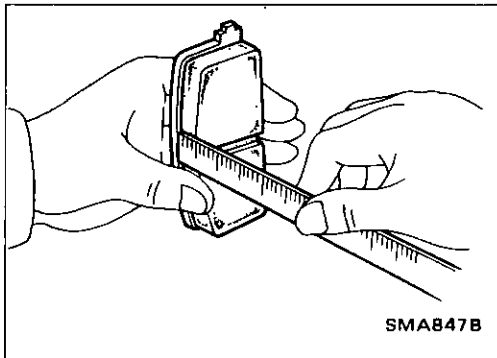
Standard thickness  
11.0 mm (0.433 in)

Minimum thickness  
2.0 mm (0.079 in)

##### CL9H:

Standard thickness  
9.0 mm (0.354 in)

Minimum thickness  
2.0 mm (0.079 in)

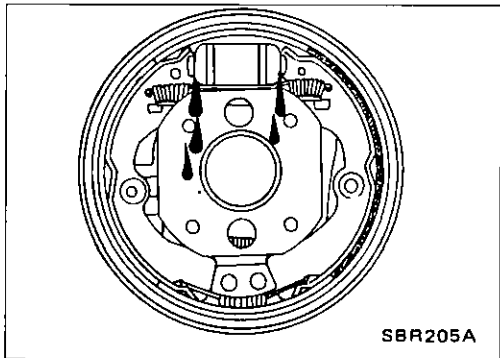


### Checking Drum Brake

Check condition of drum brake components.

#### WHEEL CYLINDER

Check operation and for leakage.

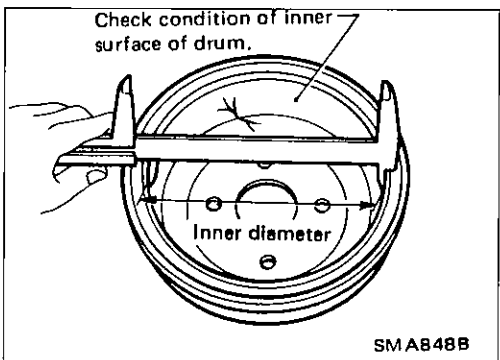


#### DRUM

Check condition of inner surface.

Standard inner diameter:  
228.6 mm (9 in)

Maximum diameter:  
230.0 mm (9.06 in)



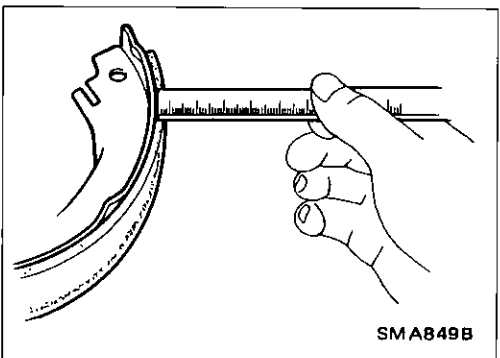
#### LINING

Check for wear or damage.

Standard thickness:  
4.5 mm (0.177 in)

Minimum thickness:  
1.5 mm (0.059 in)

Refer to section BR for shoe replacement.



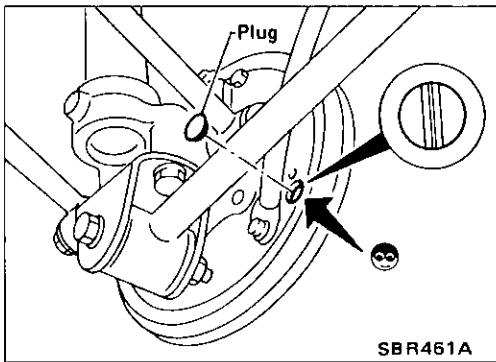


## CHASSIS AND BODY MAINTENANCE

### Checking Drum Brake (Cont'd)

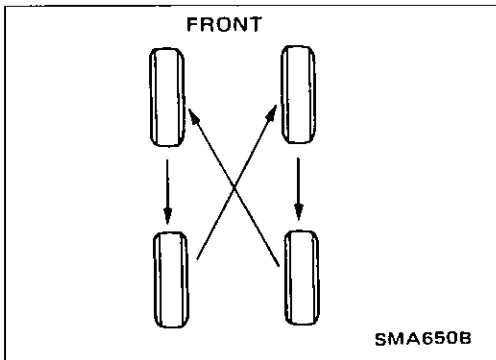
#### TEMPORARY METHOD FOR CHECKING LINING WEAR

Remove inspection hole plug and check for lining wear.



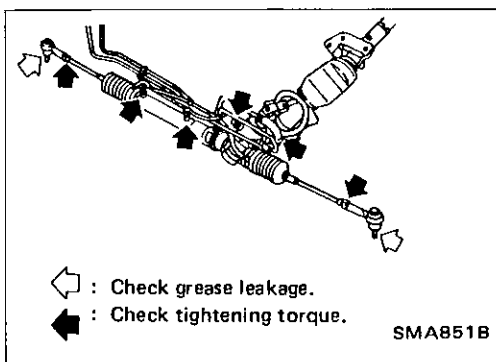
### Balancing Wheels

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



### Tire Rotation

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



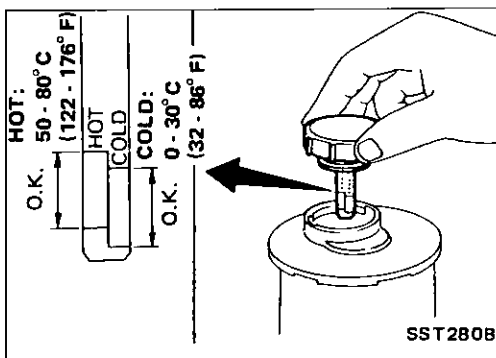
### Checking Steering Gear and Linkage

#### 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

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).

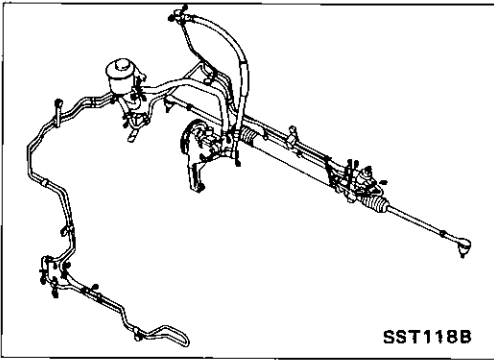
#### CAUTION:

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

## CHASSIS AND BODY MAINTENANCE

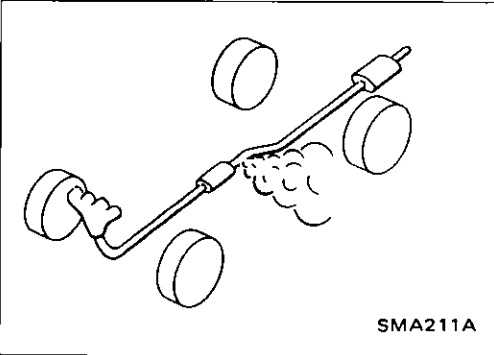
### Checking Power Steering Fluid and Lines (Cont'd)

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

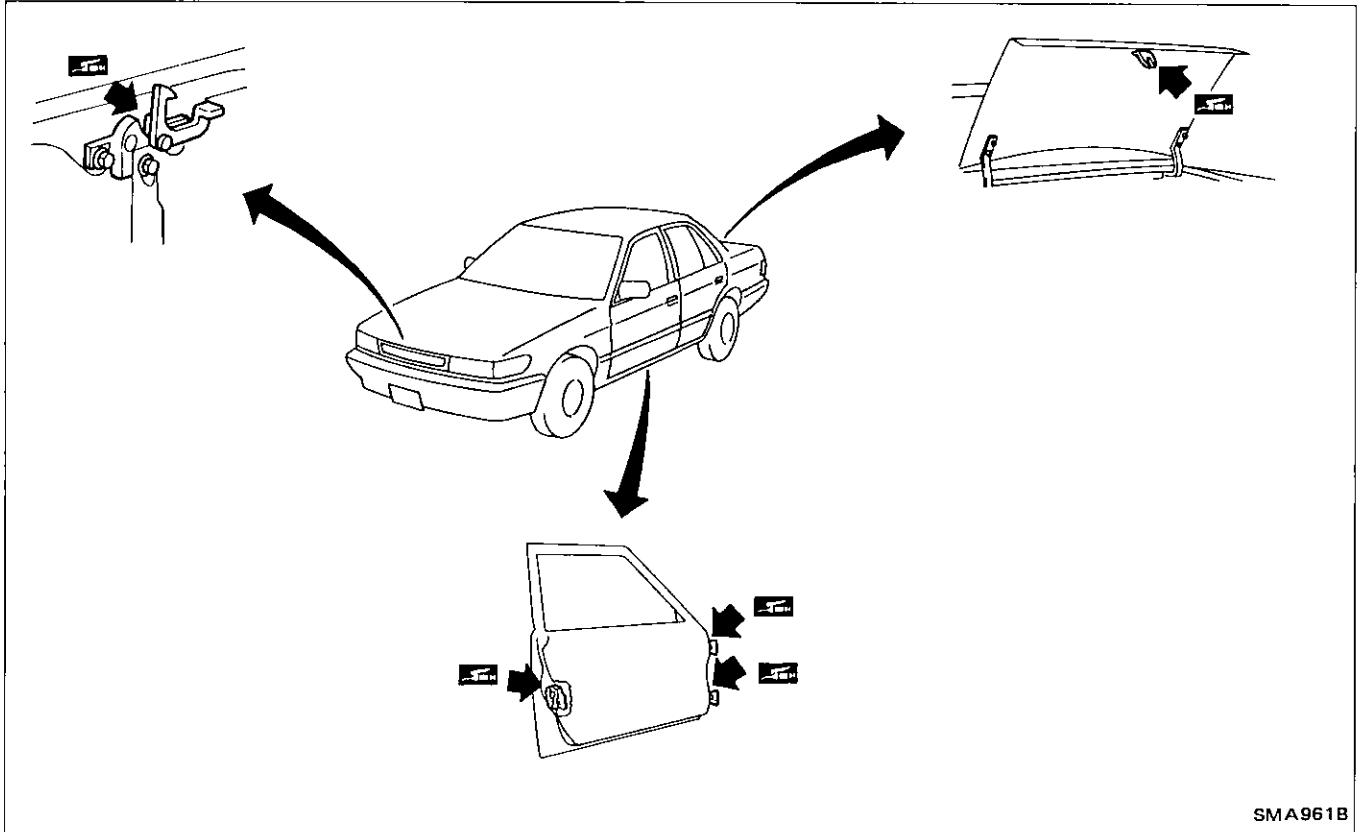


### Checking Exhaust System

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

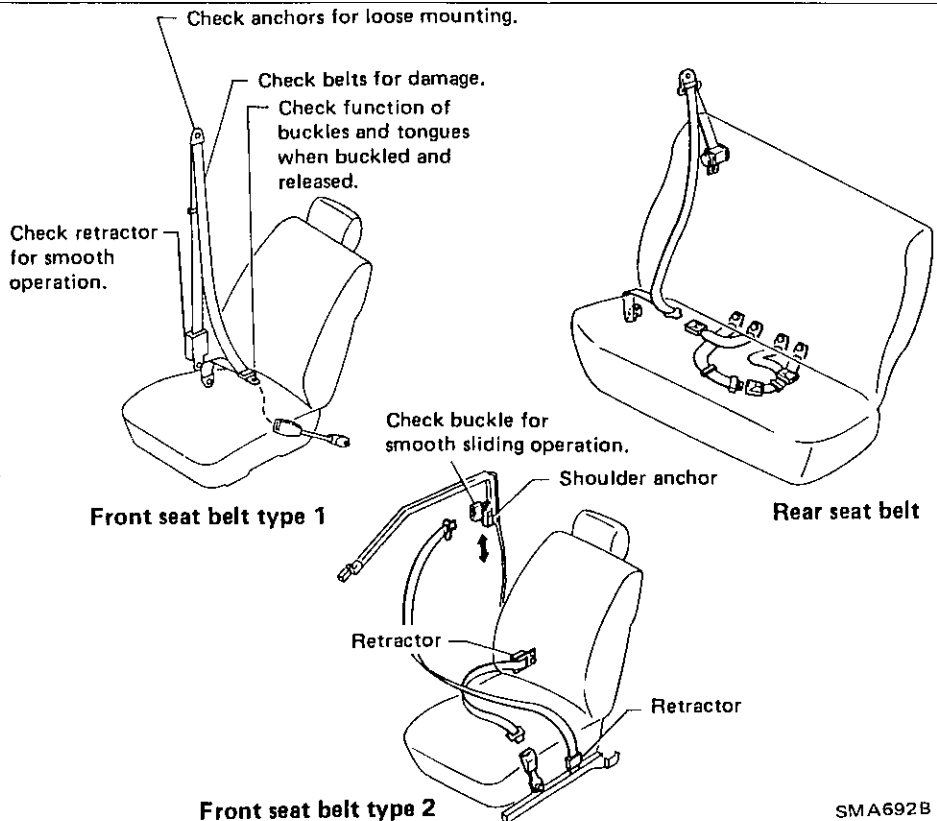
### CAUTION:

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



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

## Engine Maintenance

### INSPECTION AND ADJUSTMENT

#### Drive belt deflection

Unit: mm (in)

|                                       | Used belt deflection |                             | Deflection of new belt |
|---------------------------------------|----------------------|-----------------------------|------------------------|
|                                       | Limit                | Deflection after adjustment |                        |
| Alternator<br>Power steering oil pump | 8 (0.31)             | 6 - 7<br>(0.24 - 0.28)      | 5 - 6<br>(0.20 - 0.24) |
| Air conditioner compressor            | 8 (0.31)             | 5 - 6<br>(0.20 - 0.24)      | 4 - 5<br>(0.16 - 0.20) |
| Applied pushing force                 | 98 N (10 kg, 22 lb)  |                             |                        |

#### Oil capacity (Refill)

Unit: ℓ (US qt, Imp qt)

|                    |                    |
|--------------------|--------------------|
| With oil filter    | 3.5 (3-3/4, 3-1/8) |
| Without oil filter | 3.2 (3-3/8, 2-7/8) |

#### Oil capacity

Unit: ℓ (US qt, Imp qt)

|                     |                    |
|---------------------|--------------------|
| With reservoir tank | 7.4 (7-7/8, 6-1/2) |
|---------------------|--------------------|

#### Spark plug

|               |                                 |
|---------------|---------------------------------|
| Standard type | ZFR5E-11                        |
| Hot type      | ZFR4E-11                        |
| Cold type     | ZFR6E-11                        |
| Plug gap      | 1.0 - 1.1 mm (0.039 - 0.043 in) |

#### Ignition wire

|            |              |                    |
|------------|--------------|--------------------|
| Resistance | kΩ/m (kΩ/ft) | Less than 30 (9.1) |
|------------|--------------|--------------------|

### TIGHTENING TORQUE

| Unit         | N·m     | kg-m      | ft-lb   |
|--------------|---------|-----------|---------|
| Spark plug   | 20 - 29 | 2.0 - 3.0 | 14 - 22 |
| Drain plug   |         |           |         |
| Engine block | 34 - 44 | 3.5 - 4.5 | 25 - 33 |
| Oil pan      | 29 - 39 | 3.0 - 4.0 | 22 - 29 |

## Chassis and Body Maintenance

### INSPECTION AND ADJUSTMENT

#### Clutch

Unit: mm (in)

|                   |                         |
|-------------------|-------------------------|
| Pedal free height | 163 - 173 (6.42 - 6.81) |
| Pedal free play   | 1 - 3 (0.04 - 0.12)     |

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

|                           |         |                     |
|---------------------------|---------|---------------------|
| Chamber                   | degree  | -30' to 1°00'       |
| Caster                    | degree  | 35' - 2°05'         |
| Kingpin inclination       | degree  | 13°45' - 15°15'     |
| Toe-in                    | mm (in) | 1 - 3 (0.04 - 0.12) |
| (Total toe-in)            | degree  | 6' - 18'            |
| Front wheel turning angle |         |                     |
| Full turn                 |         |                     |
| Inside/outside            | degree  | 34° - 38°/27° - 31° |

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

#### Rear axle and rear suspension (Unladen)\*

|                 |         |                  |
|-----------------|---------|------------------|
| Camber          | degree  | -1°20' to 10'    |
| Toe-out         | mm (in) | 0 - 4 (0 - 0.16) |
| (Total toe-out) | degree  | 0' - 23'         |

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

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

## Chassis and Body Maintenance (Cont'd)

### Brake

|                                                                                      |                         |  |
|--------------------------------------------------------------------------------------|-------------------------|--|
| Disc brake                                                                           | mm (in)                 |  |
| Pad                                                                                  |                         |  |
| Standard thickness                                                                   |                         |  |
| CL25VA                                                                               | 11.0 (0.433)            |  |
| CL9H*                                                                                | 9.0 (0.354)             |  |
| Minimum thickness                                                                    |                         |  |
| CL25VA                                                                               | 2.0 (0.079)             |  |
| CL9H*                                                                                | 2.0 (0.079)             |  |
| Rotor                                                                                |                         |  |
| Standard thickness                                                                   |                         |  |
| CL25VA                                                                               | 22.0 (0.866)            |  |
| CL9H*                                                                                | 10.0 (0.394)            |  |
| Minimum thickness                                                                    |                         |  |
| CL25VA                                                                               | 20.0 (0.787)            |  |
| CL9H*                                                                                | 9.0 (0.354)             |  |
| Drum brake                                                                           | mm (in)                 |  |
| Lining                                                                               |                         |  |
| Standard thickness                                                                   | 4.5 (0.177)             |  |
| Minimum thickness                                                                    | 1.5 (0.059)             |  |
| Drum                                                                                 |                         |  |
| Standard diameter                                                                    | 228.6 (9)               |  |
| Maximum diameter                                                                     | 230.0 (9.06)            |  |
| Pedal                                                                                | mm (in)                 |  |
| Free height                                                                          |                         |  |
| M/T                                                                                  | 159 - 169 (6.26 - 6.65) |  |
| A/T                                                                                  | 169 - 179 (6.65 - 7.05) |  |
| Free play                                                                            | 1 - 3 (0.04 - 0.12)     |  |
| Depressed height<br>[Under force of 490 N<br>(50 kg, 110 lb) with engine<br>running] | 90 (3.54) or more       |  |
| Parking brake                                                                        |                         |  |
| Number of notches<br>[at pulling force 196 N<br>(20 kg, 44 lb)]                      | 9 - 11                  |  |

\*. Rear disc brake

### Wheel balance

|                             |                                   |                      |
|-----------------------------|-----------------------------------|----------------------|
| Maximum allowable unbalance | Dynamic (at rim flange)<br>g (oz) | 10 (0.35) (One side) |
|                             | Static<br>g (oz)                  | 20 (0.71)            |

### Wheel bearing

|                                        |                                      |                                      |
|----------------------------------------|--------------------------------------|--------------------------------------|
|                                        | Front                                | Rear                                 |
| Wheel bearing axle end play<br>mm (in) | 0.05 (0.0020) or less                |                                      |
| Wheel bearing lock nut                 |                                      |                                      |
| Tightening torque<br>N·m (kg-m, ft-lb) | 235 - 314<br>(24 - 32,<br>174 - 231) | 186 - 255<br>(19 - 26,<br>137 - 188) |

### TIGHTENING TORQUE

| Unit                             | N·m      | kg-m        | ft-lb     |
|----------------------------------|----------|-------------|-----------|
| Clutch                           |          |             |           |
| Pedal stopper lock nut           | 16 - 22  | 1.6 - 2.2   | 12 - 16   |
| Clutch switch lock nut           | 12 - 15  | 1.2 - 1.5   | 9 - 11    |
| Manual transaxle                 |          |             |           |
| Filler plug                      | 25 - 34  | 2.5 - 3.5   | 18 - 25   |
| Drain plug                       | 20 - 29  | 2.0 - 3.0   | 14 - 22   |
| Automatic transaxle              |          |             |           |
| Drain plug                       | 25 - 34  | 2.5 - 3.5   | 18 - 25   |
| Front axle and front suspension  |          |             |           |
| Tie-rod lock nut                 | 37 - 46  | 3.8 - 4.7   | 27 - 34   |
| Rear axle and rear suspension    |          |             |           |
| Toe adjusting lock nut           | 78 - 98  | 8.0 - 10.0  | 58 - 72   |
| Brake system                     |          |             |           |
| Air bleed valve                  | 7 - 9    | 0.7 - 0.9   | 5.1 - 6.5 |
| Brake lamp switch lock nut       | 12 - 15  | 1.2 - 1.5   | 9 - 11    |
| Brake booster input rod lock nut | 16 - 22  | 1.6 - 2.2   | 12 - 16   |
| Wheel and tire                   |          |             |           |
| Wheel nut                        | 98 - 118 | 10.0 - 12.0 | 72 - 87   |



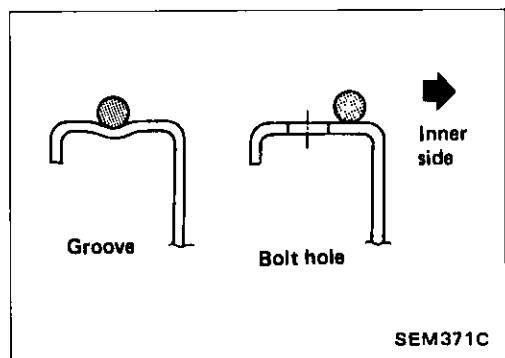
# ENGINE MECHANICAL

## SECTION **EM**



### CONTENTS

|                                                |       |
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| COMPRESSION PRESSURE .....                     | EM- 8 |
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| OIL SEAL REPLACEMENT .....                     | EM-16 |
| CYLINDER HEAD .....                            | EM-18 |
| ENGINE REMOVAL .....                           | EM-33 |
| CYLINDER BLOCK .....                           | EM-35 |
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### Liquid Gasket Application Procedure

- a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.
- 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 sealing surface around hole perimeter area.  
(Assembly should be done within 5 minutes after coating.)
- d. Wait at least 30 minutes before refilling engine oil.

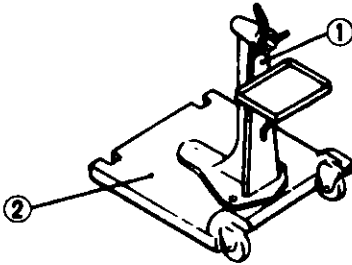
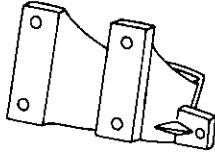
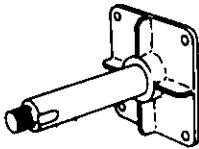
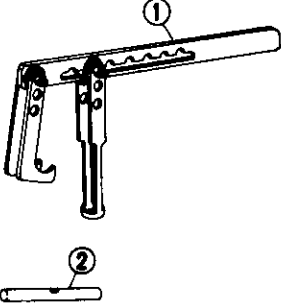
### Parts Requiring Angular Tightening

- 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 bearing cap nuts

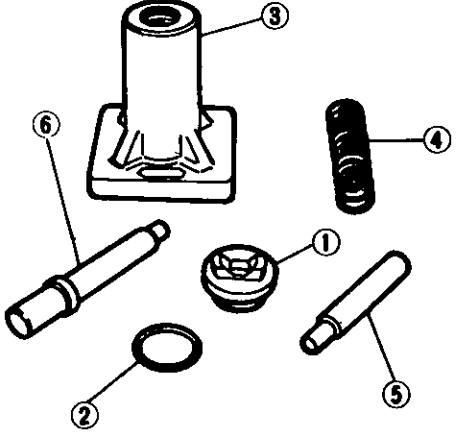
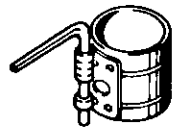
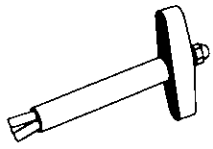
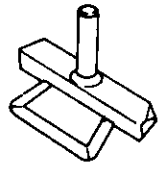
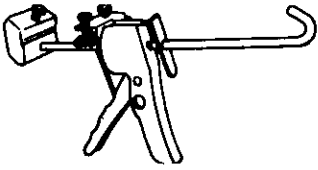
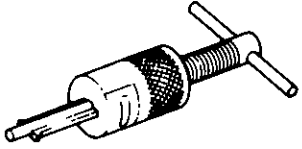


# PREPARATION

## SPECIAL SERVICE TOOLS

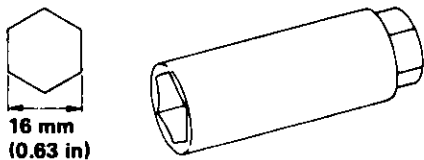
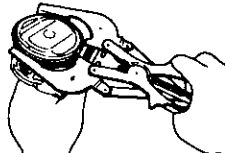
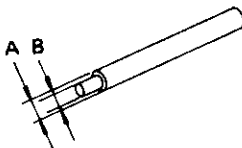
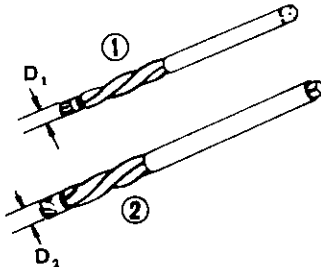
| Tool number<br>(Kent-Moore No.)<br>Tool name                                                                                 | Description                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| ST0501S000<br>( — )<br>Engine stand<br>assembly<br>① ST05011000<br>( — )<br>Engine stand<br>② ST05012000<br>( — )<br>Base    |  Disassembling and assembling                       |
| KV10114300<br>( — )<br>Engine sub-attachment                                                                                 |                                                     |
| KV101065001<br>( — )<br>Engine stand shaft                                                                                   |                                                    |
| KV101092S0<br>( — )<br>Valve spring<br>compressor<br>① KV10109210<br>( — )<br>Compressor<br>② KV10109220<br>( — )<br>Adapter |  Disassembling and assembling valve<br>components |
| KV109B0010<br>( — )<br>Valve oil seal drift                                                                                  |  Installing valve oil seal                        |

## PREPARATION

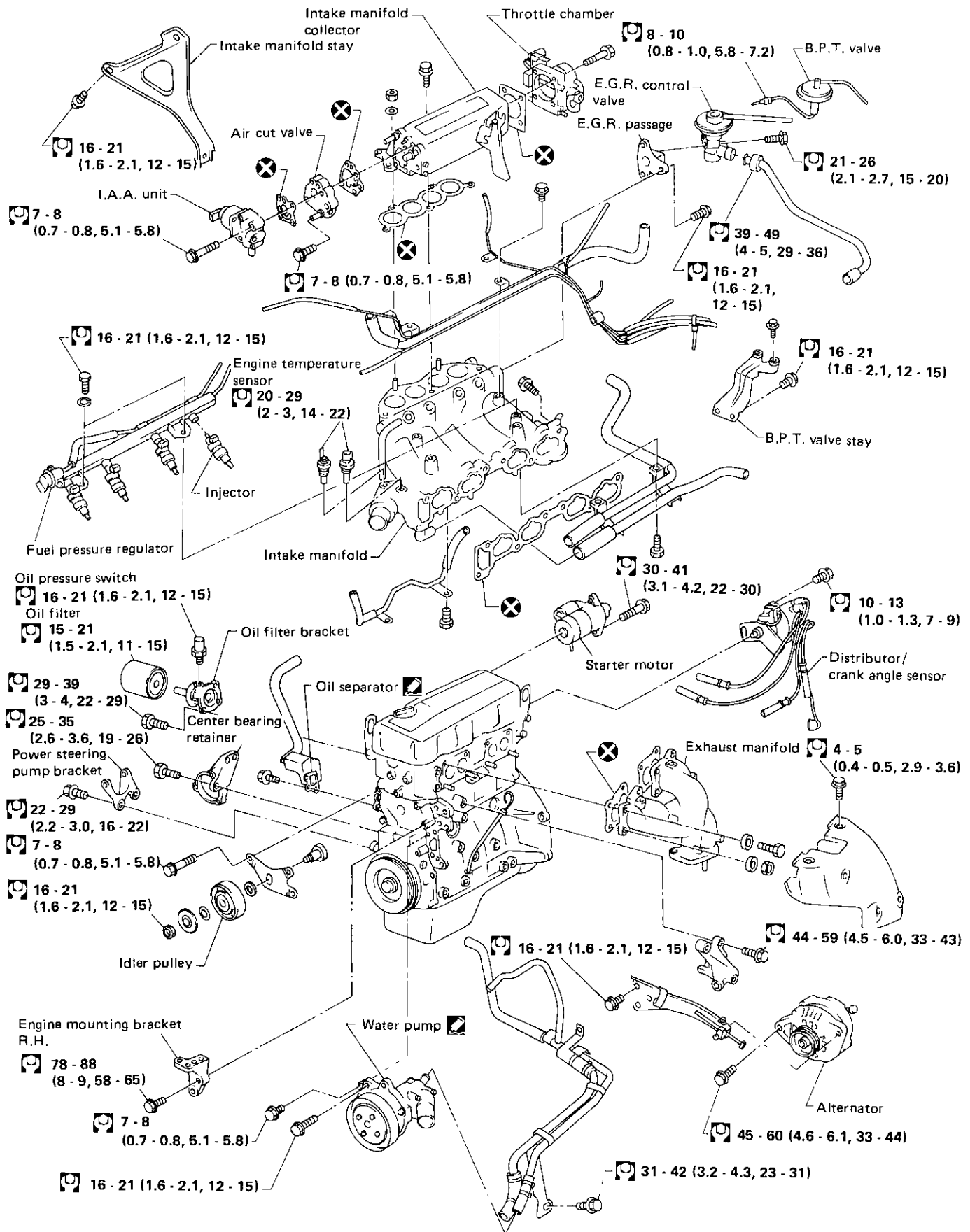
| Tool number<br>(Kent-Moore No.)<br>Tool name                                                                                                                                                                                                                                    | Description                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| KV10110300<br>( — )<br>Piston pin press stand assembly<br>① KV10110310<br>( — )<br>Cap<br>② KV10110330<br>( — )<br>Spacer<br>③ ST13030020<br>( — )<br>Press stand<br>④ ST13030030<br>( — )<br>Spring<br>⑤ KV10110340<br>( — )<br>Drift<br>⑥ KV10110320<br>( — )<br>Center shaft |  <p>Disassembling and assembling piston with connecting rod</p> |
| EM03470000<br>(J8037)<br>Piston ring compressor                                                                                                                                                                                                                                 |  <p>Installing piston assembly into cylinder bore</p>          |
| (J36467)<br>Valve oil seal remover                                                                                                                                                                                                                                              |  <p>Displacement valve oil seal</p>                           |
| KV10111100<br>( — )<br>Seal cutter                                                                                                                                                                                                                                              |  <p>Removing oil pan</p>                                      |
| WS39930000<br>( — )<br>Tube presser                                                                                                                                                                                                                                             |  <p>Pressing the tube of liquid gasket</p>                    |
| ST16610001<br>(J23907)<br>Pilot bushing puller                                                                                                                                                                                                                                  |                                                               |

# PREPARATION

## COMMERCIAL SERVICE TOOLS

| Tool name             | Description                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                  |           |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |
|-----------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--|--|---------|--|--------|---------|--|----------------|--------------|--------------|--|----------------|--------------|--------------|--|
| Spark plug wrench     |  <p>16 mm<br/>(0.63 in)</p> | 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><br><table><tr><td colspan="3">Diameter:</td><td>mm (in)</td></tr><tr><td></td><td>Intake</td><td>Exhaust</td><td></td></tr><tr><td>A</td><td>10.5 (0.413)</td><td>11.5 (0.453)</td><td></td></tr><tr><td>B</td><td>6.6 (0.260)</td><td>7.6 (0.299)</td><td></td></tr></table>                                            | Diameter: |  |  | mm (in) |  | Intake | Exhaust |  | A              | 10.5 (0.413) | 11.5 (0.453) |  | B              | 6.6 (0.260)  | 7.6 (0.299)  |  |
| Diameter:             |                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                  | mm (in)   |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |
|                       | Intake                                                                                                       | Exhaust                                                                                                                                                                                                                                                                                                                                                          |           |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |
| A                     | 10.5 (0.413)                                                                                                 | 11.5 (0.453)                                                                                                                                                                                                                                                                                                                                                     |           |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |
| B                     | 6.6 (0.260)                                                                                                  | 7.6 (0.299)                                                                                                                                                                                                                                                                                                                                                      |           |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |
| Valve guide reamer    |                           | Reaming valve guide (①) or hole for oversize valve guide (②)<br><br><table><tr><td colspan="3">Diameter:</td><td>mm (in)</td></tr><tr><td></td><td>Intake</td><td>Exhaust</td><td></td></tr><tr><td>D<sub>1</sub></td><td>7 (0.28)</td><td>8 (0.31)</td><td></td></tr><tr><td>D<sub>2</sub></td><td>11.2 (0.441)</td><td>12.2 (0.480)</td><td></td></tr></table> | Diameter: |  |  | mm (in) |  | Intake | Exhaust |  | D <sub>1</sub> | 7 (0.28)     | 8 (0.31)     |  | D <sub>2</sub> | 11.2 (0.441) | 12.2 (0.480) |  |
| Diameter:             |                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                  | mm (in)   |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |
|                       | Intake                                                                                                       | Exhaust                                                                                                                                                                                                                                                                                                                                                          |           |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |
| D <sub>1</sub>        | 7 (0.28)                                                                                                     | 8 (0.31)                                                                                                                                                                                                                                                                                                                                                         |           |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |
| D <sub>2</sub>        | 11.2 (0.441)                                                                                                 | 12.2 (0.480)                                                                                                                                                                                                                                                                                                                                                     |           |  |  |         |  |        |         |  |                |              |              |  |                |              |              |  |

# OUTER COMPONENT PARTS



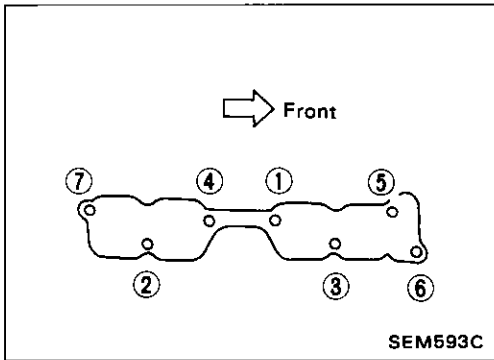
□ : N·m (kg·m, ft·lb)  
SEM549C

## OUTER COMPONENT PARTS

### Tightening Procedure of each Part

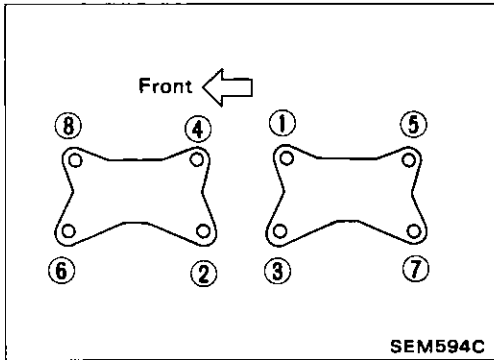
#### INTAKE MANIFOLD

☐: 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)



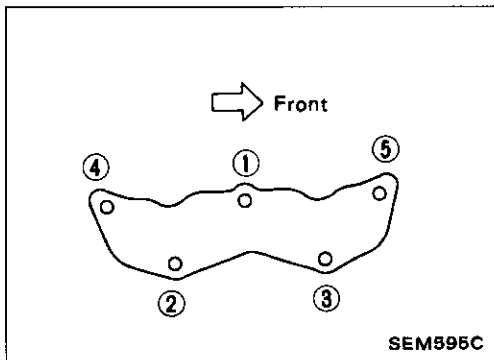
#### EXHAUST MANIFOLD

☐: 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)



#### INTAKE MANIFOLD COLLECTOR

☐: 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)



#### THROTTLE CHAMBER

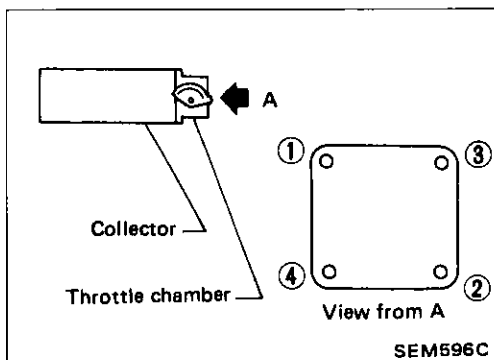
☐: Bolts should be tightened twice.

1st:

9 - 11 N·m (0.9 - 1.1 kg-m, 6.5 - 8.0 ft-lb)

2nd:

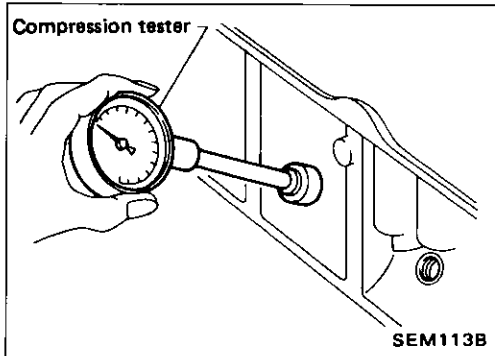
18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)



# COMPRESSION PRESSURE

## Measurement of Compression Pressure

1. Warm up engine.
2. Turn ignition switch off.
3. Disconnect fusible link for injectors.
4. Remove all spark plugs.
5. Disconnect distributor center cable.



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

**Compression pressure:**

**kPa (kg/cm<sup>2</sup>, psi)/rpm**

**Standard**

**1,206 (12.3, 175)/250**

**Minimum**

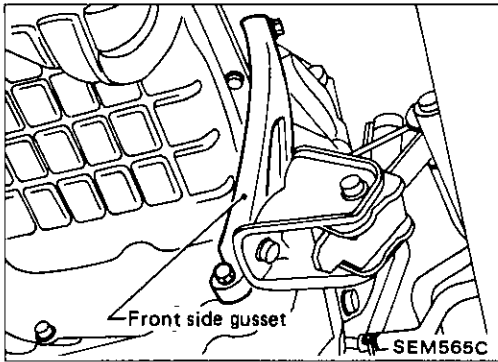
**1,010 (10.3, 146)/250**

**Difference limit between cylinders**

**98 (1.0, 14)/250**

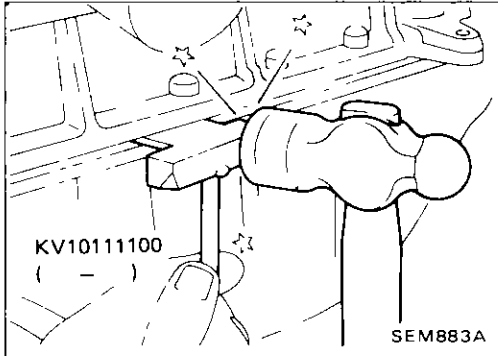
10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through spark plug holes and retest compression.
- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
  - **If pressure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

## OIL PAN

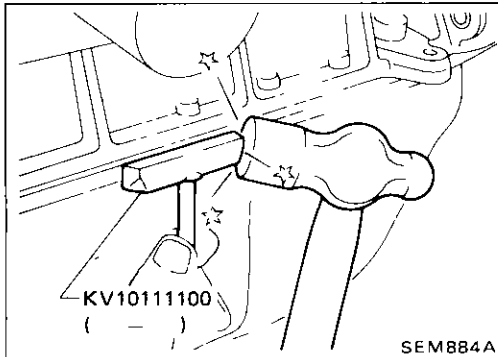


### Removal

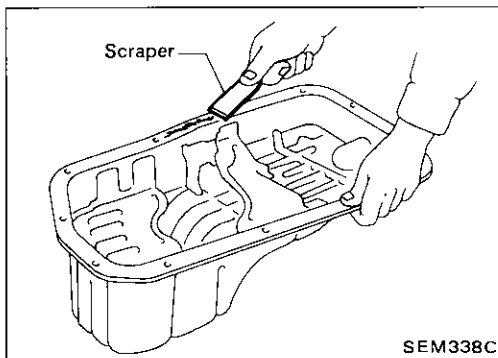
1. Remove the following parts:
  - Front exhaust tube
  - Front side gusset
  - Center member (2WD model)
2. Remove oil pan bolts.



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

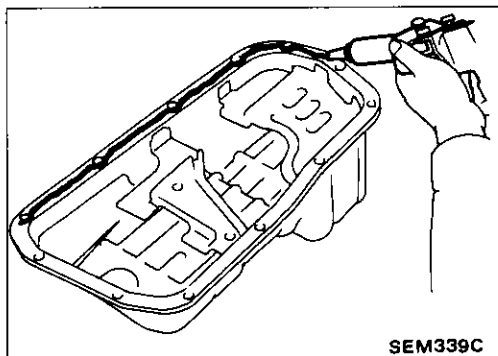


- (2) Slide Tool by tapping its side with a hammer, and remove oil pan.



### Installation

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

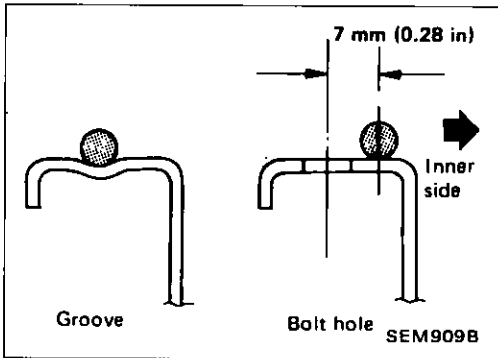
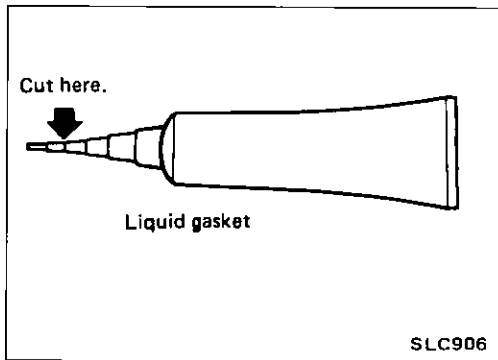


2. Apply a continuous bead of liquid gasket to mating surface of oil pan.
  - **Use Genuine Liquid Gasket or equivalent.**

## OIL PAN

### Installation (Cont'd)

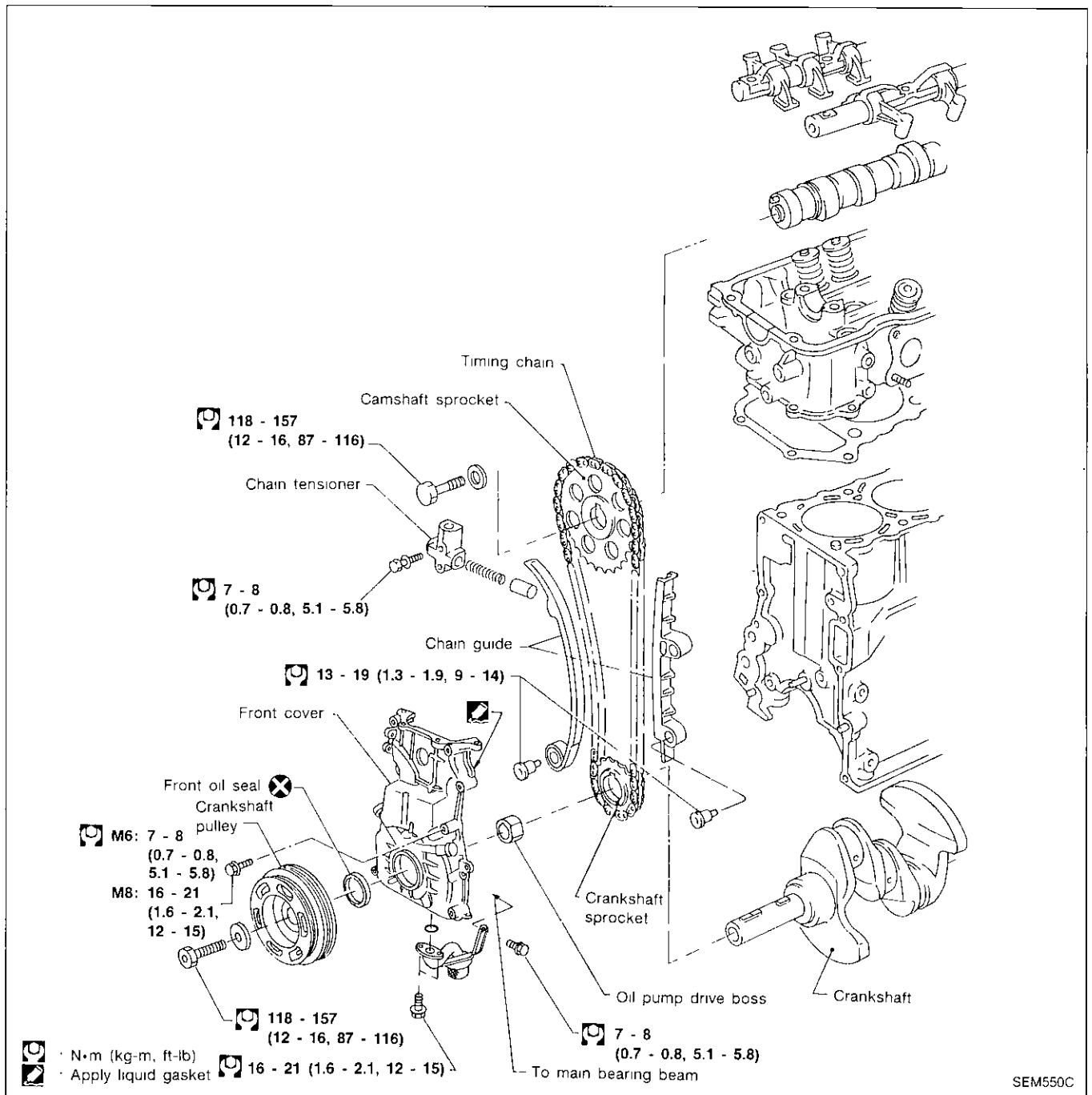
- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.



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



# TIMING CHAIN



## CAUTION:

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

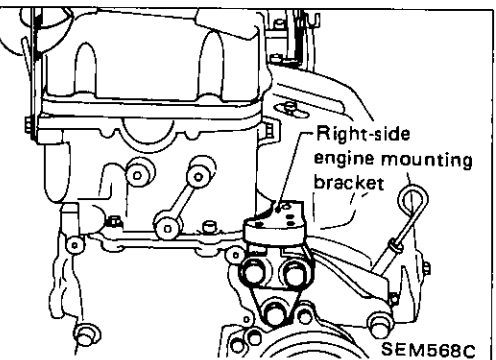
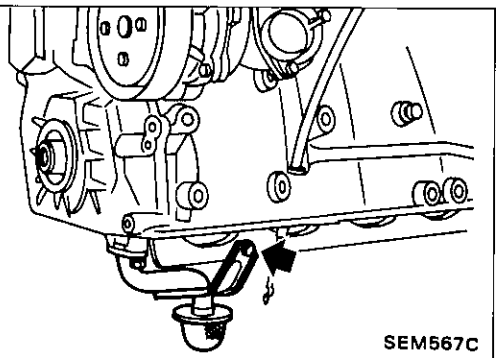
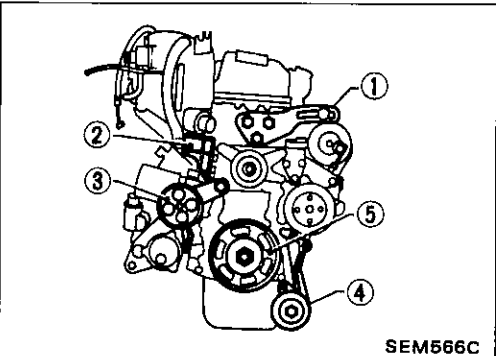
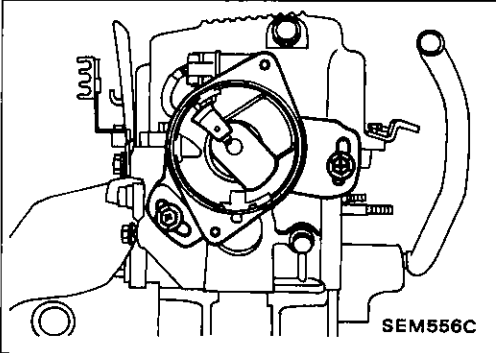
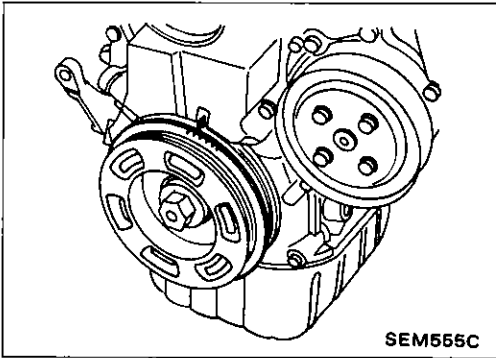
## Removal

- Place wheel chocks at both front and back of rear wheels.
- Place safety stands under designated front supporting points. Remove front right side wheel.
- Remove dust cover and under cover.
- Drain engine oil.

## TIMING CHAIN

### Removal (Cont'd)

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



6. Remove the alternator and compressor drive belts.

7. Remove the following parts.

① Alternator and adjusting bar

② Oil separator

③ Power steering pump pulley, pump stay and bracket.

④ Compressor and bracket.

⑤ Crankshaft pulley and oil pump drive boss.

8. Remove oil pan. (Refer to OIL PAN.)

9. Remove oil strainer securing bolt.

10. Remove front cover securing bolts (cover to block and head to cover).

11. Remove rocker cover.

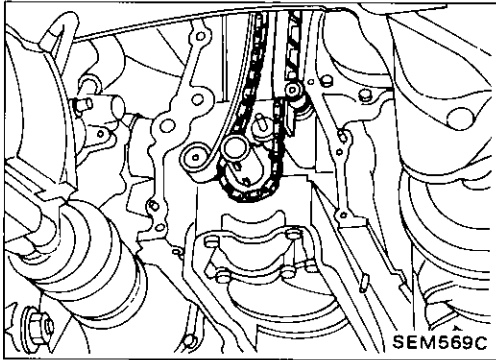
12. Support engine with hoist or chain block.

13. Remove right-side engine mounting bracket and lower the engine.

## TIMING CHAIN

### Removal (Cont'd)

14. Remove front cover.

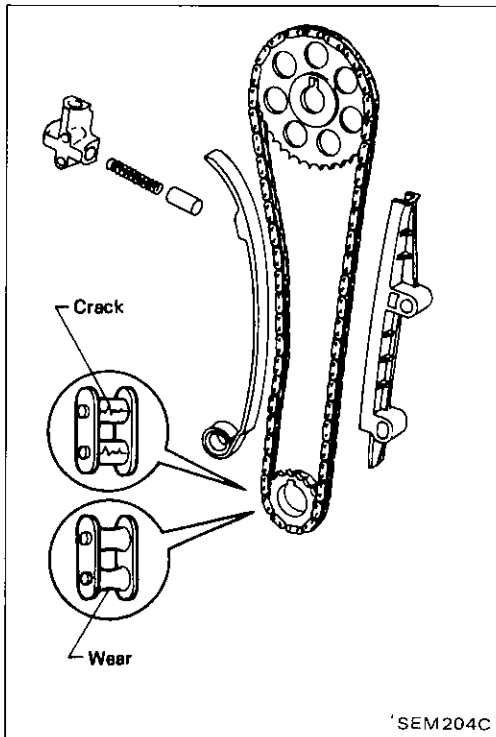


15. Remove the following parts:

- Chain tensioner
- Chain guides
- Timing chain and sprocket

### Inspection

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



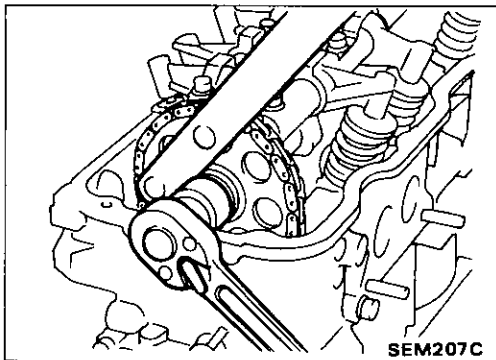
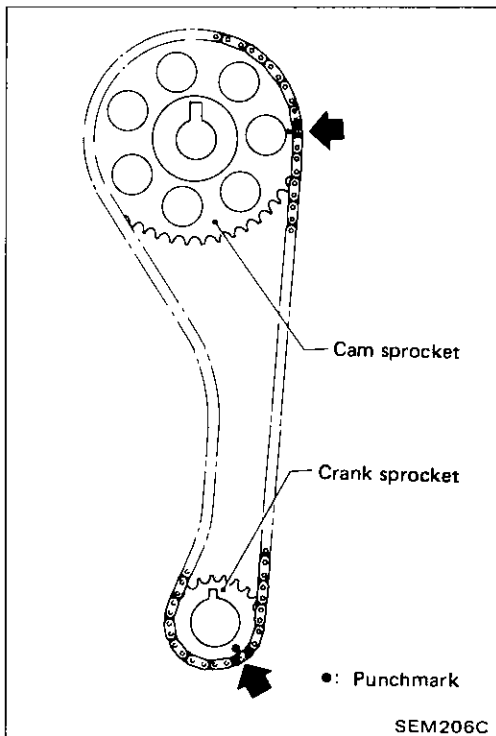
### Installation

1. Install crankshaft sprocket.
  - **Make sure that mating marks of crankshaft sprocket face engine front.**

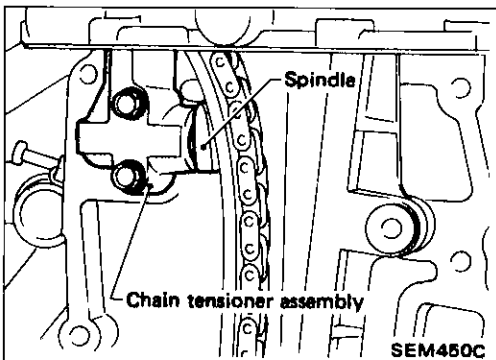
## TIMING CHAIN

### Installation (Cont'd)

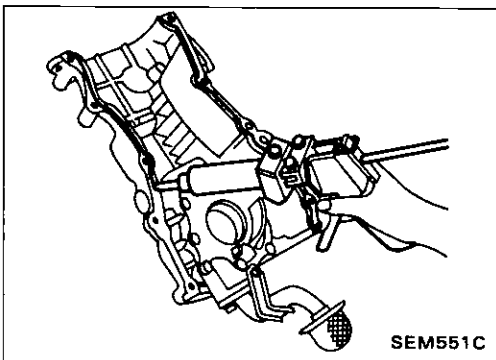
2. Install camshaft sprocket.
3. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.
4. Install timing chain.
  - **Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket.**



5. Tighten camshaft sprocket bolt.



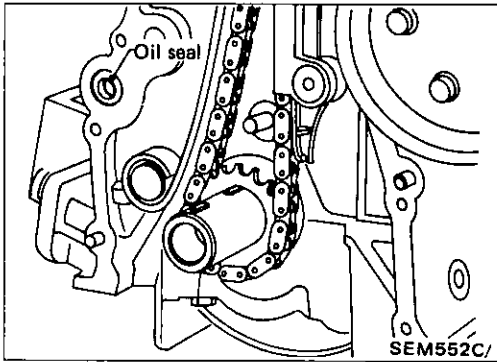
6. Install chain guide and chain tensioner.



7. Apply liquid gasket to front cover.

## TIMING CHAIN

### Installation (Cont'd)



8. Install front cover.

- Be careful not to damage cylinder head gasket.
- Do not forget oil seal.

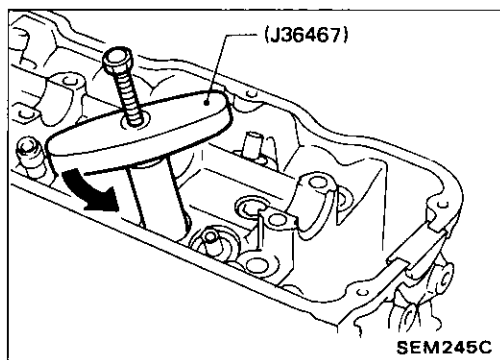
9. Install rubber plug onto cylinder head. (Refer to "Installation" of CYLINDER HEAD.)

10. Install oil pan. (Refer to OIL PAN.)

11. Install engine mounting.

12. Install any parts removed.

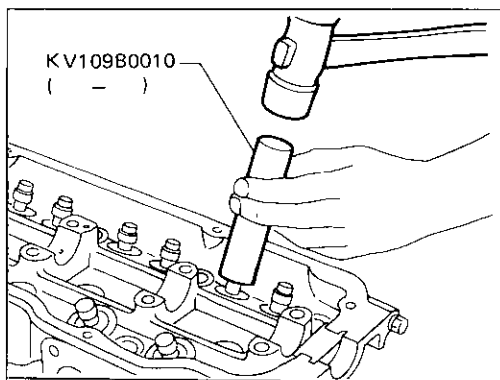
## OIL SEAL REPLACEMENT



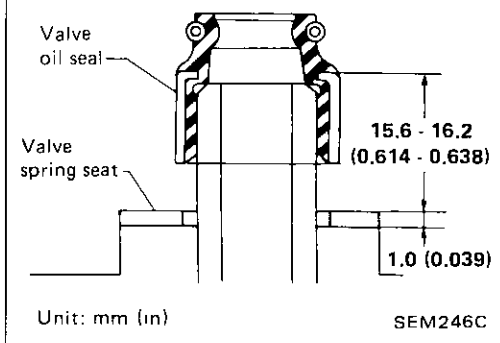
### VALVE OIL SEAL

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

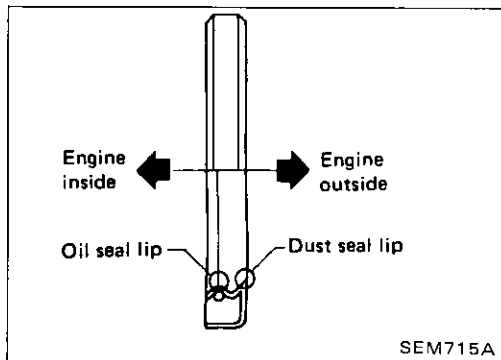
**Piston concerned should be set at T.D.C. to prevent valve from falling.**



4. Apply engine oil to new valve oil seal and install it with Tool. **Before installing valve oil seal, install valve spring seat.**



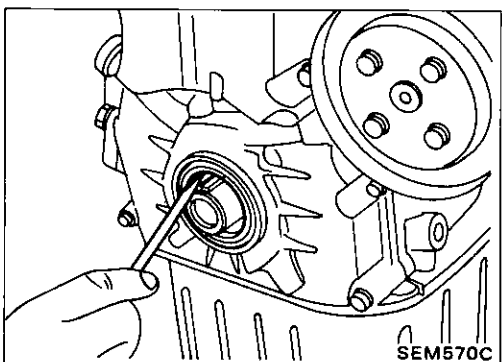
### OIL SEAL INSTALLING DIRECTION



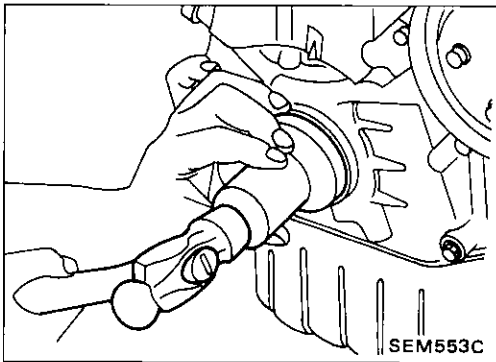
### FRONT OIL SEAL

1. Remove crankshaft pulley.
2. Remove front oil seal.

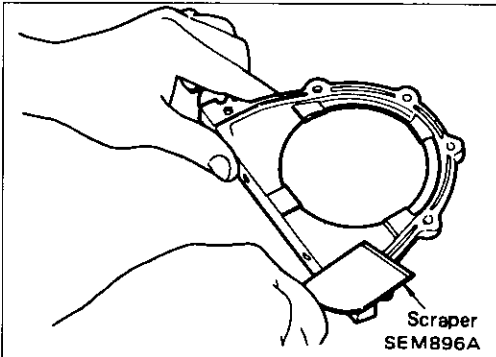
**Be careful not to damage crankshaft.**



## OIL SEAL REPLACEMENT

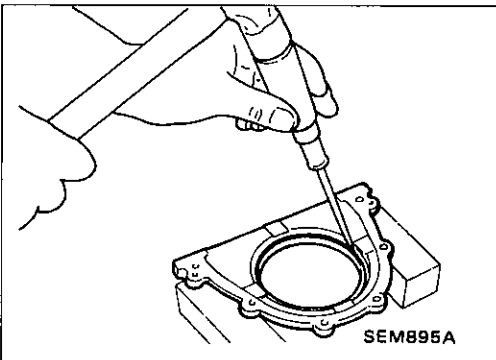


3. Apply engine oil to new oil seal and install it using a suitable tool.

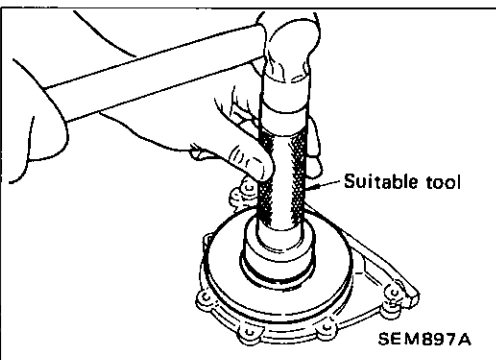


### REAR OIL SEAL

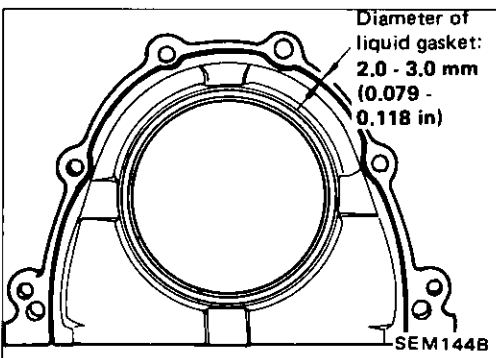
1. Remove transaxle.
2. Remove flywheel or drive plate.
3. Remove rear oil seal retainer.
4. Remove traces of liquid gasket using scraper.



5. Remove rear oil seal from retainer.

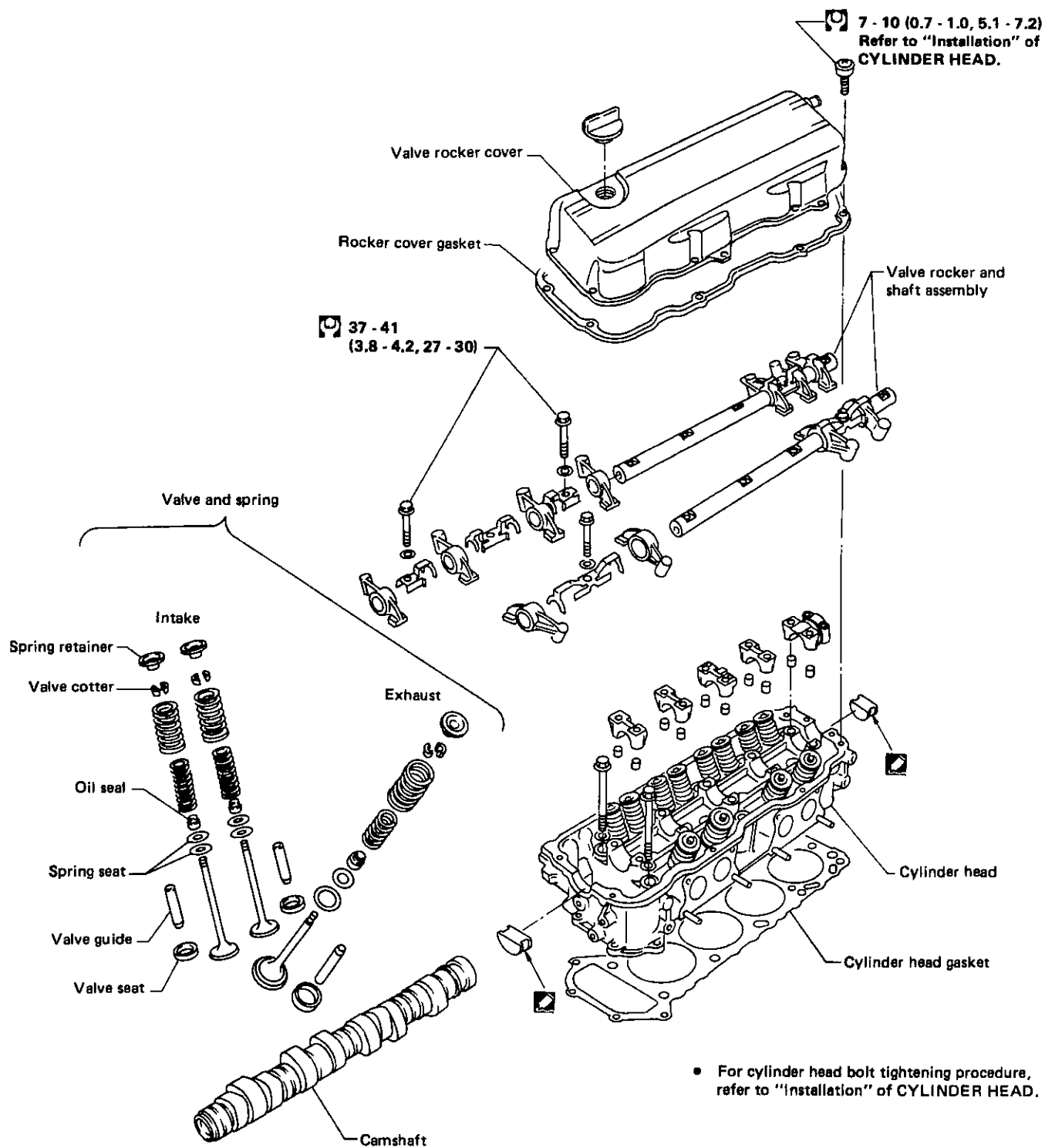


6. Apply engine oil to new oil seal and install it using a suitable tool.



7. Apply liquid gasket to rear oil seal retainer.

# CYLINDER HEAD



 : N·m (kg·m, ft·lb)

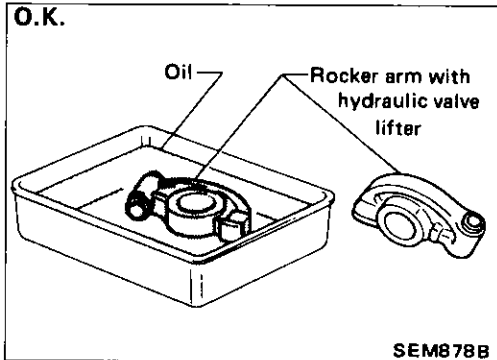
SEM554C



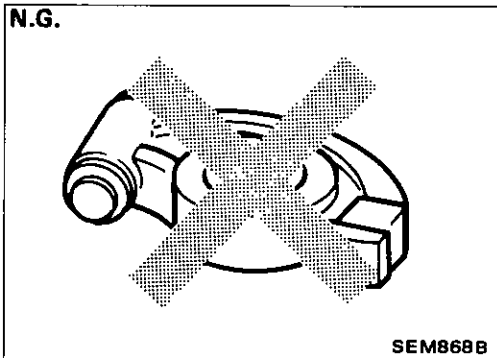
## CYLINDER HEAD

### CAUTION:

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



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



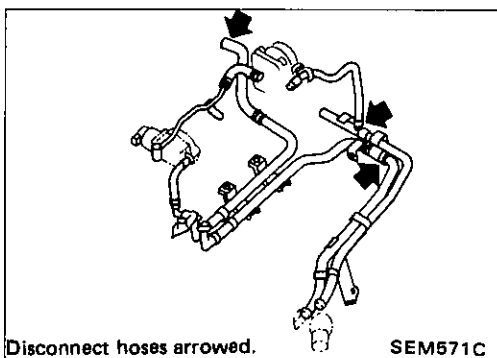
- Do not disassemble hydraulic valve lifter.
- Attach tags to valve lifters so as not to mix them up.

### Removal

1. Drain coolant from radiator.
2. Relieve fuel pressure to zero.

Refer to EF & EC section "FUEL INJECTION CONTROL SYSTEM INSPECTION".

3. Remove the following parts:
  - Exhaust manifold
  - Air duct
  - Intake manifold collector
  - Intake manifold stay
4. Disconnect hoses.
  - Vacuum gallery hoses, which are installed on intake manifold.
  - Fuel tube hoses
5. Disconnect water hoses as shown in figure.



## CYLINDER HEAD

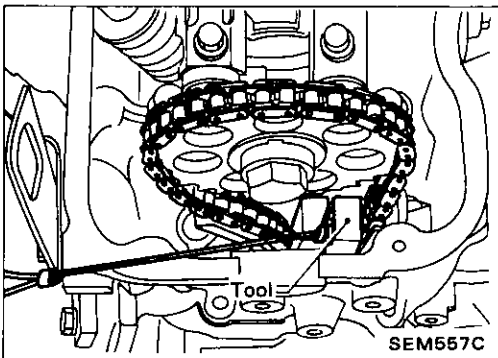
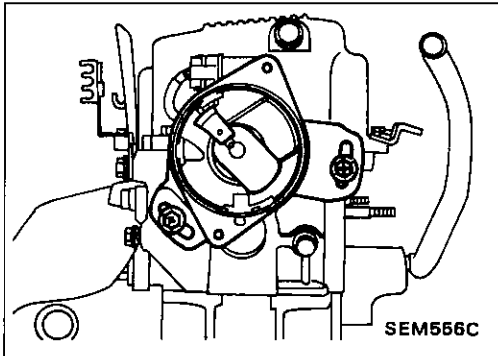
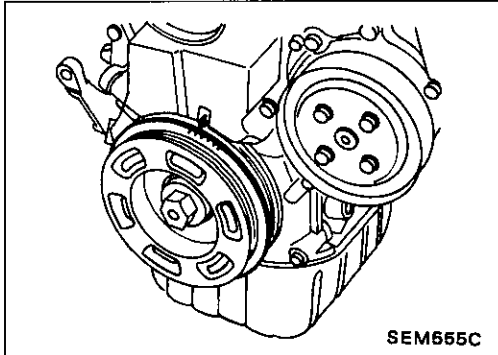
### Removal (Cont'd)

6. Remove intake manifold.

7. Remove rocker cover.

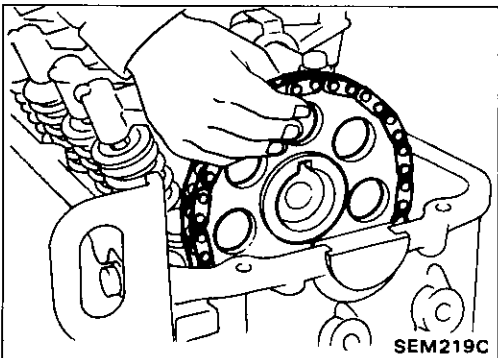
**When removing rocker cover, do not knock rocker cover against rocker arms.**

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



9. Loosen camshaft sprocket bolt.

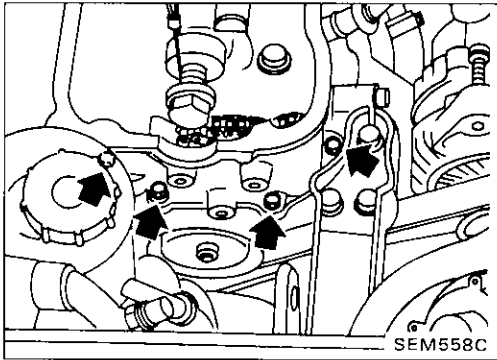
- Support timing chain by using Tool as shown in figure.



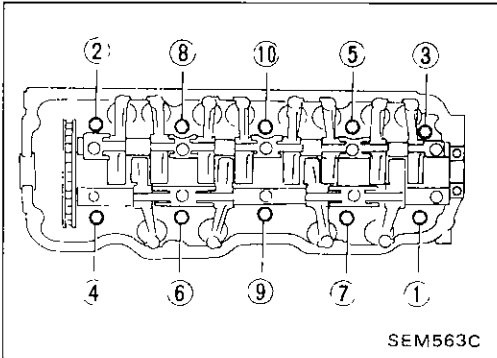
10. Remove camshaft sprocket.

## CYLINDER HEAD

### Removal (Cont'd)



11. Remove front cover tightening bolts to cylinder head.



12. Remove cylinder head.

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

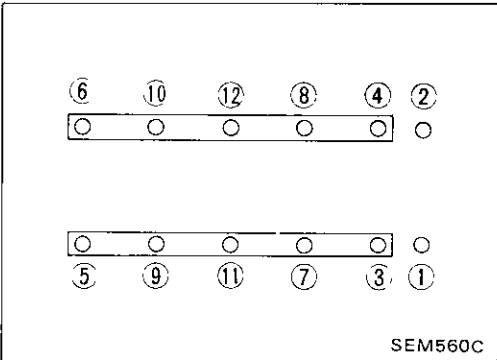
### Disassembly

1. Remove rocker shaft assembly.

- a. **When loosening bolts, evenly loosen from outside in sequence.**
- b. **Bolts should be loosened in two or three steps.**

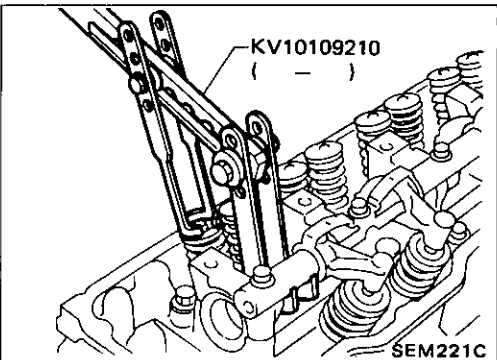
2. Remove camshaft.

- **Before removing camshaft, measure camshaft end play. (Refer to "Inspection".)**

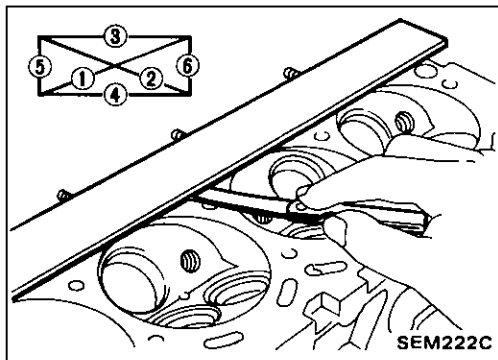


3. Remove valve components with Tool.

4. Remove valve oil seals. (Refer to OIL SEAL REPLACEMENT.)



## CYLINDER HEAD



### 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:

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

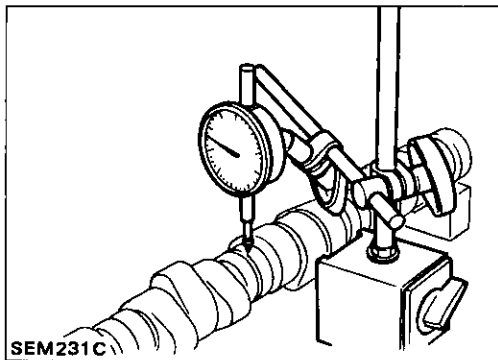
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

**Nominal cylinder head height:**

**98.8 - 99.0 mm (3.890 - 3.898 in)**

#### CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.



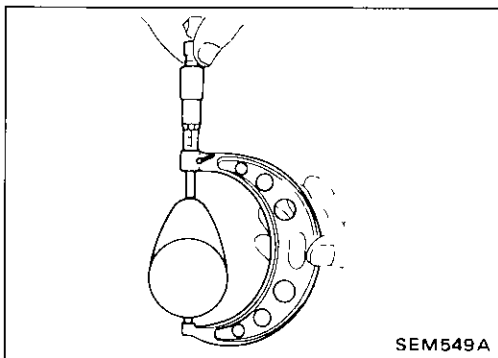
#### CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.

**Runout (Total indicator reading):**

**0 - 0.02 mm (0 - 0.0008 in)**

2. If it exceeds the limit, replace camshaft.



#### CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.

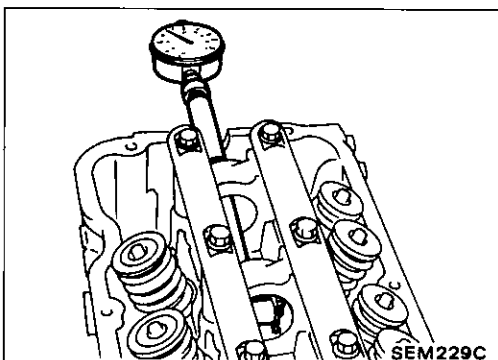
**Standard cam height:**

**44.839 - 45.029 mm (1.7653 - 1.7728 in)**

**Cam wear limit:**

**0.2 mm (0.008 in)**

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



#### CAMSHAFT JOURNAL CLEARANCE

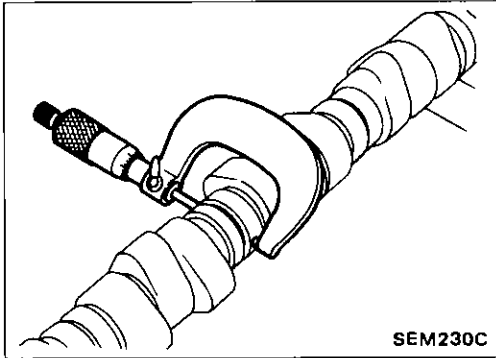
1. Install camshaft bracket and rocker shaft and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.

**Standard inner diameter:**

**33.000 - 33.025 mm (1.2992 - 1.3002 in)**

## CYLINDER HEAD

### Inspection (Cont'd)



3. Measure outer diameter of camshaft journal.

**Standard outer diameter:**

**32.935 - 32.955 mm (1.2967 - 1.2974 in)**

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

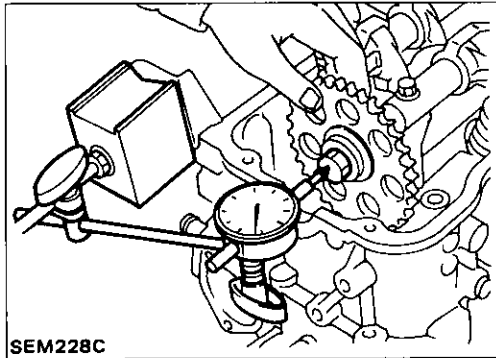
**Camshaft journal clearance:**

**Standard**

**0.045 - 0.090 mm (0.0018 - 0.0035 in)**

**Limit**

**0.12 mm (0.0047 in)**



### CAMSHAFT END PLAY

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

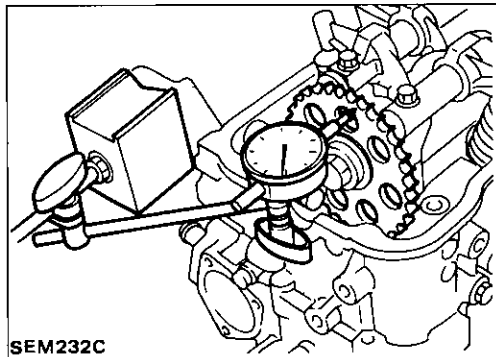
**Camshaft end play:**

**Standard**

**0.07 - 0.15 mm (0.0028 - 0.0059 in)**

**Limit**

**0.2 mm (0.008 in)**



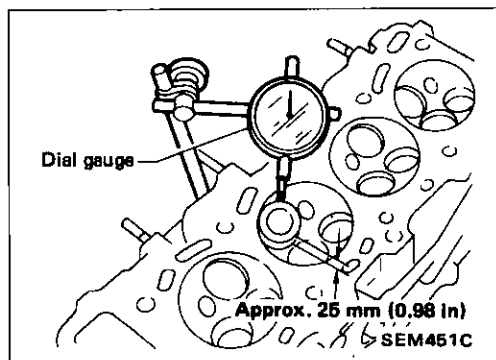
### CAMSHAFT SPROCKET RUNOUT

1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.

**Runout (Total indicator reading):**

**Limit 0.12 mm (0.0047 in)**

3. If it exceeds the limit, replace camshaft sprocket.



### VALVE GUIDE CLEARANCE

1. Measure valve deflection in a right-angled direction with camshaft. (Valve and valve guide mostly wear in this direction.)

**Valve deflection limit (Dial gauge reading):**

**0.15 mm (0.0059 in)**

## CYLINDER HEAD

### 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:

##### Standard

0.020 - 0.053 mm

(0.0008 - 0.0021 in) (Intake)

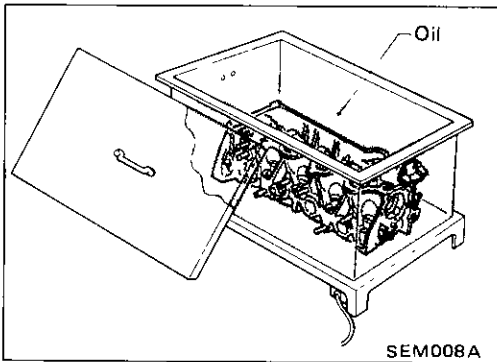
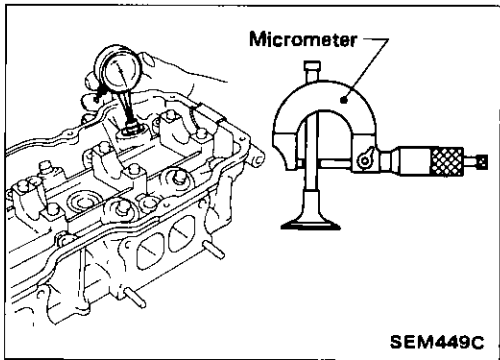
0.040 - 0.070 mm

(0.0016 - 0.0028 in) (Exhaust)

##### Limit

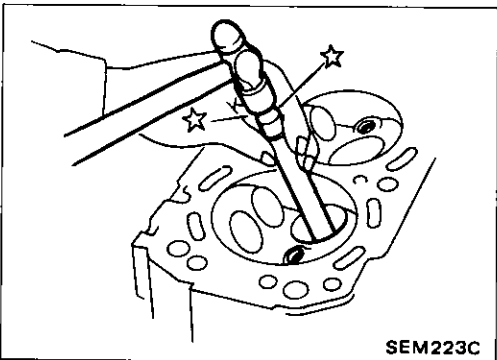
0.1 mm (0.004 in)

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

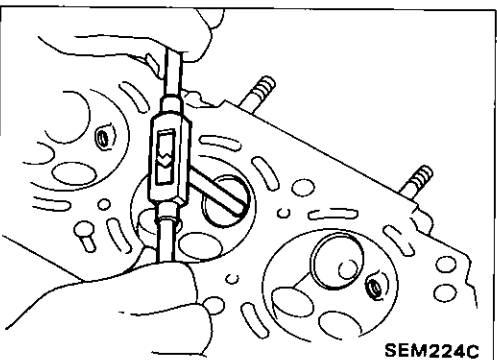


### VALVE GUIDE REPLACEMENT

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



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



3. Ream cylinder head valve guide hole.

#### Valve guide hole diameter

##### (for service parts):

##### Intake

11.175 - 11.196 mm (0.4400 - 0.4408 in)

##### Exhaust

12.175 - 12.196 mm (0.4793 - 0.4802 in)

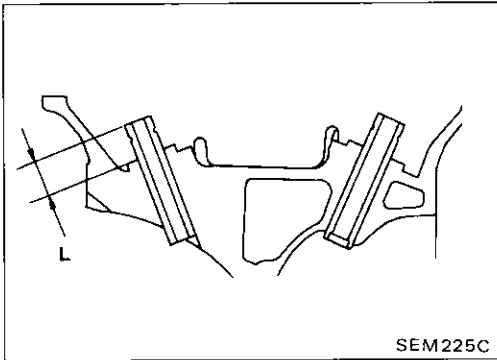
## CYLINDER HEAD

### Inspection (Cont'd)

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

**Projection "L":**

**14.9 - 15.1 mm (0.587 - 0.594 in)**



- Ream valve guide.

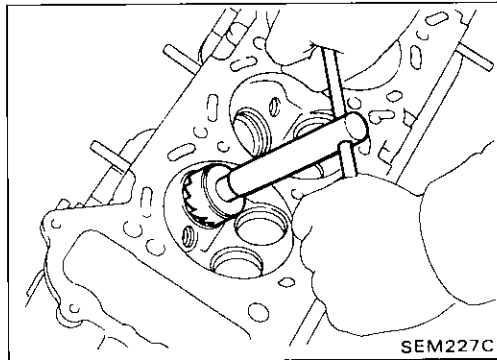
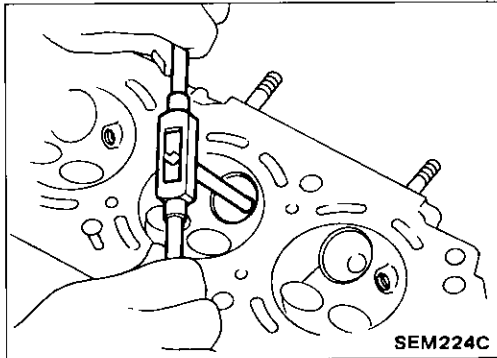
**Finished size:**

**Intake**

**7.000 - 7.018 mm (0.2756 - 0.2763 in)**

**Exhaust**

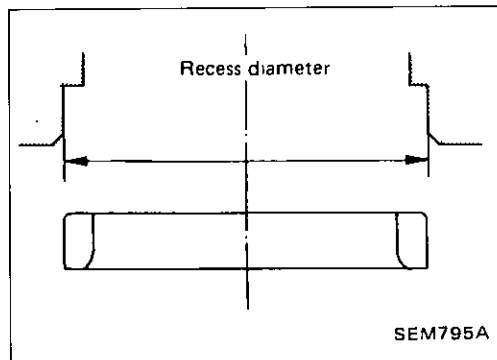
**8.000 - 8.018 mm (0.3150 - 0.3157 in)**



### VALVE SEATS

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

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



### REPLACING VALVE SEAT FOR SERVICE PARTS

- 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.
- 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**

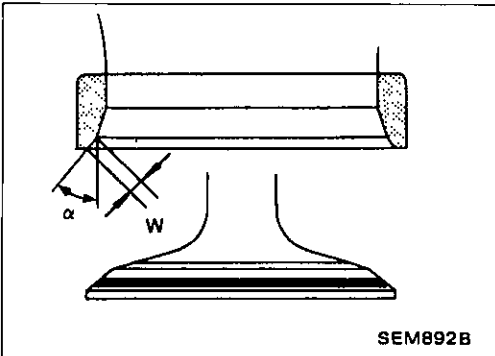
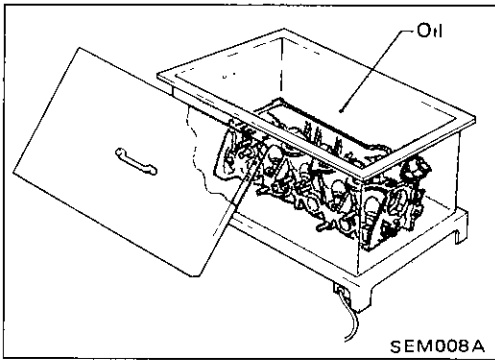
**42.500 - 42.516 mm (1.6732 - 1.6739 in)**

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

## CYLINDER HEAD

### Inspection (Cont'd)

- Heat cylinder head to 150 to 160°C (302 to 320°F).



- Cut or grind valve seat using a suitable tool to the specified dimensions as shown in S.D.S.
- After cutting, lap valve seat with abrasive compound.
- Check valve seating condition.

**Seat face angle " $\alpha$ ":**

**45 deg.**

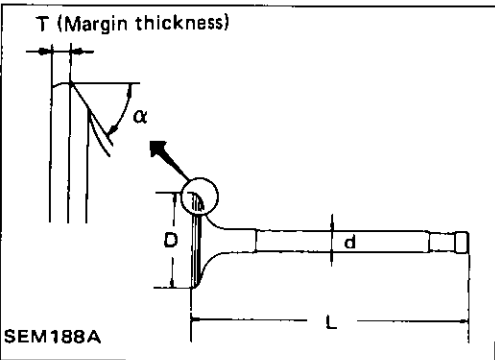
**Contacting width "W"**

**Intake**

**1.6 - 1.7 mm (0.063 - 0.067 in)**

**Exhaust**

**1.7 - 2.1 mm (0.067 - 0.083 in)**



### VALVE DIMENSIONS

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

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



## CYLINDER HEAD

### Inspection (Cont'd)

#### VALVE SPRING

##### Squareness

1. Measure "S" dimension.

##### Out-of-square:

##### Outer

##### Intake

Less than 2.5 mm (0.098 in)

##### Exhaust

Less than 2.3 mm (0.091 in)

##### Inner

##### Intake

Less than 2.3 mm (0.091 in)

##### Exhaust

Less than 2.1 mm (0.083 in)

2. If it exceeds the limit, replace spring.

##### Pressure

Check valve spring pressure.

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

##### Standard

##### Outer

##### Intake

604.1 (61.6, 135.8) at 37.6 (1.480)

##### Exhaust

640.4 (65.3, 144.0) at 34.1 (1.343)

##### Inner

##### Intake

284.4 (29.0, 63.9) at 32.6 (1.283)

##### Exhaust

328.5 (33.5, 73.9) at 29.1 (1.146)

##### Limit

##### Outer

##### Intake

567.8 (57.9, 127.7) at 37.6 (1.480)

##### Exhaust

620.8 (63.3, 139.6) at 34.1 (1.343)

##### Inner

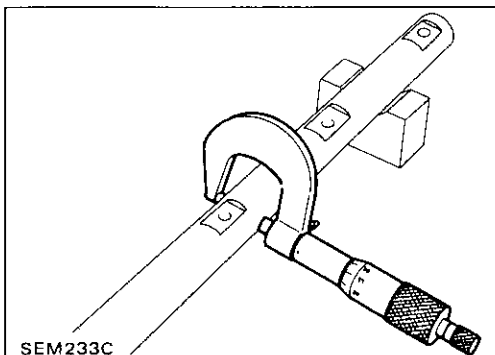
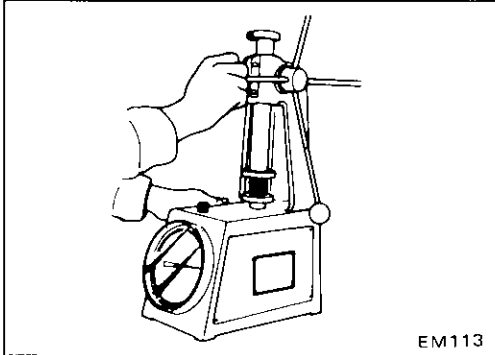
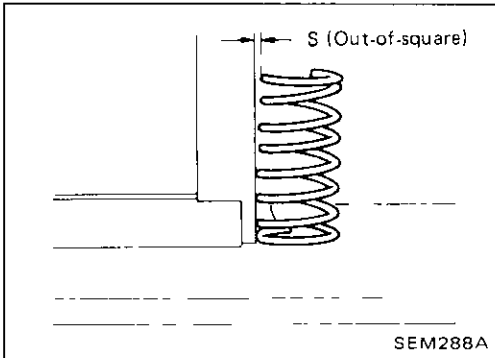
##### Intake

266.8 (27.2, 60.0) at 32.6 (1.283)

##### Exhaust

318.7 (32.5, 71.7) at 29.1 (1.146)

If it exceeds the limit, replace spring.



#### ROCKER SHAFT AND ROCKER ARM

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

##### Diameter:

21.979 - 22.000 mm (0.8653 - 0.8661 in)

## CYLINDER HEAD

### Inspection (Cont'd)

3. Check inner diameter of rocker arm.

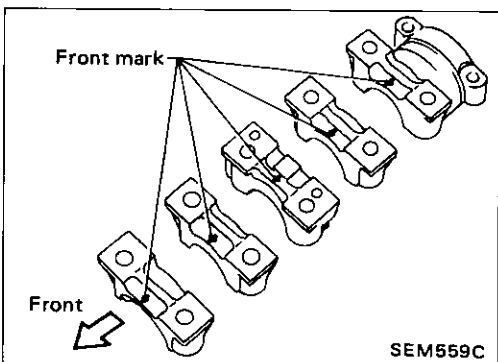
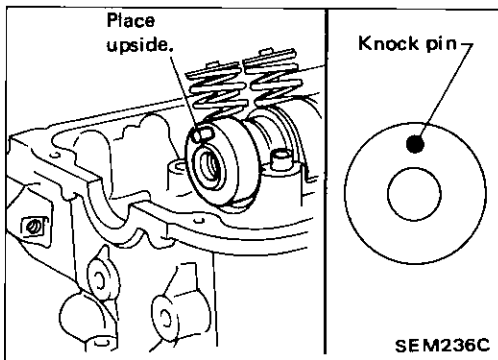
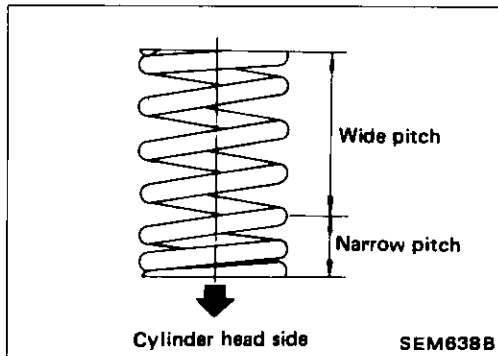
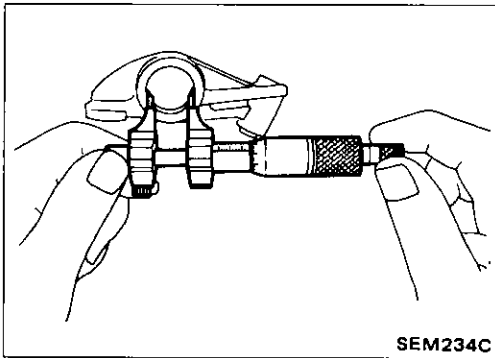
**Diameter:**

22.012 - 22.029 mm (0.8666 - 0.8673 in)

**Rocker arm to shaft clearance:**

0.012 - 0.050 mm (0.0005 - 0.0020 in)

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



### Assembly

1. Install valve component parts.

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

2. Mount camshaft onto cylinder head, placing knock pin at front end to top position.

**Apply engine oil to camshaft when mounting onto cylinder head.**

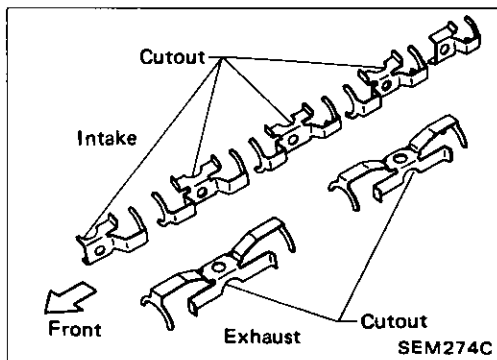
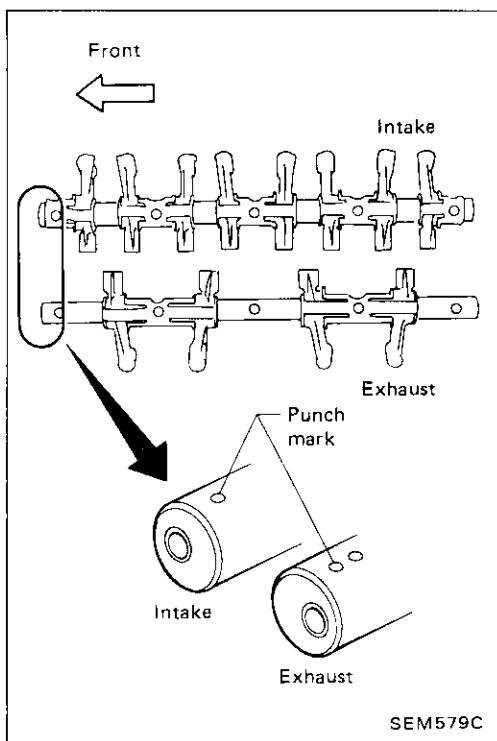
3. Install camshaft brackets.

**Front mark is punched on the camshaft bracket.**

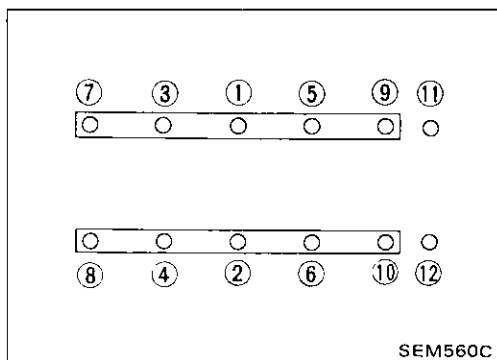
## CYLINDER HEAD

### Assembly (Cont'd)

4. Install rocker shaft with rocker arms.

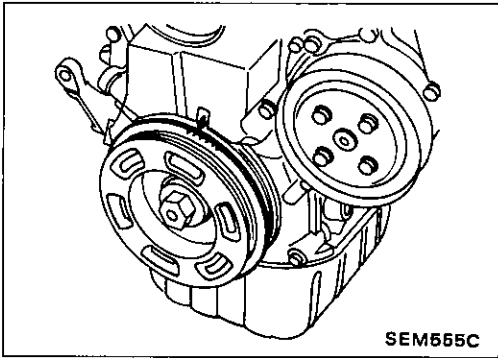


- Install retainer with cutout facing direction shown in figure at left.



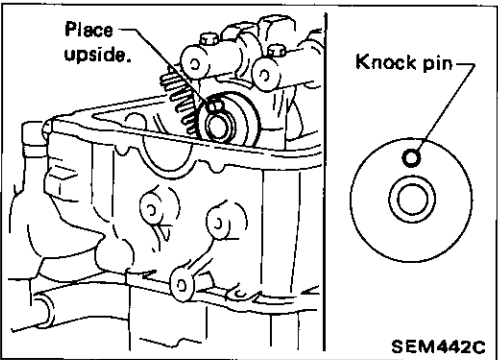
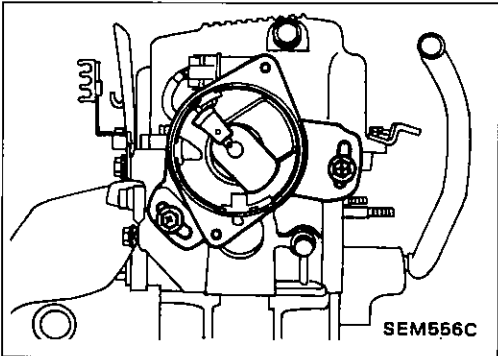
5. Tighten bolts as shown in figure at left.

## CYLINDER HEAD

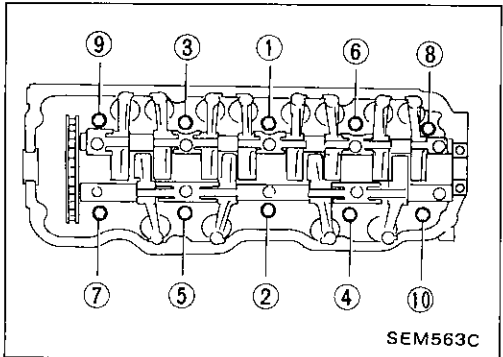


### Installation

1. Set No. 1 piston at T.D.C. on its compression stroke as follows:
  - (1) Align mark on crankshaft pulley with "0°" position and confirm that distributor rotor head is set as shown in figure.



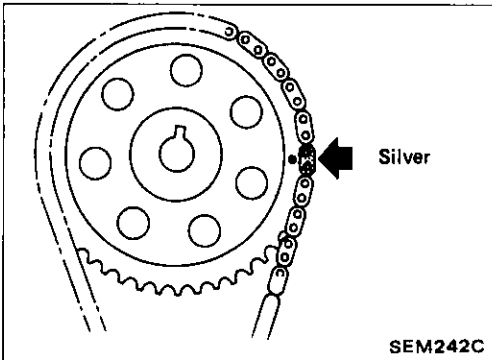
- (2) Confirm that knock pin on camshaft is set at the top.



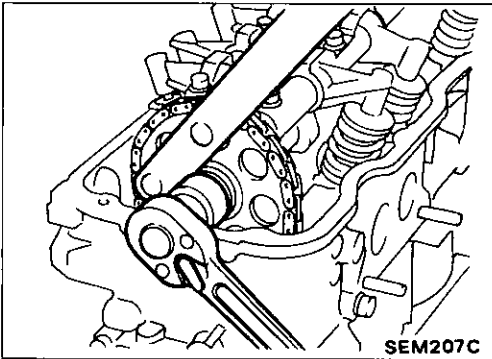
2. Install cylinder head with new gasket and tighten cylinder head bolts in numerical order.
  - **Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.**
  - **Tightening procedure**
    - (1) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
    - (2) Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).
    - (3) Loosen all bolts completely.
    - (4) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
    - (5) Turn all bolts 80 to 85 degrees clockwise with an angle wrench, or if an angle wrench is not available, tighten all bolts to 74 to 83 N·m (7.5 to 8.5 kg-m, 54 to 61 ft-lb).

## CYLINDER HEAD

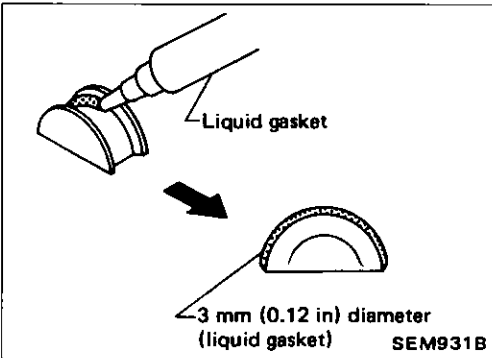
### Installation (Cont'd)



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



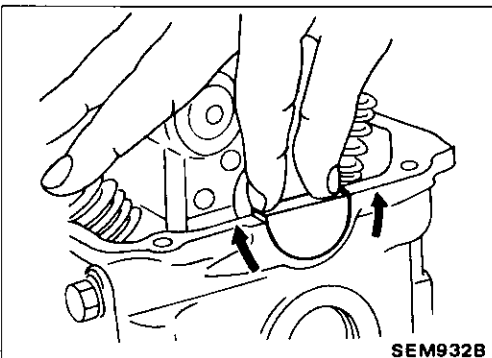
4. Tighten camshaft sprocket bolt.



5. Install rubber plugs as follows:

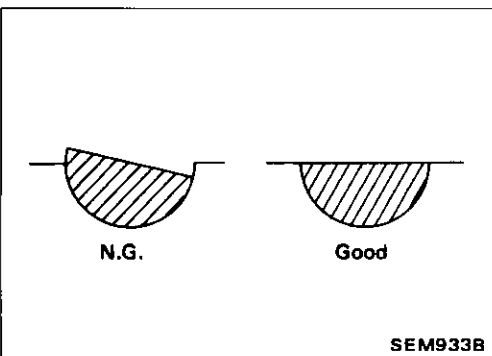
- (1) Apply liquid gasket to rubber plugs.

- Rubber plugs should be replaced with new ones.
- Rubber plugs should be installed within 5 minutes of applying liquid gasket.



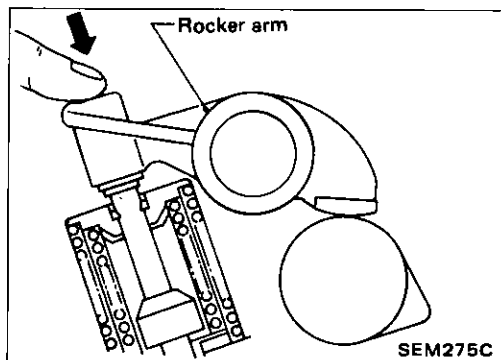
- (2) Install rubber plugs, then move them with your fingers to uniformly spread the gasket on cylinder head surface.

- Rubber plugs should be installed flush with the surface.
- Do not start the engine for 30 minutes after installing rocker cover.
- Wipe clean excessive liquid gasket from cylinder head top surface.



## CYLINDER HEAD

### Installation (Cont'd)



6. Check hydraulic valve lifter.

(1) Push hydraulic valve lifter forcefully with your finger.

● **Be sure to check it with rocker arm in its free position.**

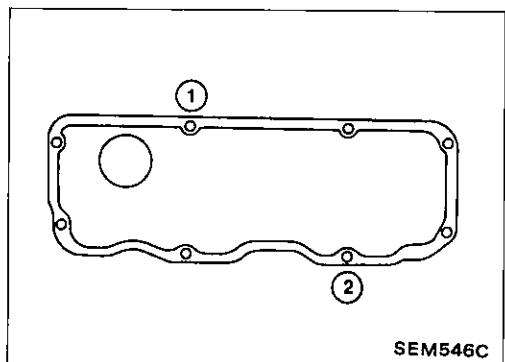
(2) If valve lifter moves more than 1 mm (0.04 in), air may be inside of it.

(3) Bleed air off by running engine at 1,000 rpm under no-load for about 20 minutes.

(4) If hydraulic valve lifters are still noisy, replace them and bleed air off again in the same manner as in step (3).

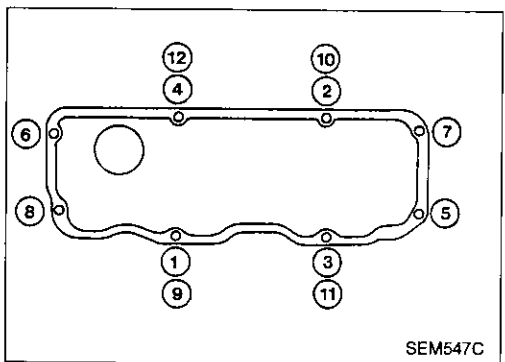
7. Install rocker cover.

● **Be sure to avoid interference between rocker cover and rocker arm.**



8. Tighten bolts as follows:

(1) Tighten 2 bolts to 3 N·m (0.3 kg-m, 2.2 ft-lb) temporarily in order shown in figure.

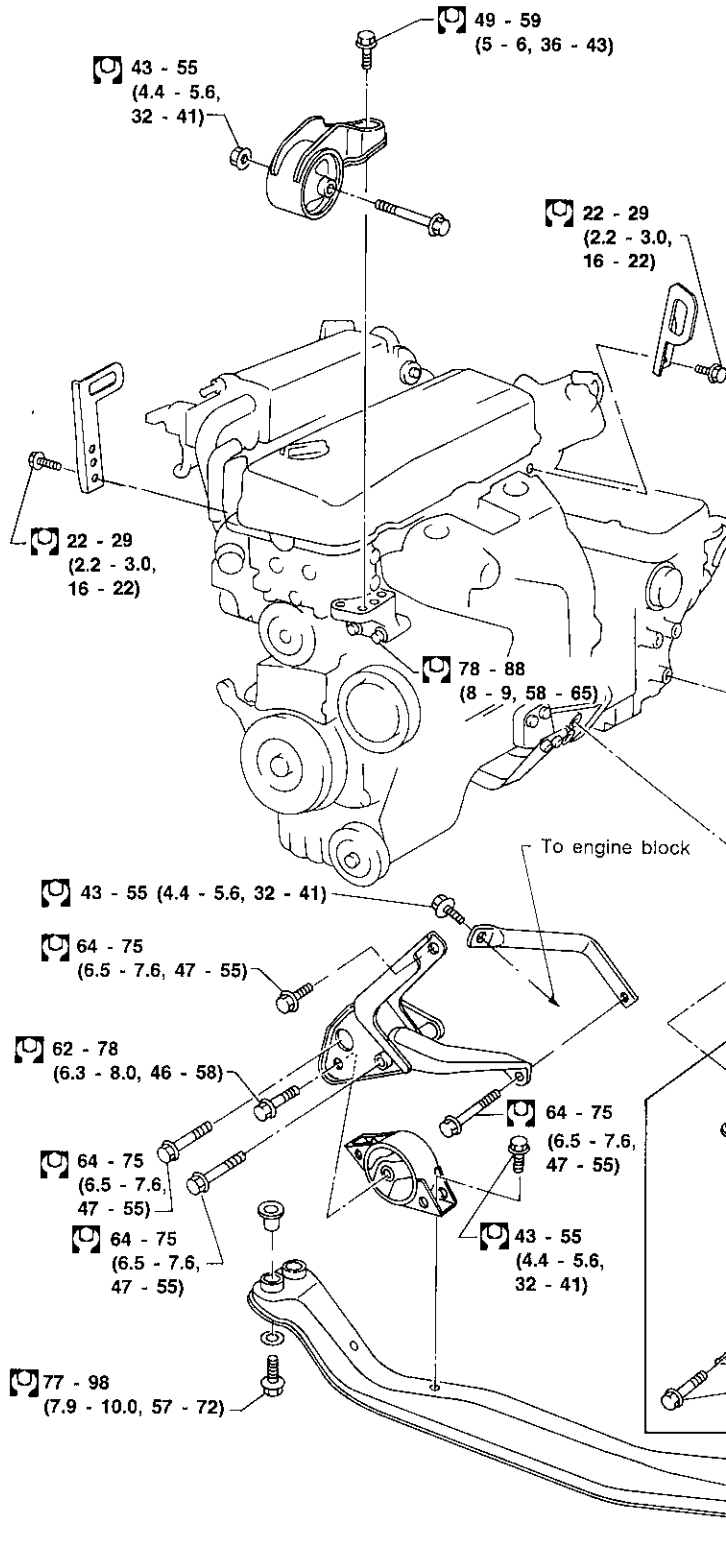


(2) Then tighten all bolts to 7 to 10 N·m (0.7 to 1.0 kg-m, 5.1 to 7.2 ft-lb) in order shown in figure.

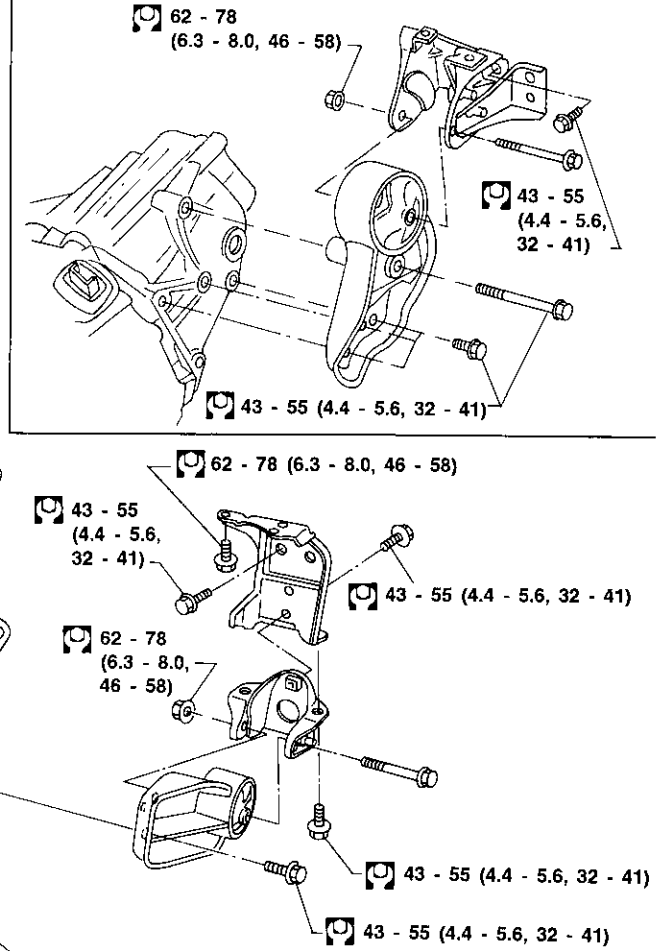
9. Install any parts removed.

# ENGINE REMOVAL

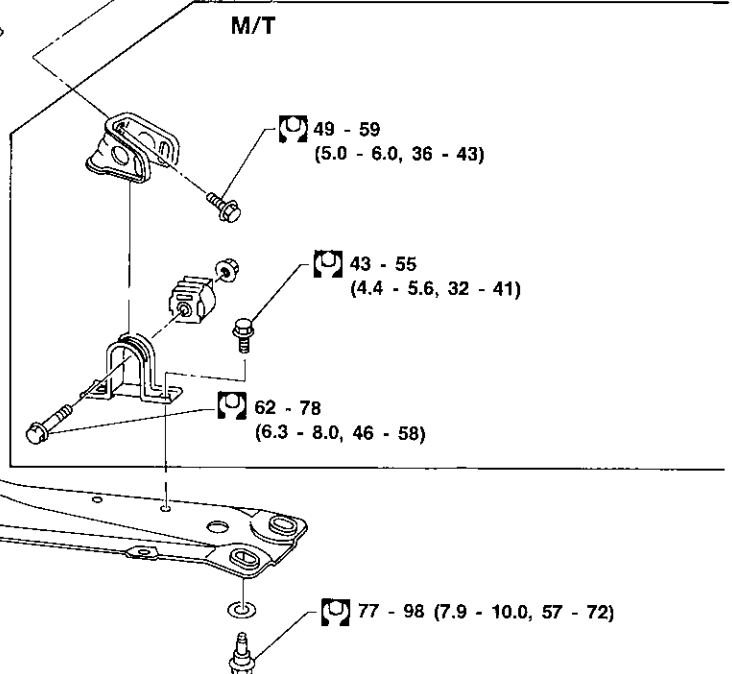
A/T



M/T



M/T



. N·m (kg·m, ft·lb)

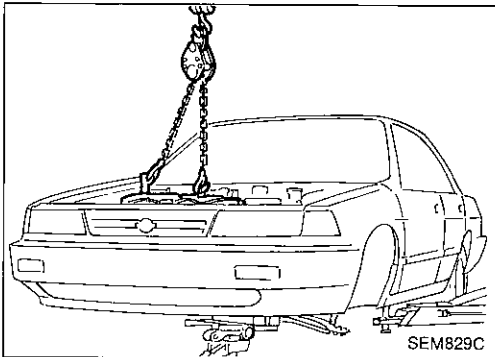
## ENGINE REMOVAL

### WARNING:

- a. Situate vehicle on a flat and solid surface.
- b. 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.
- c. For safety during subsequent steps, the tension of wires should be slackened against the engine.
- d. Before disconnecting fuel hose, release fuel pressure from fuel line.  
Refer to "Releasing Fuel Pressure" in section EF & EC.
- e. Before removing front axle from transaxle, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.
- f. Be sure to hoist engine and transaxle in a safe manner.
- g. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

### CAUTION:

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

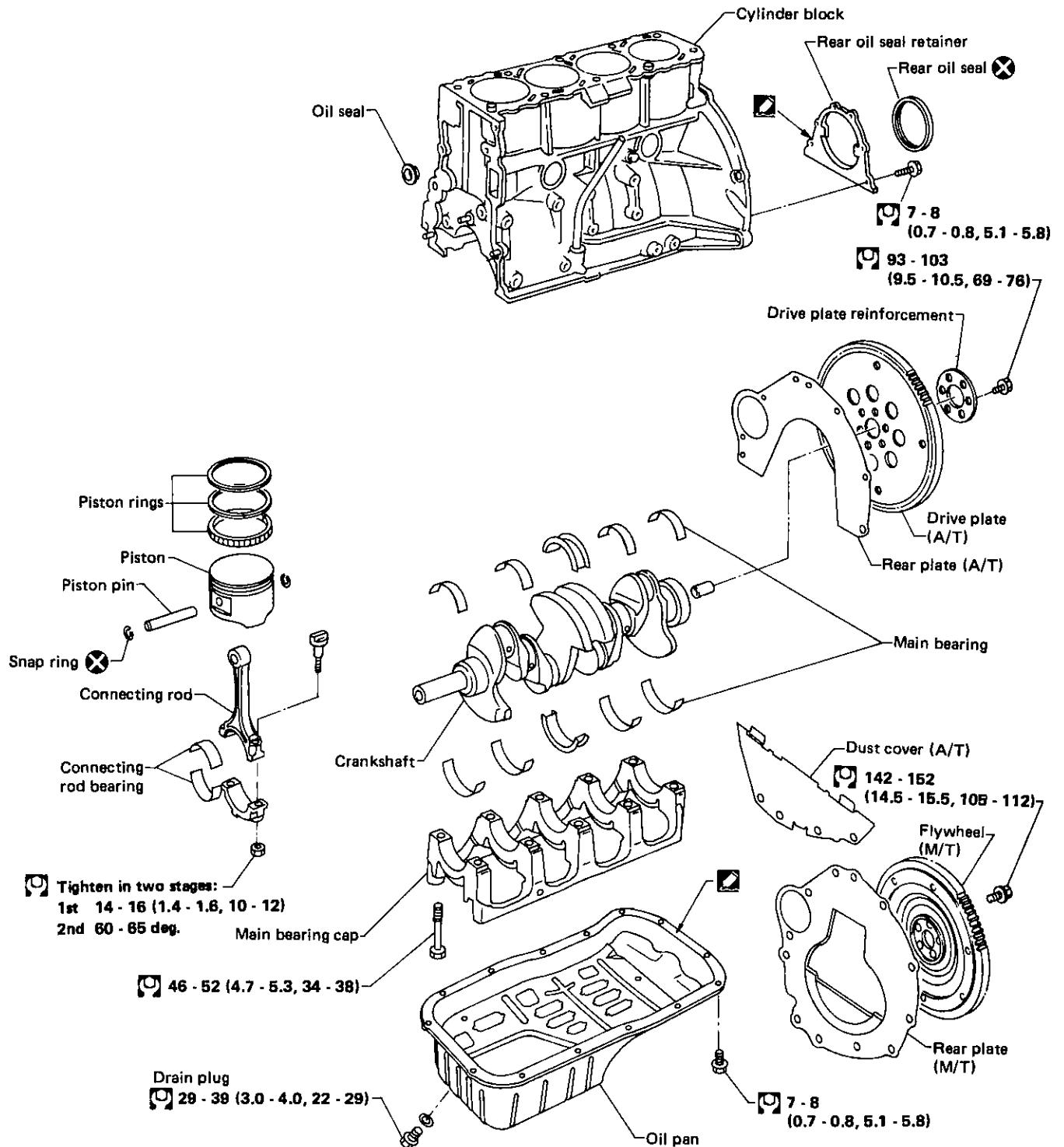


### Removal

1. Drain coolant.
2. Disconnect adjacent wires, harness, pipes and hoses.
3. Remove the following parts:
  - Drive belts
  - Power steering pump
  - A/C compressor
  - Alternator and adjusting bar
  - Drive shafts
  - Front exhaust tube
4. Lift up engine slightly with engine slingers and disconnect or remove all engine mountings.
5. Support engine and transaxle assembly by placing suitable jacks under oil pan and transaxle.
6. Lower engine and transaxle assembly.
7. Remove engine from transaxle.



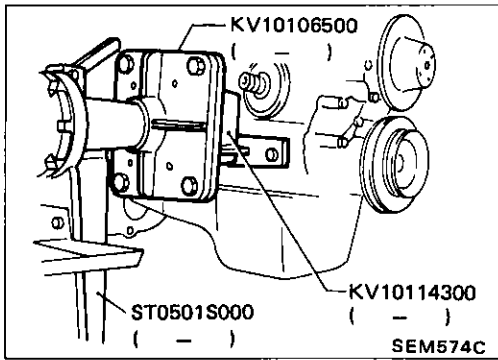
# CYLINDER BLOCK



□ : N·m (kg·m, ft·lb)  
■ : Apply liquid gasket.

SEM564C

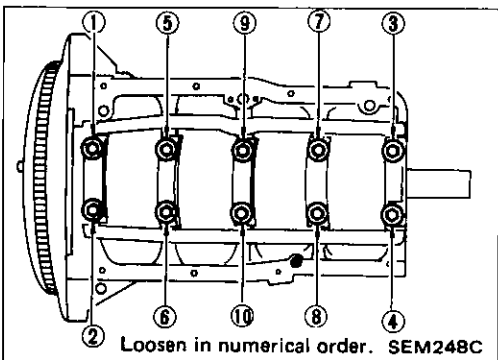
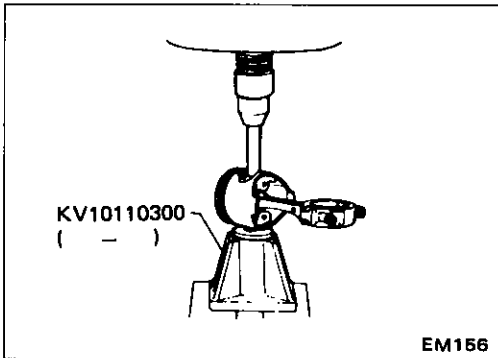
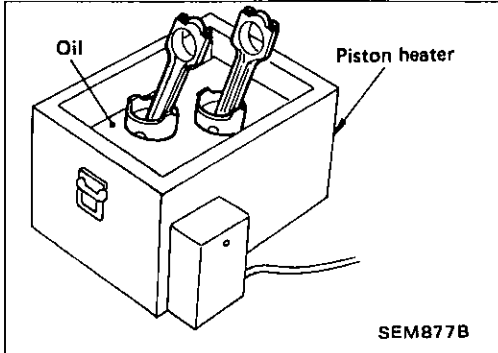
## CYLINDER BLOCK



### Disassembly

#### PISTON AND CRANKSHAFT

1. Place engine on a work stand.
2. Drain oil.
3. Remove oil pan.
4. Remove water pump.
5. Remove cylinder head.
6. Remove timing chain.
7. Remove pistons.
  - When disassembling piston and connecting rod, remove snap rings, then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.

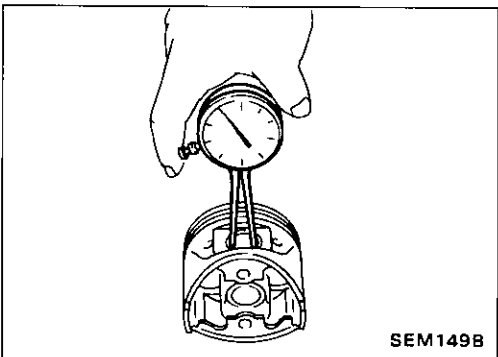


8. Remove main bearing beam and crankshaft.
  - Before removing main bearing beam, measure crankshaft end play.
  - Bolts should be loosened in two or three steps.

### Inspection

#### PISTON AND PISTON PIN CLEARANCE

1. Measure inner diameter of piston pin hole "dp".  
**Standard diameter "dp":**  
20.987 - 20.999 mm (0.8263 - 0.8267 in)



## CYLINDER BLOCK

### Inspection (Cont'd)

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

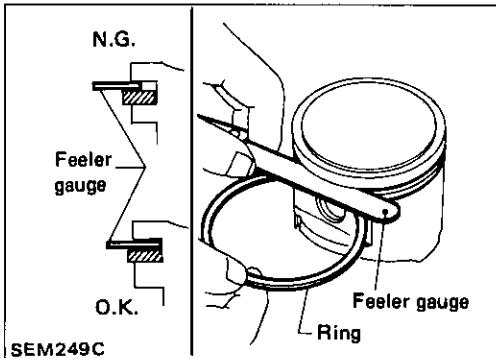
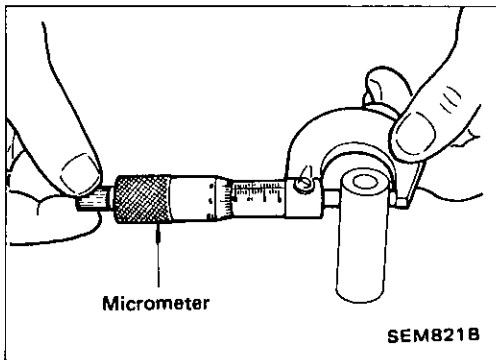
**Standard diameter "Dp":**

**20.989 - 21.001 mm (0.8263 - 0.8268 in)**

3. Calculate interference fit of piston pin to piston.

**$dp - Dp = 0 - 0.004 \text{ mm } (0 - 0.0002 \text{ in})$**

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



### PISTON RING SIDE CLEARANCE

**Side clearance:**

**Top ring**

**0.04 - 0.08 mm (0.0016 - 0.0031 in)**

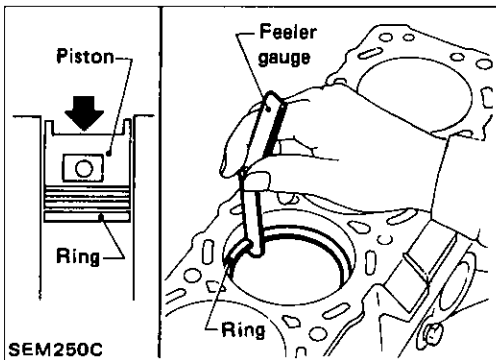
**2nd ring**

**0.03 - 0.07 mm (0.0012 - 0.0028 in)**

**Max. limit of side clearance:**

**0.1 mm (0.004 in)**

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



### PISTON RING END GAP

**End gap:**

**Top ring**

**0.28 - 0.52 mm (0.0110 - 0.0205 in)**

**2nd ring**

**0.45 - 0.69 mm (0.0177 - 0.0272 in)**

**(For rings punched with R or T.)**

**0.55 - 0.70 mm (0.0217 - 0.0276 in)**

**(For rings punched with N.)**

**Oil ring**

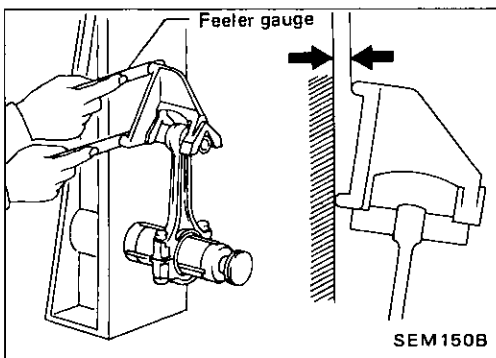
**0.20 - 0.69 mm (0.0079 - 0.0272 in)**

**Max. limit of ring gap:**

**0.5 mm (0.020 in)**

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

**Refer to S.D.S.**



### CONNECTING ROD BEND AND TORSION

**Bend:**

**Limit 0.15 mm (0.0059 in)**

**per 100 mm (3.94 in) length**

**Torsion:**

**Limit 0.30 mm (0.0118 in)**

**per 100 mm (3.94 in) length**

If it exceeds the limit, replace connecting rod assembly.

## CYLINDER BLOCK

### 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".**

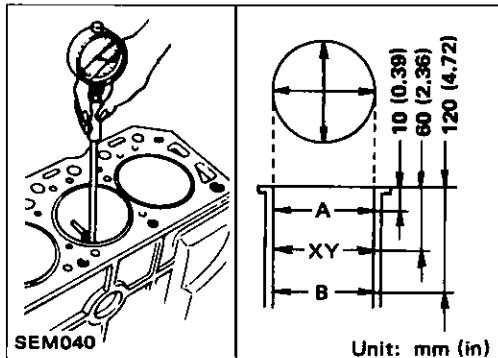
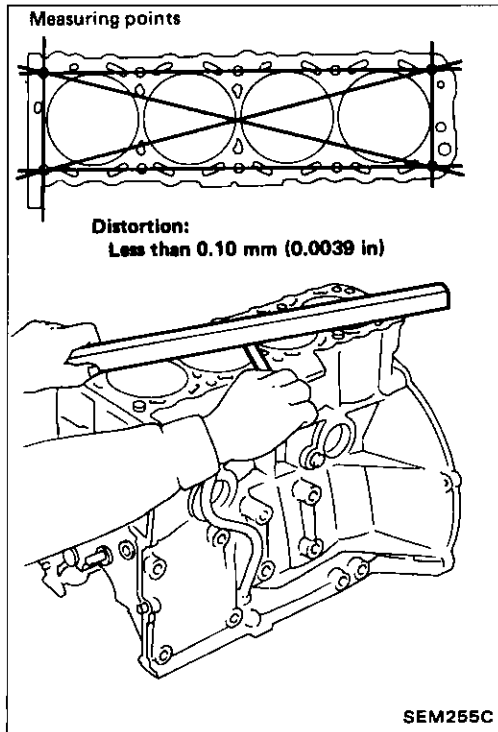
The maximum limit is as follows:

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

**Nominal cylinder block height  
from crankshaft center:**

**246.95 - 247.05 mm (9.7224 - 9.7264 in)**

3. If necessary, replace cylinder block.



#### PISTON-TO-BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.

**Standard inner diameter:**

**89.000 - 89.030 mm (3.5039 - 3.5051 in)**

**Wear limit:**

**0.2 mm (0.008 in)**

**Out-of-round (X - Y) limit:**

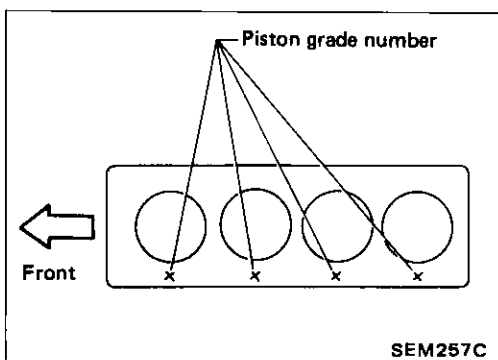
**0.015 mm (0.0006 in)**

**Taper (A - B) limit:**

**0.015 mm (0.0006 in)**

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

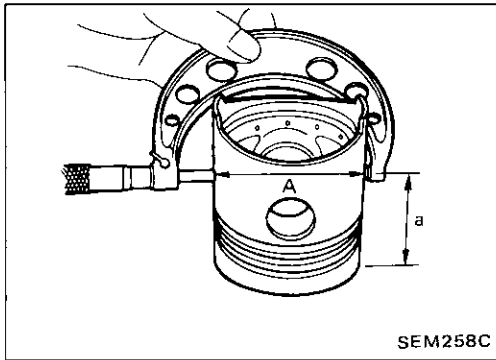
2. Check for scratches and seizure. If seizure is found, hone it.



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

## CYLINDER BLOCK

### Inspection (Cont'd)



3. Measure piston skirt diameter.

**Piston diameter "A":**

**Refer to S.D.S.**

**Measuring point "a" (Distance from the top):**

**Approximately 52 mm (2.05 in)**

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

**Piston-to-bore clearance "B":**

**0.020 - 0.040 mm (0.0008 - 0.0016 in)**

5. Determine piston oversize according to amount of cylinder wear.

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

6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".

**Rebored size calculation:**

$$D = A + B - C$$

**where,**

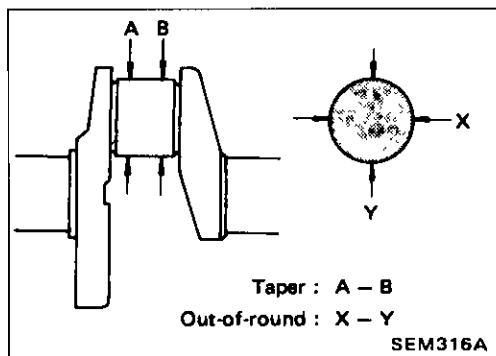
**D: Bored diameter**

**A: Piston diameter as measured**

**B: Piston-to-bore clearance**

**C: Honing allowance 0.02 mm (0.0008 in)**

7. Install main bearing caps, and tighten to the specified torque to prevent distortion of cylinder bores in final assembly.
8. Cut cylinder bores.
  - **When any cylinder needs boring, all other cylinders must also be bored.**
  - **Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**
- 9.hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.
  - **Measurement should be done after cylinder bore cools down.**



### CRANKSHAFT

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

**Out-of-round (X - Y):**

**Main journal Less than 0.01 mm (0.0004 in)**

**Crank pin Less than 0.005 mm (0.0002 in)**

**Taper (A - B):**

**Main journal Less than 0.01 mm (0.0004 in)**

**Crank pin Less than 0.005 mm (0.0002 in)**

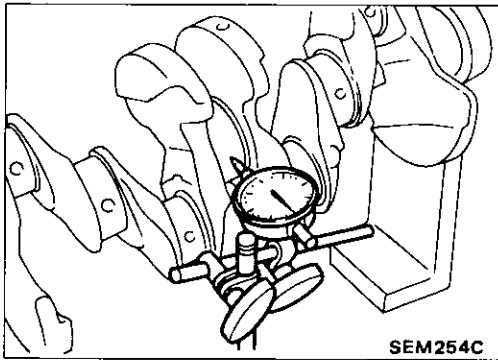
## CYLINDER BLOCK

### Inspection (Cont'd)

3. Measure crankshaft runout.

**Runout (Total indicator reading):**

**Less than 0.10 mm (0.0039 in)**



### BEARING CLEARANCE

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

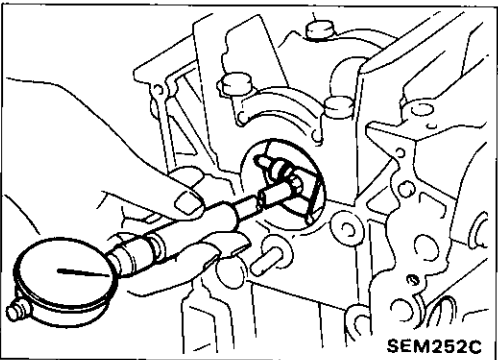
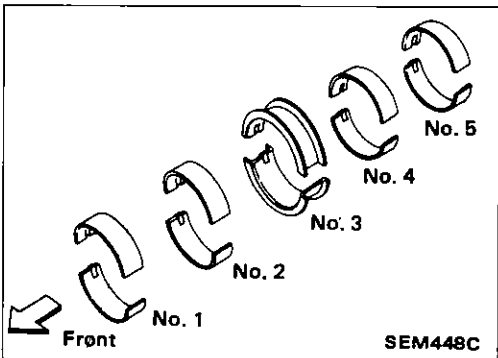
#### Method A (Using bore gauge and micrometer)

##### 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. Refer to "Assembly".**

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



4. Measure outer diameter "Dm" of each crankshaft main journal.

5. Calculate main bearing clearance.

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

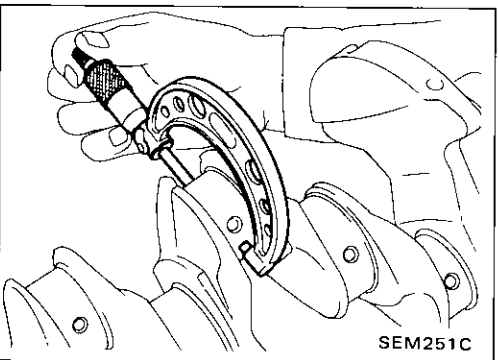
**Standard:**

**0.020 - 0.047 mm (0.0008 - 0.0019 in)**

**Limit:**

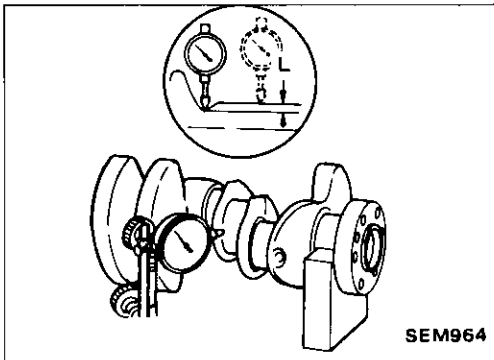
**0.1 mm (0.004 in)**

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

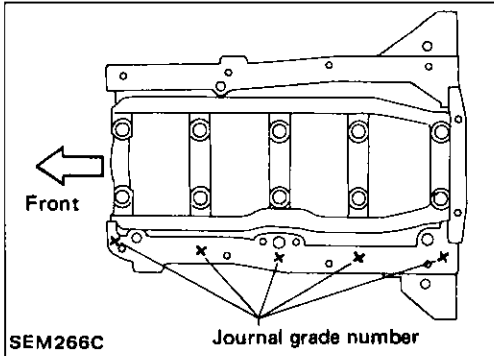


## CYLINDER BLOCK

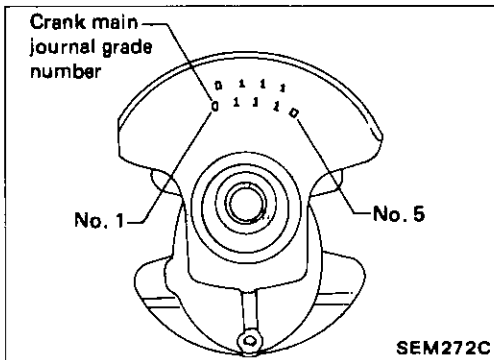
### Inspection (Cont'd)



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



8. If crankshaft, is reused, measure main bearing clearance and thickness of main bearing.  
If crankshaft is replaced with a new one, it is necessary to select thickness of main bearings as follows:
- a. Grade number of each cylinder block main journal is punched on the respective cylinder block.



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

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

#### Main bearing grade number:

| Main journal grade number<br>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

## CYLINDER BLOCK

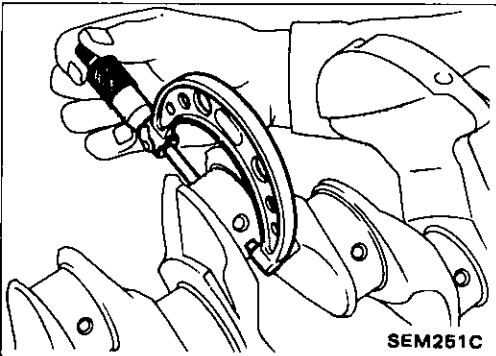
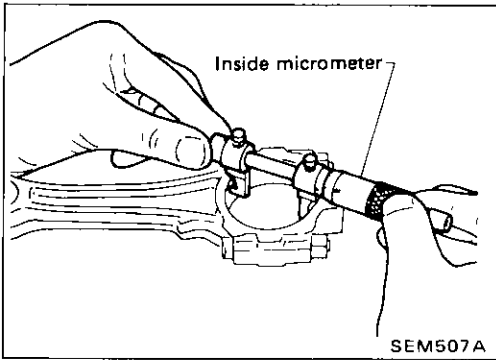
### Inspection (Cont'd)

#### Connecting rod bearing (Big end)

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

#### Tighten bolts to the specified torque.

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



4. Measure outer diameter "Dp" of each crankshaft pin journal.

5. Calculate connecting rod bearing clearance.

$$\text{Connecting rod bearing clearance} = C - Dp$$

**Standard:**

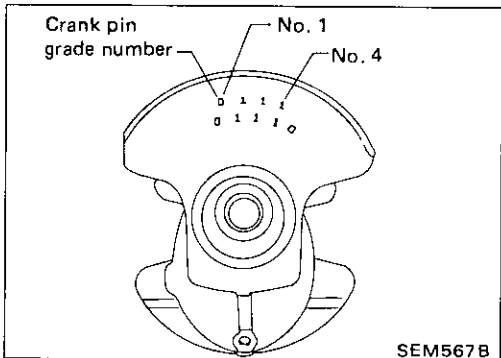
0.010 - 0.035 mm (0.0004 - 0.0014 in)

**Limit:**

0.09 mm (0.0035 in)

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

Refer to step 7 of "BEARING CLEARANCE — Main bearing".



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

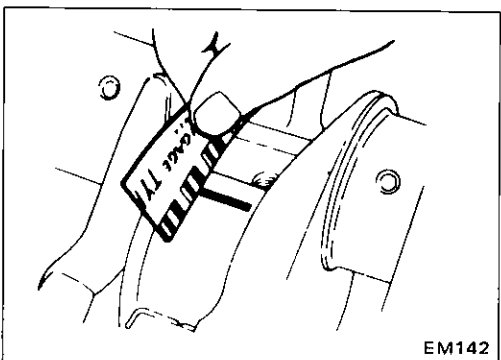
#### Connecting rod bearing grade number:

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

#### Method B (Using plastigauge)

##### CAUTION:

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



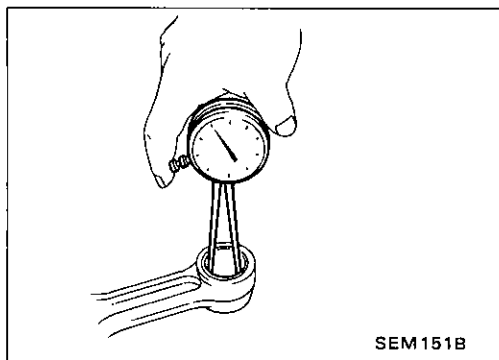


## CYLINDER BLOCK

### Inspection (Cont'd)

#### CONNECTING ROD BUSHING CLEARANCE (Small end)

1. Measure inner diameter "C" of bushing.



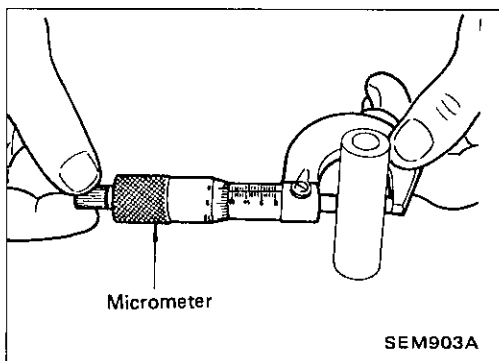
2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bearing clearance.

$$C - Dp =$$

0.005 - 0.017 mm (0.0002 - 0.0007 in) (Standard)

0.023 mm (0.0009 in) (Limit)

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



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

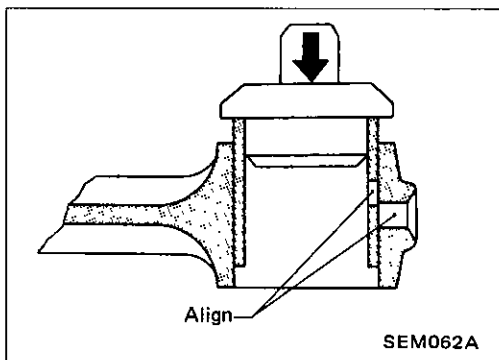
1. Drive in small end bushing until it is flush with end surface of rod.

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

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

**Clearance between small end bushing and piston pin:**

0.005 - 0.017 mm (0.0002 - 0.0007 in)



#### FLYWHEEL/DRIVE PLATE RUNOUT

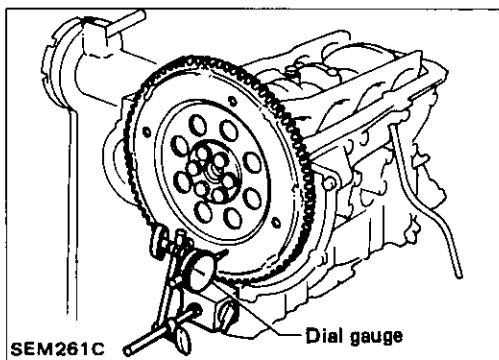
Runout (Total indicator reading):

Flywheel (M/T model)

Less than 0.1 mm (0.004 in)

Drive plate (A/T model)

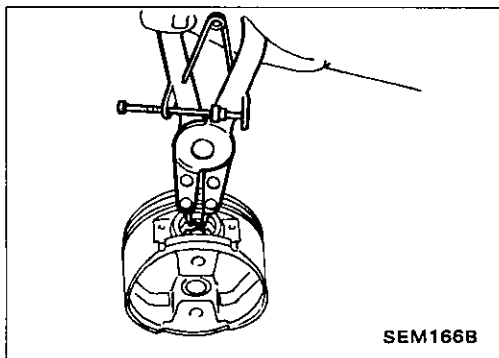
Less than 0.1 mm (0.004 in)



### Assembly

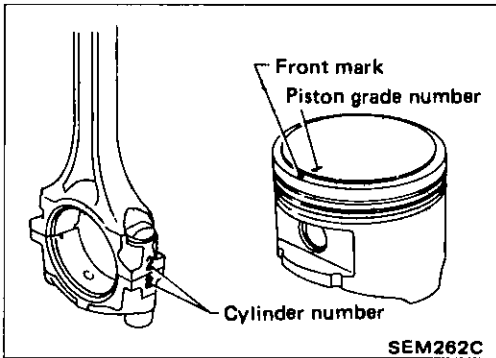
#### PISTON

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

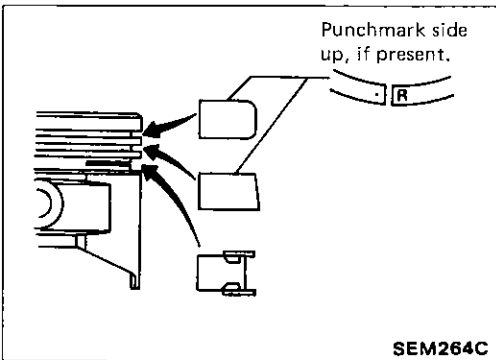
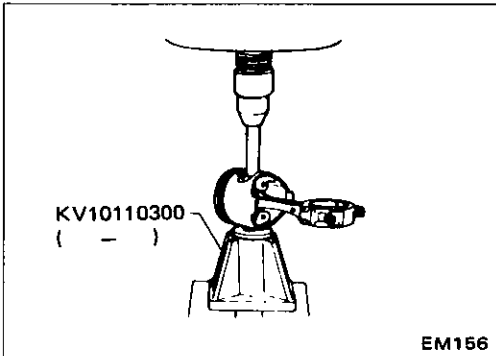


## CYLINDER BLOCK

### Assembly (Cont'd)



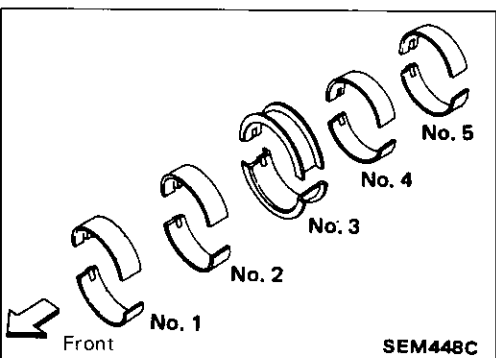
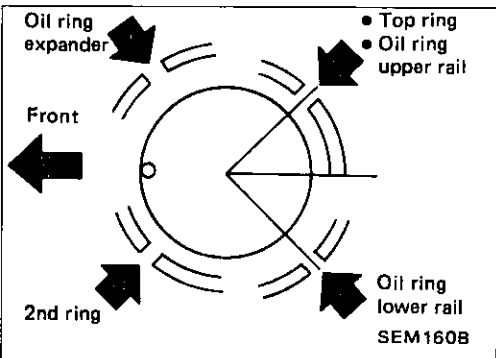
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.
  - Align the direction of piston and connecting rod.
  - Numbers stamped on connecting rod and cap correspond to each cylinder.
  - After assembly, make sure connecting rod swings smoothly.



3. Set piston rings as shown.

#### CAUTION:

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

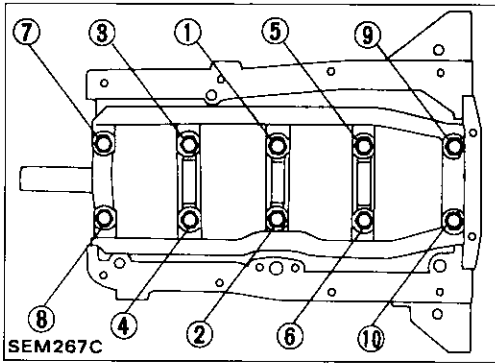


### CRANKSHAFT

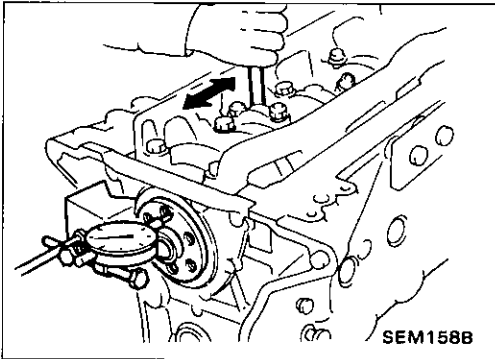
1. Set main bearings in their proper positions on cylinder block and main bearing beam.
  - Confirm that correct main bearings are used. Refer to "Inspection" of this section.

## CYLINDER BLOCK

### Assembly (Cont'd)



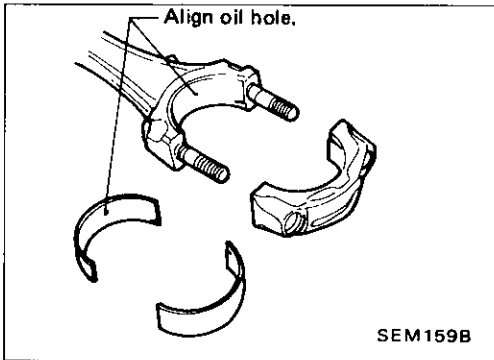
2. Install crankshaft and main bearing beam and tighten bolts to the specified torque.
  - Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.
  - Tighten bearing cap bolts gradually in two or three stages. Start with center bearing 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**  
0.3 mm (0.012 in)

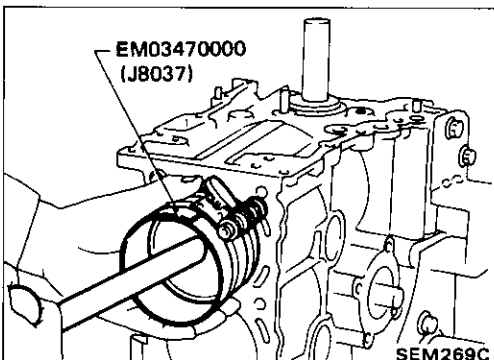
If beyond the limit, replace bearing with a new one.



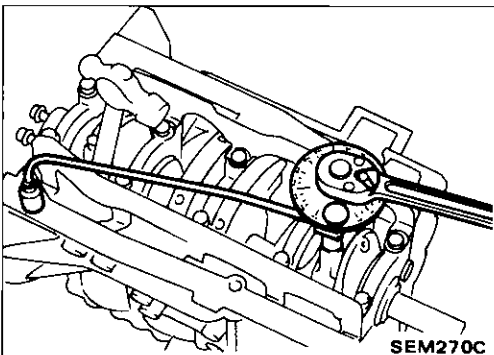
4. Install connecting rod bearings in connecting rods and connecting rod caps.
  - Confirm that correct bearings are used.

**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.



- 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 bolts 60 to 65 degrees clockwise with an angle wrench, or if an angle wrench is not available, tighten them to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).

## CYLINDER BLOCK

### Assembly (Cont'd)

6. Measure connecting rod side clearance.

#### Connecting rod side clearance:

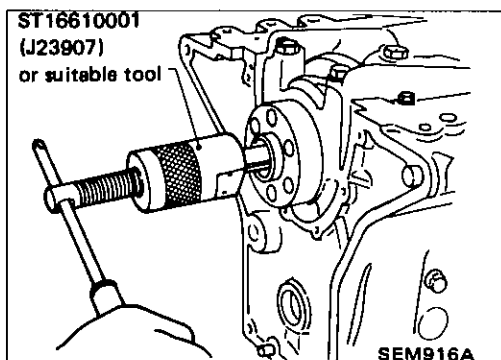
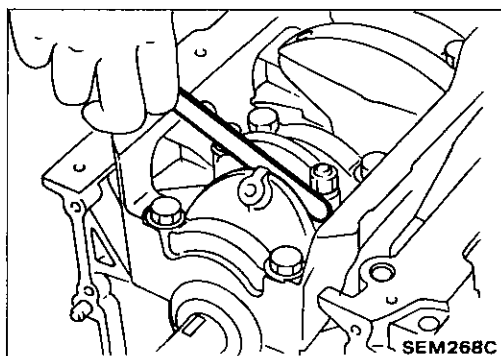
##### Standard

0.2 - 0.4 mm (0.008 - 0.016 in)

##### Limit

0.6 mm (0.024 in)

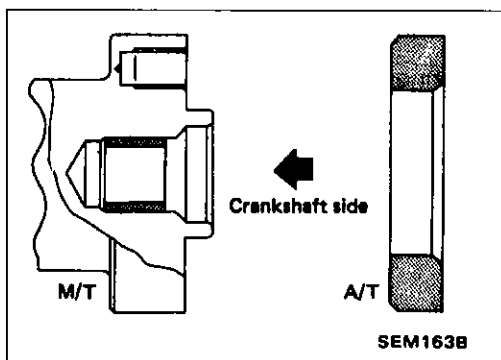
If beyond the limit, replace connecting rod and/or crankshaft.



### REPLACING PILOT BUSHING

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

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



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

### General Specifications

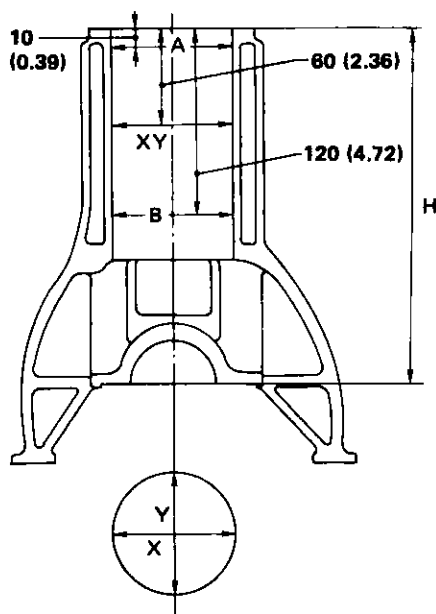
|                                           |                       |
|-------------------------------------------|-----------------------|
| Engine model                              | KA24E                 |
| Cylinder arrangement                      | 4, in-line            |
| Displacement      cm <sup>3</sup> (cu in) | 2,389 (145.78)        |
| Bore x stroke      mm (in)                | 89 x 96 (3.50 x 3.78) |
| Valve arrangement                         | O.H.C.                |
| Firing order                              | 1-3-4-2               |
| Number of piston rings                    |                       |
| Compression                               | 2                     |
| Oil                                       | 1                     |
| Number of main bearings                   | 5                     |
| Compression ratio                         | 8.6                   |

Unit: kPa (kg/cm<sup>2</sup>, psi)/rpm

|                                      |                       |
|--------------------------------------|-----------------------|
| Compression pressure                 |                       |
| Standard                             | 1,206 (12.3, 175)/250 |
| Minimum                              | 1,010 (10.3, 146)/250 |
| Differential limit between cylinders | 98 (1.0, 14)/250      |

## Inspection and Adjustment

### CYLINDER BLOCK



SEM447C

Unit: mm (in)

|                                                   |                      |         | Standard                          | Limit         |
|---------------------------------------------------|----------------------|---------|-----------------------------------|---------------|
| Distortion                                        |                      |         | —                                 | 0.1 (0.004)   |
| Cylinder bore                                     | Inner diameter       | Grade 1 | 89.000 - 89.010 (3.5039 - 3.5043) | 0.2 (0.008)*  |
|                                                   |                      | Grade 2 | 89.010 - 89.020 (3.5043 - 3.5047) |               |
|                                                   |                      | Grade 3 | 89.020 - 89.030 (3.5047 - 3.5051) |               |
|                                                   | Out-of-round (X – Y) |         | Less than 0.015 (0.0006)          | —             |
|                                                   | Taper (A – B)        |         | Less than 0.010 (0.0004)          | —             |
| Difference in inner diameter between cylinders    |                      |         | Less than 0.05 (0.0020)           | 0.2 (0.008)   |
| Piston-to-cylinder clearance                      |                      |         | 0.020 - 0.040 (0.0008 - 0.0016)   | —             |
| Cylinder block height<br>(From crankshaft center) |                      |         | 246.95 - 247.05 (9.7224 - 9.7264) | 0.2 (0.008)** |

\* Wear limit

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

### CYLINDER HEAD

Unit: mm (in)

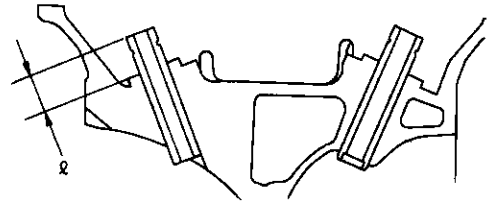
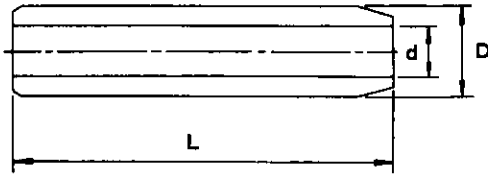
|                    | Standard                       | Limit        |
|--------------------|--------------------------------|--------------|
| Height (H)         | 98.8 - 99.0<br>(3.890 - 3.898) | 0.2 (0.008)* |
| Surface distortion | 0.03 (0.0012)                  | 0.1 (0.004)  |

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

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

## Inspection and Adjustment (Cont'd)

### VALVE GUIDE



SEM225C

SEM571B

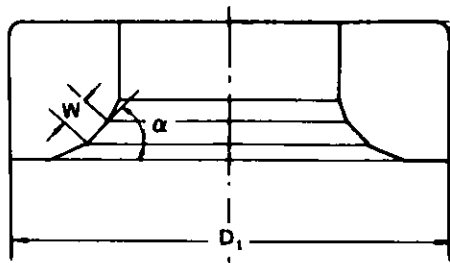
Unit: mm (in)

|                                       | Standard                             |                                      | Service                              |                                      | Limit       |
|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|-------------|
|                                       | Intake                               | Exhaust                              | Intake                               | Exhaust                              |             |
| Length (L)                            | 52.6 (2.071)                         | 56.0 (2.205)                         | 52.6 (2.071)                         | 56.0 (2.205)                         | —           |
| Outer diameter (D)                    | 11.023 - 11.034<br>(0.4340 - 0.4344) | 12.023 - 12.034<br>(0.4733 - 0.4738) | 11.223 - 11.234<br>(0.4418 - 0.4423) | 12.223 - 12.234<br>(0.4812 - 0.4817) | —           |
| Inner diameter (d)<br>(Finished size) | 7.000 - 7.018<br>(0.2756 - 0.2763)   | 8.000 - 8.018<br>(0.3150 - 0.3157)   | 7.000 - 7.018<br>(0.2756 - 0.2763)   | 8.000 - 8.018<br>(0.3150 - 0.3157)   | —           |
| Cylinder head hole diameter           | 10.975 - 10.996<br>(0.4321 - 0.4329) | 11.975 - 11.996<br>(0.4715 - 0.4723) | 11.175 - 11.196<br>(0.4400 - 0.4408) | 12.175 - 12.196<br>(0.4793 - 0.4802) | —           |
| Interference fit                      | 0.027 - 0.059 (0.0011 - 0.0023)      |                                      |                                      |                                      | —           |
| Stem to guide clearance               | 0.020 - 0.053<br>(0.0008 - 0.0021)   | 0.040 - 0.070<br>(0.0016 - 0.0028)   | 0.020 - 0.053<br>(0.0008 - 0.0021)   | 0.040 - 0.070<br>(0.0016 - 0.0028)   | 0.1 (0.004) |
| Tapping length (ℓ)                    | 14.9 - 15.1 (0.587 - 0.594)          |                                      |                                      |                                      | —           |

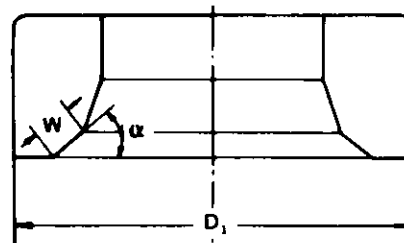
# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## Inspection and Adjustment (Cont'd)

Standard



Service



SEM177

SEM178

Unit: mm (in)

|                                             | Standard                             |                                      | Service                              |                                      |
|---------------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                                             | Intake                               | Exhaust                              | Intake                               | Exhaust                              |
| Cylinder head seat recess diameter          | 36.000 - 36.016<br>(1.4173 - 1.4179) | 42.000 - 42.016<br>(1.6535 - 1.6542) | 36.500 - 36.516<br>(1.4370 - 1.4376) | 42.500 - 42.516<br>(1.6732 - 1.6739) |
| Valve seat outer diameter (D <sub>1</sub> ) | 36.080 - 36.096<br>(1.4205 - 1.4211) | 42.080 - 42.096<br>(1.6567 - 1.6573) | 36.580 - 36.596<br>(1.4402 - 1.4408) | 42.580 - 42.596<br>(1.6764 - 1.6770) |
| Face angle (α)                              | 45°                                  | 45°                                  | 45°                                  | 45°                                  |
| Contacting width (W)                        | 1.6 - 1.7<br>(0.063 - 0.067)         | 1.7 - 2.1<br>(0.067 - 0.083)         | 1.6 - 1.7<br>(0.063 - 0.067)         | 1.7 - 2.1<br>(0.067 - 0.083)         |

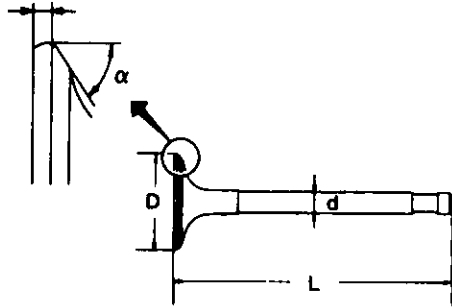


# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## Inspection and Adjustment (Cont'd)

### VALVE

T (Margin thickness)



SEM188A

Unit: mm (in)

|                         |     | Standard                             | Limit       |
|-------------------------|-----|--------------------------------------|-------------|
| Valve head diameter (D) | In. | 34.0 - 34.2<br>(1.339 - 1.346)       | —           |
|                         | Ex. | 40.0 - 40.2<br>(1.575 - 1.583)       | —           |
| Valve length (L)        | In. | 119.9 - 120.2<br>(4.720 - 4.732)     | —           |
|                         | Ex. | 120.67 - 120.97<br>(4.7508 - 4.7626) | —           |
| Valve stem diameter (d) | In. | 6.965 - 6.980<br>(0.2742 - 0.2748)   | —           |
|                         | Ex. | 7.948 - 7.960<br>(0.3129 - 0.3134)   | —           |
| Valve face angle (α)    | In. | 45°30'                               | —           |
|                         | Ex. | 45°30'                               | —           |
| Valve head margin (T)   | In. | 1.15 - 1.45<br>(0.0453 - 0.0571)     | 0.5 (0.020) |
|                         | Ex. | 1.35 - 1.65<br>(0.0531 - 0.0650)     |             |

### VALVE SPRING

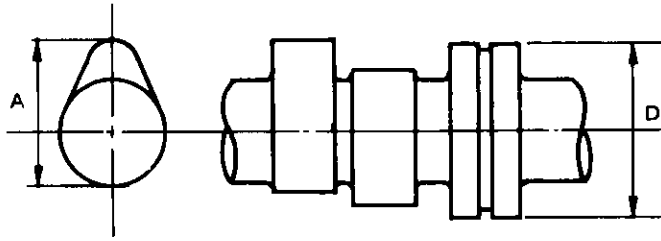
Unit: mm (in)

|                                  |       | Standard                               |                                        | Limit                                  |                                        |
|----------------------------------|-------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
|                                  |       | Intake                                 | Exhaust                                | Intake                                 | Exhaust                                |
| Free height (H)                  | Outer | 57.44 (2.2614)                         | 53.21 (2.0949)                         | —                                      | —                                      |
|                                  | Inner | 53.34 (2.1000)                         | 47.95 (1.8878)                         | —                                      | —                                      |
| Pressure<br>N (kg, lb) at height | Outer | 604.1 (61.6, 135.8)<br>at 37.6 (1.480) | 640.4 (65.3, 144.0)<br>at 34.1 (1.343) | 567.8 (57.9, 127.7)<br>at 37.6 (1.480) | 620.8 (63.3, 139.6)<br>at 34.1 (1.343) |
|                                  | Inner | 284.4 (29.0, 63.9)<br>at 32.6 (1.283)  | 328.5 (33.5, 73.9)<br>at 29.1 (1.146)  | 266.8 (27.2, 60.0)<br>at 32.6 (1.283)  | 318.7 (32.5, 71.7)<br>at 29.1 (1.146)  |
| Out-of-square                    | Outer | —                                      | —                                      | 2.5 (0.098)                            | 2.3 (0.091)                            |
|                                  | Inner | —                                      | —                                      | 2.3 (0.091)                            | 2.1 (0.083)                            |

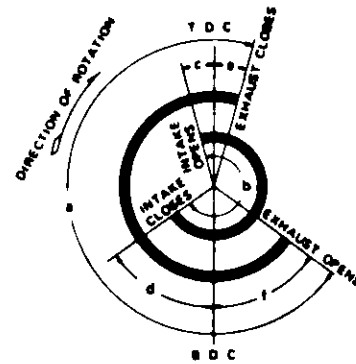
# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## Inspection and Adjustment (Cont'd)

### CAMSHAFT AND CAMSHAFT BEARING



SEM568A



EM120

Unit: mm (in)

|                                        |   | Standard                          | Limit         |
|----------------------------------------|---|-----------------------------------|---------------|
| Cam height (A)                         |   | 44.839 - 45.029 (1.7653 - 1.7728) | —             |
| Valve lift (h)                         |   | 10.4 (0.409)                      | —             |
| Wear limit of cam height               |   | —                                 | 0.2 (0.008)   |
| Camshaft journal to bearing clearance  |   | 0.045 - 0.090 (0.0018 - 0.0035)   | 0.12 (0.0047) |
| Inner diameter of camshaft bearing     |   | 33.000 - 33.025 (1.2992 - 1.3002) | —             |
| Outer diameter of camshaft journal (D) |   | 32.935 - 32.955 (1.2967 - 1.2974) | —             |
| Camshaft runout                        |   | 0 - 0.02 (0 - 0.0008)             | —             |
| Camshaft end play                      |   | 0.07 - 0.15 (0.0028 - 0.0059)     | 0.2 (0.008)   |
| Valve timing (Degree on crankshaft)    | a | 248                               | —             |
|                                        | b | 240                               | —             |
|                                        | c | 3                                 | —             |
|                                        | d | 57                                | —             |
|                                        | e | 12                                | —             |
|                                        | f | 56                                | —             |

### ROCKER ARM AND ROCKER SHAFT

Unit: mm (in)

|                                       |                                      |
|---------------------------------------|--------------------------------------|
| Rocker arm to shaft clearance         | 0.012 - 0.050<br>(0.0005 - 0.0020)   |
| Rocker shaft diameter                 | 21.979 - 22.000<br>(0.8653 - 0.8661) |
| Rocker arm rocker shaft hole diameter | 22.012 - 22.029<br>(0.8666 - 0.8673) |

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

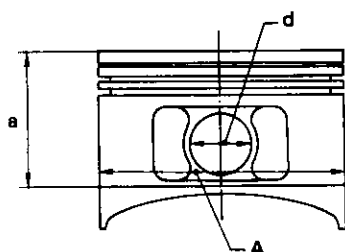
## Inspection and Adjustment (Cont'd)

### PISTON, PISTON RING AND PISTON PIN

### Piston ring

Unit: mm (in)

### Piston



SEM444C

Unit: mm (in)

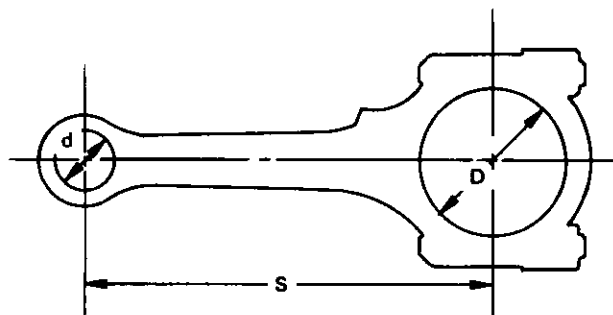
|                                   |                    |                                   |                                      |
|-----------------------------------|--------------------|-----------------------------------|--------------------------------------|
| Piston skirt diameter (A)         | Standard           | Grade No. 1                       | 88.970 - 88.980<br>(3.5027 - 3.5031) |
|                                   |                    | Grade No. 2                       | 88.980 - 88.990<br>(3.5031 - 3.5035) |
|                                   |                    | Grade No. 3                       | 88.990 - 89.000<br>(3.5035 - 3.5039) |
|                                   | Service (Oversize) | 0.5<br>(0.020)                    | 89.470 - 89.500<br>(3.5224 - 3.5236) |
|                                   |                    | 1.0<br>(0.039)                    | 89.970 - 90.000<br>(3.5421 - 3.5433) |
| Dimensions (a)                    |                    | Approximately 52 (2.05)           |                                      |
| Piston pin hole diameter (d)      |                    | 20.987 - 20.999 (0.8263 - 0.8267) |                                      |
| Piston-to-cylinder bore clearance |                    | 0.020 - 0.040 (0.0008 - 0.0016)   |                                      |

|                |                    | Standard                           | Limit       |
|----------------|--------------------|------------------------------------|-------------|
| Side clearance | Top                | 0.040 - 0.080<br>(0.0016 - 0.0031) | 0.1 (0.004) |
|                | 2nd                | 0.030 - 0.070<br>(0.0012 - 0.0028) | 0.1 (0.004) |
| Ring gap       | Top                | 0.28 - 0.52<br>(0.0110 - 0.0205)   | 0.5 (0.020) |
|                | 2nd                | 0.45 - 0.69<br>(0.0177 - 0.0272)*1 | 0.5 (0.020) |
|                |                    | 0.55 - 0.70<br>(0.0217 - 0.0276)*2 |             |
|                | Oil<br>(rail ring) | 0.20 - 0.69<br>(0.0079 - 0.0272)   | 0.5 (0.020) |

\*1: For rings punched with R or T.

\*2: For rings punched with N.

### CONNECTING ROD



SEM570A

Unit: mm (in)

### Piston pin

Unit: mm (in)

|                                                   | Standard                             | Limit             |
|---------------------------------------------------|--------------------------------------|-------------------|
| Piston pin outer diameter                         | 20.989 - 21.001<br>(0.8263 - 0.8268) | —                 |
| Interference fit of piston pin to piston pin hole | 0 - 0.004<br>(0 - 0.0002)            | —                 |
| Piston pin to connecting rod bearing clearance    | 0.005 - 0.017<br>(0.0002 - 0.0007)   | 0.023<br>(0.0009) |

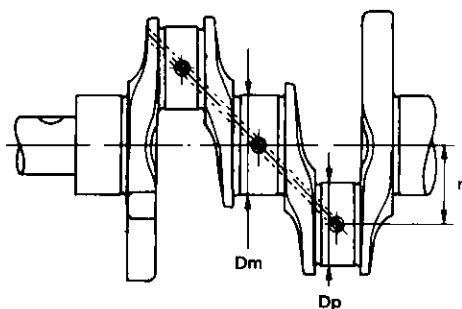
|                                            | Standard                             | Limit         |
|--------------------------------------------|--------------------------------------|---------------|
| Center distance (S)                        | 164.95 - 165.05<br>(6.4941 - 6.4980) | —             |
| Bend [per 100 mm (3.94 in)]                | —                                    | 0.15 (0.0059) |
| Torsion [per 100 mm (3.94 in)]             | —                                    | 0.3 (0.012)   |
| Piston pin bushing inner diameter (d)*     | 21.000 - 21.012<br>(0.8268 - 0.8272) | —             |
| Connecting rod big end inner diameter (D)* | 53.000 - 53.013<br>(2.0866 - 2.0871) | —             |
| Side clearance                             | 0.2 - 0.4<br>(0.008 - 0.016)         | 0.6 (0.024)   |

\* Without bearing

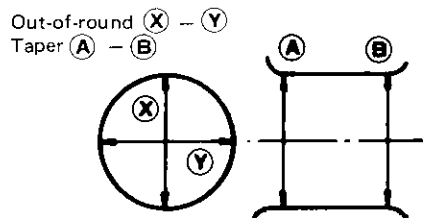
# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## Inspection and Adjustment (Cont'd)

### CRANKSHAFT



SEM394



EM715

Unit: mm (in)

|                                             |         |                                 |                                   |  |
|---------------------------------------------|---------|---------------------------------|-----------------------------------|--|
| Main journal diameter (Dm)                  | Grade   | No. 0                           | 59.967 - 59.975 (2.3609 - 2.3612) |  |
|                                             |         | No. 1                           | 59.959 - 59.967 (2.3606 - 2.3609) |  |
|                                             |         | No. 2                           | 59.951 - 59.959 (2.3603 - 2.3606) |  |
| Pin journal diameter (Dp)                   | Grade   | No. 0                           | 46.968 - 49.974 (1.8491 - 1.9675) |  |
|                                             |         | No. 1                           | 49.962 - 49.968 (1.9670 - 1.9672) |  |
|                                             |         | No. 2                           | 49.956 - 49.962 (1.9668 - 1.9670) |  |
| Center distance (r)                         |         | 47.97 - 48.03 (1.8886 - 1.8909) |                                   |  |
|                                             |         | Standard                        | Limit                             |  |
| Taper of journal and pin [(A) - (B)]        | Journal | —                               | 0.01 (0.0004)                     |  |
|                                             | Pin     | —                               | 0.005 (0.0002)                    |  |
| Out-of-round of journal and pin [(X) - (Y)] | Journal | —                               | 0.01 (0.0004)                     |  |
|                                             | Pin     | —                               | 0.005 (0.0002)                    |  |
| Runout [T.I.R.]*                            |         | —                               | 0.10 (0.0039)                     |  |
| Free end play                               |         | 0.05 - 0.18 (0.0020 - 0.0071)   | 0.3 (0.012)                       |  |
| Fillet roll                                 |         | More than 0.1 (0.004)           |                                   |  |

\* Total indicator reading

### BEARING CLEARANCE

Unit: mm (in)

|                                  | Standard                           | Limit         |
|----------------------------------|------------------------------------|---------------|
| Main bearing clearance           | 0.020 - 0.047<br>(0.0008 - 0.0019) | 0.1 (0.004)   |
| Connecting rod bearing clearance | 0.010 - 0.035<br>(0.0004 - 0.0014) | 0.09 (0.0035) |

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

### Inspection and Adjustment (Cont'd)

#### AVAILABLE MAIN BEARING

##### Standard

| Grade number | Thickness<br>mm (in)               | Identification<br>color |
|--------------|------------------------------------|-------------------------|
| 0            | 1.821 - 1.825<br>(0.0717 - 0.0719) | Black                   |
| 1            | 1.825 - 1.829<br>(0.0719 - 0.0720) | Brown                   |
| 2            | 1.829 - 1.833<br>(0.0720 - 0.0722) | Green                   |
| 3            | 1.833 - 1.837<br>(0.0722 - 0.0723) | Yellow                  |
| 4            | 1.837 - 1.841<br>(0.0723 - 0.0725) | Blue                    |

##### Undersize (service)

Unit: mm (in)

|                  | Thickness                          | Main journal<br>diameter "Dm"                                 |
|------------------|------------------------------------|---------------------------------------------------------------|
| 0.25<br>(0.0098) | 1.952 - 1.960<br>(0.0769 - 0.0772) | Grind so that bearing<br>clearance is the specified<br>value. |

#### AVAILABLE CONNECTING ROD BEARING

##### Standard

| Grade number | Thickness<br>mm (in)               | Identification<br>color |
|--------------|------------------------------------|-------------------------|
| 0            | 1.505 - 1.508<br>(0.0593 - 0.0594) | —                       |
| 1            | 1.508 - 1.511<br>(0.0594 - 0.0595) | Brown                   |
| 2            | 1.511 - 1.514<br>(0.0595 - 0.0596) | Green                   |

##### Undersize (service)

Unit: mm (in)

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

#### MISCELLANEOUS COMPONENTS

Unit: mm (in)

|                                       |                         |
|---------------------------------------|-------------------------|
| Camshaft sprocket runout<br>[T.I.R.]* | Less than 0.12 (0.0047) |
| Flywheel runout<br>[T.I.R.]*          | Less than 0.1 (0.004)   |
| Drive plate runout<br>[T.I.R.]*       | Less than 0.1 (0.004)   |

\* Total indicator reading



# ENGINE LUBRICATION & COOLING SYSTEMS

## SECTION **LC**

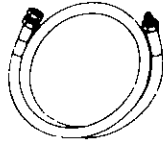
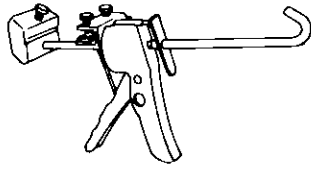
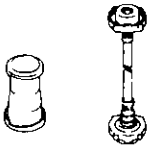
**LC**

### CONTENTS

|                                                |       |
|------------------------------------------------|-------|
| PREPARATION .....                              | LC- 2 |
| PRECAUTION .....                               | LC- 3 |
| ENGINE LUBRICATION SYSTEM .....                | LC- 4 |
| ENGINE COOLING SYSTEM .....                    | LC- 7 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... | LC-11 |

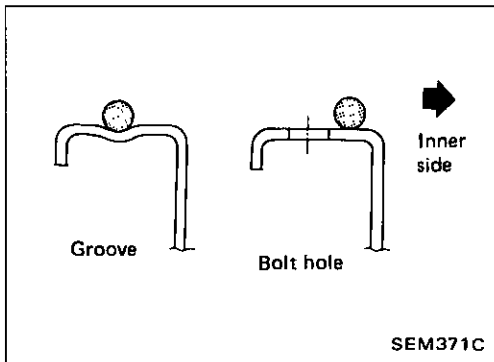
## PREPARATION

### 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<br>to cylinder block<br>         |
| EG17650301<br>( — )<br>Radiator cap tester<br>adapter | Pressing the tube of liquid<br>gasket<br>                     |
| WS39930000<br>( — )<br>Tube presser                   | Adapting radiator cap tester<br>to radiator filler neck<br> |



## PRECAUTION

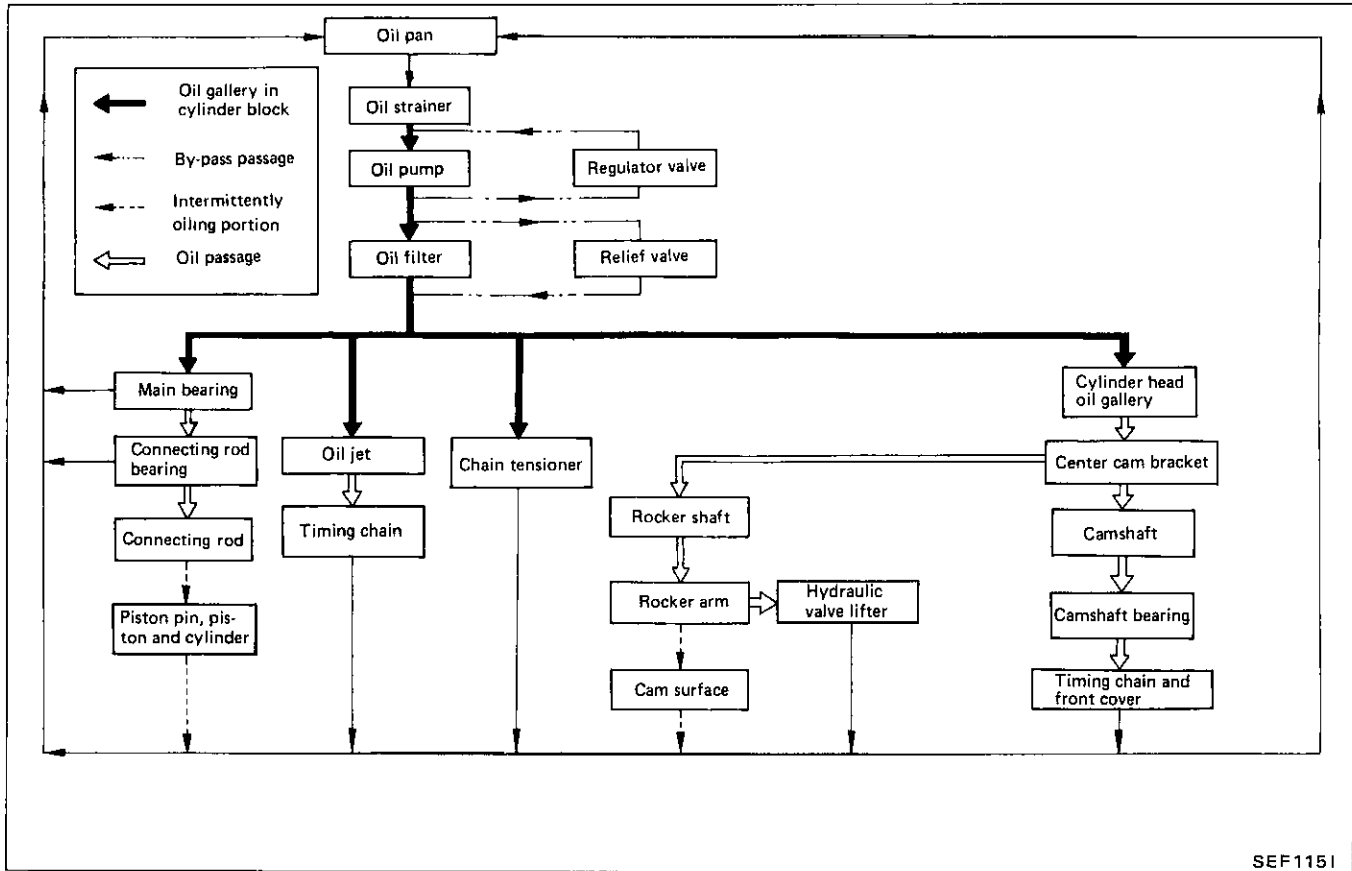


### LIQUID GASKET APPLICATION PROCEDURE

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

# ENGINE LUBRICATION SYSTEM

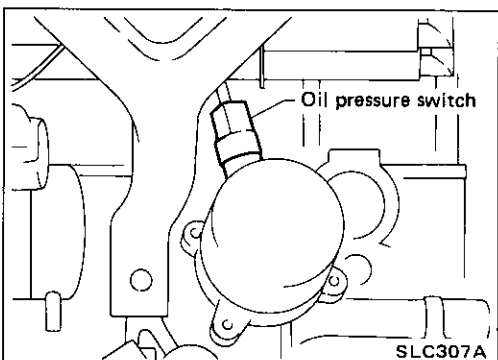
## Lubrication Circuit



## Oil Pressure Check

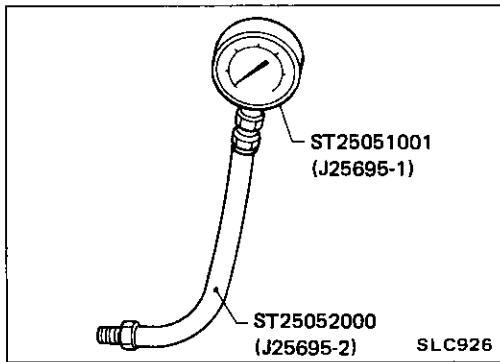
### WARNING:

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



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

## ENGINE LUBRICATION SYSTEM



### Oil Pressure Check (Cont'd)

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

| Engine rpm | Approximate discharge pressure<br>kPa (kg/cm <sup>2</sup> , psi) |
|------------|------------------------------------------------------------------|
| Idle speed | More than 78 (0.8, 11)                                           |
| 3,000      | 412 - 481 (4.2 - 4.9, 60 - 70)                                   |

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

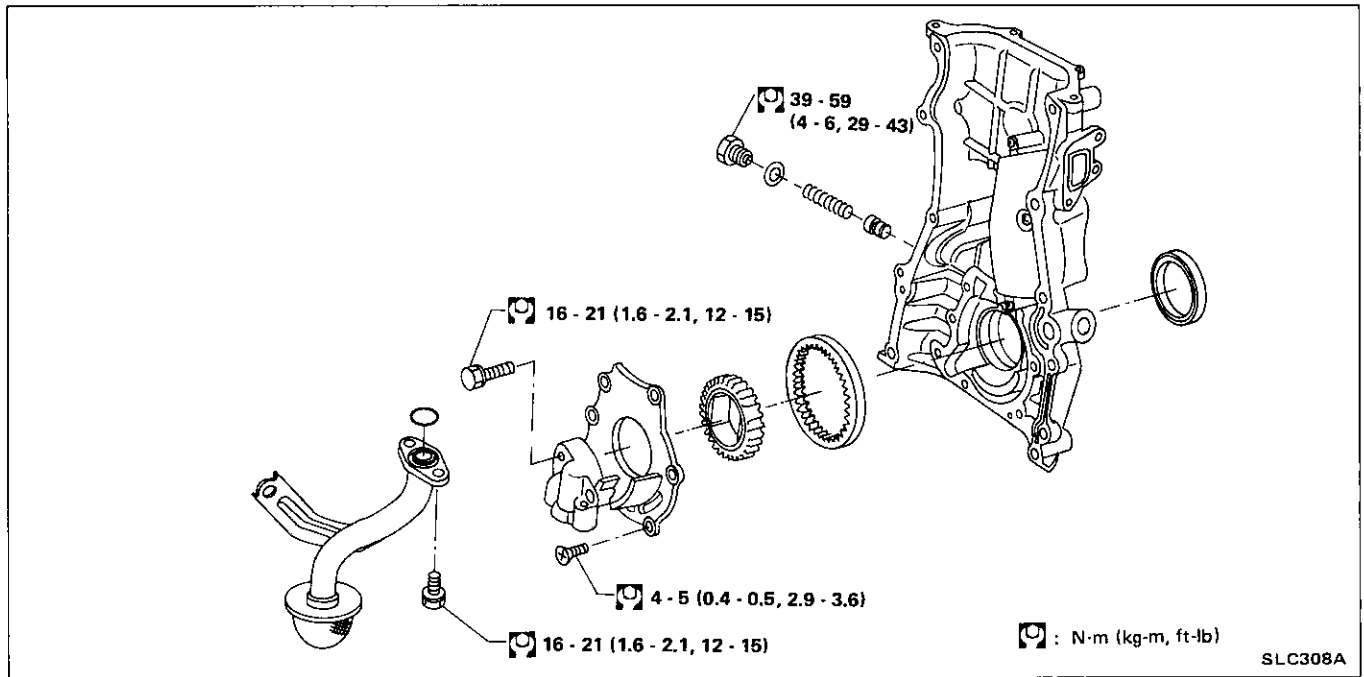
6. Install oil pressure switch with sealant.

### Oil Pump

#### REMOVAL

1. Drain oil.
2. Remove front cover. (Refer to EM section.)
3. Remove oil pump assembly.

#### DISASSEMBLY AND ASSEMBLY



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

## ENGINE LUBRICATION SYSTEM

### Oil Pump (Cont'd)

#### INSPECTION

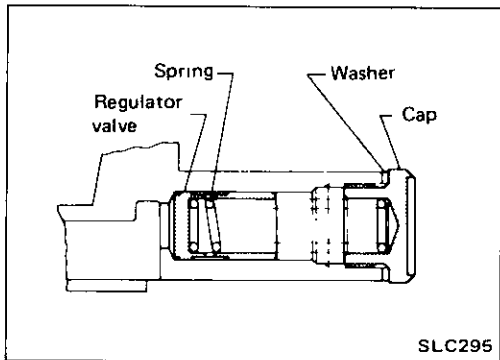
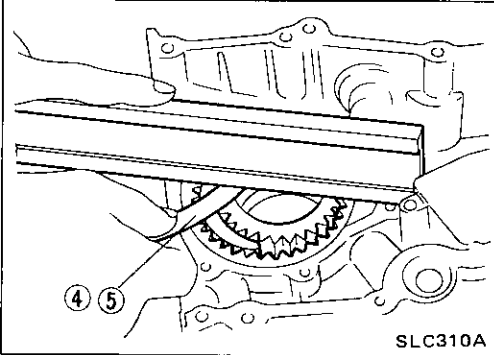
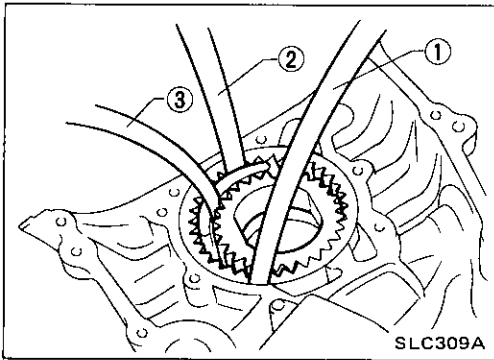
Using a feeler gauge, check the following clearances:

#### Standard clearance:

Unit: mm (in)

|                                    |                               |
|------------------------------------|-------------------------------|
| Body to outer gear clearance ①     | 0.11 - 0.20 (0.0043 - 0.0079) |
| Inner gear to crescent clearance ② | 0.22 - 0.33 (0.0087 - 0.0130) |
| Outer gear to crescent clearance ③ | 0.21 - 0.32 (0.0083 - 0.0126) |
| Housing to inner gear clearance ④  | 0.05 - 0.09 (0.0020 - 0.0035) |
| Housing to outer gear clearance ⑤  | 0.05 - 0.11 (0.0020 - 0.0043) |

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



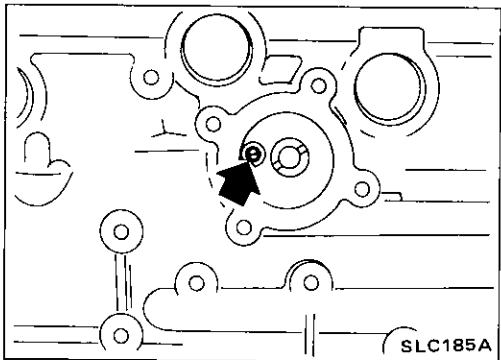
#### REGULATOR VALVE INSPECTION

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.**

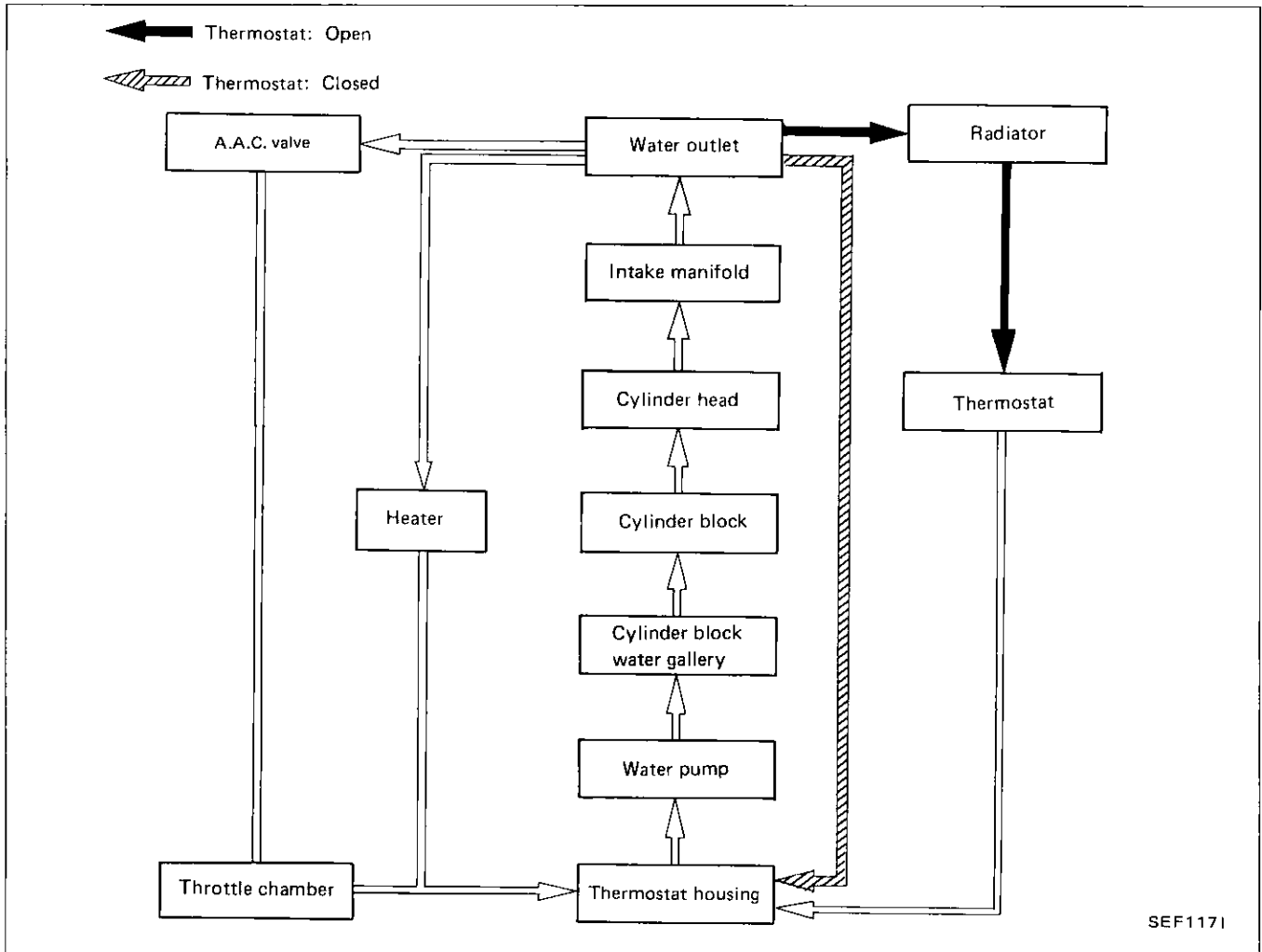
#### OIL PRESSURE RELIEF VALVE INSPECTION

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.



# ENGINE COOLING SYSTEM

## Cooling Circuit



## System Check

### WARNING:

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

Wrap a thick cloth around the cap and carefully remove 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.

## ENGINE COOLING SYSTEM

### System Check (Cont'd)

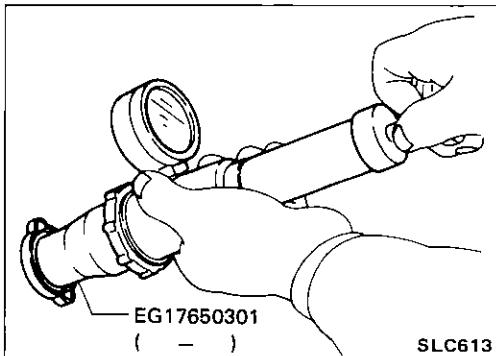
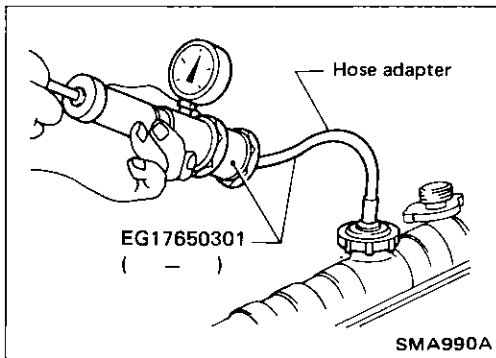
## CHECKING COOLING SYSTEM FOR LEAKS

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

**Testing pressure:**  
98 kPa (1.0 kg/cm<sup>2</sup>, 14 psi)

**CAUTION:**

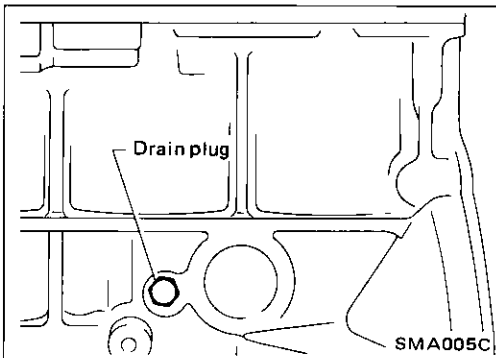
**Higher than the specified pressure may cause radiator damage.**



## CHECKING RADIATOR CAP

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

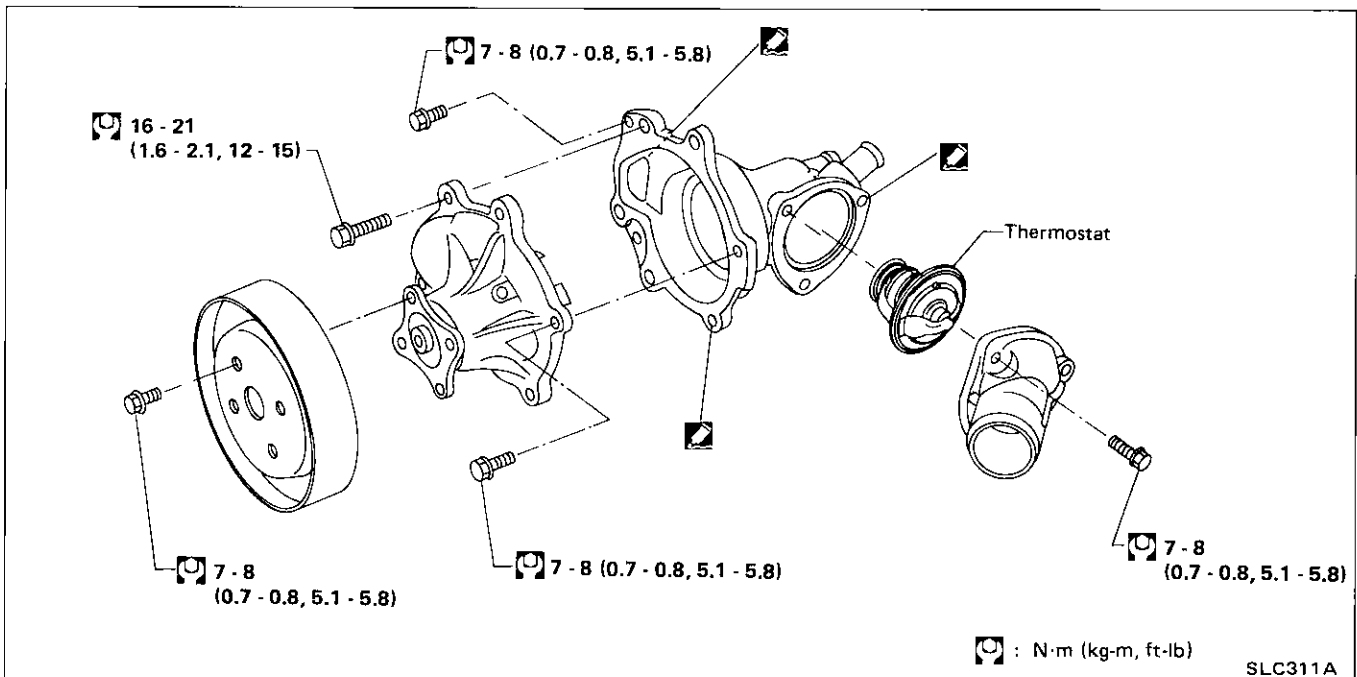
**Radiator cap relief pressure:**  
78 - 98 kPa (0.8 - 1.0 kg/cm<sup>2</sup>, 11 - 14 psi)



## Water Pump

## REMOVAL AND INSTALLATION

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

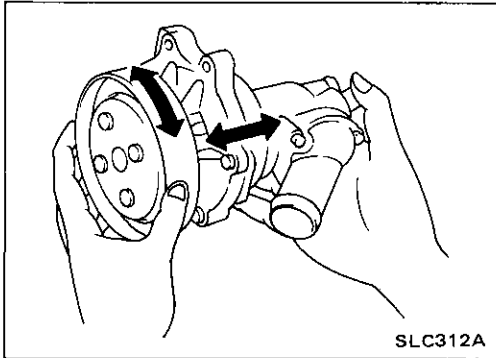


## ENGINE COOLING SYSTEM

### Water Pump (Cont'd)

#### CAUTION:

- When removing water pump assembly, be careful not to get coolant on timing belt.
- Water pump cannot be disassembled and should be replaced as a unit.
- To avoid damaging timing cover, make sure there is adequate clearance between it and the hose clamp.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.



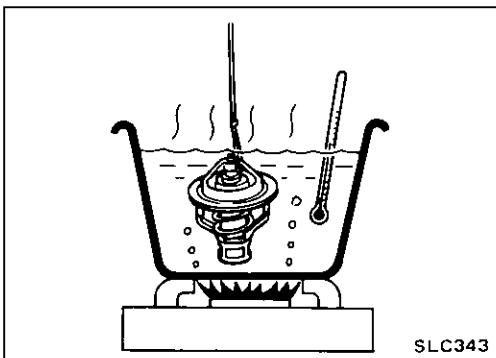
#### INSPECTION

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

### Thermostat

#### INSPECTION

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



2. Check valve opening temperature and maximum valve lift.

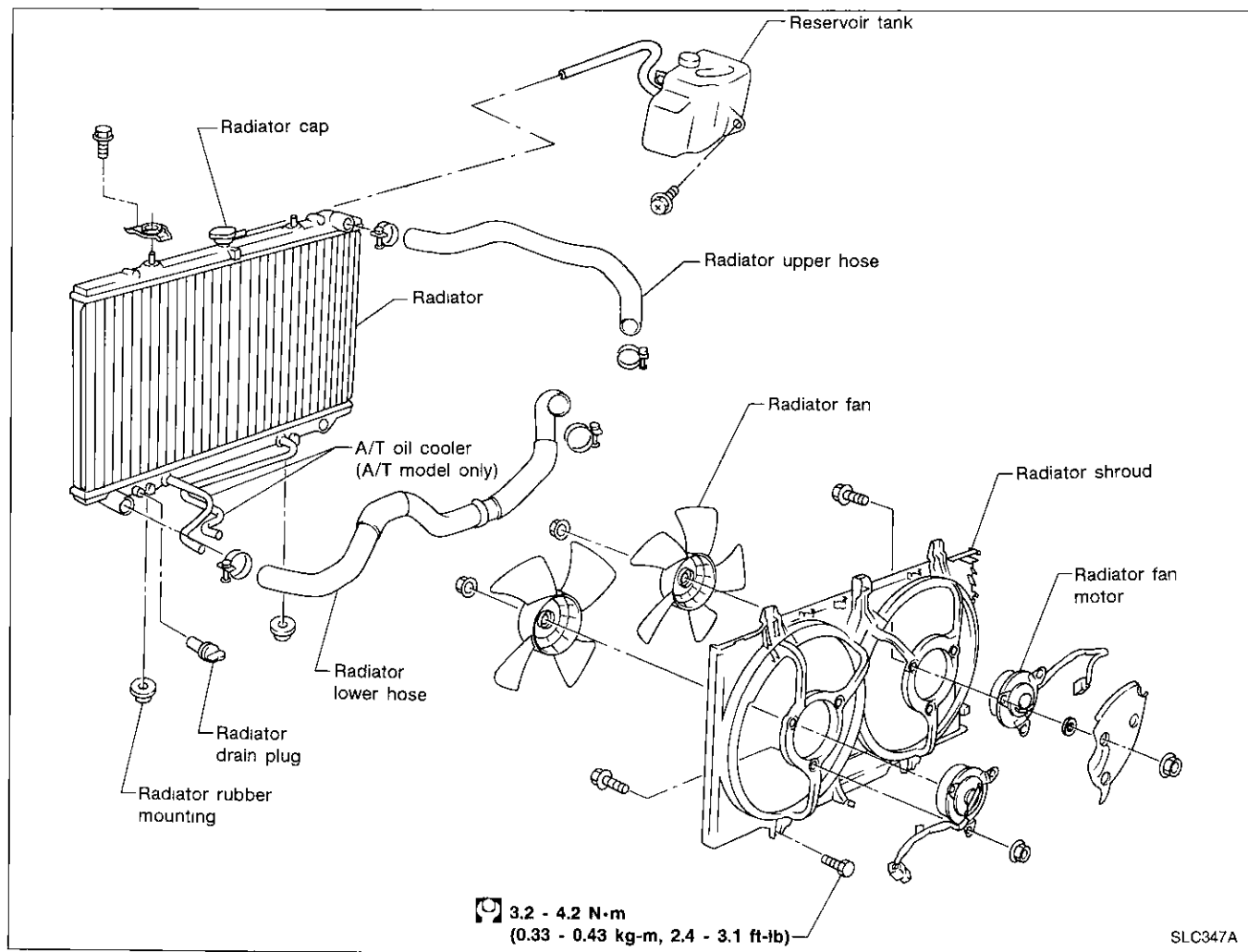
|                           |               | Standard        |
|---------------------------|---------------|-----------------|
| Valve opening temperature | °C (°F)       | 76.5 (170)      |
| Maximum valve lift        | mm/°C (in/°F) | 8/90 (0.31/194) |

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.

# ENGINE COOLING SYSTEM

## Radiator

### REMOVAL AND INSTALLATION



## Electric Cooling Fan Control System

Radiator fan and condenser fan are both controlled by E.C.C.S. control unit.

For details, refer to EF & EC section.



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

## Engine Lubrication System

### Oil pressure check

| Engine rpm | Approximate discharge pressure<br>kPa (kg/cm <sup>2</sup> , psi) |
|------------|------------------------------------------------------------------|
| Idle speed | More than 78 (0.8, 11)                                           |
| 3,000      | 412 - 481 (4.2 - 4.9, 60 - 70)                                   |

### Oil pump



OUTER GEAR



INNER GEAR

SLC573

Unit: mm (in)

| Height | H <sub>1</sub> | H <sub>2</sub> |
|--------|----------------|----------------|
|        | 11.5 (0.453)   | 17.25 (0.6791) |

Unit: mm (in)

|                                        |                               |
|----------------------------------------|-------------------------------|
| Body to outer gear clearance ①         | 0.11 - 0.20 (0.0043 - 0.0079) |
| Inner gear to crescent clearance ②     | 0.22 - 0.33 (0.0087 - 0.0130) |
| Outer gear to crescent clearance ③     | 0.21 - 0.32 (0.0083 - 0.0126) |
| Housing to inner gear side clearance ④ | 0.05 - 0.09 (0.0020 - 0.0035) |
| Housing to outer gear side clearance ⑤ | 0.05 - 0.11 (0.0020 - 0.0043) |

## Engine Cooling System

### Thermostat

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

### Radiator

Unit: kPa (kg/cm<sup>2</sup>, psi)

|                       |                              |
|-----------------------|------------------------------|
| Cap relief pressure   | 78 - 98 (0.8 - 1.0, 11 - 14) |
| Leakage test pressure | 98 (1.0, 14)                 |



# ENGINE FUEL & EMISSION CONTROL SYSTEM

## SECTION **EF & EC**

**EF & EC**

### CONTENTS

|                                                                |             |
|----------------------------------------------------------------|-------------|
| PREPARATION .....                                              | EF & EC- 2  |
| PRECAUTIONS .....                                              | EF & EC- 3  |
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| ENGINE AND EMISSION CONTROL PARTS DESCRIPTION .....            | EF & EC- 12 |
| ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION .....           | EF & EC- 18 |
| IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION ..... | EF & EC- 29 |
| TROUBLE DIAGNOSES .....                                        | EF & EC- 34 |
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| EVAPORATIVE EMISSION CONTROL SYSTEM .....                      | EF & EC-196 |
| CRANKCASE EMISSION CONTROL SYSTEM .....                        | EF & EC-198 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....                 | EF & EC-199 |

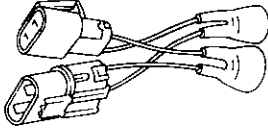
**When you read wiring diagrams:**

- 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 TOOL

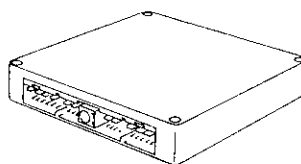
| Tool number<br>(Kent-Moore No.)<br>Tool name            | Description                                                                                              |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| EG11160000<br>( — )<br>Ignition coil adapter<br>harness |  Measuring engine speed |

## PRECAUTIONS

### E.C.U.

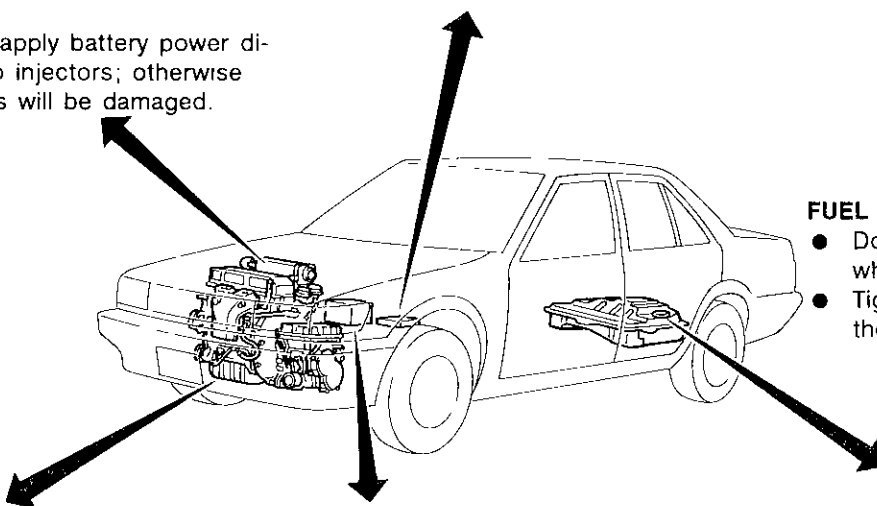
- Do not disassemble E.C.C.S. control unit. (E.C.U.)
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. will now start to self-control at its initial value. Engine operation can vary slightly when the terminal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

- Do not apply undue force to mounting bracket.
- Before connecting or disconnecting E.C.U. connector, make sure red and green LEDs are off after turning ignition key off.
- Always install the properly specified E.C.U. on car; otherwise, erroneous engine operation may result.



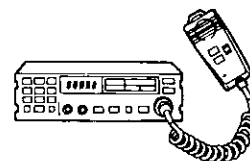
### INJECTOR

- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors; otherwise injectors will be damaged.



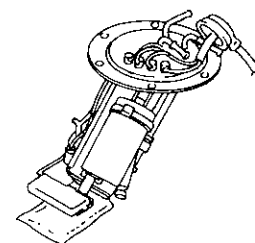
### WIRELESS EQUIPMENT

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

- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with detergent.
- Do not jolt or jar the crank angle sensor.
- Even a slight leak in the air intake system can cause serious problems.
- Do not disassemble auxiliary air control valve.

### BATTERY

- Always use a 12 volt battery as a power source.
- Do not disconnect battery cables while the engine is running.
- Do not reverse polarity of battery when connecting it. Otherwise, E.C.U. and/or injectors may be burned.



### WHEN STARTING

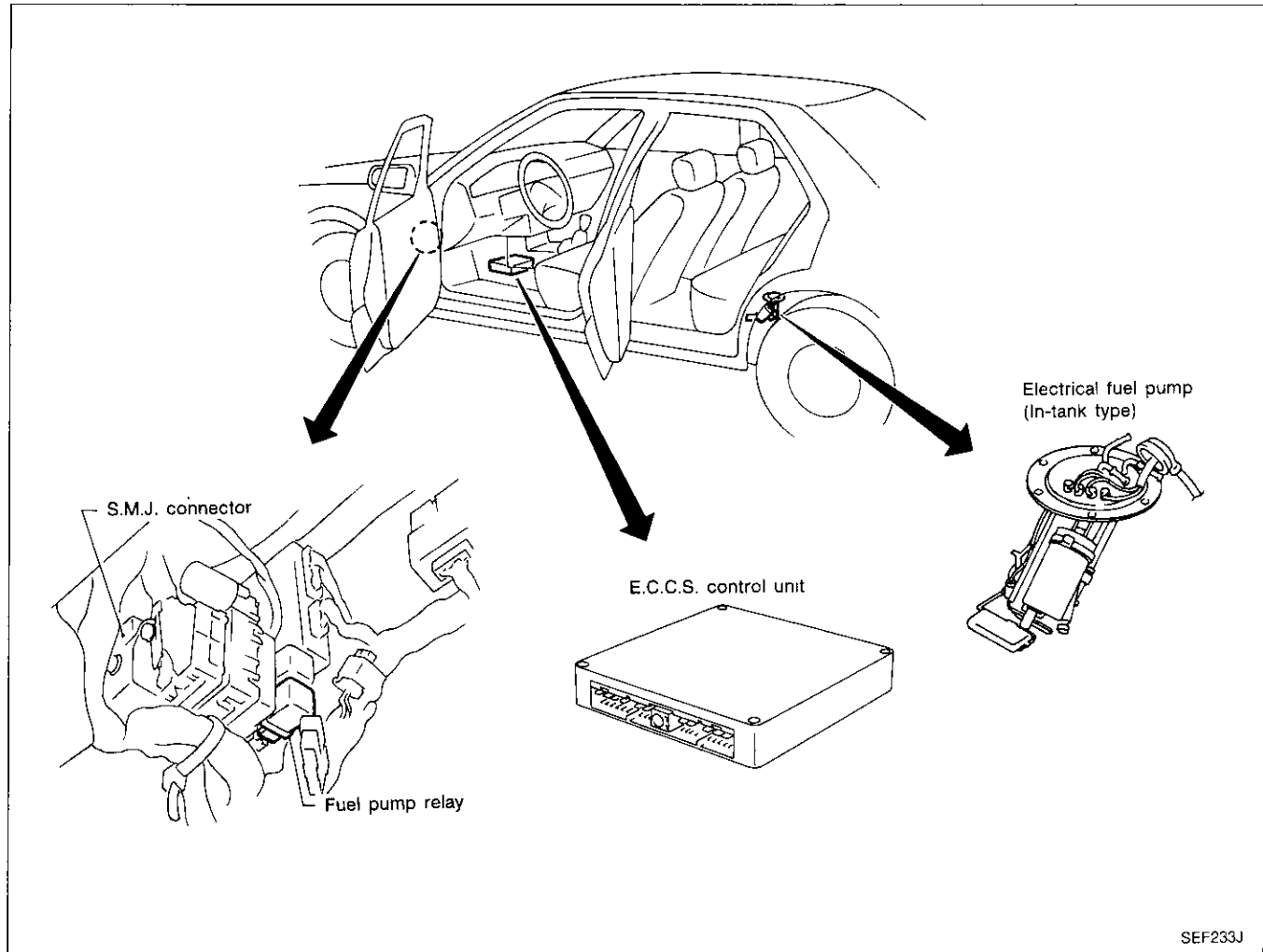
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

### E.C.C.S. HARNESS HANDLING

- Securely connect E.C.C.S. harness connectors. A poor connection can cause extremely high voltage to develop in the coil and condenser, 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.

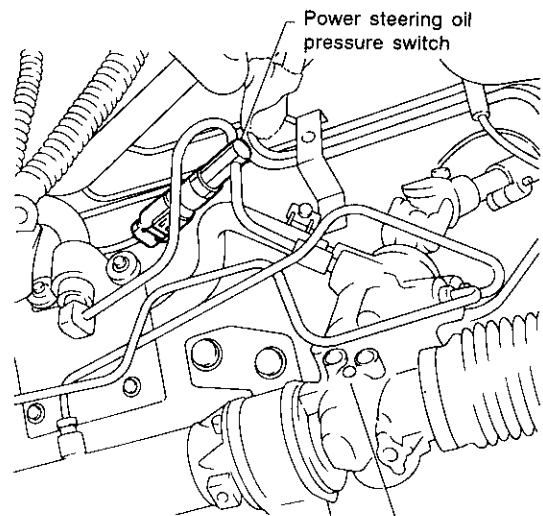
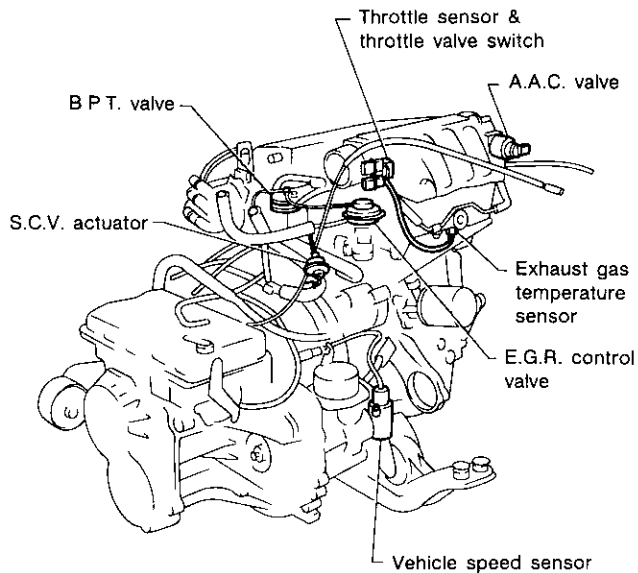
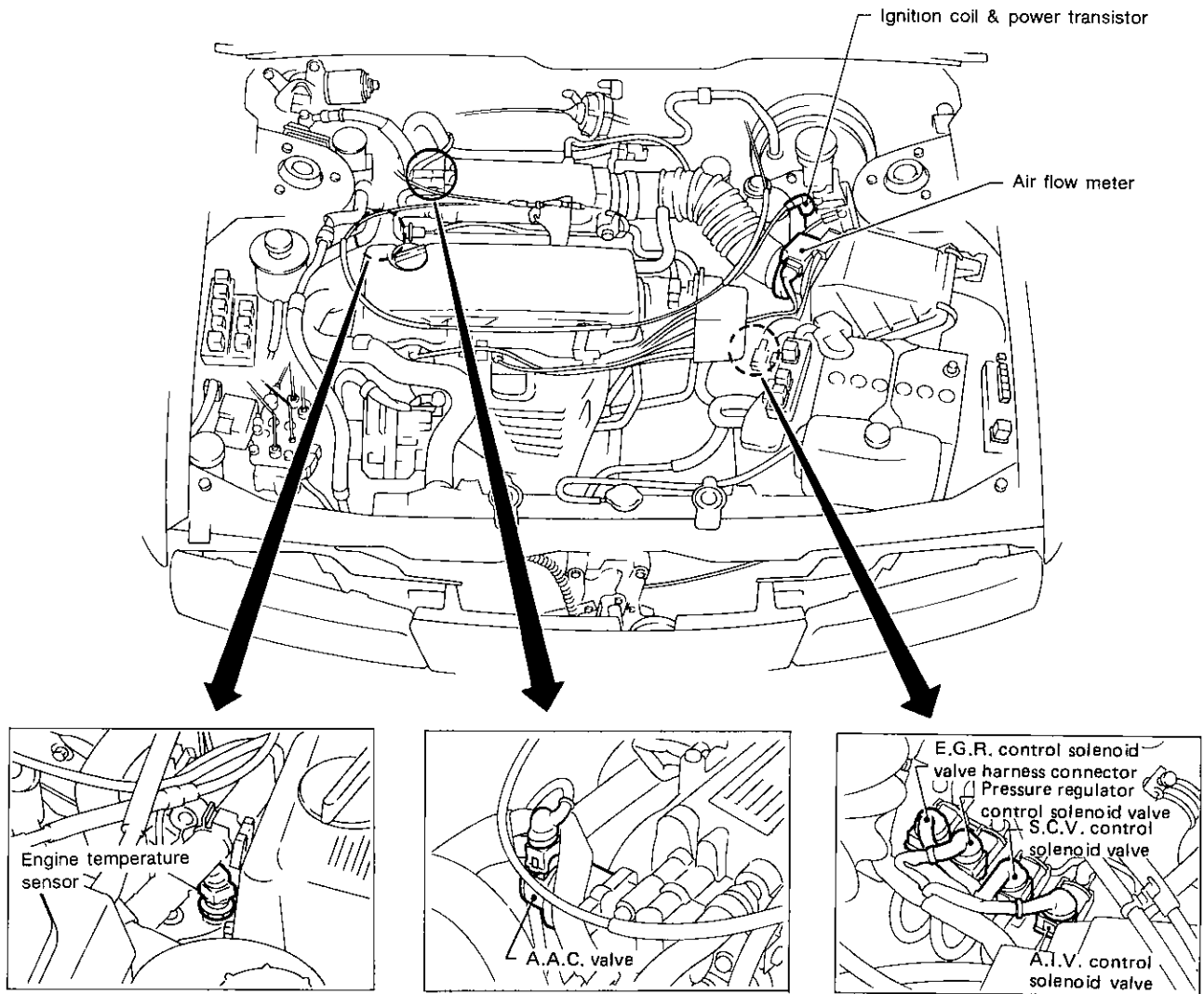
# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

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



# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

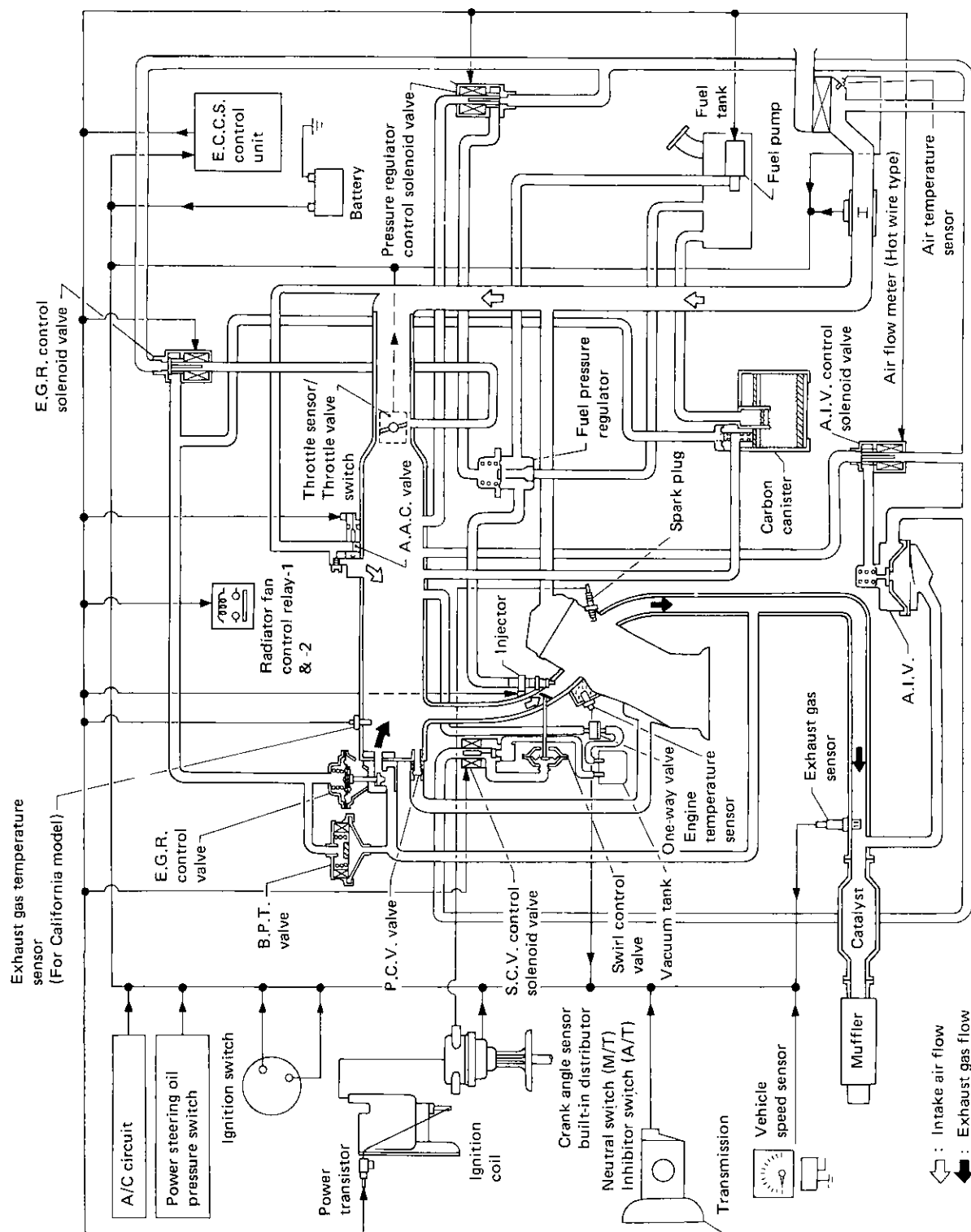
## E.C.C.S. Component Parts Location (Cont'd)



SEF234J

# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

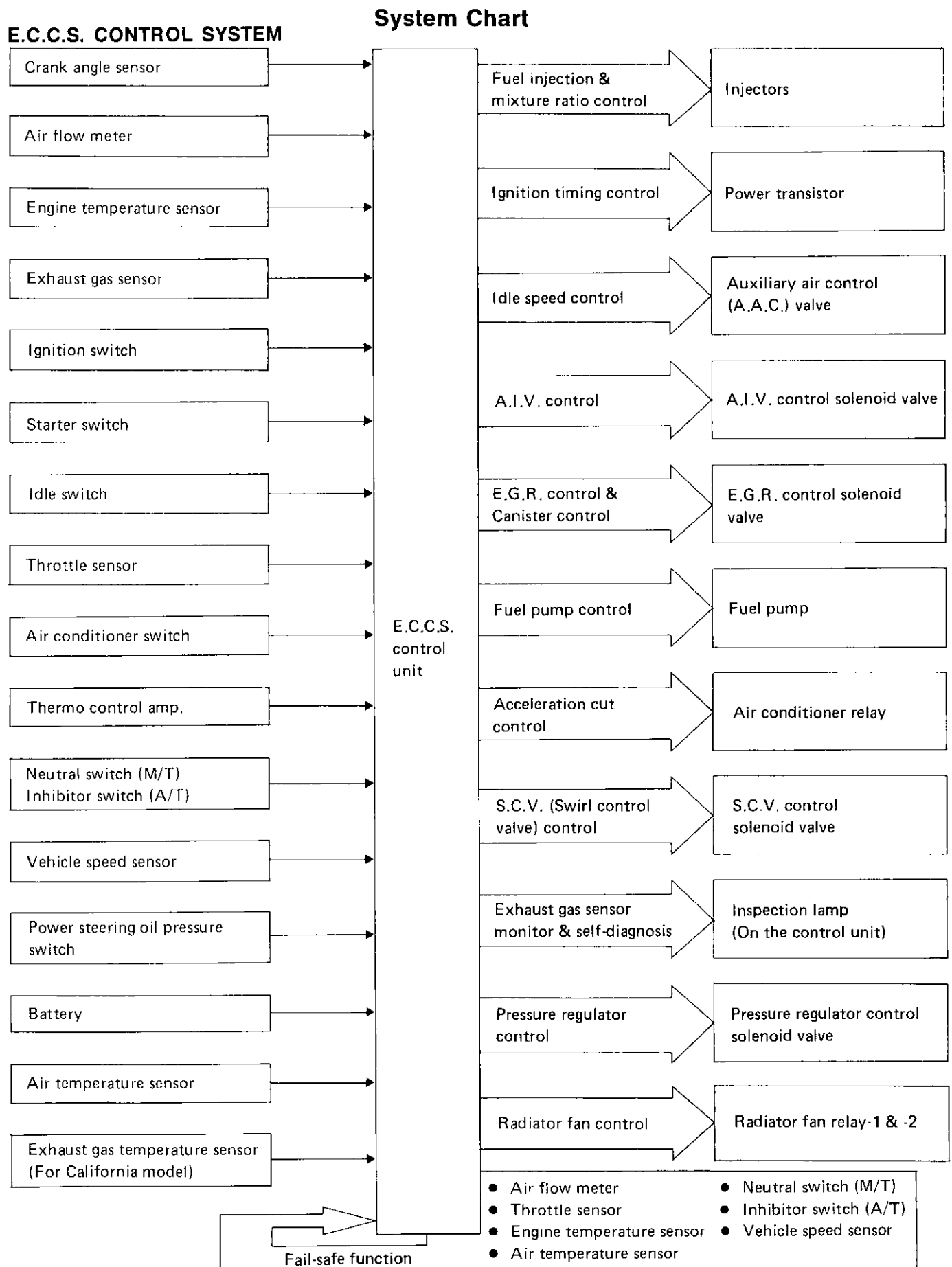
## System Diagram



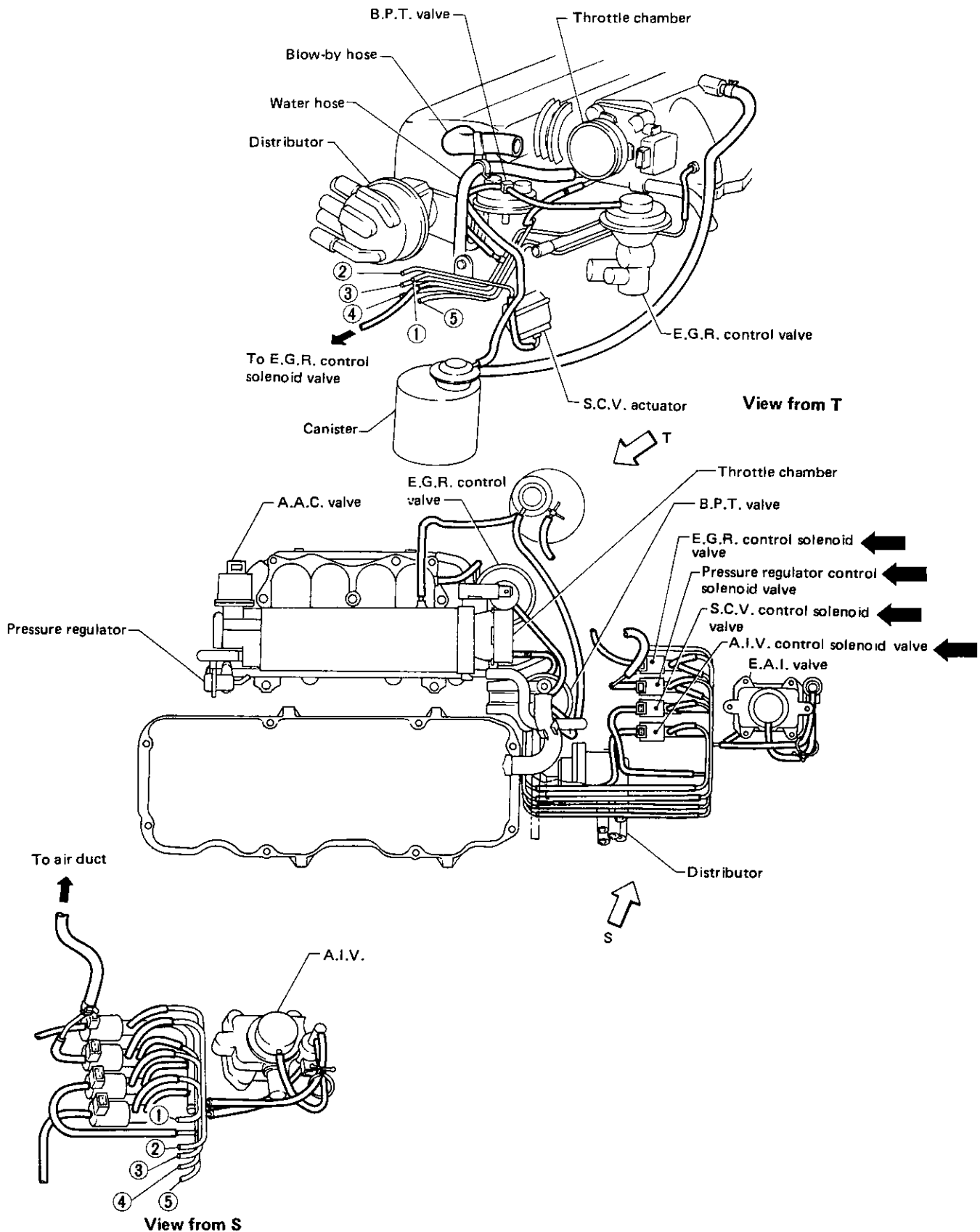
SEF405J



# ENGINE AND EMISSION CONTROL OVERALL SYSTEM



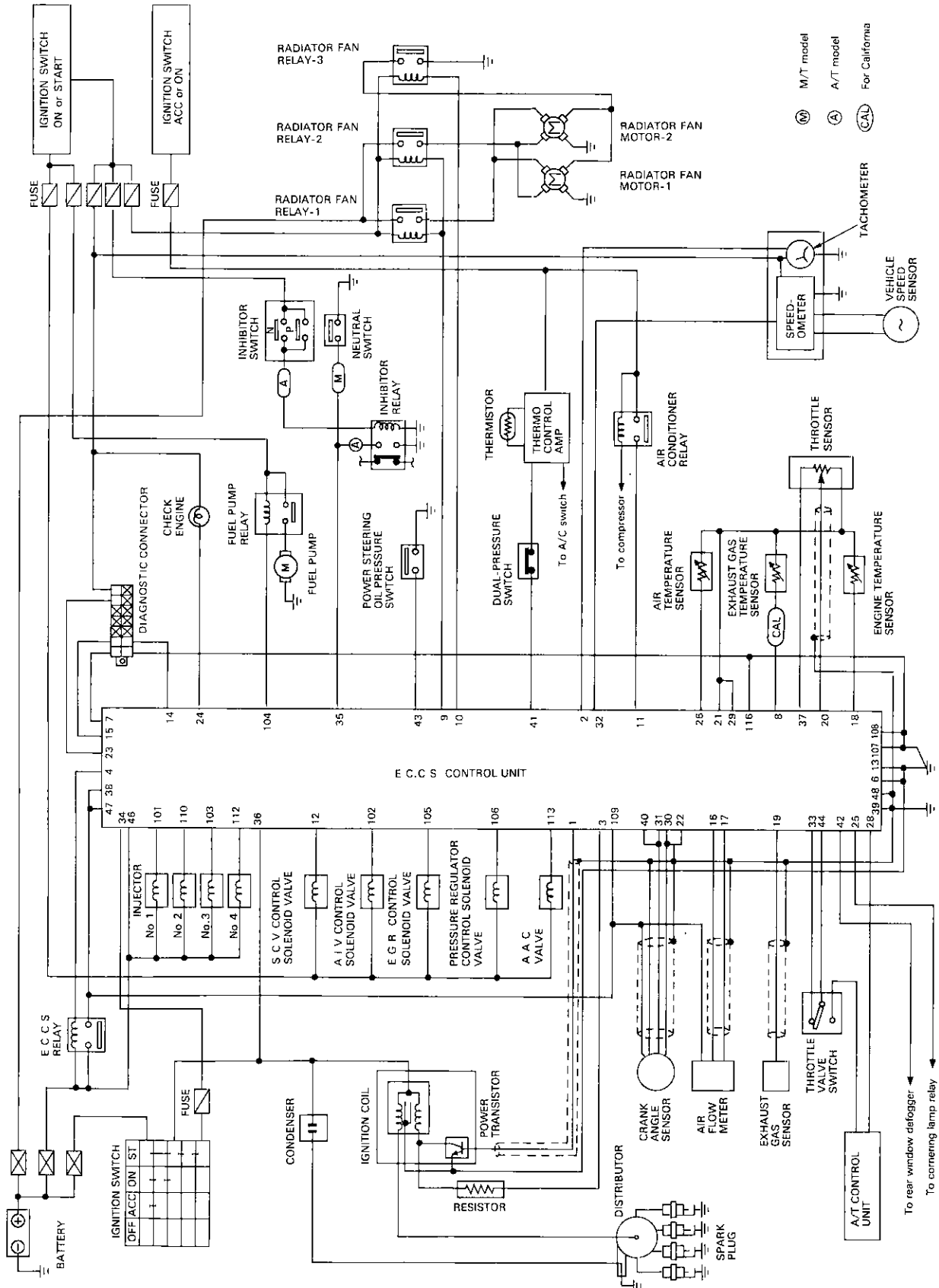
## Vacuum Hose Drawing



SEF412J

# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

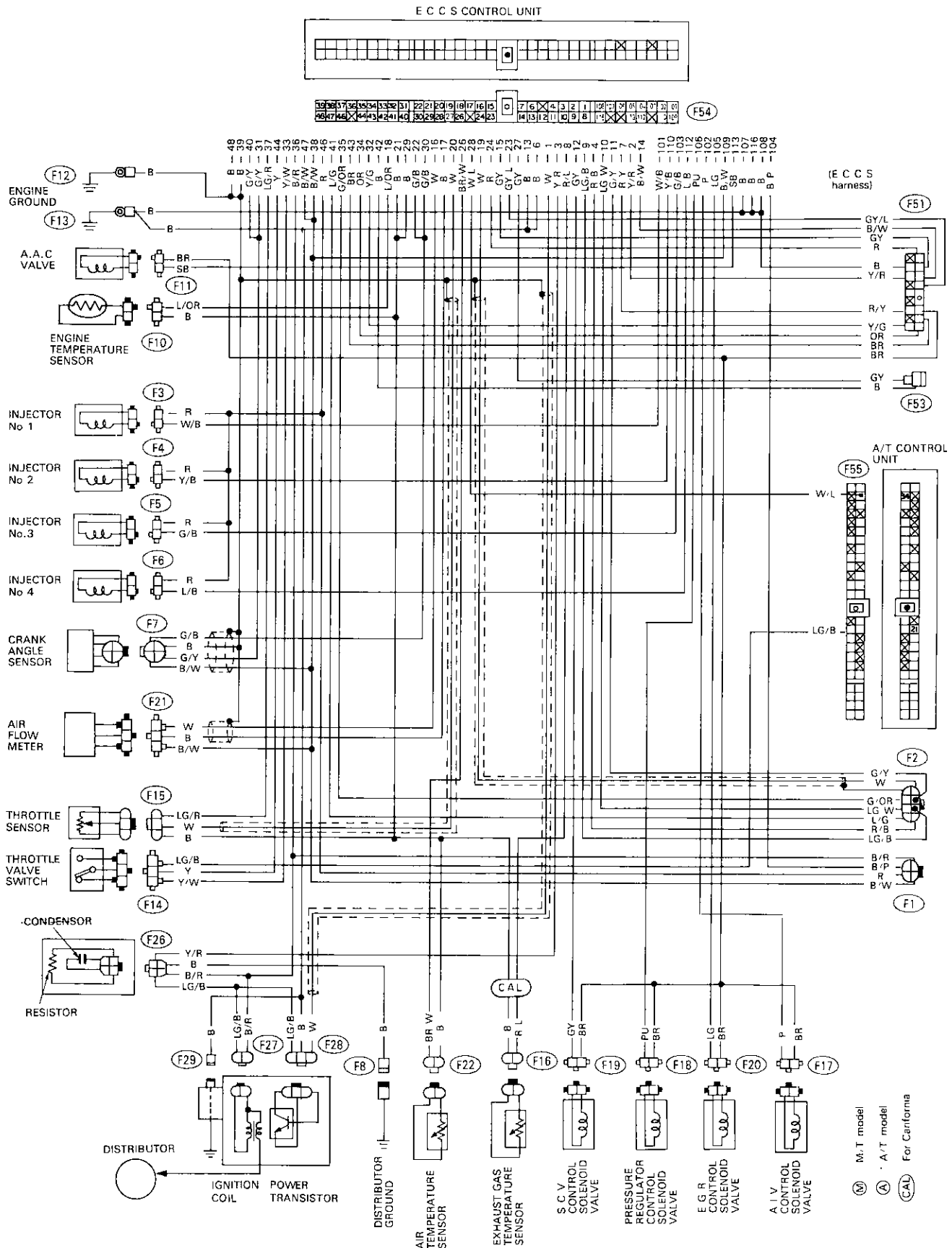
## Circuit Diagram



SEF8971

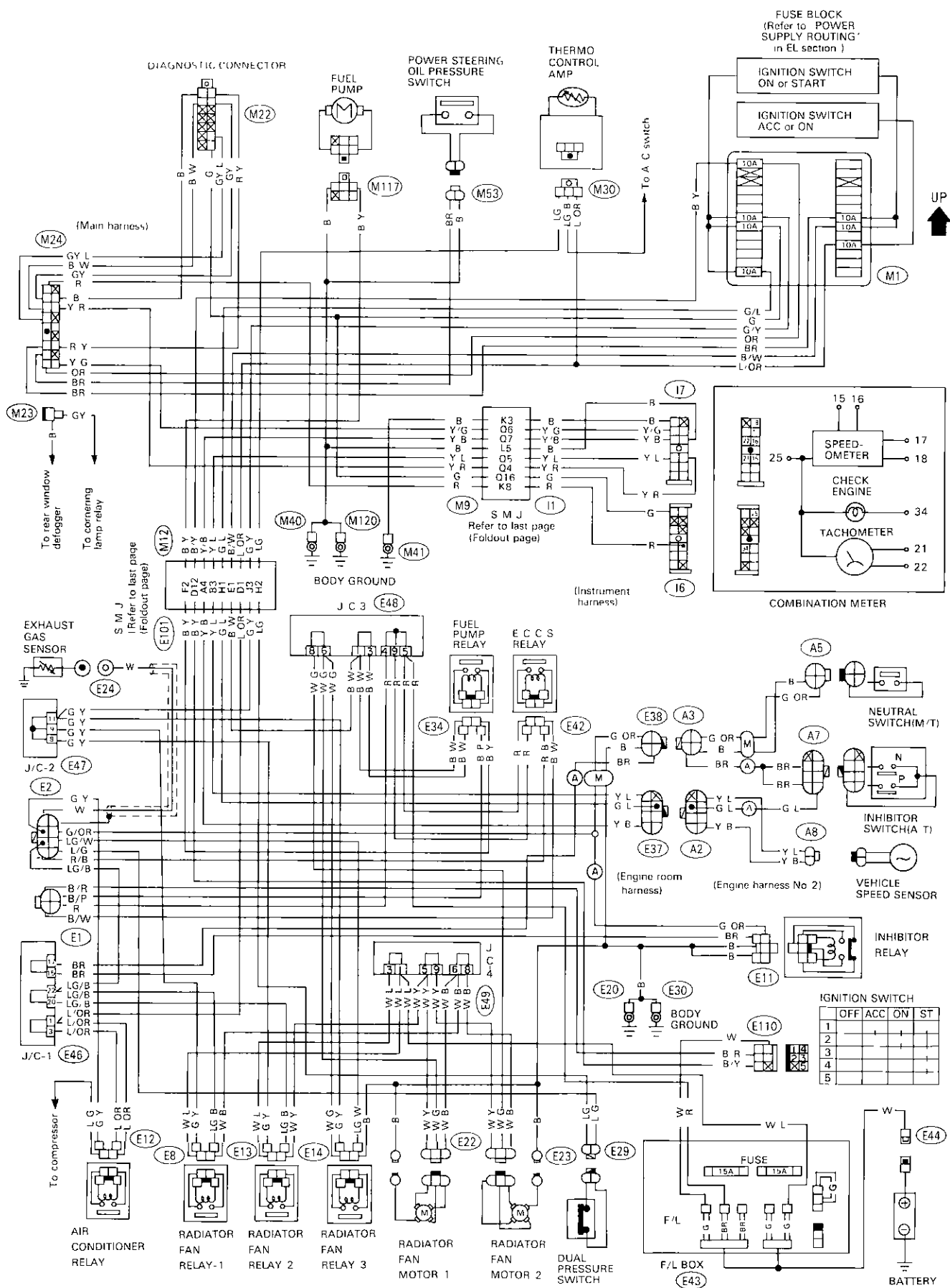
# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

## Wiring Diagram

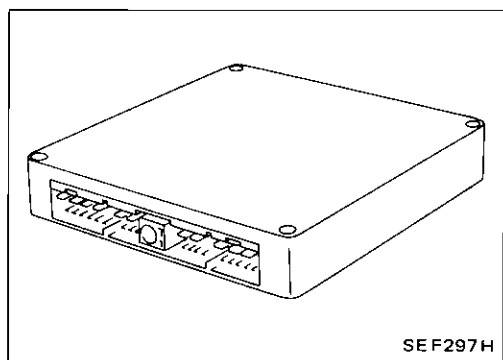


# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

## Wiring Diagram (Cont'd)

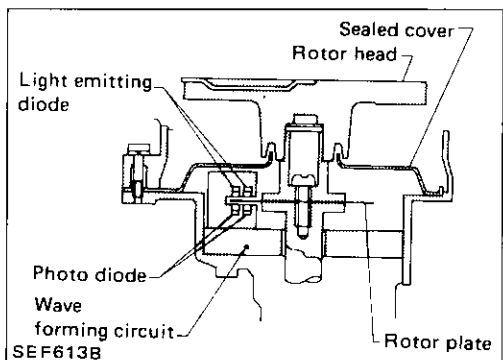


SEM965K



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

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

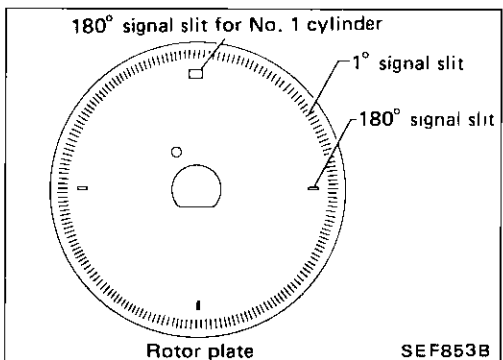


## Crank Angle Sensor

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

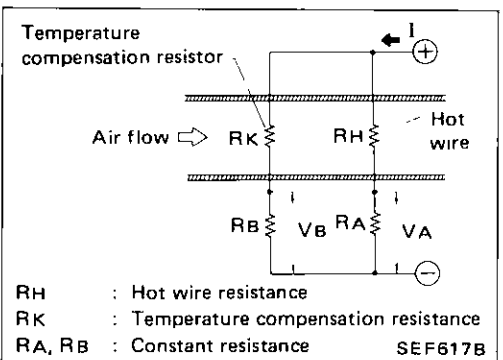
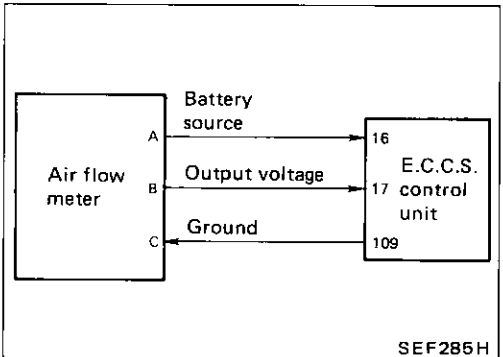
The crank angle sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (L.E.D.) and photo diodes are built in the wave-forming circuit.

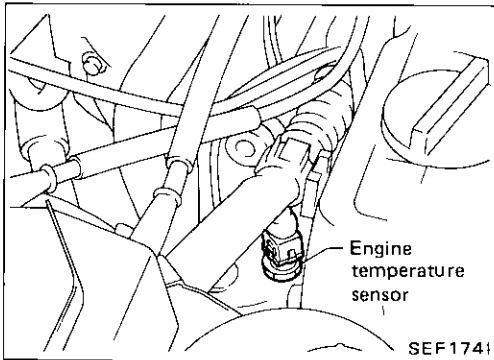
When the rotor plate passes between the L.E.D. and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the L.E.D. This generates rough-shaped pulses which are converted into on-off signals by the wave-forming circuit, which are then sent to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



## Air Flow Meter

The air flow meter measures the mass flow rate of intake air. Measurements are made so that the control circuit will emit an electrical output signal corresponding to the amount of heat dissipated from a hot wire placed in the stream of intake air. The airflow past the hot wire removes the heat from the hot wire. The temperature of the hot wire is very sensitive to the mass flow rate. The higher the temperature of the hot wire, the greater its resistance value. This temperature change (resistance) is determined by the mass air flow rate. The control circuit accurately regulates current ( $I$ ) in relation to the varying resistance value ( $R_H$ ) so that  $V_A$  always equals  $V_B$ . The air flow meter transmits a voltage value  $V_A$  to the control unit where the output is converted into an intake air signal.

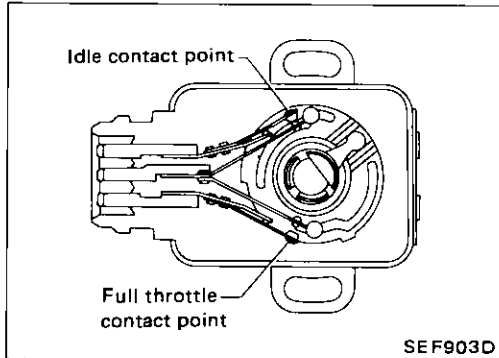




## Engine Temperature Sensor

The engine temperature sensor detects the engine temperature, which is dependent on engine coolant temperature, and transmits a signal to the E.C.U.

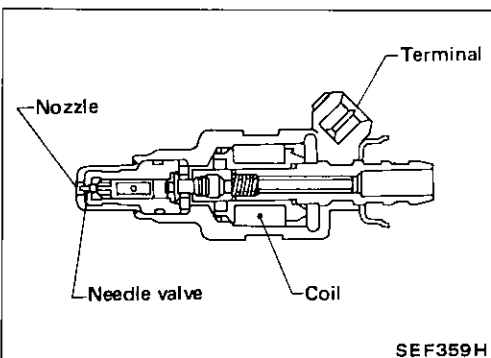
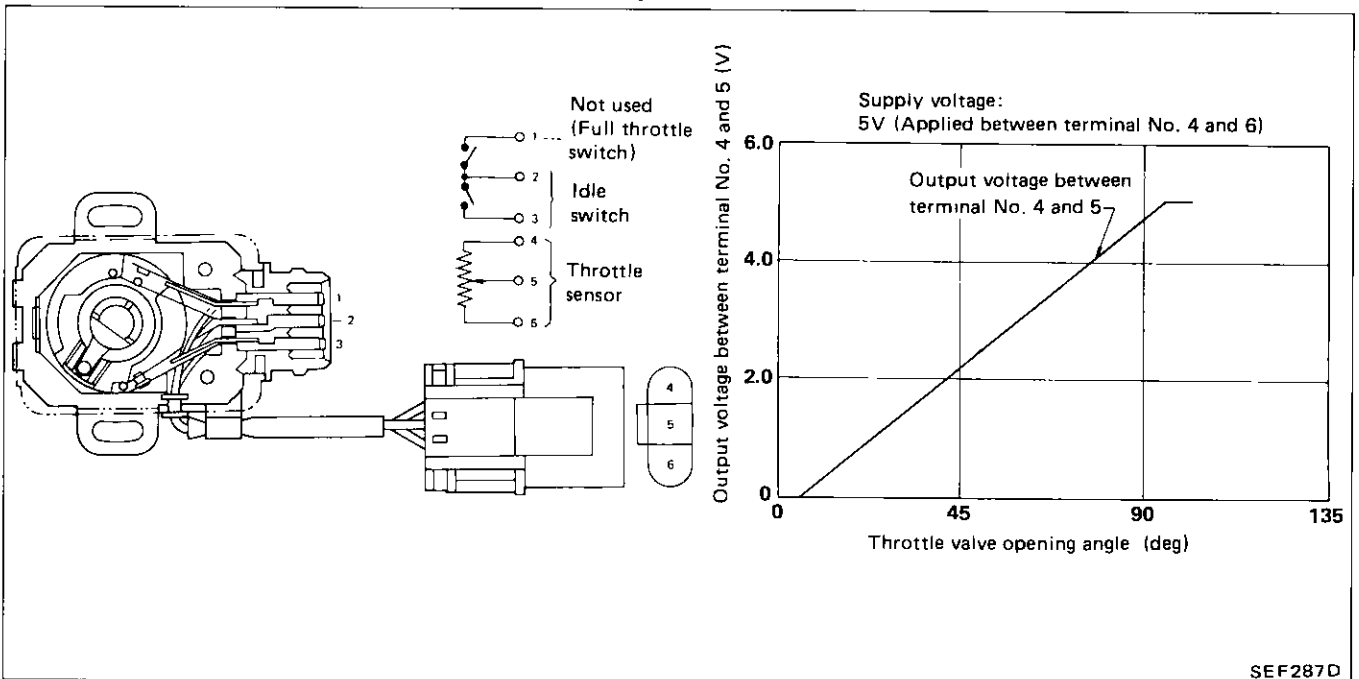
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



## Throttle Sensor & Soft/Hard Idle Switch

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

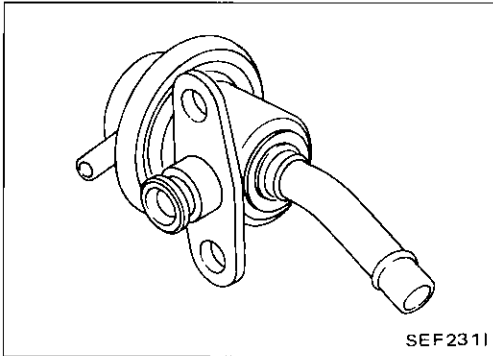
Idle position of the throttle valve is determined by the E.C.U. receiving the signal from the throttle sensor. This system is called "soft idle switch" and controls engine operation such as fuel cut. On the other hand, "hard idle switch", which is built in the throttle sensor unit, is used not for engine control but for self-diagnosis.



## Fuel Injector

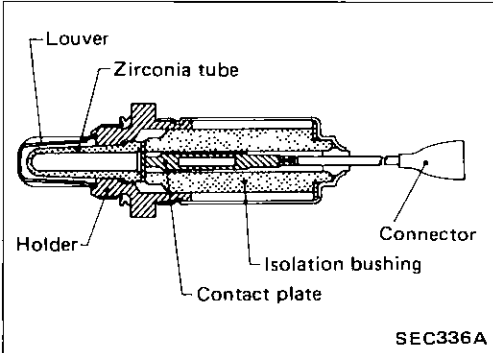
The fuel injector is a small, elaborate solenoid valve. As the E.C.U. sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the E.C.U. in terms of injection pulse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

Brass wire is used in the injector coil and thus the resistance is higher than a conventional injector.



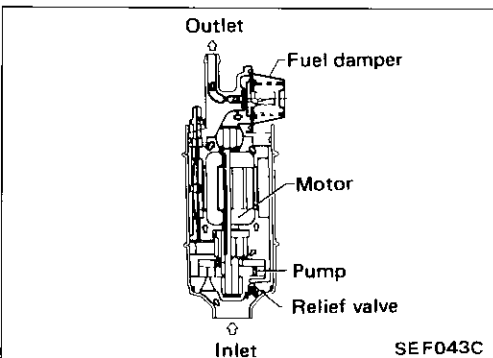
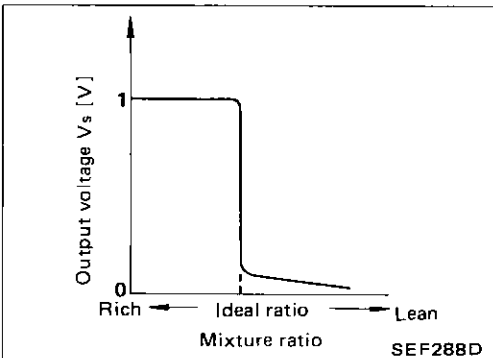
## Pressure Regulator

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



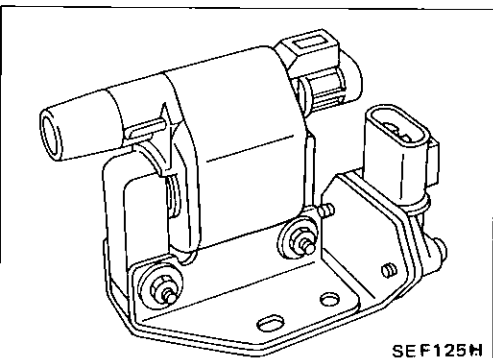
## Exhaust Gas Sensor

The exhaust gas sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas. The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve the 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.



## Fuel Pump

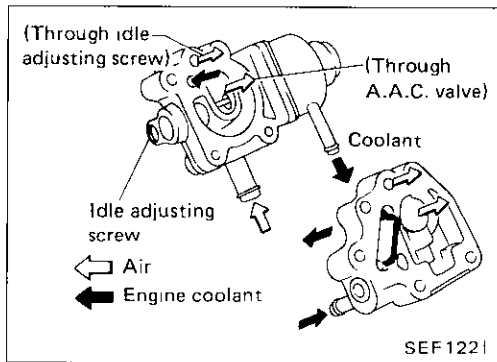
The fuel pump with a fuel damper is a submergible type, and are located in the fuel tank.



## Power Transistor

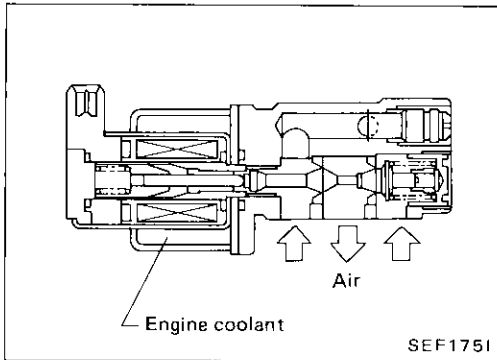
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.





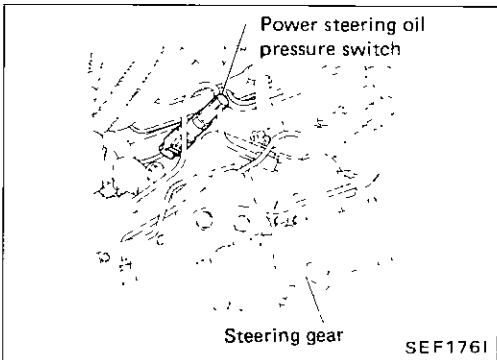
## Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the A.A.C. valve and air cut valve. It receives the signal from the E.C.U. and controls the idle speed at the preset value under various conditions. The air cut valve prevents an abnormal rise of idle rpm when A.A.C. valve operates abnormally.



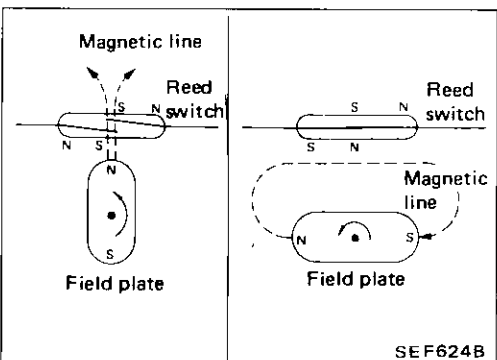
## Auxiliary Air Control (A.A.C.) Valve

The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse. The longer that ON pulse is received, the larger the amount of air that will flow through the A.A.C. valve. This air flow also varies with the temperature of the engine coolant flowing through the A.A.C. valve. The higher the coolant temperature, the less the amount of air flow.



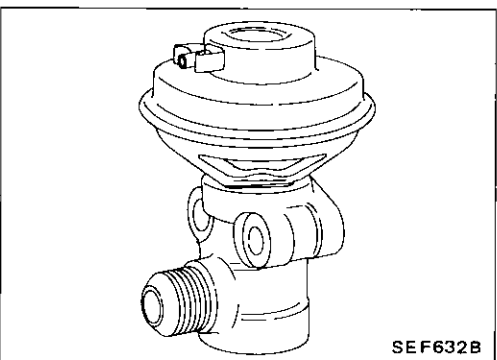
## Power Steering Oil Pressure Switch

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.



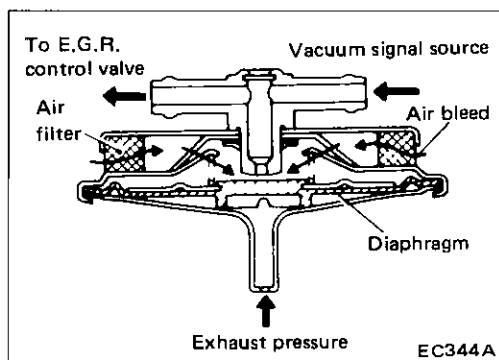
## Vehicle Speed Sensor

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 on the transmission unit and transforms vehicle speed into a pulse signal.



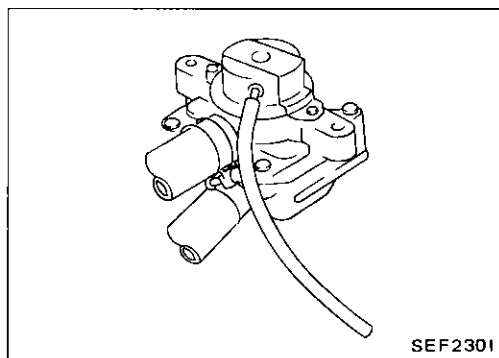
## E.G.R. Control Valve

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



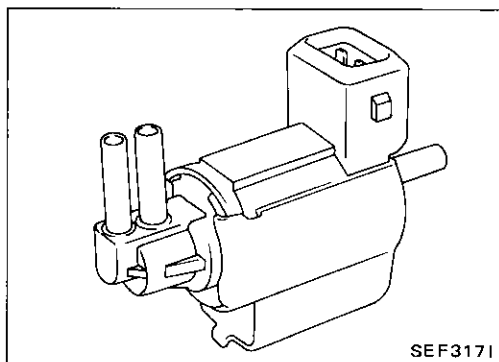
### B.P.T. Valve

The B.P.T. valve monitors exhaust pressure to activate the diaphragm, controlling throttle chamber vacuum applied to the E.G.R. control valve. In other words, recirculated exhaust gas is controlled in response to positioning of the E.G.R. control valve or to engine operation.



### 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 air cleaner.



### A.I.V. Control Solenoid Valve

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

### E.G.R. Control Solenoid Valve

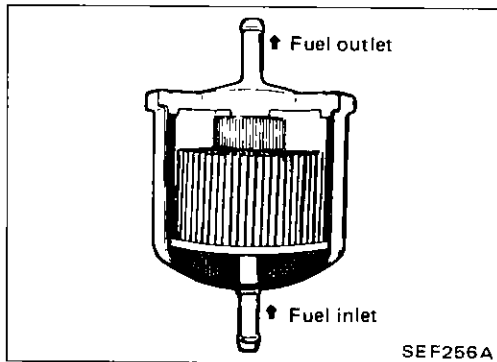
The E.G.R. system is controlled only by the E.C.U. At both low- and high-speed engine revolutions, the solenoid valve turns on and accordingly the E.G.R. valve cuts the exhaust gas leading to the intake manifold.

### Pressure Regulator (P.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.

### S.C.V. Control Solenoid Valve

The S.C.V. control solenoid valve cuts the intake manifold vacuum signal for swirl control valve. It responds to the ON/OFF signal from the E.C.U. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the control unit sends an ON signal the coil pulls the plunger and feeds the vacuum signal to the swirl control valve actuator.



### Fuel Filter

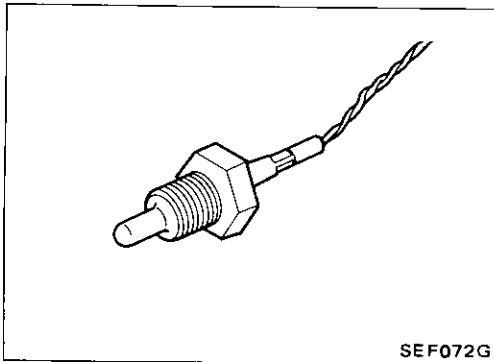
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.

### 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.

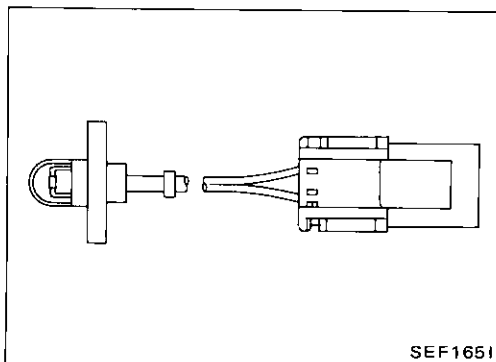
The vacuum in the intake passage upstream of the throttle valve increases in response to the amount of the intake air.

When the vacuum of the intake passage is higher than a preset value, the 2nd purge control valve opens and the absorbed gases are sucked into the intake passage for combustion purposes.



### Exhaust Gas Temperature Sensor (For California model)

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



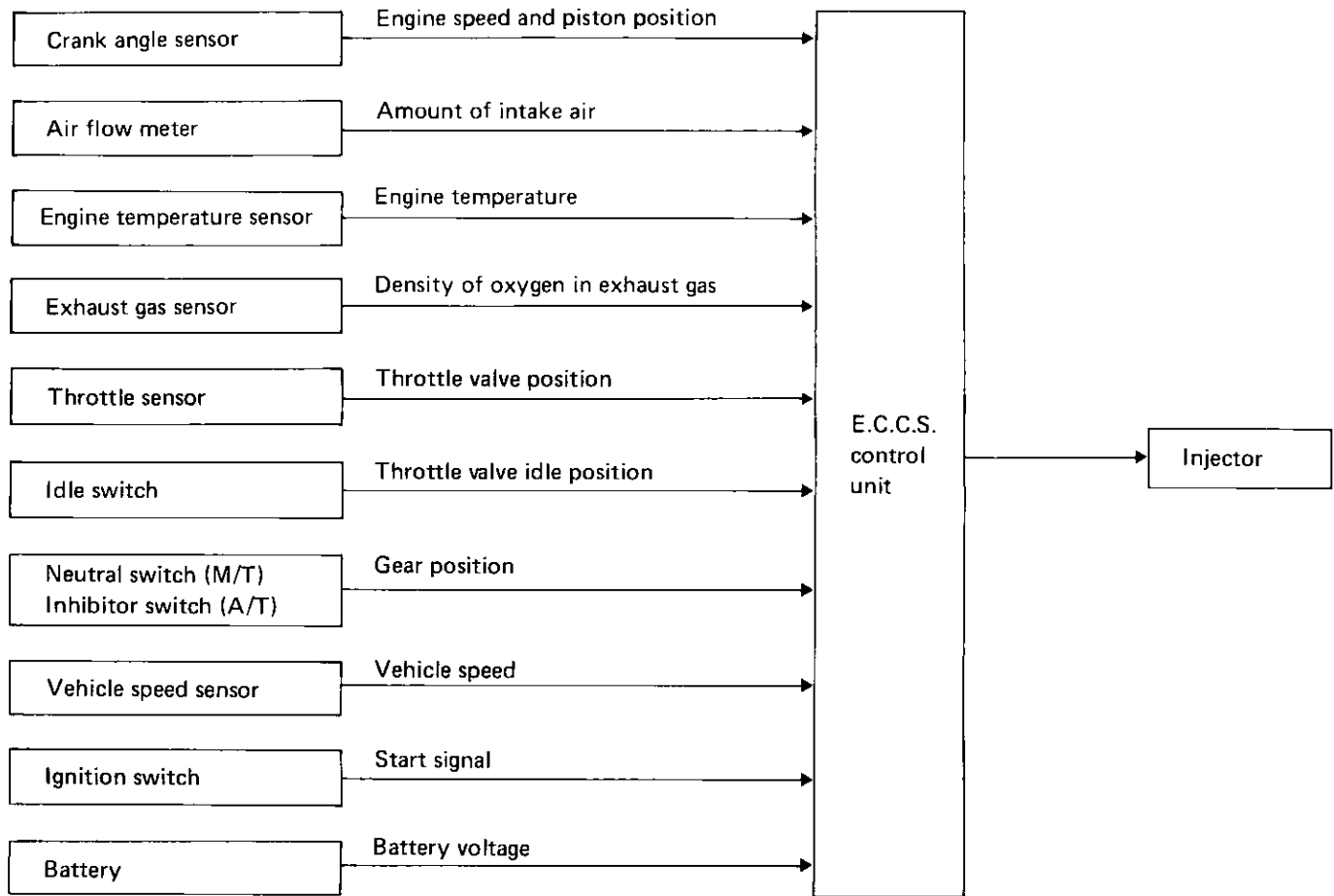
### Air Temperature Sensor

The air temperature sensor controls ignition timing when the temperature of the intake air is extremely high, in order not to cause knocking.

# ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

## 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 programmable value mapped in the E.C.U. ROM memory. In other words, the programmable 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

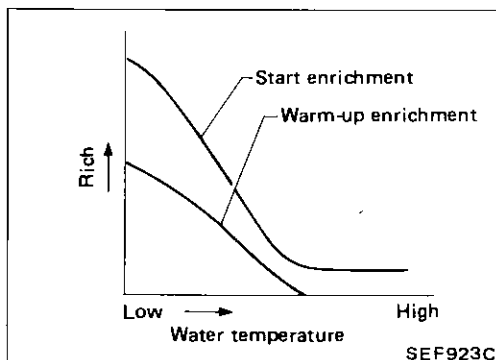
In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below:

<Fuel increase>

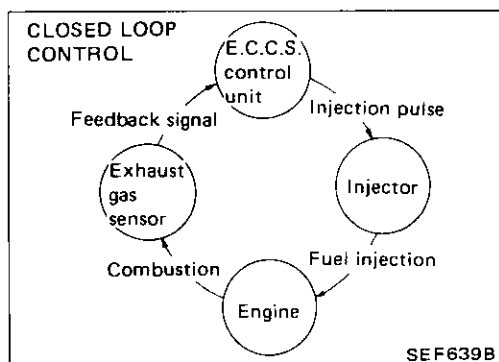
- 1) During warm-up
- 2) When starting the engine
- 3) During acceleration
- 4) Hot-engine operation

<Fuel decrease>

- 1) During deceleration



## ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION



### Fuel Injection Control (Cont'd)

#### MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NO<sub>x</sub> 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.

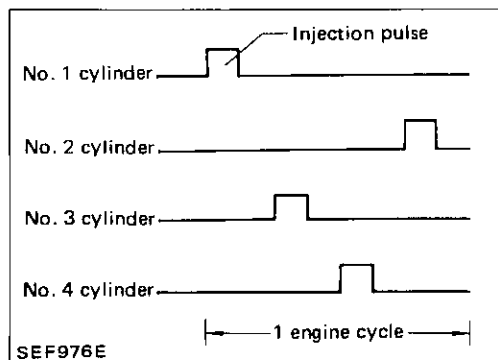
This stage refers to the closed-loop control condition. The open-loop control condition refers to that under which the E.C.U. detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

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

#### MIXTURE RATIO SELF-LEARNING CONTROL

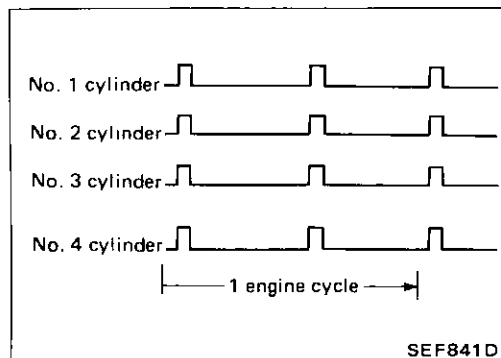
The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the exhaust gas sensor. This feedback signal is then sent to the E.C.U. to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., air flow meter hot 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 quantitatively monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.



#### FUEL INJECTION TIMING

Fuel is injected once a cycle for each cylinder in the firing order.



When engine starts, fuel is injected into all four cylinders simultaneously twice a cycle.

## ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

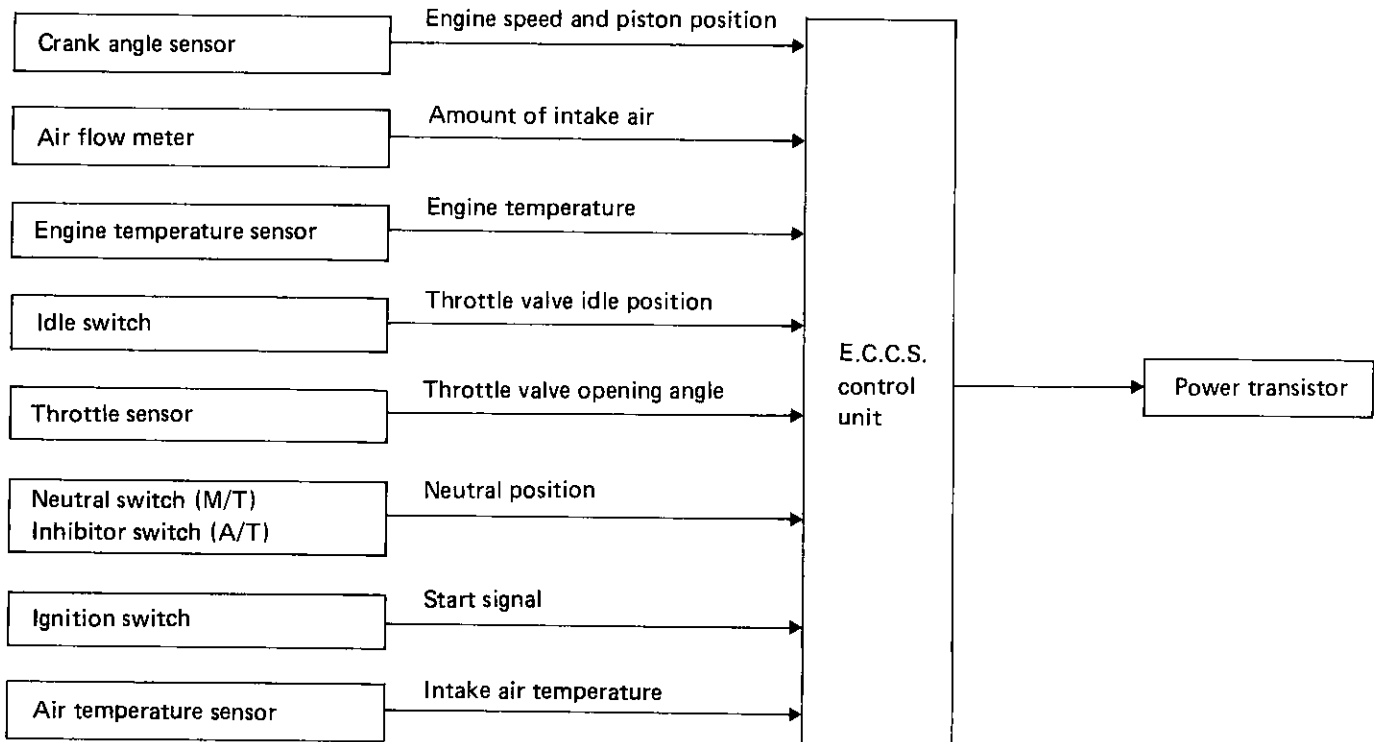
### Fuel Injection Control (Cont'd)

#### FUEL SHUT-OFF

Fuel to all cylinders is cut off during deceleration or high-speed operation.

### Ignition Timing Control

#### INPUT/OUTPUT SIGNAL LINE



# ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

## Ignition Timing Control (Cont'd)

### SYSTEM DESCRIPTION

The ignition timing is controlled by the E.C.U. in order to maintain the best air-fuel ratio in response to every running condition of the engine. The ignition timing data is stored in the ROM located in the E.C.U., in the form of the map shown below.

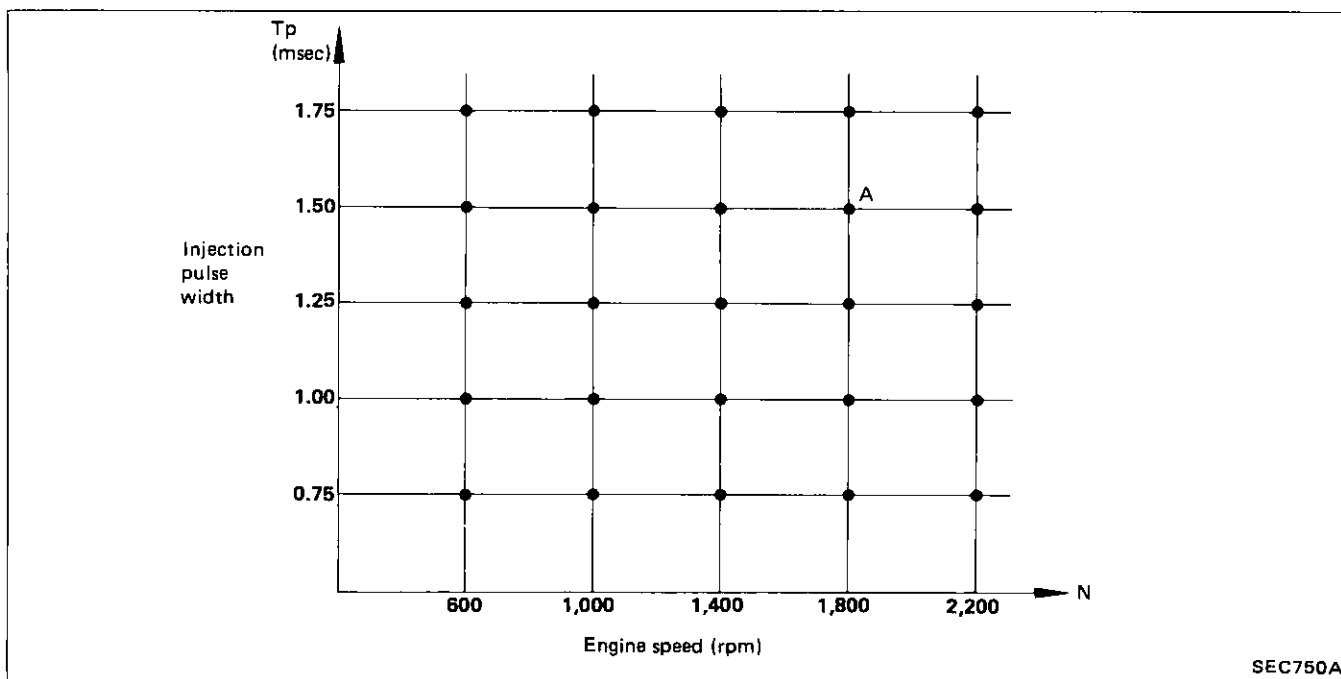
The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

e.g. N: 1,800 rpm, Tp: 1.50 msec  
A °B.T.D.C.

In addition to this,

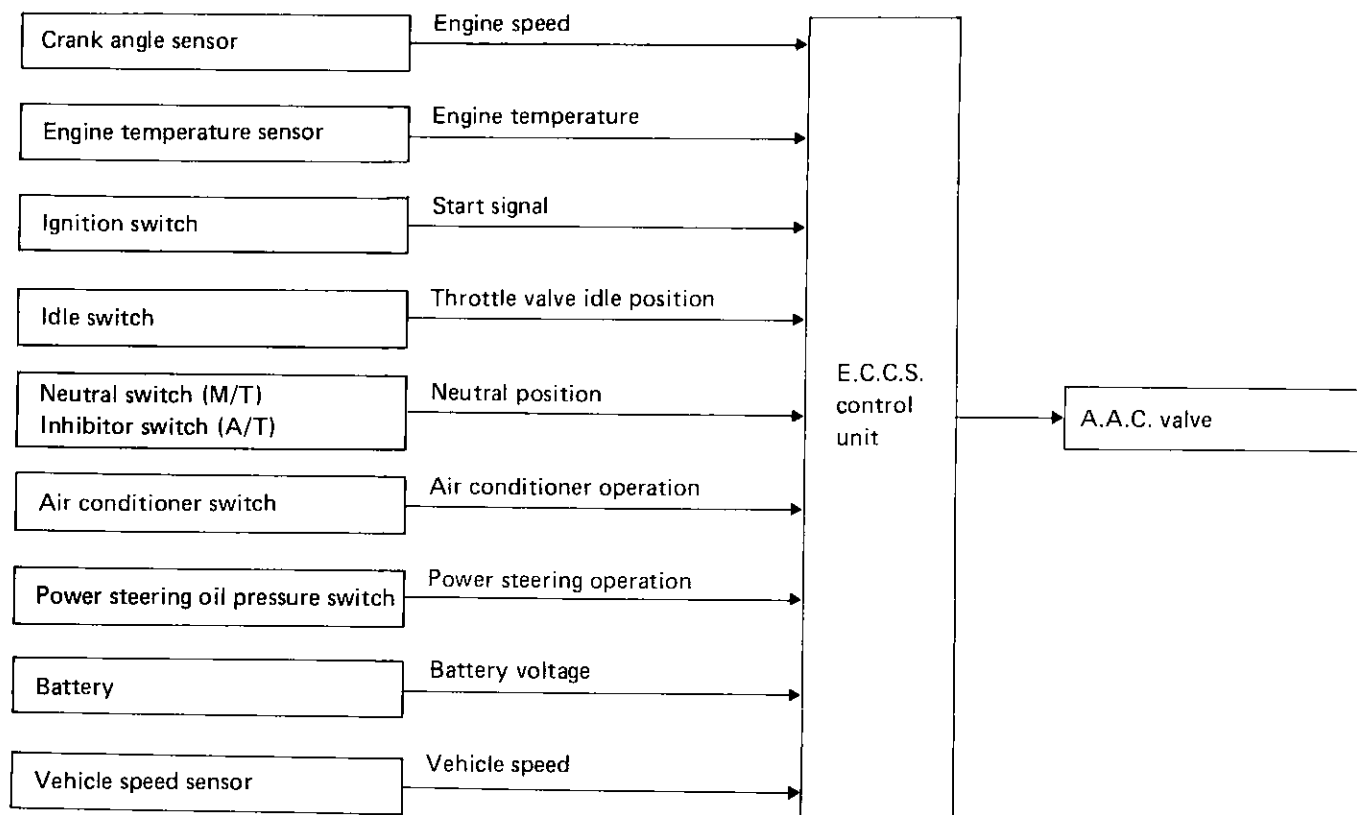
- 1 At starting
- 2 During warm-up
- 3 At idle
- 4 At low battery voltage
- 5 During swirl control valve operates
- 6 During hot engine operation
- 7 At acceleration
- 8 When intake air temperature is extremely high

the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.



## 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.

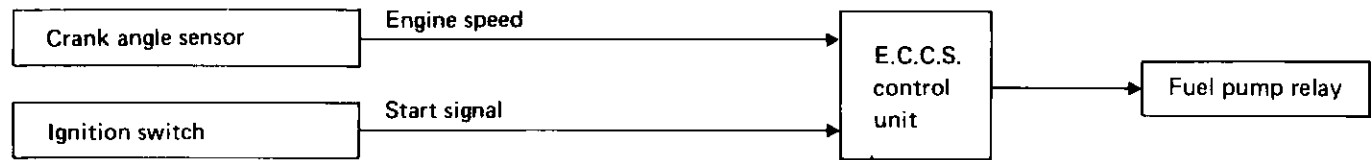
then controls the ON/OFF time of the A.A.C. valve so that engine speed coincides with the target value memorized in ROM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ROM is determined by taking into consideration various engine conditions, such as noise and vibration transmitted to the compartment, fuel consumption, and engine load.



## ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

### Fuel Pump Control

#### INPUT/OUTPUT SIGNAL LINE



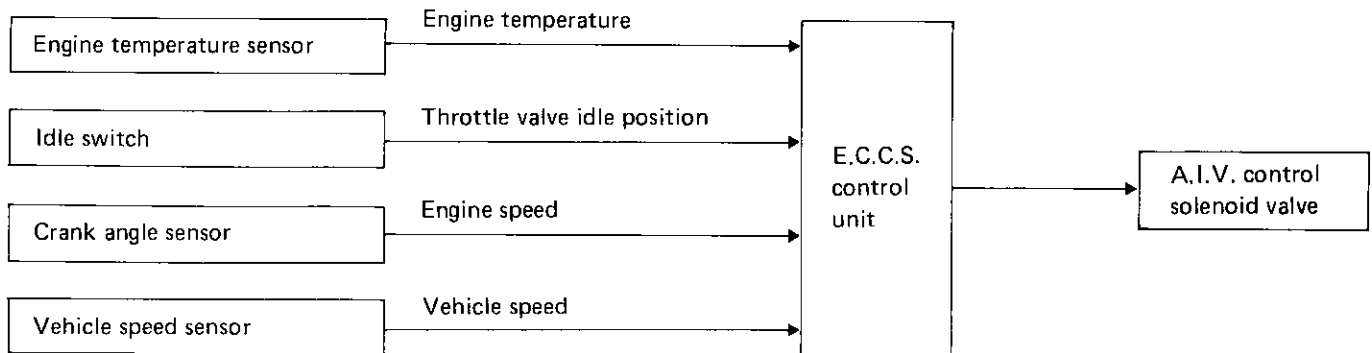
#### SYSTEM DESCRIPTION

The E.C.U. activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. 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 perform. 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 turned to ON. | Operates for 5 seconds |
| Engine running and cranking      | Operates               |
| When engine is stopped           | Stops in 1 second      |
| Except as shown above            | Stops                  |

### 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.

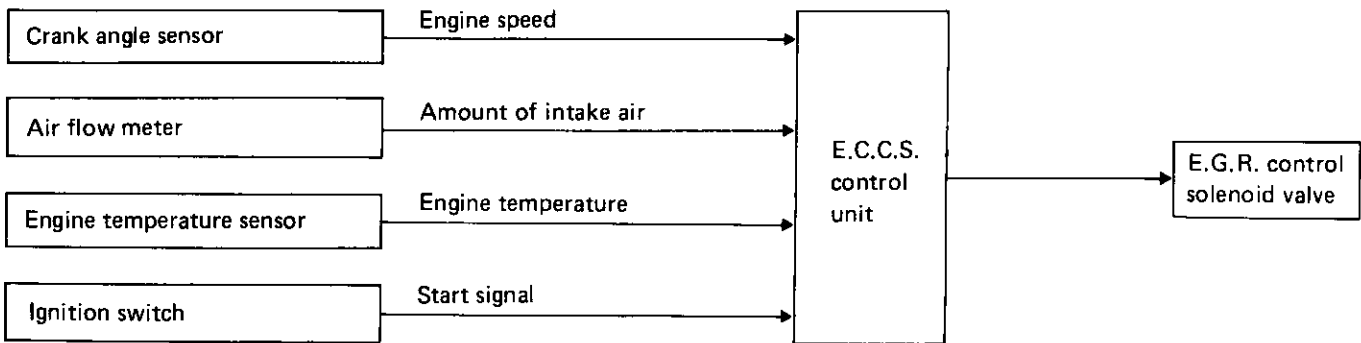
The air induction valve is controlled by the E.C.C.S. control unit, corresponding to the engine temperature. When the engine is cold, the A.I.V. control system operates to reduce HC and CO. In extremely cold conditions, A.I.V. control system does not operate to reduce after-burning. This system also operates during deceleration for the purpose of blowing off water around the air induction valve.

| Engine condition     | Water temperature<br>°C (°F)  | A.I.V. control solenoid valve | A.I.V. control system |
|----------------------|-------------------------------|-------------------------------|-----------------------|
| Idle or deceleration | Between 28 (82) and 115 (239) | ON                            | Operates              |

# ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

## 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

### E.G.R. control solenoid valve operation

| Condition                    |         | E.G.R. control solenoid valve |                 |
|------------------------------|---------|-------------------------------|-----------------|
| When starting                |         | ON                            |                 |
| Water temperature            | °C (°F) |                               | Below 60 (140)  |
|                              |         |                               | Above 115 (239) |
| Idle & heavy load conditions |         |                               | OFF             |
| Other conditions             |         |                               |                 |

### E.G.R. system operation

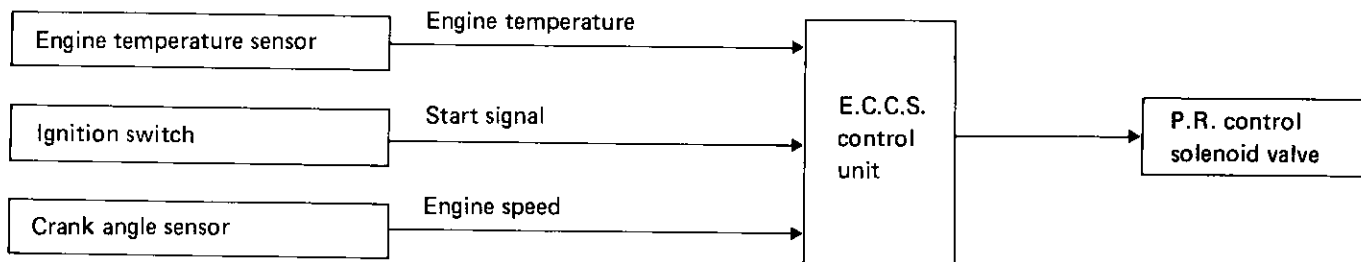
E.G.R. system operates under only the following conditions.

| Water temperature<br>°C (°F)   | B.P.T. valve         |           | Throttle position | E.G.R. control solenoid valve | E.G.R. system |
|--------------------------------|----------------------|-----------|-------------------|-------------------------------|---------------|
|                                | Exhaust gas pressure | Operation |                   |                               |               |
| Between 60 (140) and 115 (239) | High                 | Closed    | Partially open    | OFF                           | Operates      |

# ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

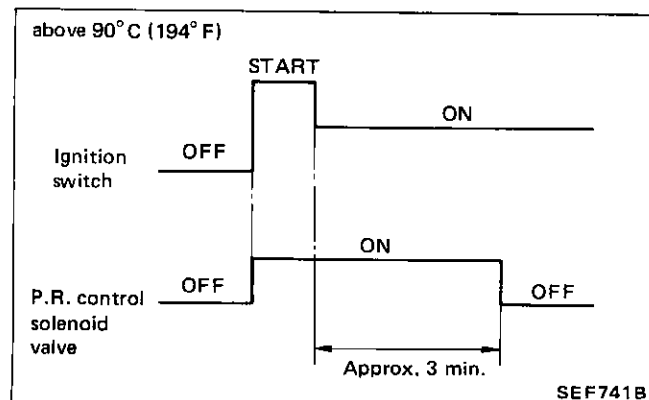
## Fuel Pressure Regulator Control

### INPUT/OUTPUT SIGNAL LINE



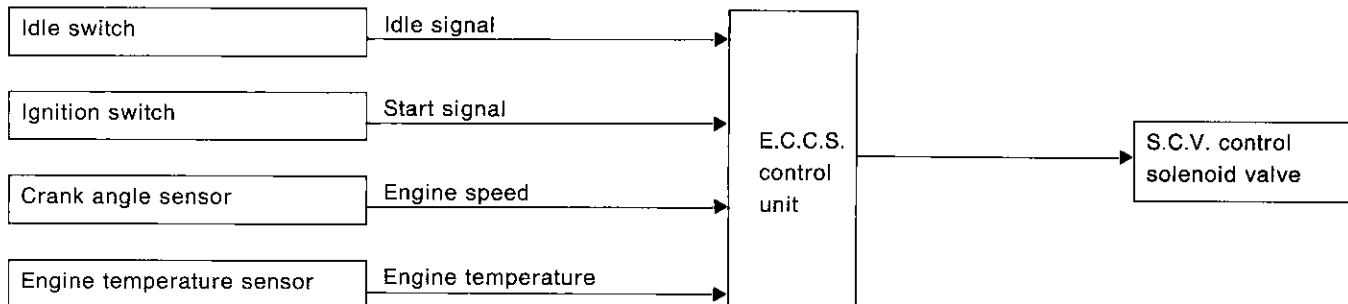
### SYSTEM DESCRIPTION

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, throttling the fuel passage to increase fuel pressure.



## Swirl Control Valve (S.C.V.) Control

### INPUT/OUTPUT SIGNAL LINE



### SYSTEM DESCRIPTION

This system has a swirl control valve (S.C.V.) in the intake passage of each cylinder.

While idling and when engine is running at low speed, the S.C.V. closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.

Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.

Also, except when idling and when engine is running at low speed, this system opens the S.C.V. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance.

The solenoid valve controls S.C.V.'s shut/open condition. This solenoid valve is operated by the E.C.U.

### SYSTEM OPERATION

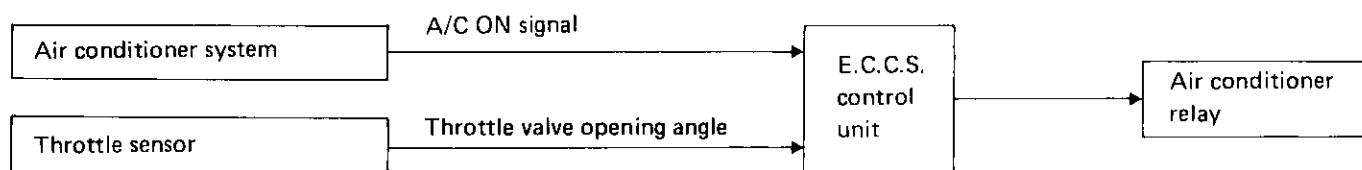
| Idle switch | Engine speed rpm | Solenoid valve | S.C.V. |
|-------------|------------------|----------------|--------|
| ON          | Below 3,600      | ON             | Close  |
| OFF         | Less than 2,000  | ON             | Close  |
|             | More than 3,600  | OFF            | Open   |

S.C.V. is kept open, when engine temperature is below 0°C (32°F).

# ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

## Acceleration Cut Control

### INPUT/OUTPUT SIGNAL LINE



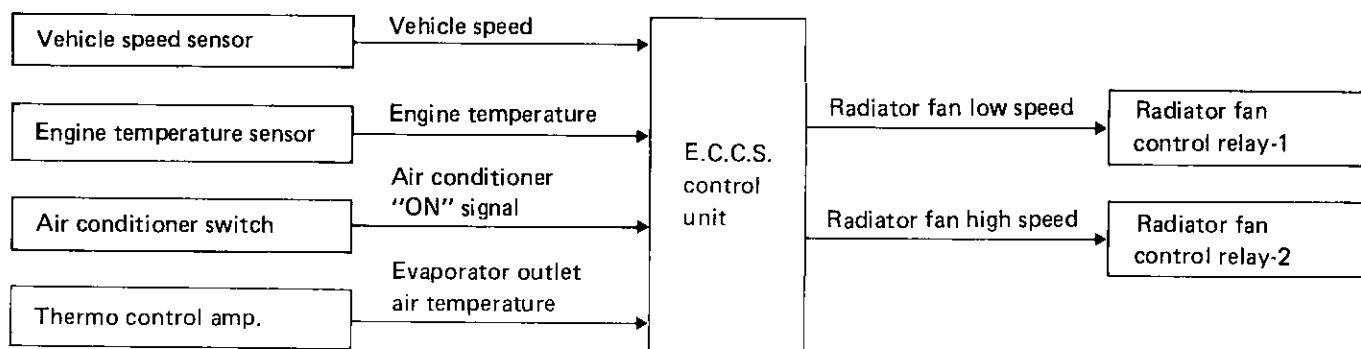
### SYSTEM DESCRIPTION

When accelerator pedal is fully depressed, air conditioner is turned off for a few seconds.

This system improves acceleration when air conditioner is used.

## Radiator Fan Control

### INPUT/OUTPUT SIGNAL LINE



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

### OPERATION

#### Air conditioner switch is "OFF"

| Engine temperature<br>°C (°F) | Radiator fan | Radiator fan control relay |     | Remarks |
|-------------------------------|--------------|----------------------------|-----|---------|
| Below 94 (201)                | OFF          | Relay-1                    | OFF | —       |
|                               |              | Relay-2                    | OFF |         |
| Between 95 (203) and 99 (210) | LOW          | Relay-1                    | ON  | —       |
|                               |              | Relay-2                    | OFF |         |
| Above 100 (212)               | HIGH         | Relay-1                    | ON  | —       |
|                               |              | Relay-2                    | ON  |         |

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

## ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

### Radiator Fan Control (Cont'd)

**Air conditioner switch and blower fan switch are "ON"**

**[Evaporator outlet air temperature is over 8°C (46°F).]**

| Engine temperature<br>°C (°F) | Radiator fan | Radiator fan control relay |    | Remarks                                          |
|-------------------------------|--------------|----------------------------|----|--------------------------------------------------|
| Below 94 (201)                | *HIGH        | Relay-1                    | ON | *OFF if vehicle speed is above 80 km/h (50 MPH). |
|                               |              | Relay-2                    | ON |                                                  |
| Between 95 (203) and 99 (210) | *HIGH        | Relay-1                    | ON | *LOW if vehicle speed is above 80 km/h (50 MPH). |
|                               |              | Relay-2                    | ON |                                                  |
| Above 100 (212)               | HIGH         | Relay-1                    | ON | —                                                |
|                               |              | Relay-2                    | ON |                                                  |

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

**Air conditioner switch and blower fan switch are "ON"**

**[Evaporator outlet air temperature is between 3°C (37°F) and 8°C (46°F).]**

| Engine temperature<br>°C (°F) | Radiator fan | Radiator fan control relay |     | Remarks                                          |
|-------------------------------|--------------|----------------------------|-----|--------------------------------------------------|
| Below 94 (201)                | *LOW         | Relay-1                    | ON  | *OFF if vehicle speed is above 80 km/h (50 MPH). |
|                               |              | Relay-2                    | OFF |                                                  |
| Between 95 (203) and 99 (210) | LOW          | Relay-1                    | ON  | —                                                |
|                               |              | Relay-2                    | OFF |                                                  |
| Above 100 (212)               | HIGH         | Relay-1                    | ON  | —                                                |
|                               |              | Relay-2                    | ON  |                                                  |

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

### Fail-safe System

#### AIR FLOW METER MALFUNCTION

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

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

#### Operation

| System                        | Fixed condition                                                                |
|-------------------------------|--------------------------------------------------------------------------------|
| E.G.R. control system         | OFF                                                                            |
| Idle speed control system     | A duty ratio is fixed at the preprogrammed value.                              |
| Fuel injection control system | Fuel is shut off above 2,400 rpm.<br>(Engine speed does not exceed 2,400 rpm.) |

## ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

### Fail-safe System (Cont'd)

#### ENGINE TEMPERATURE SENSOR MALFUNCTION

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

##### Operation

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

#### THROTTLE SENSOR MALFUNCTION

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

#### AIR TEMPERATURE SENSOR MALFUNCTION

When air temperature sensor is below or above the specified value, air temperature value is fixed at the preset value [20°C (68°F)].

#### VEHICLE SPEED SENSOR MALFUNCTION

When the vehicle speed sensor circuit is opened, fuel is temporarily shut off at 2,000 rpm during high-load operations. After this has occurred once, during all other types of driving operation fuel is shut off at 2,500 rpm. This fail-safe condition is released when the ignition switch is turned off.

#### NEUTRAL SWITCH MALFUNCTION

##### (Cont'd)

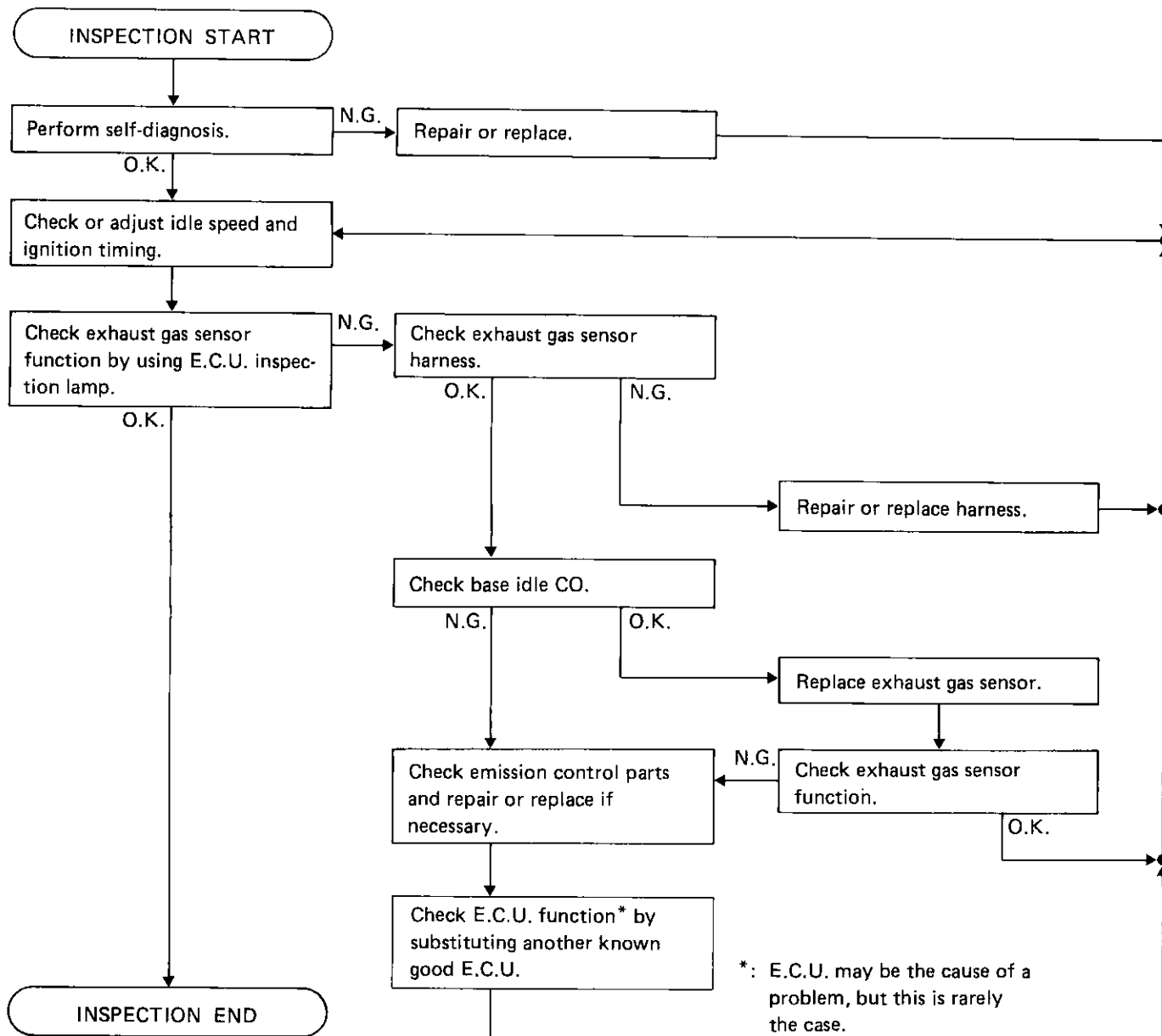
When the neutral switch (M/T) or inhibitor switch (A/T) is shorted and the vehicle speed exceeds 60 km/h (37 MPH), fuel is shut off above 2,500 rpm. The L.E.D. in the E.C.U. and the check engine light do not indicate a neutral switch (M/T) or inhibitor switch malfunction. This fail-safe condition is released when the ignition switch is turned off.

# IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

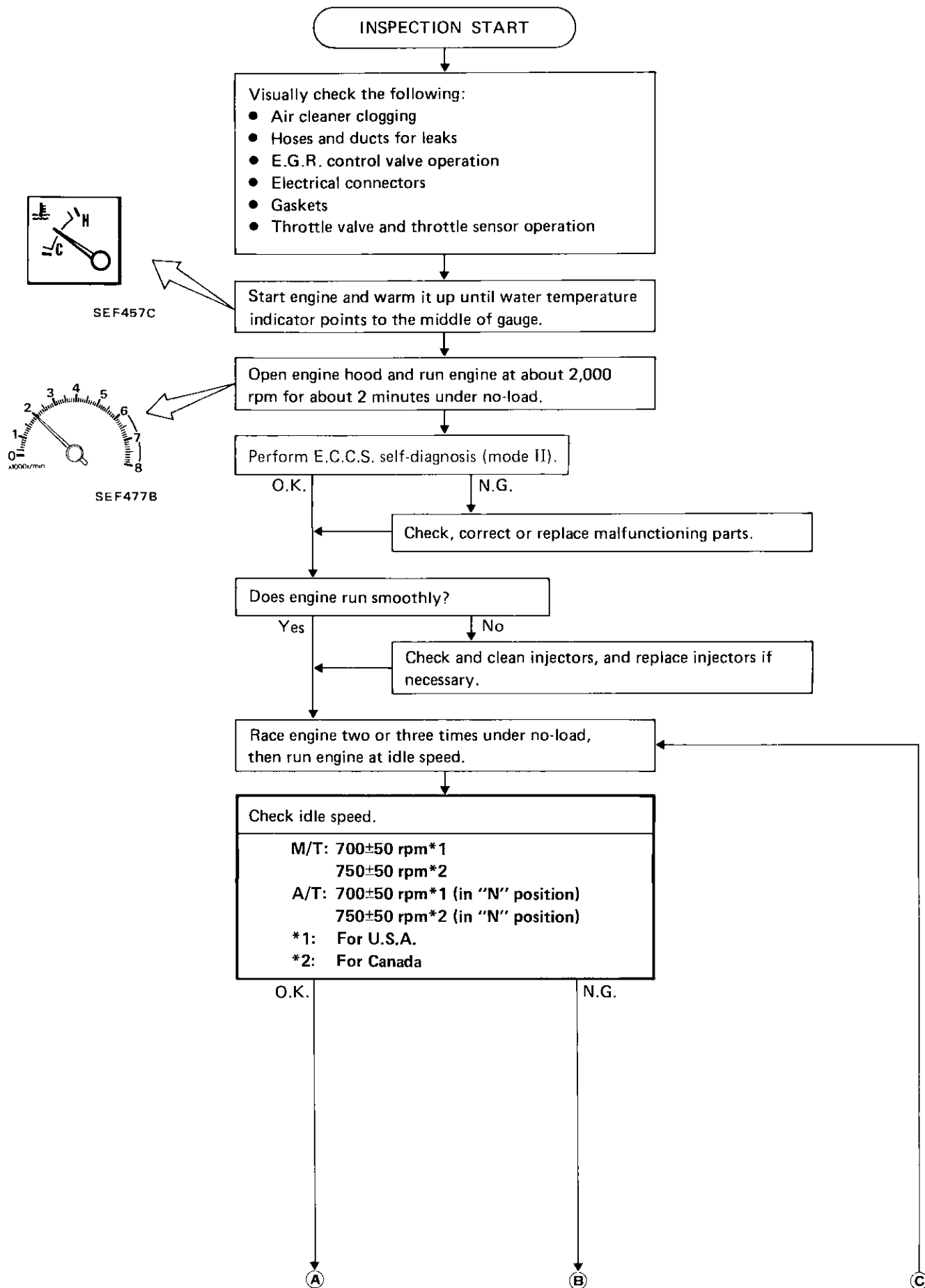
## PREPARATION

1. Make sure that the following parts are in good order.
  - Battery
  - Ignition system
  - Engine oil and coolant levels
  - Fuses
  - E.C.U. harness connector
  - Vacuum hoses
  - Air intake system (Oil filler cap, oil level gauge, etc.)
  - Fuel pressure
  - A.I.V. hose
  - Engine compression
  - E.G.R. control valve operation
2. Throttle valve and idle switch
3. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
4. On automatic transaxle equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
5. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
6. Turn off headlamps, heater blower, rear defogger.
7. Keep front wheels pointed straight ahead.
8. Make the check after the radiator fan has stopped.

## Overall inspection sequence

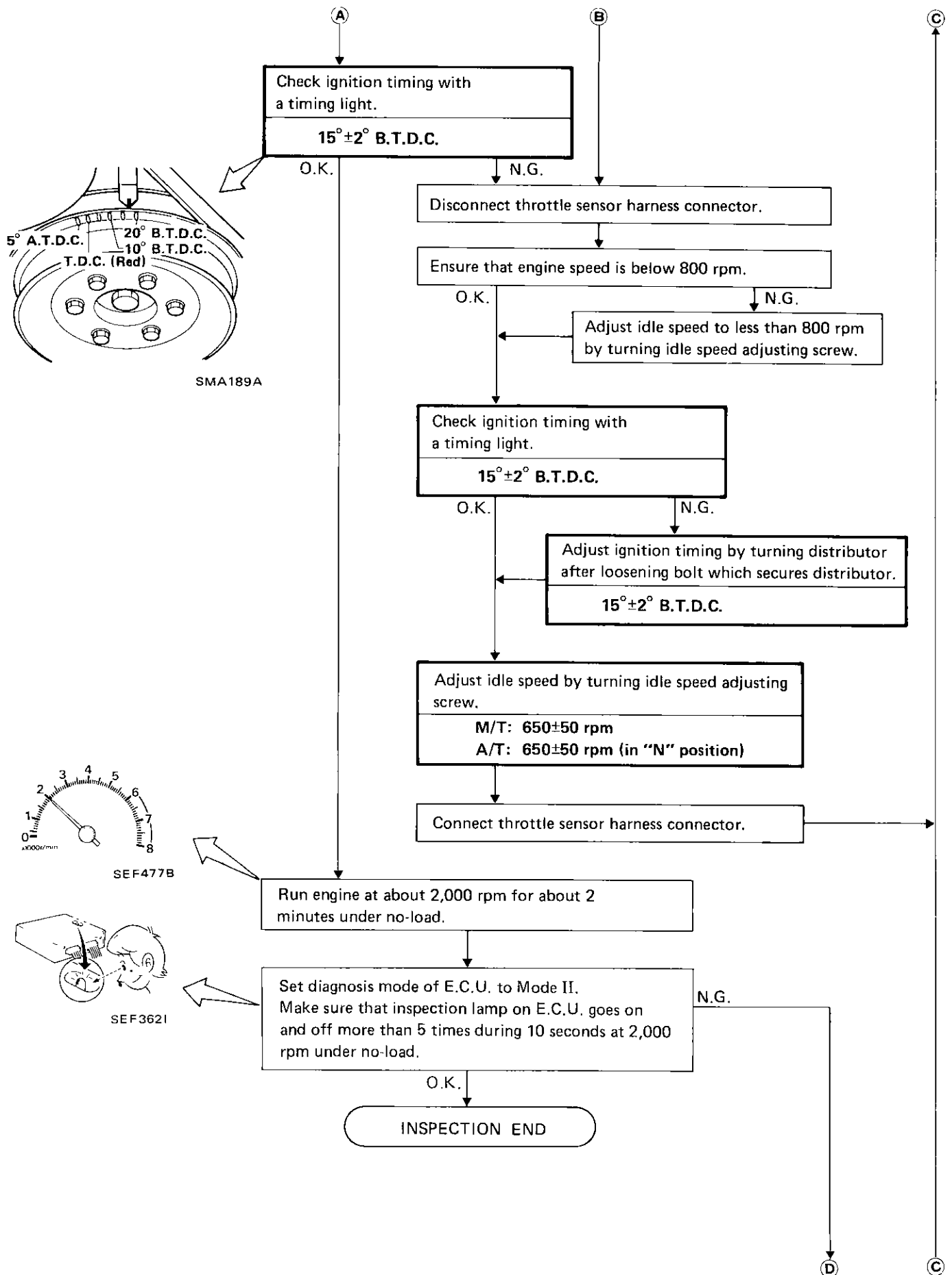


# IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

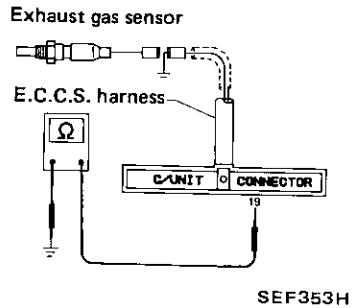




# **IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION**



# IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



Check exhaust gas sensor harness:

- 1) Turn off engine and disconnect battery ground cable.
- 2) Disconnect harness connector from E.C.U.
- 3) Disconnect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor harness connector to ground with a jumping wire.
- 4) Check for continuity between terminal No. 19 of E.C.U. harness connector and ground metal on vehicle body.

Continuity exists. .... O.K.

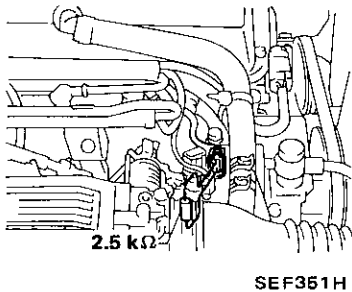
Continuity does not exist ..... N.G.

O.K.

N.G.

Repair or replace E.C.C.S. harness and connect battery ground cable.

Connect harness connector to E.C.U. and disconnect jumping wire from exhaust gas sensor.



- Disconnect engine temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of engine temperature sensor harness connector.
- Disconnect A.I.V. hose and install a suitable plug in A.I.V. pipe.
- Connect battery ground cable.

Start engine and warm it up until water temperature indicator points to the middle of gauge. (Wait more than 5 minutes after starting.)

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

Check "CO"% and if engine runs smoothly.

Idle CO: Less than 5%

After checking CO%

- 1) Turn off engine.
- 2) Disconnect the resistor (2.5 kΩ) from terminals of engine temperature sensor harness connector.
- 3) Connect engine temperature sensor harness connector to engine temperature sensor.
- 4) Connect A.I.V. hose.

O.K.

N.G.

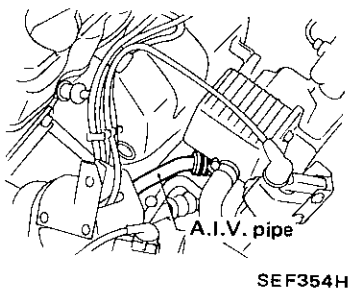
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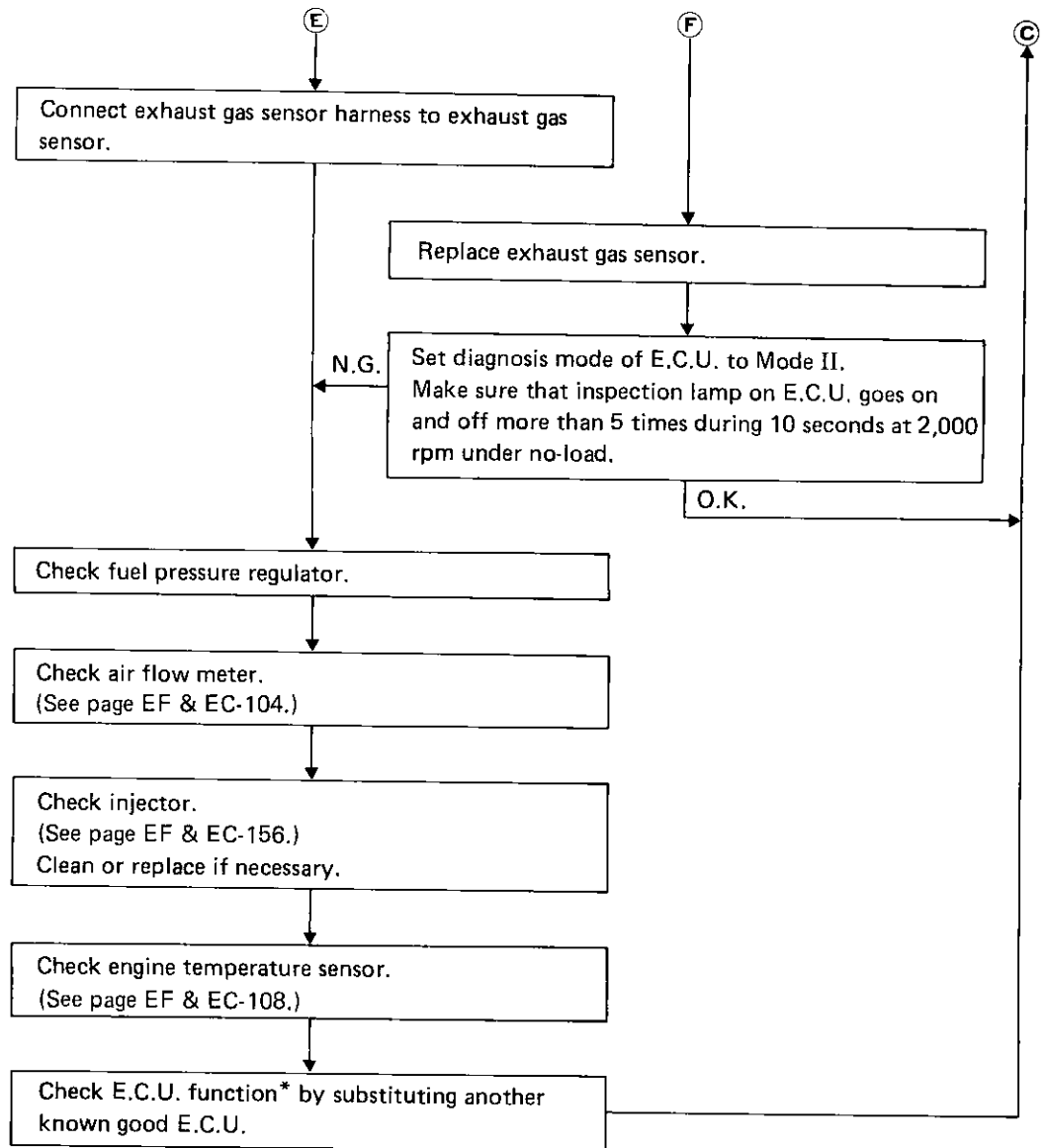
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D

C



## IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



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

# TROUBLE DIAGNOSES

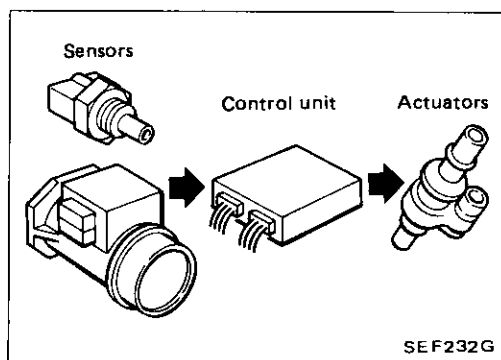
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## TROUBLE DIAGNOSES

### Contents (Cont'd)

|                                               |             |
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## How to Perform Trouble Diagnoses for Quick and Accurate Repair

### INTRODUCTION

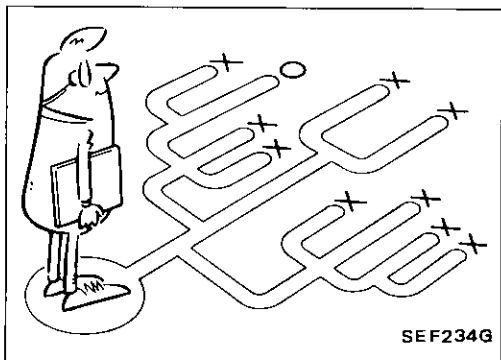
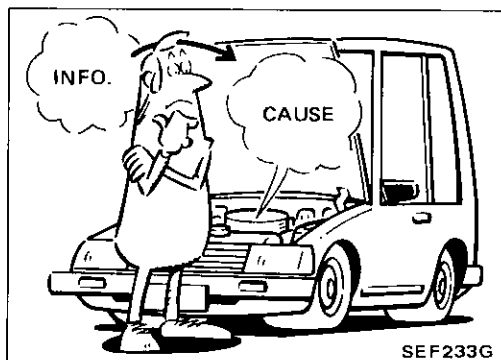
The engine has an electronic control unit to control major systems such as fuel control, ignition control, idle speed control, etc. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it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

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

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

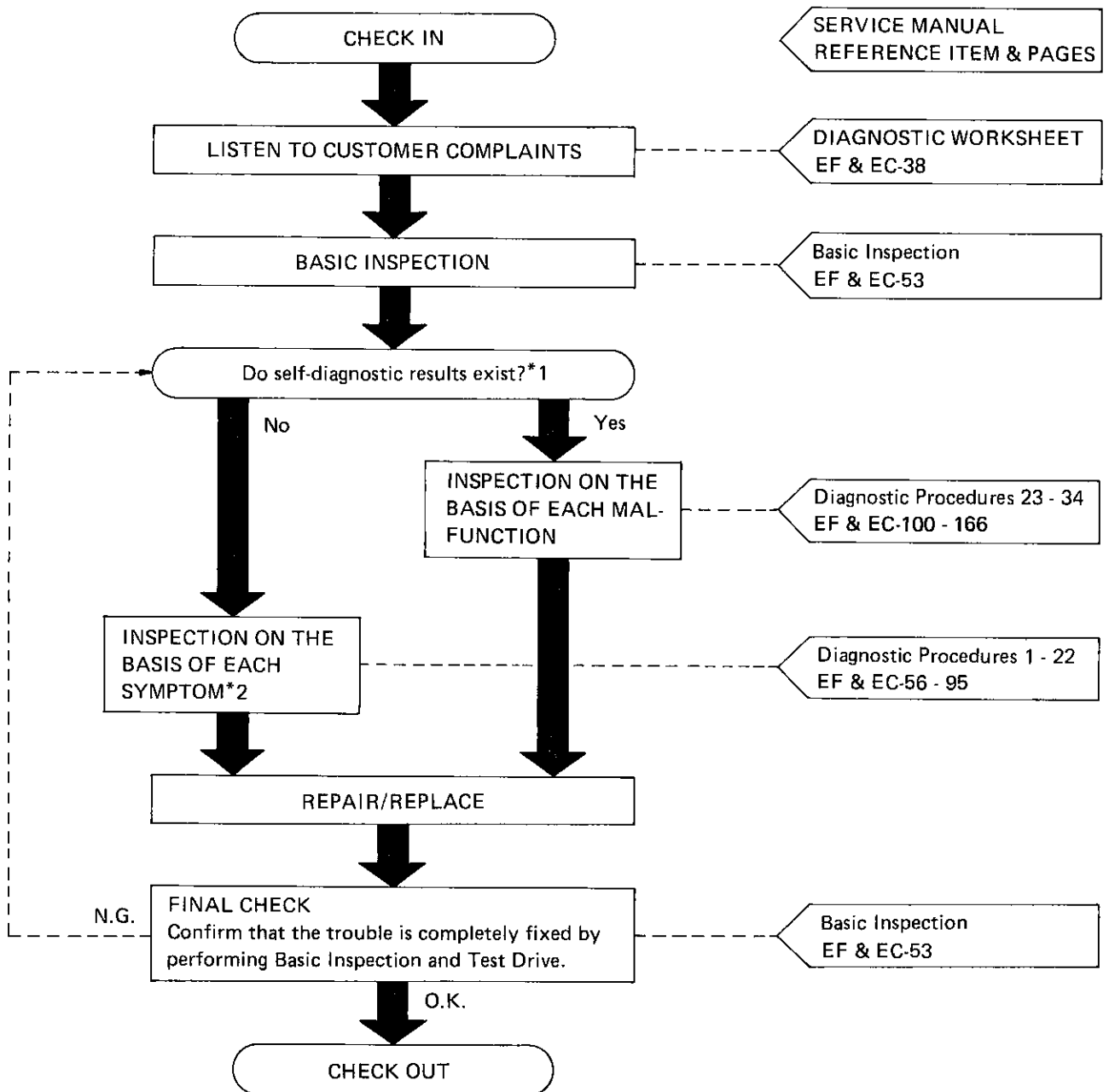
Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.



## TROUBLE DIAGNOSES

### 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-39).

## TROUBLE DIAGNOSES

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

## KEY POINTS

|              |       |                                                          |
|--------------|-------|----------------------------------------------------------|
| <b>WHAT</b>  | ..... | Vehicle & engine model                                   |
| <b>WHEN</b>  | ..... | Date, Frequencies                                        |
| <b>WHERE</b> | ..... | Road conditions                                          |
| <b>HOW</b>   | ..... | Operating conditions,<br>Weather conditions,<br>Symptoms |

## DIAGNOSTIC WORKSHEET

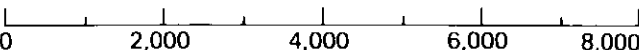
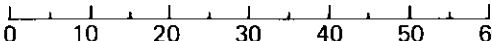
There are many kinds of operating conditions that lead to malfunctions on engine components.

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

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

Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for troubleshooting.

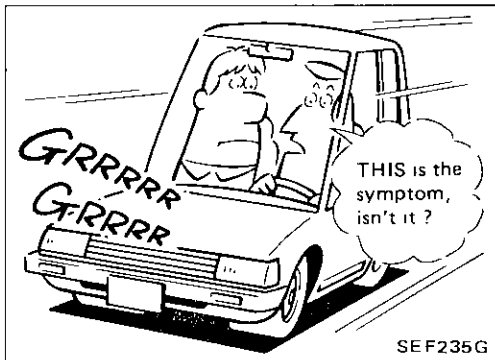
## Worksheet sample

|                     |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |
|---------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Customer name MR/MS |                                       | Model & Year                                                                                                                                                                                                                                                                                                                                                                                                                                          | VIN             |
| Engine #            |                                       | Trans.                                                                                                                                                                                                                                                                                                                                                                                                                                                | Mileage         |
| Incident Date       |                                       | Manuf. Date                                                                                                                                                                                                                                                                                                                                                                                                                                           | In Service Date |
| Symptoms            | <input type="checkbox"/> Startability | <input type="checkbox"/> Impossible to start <input type="checkbox"/> No combustion <input type="checkbox"/> Partial combustion<br><input type="checkbox"/> Partial combustion affected by throttle position<br><input type="checkbox"/> Partial combustion NOT affected by throttle position<br><input type="checkbox"/> Possible but hard to start <input type="checkbox"/> Others [ ]                                                              |                 |
|                     | <input type="checkbox"/> Idling       | <input type="checkbox"/> No fast idle <input type="checkbox"/> Unstable <input type="checkbox"/> High idle <input type="checkbox"/> Low idle<br><input type="checkbox"/> Others [ ]                                                                                                                                                                                                                                                                   |                 |
|                     | <input type="checkbox"/> Driveability | <input type="checkbox"/> Stumble <input type="checkbox"/> Surge <input type="checkbox"/> Detonation <input type="checkbox"/> Lack of power<br><input type="checkbox"/> Intake backfire <input type="checkbox"/> Exhaust backfire<br><input type="checkbox"/> Others [ ]                                                                                                                                                                               |                 |
|                     | <input type="checkbox"/> Engine stall | <input type="checkbox"/> At the time of start <input type="checkbox"/> While idling<br><input type="checkbox"/> While accelerating <input type="checkbox"/> While decelerating<br><input type="checkbox"/> Just after stopping <input type="checkbox"/> While loading                                                                                                                                                                                 |                 |
| Incident occurrence |                                       | <input type="checkbox"/> Just after delivery <input type="checkbox"/> Recently<br><input type="checkbox"/> In the morning <input type="checkbox"/> At night <input type="checkbox"/> In the daytime                                                                                                                                                                                                                                                   |                 |
| Frequency           |                                       | <input type="checkbox"/> All the time <input type="checkbox"/> Under certain conditions <input type="checkbox"/> Sometimes                                                                                                                                                                                                                                                                                                                            |                 |
| Weather conditions  |                                       | <input type="checkbox"/> Note effected                                                                                                                                                                                                                                                                                                                                                                                                                |                 |
| Weather             |                                       | <input type="checkbox"/> Fine <input type="checkbox"/> Raining <input type="checkbox"/> Snowing <input type="checkbox"/> Others [ ]                                                                                                                                                                                                                                                                                                                   |                 |
| Temperature         |                                       | <input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold <input type="checkbox"/> Humid    °F                                                                                                                                                                                                                                                                                           |                 |
| Engine conditions   |                                       | <input type="checkbox"/> Cold    During warm-up <input type="checkbox"/> After warm-up<br><br>Engine speed                                                                                                                                                                                                                                                        |                 |
| Road conditions     |                                       | <input type="checkbox"/> In town <input type="checkbox"/> In suburbs <input type="checkbox"/> Highway <input type="checkbox"/> Off road (up/down)                                                                                                                                                                                                                                                                                                     |                 |
| Driving conditions  |                                       | <input type="checkbox"/> Not affected<br><input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing<br><input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising<br><input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)<br><br>Vehicle speed  |                 |
| Check engine light  |                                       | <input type="checkbox"/> Turned on <input type="checkbox"/> Not turned on                                                                                                                                                                                                                                                                                                                                                                             |                 |



## TROUBLE DIAGNOSES

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



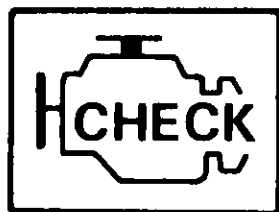
#### INTERMITTENT PROBLEM SIMULATION

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

Perform the activity listed under Service procedure and note the result.

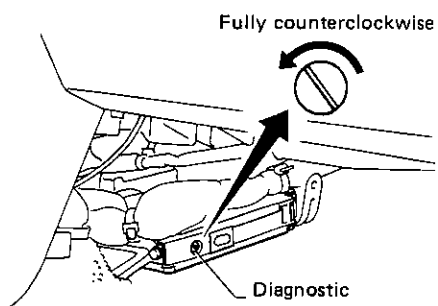
|    | Variable factor                           | Influential part             | Target condition                          | Service procedure                                                                          |
|----|-------------------------------------------|------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------|
| 1  | Mixture ratio                             | Pressure regulator           | Made lean                                 | Remove vacuum hose and apply vacuum.                                                       |
|    |                                           |                              | Made rich                                 | Remove vacuum hose and apply pressure.                                                     |
| 2  | Ignition timing                           | Distributor                  | Advanced                                  | Rotate distributor clockwise.                                                              |
|    |                                           |                              | Retarded                                  | Rotate distributor counterclockwise.                                                       |
| 3  | Mixture ratio feedback control            | Exhaust gas sensor           | Suspended                                 | Disconnect exhaust gas sensor harness connector.                                           |
|    |                                           | Control unit                 | Operation check                           | Perform self-diagnosis (Mode I/II) at 2,000 rpm.                                           |
| 4  | Idle speed                                | I.A.A. unit                  | Raised                                    | Turn idle adjusting screw counterclockwise.                                                |
|    |                                           |                              | Lowered                                   | Turn idle adjusting screw clockwise.                                                       |
| 5  | Electric connection (Electric continuity) | Harness connectors and wires | Poor electric connection or faulty wiring | Tap or wiggle.                                                                             |
|    |                                           |                              |                                           | Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks. |
| 6  | Temperature                               | Control unit                 | Cooled                                    | Cool with an icing spray or similar device.                                                |
|    |                                           |                              | Warmed                                    | Heat with a hair drier.<br><b>[WARNING: Do not overheat the unit.]</b>                     |
| 7  | Moisture                                  | Electric parts               | Damp                                      | Wet.<br><b>[WARNING: Do not directly pour water on components. Use a mist sprayer.]</b>    |
| 8  | Electric loads                            | Load switches                | Loaded                                    | Turn on headlights, air conditioner, rear defogger, etc.                                   |
| 9  | Idle switch condition                     | Control unit                 | ON-OFF switching                          | Perform self-diagnosis (Mode IV).                                                          |
| 10 | Ignition spark                            | Timing light                 | Spark power check                         | Try to flash timing light for each cylinder.                                               |

## TROUBLE DIAGNOSES



CHECK ENGINE LIGHT

SEF924F



Fully counterclockwise

Diagnostic  
mode selector

SEC239B

### 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.

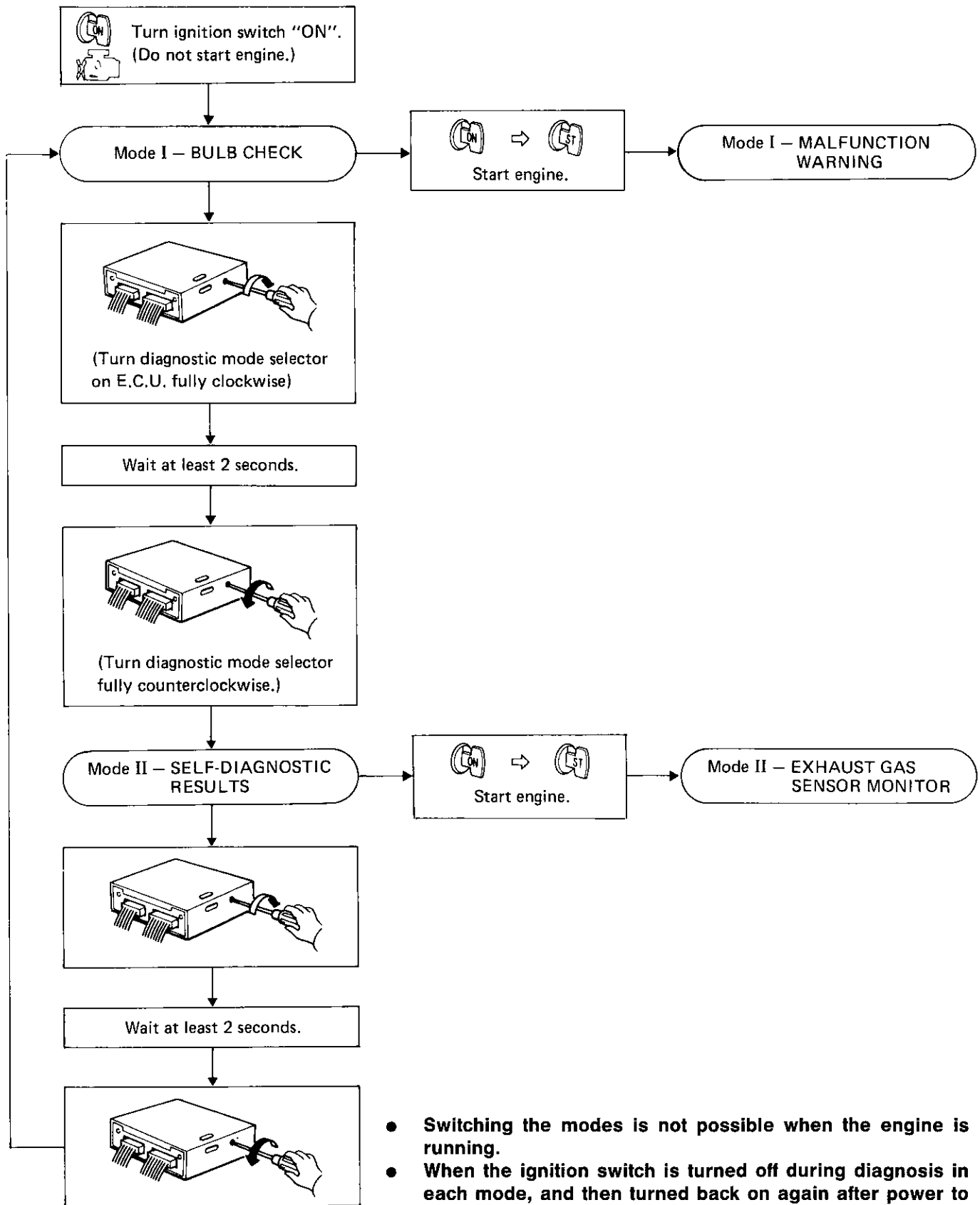
In the E.C.U., the Green and Red L.E.D.'s have now been permanently changed to one RED L.E.D.

### SELF-DIAGNOSTIC FUNCTION

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

## TROUBLE DIAGNOSES

### 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.

## TROUBLE DIAGNOSES

### 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<br>AND<br>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             |
| 35       | EXHAUST GAS TEMPERATURE SENSOR CIRCUIT |
| 43       | THROTTLE SENSOR CIRCUIT                |
| 45       | INJECTOR LEAK                          |

- 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

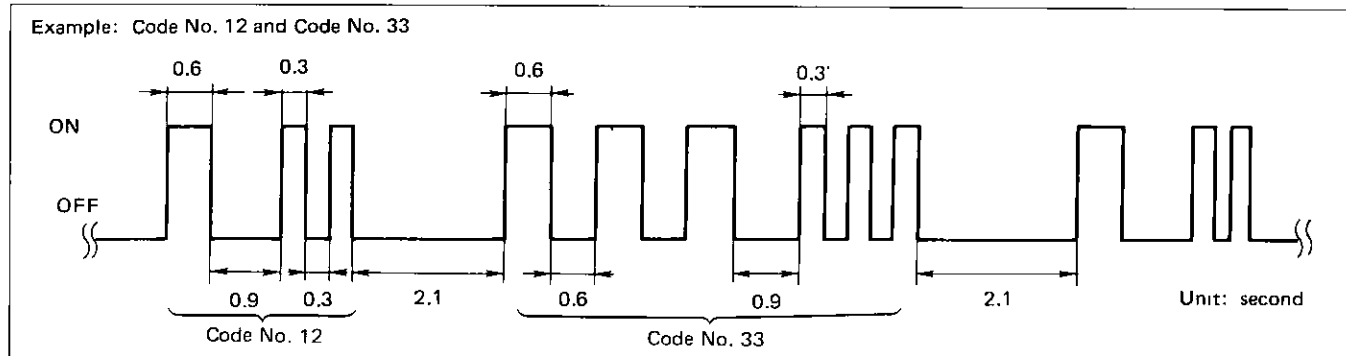
| RED L.E.D. | CONDITION                                   |
|------------|---------------------------------------------|
| ON         | WHEN THE E.C.U.'S C.P.U. IS MALFUNCTIONING. |
| OFF        | O.K.                                        |

# TROUBLE DIAGNOSES

## 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.

### Display code table

| Code No. | Detected items                         | California model | Non-California model |
|----------|----------------------------------------|------------------|----------------------|
| 11       | Crank angle sensor circuit             | X                | X                    |
| 12       | Air flow meter circuit                 | X                | X                    |
| 13       | Engine temperature sensor circuit      | X                | X                    |
| 14       | Vehicle speed sensor circuit           | X                | X                    |
| 21       | Ignition signal circuit                | X                | X                    |
| 31       | E.C.U.                                 | X                | X                    |
| 32       | E.G.R. function                        | X                | —                    |
| 33       | Exhaust gas sensor circuit             | X                | X                    |
| 35       | Exhaust gas temperature sensor circuit | X                | —                    |
| 41       | Air temperature sensor circuit         | X                | X                    |
| 43       | Throttle sensor circuit                | X                | X                    |
| 45       | Injector leak                          | X                | —                    |
| 55       | No malfunction in the above circuits   | X                | X                    |

X: Available

—: Not available

: Check engine light item

## TROUBLE DIAGNOSES

### 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             | <ul style="list-style-type: none"> <li>Either 1° or 180° signal is not entered for the first few seconds during engine cranking.</li> <li>Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.</li> </ul> | <ul style="list-style-type: none"> <li>Harness and connector (If harness and connector are normal, replace crank angle sensor.)</li> </ul>                              |
| 12       | Air flow meter circuit                 | <ul style="list-style-type: none"> <li>The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)</li> </ul>                                                                                                                 | <ul style="list-style-type: none"> <li>Harness and connector (If harness and connector are normal, replace air flow meter.)</li> </ul>                                  |
| 13       | Engine temperature sensor circuit      | <ul style="list-style-type: none"> <li>The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)</li> </ul>                                                                                               | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Engine temperature sensor</li> </ul>                                                              |
| 14       | Vehicle speed sensor circuit           | <ul style="list-style-type: none"> <li>The vehicle speed sensor circuit is open or shorted.</li> </ul>                                                                                                                                                           | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Vehicle speed sensor (reed switch)</li> </ul>                                                     |
| *21      | Ignition signal circuit                | <ul style="list-style-type: none"> <li>The ignition signal in the primary circuit is not entered during engine cranking or running.</li> </ul>                                                                                                                   | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>power transistor unit</li> </ul>                                                                  |
| 31       | E.C.U.                                 | <ul style="list-style-type: none"> <li>E.C.U. calculation function is malfunctioning.</li> </ul>                                                                                                                                                                 | (Replace E.C.C.S. control unit.)                                                                                                                                        |
| 32       | E.G.R. function                        | <ul style="list-style-type: none"> <li>E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)</li> </ul>                                                                                                                            | <ul style="list-style-type: none"> <li>E.G.R. control valve</li> <li>E.G.R. control solenoid valve</li> </ul>                                                           |
| 33       | Exhaust gas sensor circuit             | <ul style="list-style-type: none"> <li>The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)</li> </ul>                                                                                                      | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Exhaust gas sensor</li> <li>Fuel pressure</li> <li>Injectors</li> <li>Intake air leaks</li> </ul> |
| 35       | Exhaust gas temperature sensor circuit | <ul style="list-style-type: none"> <li>The exhaust gas temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)</li> </ul>                                                                                                 | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Exhaust gas temperature sensor</li> </ul>                                                         |
| 41       | Air temperature sensor circuit         | <ul style="list-style-type: none"> <li>The air temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)</li> </ul>                                                                                                         | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Air temperature sensor</li> </ul>                                                                 |
| 43       | Throttle sensor circuit                | <ul style="list-style-type: none"> <li>The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)</li> </ul>                                                                                                                | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Throttle sensor</li> </ul>                                                                        |
| 45       | injector leak                          | <ul style="list-style-type: none"> <li>Fuel leaks from injector.</li> </ul>                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Injector</li> </ul>                                                                                                              |

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

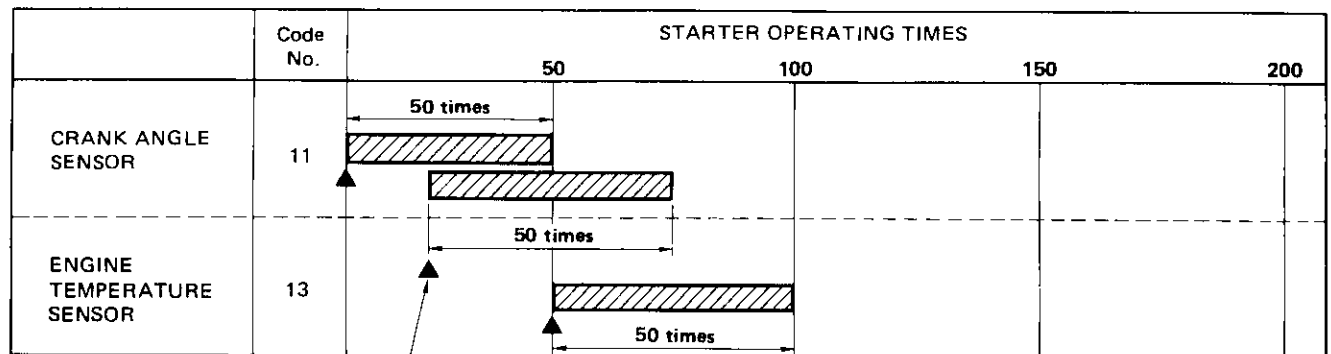
## TROUBLE DIAGNOSES

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

#### RETENTION OF DIAGNOSTIC RESULTS

The diagnostic results will remain in E.C.U. memory until the starter is operated fifty times after a diagnostic item has been judged to be malfunctioning. The diagnostic result will then be canceled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again judged to be malfunctioning before the starter is operated fifty times, the second result will replace the previous one. It will be stored in E.C.U. memory until the starter is operated fifty times more.

RETENTION TERM CHART (Example)



If the same diagnostic item is judged to be malfunctioning before the starter is operated fifty times, it will be stored in E.C.U. memory until the starter is operated fifty times from this point in time.



: Retention term



: Malfunction detecting point

SEF793D

#### HOW TO ERASE SELF-DIAGNOSTIC RESULTS

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

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

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

#### DESCRIPTION

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

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

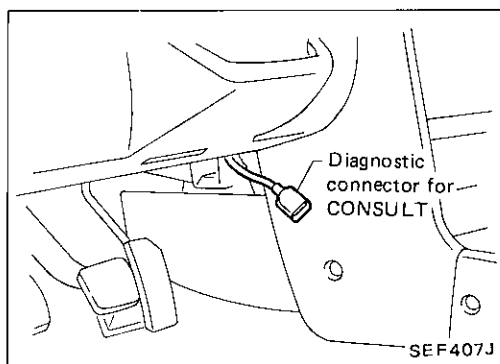
\*: Maintains conditions just before switching to open loop.

#### HOW TO CHECK EXHAUST GAS SENSOR

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



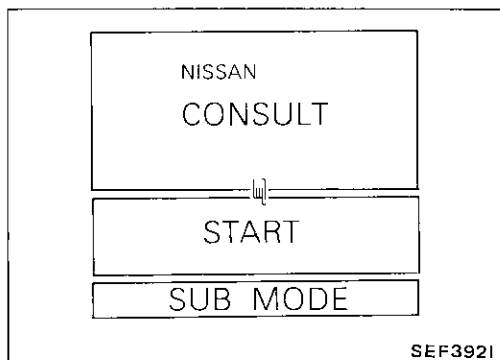
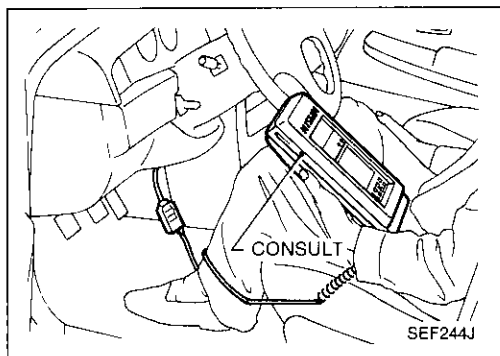
## TROUBLE DIAGNOSES



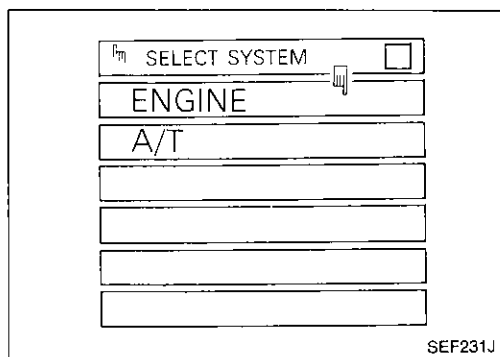
### Consult

#### CONSULT INSPECTION PROCEDURE

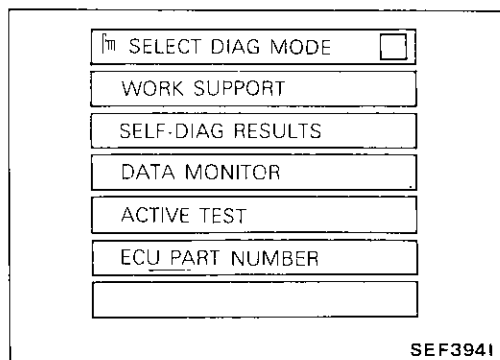
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.  
(Diagnostic connector is located in left dash side panel.)



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, read the CONSULT Operation Manual.**

# TROUBLE DIAGNOSES

## Consult (Cont'd)

### E.C.C.S. COMPONENT PARTS APPLICATION

| MODE<br>E.C.C.S. COMPONENT PARTS |                                    | WORK SUPPORT | SELF-DIAGNOSTIC RESULTS | DATA MONITOR        | ACTIVE TEST |
|----------------------------------|------------------------------------|--------------|-------------------------|---------------------|-------------|
| INPUT                            | Crank angle sensor                 |              | X                       | X                   |             |
|                                  | Air flow meter                     |              | X                       | X                   |             |
|                                  | Engine temperature sensor          |              | X                       | X                   | X           |
|                                  | Exhaust gas sensors                |              | X                       | X                   |             |
|                                  | Vehicle speed sensors              |              | X                       | X                   |             |
|                                  | Throttle sensor                    | X            | X                       | X                   |             |
|                                  | Exhaust gas temperature sensor*    |              | X                       | X                   |             |
|                                  | Ignition switch (start signal)     |              |                         | X                   |             |
|                                  | Air conditioner switch             |              |                         | X                   |             |
|                                  | Neutral switch                     |              |                         | X                   |             |
|                                  | Power steering oil pressure switch |              |                         | X                   |             |
|                                  | Battery                            |              |                         | X                   |             |
|                                  | Air temperature sensor             |              |                         | X                   |             |
| OUTPUT                           | Injectors                          |              | X                       | X                   | X           |
|                                  | Power transistor (ignition signal) |              | X                       | X (Ignition timing) | X           |
|                                  | A.A.C. valve                       | X            |                         | X                   | X           |
|                                  | Swirl control solenoid valve       |              |                         | X                   | X           |
|                                  | A.I.V. control solenoid valve      |              |                         | X                   | X           |
|                                  | P.R.V.R. control solenoid valve    |              |                         | X                   | X           |
|                                  | E.G.R. control solenoid valve      |              |                         | X                   | X           |
|                                  | Air conditioner relay              |              |                         | X                   |             |
|                                  | Fuel pump relay                    | X            |                         | X                   | X           |
|                                  | Radiator fan relay                 |              |                         | X                   | X           |

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

X: Applicable

#### CAUTION:

- a. When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.
- b. Be sure to set gears to "Neutral" before conducting "Active Test" on idle adjustment or A.A.C. valve.

## TROUBLE DIAGNOSES

### 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 numbers     | E.C.U. part numbers can be read.                                                                                                   |

#### WORK SUPPORT MODE

| WORK ITEM                   | CONDITION                                                                                                                                                                                                                                                 | USAGE                                            |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| THROTTLE SENSOR ADJUSTMENT  | CHECK THE THROTTLE SENSOR SIGNAL.<br>ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"><li>● IGN SW "ON"</li><li>● ENG NOT RUNNING</li><li>● ACC PEDAL NOT PRESSED</li></ul> | When adjusting throttle sensor initial position, |
| IGNITION TIMING ADJUSTMENT* | ● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START".<br>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. <ul style="list-style-type: none"><li>● ENGINE WARMED UP</li><li>● NO-LOAD</li></ul>                                                                                                | When adjusting idle speed,                       |
| FUEL PRESSURE RELEASE       | ● FUEL PUMP WILL STOP BY TOUCHING "START" WHEN IDLING<br>CRANK A FEW TIMES AFTER ENGINE STALLS.                                                                                                                                                           | When releasing fuel pressure from fuel line,     |

# TROUBLE DIAGNOSES

## Consult (Cont'd)

### SELF-DIAGNOSTIC RESULTS MODE

| DIAGNOSTIC ITEM       | DIAGNOSTIC ITEM IS DETECTED WHEN ...                                                                                                                                                                                                                             | CHECK ITEM (REMEDY)                                                                                                                                                     |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CRANK ANGLE SENSOR*   | <ul style="list-style-type: none"> <li>Either 1° or 180° signal is not entered for the first few seconds during engine cranking.</li> <li>Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.</li> </ul> | <ul style="list-style-type: none"> <li>Harness and connector (If harness and connector are normal, replace crank angle sensor.)</li> </ul>                              |
| AIR FLOW METER        | <ul style="list-style-type: none"> <li>The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)</li> </ul>                                                                                                                 | <ul style="list-style-type: none"> <li>Harness and connector (If harness and connector are normal, replace air flow meter.)</li> </ul>                                  |
| ENGINE TEMP SENSOR    | <ul style="list-style-type: none"> <li>The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)</li> </ul>                                                                                               | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Engine temperature sensor</li> </ul>                                                              |
| CAR SPEED SENSOR      | <ul style="list-style-type: none"> <li>The vehicle speed sensor circuit is open or shorted.</li> </ul>                                                                                                                                                           | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Vehicle speed sensor (reed switch)</li> </ul>                                                     |
| IGN SIGNAL-PRIMARY*   | <ul style="list-style-type: none"> <li>The ignition signal in primary circuit is not entered during engine cranking or running.</li> </ul>                                                                                                                       | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Power transistor unit</li> </ul>                                                                  |
| CONTROL UNIT          | <ul style="list-style-type: none"> <li>E.C.U. calculation function is malfunctioning.</li> </ul>                                                                                                                                                                 | (Replace E.C.C.S. control unit.)                                                                                                                                        |
| EGR SYSTEM*, **       | <ul style="list-style-type: none"> <li>E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)</li> </ul>                                                                                                                            | <ul style="list-style-type: none"> <li>E.G.R. control valve</li> <li>E.G.R. control solenoid valve</li> </ul>                                                           |
| EXH GAS SENSOR        | <ul style="list-style-type: none"> <li>The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)</li> </ul>                                                                                                      | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Exhaust gas sensor</li> <li>Fuel pressure</li> <li>Injectors</li> <li>Intake air leaks</li> </ul> |
| EXH GAS TEMP SENSOR** | <ul style="list-style-type: none"> <li>The exhaust gas temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)</li> </ul>                                                                                                 | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Exhaust gas temperature sensor</li> </ul>                                                         |
| AIR TEMP SENSOR       | <ul style="list-style-type: none"> <li>The air temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)</li> </ul>                                                                                                         | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Air temperature sensor</li> </ul>                                                                 |
| THROTTLE SENSOR       | <ul style="list-style-type: none"> <li>The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)</li> </ul>                                                                                                                | <ul style="list-style-type: none"> <li>Harness and connector</li> <li>Throttle sensor</li> </ul>                                                                        |
| INJECTOR LEAK**       | <ul style="list-style-type: none"> <li>Fuel leaks from injector.</li> </ul>                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Injector</li> </ul>                                                                                                              |

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

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

# TROUBLE DIAGNOSES

## Consult (Cont'd)

### DATA MONITOR MODE

| MONITOR ITEM   | CONDITION                                                                                           |                                               | SPECIFICATION                                               | CHECK ITEM WHEN OUTSIDE SPEC.                                                        |
|----------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 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                                          | 1.3 - 1.8V                                                  | ● Harness and connector<br>● Air flow meter                                          |
|                |                                                                                                     | 2,000 rpm                                     | 1.8 - 2.2V                                                  |                                                                                      |
| ENG TEMP SEN   | ● Engine: After warming up                                                                          |                                               | More than 70°C (158°F)                                      | ● Harness and connector<br>● Engine temperature sensor                               |
| EXH GAS SEN    | ● 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 |
| M/R F/C MNT    |                                                                                                     |                                               | 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                                                |                                                                                      |
| AIR 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                                                         |                                                                                      |
| 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      | Idle                                                                                                |                                               | 2.9 - 3.6 msec.                                             | ● Harness and connector<br>● Injector<br>● Air flow meter                            |
|                | 2,000 rpm                                                                                           |                                               | 2.6 - 3.3 msec.                                             |                                                                                      |

## TROUBLE DIAGNOSES

### Consult (Cont'd)

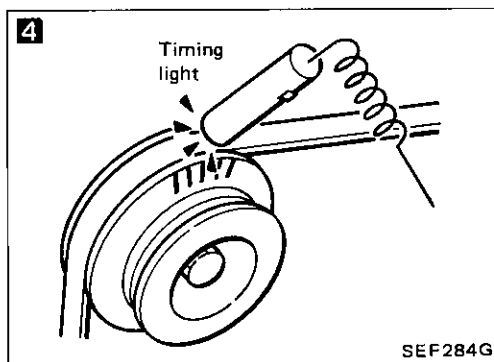
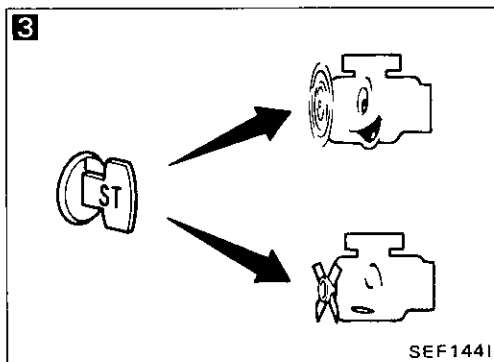
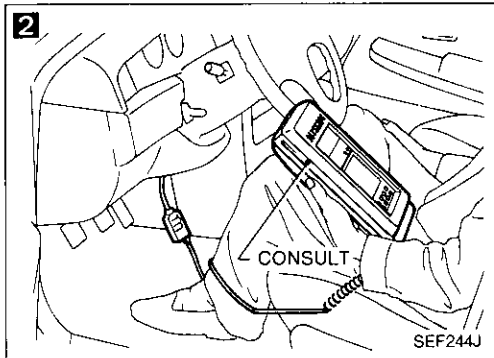
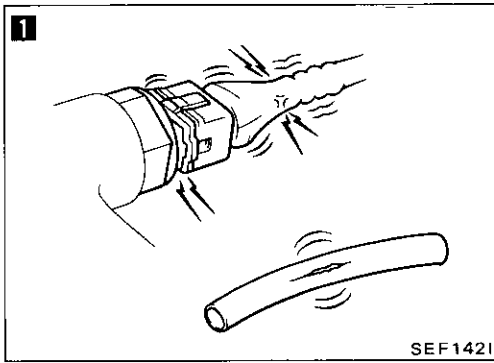
| MONITOR ITEM | CONDITION | SPECIFICATION     | CHECK ITEM WHEN OUTSIDE SPEC.                                                                           |
|--------------|-----------|-------------------|---------------------------------------------------------------------------------------------------------|
| IGN TIMING   | Idle      | 15 deg            | <ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Crank angle sensor</li> </ul> |
|              | 2,000 rpm | More than 25 deg. |                                                                                                         |
| ACC VALVE    | Idle      | 15° - 40°         | <ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● ACC valve</li> </ul>          |
|              | 2,000 rpm | —                 |                                                                                                         |

Remarks:

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

### ACTIVE TEST MODE

| TEST ITEM             | CONDITION                                                                                                                                                                                                                | JUDGEMENT                                              | CHECK ITEM (REMEDY)                                                                                                                                                                         |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FUEL INJECTION TEST   | <ul style="list-style-type: none"><li>● Engine: Return to the original trouble condition</li><li>● Change the amount of fuel injection with the CONSULT.</li></ul>                                                       | If trouble symptom disappears, see CHECK ITEM.         | <ul style="list-style-type: none"><li>● Harness and connector</li><li>● Fuel injectors</li><li>● Exhaust gas sensors</li></ul>                                                              |
| AAC/V OPENING TEST    | <ul style="list-style-type: none"><li>● Engine: After warming up, idle the engine.</li><li>● Change the AAC valve opening percent with the CONSULT.</li></ul>                                                            | Engine speed changes according to the opening percent. | <ul style="list-style-type: none"><li>● Harness and connector</li><li>● AAC valve</li></ul>                                                                                                 |
| ENGINE TEMP TEST      | <ul style="list-style-type: none"><li>● Engine: Return to the original trouble condition</li><li>● Change the engine coolant temperature with the CONSULT.</li></ul>                                                     | If trouble symptom disappears, see CHECK ITEM.         | <ul style="list-style-type: none"><li>● Harness and connector</li><li>● Engine temperature sensor</li><li>● Fuel injectors</li></ul>                                                        |
| IGN TIMING TEST       | <ul style="list-style-type: none"><li>● Engine: Return to the original trouble condition</li><li>● Timing light: Set</li><li>● Retard the ignition timing with the CONSULT.</li></ul>                                    | If trouble symptom disappears, see CHECK ITEM.         | <ul style="list-style-type: none"><li>● Adjust initial ignition timing</li></ul>                                                                                                            |
| POWER BALANCE TEST    | <ul style="list-style-type: none"><li>● Engine: After warming up, idle the engine.</li><li>● A/C switch "OFF"</li><li>● Shift lever "N"</li><li>● Cut off each injector signal one at a time with the CONSULT.</li></ul> | Engine runs rough or dies.                             | <ul style="list-style-type: none"><li>● Harness and connector</li><li>● Compression</li><li>● Injectors</li><li>● Power transistor</li><li>● Spark plugs</li><li>● Ignition coils</li></ul> |
| RADIATOR FAN TEST     | <ul style="list-style-type: none"><li>● Ignition switch: ON</li><li>● Turn the radiator fan "ON" and "OFF" with the CONSULT.</li></ul>                                                                                   | Radiator fan moves and stops.                          | <ul style="list-style-type: none"><li>● Harness and connector</li><li>● Radiator fan motor</li></ul>                                                                                        |
| FUEL PUMP RLY TEST    | <ul style="list-style-type: none"><li>● Ignition switch: ON (Engine stopped)</li><li>● Turn the fuel pump relay "ON" and "OFF" with the CONSULT and listen to operating sound.</li></ul>                                 | Fuel pump relay makes the operating sound.             | <ul style="list-style-type: none"><li>● Harness and connector</li><li>● Fuel pump relay</li></ul>                                                                                           |
| EGR CONT SOLV/V TEST  | <ul style="list-style-type: none"><li>● Ignition switch: ON</li><li>● Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.</li></ul>                                                       | Each solenoid valve makes an operating sound.          | <ul style="list-style-type: none"><li>● Harness and connector</li><li>● Solenoid valve</li></ul>                                                                                            |
| PRVR CONT SOL/V TEST  |                                                                                                                                                                                                                          |                                                        |                                                                                                                                                                                             |
| AIV CONT SOL/V TEST   |                                                                                                                                                                                                                          |                                                        |                                                                                                                                                                                             |
| SWIRL CONT SOL/V TEST |                                                                                                                                                                                                                          |                                                        |                                                                                                                                                                                             |
| SELF-LEARN CONT TEST  | <ul style="list-style-type: none"><li>● In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen.</li></ul>                            |                                                        |                                                                                                                                                                                             |



## Basic Inspection

1

### BEFORE STARTING

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

2

### CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-47.)

3

### DOES ENGINE START?

No → Go to 6.

Yes

4

### CHECK IGNITION TIMING.

Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-30.)

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

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

O.K.

(Go to ① on next page.)

# TROUBLE DIAGNOSES

## Basic Inspection (Cont'd)

**5**

**■ AAC VALVE ADJ ■**

SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITION

- ENG WARMED UP
- NO LOAD

START

SEF3721

**5**

Throttle sensor harness connector

DISCONNECT

SEF408J

**6**

**■ THROTTLE SEN ADJ ■**

\*\*\*\* ADJ MONITOR \*\*\*\*

THROTTLE SEN 0.46V

=== MONITOR ===

CAS-RPM (POS) 800rpm

IDLE POSITION ON

SEF1471

**6**

CONNECT

H.S.

SEF1481

**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 the following values?

**M/T:  $650 \pm 50$  rpm**

**A/T:  $650 \pm 50$  rpm**

**("N" position)**

OR

When disconnecting throttle sensor harness connector, does engine rpm fall to the following values?

**M/T:  $650 \pm 50$  rpm**

**A/T:  $650 \pm 50$  rpm**

**("N" position)**

No → Adjust engine rpm by turning idle adjusting screw.

**CAUTION**  
Be sure to set gears to "Neutral".

Yes

**6**

**CHECK THROTTLE SENSOR IDLE POSITION.**

1. Perform "THROTTLE SEN. ADJ." in "WORK SUPPORT" mode.

2. Check that output voltage of throttle sensor is 0.4 to 0.5V. (Throttle valve fully closes.) and "IDLE POSITION" stays "ON".

OR

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

N.G. → 1. Adjust output voltage by rotating throttle sensor body.

2. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.

3. Confirm that "IDLE POSITION" stays "ON".

O.K. → (Go to ⑥ on next page.)



# TROUBLE DIAGNOSES

## Basic Inspection (Cont'd)

**7**

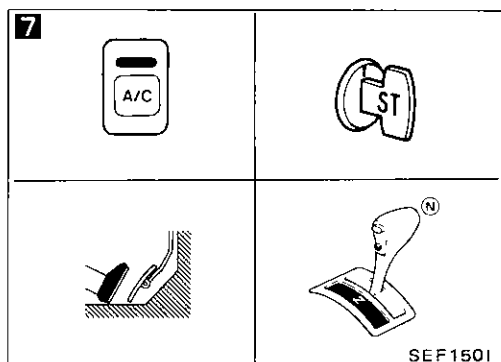
☆ MONITOR ☆ NO FAIL
☐

START SIGNAL  
 IDLE POSITION  
 AIR COND SIG  
 NEUTRAL SW

OFF  
 ON  
 OFF  
 ON

RECORD

SEF149I



**7**

ⓑ

**CHECK SWITCH INPUT SIGNAL.**

Select the following switches in "DATA MONITOR" mode,

- Start signal,
- Idle position,
- Air conditioner signal,
- Neutral (Parking) switch,

and check the switches' ON-OFF operation.

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

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

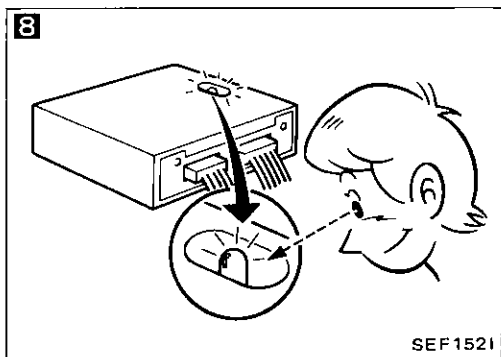
**8**

■ SELF-DIAG RESULTS ■

FAILURE DETECTED    TIME  
 ENGINE TEMP SENSOR    0

ERASE
PRINT

SEF151I



O.K.

**8**

**READ SELF-DIAGNOSTIC RESULTS.**

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

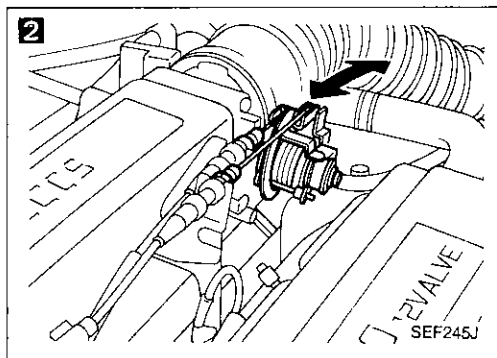
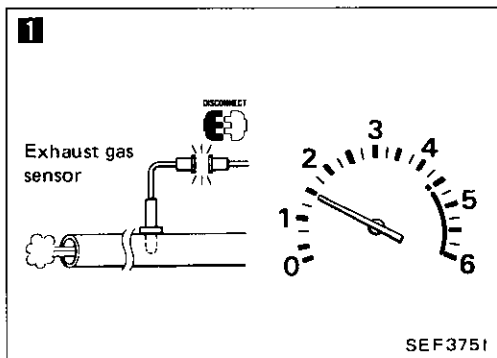
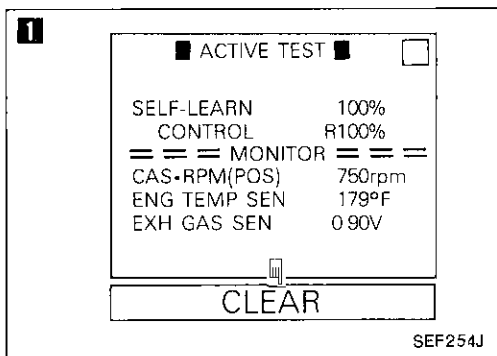
OR

- Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-45.)
- Count the number of RED L.E.D. flashes and read out the codes.
- Are the codes being output?

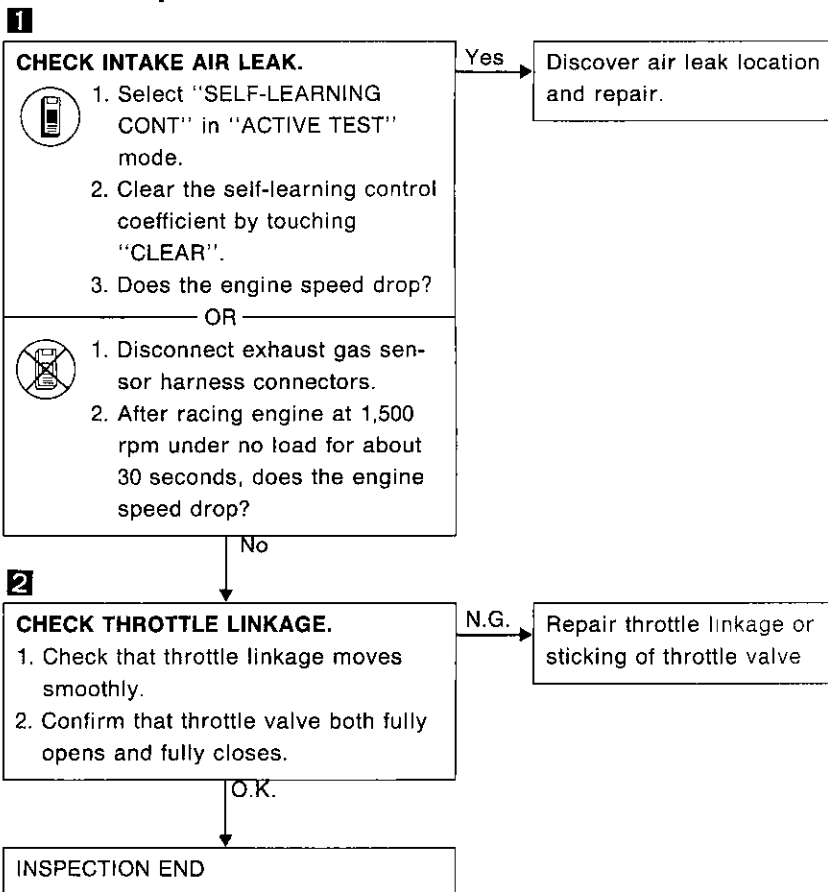
Yes → Go to the relevant inspection procedure.

No →

INSPECTION END

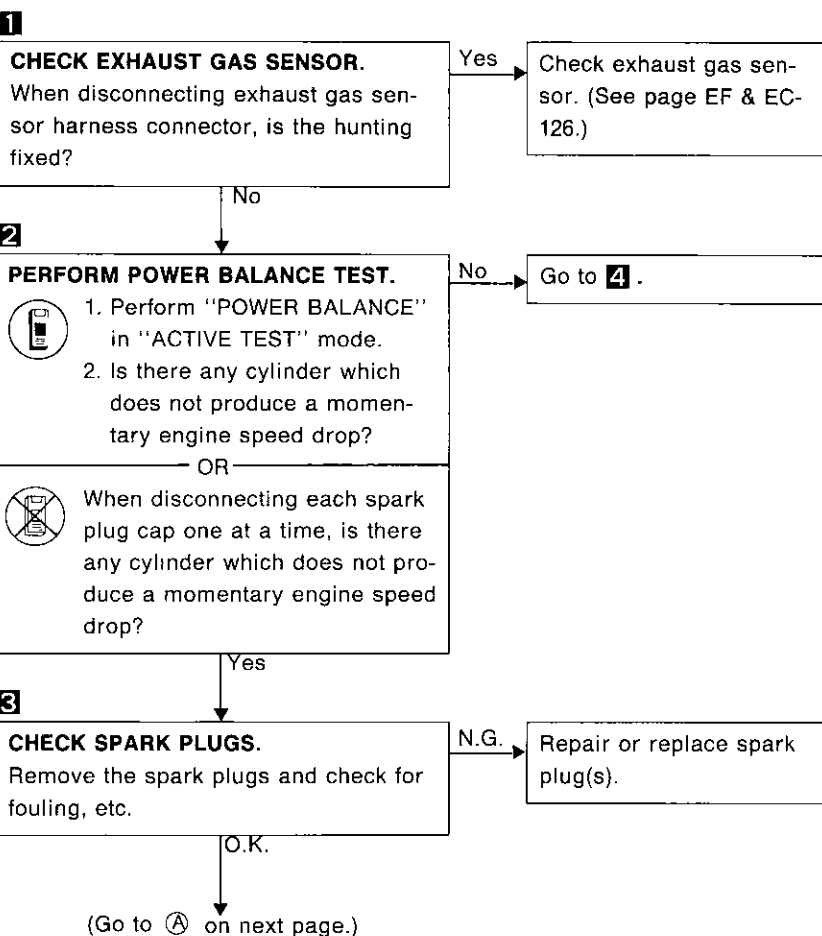
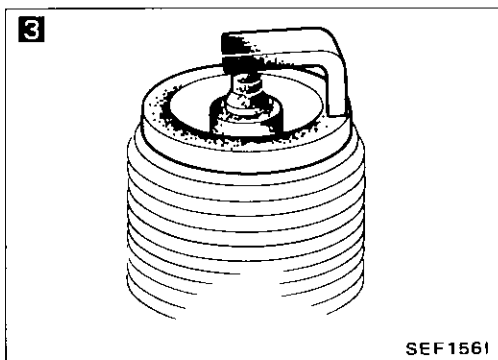
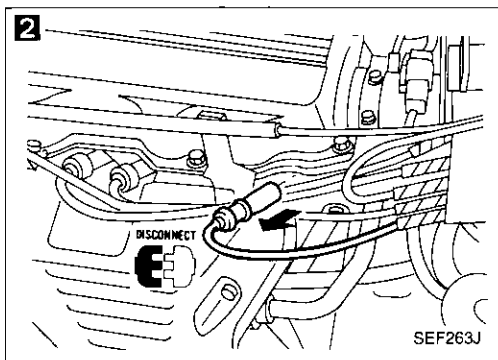
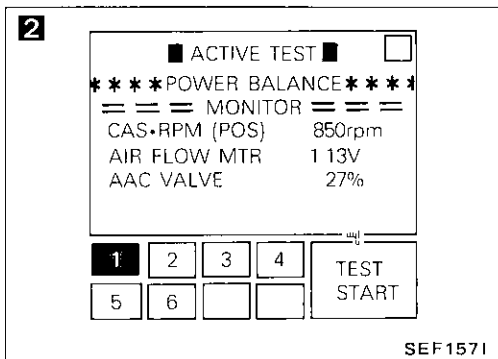
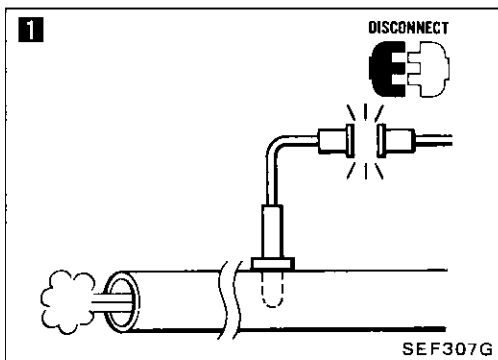


## Diagnostic Procedure 1 — High Idling after Warm-up



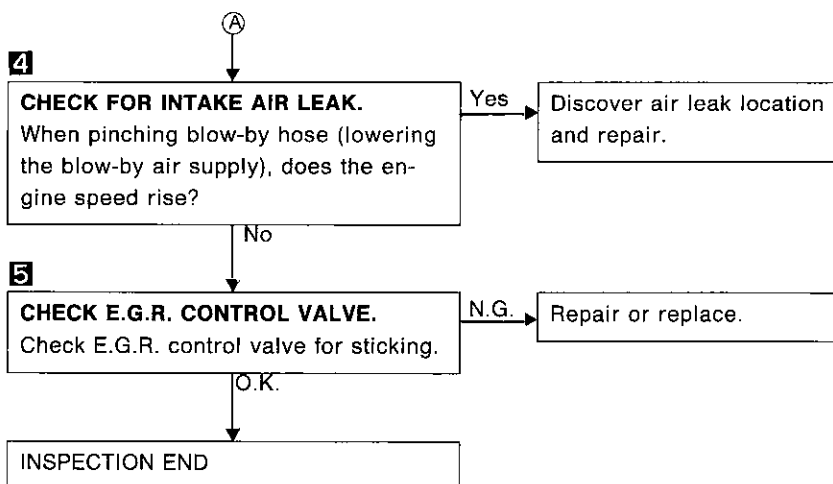
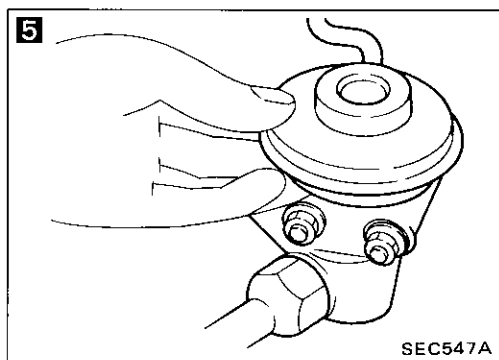
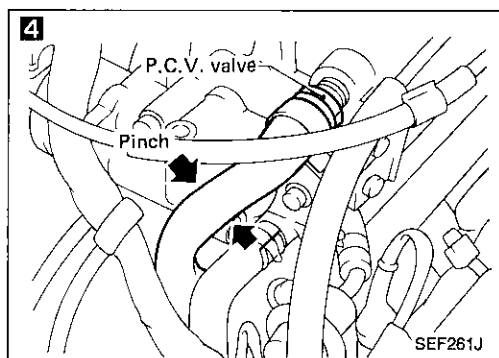
# TROUBLE DIAGNOSES

## Diagnostic Procedure 2 — Hunting

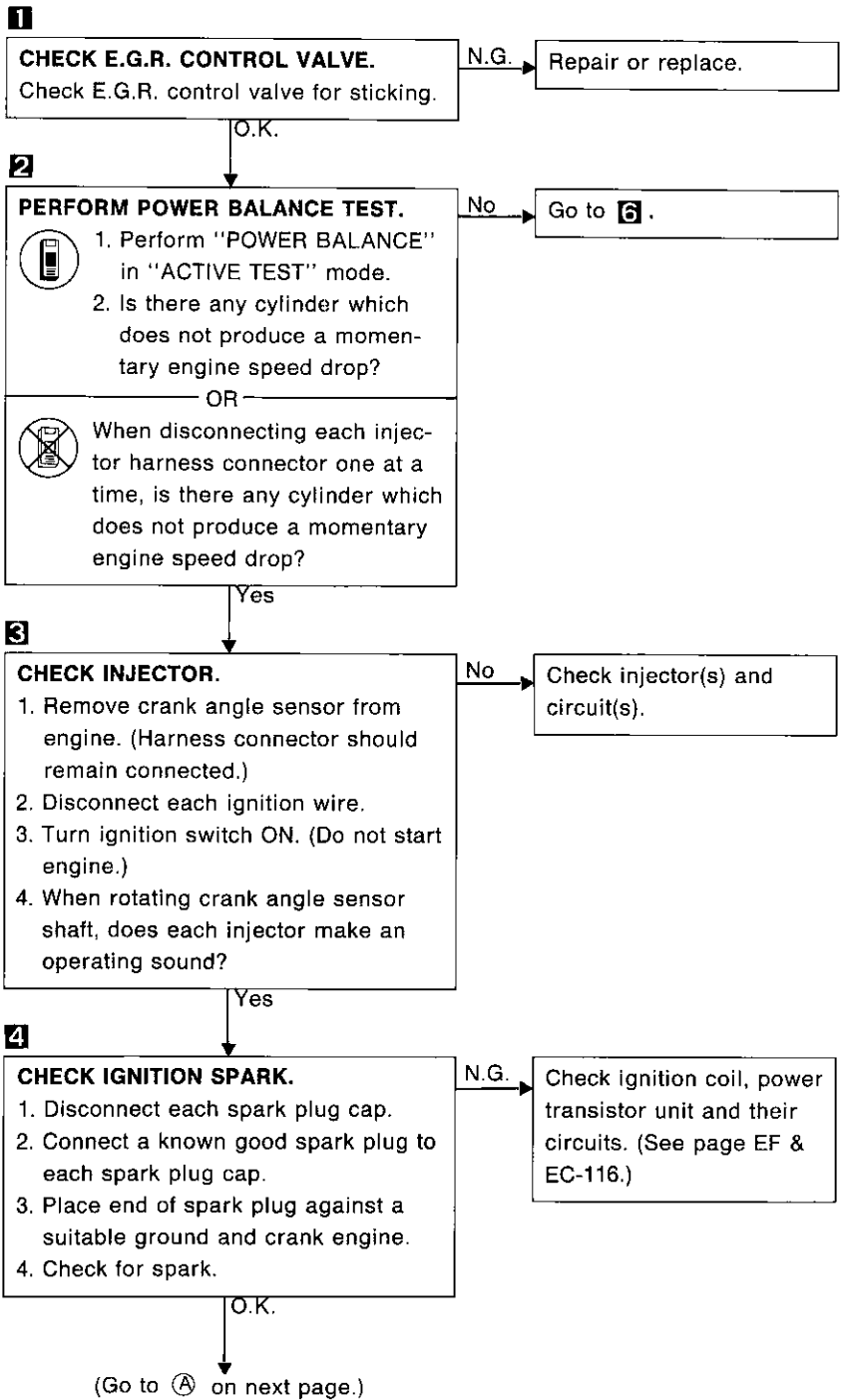
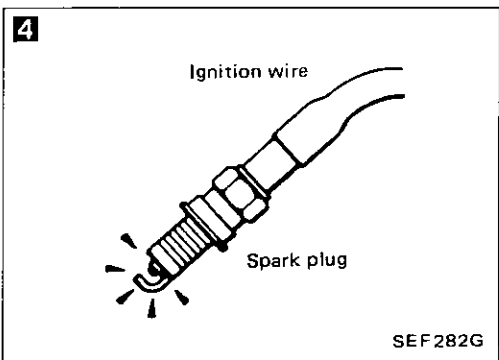
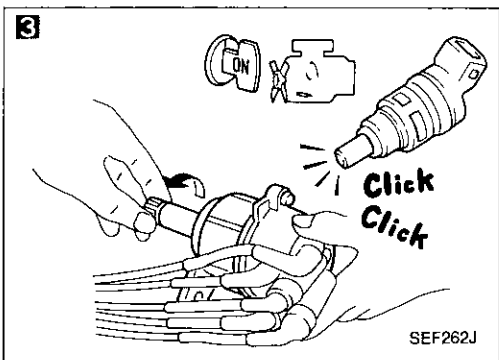
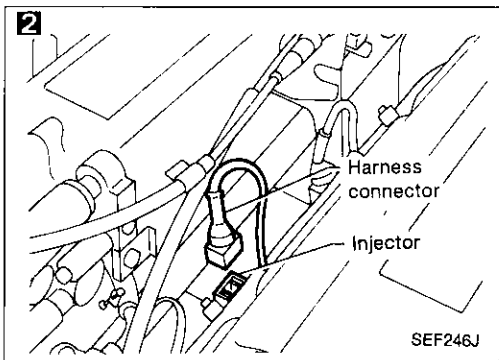
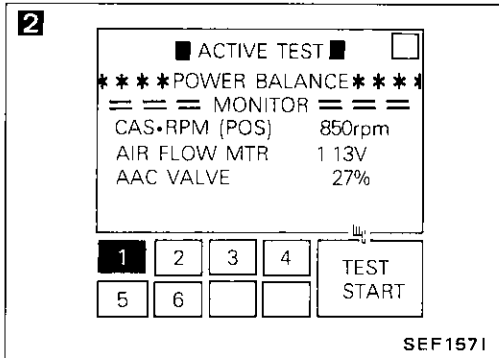
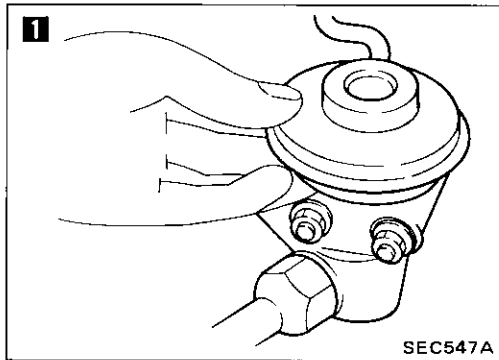


## TROUBLE DIAGNOSES

### Diagnostic Procedure 2 — Hunting (Cont'd)

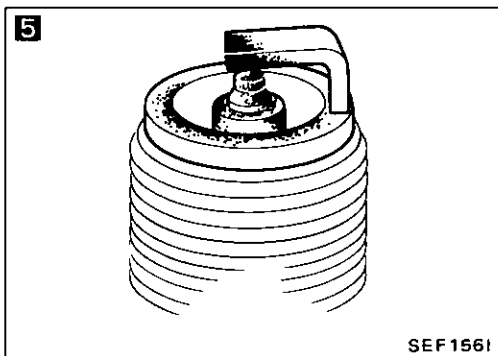


## Diagnostic Procedure 3 — Unstable Idle



## TROUBLE DIAGNOSES

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



**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. 226 kPa (2.3 kg/cm<sup>2</sup>, 33 psi)**

N.G. → Check fuel pump and circuit.



OR



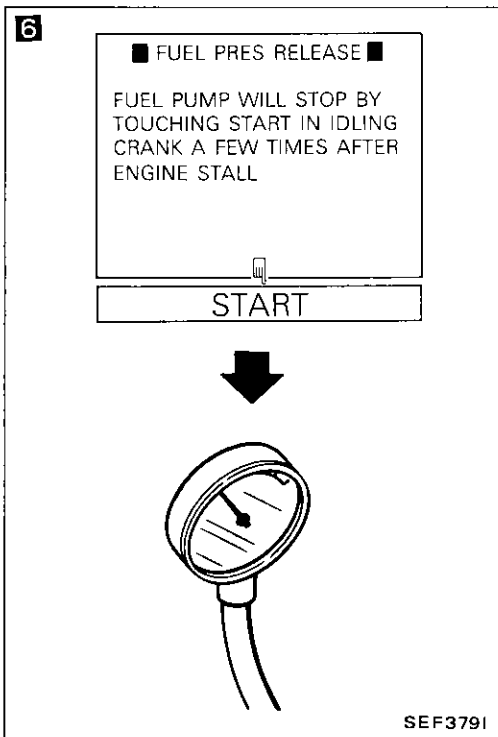
1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

(Go to Ⓑ on next page.)

#### CAUTION:

When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.



# TROUBLE DIAGNOSES

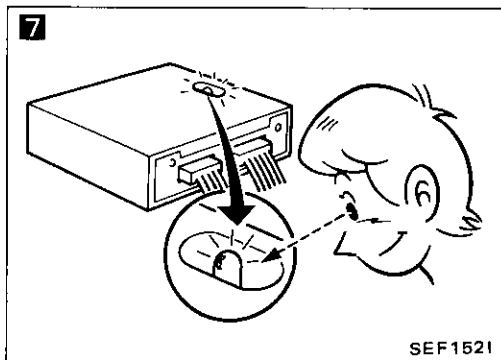
## Diagnostic Procedure 3 — Unstable Idle (Cont'd)

**7**

|              |          |                          |
|--------------|----------|--------------------------|
| ☆MONITOR     | ☆NO FAIL | <input type="checkbox"/> |
| CAS•RPM(POS) | 2087rpm  |                          |
| M/R F/C MNT  | LEAN     |                          |

RECORD

SEF265J



**7**

**CHECK EXHAUST GAS SENSOR.**

1. See "M/R F/C MNT" in "Data monitor" mode.

2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

**RICH → LEAN → RICH →**  
                     1 time   2 times  
**LEAN → RICH.....**  
                     OR  
 1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-46.)

2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

N.G. → Replace exhaust gas sensor.

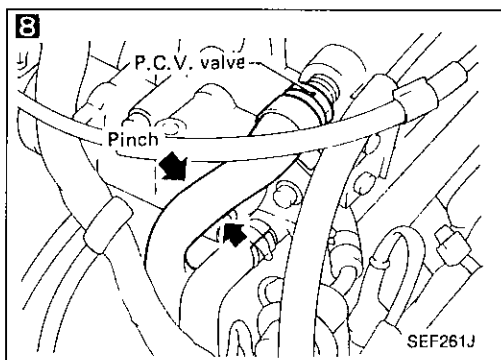
**8**

**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.)



# TROUBLE DIAGNOSES

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

**9**

■ AAC VALVE ADJ ■ □

\*\*\*\* ADJ MONITOR \*\*\*\*

CAS-RPM (POS) 712rpm

— — CONDITION SETTING — —

AAC VALVE FIXED

== == MONITOR == ==

ENG TEMP SEN 177°C

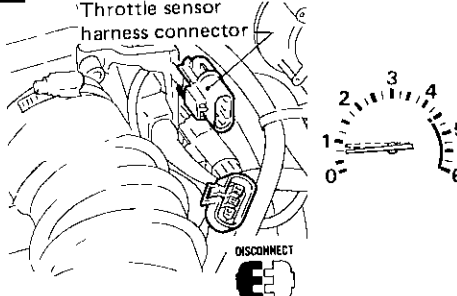
IDLE POSITION ON

AIR COND SIG OFF

SEF145I

**9**

Throttle sensor harness connector



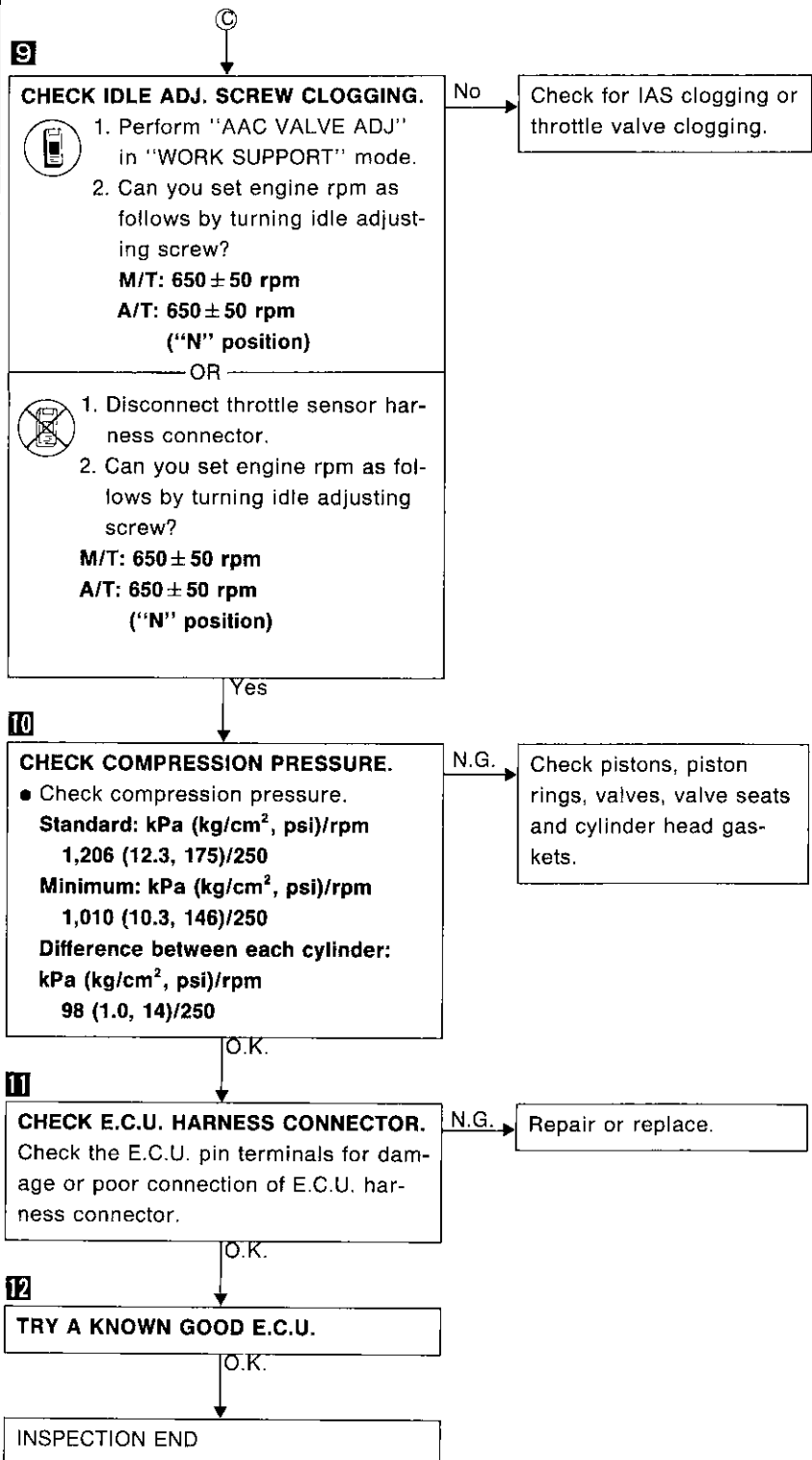
DISCONNECT

SEF408J

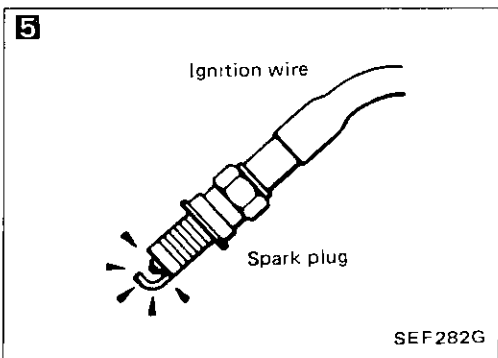
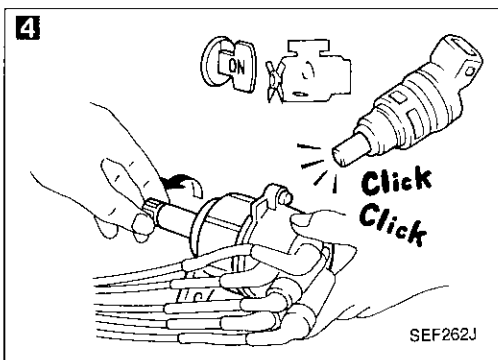
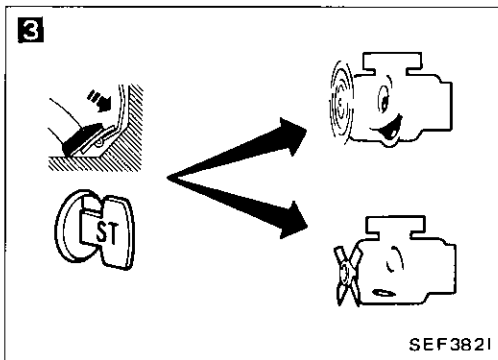
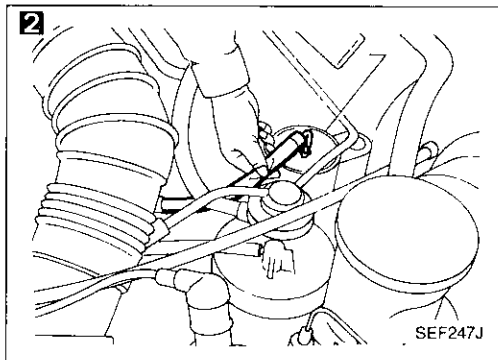
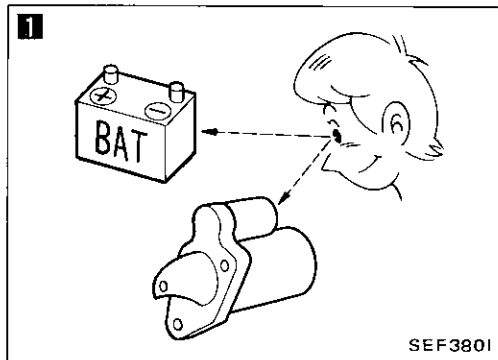
**10**

**COMPRESSION PRESSURE**

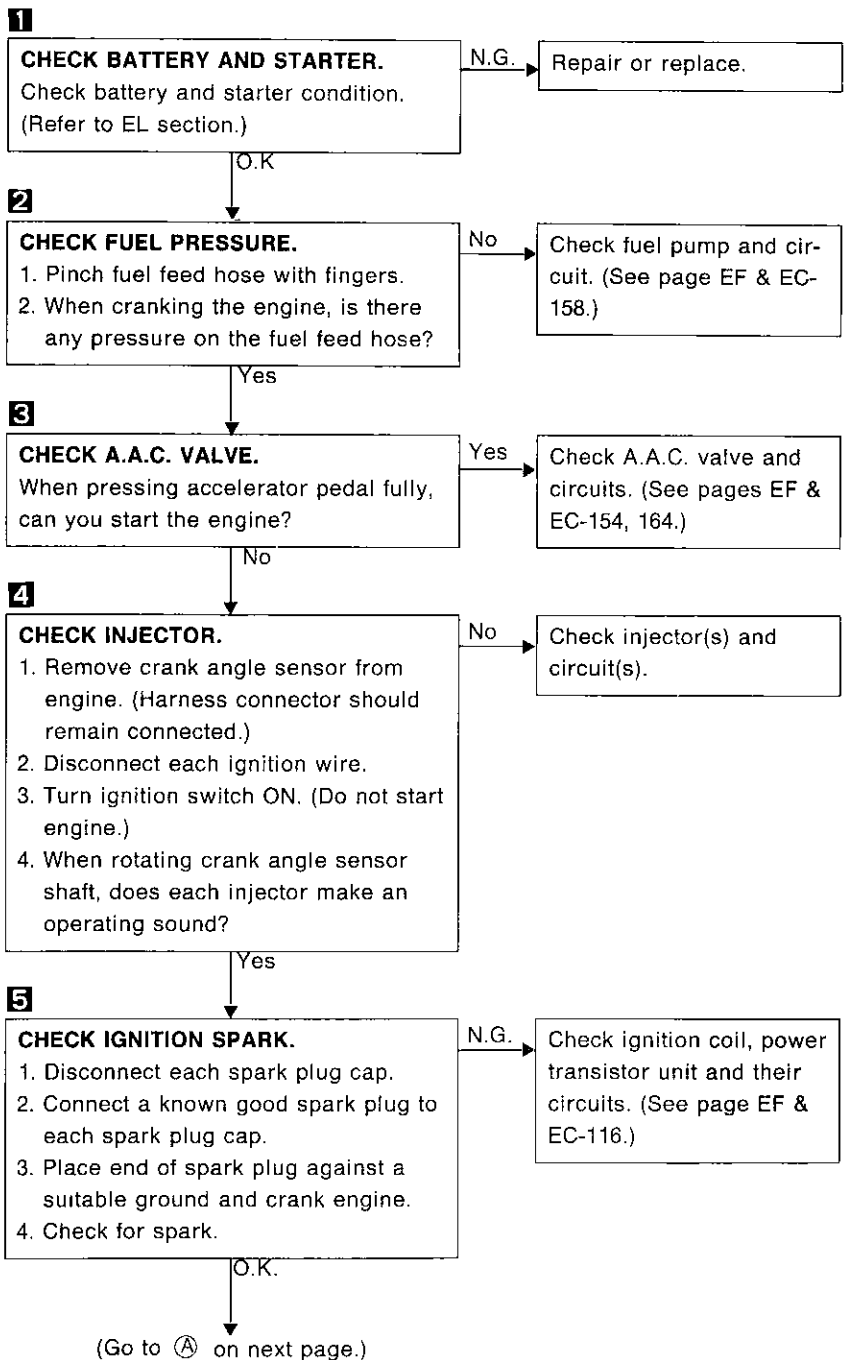
SEF309G





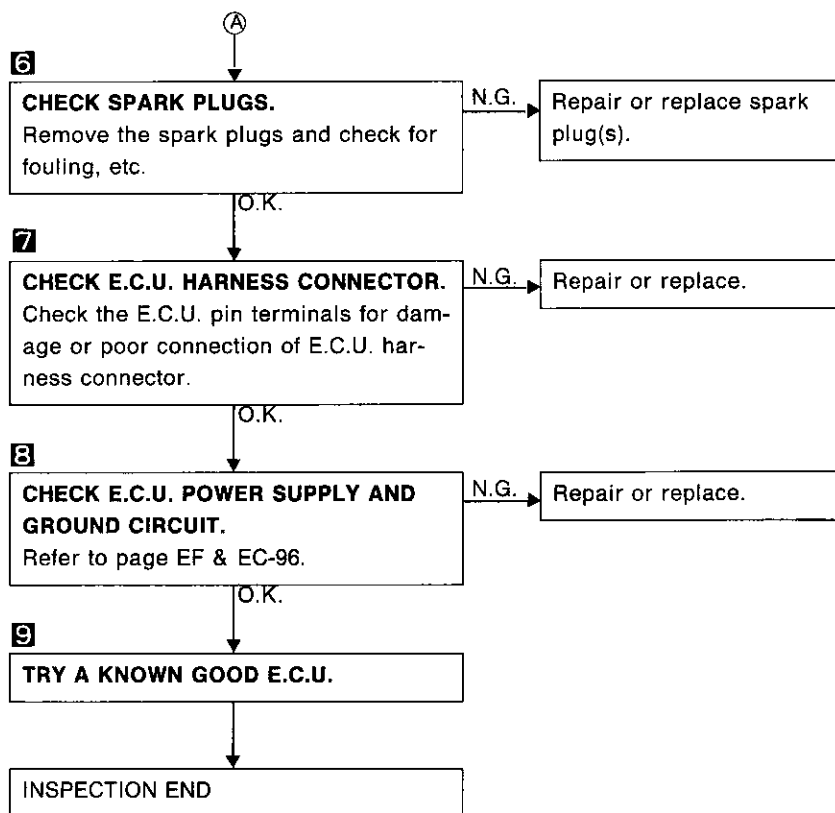
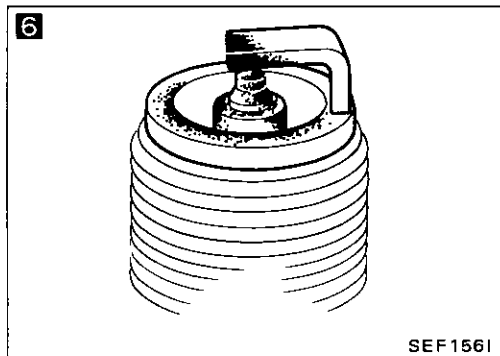


## Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold

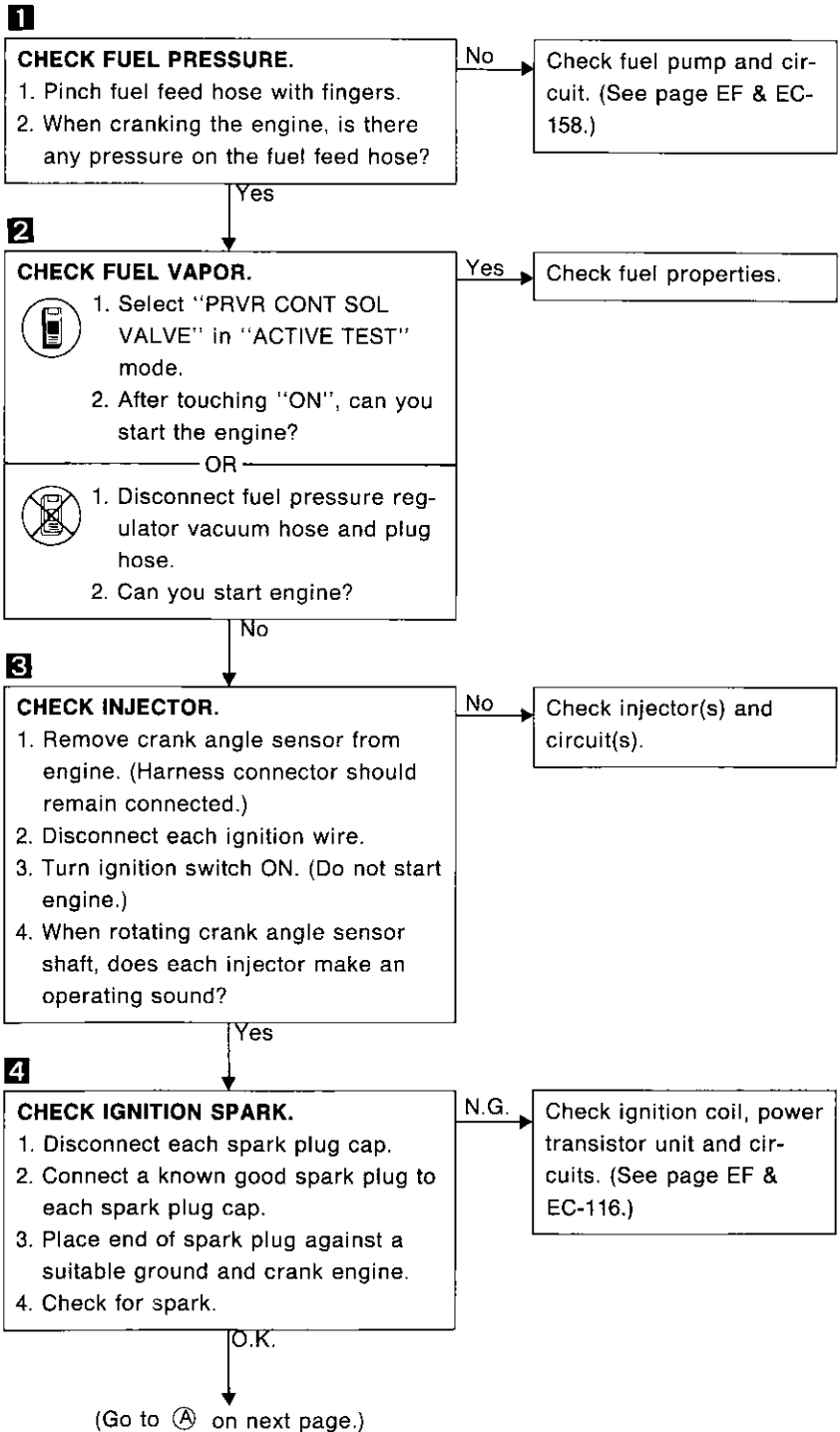
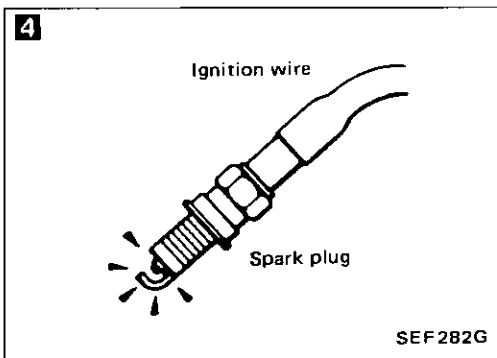
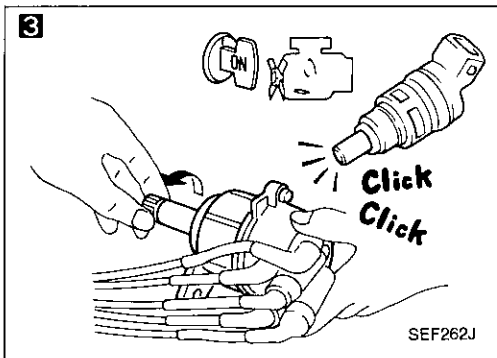
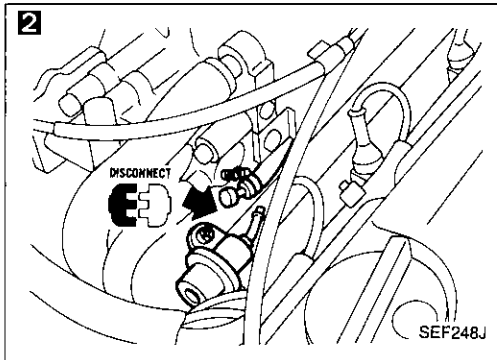
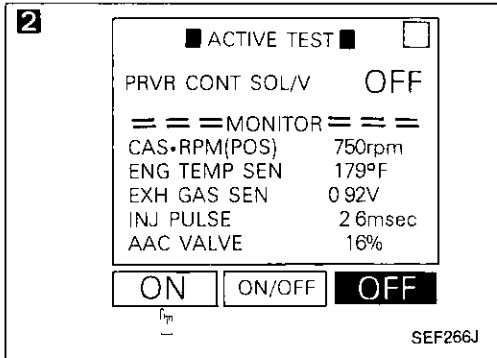
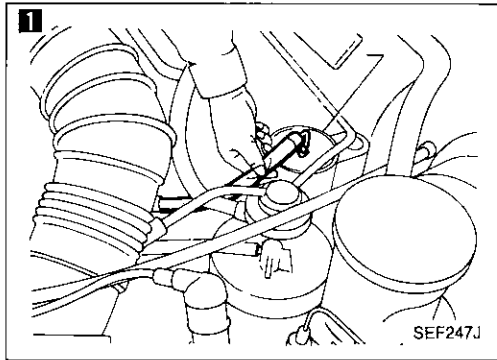


## TROUBLE DIAGNOSES

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

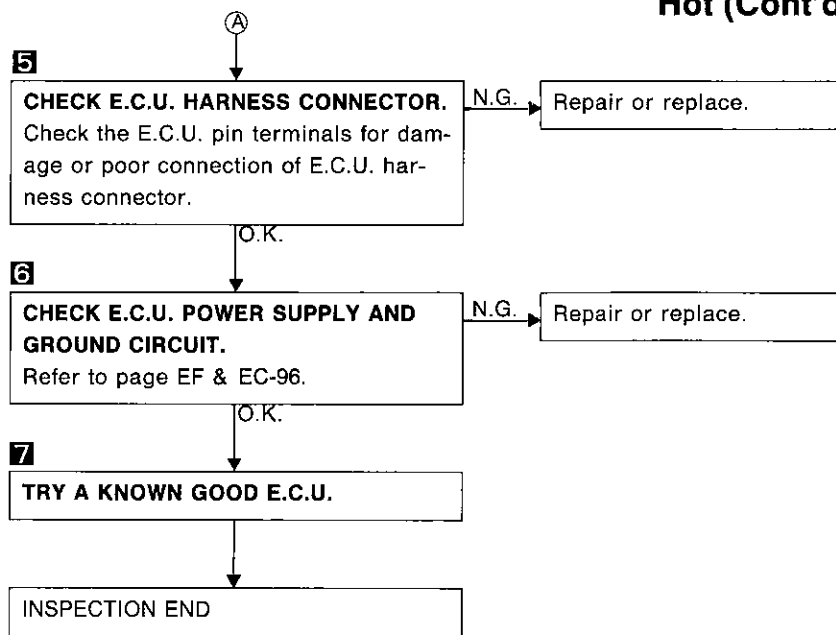


## Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot



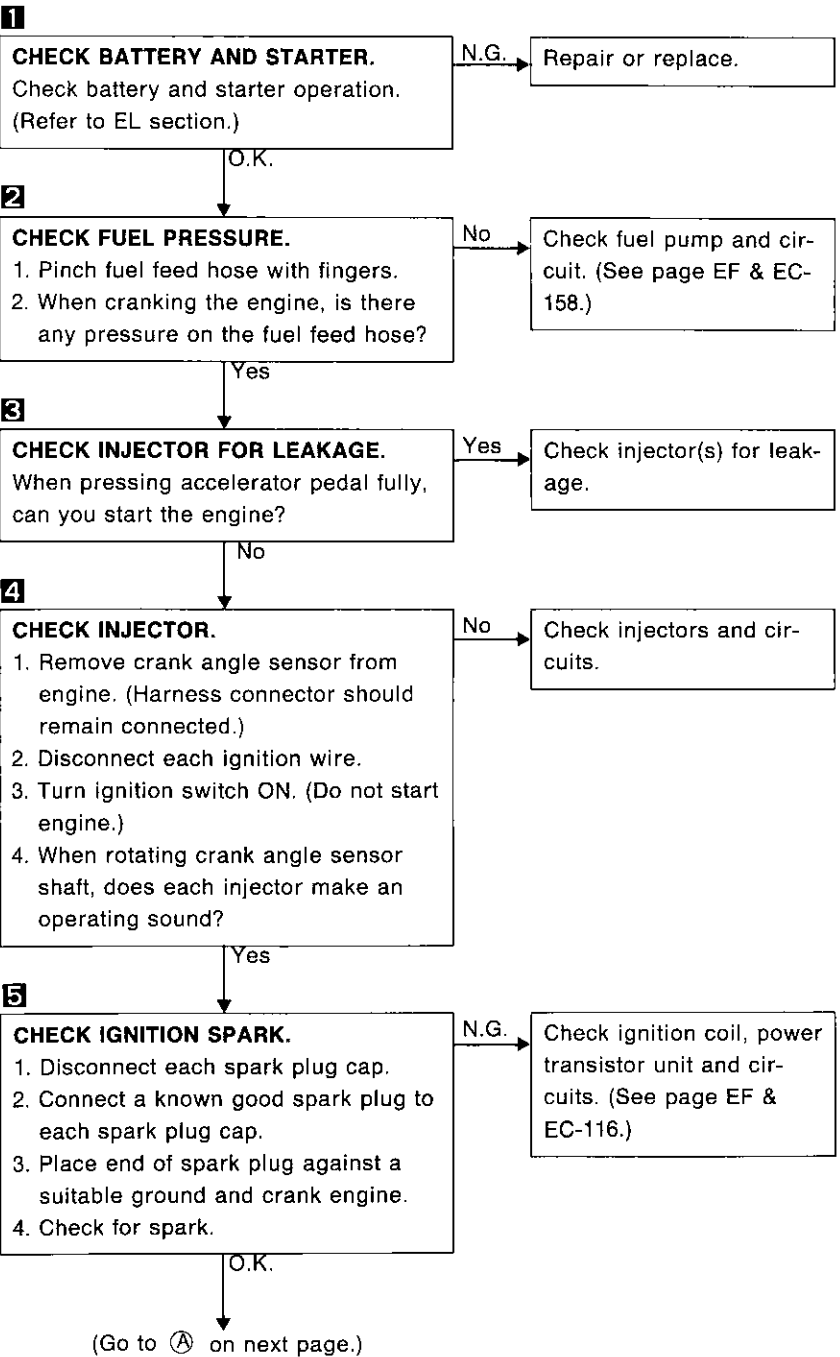
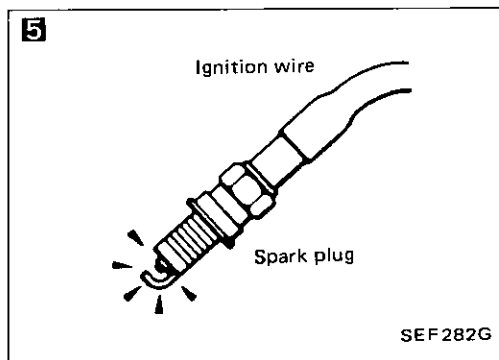
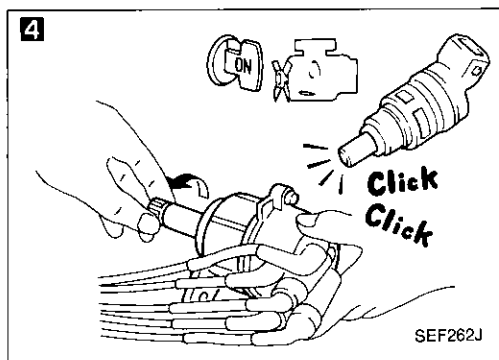
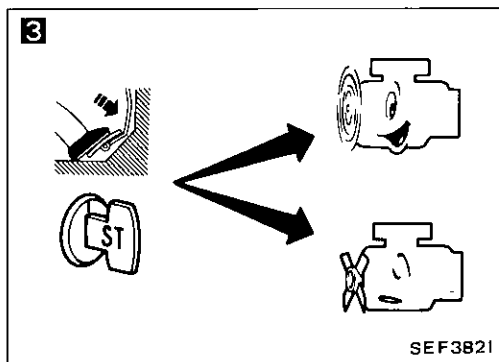
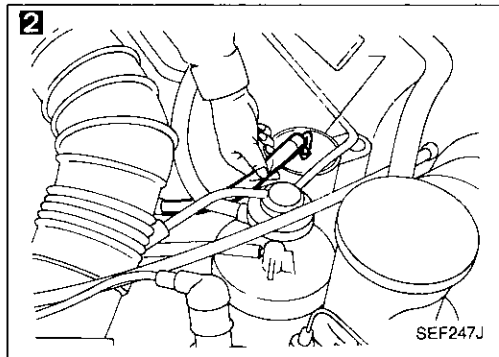
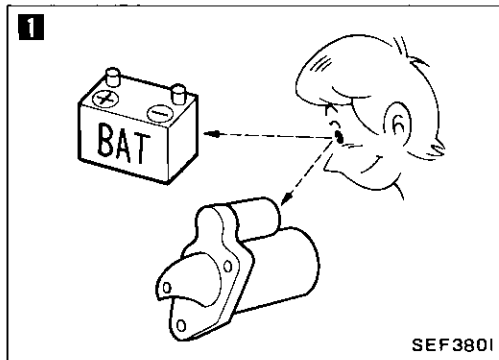
## TROUBLE DIAGNOSES

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



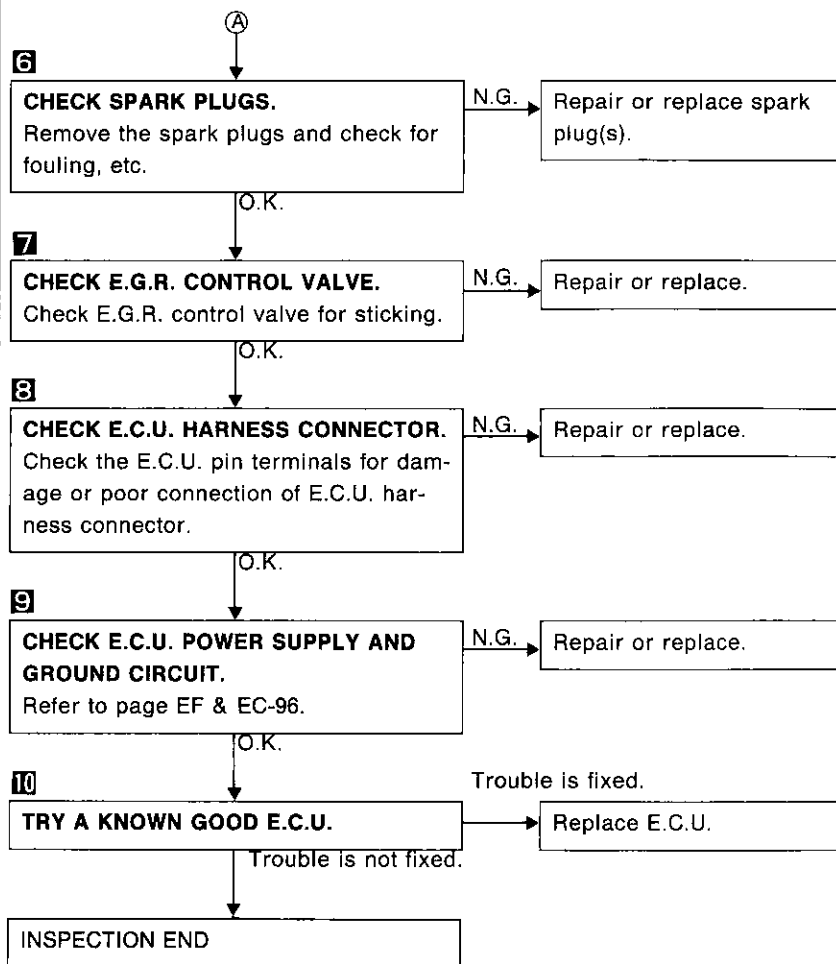
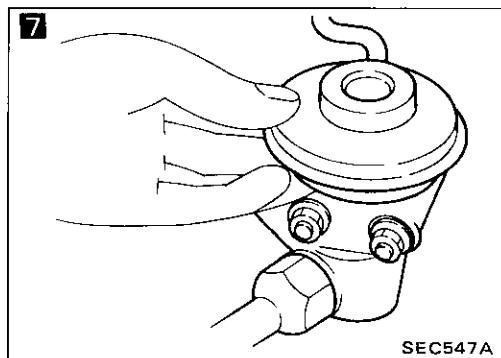
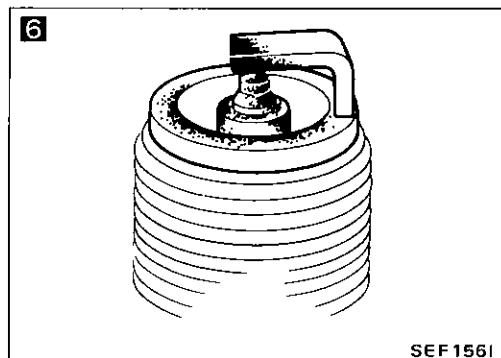
# TROUBLE DIAGNOSES

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



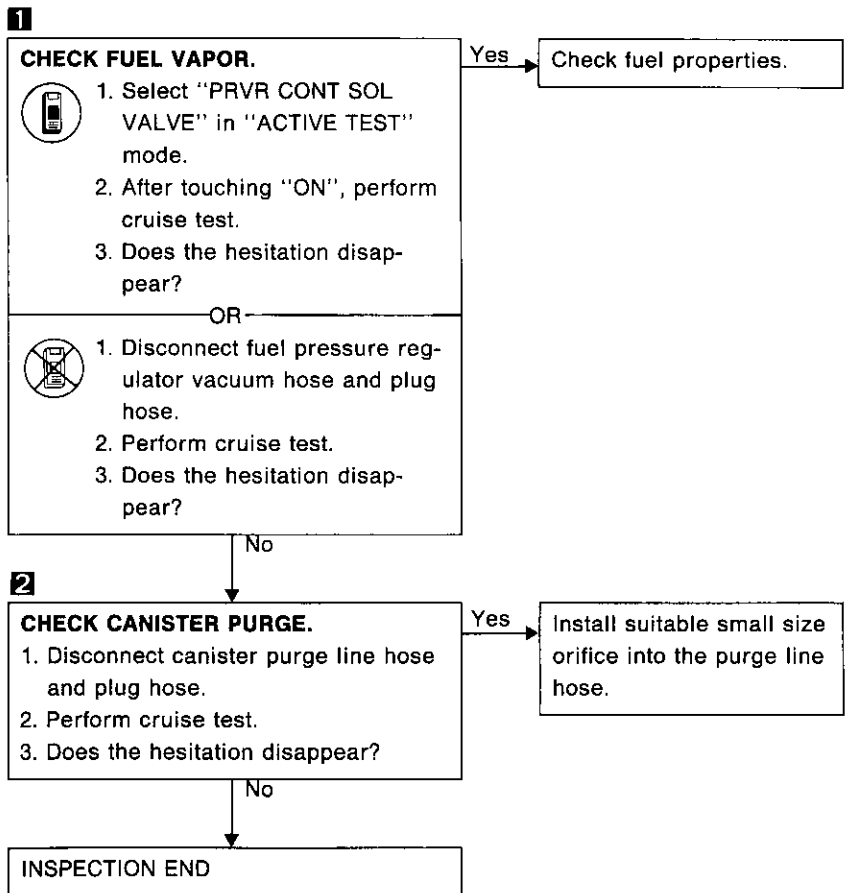
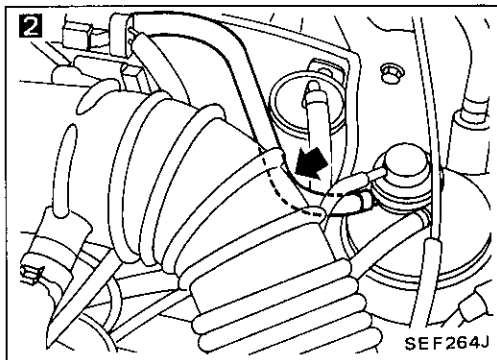
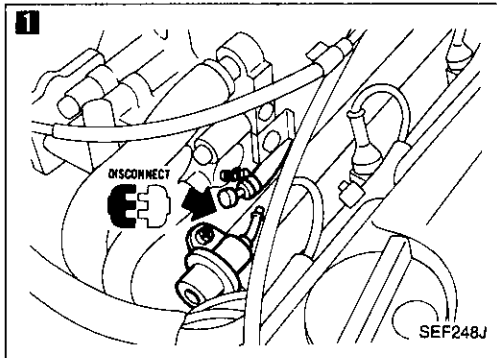
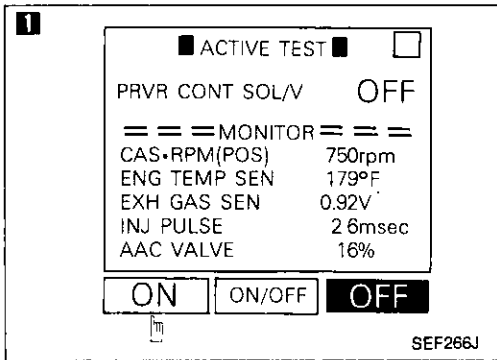
## TROUBLE DIAGNOSES

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

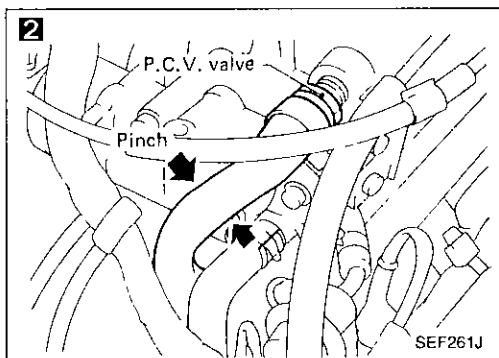
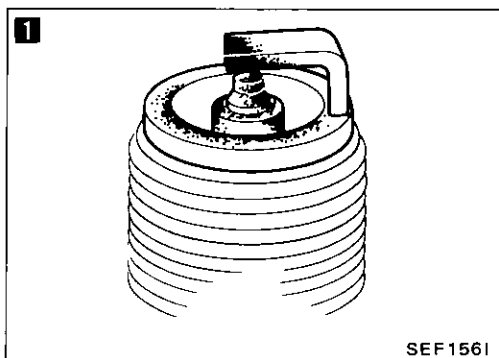


# TROUBLE DIAGNOSES

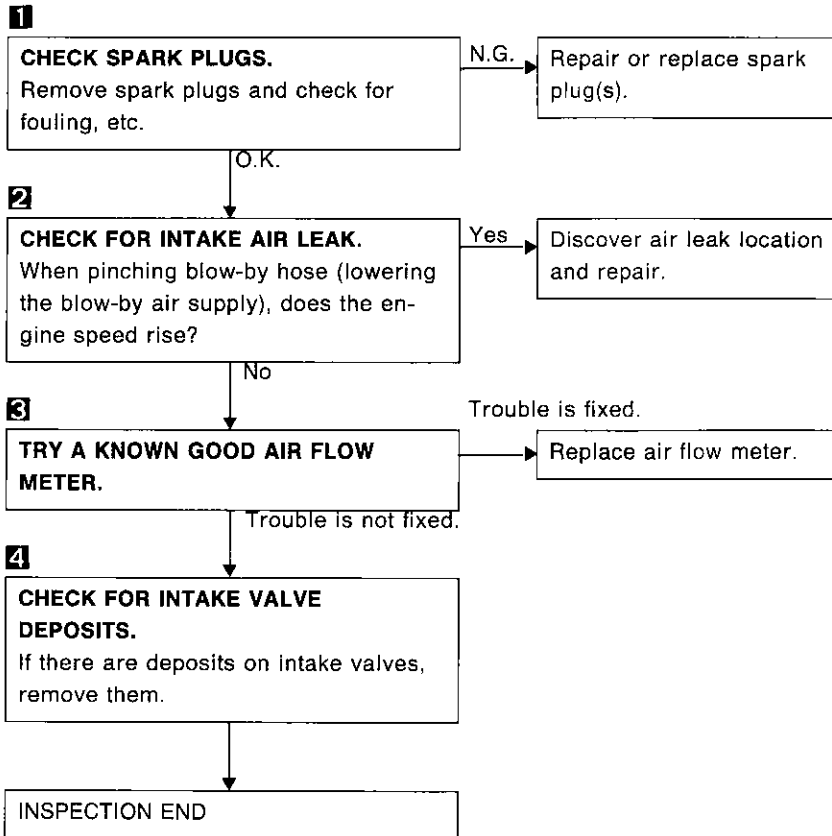
## Diagnostic Procedure 7 — Hesitation when the Engine is Hot



## TROUBLE DIAGNOSES

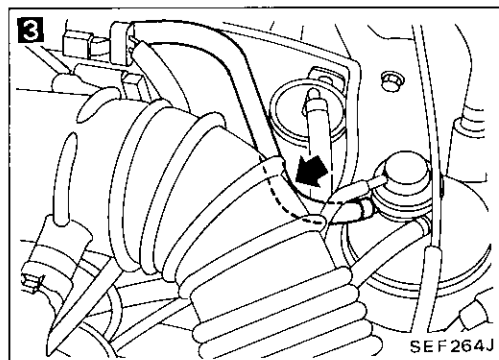
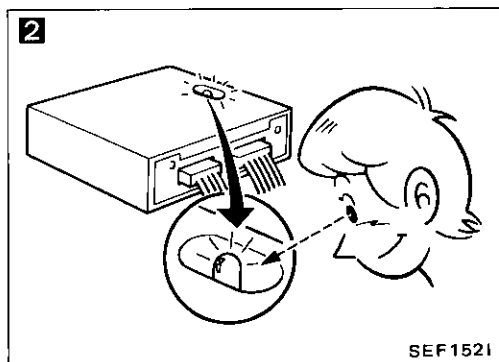
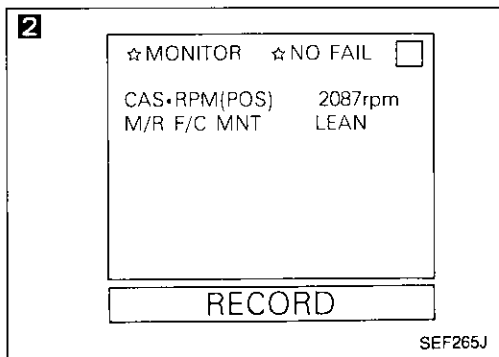
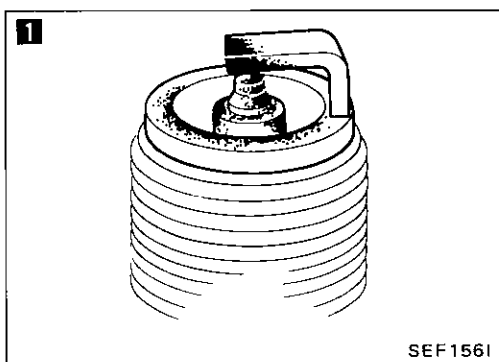


### Diagnostic Procedure 8 — Hesitation when the Engine is Cold

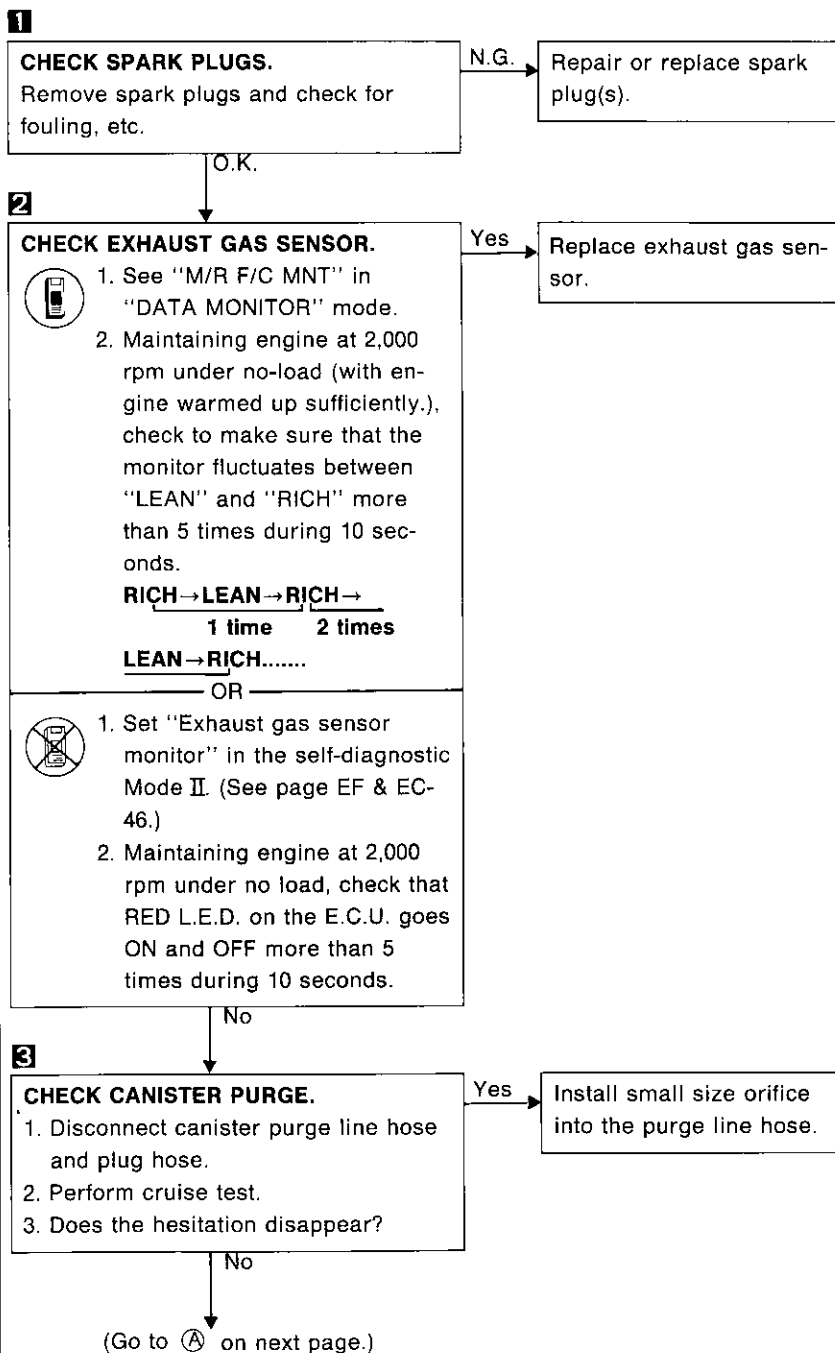




# TROUBLE DIAGNOSES

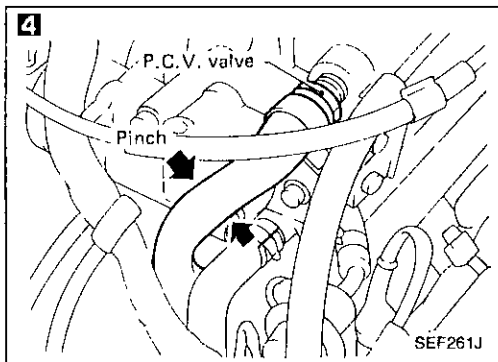


## Diagnostic Procedure 9 — Hesitation under Normal Conditions



## TROUBLE DIAGNOSES

### 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

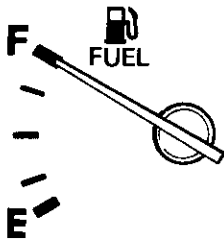
Discover air leak location and repair.

No

INSPECTION END

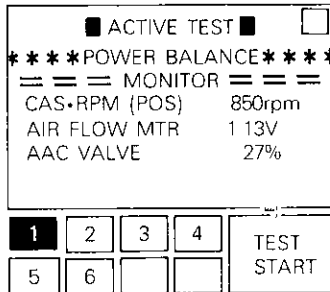
## Diagnostic Procedure 10 — Engine Stalls when Turning

**1**



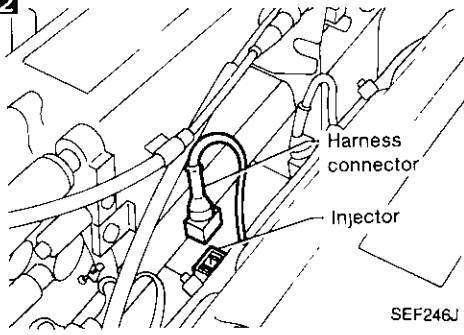
SEF386I

**2**



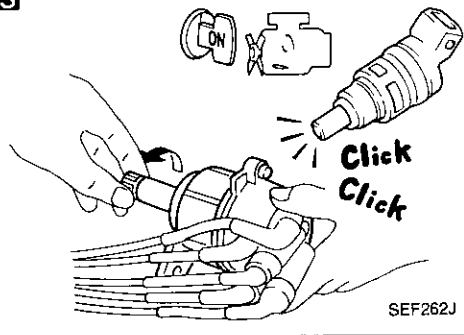
SEF157I

**2**



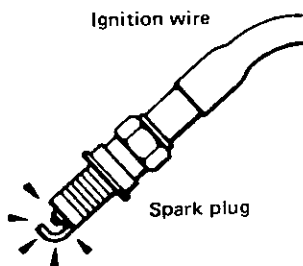
SEF246J

**3**



SEF262J

**4**



SEF282G

**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?

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

**3**

### CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Disconnect each ignition wire.
3. Turn ignition switch ON. (Do not start engine.)
4. 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 each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G.

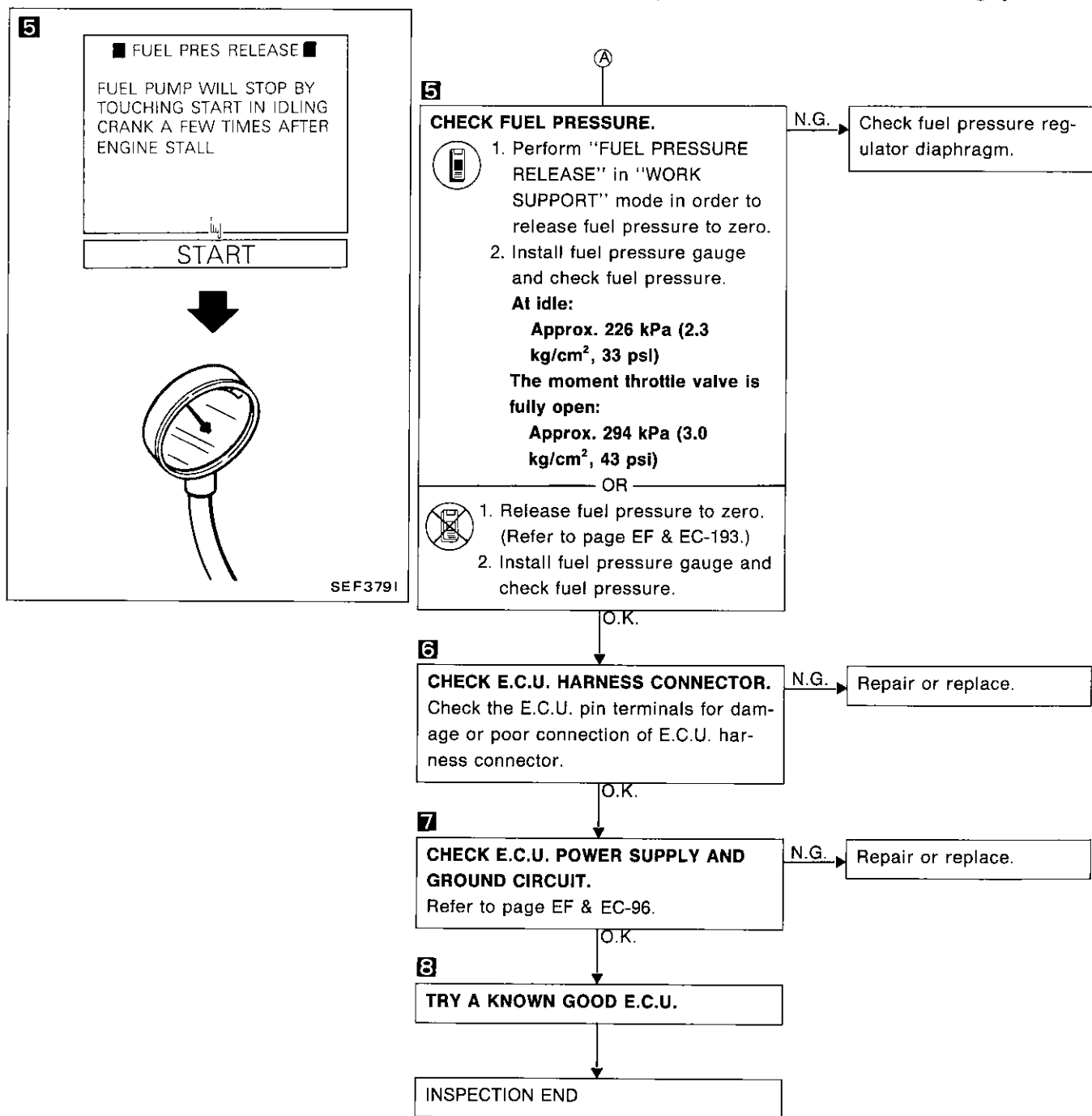
Check ignition coil, power transistor unit and circuits. (See page EF & EC-116.)

O.K.

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

## TROUBLE DIAGNOSES

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

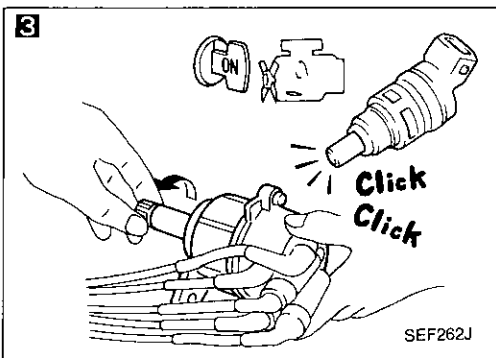
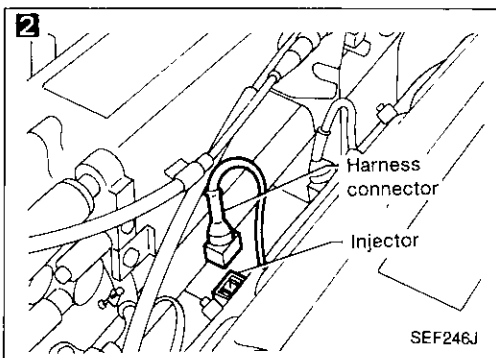
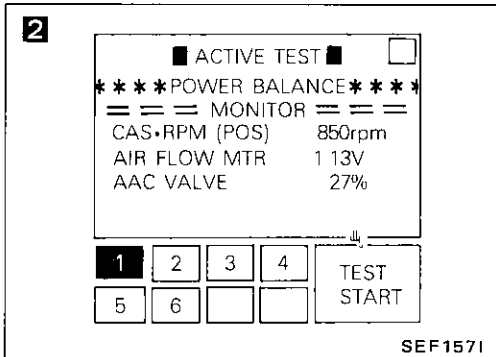
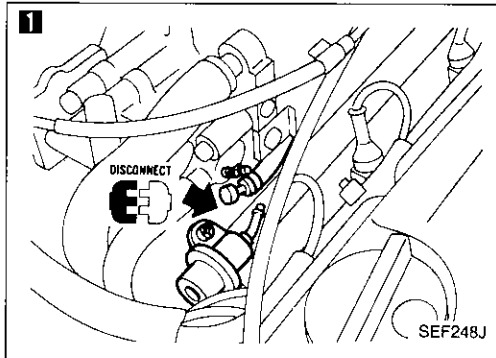
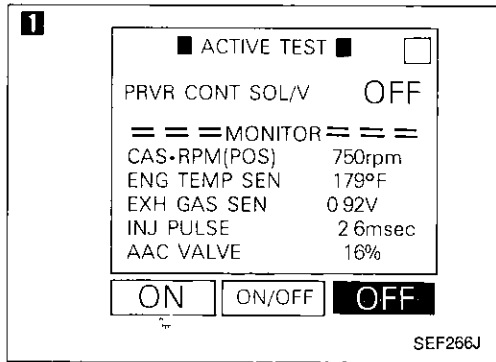


#### CAUTION:

When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

# TROUBLE DIAGNOSES

## 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?
- OR
1. 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

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

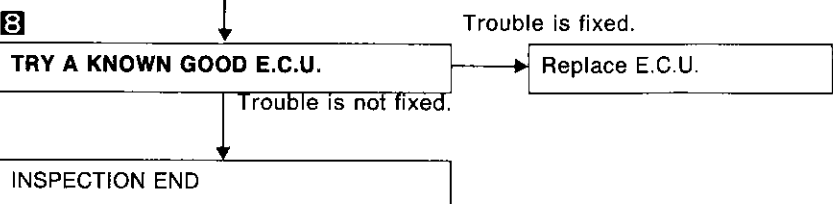
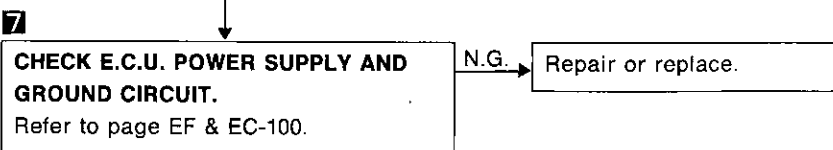
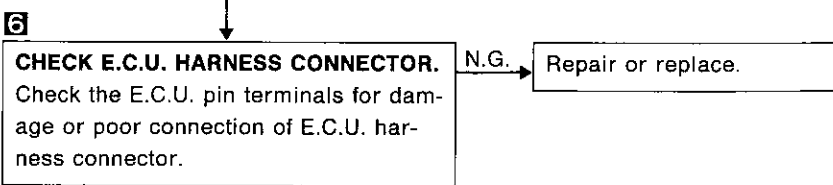
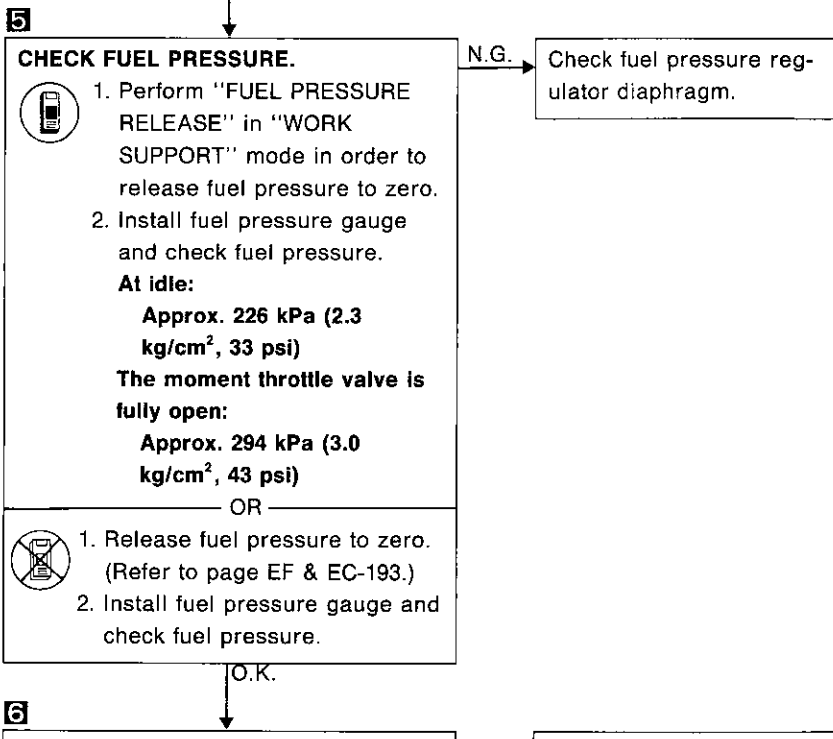
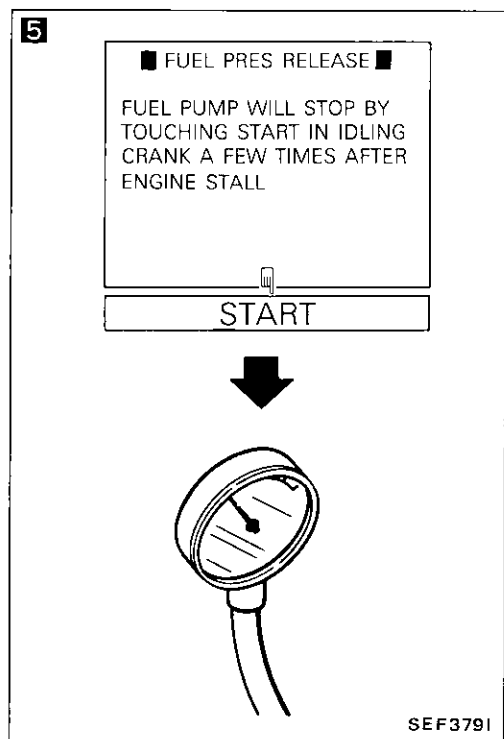
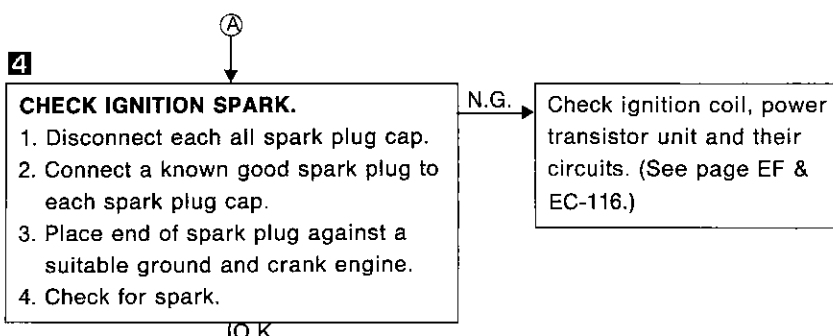
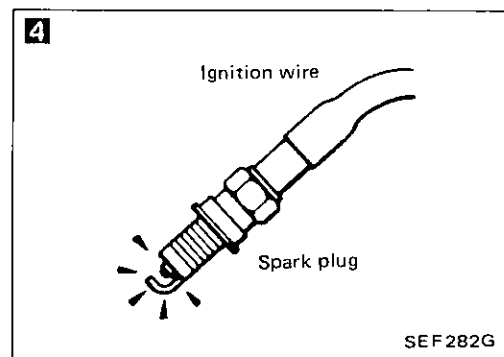
No → Check injector(s) and circuit(s).

Yes

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

## TROUBLE DIAGNOSES

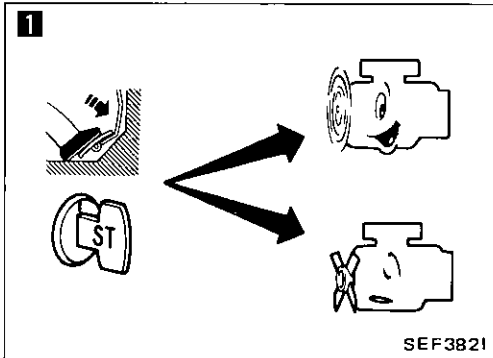
### Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)



#### CAUTION:

When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

# TROUBLE DIAGNOSES



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

**1**

### CHECK 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 and circuits. (See pages EF & EC-164.)

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.

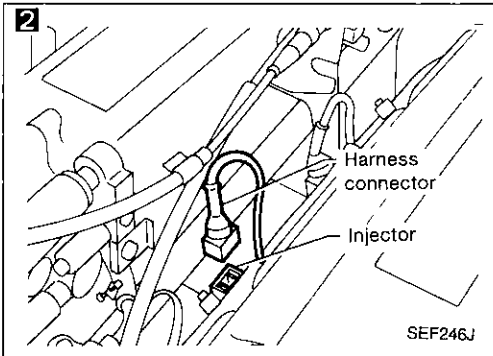
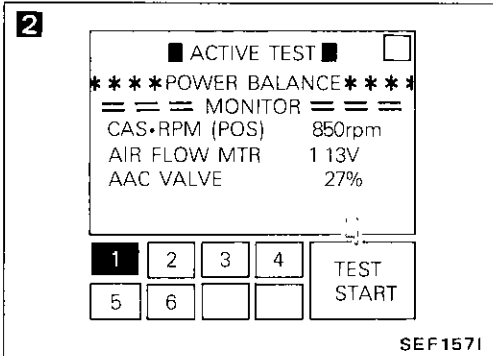
Go to **6**.

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**

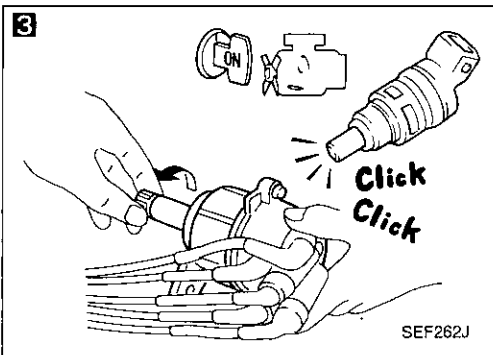
### CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Disconnect each ignition wire.
3. Turn ignition switch ON. (Do not start engine.)
4. 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.

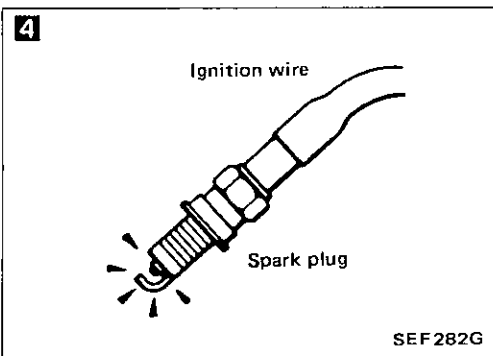
1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G.

Check ignition coil, power transistor unit and circuits. (See page EF & EC-116.)

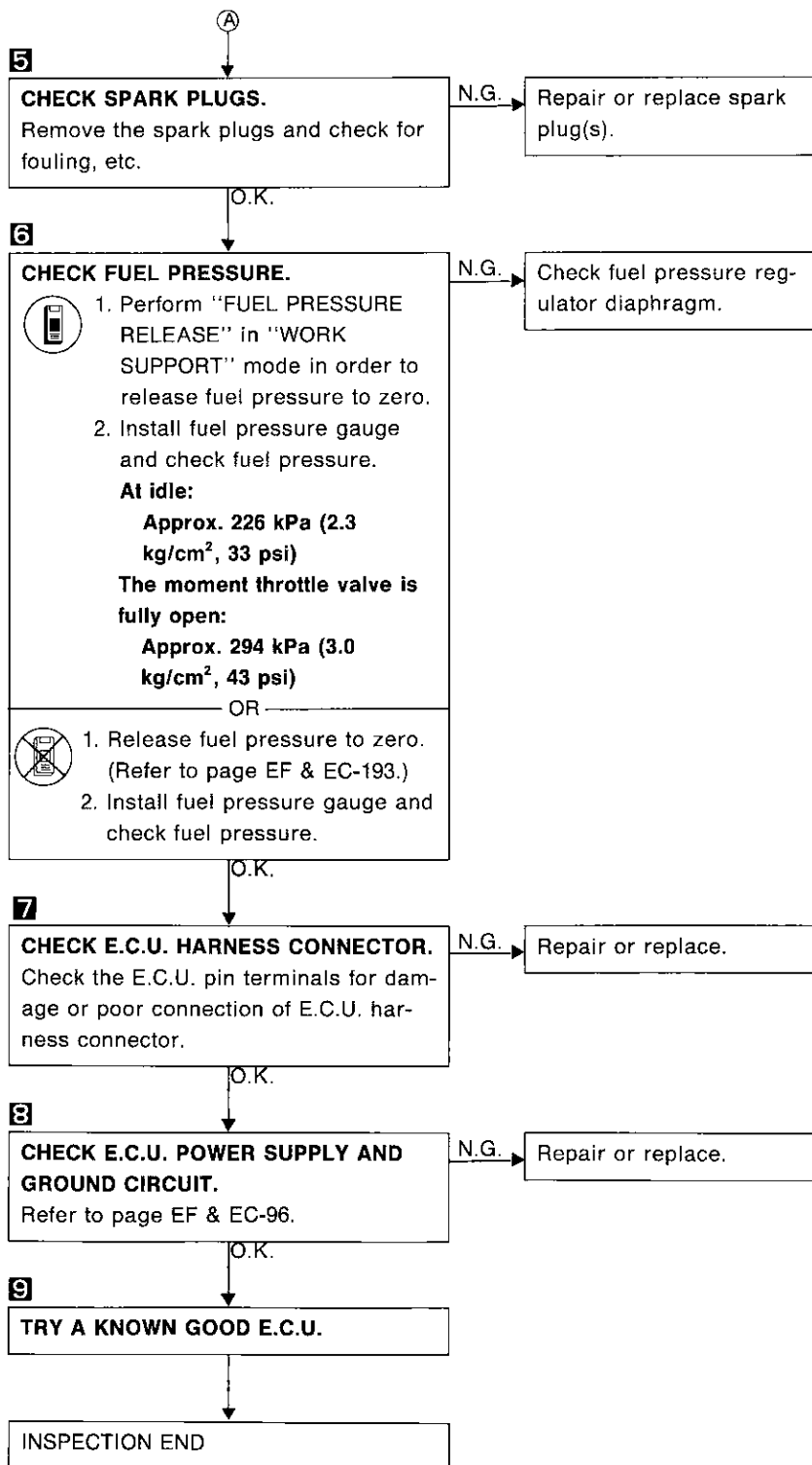
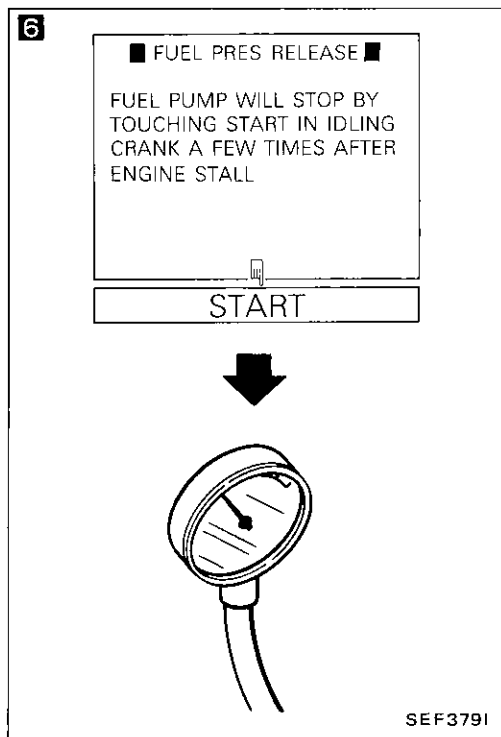
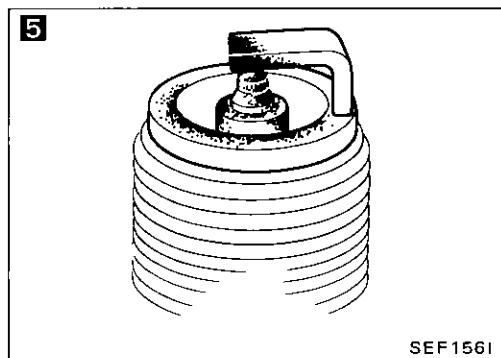
O.K.

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



## TROUBLE DIAGNOSES

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

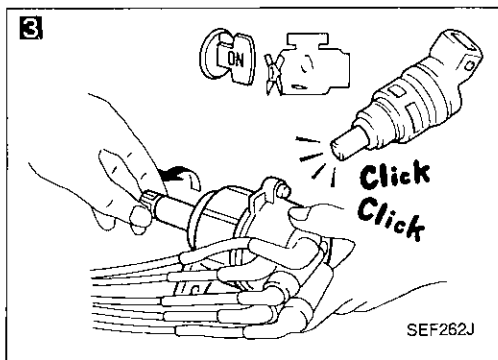
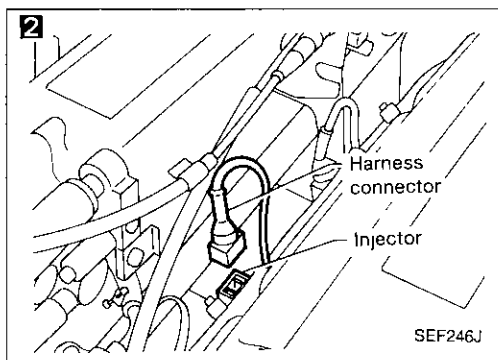
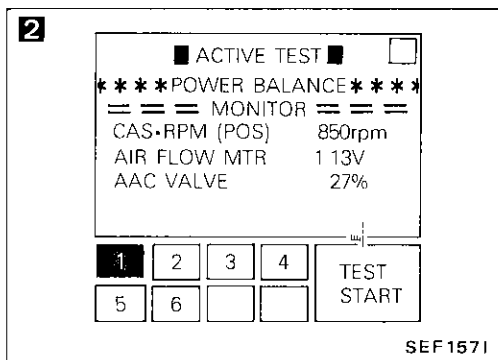
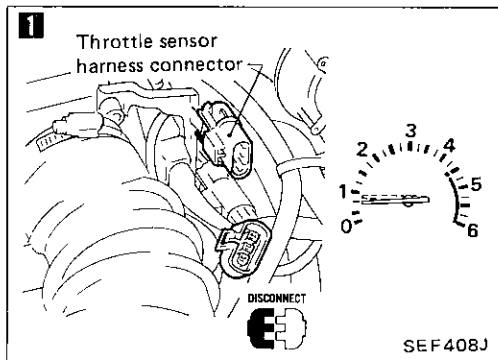
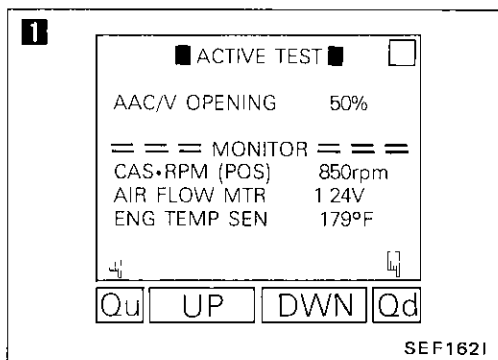


**CAUTION:**

When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.



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



**1**

**CHECK A.A.C. VALVE.**

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

No → Check A.A.C. valve and circuit. (See page EF & EC-164.)

**CAUTION:**  
Be sure to set gears to "Neutral".

OR

When disconnecting throttle sensor harness connector, does the engine speed drop?

Yes

**2**

**PERFORM POWER BALANCE TEST.**

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

No → Go to **5**.

OR

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

Yes

**3**

**CHECK INJECTOR.**

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

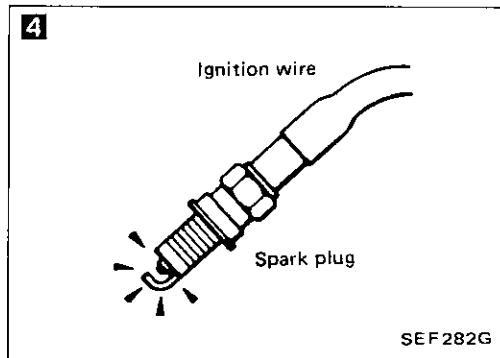
No → Check injector(s) and their circuit(s).

Yes

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

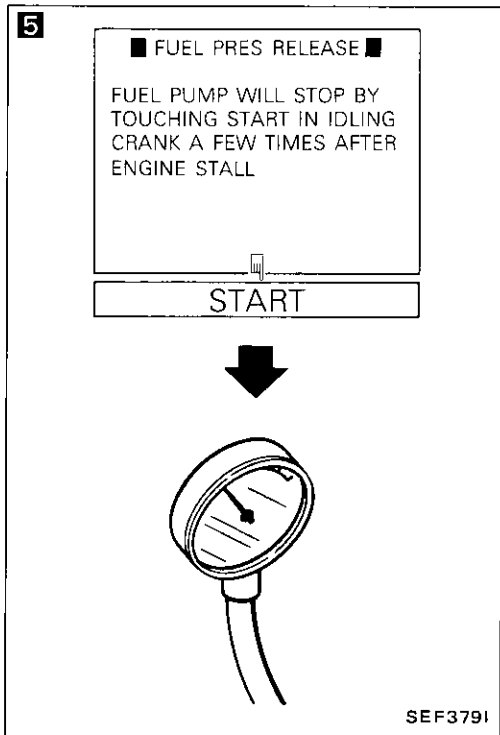
## TROUBLE DIAGNOSES

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



- 4**
- CHECK IGNITION SPARK.**
1. Disconnect each spark plug cap.
  2. Connect a known good spark plug to each spark plug cap.
  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-114.)



- 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. 226 kPa (2.3 kg/cm<sup>2</sup>, 33 psi)
- The moment throttle valve is fully open:**  
Approx. 294 kPa (3.0 kg/cm<sup>2</sup>, 43 psi)
- OR
1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
  2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

- 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.

- 7**
- CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
- Refer to page EF & EC-96.

N.G. → Repair or replace.

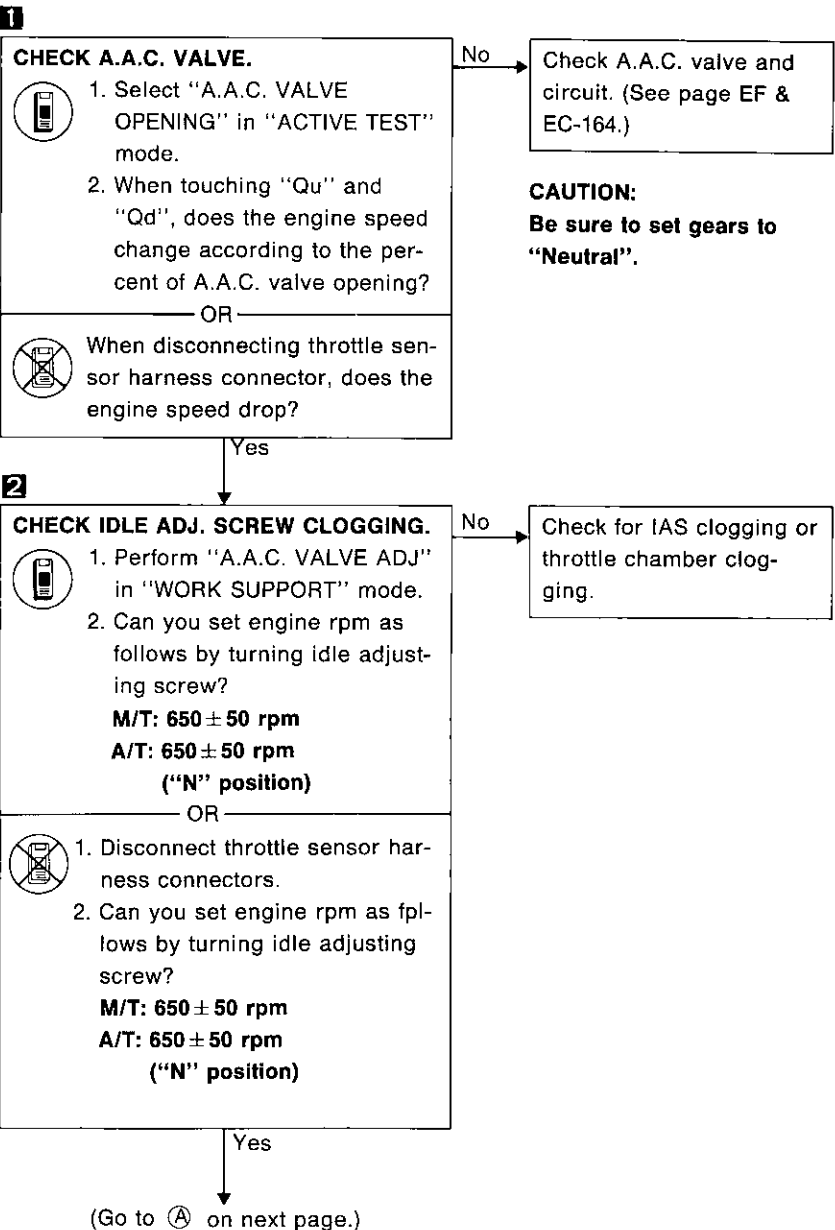
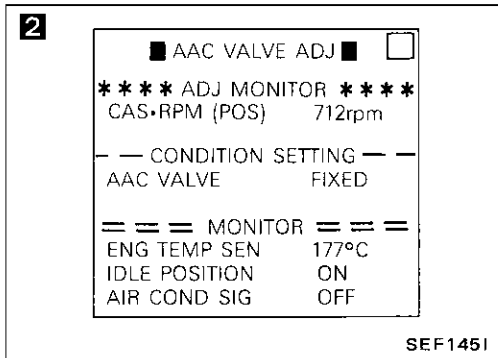
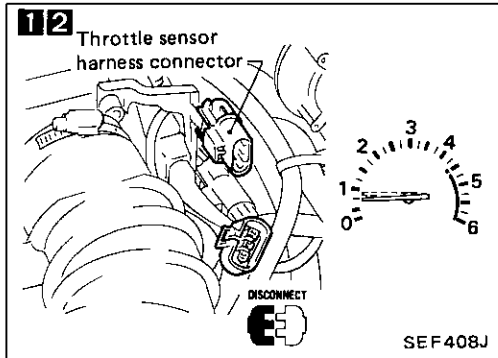
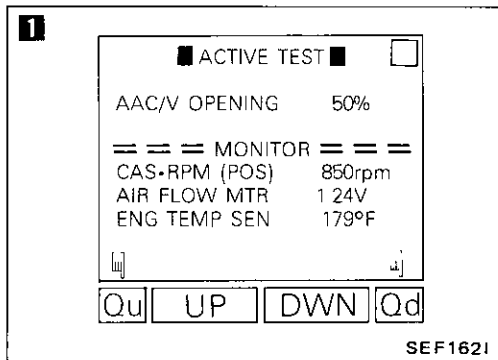
- 8**
- TRY A KNOWN GOOD E.C.U.**

INSPECTION END

**CAUTION:**

When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

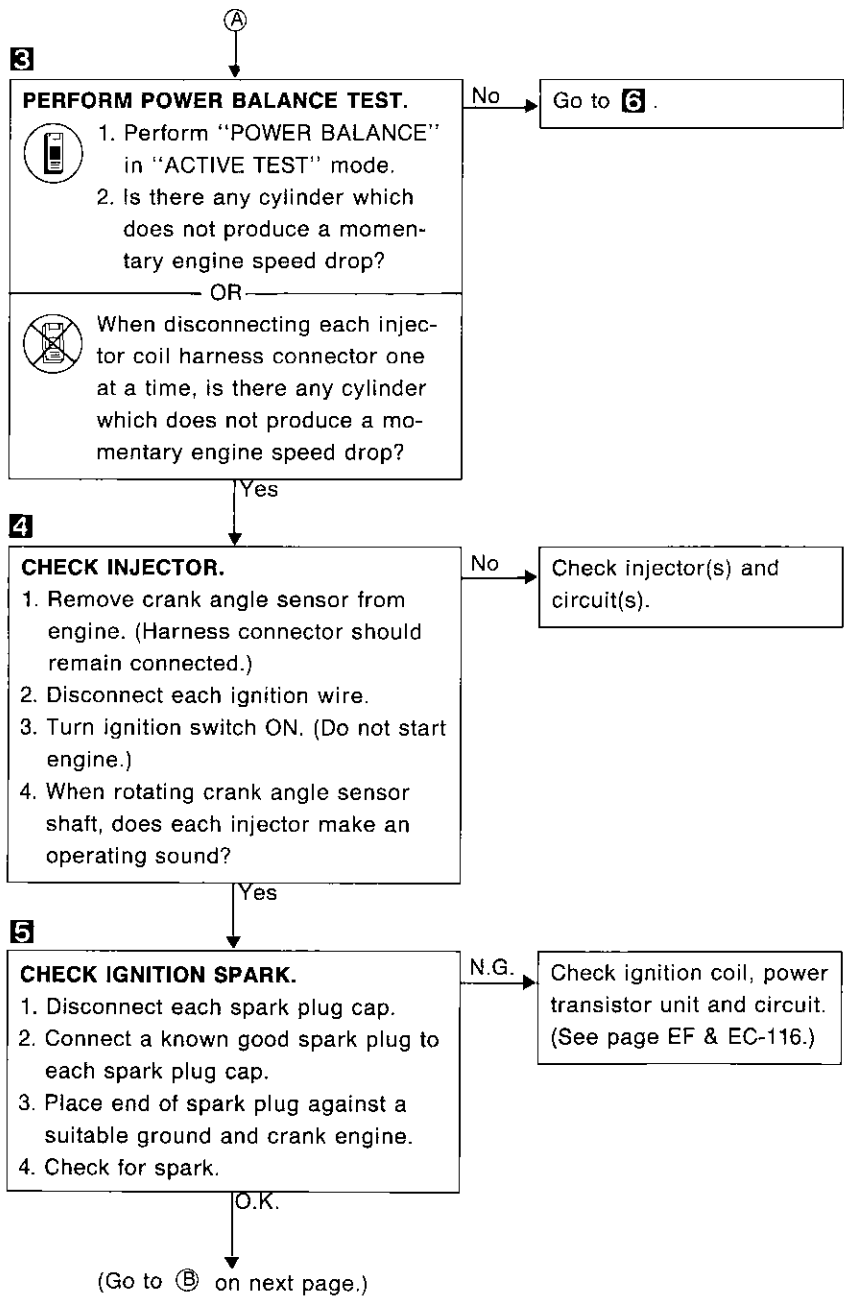
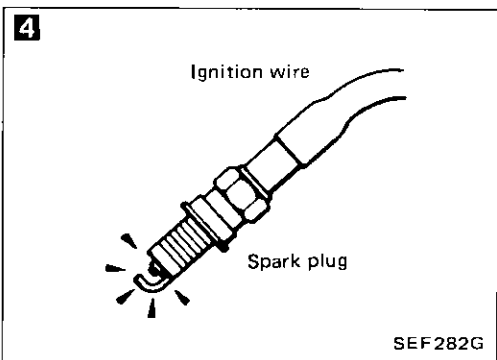
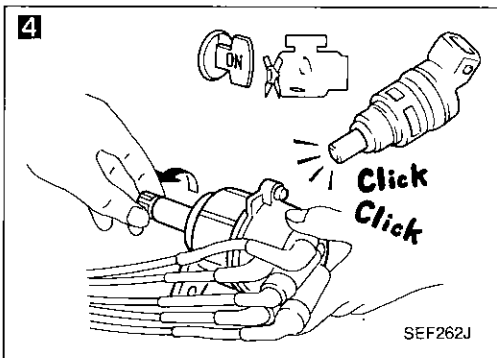
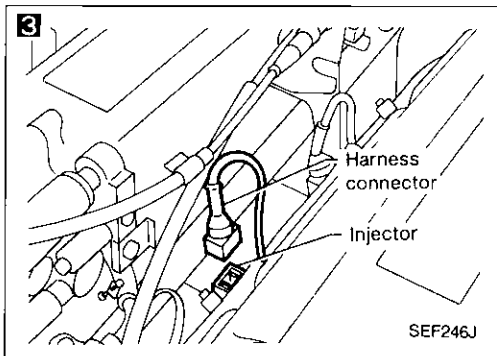
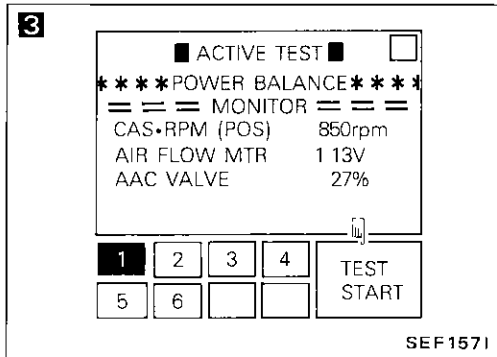
## Diagnostic Procedure 14 — Engine Stalls after Decelerating



**CAUTION:**  
Be sure to set gears to "Neutral".

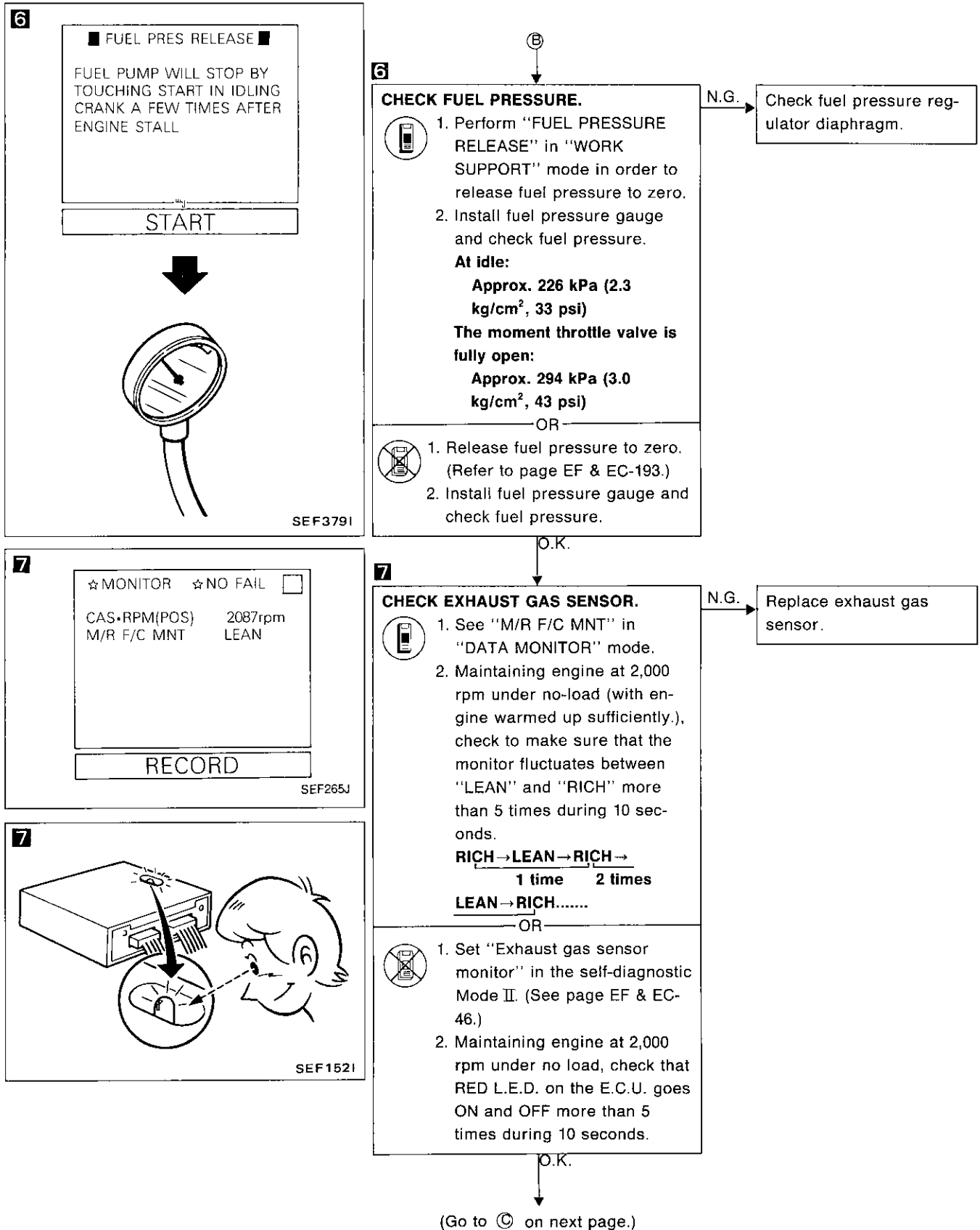
# TROUBLE DIAGNOSES

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



# TROUBLE DIAGNOSES

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

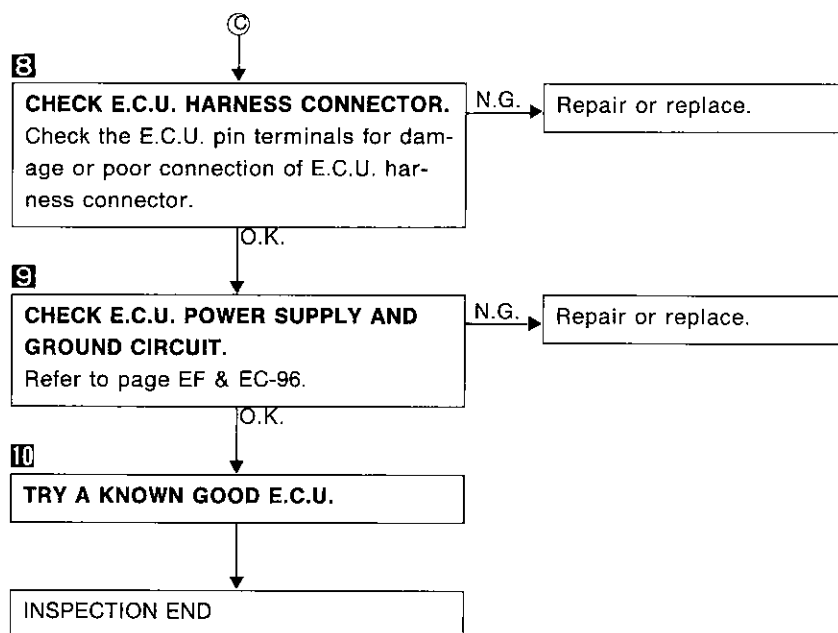


### CAUTION:

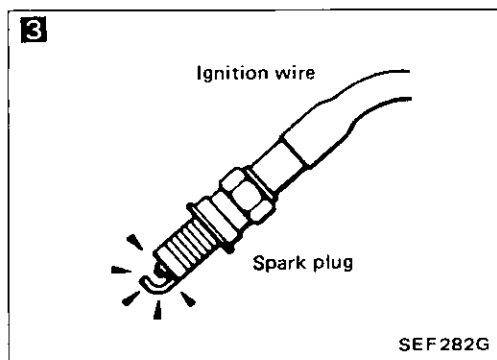
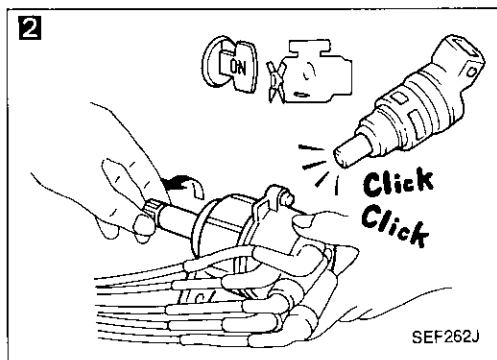
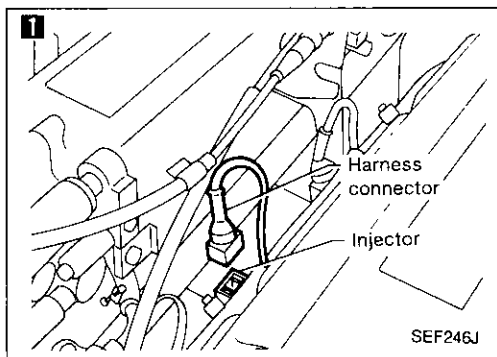
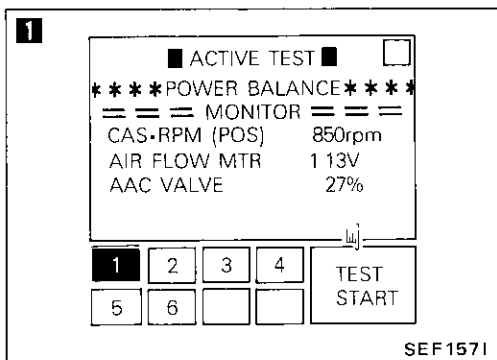
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

## TROUBLE DIAGNOSES

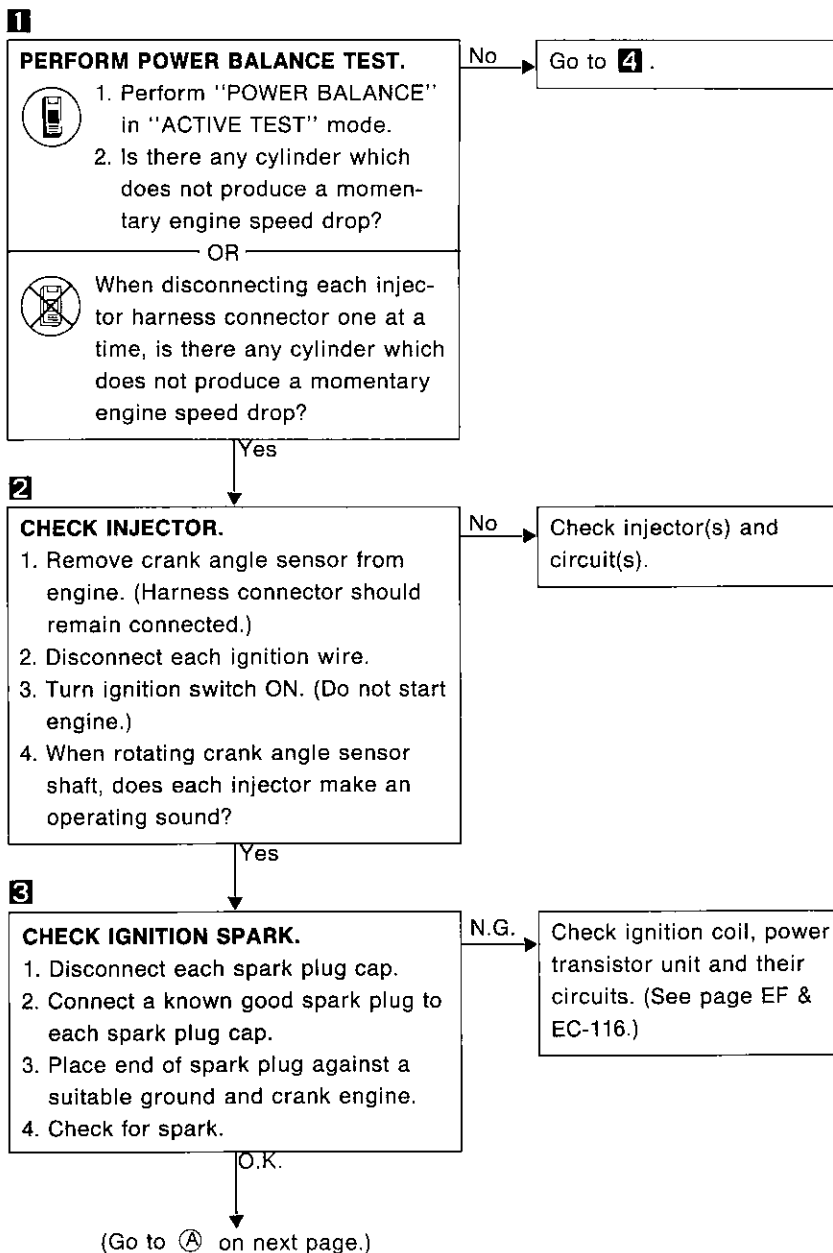
### Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



# TROUBLE DIAGNOSES



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



## TROUBLE DIAGNOSES

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

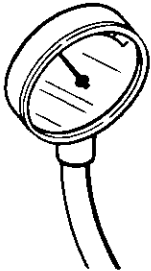
**4**

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START IN IDLING. CRANK A FEW TIMES AFTER ENGINE STALL

START

↓



SEF379I

A

**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. 226 kPa (2.3 kg/cm<sup>2</sup>, 33 psi)**

**The moment throttle valve is fully open:**  
**Approx. 294 kPa (3.0 kg/cm<sup>2</sup>, 43 psi)**

OR

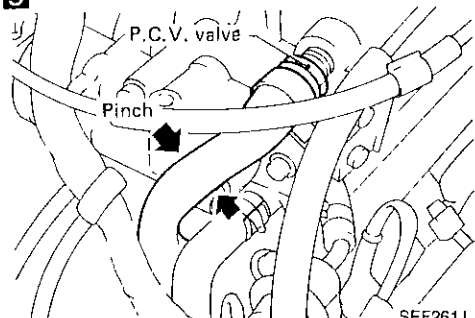


1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

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

O.K. ↓

**5**



SEF261J

**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 ↓

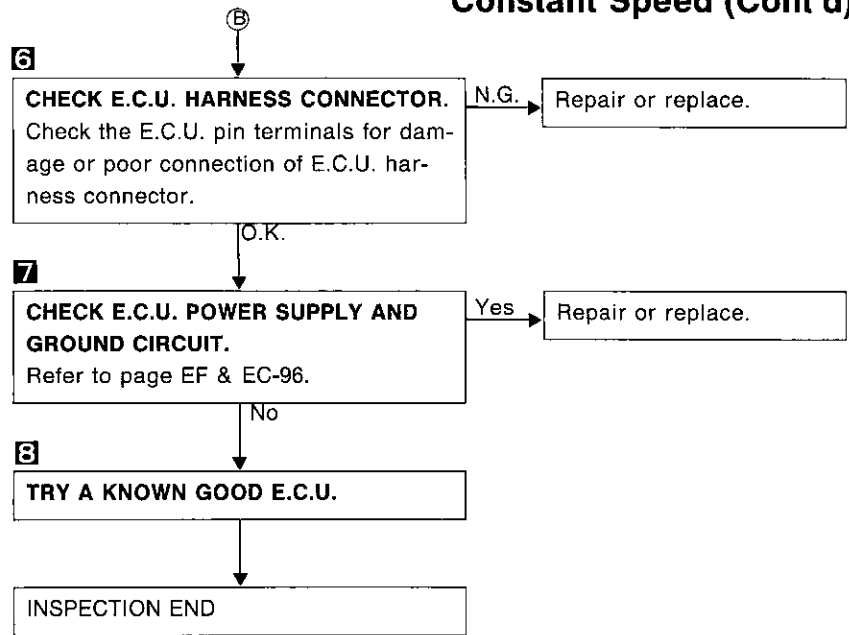
(Go to B on next page.)

**CAUTION:**  
 When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

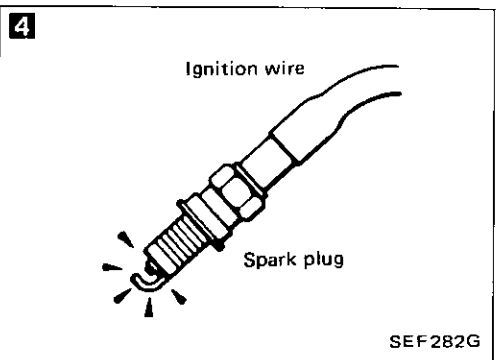
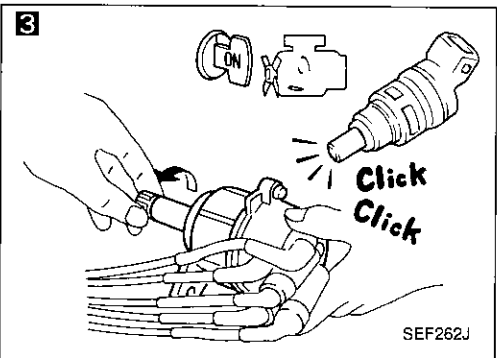
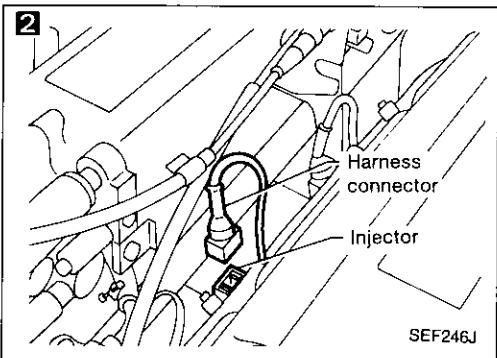
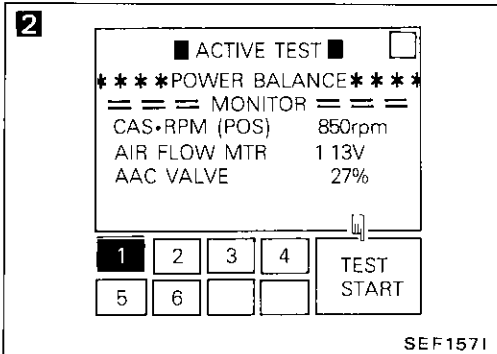
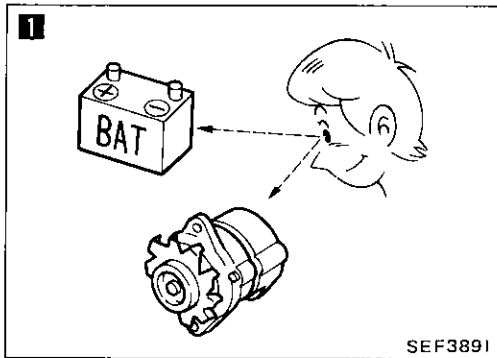


## TROUBLE DIAGNOSES

### Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (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. Disconnect each ignition wire.
3. Turn ignition switch ON. (Do not start engine.)
4. 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 each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

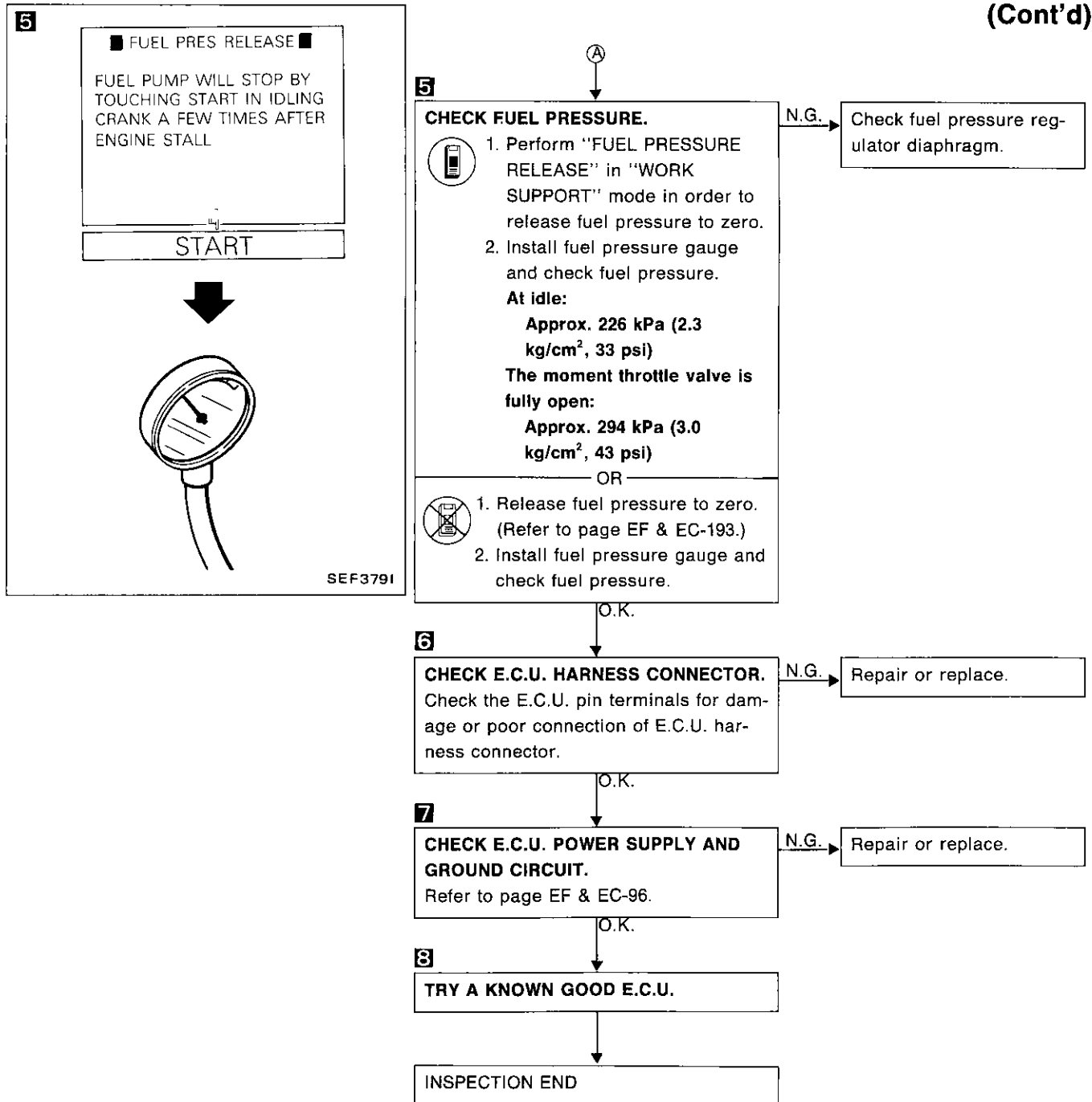
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-116.)

O.K.

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

## TROUBLE DIAGNOSES

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

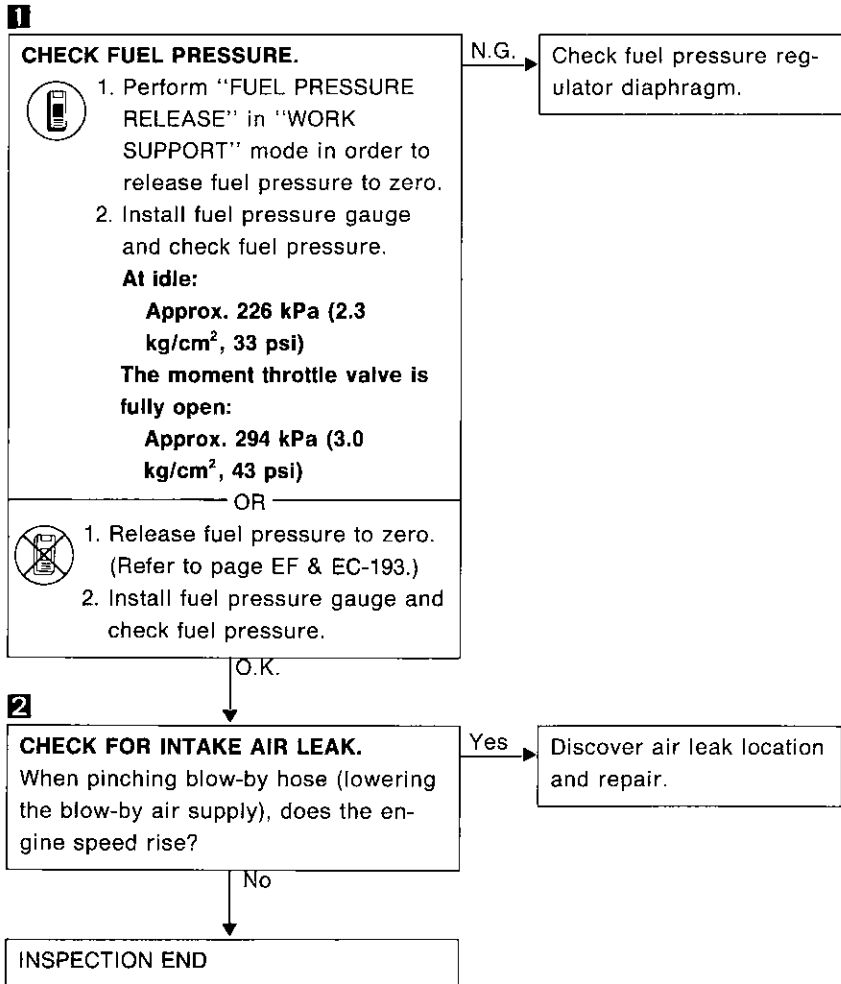
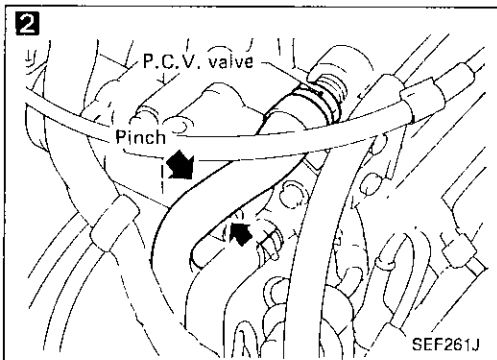
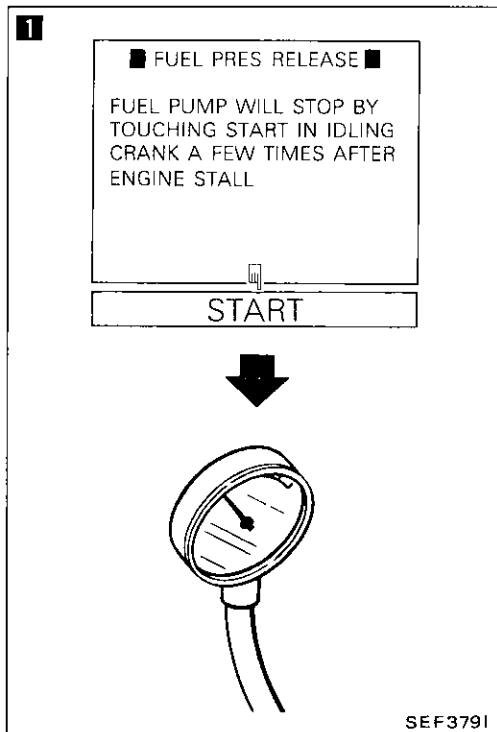


**CAUTION:**

When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

# TROUBLE DIAGNOSES

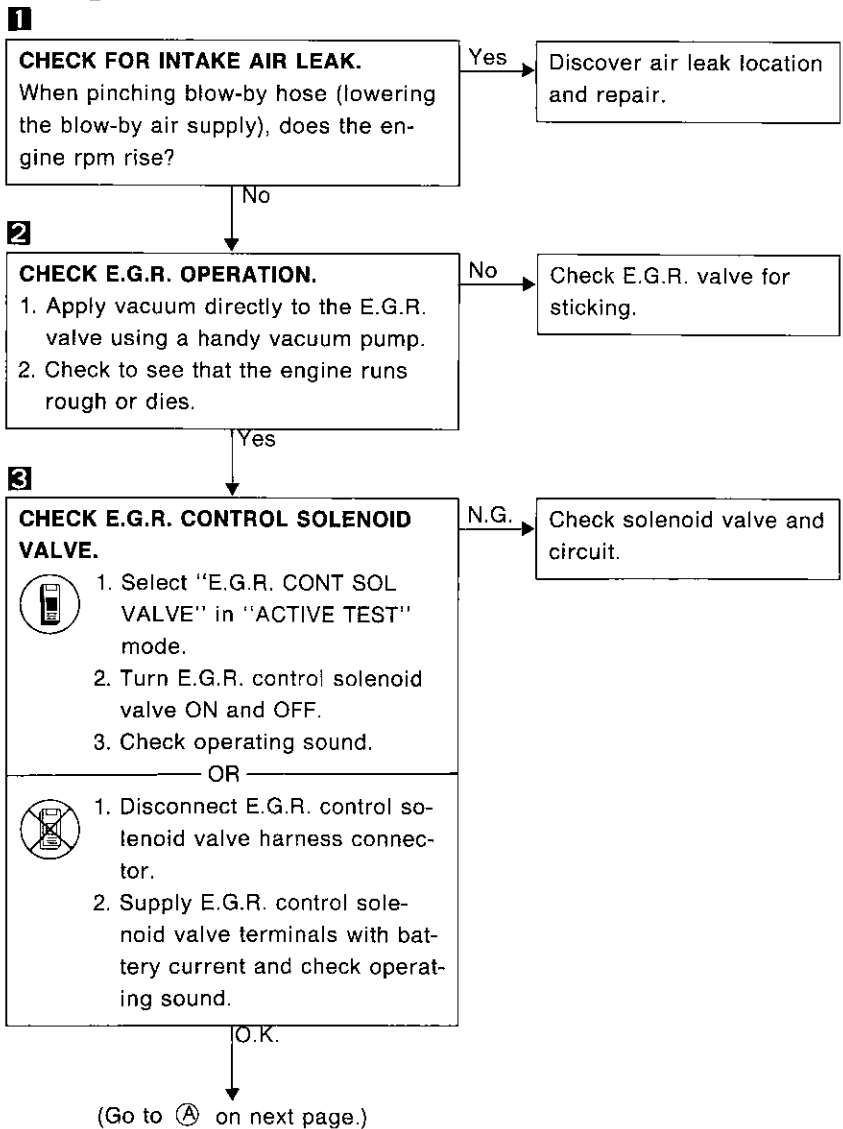
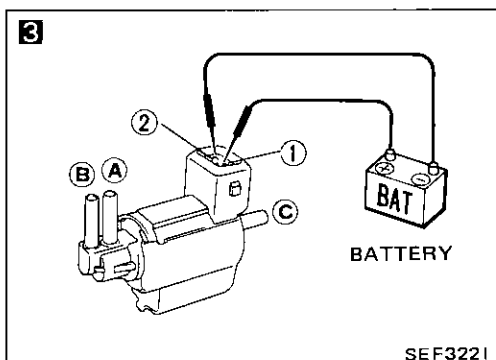
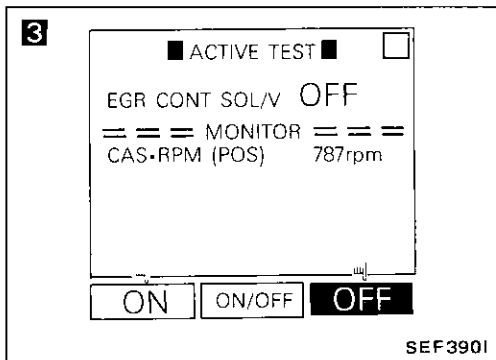
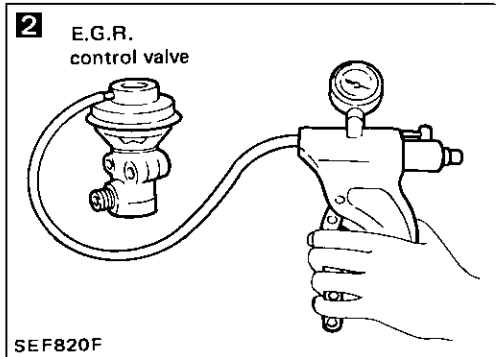
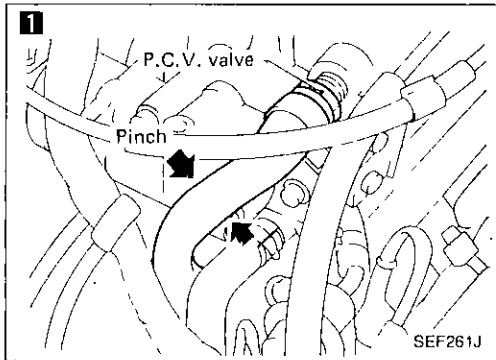
## Diagnostic Procedure 17 — Lack of Power and Stumble



### CAUTION:

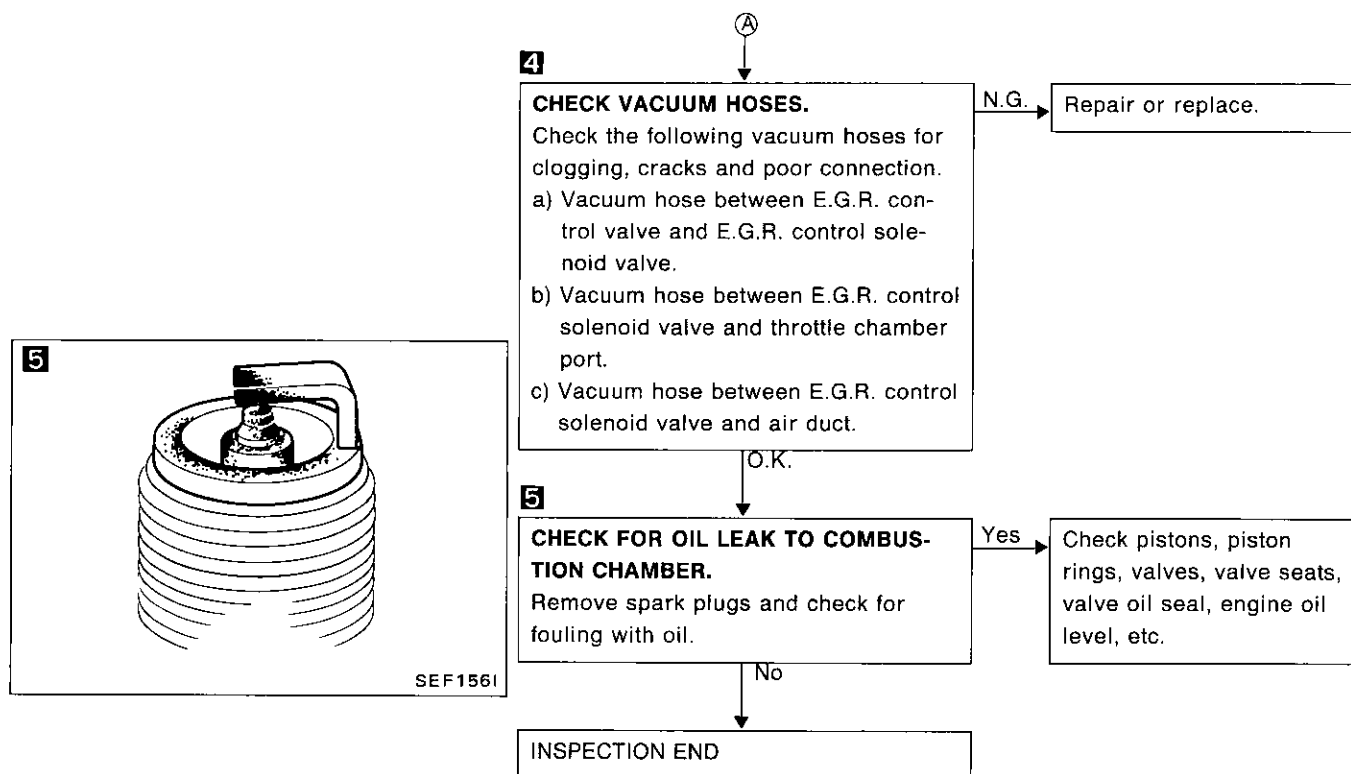
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

## Diagnostic Procedure 18 — Detonation



## TROUBLE DIAGNOSES

### Diagnostic Procedure 18 — Detonation (Cont'd)



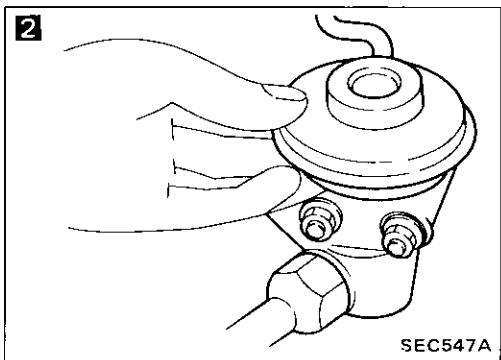
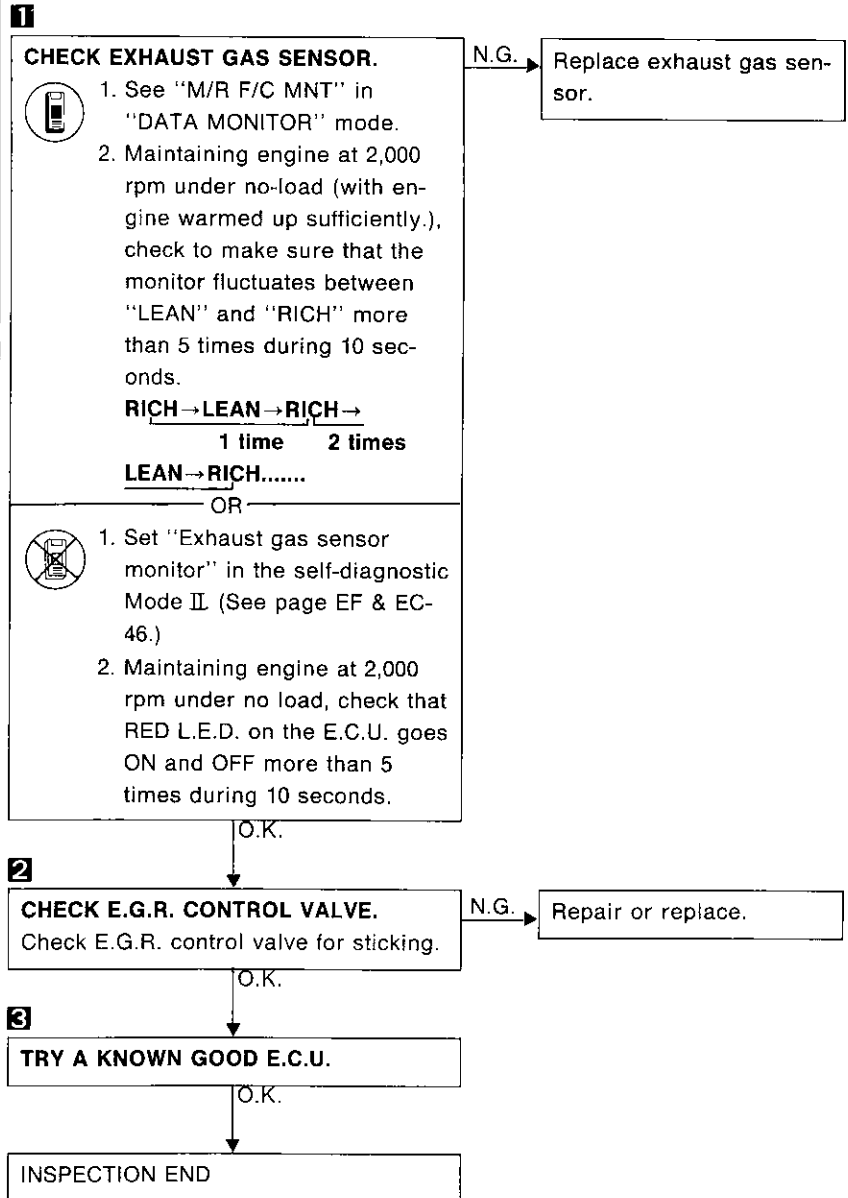
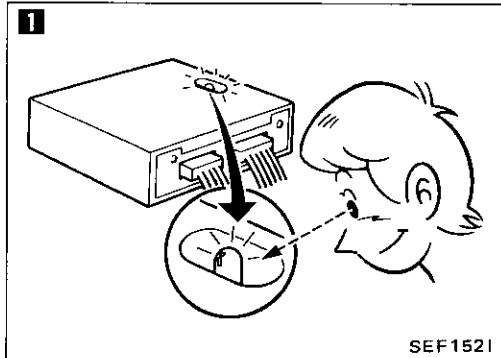
## Diagnostic Procedure 19 — Surge

**1**

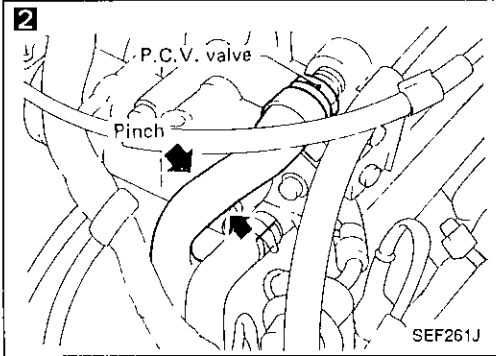
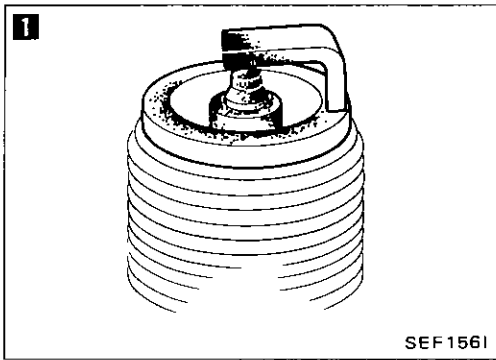
|               |          |                          |
|---------------|----------|--------------------------|
| ☆MONITOR      | ☆NO FAIL | <input type="checkbox"/> |
| CAS-RPM(POS)  | 2087rpm  |                          |
| M/R F/C MNT   | LEAN     |                          |
| M/R F/C MNT-R | RICH     |                          |

RECORD

SEF160I



## TROUBLE DIAGNOSES



### 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**

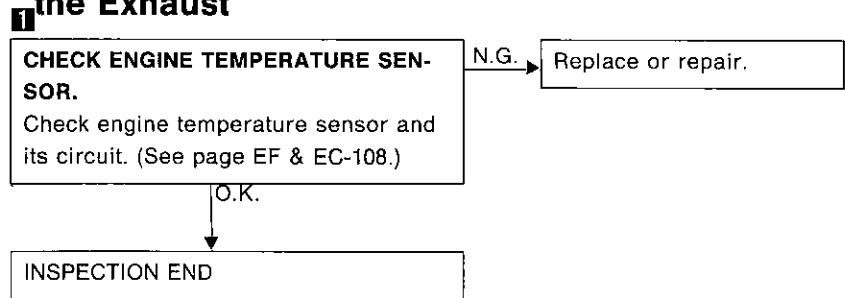
#### CHECK FOR INTAKE VALVE DEPOSITS.

If there are deposits on intake valves, remove them.

INSPECTION END

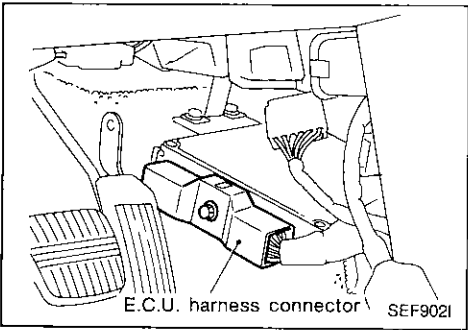


### Diagnostic Procedure 21 — Backfire through the Exhaust



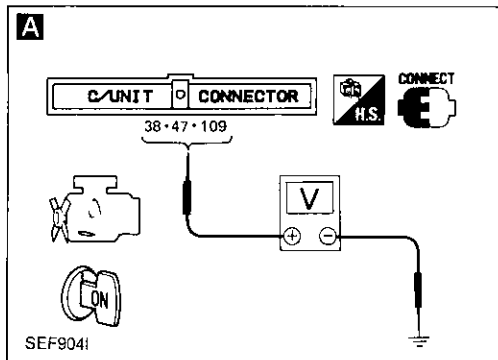
E.C.U. harness connector

SEF9021



# TROUBLE DIAGNOSES

## Diagnostic Procedure 22 (Cont'd)



INSPECTION START

**A**

CHECK POWER SUPPLY.

- 1) Turn ignition switch "ON".
- 2) Check voltage between E.C.U. terminals 38, 47, 109 and ground.

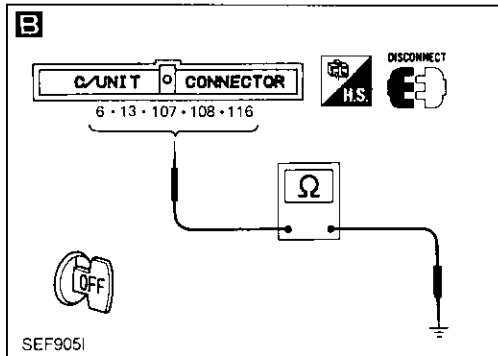
**Voltage: Battery voltage**

**B**

CHECK GROUND CIRCUIT.

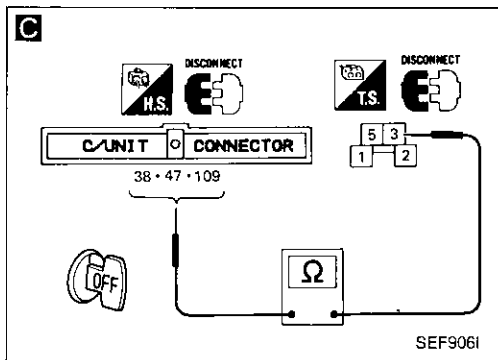
- 1) Turn ignition switch "OFF".
- 2) Disconnect E.C.U. harness connector.
- 3) Check harness continuity between E.C.U. terminals 6, 13, 107, 108, 116 and engine ground.

**Continuity should exist.**  
If N.G., repair harness or connectors.



O.K.

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



**C**

CHECK HARNESS CONTINUITY BETWEEN E.C.C.S. RELAY AND E.C.U.

- 1) Turn ignition switch "OFF".
- 2) Disconnect E.C.U. harness connector.
- 3) Disconnect E.C.C.S. relay.
- 4) Check harness continuity between E.C.U. terminals 38, 47, 109 and terminal 3.

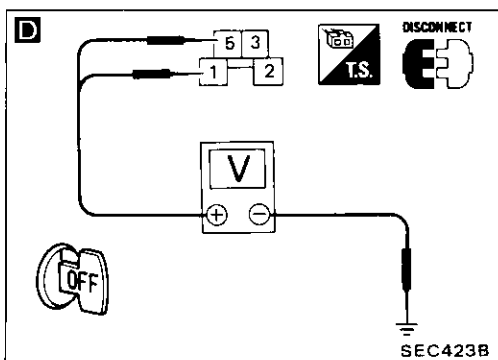
**Continuity should exist.**

N.G.

Check the following:

- Harness connectors (F1, E1)
- Harness continuity between E.C.U. and E.C.C.S. relay

If N.G., repair harness or connectors.



**D**

CHECK VOLTAGE BETWEEN E.C.C.S. RELAY AND GROUND.

- 1) Check voltage between terminals 1, 5 and ground.

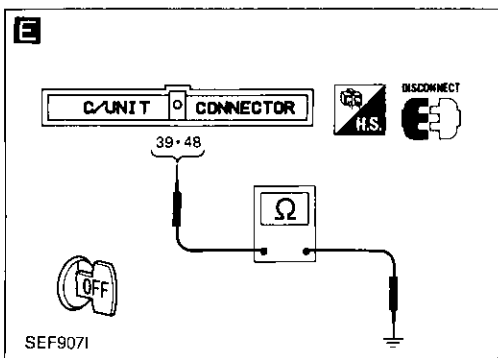
**Voltage: Battery voltage**

N.G.

Check the following:

- Joint connector-3 (E48)
- "BR" fusible link
- Harness continuity between E.C.C.S. relay and battery

If N.G., repair harness or connectors.



**E**

CHECK GROUND CIRCUIT.

- 1) Check harness continuity between E.C.U. terminals 39, 48 and engine ground.

**Continuity should exist.**

N.G.

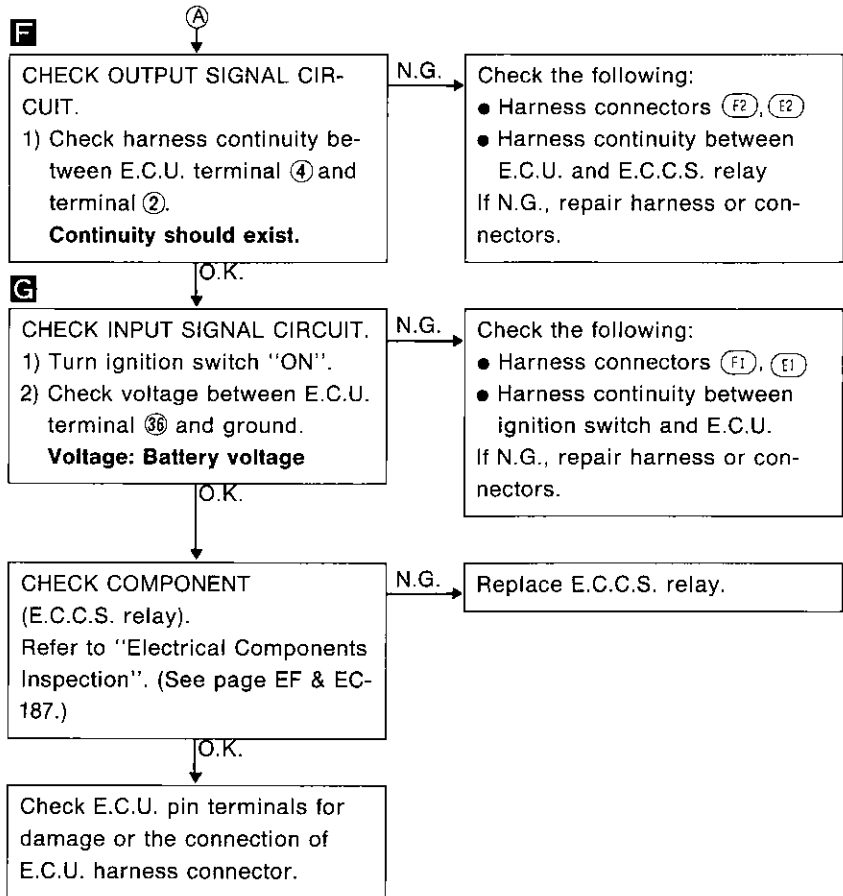
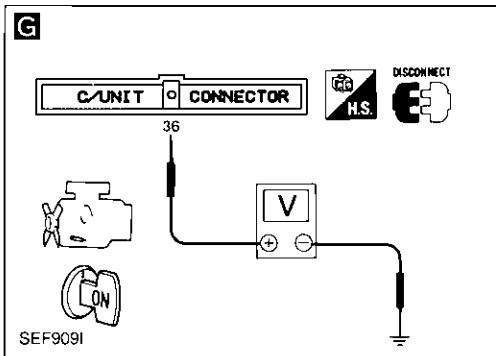
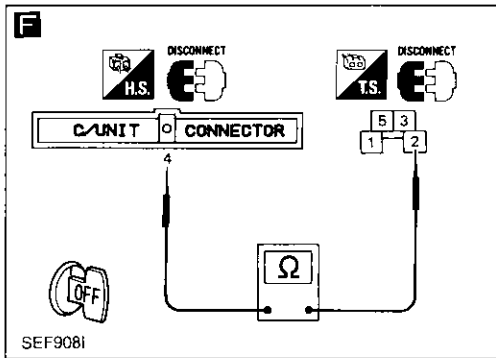
Repair harness or connectors.

O.K.

A

# TROUBLE DIAGNOSES

## Diagnostic Procedure 22 (Cont'd)



## TROUBLE DIAGNOSES

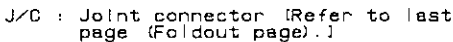
---

NOTE

\_\_\_\_\_

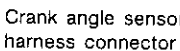
### CRANK ANGLE SENSOR (Code No. 11)

| Age Group | Percentage |
|-----------|------------|
| 18-24     | 10%        |
| 25-34     | 20%        |
| 35-44     | 25%        |
| 45-54     | 20%        |
| 55-64     | 15%        |
| 65-74     | 10%        |
| 75-84     | 5%         |
| 85+       | 5%         |



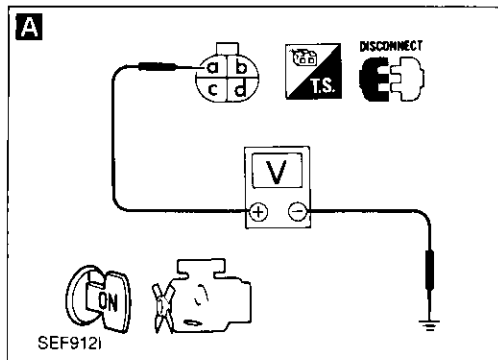
E.C.U. harness connector

SEF9021



# TROUBLE DIAGNOSES

## Diagnostic Procedure 23 (Cont'd)



**INSPECTION START**

**A**

**CHECK POWER SUPPLY.**

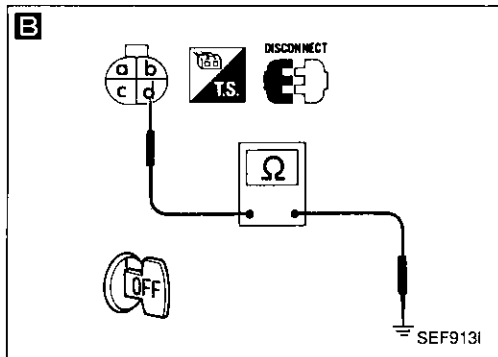
- 1) Disconnect crank angle sensor harness connector.
- 2) Turn ignition switch "ON".
- 3) Check voltage between terminal ① and ground.

**Voltage: Battery voltage**

N.G. → Check the following:

- Harness connectors (F1), (E1)
- Harness continuity between crank angle sensor and E.C.C.S. relay

If N.G., repair harness or connectors.



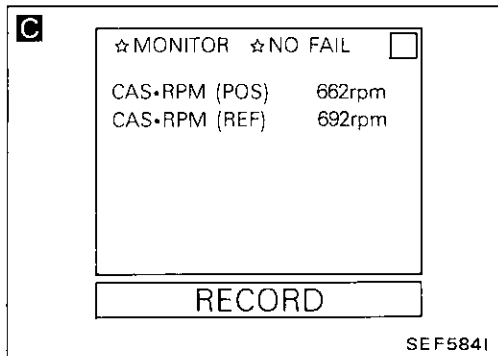
**B**

**CHECK GROUND CIRCUIT.**

- 1) Turn ignition switch "OFF".
- 2) Check harness continuity between terminal ④ and engine ground.

**Continuity should exist.**

N.G. → Repair harness or connectors.



**C**

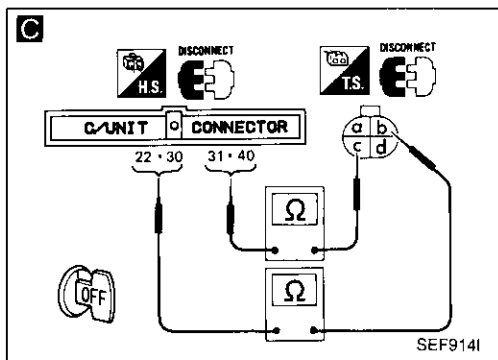
**CHECK INPUT SIGNAL CIRCUIT.**

- 1) Reconnect crank angle sensor harness connector.
- 2) Start engine.
- 3) Read crank angle sensor signals in "DATA MONITOR" mode with CONSULT.

**rpm: M/T 700 ± 50\*1  
750 ± 50\*2  
A/T 700 ± 50\*1  
750 ± 50\*2**

**\*1: U.S.A. \*2: CANADA**

N.G. → Repair harness or connectors.



**OR**

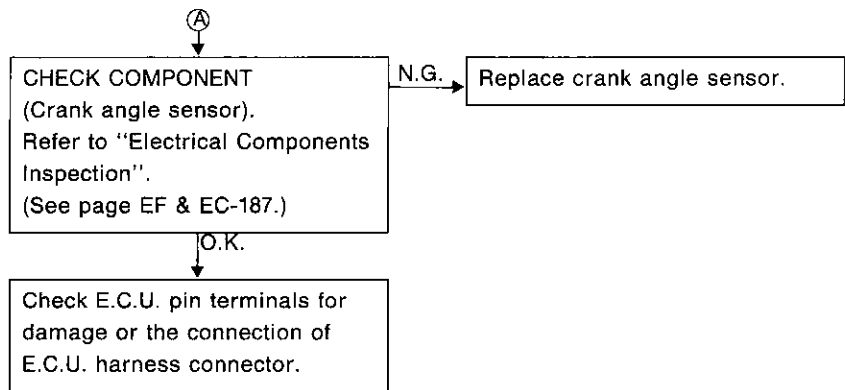
- 1) Disconnect E.C.U. harness connector.
- 2) Check harness continuity between terminal ③ and E.C.U. terminals ③①, ④① (1° signal), terminal ⑤ and E.C.U. terminals ②②, ③① (180° signal).

**Continuity should exist.**

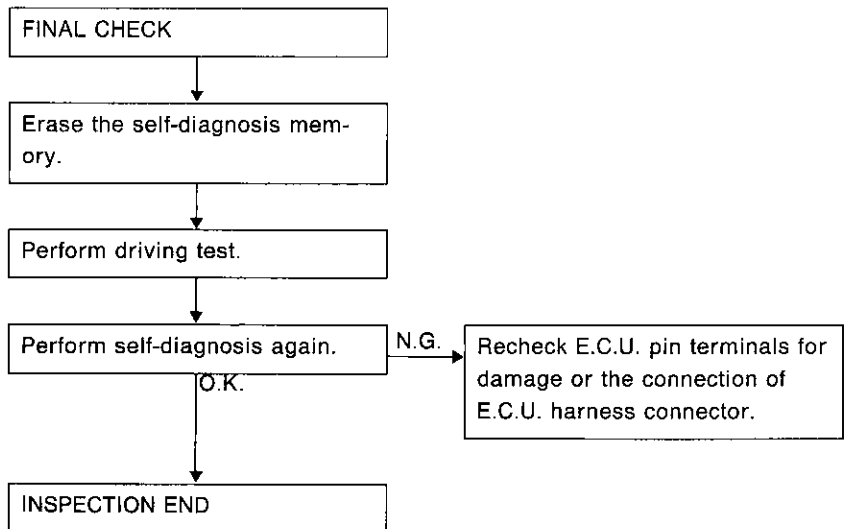
O.K. → **A**

## TROUBLE DIAGNOSES

### Diagnostic Procedure 23 (Cont'd)



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





## **TROUBLE DIAGNOSES**

---

**NOTE**

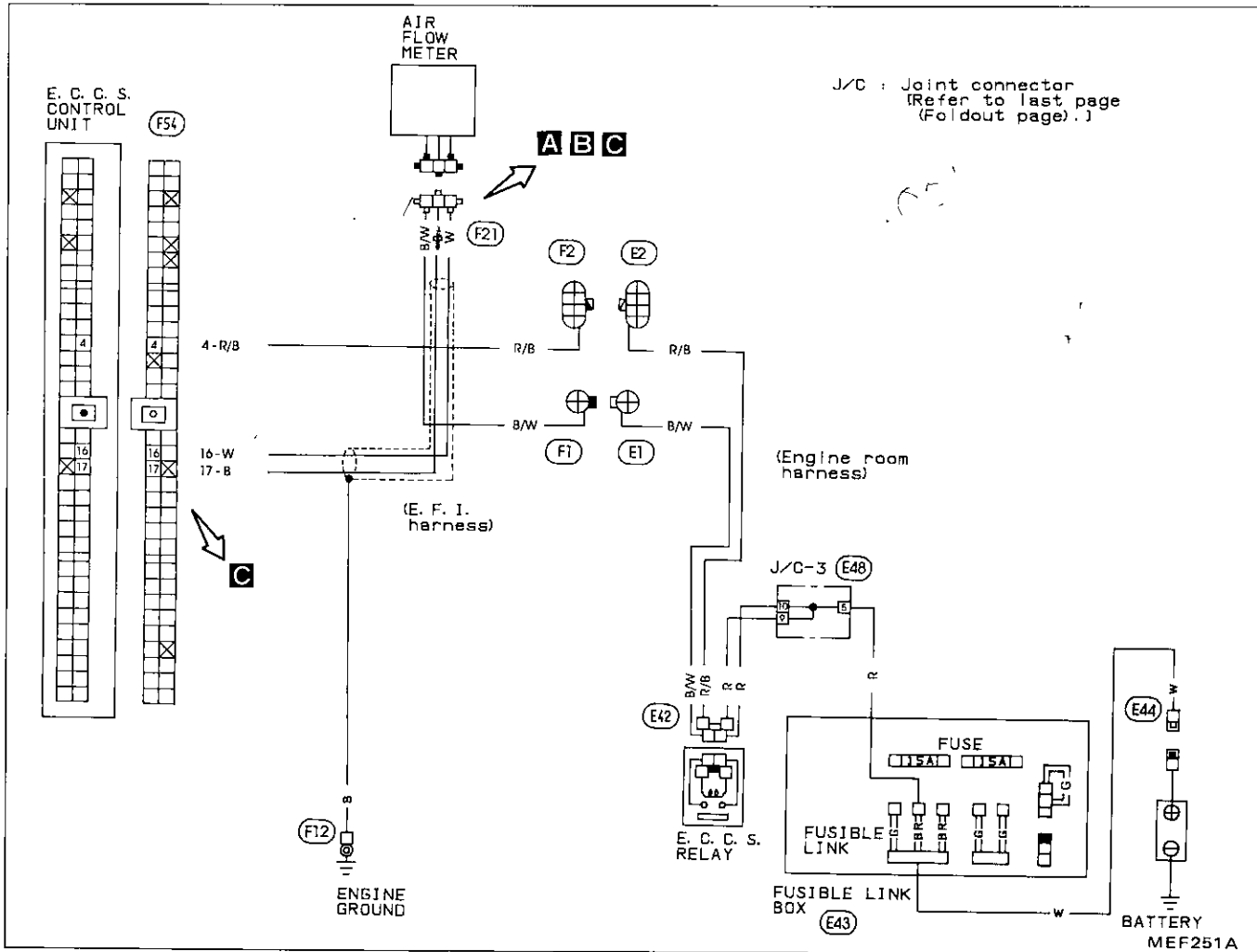
# TROUBLE DIAGNOSES

## Diagnostic Procedure 24

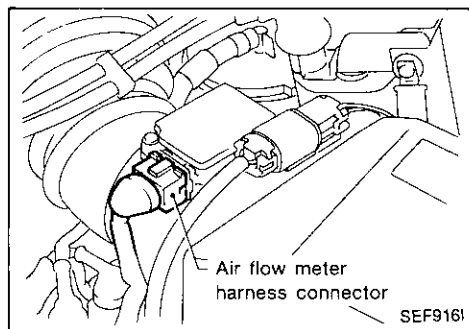
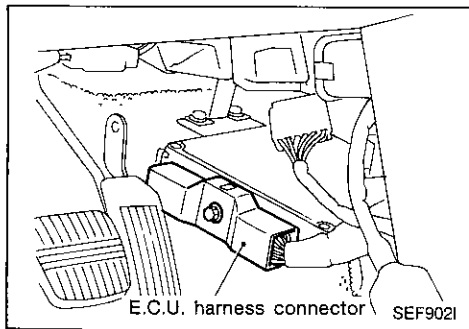
AIR FLOW METER (Code No. 12)



(CHECK ENGINE LIGHT ITEM)

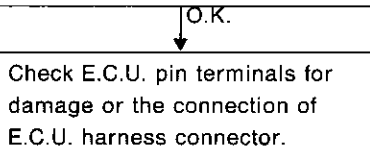
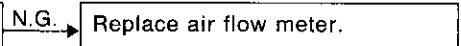
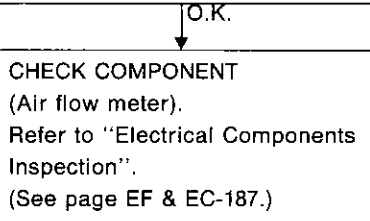
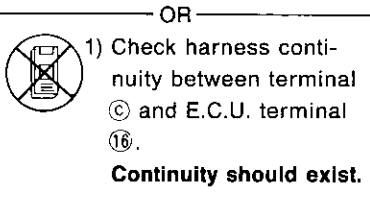
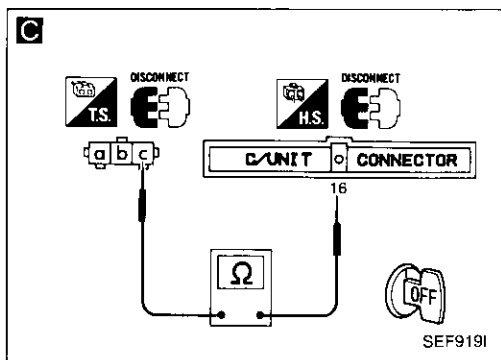
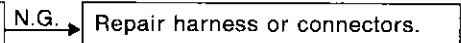
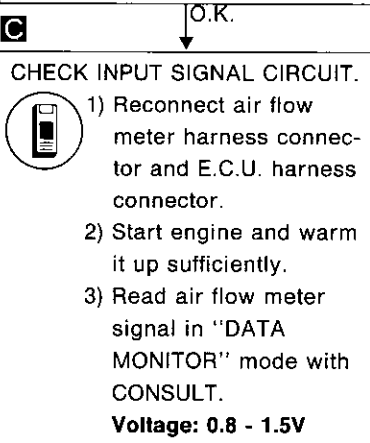
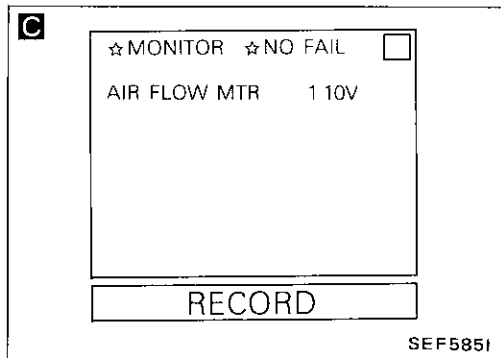
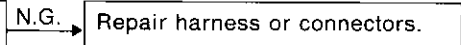
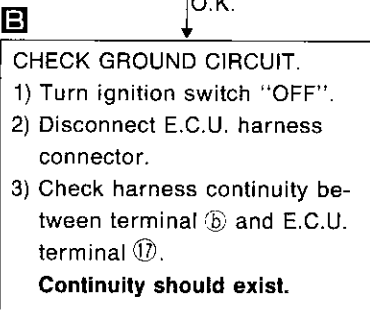
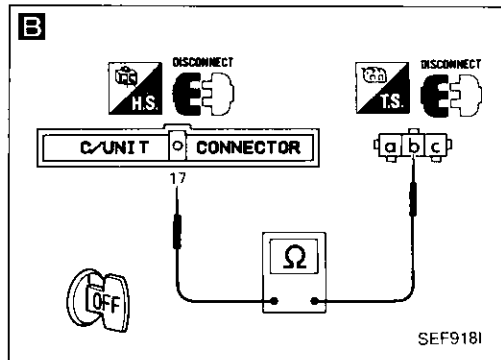
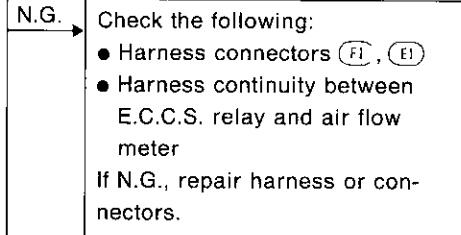
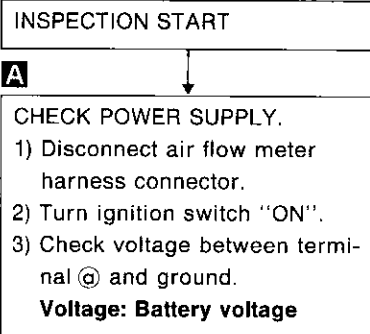
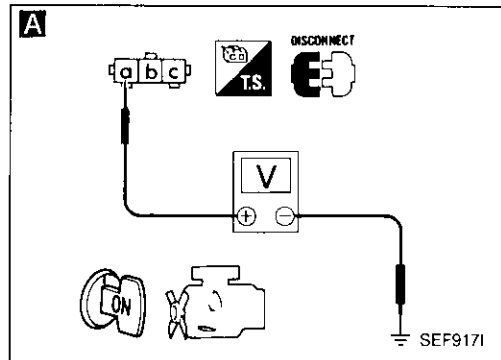


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 24 (Cont'd)

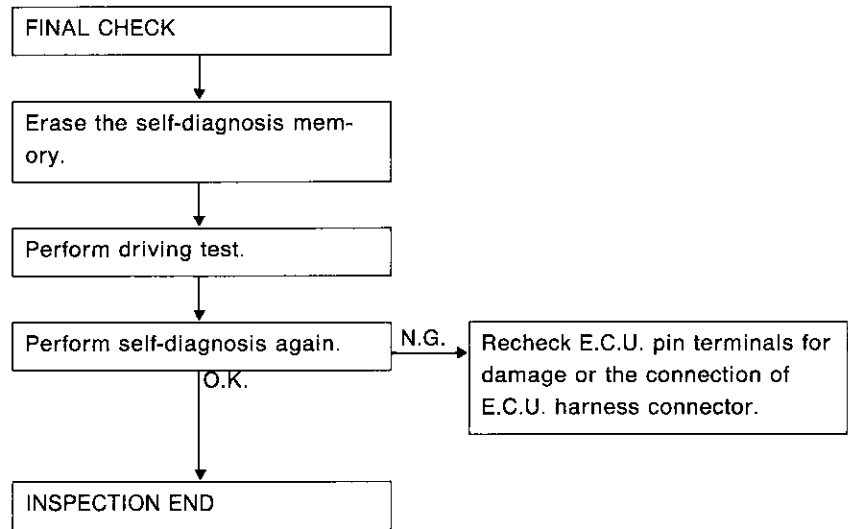


## TROUBLE DIAGNOSES

---

### Diagnostic Procedure 24 (Cont'd)

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



## **TROUBLE DIAGNOSES**

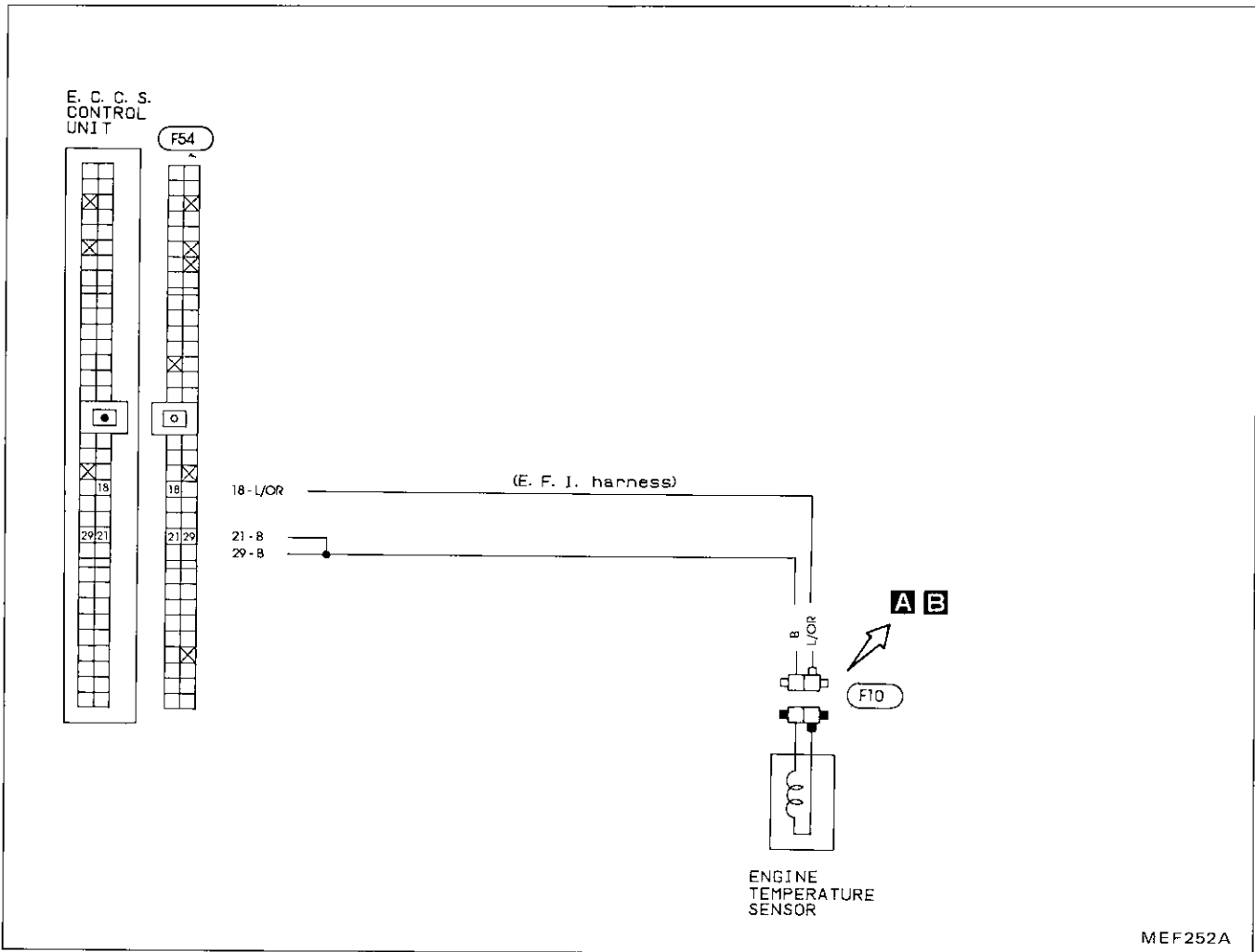
---

**NOTE**

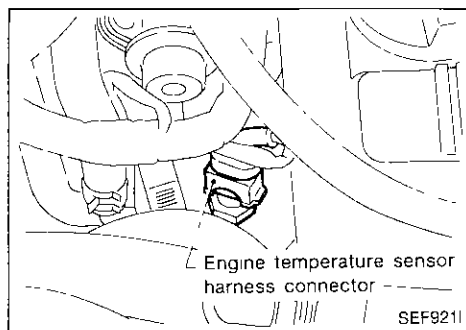
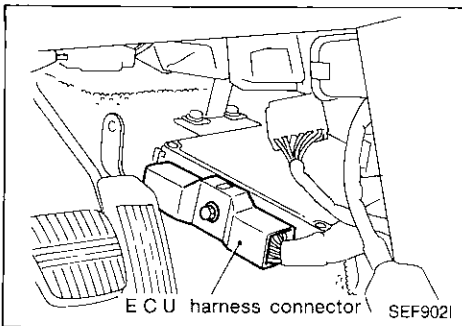
# TROUBLE DIAGNOSES

## Diagnostic Procedure 25

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

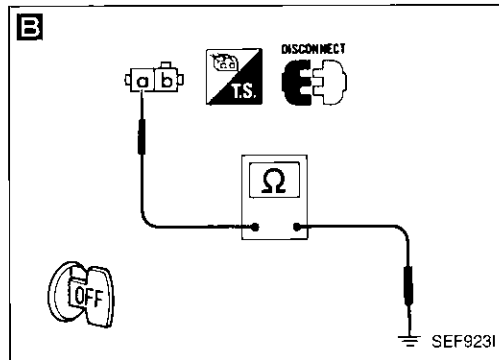
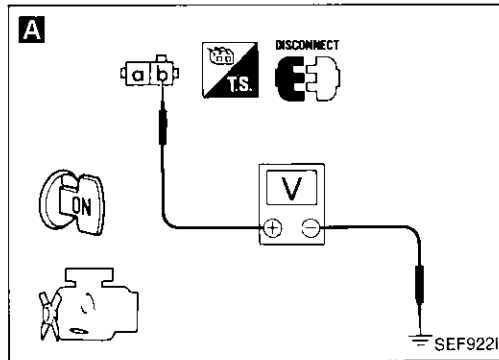
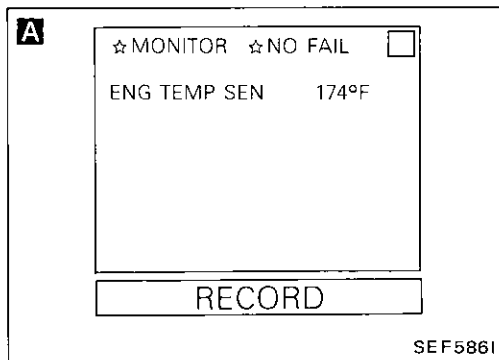


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 25 (Cont'd)



INSPECTION START

**A**

### CHECK POWER SUPPLY.



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

N.G.

Repair harness or connectors.

OR



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

**Voltage: Approximately 5V**

O.K.

Turn ignition switch "OFF".



Disconnect engine temperature sensor harness connector.

**B**

### CHECK GROUND CIRCUIT.

- 1) Check harness continuity between terminal ⑤ and engine ground.

**Continuity should exist.**

N.G.

Repair harness or connectors.

O.K.

### CHECK COMPONENT

(Engine temperature sensor). Refer to "Electrical Components Inspection". (See page EF & EC-187.)

N.G.

Replace engine temperature sensor.

O.K.

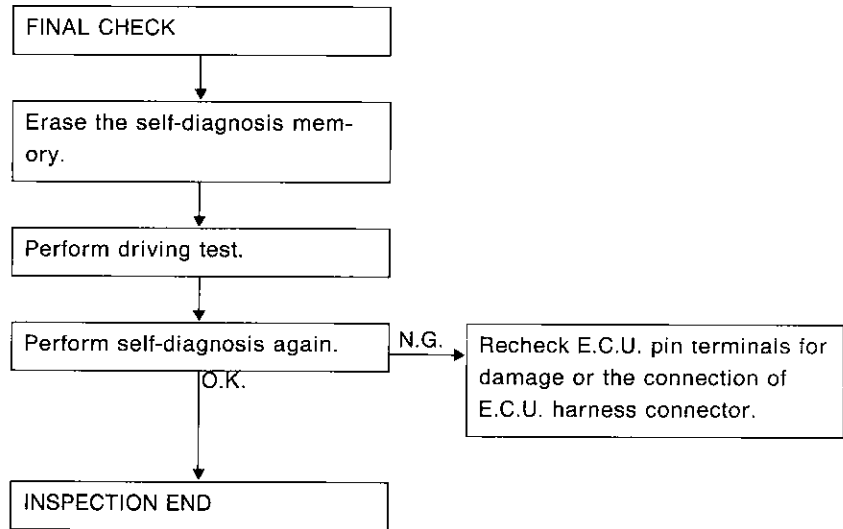
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

## TROUBLE DIAGNOSES

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### Diagnostic Procedure 25 (Cont'd)

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





## **TROUBLE DIAGNOSES**

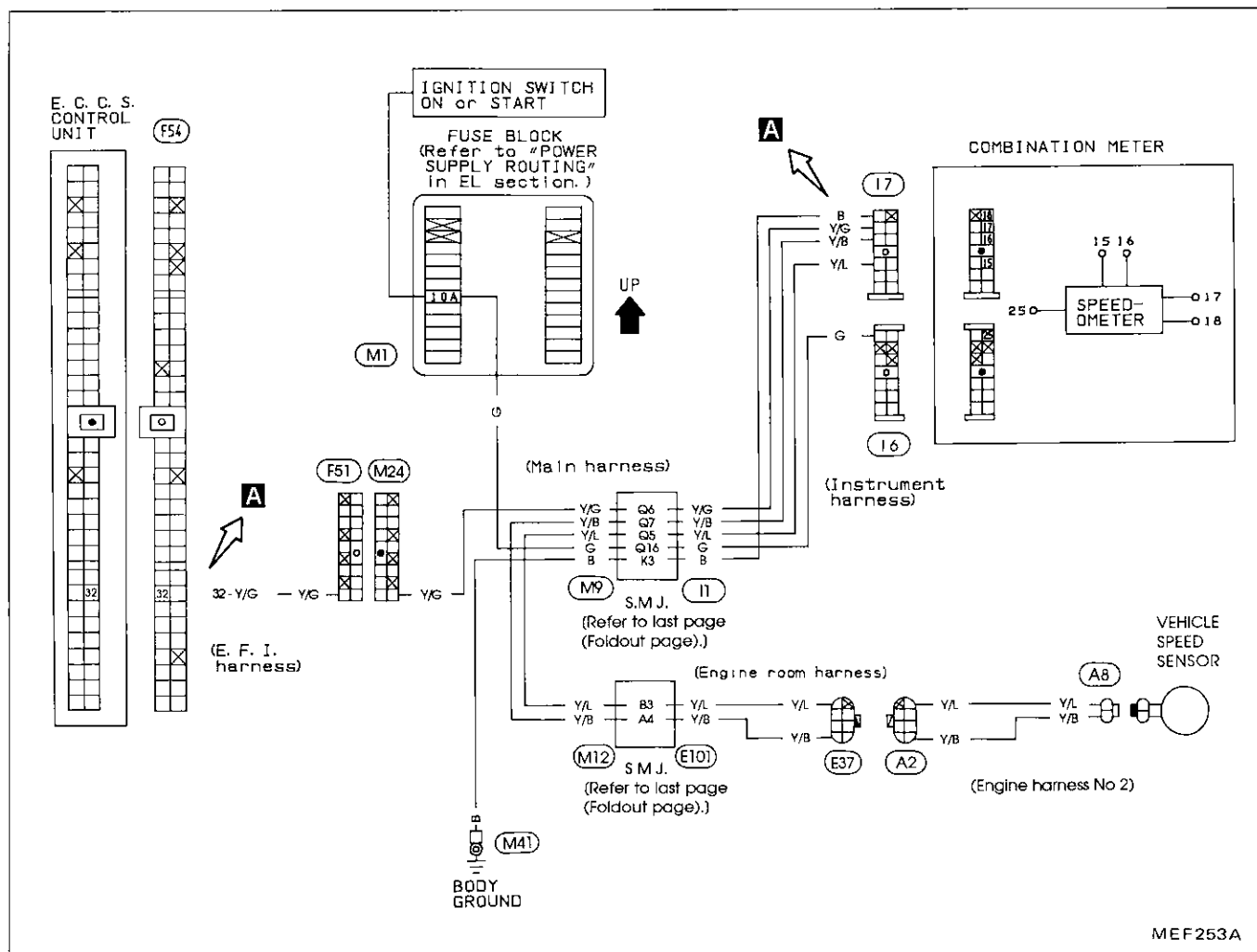
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**NOTE**

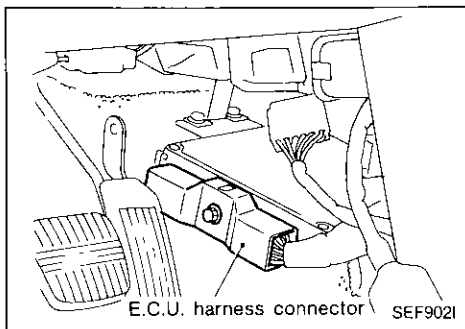
# TROUBLE DIAGNOSES

## Diagnostic Procedure 26

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



### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 26 (Cont'd)

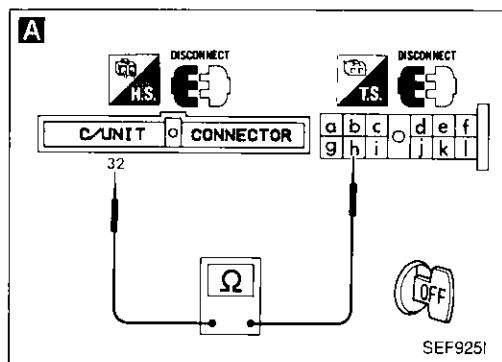
**A**

☆ MONITOR ☆ NO FAIL ☐

CAR SPEED SEN 0mph

RECORD

SEF5871



**A**

CHECK SPEEDOMETER FUNCTION.  
Make sure that speedometer functions properly.

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

**A**

CHECK INPUT SIGNAL CIRCUIT.

1) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.  
**CONSULT value should be the same as the speedometer indication**

N.G. → Check the following:  
● Harness connectors (F51, M24)  
● S.M.J. connectors (M9, J1)  
● Harness continuity between E.C.U. and combination meter.  
If N.G., repair harness or connectors.

OR

1) Turn ignition switch "OFF".  
2) Disconnect E.C.U. harness connector and combination meter harness connector (17).  
3) Check harness continuity between E.C.U. terminal 32 and terminal h.  
**Continuity should exist.**

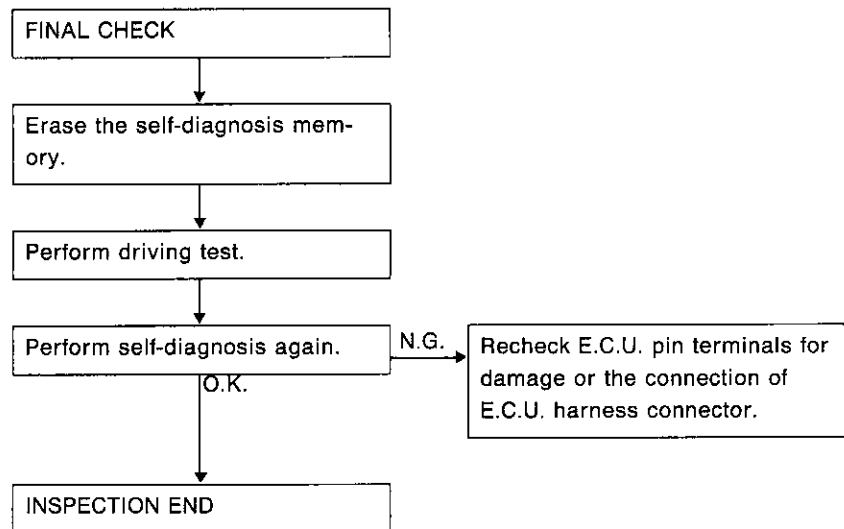
O.K.

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

## TROUBLE DIAGNOSES

### Diagnostic Procedure 26 (Cont'd)

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



## **TROUBLE DIAGNOSES**

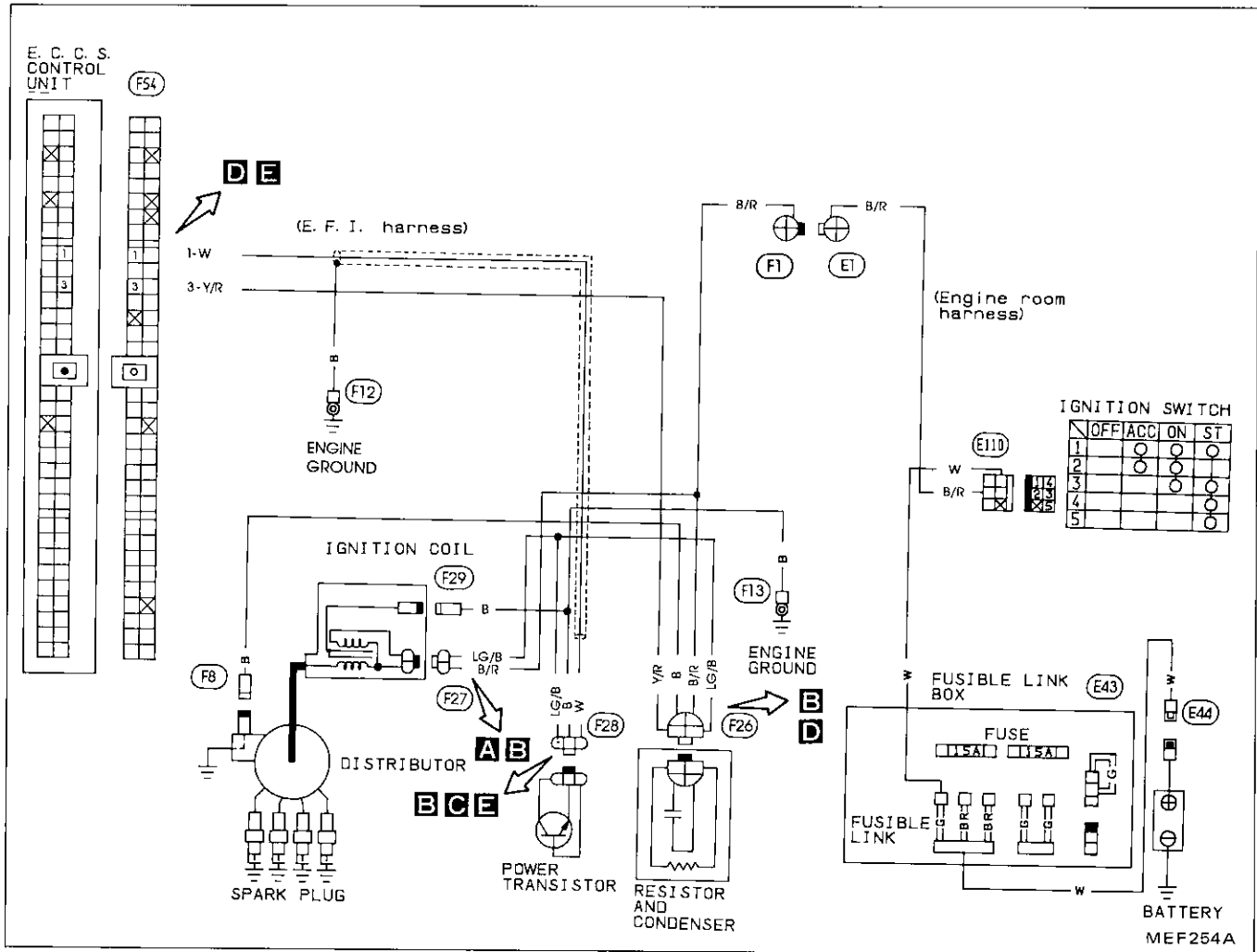
---

**NOTE**

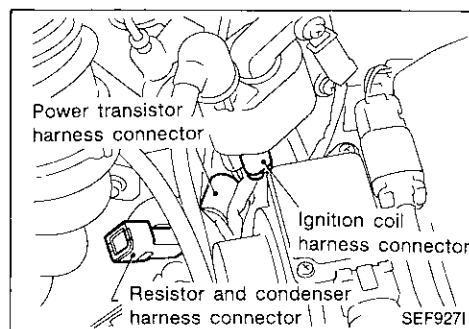
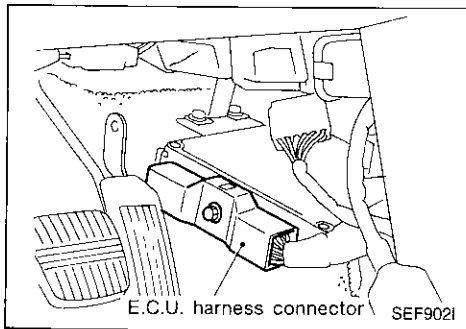
# TROUBLE DIAGNOSES

## Diagnostic Procedure 27

### IGNITION SIGNAL (Code No. 21)

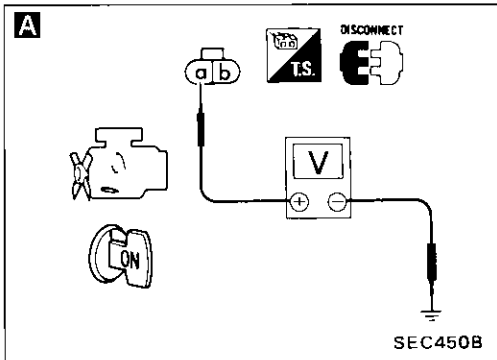


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 27 (Cont'd)



INSPECTION START

**A** CHECK POWER SUPPLY.

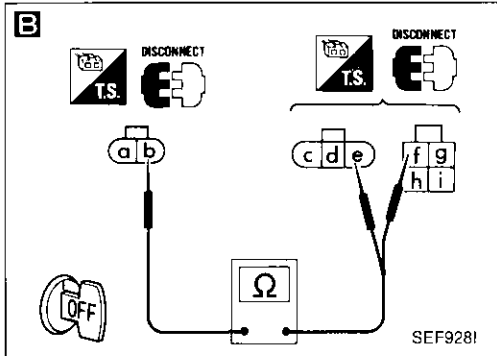
- 1) Disconnect ignition coil harness connector.
- 2) Turn ignition switch "ON".
- 3) Check voltage between terminal **a** and ground.

**Voltage: Battery voltage**

N.G. Check the following:

- Harness connectors **F1**, **E1**
- Harness continuity between ignition switch and ignition coil

If N.G., repair harness or connectors.



O.K.

**CHECK GROUND CIRCUIT.**

- 1) Turn ignition switch "OFF".
- 2) Disconnect power transistor harness connector and resistor and condenser harness connector.

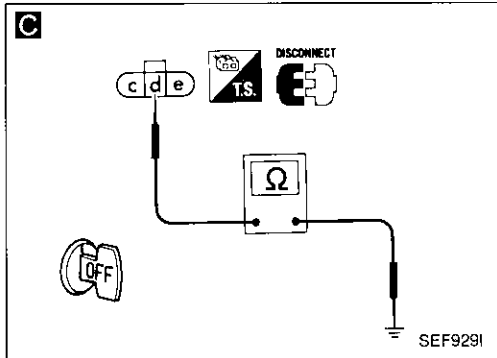
N.G. Repair harness or connectors.

**B** 3) Check harness continuity between terminal **b** and terminals **c**, **d**.

**Continuity should exist.**

**C** 4) Check harness continuity between terminal **a** and engine ground.

**Continuity should exist.**



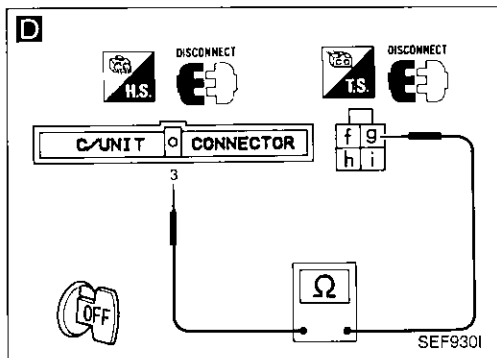
O.K.

**D** CHECK INPUT SIGNAL CIRCUIT.

- 1) Disconnect E.C.U. harness connector.
- 2) Check harness continuity between E.C.U. terminal **3** and terminal **g**.

**Continuity should exist.**

N.G. Repair harness or connectors.



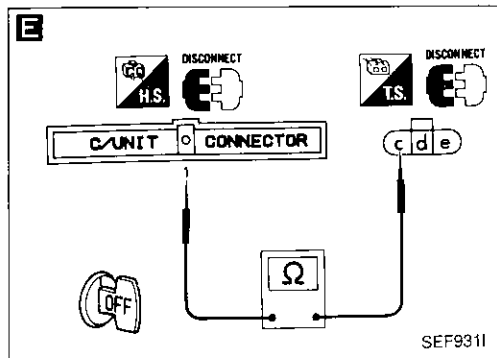
O.K.

**E** CHECK OUTPUT SIGNAL CIRCUIT.

- 1) Check harness continuity between E.C.U. terminal **1** and terminal **c**.

**Continuity should exist.**

N.G. Repair harness or connectors.

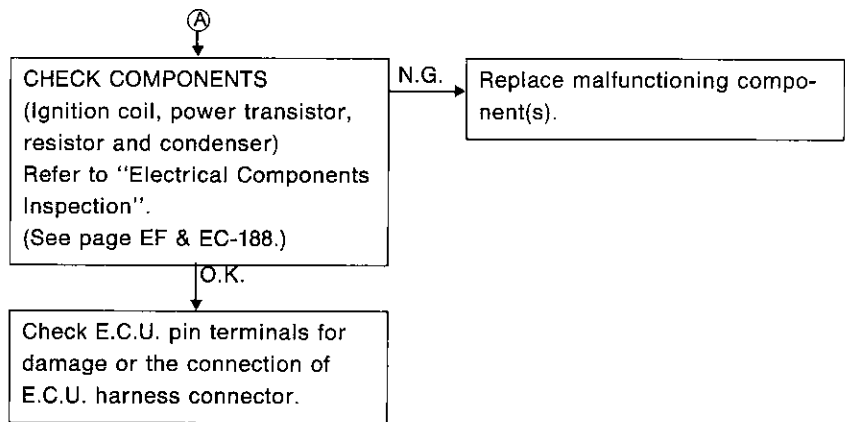


O.K.

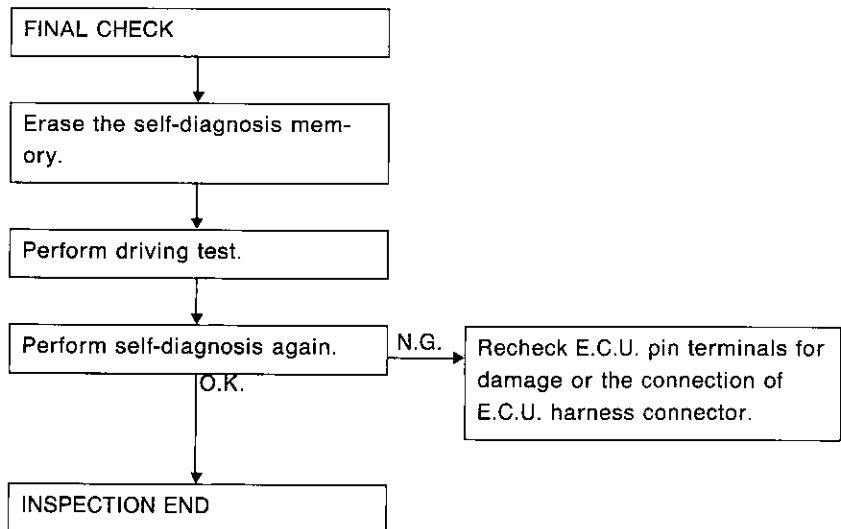
**A**

## TROUBLE DIAGNOSES

### Diagnostic Procedure 27 (Cont'd)



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





## TROUBLE DIAGNOSES

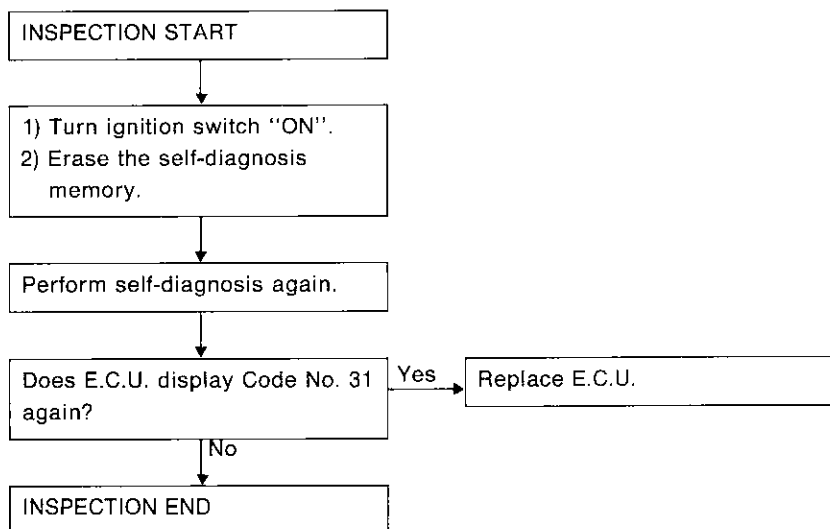
---

NOTE

## TROUBLE DIAGNOSES

### Diagnostic Procedure 28

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



## **TROUBLE DIAGNOSES**

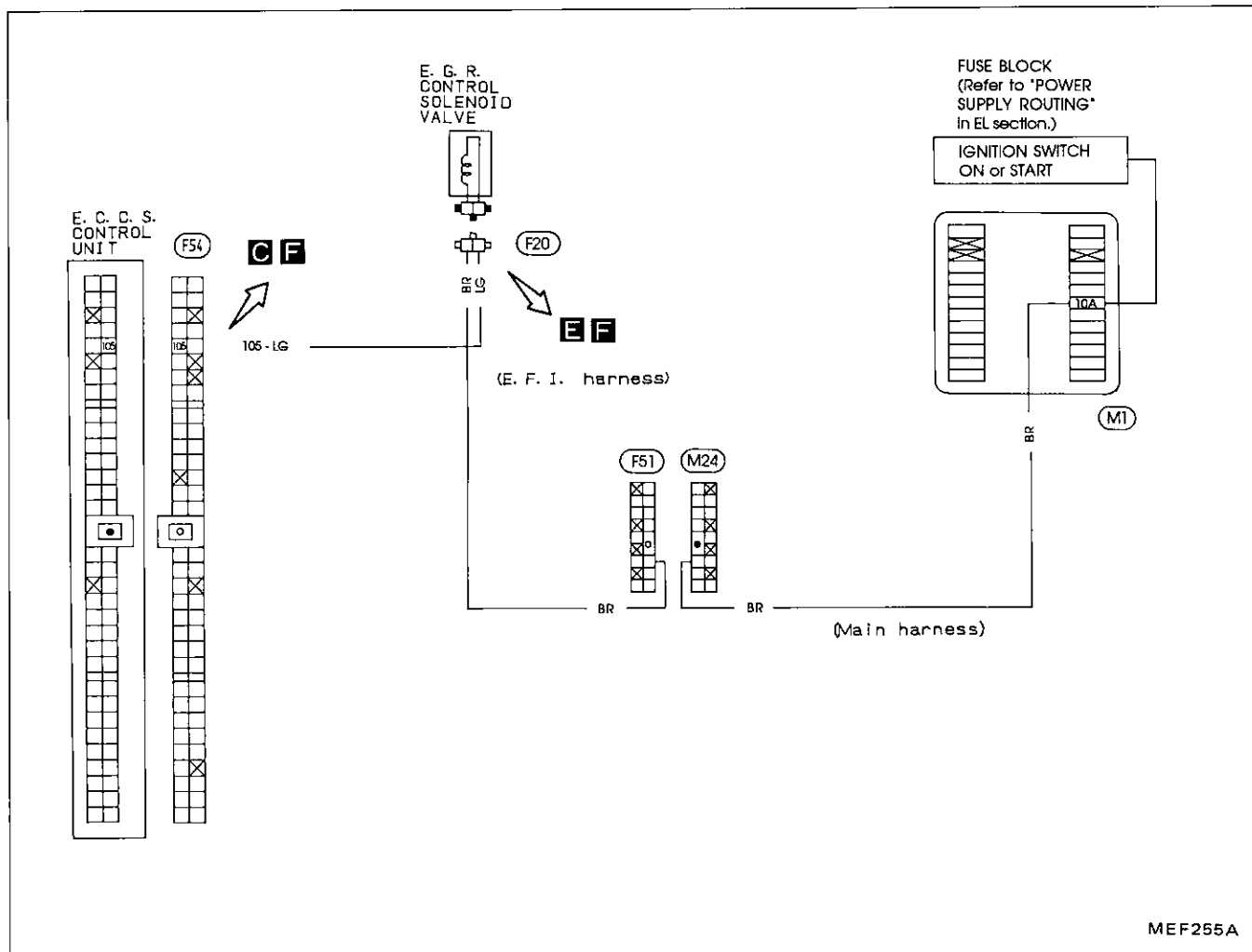
---

**NOTE**

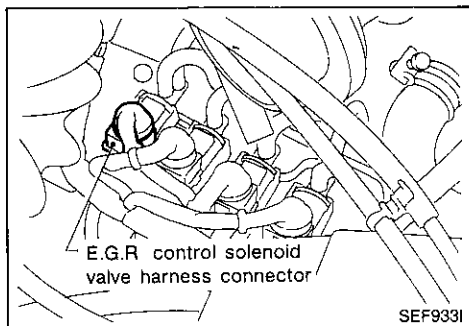
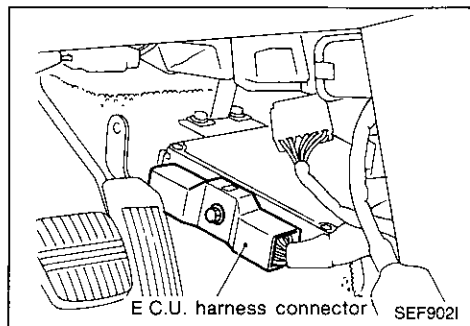
# TROUBLE DIAGNOSES

## Diagnostic Procedure 29

**E.G.R. FUNCTION (Code No. 32)  [CHECK ENGINE LIGHT ITEM (For California model)]**  
**E.G.R. CONTROL [Not self-diagnostic item (For non-California model)]**

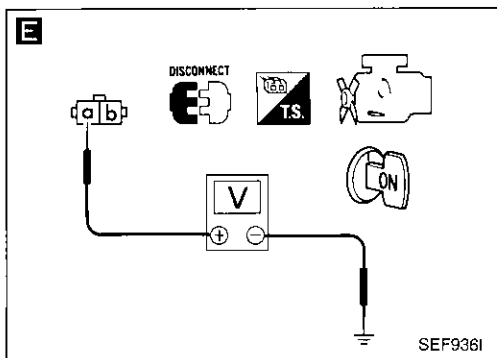
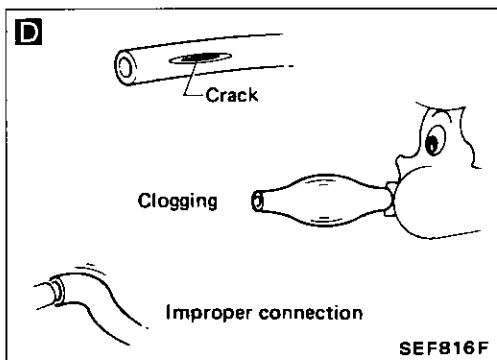
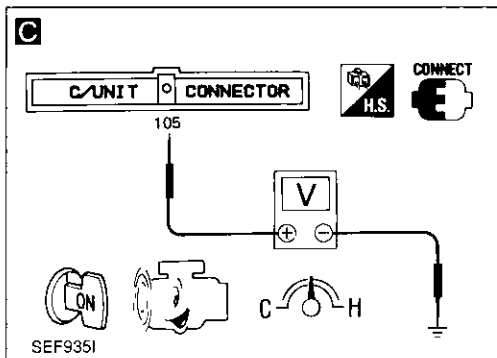
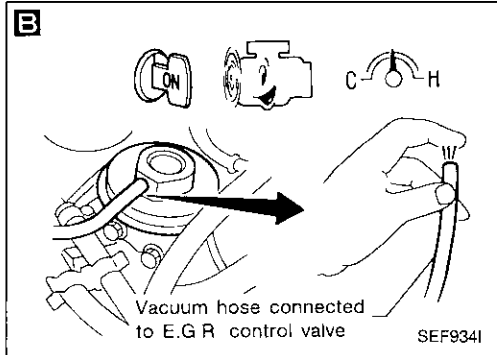
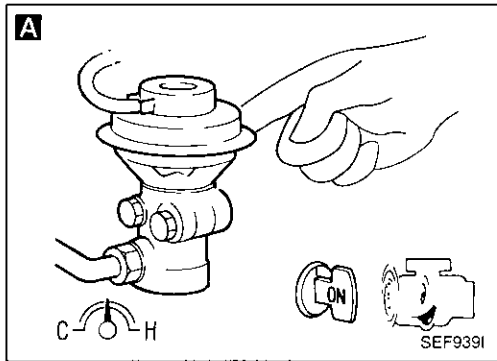


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 29 (Cont'd)



### INSPECTION START

- 1) Start engine and warm it up sufficiently.
- 2) Perform self-diagnosis. Make sure that code No. 12 is not displayed.

### **A** CHECK OVERALL FUNCTION. (Non-California model)

- 1) Make sure that E.G.R. control valve spring is lifted up and down when racing engine. (Use your finger.)

Is lifted up and down.

INSPECTION END

Is not lifted up and down.

### **B** CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.

- 1) Disconnect vacuum hose to E.G.R. control valve.
- 2) Make sure that vacuum exists under the following conditions.

**At idle:**

**Vacuum should not exist.**  
**Engine speed is about 2,000 rpm:**  
**Vacuum should exist.**

O.K.

**CHECK COMPONENTS**  
[E.G.R. control valve, B.P.T. valve and exhaust gas temperature sensor (California model)]. Refer to "Electrical Components Inspection". (See page EF & EC-188.)

N.G.

Replace malfunctioning component(s).

N.G.

### **C** CHECK CONTROL FUNCTION.

- 1) Check voltage between E.C.U. terminal 105 and ground under the following conditions.

**Voltage:**

**At idle**

**Approximately 0V**  
**Engine speed is about 2,000 rpm**  
**Battery voltage**

O.K.

### **D** CHECK VACUUM HOSE.

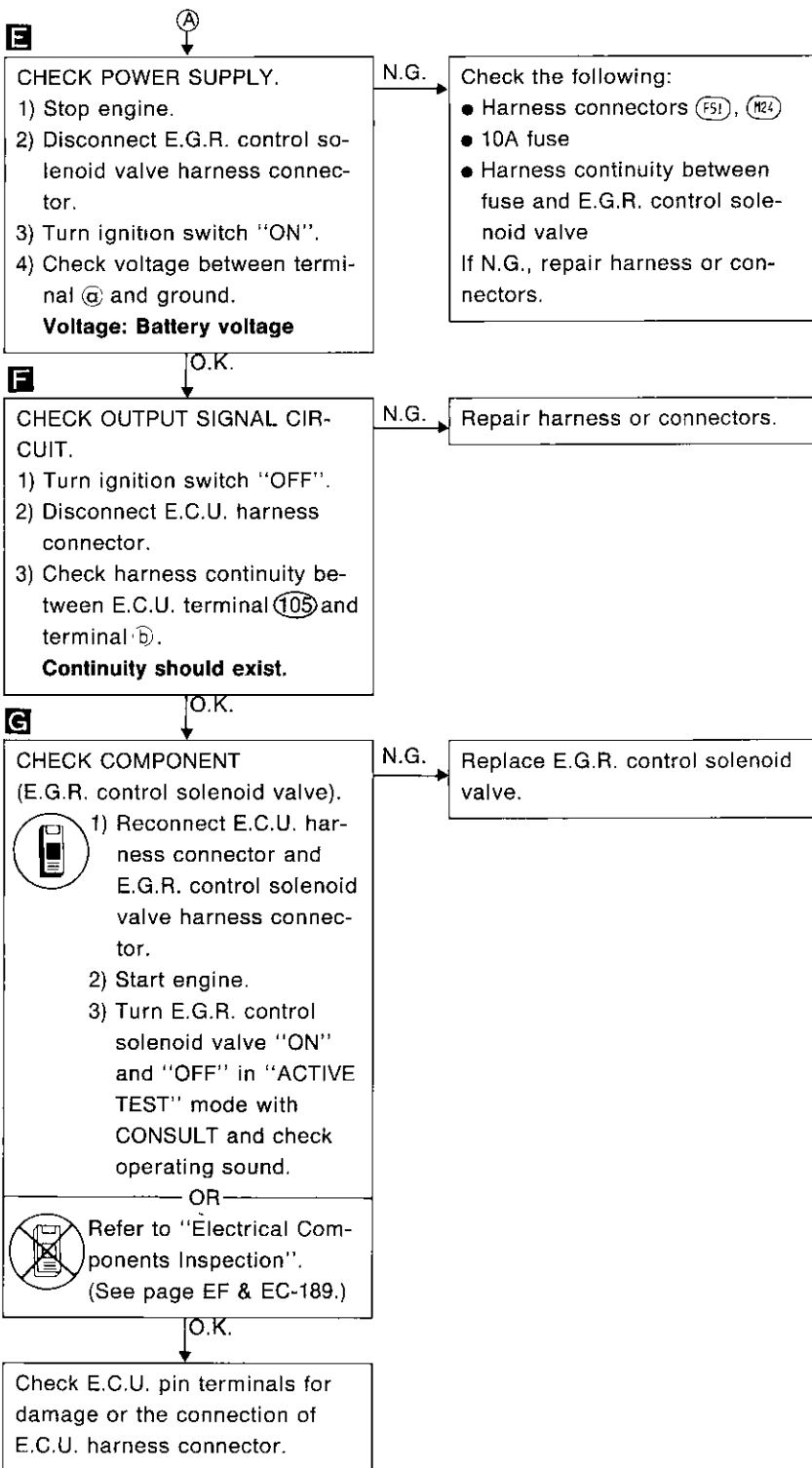
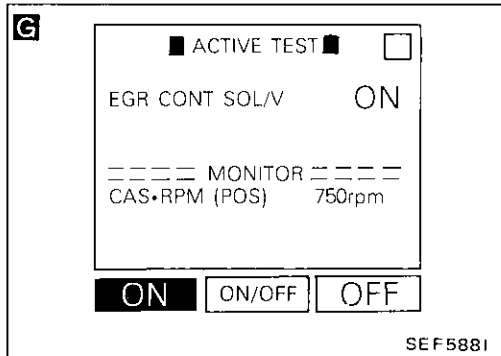
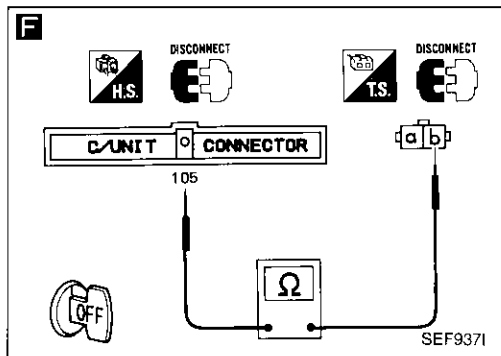
- 1) Check vacuum hose for clogging, cracks and proper connection.

N.G.

Ⓐ

# TROUBLE DIAGNOSES

## Diagnostic Procedure 29 (Cont'd)



# TROUBLE DIAGNOSES

## Diagnostic Procedure 29 (Cont'd)

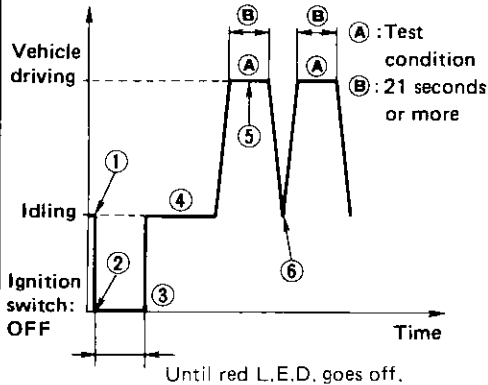
### ROAD TEST

#### Test condition

Drive vehicle under the following conditions with a suitable shift position.

- (1) Engine speed:  
M/T:  $2,200 \pm 200$  rpm  
A/T:  $2,100 \pm 300$  rpm
- (2) Intake manifold vacuum:  
M/T:  $-41.3 \pm 4.0$  kPa  
( $-310 \pm 30$  mmHg,  $-12.20 \pm 1.18$  inHg)  
A/T:  $-32.0 \pm 8.0$  kPa  
( $-240 \pm 60$  mmHg,  $-9.45 \pm 2.36$  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 revolution to less than 2,000 rpm.
- ⑦ Repeat steps ⑤ through ⑥ at least 1 time.

SEF302H

Perform FINAL CHECK by the following procedure after repair is completed. (California model)

#### FINAL CHECK

Erase the self-diagnosis memory.

#### 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 that check engine light does not come on during driving test.

Comes on.

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

Does not come on.

INSPECTION END

#### I



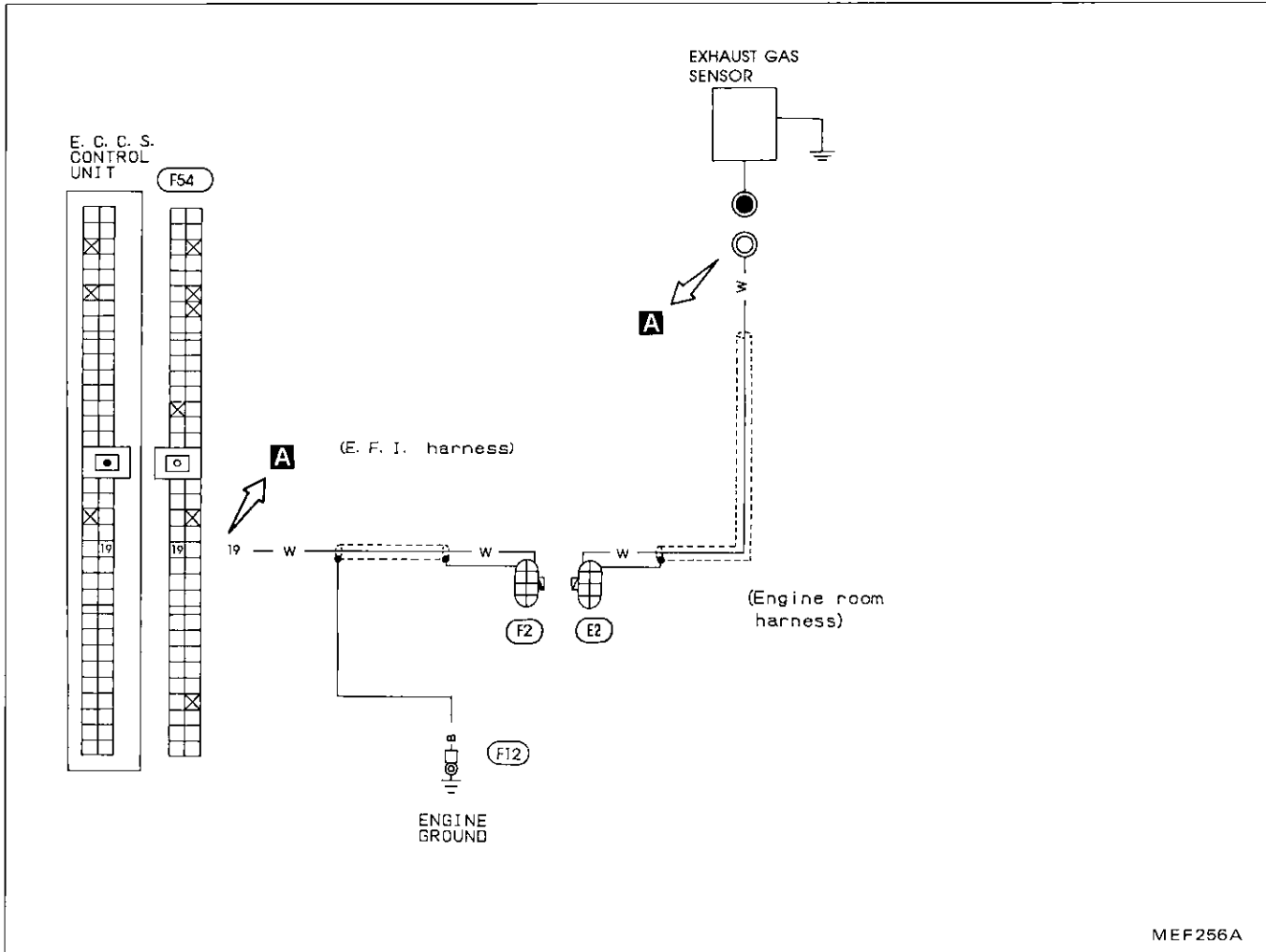
CHECK ENGINE LIGHT

SEF924F

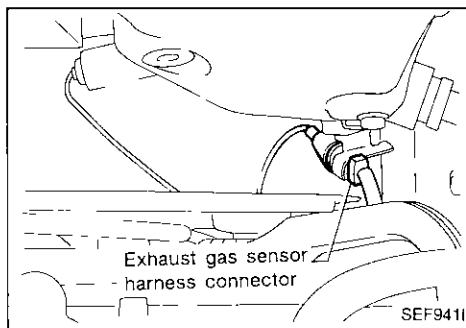
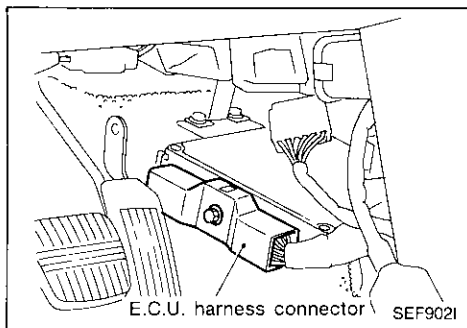
## TROUBLE DIAGNOSES

### Diagnostic Procedure 30

#### EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)



#### Harness layout





# TROUBLE DIAGNOSES

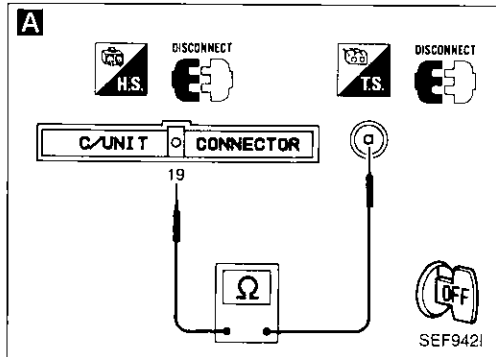
## Diagnostic Procedure 30 (Cont'd)

**A**

|              |           |                          |
|--------------|-----------|--------------------------|
| ☆ MONITOR    | ☆ NO FAIL | <input type="checkbox"/> |
| CAS-RPM(POS) | 2087rpm   |                          |
| M/R F/C MNT  | LEAN      |                          |

RECORD

SEF410J



INSPECTION START

**A**

CHECK INPUT SIGNAL CIRCUIT.



- 1) Start engine and warm it up sufficiently.
- 2) Make sure that "M/R F/C MNT" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

N.G.

Check the following:

- Harness connectors (F2), (E2)
  - Harness continuity between E.C.U. and exhaust gas sensor
- If N.G., repair harness or connectors.

OR



- 1) Disconnect E.C.U. harness connector and exhaust gas sensor harness connector.
- 2) Check harness continuity between terminal ⑨ and E.C.U. terminal ⑱.

Continuity should exist.

O.K.

CHECK COMPONENT

(Exhaust gas sensor).

Refer to "Electrical Components Inspection".

(See page EF & EC-189.)

N.G.

Replace exhaust gas sensor.

O.K.

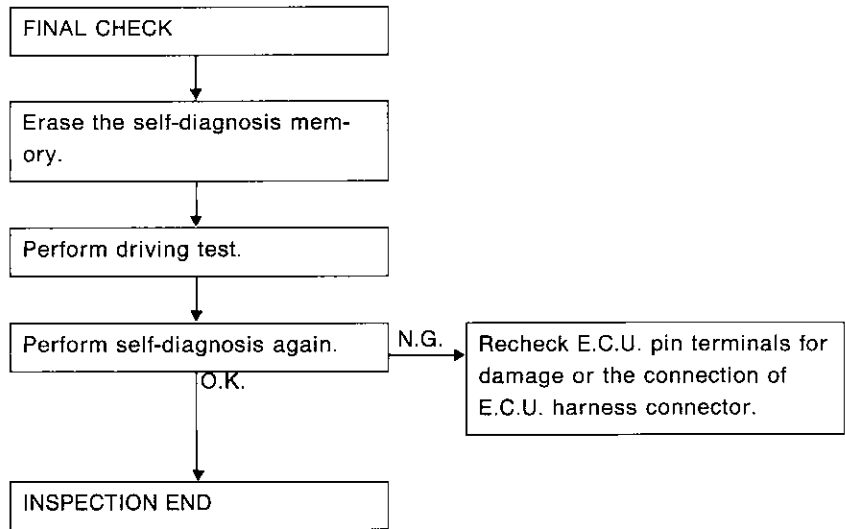
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

## TROUBLE DIAGNOSES

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### Diagnostic Procedure 30 (Cont'd)

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



## **TROUBLE DIAGNOSES**

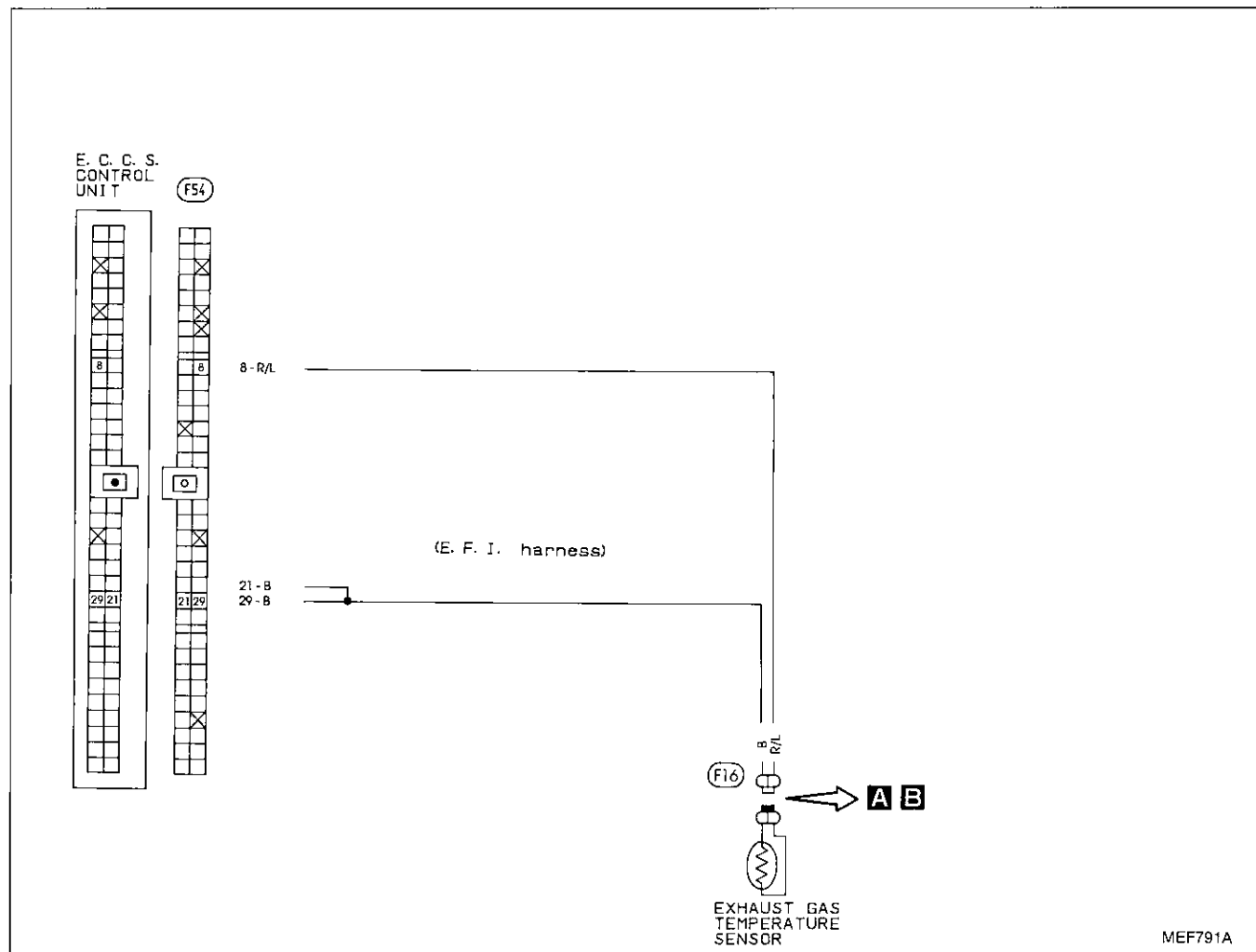
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**NOTE**

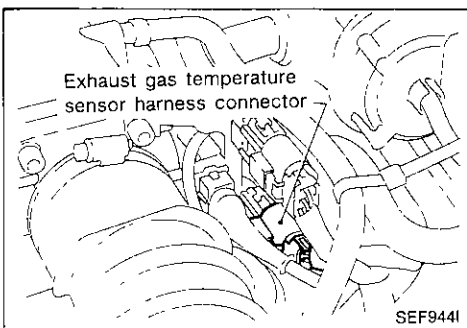
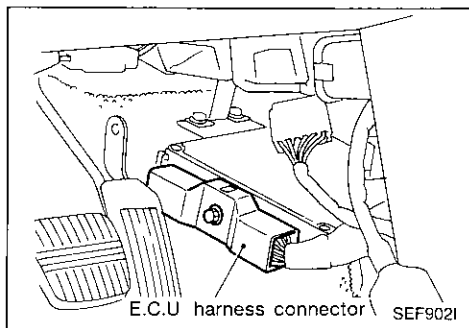
## TROUBLE DIAGNOSES

### Diagnostic Procedure 31

**EXHAUST GAS TEMPERATURE SENSOR (Code No. 35)  (CHECK ENGINE LIGHT ITEM): CALIFORNIA MODEL ONLY**

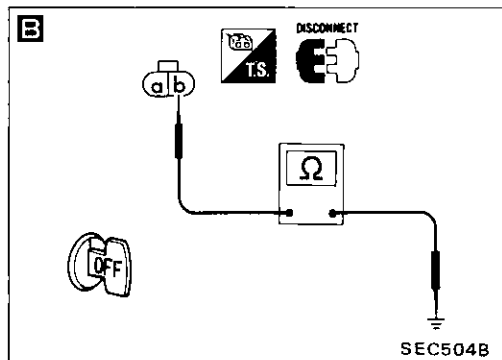
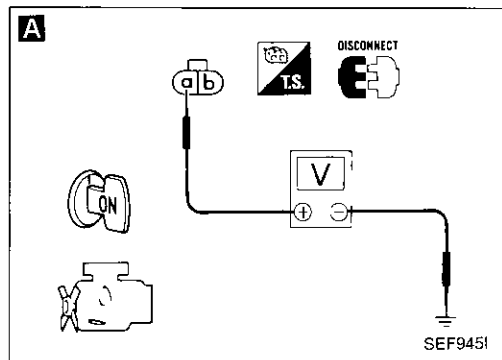
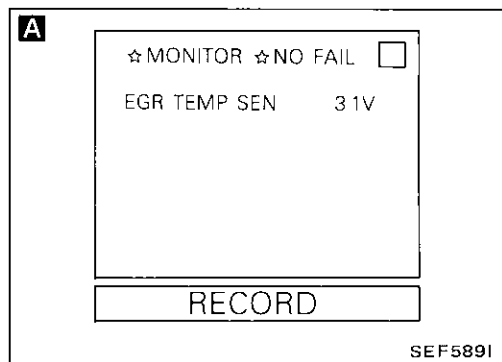


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 31 (Cont'd)



### INSPECTION START

**A**

#### CHECK POWER SUPPLY.

- 1) Start engine and warm it up sufficiently.
  - 2) Read exhaust gas temperature sensor signal in "DATA MONITOR" mode with CONSULT.
- Voltage: Less than 4.5V**

N.G.

Repair harness or connectors.

OR

- 1) Disconnect exhaust gas temperature sensor harness connector.
  - 2) Turn ignition switch "ON".
  - 3) Check voltage between terminal Ⓐ and ground.
- Voltage: Less than 4.5V**

O.K.

Turn ignition switch "OFF".



Disconnect exhaust gas temperature sensor harness connector.

**B**

#### CHECK GROUND CIRCUIT.

- 1) Check harness continuity between terminal Ⓑ and engine ground.
- Continuity should exist.**

N.G.

Repair harness or connectors.

O.K.

#### CHECK COMPONENT

(Exhaust gas temperature sensor).  
Refer to "Electrical Components Inspection". (See page EF & EC-189.)

N.G.

Replace exhaust gas temperature sensor.

O.K.

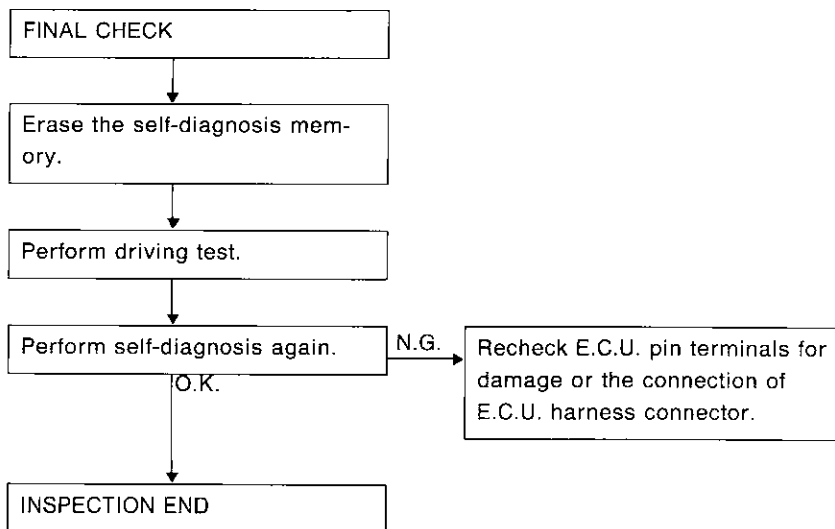
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

## TROUBLE DIAGNOSES

---

### Diagnostic Procedure 31 (Cont'd)

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



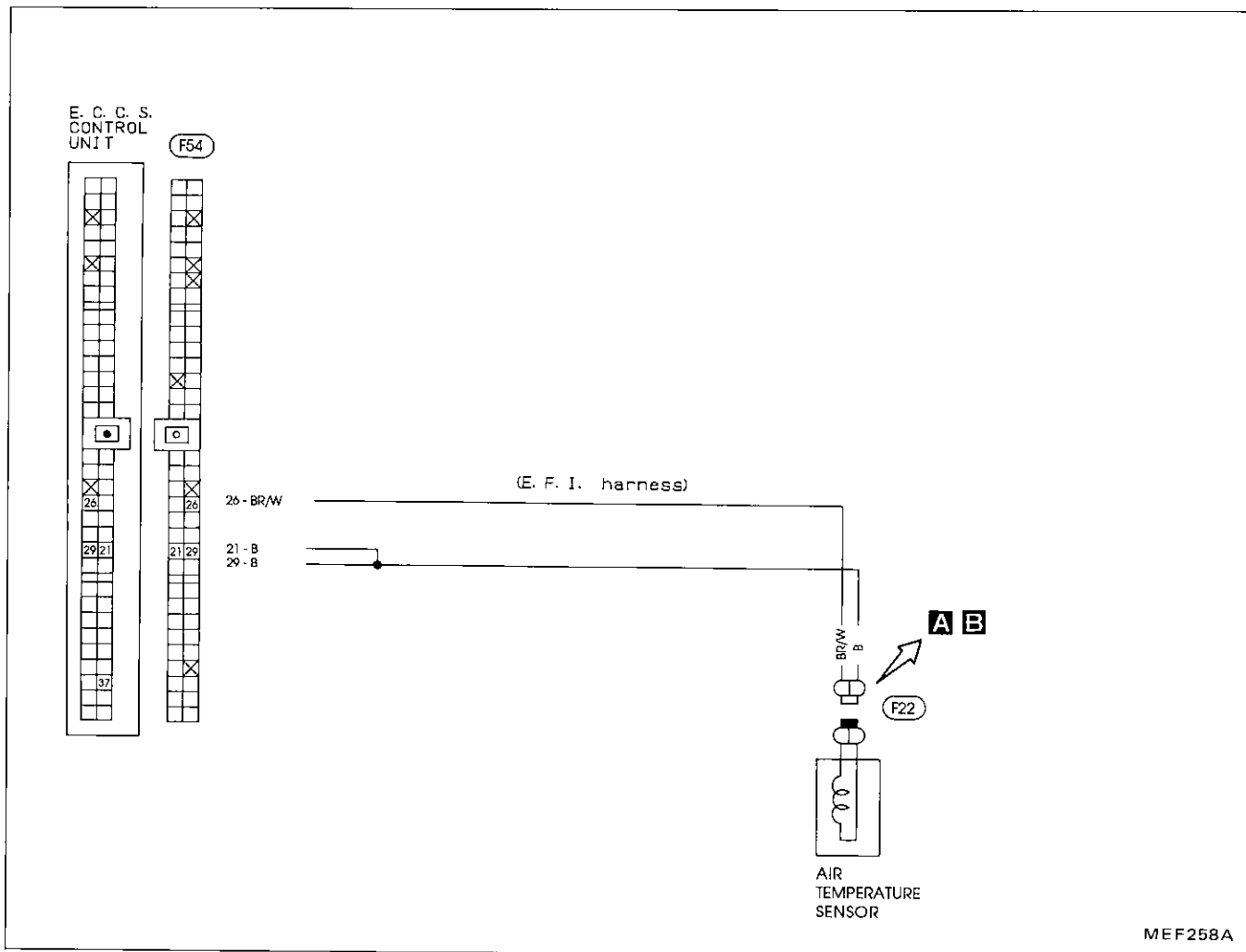
## TROUBLE DIAGNOSES

---

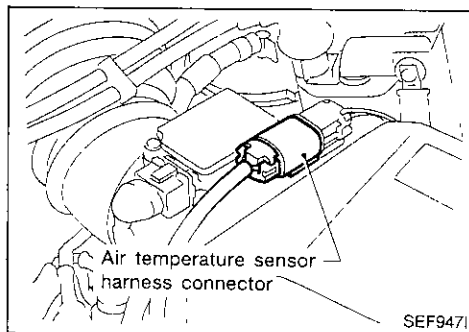
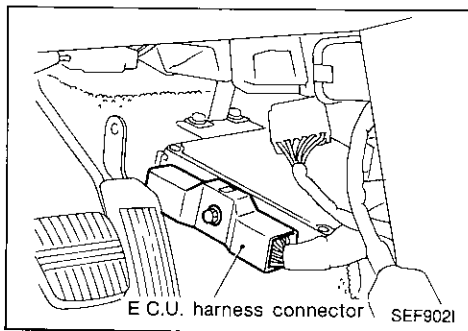
NOTE

## Diagnostic Procedure 32

### AIR TEMPERATURE SENSOR (Code No. 41)



### Harness layout





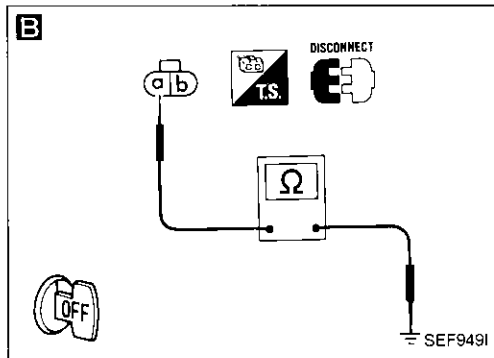
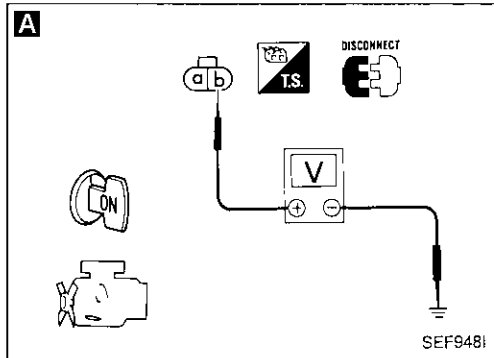
# TROUBLE DIAGNOSES

## Diagnostic Procedure 32 (Cont'd)

**A**

|               |           |   |
|---------------|-----------|---|
| ☆ MONITOR     | ☆ NO FAIL | ▲ |
| INT/A TEMP SE | 24°C      |   |
| START SIGNAL  | OFF       |   |
| IDLE POSITION | ON        |   |
| AIR COND SIG  | OFF       |   |
| NEUTRAL SW    | ON        |   |
| PW/ST SIGNAL  | OFF       |   |
| LOAD SIGNAL   | OFF       |   |

RECORD



INSPECTION START

**A**

### CHECK POWER SUPPLY.

Read intake air temperature sensor signal in "DATA MONITOR" mode with CONSULT after engine warm-up.

**Intake air temperature:**  
20 - 60°C (68 - 140°F)

OR



- 1) Disconnect air temperature sensor harness connector.
- 2) Turn ignition switch "ON".
- 3) Check voltage between terminal Ⓐ and ground.

**Voltage: Approximately 5V**

N.G.

Repair harness or connectors.

O.K.

Turn ignition switch "OFF".



Disconnect air temperature sensor harness connector.

**B**

### CHECK GROUND CIRCUIT.

- 1) Check harness continuity between terminal Ⓐ and engine ground.

**Continuity should exist.**

N.G.

Repair harness or connectors.

O.K.

### CHECK COMPONENT

(Air temperature sensor). Refer to "Electrical Components Inspection". (See page EF & EC-189.)

N.G.

Replace air temperature sensor.

O.K.

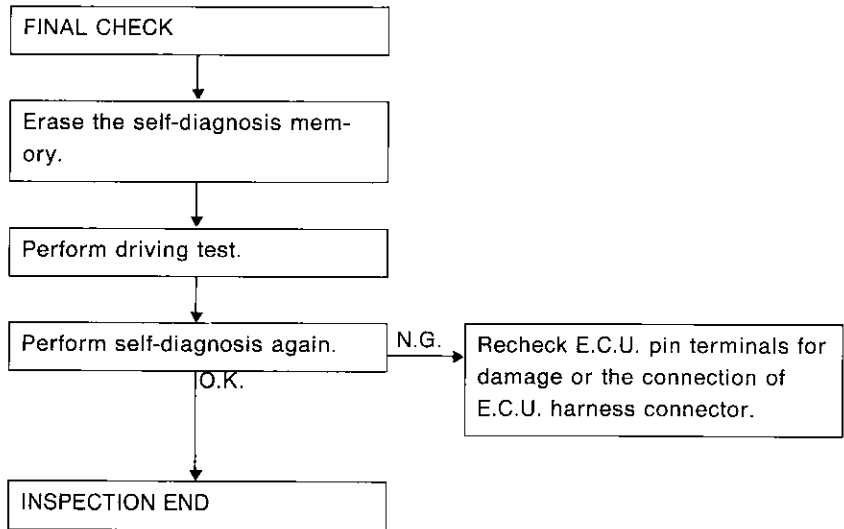
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

## TROUBLE DIAGNOSES

---

### Diagnostic Procedure 32 (Cont'd)

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



## **TROUBLE DIAGNOSES**

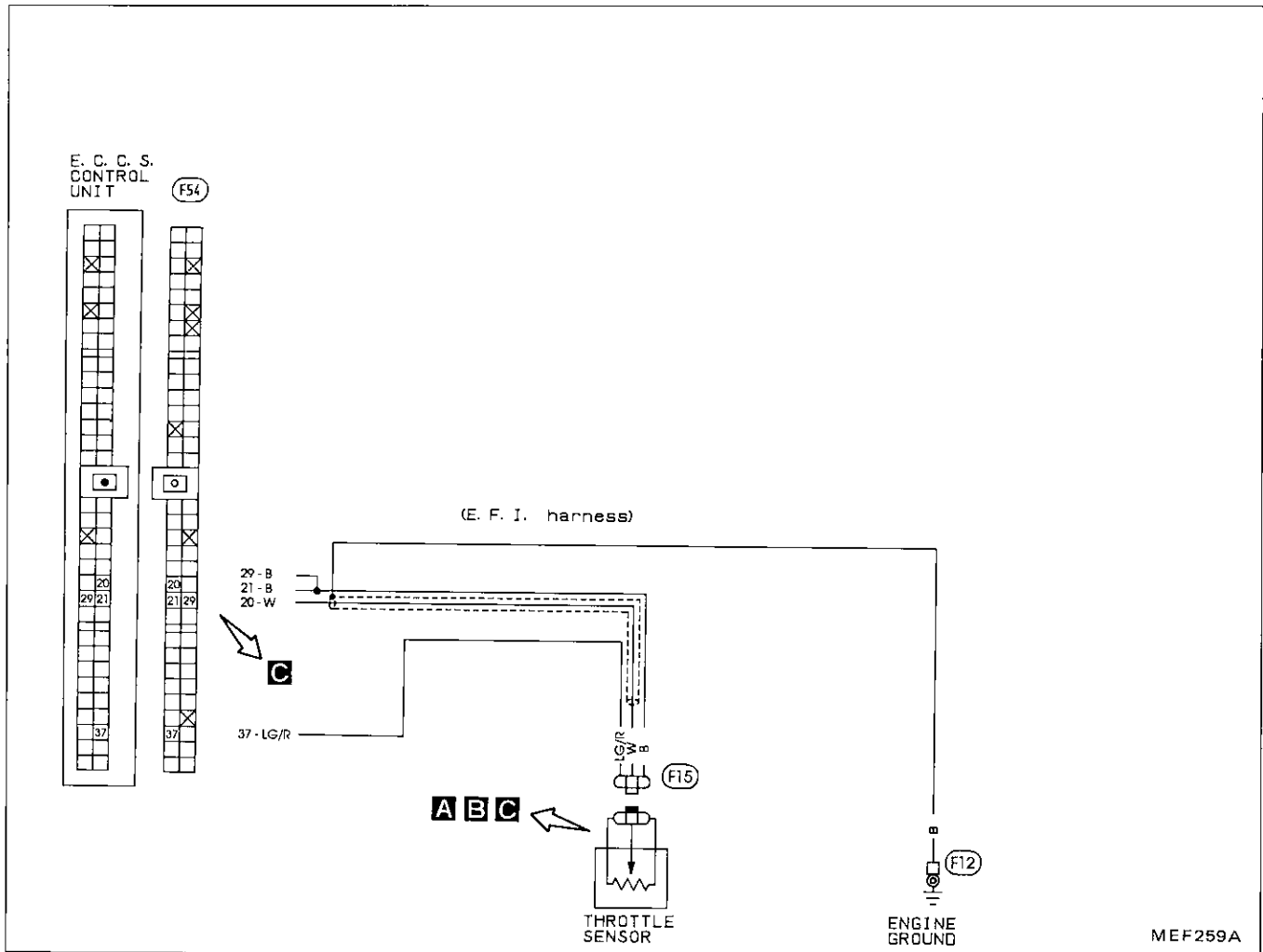
---

**NOTE**

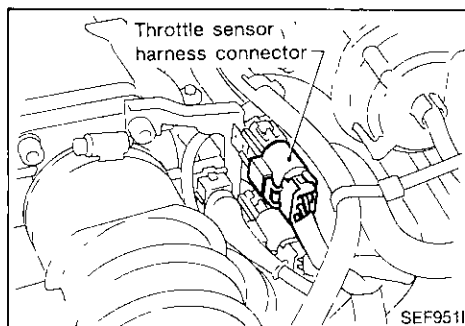
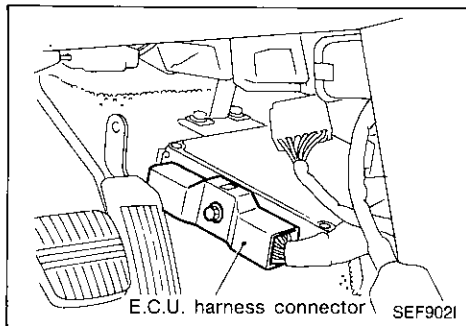
# TROUBLE DIAGNOSES

## Diagnostic Procedure 33

### THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)

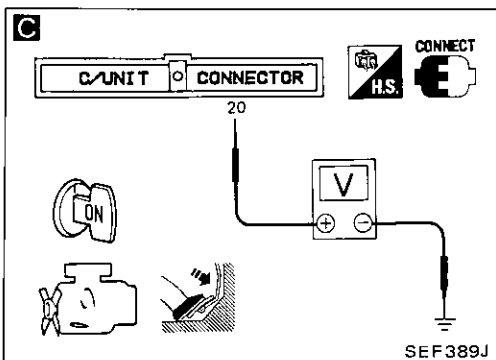
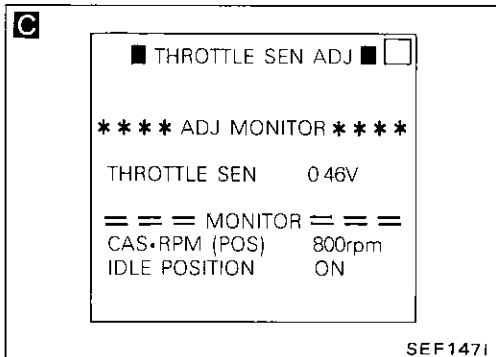
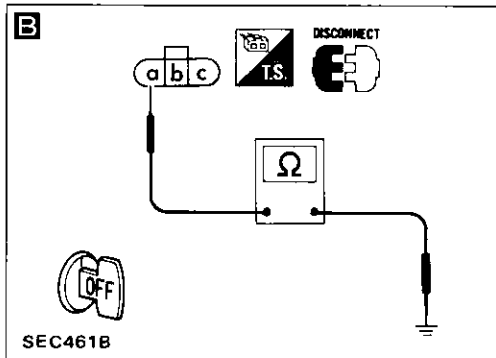
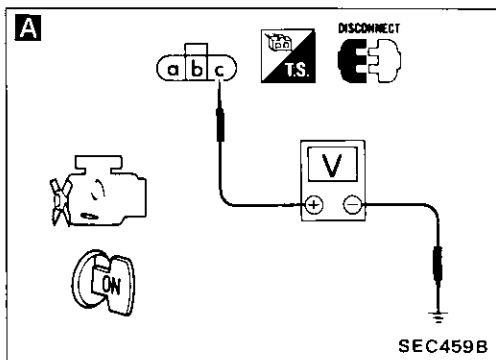


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 33 (Cont'd)



### INSPECTION START

**A**

#### CHECK POWER SUPPLY.

- 1) Disconnect throttle sensor harness connector.
- 2) Turn ignition switch "ON".
- 3) Check voltage between terminal ③ and ground.

**Voltage: Approximately 5V**

N.G.

Repair harness or connectors.

O.K.

**B**

#### CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Check harness continuity between terminal ③ and engine ground.

**Continuity should exist.**

N.G.

Repair harness or connectors.

O.K.

**C**

#### CHECK INPUT SIGNAL CIRCUIT.

- 1) Reconnect throttle sensor harness connector.
- 2) Turn ignition switch "ON".
- 3) Read throttle sensor output voltage in "WORK SUPPORT" mode with CONSULT.

**Voltage:**

**Throttle valve fully closed**

**0.4 - 0.5V**

**Throttle valve fully open**

**Approx. 4.0V**

OR



- 1) Reconnect throttle sensor harness connector.
- 2) Turn ignition switch "ON".
- 3) Make sure that voltage between E.C.U. terminal ② 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.

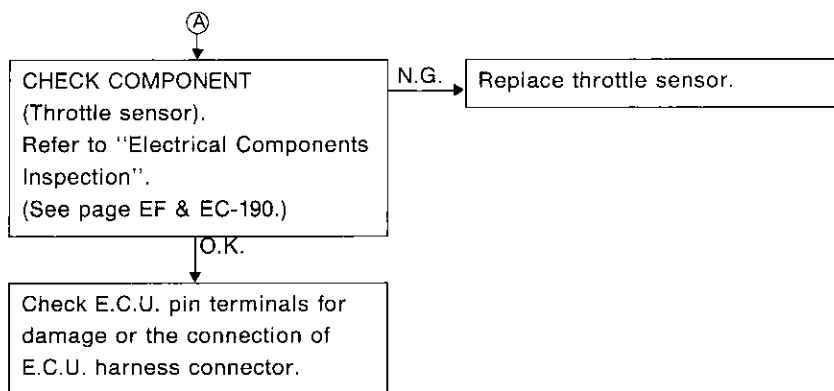
Repair harness or connectors.

O.K.

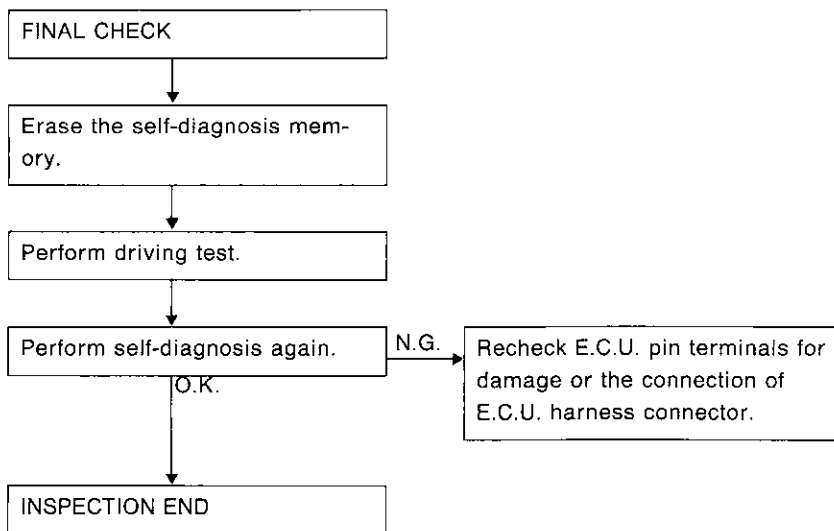


## TROUBLE DIAGNOSES

### Diagnostic Procedure 33 (Cont'd)



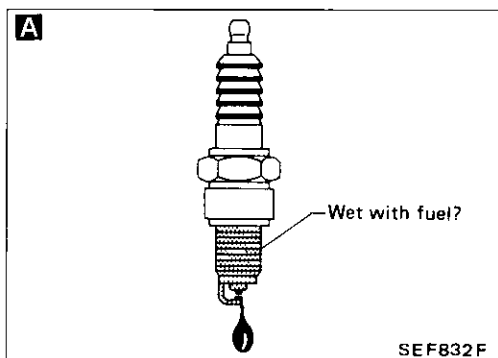
**Perform FINAL CHECK by the following procedure after repair is completed.**



## **TROUBLE DIAGNOSES**

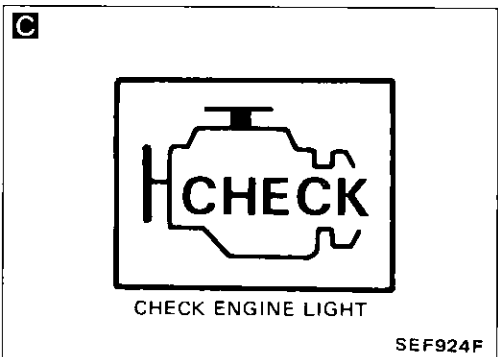
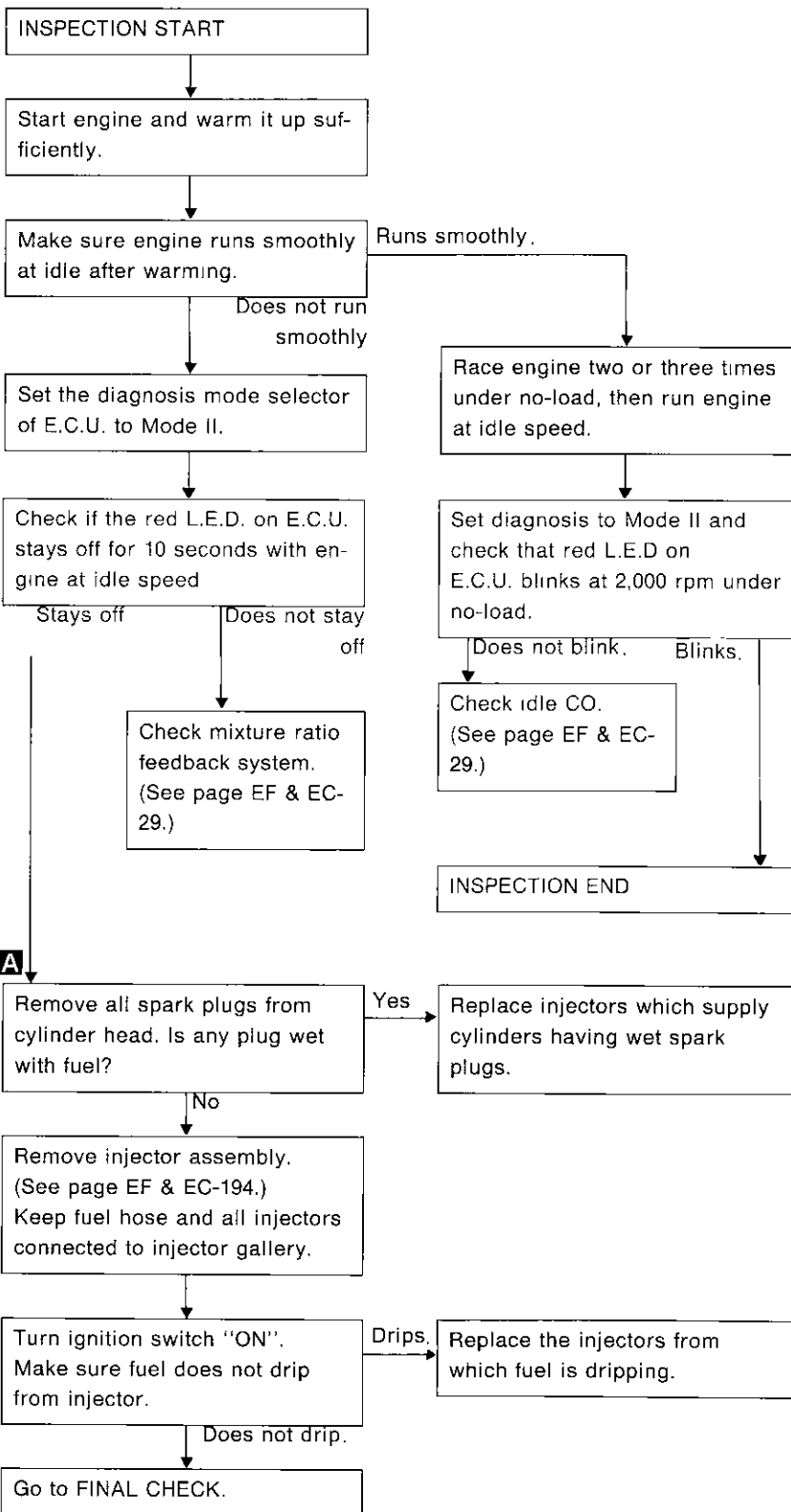
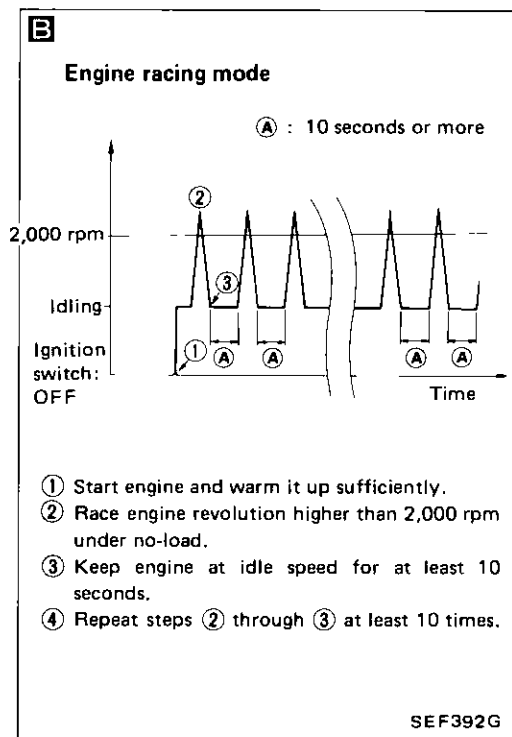
---

**NOTE**



## Diagnostic Procedure 34

**INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY**

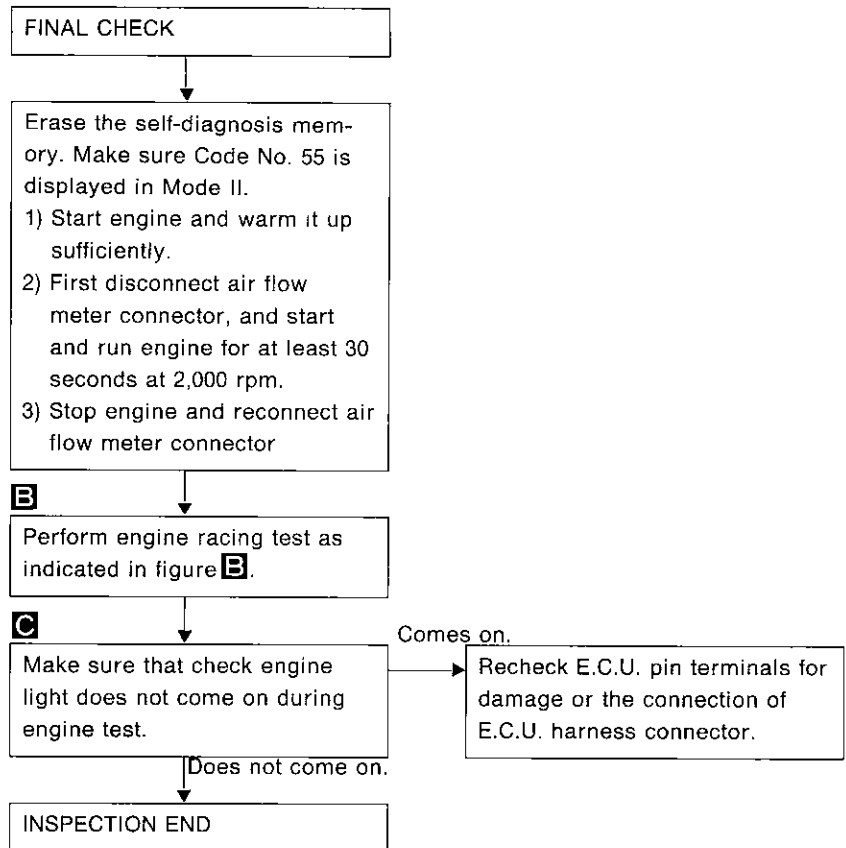




## TROUBLE DIAGNOSES

### Diagnostic Procedure 34 (Cont'd)

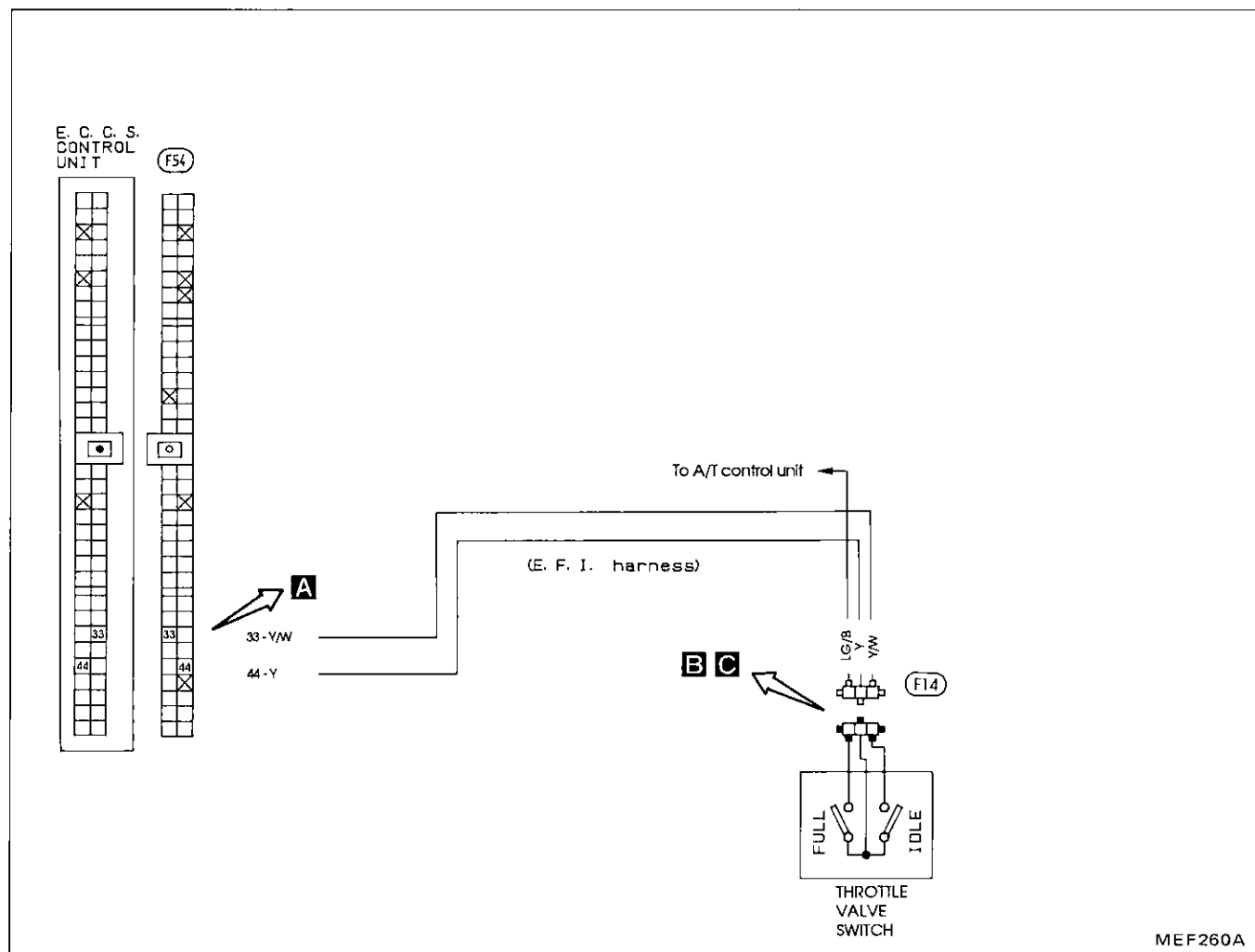
Perform FINAL CHECK by the following procedure after repair is completed.



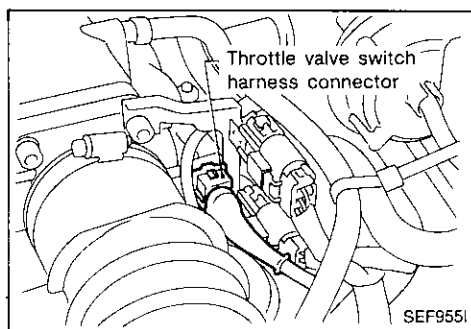
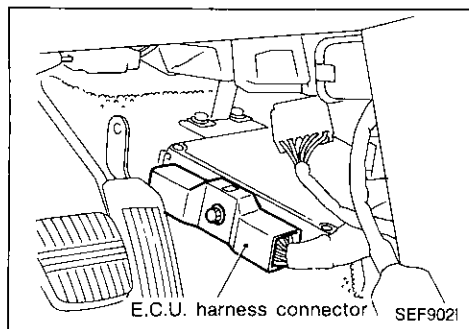
# TROUBLE DIAGNOSES

## Diagnostic Procedure 35

### THROTTLE VALVE SWITCH (Not self-diagnostic item)

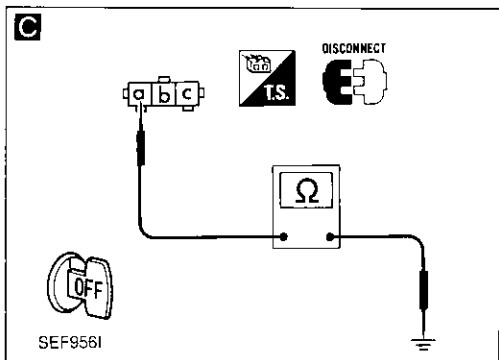
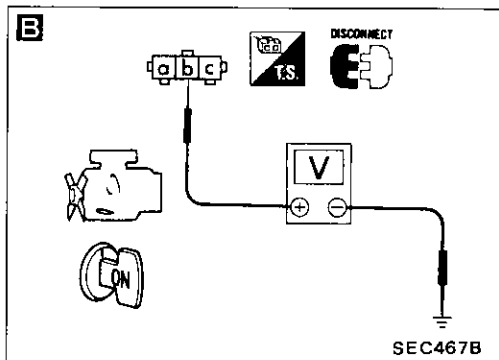
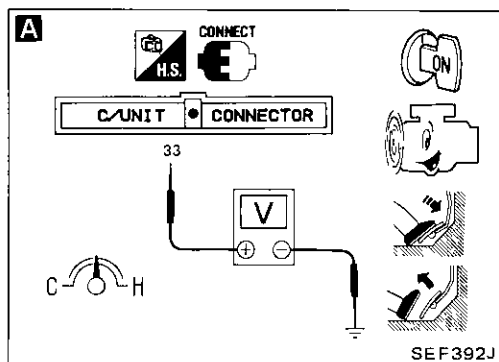


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 35 (Cont'd)



### INSPECTION START

#### A

#### CHECK OVERALL FUNCTION.

- 1) Start engine and warm it up sufficiently.
- 2) Check voltage between E.C.U. terminal ③ and ground.

#### Voltage:

**Accelerator pedal is released**

**Approximately 9 - 10V**

**Accelerator pedal is depressed**

**Approximately 0V**

O.K.

INSPECTION END

N.G.

#### B

#### CHECK POWER SUPPLY.

- 1) Stop engine.
- 2) Disconnect throttle valve switch harness connector.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal ⑤ and ground.

**Voltage: Approximately 9 - 10V**

N.G.

Repair harness or connectors.

O.K.

#### C

#### CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Check harness continuity between terminal ⑥ and engine ground.

**Continuity should exist.**

N.G.

Repair harness or connectors.

O.K.

#### CHECK COMPONENT

(Throttle valve switch).

Refer to "Electrical Components Inspection".

(See page EF & EC-192.)

N.G.

Replace throttle valve switch.

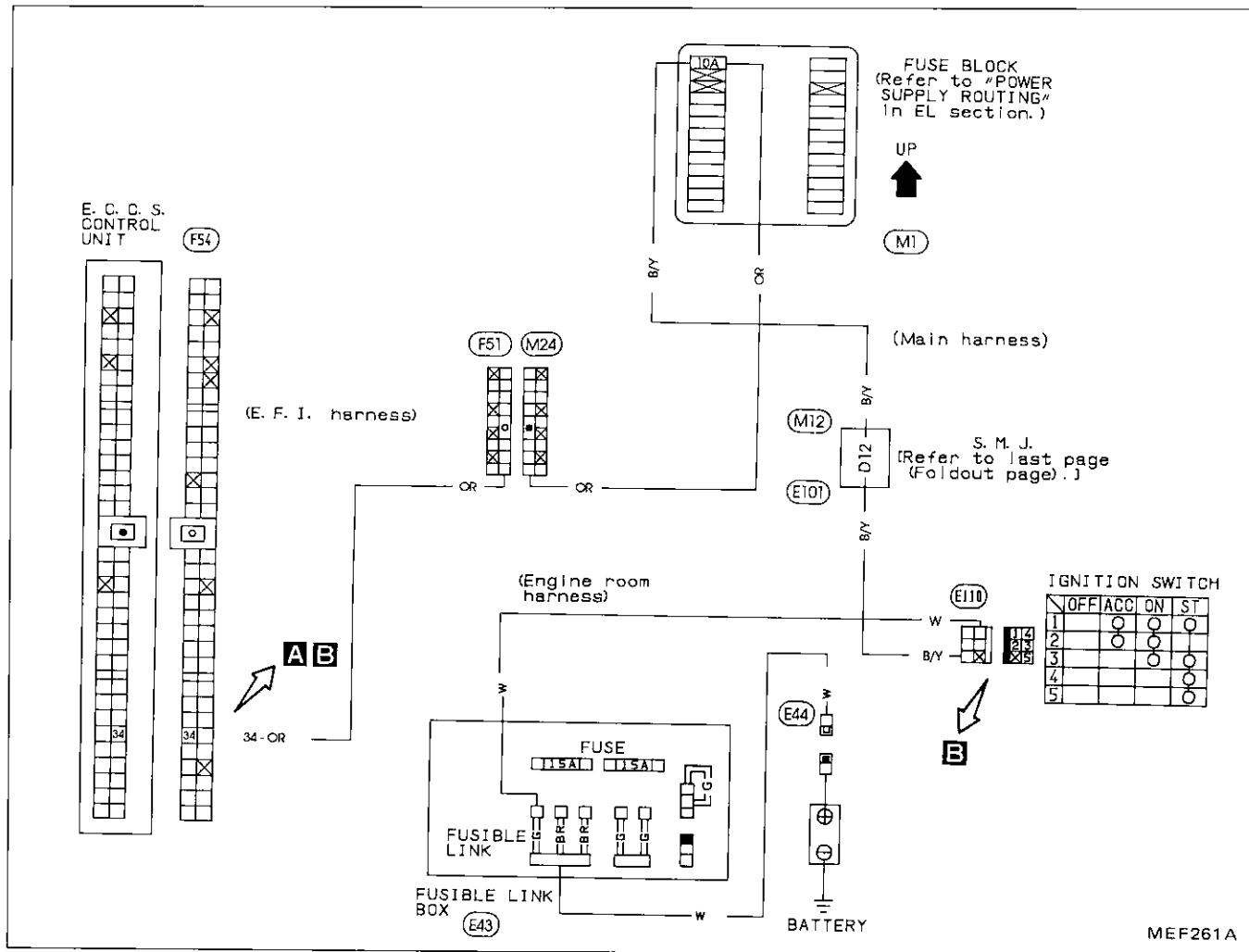
O.K.

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

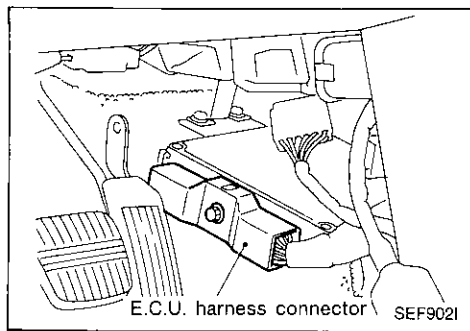
# TROUBLE DIAGNOSES

## Diagnostic Procedure 36

### START SIGNAL (Not self-diagnostic item)



### Harness layout



# TROUBLE DIAGNOSES

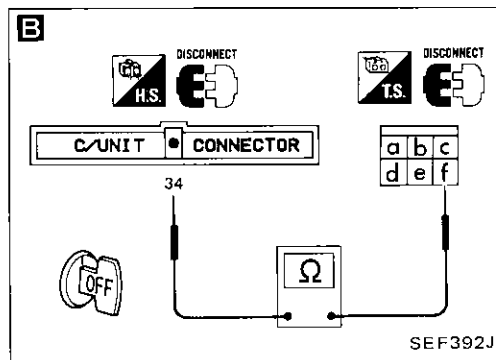
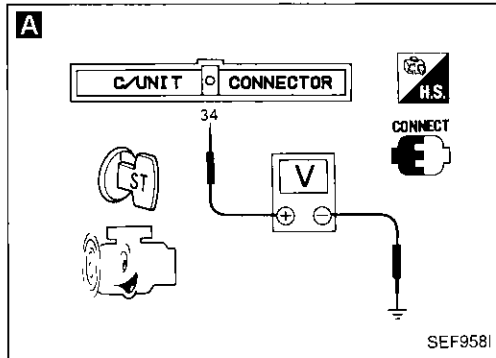
## Diagnostic Procedure 36 (Cont'd)

**A**

|               |           |                          |
|---------------|-----------|--------------------------|
| ☆ MONITOR     | ☆ NO FAIL | <input type="checkbox"/> |
| START SIGNAL  | OFF       |                          |
| IDLE POSITION | ON        |                          |
| AIR COND SIG  | OFF       |                          |
| NEUTRAL SW    | ON        |                          |

RECORD

SEF149I



INSPECTION START

**A**

CHECK OVERALL FUNCTION.

- 1) Turn ignition switch "ON".
- 2) Check start signal in "DATA MONITOR" mode with CONSULT.

|             |     |
|-------------|-----|
| IGN "ON"    | OFF |
| IGN "START" | ON  |

OR

- 1) Turn ignition switch to "START".
- 2) Check voltage between E.C.U. terminal ③④ and ground.

**Voltage:**  
**Ignition switch "START"**  
**Battery voltage**  
**Except above**  
**Approximately 0V**

**B**

CHECK INPUT SIGNAL CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Disconnect E.C.U. harness connector and ignition switch harness connector.
- 3) Check harness continuity between E.C.U. terminal ③④ and terminal ①.

**Continuity should exist.**

O.K.

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

O.K. INSPECTION END

N.G. Check the following:

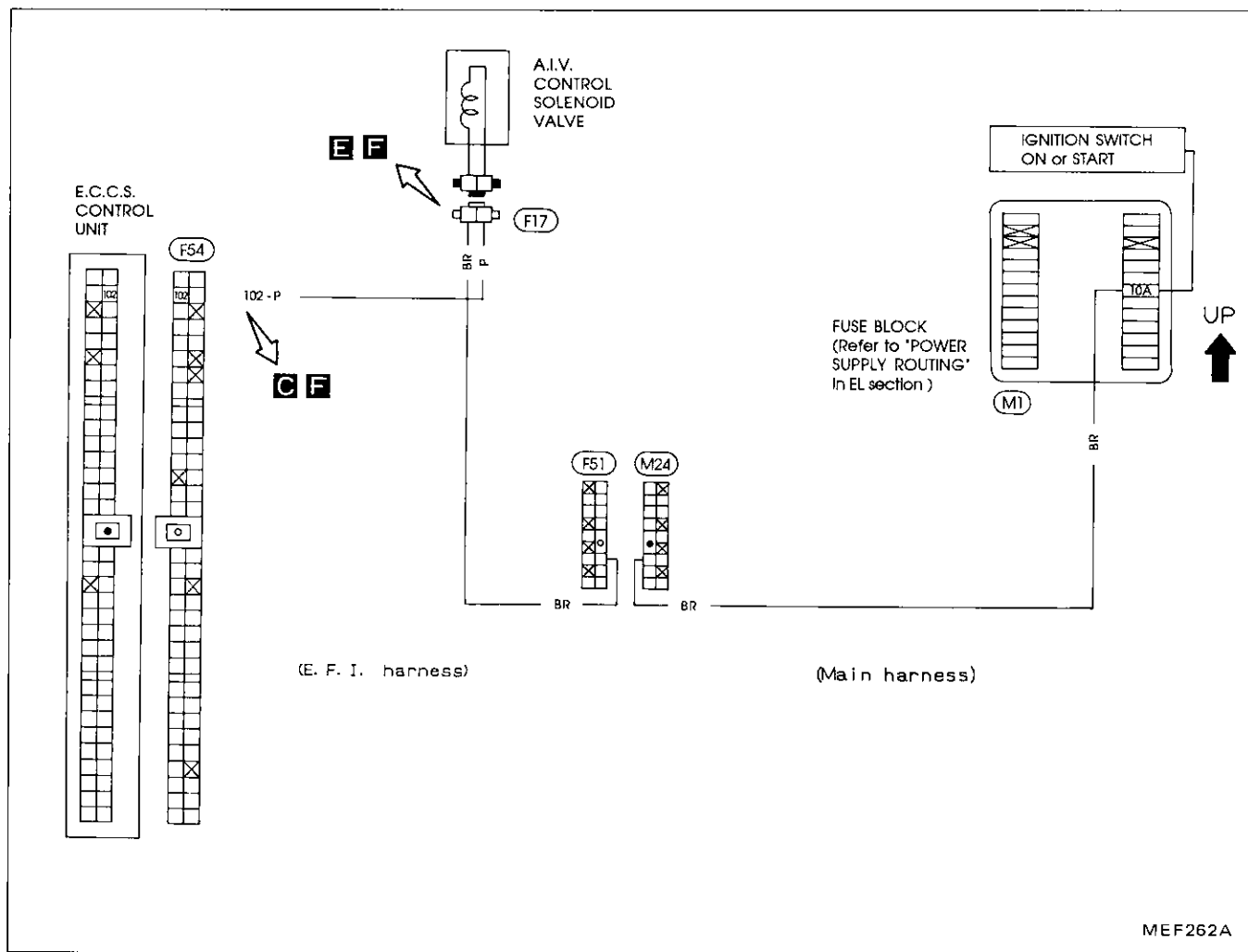
- Harness connectors (F51), (M24)
- S.M.J. connectors (M12), (E101)
- 10A fuse
- Harness continuity between E.C.U. and ignition switch

If N.G., repair harness or connectors.

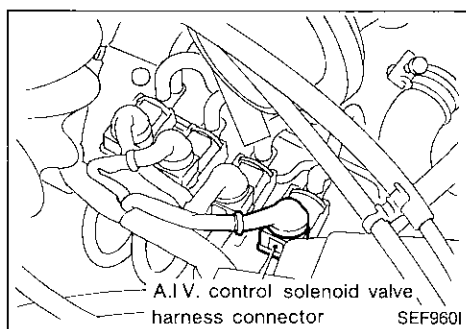
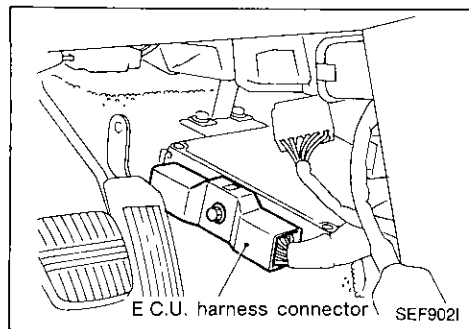
# TROUBLE DIAGNOSES

## Diagnostic Procedure 37

### A.I.V. CONTROL (Not self-diagnostic item)

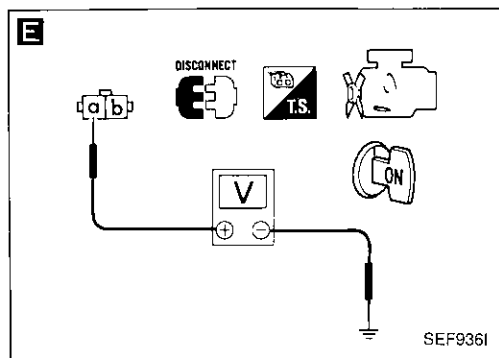
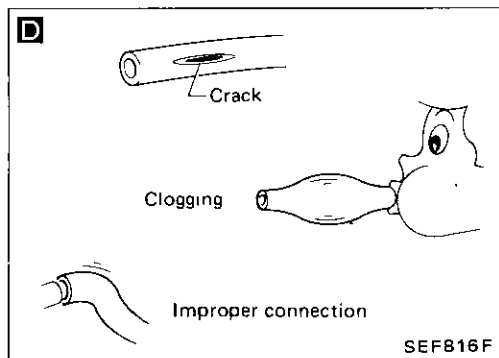
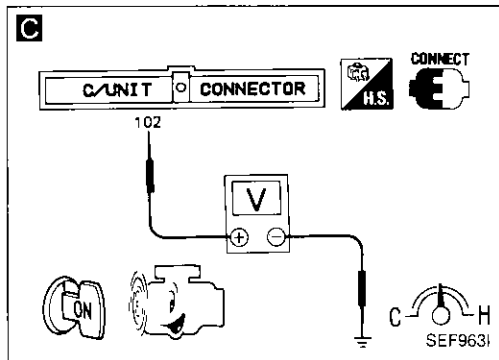
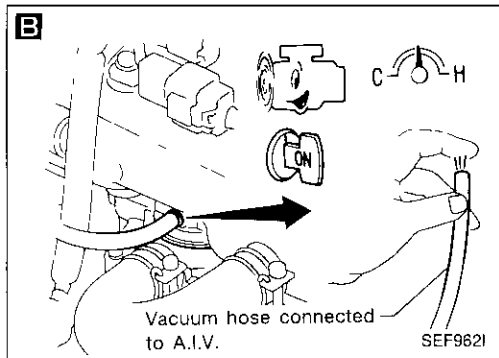
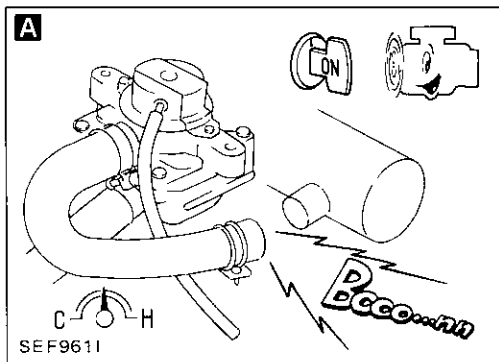


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 37 (Cont'd)



INSPECTION START

**A**

CHECK OVERALL FUNCTION.

- 1) Start engine and warm it up sufficiently.
- 2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
- 3) Release accelerator pedal fully, and run engine at idle.
- 4) Listen to A.I.V. operating sound.

**At idle and deceleration:**

**A.I.V. should operate.**

**Except above:**

**A.I.V. should not operate.**

O.K.

INSPECTION END

N.G.

**B**

CHECK VACUUM SOURCE TO A.I.V.

- 1) Disconnect vacuum hose to A.I.V.
- 2) Make sure that vacuum exists under the following conditions.

**At idle and deceleration:**

**Vacuum should exist.**

**Except above:**

**Vacuum should not exist.**

O.K.

CHECK COMPONENT

(A.I.V. ).

Refer to "Electrical Components Inspection".

(See page EF & EC-192.)

N.G.

**C**

CHECK CONTROL FUNCTION.

- 1) Check voltage between E.C.U. terminal (102) and ground.

**Voltage:**

**At idle and deceleration**

**Approximately 0V**

**Except above**

**Battery voltage**

O.K.

CHECK VACUUM HOSE.

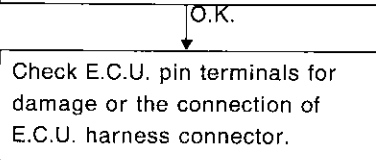
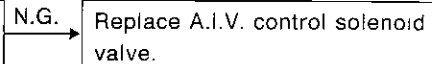
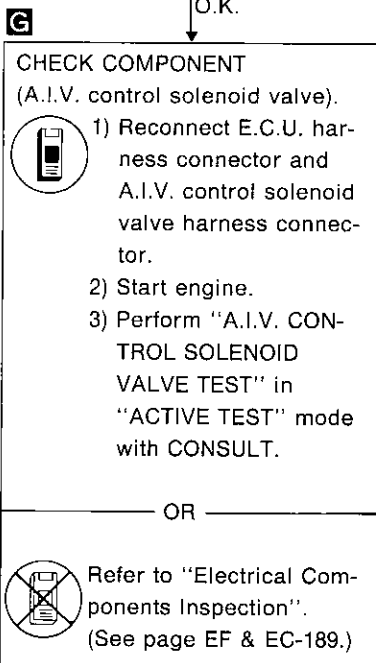
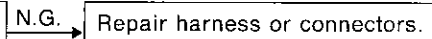
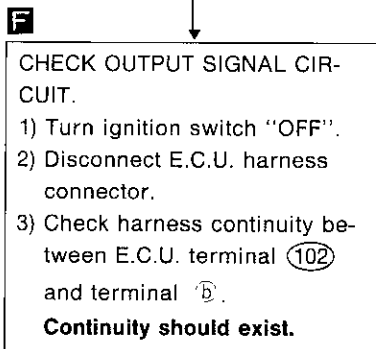
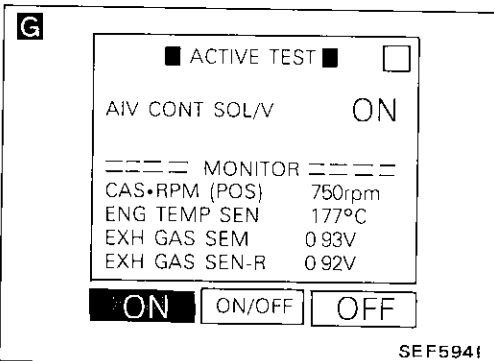
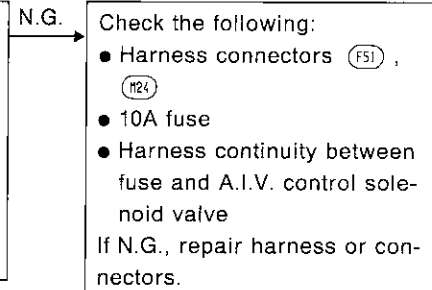
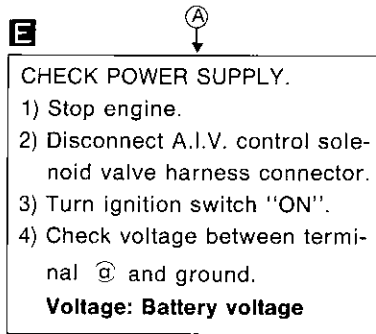
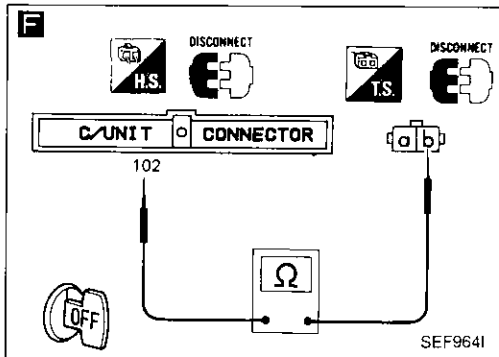
Check vacuum hose for clogging, cracks and proper connections.

N.G.

A

# TROUBLE DIAGNOSES

## Diagnostic Procedure 37 (Cont'd)





## **TROUBLE DIAGNOSES**

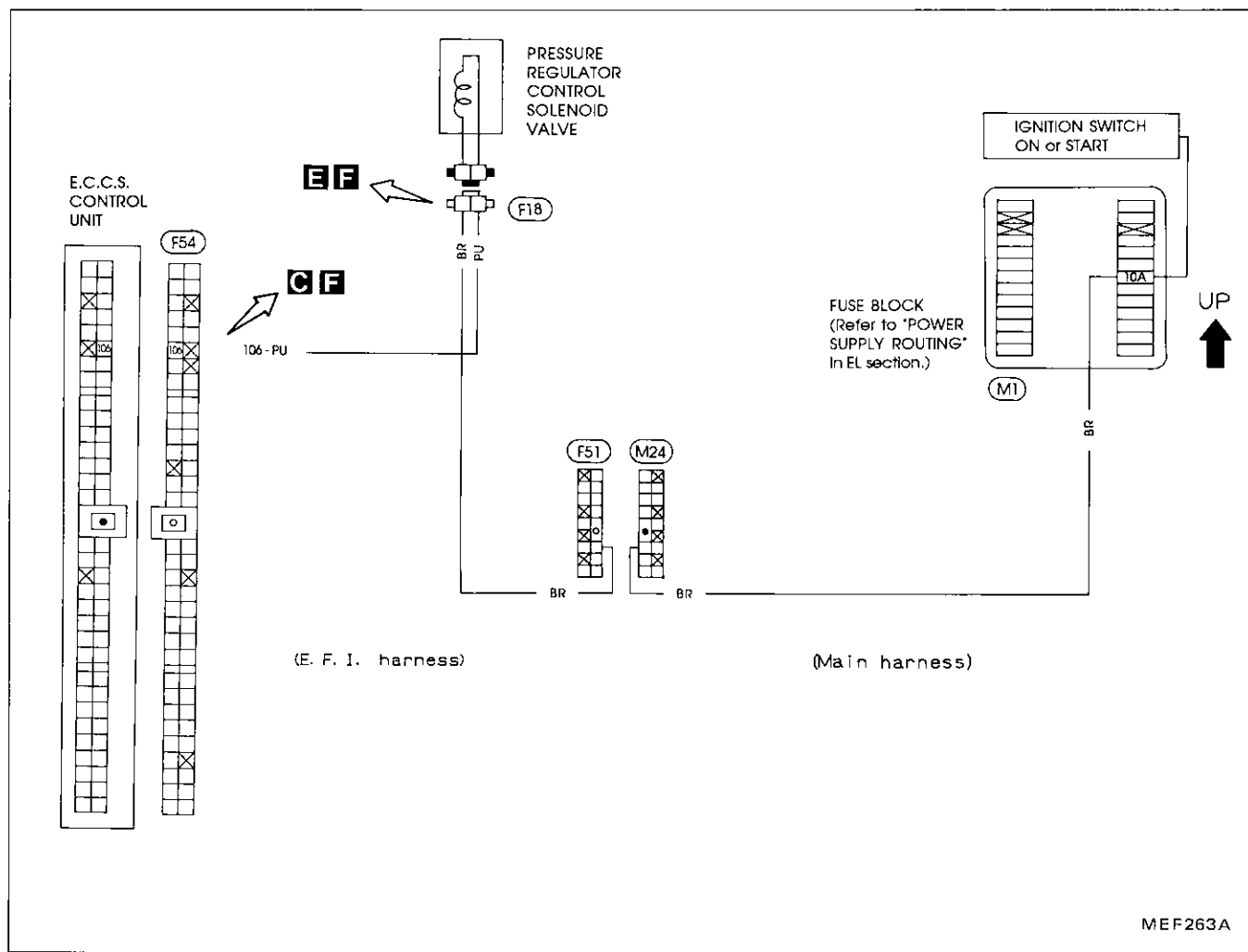
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**NOTE**

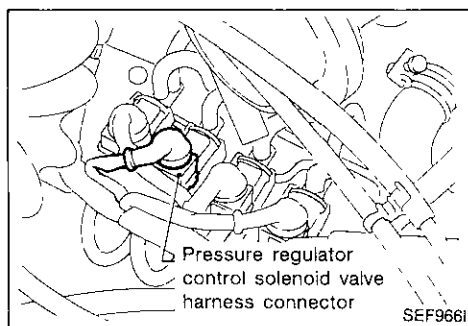
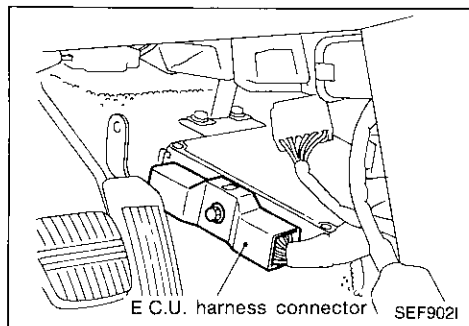
# TROUBLE DIAGNOSES

## Diagnostic Procedure 38

### P.R.V.R. CONTROL (Not self-diagnostic item)

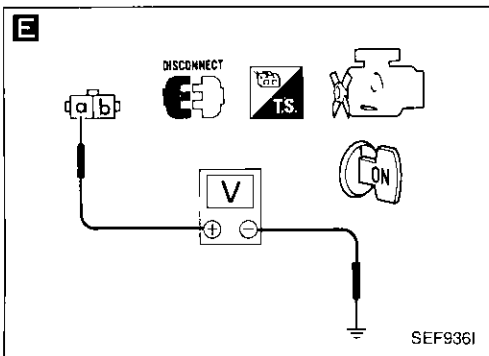
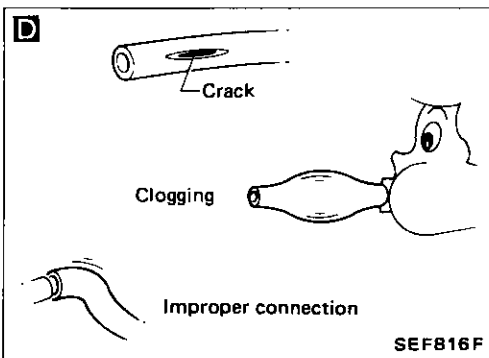
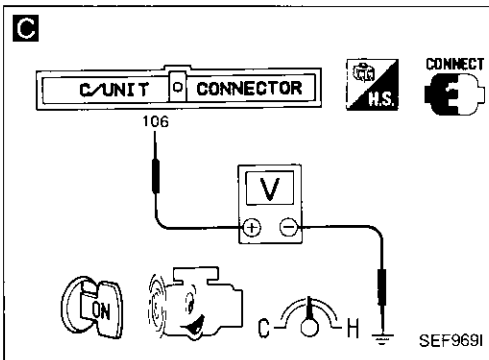
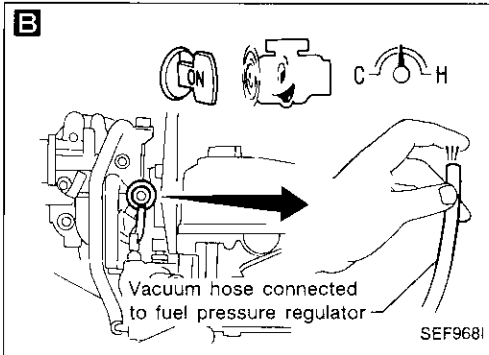
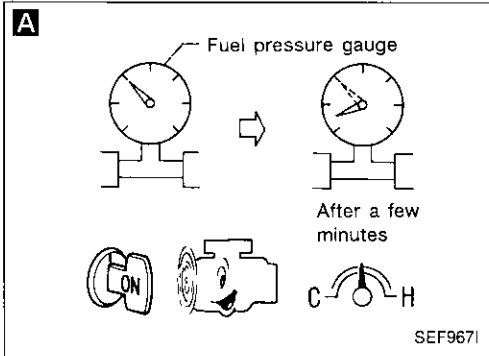


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 38 (Cont'd)



### INSPECTION START

**A**

#### CHECK OVERALL FUNCTION.

- 1) Install fuel pressure gauge in fuel feed hose.  
(See page EF & EC-193.)
- 2) Start engine and warm it up sufficiently. (\*: See NOTE.)
- 3) Stop engine.
- 4) After a few seconds, restart engine and check fuel pressure.

#### Fuel pressure:

**Approximately 294 kPa  
(3.0 kg/cm<sup>2</sup>, 43 psi)**

- 5) Make sure that fuel pressure decreases after a few minutes.

#### Fuel pressure:

**Approximately 226 kPa  
(2.3 kg/cm<sup>2</sup>, 33 psi)**

O.K. → INSPECTION END

**B**

#### CHECK VACUUM SOURCE TO FUEL PRESSURE REGULATOR.

- 1) Stop engine.
- 2) Disconnect vacuum hose connected to fuel pressure regulator.
- 3) Restart engine.
- 4) Make sure that vacuum exists.

O.K. → CHECK COMPONENT  
(Fuel pressure regulator).  
Refer to "Fuel Pressure Check".  
(See page EF & EC-193.)

**C**

#### CHECK CONTROL FUNCTION.

- 1) Stop engine and reconnect vacuum hose to fuel pressure regulator.
- 2) Restart engine.
- 3) Check voltage between E.C.U. terminal 106 and ground.
- 4) In 3 minutes, recheck voltage between E.C.U. terminal 106 and ground.

**Voltage: Approximately 0V**

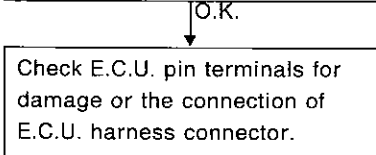
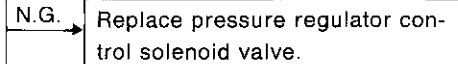
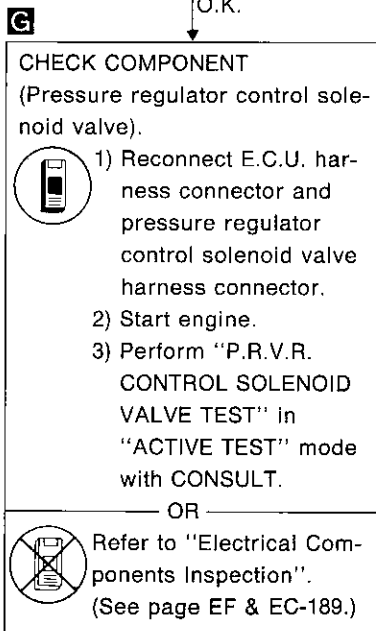
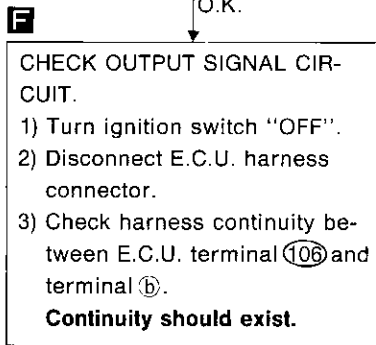
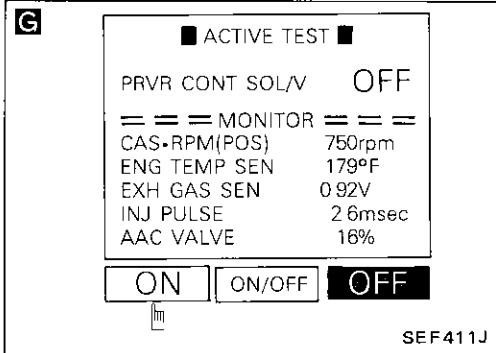
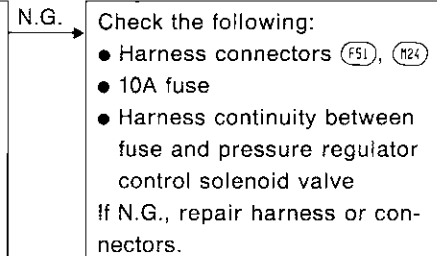
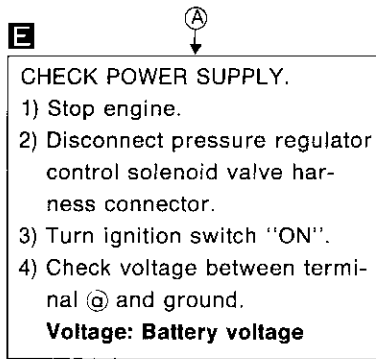
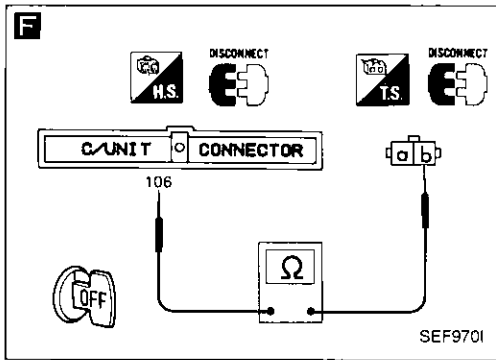
**Voltage: Battery voltage**

O.K. → CHECK VACUUM HOSE.  
1) Check vacuum hose for clogging, cracks and proper connections.

N.G. → A

# TROUBLE DIAGNOSES

## Diagnostic Procedure 38 (Cont'd)



## TROUBLE DIAGNOSES

### Diagnostic Procedure 38 (Cont'd)

#### \*NOTE

If engine cannot be warmed up sufficiently for some reason (Extreme cold, etc.), disconnect engine temperature sensor harness connector, and connect a resistor (0.1 k $\Omega$ ) to engine temperature sensor harness connector.

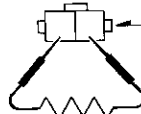


DISCONNECT



1) Do not perform this test for a long time.

2) Perform self-diagnosis after this test. If code No. 13 is displayed, erase it.



Engine temperature sensor  
harness connector

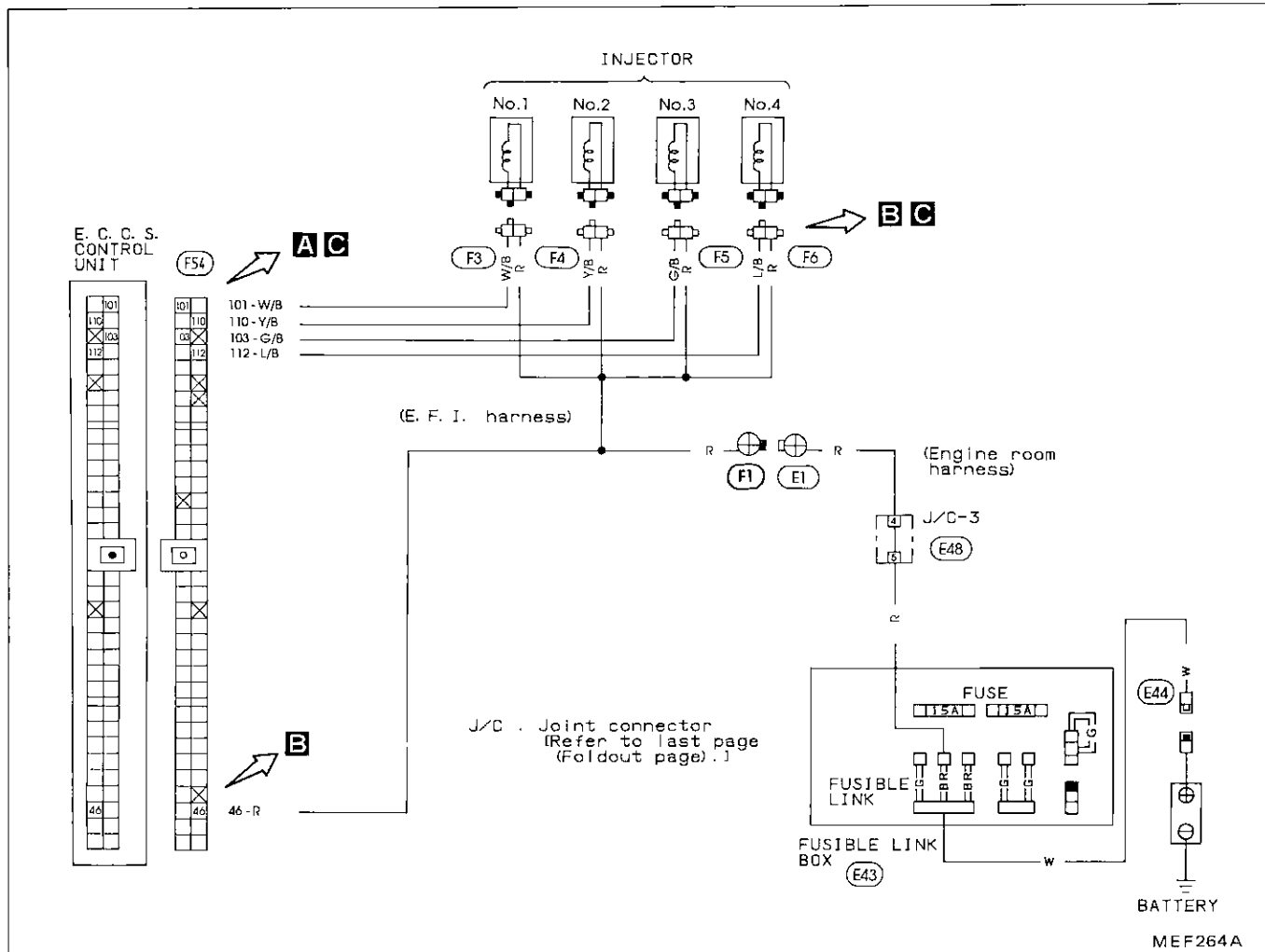
0.1 k $\Omega$

SEF9711

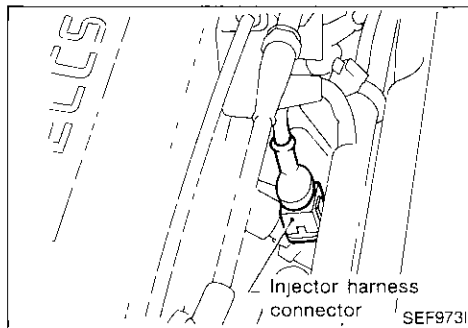
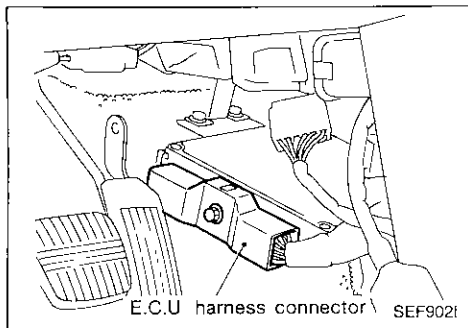
# TROUBLE DIAGNOSES

## Diagnostic Procedure 39

### INJECTOR (Not self-diagnostic item)

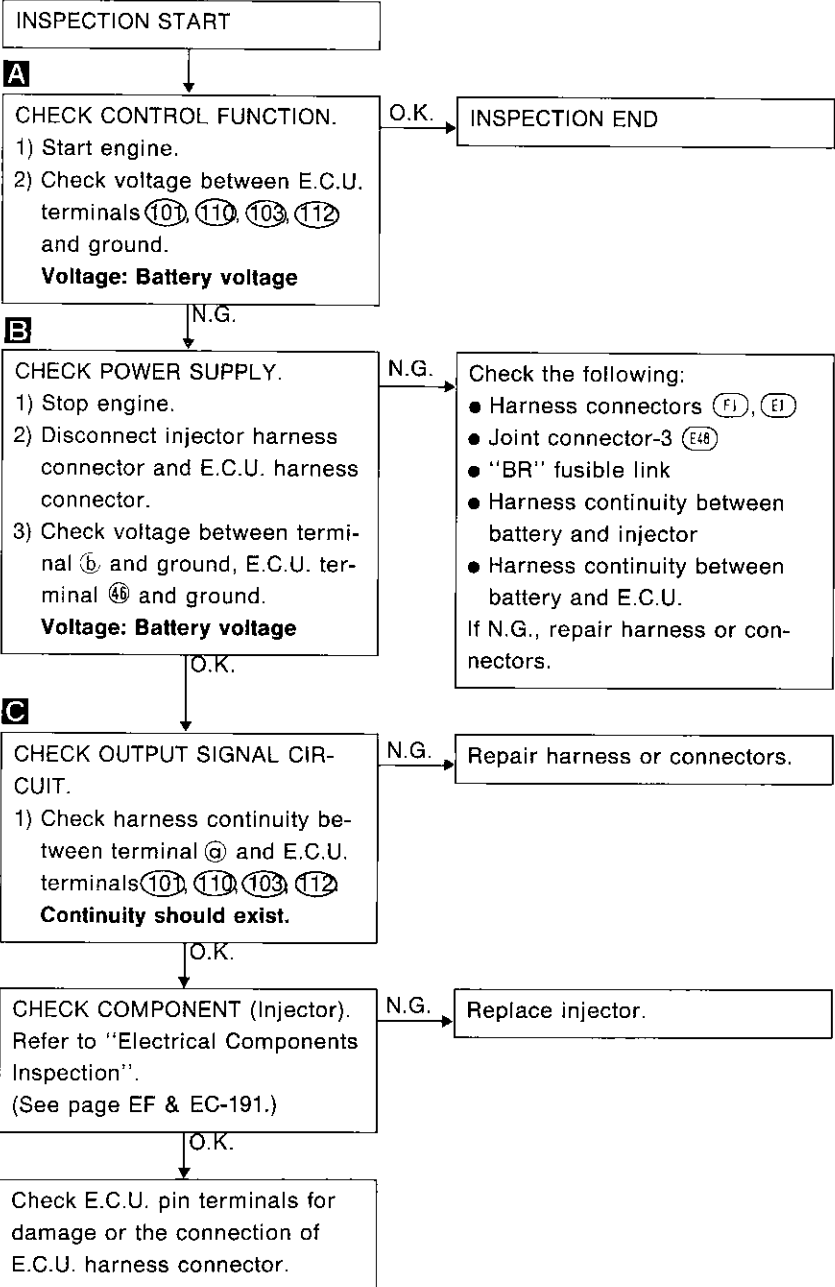
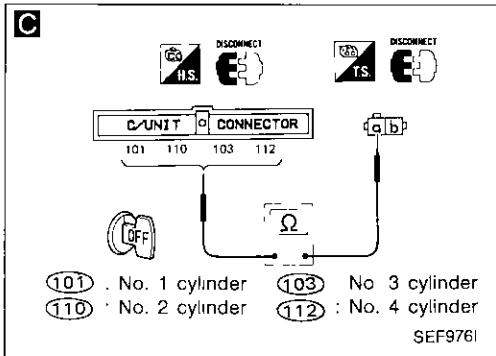
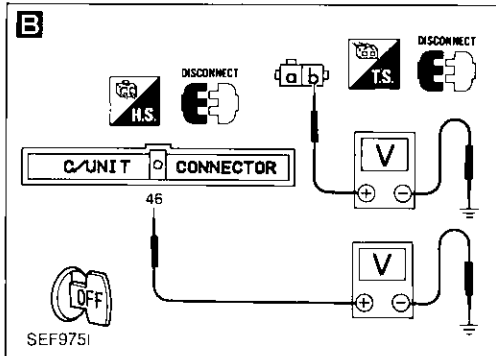
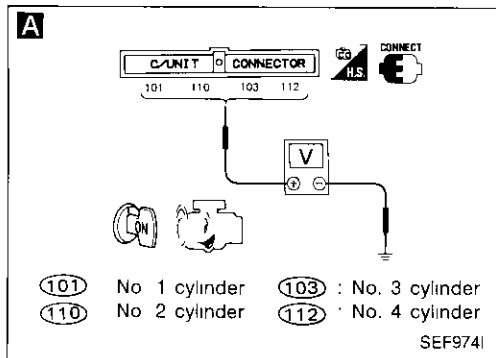


### Harness layout



# TROUBLE DIAGNOSES

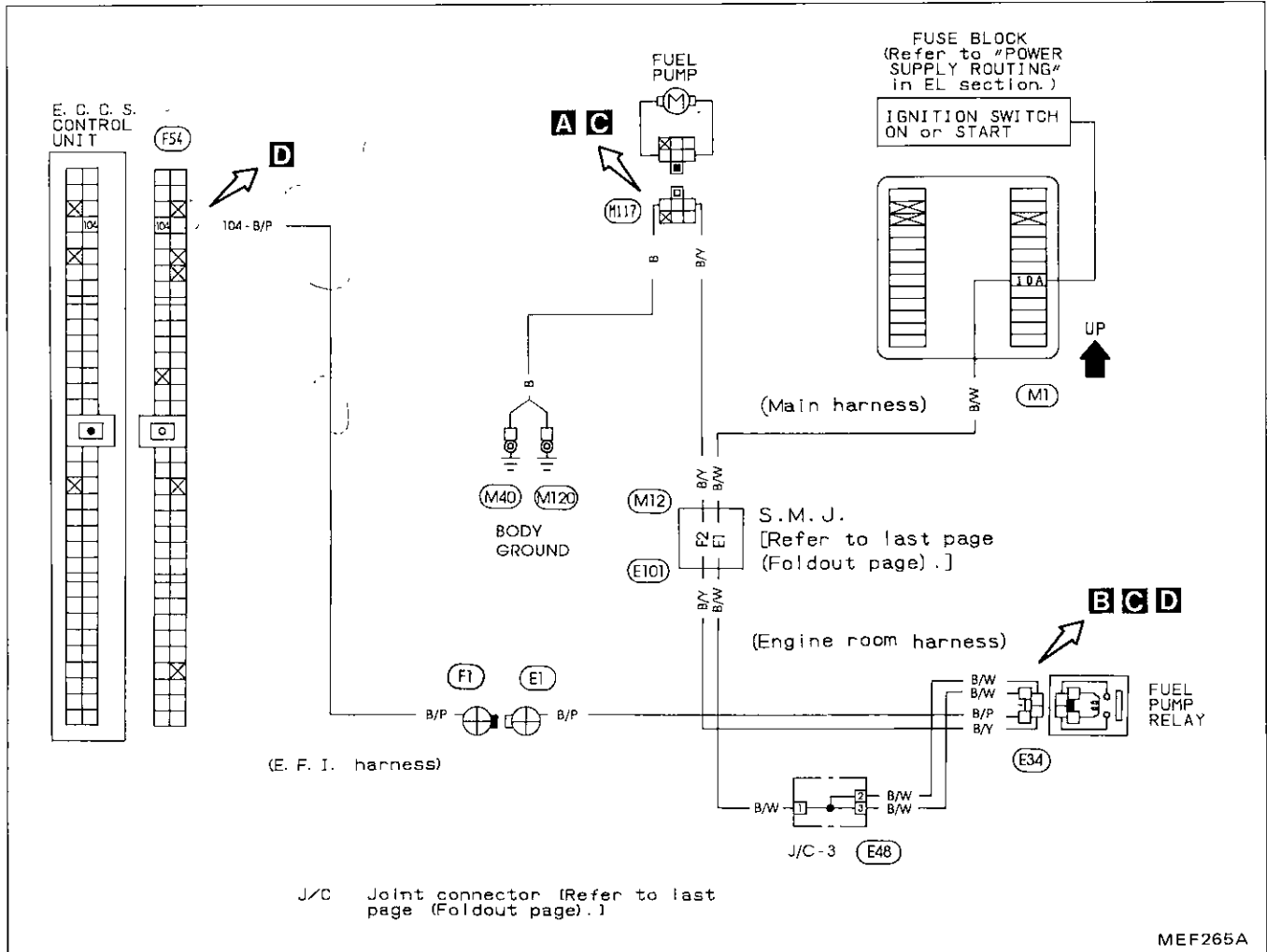
## Diagnostic Procedure 39 (Cont'd)



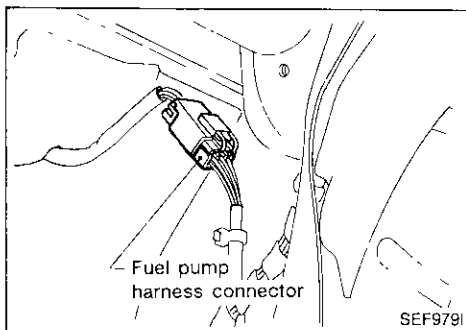
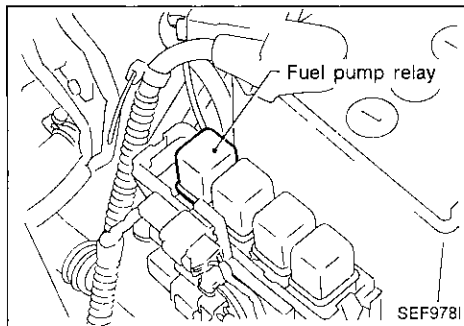
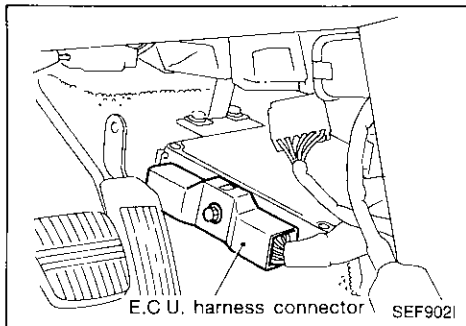
# TROUBLE DIAGNOSES

## Diagnostic Procedure 40

### FUEL PUMP (Not self-diagnostic item)



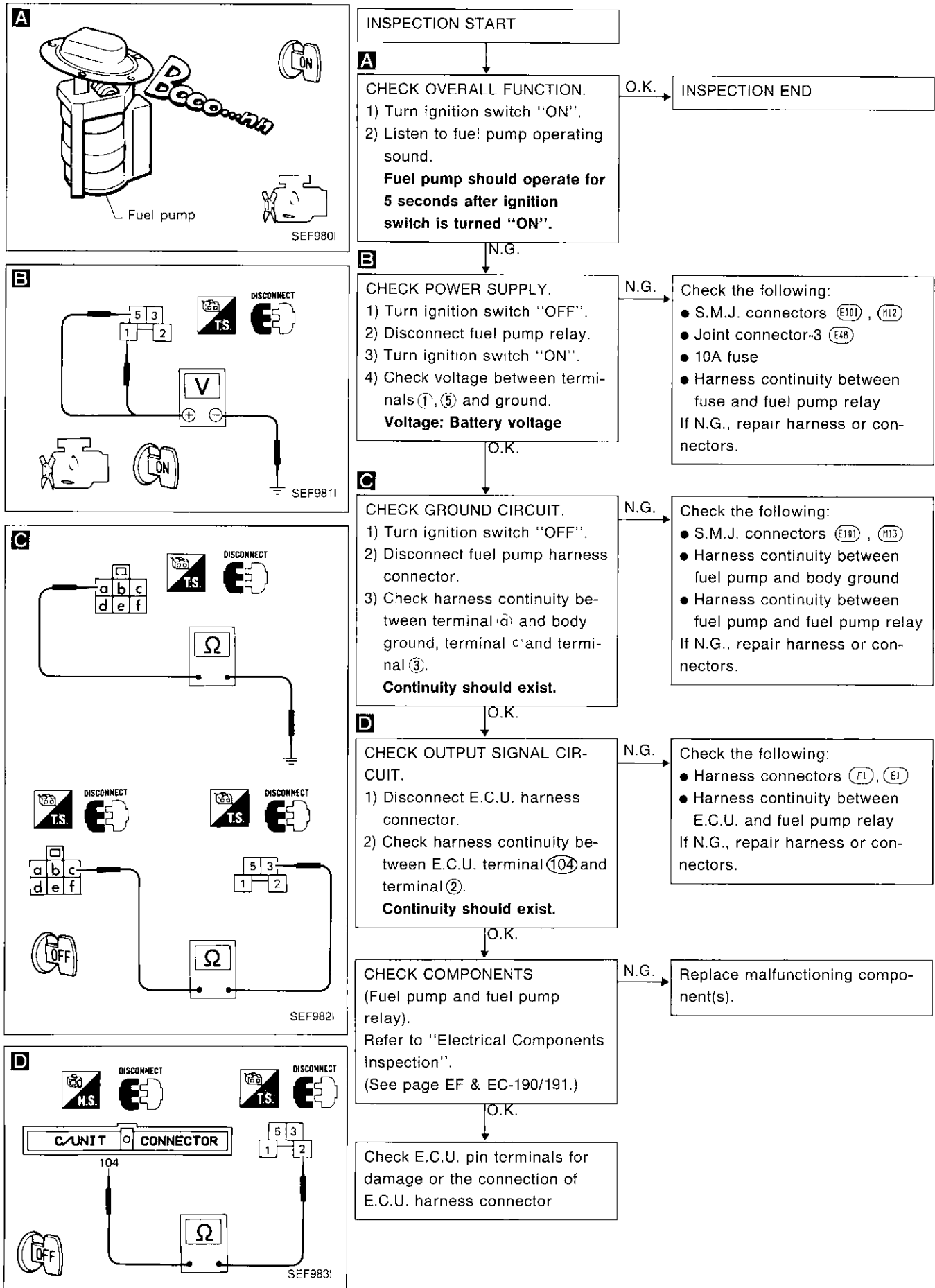
### Harness layout





# TROUBLE DIAGNOSES

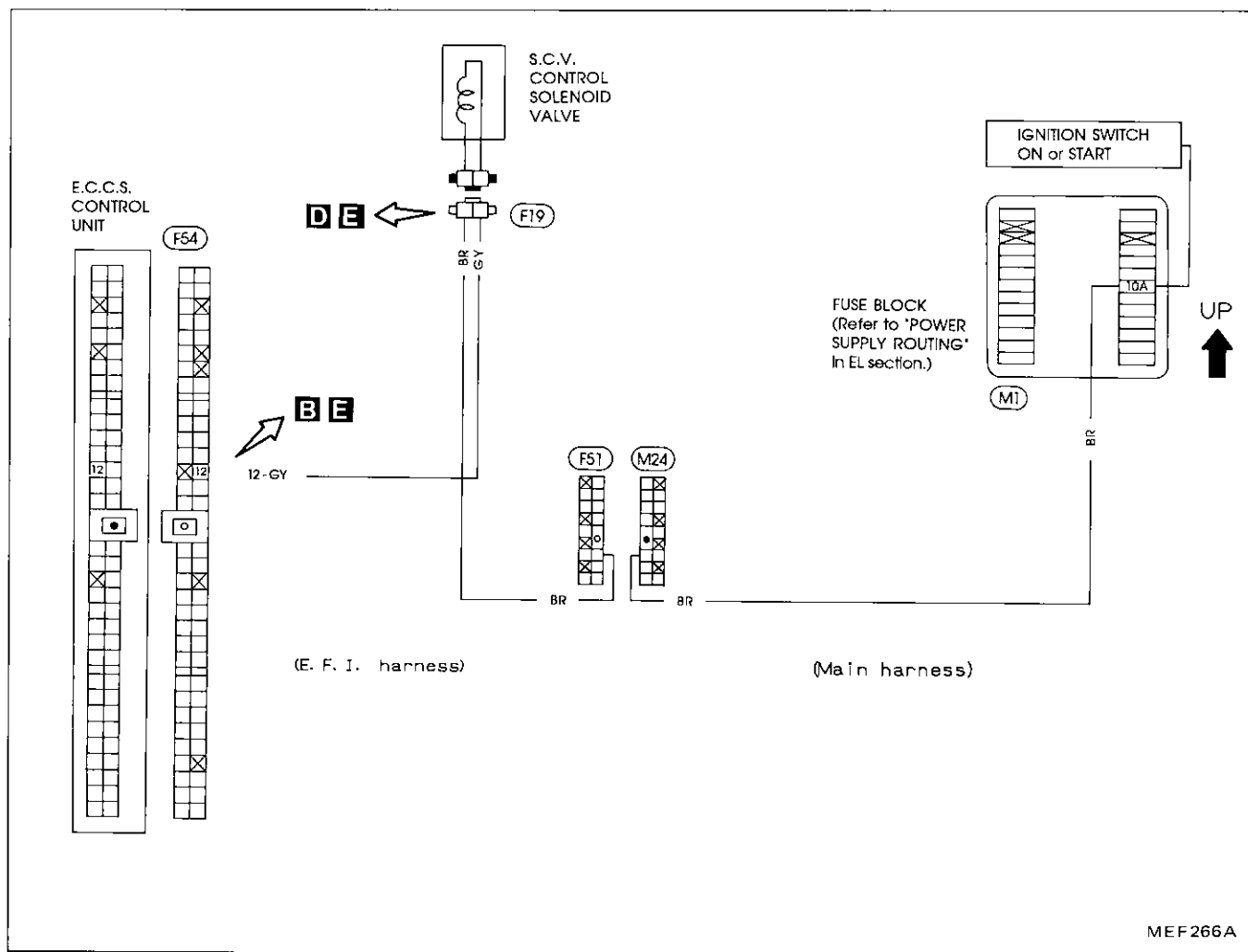
## Diagnostic Procedure 40 (Cont'd)



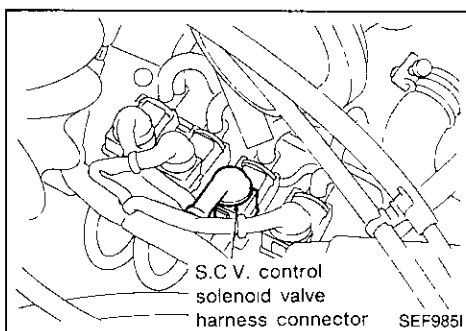
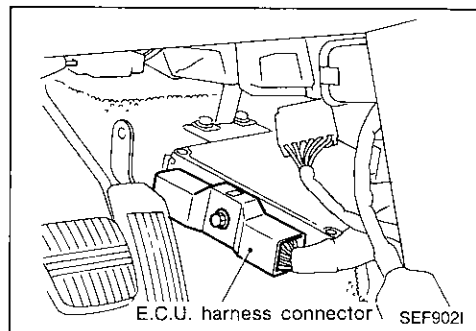
# TROUBLE DIAGNOSES

## Diagnostic Procedure 41

### S.C.V. CONTROL (Not self-diagnostic item)

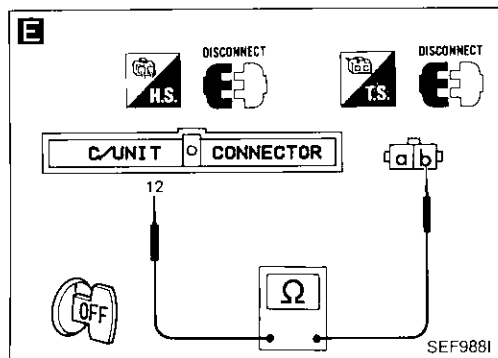
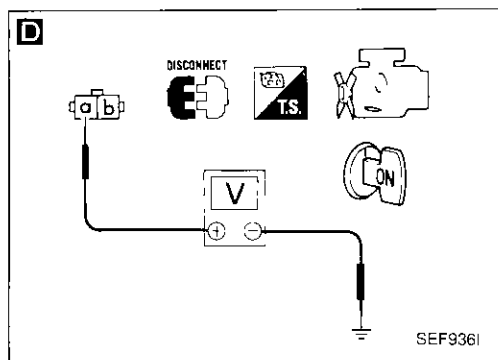
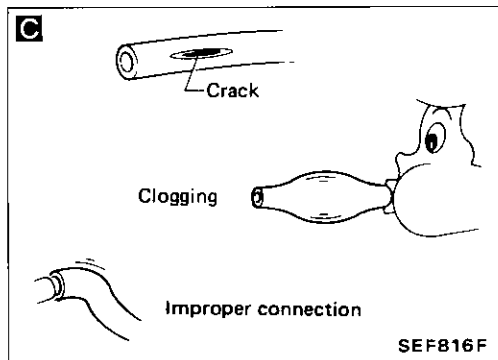
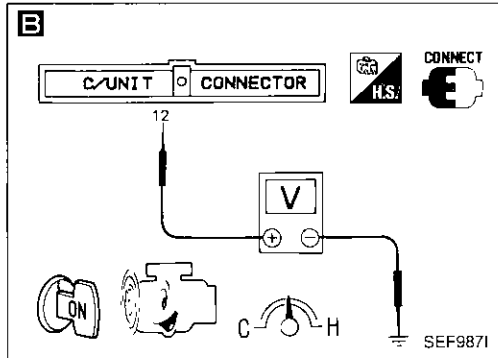
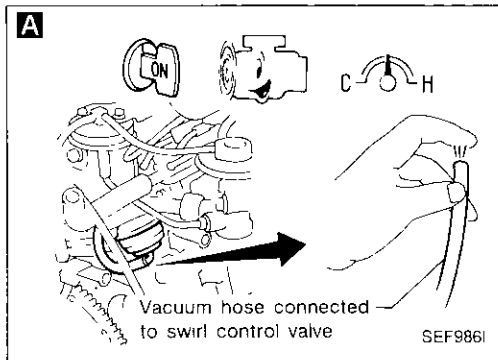


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 41 (Cont'd)



### INSPECTION START

**A**

#### CHECK VACUUM SOURCE TO SWIRL CONTROL VALVE.

- 1) Start engine and warm it up sufficiently.
- 2) Stop engine.
- 3) After a few seconds, disconnect vacuum hose to swirl control valve and restart engine.
- 4) Make sure that vacuum exists under the following conditions.

**Engine speed is less than 1,800 rpm (M/T) or 1,500 rpm (A/T):**

**Vacuum should exist.**

**Engine speed is more than 1,800 rpm (M/T) or 1,500 rpm (A/T)**

**Vacuum should not exist.**

O.K.

INSPECTION END

N.G.

**B**

#### CHECK CONTROL FUNCTION.

- 1) Check voltage between E.C.U. terminal 12 and ground.

**Voltage:**

**Engine speed is less than 1,800 rpm (M/T) or 1,500 rpm (A/T):**

**Approximately 0V**

**Engine speed is more than 1,800 rpm (M/T) or 1,500 rpm (A/T)**

**Battery voltage**

O.K.

#### CHECK VACUUM HOSE AND SWIRL CONTROL VALVE.

- 1) Check vacuum hose and swirl control valve for clogging, cracks and proper connection.

N.G.

**D**

#### CHECK POWER SUPPLY.

- 1) Stop engine.
- 2) Disconnect S.C.V. control solenoid valve harness connector.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal a) and ground.

**Voltage: Battery voltage**

N.G.

Check the following:

- Harness connectors (F51), (M24)
- 10A fuse
- Harness continuity between fuse and S.C.V. control solenoid valve

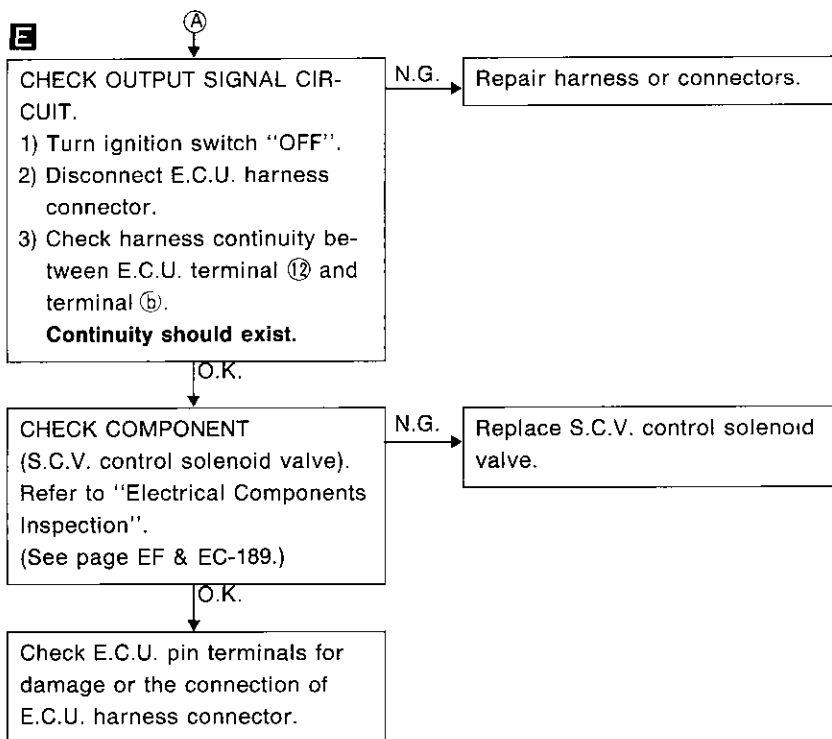
If N.G., repair harness or connectors.

O.K.

Ⓐ

## TROUBLE DIAGNOSES

### Diagnostic Procedure 41 (Cont'd)



## **TROUBLE DIAGNOSES**

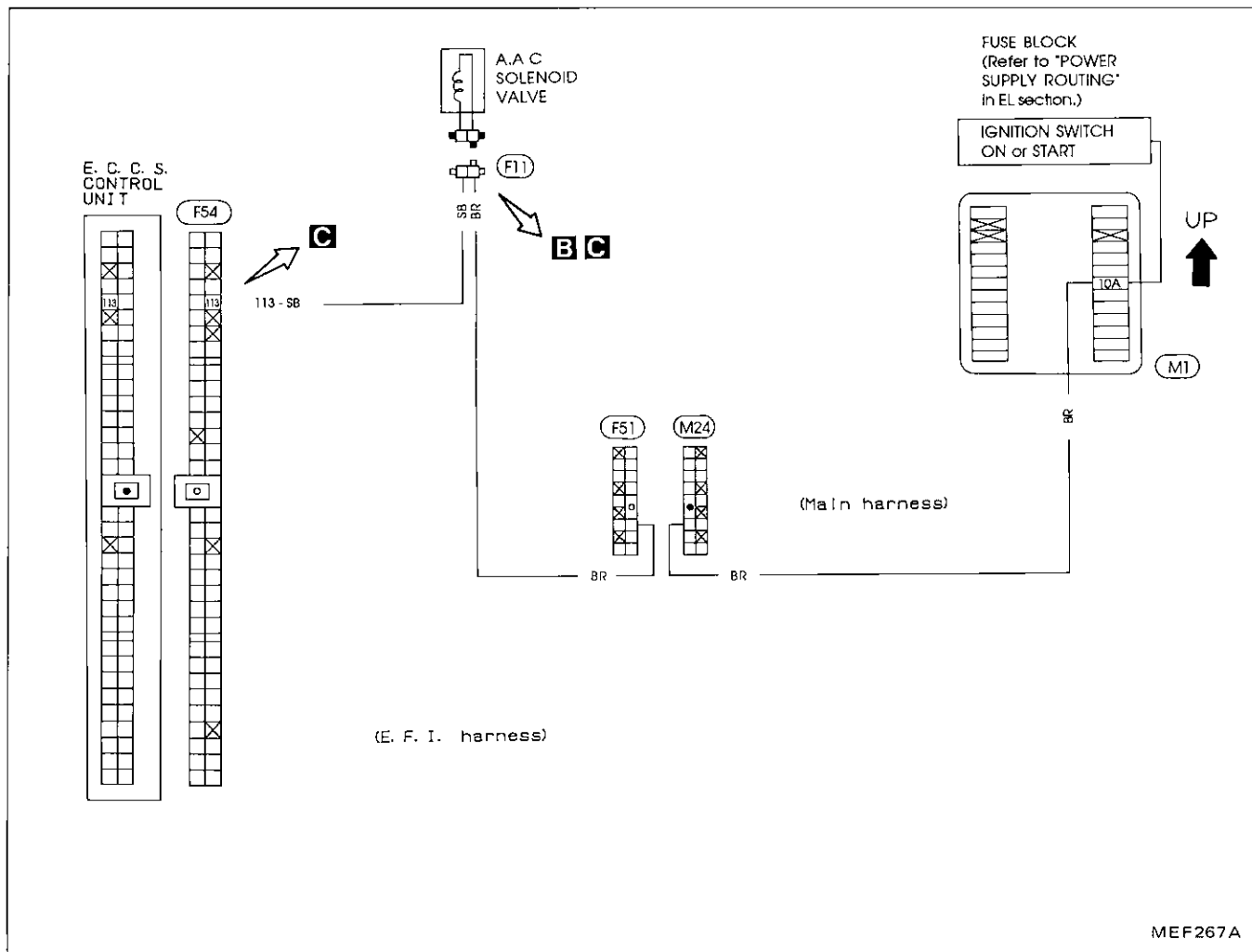
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**NOTE**

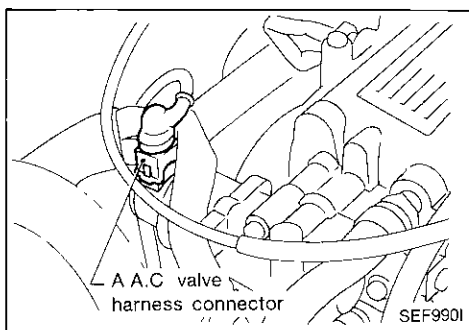
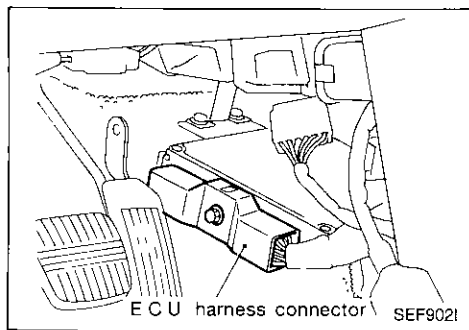
# TROUBLE DIAGNOSES

## Diagnostic Procedure 42

### A.A.C. VALVE (Not self-diagnostic item)

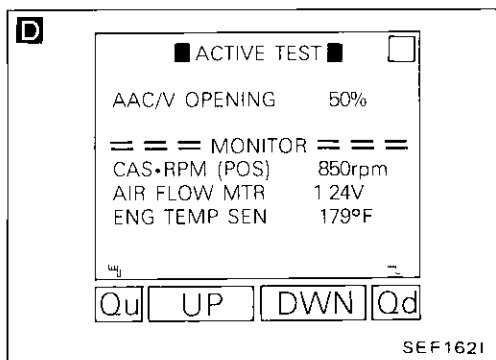
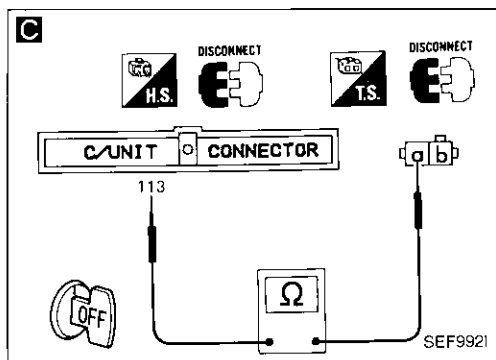
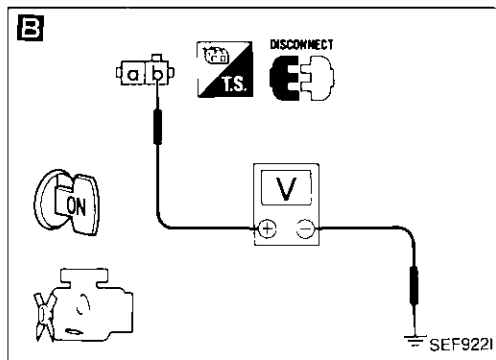
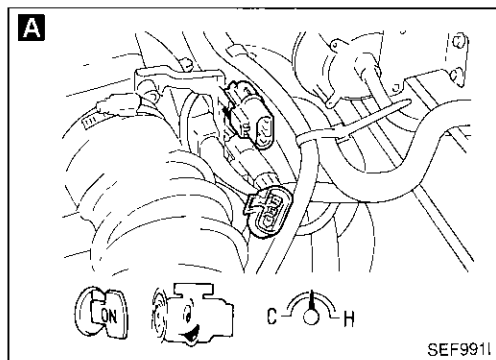


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 42 (Cont'd)



INSPECTION START

**A**

CHECK OVERALL FUNCTION.

1) Start engine and warm it up sufficiently.

2) Check idle speed.

**M/T: 700 ± 50 rpm\*1**

**750 ± 50 rpm\*2**

**A/T: 700 ± 50 rpm\*1**

**750 ± 50 rpm \*2**

**\*1 U.S.A.**

**\*2 Canada**

If N.G., adjust idle speed.

3) Disconnect throttle sensor harness connector.

4) Make sure that idle speed drops.

Drops

INSPECTION END

Does not drop.

CHECK COMPONENT

(Throttle sensor).

Refer to "Electrical Components Inspection".

(See page EF & EC-190.)

N.G.

Replace throttle sensor.

O.K.

**B**

CHECK POWER SUPPLY.

1) Stop engine.

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

3) Turn ignition switch "ON".

4) Check voltage between terminal ① and ground.

**Voltage: Battery voltage**

N.G.

Check the following:

- Harness connectors (F51), (H24)
  - 10A fuse
  - Harness continuity between A.A.C. valve and fuse
- If N.G., repair harness or connectors.

O.K.

**C**

CHECK OUTPUT SIGNAL CIRCUIT.

1) Turn ignition switch "OFF".

2) Disconnect E.C.U. harness connector.

3) Check harness continuity between E.C.U. terminal ⑪ and terminal ②.

**Continuity should exist.**

N.G.

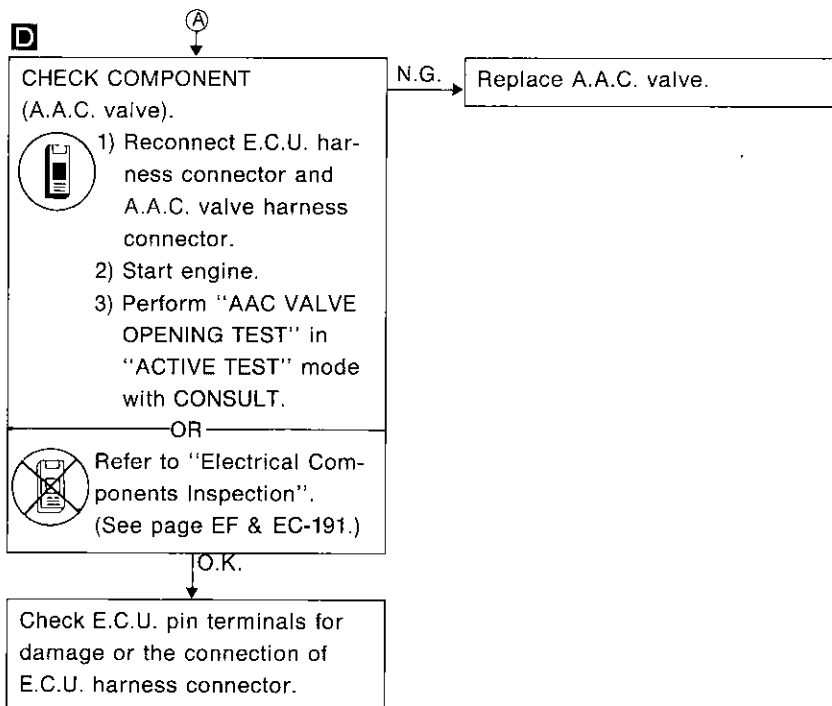
Repair harness or connectors.

O.K.

Ⓐ

## TROUBLE DIAGNOSES

### Diagnostic Procedure 42 (Cont'd)





## **TROUBLE DIAGNOSES**

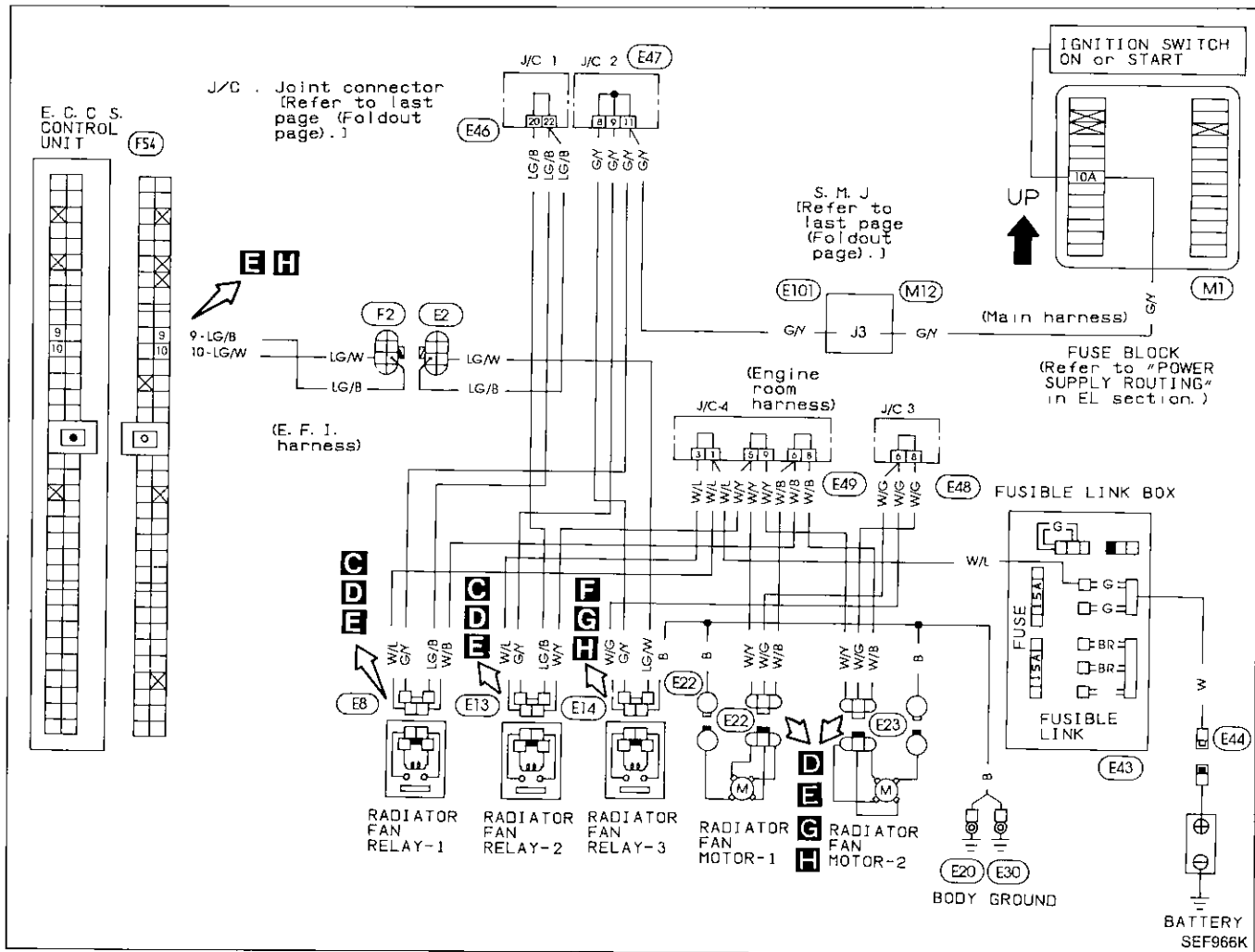
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**NOTE**

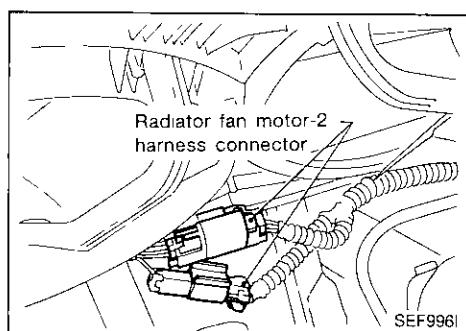
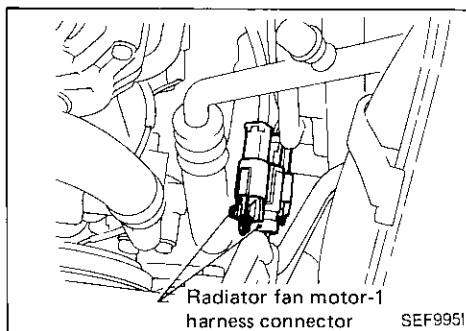
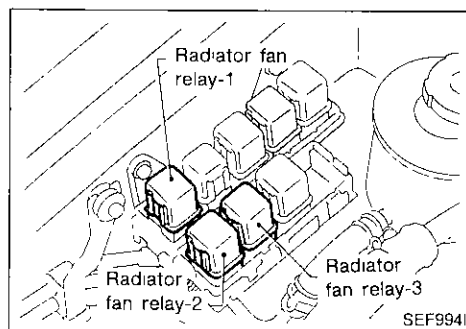
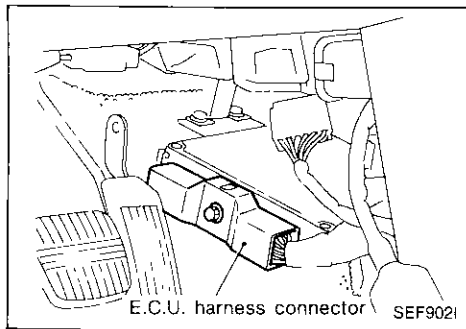
# TROUBLE DIAGNOSES

## Diagnostic Procedure 43

### RADIATOR FAN CONTROL (Not self-diagnostic item)

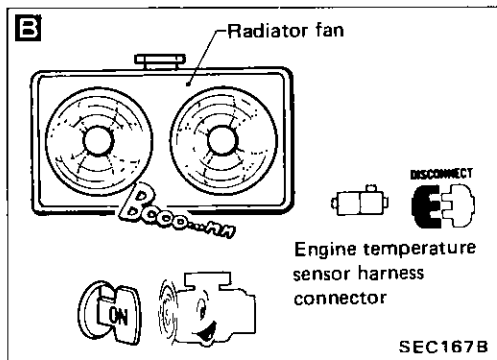
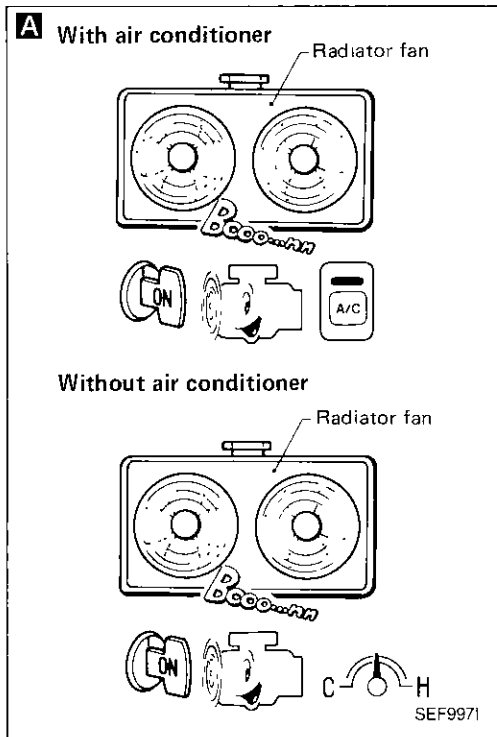


### Harness layout



# TROUBLE DIAGNOSES

## Diagnostic Procedure 43 (Cont'd)



INSPECTION START

**A**

CHECK RADIATOR FAN LOW SPEED OPERATION.

With air conditioner

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

Without air conditioner

- 1) Start engine.
- 2) Keep engine speed at about 2,000 rpm until engine is warmed up sufficiently.
- 3) Make sure that radiator fan begins to operate at low speed during warm-up.

N.G.

Check radiator fan low speed control circuit.

(Go to PROCEDURE A.)

O.K.

**B**

CHECK RADIATOR FAN HIGH SPEED OPERATION.

- 1) Turn air conditioner switch "OFF".
  - 2) Turn blower fan switch "OFF".
- (Step 1) and 2) are only performed for model with air conditioner.)
- 3) Stop engine.
  - 4) Disconnect engine temperature sensor harness connector.
  - 5) Restart engine and make sure that radiator fan operates at high speed.

N.G.

Check radiator fan high speed control circuit.

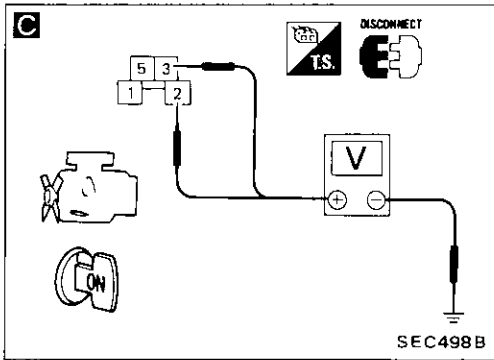
(Go to PROCEDURE B.)

O.K.

INSPECTION END

# TROUBLE DIAGNOSES

## Diagnostic Procedure 43 (Cont'd)



### PROCEDURE A

#### INSPECTION START

**C**

#### CHECK POWER SUPPLY.

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

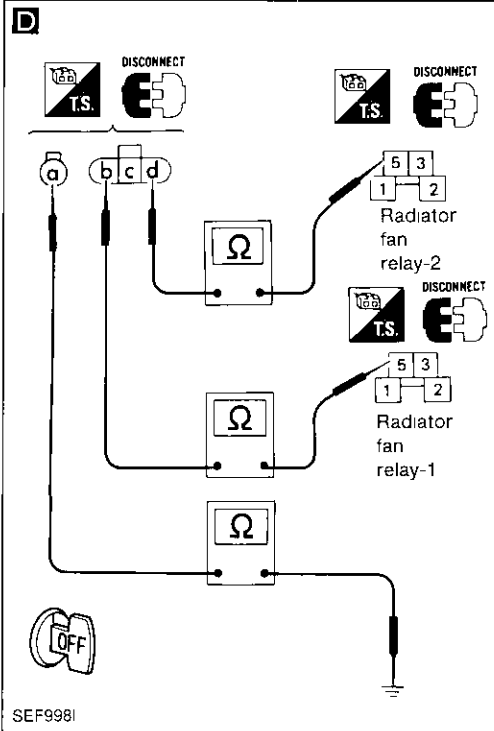
**Voltage: Battery voltage**

N.G.

#### Check the following:

- Joint connector-2 (E47), -4 (E49)
  - S.M.J. connectors (E101), (M12)
  - "G" fusible link
  - 10A fuse
  - Harness continuity between battery and radiator fan relay-1, -2
  - Harness continuity between fuse and radiator fan relay-1, -2
- If N.G., repair harness or connectors.

O.K.



**D**

#### CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
- 3) Check harness continuity between terminal ⑥ and terminal ⑤ (radiator fan relay-1), terminal ④ and terminal ⑤ (radiator fan relay-2), terminal ⑥ and body ground.

**Continuity should exist.**

N.G.

#### Check the following:

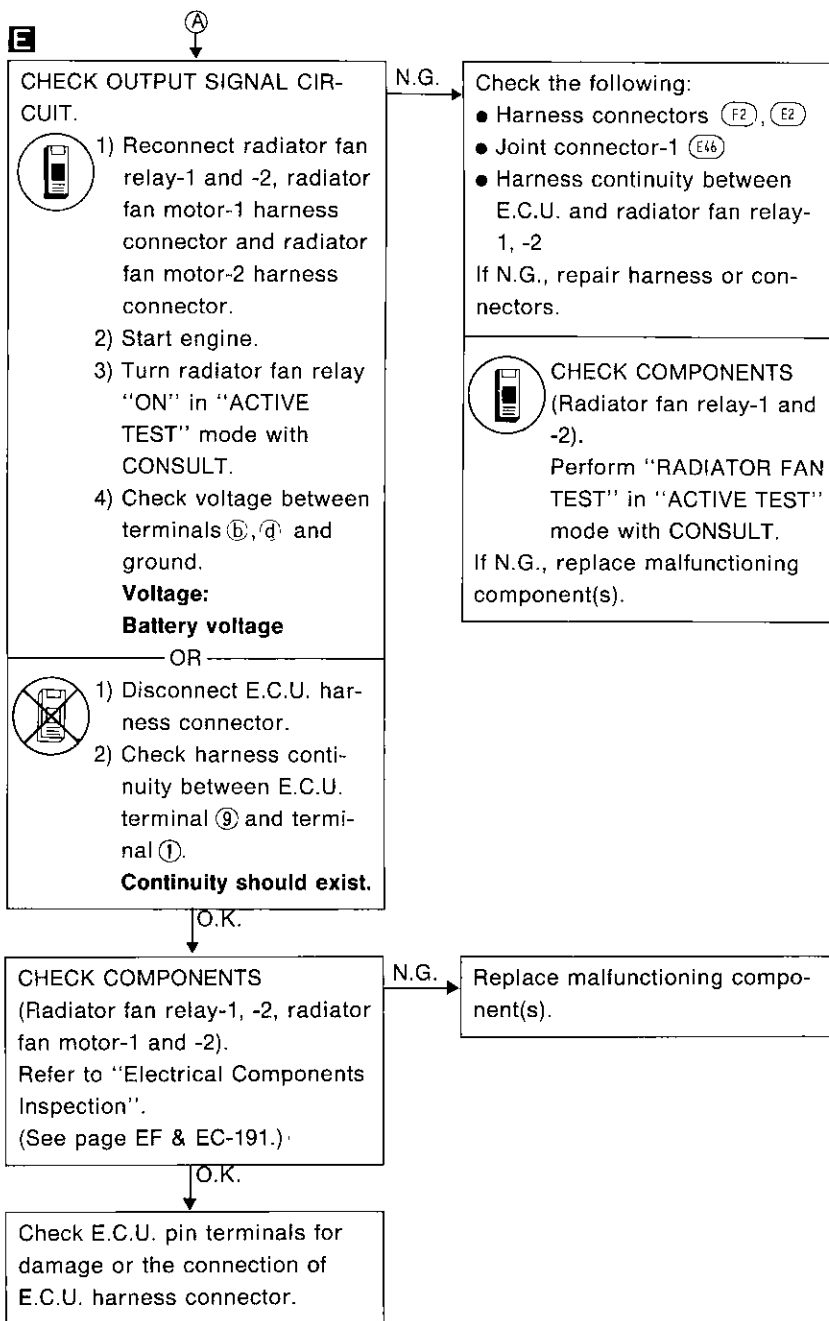
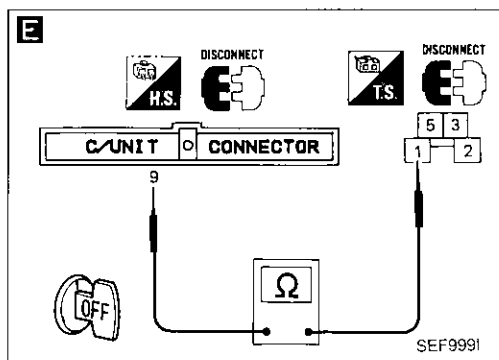
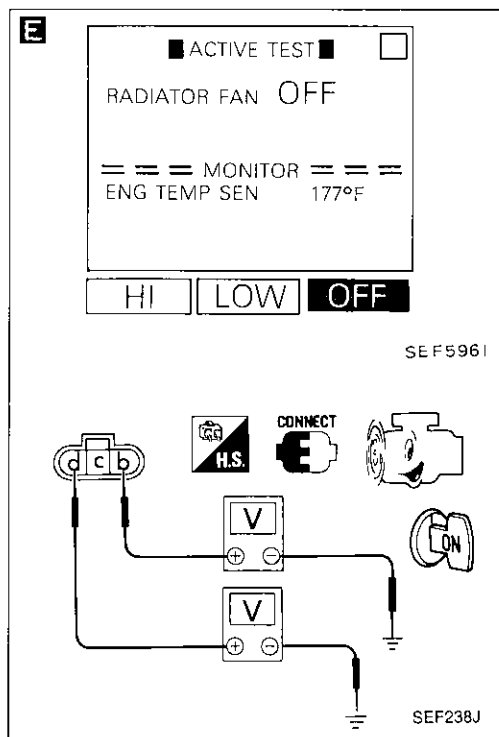
- Joint connector-4 (E49)
  - Harness continuity between radiator fan relay-1 and radiator fan motor-1, -2
  - Harness continuity between radiator fan relay-2 and radiator fan motor-1, -2
  - Harness continuity between radiator fan motor-1, -2 and body ground
- If N.G., repair harness or connectors.

O.K.

Ⓐ

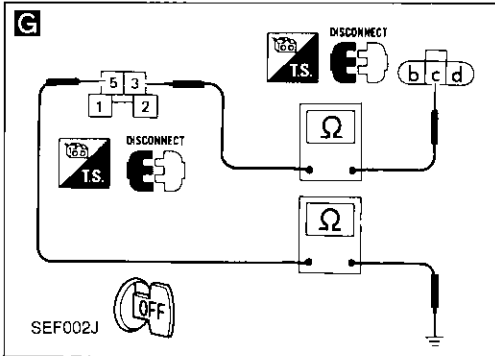
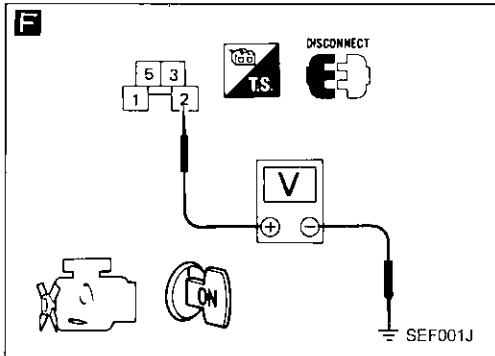
# TROUBLE DIAGNOSES

## Diagnostic Procedure 43 (Cont'd)



# TROUBLE DIAGNOSES

## Diagnostic Procedure 43 (Cont'd)



### PROCEDURE B

#### INSPECTION START

**F**

#### CHECK POWER SUPPLY.

- 1) Stop engine.
- 2) Disconnect radiator fan relay-3.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal ② and ground.

**Voltage: Battery voltage**

N.G.

#### Check the following:

- Joint connector-2 (E47)
  - S.M.J. connectors (E101), (M12)
  - 10A fuse
  - Harness continuity between fuse and radiator fan relay-3
- If N.G., repair harness or connectors.

O.K.

**G**

#### CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
- 3) Check harness continuity between terminal ② and terminal ③, terminal ⑤ and body ground.

**Continuity should exist.**

N.G.

#### Check the following:

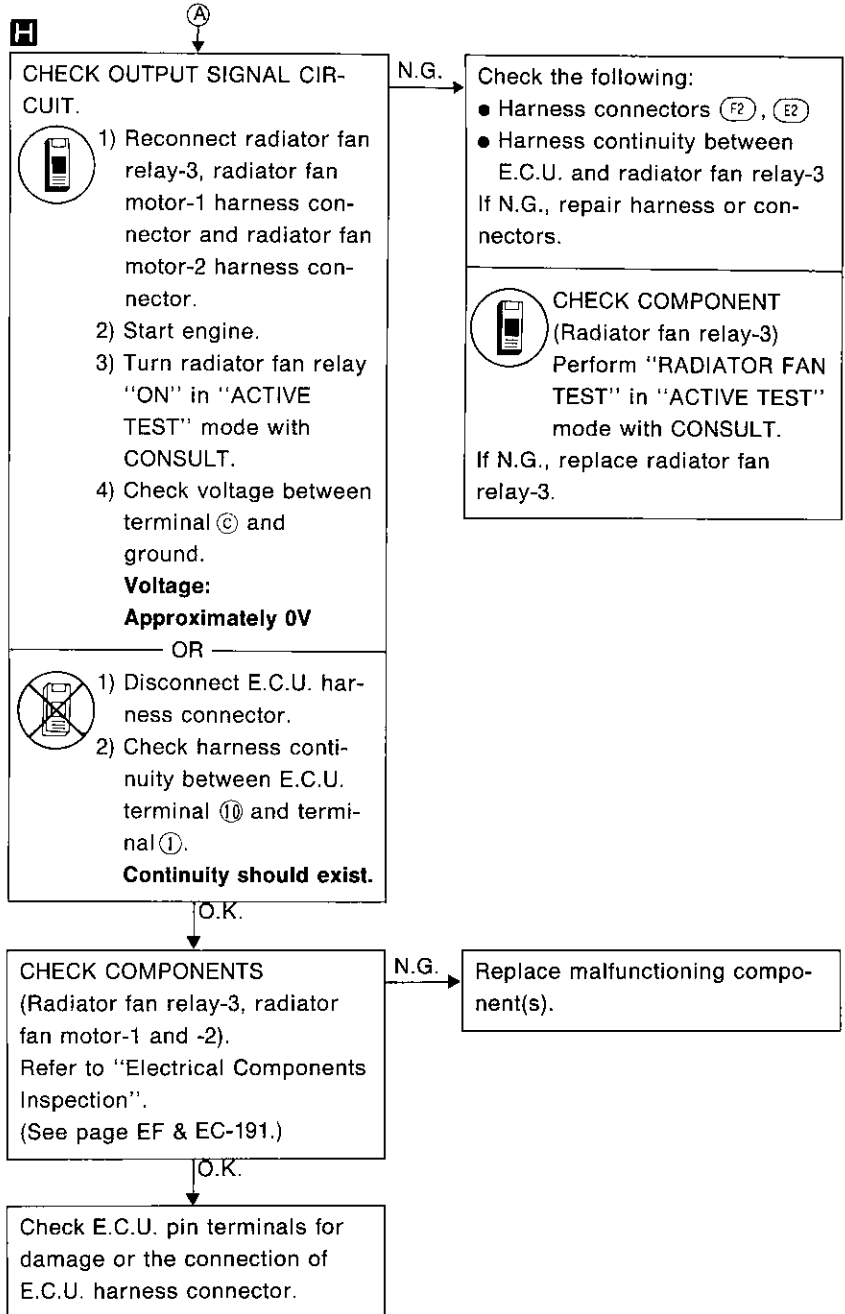
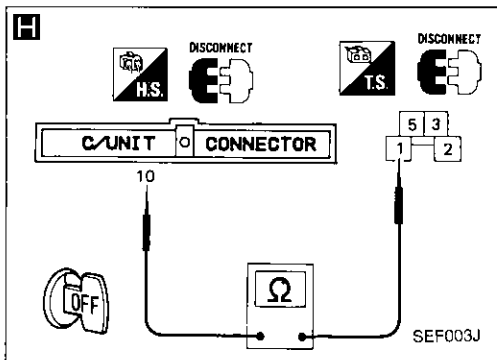
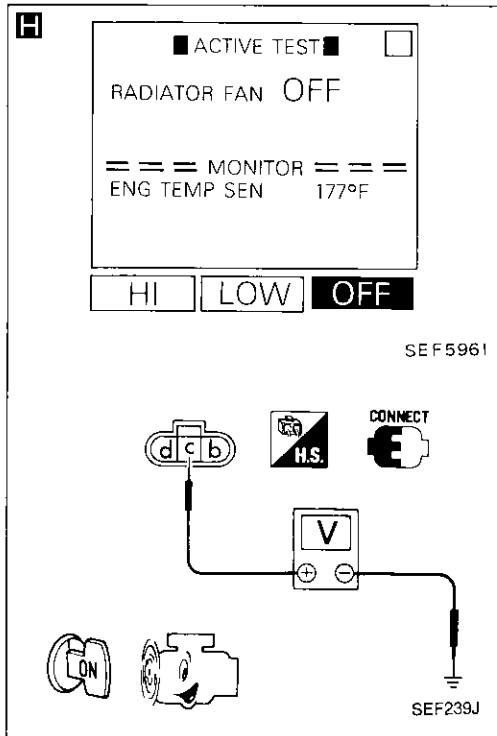
- Joint connector-3 (E48)
  - Harness continuity between radiator fan relay-3 and radiator fan motor-1, -2
  - Harness continuity between radiator fan relay-3 and body ground
- If N.G., repair harness or connectors.

O.K.

Ⓐ

# TROUBLE DIAGNOSES

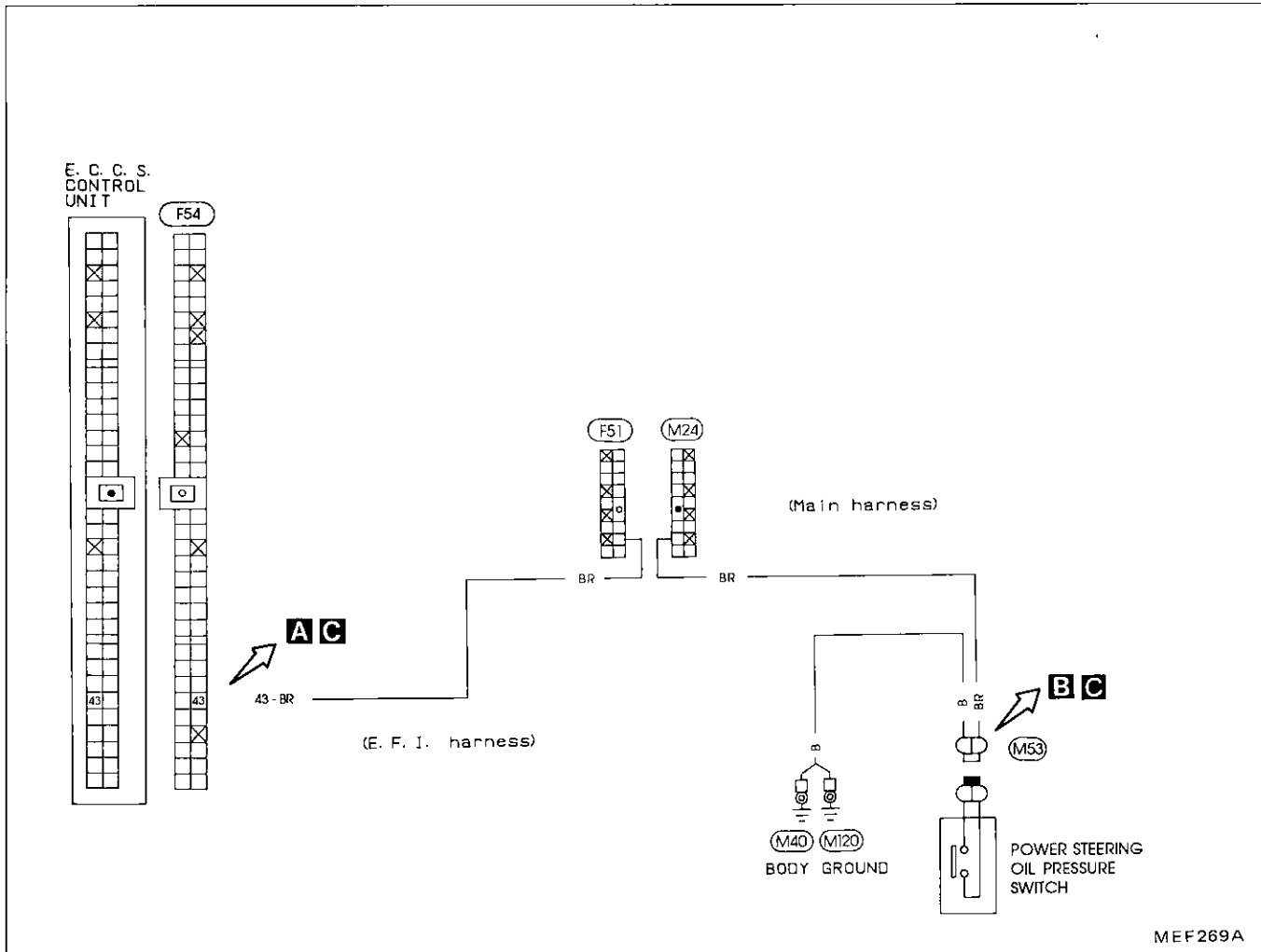
## Diagnostic Procedure 43 (Cont'd)



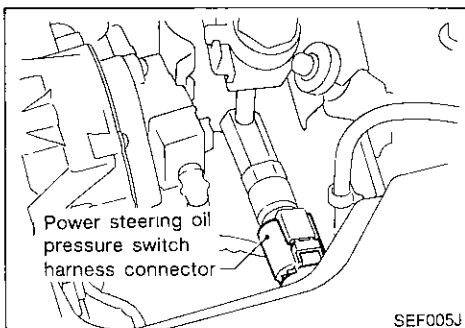
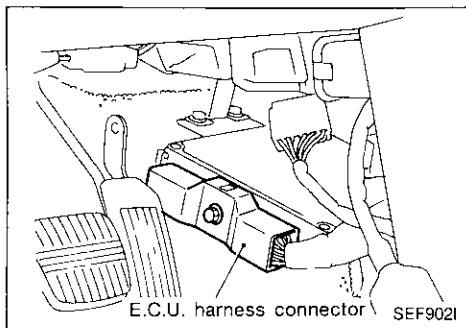
## TROUBLE DIAGNOSES

### Diagnostic Procedure 44

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



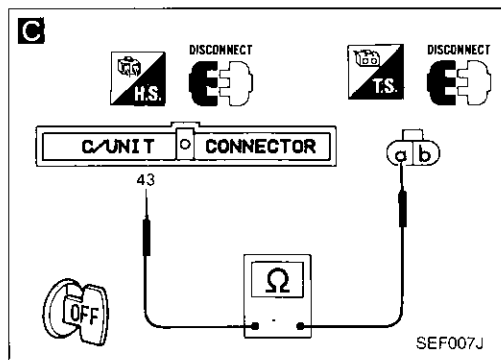
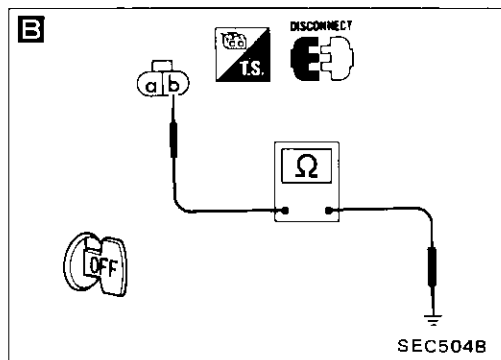
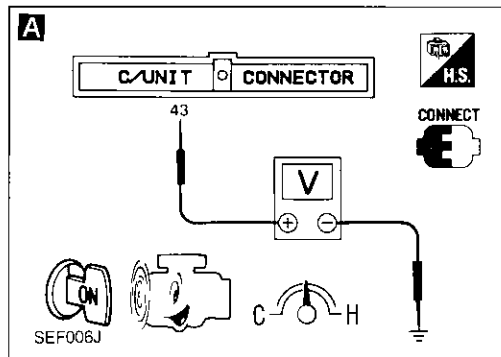
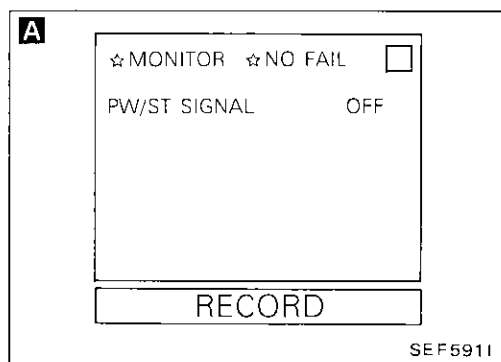
#### Harness layout





# TROUBLE DIAGNOSES

## Diagnostic Procedure 44 (Cont'd)



INSPECTION START

**A**

CHECK CONTROL FUNCTION.

- 1) Start engine and warm it up sufficiently.
- 2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.

**Steering is neutral: OFF**  
**Steering is turned: ON**

OR

- 2) Check voltage between E.C.U. terminal ④ and ground.

**Voltage:**

**When steering wheel is turned quickly**  
**Approximately 0V**  
**Except above**  
**Approximately 8 - 9V**

O.K.

INSPECTION END

**B**

CHECK GROUND CIRCUIT.

- 1) Stop engine.
- 2) Disconnect power steering oil pressure switch harness connector.
- 3) Check harness continuity between terminal b and body ground.

**Continuity should exist.**

N.G.

N.G.

Repair harness or connectors.

**C**

CHECK INPUT SIGNAL CIRCUIT.

- 1) Disconnect E.C.U. harness connector.
- 2) Check harness continuity between E.C.U. terminal ④ and terminal a.

**Continuity should exist.**

O.K.

N.G.

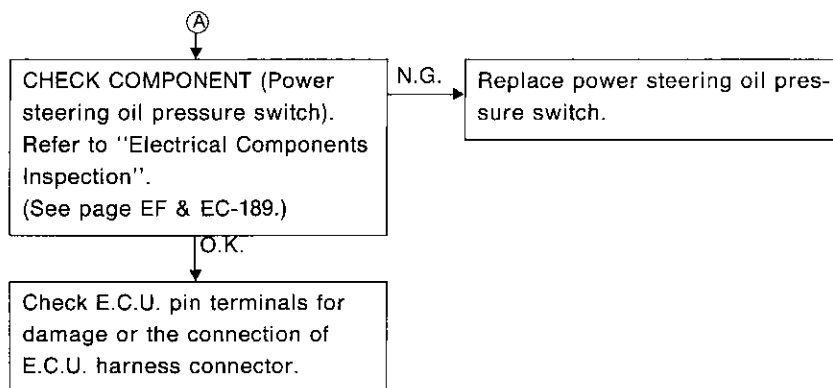
Check the following.

- Harness connectors (F51), (H24)
  - Harness continuity between E.C.U. and power steering oil pressure switch
- If N.G., repair harness or connectors.

Ⓐ

## TROUBLE DIAGNOSES

### Diagnostic Procedure 44 (Cont'd)



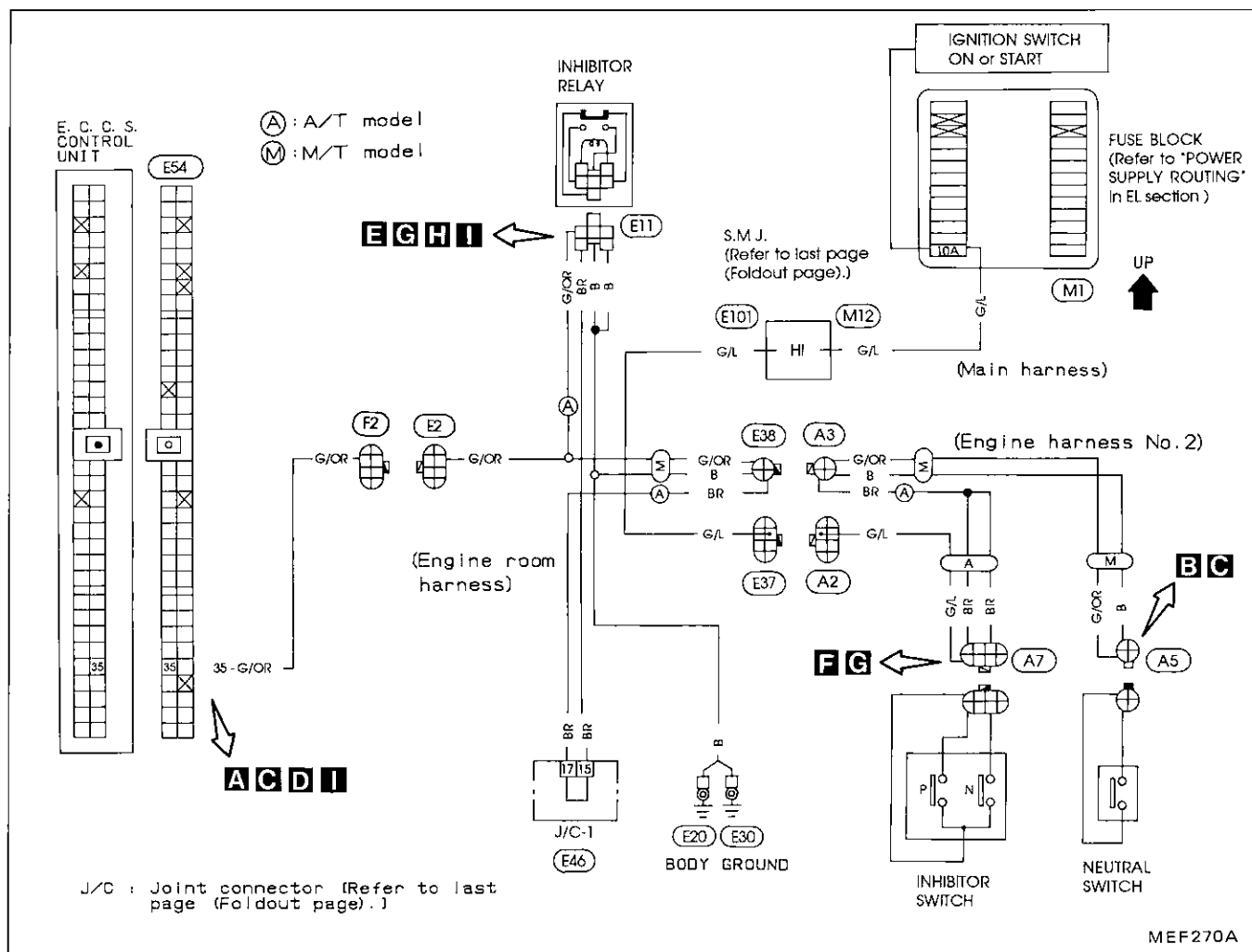
## **TROUBLE DIAGNOSES**

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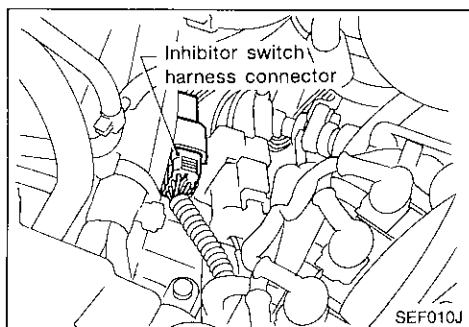
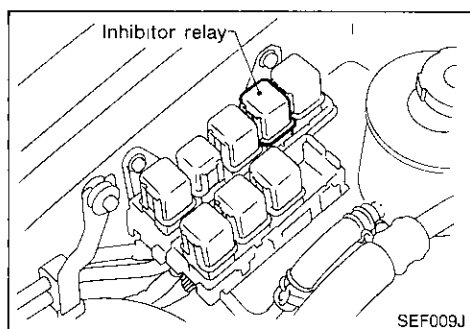
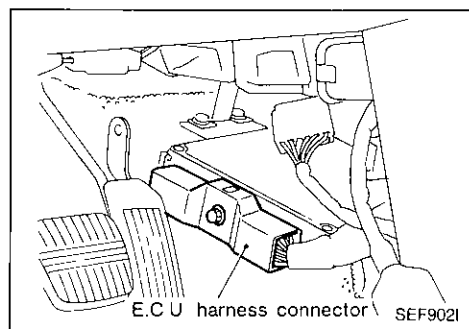
**NOTE**

## Diagnostic Procedure 45

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



### Harness layout



# TROUBLE DIAGNOSES

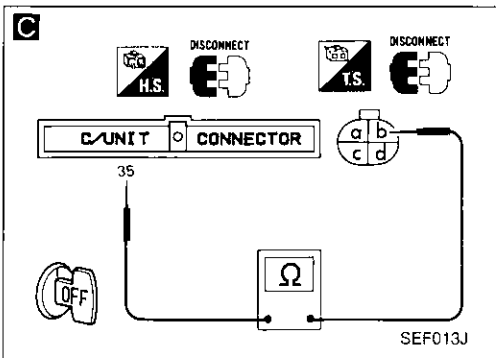
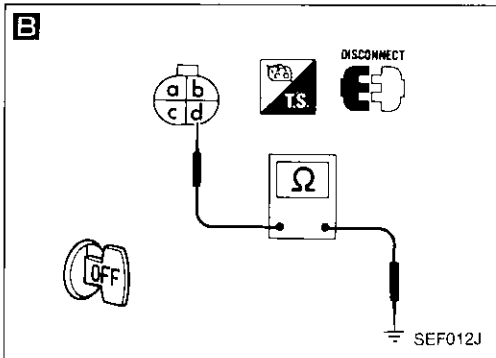
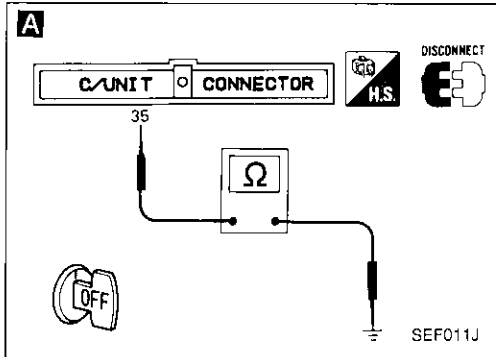
## Diagnostic Procedure 45 (Cont'd)

**A**

|               |           |                          |
|---------------|-----------|--------------------------|
| ☆ MONITOR     | ☆ NO FAIL | <input type="checkbox"/> |
| START SIGNAL  | OFF       |                          |
| IDLE POSITION | ON        |                          |
| AIR COND SIG  | OFF       |                          |
| NEUTRAL SW    | ON        |                          |

RECORD

SEF149I



### Neutral switch

#### INSPECTION START

#### **A** CHECK OVERALL FUNCTION.

- 1) Turn ignition switch "ON".
- 2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.

**Neutral position: ON**  
**Except above: OFF**

OR

- 1) Set shift lever to the neutral position.
- 2) Disconnect E.C.U. harness connector.
- 3) Check harness continuity between E.C.U. terminal ③⑤ and body ground.

**Continuity should exist.**

N.G.

- 1) Turn ignition switch "OFF".

#### **B** CHECK GROUND CIRCUIT.

- 1) Disconnect neutral switch harness connector.
- 2) Check harness continuity between terminal ④ and body ground.

**Continuity should exist.**

O.K.

- 1) Disconnect E.C.U. harness connector.

#### **C** CHECK INPUT SIGNAL CIRCUIT.

- 1) Check harness continuity between E.C.U. terminal ③⑤ and terminal ④.

**Continuity should exist.**

O.K.

O.K.

INSPECTION END

Check the following:

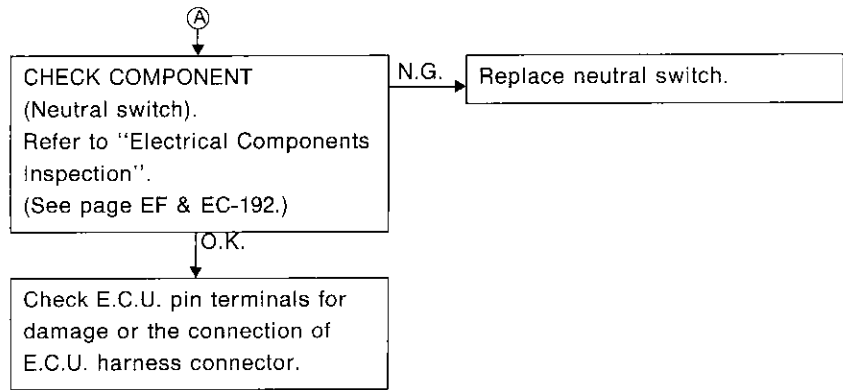
- Harness connectors (E38), (A3)
  - Harness continuity between neutral switch and body ground
- If N.G., repair harness or connectors.

Check the following:

- Harness connectors (F2), (E2)
  - Harness connectors (E38), (A3)
  - Harness continuity between E.C.U. and neutral switch
- If N.G., repair harness or connectors.

## TROUBLE DIAGNOSES

### Diagnostic Procedure 45 (Cont'd)



# TROUBLE DIAGNOSES

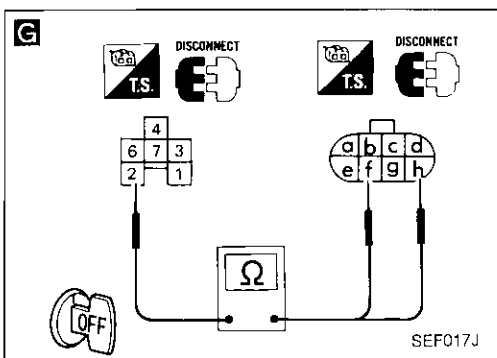
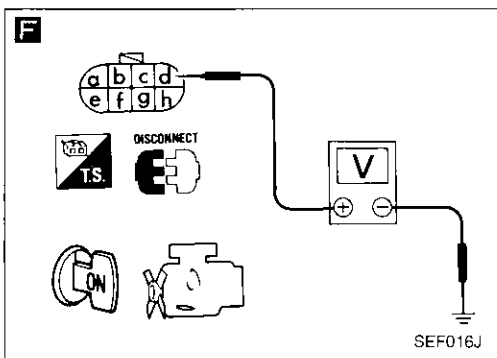
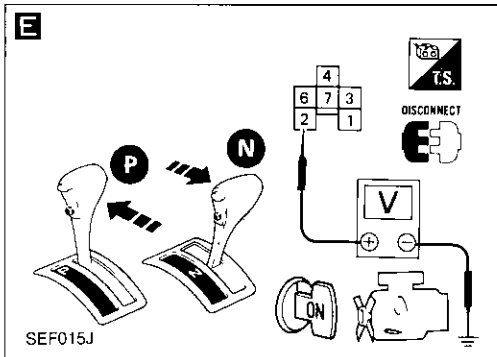
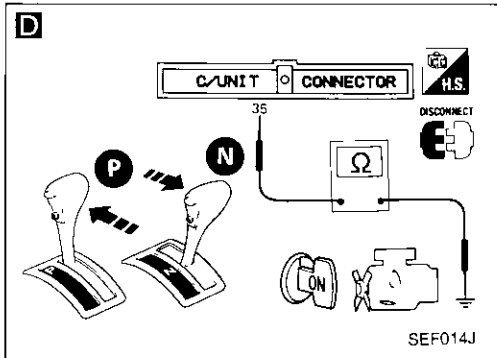
## Diagnostic Procedure 45 (Cont'd)

**D**

|                     |                          |
|---------------------|--------------------------|
| ☆ MONITOR ☆ NO FAIL | <input type="checkbox"/> |
| START SIGNAL        | OFF                      |
| IDLE POSITION       | ON                       |
| AIR COND SIG        | OFF                      |
| NEUTRAL SW          | ON                       |

RECORD

SEF149J



### Inhibitor switch

#### INSPECTION START

#### **D** CHECK OVERALL FUNCTION.

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

- OR
- 1) Shift selector lever to "P" range.
  - 2) Disconnect E.C.U. harness connector.
  - 3) Turn ignition switch "ON".
  - 4) Check harness continuity between E.C.U. terminal ③⑤ and body ground. **Continuity should exist.**
  - 5) Shift selector lever to "N" range.
  - 6) Check harness continuity between E.C.U. terminal ③⑤ and body ground. **Continuity should exist.**

N.G.

#### **E** CHECK POWER SUPPLY.

- 1) Turn ignition switch "OFF".
- 2) Disconnect inhibitor relay.
- 3) Make sure that selector lever is in "N" range.
- 4) Turn ignition switch "ON".
- 5) Check voltage between terminal ② and ground. **Voltage: Battery voltage**
- 6) Shift selector lever into "P" range.
- 7) Check voltage between terminal ② and ground. **Voltage: Battery voltage**

O.K.

A

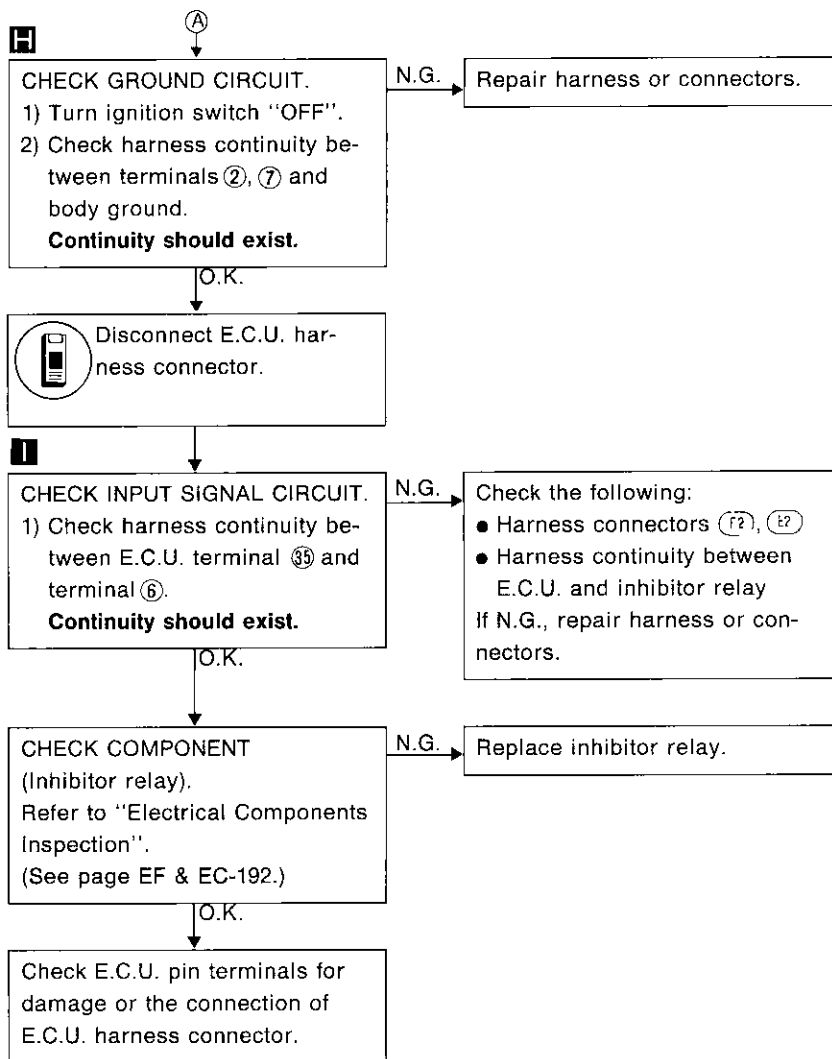
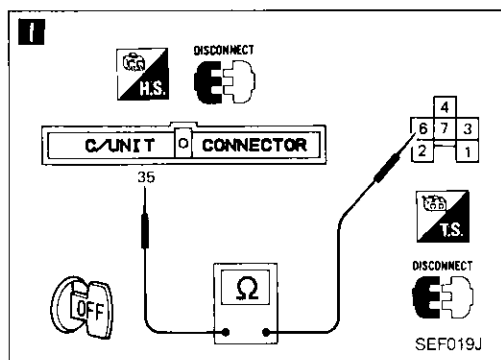
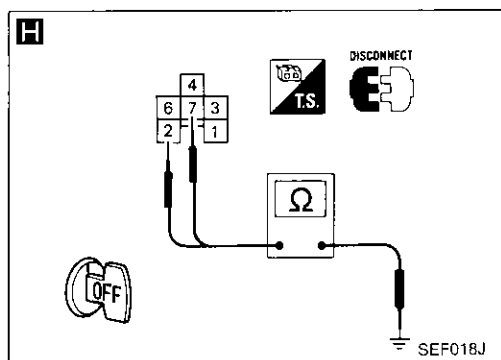
#### INSPECTION END

Check the following:

- F** CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND BATTERY.
- 1) Turn ignition switch "OFF".
  - 2) Disconnect inhibitor switch harness connector.
  - 3) Turn ignition switch "ON".
  - 4) Check voltage between terminal ② and ground. **Voltage: Battery voltage**  
 If N.G., check the following.
    - 10A fuse
    - S.M.J. connectors (M12), (E10)
    - Harness connectors (E37), (A2)
    - Harness continuity between fuse and inhibitor switch
 If N.G., repair harness or connectors.
- G** CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND INHIBITOR RELAY.
- 1) Turn ignition switch "OFF".
  - 2) Check harness continuity between terminals f, 'h' and terminal ②
- "P" range:  
**terminal f and terminal ②**  
 "N" range:  
**terminal f and terminal ②**  
**Continuity should exist.**  
 If N.G., check the following.
  - Harness connectors (E38), (A1)
  - Joint connector-1 (E46)
  - Harness continuity between inhibitor switch and inhibitor relay
 If N.G., repair harness or connectors.
- CHECK COMPONENT (Inhibitor switch).  
 Refer to "Electrical Components Inspection".  
 (See page EF & EC-192.)

# TROUBLE DIAGNOSES

## Diagnostic Procedure 45 (Cont'd)





# TROUBLE DIAGNOSES

## Electrical Components Inspection

### E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

#### E.C.U. inspection table

\*Data are reference values.

| TER-MINAL NO. | ITEM                                                          | CONDITION                                                                                                               | *DATA                                                       |
|---------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 1             | Ignition signal                                               | Engine is running.<br>└ Idle speed                                                                                      | 0.3 - 0.6V                                                  |
|               |                                                               | Engine is running.<br>└ Engine speed is 2,000 rpm                                                                       | Approximately 1.0V                                          |
| 3             | Ignition check                                                | Engine is running.<br>└ Idle speed                                                                                      | 9 - 12V                                                     |
| 4             | E.C.C.S. relay (Main relay)                                   | Engine is running.<br>↓<br>Ignition switch "OFF"<br>└ Within approximately 1 second after turning ignition switch "OFF" | 0 - 1V                                                      |
|               |                                                               | Ignition switch "OFF"<br>└ For approximately 1 second after turning ignition switch "OFF"                               | BATTERY VOLTAGE (11 - 14V)                                  |
| 8             | Exhaust gas temperature sensor<br>(Only for California model) | Engine is running.<br>└ Idle speed                                                                                      | 1.0 - 2.0V                                                  |
|               |                                                               | Engine is running.<br>└ E.G.R. system is operating.                                                                     | 0 - 1.0V                                                    |
| 11            | Air conditioner relay                                         | Engine is running.<br>└ Both A/C switch and blower switch are "ON".                                                     | 0 - 1.0V                                                    |
|               |                                                               | Engine is running.<br>└ A/C switch is "OFF".                                                                            | BATTERY VOLTAGE (11 - 14V)                                  |
| 12            | S.C.V. control solenoid valve                                 | Engine is running.<br>└ Idle speed                                                                                      | 0 - 1.0V                                                    |
|               |                                                               | Engine is running.<br>└ Engine speed is 2,000 rpm.                                                                      | BATTERY VOLTAGE (11 - 14V)                                  |
| 16            | Air flow meter                                                | Engine is running.                                                                                                      | 1.0 - 3.0V<br>Output voltage varies with engine revolution. |

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

\*Data are reference values.

| TER-MINAL NO. | ITEM                                  | CONDITION                                                                       | *DATA                                                                                  |
|---------------|---------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 18            | Engine temperature sensor             | Engine is running.                                                              | 1.0 - 5.0V<br>Output voltage varies with engine water temperature.                     |
| 19            | Exhaust gas sensor                    | Engine is running.<br>└ After warming up sufficiently.                          | 0 - Approximately 1.0V                                                                 |
| 20            | Throttle sensor                       | Ignition switch "ON"                                                            | 0.4 - Approximately 4V<br>Output voltage varies with the throttle valve opening angle. |
| 22<br>30      | Crank angle sensor (Reference signal) | Engine is running.<br><br><b>Do not run engine at high speed under no-load.</b> | 0.2 - 0.5V                                                                             |
| 26            | Air temperature sensor                | Ignition switch "ON"<br>└ Temperature of intake air is 20°C (68°F)              | Approximately 1.0 - 1.5V                                                               |
|               |                                       | Ignition switch "ON"<br>└ Temperature of intake air is 80°C (176°F)             | Approximately 0.3V                                                                     |
| 31<br>40      | Crank angle sensor (Position signal)  | Engine is running.<br><br><b>Do not run engine at high speed under no-load.</b> | 2.0 - 3.0V                                                                             |
| 33            | Idle switch ( ⊖ side)                 | Ignition switch "ON"<br>└ Throttle valve: idle position                         | Approximately 9 - 10V                                                                  |
|               |                                       | Ignition switch "ON"<br>└ Throttle valve:<br>Any position except idle position  | 0V                                                                                     |
| 34            | Start signal                          | Cranking                                                                        | 8 - 12V                                                                                |
| 35            | Neutral switch & Inhibitor switch     | Ignition switch "ON"<br>└ Neutral/Parking                                       | 0V                                                                                     |
|               |                                       | Ignition switch "ON"<br>└ Except the above gear position                        | Approximately 6V                                                                       |
| 36            | Ignition switch                       | Ignition switch "OFF"                                                           | 0V                                                                                     |
|               |                                       | Ignition switch "ON"                                                            | BATTERY VOLTAGE (11 - 14V)                                                             |
| 37            | Throttle sensor power supply          | Ignition switch "ON"                                                            | Approximately 5V                                                                       |
| 38<br>47      | Power supply for E.C.U.               | Ignition switch "ON"                                                            | BATTERY VOLTAGE (11 - 14V)                                                             |

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

\*Data are reference values.

| TER-MINAL NO. | ITEM                               | CONDITION                                                                                                                    | *DATA                      |
|---------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| 41            | Air conditioner switch             | Engine is running.<br>└ Both air conditioner switch and blower switch are "ON".                                              | 0V                         |
|               |                                    | Engine is running.<br>└ Air conditioner switch is "OFF".                                                                     | BATTERY VOLTAGE (11 - 14V) |
| 43            | Power steering oil pressure switch | Engine is running.<br>└ Steering wheel is being turned.                                                                      | 0V                         |
|               |                                    | Engine is running.<br>└ Steering wheel is not being turned.                                                                  | 8 - 9V                     |
| 44            | Idle switch ( ⊕ side)              | Ignition switch "ON"<br>└ Throttle valve: idle position                                                                      | Approximately 9 - 10V      |
|               |                                    | Ignition switch "ON"<br>└ Throttle valve:<br>Except idle position                                                            | BATTERY VOLTAGE (11 - 14V) |
| 45            | Thermo control amp.                | Engine is running<br>Air conditioner is operating.<br>└ Evaporator outlet air temperature is between 3.0 - 8.0°C (37 - 46°F) | Approximately 8 - 9V       |
|               |                                    | Engine is running.<br>Air conditioner is operating.<br>└ Evaporator outlet air temperature is over 8°C (46°F)                | Approximately. 0V          |
| 46            | Power supply (Back-up)             | Ignition switch "OFF"                                                                                                        | BATTERY VOLTAGE (11 - 14V) |
| 101           | Injector No. 1                     | Engine is running                                                                                                            | BATTERY VOLTAGE (11 - 14V) |
| 103           | Injector No. 3                     |                                                                                                                              |                            |
| 110           | Injector No. 2                     |                                                                                                                              |                            |
| 112           | Injector No. 4                     |                                                                                                                              |                            |
| 102           | A.I.V. control solenoid valve      | Engine is running.<br>└ Idle speed                                                                                           | 0 - 1.0V                   |
|               |                                    | Engine is running.<br>└ Accelerator pedal is depressed.<br>After warming up                                                  | BATTERY VOLTAGE (11 - 14V) |

# TROUBLE DIAGNOSES

## Electrical Components Inspection (Cont'd)

\*Data are reference values.

| TER-MINAL NO. | ITEM                                      | CONDITION                                                                                                                                         | *DATA                                                                                                 |
|---------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 104           | 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>Within 5 seconds after turning ignition switch "ON"                                                                       | BATTERY VOLTAGE (11 - 14V)                                                                            |
| 105           | E.G.R. control solenoid valve             | Engine is running.<br>Engine is cold.<br>Water temperature is below 60°C (140°F).                                                                 | 0.7 - 0.9V                                                                                            |
|               |                                           | Engine is running.<br>After warming up<br>Water temperature is between 60°C (140°F) and 105°C (221°F)                                             | BATTERY VOLTAGE (11 - 14V)                                                                            |
| 106           | Pressure regulator control solenoid valve | Stop and restart engine after warming it up.<br>Water temperature is above 90°C (194°F)                                                           | 0 - 1.0V<br>(for 3 minutes after ignition switch is turned off.)<br>BATTERY VOLTAGE (After 3 minutes) |
|               |                                           | Stop and restart engine after warming it up.<br>Water temperature is below 90°C (194°F)                                                           | BATTERY VOLTAGE (11 - 14V)                                                                            |
| 113           | A.A.C. valve                              | Engine is running.<br>Idle speed                                                                                                                  | 7 - 10V                                                                                               |
|               |                                           | Engine is running.<br>Steering wheel is being turned.<br>Air conditioner is operating<br>Rear defogger is "ON".<br>Headlamp are in high position. | 4 - 7V                                                                                                |

## E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT

|     |     |     |     |     |     |     |     |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 9 | 10 | 11 | 12 | 13 | 14 | 10 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |    |



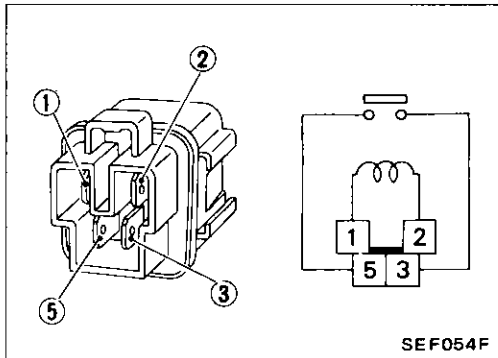
SEF419H

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

#### E.C.C.S. RELAY

Check continuity between terminals ③ and ⑤.

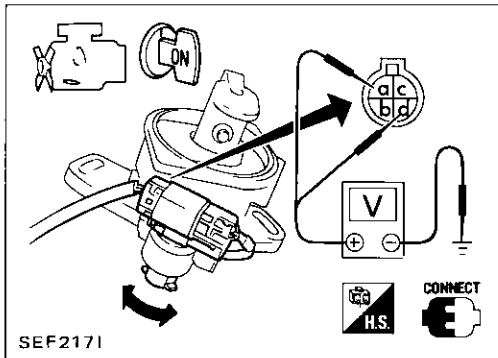


| Condition                                           | Continuity |
|-----------------------------------------------------|------------|
| 12V direct current supply between terminals ① and ② | Yes        |
| No supply                                           | No         |

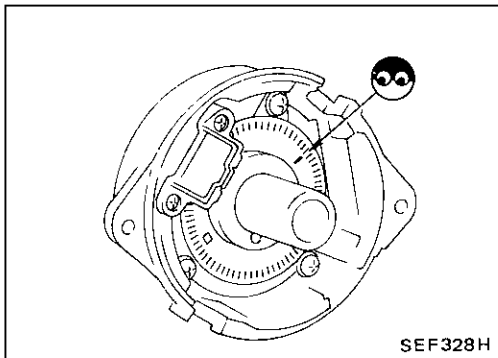
#### CRANK ANGLE SENSOR

1. Remove distributor from engine. (crank angle sensor harness connector is connected.)
2. Turn ignition switch "ON".
3. Rotate crank angle sensor shaft slowly and check voltage between terminals ①, ② and ground.

**Voltage fluctuates between 5V and 0V.**

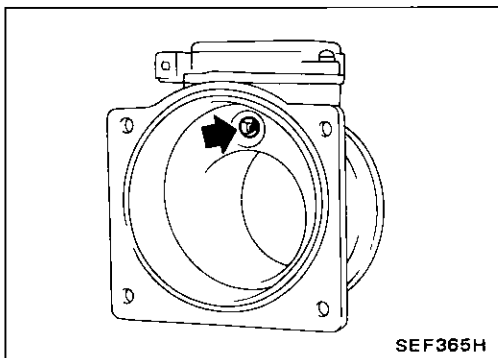


4. Visually check rotor plate for damage or dust.



#### AIR FLOW METER

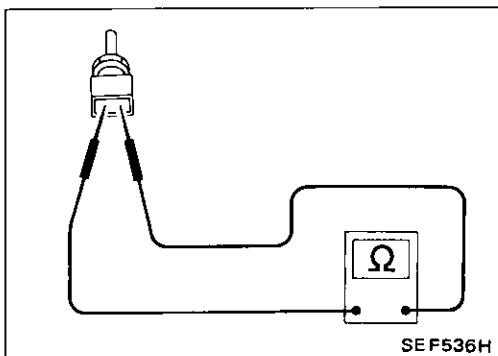
- Visually check hot wire air passage for dust.



#### ENGINE TEMPERATURE SENSOR

Check engine temperature sensor resistance.

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68)             | 2.1 - 2.9     |
| 80 (176)            | 0.30 - 0.33   |

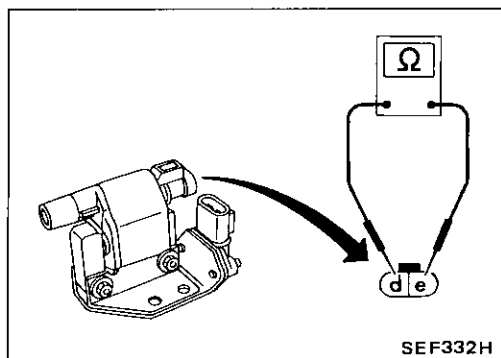


## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

#### IGNITION COIL

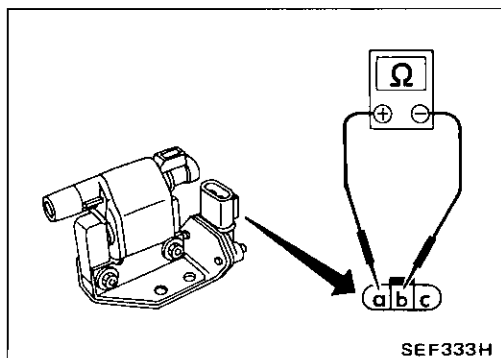
Check ignition coil resistance.



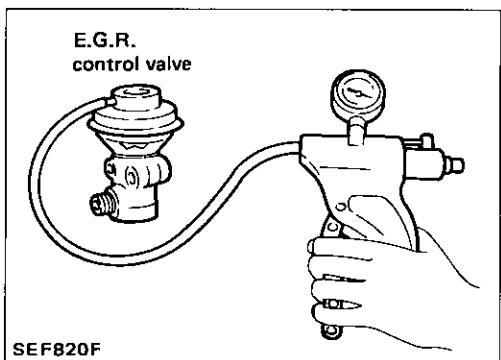
| Terminal  | Resistance         |
|-----------|--------------------|
| (d) - (e) | Approximately 0.7Ω |

#### POWER TRANSISTOR

Check continuity between power transistor terminals.



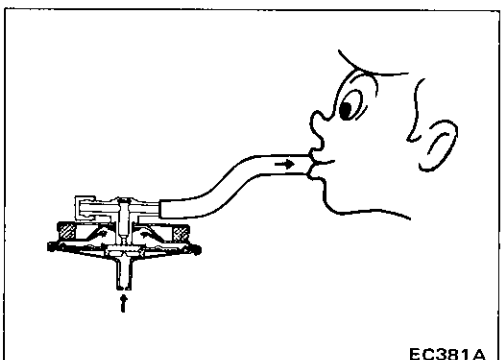
| Terminal No. | Tester polarity | Continuity |
|--------------|-----------------|------------|
| (a)          | +               | No         |
| (b)          | -               |            |
| (a)          | -               | Yes        |
| (b)          | +               |            |
| (a)          | +               | No         |
| (c)          | -               |            |
| (a)          | -               | Yes        |
| (c)          | +               |            |



#### 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.



#### B.P.T. VALVE

Plug one of two ports of B.P.T. valve.

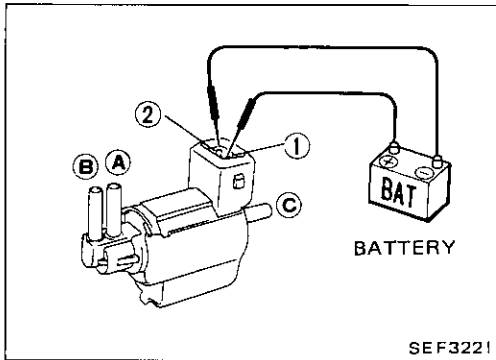
Apply a pressure above 0.490 kPa (50 mmH<sub>2</sub>O, 1.97 inH<sub>2</sub>O) to check for leakage. If a leak is noted, replace valve.

## TROUBLE DIAGNOSES

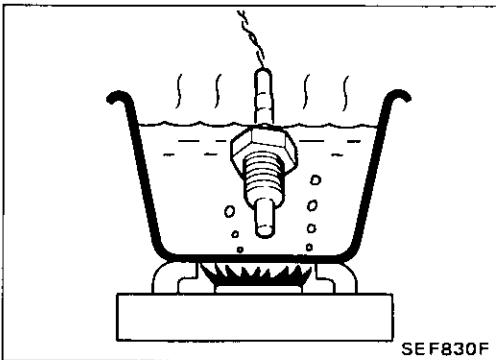
### Electrical Components Inspection (Cont'd)

#### E.G.R. CONTROL SOLENOID VALVE, A.I.V. CONTROL SOLENOID VALVE, P.R. CONTROL SOLENOID VALVE AND S.C.V. CONTROL SOLENOID VALVE

Check air passages continuity.



| Condition                                               | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|---------------------------------------------------------|--------------------------------------------|--------------------------------------------|
| 12V direct current supply between terminals (1) and (2) | Yes                                        | No                                         |
| No supply                                               | No                                         | Yes                                        |



### EXHAUST GAS SENSOR

Refer to "Diagnostic Procedure 30". (See page EF & EC-126.)

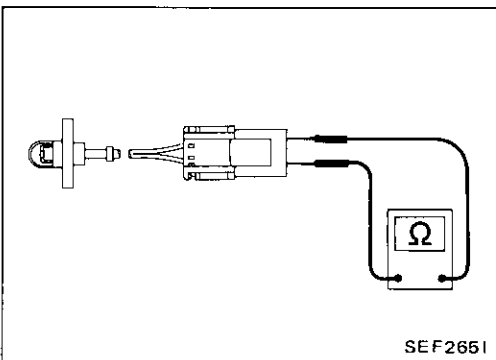
### EXHAUST GAS TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

- Resistance should decrease in response to temperature increase.

**Resistance: 100°C (212°F)**

**85.3 ± 8.53 kΩ**



### AIR TEMPERATURE SENSOR

Check air temperature sensor resistance.

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68)             | 2.1 - 2.9     |
| 80 (176)            | 0.27 - 0.38   |

### POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check resistance between terminals.

**Resistance: Approximately 2 - 3Ω**

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

#### THROTTLE SENSOR

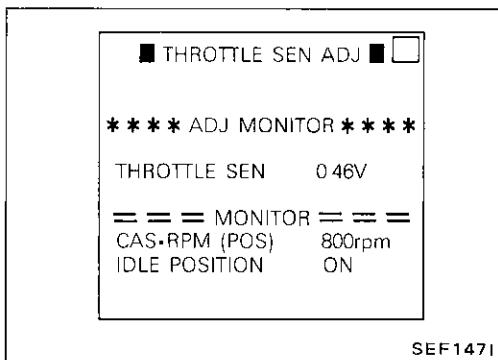
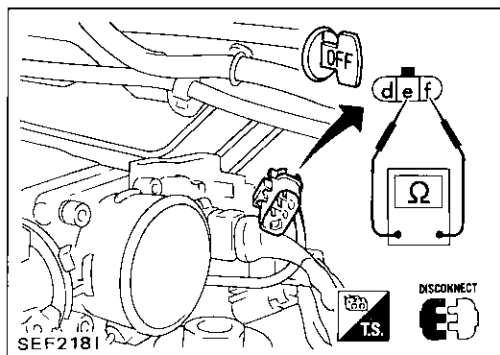
1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals **b** and **c** changes when opening throttle valve manually.

| Accelerator pedal conditions | Resistance kΩ   |
|------------------------------|-----------------|
| Completely released          | Approximately 1 |
| Partially released           | 1 - 9           |
| Completely depressed         | Approximately 9 |

If N.G., replace throttle sensor.

#### Adjustment

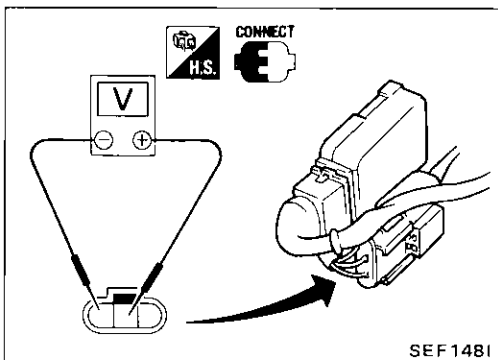
If throttle sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:



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.

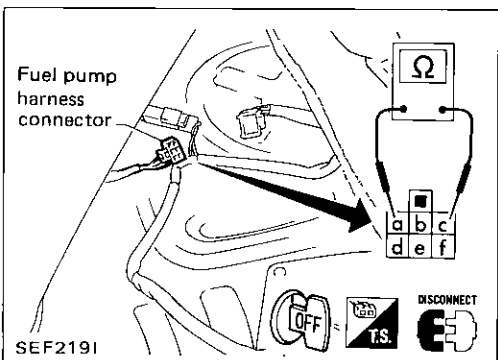


5. Adjust by rotating throttle sensor body so that output voltage is 0.4 to 0.5V.
6. Tighten mounting bolts.
7. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.

#### FUEL PUMP

Check continuity between terminals **a** and **c**.

Continuity should exist.



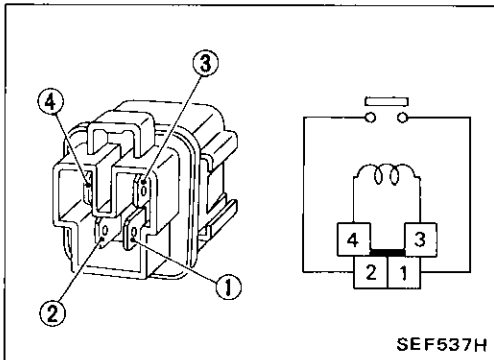


## TROUBLE DIAGNOSES

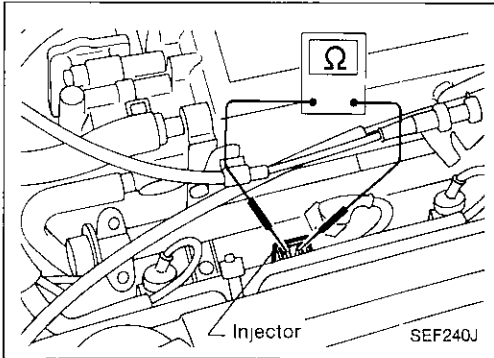
### Electrical Components Inspection (Cont'd)

#### FUEL PUMP RELAY, RADIATOR FAN REAY-1, -2 AND-3

Check continuity between terminals ① and ②.



| Condition                                           | Continuity |
|-----------------------------------------------------|------------|
| 12V direct current supply between terminals ③ and ④ | Yes        |
| No supply                                           | No         |



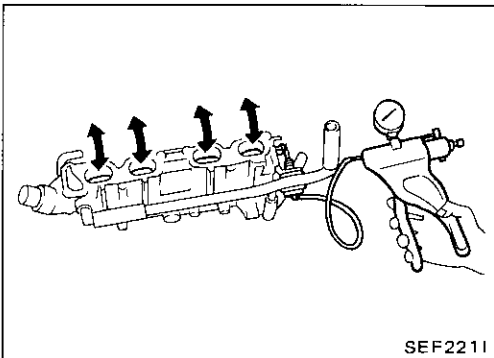
### INJECTORS

- Check injector resistance.

#### Resistance:

**Approximately 10 - 15Ω**

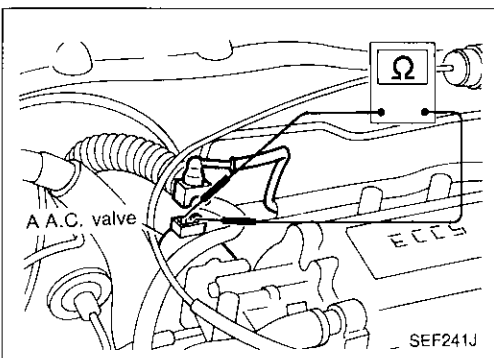
- Remove injector and check nozzle for clogging.



### SWIRL CONTROL VALVE

Supply vacuum to actuator and check swirl control valve operation.

| Condition                 | Swirl control valve |
|---------------------------|---------------------|
| Supply vacuum to actuator | Close               |
| No supply                 | Open                |

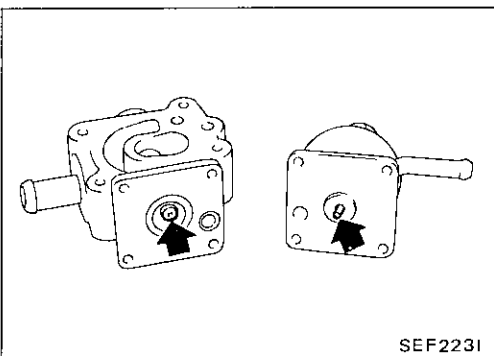


### A.A.C. VALVE

- Check A.A.C. valve resistance.

#### Resistance:

**Approximately 10Ω [at 20°C (68°F)]**



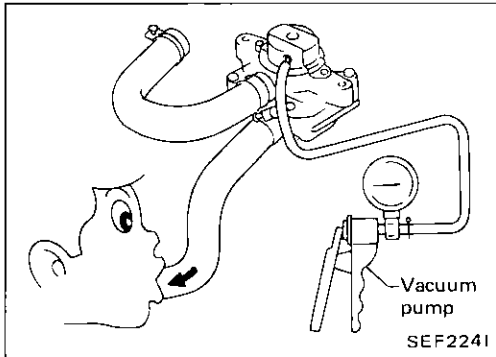
- Check plunger for seizure or sticking.
- Check spring for broken.

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

#### AIR INDUCTION VALVE

Apply vacuum to vacuum motor, suck or blow hose to make sure that air flows only towards the air induction side.

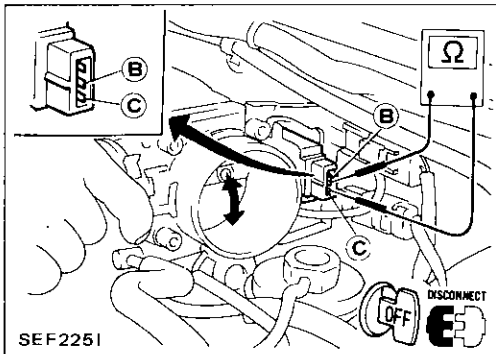


#### THROTTLE VALE SWITCH (Idle position)

##### Unit check

- Check continuity between terminals ② and ③ while moving throttle valve.

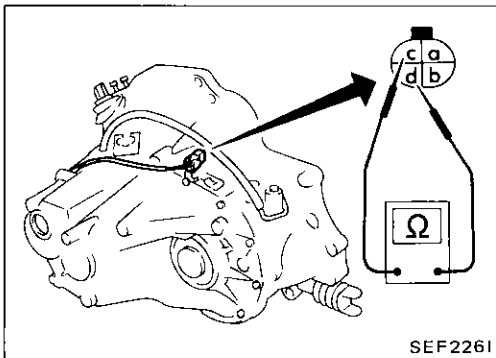
| Throttle valve condition | Continuity |
|--------------------------|------------|
| Fully closed             | Yes        |
| Open                     | No         |



#### NEUTRAL SWITCH

- Check continuity between terminals ③ and ④.

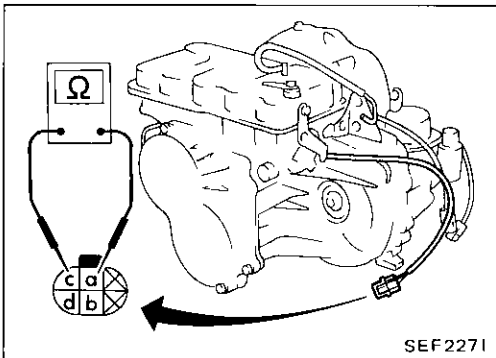
| Conditions              | Continuity |
|-------------------------|------------|
| Shift to Neutral        | Yes        |
| Shift to other position | No         |



#### INHIBITOR SWITCH

Check continuity between terminals ② and ③.

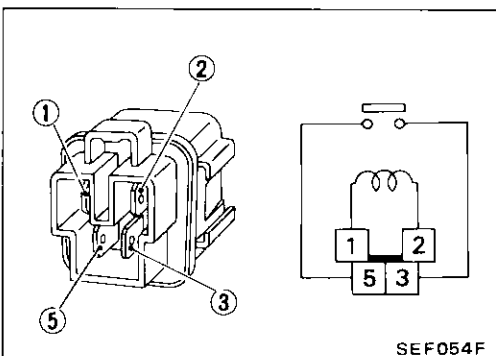
| Conditions                                | Continuity |
|-------------------------------------------|------------|
| Shift to "P" position                     | Yes        |
| Shift to "N" position                     | Yes        |
| Shift to positions other than "P" and "N" | No         |



#### INHIBITOR RELAY

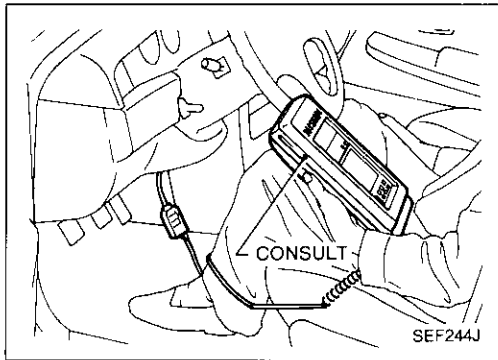
Check continuity between terminals ③ and ⑤.

| Conditions                                          | Continuity |
|-----------------------------------------------------|------------|
| 12V direct current supply between terminals ① and ② | Yes        |
| No current supply                                   | No         |



If N.G., replace relay.

# FUEL INJECTION CONTROL SYSTEM INSPECTION



## Releasing Fuel Pressure

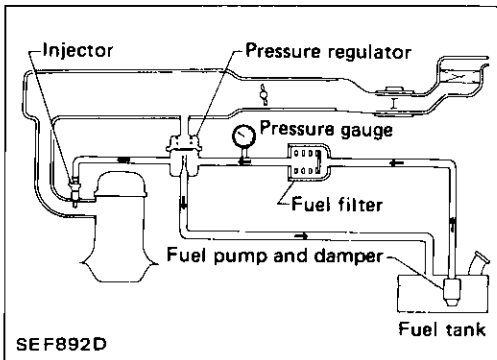
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.



Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.

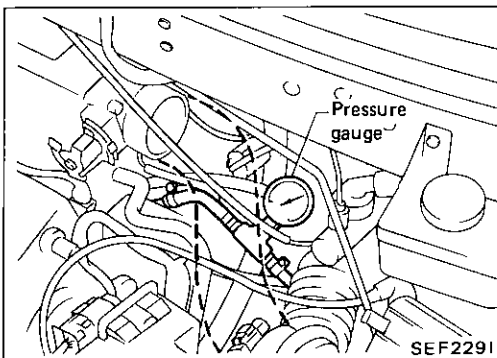


1. Remove fuel pump relay.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay.



## 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. Remove air duct.
  3. Disconnect fuel hose between fuel filter and fuel tube (engine side).
  4. Install pressure gauge between fuel filter and fuel tube.
  5. Install air duct.
  6. Start engine and check for fuel leakage.



7. Read the fuel pressure gauge indication.

**At idling:**

**When fuel pressure regulator valve vacuum hose is connected**

**More than 226 kPa (2.3 kg/cm<sup>2</sup>, 33 psi)**

**When fuel pressure regulator valve vacuum hose is disconnected**

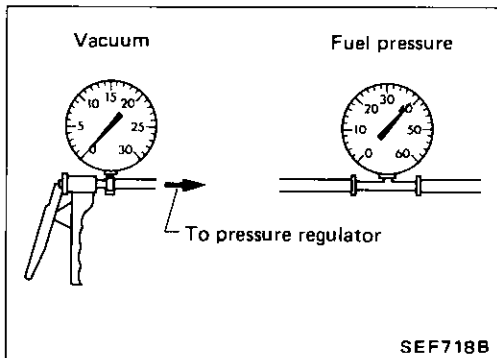
**Approximately 294 kPa (3.0 kg/cm<sup>2</sup>, 43 psi)**

8. Stop engine and disconnect vacuum hose from fuel pressure regulator.
9. Plug vacuum hose.

## FUEL INJECTION CONTROL SYSTEM INSPECTION

### Fuel Pressure Check (Cont'd)

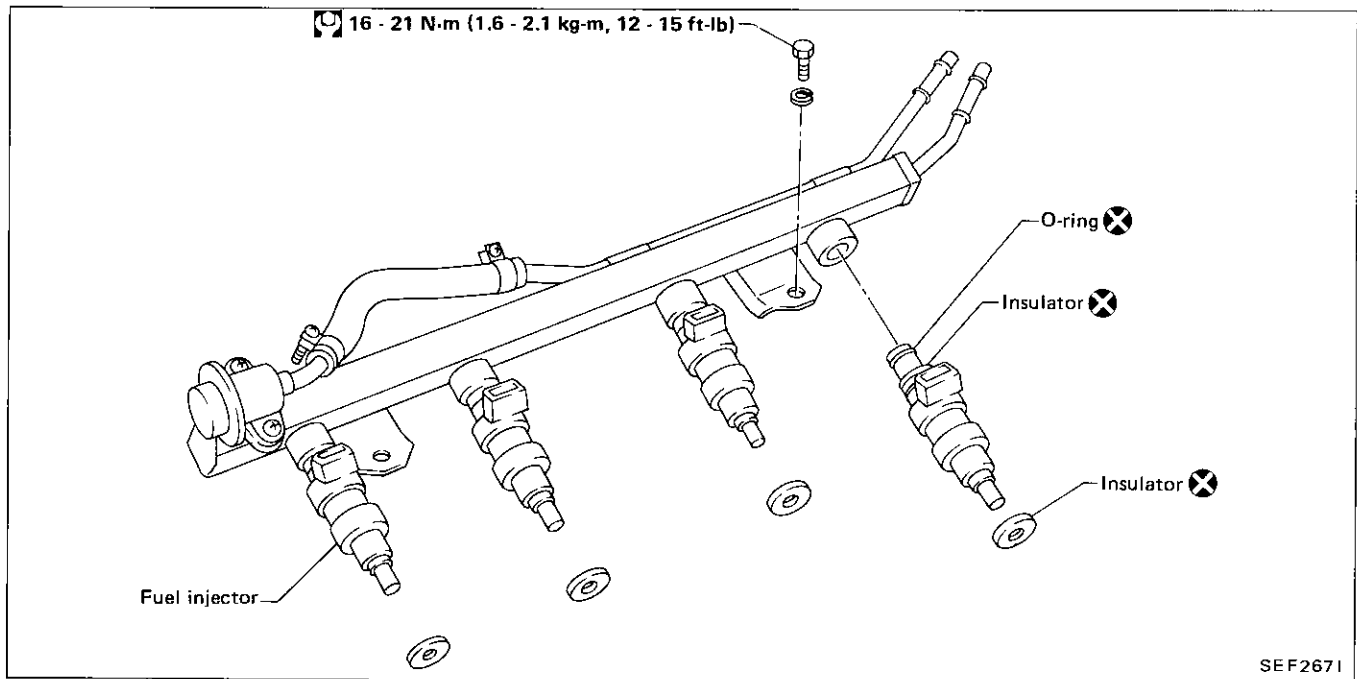
10. Connect variable vacuum source to fuel pressure regulator.



11. Start engine and read fuel pressure gauge indication as vacuum changes.

**Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.**

### Injector Removal and Installation



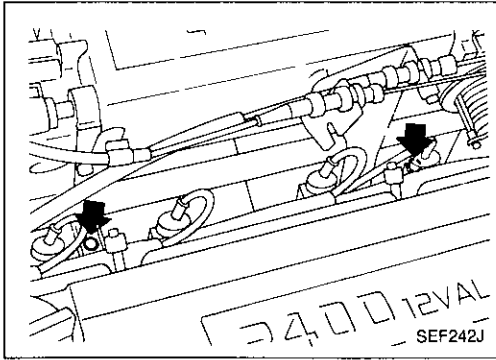
#### REMOVAL

1. Release fuel pressure to zero.
2. Remove or disconnect the following:
  - Air duct
  - Fuel hoses
  - Fuel pressure regulator.
  - Accelerator wire bracket
  - Fuel injector harness connectors

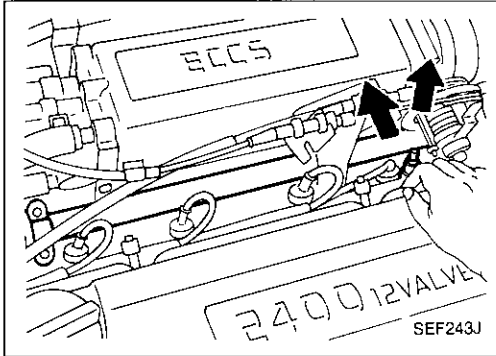
## FUEL INJECTION CONTROL SYSTEM INSPECTION

### Injector Removal and Installation (Cont'd)

3. Remove fuel tube securing bolts.



4. Move fuel tube as shown and take out injectors from #4 injector.



### INSTALLATION

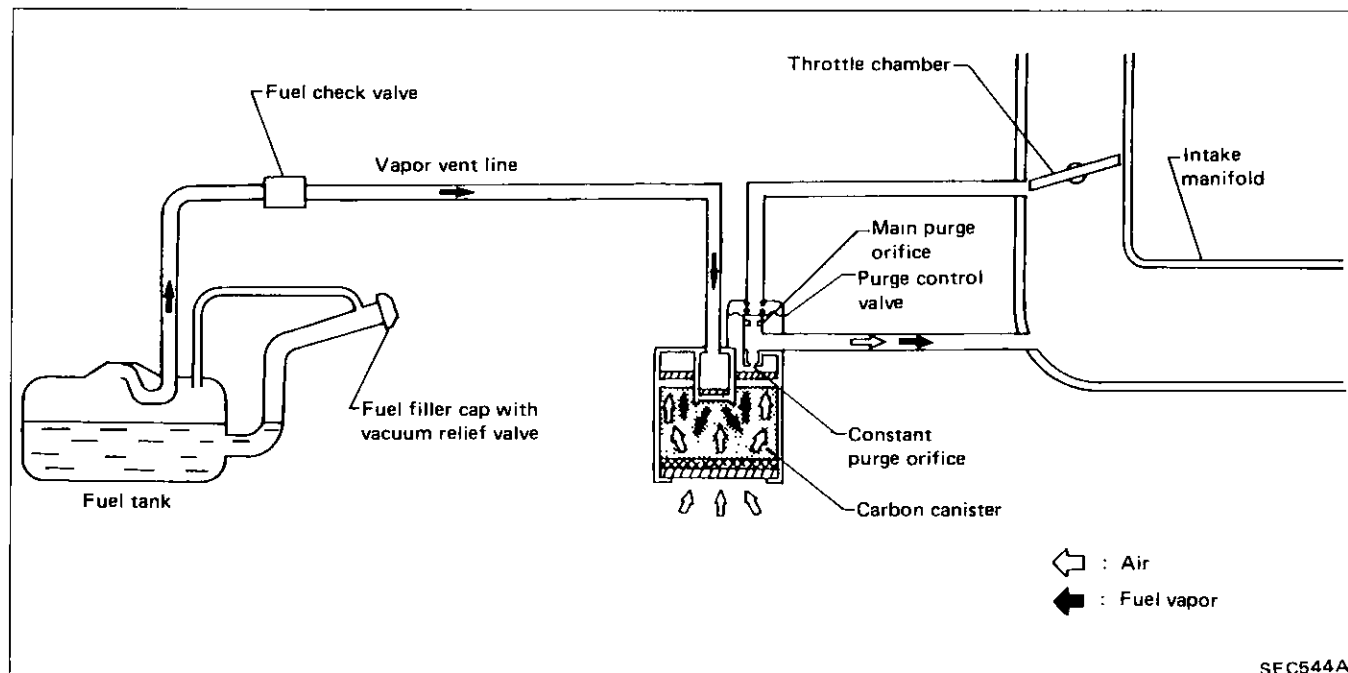
1. Clean exterior of injector tail piece.
2. Replace O-rings and insulators with new ones.
3. Install injectors.
4. Install any parts removed.

#### CAUTION:

After properly connecting injectors to fuel tube, check connections for fuel leakage.

# EVAPORATIVE EMISSION CONTROL SYSTEM

## Description

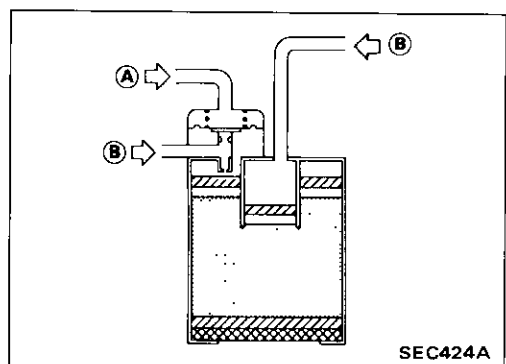


The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum increases, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



## Inspection

### CARBON CANISTER

Check carbon canister as follows:

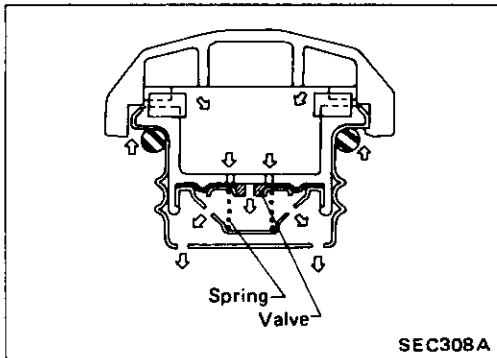
- Ⓐ: Blow air and ensure that there is no leakage.
- Ⓑ: Blow air and ensure that there is leakage.

## EVAPORATIVE EMISSION CONTROL SYSTEM

### Inspection (Cont'd)

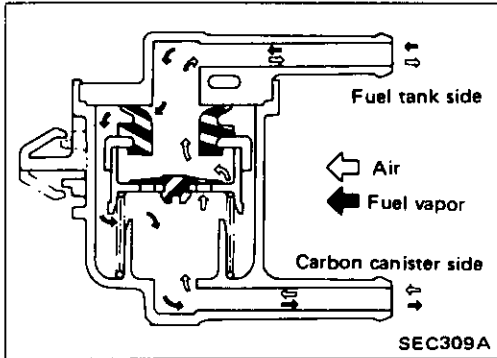
#### FUEL TANK VACUUM RELIEF VALVE

1. Wipe valve housing clean.
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.

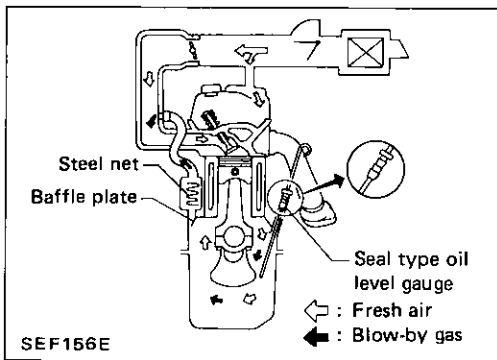


#### FUEL CHECK VALVE

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.



# CRANKCASE EMISSION CONTROL SYSTEM



## Description

This system returns blow-by gas to both the intake manifold and air cleaner.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

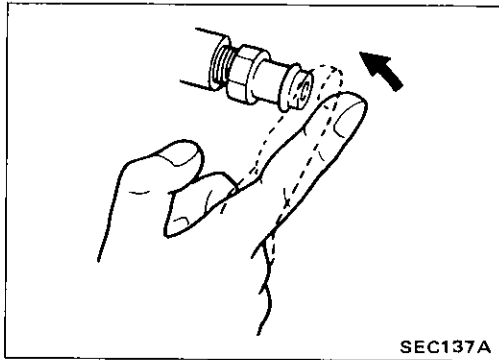
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air cleaner, through the hose connecting the air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

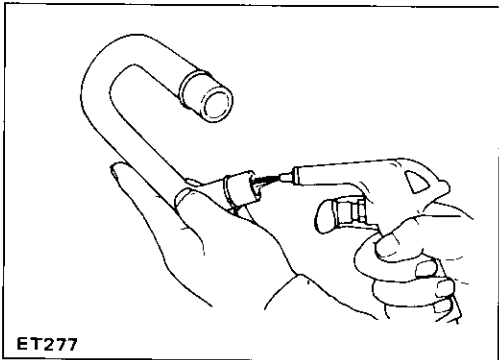
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.



## Inspection

### P.C.V. (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



### VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



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

### General Specifications

|                 |          |                                                                               |
|-----------------|----------|-------------------------------------------------------------------------------|
| IGNITION TIMING | B.T.D.C. | 15° ± 2°                                                                      |
| IDLE SPEED      | rpm      | M/T 700 ± 50*1, 750 ± 50*2<br>A/T 700 ± 50*1, 750 ± 50*2<br>(in "N" position) |

\*1: For U.S.A.

\*2: For Canada

### Inspection and Adjustment

#### IGNITION COIL

|                                          |    |                   |
|------------------------------------------|----|-------------------|
| Primary voltage                          | V  | 12                |
| Primary resistance<br>[at 20°C (68°F)]   | Ω  | Approximately 0.7 |
| Secondary resistance<br>[at 20°C (68°F)] | kΩ | Approximately 8   |

#### ENGINE TEMPERATURE SENSOR

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68)             | 2.1 - 2.9     |
| 80 (176)            | 0.30 - 0.33   |

#### AIR TEMPERATURE SENSOR

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68)             | 2.1 - 2.9     |
| 80 (176)            | 0.27 - 0.38   |

#### FUEL PRESSURE (at idling)

Unit: kPa (kg/cm<sup>2</sup>, psi)

|                                                      |                                |
|------------------------------------------------------|--------------------------------|
| (Measuring point: between fuel filter and fuel pipe) |                                |
| Vacuum hose is connected                             | Approximately<br>226 (2.3, 33) |
| Vacuum hose is disconnected                          | Approximately<br>294 (3.0, 43) |

#### IDLE SWITCH

|                                                             |     |                                                         |
|-------------------------------------------------------------|-----|---------------------------------------------------------|
| Engine speed when idle switch is changed from "OFF" to "ON" | rpm | M/T 1,000 ± 150<br>A/T 1,000 ± 150<br>(in "N" position) |
|-------------------------------------------------------------|-----|---------------------------------------------------------|

#### EXHAUST GAS TEMPERATURE SENSOR

|                                  |    |             |
|----------------------------------|----|-------------|
| Resistance<br>[at 100°C (212°F)] | kΩ | 85.3 ± 8.53 |
|----------------------------------|----|-------------|

#### A.A.C. VALVE

|            |   |                  |
|------------|---|------------------|
| Resistance | Ω | Approximately 10 |
|------------|---|------------------|

#### INJECTOR

|            |   |         |
|------------|---|---------|
| Resistance | Ω | 10 - 15 |
|------------|---|---------|

#### THROTTLE SENSOR

|                              |                 |
|------------------------------|-----------------|
| Accelerator pedal conditions | Resistance kΩ   |
| Completely released          | Approximately 1 |
| Partially released           | 1 - 9           |
| Completely depressed         | Approximately 9 |



# ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

## SECTION **FE**

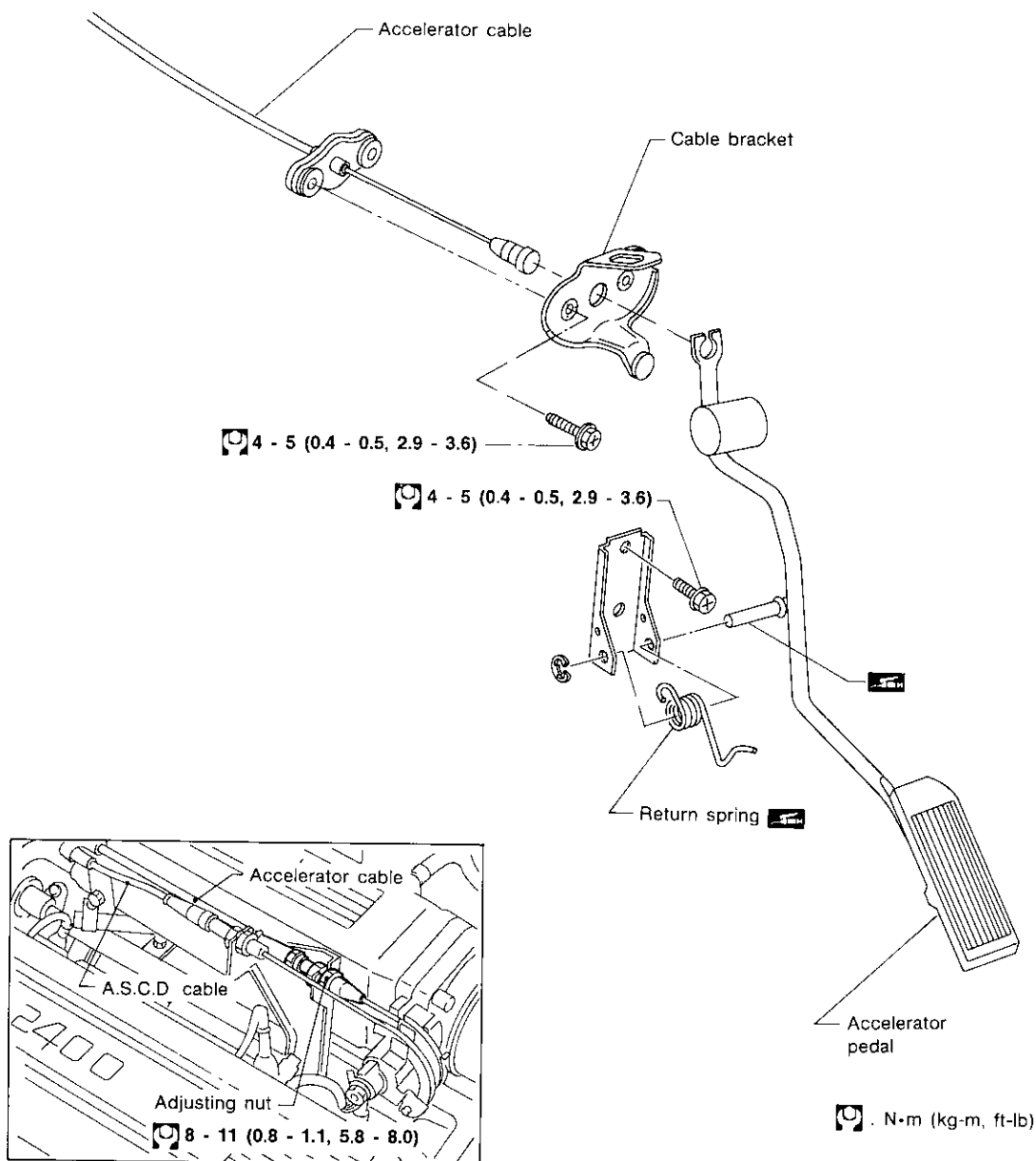
### CONTENTS

|                                  |      |
|----------------------------------|------|
| ACCELERATOR CONTROL SYSTEM ..... | FE-2 |
| FUEL SYSTEM .....                | FE-3 |
| EXHAUST SYSTEM .....             | FE-4 |



## ACCELERATOR CONTROL SYSTEM

- 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.
- Adjust accelerator cable according to the following procedure.  
Tighten "adjusting nut" until "throttle drum" starts to move.  
From that position turn back "adjusting nut" 1.5 to 2 turns, and fasten it with a lock nut.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator cable, be careful not to twist or scratch its inner wire.



SFE065A

## FUEL SYSTEM

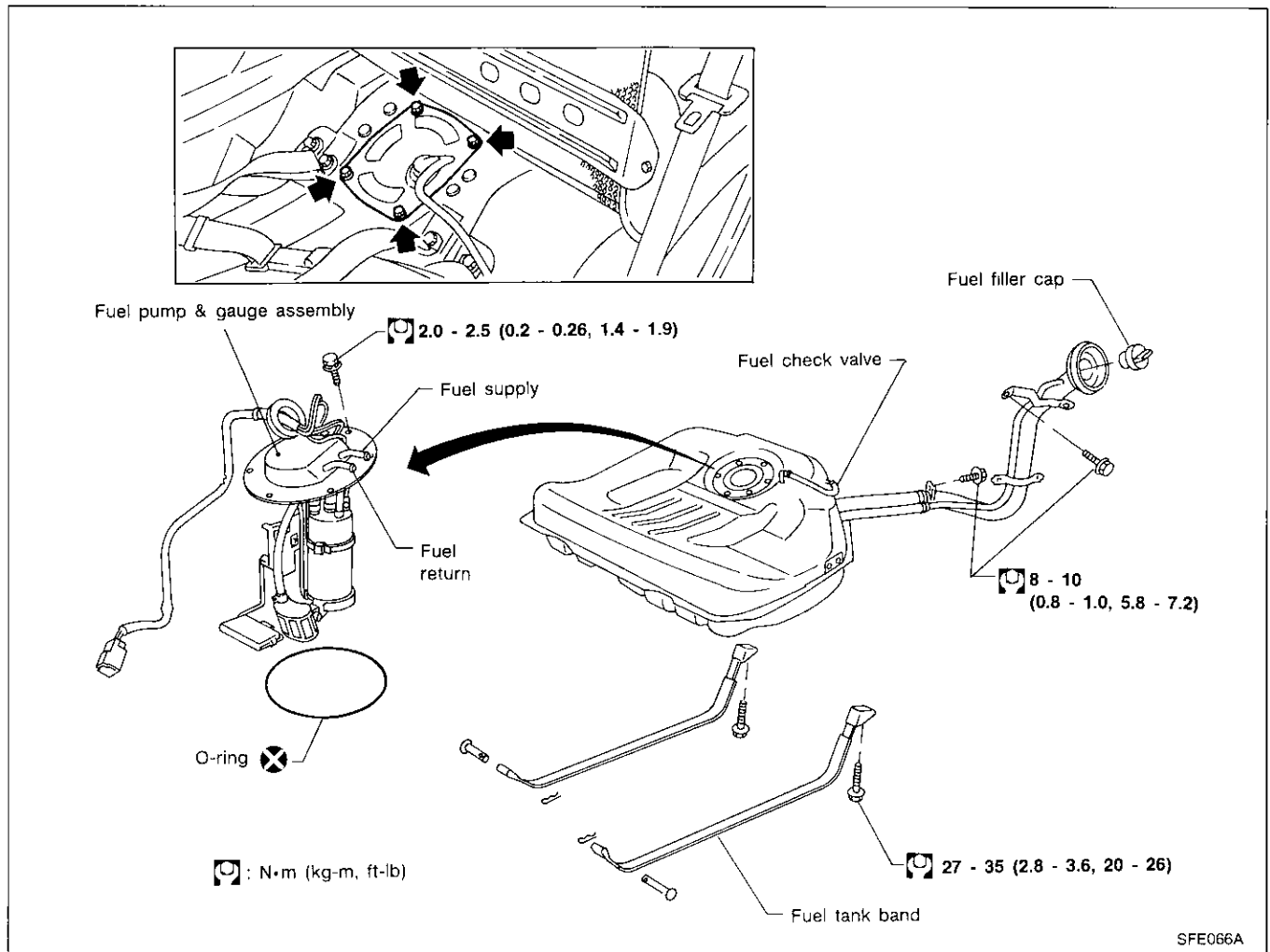
### WARNING:

When replacing fuel line parts, be sure to observe the following:

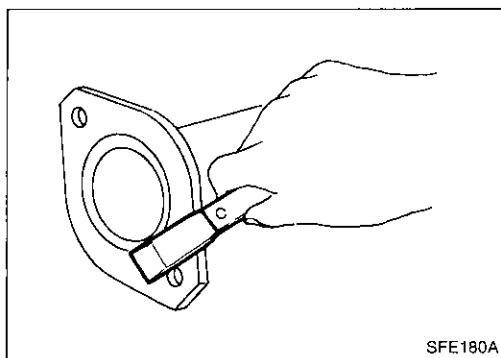
- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- Be sure to furnish workshop with a CO<sub>2</sub> fire extinguisher.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to disconnect battery ground cable before conducting operations.
- Put drained 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.
- When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)
- After assembly, run engine and check for fuel leaks at connections.

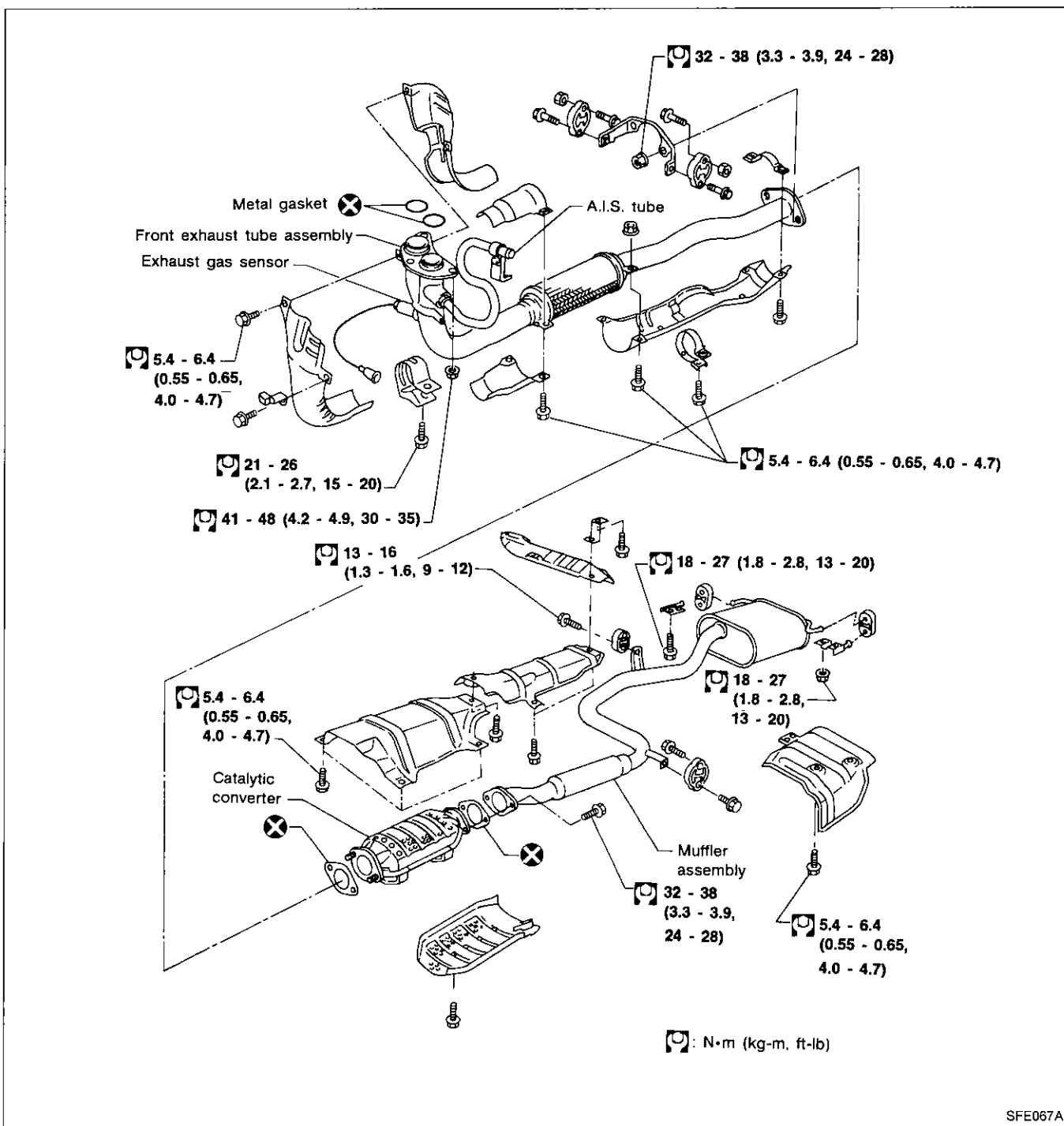


# EXHAUST SYSTEM



## CAUTION:

- Always replace exhaust gaskets with new ones when reassembling.  
If gasket is left on flange surface, scrape off completely as shown at left.
- With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.
- After installation, check to ensure that mounting brackets and mounting insulators are free from undue stress. If any of the above parts are not installed properly, excessive noise or vibration may be transmitted to the vehicle body.



# CLUTCH

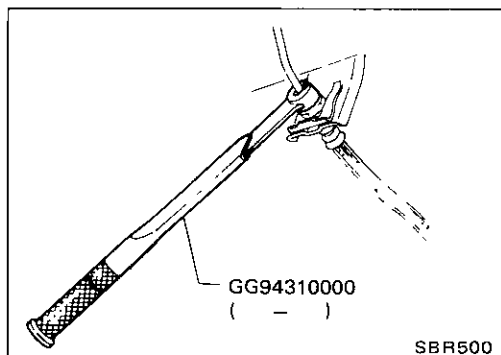
## SECTION **CL**

### CONTENTS

|                                                |       |
|------------------------------------------------|-------|
| PRECAUTIONS AND PREPARATION .....              | CL- 2 |
| CLUTCH SYSTEM — Hydraulic Type .....           | CL- 3 |
| INSPECTION AND ADJUSTMENT .....                | CL- 4 |
| HYDRAULIC CLUTCH CONTROL .....                 | CL- 6 |
| CLUTCH RELEASE MECHANISM .....                 | CL- 8 |
| CLUTCH DISC AND CLUTCH COVER .....             | CL- 9 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... | CL-12 |



## PRECAUTIONS AND PREPARATION



### Precautions

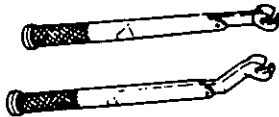
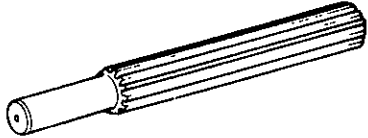
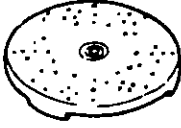
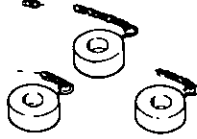
- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch piping, use Tool.
- Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.
- Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.

### WARNING:

After cleaning clutch disc, wipe it with a dust collector. Do not use compressed air.

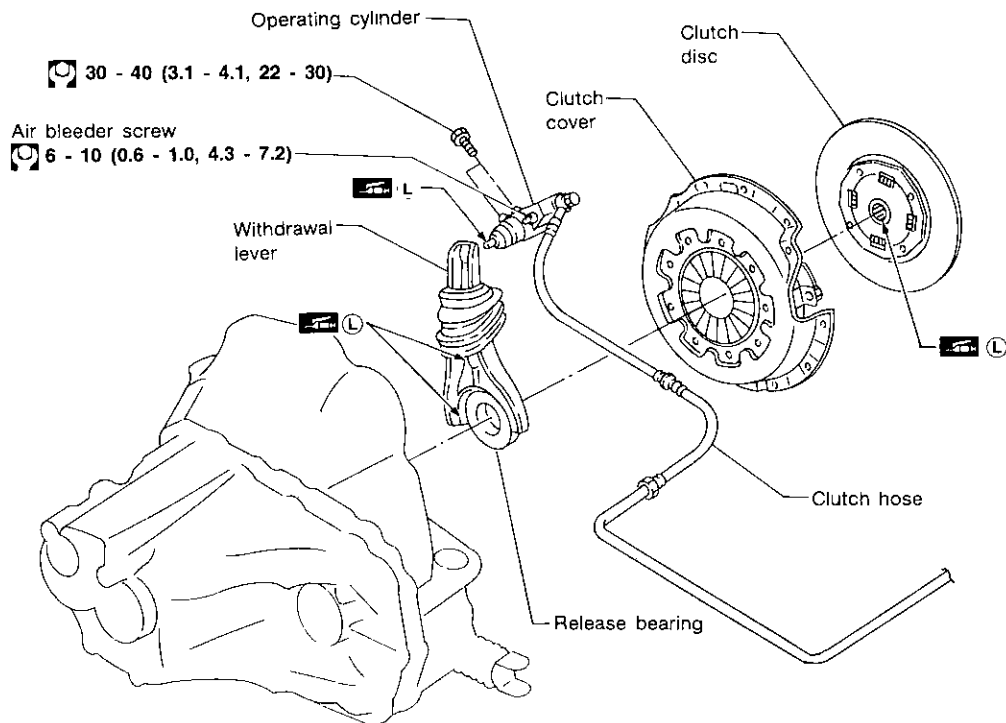
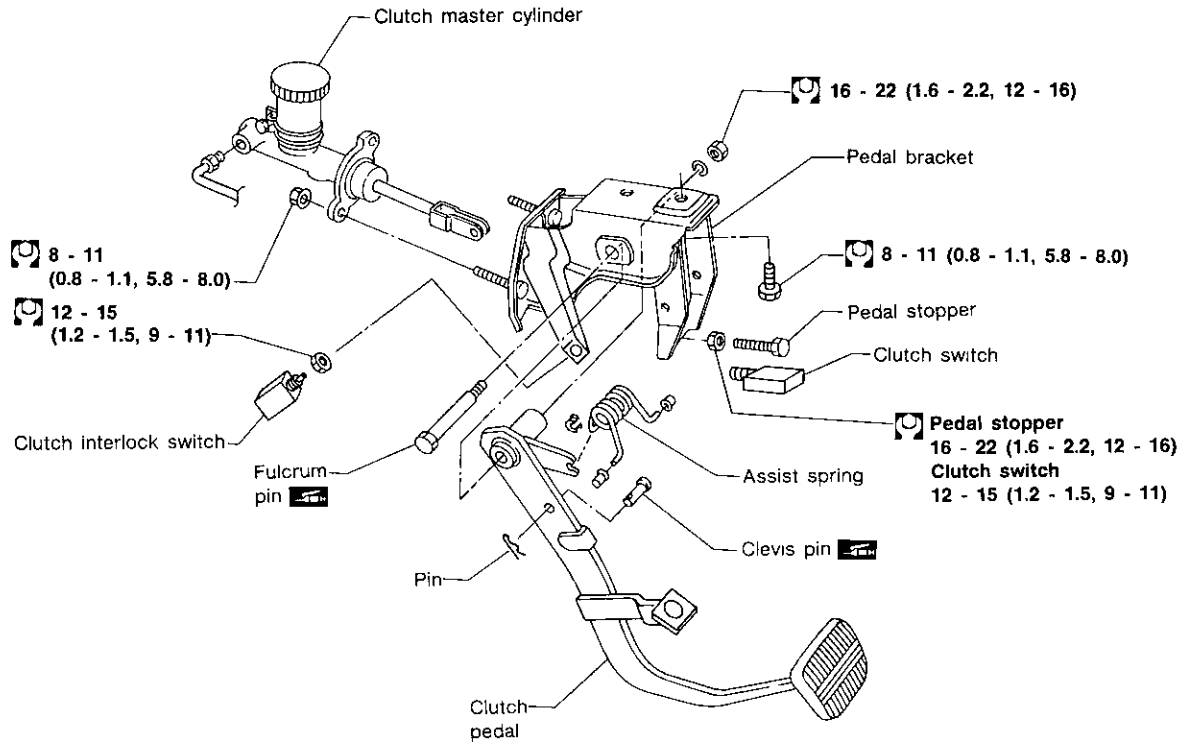
### Preparation

#### SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name                | Description                                                 |                                                                                      |
|-------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------|
| GG94310000<br>( - )<br>Flare nut torque<br>wrench           | Removing and installing clutch piping                       |   |
| KV30101000<br>(J33213)<br>Clutch aligning bar               | Installing clutch cover and clutch disc                     |  |
| ST20050010<br>( - )<br>Base plate                           | Inspecting diaphragm spring of clutch<br>cover              |  |
| ST20050100<br>( - )<br>Distance piece                       | Inspecting diaphragm spring of clutch<br>cover              |  |
| ST20050240<br>( - )<br>Diaphragm spring<br>adjusting wrench | Adjusting unevenness of diaphragm<br>spring of clutch cover |  |



# CLUTCH SYSTEM — Hydraulic Type



(L) : Apply lithium-based grease including molybdenum disulphide.

( ) : N·m (kg-m, ft-lb)

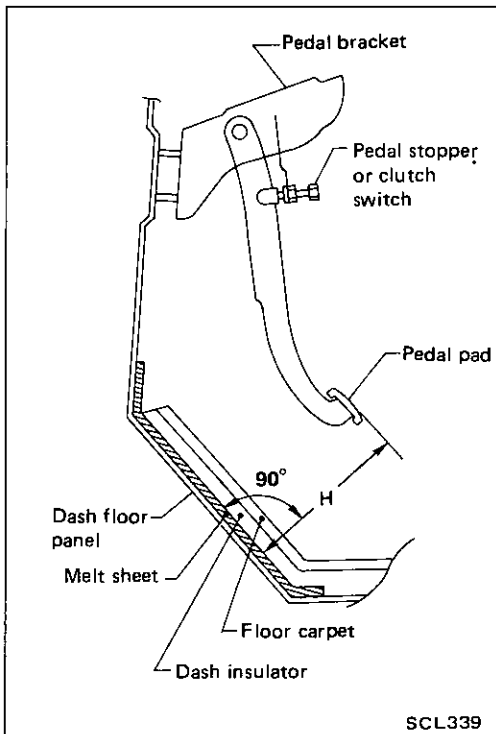
SCL387

### Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch switch.

**Pedal height "H":**

**165 - 175 mm (6.50 - 6.89 in)**



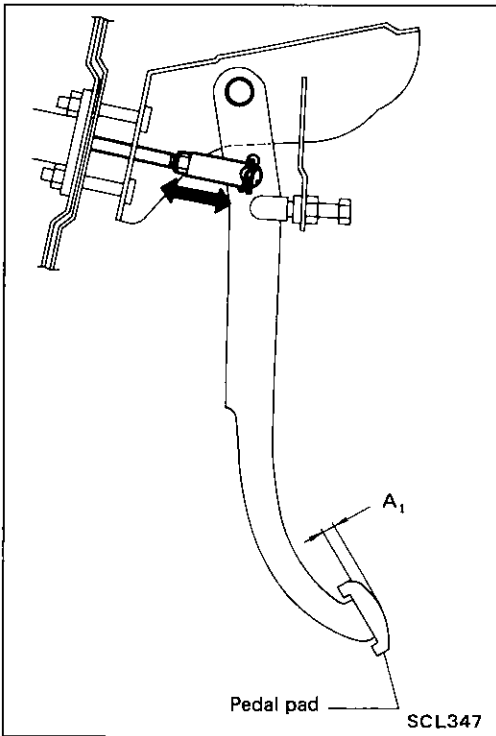
2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.

**Pedal free play "A<sub>1</sub>":**

**1.0 - 3.0 mm (0.039 - 0.118 in)**

**Pedal free play means the following total, measured at position of pedal pad:**

- Play due to clevis pin and clevis pin hole in clutch pedal.



## INSPECTION AND ADJUSTMENT

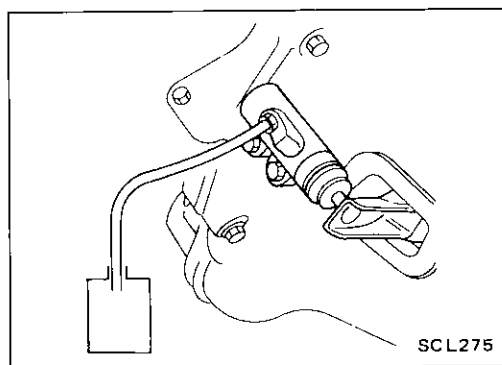
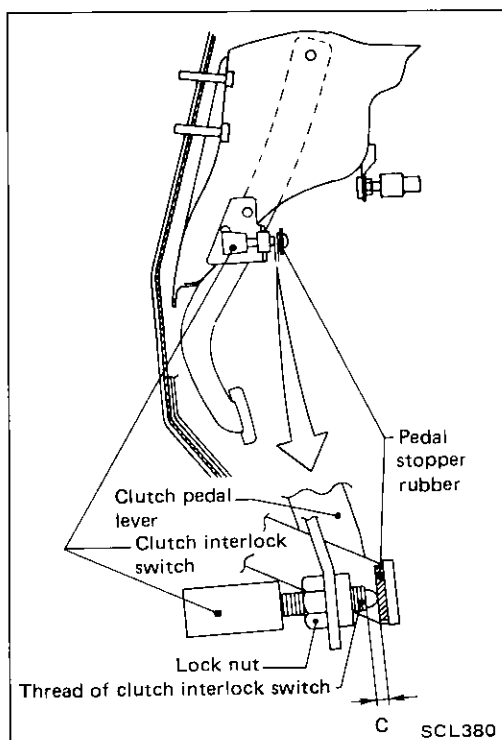
### Adjusting Clutch Pedal (Cont'd)

For U.S.A. model only

3. Adjust clearance "C" between pedal stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.

**Clearance C:**

**0.1 - 1.0 mm (0.004 - 0.039 in)**



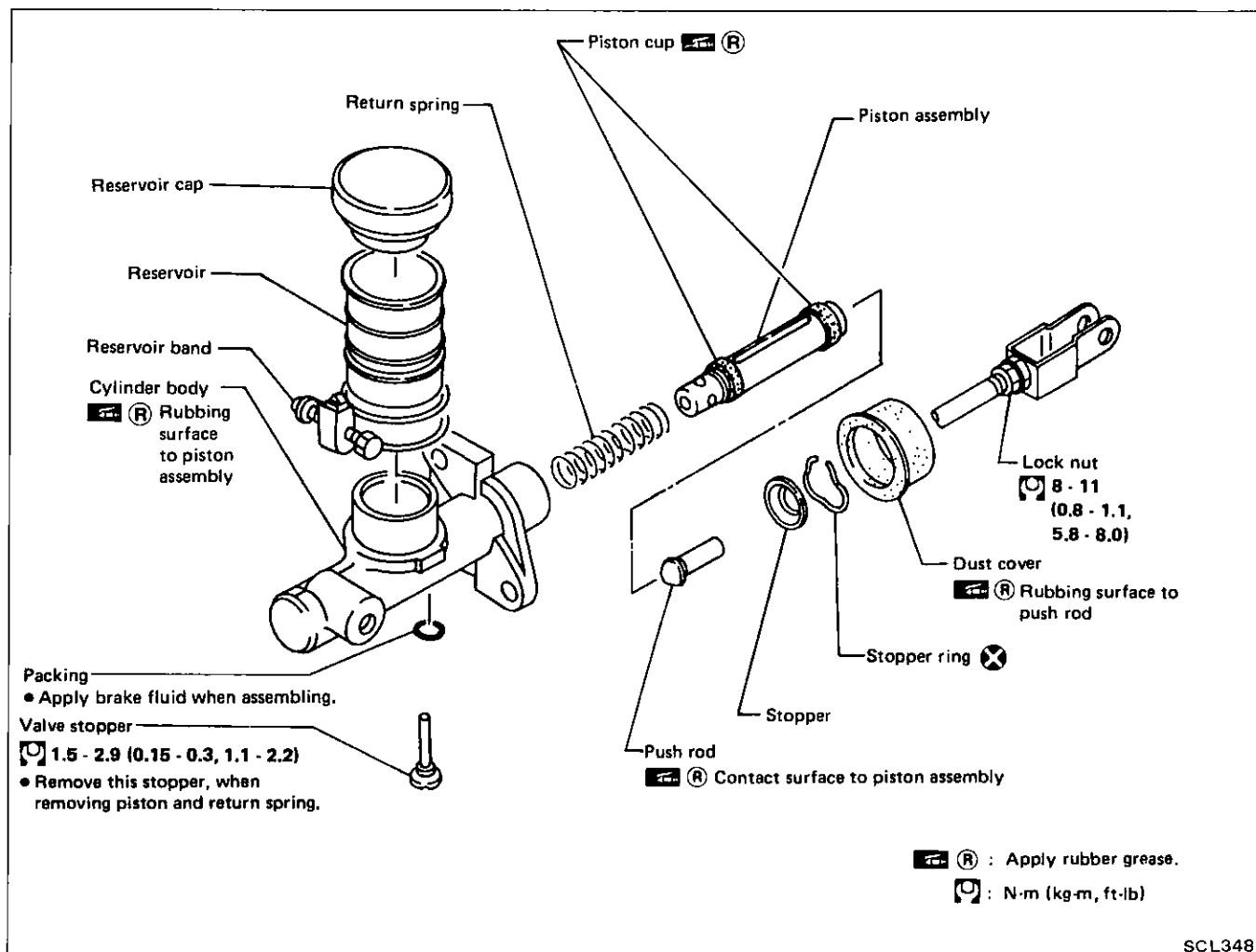
### Bleeding Procedure

Bleed air according to the following procedure.

- **Carefully monitor fluid level at master cylinder during bleeding operation.**
1. Top up reservoir with recommended brake fluid.
  2. Connect a transparent vinyl tube to air bleeder valve of clutch operating cylinder.
  3. Fully depress clutch pedal several times.
  4. With clutch pedal depressed, open bleeder valve to release air.
  5. Close bleeder valve.
  6. Repeat steps 3 through 5 above until clear brake fluid comes out of air bleeder valve.

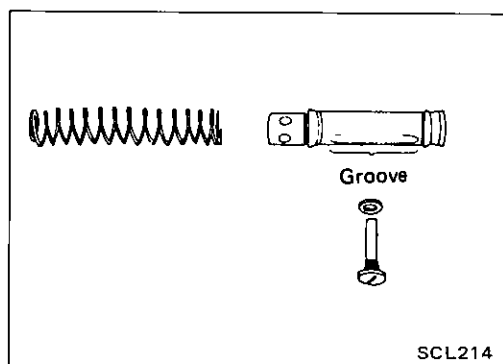
# HYDRAULIC CLUTCH CONTROL

## 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.

## HYDRAULIC CLUTCH CONTROL

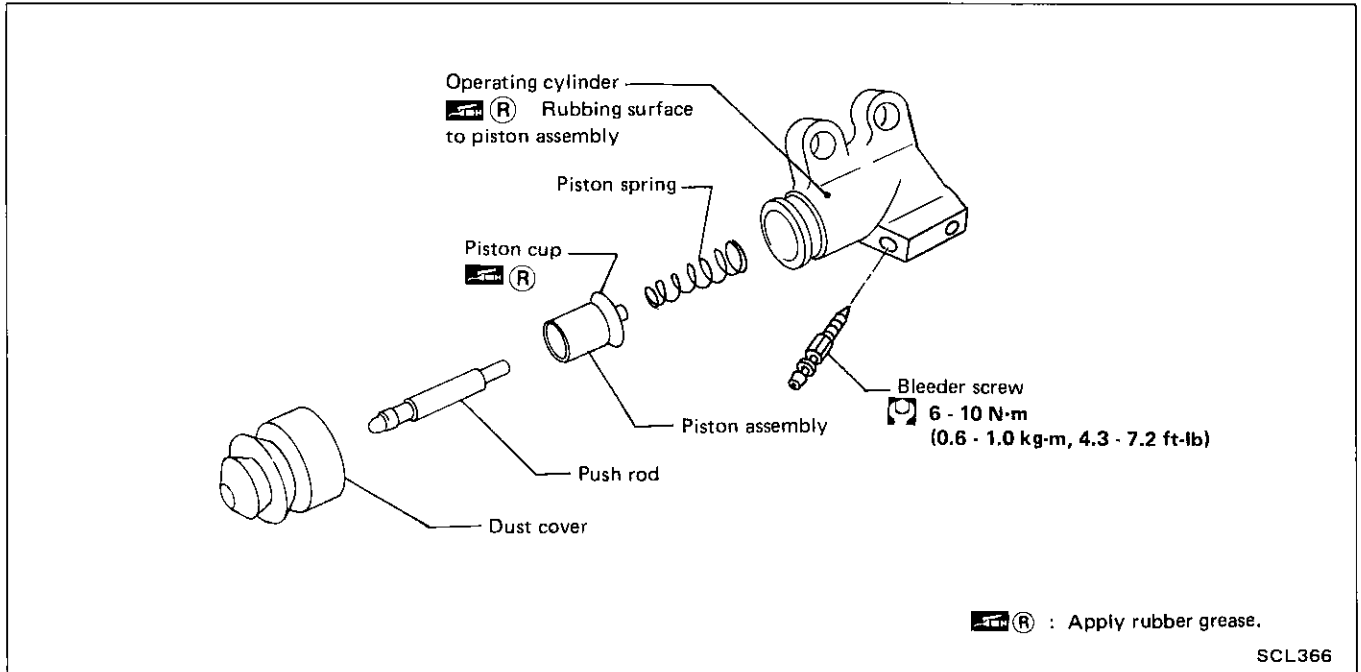
### Clutch Master Cylinder (Cont'd)

#### INSPECTION

Check the following items, and replace if necessary.

- Rubbing surface of cylinder and piston, for uneven wear, rust or damage
- Piston with piston cup, for wear or damage
- Return spring, for wear or damage
- Dust cover, for cracks, deformation or damage
- Reservoir, for deformation or damage

### Operating Cylinder

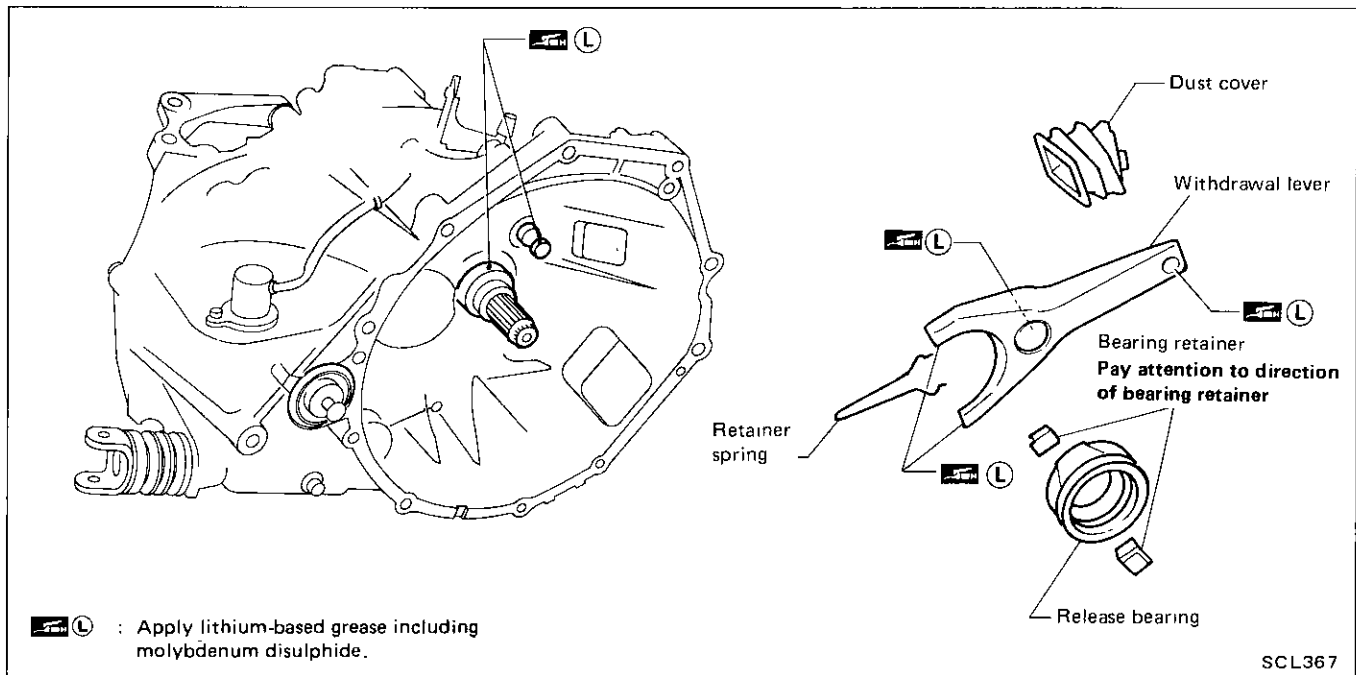


#### INSPECTION

Check the following items, and replace if necessary.

- Rubbing surface of cylinder and piston, for uneven wear, rest or damage
- Piston with piston cup, for wear or damage
- Piston spring, for wear or damage
- Dust cover, for cracks, deformation or damage

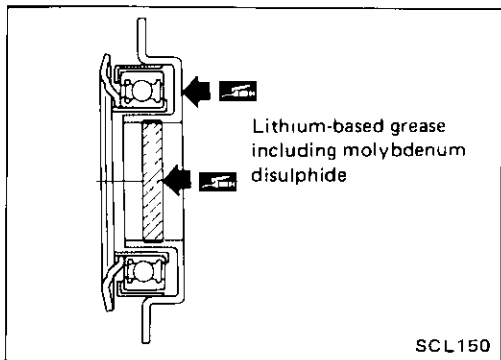
## CLUTCH RELEASE MECHANISM



### INSPECTION

Check the following items, and replace if necessary.

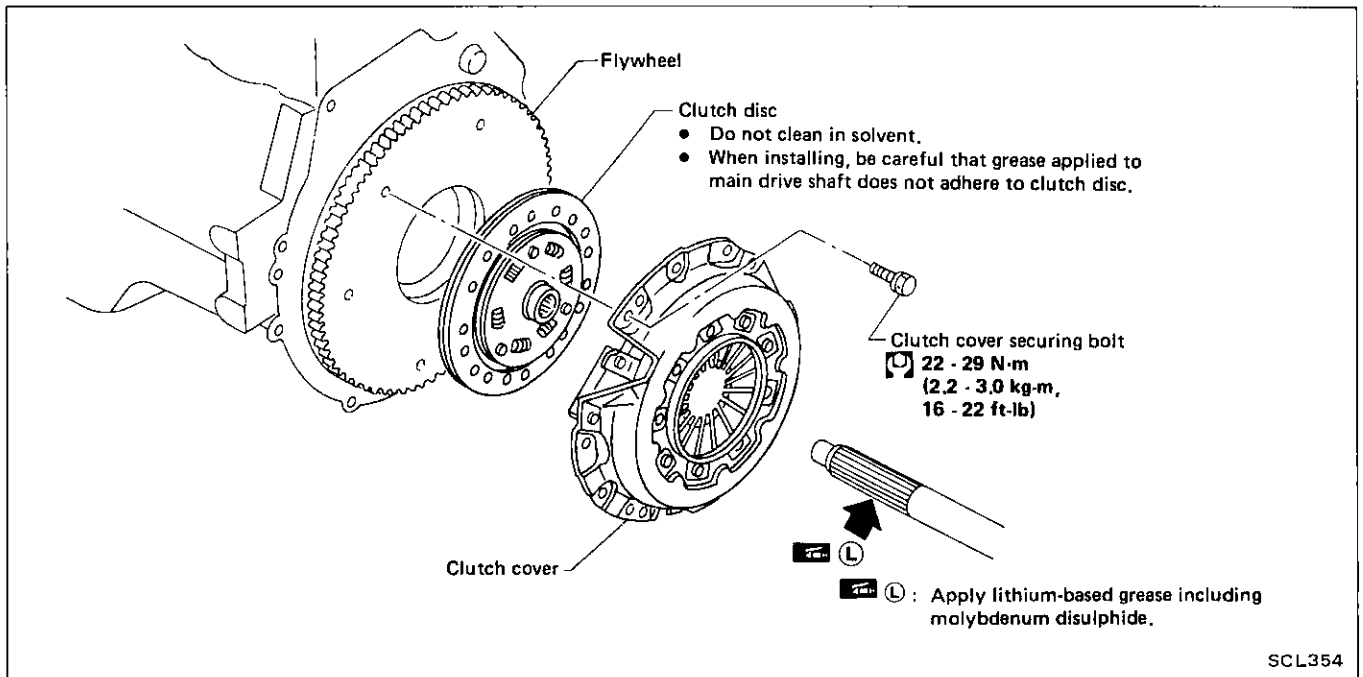
- Release bearing, to see that it rolls freely and is free from noise, cracks, pitting or wear
- Release sleeve and withdrawal lever rubbing surface, for wear, rust or damage



### LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.
- **Too much lubricant might damage clutch disc facing.**

## CLUTCH DISC AND CLUTCH COVER

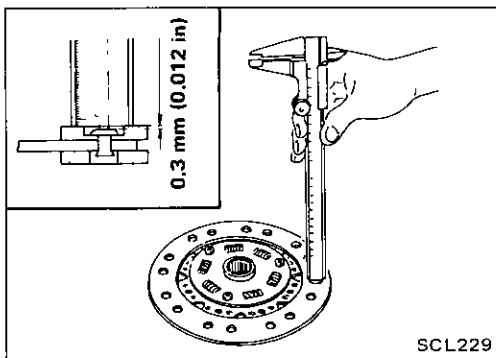


### Clutch Disc

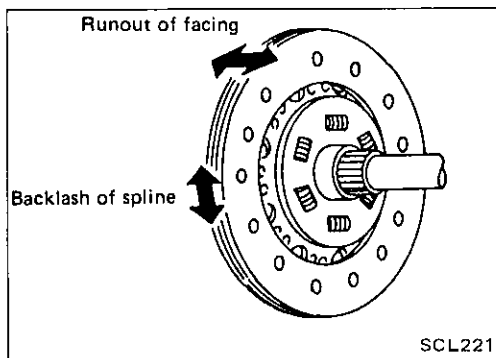
#### INSPECTION

Check the following items, and replace if necessary.

- Clutch disc, for burns, discoloration, oil or grease leakage



- Clutch disc, for wear of facing  
**Wear limit of facing surface to rivet head:**  
0.3 mm (0.012 in)



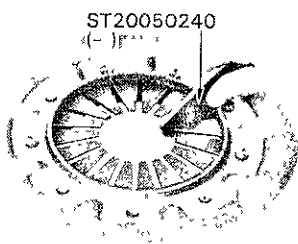
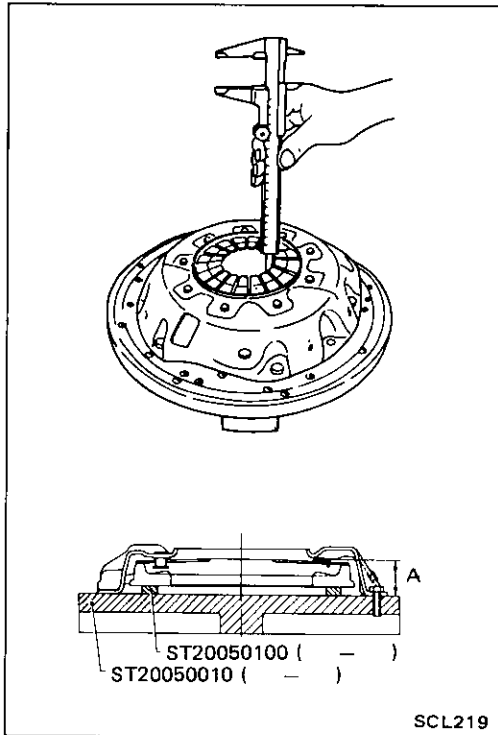
- Clutch disc, for backlash of spline  
**Maximum backlash of spline (at outer edge of disc):**  
0.9 mm (0.035 in)
- Clutch disc, for runout of facing  
**Runout limit:**  
1.0 mm (0.039 in)  
**Distance of runout check point (from hub center)**  
107.5 mm (4.23 in)

## CLUTCH DISC AND CLUTCH COVER

### Clutch Disc (Cont'd)

#### INSTALLATION

- Apply recommended grease to contact surface of spline portion.
- Too much lubricant might damage clutch facing.



### Clutch Cover and Flywheel

#### INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.
- Set 0.4 mm (0.016 in) feeler gauges on distance pieces (ST20050100) when checking diaphragm spring height.

##### Diaphragm spring height "A":

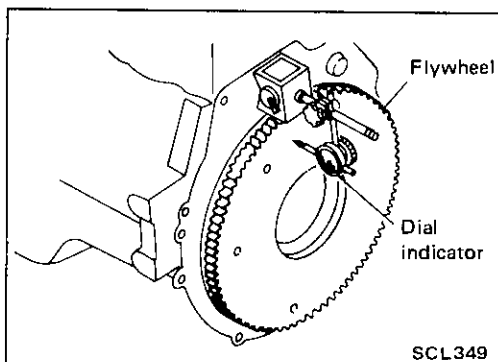
33.0 - 35.0 mm (1.299 - 1.378 in)

- Check thrust rings for wear or damage by shaking cover assembly and listening for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.

- Adjust unevenness of diaphragm spring with Tool.

##### Uneven limit:

0.7 mm (0.028 in)



#### FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.

##### Runout (Total indicator reading):

Less than 0.15 mm (0.0059 in)

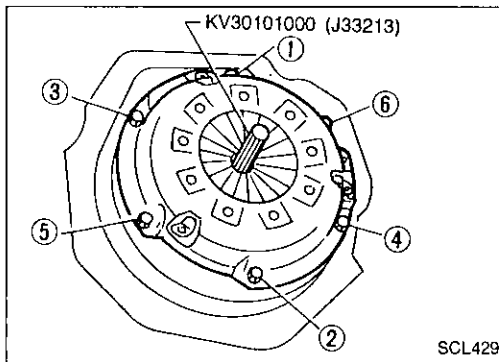


## CLUTCH DISC AND CLUTCH COVER

### Clutch Cover and Flywheel (Cont'd)

#### 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.



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

### 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

Unit: mm (in)

|                                                   |                                                                 |
|---------------------------------------------------|-----------------------------------------------------------------|
| Model                                             | 225TBL                                                          |
| Facing size (Outer dia. x inner dia. x thickness) | 225 x 150 x 3.5<br>(8.86 x 5.91 x 0.138)                        |
| Thickness of disc assembly<br>With load           | 8.0 - 8.4 (0.315 - 0.331)<br>with 5,394 N<br>(550 kg, 1,213 lb) |

#### CLUTCH COVER

|           |                                |
|-----------|--------------------------------|
| Model     | C225S                          |
| Full-load | N (kg, lb)<br>4,413 (450, 992) |

### Inspection and Adjustment

#### CLUTCH PEDAL

Unit: mm (in)

|                                                                                                                        |                           |
|------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Pedal height*                                                                                                          | 165 - 175 (6.50 - 6.89)   |
| Pedal free play                                                                                                        | 1.0 - 3.0 (0.039 - 0.118) |
| Clearance between pedal stopper rubber and clutch interlock switch threaded end while clutch pedal is fully depressed. | 0.1 - 1.0 (0.004 - 0.039) |

\*: Measured from surface of melt sheet to pedal pad

#### CLUTCH DISC

Unit: mm (in)

|                                                      |              |
|------------------------------------------------------|--------------|
| Model                                                | 225TBL       |
| 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) | 107.5 (4.23) |
| Maximum backlash of spline (at outer edge disc)      | 0.9 (0.035)  |

#### CLUTCH COVER

Unit: mm (in)

|                                             |                             |
|---------------------------------------------|-----------------------------|
| Model                                       | C225S                       |
| Diaphragm spring height                     | 33.0 - 35.0 (1.299 - 1.378) |
| Uneven limit of diaphragm spring toe height | 0.7 (0.028)                 |

# MANUAL TRANSAXLE

## SECTION **MT**

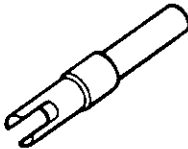
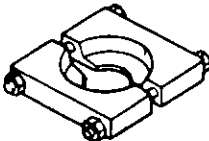
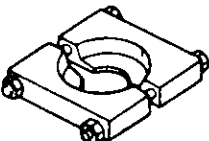
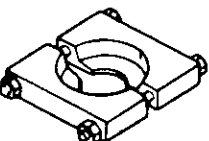
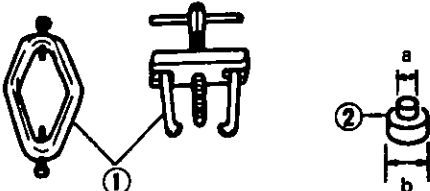
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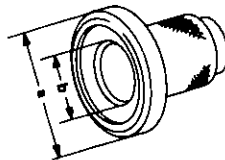
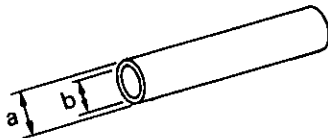
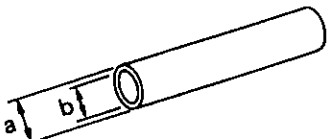
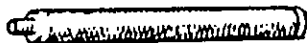
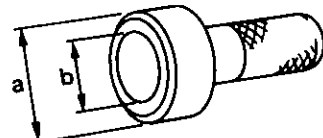
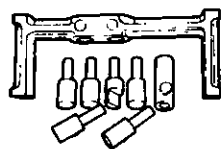


# PREPARATION

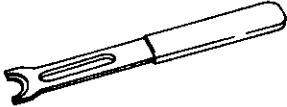
## SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name                                                                                           | Description                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| KV38106500<br>(J34284)<br>Preload adapter                                                                                              | Measuring turning torque of final drive assembly<br>Measuring total turning torque<br>Measuring clearance between side gear and differential case with washer<br>Selecting differential side bearing adjusting shim<br> |
| KV32101000<br>(J25689-A)<br>Pin punch                                                                                                  | Removing and installing retaining pin<br>                                                                                                                                                                               |
| ST22730000<br>(J25681)<br>Puller                                                                                                       | Removing mainshaft front and rear bearing inner race<br>                                                                                                                                                                |
| ST30031000<br>(J22912-01)<br>Puller                                                                                                    | Removing input shaft front and rear bearing<br>Removing 4th & 5th main gear<br>                                                                                                                                        |
| ST30021000<br>(J22912-01)<br>Puller                                                                                                    | Removing 5th synchronizer<br>Removing 3rd & 4th synchronizer<br>Removing 2nd & 3rd main gear<br>                                                                                                                      |
| ST3306S001<br>( — )<br>Differential side bearing puller set<br>① ST33051001<br>( — )<br>Puller<br>② ST33061000<br>(J8107-2)<br>Adapter | Removing differential side bearing inner race<br><br>a: 28.5 mm (1.122 in) dia.<br>b: 38 mm (1.50 in) dia.                                                                                                            |
| ST33290001<br>(J34286)<br>Puller                                                                                                       | Removing differential oil seal<br>Removing mainshaft rear bearing outer race<br>Removing differential side bearing outer race<br>                                                                                     |

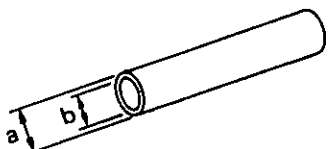
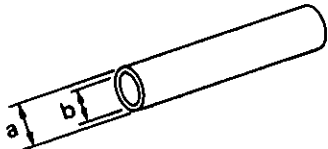
# PREPARATION

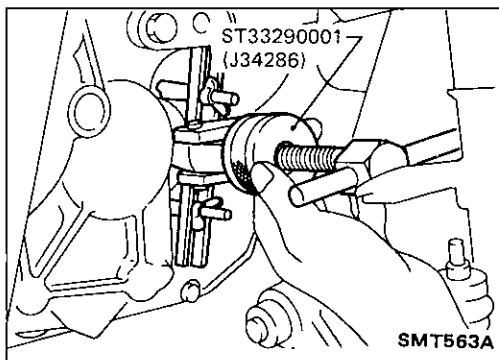
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description                                                                                                                                                                                                                   |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST33400001<br>(J26082)<br>Drift              | Installing differential oil seal<br> <p>a: 60 mm (2.36 in) dia.<br/>b: 47 mm (1.85 in) dia.</p>                                            |
| ST30600000<br>(J25863-01)<br>Drift           | Installing input shaft front bearing<br> <p>a: 36 mm (1.42 in) dia.<br/>b: 31 mm (1.22 in) dia.</p>                                        |
| ST22452000<br>( — )<br>Drift                 | Installing 3rd, 4th and 5th main gear<br> <p>a: 45 mm (1.77 in) dia.<br/>b: 36 mm (1.42 in) dia.</p>                                       |
| ST30621000<br>(J25742-5)<br>Drift            | Installing mainshaft rear bearing<br>outer race<br>(Use with ST30611000.)<br> <p>a: 79 mm (3.11 in) dia.<br/>b: 59 mm (2.32 in) dia.</p> |
| ST30611000<br>(J25742-1)<br>Drift            | Installing mainshaft rear bearing<br>outer race<br>(Use with ST30621000.)<br>                                                            |
| ST307200000<br>( — )<br>Drift                | Installing differential side bearing<br>outer race<br> <p>a: 77 mm (3.03 in) dia.<br/>b: 55.5 mm (2.185 in) dia.</p>                     |
| (J34290)<br>Shim selecting tool set          | Selecting differential side bearing ad-<br>justing shim<br>                                                                              |

## PREPARATION

| Tool number<br>(Kent-Moore No.)<br>Tool name   | Description                                                                                                                                 |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| (J34305)<br>Snap ring remover and<br>installer | Removing and installing stopper ring<br>of shift fork<br> |
| (J25407-2)                                     | Measuring reverse baulk ring wear<br>                     |

## COMMERCIAL SERVICE TOOLS

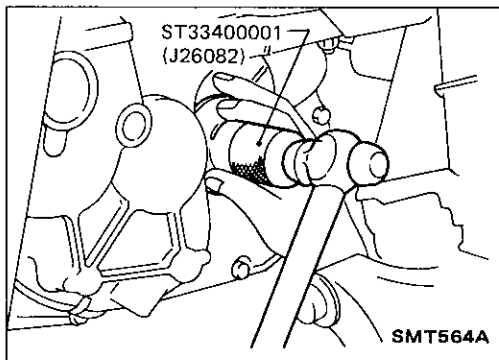
| Tool name | Description                                                                                                                                                                                 |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drift     | Installing differential side bearing inner race<br><br>a: 45 mm (1.77 in) dia.<br>b: 41 mm (1.61 in) dia. |
| Drift     | Installing striking rod oil seal<br><br>a: 38 mm (1.50 in) dia.<br>b: 20 mm (0.79 in) dia.              |



### Replacing Oil Seal

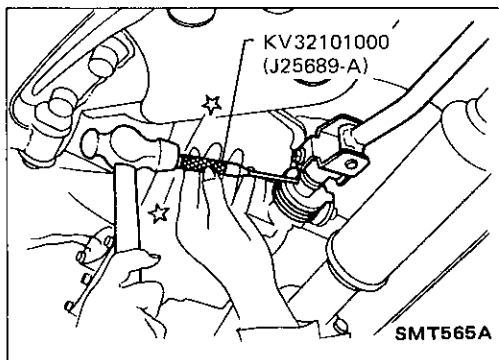
#### DIFFERENTIAL OIL SEAL

1. Drain gear oil from transaxle.
2. Remove drive shafts — Refer to section FA.
3. Remove differential oil seal.



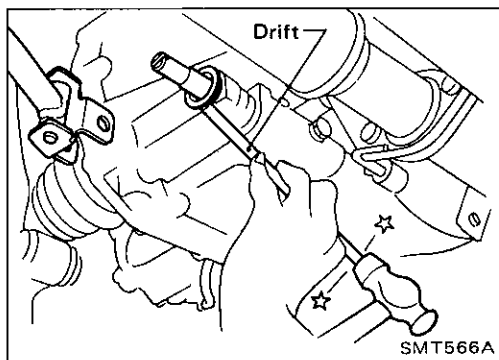
4. Install differential oil seal.

- **Apply multi-purpose grease to seal lip of oil seal before installing.**
5. Install drive shafts — Refer to section FA.

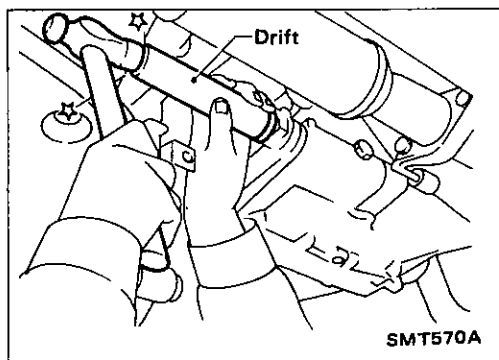


#### STRIKING ROD OIL SEAL

1. Remove transaxle control rod from yoke.
  2. Remove retaining pin of yoke.
- **Be careful not to damage boot.**

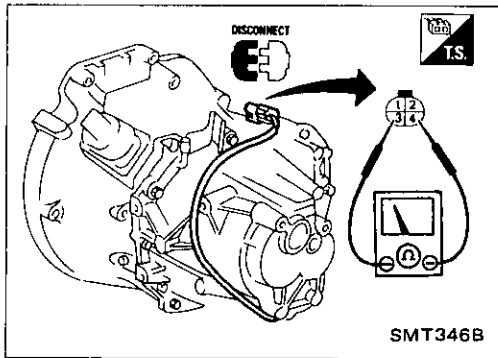


3. Remove striking rod oil seal.



4. Install striking rod oil seal.

- **Apply multi-purpose grease to seal lip of oil seal before installing.**

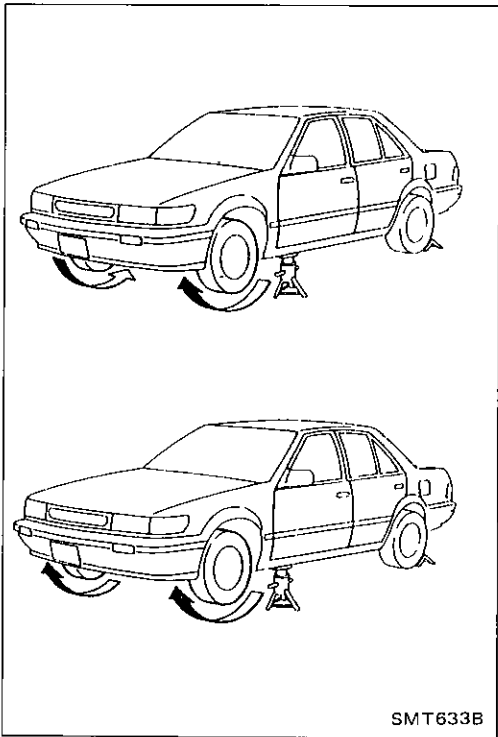


## Position Switch Check

### BACK-UP LAMP SWITCH AND NEUTRAL SWITCH

- Check continuity.

| Gear position              | Continuity |
|----------------------------|------------|
| Reverse                    | ② — ④      |
| Neutral                    | ① — ③      |
| Except reverse and neutral | No         |



## Viscous Coupling Check

1. Apply parking brake firmly and place shift lever in the neutral position.
2. Jack up front wheels.
3. Rotate one front wheel and check turning direction of the other front wheel.

### Turning direction of the two wheels is opposite:

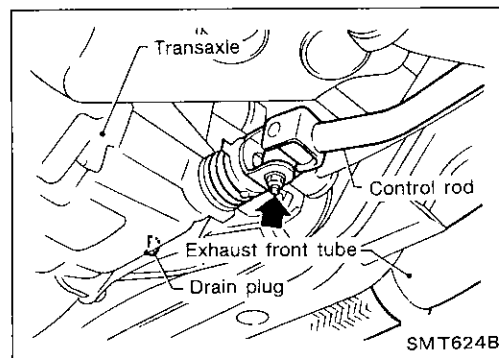
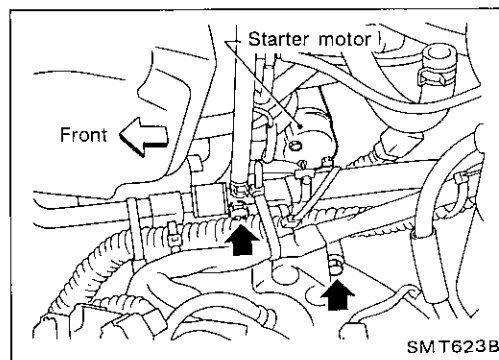
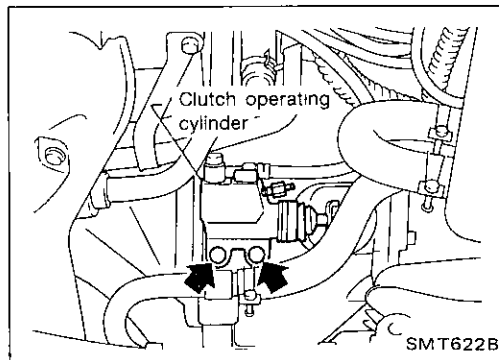
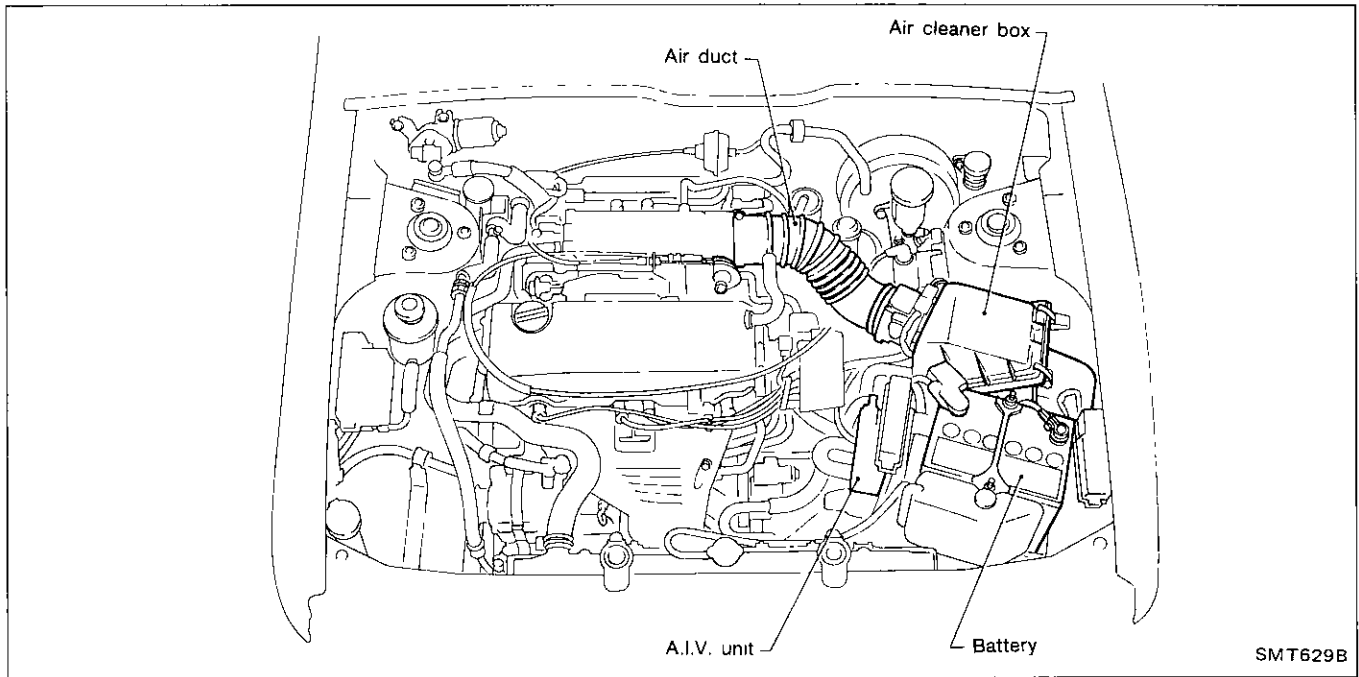
The viscous coupling is not functioning normally.

### Turning direction of the two wheels is the same:

If differential side gear and pinion mate gear thrust washers are O.K., viscous coupling is functioning normally.



## REMOVAL AND INSTALLATION



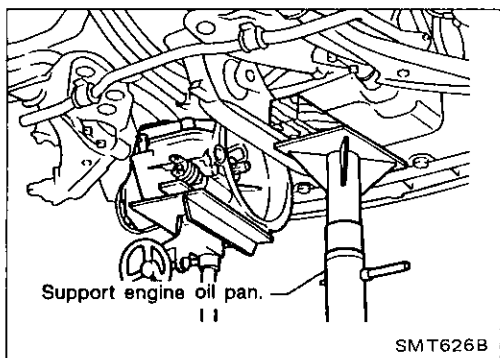
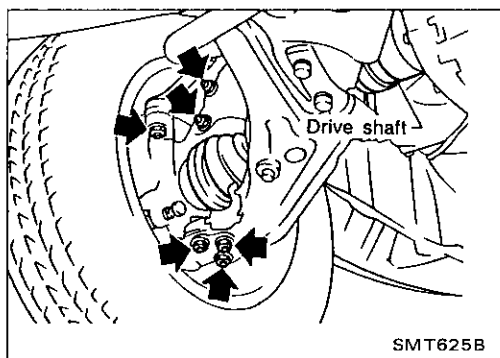
### Removal

1. Remove battery and bracket.
2. Remove air cleaner box with air flow meter.
3. Remove air duct.
4. Remove A.I.V. unit.
5. Remove clutch operating cylinder from transaxle.
6. Remove clutch hose clamp.
7. Disconnect speedometer pinion and position switch connectors.
8. Remove transaxle breather hose clamp.
9. Remove starter motor from transaxle.
10. Remove shift control rod from transaxle.
11. Drain gear oil from transaxle.
12. Remove exhaust front tube.

## REMOVAL AND INSTALLATION

### Removal (Cont'd)

13. Draw out drive shafts from transaxle.

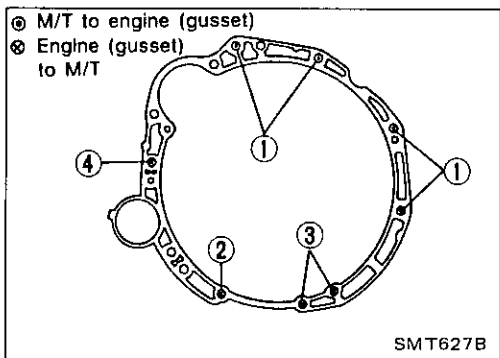


14. Support engine by placing a jack under oil pan.

#### CAUTION:

**Do not place jack under oil pan drain plug.**

15. Remove rear and L.H. mounts.
16. Remove bolts securing transaxle.
17. Lower transaxle while supporting it with a jack.



### Installation

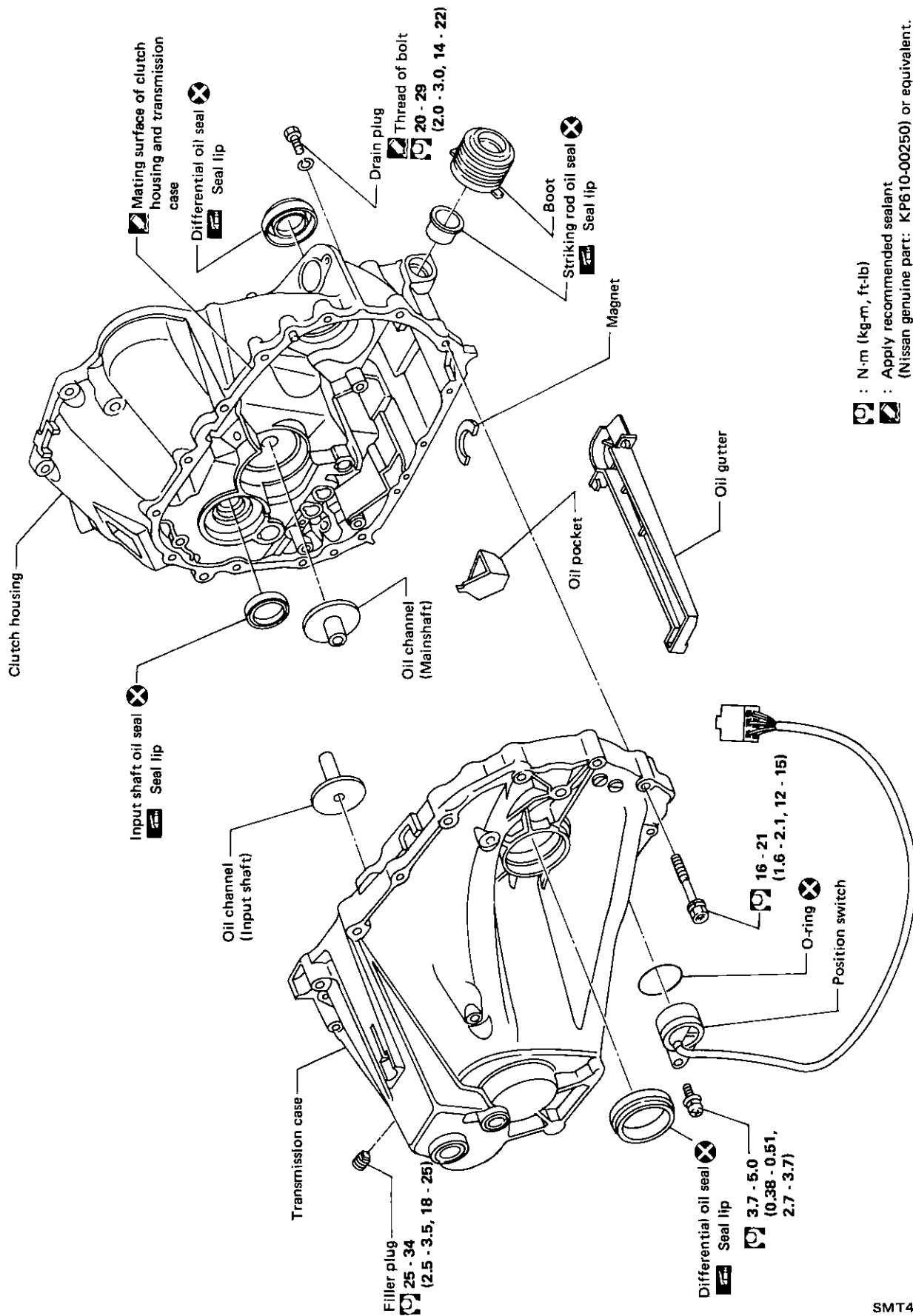
1. Tighten bolts securing transaxle.

| Bolt No. | Tightening torque<br>N·m (kg-m, ft-lb) | mm (in)   |
|----------|----------------------------------------|-----------|
| 1        | 39 - 49 (4.0 - 5.0, 29 - 36)           | 45 (1.77) |
| 2        | 39 - 49 (4.0 - 5.0, 29 - 36)           | 25 (0.98) |
| 3        | 30 - 40 (3.1 - 4.1, 22 - 30)           | 30 (1.18) |
| 4        | 30 - 40 (3.1 - 4.1, 22 - 30)           | 40 (1.57) |



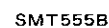
# MAJOR OVERHAUL

## Case Components

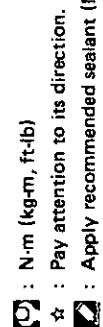


⊗ : N·m (kg·m, ft·lb)

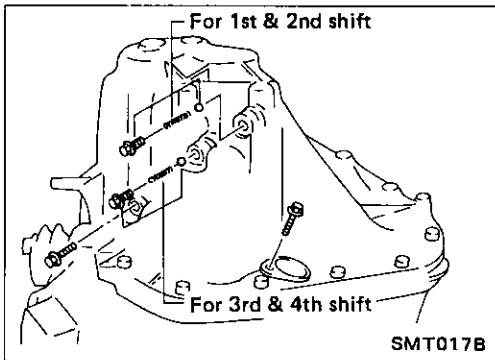
⊗ : Apply recommended sealant  
(Nissan genuine part: KP610-00250) or equivalent.



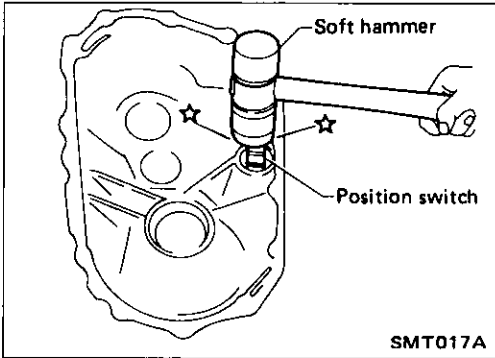
## Shift Control Components

**MT-12**

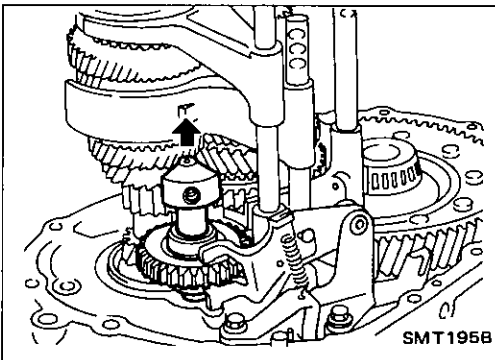
## DISASSEMBLY



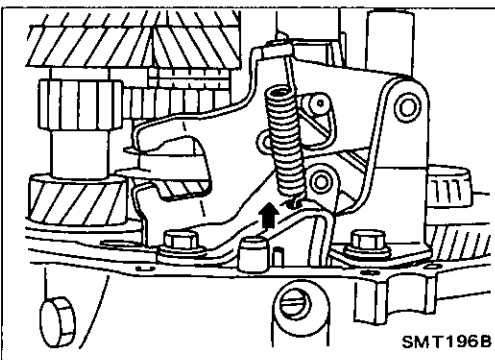
1. Before removing transmission case, remove bolts and plugs as shown left.
2. Remove transmission case.



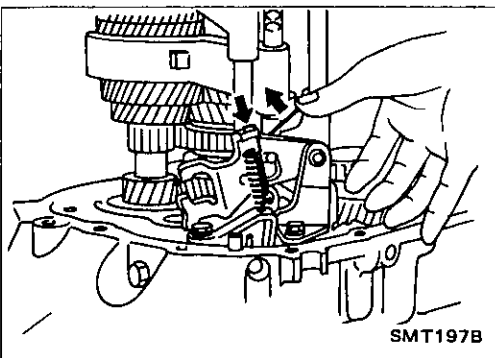
3. Remove position switch.



4. Mesh 4th gear, and then remove reverse idler shaft and reverse idler gear.

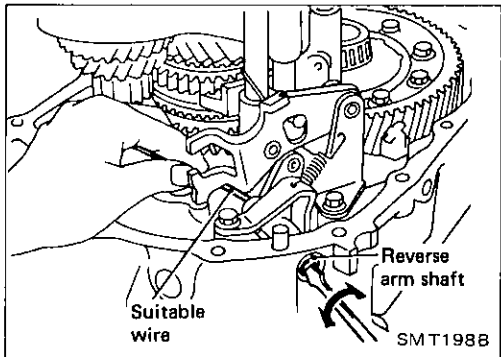


5. Pull out retaining pin from clutch housing.

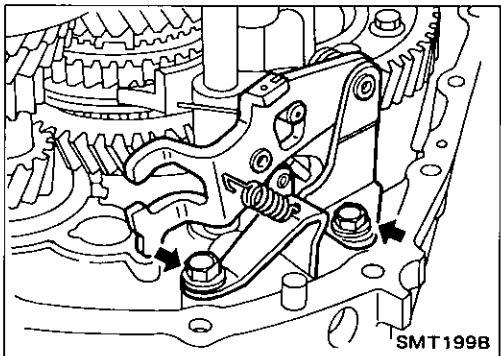


6. Remove reverse lever spring and reverse lock spring from reverse lever assembly.

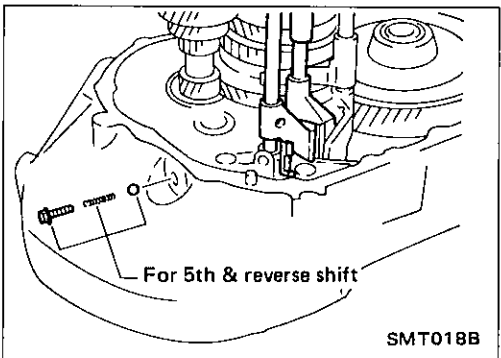
## DISASSEMBLY



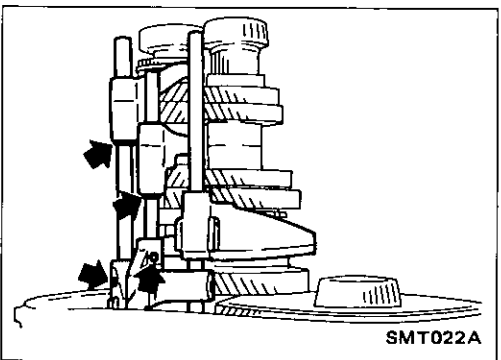
7. Remove reverse arm shaft while rotating it.



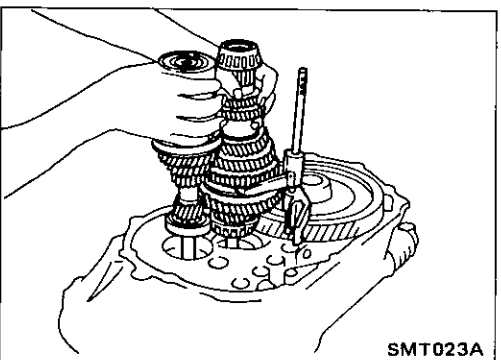
8. Remove reverse lever assembly.



9. Remove 5th & reverse check plug, spring and ball.



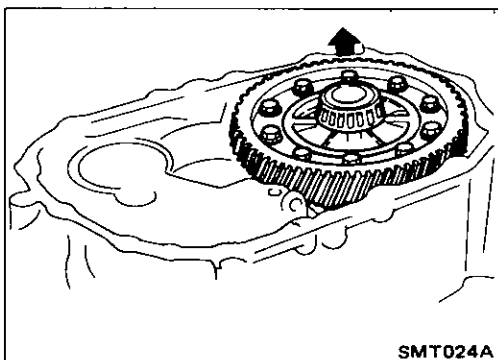
10. Remove stopper rings and retaining pins from 5th & reverse and 3rd & 4th fork rods.
11. Remove 5th & reverse and 3rd & 4th fork rods. Then remove forks and brackets.



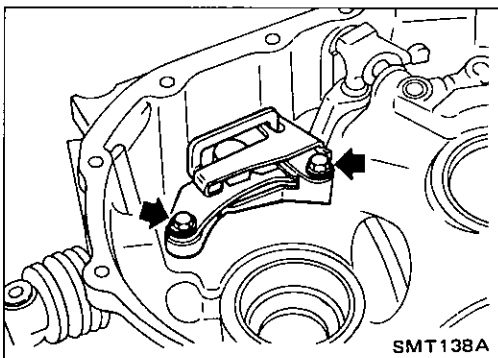
12. Remove both input and mainshafts with 1st & 2nd fork and fork rod as a set.



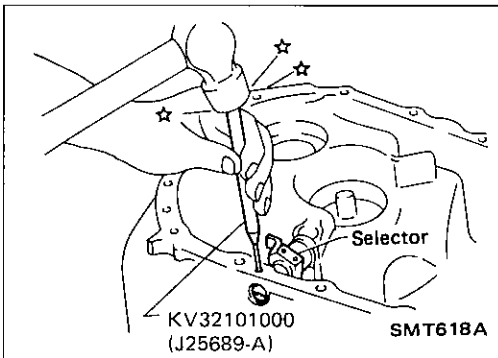
## DISASSEMBLY



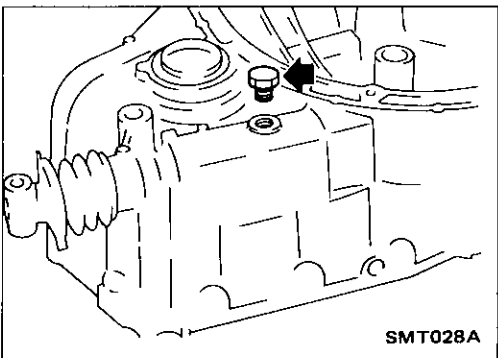
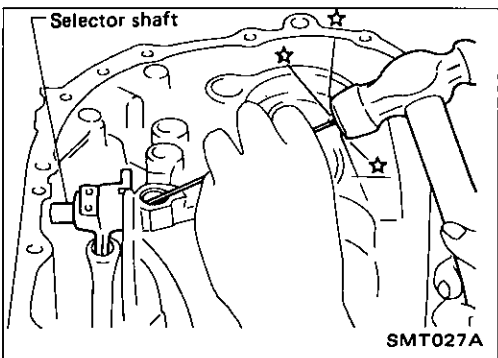
13. Remove final drive assembly.



14. Remove reverse check assembly.



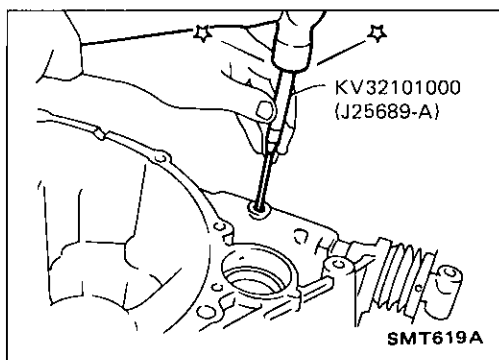
15. Remove retaining pin and detach the selector.



16. Remove drain plug for convenience in removing retaining pin which holds striking lever to striking rod.

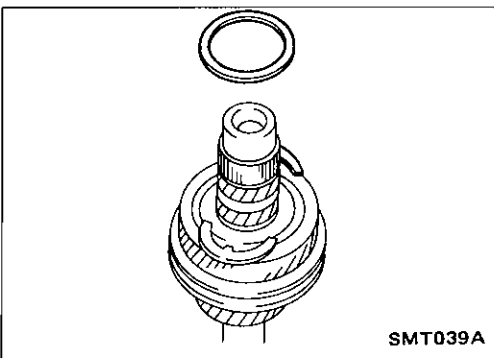
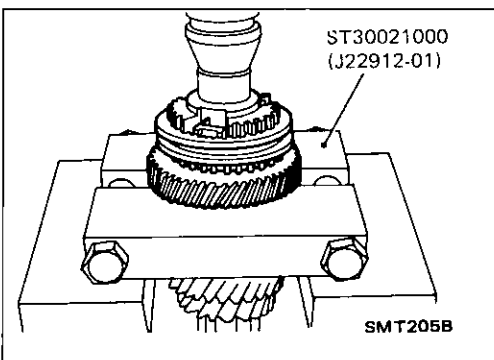
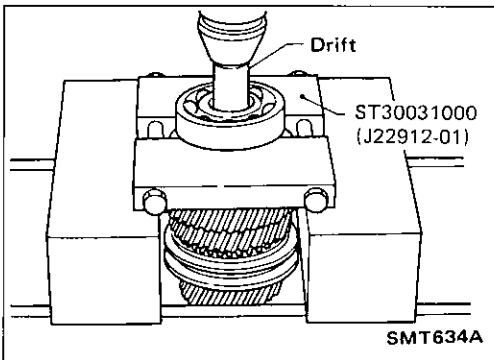
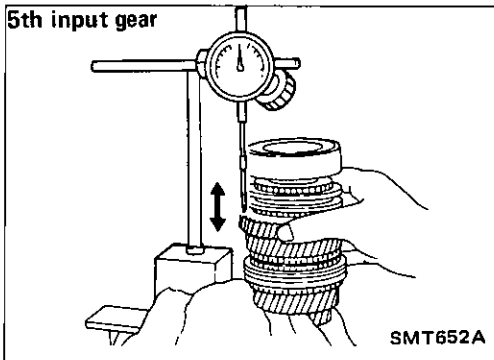
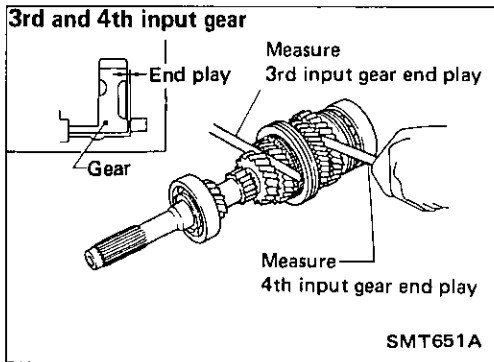
## DISASSEMBLY

---



17. Remove retaining pin and then withdraw striking lever and striking rod.

## REPAIR FOR COMPONENT PARTS



### Input Shaft and Gears

#### DISASSEMBLY

1. Before disassembly, check 3rd, 4th and 5th input gear end plays.

#### Gear end play

| Gears          | End play mm (in)              |
|----------------|-------------------------------|
| 3rd input gear | 0.23 - 0.43 (0.0091 - 0.0169) |
| 4th input gear | 0.25 - 0.55 (0.0098 - 0.0217) |
| 5th input gear | 0.23 - 0.48 (0.0091 - 0.0189) |

- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring and thrust washer — Refer to "Assembly".

2. Remove input shaft rear bearing.

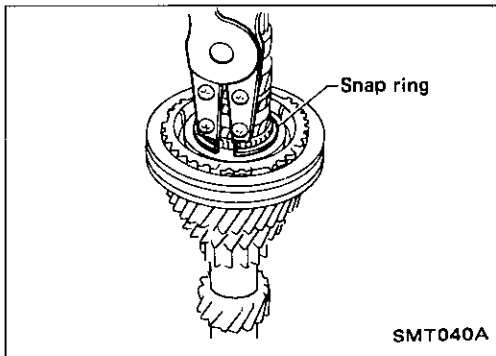
3. Remove 5th & reverse synchronizer and 5th input gear.

4. Remove thrust washer ring, thrust washers and 4th input gear.

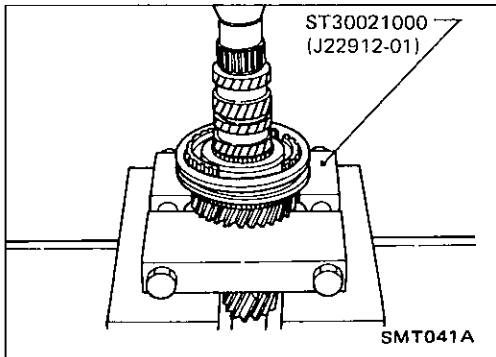
## REPAIR FOR COMPONENT PARTS

### Input Shaft and Gears (Cont'd)

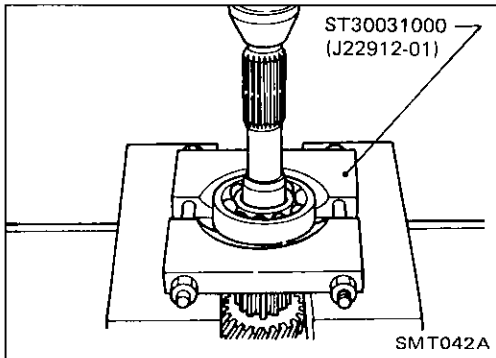
5. Remove snap ring.



6. Remove 3rd & 4th synchronizer and 3rd input gear.



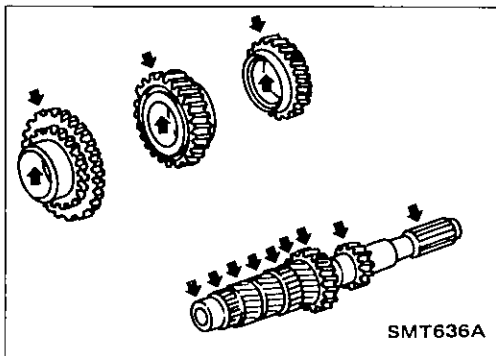
7. Remove input shaft front bearing.



### INSPECTION

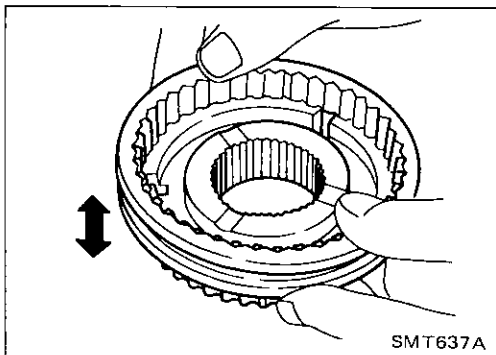
#### Gear and shaft

- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



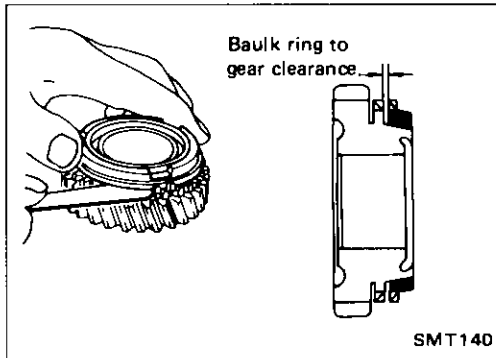
#### Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for wear or deformation.



## REPAIR FOR COMPONENT PARTS

### Input Shaft and Gears (Cont'd)



- Measure clearance between baulk ring and gear (4th and 5th).

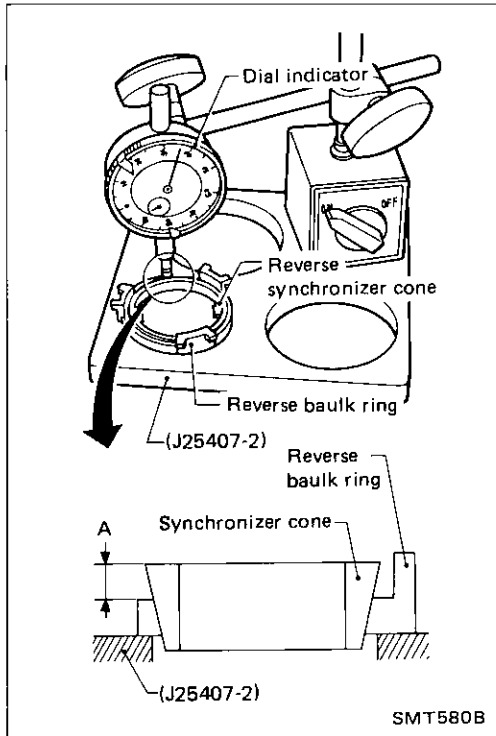
#### Clearance between baulk ring and gear:

##### Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

##### Wear limit

0.7 mm (0.028 in)



- Measure wear of reverse baulk ring.

- a. Place reverse baulk ring on Tool and then place reverse synchronizer cone on reverse baulk ring.

- Make sure projection of synchronizer cone is positioned over the recess on Tool.

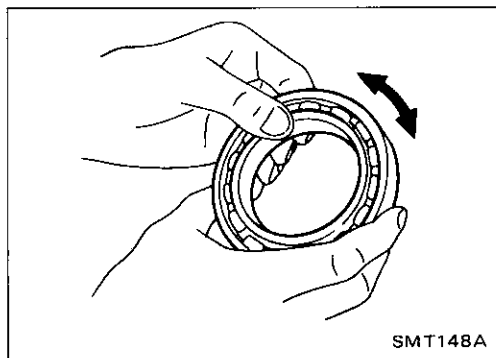
- b. While holding reverse synchronizer cone against reverse baulk ring as firmly as possible, measure dimension "A" with dial indicator.

#### Wear limit:

##### Dimension "A"

1.2 mm (0.047 in)

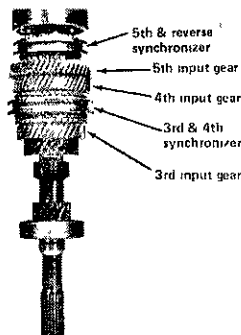
- c. If dimension "A" is smaller than the wear limit, replace baulk ring.



### Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

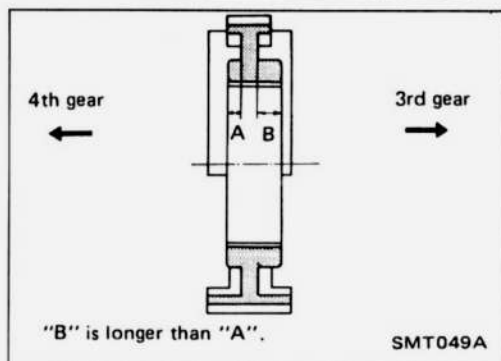
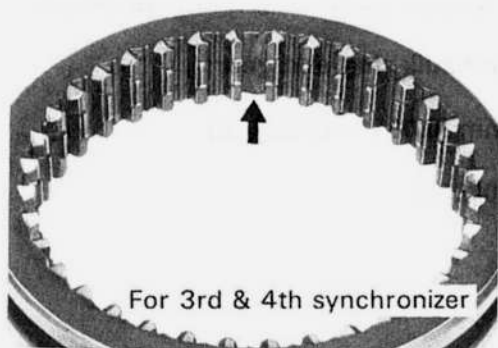
### ASSEMBLY



## REPAIR FOR COMPONENT PARTS

### Input Shaft and Gears (Cont'd)

1. Place inserts in three grooves on coupling sleeve (3rd & 4th synchronizer).



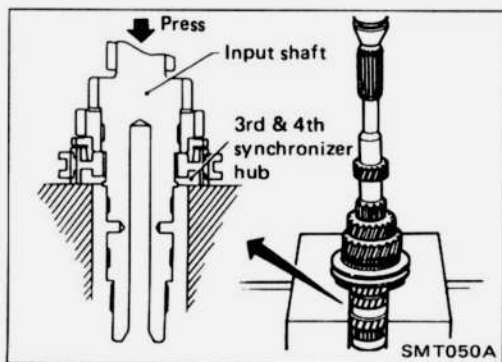
2. Install 3rd input gear and 3rd baulk ring.
3. Press on 3rd & 4th synchronizer hub.
- **Pay attention to its direction.**
4. Select proper snap ring of 3rd & 4th synchronizer hub to minimize clearance of groove, and then install it.

**Allowable clearance of groove:**

0 - 0.1 mm (0 - 0.004 in)

**Snap ring of 3rd & 4th synchronizer hub:**

**Refer to S.D.S.**



5. Install 4th input gear.
6. Select proper thrust washers to minimize clearance of groove.

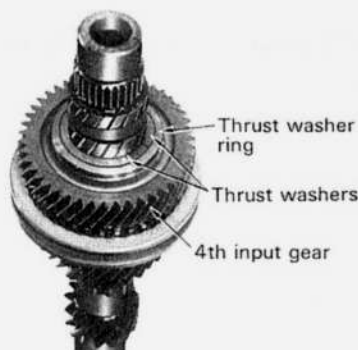
Then install them and thrust washer ring.

**Allowable clearance of groove:**

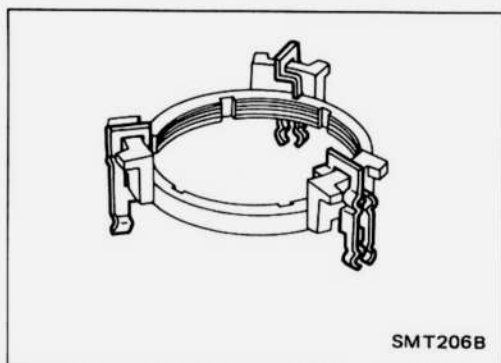
0 - 0.06 mm (0 - 0.0024 in)

**Input shaft thrust washer:**

**Refer to S.D.S.**

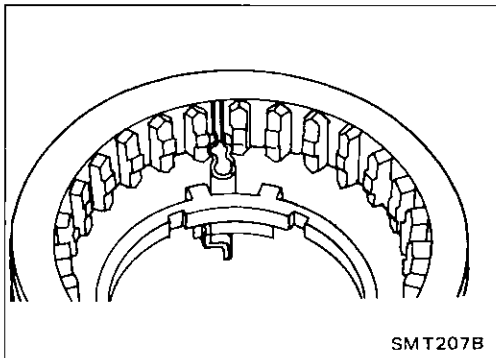


7. Install 5th & reverse synchronizer assembly.
  - a. Hook insert springs on reverse baulk ring.



## REPAIR FOR COMPONENT PARTS

### Input Shaft and Gears (Cont'd)

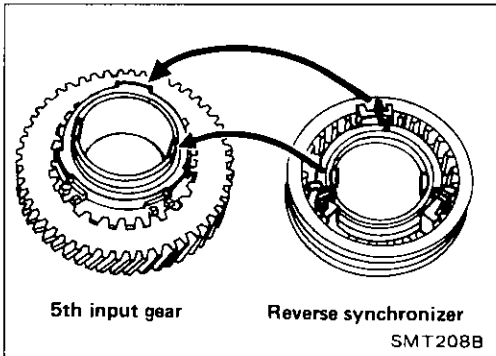


b. Install insert springs with reverse baulk ring onto coupling sleeve.

● **Pay attention to position of insert springs.**

c. Place 5th baulk ring on 5th input gear.

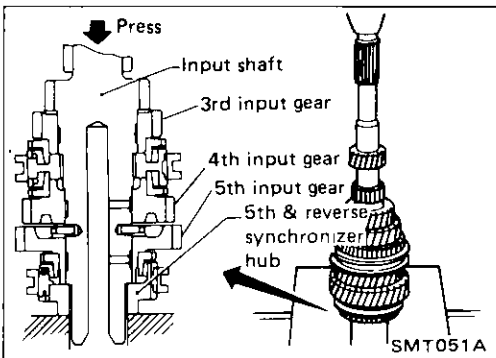
d. Install reverse synchronizer cone on reverse baulk ring.



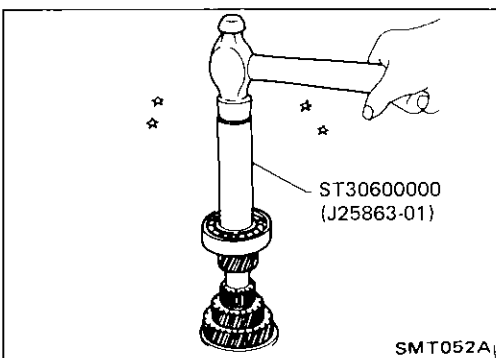
e. Place reverse synchronizer assembly on 5th input gear.

● **Mesh recesses of 5th input gear with projections of reverse synchronizer cone.**

● **Put insert spring mounts on reverse baulk ring upon those on 5th baulk ring.**

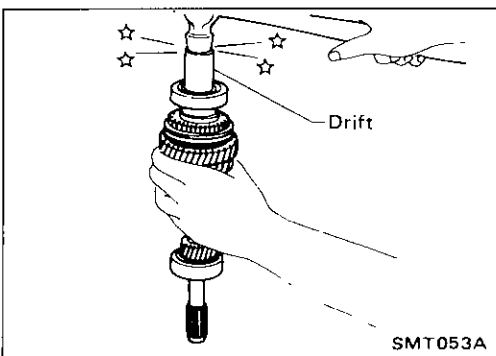


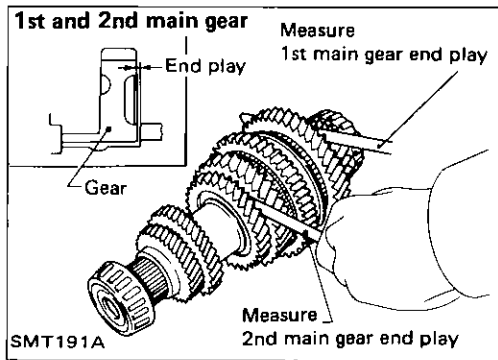
f. Press on 5th & reverse synchronizer assembly with 5th input gear.



8. Install input shaft front and rear bearings.

9. Measure gear end play as the final check — Refer to "Disassembly".





## Mainshaft and Gears

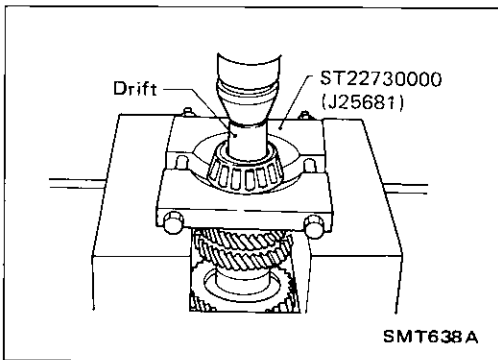
### DISASSEMBLY

- Before disassembly, check 1st and 2nd main gear end plays.

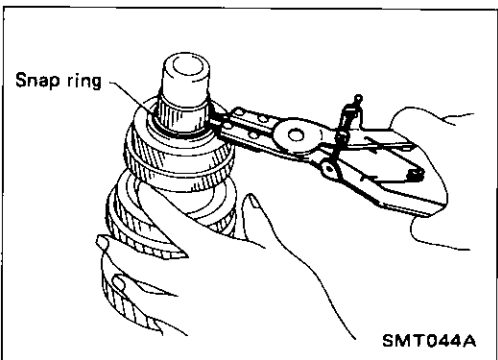
#### Gear end play

| Gears         | End play mm (in)              |
|---------------|-------------------------------|
| 1st main gear | 0.23 - 0.43 (0.0091 - 0.0169) |
| 2nd main gear | 0.23 - 0.58 (0.0091 - 0.0228) |

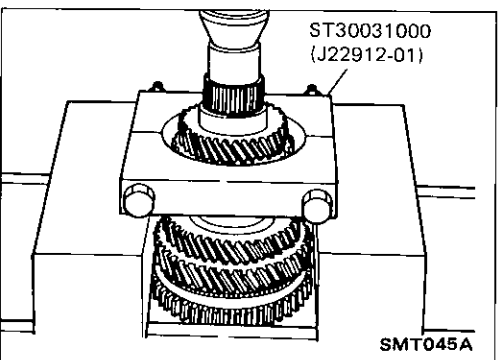
If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring — Refer to "Assembly".



- Press out mainshaft rear bearing.



- Remove thrust washer and snap ring.

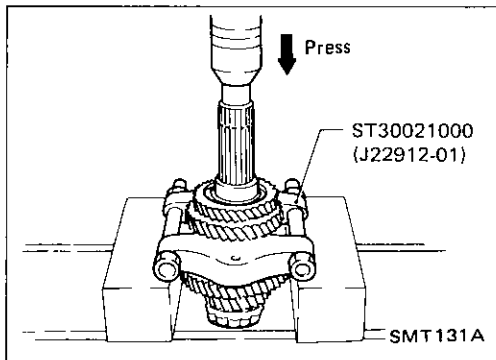


- Press out 5th main gear and 4th main gear.

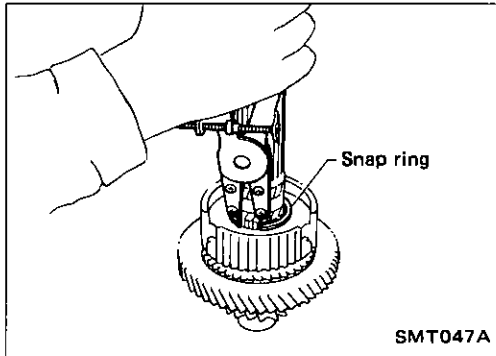


## REPAIR FOR COMPONENT PARTS

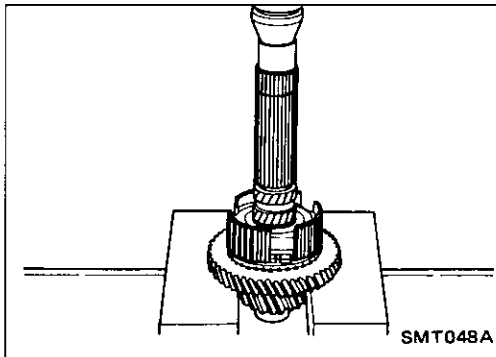
### Mainshaft and Gears (Cont'd)



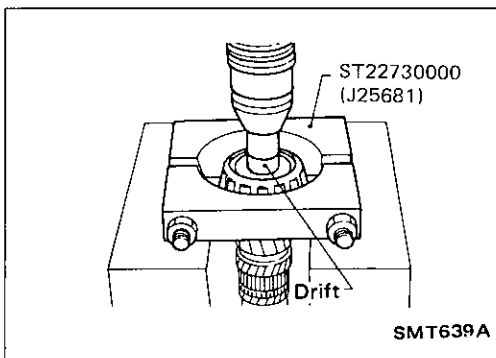
5. Press out 3rd main gear and 2nd main gear.



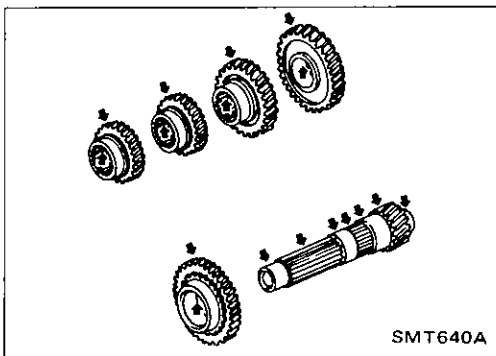
6. Remove snap ring.



7. Remove 1st & 2nd synchronizer and 1st main gear.



8. Remove mainshaft front bearing.



### INSPECTION

#### Gear and shaft

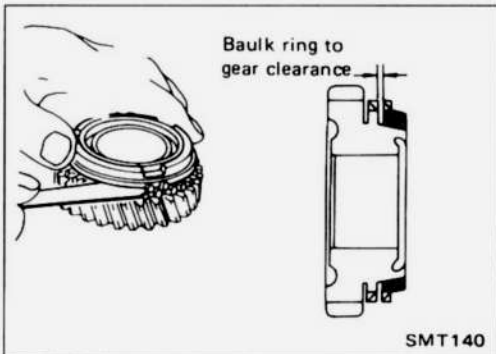
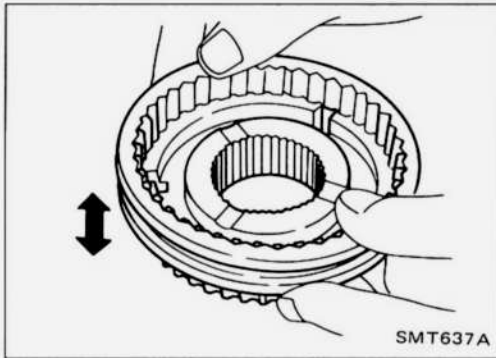
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

## REPAIR FOR COMPONENT PARTS

### Mainshaft and Gears (Cont'd)

#### Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for deformation.



- Measure clearance between baulk ring and gear (1st & 2nd).

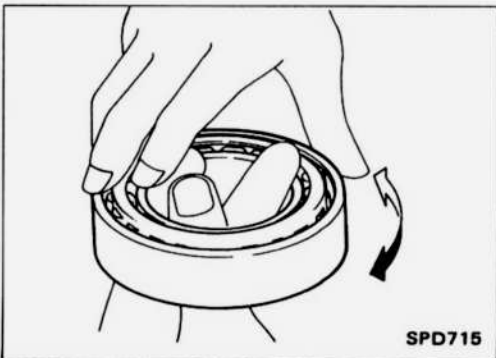
#### Clearance between baulk ring and gear:

##### Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

##### Wear limit

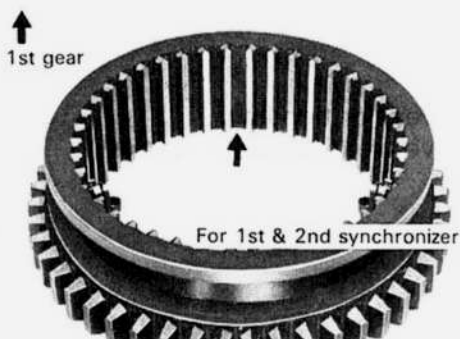
0.7 mm (0.028 in)



#### Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

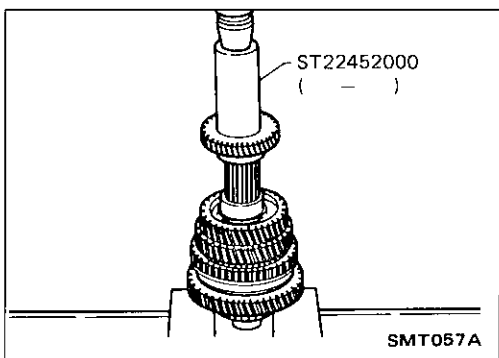
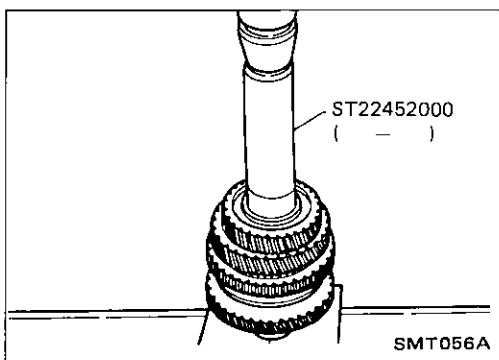
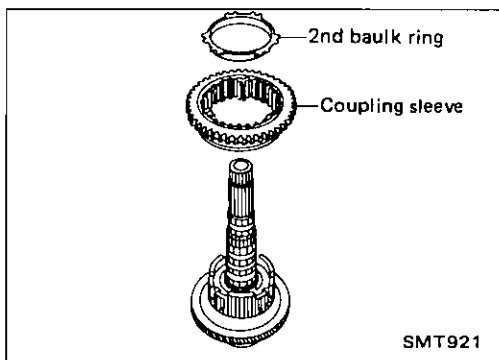
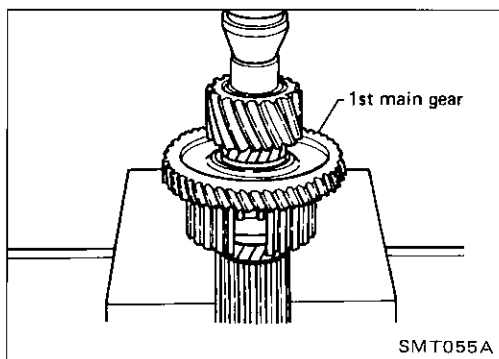
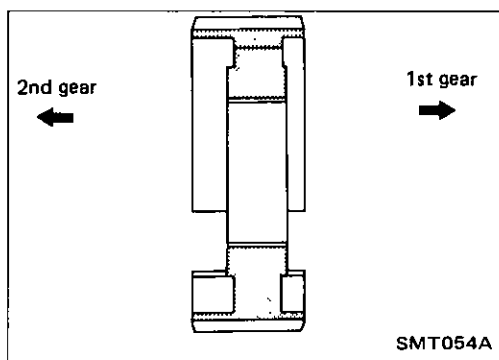
### ASSEMBLY



1. Place inserts in three grooves on coupling sleeve (1st & 2nd synchronizer).

## REPAIR FOR COMPONENT PARTS

### Mainshaft and Gears (Cont'd)



2. Install 1st main gear and 1st baulk ring.
3. Press on 1st & 2nd synchronizer hub.
- Pay attention to its direction.

4. Install coupling sleeve with three inserts and 2nd baulk ring.
5. Select proper snap ring of 1st & 2nd synchronizer hub to minimize clearance of groove and then install it.

**Allowable clearance of groove:**

**0 - 0.1 mm (0 - 0.004 in)**

**Snap ring of 1st & 2nd synchronizer hub:**

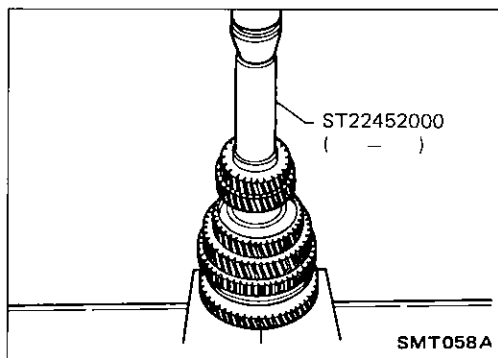
**Refer to S.D.S.**

6. Install 2nd main gear.
7. Press on 3rd main gear.

8. Press on 4th main gear.

## REPAIR FOR COMPONENT PARTS

### Mainshaft and Gears (Cont'd)



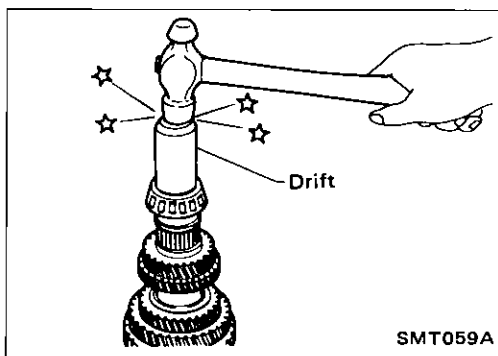
9. Press on 5th main gear.
10. Select proper snap ring of 5th main gear to minimize clearance of groove and then install it.

**Allowable clearance of groove:**

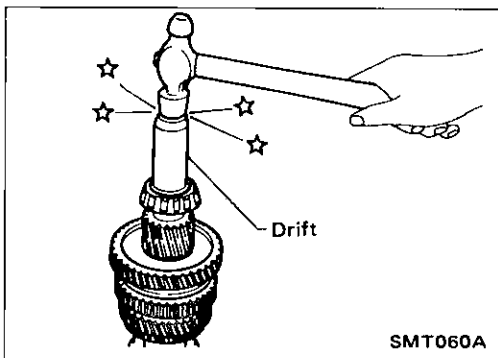
**0 - 0.15 mm (0 - 0.0059 in)**

**Snap ring of 5th main gear:**

**Refer to S.D.S.**



11. Press on thrust washer and press on mainshaft rear bearing.

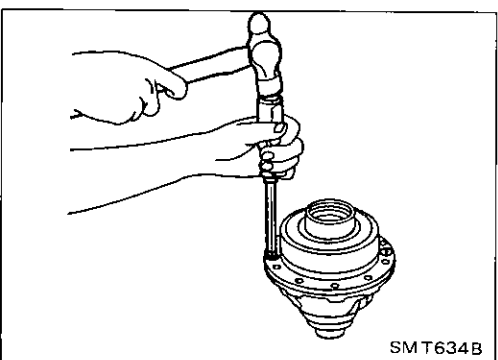
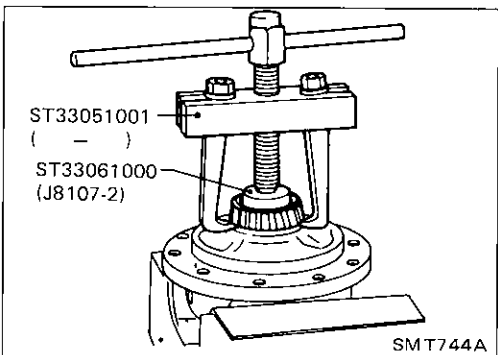


12. Press on mainshaft front bearing.
13. Measure gear end play as the final check — Refer to "Disassembly".

### Final Drive

#### DISASSEMBLY

1. Remove final gear.
  2. Remove speedometer drive gear by cutting it.
  3. Press out differential side bearings.
- **Be careful not to mix up the right and left bearings.**

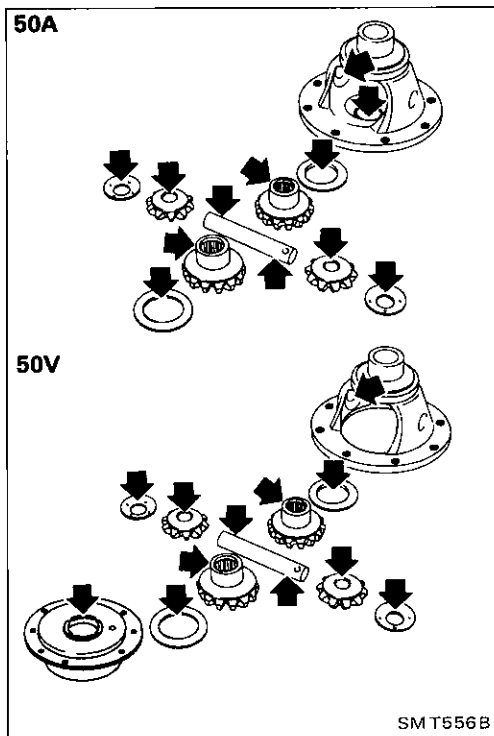
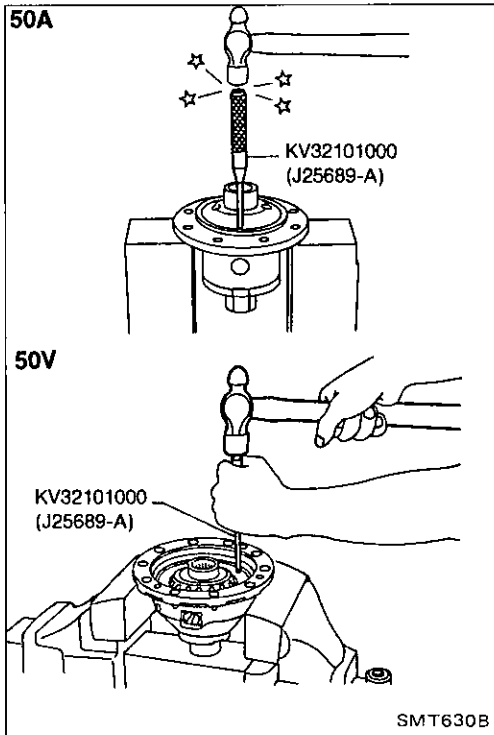


4. Remove viscous coupling (RS5F50V).

## REPAIR FOR COMPONENT PARTS

### Final Drive (Cont'd)

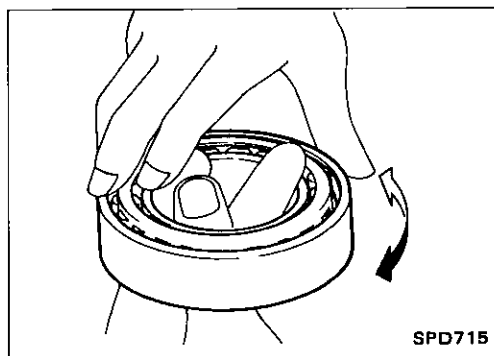
5. Drive out retaining pin and draw out pinion mate shaft.
6. Remove pinion mate gears and side gears.



### INSPECTION

#### Gear, washer, shaft and case

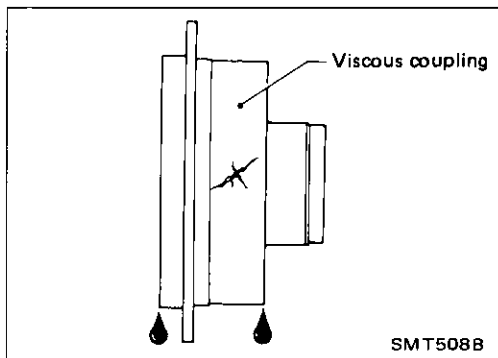
- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



#### Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

## REPAIR FOR COMPONENT PARTS



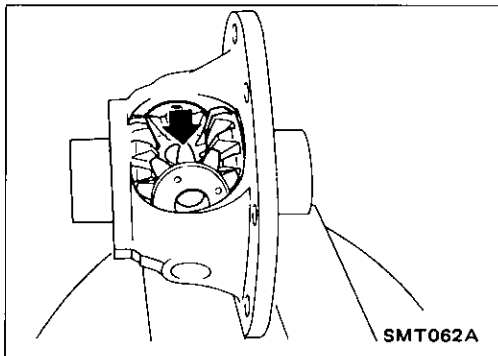
### Final Drive (Cont'd)

#### Viscous coupling — RS5F50V

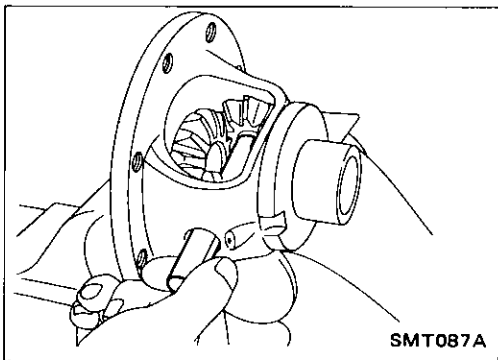
- Check case for cracks.
- Check silicone oil for leakage.

### ASSEMBLY

1. Attach side gear thrust washers to side gears, then install pinion mate washers and pinion mate gears in place.



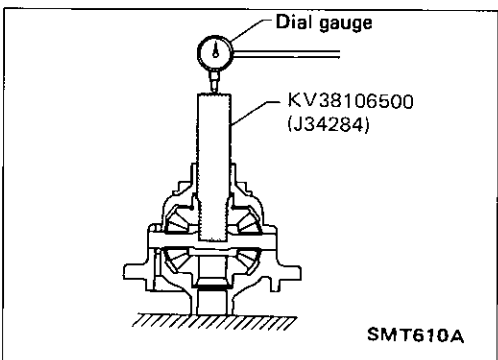
2. Insert pinion mate shaft.
  - **When inserting, be careful not to damage pinion mate thrust washers.**



3. Measure clearance between side gear and differential case with washers following the procedure below:
  - a. Set Tool and dial indicator on side gear.
  - b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

**Clearance between side gear and differential case with washers:**

**0.1 - 0.2 mm (0.004 - 0.008 in)**



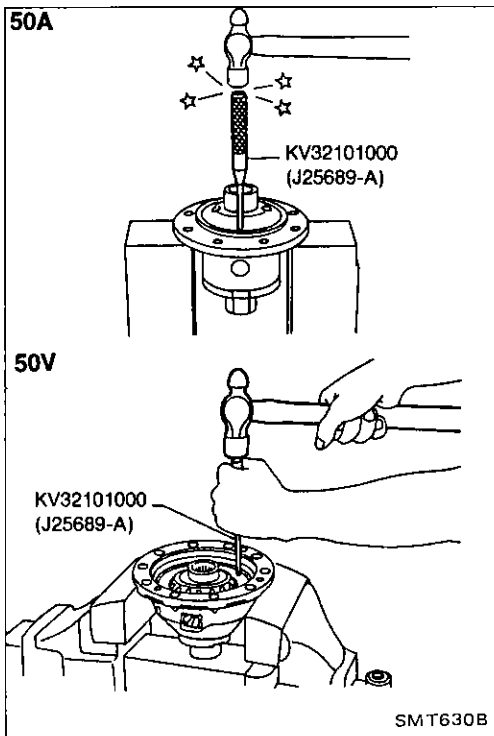
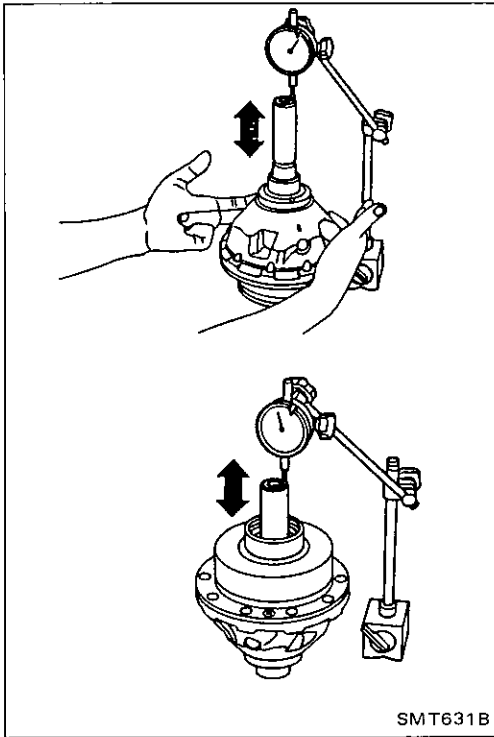
## REPAIR FOR COMPONENT PARTS

### Final Drive (Cont'd)

- c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

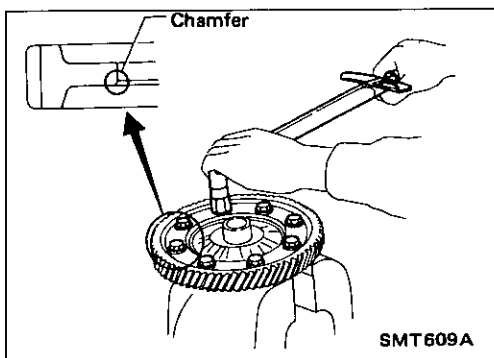
**Side gear thrust washer:**

**Refer to S.D.S.**



4. Install retaining pin.

- **Make sure that retaining pin is flush with case.**

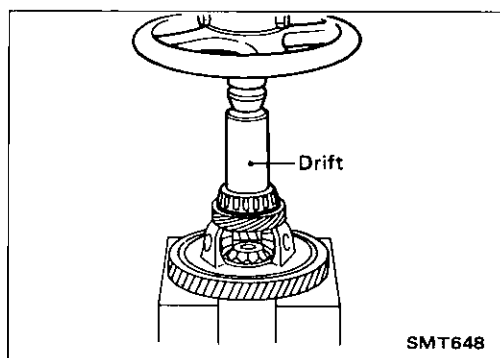


5. Install final gear.  
6. Install speedometer drive gear.

## REPAIR FOR COMPONENT PARTS

### Final Drive (Cont'd)

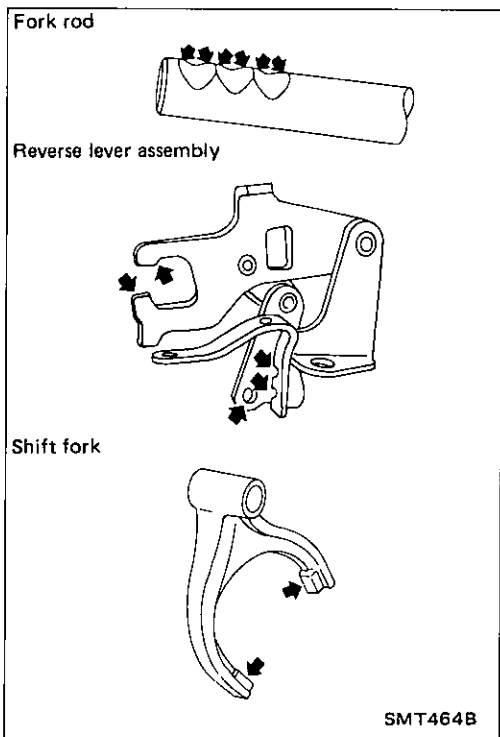
7. Press on differential side bearings.



### Shift Control Components

#### INSPECTION

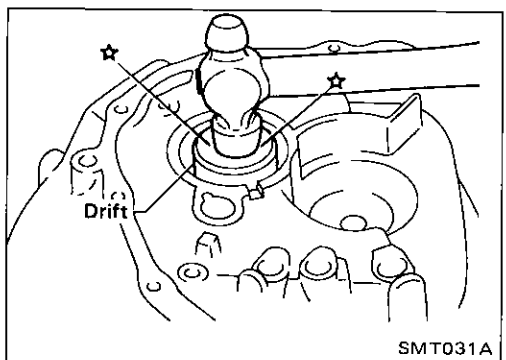
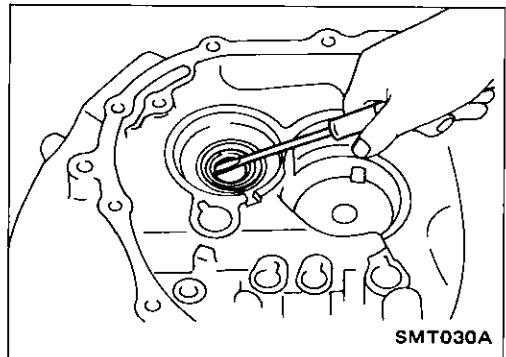
- Check contact surface and sliding surface for wear, scratches, projections or other damage.



### Case Components

#### REMOVAL AND INSTALLATION

##### Input shaft oil seal



- Apply multi-purpose grease to seal lip of oil seal before installing.

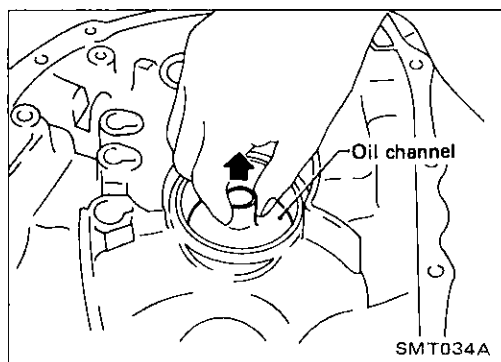


## REPAIR FOR COMPONENT PARTS

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### Case Components (Cont'd)

#### Mainshaft front bearing outer race



**Mainshaft rear bearing outer race — Refer to “ADJUSTMENT”.**  
**Differential side bearing outer race — Refer to “ADJUSTMENT”.**

## ADJUSTMENT

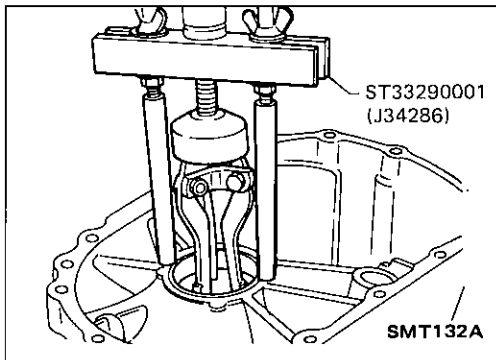
### Input Shaft End Play and Differential Side Bearing Preload

If any of the following parts are replaced, adjust input shaft end play.

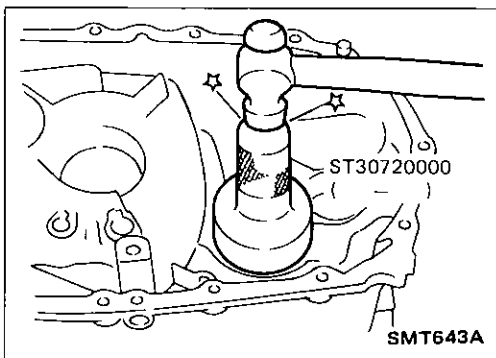
- Input shaft
- Input shaft bearing
- Clutch housing
- Transmission case

If any of the following parts are replaced, adjust differential side bearing preload.

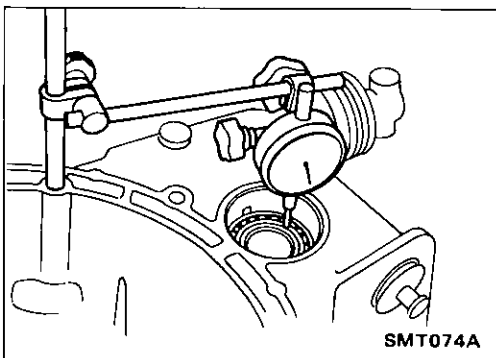
- Differential case
- Differential side bearing
- Clutch housing
- Transmission case



1. Remove differential side bearing outer race (transmission case side) and shim(s).



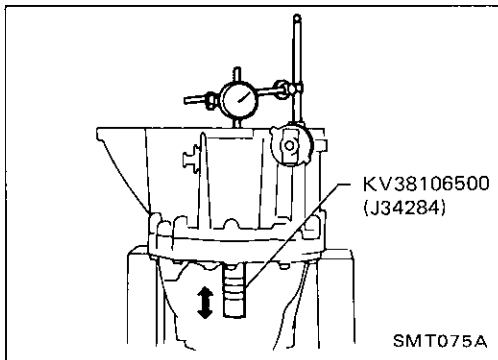
2. Reinstall differential side bearing outer race without shim(s).
3. Install input shaft and final drive assembly on clutch housing.
4. Install transmission case without input shaft bearing shim(s).  
Then tighten it to the specified torque.



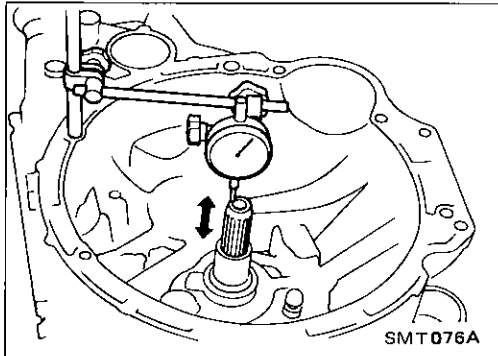
5. Using the following procedures, measure clearance between bearings and transmission case.
  - Differential side
  - a. Attach dial indicator. If clamp diameter of dial indicator is too small or too large, attach dial indicator using a magnetic stand.

## ADJUSTMENT

### Input Shaft End Play and Differential Side Bearing Preload (Cont'd)

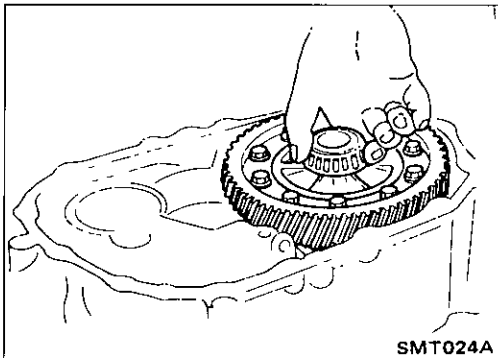


- b. Insert Tool all the way into differential side gear. Move Tool up and down and measure dial indicator deflection.



#### ● Input shaft side

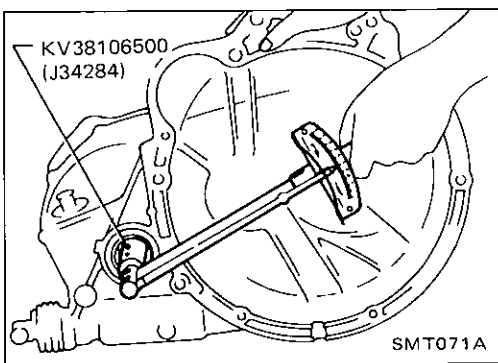
- a. Set dial indicator on rear end of input shaft.
- b. Move input shaft up and down and measure dial indicator deflection.
6. Select shims with proper thickness with S.D.S. table as a guide.
7. Install selected differential side bearing adjusting shim and differential side bearing outer race.



8. Check differential side bearing turning torque.

- a. Install final drive assembly on clutch housing.
- b. Install transmission case on clutch housing.

#### ● Tighten transmission case fixing bolts to the specified torque.



- c. Measure turning torque of final drive assembly.

#### Turning torque of final drive assembly (New bearing):

4.9 - 7.8 N·m (50 - 80 kg-cm, 43 - 69 in-lb)

- When old bearing is used again, turning torque will be slightly less than the above.
- Make sure torque is close to the specified range.

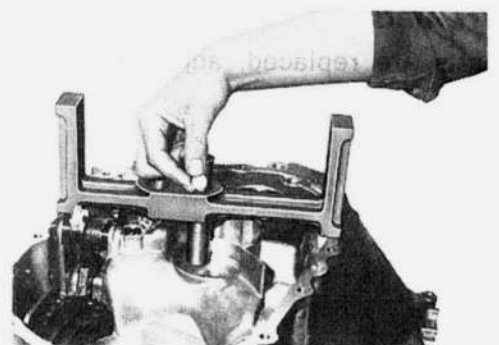
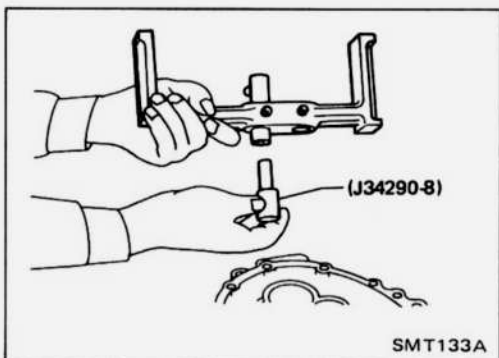
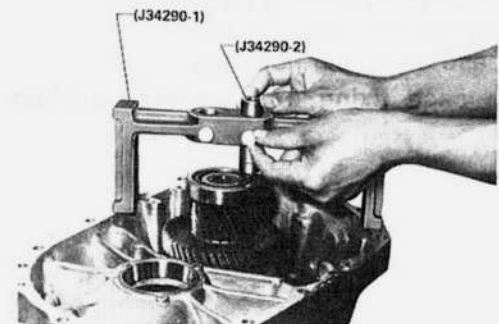
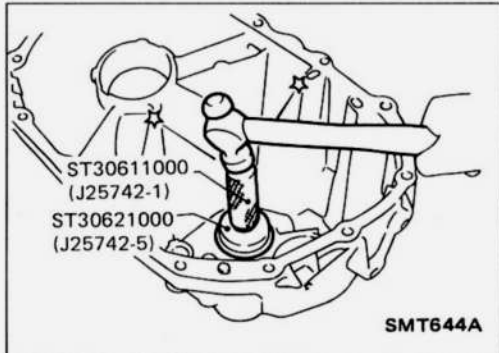
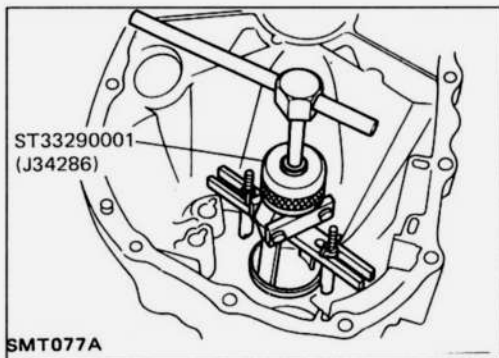
### Mainshaft Bearing Preload

If any of the following parts are replaced, adjust mainshaft bearing preload.

- Mainshaft
- Mainshaft bearings
- Clutch housing
- Transmission case

## ADJUSTMENT

### Mainshaft Bearing Preload (Cont'd)



1. Remove mainshaft rear bearing outer race and shim(s).

2. Reinstall mainshaft rear bearing outer race without shims.

3. Clean mating surfaces of clutch housing and transmission case with solvent.

4. Install mainshaft and mainshaft front bearing outer race into transmission case. Turn mainshaft while holding bearing outer race so that bearings are properly seated.

5. Place Tools (bridge and gauging cylinder) onto machined surface of transmission case, allowing gauging cylinder to rest on surface of mainshaft front bearing outer race. Use proper screw in bridge to lock gauging cylinder in place.

6. Turn bridge over and place Tool (gauging plunger) into gauging cylinder.

7. Place bridge, legs up, onto machined surface of clutch housing and allow gauging plunger to rest upon mating surface where mainshaft front bearing outer race fits.

## ADJUSTMENT

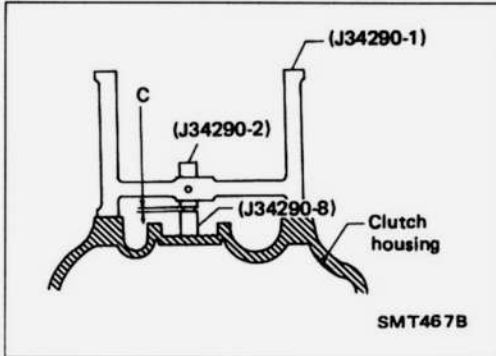
### Mainshaft Bearing Preload (Cont'd)

8. Measure with feeler gauge distance between gauging cylinder and shoulder of gauging plunger.
9. Use feeler gauge reading to select correct mainshaft preload shim(s).

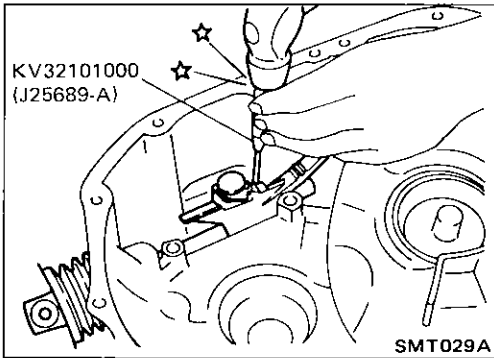
**Mainshaft bearing adjusting shim:**

**Refer to S.D.S.**

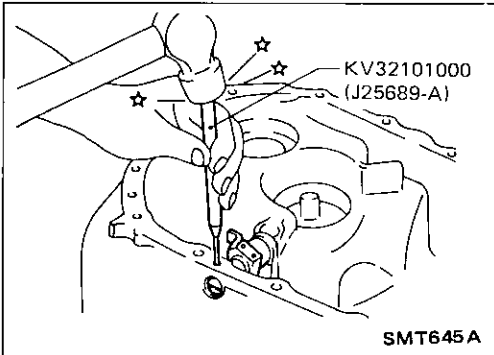
10. Install selected mainshaft bearing adjusting shim and mainshaft bearing outer race.
11. Check total turning torque after assembly — Refer to "ASSEMBLY".



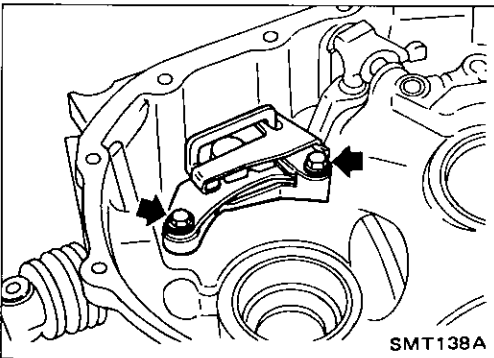
## ASSEMBLY



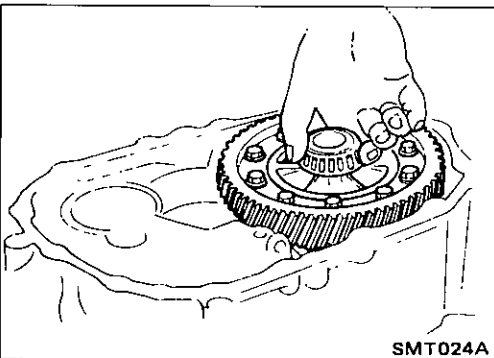
1. Install striking lever and striking rod.



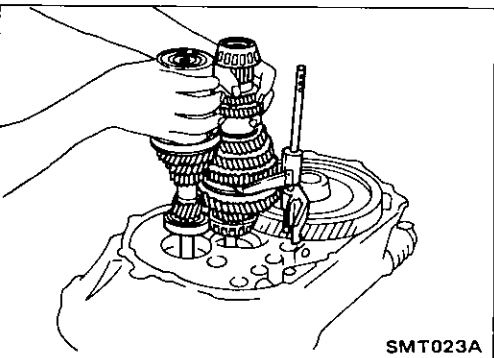
2. Install selector and retaining pin.



3. Install reverse gate assembly.

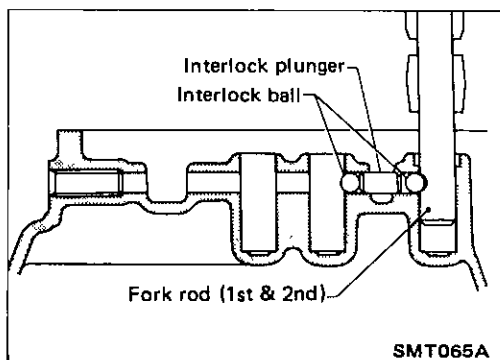


4. Install final drive assembly.

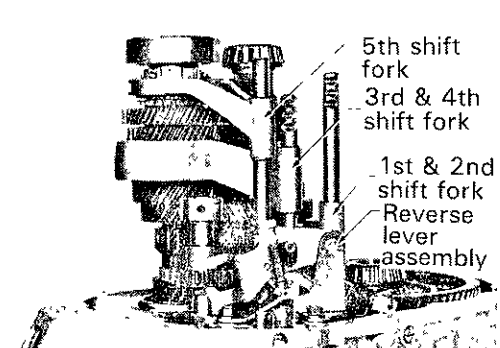


5. Install input shaft and mainshaft with 1st & 2nd shift fork assembly.
  - Be careful not to damage input shaft oil seal.

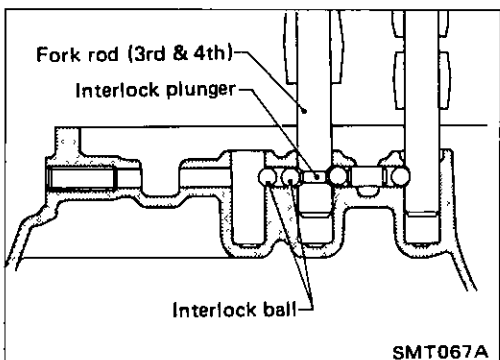
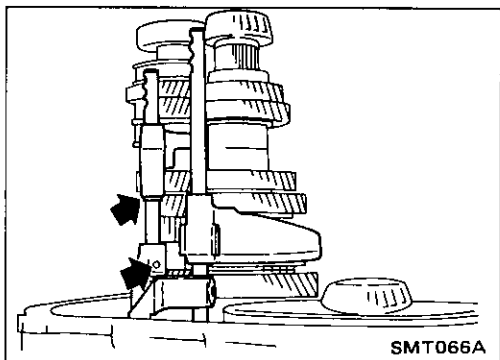
## ASSEMBLY



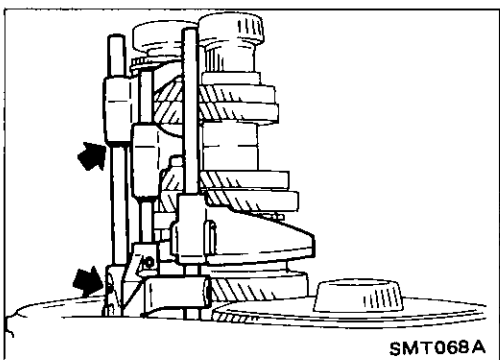
6. Install interlock balls and plunger.



7. Install 3rd & 4th shift fork and bracket, then install 3rd & 4th shift rod, stopper ring and retaining pin.

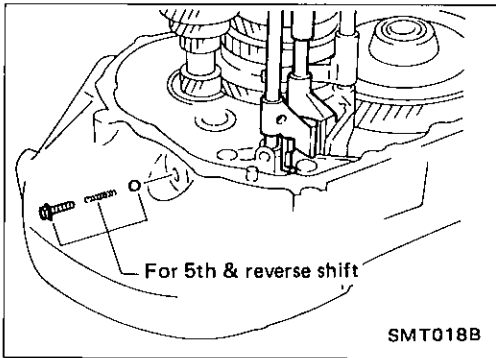


8. Install interlock balls.

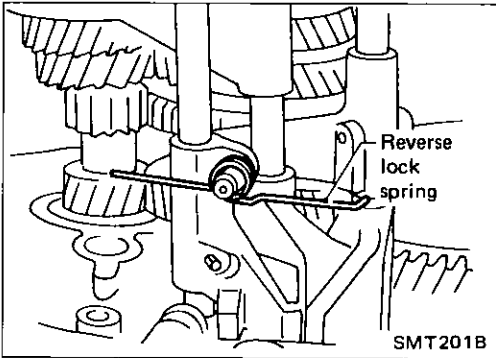


9. Install 5th shift fork and bracket, then install shift rod, stopper ring and retaining pin.

## ASSEMBLY

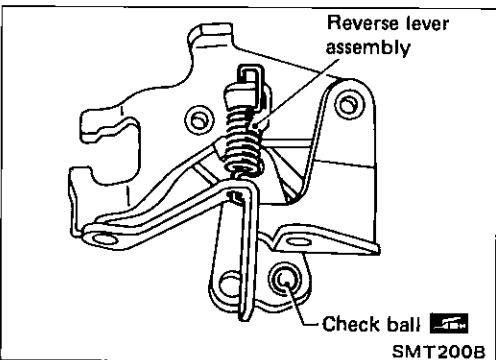


10. Install 5th & reverse check plug, spring and ball.



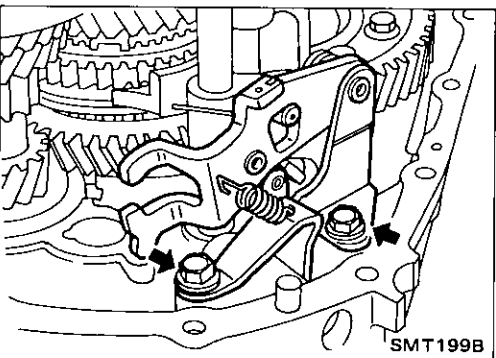
11. Install reverse lock spring on 5th & reverse bracket.

- Pay attention to its direction.

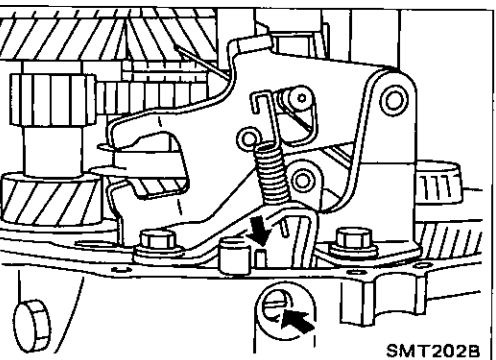


12. Install check ball and reverse lever spring on reverse lever assembly.

- Apply multi-purpose grease to check ball.
- Pay attention to direction of reverse lever spring.



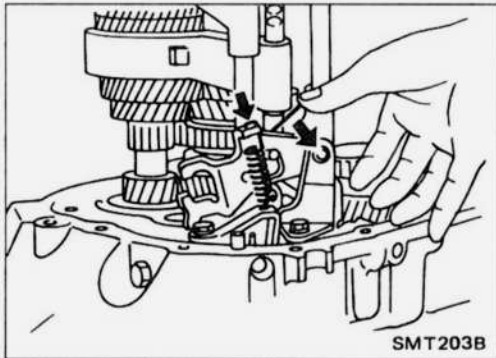
13. Install reverse lever assembly on clutch housing.



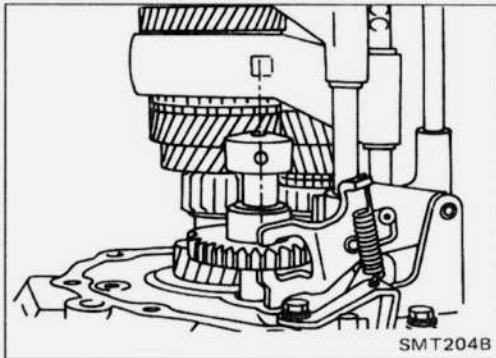
14. Install reverse arm shaft and retaining pin.



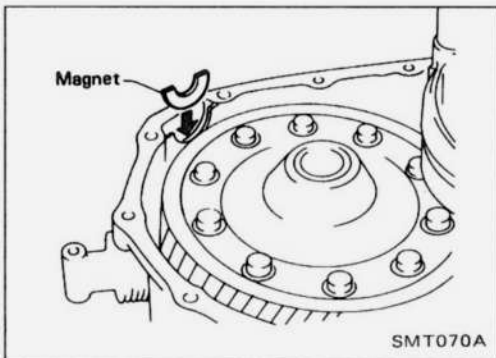
## ASSEMBLY



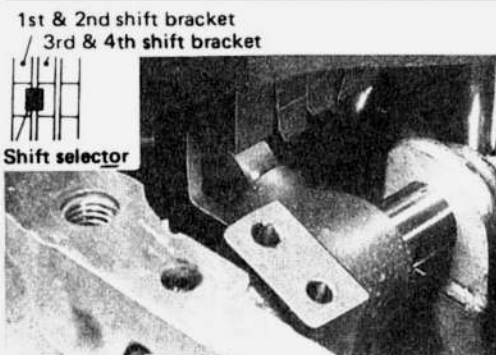
15. Hook reverse lock spring and reverse lever spring on reverse lever assembly.



16. Mesh 4th gear, then install reverse idler gear and shaft.  
● Pay attention to direction of tapped hole.



17. Place magnet on clutch housing.

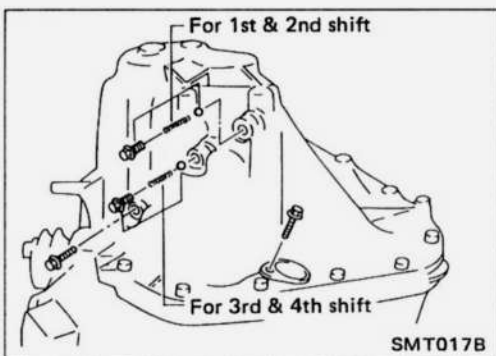


18. If bearing preload was adjusted, install selected shim(s) into transmission case.

- To aid in installation of transmission case, place shift selector in the 1st & 2nd shift bracket or between 1st & 2nd bracket and 3rd & 4th bracket.

19. Apply sealant to mating surface of transmission case and install it.

20. Install position switch.

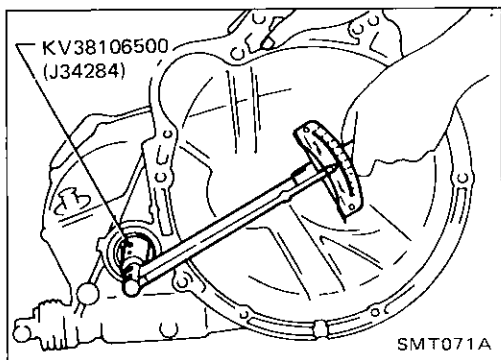


21. Apply sealant to threads of check plugs. Install balls, springs and plugs.

22. After assembly, check that you can shift into each gear smoothly.

## ASSEMBLY

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23. Measure total turning torque.

**Total turning torque (New bearing):**

**8.8 - 21.6 N·m (90 - 220 kg-cm, 78 - 191 in-lb)**

- **When old bearing is used again, preload will be slightly less than the above. Make sure torque is close to the specified range.**

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

## General Specifications

### TRANSAXLE

|                                   |                    |      |                                                                                   |         |       |
|-----------------------------------|--------------------|------|-----------------------------------------------------------------------------------|---------|-------|
| Engine                            |                    |      | KA24E                                                                             |         |       |
| Transaxle model                   |                    |      | RS5F50A                                                                           | RS5F50V |       |
| Number of speeds                  |                    |      | 5                                                                                 |         |       |
| Synchronesh type                  |                    |      | Warner                                                                            |         |       |
| Shift pattern                     |                    |      |  |         |       |
| Gear ratio                        |                    |      | 1st                                                                               | 3.400   | 3.285 |
|                                   |                    |      | 2nd                                                                               | 1.955   | 1.850 |
|                                   |                    |      | 3rd                                                                               | 1.272   | 1.206 |
|                                   |                    |      | 4th                                                                               | 0.954   | 0.954 |
|                                   |                    |      | 5th                                                                               | 0.740   | 0.740 |
|                                   |                    |      | Rev.                                                                              | 3.428   | 3.428 |
| Number of teeth                   | Input gear         | 1st  | 15                                                                                | 14      |       |
|                                   |                    | 2nd  | 22                                                                                | 20      |       |
|                                   |                    | 3rd  | 33                                                                                | 29      |       |
|                                   |                    | 4th  | 44                                                                                | 44      |       |
|                                   |                    | 5th  | 50                                                                                | 50      |       |
|                                   |                    | Rev. | 14                                                                                | 14      |       |
|                                   | Main gear          | 1st  | 51                                                                                | 46      |       |
|                                   |                    | 2nd  | 43                                                                                | 37      |       |
|                                   |                    | 3rd  | 42                                                                                | 35      |       |
|                                   |                    | 4th  | 42                                                                                | 42      |       |
|                                   |                    | 5th  | 37                                                                                | 37      |       |
|                                   |                    | Rev. | 48                                                                                | 48      |       |
|                                   | Reverse idler gear |      | 29                                                                                | 29      |       |
| Oil capacity<br>ℓ (US pt, Imp pt) |                    |      | 4.7 (10, 8-1/4)                                                                   |         |       |

### FINAL GEAR

|                   |         |         |
|-------------------|---------|---------|
| Transaxle model   | RS5F50A | RS5F50V |
| Final gear ratio  | 3.650   | 3.895   |
| Number of teeth   |         |         |
| Final gear/Pinion | 73/20   | 74/19   |
| Side gear/Pinion  | 16/10   | 16/10   |

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

## Inspection and Adjustment

### GEAR END PLAY

| Gear           | End play mm (in)              |
|----------------|-------------------------------|
| 1st main gear  | 0.23 - 0.43 (0.0091 - 0.0169) |
| 2nd main gear  | 0.23 - 0.58 (0.0091 - 0.0228) |
| 3rd input gear | 0.23 - 0.43 (0.0091 - 0.0169) |
| 4th input gear | 0.25 - 0.55 (0.0098 - 0.0217) |
| 5th input gear | 0.23 - 0.48 (0.0091 - 0.0189) |

### 1st & 2nd synchronizer hub

| Allowable clearance | 0 - 0.1 mm (0 - 0.004 in) |
|---------------------|---------------------------|
| Thickness mm (in)   | Part number               |
| 1.95 (0.0768)       | 32269-03E03               |
| 2.00 (0.0787)       | 32269-03E00               |
| 2.05 (0.0807)       | 32269-03E01               |
| 2.10 (0.0827)       | 32269-03E02               |

### CLEARANCE BETWEEN BAULK RING AND GEAR

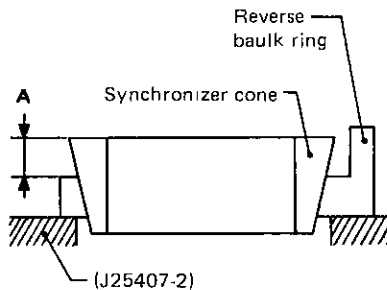
Unit: mm (in)

|           | Standard                        | Wear limit  |
|-----------|---------------------------------|-------------|
| 1st & 2nd | 1.0 - 1.35<br>(0.0394 - 0.0531) | 0.7 (0.028) |
| 3rd & 4th | 1.0 - 1.35<br>(0.0394 - 0.0531) | 0.7 (0.028) |
| 5th       | 1.0 - 1.35<br>(0.0394 - 0.0531) | 0.7 (0.028) |

### 5th main gear

| Allowable clearance | 0 - 0.15 mm (0 - 0.0059 in) |
|---------------------|-----------------------------|
| Thickness mm (in)   | Part number                 |
| 1.95 (0.0768)       | 32348-05E00                 |
| 2.05 (0.0807)       | 32348-05E01                 |
| 2.15 (0.0846)       | 32348-05E02                 |
| 2.25 (0.0886)       | 32348-05E03                 |

### REVERSE BAULK RING



SMT581B

| Dimension | Wear limit        |
|-----------|-------------------|
| A         | 1.2 mm (0.047 in) |

### AVAILABLE WASHER

#### Input shaft thrust washer

| Allowable clearance | 0 - 0.06 mm (0 - 0.0024 in) |
|---------------------|-----------------------------|
| Thickness mm (in)   | Part number                 |
| 4.500 (0.1772)      | 32278-03E01                 |
| 4.525 (0.1781)      | 32278-03E02                 |
| 4.550 (0.1791)      | 32278-03E03                 |
| 4.575 (0.1801)      | 32278-03E04                 |

#### Differential side gear thrust washer — RS5F50A

| Allowable clearance between side gear and differential case with washer | 0.1 - 0.2 mm (0.004 - 0.008 in) |
|-------------------------------------------------------------------------|---------------------------------|
| Thickness mm (in)                                                       | Part number                     |
| 0.75 - 0.80 (0.0295 - 0.0315)                                           | 38424-E3000 38424-E3020         |
| 0.80 - 0.85 (0.0315 - 0.0335)                                           | 38424-E3001 38424-E3021         |
| 0.85 - 0.90 (0.0335 - 0.0354)                                           | 38424-E3002 38424-E3022         |
| 0.90 - 0.95 (0.0354 - 0.0374)                                           | 38424-E3003 38424-E3023         |

### AVAILABLE SNAP RING

#### 3rd & 4th synchronizer hub (At input shaft)

| Allowable clearance | 0 - 0.1 mm (0 - 0.004 in) |
|---------------------|---------------------------|
| Thickness mm (in)   | Part number               |
| 1.95 (0.0768)       | 32269-03E03               |
| 2.00 (0.0787)       | 32269-03E00               |
| 2.05 (0.0807)       | 32269-03E01               |
| 2.10 (0.0827)       | 32269-03E02               |

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

### Inspection and Adjustment (Cont'd)

#### Differential side gear thrust washer — RS5F50V

| Allowable clearance between side gear and (differential case or viscous coupling) with washer |                               | 0.1 - 0.2 mm<br>(0.004 - 0.008 in) |
|-----------------------------------------------------------------------------------------------|-------------------------------|------------------------------------|
|                                                                                               | Thickness mm (in)             | Part number                        |
| Differential case side                                                                        | 0.75 - 0.80 (0.0295 - 0.0315) | 38424-E3000                        |
|                                                                                               | 0.80 - 0.85 (0.0315 - 0.0335) | 38424-E3001                        |
|                                                                                               | 0.85 - 0.90 (0.0335 - 0.0354) | 38424-E3002                        |
|                                                                                               | 0.90 - 0.95 (0.0354 - 0.0374) | 38424-E3003                        |
| Viscous coupling side                                                                         | 0.43 - 0.45 (0.0169 - 0.0177) | 38424-51E10                        |
|                                                                                               | 0.52 - 0.54 (0.0205 - 0.0213) | 38424-51E11                        |
|                                                                                               | 0.61 - 0.63 (0.0240 - 0.0248) | 38424-51E12                        |
|                                                                                               | 0.70 - 0.72 (0.0276 - 0.0283) | 38424-51E13                        |
|                                                                                               | 0.79 - 0.81 (0.0311 - 0.0319) | 38424-51E14                        |

#### Mainshaft bearing adjusting shim

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.40 (0.0157)     | 32139-03E11 |
| 0.44 (0.0173)     | 32139-03E00 |
| 0.48 (0.0189)     | 32139-03E01 |
| 0.52 (0.0205)     | 32139-03E12 |
| 0.56 (0.0220)     | 32139-03E02 |
| 0.60 (0.0236)     | 32139-03E03 |
| 0.64 (0.0252)     | 32139-03E04 |
| 0.68 (0.0268)     | 32139-03E05 |
| 0.72 (0.0283)     | 32139-03E06 |
| 0.76 (0.0299)     | 32139-03E07 |
| 0.80 (0.0315)     | 32139-03E08 |
| 1.20 (0.0472)     | 32139-03E13 |

### AVAILABLE SHIM

#### — INPUT SHAFT END PLAY AND MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

#### Bearing preload and end play

Unit: mm (in)

|                                   |                               |
|-----------------------------------|-------------------------------|
| Mainshaft bearing preload         | 0.25 - 0.31 (0.0098 - 0.0122) |
| Input shaft end play              | -0.06 to 0 (-0.0024 to 0)     |
| Differential side bearing preload | 0.40 - 0.46 (0.0157 - 0.0181) |

#### Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

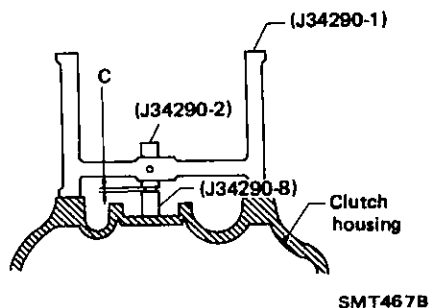
|                  |                                 |
|------------------|---------------------------------|
| Final drive only | 4.9 - 7.8 (50 - 80, 43 - 69)    |
| Total            | 8.8 - 21.6 (90 - 220, 78 - 191) |

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

## Inspection and Adjustment (Cont'd)

**Table for selecting mainshaft adjusting shim**

Unit: mm (in)



| Dimension "C"                 | Suitable shim(s)              |
|-------------------------------|-------------------------------|
| 0.30 - 0.34 (0.0118 - 0.0134) | 0.60 (0.0236)                 |
| 0.34 - 0.38 (0.0134 - 0.0150) | 0.64 (0.0252)                 |
| 0.38 - 0.42 (0.0150 - 0.0165) | 0.68 (0.0268)                 |
| 0.42 - 0.46 (0.0165 - 0.0181) | 0.72 (0.0283)                 |
| 0.46 - 0.50 (0.0181 - 0.0197) | 0.76 (0.0299)                 |
| 0.50 - 0.54 (0.0197 - 0.0213) | 0.80 (0.0315)                 |
| 0.54 - 0.58 (0.0213 - 0.0228) | 0.40 + 0.44 (0.0157 + 0.0173) |
| 0.58 - 0.62 (0.0228 - 0.0244) | 0.44 + 0.44 (0.0173 + 0.0173) |
| 0.62 - 0.66 (0.0244 - 0.0260) | 0.44 + 0.48 (0.0173 + 0.0189) |
| 0.66 - 0.70 (0.0260 - 0.0276) | 0.48 + 0.48 (0.0189 + 0.0189) |
| 0.70 - 0.74 (0.0276 - 0.0291) | 0.48 + 0.52 (0.0189 + 0.0205) |
| 0.74 - 0.78 (0.0291 - 0.0307) | 0.52 + 0.52 (0.0205 + 0.0205) |
| 0.78 - 0.82 (0.0307 - 0.0323) | 0.52 + 0.56 (0.0205 + 0.0220) |
| 0.82 - 0.86 (0.0323 - 0.0339) | 0.56 + 0.56 (0.0220 + 0.0220) |
| 0.86 - 0.90 (0.0339 - 0.0354) | 0.56 + 0.60 (0.0220 + 0.0236) |
| 0.90 - 0.94 (0.0354 - 0.0370) | 0.60 + 0.60 (0.0236 + 0.0236) |
| 0.94 - 0.98 (0.0370 - 0.0386) | 0.60 + 0.64 (0.0236 + 0.0252) |
| 0.98 - 1.02 (0.0386 - 0.0402) | 0.64 + 0.64 (0.0252 + 0.0252) |
| 1.02 - 1.06 (0.0402 - 0.0417) | 0.64 + 0.68 (0.0252 + 0.0268) |
| 1.06 - 1.10 (0.0417 - 0.0433) | 0.68 + 0.68 (0.0268 + 0.0268) |
| 1.10 - 1.14 (0.0433 - 0.0449) | 0.68 + 0.72 (0.0268 + 0.0283) |
| 1.14 - 1.18 (0.0449 - 0.0465) | 0.72 + 0.72 (0.0283 + 0.0283) |
| 1.18 - 1.22 (0.0465 - 0.0480) | 0.72 + 0.76 (0.0283 + 0.0299) |
| 1.22 - 1.26 (0.0480 - 0.0496) | 0.76 + 0.76 (0.0299 + 0.0299) |
| 1.26 - 1.30 (0.0496 - 0.0512) | 0.76 + 0.80 (0.0299 + 0.0315) |
| 1.30 - 1.34 (0.0512 - 0.0528) | 0.80 + 0.80 (0.0315 + 0.0315) |
| 1.34 - 1.38 (0.0528 - 0.0543) | 0.44 + 1.20 (0.0173 + 0.0472) |
| 1.38 - 1.42 (0.0543 - 0.0559) | 0.48 + 1.20 (0.0189 + 0.0472) |
| 1.42 - 1.46 (0.0559 - 0.0575) | 0.52 + 1.20 (0.0205 + 0.0472) |
| 1.46 - 1.50 (0.0575 - 0.0591) | 0.56 + 1.20 (0.0220 + 0.0472) |

**Input shaft bearing adjusting shim**

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.40 (0.0157)     | 32225-08E00 |
| 0.44 (0.0173)     | 32225-08E01 |
| 0.48 (0.0189)     | 32225-08E02 |
| 0.52 (0.0205)     | 32225-08E03 |
| 0.56 (0.0220)     | 32225-08E04 |
| 0.60 (0.0236)     | 32225-08E05 |
| 0.64 (0.0252)     | 32225-08E06 |
| 0.68 (0.0268)     | 32225-08E07 |
| 0.72 (0.0283)     | 32225-08E08 |
| 0.76 (0.0299)     | 32225-08E09 |
| 0.80 (0.0315)     | 32225-08E10 |
| 1.20 (0.0472)     | 32225-08E11 |

**Table for selecting input shaft bearing adjusting shim**

Unit: mm (in)

| Dial indicator deflection     | Suitable shim(s)              |
|-------------------------------|-------------------------------|
| 0.65 - 0.69 (0.0256 - 0.0272) | 0.64 (0.0252)                 |
| 0.69 - 0.73 (0.0272 - 0.0287) | 0.68 (0.0268)                 |
| 0.73 - 0.77 (0.0287 - 0.0303) | 0.72 (0.0283)                 |
| 0.77 - 0.81 (0.0303 - 0.0319) | 0.76 (0.0299)                 |
| 0.81 - 0.85 (0.0319 - 0.0335) | 0.80 (0.0315)                 |
| 0.85 - 0.89 (0.0335 - 0.0350) | 0.40 + 0.44 (0.0157 + 0.0173) |
| 0.89 - 0.93 (0.0350 - 0.0366) | 0.44 + 0.44 (0.0173 + 0.0173) |
| 0.93 - 0.97 (0.0366 - 0.0382) | 0.44 + 0.48 (0.0173 + 0.0189) |
| 0.97 - 1.01 (0.0382 - 0.0398) | 0.48 + 0.48 (0.0189 + 0.0189) |
| 1.01 - 1.05 (0.0398 - 0.0413) | 0.48 + 0.52 (0.0189 + 0.0205) |
| 1.05 - 1.09 (0.0413 - 0.0429) | 0.52 + 0.52 (0.0205 + 0.0205) |
| 1.09 - 1.13 (0.0429 - 0.0445) | 0.52 + 0.56 (0.0205 + 0.0220) |
| 1.13 - 1.17 (0.0445 - 0.0461) | 0.56 + 0.56 (0.0220 + 0.0220) |
| 1.17 - 1.21 (0.0461 - 0.0476) | 0.56 + 0.60 (0.0220 + 0.0236) |
| 1.21 - 1.25 (0.0476 - 0.0492) | 0.60 + 0.60 (0.0236 + 0.0236) |
| 1.25 - 1.29 (0.0492 - 0.0508) | 0.60 + 0.64 (0.0236 + 0.0252) |
| 1.29 - 1.33 (0.0508 - 0.0524) | 0.64 + 0.64 (0.0252 + 0.0252) |
| 1.33 - 1.37 (0.0524 - 0.0539) | 0.64 + 0.68 (0.0252 + 0.0268) |
| 1.37 - 1.41 (0.0539 - 0.0555) | 0.68 + 0.68 (0.0268 + 0.0268) |
| 1.41 - 1.45 (0.0555 - 0.0571) | 0.68 + 0.72 (0.0268 + 0.0283) |
| 1.45 - 1.49 (0.0571 - 0.0587) | 0.72 + 0.72 (0.0283 + 0.0283) |
| 1.49 - 1.53 (0.0587 - 0.0602) | 0.72 + 0.76 (0.0283 + 0.0299) |
| 1.53 - 1.57 (0.0602 - 0.0618) | 0.76 + 0.76 (0.0299 + 0.0299) |
| 1.57 - 1.61 (0.0618 - 0.0634) | 0.76 + 0.80 (0.0299 + 0.0315) |
| 1.61 - 1.65 (0.0634 - 0.0650) | 0.80 + 0.80 (0.0315 + 0.0315) |
| 1.65 - 1.69 (0.0650 - 0.0665) | 0.44 + 1.20 (0.0173 + 0.0472) |

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

## Inspection and Adjustment (Cont'd)

### Differential side bearing adjusting shim — RS5F50A

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.40 (0.0157)     | 38453-03E11 |
| 0.44 (0.0173)     | 38453-03E00 |
| 0.48 (0.0189)     | 38453-03E01 |
| 0.52 (0.0205)     | 38453-03E12 |
| 0.56 (0.0220)     | 38453-03E02 |
| 0.60 (0.0236)     | 38453-03E03 |
| 0.64 (0.0252)     | 38453-03E04 |
| 0.68 (0.0268)     | 38453-03E05 |
| 0.72 (0.0283)     | 38453-03E06 |
| 0.76 (0.0299)     | 38453-03E07 |
| 0.80 (0.0315)     | 38453-03E08 |
| 1.20 (0.0472)     | 38453-03E13 |

### Differential side bearing adjusting shim — RS5F50V

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.36 (0.0142)     | 38753-56E00 |
| 0.40 (0.0157)     | 38753-56E01 |
| 0.44 (0.0173)     | 38753-56E02 |
| 0.48 (0.0189)     | 38753-56E03 |
| 0.52 (0.0205)     | 38753-56E04 |
| 0.56 (0.0220)     | 38753-56E05 |
| 0.60 (0.0236)     | 38753-56E06 |
| 0.64 (0.0252)     | 38753-56E07 |
| 0.68 (0.0268)     | 38753-56E08 |
| 0.72 (0.0283)     | 38753-56E09 |
| 0.76 (0.0299)     | 38753-56E10 |
| 0.80 (0.0315)     | 38753-56E11 |
| 0.84 (0.0331)     | 38753-56E12 |
| 0.88 (0.0346)     | 38753-56E13 |
| 0.92 (0.0362)     | 38753-56E14 |

### Table for selecting differential side bearing adjusting shim(s) — RS5F50A

Unit: mm (in)

| Dial indicator deflection     | Suitable shim(s)              |
|-------------------------------|-------------------------------|
| 0.47 - 0.51 (0.0185 - 0.0201) | 0.44 + 0.48 (0.0173 + 0.0189) |
| 0.51 - 0.55 (0.0201 - 0.0217) | 0.48 + 0.48 (0.0189 + 0.0189) |
| 0.55 - 0.59 (0.0217 - 0.0232) | 0.48 + 0.52 (0.0189 + 0.0205) |
| 0.59 - 0.63 (0.0232 - 0.0248) | 0.52 + 0.52 (0.0205 + 0.0205) |
| 0.63 - 0.67 (0.0248 - 0.0264) | 0.52 + 0.56 (0.0205 + 0.0220) |
| 0.67 - 0.71 (0.0264 - 0.0280) | 0.56 + 0.56 (0.0220 + 0.0220) |
| 0.71 - 0.75 (0.0280 - 0.0295) | 0.56 + 0.60 (0.0220 + 0.0236) |
| 0.75 - 0.79 (0.0295 - 0.0311) | 0.60 + 0.60 (0.0236 + 0.0236) |
| 0.79 - 0.83 (0.0311 - 0.0327) | 0.60 + 0.64 (0.0236 + 0.0252) |
| 0.83 - 0.87 (0.0327 - 0.0343) | 0.64 + 0.64 (0.0252 + 0.0252) |
| 0.87 - 0.91 (0.0343 - 0.0358) | 0.64 + 0.68 (0.0252 + 0.0268) |
| 0.91 - 0.95 (0.0358 - 0.0374) | 0.68 + 0.68 (0.0268 + 0.0268) |
| 0.95 - 0.99 (0.0374 - 0.0390) | 0.68 + 0.72 (0.0268 + 0.0283) |
| 0.99 - 1.03 (0.0390 - 0.0406) | 0.72 + 0.72 (0.0283 + 0.0283) |
| 1.03 - 1.07 (0.0406 - 0.0421) | 0.72 + 0.76 (0.0283 + 0.0299) |
| 1.07 - 1.11 (0.0421 - 0.0437) | 0.76 + 0.76 (0.0299 + 0.0299) |
| 1.11 - 1.15 (0.0437 - 0.0453) | 0.76 + 0.80 (0.0299 + 0.0315) |
| 1.15 - 1.19 (0.0453 - 0.0469) | 0.80 + 0.80 (0.0315 + 0.0315) |
| 1.19 - 1.23 (0.0469 - 0.0484) | 0.44 + 1.20 (0.0173 + 0.0472) |
| 1.23 - 1.27 (0.0484 - 0.0500) | 0.48 + 1.20 (0.0189 + 0.0472) |
| 1.27 - 1.31 (0.0500 - 0.0516) | 0.52 + 1.20 (0.0205 + 0.0472) |

### Table for selecting differential side bearing adjusting shim(s) — RS5F50V

Unit: mm (in)

| Dial indicator deflection     | Suitable shim(s)              |
|-------------------------------|-------------------------------|
| 0.47 - 0.51 (0.0185 - 0.0201) | 0.44 + 0.48 (0.0173 + 0.0189) |
| 0.51 - 0.55 (0.0201 - 0.0217) | 0.48 + 0.48 (0.0189 + 0.0189) |
| 0.55 - 0.59 (0.0217 - 0.0232) | 0.48 + 0.52 (0.0189 + 0.0205) |
| 0.59 - 0.63 (0.0232 - 0.0248) | 0.52 + 0.52 (0.0205 + 0.0205) |
| 0.63 - 0.67 (0.0248 - 0.0264) | 0.52 + 0.56 (0.0205 + 0.0220) |
| 0.67 - 0.71 (0.0264 - 0.0280) | 0.56 + 0.56 (0.0220 + 0.0220) |
| 0.71 - 0.75 (0.0280 - 0.0295) | 0.56 + 0.60 (0.0220 + 0.0236) |
| 0.75 - 0.79 (0.0295 - 0.0311) | 0.60 + 0.60 (0.0236 + 0.0236) |
| 0.79 - 0.83 (0.0311 - 0.0327) | 0.60 + 0.64 (0.0236 + 0.0252) |
| 0.83 - 0.87 (0.0327 - 0.0343) | 0.64 + 0.64 (0.0252 + 0.0252) |
| 0.87 - 0.91 (0.0343 - 0.0358) | 0.64 + 0.68 (0.0252 + 0.0268) |
| 0.91 - 0.95 (0.0358 - 0.0374) | 0.68 + 0.68 (0.0268 + 0.0268) |
| 0.95 - 0.99 (0.0374 - 0.0390) | 0.68 + 0.72 (0.0268 + 0.0283) |
| 0.99 - 1.03 (0.0390 - 0.0406) | 0.72 + 0.72 (0.0283 + 0.0283) |
| 1.03 - 1.07 (0.0406 - 0.0421) | 0.72 + 0.76 (0.0283 + 0.0299) |
| 1.07 - 1.11 (0.0421 - 0.0437) | 0.76 + 0.76 (0.0299 + 0.0299) |
| 1.11 - 1.15 (0.0437 - 0.0453) | 0.76 + 0.80 (0.0299 + 0.0315) |
| 1.15 - 1.19 (0.0453 - 0.0469) | 0.80 + 0.80 (0.0315 + 0.0315) |
| 1.19 - 1.23 (0.0469 - 0.0484) | 0.72 + 0.92 (0.0283 + 0.0362) |
| 1.23 - 1.27 (0.0484 - 0.0500) | 0.76 + 0.92 (0.0299 + 0.0362) |
| 1.27 - 1.31 (0.0500 - 0.0516) | 0.80 + 0.92 (0.0315 + 0.0362) |





# AUTOMATIC TRANSAXLE

## SECTION **AT**

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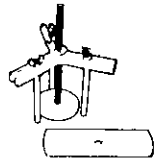
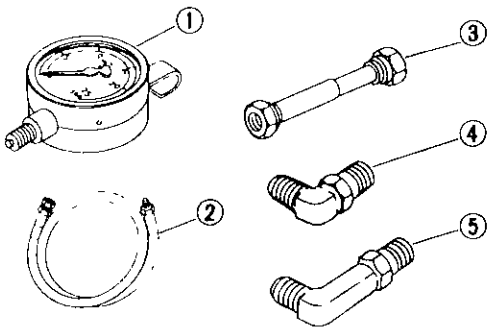
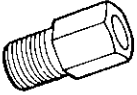
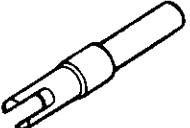
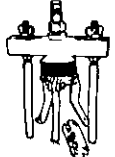
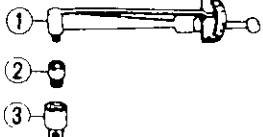
**When you read wiring diagrams:**

- Read G1 section, "HOW TO READ WIRING DIAGRAMS".
  - See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.
- When you perform trouble diagnoses, read G1 section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".**

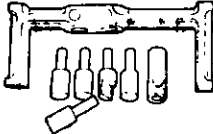
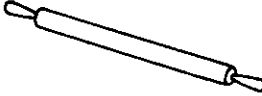
**AT**

# PREPARATION

## SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name                                                                                                                                                                                                                               | Description                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| ST25420001<br>(J34285)<br>Clutch spring compressor                                                                                                                                                                                                                         | Removing and installing clutch springs.<br>         |
| ST2505S001<br>(J25695-A)<br>Oil pressure gauge set<br>① ST25051001<br>(J25695-1)<br>Oil pressure gauge<br>② ST25052000<br>(J25695-2)<br>Hose<br>③ ST25053000<br>(J25695-3)<br>Joint pipe<br>④ ST25054000<br>(J25695-4)<br>Adapter<br>⑤ ST25055000<br>(J25695-5)<br>Adapter | Measuring oil pressure<br>                           |
| KV31101200<br>(J34282)<br>Oil pressure gauge adapter                                                                                                                                                                                                                       | Measuring oil pressure<br>                        |
| KV38106500<br>(J34284)<br>Preload adapter                                                                                                                                                                                                                                  | Checking differential side bearing preload<br>    |
| ST33290001<br>(J34286)<br>Side bearing outer race puller                                                                                                                                                                                                                   | Removing differential side bearing outer race<br> |
| ST3127S000<br>(See J25765-A)<br>Preload gauge<br>① GG91030000<br>(J25765-A)<br>Torque wrench<br>② HT62940000<br>( — )<br>Socket adapter<br>③ HT62900000<br>( — )<br>Socket adapter                                                                                         | Checking differential side bearing preload<br>     |

## PREPARATION

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (J34290)<br>Shim selecting tool              | <p>Selecting oil pump housing bearing race</p> <p>Selecting clutch pack thrust washer</p> <p>Selecting differential side bearing adjusting shim</p> <p>Selecting output shaft bearing adjusting shim</p> <p>Selecting idler gear bearing adjusting shim</p>  |
| (J26774-A)<br>Seal installation tool         | <p>Installing piston</p>                                                                                                                                                                                                                                    |

## **PRECAUTIONS**

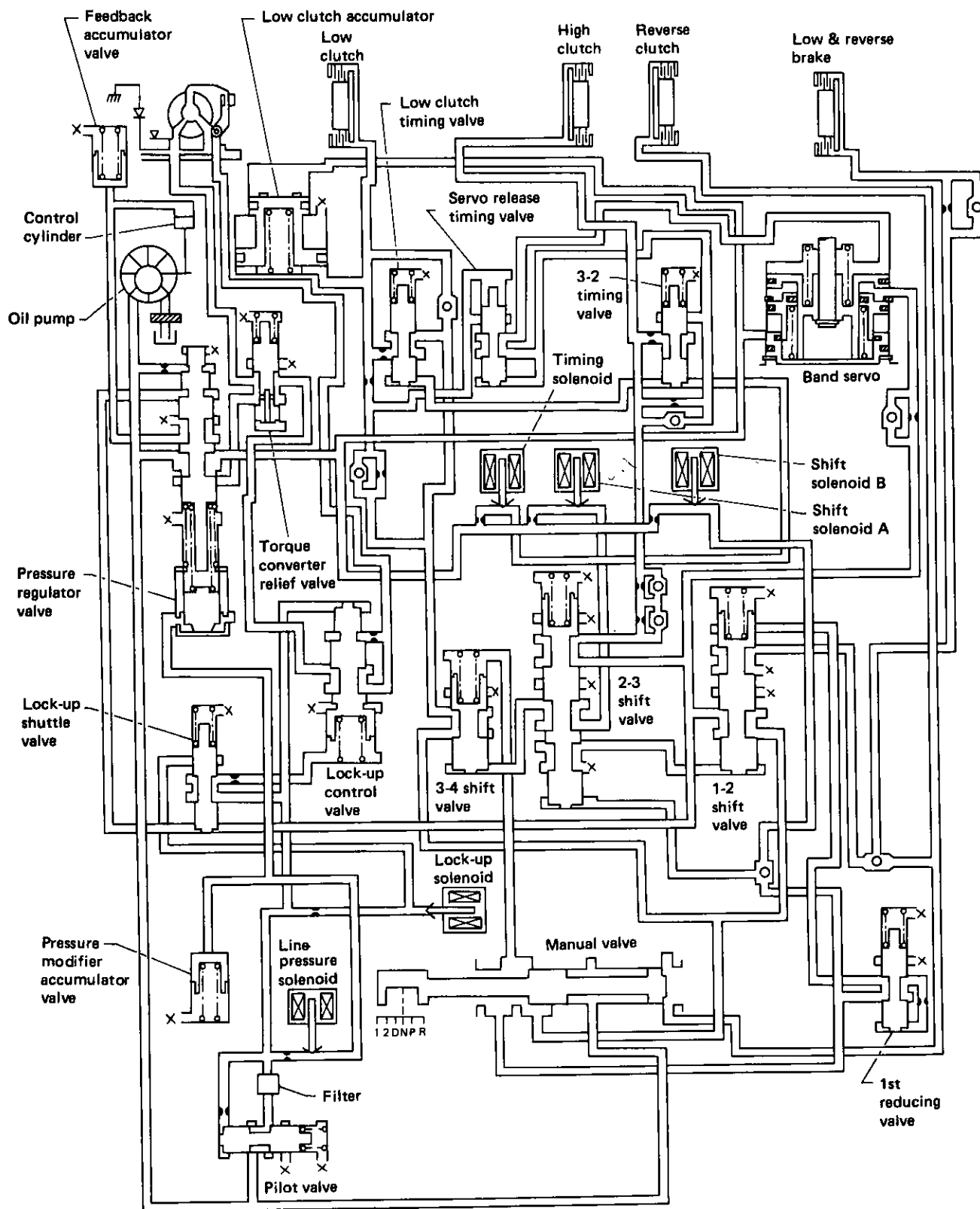
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### **Service Notice**

- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transaxle is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during reassembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transaxle with new A.T.F.

# A/T CONTROL DIAGRAM

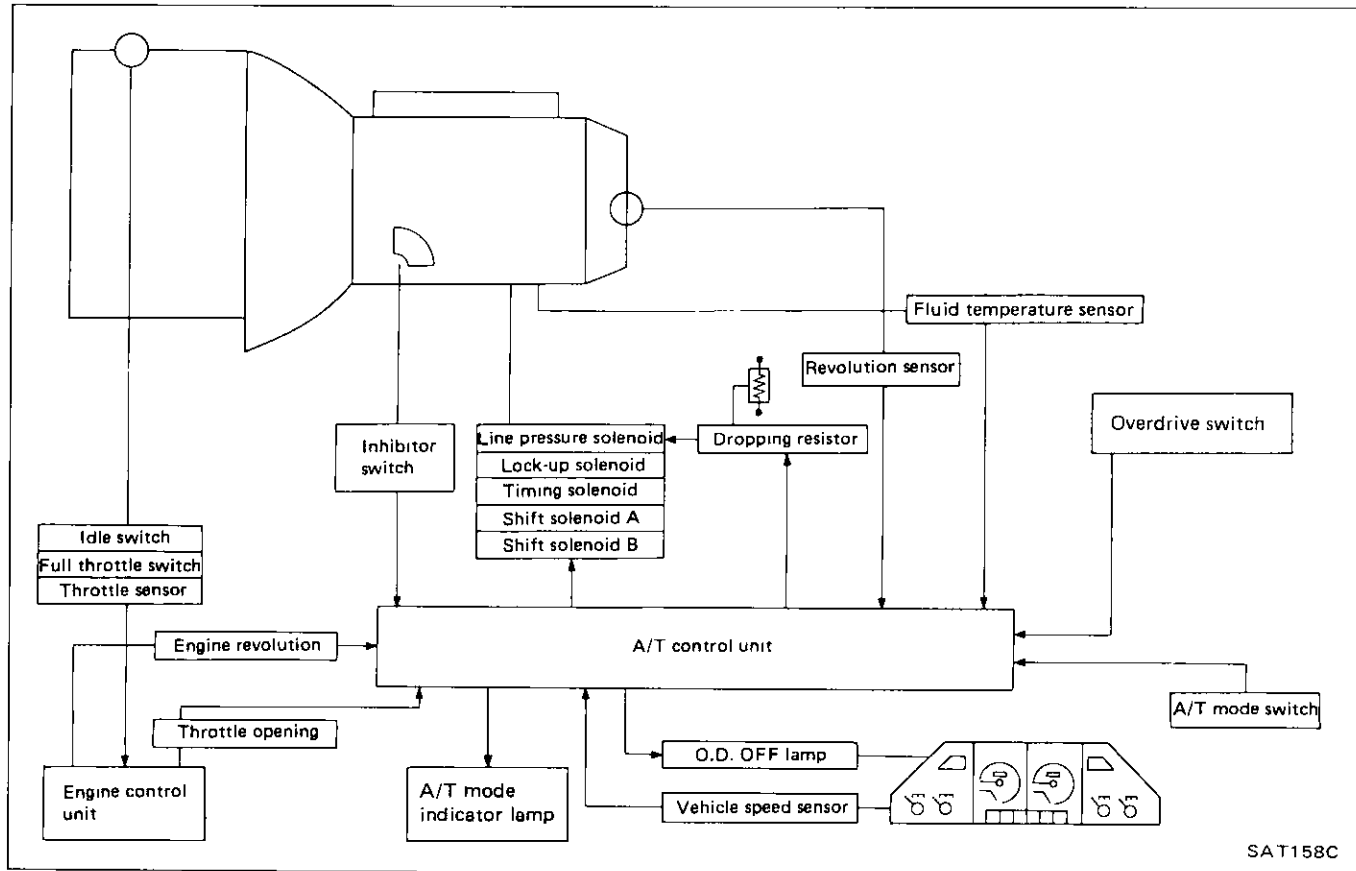
## Hydraulic Control Circuits



SAT716B

# A/T CONTROL DIAGRAM

## Electrical Control Chart

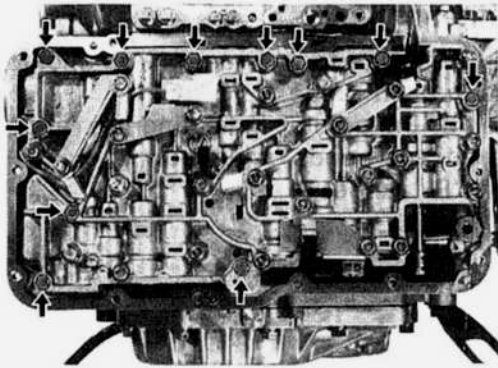


## Mechanical Operation

| Range   |                           | Reverse clutch | High clutch | Low clutch | Band servo |         | Low & reverse brake | One-way clutch | Parking pawl | Lock-up |
|---------|---------------------------|----------------|-------------|------------|------------|---------|---------------------|----------------|--------------|---------|
|         |                           |                |             |            | Operation  | Release |                     |                |              |         |
| Park    |                           |                |             |            |            |         |                     |                | on           |         |
| Reverse |                           | on             |             |            |            |         | on                  |                |              |         |
| Neutral |                           |                |             |            |            |         |                     |                |              |         |
| Drive   | D <sub>1</sub> Low        |                |             | on         |            |         |                     | on             |              |         |
|         | D <sub>2</sub> Second     |                |             | on         | on         |         |                     |                |              |         |
|         | D <sub>3</sub> Top (3rd)  |                | on          | on         | (on)       | on      |                     |                |              | on*1    |
|         | D <sub>4</sub> O.D. (4th) |                | on          |            | on         |         |                     |                |              | on*2    |
| 2       | 2 <sub>1</sub> Low        |                |             | on         |            |         |                     | on             |              |         |
|         | 2 <sub>2</sub> Second     |                |             | on         | on         |         |                     |                |              |         |
| 1       | 1 <sub>1</sub> Low        |                |             | on         |            |         | on                  | on             |              |         |
|         | 1 <sub>2</sub> Second     |                |             | on         | on         |         |                     |                |              |         |

\*1: Lock-up operates in 3rd speed (lock-up) range when O.D. control switch is "OFF" (Overdrive not allowed).

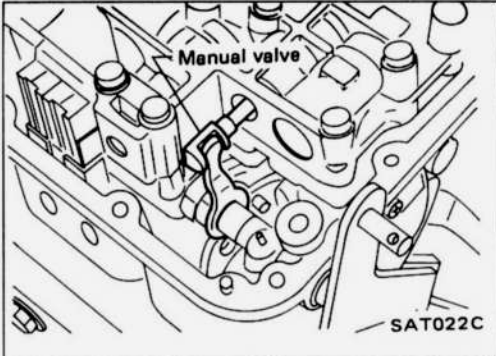
\*2: Lock-up operates in 4th speed (lock-up) range when O.D. control switch is "ON" (Overdrive allowed).



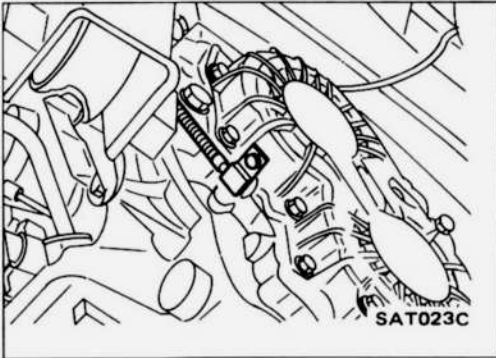
### Control Valve Assembly

1. Remove air cleaner, battery and its bracket.
2. Remove control valve cover.
3. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

**Be careful not to drop manual valve out of valve body.**



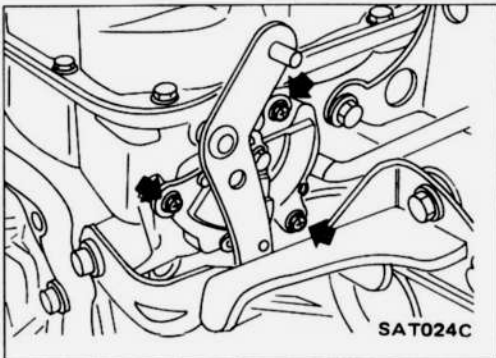
4. Disassemble, inspect and assemble control valve assembly. Refer to "Control Valve Body".
- Set manual shaft in "N" position, then align manual plate with groove in manual valve of control valve assembly.
  - After installing control valve to transmission case, make sure that selector lever can be moved to all positions.



### Revolution Sensor Replacement

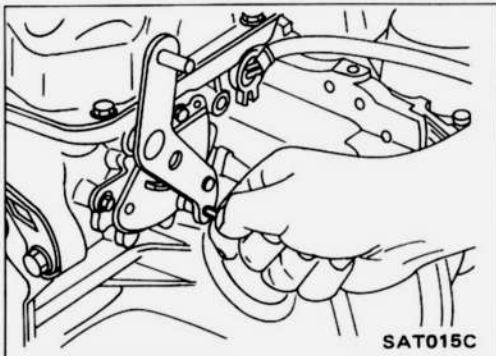
1. Remove under cover.
2. Remove revolution sensor from A/T.
3. Reinstall any part removed.

**Always use new sealing parts.**

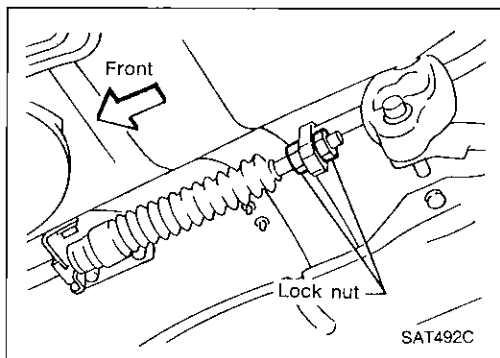


### Inhibitor Switch Adjustment

1. Remove control cable from manual shaft.
2. Set manual shaft in "N" position.
3. Loosen inhibitor switch fixing bolts.



4. Insert pin into adjustment holes in both inhibitor switch and manual shaft as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".

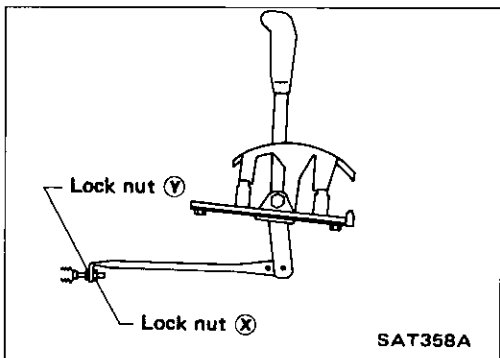


### Control Cable Adjustment

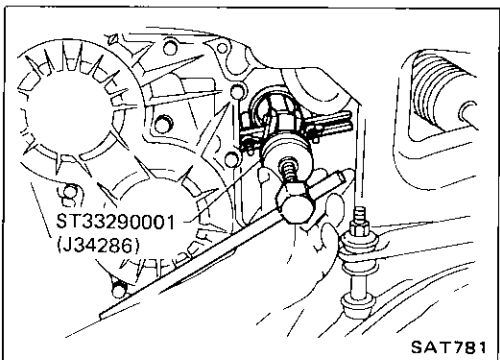
Move selector lever from "P" range to "1" range. You should be able to feel the detents in each range.

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.

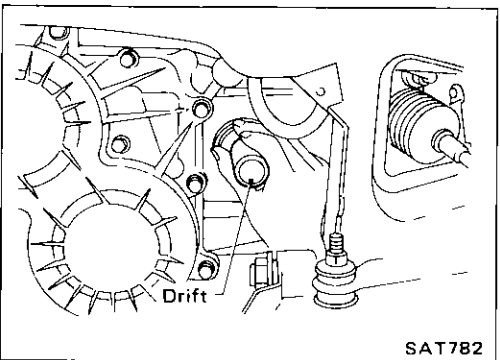


3. Screw lock nut ④ until it touches select rod end while holding select rod horizontal, and tighten lock nut ⑤.
4. Move selector lever from "P" range to "1" range again. Make sure selector lever moves smoothly.



### Differential Side Oil Seal Replacement

1. Remove drive shaft assembly. — Refer to section FA.
2. Remove oil seal.



3. Install oil seal.
- Apply A.T.F. before installing.**
4. Reinstall any part removed.



# TROUBLE DIAGNOSES

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## TROUBLE DIAGNOSES

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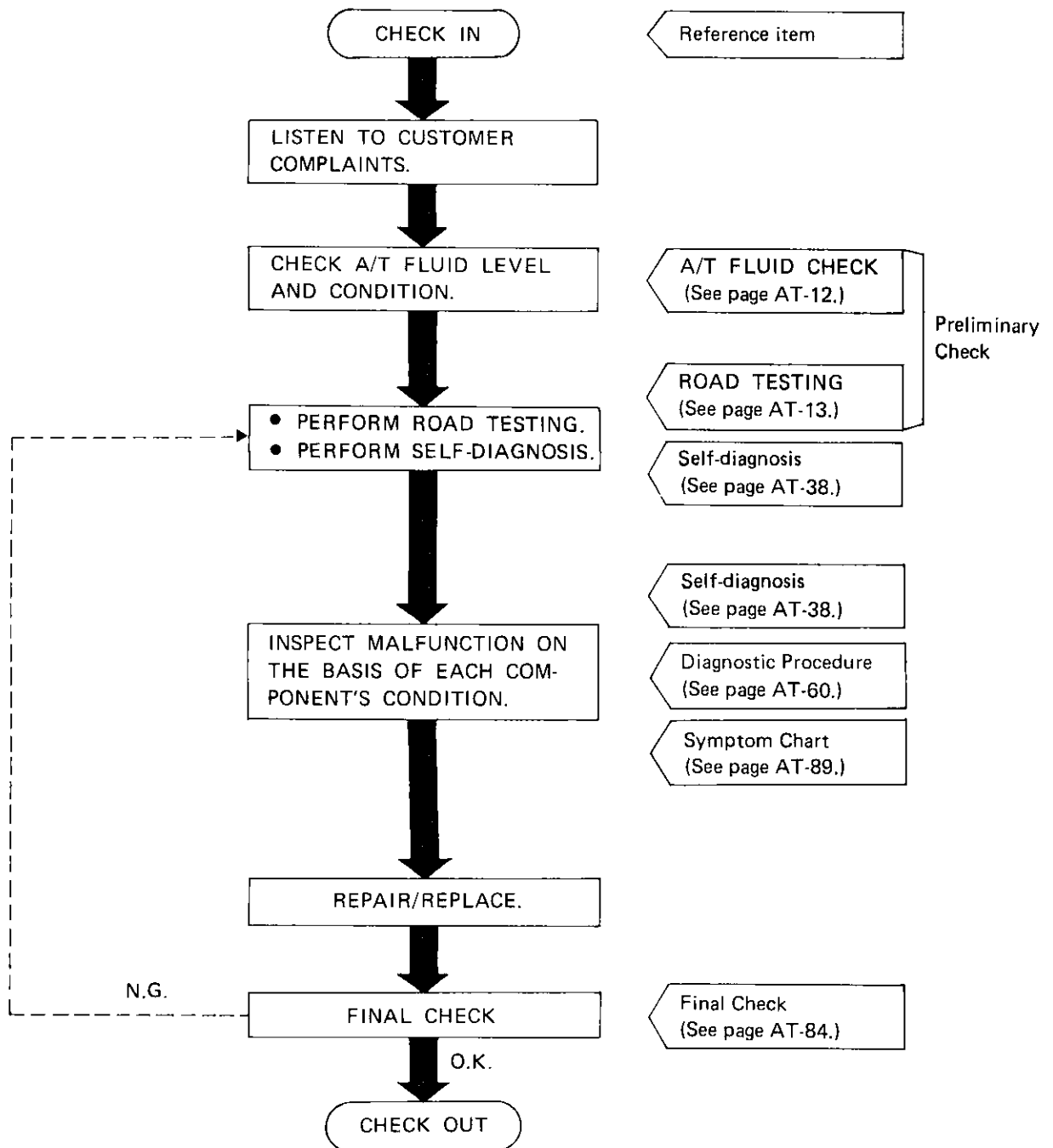
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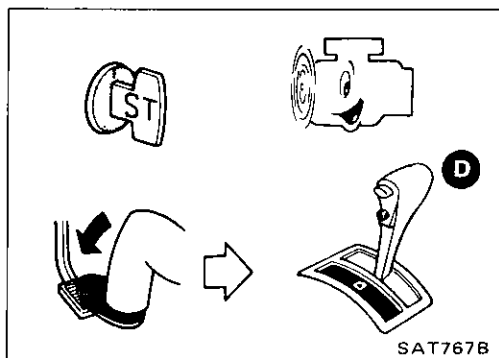
# TROUBLE DIAGNOSES

## How to Perform Trouble Diagnoses for Quick and Accurate Repair

### WORK FLOW



## TROUBLE DIAGNOSES

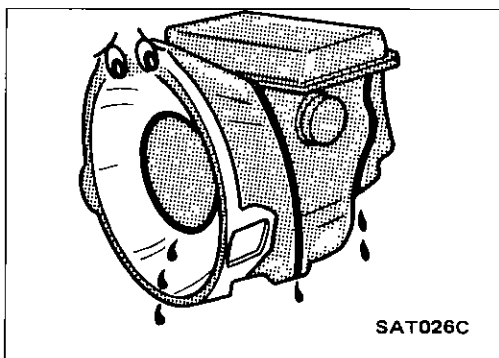


### Preliminary Check

#### 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<br>— Road water entering through filler tube or breather |
| Varnished fluid, light to dark brown any tacky | Oxidation<br>— Over or under filling<br>— Overheating                        |

##### Fluid level check

Refer to section MA.

## TROUBLE DIAGNOSES

### ROAD TEST PROCEDURE

1. Check before engine is started.

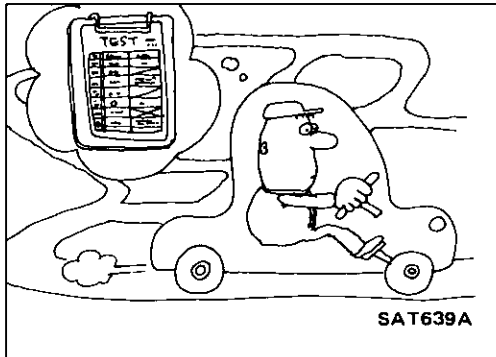


2. Check at idle.



3. Cruise test.

SAT786A



SAT639A

### Preliminary Check (Cont'd)

#### ROAD TESTING

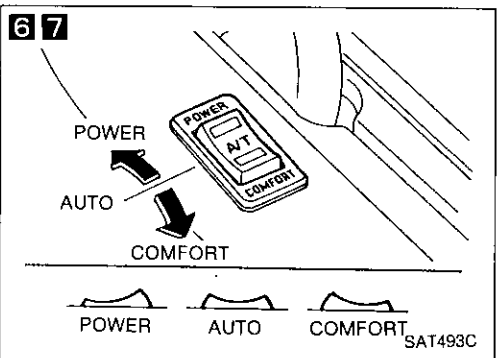
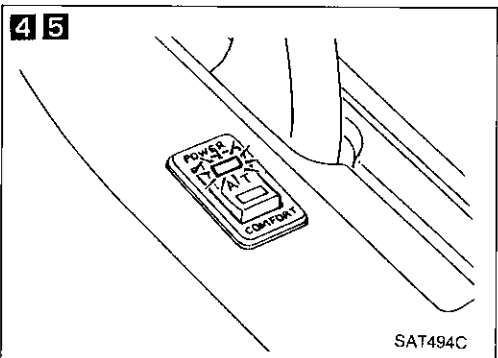
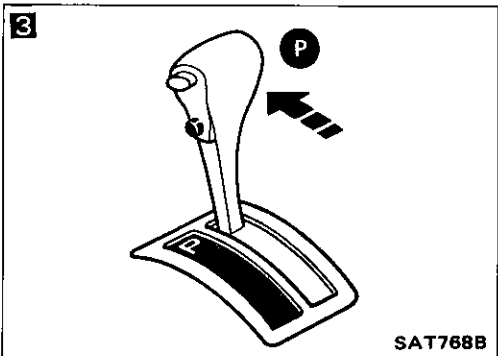
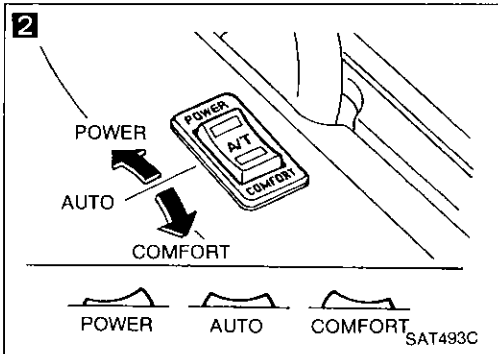
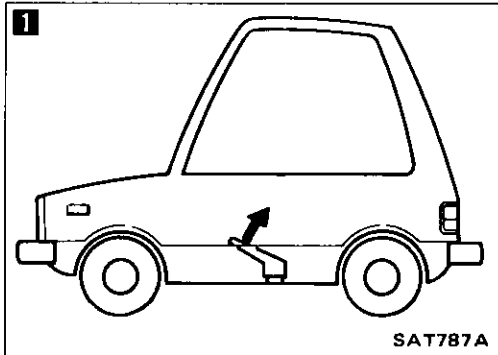
##### Description

- The purpose of this road test is to determine overall performance of automatic transaxle 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".

# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

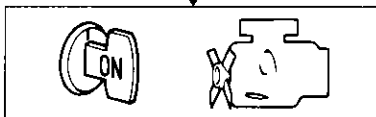
### 1. Check before engine is started



**1**  
Park vehicle on flat surface.

**2**  
Set A/T mode switch in "AUTO" position.

**3**  
Move selector lever to "P" range.



**4**  
Does power indicator lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

**5**  
Does power indicator lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.

**6**  
Set A/T mode switch in "POWER" position.

Does power indicator lamp come on?

No → Go to Diagnostic Procedure 2.

**7**  
Set A/T mode switch in "COMFORT" position.

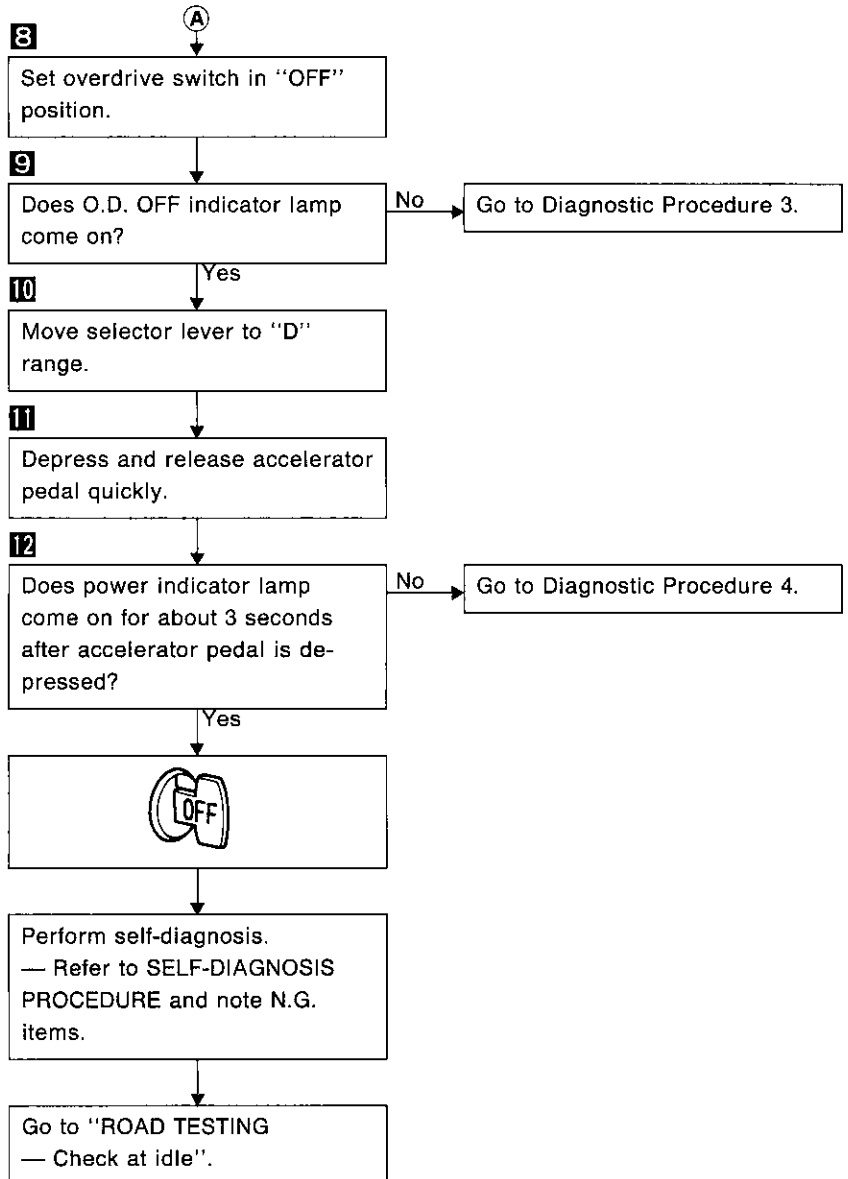
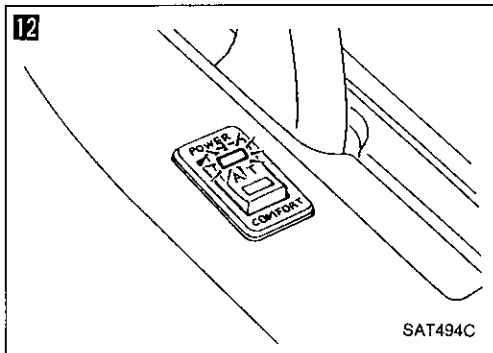
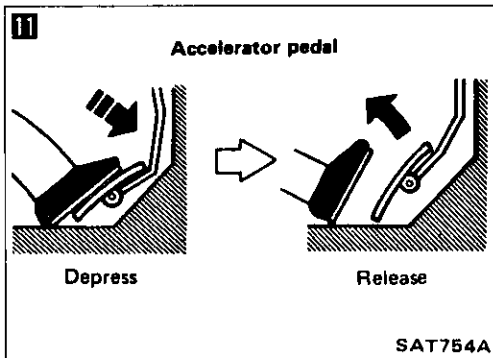
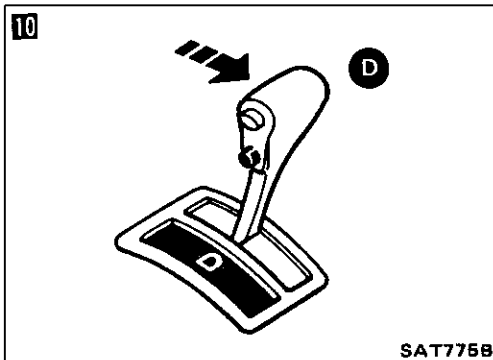
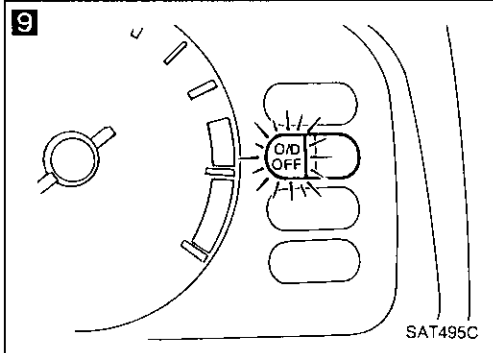
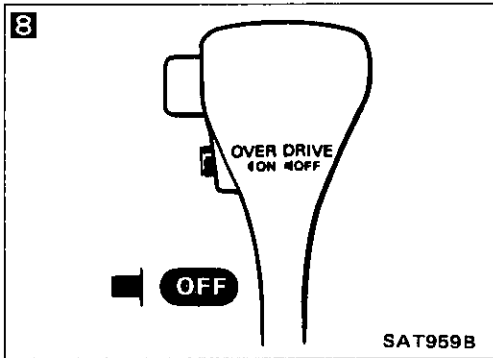
Does comfort indicator lamp come on?

No → Go to Diagnostic Procedure 2.

Yes  
A

# TROUBLE DIAGNOSES

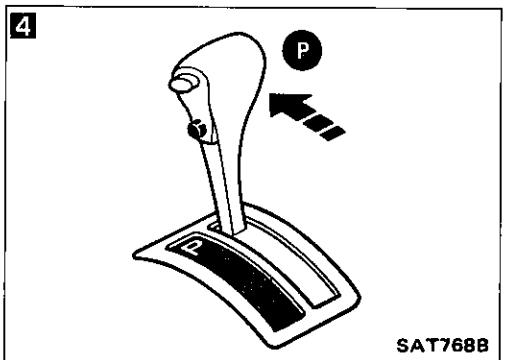
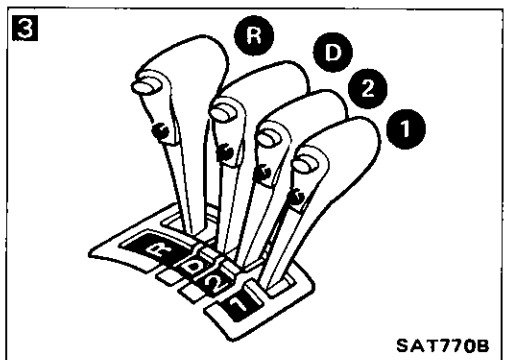
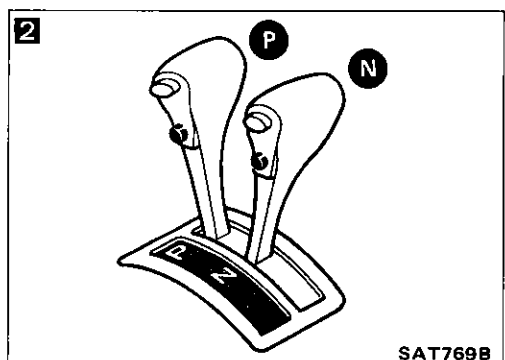
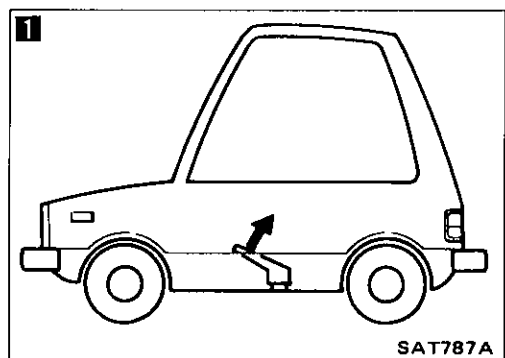
## Preliminary Check (Cont'd)



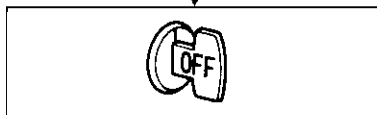
# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

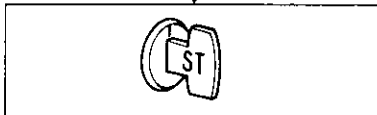
### 2. Check at idle



**1**  
Park vehicle on flat surface.

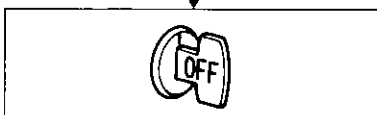


**2**  
Move selector lever to "P" or "N" range.

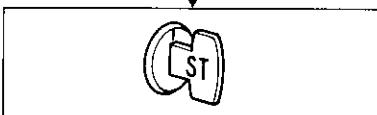


Is engine started?

No → Go to Diagnostic Procedure 5.

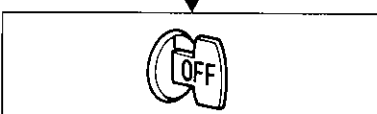


**3**  
Move selector lever to "D", "1", "2" or "R" range.



Is engine started?

Yes → Go to Diagnostic Procedure 5.



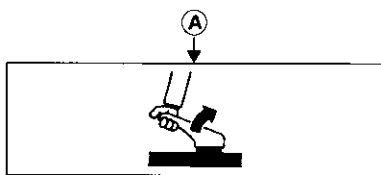
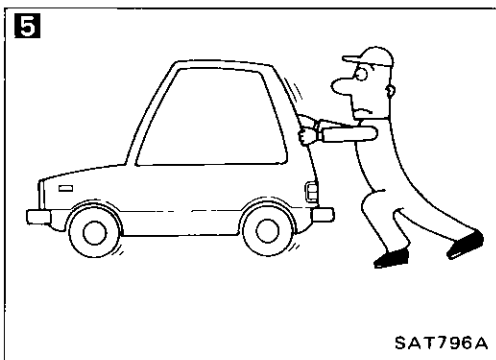
**4**  
Move selector lever to "P" range.

Ⓐ

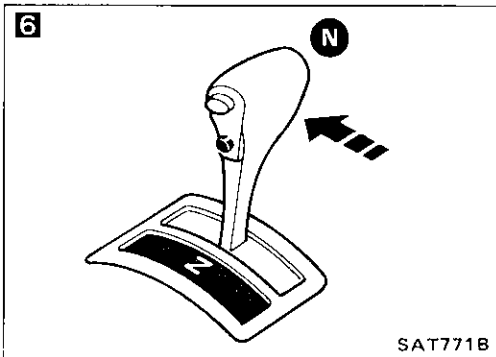


# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

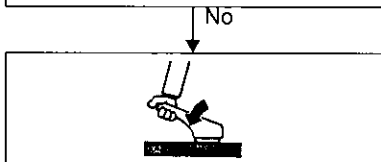


**5**  
Push vehicle forward or backward.

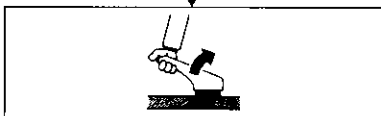
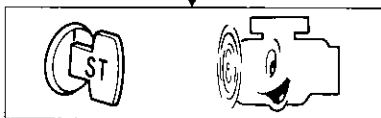
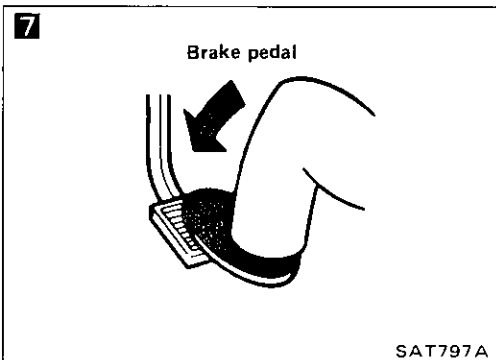


Does vehicle move when it is pushed forward or backward?

Yes → Go to Diagnostic Procedure 6.



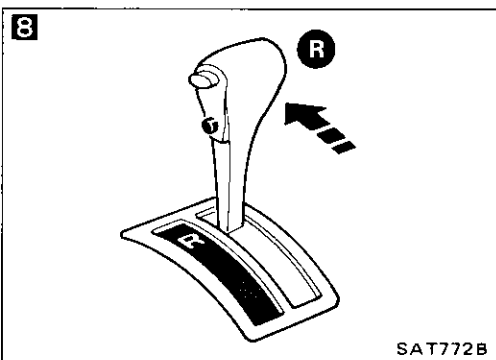
**6**  
Move selector lever to "N" range.



Does vehicle move forward or backward?

Yes → Go to Diagnostic Procedure 7.

No  
**7**  
Apply foot brake.

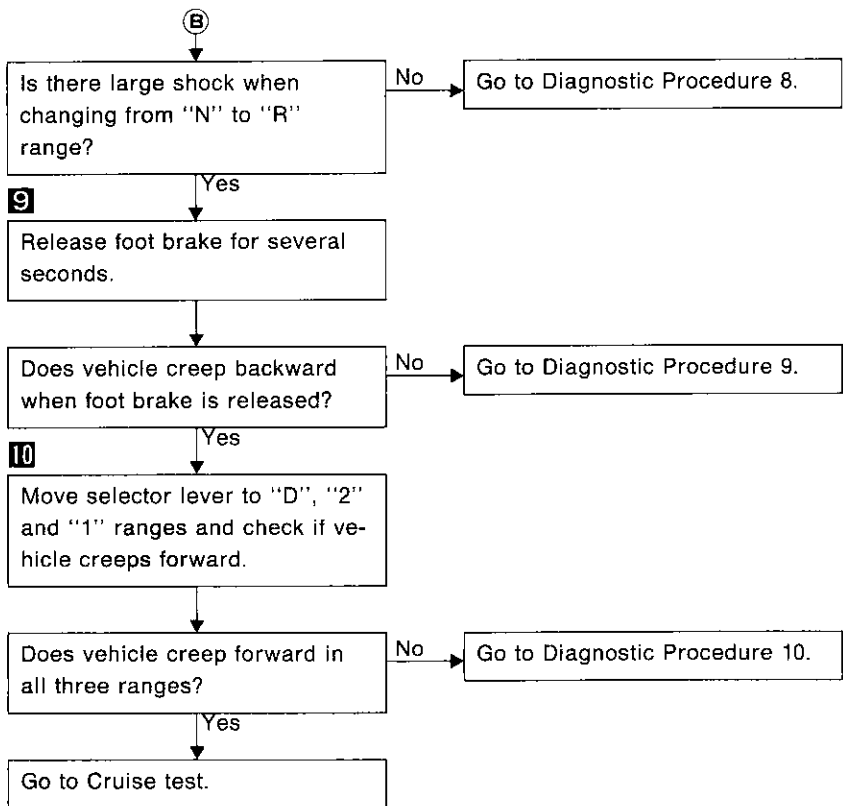
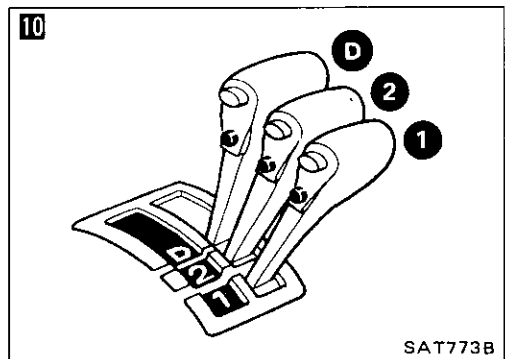
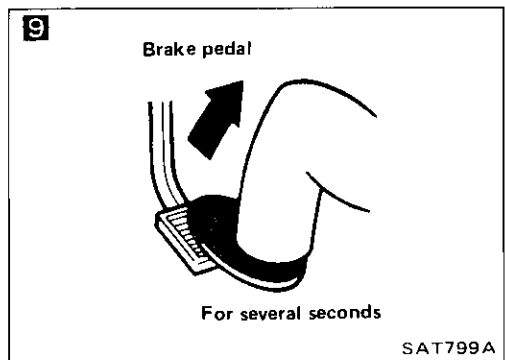


**8**  
Move selector lever to "R" range.

**B**

## TROUBLE DIAGNOSES

### Preliminary Check (Cont'd)



## TROUBLE DIAGNOSES

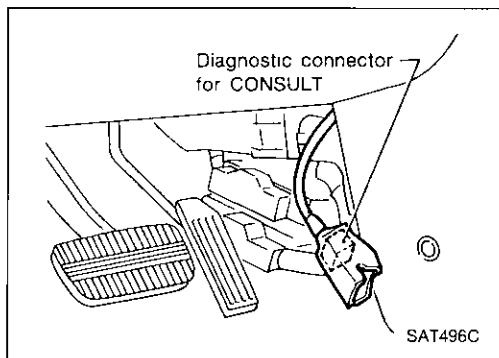
### Preliminary Check (Cont'd)

#### 3. Cruise test



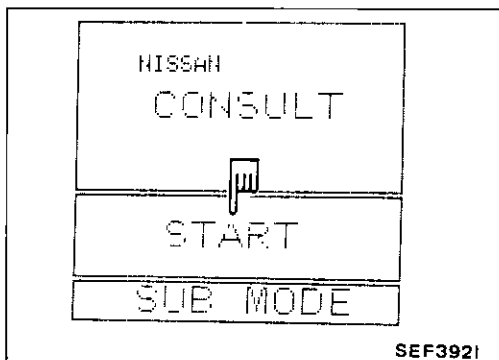
##### With CONSULT

- Using CONSULT, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule."
- Check all items listed in Parts 1 through 3.

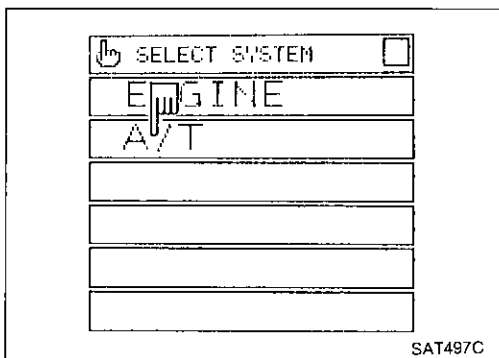


#### CONSULT setting procedure

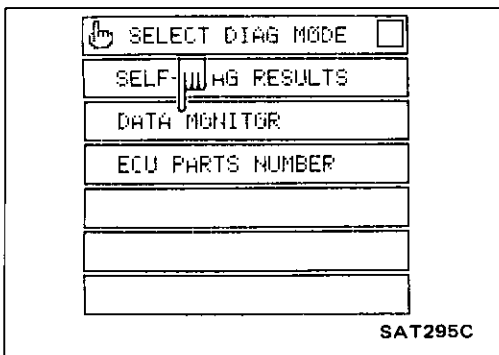
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector. (Diagnostic connector is located in left dash side panel.)



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



5. Touch "A/T".

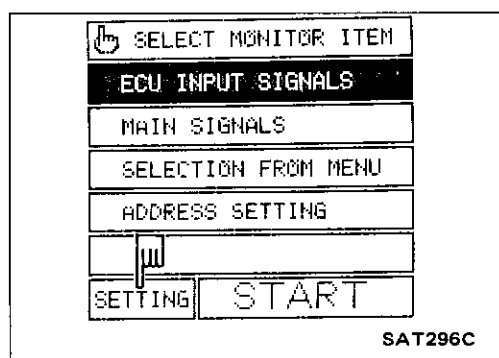


6. Touch "DATA MONITOR".

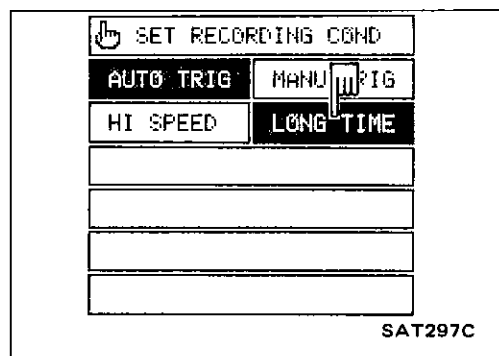
## TROUBLE DIAGNOSES

### Preliminary Check (Cont'd)

7. Touch "SETTING" to set recording condition.

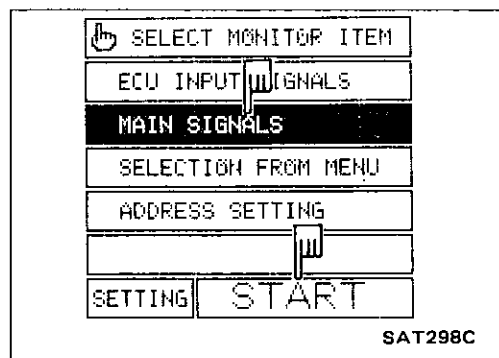


8. Touch "LONG TIME" and "ENTER" key.

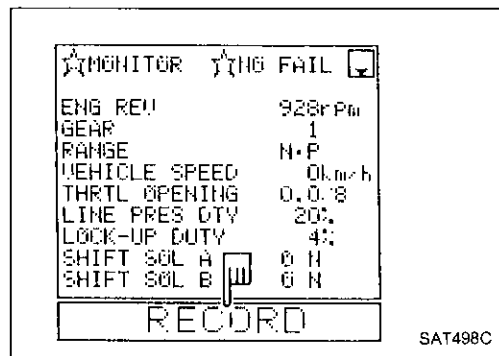


9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".

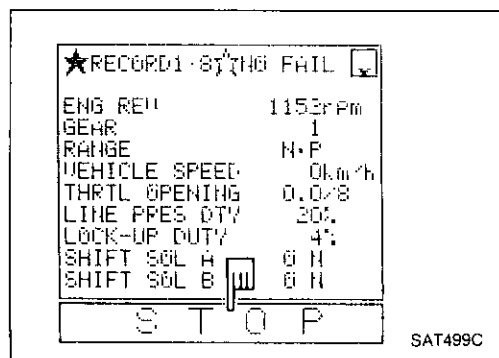
10. Touch "START".



11. When performing cruise test, touch "RECORD".



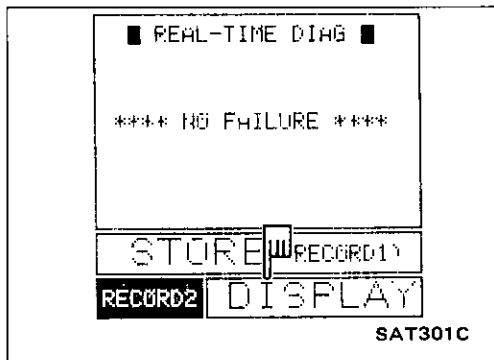
12. After finishing cruise test part 1, touch "STOP".



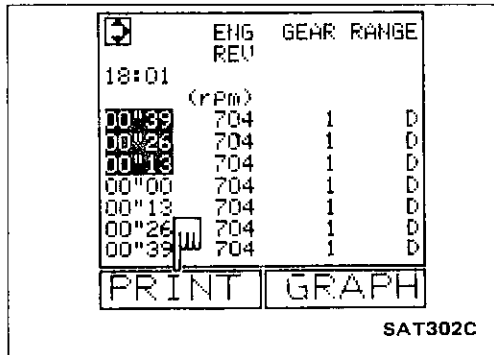
## TROUBLE DIAGNOSES

### Preliminary Check (Cont'd)

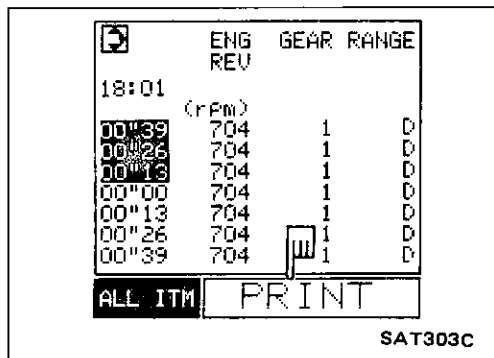
13. Touch "DISPLAY".



14. Touch "PRINT".

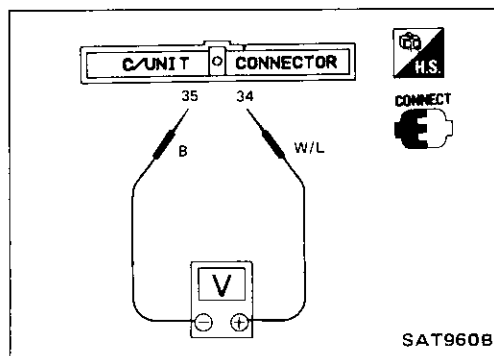
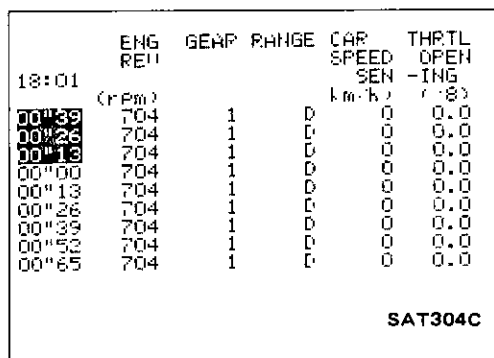


15. Touch "PRINT" again.



16. Check the monitor data printed out.

17. Continue cruise test part 2 and 3.

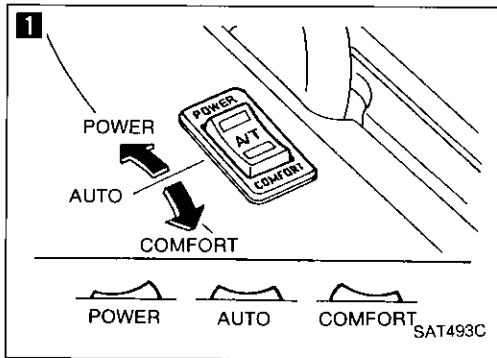


Without CONSULT

- Throttle position can be controlled by voltage across terminals ③④ and ③⑤ of A/T control unit.

# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

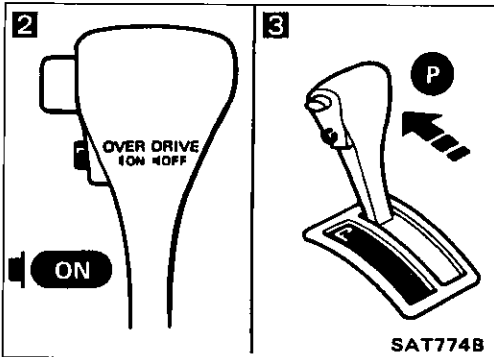


### Cruise test — Part 1

Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

**A.T.F. operating temperature:**  
50 - 80°C (122 - 176°F)

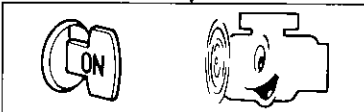
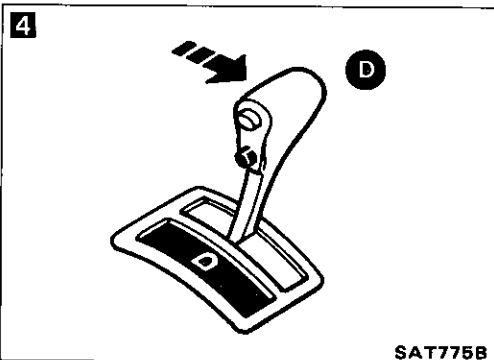
Park vehicle on flat surface.



**1** Set A/T mode switch in "AUTO" position.

**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<sub>1</sub>?  
**Read gear position.**

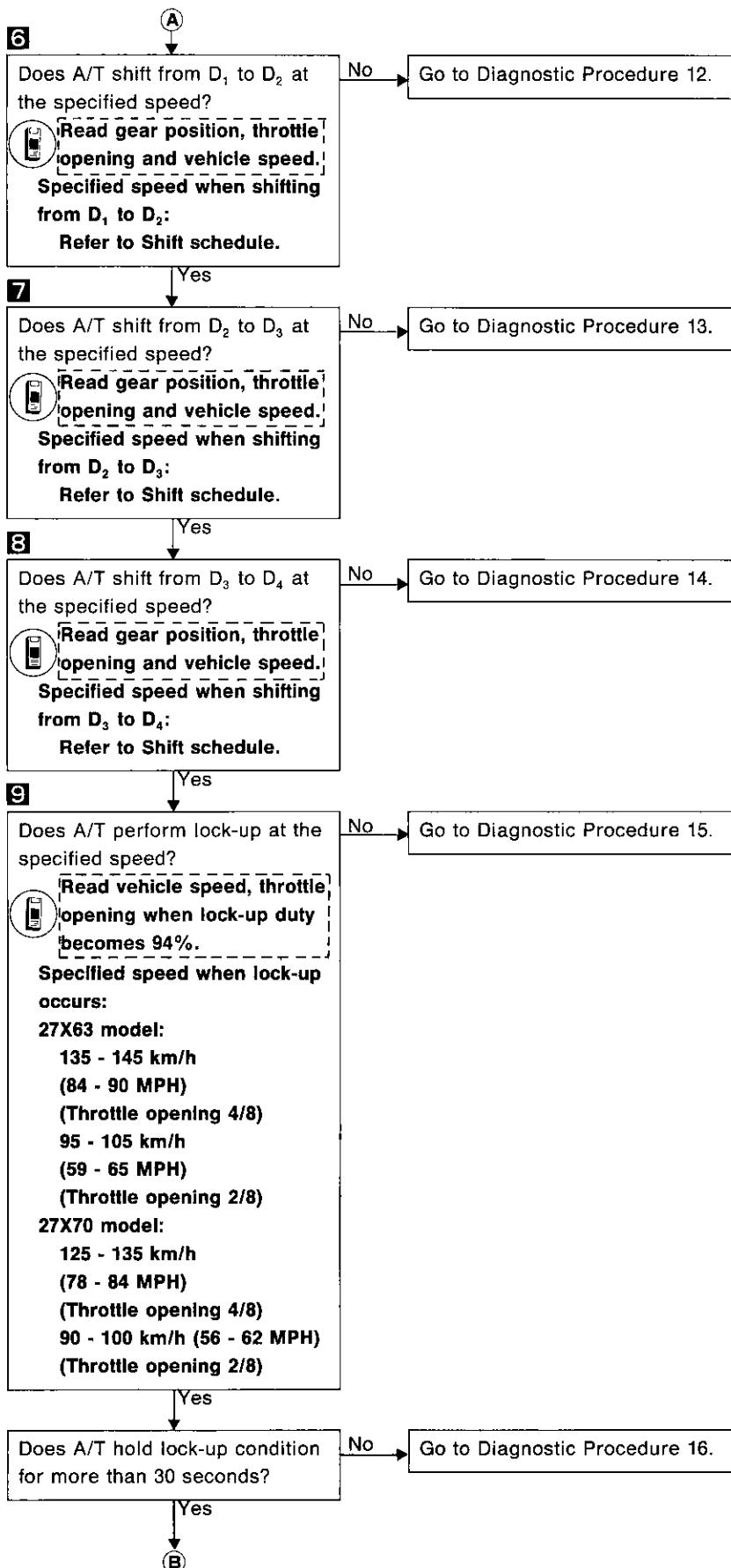
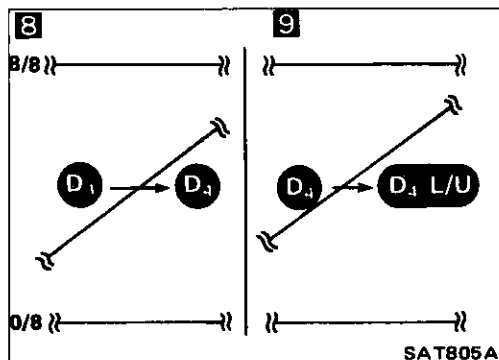
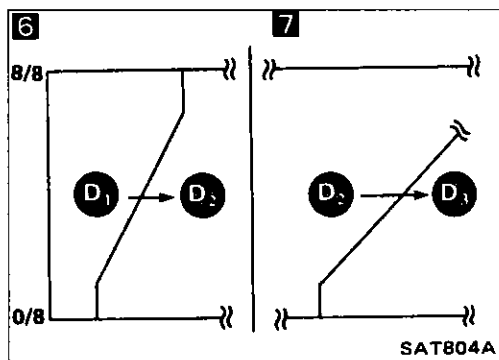
No → Go to Diagnostic Procedure 11.

Yes

A

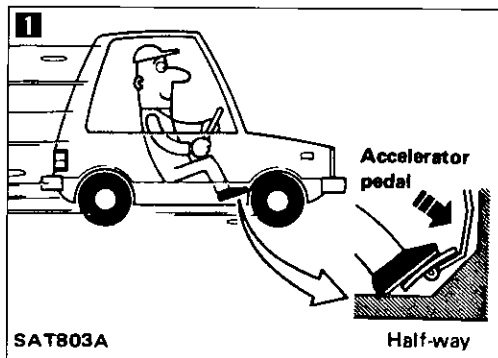
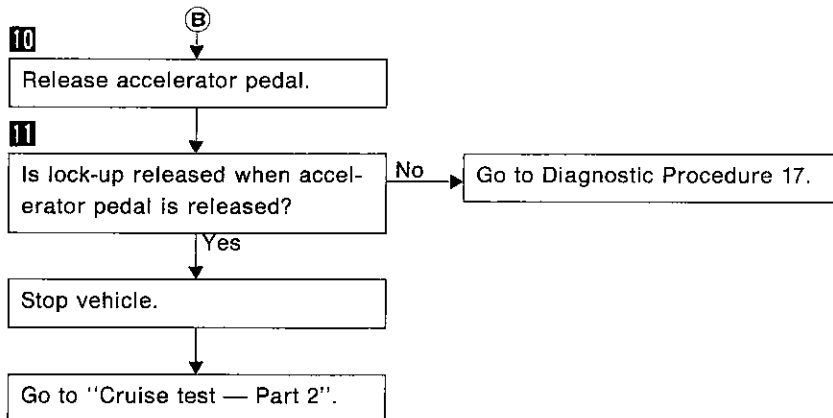
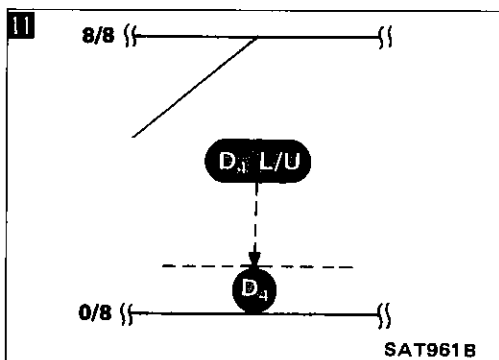
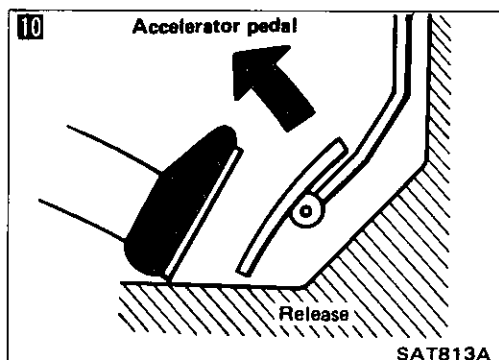
# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

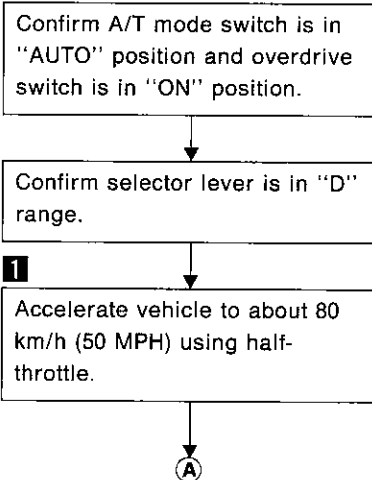


# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)



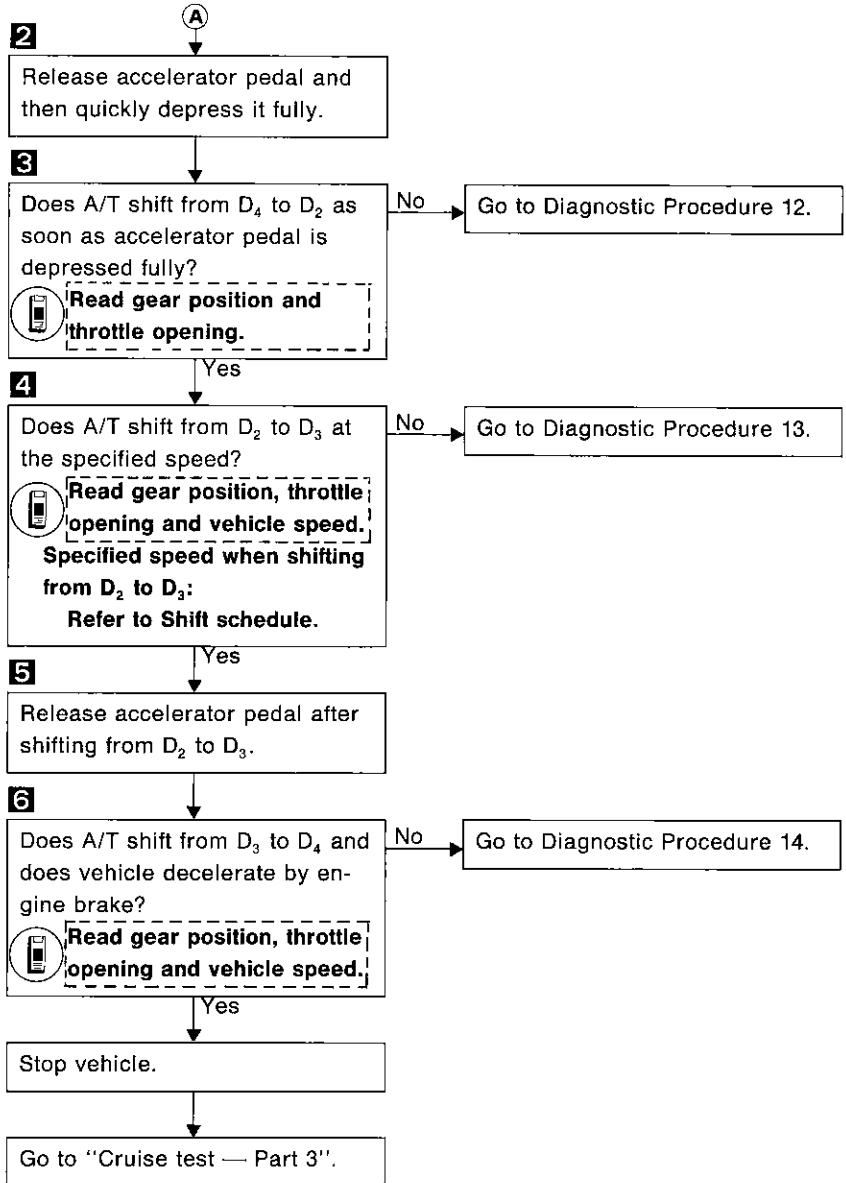
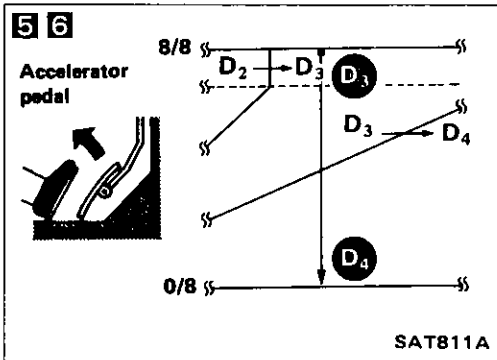
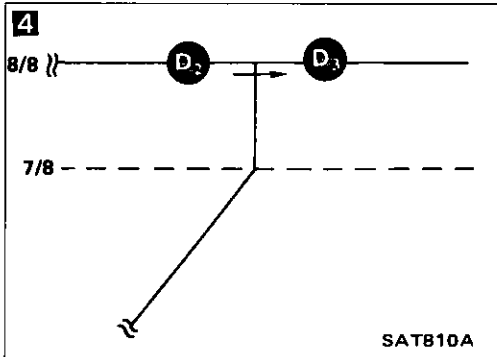
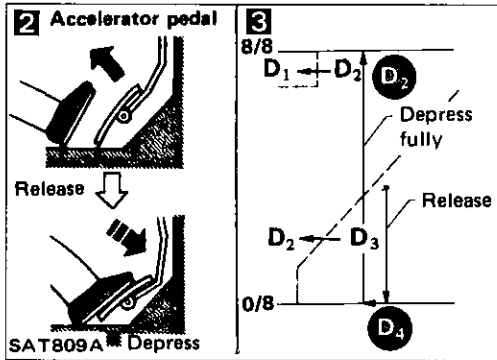
## Cruise test — Part 2





# TROUBLE DIAGNOSES

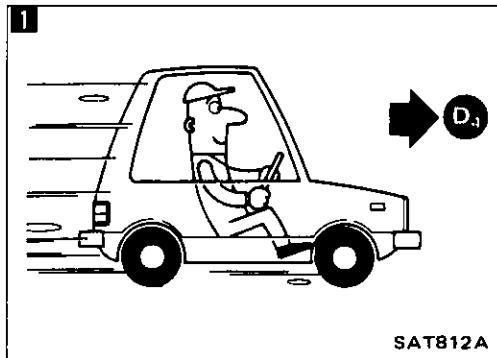
## Preliminary Check (Cont'd)



# TROUBLE DIAGNOSES

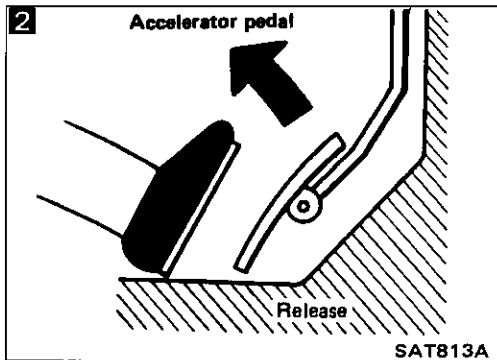
## Preliminary Check (Cont'd)

### Cruise test — Part 3



Confirm A/T mode switch is in "AUTO" position and overdrive switch is in "ON" position.

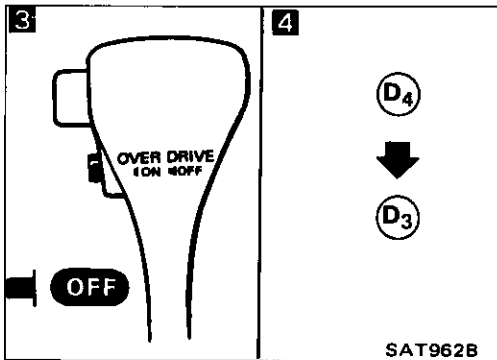
Confirm selector lever is in "D" range.



Accelerate vehicle to  $D_4$  using half-throttle.

Release accelerator pedal.

Set overdrive switch in "OFF" position while driving in  $D_4$  range.



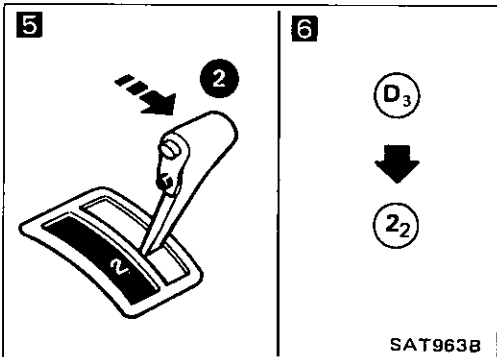
Does A/T shift from  $D_4$  to  $D_3$ ?

Read gear position and vehicle speed.

Move selector lever from "D" to "2" range while driving in  $D_3$ .

Does A/T shift from  $D_3$  to  $2_2$ ?

Read gear position.



Yes

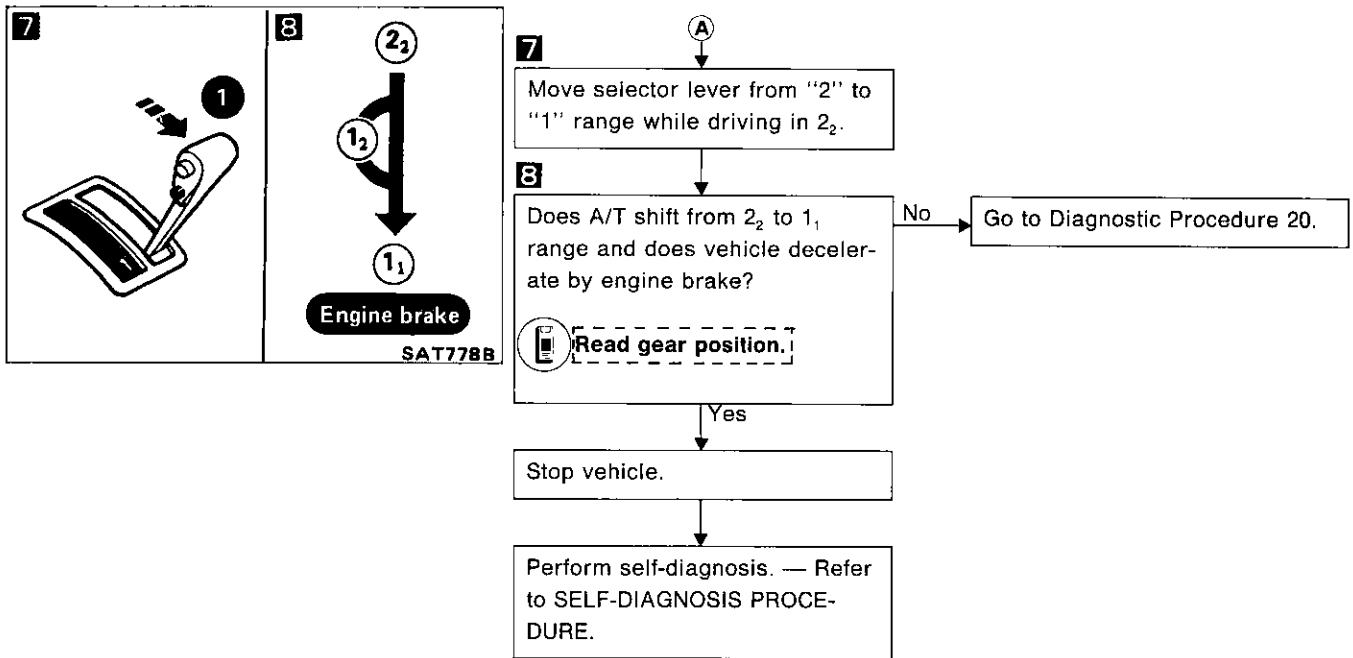
A

No → Go to Diagnostic Procedure 18.

No → Go to Diagnostic Procedure 19.

## TROUBLE DIAGNOSES

### Preliminary Check (Cont'd)

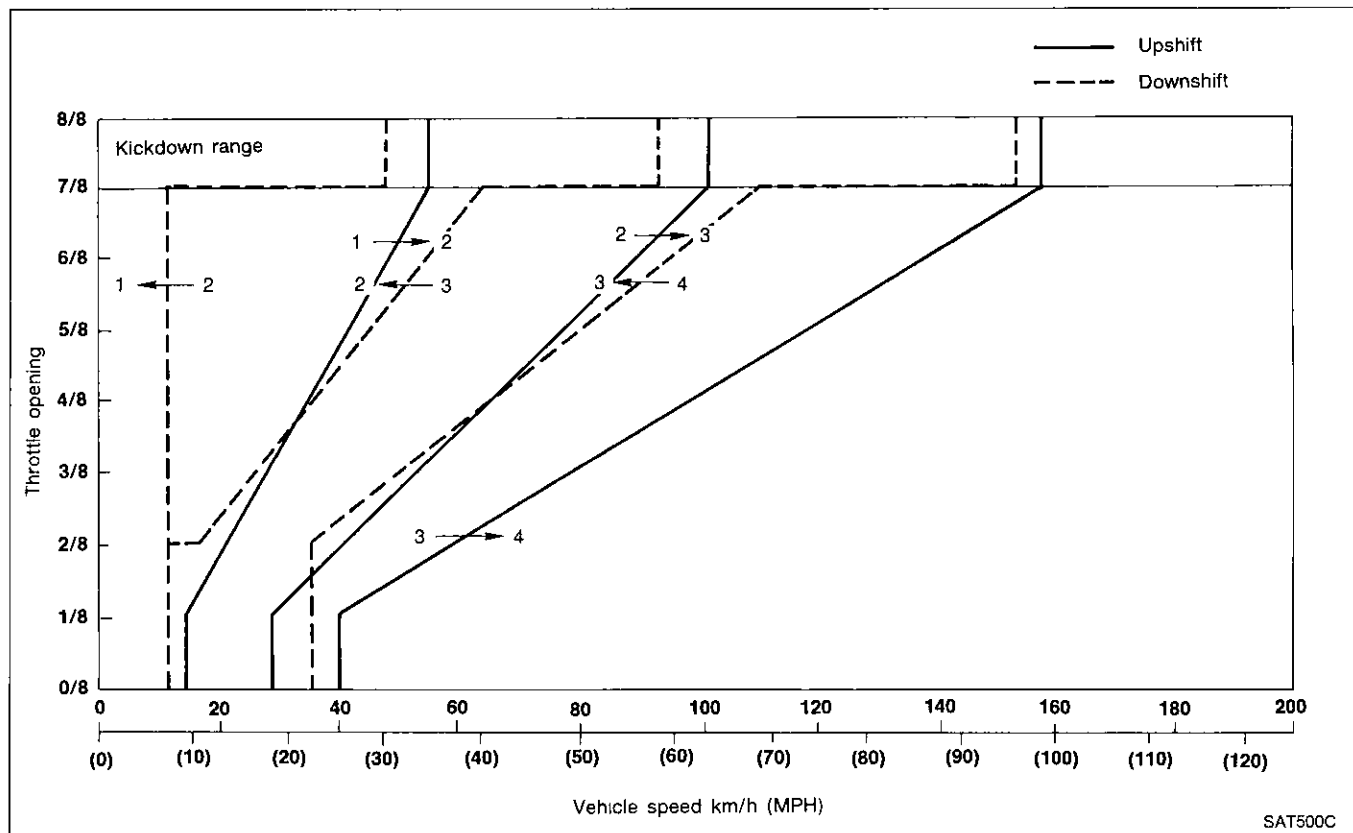


## TROUBLE DIAGNOSES

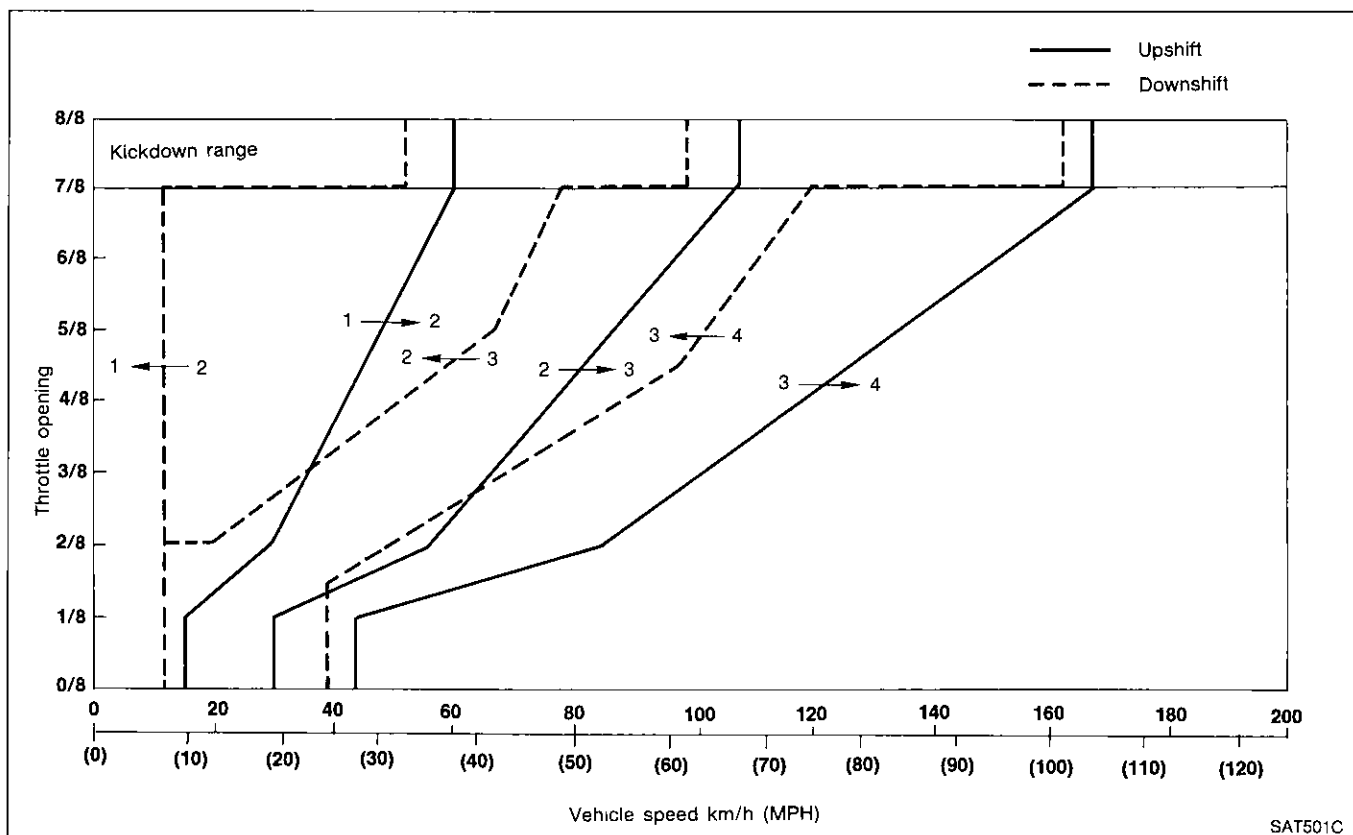
### Preliminary Check (Cont'd)

#### SHIFT SCHEDULE

##### 27 X 63 model (COMFORT pattern)



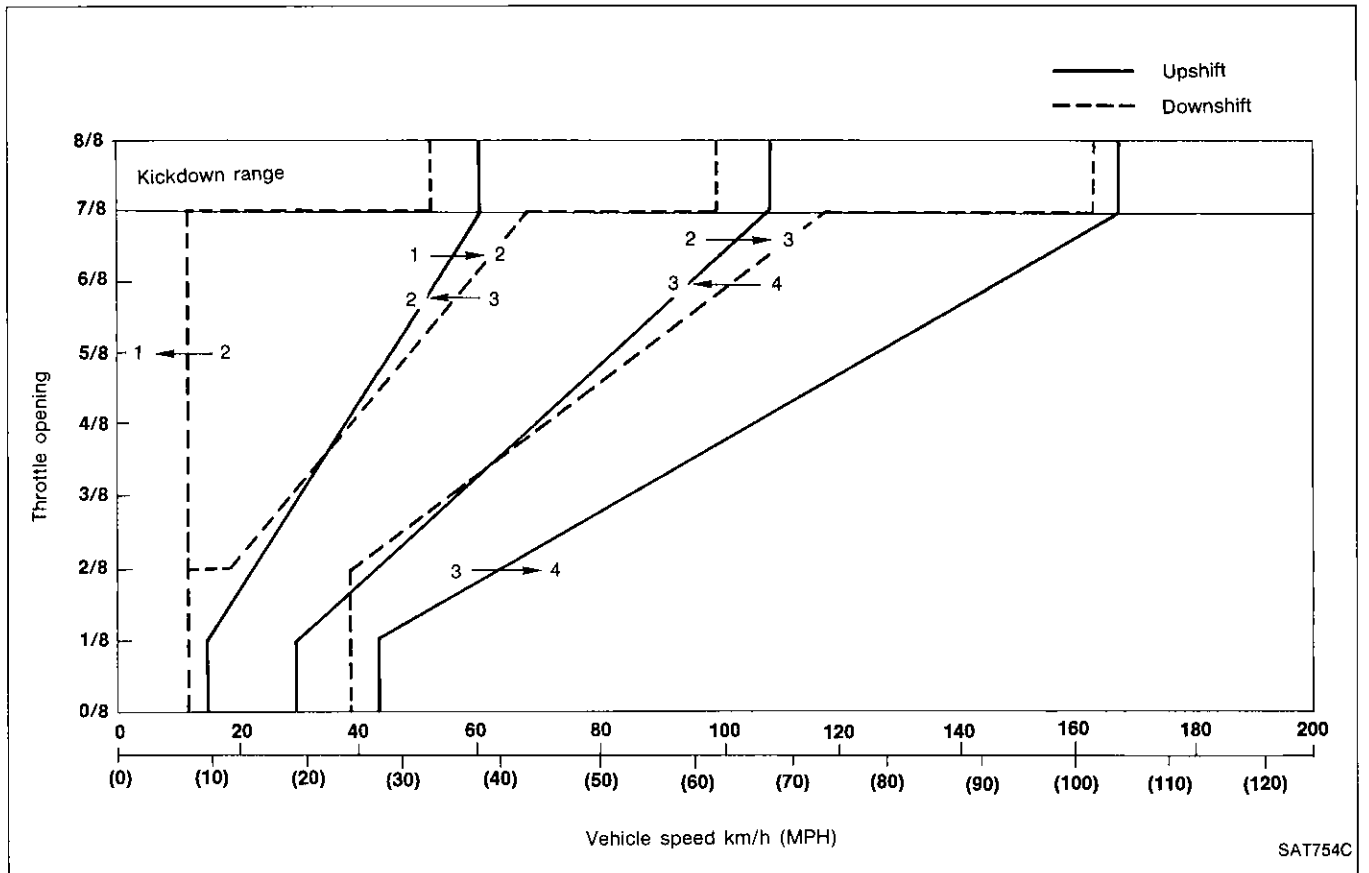
##### 27 X 63 model (POWER pattern)



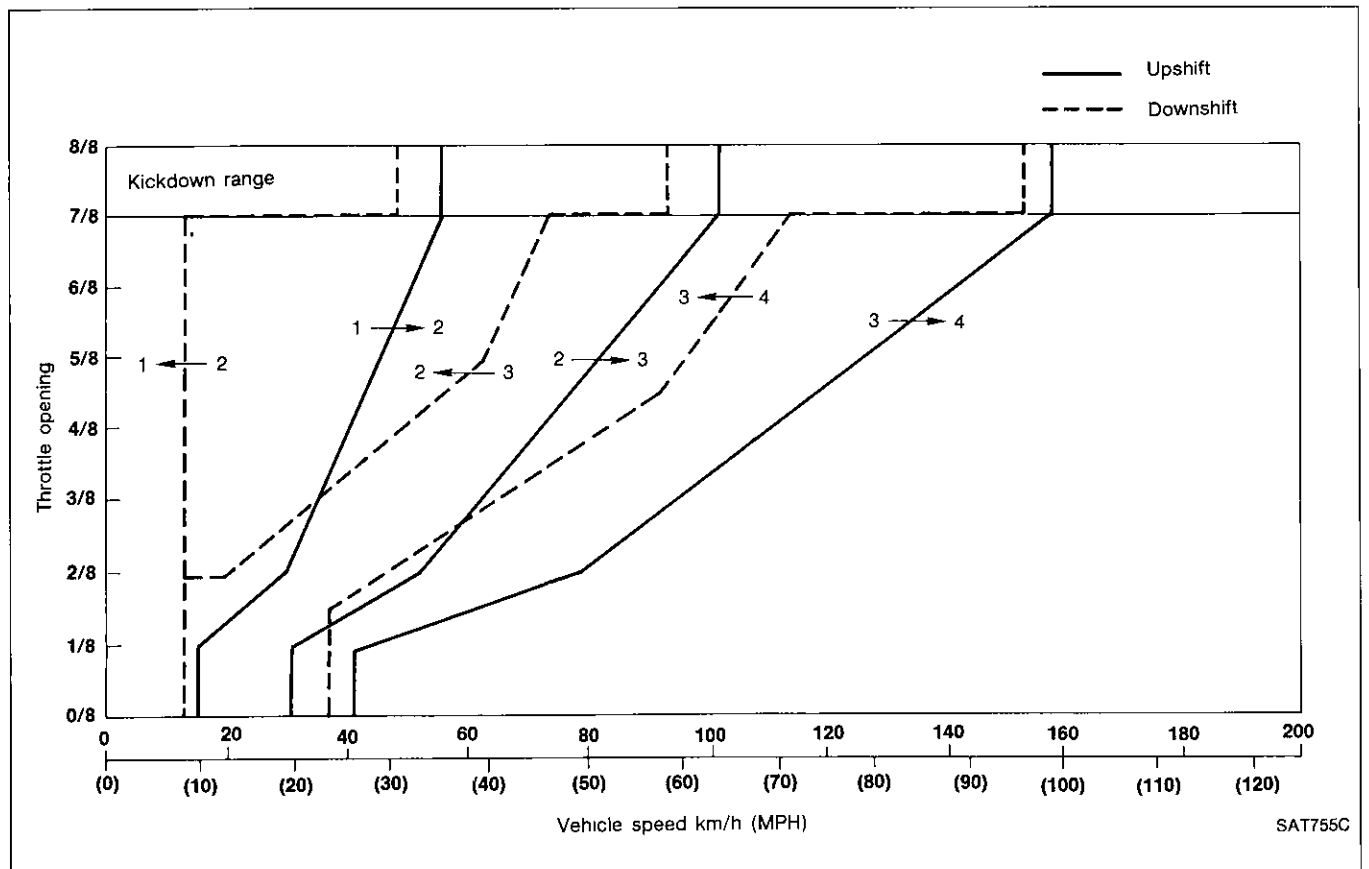
# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

### 27 X 70 model (COMFORT pattern)



### 27 X 70 model (POWER pattern)



### **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).

## TROUBLE DIAGNOSES

### Diagnosis by CONSULT (Cont'd)

#### DATA MONITOR APPLICATION

| Item                                         | Application |
|----------------------------------------------|-------------|
| Vehicle speed sensor 1 (A/T)                 | ×           |
| Vehicle speed sensor 2 (meter)               | ×           |
| Throttle sensor                              | ×           |
| Fluid temperature sensor                     | ×           |
| Battery voltage                              | ×           |
| Engine rpm                                   | ×           |
| Selector lever switch (O.D. switch)          | ×           |
| A.S.C.D. — cruise signal                     | ×           |
| A.S.C.D. — O.D. cut signal                   | ×           |
| Kickdown switch                              | —           |
| Power shift switch (A/T mode switch — POWER) | ×           |
| Idle switch                                  | ×           |
| Full throttle switch                         | ×           |
| Shift solenoid A                             | ×           |
| Shift solenoid B                             | ×           |
| Timing solenoid                              | ×           |
| *Shift solenoid A (feedback)                 | ×           |
| *Shift solenoid B (feedback)                 | ×           |
| *Timing solenoid (feedback)                  | ×           |
| Hold mode switch (A/T mode switch — COMFORT) | ×           |
| 1 range switch                               | ×           |
| 2 range switch                               | ×           |
| D range switch                               | ×           |
| N range switch                               | ×           |
| R range switch                               | ×           |
| Gear position                                | ×           |
| Range position                               | ×           |
| Vehicle speed                                | ×           |
| Throttle opening                             | ×           |
| Line-pressure solenoid                       | ×           |
| Lock-up solenoid                             | ×           |

×: Applicable

—: Not applicable

## TROUBLE DIAGNOSES

### Diagnosis by CONSULT (Cont'd)

#### DATA ANALYSIS

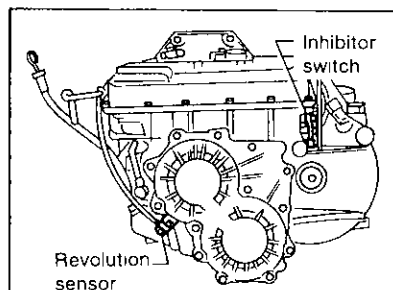
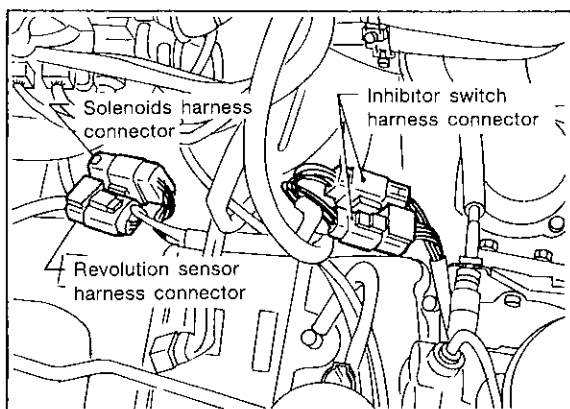
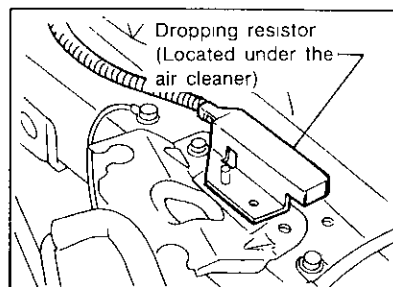
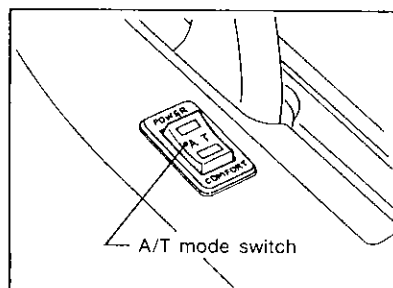
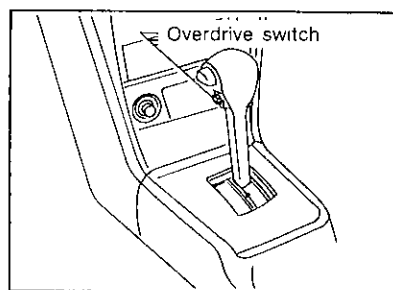
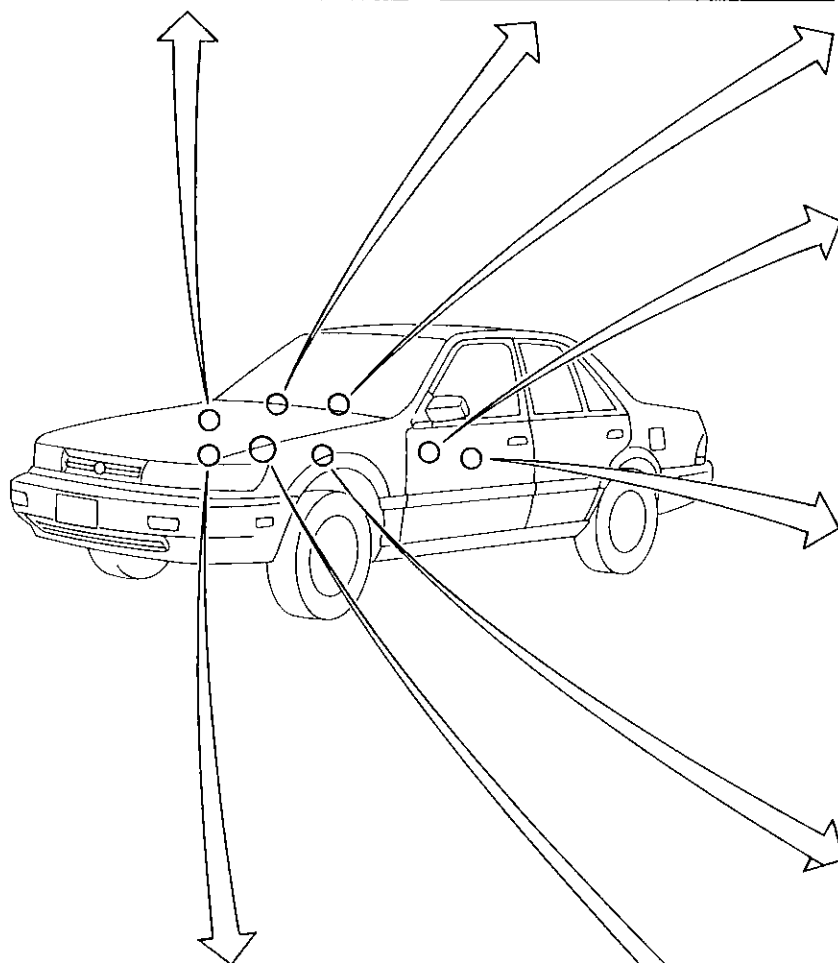
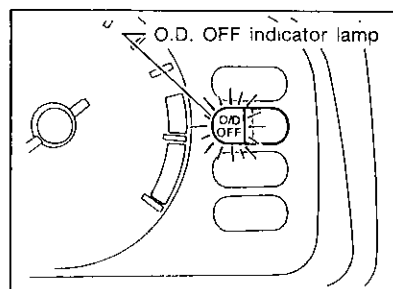
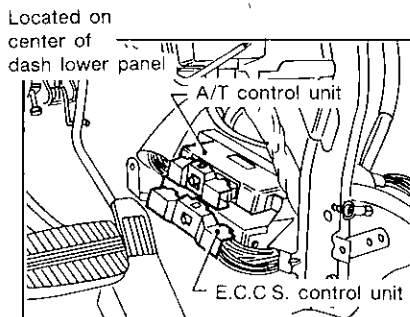
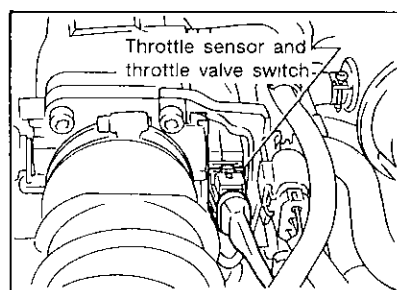
| Item                     | Display                 | Condition                                           |
|--------------------------|-------------------------|-----------------------------------------------------|
| Lock-up duty             | Approximately 4%        | Lock-up "OFF"                                       |
|                          | ↓<br>Approximately 94%  | ↓<br>Lock-up "ON"                                   |
| Line pressure duty       | Approximately 20%       | Low line-pressure<br>(Small throttle opening)       |
|                          | ↓<br>Approximately 94%  | ↓<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      | Cold [20°C (68°F)]                                  |
|                          | ↓<br>Approximately 0.5V | ↓<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 |



# TROUBLE DIAGNOSES

## A/T Electrical Parts Location



SAT502C

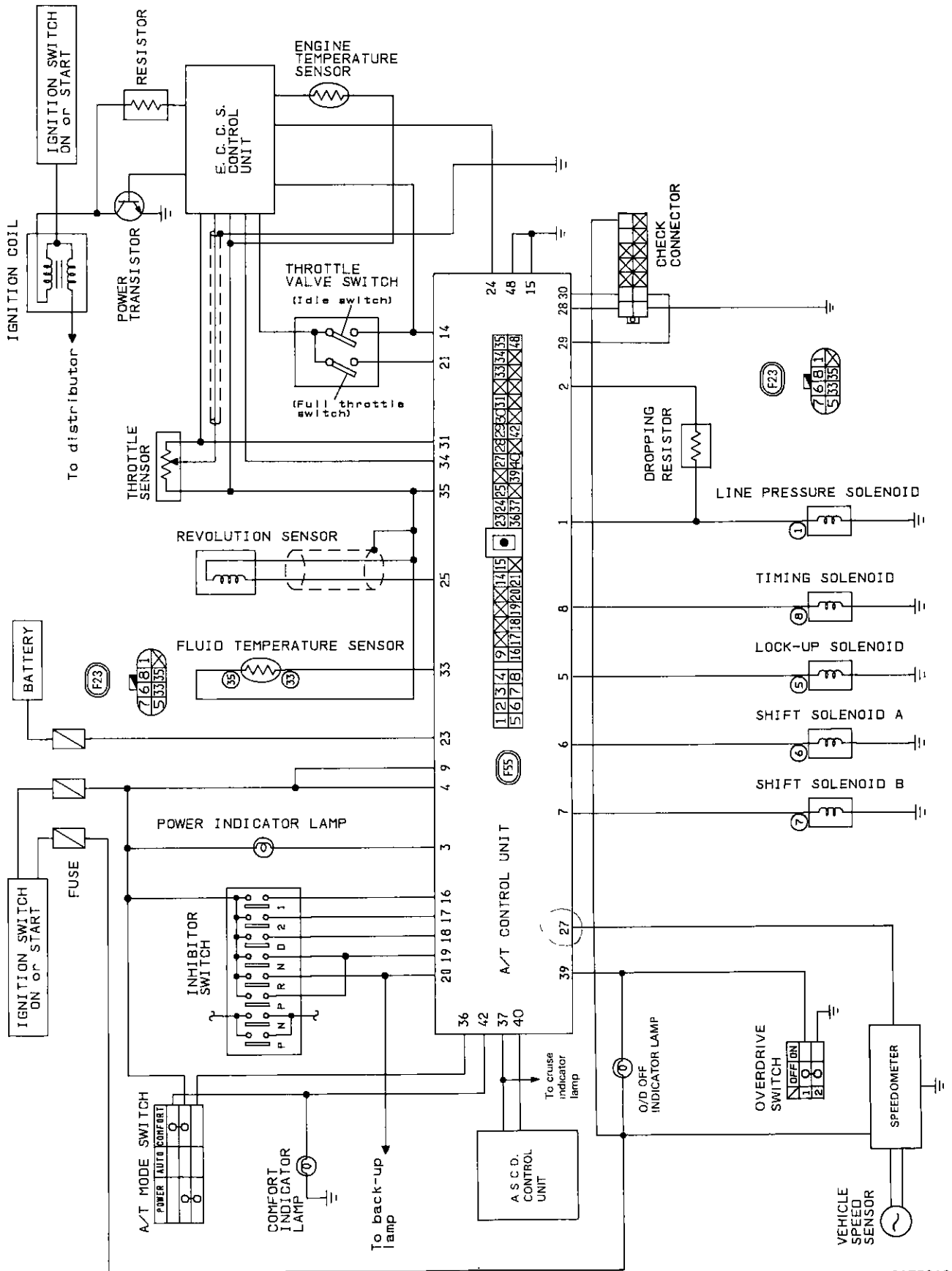
## **TROUBLE DIAGNOSES**

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**NOTE**

# TROUBLE DIAGNOSES

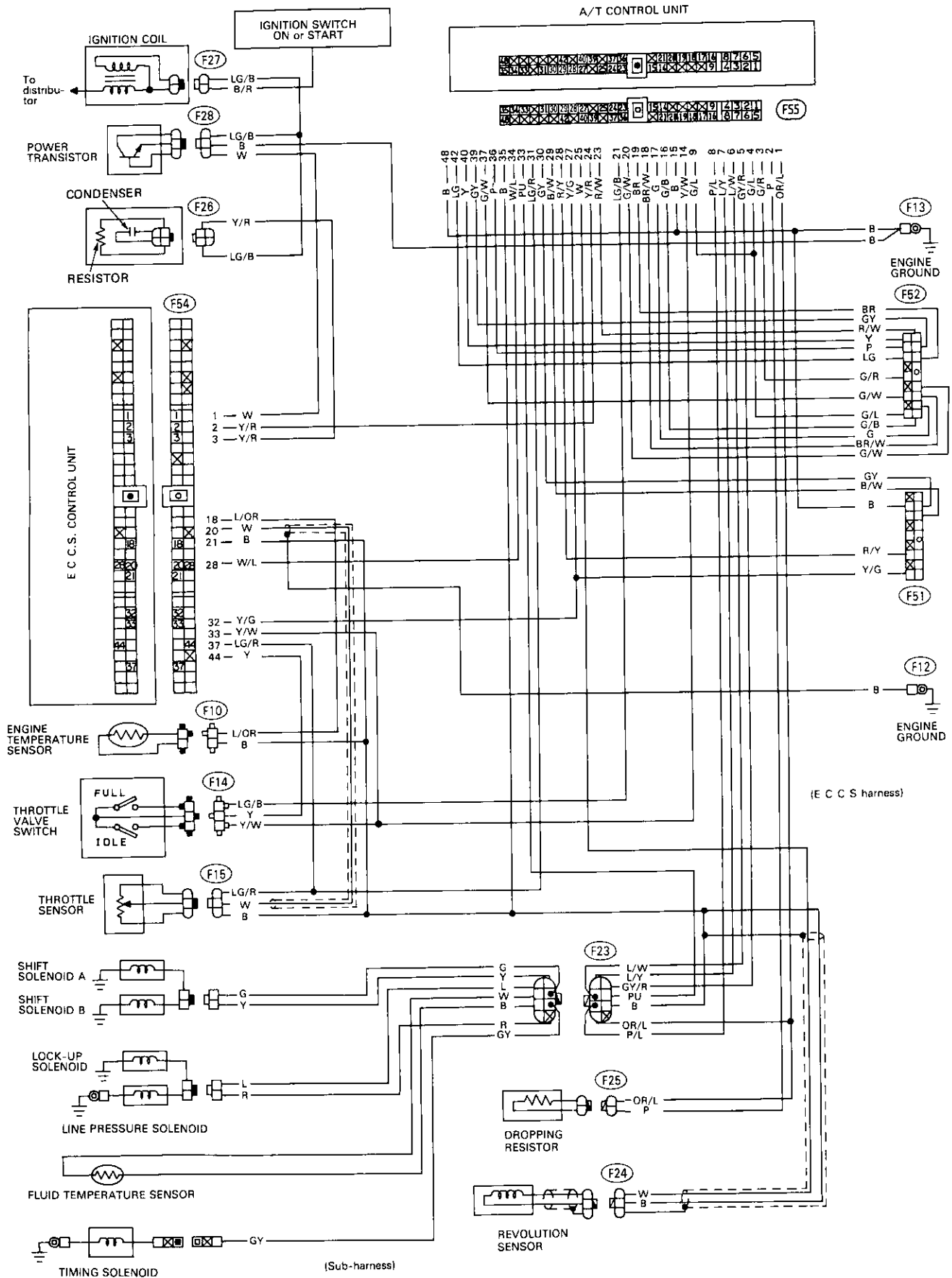
## Circuit Diagram for Quick Pinpoint Check



SAT521C

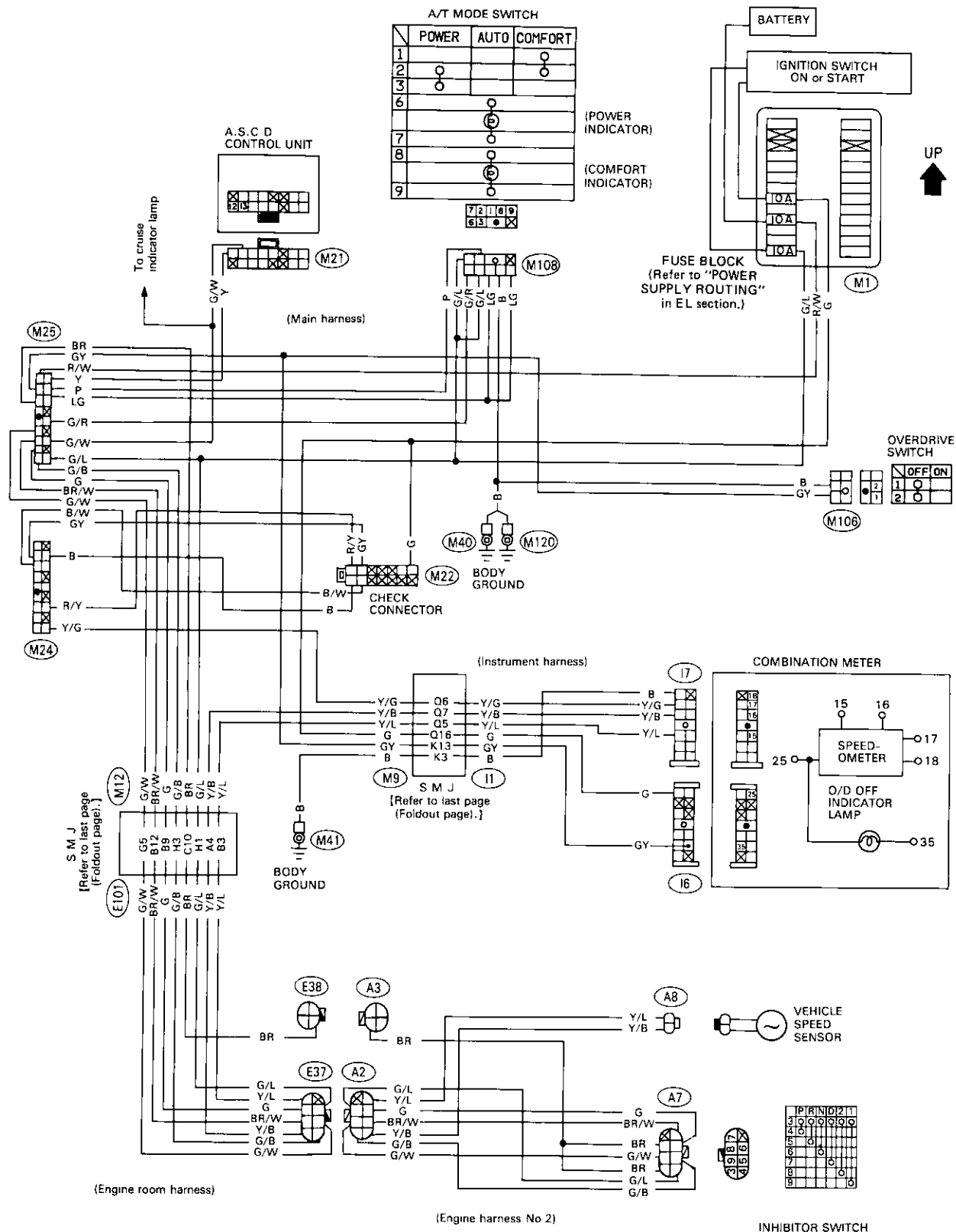
# TROUBLE DIAGNOSES

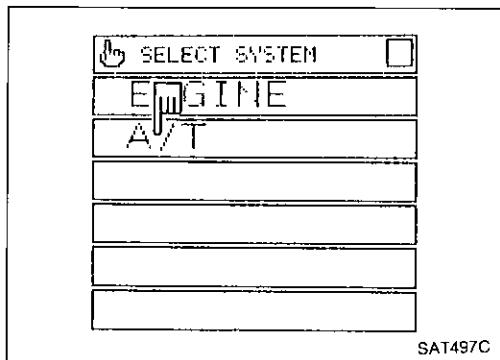
## Wiring Diagram



# TROUBLE DIAGNOSES

## Wiring Diagram (Cont'd)

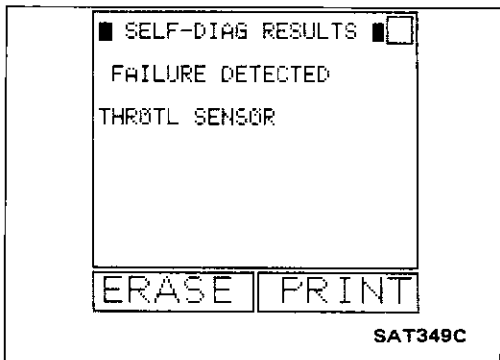




### Self-diagnosis

#### SELF-DIAGNOSTIC PROCEDURE ( With CONSULT)

1. Turn on CONSULT.
2. Touch "A/T".



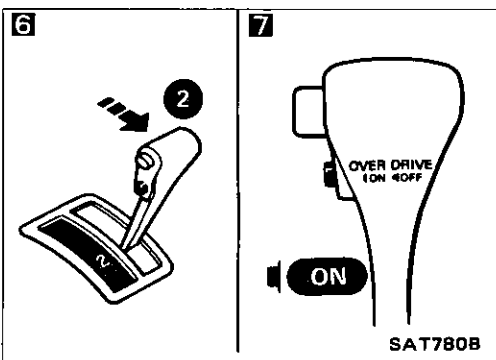
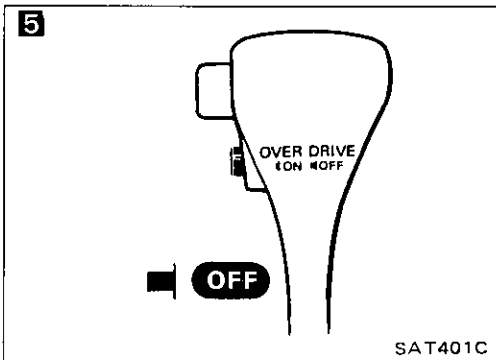
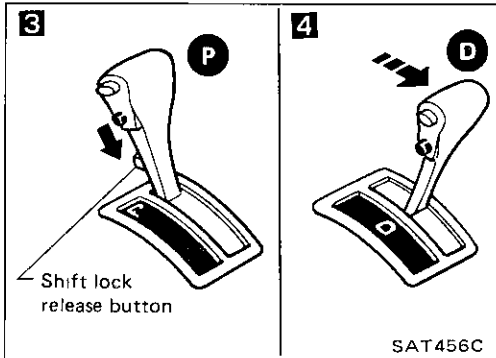
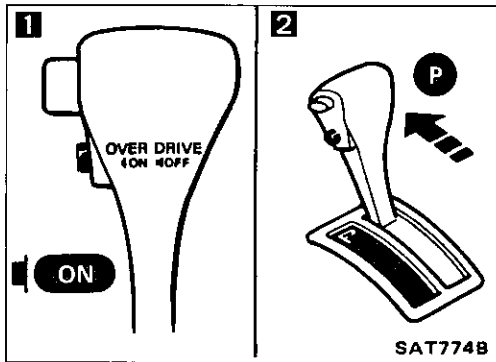
3. Touch "SELF-DIAGNOSIS".  
CONSULT performs REAL-TIME SELF-DIAGNOSIS.

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### SELF-DIAGNOSTIC PROCEDURE

( Without CONSULT)



DIAGNOSIS START

Start engine and warm it up to normal engine operating temperature.



Set A/T mode switch in "AUTO" position.

1 Set overdrive switch in "ON" position.

2 Move selector lever to "P" range.



Does power indicator lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

Yes



3 Push shift lock release button.

4 Move selector lever to "D" range.

5 Set overdrive switch in "OFF" position.



Wait for more than 2 seconds after ignition switch "ON".

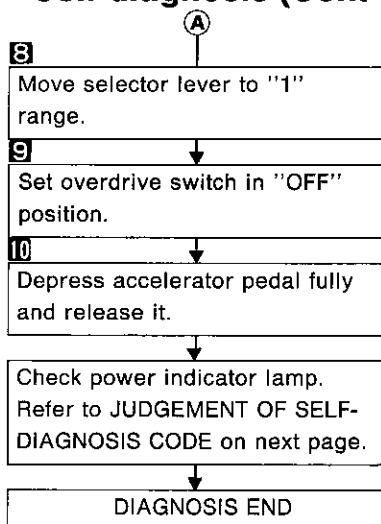
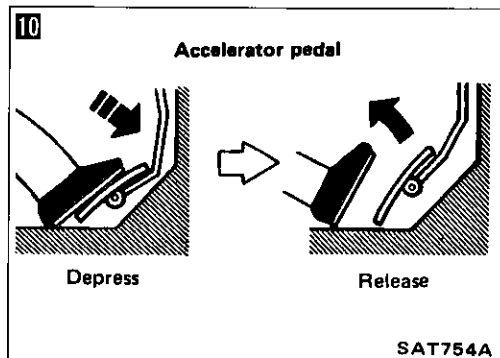
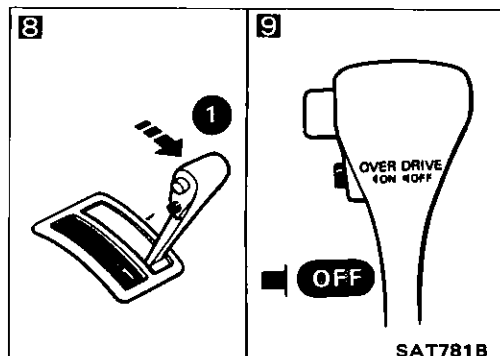
6 Move selector lever to "2" range.

7 Set overdrive switch in "ON" position.

A

## TROUBLE DIAGNOSES

### Self-diagnosis (Cont'd)





# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

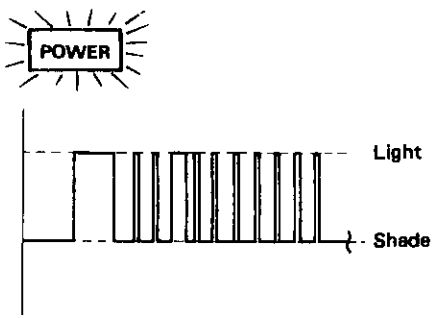
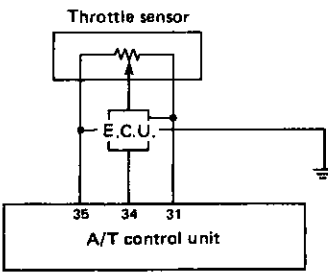
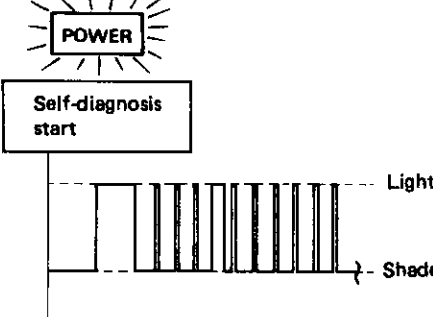
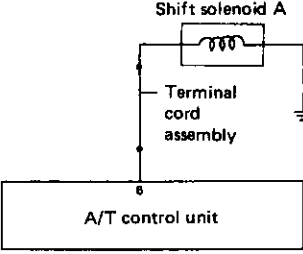
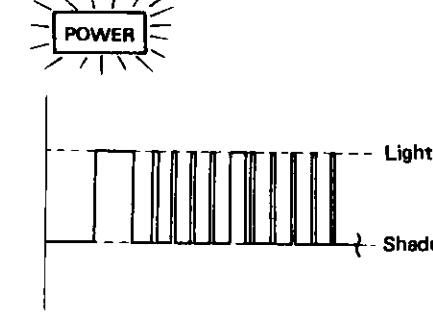
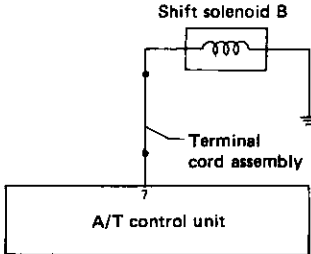
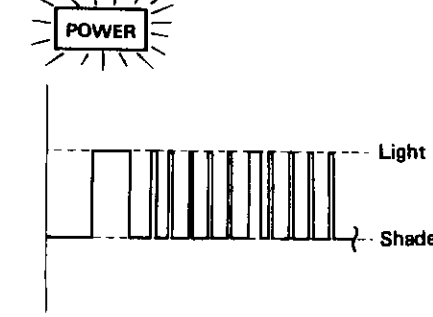
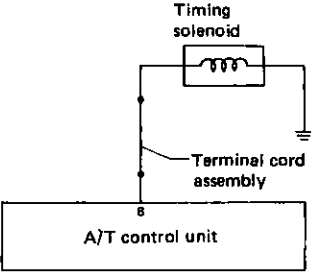
### JUDGEMENT OF SELF-DIAGNOSIS CODE

| Power indicator lamp:                                              | Damaged circuit                                                                                                                     |
|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <p>All judgement flickers are same.</p> <p>SAT755A</p>             | <p>All circuits that can be confirmed by self-diagnosis are O.K.</p>                                                                |
| <p>1st judgement flicker is longer than others.</p> <p>SAT756A</p> | <p>Revolution sensor circuit is short-circuited or disconnected.</p> <p>➡ Go to revolution sensor circuit check.</p> <p>SAT965B</p> |
| <p>2nd judgement flicker is longer than others.</p> <p>SAT757A</p> | <p>Speed sensor circuit is short-circuited or disconnected.</p> <p>➡ Go to speed sensor circuit check.</p> <p>SAT966B</p>           |

$t_1 = 2.5$  seconds     $t_2 = 2.0$  seconds     $t_3 = 1.0$  second

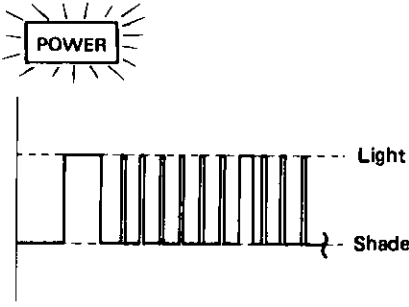
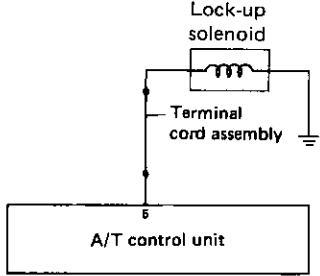
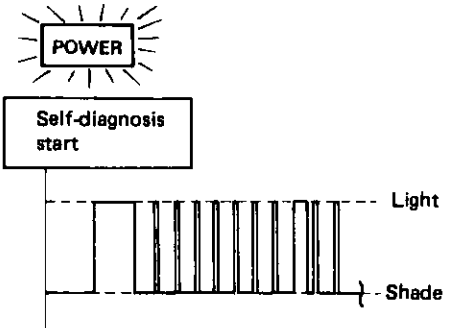
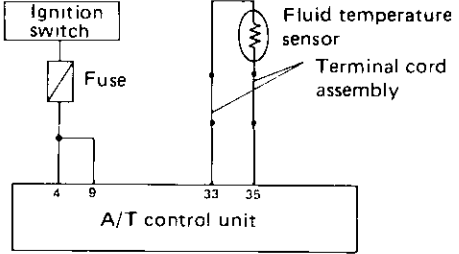
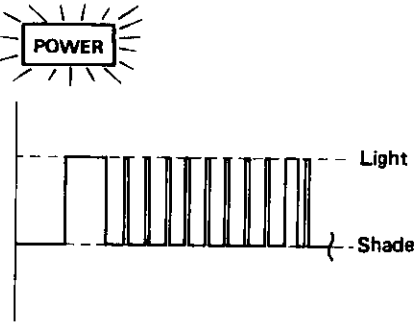
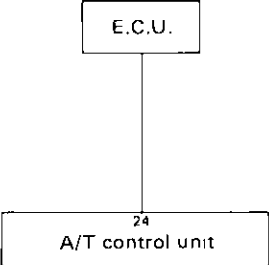
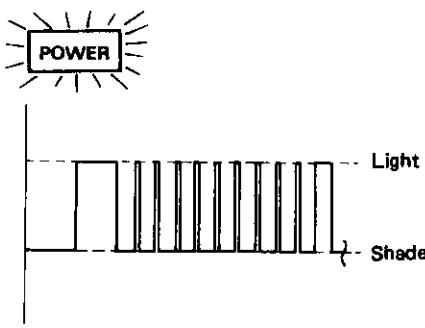
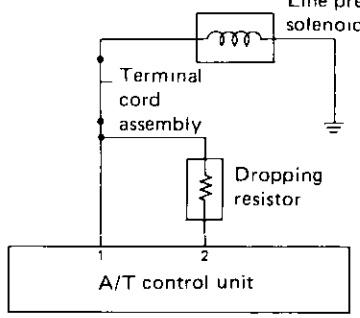
# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

|                                                                                                                                                                                   |                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Power indicator lamp:</p> <p>3rd judgement flicker is longer than others.</p>  <p>SAT758A</p> | <p>Damaged circuit</p> <p>Throttle sensor circuit is short-circuited or disconnected.</p>  <p>➡ Go to throttle sensor circuit check.</p> <p>SAT967B</p> |
| <p>4th judgement flicker is longer than others.</p> <p>Self-diagnosis start</p>  <p>SAT762A</p> | <p>Shift solenoid A circuit is short-circuited or disconnected.</p>  <p>➡ Go to shift solenoid A circuit check.</p> <p>SAT968B</p>                      |
| <p>5th judgement flicker is longer than others.</p>  <p>SAT763A</p>                            | <p>Shift solenoid B circuit is short-circuited or disconnected.</p>  <p>➡ Go to shift solenoid B circuit check.</p> <p>SAT969B</p>                    |
| <p>6th judgement flicker is longer than others.</p>  <p>SAT764A</p>                            | <p>Timing solenoid circuit is short-circuited or disconnected.</p>  <p>➡ Go to timing solenoid circuit check.</p> <p>SAT970B</p>                      |

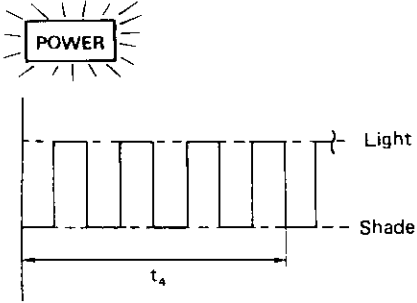
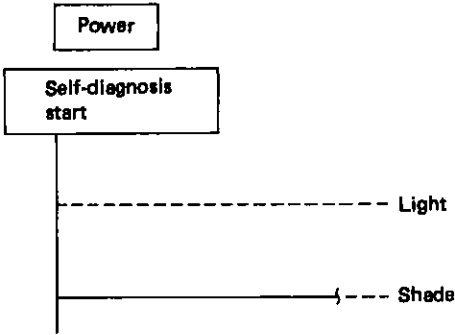
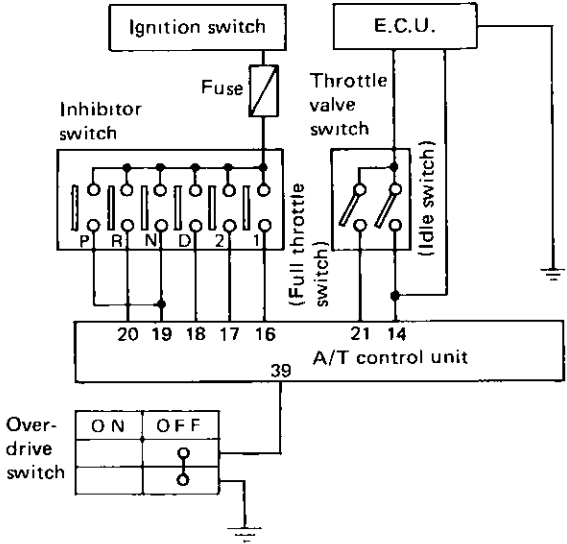
# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

|                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Power indicator lamp:</p> <p>7th judgement flicker is longer than others.</p>  <p>SAT765A</p> | <p>Damaged circuit</p> <p>Lock-up solenoid circuit is short-circuited or disconnected.</p>  <p>➡ Go to lock-up solenoid circuit check.</p> <p>SAT971B</p>                                                              |
| <p>8th judgement flicker is longer than others.</p>  <p>SAT770A</p>                             | <p>Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.</p>  <p>➡ Go to fluid temperature sensor circuit and A/T control unit power source circuit check.</p> <p>SAT972B</p> |
| <p>9th judgement flicker is longer than others.</p>  <p>SAT771A</p>                            | <p>Engine revolution signal circuit is short-circuited or disconnected.</p>  <p>➡ Go to engine revolution signal circuit check.</p> <p>SAT973B</p>                                                                  |
| <p>10th judgement flicker is longer than others.</p>  <p>SAT772A</p>                           | <p>Line pressure solenoid circuit is short-circuited or disconnected.</p>  <p>➡ Go to line pressure solenoid circuit check.</p> <p>SAT974B</p>                                                                       |

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

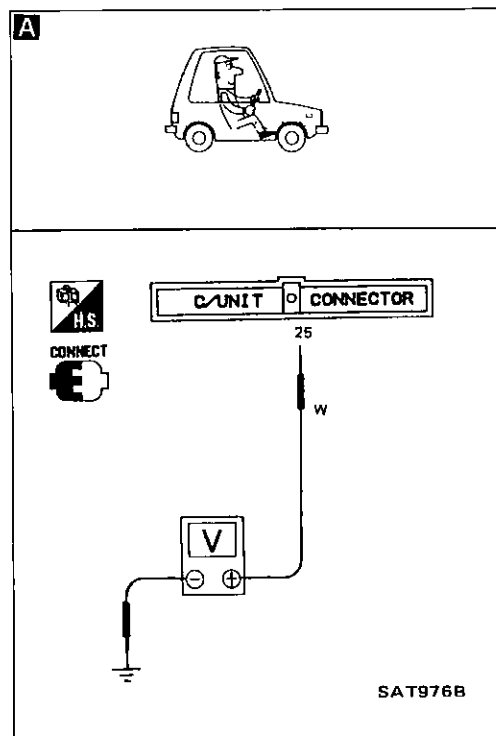
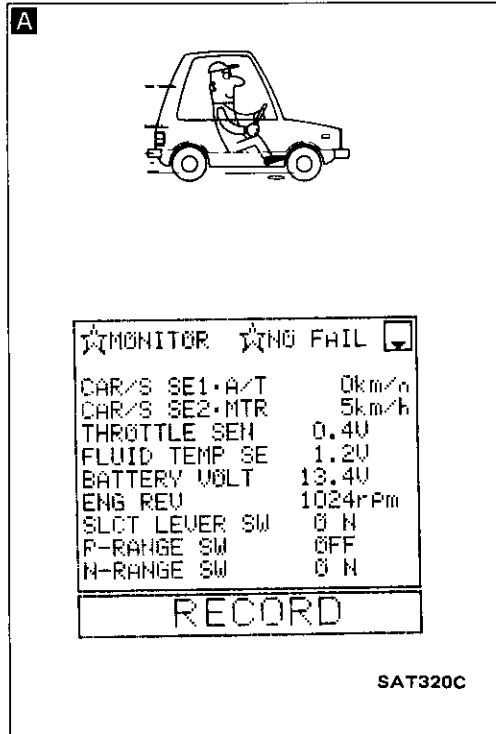
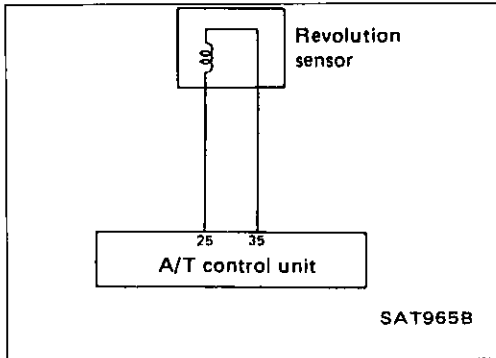
| Power indicator lamp:                                                                                                                                       | Damaged circuit                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Flickers as shown below.</p>  <p style="text-align: right;">SAT773A</p> | <p>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.)</p>                                                                                                          |
| <p>Does not come on.</p>  <p style="text-align: right;">SAT146B</p>       | <p>Inhibitor switch, overdrive switch or throttle valve switch circuit is disconnected or A/T control unit is damaged.</p>  <p>➡ Go to inhibitor, overdrive and throttle valve switch circuit checks.</p> <p style="text-align: right;">SAT975B</p> |

$t_4 = 1.0$  second

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### REVOLUTION SENSOR CIRCUIT CHECK



**CHECK REVOLUTION SENSOR.**  
— Refer to "Electrical Components Inspection".

N.G.

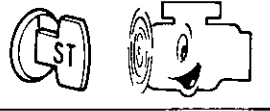
Repair or replace revolution sensor.

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.

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**

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### SPEED SENSOR CIRCUIT CHECK

**A**

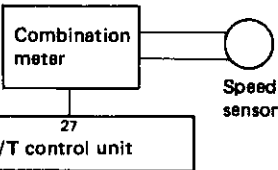


|               |          |
|---------------|----------|
| ☆MONITOR      | ☆NO FAIL |
| CAR/S SE1-A/T | 0km/h    |
| CAR/S SE2-MTR | 5km/h    |
| THROTTLE SEN  | 0.4V     |
| FLUID TEMP SE | 1.2V     |
| BATTERY VOLT  | 13.4V    |
| ENG REV       | 1024rpm  |
| SLCT LEVER SW | 0 N      |
| P-RANGE SW    | OFF      |
| N-RANGE SW    | 0 N      |

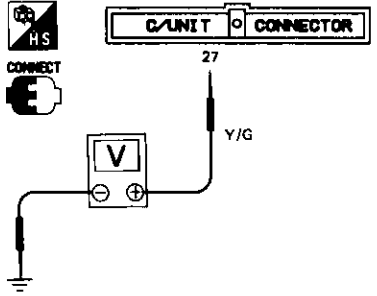
RECORD

SAT320C

**A**



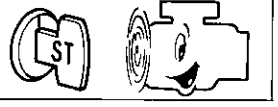
At 2 - 3 km/h  
(1 - 2 MPH)

SAT977B

**A**

**CHECK INPUT SIGNAL.**

- 
- 
  - 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

O.K. → Perform self-diagnosis again after driving for a while.

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. → INSPECTION END

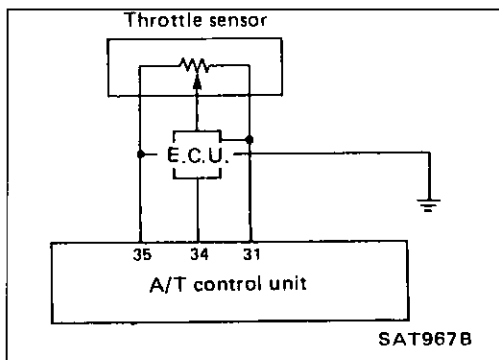
N.G. →

- Perform A/T control unit input/output signal inspection.
- If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### THROTTLE SENSOR CIRCUIT CHECK



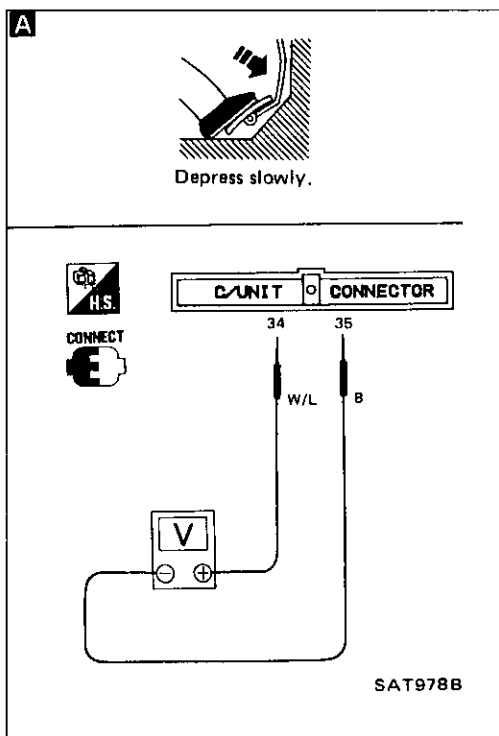
**A**

Depress slowly.

| ☆MONITOR ☆NG FAIL |         |
|-------------------|---------|
| CAR/S SE1-A/T     | 0km/h   |
| CAR/S SE2-MTR     | 5km/h   |
| THROTTLE SEN      | 0.4V    |
| FLUID TEMP SE     | 1.2V    |
| BATTERY VOLT      | 13.4V   |
| ENG REV           | 1024rpm |
| SLCT LEVER SW     | 0 N     |
| R-RANGE SW        | OFF     |
| N-RANGE SW        | 0 N     |

RECORD

SAT321C



Perform self-diagnosis (Mode III) for engine control.

N.G.

Check throttle sensor circuit for engine control. — Refer to section EF & EC.

O.K.

**A**

#### CHECK INPUT SIGNAL.

- 1.
- 2.

- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "THROTTLE SENSOR"

#### Voltage:

Fully-closed throttle:

Approximately  
0.5V

Fully-open throttle:

Approximately  
4V

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.

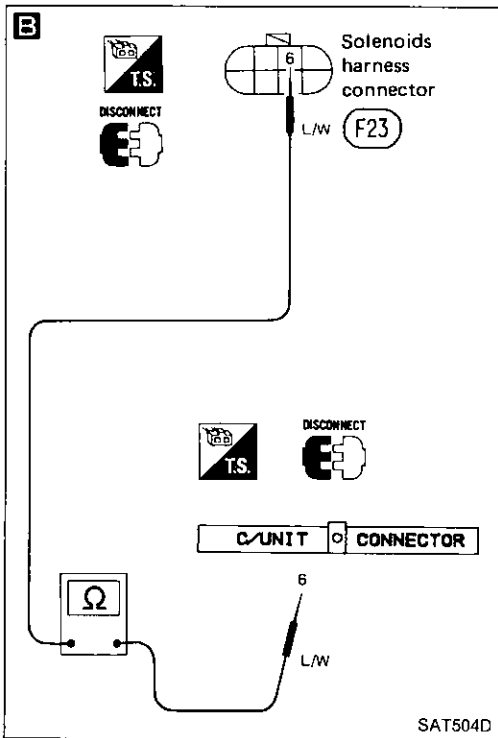
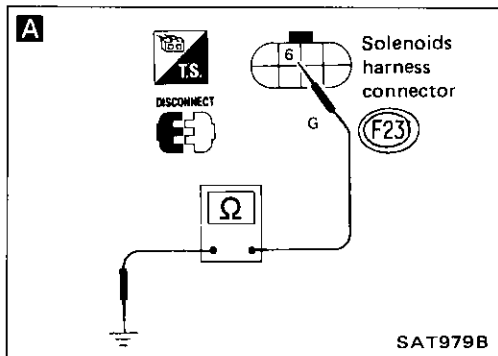
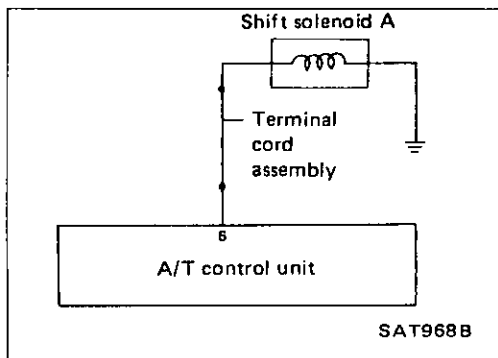
O.K.

INSPECTION END

# TROUBLE DIAGNOSES

## 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.

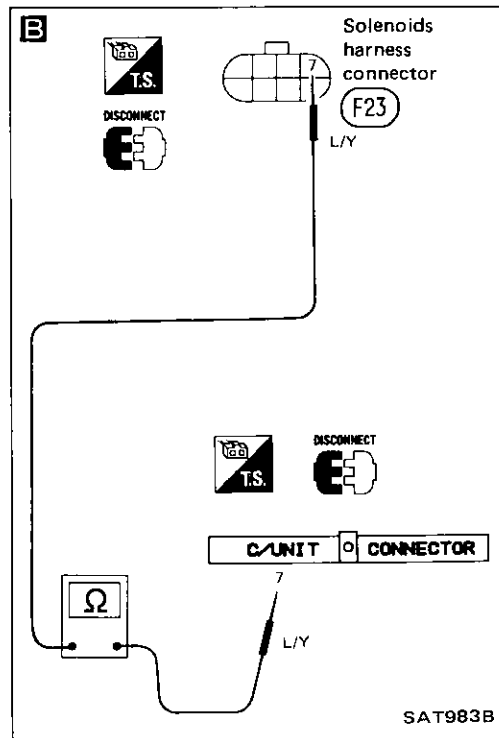
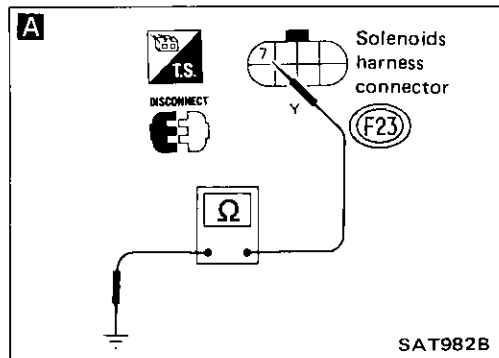
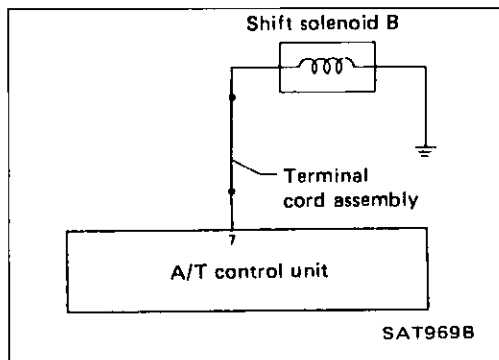
**INSPECTION END**



## TROUBLE DIAGNOSES

### 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

**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.

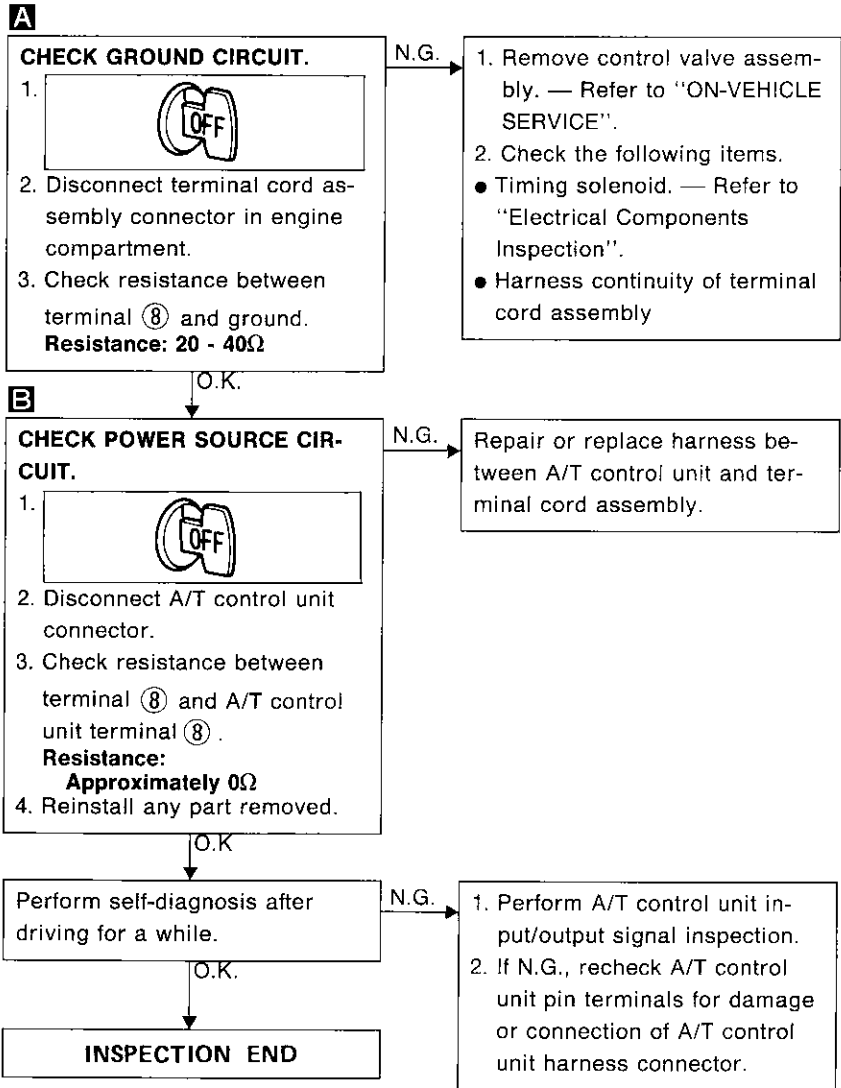
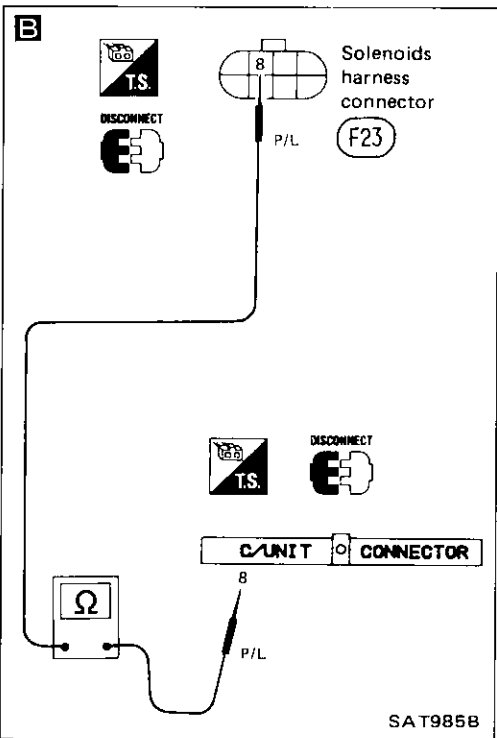
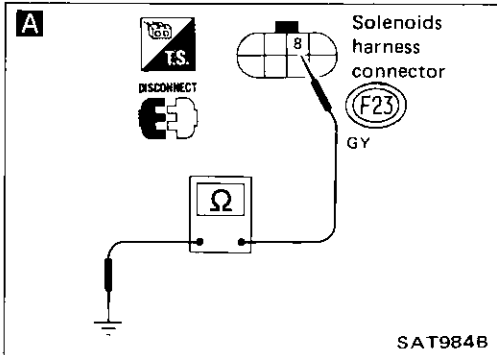
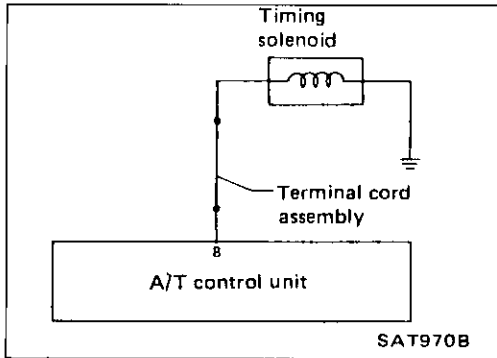
O.K.

**INSPECTION END**

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

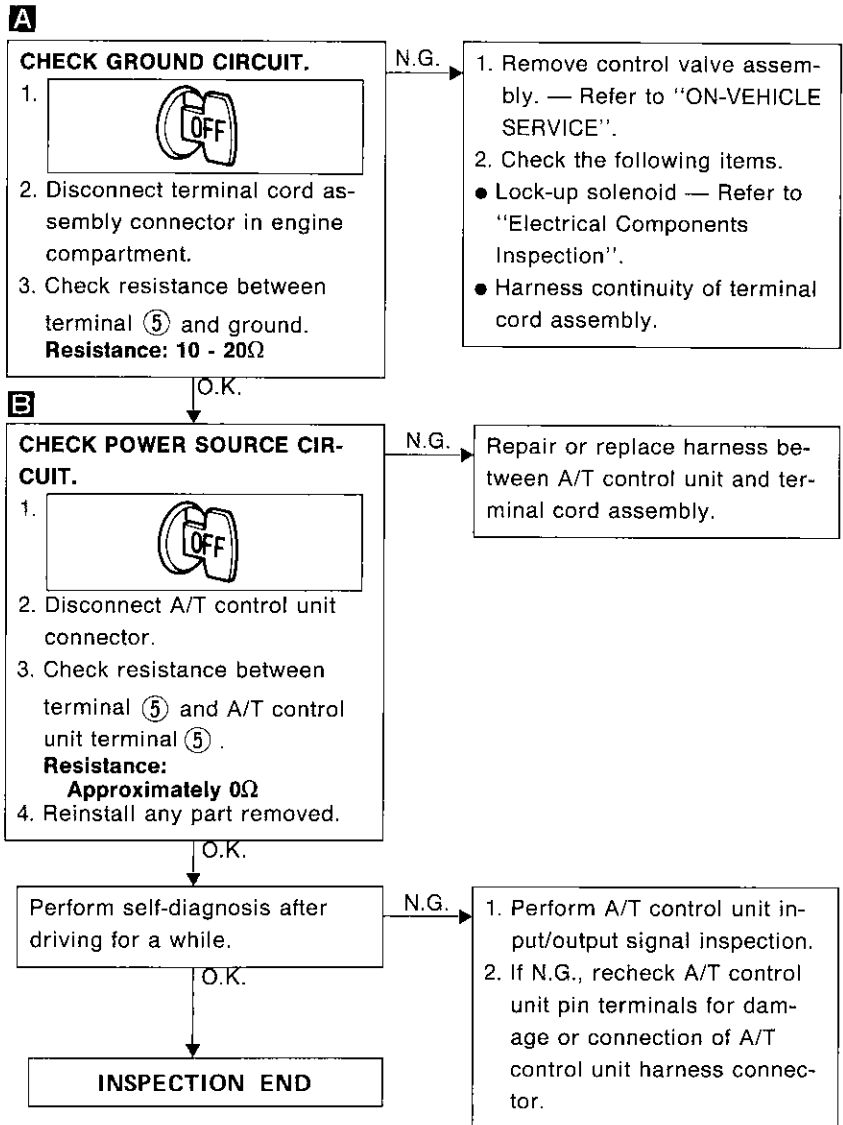
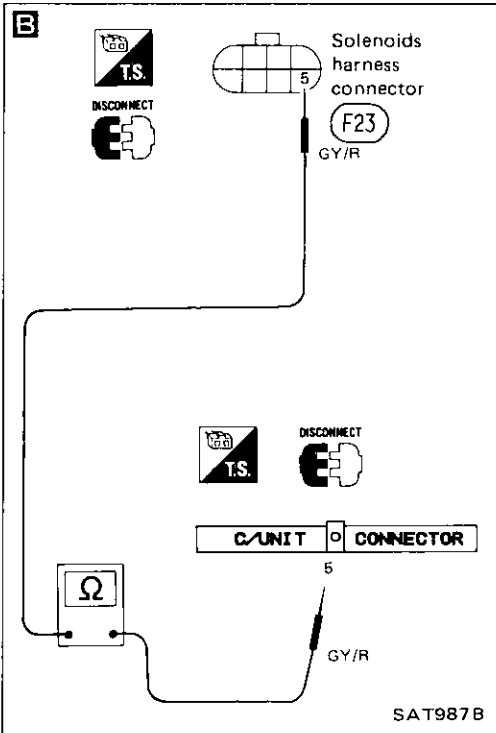
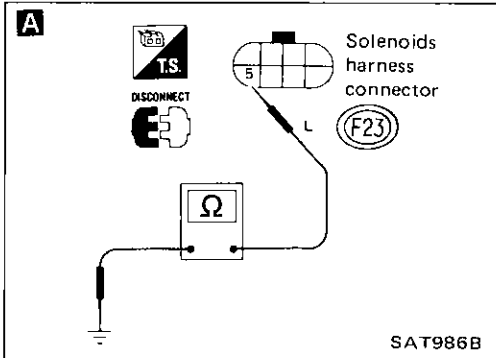
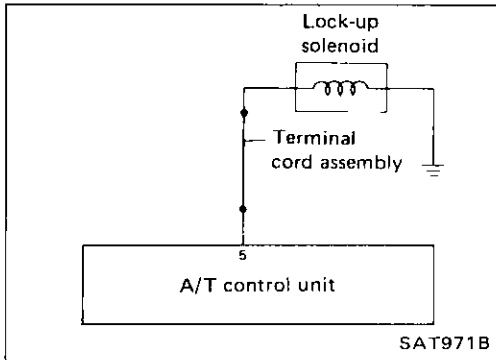
### TIMING SOLENOID CIRCUIT CHECK



# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

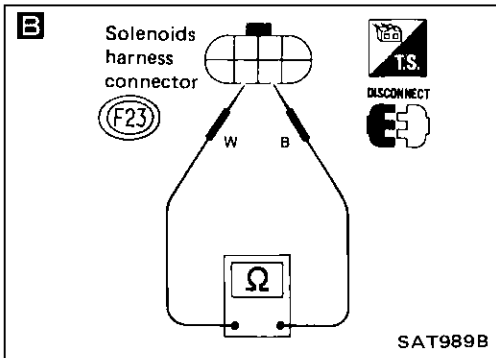
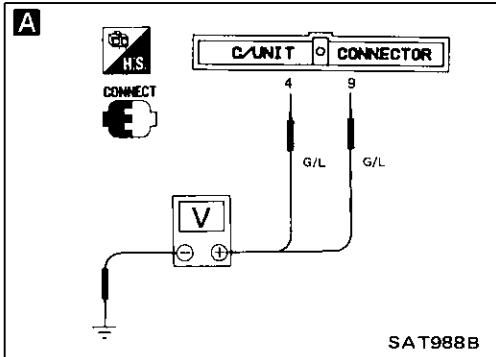
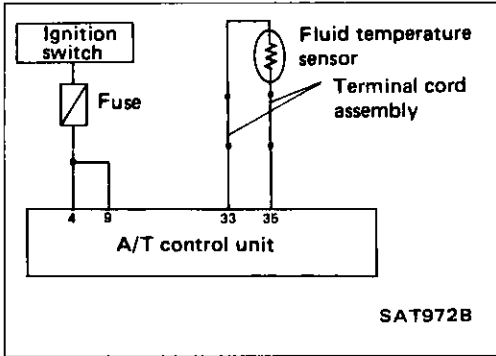
### LOCK-UP SOLENOID CIRCUIT CHECK



# TROUBLE DIAGNOSES

## 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.

**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.

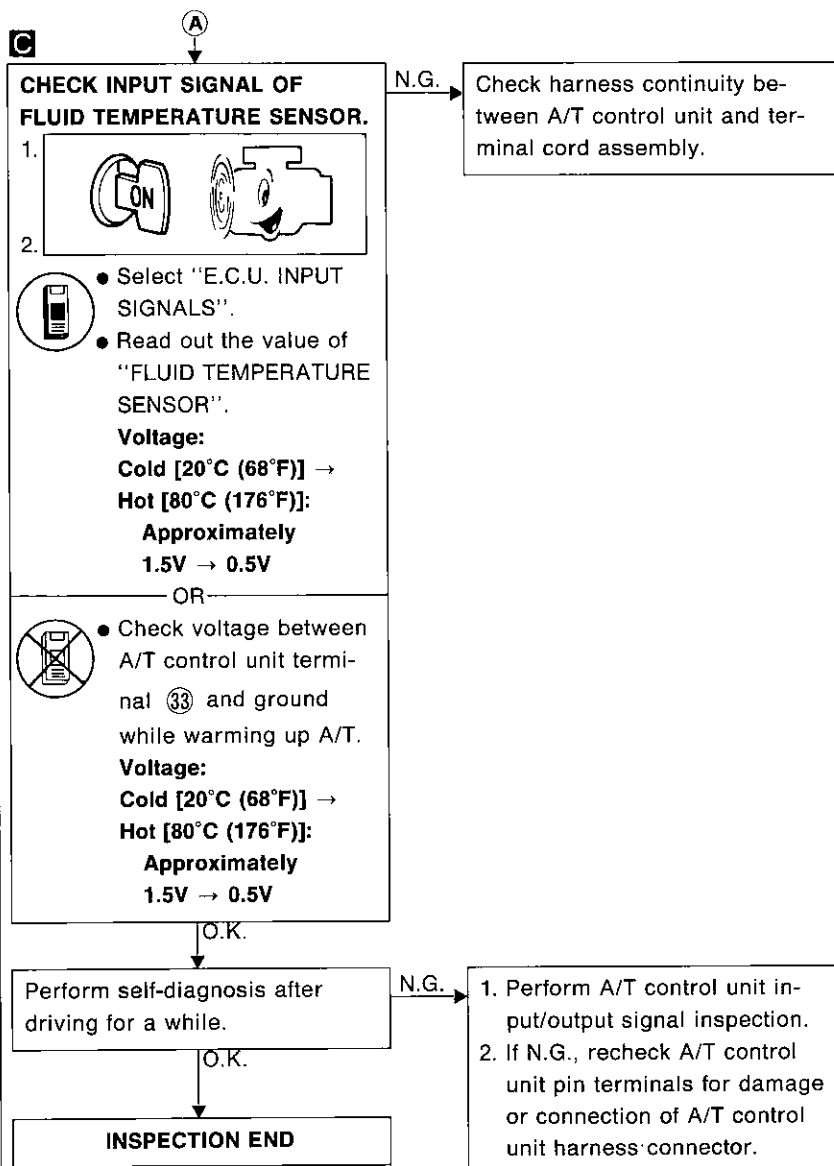
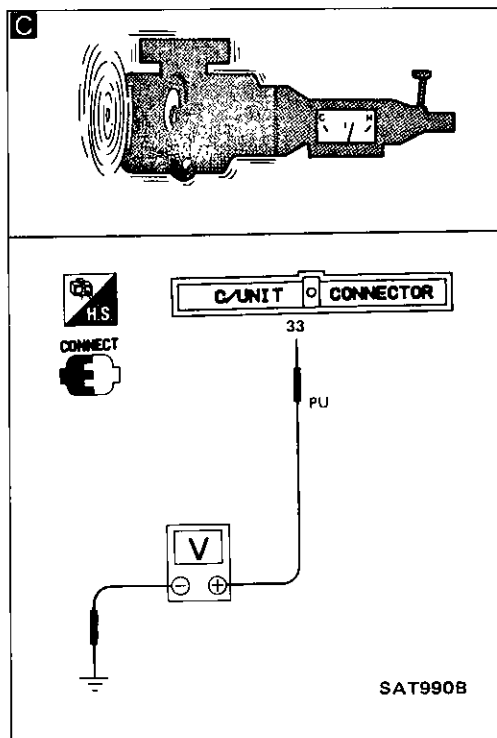
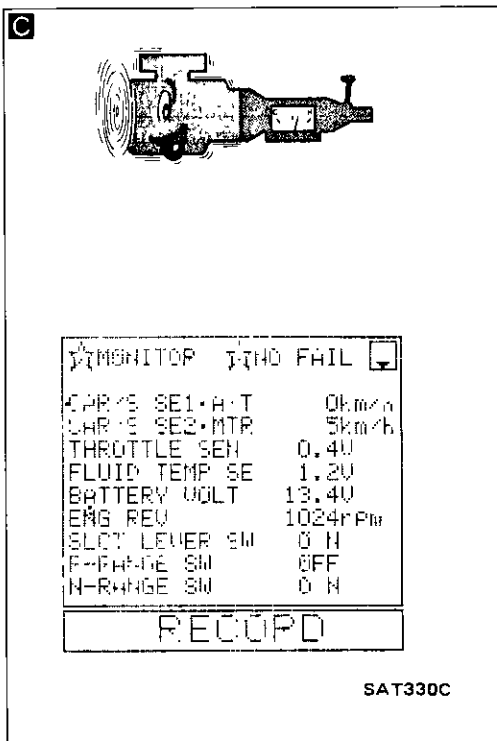
N.G. → 1. Remove control valve cover.  
2. Check the following items.

- Fluid temperature sensor — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. →

# TROUBLE DIAGNOSES

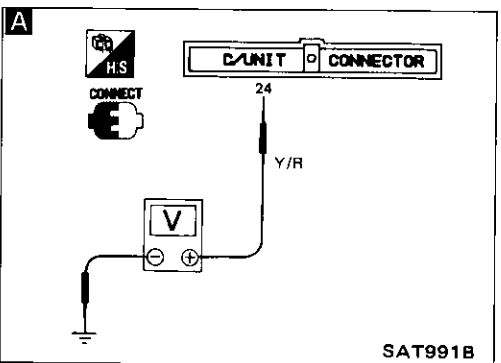
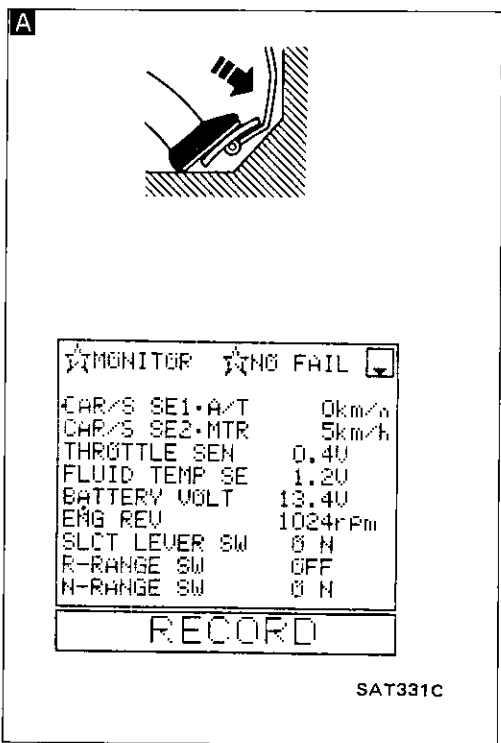
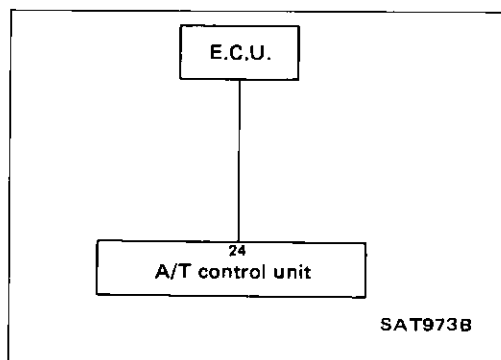
## Self-diagnosis (Cont'd)



# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### ENGINE REVOLUTION SIGNAL CIRCUIT CHECK



Check ignition circuit condition for engine.

N.G.

Repair or replace. — Refer to section EF & EC.

O.K.

**A**

#### CHECK INPUT SIGNAL.

1.



2.



- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "ENGINE REVOLUTION".
- Check engine revolution changes according to throttle opening.

OR



- Check voltage between A/T control unit terminal ②④ and ground.

**Voltage: 0.9 - 4.5V**

N.G.

Check harness continuity between A/T control unit and E.C.C.S. control unit.

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.

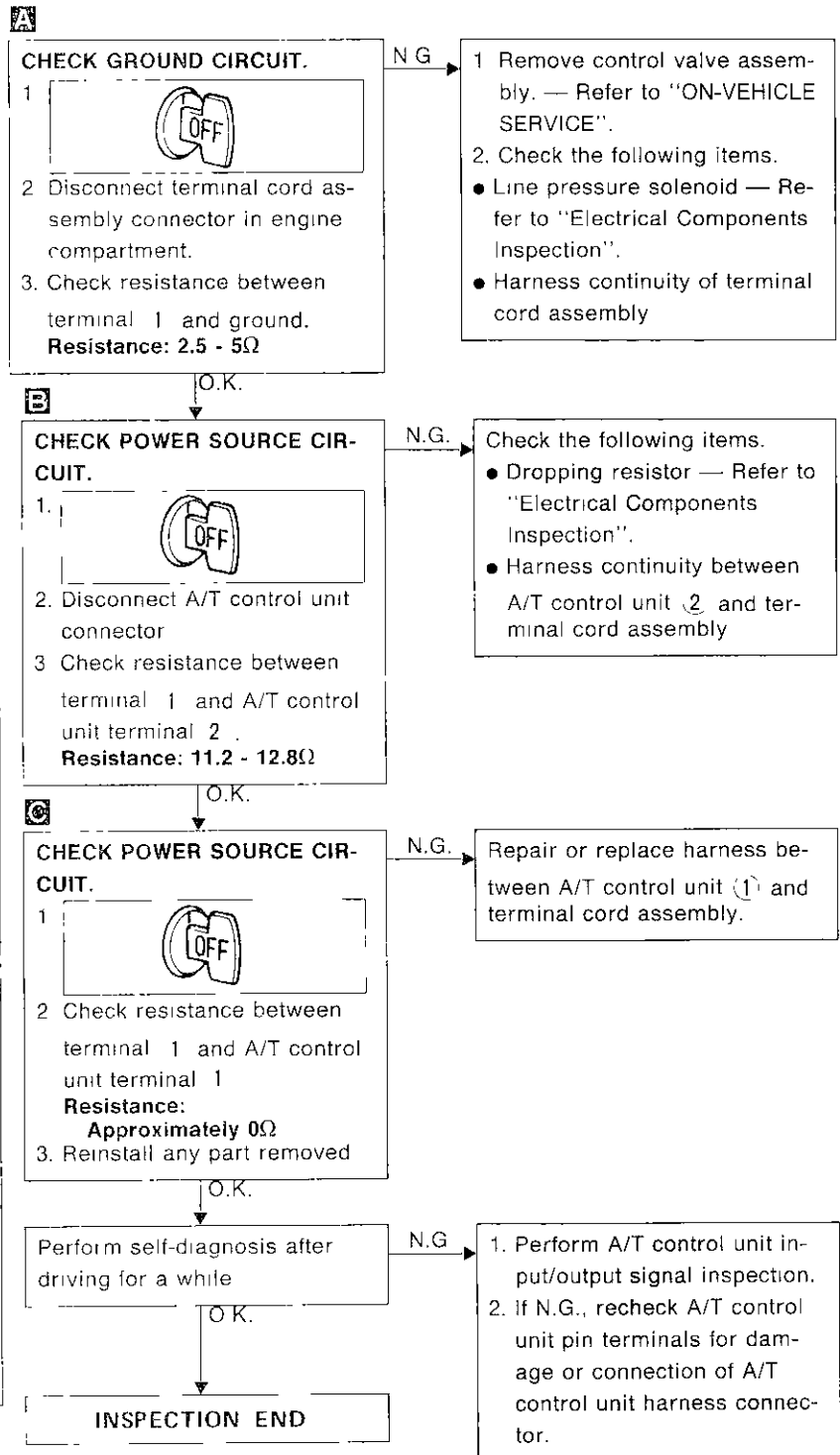
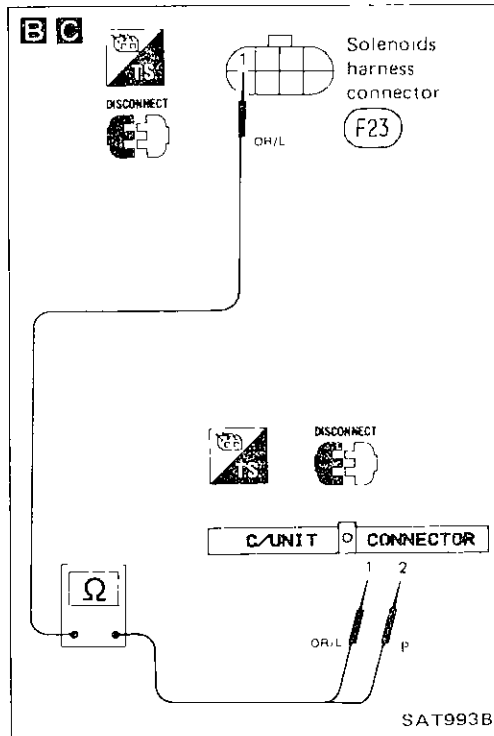
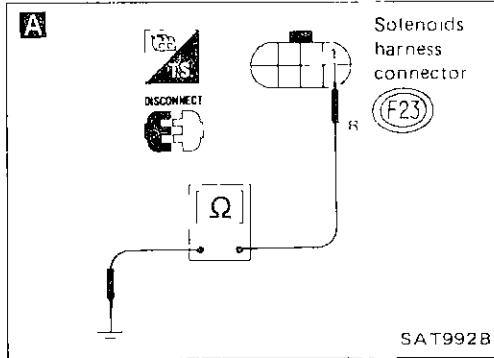
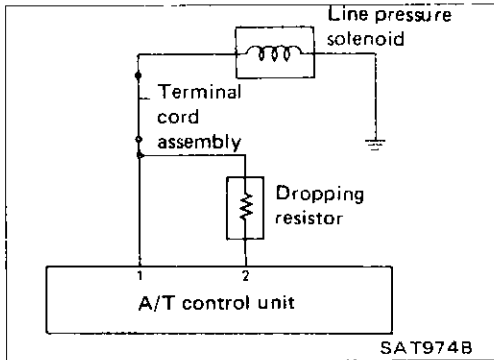
O.K.

**INSPECTION END**

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

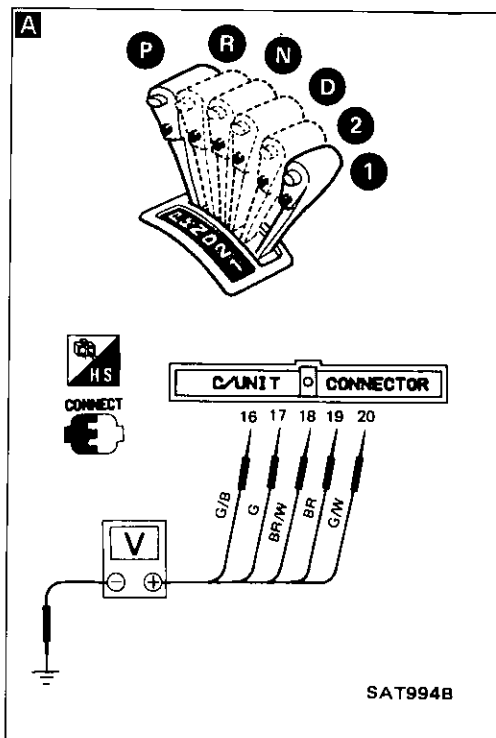
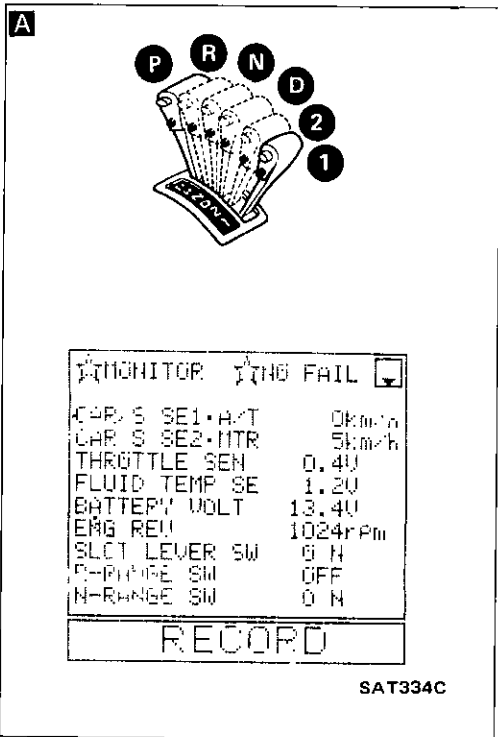
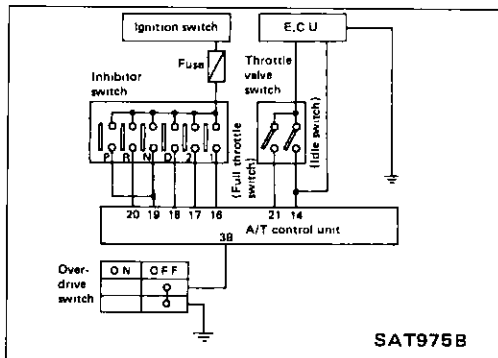
### LINE PRESSURE SOLENOID CIRCUIT CHECK



# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

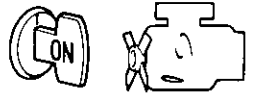
### INHIBITOR, OVERDRIVE AND THROTTLE VALVE SWITCH CIRCUIT CHECKS



A

#### CHECK INHIBITOR SWITCH CIRCUIT.

1.



- Select "E.C.U. INPUT signals".
- Read out "R, N, D, 1 and 2 range switches" moving selector lever to each range.
- Check the selector lever position is indicated properly.

OR



- Check voltage between A/T control unit terminals ①⑥, ①⑦, ①⑧, ①⑨, ②① and ground while moving selector lever through each range.

Voltage:

B: Battery voltage

0: 0V

| Terminal No    | ①⑨ | ②① | ①⑧ | ①⑦ | ①⑥ |
|----------------|----|----|----|----|----|
| Lever position |    |    |    |    |    |
| 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.

A

N.G.

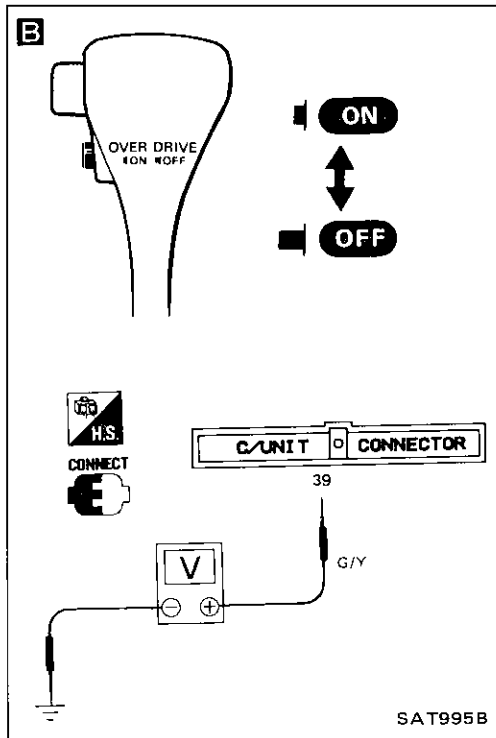
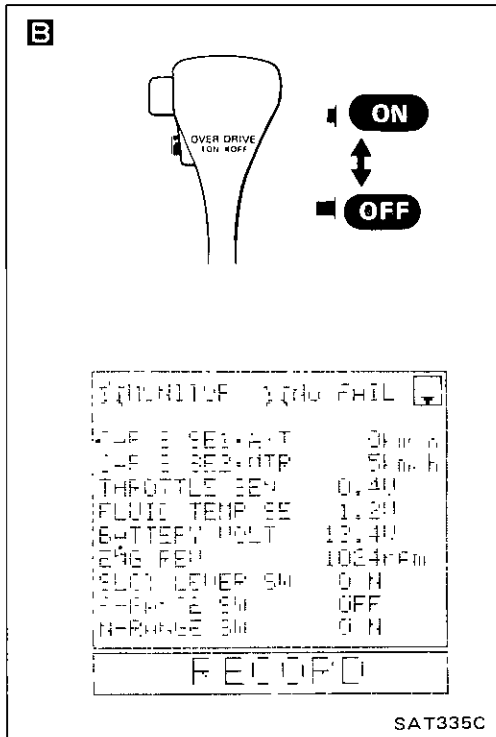
Check the following items.

- 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



# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)



**B**

**CHECK OVERDRIVE SWITCH CIRCUIT.**

1. ON

2. OFF

- Select "E.C.U. INPUT SIGNALS".
- Read out "SELECTOR LEVER SWITCH (Overdrive switch)".
- Check the selector lever switch position is indicated properly. (Selector lever switch "ON" displayed on CONSULT means overdrive "OFF".)

OR

- Check voltage between A/T control unit terminal ③⑨ and ground when overdrive switch is in "ON" position and in "OFF" position.

| Switch position | Voltage         |
|-----------------|-----------------|
| ON              | Battery voltage |
| OFF             | 1V or less      |

N.G. → Check the following items.

- Overdrive switch — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit and overdrive switch
- Harness continuity of ground circuit for overdrive switch

O.K. → **B**

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

**C**

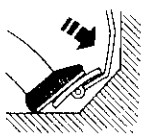


| MONITOR       |     | NO FAIL |
|---------------|-----|---------|
| D-RANGE SW    | OFF |         |
| 1-RANGE SW    | OFF |         |
| 2-RANGE SW    | OFF |         |
| ASCD+CRUISE   | OFF |         |
| ASCD+BD CUT   | OFF |         |
| KICKDOWN SW   | OFF |         |
| POWERSHIFT SW | OFF |         |
| IDLE SW       | ON  |         |
| FULL THRTL SW | OFF |         |

RECORD

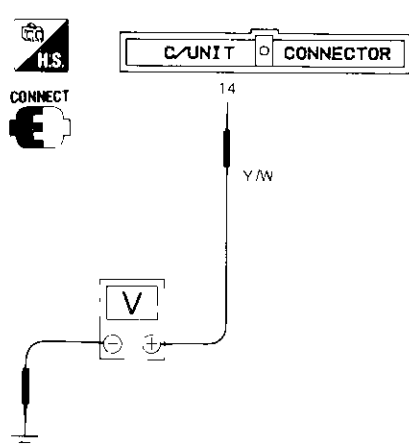
SAT338C

**C**

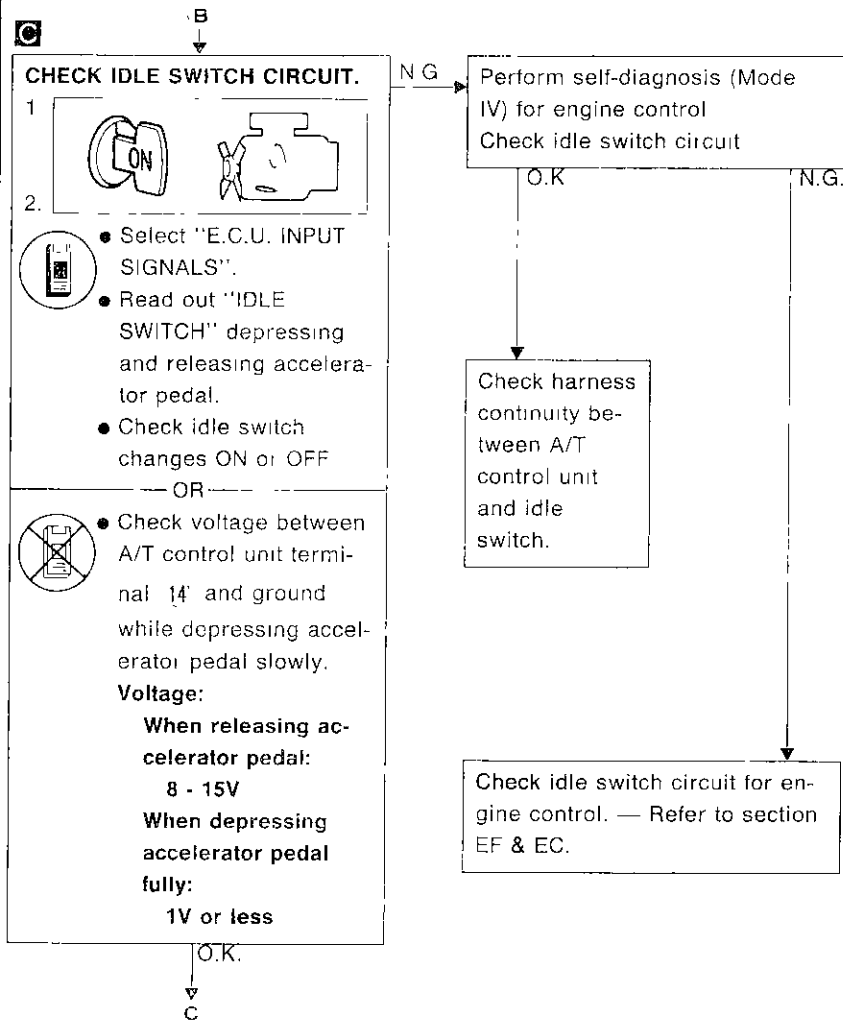


**H.S.**

**CONNECT**



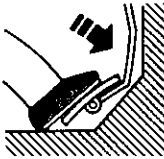
SAT339C



# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

**D**

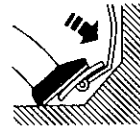
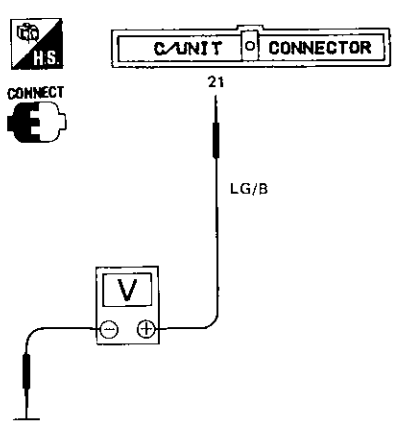


| MONITOR       |     | FAIL |  |
|---------------|-----|------|--|
| D-RANGE SW    | OFF |      |  |
| 1-RANGE SW    | OFF |      |  |
| 2-RANGE SW    | OFF |      |  |
| ASCO-CRUISE   | OFF |      |  |
| ASCO-OD CUT   | OFF |      |  |
| KICKDOWN SW   | OFF |      |  |
| POWERSHIFT SW | OFF |      |  |
| IDLE SW       | ON  |      |  |
| FULL THRTL SW | OFF |      |  |

RECORD

SAT338C

**D**

SAT505C

**D**

**CHECK FULL THROTTLE SWITCH CIRCUIT.**

- 
- 

- Select "E.C.U. INPUT SIGNALS".
- Read out "FULL THROTTLE SWITCH" depressing and releasing accelerator pedal.
- Check full throttle switch changes ON or OFF.

OR

- Check voltage between A/T control unit terminal ② and ground while depressing accelerator pedal slowly.

**Voltage:**

**When releasing accelerator pedal:**  
1V or less

**When depressing accelerator pedal fully:**  
8 - 15V

O.K. → Perform self-diagnosis again after driving for a while.

N.G. → Check harness continuity between A/T control unit and full throttle switch.

O.K. → **INSPECTION END**

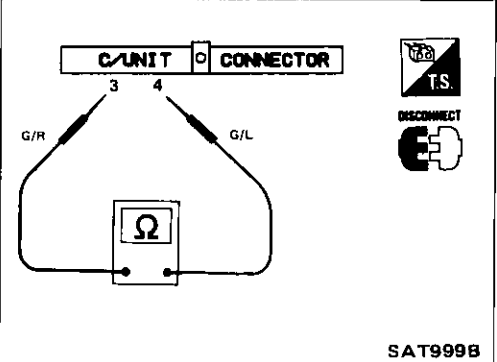
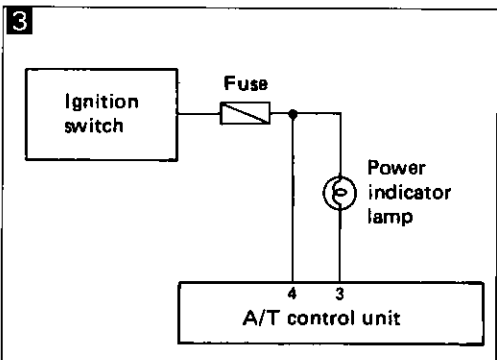
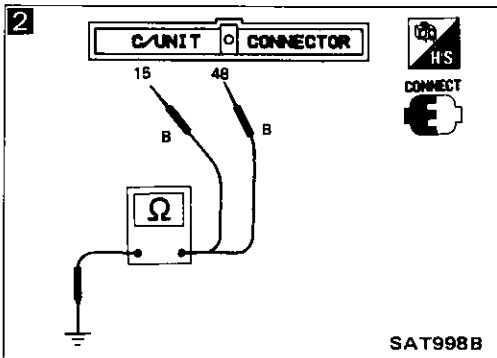
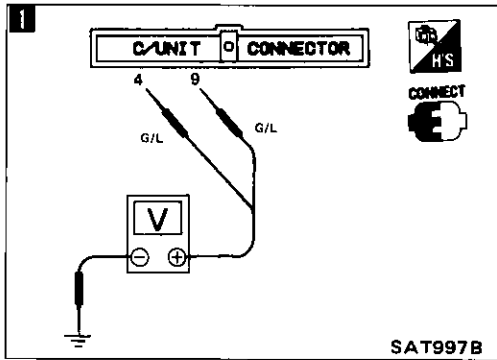
N.G. → 1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

# TROUBLE DIAGNOSES

## Diagnostic Procedure 1

### SYMPTOM:

Power indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".



**1**

### CHECK A/T CONTROL UNIT POWER SOURCE.

1. 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. Disconnect A/T control unit connector.
2. 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. Disconnect A/T control unit connector.
2. Check resistance between A/T control unit terminals ③ and ④. **Resistance: 5 - 20Ω**
3. Reinstall any part removed.

N.G.

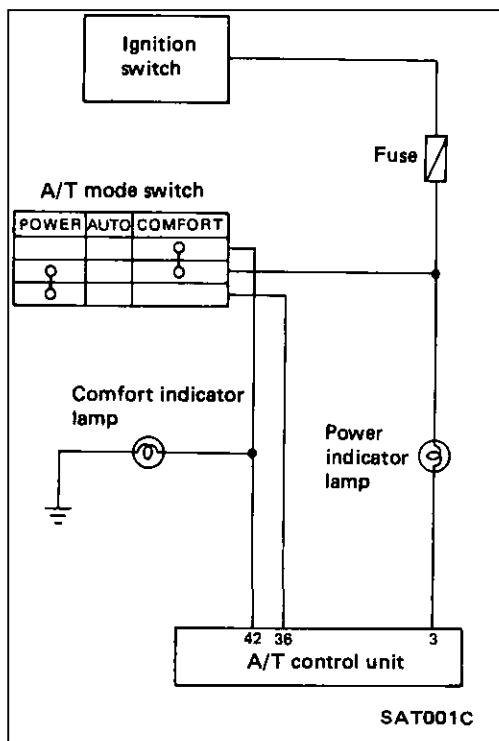
Check the following items.

- Power indicator lamp — Refer to section EL.
- Harness continuity between ignition switch and power indicator lamp
- Harness continuity between power indicator lamp and A/T control unit

O.K.

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.

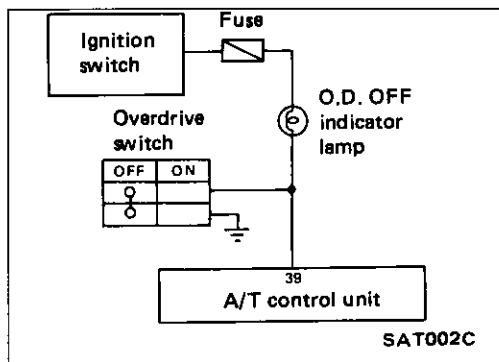
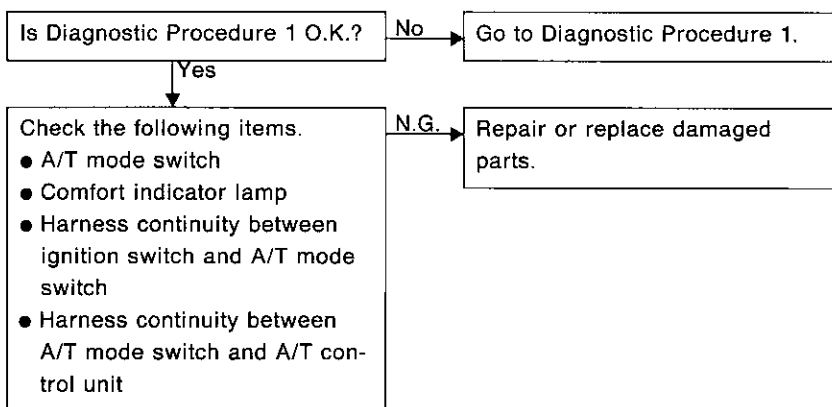
## TROUBLE DIAGNOSES



### Diagnostic Procedure 2

#### SYMPTOM:

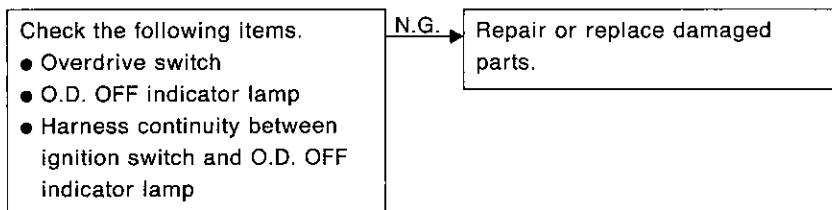
**Power indicator lamp or comfort indicator lamp does not come on when turning A/T mode switch to the appropriate position.**

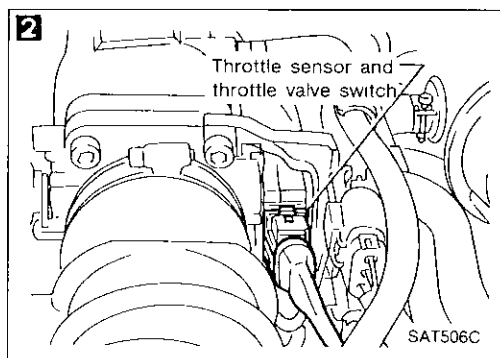
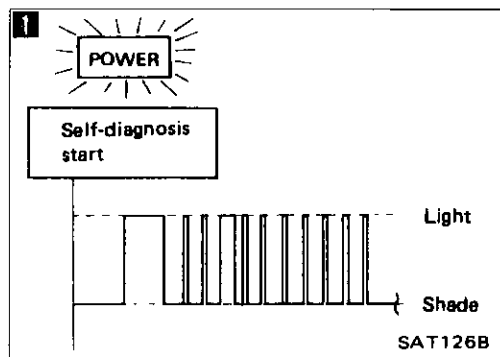


### Diagnostic Procedure 3

#### SYMPTOM:

**O.D. OFF indicator lamp does not come on when setting overdrive switch in "OFF" position.**

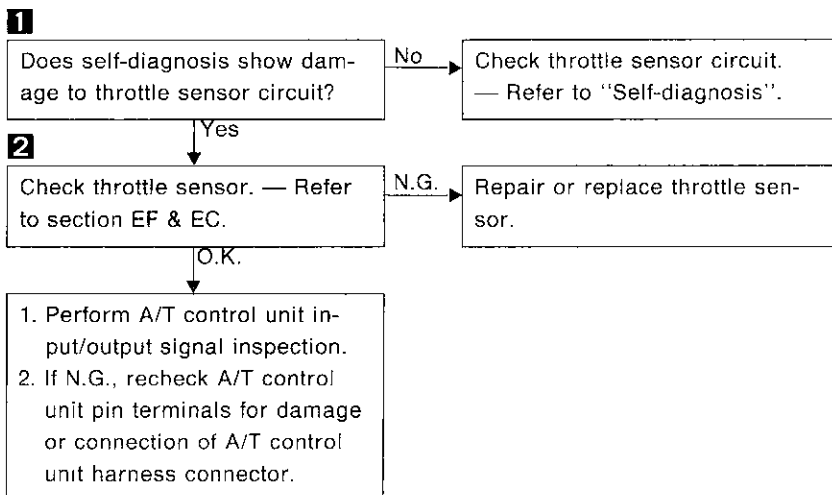




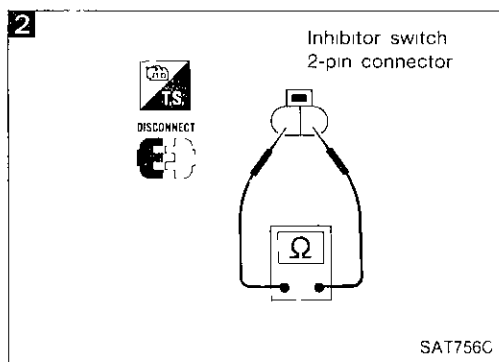
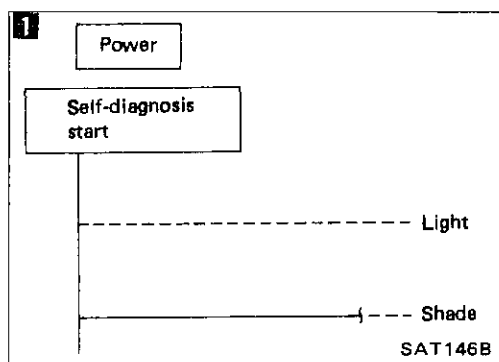
## Diagnostic Procedure 4

### SYMPTOM:

Power indicator lamp does not come on for about 3 seconds when depressing and releasing accelerator pedal fully.



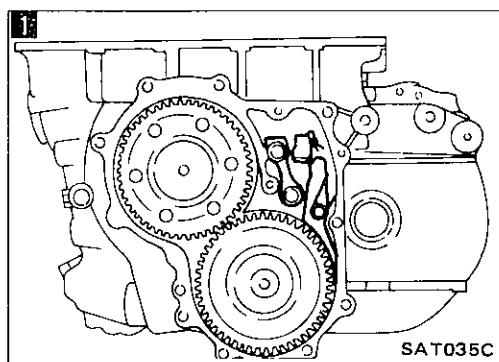
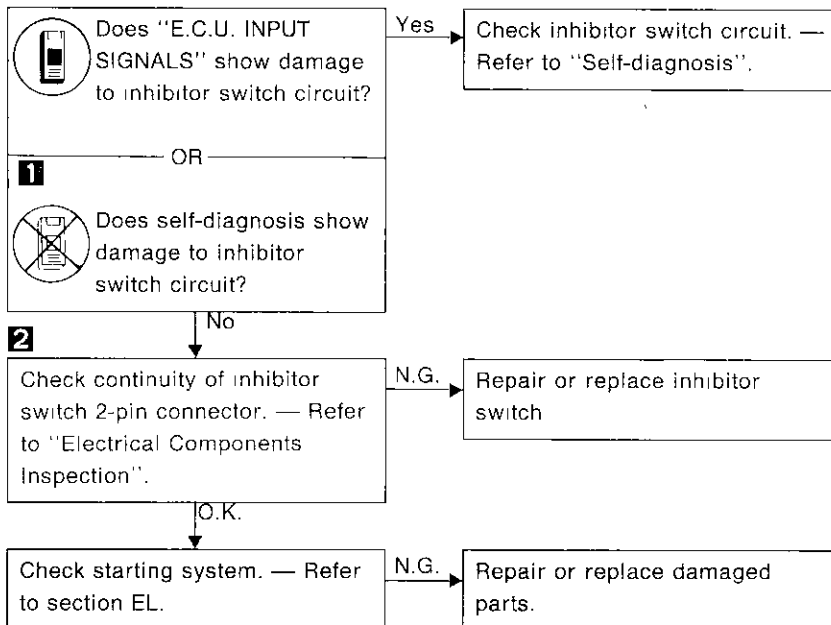
## TROUBLE DIAGNOSES



### Diagnostic Procedure 5

#### SYMPTOM:

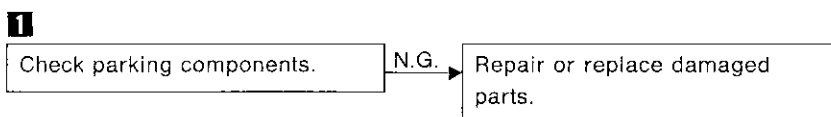
Engine cannot be started with selector lever in "P" or "N" range or engine can be started with selector lever in "D", "2", "1" or "R" range.



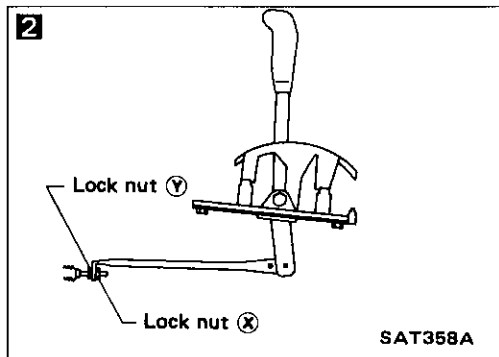
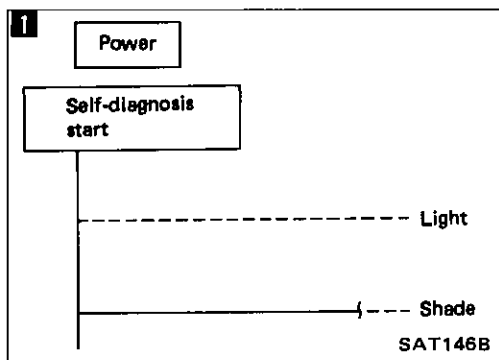
### Diagnostic Procedure 6

#### SYMPTOM:

Vehicle moves when it is pushed forward or backward with selector lever in "P" range.



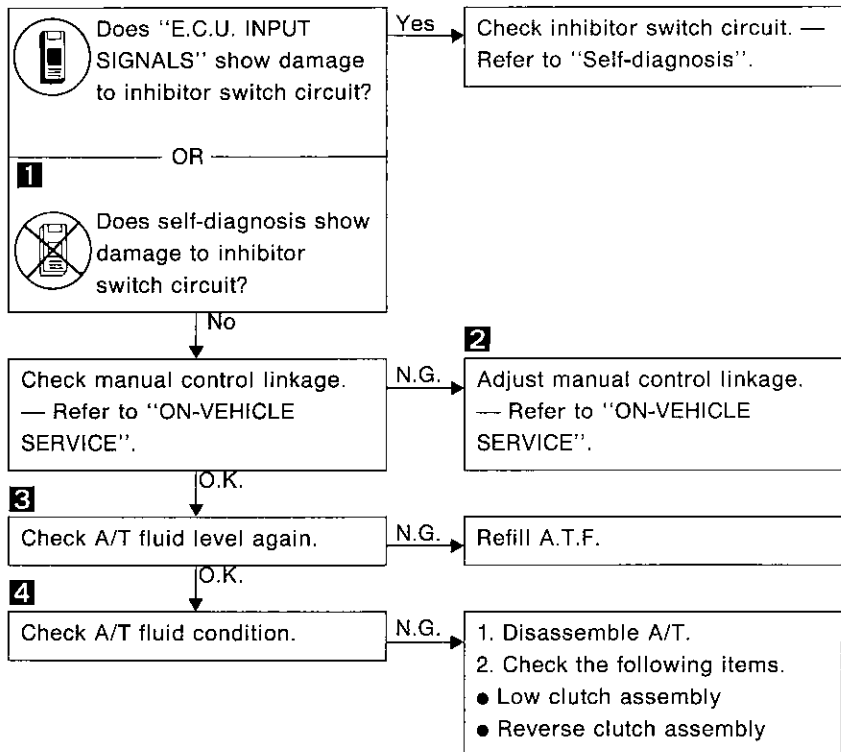
# TROUBLE DIAGNOSES



## Diagnostic Procedure 7

### SYMPTOM:

Vehicle moves forward or backward when selecting "N" range.

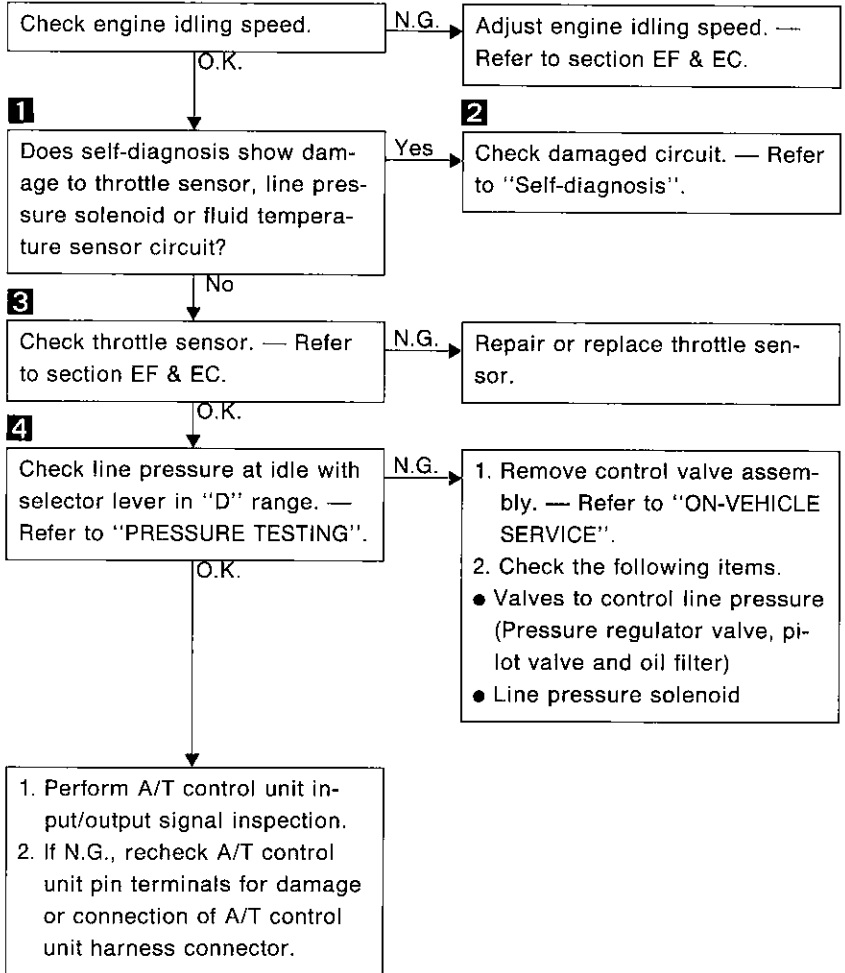
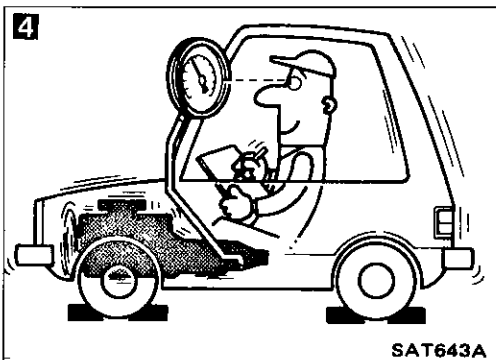
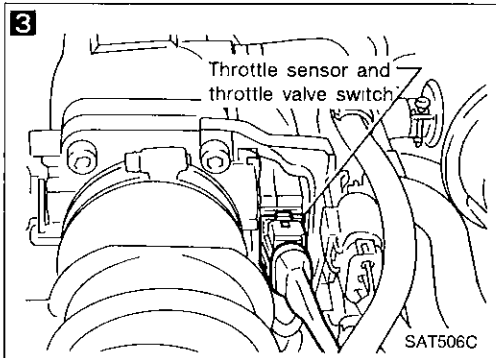
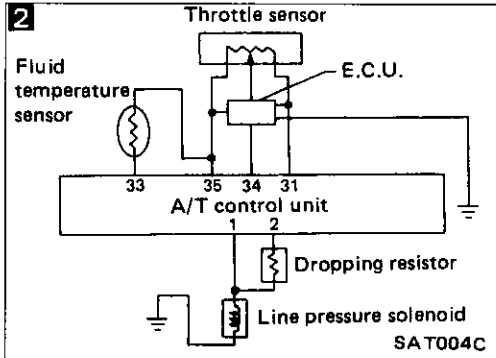
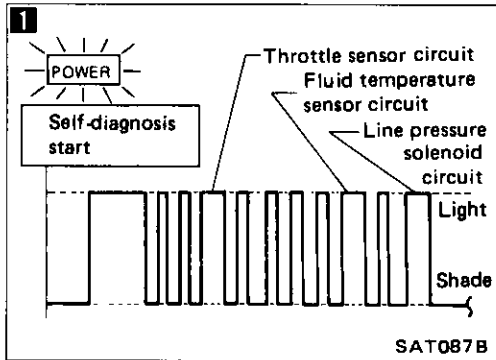


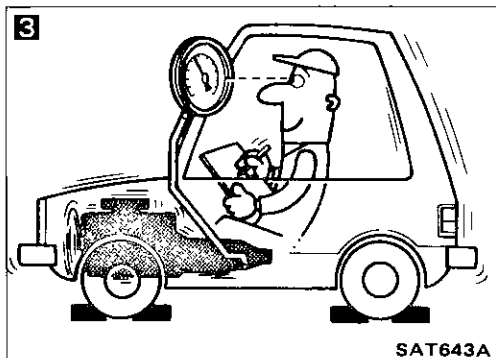
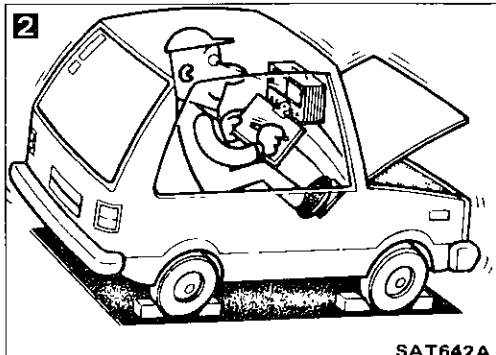
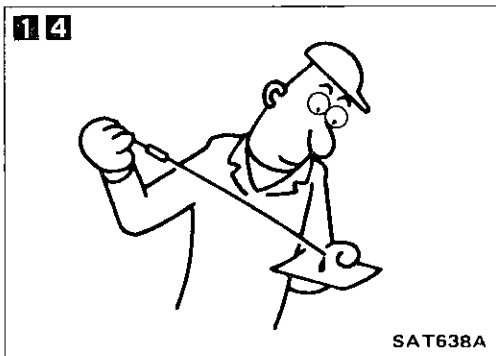


## Diagnostic Procedure 8

### SYMPTOM:

There is large shock when changing from "N" to "R" range.

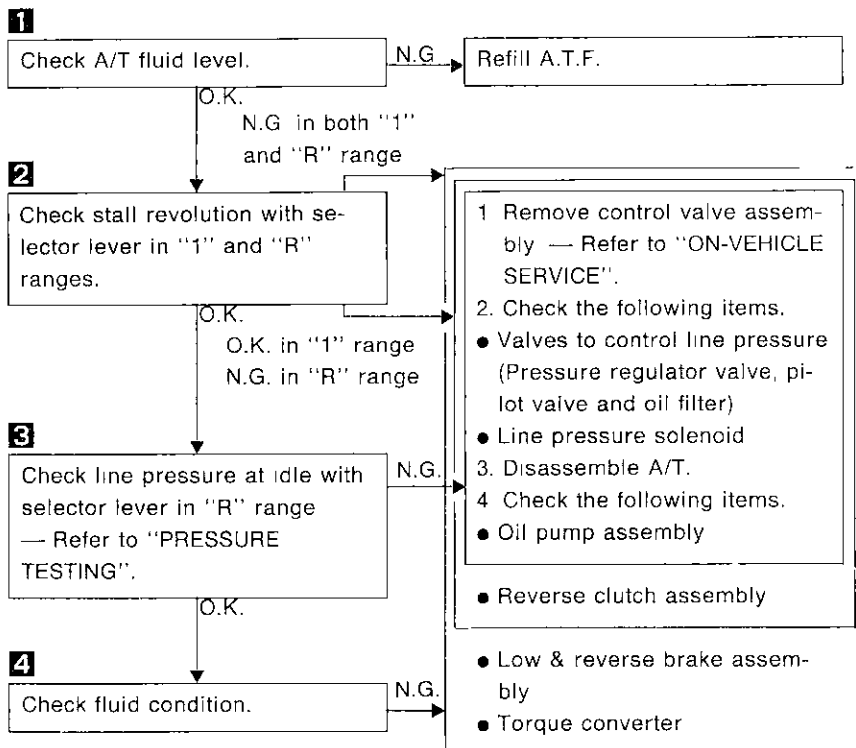




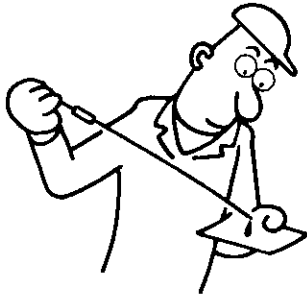
## Diagnostic Procedure 9

### SYMPTOM:

Vehicle does not creep backward when selecting "R" range.



**14**



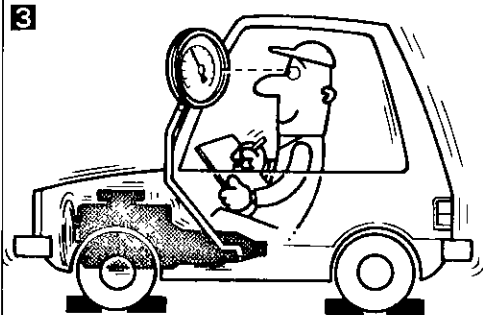
SAT638A

**2**



SAT642A

**3**



SAT643A

## Diagnostic Procedure 10

### SYMPTOM:

Vehicle does not creep forward when selecting "D", "2" or "1" range.

**1**

Check A/T fluid level.

N.G.

Refill A.T.F.

O.K.

**2**

Check stall revolution with selector lever in "D" and "1" ranges. — 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, pilot valve and oil filter)

- Line pressure solenoid

3. Disassemble A/T.

4. Check the following items.

- Oil pump assembly

O.K.

**3**

Check line pressure at idle with selector lever in "D", "2" and "1" ranges. — Refer to "PRESSURE TESTING".

N.G.

O.K.

**4**

Check A/T fluid condition.

N.G.

- Low clutch assembly

- One-way clutch

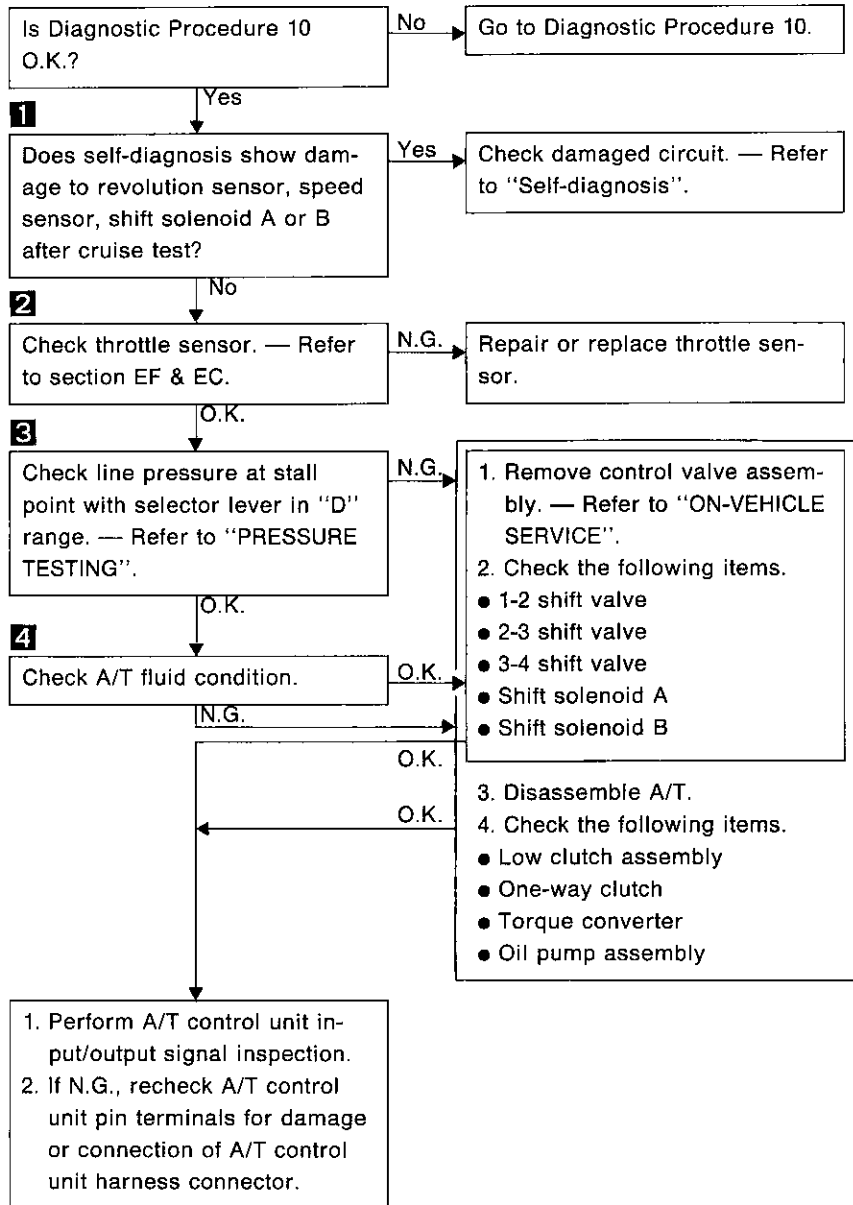
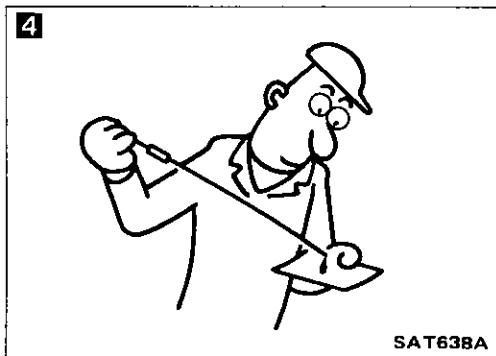
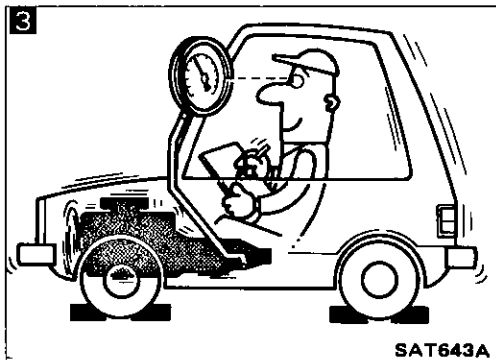
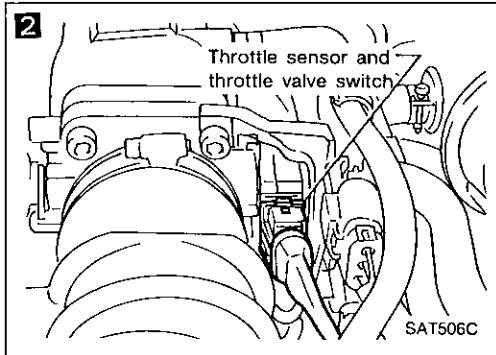
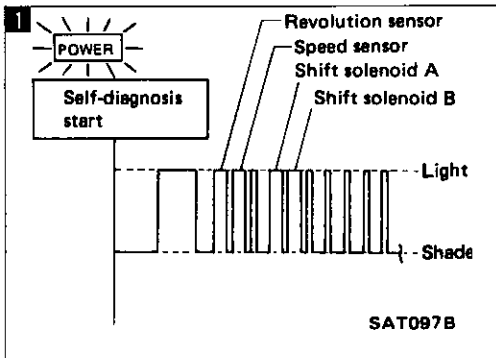
- Low & reverse brake assembly

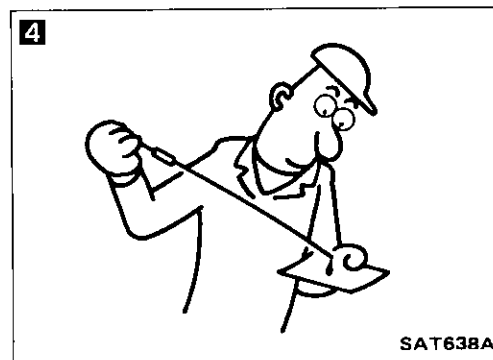
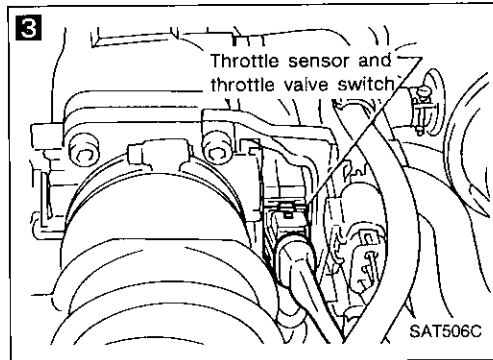
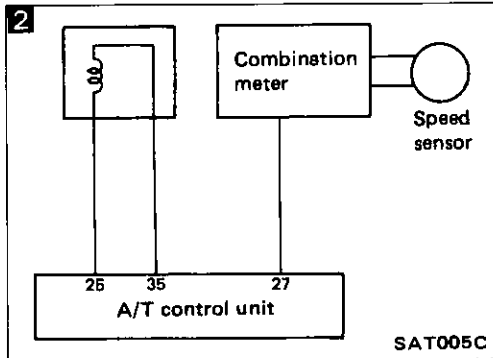
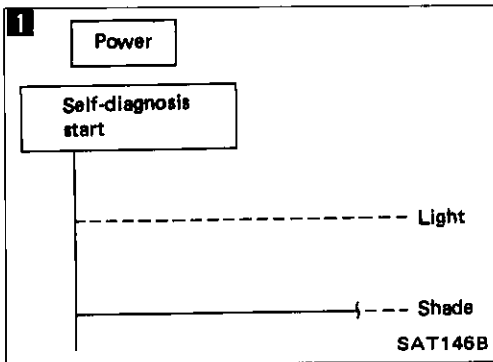
- Torque converter

## Diagnostic Procedure 11

### SYMPTOM:

Vehicle cannot be started from D<sub>1</sub>.



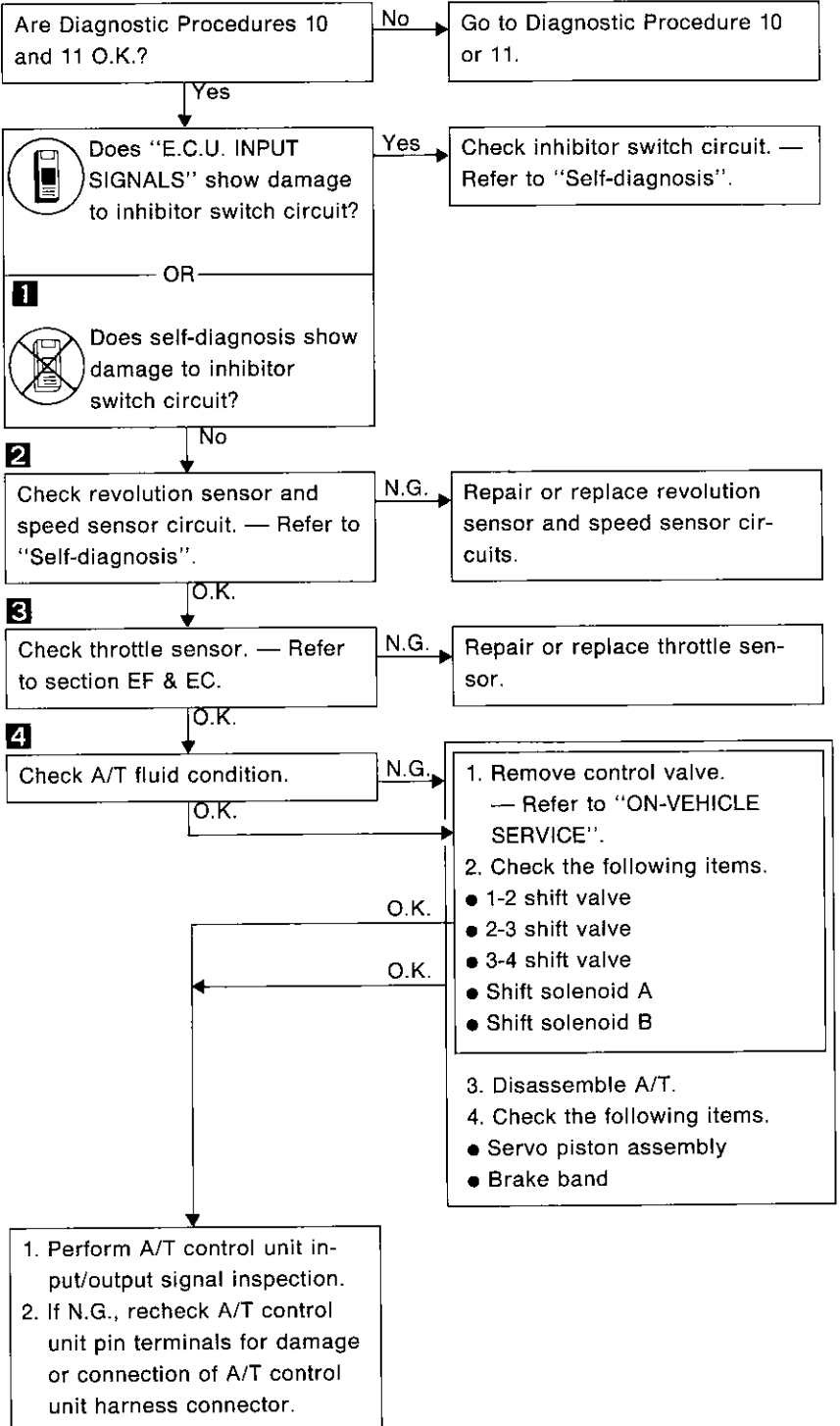


## Diagnostic Procedure 12

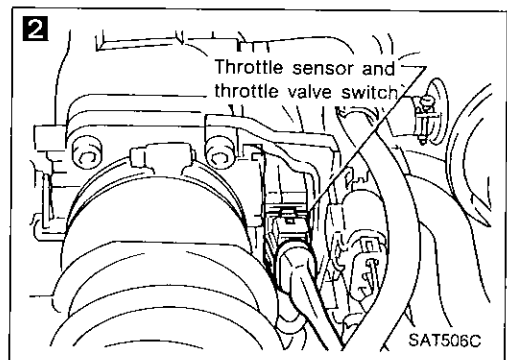
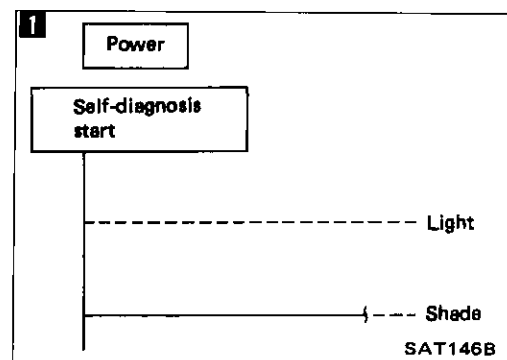
### SYMPTOM:

A/T does not shift from D<sub>1</sub> to D<sub>2</sub> at the specified speed.

A/T does not shift from D<sub>4</sub> to D<sub>2</sub> when depressing accelerator pedal fully at the specified speed.



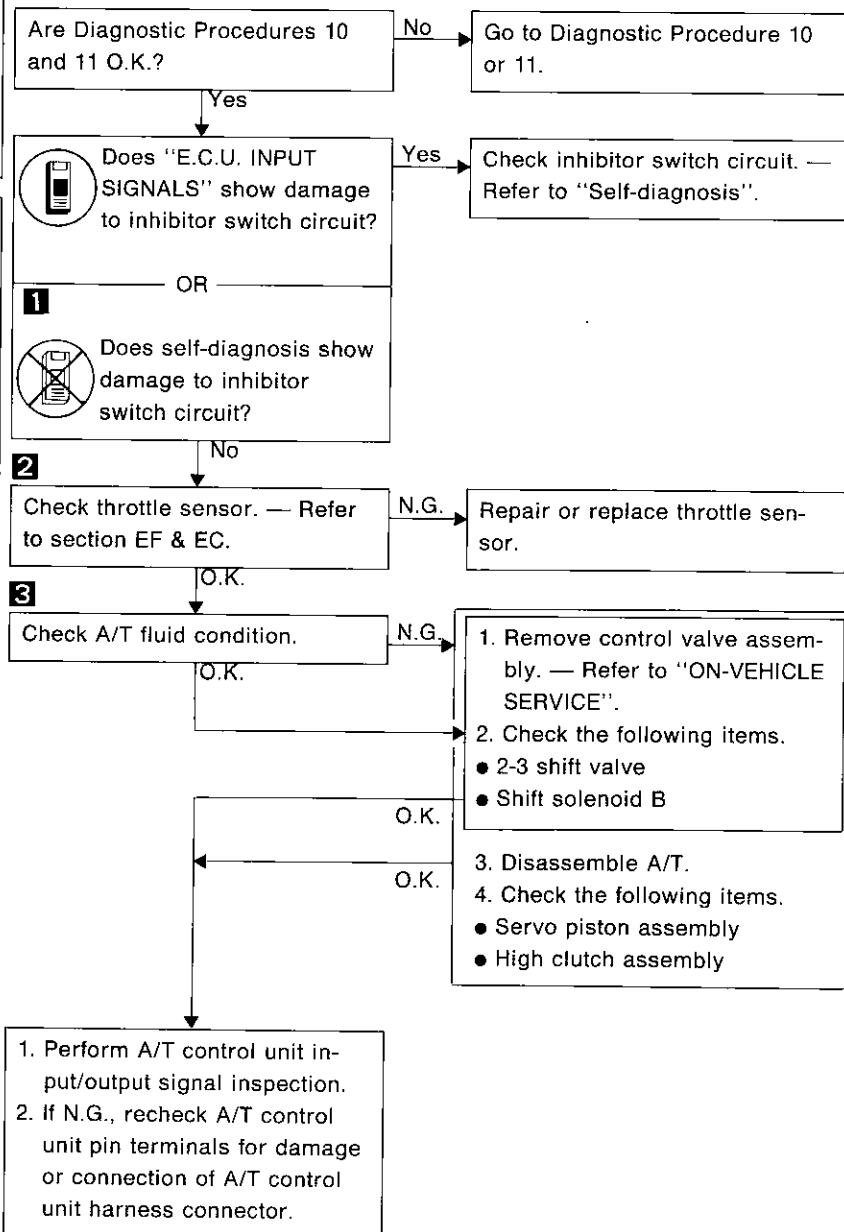
# TROUBLE DIAGNOSES



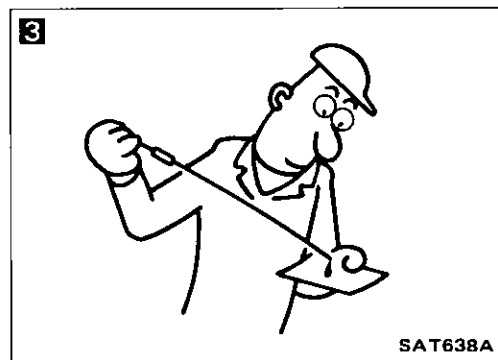
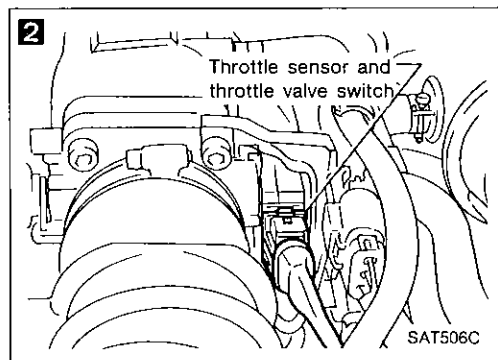
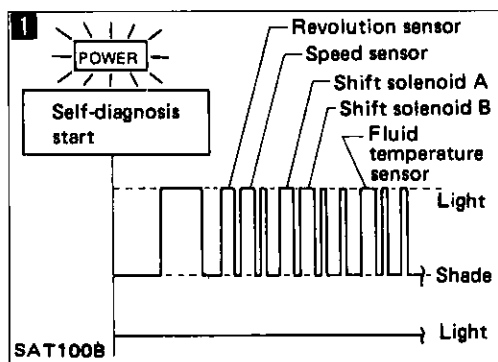
## Diagnostic Procedure 13

### SYMPTOM:

A/T does not shift from D<sub>2</sub> to D<sub>3</sub> at the specified speed.



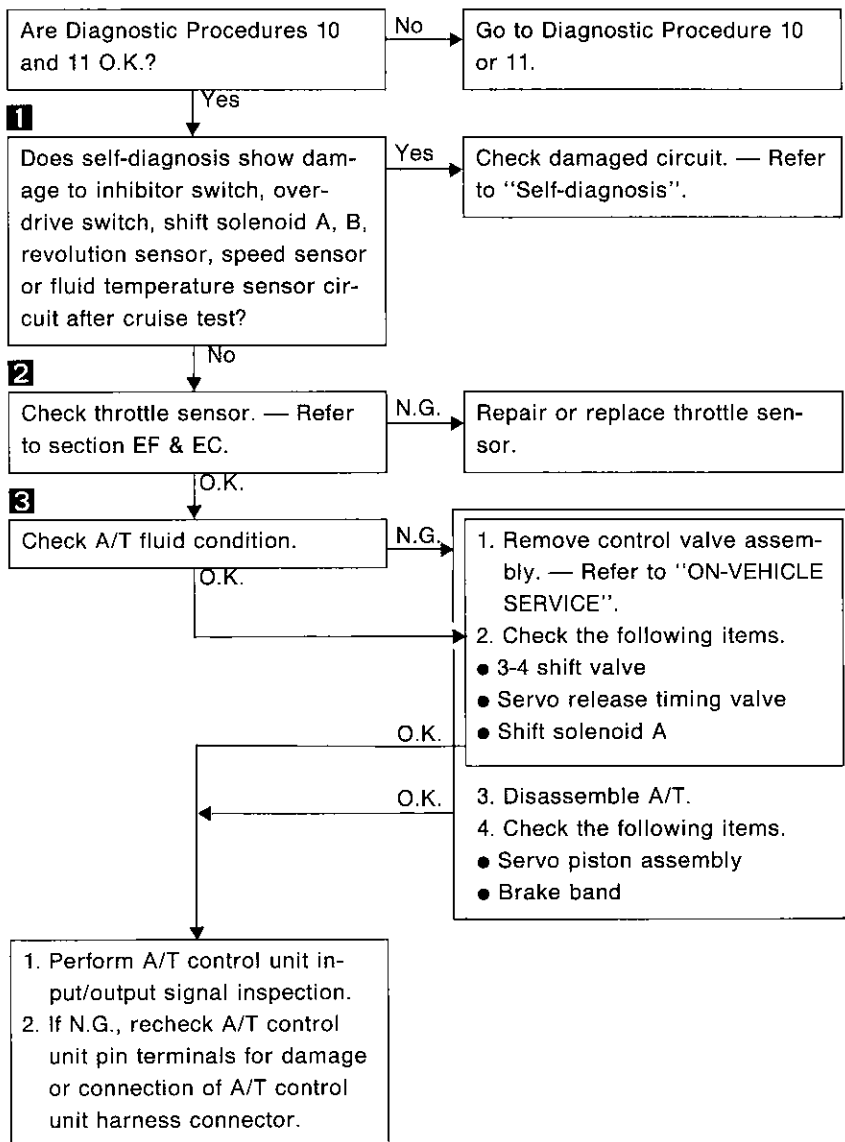
# TROUBLE DIAGNOSES

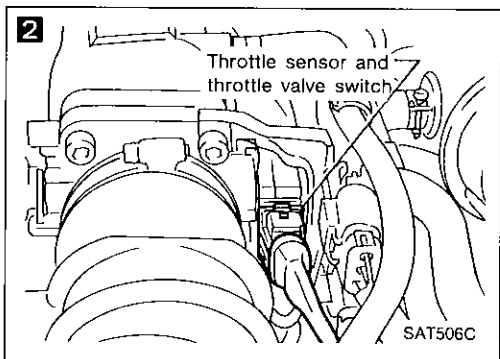
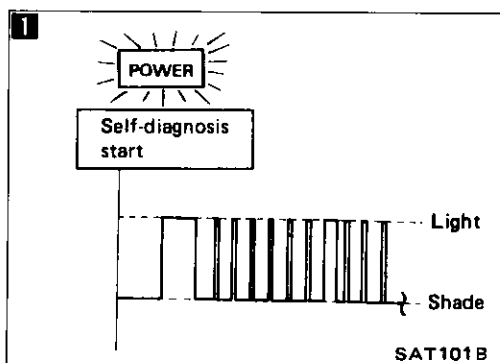


## Diagnostic Procedure 14

### SYMPTOM:

A/T does not shift from D<sub>3</sub> to D<sub>4</sub> at the specified speed.

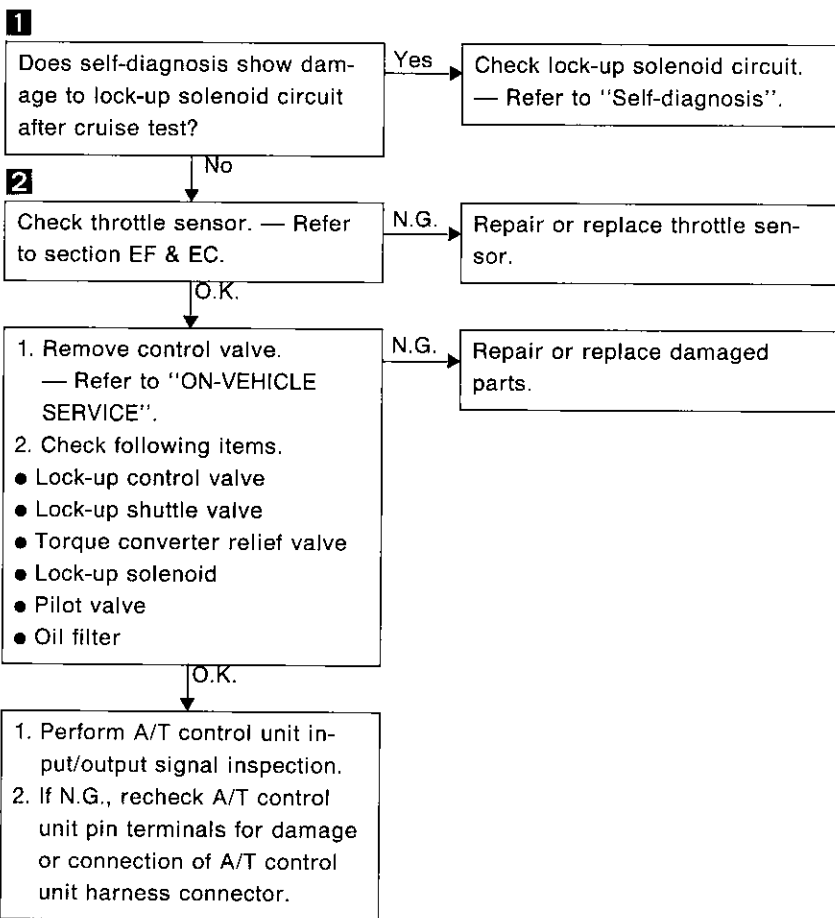




## Diagnostic Procedure 15

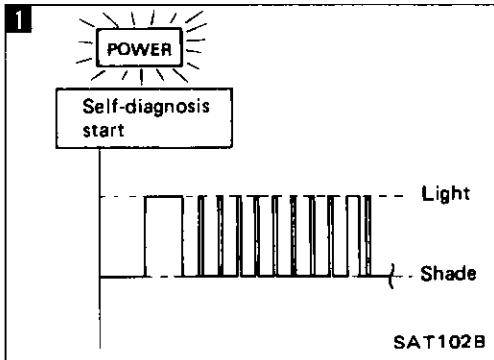
### SYMPTOM:

A/T does not perform lock-up at the specified speed.





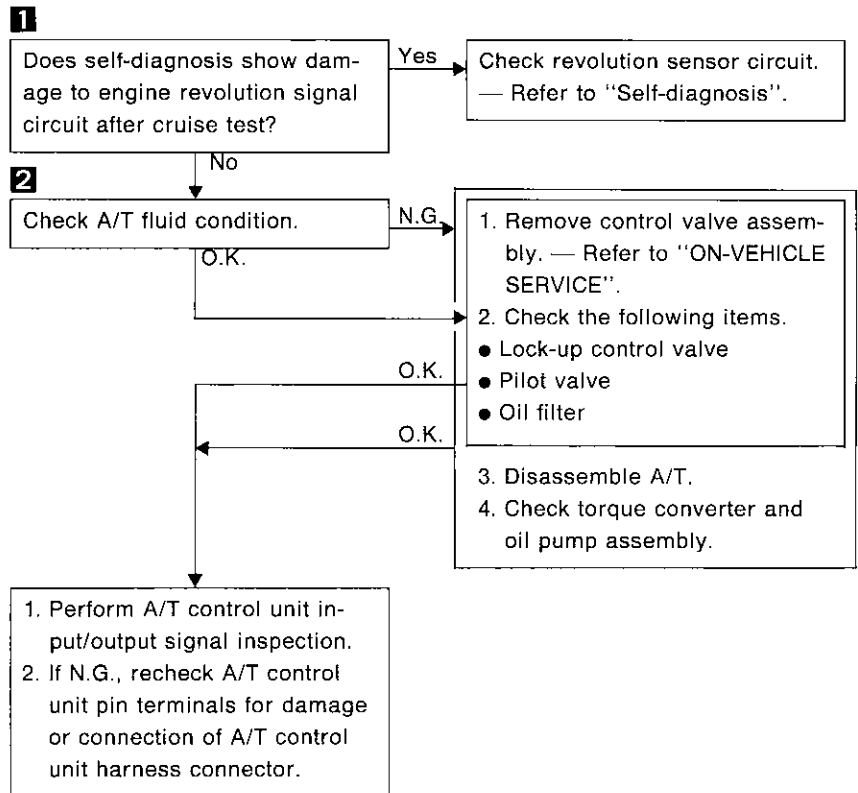
## TROUBLE DIAGNOSES



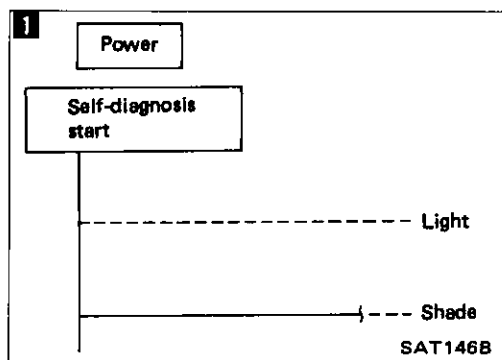
### Diagnostic Procedure 16

#### SYMPTOM:

A/T does not hold lock-up condition for more than 30 seconds.



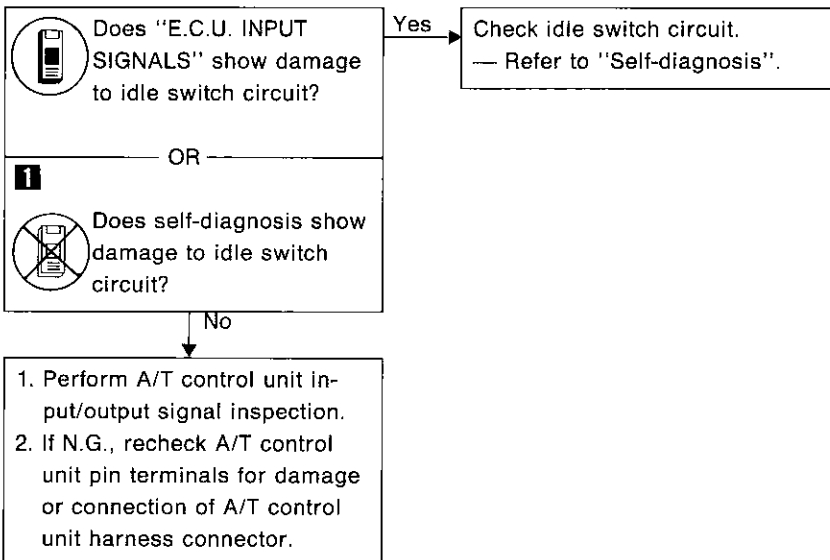
## TROUBLE DIAGNOSES



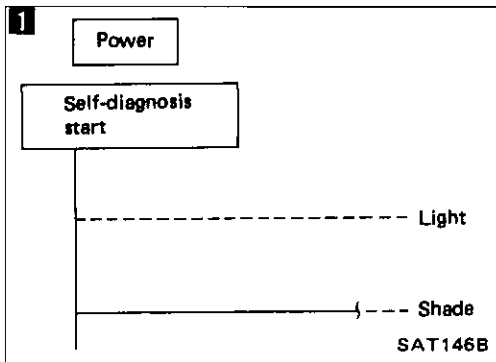
### Diagnostic Procedure 17

#### SYMPTOM:

Lock-up is not released when accelerator pedal is released.



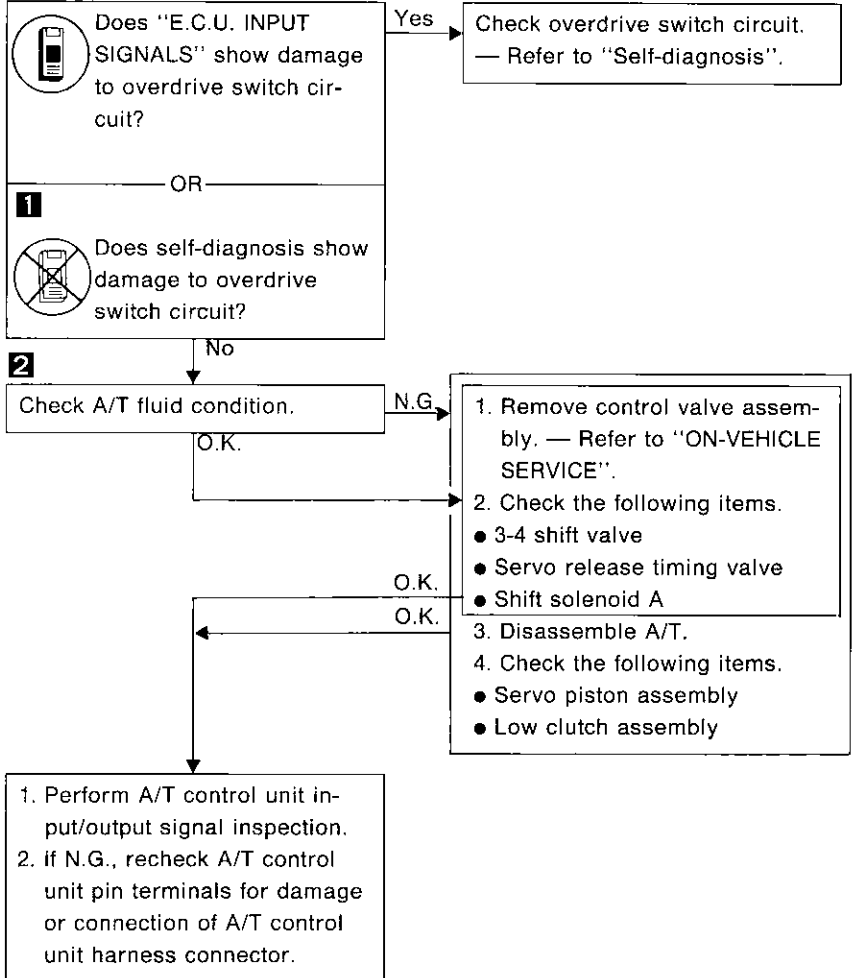
# TROUBLE DIAGNOSES



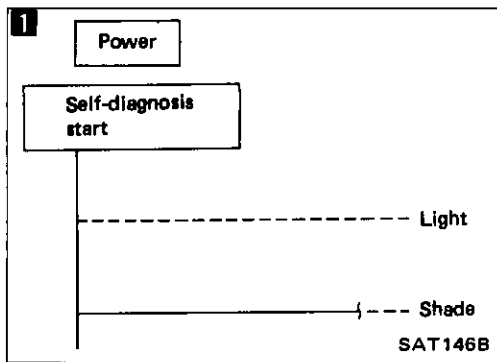
## Diagnostic Procedure 18

### SYMPTOM:

A/T does not shift from D<sub>4</sub> to D<sub>3</sub> when changing overdrive switch to "OFF" position.



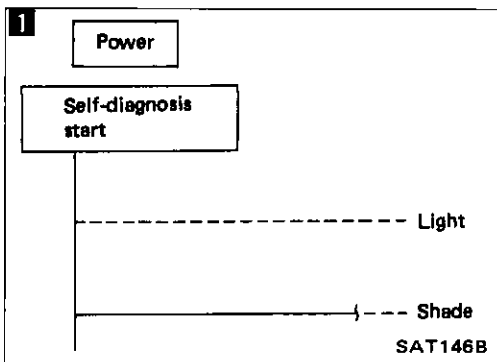
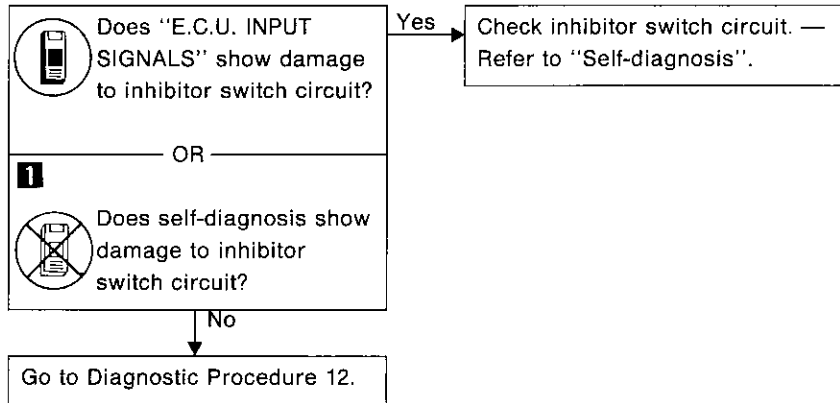
# TROUBLE DIAGNOSES



## Diagnostic Procedure 19

### SYMPTOM:

A/T does not shift from  $D_3$  to  $2_2$  when changing selector lever from "D" to "2" range.

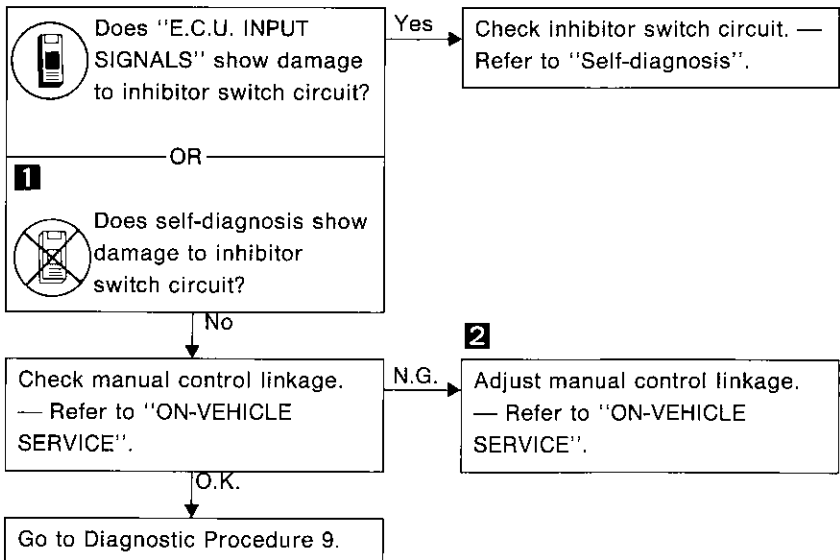
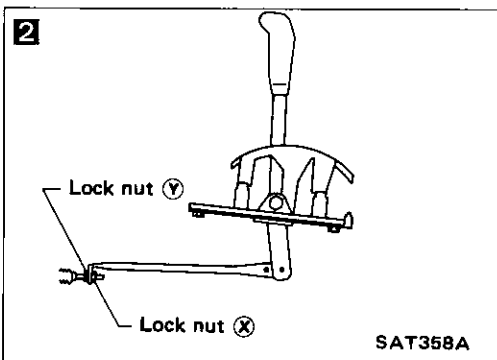


## Diagnostic Procedure 20

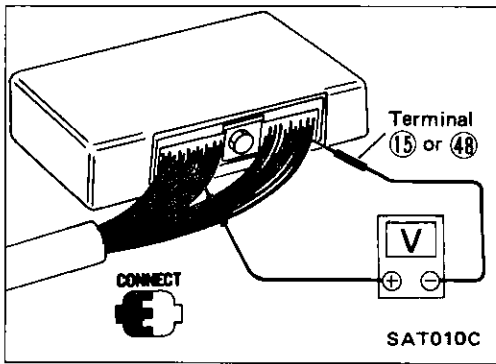
### SYMPTOM:

A/T does not shift from  $2_2$  to  $1_1$  when changing selector lever from "2" to "1" range.

Vehicle does not decelerate by engine brake when shifting from  $2_2$  ( $1_2$ ) to  $1_1$ .



## TROUBLE DIAGNOSES



### 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.

|   |   |   |   |    |    |    |    |    |    |    |  |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|---|---|---|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 9  | 10 | 11 | 12 | 13 | 14 | 15 |  | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 5 | 6 | 7 | 8 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |  | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |



SAT011C

## TROUBLE DIAGNOSES

### 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            | Power indicator lamp                            | When A/T mode switch is set in "POWER" position.                                                  | 1V or less         |
|              |                                                 | When A/T mode switch is set in any position except in "POWER" position.                           | 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 <sub>1</sub> " or "D <sub>4</sub> ".)     | Battery voltage    |
|              |                                                 | When shift solenoid A is not operating. (When driving in "D <sub>2</sub> " or "D <sub>3</sub> ".) | 1V or less         |
| 7            | Shift solenoid B                                | When shift solenoid B is operating. (When driving in "D <sub>1</sub> " or "D <sub>2</sub> ".)     | Battery voltage    |
|              |                                                 | When shift solenoid B is not operating. (When driving in "D <sub>3</sub> " or "D <sub>4</sub> ".) | 1V or less         |
| 8            | Timing solenoid                                 | When timing solenoid is operating. (When driving in "D <sub>1</sub> " or "D <sub>4</sub> ".)      | Battery voltage    |
|              |                                                 | When timing solenoid is not operating. (When driving in "D <sub>2</sub> " or "D <sub>3</sub> ".)  | 1V or less         |

# TROUBLE DIAGNOSES

## 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<br>(in throttle valve switch) | When accelerator pedal is released after warming up engine.                     | 8 - 15V            |
|              |                                           | When accelerator pedal is depressed after warming up engine.                    | 1V or less         |
| 15           | Ground                                    | —                                                                               | —                  |
| 16           | Inhibitor "1" range switch                | When selector lever is set to "1" range.                                        | Battery voltage    |
|              |                                           | When selector lever is set to other ranges.                                     | 1V or less         |
| 17           | Inhibitor "2" range switch                | When selector lever is set to "2" range.                                        | Battery voltage    |
|              |                                           | When selector lever is set to other ranges.                                     | 1V or less         |
| 18           | Inhibitor "D" range switch                | When selector lever is set to "D" range.                                        | Battery voltage    |
|              |                                           | When selector lever is set to other ranges.                                     | 1V or less         |
| 19           | Inhibitor "N" or "P" range switch         | When selector lever is set to "N" range.                                        | Battery voltage    |
|              |                                           | When selector lever is set to other ranges.                                     | 1V or less         |
| 20           | Inhibitor "R" range switch                | When selector lever is set to "R" range.                                        | Battery voltage    |
|              |                                           | When selector lever is set to other ranges.                                     | 1V or less         |
| 21           | Full throttle switch                      | When accelerator pedal is depressed more than half-way after warming up engine. | 8 - 15V            |
|              |                                           | When accelerator pedal is released after warming up engine.                     | 1V or less         |
| 22           | —                                         | —                                                                               | —                  |
| 23           | Power source<br>(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 |

\*: 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.

# TROUBLE DIAGNOSES

## Electrical Components Inspection (Cont'd)

| Terminal No. | Item                                       |                                                                                     | Condition                                                                          | Judgement standard                                                  |
|--------------|--------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 25           | Revolution sensor<br>(Measure in AC range) |    | When vehicle is cruising at 30 km/h (19 MPH).                                      | 1V or more<br>Voltage rises gradually in response to vehicle speed. |
| 26           | —                                          |                                                                                     | When vehicle is parked.                                                            | 0V                                                                  |
| 27           | Speed sensor                               |                                                                                     | —                                                                                  | —                                                                   |
| 28           | —                                          |   | When vehicle is moving at 2 to 3 km/h (1 to 2 MPH) for 1m (3 ft) or more.          | Vary from 0 to 5V                                                   |
| 29           | —                                          |                                                                                     | —                                                                                  | —                                                                   |
| 30           | —                                          |                                                                                     | —                                                                                  | —                                                                   |
| 31           | Throttle sensor<br>(Power source)          |                                                                                     | —                                                                                  | 4.5 - 5.5V                                                          |
| 32           | —                                          |                                                                                     | —                                                                                  | —                                                                   |
| 33           | Fluid temperature sensor                   |                                                                                     | When A.T.F. temperature is 20°C (68°F).                                            | Approximately 1.5V                                                  |
| 34           | Throttle sensor                            |                                                                                     | When A.T.F. temperature is 80°C (176°F).                                           | Approximately 0.5V                                                  |
|              |                                            |                                                                                     | When accelerator pedal is depressed slowly after warming up engine.                | Fully-closed throttle:<br>Approximately 0.5V                        |
|              |                                            |                                                                                     | Voltage rises gradually in response to throttle opening angle.                     | Fully-open throttle:<br>Approximately 4V                            |
| 35           | Throttle sensor<br>(Ground)                | —                                                                                   | —                                                                                  |                                                                     |
| 36           | A/T mode switch<br>“POWER”                 |  | When A/T mode switch is set in “POWER” position.                                   | Battery voltage                                                     |
|              |                                            |                                                                                     | When A/T mode switch is set in any position except in “POWER” position.            | 1V or less                                                          |
| 37           | A.S.C.D. cruise signal                     |  | When A.S.C.D. cruise is being performed.<br>(“CRUISE” light comes on.)             | Battery voltage                                                     |
|              |                                            |                                                                                     | When A.S.C.D. cruise is not being performed.<br>(“CRUISE” light does not come on.) | 1V or less                                                          |



## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

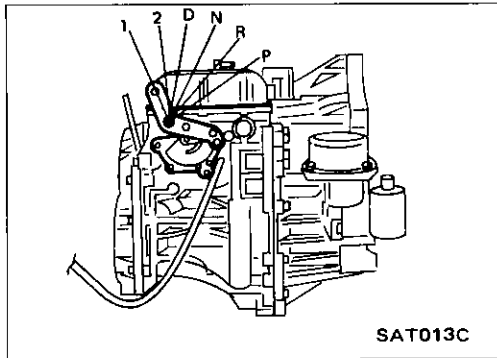
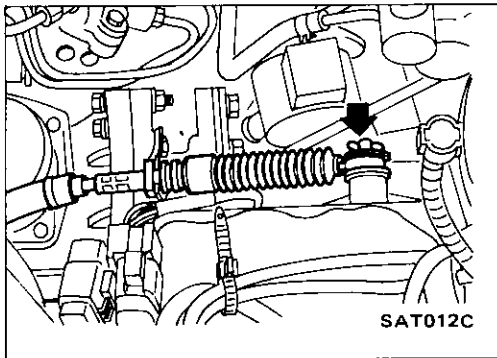
| Terminal No. | Item                      | Condition                                                                         |                                                                           | Judgement standard |
|--------------|---------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------|
| 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           | —                         |  | —                                                                         | —                  |
| 42           | A/T mode switch "COMFORT" |                                                                                   | When A/T mode switch is set in "COMFORT" position.                        | Battery voltage    |
|              |                           |                                                                                   | When A/T mode switch is set in any position except in "COMFORT" position. | 1V or less         |
| 43           | —                         |                                                                                   | —                                                                         | —                  |
| 44           | —                         |                                                                                   | —                                                                         | —                  |
| 45           | —                         |                                                                                   | —                                                                         | —                  |
| 46           | —                         |  | —                                                                         | —                  |
| 47           | —                         |                                                                                   | —                                                                         | —                  |
| 48           | Ground                    |                                                                                   | —                                                                         | —                  |

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

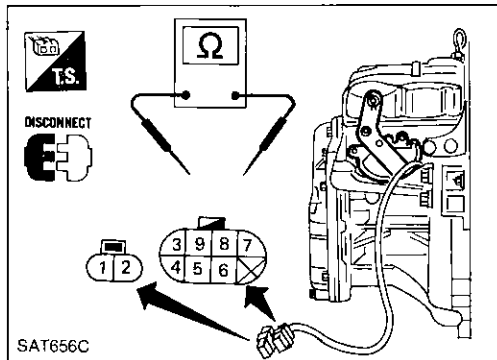
#### INHIBITOR SWITCH

1. Disconnect control cable from manual shaft.

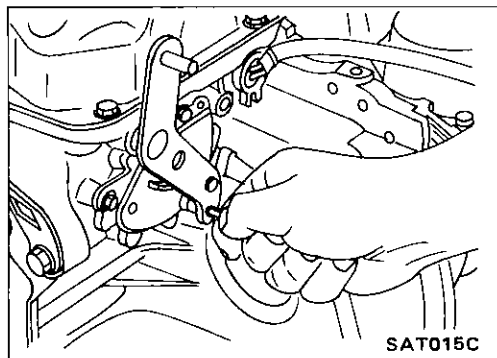


2. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each range.

| Terminal No.   | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |
|----------------|---|---|---|---|---|---|---|---|---|
| Lever position |   |   |   |   |   |   |   |   |   |
| P              | ○ | ○ | ○ | ○ |   |   |   |   |   |
| R              |   |   | ○ | ○ | ○ |   |   |   |   |
| N              | ○ | ○ | ○ | ○ | ○ | ○ |   |   |   |
| D              |   |   | ○ | ○ | ○ | ○ | ○ |   |   |
| 2              |   |   | ○ | ○ | ○ | ○ | ○ | ○ |   |
| 1              |   |   | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

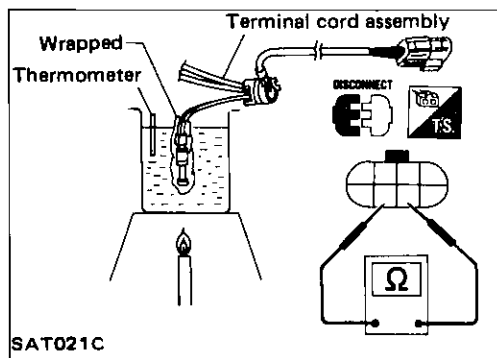


3. If N.G., adjust inhibitor switch.
4. Check terminal continuity again.
5. If N.G., replace inhibitor switch.



#### 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 kΩ     |
|---------------------|-------------------|
| 20 (68)             | Approximately 2.5 |
| 80 (176)            | Approximately 0.3 |

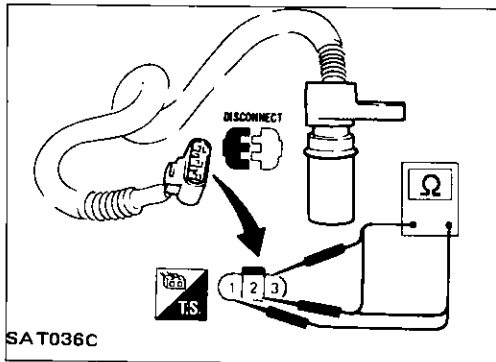
## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

#### 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 |

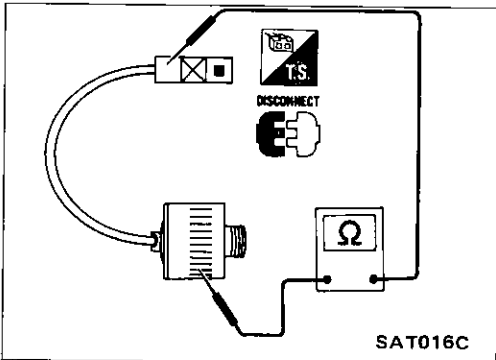


#### TIMING SOLENOID

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

**Resistance:**

**Timing solenoid 20 - 40Ω**

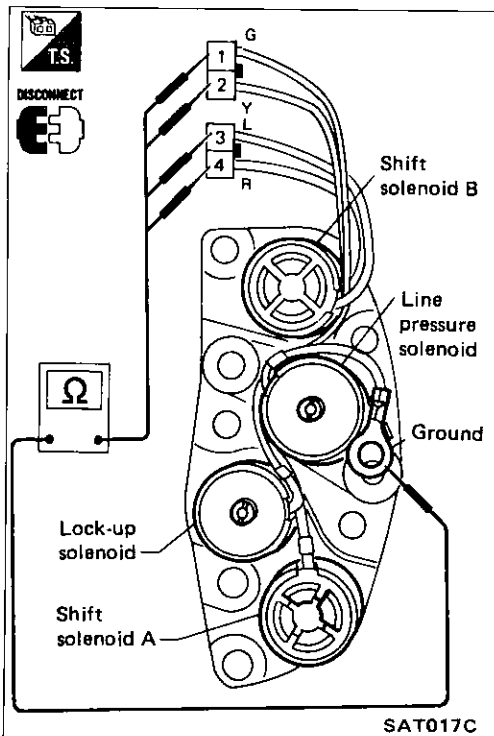


#### 4-UNIT SOLENOID ASSEMBLY

(Shift solenoid A, B, lock-up solenoid and line pressure solenoid)

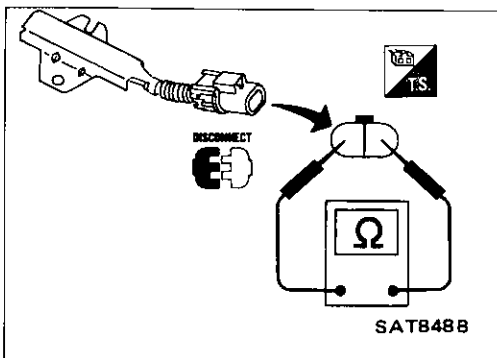
- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.

| Solenoid               | Terminal No. |                 | Resistance Ω |
|------------------------|--------------|-----------------|--------------|
| Shift solenoid A       | ①            | Ground terminal | 20 - 40      |
| Shift solenoid B       | ②            |                 |              |
| Lock-up solenoid       | ③            |                 | 10 - 20      |
| Line pressure solenoid | ④            |                 | 2.5 - 5      |



#### DROPPING RESISTOR

- Check resistance between two terminals.
- Resistance: 11.2 - 12.8Ω**



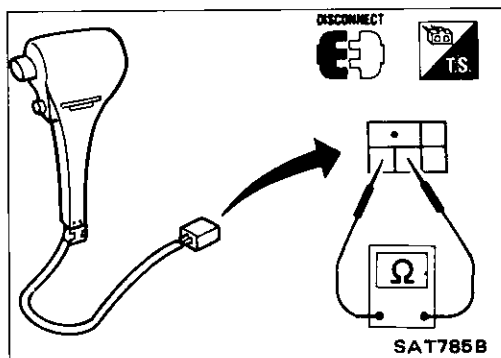
## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

#### OVERDRIVE SWITCH

- Check continuity between two terminals.

| O.D. switch position | Continuity |
|----------------------|------------|
| ON                   | No         |
| OFF                  | Yes        |



SAT785B

### Final Check

#### STALL TESTING

##### Stall test procedure

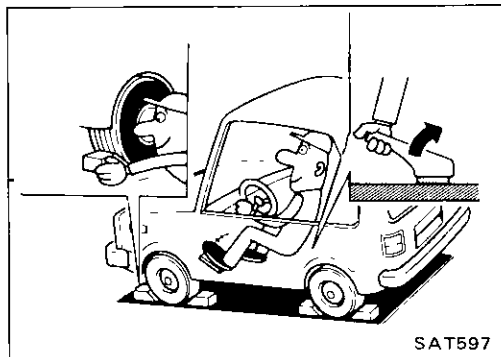
- Check A/T and engine fluid levels. If necessary, add.
- Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

**A.T.F. operating temperature:**

**50 - 80°C (122 - 176°F)**

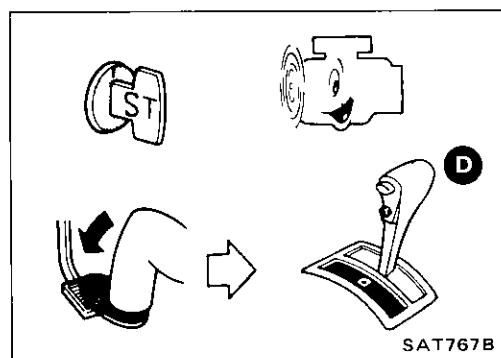
- Set parking brake and block wheels.
- Install a tachometer where it can be seen by driver during test.

- It is good practice to put a mark on point of specified engine rpm on indicator.



SAT597

- Start engine, apply foot brake, and place selector lever in "D" range.



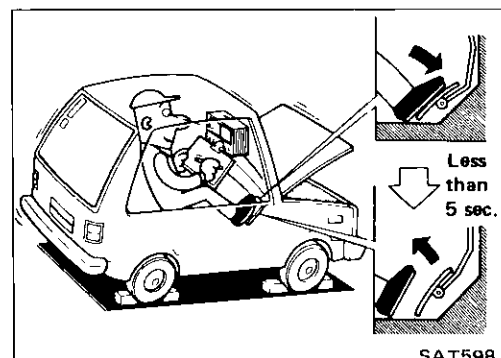
SAT767B

- Accelerate to wide-open throttle gradually while applying foot brake.
- Quickly note the engine stall revolution and immediately release throttle.

- During test, never hold throttle wide-open for more than 5 seconds.

**Stall revolution:**

**1,950 - 2,250 rpm**



SAT598

## TROUBLE DIAGNOSES

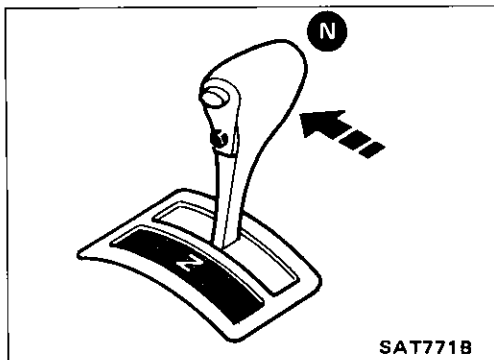
### Final Check (Cont'd)

8. Shift selector lever to "N".

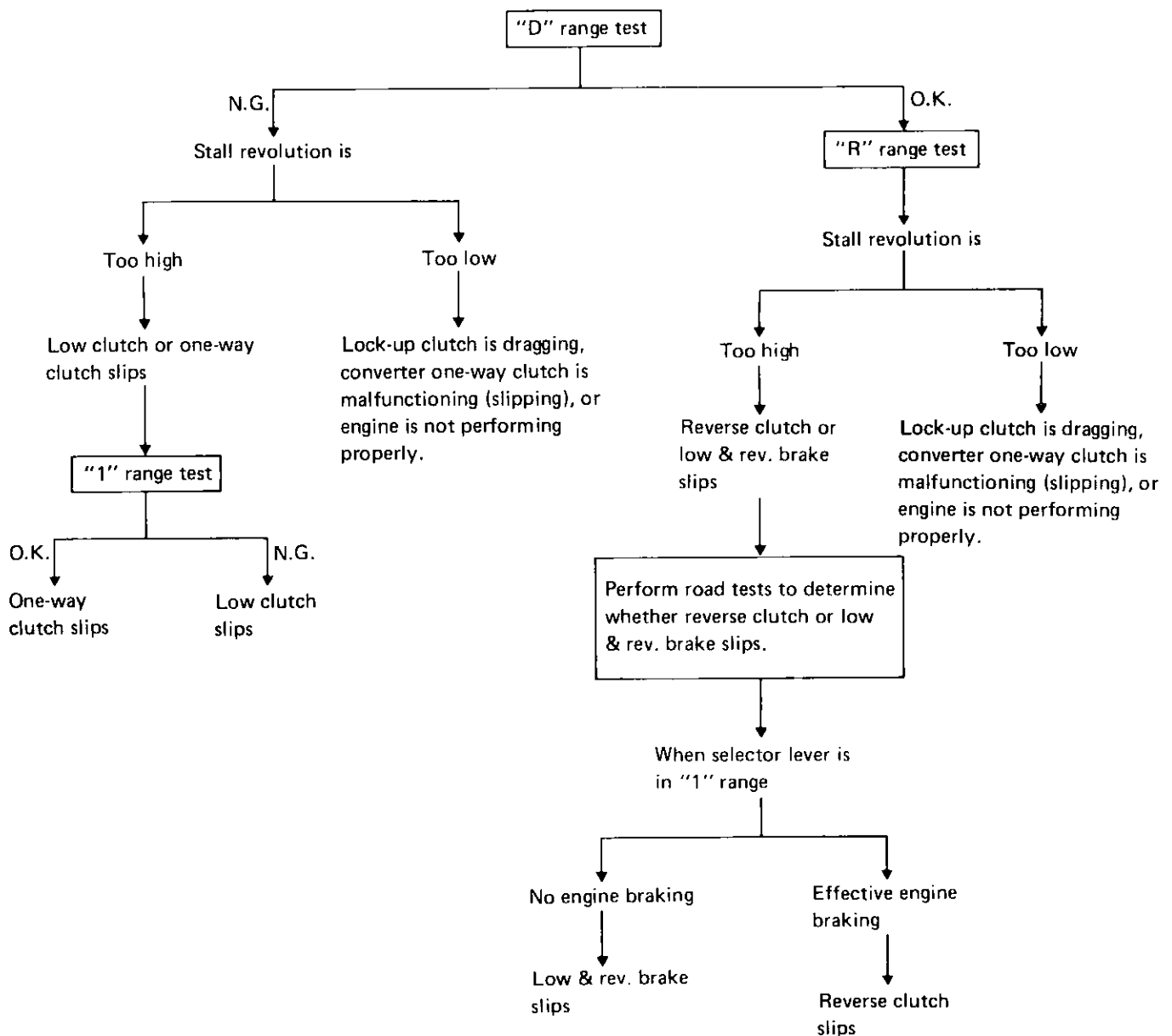
9. Cool off A.T.F.

**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 "1" and "R", respectively.



### JUDGEMENT OF STALL TEST



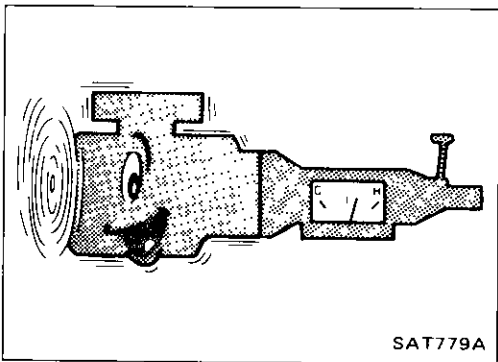
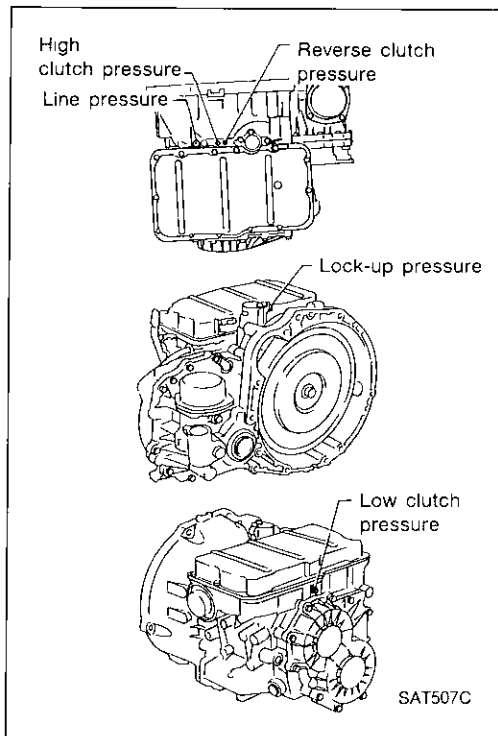
If converter one-way clutch is frozen, vehicle will have poor high-speed performance and low engine rpm when it is raced in "N" range. If converter one-way clutch is slipping, vehicle will be sluggish up to 50 or 60 km/h (30 or 40 MPH).

## TROUBLE DIAGNOSES

### Final Check (Cont'd)

#### PRESSURE TESTING

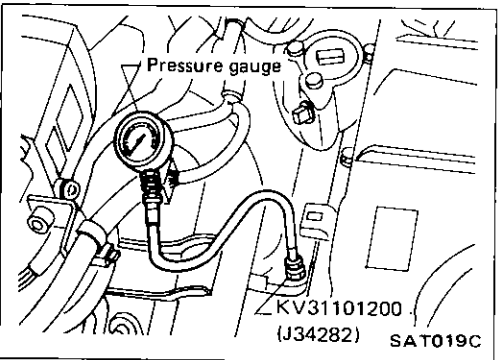
- Location of line pressure test port
- **Always replace line pressure plugs as they are self-sealing bolts.**



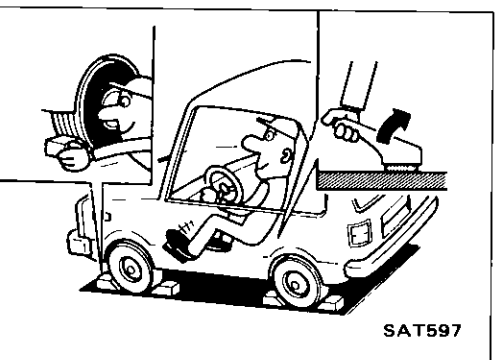
#### Line pressure test procedure

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)

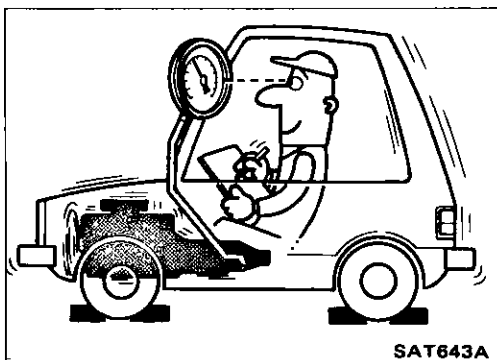


3. Install pressure gauge to line pressure port.



4. Set parking brake and block wheels.
- **Continue to depress brake pedal fully while line pressure test at stall speed is performed.**

## TROUBLE DIAGNOSES



### Final Check (Cont'd)

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<br>rpm | Line pressure kPa (kg/cm <sup>2</sup> , psi) |
|---------------------|----------------------------------------------|
|                     | D, 2, 1 and R ranges                         |
| Idle                | 382 - 422 (3.9 - 4.3, 55 - 61)               |
| Stall               | 1,285 - 1,363 (13.1 - 13.9, 186 - 198)       |

### JUDGEMENT OF LINE PRESSURE TEST

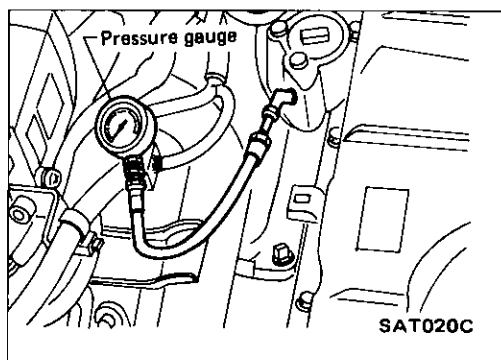
| Judgement      |                                           | Suspected parts                                                                                                                                                                                                                                                                                                      |
|----------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| At idle        | Line pressure is low in all ranges.       | <ul style="list-style-type: none"> <li>● Oil pump wear</li> <li>● Control piston damage</li> <li>● Pressure regulator valve or plug sticking</li> <li>● Spring for pressure regulator valve damaged</li> <li>● Fluid pressure leakage between oil strainer and pressure regulator valve</li> </ul>                   |
|                | Line pressure is low in particular range. | <ul style="list-style-type: none"> <li>● Fluid pressure leakage between manual valve and particular clutch.</li> <li>● 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 &amp; reverse brake circuit.</li> </ul>              |
|                | Line pressure is high.                    | <ul style="list-style-type: none"> <li>● Mal-adjustment of throttle sensor</li> <li>● Fluid temperature sensor damaged</li> <li>● Line pressure solenoid sticking</li> <li>● Short circuit of line pressure solenoid circuit</li> <li>● Pressure regulator valve or plug sticking</li> </ul>                         |
| At stall speed | Line pressure is low.                     | <ul style="list-style-type: none"> <li>● Mal-adjustment of throttle sensor</li> <li>● Control position damaged</li> <li>● Line pressure solenoid sticking</li> <li>● Short circuit of line pressure solenoid circuit</li> <li>● Pressure regulator valve or plug sticking</li> <li>● Pilot valve sticking</li> </ul> |

## TROUBLE DIAGNOSES

### Final Check (Cont'd)

#### LOCK-UP TEST

Install pressure gauge to lock-up pressure port. Shift selector lever in "D" range.



| Condition     | Torque converter lock-up pressure<br>kPa (kg/cm <sup>2</sup> , psi) |
|---------------|---------------------------------------------------------------------|
| Lock-up "ON"  | 49 (0.5, 7) or less                                                 |
| Lock-up "OFF" | 196 (2, 28) or more                                                 |

If lock-up pressure is not within specifications, refer to Diagnostic Procedures 15 and 16.



# TROUBLE DIAGNOSES

## Symptom Chart

|                      |                                                                                                                                                                     | ON vehicle |                                |                                                  |                                                                                            |                                    |                                            |                                            |                                     |                                                  |                             | OFF vehicle                         |                              |                               |                              |                                   |                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------|--------------------------------------------|-------------------------------------|--------------------------------------------------|-----------------------------|-------------------------------------|------------------------------|-------------------------------|------------------------------|-----------------------------------|-----------------------------------------|
| Reference page(AT- ) | Reference page (AT- )                                                                                                                                               | -          | 8, 12                          | 82                                               | 82, 83                                                                                     | 86                                 | 83, 126                                    | 83                                         | 83                                  | 117, 143                                         | -                           | 84                                  | 108, 122                     | 137, 141                      | 120, 140                     | 142, 143                          | 143 168                                 |
|                      | Numbers are arranged in order of probability.<br>Perform inspections starting with number one and working up                                                        | Fuse       | Fluid level<br>Control linkage | Inhibitor switch<br>Throttle sensor (Adjustment) | Revolution sensor and speed sensor<br>Engine revolution signal<br>Fluid temperature sensor | Engine idling rpm<br>Line pressure | Control valve assembly<br>Shift solenoid A | Shift solenoid B<br>Line pressure solenoid | Lock-up solenoid<br>Timing solenoid | Low clutch accumulator<br>Band servo accumulator | Ignition switch and starter | Overdrive switch<br>A/T mode switch | Torque converter<br>Oil pump | Reverse clutch<br>High clutch | Low clutch<br>One-way clutch | Low & reverse brake<br>Brake band | Band servo piston<br>Parking components |
| 63                   | Engine does not start in "N", "P" ranges.                                                                                                                           | 1          | 3                              | 4                                                | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | 2                           | .                                   | .                            | .                             | .                            | .                                 | .                                       |
| 63                   | Engine starts in range other than "N" and "P".                                                                                                                      | .          | .                              | 1                                                | 2                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | .                                   | .                            | .                             | .                            | .                                 | .                                       |
| -                    | Transaxle noise in "P" and "N" ranges.                                                                                                                              | .          | 1                              | .                                                | 3                                                                                          | 4                                  | 5                                          | .                                          | 2                                   | .                                                | .                           | .                                   | 7                            | 6                             | .                            | .                                 | .                                       |
| 63                   | Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.                                                        | .          | .                              | 1                                                | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | .                                   | .                            | .                             | .                            | .                                 | 2                                       |
| 64                   | Vehicle runs in "N" range.                                                                                                                                          | .          | .                              | 1                                                | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | .                                   | .                            | 3                             | .                            | 2                                 | .                                       |
| 66                   | Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.                                                      | .          | .                              | 1                                                | .                                                                                          | .                                  | .                                          | .                                          | 2                                   | 4                                                | .                           | 3                                   | .                            | .                             | .                            | 5                                 | 6                                       |
| -                    | Vehicle braked when shifting into "R" range.                                                                                                                        | .          | 1                              | 2                                                | .                                                                                          | .                                  | .                                          | .                                          | 3                                   | 5                                                | .                           | 4                                   | .                            | .                             | .                            | 6                                 | 8                                       |
| -                    | Sharp shock in shifting from "N" to "D" range.                                                                                                                      | .          | .                              | .                                                | 2                                                                                          | .                                  | 6                                          | 5                                          | 1                                   | 3                                                | 8                           | .                                   | 7                            | .                             | 4                            | 9                                 | .                                       |
| -                    | Vehicle will not run in "D" and "2" ranges (but runs in "1" and "R" ranges).                                                                                        | .          | .                              | 1                                                | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | .                                   | .                            | .                             | .                            | 2                                 | .                                       |
| 67                   | Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.                                                         | .          | 1                              | .                                                | .                                                                                          | .                                  | .                                          | .                                          | 2                                   | 4                                                | .                           | 3                                   | .                            | .                             | .                            | 5                                 | .                                       |
| -                    | Clutches or brakes slip somewhat in starting.                                                                                                                       | .          | 1                              | 3                                                | 4                                                                                          | .                                  | .                                          | .                                          | 5                                   | 7                                                | .                           | 6                                   | .                            | .                             | .                            | 8                                 | .                                       |
| -                    | Excessive creep.                                                                                                                                                    | .          | .                              | .                                                | .                                                                                          | .                                  | .                                          | .                                          | 1                                   | .                                                | .                           | .                                   | .                            | .                             | .                            | .                                 | .                                       |
| 66,67                | No creep at all.                                                                                                                                                    | .          | 1                              | .                                                | .                                                                                          | .                                  | .                                          | .                                          | 2                                   | 3                                                | .                           | .                                   | .                            | .                             | .                            | 4                                 | .                                       |
| -                    | Failure to change gear.                                                                                                                                             | 1          | .                              | .                                                | 5                                                                                          | 2                                  | .                                          | .                                          | .                                   | 3                                                | 4                           | .                                   | .                            | .                             | .                            | .                                 | .                                       |
| -                    | Failure to change gear from "D <sub>1</sub> " to "D <sub>2</sub> ".                                                                                                 | .          | .                              | 2                                                | 1                                                                                          | 5                                  | .                                          | .                                          | .                                   | 4                                                | 3                           | .                                   | .                            | .                             | .                            | .                                 | 6                                       |
| -                    | Failure to change gear from "D <sub>2</sub> " to "D <sub>3</sub> ".                                                                                                 | .          | .                              | 2                                                | 1                                                                                          | .                                  | 5                                          | .                                          | .                                   | .                                                | 4                           | .                                   | 3                            | .                             | .                            | .                                 | 7                                       |
| -                    | Failure to change gear from "D <sub>3</sub> " to "D <sub>4</sub> ".                                                                                                 | .          | .                              | 3                                                | 1                                                                                          | .                                  | 5                                          | 6                                          | .                                   | .                                                | .                           | 4                                   | .                            | .                             | .                            | .                                 | 7                                       |
| 69,70, 71            | Too high a gear change point from "D <sub>1</sub> " to "D <sub>2</sub> ", from "D <sub>2</sub> " to "D <sub>3</sub> ", from "D <sub>3</sub> " to "D <sub>4</sub> ". | .          | .                              | .                                                | .                                                                                          | 1                                  | 2                                          | .                                          | .                                   | .                                                | .                           | 4                                   | 5                            | .                             | .                            | .                                 | .                                       |
| -                    | Gear change directly from "D <sub>1</sub> " to "D <sub>3</sub> " occurs.                                                                                            | .          | 3                              | .                                                | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | 2                                   | .                            | .                             | .                            | .                                 | 1                                       |

# TROUBLE DIAGNOSES

## Symptom Chart (Cont'd)

|                      |                                                                                                                                                                | ON vehicle |                                |                                                  |                                                                                            |                                    |                                            |                                            |                                     |                                                  |                             |                                     |                              | OFF vehicle                   |                              |                                   |                   |                    |  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------|--------------------------------------------|-------------------------------------|--------------------------------------------------|-----------------------------|-------------------------------------|------------------------------|-------------------------------|------------------------------|-----------------------------------|-------------------|--------------------|--|
| Reference page(AT- ) | Reference page (AT- )                                                                                                                                          | -          | 8,<br>12                       | 82                                               | 82,<br>83                                                                                  | 86                                 | 83,<br>126                                 | 83                                         | 83                                  | 117,<br>143                                      | -                           | 84                                  | 108,<br>122                  | 137,<br>141                   | 120,<br>140                  | 142,<br>143                       | 143               | 168                |  |
|                      | Numbers are arranged in order of probability.<br>Perform inspections starting with number one and working up.                                                  | Fuse       | Fluid level<br>Control linkage | Inhibitor switch<br>Throttle sensor (Adjustment) | Revolution sensor and speed sensor<br>Engine revolution signal<br>Fluid temperature sensor | Engine idling rpm<br>Line pressure | Control valve assembly<br>Shift solenoid A | Shift solenoid B<br>Line pressure solenoid | Lock-up solenoid<br>Timing solenoid | Low clutch accumulator<br>Band servo accumulator | Ignition switch and starter | Overdrive switch<br>A/T mode switch | Torque converter<br>Oil pump | Reverse clutch<br>High clutch | Low clutch<br>One-way clutch | Low & reverse brake<br>Brake band | Band servo piston | Parking components |  |
| -                    | Engine stops when shifting lever into "R", "D", "2" and "1".                                                                                                   | .          | .                              | .                                                | .                                                                                          | 1 2                                | 4                                          | .                                          | 3                                   | .                                                | .                           | .                                   | 5                            | .                             | .                            | .                                 | .                 | .                  |  |
| -                    | Too sharp a shock in change from "D <sub>1</sub> " to "D <sub>2</sub> ".                                                                                       | .          | .                              | 1                                                | 7 8                                                                                        | 2                                  | 5                                          | 3                                          | 4                                   | 6                                                | .                           | .                                   | .                            | .                             | .                            | 9                                 | .                 | .                  |  |
| -                    | Too sharp a shock in change from "D <sub>2</sub> " to "D <sub>3</sub> ".                                                                                       | .          | .                              | 1                                                | .                                                                                          | 2                                  | 4                                          | 3                                          | .                                   | .                                                | .                           | .                                   | .                            | 5                             | .                            | .                                 | 6                 | .                  |  |
| -                    | Too sharp a shock in change from "D <sub>3</sub> " to "D <sub>4</sub> ".                                                                                       | .          | .                              | 1                                                | .                                                                                          | 2                                  | 4                                          | 3                                          | .                                   | .                                                | .                           | .                                   | .                            | .                             | .                            | .                                 | 5                 | .                  |  |
| -                    | Almost no shock or clutches slipping in change from "D <sub>1</sub> " to "D <sub>2</sub> ".                                                                    | .          | 1                              | 2                                                | .                                                                                          | 3                                  | 7                                          | .                                          | 4                                   | 6                                                | .                           | .                                   | .                            | .                             | .                            | 8                                 | 5                 | .                  |  |
| -                    | Almost no shock or slipping in change from "D <sub>2</sub> " to "D <sub>3</sub> ".                                                                             | .          | 1                              | 2                                                | .                                                                                          | 3                                  | 6                                          | 4                                          | .                                   | .                                                | .                           | .                                   | .                            | 7                             | .                            | .                                 | 5                 | .                  |  |
| -                    | Almost no shock or slipping in change from "D <sub>3</sub> " to "D <sub>4</sub> ".                                                                             | .          | 1                              | 2                                                | .                                                                                          | 3                                  | 4                                          | 8                                          | .                                   | .                                                | .                           | .                                   | .                            | 6                             | .                            | 7                                 | 5                 | .                  |  |
| -                    | Vehicle braked by gear change from "D <sub>1</sub> " to "D <sub>2</sub> ".                                                                                     | .          | 1                              | .                                                | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | .                                   | .                            | 2 4                           | 5                            | 3                                 | .                 | .                  |  |
| -                    | Vehicle braked by gear change from "D <sub>2</sub> " to "D <sub>3</sub> ".                                                                                     | .          | 1                              | .                                                | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | .                                   | .                            | .                             | .                            | 2                                 | .                 | .                  |  |
| -                    | Vehicle braked by gear change from "D <sub>3</sub> " to "D <sub>4</sub> ".                                                                                     | .          | 1                              | .                                                | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | .                                   | .                            | 3                             | 2                            | .                                 | .                 | .                  |  |
| -                    | Maximum speed not attained. Acceleration poor.                                                                                                                 | .          | 1                              | 2                                                | .                                                                                          | .                                  | 5 3                                        | 4                                          | .                                   | .                                                | .                           | 6                                   | 12 11                        | 7 8                           | .                            | 10 9                              | .                 | .                  |  |
| -                    | Failure to change gear from "D <sub>4</sub> " to "D <sub>3</sub> ".                                                                                            | .          | 1                              | 2                                                | .                                                                                          | .                                  | 6 4                                        | 5                                          | 3                                   | .                                                | .                           | .                                   | .                            | .                             | 8                            | 7                                 | .                 | .                  |  |
| -                    | Failure to change gear from "D <sub>3</sub> " to "D <sub>2</sub> " or from "D <sub>4</sub> " to "D <sub>2</sub> ".                                             | .          | 1                              | 2                                                | .                                                                                          | .                                  | 5 3                                        | 4                                          | .                                   | .                                                | .                           | .                                   | .                            | 7                             | .                            | 8                                 | 6                 | .                  |  |
| -                    | Failure to change gear from "D <sub>2</sub> " to "D <sub>1</sub> " or from "D <sub>3</sub> " to "D <sub>1</sub> ".                                             | .          | 1                              | 2                                                | .                                                                                          | .                                  | 5 3                                        | 4                                          | .                                   | .                                                | .                           | .                                   | .                            | 7                             | 6                            | 8                                 | .                 | .                  |  |
| -                    | Gear change shock felt during deceleration by releasing accelerator pedal.                                                                                     | .          | .                              | 1                                                | .                                                                                          | 2                                  | 4                                          | .                                          | 3                                   | .                                                | .                           | .                                   | .                            | 6                             | 5                            | .                                 | .                 | .                  |  |
| -                    | Too high a change point from "D <sub>4</sub> " to "D <sub>3</sub> ", from "D <sub>3</sub> " to "D <sub>2</sub> ", from "D <sub>2</sub> " to "D <sub>1</sub> ". | .          | .                              | 1 2                                              | .                                                                                          | .                                  | .                                          | .                                          | .                                   | .                                                | .                           | 3                                   | .                            | .                             | .                            | .                                 | .                 | .                  |  |
| -                    | Kickdown does not operate when depressing pedal in "D <sub>4</sub> " within kickdown vehicle speed.                                                            | .          | .                              | 1 2                                              | .                                                                                          | .                                  | 3 4                                        | .                                          | .                                   | .                                                | .                           | .                                   | .                            | .                             | .                            | .                                 | .                 | .                  |  |
| -                    | Kickdown operates or engine overruns when depressing pedal in "D <sub>4</sub> " beyond kickdown vehicle speed limit.                                           | .          | .                              | 2                                                | 1                                                                                          | .                                  | 3 4                                        | .                                          | .                                   | .                                                | .                           | .                                   | .                            | .                             | .                            | .                                 | .                 | .                  |  |
| -                    | Races extremely fast or slips in changing from "D <sub>4</sub> " to "D <sub>3</sub> " when depressing pedal.                                                   | .          | 1                              | 3                                                | .                                                                                          | 4                                  | 6                                          | 5                                          | 2                                   | .                                                | .                           | .                                   | .                            | 7                             | .                            | .                                 | .                 | .                  |  |

# TROUBLE DIAGNOSES

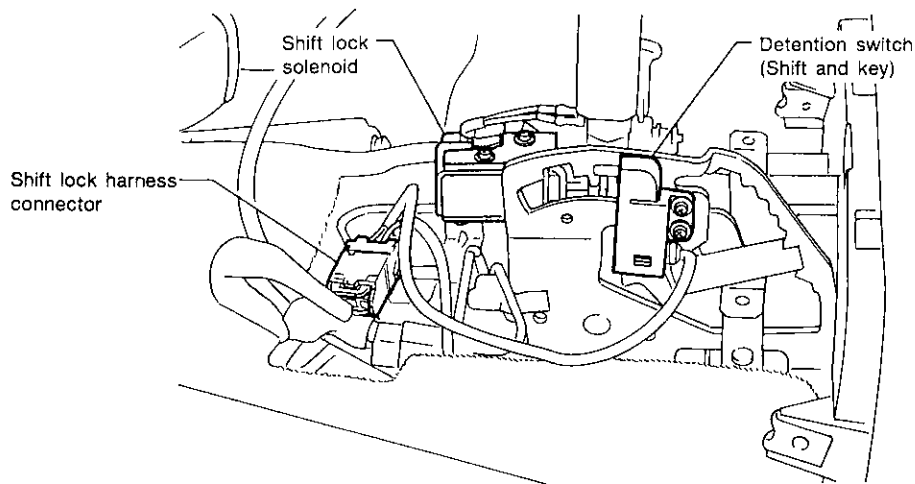
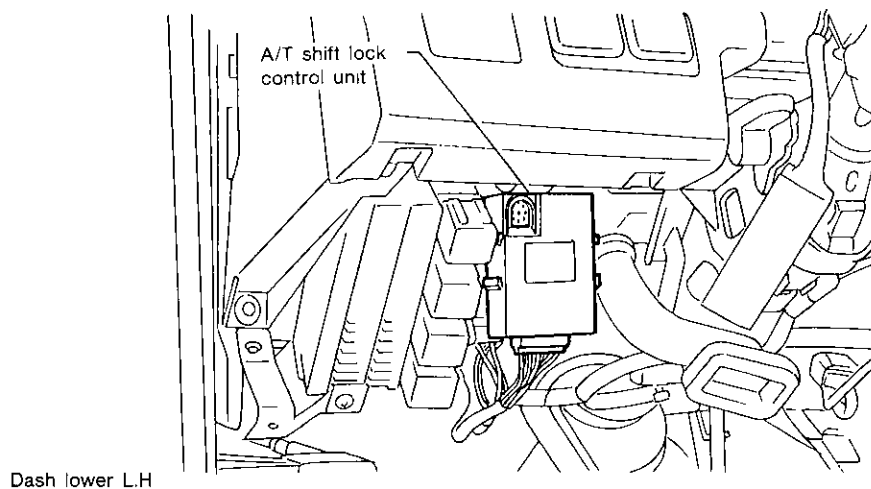
## Symptom Chart (Cont'd)

|                      |                                                                                                                                   | ON vehicle |                             |                                               |                                                                                      |                                 |                                         |                                         |                                  |                                               |                             | OFF vehicle                      |                           |                            |                           |                                |                                      |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------|-----------------------------------------|----------------------------------|-----------------------------------------------|-----------------------------|----------------------------------|---------------------------|----------------------------|---------------------------|--------------------------------|--------------------------------------|
| Reference page(AT- ) | Reference page (AT- )                                                                                                             |            | 8, 12                       | 82                                            | 82, 83                                                                               | 86                              | 83, 126                                 | 83                                      | 83                               | 117, 143                                      | -                           | 84                               | 108, 122                  | 137, 141                   | 120, 140                  | 142, 143                       | 143, 168                             |
|                      |                                                                                                                                   | Fuse       | Fluid level Control linkage | Inhibitor switch Throttle sensor (Adjustment) | Revolution sensor and speed sensor Engine revolution signal Fluid temperature sensor | Engine idling rpm Line pressure | Control valve assembly Shift solenoid A | Shift solenoid B Line pressure solenoid | Lock-up solenoid Timing solenoid | Low clutch accumulator Band servo accumulator | Ignition switch and starter | Overdrive switch A/T mode switch | Torque converter Oil pump | Reverse clutch High clutch | Low clutch One-way clutch | Low & reverse brake Brake band | Band servo piston Parking components |
| -                    | Races extremely fast or slips in changing from "D <sub>4</sub> " to "D <sub>2</sub> " when depressing pedal.                      | 1          |                             | 3                                             |                                                                                      | 4                               | 7 6                                     | 5                                       | 2                                |                                               |                             |                                  |                           |                            |                           | 8                              |                                      |
| -                    | Races extremely fast or slips in changing from "D <sub>3</sub> " to "D <sub>2</sub> " when depressing pedal.                      | 1          |                             | 3                                             |                                                                                      | 4                               | 6                                       | 5                                       | 2                                |                                               |                             |                                  |                           | 8                          |                           | 7                              |                                      |
| -                    | Races extremely fast or slips in changing from "D <sub>4</sub> " or "D <sub>3</sub> " to "D <sub>1</sub> " when depressing pedal. | 1          |                             | 2                                             |                                                                                      | 3                               | 5                                       | 4                                       |                                  |                                               |                             |                                  |                           |                            | 6 7                       |                                |                                      |
| -                    | Vehicle will not run in any range                                                                                                 | 1 2        |                             |                                               |                                                                                      | 3                               |                                         | 4                                       |                                  |                                               |                             |                                  | 10 6                      | 7                          | 9 8                       |                                | 5 11                                 |
| -                    | Transaxle noise in "D", "2", "1" and "R" ranges.                                                                                  | 1          |                             |                                               |                                                                                      |                                 |                                         |                                         |                                  |                                               |                             |                                  | 2                         |                            |                           |                                |                                      |
| 76                   | Failure to change from "D <sub>3</sub> " to "D <sub>2</sub> " when changing lever into "2" range.                                 | 6          | 1 2                         |                                               |                                                                                      |                                 | 5 4                                     | 3                                       |                                  |                                               |                             |                                  |                           |                            | 8                         | 7                              |                                      |
| -                    | Gear change from "2" to "3" in "2" range.                                                                                         | 2          | 1                           |                                               |                                                                                      |                                 |                                         |                                         |                                  |                                               |                             |                                  |                           |                            |                           |                                |                                      |
| 76                   | Engine brake does not operate in "1" range.                                                                                       | 2          | 1                           | 3                                             |                                                                                      |                                 | 5 4                                     |                                         |                                  |                                               |                             |                                  |                           |                            | 6                         | 7                              |                                      |
| -                    | Gear change from "1" to "1 <sub>2</sub> " in "1" range.                                                                           | 2          | 1                           |                                               |                                                                                      |                                 |                                         |                                         |                                  |                                               |                             |                                  |                           |                            |                           |                                |                                      |
| -                    | Does not change from "1 <sub>2</sub> " to "1" in "1" range.                                                                       |            | 1                           | 2                                             |                                                                                      |                                 | 4 3                                     |                                         |                                  |                                               |                             |                                  |                           |                            | 5                         | 6                              |                                      |
| -                    | Large shock changing from "1 <sub>2</sub> " to "1" in "1" range.                                                                  |            |                             |                                               |                                                                                      | 1                               |                                         |                                         |                                  |                                               |                             |                                  |                           |                            |                           | 2                              |                                      |
| -                    | Transaxle overheats.                                                                                                              | 1          |                             | 3                                             |                                                                                      | 2 4                             | 6                                       | 5                                       |                                  |                                               |                             |                                  | 13 7                      | 8 9                        | 11                        | 12 10                          |                                      |
| -                    | A.T.F. shoots out during operation. White smoke emitted from exhaust pipe during operation.                                       | 1          |                             |                                               |                                                                                      |                                 |                                         |                                         |                                  |                                               |                             |                                  |                           | 2 3                        | 5                         | 6 4                            |                                      |
| -                    | Offensive smell at fluid charging pipe.                                                                                           | 1          |                             |                                               |                                                                                      |                                 |                                         |                                         |                                  |                                               |                             |                                  | 2 3                       | 4 5                        | 7                         | 8 6                            |                                      |
| -                    | Torque converter is not locked up.                                                                                                |            | 3 1                         | 2 4 5                                         |                                                                                      | 6                               | 8                                       |                                         | 7                                |                                               |                             |                                  | 9                         |                            |                           |                                |                                      |
| -                    | Lock-up piston slip.                                                                                                              | 1          |                             | 2                                             |                                                                                      | 3                               | 6                                       | 5                                       | 4                                |                                               |                             |                                  | 7                         |                            |                           |                                |                                      |
| 72                   | Lock-up point is extremely high or low.                                                                                           |            |                             | 1                                             | 2 4                                                                                  |                                 | 5                                       |                                         | 3                                |                                               |                             |                                  |                           |                            |                           |                                |                                      |
| -                    | A/T does not shift to "D <sub>4</sub> " when setting overdrive switch to "ON" position.                                           |            | 3 2                         | 4                                             | 8                                                                                    | 9                               | 7 5                                     |                                         | 6                                |                                               |                             | 1                                |                           |                            |                           |                                |                                      |
| -                    | Engine is stopped at "R", "D", "2" and "1" ranges.                                                                                | 1          |                             |                                               |                                                                                      |                                 | 5 4                                     | 3                                       | 2                                |                                               |                             |                                  |                           |                            |                           |                                |                                      |
| -                    | Lock-up judder occurs.                                                                                                            |            |                             | 5                                             | 4                                                                                    | 1                               |                                         | 2                                       | 3                                |                                               |                             |                                  | 7 6                       |                            |                           |                                |                                      |
| -                    | Engine uses too much gasoline.                                                                                                    | 4          |                             | 3                                             |                                                                                      | 5                               |                                         |                                         |                                  |                                               |                             | 1 2                              |                           |                            |                           |                                |                                      |

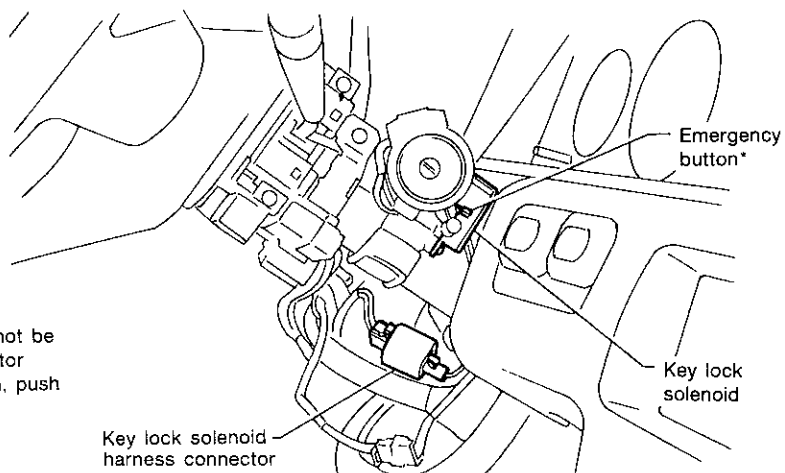
## TROUBLE DIAGNOSES

### A/T Shift Lock System

#### SHIFT LOCK ELECTRICAL PARTS LOCATION



\*: When ignition key cannot be removed, even if selector lever is in "P" position, push emergency button and remove ignition key.

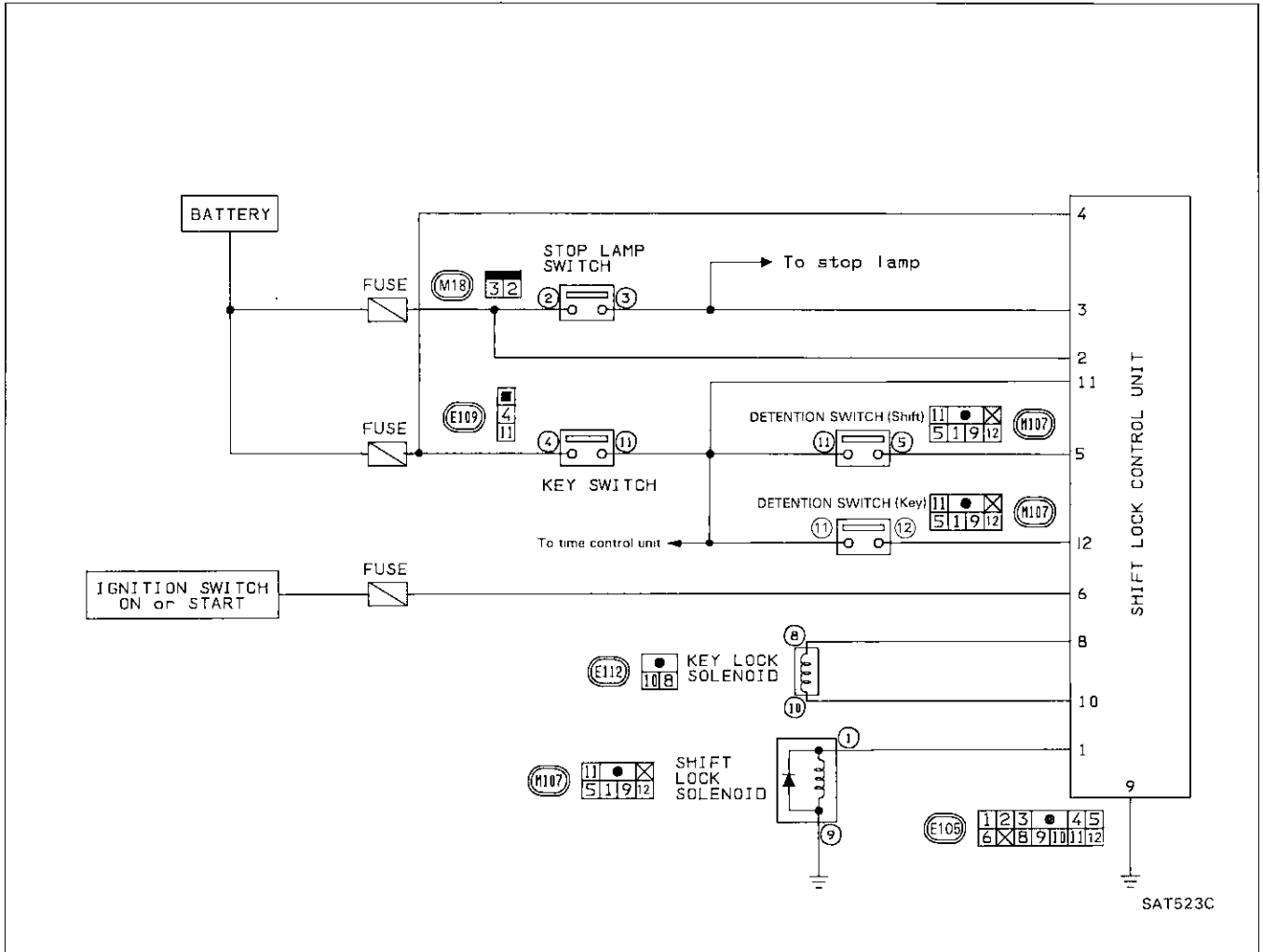


SAT508C

## TROUBLE DIAGNOSES

### A/T Shift Lock System (Cont'd)

#### CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



### A/T Shift Lock System (Cont'd)

#### WIRING DIAGRAM



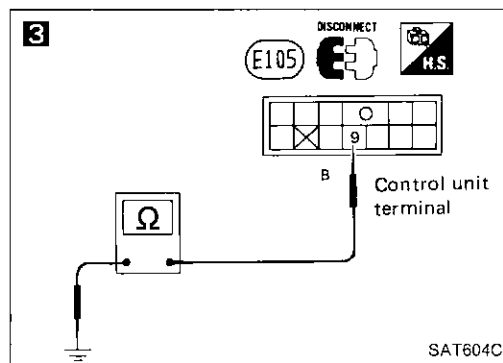
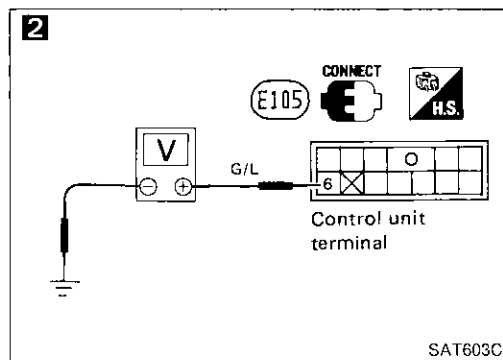
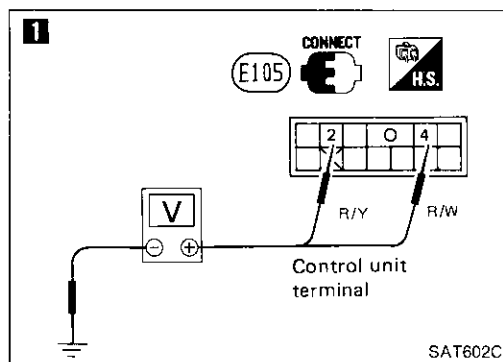
# TROUBLE DIAGNOSES

## 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

**2**

#### CHECK IGNITION SIGNAL.

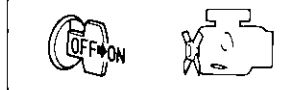
1.



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

**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.

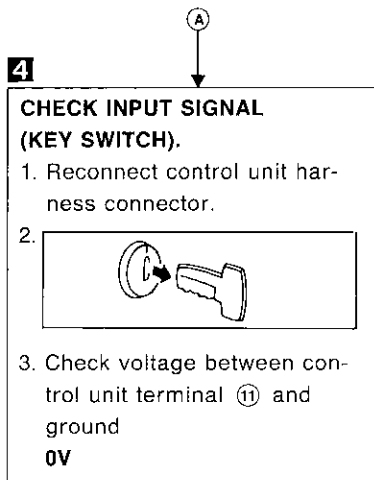
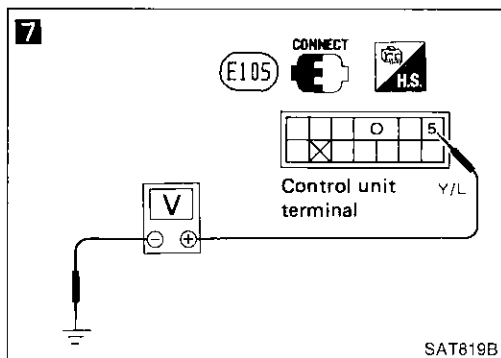
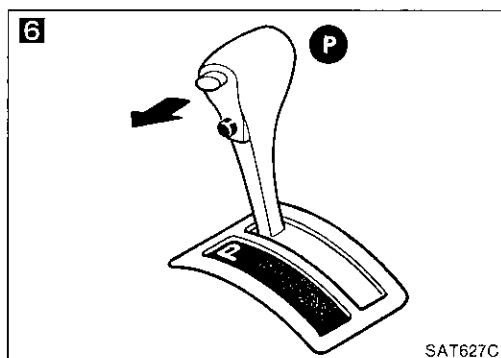
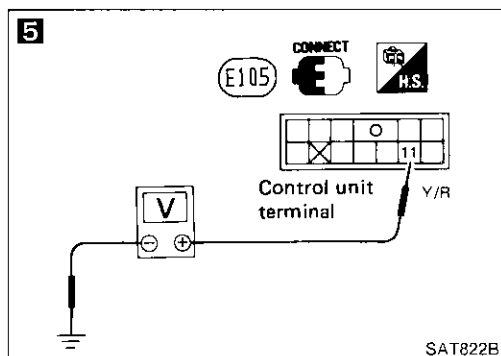
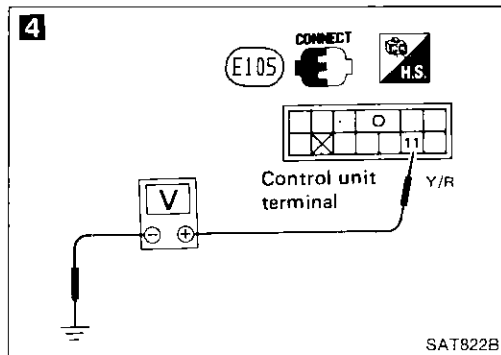
Repair harness or connector.

O.K.

A

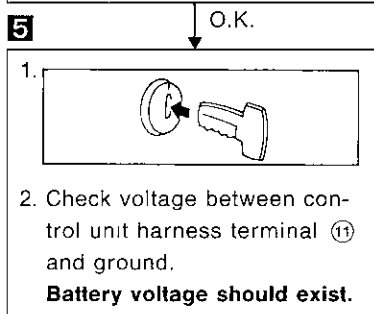
# TROUBLE DIAGNOSES

## A/T Shift Lock System (Cont'd)



N.G.

Check key switch.  
(Refer to "COMPONENT CHECK".)

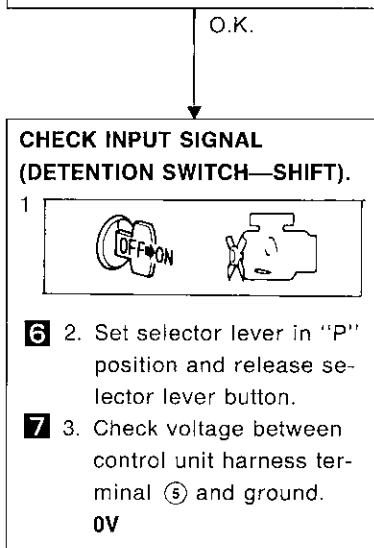


O.K.

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.

N.G.

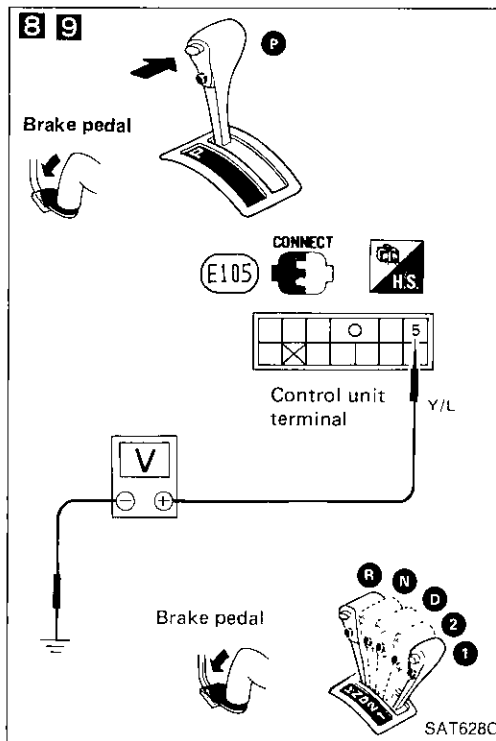
Check detention switch—shift.  
(Refer to "COMPONENT CHECK".)

**B**

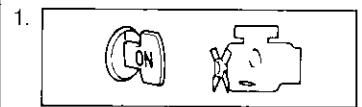


# TROUBLE DIAGNOSES

## A/T Shift Lock System (Cont'd)



### CHECK INPUT SIGNAL (DETENTION SWITCH—SHIFT).



- 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".

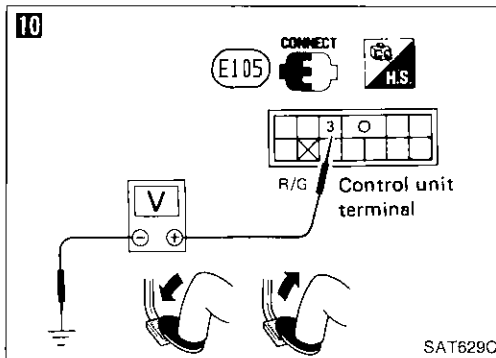
**When selector lever cannot be moved from "P" position with brake pedal depressed, push shift lock release knob.**

**Battery voltage should exist.**

N.G.

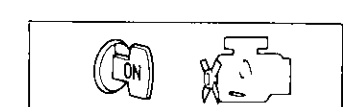
Check the following items:

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.

### CHECK INPUT SIGNAL (STOP LAMP SWITCH).



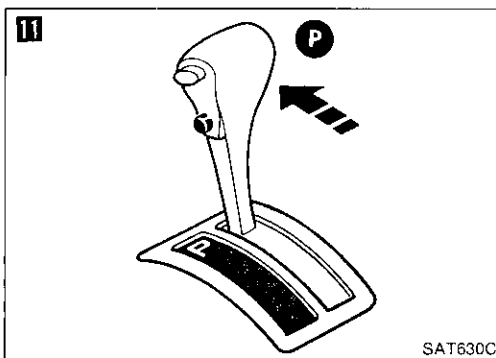
- Check voltage between control unit harness terminal ③ and ground.

| 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".)



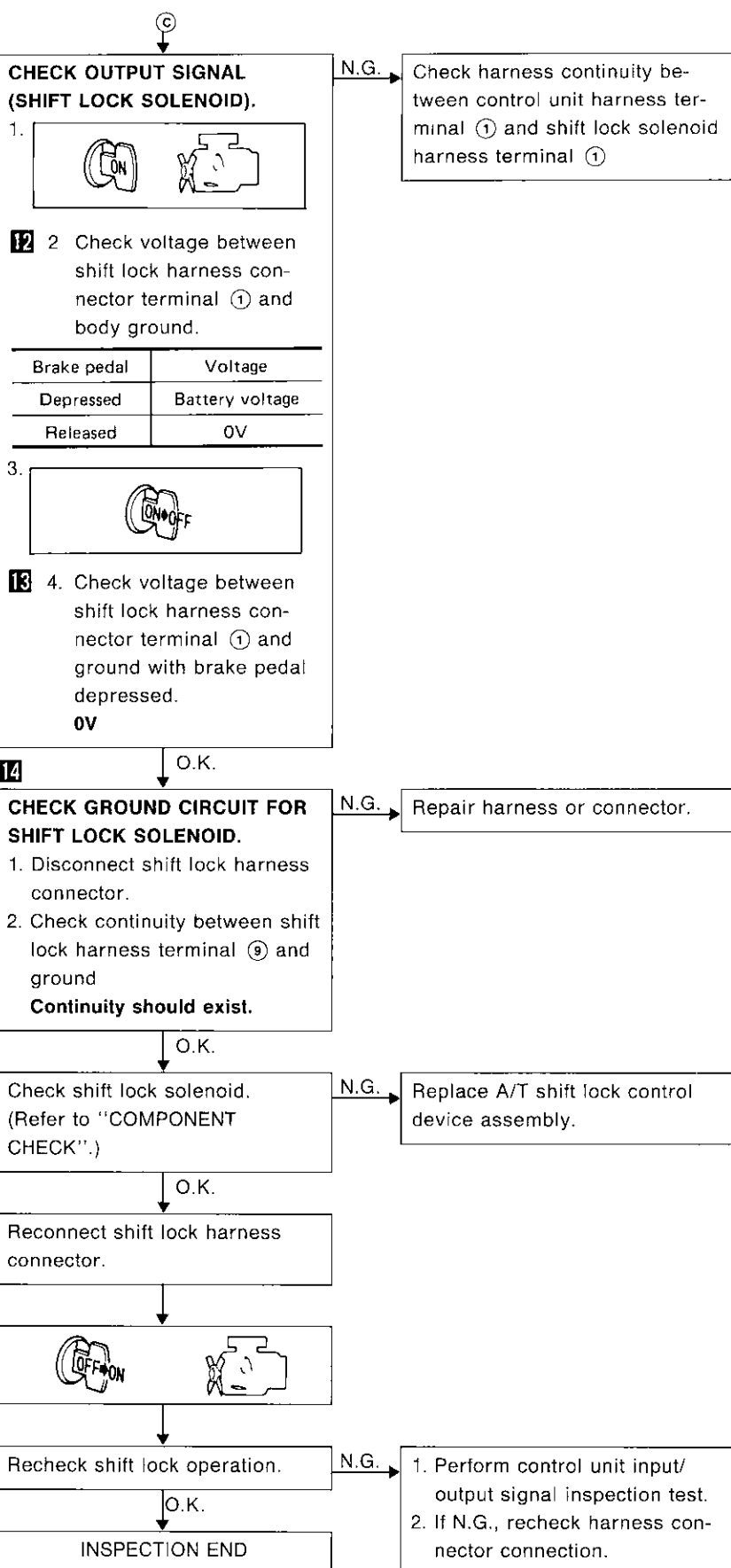
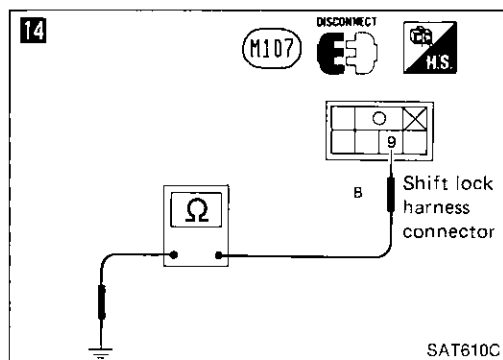
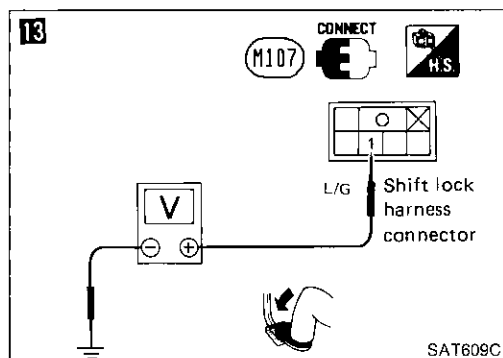
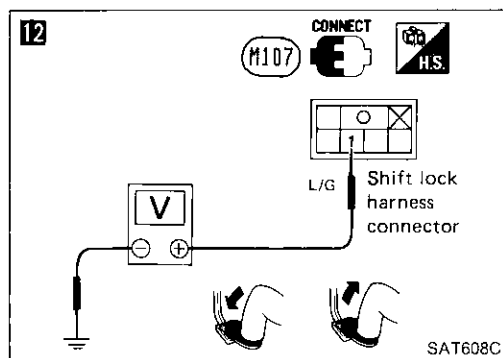
O.K.

Set selector lever in "P" position.

③

# TROUBLE DIAGNOSES

## A/T Shift Lock System (Cont'd)



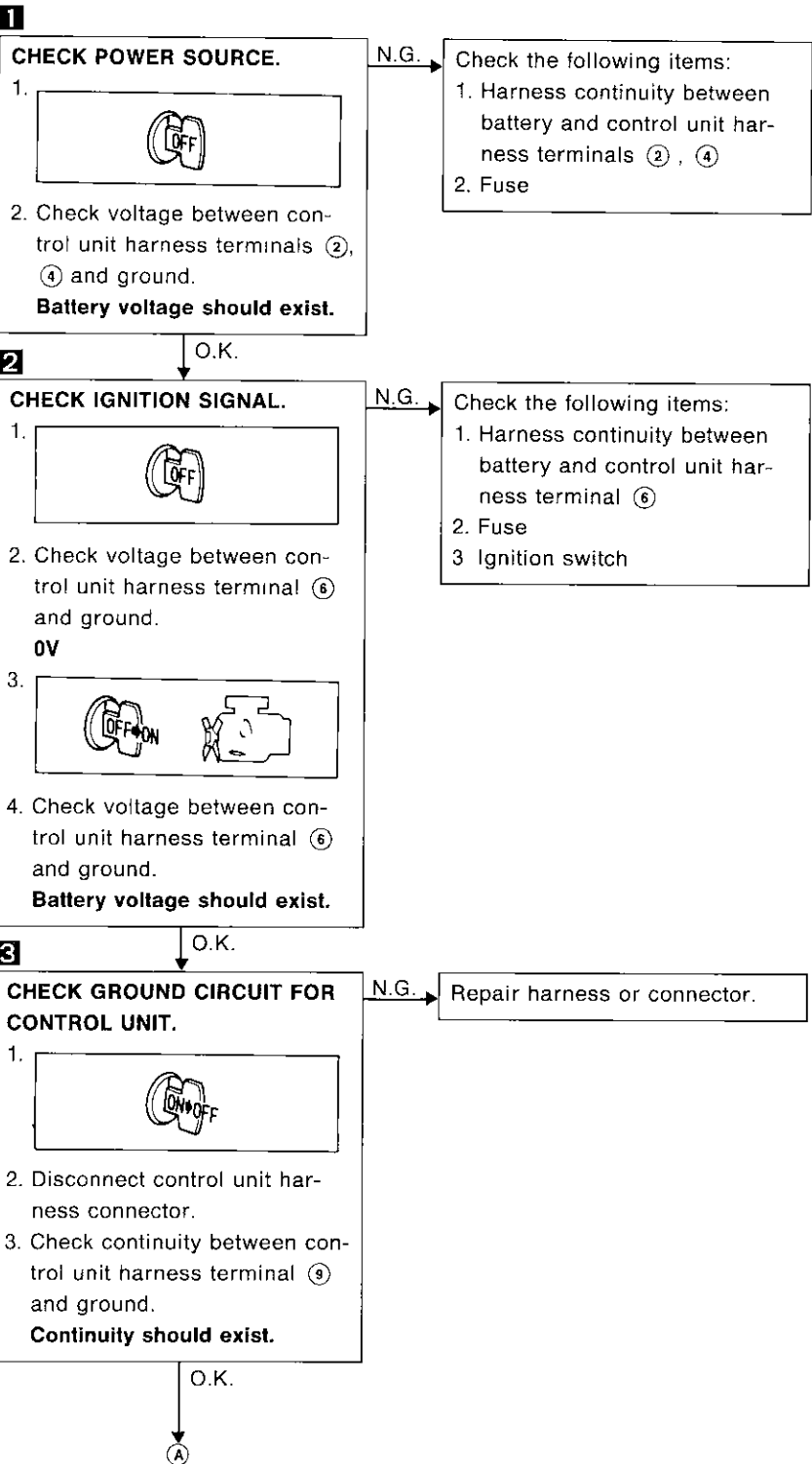
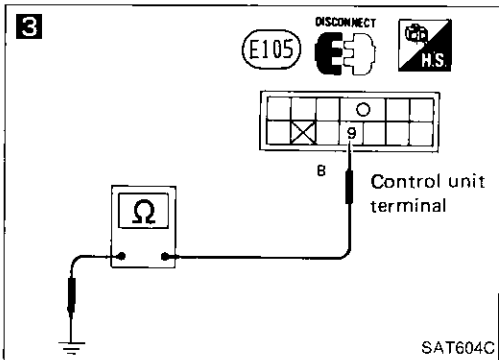
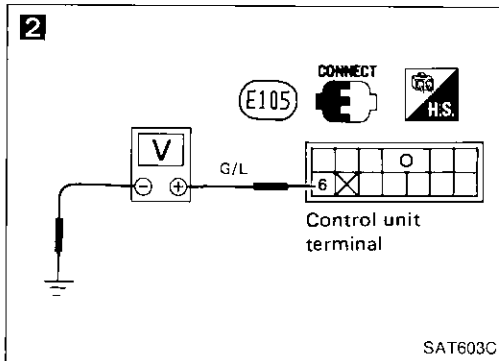
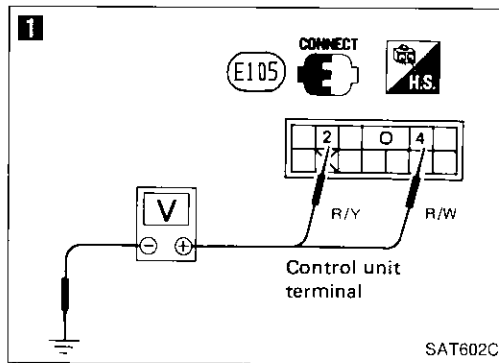
# TROUBLE DIAGNOSES

## A/T Shift Lock System (Cont'd)

### DIAGNOSTIC PROCEDURE 2

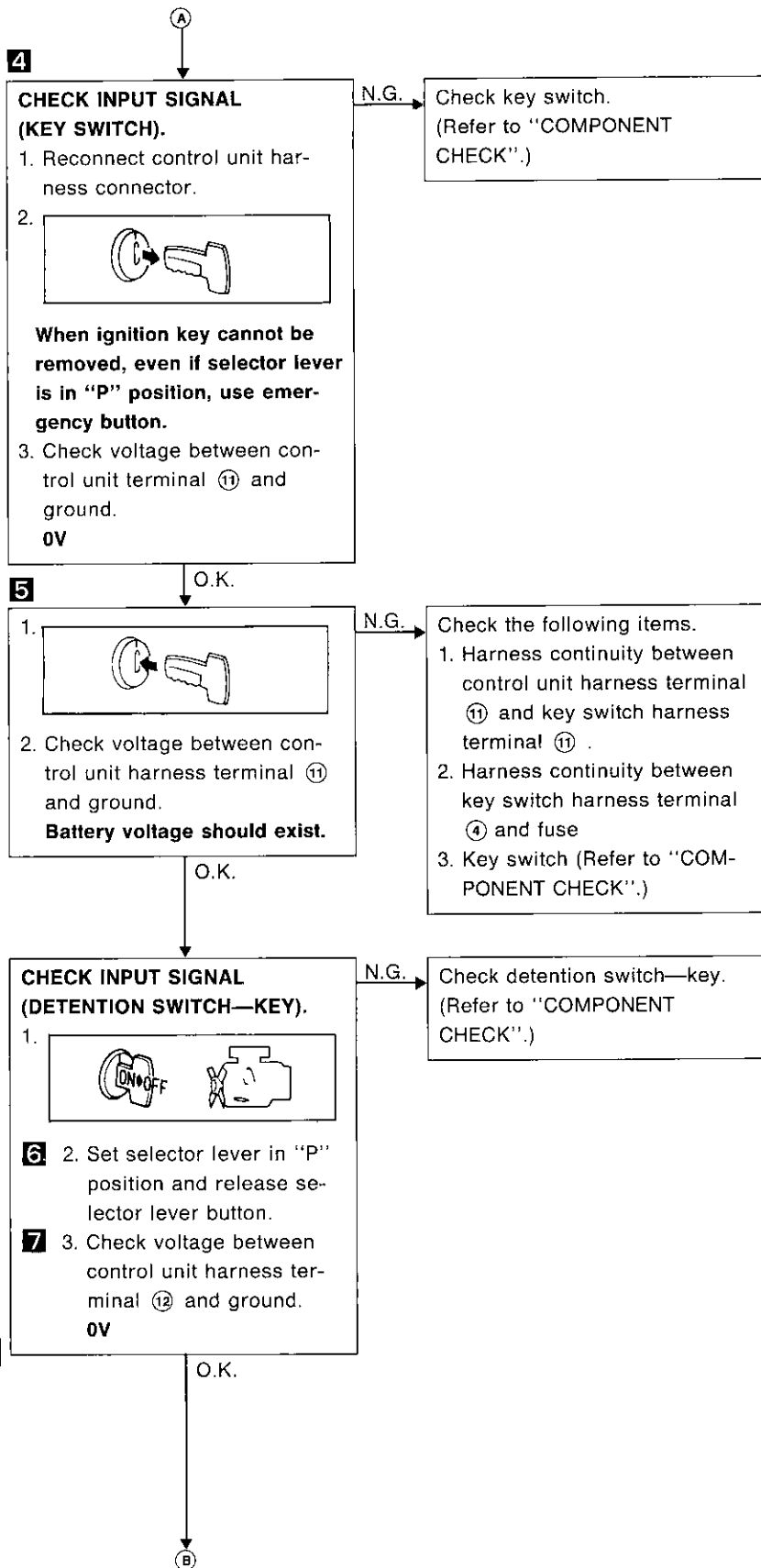
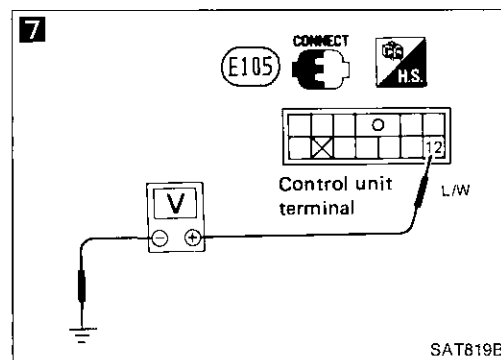
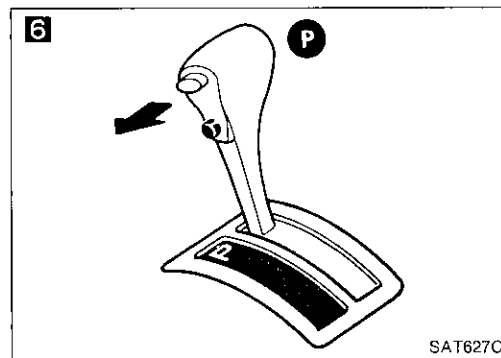
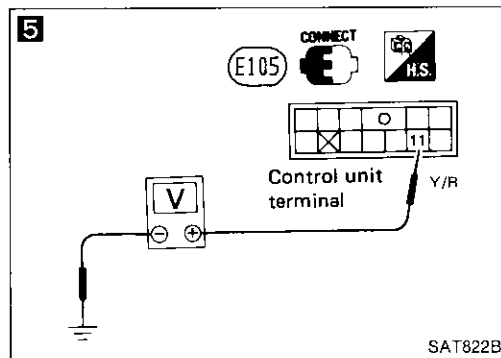
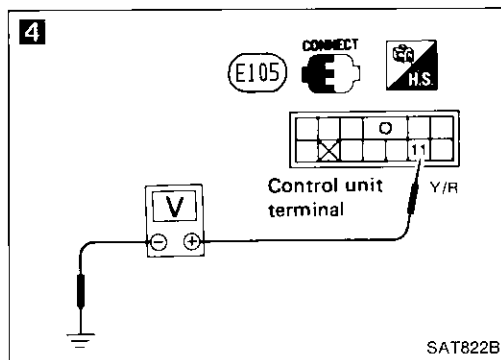
#### SYMPTOM:

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".



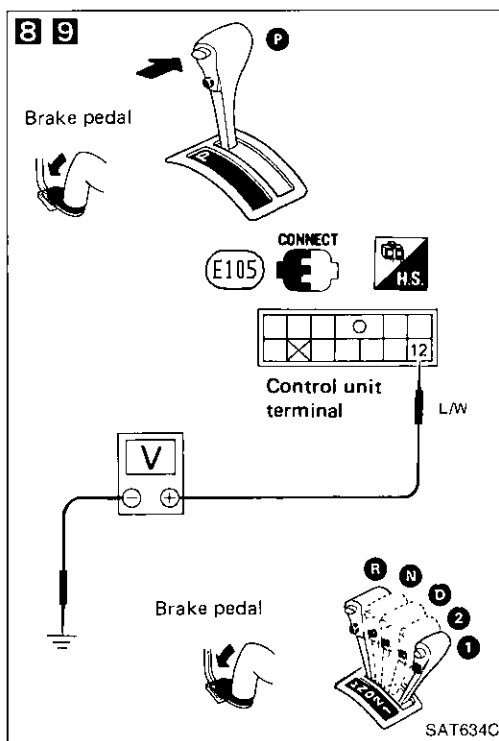
# TROUBLE DIAGNOSES

## A/T Shift Lock System (Cont'd)

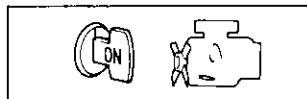


# TROUBLE DIAGNOSES

## A/T Shift Lock System (Cont'd)



### CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).



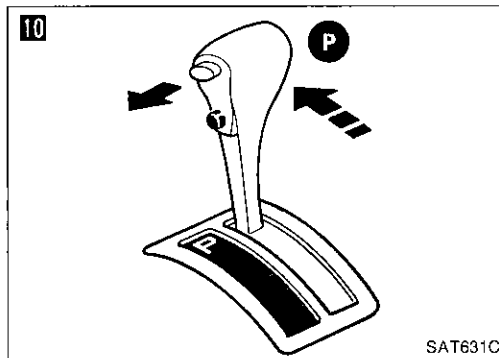
- 8** 1. Check voltage between control unit harness terminal ⑫ and ground with brake pedal depressed and selector lever button pushed.
- Battery voltage should exist.**

- 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.

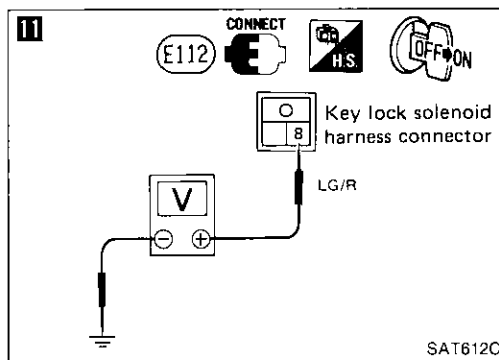
Check the following items:

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.

Set selector lever in "P" position and release selector lever button.



### 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 ⑥ and control unit harness terminal ⑥.

O.K.

N.G.

Repair harness or connector.

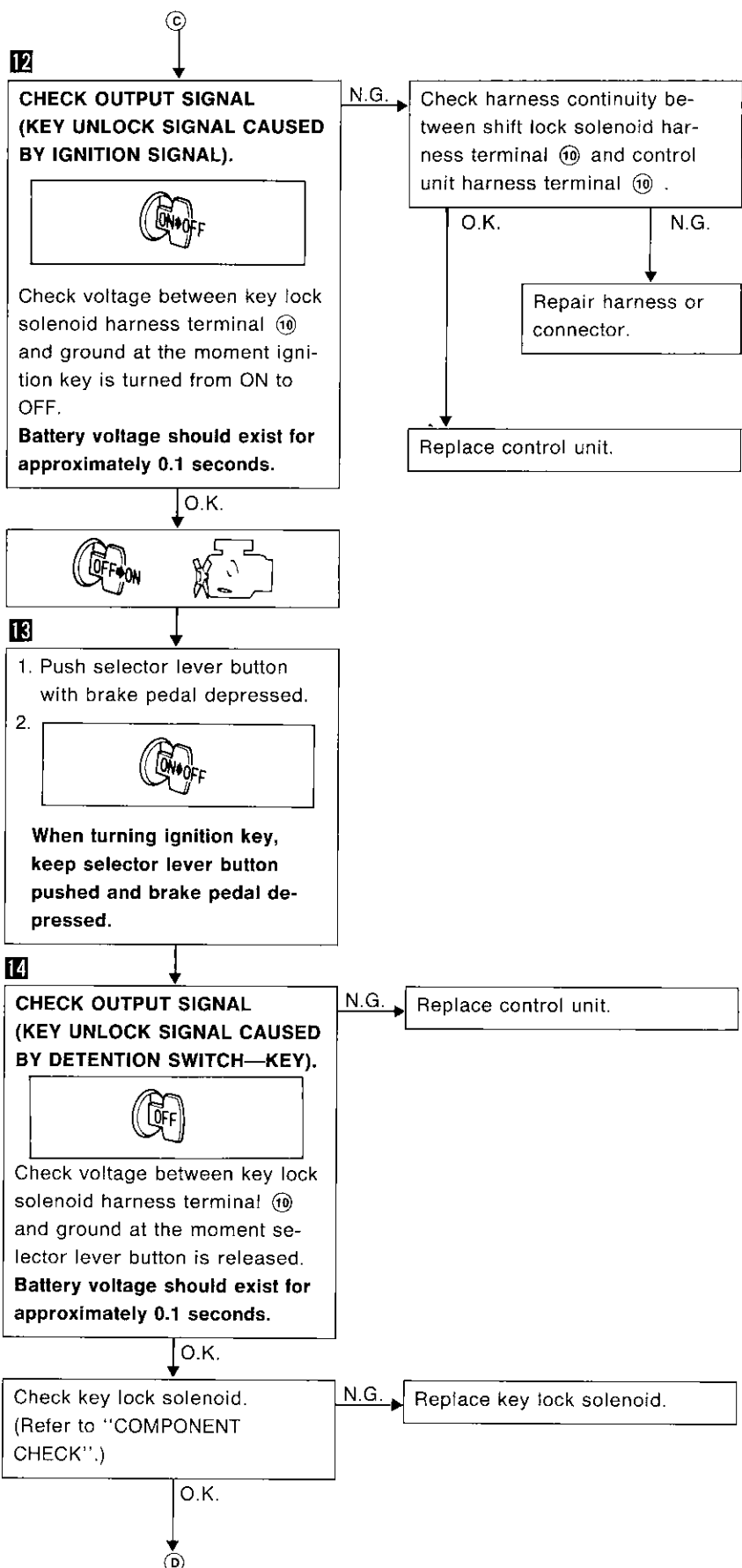
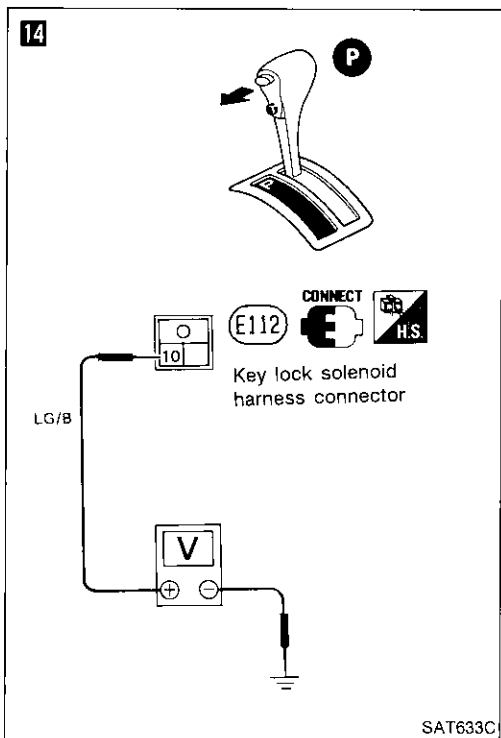
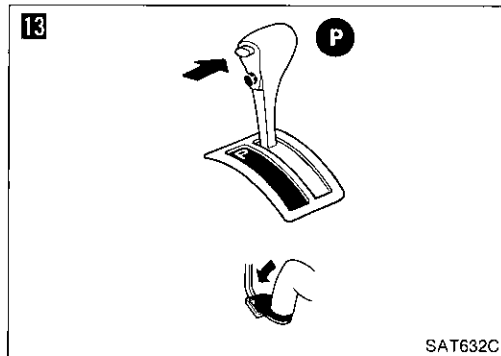
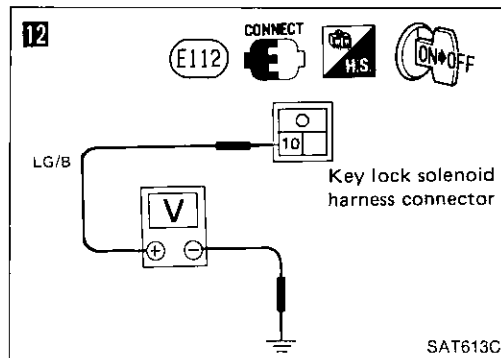
Replace control unit.

O.K.

③

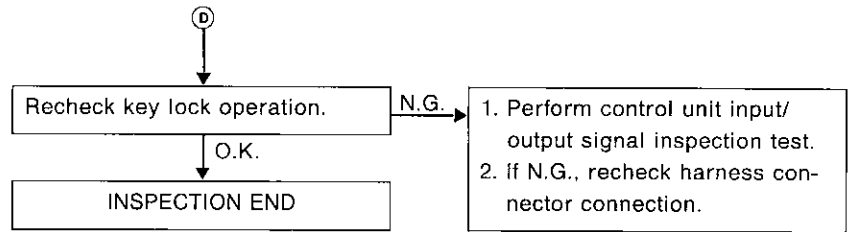
# TROUBLE DIAGNOSES

## A/T Shift Lock System (Cont'd)



## TROUBLE DIAGNOSES

### A/T Shift Lock System (Cont'd)

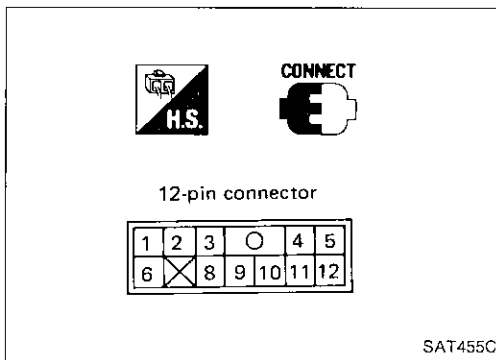


## TROUBLE DIAGNOSES

### 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.





# TROUBLE DIAGNOSES

## A/T Shift Lock System (Cont'd)

### SHIFT LOCK CONTROL UNIT INSPECTION TABLE (Data are reference values.)

| Terminal No. |    | Item                     | Condition                                                                                                                                                                                                                          | Judgment standard                                   |
|--------------|----|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| ⊕            | ⊖  |                          |                                                                                                                                                                                                                                    |                                                     |
| 1            | 9  | Shift lock signal        |  When selector lever is set in "P" position and brake pedal is depressed.                                                                         | Battery voltage                                     |
|              |    |                          | Except above                                                                                                                                                                                                                       | 0V                                                  |
| 2            |    | Power source             | Any condition                                                                                                                                                                                                                      | Battery voltage                                     |
| 3            |    | Stop lamp switch         | When brake pedal is depressed.                                                                                                                                                                                                     | Battery voltage                                     |
|              |    |                          | When brake pedal is released                                                                                                                                                                                                       | 0V                                                  |
| 4            |    | Power source             | Any condition                                                                                                                                                                                                                      | Battery voltage                                     |
| 5            |    | Detention switch (Shift) | <ul style="list-style-type: none"><li>When key is inserted into key cylinder and selector lever is set in "P" position with selector lever button pushed.</li><li>When selector lever is set in any position except "P".</li></ul> | Battery voltage                                     |
|              |    |                          | Except above                                                                                                                                                                                                                       | 0V                                                  |
| 6            |    | Ignition signal          |                                                                                                                                                   | Battery voltage                                     |
|              |    |                          | Except above                                                                                                                                                                                                                       | 0V                                                  |
| 8            | 10 | Key lock signal          | When ignition switch is turned from LOCK, OFF or ACC to ON.                                                                                                                                                                        | Battery voltage<br>(Approximately 0.1 sec-<br>onds) |
|              |    |                          | Except above                                                                                                                                                                                                                       | 0V                                                  |
| 9            | —  | Ground                   | —                                                                                                                                                                                                                                  | —                                                   |
| 10           | 8  | Key unlock signal        | When selector lever is set in "P" position and ignition key is turned from ON to LOCK, OFF or ACC with selector lever button released.                                                                                             | Battery voltage<br>(Approximately 0.1 sec-<br>onds) |
|              |    |                          | 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)   | <ul style="list-style-type: none"><li>When key is inserted into key cylinder and selector lever is set in "P" position with selector lever button pushed.</li><li>When selector lever is set in any position except "P".</li></ul> | Battery voltage                                     |
|              |    |                          | Except above                                                                                                                                                                                                                       | 0V                                                  |

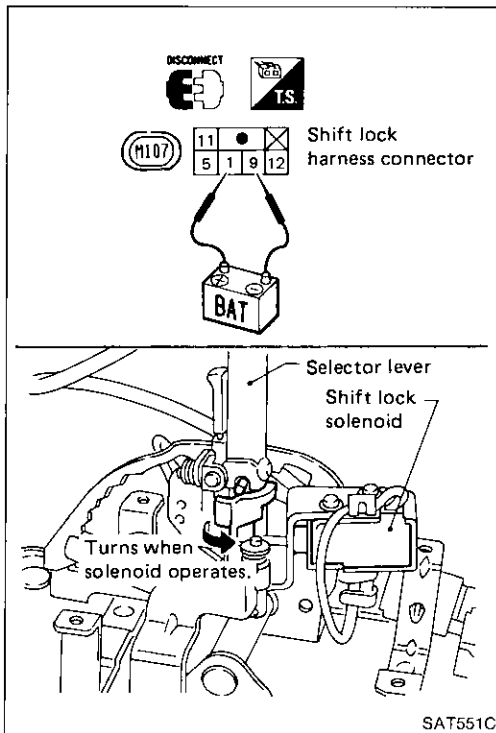
## TROUBLE DIAGNOSES

### A/T Shift Lock System (Cont'd)

#### COMPONENT CHECK

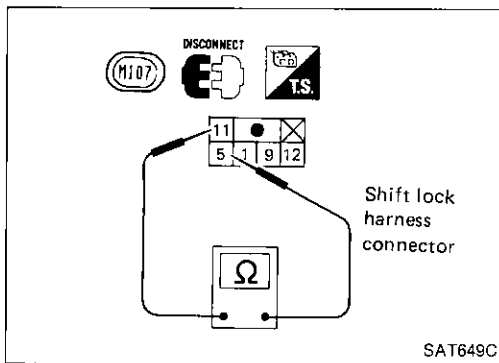
##### Shift lock solenoid

- Check operation by applying battery voltage to shift lock harness connector.



##### Detention switch—shift

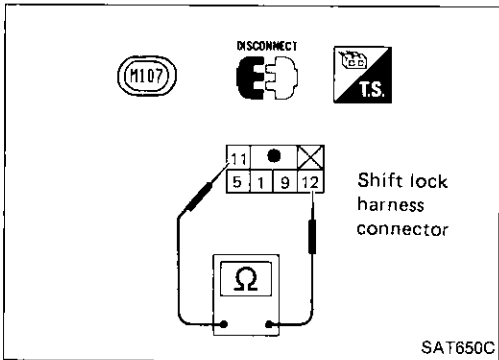
- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.



| Condition                                                                        | Continuity |
|----------------------------------------------------------------------------------|------------|
| When selector lever is set in "P" position and selector lever button is released | No         |
| Except above                                                                     | Yes        |

##### Detention switch—key

- Check continuity between terminals ⑪ and ⑫ of shift lock harness connector.

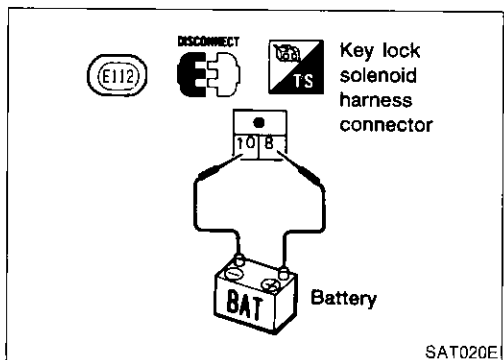


| Condition                                                                        | Continuity |
|----------------------------------------------------------------------------------|------------|
| When selector lever is set in "P" position and selector lever button is released | No         |
| Except above                                                                     | Yes        |

##### Key lock solenoid

- Operation of locking mechanism
- Check operation by applying battery voltage to key lock solenoid harness connector.

Operating sound must be emitted.

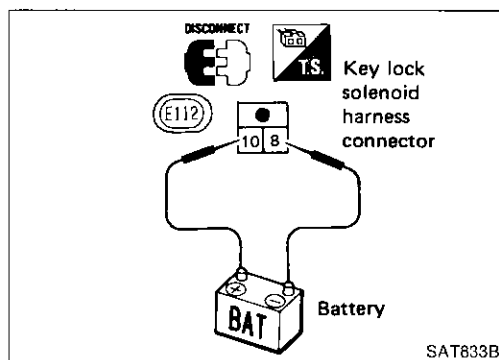


## TROUBLE DIAGNOSES

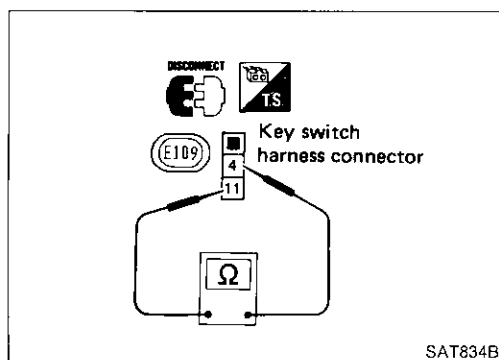
### A/T Shift Lock System (Cont'd)

- Operation of unlocking mechanism
- Check operation by applying battery voltage to key lock solenoid harness connector.

**Operating sound must be emitted.**



SAT833B

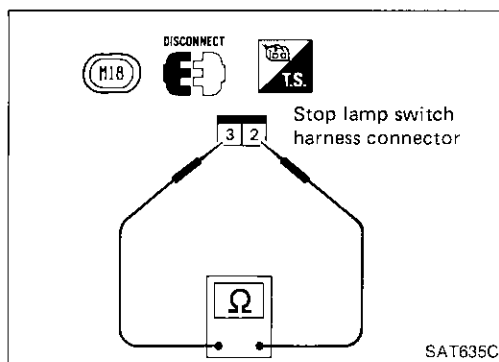


SAT834B

#### 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         |



SAT635C

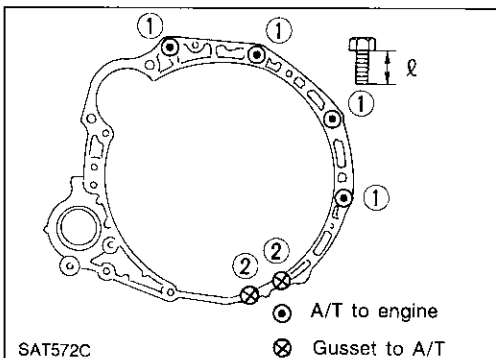
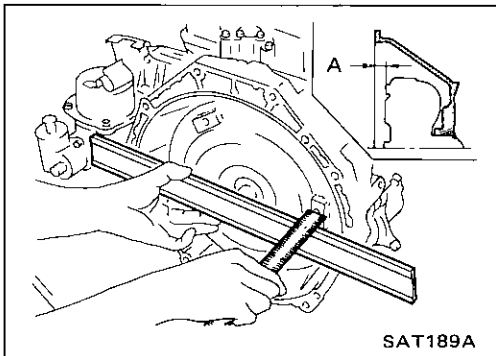
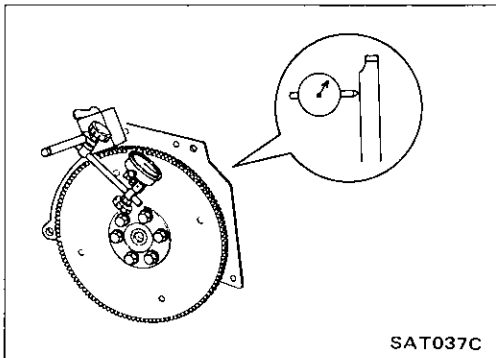
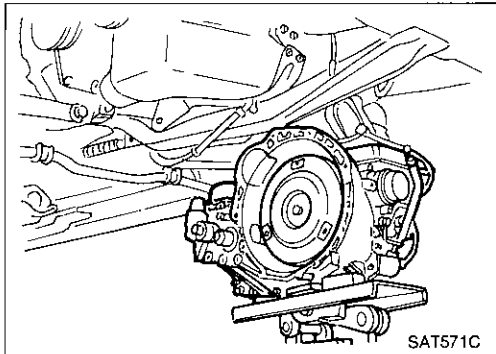
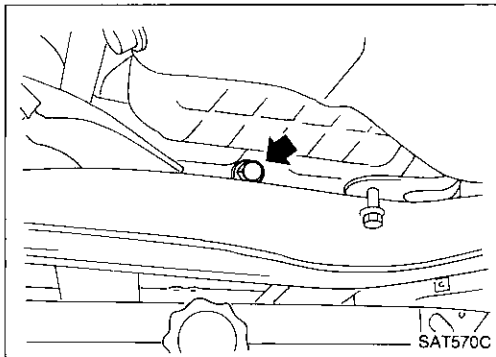
#### Stop lamp switch

- 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.**

## REMOVAL AND INSTALLATION



### Removal

- Disconnect drive shafts. Refer to Drive Shaft (section FA) for removal.
- Support transaxle with transmission jack.
- Place wooden blocks between engine and center member to support engine.
- Remove bolts securing rear mounting to transaxle.
- Remove drive plate cover.
- Remove bolts securing torque converter to drive plate.
- a. **Remove those bolts by turning crankshaft.**
- b. **Immediately after transaxle is disconnected, inscribe matching marks on torque converter and drive plate so that they may be reinstalled in their original positions.**
- Plug up openings such as oil charging pipe, etc.

### Installation

- Drive plate runout  
**Maximum allowable runout:**  
**0.5 mm (0.020 in)**  
 If this runout is out of allowance, replace drive plate and ring gear.
  - When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.  
**Distance "A":**  
**19 mm (0.75 in) or more**
  - Install converter to drive plate.
- After converter is installed, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.**

- Tighten bolt securing transaxle.

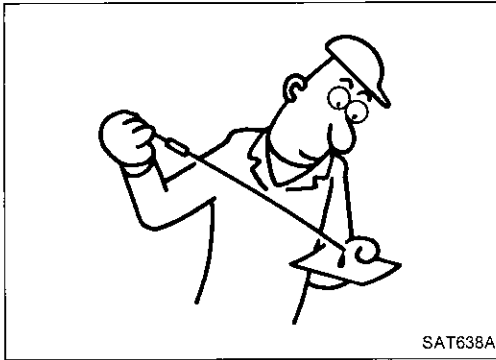
| Bolt No. | Tightening torque<br>N·m (kg-m, ft-lb) | ℓ mm (in) |
|----------|----------------------------------------|-----------|
| 1        | 39 - 49<br>(4.0 - 5.0, 29 - 36)        | 45 (1.77) |
| 2        | 30 - 40<br>(3.1 - 4.1, 22 - 30)        | 20 (0.79) |

- Reinstall any part removed.

## REMOVAL AND INSTALLATION

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### Installation (Cont'd)



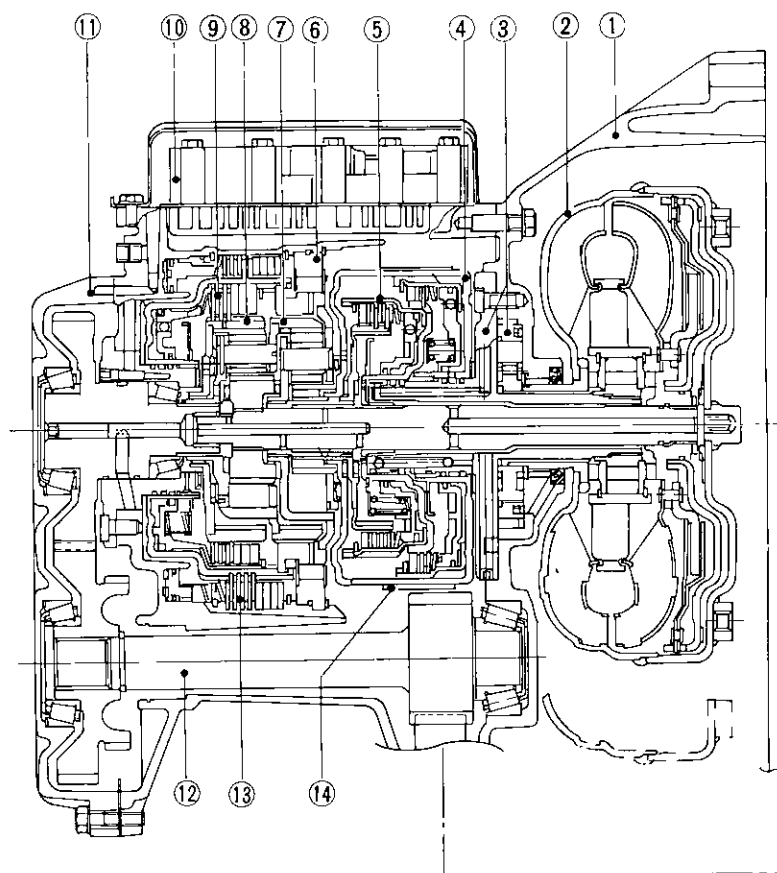
- Reinstall any part removed.
- Refill transaxle with A.T.F. and check fluid level.
- Adjust control cable and inhibitor switch. — Refer to "ON-VEHICLE SERVICE".
- Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".
- Move selector lever through all positions to be sure that transaxle 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 transaxle is shifted.
- Perform road test — Refer to "Road Testing".

## REMOVAL AND INSTALLATION

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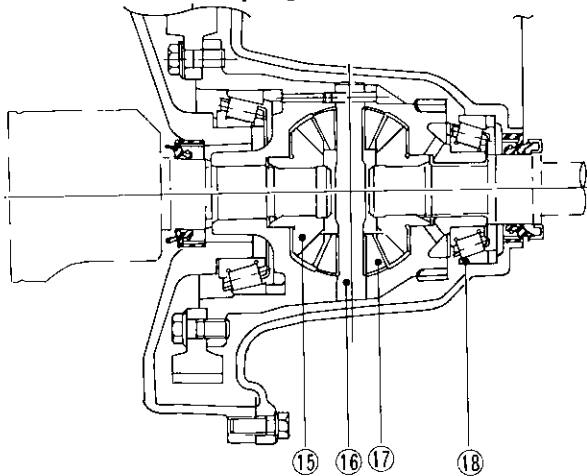
### NOTE

# MAJOR OVERHAUL

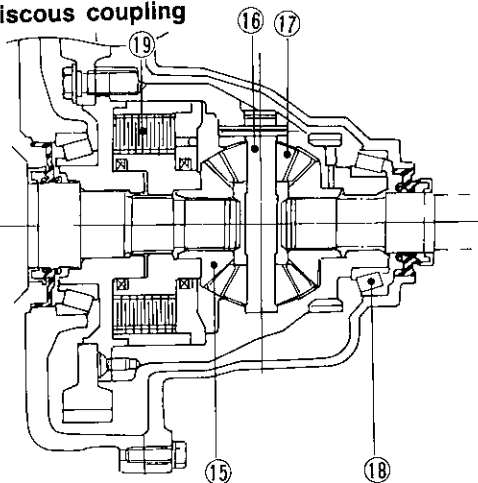


- 1 Converter housing
- 2 Torque converter
- 3 Oil pump
- 4 Reverse clutch
- 5 High clutch
- 6 One-way clutch
- 7 Front planetary gear
- 8 Rear planetary gear
- 9 Low clutch
- 10 Control valve
- 11 Side cover
- 12 Reduction gear
- 13 Low reverse brake
- 14 Band brake
- 15 Side gear
- 16 Pinion mate shaft
- 17 Pinion mate gear
- 18 Differential side bearing
- 19 Viscous coupling

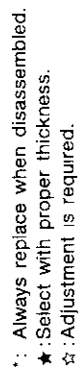
**Without viscous coupling**



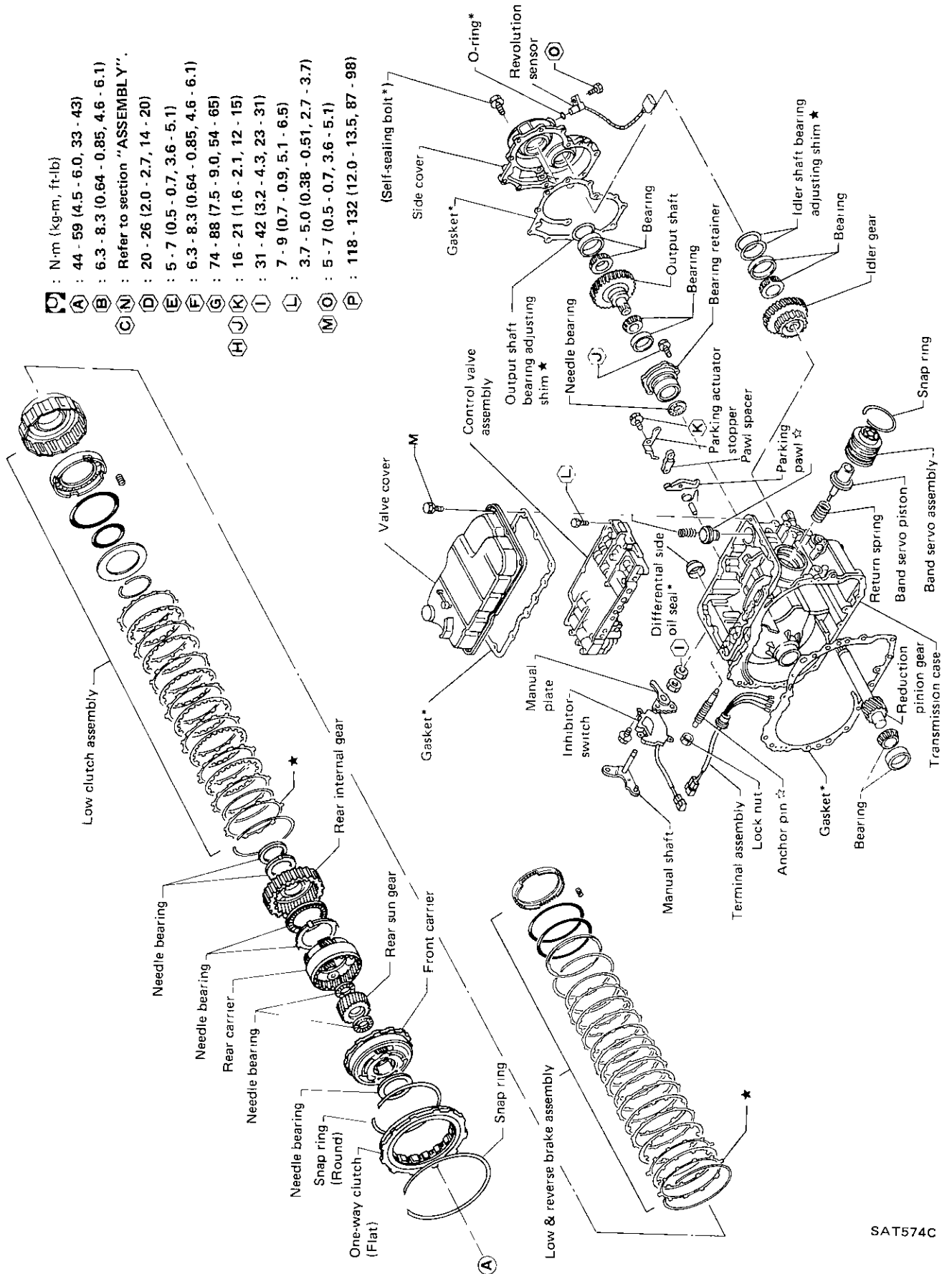
**With viscous coupling**



SAT573C





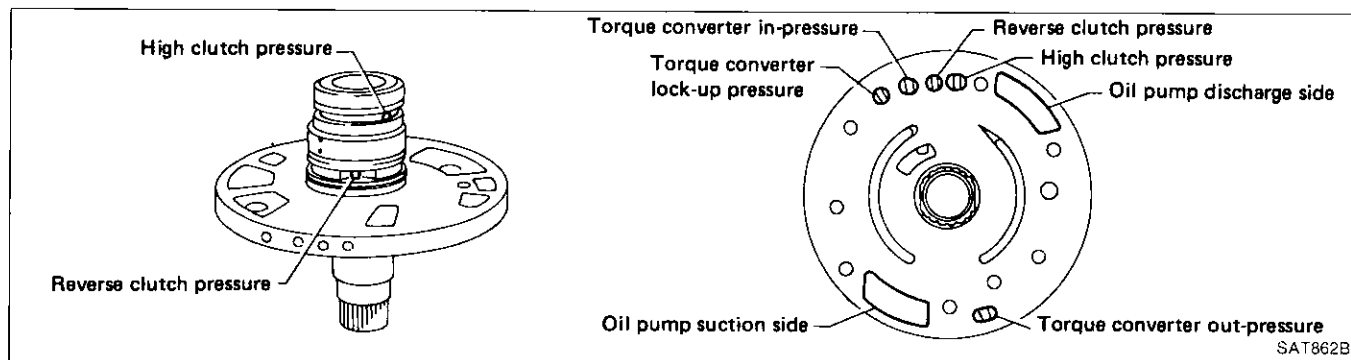


SAT574C

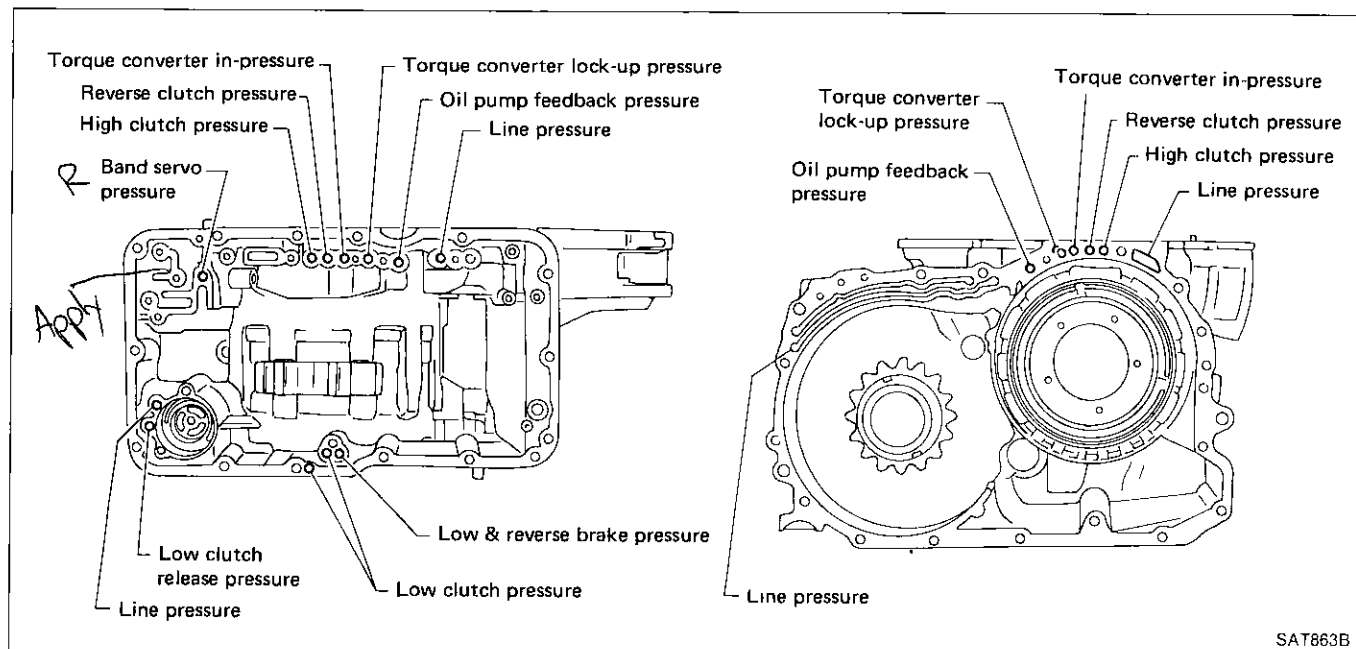
# MAJOR OVERHAUL

## Oil Channel

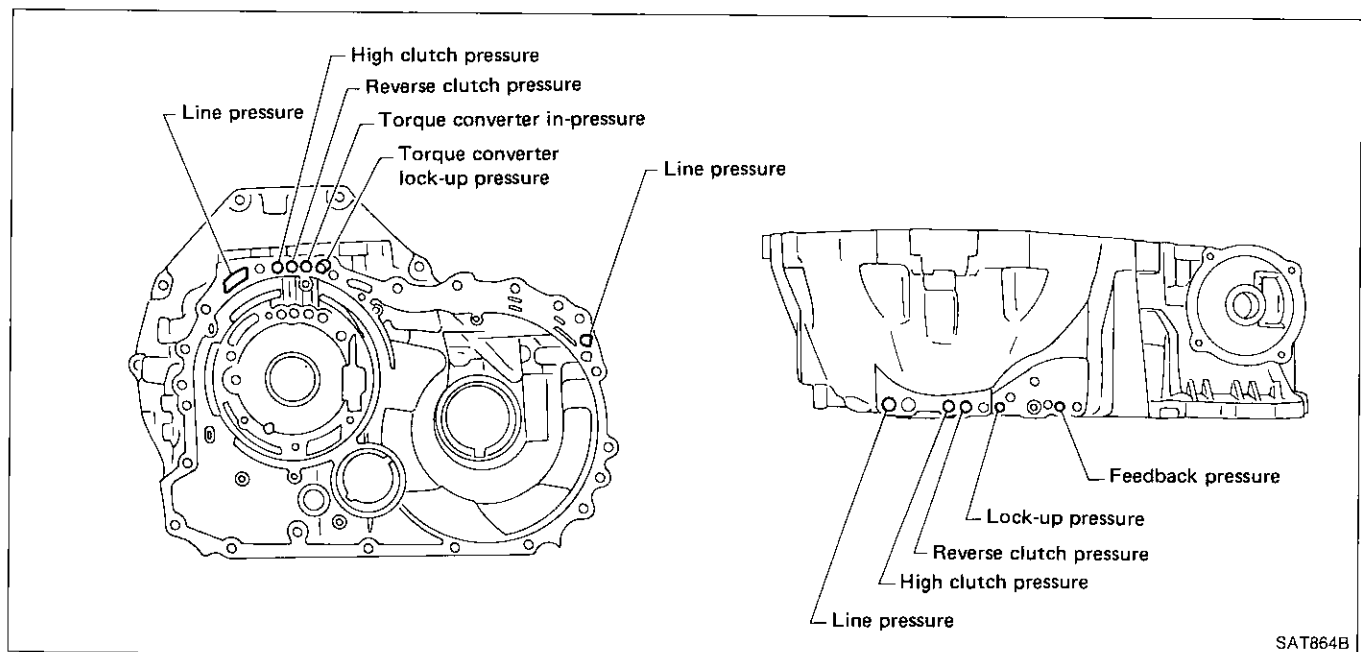
### OIL CHANNELS IN OIL PUMP COVER

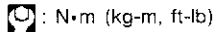


### OIL CHANNELS IN TRANSMISSION CASE



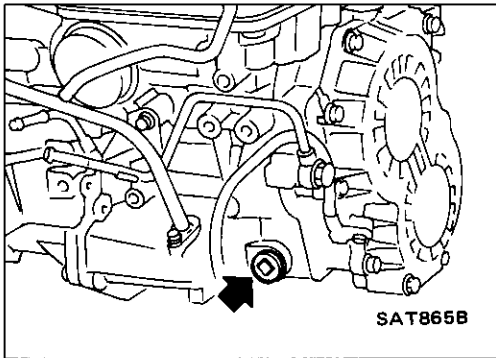
### OIL CHANNELS IN CONVERTER HOUSING



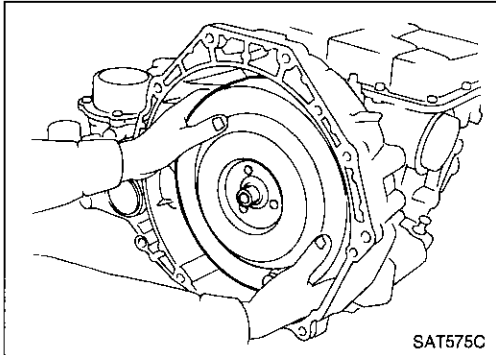


- SAT019E

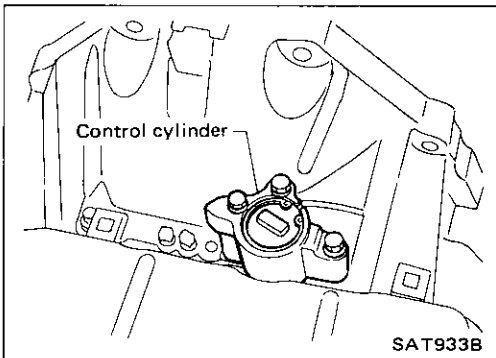
## DISASSEMBLY



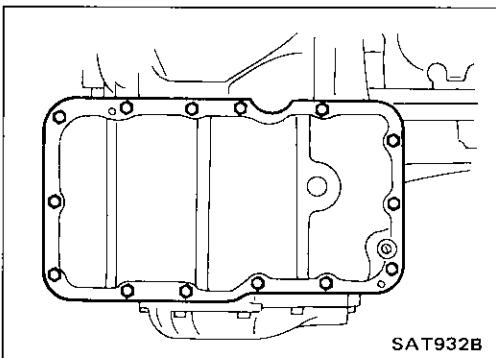
1. Drain A.T.F. through drain hole.



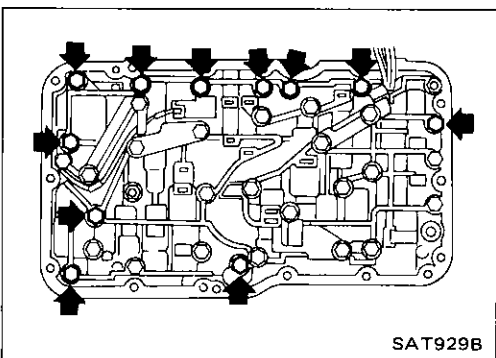
2. Remove torque converter.



3. Remove control cylinder.

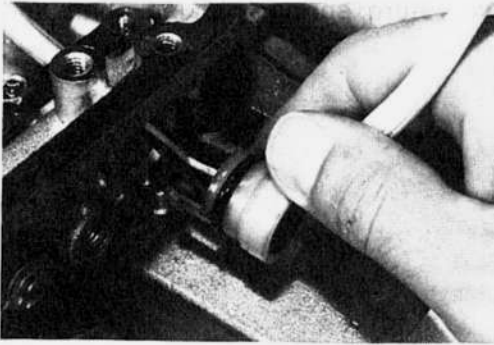


4. Remove control valve cover.



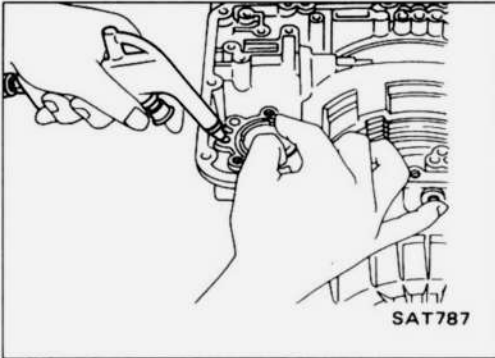
5. Disconnect harness connectors on control valve and remove control valve assembly.

## DISASSEMBLY

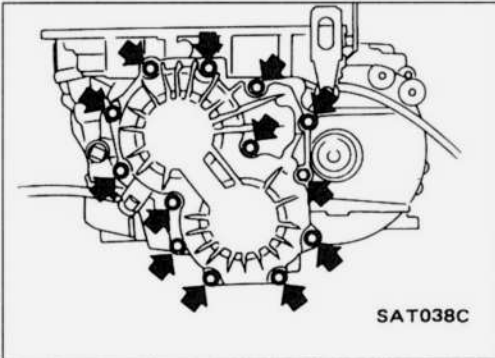


6. Remove terminal assembly.

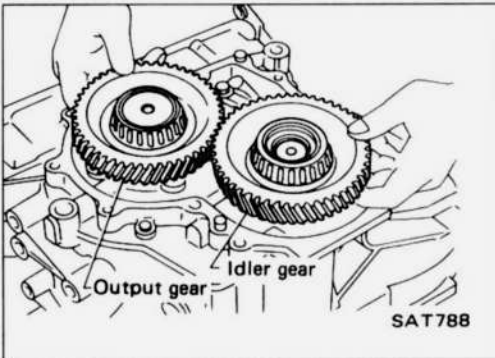
**The terminal retrieving hooks will break if they are forced inward too far. Bend them gently inward while pulling carefully outward on the terminal. Do not pull on the wires.**



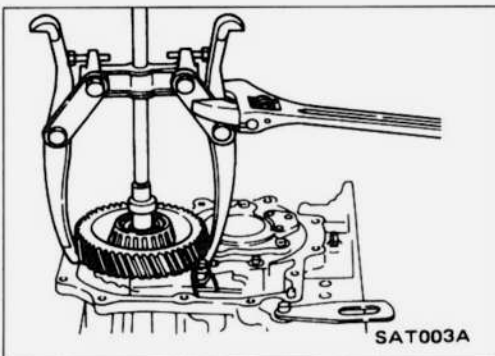
7. Remove accumulator.



8. Remove side cover.

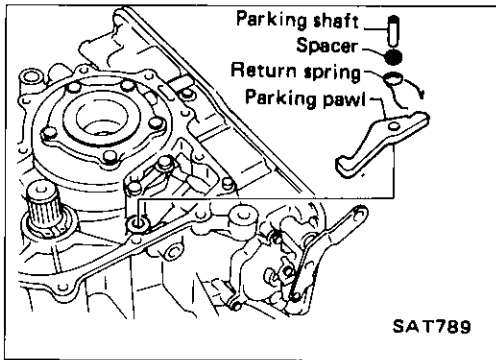


9. Remove output gear.

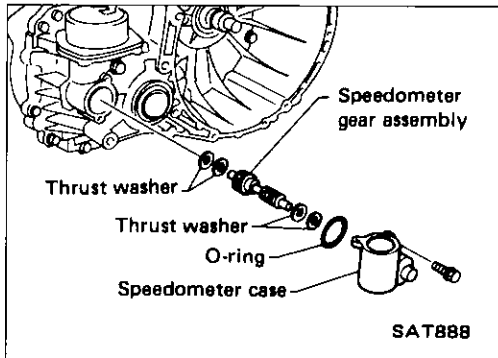


10. Draw out idler gear.

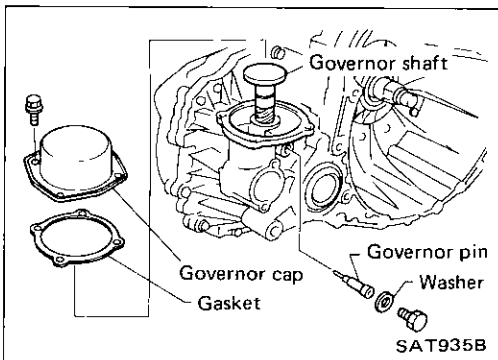
## DISASSEMBLY



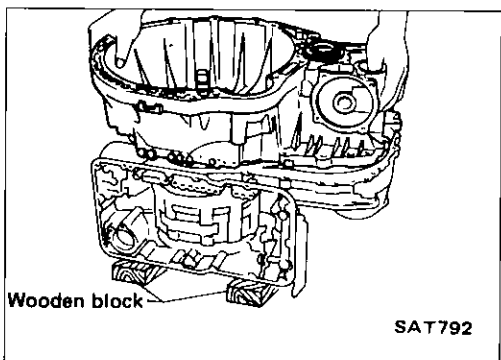
11. Remove parking pawl, return spring, parking shaft and spacer.



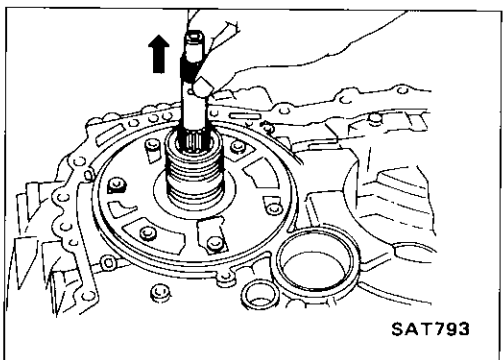
12. Remove speedometer and speedometer gear.



13. Remove governor shaft.

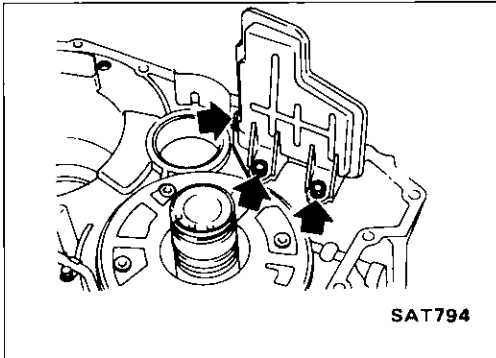


14. Put transaxle assembly on wooden block and remove converter housing.

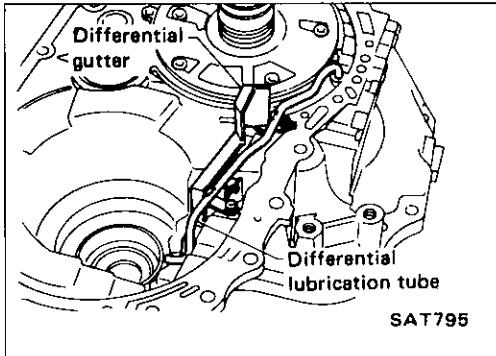


15. Remove final drive assembly and reduction pinion gear.  
16. After removing O-ring from input shaft, extract input shaft from converter housing.

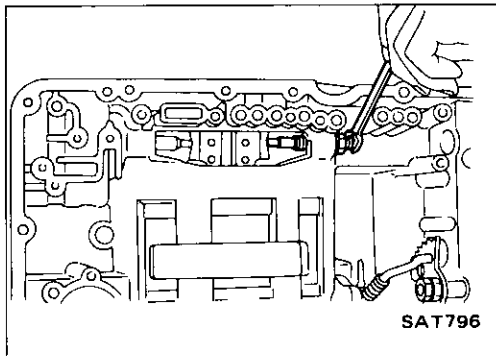
## DISASSEMBLY



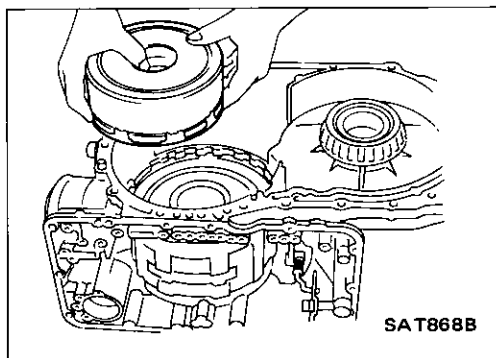
17. Remove oil strainer.



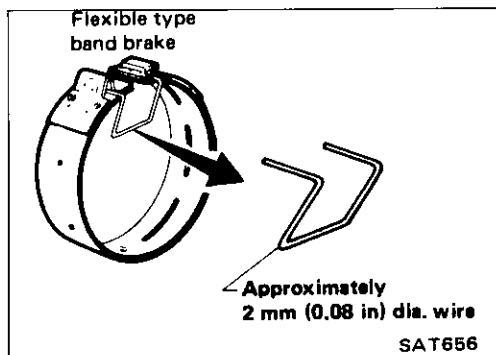
18. Remove differential lubrication tube and gutter.



19. Loosen band brake stem lock nut, then back off piston stem.

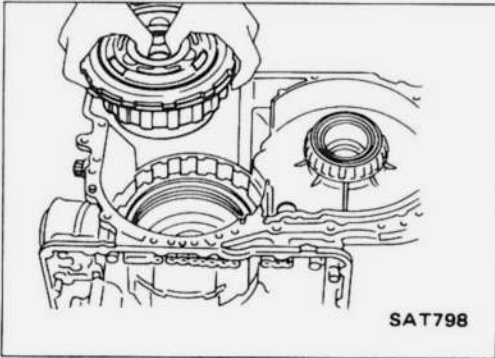


20. Remove brake band and high clutch & reverse clutch pack.

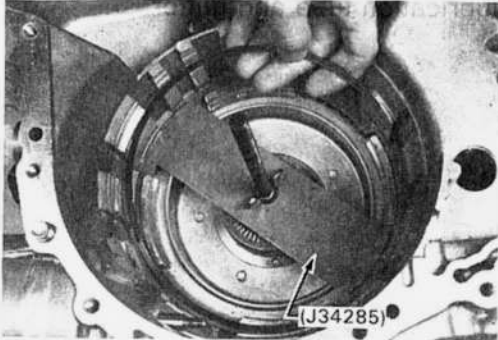


- To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure at left. Leave the clip in position after removing the brake band.

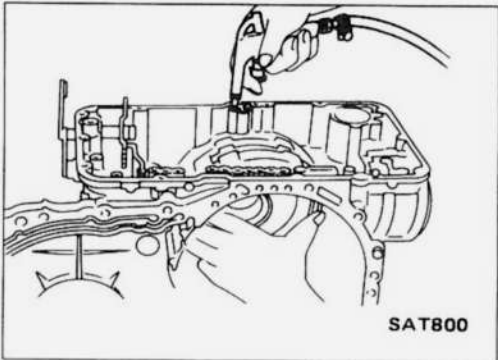
## DISASSEMBLY



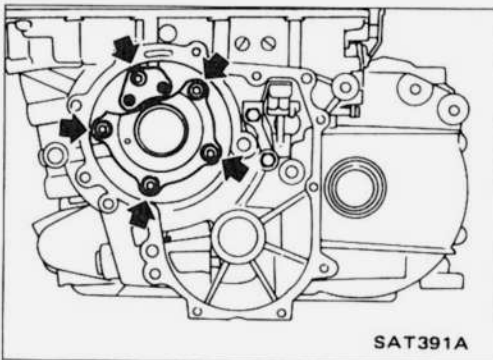
21. Remove one-way clutch, front carrier, rear carrier and low clutch as a set.



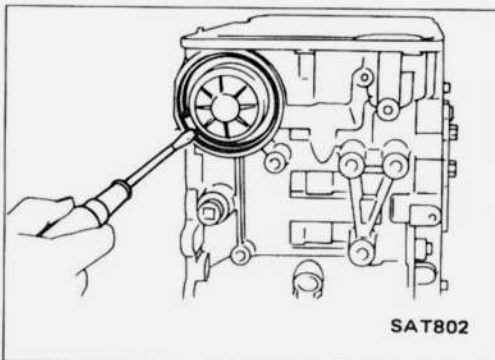
22. Remove low & reverse brake clutches, and detach low & reverse brake retainer snap ring pushing retainer.



23. Remove low and reverse brake piston with compressed air.



24. Remove bearing retainer assembly.

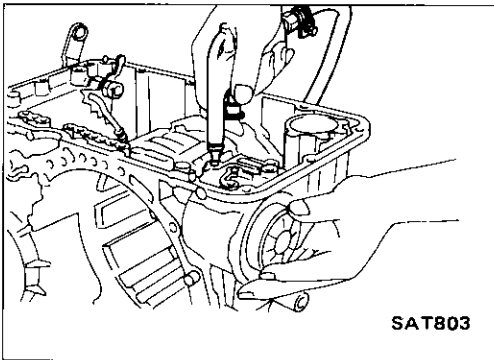


25. Remove band servo snap ring.

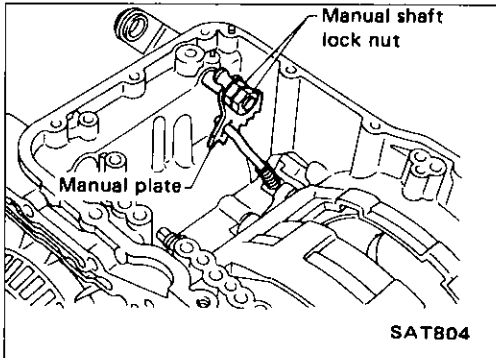


## DISASSEMBLY

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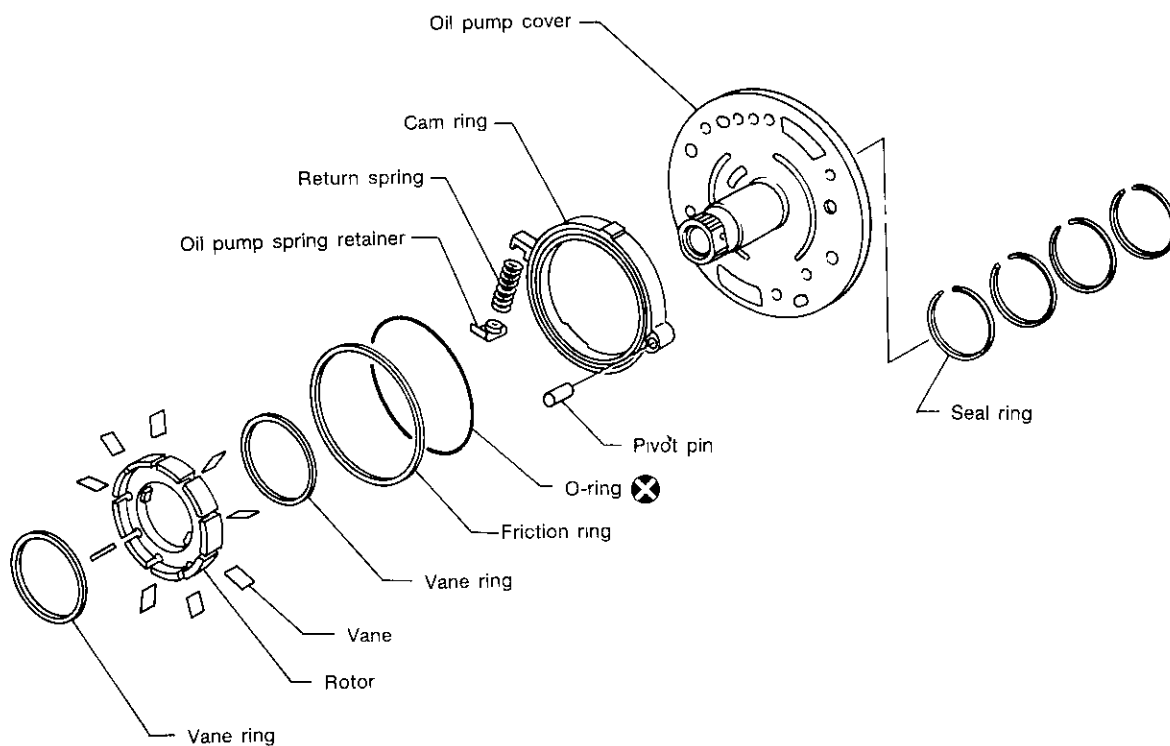


26. Remove band brake servo, retainer and return spring.

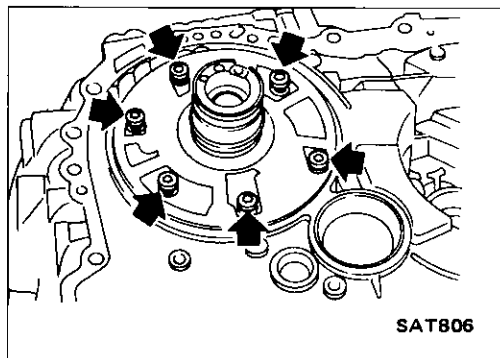


27. Loosen manual shaft lock nuts and remove manual plate.  
28. Pull out retaining pin, then remove manual shaft.

## Oil Pump

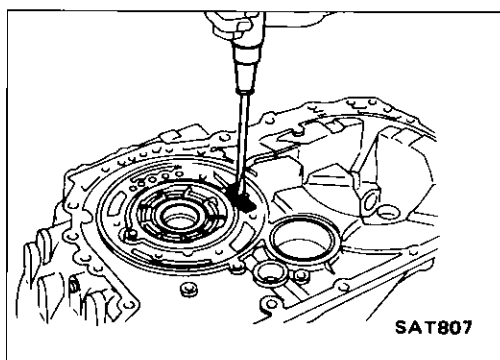


SAT576C



### DISASSEMBLY

1. Remove oil pump cover.



2. Remove return spring taking care not to damage converter housing.

## Oil Pump (Cont'd)

### INSPECTION

1. Inspect oil pump cover, cam ring, rotor and vanes for damage and visible wear.
2. Measure clearance between oil pump cover and cam ring, rotor and vanes in at least four places along their circumstances. The maximum measured value should be within the specified range.

- **Be sure to remove friction ring and vane ring when measuring clearance.**

#### Standard clearance:

0.010 - 0.024 mm

(0.0004 - 0.0009 in) (Cam ring to oil pump cover)

0.017 - 0.031 mm

(0.0007 - 0.0012 in) (Rotor to oil pump cover)

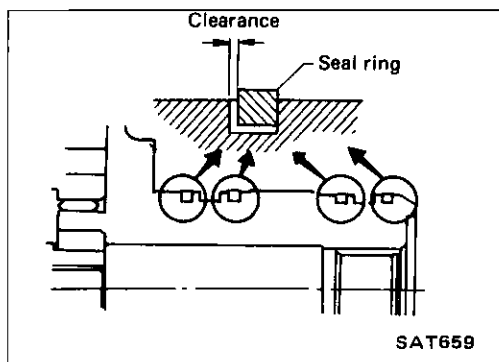
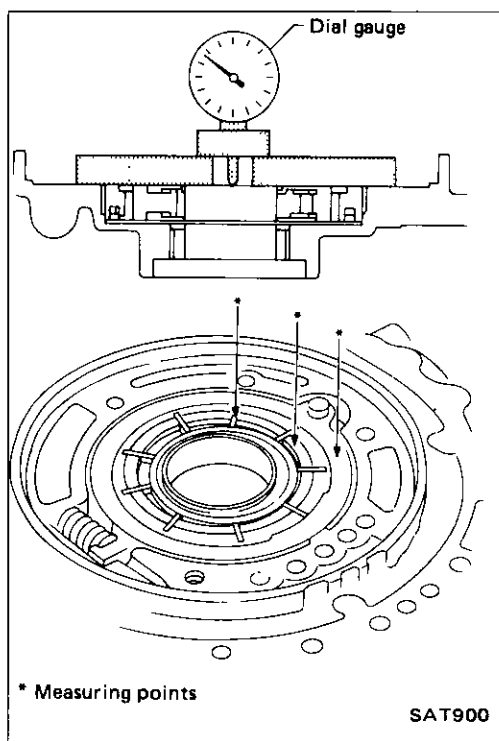
0.017 - 0.031 mm

(0.0007 - 0.0012 in) (Vane to oil pump cover)

#### Wear limit:

0.034 mm (0.0013 in)

If the clearance is out of above specification, replace oil pump as an assembly.



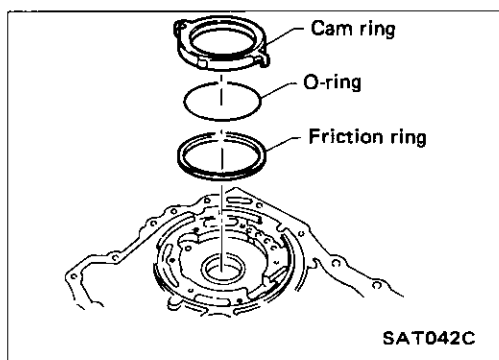
3. Measure clearance between seal ring and ring groove.

#### Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

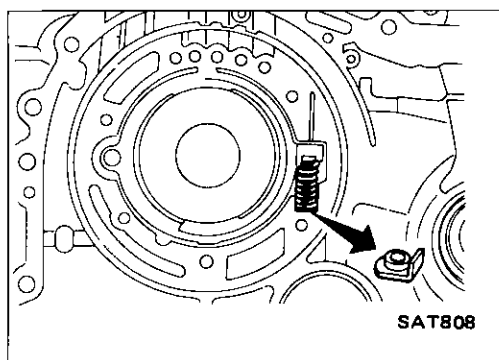
#### Wear limit:

0.25 mm (0.0098 in)



### ASSEMBLY

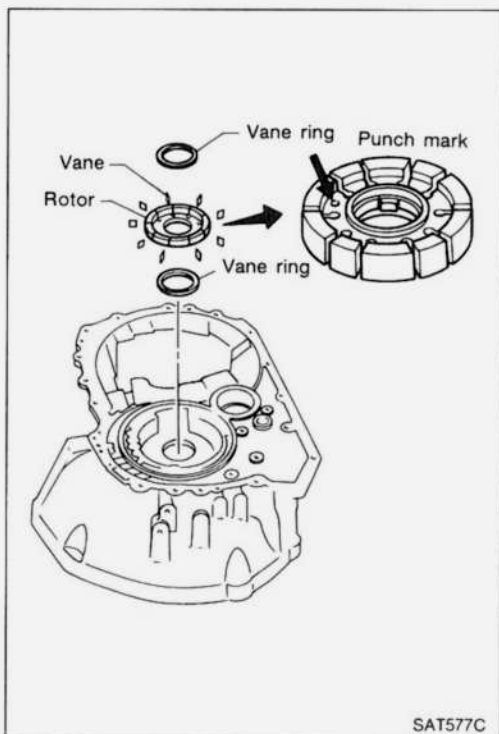
1. Install cam ring, O-ring and friction ring.



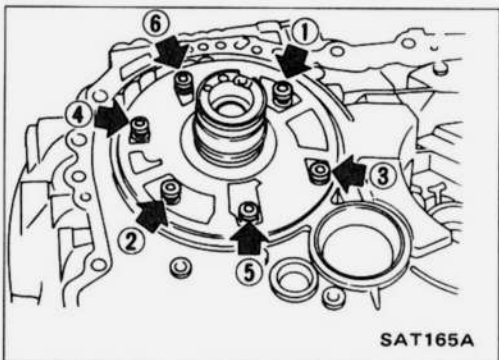
2. Install return spring and spring retainer.

### Oil Pump (Cont'd)

3. Assemble rotor, vanes and vane rings. Pay attention to direction of rotor.

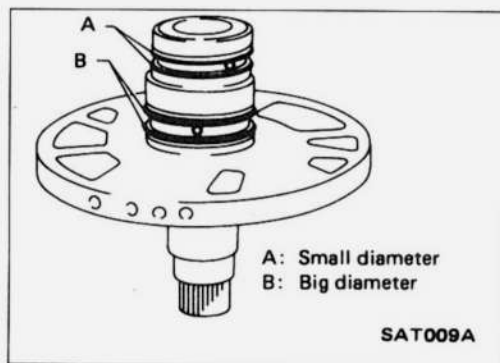


4. Install oil pump cover. Tighten down cover evenly in a criss-cross type pattern.



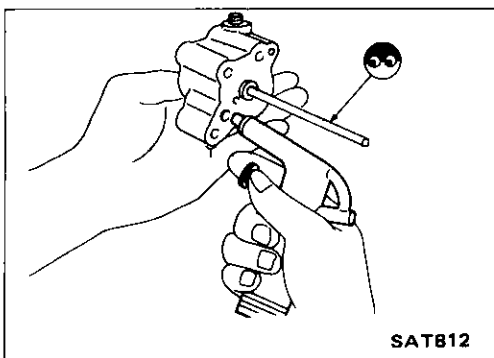
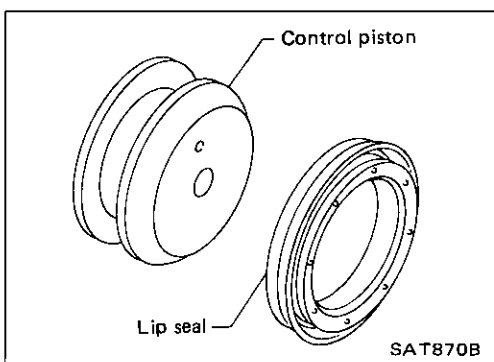
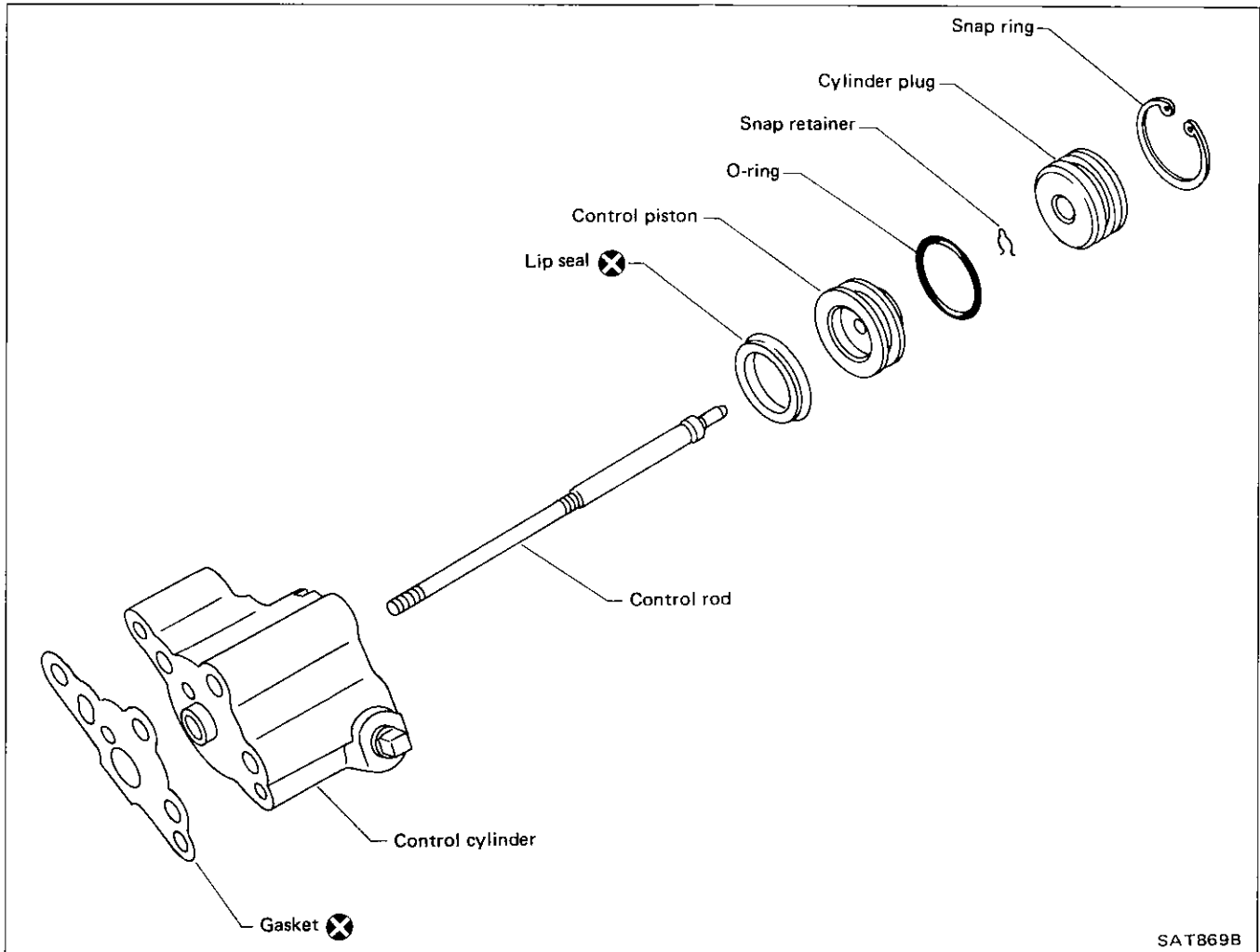
5. Rotate the pump when it has been assembled to ensure that all parts have been correctly assembled.
6. Install seal rings.

Refer to the figure at left for proper locations of the two different types of seal rings.



- These seal rings can be cut or deformed if they are improperly seated in their grooves when the drum is installed. Clean the ring grooves carefully and fill them with petroleum jelly. Then install the rings making sure they fit into the grooves as tightly as possible.

### Control Cylinder

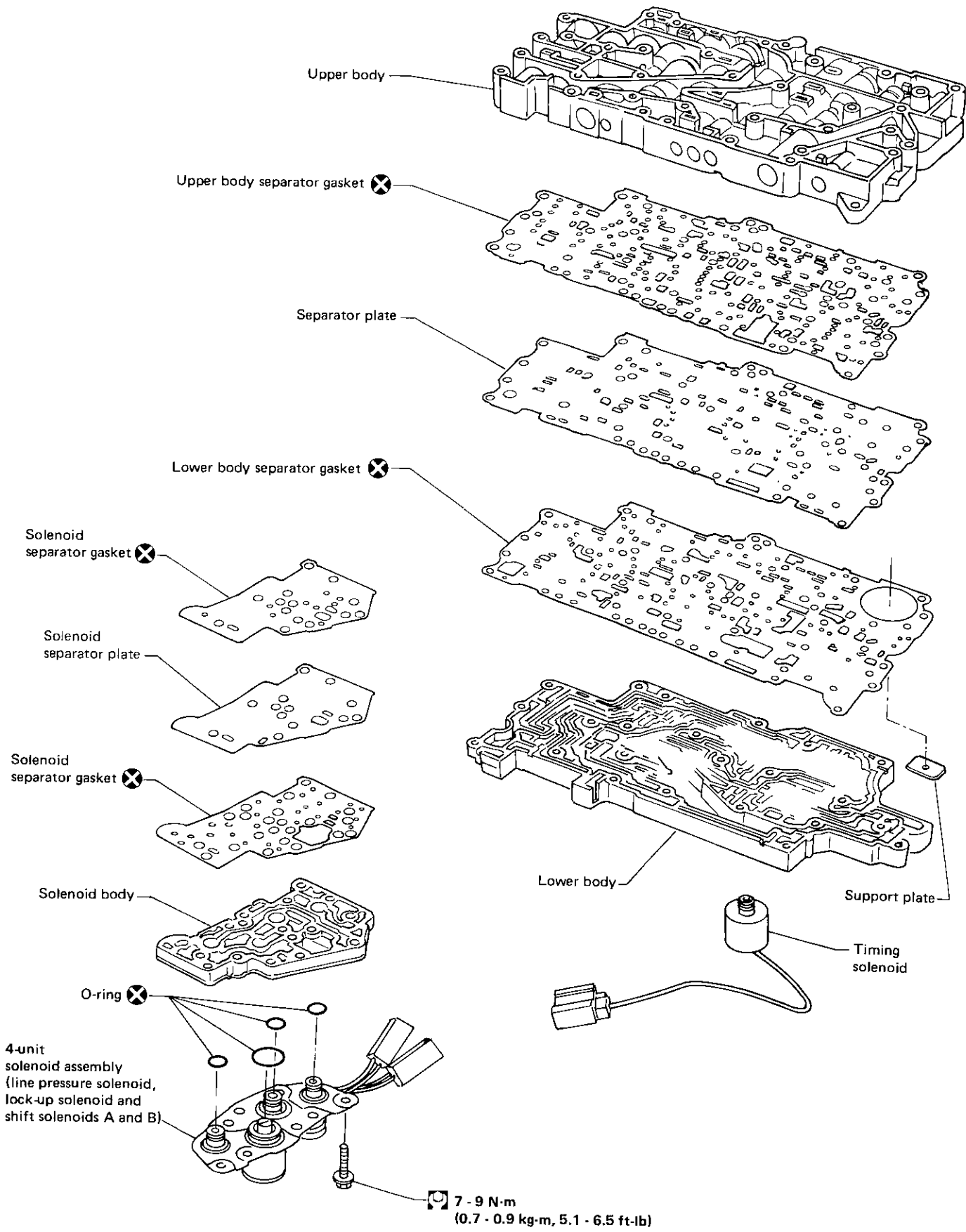


### INSPECTION AND ASSEMBLY

- Inspect control cylinder body, control piston and cylinder plug for scratches or damage. Replace if necessary.
- When assembling, pay attention to the direction of lip seal.

- After assembling, check the operation.

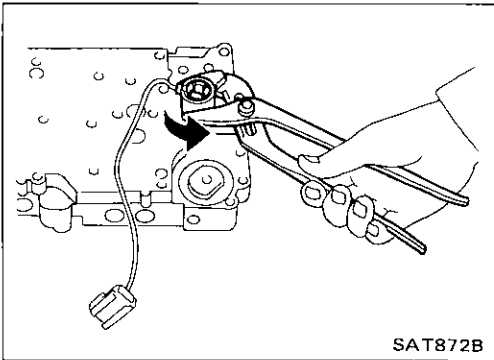
Control Valve Assembly



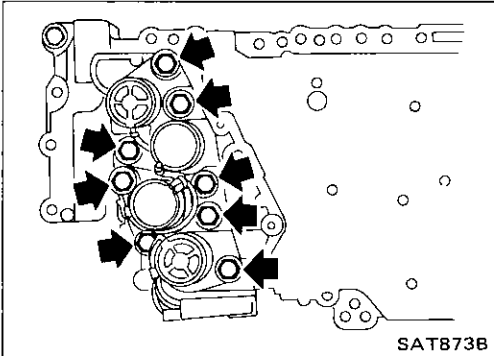
## REPAIR FOR COMPONENT PARTS

### Control Valve Assembly (Cont'd)

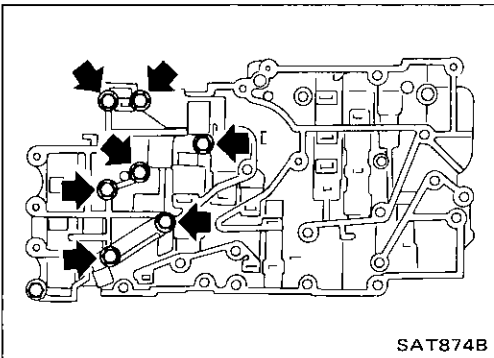
#### DISASSEMBLY



1. Remove solenoids.
  - a. Remove timing solenoid.
  - b. Remove O-ring from solenoid.

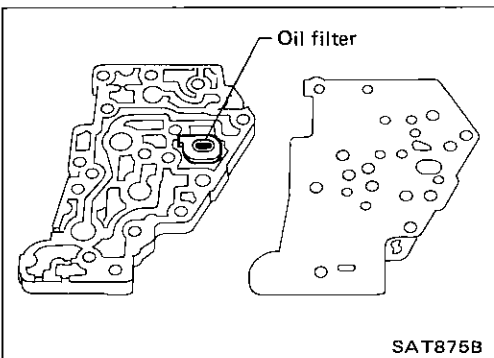


- c. Remove shift solenoid A, shift solenoid B, line pressure solenoid and lock-up solenoid.
  - d. Remove O-rings from solenoids.

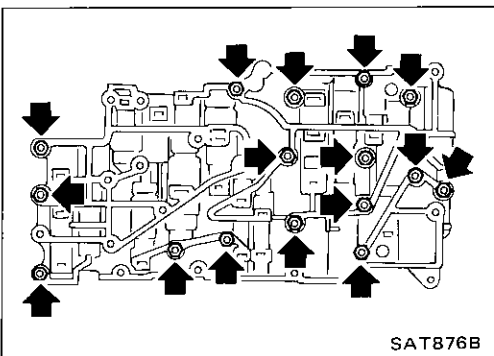


2. Remove solenoid body.
  - a. Place lower body facedown and remove bolts.

**Be careful not to drop solenoid body.**



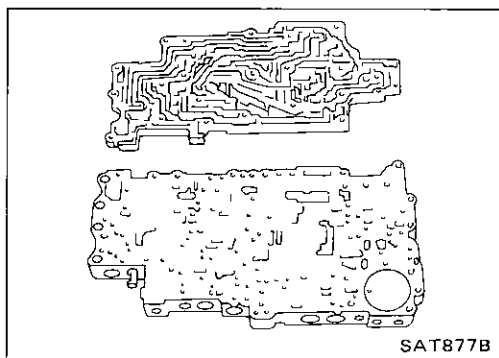
- b. Place upper body face down, and remove solenoid body with separator gaskets and separator plate.
  - c. Remove separator gaskets, separator plate and oil filter from solenoid body.



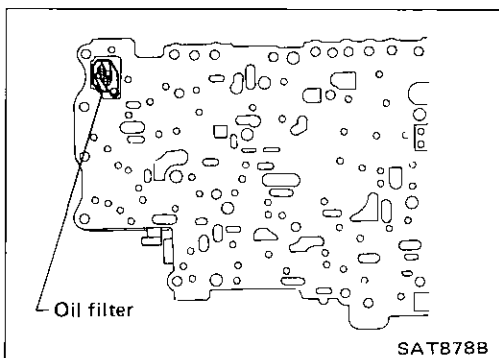
3. Disassemble upper and lower bodies.
  - a. Place lower body facedown, and remove bolts, reamer bolts and support plate.

## REPAIR FOR COMPONENT PARTS

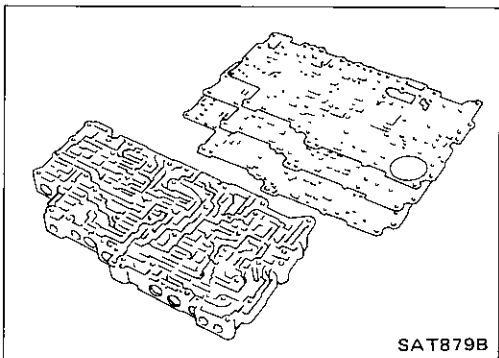
### Control Valve Assembly (Cont'd)



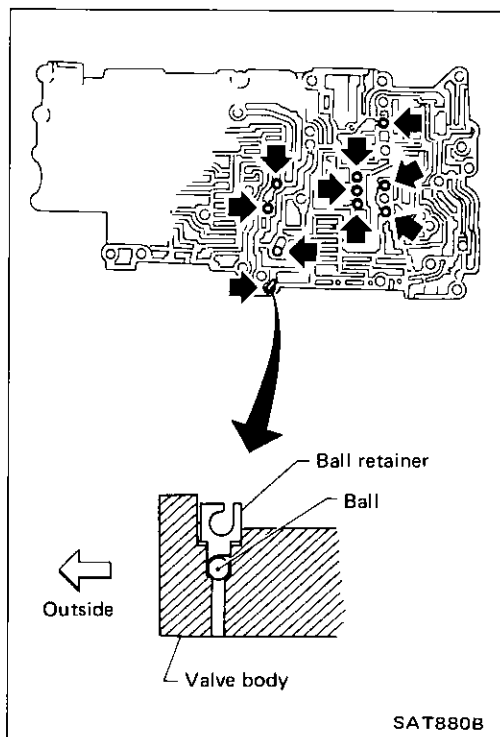
- b. Position upper body downward. Remove lower body with separator plate and separator gasket attached to upper body.



- c. Remove oil filter, separator gaskets and separator plate from upper body.



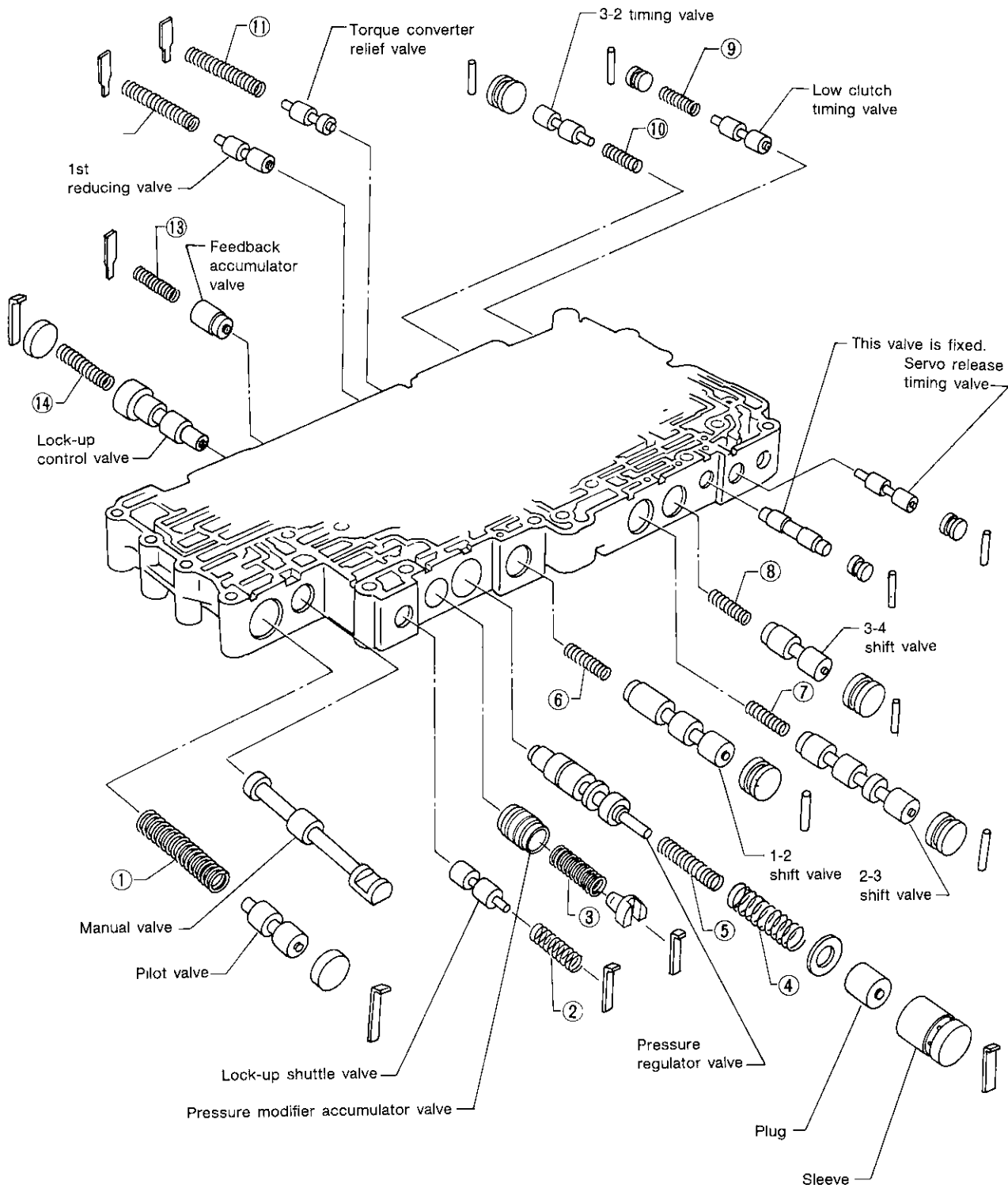
- d. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.





## REPAIR FOR COMPONENT PARTS

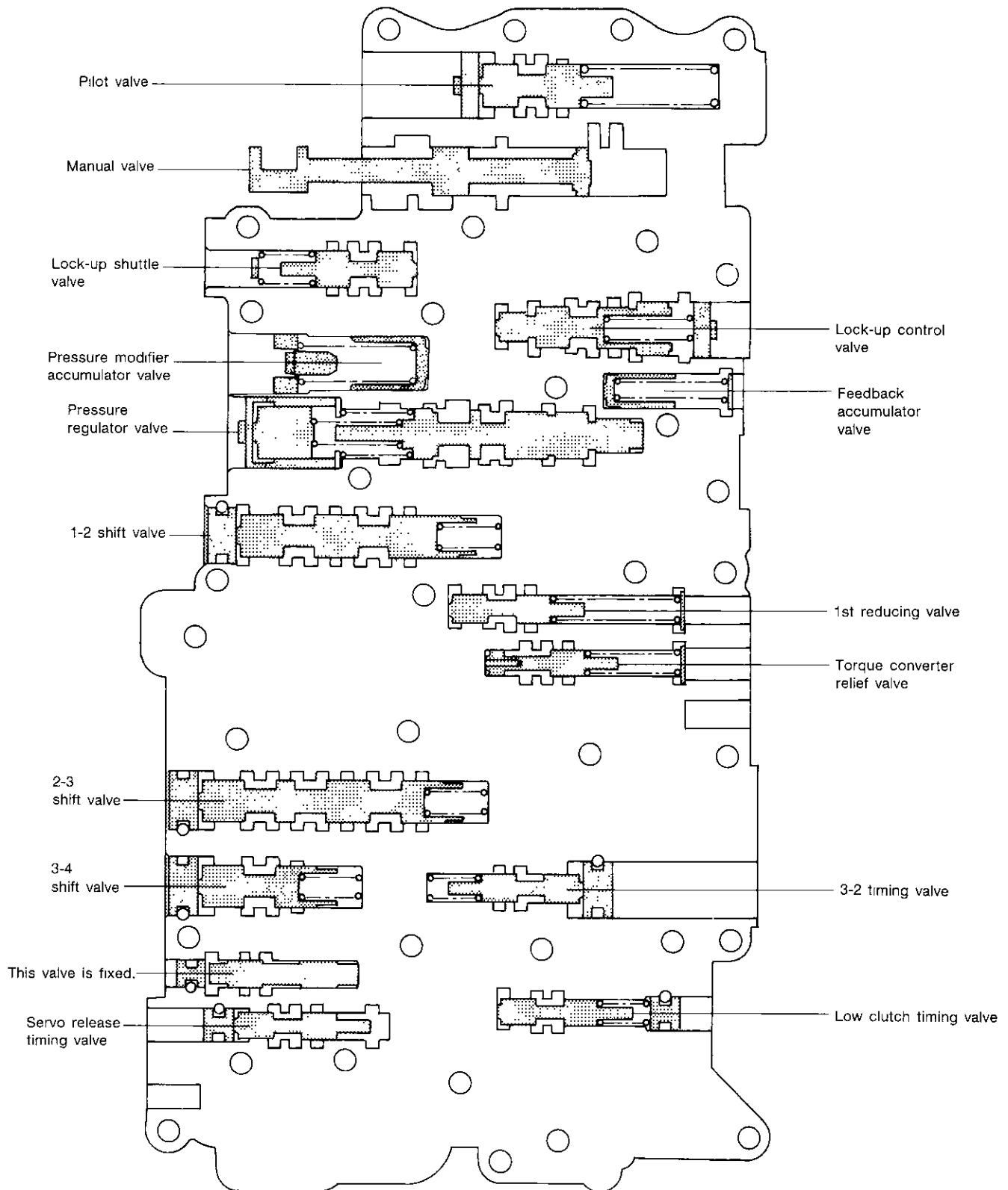
### Control Valve Upper Body



SAT597C

## REPAIR FOR COMPONENT PARTS

### Control Valve Upper Body (Cont'd)



SAT598C

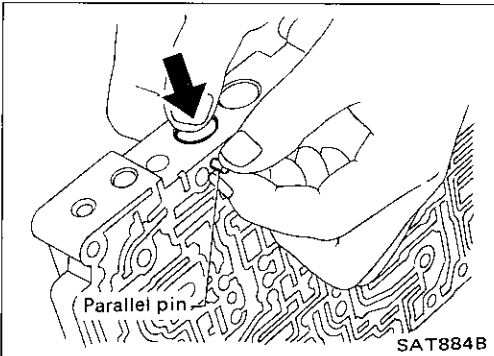
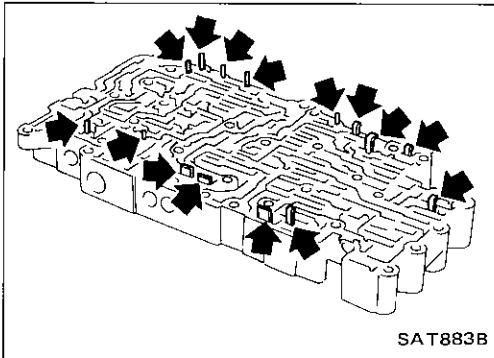
## REPAIR FOR COMPONENT PARTS

### Control Valve Upper Body (Cont'd)

#### DISASSEMBLY

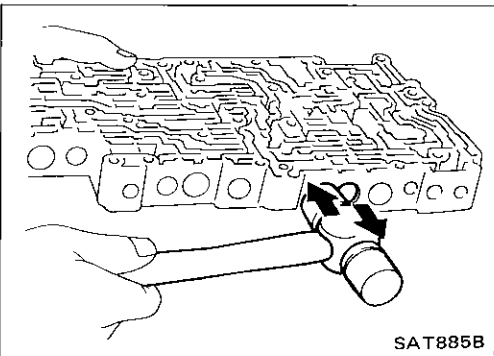
1. Remove valves at parallel pins.

**Do not use a magnetic hand.**



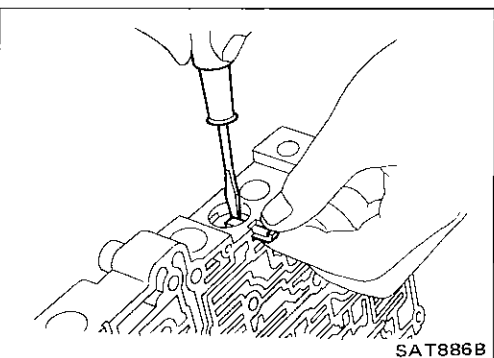
- a. Remove parallel pins while pressing their corresponding plugs and sleeves.

**Remove plug slowly to prevent internal parts from jumping out.**



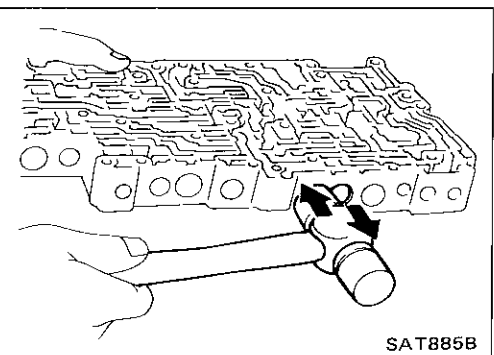
- b. Place mating surface of valve facedown, and remove internal parts.

- 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.



2. Remove valves at retainer plates.

- a. Remove retainer plates while pressing their corresponding plugs, sleeves or springs.



- b. 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.

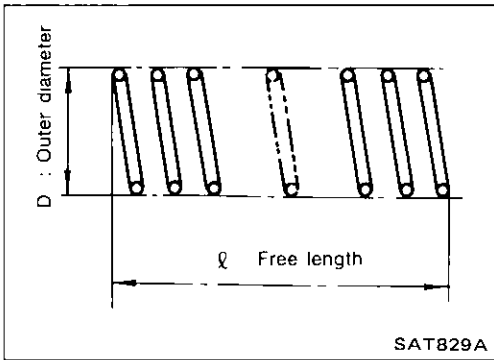
## REPAIR FOR COMPONENT PARTS

### 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 page AT-128.



#### Inspection standard

Unit: mm (in)

| Parts                                        | Item | Part No.    | ℓ              | D             |
|----------------------------------------------|------|-------------|----------------|---------------|
| ① Pilot valve spring                         |      | 31742-27X60 | 56.6 (2.228)   | 10.9 (0.429)  |
| ② Lock-up shuttle valve spring               |      | 31742-27X65 | 28.8 (1.134)   | 9.0 (0.354)   |
| ③ Pressure modifier accumulator valve spring |      | 31742-27X72 | 30.84 (1.2142) | 9.8 (0.386)   |
| ④ Pressure regulator valve outer spring      |      | 31742-27X61 | 37.3 (1.469)   | 12.9 (0.508)  |
| ⑤ Pressure regulator valve inner spring      |      | 31742-27X62 | 37.7 (1.484)   | 7.95 (0.3130) |
| ⑥ 1 - 2 shift valve spring                   |      | 31742-27X61 | 24.9 (0.980)   | 7.0 (0.276)   |
| ⑦ 2 - 3 shift valve spring                   |      | 31762-27X61 | 24.9 (0.980)   | 7.0 (0.276)   |
| ⑧ 3 - 4 shift valve spring                   |      | 31762-27X61 | 24.9 (0.980)   | 7.0 (0.276)   |
| ⑨ Low clutch timing valve spring             |      | 31736-01X02 | 21.7 (0.854)   | 6.65 (0.2618) |
| ⑩ 3 - 2 timing valve spring                  |      | 31736-01X02 | 21.7 (0.854)   | 6.65 (0.2618) |
| ⑪ Torque converter relief valve spring       |      | 31742-27X01 | 44.7 (1.760)   | 7.0 (0.276)   |
| ⑫ 1st reducing valve spring                  |      | 31742-27X67 | 48.8 (1.921)   | 6.8 (0.268)   |
| ⑬ Feedback accumulator valve spring          |      | 31742-27X   | 33.75 (1.3287) | 6.35 (0.2500) |
| ⑭ Lock-up control valve spring               |      | 31742-27X69 | 41.8 (1.646)   | 7.0 (0.276)   |

- Replace valve springs if deformed or fatigued.

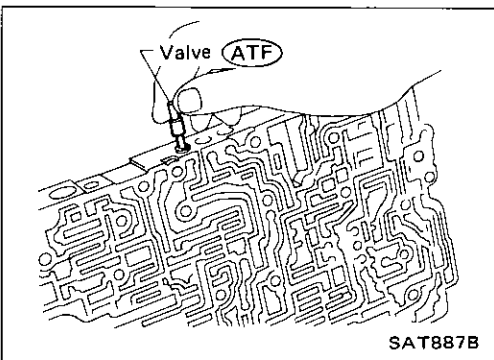
#### Control valves

- Check sliding surfaces of valves, sleeves and plugs.

#### ASSEMBLY

1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

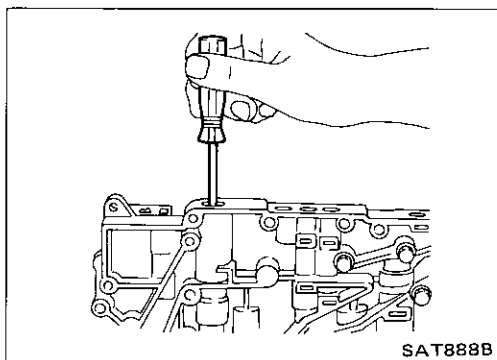
**Be careful not to scratch or damage valve body.**



## REPAIR FOR COMPONENT PARTS

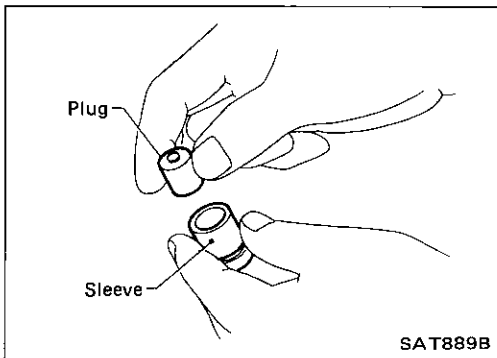
### Control Valve Upper Body (Cont'd)

- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.

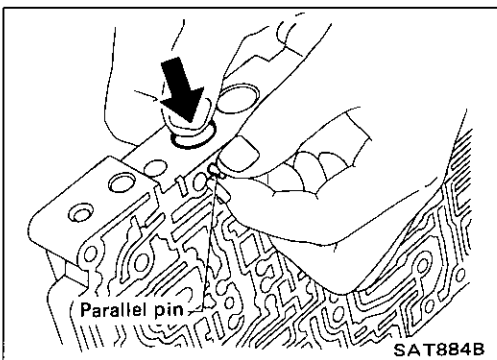
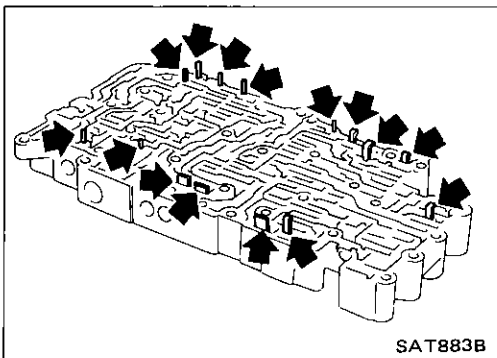


#### — Pressure regulator valve —

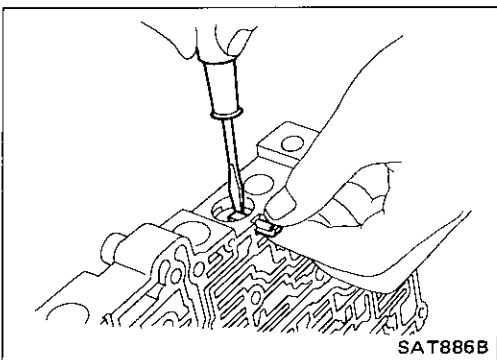
Position plug in sleeve and install pressure regulator valve on upper body.



2. Install parallel pins and retainer plates.

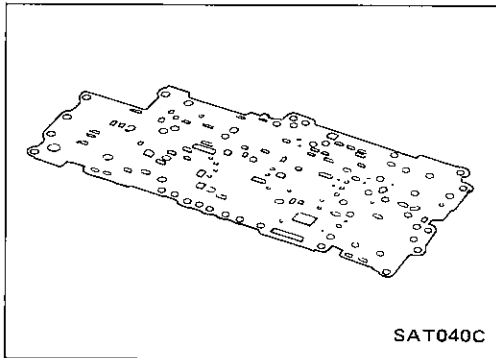


- While pushing plug, install parallel pin.



- Insert retainer plate while pressing their corresponding plugs, sleeves or springs.

## REPAIR FOR COMPONENT PARTS

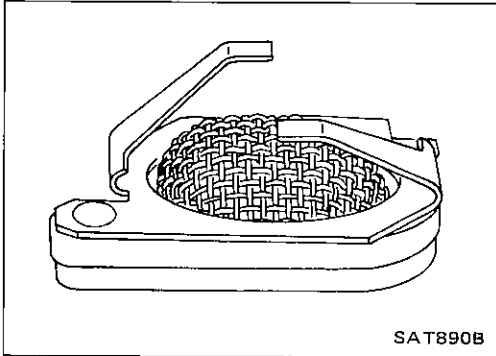


### Control Valve Assembly

#### INSPECTION

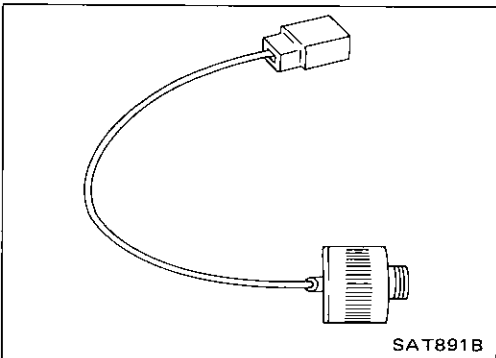
##### Separator plates

Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.



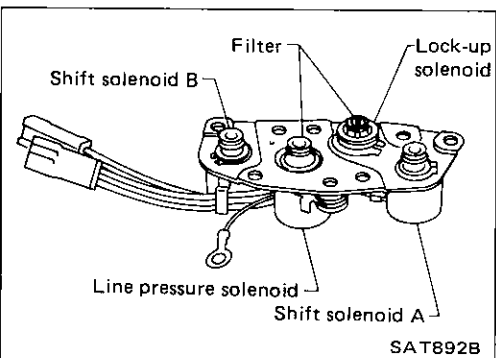
##### Oil filter

Check to make sure that filter is not clogged or damaged.



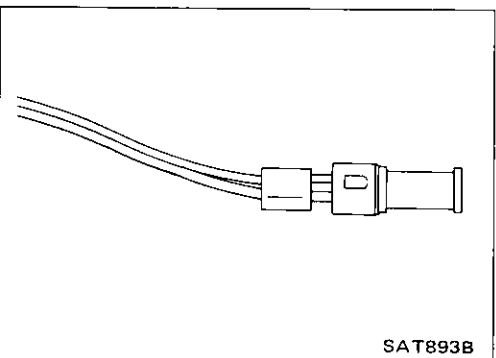
##### Timing solenoid

Measure resistance — Refer to "Electrical Components Inspection".



#### 4-unit solenoid assembly (Line pressure solenoid, lock-up solenoid and shift solenoids A and B)

- Check that filter is not clogged or damaged (line pressure solenoid and lock-up solenoid).
- Measure resistance of each solenoid — Refer to "Electrical Components Inspection".



##### Fluid temperature sensor

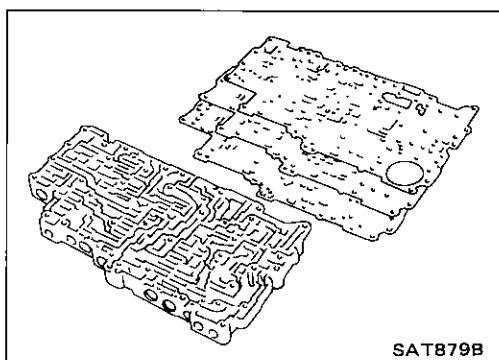
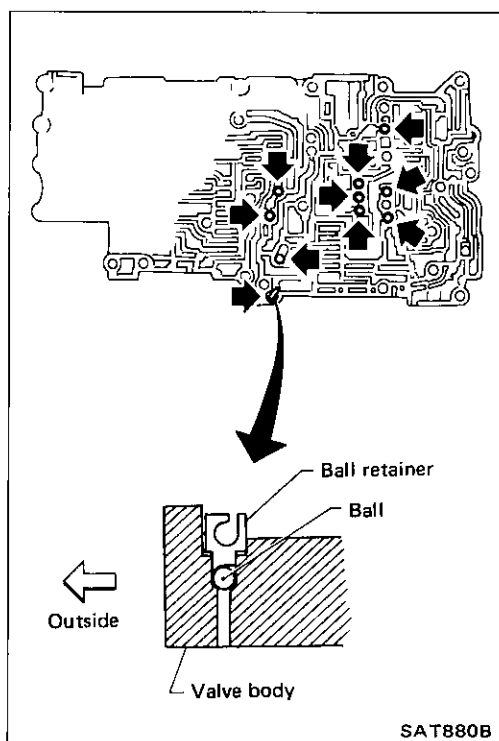
Measure resistance — Refer to "Electrical Components Inspection".

## REPAIR FOR COMPONENT PARTS

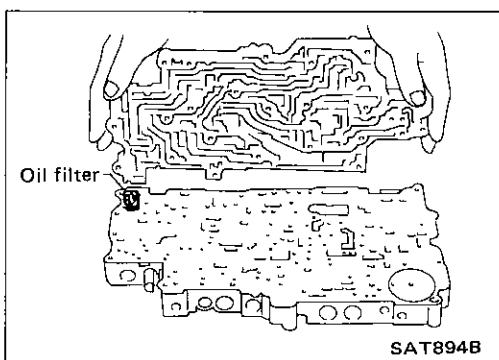
### Control Valve Assembly (Cont'd)

#### ASSEMBLY

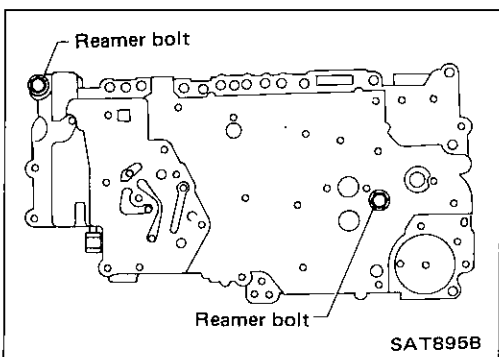
1. Assemble upper and lower bodies.
  - a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



- b. Install upper body separator gasket, separator plate and lower body separator gasket on upper body.



- c. Fit oil filter and install lower body on upper body.

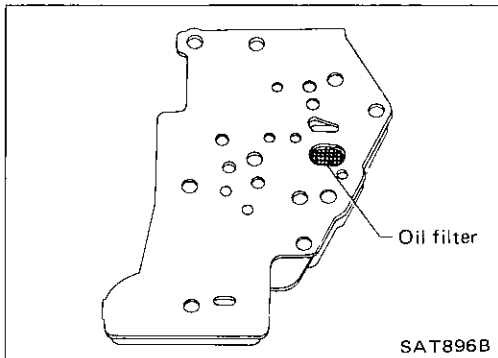


- d. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

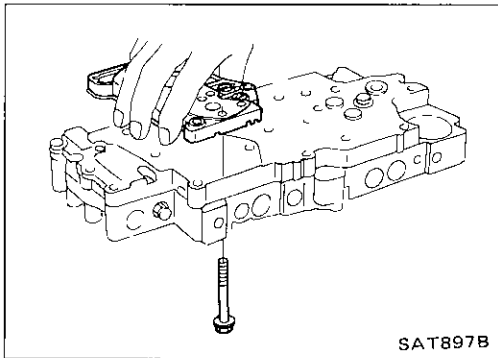
**Be careful not to dislocate or drop steel balls and oil filter.**

## REPAIR FOR COMPONENT PARTS

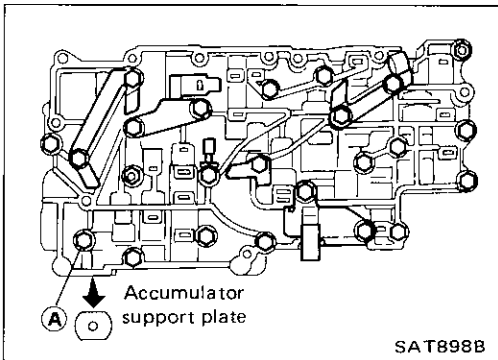
### Control Valve Assembly (Cont'd)



2. Install solenoid body on control valve body.
  - a. Fit oil filter and install solenoid body separator gaskets and separator plate on solenoid body.



- b. Install solenoid body on control valve body and temporarily tighten bolts.



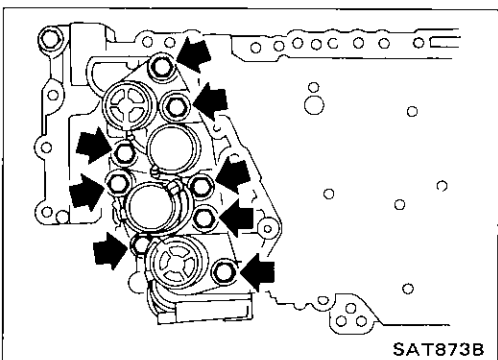
- c. Install accumulator support plate and harness clips in their proper locations, and tighten all bolts.

**Bolt A:**

: 3.4 - 4.4 N·m (0.35 - 0.45 kg-m, 2.5 - 3.3 ft-lb)

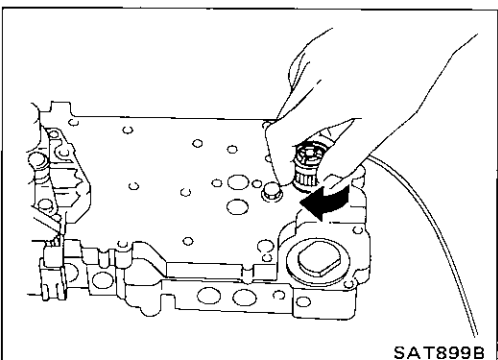
**Other bolts:**

: 7 - 9 N·m (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)



3. Install solenoids.
  - a. Attach O-ring and install 4-unit solenoid assembly on solenoid body.

: 7 - 9 N·m (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)

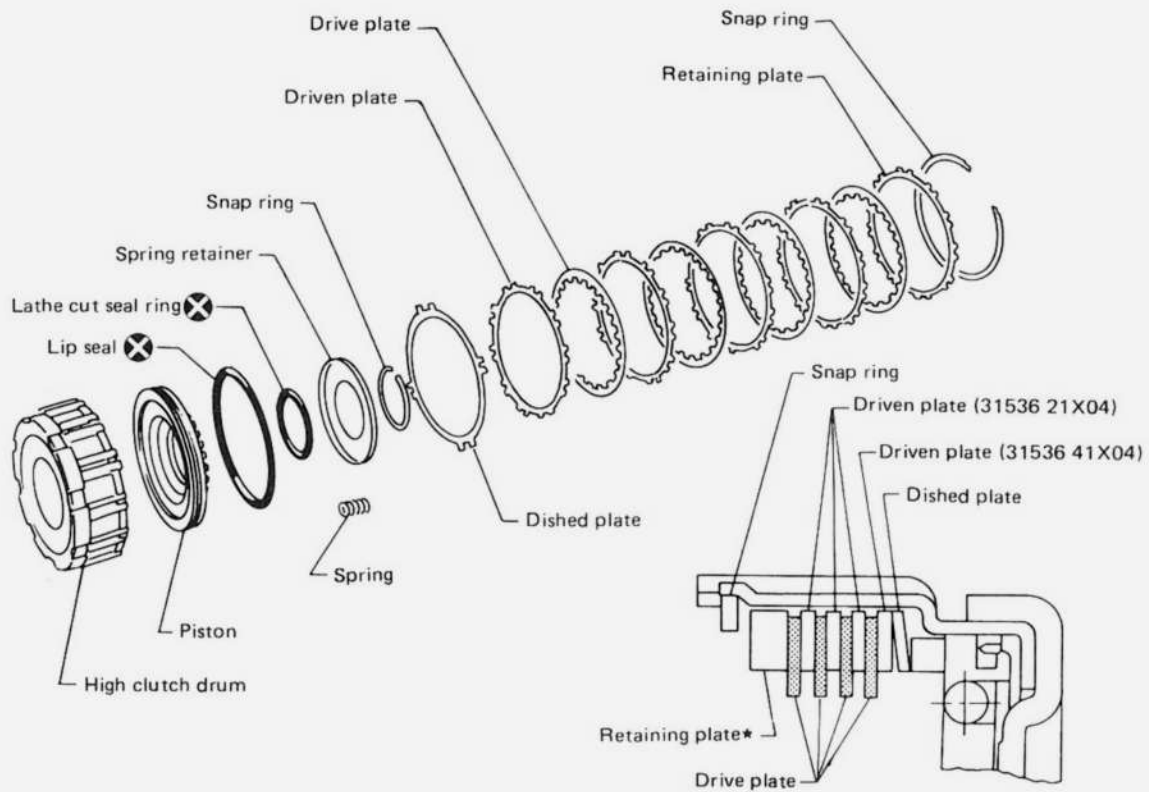


- b. Attach O-ring, and install and tighten timing solenoid firmly.



## High Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

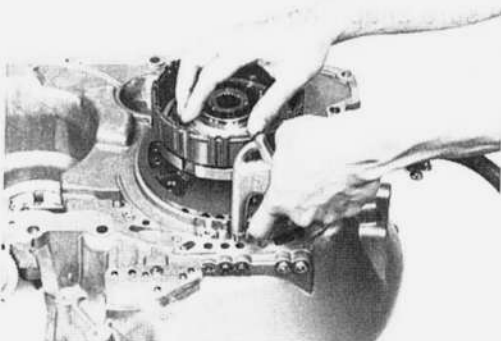
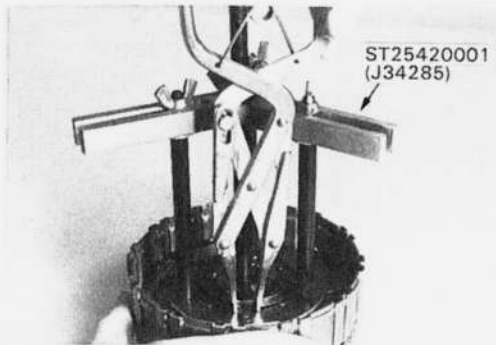


★: Select with proper thickness.

SAT211C

### DISASSEMBLY

- Compress clutch springs and remove snap ring from spring retainer.
- Place clutch drum onto oil pump, and withdraw clutch piston with compressed air.



### High Clutch (Cont'd)

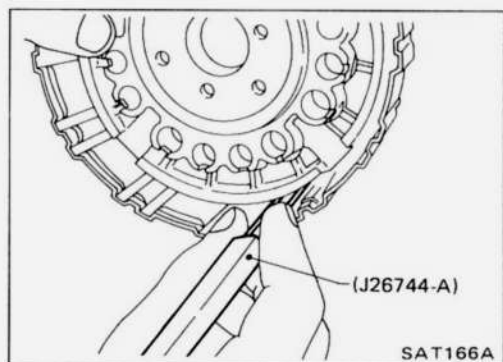
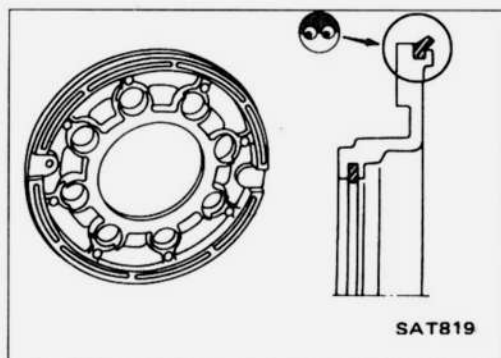
#### INSPECTION AND ASSEMBLY

1. Check clutch drive plate facing for wear or damage.

**Standard drive plate thickness:**

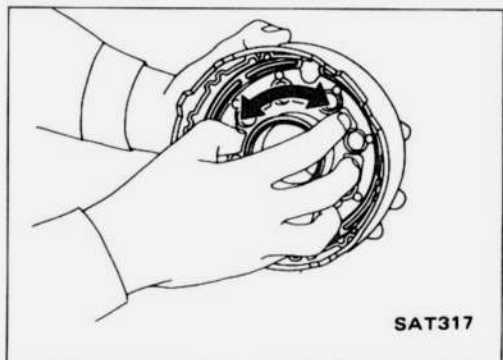
**1.6 mm (0.063 in)**

2. Check for wear on snap ring, weak or broken coil springs, and warped spring retainer.
  3. Lubricate clutch drum bushing, and install inner seal and piston seal as illustrated. Be careful not to stretch seals during installation.
- Never assemble clutch dry; always lubricate its components thoroughly.
  - Always install piston seal in direction shown in figure at left.

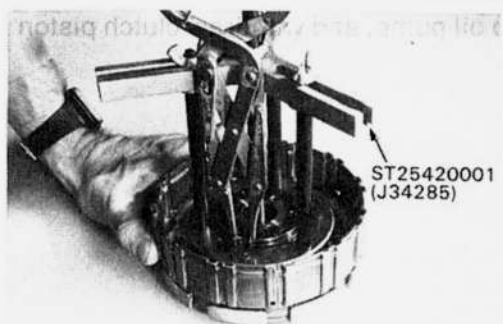


4. Assemble piston, being careful not to allow seal to kink or become damaged during installation.

**Use Tool, which does not damage lip seal, to make sure the lip seal goes into place.**



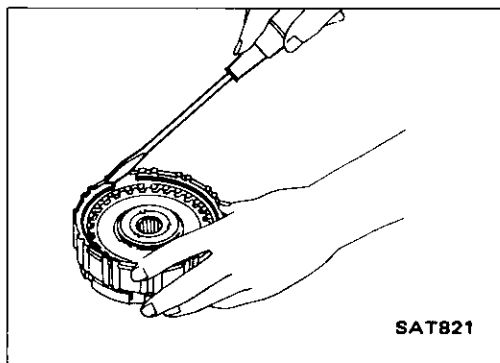
- After installing piston, turn piston by hand to ensure that there is no binding.



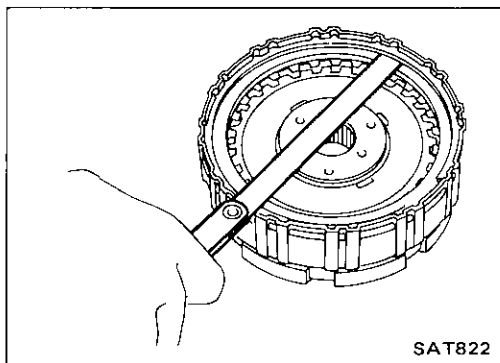
5. Install clutch springs.
6. Reinstall snap ring. Be sure snap ring is properly seated.

## REPAIR FOR COMPONENT PARTS

### High Clutch (Cont'd)



7. Install driven plates, drive plates, and secure with snap ring.



8. Measure clearance between retaining plate and snap ring. Always measure the existing minimum clearance, since snap ring is a wave type.

**Specified clearance:**

**Standard**

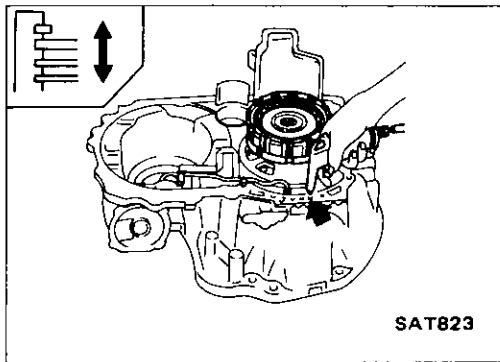
1.4 - 1.8 mm (0.055 - 0.071 in)

**Allowable limit**

2.6 mm (0.102 in)

**Available retaining plates:**

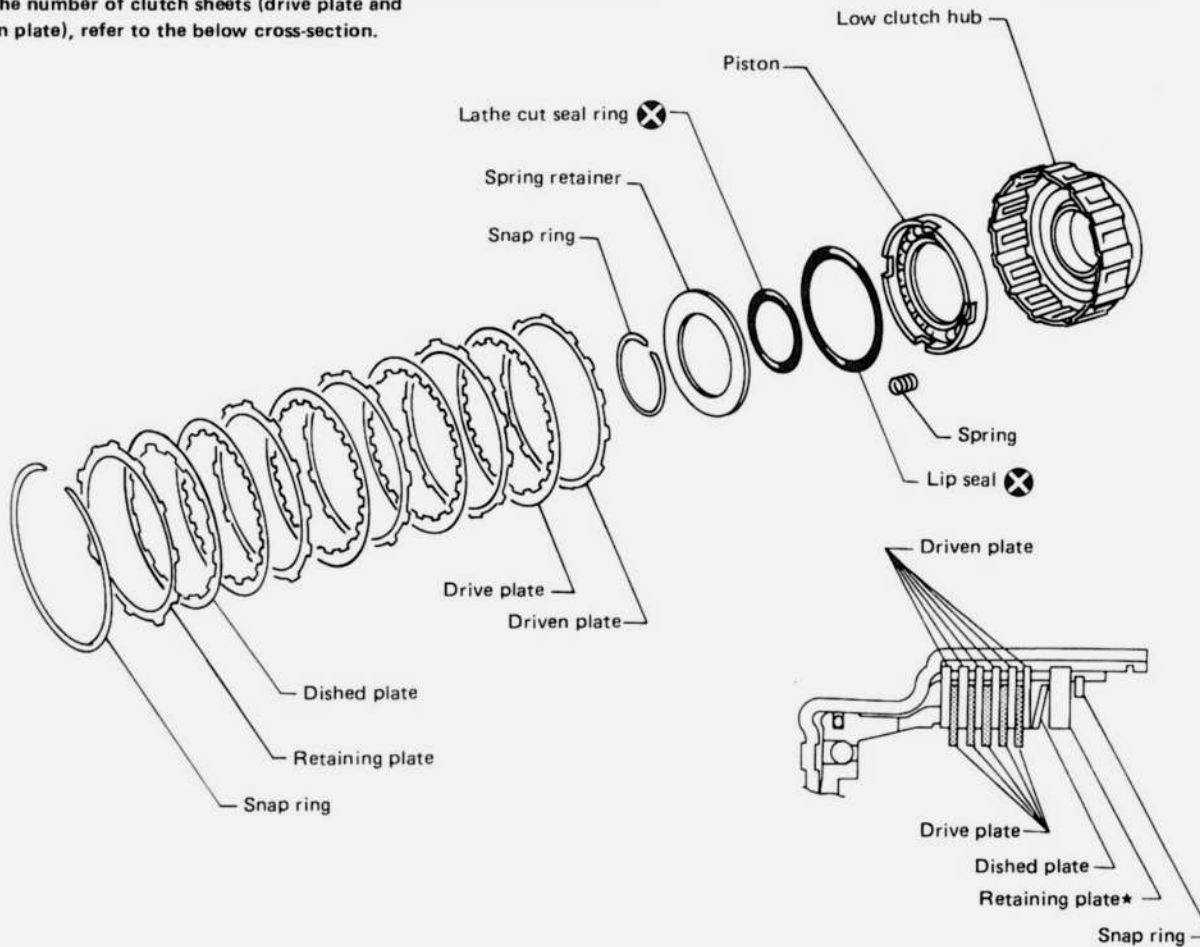
Refer to S.D.S.



9. Check high clutch operation using compressed air.

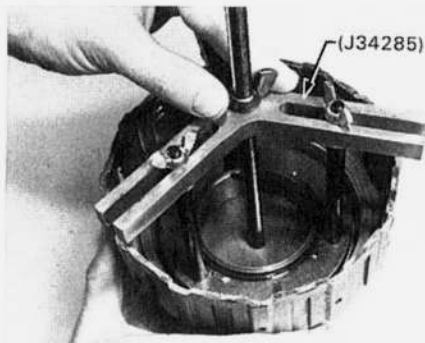
## Low Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

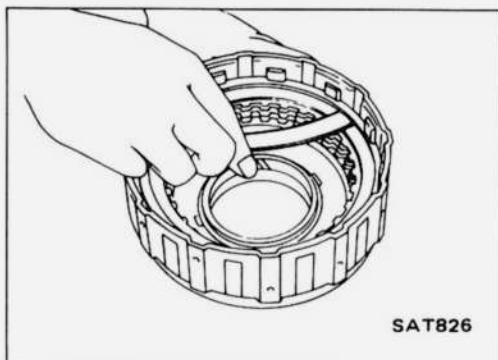


★: Select with proper thickness.

SAT212C



- Use Tool to remove the clutch spring snap ring.



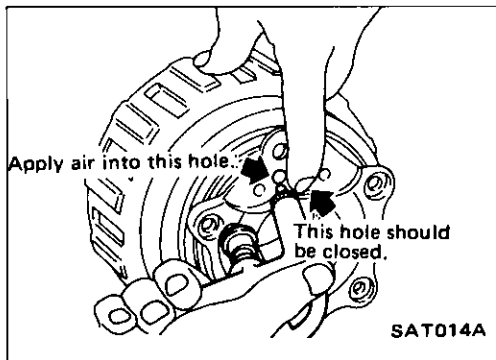
SAT826

- Service procedures for low clutch are essentially the same as those for high clutch, with the following exception:  
**Specified clearance between retaining plate and snap ring:**  
**Standard**  
 0.5 - 0.8 mm (0.020 - 0.031 in)  
**Allowable limit**  
 1.8 mm (0.071 in)  
**Available retaining plates:**  
 Refer to S.D.S.

## REPAIR FOR COMPONENT PARTS

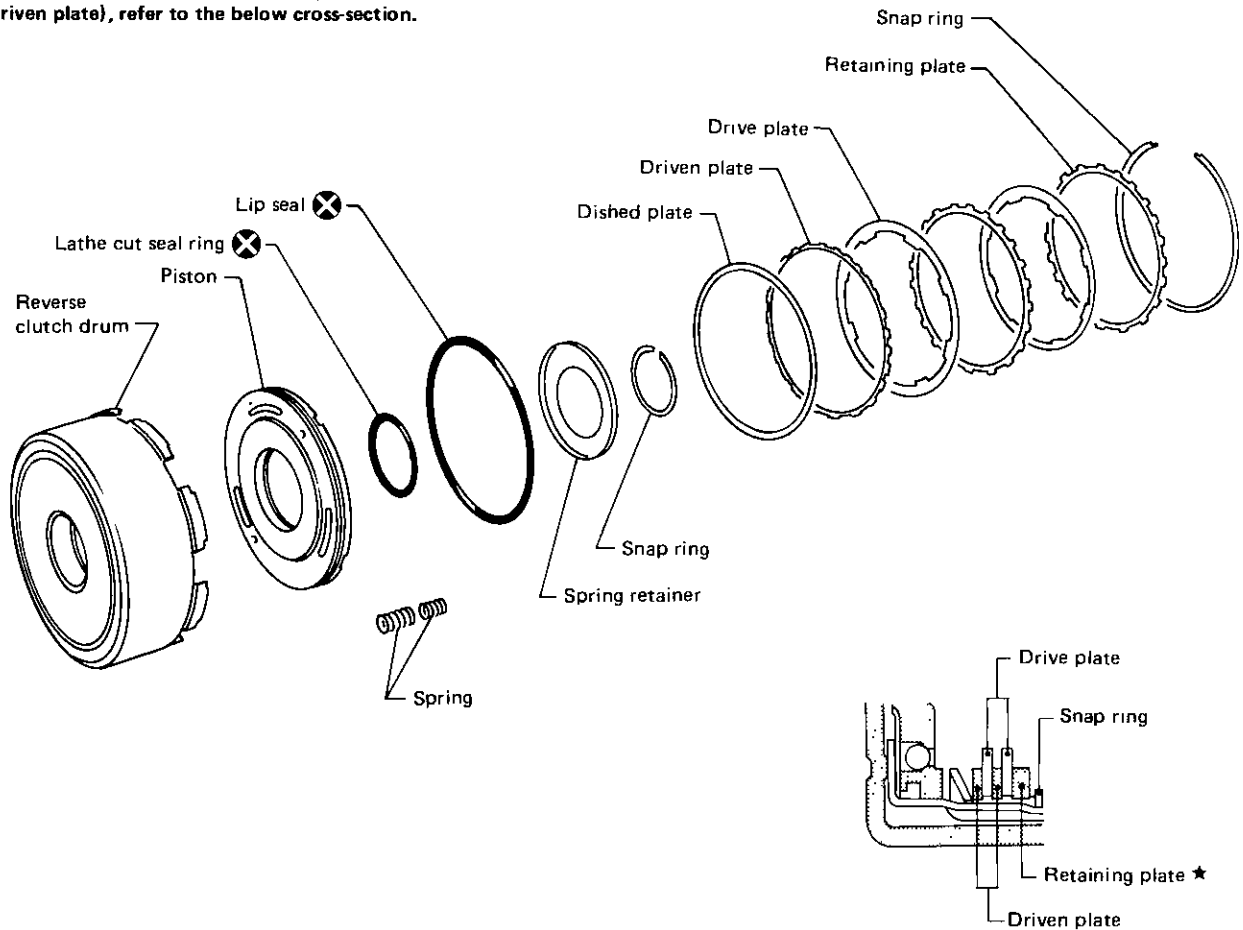
### Low Clutch (Cont'd)

- After assembly, check the operation of clutch.



### Reverse Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



★: Select with proper thickness.

SAT067C



Service procedures for reverse clutch are essentially the same as those for high clutch, with the following exception:

- Remove reverse clutch piston.

## REPAIR FOR COMPONENT PARTS

### Reverse Clutch (Cont'd)

Specified clearance between retaining plate and snap ring:

Standard

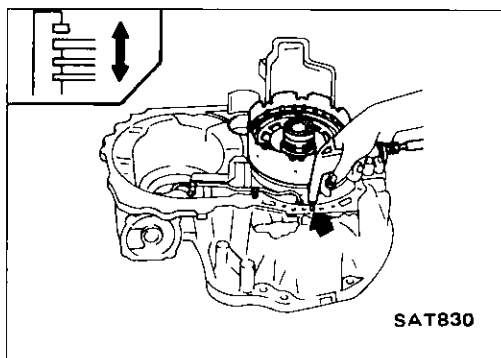
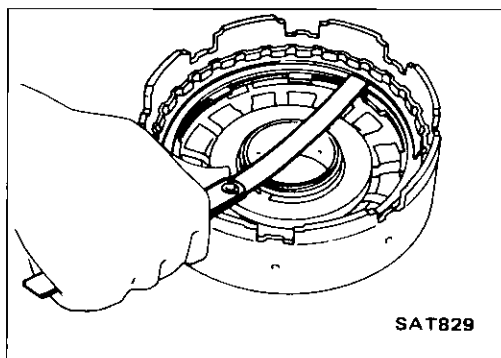
0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.2 mm (0.047 in)

Available retaining plates:

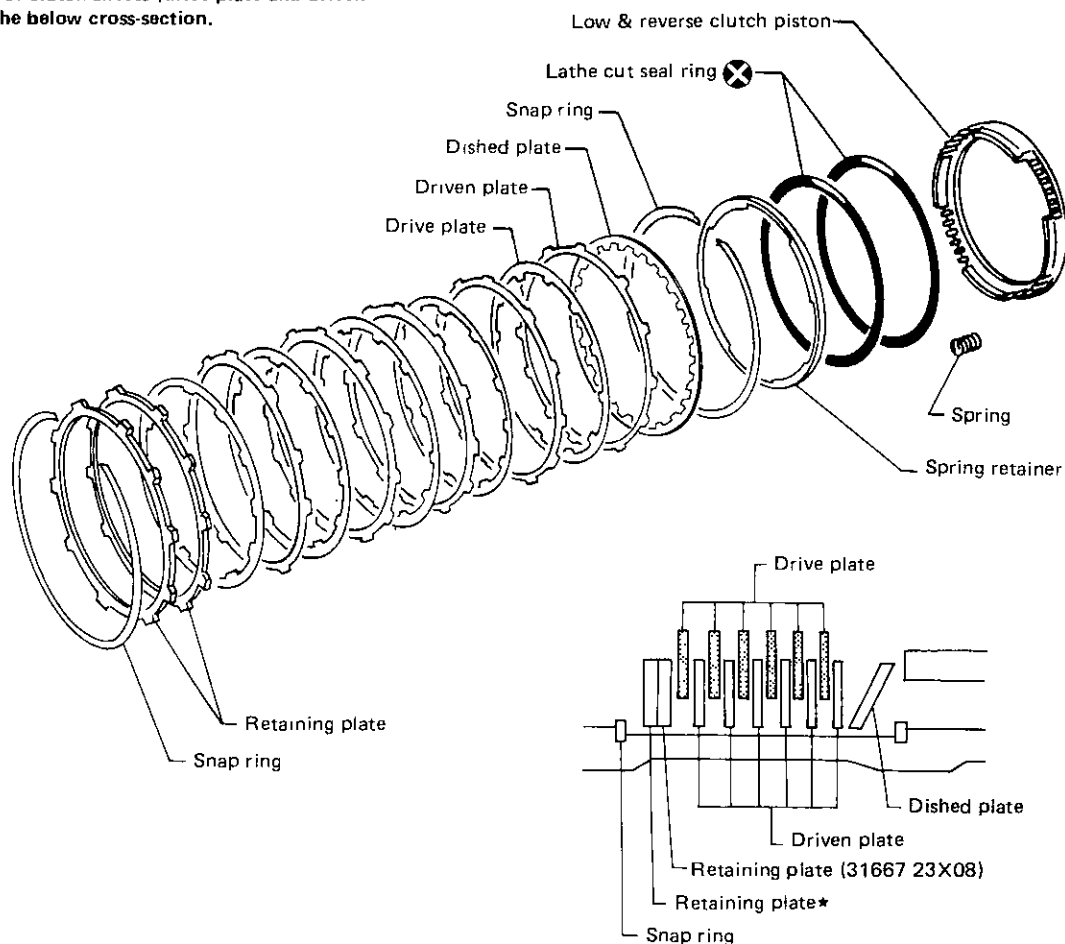
Refer to S.D.S.



- After assembly, check the operation of clutch.

### Low & Reverse Brake

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



\*: Select with proper thickness.

SAT213C

## REPAIR FOR COMPONENT PARTS

### Low & Reverse Brake (Cont'd)

#### INSPECTION

- Examine low and reverse brake for damaged clutch drive plate facing and worn snap ring.
- Check drive plate facing for wear or damage; if necessary, replace.

**Specified clearance between retaining plate and snap ring:**

**Standard**

**1.2 - 1.6 mm (0.047 - 0.063 in)**

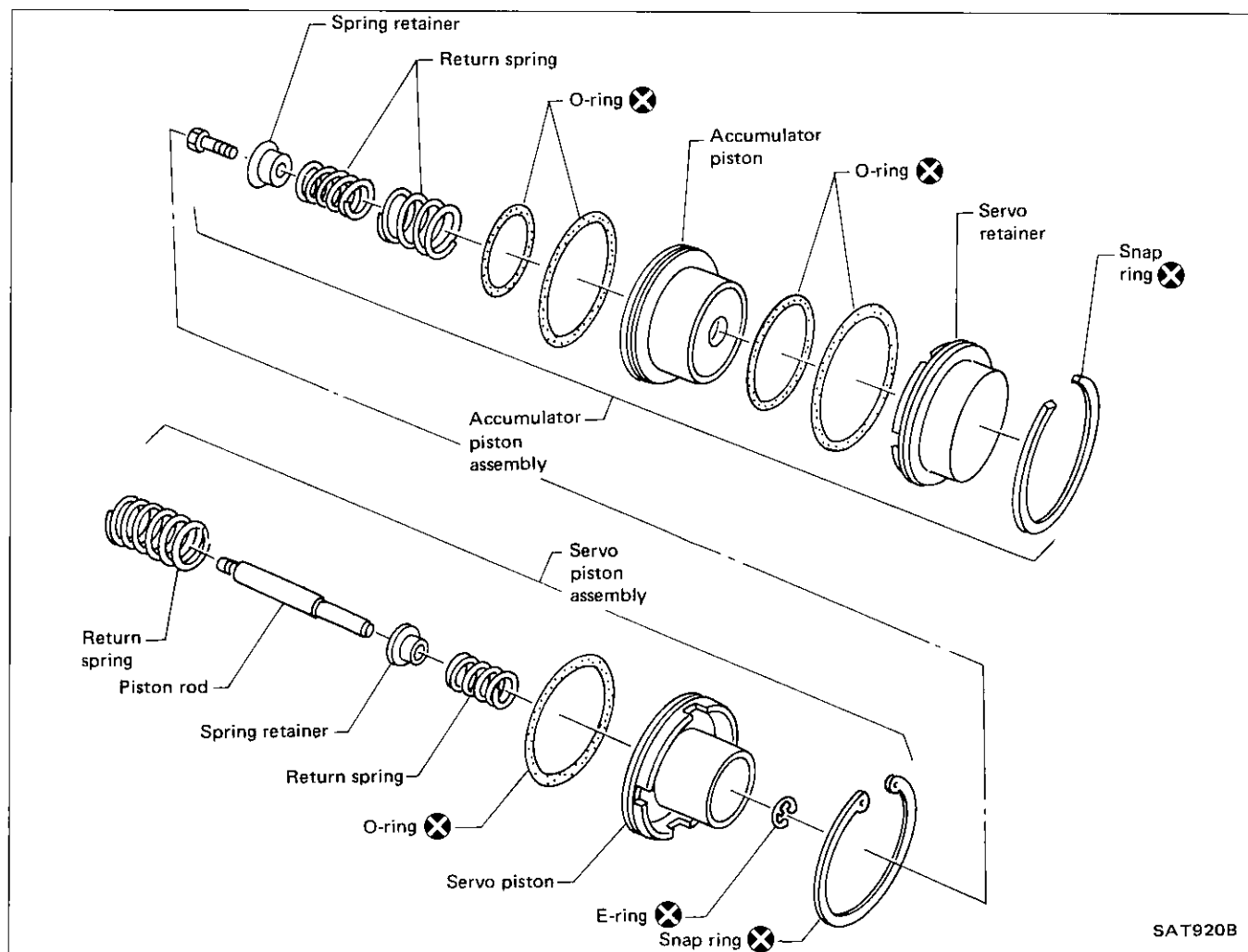
**Allowable limit**

**2.8 mm (0.110 in)**

**Available retaining plates:**

**Refer to S.D.S.**

### Brake Band and Band Servo

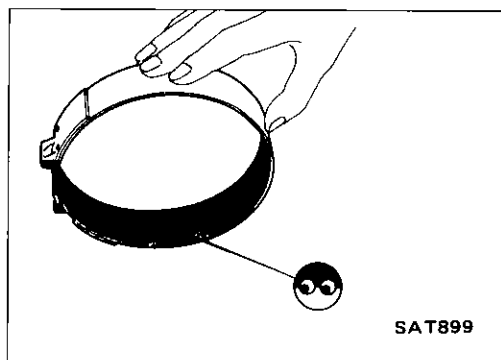


## REPAIR FOR COMPONENT PARTS

### Brake Band and Band Servo (Cont'd)

#### INSPECTION

- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.
- Check band servo components for wear and scoring.



### Planetary Carrier

#### INSPECTION

- Check clearance between pinion washer and planetary carrier with a feeler gauge.

**Standard clearance:**

**Front carrier**

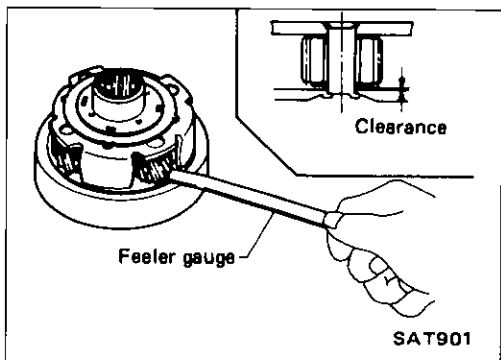
0.15 - 0.70 mm (0.0059 - 0.0276 in)

**Rear carrier**

0.20 - 0.70 mm (0.0079 - 0.0276 in)

Replace if the clearance exceeds 0.80 mm (0.0315 in).

- Check planetary gear sets and bearings for damaged or worn gears.



### Bearing Retainer and Output Shaft

#### INSPECTION

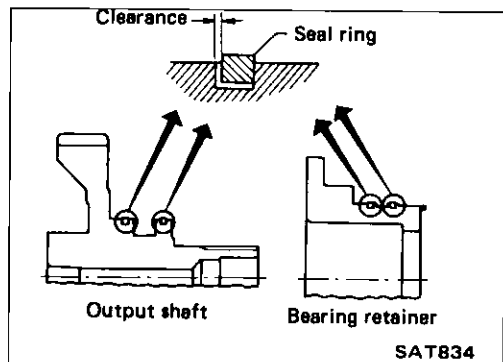
Measure clearance between seal ring and ring groove.

**Standard clearance:**

0.10 - 0.25 mm (0.0039 - 0.0098 in)

**Wear limit:**

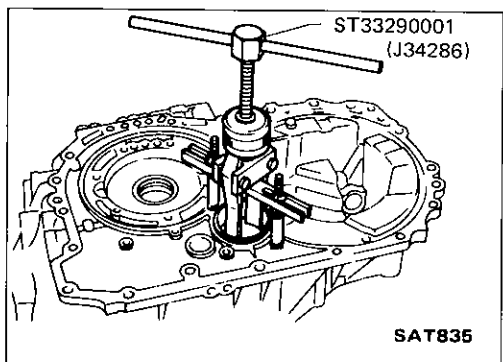
0.25 mm (0.0098 in)



### Converter Housing and Transmission Case

#### BEARING OUTER RACE

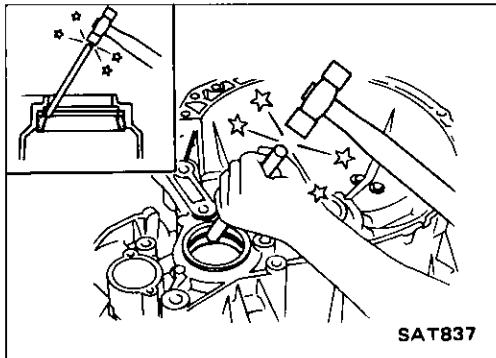
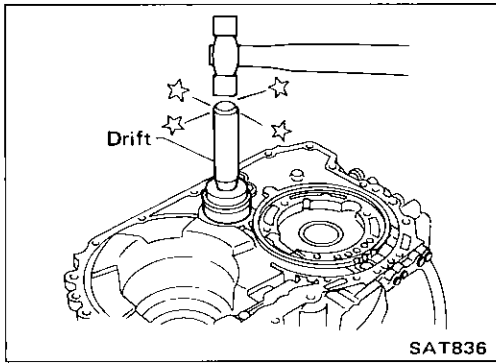
- Reduction pinion gear front bearing outer race.



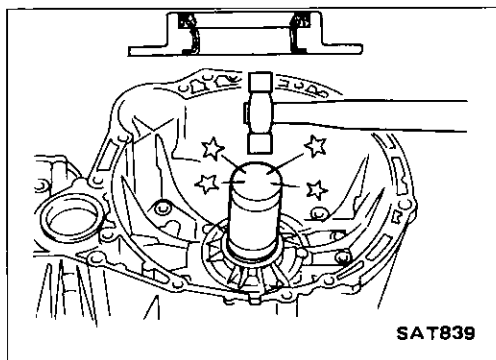
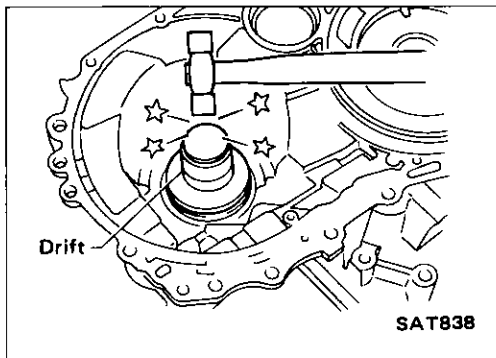


## REPAIR FOR COMPONENT PARTS

### Converter Housing and Transmission Case (Cont'd)

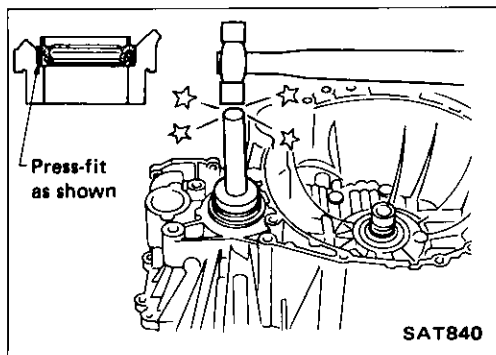


- Differential side bearing outer race



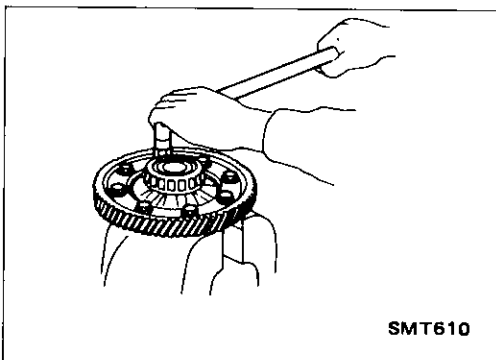
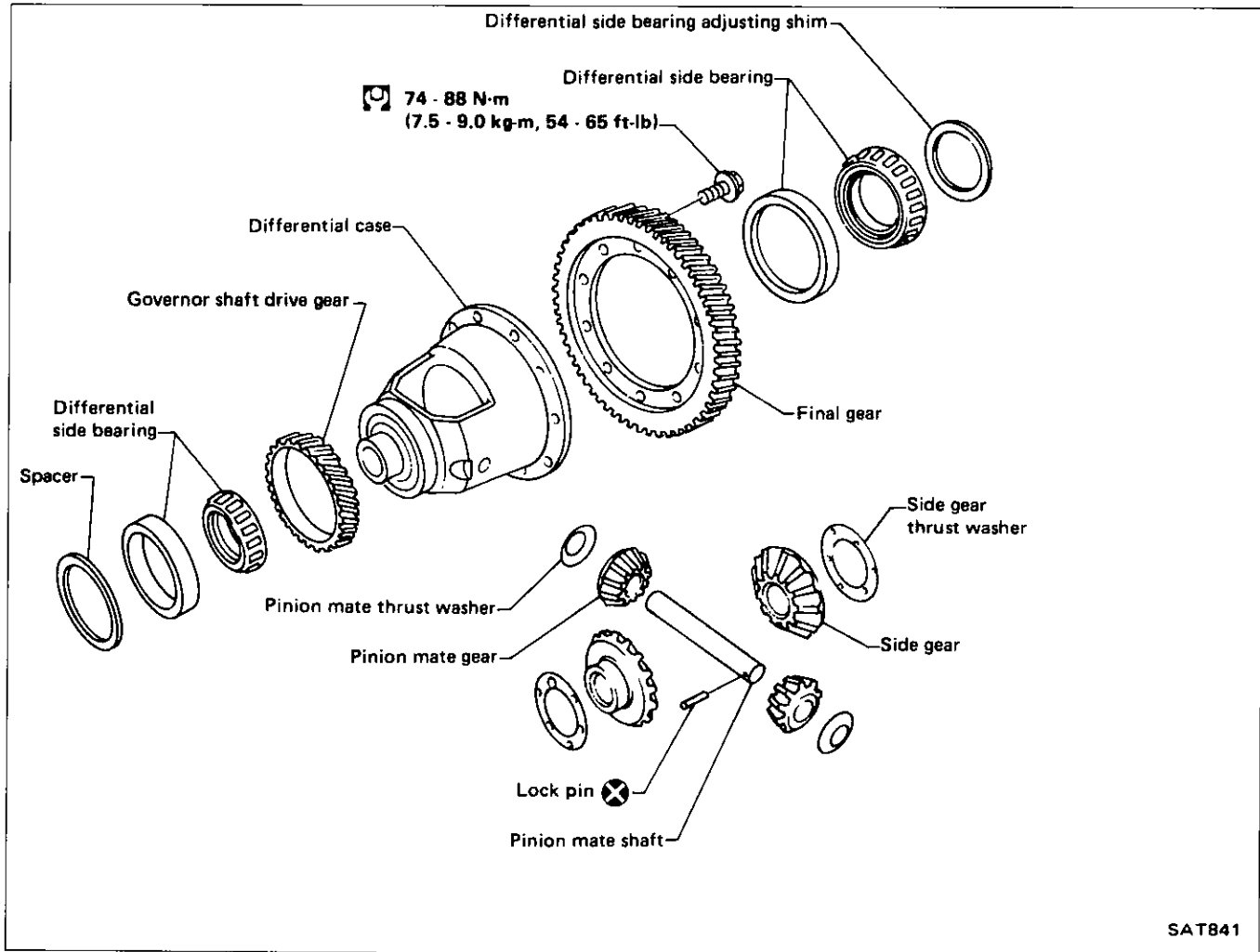
#### OIL SEAL

- Torque converter oil seal



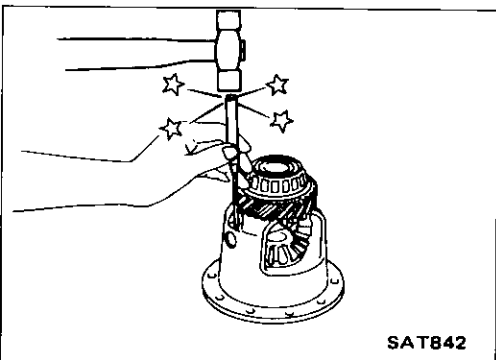
- Differential side oil seal

## Final Drive (Without viscous coupling)



### DISASSEMBLY

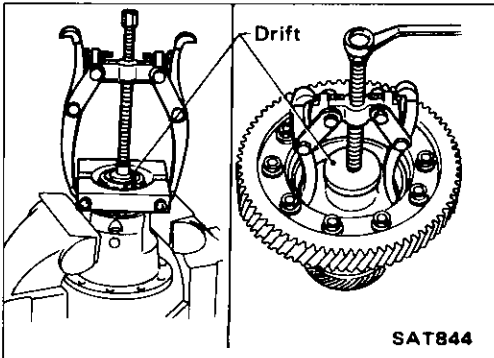
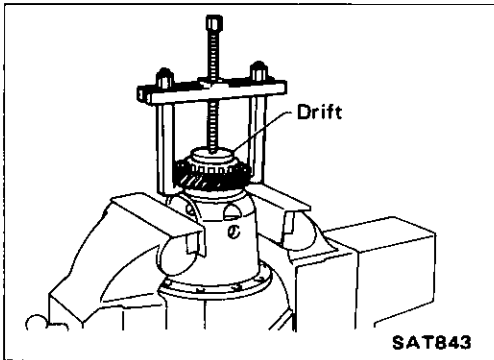
1. Remove final gear.



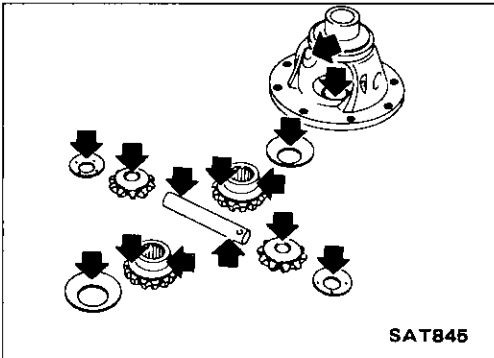
## REPAIR FOR COMPONENT PARTS

### Final Drive (Without viscous coupling) (Cont'd)

3. Remove governor shaft drive gear.

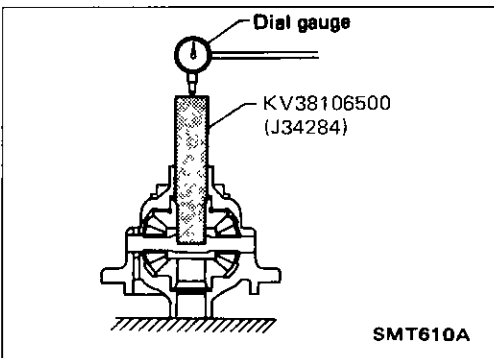


4. Drive out differential side bearing outer race and inner cone.

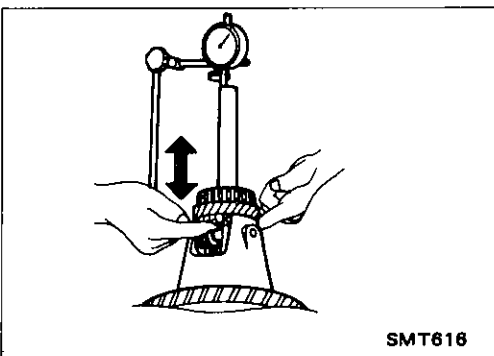


### INSPECTION

1. Check mating surface of differential case, side gears and pinion mate gears. Replace as required.



2. Check clearance between side gear and differential case with washer following the procedure below.
  - a. Set Tool and dial gauge on side gear.



- b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.

**Clearance between side gear and differential case with washer:**

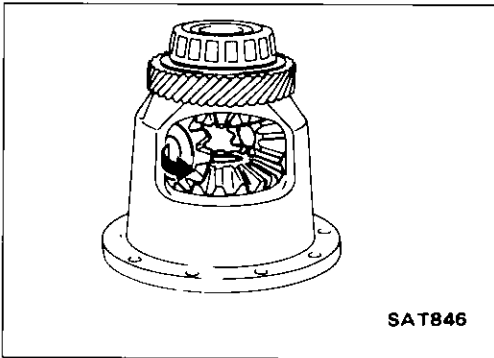
**0.1 - 0.2 mm (0.004 - 0.008 in)**

- c. If clearance exceeds the specified value, check for wear and replace necessary parts.
3. Check tapered roller bearings for wear, scratches, pitching or flaking.

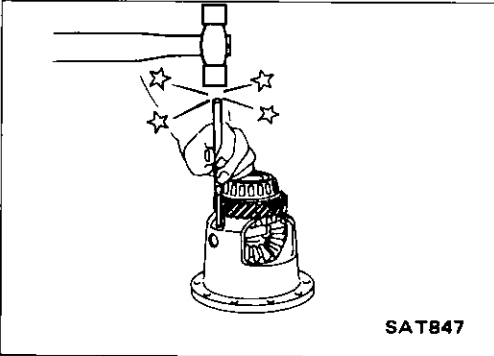
## REPAIR FOR COMPONENT PARTS

### Final Drive (Without viscous coupling) (Cont'd)

#### ASSEMBLY



1. Install the side gear and thrust washer in the differential case.
2. Install the pinion mate gear and thrust washer in the differential case while rotating them.



3. Insert pinion mate shaft.

**When inserting, be careful not to damage pinion mate washers.**

4. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.

**Side gear to pinion mate clearance:**

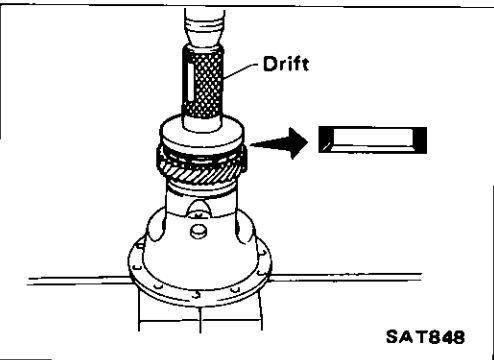
**0.1 - 0.2 mm (0.004 - 0.008 in)**

**Side gear thrust washer:**

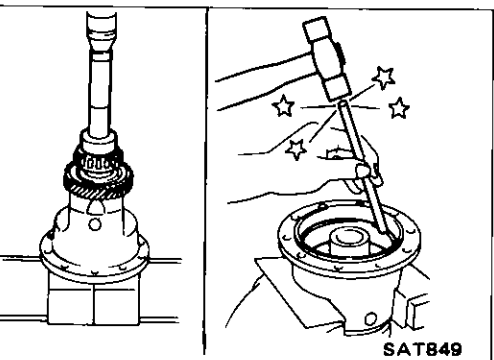
**Refer to S.D.S.**

5. Install pinion mate shaft lock pin using a punch.

**Make sure that lock pin is flush with case.**

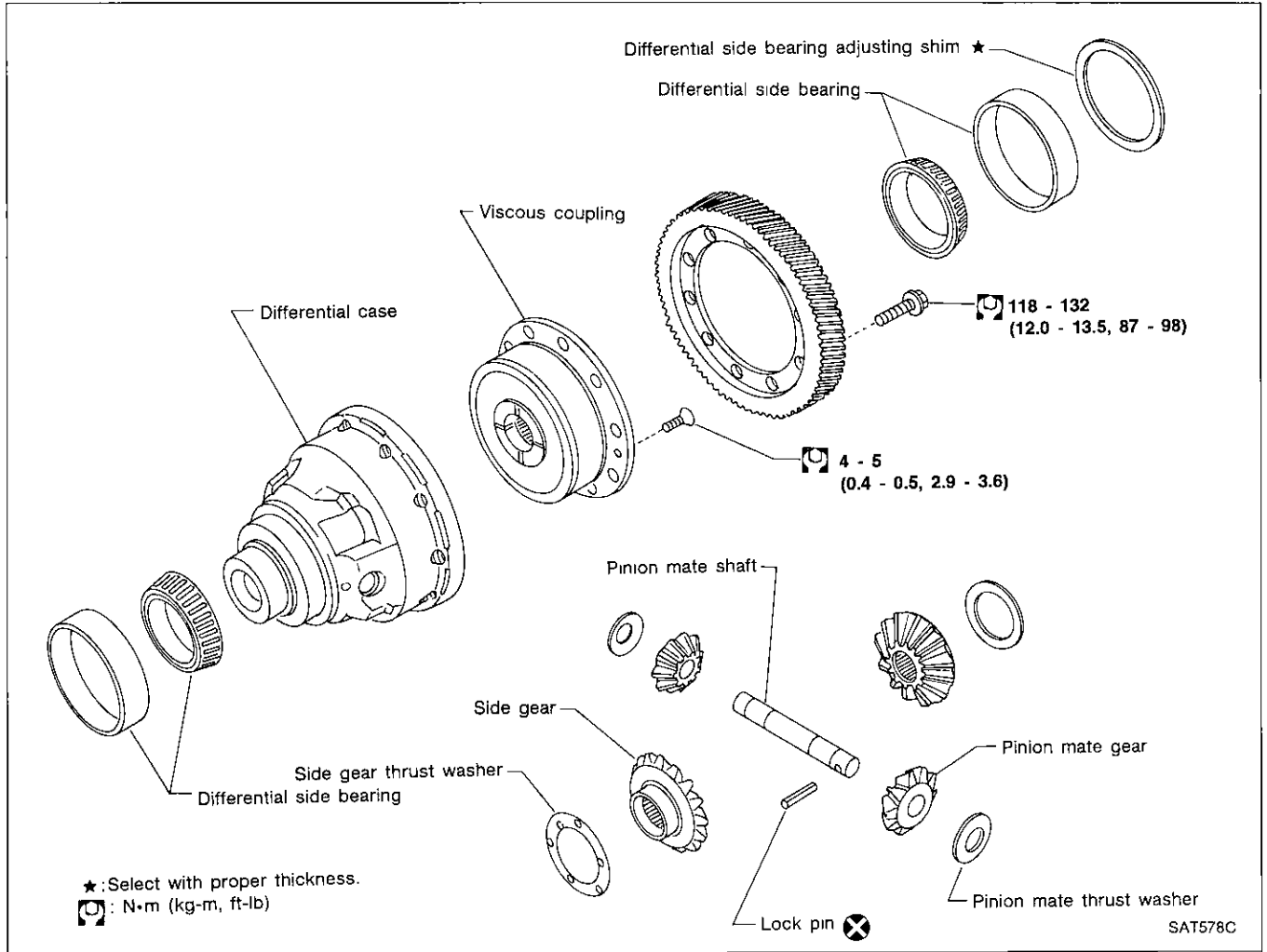


6. Install governor shaft drive gear.



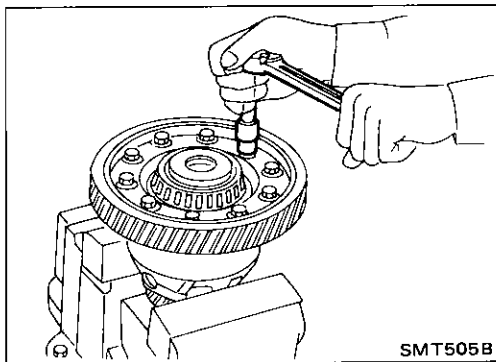
7. Press on differential side bearing inner cone and outer race.
8. Install final gear.

## Final Drive (With viscous coupling)

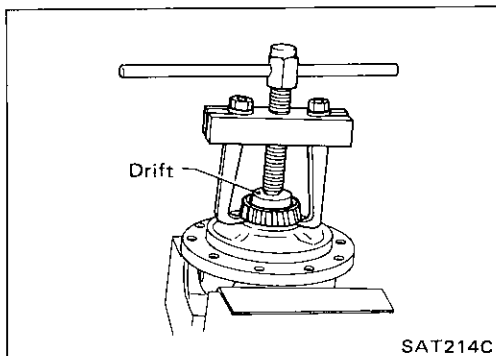


### DISASSEMBLY

1. Remove final gear.



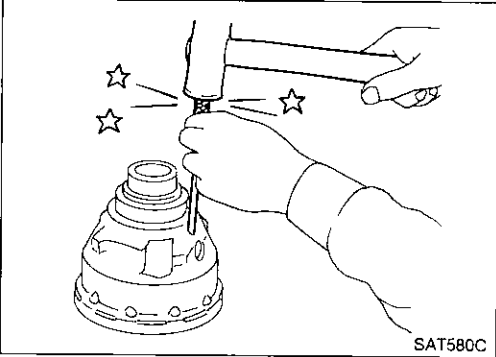
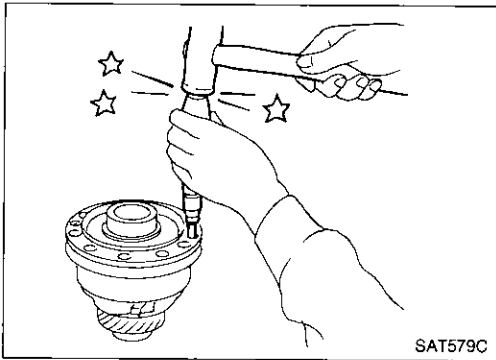
2. Remove differential side bearings.



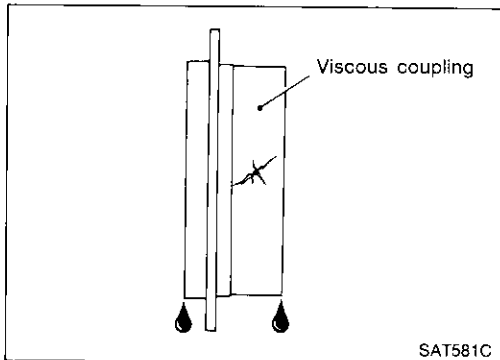
## REPAIR FOR COMPONENT PARTS

### Final Drive (With viscous coupling) (Cont'd)

3. Remove viscous coupling.

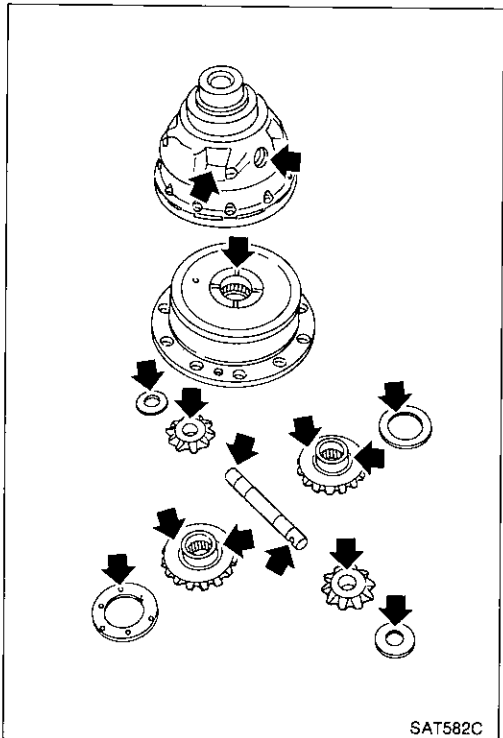


4. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.



### INSPECTION

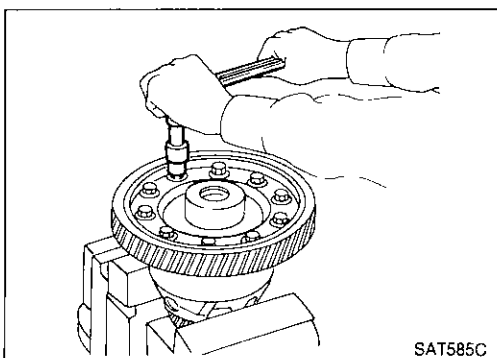
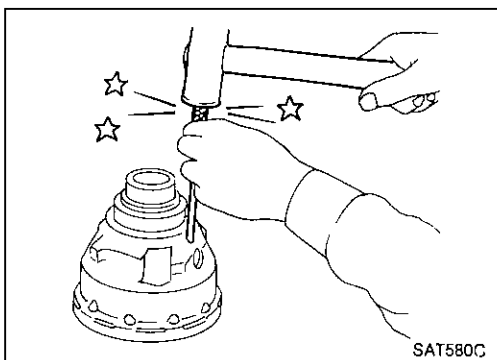
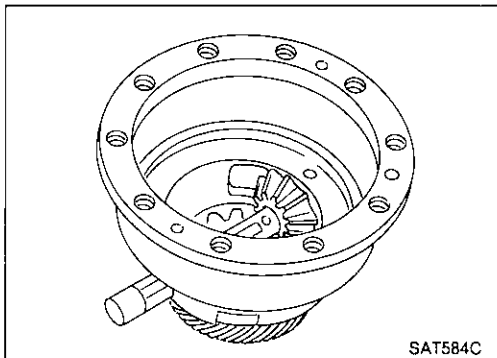
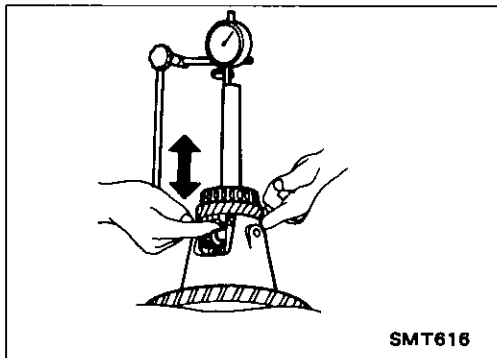
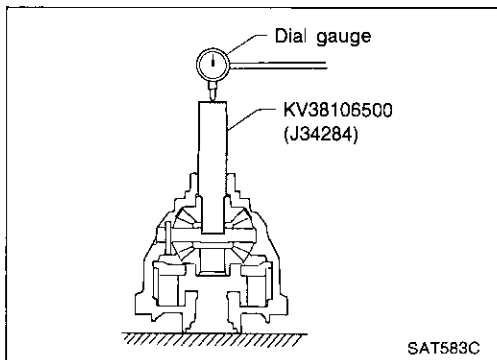
1. Check viscous coupling case for cracks and silicone oil leakage.



2. Check mating surface of differential case, side gears and pinion mate gears. Replace as required.

## REPAIR FOR COMPONENT PARTS

### Final Drive (With viscous coupling) (Cont'd)



3. Check clearance between side gear and differential case with washer following the procedure below.
  - a. Set Tool and dial gauge on side gear.

- b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.

**Clearance between side gear and differential case with washer:**

**0.1 - 0.2 mm (0.004 - 0.008 in)**

- c. If clearance exceeds the specified value, check for wear and replace necessary parts.
  4. Check tapered roller bearings for wear, scratches, pitching or flaking.

### ASSEMBLY

1. Install the side gear and thrust washer in the differential case.
2. Install the pinion mate gear and thrust washer in the differential case while rotating them.
3. Insert pinion mate shaft.

**When inserting, be careful not to damage pinion mate washers.**

4. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.

**Side gear to pinion mate clearance:**

**0.1 - 0.2 mm (0.004 - 0.008 in)**

**Side gear thrust washer:**

**Refer to S.D.S.**

5. Install pinion mate shaft lock pin using a punch.

**Make sure that lock pin is flush with case.**

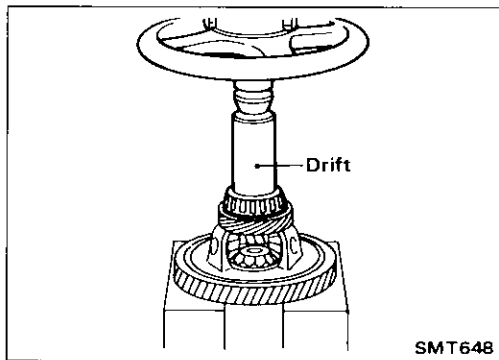
6. Install viscous coupling and final gear.

## REPAIR FOR COMPONENT PARTS

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### Final Drive (With viscous coupling) (Cont'd)

7. Press on differential side bearings.

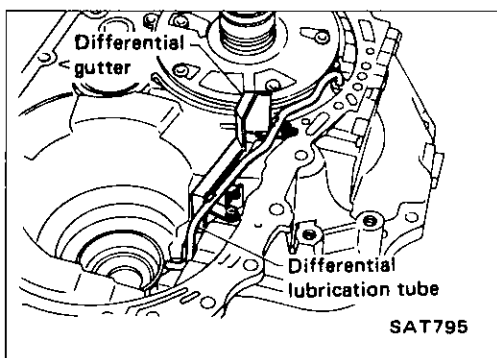




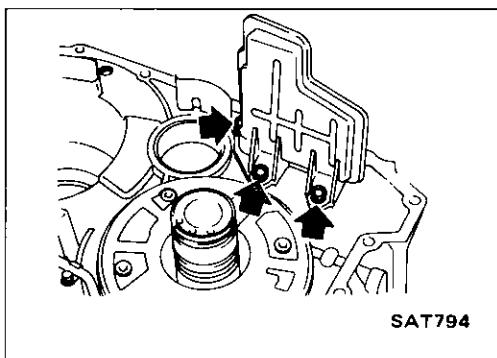


**When installing, apply vaseline to parts with “\*” so that they will not drop off.**

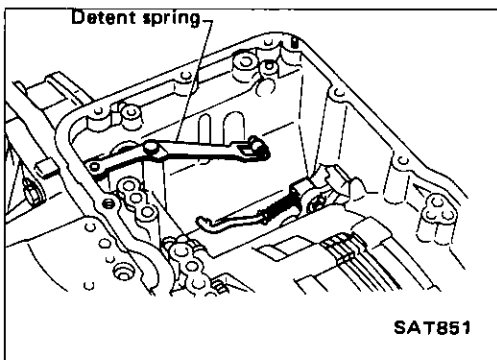
## ASSEMBLY



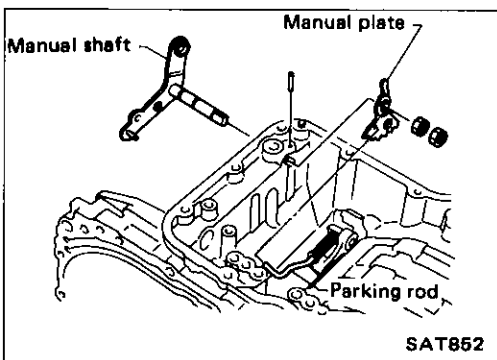
1. Install differential lubrication tube and differential gutter to converter housing.



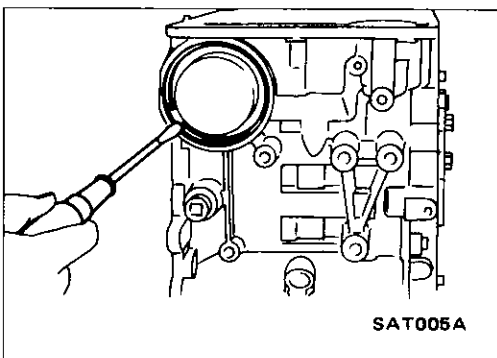
2. Install oil strainer.



3. Install detent spring assembly.

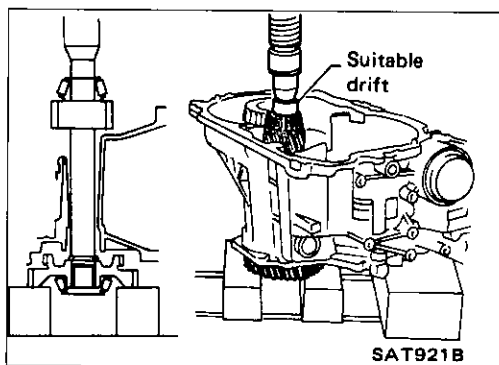


4. Pass parking rod into the hole in the manual plate and then install manual plate on manual shaft.

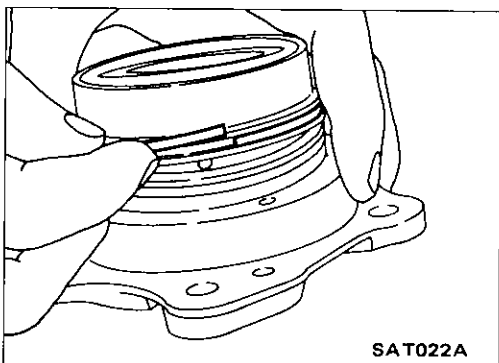


5. Install band brake servo, retainer and return spring and secure with snap ring.

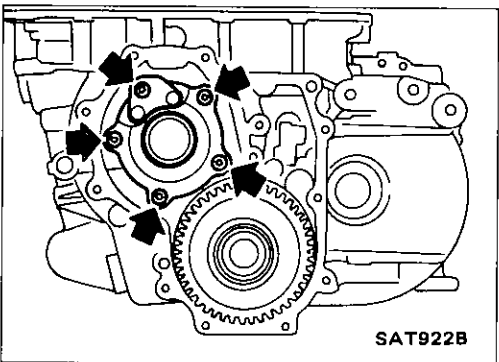
## ASSEMBLY



6. Install reduction gear.
  - a. Position reduction gear in transmission case so that it meshes with idler gear.
  - b. Press reduction gear into place using a drift, and install idler gear.



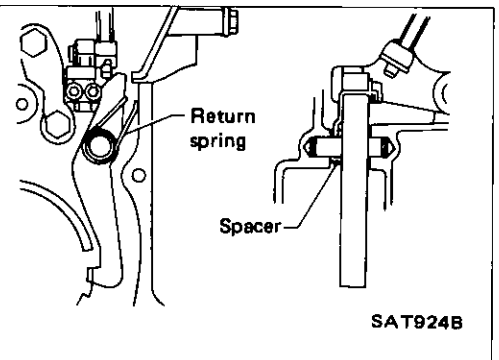
7. Install bearing retainer assembly.
  - a. Install seal rings onto bearing retainer with great care. Clean the grooves and liberally apply petroleum jelly to hold the rings in place. Otherwise, they could be cut or deformed when the low clutch and carrier assembly are installed.



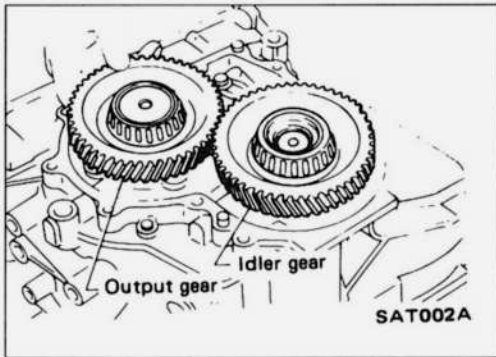
- b. Install bearing retainer assembly.



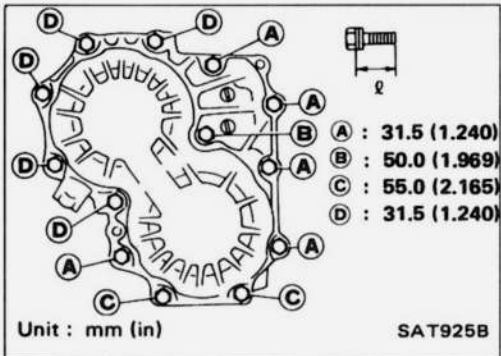
8. Install parking pawl and parking shaft.



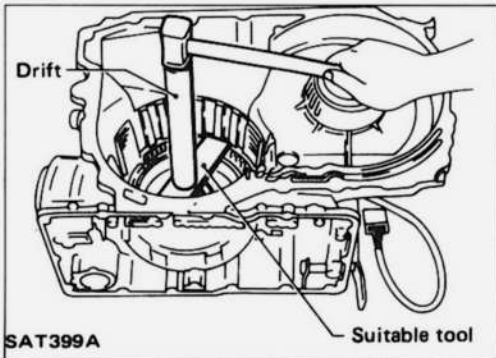
9. Install spacer and return spring.



10. Install output gear.



11. Temporarily install side cover and gasket.



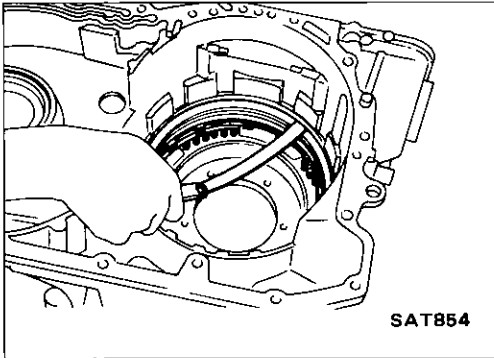
12. Lubricate low and reverse brake piston seal, then install piston by tapping it evenly with Tool.



13. Install low and reverse brake retainer, and secure with snap ring.

14. Install low and reverse brake driven & drive plates and retaining plate, then secure with snap ring.

## ASSEMBLY



15. After low and reverse brake has been completely assembled, measure clearance between snap ring and retainer plate. If measurement exceeds specifications, it can be adjusted by replacing retainer plate with one of a different thickness.

**Low and reverse brake clearance:**

**Standard**

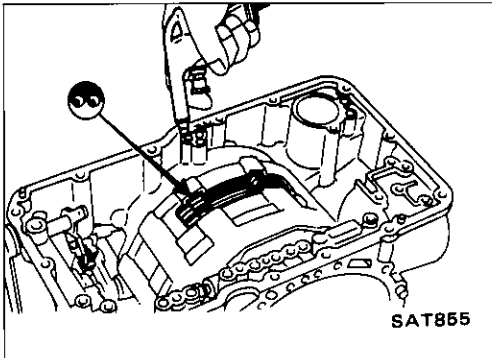
1.2 - 1.6 mm (0.047 - 0.063 in)

**Allowable limit**

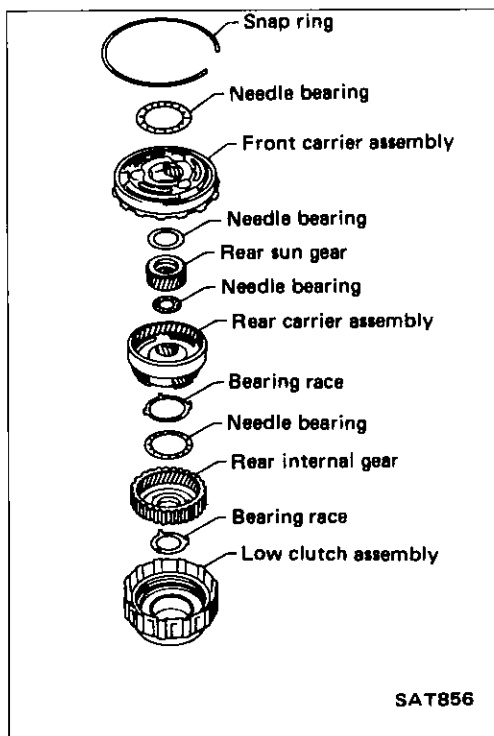
3.0 mm (0.118 in)

**Retaining plate of low & reverse brake:**

Refer to S.D.S.

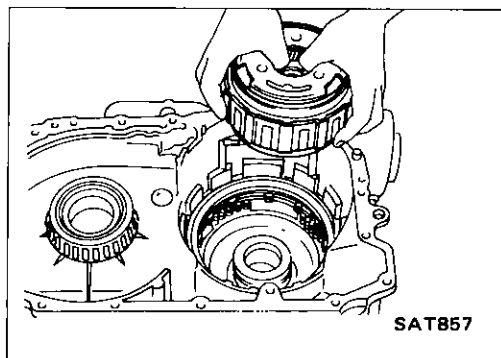


- Check low & reverse brake operation using air.

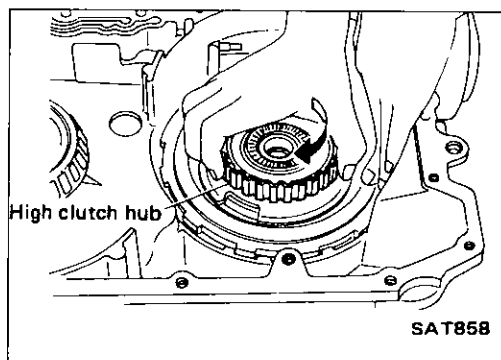


16. Assemble front carrier, rear carrier and low clutch.

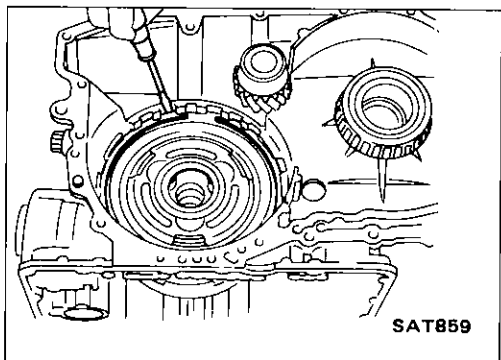
## ASSEMBLY



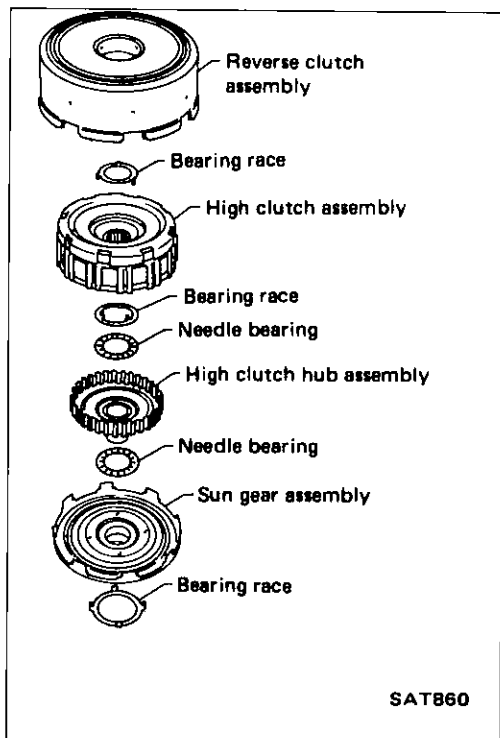
17. Install carrier set.



18. Install one-way clutch assembly while rotating front carrier with high clutch hub.

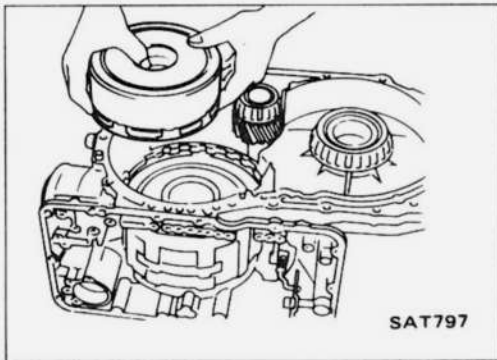


19. Remove high clutch hub, and install clutch snap ring.

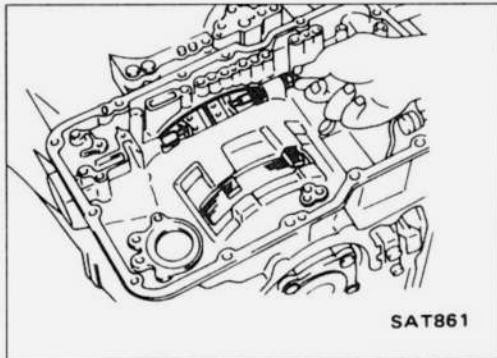


20. Assemble reverse clutch and high clutch.

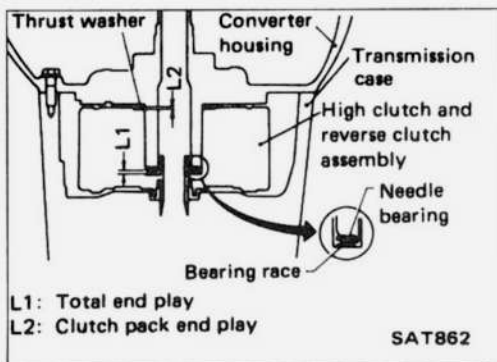
## ASSEMBLY



21. Install reverse and high clutch as a pack.



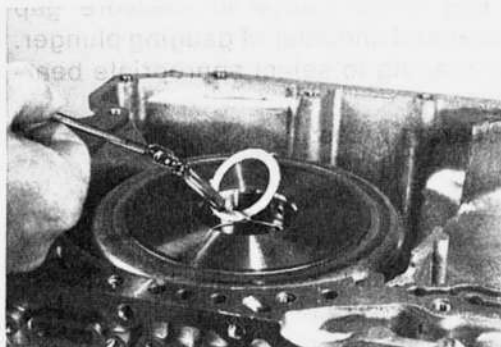
22. Install brake band and anchor pin. Temporarily tighten anchor bolt by hand.



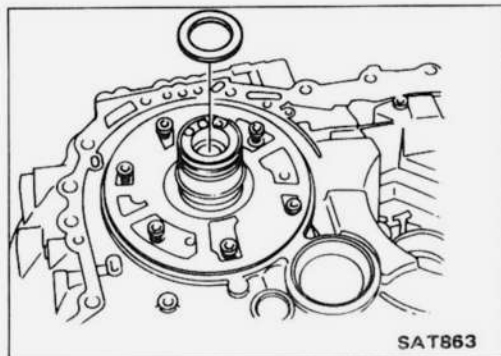
23. Adjust total end play and clutch pack end play as follows:

### — Total end play —

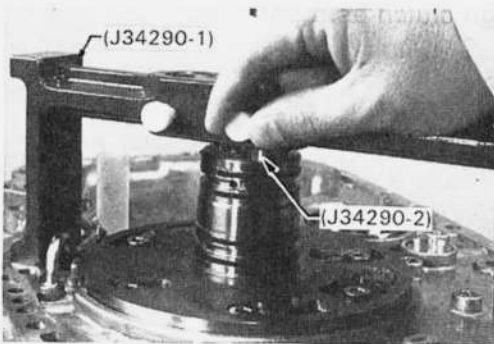
a. Remove thrust bearing race from high clutch drum.



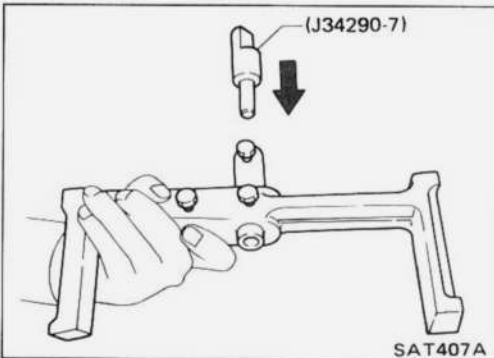
b. Install needle bearing on top of oil pump cover.



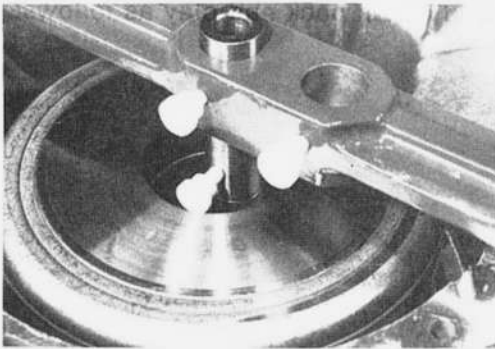
## ASSEMBLY



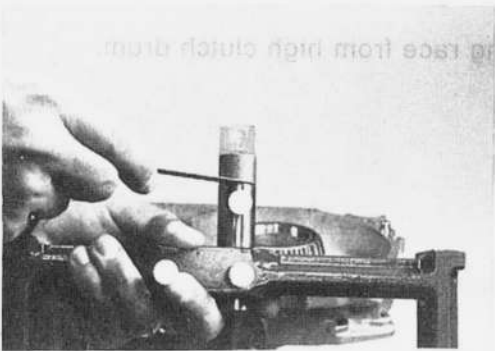
- c. Place Tools (bridge and gauging cylinder) on machined gasket surface of converter housing. Allow gauging cylinder to rest on needle bearing and lock it in place with thumbscrew.



- d. Insert Tool (total end play gauging plunger) into gauging cylinder.



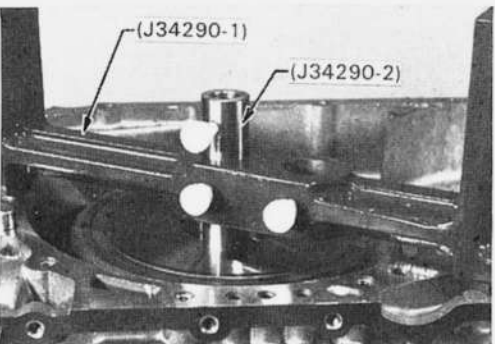
- e. Place bridge, legs up, onto machined gasket surface of transaxle case, allowing gauging plunger to rest on surface where bearing race was removed. Lock plunger in place.



- f. Remove bridge and use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.  
g. Use your feeler gauge reading to select appropriate bearing race thickness.

**Oil pump housing bearing races:**

**Refer to S.D.S.**

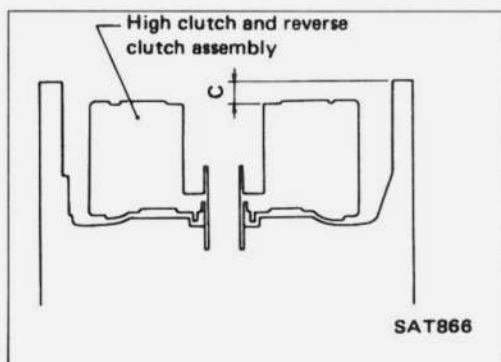


### — Clutch pack end play —

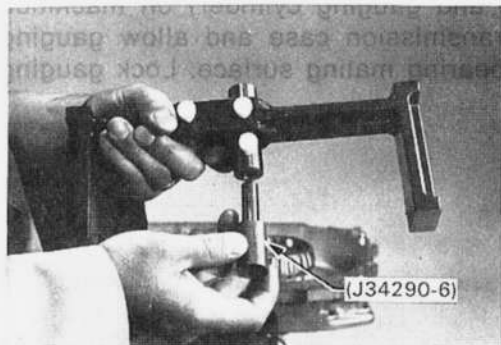
- a. Place Tools (bridge and gauging cylinder) onto machined gasket surface of transaxle case and allow cylinder to rest on high clutch drum. Lock cylinder into place.



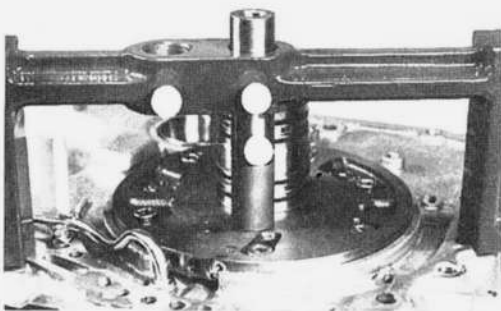
## ASSEMBLY



- You are now measuring dimension "C".



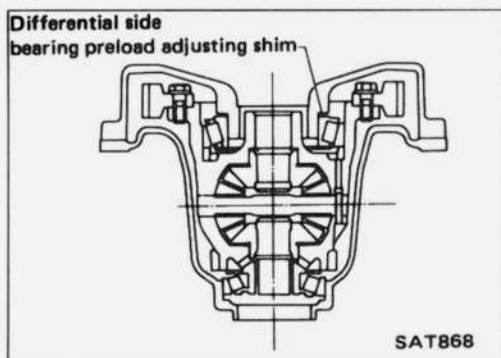
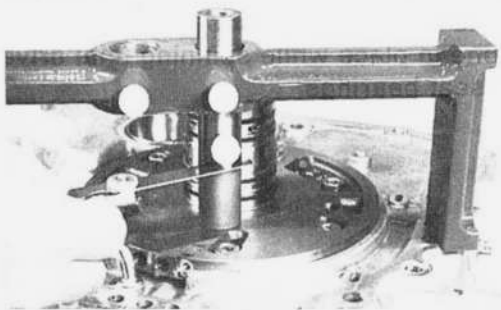
- Now, insert Tool (clutch pack gauging plunger) into gauging cylinder.



- Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing. Make sure thrust washer is removed. Lock gauging plunger in place.
- Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
- Use your feeler gauge measurement to select correct washer thickness to give proper clutch pack end play.

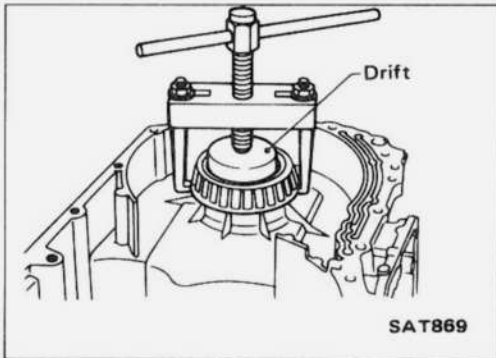
**Clutch pack thrust washers:**

**Refer to S.D.S.**



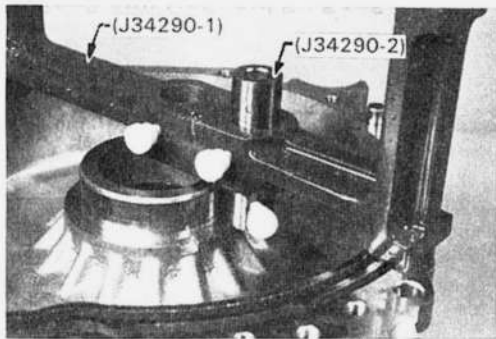
- Adjust differential side bearing preload as follows:

## ASSEMBLY

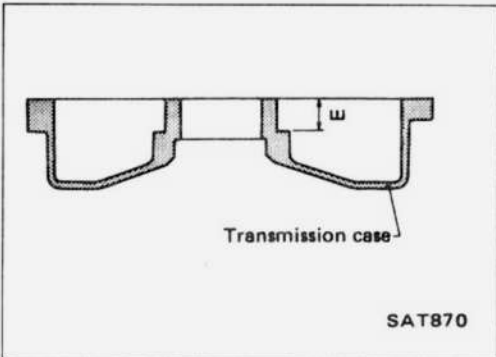


— Without viscous coupling —

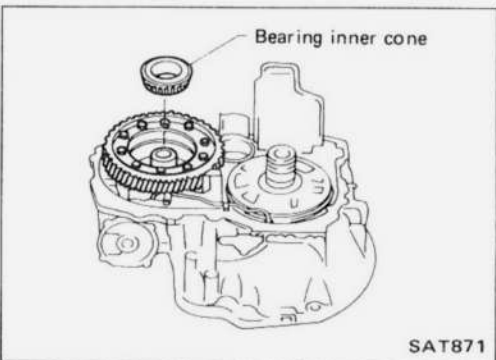
- a. Remove left side bearing inner cone from transmission case.



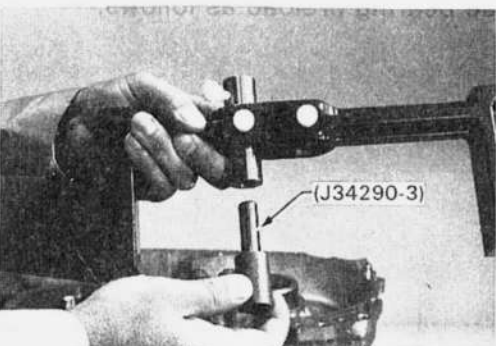
- b. Place Tools (bridge and gauging cylinder) on machined gasket surface of transmission case and allow gauging cylinder to rest on bearing mating surface. Lock gauging cylinder in place.



- You are now measuring dimension "E".

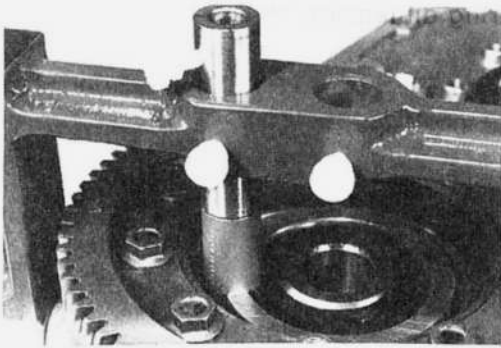


- c. Put final drive assembly into converter housing, then put side bearing inner cone on differential case.
- d. Hold inner bearing cone in place while spinning final drive assembly in order to seat bearings.



- e. Insert Tool (differential side bearing gauging plunger) into gauging cylinder.

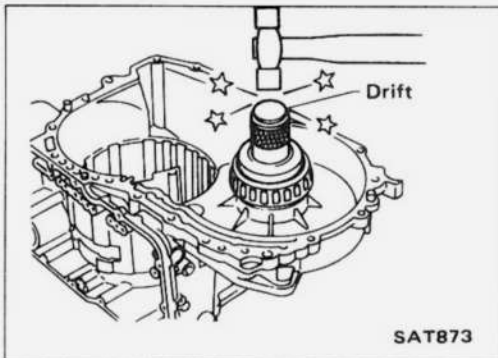
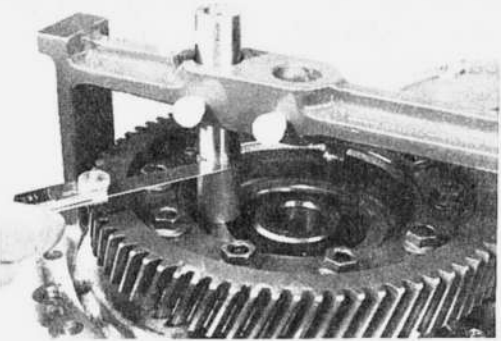
## ASSEMBLY



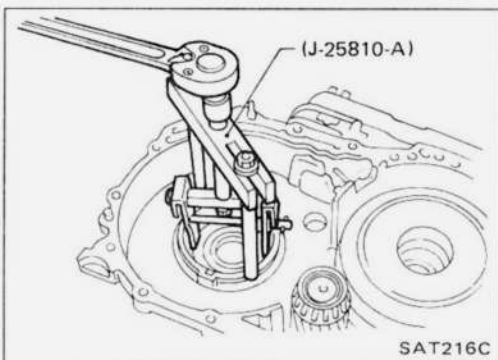
- f. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing and allow gauging plunger to rest on surface of bearing inner cone. Lock plunger in place.
- g. Use feeler gauge to measure clearance between gauging cylinder and shoulder of the gauging plunger.
- h. Use your feeler gauge reading to select appropriate side bearing preload shim(s).

**Differential side bearing adjusting shims:**

**Refer to S.D.S.**

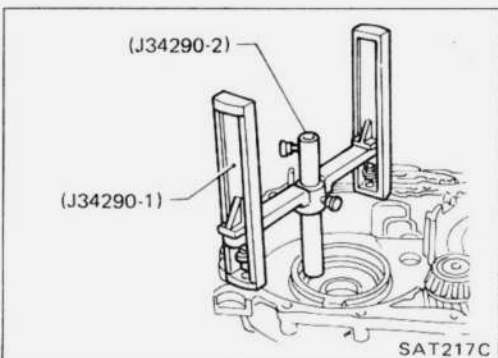


- i. Install selected shims and left side bearing inner cone.



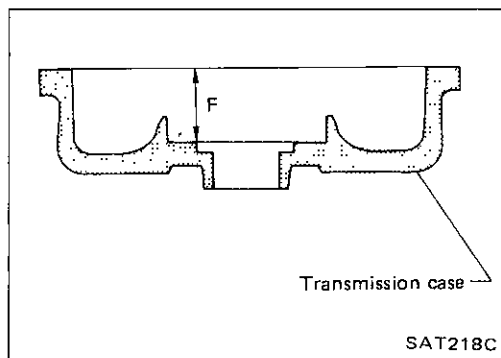
— With viscous coupling —

- a. Remove left side bearing outer race and preload adjusting shims from transmission case.

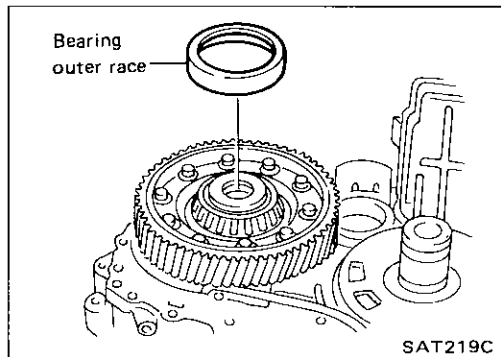


- b. Place Tools (bridge and gauging cylinder) on machined gasket surface of transmission case and allow gauging cylinder to drop into bearing race bore until it bottoms. Lock gauging cylinder in place.

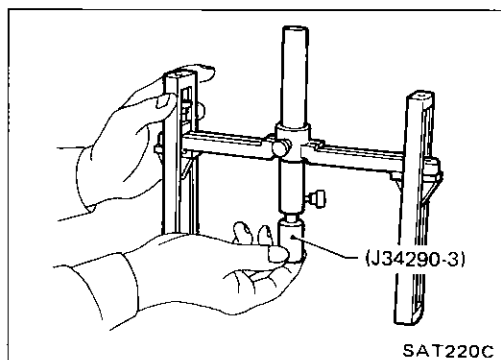
## ASSEMBLY



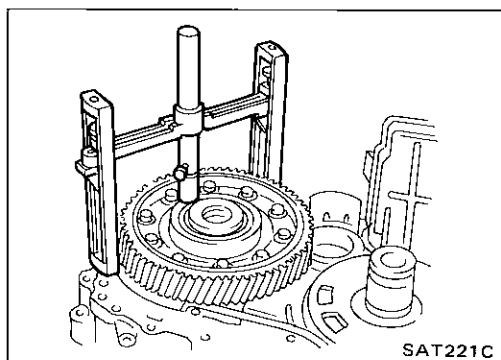
- You are now measuring dimension "F".



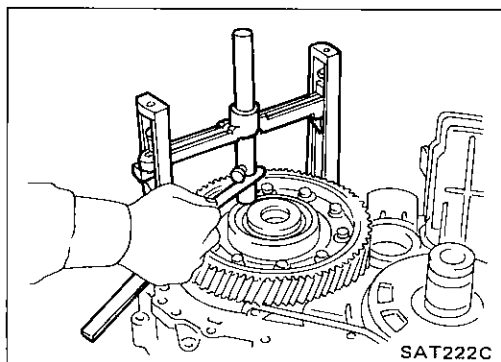
- c. Put final drive assembly into converter housing, then put side bearing outer race on differential side bearing.
- d. Turn outer race to seat bearing.



- e. Insert Tool (differential side bearing gauging plunger) into gauging cylinder.



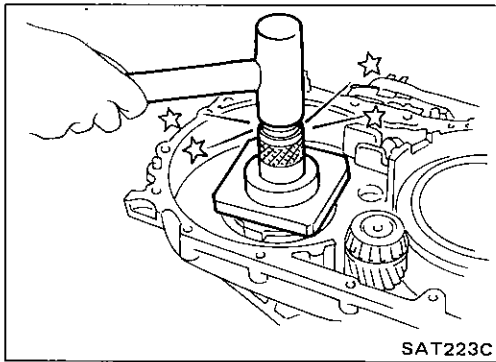
- f. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing and allow gauging plunger to drop onto rear surface of side bearing outer race. Lock plunger in place.



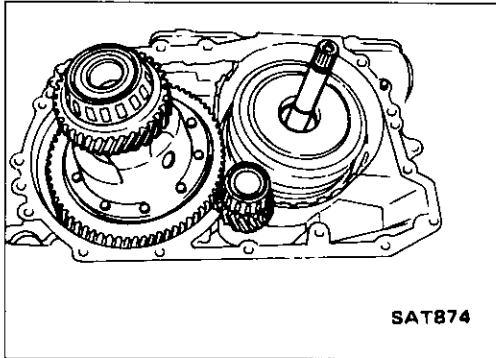
- g. Use feeler gauge to measure clearance between gauging cylinder and shoulder of the gauging plunger.
- h. Use your feeler gauge reading to select appropriate side bearing preload shim(s).

**Available differential side bearing adjusting shims:  
Refer to S.D.S.**

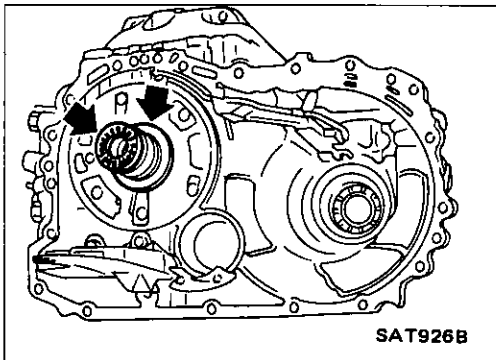
## ASSEMBLY



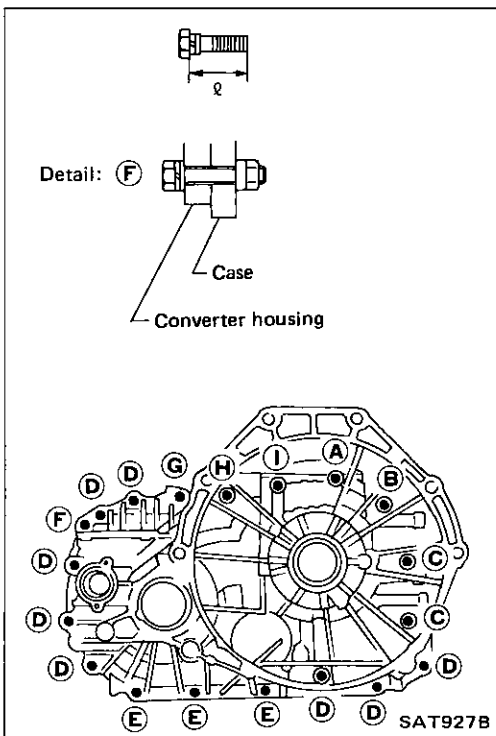
- i. Install selected shims and left side bearing outer race.



25. Install input shaft.



26. Install selected thrust washer and bearing on oil pump cover.

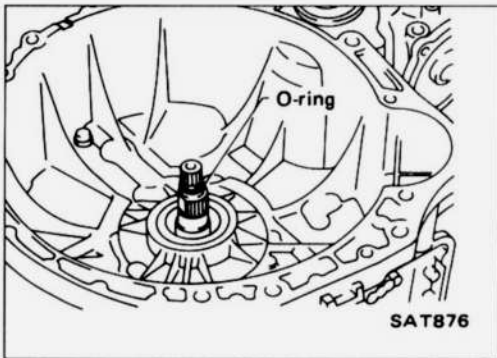


27. Place gasket on transmission case and install converter housing.

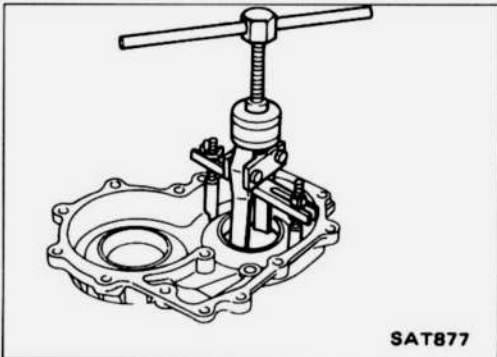
| Bolt | Tightening torque<br>N·m (kg-m, ft-lb) | ℓ mm (in)    |
|------|----------------------------------------|--------------|
| (A)  | 21 - 23 (2.1 - 2.3, 15 - 17)           | 31.5 (1.240) |
| (B)  |                                        | 27 (1.06)    |
| (C)  | 19 - 23 (1.9 - 2.3, 14 - 17)           | 31.5 (1.240) |
| (D)  |                                        | 35 (1.38)    |
| (E)  | 43 - 47 (4.4 - 4.8, 32 - 35)           | 50 (1.97)    |
| (F)  | 21 - 25 (2.1 - 2.6, 15 - 19)           | 39 (1.54)    |
| (G)  | 43 - 47 (4.4 - 4.8, 32 - 35)           |              |
| (H)  | 45 - 47 (4.6 - 4.8, 33 - 35)           | 35 (1.38)    |
| (I)  |                                        |              |

**Always use new bolts at portions (A), (B), (H) and (I) as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix converter housing to transmission case when installing them.**

## ASSEMBLY

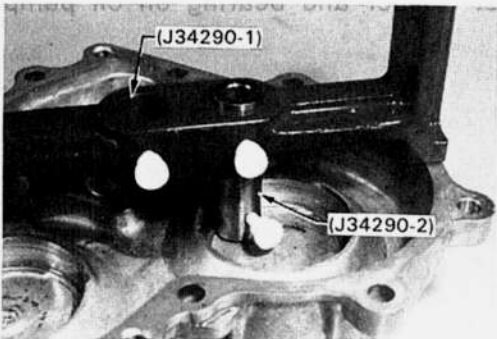


28. Install O-ring onto input shaft.

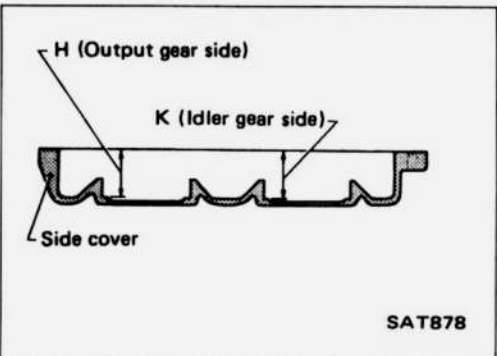


29. Adjust output shaft and idler gear bearing preload as follows:

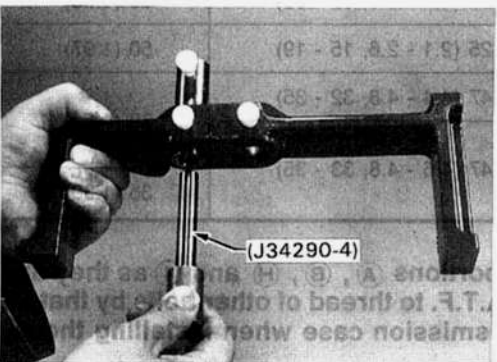
- Remove side cover temporarily installed.
- Remove output gear and idler gear bearing outer races and shims. (The races will interchange, so be sure to keep each race with its correct bearing.)



c. Place Tools (bridge and gauging cylinder) onto machined gasket surface of side cover. Allow gauging cylinder to drop into output gear bearing race bore until it bottoms. Lock cylinder in place with the thumbscrew.

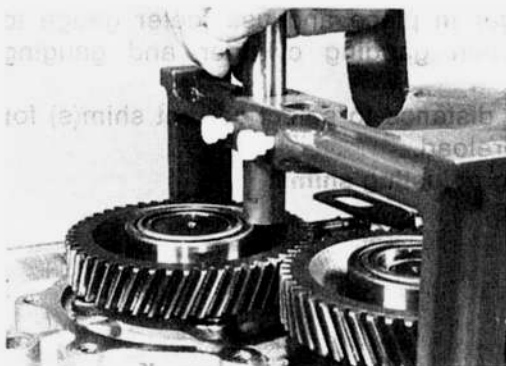


- You are now measuring dimension "H".
- d. Put correct bearing races on the output gear and idler gear bearings, and turn races to seat bearings.

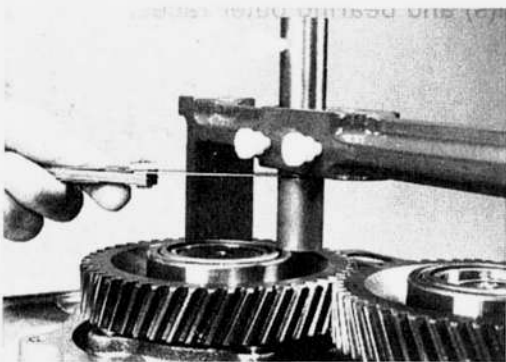


e. Place Tool (output gauging plunger) into the gauging cylinder.

## ASSEMBLY



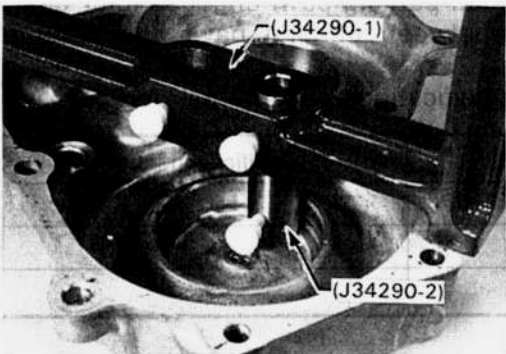
- f. Now, place bridge onto machined gasket surface of transmission case and allow gauging plunger to drop onto rear surface of output gear bearing race.



- g. Lock gauging plunger in place with thumbscrew. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.  
h. Use feeler gauge reading to select the correct shim(s).

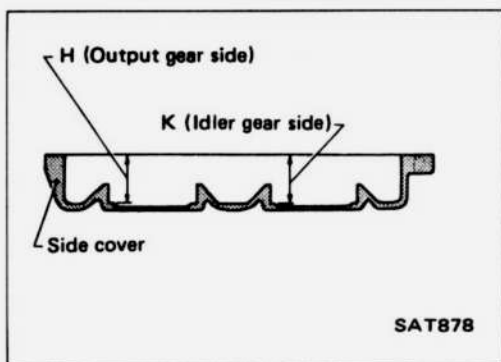
**Output shaft bearing adjusting shims:**

**Refer to S.D.S.**



- i. Now, measure for the correct preload shims at the idler gear bearing in the same way. Place bridge onto machined surface of side cover and allow gauging cylinder to drop until it contacts idler bearing race mating surface.

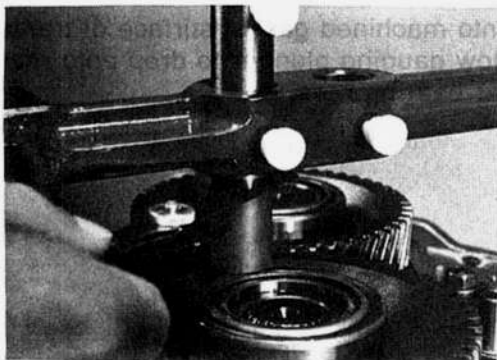
- You are now measuring dimension "K".



- j. Lock gauging cylinder in place. Insert Tool (gauging plunger) into gauging cylinder and place bridge onto machined surface of case, so that gauging plunger meets idler bearing race rear surface.



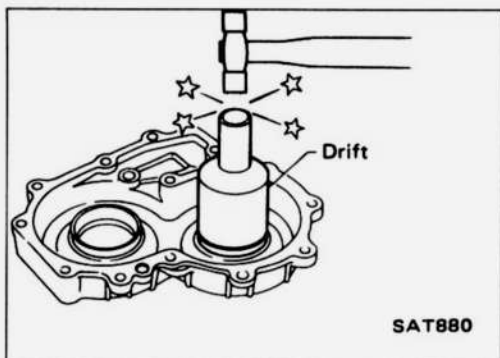
## ASSEMBLY



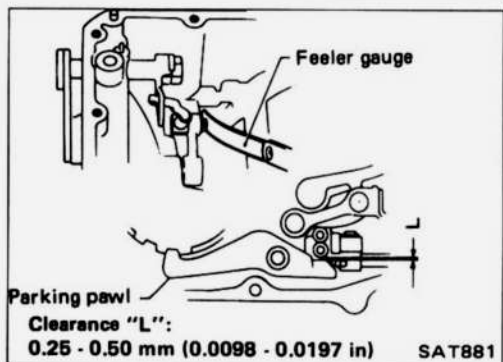
- k. Lock gauging plunger in place and use feeler gauge to measure gap between gauging cylinder and gauging plunger.
- l. Use your measured distance to select correct shim(s) for idler gear bearing preload.

**Idler gear bearing adjusting shims:**

**Refer to S.D.S.**



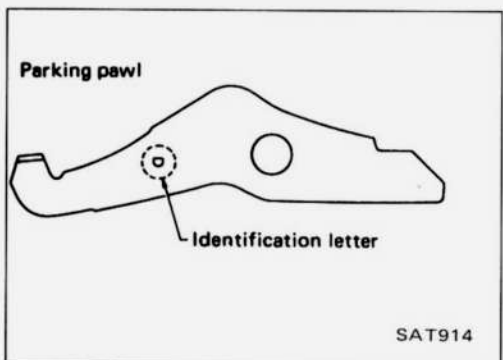
- m. Install selected shim(s) and bearing outer races.



30. Move manual lever until parking pawl engages idler gear. Measure clearance between parking pawl and parking actuator.

If clearance is outside specifications, replace parking pawl.

| Part number | Identification letter |
|-------------|-----------------------|
| 31989-21X00 | D                     |
| 31989-21X01 | E                     |
| 31989-21X02 | F                     |



Example:

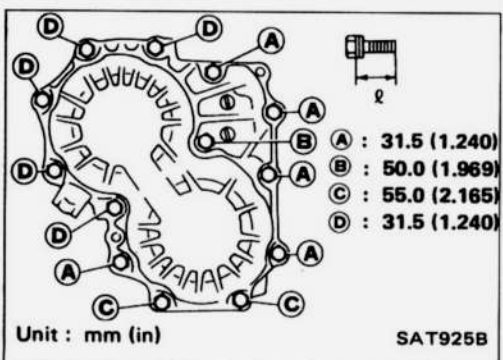
When parking pawl with identification letter "E" is used:

Clearance "L" is larger.

→ Replace with parking pawl with identification letter "D".

Clearance "L" is smaller.

→ Replace with parking pawl with identification letter "F".



31. Install side cover and gasket.

**Always use new bolts at portions ② and ④ as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix side cover to transmission case when installing them.**

**Bolts ① and ③:**

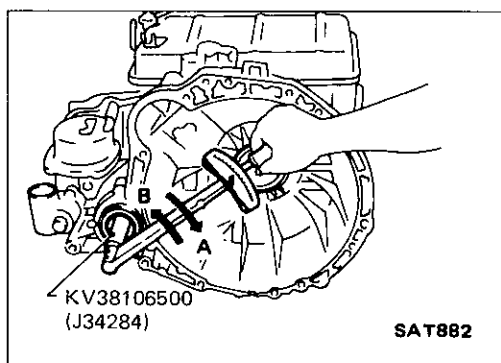
⌚: 19 - 23 N·m (1.9 - 2.3 kg-m, 14 - 17 ft-lb)

**Bolts ② and ④:**

⌚: 21 - 23 N·m (2.1 - 2.3 kg-m, 15 - 17 ft-lb)



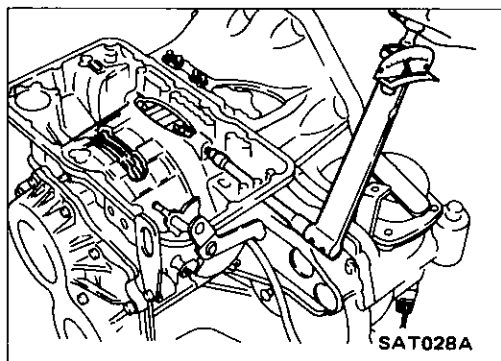
## ASSEMBLY



32. Insert Tool into final drive portion to see if internal parts rotates smoothly. Rotating in direction "B" is slightly harder than in direction "A".

If abnormalities are noted, proceed with the following:

- Disassemble parts to see if they are properly assembled.
- Readjust bearing preloads of final drive, output shaft and idler gear.



33. Adjust brake band.

a. First tighten anchor end pin.

**Anchor end pin:**

: 4 - 6 N·m (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)

b. Back off anchor end pin "N" turns.

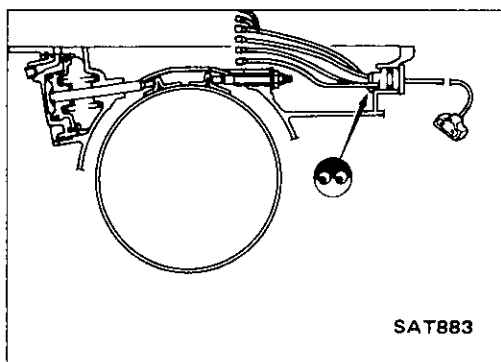
**Number of returning revolutions for anchor end pin "N":**

**5.25 turn**

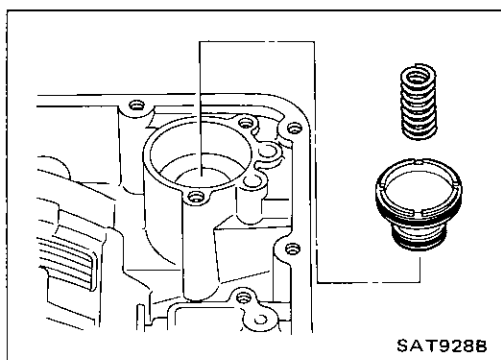
c. Tighten lock nut while holding anchor end pin stationary.

**Lock nut:**

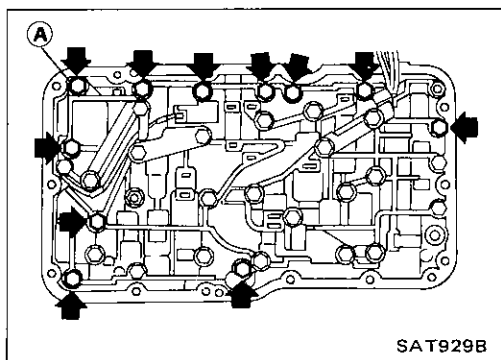
: 31 - 42 N·m (3.2 - 4.3 kg-m, 23 - 31 ft-lb)



34. Install terminal assembly, paying attention to the direction of its hook.



35. Install accumulator and spring.



36. Insert manual valve to control valve body, then assemble them to transmission case.

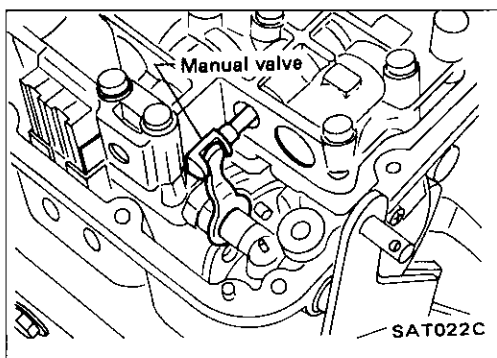
**Bolt ① :**

: 3.7 - 5.0 N·m (0.38 - 0.51 kg-m, 2.7 - 3.7 ft-lb)

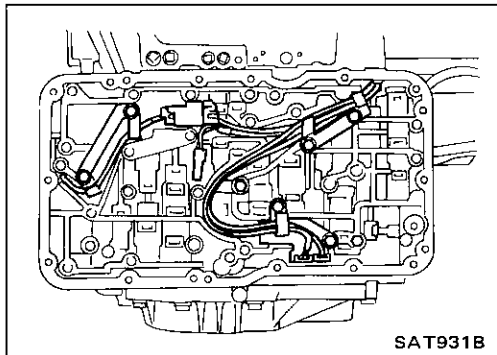
**Other bolts:**

: 7 - 9 N·m (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)

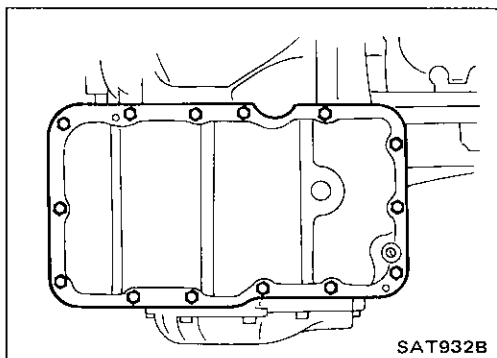
## ASSEMBLY



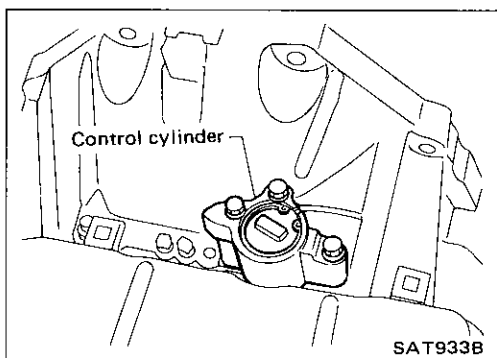
- Pay attention to the direction of manual valve groove.



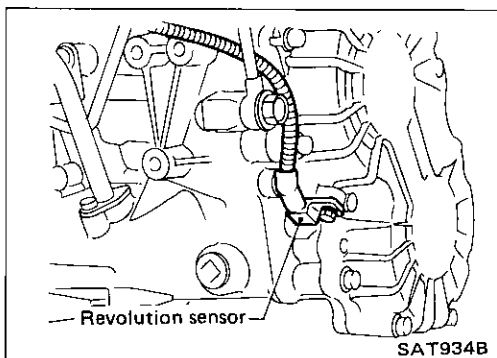
37. Connect harness connectors between terminal assembly and solenoids.



38. Put gasket on transmission case and install valve cover.  
**Always use new bolts as they are self-sealing bolts.**

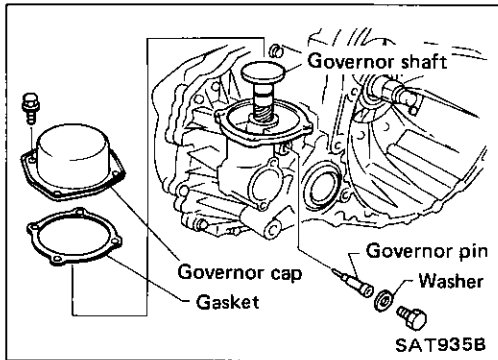


39. Install control cylinder.

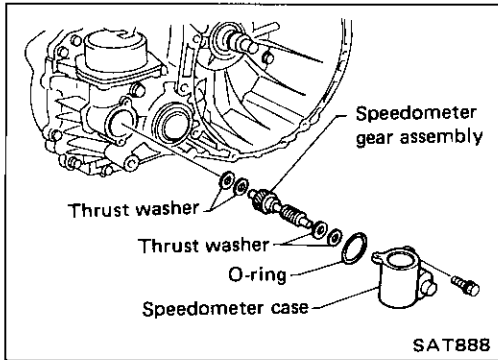


40. Install revolution sensor.

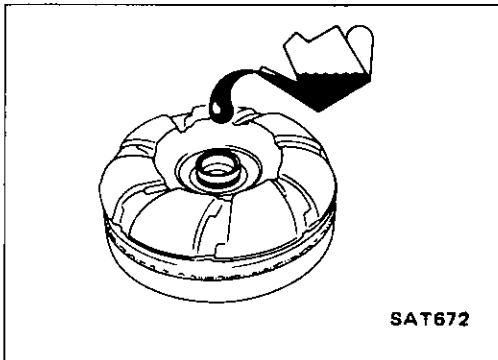
## ASSEMBLY



41. Install governor shaft.



42. Install speedometer parts.



43. Pour approximately 2 liters (2-1/8 US qt, 1-3/4 Imp qt) of automatic transmission fluid into converter housing.

44. Install torque converter to converter housing.

**Be careful not to scratch front oil seal.**

45. Apply sealant to threads of drain plug and install it in place.

46. Install inhibitor switch to transmission case.

47. Adjust inhibitor switch. Refer to On-vehicle Service.

48. Make sure that manual lever operates smoothly.

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

## General Specifications

|                                                   |                                              |                                    |
|---------------------------------------------------|----------------------------------------------|------------------------------------|
| Engine model                                      | KA24E                                        |                                    |
| Automatic transaxle model                         | RE4F02A                                      | RE4F02V                            |
| Automatic transaxle assembly<br>Model code number | 27 X 63<br>(Without viscous coupling)        | 27 X 70<br>(With viscous coupling) |
| Transaxle gear ratio                              |                                              |                                    |
| 1st                                               | 2.785                                        |                                    |
| 2nd                                               | 1.545                                        |                                    |
| 3rd                                               | 1.000                                        |                                    |
| 4th                                               | 0.694                                        |                                    |
| Reverse                                           | 2.272                                        |                                    |
| Final drive<br>(Center differential gear)         | 3.642                                        | 3.876                              |
| Recommended oil                                   | Automatic transmission fluid<br>Type DEXRON™ |                                    |
| Oil capacity (Approximately) ℓ (US qt, Imp qt)    | 7.4 (7-7/8, 6-1/2)                           |                                    |

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

## Specifications and Adjustment

### CLUTCHES AND BRAKES

|                                     |                           |             |
|-------------------------------------|---------------------------|-------------|
| <b>High clutch</b>                  |                           |             |
| Number of drive plates              | 4                         |             |
| Number of driven plates             | 3 + 1                     |             |
| Thickness of drive plate<br>mm (in) |                           |             |
| Standard                            | 1.6 (0.063)               |             |
| Allowable limit                     | 1.4 (0.055)               |             |
| Clearance<br>mm (in)                |                           |             |
| Standard                            | 1.4 - 1.8 (0.055 - 0.071) |             |
| Allowable limit                     | 2.6 (0.102)               |             |
| Thickness of retaining plate        | Thickness<br>mm (in)      | Part number |
|                                     | 3.6 (0.142)               | 31537-41X61 |
|                                     | 3.8 (0.150)               | 31537-41X62 |
|                                     | 4.0 (0.157)               | 31537-41X63 |
|                                     | 4.2 (0.165)               | 31537-41X64 |
|                                     | 4.4 (0.173)               | 31537-41X65 |
|                                     | 4.6 (0.181)               | 31537-41X66 |
|                                     | 4.8 (0.189)               | 31537-41X67 |
|                                     | 5.0 (0.197)               | 31537-41X68 |
| <b>Low clutch</b>                   |                           |             |
| Number of drive plates              | 5                         |             |
| Number of driven plates             | 6                         |             |
| Thickness of drive plate<br>mm (in) |                           |             |
| Standard                            | 2.0 (0.079)               |             |
| Allowable limit                     | 1.8 (0.071)               |             |
| Clearance<br>mm (in)                |                           |             |
| Standard                            | 0.5 - 0.8 (0.020 - 0.031) |             |
| Allowable limit                     | 1.8 (0.071)               |             |
| Thickness of retaining plate        | Thickness<br>mm (in)      | Part number |
|                                     | 4.8 (0.189)               | 31597-21X00 |
|                                     | 5.0 (0.197)               | 31597-21X01 |
|                                     | 5.2 (0.205)               | 31597-21X02 |
|                                     | 5.4 (0.213)               | 31597-21X03 |
|                                     | 5.6 (0.220)               | 31597-21X04 |
|                                     | 5.8 (0.228)               | 31597-21X05 |
|                                     | 6.0 (0.236)               | 31597-21X06 |

|                                     |                           |             |
|-------------------------------------|---------------------------|-------------|
| <b>Reverse clutch</b>               |                           |             |
| Number of drive plates              | 2                         |             |
| Number of driven plates             | 2                         |             |
| Thickness of drive plate<br>mm (in) |                           |             |
| Standard                            | 2.0 (0.079)               |             |
| Allowable limit                     | 1.8 (0.071)               |             |
| Clearance<br>mm (in)                |                           |             |
| Standard                            | 0.5 - 0.8 (0.020 - 0.031) |             |
| Allowable limit                     | 1.2 (0.047)               |             |
| Thickness of retaining plate        | Thickness<br>mm (in)      | Part number |
|                                     | 4.6 (0.181)               | 31537-21X60 |
|                                     | 4.8 (0.189)               | 31537-21X61 |
|                                     | 5.0 (0.197)               | 31537-21X62 |
|                                     | 5.2 (0.205)               | 31537-21X63 |
|                                     | 5.4 (0.213)               | 31537-21X64 |

|                                     |                           |             |
|-------------------------------------|---------------------------|-------------|
| <b>Low &amp; reverse brake</b>      |                           |             |
| Number of drive plates              | 6                         |             |
| Number of driven plates             | 6                         |             |
| Thickness of drive plate<br>mm (in) |                           |             |
| Standard                            | 2.0 (0.079)               |             |
| Allowable limit                     | 1.8 (0.071)               |             |
| Clearance<br>mm (in)                |                           |             |
| Standard                            | 1.2 - 1.6 (0.047 - 0.063) |             |
| Allowable limit                     | 2.8 (0.110)               |             |
| Thickness of retaining plate        | Thickness<br>mm (in)      | Part number |
|                                     | 3.4 (0.134)               | 31667-23X00 |
|                                     | 3.6 (0.142)               | 31667-23X01 |
|                                     | 3.8 (0.150)               | 31667-23X02 |
|                                     | 4.0 (0.157)               | 31667-23X03 |
|                                     | 4.2 (0.165)               | 31667-23X04 |
|                                     | 4.4 (0.173)               | 31667-23X05 |
|                                     | 4.6 (0.181)               | 31667-23X06 |
|                                     | 4.8 (0.189)               | 31667-23X07 |
|                                     | 5.0 (0.197)               | 31667-23X08 |

|                                                          |                                 |  |
|----------------------------------------------------------|---------------------------------|--|
| <b>Brake band</b>                                        |                                 |  |
| Piston size<br>mm (in)                                   |                                 |  |
| Big dia.                                                 | 75 (2.95)                       |  |
| Small dia.                                               | 43 (1.69)                       |  |
| Anchor end pin tightening<br>torque<br>N·m (kg-m, ft-lb) | 4 - 6<br>(0.4 - 0.6, 2.9 - 4.3) |  |
| Number of returning<br>revolutions for anchor<br>end pin | 5.0 - 5.5                       |  |
| Lock nut tightening<br>torque<br>N·m (kg-m, ft-lb)       | 31 - 42<br>(3.2 - 4.3, 23 - 31) |  |

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

## Specifications and Adjustment (Cont'd)

### PLANETARY CARRIER

Unit: mm (in)

|                                                       | Front carrier                    | Rear carrier                     |
|-------------------------------------------------------|----------------------------------|----------------------------------|
| Clearance between pinion washer and planetary carrier |                                  |                                  |
| Standard                                              | 0.15 - 0.70<br>(0.0059 - 0.0276) | 0.20 - 0.70<br>(0.0079 - 0.0276) |
| Allowable limit                                       | 0.80 (0.0315)                    |                                  |

### CLUTCH PACK END PLAY

| Clutch pack end play                   | 0.4 - 0.8 mm (0.016 - 0.031 in) |             |
|----------------------------------------|---------------------------------|-------------|
| Thickness of clutch pack thrust washer | Thickness mm (in)               | Part number |
|                                        | 0.7 (0.028)                     | 31528-21X00 |
|                                        | 0.9 (0.035)                     | 31528-21X01 |
|                                        | 1.1 (0.043)                     | 31528-21X02 |
|                                        | 1.3 (0.051)                     | 31528-21X03 |
|                                        | 1.5 (0.059)                     | 31528-21X04 |
|                                        | 1.7 (0.067)                     | 31528-21X05 |
|                                        | 1.9 (0.075)                     | 31528-21X06 |

### OIL PUMP, BEARING RETAINER AND OUTPUT SHAFT

Unit: mm (in)

|                           |                                 |
|---------------------------|---------------------------------|
| Oil pump clearance        |                                 |
| Cam ring — oil pump cover |                                 |
| Standard                  | 0.010 - 0.024 (0.0004 - 0.0009) |
| Allowable limit           | 0.034 (0.0013)                  |
| Rotor — oil pump cover    |                                 |
| Standard                  | 0.017 - 0.031 (0.0007 - 0.0012) |
| Allowable limit           | 0.034 (0.0013)                  |
| Vane — oil pump cover     |                                 |
| Standard                  | 0.017 - 0.031 (0.0007 - 0.0012) |
| Allowable limit           | 0.034 (0.0013)                  |
| Seal ring clearance       |                                 |
| Standard                  | 0.10 - 0.25 (0.0039 - 0.0098)   |
| Allowable limit           | 0.25 (0.098)                    |

### DIFFERENTIAL SIDE GEAR THRUST WASHER

#### Without viscous coupling

| Allowable clearance between side gear and differential case with washer | 0.1 - 0.2 mm<br>(0.004 - 0.008 in) |
|-------------------------------------------------------------------------|------------------------------------|
| Thickness mm (in)                                                       | Part number                        |
| 0.75 - 0.80 (0.0295 - 0.0315)                                           | 38424-E3000 or 38424-E3020         |
| 0.80 - 0.85 (0.0315 - 0.0335)                                           | 38424-E3001 or 38424-E3021         |
| 0.85 - 0.90 (0.0335 - 0.0354)                                           | 38424-E3002 or 38424-E3022         |
| 0.90 - 0.95 (0.0354 - 0.0374)                                           | 38424-E3003 or 38424-E3023         |

#### With viscous coupling (L.H. side gear)

| Allowable clearance between side gear and viscous coupling with washer | 0.1 - 0.2 mm<br>(0.004 - 0.008 in) |
|------------------------------------------------------------------------|------------------------------------|
| Thickness mm (in)                                                      | Part number                        |
| 0.43 - 0.45 (0.0169 - 0.0177)                                          | 38424-51E10                        |
| 0.52 - 0.54 (0.0205 - 0.0213)                                          | 38424-51E11                        |
| 0.61 - 0.63 (0.0240 - 0.0248)                                          | 38424-51E12                        |
| 0.70 - 0.72 (0.0276 - 0.0283)                                          | 38424-51E13                        |
| 0.79 - 0.81 (0.0311 - 0.0319)                                          | 38424-51E14                        |

#### With viscous coupling (R.H. side gear)

| Allowable clearance between side gear and differential case with washer | 0.1 - 0.2 mm<br>(0.004 - 0.008 in) |
|-------------------------------------------------------------------------|------------------------------------|
| Thickness mm (in)                                                       | Part number                        |
| 0.75 - 0.80 (0.0295 - 0.0315)                                           | 38424-21X00                        |
| 0.80 - 0.85 (0.0315 - 0.0335)                                           | 38424-21X01                        |
| 0.85 - 0.90 (0.0335 - 0.0354)                                           | 38424-21X02                        |
| 0.90 - 0.95 (0.0354 - 0.0374)                                           | 38424-21X03                        |

### TOTAL END PLAY

|                                            |                                        |             |
|--------------------------------------------|----------------------------------------|-------------|
| Total end play                             | 0.25 - 0.55 mm<br>(0.0098 - 0.0217 in) |             |
| Thickness of oil pump housing bearing race | Thickness mm (in)                      | Part number |
|                                            | 0.8 (0.031)                            | 31429-21X00 |
|                                            | 1.0 (0.039)                            | 31429-21X01 |
|                                            | 1.2 (0.047)                            | 31429-21X02 |
|                                            | 1.4 (0.055)                            | 31429-21X03 |
|                                            | 1.6 (0.063)                            | 31429-21X04 |
|                                            | 1.8 (0.071)                            | 31429-21X05 |
|                                            | 2.0 (0.079)                            | 31429-21X06 |

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

### Specifications and Adjustment (Cont'd)

#### DIFFERENTIAL SIDE BEARING PRELOAD

##### Differential side bearing adjusting shim (Without viscous coupling)

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.12 (0.0047)     | 38453-21X13 |
| 0.16 (0.0063)     | 38453-21X14 |
| 0.20 (0.0079)     | 38453-21X15 |
| 0.24 (0.0094)     | 38453-21X16 |
| 0.28 (0.0110)     | 38453-21X17 |
| 0.32 (0.0126)     | 38453-21X18 |
| 0.36 (0.0142)     | 38453-21X19 |
| 0.40 (0.0157)     | 38453-21X20 |
| 0.44 (0.0173)     | 38453-21X00 |
| 0.48 (0.0189)     | 38453-21X01 |
| 0.52 (0.0205)     | 38453-21X02 |
| 0.56 (0.0220)     | 38453-21X03 |
| 0.60 (0.0236)     | 38453-21X04 |
| 0.64 (0.0252)     | 38453-21X05 |
| 0.68 (0.0268)     | 38453-21X06 |
| 0.72 (0.0283)     | 38453-21X07 |
| 0.76 (0.0299)     | 38453-21X08 |
| 0.80 (0.0315)     | 38453-21X09 |
| 0.84 (0.0331)     | 38453-21X10 |
| 0.88 (0.0346)     | 38453-21X11 |
| 0.92 (0.0362)     | 38453-21X12 |

##### Differential side bearing adjusting shim (With viscous coupling)

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.12 (0.0047)     | 38753-56E15 |
| 0.16 (0.0063)     | 38753-56E16 |
| 0.20 (0.0079)     | 38753-56E17 |
| 0.24 (0.0094)     | 38753-56E18 |
| 0.28 (0.0110)     | 38753-56E19 |
| 0.32 (0.0126)     | 38753-56E20 |
| 0.36 (0.0142)     | 38753-56E00 |
| 0.40 (0.0157)     | 38753-56E01 |
| 0.44 (0.0173)     | 38753-56E02 |
| 0.48 (0.0189)     | 38753-56E03 |
| 0.52 (0.0205)     | 38753-56E04 |
| 0.56 (0.0220)     | 38753-56E05 |
| 0.60 (0.0236)     | 38753-56E06 |
| 0.64 (0.0252)     | 38753-56E07 |
| 0.68 (0.0268)     | 38753-56E08 |
| 0.72 (0.0283)     | 38753-56E09 |
| 0.76 (0.0299)     | 38753-56E10 |
| 0.80 (0.0315)     | 38753-56E11 |
| 0.84 (0.0331)     | 38753-56E12 |
| 0.88 (0.0346)     | 38753-56E13 |
| 0.92 (0.0362)     | 38753-56E14 |

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

### Specifications and Adjustment (Cont'd)

#### OUTPUT SHAFT PRELOAD

#### IDLER GEAR PRELOAD

##### Output shaft preload adjusting shim

##### Idler gear preload adjusting shim

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.12 (0.0047)     | 31499-21X00 |
| 0.16 (0.0063)     | 31499-21X01 |
| 0.20 (0.0079)     | 31499-21X02 |
| 0.24 (0.0094)     | 31499-21X03 |
| 0.28 (0.0110)     | 31499-21X04 |
| 0.32 (0.0126)     | 31499-21X05 |
| 0.36 (0.0142)     | 31499-21X06 |
| 0.40 (0.0157)     | 31499-21X07 |
| 0.44 (0.0173)     | 31499-21X08 |
| 0.48 (0.0189)     | 31499-21X09 |
| 0.52 (0.0205)     | 31499-21X10 |
| 0.56 (0.0220)     | 31499-21X11 |
| 0.60 (0.0236)     | 31499-21X12 |
| 0.64 (0.0252)     | 31499-21X13 |
| 0.68 (0.0268)     | 31499-21X14 |
| 0.72 (0.0283)     | 31499-21X15 |
| 0.76 (0.0299)     | 31499-21X16 |
| 0.80 (0.0315)     | 31499-21X17 |
| 0.84 (0.0331)     | 31499-21X18 |
| 0.88 (0.0346)     | 31499-21X19 |
| 0.92 (0.0362)     | 31499-21X20 |
| 1.44 (0.0567)     | 31499-21X21 |
| 1.96 (0.0772)     | 31499-21X22 |

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.36 (0.0142)     | 31499-21X06 |
| 0.40 (0.0157)     | 31499-21X07 |
| 0.44 (0.0173)     | 31499-21X08 |
| 0.48 (0.0189)     | 31499-21X09 |
| 0.52 (0.0205)     | 31499-21X10 |
| 0.56 (0.0220)     | 31499-21X11 |
| 0.60 (0.0236)     | 31499-21X12 |
| 0.64 (0.0252)     | 31499-21X13 |
| 0.68 (0.0268)     | 31499-21X14 |
| 0.72 (0.0283)     | 31499-21X15 |
| 0.76 (0.0299)     | 31499-21X16 |
| 0.80 (0.0315)     | 31499-21X17 |
| 0.84 (0.0331)     | 31499-21X18 |
| 0.88 (0.0346)     | 31499-21X19 |
| 0.92 (0.0362)     | 31499-21X20 |
| 1.44 (0.0567)     | 31499-21X21 |
| 1.96 (0.0772)     | 31499-21X22 |

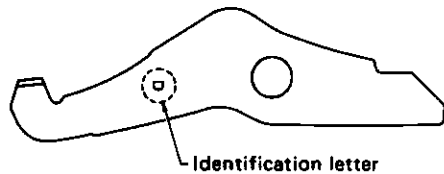


## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Specifications and Adjustment (Cont'd)

#### PARKING PAWL

|                       |                                        |
|-----------------------|----------------------------------------|
| Clearance "L"         | 0.25 - 0.50 mm<br>(0.0098 - 0.0197 in) |
| Identification letter | Part number                            |
| D                     | 31989-21X00                            |
| E                     | 31989-21X01                            |
| F                     | 31989-21X02                            |



SAT914

#### REMOVAL AND INSTALLATION

|                                                                |                                                 |
|----------------------------------------------------------------|-------------------------------------------------|
| Throttle wire                                                  |                                                 |
| Stroke "L"                                                     | 39 - 43 mm (1.54 - 1.69 in)                     |
| Number of returning<br>revolution for lock nut                 | 2.75 - 3.25                                     |
| Lock nut tightening torque                                     | 8 - 10 N·m<br>(0.8 - 1.0 kg-m, 5.8 - 7.2 ft-lb) |
| Distance between end of clutch<br>housing and torque converter | 19.0 mm (0.748 in) or more                      |
| Drive plate runout limit                                       | 0.5 mm (0.020 in)                               |



# FRONT AXLE & FRONT SUSPENSION

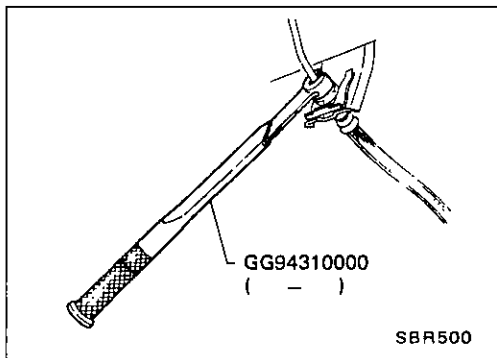
## SECTION **FA**

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## PRECAUTIONS AND PREPARATION

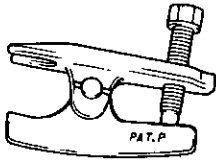
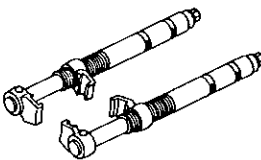
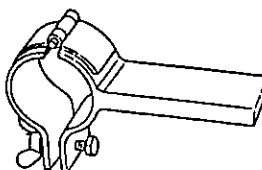
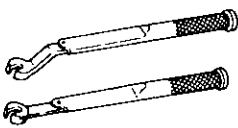
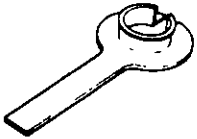


### Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.  
\*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Use Tool when removing or installing brake tubes.

### Preparation

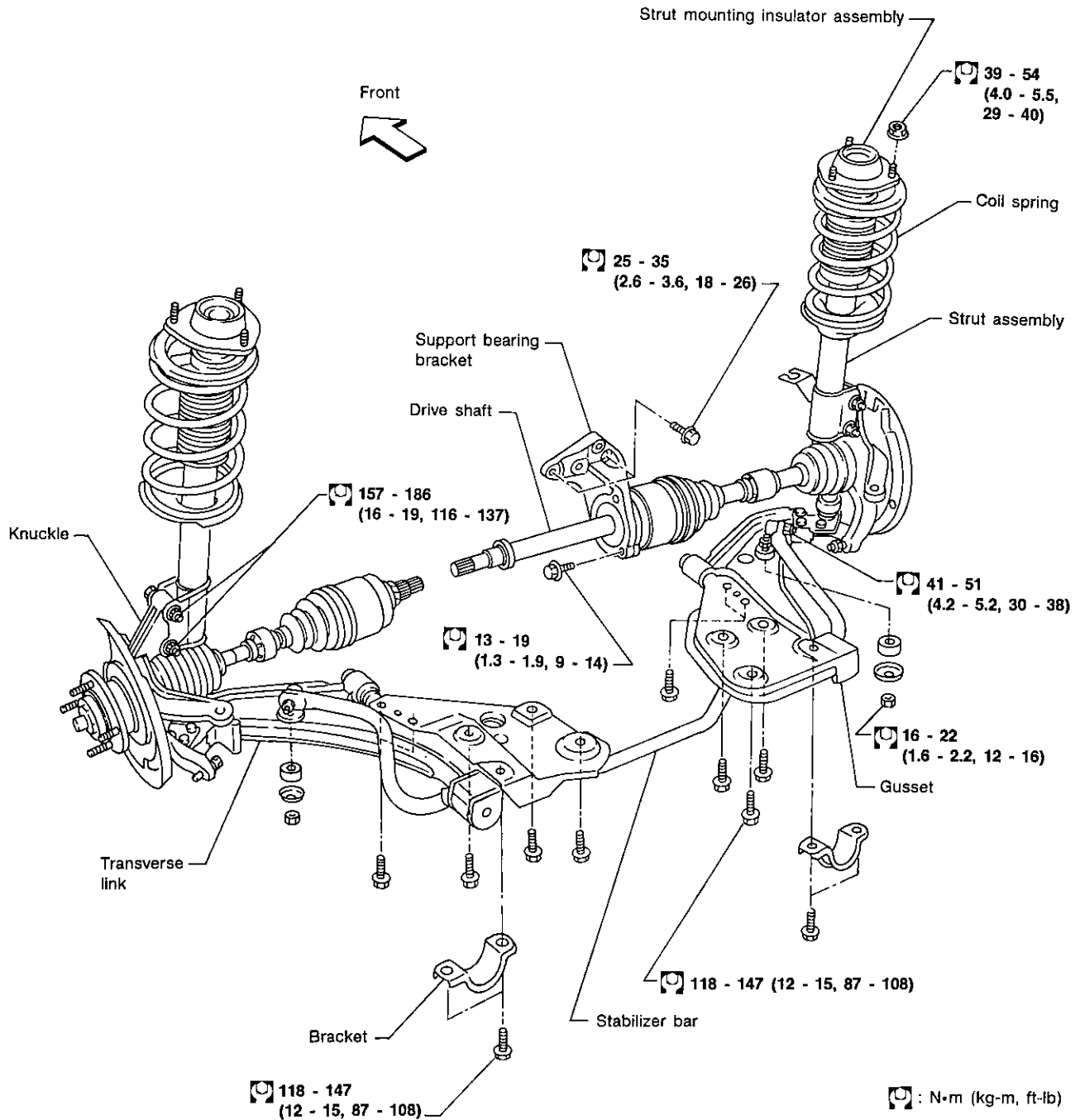
#### SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name                                             | Description                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HT72520000<br>(J25730-A)<br>Ball joint remover                                           |  Removing tie-rod outer end and lower ball joint                                                                              |
| HT71780000<br>( - )<br>Spring compressor                                                 |  Removing and installing coil spring                                                                                         |
| ST35652000<br>( - )<br>Strut attachment                                                  |  Fixing strut assembly                                                                                                      |
| GG94310000<br>( - )<br>Flare nut torque wrench                                           |  Removing and installing brake piping                                                                                       |
| KV38106700<br>(J34296)<br>KV38106800<br>(J34297)<br>Differential side oil seal protector |  <div>           Installing drive shaft<br/><br/>           L.H.: KV38106700<br/>           R.H.: KV38106800         </div> |

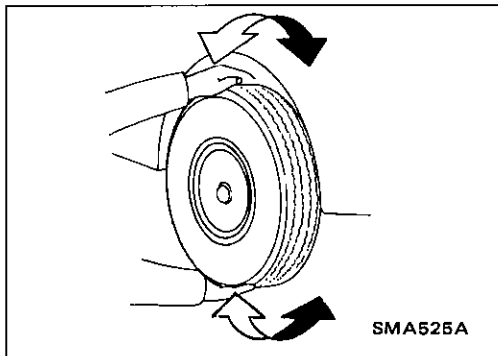
# FRONT AXLE AND FRONT SUSPENSION

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

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



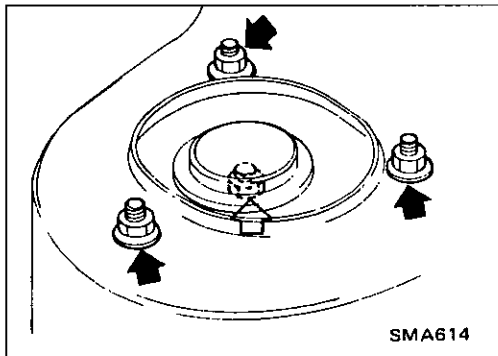
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### Front Axle and Front Suspension Parts

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

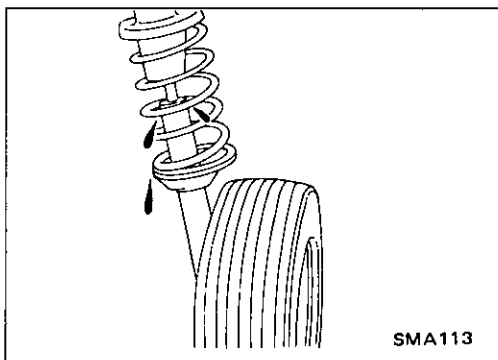
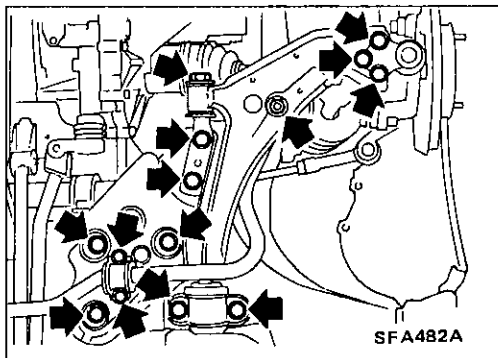
- Shake each front wheel to check for excessive play.



- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

**Tightening torque:**

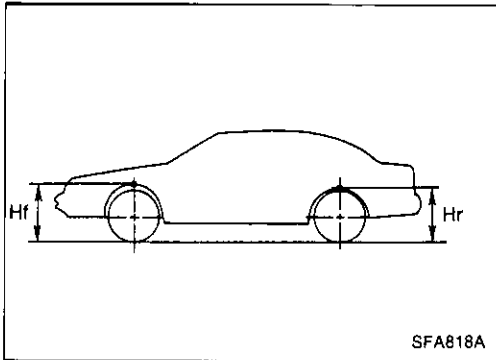
**Refer to FRONT SUSPENSION.**



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

## CHECK AND ADJUSTMENT — On-vehicle

### Front Axle and Front Suspension Parts (Cont'd)



- Check spring height from the top of the wheelarch to the ground.
- (1) Vehicle must be unladen\*, parked on a level surface, and tires checked for proper inflation and wear (tread wear indicator must not be showing).

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

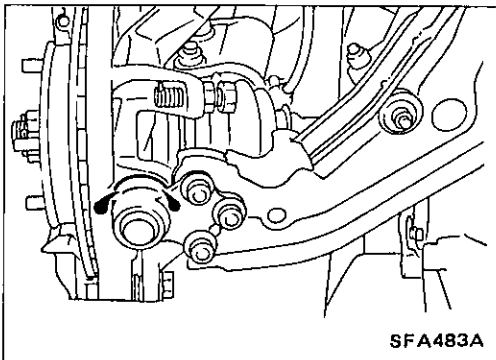
- (2) Bounce the vehicle up and down several times before measuring.

#### Standard height:

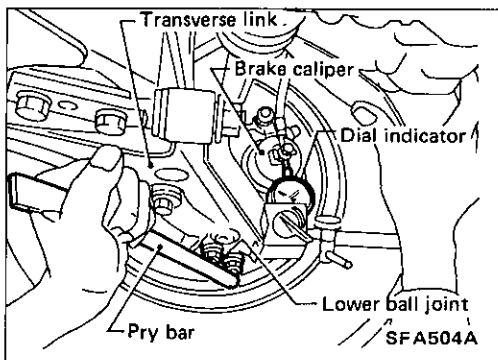
**Front (Hf): 676 mm (26.61 in)**

**Rear (Hr): 645 mm (25.39 in)**

- (3) Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.



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

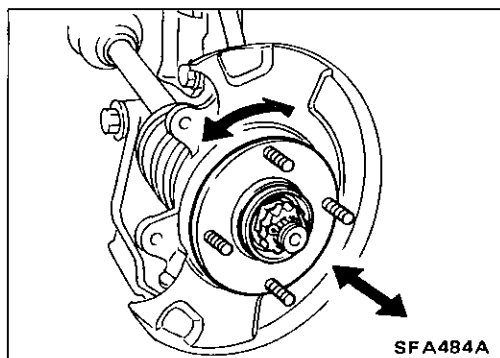


- Check suspension ball joint end play.
- (1) Jack up front of vehicle and set the stands.
- (2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
- (3) Make sure front wheels are straight and brake pedal is depressed.
- (4) Place a pry bar between transverse link and inner rim of road wheel.
- (5) While raising and releasing pry bar, observe maximum dial indicator value.

#### Vertical end play:

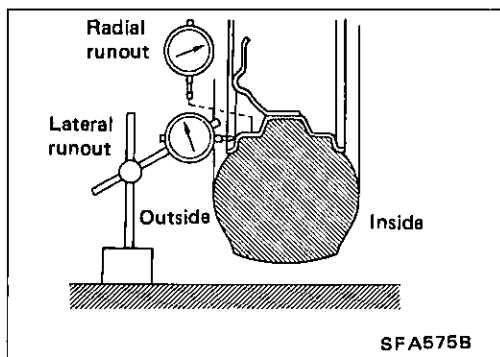
**0 mm (0 in)**

- (6) If ball joint movement is beyond specifications, remove and recheck it.



### Front Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.  
**Axial end play:**  
**0.05 mm (0.0020 in) or less**
- If axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to FRONT AXLE — Wheel Hub and Knuckle.



### Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen\*).

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

### PRELIMINARY INSPECTION

1. Check tires for wear and improper inflation.
2. Check wheel runout.  
**Wheel runout:**  
**Refer to S.D.S.**
3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work properly by using the standard bounce test.
7. Check vehicle posture (Unladen).

### CAMBER, CASTER AND KINGPIN INCLINATION

**Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.**

1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.

**Camber:**

**-30' to 1°00'**

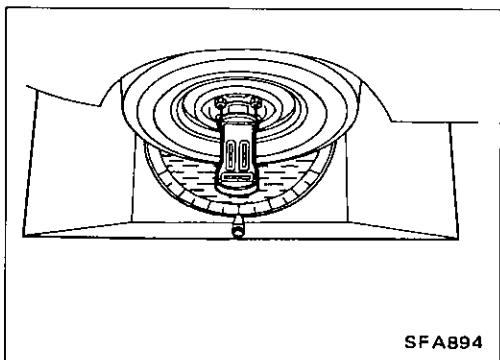
**Caster:**

**35' - 2°05'**

**Kingpin inclination:**

**13°45' - 15°15'**

2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.



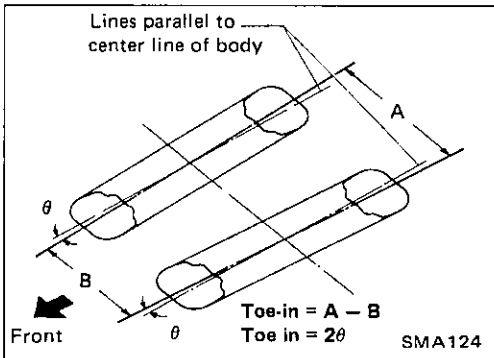
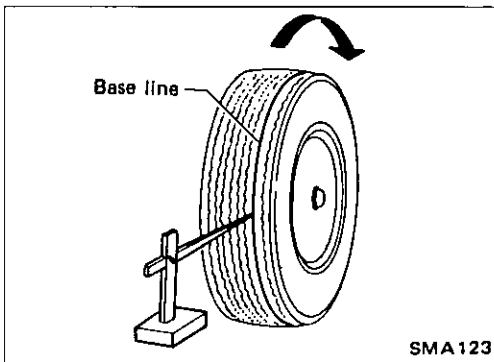


## CHECK AND ADJUSTMENT — On-vehicle

### Front Wheel Alignment (Cont'd)

#### TOE-IN

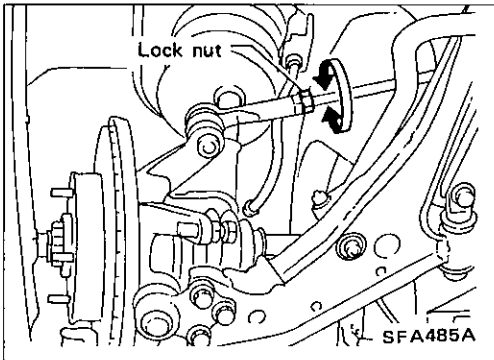
1. Draw a base line across the tread.
  - After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight-ahead position.



2. Measure toe-in.
  - Measure distance "A" and "B" at the same height as hub center.

#### Toe-in (Unladen):

A - B: 1 - 3 mm (0.04 - 0.12 in)  
2θ: 6' - 18'



3. Adjust toe-in by varying the length of steering tie-rods.
  - (1) Loosen lock nuts.
  - (2) Adjust toe-in by screwing tie-rods in and out.

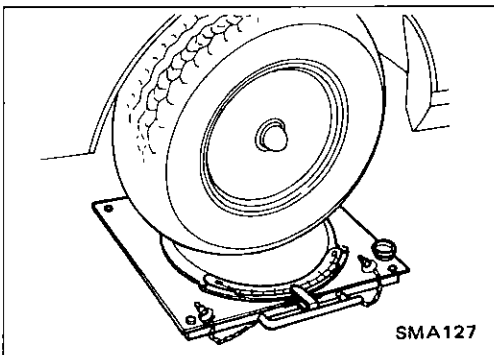
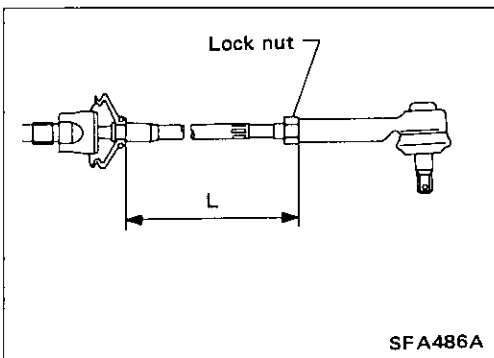
#### Standard length "L":

Refer to ST section.

- (3) Tighten lock nuts to specified torque.

#### Lock nut tightening torque:

Refer to ST section.

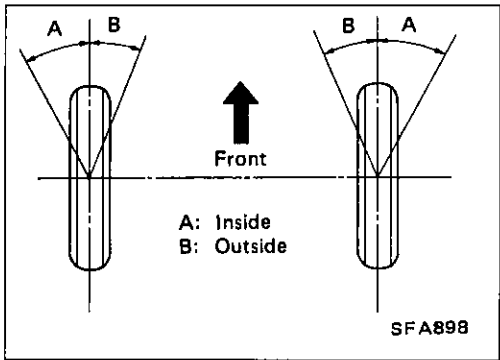


### FRONT WHEEL TURNING ANGLE

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

## CHECK AND ADJUSTMENT — On-vehicle

### Front Wheel Alignment (Cont'd)

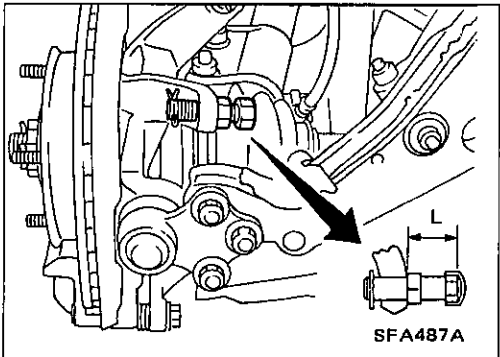


2. Rotate steering wheel all the way right and left; measure turning angle.

**Wheel turning angle (Full turn):**

**Inside wheel: 34° - 38°**

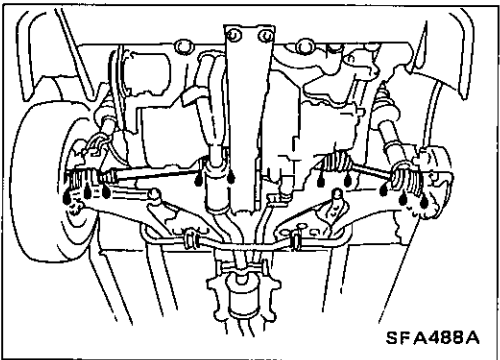
**Outside wheel: 27° - 31°**



3. Adjust with stopper bolt if necessary.

**Stopper bolt lock nut tightening torque:**

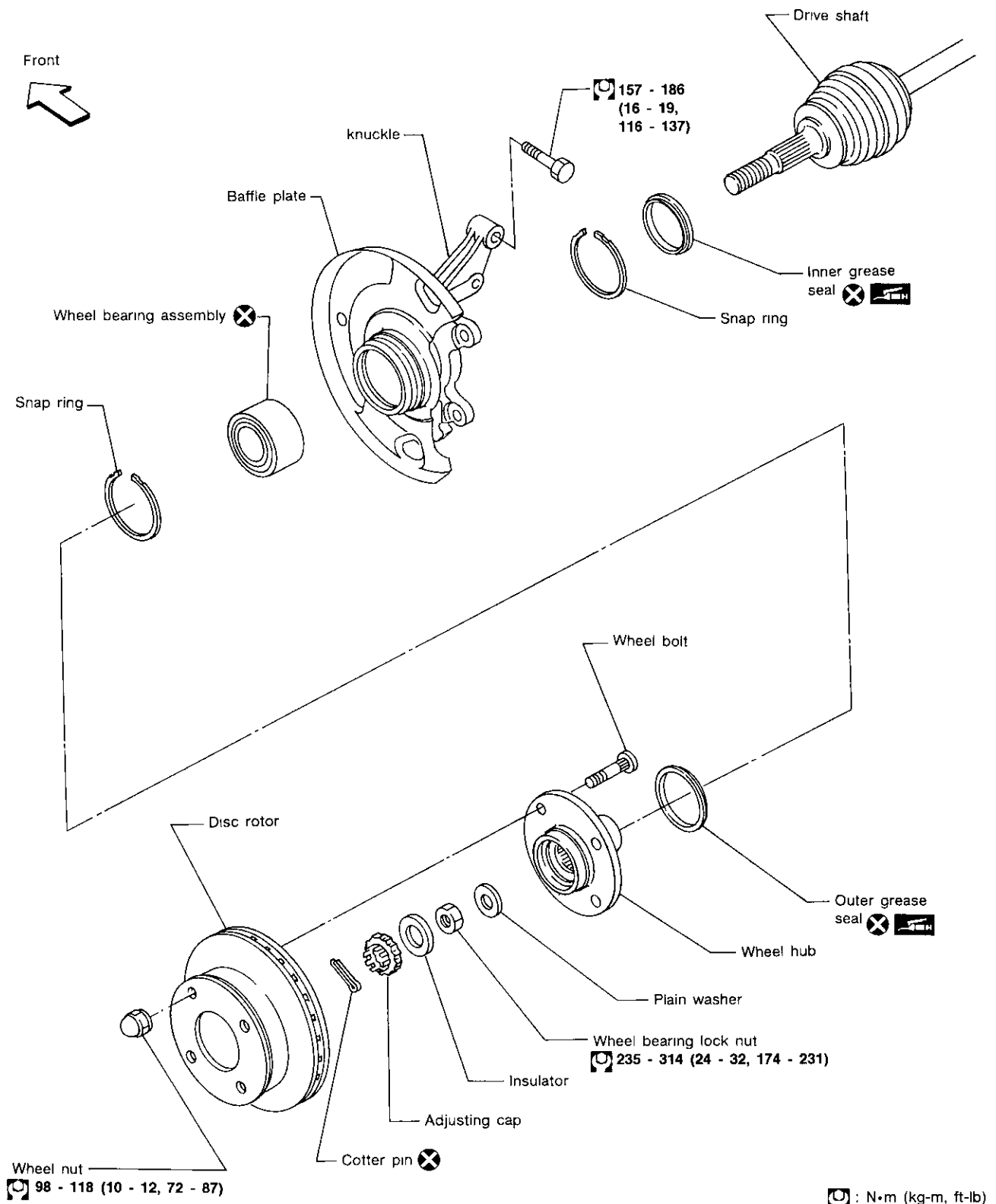
**54 - 72 N·m (5.5 - 7.3 kg-m, 40 - 53 ft-lb)**



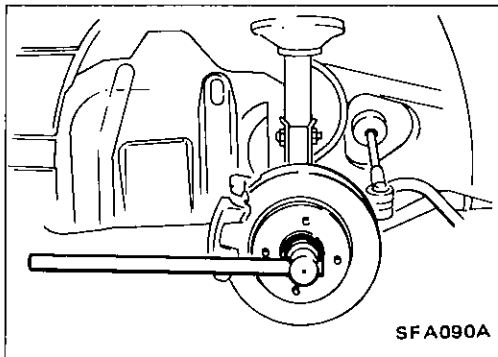
### Drive Shaft

Check for grease leakage or other damage.

# FRONT AXLE

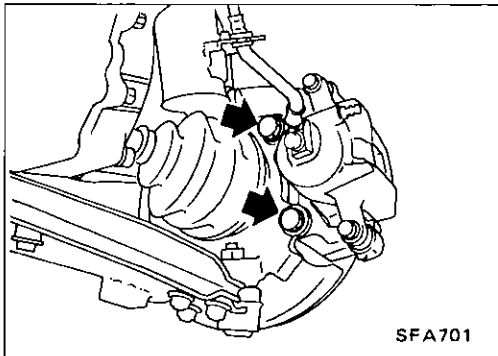


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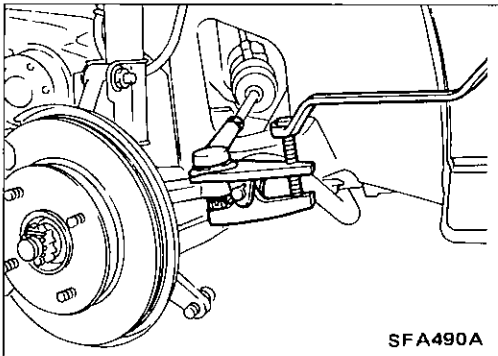


### Removal

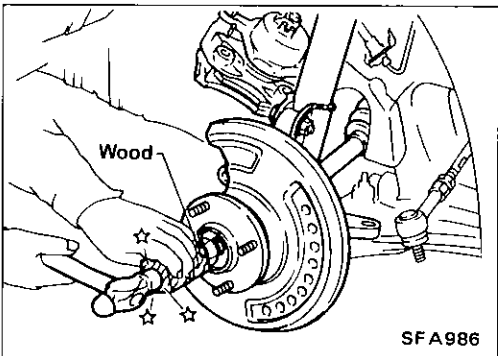
- Remove wheel bearing lock nut.



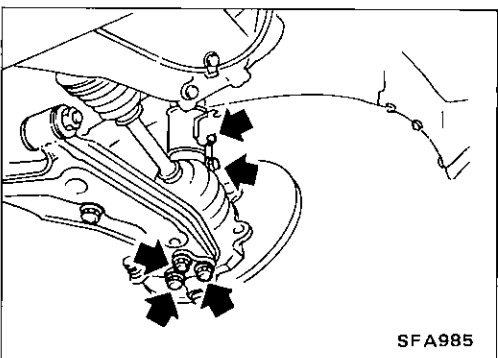
- Remove brake caliper assembly.  
**Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.**



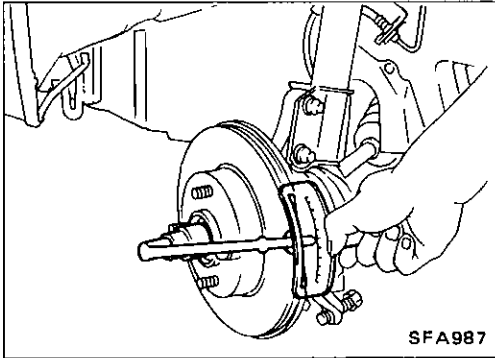
- Separate tie-rod from knuckle with Tool.  
**Install stud nut conversely on stud bolt to prevent damage to stud bolt.**



- Separate drive shaft from knuckle with Tool.  
**When removing drive shaft, cover boots with waste cloth to prevent damage to them.**

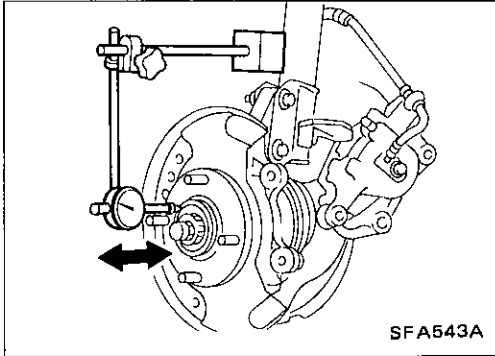


- Remove bolts and nuts as shown at left.

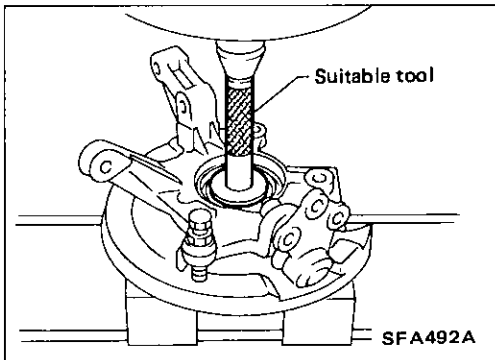


### Installation

- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.  
☞: 235 - 314 N·m  
(24 - 32 kg-m, 174 - 231 ft-lb)



- Check wheel bearing axial end play.  
**Axial end play:**  
0.05 mm (0.0020 in) or less.



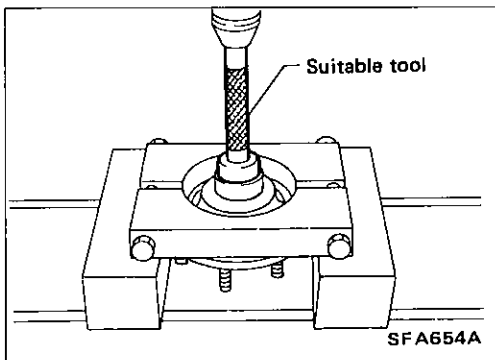
### Disassembly

#### CAUTION:

When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner races and grease seals) with a new one.

### WHEEL HUB

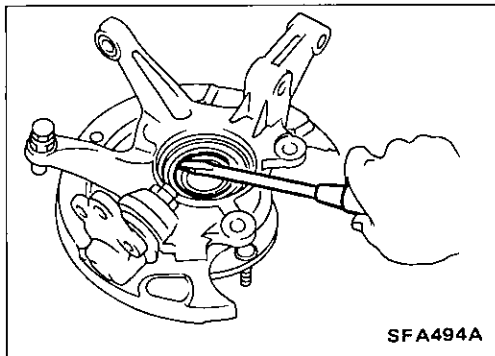
Drive out hub with inner race (outside) from knuckle with a suitable tool.



### WHEEL BEARING

When replacing wheel bearing, replace wheel bearing assembly (inner races and outer race).

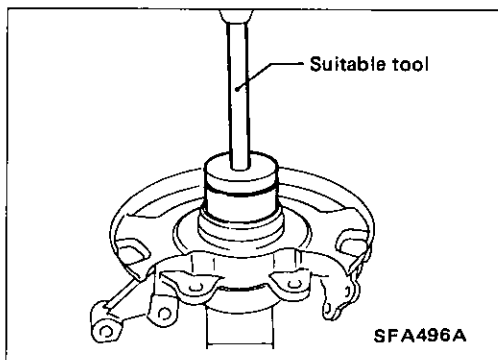
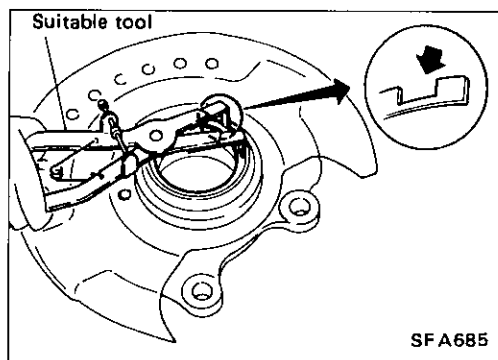
- Remove bearing inner race (outside), then remove outer grease seal.
- Remove inner grease seal from knuckle.



## FRONT AXLE — Wheel Hub and Knuckle

### Disassembly (Cont'd)

- Remove inner and outer snap rings.



- Press out bearing outer race.

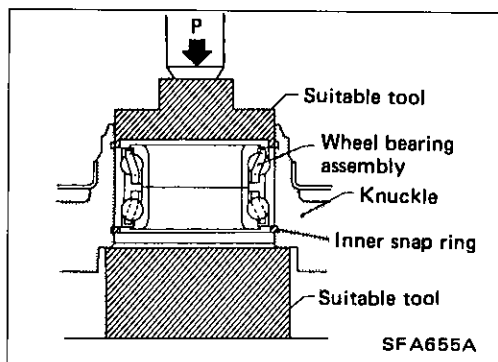
### Inspection

#### WHEEL HUB AND KNUCKLE

Check wheel hub and knuckle for cracks by using a magnetic exploration or dyeing test.

#### SNAP RING

Check snap ring for wear or cracks. Replace if necessary.



### Assembly

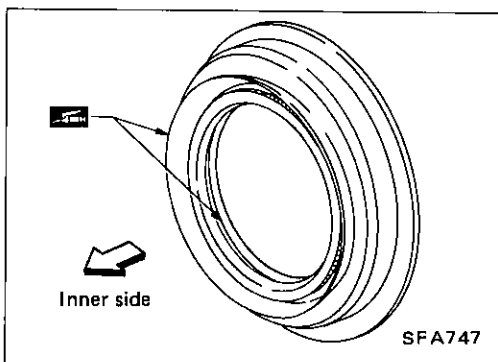
1. Install inner snap ring into groove of knuckle.
2. Press new wheel bearing assembly into knuckle.

**Maximum load P:**

**29 kN (3 t, 3.3 US ton, 3.0 Imp ton)**

#### CAUTION:

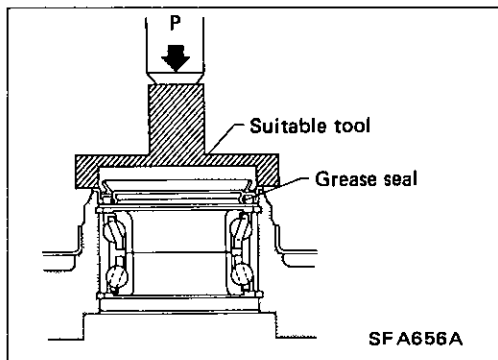
- Do not press inner race of wheel bearing assembly.
  - Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.
3. Install outer snap ring into groove of knuckle.
  4. Pack grease seal lip with multi-purpose grease.



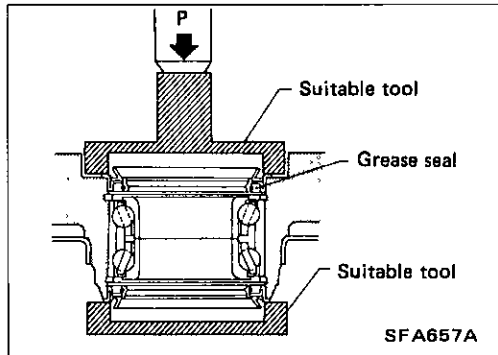
## FRONT AXLE — Wheel Hub and Knuckle

### Assembly (Cont'd)

5. Install outer grease seal.



6. Install inner grease seal.

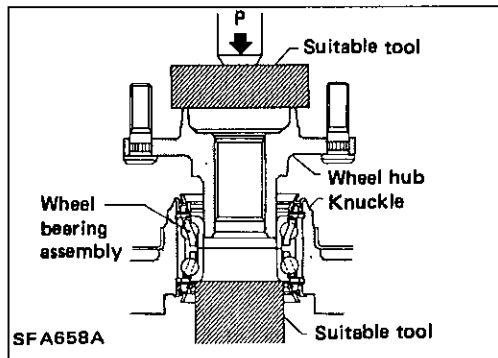


7. Press wheel hub into knuckle.

**Maximum load P:**

**29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)**

**Be careful not to damage grease seal.**



8. Check bearing operation.

- (1) Add load P with press.

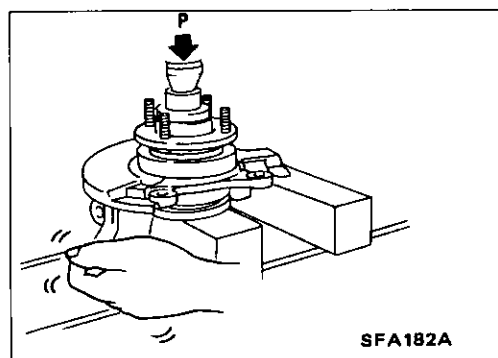
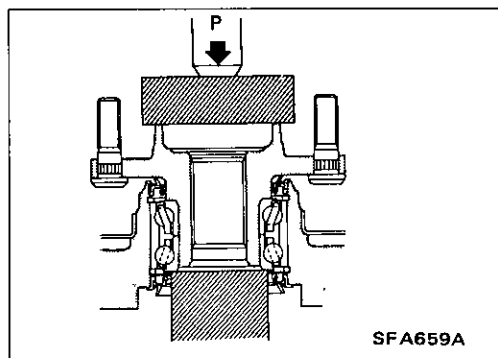
**Load P:**

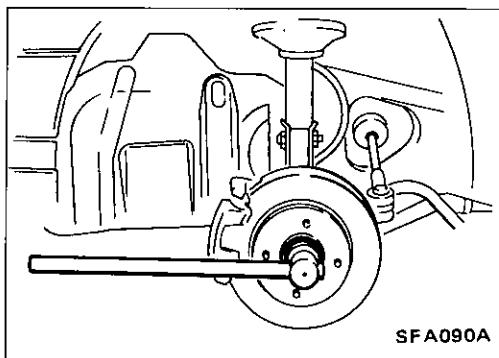
**34.3 - 49.0 kN**

**(3.5 - 5.0 ton, 3.9 - 5.5 US ton, 3.44 - 4.92 Imp ton)**

- (2) Spin knuckle several turns in both directions.

- (3) Make sure that wheel bearings operate smoothly.



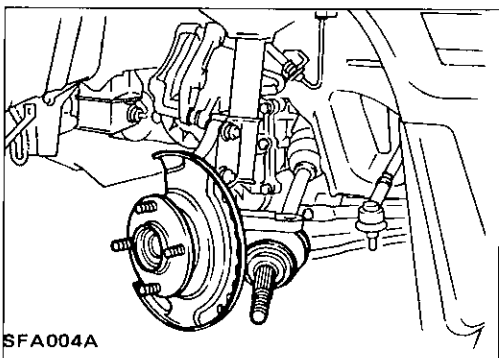


### Removal

- Remove wheel bearing lock nut.
- Remove brake caliper assembly.

**Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out.**

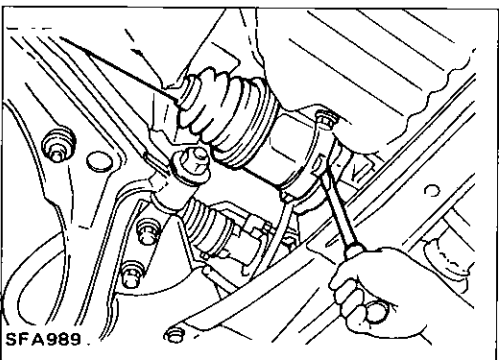
**Make sure brake hose is not twisted.**



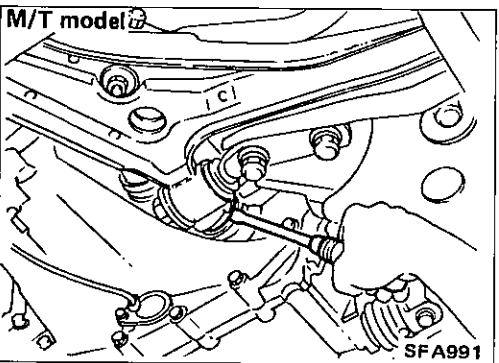
- Remove tie-rod ball joint.
- Separate drive shaft from knuckle by slightly tapping it.

**When removing drive shaft, cover boots with waste cloth to prevent damage to them.**

Refer to FRONT AXLE — Wheel Hub and Knuckle.



1. Remove right drive shaft from transaxle.



2. Remove left drive shaft from transaxle.

**— FOR M/T MODELS —**



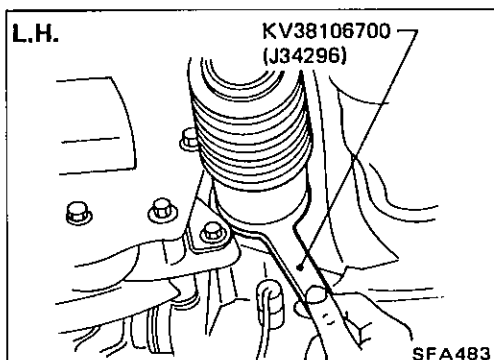
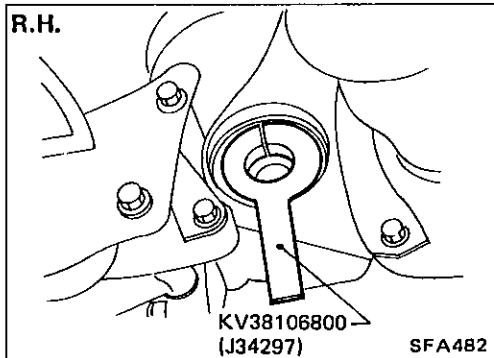
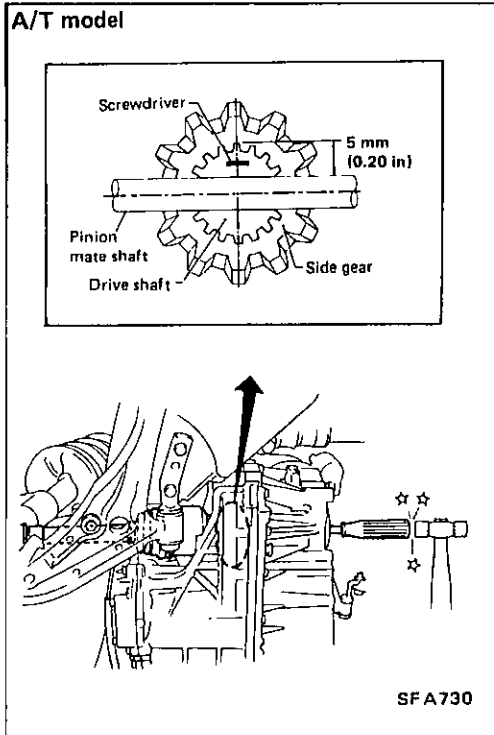
## FRONT AXLE — Drive Shaft

### Removal (Cont'd)

— FOR A/T MODELS —

- Remove left drive shaft with a suitable tool.

**Be careful not to damage pinion mate shaft and side gear.**



### Installation

#### TRANSAXLE SIDE

1. Drive a new oil seal to transaxle. Refer to section MT or AT.
2. Set Tool along the inner circumference of oil seal (transaxle side).

3. Insert drive shaft into transaxle. Be sure to properly align the serrations and then withdraw Tool.
4. Push drive shaft, then press-fit circular clip on the drive shaft into circular clip groove of side gear.
5. After its insertion, try to pull the flange out of the slide joint by hand. If it pulls out, the circular clip is not properly meshed with the side gear.

#### WHEEL SIDE

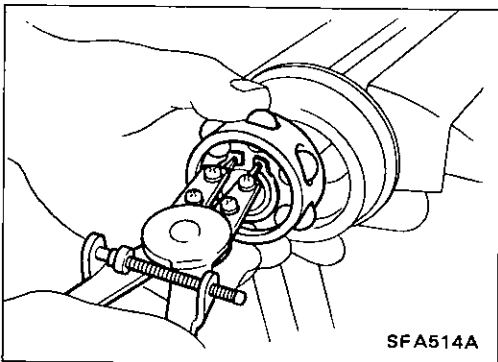
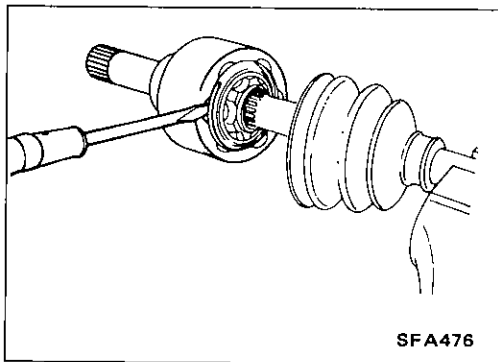
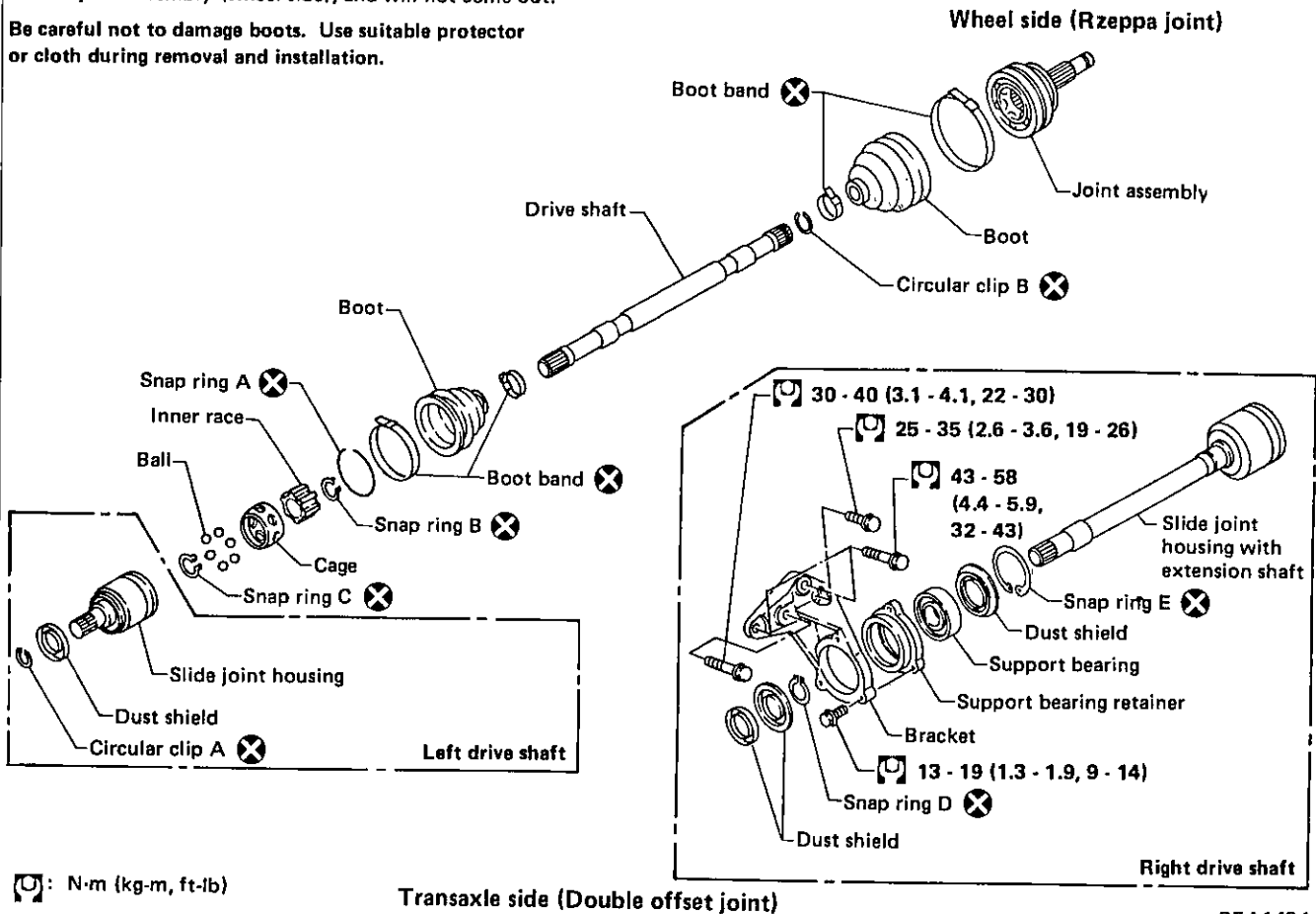
- Install drive shaft into knuckle.
- Tighten wheel bearing lock nut.

## Components

### Circular clip:

Make sure circular clip is properly meshed with side gear (transaxle side) and joint assembly (wheel side), and will not come out.

Be careful not to damage boots. Use suitable protector or cloth during removal and installation.



## Disassembly

### TRANSAXLE SIDE

1. Remove boot bands.
2. Put matching marks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.

4. Put matching marks on inner race and drive shaft.
5. Pry off snap ring "C", then remove ball cage, inner race and balls as a unit.
6. Pry off snap ring "B".
7. Draw out boot.

**Cover drive shaft serrations with tape so as not to damage the boot.**

## FRONT AXLE — Drive Shaft

### Disassembly (Cont'd)

#### WHEEL SIDE

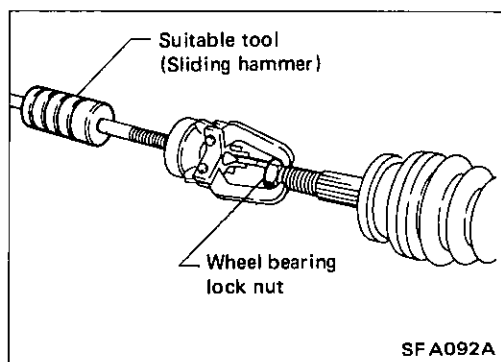
##### CAUTION:

The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

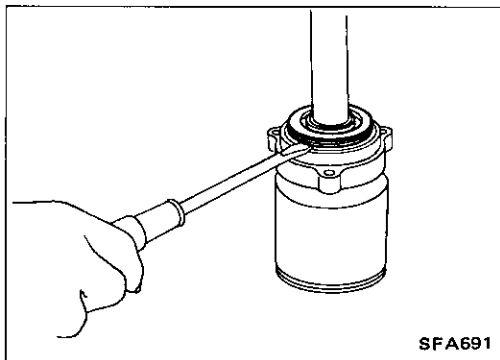
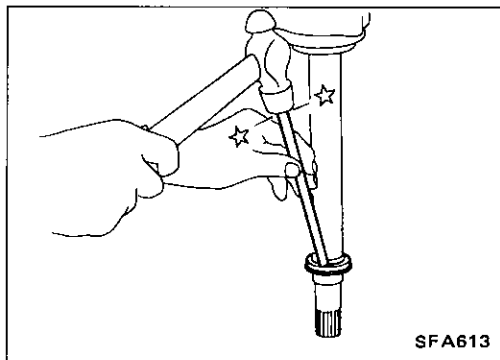
**Be careful not to damage threads on drive shaft.**

- Remove boot bands.

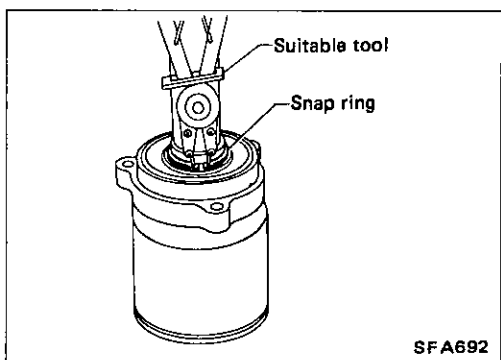


#### SUPPORT BEARING

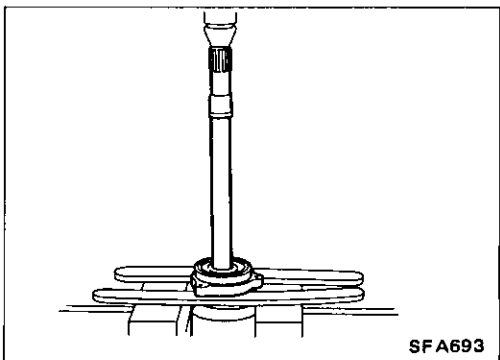
- Remove dust shield.



- Pry off snap ring.



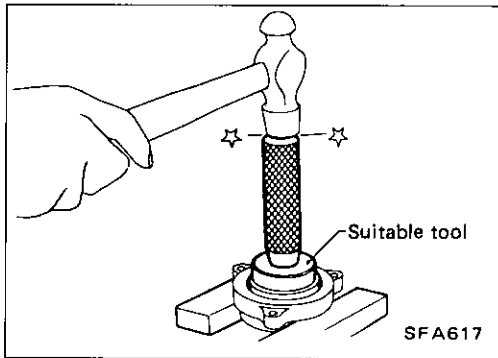
- Press support bearing assembly out of drive shaft.



## FRONT AXLE — Drive Shaft

### Disassembly (Cont'd)

- Press support bearing out of retainer.



### Inspection

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

### DRIVE SHAFT

Replace drive shaft if it is twisted or cracked.

### BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

### JOINT ASSEMBLY (Transaxle side)

- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

### JOINT ASSEMBLY (Wheel side)

Replace joint assembly if it is deformed or damaged.

### SUPPORT BEARING

Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

### SUPPORT BEARING BRACKET

Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

### Assembly

- After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.
- Use NISSAN GENUINE GREASE or equivalent after every overhaul.

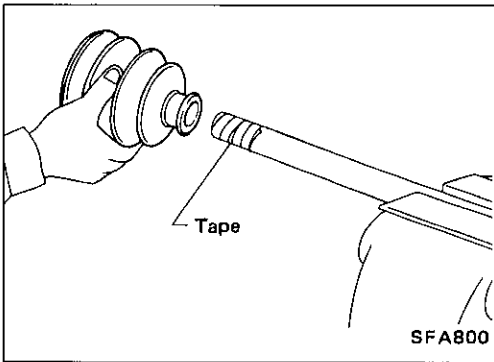
## FRONT AXLE — Drive Shaft

### Assembly (Cont'd)

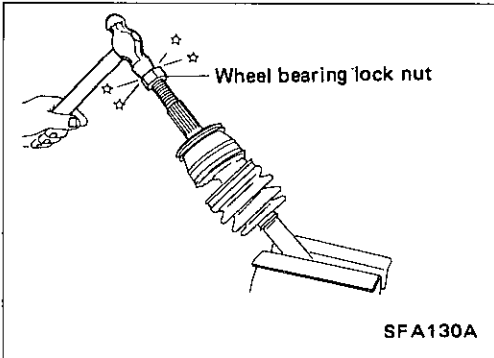
#### WHEEL SIDE

1. Install boot and new small boot band on drive shaft.

**Cover drive shaft serration with tape so as not to damage boot during installation.**



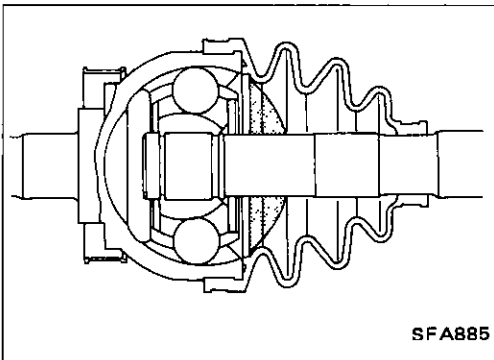
2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



3. Pack drive shaft with specified amount of grease.

**Specified amount of grease:**

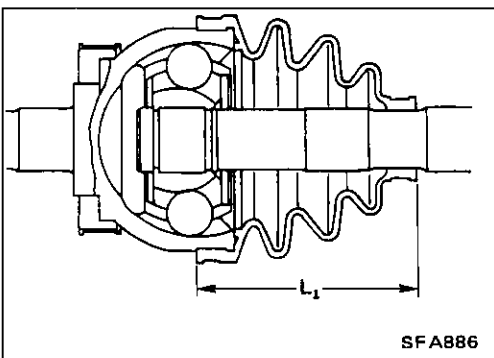
**205 - 225 g (7.23 - 7.94 oz)**



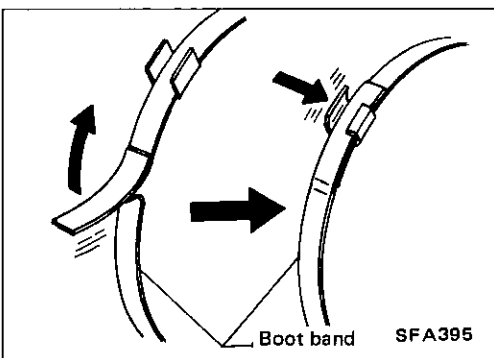
4. Make sure that boot is properly installed on the drive shaft groove. Set boot so that it does not swell and deform when its length is " $L_1$ ".

**Length " $L_1$ ":**

**96 - 98 mm (3.78 - 3.86 in)**

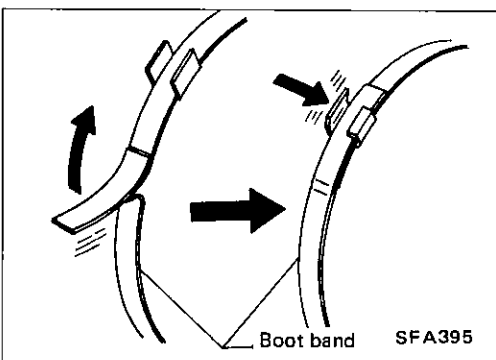
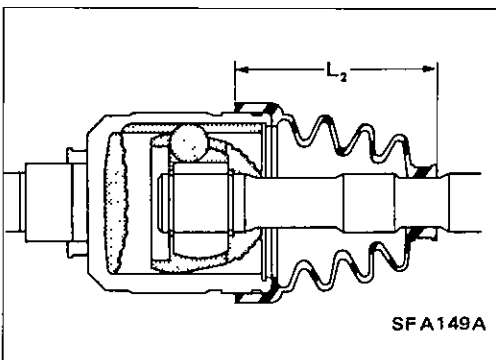
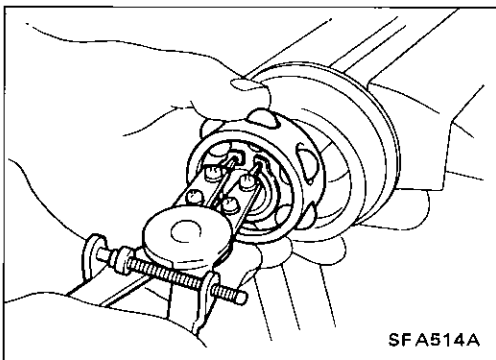
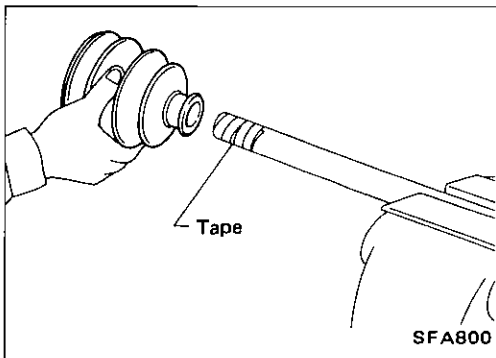
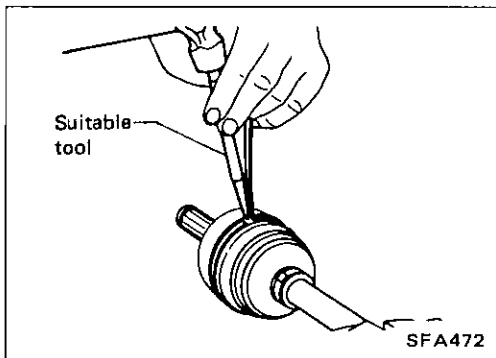


5. Lock new larger and smaller boot bands securely with a suitable tool.



## FRONT AXLE — Drive Shaft

### Assembly (Cont'd)



#### TRANSAXLE SIDE

1. Install boot and new small boot band on drive shaft.

**Cover drive shaft serration with tape so as not to damage boot during installation.**

2. Install new snap ring "B", then securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "C".

4. Pack drive shaft with specified amount of grease.

**Specified amount of grease:**

**160 - 180 g (5.64 - 6.35 oz)**

5. Install slide joint housing, then install new snap ring "A".
6. Make sure that boot is properly installed on the drive shaft groove.  
Set boot so that it does not swell and deform when its length is "L<sub>2</sub>".

**Length "L<sub>2</sub>":**

**97 - 99 mm (3.82 - 3.90 in)**

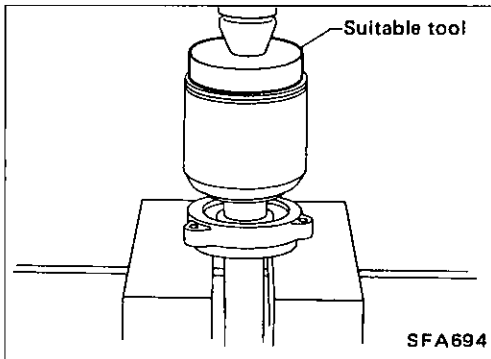
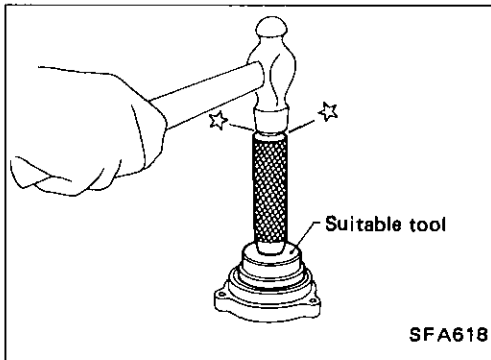
7. Lock new larger and smaller boot bands securely with a suitable tool.

## FRONT AXLE — Drive Shaft

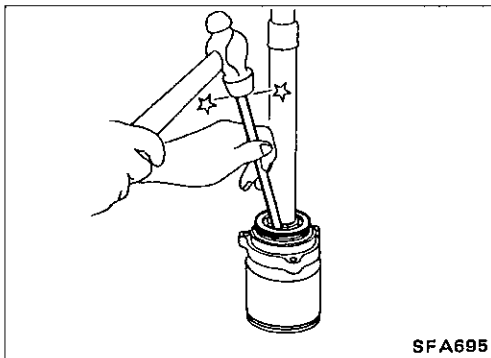
### Assembly (Cont'd)

#### SUPPORT BEARING

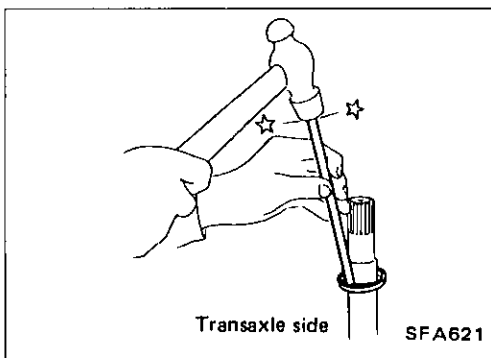
- Press bearing into retainer.



- Press drive shaft into bearing.



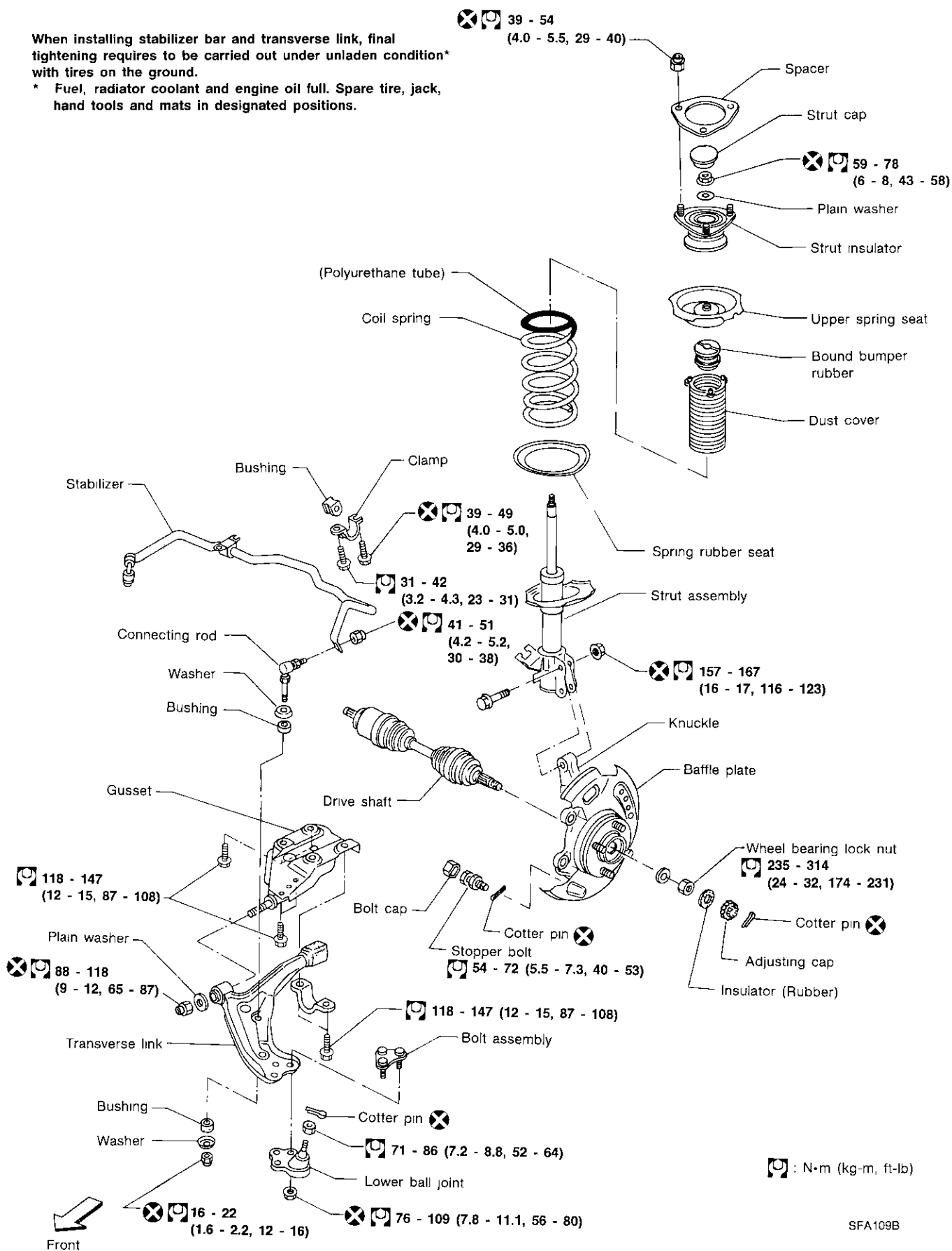
- Install snap ring.
- Install new dust shield.



# FRONT SUSPENSION

When installing stabilizer bar and transverse link, final tightening requires to be carried out under unladen condition\* with tires on the ground.

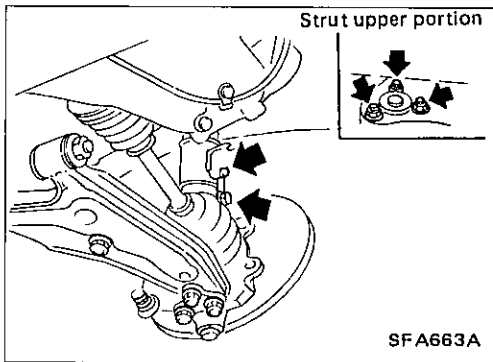
\* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



SFA109B



## FRONT SUSPENSION — Coil Spring and Strut Assembly



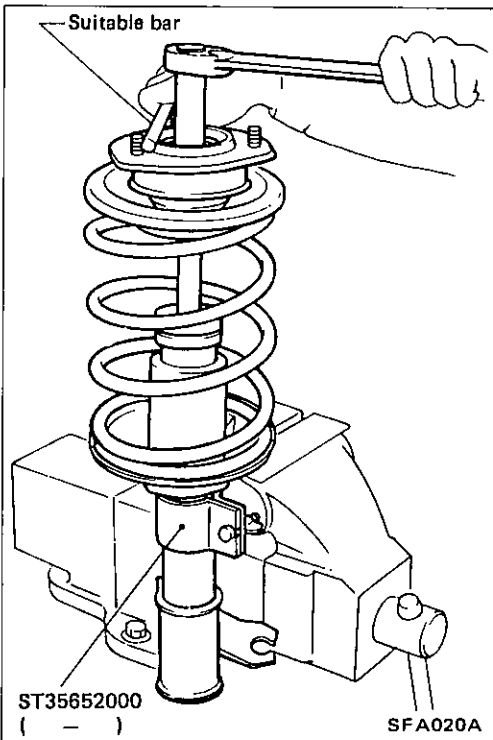
### Removal and Installation

- Remove strut assembly fixing bolts and nuts (to hoodledge).  
**Do not remove piston rod lock nut on vehicle.**

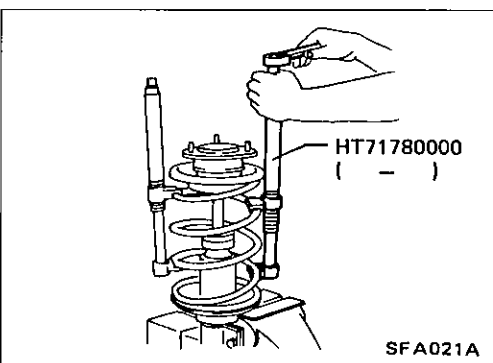
### Disassembly

1. Set strut assembly on vise with Tool, then loosen piston rod lock nut.

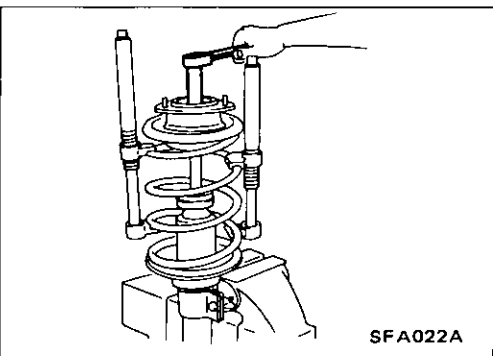
**Do not remove piston rod lock nut.**



2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.



3. Remove piston rod lock nut.



### Inspection

#### STRUT ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portion.
- Check piston rod for cracks, deformation or other damage.
- Replace if necessary.

#### STRUT MOUNTING INSULATOR

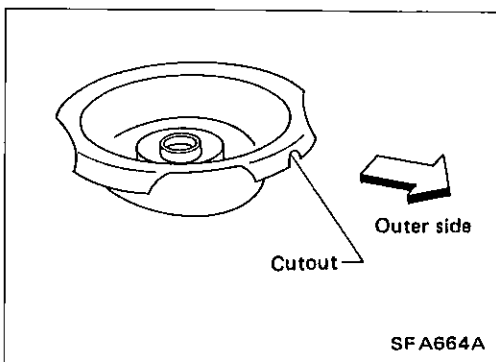
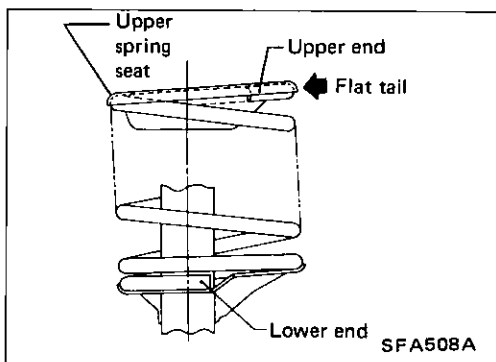
- Check cemented rubber-to-metal portion for separation or cracks.
- Check rubber parts for deterioration.

#### THRUST BEARING

- Check thrust bearing parts for abnormal noise or excessive rattle in axial direction.
- Replace if necessary.

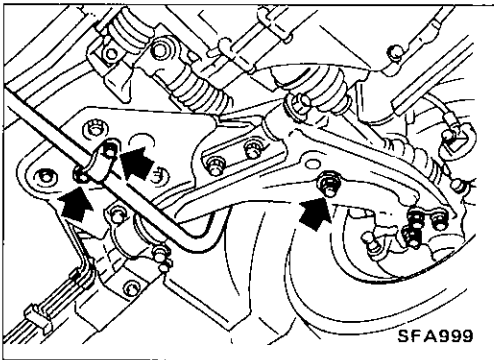
#### COIL SPRING

Check for cracks, deformation or other damage. Replace if necessary.



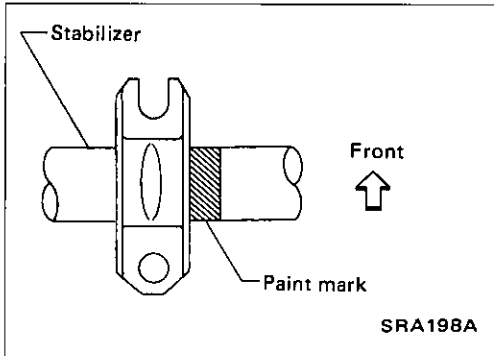
### Assembly

- When installing coil spring on strut, it must be positioned as shown in the figure at left.
- Install upper spring seat with its cutout facing the outer side of vehicle.

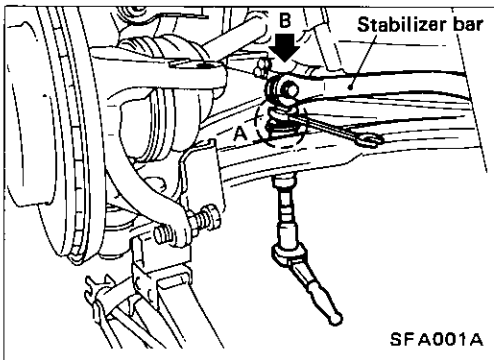


### Removal and Installation

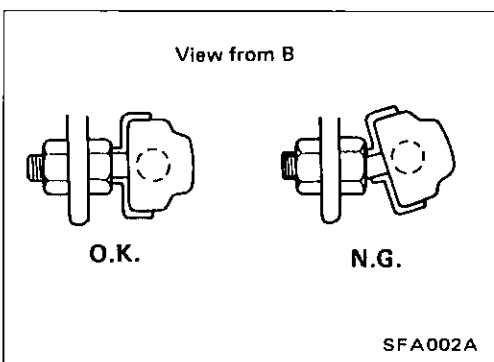
- Remove stabilizer bar.



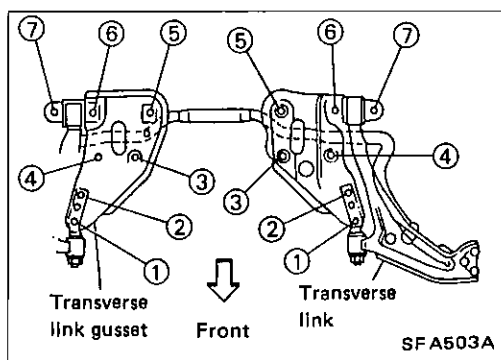
- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.



- When removing and installing stabilizer bar, fix portion A.



- Install stabilizer bar with ball joint socket properly placed.



### Removal and Installation

- Remove stabilizer bar.
- Remove fixing bolts.
- Install bolts in order of number.

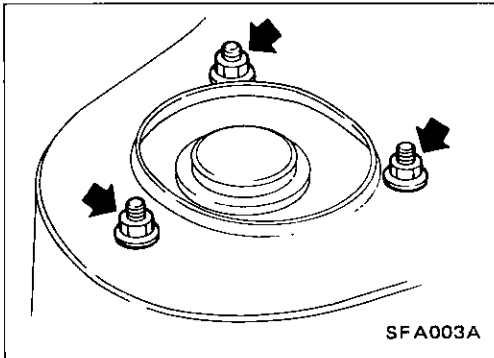
#### Tightening torque:

Refer to **FRONT SUSPENSION**.

- During installation, final tightening must be carried out at curb weight with tires on the ground.
- After installation, check wheel alignment. Refer to **CHECK AND ADJUSTMENT**.

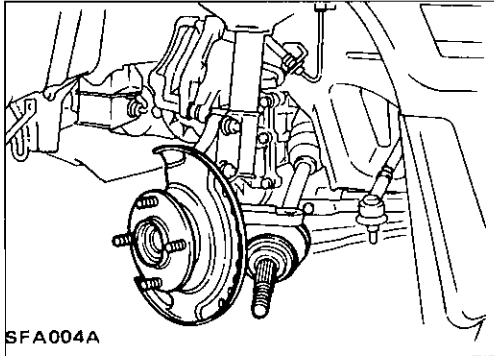
### Inspection

- 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.
- Check transverse link gusset for damage, cracks or deformation. Replace it if necessary.



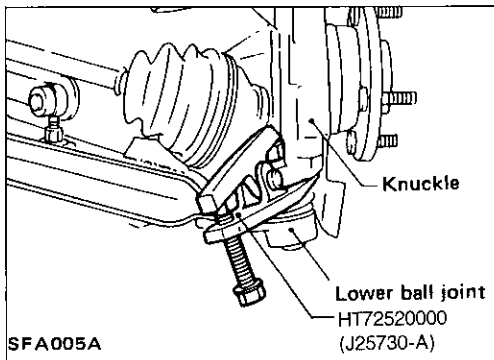
### Removal and Installation

1. Remove wheel bearing lock nut.
2. Remove tie-rod ball joint.
3. Loosen (do not remove) strut mounting nuts.

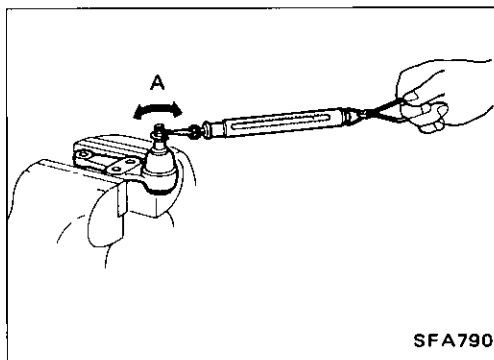


4. Remove nut securing lower ball joint to transverse link.
5. Separate drive shaft from knuckle by slightly tapping drive shaft end.

**Cover boots with waste cloth so as not to damage them when removing drive shaft.**



6. Remove lower ball joint from knuckle with Tool.



### Inspection

- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace lower ball joint.

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

**Swinging force "A":**

(measuring point: cotter pin hole of ball stud)

7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb)

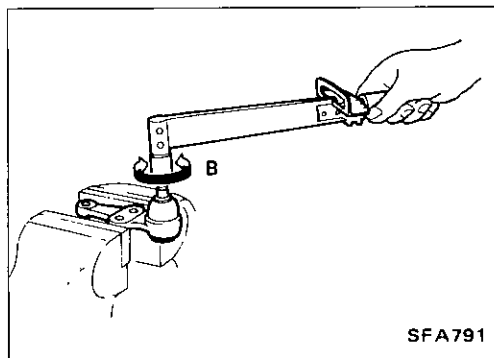
**Turning torque "B":**

0.49 - 3.43 N·m (5.0 - 35 kg-cm, 4.3 - 30.4 in-lb)

**Vertical end play:**

0 mm (0 in)

- Check dust cover for damage. Replace it and cover clamp if necessary.



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

## General Specifications

### COIL SPRING

| Applied model                          |         | M/T                  | A/T                     |
|----------------------------------------|---------|----------------------|-------------------------|
| Wire diameter                          | mm (in) | 12.3 (0.484)         | 12.7 (0.500)            |
| Coil diameter                          | mm (in) | 130 (5.12)           |                         |
| Free length                            | mm (in) | 344 (13.54)          | 361 (14.21)             |
| Spring constant<br>N/mm (kg/mm, lb/in) |         | 23.5 (2.4, 134)      |                         |
| Identification color                   |         | Red x 1,<br>Blue x 2 | Yellow x 1,<br>Blue x 2 |

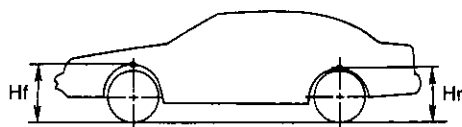
### STRUT

| Applied model                             |            | All                                     |
|-------------------------------------------|------------|-----------------------------------------|
| Piston rod diameter                       | mm (in)    | 22 (0.87)                               |
| Damping force<br>[at 0.3 m (1.0 ft)/sec.] | N (kg, lb) |                                         |
| Expansion                                 |            | 1,089 - 1,461<br>(111 - 149, 245 - 329) |
| Compression                               |            | 471 - 706 (48 - 72, 106 - 159)          |

### FRONT STABILIZER BAR

| Applied model        |         | All          |
|----------------------|---------|--------------|
| Stabilizer diameter  | mm (in) | 26.5 (1.043) |
| Identification color |         | Blue         |

### WHEELARCH HEIGHT (Unladen\*)



SFA818A

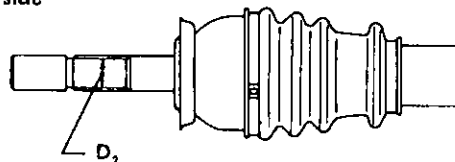
| Applied model |         | All         |
|---------------|---------|-------------|
| Front (Hf)    | mm (in) | 676 (26.61) |
| Rear (Hr)     | mm (in) | 645 (25.39) |

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

### DRIVE SHAFT

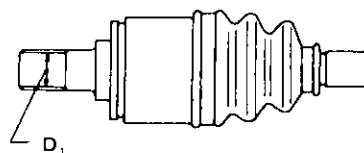
| Applied model                 |  | All                                    |
|-------------------------------|--|----------------------------------------|
| Joint type                    |  |                                        |
| Transaxle side                |  | DS90                                   |
| Wheel side                    |  | ZF100                                  |
| Diameter                      |  | mm (in)                                |
| Transaxle side D <sub>1</sub> |  | 28 (1.10)                              |
| Wheel side D <sub>2</sub>     |  | 28 (1.10)                              |
| Grease                        |  | Nissan genuine grease<br>or equivalent |
| Capacity                      |  | g (oz)                                 |
| Transaxle side                |  | 160 - 180 (5.64 - 6.35)                |
| Wheel side                    |  | 205 - 225 (7.23 - 7.94)                |

#### Wheel side



SFA562

#### Transaxle side



SFA563

## Inspection and Adjustment

### WHEEL ALIGNMENT (Unladen\*1)

| Applied model             |                     | All                 |
|---------------------------|---------------------|---------------------|
| Camber                    | degree              | - 30' to 1° 00'     |
| Caster                    | degree              | 35' - 2° 05'        |
| Kingpin inclination       | degree              | 13°45' - 15°15'     |
| Toe-in                    | mm (in)             | 1 - 3 (0.04 - 0.12) |
|                           | Total toe-in degree | 6' - 18'            |
| Front wheel turning angle |                     |                     |
| Full turn*2               | Inside              | 34° - 38°           |
|                           | Outside             | 27° - 31°           |

\*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

\*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle

### WHEEL BEARING

|                                          |                   |                                |
|------------------------------------------|-------------------|--------------------------------|
| Wheel bearing axial end play limit       | mm (in)           | 0.05 (0.0020)                  |
| Wheel bearing lock nut tightening torque | N·m (kg-m, ft-lb) | 235 - 314 (24 - 32, 174 - 231) |

### LOWER BALL JOINT

|                                                 |                    |                                    |
|-------------------------------------------------|--------------------|------------------------------------|
| Swinging force<br>(Measured at cotter pin hole) | N (kg, lb)         | 7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3) |
| Turning torque                                  | N·m (kg-cm, in-lb) | 0.49 - 3.43 (5.0 - 35, 4.3 - 30.4) |
| Vertical end play limit                         | mm (in)            | 0 (0)                              |

### WHEEL RUNOUT

Unit: mm (in)

| Wheel type                   | Aluminum wheel | Steel wheel |
|------------------------------|----------------|-------------|
| Maximum radial runout limit  | 0.3 (0.012)    | 0.5 (0.020) |
| Maximum lateral runout limit | 0.3 (0.012)    | 0.8 (0.031) |





# REAR AXLE & REAR SUSPENSION

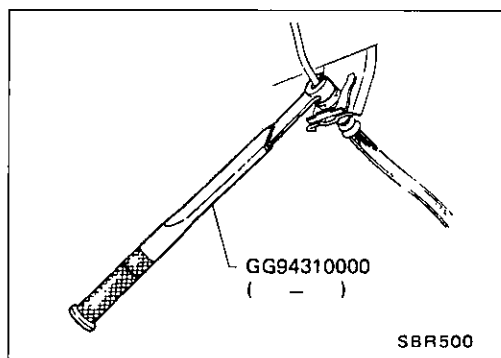
## SECTION **RA**

### CONTENTS

|                                                        |       |
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| PRECAUTIONS AND PREPARATION .....                      | RA- 2 |
| REAR AXLE AND REAR SUSPENSION .....                    | RA- 3 |
| CHECK AND ADJUSTMENT — On-vehicle .....                | RA- 4 |
| REAR AXLE — Wheel Hub .....                            | RA- 7 |
| REAR SUSPENSION .....                                  | RA- 9 |
| REAR SUSPENSION — Coil Spring and Strut Assembly ..... | RA-11 |
| REAR SUSPENSION — Stabilizer Bar .....                 | RA-13 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....         | RA-14 |

**RA**

## PRECAUTIONS AND PREPARATION

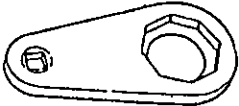
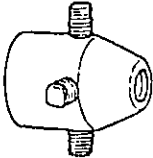
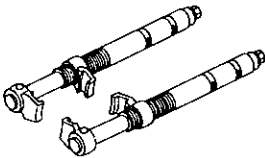
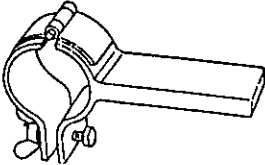
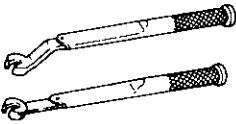


### Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.
- \*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, and mats in designated positions.
- Use Tool when removing or installing brake tubes.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Do not jack up at the parallel links.

### Preparation

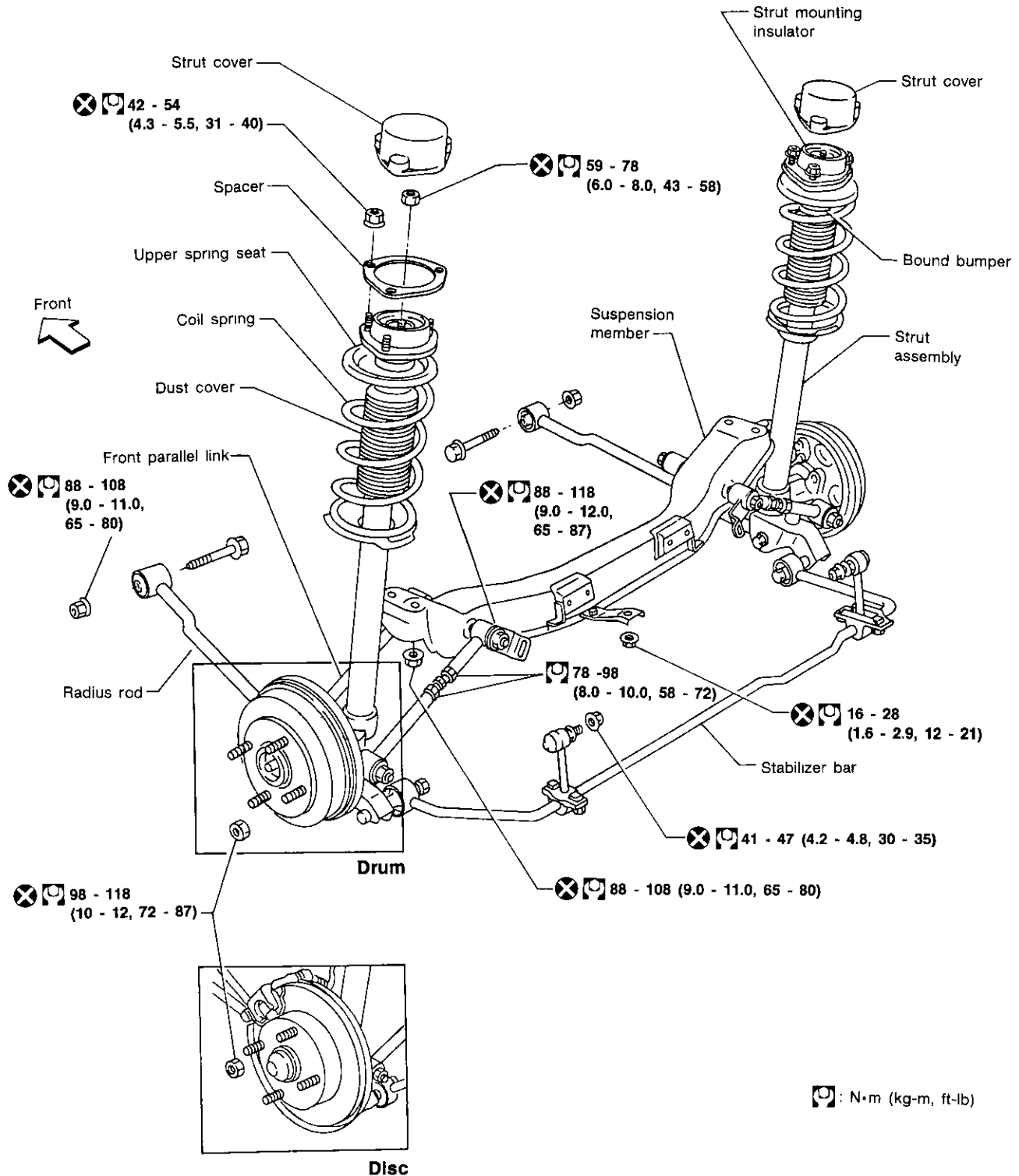
#### SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name   | Description                                                                                                              |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| ST35490000<br>(J26083)<br>Gland packing wrench |  Removing and installing gland packing  |
| KV401021S0<br>( - )<br>Bearing race drift      |  Installing wheel bearing outer race   |
| HT71780000<br>( - )<br>Spring compressor       |  Removing and installing coil spring  |
| ST35652000<br>( - )<br>Strut attachment        |  Fixing strut assembly                |
| GG94310000<br>( - )<br>Flare nut torque wrench |  Removing and installing brake piping |

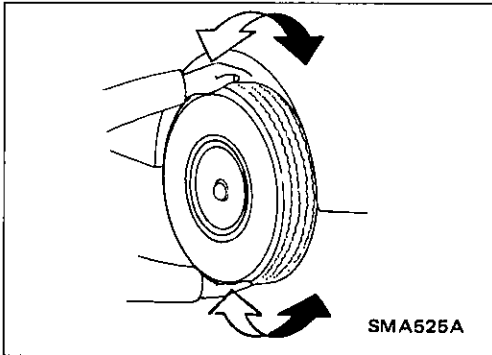
# REAR AXLE AND REAR SUSPENSION

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

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



SRA265A

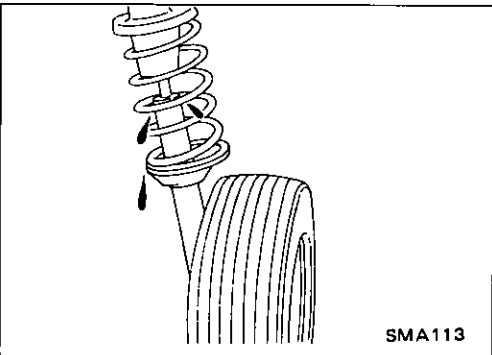
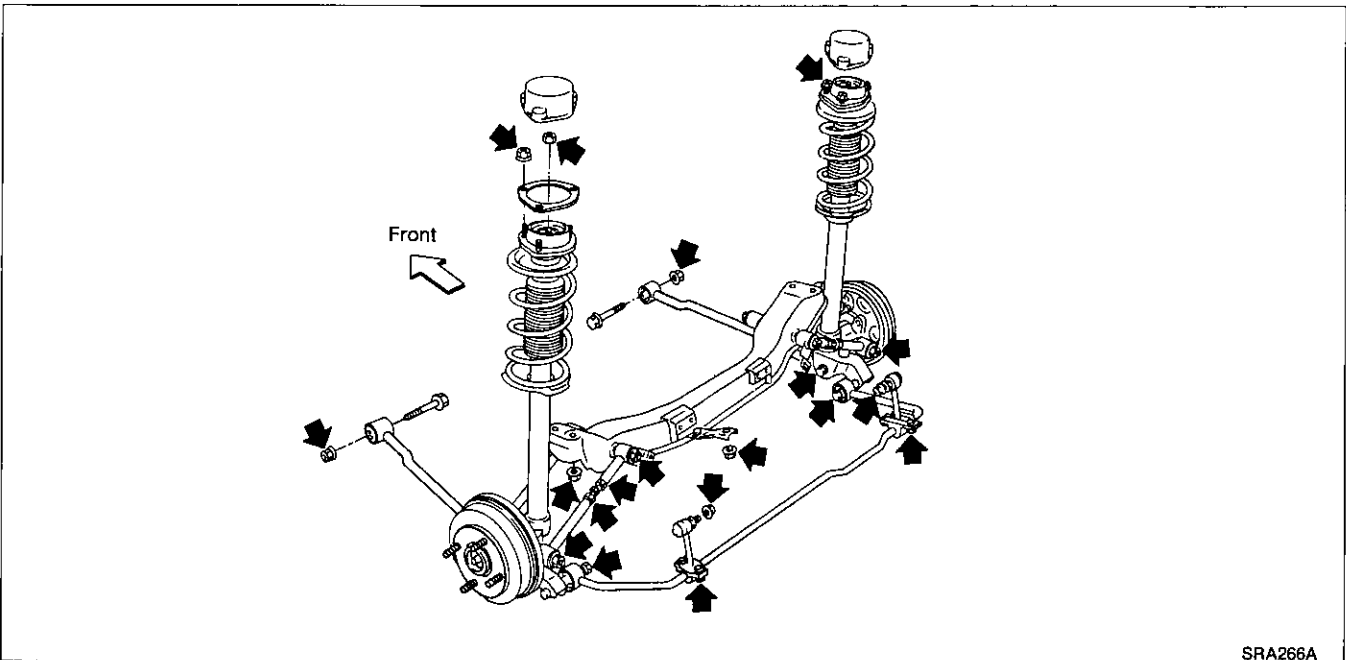


### Rear Axle and Rear Suspension Parts

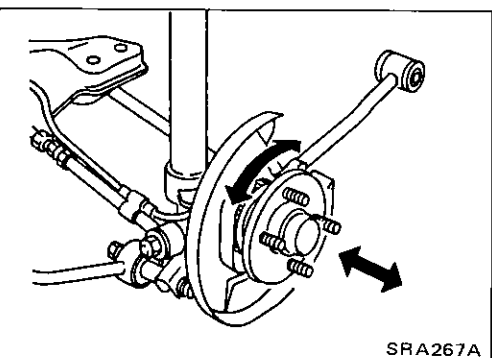
Check axle and suspension parts for looseness, wear or damage.

- Shake each rear wheel to check for excessive play.

- Retighten all nuts and bolts to the specified torque.  
**Tightening torque: Refer to pages RA-3 and RA-9.**



- Check strut (shock absorber) for oil leakage or other damage.
- Check wheelarch height. Refer to CHECK AND ADJUSTMENT — On-vehicle in section FA.



### Rear Wheel Bearing

- Check axial end play.

**Axial end play:**

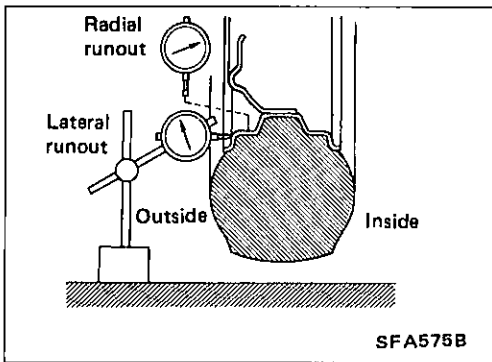
**0.05 mm (0.0020 in) or less**

- Check that wheel bearings operate smoothly.
- Check tightening torque of wheel bearing lock nut.

**[Ⓜ]: 186 - 255 N·m**

**(19 - 26 kg-m, 137 - 188 ft-lb)**

- If there is any axial end play or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to REAR AXLE — Wheel Hub.



## Rear Wheel Alignment

### PRELIMINARY INSPECTION

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

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

**Wheel runout: Refer to S.D.S. in section FA.**

- Check that rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen\*).

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

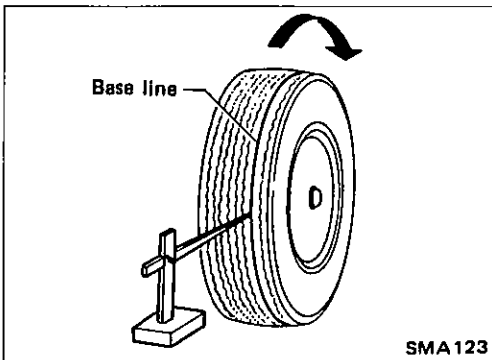
### CAMBER

**Camber is preset at factory and cannot be adjusted.**

**Camber:**

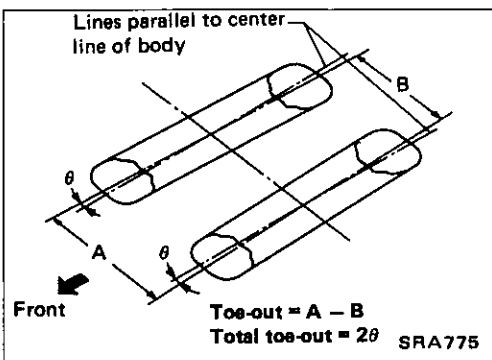
**-1°20' to 0°10'**

- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.



### TOE-OUT

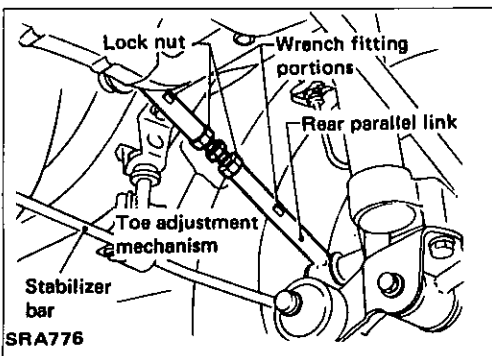
1. Draw a base line across the tread.
- After lowering rear of vehicle, move it up and down to eliminate friction.



2. Measure toe-out.
- Measure distance "A" and "B" at the same height as hub center.

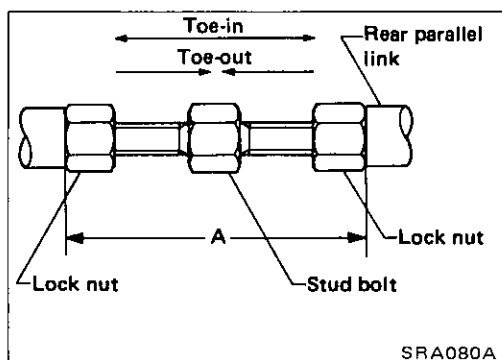
**Toe-out:**

|              |                               |
|--------------|-------------------------------|
| <b>A - B</b> | <b>0 - 4 mm (0 - 0.16 in)</b> |
| <b>2θ</b>    | <b>0° - 23'</b>               |



3. Adjust toe-out by varying the lengths of rear parallel links.

### Rear Wheel Alignment (Cont'd)

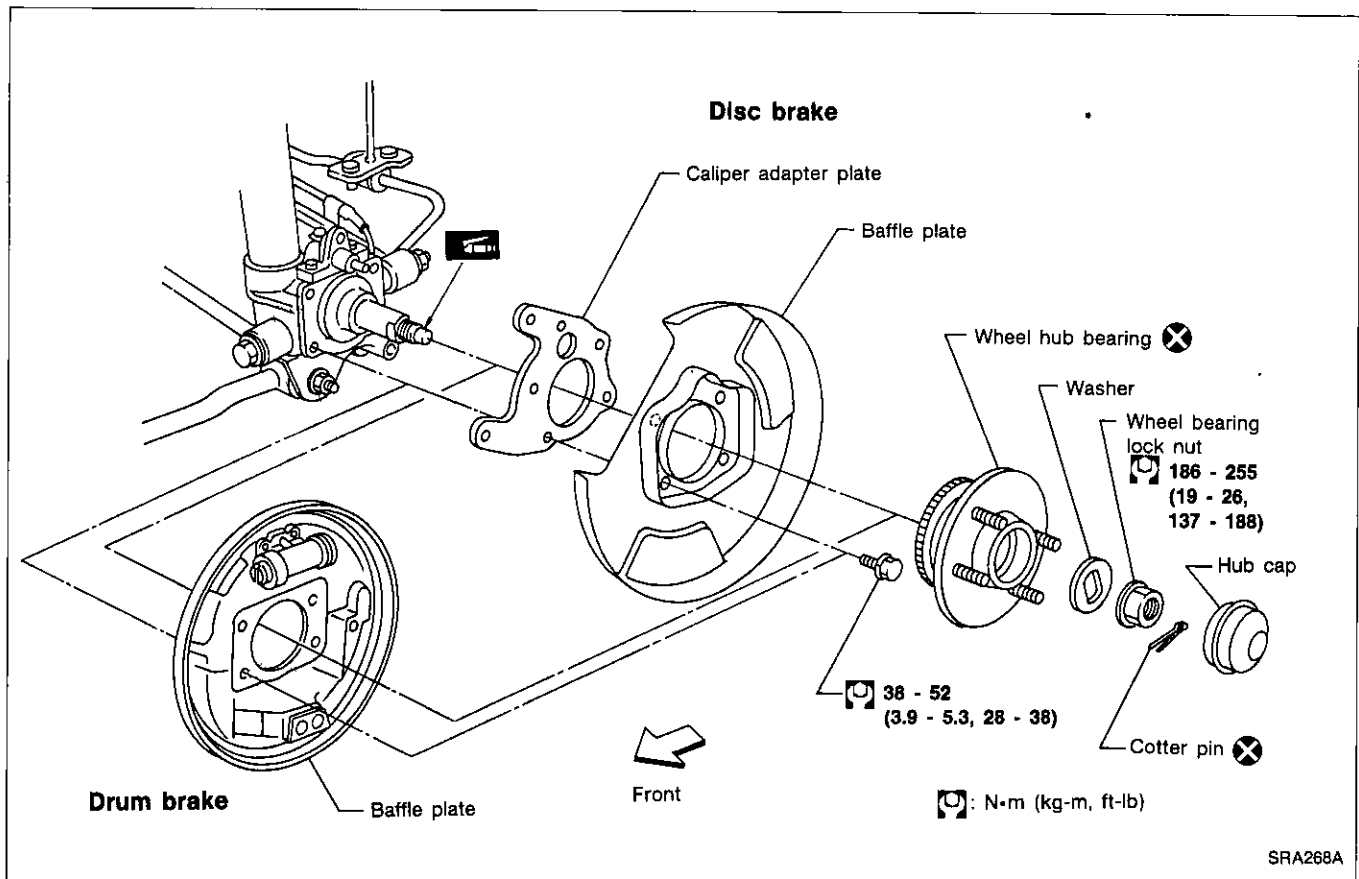


- Adjust left and right rear parallel links to the same length "A".
- Tighten lock nut while holding rear parallel link with wrench to prevent bushing from twisting.

**Standard length "A":**

**50 - 55 mm (1.97 - 2.17 in)**

## REAR AXLE — Wheel Hub

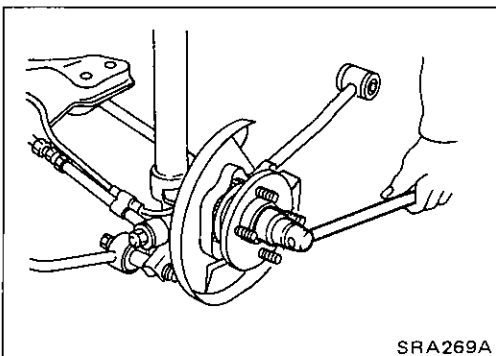


### Removal

#### CAUTION:

Wheel hub bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel hub bearing assembly.

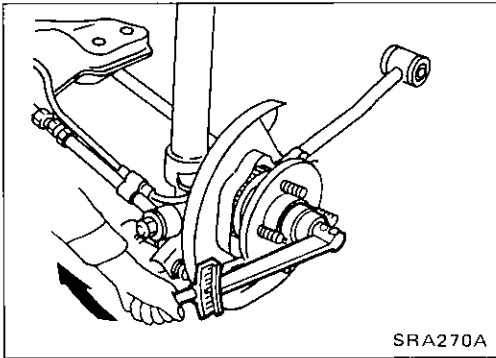
- Growling noise is emitted from wheel hub bearing during operation.
- Wheel hub bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.
- After wheel hub bearing is removed from knuckle spindle.



- 1) Remove brake caliper assembly.
- 2) Remove wheel bearing lock nut.

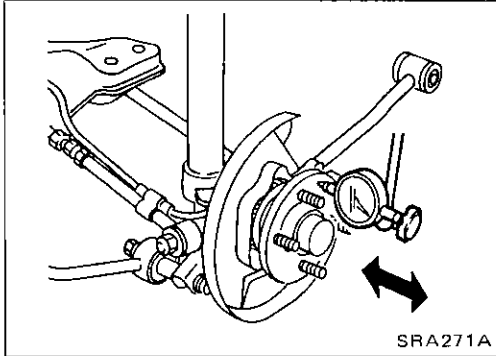
**Brake hose does not need to be disconnected from brake caliper.**

**Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.**



### Installation

- Install wheel hub bearing.
- Tighten wheel bearing lock nut.  
☑: 186 - 255 N·m  
(19 - 26 kg-m, 137 - 188 ft-lb)
- Check that wheel bearings operate smoothly.



- Check wheel bearing axial end play.  
**Axial end play:**  
0.05 mm (0.0020 in) or less



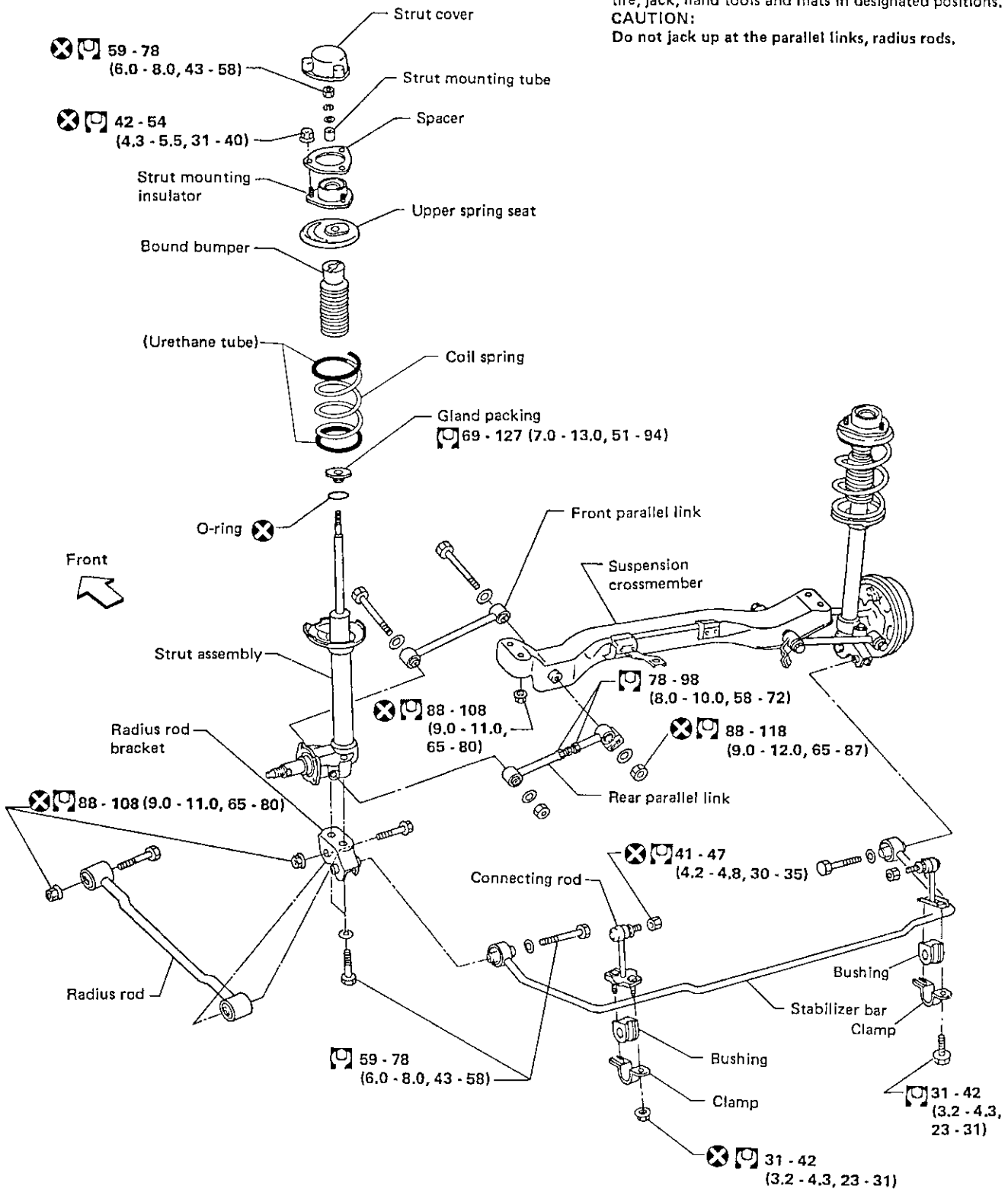
# REAR SUSPENSION

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

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

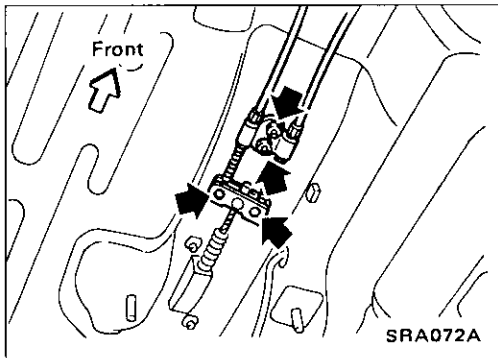
**CAUTION:**

Do not jack up at the parallel links, radius rods,



: N.m (kg-m, ft-lb)

## REAR SUSPENSION

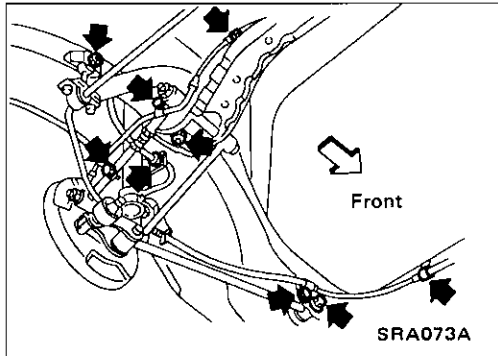


### Removal and Installation

#### CAUTION:

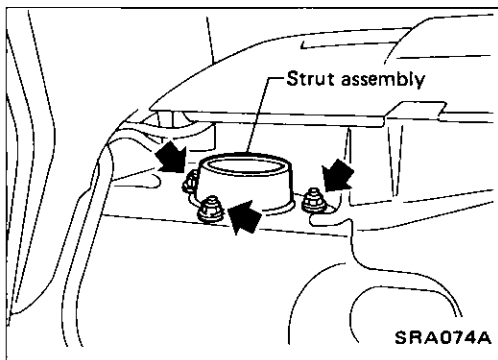
**Do not jack up at the parallel links or radius rods.**

- Disconnect brake hydraulic line and parking brake cable at equalizer.



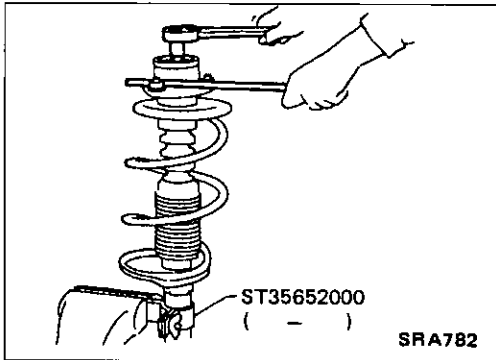
- Remove suspension assembly.

- 1) Remove parallel link fixing bolt, radius rod fixing bolt, stabilizer fixing bolt, stabilizer connecting rod brackets and parking brake cable fixing bolts.



- 2) Remove rear seat and parcel shelf. Refer to section BF.
- 3) Remove strut securing nuts (Upper side). Then pull out strut assembly.

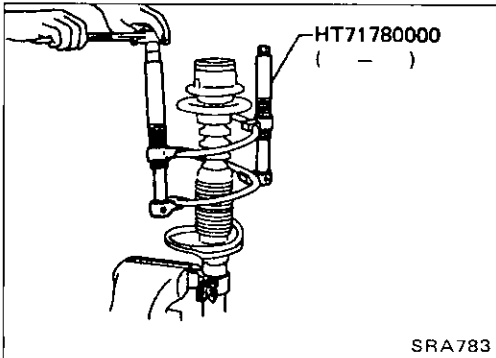
## REAR SUSPENSION — Coil Spring and Strut Assembly



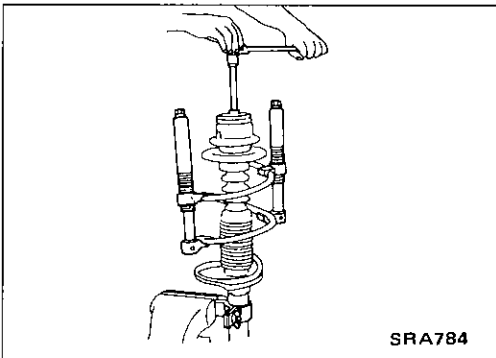
### Disassembly

1. Set strut assembly on vise with attachment, then loosen piston rod lock nut.

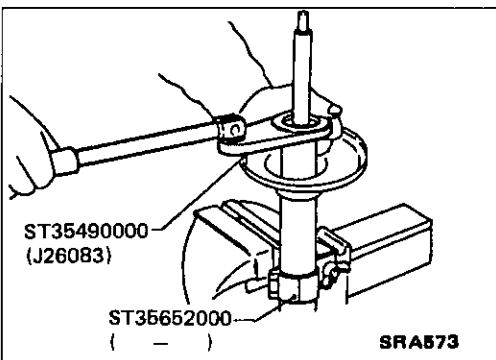
**Do not remove piston rod lock nut.**



2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.



3. Remove piston rod lock nut.



4. Remove gland packing with Tool.

**Avoid getting dirt and dust into gland packing portion.**

5. Retract piston rod by pushing it down until it bottoms. Then, slowly withdraw piston rod from cylinder together with piston guide.

### Inspection

#### STRUT ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

## REAR SUSPENSION — Coil Spring and Strut Assembly

### Inspection (Cont'd)

#### UPPER RUBBER SEAT AND BUSHING

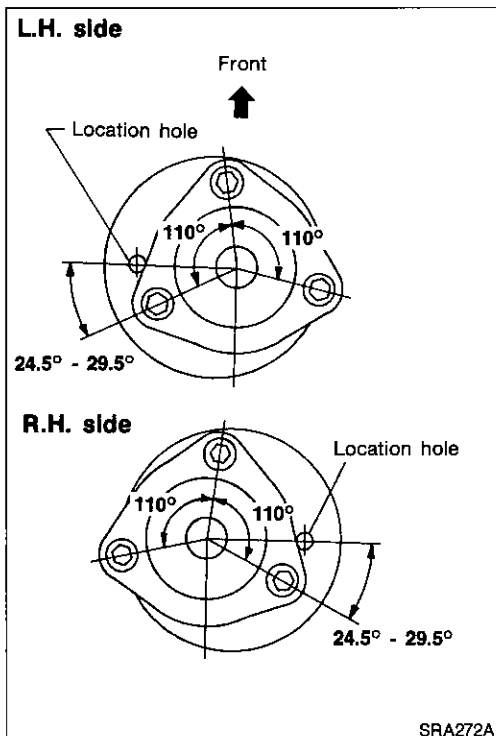
Check rubber parts for deterioration or cracks.  
Replace if necessary.

#### STRUT MOUNTING INSULATOR

- Check cemented rubber-to-metal portion for melting or cracks.
- Check rubber parts for deterioration.

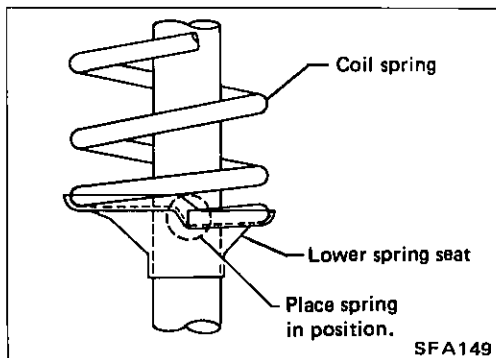
#### COIL SPRING

Check for cracks, deformation or other damage.  
Replace if necessary.



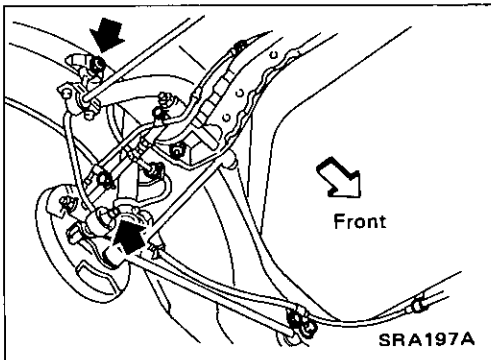
### Assembly

1. Locate upper spring seat as shown.



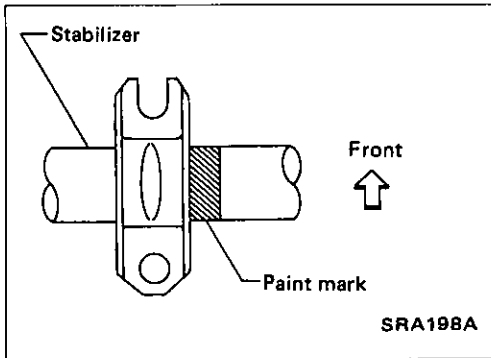
2. After placing coil spring in position on lower spring seat, release spring compressor gradually.

## REAR SUSPENSION — Stabilizer Bar

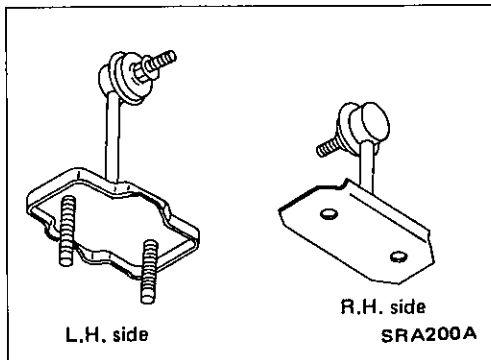


### Removal and Installation

- Remove stabilizer bar.



- When installing stabilizer, refer to paint marks to mount it even.



- When installing connecting rod, make sure that parts are in their correct position.

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

### General Specifications

#### COIL SPRING

| Applied model        |                     | All                  |
|----------------------|---------------------|----------------------|
| Wire diameter        | mm (in)             | 12 (0.47)            |
| Coil diameter        | mm (in)             | 130 (5.12)           |
| Free length          | mm (in)             | 299 (11.77)          |
| Spring constant      |                     | 21.6 (2.2, 123)      |
|                      | N/mm (kg/mm, lb/in) |                      |
| Identification color |                     | Purple x 1, Pink x 1 |

#### STRUT

| Applied model            |            | All                            |
|--------------------------|------------|--------------------------------|
| Piston rod diameter      | mm (in)    | 22 (0.87)                      |
| Damping force            |            |                                |
| [at 0.3 m (1.0 ft)/sec.] |            |                                |
|                          | N (kg, lb) |                                |
| Expansion                |            | 667 - 902 (68 - 92, 150 - 203) |
| Compression              |            | 226 - 363 (23 - 37, 51 - 82)   |

#### STABILIZER BAR

| Applied model |         | All       |
|---------------|---------|-----------|
| Diameter      | mm (in) | 12 (0.47) |

### Inspection and Adjustment

#### WHEEL ALIGNMENT (Unladen\*)

| Applied model   |         | All              |
|-----------------|---------|------------------|
| Camber          | degree  | -1°20' to 0°10'  |
| Toe-out         | mm (in) | 0 - 4 (0 - 0.16) |
| (Total toe-out) |         |                  |
|                 | degree  | 0' - 23'         |

#### WHEEL BEARING

| Applied model                            |                   | All                               |
|------------------------------------------|-------------------|-----------------------------------|
| Wheel bearing axial end play             |                   |                                   |
|                                          | mm (in)           | 0.05 (0.0020) or less             |
| Wheel bearing lock nut tightening torque |                   |                                   |
|                                          | N·m (kg-m, ft-lb) | 186 - 255<br>(19 - 26, 137 - 188) |

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

# BRAKE SYSTEM

## SECTION **BR**

### CONTENTS

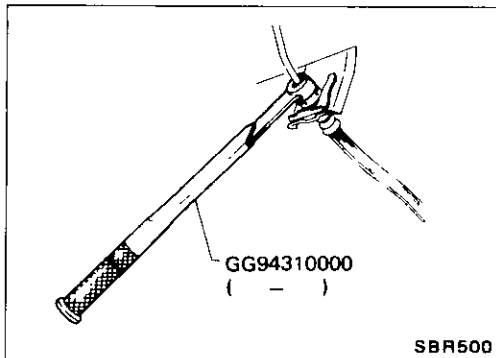
|                                                |       |
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**BR**

## PRECAUTIONS AND PREPARATION

### 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 the hydraulic system.



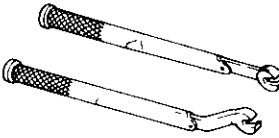
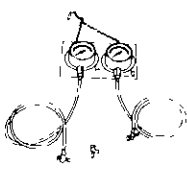
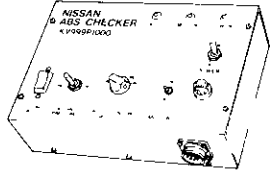
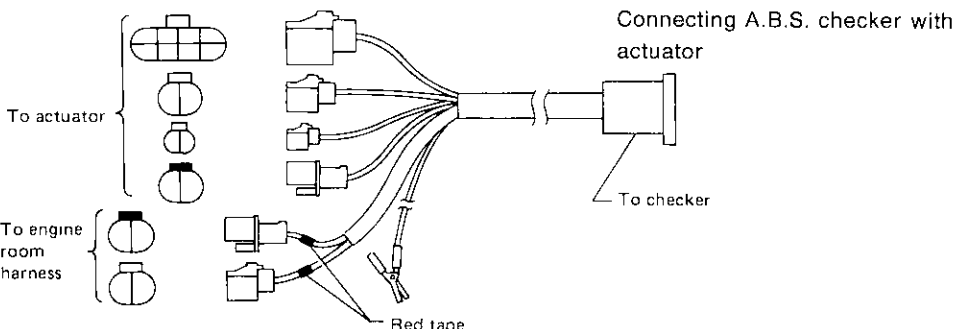
- Use Tool when removing and installing brake tube.

#### WARNING:

- Clean brake pads and shoes with a waste cloth, then wipe with a dust collector.

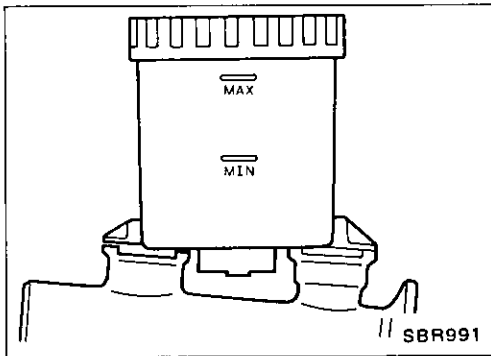
### Preparation

#### SPECIAL SERVICE TOOL

| Tool number<br>(Kent-Moore No.)<br>Tool name          | Description                                                                                                                   |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| GG94310000<br>( - )<br>Flare nut torque wrench        |  Removing and installing each brake piping |
| KV991V0010<br>( - )<br>Brake fluid pressure gauge     |  Measuring brake fluid pressure            |
| KV999P1000<br>( - )<br>A.B.S. checker                 |  Checking A.B.S. actuator operation        |
| KV999P1010<br>( - )<br>A.B.S. checker adapter harness |                                           |

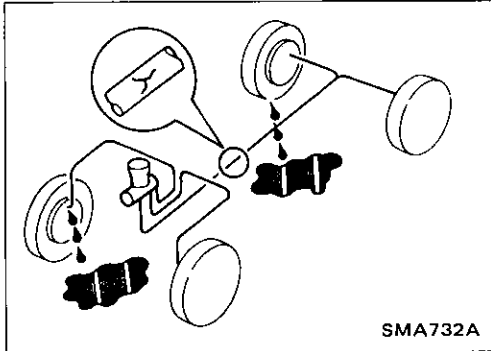


## CHECK AND ADJUSTMENT



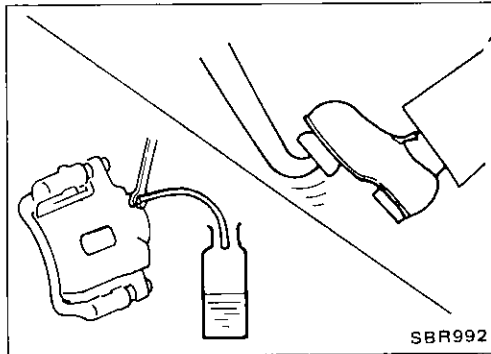
### Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.



### Checking Brake System

- Check brake lines (tubes and 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.

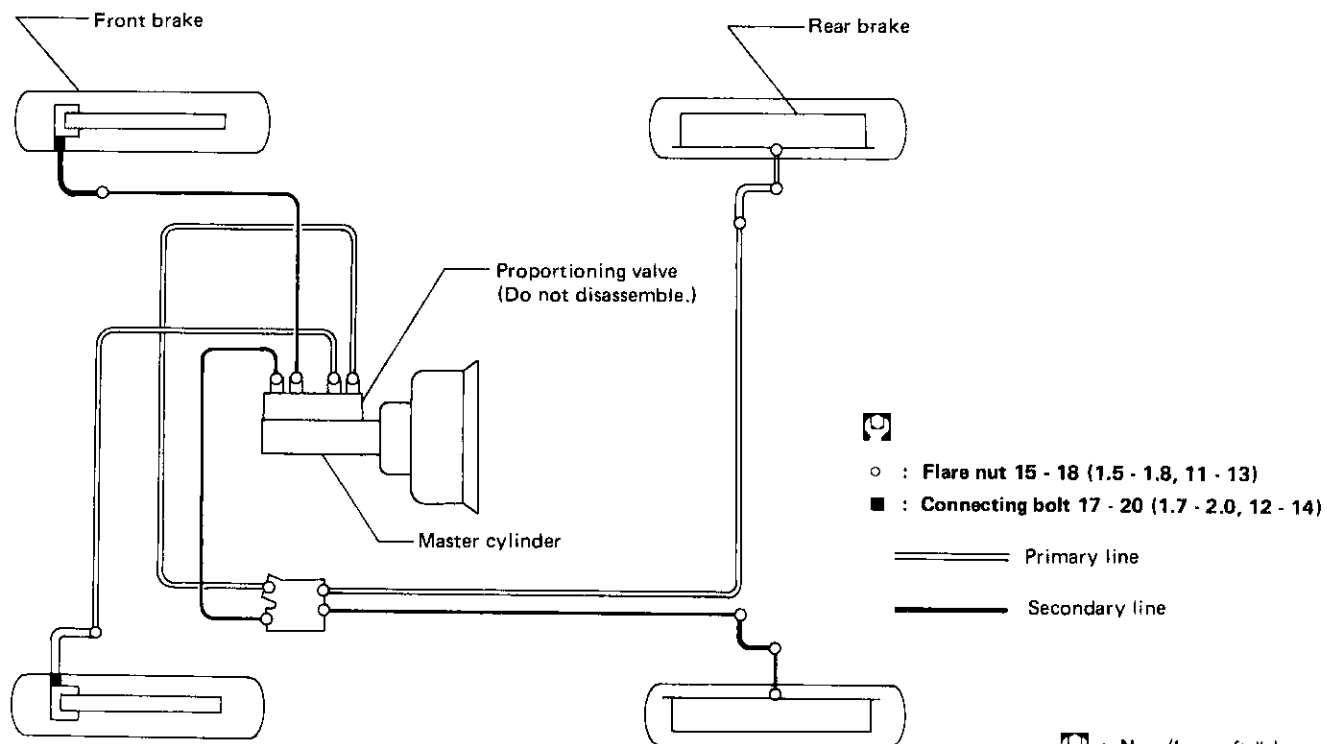


### Changing Brake Fluid

1. Drain brake fluid from 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.**

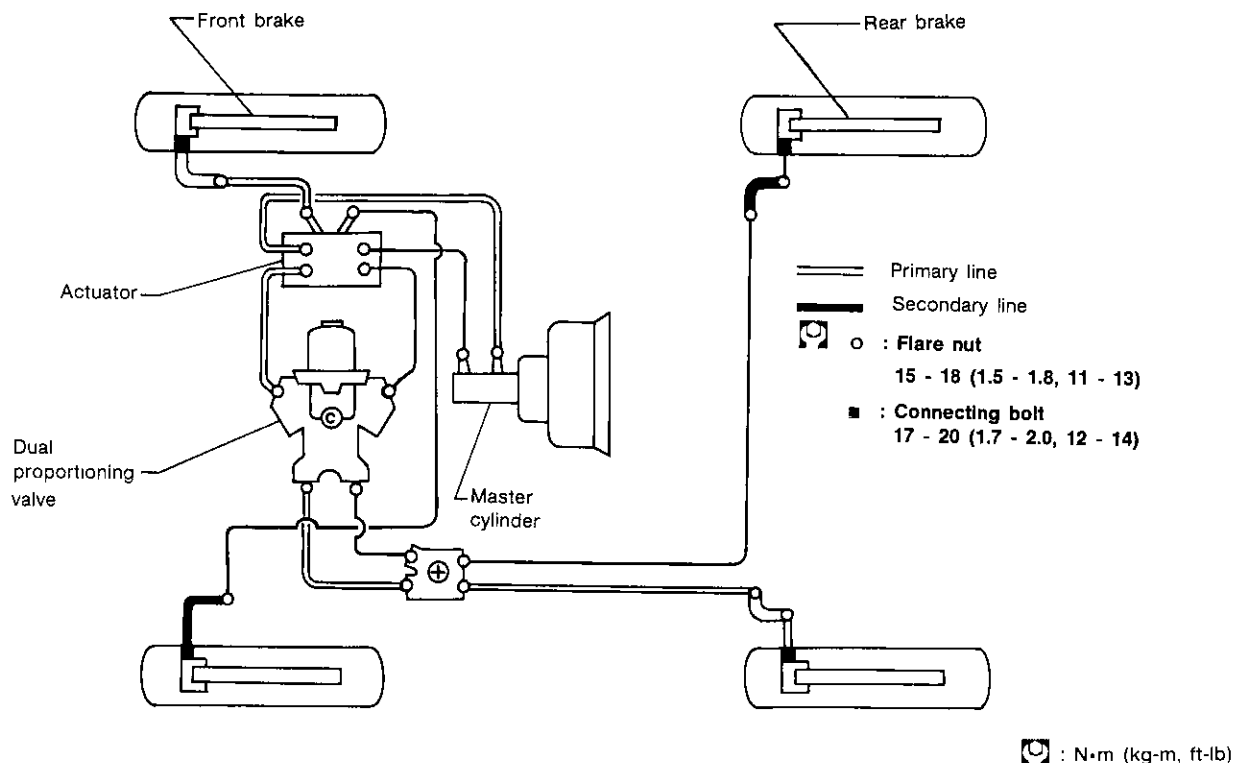
# BRAKE HYDRAULIC LINE

## Without anti-lock braking system



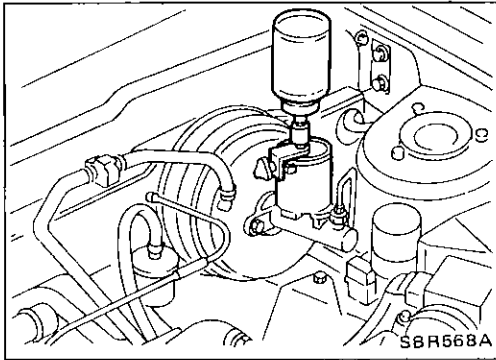
SBR446A

## With anti-lock braking system



SBR894A

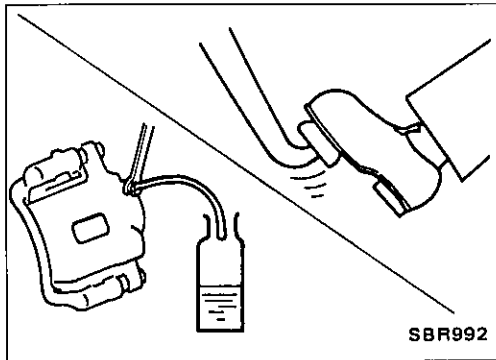
## BRAKE HYDRAULIC LINE



### Bleeding Procedure

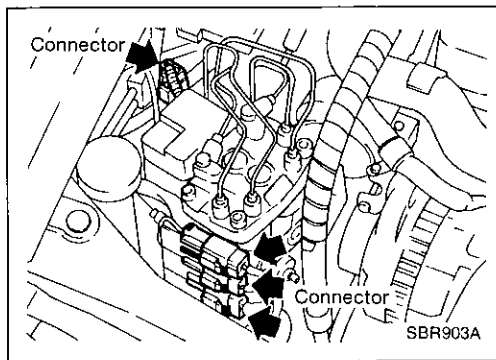
#### CAUTION:

- 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.
- 
- Bleed air according to the following order.  
Left rear wheel cylinder (or caliper) → Right front caliper → Right rear wheel cylinder (or caliper) → Left front caliper
  - To bleed air out of lines, wheel cylinders and calipers, use the following procedure.



#### WITHOUT ANTI-LOCK BRAKING SYSTEM

- 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.



#### WITH ANTI-LOCK BRAKING SYSTEM

- 1) Turn ignition switch to "OFF" position, and then disconnect A.B.S. actuator connectors.
- 2) Connect a transparent vinyl tube to air bleeder valve.
- 3) Fully depress brake pedal several times.
- 4) With brake pedal depressed, open air bleeder valve to release air.
- 5) Close air bleeder valve.
- 6) Release brake pedal slowly.
- 7) Repeat steps 3) through 6) until clear brake fluid comes out of air bleeder valve.

### Removal and Installation

1. To remove brake hose, first remove flare nut securing brake tube 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.

## **BRAKE HYDRAULIC LINE**

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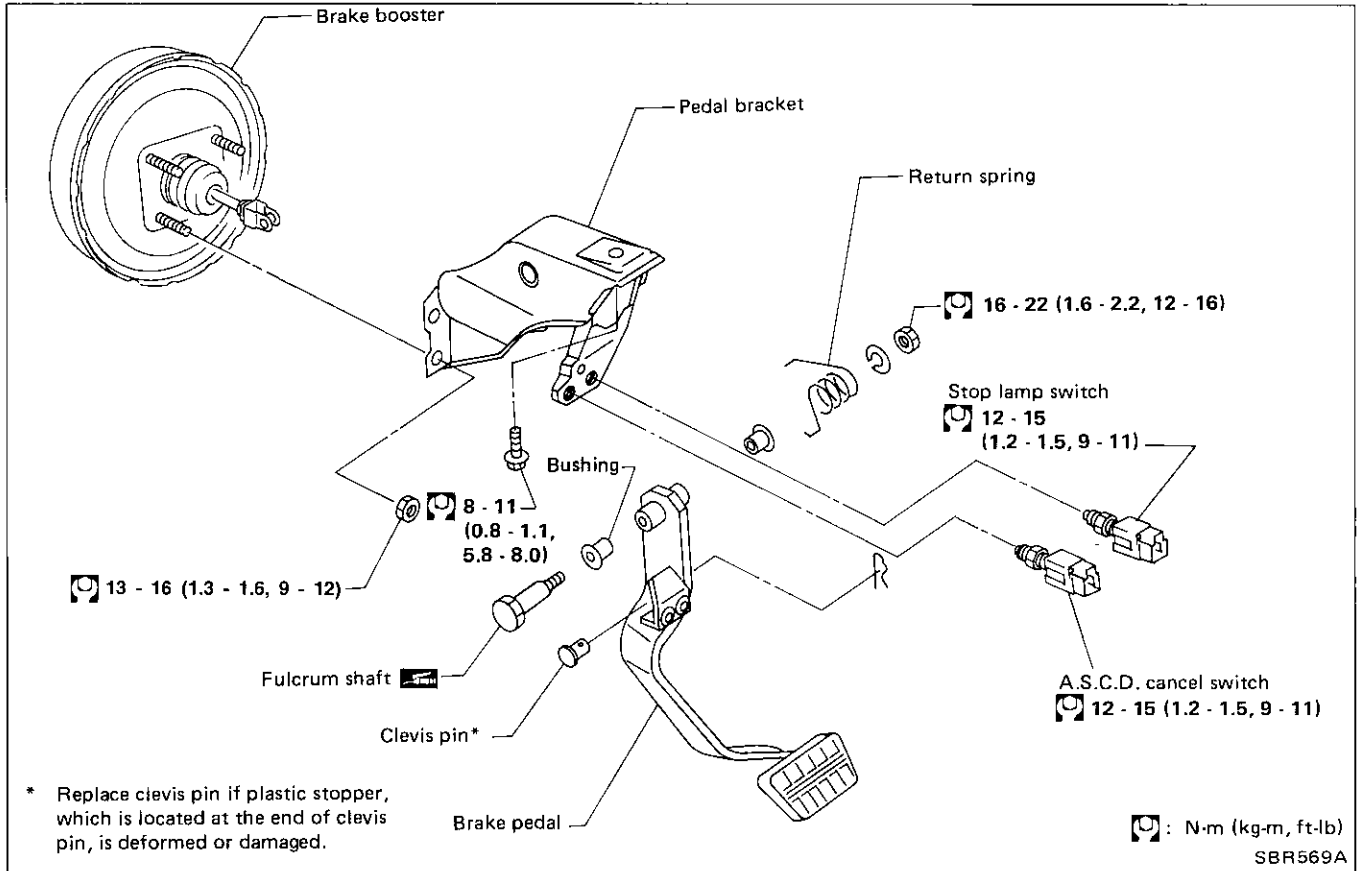
### **Inspection**

Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

# BRAKE PEDAL AND BRACKET

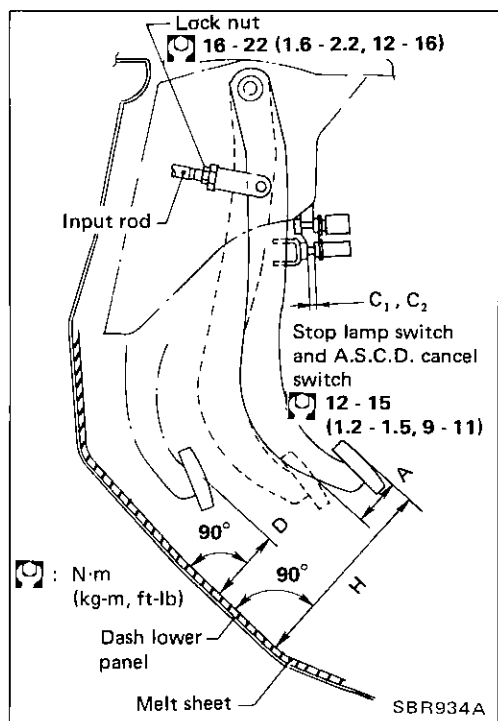
## Removal and Installation



## Inspection

Check brake pedal for the following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion



## Pedal Adjustment

Check brake pedal free height from melt sheet. Adjust if necessary.

**H: Free height**

Refer to S.D.S.

**D: Depressed height**

Refer to S.D.S.

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

**C<sub>1</sub>: Clearance between pedal stopper and threaded end of stop lamp switch**

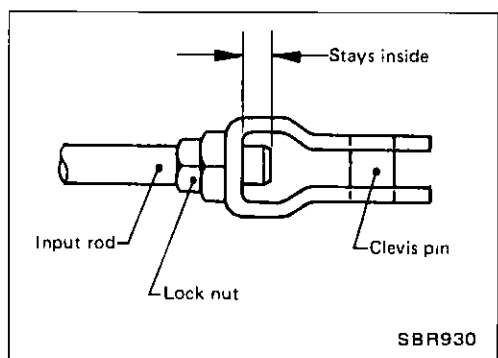
0.3 - 1.0 mm (0.012 - 0.039 in)

**C<sub>2</sub>: Clearance between pedal stopper and threaded end of A.S.C.D. cancel 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<sub>1</sub>" and "C<sub>2</sub>" with stop lamp switch and A.S.C.D. cancel switch respectively. Then tighten lock nuts.
3. Check pedal free play.

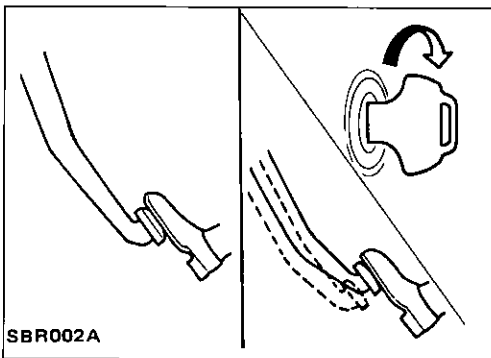
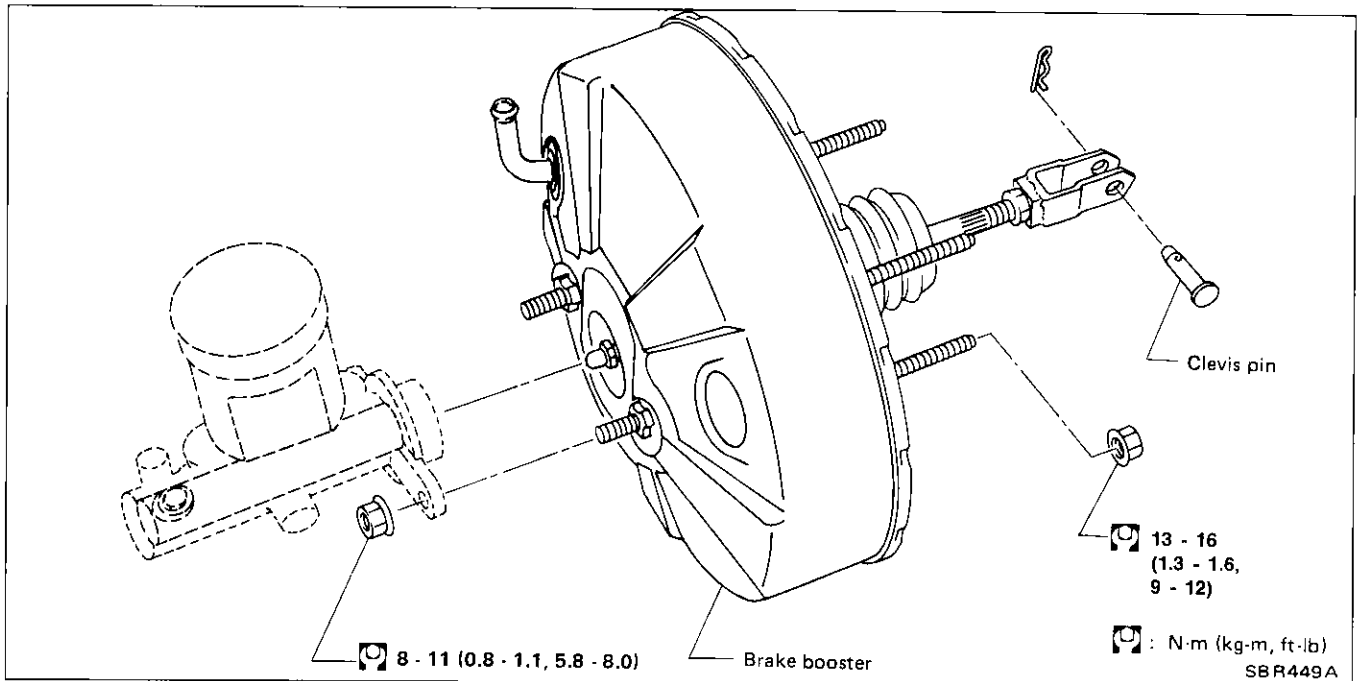
**Make sure that stop lamp is off when pedal is released.**

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.

# BRAKE BOOSTER

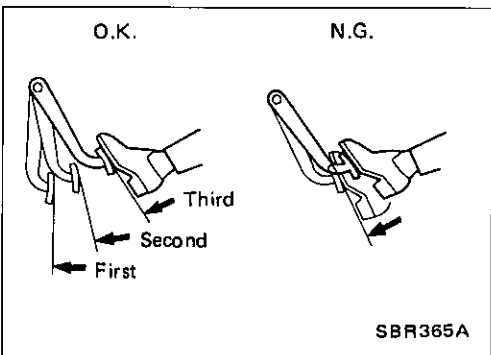
## Removal and Installation



## Inspection

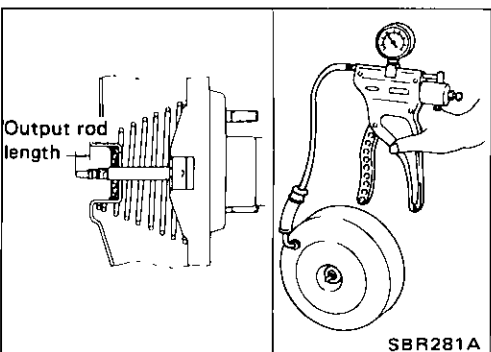
### OPERATING CHECK

- 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. Supply brake booster with vacuum of  $-66.7 \text{ kPa}$  ( $-500 \text{ mmHg}$ ,  $-19.69 \text{ inHg}$ ) using a handy vacuum pump.
2. Check output rod length.

#### Specified length:

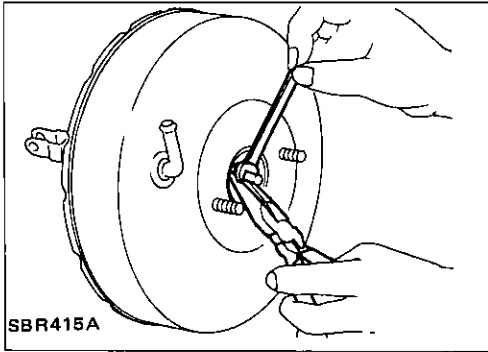
10.275 - 10.525 mm (0.4045 - 0.4144 in)

## BRAKE BOOSTER

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### Inspection (Cont'd)

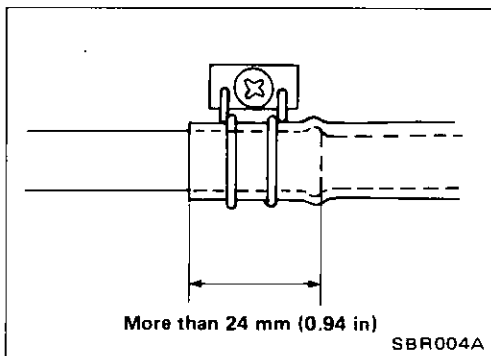
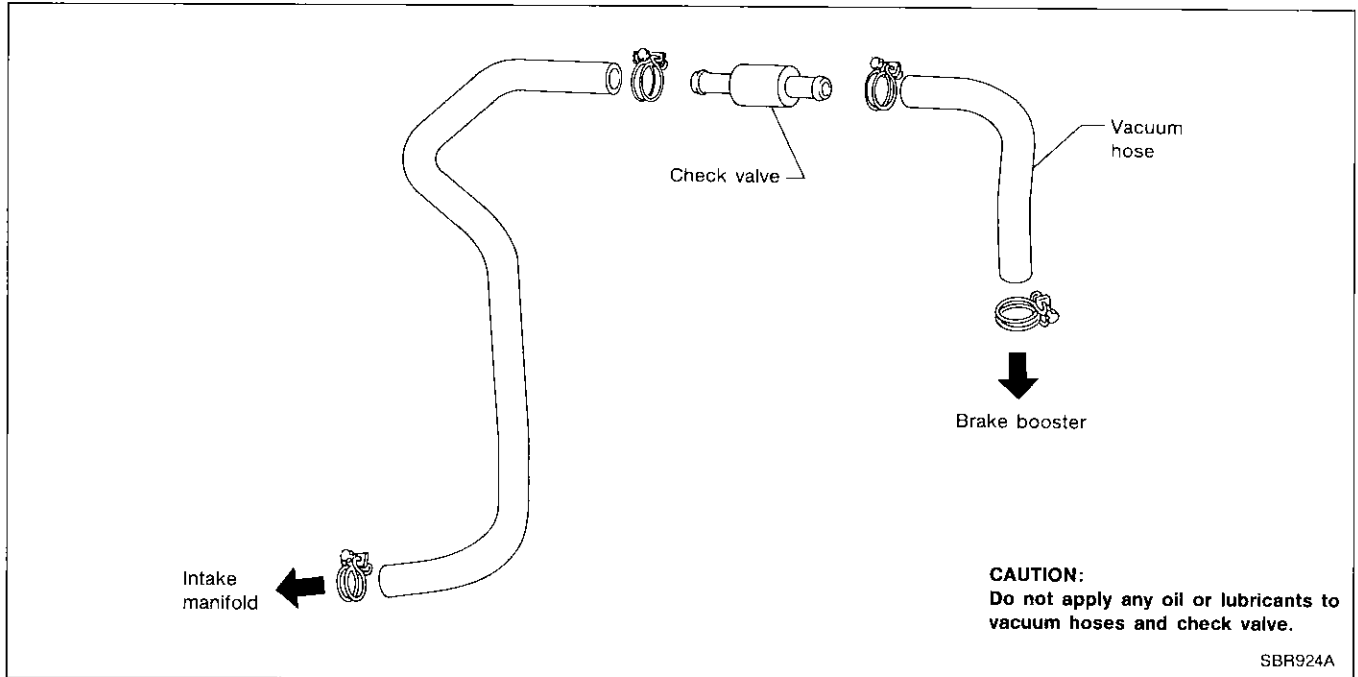
3. Adjust rod length if necessary.
4. If rod length is without specification, replace brake booster.



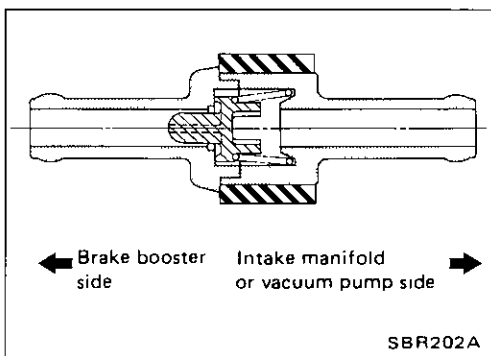


# VACUUM PIPING

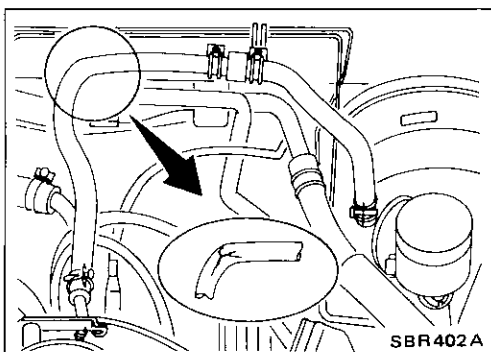
## Removal and Installation



- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).



- Install check valve, paying attention to its direction.



## Inspection

### HOSES AND CONNECTORS

- Check vacuum lines, connections and check valve for airtightness, chafing and deterioration.

## **VACUUM PIPING**

---

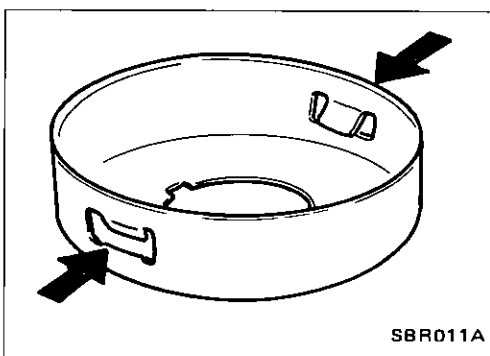
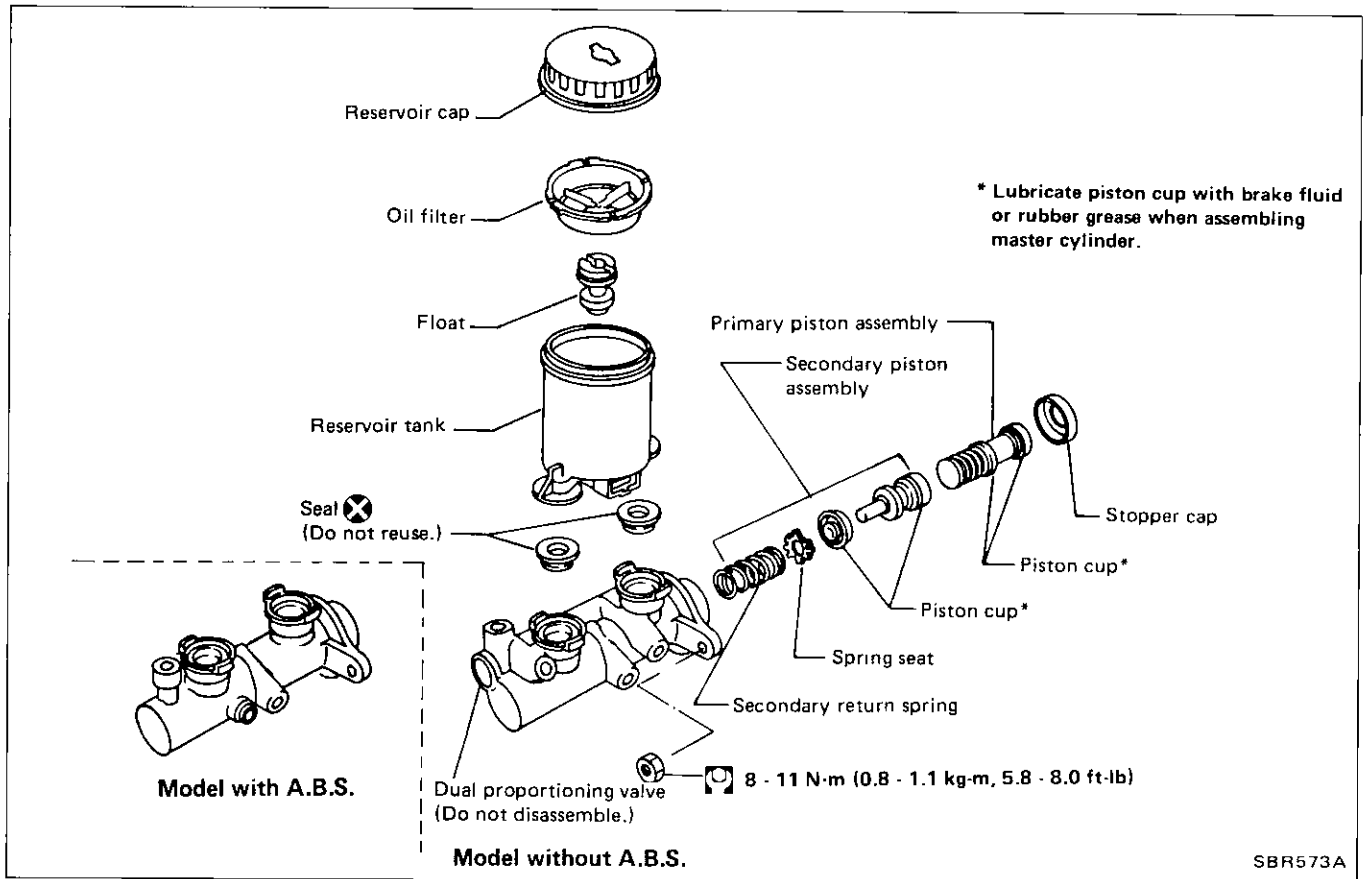
### **Inspection (Cont'd)**

#### **CHECK VALVE**

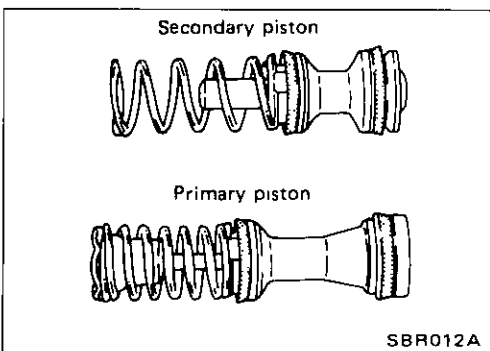
- When pressure is applied to brake booster side of check valve and valve does not open, replace check valve with a new one.

# MASTER CYLINDER

## Removal and Installation



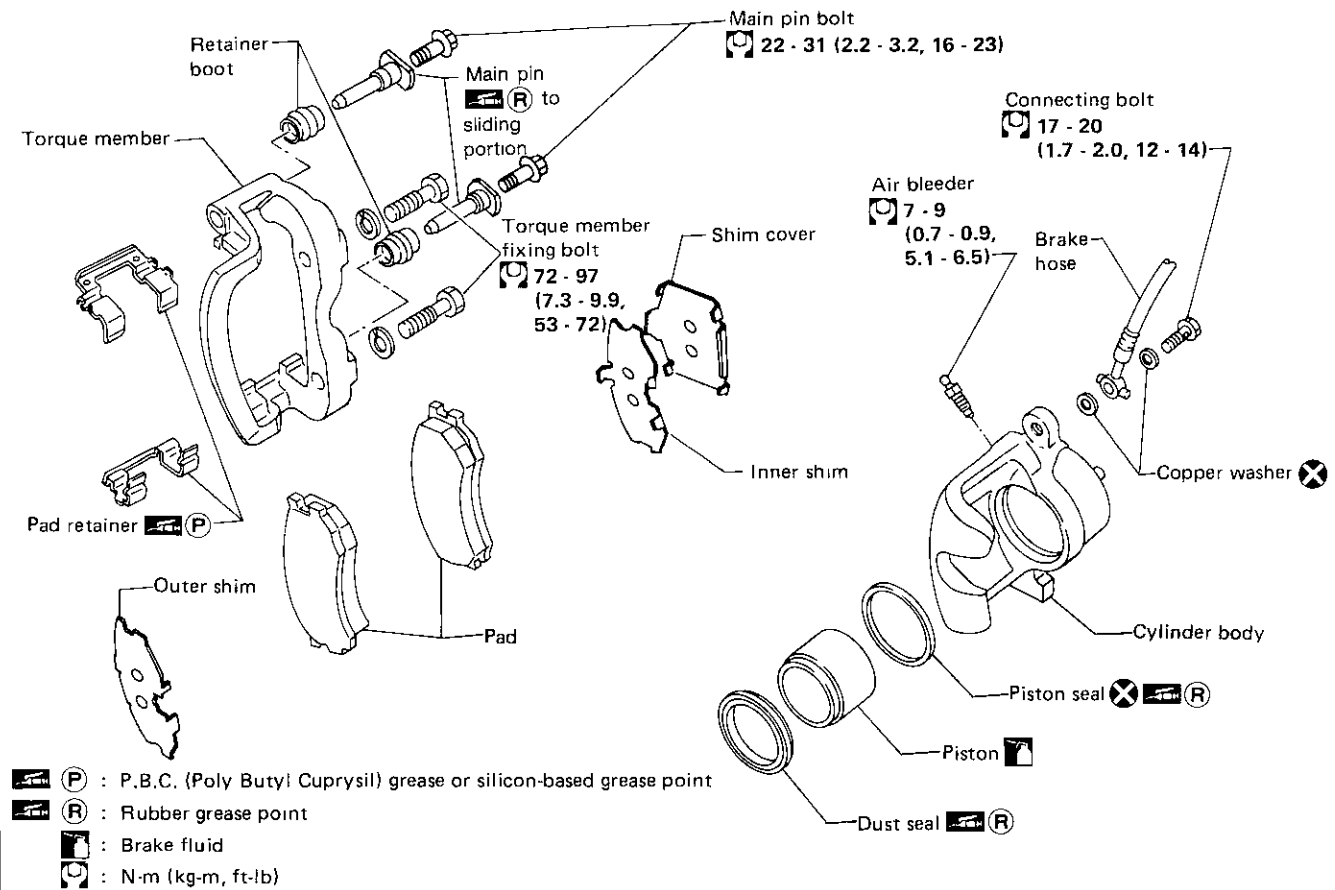
- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.



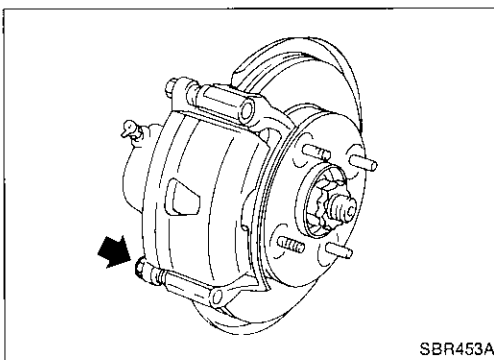
- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.

# FRONT DISC BRAKE — Caliper

CL25VA

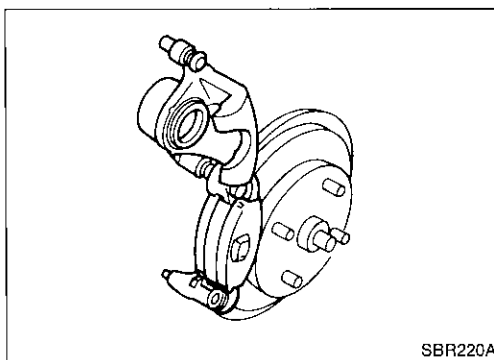


SBR927A



## Pad Replacement

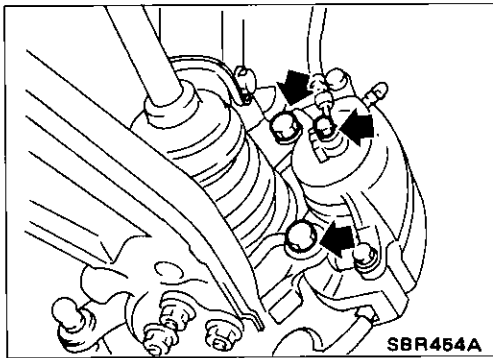
1. Remove pin bolt.



2. Swing cylinder body upward. Then remove pad retainer, and inner and outer shims.

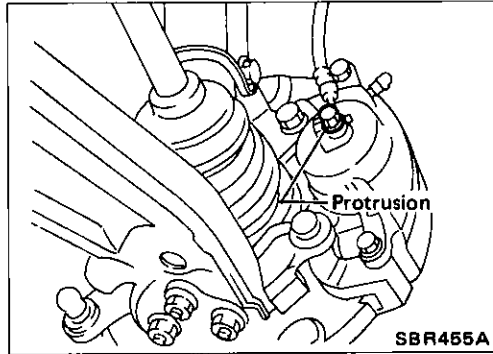
### CAUTION:

- When cylinder body is swung up, do not depress brake pedal because piston will pop out.
- Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads or if shims are rusted or rubber coat is separated.

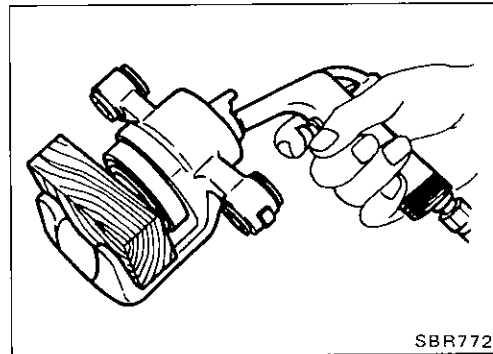


### Removal and Installation

- Remove torque member fixing bolts and connecting bolt.

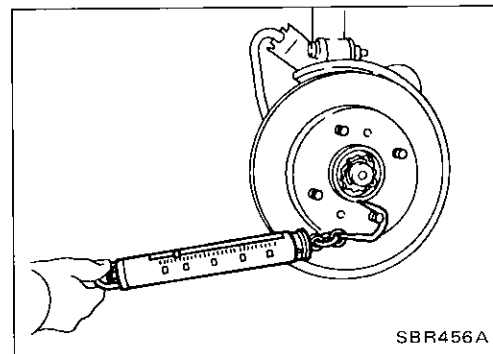


- Install brake hose to caliper at protrusions securely.



### Disassembly

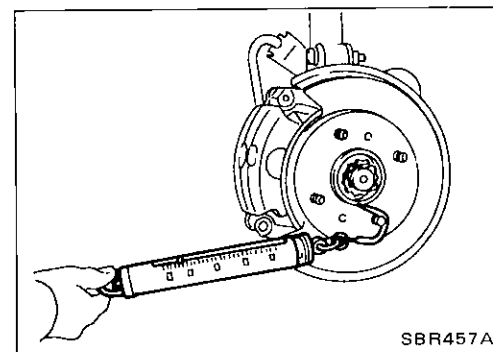
- Push out piston with dust seal using compressed air.



### Inspection

#### INSPECTION OF BRAKE DRAG FORCE

1. Swing cylinder body upward.
2. Make sure that wheel bearing is adjusted properly. Refer to section FA.
3. Measure rotating force ( $F_1$ ).



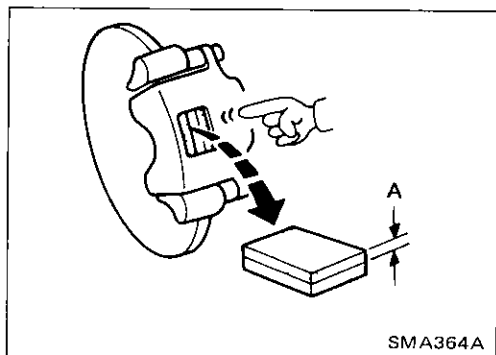
4. Install caliper with pads to the original position.
5. Depress brake pedal for 5 seconds.
6. Release brake pedal and rotate disc rotor 10 revolutions.
7. Measure rotating force ( $F_2$ ).
8. Calculate brake drag force by subtracting  $F_1$  from  $F_2$ .

**Maximum brake drag force ( $F_2 - F_1$ ):**

**114.7 N (11.7 kg, 25.8 lb)**

If it is not within specification, check main pins and retainer boots in caliper.

## FRONT DISC BRAKE — Caliper



### Inspection (Cont'd)

#### DISC PAD

Check disc pad for wear or damage.

**Pad standard thickness (A):**

11.0 mm (0.433 in)

**Pad wear limit (A):**

2.0 mm (0.079 in)

#### CYLINDER BODY

- 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

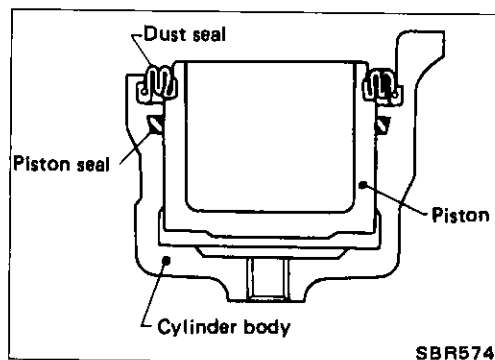
Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

#### CAUTION:

**Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.**

#### PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks or other damage. Replace if any condition exists.



### Assembly

- Insert piston seal into groove on cylinder body.
- With dust seal fitted to piston, install piston into cylinder body.

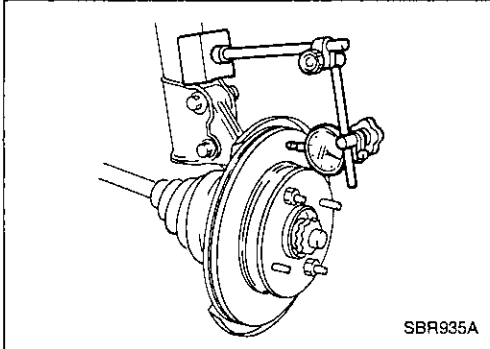
#### CAUTION:

- **Secure dust seal properly.**

### Inspection

#### RUBBING SURFACE

Check rotor for roughness, cracks or chips.



#### RUNOUT

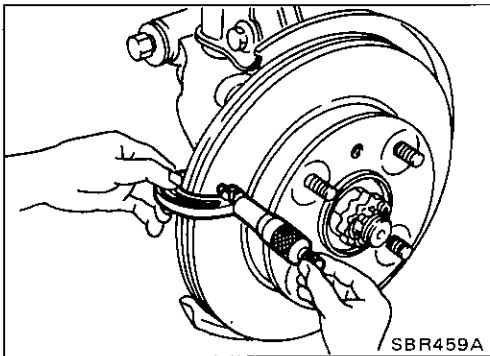
Adjust wheel bearing preload. Check runout using a dial indicator.

##### Rotor repair limit:

##### Maximum runout

(Total indicator reading at center of rotor pad contact surface)

**0.07 mm (0.0028 in)**



#### THICKNESS

- Measure thickness of brake disc at least four points to determine maximum worn area.

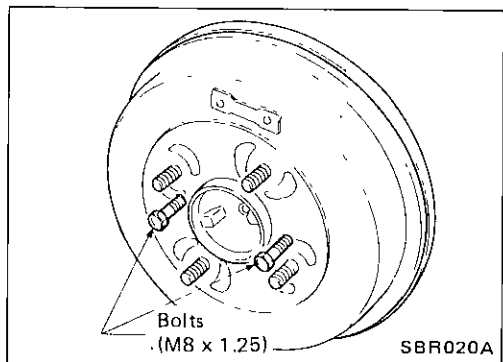
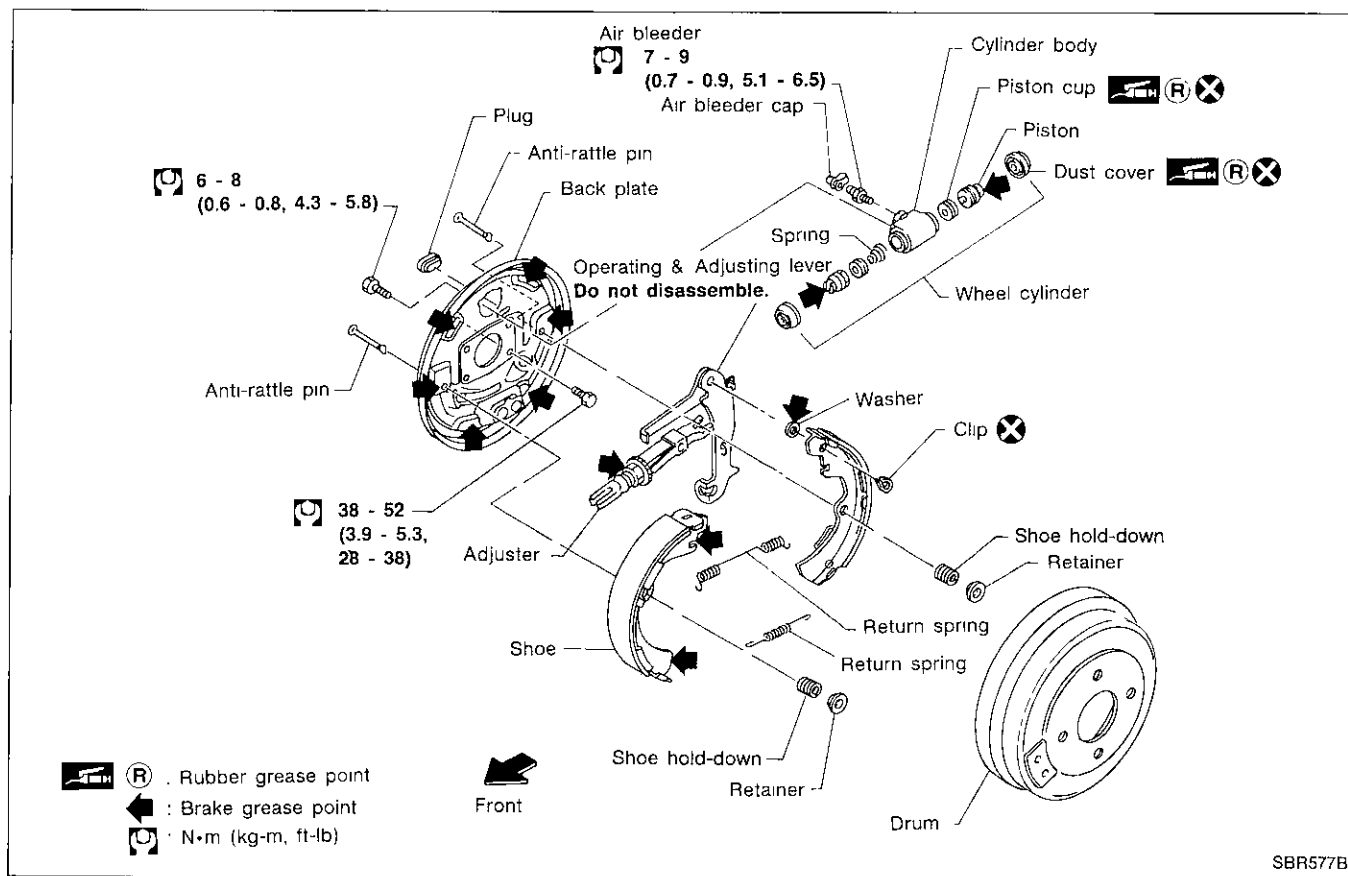
##### Standard thickness:

**22.0 mm (0.866 in)**

##### Minimum thickness:

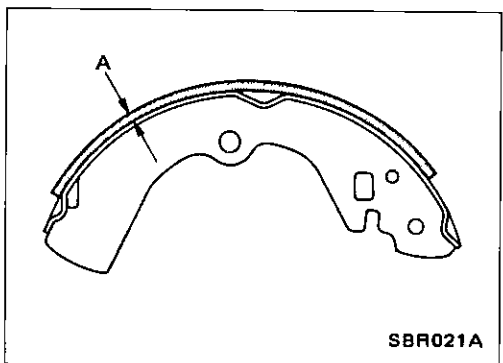
**20.0 mm (0.787 in)**

# REAR DRUM BRAKE



## Brake Drum Removal

- Release parking brake control lever fully.
- Tighten two bolts gradually if brake drum is hard to remove.



## Shoe Replacement

- Measure lining thickness.

**Standard thickness:**

4.5 mm (0.177 in)

**Lining wear limit (A):**

1.5 mm (0.059 in)

Before installing new shoes, rotate nut until adjuster rod is at its shortest point.

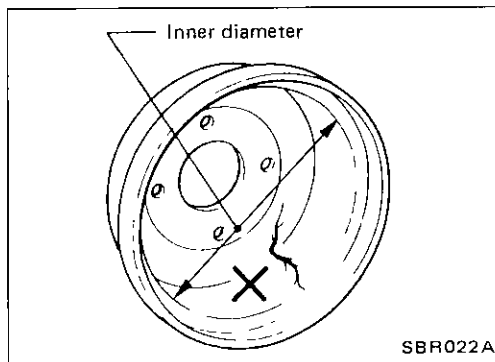
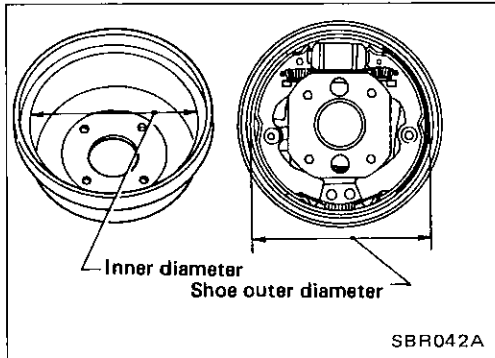
After installation, adjust shoe-to-drum clearance. Refer to Removal and Installation.



## REAR DRUM BRAKE

### Wheel Cylinder Inspection

- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions.  
Replace if any such condition exists.



### Removal and Installation

When installing, measure brake drum inside diameter and diameter of brake shoes. Check that difference between diameters is correct shoe clearance.

#### Shoe clearance:

**0.35 - 0.55 mm (0.0138 - 0.0217 in)**

If necessary, adjust by rotating adjuster.

### Drum Inspection

#### Standard inner diameter:

**228.6 mm (9 in)**

#### Maximum inner diameter:

**230.0 mm (9.06 in)**

#### Out-of-roundness (Ellipticity):

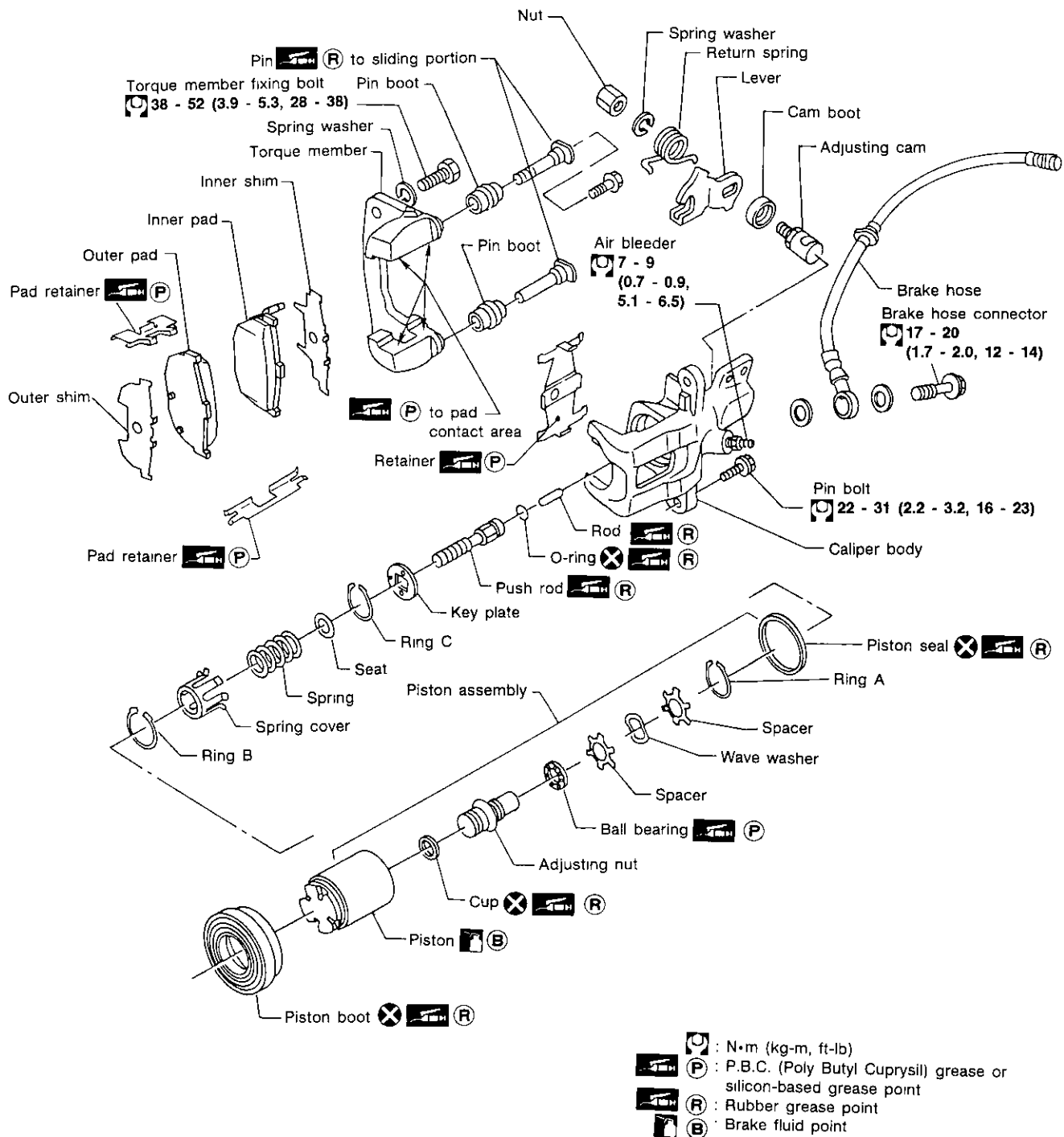
**0.03 mm (0.0012 in) or less**

#### Radial runout (Total indicator reading):

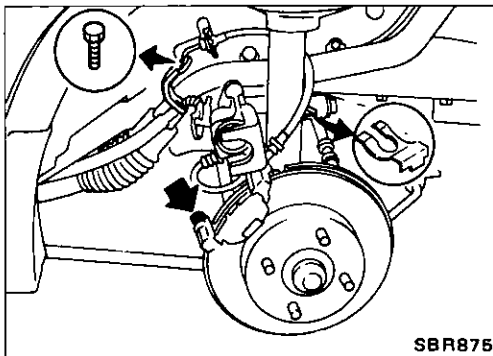
**0.05 mm (0.0020 in) or less**

- Contact surface should be finefinished with No. 120 to 150 emery paper.
- Using a drum lathe, lathe brake drum if it shows scoring, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.

# REAR DISC BRAKE — Caliper



SBR895A

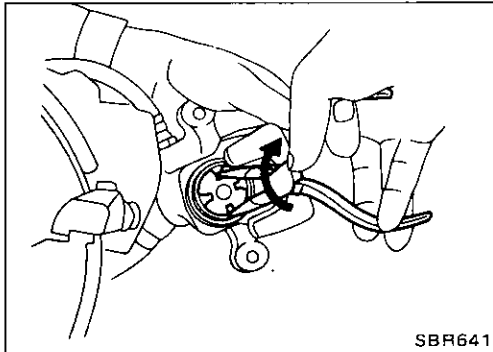


### Pad Replacement

1. Remove parking cable stay fixing bolt, pin bolt and lock spring. Then remove pad retainers, pads and shims.

#### CAUTION:

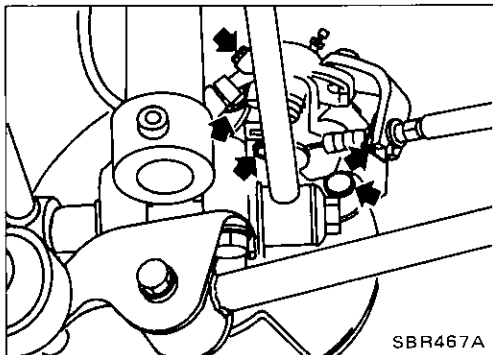
When cylinder body is swung up, do not depress brake pedal because piston will pop out.



2. When installing pads, retract piston into cylinder body by turning piston clockwise.

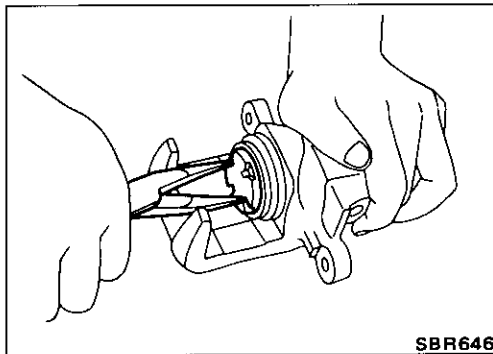
#### CAUTION:

Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.



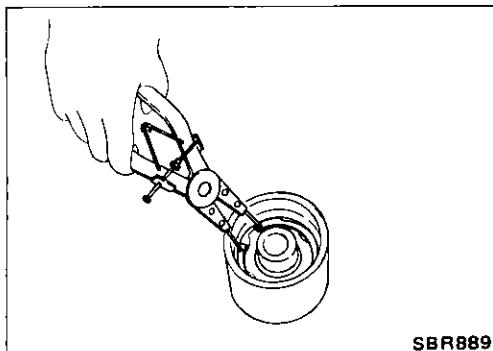
### Removal and Installation

Disconnect parking brake cable and brake hose, then remove caliper assembly.



### Disassembly

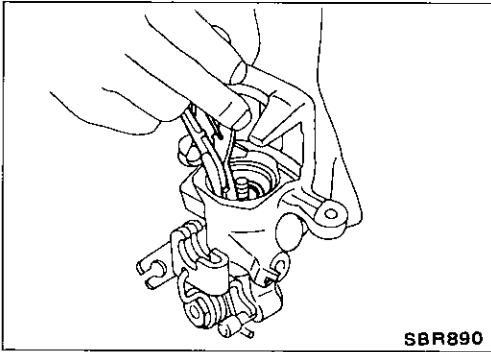
1. Remove piston by turning it counterclockwise with suitable long nose pliers.



2. Pry off ring A from piston with suitable pliers and remove adjusting nut.

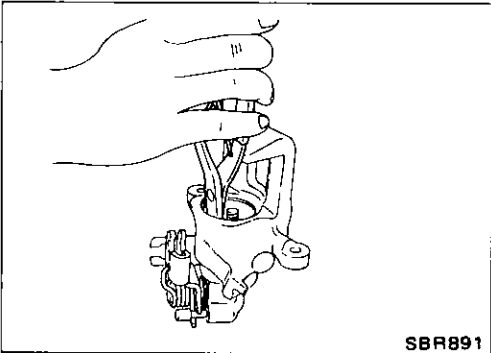
## REAR DISC BRAKE — Caliper

### Disassembly (Cont'd)

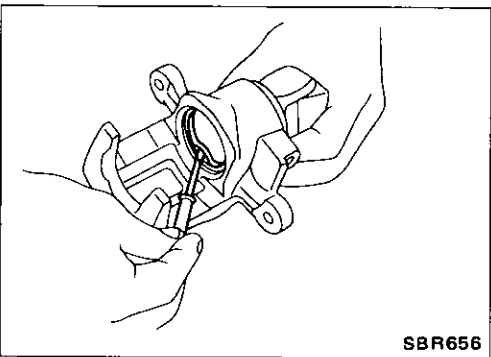


3. Disassemble cylinder body.

- (1) Pry off ring B with suitable pliers, then remove spring cover, spring and seat.

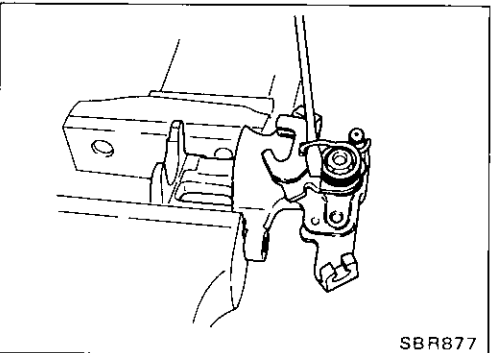


- (2) Pry off ring C, then remove key plate, push rod and rod.



- (3) Remove piston seal.

**Be careful not to damage cylinder body.**



4. Remove return spring and lever.

### Inspection

#### CAUTION:

**Use brake fluid to clean cylinder. Never use mineral oil.**

#### CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

## REAR DISC BRAKE — Caliper

### Inspection (Cont'd)

#### TORQUE MEMBER

Check for wear, cracks or other damage. Replace if necessary.

#### PISTON

Check piston for score, rust, wear, damage or presence of foreign materials.

Replace if any of the above conditions are observed.

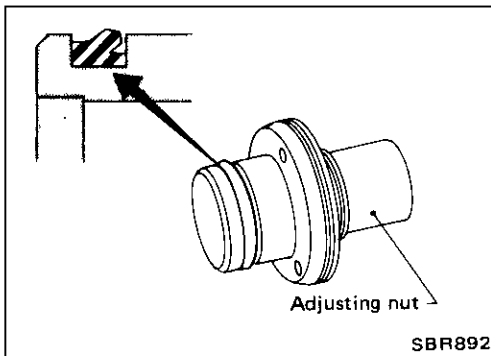
#### CAUTION:

**Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.**

#### PIN AND PIN BOOT

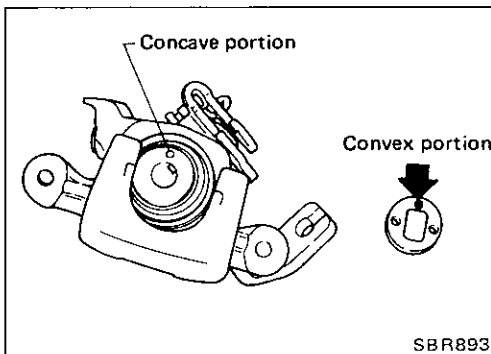
Check for wear, cracks or other damage.

Replace if any of the above conditions are observed.

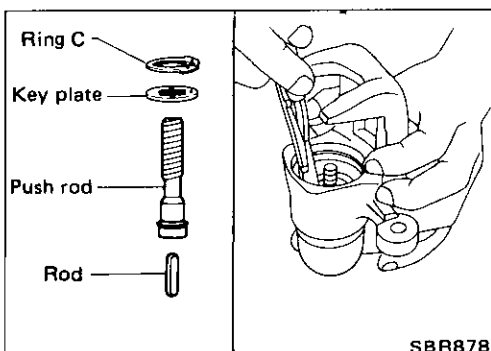


### Assembly

1. Install cup in the specified direction.



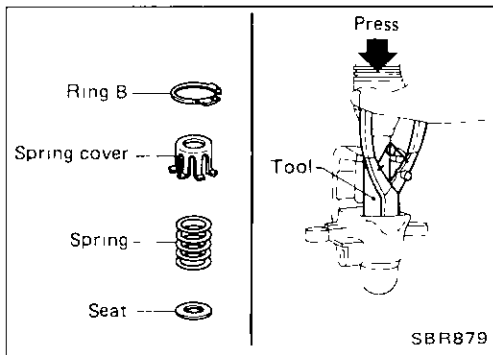
2. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.



3. Install ring C with a suitable tool.

## REAR DISC BRAKE — Caliper

### Assembly (Cont'd)



4. Install seat, spring, spring cover and ring B with suitable press and drift.

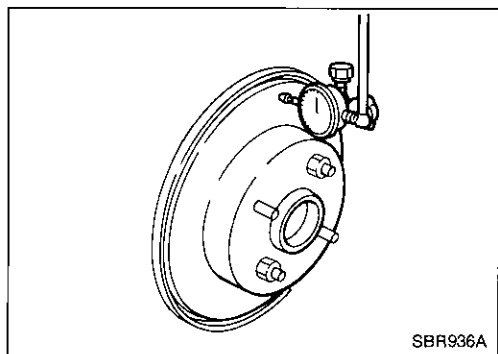
## REAR DISC BRAKE — Rotor

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### Inspection

#### RUBBING SURFACE

Check rotor for roughness, cracks or chips.



#### RUNOUT

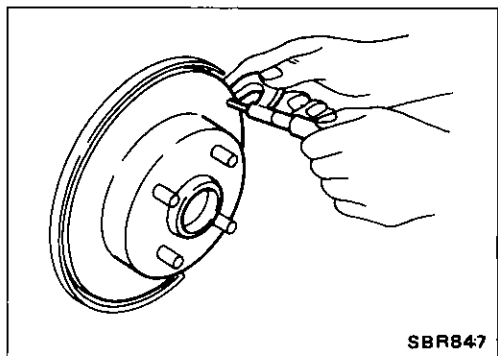
Make sure that axial end play is within the specifications before measuring. Refer to section RA. Then check runout with a dial indicator.

##### Rotor repair limit:

##### Maximum runout

(Total indicator reading at center of rotor pad contact surface)

0.07 mm (0.0028 in)



#### THICKNESS

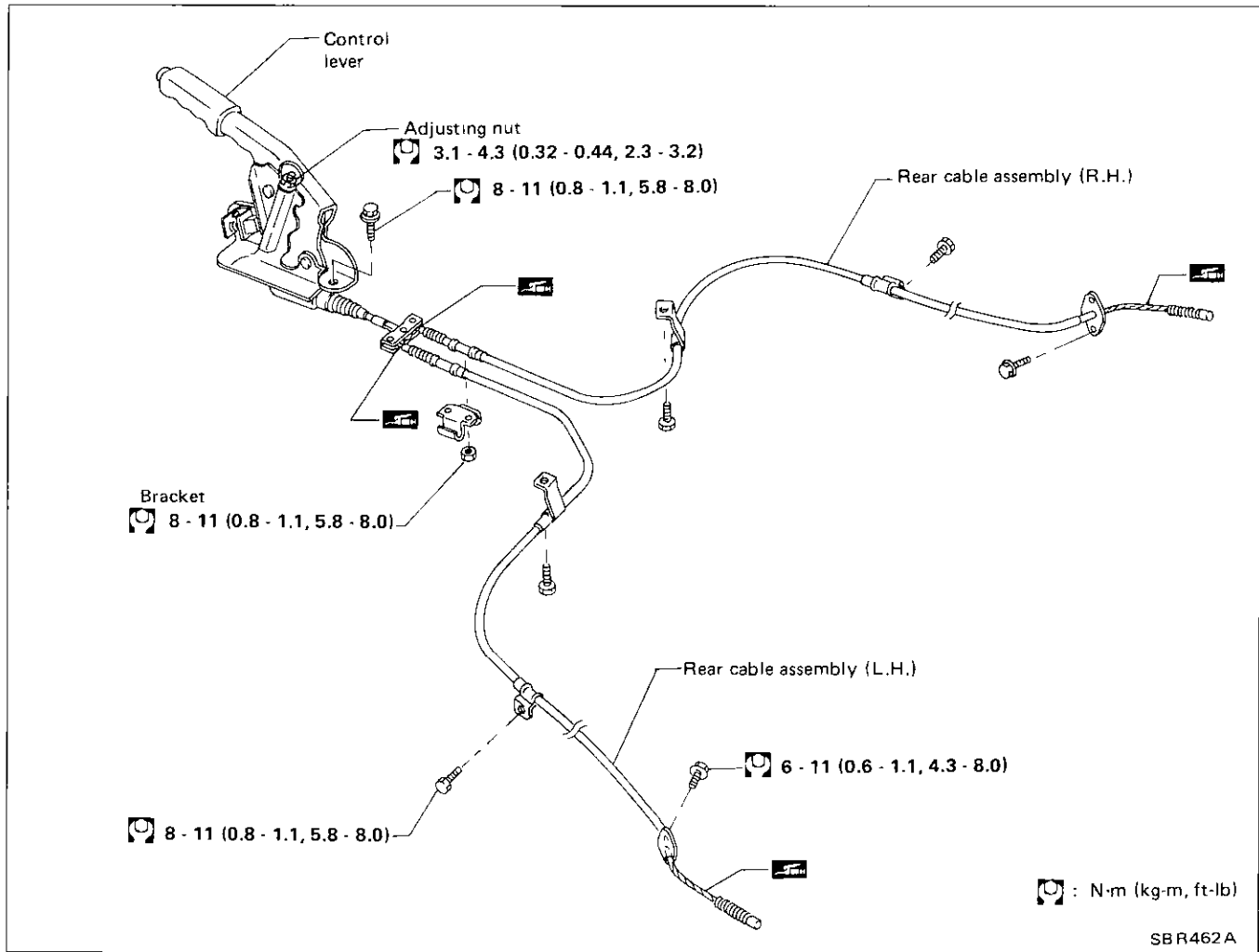
##### Rotor repair limit:

##### Minimum thickness

9.0 mm (0.354 in)

# PARKING BRAKE CONTROL

## Removal and Installation



- Before removing parking brake control assembly, remove console box.
- Make sure there is no free play after installing.

### Inspection

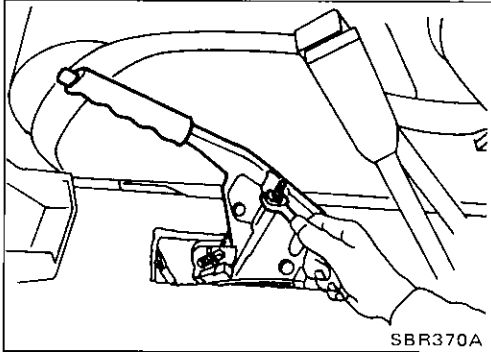
1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables and lamp switch. Replace if necessary.
3. Check parts at each connecting portion for deformation or damage, and if found, replace.



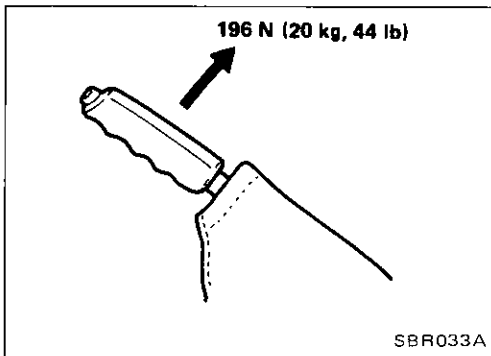
## PARKING BRAKE CONTROL

### Adjustment

Adjust control lever stroke as follows:



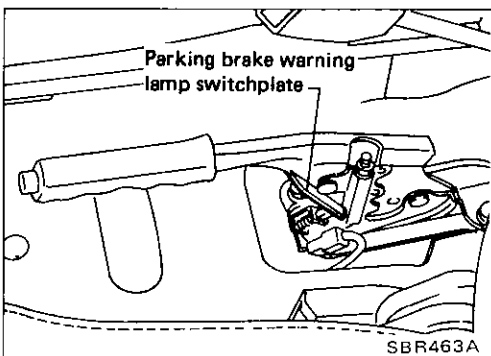
1. Adjust control lever by turning adjusting nut.



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

**Number of notches**

**Center lever type: 9 - 11**

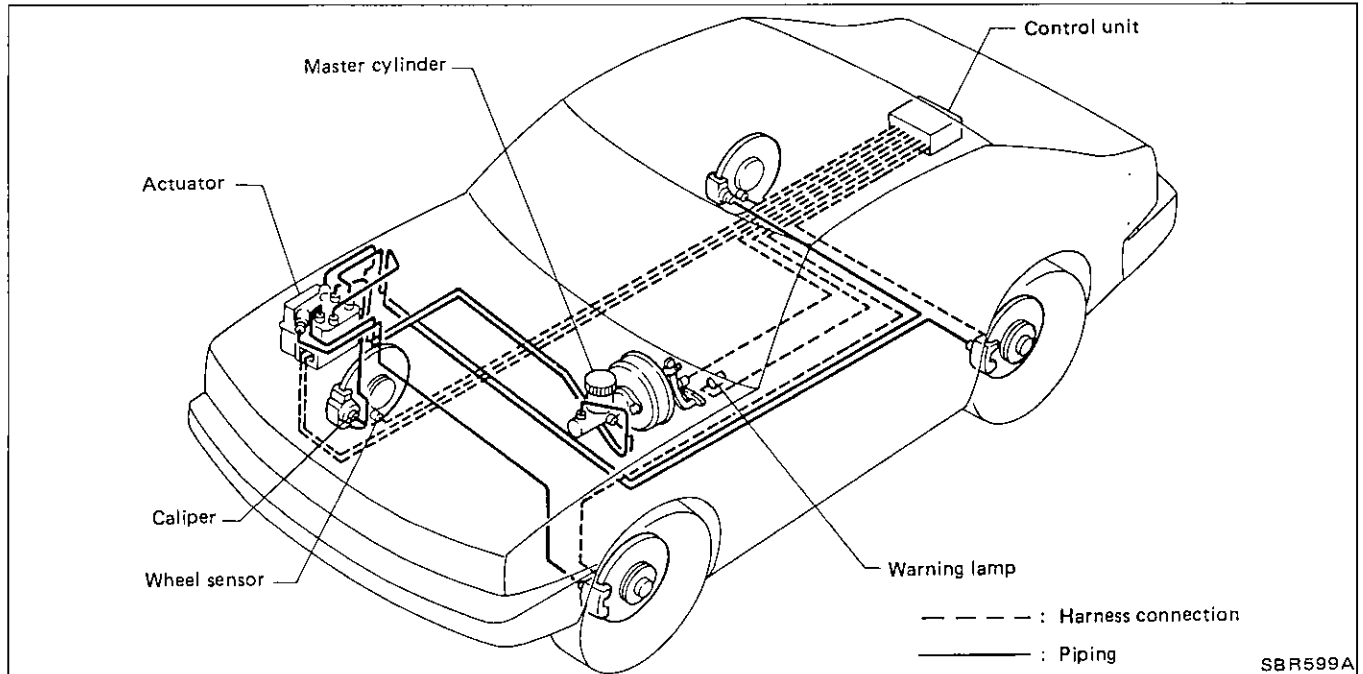


3. Bend parking brake warning lamp switchplate so that brake warning lamp comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.

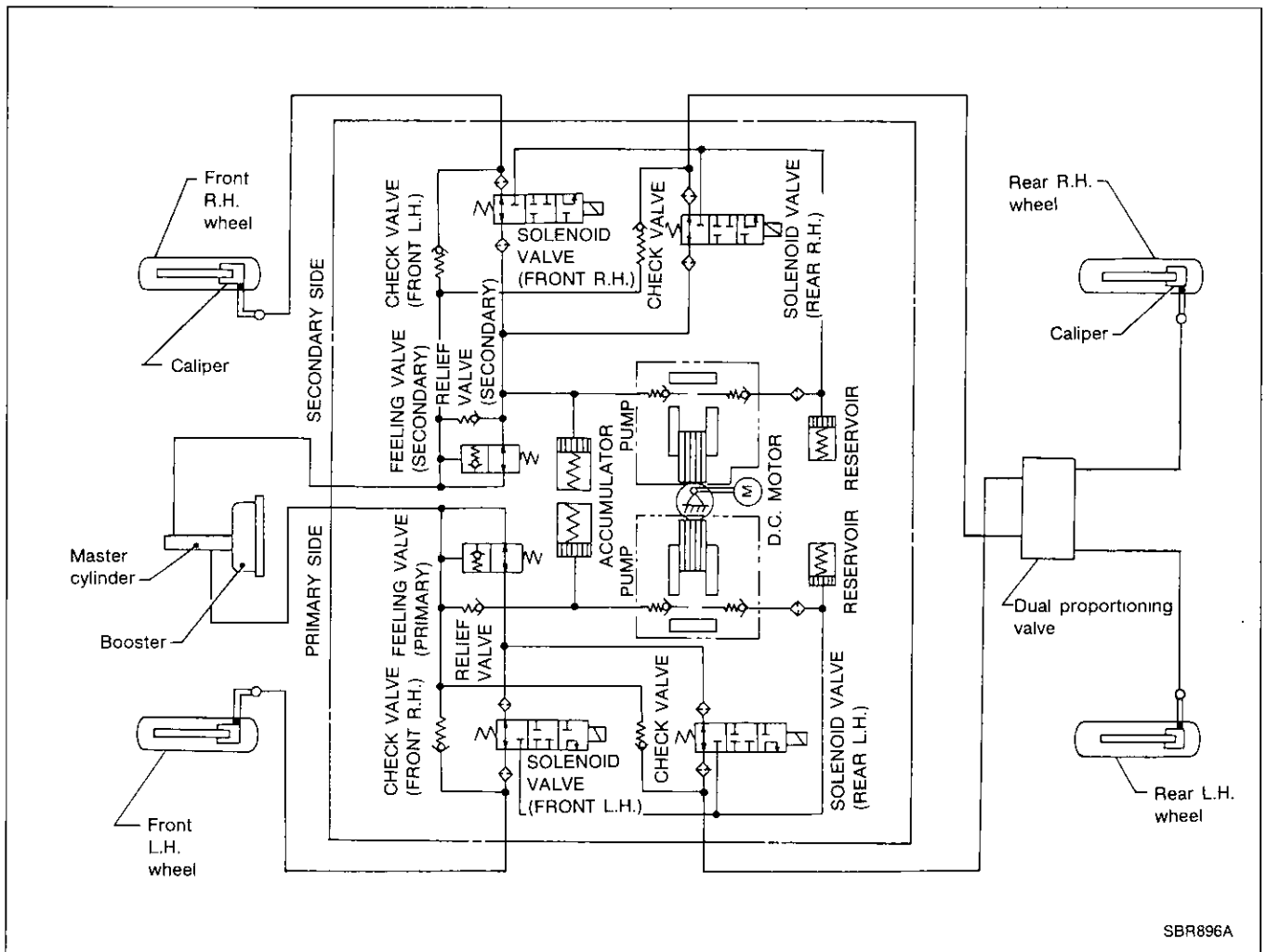
**Number of "A" notches : 1 - 2**

# ANTI-LOCK BRAKING SYSTEM

## System Components

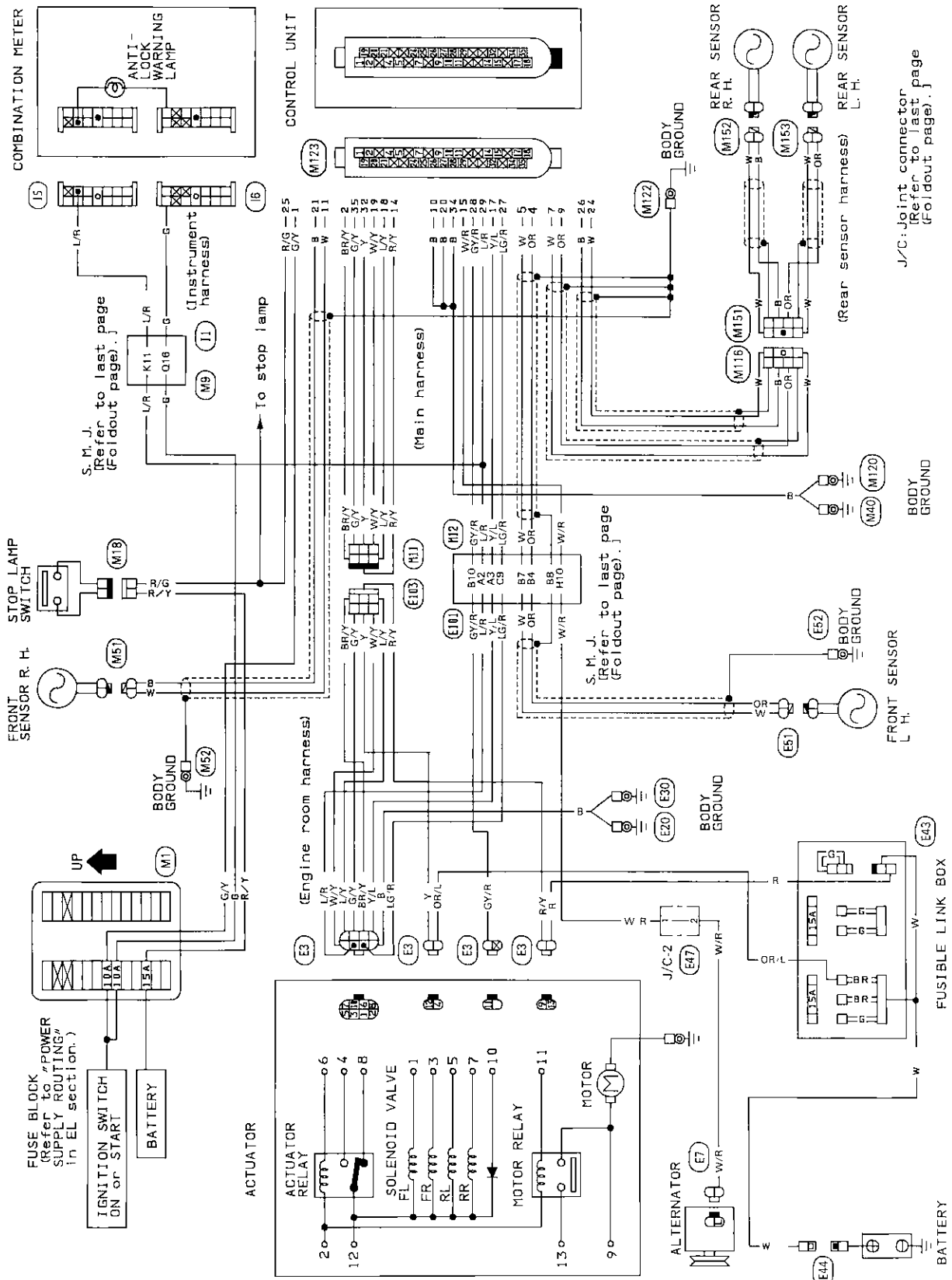


## Hydraulic Circuit



# ANTI-LOCK BRAKING SYSTEM

## Wiring Diagram



J/C: Joint connector  
[Refer to last page  
(Foldout page).]

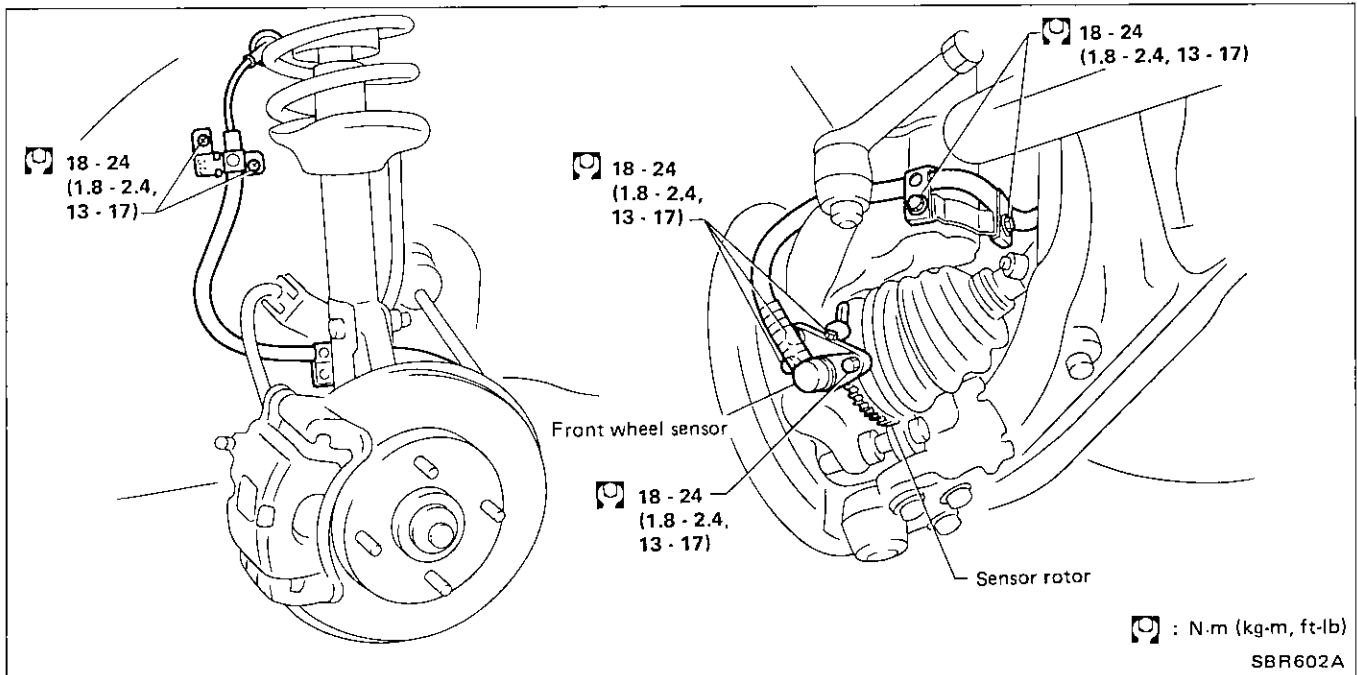
# ANTI-LOCK BRAKING SYSTEM

## Removal and Installation

### CAUTION:

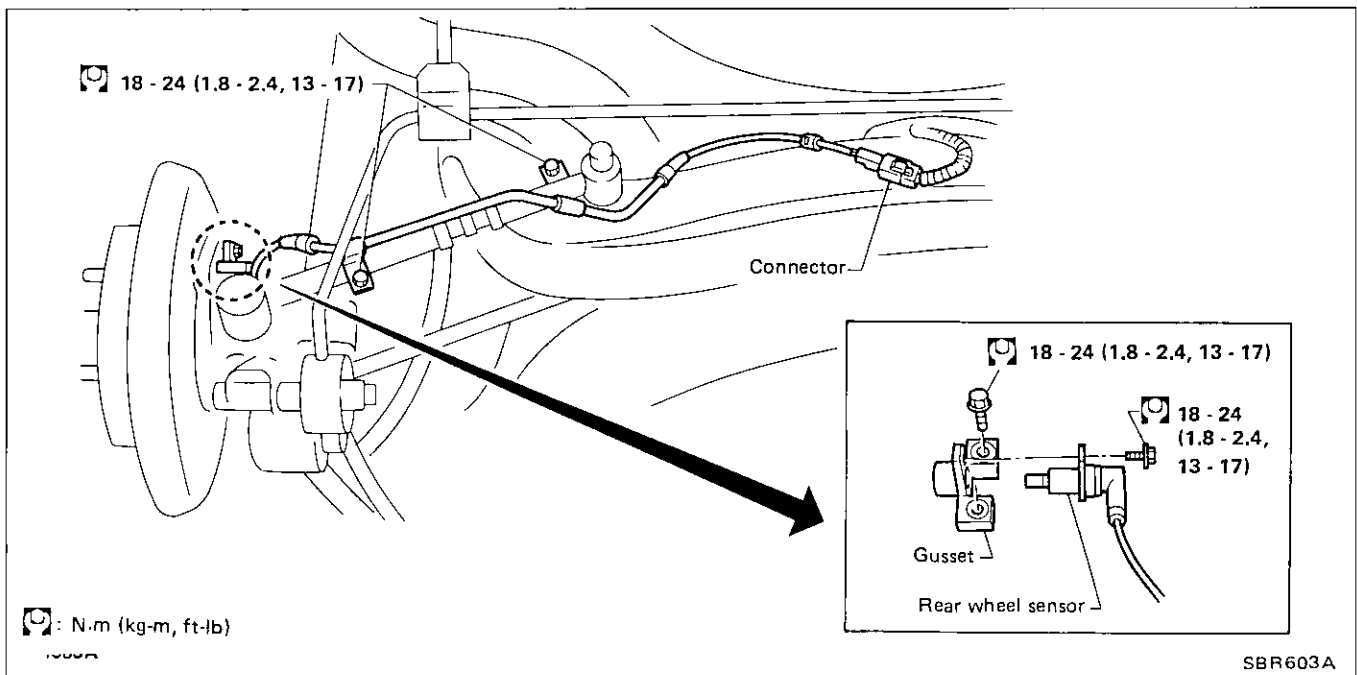
Be careful not to damage sensor edge and sensor rotor teeth.

### FRONT WHEEL SENSOR



- Remove sensor rotor with front wheel hub, referring to FA section.

### REAR WHEEL SENSOR



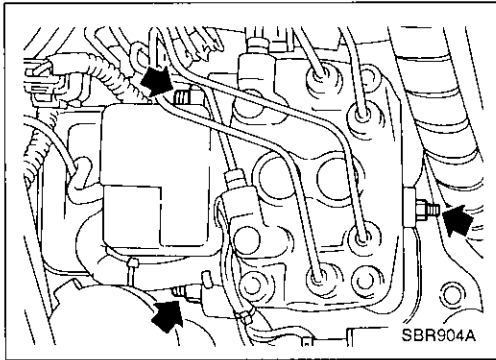
## ANTI-LOCK BRAKING SYSTEM

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### Removal and Installation (Cont'd)

#### ACTUATOR

- Disconnect 4 connectors and brake tubes.
- Remove 3 nuts fixing actuator to bracket.

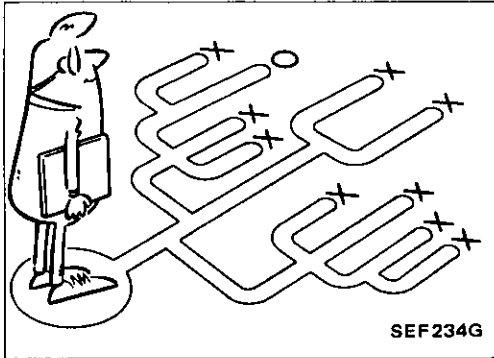
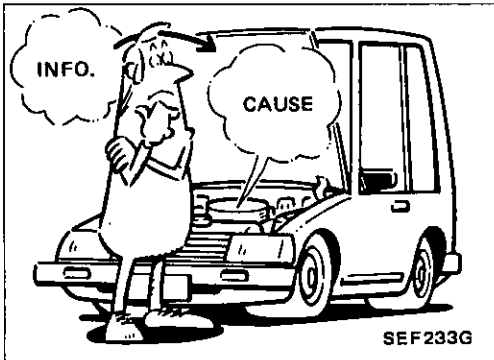


# **TROUBLE DIAGNOSES**

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| <b>Diagnostic Procedure 9 .....</b>                                         | <b>BR-52</b> |
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### How to Perform Trouble Diagnoses for Quick and Accurate Repair

#### INTRODUCTION

The A.B.S. system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as air leaks in the booster or lines, lack of brake fluid, or other problems with brake system.

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

A visual check only may not find the cause of the problems, so a road test should be performed.

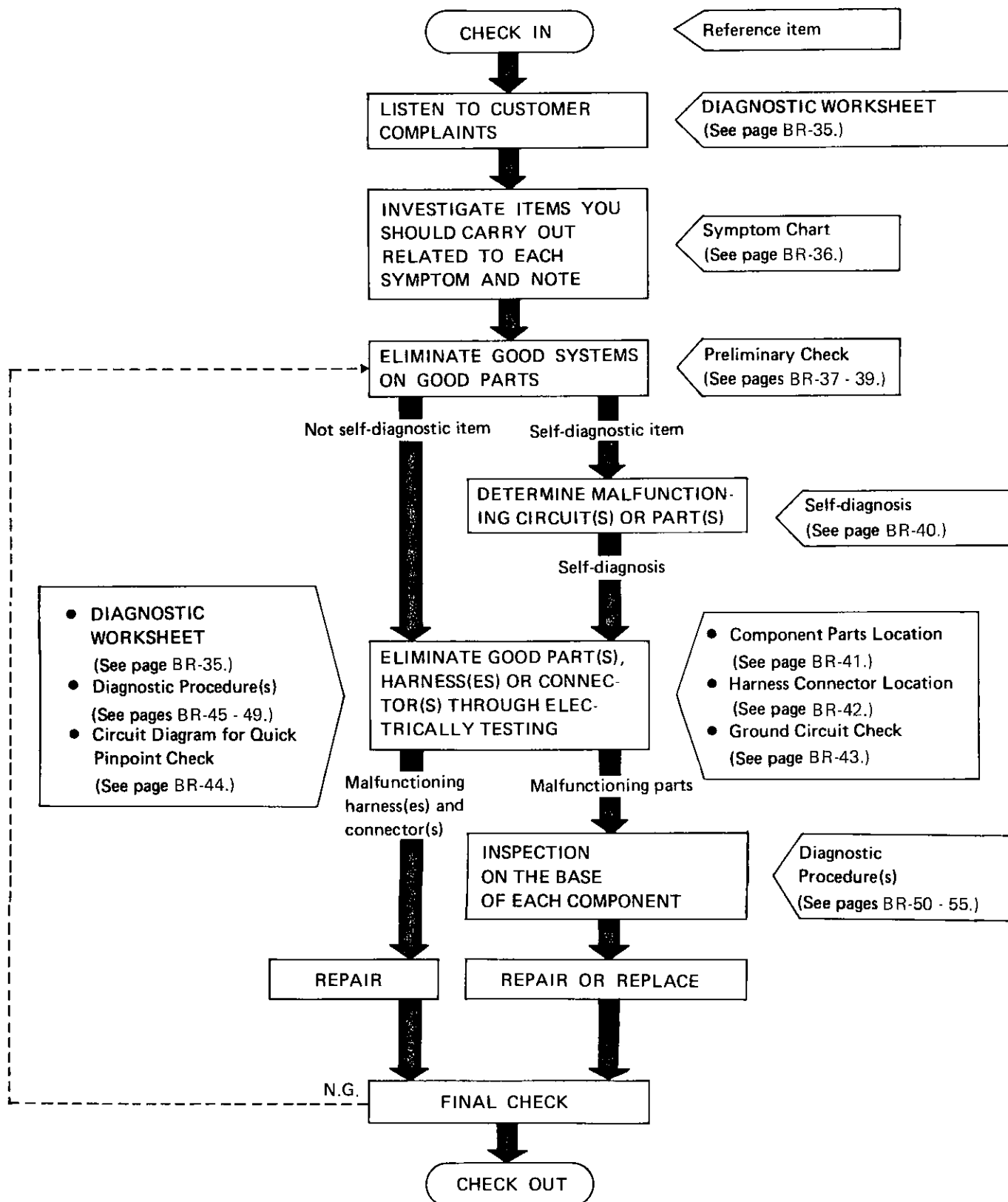
Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a A.B.S. complaint. The customer is a very good source of information on such problems; especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an A.B.S. controlled vehicle.

## TROUBLE DIAGNOSES

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

#### WORK FLOW





## TROUBLE DIAGNOSES

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

#### KEY POINTS

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

#### DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to customer complaints, even if the system is normal.

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

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

Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

#### Worksheet sample

|                           |                                                    |                                                                                                                                                                                                                                         |                                                 |                                                |                                              |                                                             |                                                  |
|---------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------|----------------------------------------------|-------------------------------------------------------------|--------------------------------------------------|
| Customer name    MR/MS    |                                                    | Model & Year                                                                                                                                                                                                                            |                                                 |                                                | VIN                                          |                                                             |                                                  |
| Engine #                  |                                                    | Trans.                                                                                                                                                                                                                                  |                                                 |                                                | Mileage                                      |                                                             |                                                  |
| Incident Date             |                                                    | Manuf. Date                                                                                                                                                                                                                             |                                                 |                                                | In Service Date                              |                                                             |                                                  |
| Symptoms                  | <input type="checkbox"/> Pedal vibration and noise | <input type="checkbox"/> Warning activates                                                                                                                                                                                              | <input type="checkbox"/> Long stopping distance | <input type="checkbox"/> Abnormal pedal action | <input type="checkbox"/> A.B.S. doesn't work | <input type="checkbox"/> A.B.S. works but warning activates | <input type="checkbox"/> A.B.S. works frequently |
| Engine conditions         |                                                    | <input type="checkbox"/> When starting <input type="checkbox"/> After starting<br><input type="checkbox"/> Engine speed: 5,000 rpm or more                                                                                              |                                                 |                                                |                                              |                                                             |                                                  |
| Road conditions           |                                                    | <input type="checkbox"/> Low friction road ( <input type="checkbox"/> Snow <input type="checkbox"/> Gravel <input type="checkbox"/> Other)<br><input type="checkbox"/> Protrusion                                                       |                                                 |                                                |                                              |                                                             |                                                  |
| Driving conditions        |                                                    | <input type="checkbox"/> High speed cornering<br><input type="checkbox"/> Vehicle speed: Greater than 10 km/h (6 MPH)<br><input type="checkbox"/> Vehicle speed: 10 km/h (6 MPH) or less<br><input type="checkbox"/> Vehicle is stopped |                                                 |                                                |                                              |                                                             |                                                  |
| Applying brake conditions |                                                    | <input type="checkbox"/> Suddenly<br><input type="checkbox"/> Gradually                                                                                                                                                                 |                                                 |                                                |                                              |                                                             |                                                  |
| Other conditions          |                                                    | <input type="checkbox"/> Operation of electrical equipment<br><input type="checkbox"/> Large pedal stroke<br><input type="checkbox"/> Operation of clutch                                                                               |                                                 |                                                |                                              |                                                             |                                                  |

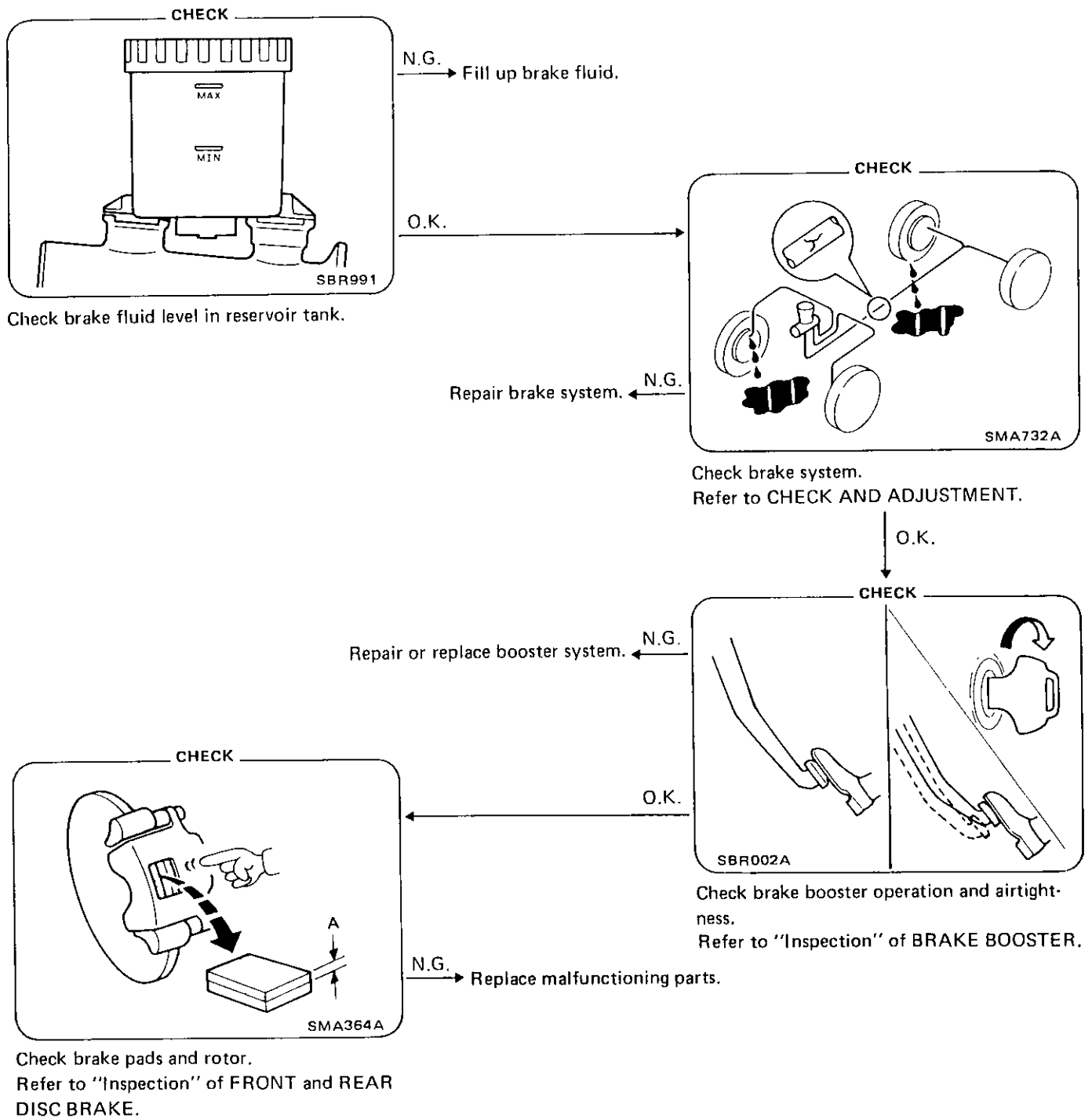
# TROUBLE DIAGNOSES

## Symptom Chart

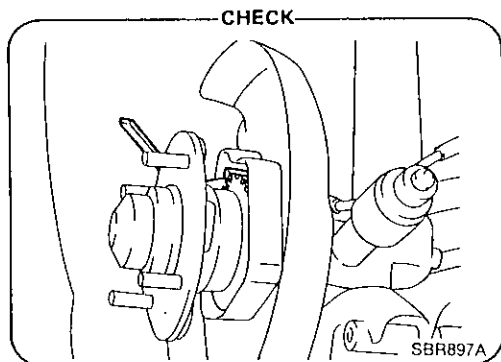
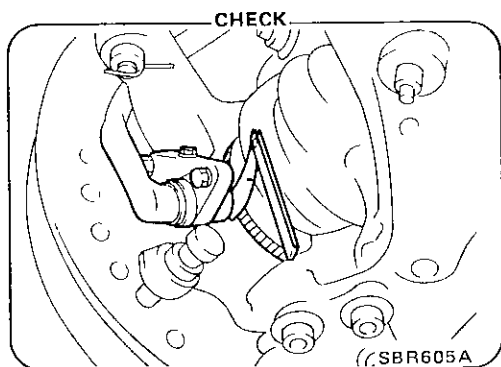
|                                                                      |                |                        |         |                         |                   |                        |                       |                     |                                    |                         |
|----------------------------------------------------------------------|----------------|------------------------|---------|-------------------------|-------------------|------------------------|-----------------------|---------------------|------------------------------------|-------------------------|
| PROCEDURE                                                            | REFERENCE PAGE |                        | SYMPTOM | Pedal vibration & noise | Warning activates | Long stopping distance | Abnormal pedal action | A.B.S. doesn't work | A.B.S. works but warning activates | A.B.S. works frequently |
|                                                                      |                |                        |         |                         |                   |                        |                       |                     |                                    |                         |
| Preliminary Check                                                    | BR-37          | Preliminary Check 1    |         |                         |                   | ○                      | ○                     |                     |                                    | ○                       |
|                                                                      | BR-38          | Preliminary Check 2    |         |                         | ○                 |                        |                       | ○                   |                                    | ○                       |
|                                                                      | BR-39          | Preliminary Check 3    |         |                         | ○                 |                        |                       |                     |                                    |                         |
|                                                                      | BR-39          | Preliminary Check 4    |         |                         | ○                 | ○                      | ○                     | ○                   | ○                                  |                         |
| Diagnostic Procedure                                                 | BR-45          | Diagnostic Procedure 1 |         | ○                       |                   |                        |                       |                     |                                    |                         |
|                                                                      | BR-47          | Diagnostic Procedure 2 |         |                         |                   | ○                      |                       |                     |                                    |                         |
|                                                                      | BR-47          | Diagnostic Procedure 3 |         |                         |                   |                        | ○                     |                     |                                    |                         |
|                                                                      | BR-48          | Diagnostic Procedure 4 |         |                         |                   |                        |                       | ○                   |                                    |                         |
|                                                                      | BR-48          | Diagnostic Procedure 5 |         |                         |                   |                        |                       |                     | ○                                  |                         |
|                                                                      | BR-49          | Diagnostic Procedure 6 |         |                         |                   |                        |                       |                     |                                    | ○                       |
| Diagnostic Procedure<br>(Select inspection with L.E.D. flashing No.) | BR-50          | L.E.D. flashing 1 - 4  |         | ○                       | ○                 | ○                      | ○                     | ○                   | ○                                  |                         |
|                                                                      | BR-51          | L.E.D. flashing 5 - 8  |         | ○                       | ○                 | ○                      | ○                     | ○                   | ○                                  |                         |
|                                                                      | BR-52          | L.E.D. flashing 9      |         | ○                       | ○                 | ○                      | ○                     | ○                   | ○                                  |                         |
|                                                                      | BR-53          | L.E.D. flashing 10     |         | ○                       | ○                 | ○                      | ○                     | ○                   | ○                                  |                         |
|                                                                      | BR-54          | L.E.D. flashing 16     |         | ○                       | ○                 | ○                      | ○                     | ○                   | ○                                  |                         |
|                                                                      | BR-55          | L.E.D. is off          |         | ○                       | ○                 | ○                      | ○                     | ○                   | ○                                  |                         |
| Ground Circuit Check                                                 | BR-43          | Sensor shield          |         | ○                       |                   |                        |                       |                     |                                    | ○                       |
|                                                                      | BR-43          | Motor ground           |         |                         |                   |                        |                       | ○                   |                                    |                         |
| Electrical Components Inspection                                     | BR-56          | Actuator inspection    |         |                         |                   |                        |                       | ○                   |                                    |                         |

# TROUBLE DIAGNOSES

## Preliminary Check 1



## Preliminary Check 2



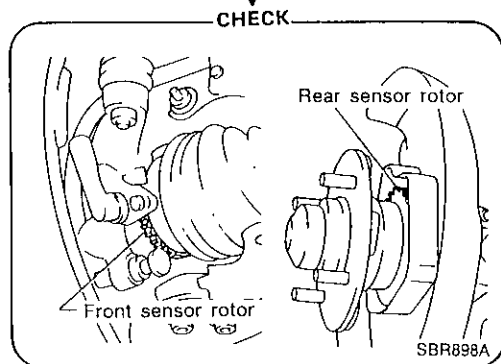
Check sensor clearance.

Clearance:

0.2 - 1.0 mm

(0.008 - 0.039 in)

O.K.



Check sensor rotor for teeth damage.

N.G.

Check sensor for the following items:

- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K.

N.G.

Repair or replace malfunctioning sensor.

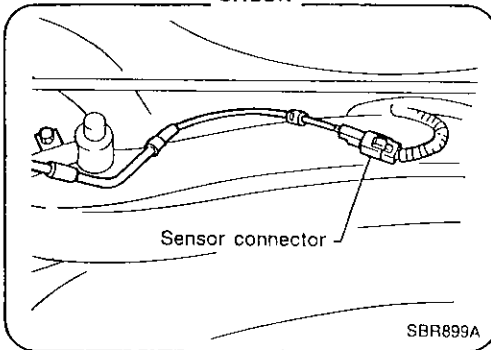
N.G.

Replace sensor rotor with wheel hub or companion flange as a set..

# TROUBLE DIAGNOSES

## Preliminary Check 3

CHECK



Measure each sensor resistance.  
0.8 - 1.2 kΩ

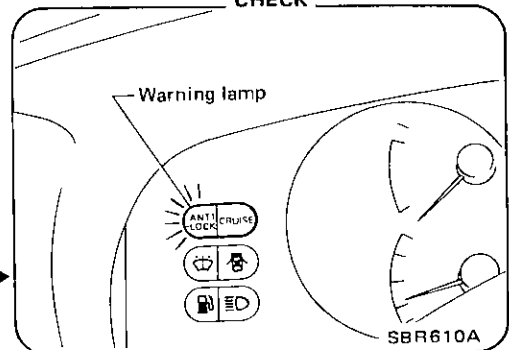
N.G. → Replace.

O.K. →

## Preliminary Check 3, 4

## Preliminary Check 4

CHECK



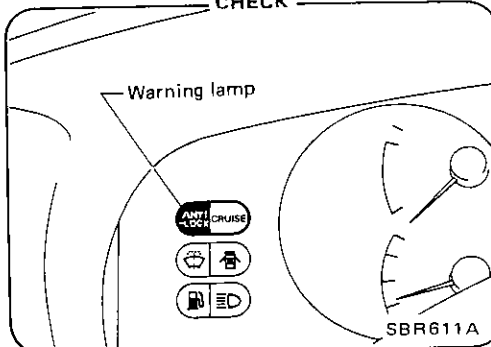
Check warning lamp activation.  
When ignition switch is turned on, warning lamp turns on.

O.K. →

N.G. →

Check fuse.  
Check bulb condition and remedy.

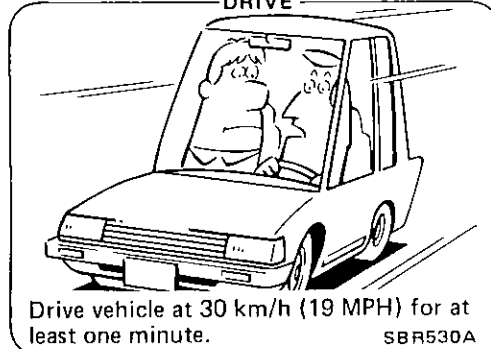
CHECK



Check warning lamp for deactivation.  
When engine starts, warning lamp deactivates.

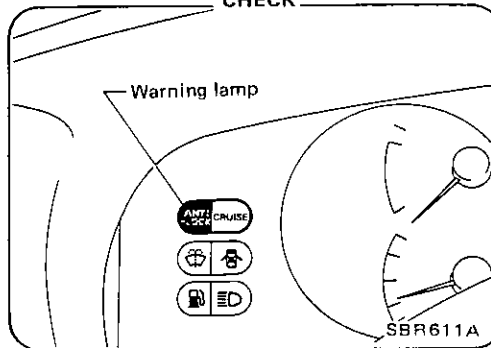
O.K. →

DRIVE



Drive vehicle at 30 km/h (19 MPH) for at least one minute.

CHECK



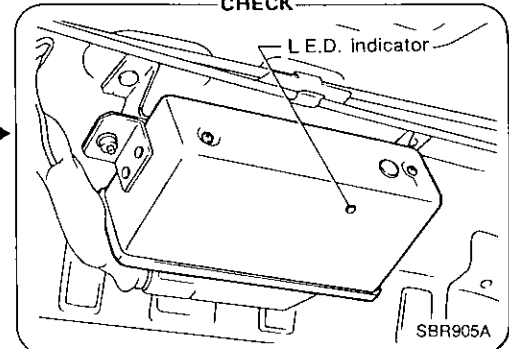
Ensure warning lamp remains off while driving.

N.G. →

O.K. →

If Preliminary Check 2 is not performed  
and there is abnormal A.B.S. operation,  
perform Preliminary Check 2.

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 page BR-40.)

## TROUBLE DIAGNOSES

### Self-diagnosis

#### CHECKING THE NUMBER OF L.E.D. FLASHES

When a problem occurs in the A.B.S., the warning light on the instrument panel comes on. As shown in the Table, the control unit performs self-diagnosis.

To obtain satisfactory self-diagnosing results, the vehicle must be driven above 30 km/h (19 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle is stopped, the number of L.E.D. flashes is counted while the engine is running.

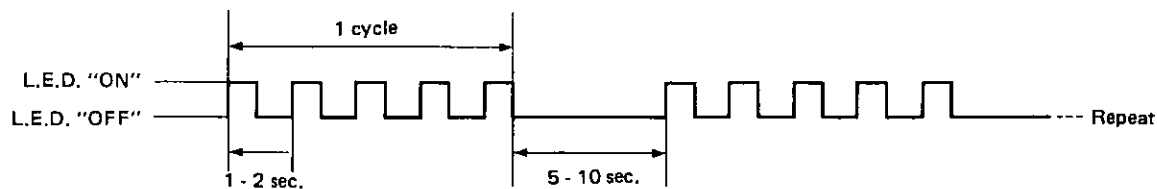
The L.E.D. is located on the control unit, identifying a malfunctioning part or unit by the number of flashes. Both the warning light and the L.E.D. persistently activate, even after a malfunctioning part or unit has been repaired, unless the ignition switch is turned "OFF". After repairs, turn the ignition switch "OFF". Then start the engine and drive the vehicle over 30 km/h (19 MPH) for at least one minute to ensure that the malfunctioning part or unit has been repaired properly.

If more than two circuits malfunction at the same time, the L.E.D. will flash to indicate one of the malfunctioning circuits. After the circuit has been repaired, the L.E.D. will then flash to indicate that the other circuit is malfunctioning.

| No. of L.E.D. flashes              | Malfunctioning part or unit                     |
|------------------------------------|-------------------------------------------------|
| 1                                  | Left front actuator solenoid circuit            |
| 2                                  | Right front actuator solenoid circuit           |
| 3                                  | Right rear actuator solenoid circuit            |
| 4                                  | Left rear actuator solenoid circuit             |
| 5                                  | Left front wheel sensor circuit                 |
| 6                                  | Right front wheel sensor circuit                |
| 7                                  | Right rear wheel sensor circuit                 |
| 8                                  | Left rear wheel sensor circuit                  |
| 9                                  | Motor and motor relay                           |
| 10                                 | Solenoid valve relay                            |
| 16 or continuous                   | Control unit                                    |
| Warning activates and L.E.D. "OFF" | Power supply or ground circuit for control unit |

#### Example

Improper operation of left front rotor sensor circuit

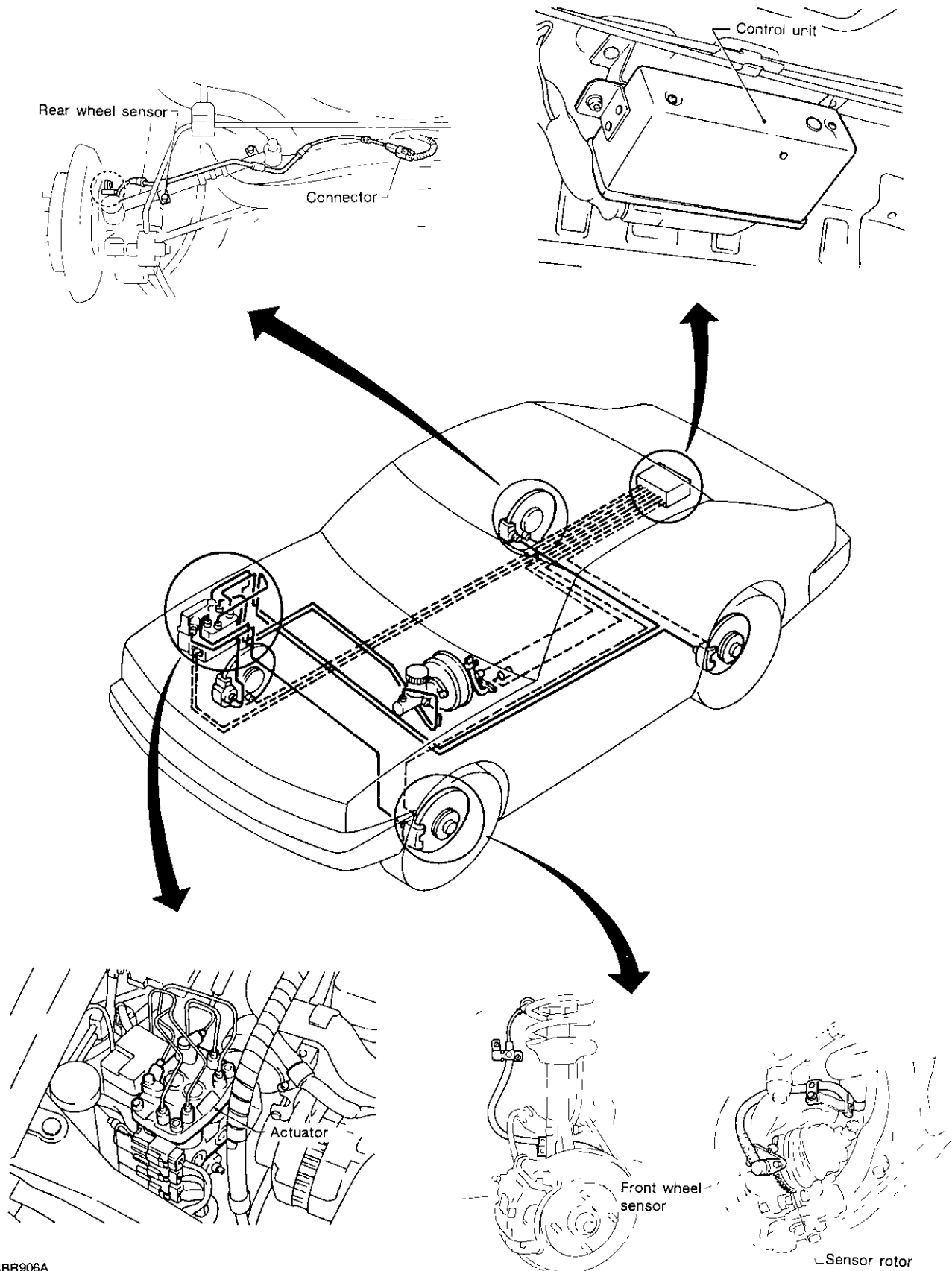


SBR531A

Go to Diagnostic Procedures 7-12, where malfunction portion is concerned.

# TROUBLE DIAGNOSES

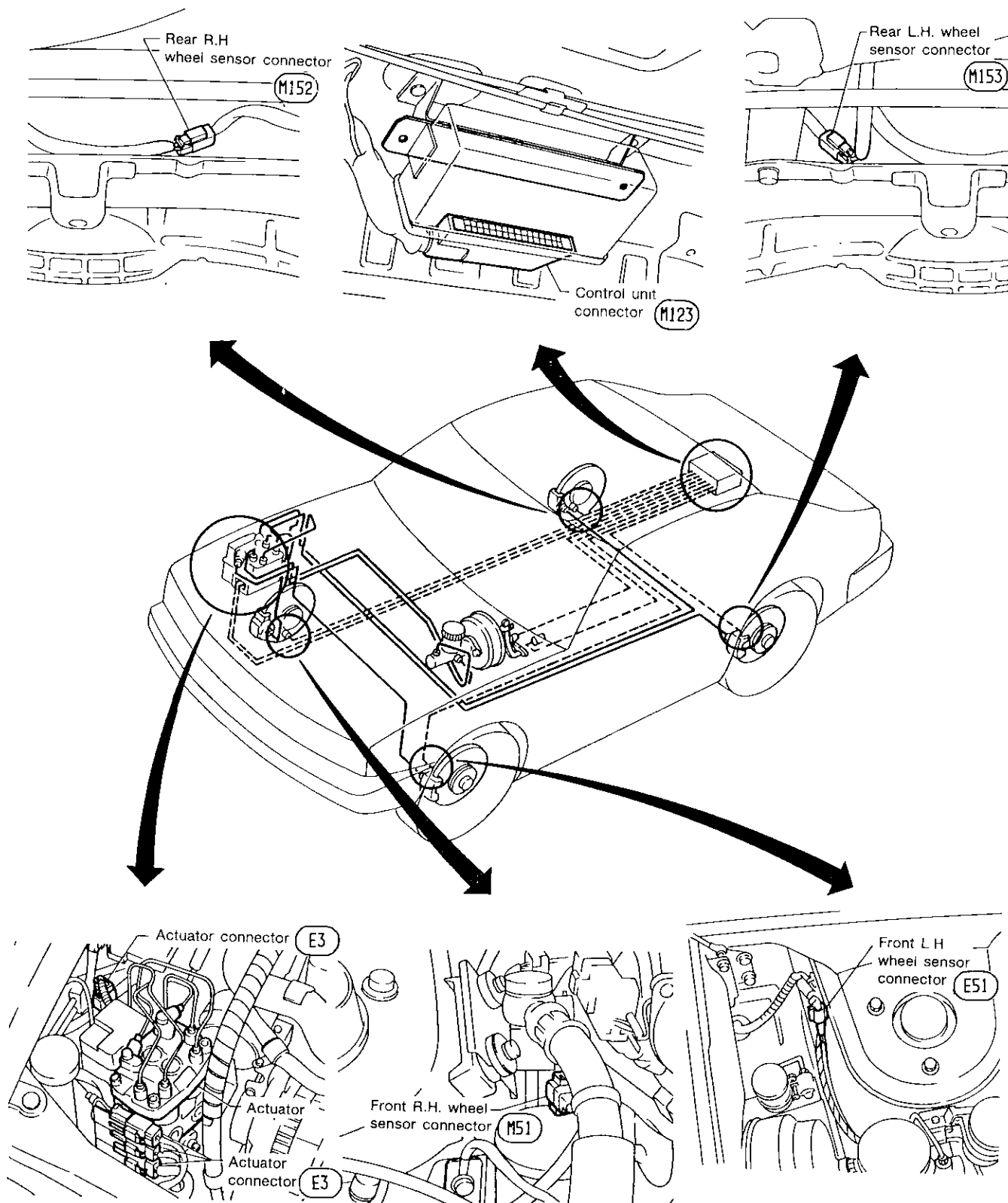
## Component Parts Location



SBR906A

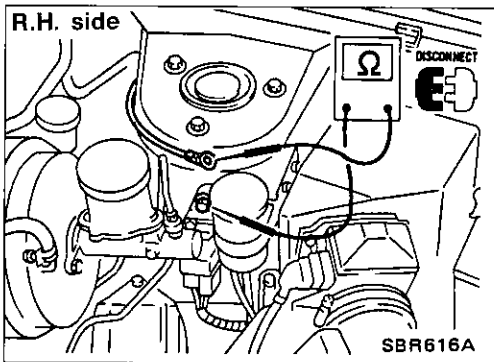
# TROUBLE DIAGNOSES

## Harness Connector Location



SBR907A





### Ground Circuit Check

#### FRONT WHEEL SENSOR SHIELDED WIRE GROUND

1. Remove ground terminals (on both L.H. and R.H. sides).
2. Check resistance between ground terminals and ground.

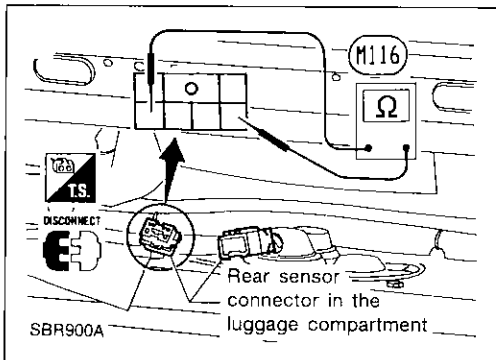
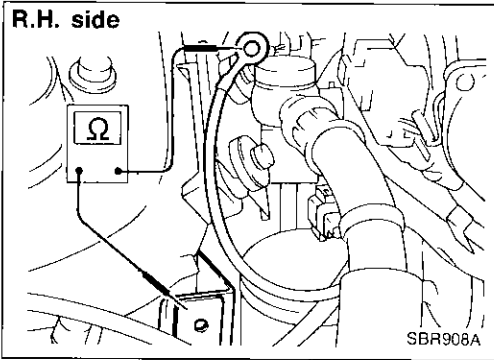
**Resistance:**

L.H. side

$0\Omega$

R.H. side

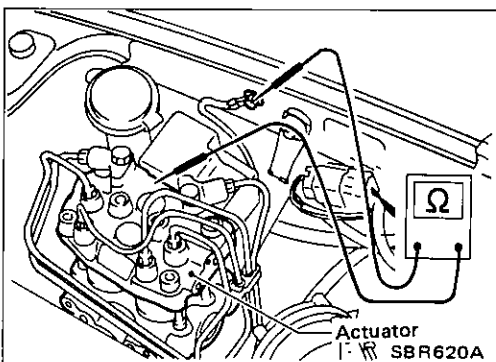
$0\Omega$



#### REAR WHEEL SENSORS SHIELDED WIRE GROUND

- Check resistance between both terminals.

**Resistance:**  $0\Omega$



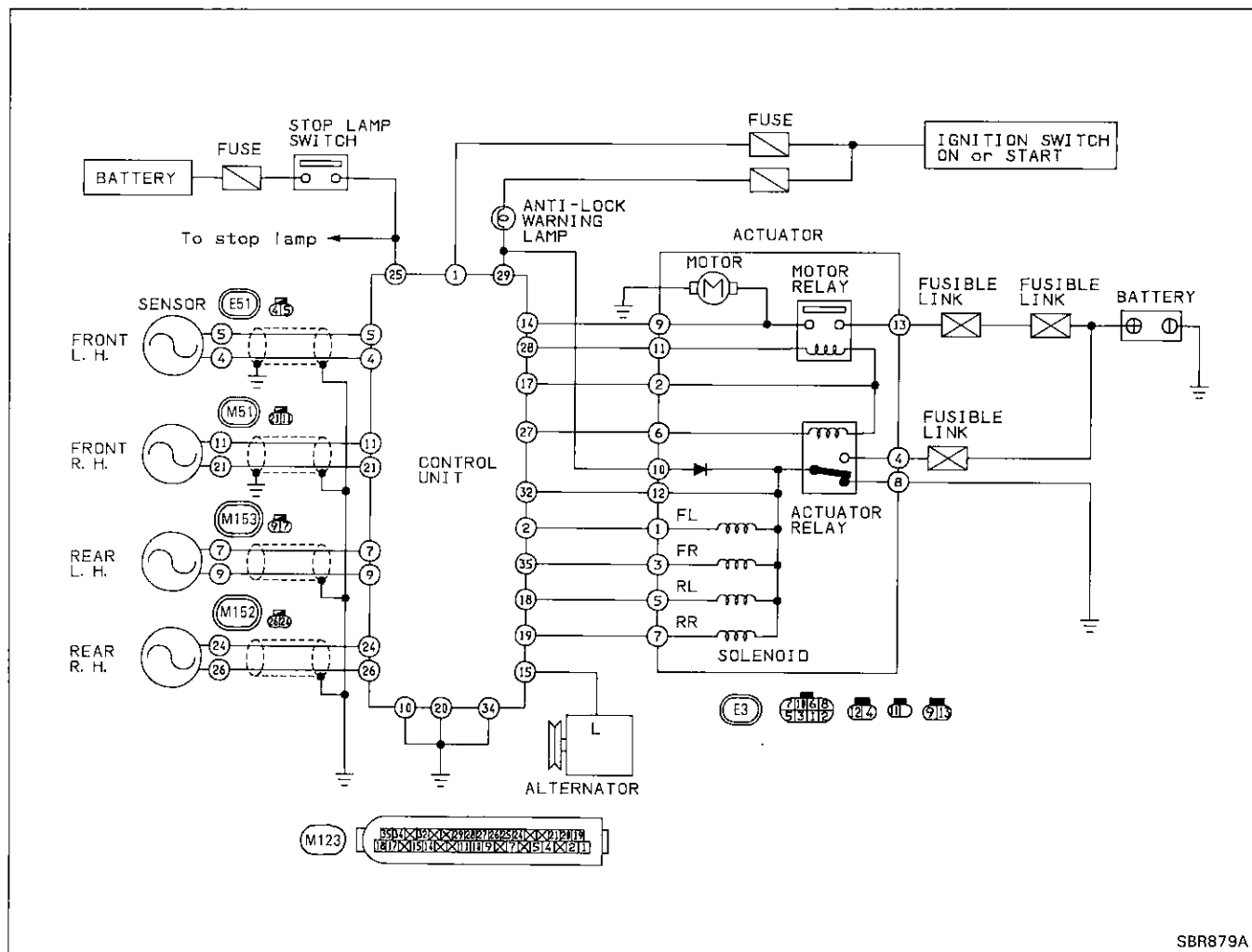
#### ACTUATOR MOTOR GROUND

- Check resistance between both terminals.

**Resistance:**  $0\Omega$

# TROUBLE DIAGNOSES

## Circuit Diagram for Quick Pinpoint Check



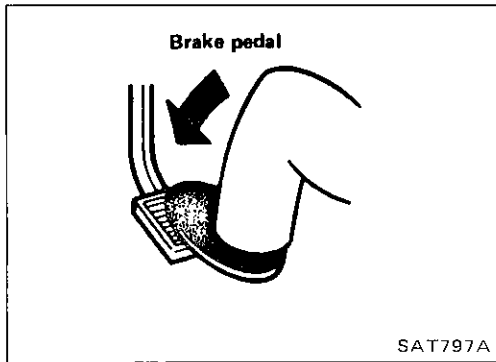
SBR879A

# TROUBLE DIAGNOSES

## Diagnostic Procedure 1

### SYMPTOM: Pedal vibration and noise

Refer to worksheet result.



Check whether the symptom appears only when brake is applied suddenly.

Yes

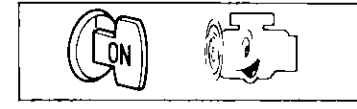
When brake is normally applied, A.B.S. works and produces pedal vibration or noise

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

A

Yes

A.B.S. may sometimes operate when load is high and voltage is low due to insufficient alternator output.

No

Check whether the symptom appears while the vehicle is being driven.

No

A

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

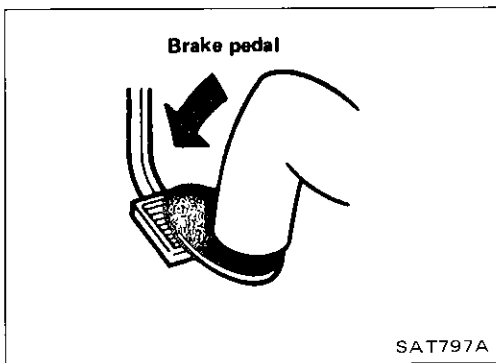
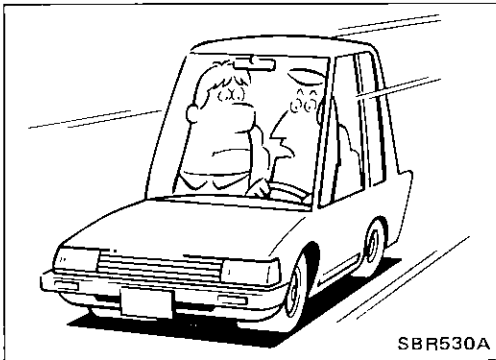
No

B

Yes

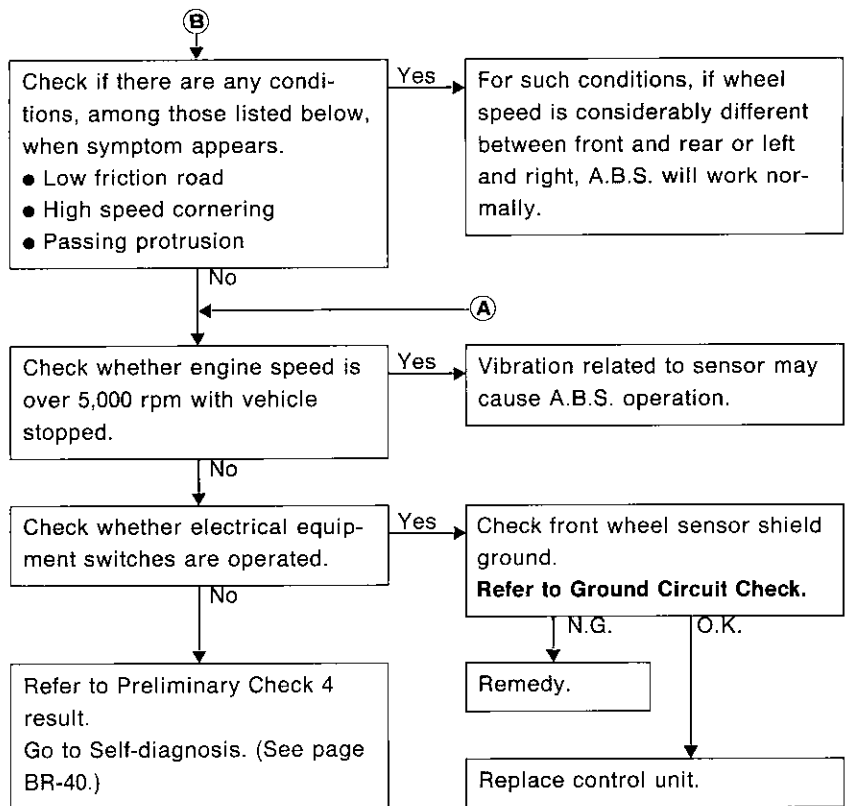
Under these conditions individual wheel speed can change suddenly. This may sometimes cause the A.B.S. to operate.

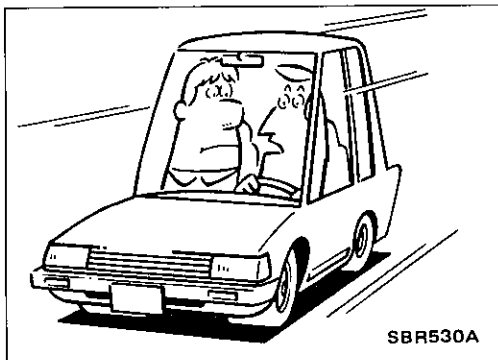
B



## TROUBLE DIAGNOSES

### Diagnostic Procedure 1 (Cont'd)

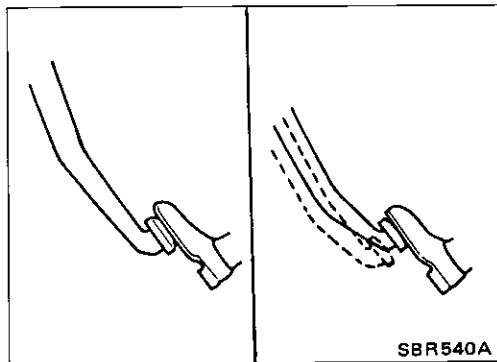
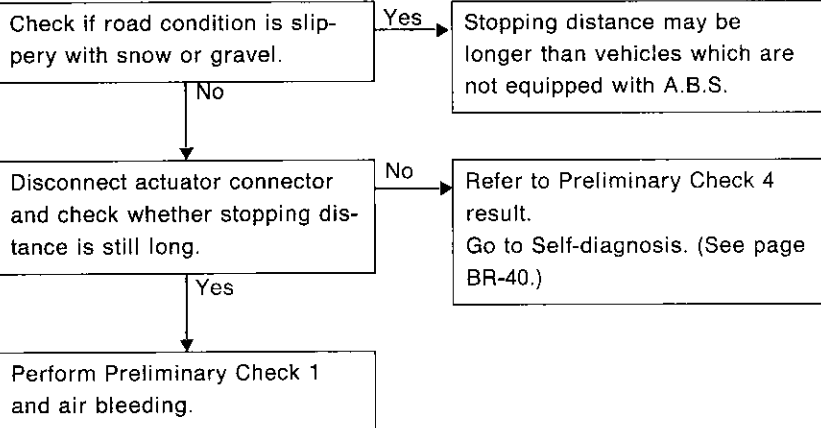




## Diagnostic Procedure 2

**SYMPTOM: Long stopping distance**

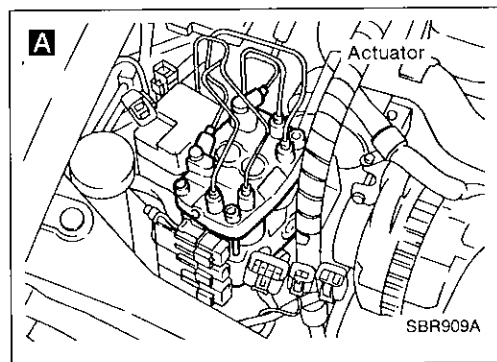
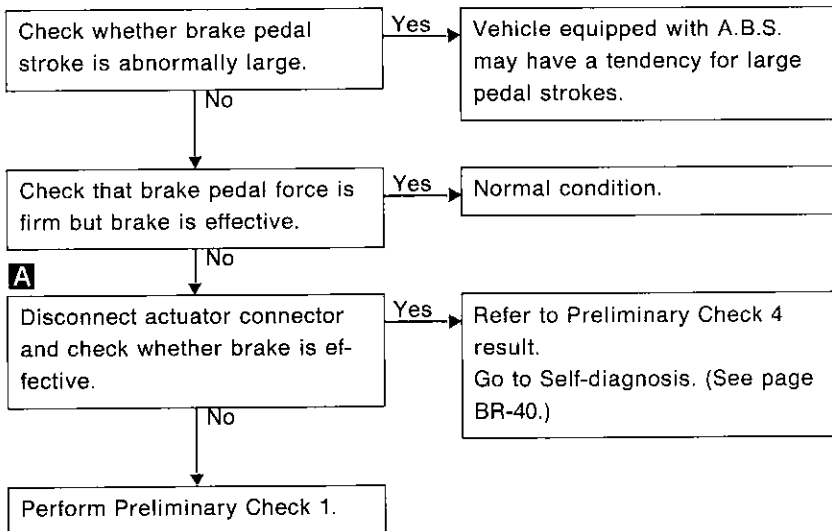
Refer to worksheet results.



## Diagnostic Procedure 3

**SYMPTOM: Abnormal pedal action**

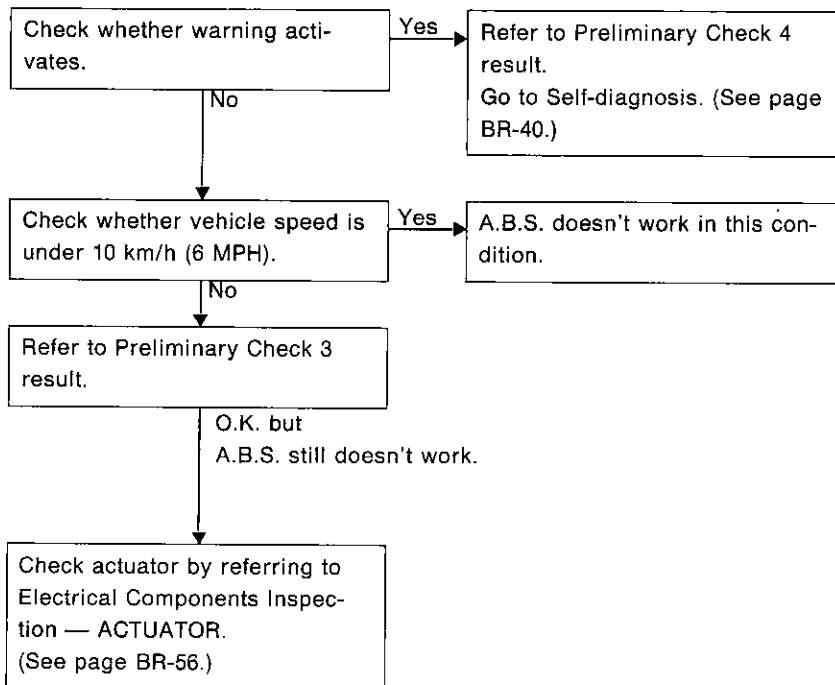
Refer to worksheet results.



## Diagnostic Procedure 4

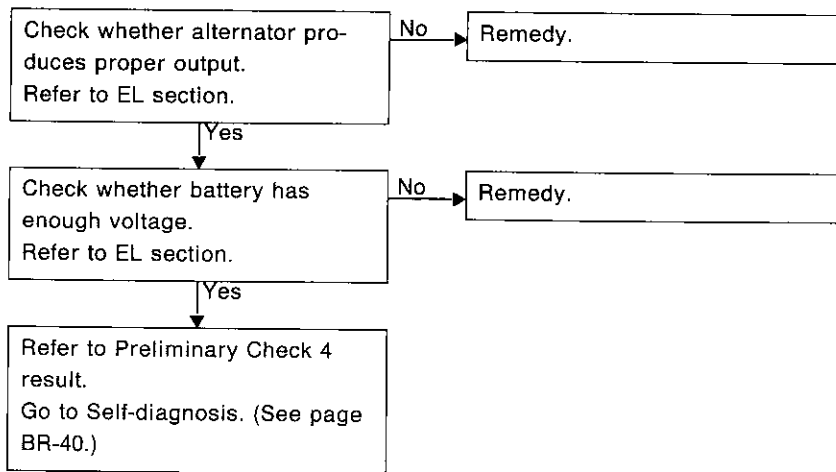
**SYMPTOM: A.B.S. doesn't work.**

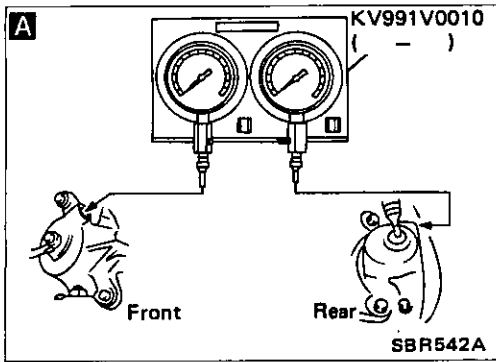
**Refer to worksheet results.**



## Diagnostic Procedure 5

**SYMPTOM: A.B.S. works but warning activates.**





## Diagnostic Procedure 6

**SYMPTOM: A.B.S. works frequently.**

**A**

**CHECK BRAKE FLUID PRES-SURE.**

Check whether brake fluid pressure distribution is normal.

$D_2/D_1$ : 5,100 - 6,473 kPa  
(52 - 66 kg/cm<sup>2</sup>, 739 - 939 psi)/  
9,807 kPa (100 kg/cm<sup>2</sup>, 1,422 psi)

No

Perform Preliminary Check 1.

Yes

**B**

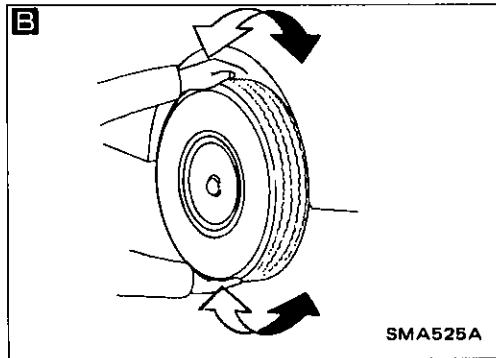
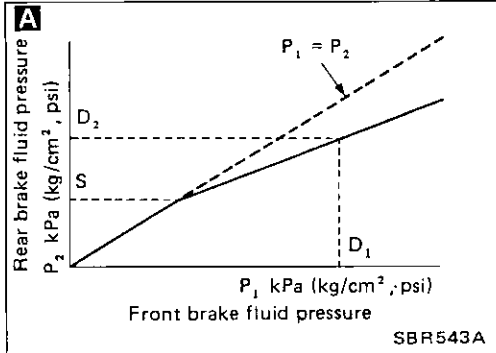
Check whether front axles have excessive looseness.

Yes

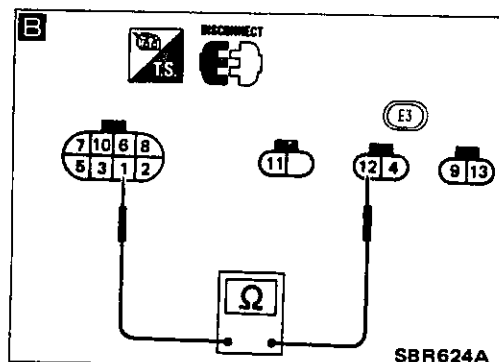
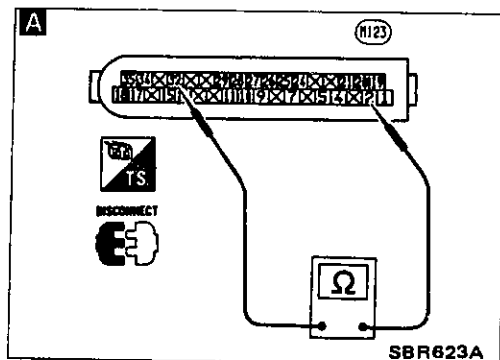
Remedy.

No

Perform Preliminary Check 2 and Ground Circuit Check.



# TROUBLE DIAGNOSES



## Diagnostic Procedure 7

### ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

#### INSPECTION START

Remove battery negative terminal connector.

**A**

#### CHECK SOLENOID VALVE RESISTANCE.

Check resistance between control unit connector (vehicle side) terminals.

Flashing number 1:

Terminals ③② and ②

Flashing number 2:

Terminals ③② and ③⑤

Flashing number 3:

Terminals ③② and ①⑨ ←

Flashing number 4:

Terminals ③② and ①⑧ ←

**Resistance: 0.7 - 1.6Ω**

O.K.

Replace control unit.

N.G.

**B**

Check resistance between actuator connector (actuator side) terminals.

Flashing number 1:

Terminals ①② and ①

Flashing number 2:

Terminals ①② and ③

Flashing number 3:

Terminals ①② and ⑦

Flashing number 4:

Terminals ①② and ⑤

**Resistance: 0.7 - 1.6Ω**

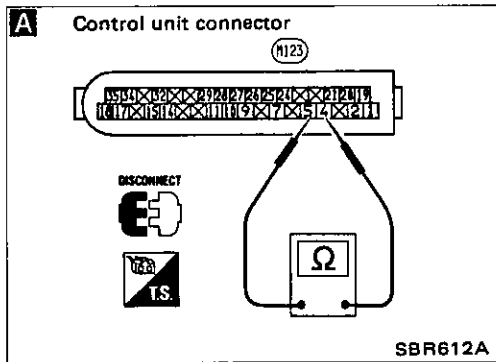
O.K.

Repair harness between actuator connector and control unit connector.

N.G.

Replace actuator.





## Diagnostic Procedure 8

### WHEEL SPEED SENSOR (L.E.D. flashing number 5 - 8)

#### INSPECTION START

Remove battery negative terminal connector.

#### A

#### CHECK SPEED SENSOR RESISTANCE.

Check resistance between control unit connector (vehicle side) terminals.

Flashing number 5 (Fr. L.H.):

Terminals ④ and ⑤

Flashing number 6 (Fr. R.H.):

Terminals ⑪ and ⑫

Flashing number 7 (Rr. R.H.):

Terminals ⑳ and ㉑

Flashing number 8 (Rr. L.H.):

Terminals ⑦ and ⑧

**Resistance: 0.8 - 1.2kΩ**

O.K.

Replace control unit.

N.G.

Refer to Preliminary Check 3 result. Check whether sensor has 0.8 to 1.2 kΩ resistance.

N.G.

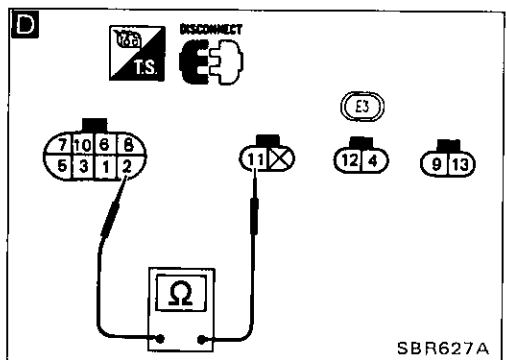
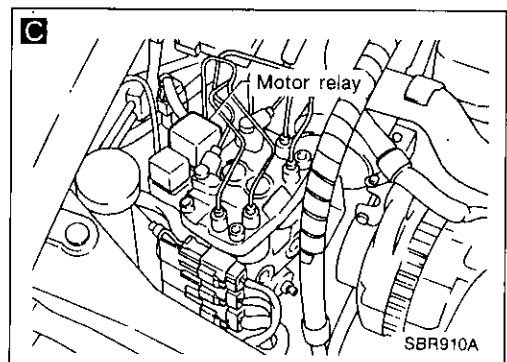
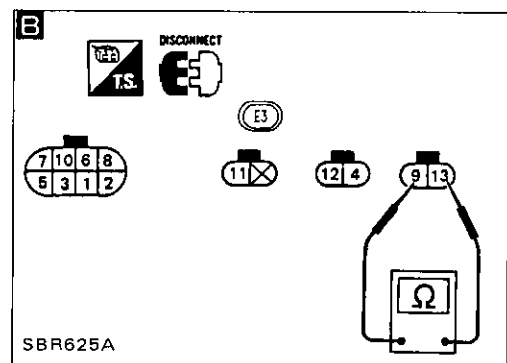
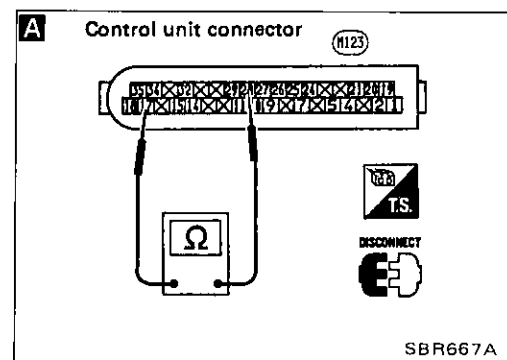
Replace sensor.

O.K.

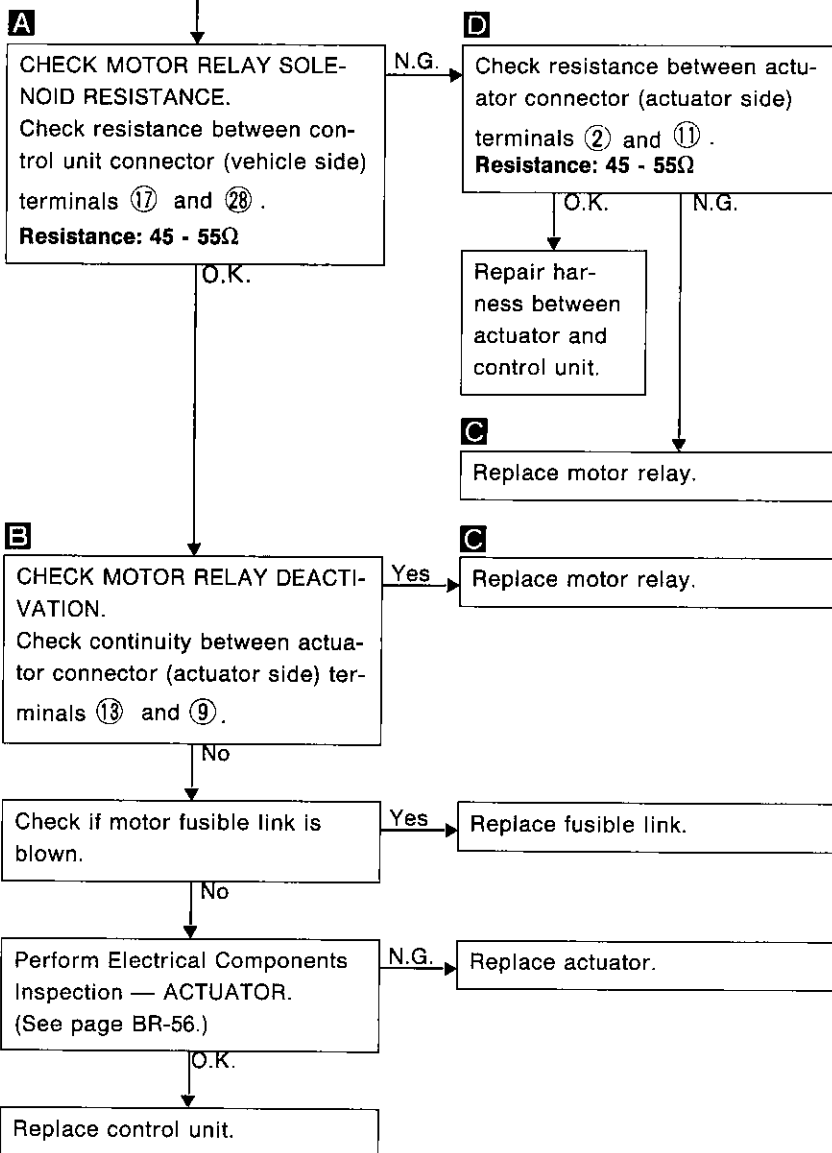
Repair harness between sensor connector and control unit connector.

## Diagnostic Procedure 9

### ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)



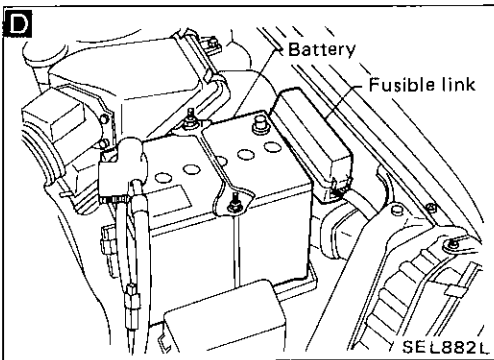
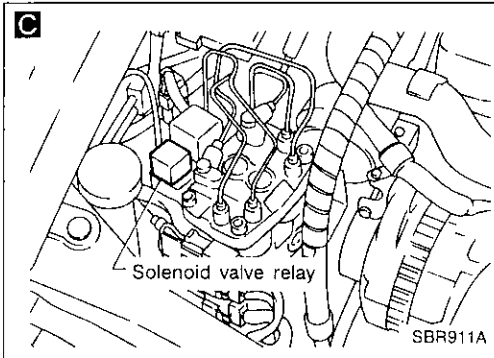
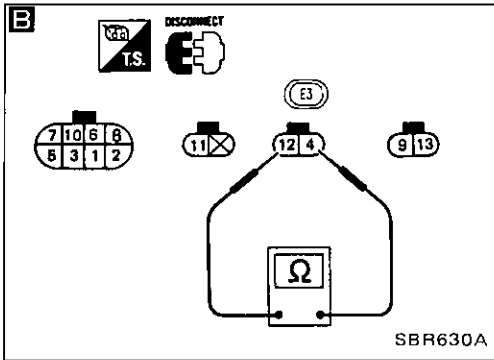
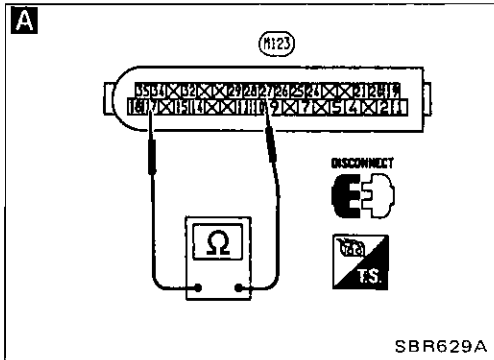
**INSPECTION START**  
Remove battery negative terminal connector.



# TROUBLE DIAGNOSES

## 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.**  
Check resistance between control unit connector (vehicle side) terminals ②⑦ and ①⑦.  
**Resistance: 80 - 90Ω**

N.G. → Check resistance between actuator connector (actuator side) terminals ⑥ and ②.  
**Resistance: 80 - 90Ω**

O.K. → Repair harness between actuator and control unit.  
N.G. →

**C**  
Replace solenoid valve relay.

**B**  
**CHECK SOLENOID VALVE RELAY MOVEMENT.**  
Disconnect actuator connector.  
Check continuity between actuator connector (actuator side) terminals ④ and ⑫.

Yes → **C**  
Replace solenoid valve relay.

No → **D**  
Check if solenoid valve relay 30A fusible link is melted ("ANTI-SKID" written on cover).

Yes → Repair harness between terminal ④ and fusible link box. Then replace 30A fusible link.

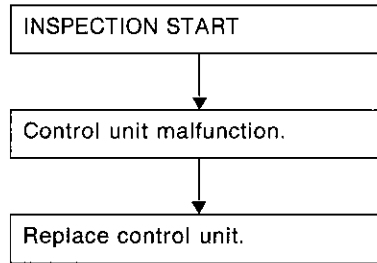
No → Perform Electrical Components Inspection — ACTUATOR. (See page BR-56.)

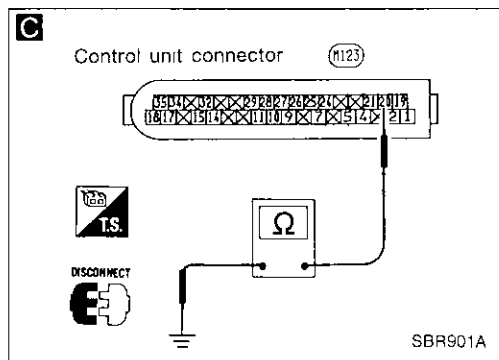
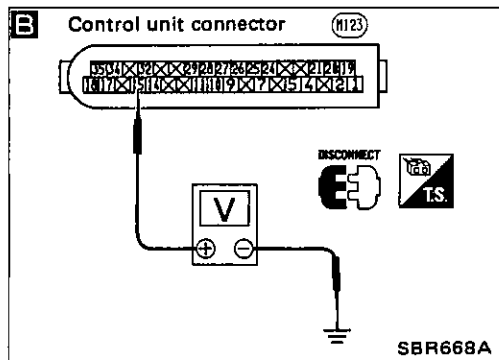
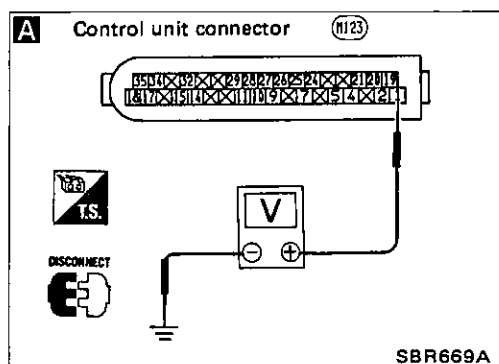
N.G. → Replace actuator.

O.K. → Replace control unit.

### Diagnostic Procedure 11

**CONTROL UNIT (L.E.D. flashing number 16 or continuous)**

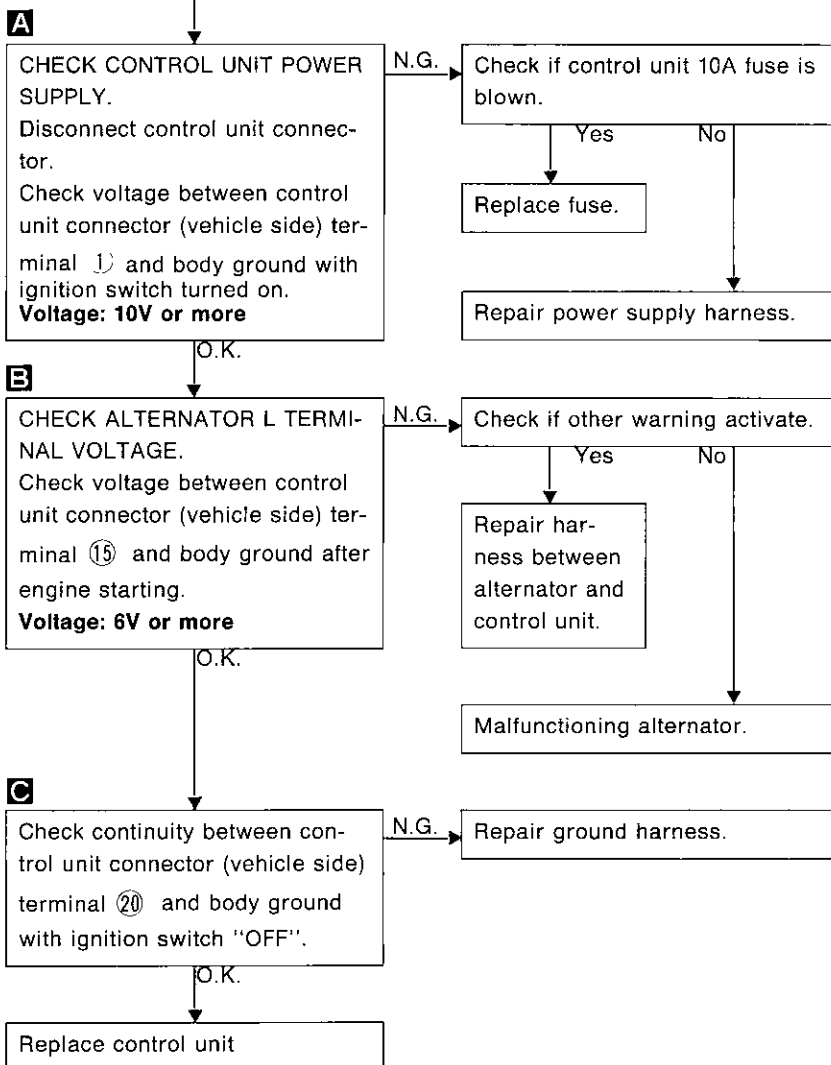




## Diagnostic Procedure 12

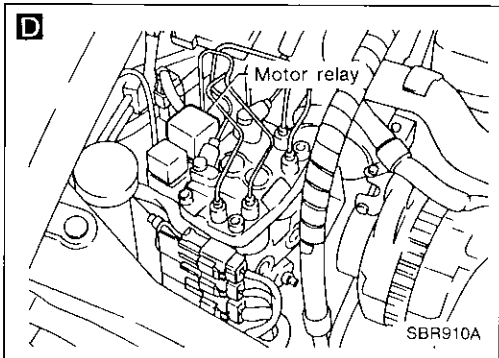
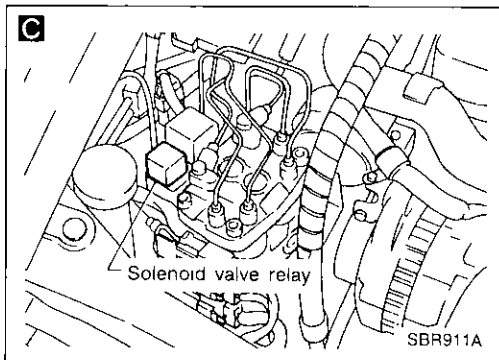
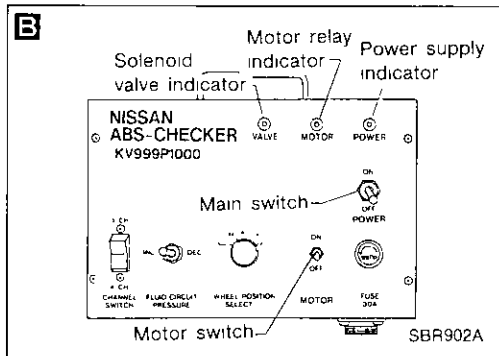
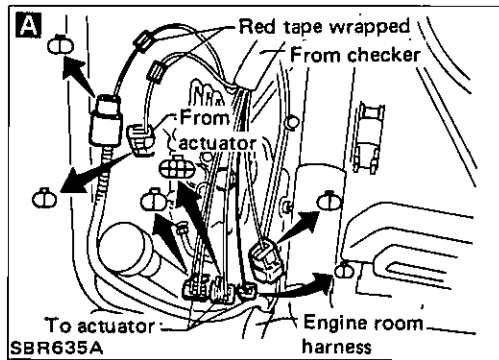
## CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)

INSPECTION START



## Electrical Components Inspection

### ACTUATOR (Not self-diagnostic item)



#### INSPECTION START

**A**  
Connect A.B.S. checker to actuator connector and vehicle harness with battery terminal connected and all checker switch turning off.  
Use harness for 4 channel.  
Set channel select switch to 4 channel.

**B**  
Turn checker main switch on.  
Check power supply indicator for coming on.

No → Replace battery with fully charged new one, if checker connection is correct.

**B**  
Check checker valve relay indicator for coming on.

No → Replace solenoid valve relay, if checker connection is correct.

**B step A**  
Select one valve — FL, FR, RL or RR. (valves corresponding to each wheel position.)  
Select brake circuit pressure decreasing position by switch then turn motor switch on.  
Select pressure increasing position.

**B**  
Check motor relay indicator for coming on while motor switch is turned on.

No → Replace motor relay, if checker connection is correct.

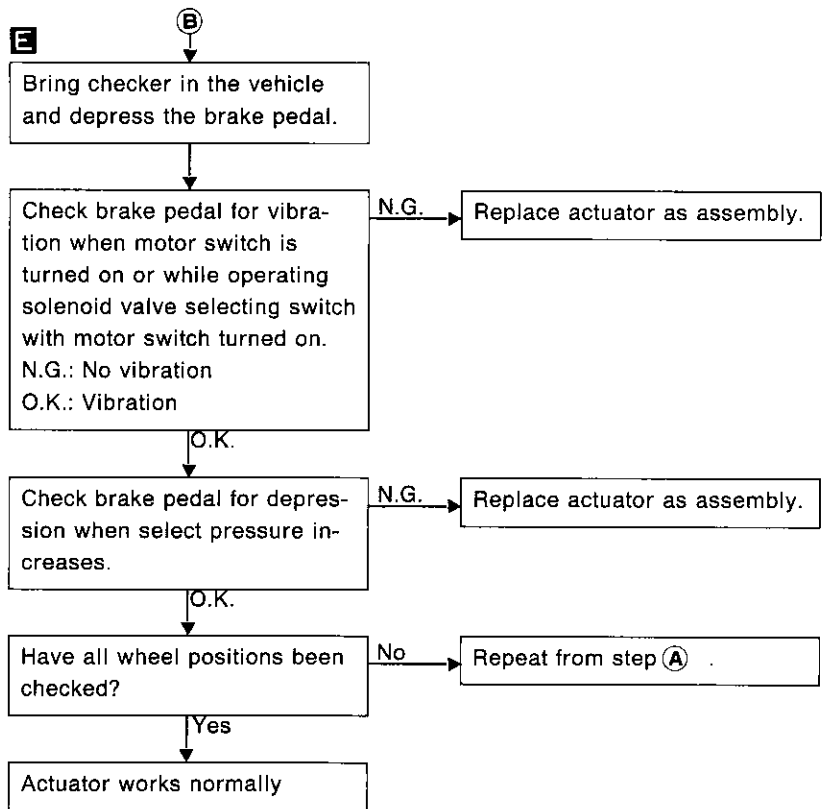
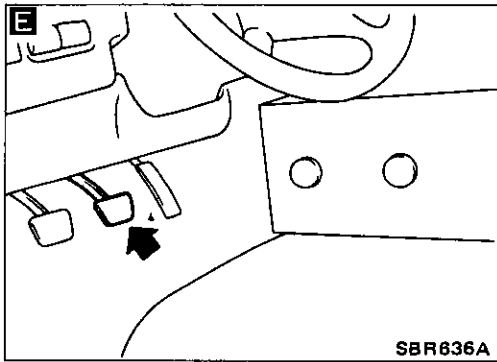
Check motor for operational sound beside the actuator in a quiet place.

No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.

(B)

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)



#### CAUTION:

Do not set checker at pressure decrease position for more than 5 seconds at a time. Actuator solenoid valve may be damaged.

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

## General Specifications

| Item                                                                     | Model | Without A.B.S.                                            | With A.B.S.                                        |
|--------------------------------------------------------------------------|-------|-----------------------------------------------------------|----------------------------------------------------|
| Front brake                                                              |       |                                                           |                                                    |
| Brake model                                                              |       | CL25VA<br>disc brake                                      |                                                    |
| Cylinder bore diameter<br>mm (in)                                        |       | 57.2 (2.252)                                              |                                                    |
| Pad<br>mm (in)                                                           |       |                                                           |                                                    |
| Length x width x thick-<br>ness                                          |       | 125.6 x 45.3 x 11.0<br>(4.94 x 1.783 x 0.433)             |                                                    |
| Rotor outer diameter<br>x thickness<br>mm (in)                           |       | 257 x 22<br>(10.12 x 0.87)                                |                                                    |
| Rear brake                                                               |       |                                                           |                                                    |
| Brake model                                                              |       | LT23B<br>drum brake                                       | CL9H<br>disc brake                                 |
| Cylinder bore diameter<br>mm (in)                                        |       | 20.64 (13/16)                                             | 33.96 (1.3370)                                     |
| Lining or pad<br>mm (in)                                                 |       |                                                           |                                                    |
| Length x width x thick-<br>ness                                          |       | 219.4 x 40.0 x 4.5<br>(8.64 x 1.575 x 0.177)              | 75 x 40.0 x 9<br>(2.95 x 1.575 x 0.35)             |
| Drum inner diameter or<br>rotor outer diameter x<br>thickness<br>mm (in) |       | 228.6 (9)                                                 | 258 x 10<br>(10.16 x 0.39)                         |
| Master cylinder                                                          |       |                                                           |                                                    |
| Cylinder bore diameter<br>mm (in)                                        |       | 23.81 (15/16)                                             | 25.40 (1)                                          |
| Control valve                                                            |       |                                                           |                                                    |
| Valve model                                                              |       | Dual proportion-<br>ing valve (within<br>master cylinder) | Dual proportion-<br>ing valve                      |
| Split point<br>kPa (kg/cm <sup>2</sup> , psi)<br>x reducing ratio        |       | 2,452 (25, 356) x<br>0.2                                  | 2,452 (25, 356) x<br>0.4                           |
| Brake booster                                                            |       |                                                           |                                                    |
| Booster model                                                            |       | M195T                                                     | M215T                                              |
| Diaphragm diameter<br>mm (in)                                            |       | Primary:<br>205 (8.07)<br>Secondary:<br>180 (7.09)        | Primary:<br>230 (9.06)<br>Secondary:<br>205 (8.07) |
| Recommended brake fluid                                                  |       | DOT 3                                                     |                                                    |



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

### Inspection and Adjustment

#### DISC BRAKE

|                            |               |             |
|----------------------------|---------------|-------------|
| Brake model                | CL25VA        | CL9H        |
| Pad wear limit mm (in)     | 2.0 (0.079)   |             |
| Minimum thickness          |               |             |
| Rotor repair limit mm (in) | 20.0 (0.787)  | 9.0 (0.354) |
| Minimum thickness          |               |             |
| Maximum runout             | 0.07 (0.0028) |             |

#### DRUM BRAKE

|                           |               |
|---------------------------|---------------|
| Brake model               | LT23B         |
| Lining wear limit mm (in) | 1.5 (0.059)   |
| Minimum thickness         |               |
| Drum repair limit mm (in) | 230 (9.06)    |
| Maximum inner diameter    |               |
| Out-of-roundness          | 0.03 (0.0012) |
| Radial runout             | 0.05 (0.0020) |

#### BRAKE PEDAL

|                                                                  |                           |
|------------------------------------------------------------------|---------------------------|
| Free height "H" mm (in)                                          | 159 - 169 (6.26 - 6.65)   |
| M/T                                                              |                           |
| A/T                                                              | 169 - 179 (6.65 - 7.05)   |
| Depressed height "D" mm (in)                                     | 90 (3.54)                 |
| [under force of 490 N (50 kg, 110 lb) with engine running]       |                           |
| Clearance between switches and pedal stopper bracket "C" mm (in) | 0.3 - 1.0 (0.012 - 0.039) |
| Pedal free play "A" mm (in)                                      | 1 - 3 (0.04 - 0.12)       |

#### PARKING BRAKE

|                                                     |        |
|-----------------------------------------------------|--------|
| Number of notches                                   | 9 - 11 |
| [under force of 196 N (20 kg, 44 lb)]               |        |
| Number of notches when warning lamp switch comes on | 1 - 2  |



# STEERING SYSTEM

## SECTION **ST**

### CONTENTS

|                                                      |       |
|------------------------------------------------------|-------|
| PRECAUTIONS .....                                    | ST- 2 |
| PREPARATION .....                                    | ST- 3 |
| ON-VEHICLE INSPECTION .....                          | ST- 5 |
| ON-VEHICLE INSPECTION (Power Steering) .....         | ST- 6 |
| STEERING WHEEL AND STEERING COLUMN .....             | ST- 9 |
| POWER STEERING GEAR AND LINKAGE (Model PR26SC) ..... | ST-13 |
| POWER STEERING OIL PUMP .....                        | ST-25 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....       | ST-28 |



## **PRECAUTIONS**

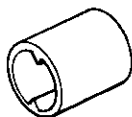
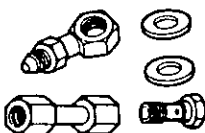
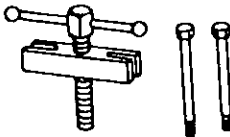
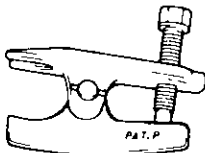
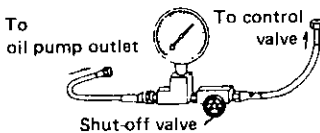
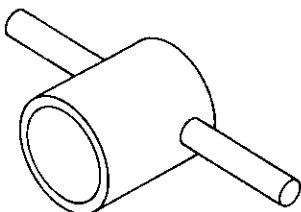
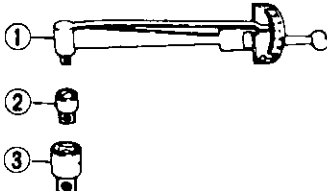
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- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- When disassembling parts, be sure to place them in order on a part rack so they can be reinstalled in their proper positions.
- Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.
- Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
- Before assembly, apply a coat of recommended A.T.F.\* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.

\*: Automatic transmission fluid

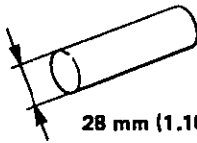
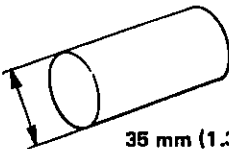
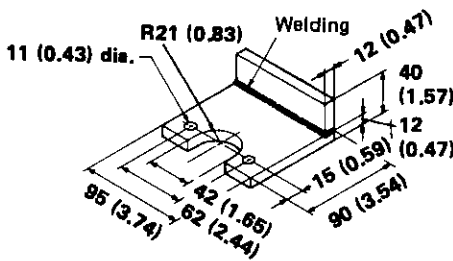
# PREPARATION

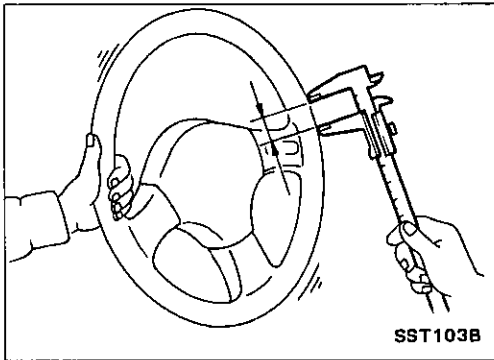
## SPECIAL SERVICE TOOLS

| Tool number<br>(Kent-Moore No.)<br>Tool name                                                                                                                      | Description                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| KV48100700<br>(J26364)<br>Torque adapter                                                                                                                          | Measuring pinion rotating torque<br>       |
| KV48102500<br>( — )<br>Pressure gauge adapter                                                                                                                     | Measuring oil pressure<br>                 |
| ST27180001<br>(J25726-A)<br>Steering wheel puller                                                                                                                 | Removing and installing steering wheel<br> |
| HT72520000<br>(J25730-A)<br>Ball joint remover                                                                                                                    | Removing ball joint<br>                   |
| ST27091000<br>(J26357)<br>Pressure gauge                                                                                                                          | Measuring oil pressure<br>               |
| KV48104400<br>( — )<br>Rack seal ring reformer                                                                                                                    | Reforming teflon ring<br>                |
| ST3127S000<br>(See J25765-A)<br>① GG91030000<br>(J25765-A)<br>Torque wrench<br>② HT62940000<br>( — )<br>Socket adapter<br>③ HT62900000<br>( — )<br>Socket adapter | Measuring turning torque<br>             |

# PREPARATION

## COMMERCIAL SERVICE TOOLS

| Tool name             | Description                                                                                                                                                      |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rear oil seal drift   | <div>  <p>28 mm (1.10 in) dia.</p> </div> <p>Installing rear oil seal</p>       |
| Pinion oil seal drift | <div>  <p>35 mm (1.38 in) dia.</p> </div> <p>Installing pinion oil seal</p>     |
| Oil pump attachment   | <div>  <p>Unit: mm (in)</p> </div> <p>Disassembling and assembling oil pump</p> |



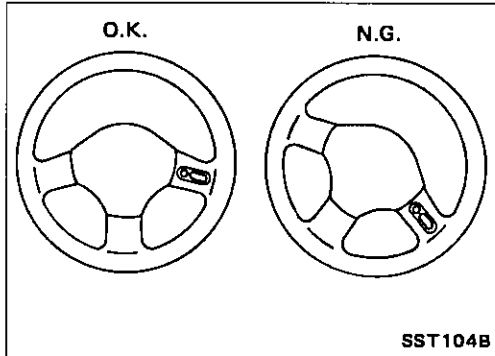
### Checking Steering Wheel Play

1. With wheels in a straight-ahead position, check steering wheel play.

**Steering wheel play:**

**35 mm (1.38 in) or less**

2. If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.



### Checking Neutral Position on Steering Wheel

#### Pre-checking

- Make sure that wheel alignment is correct.

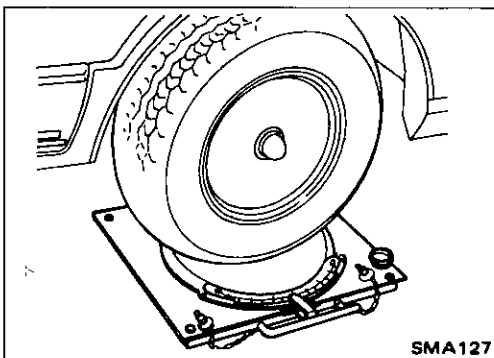
**Wheel alignment:**

**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.

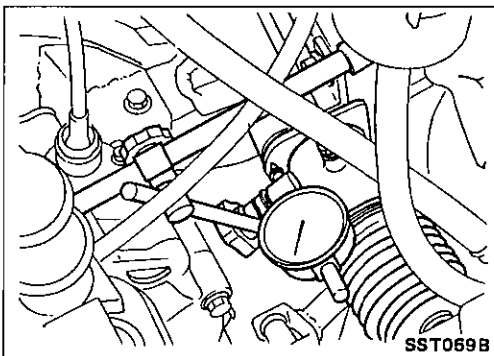
**Turning angle of full turns:**

**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.**



### 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.

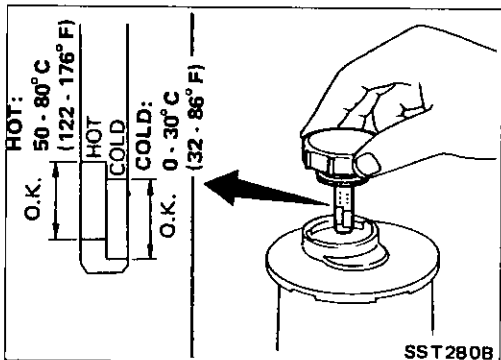
**Movement of gear housing:**

**±2 mm (±0.08 in) or less**

2. If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.

### Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.



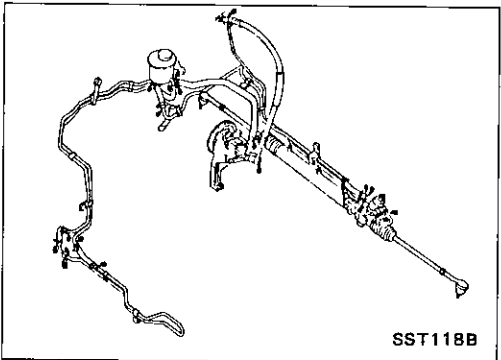
### Checking Fluid Level

Check fluid level.

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

#### CAUTION:

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



### Checking Fluid Leakage

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

1. Run engine between idle speed and 1,000 rpm.

**Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).**

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

#### CAUTION:

**Do not hold the steering wheel in a locked position for more than 15 seconds.**

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

**Do not overtighten connector as this can damage O-ring, washer and connector.**

### Bleeding Hydraulic System

1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers.  
Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.  
Repeat step 2 above.

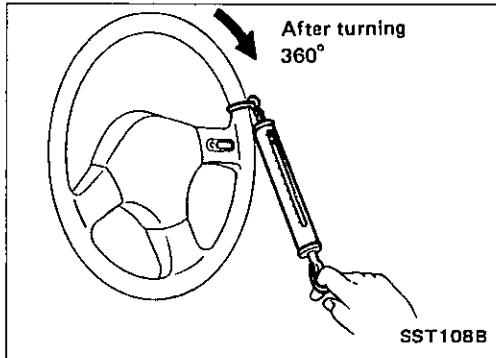


## ON-VEHICLE INSPECTION (Power steering)

### Bleeding Hydraulic System (Cont'd)

- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.
  - a. Generation of air bubbles in reservoir tank
  - b. Generation of clicking noise in oil pump
  - c. Excessive buzzing in oil pump

While the vehicle is stationary or while moving the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.



### Checking Steering Wheel Turning Force

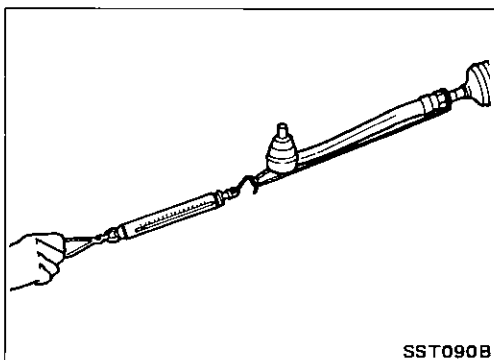
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

**Tires need to be inflated to normal pressure.**

4. Check steering wheel turning force when steering wheel has been turned 360° from 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  $\pm 11.5$  mm ( $\pm 0.453$  in) range from the neutral position, make sure rack sliding force is within specification.

**Average rack sliding force:**

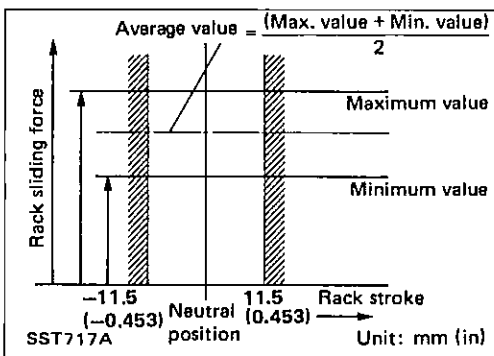
**284 N (29 kg, 64 lb)**

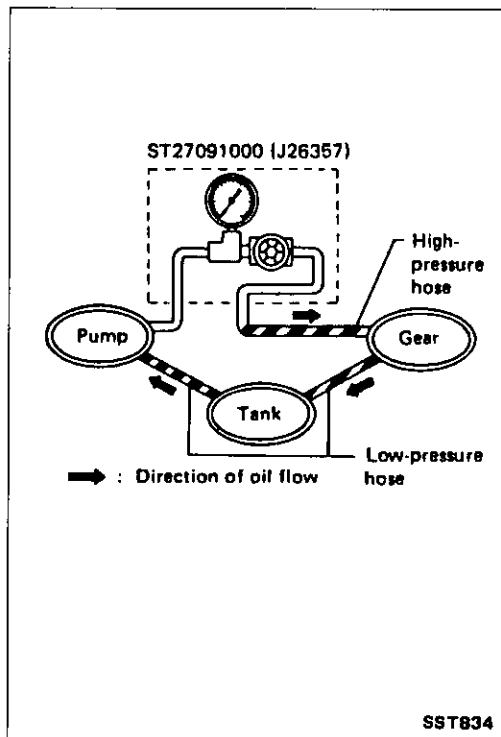
- d. Check sliding force outside above range.

**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:**

**7,355 - 8,336 kPa (75 - 85 kg/cm<sup>2</sup>, 1,067 - 1,209 psi)**

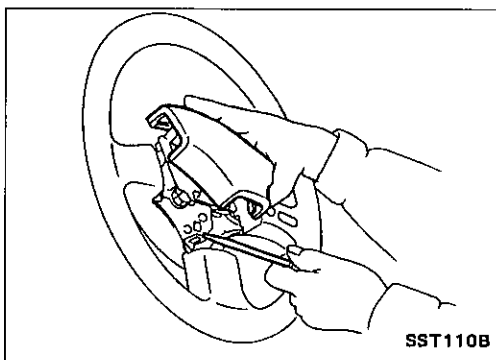
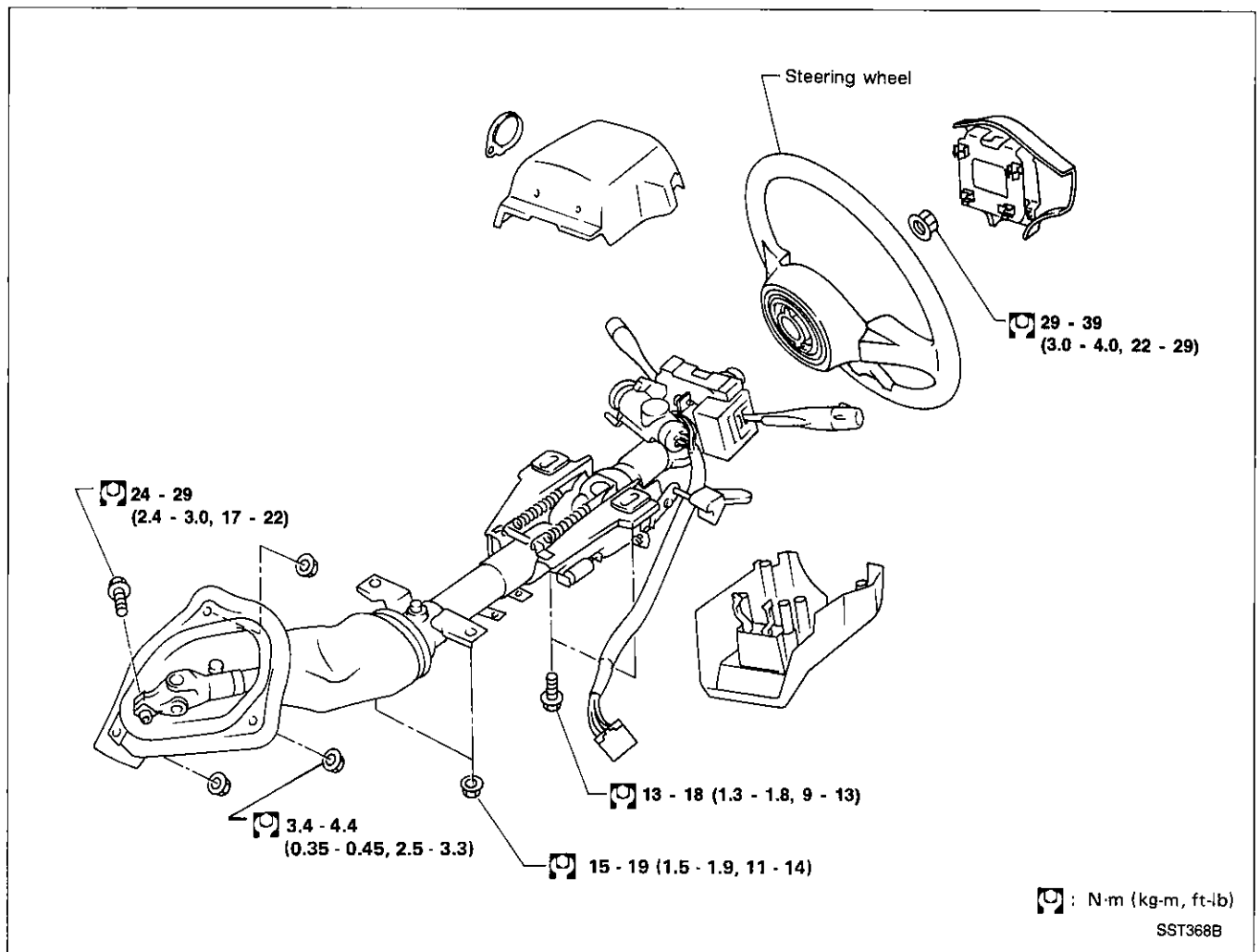
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.
  - When pressure reaches standard pressure, gear is damaged.
  - When pressure remains below standard pressure, pump is damaged.

#### CAUTION:

**Do not close shut-off valve for more than 15 seconds.**

5. If oil pressure is higher than standard pressure, check oil pump flow control valve.
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

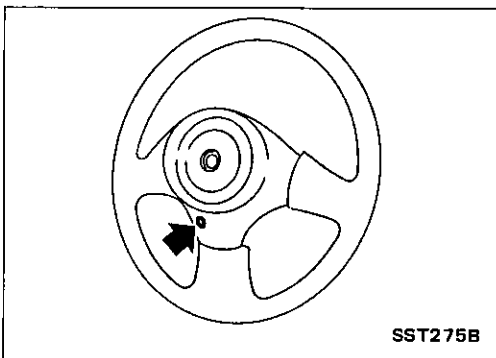
## STEERING WHEEL AND STEERING COLUMN



### Removal

#### STEERING WHEEL

1. Pull out horn pad.

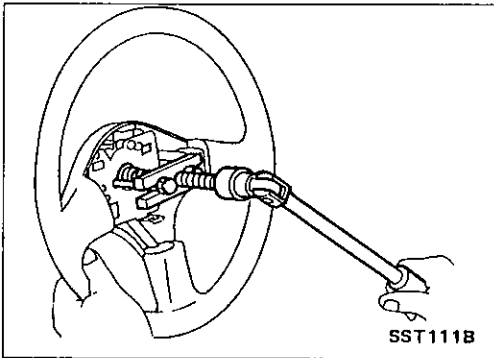


- If it is hard to pull out horn pad, temporarily loosen fixing screw of horn pad retaining spring.

## STEERING WHEEL AND STEERING COLUMN

### Removal (Cont'd)

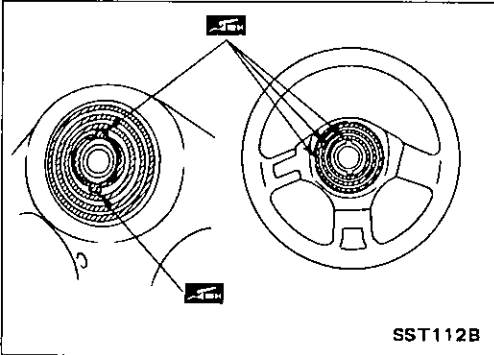
2. Remove steering wheel with Tool.



### Installation

#### STEERING WHEEL

When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.

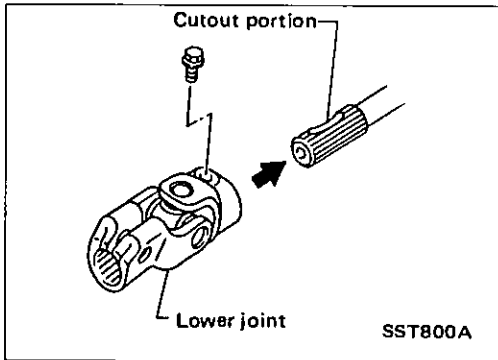


#### STEERING COLUMN

- 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.

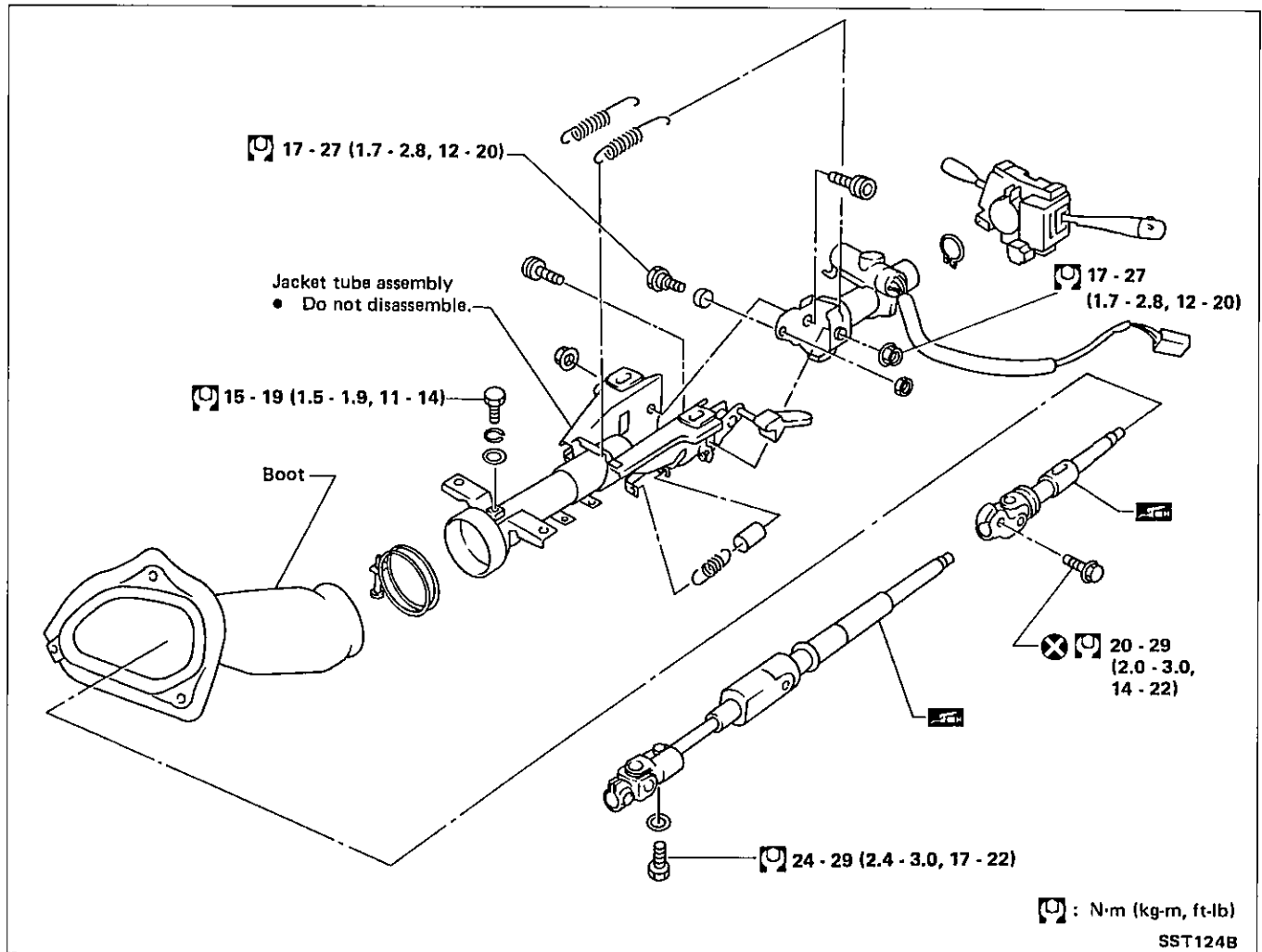
#### CAUTION:

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.

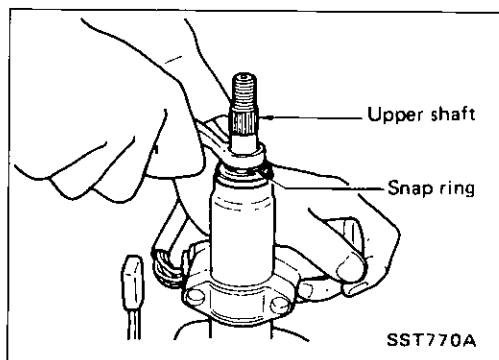


# STEERING WHEEL AND STEERING COLUMN

## Disassembly and Assembly



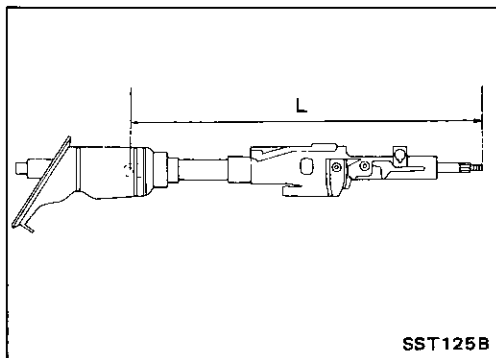
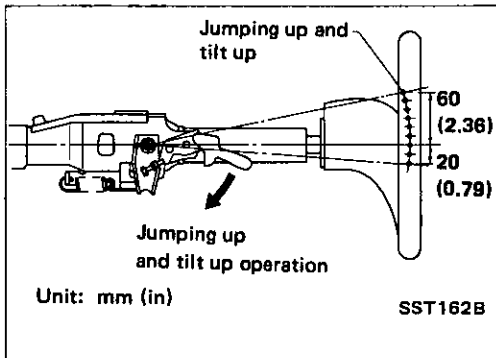
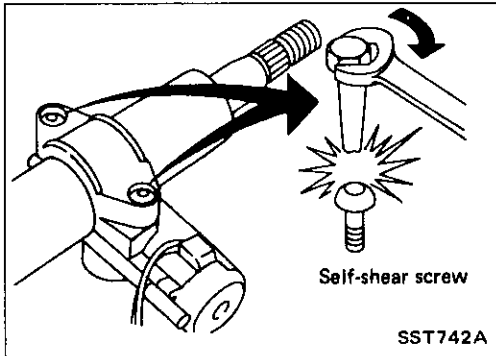
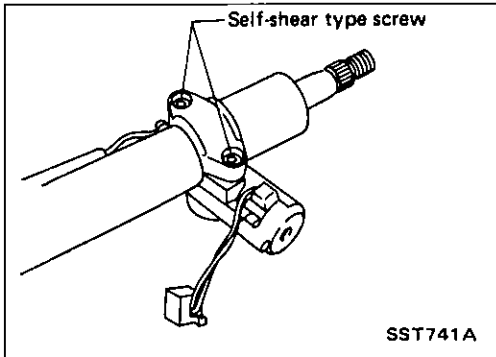
- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.



- Install snap ring on upper shaft with a suitable tool.

## STEERING WHEEL AND STEERING COLUMN

### 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.
- After installing steering column, check tilt mechanism operation.

### Inspection

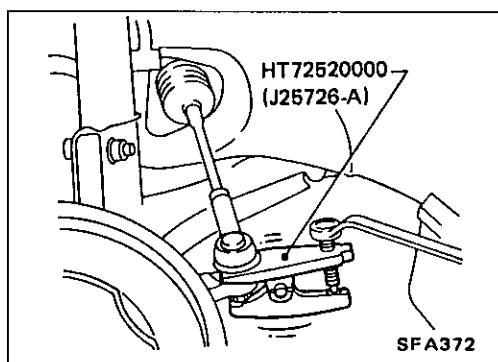
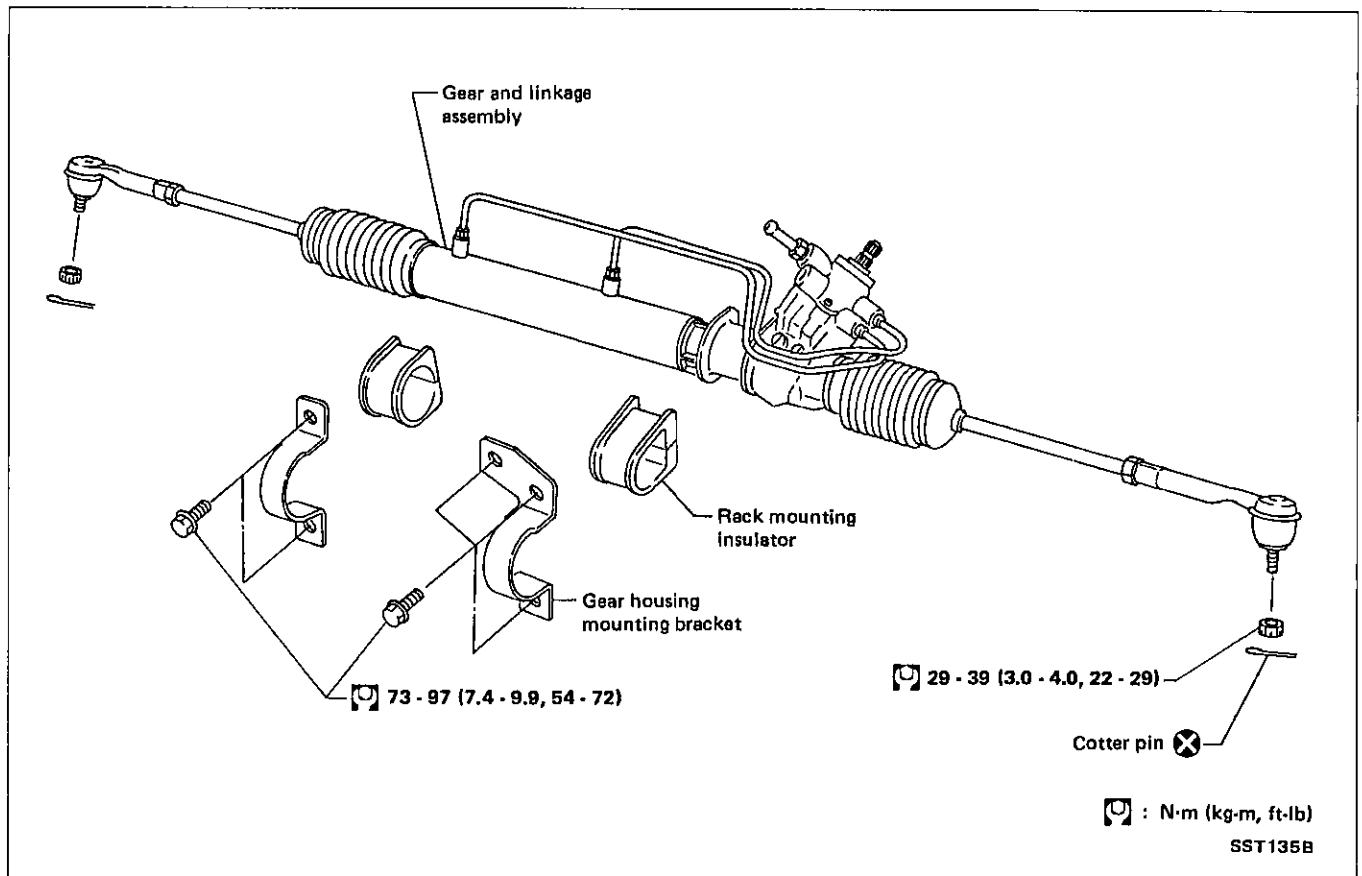
- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.
  - a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
  - b. Check jacket tube for deformation or breakage. Replace if necessary.
- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column as an assembly.

**Column length "L":**

**581.2 - 582.8 mm (22.88 - 22.94 in)**

## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

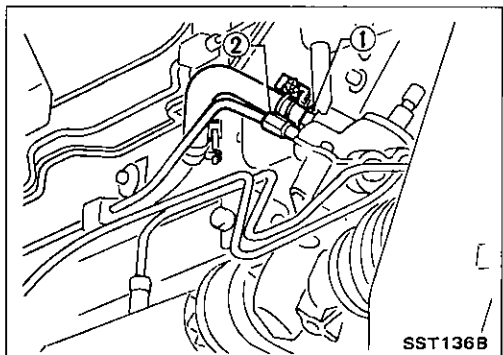
### Removal and Installation



- Detach tie-rod outer sockets from knuckle arms with Tool.

## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

### Removal and Installation (Cont'd)



- Install pipe connector.
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.

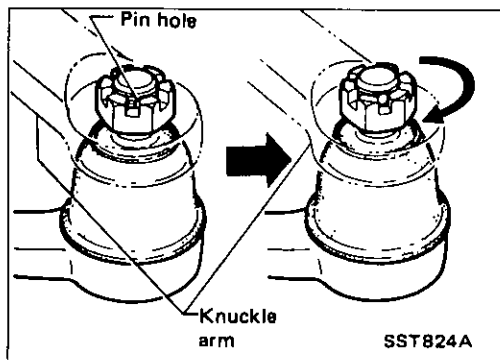
#### Connector tightening torque:

##### Low-pressure side "1"

27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)

##### High-pressure side "2"

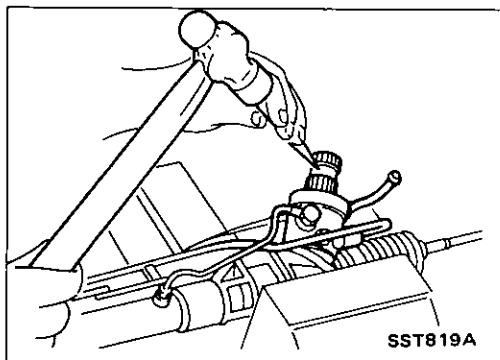
15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)



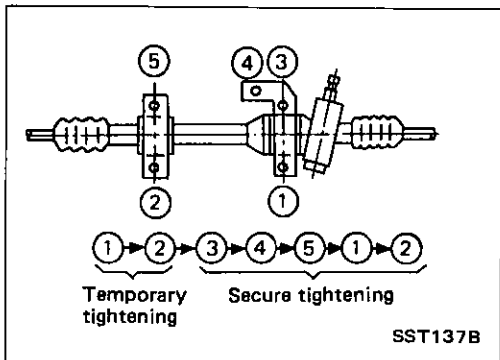
- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

#### CAUTION:

Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



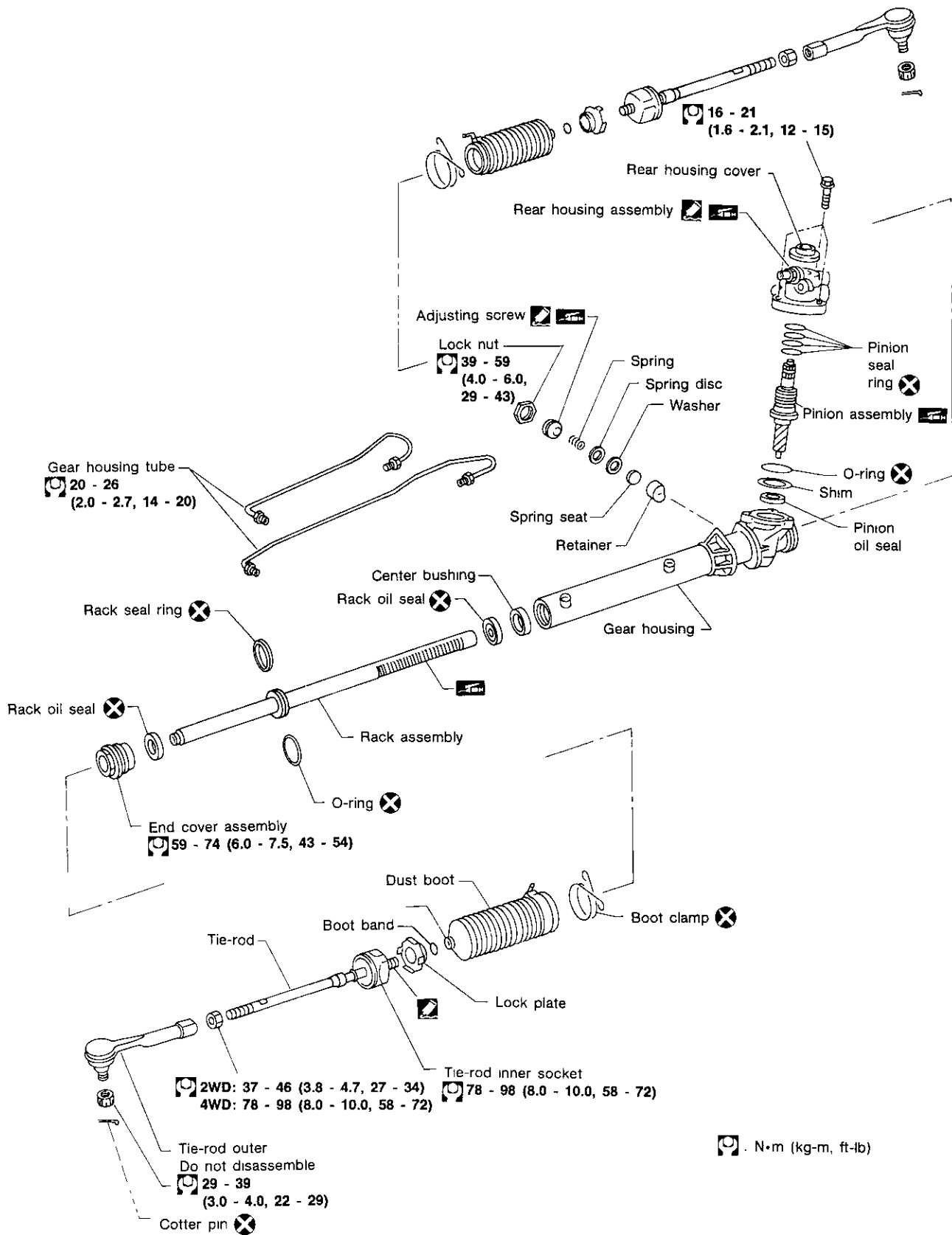
- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matching marks of pinion shaft and pinion housing.



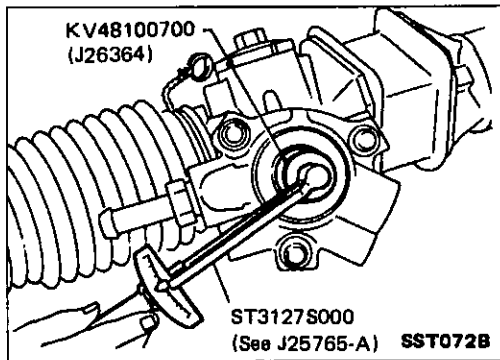
- Tighten gear housing mounting bracket bolts in the order shown.



# POWER STEERING GEAR AND LINKAGE (Model PR26SC)



SST369B



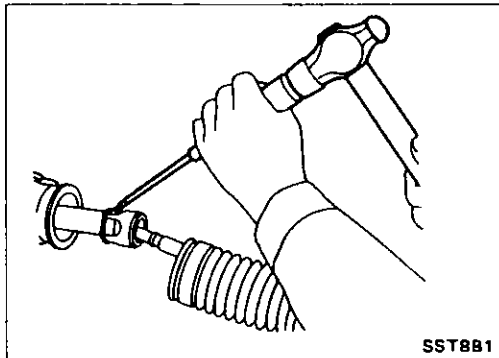
### Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

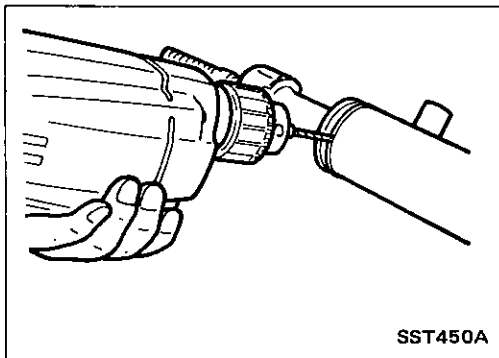
- Before measuring, disconnect gear housing tube and drain fluid.
- Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.

2. Remove pinion gear.

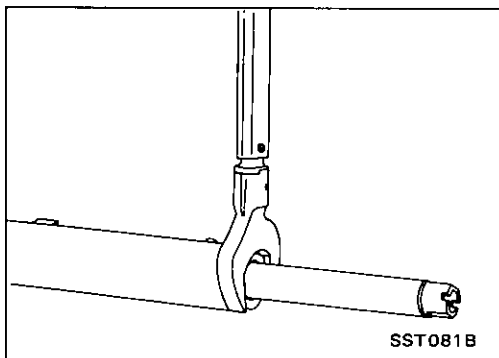
**Be careful not to damage pinion gear when removing pinion seal ring.**



3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.

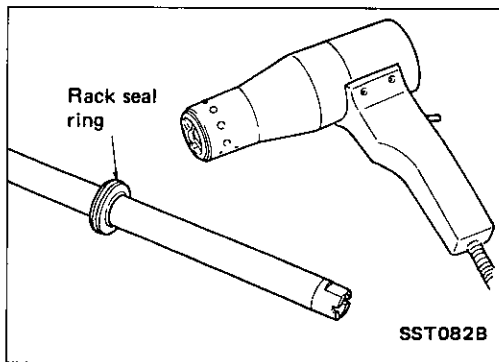


7. Drill staked portion of gear housing end with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.



8. Remove end cover assembly with a suitable tool.
9. Draw out rack assembly.

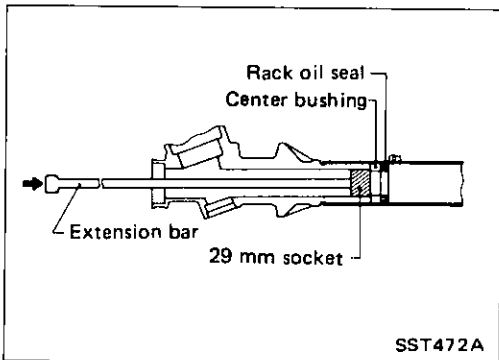
## POWER STEERING GEAR AND LINKAGE (Model PR26SC)



### Disassembly (Cont'd)

10. Remove rack seal ring.
  - Using a heat gun, heat rack seal to approximately 40°C (104°F).
  - Remove rack seal ring.

**Be careful not to damage rack.**



11. Remove center bushing and rack oil seal using tape wrapped socket and extension bar.

**Do not scratch inner surfaces of pinion housing.**

### Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "Dexron™" type, and blow dry with compressed air, if available.

### BOOT

Check condition of boot. If cracked excessively, replace it.

### RACK

Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

### PINION ASSEMBLY

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

### GEAR HOUSING CYLINDER

Check gear housing cylinder bore for scratches or other damage. Replace if necessary.

## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

### Inspection (Cont'd)

#### TIE-ROD OUTER AND INNER SOCKET

- Check ball joint for swinging force.

**Tie-rod outer ball joint:**

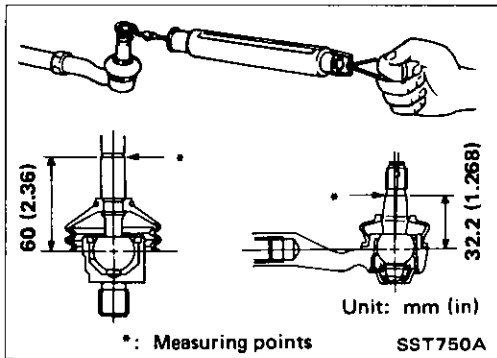
6.9 - 63.7 N

(0.7 - 6.5 kg, 1.5 - 14.3 lb)

**Tie-rod inner ball joint:**

8.8 - 122.6 N

(0.9 - 12.5 kg, 2.0 - 27.6 lb)

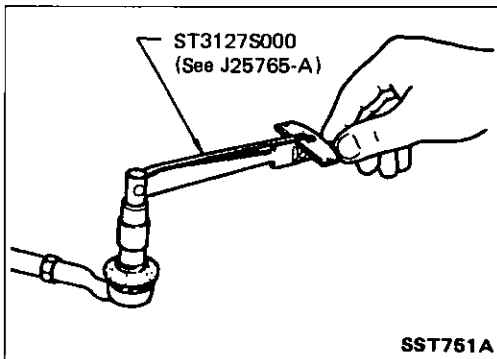


- Check ball joint for rotating torque.

**Tie-rod outer ball joint:**

0.3 - 2.9 N·m

(3 - 30 kg-cm, 2.6 - 26.0 in-lb)



- Check ball joint for axial end play.

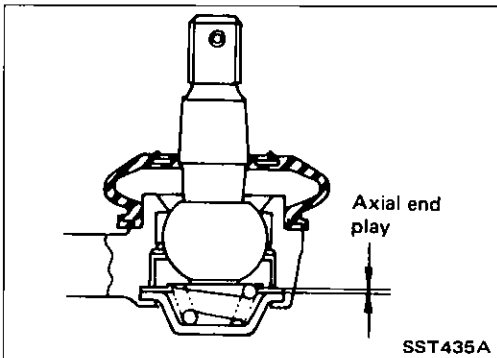
**Tie-rod outer ball joint:**

0.5 mm (0.020 in) or less

**Tie-rod inner ball joint:**

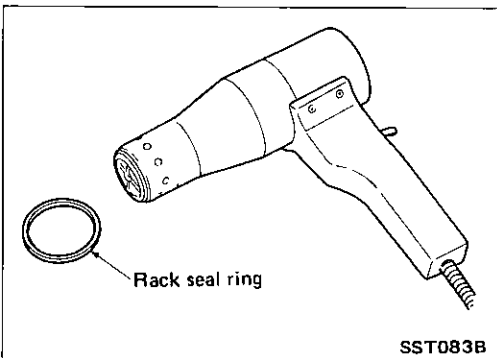
0 mm (0 in)

- Check condition of dust cover. If cracked excessively, replace it.



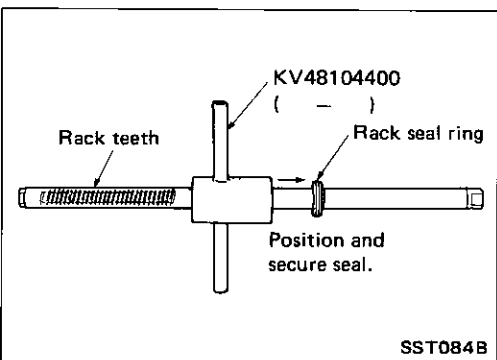
### Assembly

1. Using a heat gun, heat new rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.



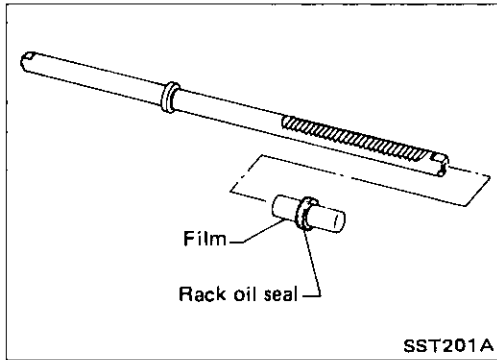
2. Using Tool, compress periphery of rack seal ring to position and secure it on rack.

**Always insert Tool from the rack gear side.**



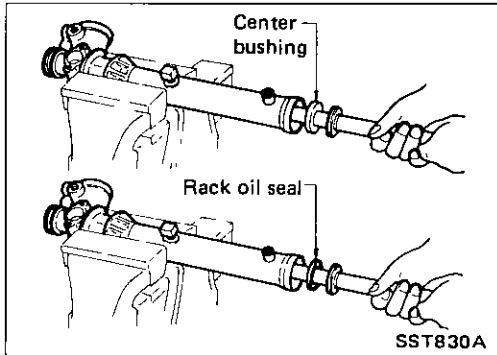
## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

### Assembly (Cont'd)

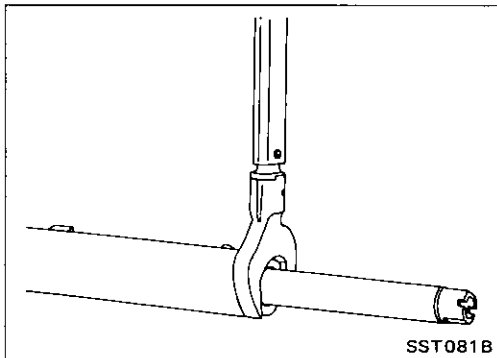


3. Insert new rack oil seal.

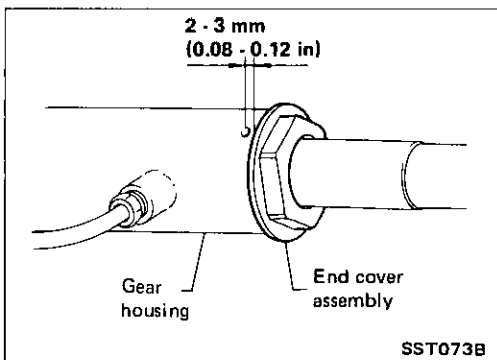
- Place plastic film into rack oil seal to prevent damage by rack teeth.
- Do not forget to remove plastic film after rack oil seal is positioned properly.
- Make sure lips of rack oil seal face each other.



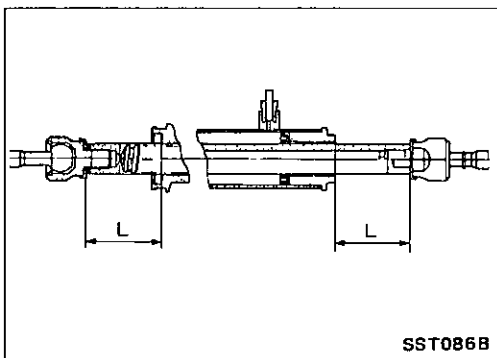
4. Install center bushing and rack oil seal with rack assembly.



5. Tighten end cover assembly with a suitable tool.



6. Fasten end cover assembly to gear housing by staking.



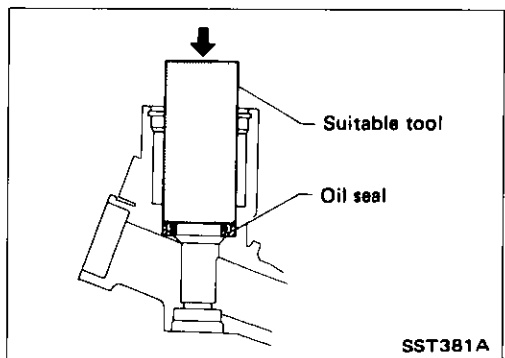
7. Set rack gear in neutral position.

**Rack stroke "L":**

**Refer to S.D.S.**

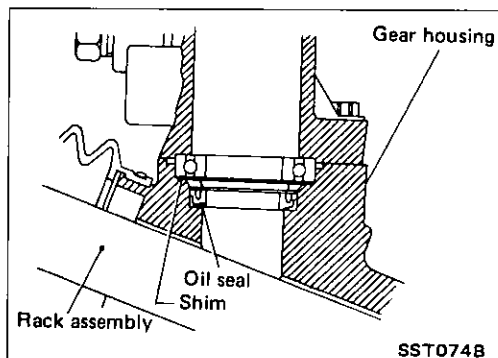
## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

### Assembly (Cont'd)



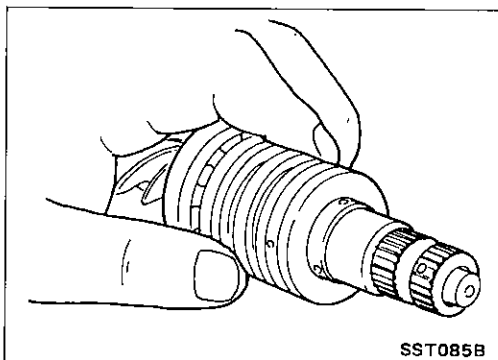
8. Coat seal lip of new pinion oil seal with multi-purpose grease and install it to pinion housing of gear housing with a suitable tool.

**Make sure lip of oil seal faces up when installed.**



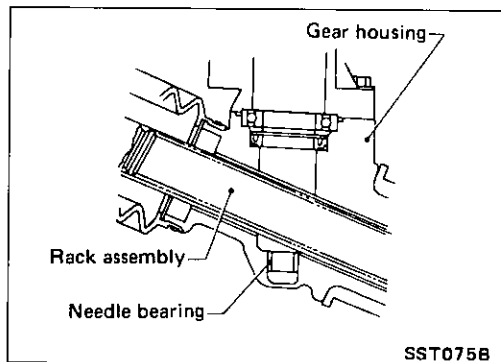
9. Install pinion bearing adjusting shim(s).

- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.

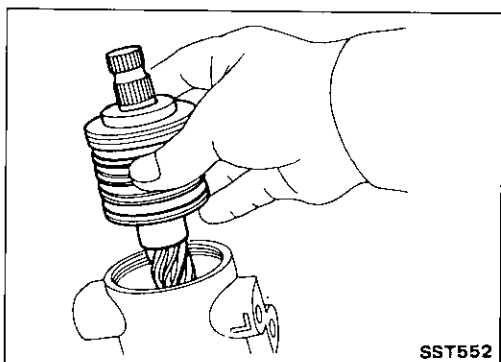


10. Install new pinion seal ring (made of Teflon) on pinion gear assembly.

- Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
- Make sure pinion seal ring is properly settled in valve groove.



11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.

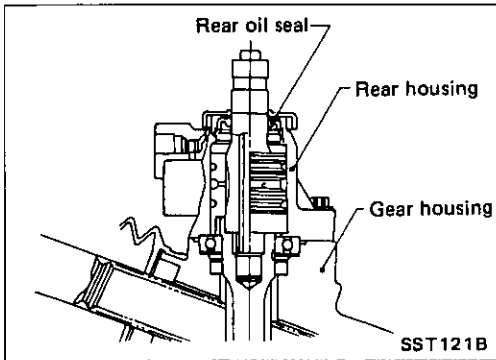


12. Install pinion assembly to pinion housing.

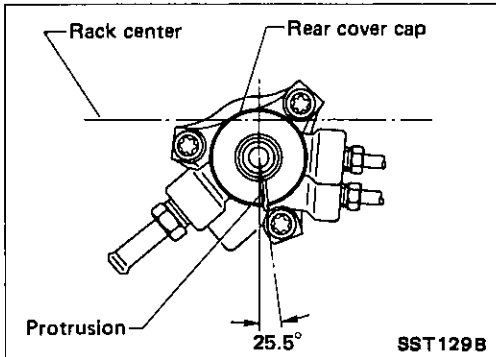
**Be careful not to damage pinion oil seal.**

## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

### Assembly (Cont'd)

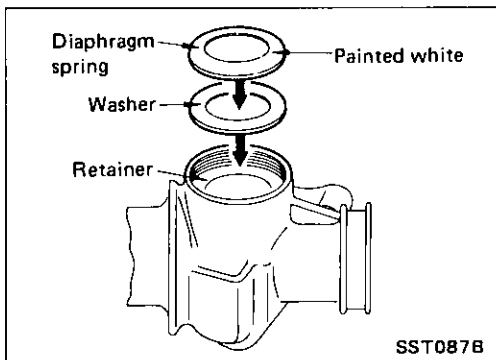


13. Apply a coat of multi-purpose grease to new rear oil seal lip before installing rear housing.

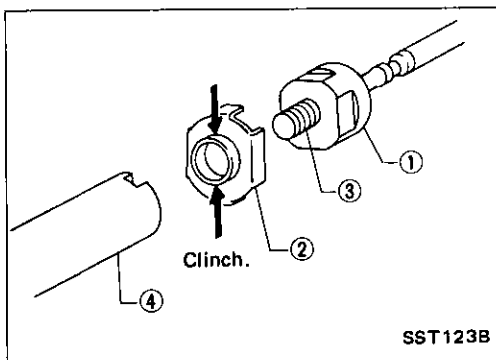


14. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left.

**Be careful not to damage worm ring and oil seal.**



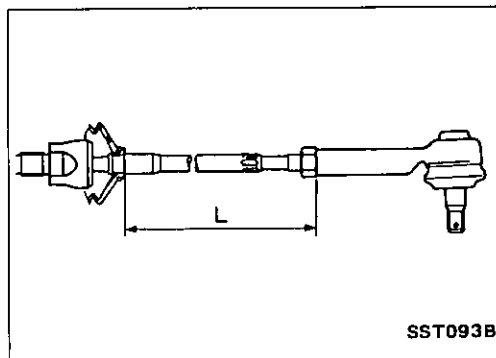
15. Install diaphragm spring into gear housing.
- Always install retainer, spring washer and diaphragm spring in that order.
  - Make sure convex end (painted white) of diaphragm spring faces outward when installing.
16. Install retainer spring and adjusting screw temporarily.



17. Install new lock plate.
- Attach lock plate ② to side rod inner socket ①.
  - Apply locking sealant to inner socket threads ③.
  - Screw inner socket into rack ④ and tighten to specified torque.
  - Clinch two places of lock plate at rack's groove.

#### CAUTION:

**To prevent scratching the boot, remove burrs from lock plate.**



18. Tighten outer socket lock nut.

**Tie-rod length "L":**

**Refer to S.D.S.**

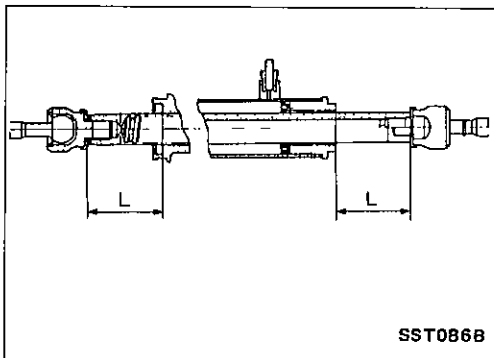
## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

### Assembly (Cont'd)

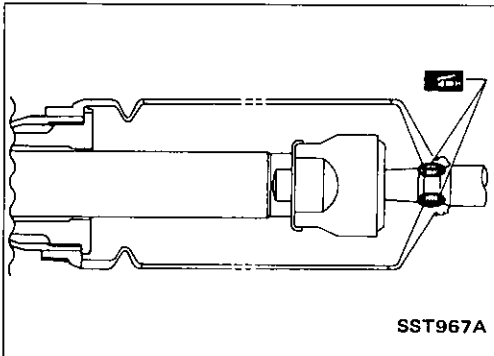
19. Measure rack stroke.

**Rack stroke "L":**

**Refer to S.D.S.**

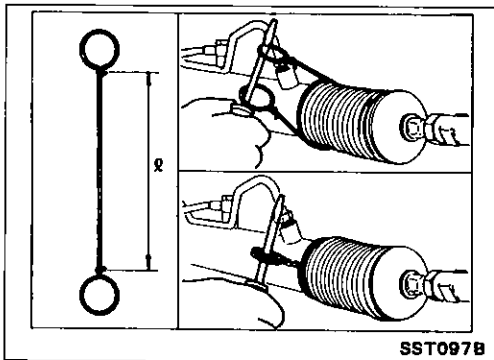


20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

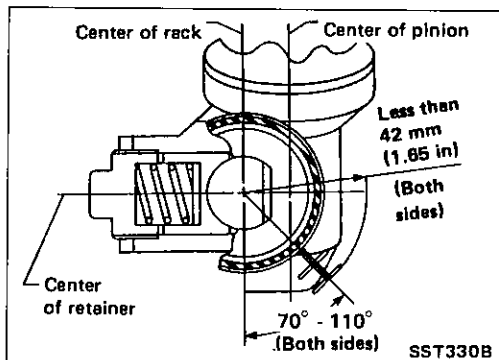


21. Install boot clamps.

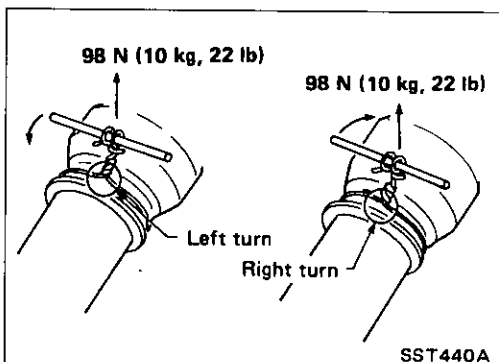
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).



- 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.)



- Twist boot clamp in the direction shown in figure at left.

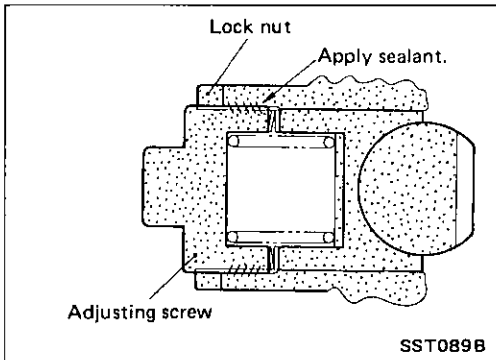
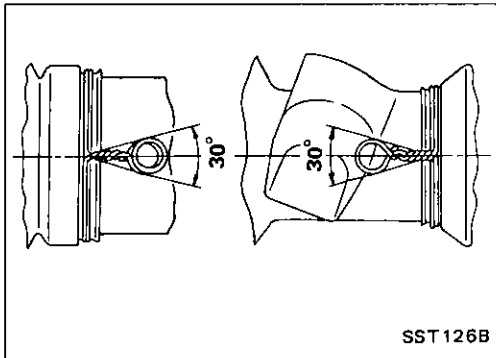




## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

### Assembly (Cont'd)

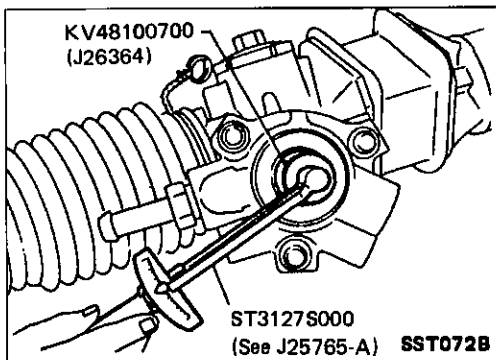
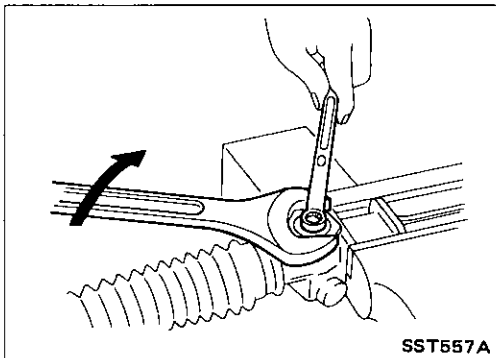
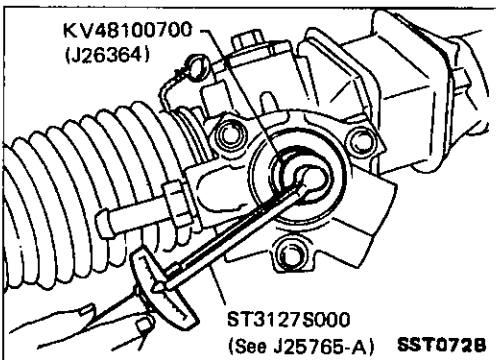
- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.



### Adjustment

Adjust pinion rotating torque as follows:

- Set rack to the neutral position without fluid in the gear.
- Coat the adjusting screw with locking sealant and screw it in.
- Lightly tighten lock nut.
- Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
- Loosen adjusting screw, then retighten it to 0.2 N·m (2 kg-cm, 1.7 in-lb).
- Move rack over its entire stroke several times.
- Measure pinion rotating torque within the range of 180° from neutral position.  
Stop the gear at the point of maximum torque.
- Loosen adjusting screw, then retighten it to 4.9 N·m (50 kg-cm, 43 in-lb).
- Loosen adjusting screw by 40° to 60°.
- Prevent adjusting screw from turning, and tighten lock nut to specified torque.



- Measure pinion rotating torque.

**Within  $\pm 100^\circ$  from the neutral position:**

**Average rotating torque**

0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)

**Maximum torque deviation**

0.4 N·m (4 kg-cm, 3.5 in-lb)

**Except for above measuring range:**

**Maximum rotating torque**

1.9 N·m (19 kg-cm, 16 in-lb)

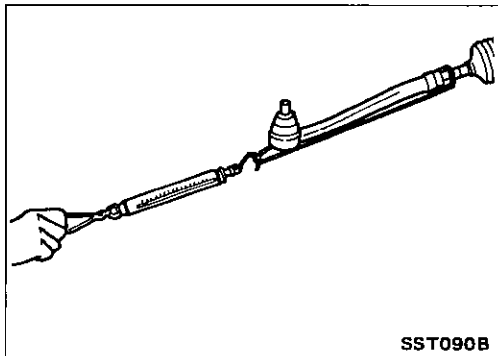
**Maximum force deviation**

0.6 N·m (6 kg-cm, 5.2 in-lb)

## POWER STEERING GEAR AND LINKAGE (Model PR26SC)

### Adjustment (Cont'd)

- If pinion rotating torque is not within specifications, readjust it starting from procedure 4. If pinion rotating torque is still out of specifications after readjustment, replace steering gear assembly.



12. Check rack sliding force on vehicle as follows:
  - a. Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
  - b. Connect all piping and fill with steering fluid.
  - c. Start engine and bleed air completely.
  - d. Disconnect steering column lower joint from the gear.
  - e. Keep engine at idle and make sure steering fluid has reached normal operating temperature.
  - f. While pulling tie-rod slowly in the  $\pm 11.5$  mm ( $\pm 0.453$  in) range from the neutral position, make sure rack sliding force is within specification.

#### Average rack sliding force:

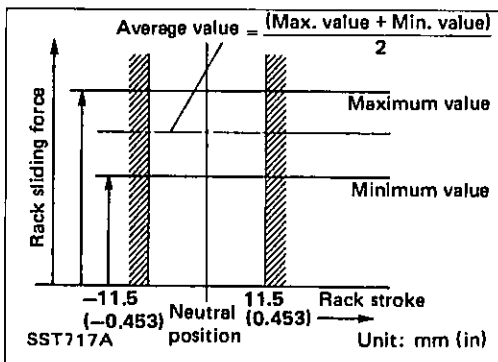
**284 N (29 kg, 64 lb)**

- g. Check sliding force outside above range.

#### Maximum rack sliding force:

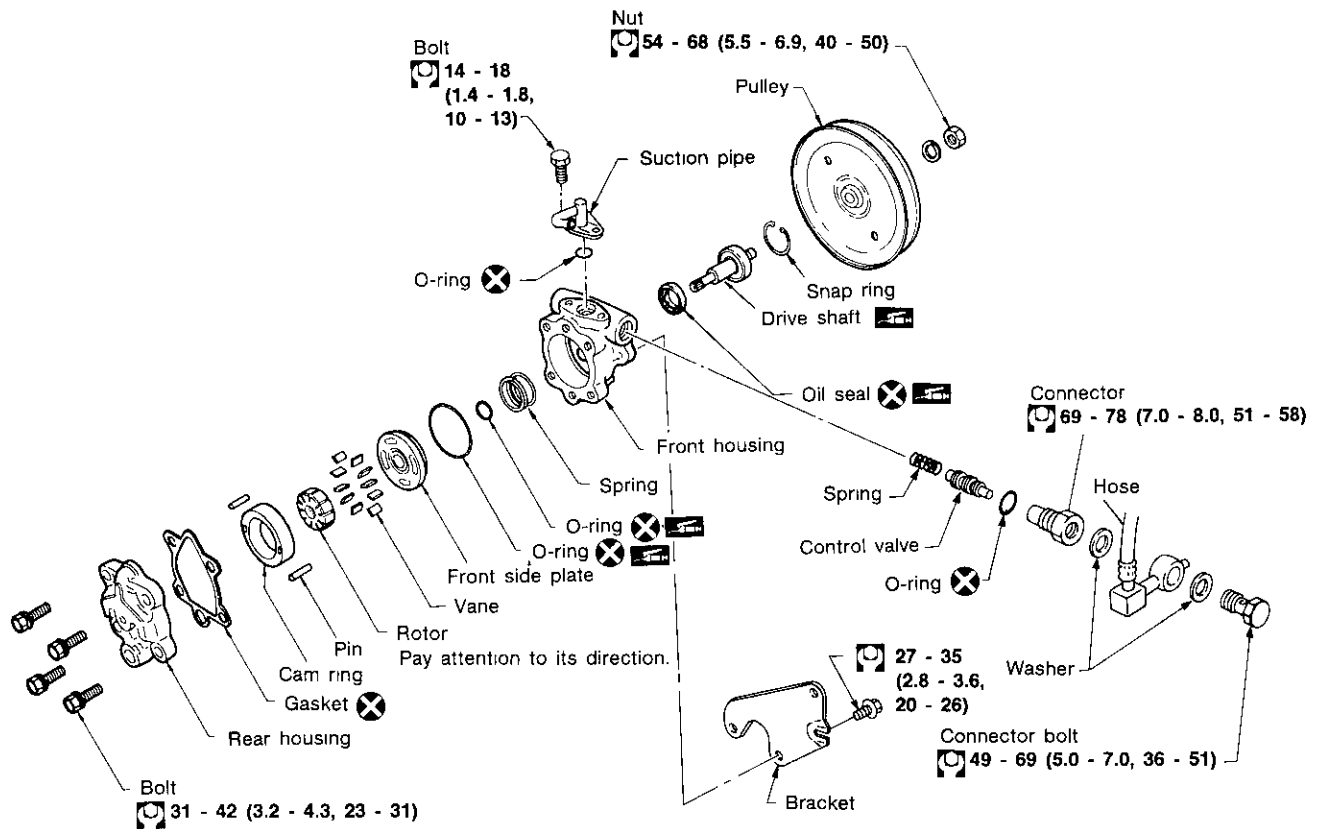
**Not more than 39 N (4 kg, 9 lb) beyond above value**

- 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.



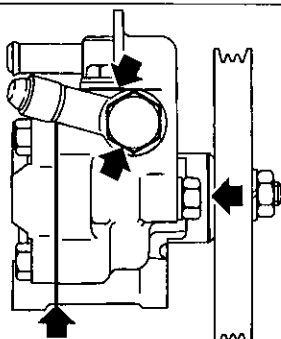
# POWER STEERING OIL PUMP

## Disassembly and Assembly



. N·m (kg-m, ft-lb)  
 . Lubrication points  
 (With automatic transmission fluid "DEXRON™ Type")

SST370B



SST984A

## Pre-disassembly Inspection

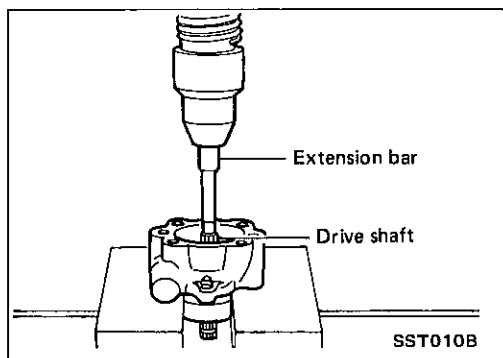
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance.

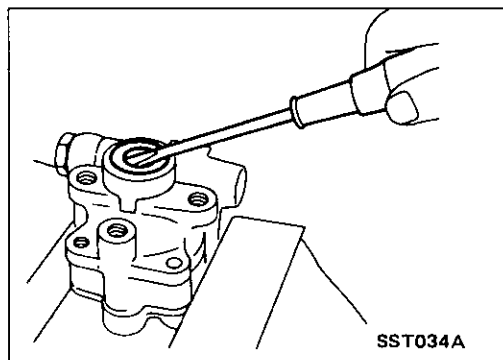
## Disassembly

### CAUTION:

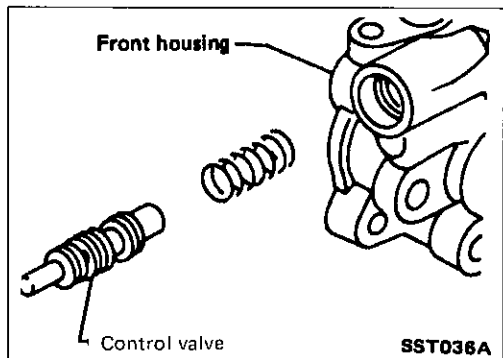
- Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.
- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- Follow the procedures and cautions in the Service Manual.
- When disassembling and reassembling, do not let foreign matter enter or contact the parts.



- Remove snap ring, then draw drive shaft out.  
**Be careful not to drop drive shaft.**



- Remove oil seal.  
**Be careful not to damage front housing.**

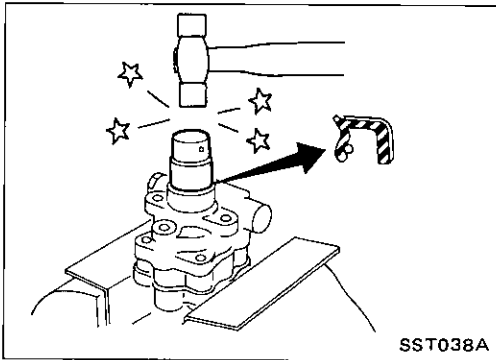


- Remove connector.  
**Be careful not to drop control valve.**

## Inspection

Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.

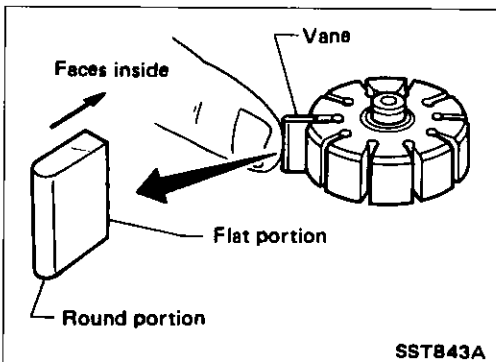
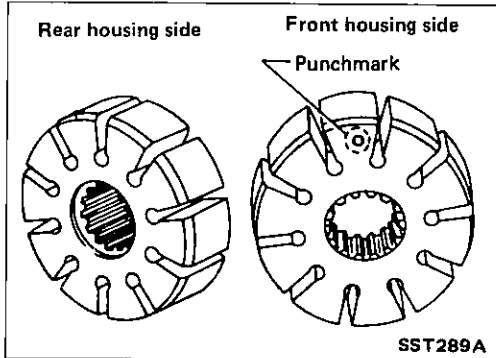
## POWER STEERING OIL PUMP



### Assembly

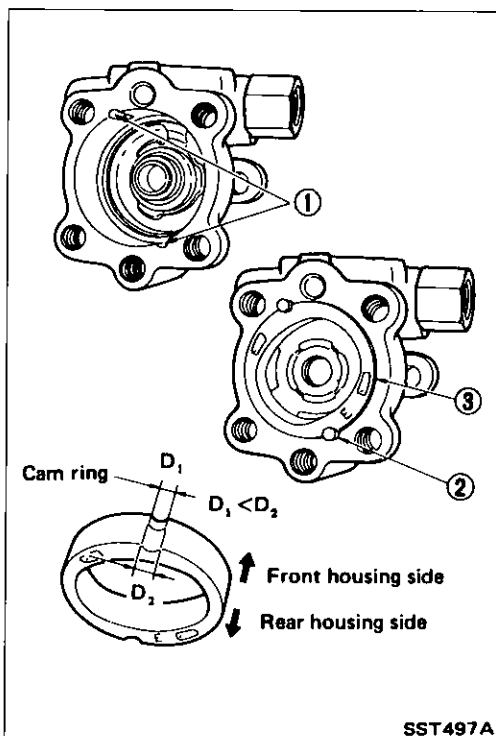
Assemble oil pump, noting the following instructions.

- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- Coat each part with A.T.F. when assembling.



- Pay attention to the direction of rotor.

- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.



- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

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

## General Specifications

| Applied model                             | All               |
|-------------------------------------------|-------------------|
| Steering model                            | Power steering    |
| Steering gear type                        | PR26SC            |
| Steering overall gear ratio               | 16.8              |
| Turns of steering wheel<br>(Lock to lock) | 3.01              |
| Steering column type                      | Collapsible, tilt |

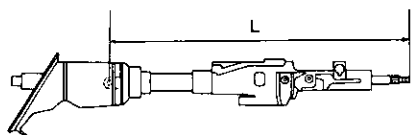
## Inspection and Adjustment

### GENERAL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Steering wheel axial play<br>mm (in) | 0 (0)                          |
| Steering wheel play mm (in)          | 35 (1.38) or less              |
| Movement of gear housing<br>mm (in)  | $\pm 2$ ( $\pm 0.08$ ) or less |

### STEERING COLUMN

|                                       |                               |
|---------------------------------------|-------------------------------|
| Steering column length "L"<br>mm (in) | 581.2 - 582.8 (22.88 - 22.94) |
|---------------------------------------|-------------------------------|

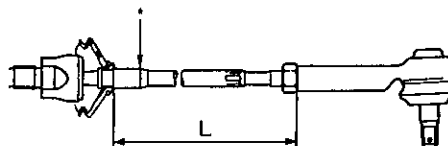


SST126B

### STEERING GEAR AND LINKAGE

| Steering gear type                                                           | PR26SC                                  |
|------------------------------------------------------------------------------|-----------------------------------------|
| Side rod outer ball joint<br>Swinging force<br>at cotter pin hole N (kg, lb) | 6.9 - 63.7<br>(0.7 - 6.5, 1.5 - 14.3)   |
| Rotating torque<br>N-m (kg-cm, in-lb)                                        | 0.3 - 2.9<br>(3 - 30, 2.6 - 26.0)       |
| Axial end play mm (in)                                                       | 0.5 (0.020) or less                     |
| Side rod inner ball joint<br>Swinging force* N (kg, lb)                      | 8.8 - 122.6<br>(0.9 - 12.5, 2.0 - 27.6) |
| Axial end play mm (in)                                                       | 0 (0)                                   |
| Side rod standard length "L" mm (in)                                         | 179 (7.05)                              |

\*: Measuring point



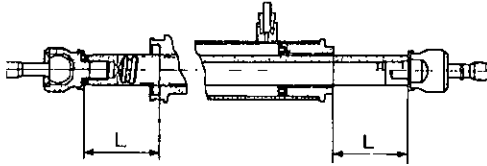
SST371B

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

## Inspection and Adjustment (Cont'd)

### STEERING GEAR AND LINKAGE (Cont'd)

|                    |           |
|--------------------|-----------|
| Steering gear type | PR26SC    |
| Rack stroke "L"    | 72 (2.83) |
| mm (in)            |           |



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|                                                  |                                         |
|--------------------------------------------------|-----------------------------------------|
| Pinion gear preload without gear oil             |                                         |
| N·m (kg-cm, in-lb)                               |                                         |
| Within $\pm 100^\circ$ from the neutral position |                                         |
| Average rotating torque                          | 0.78 - 1.27<br>(8.0 - 13.0, 6.9 - 11.3) |
| Maximum torque deviation                         | 0.4 (4, 3.5)                            |
| Except above range                               |                                         |
| Maximum rotating torque                          | 1.9 (19, 16)                            |
| Maximum torque deviation                         | 0.6 (6, 5.2)                            |

### POWER STEERING

|                                                                                    |                                |                                            |
|------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------|
| Rack sliding force                                                                 | N (kg, lb)                     |                                            |
| Under normal operating oil pressure                                                |                                |                                            |
| Range within $\pm 11.5$ mm ( $\pm 0.453$ in) from the neutral position             |                                | 284 (29, 64)                               |
| Maximum force deviation                                                            |                                | 39 (4, 9)                                  |
| Except above range                                                                 |                                | Not more than 39 (4, 9) beyond above value |
| Retainer adjustment                                                                |                                |                                            |
| Adjusting screw                                                                    |                                |                                            |
| Initial tightening torque                                                          | N·m (kg-cm, in-lb)             | 4.9 - 5.9 (50 - 60, 43 - 52)               |
| Retightening torque after loosening                                                |                                | 0.2 (2, 1.7)                               |
| Tightening torque after gear has settled                                           |                                | 4.9 (50, 43)                               |
| Returning angle                                                                    | degree                         | 40° - 60°                                  |
| Steering wheel turning force (Measured at one full turn from the neutral position) | N (kg, lb)                     | 39 (4, 9) or less                          |
| Fluid capacity (Approximate)                                                       | ℓ (US qt, Imp qt)              | 0.9 (1, 3/4)                               |
| Oil pump maximum pressure                                                          | kPa (kg/cm <sup>2</sup> , psi) | 7,355 - 8,336<br>(75 - 85, 1,067 - 1,209)  |





## SECTION **BF**

### CONTENTS

|                                                      |       |
|------------------------------------------------------|-------|
| GENERAL SERVICING                                    |       |
| (Including all clips & fasteners) .....              | BF- 2 |
| BODY END .....                                       | BF- 6 |
| DOOR                                                 |       |
| (Including "Power Door Lock" & "Power Window") ..... | BF-10 |
| INSTRUMENT PANEL .....                               | BF-24 |
| INTERIOR AND EXTERIOR                                |       |
| (In EXTERIOR, including "Weatherstrips") .....       | BF-26 |
| SEAT .....                                           | BF-35 |
| AUTOMATIC SEAT BELT SYSTEM .....                     | BF-38 |
| AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses ..... | BF-43 |
| SUN ROOF .....                                       | BF-68 |
| WINDSHIELD AND WINDOWS .....                         | BF-73 |
| MIRROR .....                                         | BF-76 |
| BODY ALIGNMENT .....                                 | BF-77 |

**When you read wiring diagrams:**

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

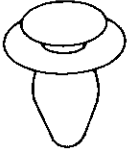
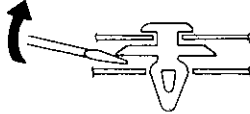
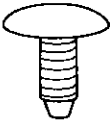
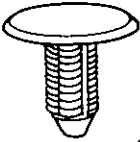
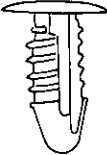
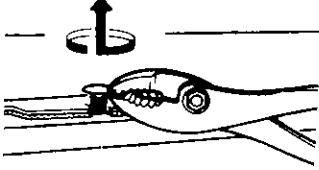
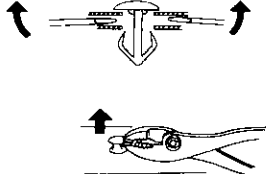
\* For seat belt, refer to MA section.

## Precautions

- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

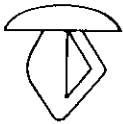
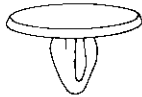
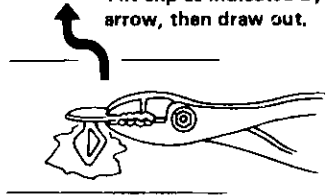
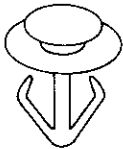
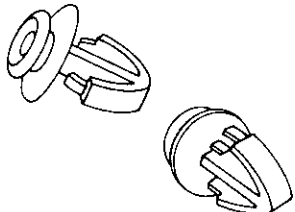
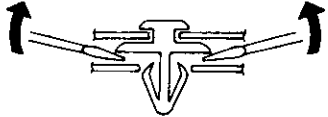
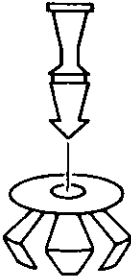
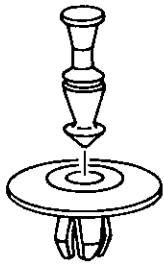
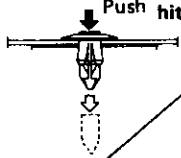
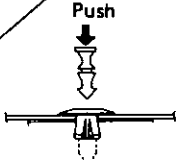
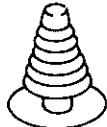
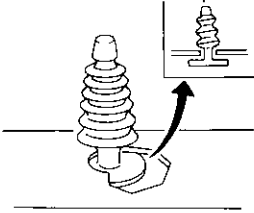
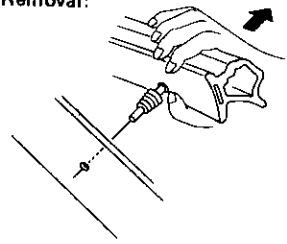
## Clip and Fastener

- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

| No.  | Symbol                                                                                         | Shape                                                                                                                                                                                         | Removal & Installation                                                                                                                                                         |
|------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C101 | <br>SBF092B   | <br>SBF109B                                                                                                  | <p><b>Removal:</b><br/>Remove by bending up with a flat-bladed screwdriver.</p> <br>SBF094B |
| C102 | <br>SBF113B | <br>SBF114B <br>SBF137B | <br><p><b>Removal:</b><br/>Pull up by rotating.</p> SBF115B                               |
| C103 | <br>SBF110B | <br>SBF111B                                                                                                | <p><b>Removal:</b><br/>Remove with flat-bladed screwdrivers or pliers.</p> <br>SBF112B    |

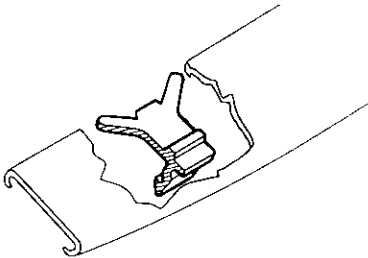
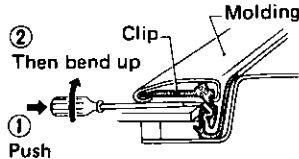
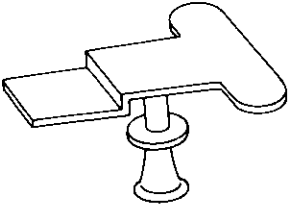
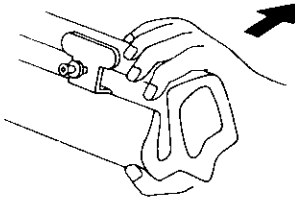
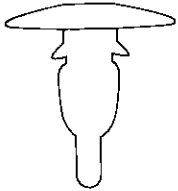
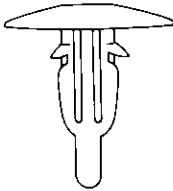
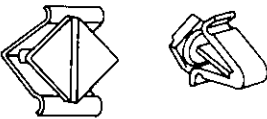
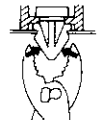
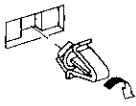
# GENERAL SERVICING

## Clip and Fastener (Cont'd)

| No.   | Symbol                                                                                         | Shape                                                                                           | Removal & Installation                                                                                                                                                                                                                                                                                |
|-------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C105  | <br>SBF141B   | <br>SBF142B    | <p>Removal:<br/>Tilt clip as indicated by arrow, then draw out.</p> <br>SBF143B                                                                                                                                    |
| C107  | <br>SBF365B   | <br>SBF366B   | <p>Removal:<br/>Remove by bending up with flat-bladed screwdrivers.</p> <br>SBF367B                                                                                                                                |
| C203  | <br>SBF318C  | <br>SBF319C   | <p>Push center pin to catching position. (Do not remove center pin by hitting it.)</p> <br><p>Installation:</p> <br>SBF320C |
| CE103 | <br>SBF103B | <br>SBF104B | <p>Removal:</p> <br>SBF147B                                                                                                                                                                                      |

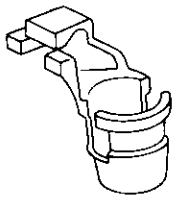
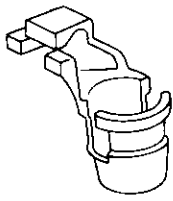
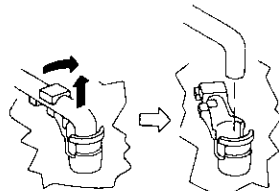
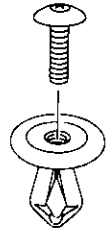
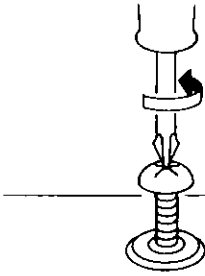
# GENERAL SERVICING

## Clip and Fastener (Cont'd)

| No.   | Symbol                                                                              | Shape   | Removal & Installation                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------|-------------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CE106 |    | SBF653B | <b>Removal:</b><br><br>                                                                                                                                                                                                                                      |
| CE112 |    | SBF028C | <b>Removal:</b><br><br>                                                                                                                                                                                                                                      |
| CE117 |  | SBF173D | <br>                                                                                                                                                                                                                                                       |
| CG101 |  | SBF144B | <br>                                                                                                                                                                                                                                                         |
|       |                                                                                     |         | <b>Removal</b><br><br>Rotate 45° to remove.<br><br><b>Installation</b><br><br> |

# GENERAL SERVICING

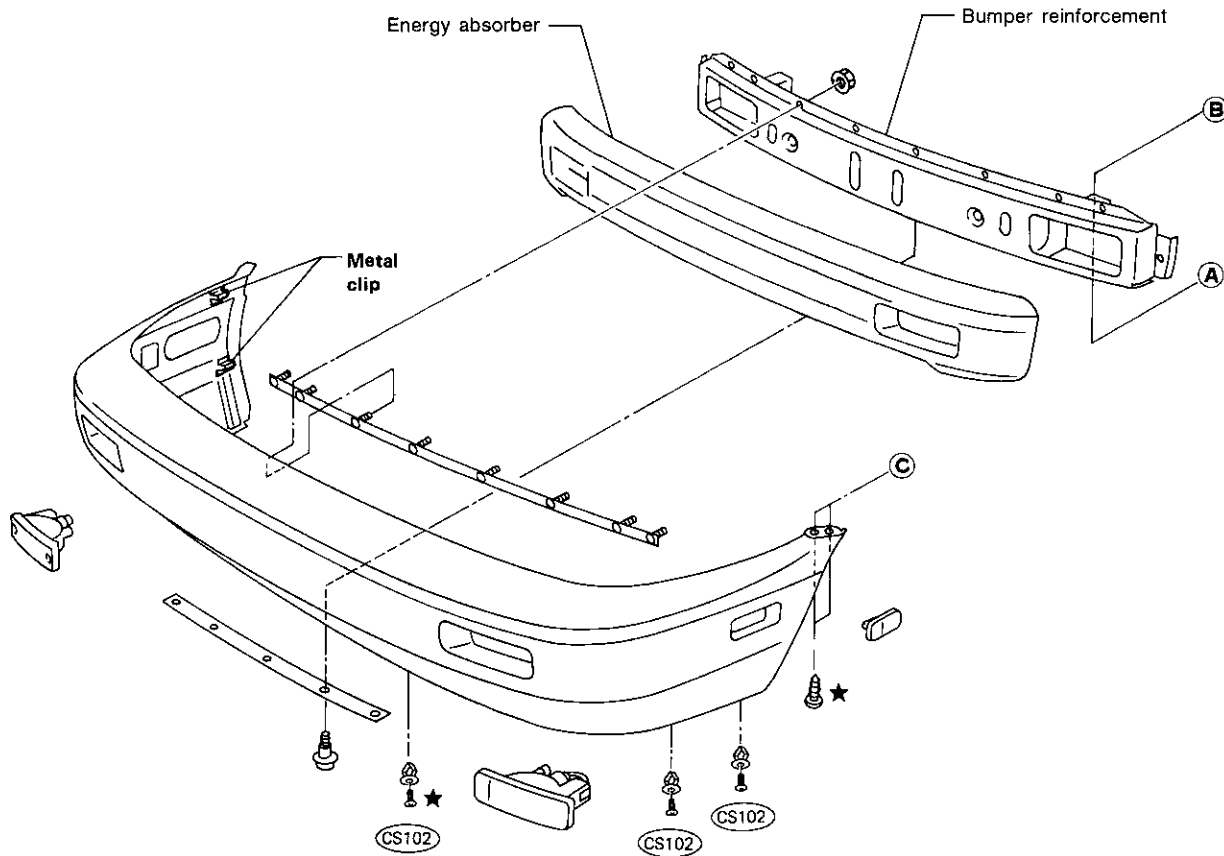
## Clip and Fastener (Cont'd)

| No.   | Symbol                                                                            | Shape                                                                             | Removal & Installation                                                                                                                                                                                |
|-------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CR103 |  |  | <p><b>Removal:</b><br/>Holder portion of clip must be spread out to remove rod.</p>  <p>SBF768B</p> <p>SBF770B</p> |
| CS102 |  |  | <p><b>Removal:</b><br/>Screw out with a Phillips screwdriver.</p>  <p>SBF138B</p> <p>SBF139B</p> <p>SBF140B</p>    |

## BODY END

### Body Front End

- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.



★ : Bumper assembly mounting bolts, screws, clips and pins  
Ⓢ : N·m (kg-m, ft-lb)

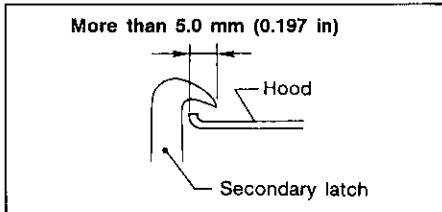
# BODY END

## Body Front End (Cont'd)

### Hood lock adjustment

- Adjust hood so that hood primary lock meshes at position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

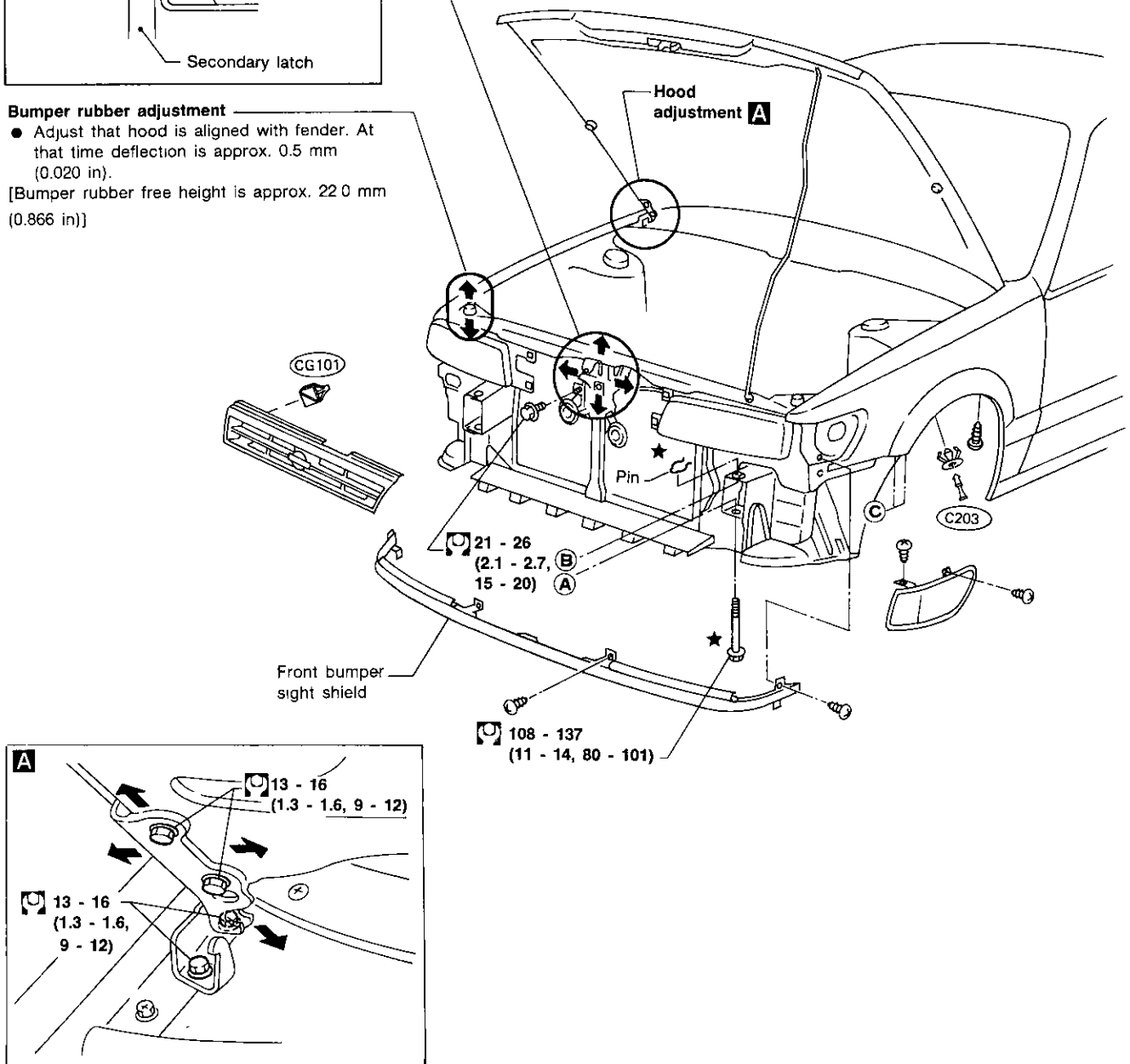
### Hood lock secondary latch hooking length



### Bumper rubber adjustment

- Adjust that hood is aligned with fender. At that time deflection is approx. 0.5 mm (0.020 in).

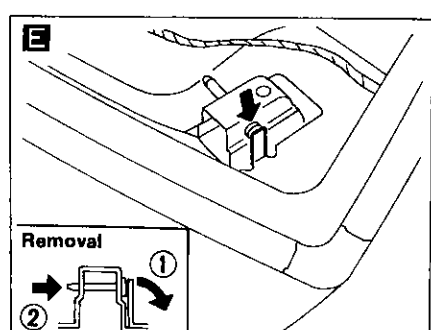
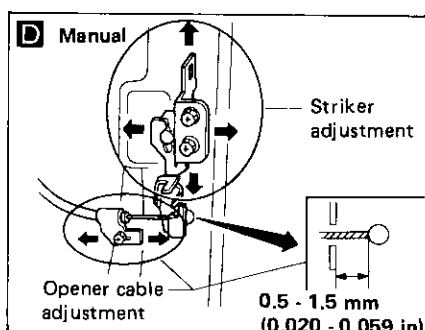
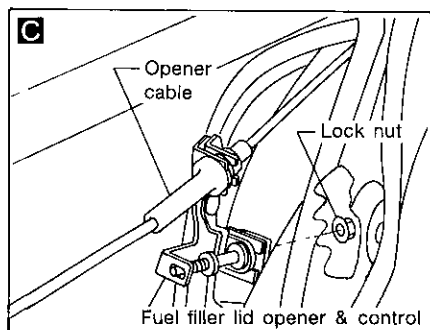
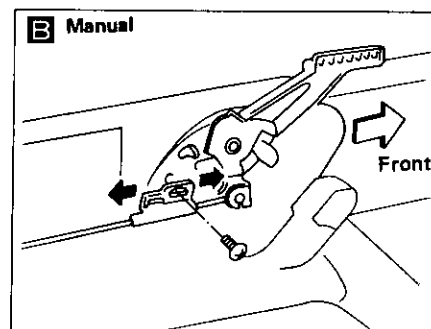
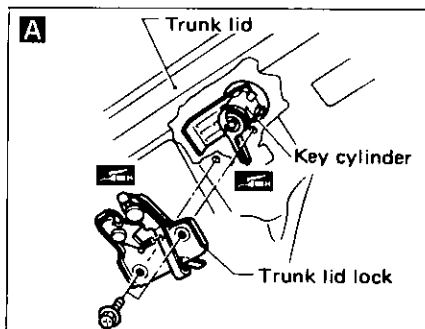
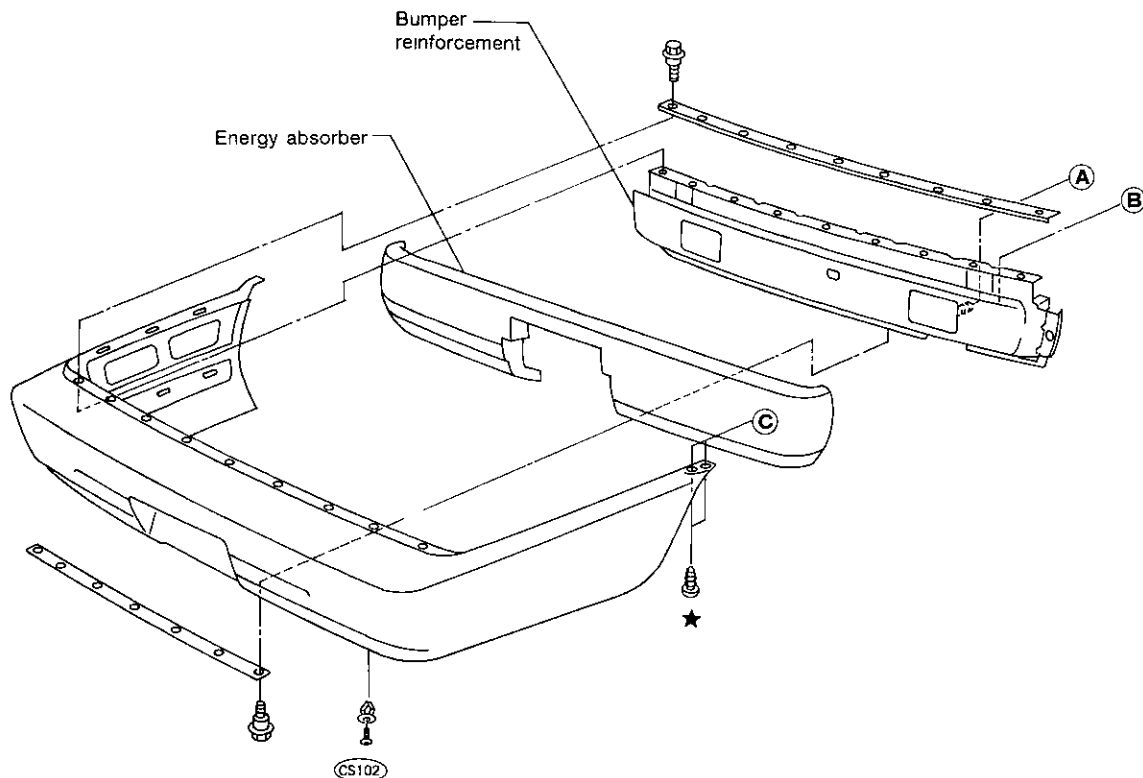
[Bumper rubber free height is approx. 22.0 mm (0.866 in)]



SBF084F

## Body Rear End and Opener

- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid and fuel filler lid open smoothly.



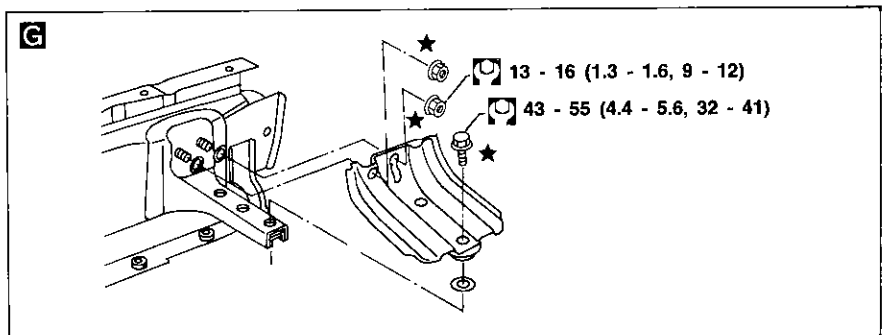
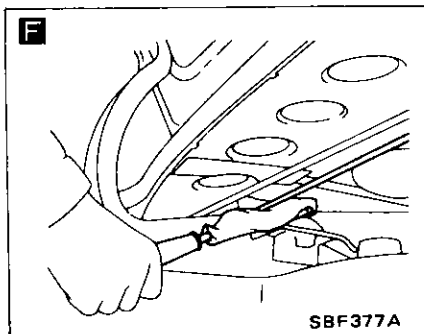
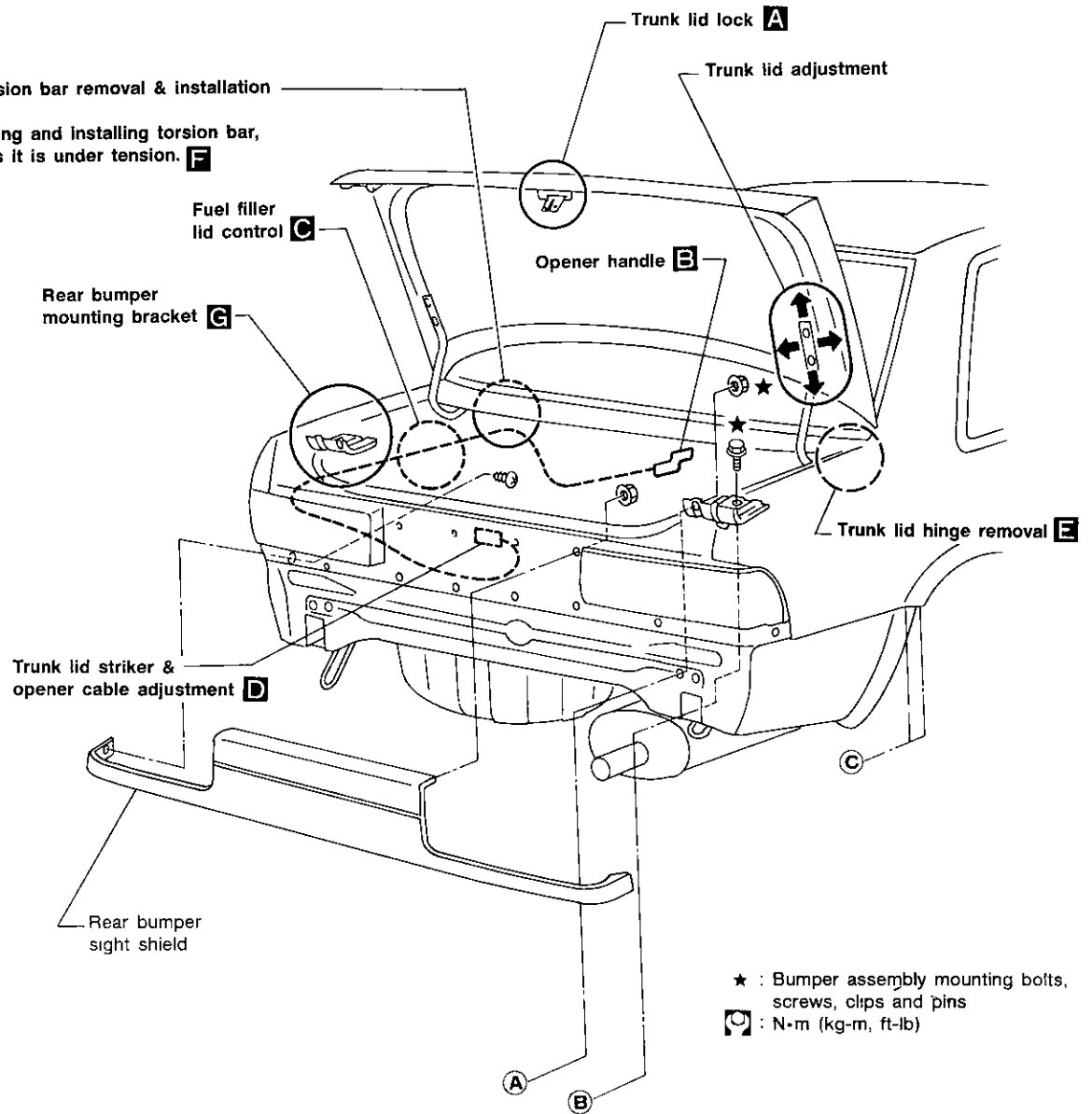


## BODY END

### Body Rear End and Opener (Cont'd)

#### Trunk lid torsion bar removal & installation

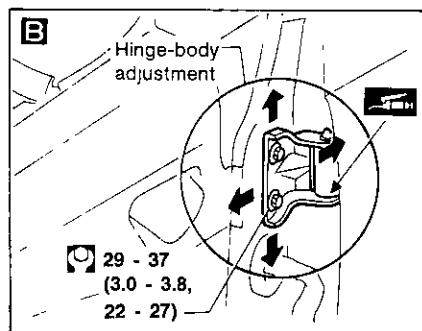
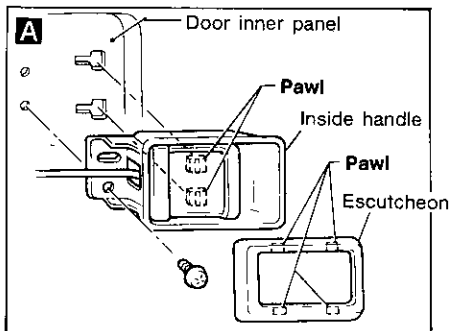
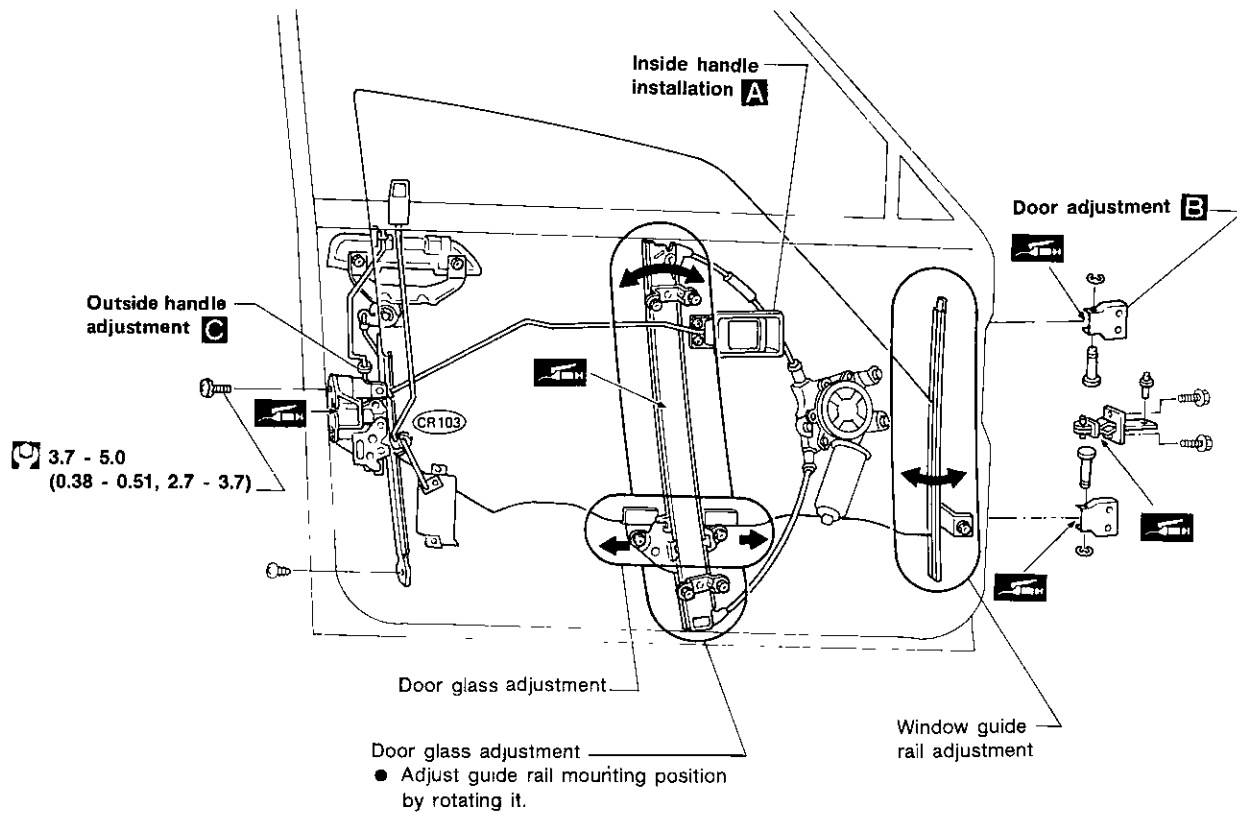
**WARNING:**  
When removing and installing torsion bar,  
be careful as it is under tension. **F**



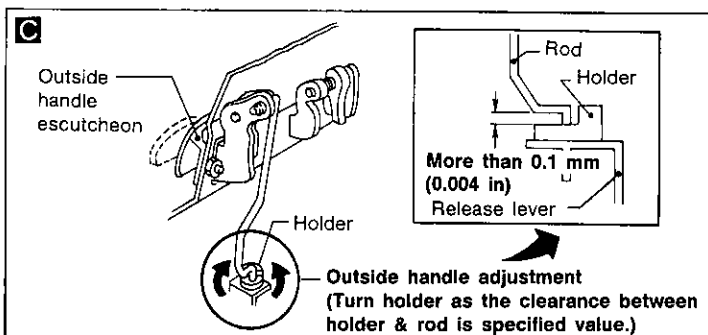
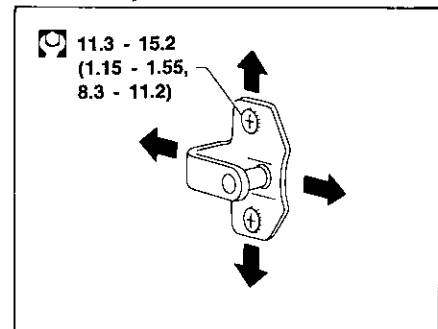
SBF085F

# DOOR

## Front Door



### Striker adjustment

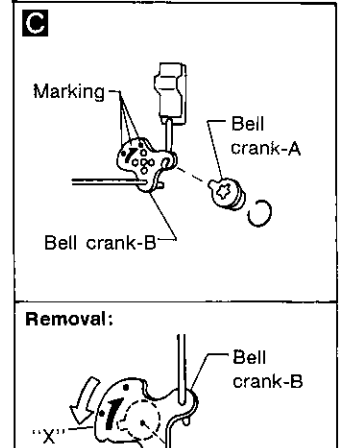
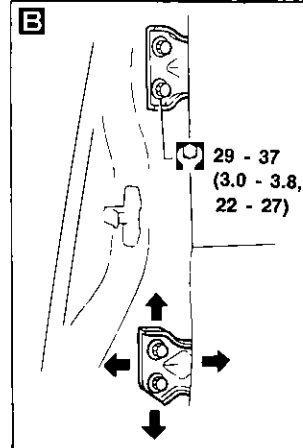
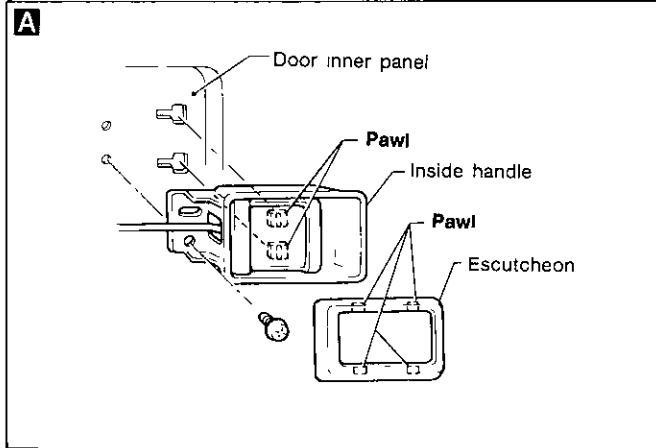
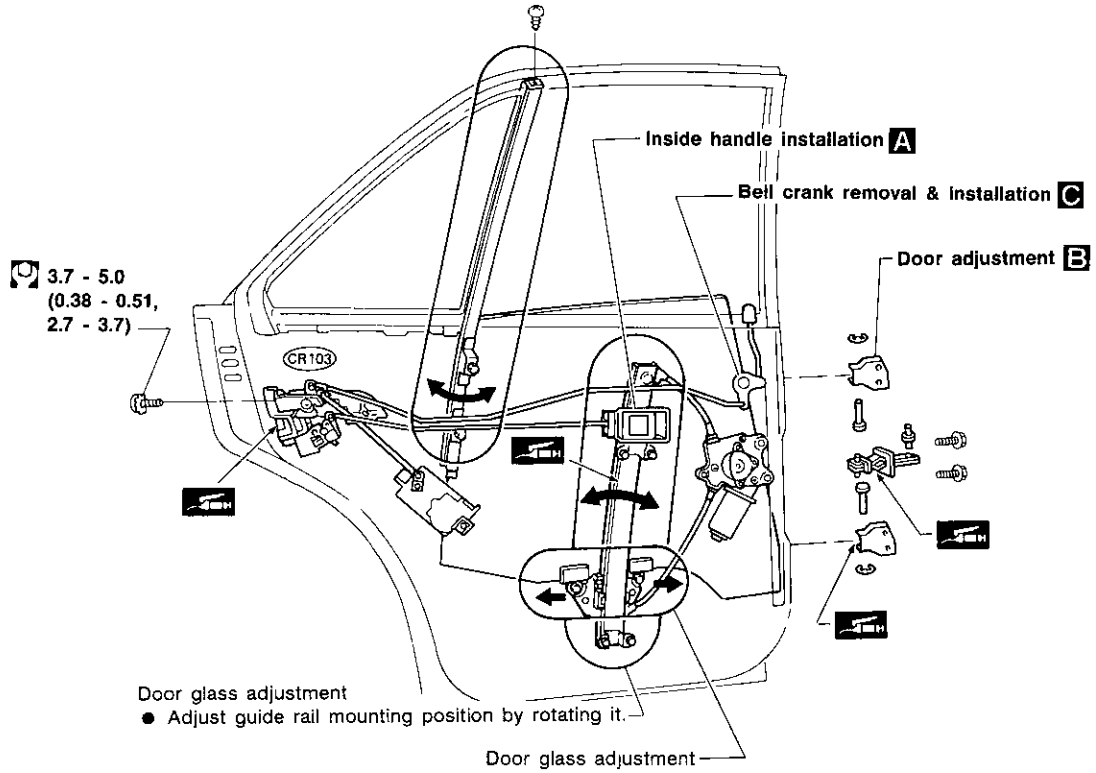


: N·m (kg-m, ft-lb)

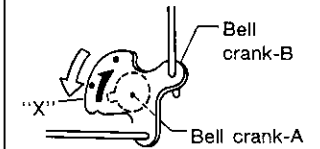
SBF086F

# DOOR

## Rear Door

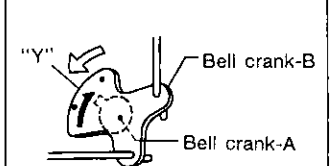


### Removal:



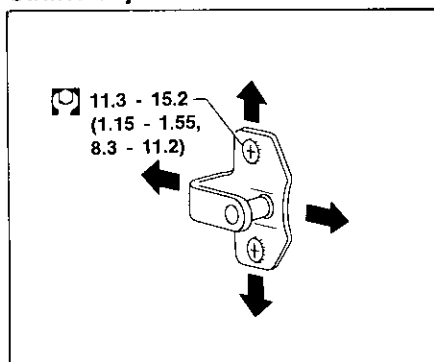
Turn bell crank-A counter-clockwise (as white arrow) to the position "X".

### Installation:

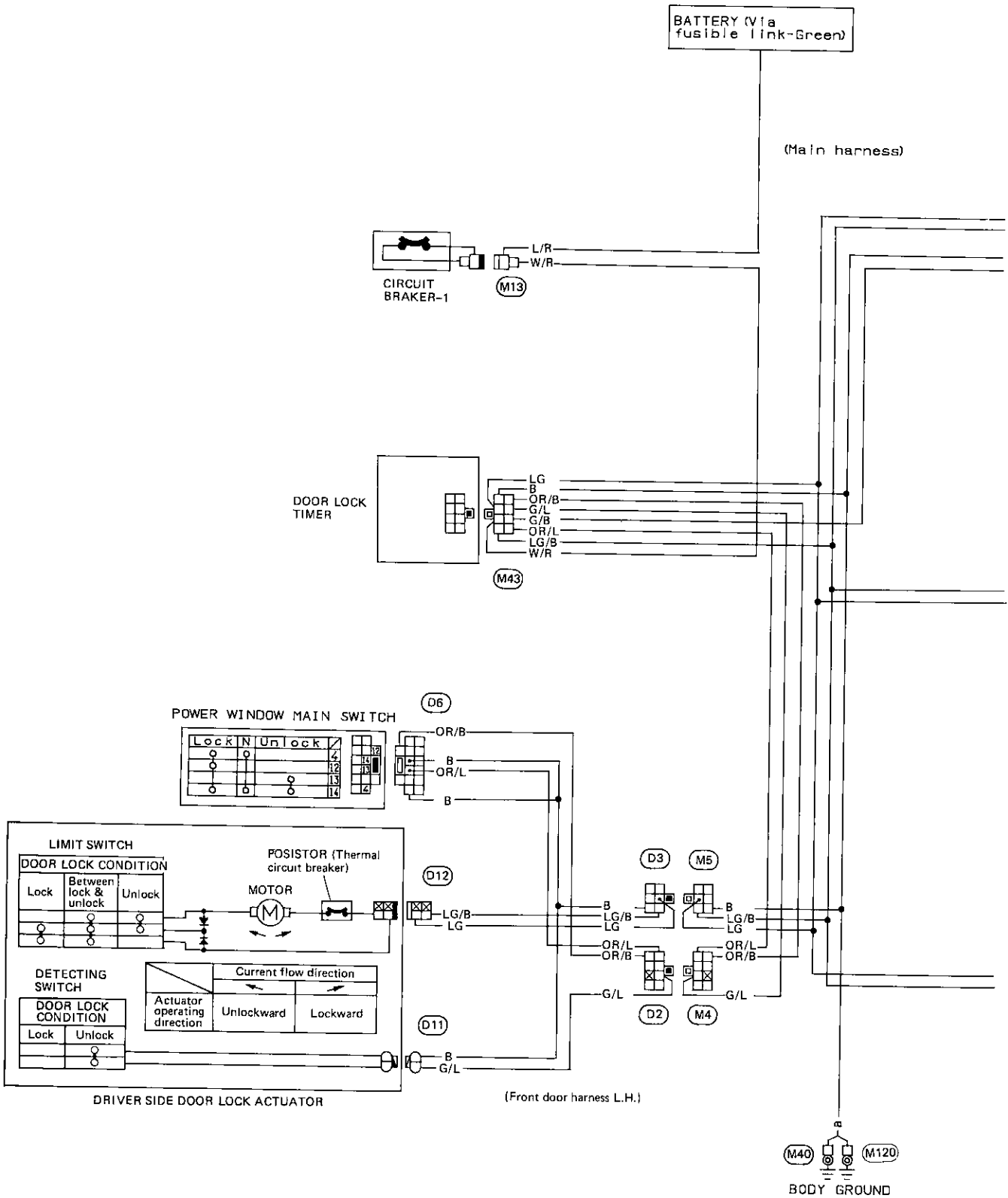


Turn bell crank-A counter-clockwise to the position "Y".

### Striker adjustment

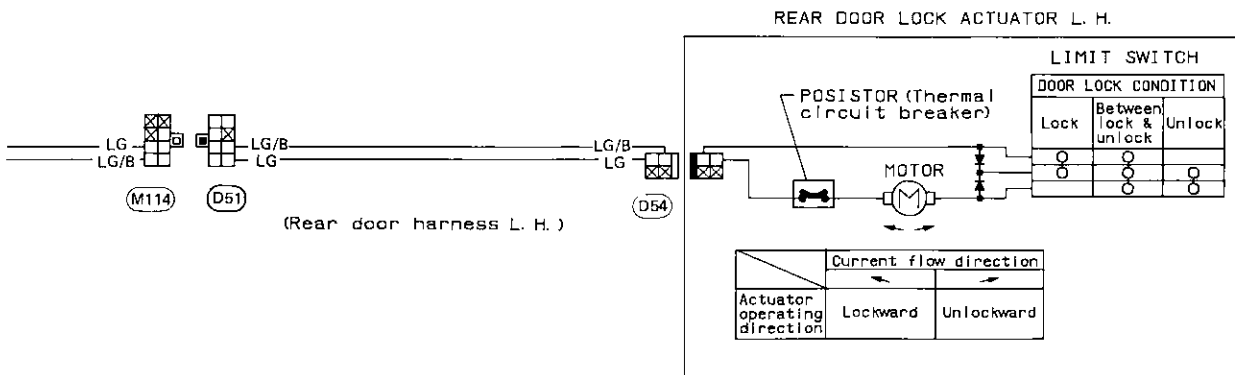
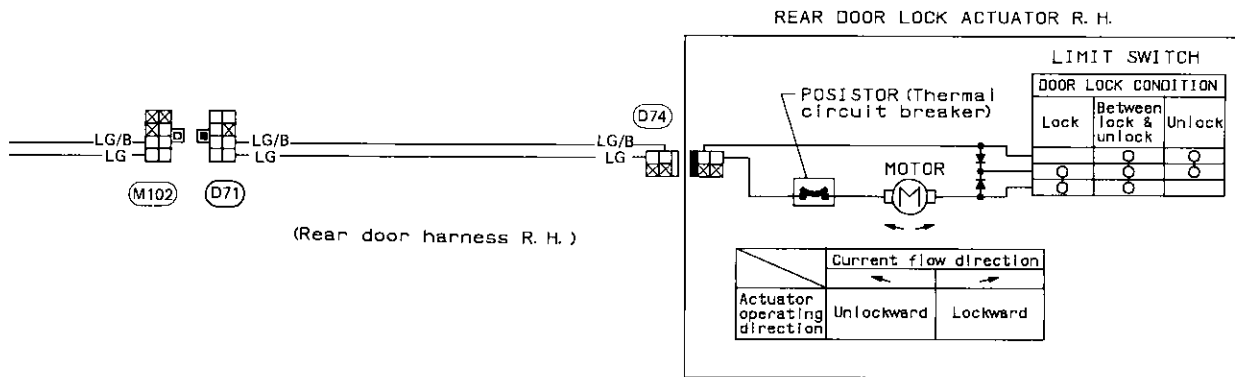
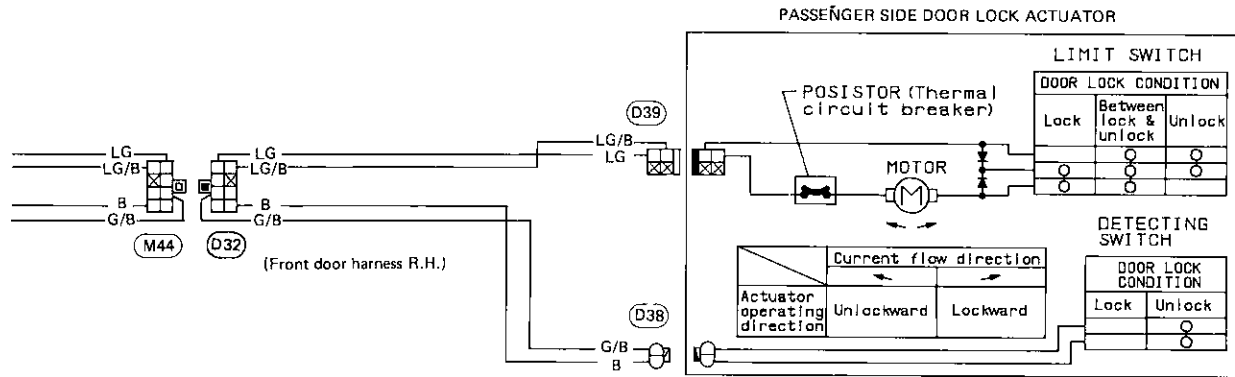


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# DOOR

## Power Door Lock (Cont'd)



SBF145F

### Power Door Lock Trouble-shooting

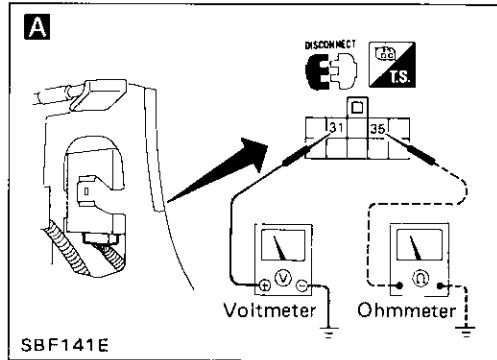
| PRIORITY | SYMPTOM                                 | "HOW TO REPAIR"                     |
|----------|-----------------------------------------|-------------------------------------|
| 1        | All doors do not operate.               | Go to TROUBLE-SHOOTING PROCEDURE 1. |
| 2        | Either one or two doors do not operate. | Go to TROUBLE-SHOOTING PROCEDURE 2. |

This trouble-shooting must be applied according to priority.  
Driver's door lock does not operate by this system.

# DOOR

## Power Door Lock Trouble-shooting (Cont'd)

### TROUBLE-SHOOTING PROCEDURE 1

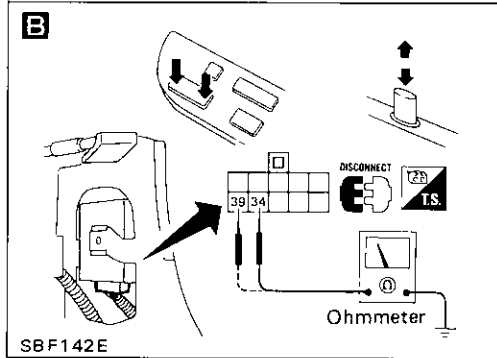


**A** Disconnect door lock timer connector.

**A** Check voltage between terminal ③① and body ground.

③① - Body ground: 12V

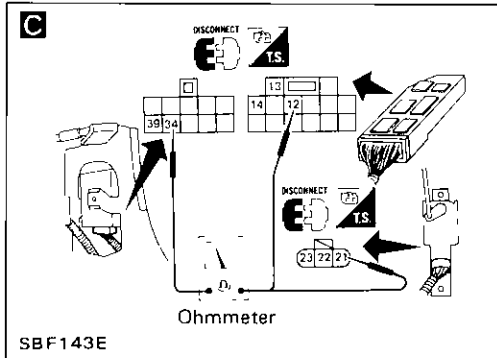
N.G. Repair harness between terminal ③① and battery.



**B** Check continuity between terminal ③⑤ and body ground.

③⑤ - Body ground: 0Ω

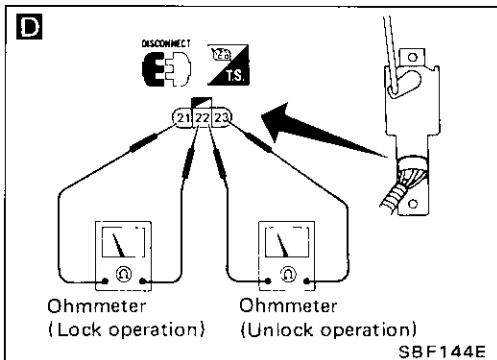
N.G. Repair harness between terminal ③⑤ and body ground (⑤M and ⑤9M).



**C** Check continuity between terminal ③④ and body ground (Lock), and ③⑨ and body ground (Unlock).

For power window main switch, continuity should exist when pushing switch to lock/unlock. For auto door lock switch, continuity should exist once when pushing (to lock)/pulling (to unlock) lock knob.

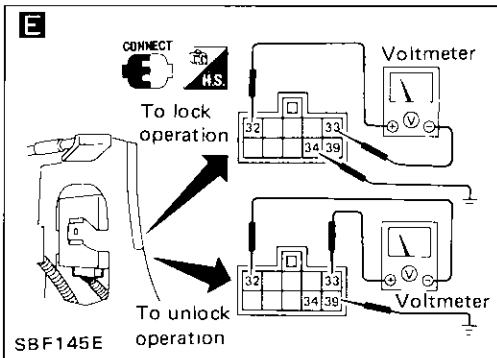
N.G. Disconnect power window main and/or auto door lock switch.



O.K. Connect door lock timer connector.

**C** Check continuity between terminals ①②, ①③, ①④, ②①, ②② or ②③ and ③④, ③⑨ or body ground.

N.G. Repair harness.



**E** Check door lock timer. Battery voltage should exist once for 1 second only when grounding. ⊕ and ⊖ terminals are reversed for lock and unlock operations.

**D** Check auto door lock switch. Continuity exists once when operating to unlock or to lock. In other cases, continuity should not exist.

O.K. Replace power window main switch.

N.G. Replace auto door lock switch.

N.G. Replace door lock timer.

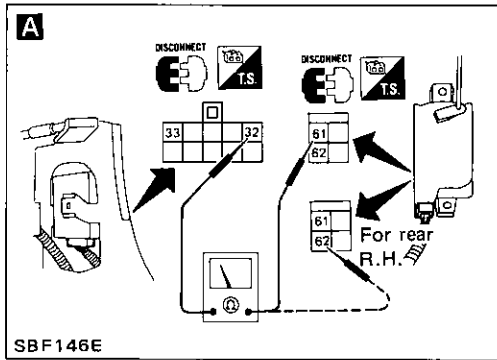
O.K. Disconnect actuator connectors and timer connector.

Go to **A** of TROUBLE-SHOOTING PROCEDURE 2.

## DOOR

### Power Door Lock Trouble-shooting (Cont'd)

#### TROUBLE-SHOOTING PROCEDURE 2



Disconnect door lock timer and actuator connectors.

**A**

Check continuity between terminals 32 and 61 (\* 62 ), and 33 and 62 (\* 61 ).

\*: For rear R.H. actuator only.

O.K.

Replace door lock actuator.

N.G.

Repair harness.

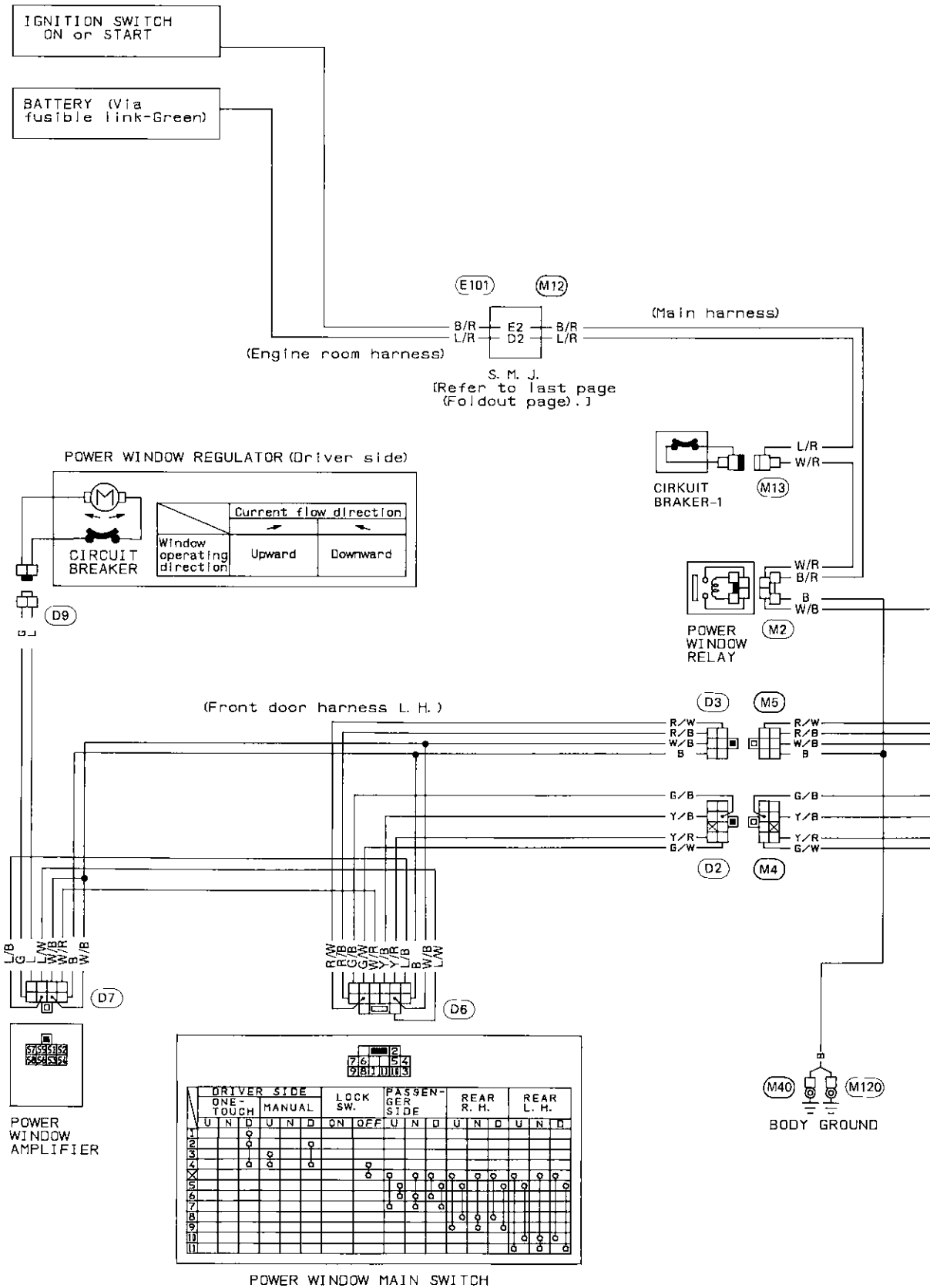


**NOTE**

# DOOR

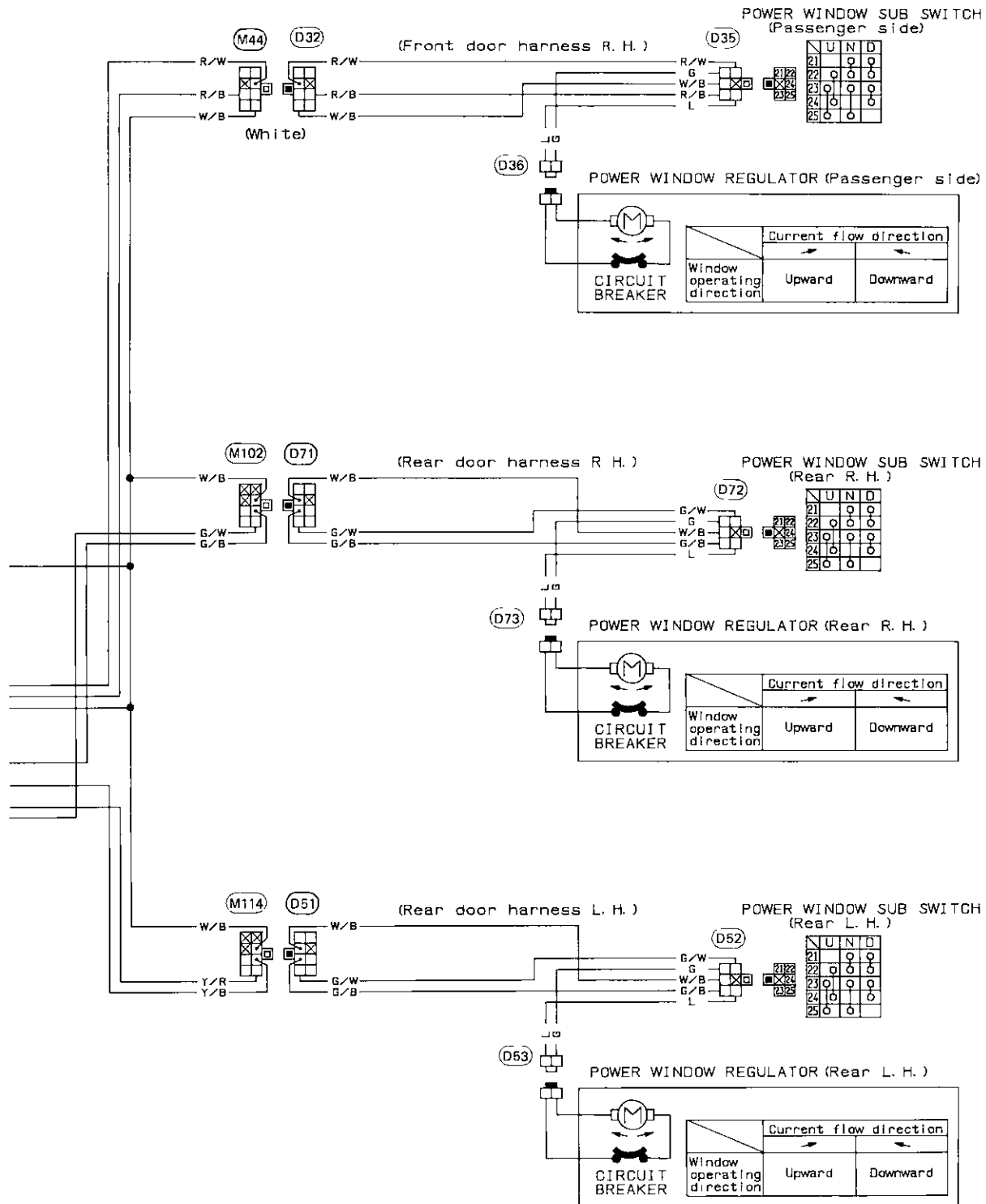
## Power Window

### WIRING DIAGRAM



# DOOR

## Power Window (Cont'd)



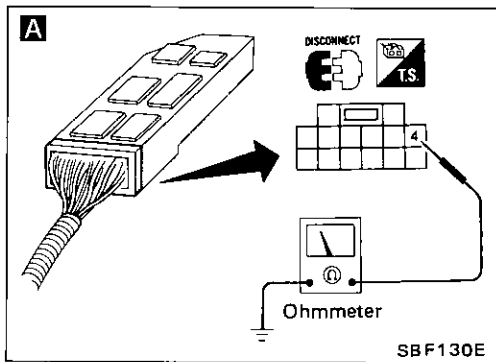
SBF144F

## Power Window Trouble-shooting

| SYMPTOM                                                             | "HOW TO REPAIR"                     |
|---------------------------------------------------------------------|-------------------------------------|
| All windows do not operate.                                         | Go to TROUBLE-SHOOTING PROCEDURE 1. |
| Driver's window does not operate.                                   | Go to TROUBLE-SHOOTING PROCEDURE 2. |
| Windows except driver's do not operate by sub* switches.            | Go to TROUBLE-SHOOTING PROCEDURE 3. |
| Windows except driver's do not operate by main** and sub* switches. | Go to TROUBLE-SHOOTING PROCEDURE 4. |

\*: Sub switches mean switches except driver's switch.

\*\*: Main switch means driver's switch.



### TROUBLE-SHOOTING PROCEDURE 1

Disconnect main switch harness connector.

**A** Check harness continuity between terminal ④ and body ground.  
④ - Body ground: 0Ω

N.G. → Repair harness between terminal ④ and body ground (H40 and H120).

**B** Check fusible link — Green.

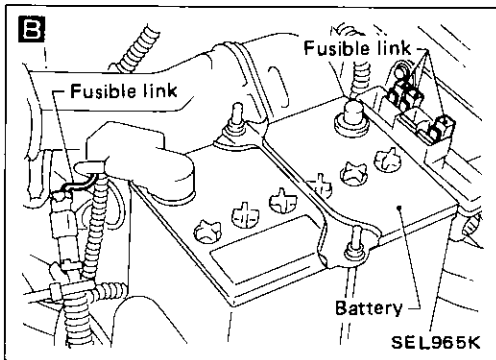
Melted →  
• Check harness and eliminate cause of problem due to critical short circuit.  
• Replace fusible link.

Not melted → Check power window relay. Refer to STANDARDIZED RELAY in EL section.

N.G. → Replace power window relay.

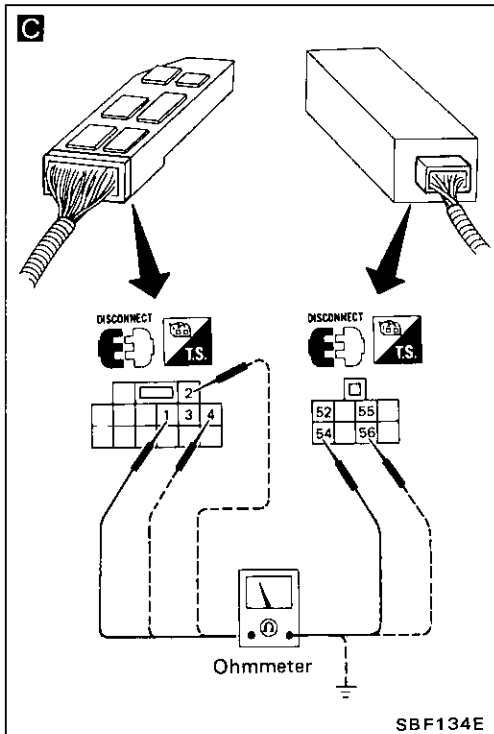
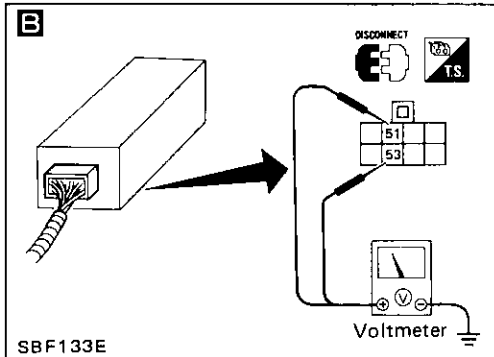
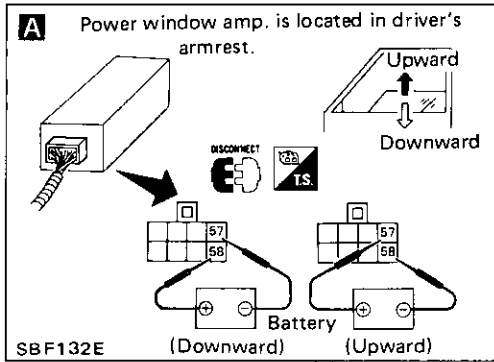
O.K. → Repair harness between terminal ⑤ and battery.

END



## Power Window Trouble-shooting (Cont'd)

### TROUBLE-SHOOTING PROCEDURE 2



Disconnect power window amp. connector.

**A** Check power window motor applying battery voltage to the terminals.

| Terminal |    | Operation |
|----------|----|-----------|
| +        | -  |           |
| 57       | 58 | Upward    |
| 58       | 57 | Downward  |

N.G. Check harness for continuity.  
O.K. Replace motor.

Repair harness between terminal 57 or 58 and motor.

**B** Check voltage between terminal 51 or 53 and body ground with ignition switch ON.

51 - Body ground: 12V

53 - Body ground: 12V

N.G. Check fuse.  
O.K. Replace fuse.

Repair harness between terminal 51 or 53 and battery.

Disconnect main switch connector.

**C** Check continuity between terminals.

| Terminal           | Resistance |
|--------------------|------------|
| 1 and 54           | 0Ω         |
| 2 and 56           | 0Ω         |
| 3 and 55           | 0Ω         |
| 4 and body ground  | 0Ω         |
| 52 and body ground | 0Ω         |

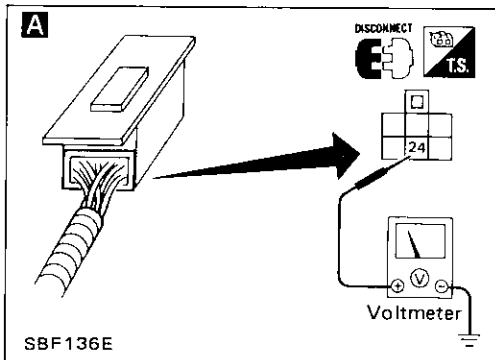
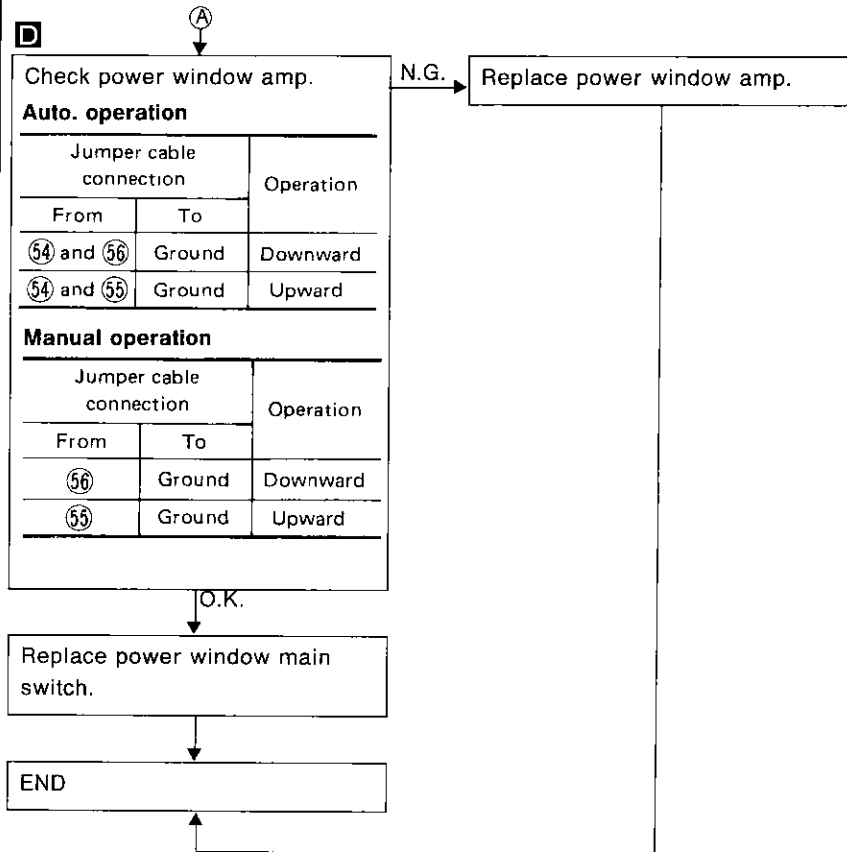
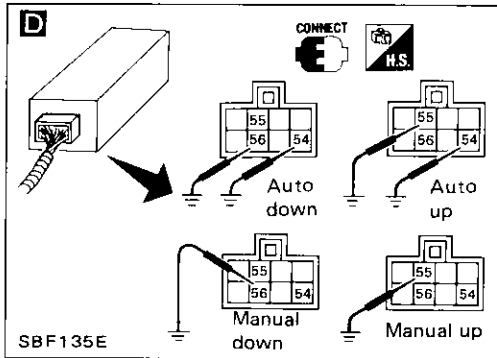
N.G. Repair harness between terminals 1, 2, 3, 4 or 52 and 54, 56, 55 or body ground (N40 and N120).

O.K. Connect power window amp. connector.

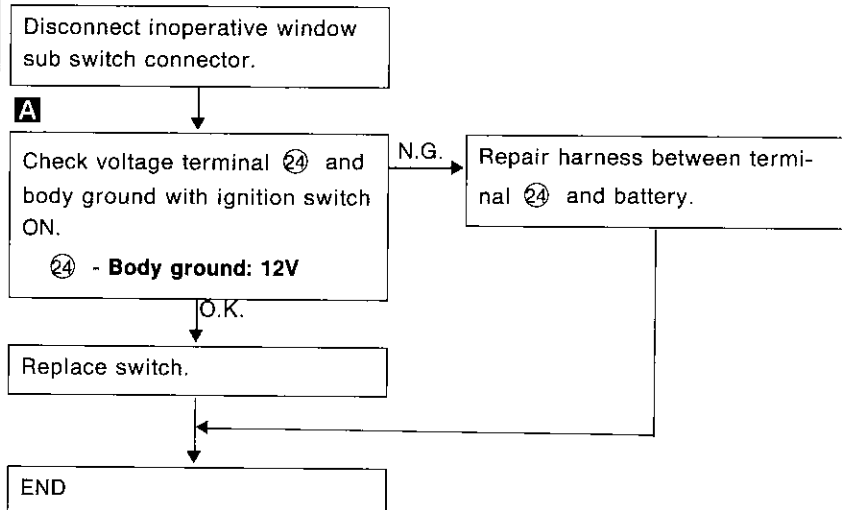
A

# DOOR

## Power Window Trouble-shooting (Cont'd)

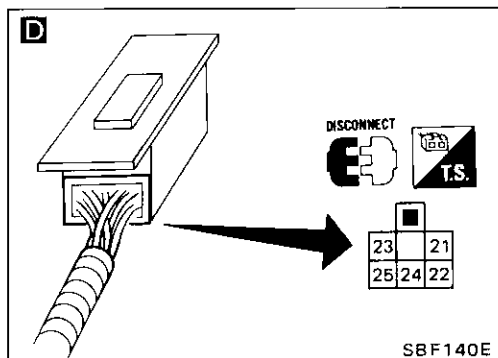
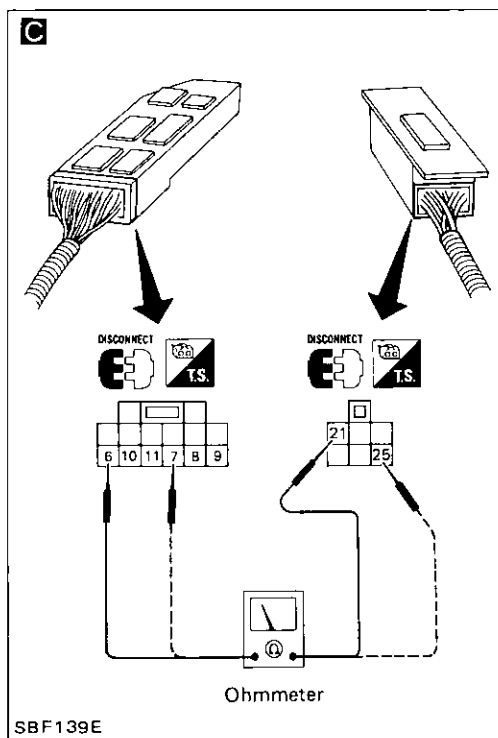
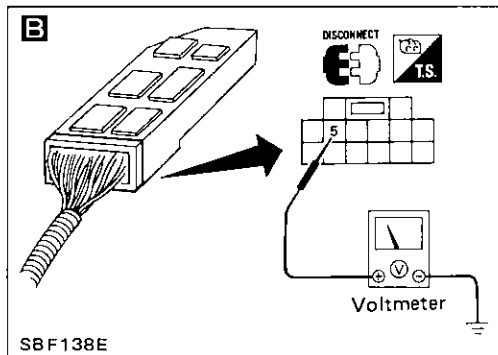
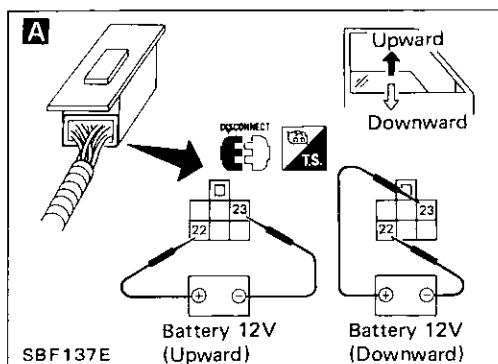


### TROUBLE-SHOOTING PROCEDURE 3



## Power Window Trouble-shooting (Cont'd)

## TROUBLE-SHOOTING PROCEDURE 4



Disconnect inoperative window sub switch connector.

**A**

Check power window motor applying battery voltage to the connector.

| Terminal |    | Operation |
|----------|----|-----------|
| ⊕        | ⊖  |           |
| 22       | 23 | Upward    |
| 23       | 22 | Downward  |

O.K.

Disconnect main switch connector.

**B**

Check voltage between terminal ⑤ and body ground with ignition switch ON.

⑤ - Body ground: 12V

O.K.

**C**

Check harness between main and sub switches for continuity.

| Window    | Terminal | Resistance |
|-----------|----------|------------|
| Passenger | ⑥ and ②① | 0Ω         |
|           | ⑦ and ②⑤ | 0Ω         |
| Rear R.H. | ⑧ and ②① | 0Ω         |
|           | ⑨ and ②⑤ | 0Ω         |
| Rear L.H. | ⑩ and ②① | 0Ω         |
|           | ⑪ and ②⑤ | 0Ω         |

O.K.

**D**

Check sub switch for continuity.

| Terminal | Continuity |   |   |
|----------|------------|---|---|
|          | U          | N | D |
| ②①       |            | ○ | ○ |
| ②②       | ○          | ○ | ○ |
| ②③       | ○          | ○ | ○ |
| ②④       | ○          | ○ | ○ |
| ②⑤       | ○          | ○ |   |

O.K.

Replace main switch.

END

N.G. Check harness for continuity.

O.K.

Replace motor.

N.G.

Repair harness between terminal ②② or ②③ and motor.

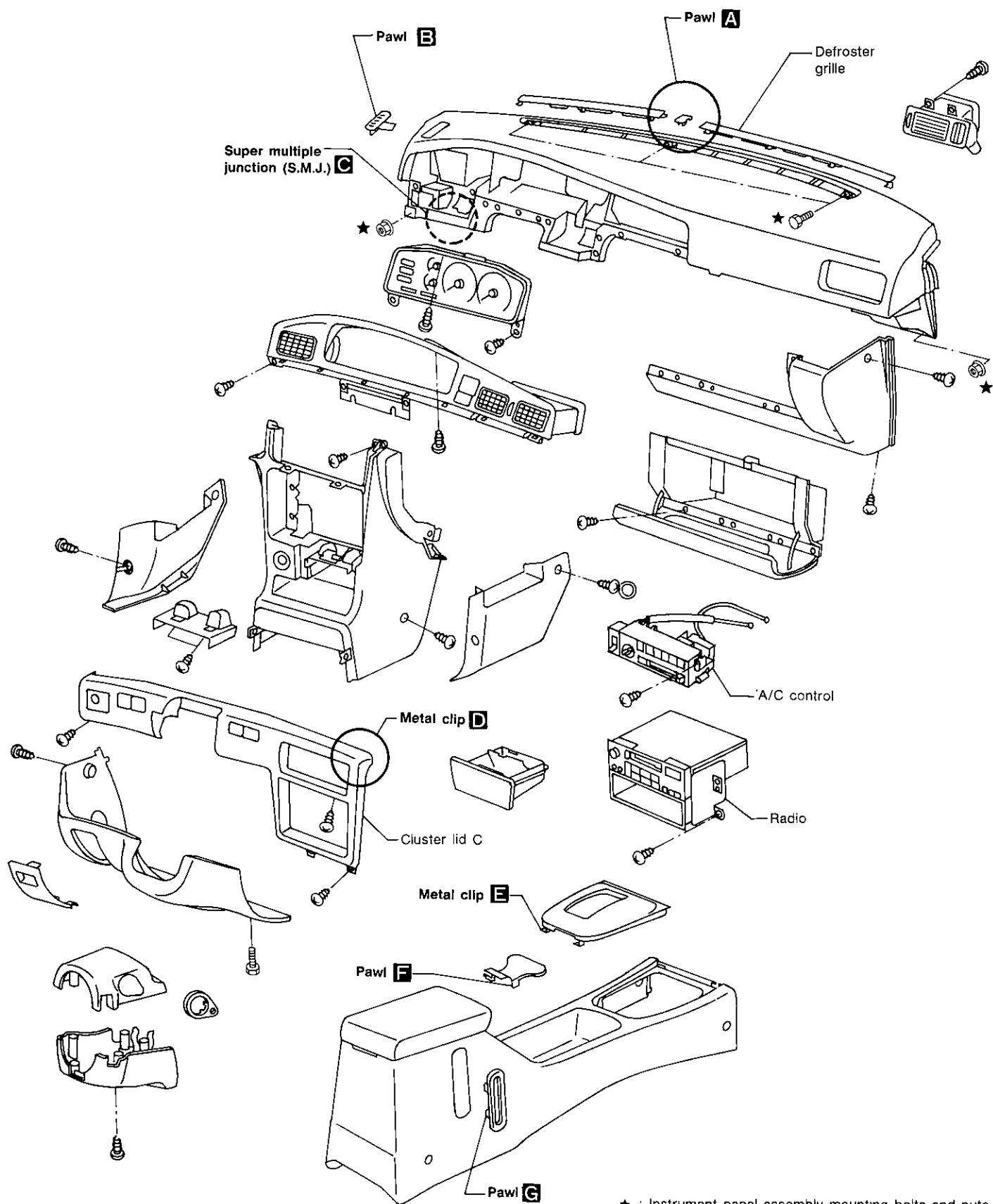
N.G. Repair harness between terminal ⑤ and battery.

N.G. Repair harness between terminals ⑥, ⑦, ⑧, ⑨, ⑩ or ⑪ and ②① or ②⑤.

N.G. Replace sub switch.

# INSTRUMENT PANEL

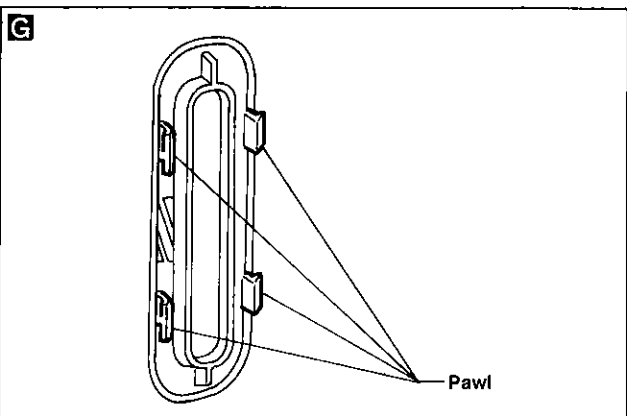
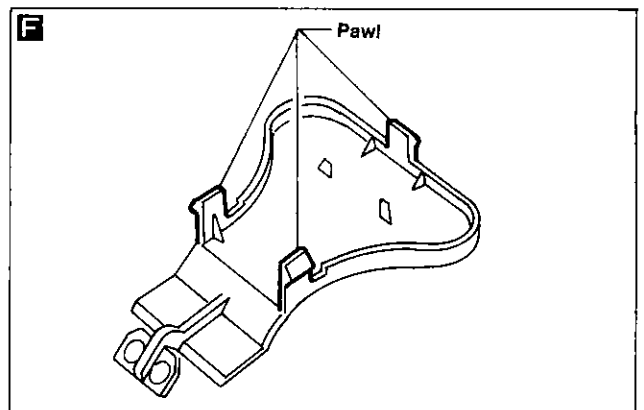
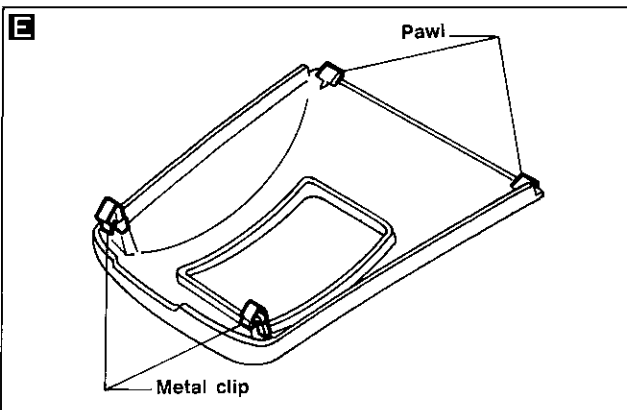
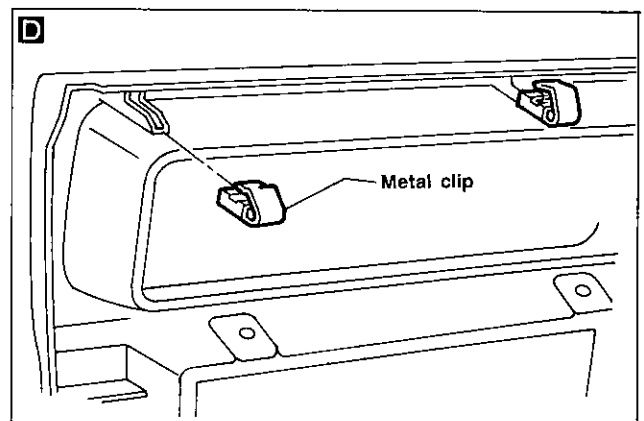
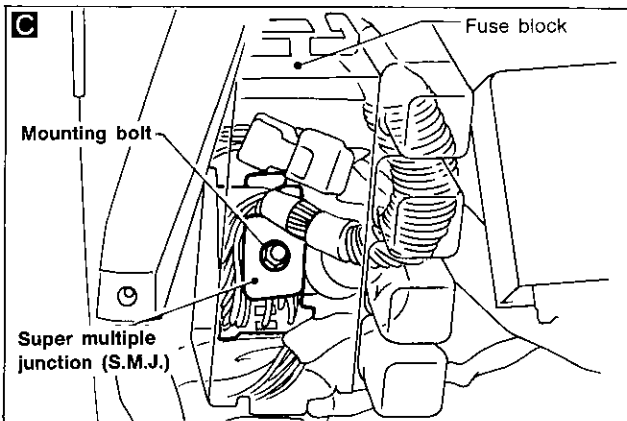
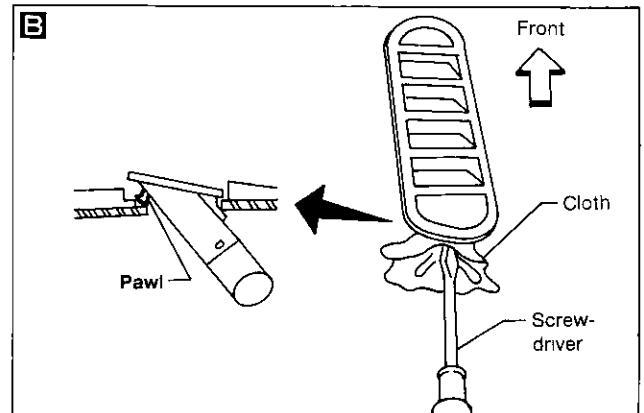
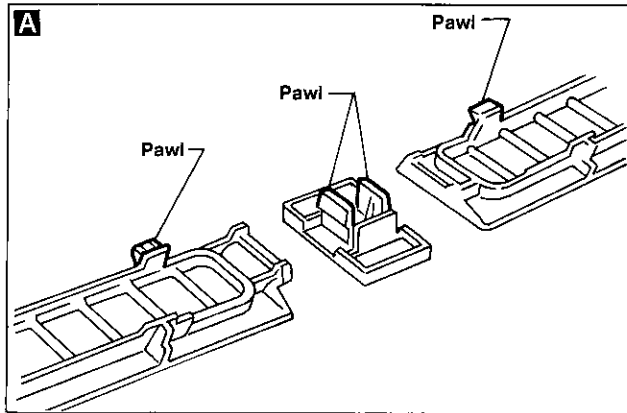
- When removing instrument panel assembly, remove defroster grille, combination meter, A/C or heater control, cluster lid C and S.M.J. first.



★ : Instrument panel assembly mounting bolts and nuts



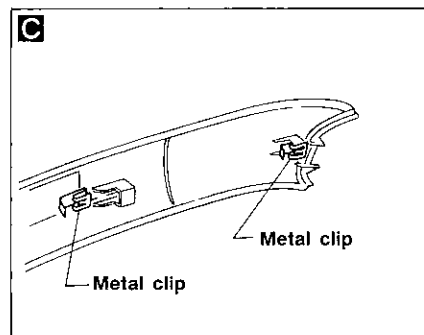
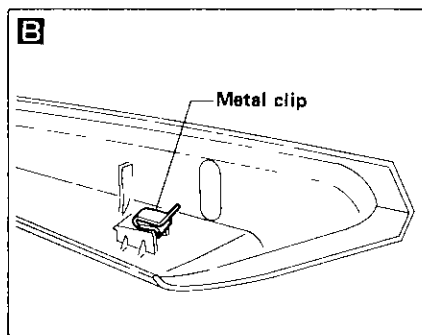
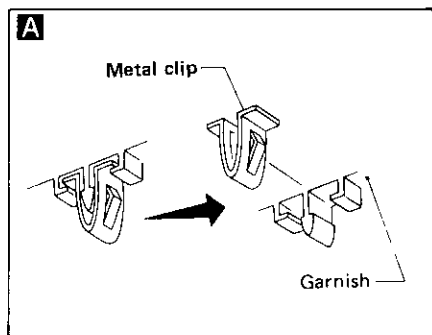
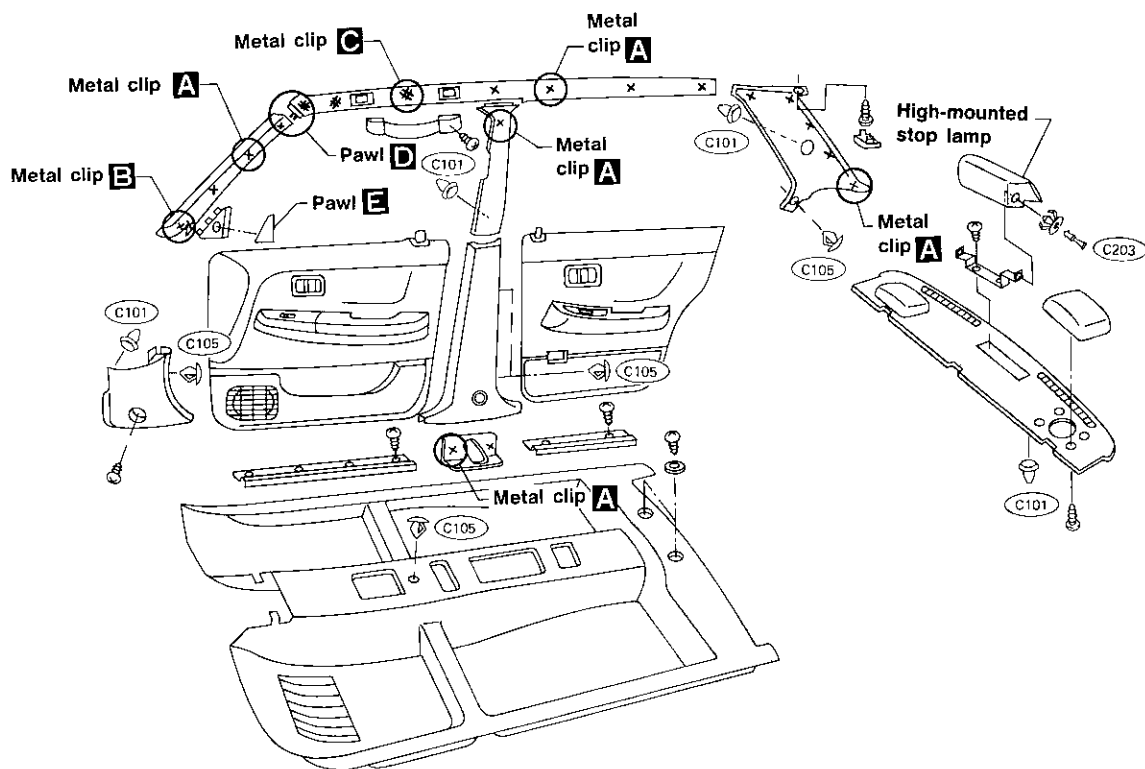
# INSTRUMENT PANEL



SBF088F

## Interior

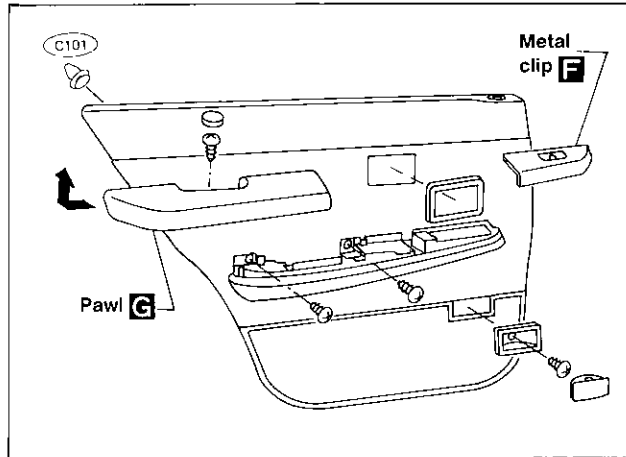
### SIDE AND FLOOR TRIM — Passenger room



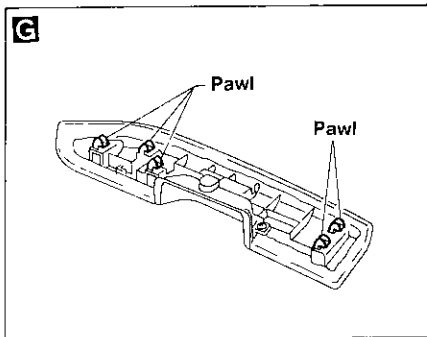
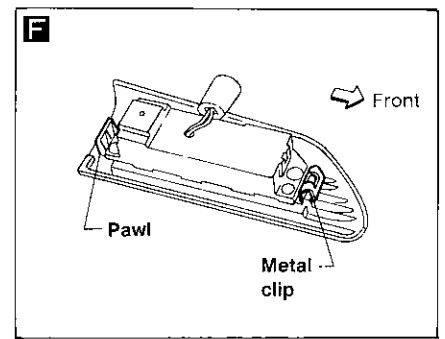
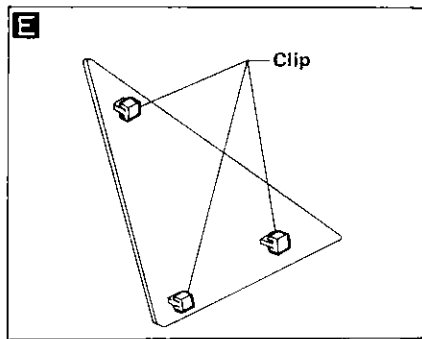
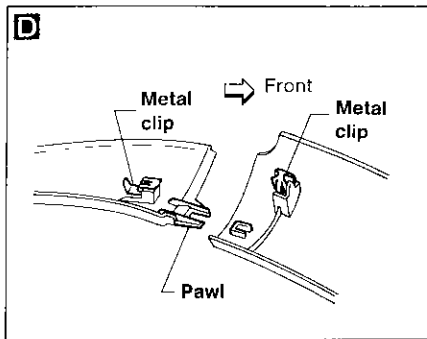
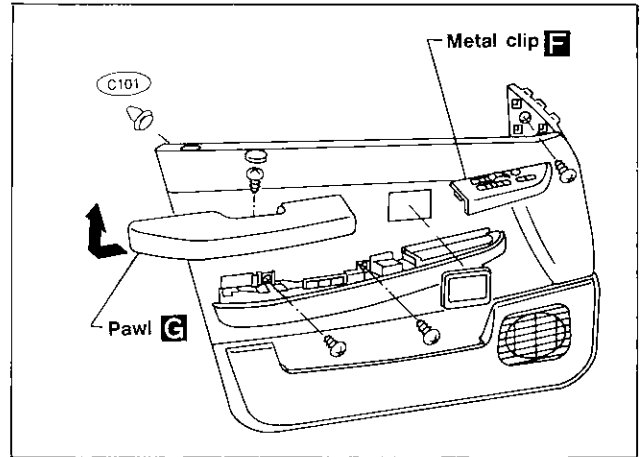
# INTERIOR AND EXTERIOR

## Interior (Cont'd)

Rear door



Front door

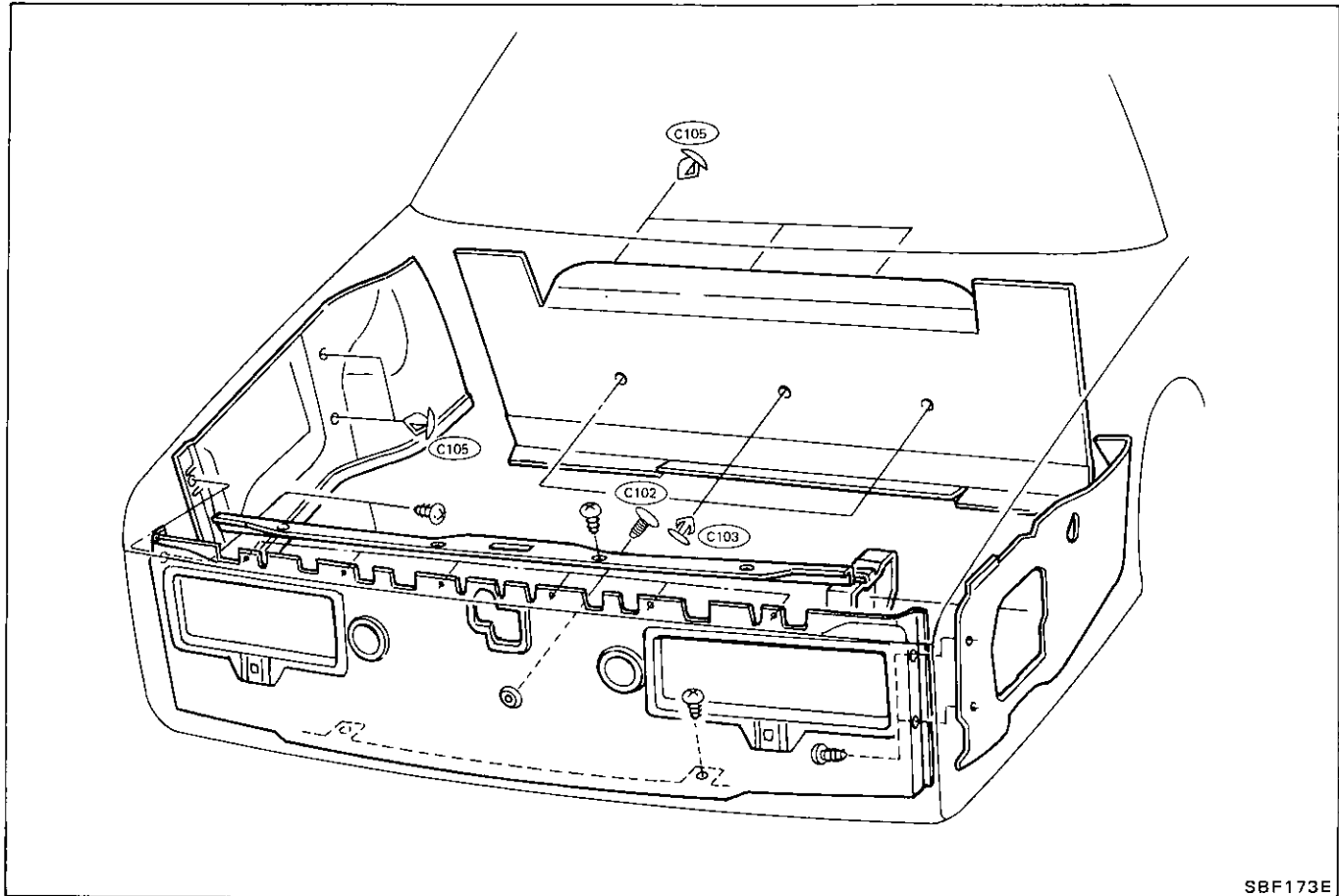


SBF089F

## INTERIOR AND EXTERIOR

### Interior (Cont'd)

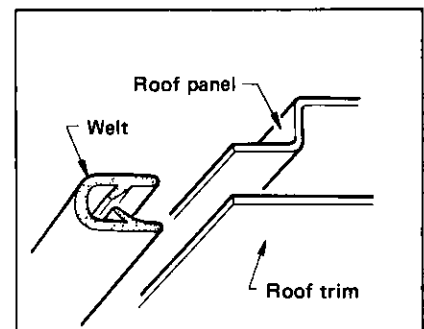
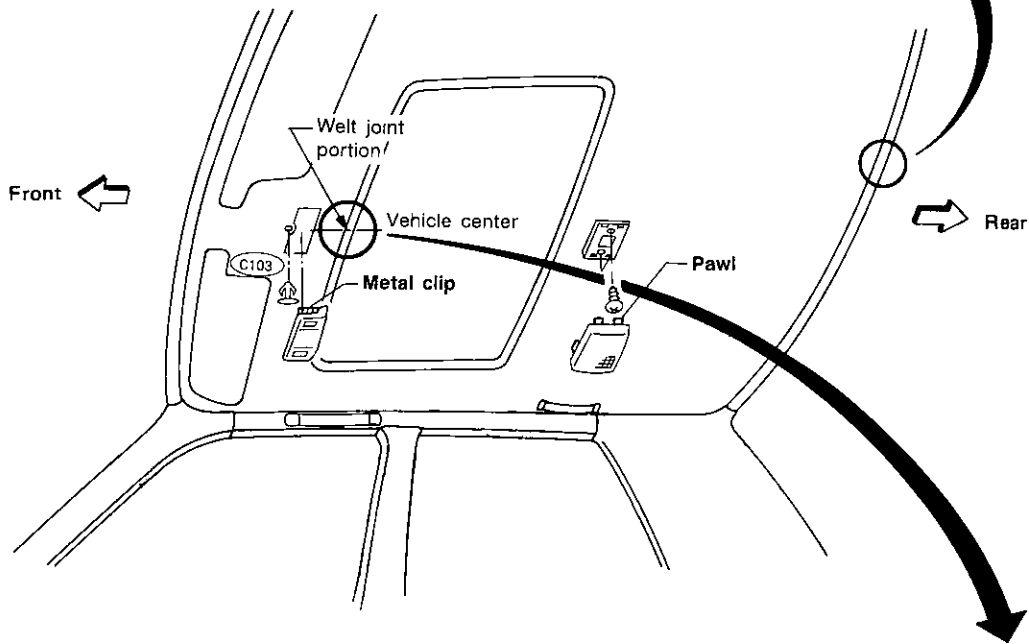
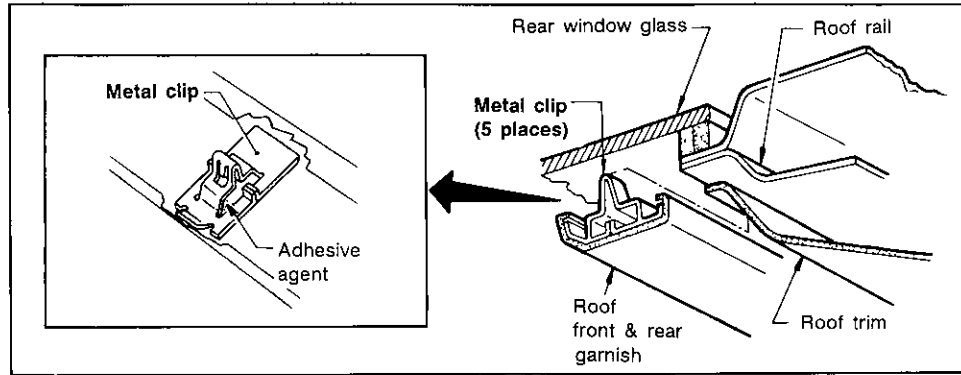
#### LUGGAGE ROOM TRIM — Trunk space



# INTERIOR AND EXTERIOR

## Interior (Cont'd)

### ROOF TRIM

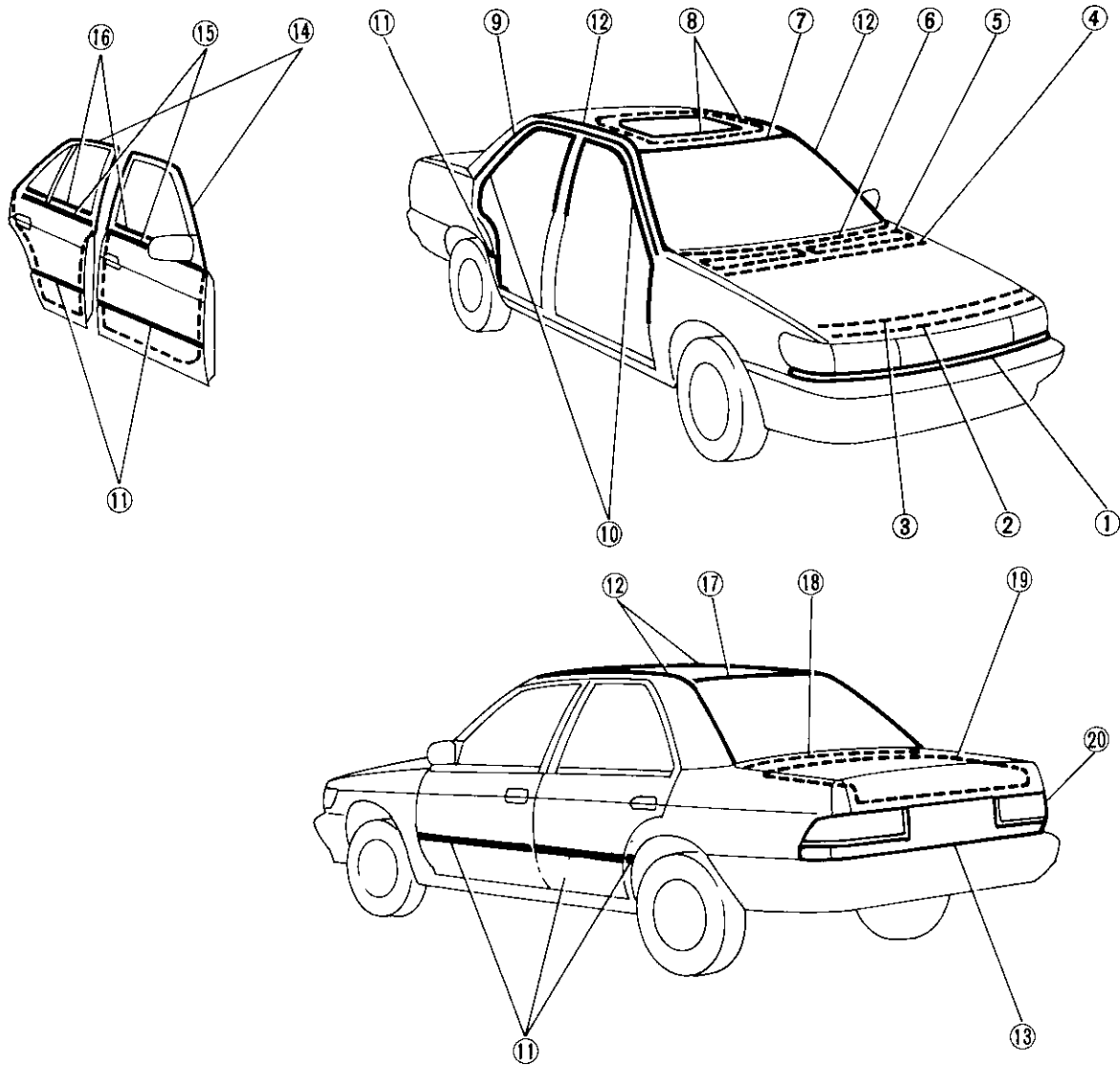


SBF090F

## INTERIOR AND EXTERIOR

### Exterior

- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.



SBF091F

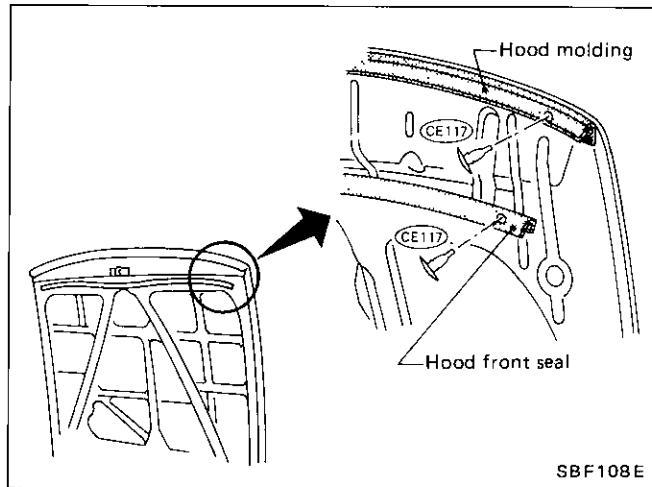
## INTERIOR AND EXTERIOR

### Exterior (Cont'd)

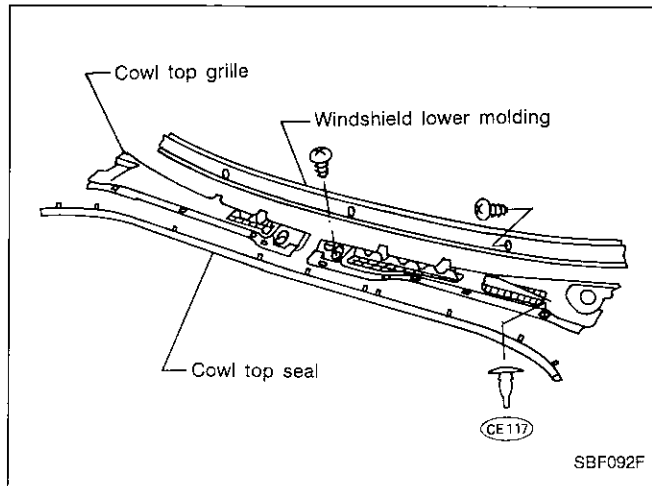
#### ① Front bumper sight shield

Refer to "Body Front End".

#### ② ③ Hood molding and hood front seal



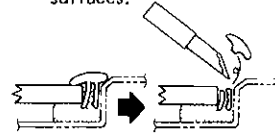
#### ④ ⑤ ⑥ Cowl top seal, cowl top grille and windshield lower molding



#### ⑦ Windshield upper molding

##### Method 1

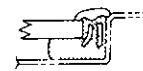
Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.



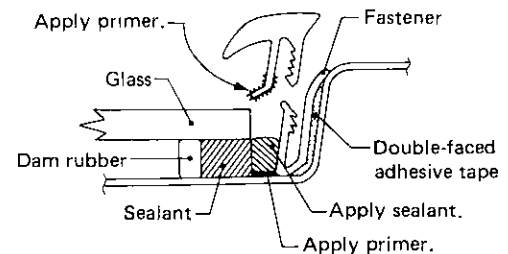
Cut off lower portion of new molding.



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 to body panel, and apply primer to molding and body.



4. Install molding by aligning the molding mark located on center with vehicle center. Be sure to install tightly so that there is no gap around the corner.

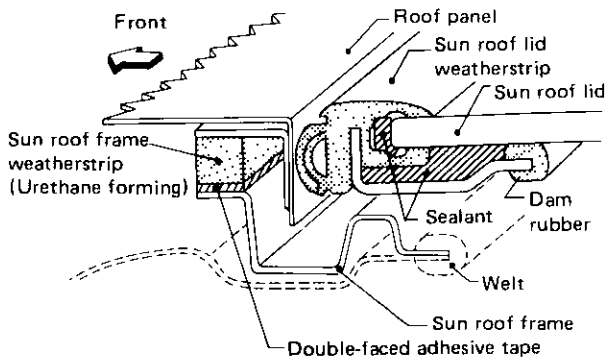
SBF161E

## INTERIOR AND EXTERIOR

### Exterior (Cont'd)

#### ⑧ Sun roof frame weatherstrip and sun roof lid weatherstrip

Sun roof lid weatherstrip is bonded to lid.  
Apply primer before bonding it.

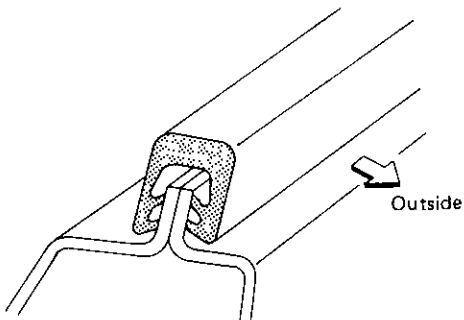


SBF166E

#### ⑨ Drip molding

It is mounted with screws.

#### ⑩ Body side welt



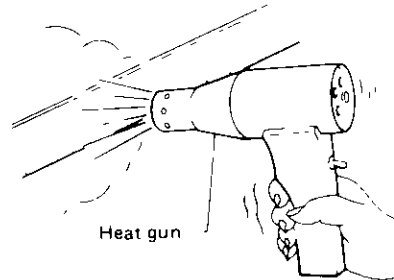
SBF110E

#### ⑪ Side guard molding

- Side guard molding is affixed with double-faced adhesive tape.

##### • Removal:

- Heat molding portion to 30 to 40°C (86 to 104°F) with a heat gun.



SBF455A

- Raise end of molding and, while cutting off bonding agent, detach molding.

##### • Installation:

- Remove all traces of bonding agent from body panel. Then clean contact face of body.
- Heat body panel and molding to 30 to 40°C (86 to 104°F) with a heat gun. Then install molding.

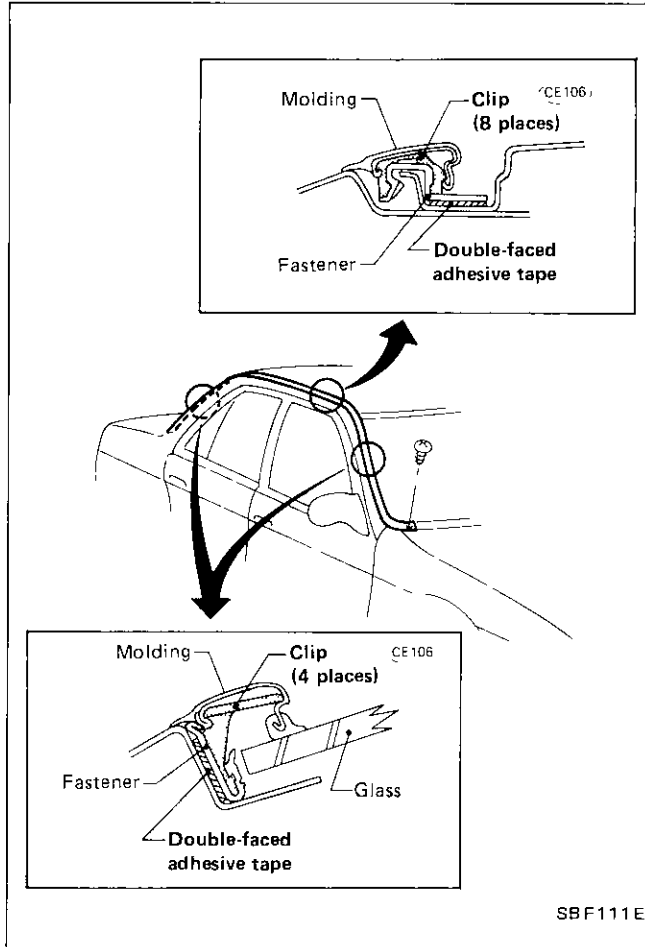
SBF742C



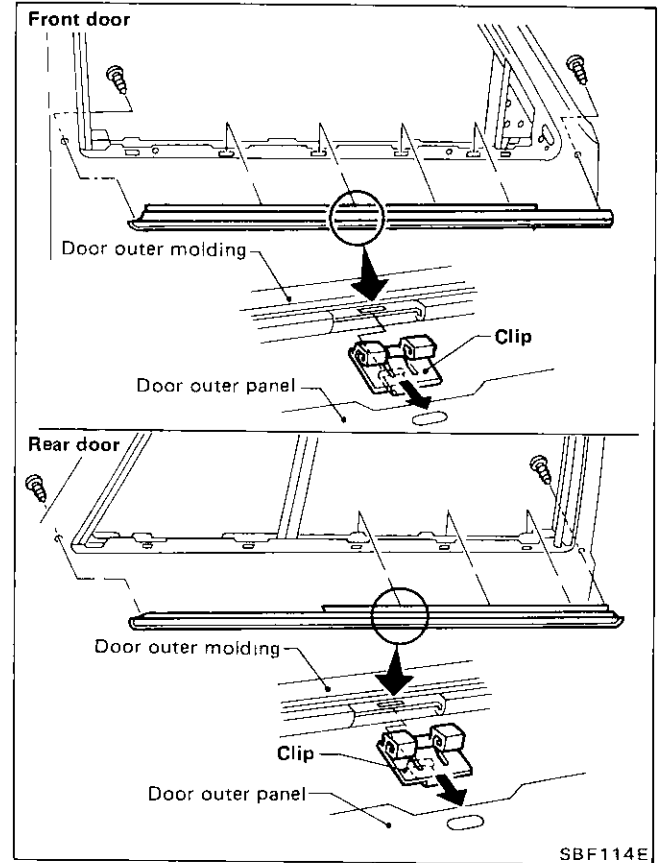
# INTERIOR AND EXTERIOR

## Exterior (Cont'd)

### 12 Roof side molding



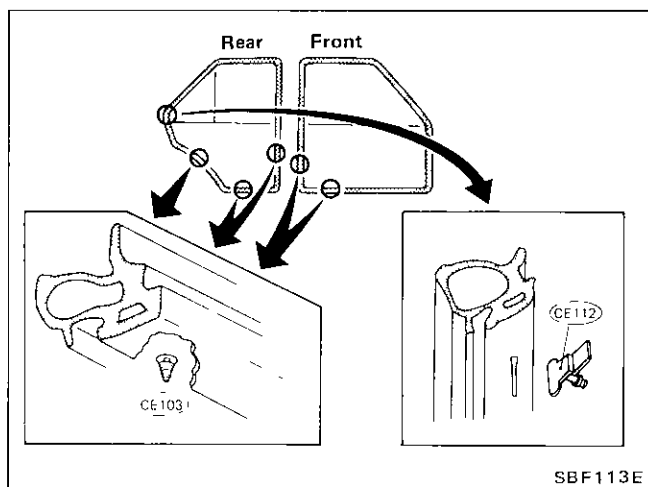
### 15 Door outside molding



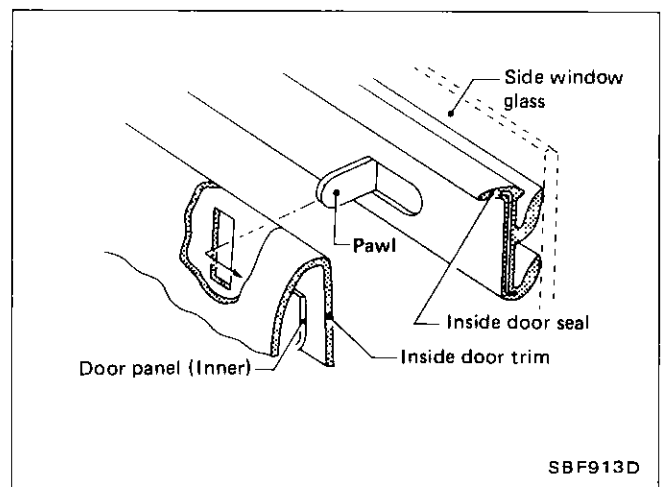
### 13 Rear bumper sight shield

Refer to "Body Rear End".

### 14 Door weatherstrip



### 16 Door inside seal



## INTERIOR AND EXTERIOR

### Exterior (Cont'd)

#### 17 Rear window upper molding

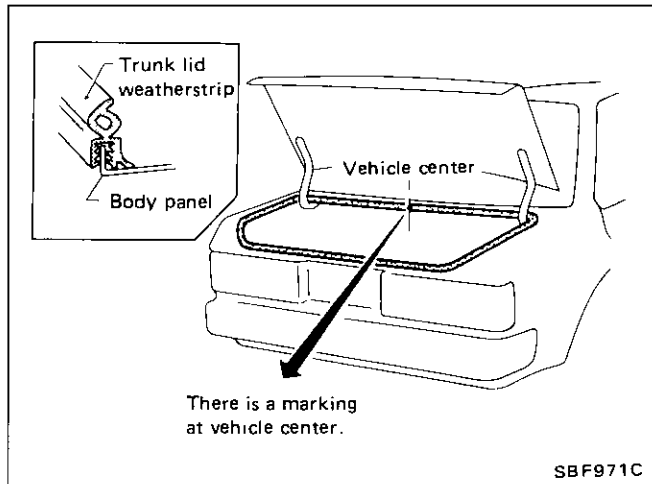
Basically the same as windshield upper molding.

Refer to ⑦ Windshield upper molding.

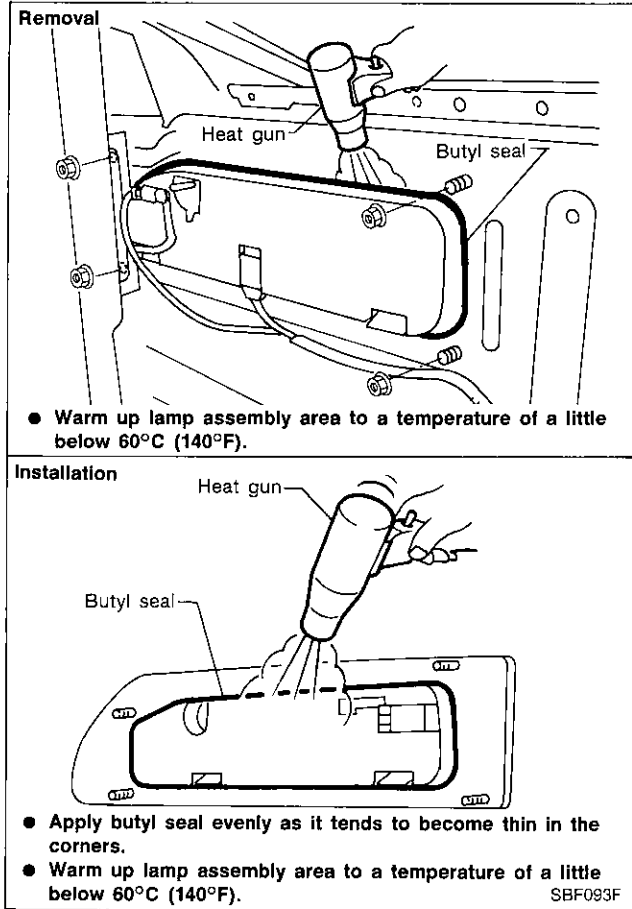
#### 18 Rear window lower molding

It is mounted with screws.

#### 19 Trunk lid weatherstrip



#### 20 Rear combination lamp



- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

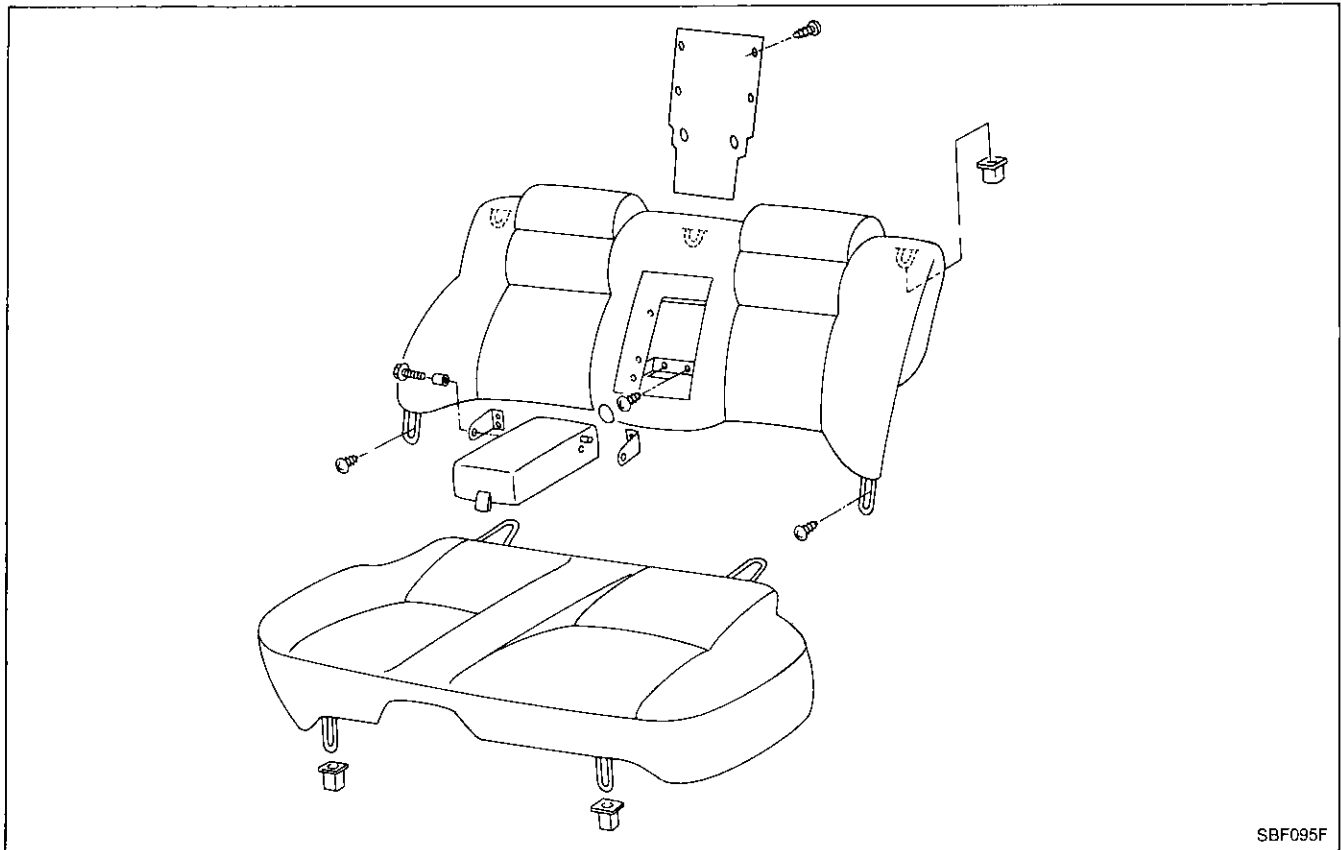
[illegible]

SBF094F

# SEAT

## Rear Seat

### Type 1

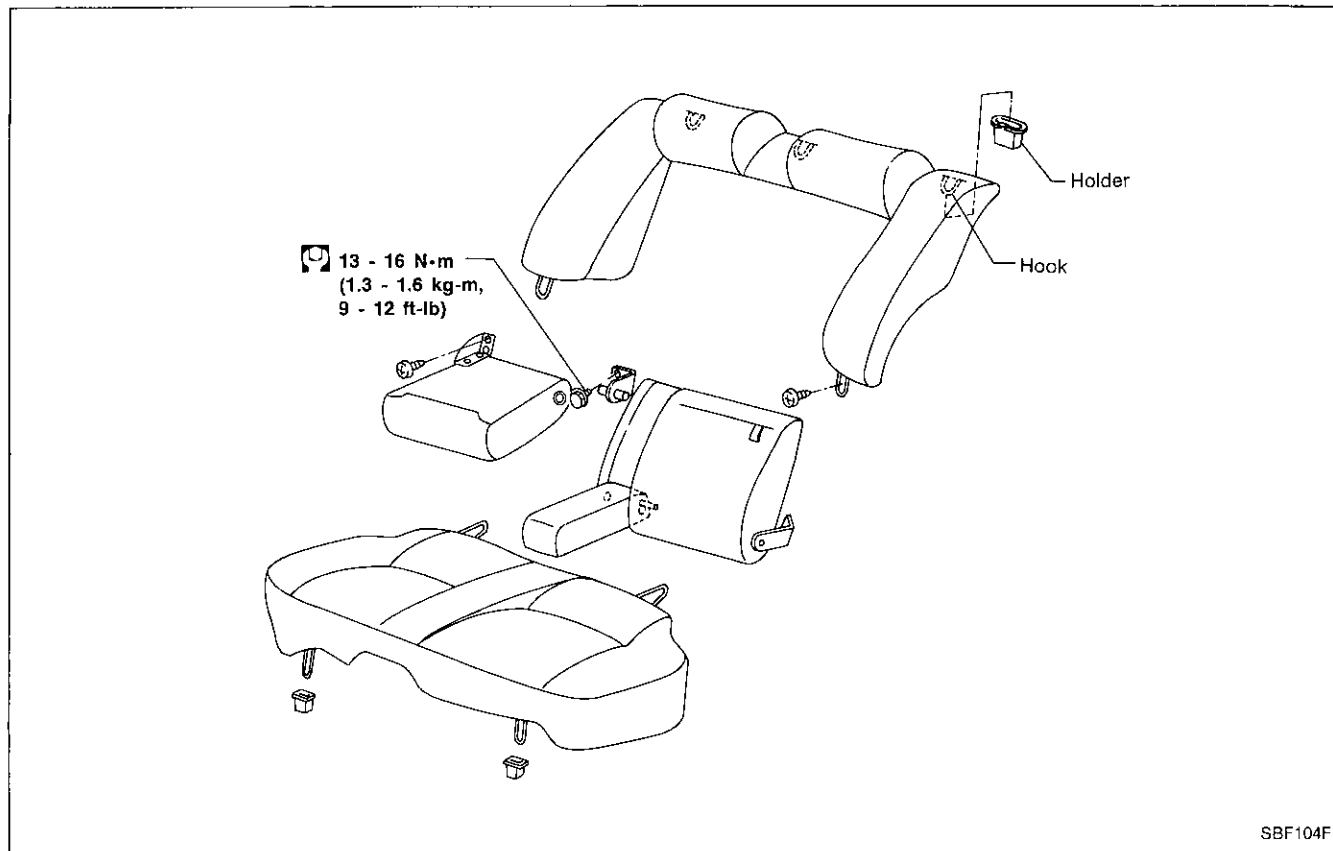


SBF095F

# SEAT

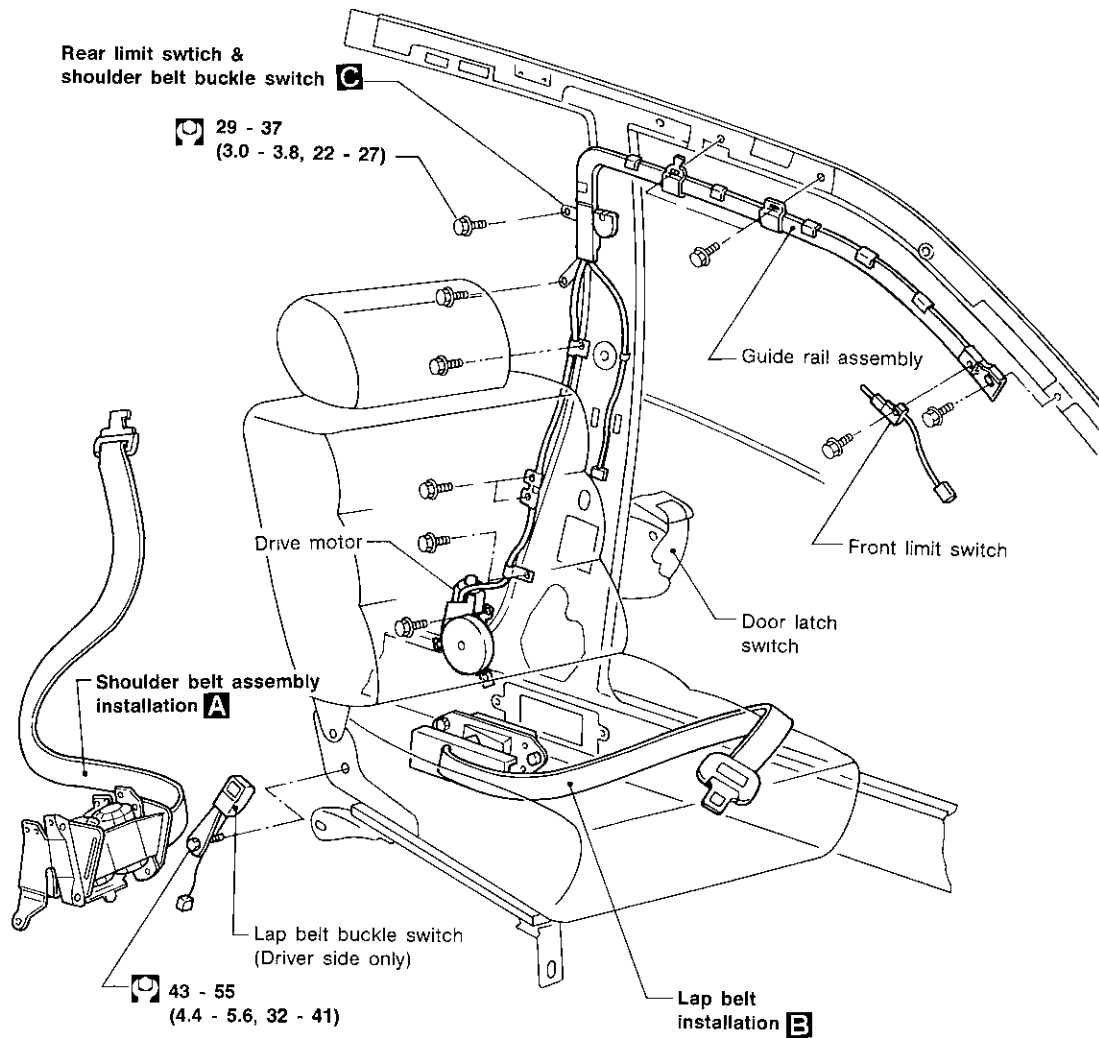
## Rear Seat (Cont'd)

### Type 2

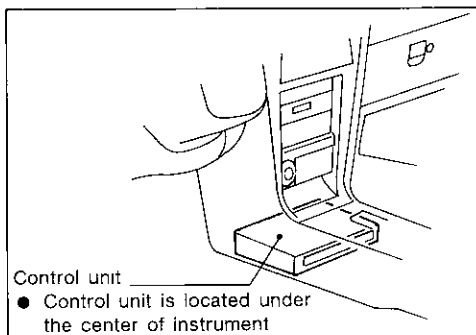


# AUTOMATIC SEAT BELT SYSTEM

## Unit Location



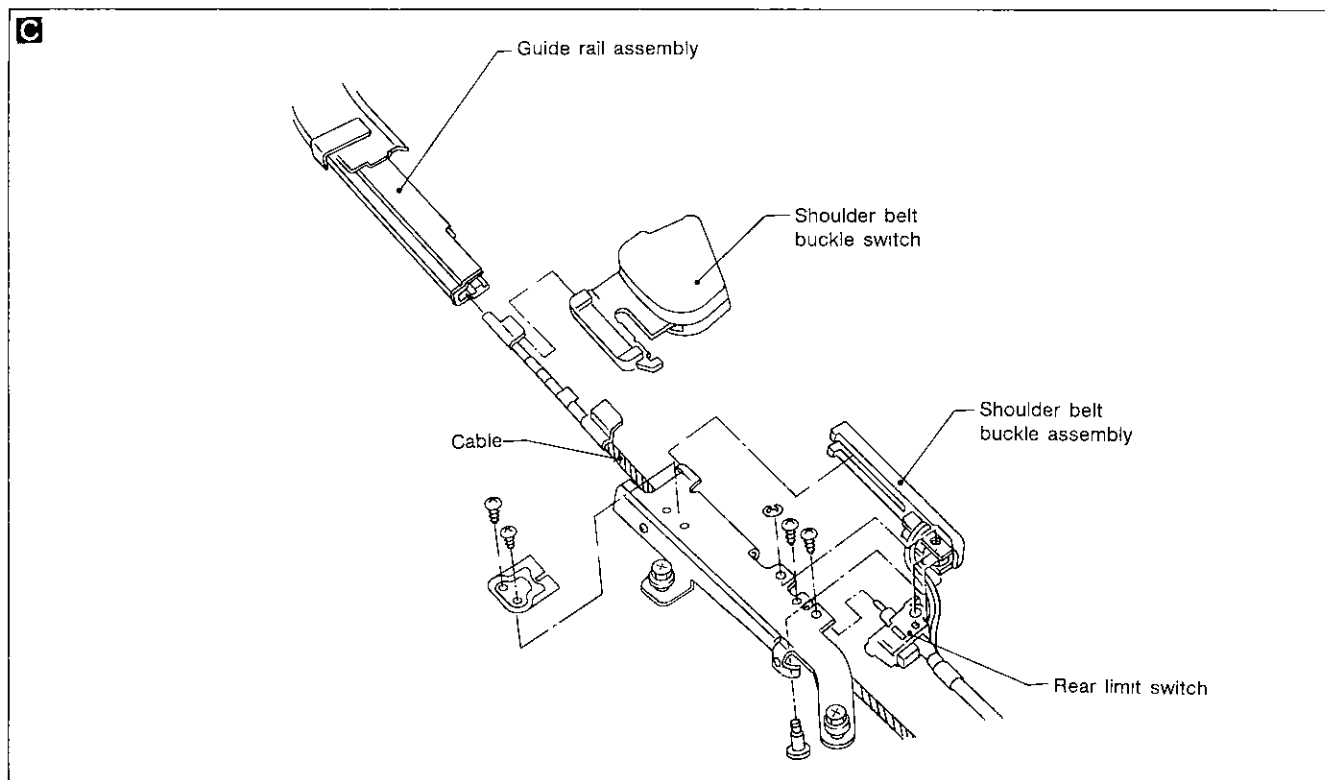
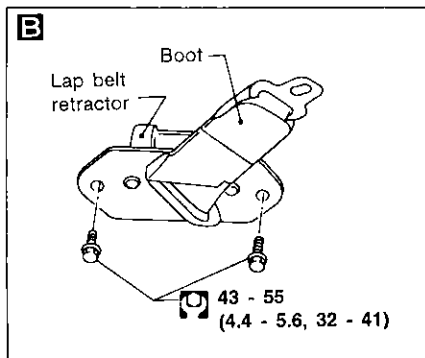
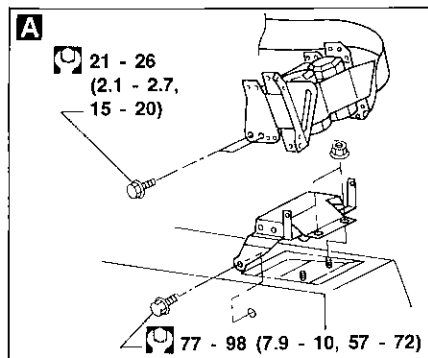
## Control unit



 : N•m (kg-m, ft-lb)

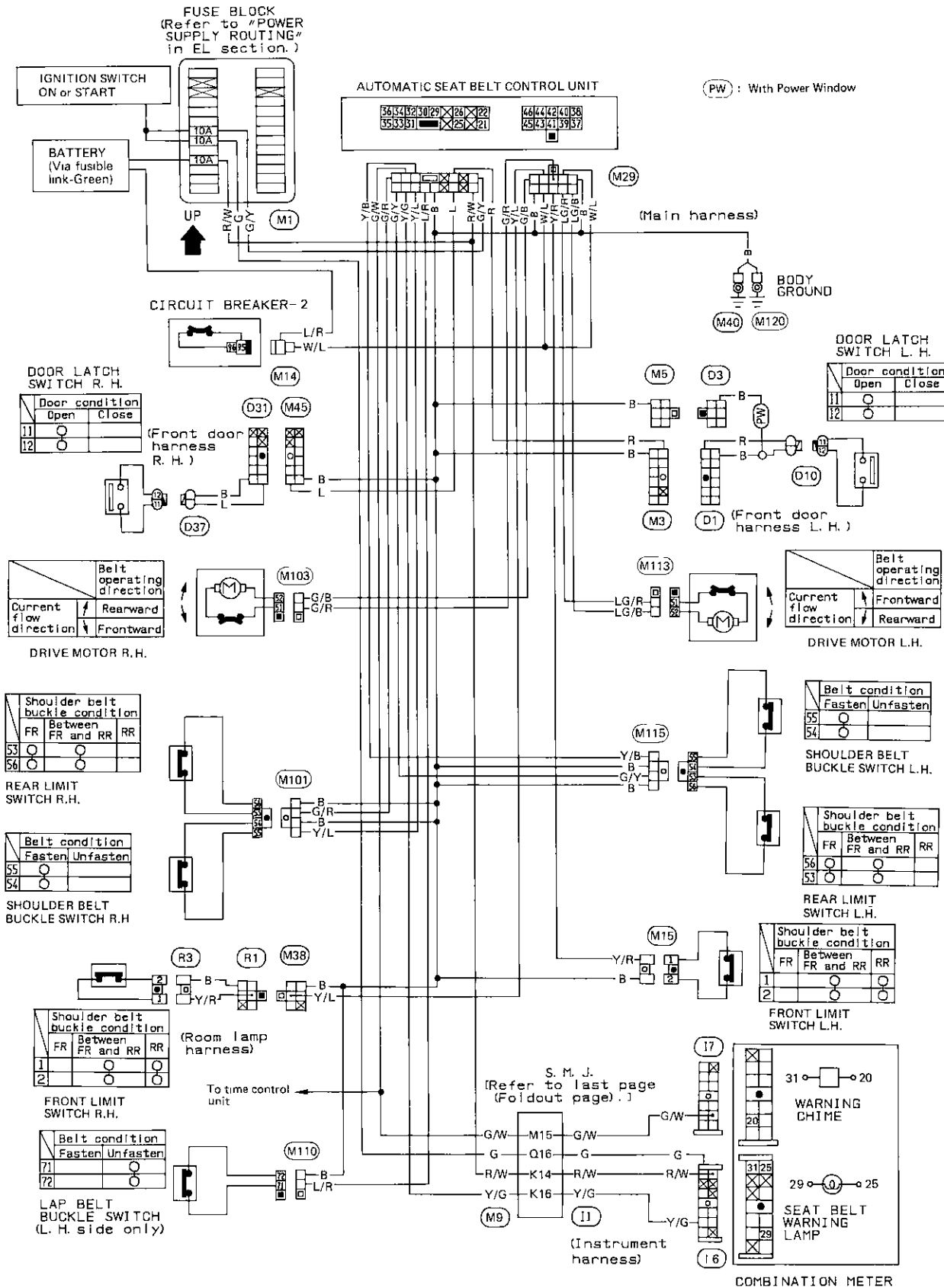
# AUTOMATIC SEAT BELT SYSTEM

## Unit Location (Cont'd)



# AUTOMATIC SEAT BELT SYSTEM

## Wiring Diagram





# AUTOMATIC SEAT BELT SYSTEM

## Description

### FUNCTION

Shoulder belt buckle is mainly operated while ignition switch is "ON".

Condition (A): Ignition switch is "ON".

When door is opened, shoulder belt buckle is moved frontward and when door is closed, buckle is moved rearward.

Condition (B): Ignition switch is "OFF".

When door is opened, shoulder belt buckle is moved frontward. When the door is closed, buckle will remain in front position.

(Voltage of output signal is approximate value.)

|                      |                                                  |       |       |               |                      |      |               |                      |       |      |               |                      |
|----------------------|--------------------------------------------------|-------|-------|---------------|----------------------|------|---------------|----------------------|-------|------|---------------|----------------------|
| Input signal         | Ignition switch                                  | OFF   | OFF   | ON            | ON                   | ON   | ON            | ON                   | ON    | OFF  | OFF           | OFF                  |
|                      | Door latch switch                                | OFF   | ON    | OFF           | OFF                  | OFF  | ON            | ON                   | ON    | OFF  | ON            | ON                   |
|                      | Front limit switch                               | OFF   | OFF   | OFF           | ON                   | ON   | ON            | ON                   | OFF   | ON   | ON            | ON                   |
|                      | Rear limit switch                                | ON    | ON    | ON            | ON                   | OFF  | OFF           | ON                   | ON    | OFF  | OFF           | ON                   |
| Output signal        | Drive motor power source for frontward operation | 0V    | 0V    | 0V            | 0V                   | 0V   | 12V           | 12V                  | 0V    | 0V   | 12V           | 12V                  |
|                      | Drive motor power source for rearward operation  | 0V    | 0V    | 12V           | 12V                  | 0V   | 0V            | 0V                   | 0V    | 0V   | 0V            | 0V                   |
| Shoulder belt buckle | Function                                         | Stop  | Stop  | Start to move | Moving               | Stop | Start to move | Moving               | Stop  | Stop | Start to move | Moving               |
|                      | Position                                         | Front | Front | Front         | Between Front & Rear | Rear | Rear          | Between Front & Rear | Front | Rear | Rear          | Between Front & Rear |

### TIMER (Ignition switch either "ON" or "OFF")

If limit switch does not operate (when accomplishing frontward operation when door is opened, front limit switch can not be turned "OFF" or when accomplishing rearward operation, rear limit switch can not be turned "OFF"), control unit will continue to supply power to drive motor for 15 seconds.

### QUICK WARNING (Ignition switch "ON")

If front limit switch is not turned "OFF" after accomplishing frontward operation (when door is opened), control unit will stop supplying power 15 seconds later and warning lamp will flash and chime will operate rapidly for approximately 6 seconds.

### REAR LOCK (Fail safe operation)

If quick warning functions twice successively while ignition switch is "ON", shoulder belt buckle will move to rear position when the door is closed as normal but will remain in rear position even if door is opened. This operation is canceled when ignition switch is "OFF".

# AUTOMATIC SEAT BELT SYSTEM

## Description (Cont'd)

### WARNING

| Priority | Warning item                                                                                                                                             | Ignition switch | Indication of warning (Indicating time is approximate value.) |                                              |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------|----------------------------------------------|
| 1        | Shoulder anchors are not at rear lock position.<br>(All belts are fastened.)<br><br>Condition:<br>● Door is opened.<br>● When closing door within 6 sec. | ON              | Lamp                                                          | ON<br>OFF<br>ON<br>OFF<br>Continues flashing |
|          |                                                                                                                                                          | OFF → ON        | Lamp                                                          | ON<br>OFF<br>ON<br>OFF<br>Continues flashing |
|          |                                                                                                                                                          | OFF → ON        | Chime                                                         | ON<br>OFF<br>ON<br>OFF<br>Continues flashing |
| 2        | Either or both shoulder belts are not fastened.<br><br>Condition:<br>● Doors are closed.<br>● When unfastening shoulder belt with doors closed.          | ON              | Anchor                                                        | Not rear<br>Rear<br>6 sec.                   |
|          |                                                                                                                                                          |                 | Lamp                                                          | ON<br>OFF<br>ON<br>OFF<br>6 sec.             |
|          |                                                                                                                                                          |                 | Chime                                                         | ON<br>OFF<br>ON<br>OFF<br>6 sec.             |
| 3        | Only driver side lap belt is not fastened.<br><br>Condition:<br>● Doors are closed.                                                                      | OFF → ON        | Belts                                                         | Not fastened<br>Fastened<br>100 sec.         |
|          |                                                                                                                                                          |                 | Lamp                                                          | ON<br>OFF<br>ON<br>OFF<br>6 sec.             |
|          |                                                                                                                                                          |                 | Chime                                                         | ON<br>OFF<br>ON<br>OFF<br>6 sec.             |
| 4        | Normal (All belts are fastened and shoulder anchors are in rear lock position.)<br><br>Condition:<br>● Doors are closed.                                 | OFF → ON        | Belts                                                         | Not fastened<br>Fastened<br>6 sec.           |
|          |                                                                                                                                                          |                 | Lamp                                                          | ON<br>OFF<br>ON<br>OFF<br>6 sec.             |
|          |                                                                                                                                                          |                 | Chime                                                         | ON<br>OFF<br>ON<br>OFF<br>6 sec.             |

## Contents

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Since left and right component parts are basically the same, harness layout and methods for electrical components inspection are shown for one side only.

For those methods enclosed by double rectangles, component parts on both sides must be checked.

### **Harness Layout**

Refer to EL section.

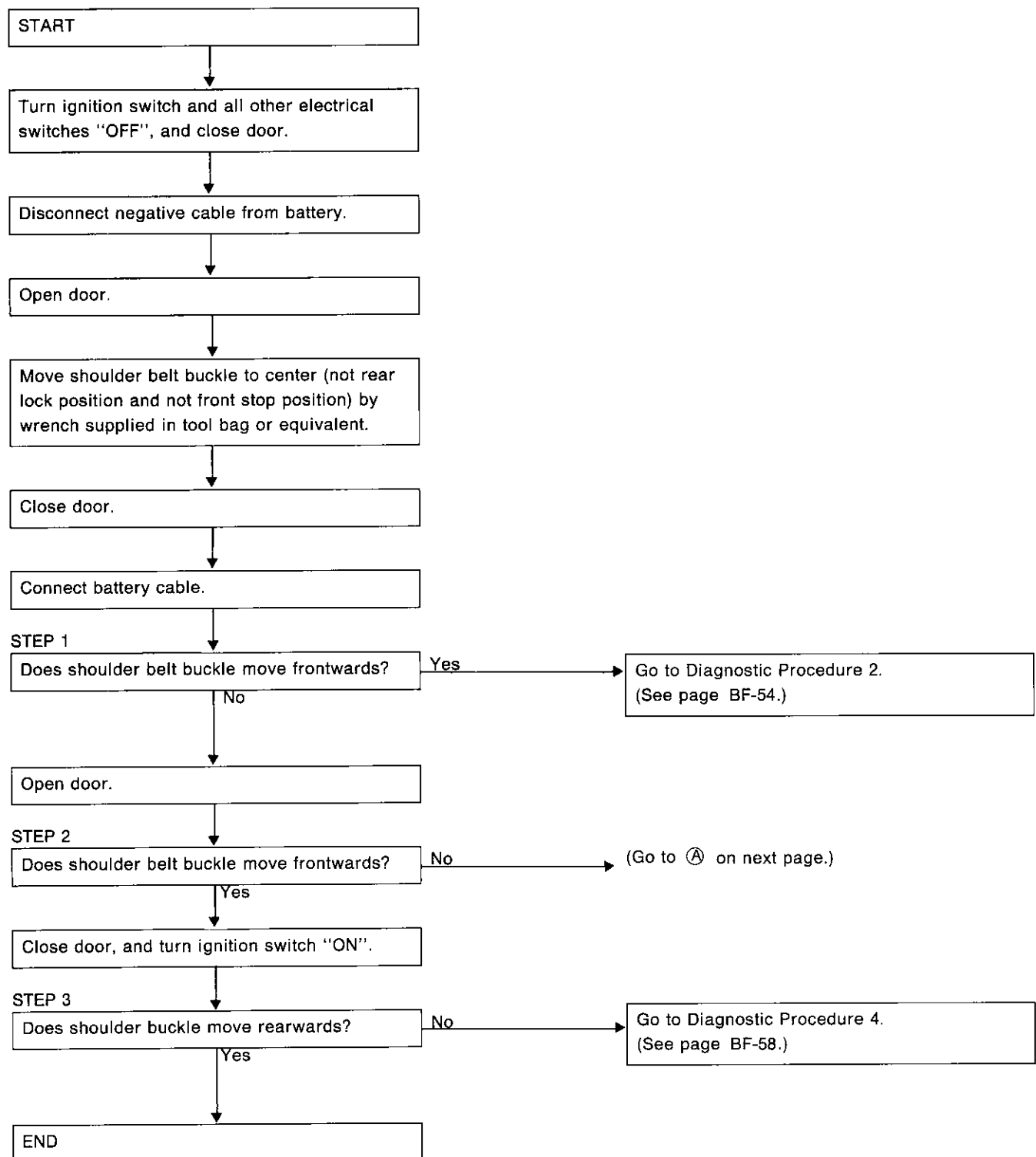
## AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Symptom Chart

[illegible]

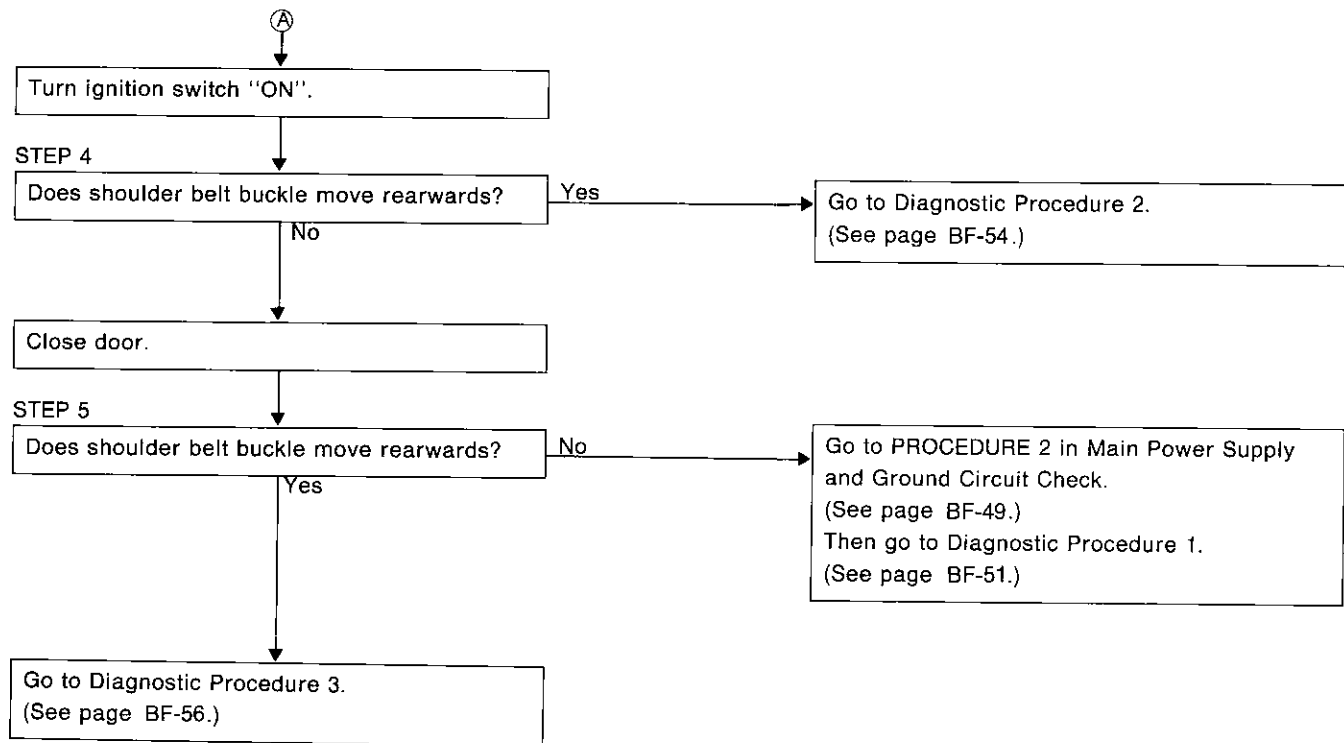
## Preliminary Check

### PROCEDURE 1



# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

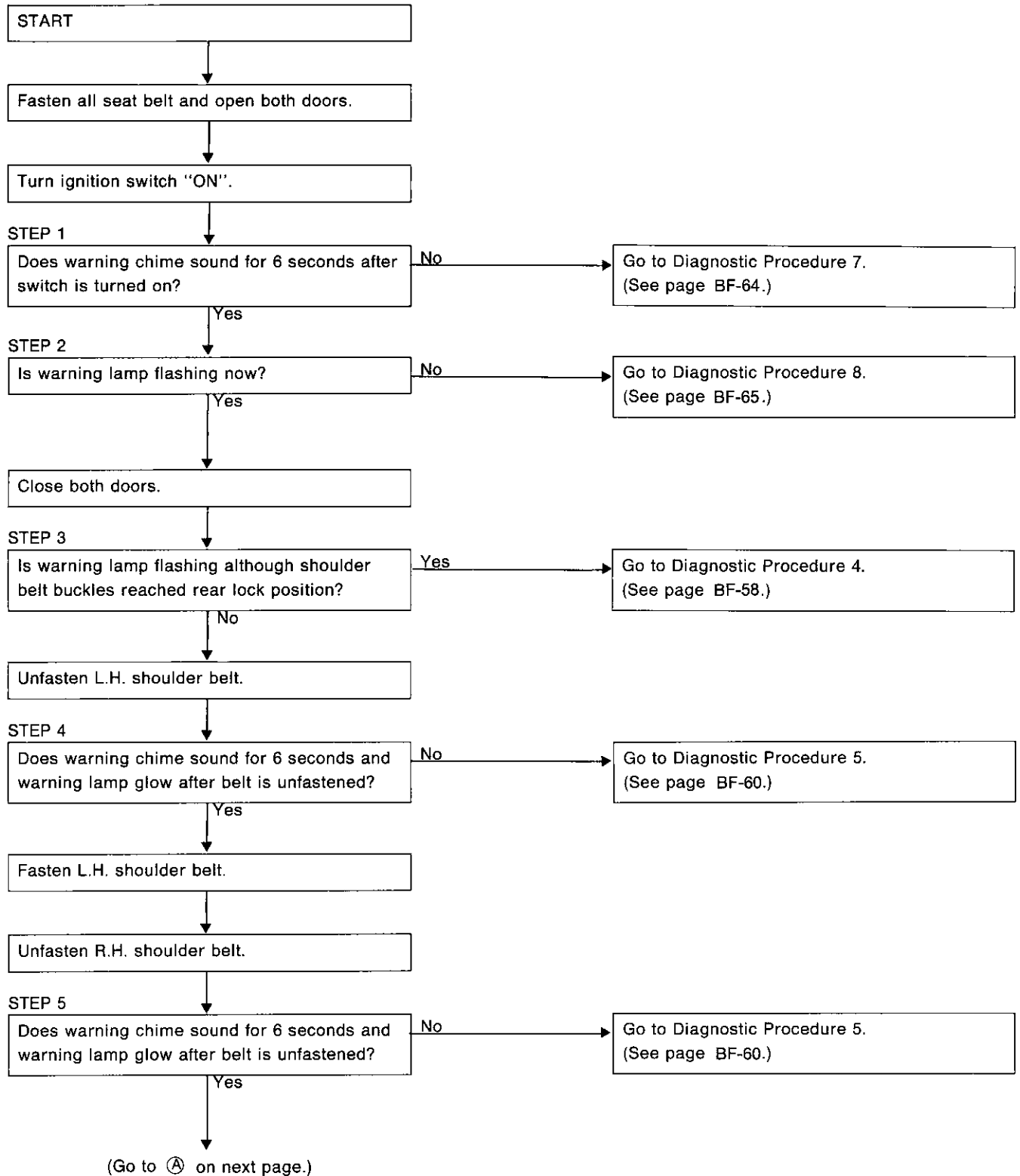
## Preliminary Check (Cont'd)



# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

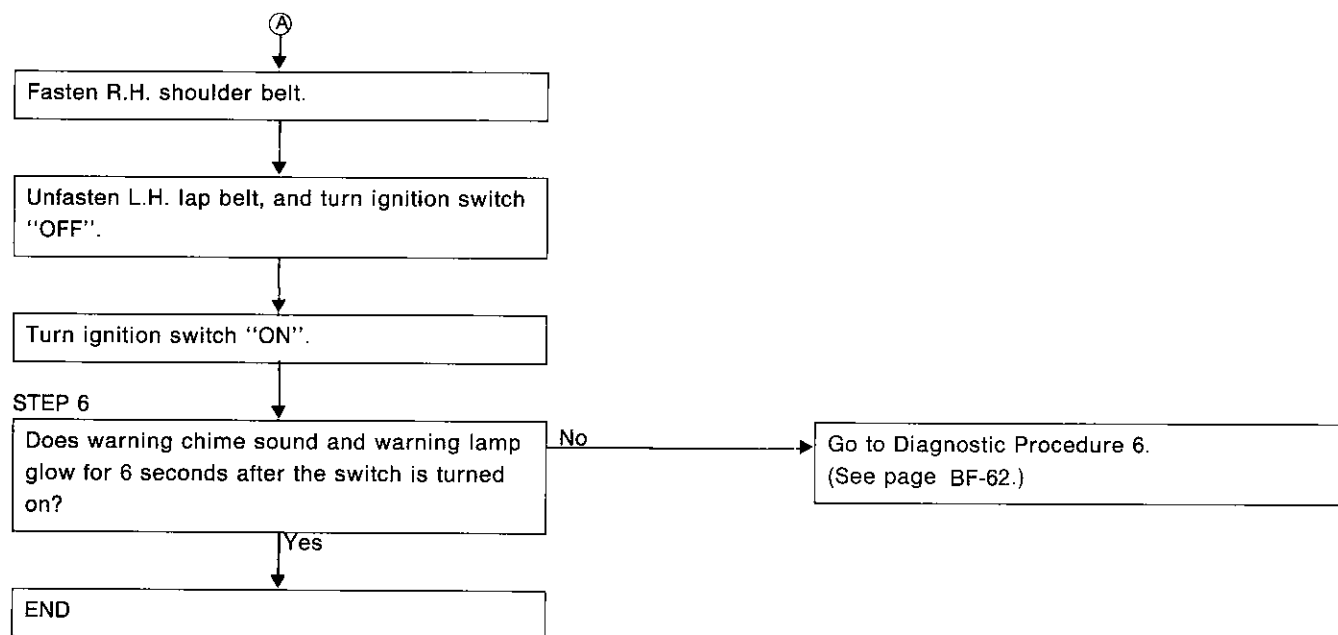
## Preliminary Check (Cont'd)

### PROCEDURE 2



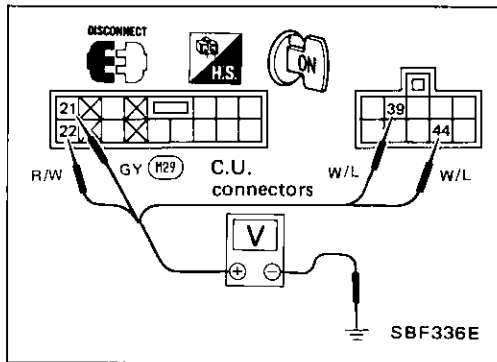
## AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

### Preliminary Check (Cont'd)





# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

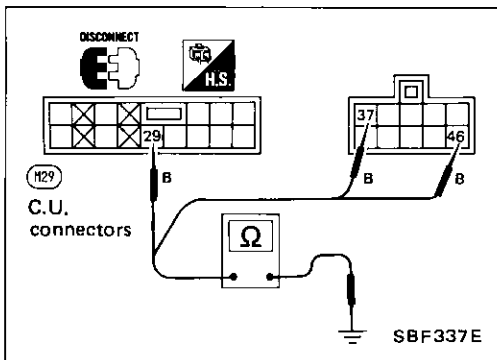


## Main Power Supply and Ground Circuit Check

### PROCEDURE 1

#### Main power supply

| Terminals   | Battery voltage existence condition |                                 |
|-------------|-------------------------------------|---------------------------------|
|             | Ignition switch "ON"                | Other than ignition switch "ON" |
| ②① - Ground | Yes                                 | No                              |
| ②② - Ground | Yes                                 | Yes                             |
| ③⑨ - Ground | Yes                                 | Yes                             |
| ④④ - Ground | Yes                                 | Yes                             |



#### Ground circuit

| Terminals   | Continuity |
|-------------|------------|
| ②⑨ - Ground | Yes        |
| ③⑦ - Ground | Yes        |
| ④⑥ - Ground | Yes        |

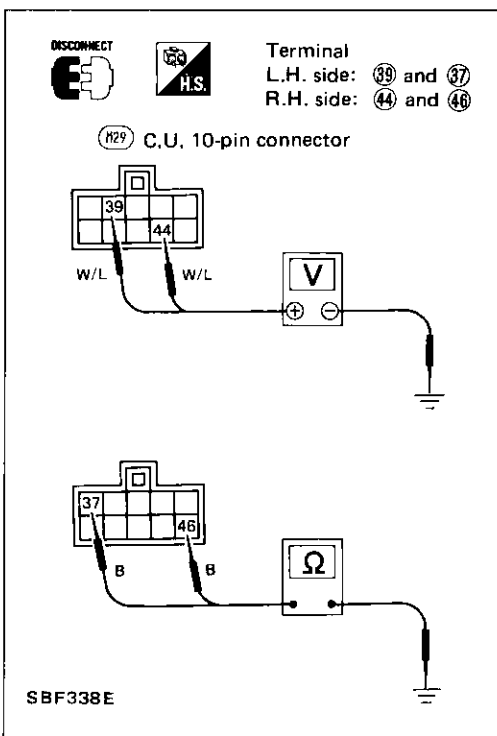
### PROCEDURE 2

#### Power supply for motor drive

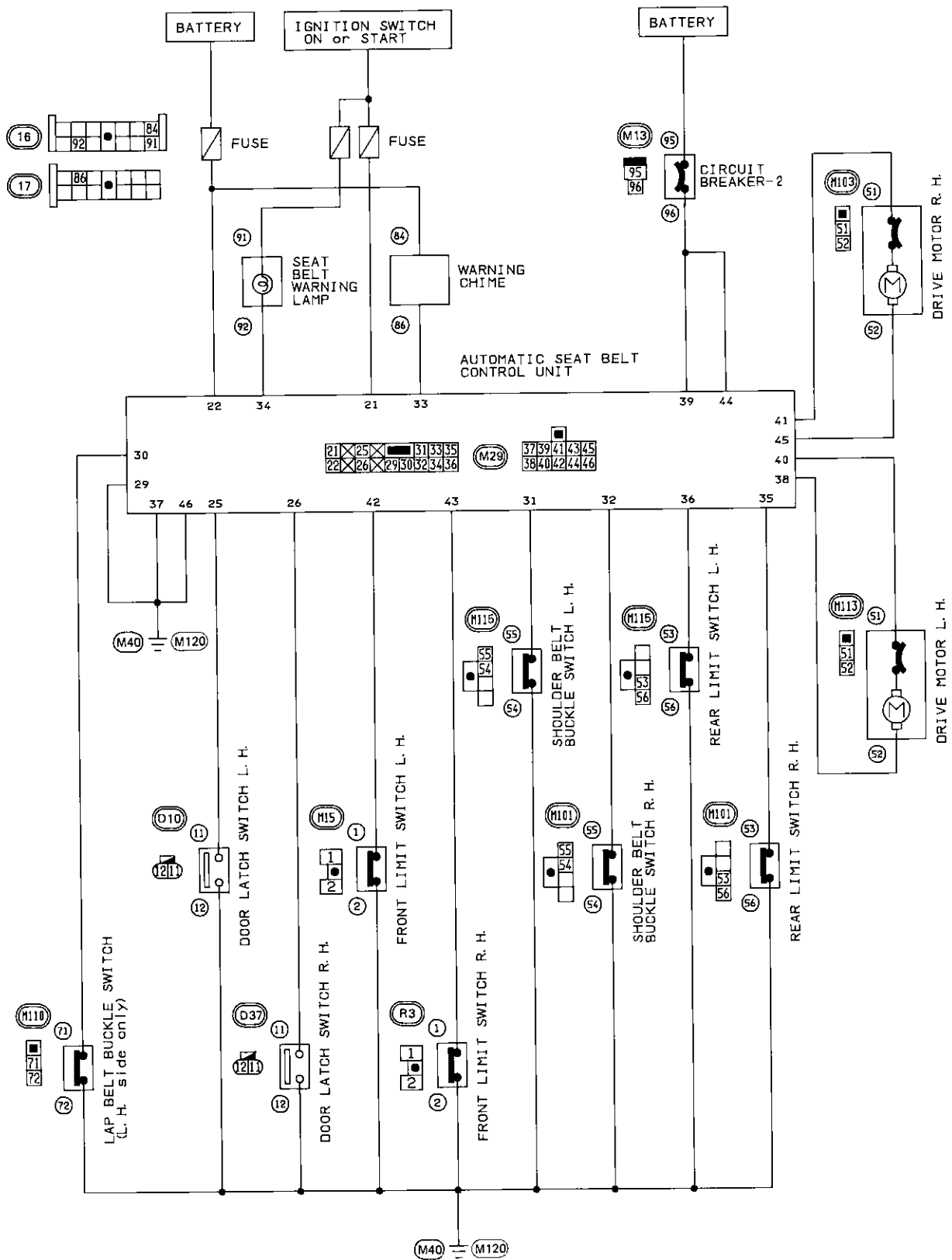
|           | Terminals   | Battery voltage existence |
|-----------|-------------|---------------------------|
| L.H. side | ③⑨ - Ground | Yes                       |
| R.H. side | ④④ - Ground | Yes                       |

#### Ground circuit for motor drive

|           | Terminals   | Continuity |
|-----------|-------------|------------|
| L.H. side | ③⑦ - Ground | Yes        |
| R.H. side | ④⑥ - Ground | Yes        |

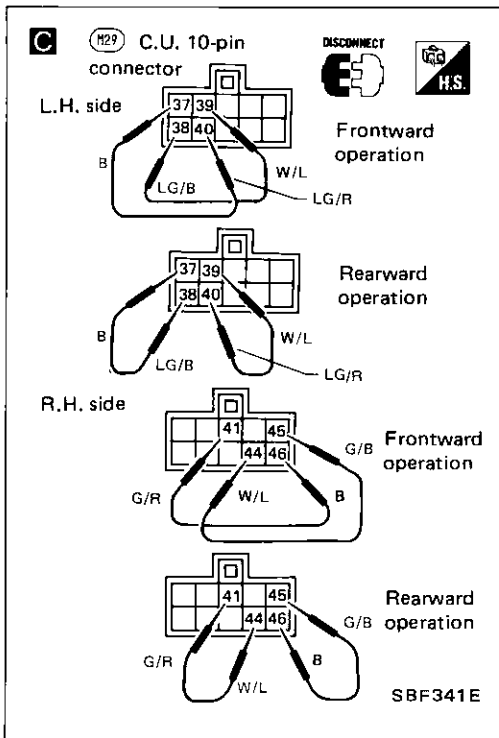
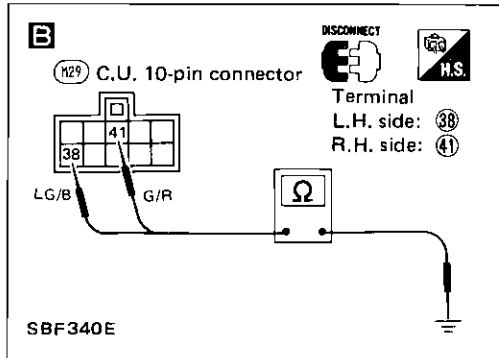
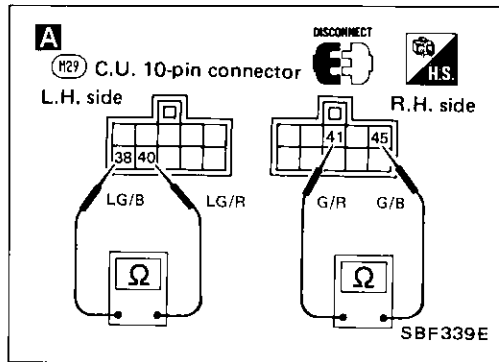


## Circuit Diagram for Quick Pinpoint Check



# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Diagnostic Procedure 1



START

**A**

### CHECK MOTOR CIRCUIT.

- 1) Disconnect 10-pin connector from control unit.
- 2) Check continuity.

N.G.

→ (Go to **A** on next page.)

|           | Terminals |
|-----------|-----------|
| L.H. side | 38 - 40   |
| R.H. side | 41 - 45   |

Continuity should exist.

O.K.

**B**

### Does continuity exist?

Yes

→ (Go to **B** on next page.)

|           | Terminals   |
|-----------|-------------|
| L.H. side | 38 - Ground |
| R.H. side | 41 - Ground |

No

**C**

### CHECK MOTOR OPERATION.

Check shoulder belt buckle movement.

O.K.

→ (Go to **C** on page BF-53.)

N.G.

Go to DRIVE MOTOR ASSEMBLY in Electrical Components Inspection. (See page BF-66.)

N.G.

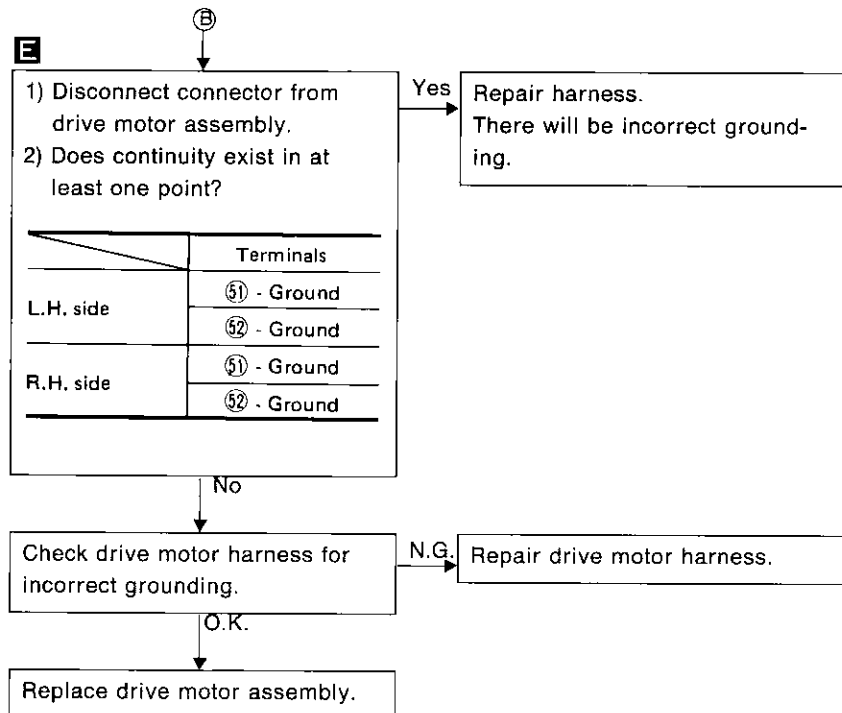
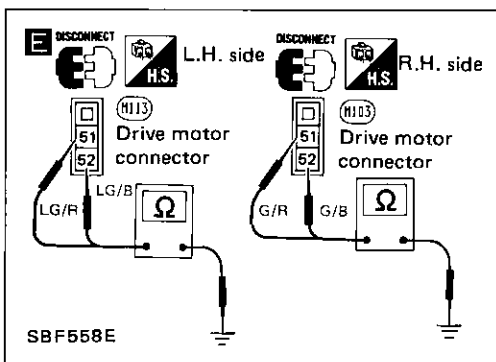
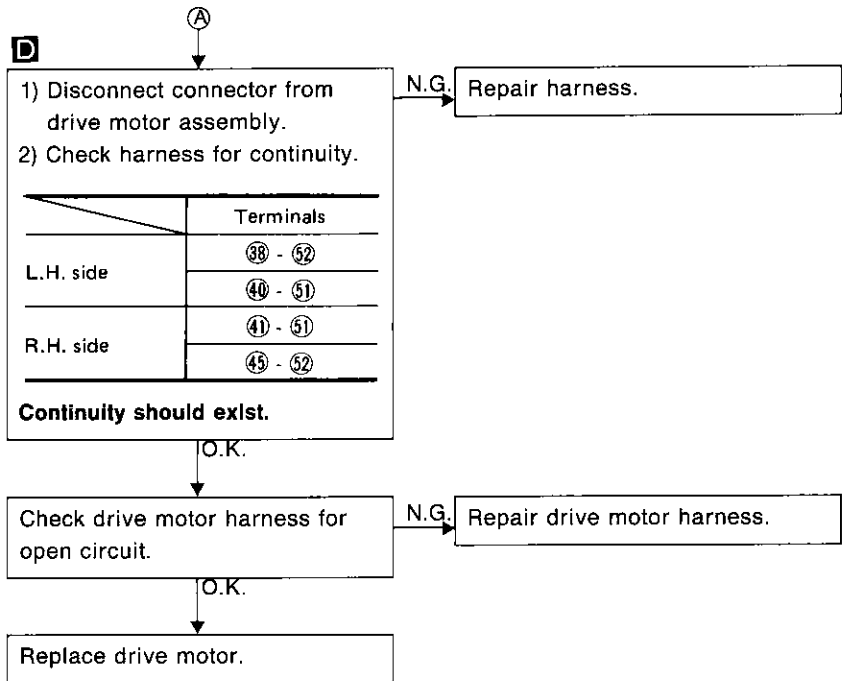
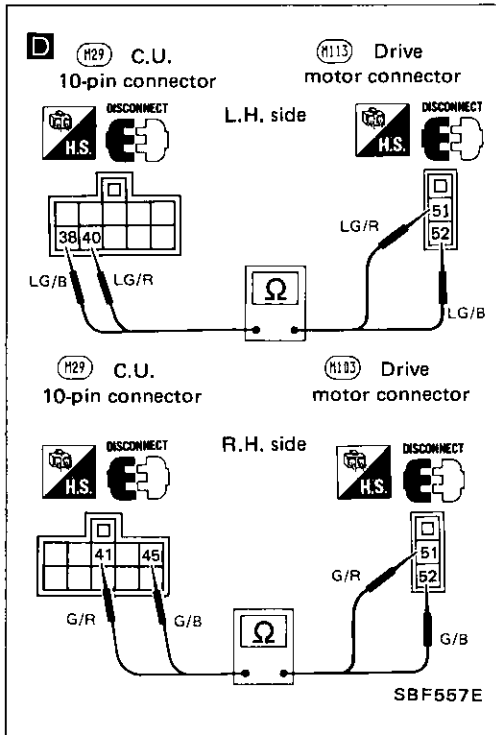
Replace drive motor assembly.

O.K.

Replace guide rail assembly.

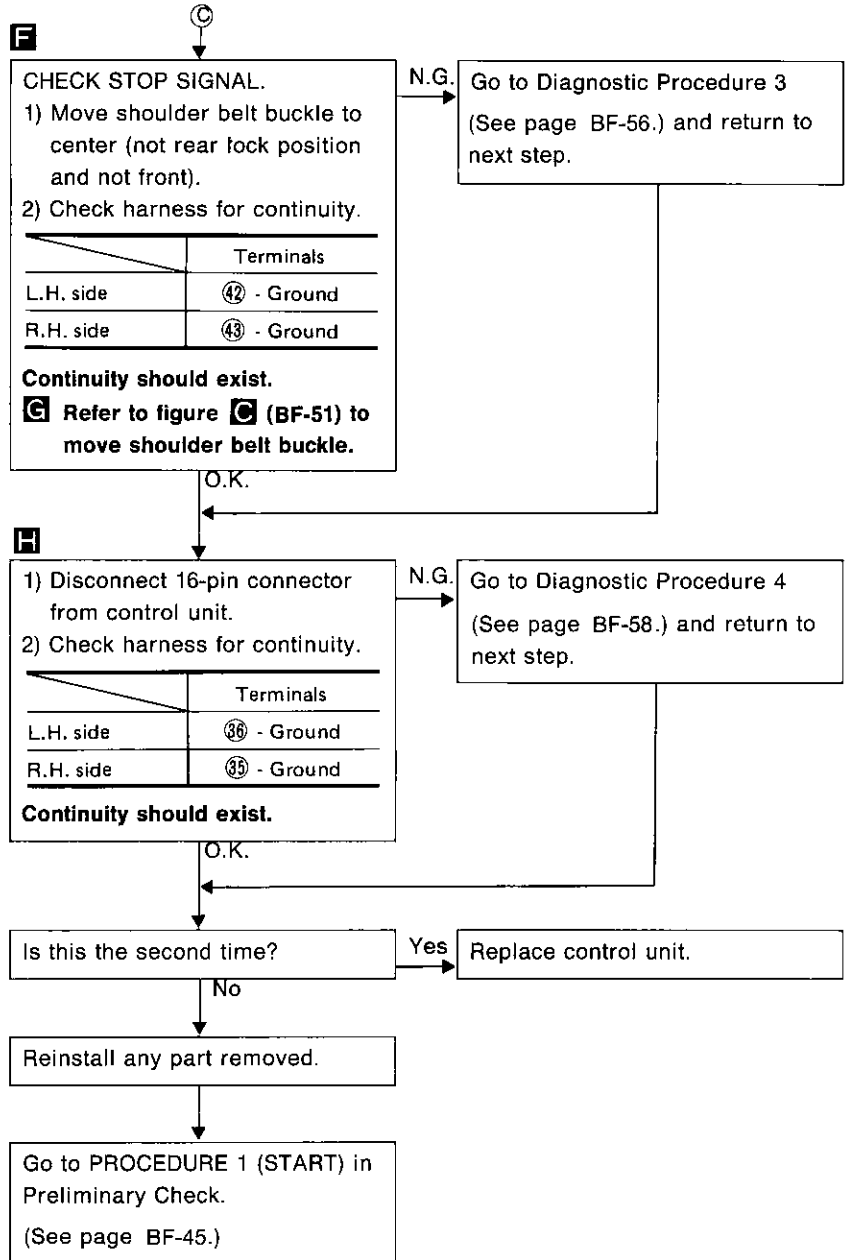
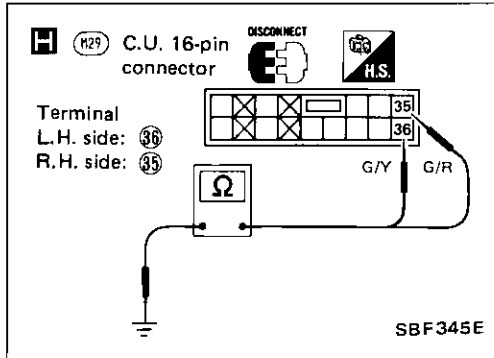
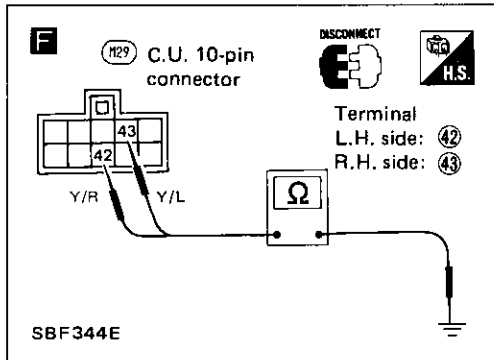
# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Diagnostic Procedure 1 (Cont'd)



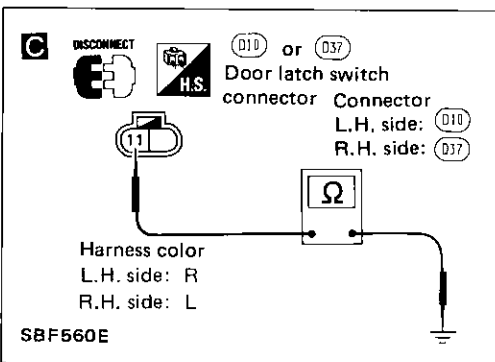
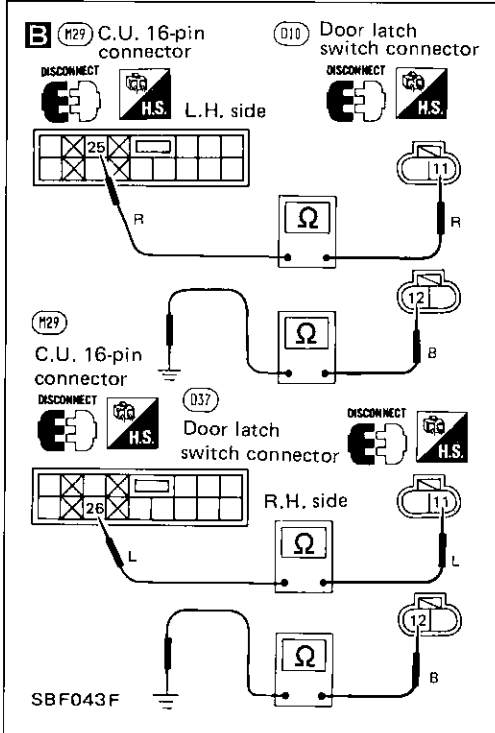
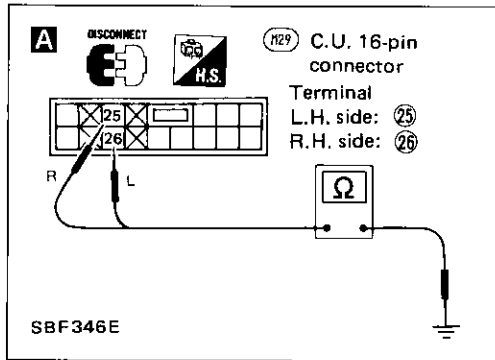
# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Diagnostic Procedure 1 (Cont'd)



# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Diagnostic Procedure 2



START

**A**

CHECK DOOR SWITCH CIRCUIT.

- 1) Disconnect 16-pin connector from control unit.
- 2) Check continuity.

|              | Ter-<br>minals | Door<br>condition | Con-<br>tinuity |
|--------------|----------------|-------------------|-----------------|
| L.H.<br>side | 25 -<br>Ground | Open              | Yes             |
|              |                | Close             | No              |
| R.H.<br>side | 26 -<br>Ground | Open              | Yes             |
|              |                | Close             | No              |

O.K.

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

N.G.

**B**

- 1) Disconnect door latch switch connector.
- 2) Check continuity.

|              | Terminals                          |
|--------------|------------------------------------|
| L.H.<br>side | 25 - 11<br>12 - Ground (M40, M120) |
| R.H.<br>side | 26 - 11<br>12 - Ground (M40, M120) |

Continuity should exist.

N.G.

Repair harness.

O.K.

**C**

Does continuity exist?

|           | Connector | Terminals   |
|-----------|-----------|-------------|
| L.H. side | (D10)     | 11 - Ground |
| R.H. side | (D37)     | 11 - Ground |

Yes

Repair harness.

There will be incorrect grounding between terminals 25 and 11 or 26 and 11.

No

Go to DOOR LATCH SWITCH in Electrical Components Inspection. (See page BF-66.)

O.K.

Reinstall any part removed.

N.G.

Go to PROCEDURE 1 (START) in Preliminary Check. (See page BF-45.)

Check door latch switch harness for open and short circuit.

N.G.

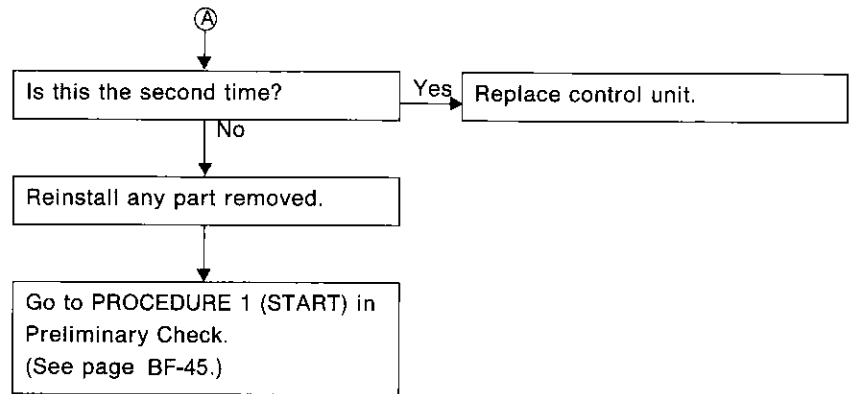
Repair door latch switch harness.

O.K.

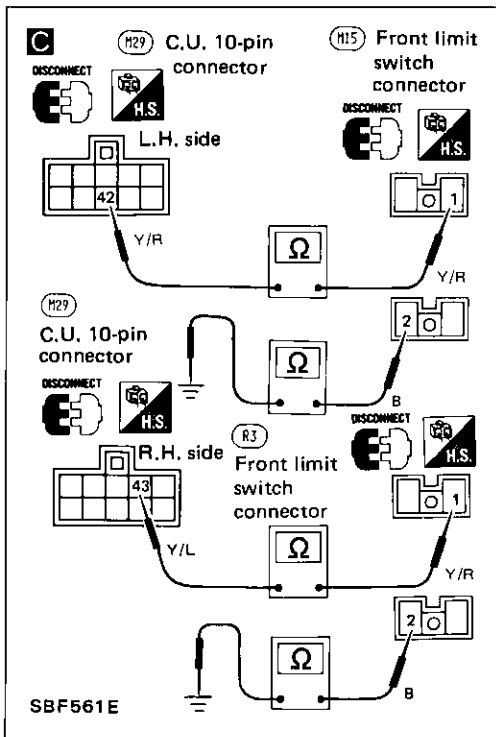
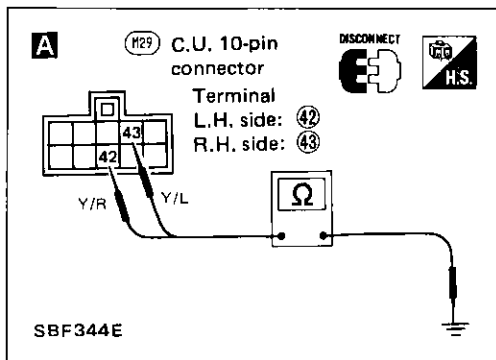
Replace door lock assembly.

## AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

### Diagnostic Procedure 2 (Cont'd)



## Diagnostic Procedure 3



START

**A**

CHECK FRONT LIMIT SWITCH CIRCUIT.

- 1) Disconnect 10-pin connector from control unit.
- 2) Check continuity.

O.K.

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

|              | Ter-<br>minals | Shoulder<br>belt<br>buckle<br>position | Con-<br>tinuity |
|--------------|----------------|----------------------------------------|-----------------|
| L.H.<br>side | ④② -<br>Ground | At front                               | No              |
|              |                | Not<br>at front                        | Yes             |
| R.H.<br>side | ④③ -<br>Ground | At front                               | No              |
|              |                | Not<br>at front                        | Yes             |

**B** Refer to figure **C** (BF-51) to move shoulder belt buckle.

N.G.

**C**

- 1) Disconnect connector from front limit switch.
- 2) Check continuity.

N.G.

Repair harness.

|              | Terminals              |
|--------------|------------------------|
| L.H.<br>side | ④② - ①                 |
|              | ② - Ground (M40, M120) |
| R.H.<br>side | ④③ - ①                 |
|              | ② - Ground (M40, M120) |

Continuity should exist.

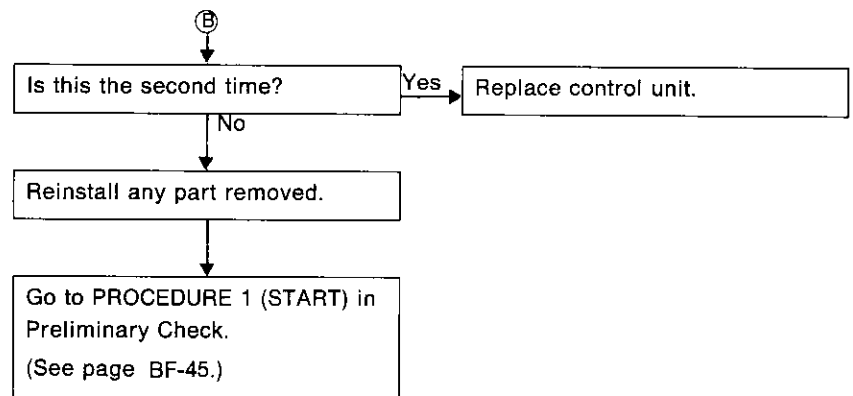
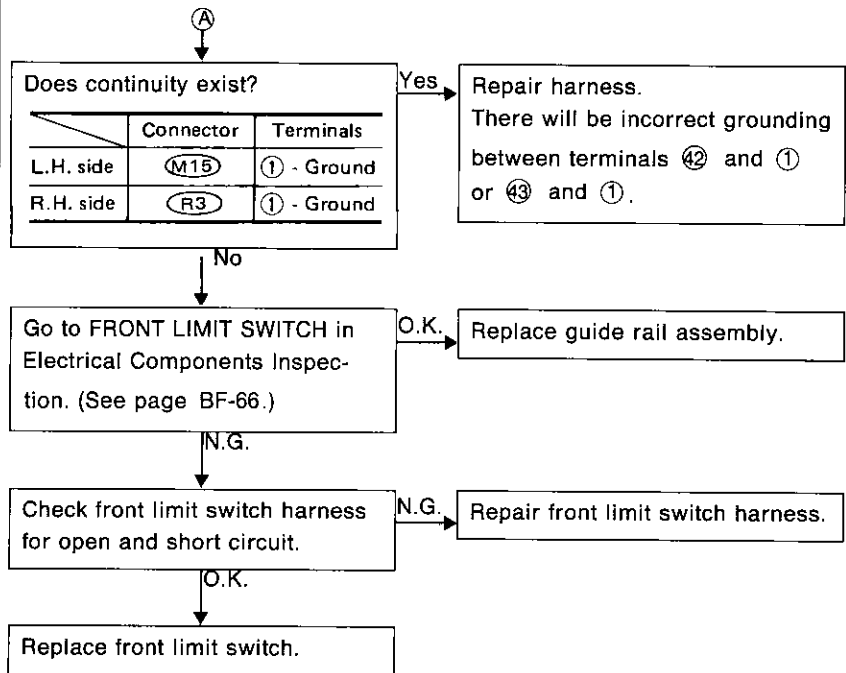
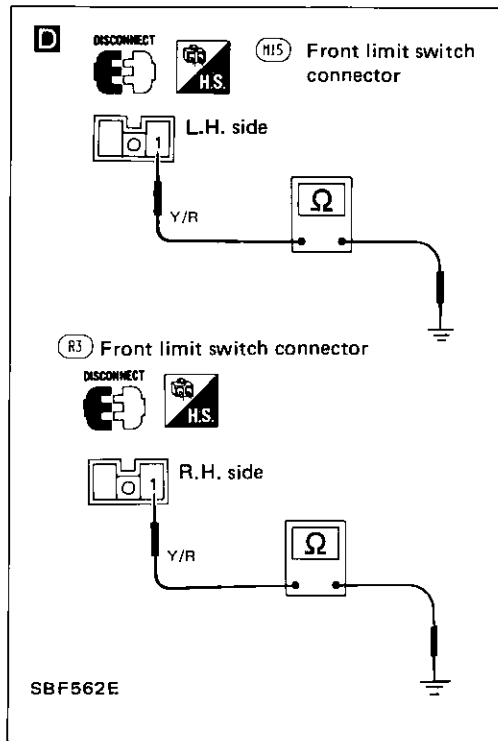
O.K.

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

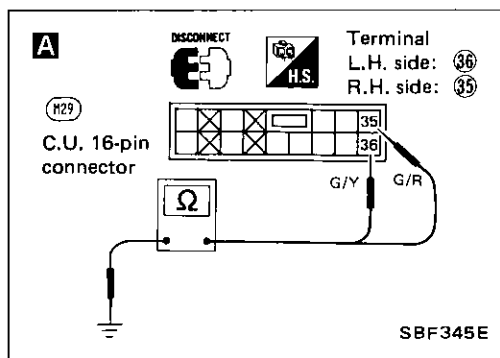


# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Diagnostic Procedure 3 (Cont'd)



## Diagnostic Procedure 4



START

**A**

### CHECK REAR LIMIT SWITCH CIRCUIT.

- 1) Disconnect 16-pin connector from control unit.
- 2) Check continuity.

O.K.

(Go to ⑤ on next page.)

|              | Ter-<br>minals | Shoulder<br>belt<br>buckle<br>position | Con-<br>tinuity |
|--------------|----------------|----------------------------------------|-----------------|
| L.H.<br>side | ③⑥ -<br>Ground | At rear                                | No              |
|              |                | Not<br>at rear                         | Yes             |
| R.H.<br>side | ③⑤ -<br>Ground | At rear                                | No              |
|              |                | Not<br>at rear                         | Yes             |

**B** Refer to figure ③ (BF-51) to move shoulder belt buckle.

N.G.

**C**

- 1) Disconnect connector from rear switch assembly.
- 2) Check continuity.

N.G.

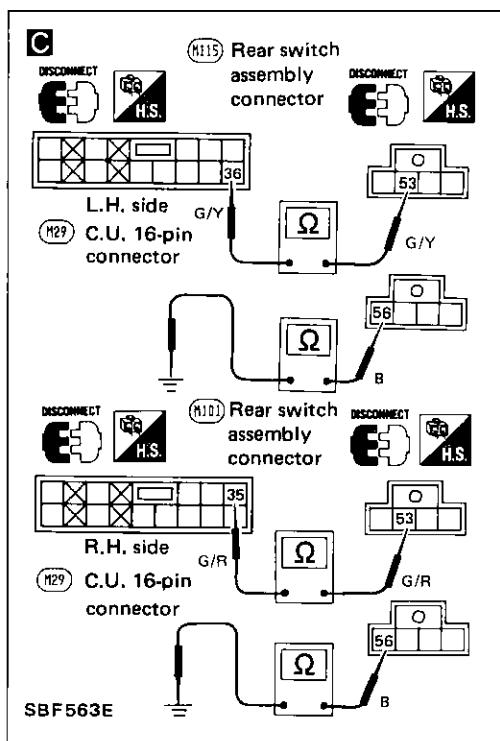
Repair harness.

|              | Terminals                  |
|--------------|----------------------------|
| L.H.<br>side | ③⑥ - ⑤③                    |
|              | ⑤⑥ - Ground ( ①④④ , ①①②① ) |
| R.H.<br>side | ③⑤ - ⑤③                    |
|              | ⑤⑥ - Ground ( ①④④ , ①①②① ) |

Continuity should exist.

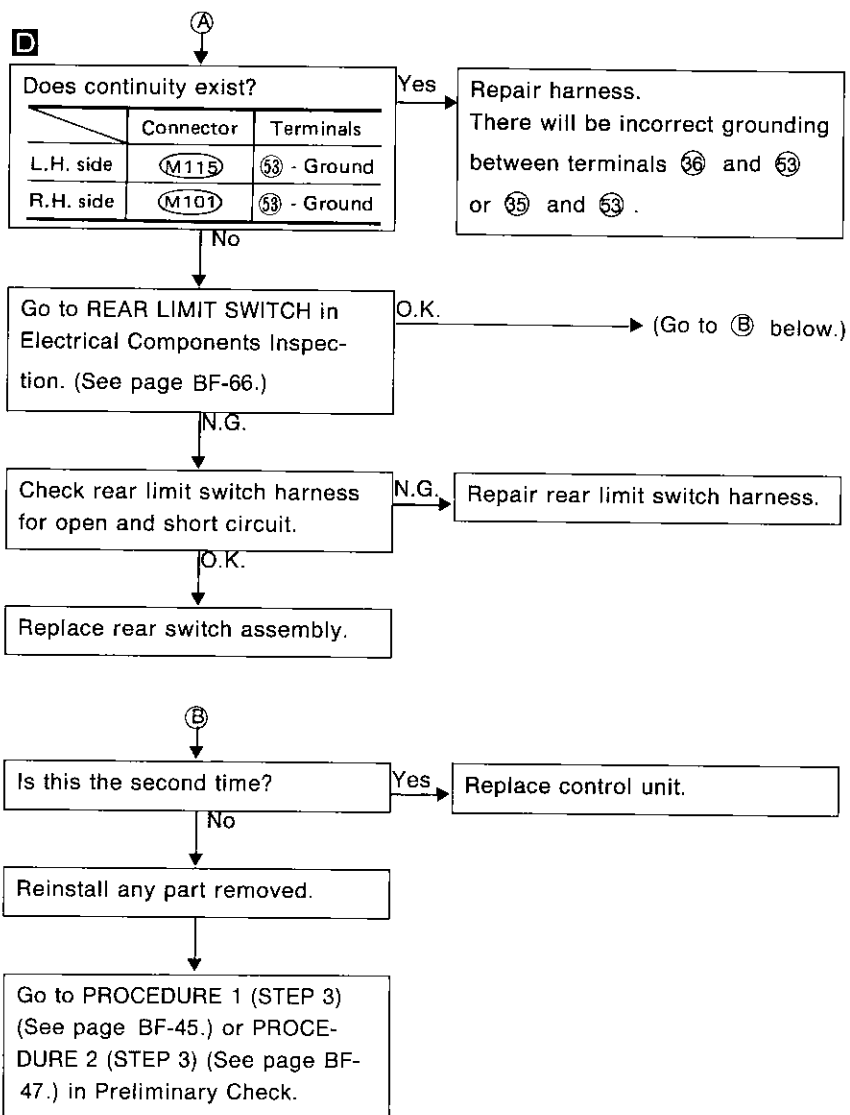
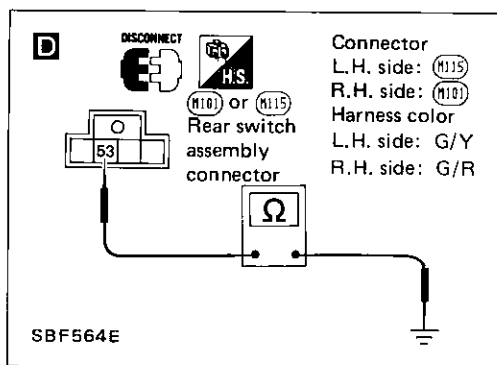
O.K.

(Go to ① on next page.)

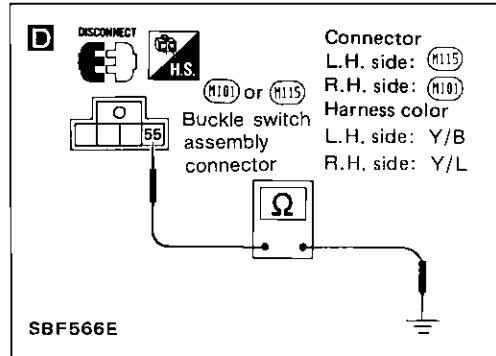
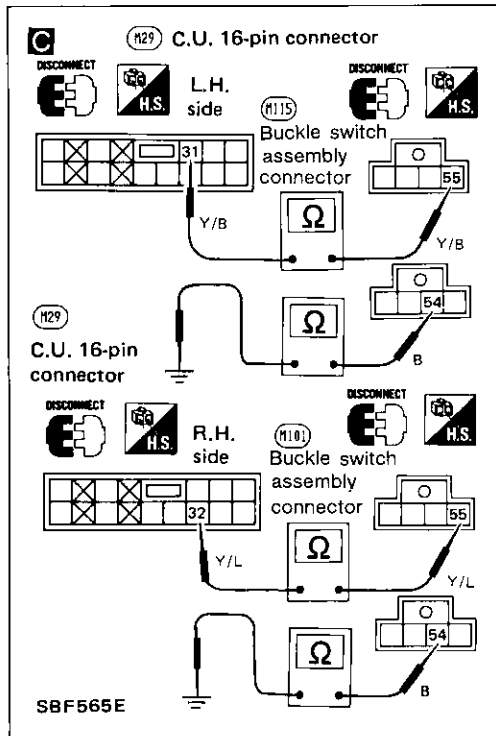
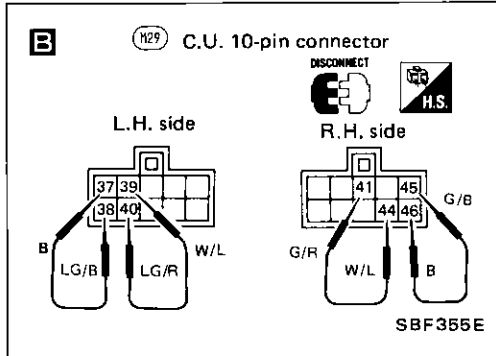
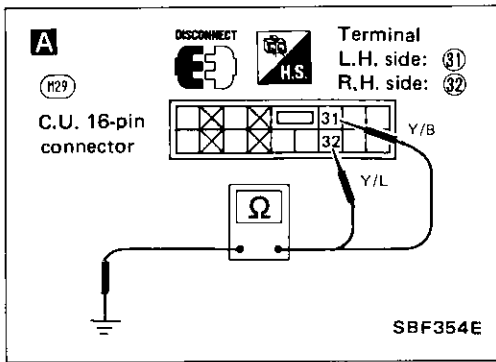


# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Diagnostic Procedure 4 (Cont'd)



## Diagnostic Procedure 5



START

**A**

CHECK SHOULDER BELT BUCKLE SWITCH CIRCUIT.

- 1) Disconnect 16-pin connector from control unit.
- 2) Check continuity when shoulder belt buckle is at rear lock position.

O.K.

→ (Go to **B** on next page.)

|              | Ter-<br>minals | Shoulder<br>belt   | Con-<br>tinuity |
|--------------|----------------|--------------------|-----------------|
| L.H.<br>side | ③1 -<br>Ground | Fasten<br>Unfasten | Yes<br>No       |
| R.H.<br>side | ③2 -<br>Ground | Fasten<br>Unfasten | Yes<br>No       |

**B** If shoulder belt buckle is not at rear lock position, check drive motor operation.

N.G.

**C**

- 1) Disconnect connector from rear switch assembly.
- 2) Check continuity.

N.G.

Repair harness.

|              | Terminals                          |
|--------------|------------------------------------|
| L.H.<br>side | ③1 - ⑤⑤<br>⑤④ - Ground (M40, M120) |
| R.H.<br>side | ③2 - ⑤⑤<br>⑤④ - Ground (M40, M120) |

Continuity should exist.

O.K.

**D**

Does continuity exist?

|           | Connector | Terminals   |
|-----------|-----------|-------------|
| L.H. side | ①115      | ⑤⑤ - Ground |
| R.H. side | ①101      | ⑤⑤ - Ground |

Yes

Repair harness.  
There will be incorrect grounding between terminals ③1 and ⑤⑤ or ③2 and ⑤⑤.

No

Go to SHOULDER BELT BUCKLE SWITCH in Electrical Components Inspection.  
(See page BF-66.)

O.K.

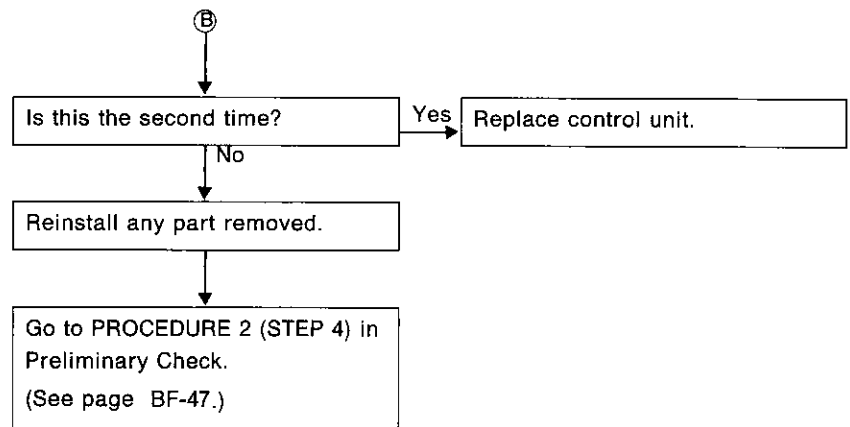
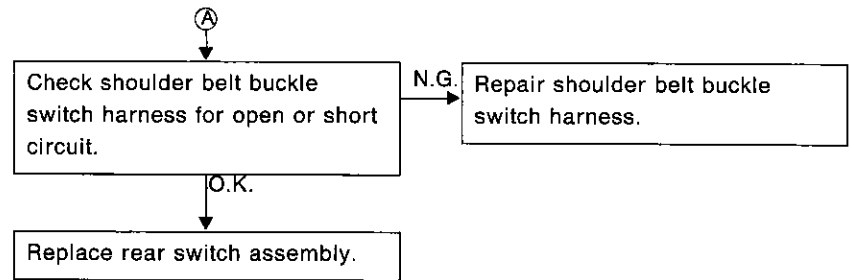
→ (Go to **B** on next page.)

N.G.

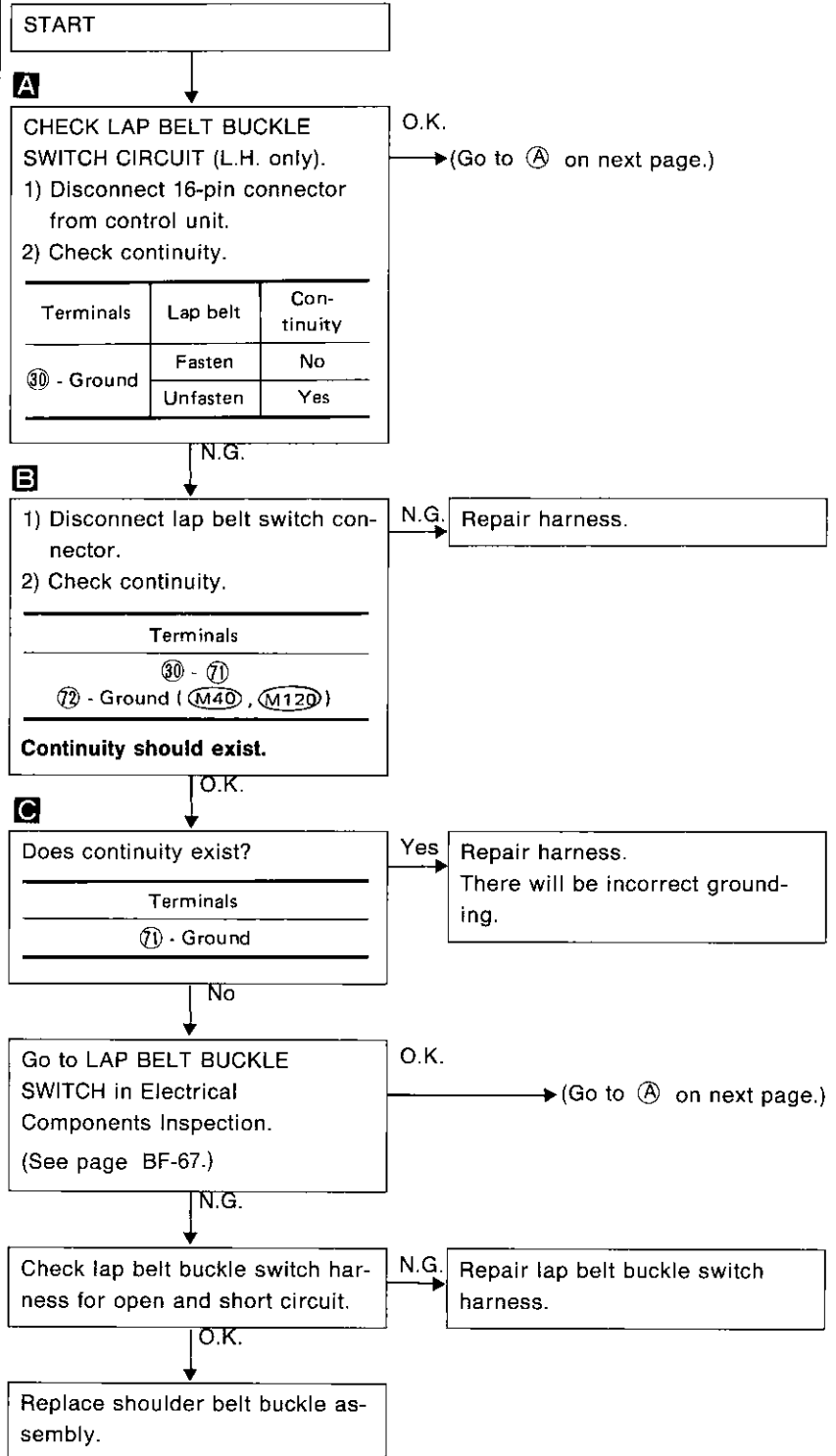
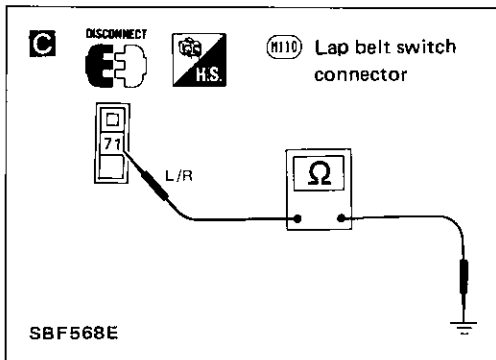
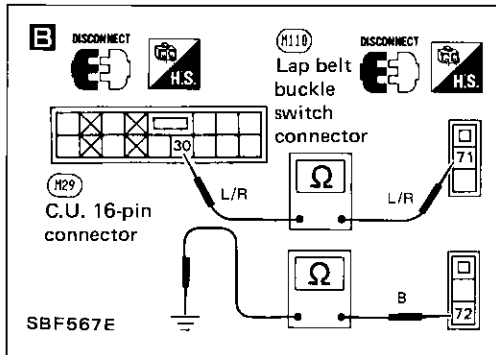
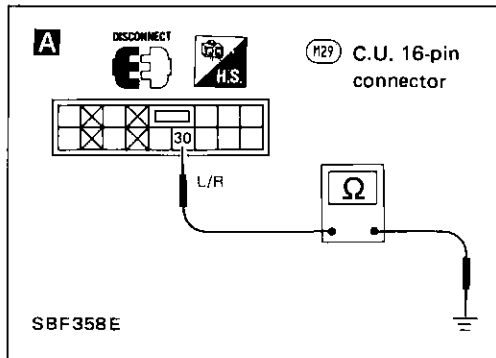
(Go to **A** on next page.)

## AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

### Diagnostic Procedure 5 (Cont'd)

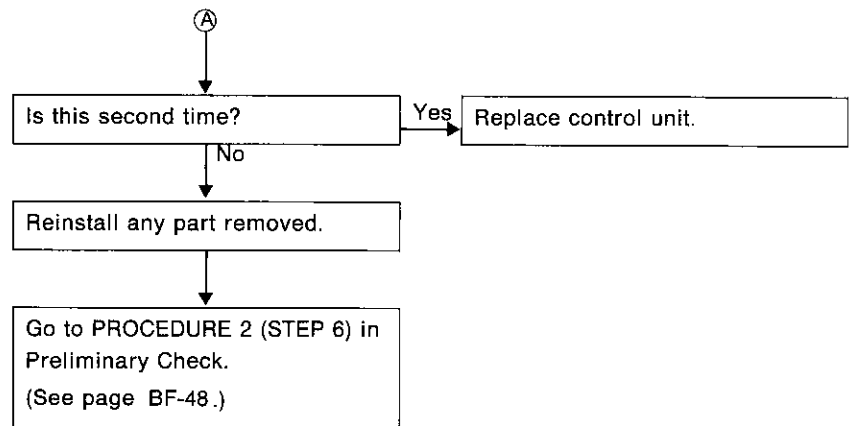


## Diagnostic Procedure 6



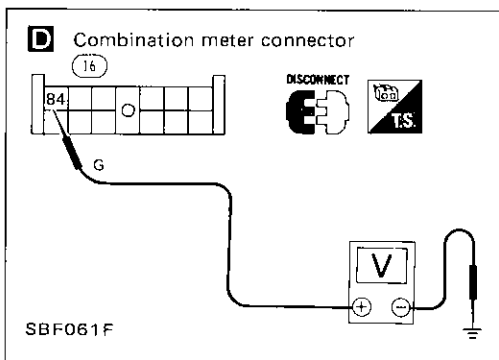
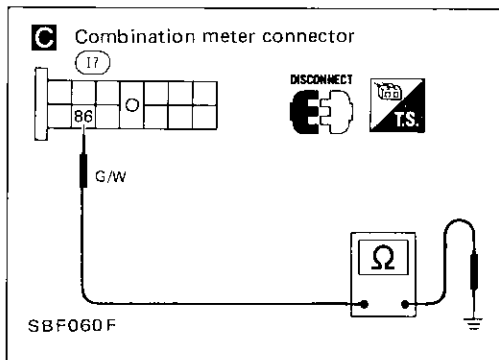
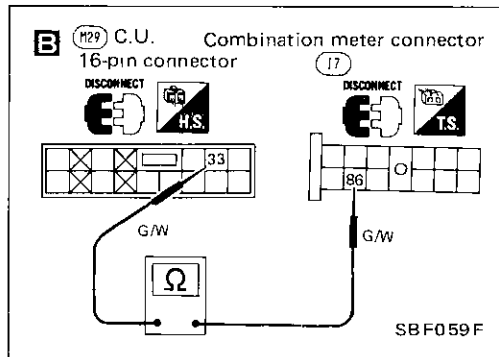
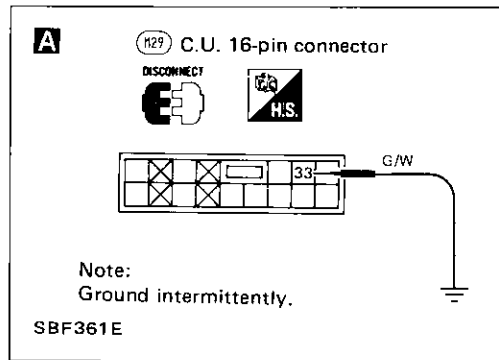
## AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

### Diagnostic Procedure 6 (Cont'd)



# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Diagnostic Procedure 7



START

**A** CHECK WARNING CHIME CIRCUIT.

- 1) Disconnect 16-pin connector from control unit.
- 2) Check warning chime.

| Terminals   | Method                 | Result |
|-------------|------------------------|--------|
| ③③ - Ground | Ground intermittently. | Sound  |

O.K.  
→ (Go to ① below.)

- B**
- 1) Disconnect connector(s) from combination meter.
  - 2) Check continuity.

| Terminals |
|-----------|
| ③③ - ⑥⑥   |

Continuity should exist.

N.G. → Repair harness.

**C** Does continuity exist?

| Terminals   |
|-------------|
| ⑥⑥ - Ground |

Yes → Repair harness.  
There will be incorrect grounding.

**D** Check battery voltage existence.

| Terminals   |
|-------------|
| ⑧④ - Ground |

Battery voltage should exist.

N.G. → Repair harness.  
For details, refer to POWER SUPPLY ROUTING in EL section.

Is this the first time?

Yes → Replace warning chime.

Is this the second time?

Yes → ① Replace control unit.

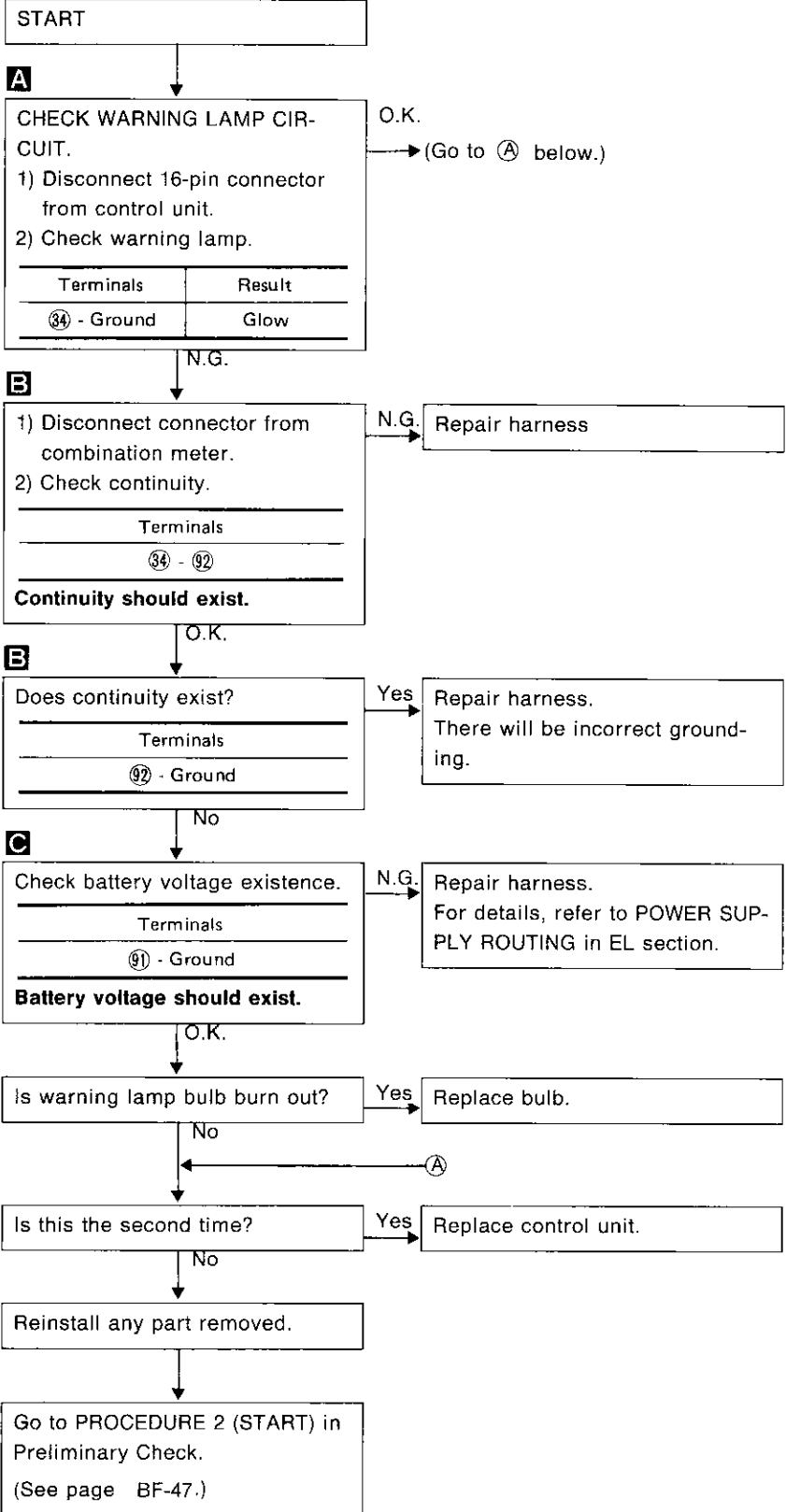
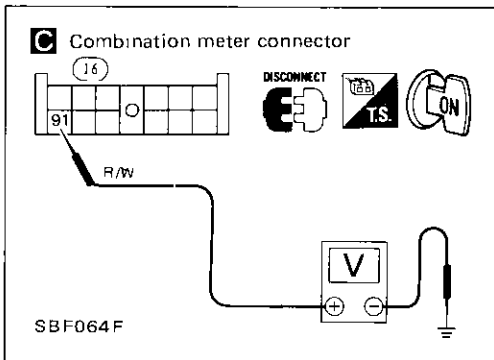
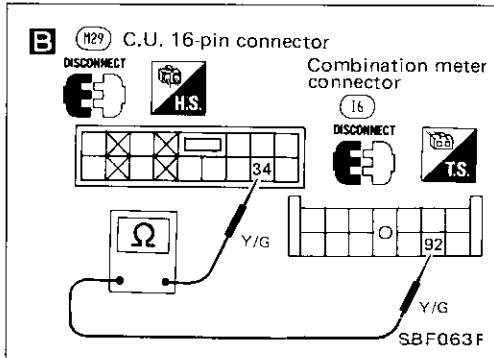
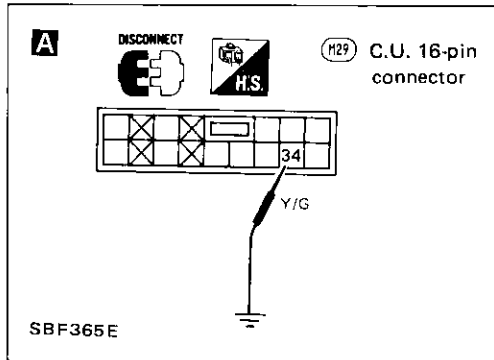
Reinstall any part removed.

Go to PROCEDURE 2 (START) in Preliminary Check.  
(See page BF-47.)

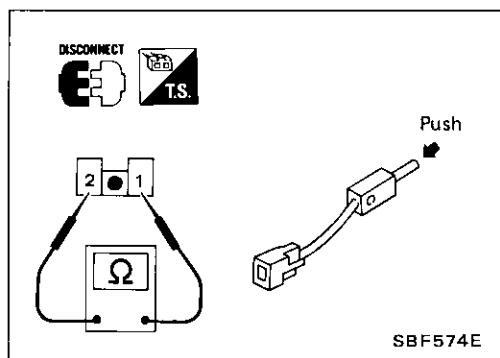


# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

## Diagnostic Procedure 8



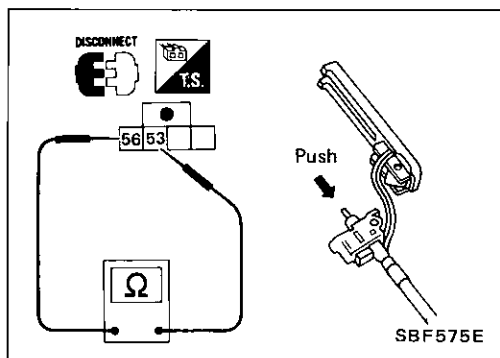
# AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses



## Electrical Components Inspection

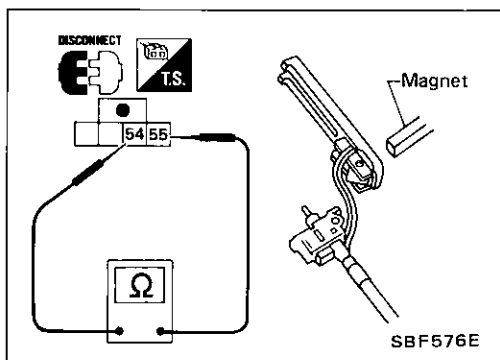
### FRONT LIMIT SWITCH

| Condition | Continuity |
|-----------|------------|
| Pushed    | No         |
| Released  | Yes        |



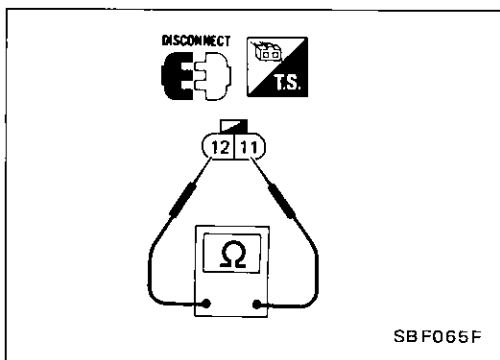
### REAR LIMIT SWITCH

| Condition | Continuity |
|-----------|------------|
| Pushed    | No         |
| Released  | Yes        |



### SHOULDER BELT BUCKLE SWITCH

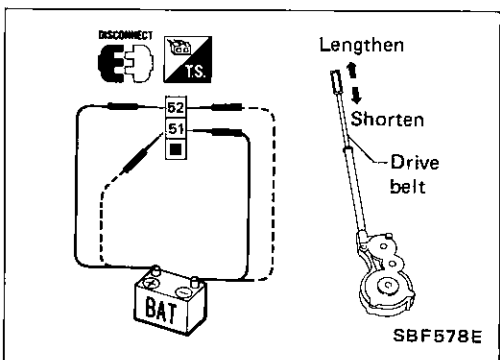
| Condition                            | Continuity |
|--------------------------------------|------------|
| Move magnet toward buckle switch.    | Yes        |
| Move magnet away from buckle switch. | No         |



### DOOR LATCH SWITCH

(Built-in door lock assembly)

| Door condition | Continuity |
|----------------|------------|
| Open           | Yes        |
| Closed         | No         |

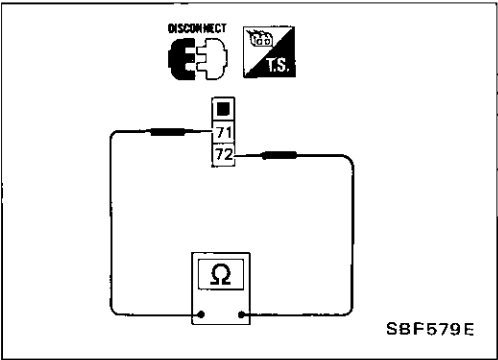


### DRIVE MOTOR ASSEMBLY

| Terminals |    | Drive belt operation |
|-----------|----|----------------------|
| ⊕         | ⊖  |                      |
| 52        | 51 | Lengthen             |
| 51        | 52 | Shorten              |

**Electrical Components Inspection (Cont'd)**  
**LAP BELT BUCKLE SWITCH**

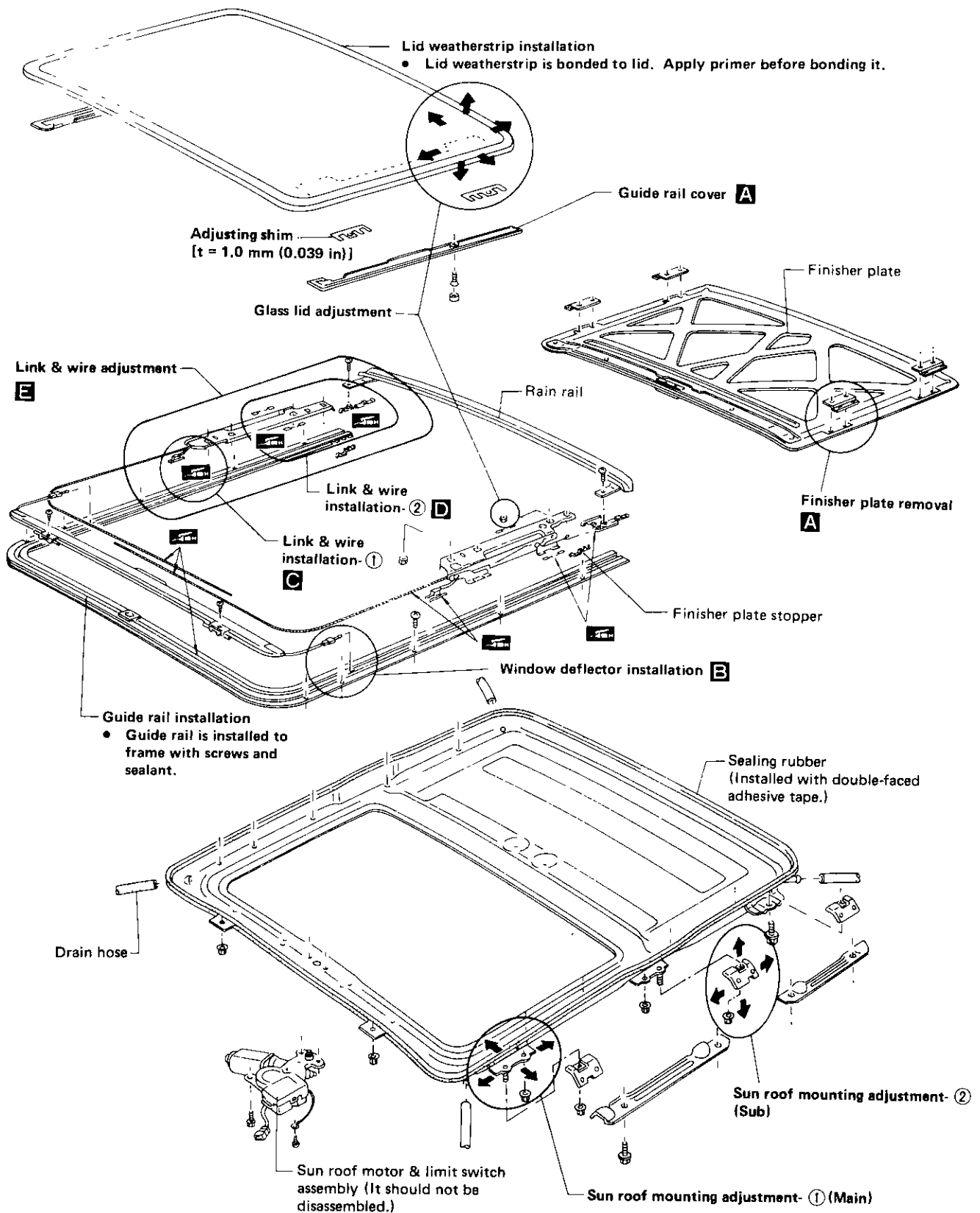
**(L.H. side only)**



| Condition  | Continuity |
|------------|------------|
| Fastened   | No         |
| Unfastened | Yes        |

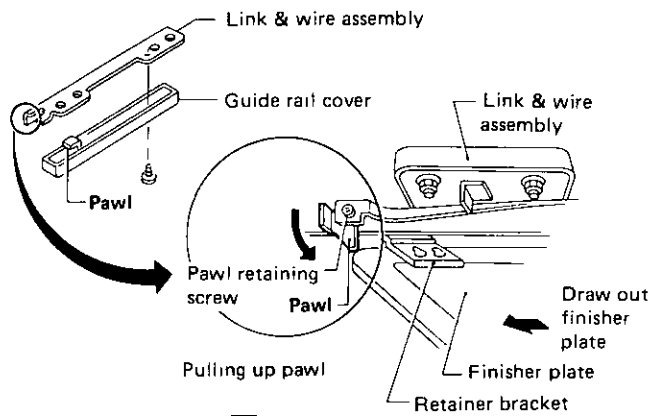
# SUN ROOF

- After any adjustment, check sun roof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to damage it.
- It is desirable for easy installation to mark each point before removal.

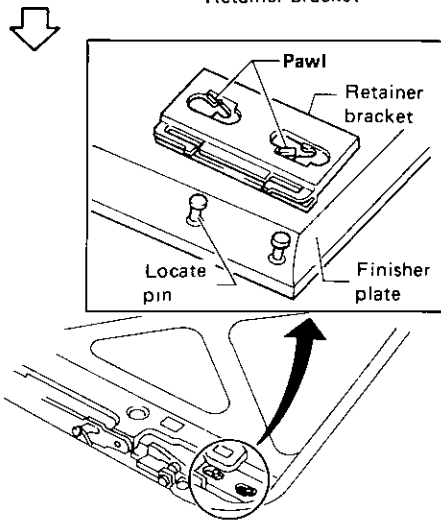


## Finisher plate removal **A**

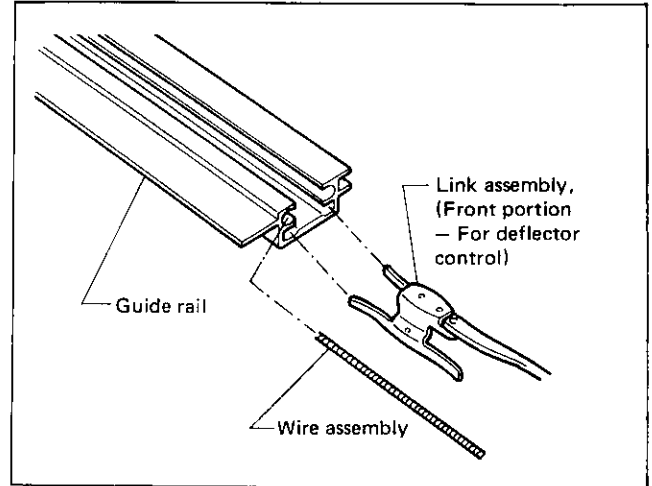
Remove guide rail cover and pull up pawl by loosening retaining screw, then draw out finisher plate with sun roof lid open.



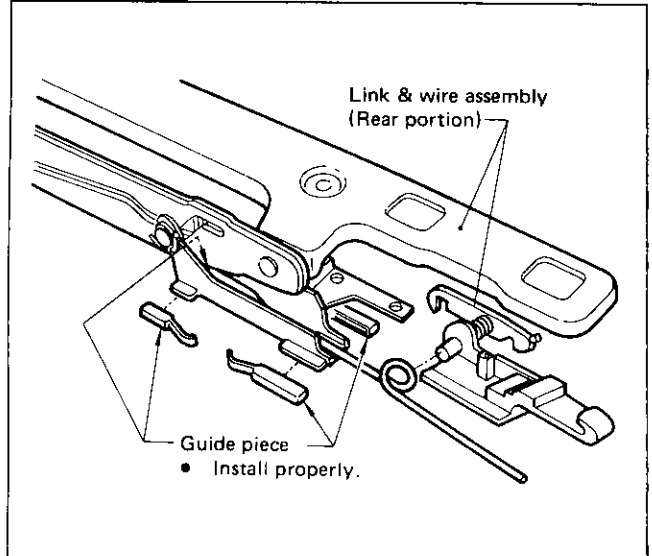
Removal:  
Raise pawl of retainer bracket, shift finisher plate and remove locate pins from retainer bracket. Then remove finisher plate.



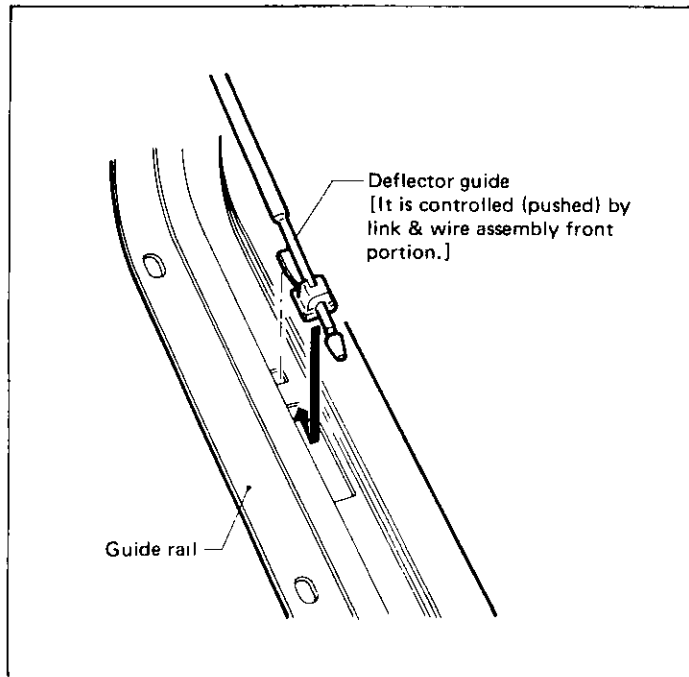
## Link & wire installation-① **C**



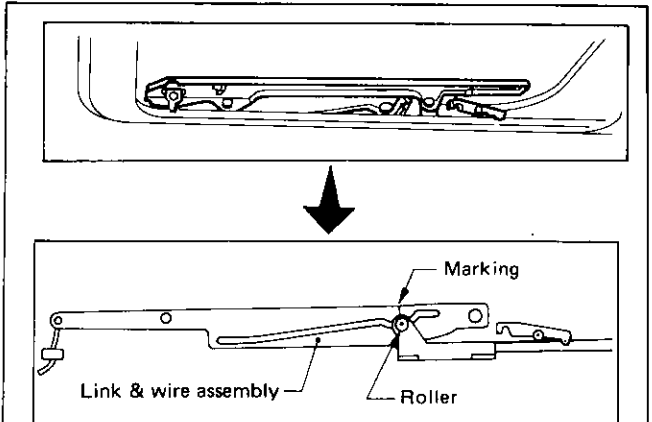
## Link & wire installation-② **D**



## Wind deflector installation **B**



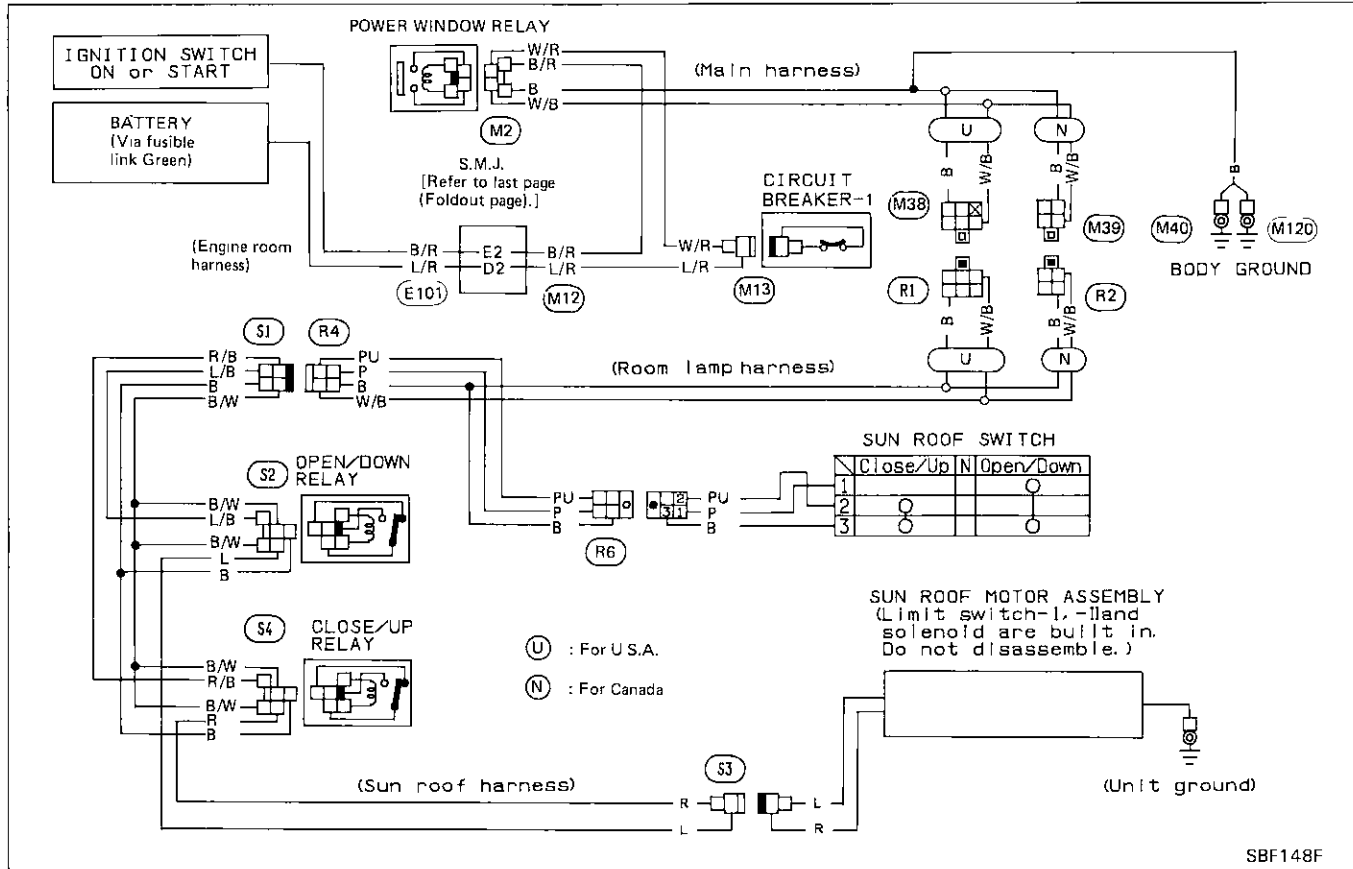
## Link & wire adjustment **E**



When installing motor & limit switch assembly, set motor & limit switch assembly to fully closed condition using the vehicle's harness and switch first. And adjust link & wire assembly's position as the roller line up at the marking. Then install the motor & limit switch assembly.

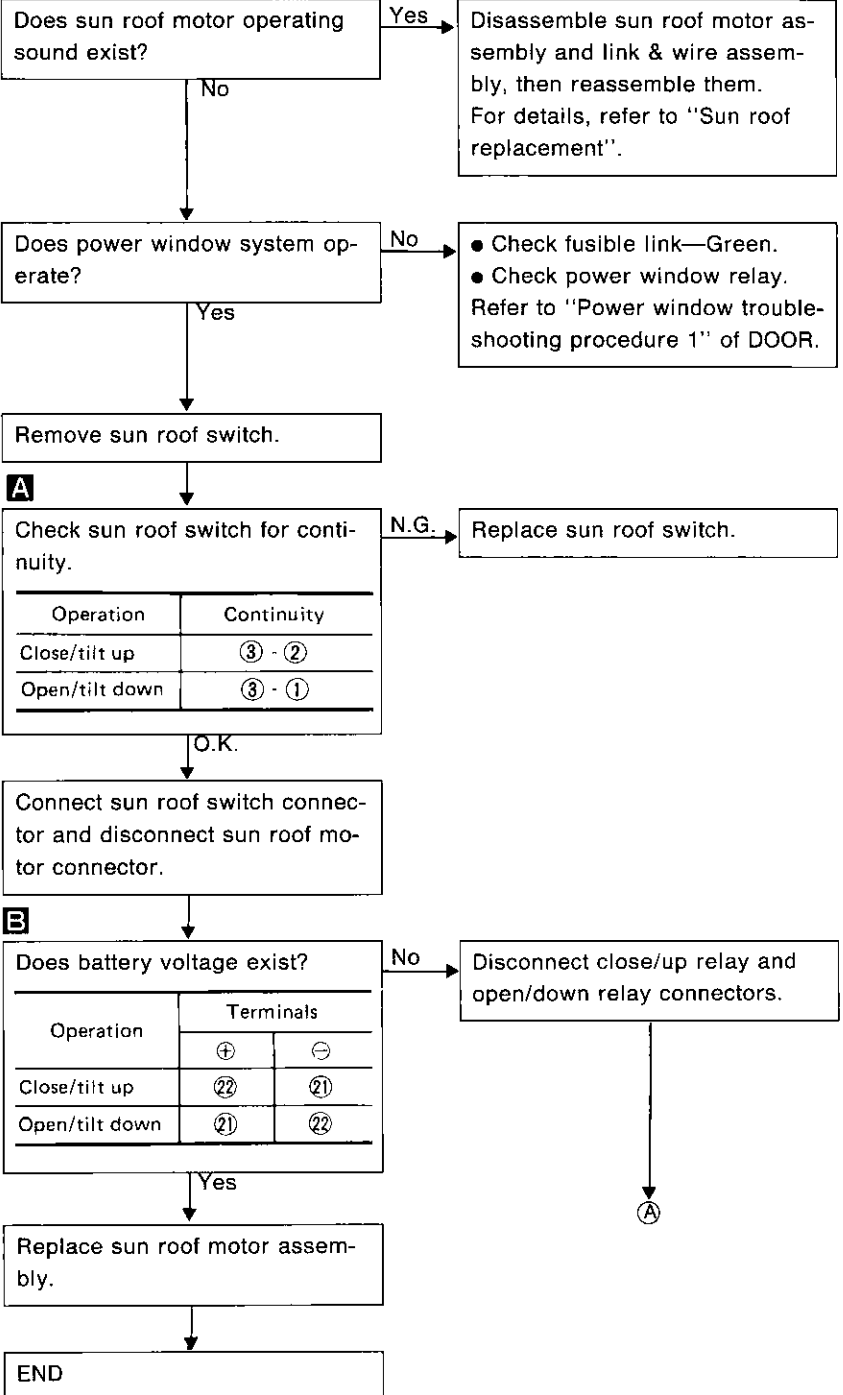
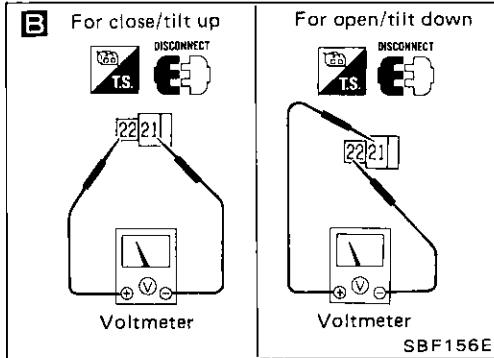
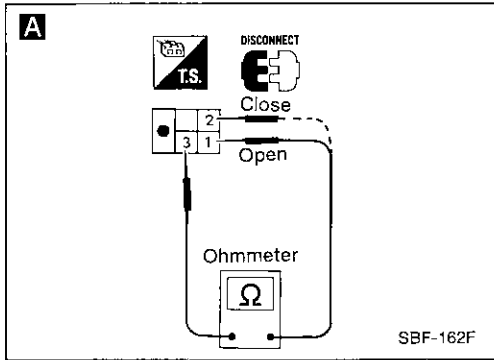
# SUN ROOF

## Wiring Diagram

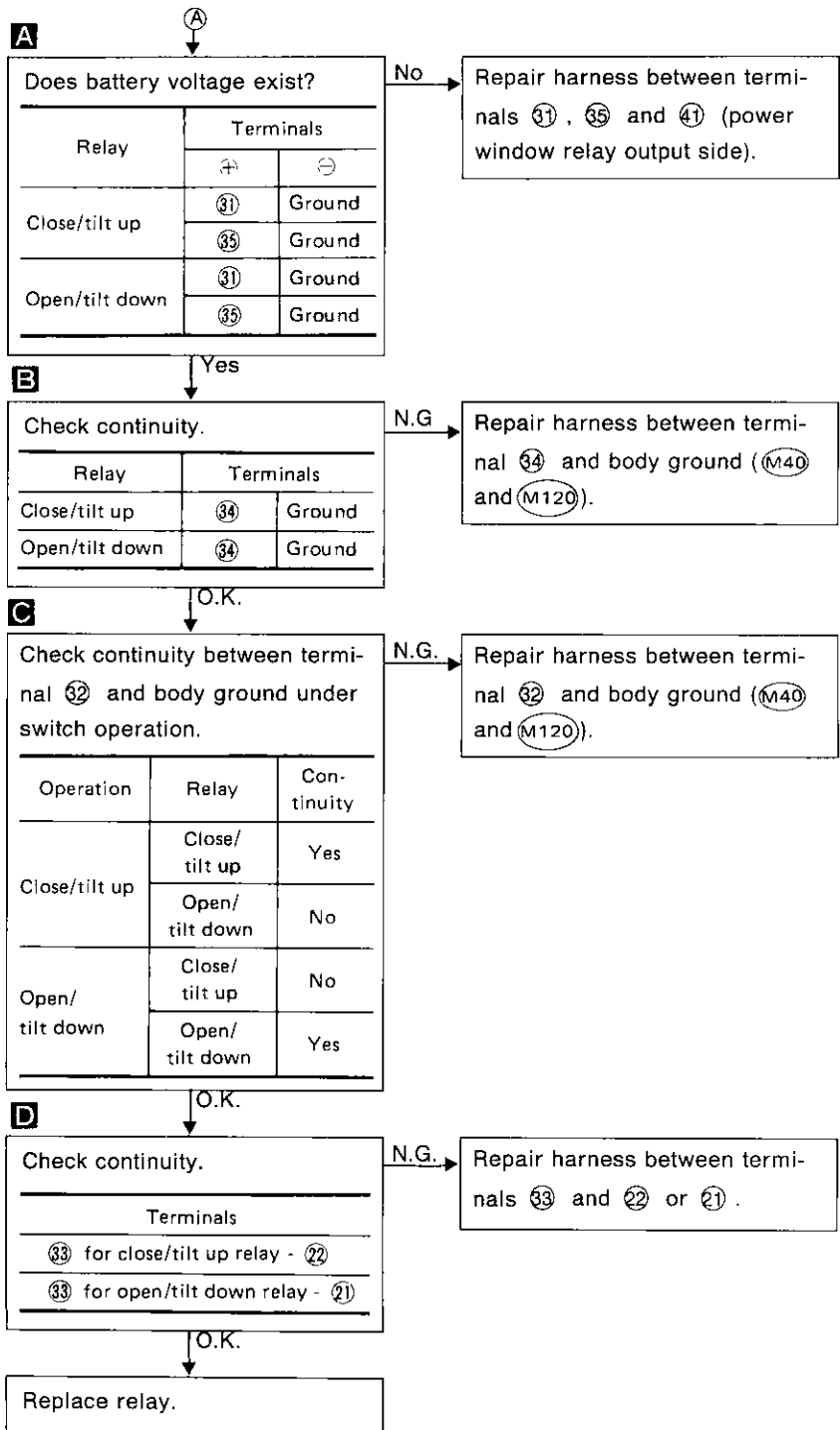
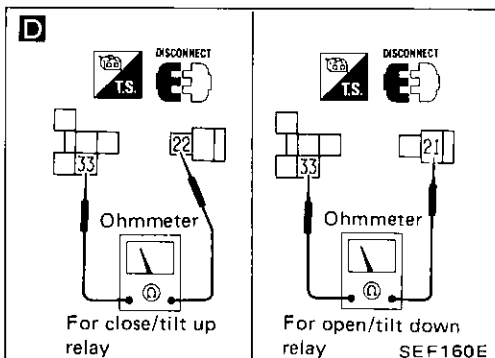
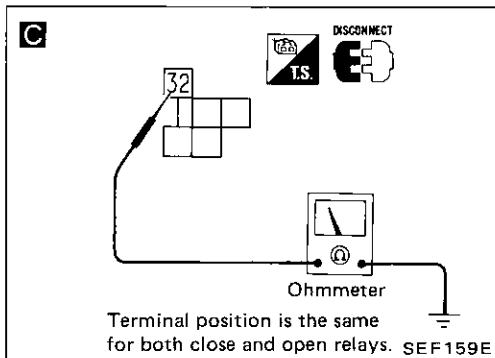
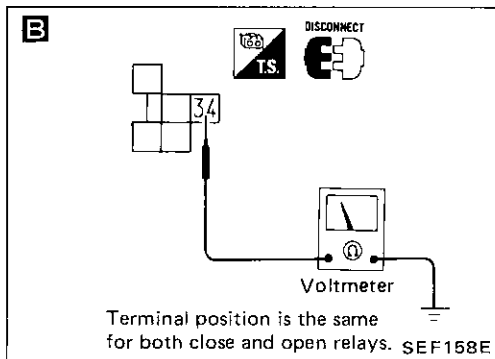
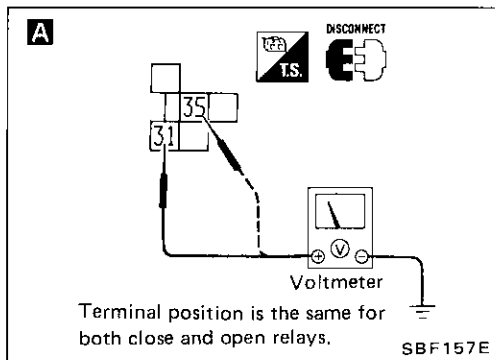


# SUN ROOF

## Sun Roof Trouble-shooting



## Sun Roof Trouble-shooting (Cont'd)



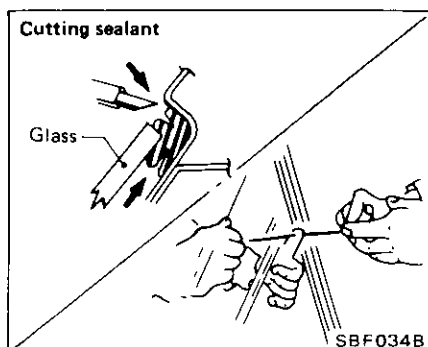


# WINDSHIELD AND WINDOWS

## Windshield and Rear Window

### REMOVAL

After removing moldings, remove glass.



### CAUTION:

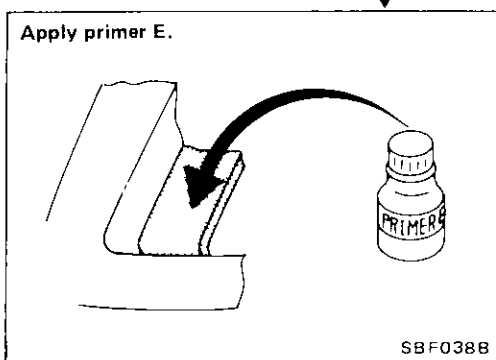
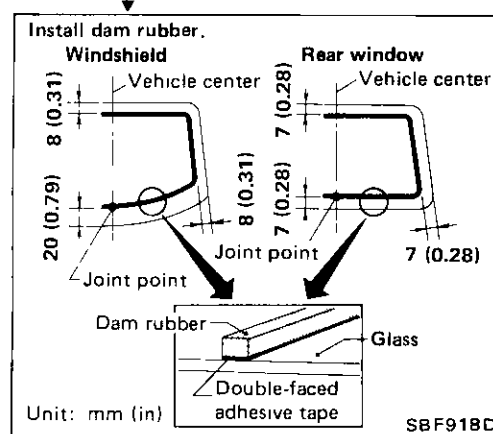
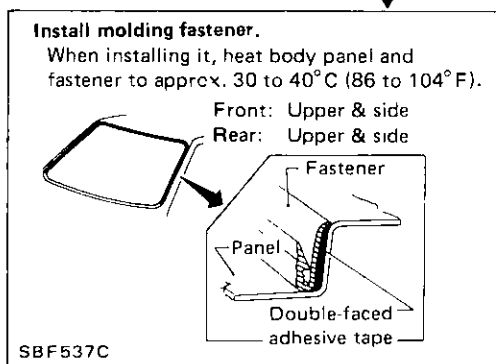
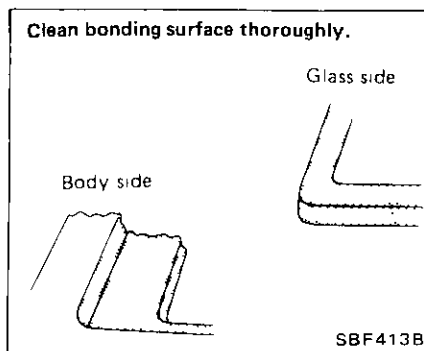
Be careful not to scratch glass when removing.

### INSTALLATION

- Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.
- After installation, the vehicle should remain stationary for about 24 hours.
- Do not use sealant which is more than 12 months past its production date.
- Do not leave cartridge unattended with its cap open.
- Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.

### WARNING:

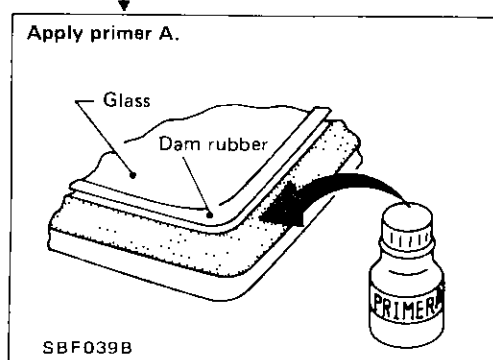
Keep heat or open flames away as primers are flammable.



### CAUTION:

Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

A



### CAUTION:

Do not apply primer A to windshield opening flanges.

B

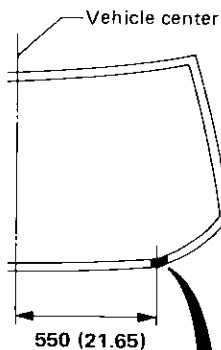
# WINDSHIELD AND WINDOWS

## Windshield and Rear Window (Cont'd)

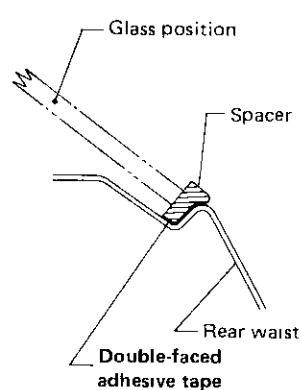
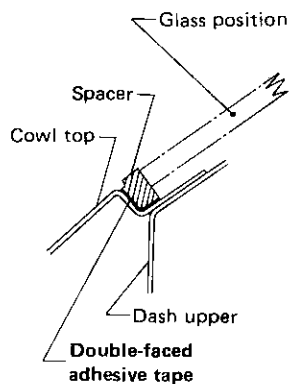
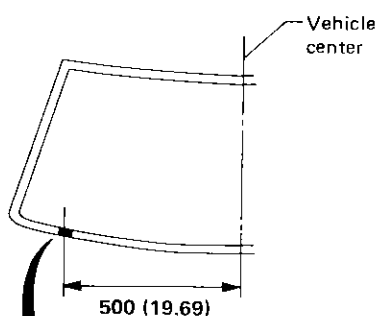
A

Install spacers with double-faced adhesive tape.

Windshield



Rear window



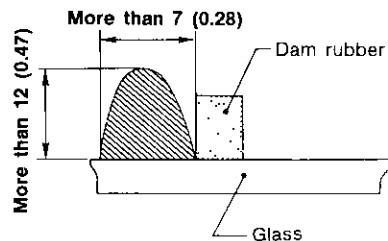
Unit: mm (in)

SBF117E

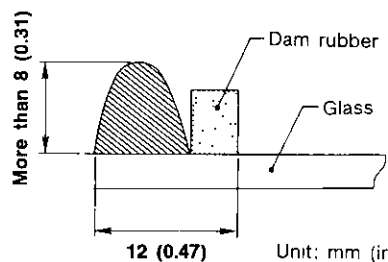
B

Apply sealant evenly.

Windshield



Rear window



Unit: mm (in)  
SBF097F

### CAUTION:

Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

Set glass in position and press glass lightly and evenly.

Check for water leakage.

Install moldings.

### CAUTION:

Molding must be installed securely so that it is in position and leaves no gap.

## WINDSHIELD AND WINDOWS

### Drying Time for Sealant

Reference: Time required for sealant to dry to desired hardness.

Unit: days

| Temperature °C (°F) | Relative humidity | Windshield |      |      | Rear window |      |      |
|---------------------|-------------------|------------|------|------|-------------|------|------|
|                     |                   | 90         | 50   | 25   | 90          | 50   | 25   |
| 40 (104)            |                   | 1.5        | 2.5  | 5.0  | 2.0         | 2.5  | 5.5  |
| 25 (77)             |                   | 2.5        | 4.0  | 7.5  | 2.5         | 4.5  | 8.0  |
| 5 (41)              |                   | 5.0        | 13.0 | 20.5 | 5.5         | 14.0 | 22.0 |

#### CAUTION:

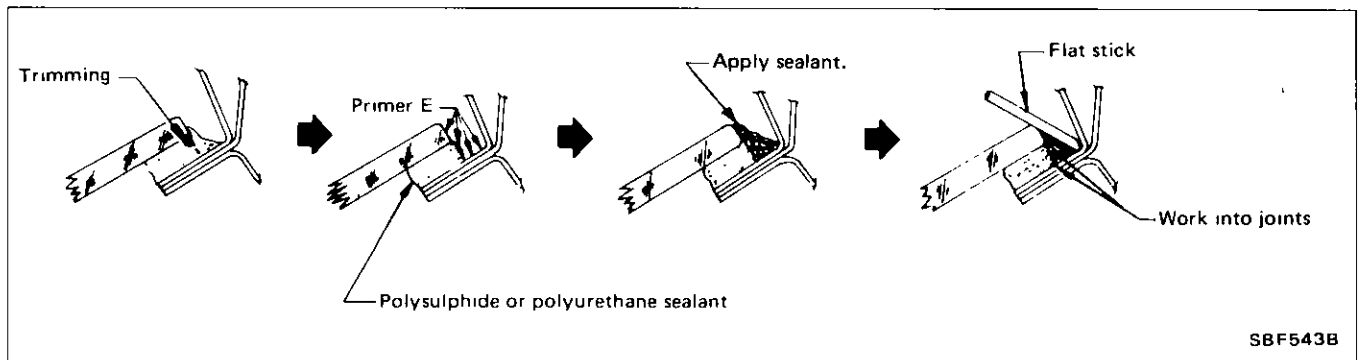
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

### Repairing Water Leaks for Windshield and Rear Window

Leaks can be repaired without removing and reinstalling glass.

If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

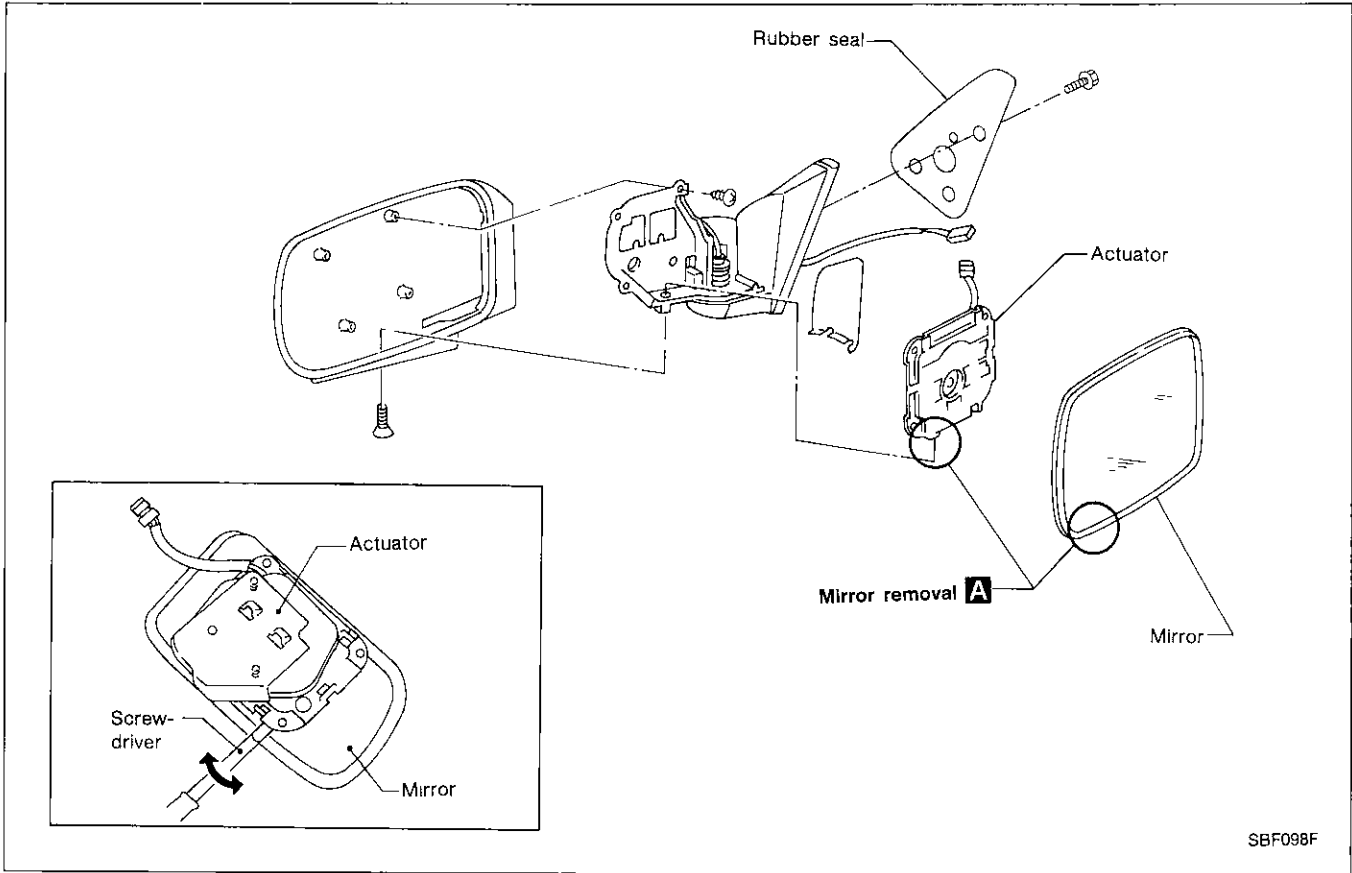
To stop the leak, apply primer and then sealant to the leak point.



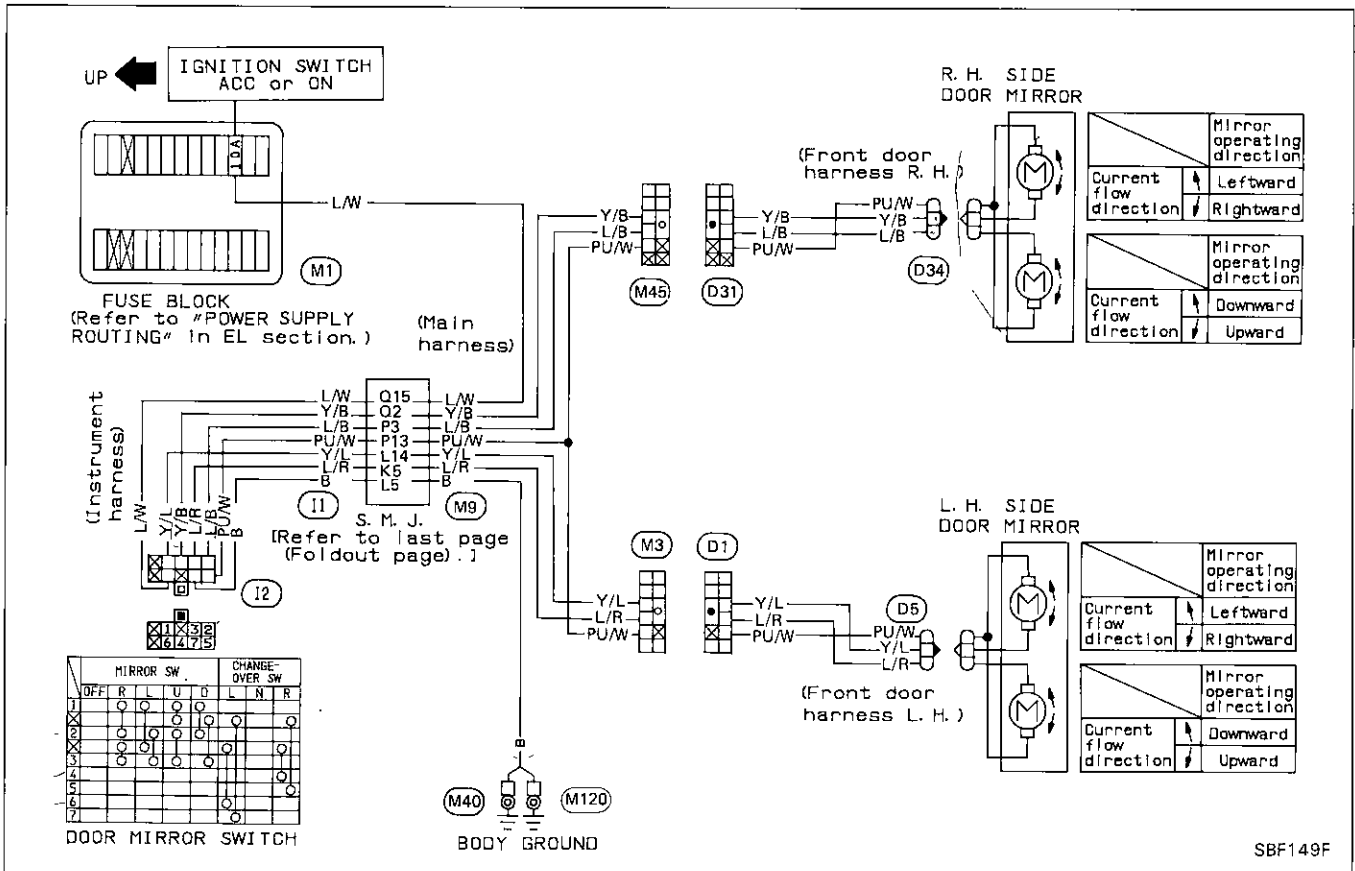
Afterwards, install molding securely.

# MIRROR

## Door Mirror

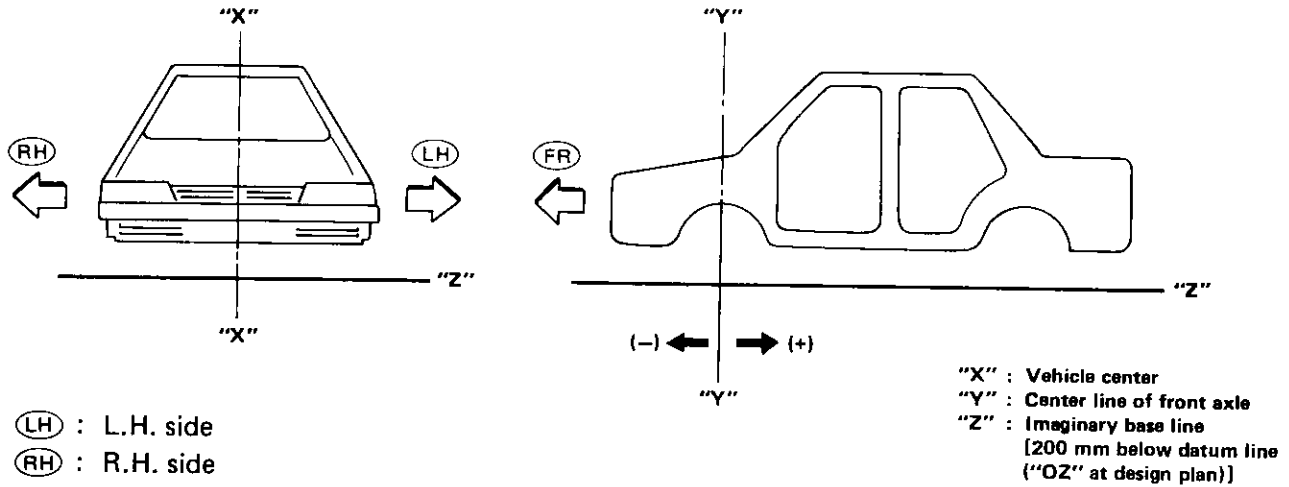


## WIRING DIAGRAM



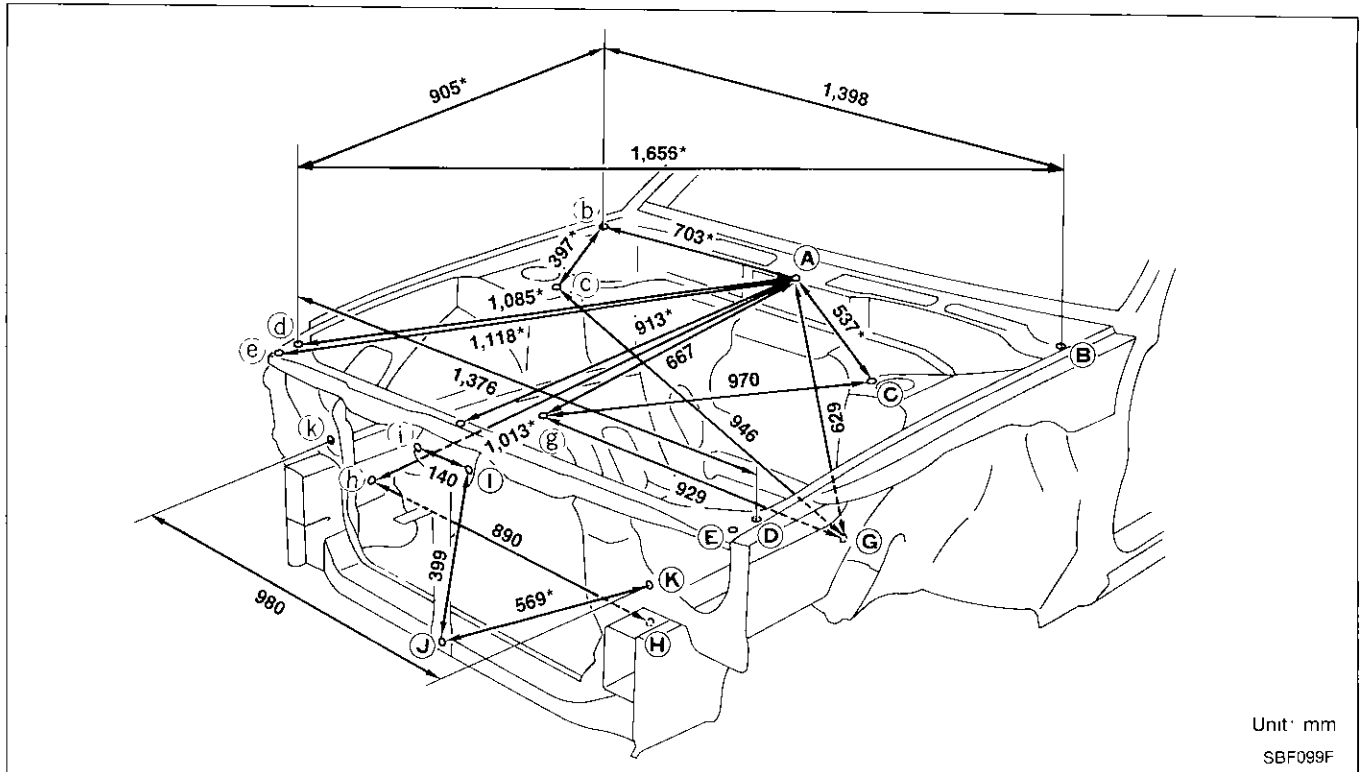
## BODY ALIGNMENT

- All dimensions indicated in figures are actual ones.
- When a tram tracking gauge is used, adjust both pointers to equal length and check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (\*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- The coordinates of the measurement points are the distances measured from the standard line of "X", "Y" and "Z".



## Engine Compartment

### MEASUREMENT



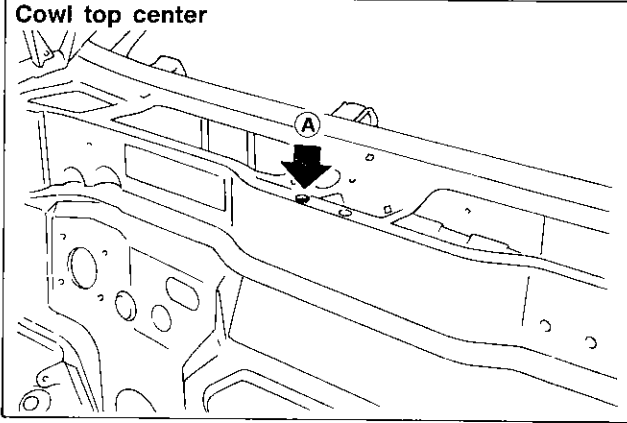
# BODY ALIGNMENT

## Engine Compartment (Cont'd)

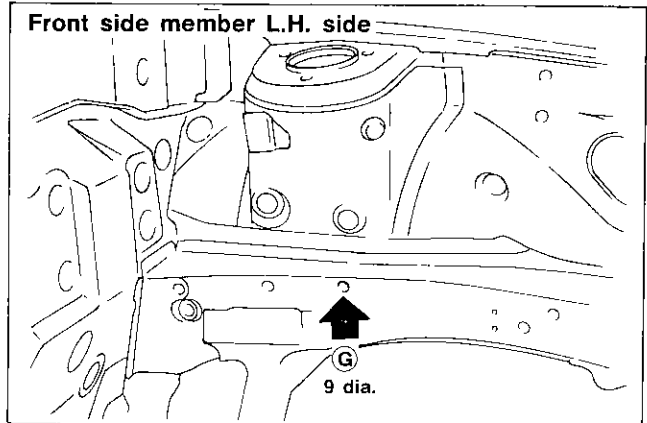
### MEASUREMENT POINTS

Unit: mm

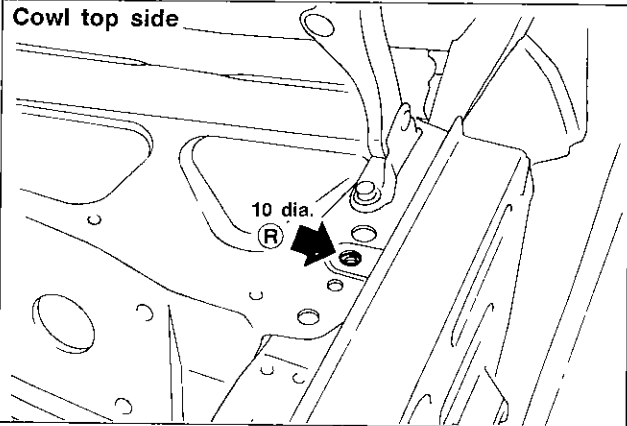
Cowl top center



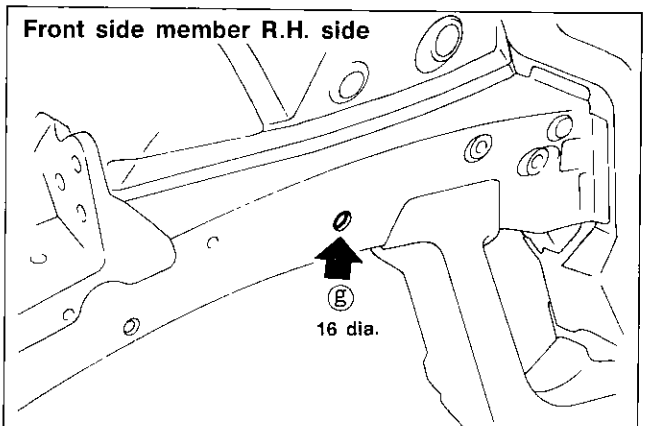
Front side member L.H. side



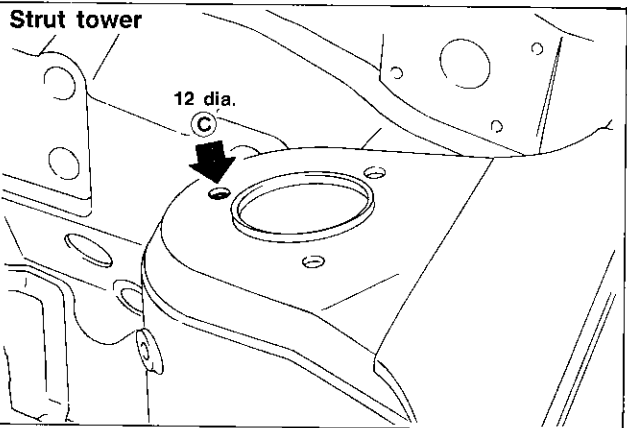
Cowl top side



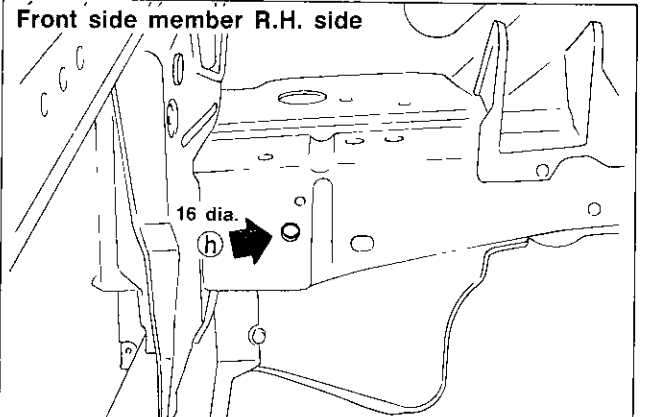
Front side member R.H. side



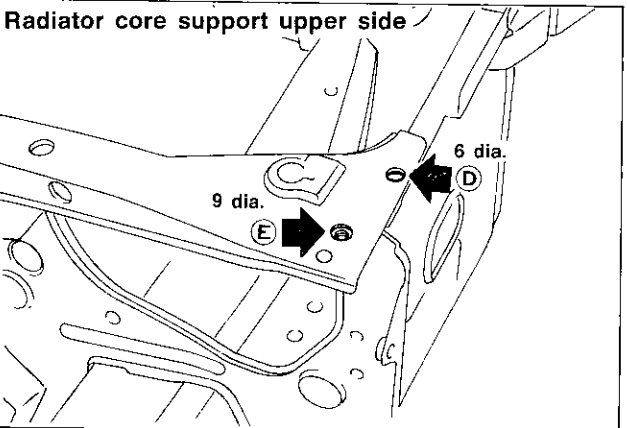
Strut tower



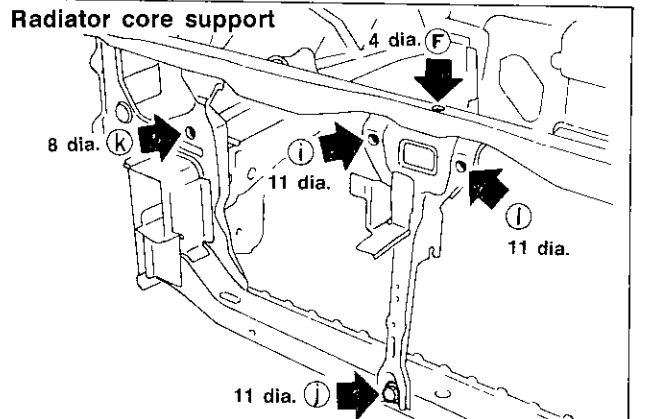
Front side member R.H. side



Radiator core support upper side



Radiator core support

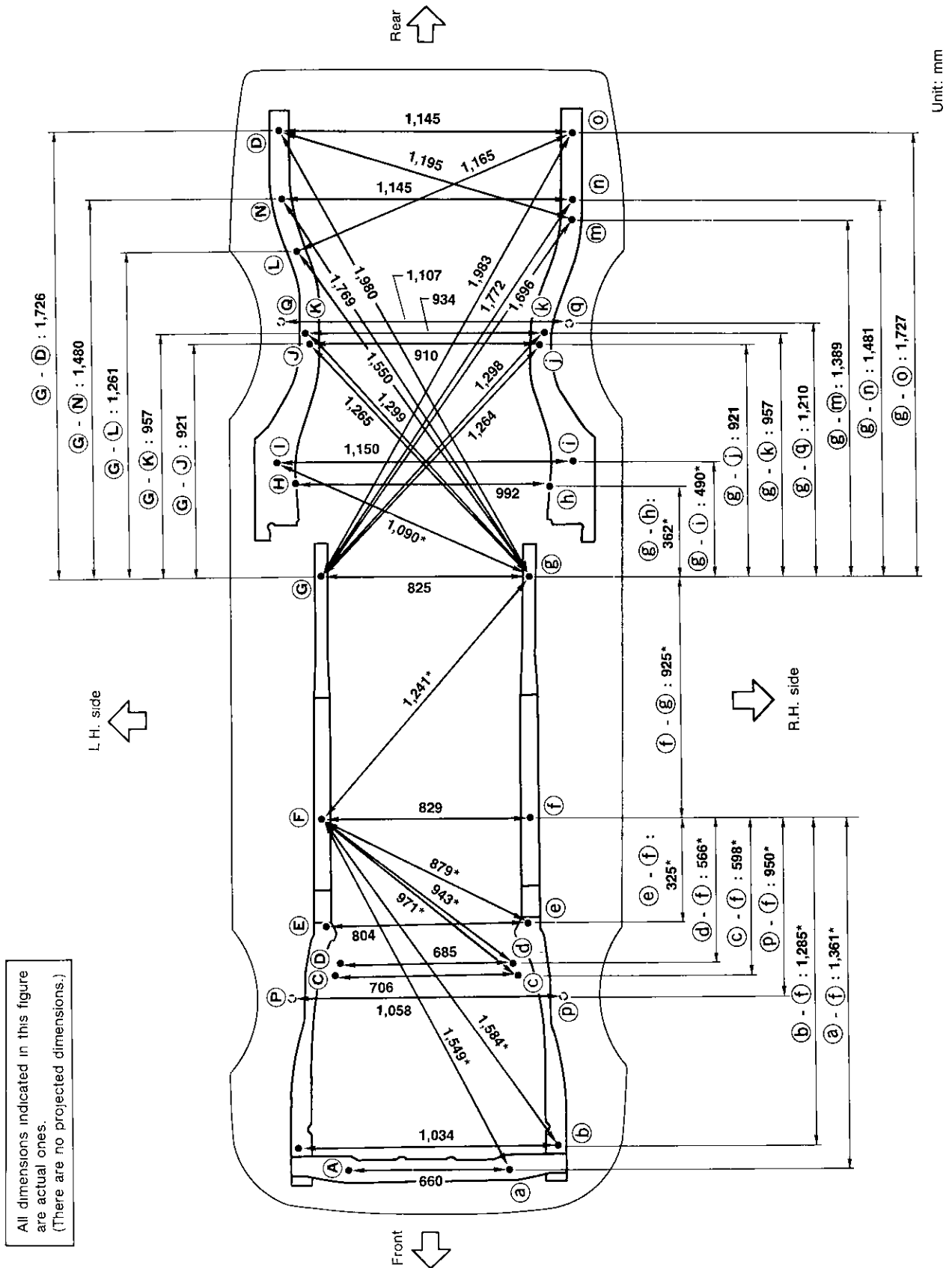


SBF100F

# BODY ALIGNMENT

## Underbody

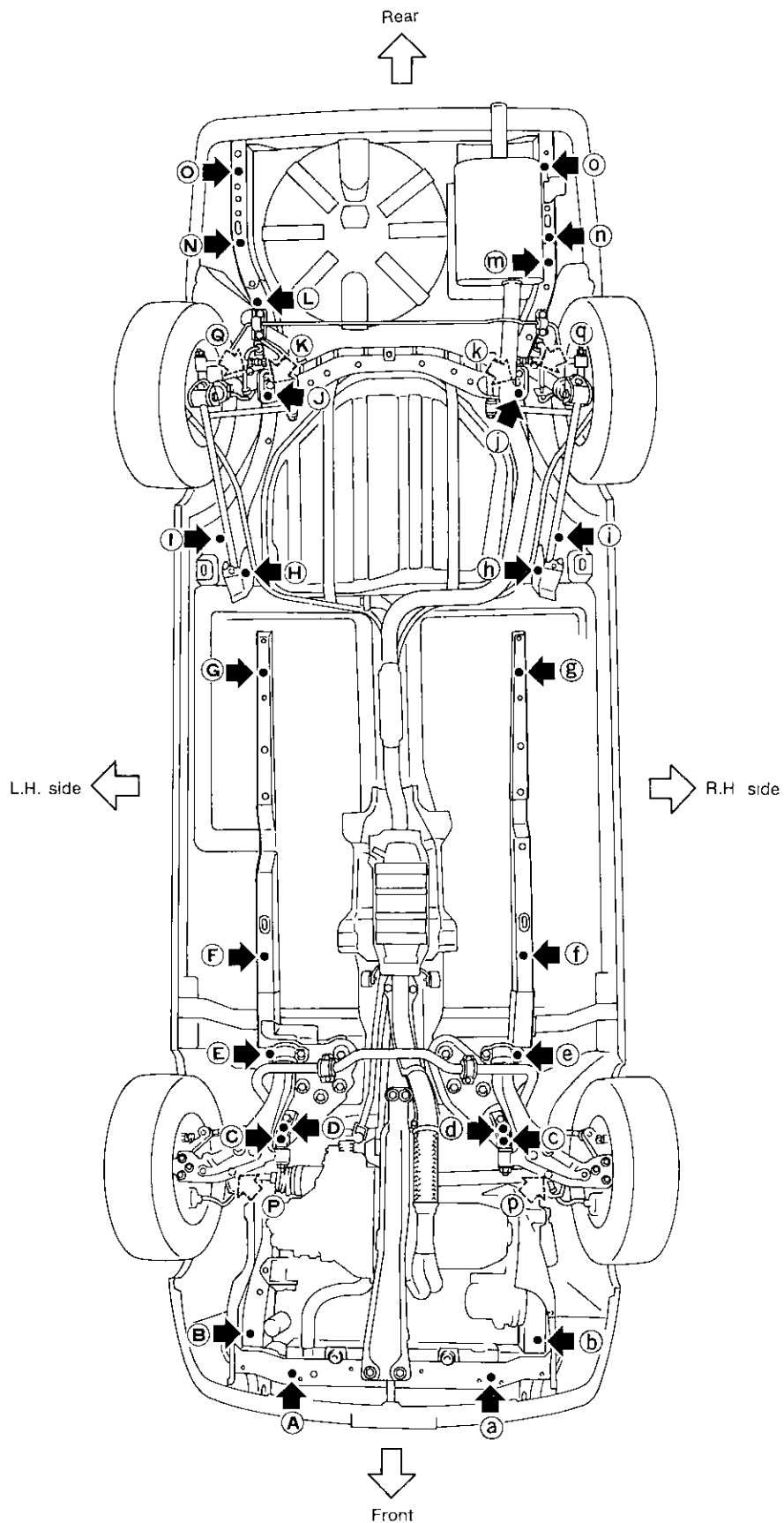
### MEASUREMENT



# BODY ALIGNMENT

## Underbody (Cont'd)

### MEASUREMENT POINTS



SBF102F



# BODY ALIGNMENT

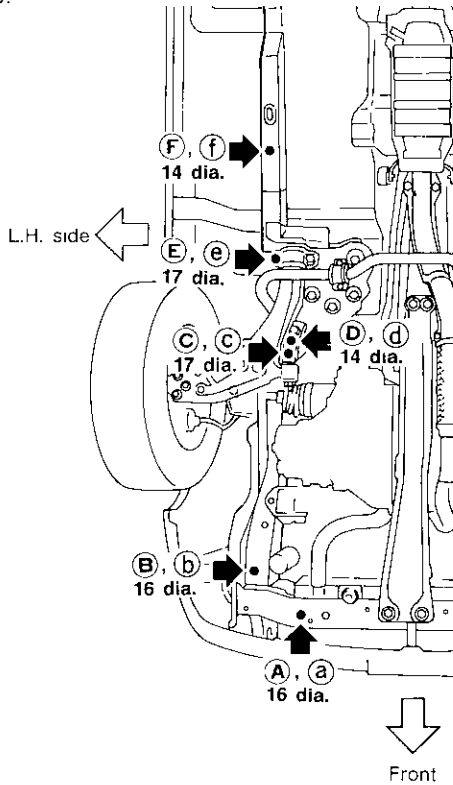
## Underbody (Cont'd)

Unit: mm

Radiator core lower support, front side member, front side member extension, front suspension mounting lower member and dash lower cross-member

Coordinates:

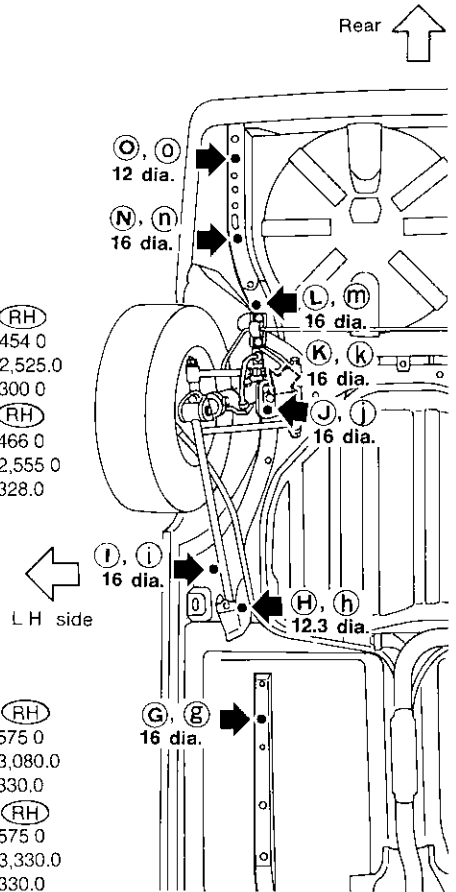
(A), (a)  
X: 330.0  
Y: -655.0  
Z: 208.0  
(B), (b)  
X: 517.0  
Y: -560.0  
Z: 340.0  
(C), (c)  
X: 353.0  
Y: 106.2  
Z: 142.7  
(D), (d)  
X: 342.5  
Y: 139.5  
Z: 145.6  
(E), (e)  
X: 402.0  
Y: 378.9  
Z: 157.2  
(F), (f)  
X: 414.5  
Y: 700.0  
Z: 110.0



Front side member rear extension, rear side member, rear suspension radius rod bracket and rear suspension mounting bolt top

Coordinates:

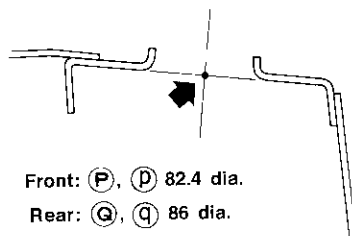
(G), (g)  
X: 412.5  
Y: 1,625.0  
Z: 109.3  
(H), (h)  
X: 496.0  
Y: 1,969.2  
Z: 183.9  
(I), (i)  
X: 575.0  
Y: 2,070.0  
Z: 234.0  
(J) (LH) (J) (RH)  
X: 456.0 X: 454.0  
Y: 2,525.0 Y: 2,525.0  
Z: 300.0 Z: 300.0  
(K) (LH) (K) (RH)  
X: 468.0 X: 466.0  
Y: 2,555.0 Y: 2,555.0  
Z: 328.0 Z: 328.0  
(L) (LH)  
X: 493.0  
Y: 2,864.0  
Z: 328.0  
(M) (RH)  
X: 575.0  
Y: 2,987.0  
Z: 328.0  
(N) (LH) (N) (RH)  
X: 570.0 X: 575.0  
Y: 3,080.0 Y: 3,080.0  
Z: 330.0 Z: 330.0  
(O) (LH) (O) (RH)  
X: 570.0 X: 575.0  
Y: 3,330.0 Y: 3,330.0  
Z: 330.0 Z: 330.0



Front and rear strut tower centers

Coordinate

(P), (p)  
X: 529.0  
Y: 13.5  
Z: 756.1  
(Q), (q)  
X: 553.7  
Y: 2,598.6  
Z: 813.1



SBF103F



# HEATER & AIR CONDITIONER

## SECTION **HA**

### CONTENTS

|                                                      |       |
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| SYSTEM DESCRIPTION — Push Control .....              | HA-86 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....       | HA-91 |

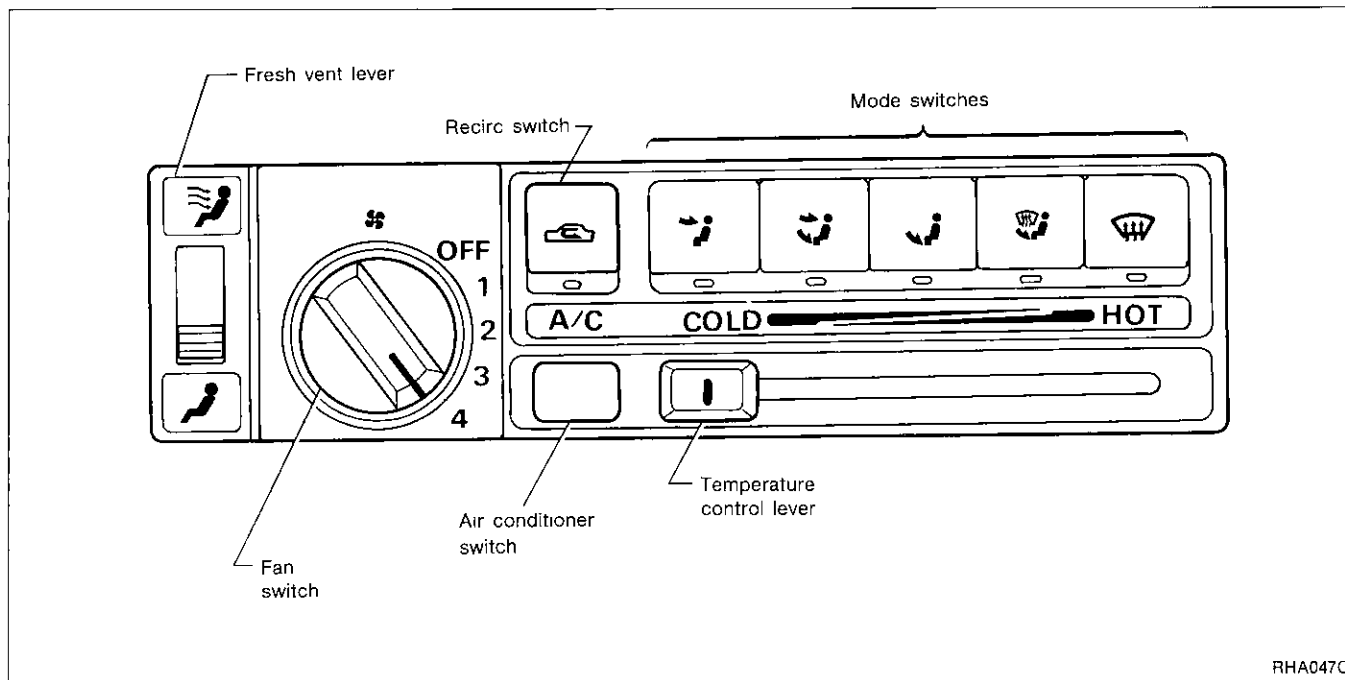
**When you read wiring diagrams:**

- 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”.**



### Control Operation



#### FAN SWITCH

This switch turns the fan ON and OFF, and controls fan speed.

#### MODE SWITCHES

These switches allow you to select the outlet air flow. When the MODE is set to "DEF" or "F/D", the push control unit sets the intake door to "FRE". In the DEF mode, the compressor turns on.

#### 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. This switch doesn't operate when the Mode switch is set to "FOOT/DEF" or "DEF".

#### AIR CONDITIONER SWITCH

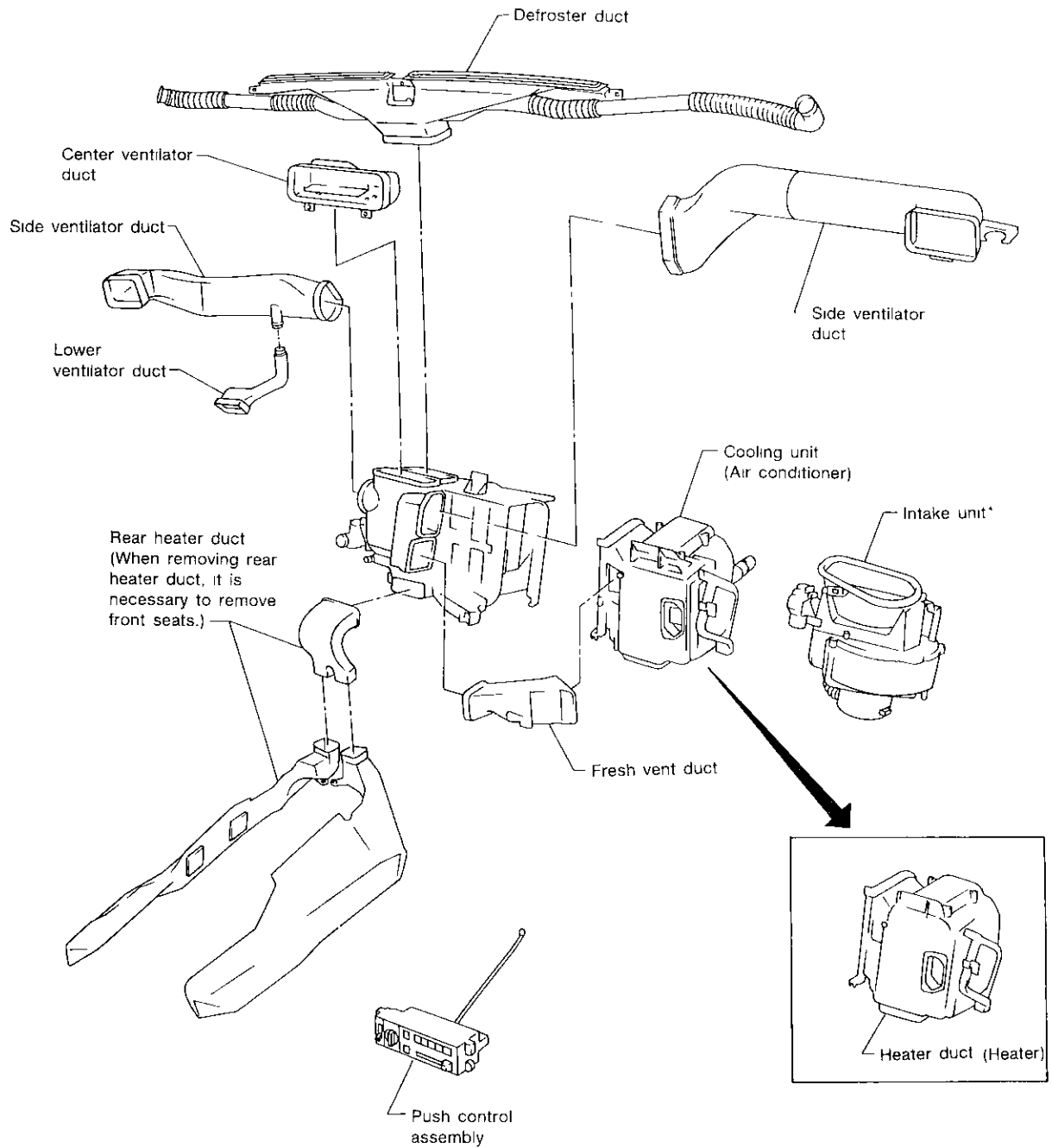
Start the engine, move the fan control lever to the desired (1 to 4) position and push the air conditioner switch to turn ON the air conditioner. The indicator light will come on when the air conditioner is ON. To stop the air conditioner, push the switch again to return it to the original position.

**The air conditioner cooling function operates only when the engine is running.**

#### FRESH VENT LEVER

In order to prevent unpleasant hot air on the face in the heater mode or especially in the FOOT, FOOT/DEF or DEF modes, this system allows cold air to flow from the ventilator ducts directly (without passing through the heater core) by means of a fresh vent lever beside the push control unit.

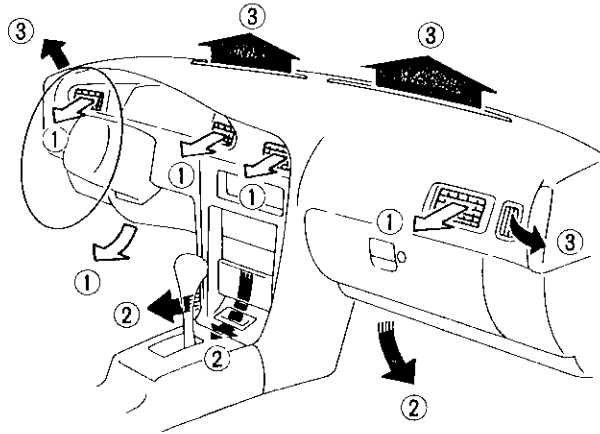
## Component Layout



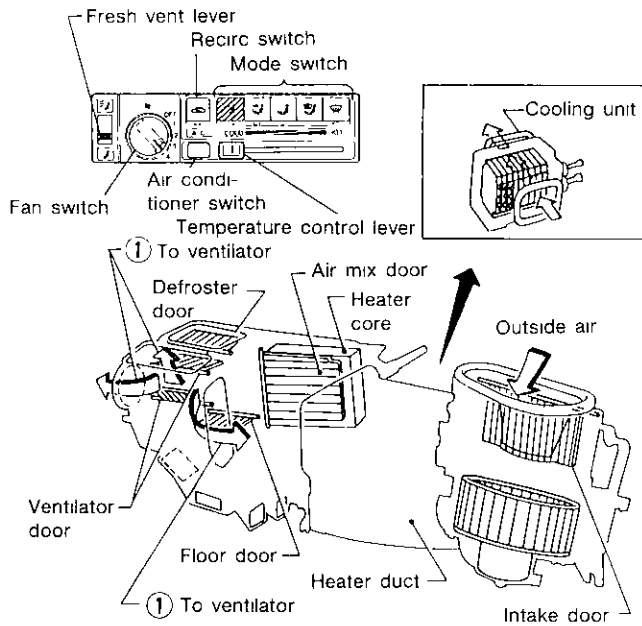
\* For removal, it is necessary to remove instrument assembly

RHA153B

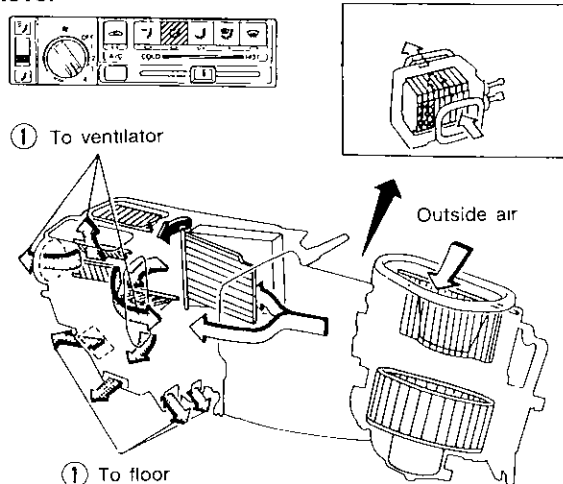
## Air Flow



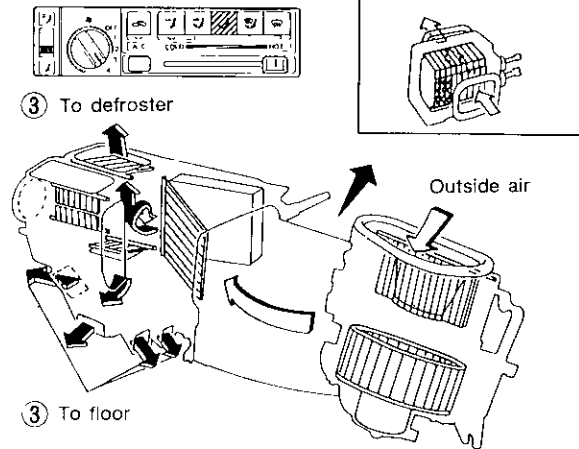
### Ventilation



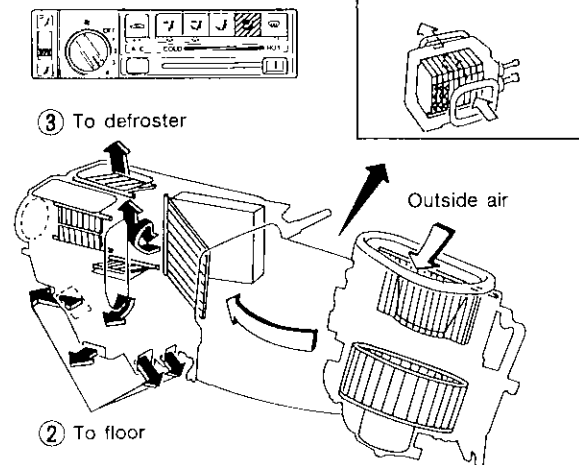
### Bi-level



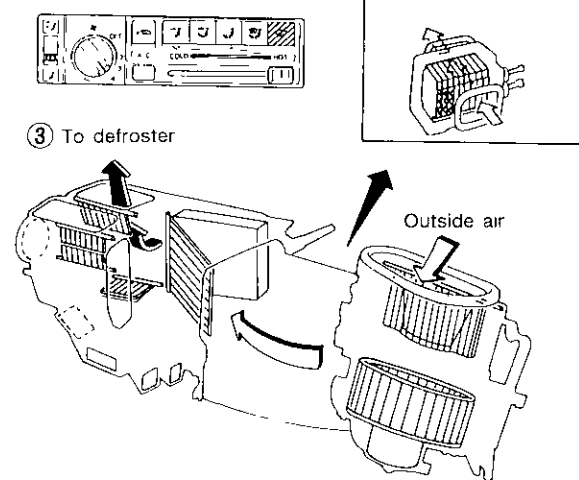
### Floor



### Floor and defroster



### Defroster



← : Air passed through heater core  
 ← + ← : Mixed air  
 ← : Air not passed through heater core

RHA150B

### Refrigeration Cycle

#### REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the evaporator, and back to the compressor.

The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

#### FREEZE PROTECTION

The compressor cycles on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

#### REFRIGERANT SYSTEM PROTECTION

##### Dual-pressure switch

The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

##### Fusible plug

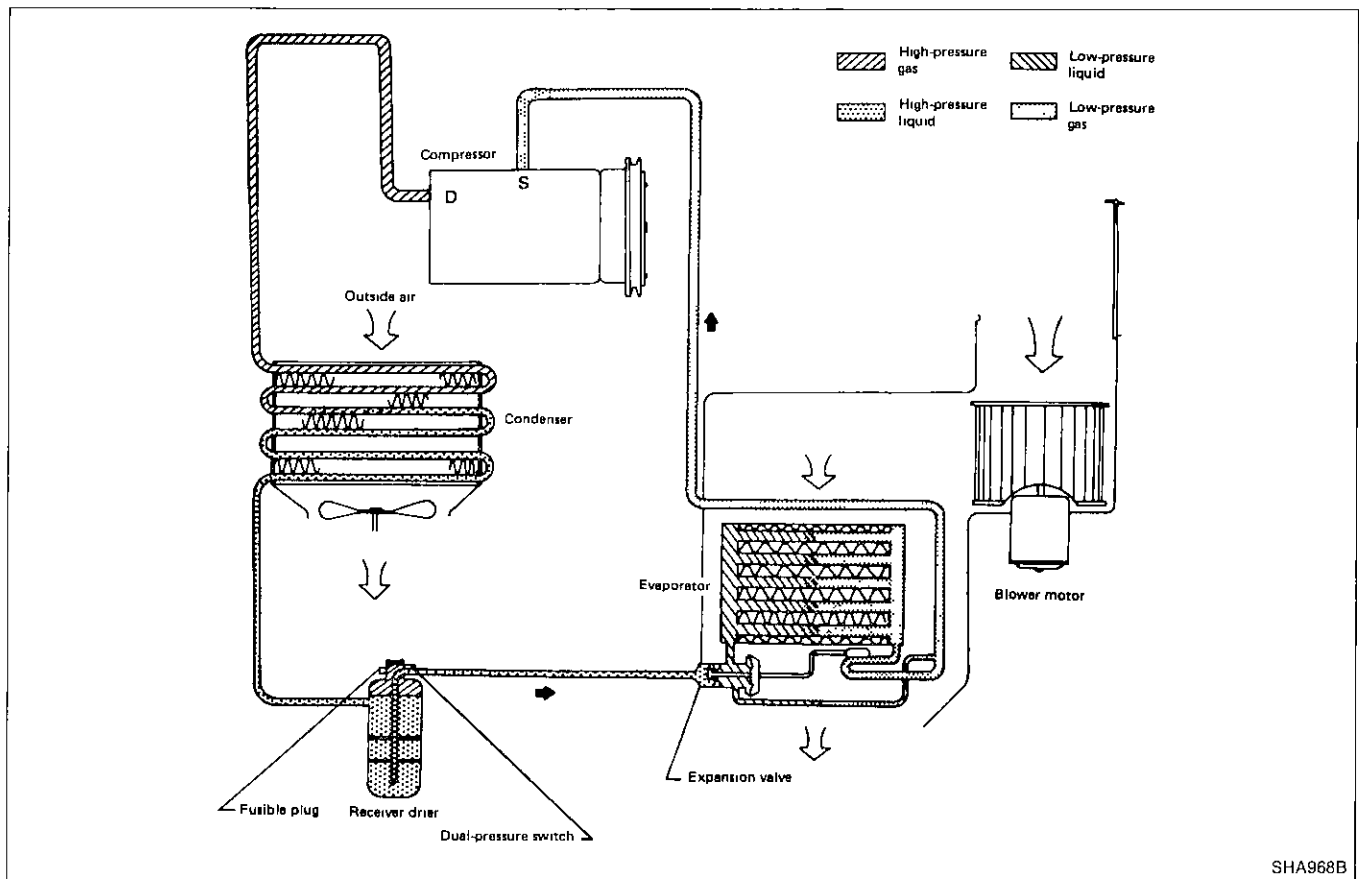
Open at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace receiver drier.

##### Pressure relief valve

The refrigerant system is also protected by a pressure relief valve, located on the end of high flexible hose near compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm<sup>2</sup>, 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.

## DESCRIPTION — Refrigeration System

### Refrigeration Cycle (Cont'd)



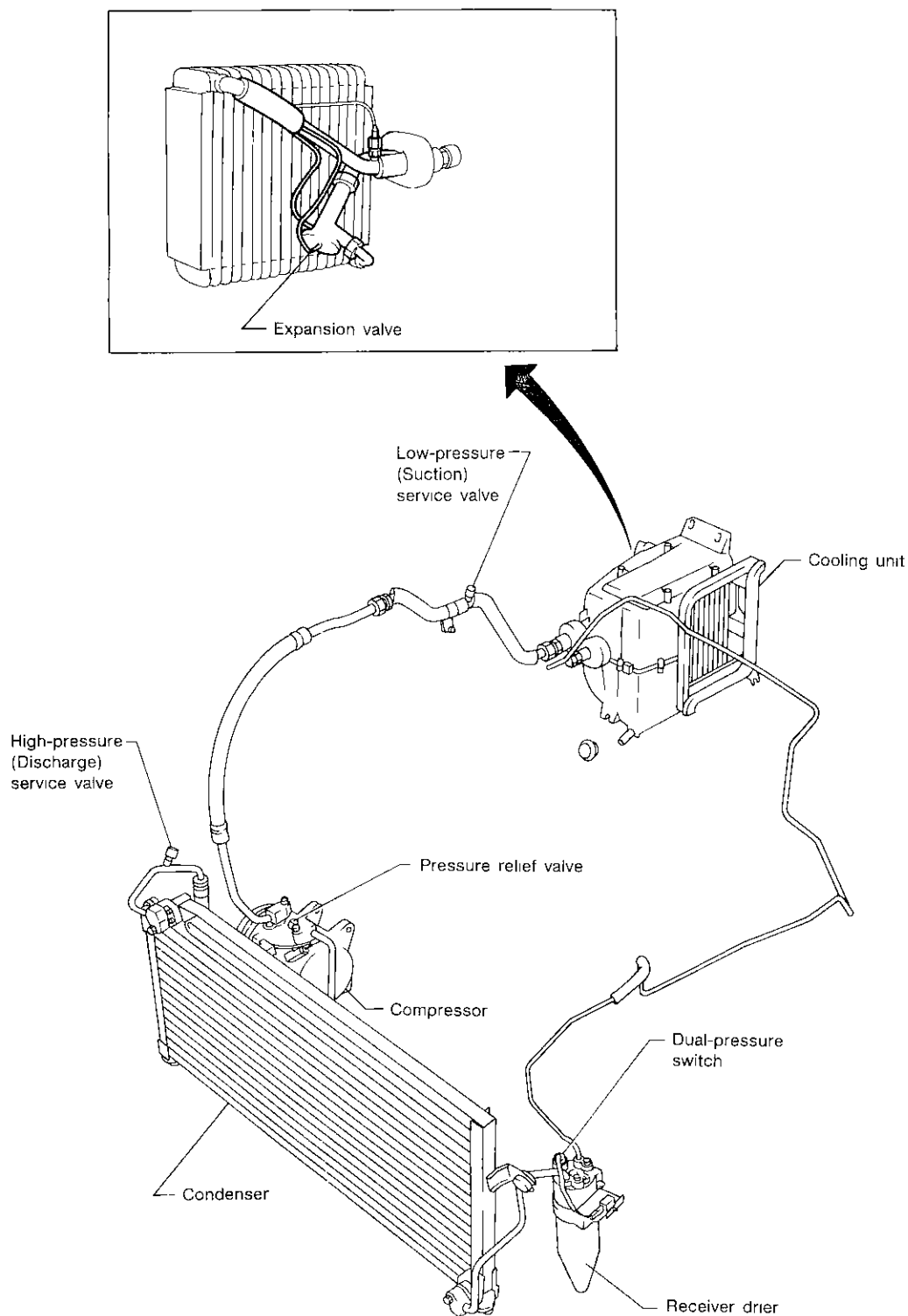
### Acceleration Cut System

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.



## Refrigerant System

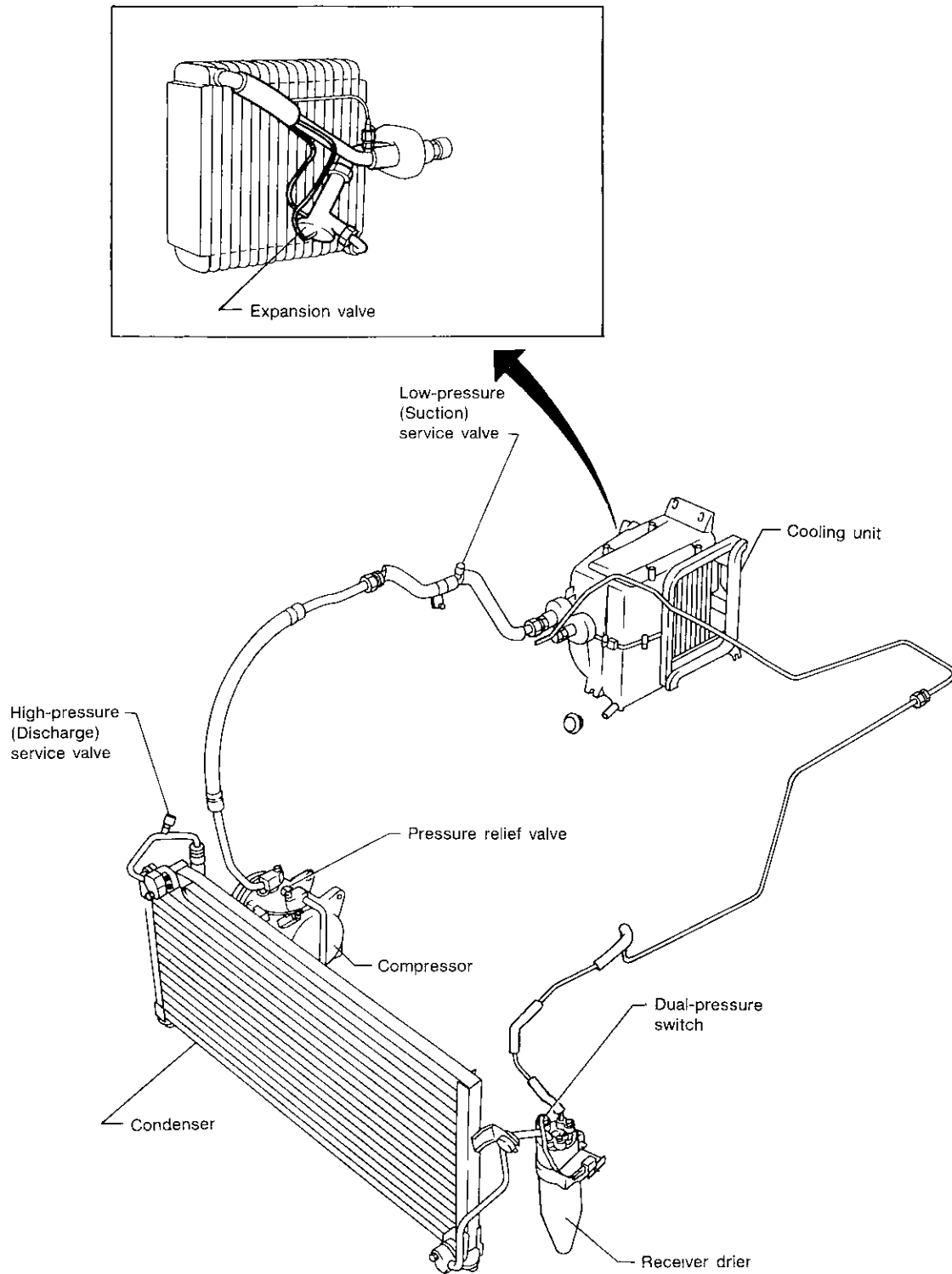
For production A/C model



## DESCRIPTION — Refrigeration System

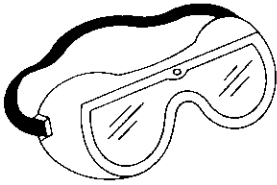
### Refrigerant System (Cont'd)

For kit A/C model



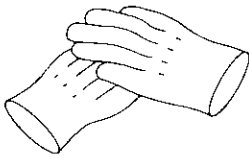
## PRECAUTIONS

Goggles

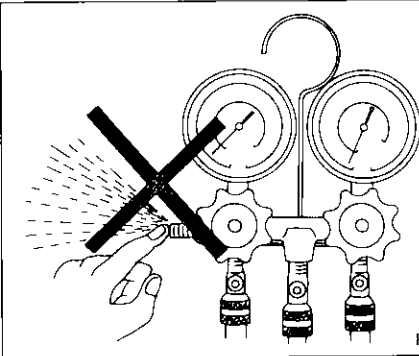


RHA260B

Gloves

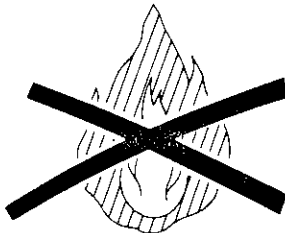


RHA261B



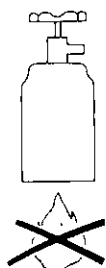
RHA676B

Avoid Open Flame



RHA262B

No Direct Heat  
on Container



RHA263B

### Precautions for the Handling of Refrigerant

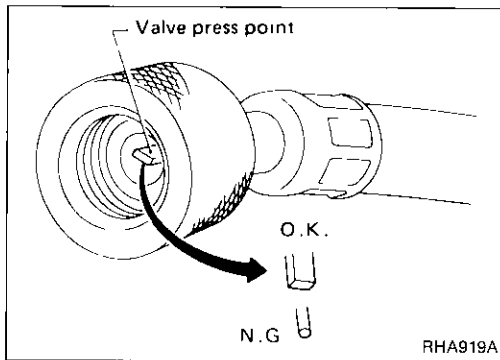
- Always wear eye protection when working around the system.
- Always be careful that refrigerant does not come in contact with your skin.
- Do not release refrigerant into the air. Use your refrigerant recycling equipment to capture the refrigerant every time you need to discharge an air conditioning system.
- 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.

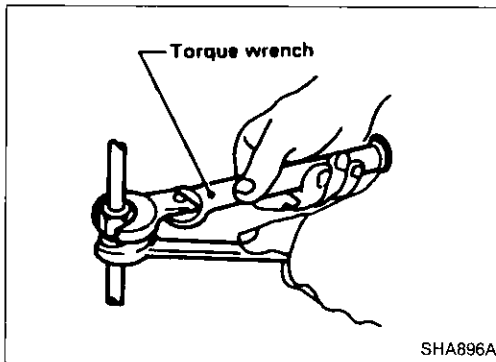
## PRECAUTIONS

### Precautions for the Handling of Refrigerant (Cont'd)



- Do not use manifold gauge set whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.
- Do not over-tighten service valve cap.
- Follow the manufacturer's instructions for discharging into your refrigerant recycling equipment.

## PRECAUTIONS



### Precautions for Refrigerant Connection

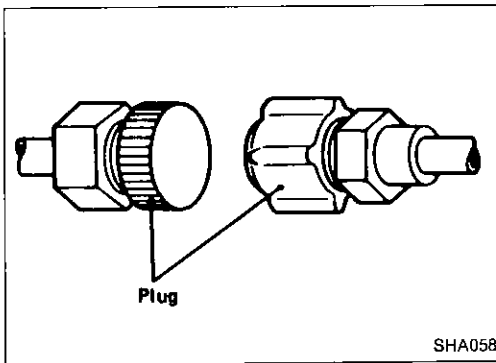
#### WARNING:

Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric. Then gradually loosen the discharge side hose fitting and remove it.

#### CAUTION:

When replacing or cleaning refrigerant cycle components, observe the following.

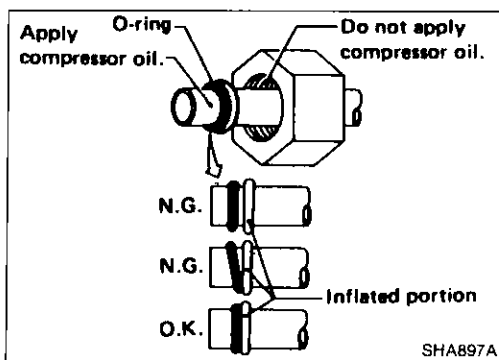
- Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.
- When connecting tubes, always use a torque wrench and a back-up wrench.



- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.

#### CAUTION:

- When installing an air conditioner in the vehicle, the pipes must be connected as the final stage of the operation. The seal caps of the pipes and other components must not be removed until their removal is required for connection.
- Before installing any air conditioner component that has been stored in a cool location to a vehicle that has been exposed to the hot sun, leave the component as it is for some time in a hot location with its seal cap unremoved. This step is necessary to prevent condensation of moisture inside the cold component.
- Thoroughly remove moisture from the refrigeration system before charging the refrigerant.

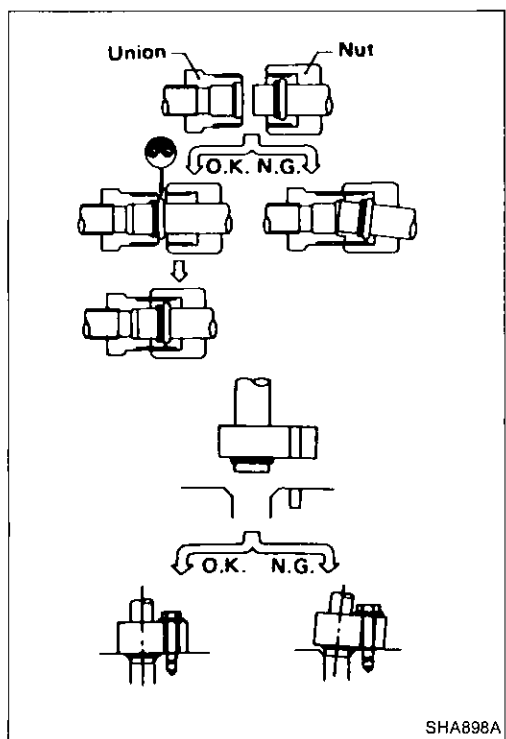


- Always replace used O-rings.
- When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.

## PRECAUTIONS

### Precautions for Refrigerant Connection (Cont'd)

- 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.

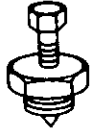
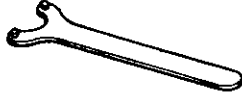
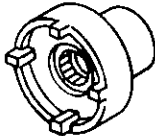


### Precautions for Servicing the Compressor

- 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.

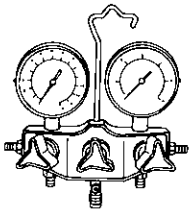
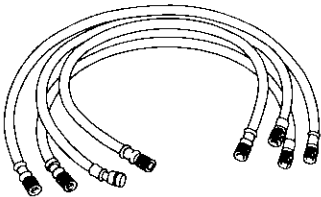
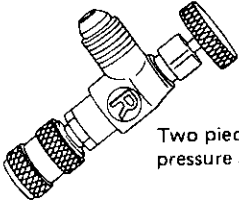
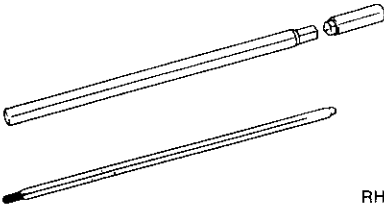
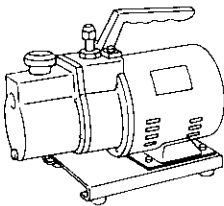
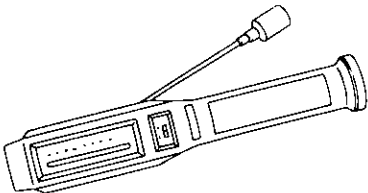
## PREPARATION

### Special Service Tools

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description                                                                                                          |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| KV998VR001<br>( — )<br>Clutch disc puller    |  Removing clutch disc               |
| KV99231010<br>( — )<br>Clutch disc wrench    |  Removing shaft nut and clutch disc |
| KV99235160<br>(J29751)<br>Nut wrench         |  Removing lock nut                  |

# PREPARATION

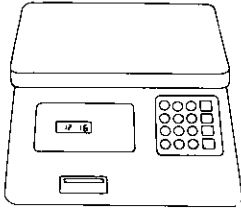
## Service Tools

| Tool name                        | Description                                                                                                                                                                                                            |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manifold gauge<br>(3-valve type) |  <p>RHA570B</p> <p>Discharging, evacuating and charging refrigerant</p>                                                               |
| Charging hose<br>(Four)          |  <p>RHA571B</p> <p>Discharging, evacuating and charging refrigerant</p>                                                               |
| Adapter valve                    |  <p>Two pieces on each high pressure and low pressure line</p> <p>RHA573B</p> <p>Discharging, evacuating and charging refrigerant</p> |
| Thermometer                      |  <p>RHA574B</p> <p>Checking temperature</p>                                                                                          |
| Vacuum pump                      |  <p>RHA575B</p> <p>Evacuating</p>                                                                                                   |
| Gas leak detector                |  <p>RHA577B</p> <p>Checking refrigerant leaks</p>                                                                                   |
| Charging cylinder                |  <p>RHA578B</p> <p>Checking amount of refrigerant and charging refrigerant</p>                                                      |



## PREPARATION

### Service Tools (Cont'd)

| Tool name                       | Description                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Weight scale                    | <div></div> <div>Checking amount of refrigerant</div> <div>RHA579B</div>      |
| Refrigerant recycling equipment | <div></div> <div>Capturing and recycling refrigerant</div> <div>SHA732C</div> |

**For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.**

## PREPARATION

### Service Tools (Cont'd)

#### HANDLING METHOD AND STRUCTURE

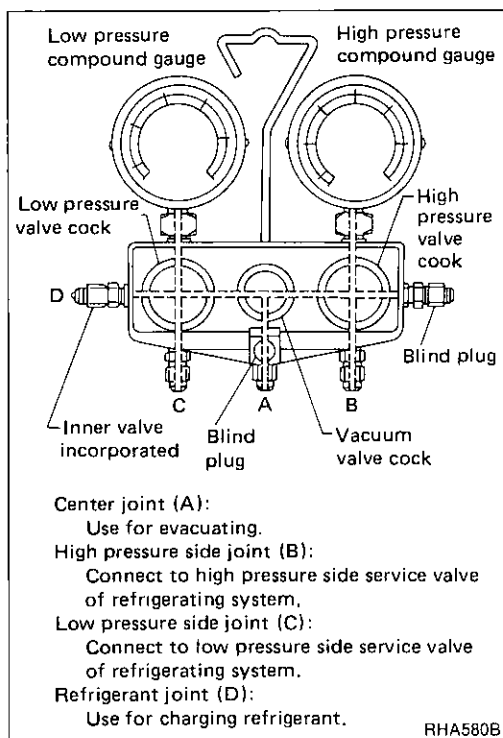
##### Manifold gauge

The manifold gauge is used to measure the operating pressure accurately in the high pressure and low pressure lines of the refrigerating system.

The high pressure gauge measures from  $-101.3 \text{ kPa}$  ( $-760 \text{ mmHg}$ ,  $-29.92 \text{ inHg}$ ) to  $2,942 \text{ kPa}$  ( $30 \text{ kg/cm}^2$ ,  $427 \text{ psi}$ ), and the low pressure gauge measures generally from  $-101.3 \text{ kPa}$  ( $-760 \text{ mmHg}$ ,  $-29.92 \text{ inHg}$ ) to  $1,471 \text{ kPa}$  ( $15 \text{ kg/cm}^2$ ,  $213 \text{ psi}$ ).

##### CAUTION:

- When installing the gauge to the refrigerating system, use utmost care not to mistake high pressure and low pressure line connections. (Wrong connections will lead to a damaged gauge.)
- Before evacuating, confirm that the gauge has a negative pressure scale. (If not, the gauge will be damaged.)

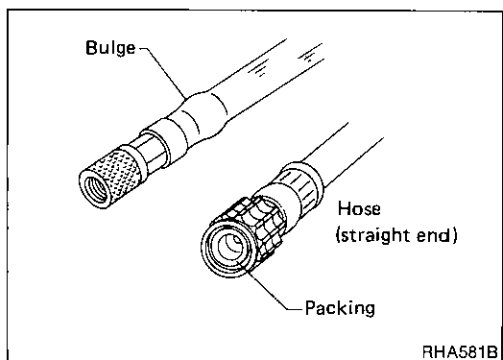


##### Charging hose

1. Completely tighten the high pressure valve, low pressure valve and vacuum pump valve cocks of the gauge manifold.
2. Connect the charging hoses to the high and low pressure lines.
3. Connect the charging hose fitted with a valve core to the 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.

## PREPARATION

### Service Tools (Cont'd)

#### Installing the adapter valve

Install the adapter valve to each of the high pressure and low pressure service valves so that air purging from the charging hose can be omitted. This also ensures that refrigerant leakage upon disconnection of the hose can be prevented.

1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

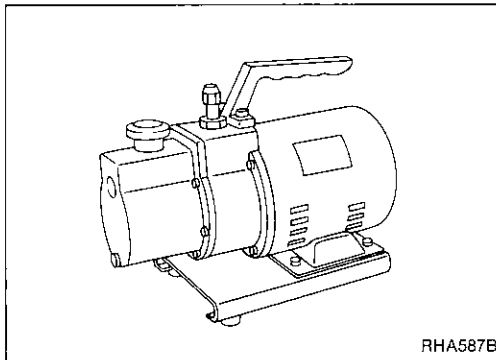
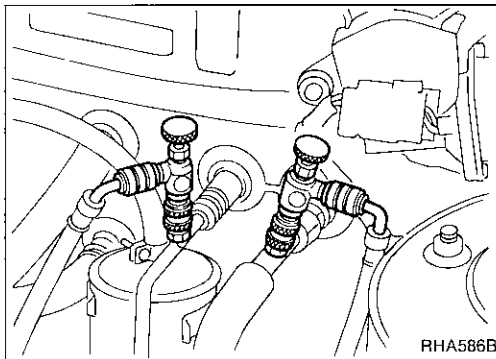
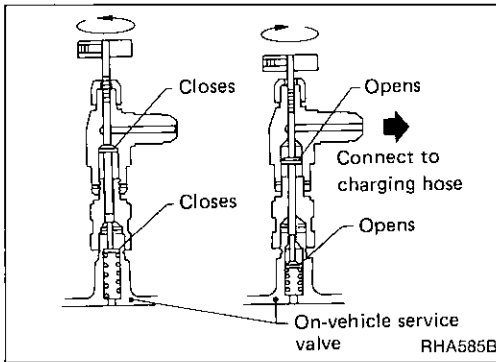
#### CAUTION:

**Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace it with a new one.**

2. Connect the charging hose to the adapter valve.

**Turning the handle clockwise will cause the on-vehicle service valve pin to be pushed open by the adapter valve pin, thus opening the refrigerant passage.**

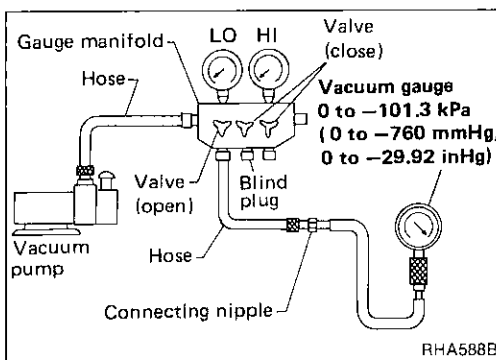
**Turning the handle counterclockwise will close the passage. Before removing the adapter valve from the on-vehicle service valve, be sure to fully turn the handle counterclockwise to shut off the refrigerant passage.**



#### Vacuum pump

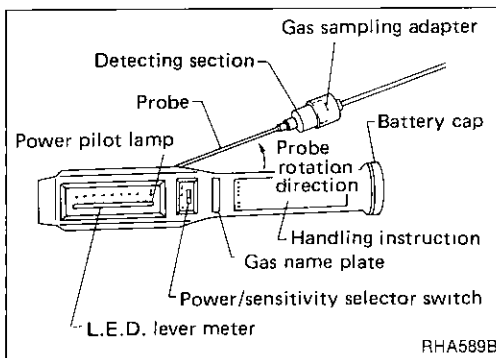
The vacuum pump is used to purge air and moisture from the inside of the refrigeration system by evacuation, thereby ensuring proper functioning of the air conditioner system.

**Check the vacuum pump to see that the vacuum pump capacity is greater than  $-100.0$  kPa ( $-750$  mmHg,  $-29.53$  inHg).**



#### Vacuum pump performance check procedure

1. Connect the vacuum gauge to the system.
2. Run the vacuum pump, and check to see that the needle pointers of the gauge manifold and vacuum gauge move smoothly, indicating a similar value.
3. After running the vacuum pump for two or three minutes, read the vacuum gauge. The measured value indicates the capacity of the vacuum pump.



#### Gas leak detector

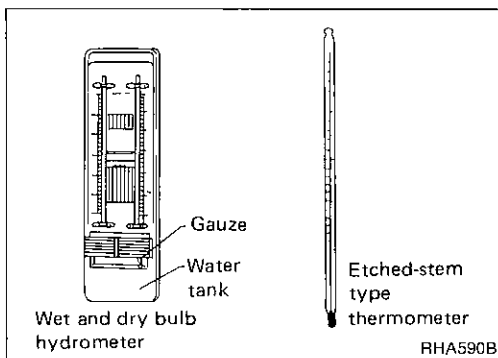
The gas leak detector is used to check whether the refrigeration system is leaking. The detector is available in two types; halide torch or electrical. The features of these gas leak detectors are listed on the next page.

## PREPARATION

### Service Tools (Cont'd)

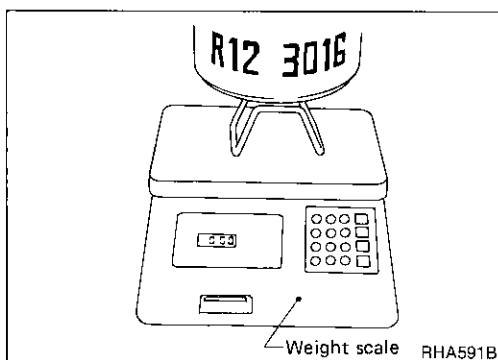
| Type                                                              |                                           | Detection ability                                                                                | Features                                                                                                                                                                                |
|-------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Halide torch                                                      |                                           | 200 g (7.05 oz)/year (thin green)                                                                | <ul style="list-style-type: none"> <li>● Low price</li> <li>● Low sensitivity</li> <li>● Less safe because of the use of flame for detection</li> </ul>                                 |
| Electrical                                                        | Discharge type (Suction type)             | 3 - 50 g (0.11 - 1.76 oz)/year                                                                   | <ul style="list-style-type: none"> <li>● Easy handling</li> <li>● Medium sensitivity</li> <li>● Each point needs two or more seconds for detection.</li> </ul>                          |
|                                                                   | Positive ion emission type (Suction type) | 2 g (0.07 oz)/year                                                                               | <ul style="list-style-type: none"> <li>● High sensitivity</li> <li>● High price</li> <li>● Warm-up time is needed because a heater is incorporated.</li> </ul>                          |
| Other simple checking method:<br>Change in vacuum when evacuating |                                           | 1 kg (2 lb)/month; if 13.3 kPa (100 mmHg, 3.94 inHg) change in vacuum is detected in 10 minutes. | <ul style="list-style-type: none"> <li>● Can be used easily in refrigerant charging operation.</li> <li>● Detection ability is very low with vacuum gauge in gauge manifold.</li> </ul> |

- **Leakage inspection of a refrigeration system needs a sensitivity greater than 20 g (0.71 oz)/year.**
- **The actual amount of leak is estimated at 5 to 10 times the detected amount.**
- **Insufficient cooling may be felt if leakage exceeds 150 to 200 g (5.29 to 7.05 oz).**



#### Temperature gauge

Use to check the air conditioner performance. An etched stem type thermometer may be used. A hygrometer must also be used because the air conditioner performance depends on the humidity.



#### Scale

Measure the weight of the refrigerant to determine how much the refrigerant is charged.

## PREPARATION

### Service Tools (Cont'd)

#### Charging cylinder

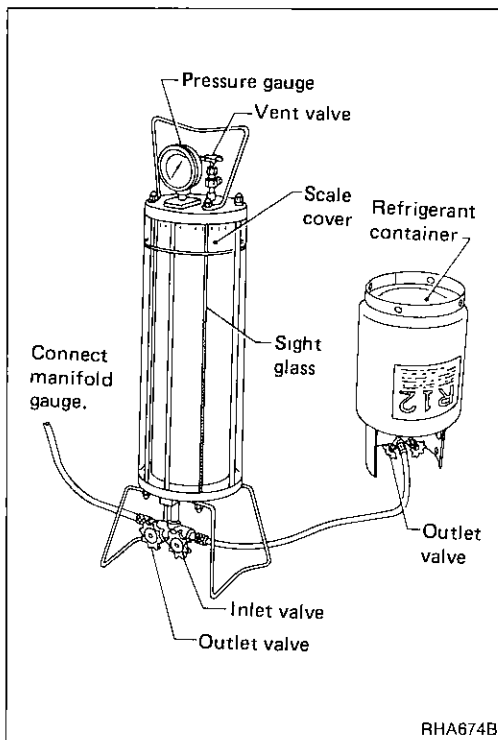
The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

##### Features

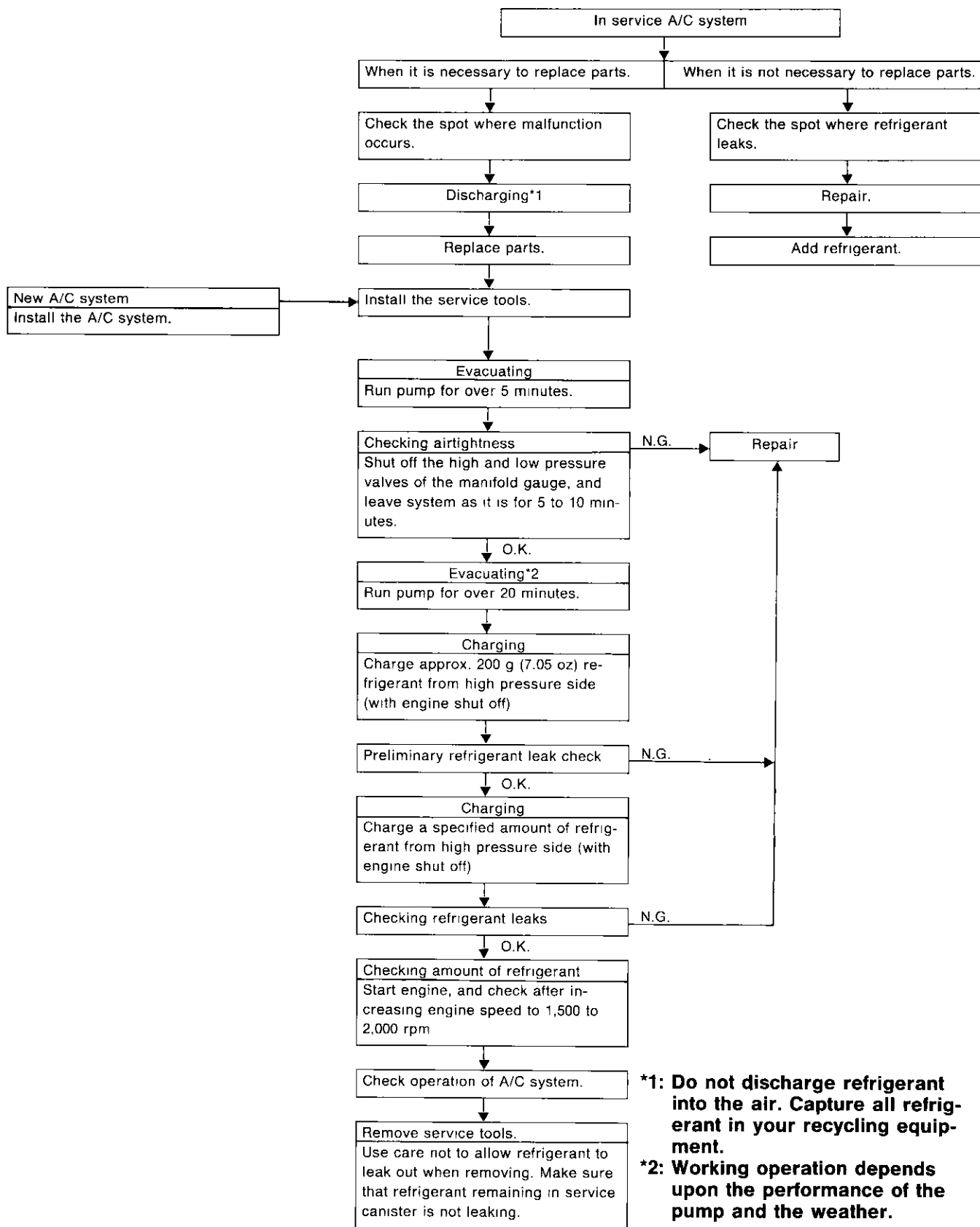
- With the charging cylinder, the operator can measure correctly the amount of refrigerant to be charged into the system.
- Change in the refrigerant volume due to a change in temperature and pressure can be supplemented, and this ensures correct charging of refrigerant.

##### CAUTION:

- **Never attempt to carry the charging cylinder containing refrigerant.**
- **Do not put the charging cylinder in a hot place. If the temperature and pressure of the refrigerant in the cylinder increase, the safety valve will be pushed open and the refrigerant will be released into the atmosphere.**
- **Do not expose the cylinder to the direct sunlight.**
- **Do not over-charge the refrigerant so that it exceeds the maximum limit of the cylinder.**
- **Do not charge the cylinder with more refrigerant than is needed.**

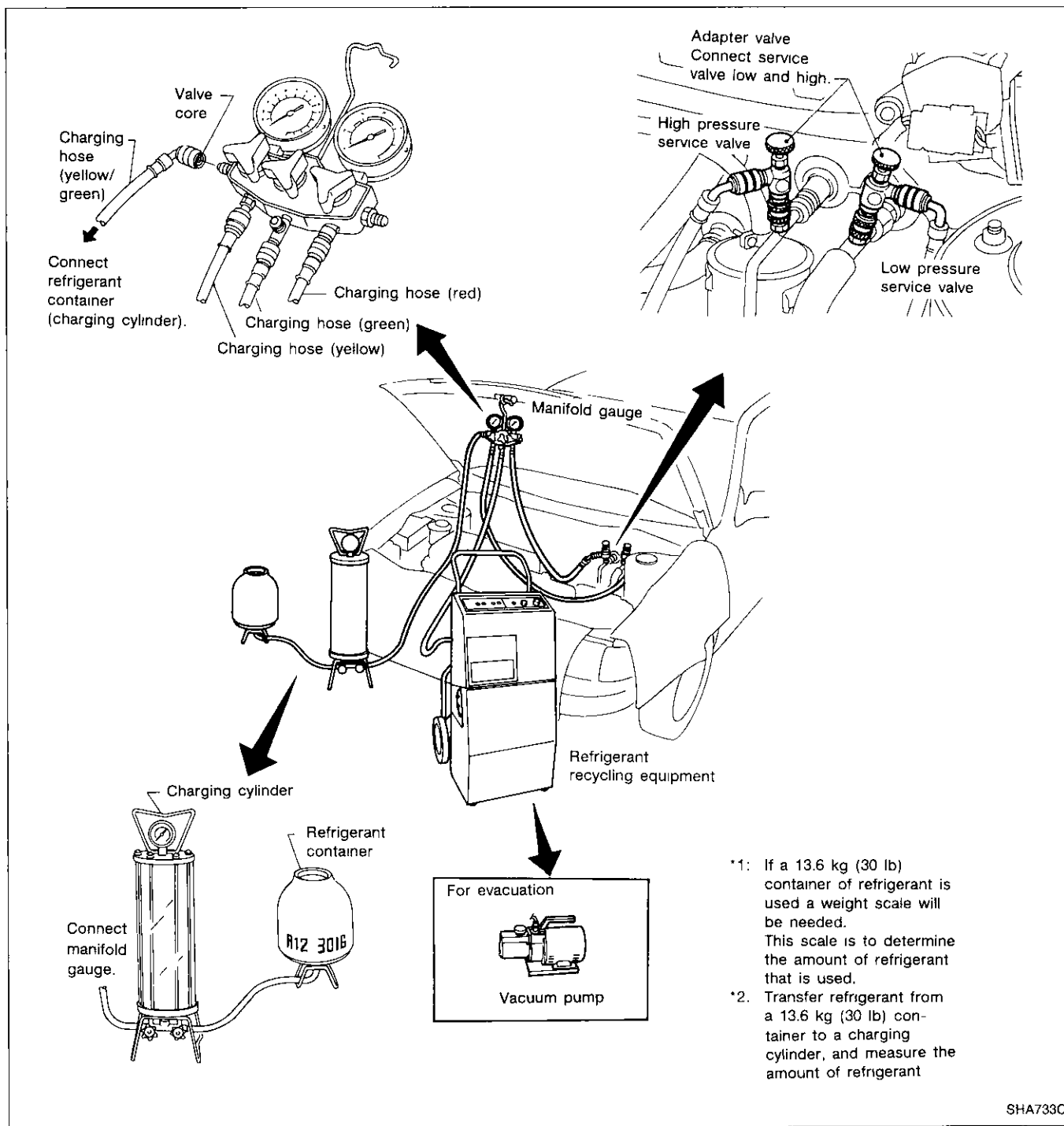


## Work Procedure



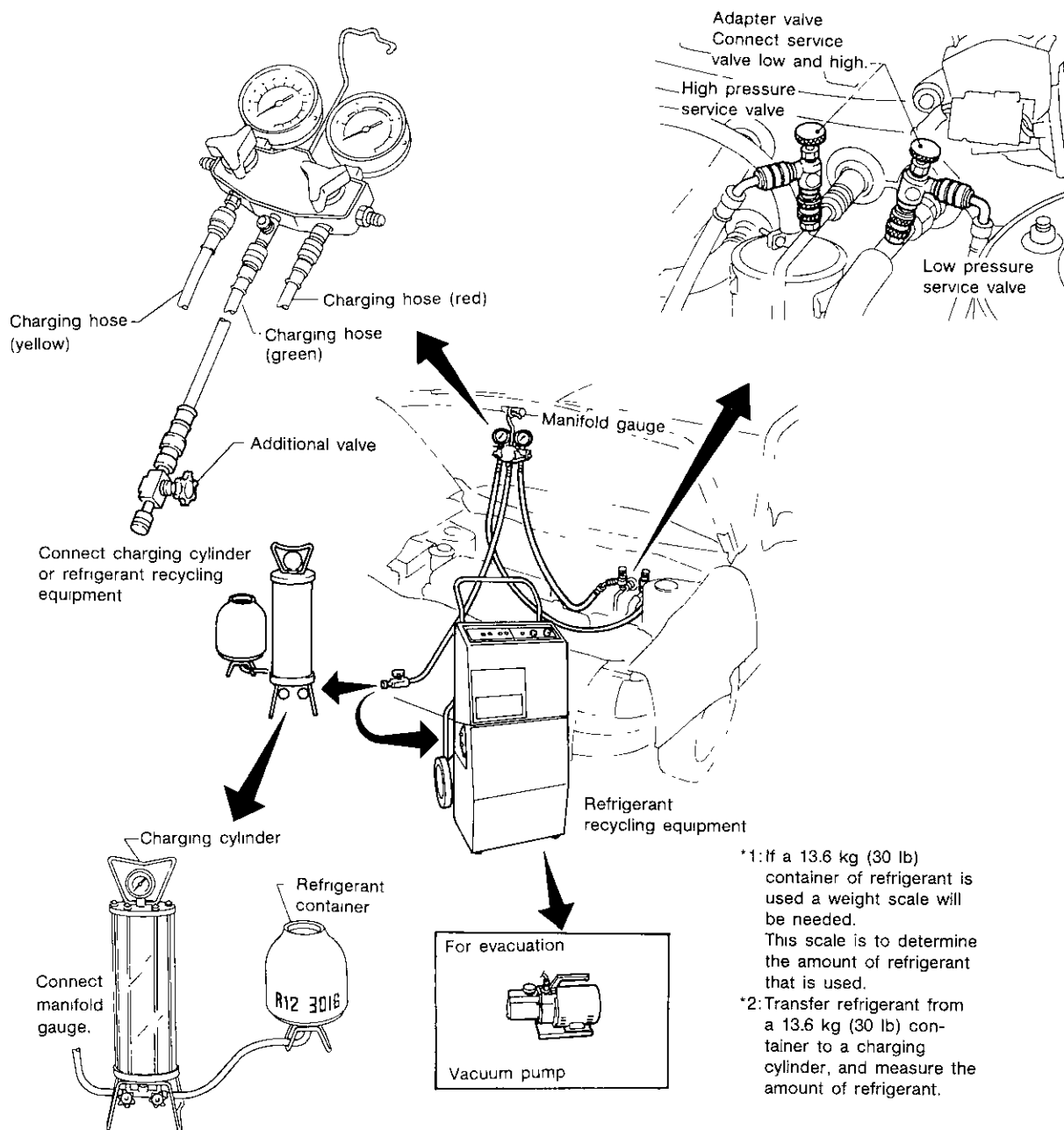
## Setting of Service Tools

Make sure that the service tools are set as indicated below and that no refrigerant is leaking.



## Setting of Service Tools (Cont'd)

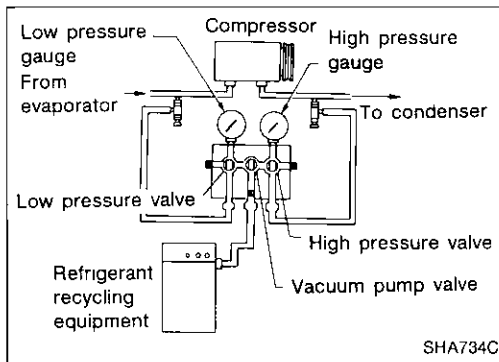
When a 3-valve type manifold gauge is unavailable, use a 2-valve type manifold gauge with one additional valve at the end of the charging hose.



SHA761C



# DISCHARGING, EVACUATING, CHARGING AND CHECKING



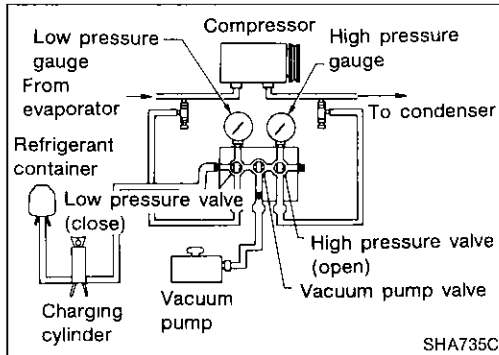
## Discharging

### WARNING:

**Discharge only into your recycling equipment.**

**Do not release refrigerant into the air.**

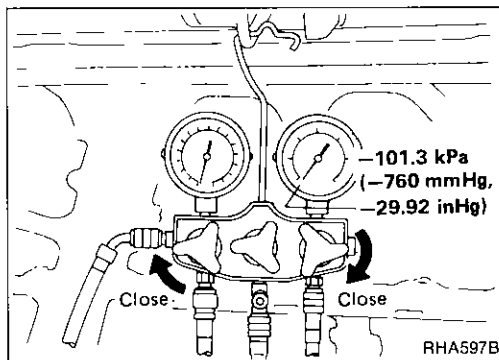
Slowly open the valves to discharge the refrigerant. If they are opened quickly, compressor oil will also be discharged.



## Evacuation

### EVACUATION PROCEDURE

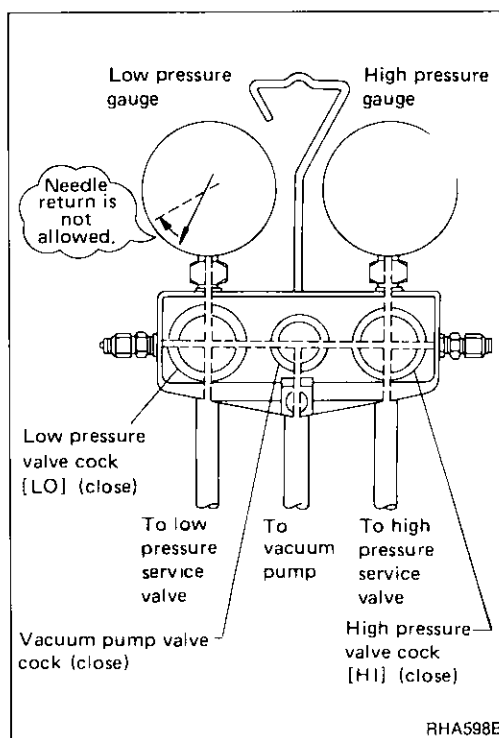
1. Completely tighten the low pressure and high pressure adapter valves.  
Turn on the high and low pressure service valves.
2. Open the high and low pressure valves and vacuum pump valve of the manifold gauge set.
3. Run the vacuum pump.
4. Perform evacuation for more than five minutes to stabilize 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 vacuum pump valve of the manifold gauge set.



### CHECKING AIRTIGHTNESS

1. Shut off the high and low pressure valves and vacuum pump valve of the manifold gauge set, and leave the system as it is for 5 to 10 minutes.
2. Make sure that the needle of the 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.**



# DISCHARGING, EVACUATING, CHARGING AND CHECKING

## Evacuation (Cont'd)

### MAINTENANCE

If inadequate airtightness is detected, check and service the following portions:

| Leak from pipe joints                                                                                                                                                                                  | Leak from manifold gauge set                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>● Contaminated, damaged, or deformed O-ring</li><li>● No oil applied when connecting pipe</li><li>● Excessive or insufficient tightening of pipe joint</li></ul> | <ul style="list-style-type: none"><li>● Malfunctioning hose</li><li>● Improper installation of manifold</li><li>● Malfunctioning valve</li><li>● Malfunctioning packing</li></ul> |

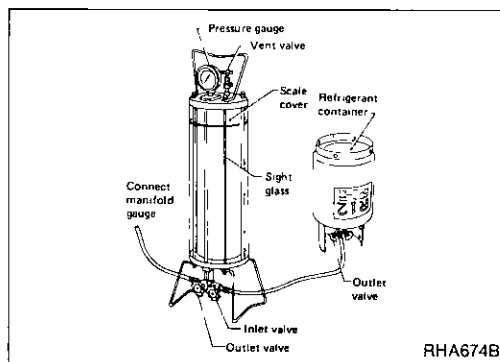
### EVACUATION

If no abnormality is found during the airtightness check, perform evacuation again for more than 20 minutes.

1. Run the vacuum pump.
2. Open the high and low pressure valve and vacuum pump valve of the manifold gauge set.
3. Evacuate for more than 20 minutes.
4. Close the high and low pressure valves and vacuum pump valve of the manifold gauge set.

### Charging Refrigerant

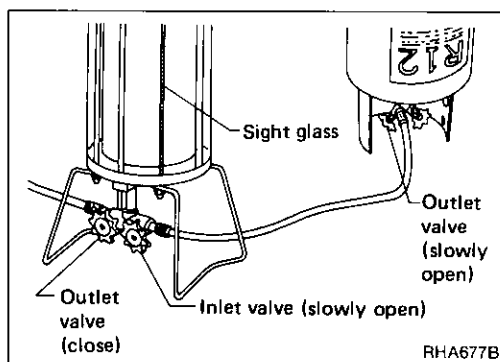
Install the charging cylinder correctly to the vehicle. Refer to "Setting of Service Tools".



#### PRELIMINARY CHARGING OF REFRIGERANT-1

1. Make sure that the inlet and outlet valves of the charging cylinder are closed.
2. Slowly open the outlet valve of a refrigerant container [13.6 kg (30 lb)].
3. Slowly open the inlet valve of the charging cylinder.

**The refrigerant will flow into the sight glass of the charging cylinder as the valve is opened.**



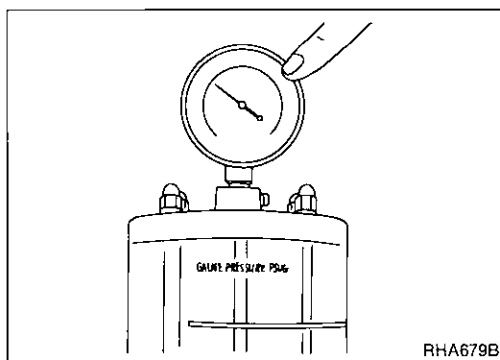
4. Slowly open the upper vent valve to release pressure from the charging cylinder. While doing so, continue charging until the required amount of refrigerant is reached.

**The refrigerant volume changes with the temperature and pressure. It is necessary to charge refrigerant with a little more than the required amount (indicated on the sight glass).**

5. Close the inlet valve and upper vent valve of the charging cylinder.

## DISCHARGING, EVACUATING, CHARGING AND CHECKING

### Charging Refrigerant (Cont'd)



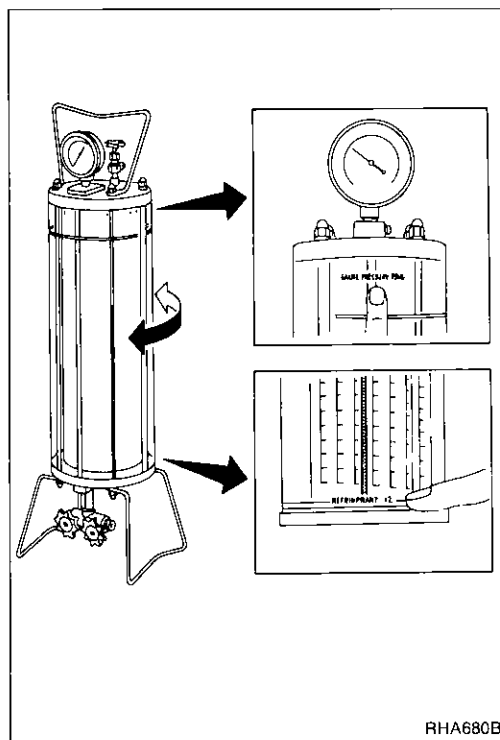
6. Turn on the heater switch (the charging cylinder is provided with a heater.)

The refrigerant charging time can be reduced by heating the refrigerant to increase its pressure. In this case, do not allow the pressure in the cylinder to rise higher than 1,030 kPa (10.5 kg/cm<sup>2</sup>, 150 psi). (If pressure rises above this level, turn off the heater.)

The pressure in the charging cylinder can be measured by the upper pressure gauge.

### EVACUATION AND AIRTIGHTNESS CHECK

Refer to "EVACUATION PROCEDURE" and "CHECKING AIRTIGHTNESS" in "Evacuation".



### SETTING OF FLOW METER

1. Rotate the charging cylinder main body until the scale for R12 is at the correct position on the sight glass.
2. Read the charging cylinder pressure gauge.
3. Rotate the charging cylinder so that the scale of the charging cylinder agrees with the pressure value indicated on the pressure gauge.
4. Open the outlet valve of the charging cylinder.

### Charging Refrigerant (Cont'd)

#### 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.

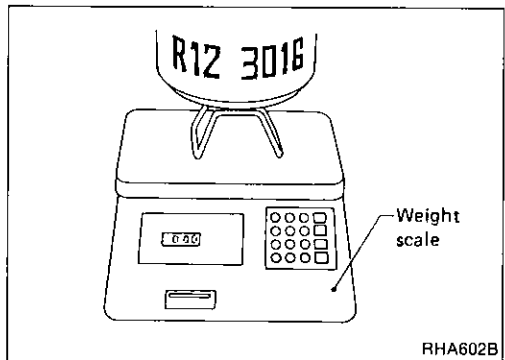
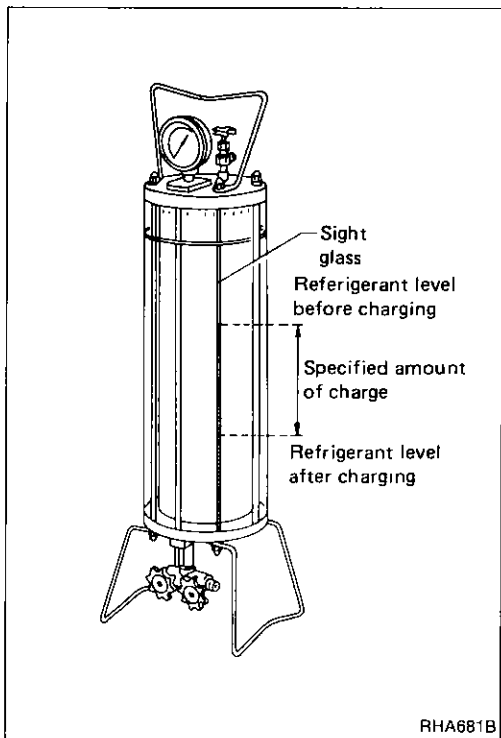
#### Example:

Level in sight glass: 3 lb 8 oz

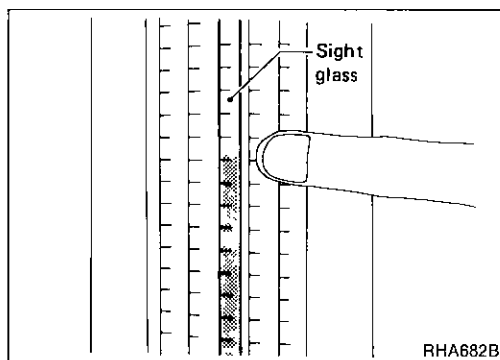
Charge specification (from S.D.S.) 2.0 - 2.4 lb.

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 the level in the sight glass (3 lb 8 oz) = 1 lb 2 oz.

This will be our ending point.



If a flow meter is not available, the amount of charged refrigerant also can be determined by subtracting the weight of the canister measured after charging from its weight measured before charging.



### Charging Refrigerant (Cont'd)

#### PRELIMINARY CHARGING OF REFRIGERANT-2

1. Slowly open the high pressure side valve of the manifold gauge to charge refrigerant from the high pressure side.
2. Close the high pressure valve after charging approx. 200 g (7.05 oz) refrigerant.

#### CAUTION:

The refrigerant in the charging cylinder is kept in the liquid state, so the refrigerant should be charged from high pressure side. Do not start the engine with the high pressure valve kept open.

#### PRELIMINARY CHECK FOR REFRIGERANT LEAKS

Refer to "PRELIMINARY CHECK FOR REFRIGERANT LEAKS" in "Charging Refrigerant".

#### CHARGING REFRIGERANT

1. Slowly open the high pressure valve of the manifold gauge, and charge the calculated amount of refrigerant in "CALCULATING CHARGING AMOUNT OF REFRIGERANT".

#### CAUTION:

The refrigerant in the charging cylinder is kept in the liquid state, so the refrigerant should be charged from high pressure side. Do not start the engine with the high pressure valve kept open.

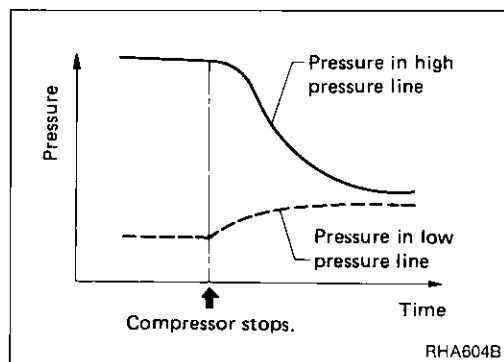
2. Close the high pressure valve of the manifold gauge.
3. Make sure that the calculated amount of refrigerant is in the sight glass.
4. Close the charging cylinder outlet valve.
5. Turn off the heater if it is on (when using heater equipped type).

### Inspection for Refrigerant Leaks

#### WORK PROCEDURE

To facilitate inspection for refrigerant leaks, establish the following conditions:

- Start the engine.
- Run the air conditioner.
- Set the blower fan control to MAX.
- Set the temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate the refrigerant through the system).



Refrigerant leaks should be checked immediately after stopping the engine, beginning with the high pressure line, using a gas leak detector. This is because the pressure in the high pressure line drops gradually after the refrigerant circulation stops while the pressure in the low pressure line rises gradually as shown in the graph. Leaks can be detected easily when pressure is high.

To prevent detecting errors, make sure that there is no refrigerant vapor or tobacco smoke in the vicinity of the vehicle. It is also necessary to shield the vehicle from the wind so that the leaking refrigerant is not blown away.

## DISCHARGING, EVACUATING, CHARGING AND CHECKING

### Inspection for Refrigerant Leaks (Cont'd)

#### INSPECTION POINTS

Check carefully each of the tube joints. To check, wipe the portion to be checked with waste cloth, and move the tester probe all around the joint.

#### Compressor

Check the shaft seals and bolt holes, and also around the magnet clutch.

#### Receiver drier

Check the pressure valve, safety valve and the fusible plug mounts.

#### Service valve

Check all around the service valves.

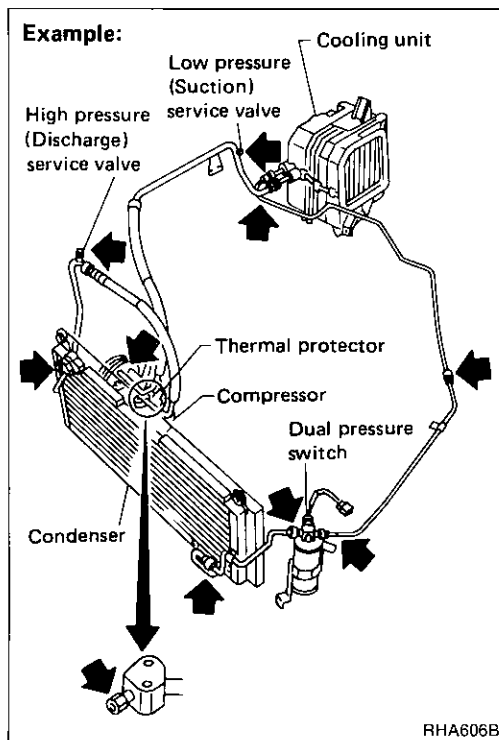
Ensure that the valve core is not loose.

The service valve cap must be attached to the valve (to prevent leak).

Also check that there are no foreign objects inside the cap.

#### Inside of cooling unit

To check, insert the leak tester probe into the drain hose immediately after stopping the engine. (Keep the probe inserted for more than 10 seconds.)



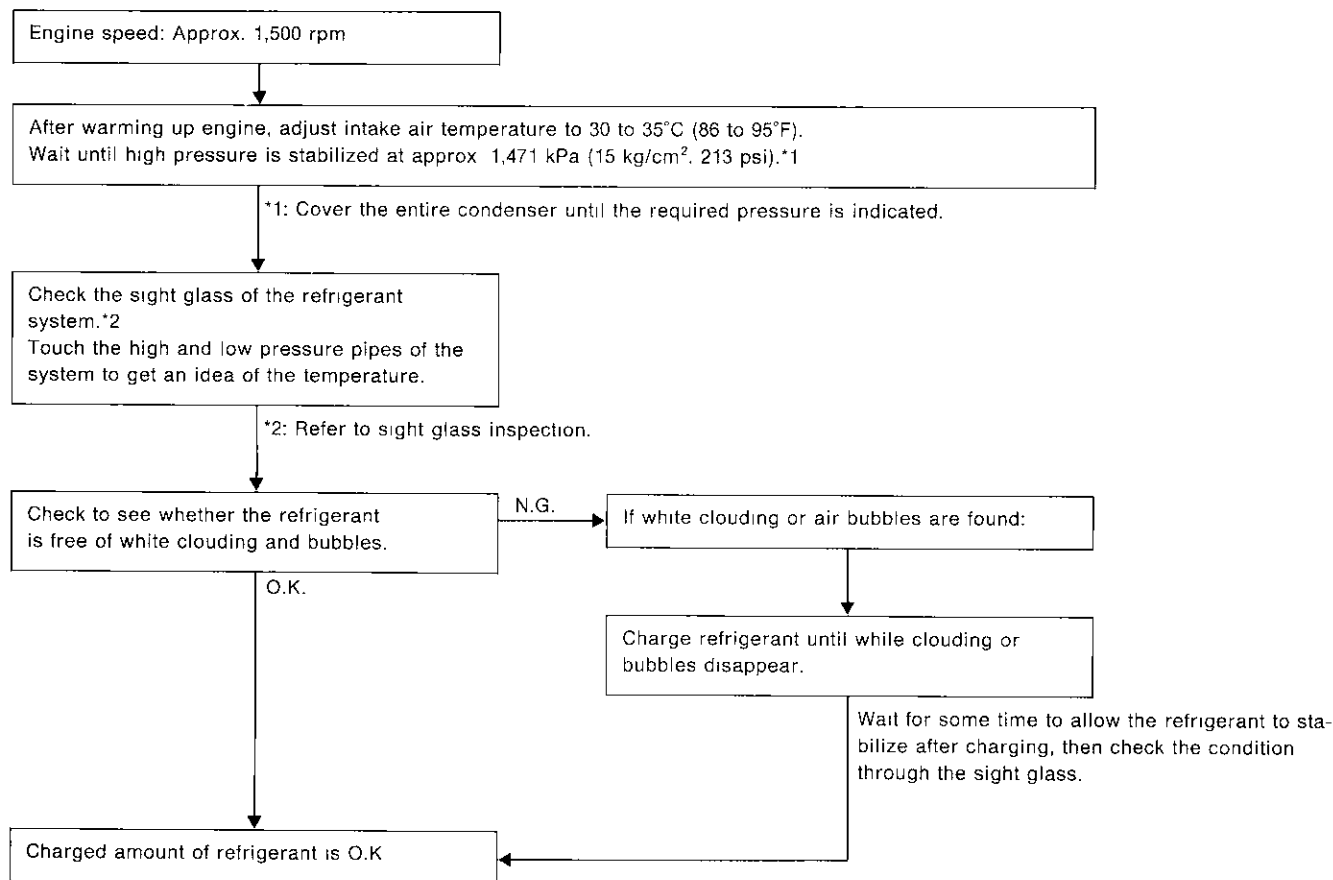
## Confirmation of Amount of Charged Refrigerant

The amount of refrigerant charged into the system can be observed through the sight glass by watching the flow of the refrigerant and by reading the high pressure and low pressure manifold gauges under the following conditions:

### CONDITIONS

- Doors: Close completely.
- Window glasses: Close completely.
- Intake door position: RECIRC
- Mode door position: VENT
- Blower fan: HI
- TEMP control: Optional (Set so that intake air temperature is 30 to 35°C (86 to 95°F).
- AIR CON switch: ON
- Engine speed: Approx. 1,500 rpm

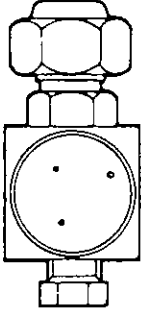
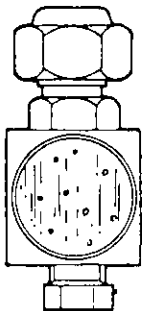
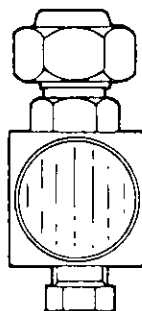
### WORK PROCEDURE





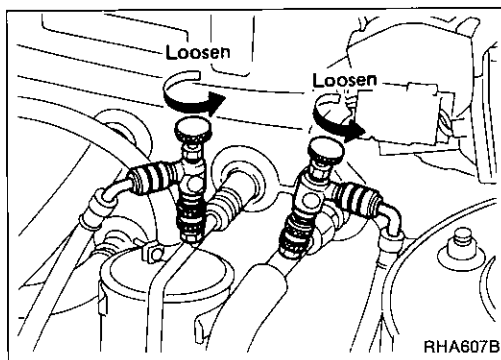
# DISCHARGING, EVACUATING, CHARGING AND CHECKING

## Confirmation of Amount of Charged Refrigerant (Cont'd)

| Amount of charge                               | Appropriate                                                                                                                                                                            | Refrigerant is insufficient                                                                                                             | Almost no refrigerant                                                                                      | Overcharged, or air in system                                                                                                                |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Check item                                     |                                                                                                                                                                                        |                                                                                                                                         |                                                                                                            |                                                                                                                                              |
| Temperature of high and low pressure pipes     | High pressure side is hot while low pressure side is cold.                                                                                                                             | High pressure side is warm and low pressure side is somewhat cold.                                                                      | No difference is felt between high and low pressure sides.                                                 | High pressure side is very hot.                                                                                                              |
| Flow of refrigerant viewed through sight glass | Mostly transparent. Occasionally some bubbles are seen when engine rpm is increased or decreased.<br> | Bubbles are always flowing. Refrigerant is cloudy.<br> | Nothing is visible.<br> | 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 <sup>2</sup> , 199 - 256 psi)<br>Normal low pressure: 147 - 294 kPa (1.5 - 3 kg/cm <sup>2</sup> , 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                                 | <b>Air bubbles may be generated when the receiver drier strainer is clogged, or when the expansion valve is opened excessively.</b>                                                    | 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.



### Recovery Procedure

#### REMOVAL OF REFRIGERANT CHARGING DEVICE

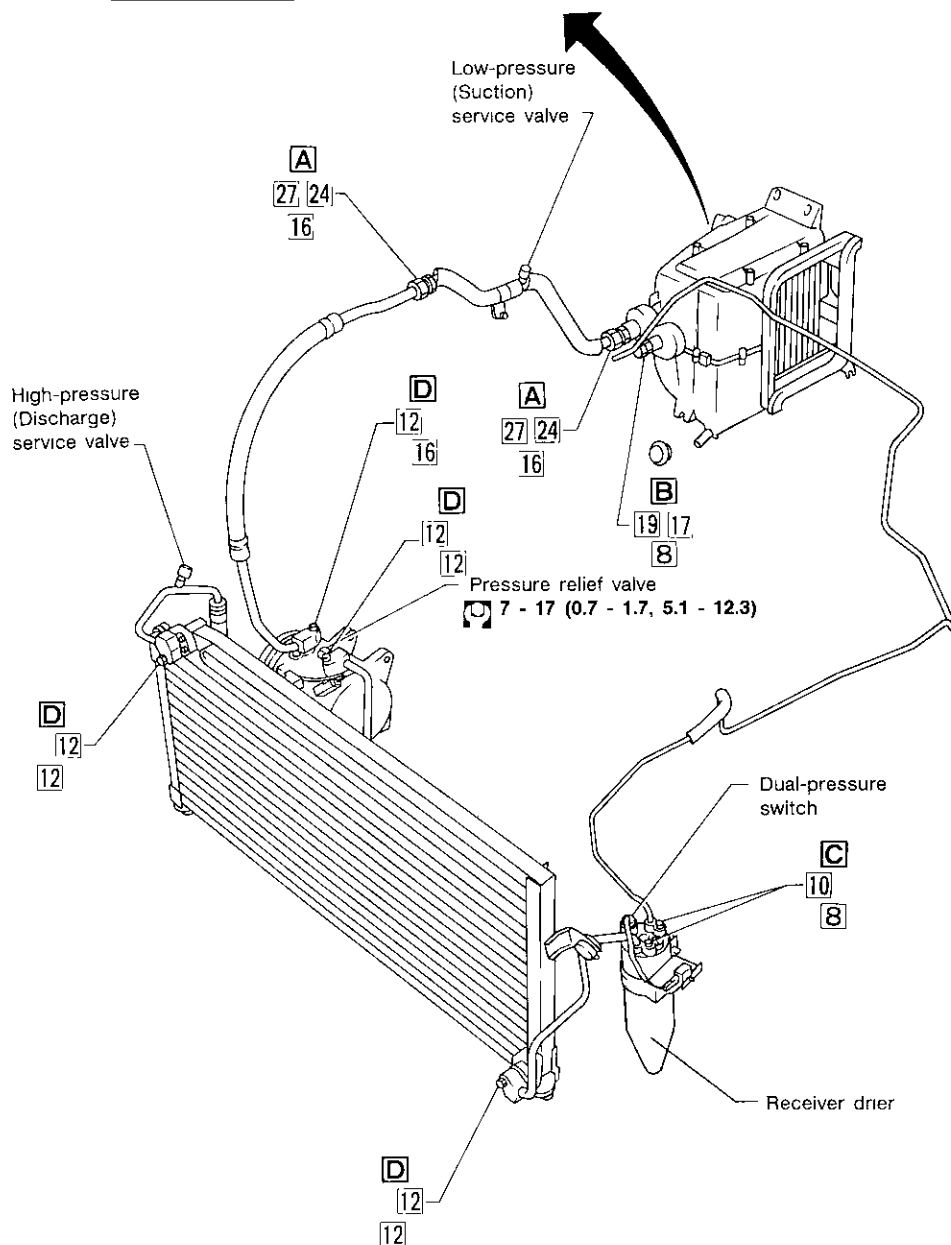
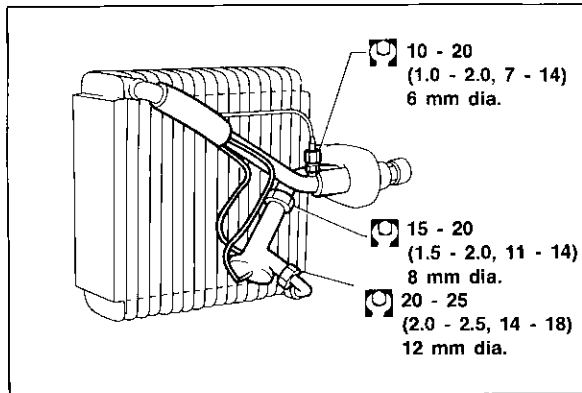
1. Completely loosen the adapter valves of the low pressure and high pressure lines. The inner valve of the adapter valve will prevent the refrigerant from leaking out.
2. Remove both the high-pressure and low-pressure side adapter valves from the on-vehicle service valve.

**If adapter valve is not used for charging, proceed as follows to minimize the refrigerant discharge into the atmosphere.**

3. Loosen the nut of the low pressure charging hose while pressing it against the service valve to prevent refrigerant leakage.
4. After loosening the nut, quickly remove the charge valve from the service valve.
5. Wait until the high pressure gauge indication drops to below 981 kPa (10 kg/cm<sup>2</sup>, 142 psi), then similarly disconnect the high pressure charging hose.

## Refrigerant Lines

For production A/C model



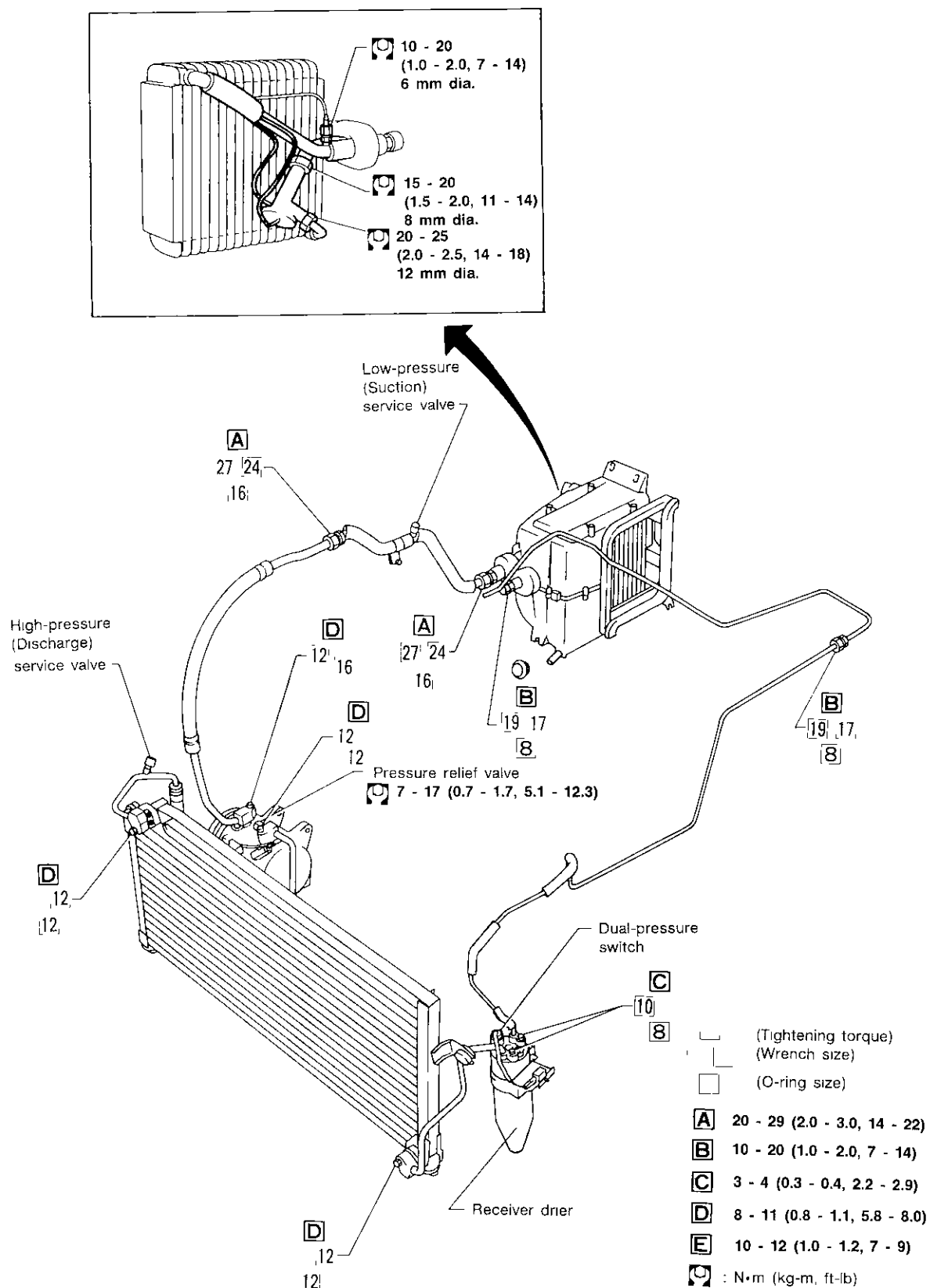
- (Tightening torque)
- (Wrench size)
- (O-ring size)

- A** 20 - 29 (2.0 - 3.0, 14 - 22)
- B** 10 - 20 (1.0 - 2.0, 7 - 14)
- C** 3 - 4 (0.3 - 0.4, 2.2 - 2.9)
- D** 8 - 11 (0.8 - 1.1, 5.8 - 8.0)
- E** 10 - 12 (1.0 - 1.2, 7 - 9)
- : N·m (kg·m, ft·lb)

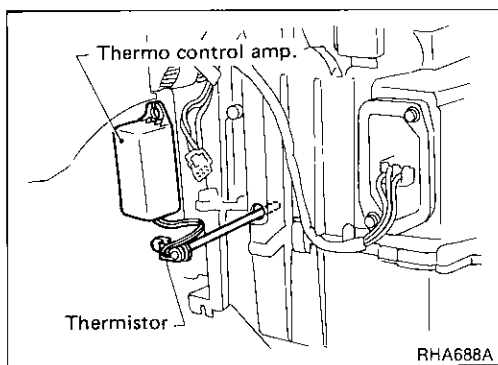
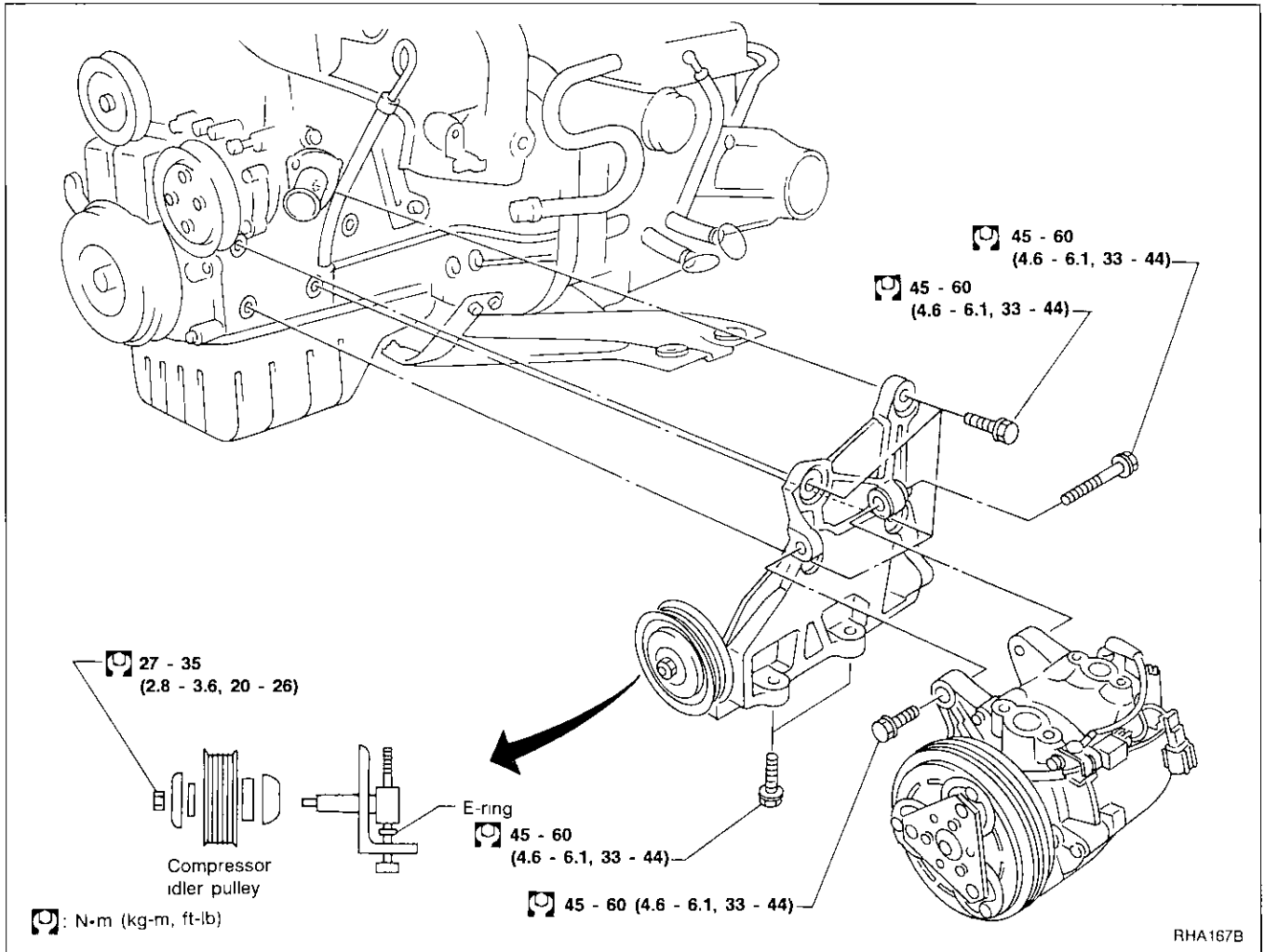
# SERVICE PROCEDURE

## Refrigerant Lines (Cont'd)

For kit A/C model



## Compressor Mounting



## Thermo Control Amp.

### REPLACEMENT

Remove screws, which secure thermistor locating stay, from front of cooling unit. Replace thermo control amp. assembly with a new one. (Cooling unit need not be removed during the replacement.)

## Belt Tension

- Refer to MA section.

## Fast Idle Control Device (F.I.C.D.)

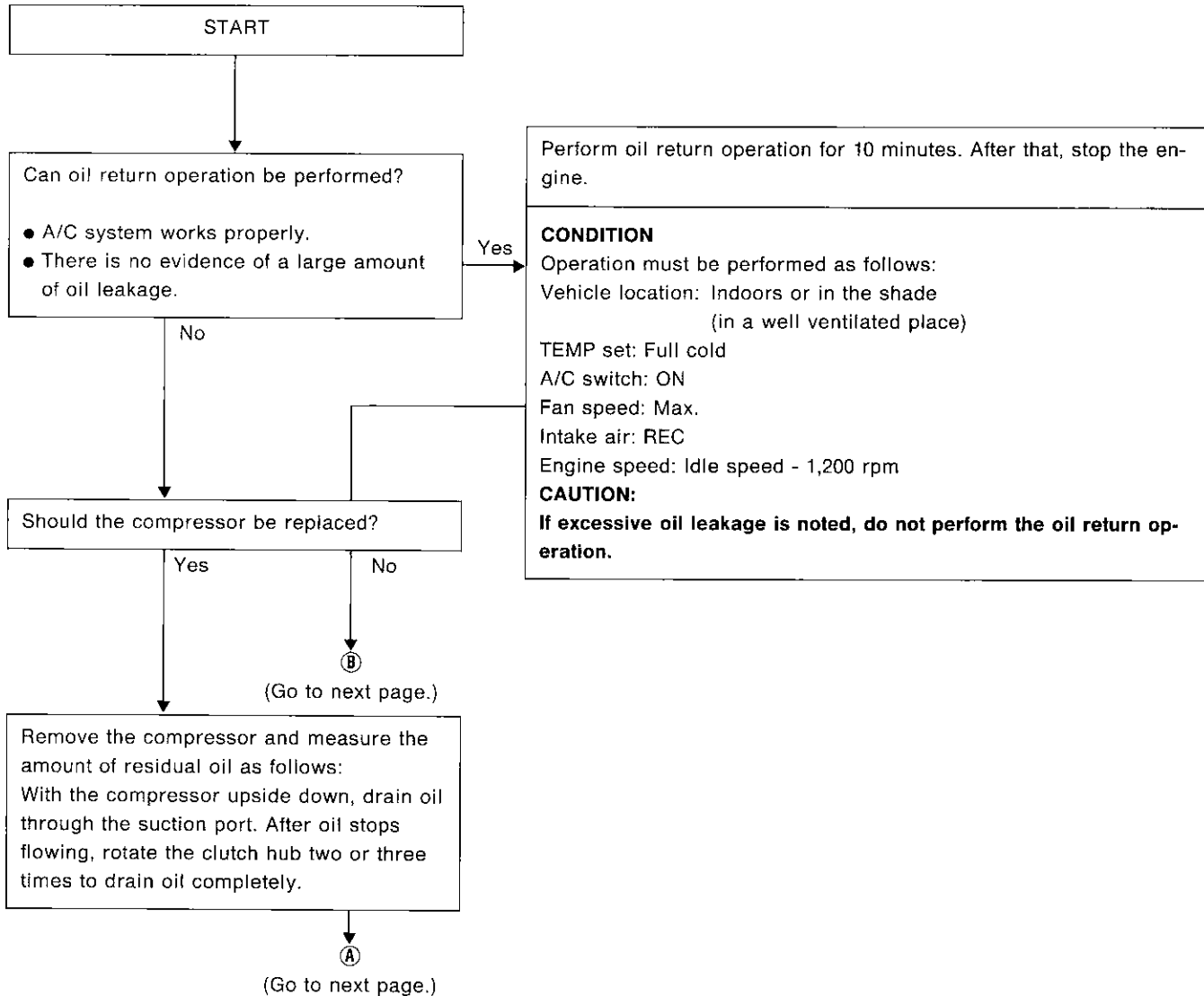
- Refer to EF & EC section.

## 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)



# COMPRESSOR OIL — Checking and Adjusting

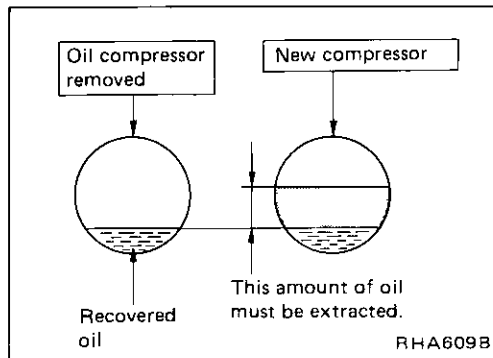
## Maintenance of Oil Quantity in Compressor (Cont'd)

Ⓐ

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<br>(2.4, 2.5)                  | 110 (3.7, 3.9)                                      |
|                   |                                             | Greater than 70<br>(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<br>(3.0, 3.2)                  | 90 (3.0, 3.2)                                       |
|                   |                                             | Greater than 90<br>(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<br>(6.4, 6.7)                 | 60 (2.0, 2.1)                                       |
|                   |                                             | Greater than 190<br>(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)                                       |
| V-5               | 236 (8.0, 8.3)                              | Less than 95<br>(3.2, 3.3)                  | 150 (5.1, 5.3)                                      |
|                   |                                             | Greater than 95<br>(3.2, 3.3)               | 236 (8.0, 8.3) – [Recovered amount + 20 (0.7, 0.7)] |

Ⓑ

Is there any part to be replaced? (Evaporator, condenser, receiver drier or in case there is evidence of a large amount of oil leakage.)

Yes

After replacing any of the following major components of the system, be sure to add the correct amount of oil to the system.

### Amount of oil to be added

| Part replaced               | Oil to be added to system                    |                | Remarks      |
|-----------------------------|----------------------------------------------|----------------|--------------|
|                             | Amount of oil<br>mℓ (US fl oz,<br>Imp fl oz) | Ratio*2<br>(%) |              |
| Evaporator                  | 45 - 75<br>(1.5 - 2.5, 1.6 - 2.6)            | 30             | —            |
| Condenser                   | 30 - 50<br>(1.0 - 1.7, 1.1 - 1.8)            | 20             | —            |
| Receiver drier              | 15 - 25<br>(0.5 - 0.8, 0.5 - 0.9)            | 10             | —            |
| In case of refrigerant leak | 30 - 50<br>(1.0 - 1.7, 1.1 - 1.8)            | —              | Large leak   |
|                             | —                                            | —              | Small leak*1 |

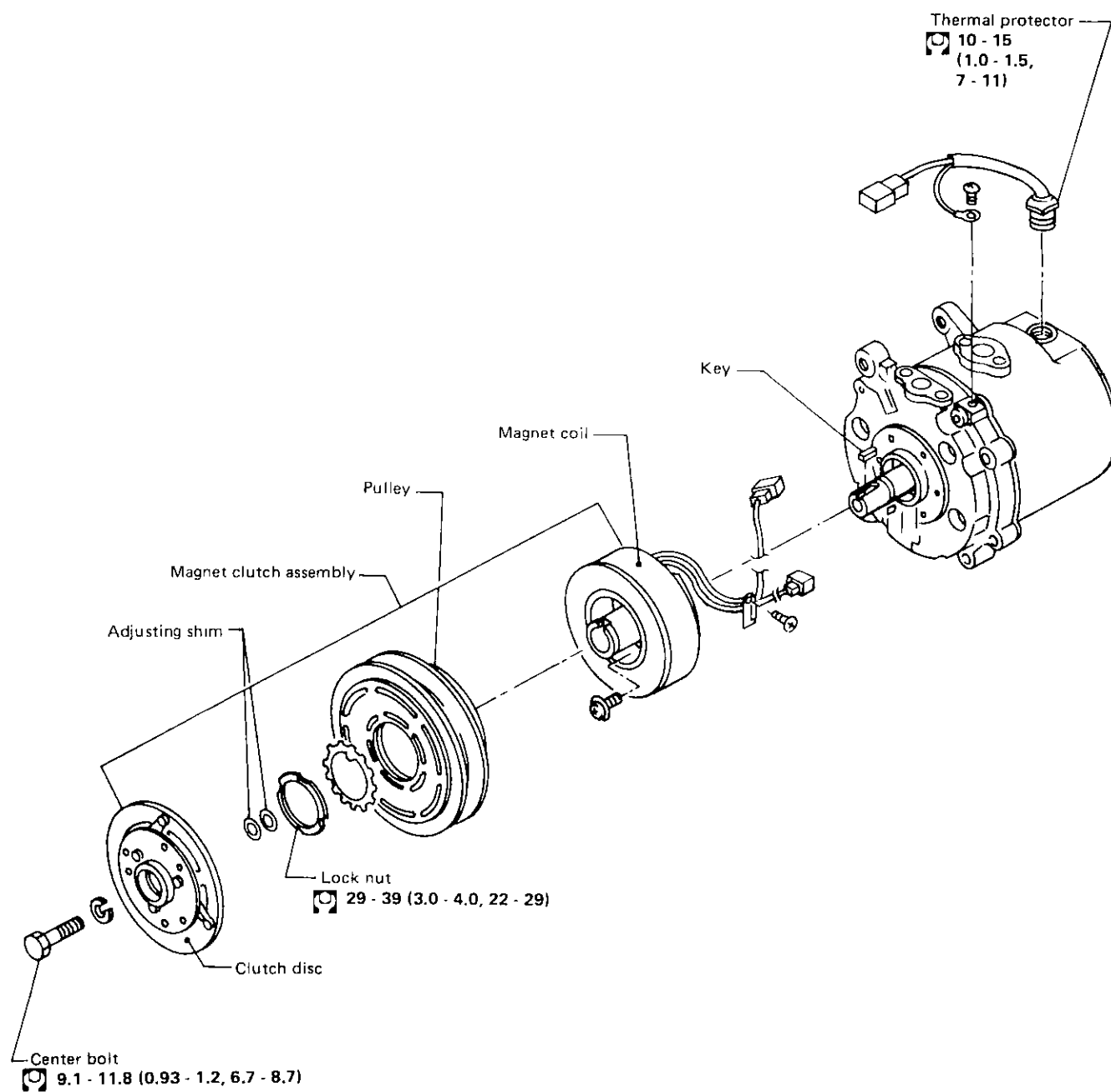
\*1: If refrigerant leak is small, no addition of oil is needed.

\*2: "Ratio" in this table indicates the ratio of added oil to the overall amount of oil needed in the system.

No

Carry out the A/C performance test.

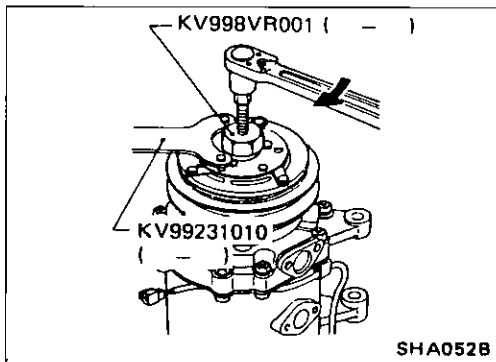
# COMPRESSOR — Model NVR 140S (ATSUGI make)



 : N·m (kg·m, ft·lb)

RHA283

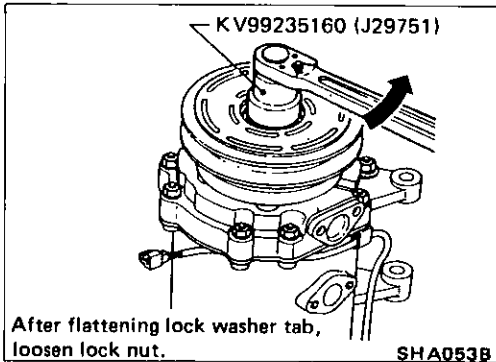




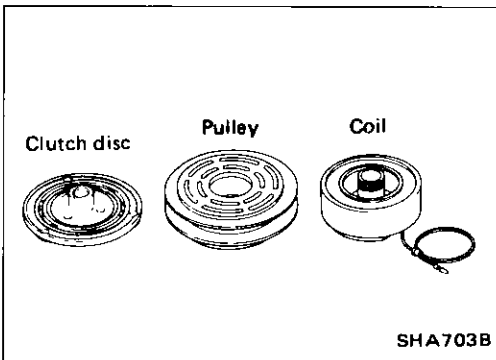
### Compressor Clutch

#### REPLACEMENT

- When removing center bolt, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed.



- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.



#### 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.

### Compressor Clutch (Cont'd)

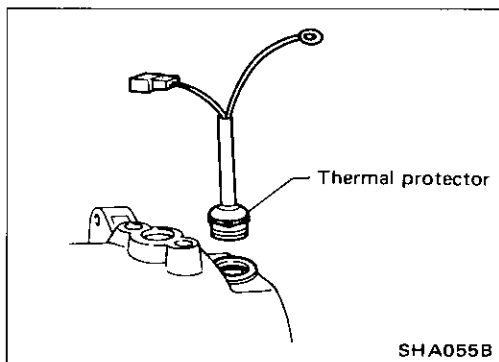
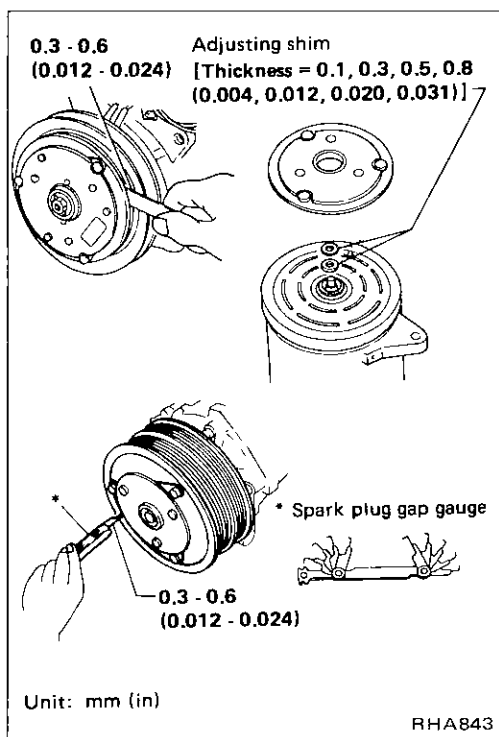
#### ADJUSTMENT

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

#### BREAK-IN OPERATION

When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times.

Break-in operation raises the level of transmitted torque.

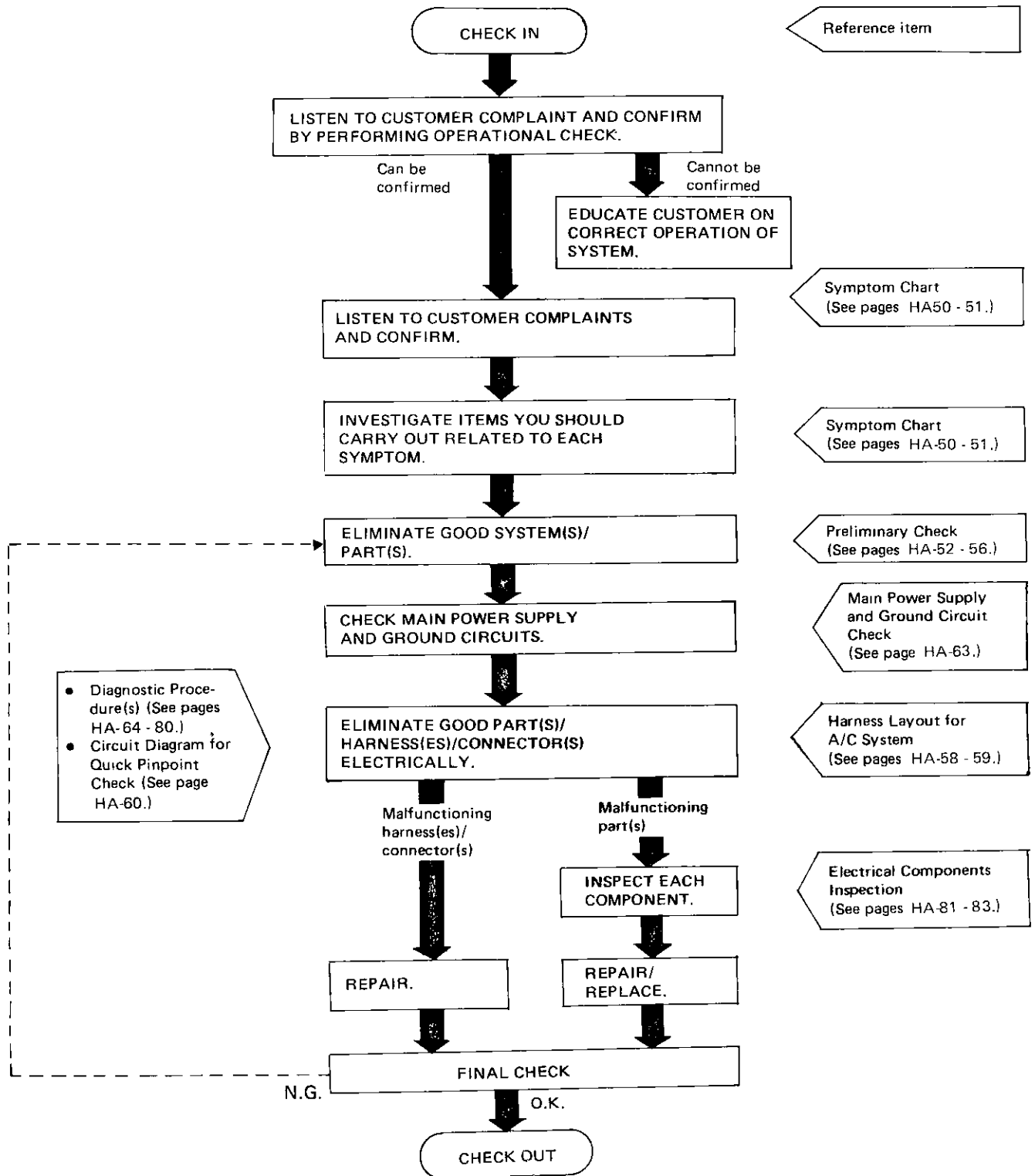


#### Thermal Protector

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.

## How to Perform Trouble Diagnoses for Quick and Accurate Repair

### WORK FLOW



### Operational Check

The purpose of the operational check is to confirm that the system operates as it should. The systems which are checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase.

#### CONDITIONS:

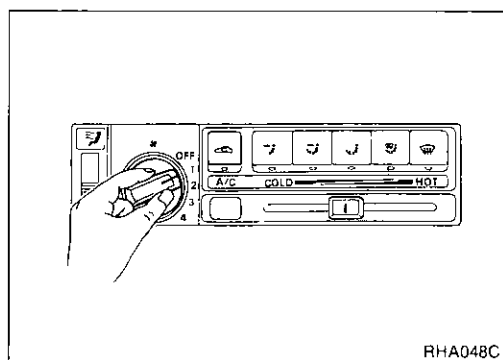
Engine running at normal operating temperature.

Fresh vent "OFF"

#### PROCEDURE:

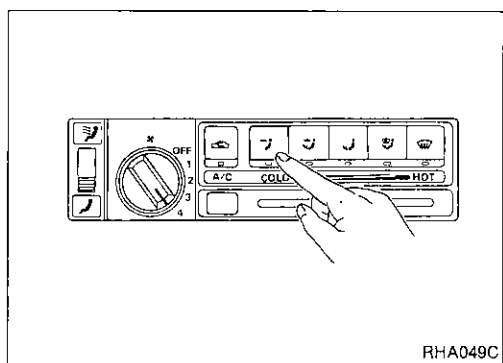
##### 1. Check blower

- 1) Turn Fan switch to 1-speed.  
Blower should operate on 1-speed.
- 2) Then turn Fan switch to 2-speed.
- 3) Continue checking blower speed until all four speeds are checked.
- 4) Leave blower on 4-speed.



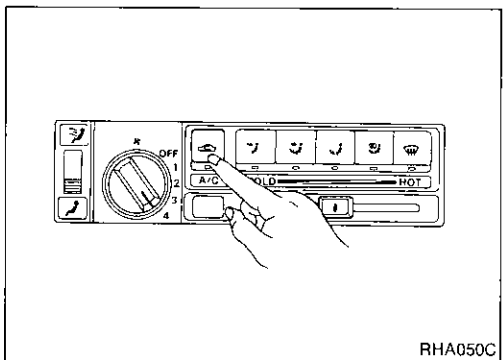
##### 2. Check discharge air

- 1) Press the VENT button.  
VENT indicator should light.
- 2) Confirm that all discharge air comes out of face vents.
- 3) Press the B/L button.  
B/L indicator should light.
- 4) Confirm that discharge air comes out of face vents and foot vents.
- 5) Press the FOOT button.  
FOOT indicator should light.
- 6) Confirm that discharge air comes out of foot vents, with some air from defroster vents.
- 7) Press the F/D button.  
F/D indicator should light.
- 8) Confirm that discharge air comes out of foot vents, with some air from defroster vents, and that intake door position is at FRE.
- 9) Press the DEF button.  
DEF indicator should light.
- 10) The discharge air should be coming only from defroster vents. At the same time compressor should turn ON and intake door position be at FRE.



##### 3. Check recirc

- 1) Press RECIRC button.  
RECIRC indicator should light.
- 2) Listen for intake door position change (you should hear blower sound change slightly).

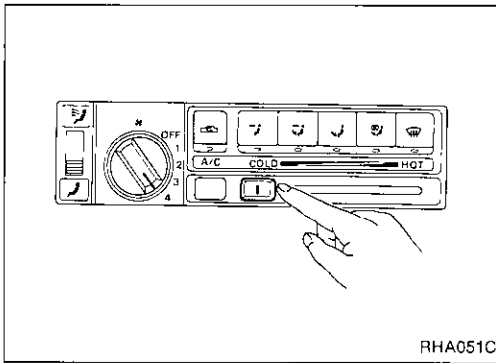


## DIAGNOSES — Overall System

### Operational Check (Cont'd)

#### 4. Check temperature decrease

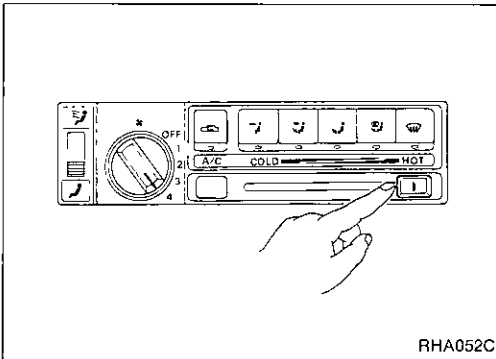
- 1) Slide temperature control lever to full cold.
- 2) Check for cold air at discharge air outlets.



RHA051C

#### 5. Check temperature increase

- 1) Slide temperature control lever to full hot.
- 2) Check for hot air at discharge air outlets.

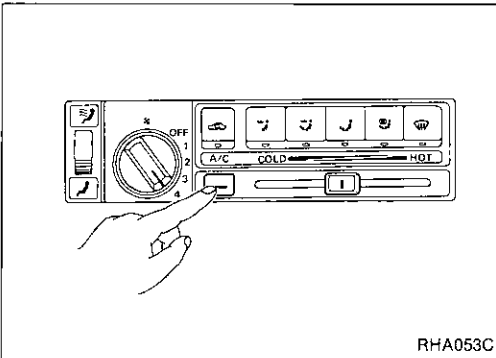


RHA052C

#### 6. Check air conditioner switch

Move the fan switch to the desired (1 to 4-speed) position and push the air conditioner button to turn ON the air conditioner.

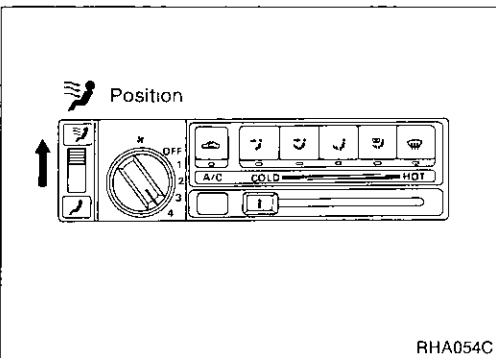
The indicator light should come on when air conditioner is ON.



RHA053C

#### 7. Check fresh vent lever

- 1) Press FOOT, FOOT/DEF or DEF.
- 2) Move fresh vent lever in direction of arrow.
- 3) Confirm that discharge air comes out of foot & def vents with a cold air from face vents.



RHA054C

## Performance Chart

### TEST CONDITION

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)

Doors: Closed

Door window: Open

Hood: Open

TEMP. lever position: Max. COLD

OUTLET air:  (Ventilation)

INTAKE air:  (Recirculation)

FAN speed: Max.

Engine speed: 1,500 rpm

Time required before starting testing after air conditioner starts operating: More than 10 minutes

### TEST READING

**Recirculating-to-discharge air temperature table**

| Inside air (Recirculating air)<br>at blower assembly inlet |                            | Discharge air temperature at center ventilator<br>°C (°F) |
|------------------------------------------------------------|----------------------------|-----------------------------------------------------------|
| Relative humidity<br>%                                     | Air temperature<br>°C (°F) |                                                           |
| 50 - 60                                                    | 20 (68)                    | 6.0 (43)                                                  |
|                                                            | 25 (77)                    | 9.0 (48)                                                  |
|                                                            | 30 (86)                    | 13.8 (57)                                                 |
|                                                            | 35 (95)                    | 18.2 (65)                                                 |
|                                                            | 40 (104)                   | 23.0 (73)                                                 |
| 60 - 70                                                    | 20 (68)                    | 6.0 (43)                                                  |
|                                                            | 25 (77)                    | 10.8 (51)                                                 |
|                                                            | 30 (86)                    | 15.8 (60)                                                 |
|                                                            | 35 (95)                    | 21.0 (70)                                                 |
|                                                            | 40 (104)                   | 26.0 (79)                                                 |

**Ambient air temperature-to-compressor pressure table**

| Ambient air            |                            | High-pressure (Discharge side)<br>kPa (kg/cm <sup>2</sup> , psi) | Low-pressure (Suction side)<br>kPa (kg/cm <sup>2</sup> , psi) |
|------------------------|----------------------------|------------------------------------------------------------------|---------------------------------------------------------------|
| Relative humidity<br>% | Air temperature<br>°C (°F) |                                                                  |                                                               |
| 50 - 70                | 20 (68)                    | 1,128 (11.5, 164) or less                                        | 157 (1.6, 23) or less                                         |
|                        | 25 (77)                    | 1,275 (13.0, 185)                                                | 171.6 (1.75, 24.9)                                            |
|                        | 30 (86)                    | 1,608 (16.4, 233)                                                | 226 (2.3, 33)                                                 |
|                        | 35 (95)                    | 1,961 (20.0, 284)                                                | 284 (2.9, 41)                                                 |
|                        | 40 (104)                   | 2,275 (23.2, 330)                                                | 343 (3.5, 50)                                                 |

## Performance Test Diagnoses

Characteristics revealed by the manifold gauge readings for the air conditioning system are shown in the following.

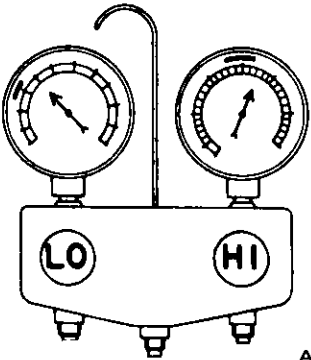
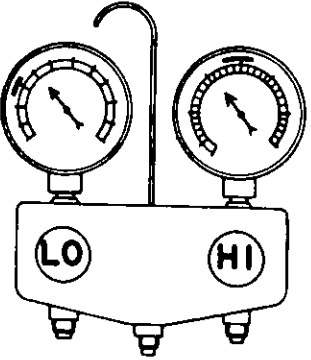
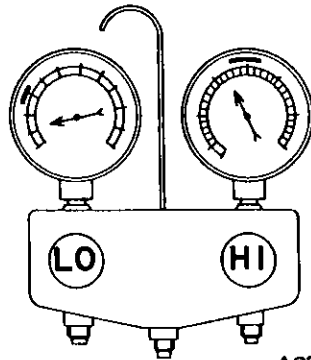
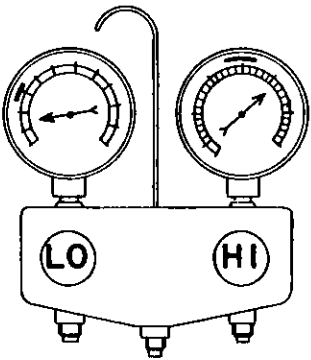
For how to do the performance test, refer to the item "Performance Chart".

In the following table, the portion smeared with ink on each gauge scale indicates the range showing that the air conditioning system is in good order. This range is described in Performance Chart.

| Condition                       |               | Probable cause                                                                                | Corrective action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|---------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INSUFFICIENT REFRIGERANT CHARGE | <p>AC352A</p> | <p>Insufficient cooling.<br/>Bubbles appear in sight glass.</p>                               | <p>Refrigerant is low, or leaking slightly.</p> <p>1. Leak test.<br/>2. Repair leak.<br/>3. Charge system.<br/><b>Evacuate, as necessary, and recharge system.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| ALMOST NO REFRIGERANT           | <p>AC353A</p> | <p>No cooling action.<br/>A lot of bubbles or something like mist appears in sight glass.</p> | <p>Serious refrigerant leak.</p> <p>Stop compressor immediately.</p> <p>1. Leak test.<br/>2. Discharge system.<br/>3. Repair leak(s).<br/>4. Replace receiver drier if necessary.<br/>5. Check oil level.<br/>6. Evacuate and recharge system.</p>                                                                                                                                                                                                                                                                                                                                                                                |
| MALFUNCTIONING EXPANSION VALVE  | <p>AC354A</p> | <p>Slight cooling.<br/>Sweat or frosting on expansion valve inlet.</p>                        | <p>Expansion valve restricts refrigerant flow.</p> <ul style="list-style-type: none"> <li>● Expansion valve is clogged.</li> <li>● Expansion valve is inoperative.                             <ul style="list-style-type: none"> <li>Valve stuck closed.</li> <li>Thermal bulb has lost charge.</li> </ul> </li> </ul> <p>If valve inlet reveals sweat or frost:</p> <p>1. Discharge system.<br/>2. Remove valve and clean it. Replace it if necessary.<br/>3. Evacuate system.<br/>4. Charge system.</p> <p>If valve does not operate:</p> <p>1. Discharge system.<br/>2. Replace valve.<br/>3. Evacuate and charge system.</p> |

# DIAGNOSES — Overall System

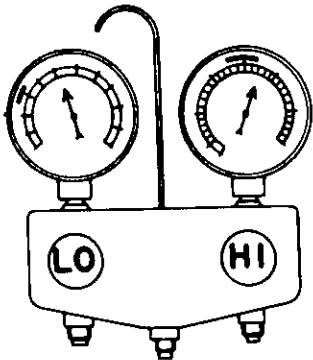
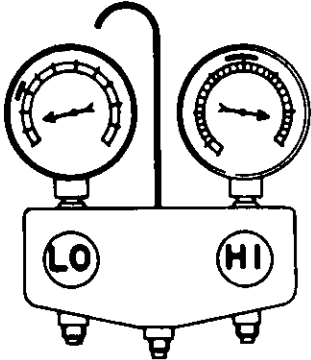
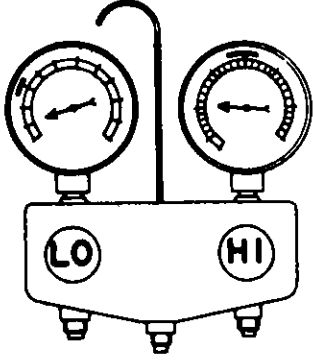
## Performance Test Diagnoses (Cont'd)

| Condition                                                                                         | Probable cause                                           | Corrective action                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>AC355A</p>   | <p>Insufficient cooling.<br/>Sweat on suction line.</p>  | <p>Expansion valve allows too much refrigerant through evaporator.</p> <p>Check valve for operation. If suction side does not show a pressure decrease, replace valve.</p>                          |
|  <p>AC356A</p>   | <p>No cooling.<br/>Sweat or frosting on suction line</p> | <p>Malfunctioning expansion valve.</p> <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace valve.</li> <li>3. Evacuate and charge system.</li> </ol>                    |
| MALFUNCTIONING SUCTION THROTTLE VALVE                                                             |                                                          |                                                                                                                                                                                                     |
|  <p>AC357A</p> | <p>Insufficient cooling.<br/>Frosted evaporator.</p>     | <p>Suction throttle valve is inoperative.</p> <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace valve.</li> <li>3. Evacuate and charge system.</li> </ol>             |
|  <p>AC358A</p> | <p>Insufficient cooling.</p>                             | <p>Suction throttle valve restricts refrigerant flow.</p> <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace valve.</li> <li>3. Evacuate and charge system.</li> </ol> |



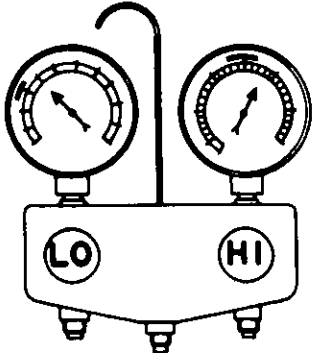
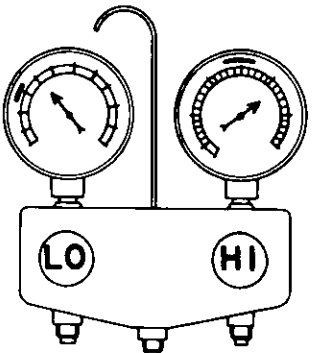
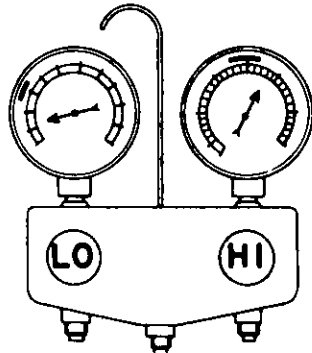
## DIAGNOSES — Overall System

### Performance Test Diagnoses (Cont'd)

| Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Probable cause                                                      | Corrective action                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div style="border: 1px solid black; padding: 2px;">MALFUNCTIONING CONDENSER</div> <div>  </div> <div>AC361A</div> <div> <p>No cooling action: engine may overheat.<br/>Bubbles appear in sight glass of drier.<br/>Suction line is very hot.</p> </div> | <p>Usually a malfunctioning condenser.</p>                          | <ul style="list-style-type: none"> <li>● Check fan belt and fluid coupling</li> <li>● Check radiator fan motor.</li> <li>● Check condenser for dirt accumulation.</li> <li>● Check engine cooling system for overheating.</li> <li>● Check for refrigerant overcharging.</li> </ul> <p>If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.</p> |
| <div style="border: 1px solid black; padding: 2px;">HIGH-PRESSURE LINE BLOCKED</div> <div>  </div> <div>AC362A</div> <div> <p>Insufficient cooling.<br/>Frosted high-pressure liquid line.</p> </div>                                                | <p>Drier clogged, or restriction in high-pressure line.</p>         | <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Remove receiver drier or strainer and replace it.</li> <li>3. Evacuate and charge system.</li> </ol>                                                                                                                                                                                                                                         |
| <div style="border: 1px solid black; padding: 2px;">MALFUNCTIONING COMPRESSOR</div> <div>  </div> <div>AC363A</div> <div> <p>Insufficient cooling.</p> </div>                                                                                  | <p>Internal problem in compressor, or damaged gasket and valve.</p> | <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Remove and check compressor.</li> <li>3. Repair or replace compressor.</li> <li>4. Check oil level.</li> <li>5. Replace receiver drier.</li> <li>6. Evacuate and charge system.</li> </ol>                                                                                                                                                   |

# DIAGNOSES — Overall System

## Performance Test Diagnoses (Cont'd)

| Condition                                                                                                                                                  |                                                                                                                                                                                                                    | Probable cause                                                                                                   | Corrective action                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>TOO MUCH OIL IN SYSTEM (Excessive)</div> <div>  <p>AC364A</p> </div> | <p>Insufficient cooling.</p>                                                                                                                                                                                       | <p>Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.</p>       | <p>Refer to COMPRESSOR OIL for correcting oil level.</p>                                                                                                                                                                                         |
| <div>AIR IN SYSTEM</div> <div>  <p>AC359A</p> </div>                     | <p>Insufficient cooling.<br/>Sight glass shows occasional bubbles.</p>                                                                                                                                             | <p>Air mixed with refrigerant in system.</p>                                                                     | <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace receiver drier.</li> <li>3. Evacuate and charge system.</li> </ol>                                                                                               |
| <div>MOISTURE IN SYSTEM</div> <div>  <p>AC360A</p> </div>               | <p>After short operation, suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading vibrates around 39 kPa (0.4 kg/cm<sup>2</sup>, 6 psi).</p> | <p>Drier is saturated with moisture. Moisture has frozen in expansion valve. Refrigerant flow is restricted.</p> | <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace receiver drier (twice if necessary).</li> <li>3. Evacuate system completely. (Repeat 30-minutes evacuating three times.)</li> <li>4. Recharge system.</li> </ol> |

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# TROUBLE DIAGNOSES

## Symptom Chart

### DIAGNOSTIC TABLE

| PROCEDURE                                                             | Preliminary Check   |                     |                     |                     |                     | Diagnostic Procedure   |                        |                        |                        |                        | Main Power Supply and Ground Circuit Check |          |                   |                     |
|-----------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------------------------------------|----------|-------------------|---------------------|
| REFERENCE PAGE                                                        | HA-52               | HA-53               | HA-54               | HA-55               | HA-56               | HA-64 - 67             | HA-68 - 69             | HA-70                  | HA-71 - 75             | HA-76 - 80             | HA-63                                      | HA-63    | HA-63             | HA-63               |
| SYMPTOM                                                               | Preliminary check 1 | Preliminary check 2 | Preliminary check 3 | Preliminary check 4 | Preliminary check 5 | Diagnostic procedure 1 | Diagnostic procedure 2 | Diagnostic procedure 3 | Diagnostic procedure 4 | Diagnostic procedure 5 | 20A Fuses                                  | 15A Fuse | Push control unit | Thermo control amp. |
| A/C does not blow cold air.                                           |                     | ①                   |                     |                     |                     | ○                      |                        |                        | ○                      |                        | ○                                          | ○        |                   | ○                   |
| Blower motor does not rotate.                                         |                     | ①                   |                     |                     |                     | ②                      |                        |                        |                        |                        | ○                                          |          |                   |                     |
| Air outlet does not change.                                           |                     |                     |                     | ①                   |                     |                        | ②                      |                        |                        |                        |                                            | ○        | ○                 |                     |
| Intake door does not change in VENT, B/L or FOOT mode.                |                     |                     |                     |                     |                     |                        |                        | ②                      |                        |                        |                                            | ○        | ○                 |                     |
| Intake door is not set at "FRESH" in DEF or FOOT mode.                | ①                   |                     |                     |                     |                     |                        |                        | ○                      |                        |                        |                                            | ○        | ○                 |                     |
| Magnet clutch does not operate with A/C switch and fan switch are ON. |                     | ①                   |                     |                     |                     |                        |                        |                        | ②                      |                        |                                            | ○        |                   | ○                   |
| Magnet clutch does not operate in DEF mode.                           |                     | ①                   | ②                   |                     |                     |                        |                        |                        | ○                      |                        |                                            | ○        |                   | ○                   |
| Illumination or indicators of push control unit do not come on.       |                     |                     |                     |                     |                     |                        |                        |                        |                        | ①                      |                                            | ○        |                   |                     |
| Noise                                                                 |                     |                     |                     |                     | ①                   |                        |                        |                        |                        |                        |                                            |          |                   |                     |

①, ②: The number means checking order.

○: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

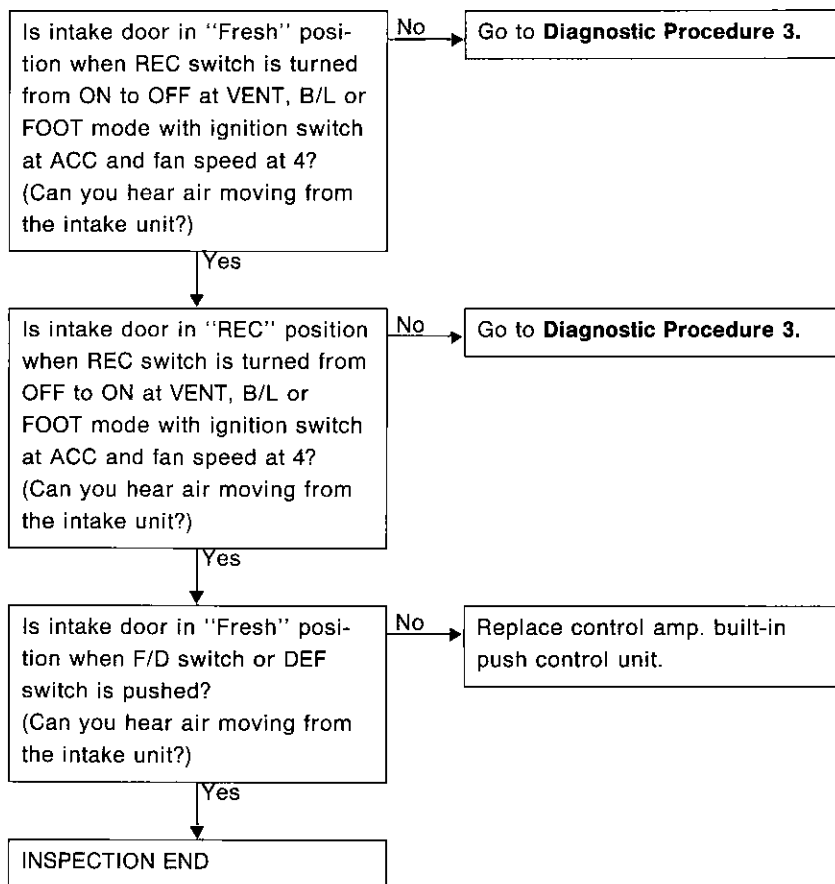
### Symptom Chart (Cont'd)

[illegible]

## Preliminary Check

### PRELIMINARY CHECK 1

Intake door is not set at "FRESH" in DEF or F/D mode.

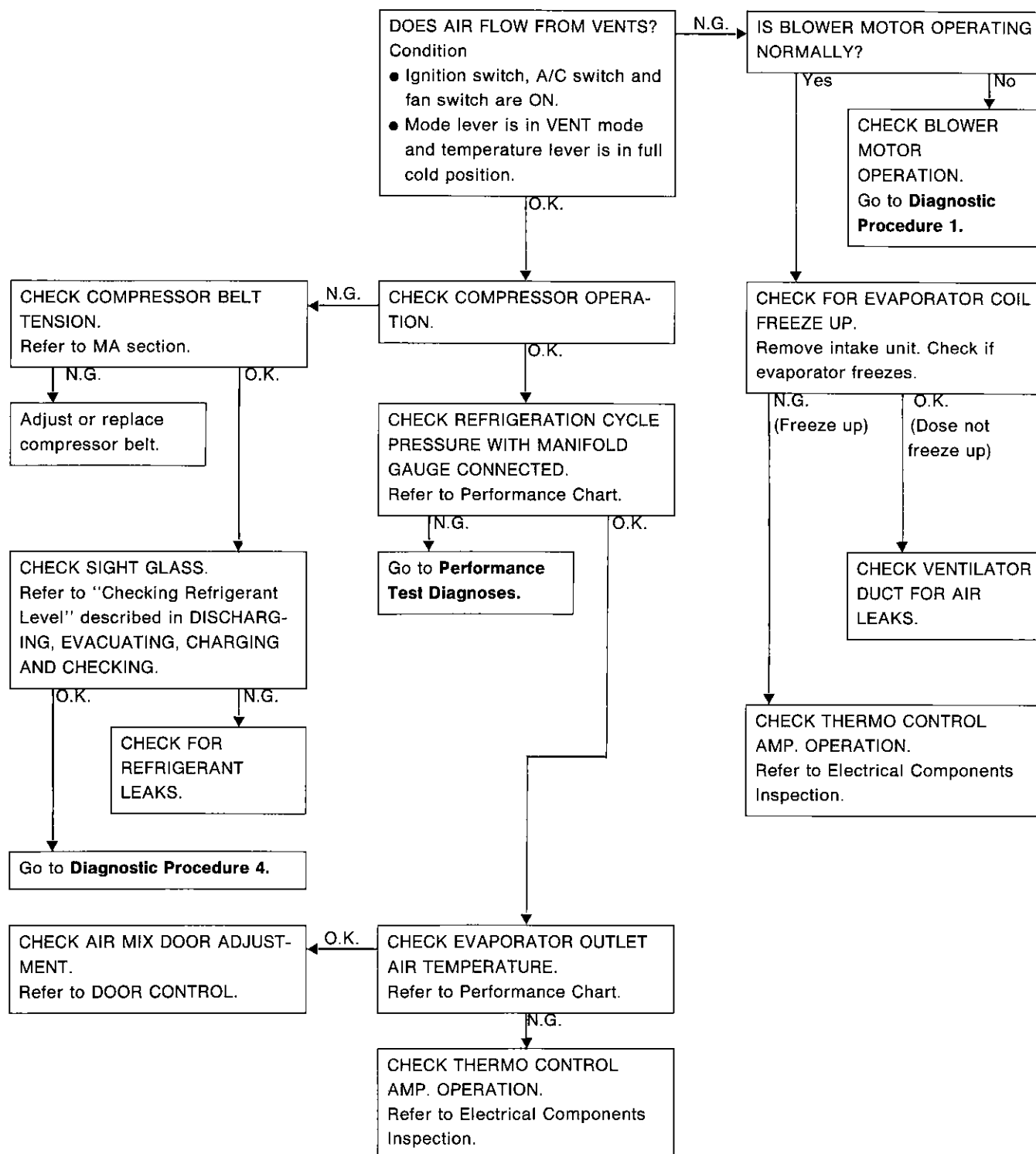


# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 2

A/C does not blow cold air.



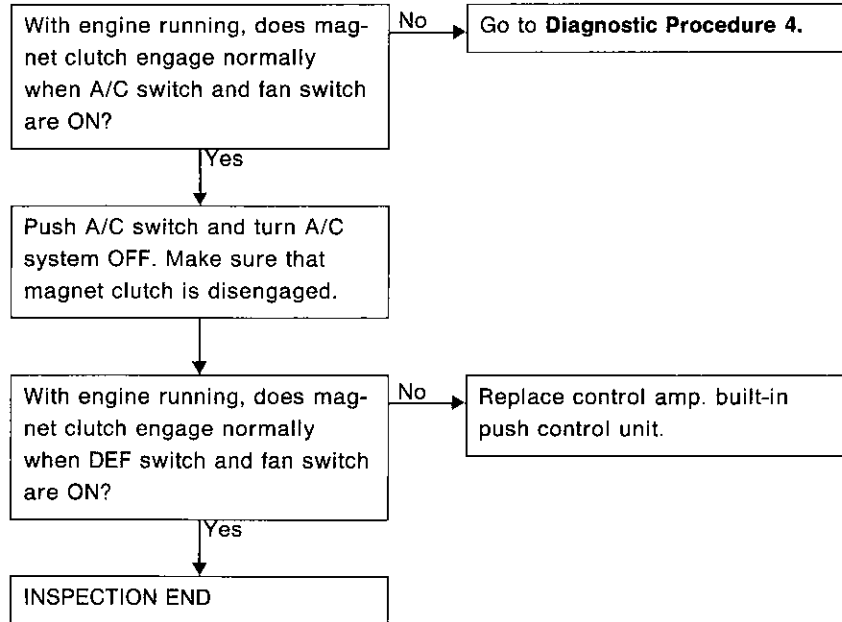
## TROUBLE DIAGNOSES

### Preliminary Check (Cont'd)

#### PRELIMINARY CHECK 3

Magnet clutch does not engage in DEF mode.

- Perform PRELIMINARY CHECK 2 before referring to the following flow chart.





# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

### PRELIMINARY CHECK 4

Air outlet does not change.

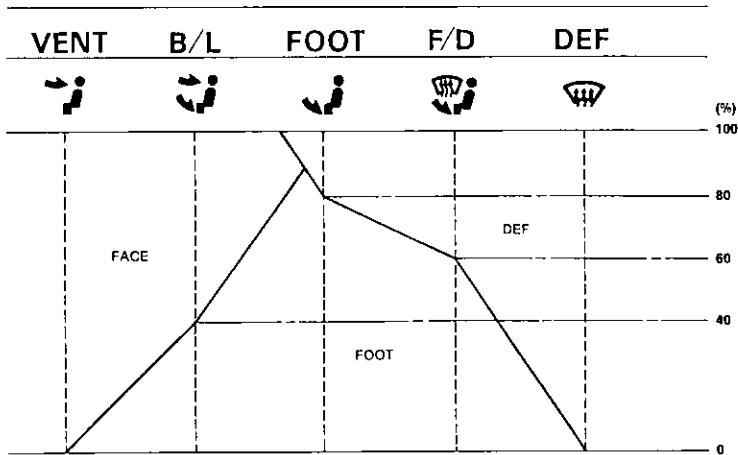
DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS PUSHED WITH IGNITION SWITCH AT ON?

No

Go to **Diagnostic Procedure 2.**

| Switch |                                                                                   | Indicator illuminates                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Air outlet  |
|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------|
|        |                                                                                   |  |  |  |  |  |             |
| Mode   |  | ○                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | VENT        |
|        |  |                                                                                   | ○                                                                                 |                                                                                   |                                                                                   |                                                                                   | FOOT & VENT |
|        |  |                                                                                   |                                                                                   | ○                                                                                 |                                                                                   |                                                                                   | FOOT & DEF  |
|        |  |                                                                                   |                                                                                   |                                                                                   | ○                                                                                 |                                                                                   | FOOT & DEF  |
|        |  |                                                                                   |                                                                                   |                                                                                   |                                                                                   | ○                                                                                 | DEF         |

Air distribution ratios



Yes

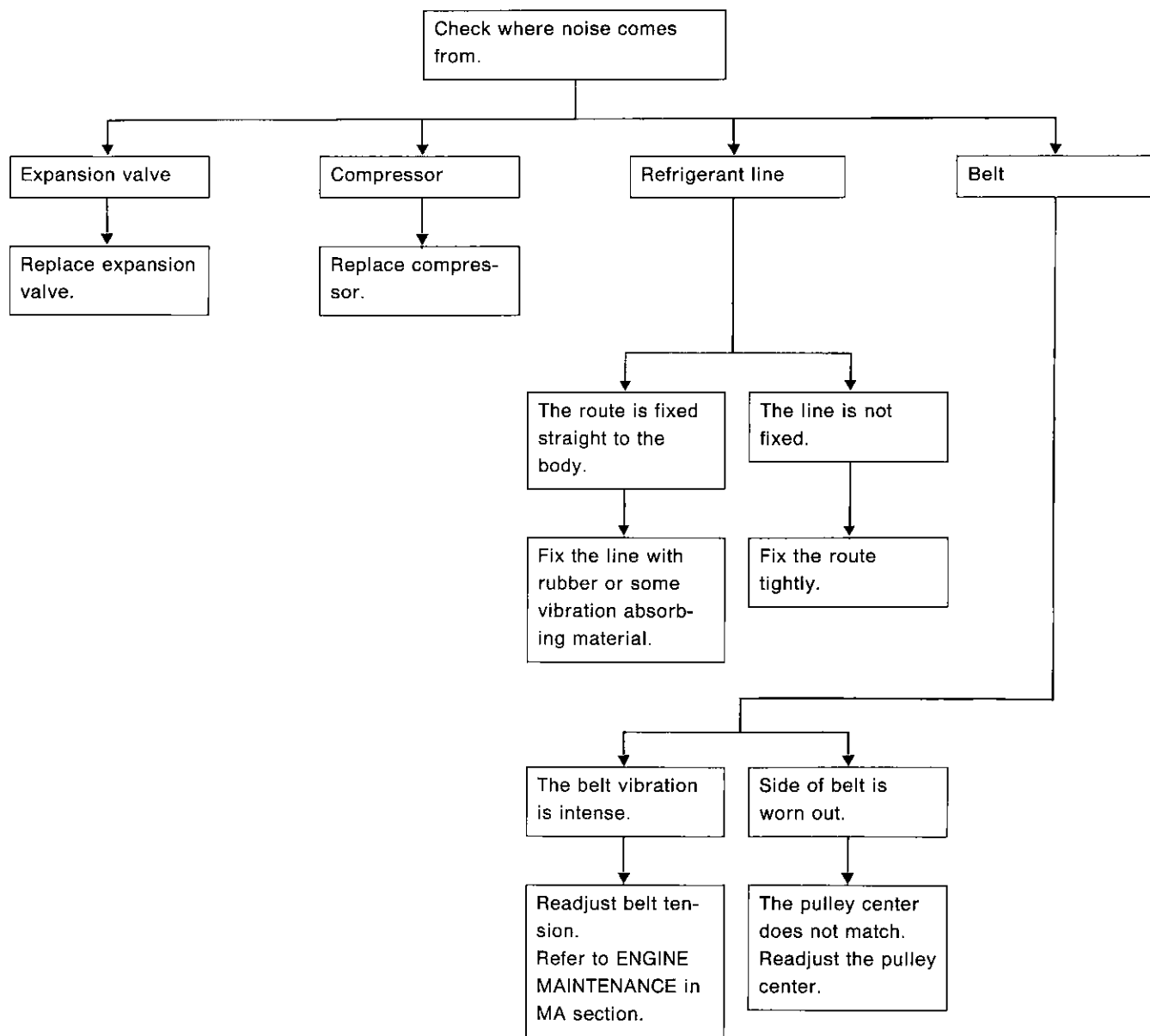
INSPECTION END

## TROUBLE DIAGNOSES

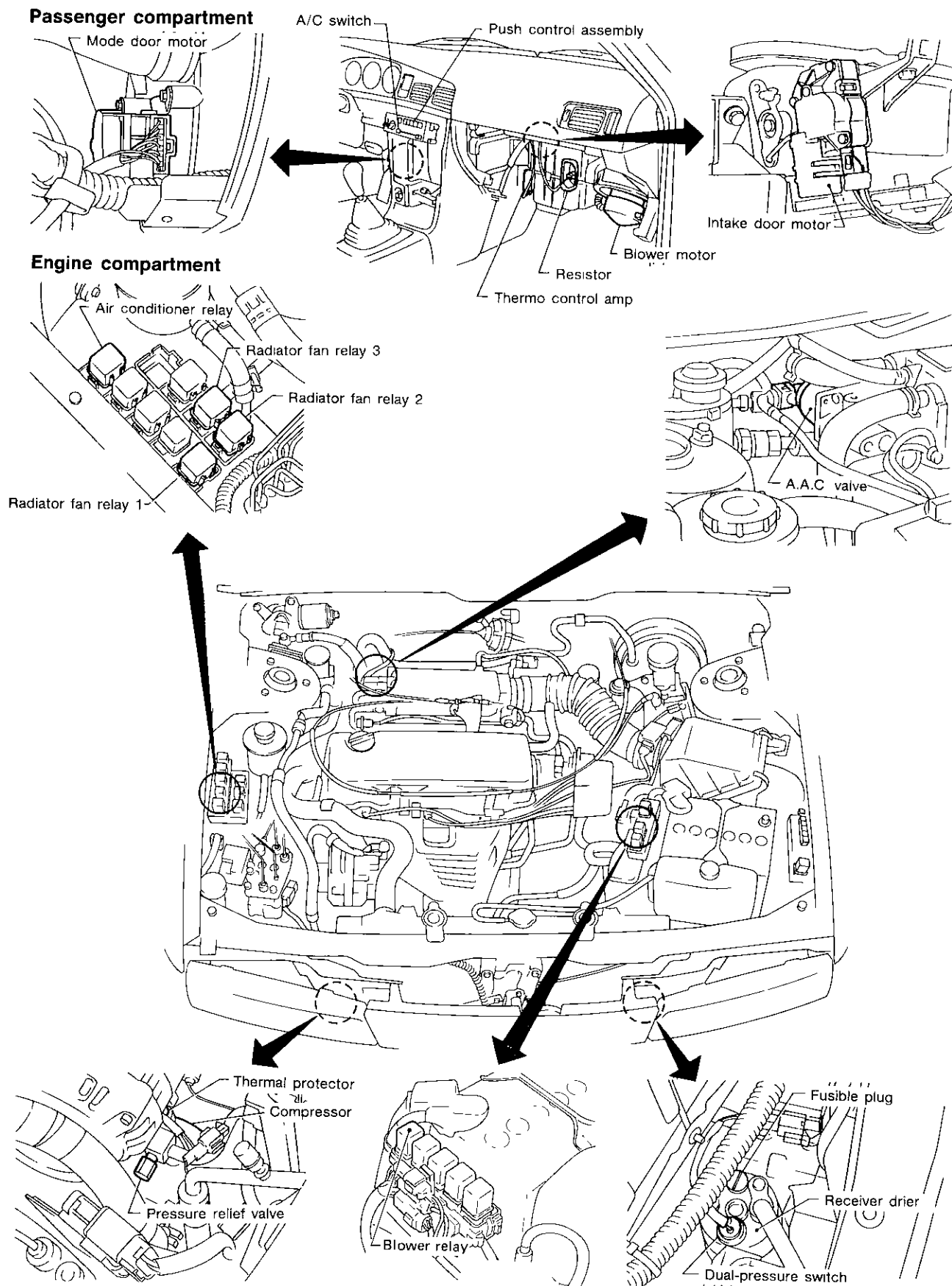
### Preliminary Check (Cont'd)

#### PRELIMINARY CHECK 5

##### Noise

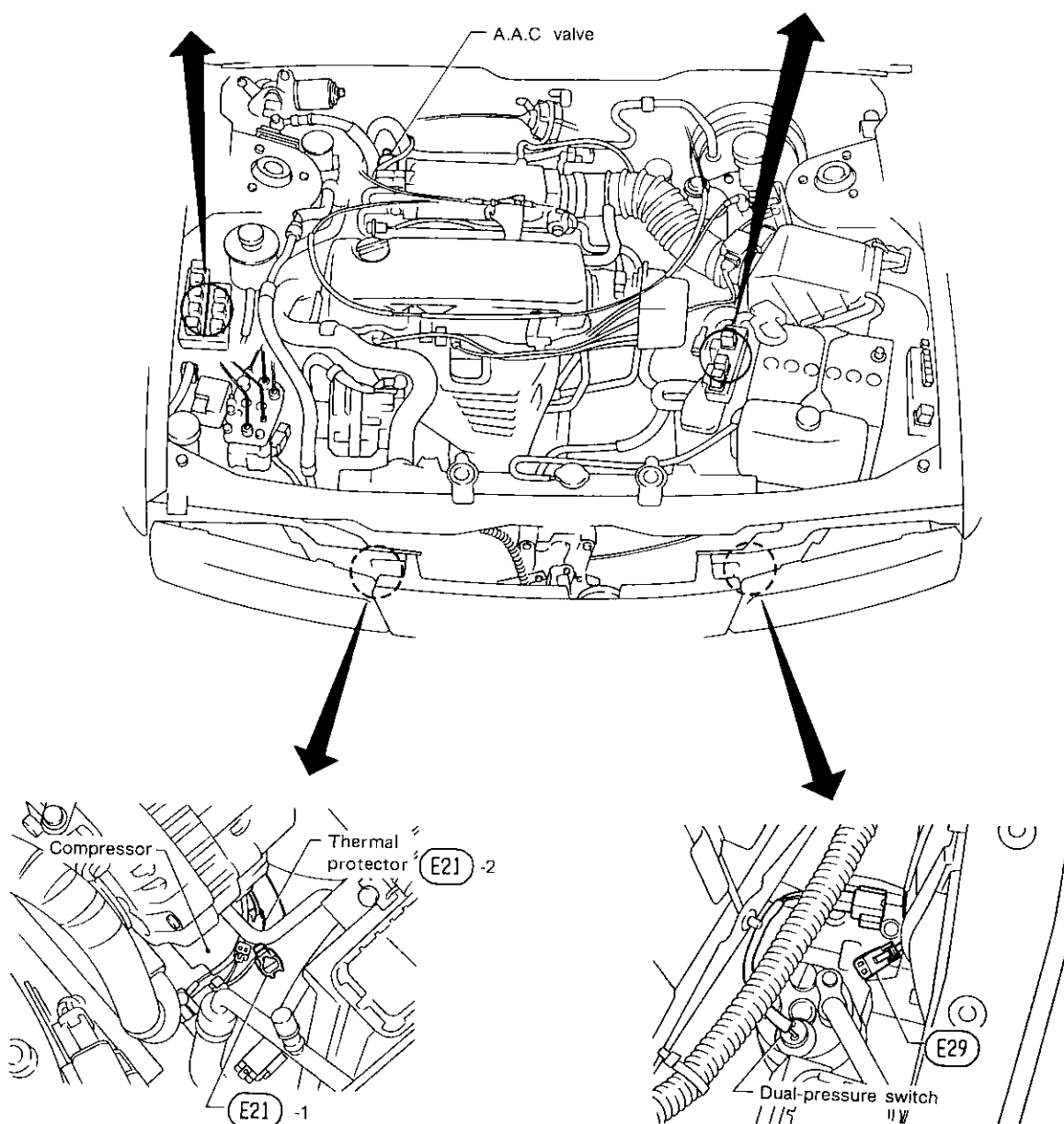
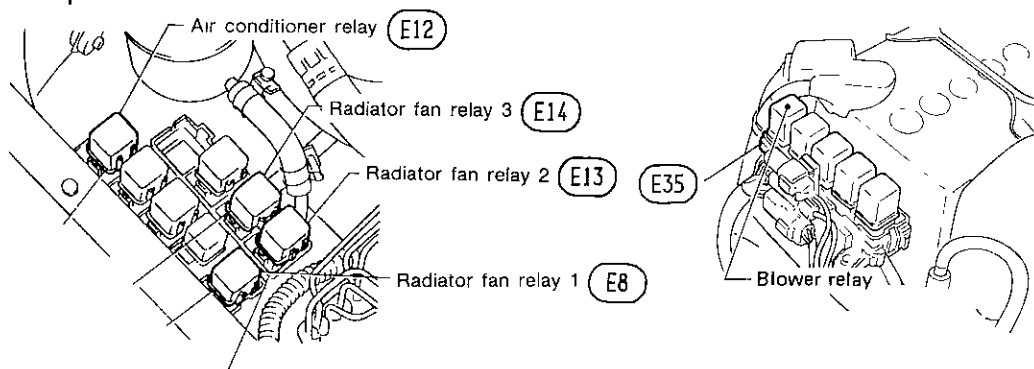


## A/C Component Layout



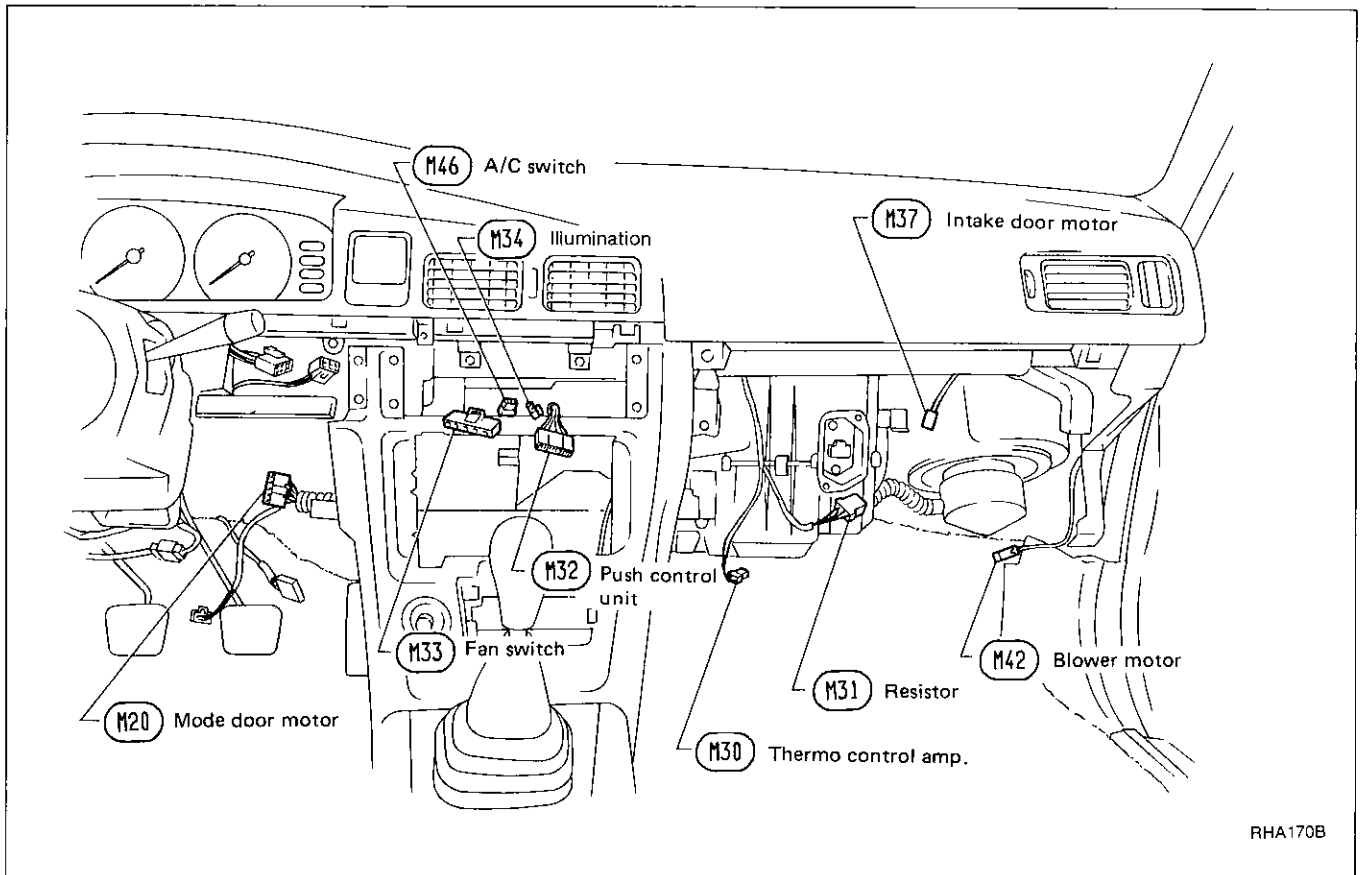
## Harness Layout for A/C System

### Engine compartment

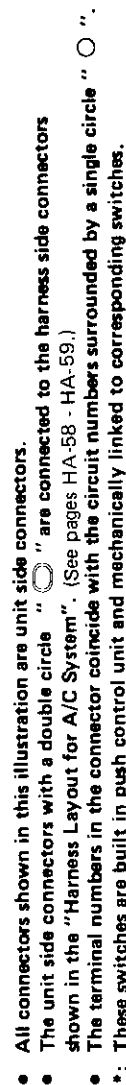


## TROUBLE DIAGNOSES

### Harness Layout for A/C System (Cont'd)

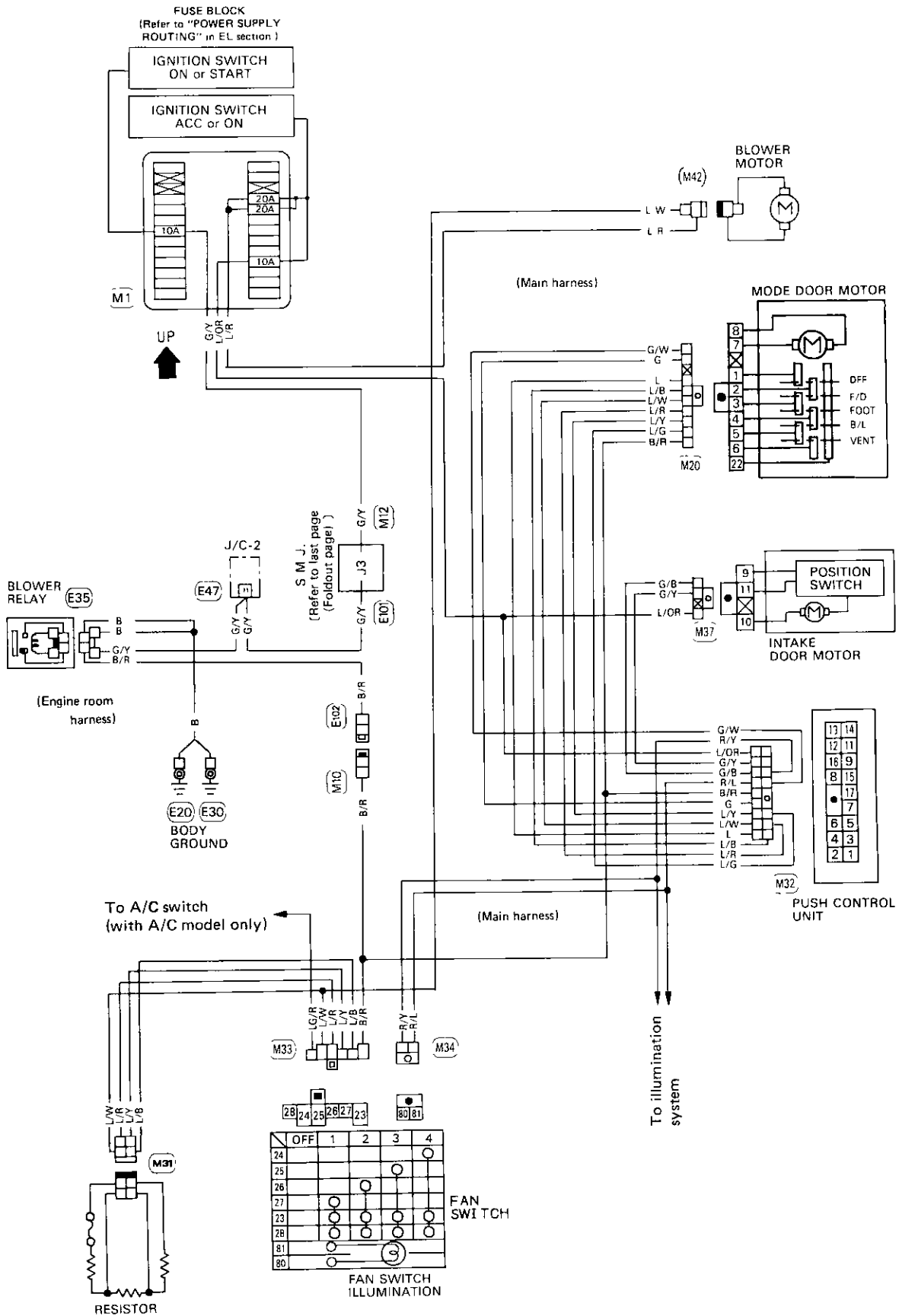


### Circuit Diagram for Quick Pinpoint Check



## Wiring Diagram

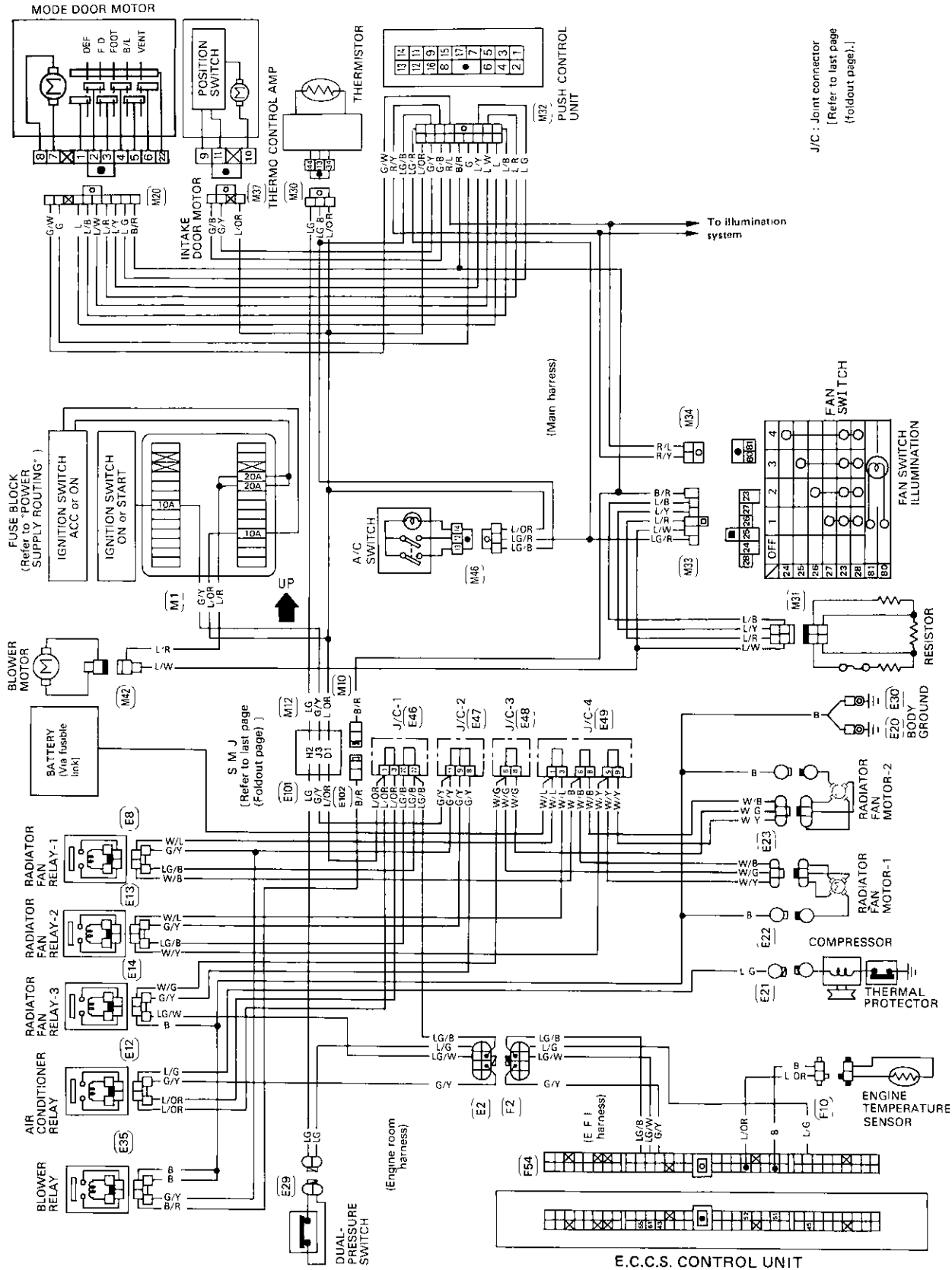
### HEATER ELECTRICAL CIRCUIT



# TROUBLE DIAGNOSES

## Wiring Diagram (Cont'd)

### A/C ELECTRICAL CIRCUIT



J/C : Joint connector  
[Refer to last page  
(foldout page).]

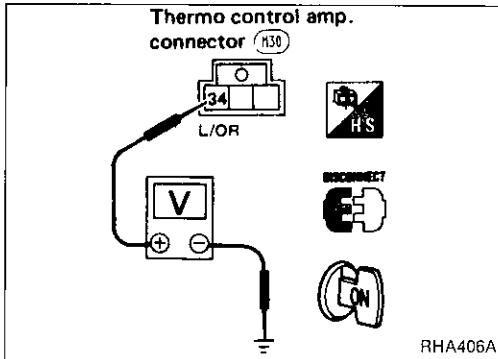


## Main Power Supply and Ground Circuit Check

### POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.

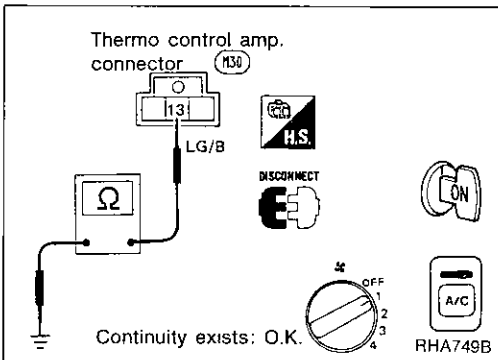


### THERMO CONTROL AMP. CHECK

Check power supply circuit for thermo control amp. with ignition switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. 34 and body ground.

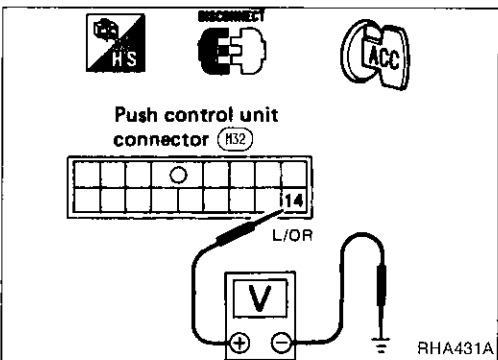
| Voltmeter terminal |             | Voltage     |
|--------------------|-------------|-------------|
| ⊕                  | ⊖           |             |
| 34                 | Body ground | Approx. 12V |



Check body ground circuit for thermo control amp. with ignition switch OFF, A/C switch ON and fan switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. 13 and body ground.

| Ohmmeter terminal |             | Continuity |
|-------------------|-------------|------------|
| ⊕                 | ⊖           |            |
| 13                | Body ground | Yes        |

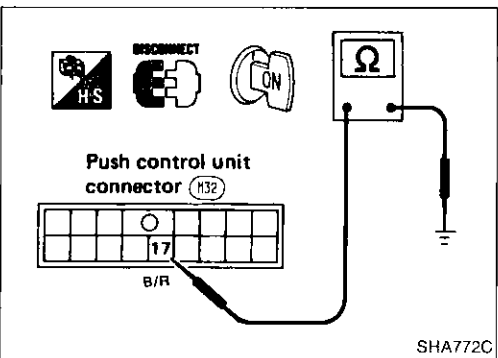


### PUSH CONTROL UNIT CHECK

Check power supply circuit for push control unit with ignition switch at ACC.

1. Disconnect push control unit harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. 14 and body ground.

| Voltmeter terminal |             | Voltage     |
|--------------------|-------------|-------------|
| ⊕                  | ⊖           |             |
| 14                 | Body ground | Approx. 12V |



Check body ground circuit for push control unit with ignition switch ON.

1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. 17 and body ground.

# TROUBLE DIAGNOSES

|   | INCIDENT                        | Flow chart No. |
|---|---------------------------------|----------------|
| 1 | Fan fails to rotate.            | [1]            |
| 2 | Fan does not rotate at 1-speed. | [2]            |
| 3 | Fan does not rotate at 2-speed. | [3]            |
| 4 | Fan does not rotate at 3-speed. | [4]            |
| 5 | Fan does not rotate at 4-speed. | [5]            |

## Diagnostic Procedure 1

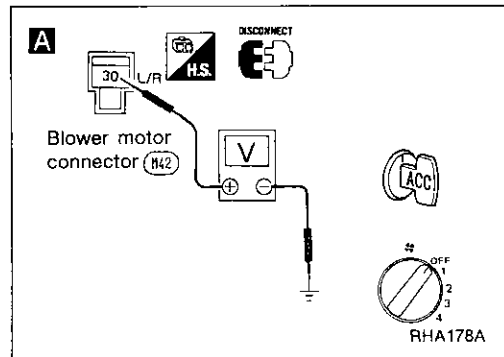
**SYMPTOM: Blower motor does not rotate.**

- Perform **PRELIMINARY CHECK 2** before referring to the following flow chart.

Check if blower motor rotates properly at each fan speed. Conduct check as per flow chart at left.



(Go to next page.)



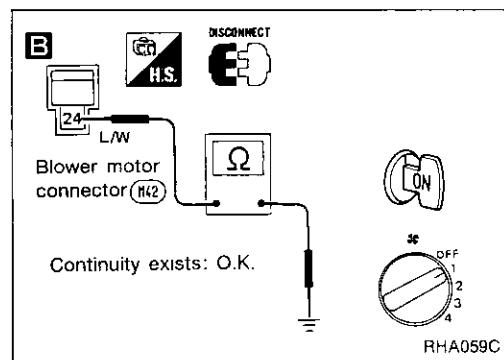
**A**

**CHECK POWER SUPPLY FOR BLOWER MOTOR.**  
Disconnect blower motor harness connector.  
Do approx. 12 volts exist between blower motor harness terminal No. 30 and body ground?

N.G.

Check 20A fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K.



**B**

Check circuit continuity between blower motor harness terminal No. 24 and body ground.

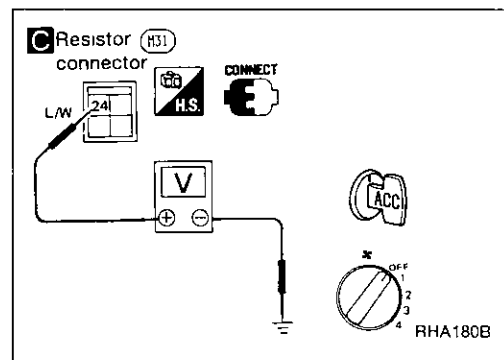
N.G.

Reconnect blower motor harness connector.

O.K.

**CHECK BLOWER MOTOR.**  
(Refer to Electrical Components Inspection.)

Replace blower motor.



**C**

**CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.**  
Do approx. 12 volts exist between resistor harness terminal No. 24 and body ground?

N.G.

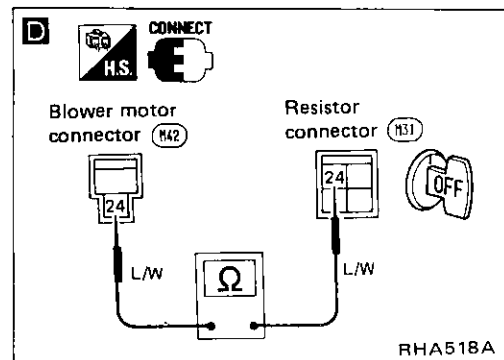
Disconnect blower motor and resistor harness connectors.

O.K.

**D** Note  
Check circuit continuity between blower motor harness terminal No. 24 and resistor harness terminal No. 24.

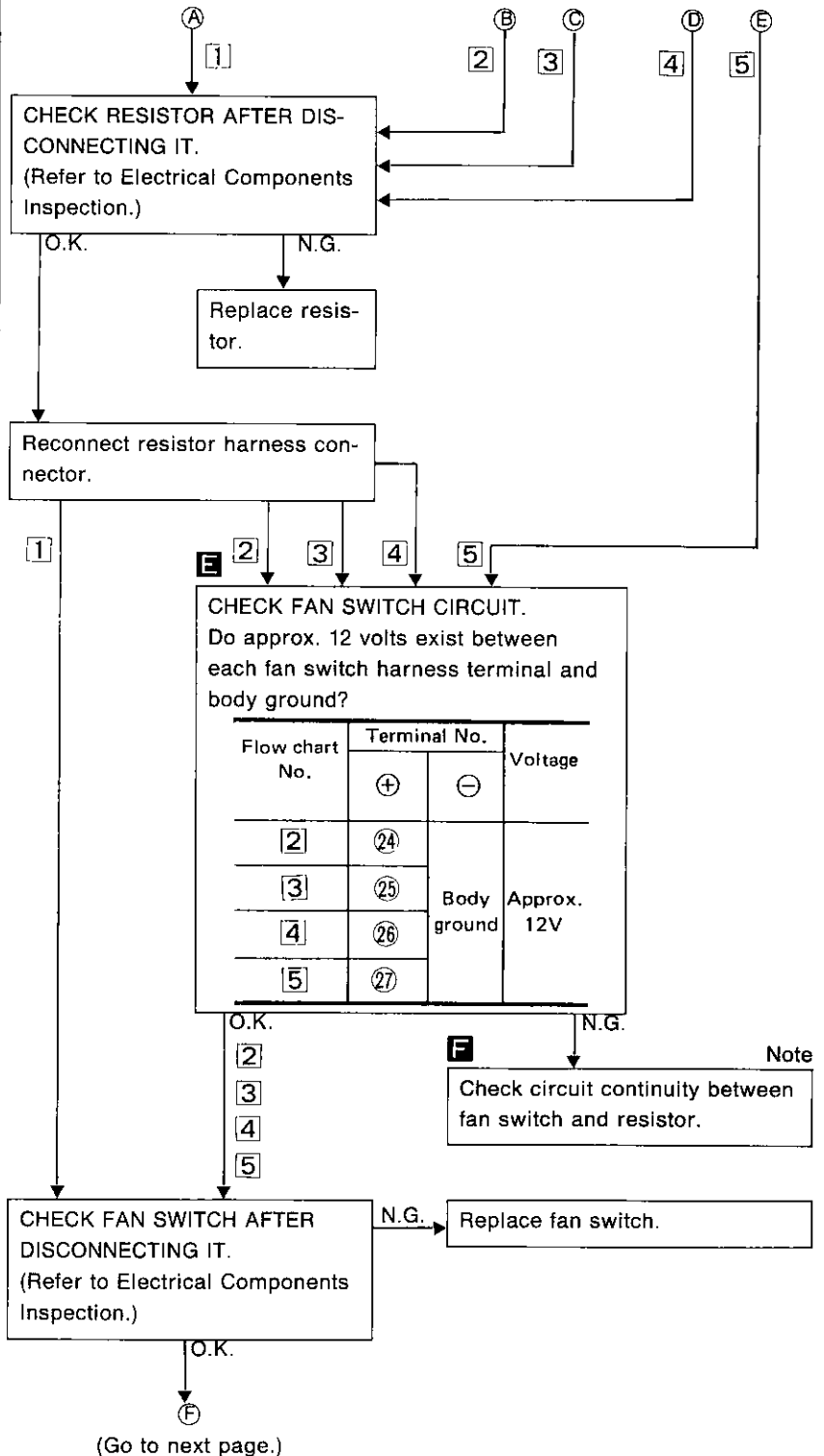
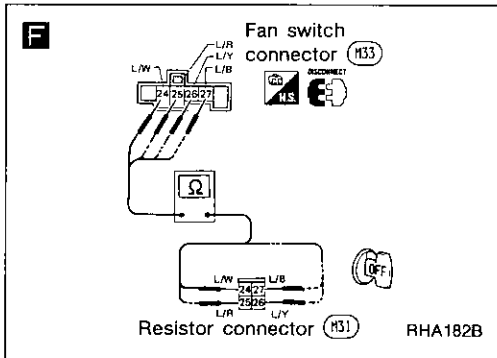
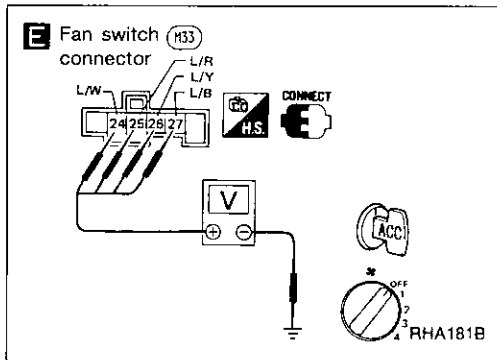
(Go to next page.)

**Note:**  
If the result is N.G. after checking circuit continuity, repair harness or connector.



# TROUBLE DIAGNOSES

## Diagnostic Procedure 1 (Cont'd)

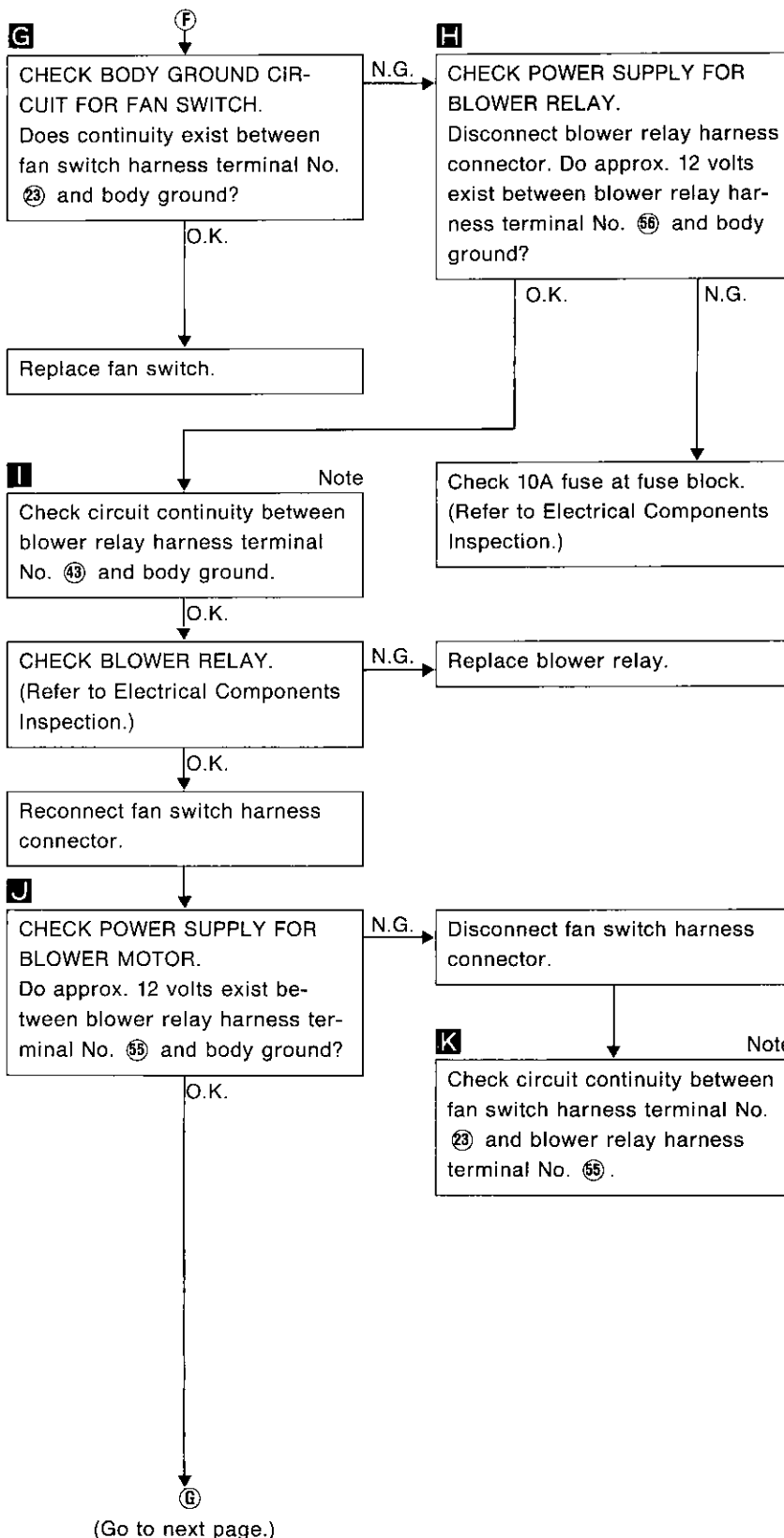
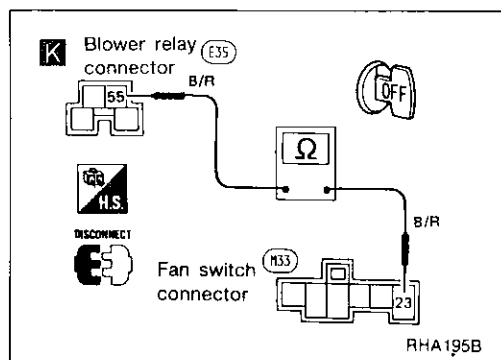
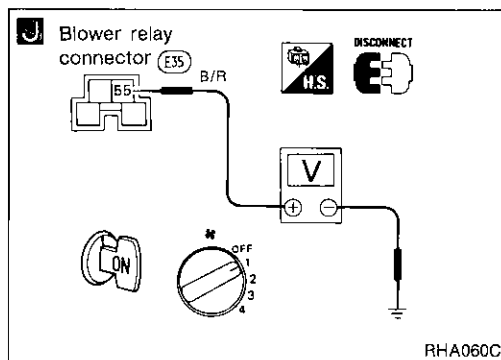
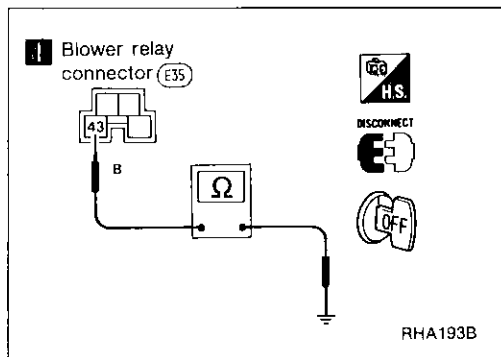
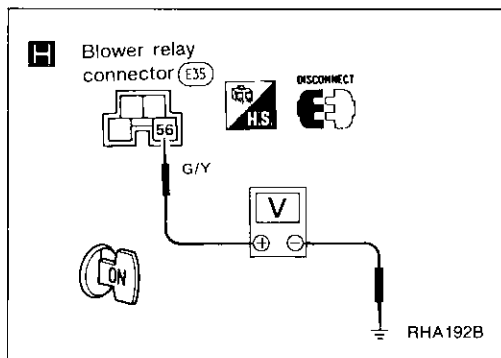
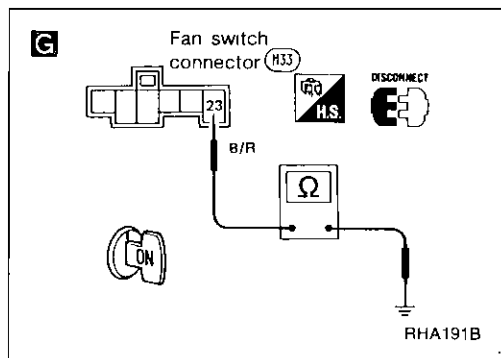


### Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES

## Diagnostic Procedure 1 (Cont'd)

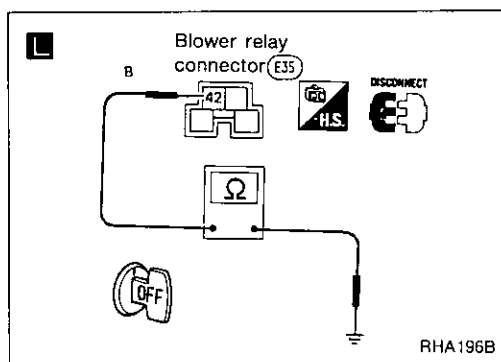


### Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

## TROUBLE DIAGNOSES

### Diagnostic Procedure 1 (Cont'd)



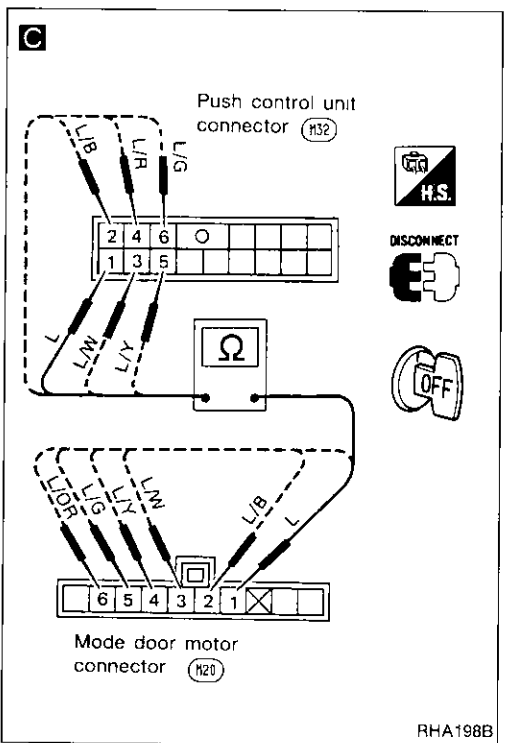
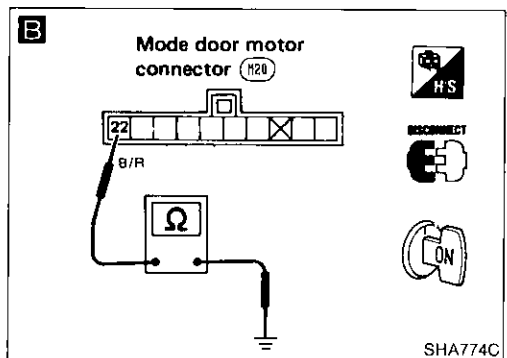
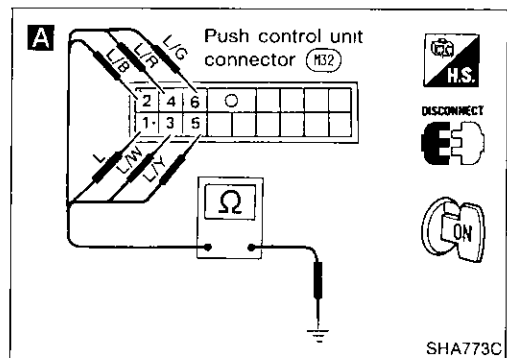
**L**

Note

CHECK BODY GROUND CIRCUIT FOR BLOWER RELAY.  
Does continuity exist between  
blower relay harness terminal  
No. 42 and body ground?

**Note:**

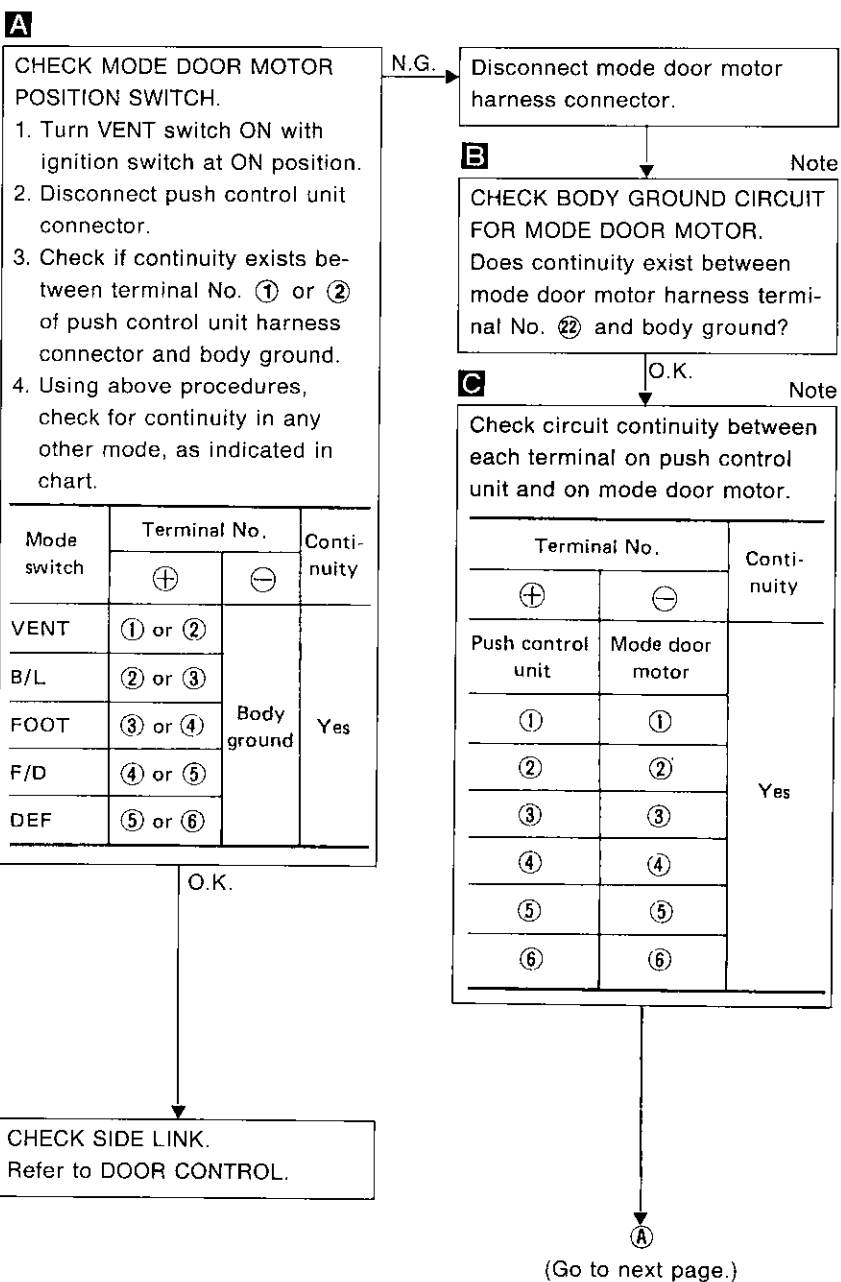
If the result is N.G. after checking circuit continuity, repair harness or connector.



## Diagnostic Procedure 2

**SYMPTOM:** Air outlet does not change.

- Perform **PRELIMINARY CHECK 4** and **Main Power Supply and Ground Circuit Check** before referring to the following flow chart.

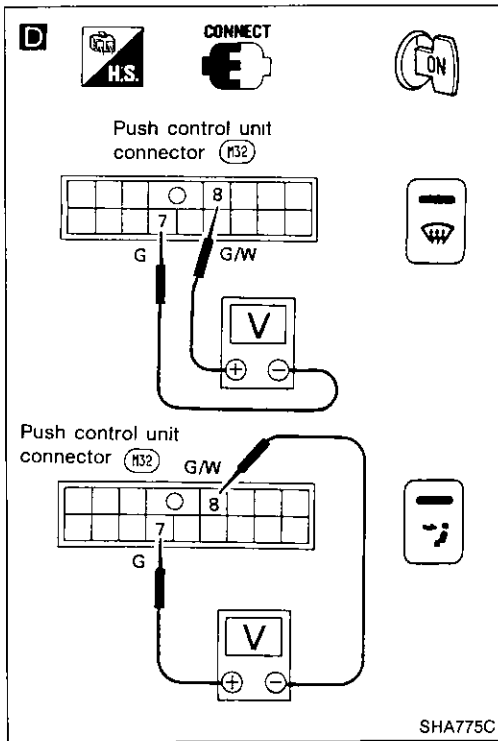


**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES

## Diagnostic Procedure 2 (Cont'd)



**A**

Reconnect push control unit and mode door motor harness connectors.

**D**

**CHECK FOR OUTPUT OF PUSH CONTROL UNIT.**  
Do approx. 12 volts exist between push control unit harness terminal No. ⑦ and ⑧ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

N.G.

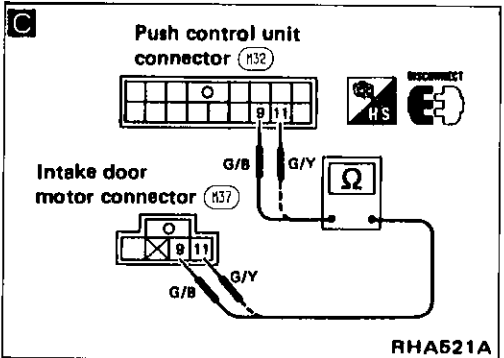
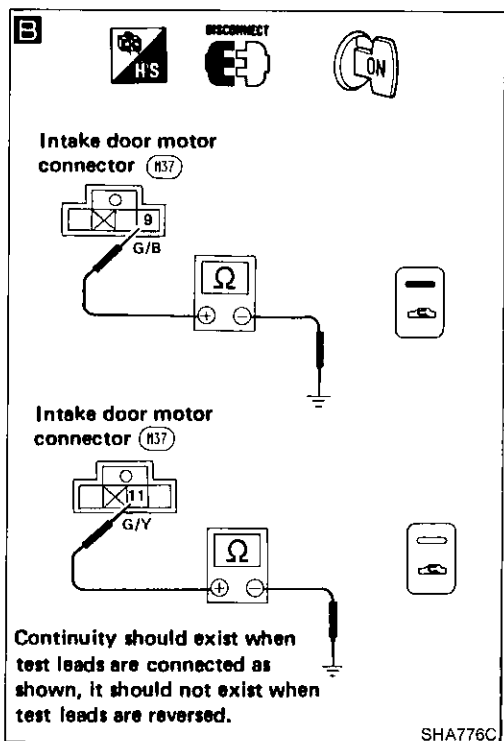
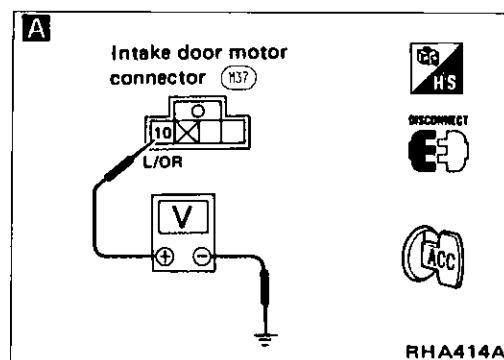
Replace control amp. built-in push control unit.

| Terminal No. |   | Mode door motor     |                               |
|--------------|---|---------------------|-------------------------------|
| ⑦            | ⑧ | Mode door operation | Direction of linkage rotation |
| ⊖            | ⊖ | Stop                | Stop                          |
| ⊖            | ⊕ | VENT → DEF          | Clock-wise                    |
| ⊕            | ⊖ | DEF → VENT          | Counter-clock-wise            |

O.K.

Replace mode door motor.

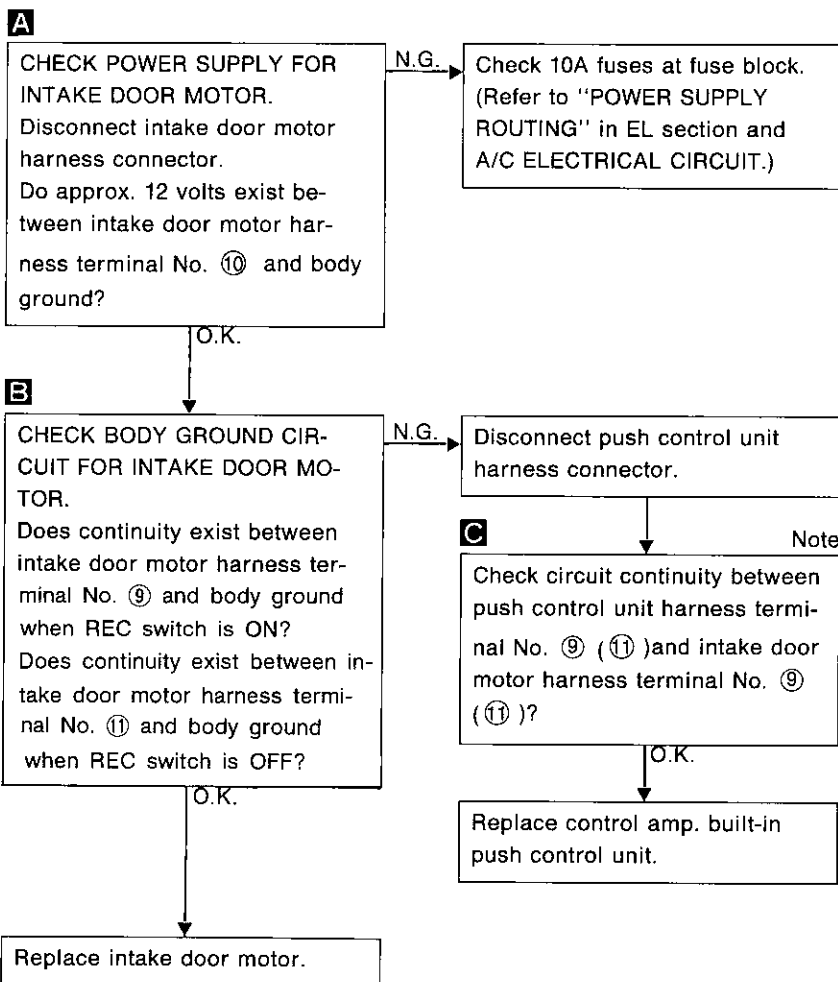
# TROUBLE DIAGNOSES



## 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.



**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

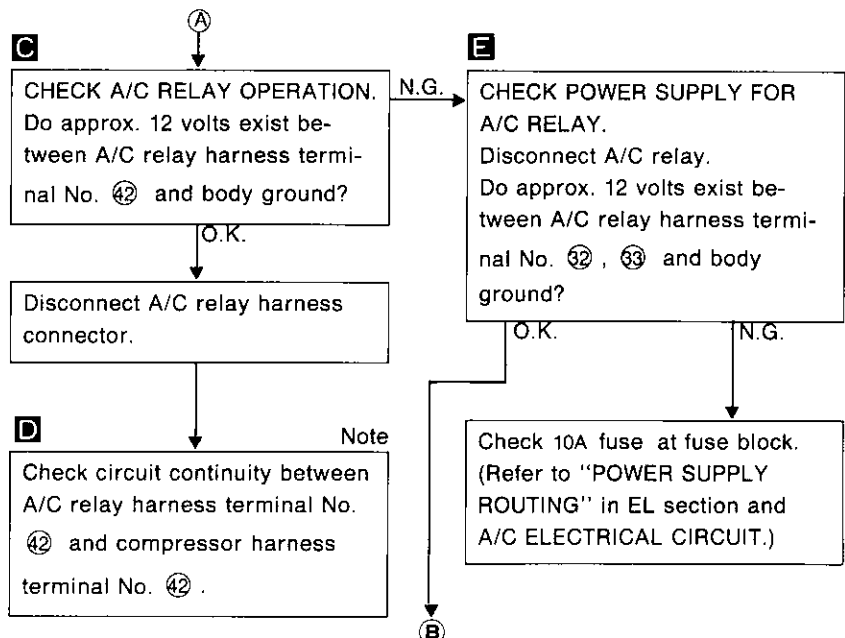
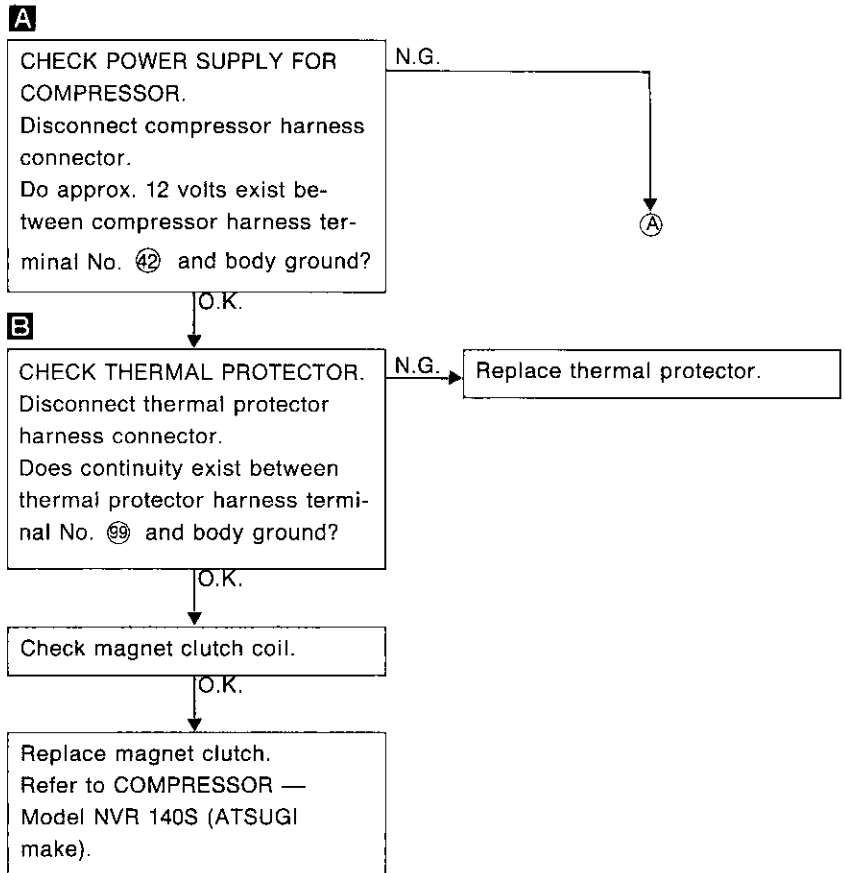
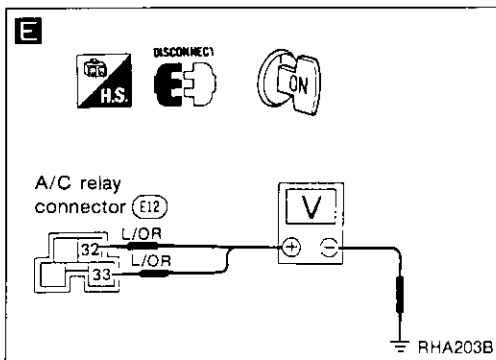
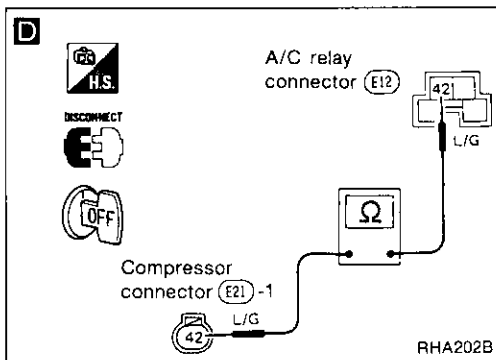
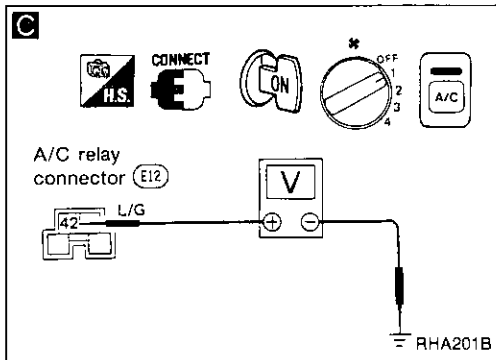
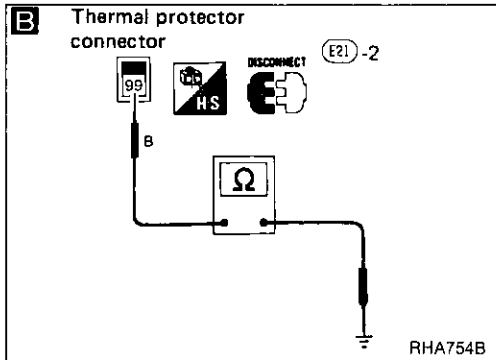
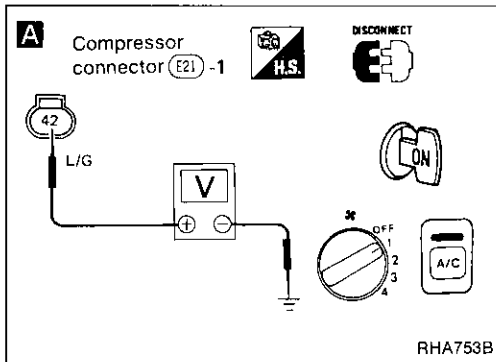


# TROUBLE DIAGNOSES

## Diagnostic Procedure 4

**SYMPTOM:** Magnet clutch does not engage with A/C switch and fan switch are ON.

- Perform **PRELIMINARY CHECK 2** before referring to the following flow chart.



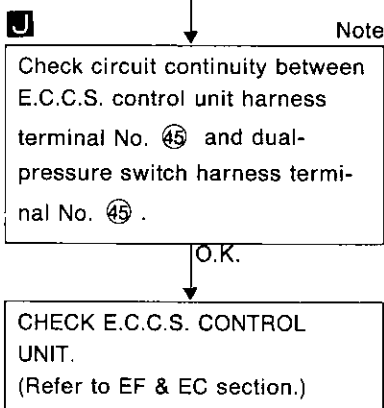
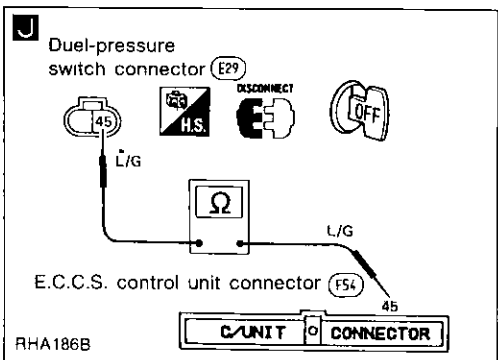
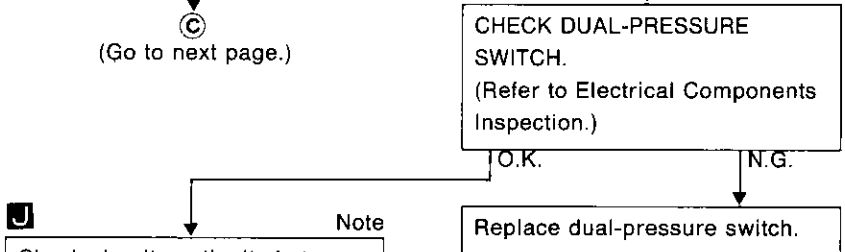
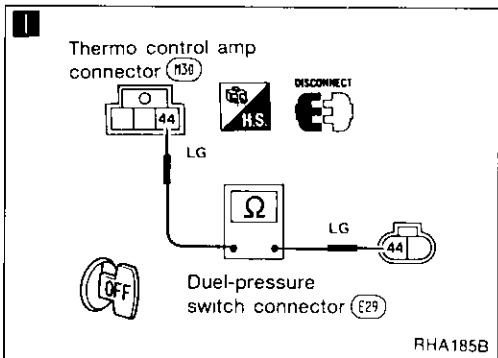
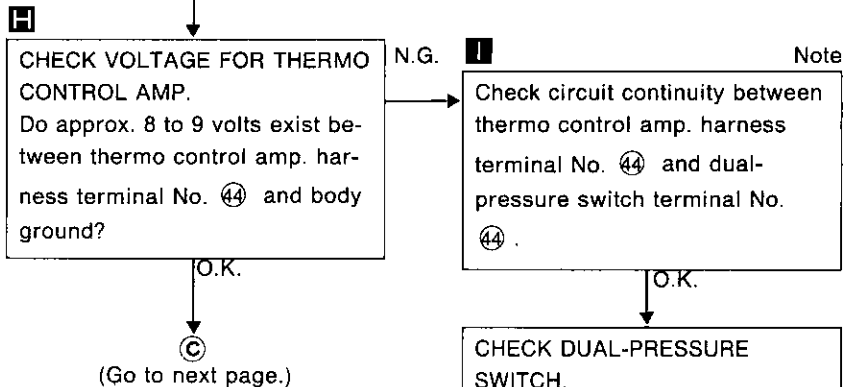
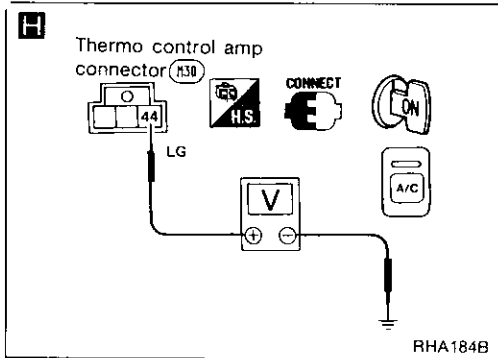
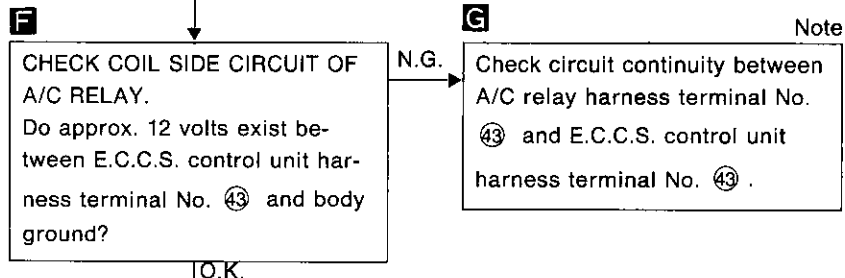
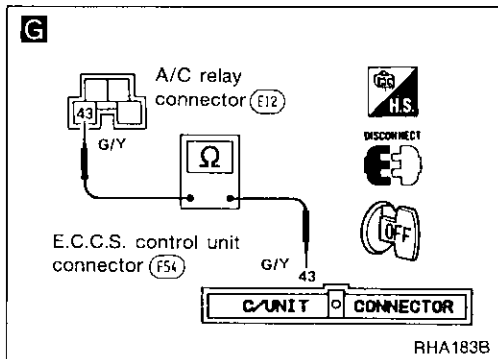
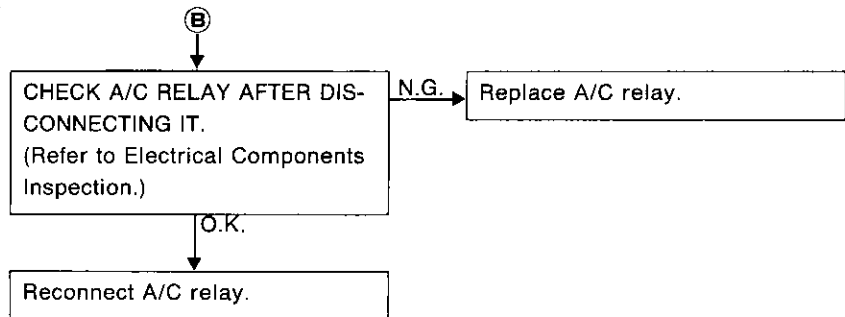
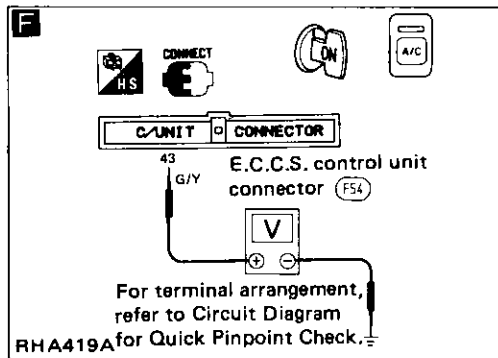
(Go to next page.)

**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES

## Diagnostic Procedure 4 (Cont'd)

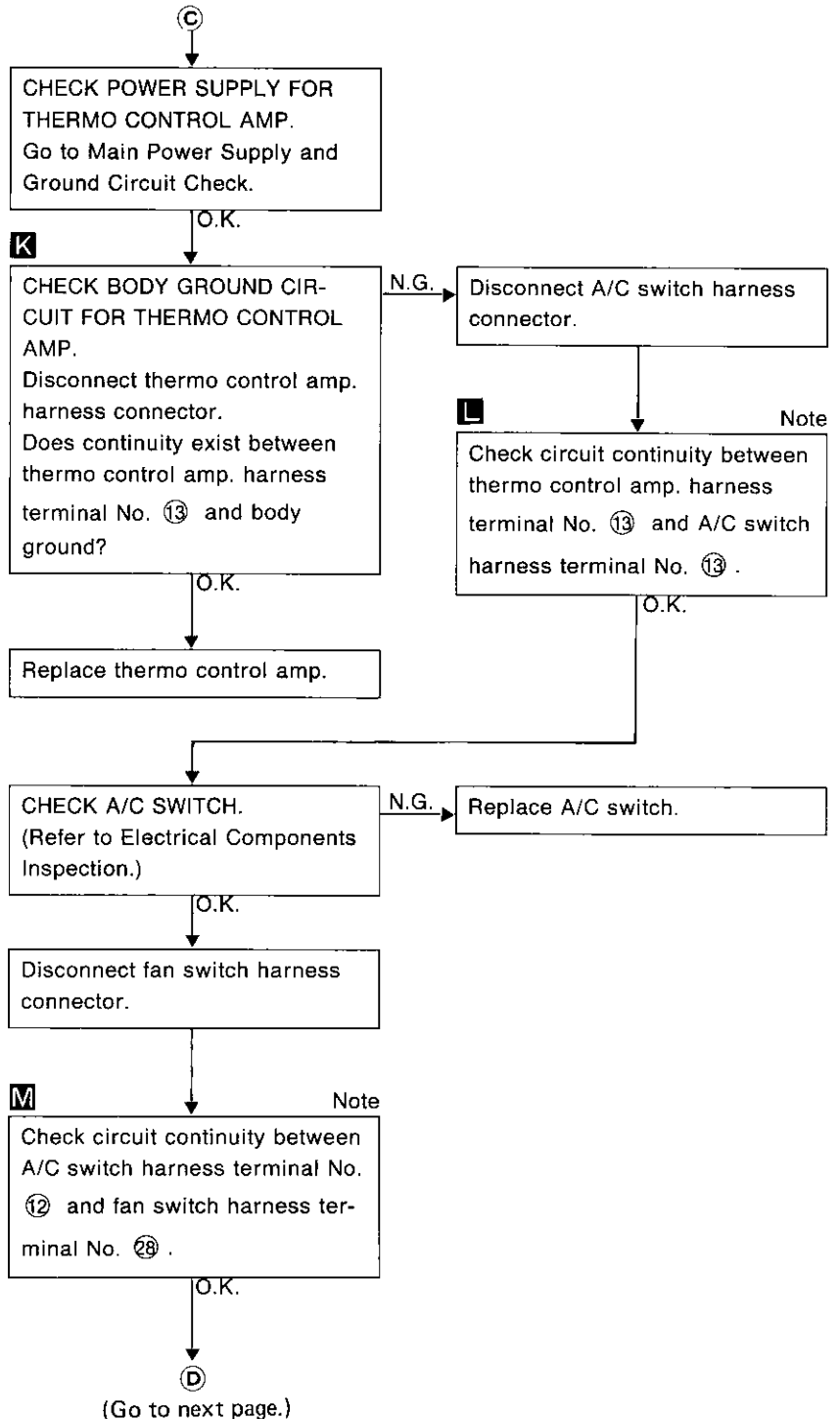
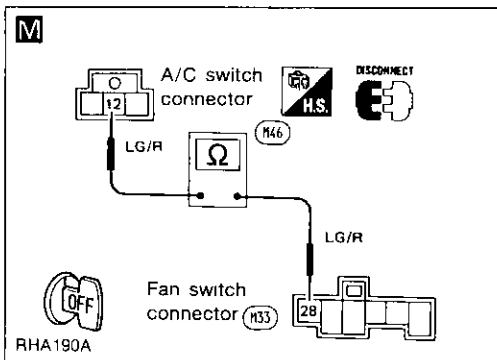
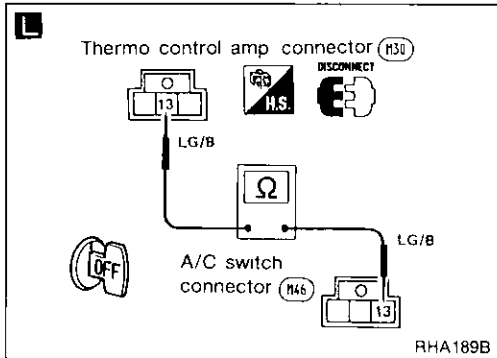
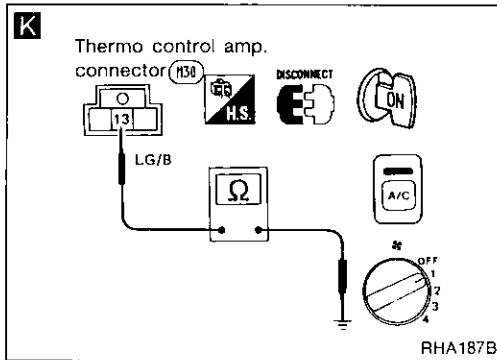


### Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES

## Diagnostic Procedure 4 (Cont'd)

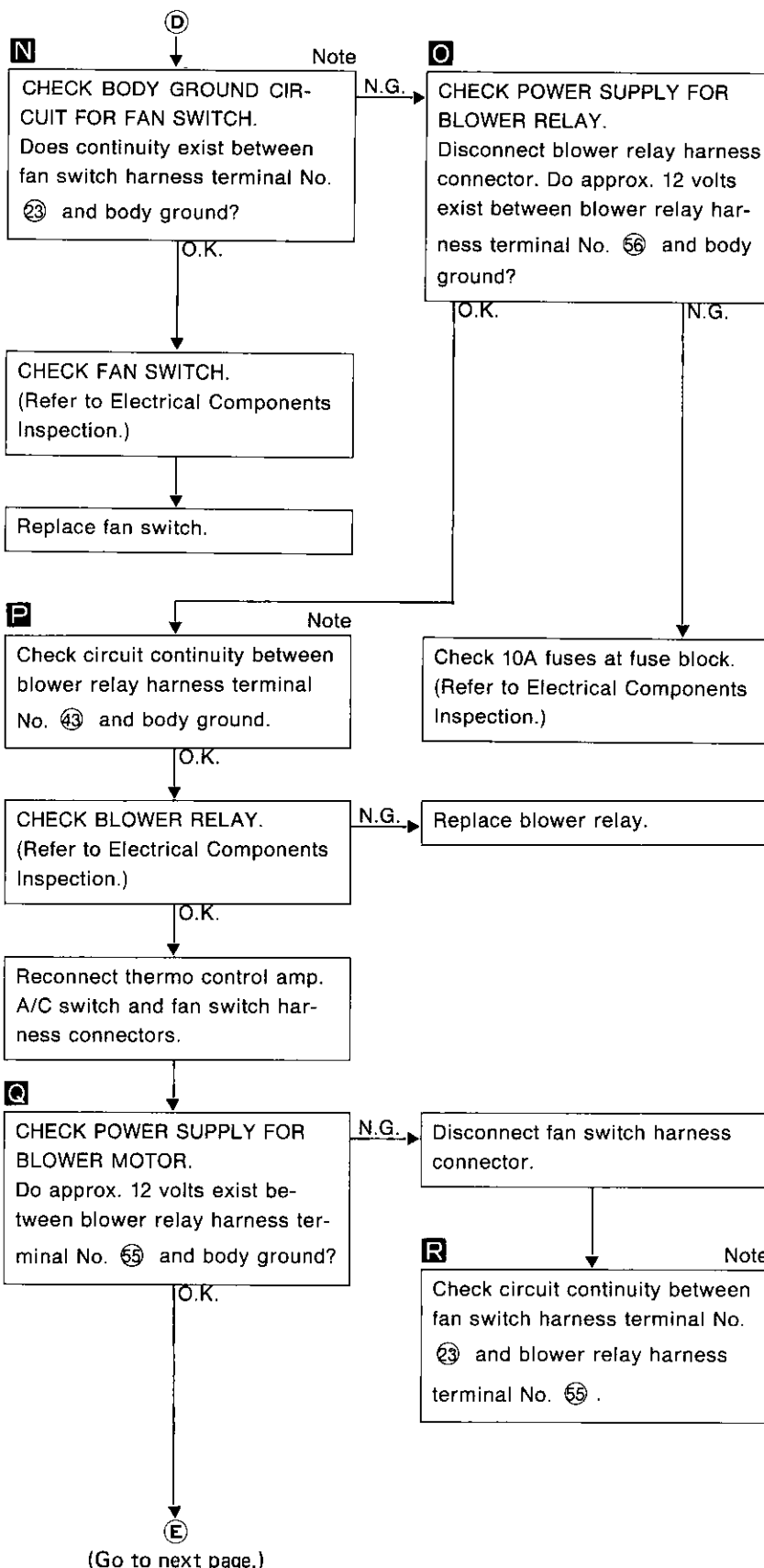
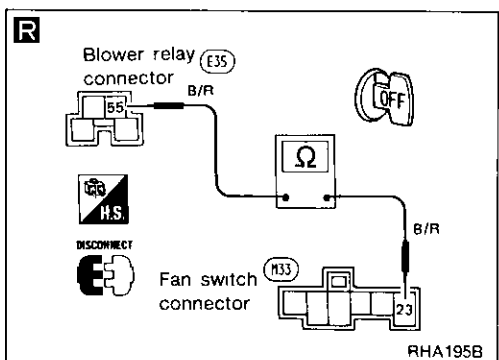
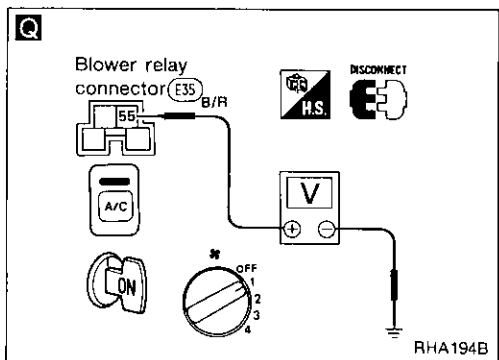
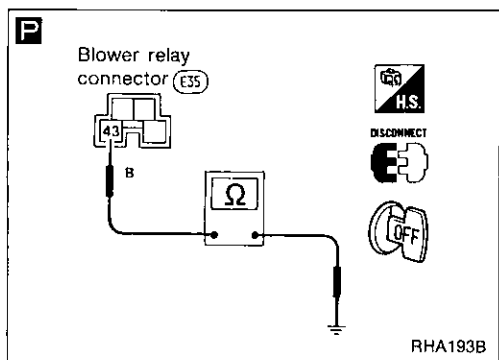
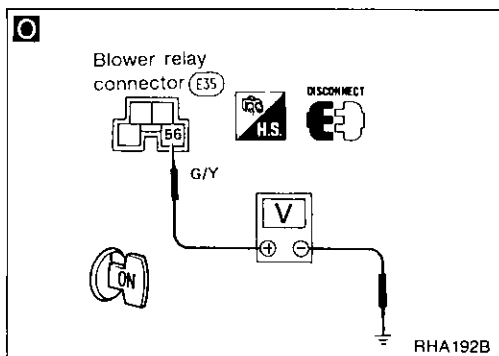
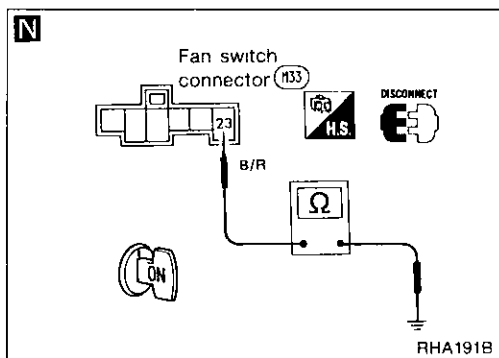


Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES

## Diagnostic Procedure 4 (Cont'd)

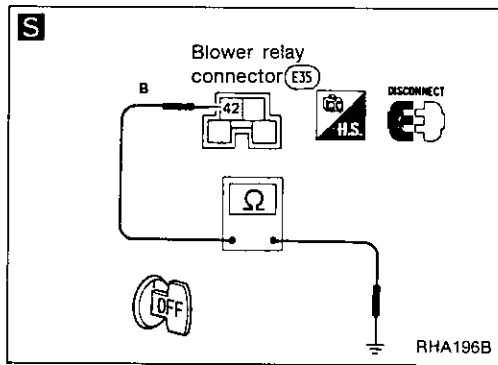


**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

## TROUBLE DIAGNOSES

### Diagnostic Procedure 4 (Cont'd)



**S**

**E**

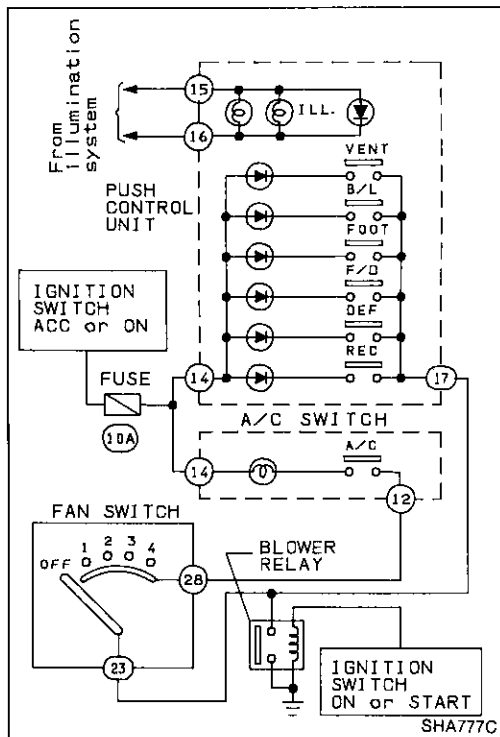
Note

CHECK BODY GROUND CIR-  
CUIT FOR BLOWER RELAY.  
Does continuity exist between  
blower relay harness terminal  
No. 42 and body ground?

**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES



## Diagnostic Procedure 5

**SYMPTOM:** Illumination or indicators of push control unit do not come on.

- Perform Main Power Supply and Ground Circuit Check before referring to the following flow chart.

Turn ignition switch and lighting switch ON.

### CHECK ILLUMINATION AND INDICATORS.

- Turn A/C, REC and fan switches ON.
- Push VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown:

| INCIDENTS         |            |      |     |      |     |     |     | "How to repair" |                                                  |
|-------------------|------------|------|-----|------|-----|-----|-----|-----------------|--------------------------------------------------|
| ILL.              |            | VENT | B/L | FOOT | F/D | DEF | REC |                 | A/C                                              |
| Push control unit | Fresh vent |      |     |      |     |     |     |                 |                                                  |
| X                 | ○          | ○    | ○   | ○    | ○   | ○   | ○   | ↘               | Go to DIAGNOSTIC PROCEDURE 5-1.                  |
| ○                 | X          | ○    | ○   | ○    | ○   | ○   | ○   | ↘               | Go to DIAGNOSTIC PROCEDURE 5-2                   |
| ↘                 |            | ○    | ○   | ○    | ○   | ○   | ○   | X               | Go to DIAGNOSTIC PROCEDURE 5-3.                  |
| ○                 |            | X    | X   | X    | X   | X   | X   | ↘               | Go to DIAGNOSTIC PROCEDURE 5-4.                  |
| ↘                 |            | Δ    |     |      |     |     |     | ↘               | Replace control amp. built in push control unit. |
| ○                 |            | X    | X   | X    | X   | X   | X   | ○               | Replace control amp. built-in push control unit. |
| ↘                 |            | X    | X   | X    | X   | X   | X   | ○               | Go to DIAGNOSTIC PROCEDURE 5-5.                  |

O: Illumination or indicator comes on.

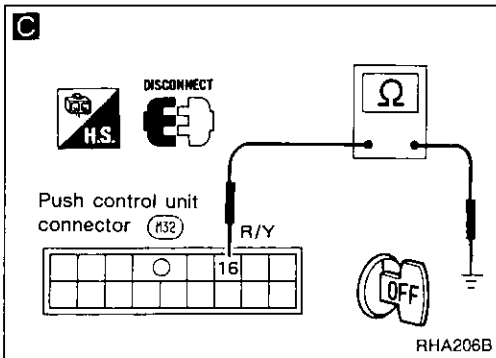
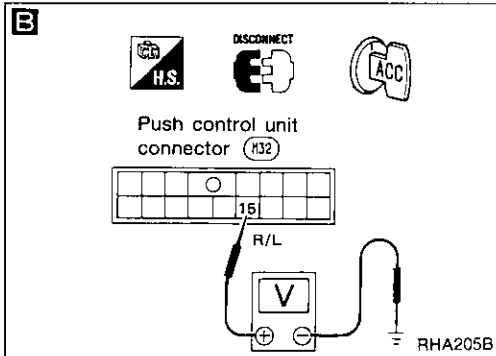
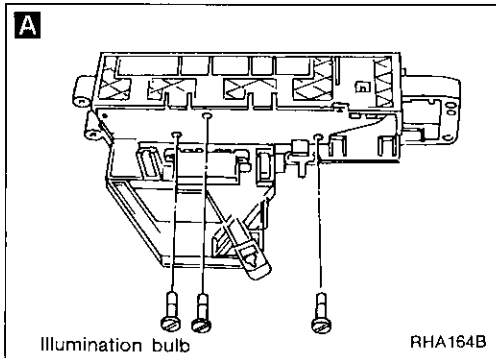
X: Illumination or indicator does not come on.

Δ: Some indicators for VENT, B/L, FOOT, F/D, DEF or REC come on

# TROUBLE DIAGNOSES

## Diagnostic Procedure 5 (Cont'd)

### DIAGNOSTIC PROCEDURE 5-1



CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.  
Do the other illumination come on with ignition switch and lighting switch ON?

N.G.

CHECK ILLUMINATION SYSTEM.  
Refer to illumination/Wiring Diagram in EL section.

O.K.

Turn ignition switch and lighting switch OFF.

**A**  
CHECK ILLUMINATION BULB.  
Remove push control unit and disconnect harness connectors.  
Remove illumination bulb(s) and check them.

N.G.

Replace illumination bulb(s).

O.K.

**B**  
CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.  
Do approx. 12 volts exist between push control unit harness terminal No. 15 and body ground?

N.G.

CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM.  
Refer to illumination/Wiring Diagram in EL section.

O.K.

**C**  
CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.  
Does continuity exist between push control unit harness terminal No. 16 and body ground?

Note

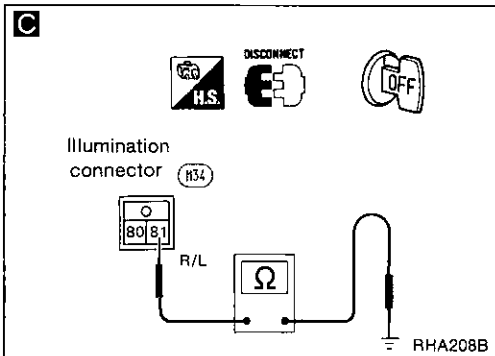
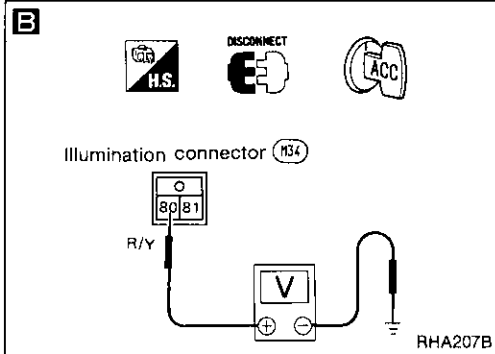
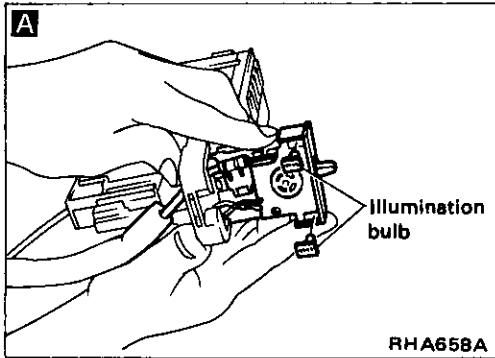
O.K.

Replace control amp. built-in push control unit.

# TROUBLE DIAGNOSES

## Diagnostic Procedure 5 (Cont'd)

### DIAGNOSTIC PROCEDURE 5-2



CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.  
Do the other illumination come on with ignition switch and lighting switch ON?

N.G.

CHECK ILLUMINATION SYSTEM. Refer to illumination/Wiring Diagram in EL section.

O.K.

Turn ignition switch and lighting switch OFF.

**A**  
CHECK ILLUMINATION BULB. Remove fresh vent assembly and disconnect harness connectors. Remove illumination bulb(s) and check them.

N.G.

Replace illumination bulb(s).

O.K.

**B**  
CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.  
Do approx. 12 volts exist between push control unit harness terminal No. ⑧⑩ and body ground?

N.G.

CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM. Refer to illumination/Wiring Diagram in EL section.

O.K.

**C** Note  
CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.  
Does continuity exist between push control unit harness terminal No. ⑧⑪ and body ground?

O.K.

Replace control amp. built-in push control unit.

#### Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



## TROUBLE DIAGNOSES

### Diagnostic Procedure 5 (Cont'd)

#### DIAGNOSTIC PROCEDURE 5-3

CHECK MAGNET CLUTCH ENGAGEMENT.  
Does magnet clutch engage normally when engine ON, A/C switch, fan switch are ON?

N.G.

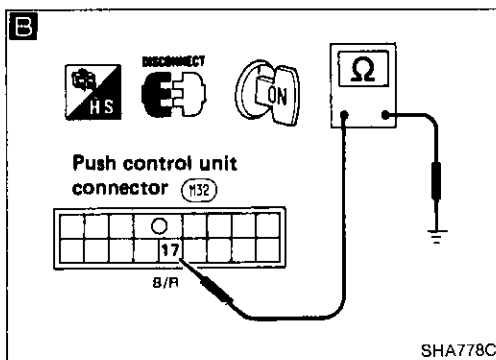
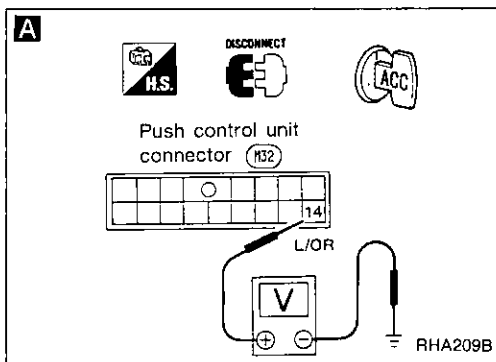
Go to Diagnostic Procedure 4.

O.K.

Check bulb.

N.G.

Replace bulb.



#### DIAGNOSTIC PROCEDURE 5-4

Turn ignition switch and lighting switch OFF.

Disconnect push control unit harness connector.

**A** CHECK POWER SUPPLY FOR PUSH CONTROL UNIT.  
Do approx. 12 volts exist between push control unit harness terminal No. ⑭ and body ground?

N.G.

Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K.

**B** CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.  
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

Note

O.K.

Replace control amp. built-in push control unit.

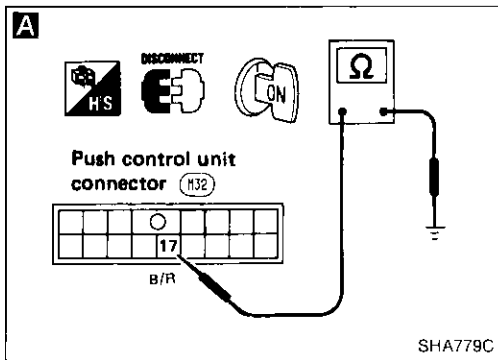
#### Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

## TROUBLE DIAGNOSES

### Diagnostic Procedure 5 (Cont'd)

#### DIAGNOSTIC PROCEDURE 5-5



Turn ignition switch and lighting switch OFF.

Disconnect push control unit harness connector.

**A**

Note

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.

Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

O.K.

Replace control amp. built-in push control unit.

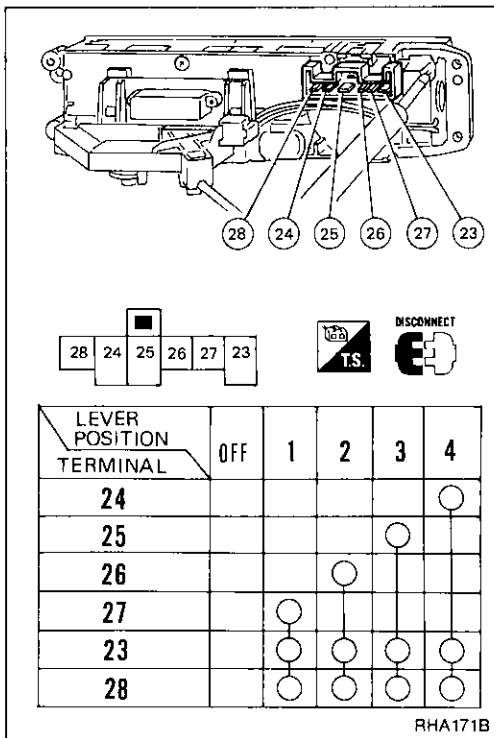
**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

## Electrical Components Inspection

### FAN SWITCH

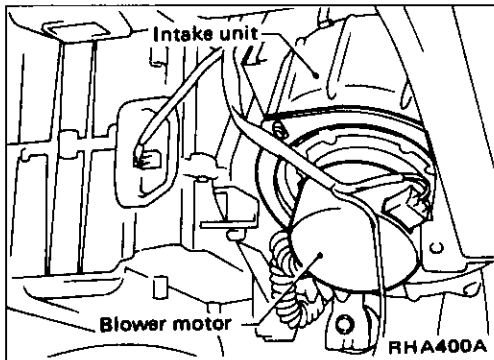
Check continuity between terminals at each switch position.



### BLOWER MOTOR

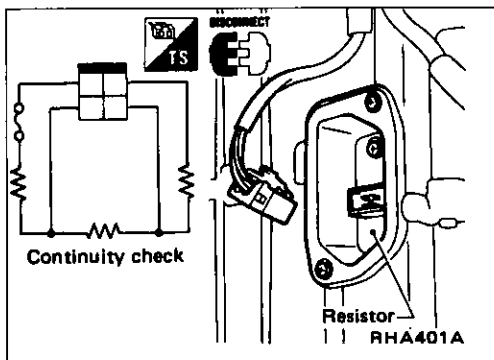
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.



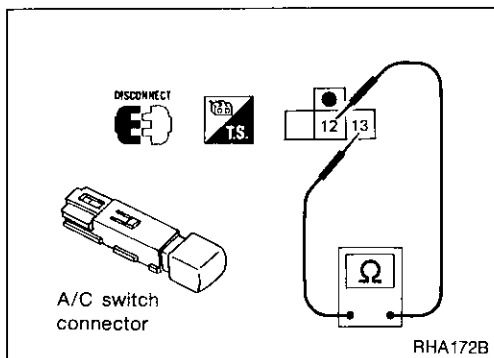
### BLOWER RESISTOR

Check continuity between terminals.



### A/C SWITCH

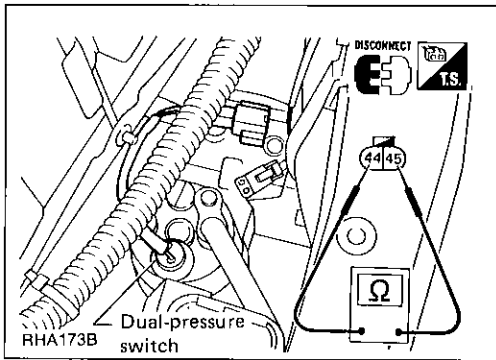
Check continuity between terminals at each switch position.



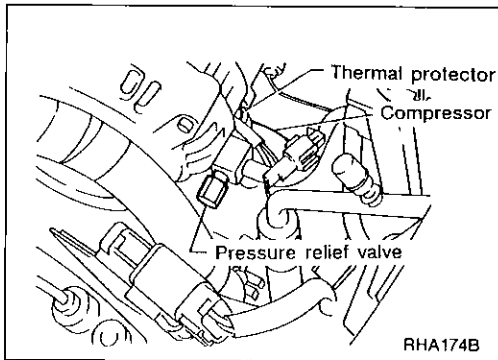
| Switch condition | Terminal No. |   | Continuity |
|------------------|--------------|---|------------|
|                  | ⊕            | ⊖ |            |
| ON               |              |   | Yes        |
| OFF              | ⑬            | ⑫ | No         |

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd) DUAL-PRESSURE SWITCH

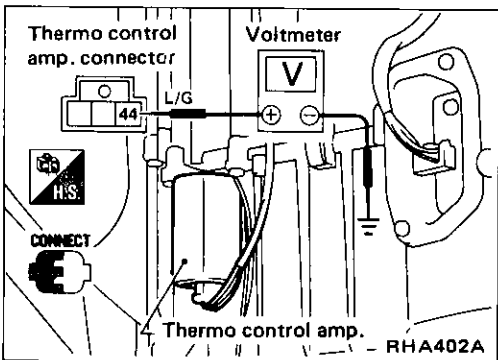


| High-pressure side line pressure<br>kPa (kg/cm <sup>2</sup> , psi)                                     | Operation | Continuity     |
|--------------------------------------------------------------------------------------------------------|-----------|----------------|
| Decreasing to<br>177 - 216 (1.8 - 2.2, 26 - 31)<br>Increasing to<br>2,452 - 2,844 (25 - 29, 356 - 412) | Turn OFF  | Does not exist |
| Increasing to<br>177 - 235 (1.8 - 2.4, 26 - 34)<br>Decreasing to<br>1,863 - 2,354 (19 - 24, 270 - 341) | Turn ON   | Exists         |



### THERMAL PROTECTOR

| Temperature of compressor<br>°C (°F)        | Operation |
|---------------------------------------------|-----------|
| Increasing to approx. 135 - 145 (275 - 293) | Turn OFF  |
| Decreasing to approx. 120 - 130 (248 - 266) | Turn ON   |



### THERMO CONTROL AMP.

1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

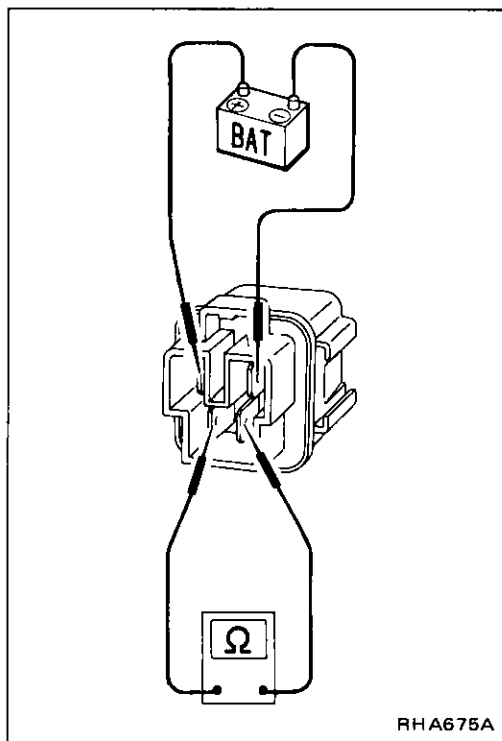
| Evaporator outlet air temperature<br>°C (°F) | Thermo amp. op-<br>eration | Tester      |
|----------------------------------------------|----------------------------|-------------|
| Decreasing to 2.5 - 3.5 (37 - 38)            | Turn OFF                   | Approx. 12V |
| Increasing to 4.0 - 5.0 (39 - 41)            | Turn ON                    | Approx. 0V  |

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

#### RELAYS

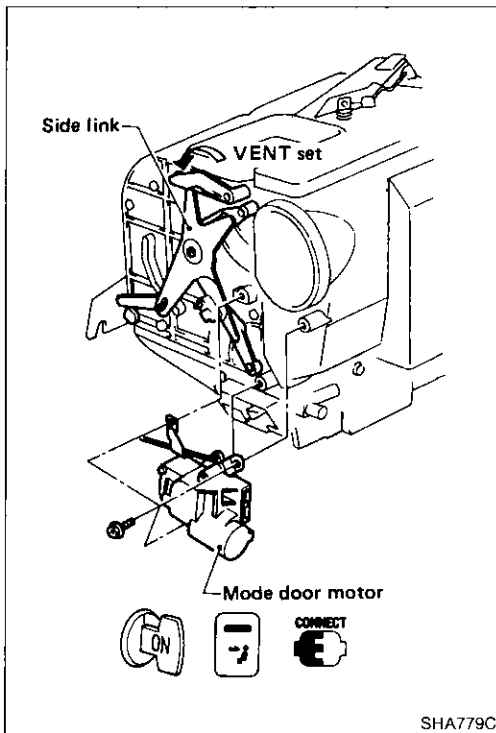
Check circuit continuity between terminals by supplying 12 volts to coil side terminals of the relay.



## Control Cable and Rod Adjustment

### MODE DOOR

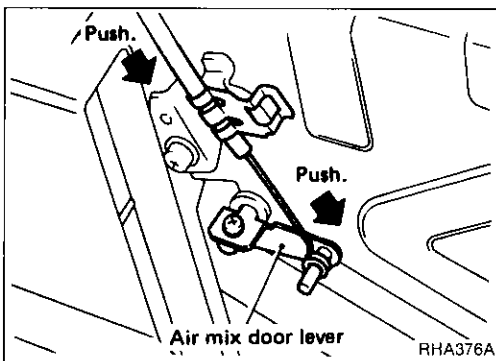
1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ON.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.



### TEMPERATURE CONTROL CABLE

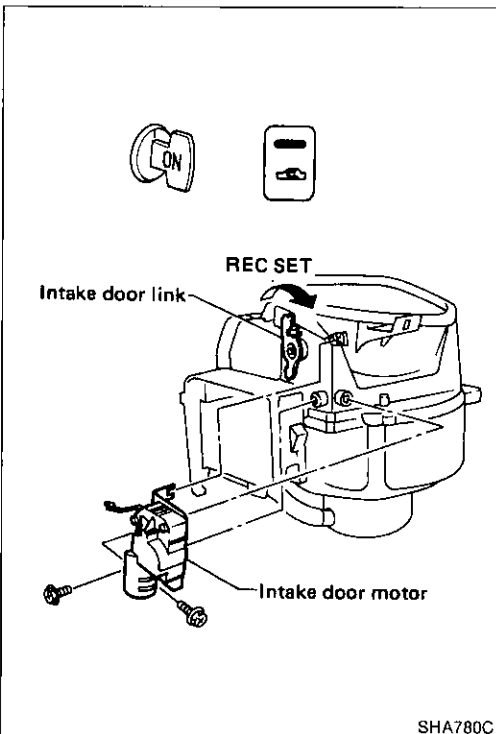
- Move the temperature control lever to the full hot position. Set the air mix door lever in the full hot position. Pull on the outer cable in the direction of the arrow and then clamp it.

**After positioning control cable, check it operates properly.**



### INTAKE DOOR

1. Connect the intake door motor harness connector before installing to the intake door motor.
2. Turn ignition switch to ON.
3. Turn REC switch ON.
4. Install intake door motor on intake unit.
5. Install intake door lever.
6. Set intake door rod in REC position and fasten door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

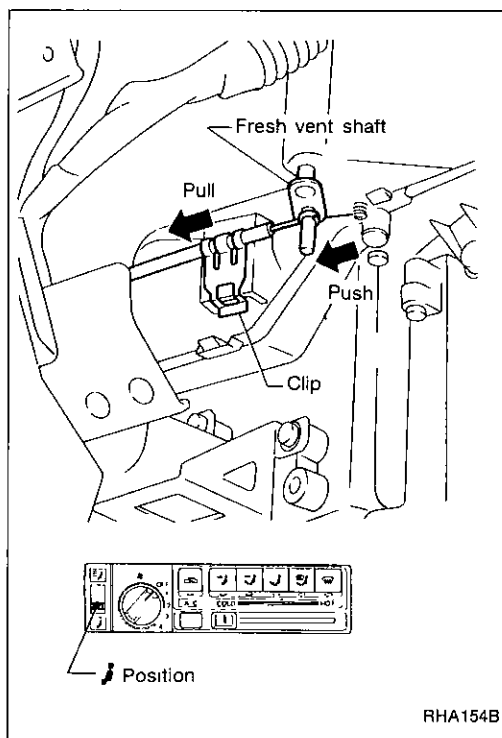


## TROUBLE DIAGNOSES

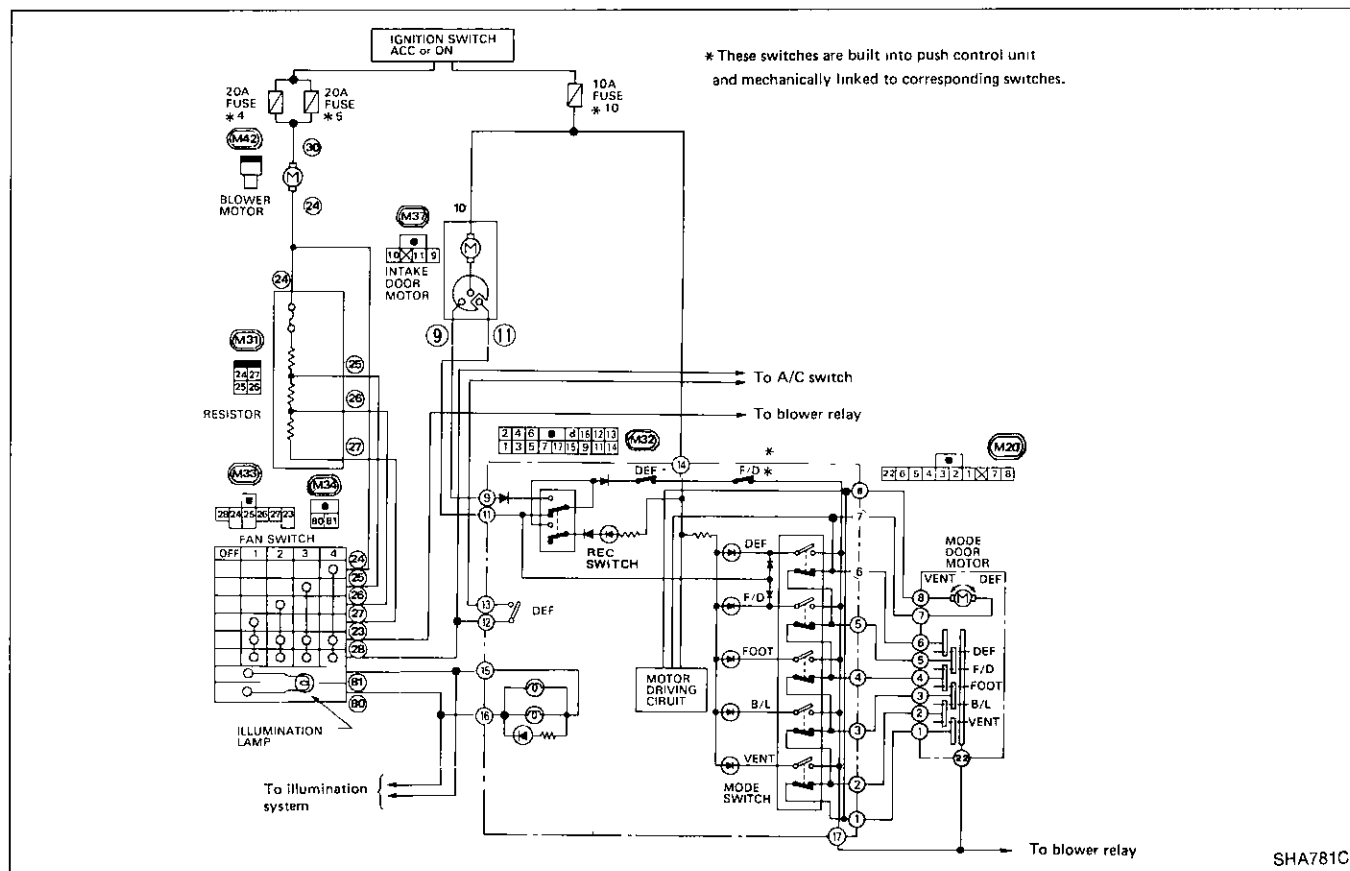
### Control Cable and Rod Adjustment (Cont'd) FRESH VENT DOOR

- Set the fresh vent shaft in the direction of the arrow. Pull on the outer cable and then clamp it.

**After positioning control cable, check it operates properly.**



## Push Control System



This push control system operates the intake and mode door motors to activate their corresponding doors.

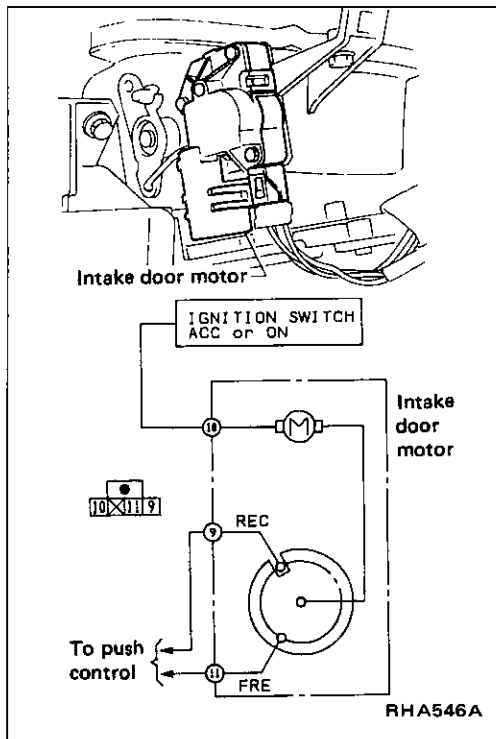
### SWITCHES AND THEIR CONTROL FUNCTIONS

| Switch | Indicator illuminates |                       |                       |                       |                       |                       |                          | Air outlet | Intake air | Compressor |
|--------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------------------|------------|------------|------------|
|        | A/C                   |                       |                       |                       |                       |                       |                          |            |            |            |
| A/C    | <input type="radio"/> |                       |                       |                       |                       |                       |                          |            |            | ON*1       |
| Mode   |                       | <input type="radio"/> |                       |                       |                       |                       |                          | VENT       |            |            |
|        |                       |                       | <input type="radio"/> |                       |                       |                       |                          | B/L        |            |            |
|        |                       |                       |                       | <input type="radio"/> |                       |                       |                          | FOOT       |            |            |
|        |                       |                       |                       |                       | <input type="radio"/> |                       |                          | F/D        | FRE        |            |
|        |                       |                       |                       |                       |                       | <input type="radio"/> |                          | DEF        | FRE        | ON*1       |
|        |                       |                       |                       |                       |                       |                       | <input type="radio"/> *2 |            | REC*2      |            |

\*1: Compressor is operated by thermo control amp.

\*2: Depending on mode switch position

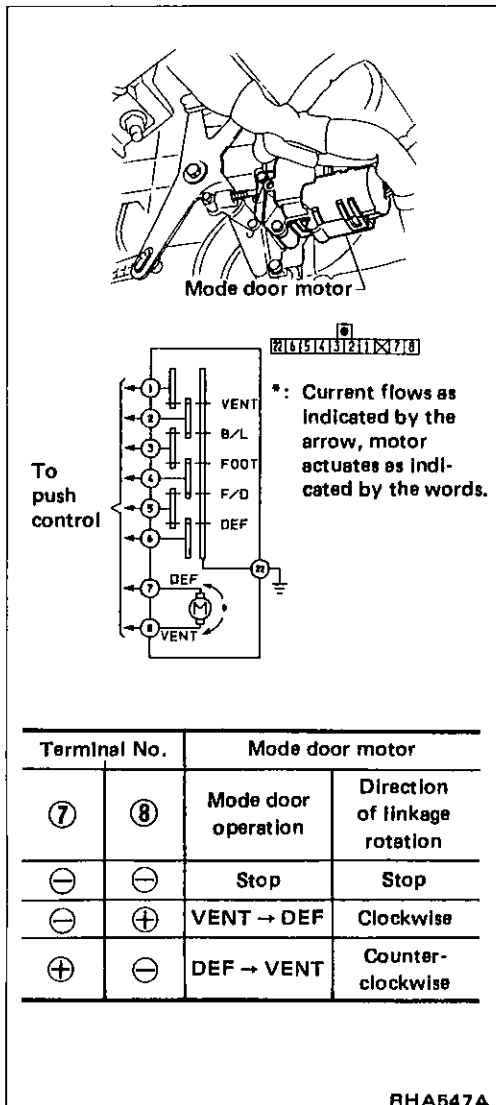




## Intake Door Motor

The intake door motor is installed on the front portion of the intake unit. Using a rod and link it opens and closes the intake door.

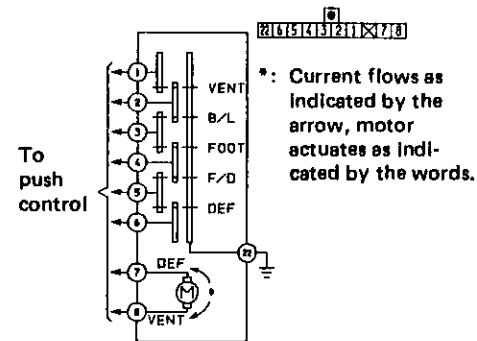
When the REC switch is ON (OFF), the ground line of the intake door motor is switched from terminal ⑪ to ⑨ (⑨ to ⑪). This causes the motor to start because the position switch contacts built into it are set to the current flow position. The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop. The motor always turns in the same direction.



## Mode Door Motor

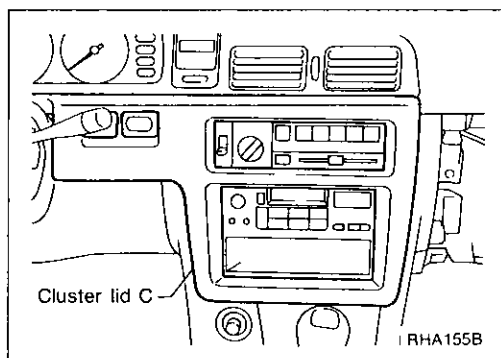
The mode door motor is located on the left side of the heater unit. Through the side link it opens and closes the vent, foot and defroster door.

When one mode switch is pushed, the position switch built into it reads the corresponding mode to determine the direction of the motor rotation. As soon as the desired mode is set, the position switch stops the motor.



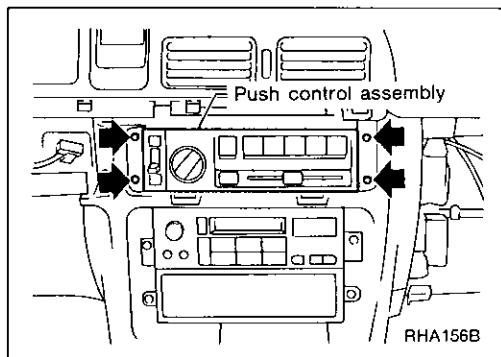
| Terminal No. |   | Mode door motor     |                               |
|--------------|---|---------------------|-------------------------------|
| ⑦            | ⑧ | Mode door operation | Direction of linkage rotation |
| ⊖            | ⊖ | Stop                | Stop                          |
| ⊖            | ⊕ | VENT → DEF          | Clockwise                     |
| ⊕            | ⊖ | DEF → VENT          | Counter-clockwise             |

## SYSTEM DESCRIPTION — Push Control



### Removal and Installation

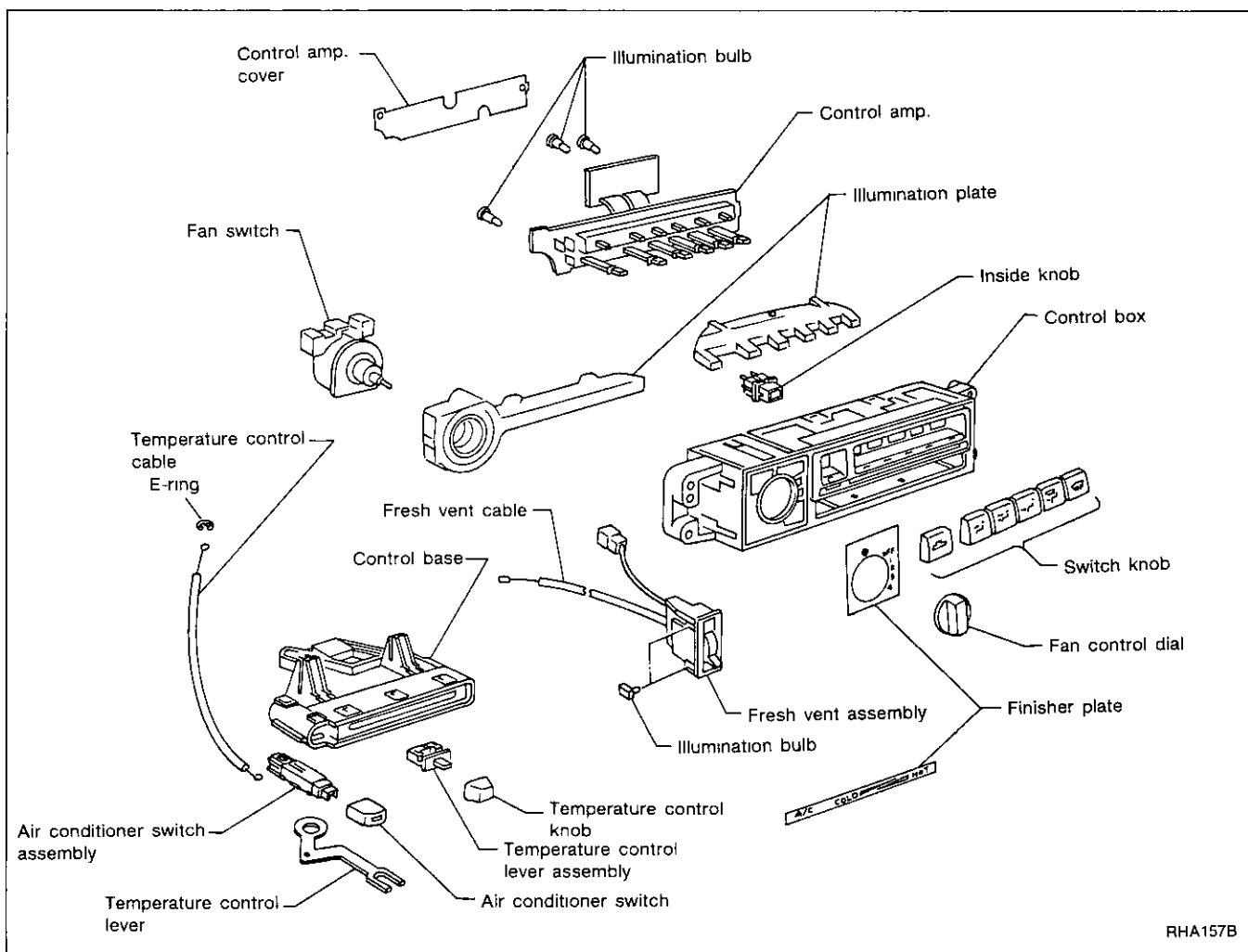
1. Remove cluster lid C.



2. Remove audio (radio).
3. Remove four screws of push control unit.
4. Remove temperature control cable.
5. Remove fresh vent door cable.
6. Disconnect push control unit harness connectors.
7. Remove push control unit.
8. Installation is in the reverse order of removal.

Refer to "Control Cable and Rod Adjustment" for temperature control cable.

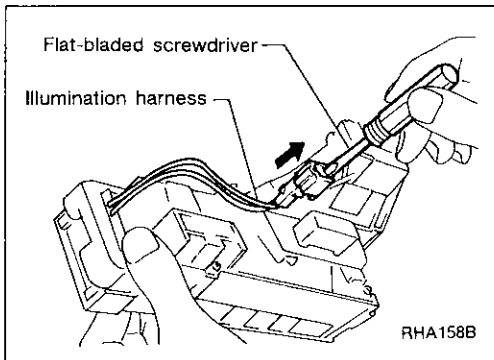
### Overhaul — Push control unit assembly



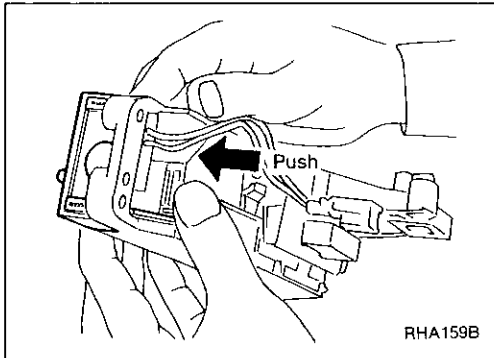
## SYSTEM DESCRIPTION — Push Control

### Overhaul — Push control unit assembly (Cont'd)

1. Disconnect illumination harness connector.

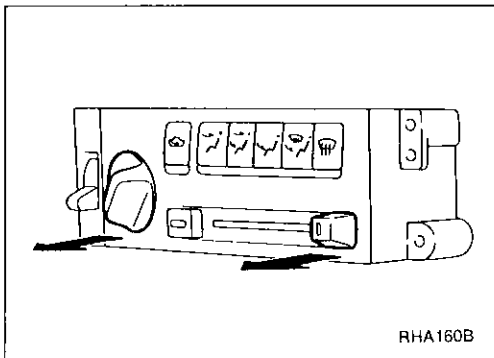


2. Remove fresh vent assembly.

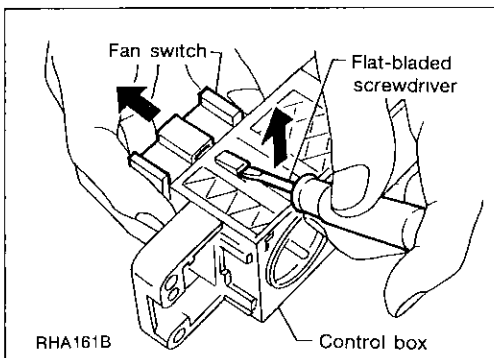


3. Remove temperature control knob & fan control dial.

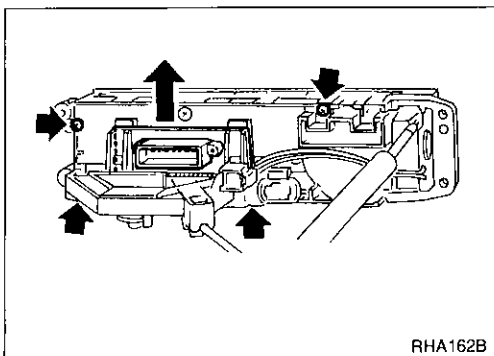
**Wrap temperature knob & fan control dial with a cloth and pull in direction indicated by arrow as shown in figure at left. Be careful not to scratch knobs during removal.**



4. Remove fan switch.



5. Remove control base & control amp. cover.

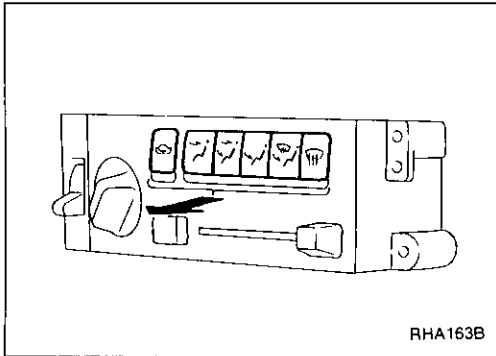


## SYSTEM DESCRIPTION — Push Control

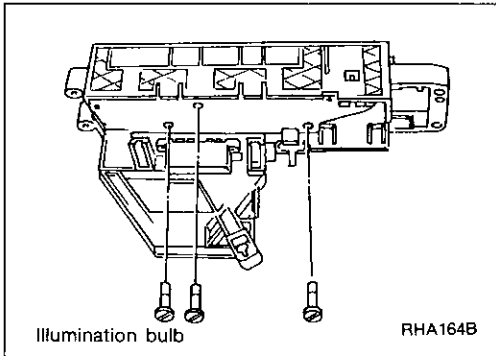
### Overhaul — Push control unit assembly (Cont'd)

6. Remove control knobs.

**Wrap finisher with a cloth and remove knobs using flat-bladed screwdriver or similar tool. Be careful not to scratch finisher surface.**



7. Remove illumination bulbs.



8. Remove control amp.

**Be careful not to damage substrate when removing.**

9. Remove illumination plate.

10. Remove finisher plate.

11. Disconnect temperature control cable.

12. Installation is in reverse order of removal.

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

### General Specifications

#### COMPRESSOR

|                                              |                                      |
|----------------------------------------------|--------------------------------------|
| Model                                        | ATSUGI make<br>NVR 140S              |
| Type                                         | Vane rotary                          |
| Displacement    cm <sup>3</sup> (cu in)/Rev. | 140 (8.54)                           |
| Direction of rotation                        | Clockwise<br>(Viewed from drive end) |
| Drive belt                                   | Poly V                               |

#### LUBRICATION OIL

|                                               |                         |
|-----------------------------------------------|-------------------------|
| Model                                         | ATSUGI make<br>NVR 140S |
| Type                                          | SUNISO 5GS              |
| Capacity<br>ml (US fl oz, Imp fl oz)          |                         |
| Total in system                               | 200 (6.8, 7.0)          |
| Amount of oil which can be<br>drained         | Approx. 100 (3.4, 3.5)  |
| Compressor (Service parts)<br>charging amount | 200 (6.8, 7.0)          |

#### REFRIGERANT

|                                       |                           |
|---------------------------------------|---------------------------|
| Type                                  | R-12                      |
| 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                                   | NVR 140S                     |
| Clutch disc-pulley clearance<br>mm (in) | 0.3 - 0.6<br>(0.012 - 0.024) |



# ELECTRICAL SYSTEM

## SECTION **EL**

When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".

## CONTENTS

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| STARTING SYSTEM — Starter — .....               | EL- 17       |
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| JOINT CONNECTOR (J/C) .....                     | Foldout page |

### WIRING DIAGRAM REFERENCE CHART

|                                                                                              |                 |
|----------------------------------------------------------------------------------------------|-----------------|
| E.C.C.S. (Ignition system) .....                                                             | EF & EC SECTION |
| AUTOMATIC TRANSAXLE CONTROL SYSTEM, SHIFT LOCK SYSTEM .....                                  | AT SECTION      |
| ANTI-LOCK BRAKING SYSTEM .....                                                               | BR SECTION      |
| POWER WINDOW AND POWER DOOR LOCK, AUTOMATIC SEAT BELT SYSTEM,<br>SUN ROOF, DOOR MIRROR ..... | BF SECTION      |
| HEATER AND AIR CONDITIONER .....                                                             | HA SECTION      |



# HARNESS CONNECTOR

## Description

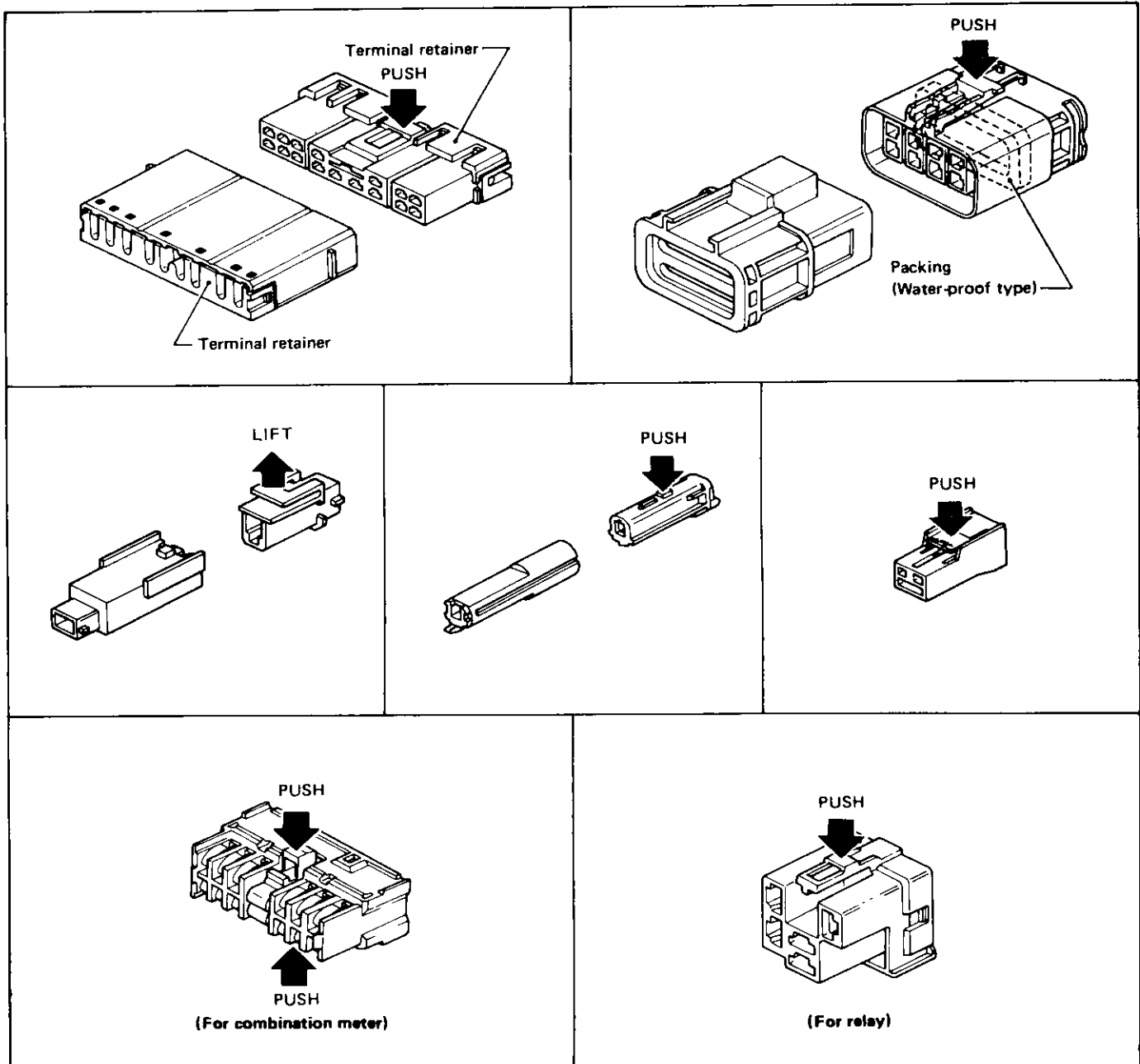
### HARNESS CONNECTOR

- 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

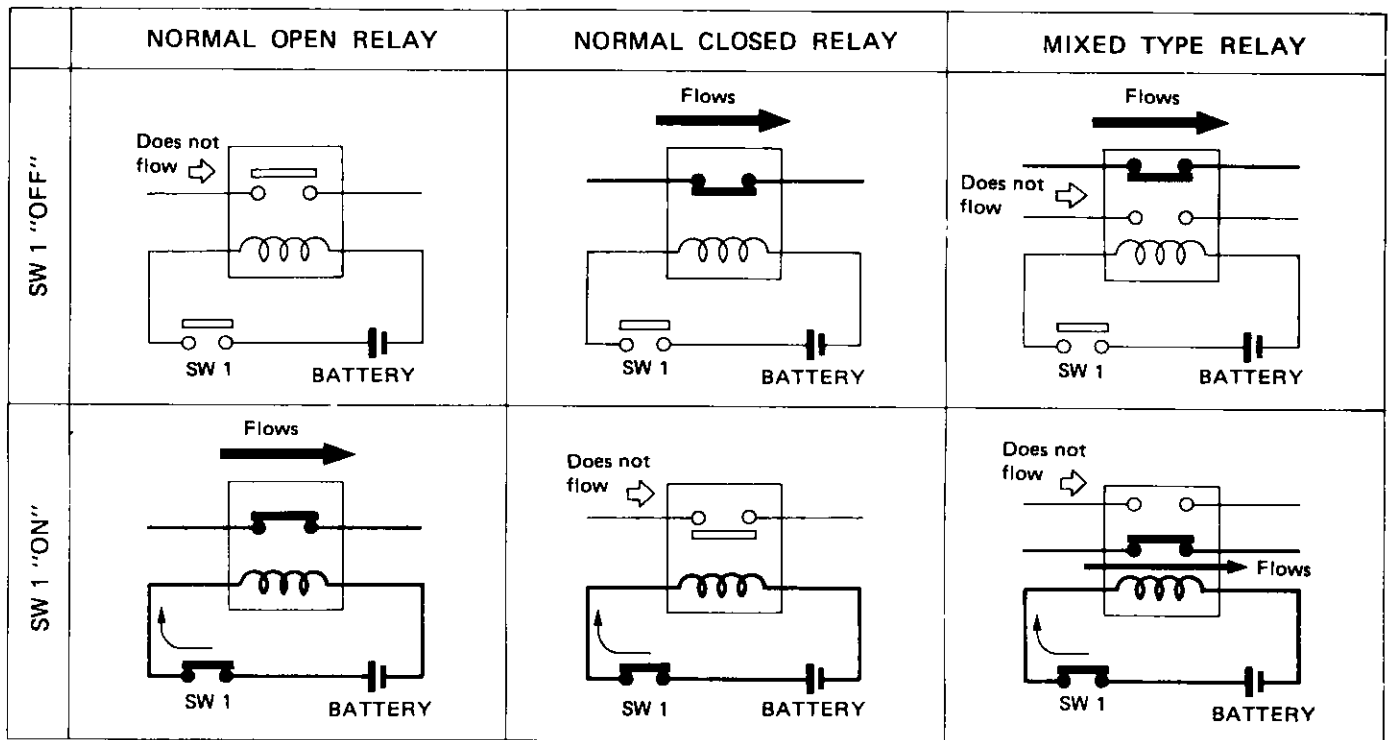


# STANDARDIZED RELAY

## Description

### NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

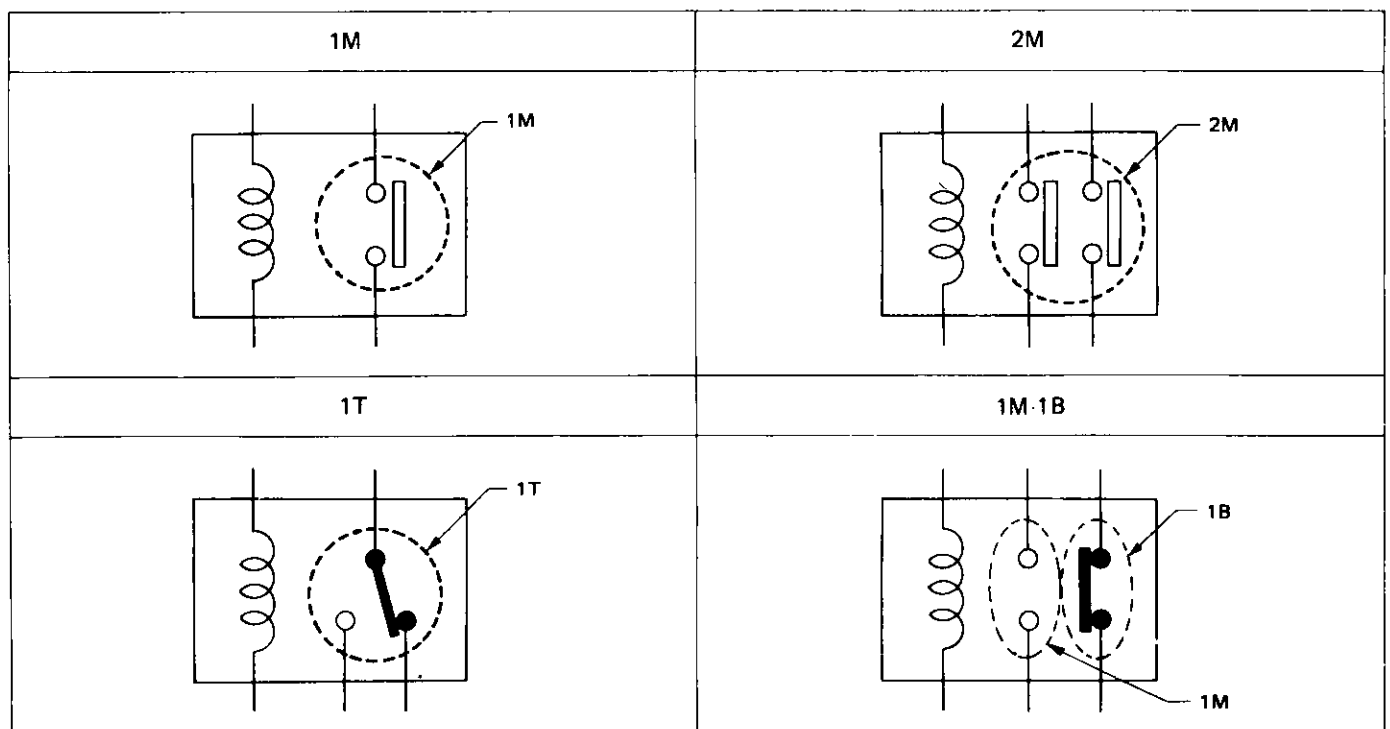
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

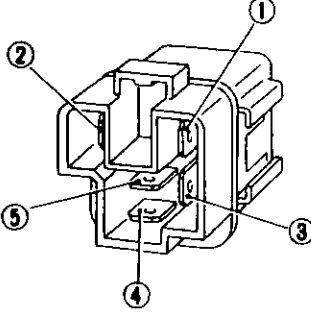
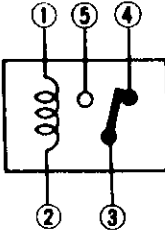
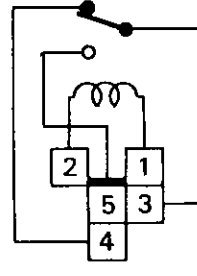
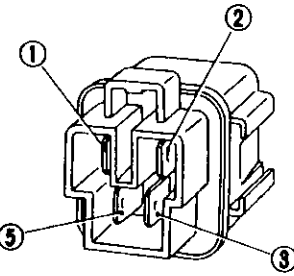
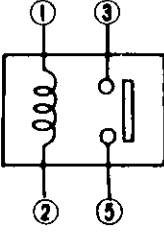
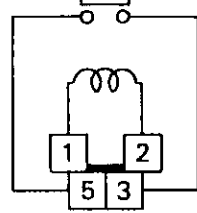
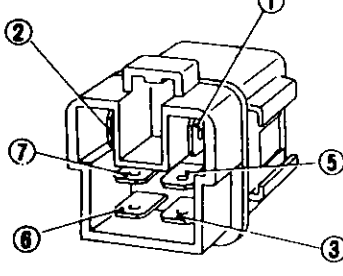
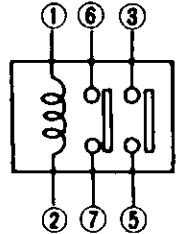
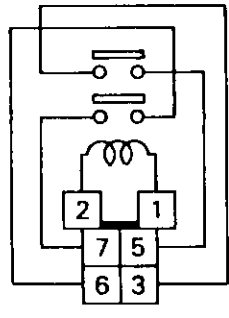
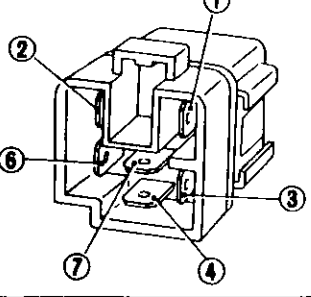
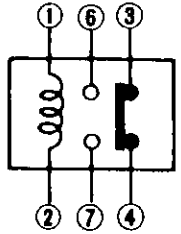
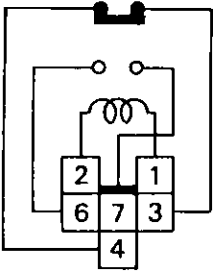
### TYPE OF STANDARDIZED RELAYS

1M ..... 1 Make      2M ..... 2 Make  
 1T ..... 1 Transfer      1M·1B ..... 1 Make 1 Break



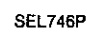
SEL882H

# STANDARDIZED RELAY

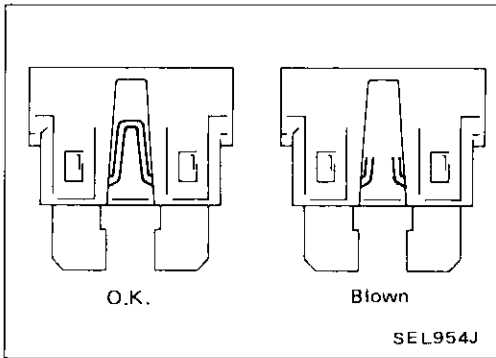
| Type  | Outer view                                                                          | Circuit                                                                             | Connector symbol and connection                                                      | Case color    |
|-------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------|
| 1T    |    |    |    | BLACK         |
| 1M    |    |    |    | BLUE or GREEN |
| 2M    |  |  |   | BROWN         |
| 1M-1B |  |  |  | GRAY          |

SEL883H

## Wiring Diagram

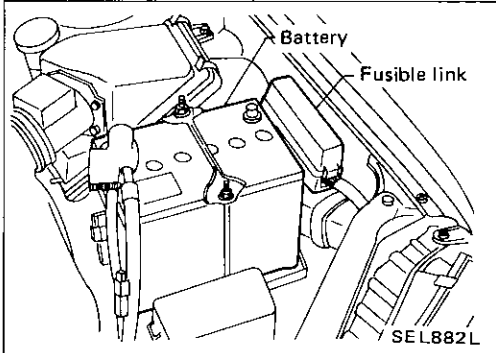


## POWER SUPPLY ROUTING



### Fuse

- If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
- Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not install fuse in oblique direction; always insert it into fuse holder properly.
- Remove fuse for clock if vehicle is not used for a long period of time.



### Fusible Link

A melted fusible link can be detected by visual inspection. If its condition is questionable, use circuit tester or test lamp.

#### CAUTION:

- If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.
- Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.

### FUSIBLE LINK (WIRE TYPE) VARIATION

| Color | Maximum amperage (A) |
|-------|----------------------|
| Brown | 15                   |
| Green | 20                   |
| Red   | 30                   |
| Black | 35                   |
| Gray  | 40                   |

\*Temperature condition: Less than 80°C (176°F)

# BATTERY

## CAUTION:

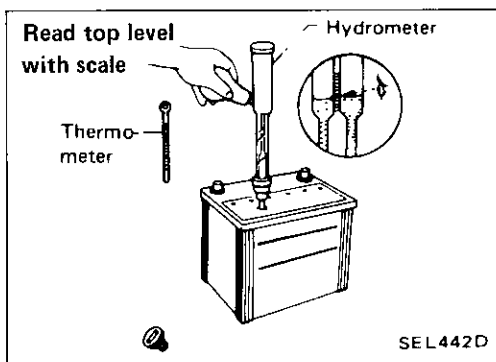
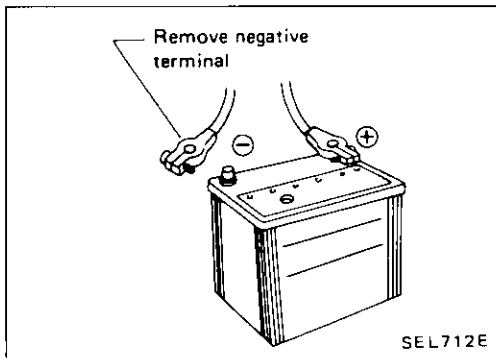
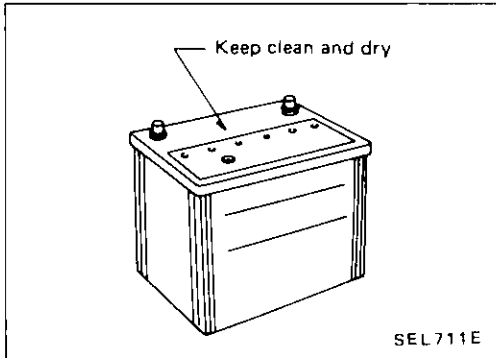
- If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specific gravity.

## 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.



## BATTERY

### How to Handle Battery (Cont'd)

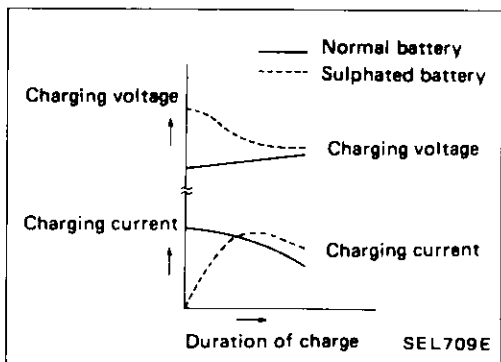
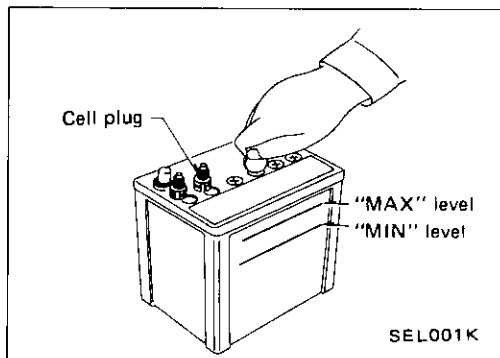
#### CHECKING ELECTROLYTE LEVEL

##### WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

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.

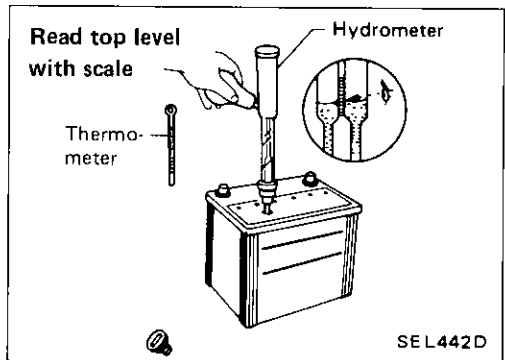
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



#### SULPHATION

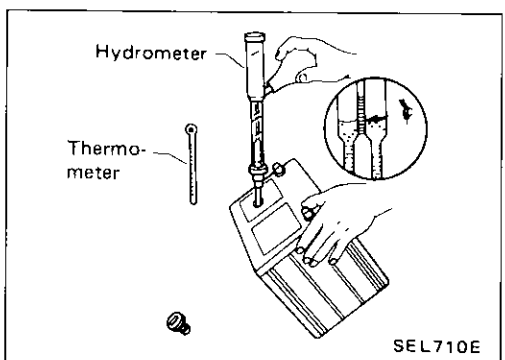
When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

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.



- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

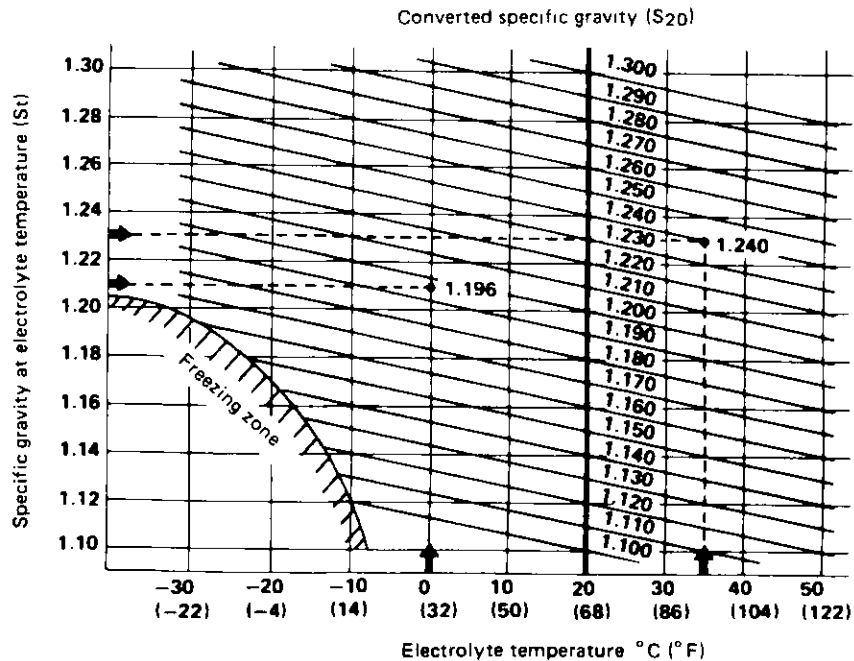
## BATTERY

### How to Handle Battery (Cont'd)

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.

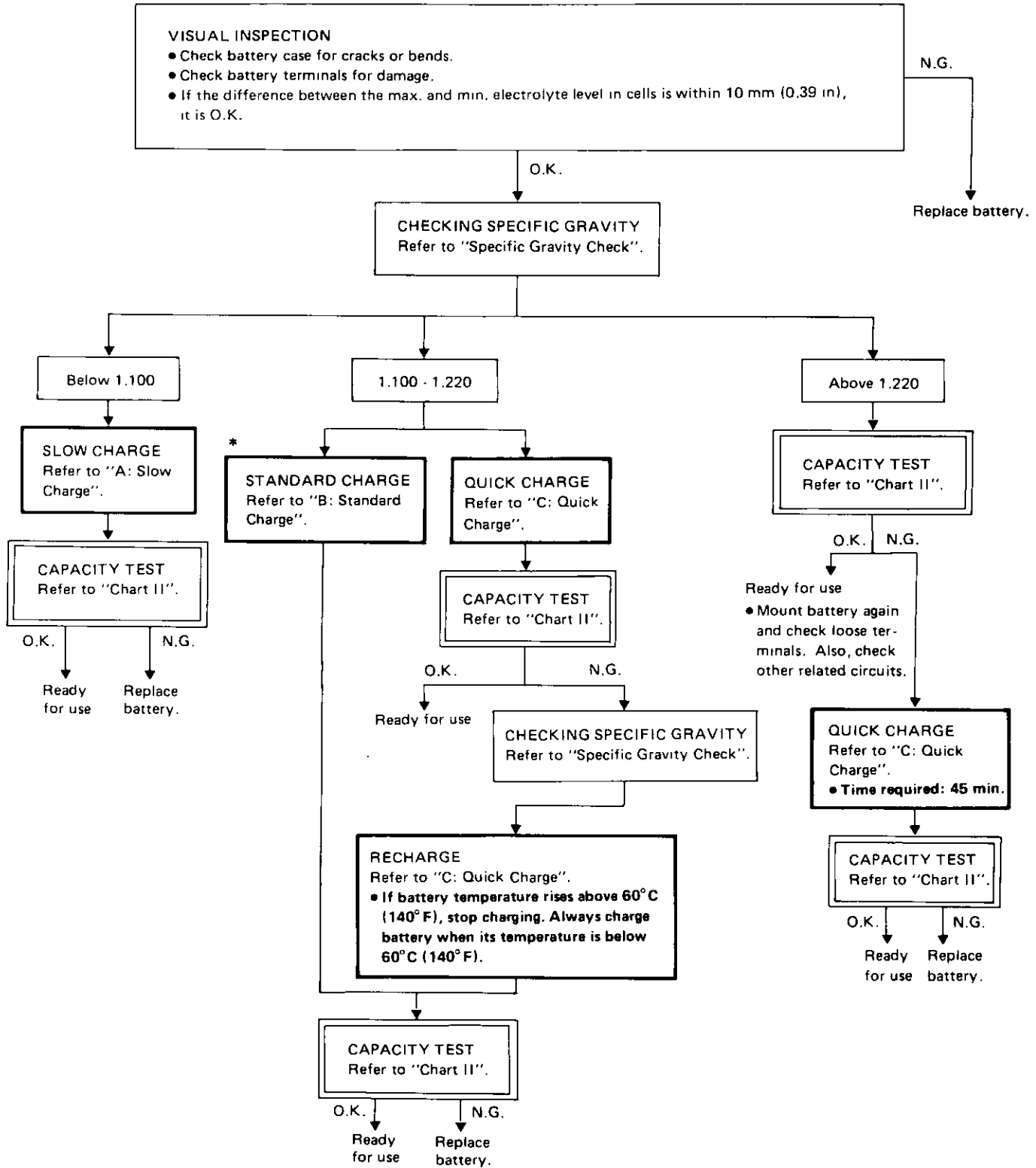


SEL042D

# BATTERY

## Battery Test and Charging Chart

Chart I



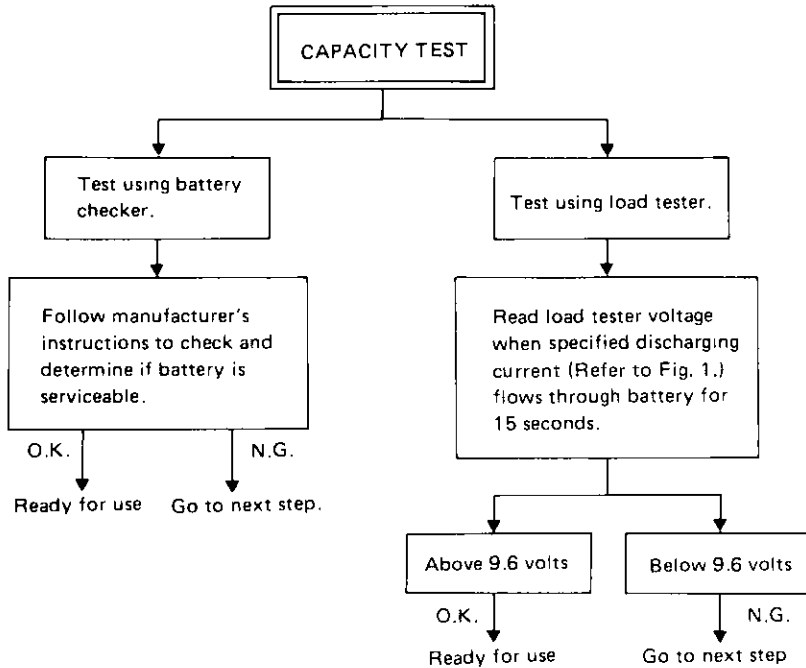
\* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.



# BATTERY

## Battery Test and Charging Chart (Cont'd)

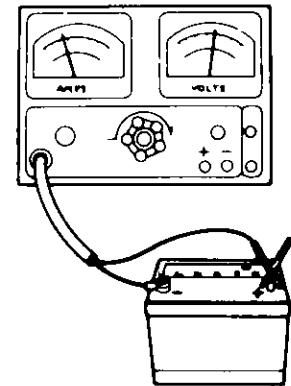
Chart II



- 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

## Battery Test and Charging Chart (Cont'd)

### A: SLOW CHARGE

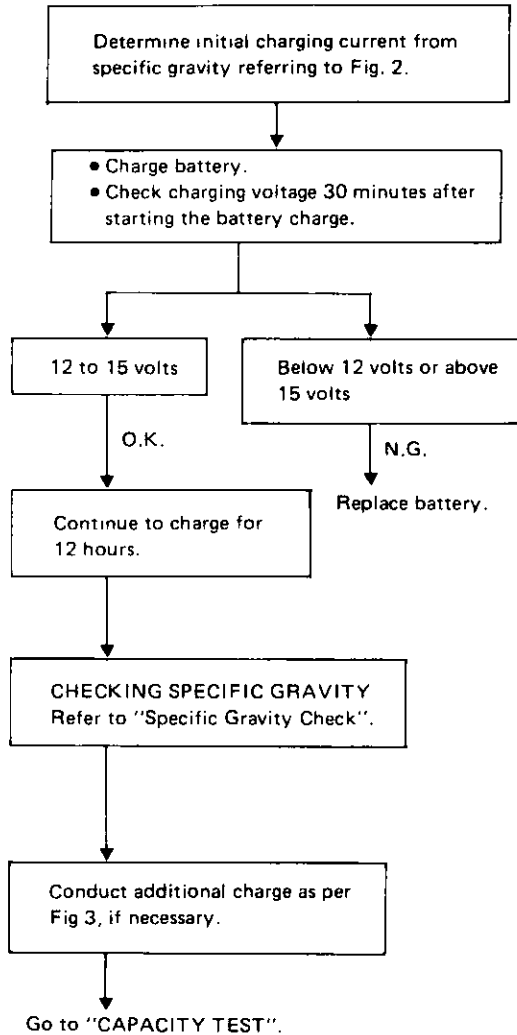
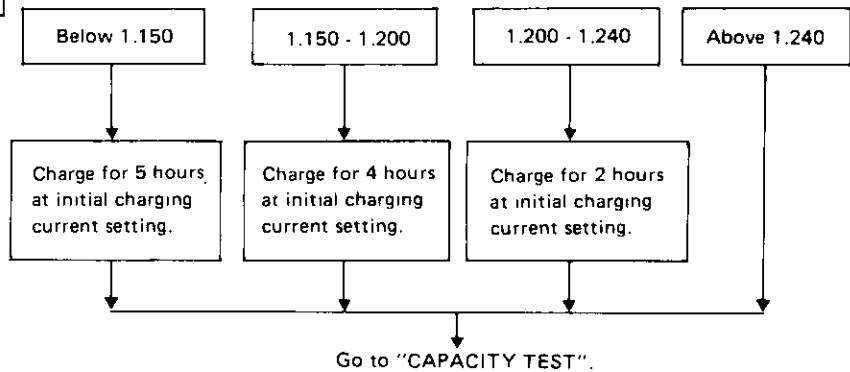


Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

| BATTERY TYPE<br>CON-<br>VERTED<br>SPECIFIC<br>GRAVITY | 28B19R(L)<br>34B19R(L) | 46B24R(L)<br>55B24R(L) | 50D23R(L)<br>55D23R(L) | 65D26R(L)<br>80D26R(L) | 75D31R(L)  | 95D31R(L)<br>95E41R(L) | 130E41R(L)  |
|-------------------------------------------------------|------------------------|------------------------|------------------------|------------------------|------------|------------------------|-------------|
| Below 1.100                                           | 4.0<br>(A)             | 5.0<br>(A)             | 7.0<br>(A)             | 8.0<br>(A)             | 9.0<br>(A) | 10.0<br>(A)            | 14.0<br>(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:

- 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.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

# BATTERY

## Battery Test and Charging Chart (Cont'd)

### B: STANDARD CHARGE

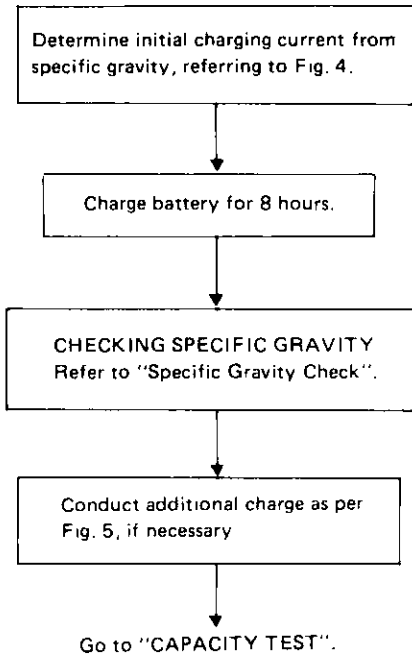
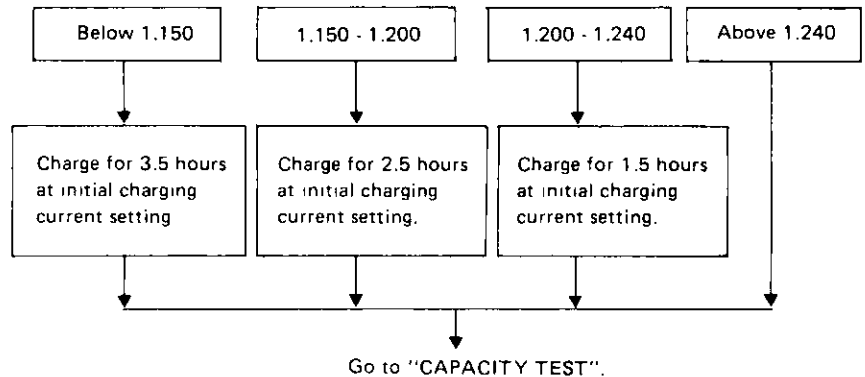


Fig. 4 INITIAL CHARGING CURRENT SETTING  
(Standard charge)

| BATTERY TYPE<br>CON-<br>VERTED<br>SPECIFIC<br>GRAVITY | 28B19R(L)<br>34B19R(L) | 46B24R(L)<br>55B24R(L) | 50D23R(L)<br>55D23R(L) | 65D26R(L)<br>80D26R(L) | 75D31R(L) | 95D31R(L)<br>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:

- Do not use standard charge method on a battery whose specific gravity is less than 1.100.
- 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.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

# BATTERY

## Battery Test and Charging Chart (Cont'd)

### C: QUICK CHARGE

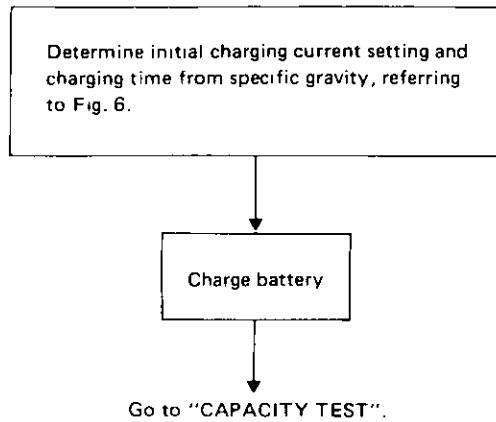


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

| CON-<br>VERTED<br>SPECIFIC<br>GRAVITY | BATTERY<br>TYPE      |  | CUR-<br>RENT<br>[A] | 28B19R(L)<br>34B19R(L) | 46B24R(L)<br>55B24R(L)<br>50D23R(L) | 55D23R(L)<br>65D26R(L)<br>80D26R(L) | 75D31R(L)<br>95D31R(L)<br>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:

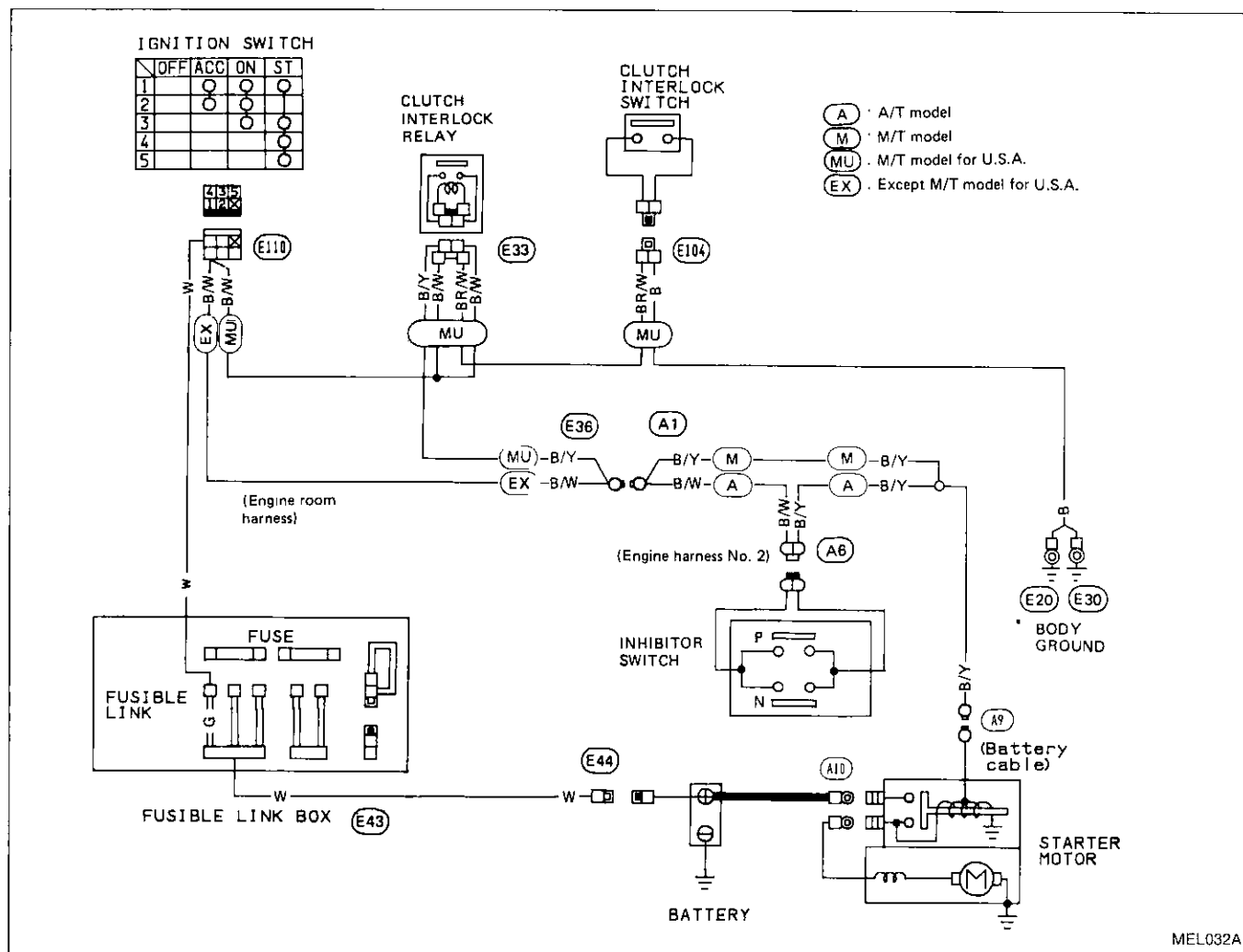
- Do not use quick charge method on a battery whose specific gravity is less than 1.100.
- Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- 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).
- 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 |      | For U.S.A. | For Canada |
| Type          |      | 55D23L     | 65D26L     |
| Capacity      | V-AH | 12-60      | 12-65      |

# STARTING SYSTEM

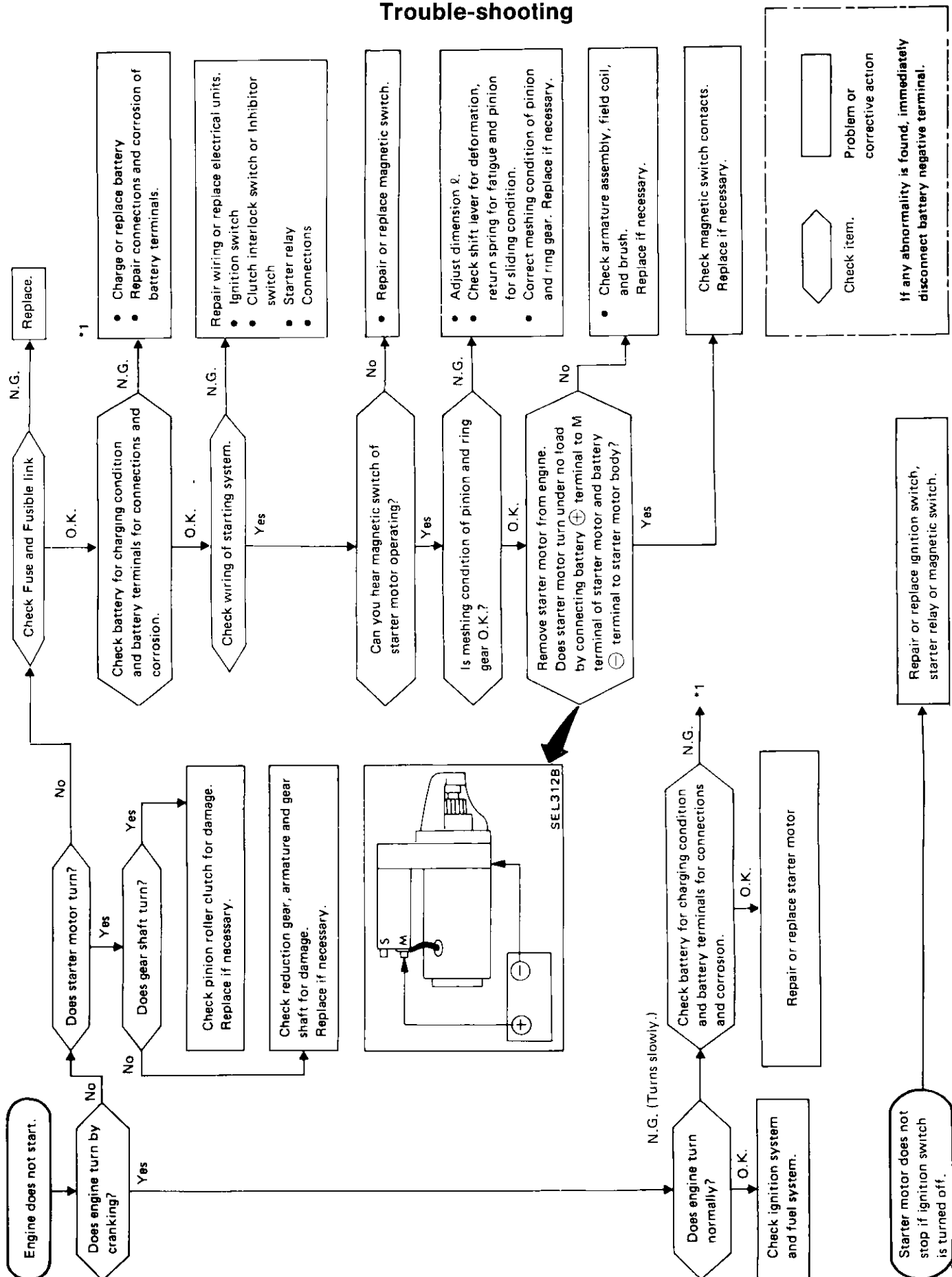
## Wiring Diagram



MEL032A

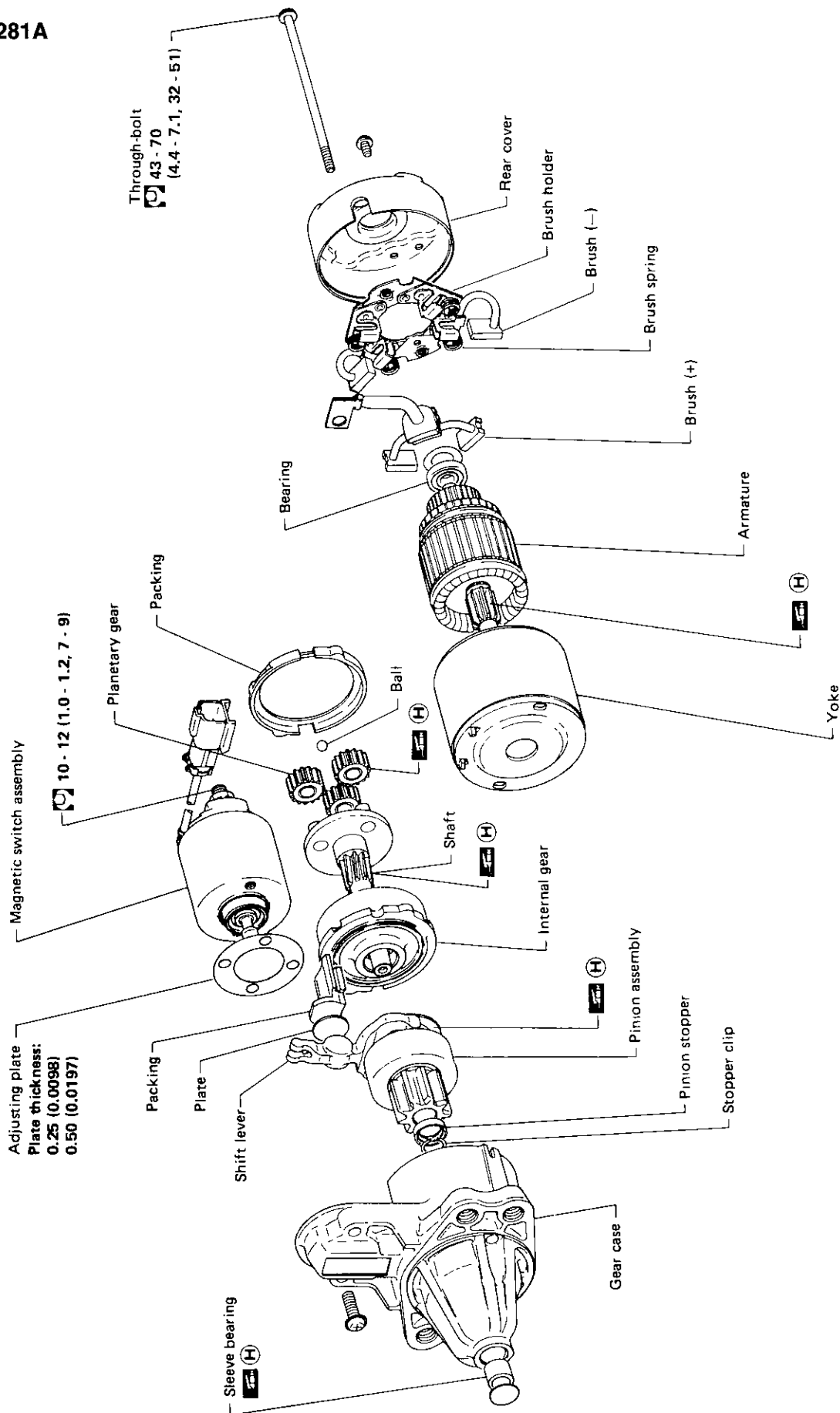
# STARTING SYSTEM

## Trouble-shooting



M1T72281A

## Construction



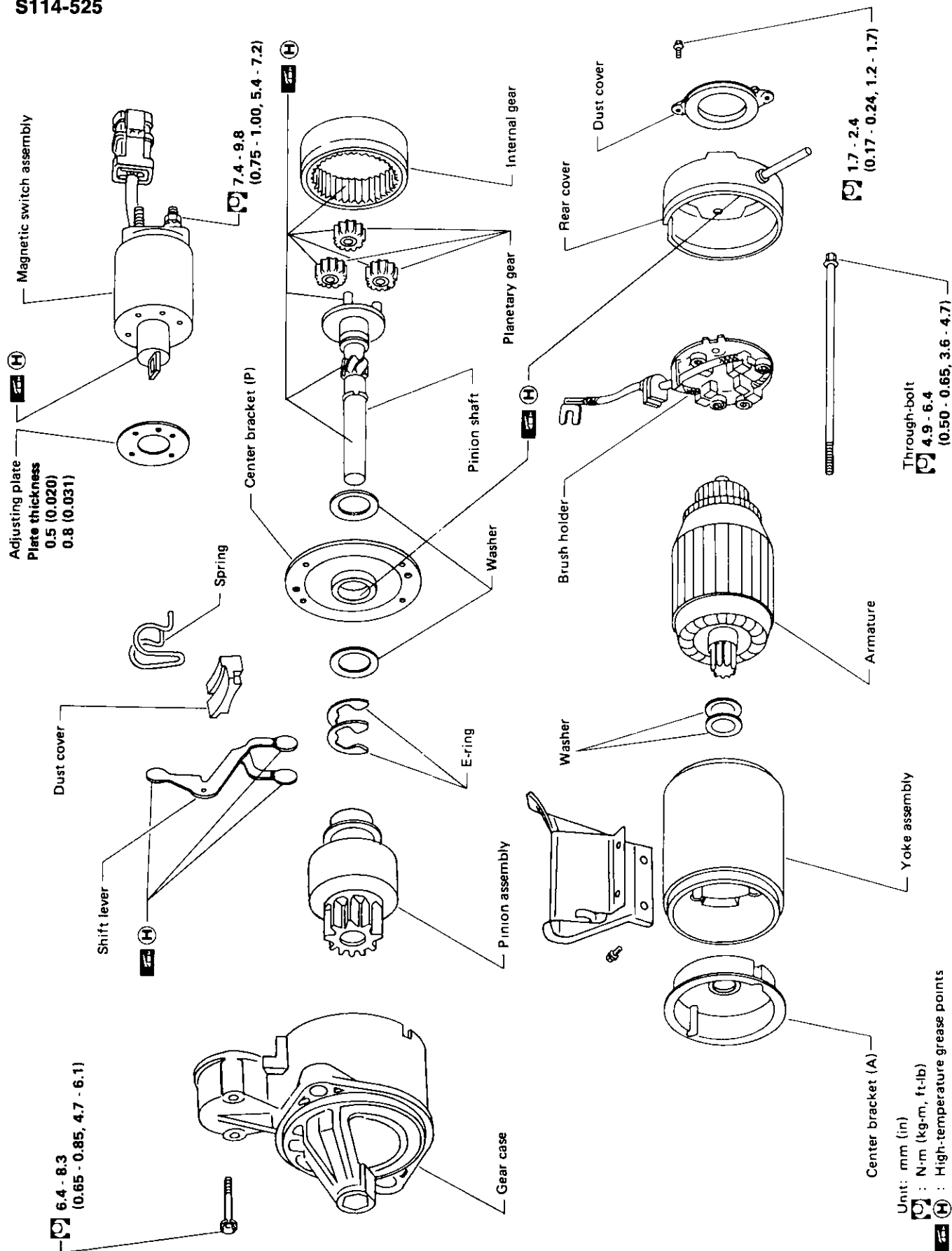
Unit: mm (in)

Ⓜ : N·m (kg·m, ft·lb)

Ⓜ : High-temperature grease point

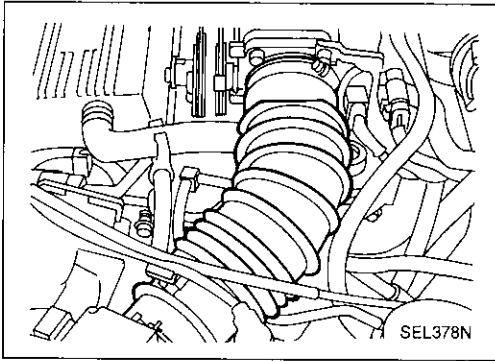
SEL628L

S114-525



SEL647J

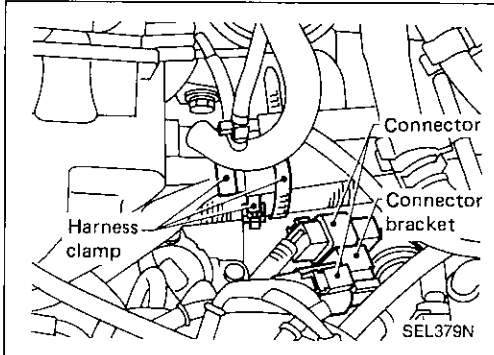




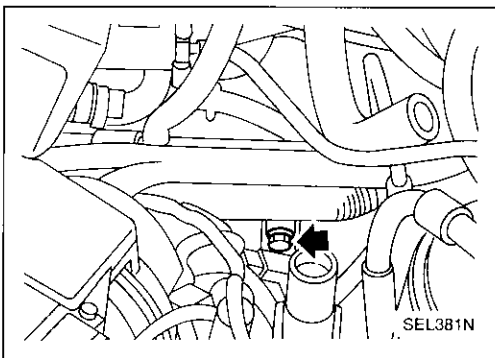
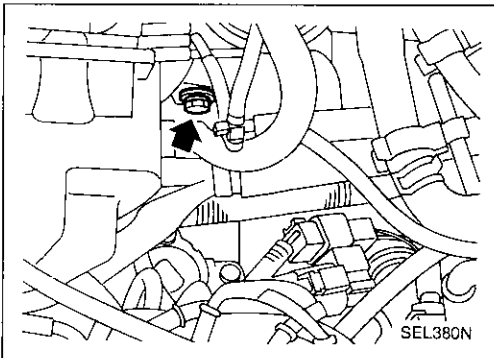
### Removal and Installation

#### REMOVAL

1. Remove air duct.
2. Remove harness clamps. For A/T model, remove harness connectors from harness connector bracket.
3. Remove starter cable from starter.

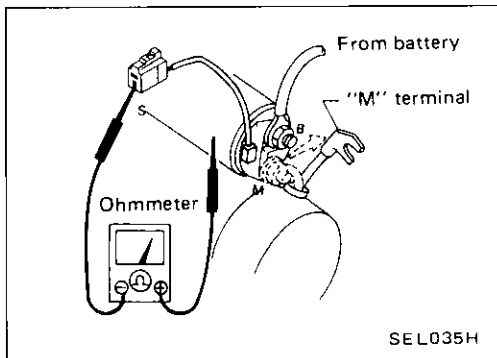


4. Remove starter fixing bolts.



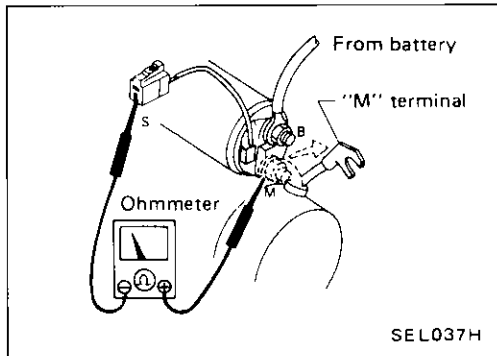
#### INSTALLATION

- Installation is in reverse order of removal.
- Starter upper fixing bolt is shorter than lower bolt.**

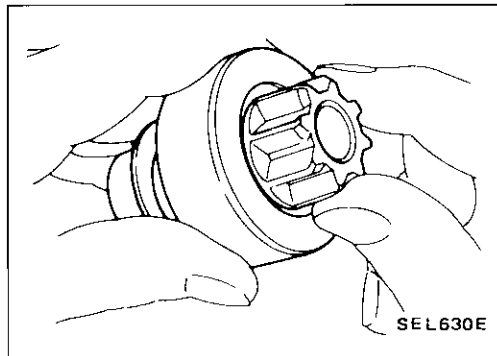


### Magnetic Switch Check

- 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

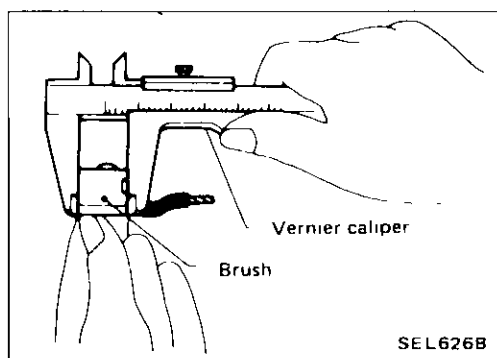
#### BRUSH

Check brush for wear.

**Wear limit length:**

**Refer to S.D.S.**

- Excessive wear ... Replace.



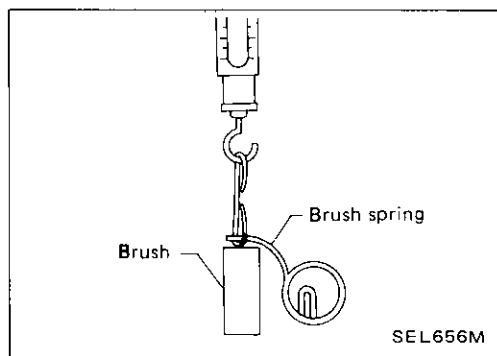
### BRUSH SPRING PRESSURE

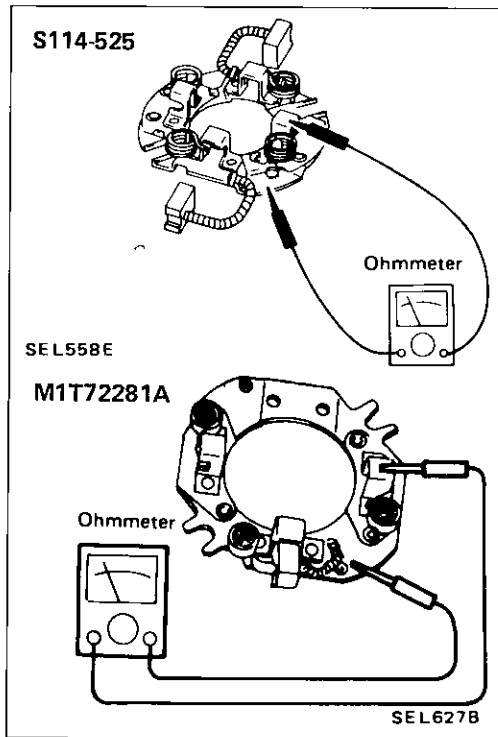
Check brush spring pressure with brush spring detached from brush.

**Spring pressure (with new brush):**

**Refer to S.D.S.**

- Not within the specified values ... Replace.

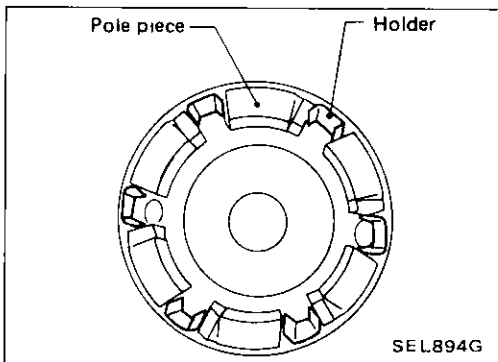




## Brush Check (Cont'd)

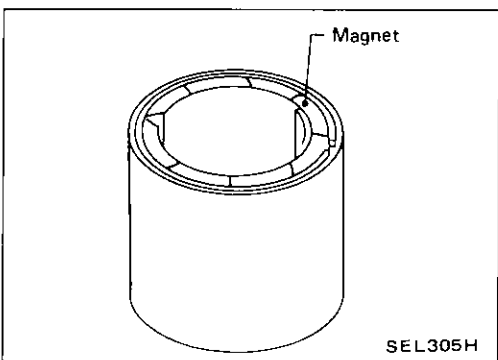
### BRUSH HOLDER

1. Perform insulation test between brush holder (positive side) and its base (negative side).
  - Continuity exists. ... Replace.
2. Check brush to see if it moves smoothly.
  - If brush holder is bent, replace it; if sliding surface is dirty, clean.



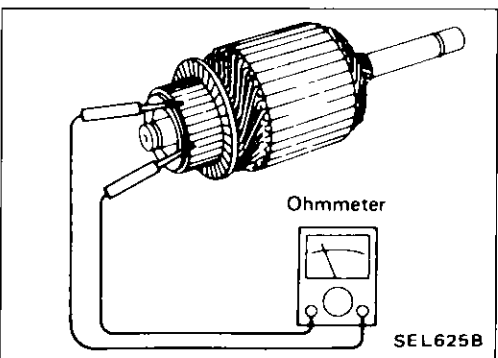
## Pole Piece Check (M1T72281A)

Pole piece is secured to yoke by bonding agent. Check pole piece to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly. Holder may move slightly as it is only inserted and not bonded.



## Yoke Assembly Check (S114-525)

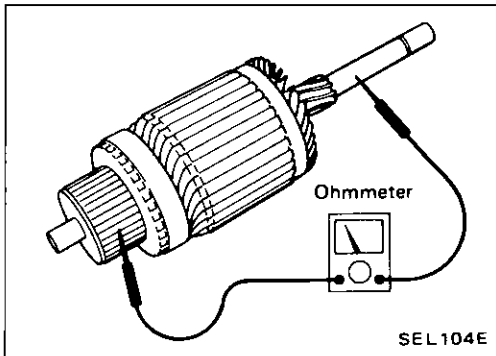
Check magnet for cracks. If there is any crack, replace malfunctioning parts as an assembly.



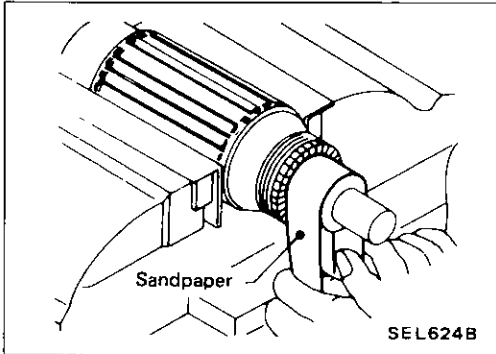
## Armature Check

1. Continuity test (between two segments side by side).
  - No continuity ... Replace.

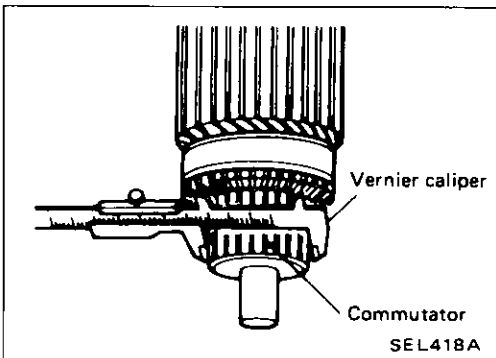
### Armature Check (Cont'd)



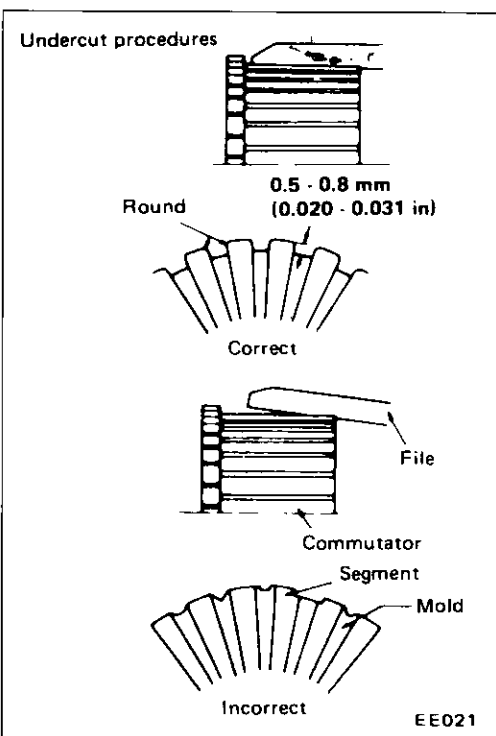
2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.



3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 sandpaper.



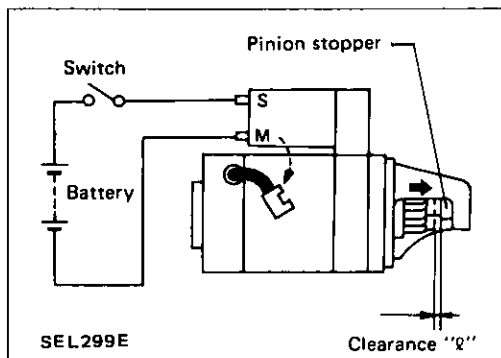
4. Check diameter of commutator.
- Commutator minimum diameter:**  
**Refer to S.D.S.**
- Less than specified value ... Replace.



5. Check depth of insulating mold from commutator surface.
- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in)

## Assembly

Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.  
Carefully observe the following instructions.



## PINION PROTRUSION LENGTH ADJUSTMENT

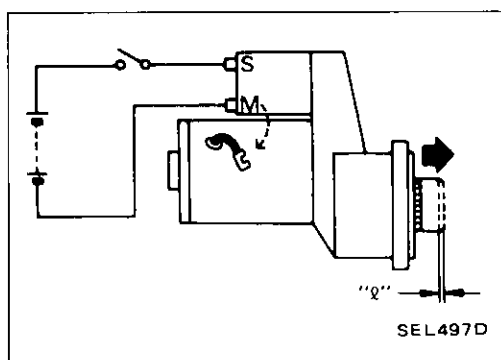
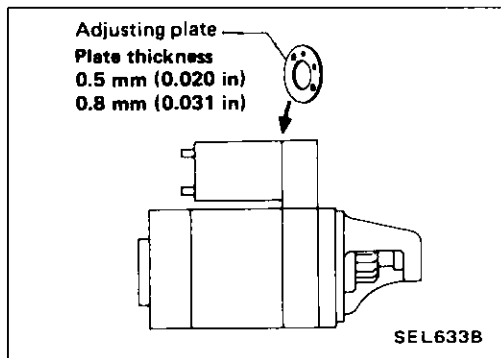
### M1T72281A

With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "ℓ" between the front edge of the pinion and the pinion stopper.

**Clearance "ℓ":**

**Refer to S.D.S.**

- Not in the specified value ... Adjust with adjusting plate.



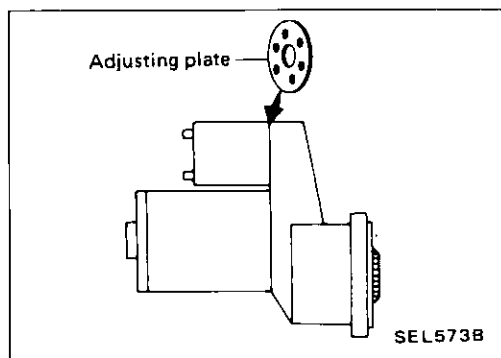
### S114-525

Compare movement "ℓ" in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

**Movement "ℓ":**

**Refer to S.D.S.**

- Not in the specified value ... Adjust by adjusting plate.



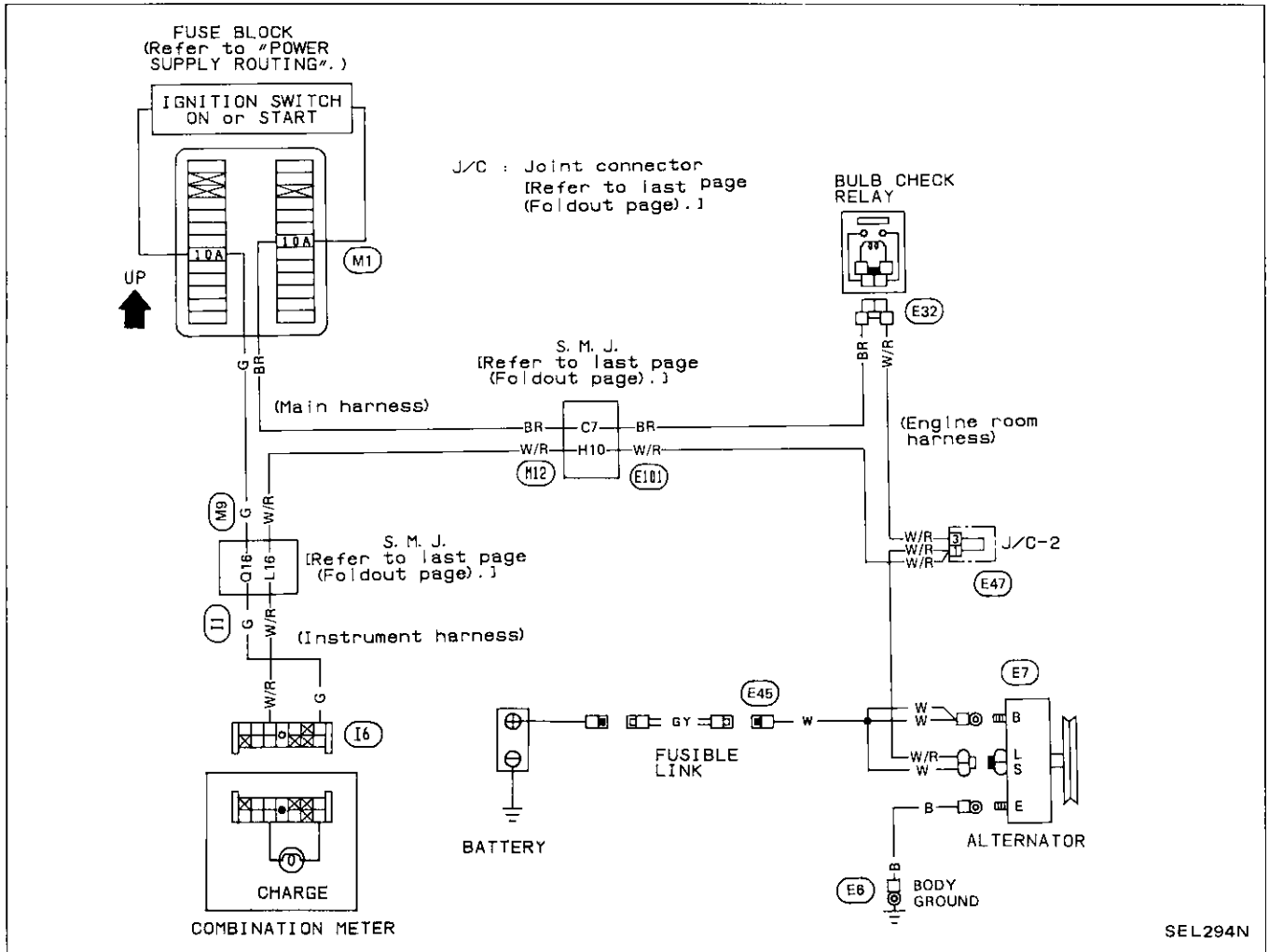
**Service Data and Specifications (S.D.S.)**

**STARTER**

| Type                                                          |                  | M1T72281A                          | S114-525                           |
|---------------------------------------------------------------|------------------|------------------------------------|------------------------------------|
|                                                               |                  | MITSUBISHI make                    | HITACHI make                       |
|                                                               |                  | Reduction gear                     |                                    |
| System voltage                                                | V                | 12                                 |                                    |
| No-load                                                       | Terminal voltage | V                                  | 11.0                               |
|                                                               | Current          | A                                  | 50 - 75      Less than 90          |
|                                                               | Revolution       | rpm                                | 3,000 - 4,000      More than 2,950 |
| Minimum length of brush                                       | mm (in)          | 12.0 (0.472)                       | 11.0 (0.433)                       |
| Brush spring tension<br>(With new brush)                      | N (kg, lb)       | 13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7) | 17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9) |
| Minimum diameter of commutator                                | mm (in)          | 28.8 (1.134)                       | 32.0 (1.260)                       |
| Clearance "ℓ" between pinion front edge and<br>pinion stopper | mm (in)          | 0.5 - 2.0 (0.020 - 0.079)          | —                                  |
| Movement "ℓ" in height of pinion assembly                     | mm (in)          | —                                  | 0.3 - 1.5 (0.012 - 0.059)          |
| Clearance between bearing metal and armature<br>shaft         | mm (in)          | —                                  | Less than 0.3 (0.012)              |

# CHARGING SYSTEM

## Wiring Diagram



SEL294N

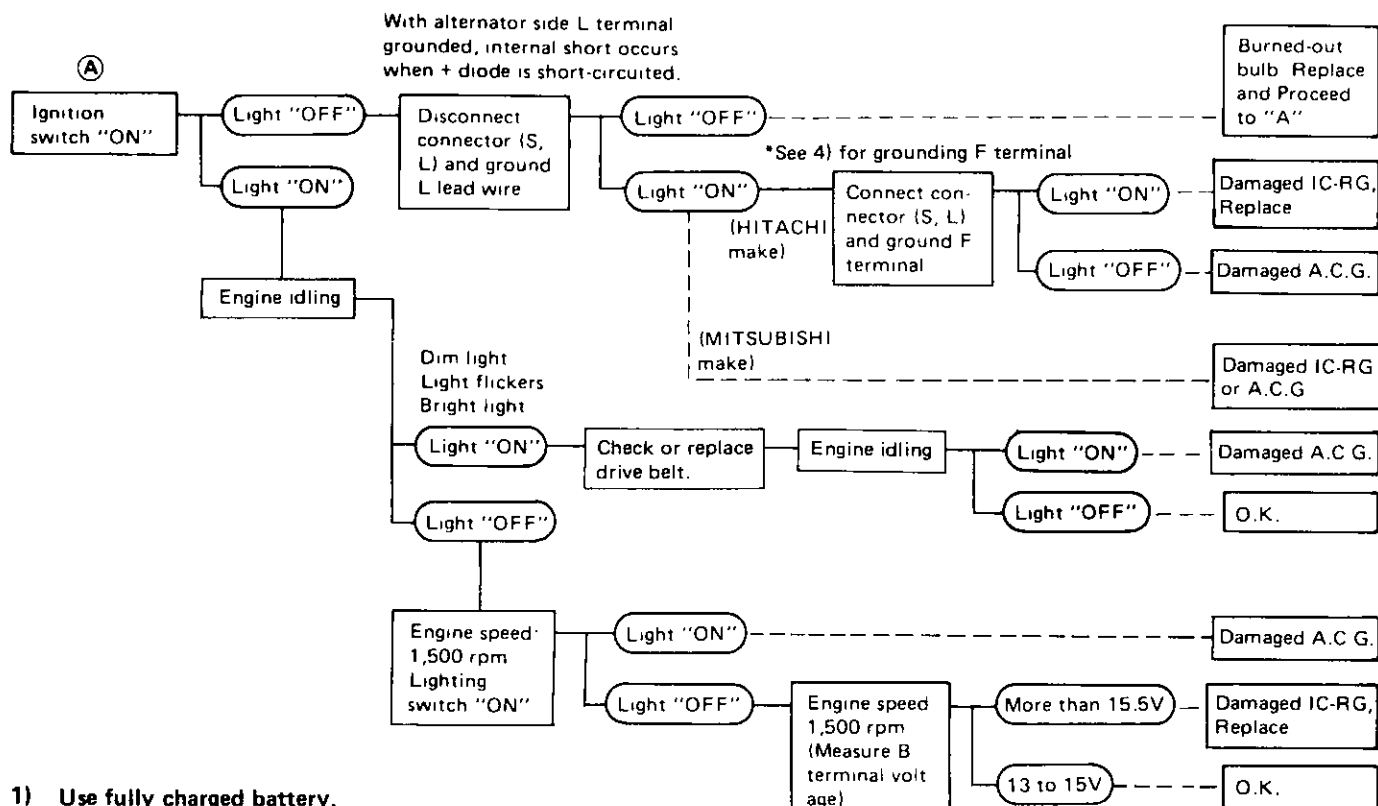
# CHARGING SYSTEM

## 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.

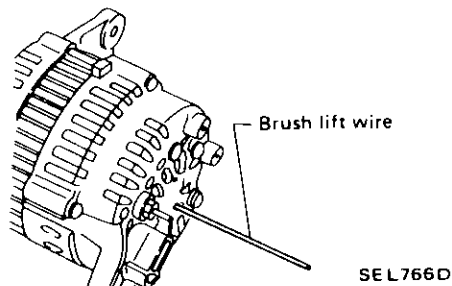
**Before starting trouble-shooting, inspect the fusible link.**

### 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)

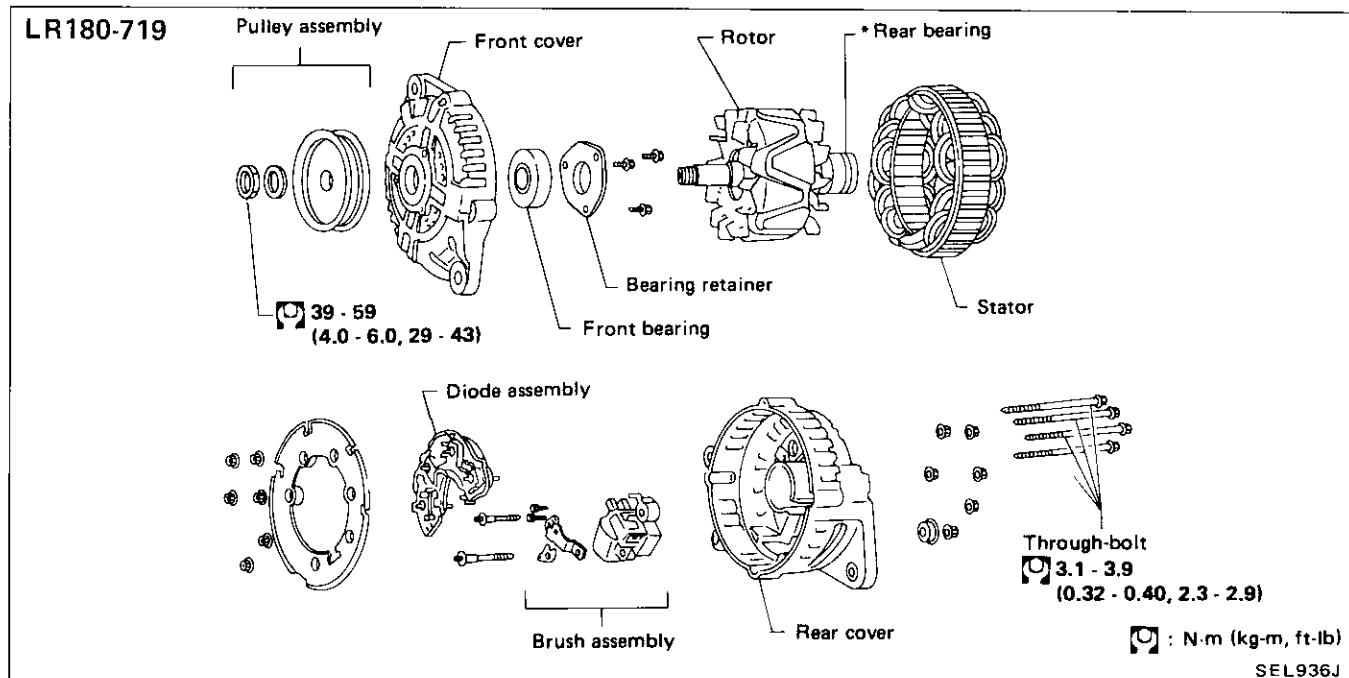
Contact tip of wire with brush and attach wire to alternator body.



- 5) Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.



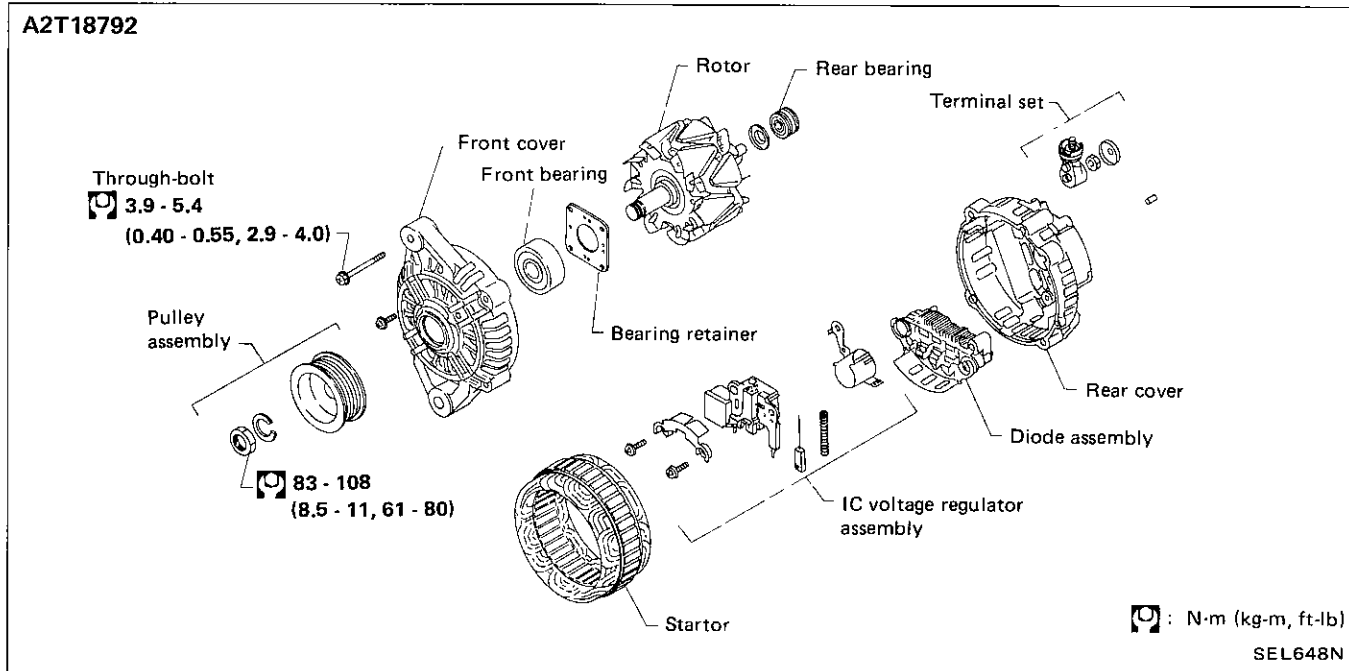
## Construction



### \* Rear bearing

#### CAUTION:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.

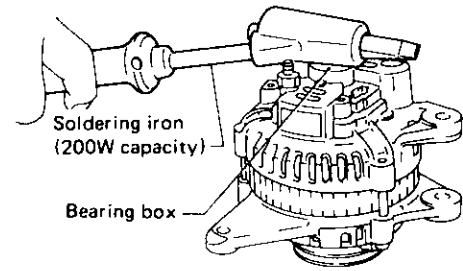


### REAR BEARING

#### CAUTION:

Do not reuse bearing or oil seal after removal. Replace with a new one.  
Do not lubricate rear bearing outer race.

[HITACHI make]



SEL628D

## Disassembly

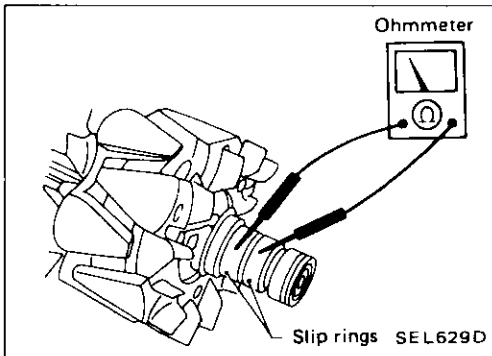
### REAR COVER REMOVAL [LR180 - 719]

#### 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.

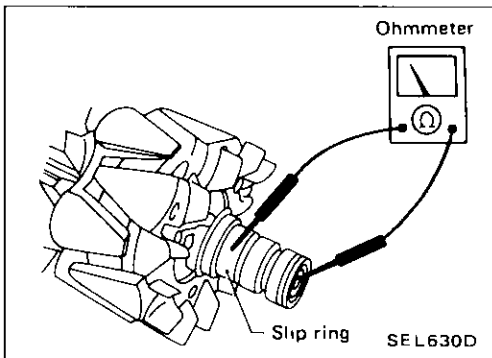
## Rotor Slip Ring Check

1. Continuity test
  - No continuity ... Replace rotor.



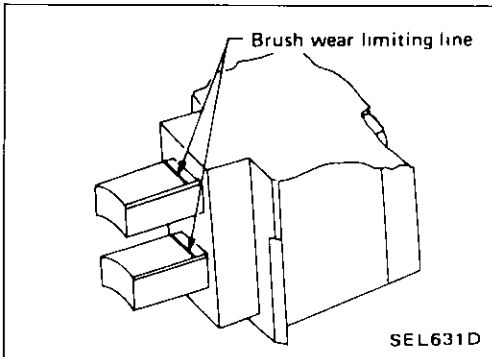
2. Insulator test
  - Continuity exists. ... Replace rotor.
3. Check slip ring for wear.
 

**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.



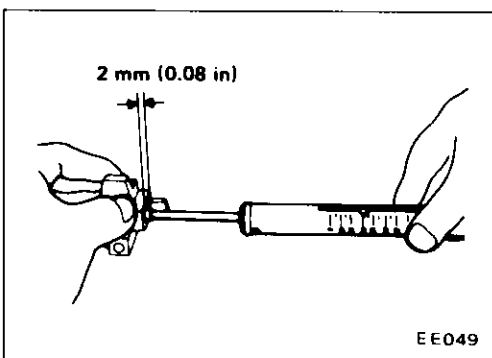
3. Check brush lead wire for damage.
  - Damaged ... Replace.
4. Check brush spring pressure.
 

Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

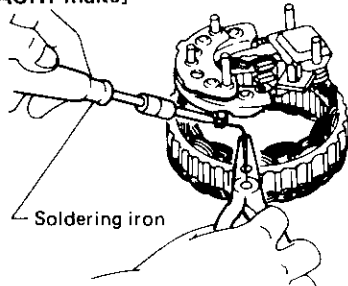
#### Spring pressure:

**Refer to S.D.S.**

- Not within the specified values ... Replace.



[HITACHI make]



SEL587A

### Stator Check

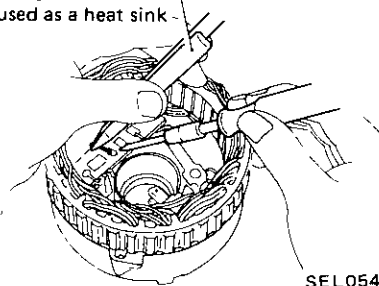
To test the stator or diode, separate them by unsoldering the connecting wires.

#### CAUTION:

Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.

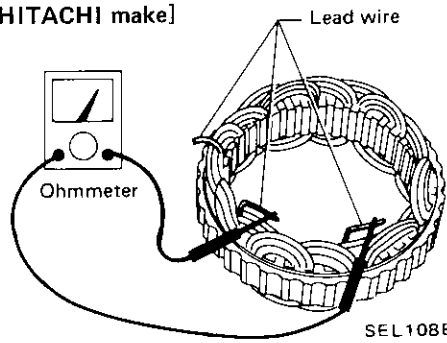
[MITSUBISHI make]

Long nose pliers  
used as a heat sink



SEL054D

[HITACHI make]

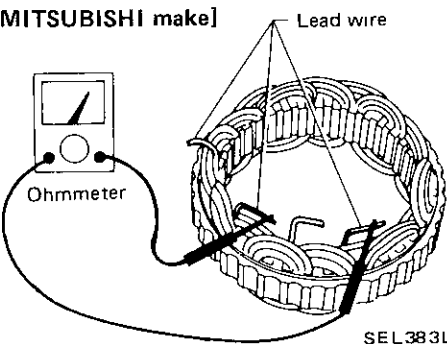


SEL108E

1. Continuity test

- No continuity ... Replace stator.

[MITSUBISHI make]

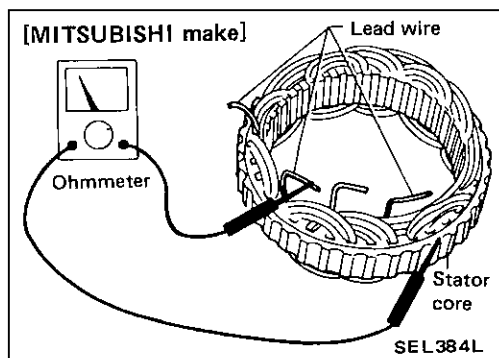
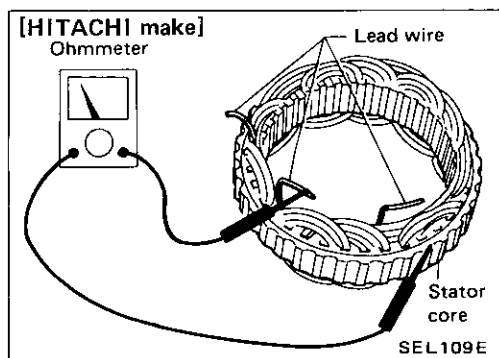


SEL383L

### Stator Check (Cont'd)

#### 2. Ground test

- Continuity exists. ... Replace stator.



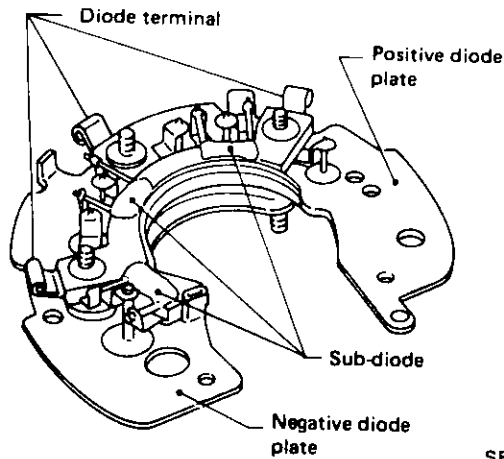
## Diode Check

### MAIN DIODES

- Use an ohmmeter to check condition of diodes as indicated in chart below:
- If any of the test results is not satisfactory, replace diode assembly.

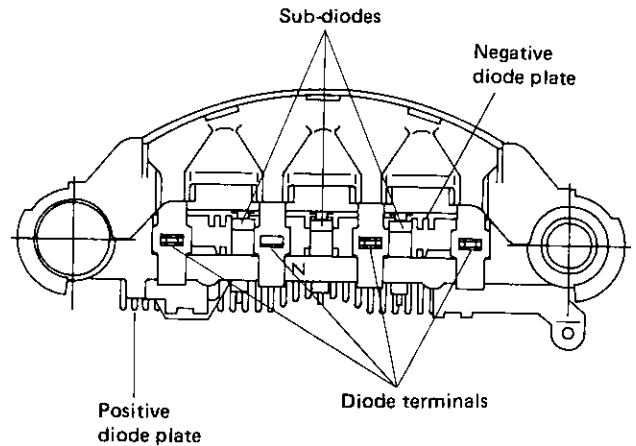
|                              | Ohmmeter probes      |                      | Continuity |
|------------------------------|----------------------|----------------------|------------|
|                              | Positive ⊕           | Negative ⊖           |            |
| Diodes check (Positive side) | Positive diode plate | Diode terminals      | Yes        |
|                              | Diode terminals      | Positive diode plate | No         |
| Diodes check (Negative side) | Negative diode plate | Diode terminals      | No         |
|                              | Diode terminals      | Negative diode plate | Yes        |

### [HITACHI make]



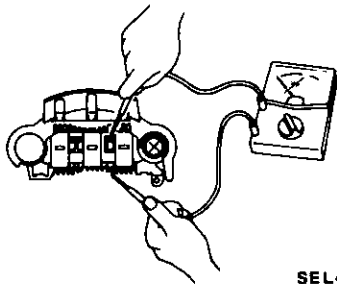
SEL768D

### [MITSUBISHI make]



SEL385L

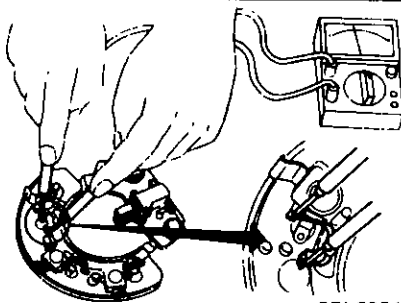
### [MITSUBISHI make]



SEL494H

### SUB-DIODES

- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

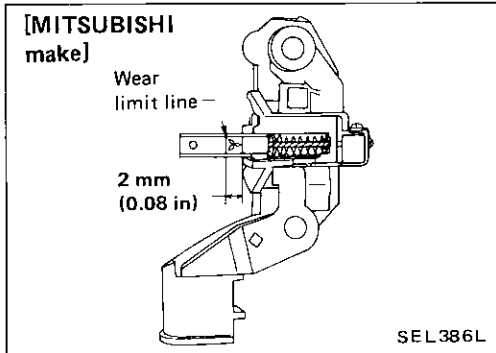


SEL593A

### Assembly

Carefully observe the following instructions.

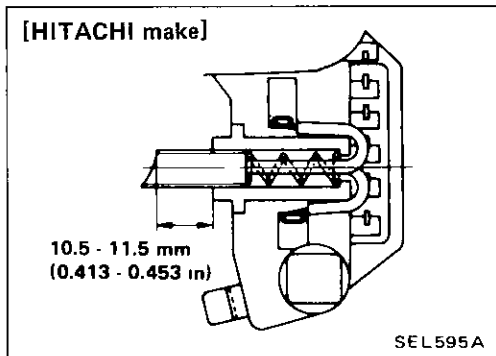
- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.



### WHEN SOLDERING BRUSH LEAD WIRE

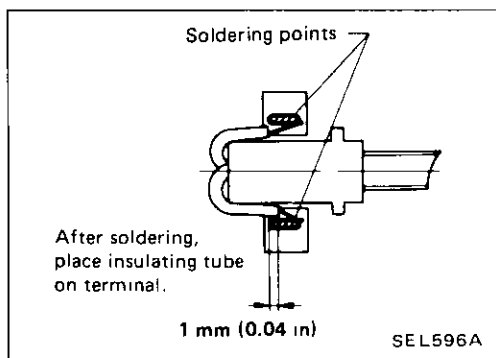
#### [MITSUBISHI make]

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.



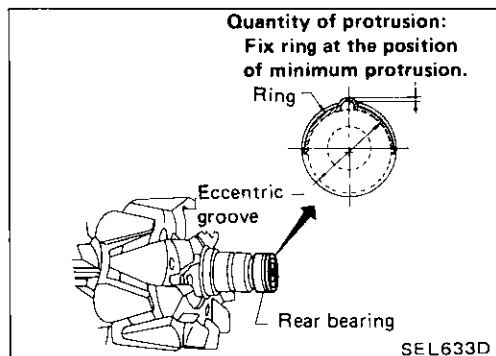
#### [HITACHI make]

- (1) Position brush so that it extends 10.5 to 11.5 mm (0.413 to 0.453 in) from brush holder.



- (2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

**When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.**



### RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

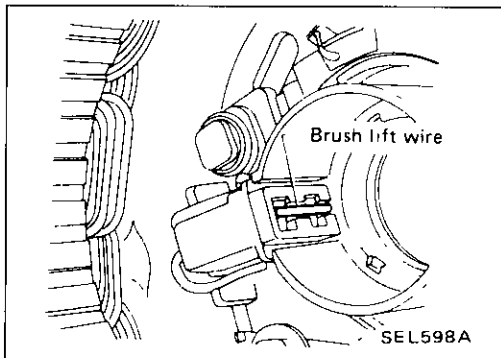
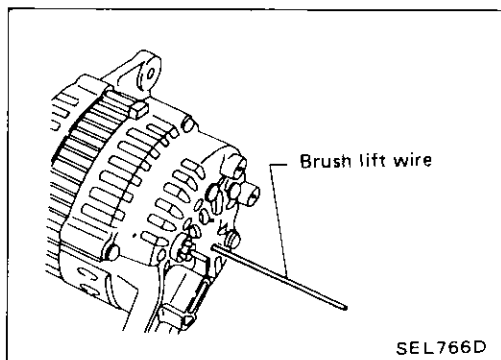
### Assembly (Cont'd)

#### 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 brush lift wire by pushing toward the center.

#### [HITACHI make]

**Do not pull brush lift wire by pushing toward outside of rear cover as it will damage slip ring sliding surface.**



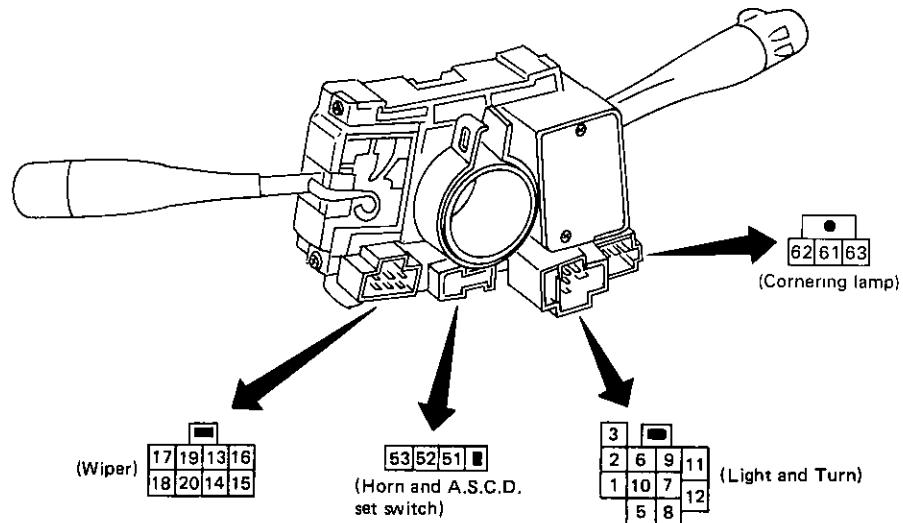
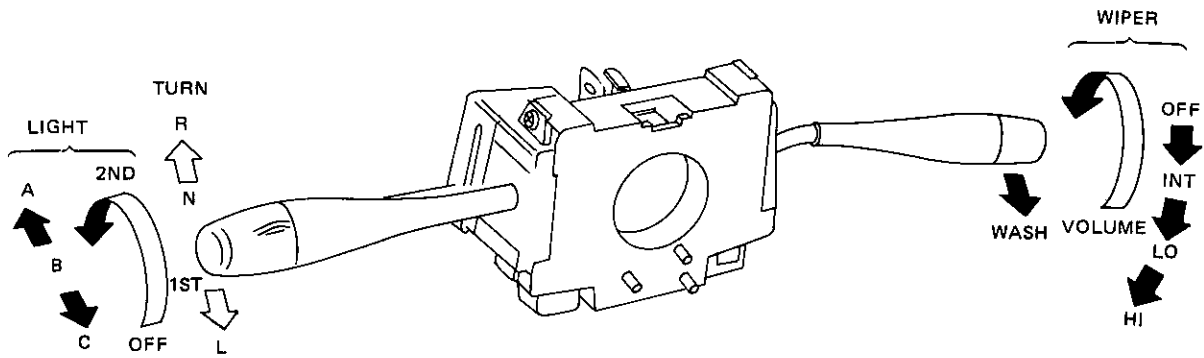
**Service Data and Specifications (S.D.S.)****ALTERNATOR**

| Type                                                                   |           | LR180-719                                  | A2T18792                                       |
|------------------------------------------------------------------------|-----------|--------------------------------------------|------------------------------------------------|
|                                                                        |           | HITACHI                                    | MITSUBISHI                                     |
| Nominal rating                                                         | V-A       | 12 - 70                                    | 12 - 80                                        |
| Ground polarity                                                        |           | Negative                                   |                                                |
| Minimum revolution<br>under no-load<br>(When 13.5 volts is<br>applied) | rpm       | Less than 950                              | 1,100                                          |
| Hot output current                                                     | A/rpm     | More than 50/2,500<br>More than 67/5,000   | More than 21/1,300<br>More than 60/2,500       |
| Regulated output<br>voltage                                            | V         | 14.1 - 14.7                                |                                                |
| Minimum length of<br>brush                                             | mm (in)   | 7 (0.28)                                   | 8 (0.31)                                       |
| Brush spring pressure                                                  | N (g, oz) | 2.746 - 3.923<br>(280 - 400, 9.88 - 14.11) | 3.138 - 4.315<br>(320 - 440, 11.29 -<br>15.52) |
| Slip ring minimum<br>outer diameter                                    | mm (in)   | 30.6 (1.205)                               | 22.1 (0.870)                                   |



# COMBINATION SWITCH

## Check

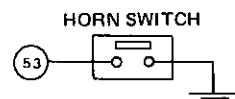
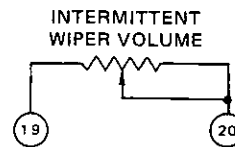


LIGHTING SWITCH

|    | OFF |   |   | 1ST |   |   | 2ND |   |   |
|----|-----|---|---|-----|---|---|-----|---|---|
|    | A   | B | C | A   | B | C | A   | B | C |
| 5  |     |   |   |     |   |   |     |   |   |
| 6  |     |   |   |     |   |   |     |   |   |
| 7  |     |   |   |     |   |   |     |   |   |
| 8  |     |   |   |     |   |   |     |   |   |
| 9  |     |   |   |     |   |   |     |   |   |
| 10 |     |   |   |     |   |   |     |   |   |
| 11 |     |   |   |     |   |   |     |   |   |
| 12 |     |   |   |     |   |   |     |   |   |

WIPER SWITCH

|    | OFF | INT | LO | HI | WASH |
|----|-----|-----|----|----|------|
| 13 |     |     |    |    |      |
| 14 |     |     |    |    |      |
| 15 |     |     |    |    |      |
| 16 |     |     |    |    |      |
| 17 |     |     |    |    |      |
| 18 |     |     |    |    |      |



TURN SIGNAL SWITCH

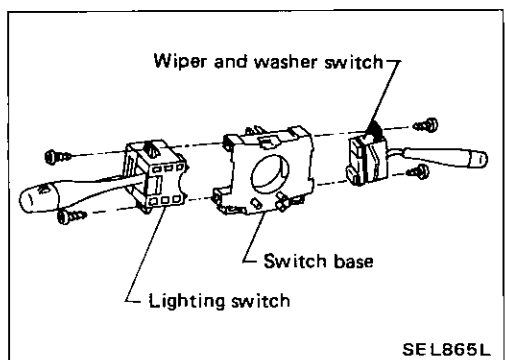
|   | R | N | L |
|---|---|---|---|
| 1 |   |   |   |
| 2 |   |   |   |
| 3 |   |   |   |

CORNERING LAMP SWITCH

|    | R | N | L |
|----|---|---|---|
| 61 |   |   |   |
| 62 |   |   |   |
| 63 |   |   |   |

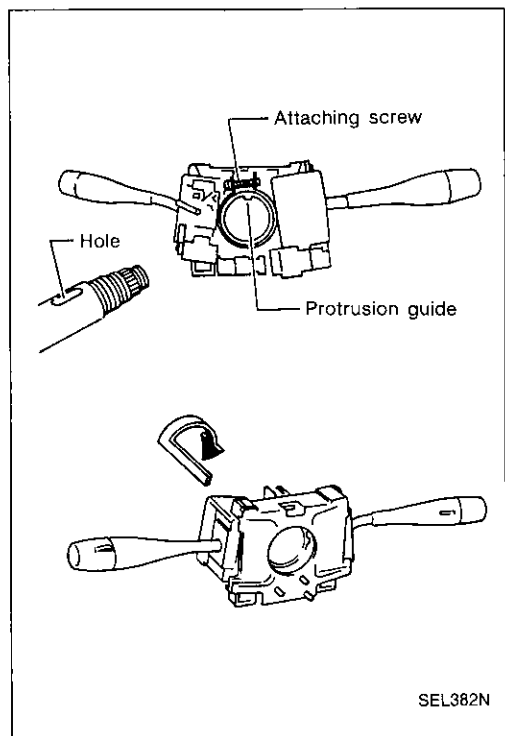
SEL295N

## COMBINATION SWITCH



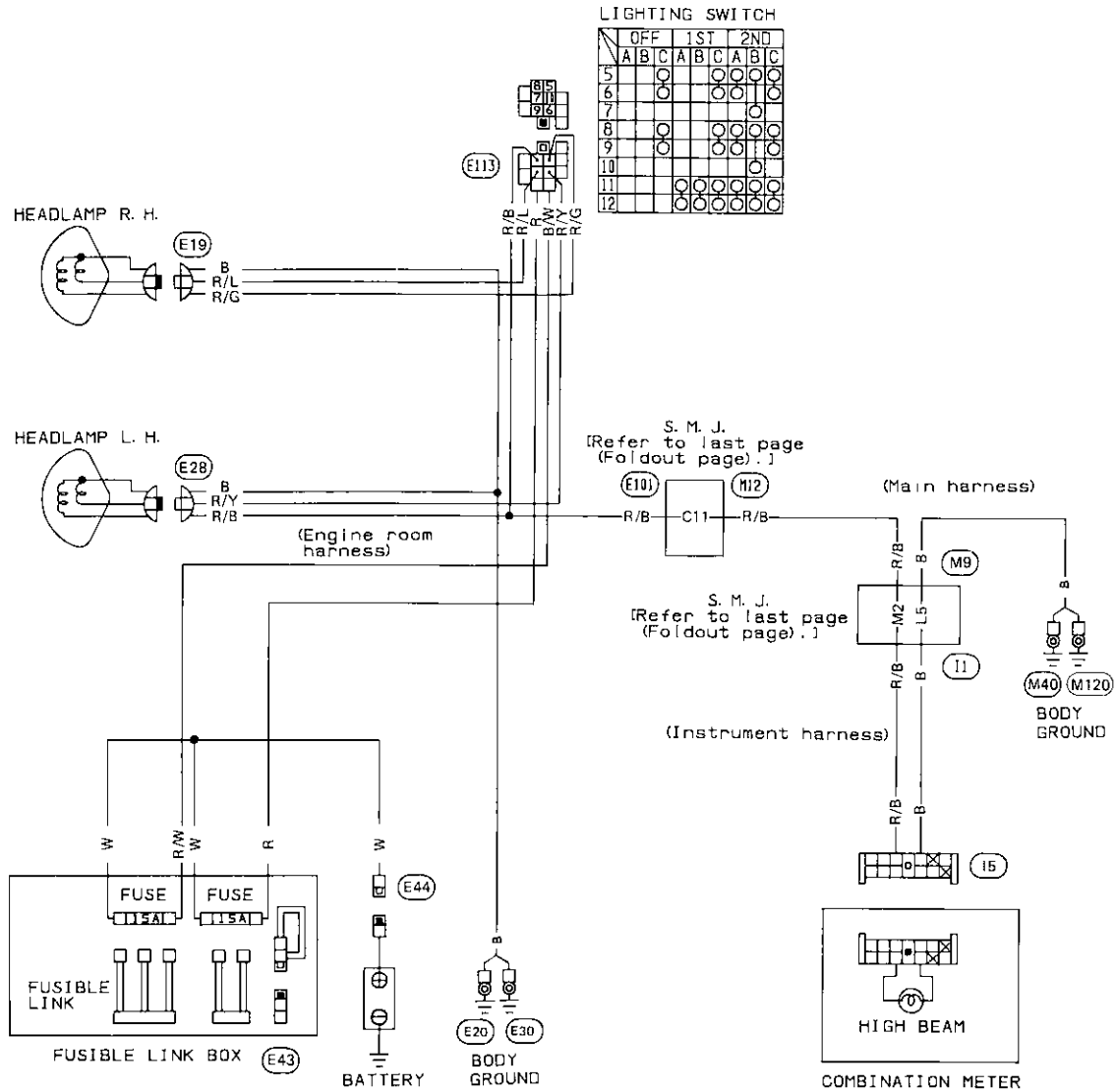
### Replacement

- Each switch can be replaced without removing combination switch base.
- To remove combination switch base, remove base attaching screw and turn after pushing on it.



# HEADLAMP

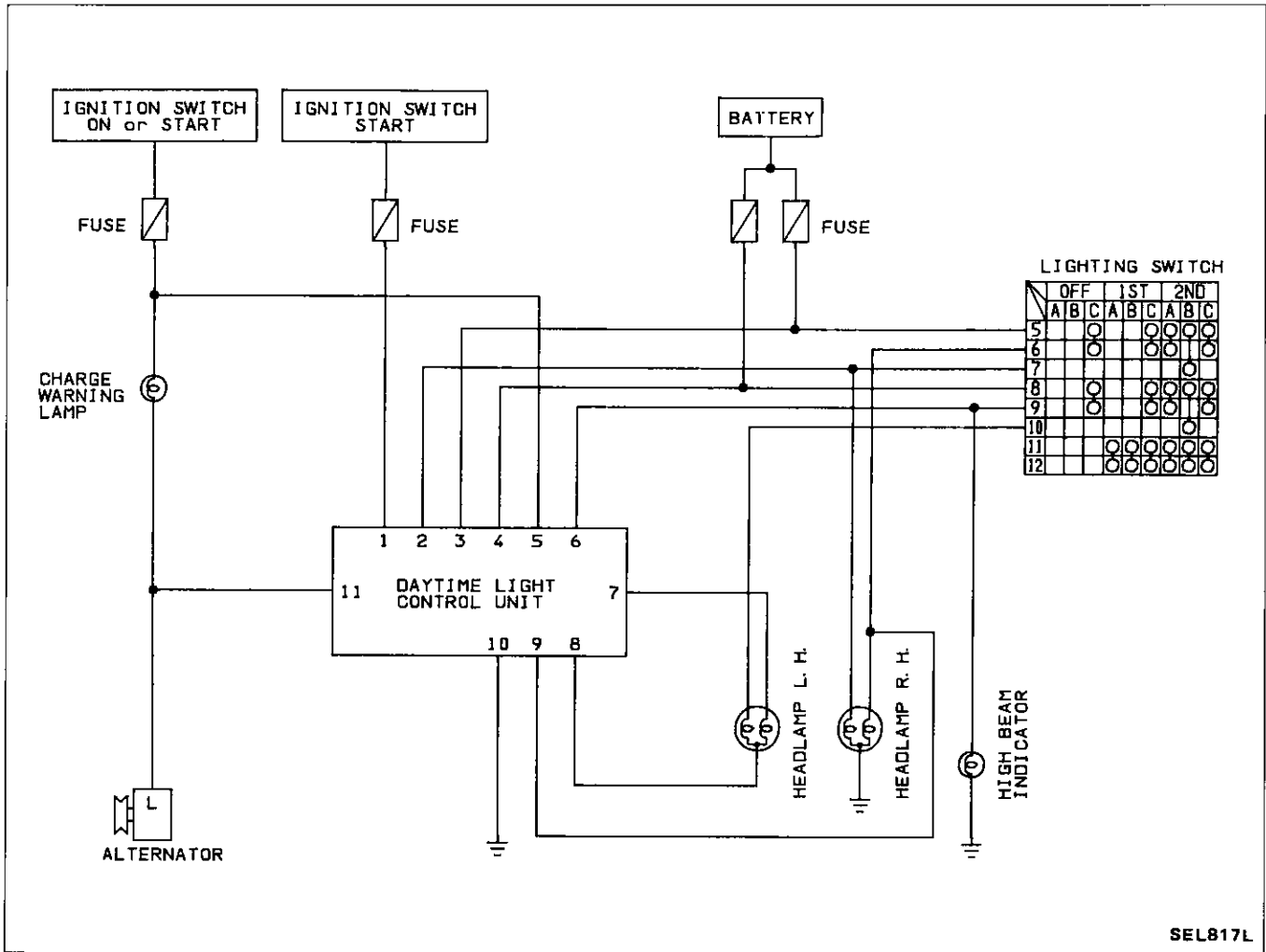
## Wiring Diagram (For U.S.A.)



SEL296N

# HEADLAMP

## Schematic (For Canada)



### Operation (Daytime light system equipped model)

After starting the engine with the lighting switch in the "OFF" position or "1ST" position, the headlamp high beam automatically turns on. Lighting switch operations other than the above are the same as conventional light systems.

| Engine                                   |           | With engine stopped |   |   |     |   |   |     |   |   | With engine running |   |   |     |   |   |     |   |   |
|------------------------------------------|-----------|---------------------|---|---|-----|---|---|-----|---|---|---------------------|---|---|-----|---|---|-----|---|---|
| Lighting switch                          |           | OFF                 |   |   | 1ST |   |   | 2ND |   |   | OFF                 |   |   | 1ST |   |   | 2ND |   |   |
|                                          |           | 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 |

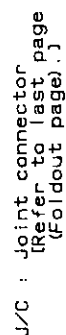
O: Lamp "ON"

X: Lamp "OFF"

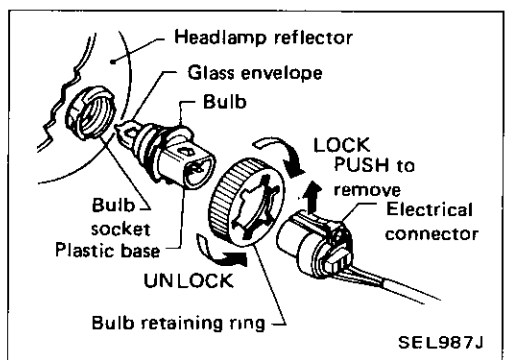
△: Lamp dims.

■: Added functions

### Wiring Diagram (For Canada)



## HEADLAMP



### Bulb Replacement

The headlamp is a semi-sealed beam type which uses a replaceable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.

- **Grasp only the plastic base when handling the bulb. Never touch the glass envelope.**

1. Disconnect the battery cable.
2. Turn the bulb retaining ring counterclockwise until it is free from the headlamp reflector, and then remove it.
3. Disconnect the harness connector from the back side of the bulb.
4. Remove the headlamp bulb carefully. Do not shake or rotate the bulb when removing it.
5. Install in the reverse order of removal.

#### CAUTION:

- **Do not leave the bulb out of the headlamp reflector for a long period of time as dust, moisture, smoke, etc. may enter the headlamp body and affect the performance of the headlamp. Thus, the headlamp bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed.**

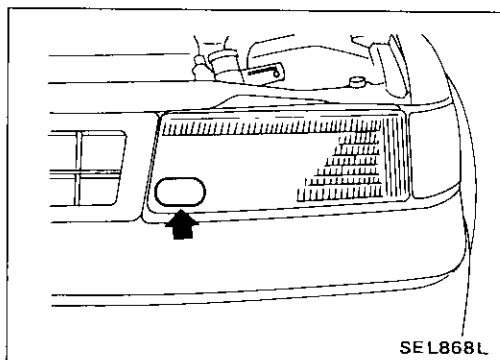
### Aiming Adjustment

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

**For details, refer to the regulations in your own country.**

- a. **Keep all tires inflated to correct pressures.**
- b. **Place vehicle and tester on one and same flat surface.**
- c. **See that there is no-load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).**



### AIMER ADJUSTMENT MARK

When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

Example:

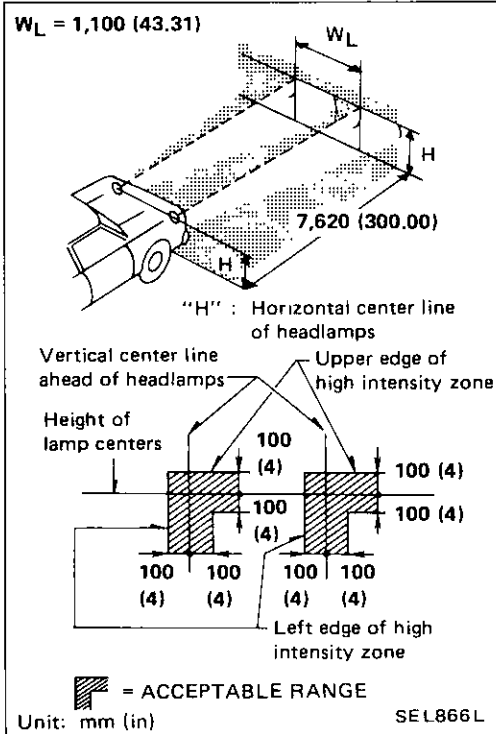
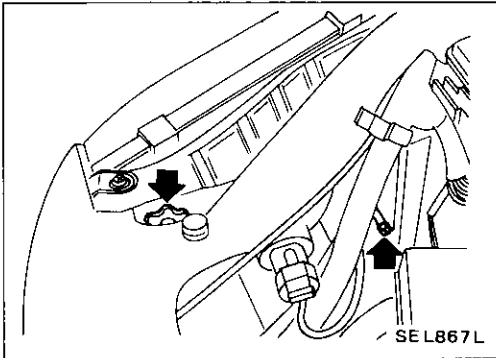
4H2V  
└─ Vertical side: 2  
└─ Horizontal side: 4

## HEADLAMP

### Aiming Adjustment (Cont'd)

#### LOW BEAM

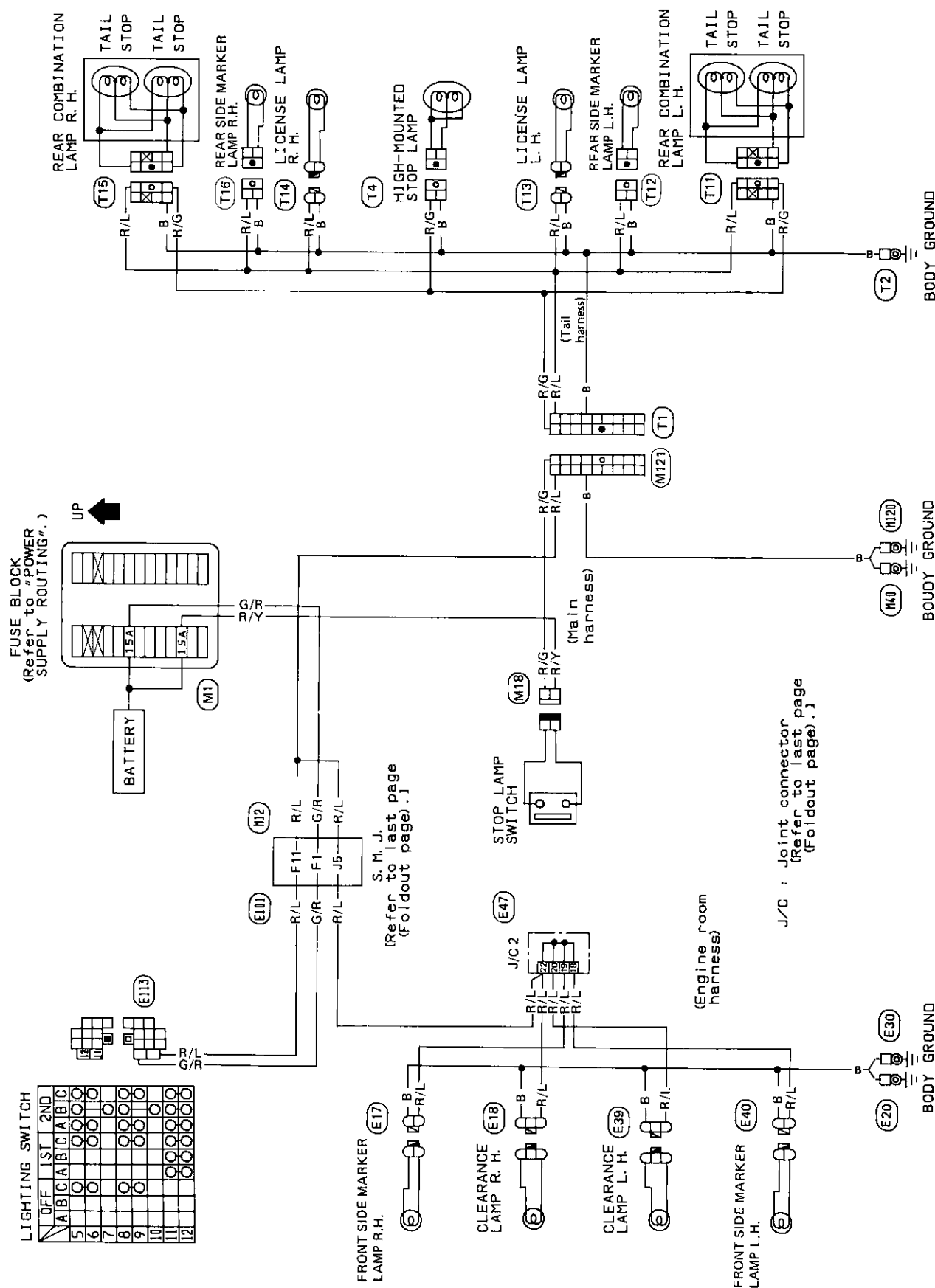
1. Turn headlamp low beam on.
  2. Use adjusting screws to perform aiming adjustment.
- **First tighten the adjusting screw all the way and then make adjustment by loosening the screw.**



- **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

# EXTERIOR LAMP

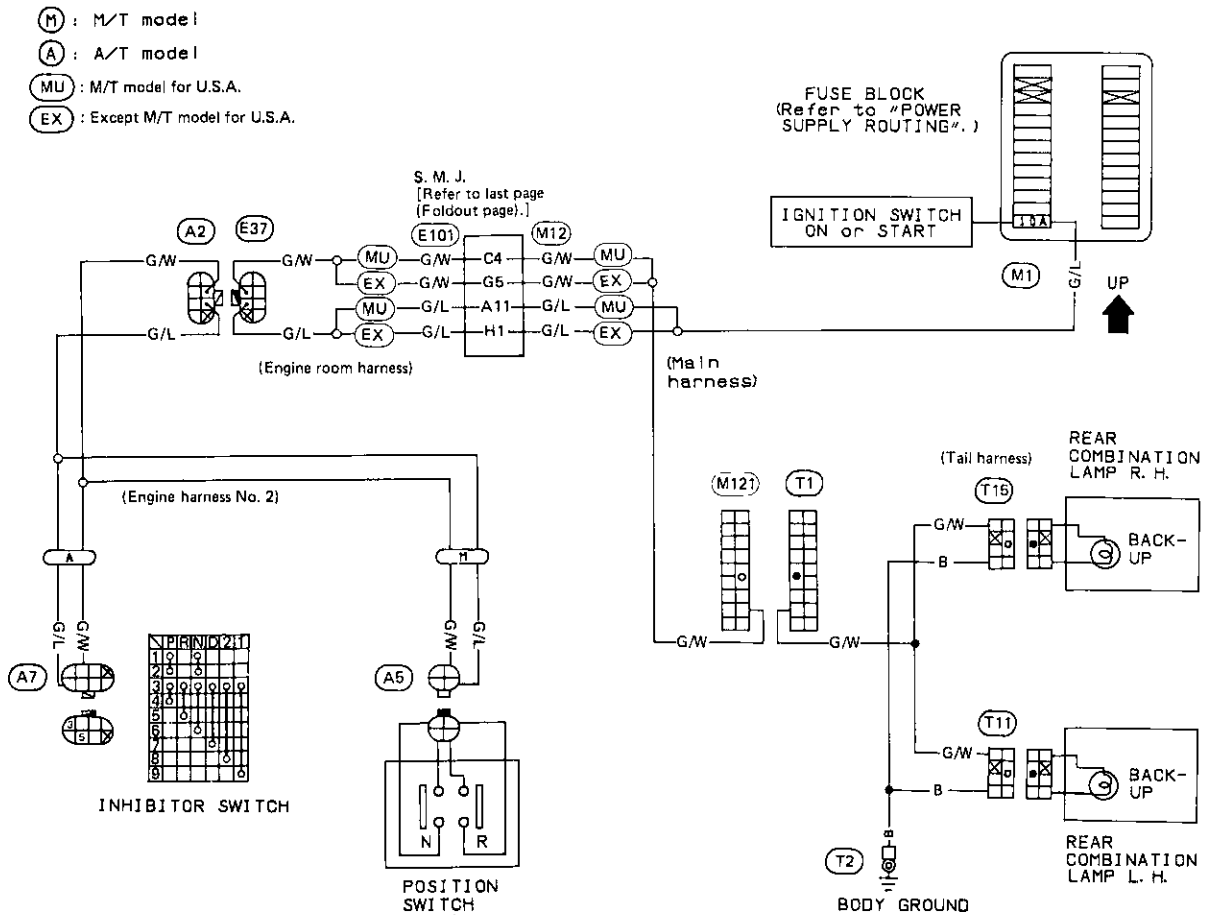
## Clearance, License, Tail and Stop Lamps/Wiring Diagram





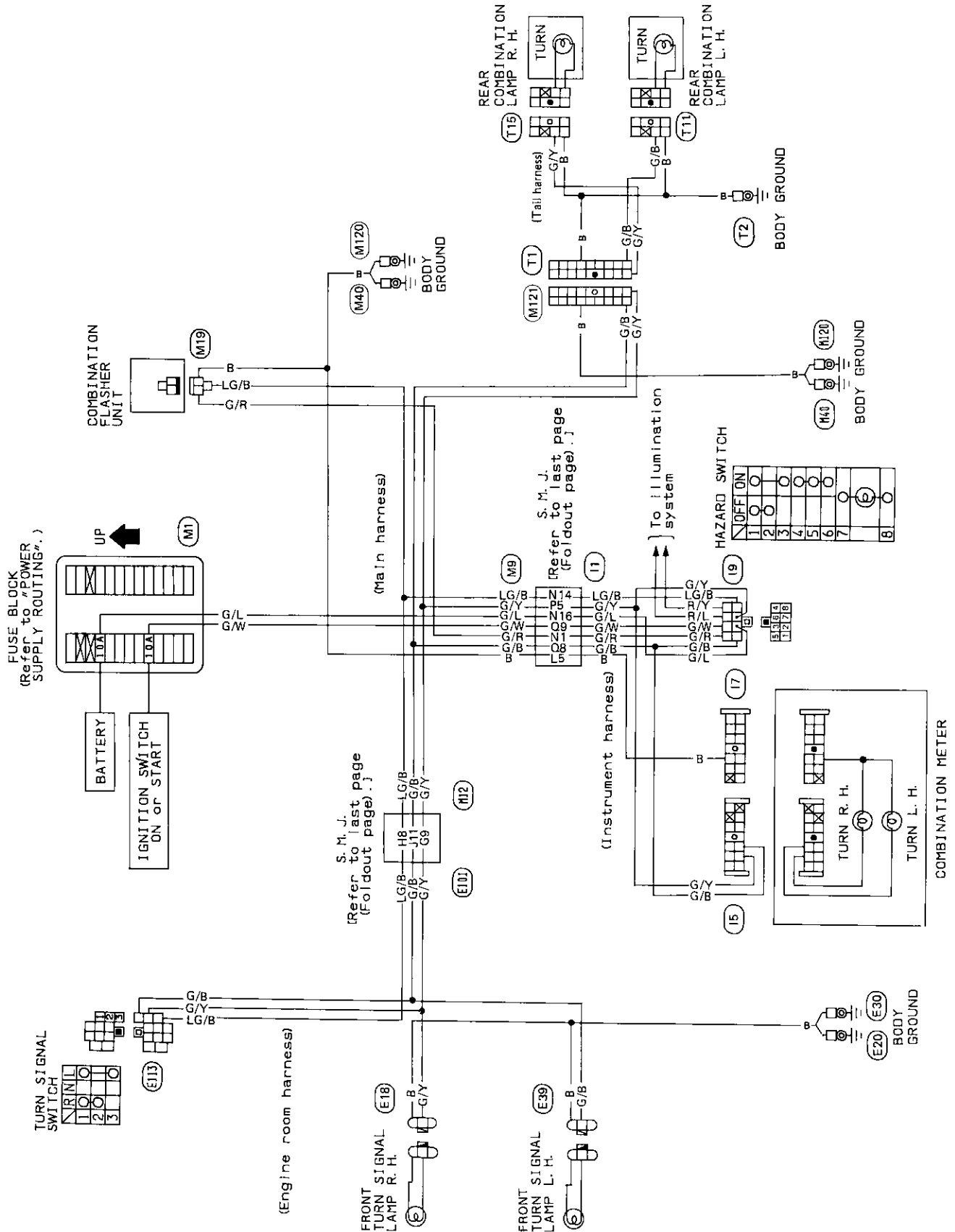
# EXTERIOR LAMP

## Back-up Lamp/Wiring Diagram



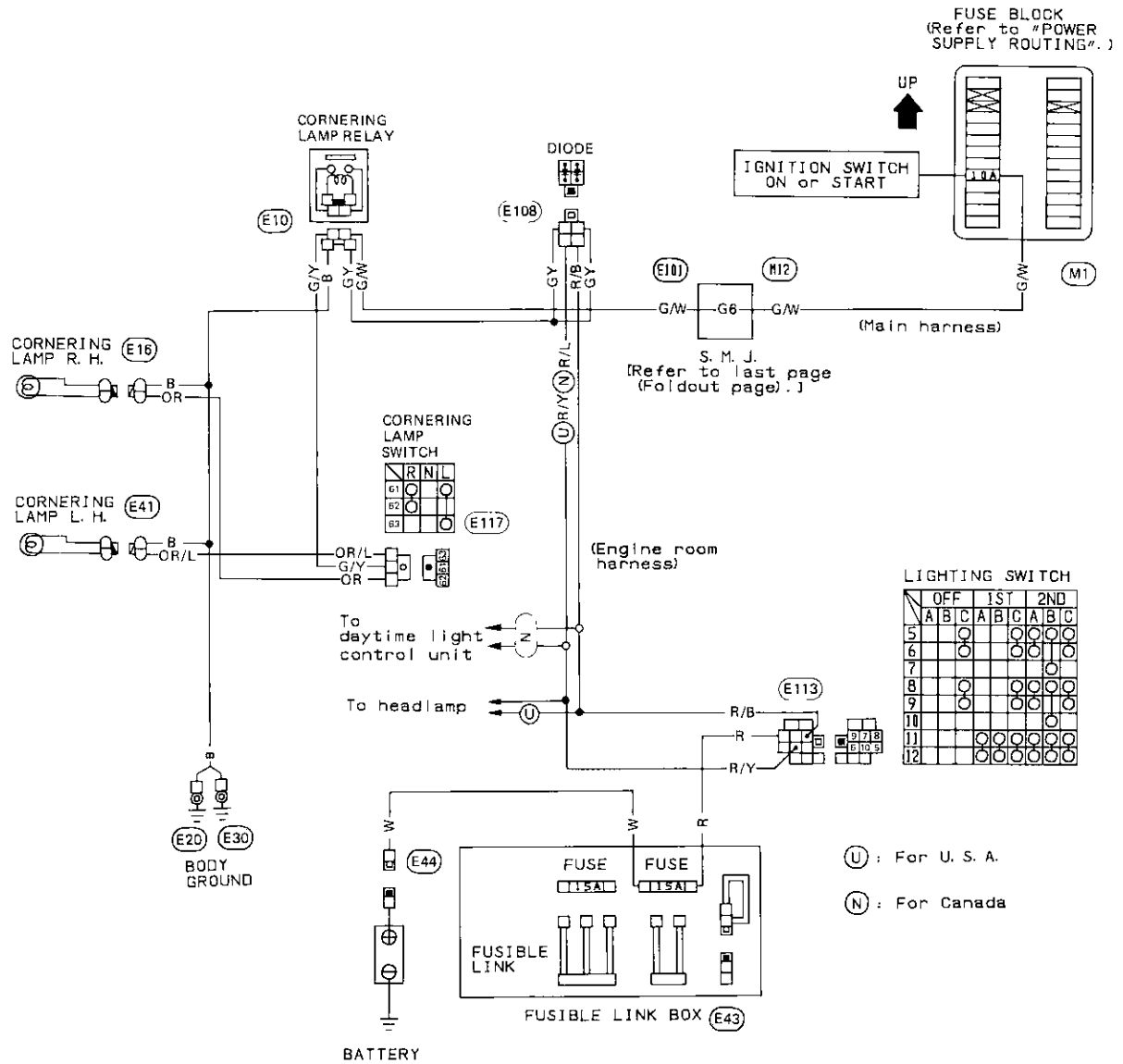
SEL299N

## Turn Signal and Hazard Warning Lamps/Wiring Diagram



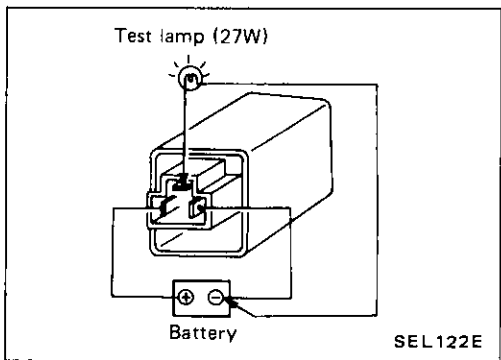
# EXTERIOR LAMP

## Cornering Lamp/Wiring Diagram



SEL301N

## EXTERIOR LAMP



### Combination Flasher Unit Check

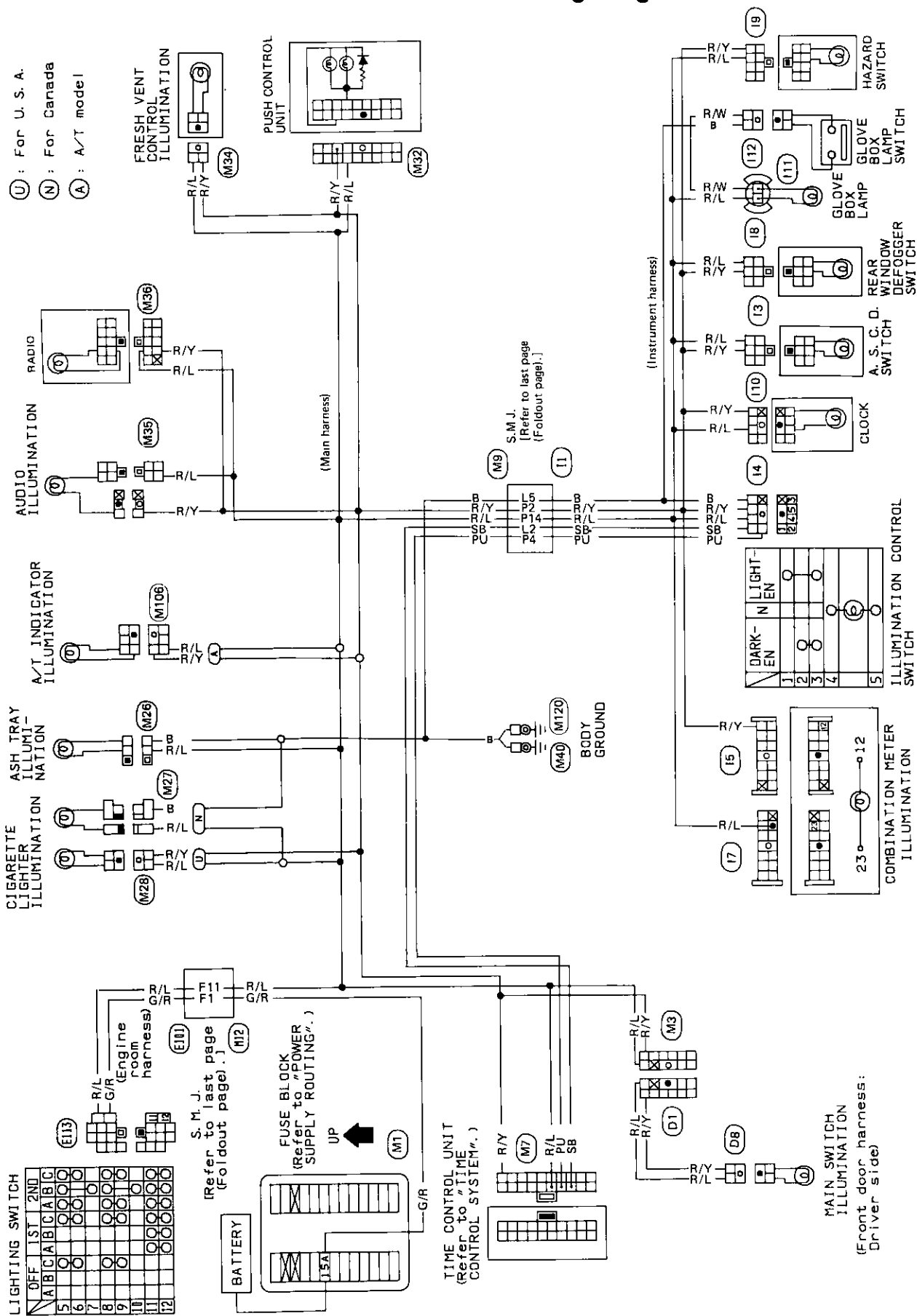
- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

### Bulb Specifications

|                                     | Wattage (12 volt) |
|-------------------------------------|-------------------|
| Headlamp (Semi-sealed beam)         |                   |
| High/Low                            | 65/45             |
| Front turn signal lamp              | 27                |
| Cornering lamp/Front clearance lamp | 27/8              |
| Front side marker lamp              | 3.8               |
| Rear combination lamp               |                   |
| Turn signal                         | 27                |
| Stop/Tail                           | 27/8              |
| Back-up                             | 27                |
| Rear side marker lamp               | 3.8               |
| License plate lamp                  | 5                 |
| High-mounted stop lamp              | 18                |
| Interior lamp                       | 10                |
| Spot lamp                           | 8                 |
| Trunk room lamp                     | 3.4               |

# INTERIOR LAMP

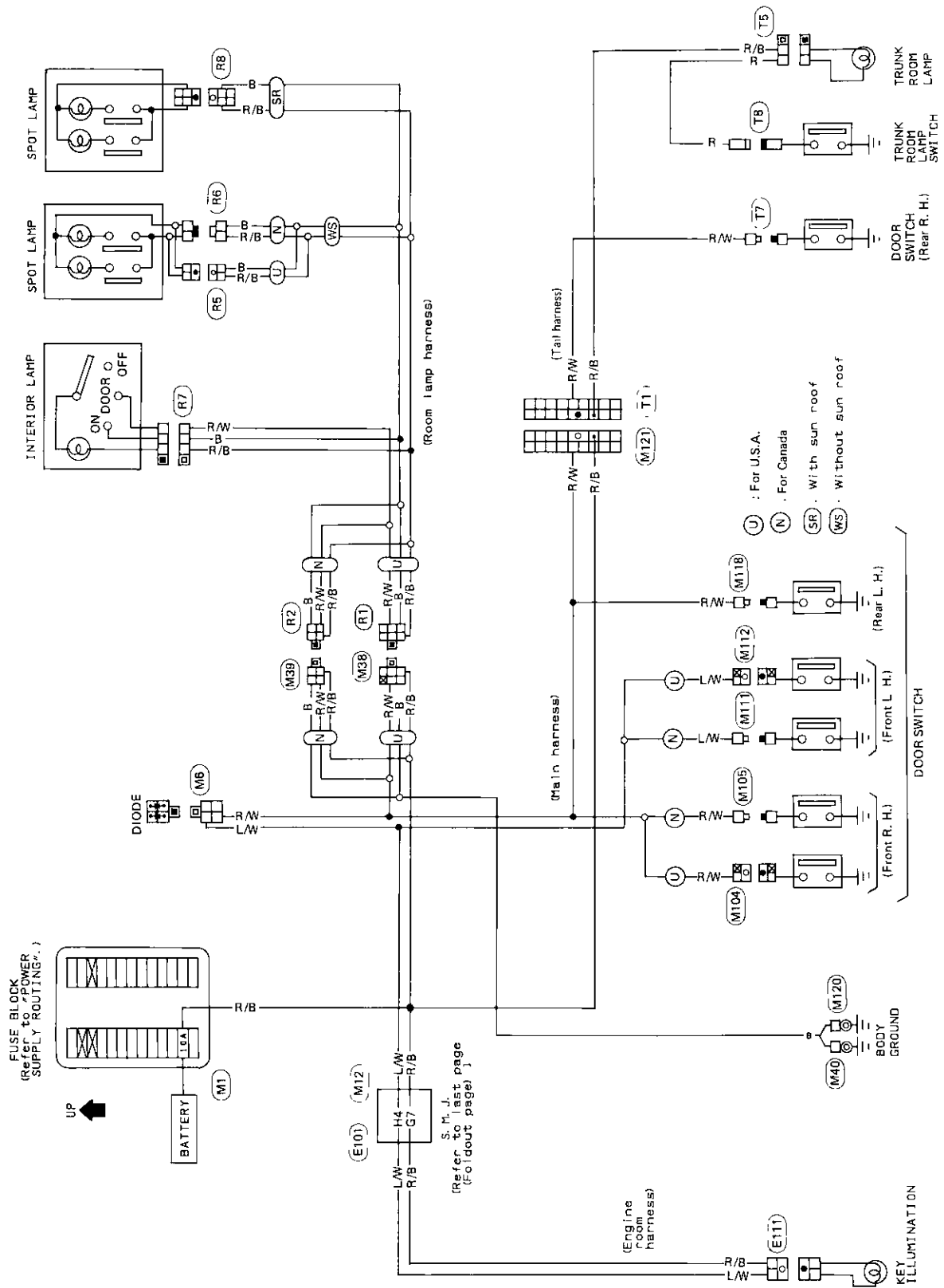
## Illumination/Wiring Diagram



SEL749P

# INTERIOR LAMP

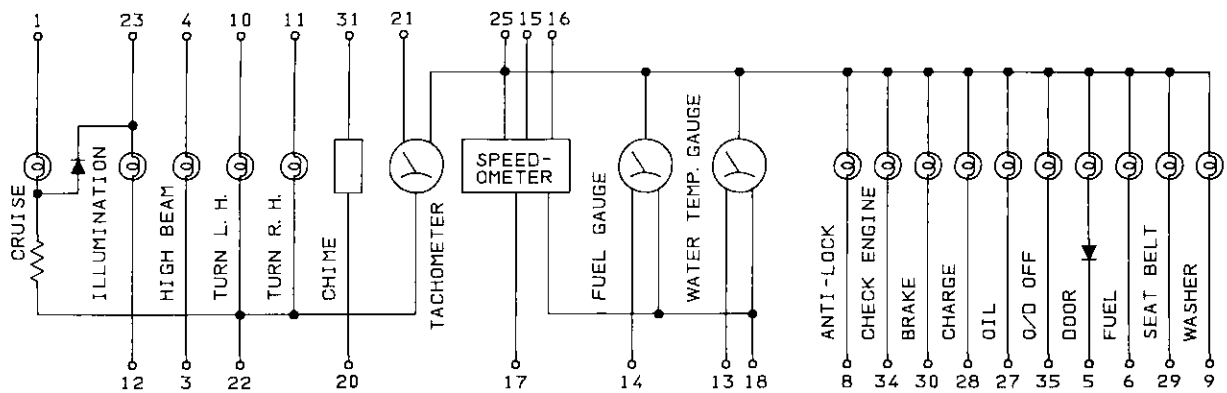
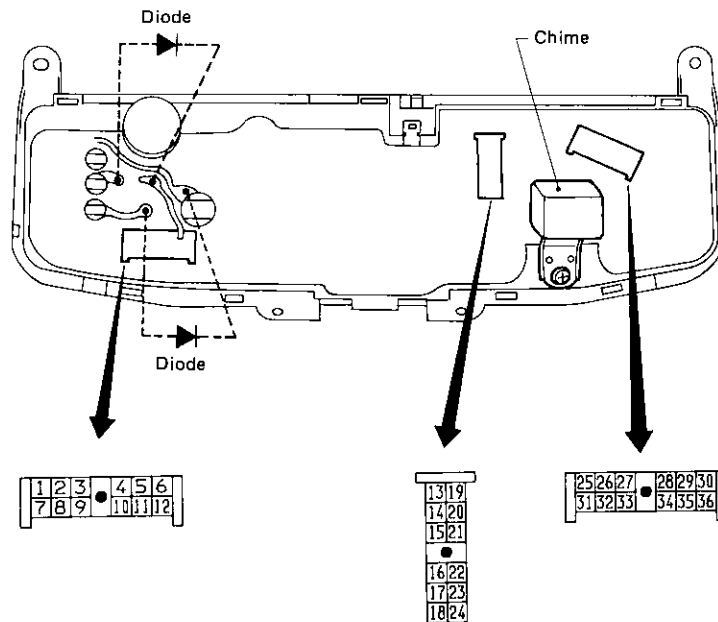
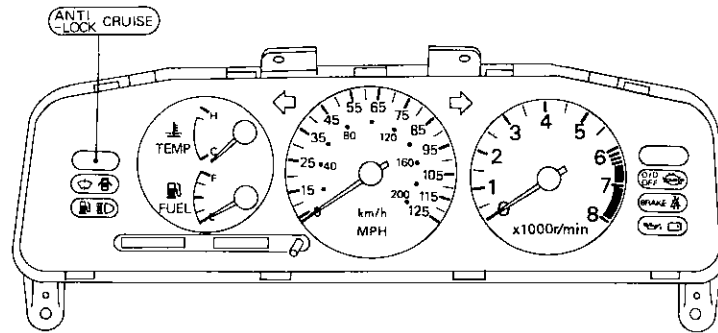
## Interior, Spot and Trunk Room Lamps/Wiring Diagram



SEL303N

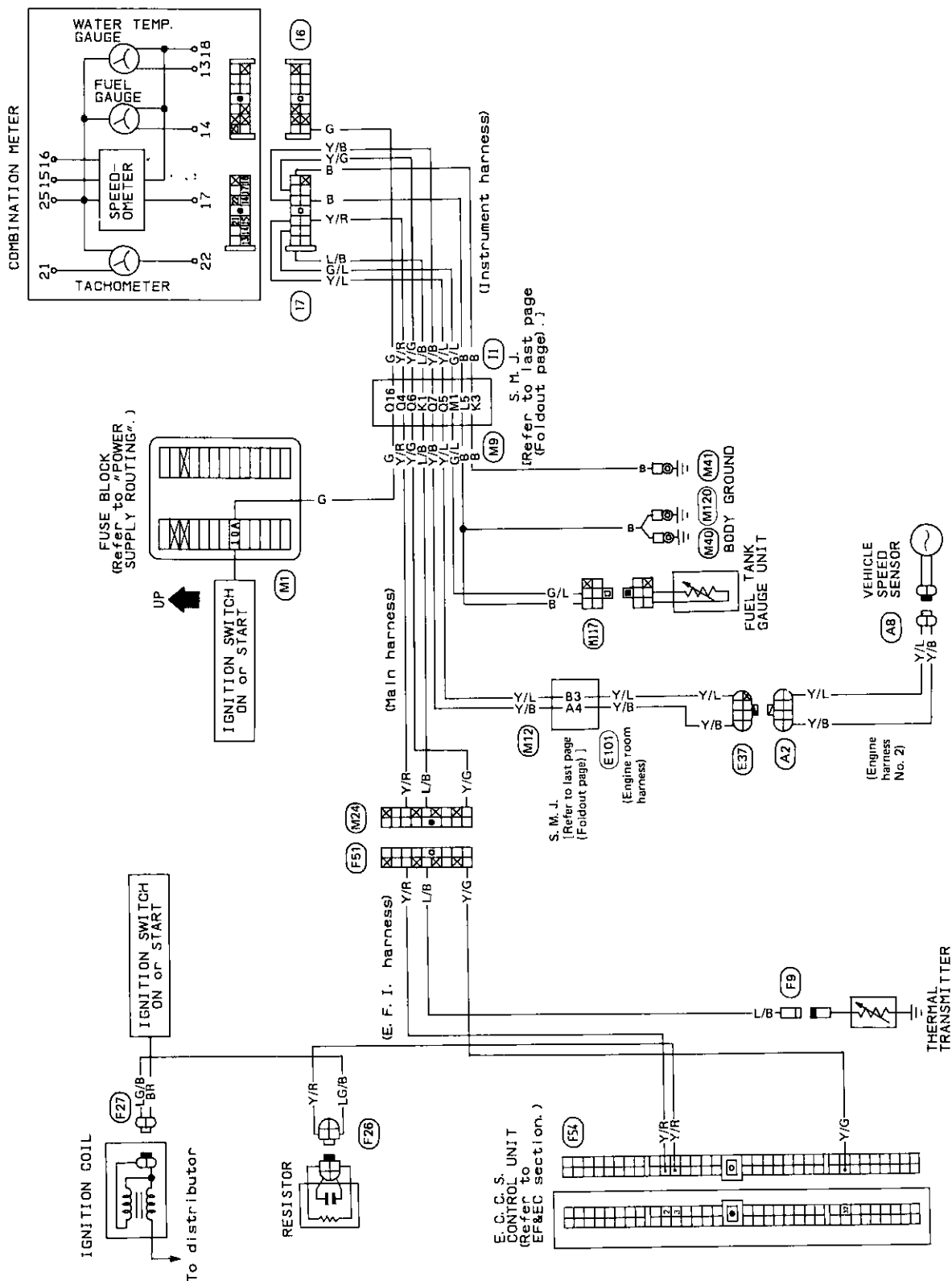
# METER AND GAUGES

## Combination Meter



SEL304N

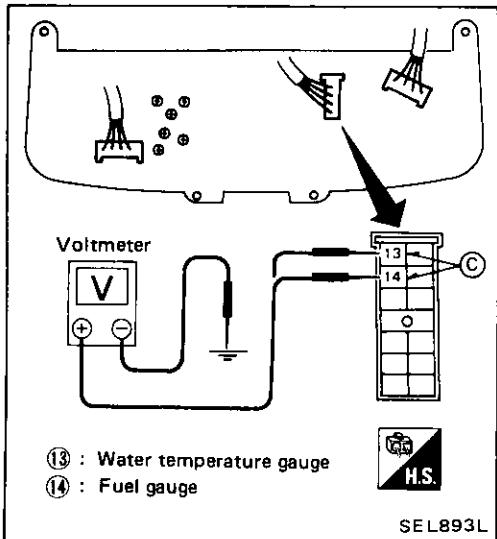
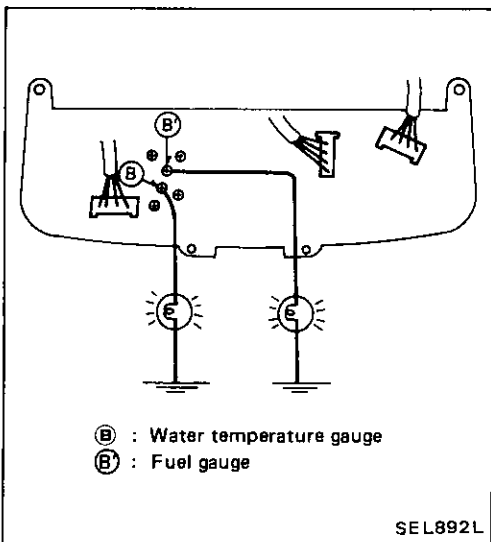
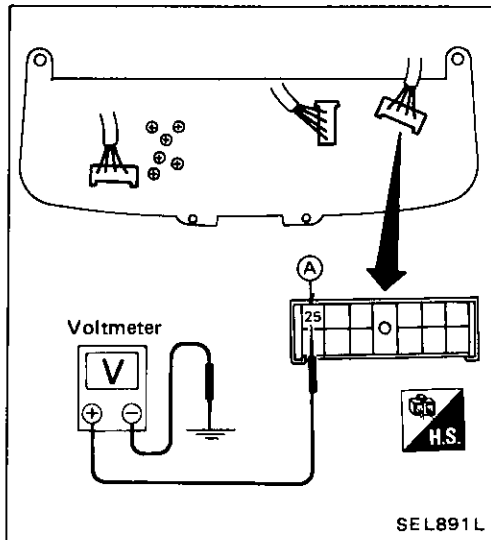
## Speedometer, Tachometer, Temp., and Fuel Gauges/Wiring Diagram



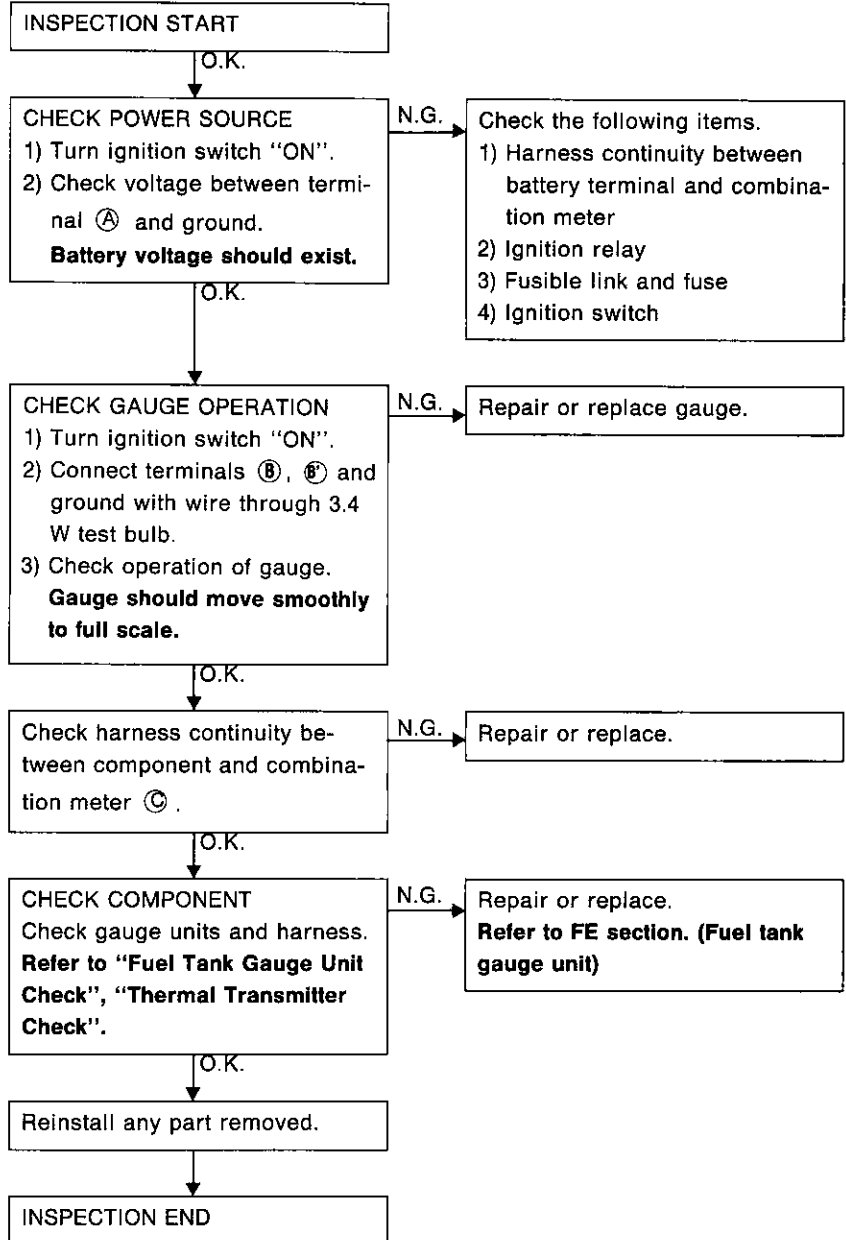
SEL305N



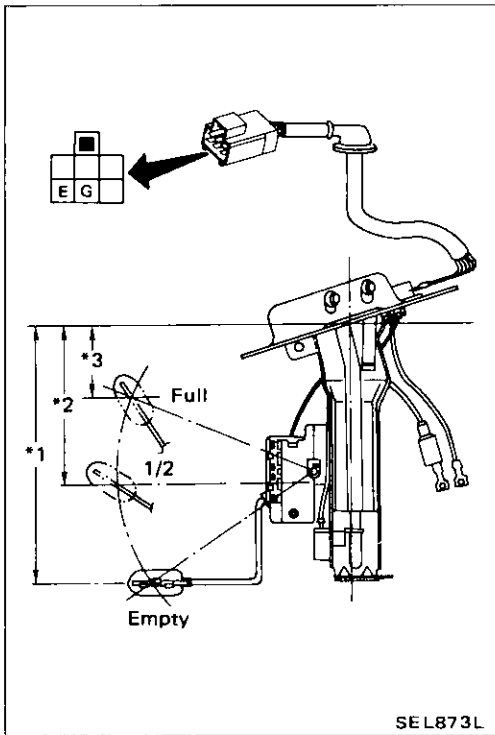
## METER AND GAUGES



### Inspection/Fuel Gauge and Water Temperature Gauge



## Fuel Tank Gauge Unit Check

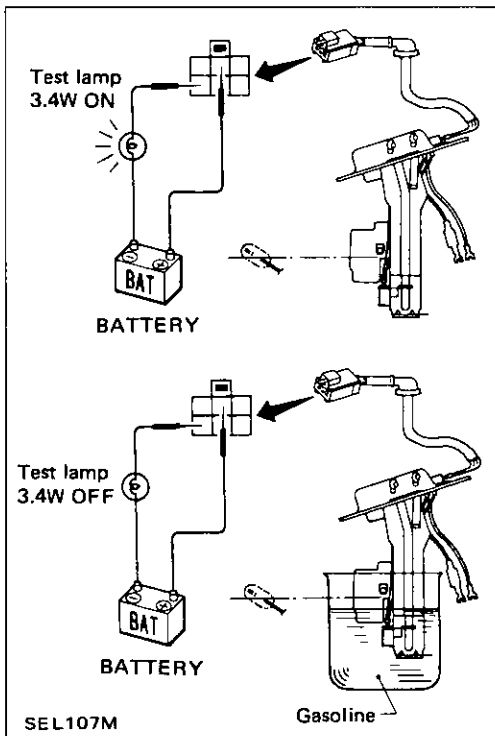


| Ohmmeter |     | Float position<br>mm (in) |       |            | Resistance value<br>(Ω) |
|----------|-----|---------------------------|-------|------------|-------------------------|
| (+)      | (-) |                           |       |            |                         |
| G        | E   | *3                        | Full  | 50 (1.97)  | Approx. 4 - 6           |
|          |     | *2                        | 1/2   | 111 (4.37) | 28 - 34                 |
|          |     | *1                        | Empty | 160 (6.30) | 74 - 85                 |

- For removal, refer to FE section.  
Check the resistance between terminals  $\textcircled{G}$  and  $\textcircled{E}$ .

## Fuel Warning Lamp Sensor Check

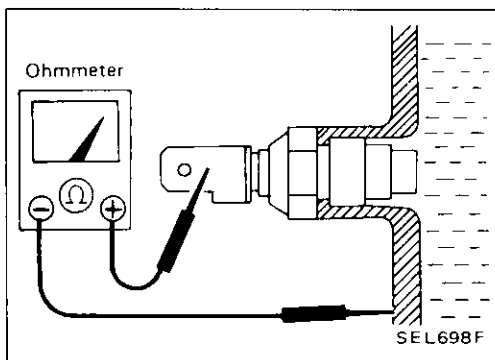
- It will take a short time for the bulb to light.

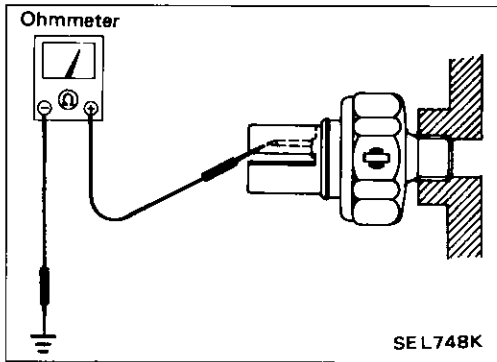


## Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

| Water temperature | Resistance               |
|-------------------|--------------------------|
| 60°C (140°F)      | Approx. 70 - 90 $\Omega$ |
| 100°C (212°F)     | Approx. 21 - 24 $\Omega$ |

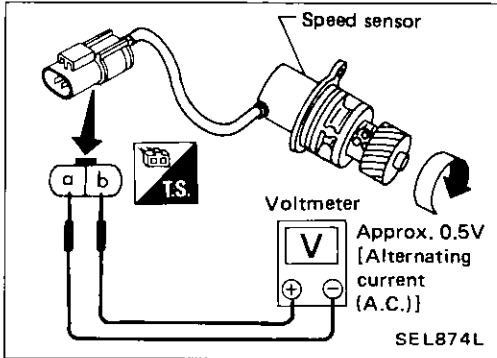




## Oil Pressure Switch Check

|              | Oil pressure<br>kPa (kg/cm <sup>2</sup> , psi) | Continuity |
|--------------|------------------------------------------------|------------|
| Engine start | More than 10 - 20<br>(0.1 - 0.2, 1.4 - 2.8)    | NO         |
| Engine stop  | Less than 10 - 20<br>(0.1 - 0.2, 1.4 - 2.8)    | YES        |

Check the continuity between the terminals of oil pressure switch and body ground.

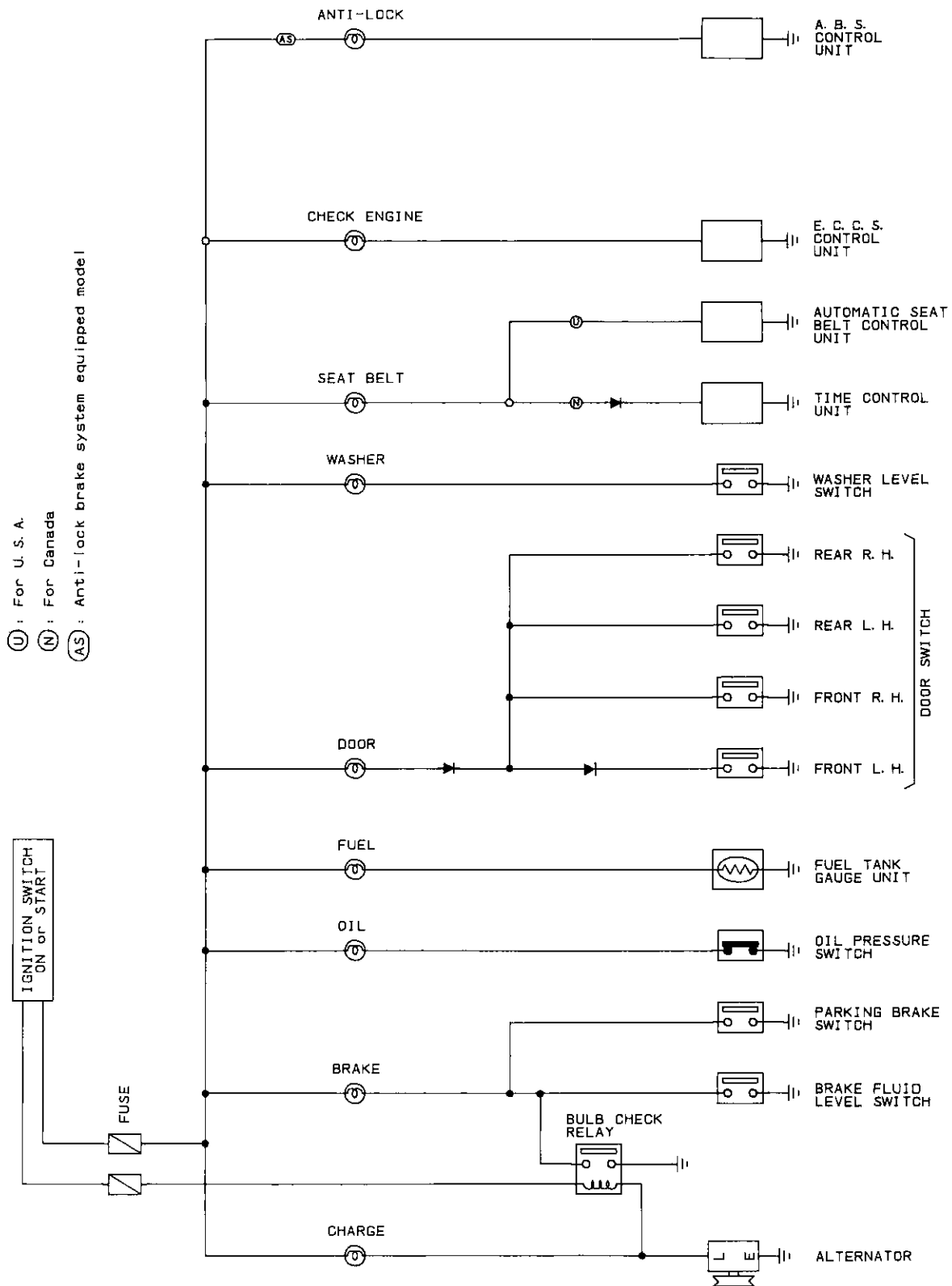


## Speed Sensor Signal Check

1. Remove speed sensor from transmission.  
Location: Refer to "Location of Electrical Units"
2. Turn speedometer pinion quickly and measure voltage across ① and ②.

# WARNING LAMPS AND CHIME

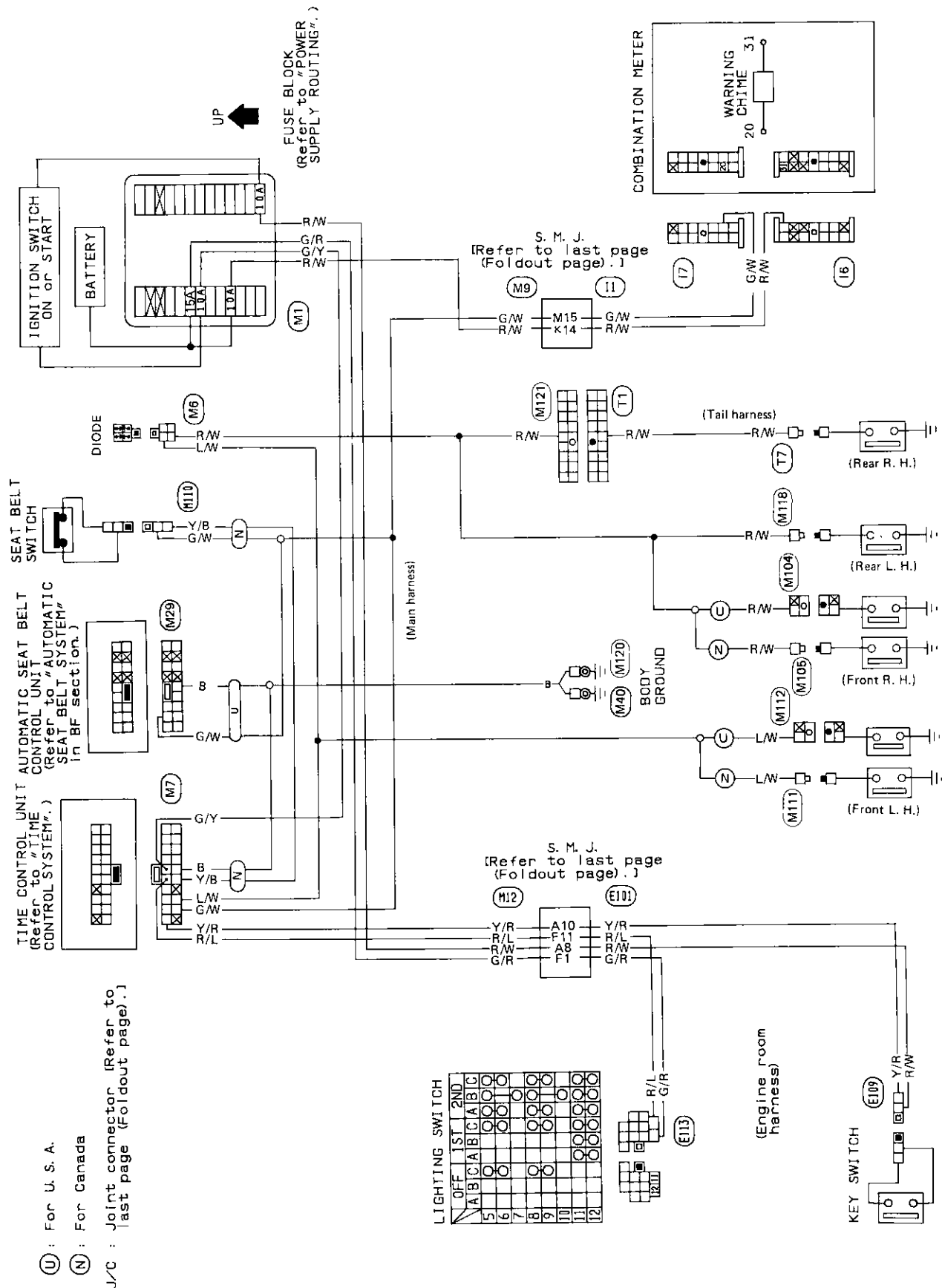
## Warning Lamps/Schematic

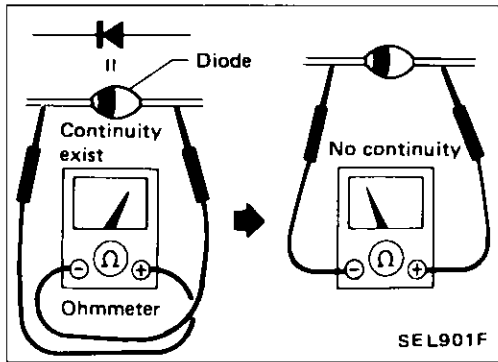


SEL306N



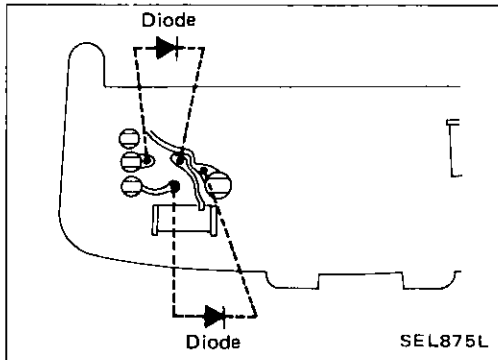
## Warning Chime/Wiring Diagram





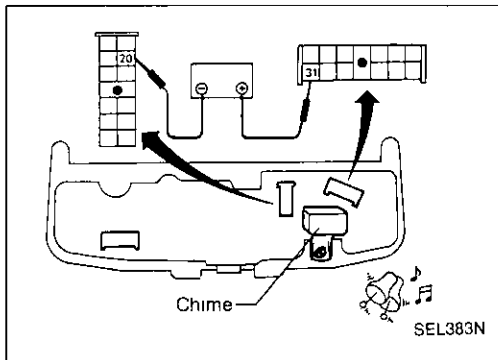
### Diode Check

- 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.

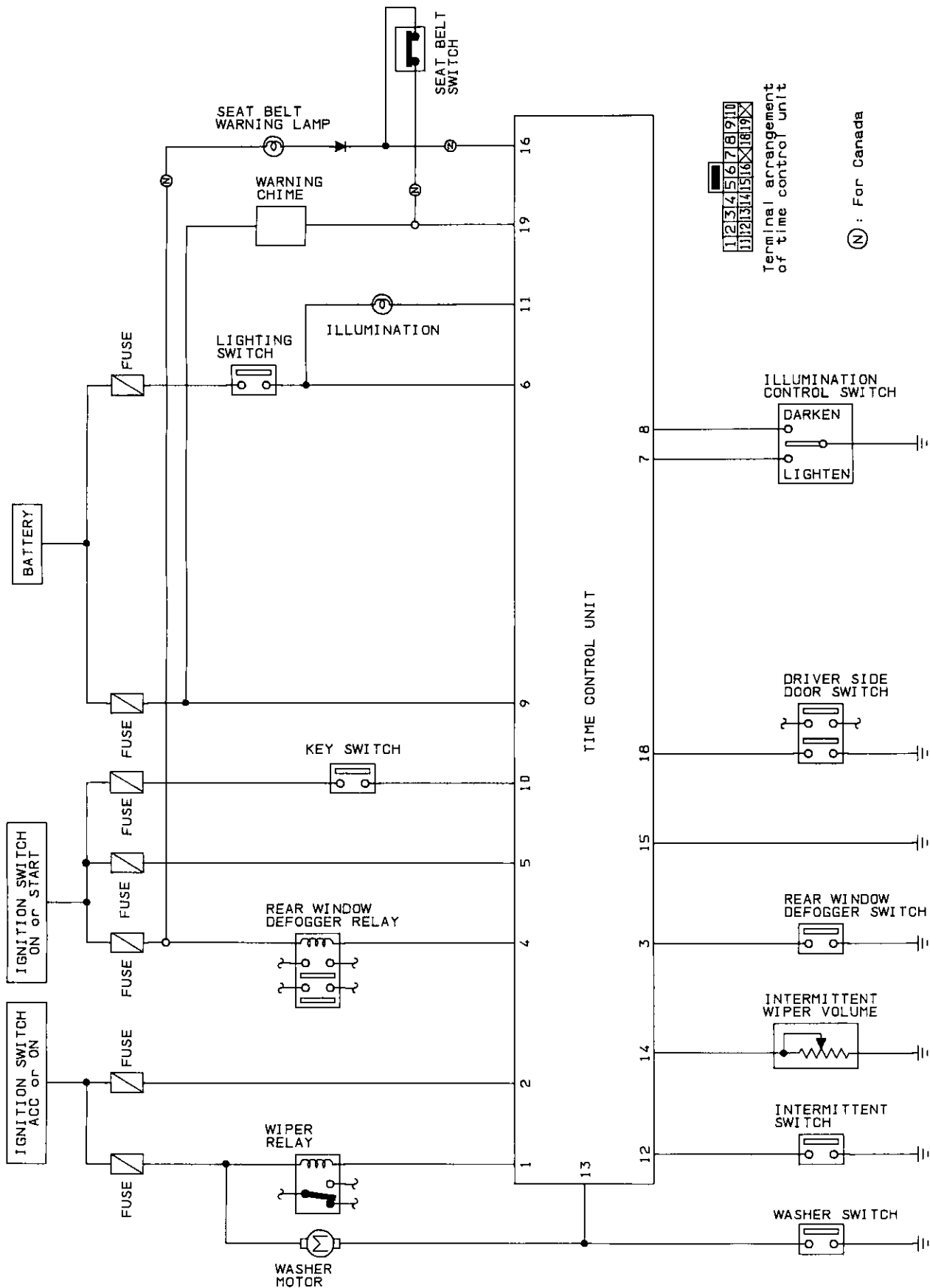
Refer to "Combination Meter".



### Warning Chime Check

# TIME CONTROL SYSTEM

## Schematic

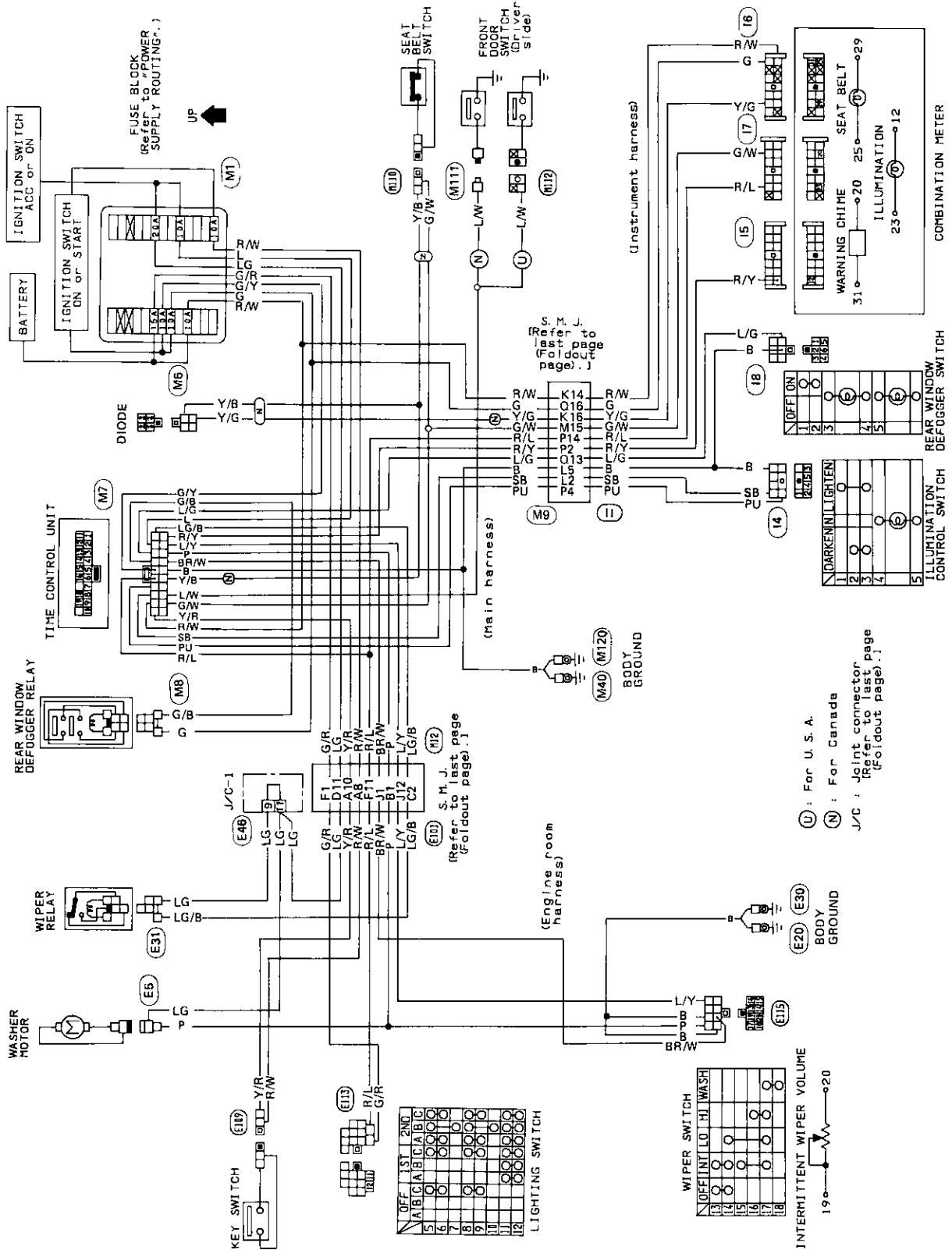


SEL309N



# TIME CONTROL SYSTEM

## Wiring Diagram



# TIME CONTROL SYSTEM

## Description

### FUNCTION

- Time control unit has the following functions.

| Item |                                      | Details of control                                                                                                                  |
|------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Intermittent wiper control           | Regulates intermittent time from approximately 3 to 12 seconds depending on the intermittent wiper volume setting.                  |
| 2    | Washer and wiper combination control | Wiper is operated in conjunction with washer switch.                                                                                |
| 3    | Illumination control                 | Regulates brightness of illumination in 16 stages depending on the illumination control switch setting.                             |
| 4    | Light warning chime timer            | When driver's door is opened with light switch "ON" and ignition switch "OFF", warning chime sounds.                                |
| 5    | Seat belt warning lamp timer         | Seat-belt warning lamp blinks for about 7 seconds when ignition switch is turned to "ON".                                           |
| 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). |

### OPERATING CONDITIONS

| Item                                 | Input signal   |                 | Power source from battery | Ignition switch | Light switch | Wiper switch "INT" | Washer switch | Driver's side door switch *1 | Seat belt switch *2 | Illumination control switch |
|--------------------------------------|----------------|-----------------|---------------------------|-----------------|--------------|--------------------|---------------|------------------------------|---------------------|-----------------------------|
|                                      | Input terminal | Output terminal |                           |                 |              |                    |               |                              |                     |                             |
| Intermittent wiper control           | ①              |                 | ON                        | ACC or ON       |              | ON                 |               |                              |                     |                             |
| Washer and wiper combination control | ⑫              |                 | ON                        | ACC or ON       |              |                    | ON            |                              |                     |                             |
| Illumination control                 | ⑪              |                 | ON                        |                 | ON           |                    |               |                              |                     | ON                          |
| Light warning chime timer            | ⑲              |                 | ON                        | OFF or ACC      | ON           |                    |               | ON                           |                     |                             |
| Seat belt warning lamp timer         | ⑯              |                 | ON                        | OFF or ACC → ON |              |                    |               |                              |                     |                             |
| Seat belt warning chime timer        | ⑲              |                 | ON                        | OFF or ACC → ON |              |                    |               |                              | ON                  |                             |

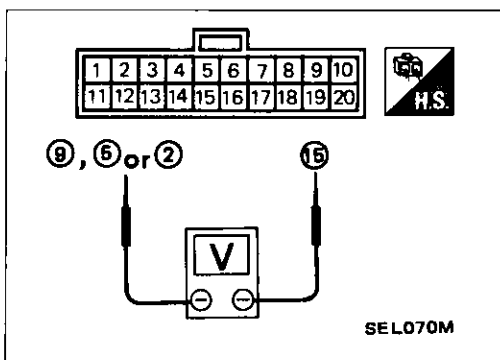
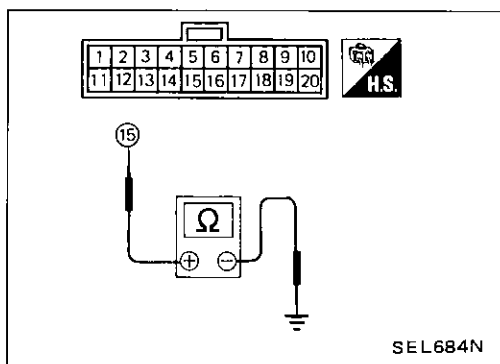
\*1: Door switch is turned "ON" when door is opened.

\*2: Seat belt switch is turned "ON" when driver's side seat belt is unfastened.

# TIME CONTROL SYSTEM

## Trouble-diagnosis

| Symptom        |                                                                | DIAGNOSTIC PROCEDURE |
|----------------|----------------------------------------------------------------|----------------------|
| Wiper & washer | Intermittent wiper does not operate.                           | 1                    |
|                | Intermittent time of wiper cannot be adjusted.                 | 2                    |
|                | Wiper and washer activate individually but not in combination. | 3                    |
| Illumination   | Illumination control system does not actuate.                  | 4                    |
| Warning        | Light warning chime does not activate.                         | 5                    |
|                | Seat belt warning chime does not activate.                     | 6                    |
|                | Seat belt warning lamp does not go off nor come on.            | 7                    |
|                | Ignition key warning chime does not activate.                  | 8                    |
| Rear defogger  | Rear defogger does not activate, or does not go off.           | 9                    |



### PREPARATION FOR TROUBLE-DIAGNOSIS

1. Remove lower trim.
2. Remove time control unit with harness connected.

### POWER SUPPLY CIRCUIT CHECK

1. Connect ohmmeter from harness side.
2. Check continuity between terminal 15 and body ground.

| Ohmmeter terminals |             | Continuity |
|--------------------|-------------|------------|
| (+)                | (-)         |            |
| 15                 | Body ground | Yes        |

3. Connect voltmeter from harness side.
4. Measure voltage across terminal 15 and terminals 2, 5 or 9.

| Voltmeter terminals |     | Ignition switch position |             |             |
|---------------------|-----|--------------------------|-------------|-------------|
| (+)                 | (-) | OFF                      | ACC         | ON          |
| 9                   | 15  | Approx. 12V              | Approx. 12V | Approx. 12V |
| 5                   | 15  | 0V                       | 0V          | Approx. 12V |
| 2                   | 15  | 0V                       | Approx. 12V | Approx. 12V |

# TIME CONTROL SYSTEM

## Trouble-diagnosis (Cont'd)

### DIAGNOSTIC PROCEDURE-1

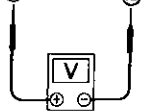
Intermittent wiper does not operate.

#### A T.C.U. OUTPUT FOR WIPER RELAY CIRCUIT CHECK

Measure voltage across ① and ⑮.



Wiper switch → "INT"



Needle swings from 0 to 12V every 3 to 12 seconds.

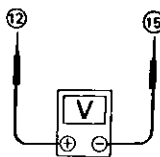
SEL071M

#### B WIPER SWITCH CIRCUIT CHECK

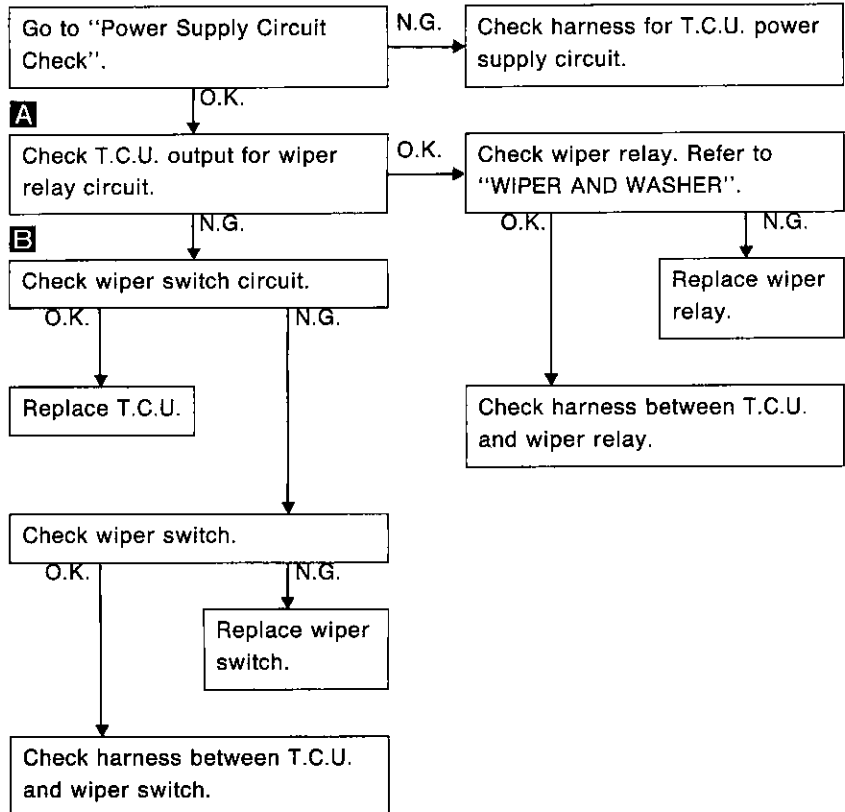
Check continuity between ⑫ and ⑮.



Wiper switch → "INT"



SEL072M



#### A INTERMITTENT WIPER VOLUME CIRCUIT CHECK

Measure resistance between ⑭ and ⑮ while turning intermittent wiper volume.



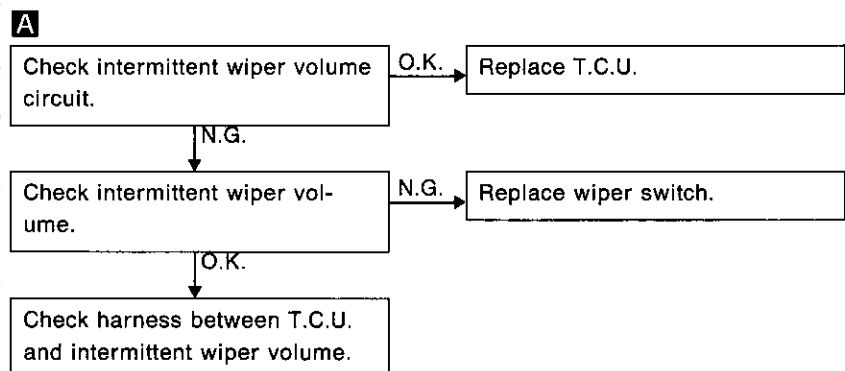
Intermittent wiper knob

0Ω at "S" position  
Approx.  
1 kΩ at "L" position

SEL073M

### DIAGNOSTIC PROCEDURE-2

Intermittent time of wiper cannot be adjusted.

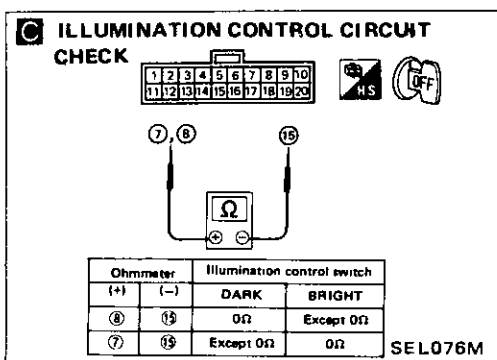
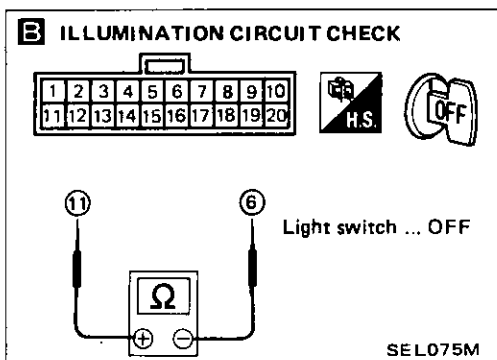
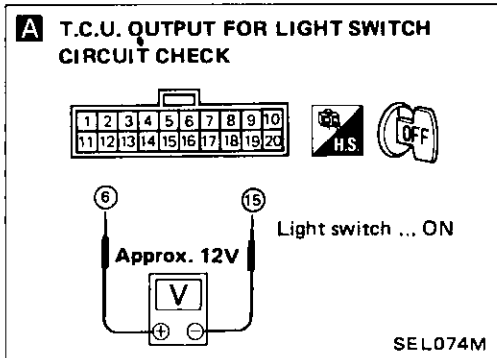
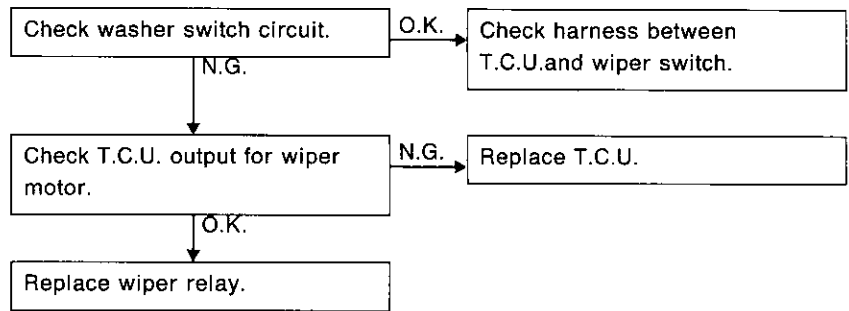


# TIME CONTROL SYSTEM

## Trouble-diagnosis (Cont'd)

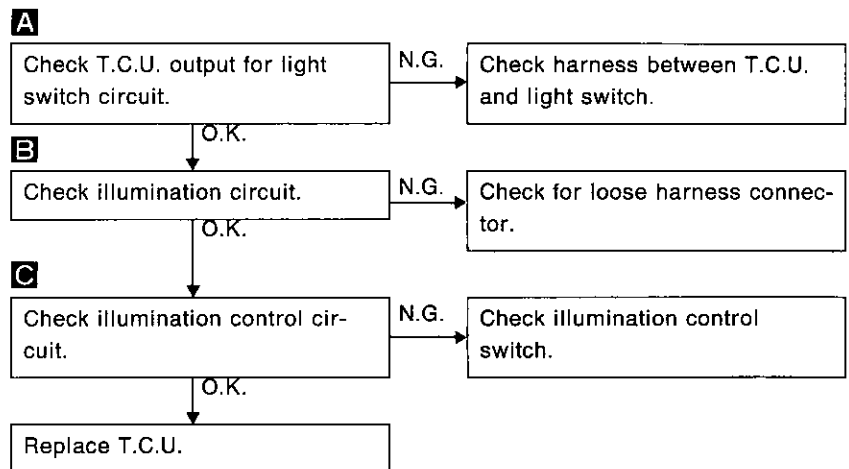
### DIAGNOSTIC PROCEDURE-3

Wiper and washer activate individually but not in combination.



### DIAGNOSTIC PROCEDURE-4

Illumination control system does not actuate.

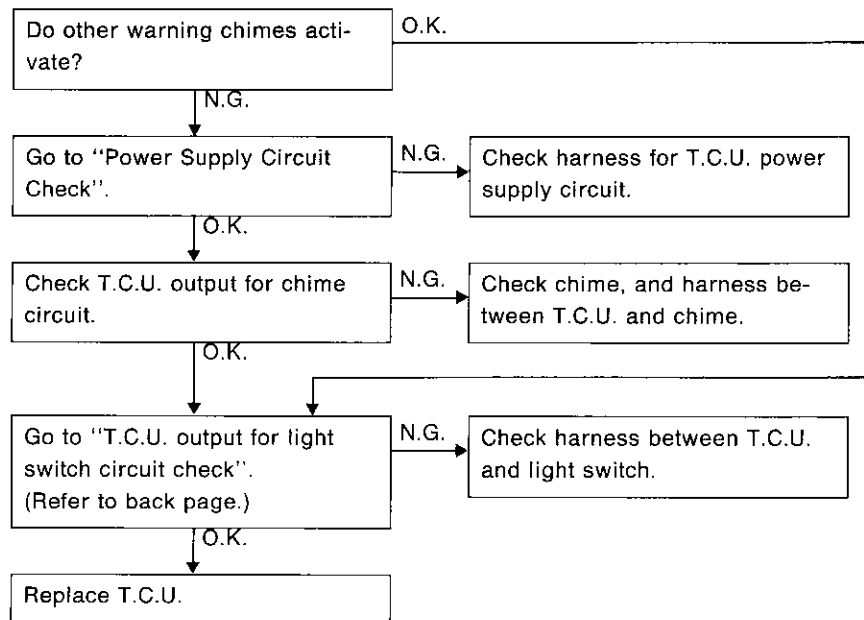


# TIME CONTROL SYSTEM

## Trouble-diagnosis (Cont'd)

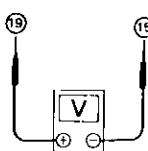
### DIAGNOSTIC PROCEDURE-5

Light warning chime does not activate.



#### A T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

Measure voltage across (19) and (15) when driver side door is opened and close.

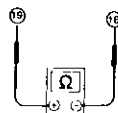


- Light switch ... 1ST
- Approx. 12V when driver side door is closed.
  - Voltmeter needle swings (0 - 12V) when driver side door is opened.

SEL077M

#### B SEAT BELT SWITCH CIRCUIT CHECK

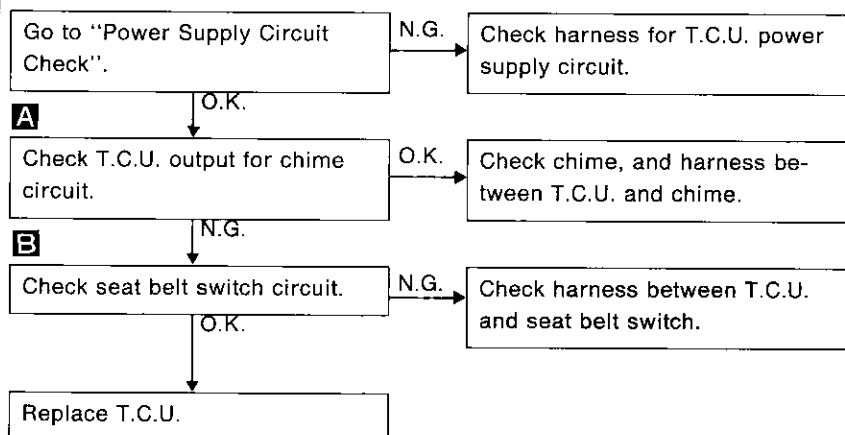
1. Unfasten driver side seat belt.
2. Check continuity between (19) and (16).
3. Fasten driver side seat belt.
4. Check to determine if continuity does not exist between (19) and (16).



SEL078M

### DIAGNOSTIC PROCEDURE-6

Seat belt warning chime does not activate.



## TIME CONTROL SYSTEM

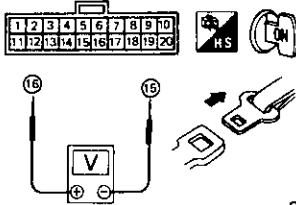
### Trouble-diagnosis (Cont'd)

#### DIAGNOSTIC PROCEDURE-7

Seat belt warning lamp does not go off nor comes on.

#### A T.C.U. OUTPUT FOR BELT WARNING LAMP CIRCUIT CHECK

Measure voltage across ⑮ and ⑮ when ignition switch is "ON".



Go to "Power Supply Circuit Check".

N.G.

Check harness for T.C.U. power supply circuit.

O.K.

A Check T.C.U. output for belt warning lamp circuit.

N.G.

Replace T.C.U.

Voltmeter needle keeps swinging (approx. 0  $\leftrightarrow$  12V) for about 7 seconds after ignition switch is turned "ON".

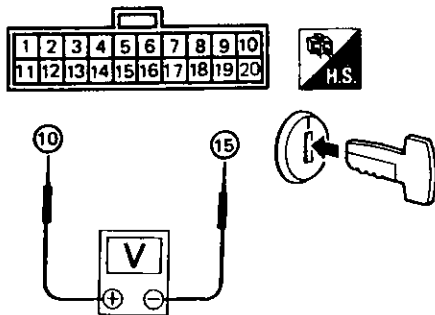
O.K.

Check warning lamp, and harness between T.C.U. and warning lamp.

# TIME CONTROL SYSTEM

## A KEY SWITCH CIRCUIT CHECK

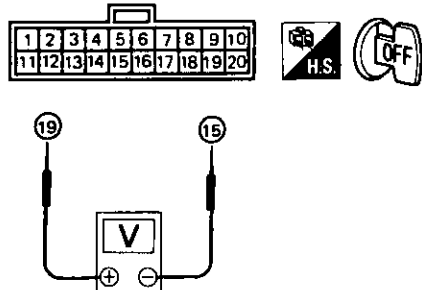
Measure voltage across ⑩ and ⑮.



SEL082M

## B T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

Measure voltage across ⑲ and ⑮ when driver side door is opened and closed.

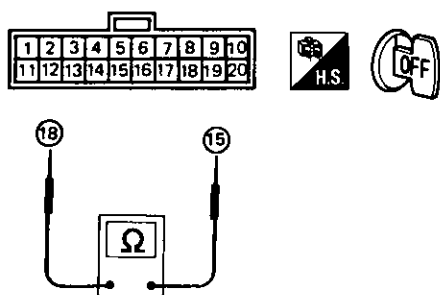


- Approx. 12V when driver side door is opened.

SEL080M

## C DRIVER'S DOOR SWITCH CIRCUIT CHECK

Check continuity between ⑱ and ⑮.



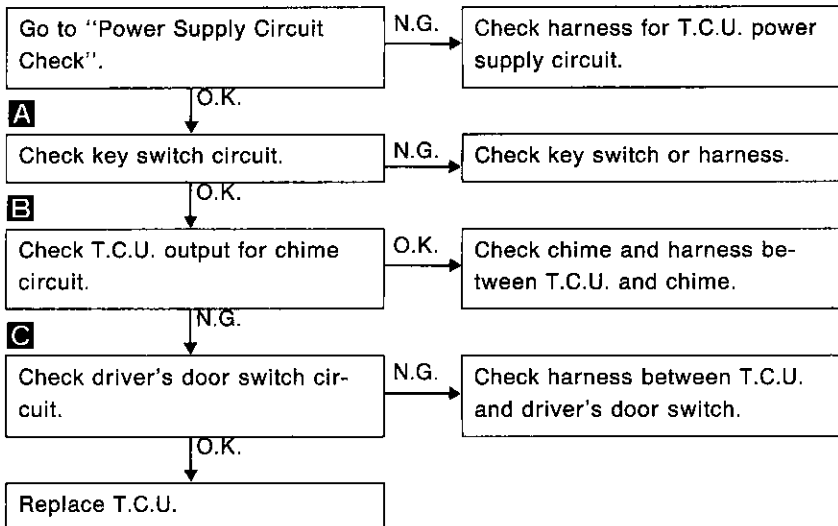
Driver side door ... Open

SEL081M

## Trouble-diagnosis (Cont'd)

### DIAGNOSTIC PROCEDURE-8

Ignition key warning chime does not activate.





# TIME CONTROL SYSTEM

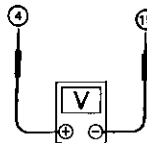
## Trouble-diagnosis (Cont'd)

### DIAGNOSTIC PROCEDURE-9

Rear defogger does not activate, or does not go off.

#### A T.C.U. OUTPUT FOR REAR DEFOGGER CIRCUIT CHECK

Measure voltage across ④ and ⑮ while operating rear defogger switch.

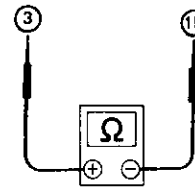
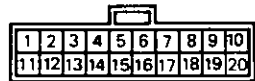


Rear defogger switch → ON

- Rear defogger switch "OFF": Approx. 12V
- Rear defogger switch "ON": Approx. 0V

SEL083M

#### B DEFOGGER SWITCH CIRCUIT CHECK



- Rear defogger switch "OFF": Except 0Ω
- Rear defogger switch "ON": 0Ω

SEL084M

Go to "Power Supply Circuit Check".

N.G.

Check harness for T.C.U. power supply circuit.

O.K.

A Check T.C.U. output for rear defogger circuit.

N.G.

Check rear defogger relay, and harness between T.C.U. and rear defogger relay.

O.K.

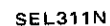
B Check defogger switch circuit.

N.G.

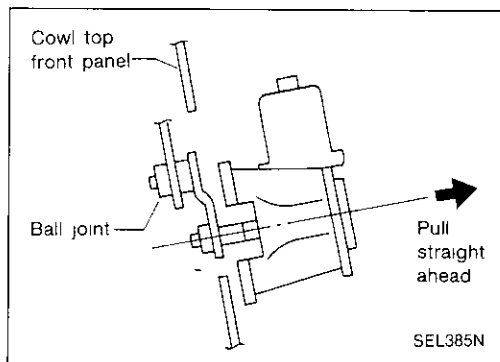
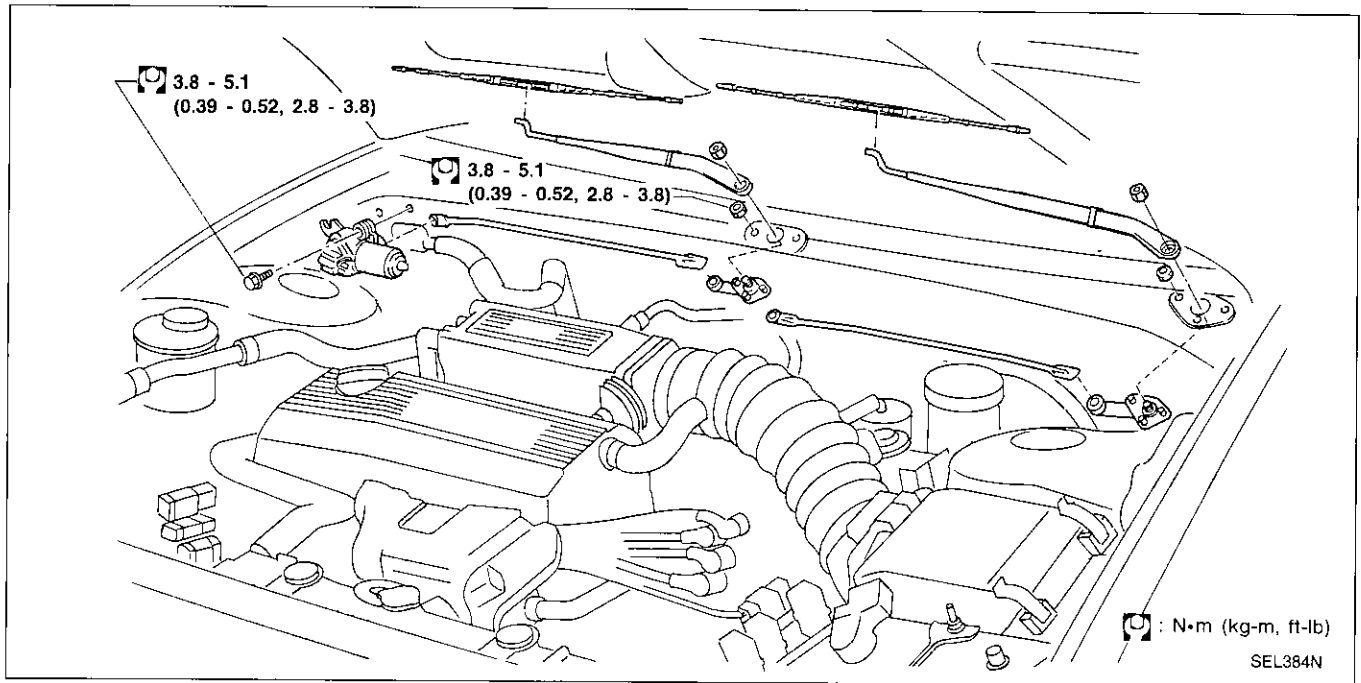
Check defogger switch, and harness between T.C.U. and defogger switch.

O.K.

Replace T.C.U.



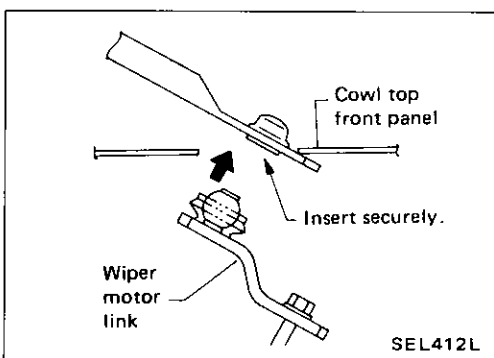
## Wiper Removal and Installation



### FRONT WIPER REMOVAL

Before removing front wiper motor link, turn wiper switch OFF and disconnect motor leads at connectors.

1. Remove wiper arm.
2. Remove cowl cover.
3. Remove bolts which secure wiper motor.
4. Extract wiper motor so that wiper motor link comes out of hole in front cowl top panel. Then, pull motor straight out to disconnect ball joint which connects motor link and wiper link. Wiper motor can then be removed.
5. Remove wiper link pivot blocks on driver and passenger sides.
6. Extract wiper link and pivot blocks (as one unit) from oblong hole on left side (L.H.D.) of cowl top.



### FRONT WIPER INSTALLATION

1. Position wiper link and pivot blocks (as one unit) in cowl top through oblong hole.
2. Before installing pivot blocks on cowl top, hold end (motor link side) of wiper link at hole in front cowl top panel and insert motor link's ball pin into hole in wiper link.
3. Install front wiper in reverse order of above removal procedures.
- Apply a small amount of grease to ball joints before installation.

## WIPER AND WASHER

### Installation

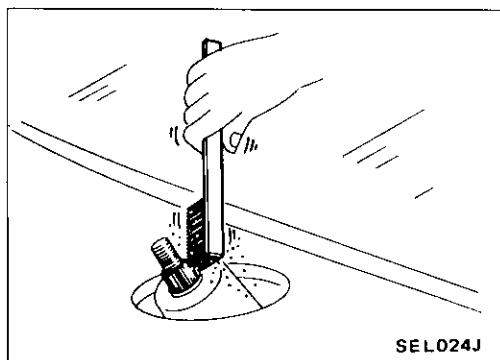
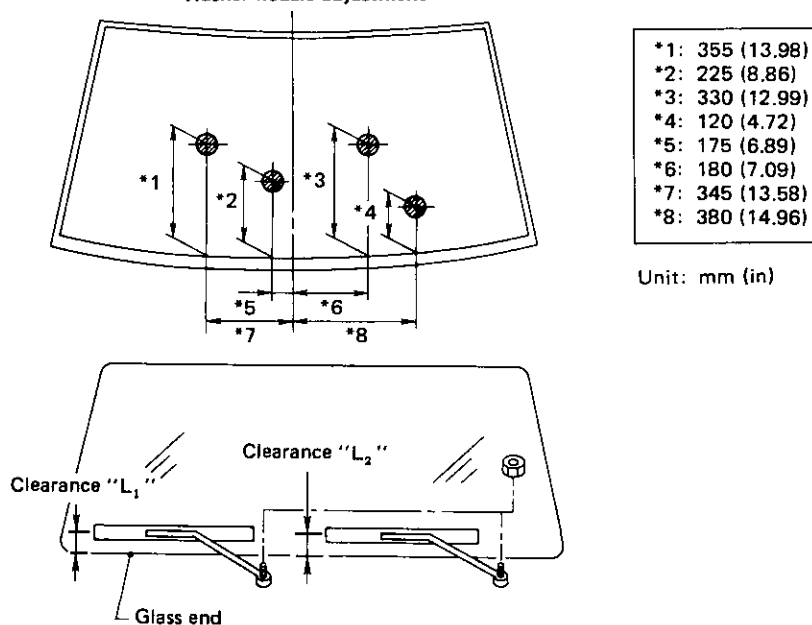
1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
  2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance " $L_1$ " or " $L_2$ " immediately before tightening nut.
  3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
  4. Ensure that wiper blades stop within clearance " $L_1$ " & " $L_2$ ".
    - Clearance " $L_1$ ": 22 - 32 mm (0.87 - 1.26 in)
    - Clearance " $L_2$ ": 43 - 53 mm (1.69 - 2.09 in)
- Tighten windshield wiper arm nuts to specified torque.

**Windshield wiper:**

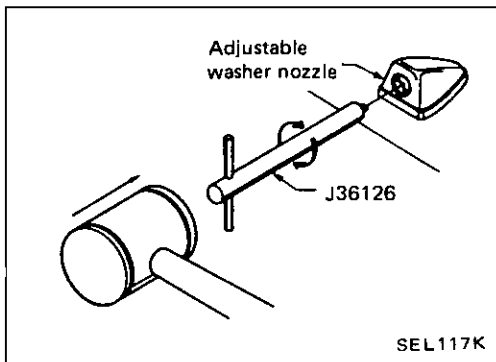
**17 - 23 N·m (1.7 - 2.3 kg-m, 12 - 17 ft-lb)**

### Windshield wiper and washer

#### Washer nozzle adjustment



- Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

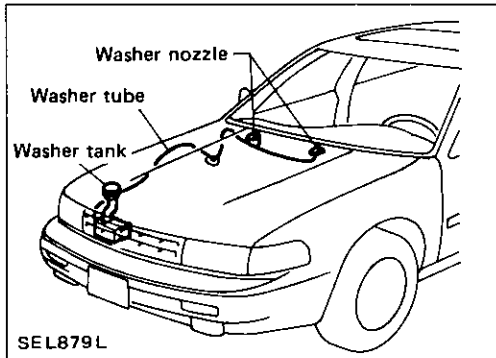


### Washer Nozzle Adjustment

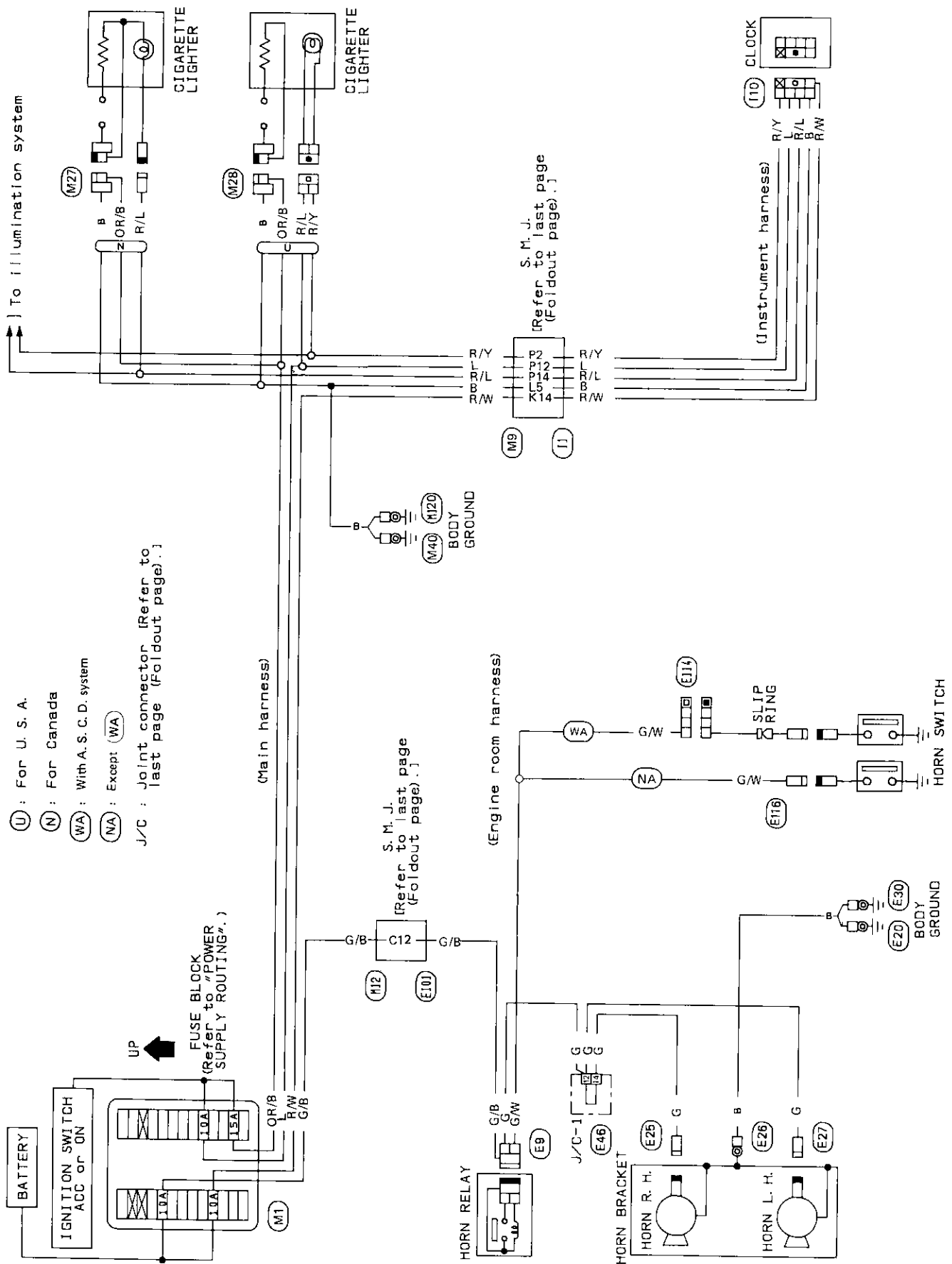
- Using Tool J36126, adjust windshield washer nozzle to correct its spray pattern.

**Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle.**

**This will prevent “rounding out” the small female square in the center of the nozzle.**

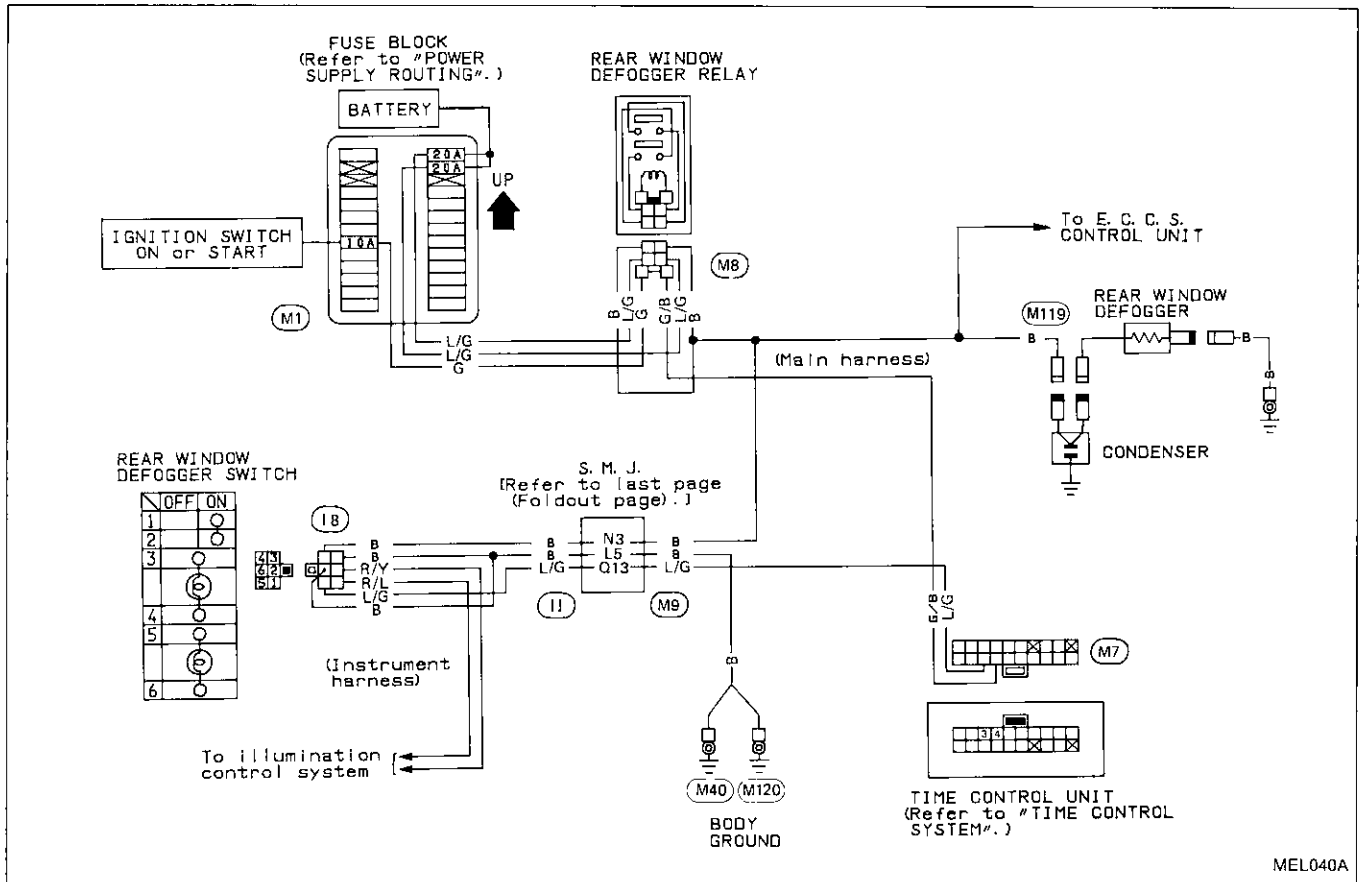


## Wiring Diagram

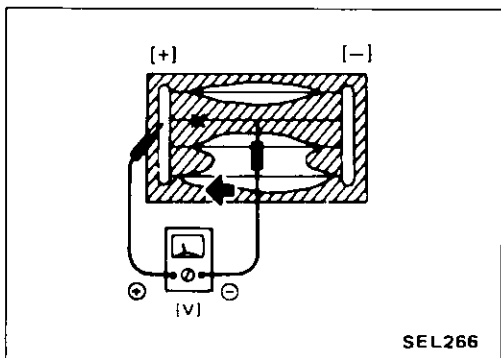
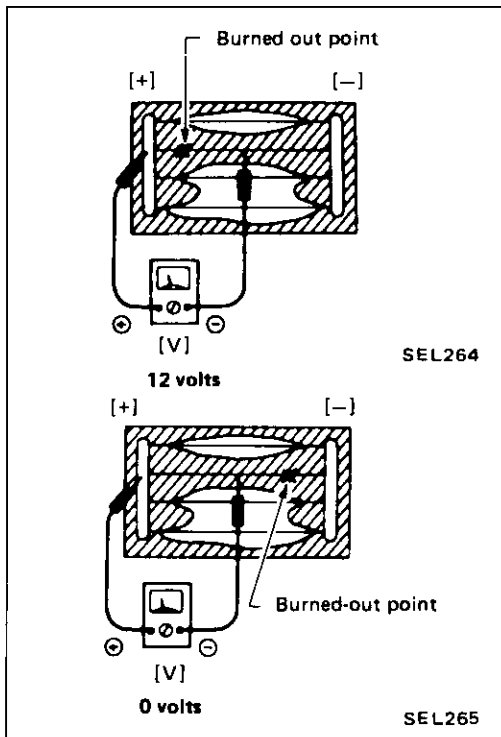
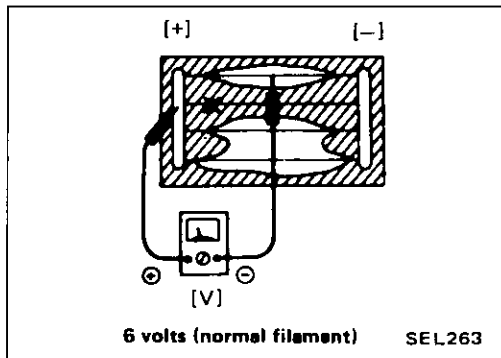


# REAR WINDOW DEFOGGER

## Wiring Diagram



## REAR WINDOW DEFOGGER



### 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



## REAR WINDOW DEFOGGER

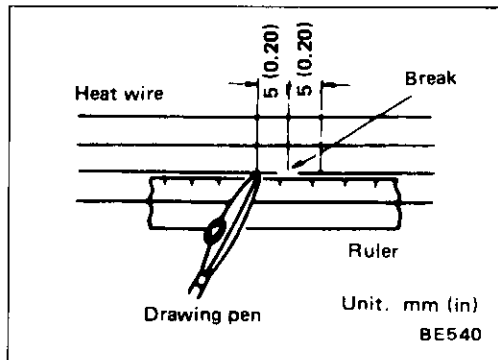
### Filament Repair (Cont'd)

#### 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.

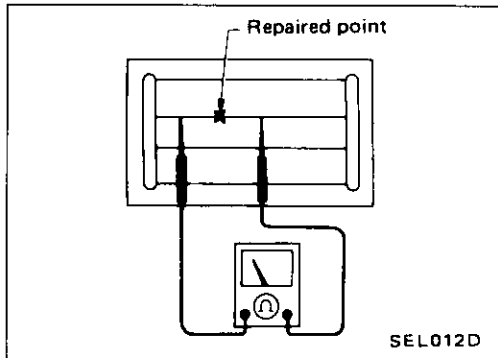
**Shake silver composition container before use.**

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.

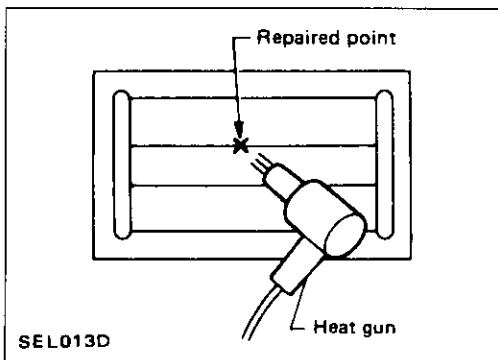


4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

**Do not touch repaired area while test is being conducted.**

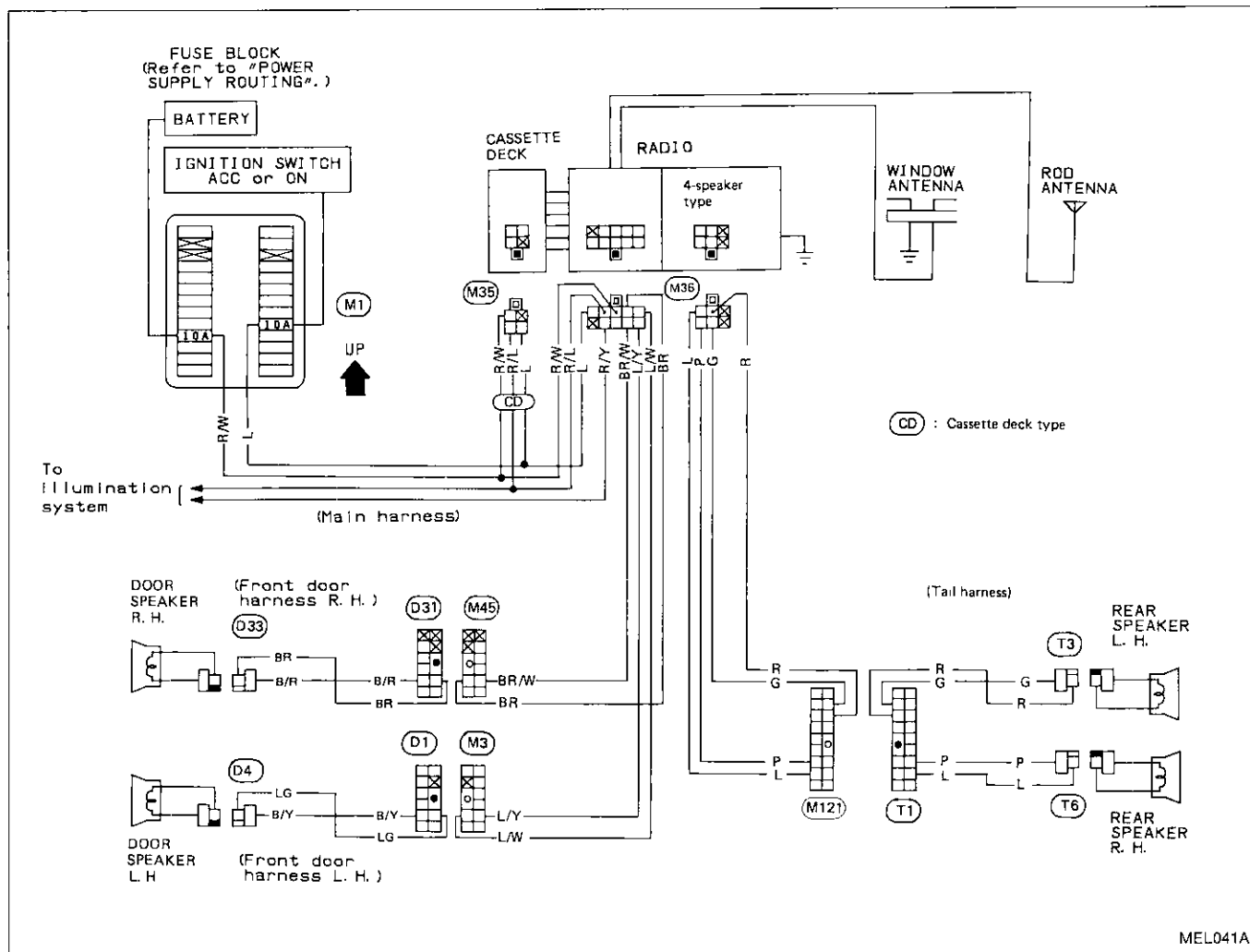


5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.



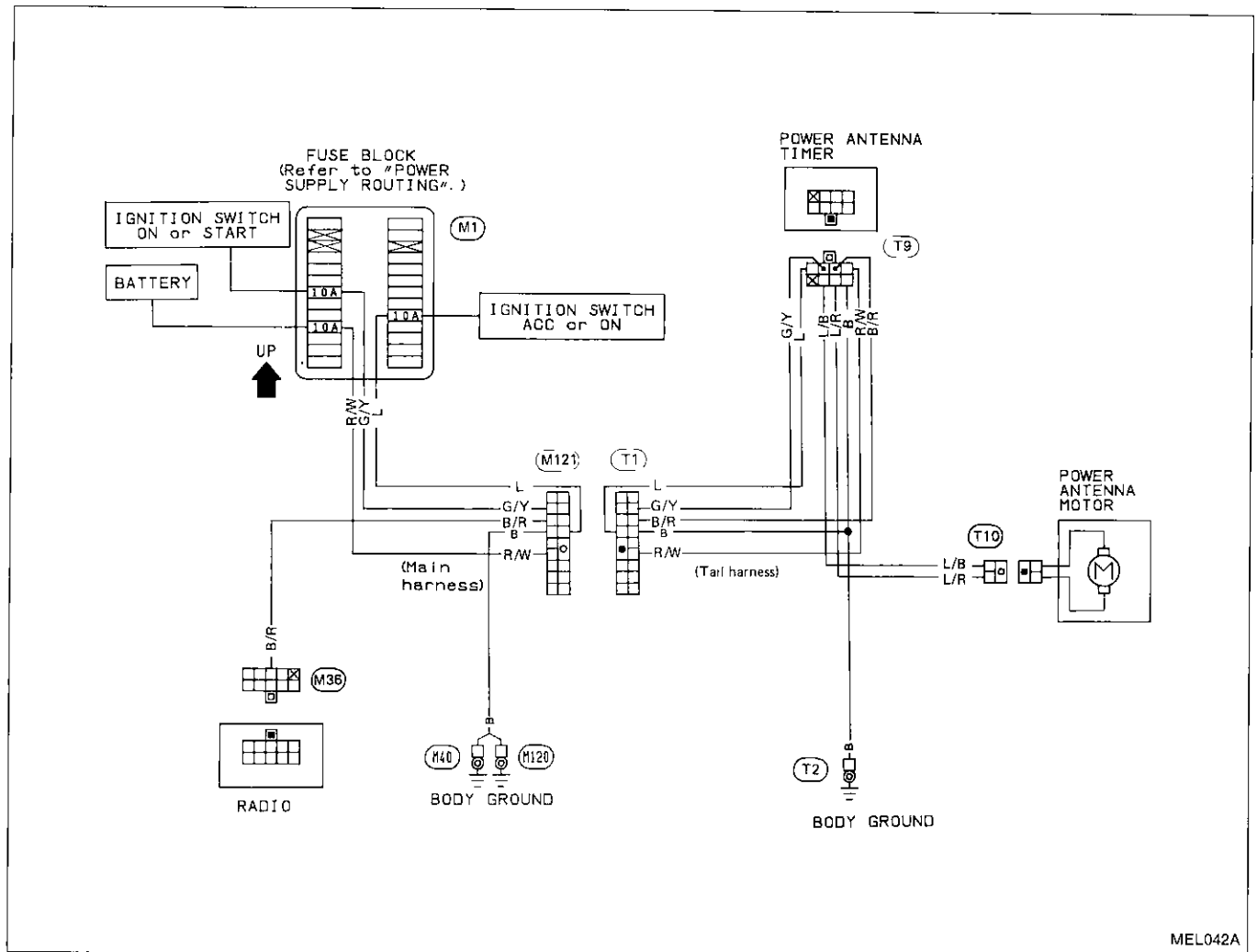
# AUDIO AND POWER ANTENNA

## Audio/Wiring Diagram

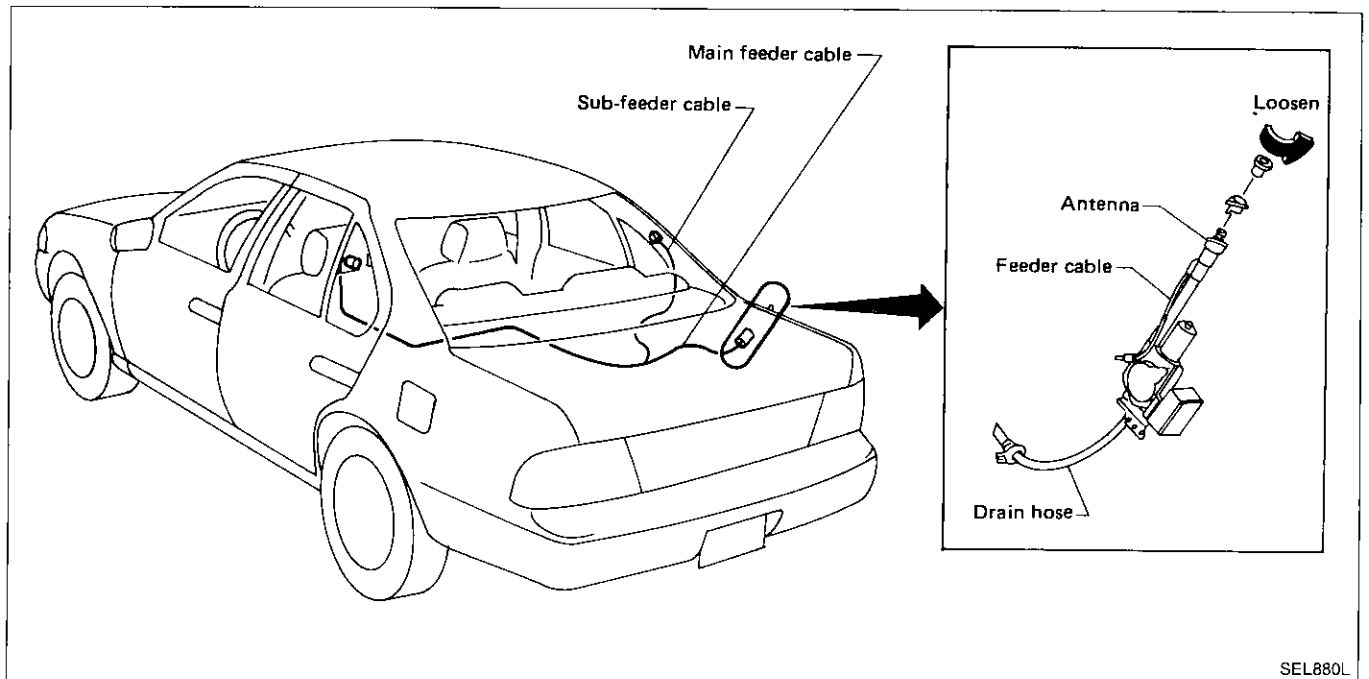


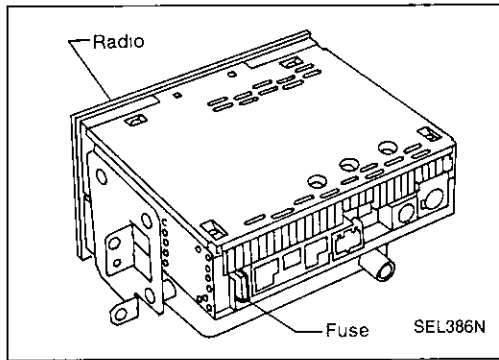
# AUDIO AND POWER ANTENNA

## Power Antenna/Wiring Diagram

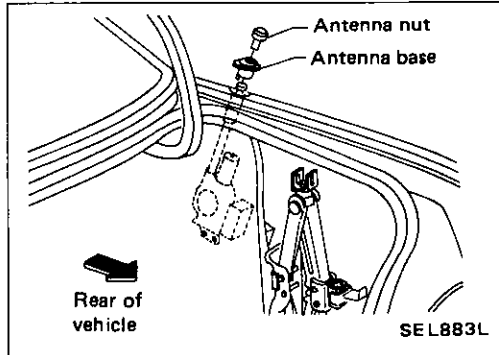


## Location of Antenna





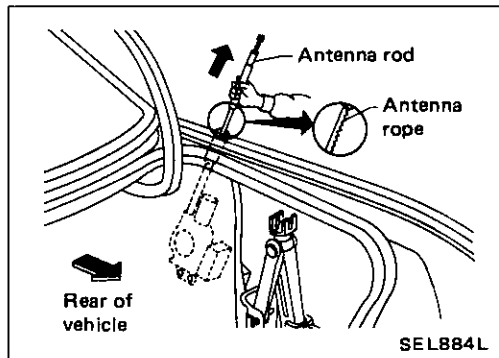
### Radio Fuse Check



### Antenna Rod Replacement

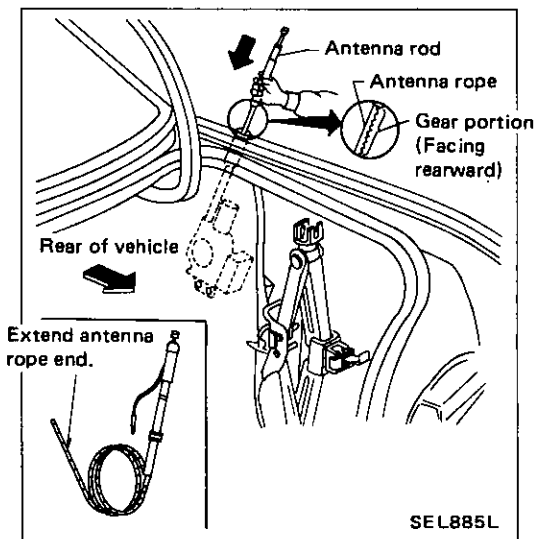
#### REMOVAL

1. Remove antenna nut and antenna base.
2. Withdraw antenna rod while raising it by operating antenna motor.



#### INSTALLATION

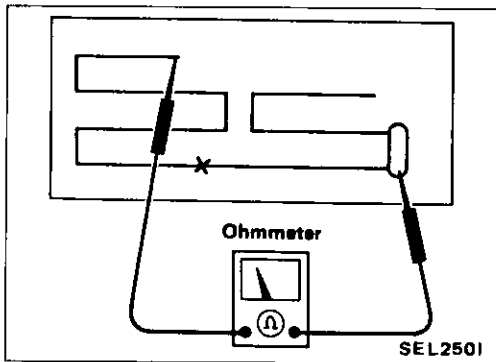
1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.



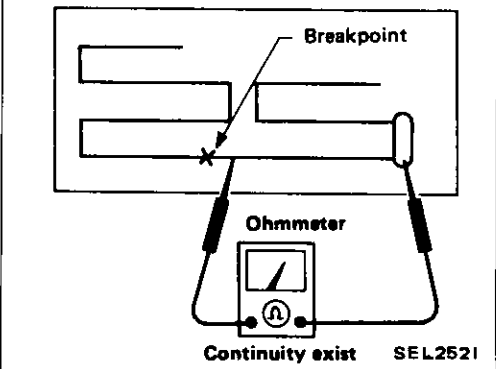
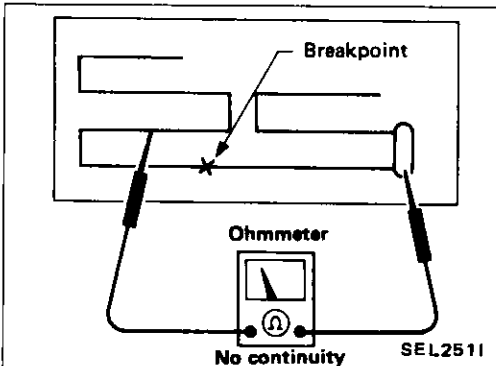
### Window Antenna Repair

#### ELEMENT CHECK

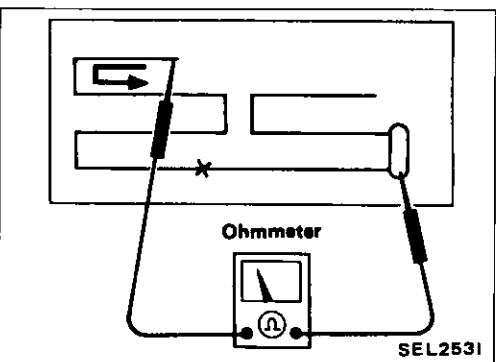
1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



2. If an element is broken, no continuity will exist.



3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

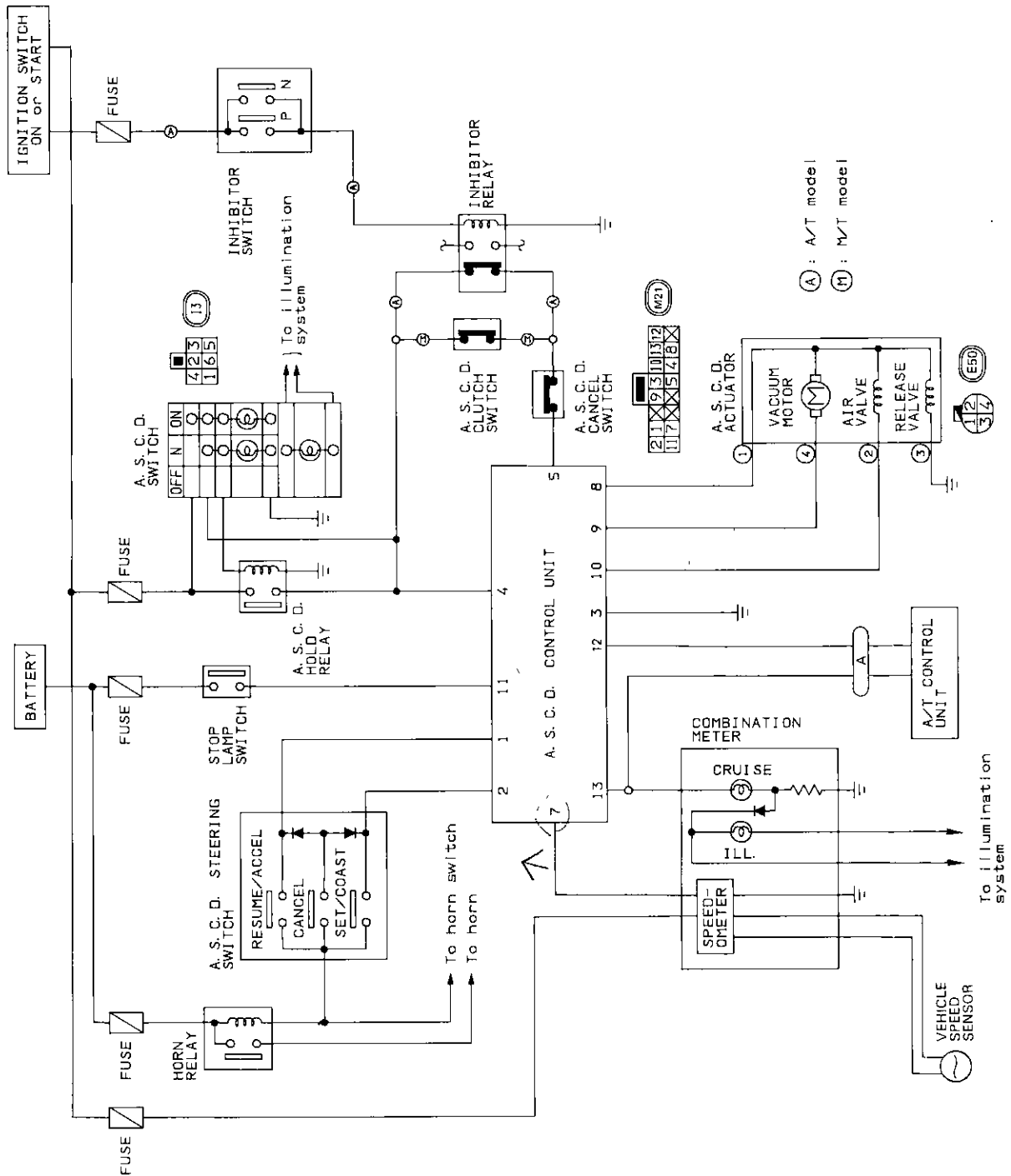


#### ELEMENT REPAIR

Refer to REAR WINDOW DEFOGGER "Filament Repair".

# AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

## Schematic

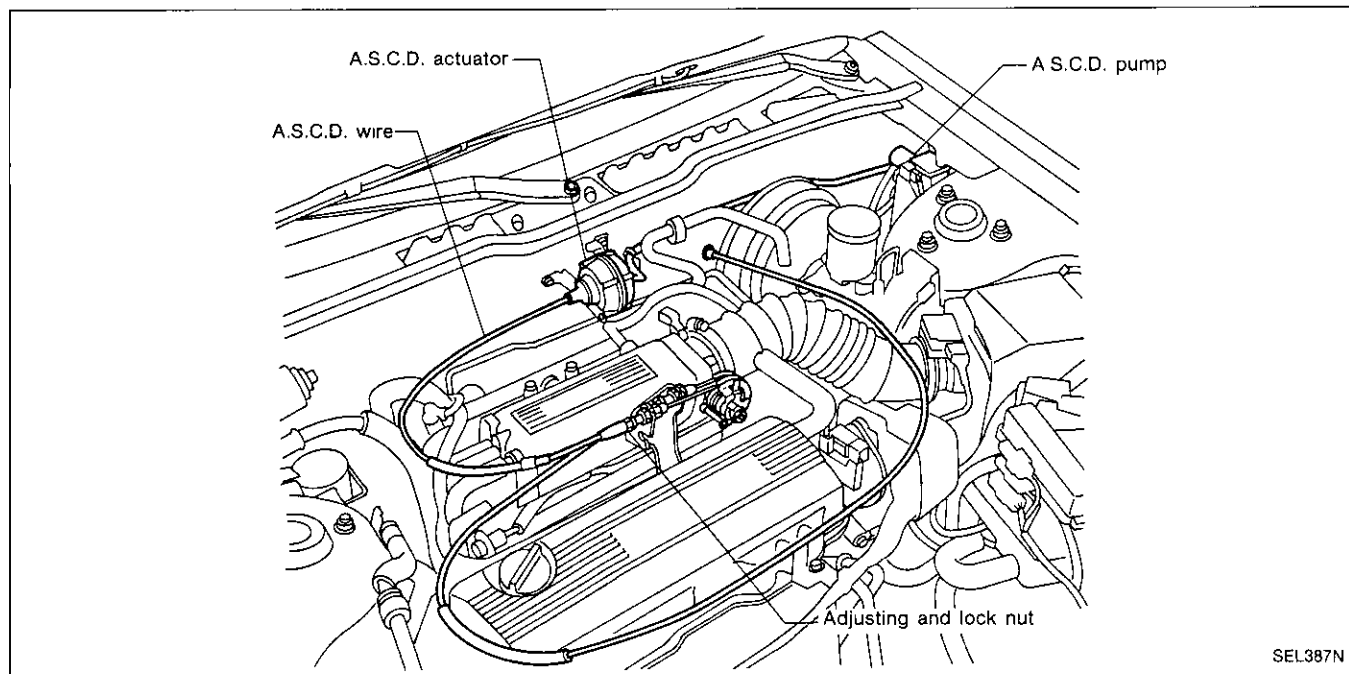


SEL316N

## Wiring Diagram



## 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.
- For A.S.C.D. cancel switch, stop lamp switch and clutch switch adjustment, refer to BR and CL sections.



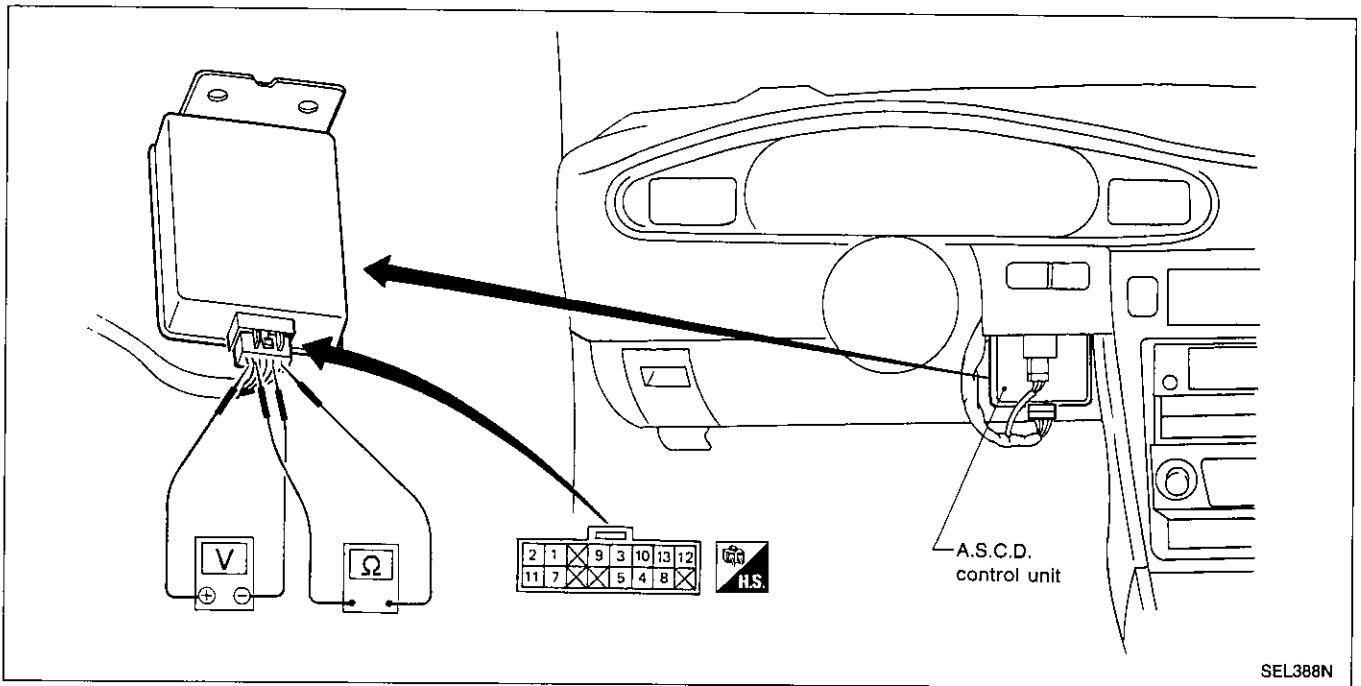
# AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

## Trouble Diagnoses

| Symptom                                                      | DIAGNOSTIC PROCEDURE |
|--------------------------------------------------------------|----------------------|
| A.S.C.D. control unit cannot be set properly.                | 1                    |
| Resume switch will not operate.                              | 2                    |
| Cancel switch will not operate.                              | 3                    |
| Engine hunts.                                                | 4                    |
| Large difference between set vehicle speed and actual speed. | 5                    |
| Set speed cannot be canceled.                                | 6                    |

## PREPARATION FOR TROUBLE-DIAGNOSIS

1. Remove lower trim.
2. Remove A.S.C.D. control unit with harness connected.
3. Perform check from harness side using circuit tester, with harness connector connected.



## GROUND CIRCUIT CHECK

- Check continuity between ③ and body ground.

# AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

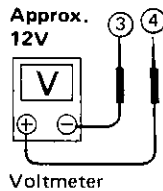
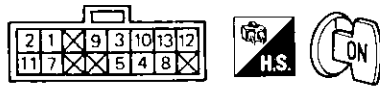
## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE-1

**A.S.C.D. control unit cannot be set properly.**

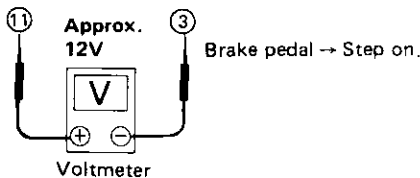
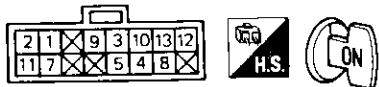
#### POWER SUPPLY CIRCUIT CHECK

1. Turn A.S.C.D. main switch to "ON".
2. Check voltage between (4) and (3).



#### CUT-OFF CIRCUIT CHECK

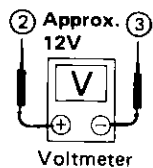
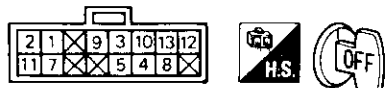
1. Step on brake pedal.
2. Turn A.S.C.D. main switch to "ON".
3. Check voltage between (1) and (3).



SEL685N

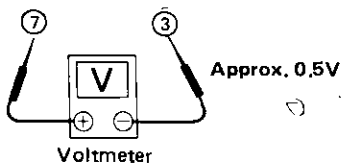
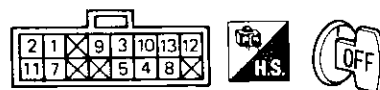
#### SET SWITCH CIRCUIT CHECK

1. Push A.S.C.D. set switch.
2. Check voltage between (2) and (3).



#### SPEED SENSOR CIRCUIT CHECK

1. Disconnect speed sensor from transmission.
  2. Connect a voltmeter between (7) and (3).
  3. Slowly turn speed sensor by hand to make sure voltmeter pointer deflects.
- Voltmeter pointer deflects twice per rotation of pinion.



SEL630L

Turn A.S.C.D. main switch "OFF" and then "ON" to make sure indicator illuminates.

N.G.

Check indicator bulb, A.S.C.D. main switch and hold relay.

O.K.

Check power supply circuit for A.S.C.D. control unit.

N.G.

Check A.S.C.D. power supply harness.

O.K.

Check cut-off circuit for A.S.C.D. control unit.

N.G.

Check A.S.C.D. cancel switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).

O.K.

Check A.S.C.D. set switch circuit for A.S.C.D. control unit.

N.G.

Check A.S.C.D. set switch and harness between control unit and set switch.

O.K.

Check speed sensor circuit.

N.G.

Check speed sensor and harness between A.S.C.D. control unit and speed sensor signal output terminal of combination meter.

O.K.

Check actuator. Refer to "Actuator Check".

N.G.

Replace actuator.

O.K.

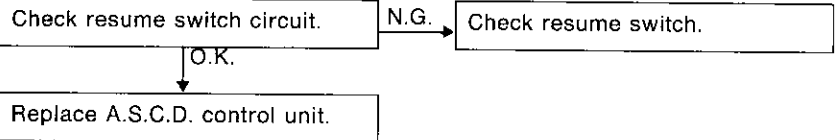
Replace A.S.C.D. control unit.

## AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

### Trouble Diagnoses (Cont'd)

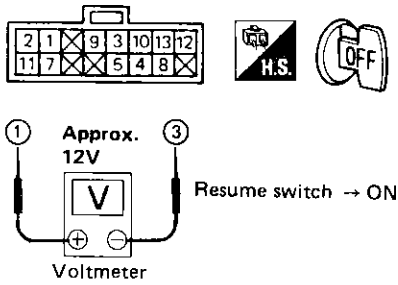
#### DIAGNOSTIC PROCEDURE-2

**Resume switch will not operate.**



#### RESUME SWITCH CIRCUIT CHECK

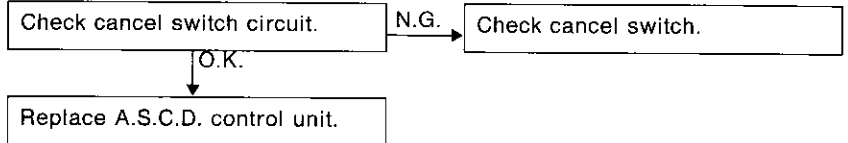
1. Turn resume switch to "ON".
2. Check voltage between (1) and (3).



SEL636L

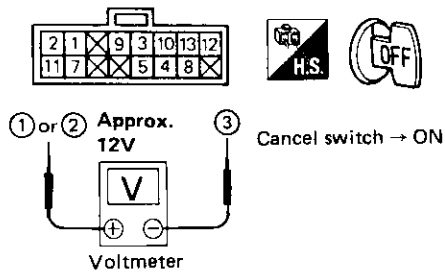
#### DIAGNOSTIC PROCEDURE-3

**Cancel switch will not operate.**



#### CANCEL SWITCH CIRCUIT CHECK

1. Turn cancel switch to "ON".
2. Check voltage between (2) and (3) or (1) and (3).



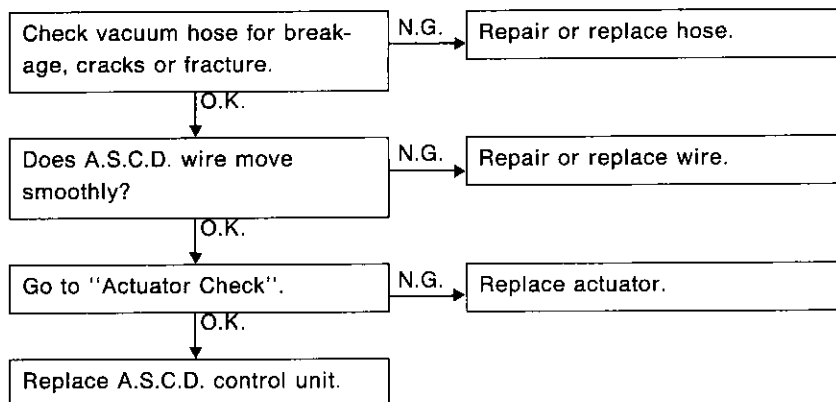
SEL637L

## AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

### Trouble Diagnoses (Cont'd)

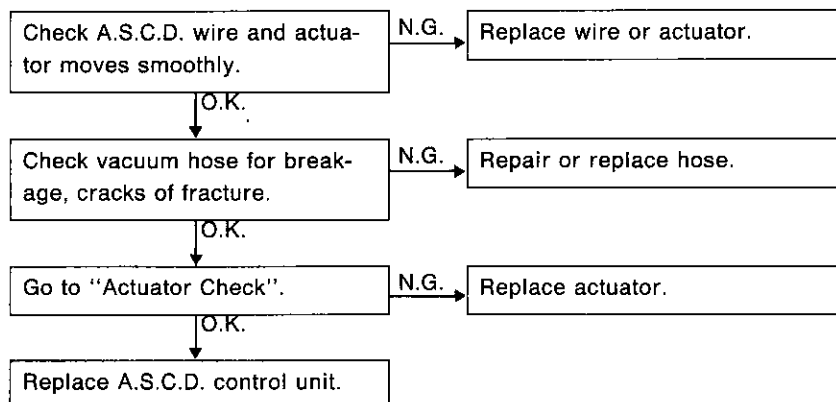
#### DIAGNOSTIC PROCEDURE-4

##### Engine hunts.



#### DIAGNOSTIC PROCEDURE-5

##### Large difference between set vehicle speed and actual speed.

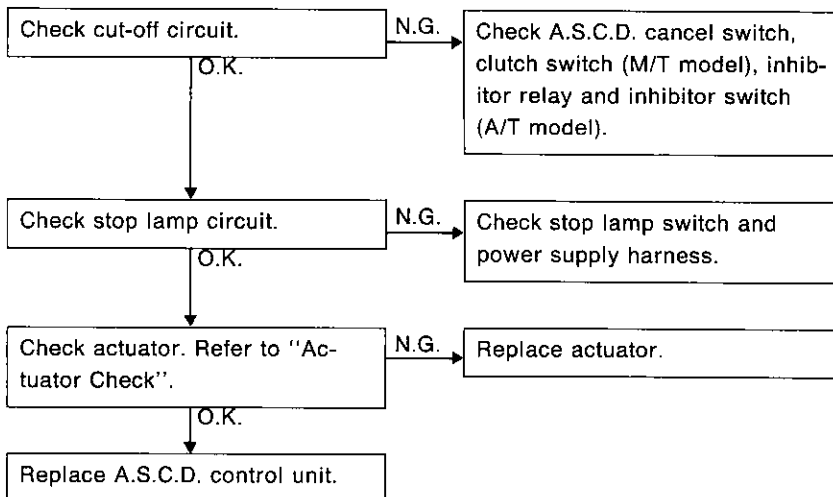


# AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

## Trouble Diagnoses (Cont'd)

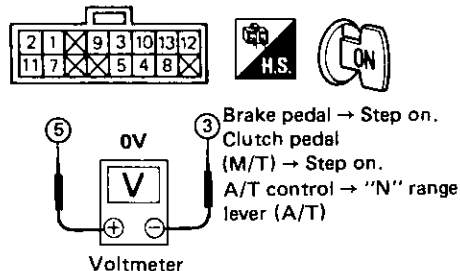
### DIAGNOSTIC PROCEDURE-6

Set speed cannot be canceled.



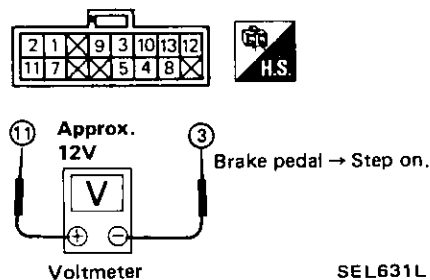
### CUT-OFF CIRCUIT CHECK

1. Turn A.S.C.D. main switch to "ON".
2. Turn A.S.C.D. main switch to "ON" again.
3. Step on brake pedal.
4. Step on clutch pedal (M/T) or shift in "N" range (A/T).
5. Check voltage between ⑤ and ③.



### STOP LAMP CIRCUIT CHECK

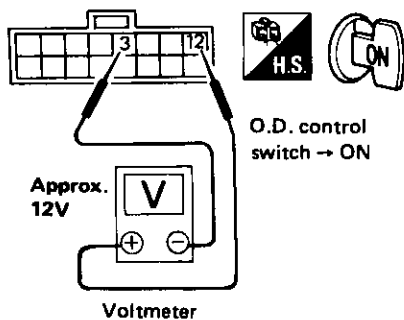
1. Step on brake pedal.
2. Check voltage between ⑪ and ③.



SEL631L

### O.D. CANCEL CIRCUIT CHECK FOR A.S.C.D. CONTROL UNIT

1. Turn O.D. control switch to "ON"
2. Measure voltage across ⑫ and ③.

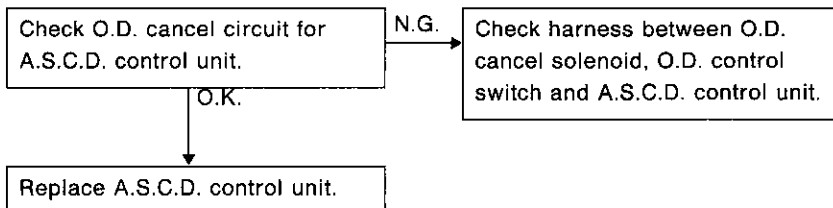


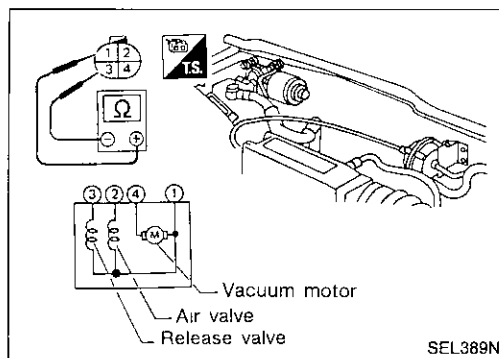
SEL640M

### DIAGNOSTIC PROCEDURE-7

A/T model only:

- When A.S.C.D. is set while vehicle is operating in "O.D." range, O.D. will be canceled and shifting to O.D. cannot be made thereafter.
- O.D. will not be canceled even if actual vehicle speed is 6 km/h (4 MPH) lower than set speed. (Set speed cannot be maintained.)
- O.D. will not be canceled even if accelerator switch is turned "ON".





## Actuator Check

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. pump.

**B**

O.K.

Check to see if A.S.C.D. wire is pulled when 12V D.C. is applied across ①, ②, ③ and ④.

N.G.

Disconnect vacuum hose from A.S.C.D. actuator and check for presence of vacuum pressure at A.S.C.D. pump.

N.G.

O.K.

Replace A.S.C.D. actuator.

**C**

Check to see if A.S.C.D. wire returns to original position 50 to 60 seconds after disconnecting lead from ④.

N.G.

Replace A.S.C.D. pump.

O.K. (Wire is pulled.)

O.K. (Wire does not return.)

**D**

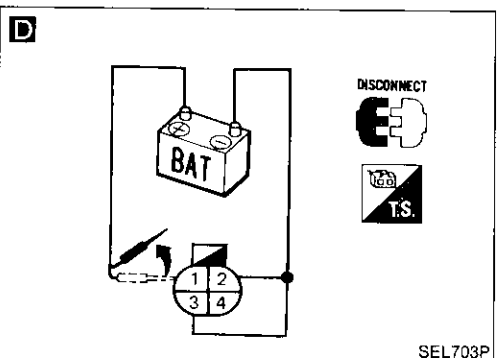
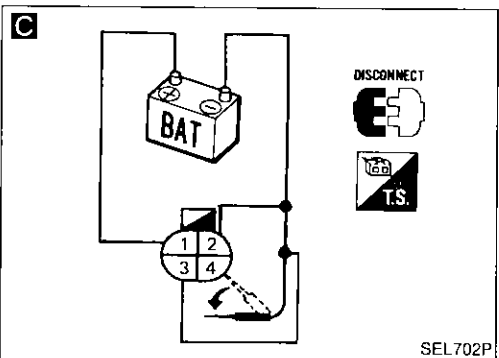
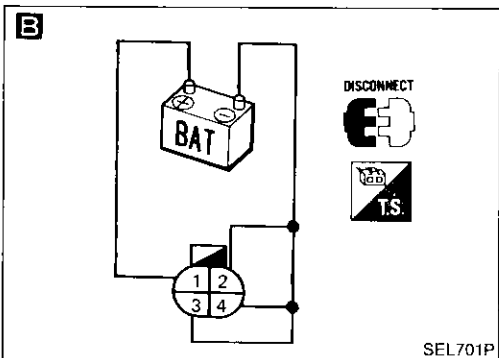
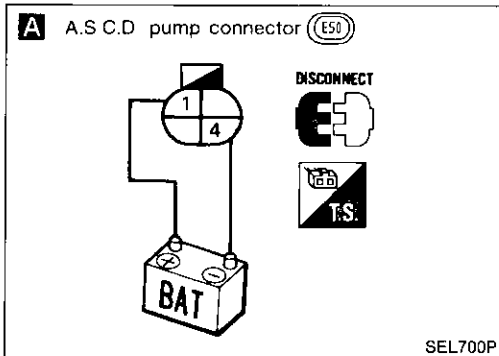
Disconnect lead from ① to see if A.S.C.D. wire returns immediately.

N.G.

Replace A.S.C.D. pump.

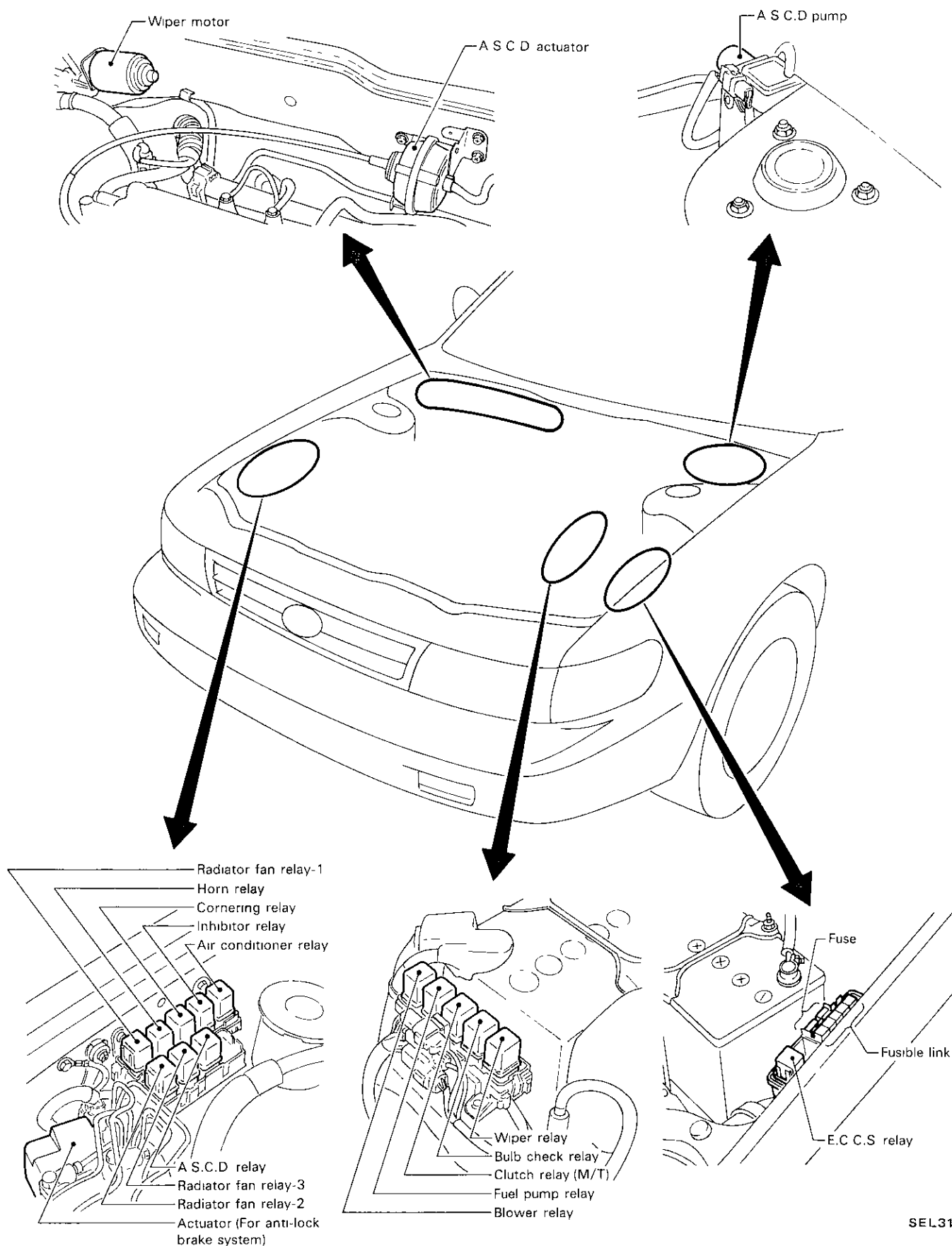
O.K. (Wire returns.)

A.S.C.D. actuator/A.S.C.D. pump are O.K.



# LOCATION OF ELECTRICAL UNITS

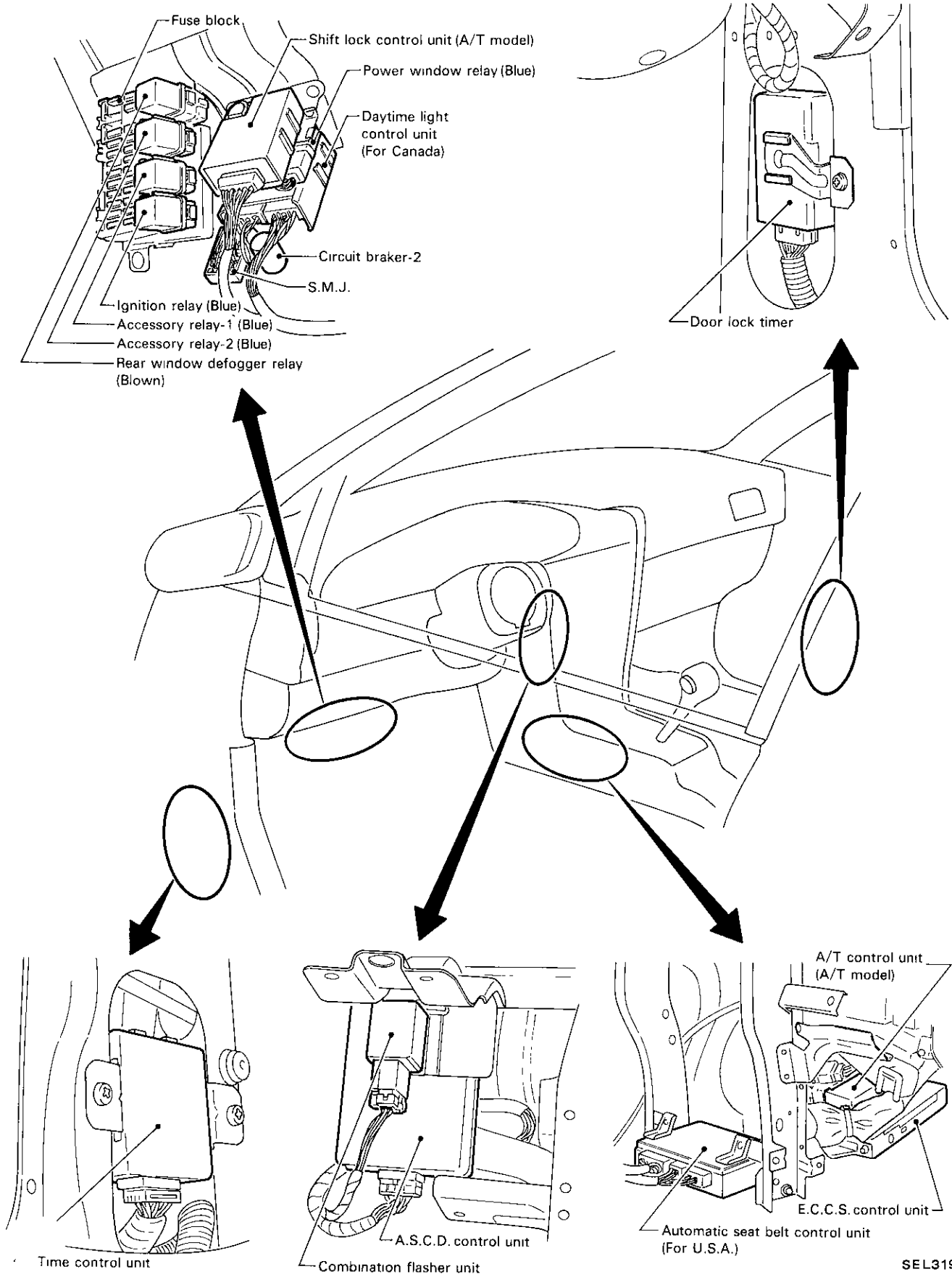
## Engine Compartment



SEL318N

# LOCATION OF ELECTRICAL UNITS

## Passenger Compartment

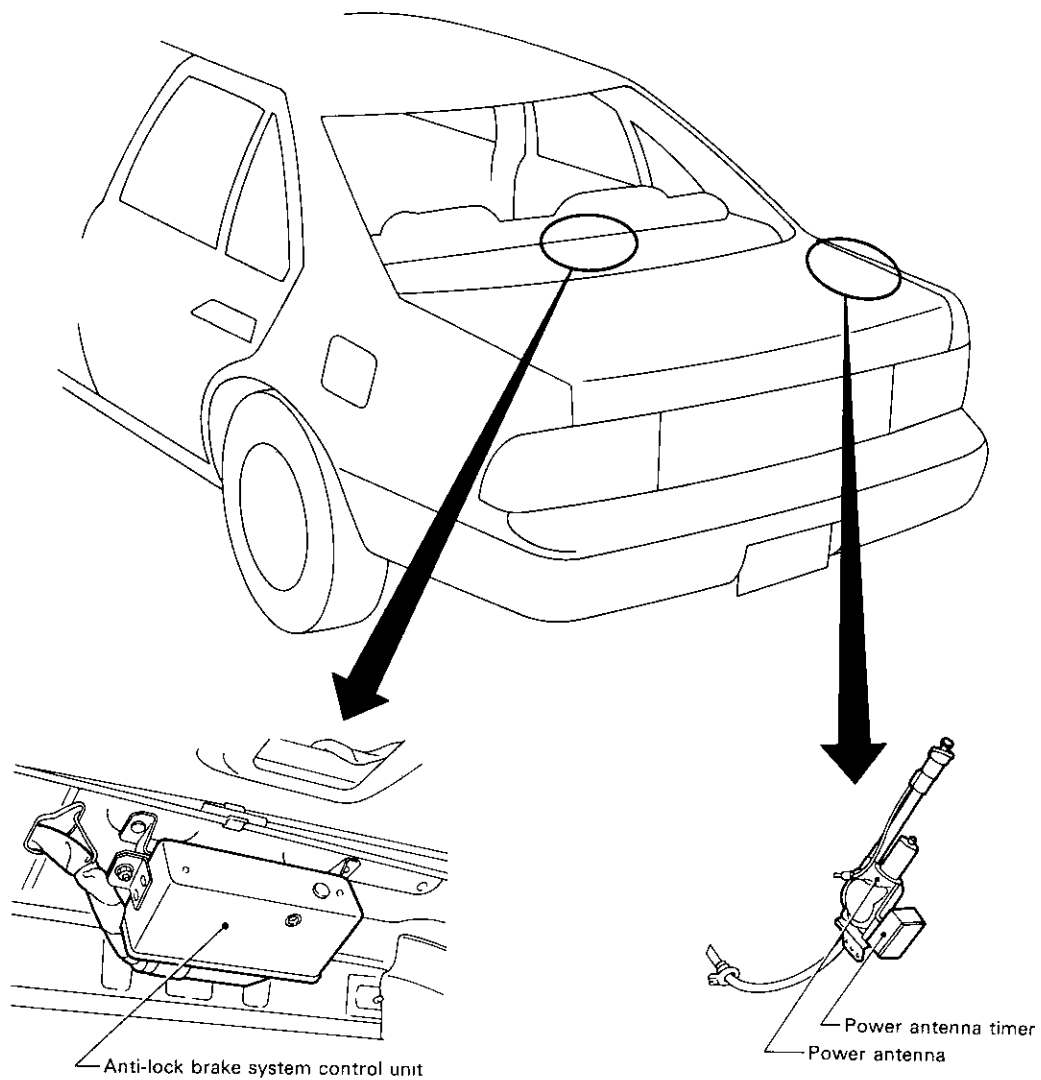


SEL319N



## LOCATION OF ELECTRICAL UNITS

### Luggage Compartment



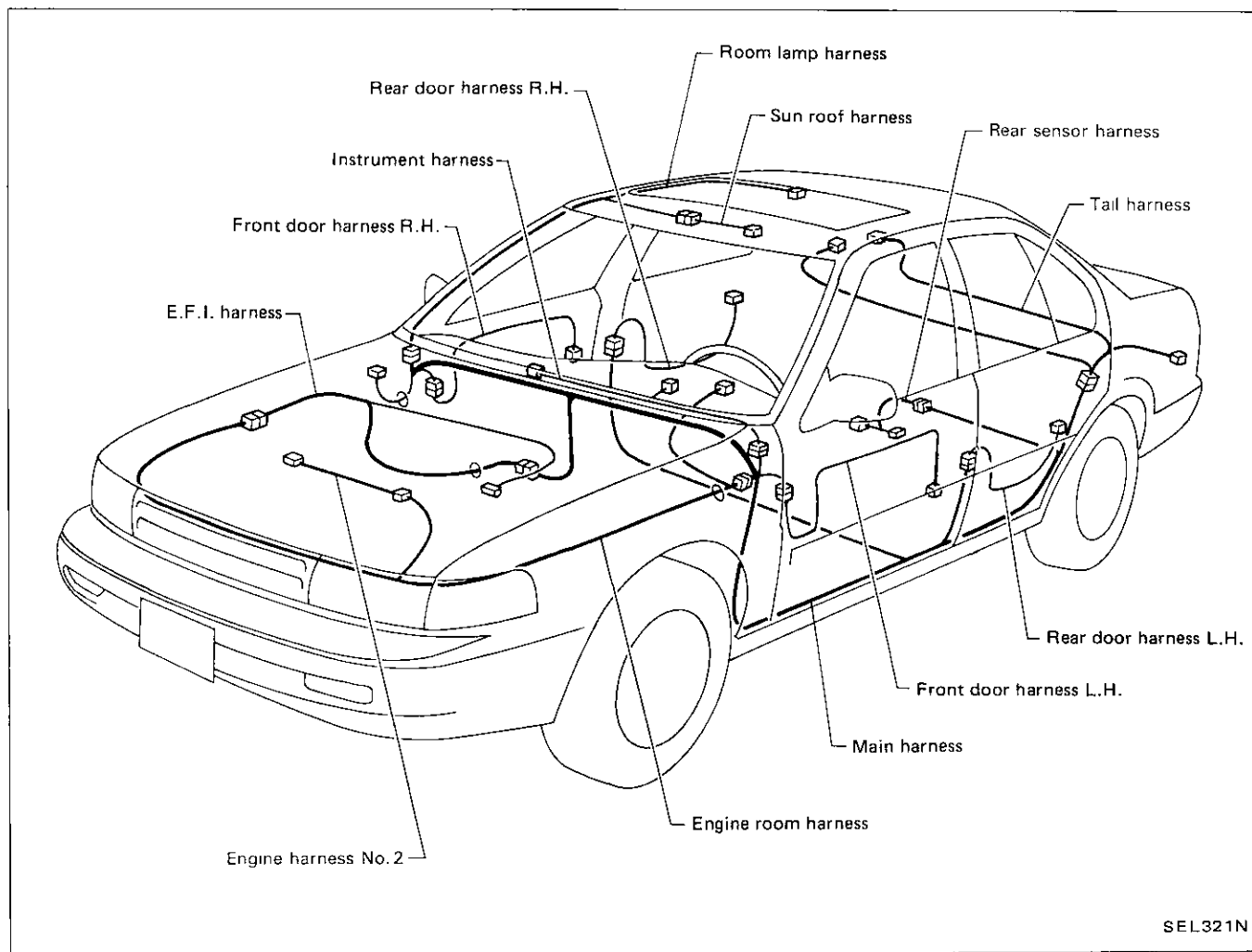
## LOCATION OF ELECTRICAL UNITS

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NOTE

# HARNESS LAYOUT

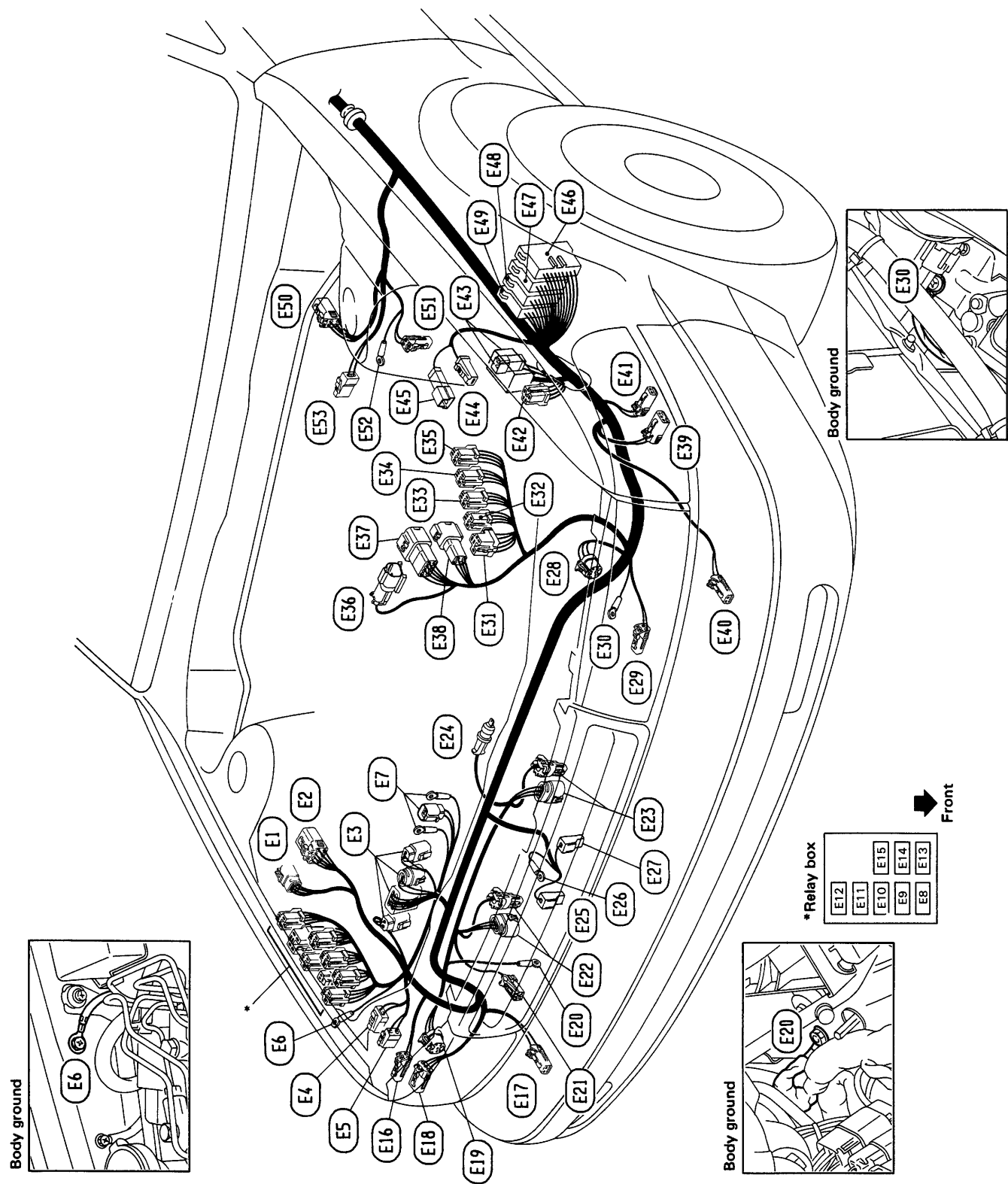
## Outline



HARNESS LAYOUT

Engine Room Harness

ENGINE COMPARTMENT



# HARNESS LAYOUT

## Engine Room Harness (Cont'd)

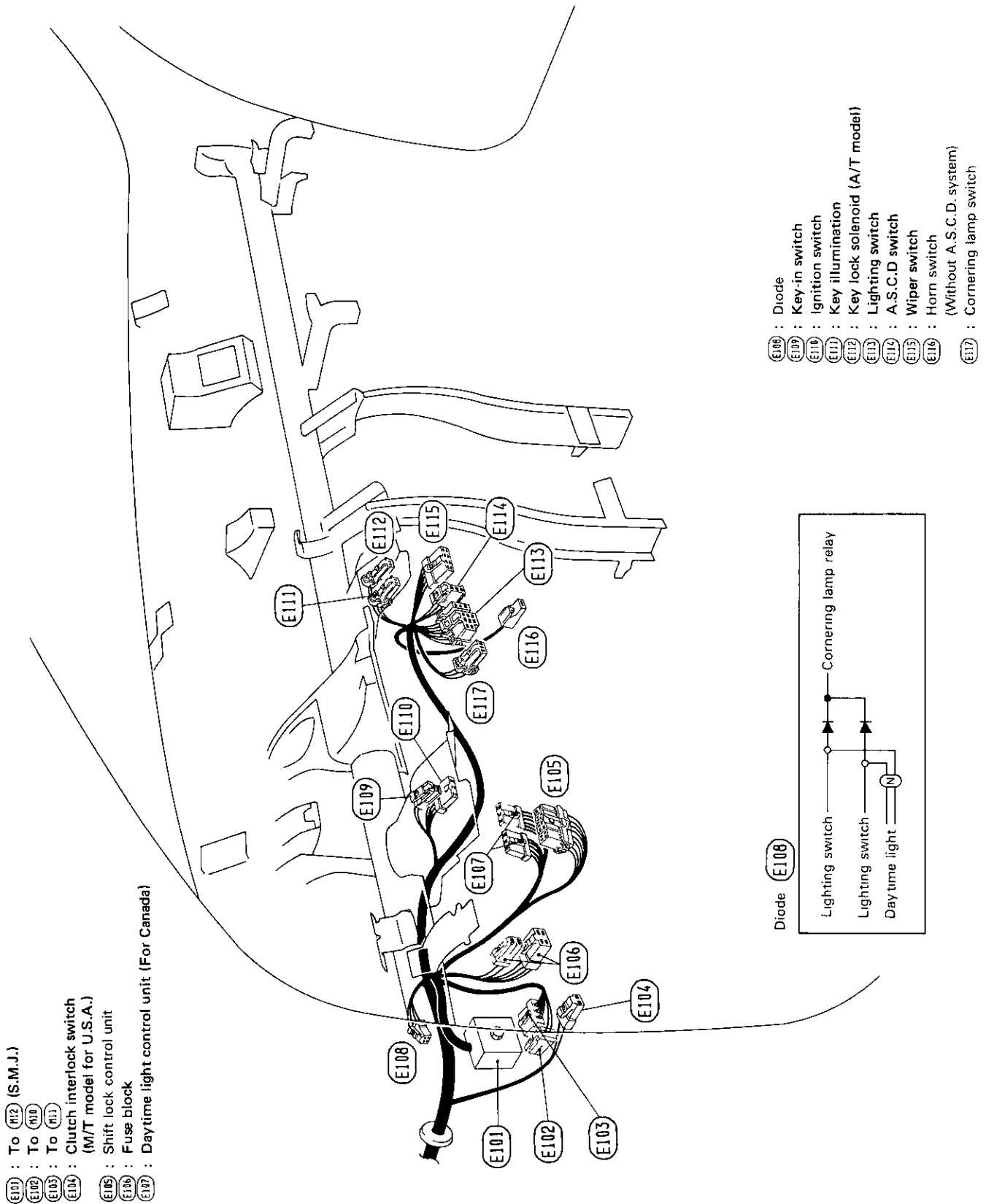
E1 : To F1  
 E2 : To F2  
 E3 : Actuator (For anti-lock brake system)  
 E4 : Washer sensor  
 E5 : Washer motor  
 E6 : Body ground  
 E7 : Alternator  
 E8 : Radiator fan relay-1  
 E9 : Horn relay  
 E10 : Cornering lamp relay  
 E11 : Inhibitor relay (A/T model)  
 E12 : Air conditioner relay  
 E13 : Radiator fan relay-2  
 E14 : Radiator fan relay-3  
 E15 : A.S.C.D. hold relay  
 E16 : Cornering lamp R.H.  
 E17 : Front turn signal lamp R.H.  
 E18 : Front combination lamp R.H.  
 E19 : Headlamp R.H.  
 E20 : Body ground  
 E21 : Compressor  
 E22 : Radiator fan motor-1  
 E23 : Radiator fan motor-2  
 E24 : Exhaust gas sensor  
 E25 : Horn R.H.  
 E26 : Horn ground  
 E27 : Horn L.H.

E28 : Headlamp L.H.  
 E29 : Dual-pressure switch  
 E30 : Body ground  
 E31 : Wiper relay  
 E32 : Bulb check relay  
 E33 : Interlock relay (M/T model for U.S.A.)  
 E34 : Fuel pump relay  
 E35 : Blower relay  
 E36 : To A1  
 E37 : To A2  
 E38 : To A3  
 E39 : Front combination lamp L.H.  
 E40 : Front turn signal lamp L.H.  
 E41 : Cornering lamp L.H.  
 E42 : E.C.C.S. relay  
 E43 : Fusible link box  
 E44 : Battery  
 E45 : Fusible link  
 E46 : Joint connector-1  
 E47 : Joint connector-2  
 E48 : Joint connector-3  
 E49 : Joint connector-4  
 E50 : A.S.C.D. pump  
 E51 : Front sensor L.H.  
 (For anti-lock brake system)  
 E52 : Body ground (For anti-lock brake system)  
 E53 : Brake fluid level switch

# HARNESS LAYOUT

## Engine Room Harness (Cont'd)

### PASSENGER COMPARTMENT



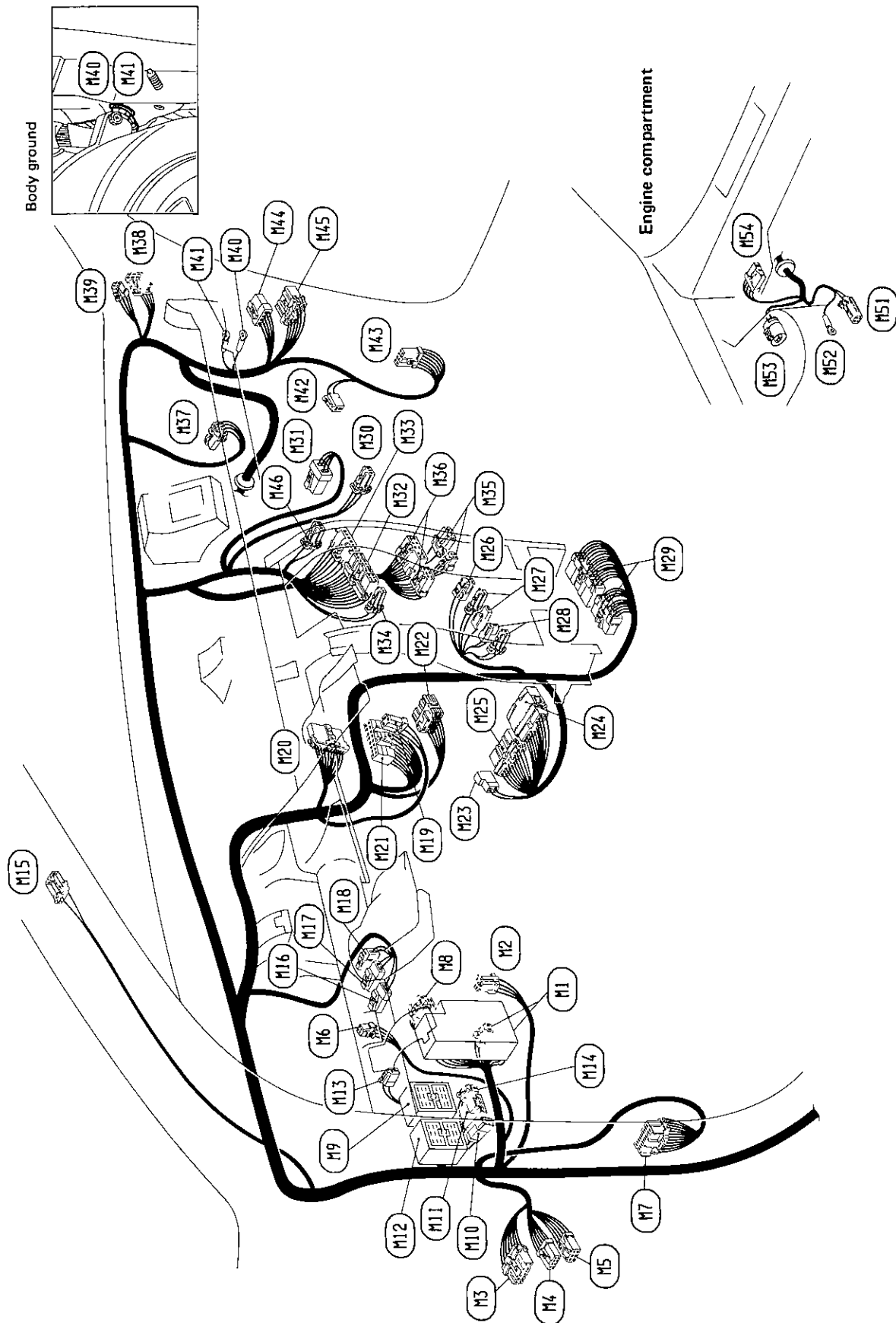
## HARNESS LAYOUT

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NOTE

# HARNESS LAYOUT

## Main Harness

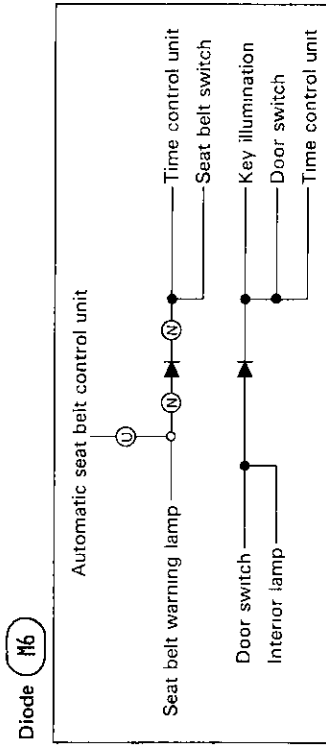




# HARNESS LAYOUT

## Main Harness (Cont'd)

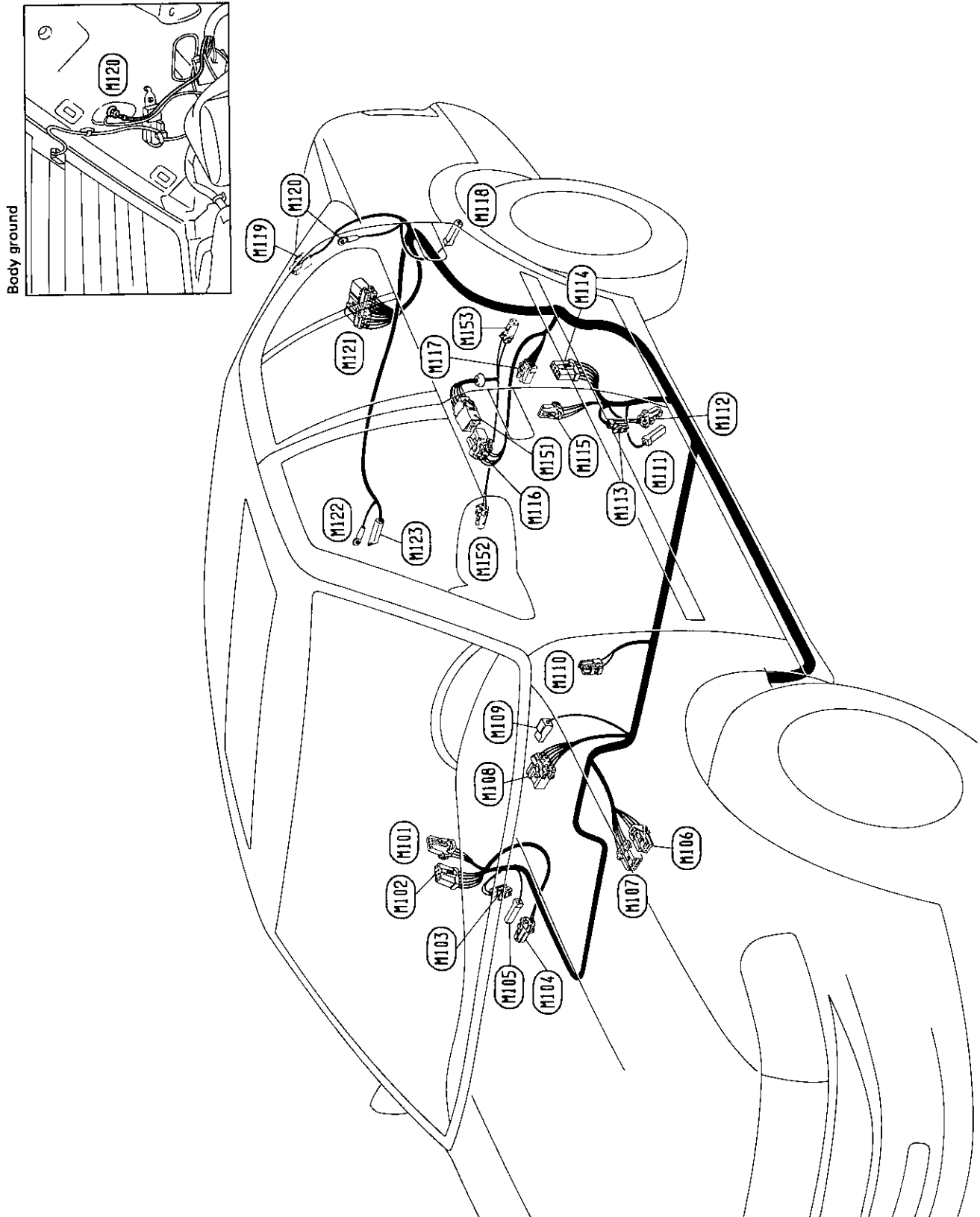
**Engine compartment**  
 (M51) : Front sensor R.H. (For anti-lock brake system)  
 (M52) : Body ground (For anti-lock brake system)  
 (M53) : Power steering oil pressure switch  
 (M54) : Wiper motor



(M1) : Fuse block  
 (M2) : Power window relay  
 (M3) : To (D1)  
 (M4) : To (D2)  
 (M5) : To (D3)  
 (M6) : Diode  
 (M7) : Time control unit  
 (M8) : Rear window defogger relay  
 (M9) : To (I1) (S.M.J.)  
 (M10) : To (E102)  
 (M11) : To (E103)  
 (M12) : To (E101) (S.M.J.)  
 (M13) : Circuit breaker-1  
 (M14) : Circuit breaker-2  
 (M15) : Front limit switch L.H. (For U.S.A.)  
 (M16) : A.S.C.D. clutch switch  
 (M17) : A.S.C.D. cancel switch  
 (M18) : Stop lamp switch  
 (M19) : Combination flasher unit  
 (M20) : Mode door motor  
 (M21) : A.S.C.D. control unit  
 (M22) : Check connector  
 (M23) : To (F53)  
 (M24) : To (F51)  
 (M25) : To (F52)  
 (M26) : Ash tray illumination  
 (M27) : Cigarette lighter (For Canada)  
 (M28) : Cigarette lighter (For U.S.A.)  
 (M29) : Automatic seat belt control unit (For U.S.A.)  
 (M30) : Thermo control amp.  
 (M31) : Resistor  
 (M32) : Push control unit  
 (M33) : Fan switch  
 (M34) : Fresh vent control illumination  
 (M35) : Cassete deck  
 (M36) : Radio  
 (M37) : Intake door motor  
 (M38) : To (R1) (For U.S.A.)  
 (M39) : To (R2) (For Canada)  
 (M40) : Body ground  
 (M41) : Body ground  
 (M42) : Blower motor  
 (M43) : Door lock timer  
 (M44) : To (D32)  
 (M45) : To (D31)  
 (M46) : A/C switch

# HARNESS LAYOUT

## Main Harness (Cont'd)



# HARNESS LAYOUT

## Main Harness (Cont'd)

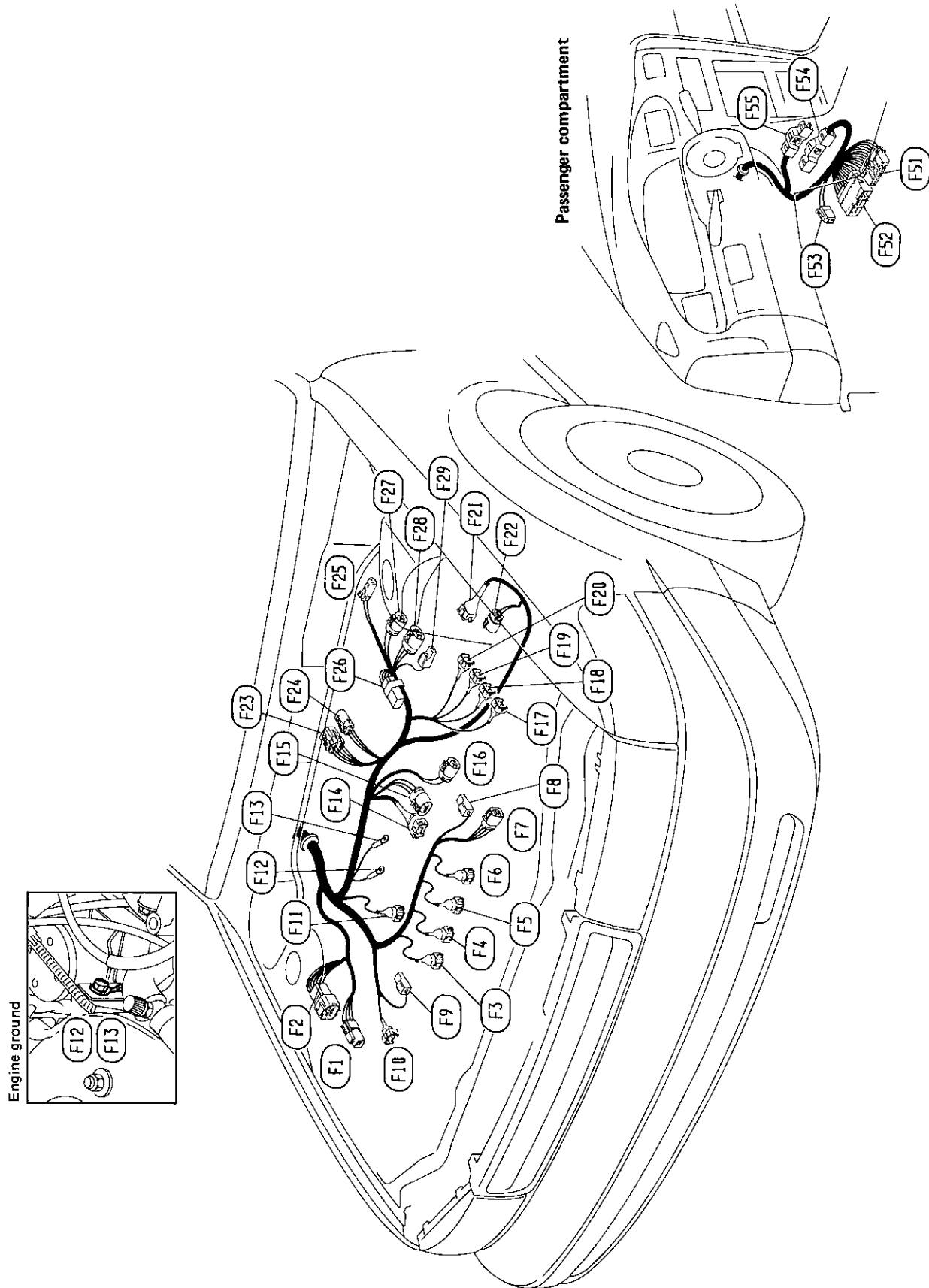
### Rear sensor harness (For anti-lock brake system)

- (M101) : Rear limit switch and shoulder belt buckle switch R.H.  
(For U.S.A.)
- (M102) : To (M71)
- (M103) : Drive motor R.H. (For U.S.A.)
- (M104) : Front door switch R.H. (For U.S.A.)
- (M105) : Front door switch R.H. (For Canada)
- (M106) : Overdrive switch and A/T indicator illumination  
(A/T model)
- (M107) : Shift lock solenoid and detention switch (A/T model)
- (M108) : A/T mode switch
- (M109) : Parking brake switch
- (M110) : Lap belt buckle switch (For U.S.A.)  
Seat belt switch (For Canada)
- (M111) : Front door switch L.H. (For Canada)
- (M112) : Front door switch L.H.
- (M113) : Drive motor L.H. (For U.S.A.)
- (M114) : To (M51)
- (M115) : Rear limit switch and shoulder belt buckle switch L.H.  
(For U.S.A.)
- (M116) : To (M15) (For anti-lock brake system)
- (M117) : Fuel tank gauge unit
- (M118) : Rear door switch L.H.
- (M119) : Rear window defogger
- (M120) : Body ground
- (M121) : To (T1)
- (M122) : Body ground (For anti-lock brake system)
- (M123) : Anti-lock brake system control unit

- (M151) : To (M16)
- (M152) : Rear sensor R.H.
- (M153) : Rear sensor L.H.

# HARNESS LAYOUT

## E.F.I. Harness



# HARNESS LAYOUT E.F.I. Harness (Cont'd)

- Passenger compartment

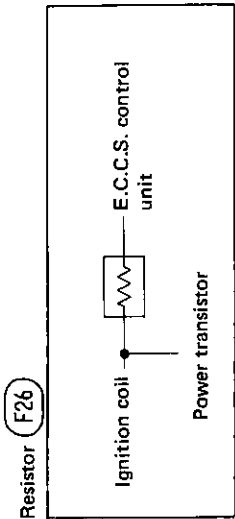
F51 : To M24

F52 : To M25

F53 : To M23

F54 : E.C.C.S. control unit

F55 : A/T control unit (A/T model)



- F1 : To E1

F2 : To F2

F3 : Injector No. 1

F4 : Injector No. 2

F5 : Injector No. 3

F6 : Injector No. 4

F7 : Crank angle sensor

F8 : Distributor ground

F9 : Thermal transmitter

F10 : Engine temperature sensor

F11 : A.A.C. valve

F12 : Engine ground

F13 : Engine ground

F14 : Throttle valve switch

F15 : Throttle sensor

F16 : Exhaust gas temperature sensor

(For California)

F17 : A.I.V. control solenoid valve

F18 : Pressure regulator control solenoid valve

F19 : S.C.V. control solenoid valve

F20 : E.G.R. control solenoid valve

F21 : Air flow meter

F22 : Air temperature sensor

F23 : To terminal cord assembly (A/T model)

F24 : Speed sensor

F25 : Dropping resistor (A/T model)

F26 : Resistor and condenser

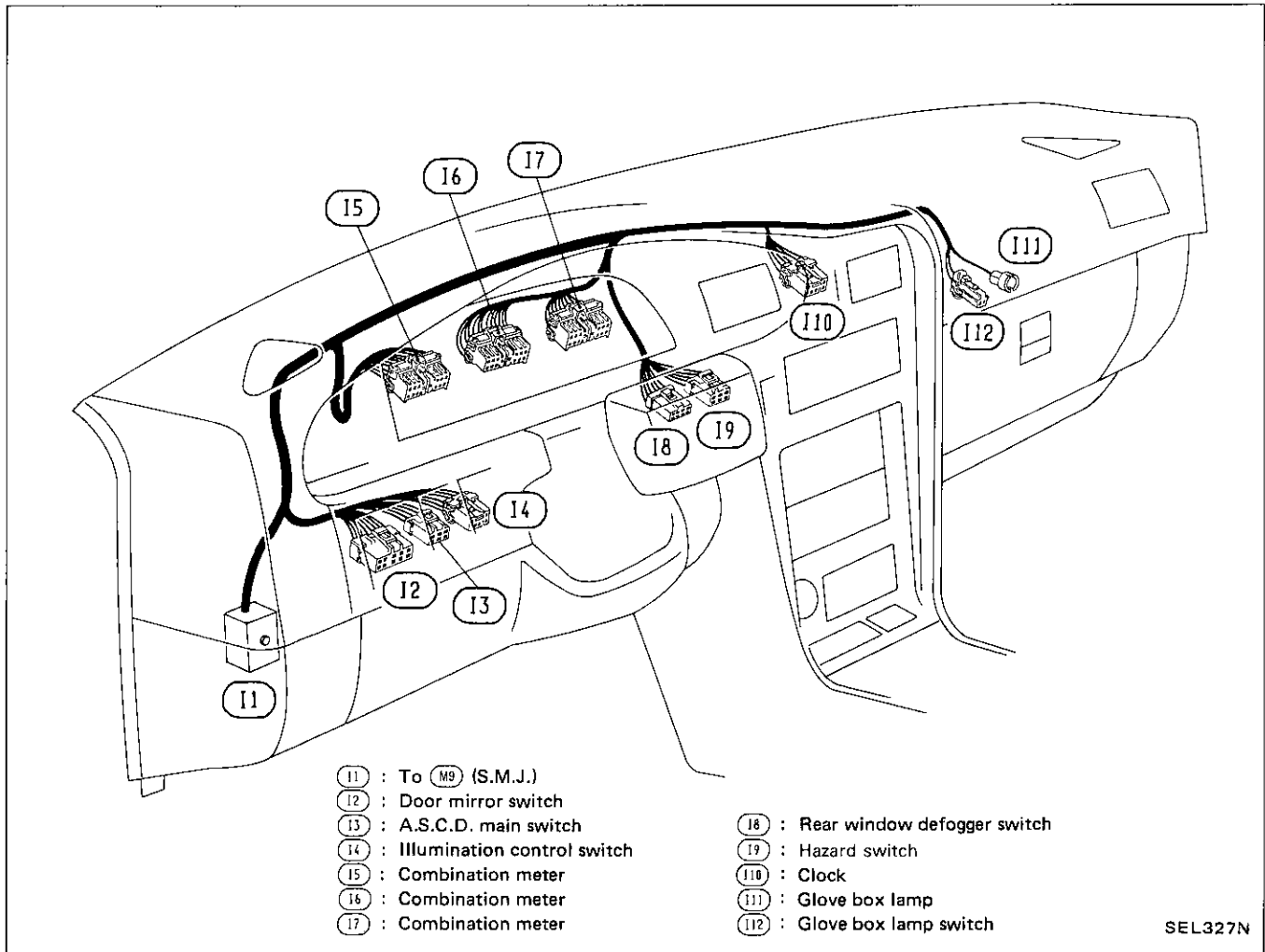
F27 : Ignition coil

F28 : Power transistor

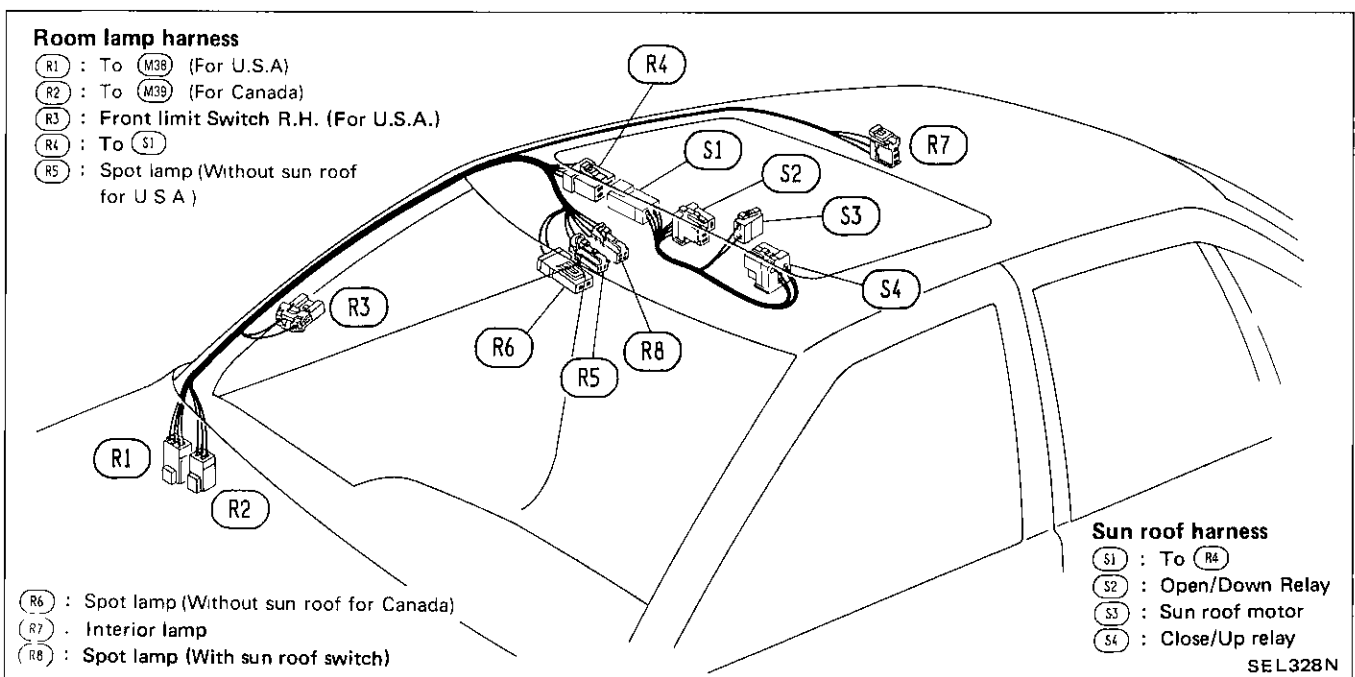
F29 : Ignition coil

# HARNESS LAYOUT

## Instrument Harness



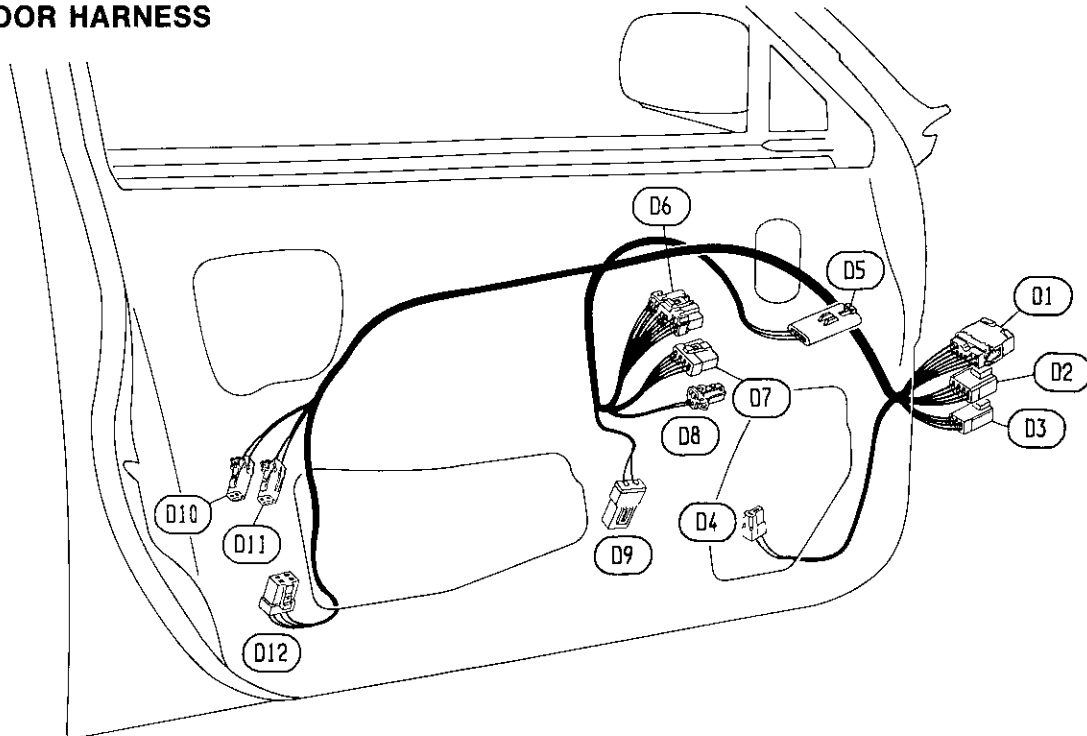
## Room Lamp and Sun Roof Harness



# HARNESS LAYOUT

## Door Harness (L.H. side)

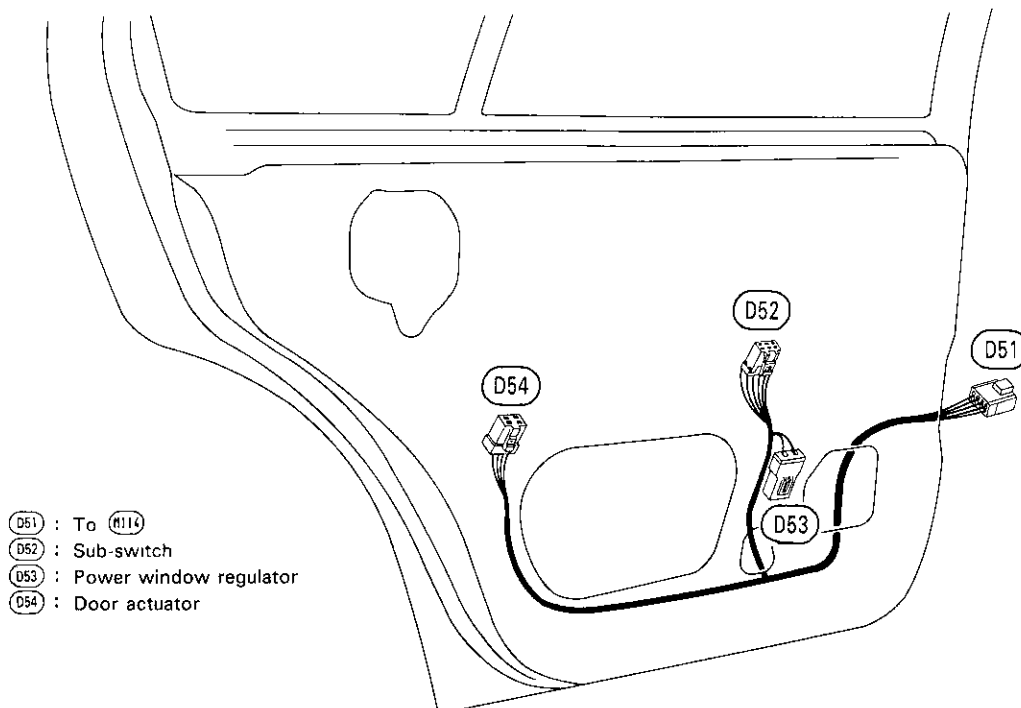
### FRONT DOOR HARNESS



- D1 : To M3
- D2 : To M4
- D3 : To M5
- D4 : Door speaker
- D5 : Door mirror
- D6 : Main switch
- D7 : Power window amp
- D8 : Main switch illumination
- D9 : Power window regulator

- D10 : Door latch switch (For U.S.A.)
- D11 : Door lock knob switch
- D12 : Door actuator

### REAR DOOR HARNESS



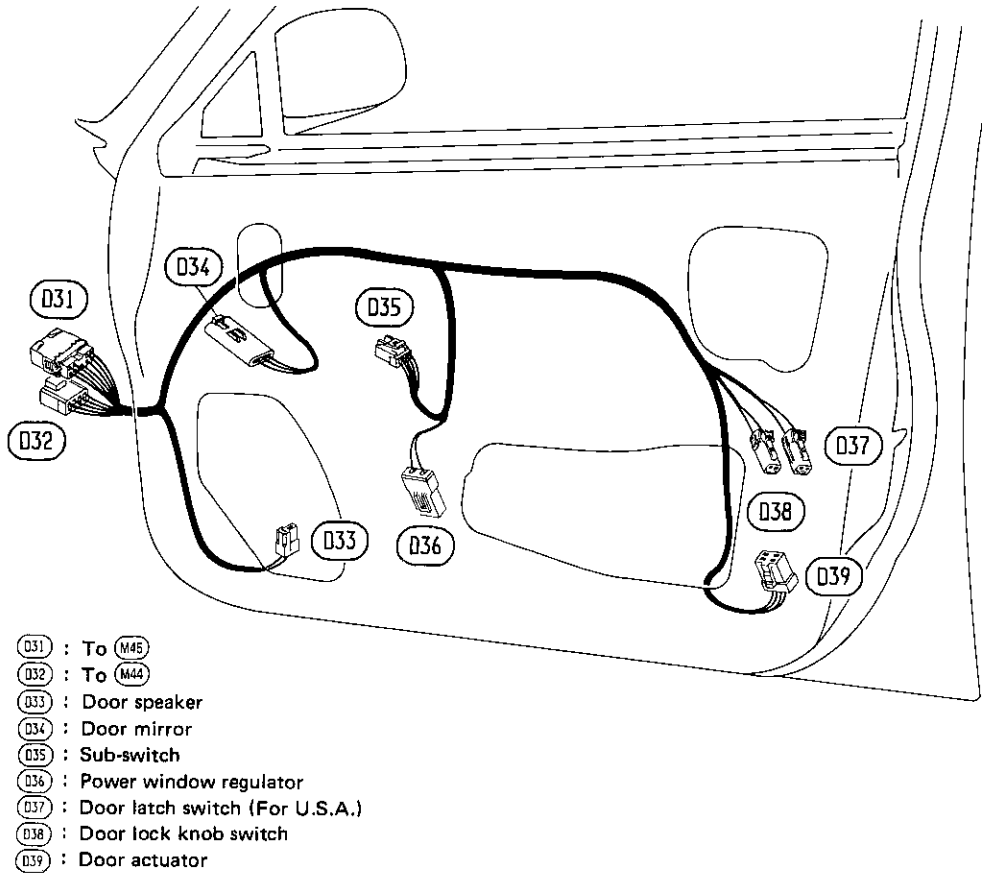
- D51 : To R114
- D52 : Sub-switch
- D53 : Power window regulator
- D54 : Door actuator

SEL329N

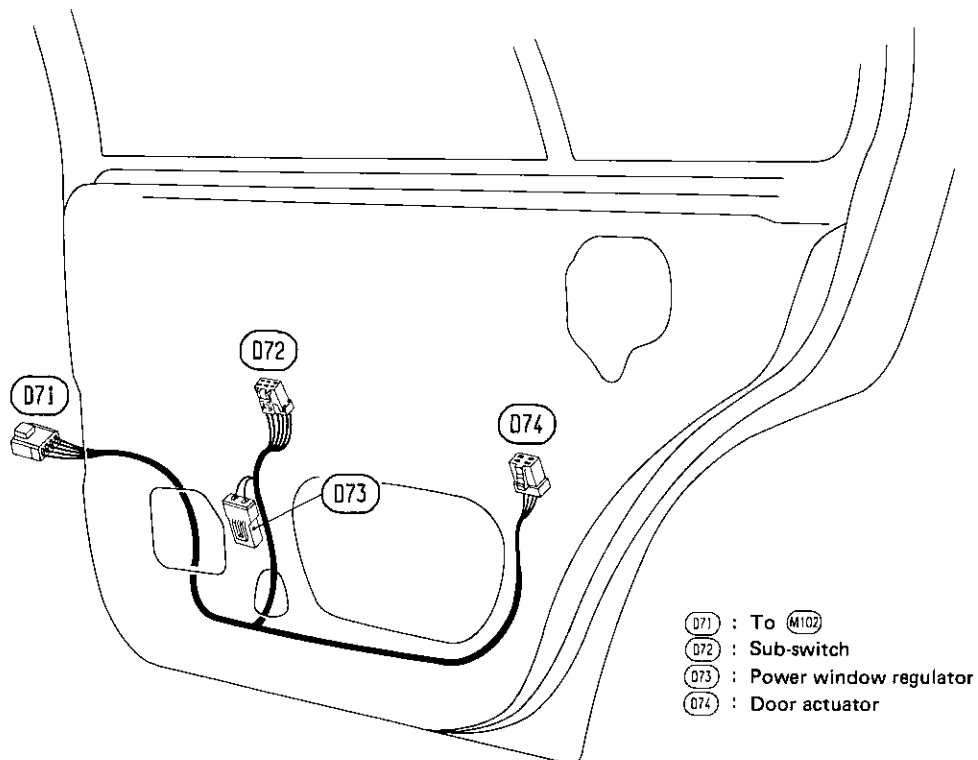
# HARNESS LAYOUT

## Door Harness (R.H. side)

### FRONT DOOR HARNESS



### REAR DOOR HARNESS

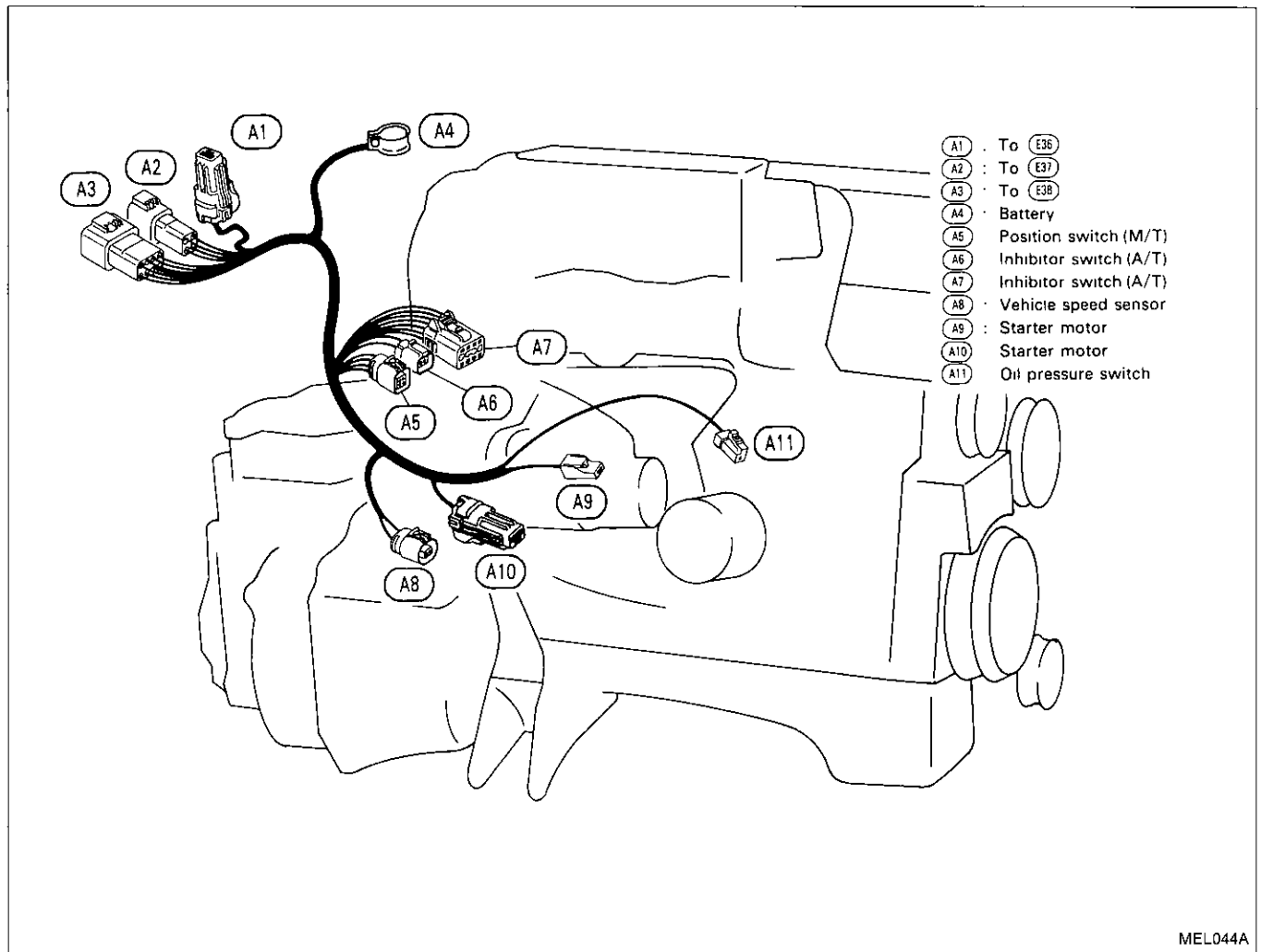


SEL330N



# HARNESS LAYOUT

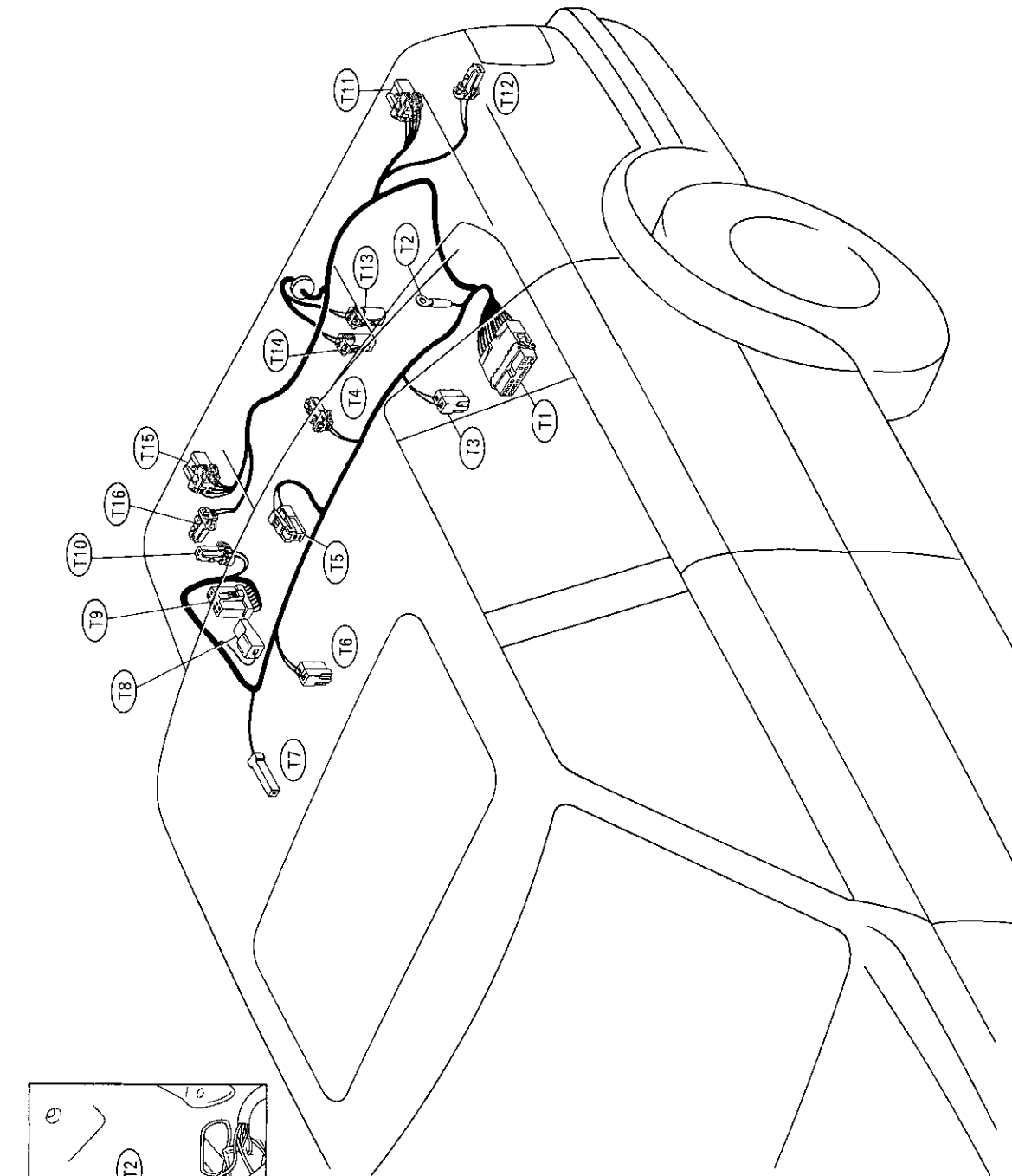
## Engine Harness No. 2



MEL044A

# HARNESS LAYOUT

## Tail Harness

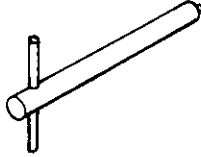


- (T1) : To (MT2)
- (T2) : Body ground
- (T3) : Rear speaker L.H.
- (T4) : High-mounted stop lamp
- (T5) : Trunk room lamp
- (T6) : Rear speaker R.H.
- (T7) : Rear door switch R.H.
- (T8) : Trunk room lamp switch
- (T9) : Power antenna timer
- (T10) : Power antenna motor
- (T11) : Rear combination lamp L.H.
- (T12) : Rear side marker L.H.
- (T13) : License lamp L.H.
- (T14) : License lamp R.H.
- (T15) : Rear combination lamp R.H.
- (T16) : Rear side marker R.H.

SEL332N

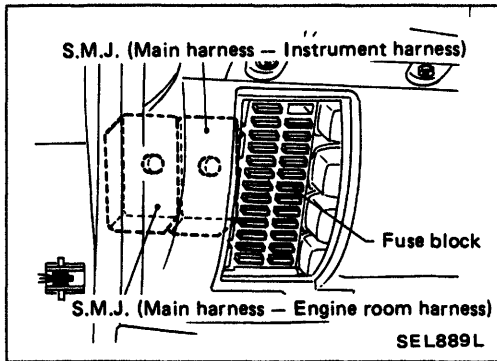
## SPECIAL SERVICE TOOL

| Cool Number | Tool name                    |
|-------------|------------------------------|
| (J35126)    | Washer nozzle adjusting tool |



**NOTE**

## SUPER MULTIPLE JUNCTION (S.M.J.)



### INSTALLATION

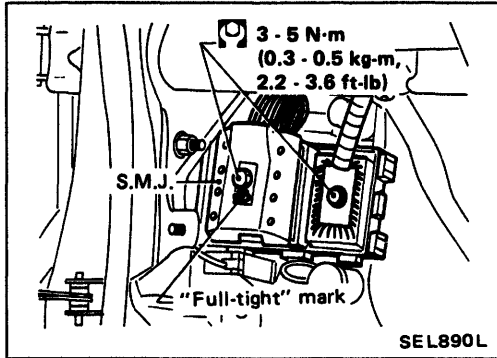
To install S.M.J., tighten bolts until orange "fulltight" mark appears and then retighten to specified torque as required.

☐: 3 - 5 N·m

(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

### CAUTION:

Do not overtighten bolts, otherwise, they may be damaged.



# SUPER MULTIPLE JUNCTION (S.M.J.)

## Terminal Arrangement

### MAIN HARNESS

|    |    |    |    |    |    |     |     |    |     |     |     |
|----|----|----|----|----|----|-----|-----|----|-----|-----|-----|
| J1 | J2 | J3 | J4 | J5 | J6 | J7  | J8  | J9 | J10 | J11 | J12 |
| H1 | H2 | H3 | H4 | H5 | H6 | H7  | H8  | H9 | H10 | H11 | H12 |
| G1 | G2 | G3 | G4 | G5 | G6 | G7  | G8  | G9 | G10 | G11 | G12 |
| F1 | F2 |    |    |    |    | F11 | F12 |    |     |     |     |
| E1 | E2 |    |    |    |    | E11 | E12 |    |     |     |     |
| D1 | D2 |    |    |    |    | D11 | D12 |    |     |     |     |
| C1 | C2 | C3 | C4 | C5 | C6 | C7  | C8  | C9 | C10 | C11 | C12 |
| B1 | B2 | B3 | B4 | B5 | B6 | B7  | B8  | B9 | B10 | B11 | B12 |
| A1 | A2 | A3 | A4 | A5 | A6 | A7  | A8  | A9 | A10 | A11 | A12 |

|     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
| K1  | L1  | M1  | N1  | P1  | Q1  |
| K2  | L2  | M2  | N2  | P2  | Q2  |
| K3  | L3  | M3  | N3  | P3  | Q3  |
| K4  | L4  | M4  | N4  | P4  | Q4  |
| K5  | L5  | M5  | N5  | P5  | Q5  |
| K6  |     |     |     |     | Q6  |
| K7  |     |     |     |     | Q7  |
| K8  |     |     |     |     | Q8  |
| K9  |     |     |     |     | Q9  |
| K10 |     |     |     |     | Q10 |
| K11 |     |     |     |     | Q11 |
| K12 | L12 | M12 | N12 | P12 | Q12 |
| K13 | L13 | M13 | N13 | P13 | Q13 |
| K14 | L14 | M14 | N14 | P14 | Q14 |
| K15 | L15 | M15 | N15 | P15 | Q15 |
| K16 | L16 | M16 | N16 | P16 | Q16 |

|    |    |    |    |    |    |     |     |    |     |     |     |
|----|----|----|----|----|----|-----|-----|----|-----|-----|-----|
| A1 | A2 | A3 | A4 | A5 | A6 | A7  | A8  | A9 | A10 | A11 | A12 |
| B1 | B2 | B3 | B4 | B5 | B6 | B7  | B8  | B9 | B10 | B11 | B12 |
| C1 | C2 | C3 | C4 | C5 | C6 | C7  | C8  | C9 | C10 | C11 | C12 |
| D1 | D2 |    |    |    |    | D11 | D12 |    |     |     |     |
| E1 | E2 |    |    |    |    | E11 | E12 |    |     |     |     |
| F1 | F2 |    |    |    |    | F11 | F12 |    |     |     |     |
| G1 | G2 | G3 | G4 | G5 | G6 | G7  | G8  | G9 | G10 | G11 | G12 |
| H1 | H2 | H3 | H4 | H5 | H6 | H7  | H8  | H9 | H10 | H11 | H12 |
| J1 | J2 | J3 | J4 | J5 | J6 | J7  | J8  | J9 | J10 | J11 | J12 |

|     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
| K16 | L16 | M16 | N16 | P16 | Q16 |
| K15 | L15 | M15 | N15 | P15 | Q15 |
| K14 | L14 | M14 | N14 | P14 | Q14 |
| K13 | L13 | M13 | N13 | P13 | Q13 |
| K12 | L12 | M12 | N12 | P12 | Q12 |
| K11 |     |     |     |     | Q11 |
| K10 |     |     |     |     | Q10 |
| K9  |     |     |     |     | Q9  |
| K8  |     |     |     |     | Q8  |
| K7  |     |     |     |     | Q7  |
| K6  |     |     |     |     | Q6  |
| K5  | L5  | M5  | N5  | P5  | Q5  |
| K4  | L4  | M4  | N4  | P4  | Q4  |
| K3  | L3  | M3  | N3  | P3  | Q3  |
| K2  | L2  | M2  | N2  | P2  | Q2  |
| K1  | L1  | M1  | N1  | P1  | Q1  |

### ENGINE ROOM HARNESS

### INSTRUMENT HARNESS

## E. C. C. S. CONTROL UNIT

|     |     |     |     |     |     |     |     |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3  | 4  | 5  | 6  | 7  | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |

View from harness side

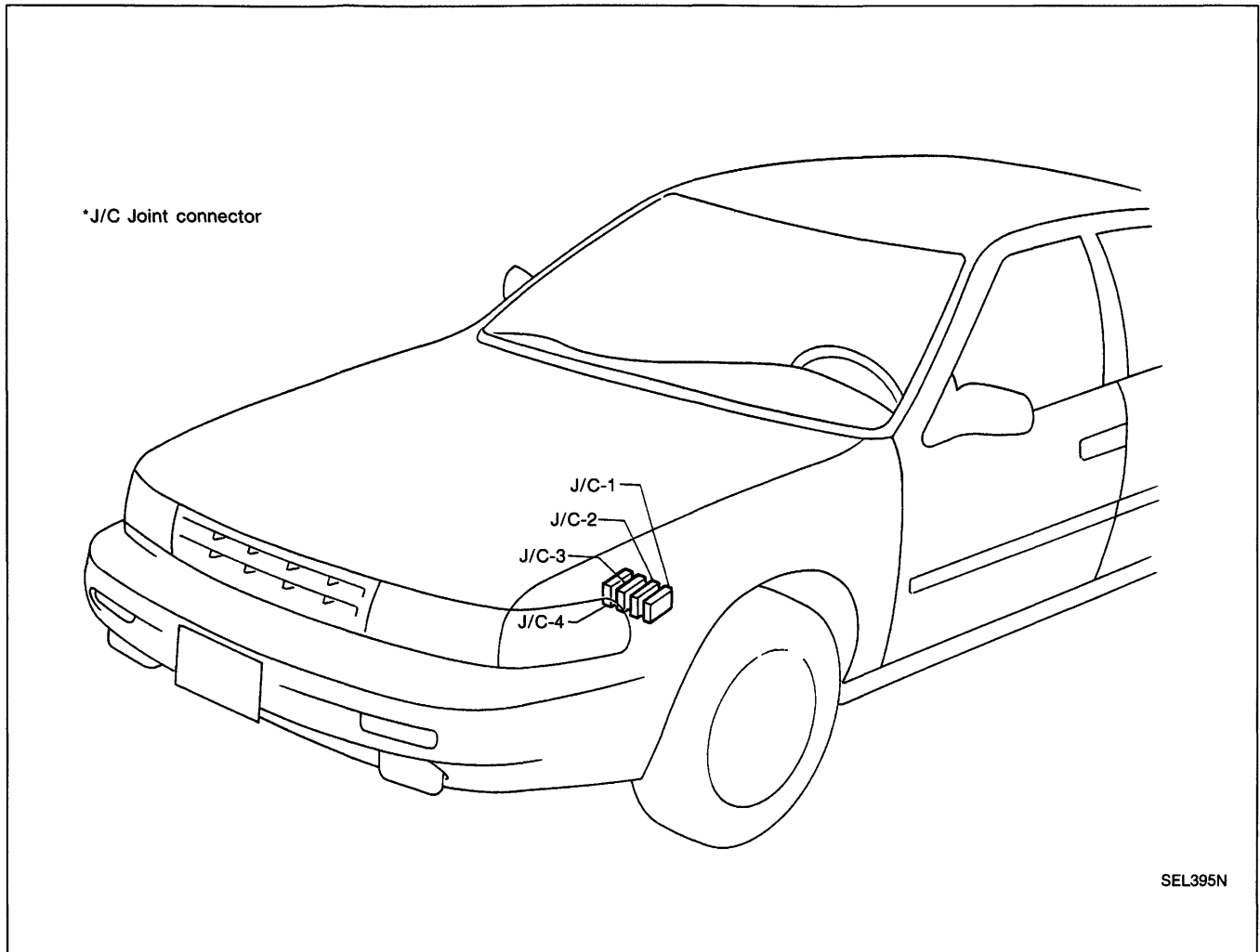
## A/T CONTROL UNIT

|   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 5 | 6 | 7 | 8 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |

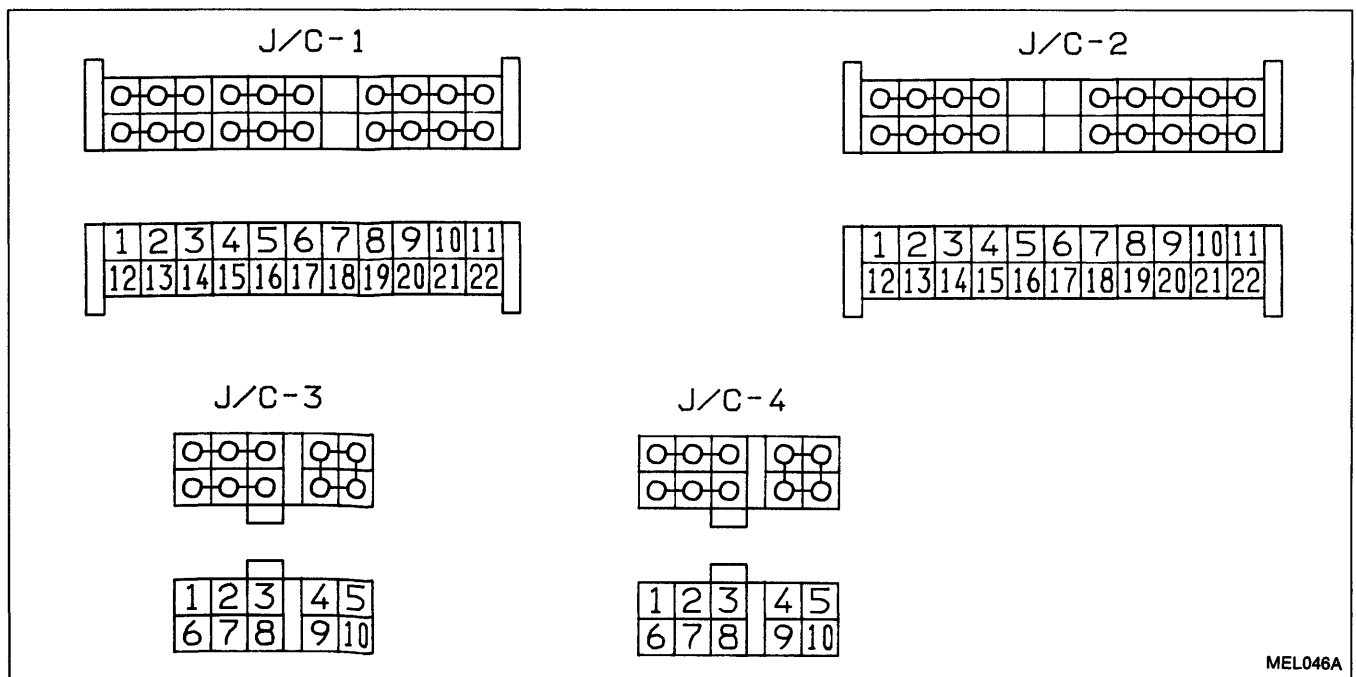
View from harness side

# JOINT CONNECTOR (J/C)

## Location



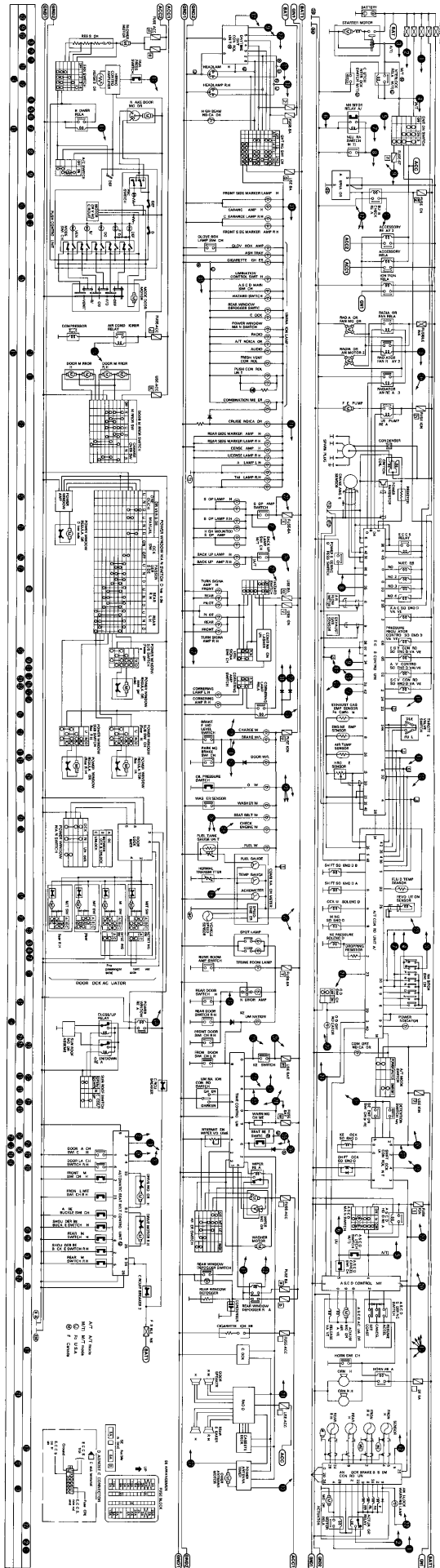
## Terminal Arrangement







# 1991 NISSAN STANZA 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 : STANZA 1991

## ENGINE TUNE-UP DATA

|                                                    |                                                     |                           |                             |
|----------------------------------------------------|-----------------------------------------------------|---------------------------|-----------------------------|
| Engine model                                       | KA24E                                               |                           |                             |
| Firing order                                       | 1-3-4-2                                             |                           |                             |
| Idle speed                                         | rpm                                                 |                           |                             |
| M/T                                                | 700±50, 750±50*                                     |                           |                             |
| A/T (in "N" position)                              | 700±50, 750±50*                                     |                           |                             |
| Ignition timing<br>(degree B.T.D.C. at idle speed) | 15±2                                                |                           |                             |
| Idle "CO" (% at idle speed)                        | Idle mixture screw is preset and sealed at factory. |                           |                             |
| High tension cable resistance<br>kΩ/m (kΩ/ft)      | Less than 30 (9.14)                                 |                           |                             |
| Spark plug                                         | Standard ZFR5E-11                                   |                           |                             |
| Type                                               | Hot                                                 | ZFR4E-11                  |                             |
|                                                    | Cold                                                | ZFR6E-11                  |                             |
| Gap                                                | mm (in)                                             | 1.0 - 1.1 (0.039 - 0.043) |                             |
| Drive belt deflection (Cold)                       | mm (in)                                             | Used belt deflection      |                             |
|                                                    |                                                     | Limit                     | Deflection after adjustment |
| Alternator                                         |                                                     | 8 (0.31)                  | 6 - 7<br>(0.24 - 0.28)      |
| Air conditioner compressor                         |                                                     | 8 (0.31)                  | 5 - 6<br>(0.20 - 0.24)      |
| Applied pressed force                              | N (kg, lb)                                          | 98 (10, 22)               |                             |
| Tightening torque                                  |                                                     | N-m                       | kg-m                        |
| Spark plug                                         |                                                     | 20 - 29                   | 2.0 - 3.0                   |
| Oil pan drain plug                                 |                                                     | 29 - 39                   | 3.0 - 4.0                   |

\*: For Canada

## BRAKE

|                          |                               |               |
|--------------------------|-------------------------------|---------------|
|                          |                               | Unit: mm (in) |
| Disc brake               |                               |               |
| Pad minimum thickness    | 2.0 (0.079)                   |               |
| Rotor repair limit       |                               |               |
| Runout                   | 0.07 (0.0028) or less         |               |
| Minimum thickness        | 20.0 (0.787)*1, 9.0 (0.354)*2 |               |
| Drum brake               |                               |               |
| Lining minimum thickness | 1.5 (0.059)                   |               |
| Drum repair limit        |                               |               |
| Maximum inner diameter   | 230.0 (9.06)                  |               |

\*1 Front disc brake

\*2 Rear disc brake

## REFILL CAPACITIES

| Unit                    |                    | Liter       | US measure     |
|-------------------------|--------------------|-------------|----------------|
| Fuel tank               |                    | 62          | 16-3/8 gal     |
| Coolant                 |                    | 7.4         | 7-7/8 qt       |
| Engine                  | With oil filter    | 3.5         | 3-3/4 qt       |
|                         | Without oil filter | 3.1         | 3-1/4 qt       |
| Transaxle               | M/T                | 4.7         | 10 pt          |
|                         | A/T                | 7.4         | 7-7/8 qt       |
| Power steering system   |                    | 0.9         | 1 qt           |
| Air conditioning system | Compressor oil     | 0.2         | 6.8 fl oz      |
|                         | Refrigerant        | 0.75 - 0.85 | 1.65 - 1.87 lb |

## CLUTCH PEDAL

Unit: mm (in)

|                 |                         |
|-----------------|-------------------------|
| Pedal height    | 165 - 175 (6.50 - 6.89) |
| Pedal free play | 1 - 3 (0.04 - 0.12)     |

## FRONT WHEEL ALIGNMENT (Unladen\*)

|                     |         |                     |
|---------------------|---------|---------------------|
| Camber              | degree  | -30' to 1°00'       |
| Caster              | degree  | 35' - 2°05'         |
| Kingpin inclination | degree  | 13°45' - 15°15'     |
| Toe in              | mm (in) | 1 - 3 (0.04 - 0.12) |
| Total toe-in        | degree  | 6' - 18'            |
| Turning angle       |         |                     |
| Inside              |         | 34° - 38°           |
| Outside             |         | 27° - 31°           |

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

## REAR WHEEL ALIGNMENT (Unladen\*)

|               |         |                  |
|---------------|---------|------------------|
| Camber        | degree  | -1°20' to 0°10'  |
| Toe-out       | mm (in) | 0 - 4 (0 - 0.16) |
| Total toe-out | degree  | 0' - 23'         |

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



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