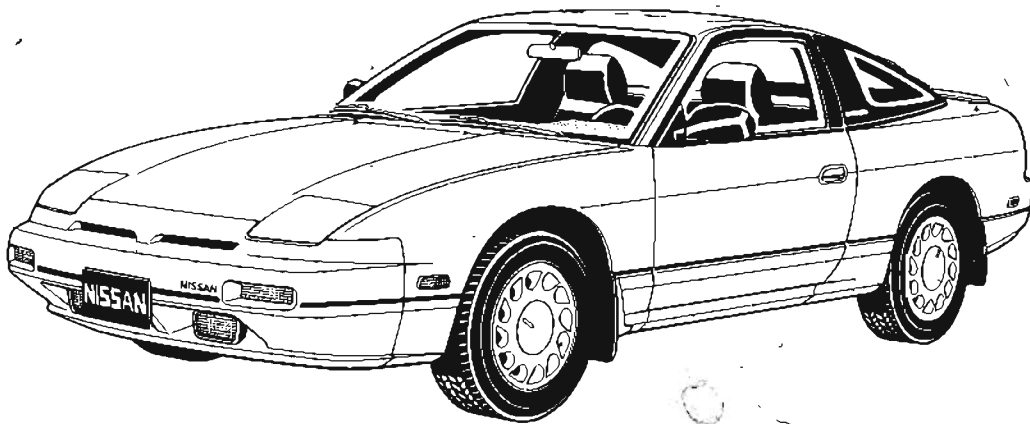




NISSAN 240SX

1989



SERVICE MANUAL

QUICK REFERENCE INDEX

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

NISSAN 240SX

MODEL S13 SERIES

FOREWORD

This manual contains maintenance and repair procedures for the 1989 Nissan 240SX.

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

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

IMPORTANT SAFETY NOTICE

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

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

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



NISSAN MOTOR CO., LTD.

Overseas Service Department

Tokyo, Japan

GENERAL INFORMATION

GI

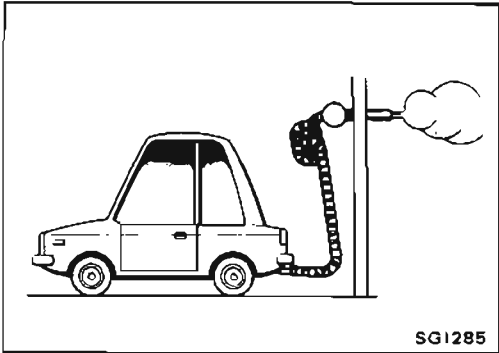
SECTION **GI**

CONTENTS

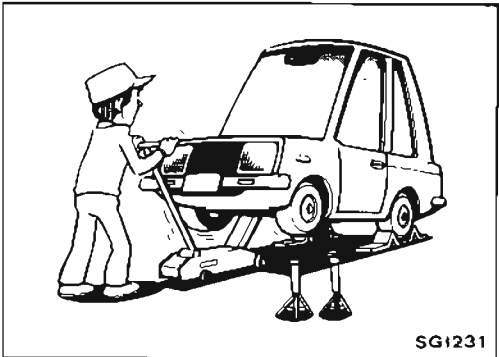
| | |
|---|-------|
| PRECAUTIONS | GI- 2 |
| HOW TO USE THIS MANUAL | GI- 5 |
| HOW TO READ WIRING DIAGRAMS | GI- 7 |
| HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES | GI-10 |
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| LIFTING POINTS AND TOW TRUCK TOWING | GI-17 |
| TIGHTENING TORQUE OF STANDARD BOLTS | GI-20 |

PRECAUTIONS

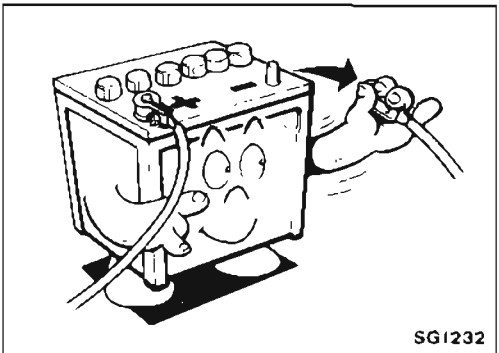
Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.



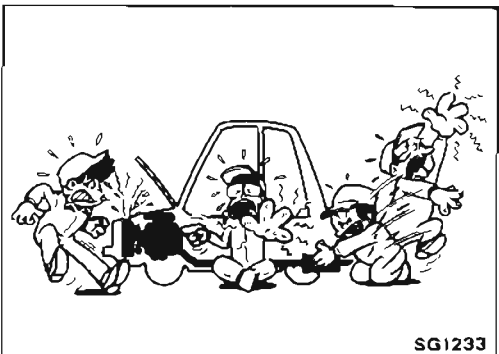
1. Do not operate the engine for an extended period of time without proper exhaust ventilation. Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working 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.

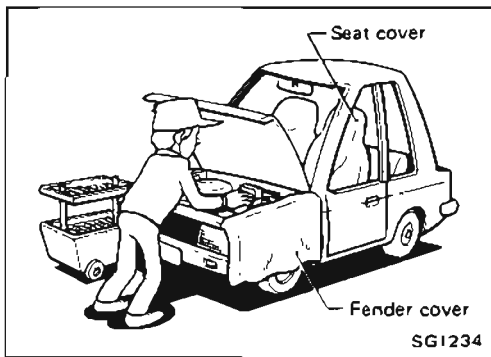


4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.



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 caution that keys, buckles or buttons on your person do not scratch the paint.

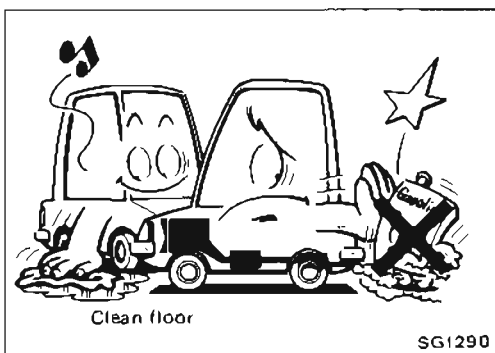
7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
9. Replace inner and outer races of tapered roller bearings and needle bearings as a set.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which use microcomputers (such as electronic control units).
Static electricity may damage internal electronic components.
12. After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
13. Use only the lubricants specified in MA section.
14. Use approved bonding agent, sealants or their equivalents when required.
15. Use tools and recommended special tools where specified for safe and efficient service repairs.
16. When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.
17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.



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

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

PRECAUTIONS



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:

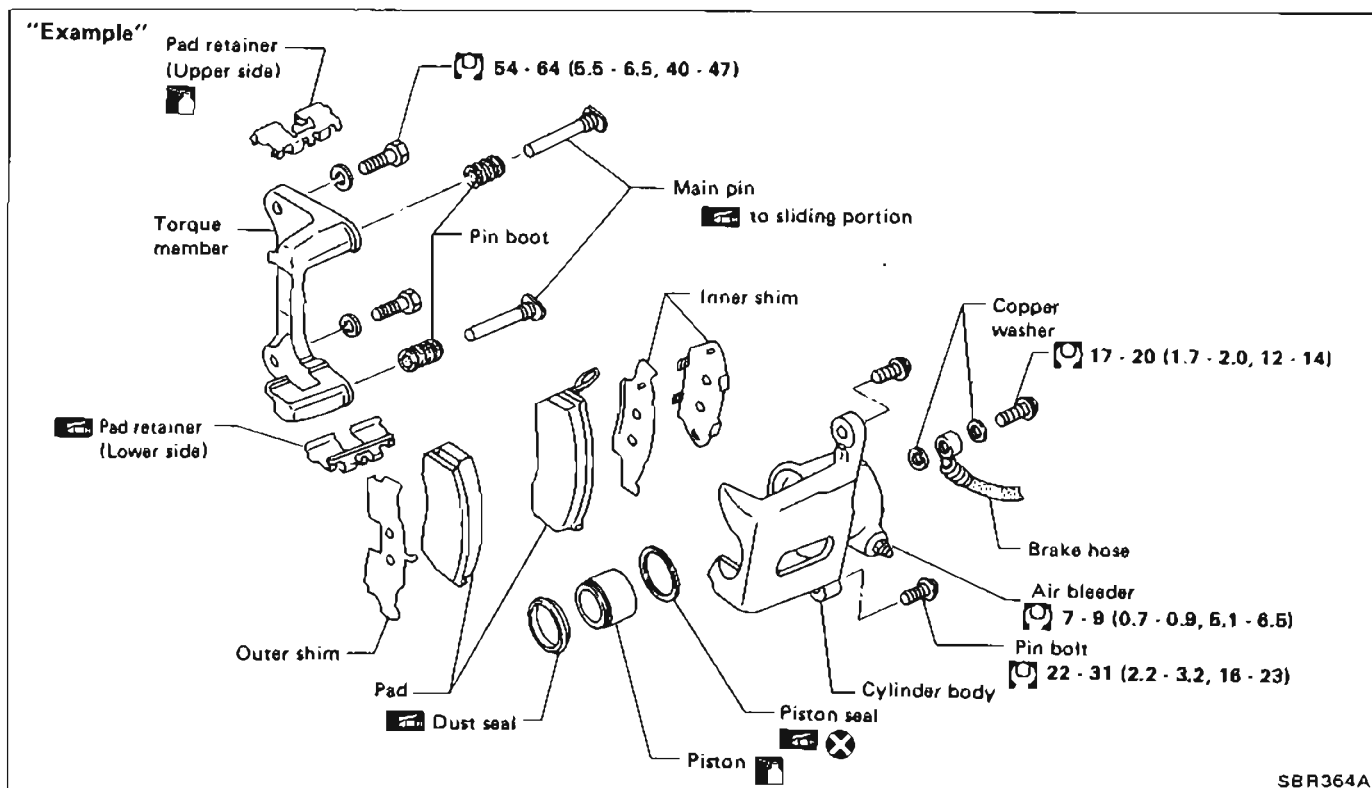
1. Use unleaded gasoline only. Leaded gasoline will seriously damage the catalytic converter.
2. When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
3. Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing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

Precautions for Fuel

Unleaded gasoline of
at least 87 AKI number (RON 91)

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

| | | | |
|------------|---|----------------|------------------------------------|
| | : Tightening torque | M/T | : Manual Transaxle/Transmission |
| | : Should be lubricated with grease. Unless otherwise indicated, use 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 disassembly. | A.T.F. | : Automatic Transmission Fluid |
| | : Apply petroleum jelly. | D ₁ | : Drive range 1st gear |
| | : Apply A.T.F. | D ₂ | : Drive range 2nd gear |
| ★ | : Select with proper thickness. | D ₃ | : Drive range 3rd gear |
| ☆ | : Adjustment is required. | D ₄ | : Drive range 4th gear |
| S.D.S. | : Service Data and Specifications | O.D. | : Overdrive |
| L.H., R.H. | : Left-Hand, Right-Hand | 2 ₂ | : 2nd range 2nd gear |
| | | 2 ₁ | : 2nd range 1st gear |
| | | 1 ₂ | : 1st range 2nd gear |
| | | 1 ₁ | : 1st range 1st gear |

HOW TO USE THIS MANUAL

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:

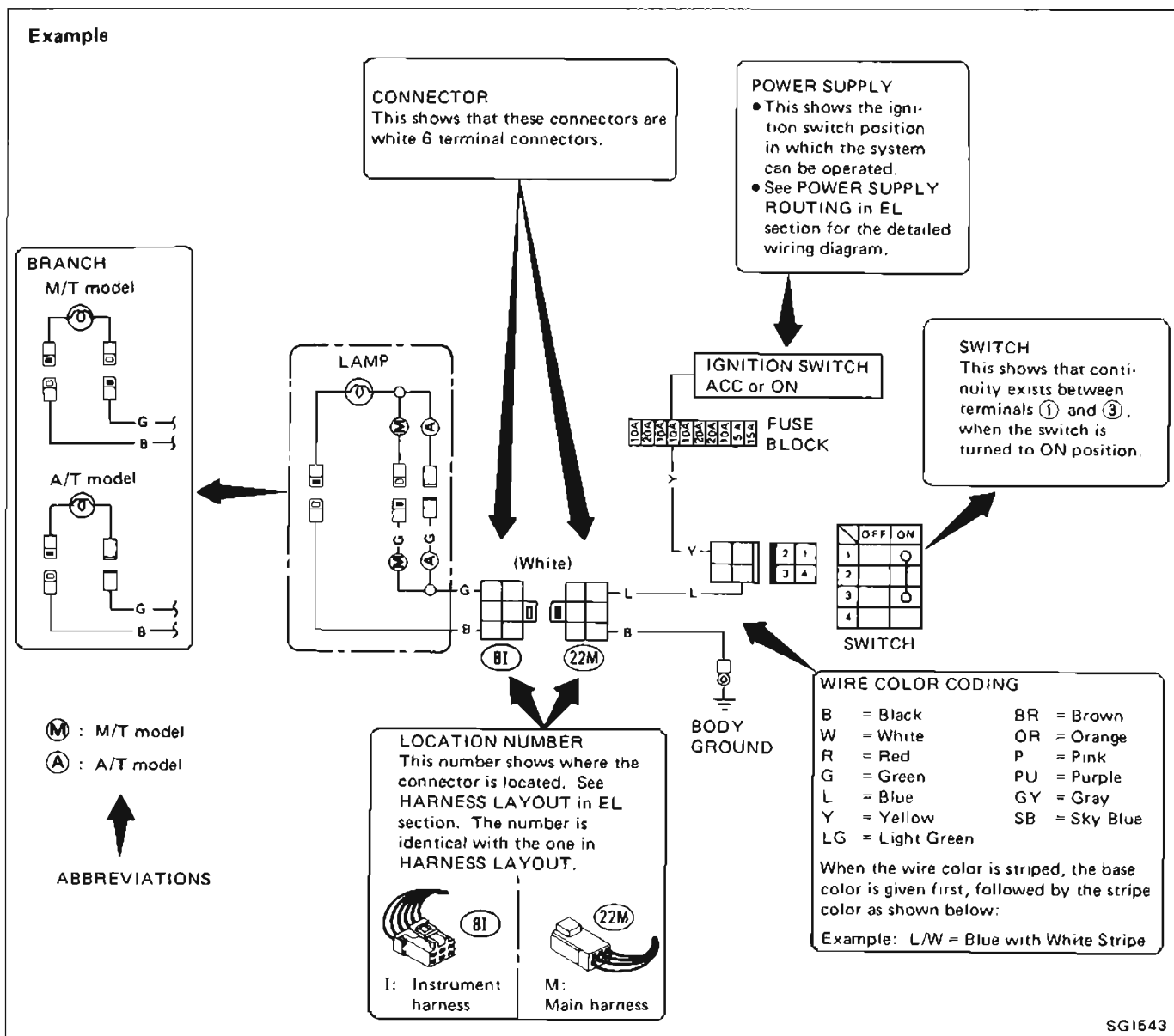
59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

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

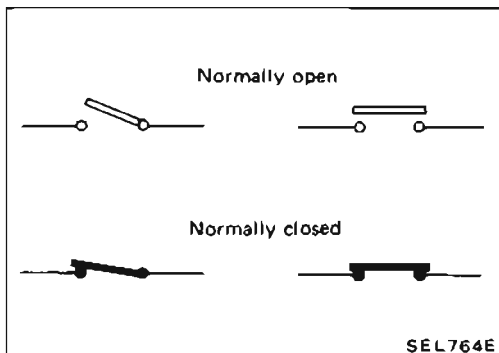
HOW TO READ WIRING DIAGRAMS

WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:



SG1543



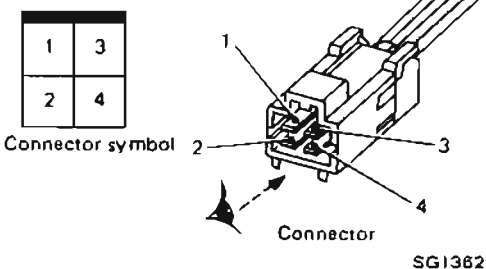
SWITCH POSITIONS

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

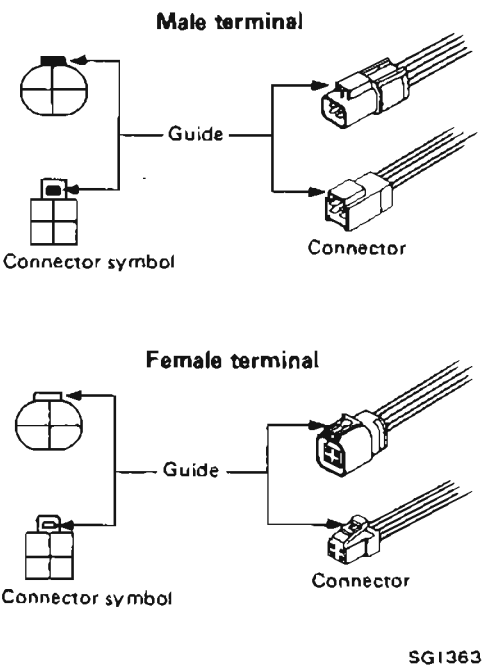
Example



CONNECTOR SYMBOLS

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

Example

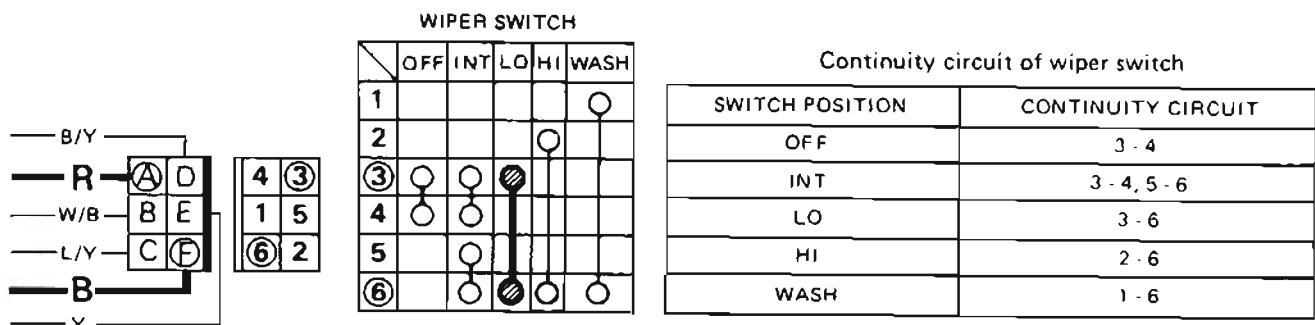


- Male and female terminals
Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

MULTIPLE SWITCH

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

Example



Example: Wiper switch in LO position

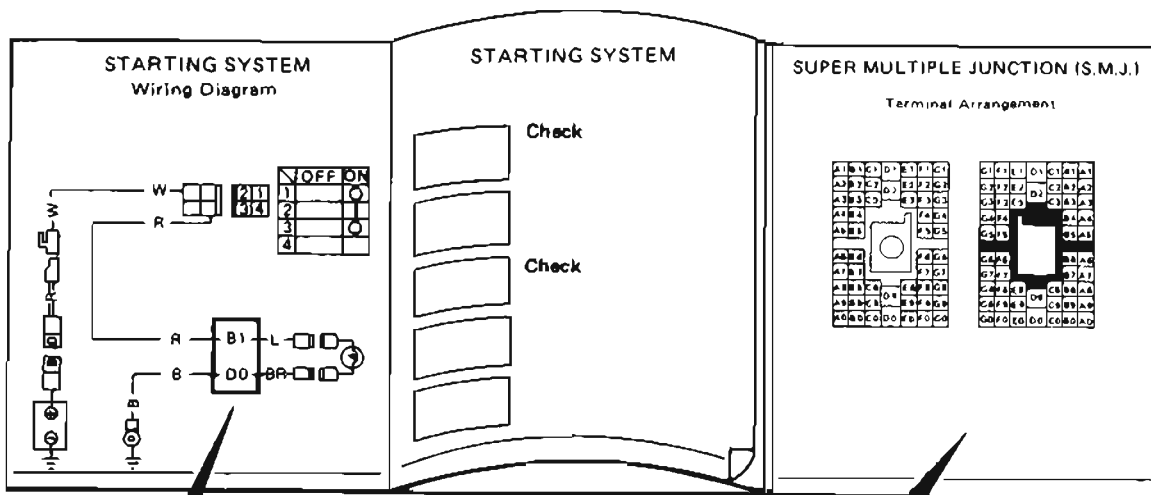
Continuity circuit: Red wire - (A) terminal - (③) terminal - Wiper switch (● - ●: LO) - (⑥) terminal - (F) terminal - Black wire

HOW TO READ WIRING DIAGRAMS

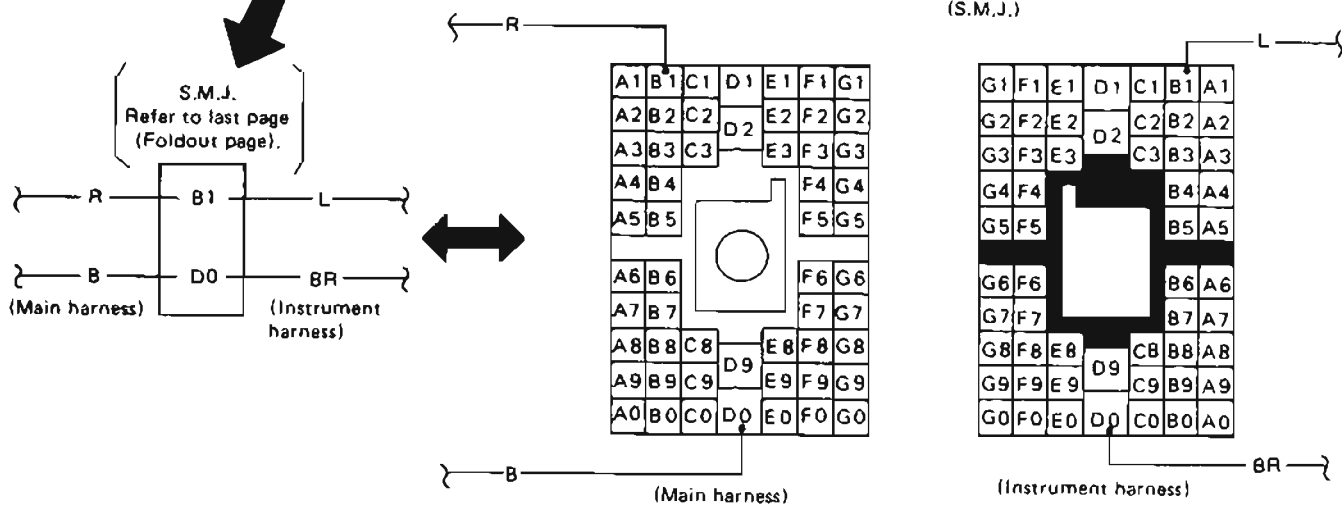
SUPER MULTIPLE JUNCTION (S.M.J.)

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

Example

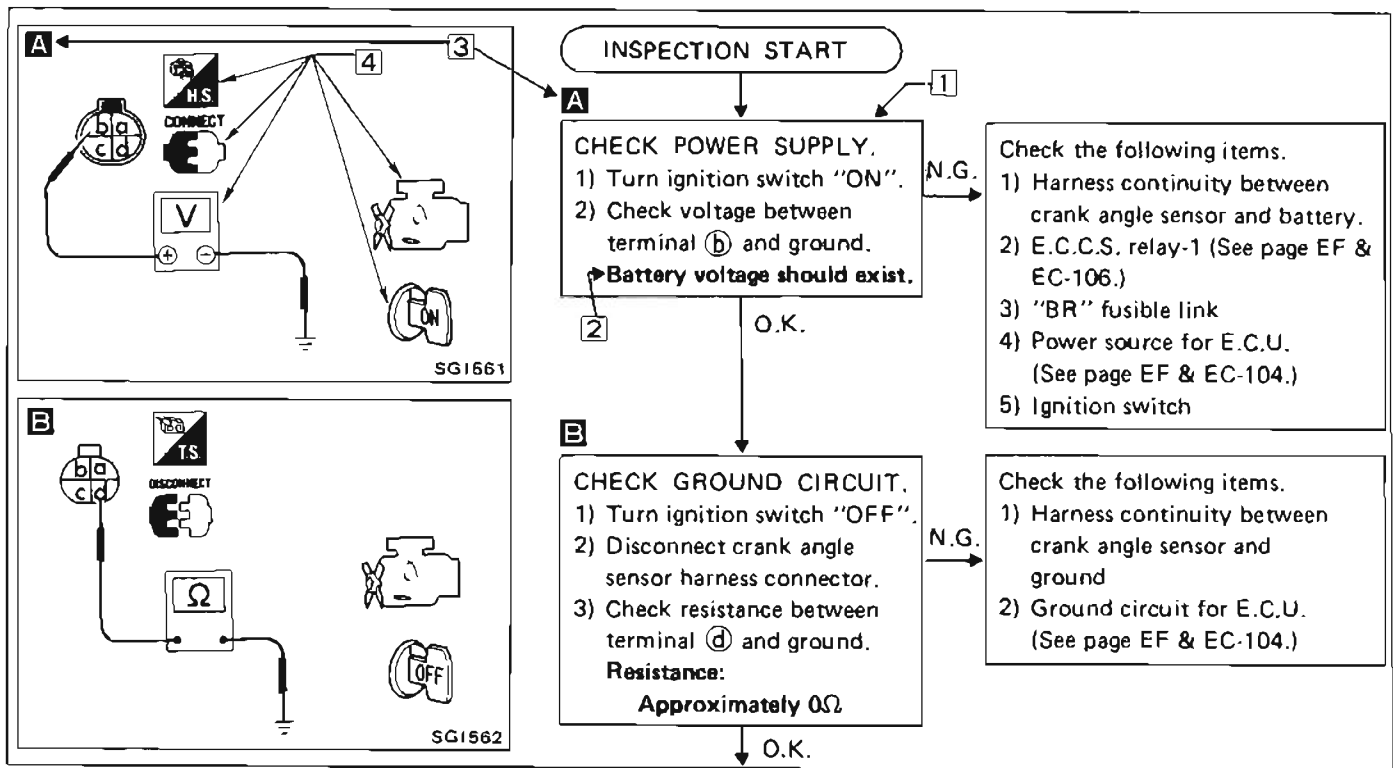


Super Multiple Junction (S.M.J.)



SEL653F

HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES



NOTICE

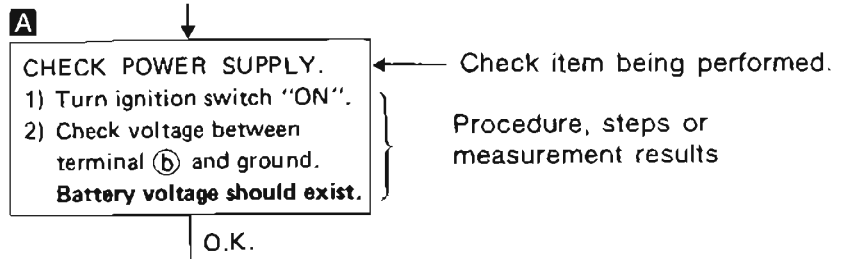
The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

- 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 Pin Point 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 it was.

HOW TO FOLLOW THIS FLOW CHART

1 Work and diagnostic procedure

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



2 Measurement results

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

These have the following meanings:

Battery voltage → 11 - 14V or approximately 12V

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

3 Cross reference of work symbols in the text and illustrations

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

4 Symbols used in illustrations

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

Direction mark

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

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



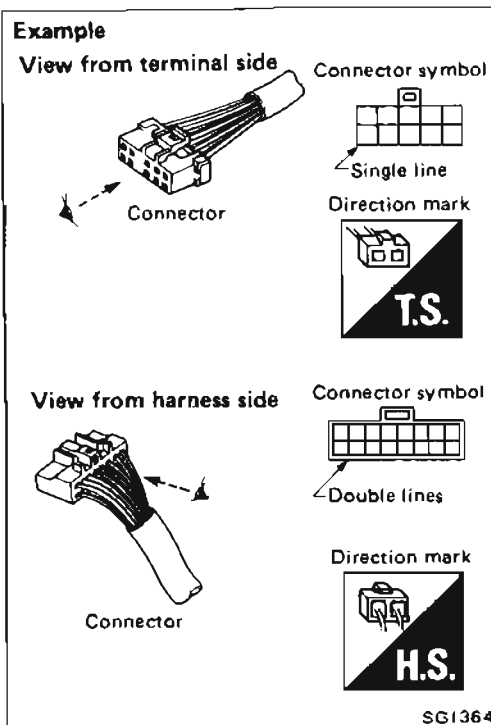
: View from terminal side ... T.S.

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
















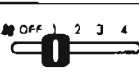
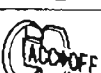
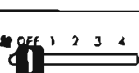















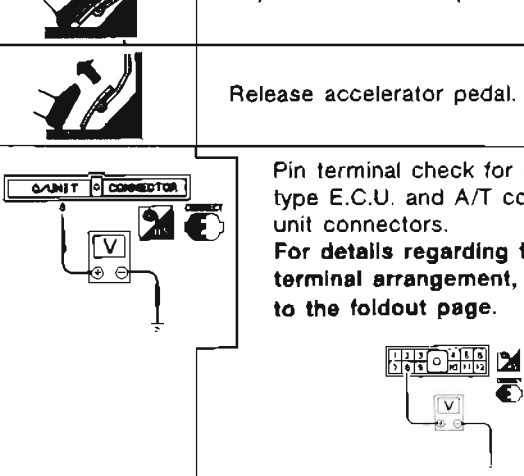

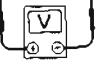
: View from harness side ... H.S.

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



HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

Key to symbols signifying measurements or procedures

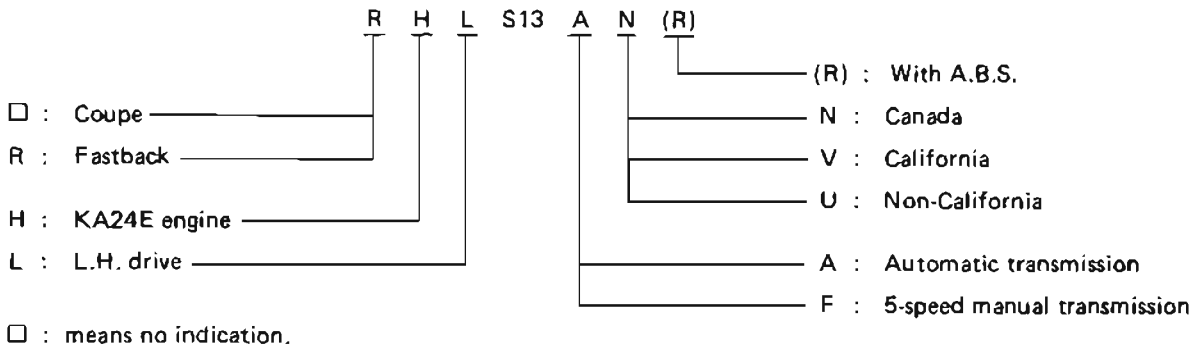
| Symbol | Symbol explanation | Symbol | Symbol explanation |
|---|---|--|---|
|  | Check after disconnecting the connector to be measured. |  | A/C switch is "OFF". |
|  | Check after connecting the connector to be measured. |  | A/C switch is "ON". |
|  | Insert key into ignition switch. |  | REC switch is "ON". |
|  | Turn ignition switch to "OFF" position. |  | REC switch is "OFF". |
|  | Turn ignition switch to "ON" position. |  | DEF switch is "ON". |
|  | Turn ignition switch to "START" position. |  | VENT switch is "ON". |
|  | Turn ignition switch from "OFF" to "ACC" position. |  | Fan switch is "ON". (At any position except for "OFF" position) |
|  | Turn ignition switch from "ACC" to "OFF" position. |  | Fan switch is "OFF". |
|  | Turn ignition switch from "OFF" to "ON" position. |  | Apply battery voltage directly to components. |
|  | Turn ignition switch from "ON" to "OFF" position. |  | Drive vehicle. |
|  | Do not start engine, or check with engine stopped. |  | Disconnect battery negative cable. |
|  | Start engine, or check with engine running. |  | Depress brake pedal. |
|  | Apply parking brake. |  | Release brake pedal. |
|  | Release parking brake. |  | Depress accelerator pedal. |
|  | Check after engine is warmed up sufficiently. |  | Release accelerator pedal. |
|  | Voltage should be measured with a voltmeter. |  <p>Pin terminal check for S.M.J type E.C.U. and A/T control unit connectors. For details regarding the terminal arrangement, refer to the foldout page.</p> | |
|  | Circuit resistance should be measured with an ohmmeter. | | |
|  | Current should be measured with an ammeter. | | |

IDENTIFICATION INFORMATION

Model Variation

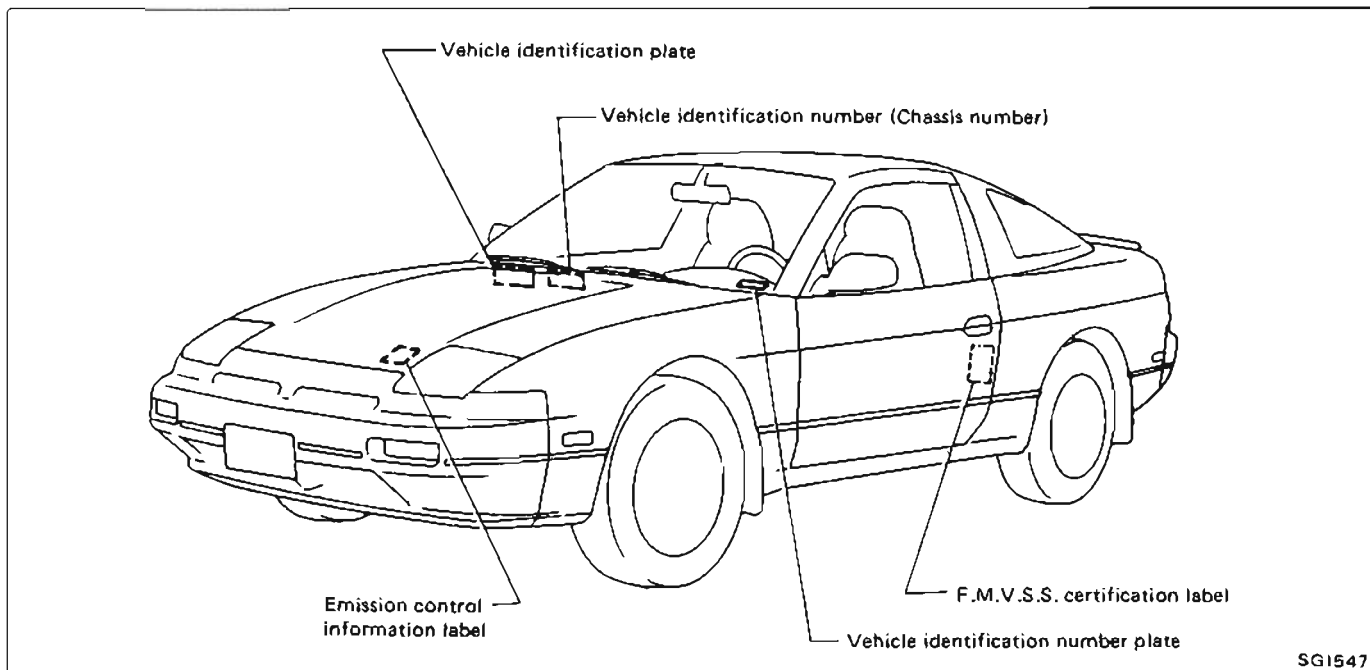
| Destination | Body | Model | Engine | Transmission | Differential carrier |
|----------------|----------|----------|--------|--------------|----------------------|
| Non-California | Coupe | HLS13FU | KA24E | FS5W71C | R200 |
| | Fastback | RHLS13FU | | | |
| | Coupe | HLS13AU | | RE4R01A | |
| | Fastback | RHLS13AU | | | |
| California | Coupe | HLS13FV | | FS5W71C | |
| | Fastback | RHLS13FV | | | |
| | Coupe | HLS13AV | | RE4R01A | |
| | Fastback | RHLS13AV | | | |
| Canada | Coupe | HLS13FN | | FS5W71C | |
| | Fastback | RHLS13FN | | | |
| | Coupe | HLS13AN | | RE4R01A | |
| | Fastback | RHLS13AN | | | |

Prefix and suffix designations:



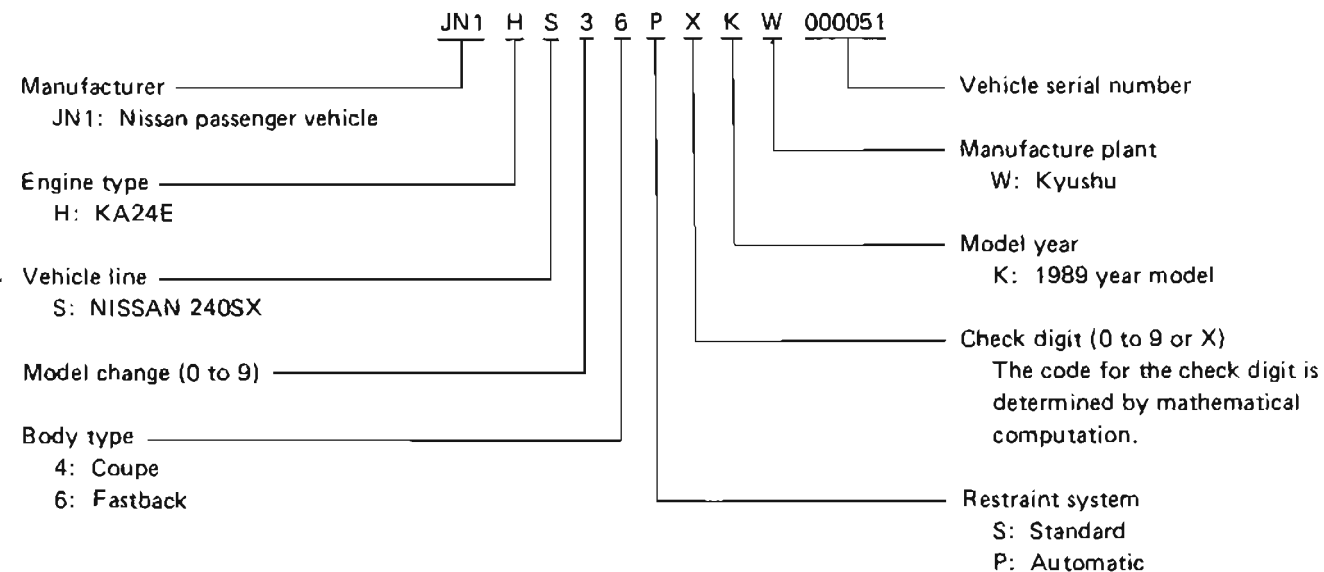
IDENTIFICATION INFORMATION

Identification Number



SG1547

VEHICLE IDENTIFICATION NUMBER ARRANGEMENT



IDENTIFICATION INFORMATION

Identification Number (Cont'd)

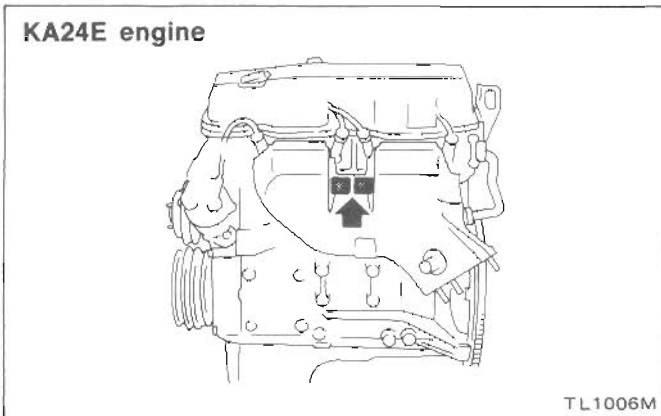
IDENTIFICATION PLATE

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

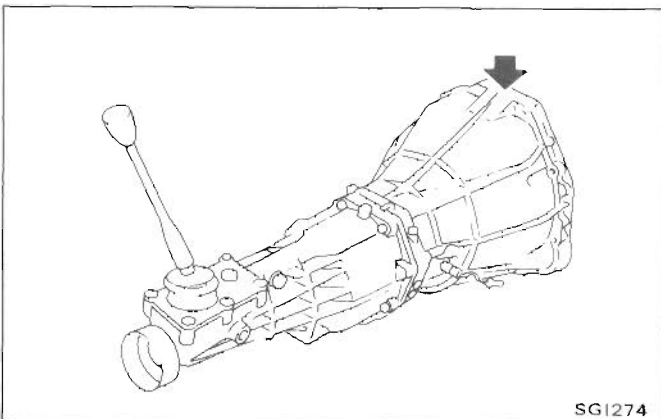
SG1315

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

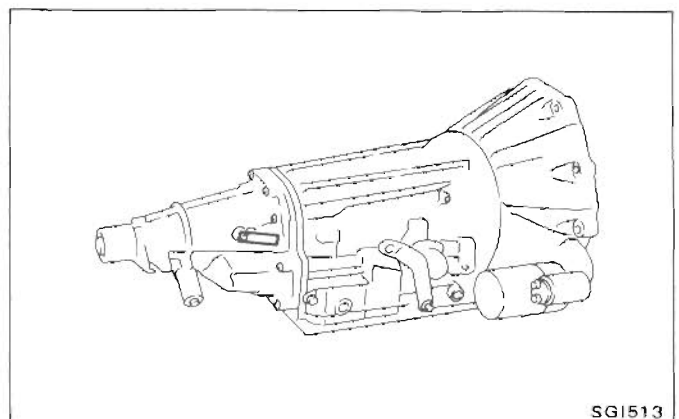
ENGINE SERIAL NUMBER



MANUAL TRANSMISSION NUMBER



AUTOMATIC TRANSMISSION NUMBER



IDENTIFICATION INFORMATION

Dimensions

Unit: mm (in)

| | Coupe | Fastback |
|----------------|---------------|---------------|
| Overall length | 4,520 (178.0) | 4,520 (178.0) |
| Overall width | 1,690 (66.5) | 1,690 (66.5) |
| Overall height | 1,290 (50.8) | 1,290 (50.8) |
| Front tread | 1,465 (57.7) | 1,465 (57.7) |
| Rear tread | 1,460 (57.5) | 1,460 (57.5) |
| Wheelbase | 2,475 (97.4) | 2,475 (97.4) |

Wheels and Tires

| | | | |
|------------|--------------|---------|----------------|
| Road wheel | Steel | | 6-JJx15 |
| | Aluminum | | 6-JJx15 |
| | Offset | mm (in) | 40 (1.57) |
| Tire size | Conventional | | 195/60R15 86H |
| | | | 205/60R15 89H* |
| | Spare | | T125/70D15 |

*: Option

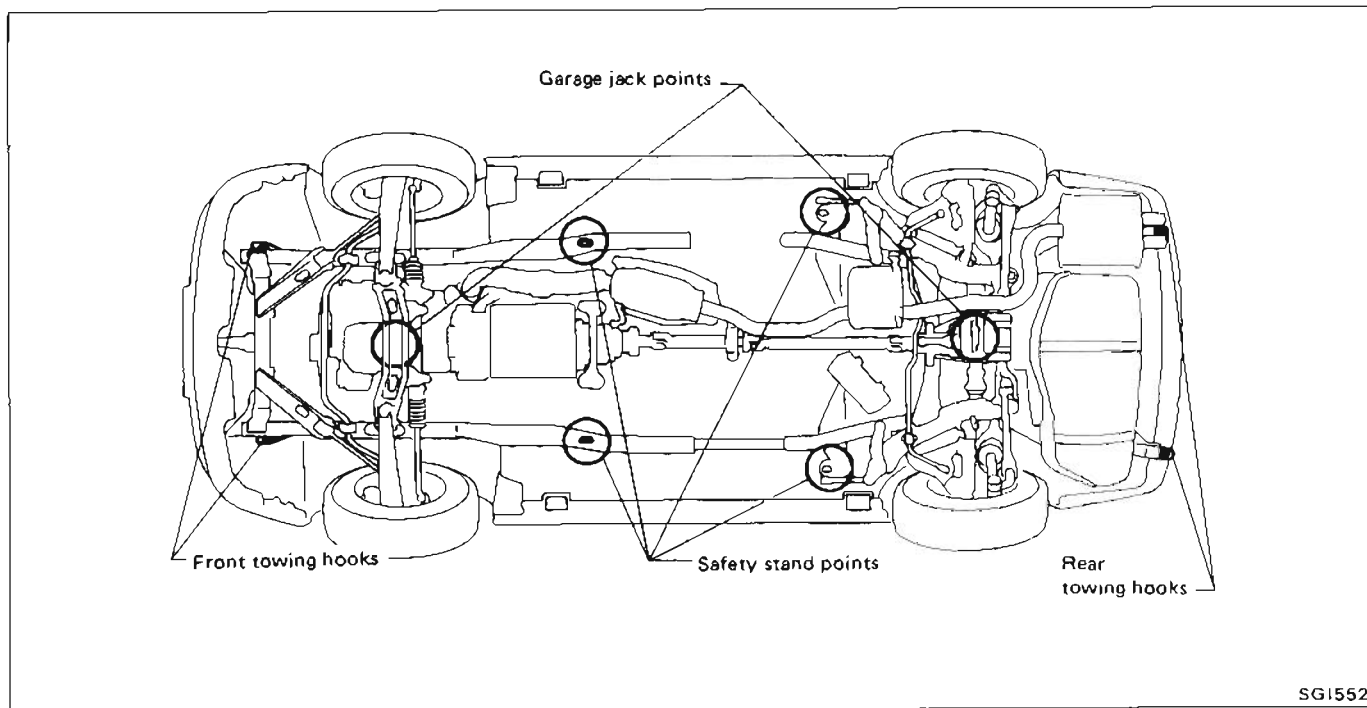
Garage Jack and Safety Stand

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.

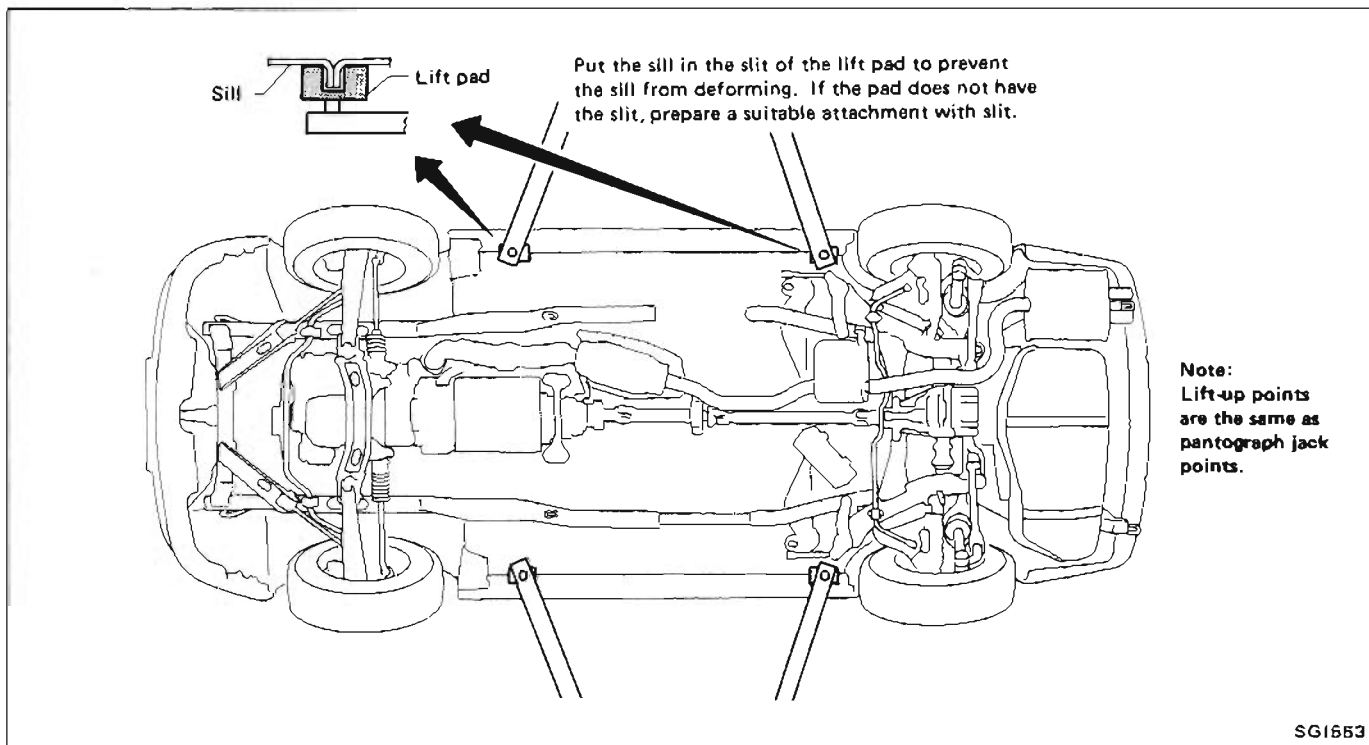


2-pole Lift

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.

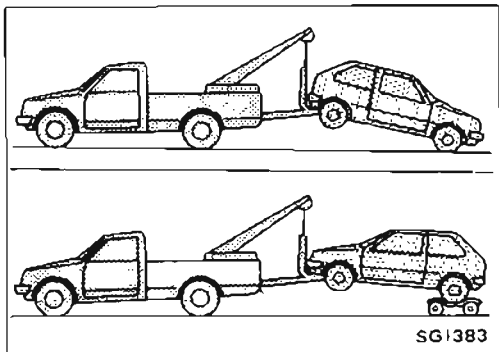


Tow Truck Towing

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 ("N" position).

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



LIFTING POINTS AND TOW TRUCK TOWING

Tow Truck Towing (Cont'd)

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

Observe the following restricted towing speeds and distances.

Speed:

Below 50 km/h (30 MPH)

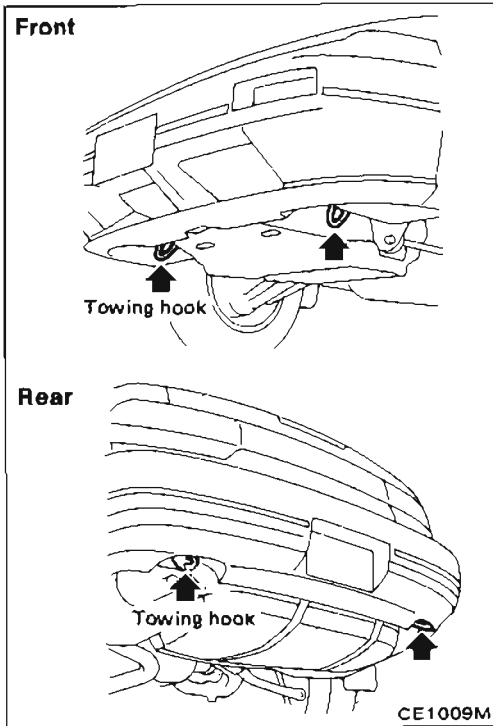
Distance:

Less than 65 km (40 miles)

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

TOWING POINT

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



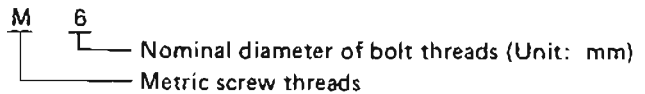
TIGHTENING TORQUE OF STANDARD BOLTS

| 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 | 26 | 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.

*: Nominal diameter

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



MAINTENANCE

SECTION MA

MA

CONTENTS

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PERIODIC MAINTENANCE

The following charts show the normal maintenance schedule. Under severe driving conditions, additional or more frequent maintenance will be required. Refer to "Maintenance under severe driving conditions".

The periodic maintenance schedule is repeated beyond the last mileage and period shown by returning to the first 15,000 miles (24,000 km) or 12 months.

EMISSION CONTROL SYSTEM MAINTENANCE

| MAINTENANCE OPERATION Perform at number of miles, kilometers or months, whichever comes first. | Miles x 1,000 (km x 1,000) Months | MAINTENANCE INTERVAL | | | | | Reference page |
|---|---|----------------------|------------|---|------------|------------|----------------|
| | | 7.5 (12) | 15 (24) | 30 (48) | 45 (72) | 60 (96) | |
| | | 6 | 12 | 24 | 36 | 48 | |
| Drive belts | See NOTE (1). | | | | | I* | MA-8 |
| Air cleaner filter | | | | Replace every 30,000 miles (48,000 km). | | | MA-10 |
| Vapor lines | | | | I* | | I* | MA-13 |
| Fuel lines | | | | I* | | I* | MA-9 |
| Fuel filter | See NOTE (2)*. | | | | | | MA-10 |
| Engine coolant | | | | R | | R | MA-8 |
| Engine oil | | R | | Then replace every 7,500 miles (12,000 km) or 6 months. | | | MA-11 |
| Engine oil filter (Use Nissan PREMIUM type or equivalent.) | | R | | Then replace every second oil change. | | | MA-11 |
| Spark plugs | | | | Replace every 30,000 miles (48,000 km). | | | MA-12 |
| Ignition wires | | | | Inspect every 3 years.* | | | MA-12 |

CHASSIS AND BODY MAINTENANCE

| MAINTENANCE OPERATION Perform at number of miles, kilometers or months, whichever comes first. | Miles x 1,000 (km x 1,000) Months | MAINTENANCE INTERVAL | | | | Reference page |
|---|---|----------------------|------------|------------|------------|-------------------|
| | | 15 (24) | 30 (48) | 45 (72) | 60 (96) | |
| | | 12 | 24 | 36 | 48 | |
| Break lines & cables | | I | I | I | I | MA-16 |
| Brake pads & discs | | I | I | I | I | MA-17 |
| Manual and automatic transmission & differential gear oil | | I | I | I | I | MA-14, 15, 16 |
| Steering gear & linkage, and axle & suspension parts | | | I | | I | MA-18, FA-4, RA-4 |
| Exhaust system | | I | I | I | I | MA-14 |

NOTE:

- (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km).
- (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) Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

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

PERIODIC MAINTENANCE

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance is required to be performed on the following items as shown in the table.

Severe driving conditions

- A – Repeated short trips less than 5 miles (8 km) and outside temperatures remain below freezing
- B – Extensive idling and/or low speed driving for a long distance such as police, taxi or door-to-door delivery use
- C – Driving in dusty conditions
- D – Driving on rough, muddy, or salt spread roads
- E – Towing a trailer, using a camper or a car-top carrier

| Driving condition | Maintenance item | Maintenance operation | Maintenance interval | Reference page |
|-------------------|---|-----------------------|--|-------------------|
| . . C . . | Air cleaner filter | R | More frequently | MA-10 |
| A B C D E | Engine oil & oil filter | R | Every 3,000 miles (5,000 km) or 3 months | MA-11 |
| A . C D E | Brake pads & discs | I | Every 7,500 miles (12,000 km) or 6 months | MA-17 |
| . . . D E | Manual and automatic transmission & differential gear oil | R | Every 30,000 miles (48,000 km) or 24 months | MA-14, 15, 16 |
| . . . D . | Steering gear & linkage, and axle & suspension parts | I | | MA-18, FA-4, RA-4 |
| . . C D . | Steering linkage ball joints & front suspension ball joints | I | Every 7,500 miles (12,000 km) or 6 months | MA-18, FA-4 |
| A . . D E | Exhaust system | I | | MA-14 |

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

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 |
|---|-----------------------|
| OUTSIDE THE VEHICLE | |
| The maintenance items listed here should be performed from time to time, unless otherwise specified. | |
| Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear. | — |
| Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary. | — |
| Tire rotation Tires should be rotated every 12,000 km (7,500 miles.) | MA-18 |
| Wheel alignment and balance If the vehicle should pull to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed. | MA-17 FA-6 RA-6 |
| Windshield wiper blades Check for cracks or wear if they do not wipe properly. | — |
| Doors and engine hood Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. Also ensure, that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released. | MA-19 |
| When driving in areas using road salt or other corrosive materials, check lubrication frequently. | |
| INSIDE THE VEHICLE | |
| The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc. | |
| Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim. | — |
| Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly. | — |
| Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak. | — |
| Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner. | — |
| Steering wheel Check that it has the specified free play. Be sure to check for changes in the steering condition, such as excessive free play, hard steering or strange noises. Free play: Less than 35 mm (1.38 in) | — |
| Seats Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head 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 seat-backs. | — |
| Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage. | MA-19 |

GENERAL MAINTENANCE

| Item | Reference page |
|---|----------------|
| Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel. | CL-5 |
| Brakes Check that the brake does not pull the vehicle to one side when applied. | — |
| Brake pedal Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function. | BR-7 |
| Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied. | BR-23 |
| Automatic transmission "Park" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes. | — |
| UNDER THE HOOD AND VEHICLE | |
| The maintenance items listed here should be checked periodically (e.g. each time you check the engine oil or refuel). | — |
| Windshield washer fluid Check that there is adequate fluid in the tank. | |
| Engine coolant level Check the coolant level when the engine is cold. | MA-9 |
| Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections. | — |
| Brake and clutch fluid levels Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir. | MA-14, 16 |
| Engine drive belts Make sure that no belt is frayed, worn, cracked or oily. | MA-8 |
| Engine oil level Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine. | MA-11 |
| Power steering fluid level and lines Check the level when the fluid is cold and the engine is turned off. Check the lines for proper attachment, leaks, cracks, etc. | MA-18 |
| Automatic transmission fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling. | MA-15 |
| Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it. | MA-14 |
| Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate. | — |
| Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately. | — |

RECOMMENDED LUBRICANTS AND FLUIDS

Lubricants and Fluids

| | Capacity (Approximate) | | | Recommended lubricants and fluids |
|--------------------------------------|------------------------|-------------|-------|--|
| | US measure | Imp measure | Liter | |
| Engine oil (Refill) | | | | |
| With oil filter | 3-3/4 qt | 3-1/8 qt | 3.5 | Genuine Nissan Motor Oil*1 or equivalent (Energy Conserving Oils of API SF or SG)*2, *3 |
| Without oil filter | 3-3/8 qt | 2-7/8 qt | 3.2 | |
| Cooling system (with reservoir tank) | 7-1/8 qt | 5-7/8 qt | 6.7 | Anti-freeze coolant (Ethylene glycol base) |
| Reservoir tank | 3/4 qt | 5/8 qt | 0.7 | |
| Manual transmission oil | 5-1/8 pt | 4-1/4 pt | 2.4 | API GL-4*2 |
| Differential gear oil | 2-3/4 pt | 2-1/4 pt | 1.3 | API GL-5*2 |
| Automatic transmission fluid | 8-3/4 qt | 7-1/4 qt | 8.3 | Genuine Nissan ATF*1 or equivalent Type DEXRON™ |
| Power steering fluid | 1 qt | 3/4 qt | 0.9 | Type DEXRON™ |
| Brake fluid | — | — | — | Genuine Nissan Brake Fluid*1 or equivalent DOT 3 (US FMVSS No. 116) |
| Multi-purpose grease | — | — | — | NLG1 No. 2 (Lithium soap base) |

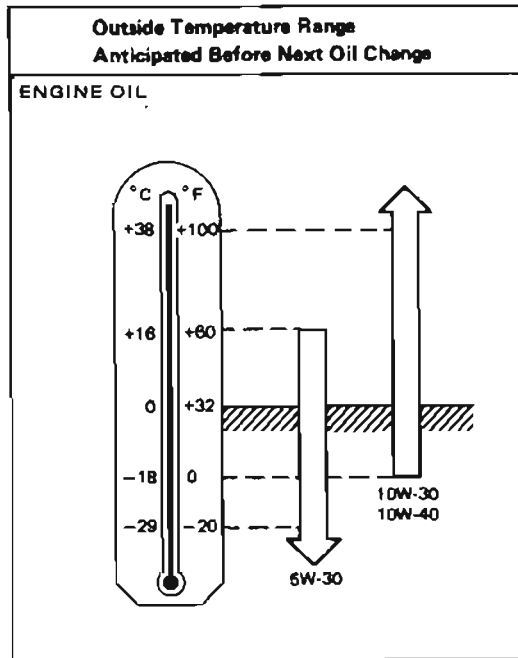
*1: Available in mainland U.S.A. through your Nissan dealer.

*2: For further details, see "SAE Viscosity Number".

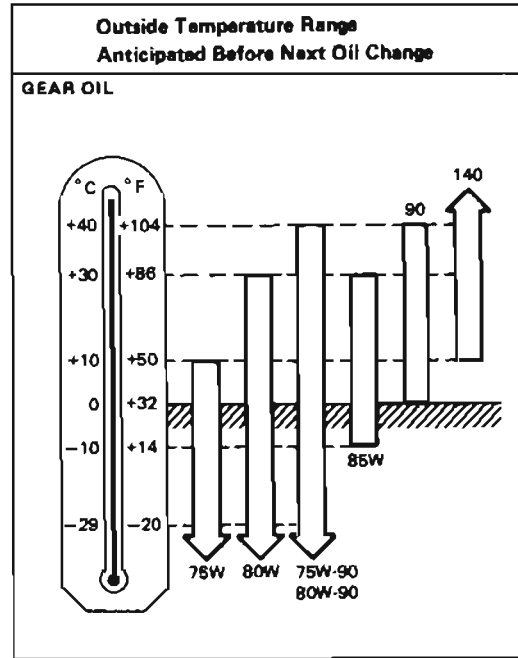
*3: Energy Conserving Oils

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

SAE Viscosity Number



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



80W-90 is preferable if the ambient temperature is below 40°C (104°F).

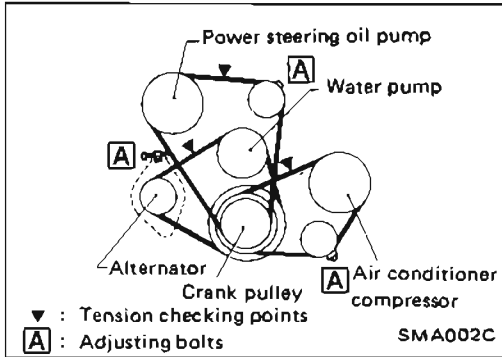
Checking Drive Belts

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

Adjust if belt deflections exceed the limit.

Belt deflection:

Inspect drive belt deflections when engine is cold.



Unit: mm (in)

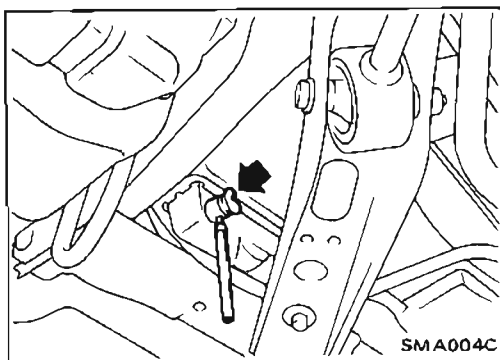
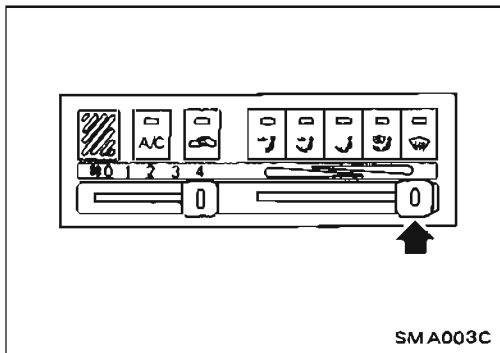
| | Used belt deflection | | Set deflection of new belt |
|----------------------------|----------------------|------------------------|----------------------------|
| | Limit | Adjusted deflection | |
| Alternator | 11 (0.43) | 7 - 8 (0.28 - 0.31) | 6 - 7 (0.24 - 0.28) |
| Air conditioner compressor | 12 (0.47) | 7 - 8 (0.28 - 0.31) | 6 - 7 (0.24 - 0.28) |
| Power steering oil pump | 13 (0.51) | 8 - 9 (0.31 - 0.35) | 7 - 8 (0.28 - 0.31) |
| Applied pushing force | 98 N (10 kg, 22 lb) | | |

Changing Engine Coolant

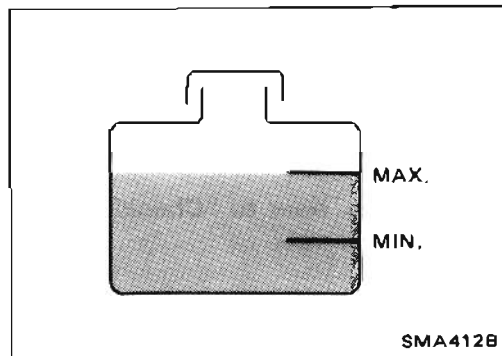
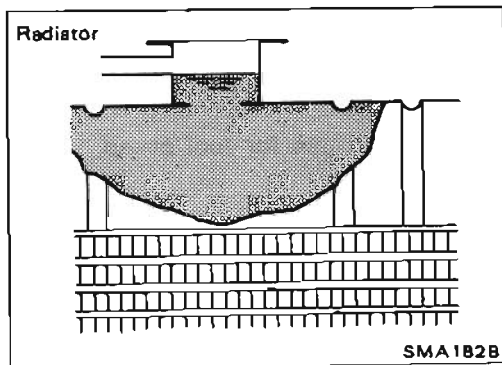
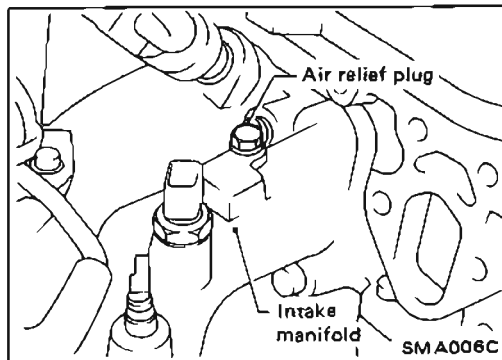
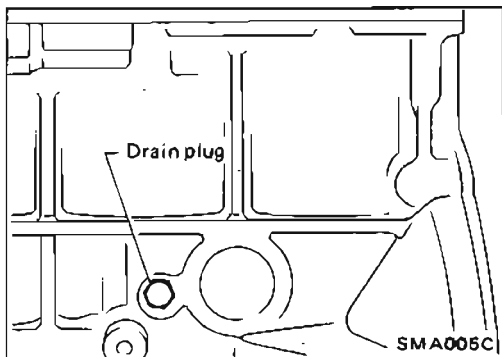
WARNING:

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.



Changing Engine Coolant (Cont'd)



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. Repeat step 2 through step 9 until clear water begins to drain from radiator.
11. Drain water.

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)

6.7 ℓ (7-1/8 US qt, 5-7/8 Imp qt)

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

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.

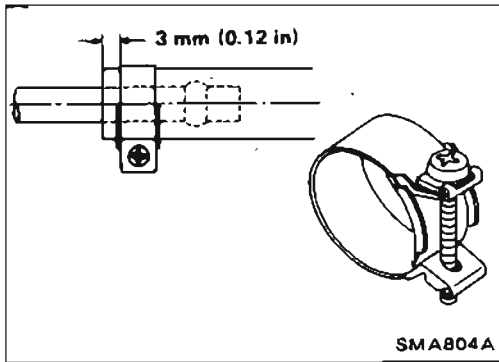
Checking Fuel Lines

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.

ENGINE MAINTENANCE

Checking Fuel Lines (Cont'd)



CAUTION:

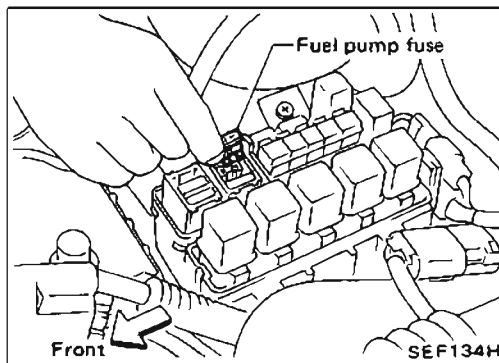
Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.

Ensure that screw does not contact adjacent parts.

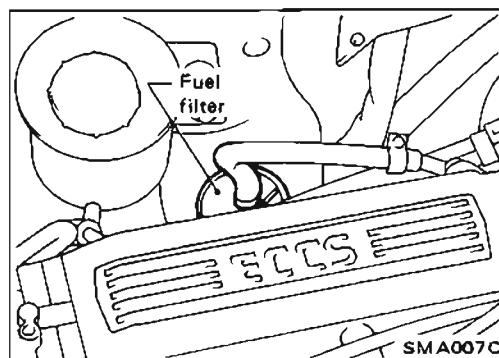
Changing Fuel Filter

WARNING:

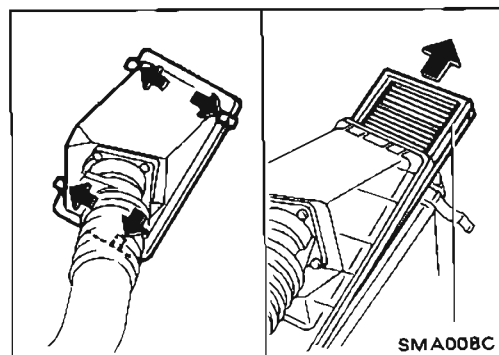
Before removing fuel filter, release fuel pressure from fuel line.



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.

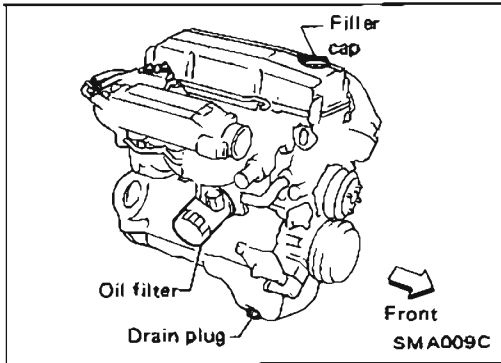


5. Loosen fuel hose clamps.
6. Replace fuel filter.
 - Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.
 - Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.
 - When tightening fuel hose clamps, refer to "Checking Fuel Lines".



Changing Air Cleaner Filter

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:

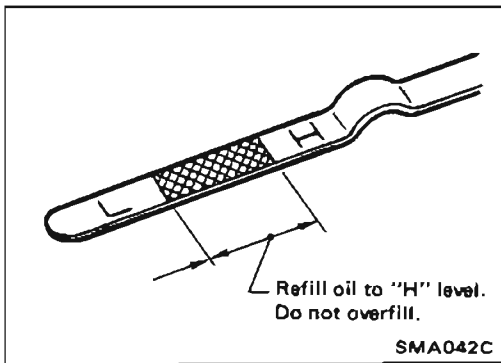
- Be sure to clean drain plug and install with new washer.

Drain plug:

☐: 29 - 39 N·m

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

- Use recommended engine oil.



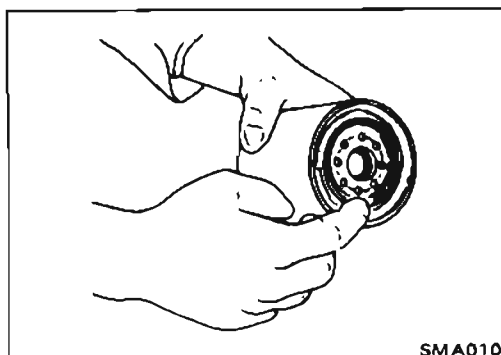
4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

Changing Oil Filter

1. Remove oil filter with a suitable tool.

WARNING:

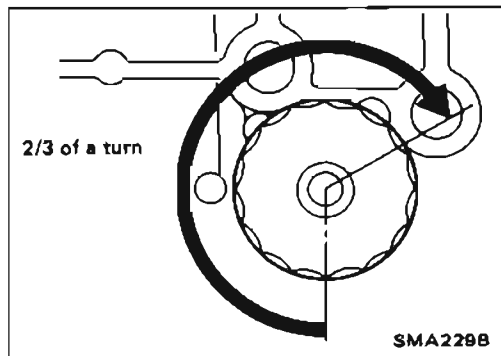
Be careful not to burn yourself, as the engine and the engine oil are hot.



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.

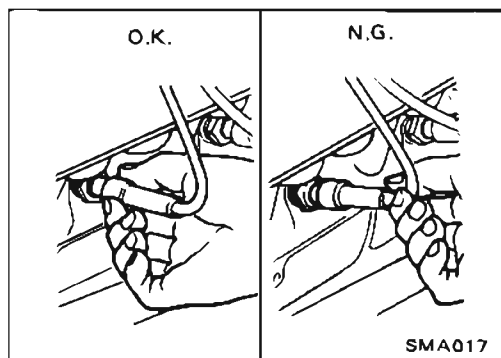
Changing Oil Filter (Cont'd)

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



Changing Spark Plugs

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



2. Remove spark plugs with spark plug wrench.

Spark plug:

Standard type

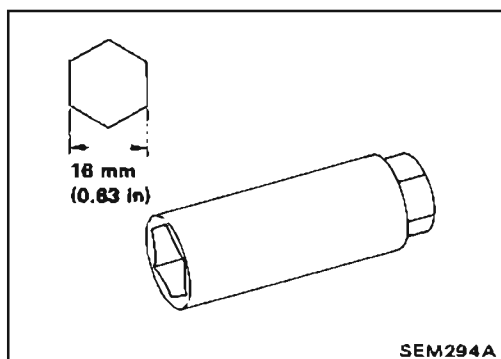
ZFR5D-11

Hot type

ZFR4D-11

Cold type

ZFR6D-11



3. Check plug gap of each new spark plug.

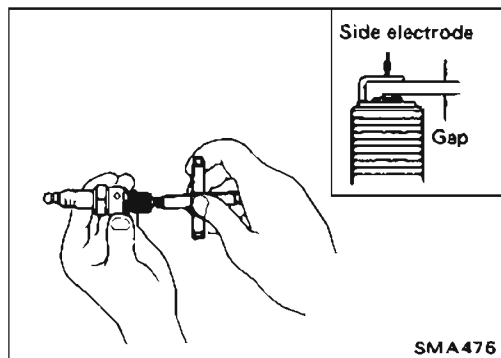
Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)

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)

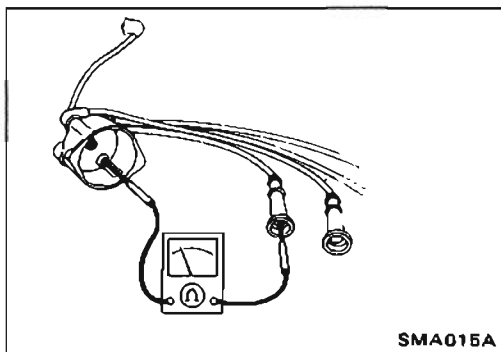


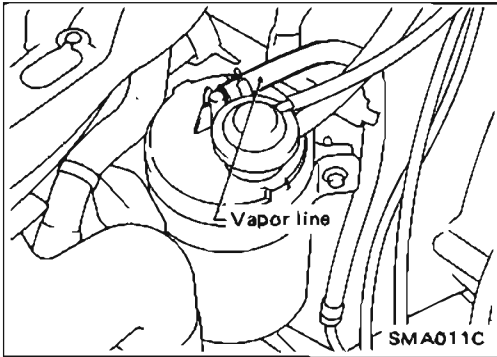
Checking Ignition Wires

1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires and check for intermittent breaks by shaking them.

Resistance: Less than 30 kΩ

If it exceeds the limit, replace the ignition wire with a new one.

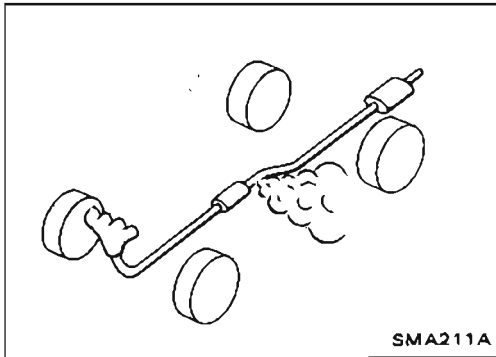




Checking Vapor Lines

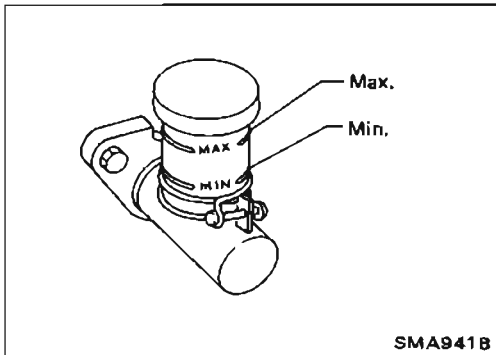
1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

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



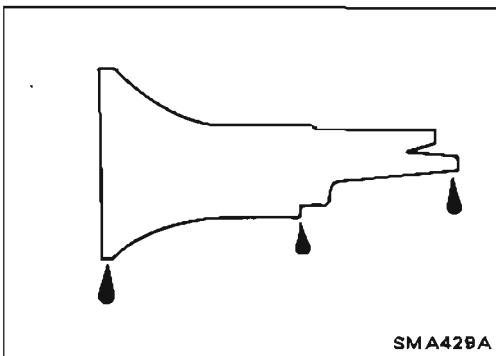
Checking Exhaust System

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



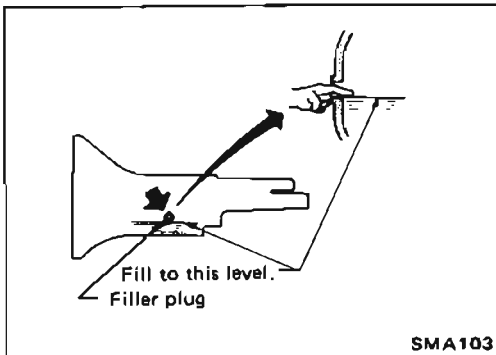
Checking Clutch Fluid Level and Leaks

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



Checking M/T Oil

1. Check for oil leakage.

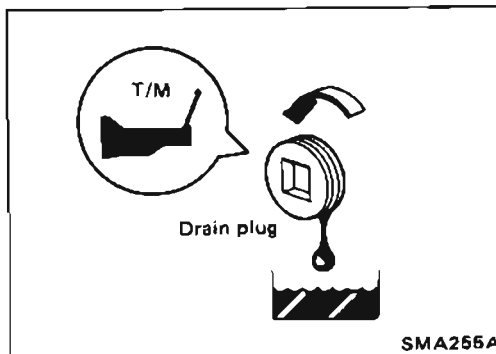


2. If leakage is found, check oil level.

Never start engine while checking oil level.

Filler plug:

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



Changing M/T Oil

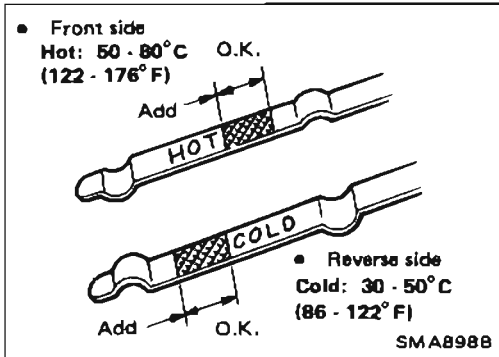
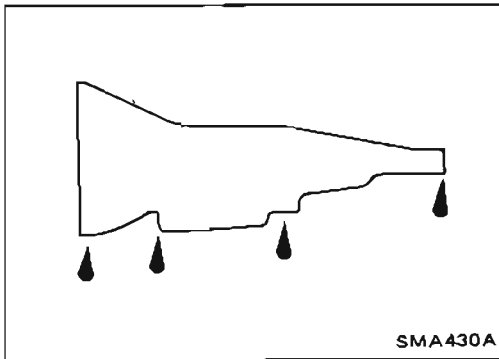
1. Drain oil and refill with new gear oil.
2. Check oil level.

Oil capacity:

2.4 ℓ (5-1/8 US pt, 4-1/4 Imp pt)

Drain plug:

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



Checking A/T Fluid

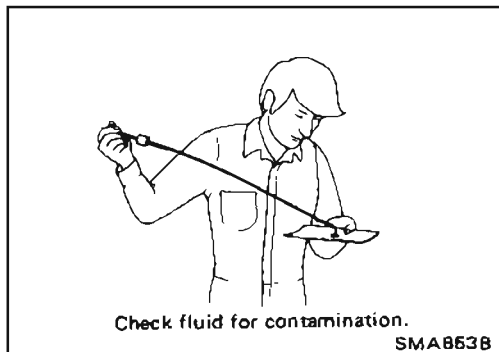
1. Check for fluid leakage.

2. If leakage is found, check fluid level.

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

- 1) Park vehicle on level surface and set parking brake.
- 2) Start engine and then move selector lever through each gear range, ending in "P".
- 3) Check fluid level with engine idling.
- 4) Remove dipstick and wipe it clean with lint-free paper.
- 5) Reinsert dipstick into charging pipe as far as it will go.
- 6) Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

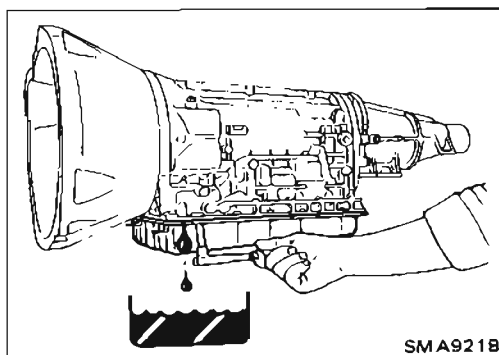
Do not overfill.



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.

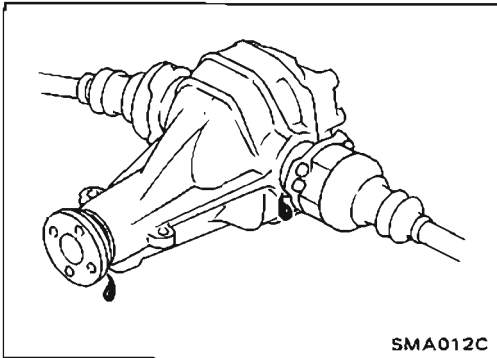


Changing A/T Fluid

1. Drain fluid by removing oil pan.
2. Replace gasket with new one.
3. Refill with fluid and then check fluid level.

Oil capacity (With torque converter):

8.3 ℓ (8-3/4 US qt, 7-1/4 Imp qt)



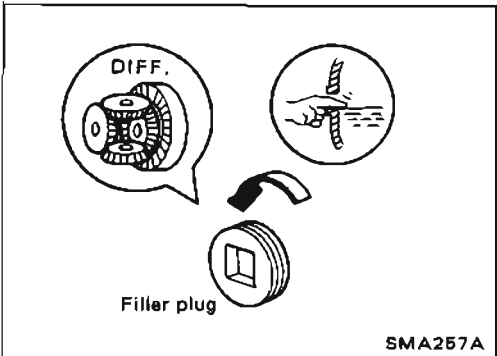
Checking Differential Gear Oil

1. Check differential carrier for oil leakage.

2. If leakage is found, check oil level.

Filler plug:

[⊞]: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)



Changing Differential Gear Oil

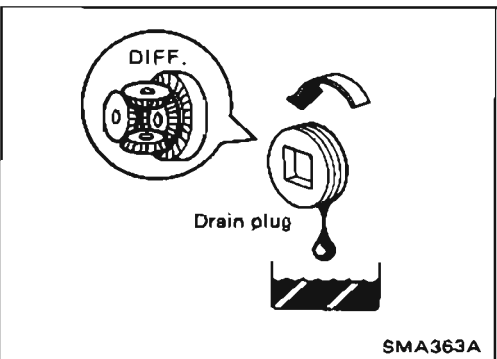
1. Drain oil and refill with new gear oil.
2. Check oil level.

Oil capacity:

1.3 ℓ (2-3/4 US pt, 2-1/4 Imp pt)

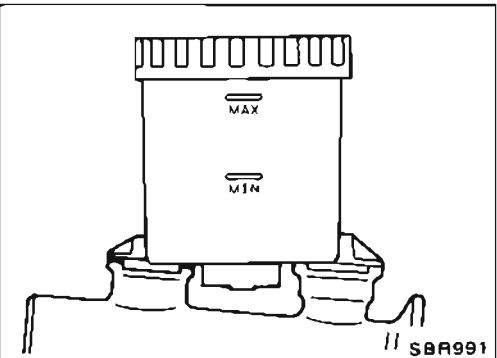
Drain plug:

[⊞]: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)



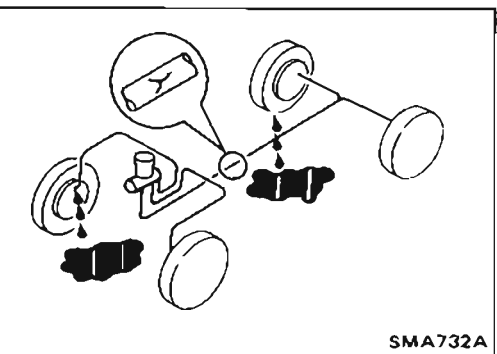
Checking Brake Fluid Level and Leaks

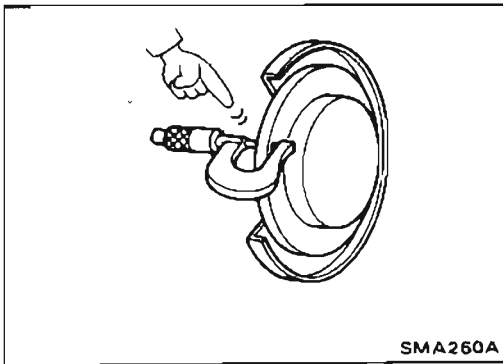
- If fluid level is extremely low, check brake system for leaks.



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

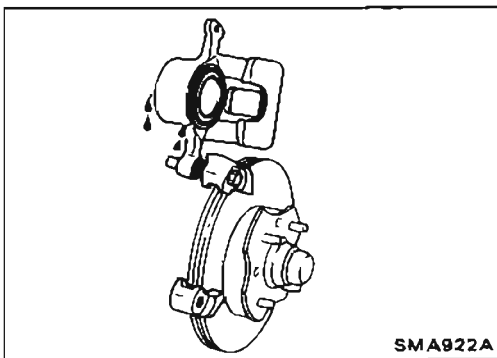
- Check condition of disc brake components.

ROTOR

- Check condition and thickness.

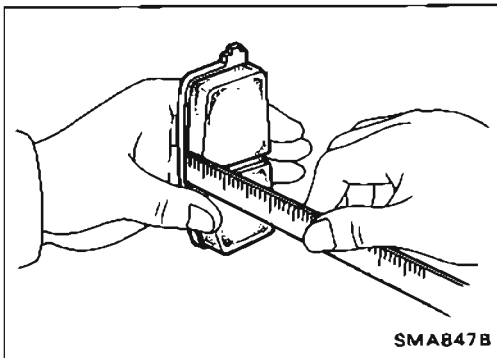
Unit: mm (in)

| | Front | Rear |
|--------------------|--------------|-------------|
| Disc brake type | CL22VB | CL9H |
| Standard thickness | 20.0 (0.787) | 9.0 (0.354) |
| Minimum thickness | 18.0 (0.709) | 8.0 (0.315) |



CALIPER

- Check operation and for leakage.



PAD

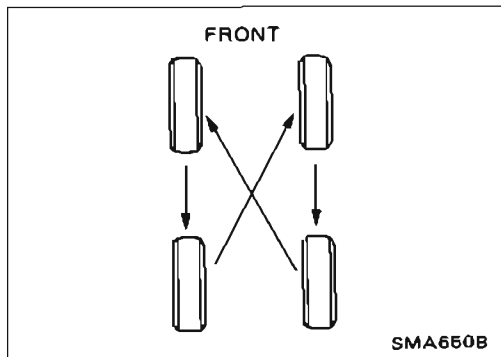
- Check for wear or damage.

Unit: mm (in)

| | Front | Rear |
|--------------------|--------------|-------------|
| Disc brake type | CL22VB | CL9H |
| Standard thickness | 10.0 (0.394) | 9.5 (0.374) |
| Minimum thickness | 2.0 (0.079) | |

Balancing Wheels

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



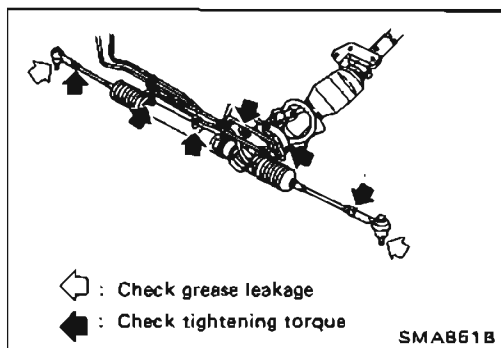
Tire Rotation

- 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)



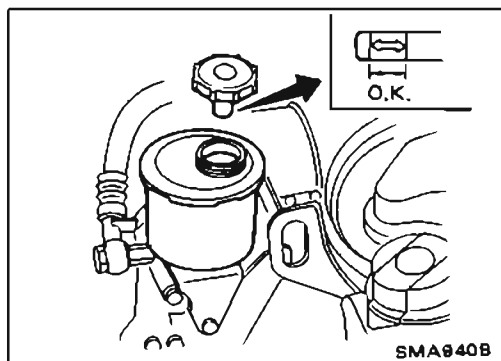
Checking Steering Gear and Linkage

STEERING GEAR

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

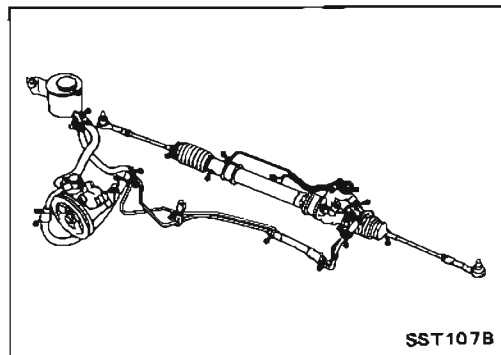
STEERING LINKAGE

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



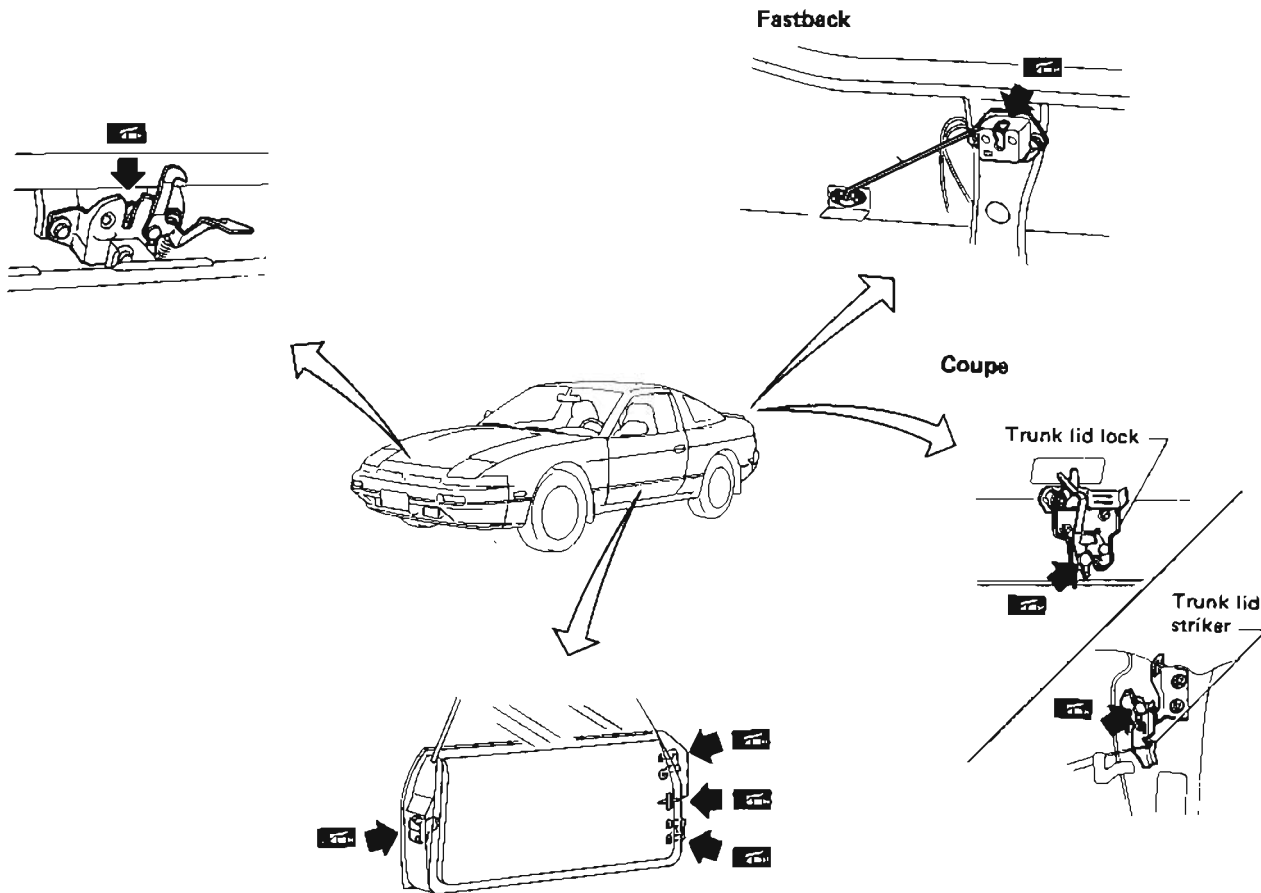
Checking Power Steering Fluid and Lines

- Check fluid level, when the fluid is cold.



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

LUBRICATING LOCKS, HINGES AND HOOD LATCHES



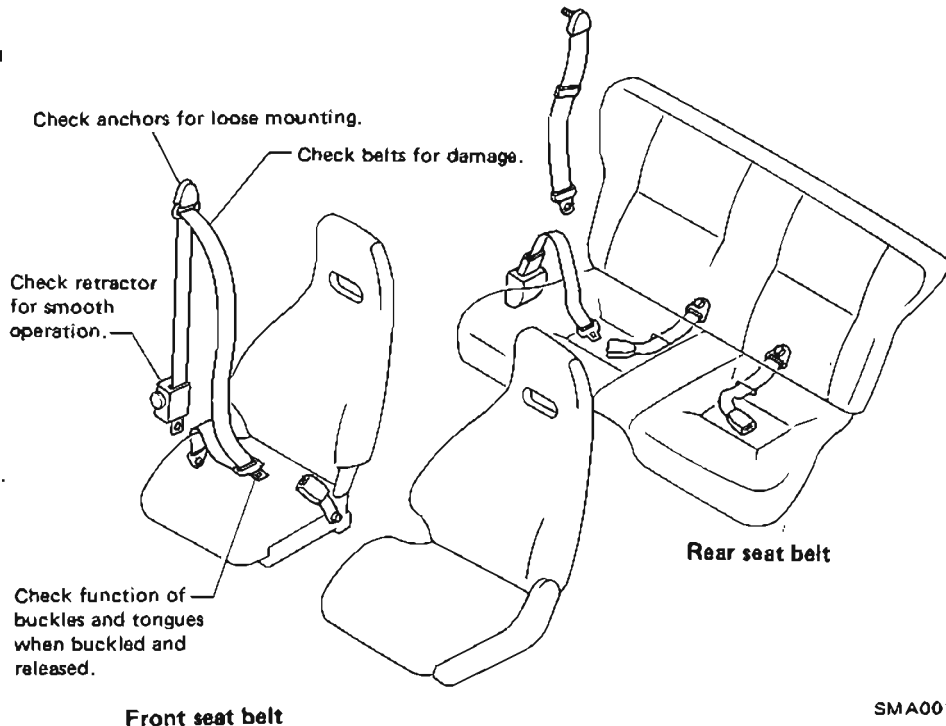
SMA999B

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 a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.
3. If webbing is cut, frayed, or damaged, replace seat 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
 24 - 31 N·m
 (2.4 - 3.2 kg-m, 17 - 23 ft-lb)
 For automatic seat belt, refer to BF section.



SMA001C

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

Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

| | Used belt deflection | | Set deflection of new belt |
|----------------------------|----------------------|------------------------|----------------------------|
| | Limit | Adjusted deflection | |
| Alternator | 11 (0.43) | 7 - 8 (0.28 - 0.31) | 6 - 7 (0.24 - 0.28) |
| Air conditioner compressor | 12 (0.47) | 7 - 8 (0.28 - 0.31) | 6 - 7 (0.24 - 0.28) |
| Power steering oil pump | 13 (0.51) | 8 - 9 (0.31 - 0.35) | 7 - 8 (0.28 - 0.31) |
| 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) |

Coolant capacity

Unit: ℓ (US qt, Imp qt)

| | |
|---------------------|--------------------|
| With reservoir tank | 6.7 (7-1/8, 6-7/8) |
|---------------------|--------------------|

Spark plug

| | |
|---------------|---------------------------------|
| Standard type | ZFR5D-11 |
| Hot type | ZFR4D-11 |
| Cold type | ZFR6D-11 |
| Plug gap | 1.0 - 1.1 mm (0.039 - 0.043 in) |

Ignition wire

| | |
|---------------|--------------|
| Resistance kΩ | Less than 30 |
|---------------|--------------|

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 |

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

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

| | |
|-----------------------|---------------------------|
| Pedal free height "H" | 186 - 196 (7.32 - 7.72) |
| Pedal free play "A" | 1.0 - 3.0 (0.039 - 0.118) |

Front axle and front suspension (Unladen)*

| | | |
|--|---------|------------------|
| Camber | degree | -1°30' to 0° |
| Caster | degree | 6°00' - 7°30' |
| Toe-in | mm (in) | 0 - 2 (0 - 0.08) |
| (Total toe-in) | degree | 0' - 12' |
| Kingpin inclination | degree | 12°30' - 14°00' |
| Front wheel turning angle Full turn Inside/outside | degree | 39° - 43°/33° |

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

Rear axle and rear suspension (Unladen)*

| | | |
|-----------------|---------|------------------|
| Camber | degree | -1°36' to -0°36' |
| Toe-out | mm (in) | 0 - 5 (0 - 0.20) |
| (Total toe-out) | degree | 0' - 28' |

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

Wheel bearing

| | Front | Rear |
|--|--------------------------------------|--------------------------------------|
| Wheel bearing axle end play mm (in) | 0.03 (0.0012) or less | 0.05 (0.0020) or less |
| Wheel bearing lock nut Tightening torque N·m (kg·m, ft·lb) | 147 - 216 (15 - 22, 108 - 159) | 235 - 314 (24 - 32, 174 - 231) |

Brake

Unit: mm (in)

| | |
|--|-------------------------|
| Disc brake Pad | |
| Standard thickness CL22VB | 10.0 (0.394) |
| CL9H | 9.5 (0.374) |
| Minimum thickness CL22VB | 2.0 (0.079) |
| CL9H | 2.0 (0.079) |
| Rotor | |
| Standard thickness CL22VB | 20.0 (0.787) |
| CL9H | 9.0 (0.354) |
| Minimum thickness CL22VB | 18.0 (0.709) |
| CL9H | 8.0 (0.316) |
| Pedal | |
| Free height M/T | 177 - 187 (6.97 - 7.36) |
| A/T | 186 - 196 (7.32 - 7.72) |
| Free play | 1 - 3 (0.04 - 0.12) |
| Depressed height (under force of 490 N (50 kg, 110 lb) with engine running) | 100 (3.94) or more |
| Parking brake Number of notches (at pulling force 196 N (20 kg, 44 lb)) | 6 - 8 |

Wheel balance

| | | |
|---|--------|--|
| Wheel balance (Maximum allowable unbalance at rim flange) | g (oz) | 10 (0.35) |
| Tire balance weight | g (oz) | 5 - 60 (0.18 - 2.12) Spacing 5 (0.18) |

SERVICE DATA AND SPECIFICATIONS (S.D.S.)**Chassis and Body Maintenance (Cont'd)****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 transmission | | | |
| Drain and filler plugs | 25 - 34 | 2.5 - 3.5 | 18 - 25 |
| Final drive | | | |
| Drain plug | 59 - 98 | 6 - 10 | 43 - 72 |
| Filler plug | 59 - 98 | 6 - 10 | 43 - 72 |
| Front axle and front suspension | | | |
| Tie-rod lock nut | 37 - 46 | 3.8 - 4.7 | 27 - 34 |
| Camber adjusting pin | 124 - 143 | 12.6 - 14.6 | 91 - 106 |
| Rear axle and rear suspension | | | |
| Toe adjusting pin | 69 - 88 | 7.0 - 9.0 | 51 - 65 |
| Camber adjusting pin | 69 - 88 | 7.0 - 9.0 | 51 - 65 |
| Brake system | | | |
| Air bleed valve | 7 - 9 | 0.7 - 0.9 | 5.1 - 6.6 |
| 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

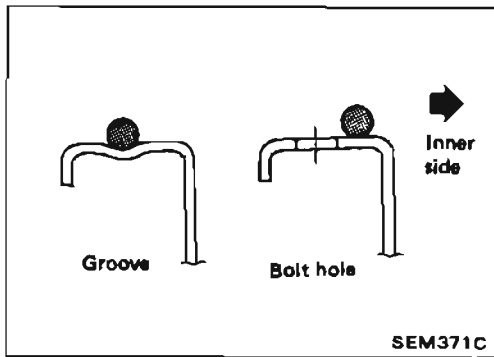
SECTION **EM**

EM

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| | |
|--|-------|
| PRECAUTION | EM- 2 |
| PREPARATION | EM- 3 |
| OUTER COMPONENT PARTS | EM- 6 |
| COMPRESSION PRESSURE | EM- 7 |
| OIL PAN | EM- 8 |
| TIMING CHAIN | EM-10 |
| OIL SEAL REPLACEMENT | EM-16 |
| CYLINDER HEAD | EM-18 |
| ENGINE REMOVAL | EM-32 |
| CYLINDER BLOCK | EM-34 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | EM-46 |

PRECAUTION

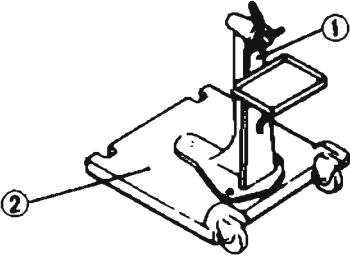

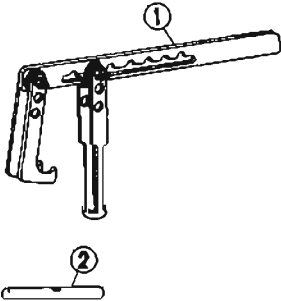

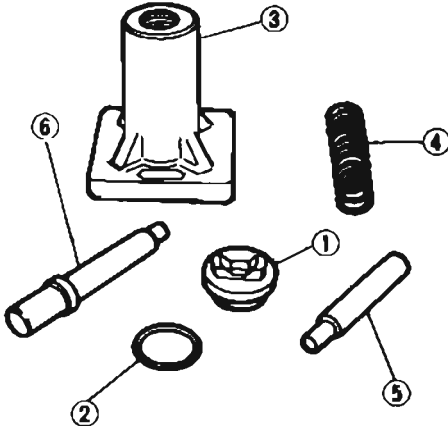


LIQUID GASKET APPLICATION PROCEDURE

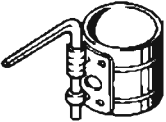
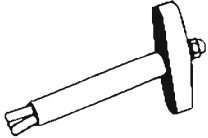
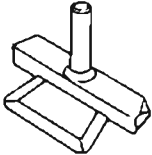
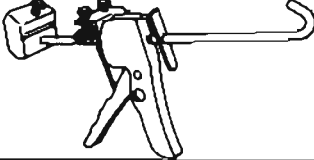

- Before applying liquid gasket, remove all traces of old liquid gasket from mating surface using a scraper.
- Apply a continuous bead of liquid gasket to mating surface. (Use Genuine Liquid Gasket or equivalent.)
- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
Be sure 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.

PREPARATION

SPECIAL SERVICE TOOLS

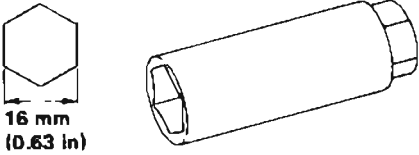

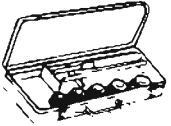
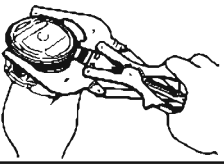
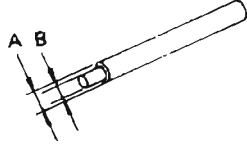
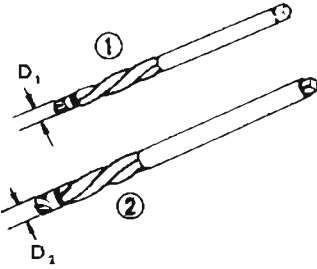
| Tool number (Kent-Moore No.) Tool name | Description |
|--|--|
| ST0501S000 (-) Engine stand assembly ① ST05011000 (-) Engine stand ② ST05012000 (-) Base | Disassembling and assembling  |
| KV10105001 (-) Engine attachment |  |
| KV101092S0 (-) Valve spring compressor ① KV10109210 (-) Compressor ② KV10109220 (-) Adapter | Disassembling and assembling valve components  |
| KV109B0010 (-) Valve oil seal drift | Installing valve oil seal  |
| KV10110300 (-) Piston pin press stand assembly ① KV10110310 (-) Cap ② KV10110330 (-) Spacer ③ ST13030020 (-) Press stand ④ ST13030030 (-) Spring ⑤ KV10110340 (-) Drift ⑥ KV10110320 (-) Center shaft | Disassembling and assembling piston with connecting rod  |

PREPARATION

| Tool number (Kent-Moore No.) Tool name | Description |
|---|--|
| EM03470000 (J8037) Piston ring compressor |  Installing piston assembly into cylinder bore |
| (J38467) Valve oil seal remover |  Displacement valve oil seal |
| KV10111100 (-) Seal cutter |  Removing oil pan |
| WS39930000 (-) Tube presser |  Pressing the tube of liquid gasket |
| ST16610001 (J23907) Pilot bushing puller |  |

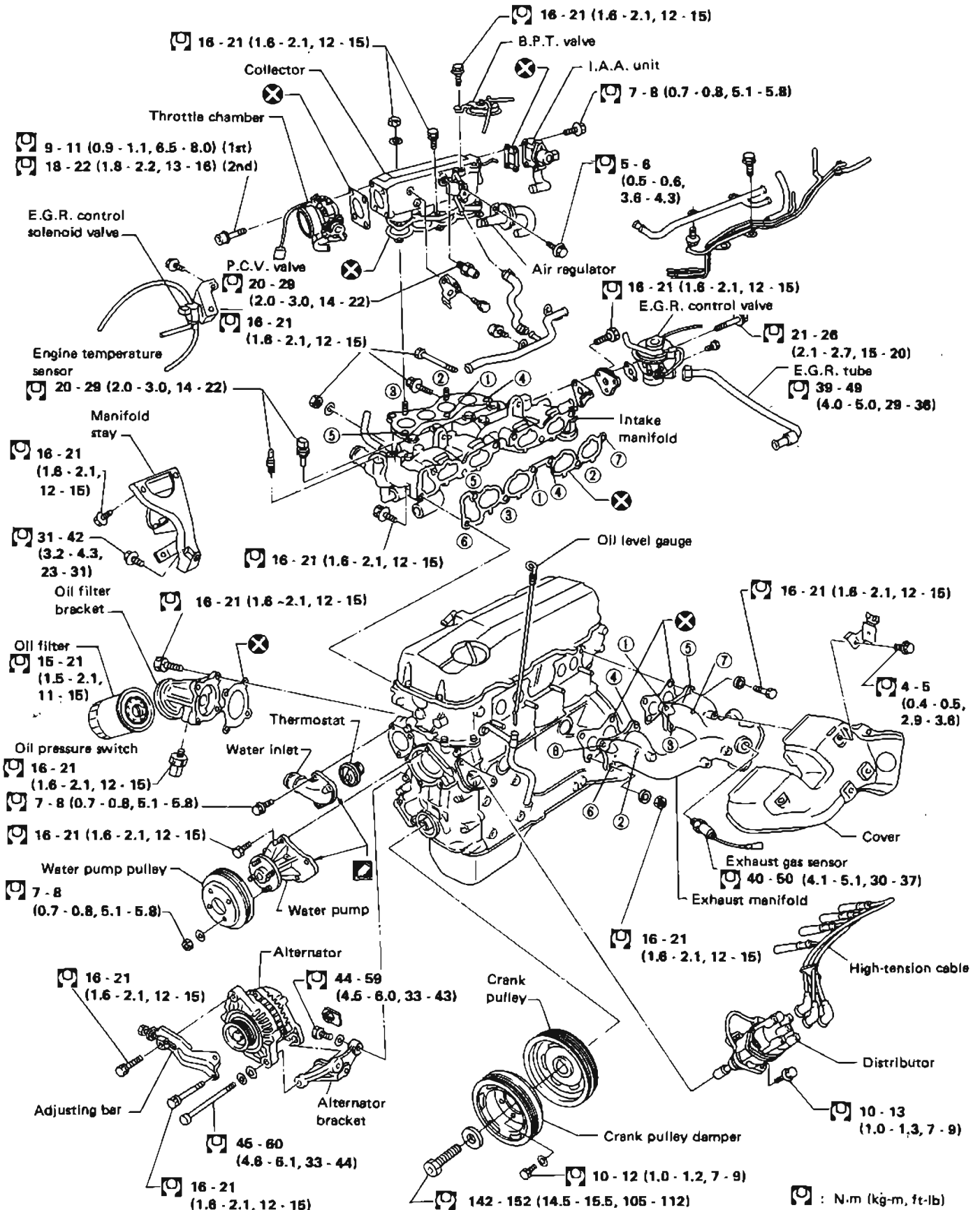
PREPARATION

COMMERCIAL SERVICE TOOLS

| Tool name | Description | | | | | | | | | | |
|-----------------------|--|---|--|--------|---------|----------------|--------------|--------------|----------------|--------------|--------------|
| Spark plug wrench |  <p style="text-align: center;">16 mm (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 Diameter: mm (in) <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Intake</th> <th>Exhaust</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>10.5 (0.413)</td> <td>11.5 (0.453)</td> </tr> <tr> <td>B</td> <td>6.6 (0.260)</td> <td>7.6 (0.299)</td> </tr> </tbody> </table> | | Intake | Exhaust | A | 10.5 (0.413) | 11.5 (0.453) | B | 6.6 (0.260) | 7.6 (0.299) |
| | 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) Diameter: mm (in) <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Intake</th> <th>Exhaust</th> </tr> </thead> <tbody> <tr> <td>D₁</td> <td>7 (0.28)</td> <td>8 (0.31)</td> </tr> <tr> <td>D₂</td> <td>11.2 (0.441)</td> <td>12.2 (0.480)</td> </tr> </tbody> </table> | | Intake | Exhaust | D ₁ | 7 (0.28) | 8 (0.31) | D ₂ | 11.2 (0.441) | 12.2 (0.480) |
| | Intake | Exhaust | | | | | | | | | |
| D ₁ | 7 (0.28) | 8 (0.31) | | | | | | | | | |
| D ₂ | 11.2 (0.441) | 12.2 (0.480) | | | | | | | | | |

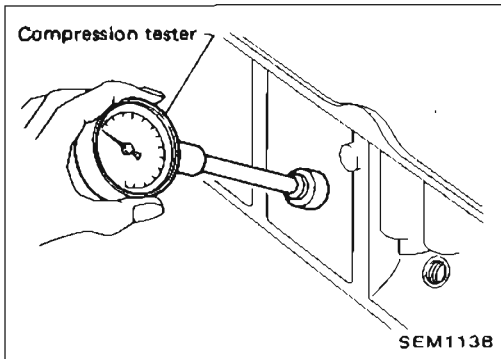
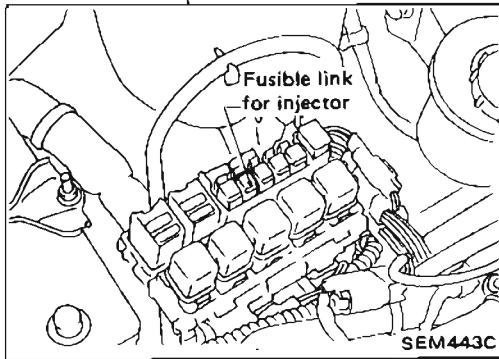
OUTER COMPONENT PARTS

KA24E ENGINE



: N.m (kg-m, ft-lb)
 : Apply liquid gasket.

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/cm², psi)/rpm

Standard

1,324 (13.5, 192)/300

Minimum

981 (10, 142)/300

Difference limit between cylinders

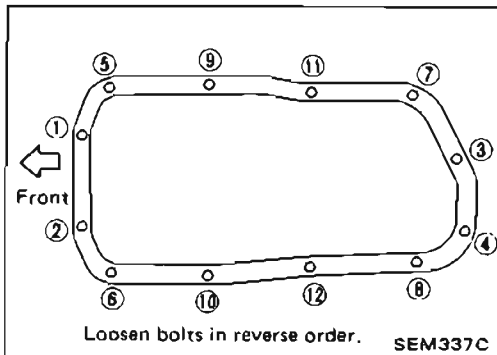
98 (1.0, 14)/300

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.**

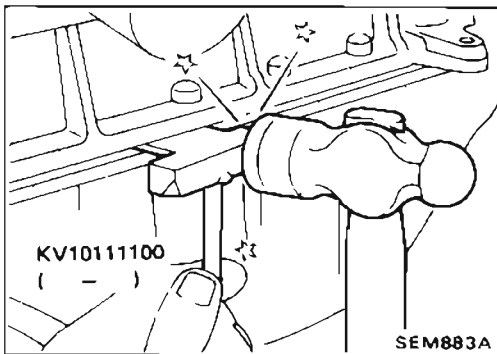
OIL PAN

Removal

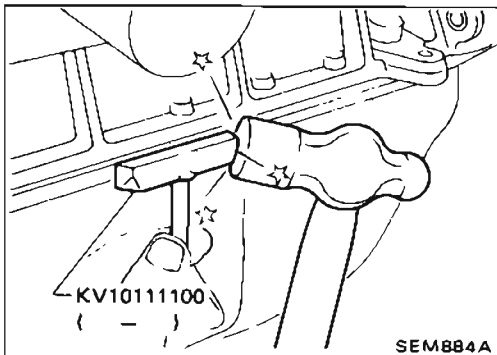
1. Raise vehicle and support it with safety stands.
2. Drain engine oil.
3. Remove front stabilizer bar securing bolts and nuts from side member.
4. Lift engine.



5. Remove oil pan bolts.



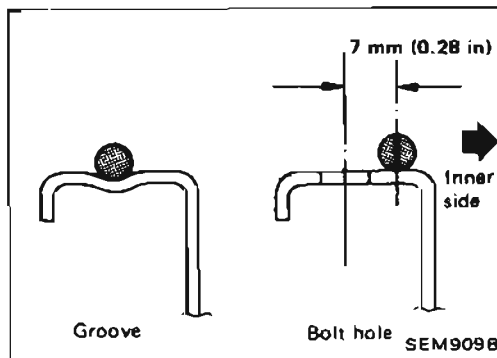
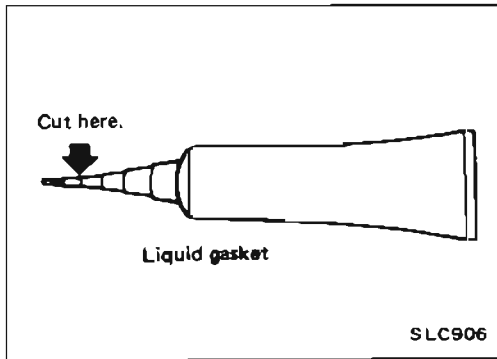
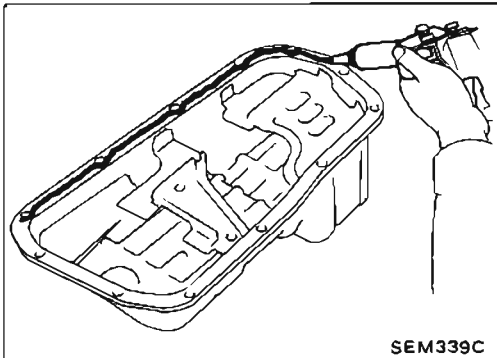
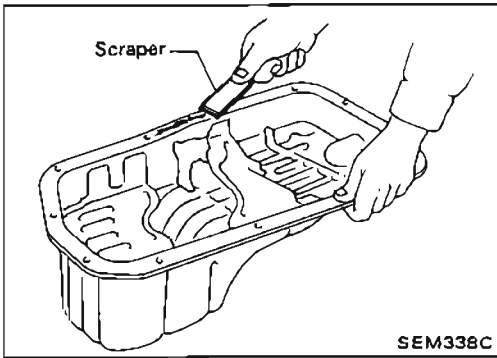
6. Remove oil pan.
 - (1) Insert Tool between cylinder block and oil pan.
 - Do not drive seal cutter into oil pump or rear oil seal retainer portion, or aluminum mating face will be damaged.
 - Do not insert screwdriver, or oil pan flange will be deformed.



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

7. Pull out oil pan from front side.

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.**

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

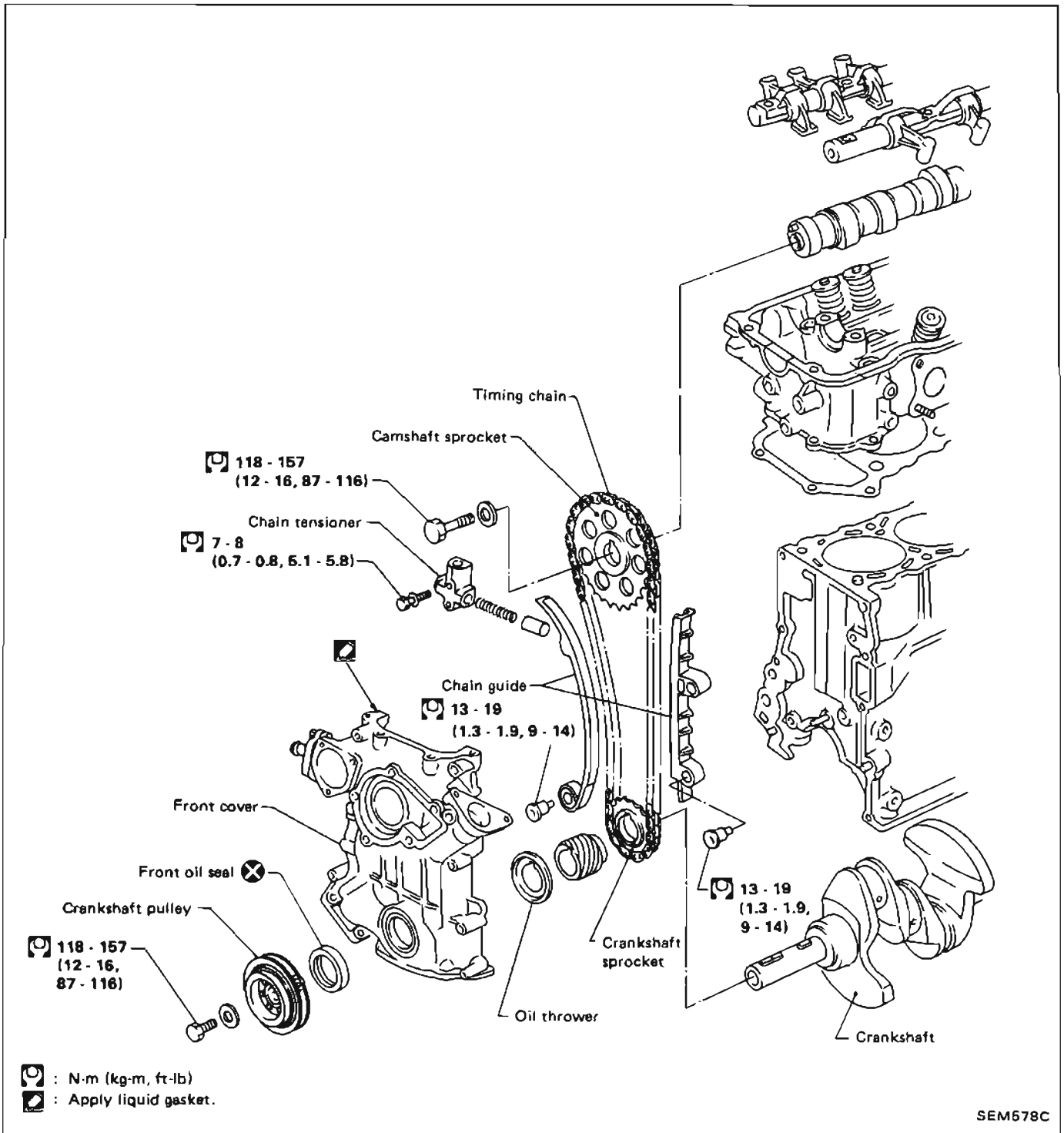
3. Apply liquid gasket to inner sealing surface as shown in figure.

- Attaching should be done within 5 minutes after coating.

4. Install oil pan.

- **Wait at least 30 minutes before refilling engine oil.**

TIMING CHAIN



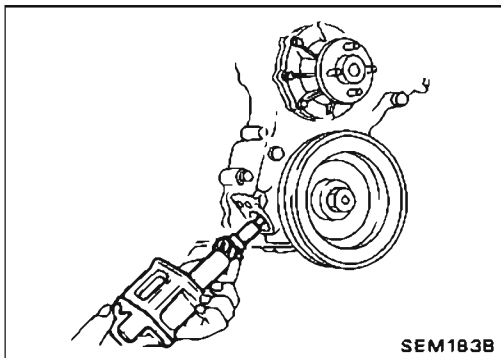
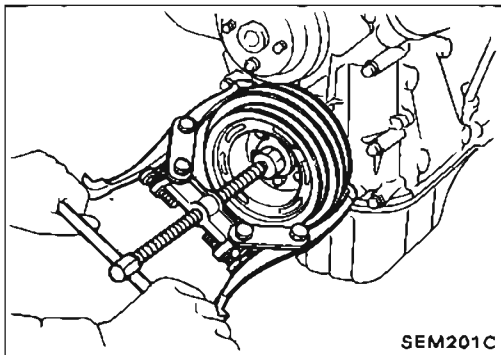
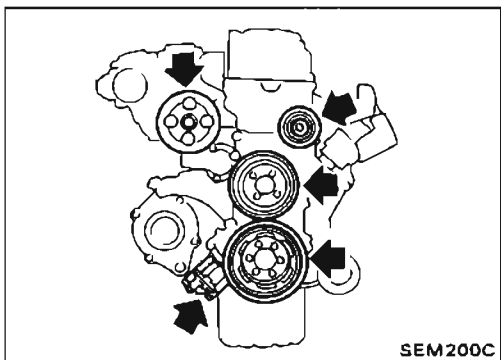
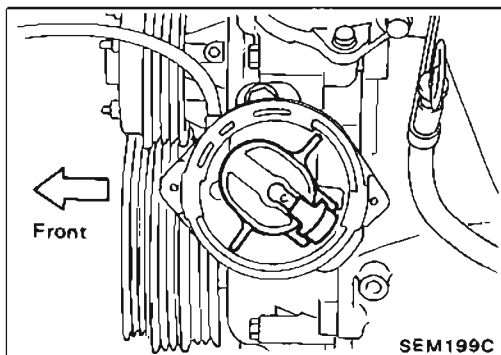
CAUTION:

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

TIMING CHAIN

Removal

1. Disconnect battery terminal.
2. Drain coolant from radiator.
3. Remove radiator shroud and cooling fan.
4. Remove the following belts.
 - Power steering drive belt
 - Compressor drive belt
 - Alternator drive belt
5. Remove all spark plugs.
6. Set No. 1 piston at T.D.C. on its compression stroke.

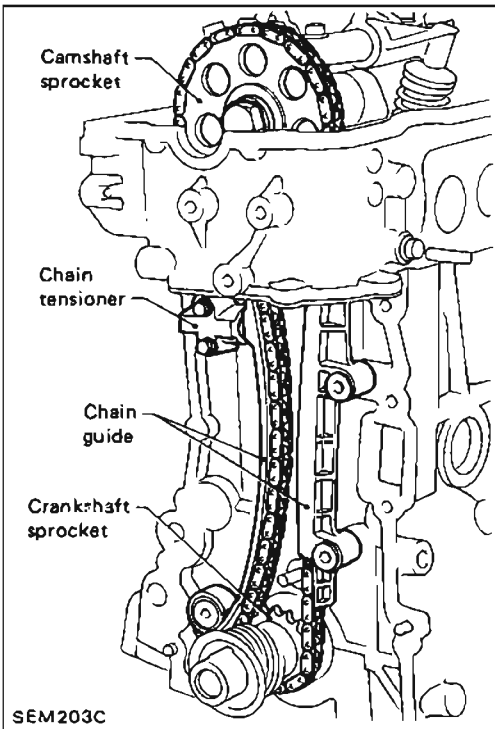
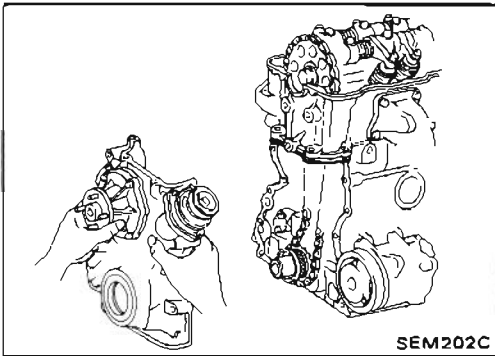


7. Remove the following parts.
 - Power steering pump, idler pulley and power steering pump brackets
 - Compressor idler pulley
 - Crankshaft pulley
 - Oil pump with pump drive spindle
 - Rocker cover

TIMING CHAIN

Removal (Cont'd)

8. Remove oil pan. (Refer to OIL PAN.)
9. Remove front cover.

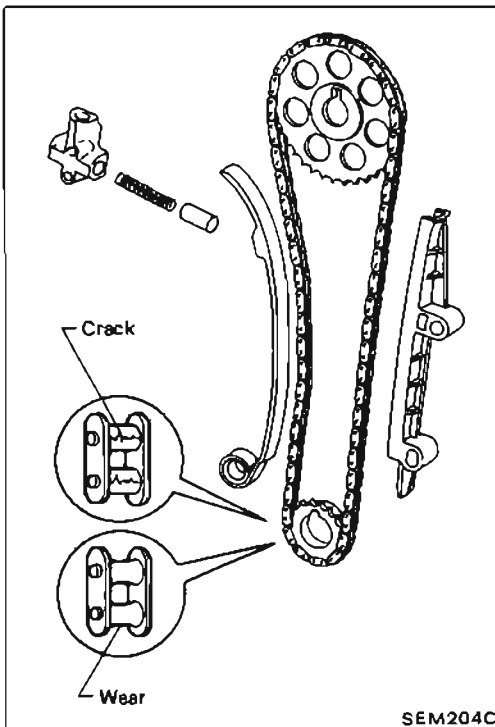


10. Remove the following parts.

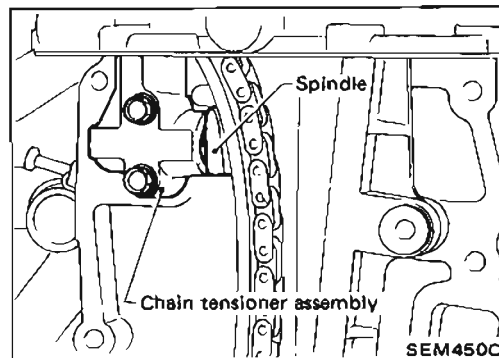
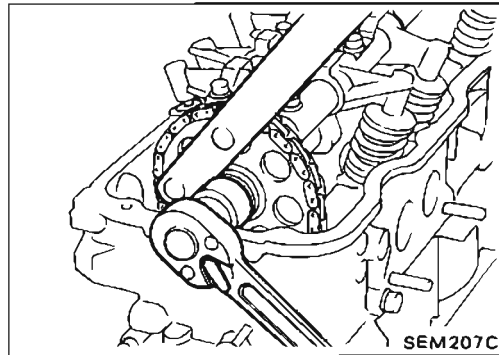
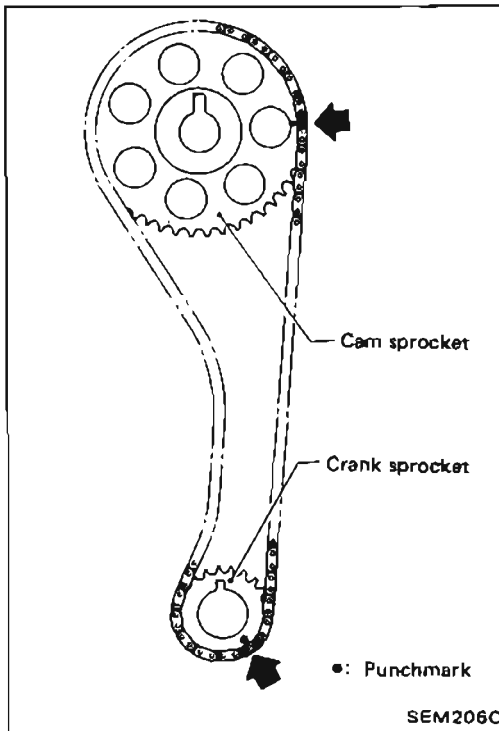
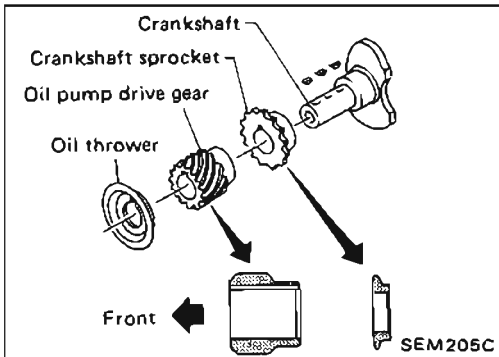
- Chain tensioner
- Chain guides
- Timing chain and sprocket
- Oil thrower, oil pump drive gear and crankshaft sprocket

Inspection

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



TIMING CHAIN

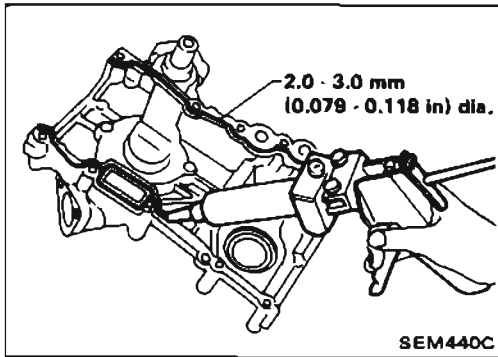


Installation

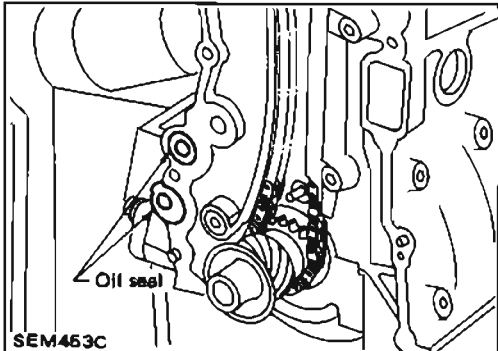
1. Install crankshaft sprocket, oil pump drive gear and oil thrower.
 - **Make sure that mating marks of crankshaft sprocket face engine front.**
2. Install camshaft sprocket.
3. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.
4. Install timing chain.
 - **Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket.**
5. Tighten camshaft sprocket bolt.
6. Install chain guide and chain tensioner.

TIMING CHAIN

Installation (Cont'd)



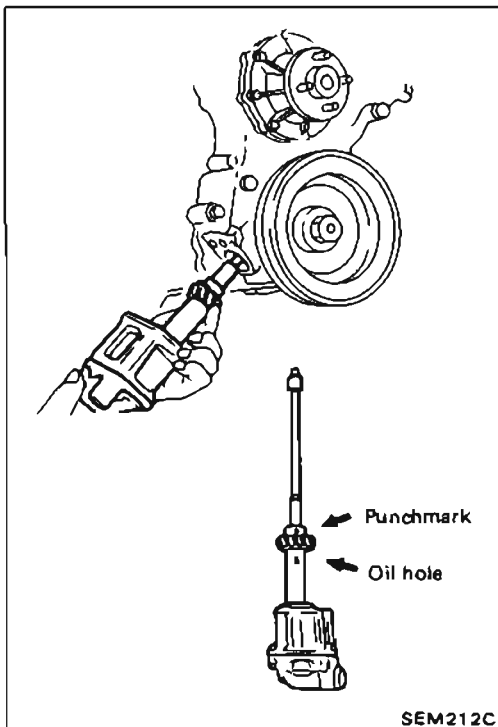
7. Apply liquid gasket to front cover.
8. Apply lithium grease to sealing lip of crankshaft oil seal.



9. Install front cover.
 - Be careful not to damage cylinder head gasket.
 - Do not forget oil seal.

10. Install rubber plug. (Refer to "Installation" of CYLINDER HEAD.)

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



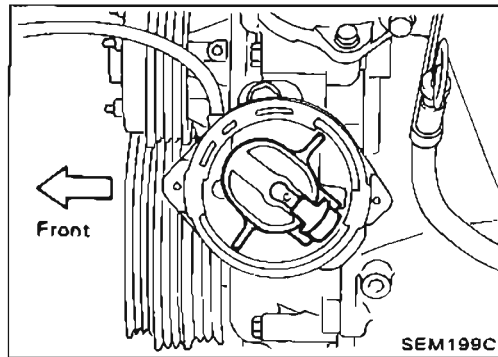
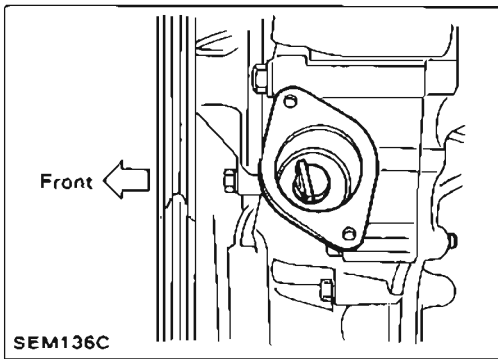
12. Install oil pump and distributor driving spindle with new gasket in front cover.

- (1) Assemble oil pump and driving spindle, aligning punchmark on driving spindle with oil hole.

TIMING CHAIN

Installation (Cont'd)

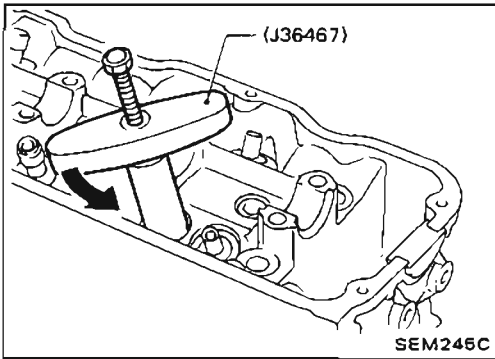
(2) Make sure that driving spindle is set as shown in figure.



13. Install distributor.

14. Make sure that No. 1 piston is set at T.D.C. and that distributor rotor is set at No. 1 cylinder spark position.

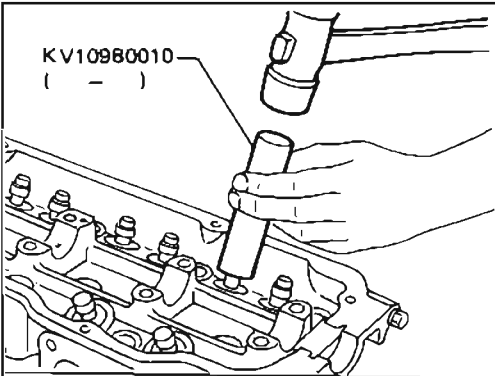
OIL SEAL REPLACEMENT



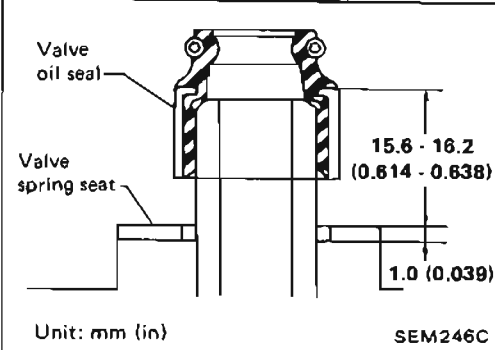
VALVE OIL SEAL

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

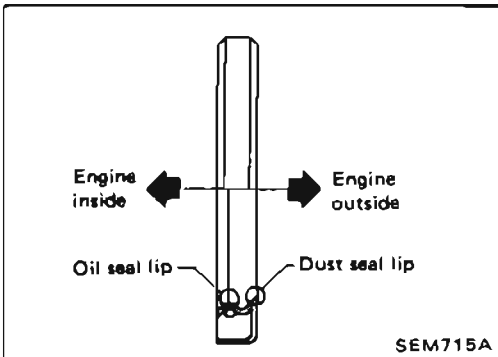
Piston concerned should be set at T.D.C. to prevent valve from falling.



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

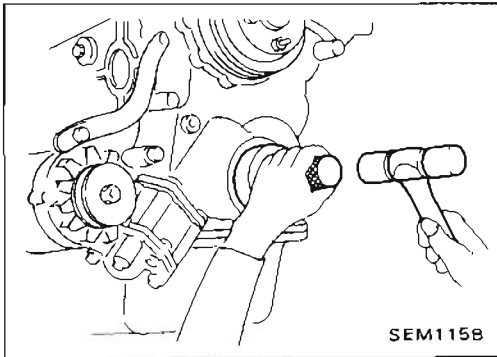


FRONT OIL SEAL

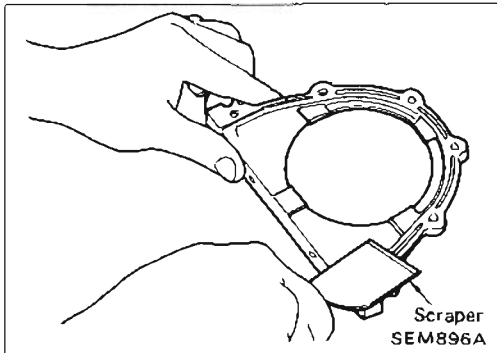
1. Remove radiator shroud and crankshaft pulley.
2. Remove front oil seal.

Be careful not to damage crankshaft.

OIL SEAL REPLACEMENT

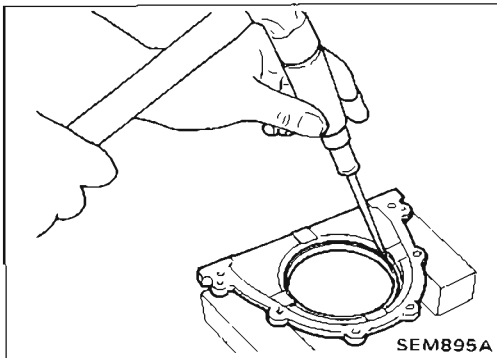


3. Apply engine oil to new oil seal and install it using suitable tool.

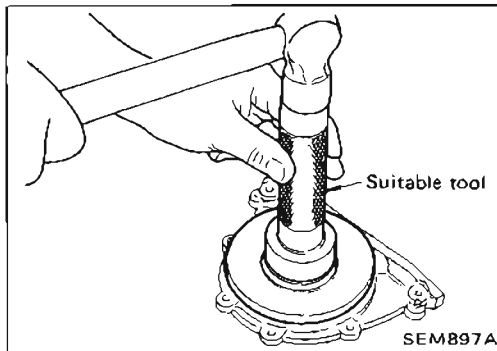


REAR OIL SEAL

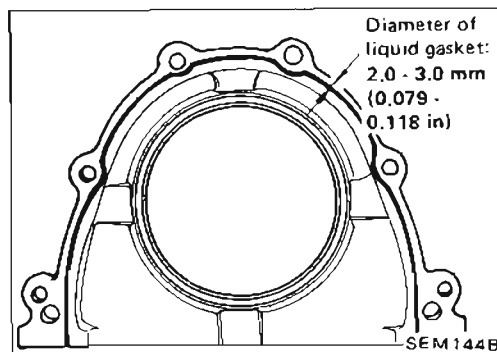
1. Remove flywheel or drive plate.
2. Remove rear oil seal retainer.
3. Remove traces of liquid gasket using scraper.



4. Remove rear oil seal from retainer.

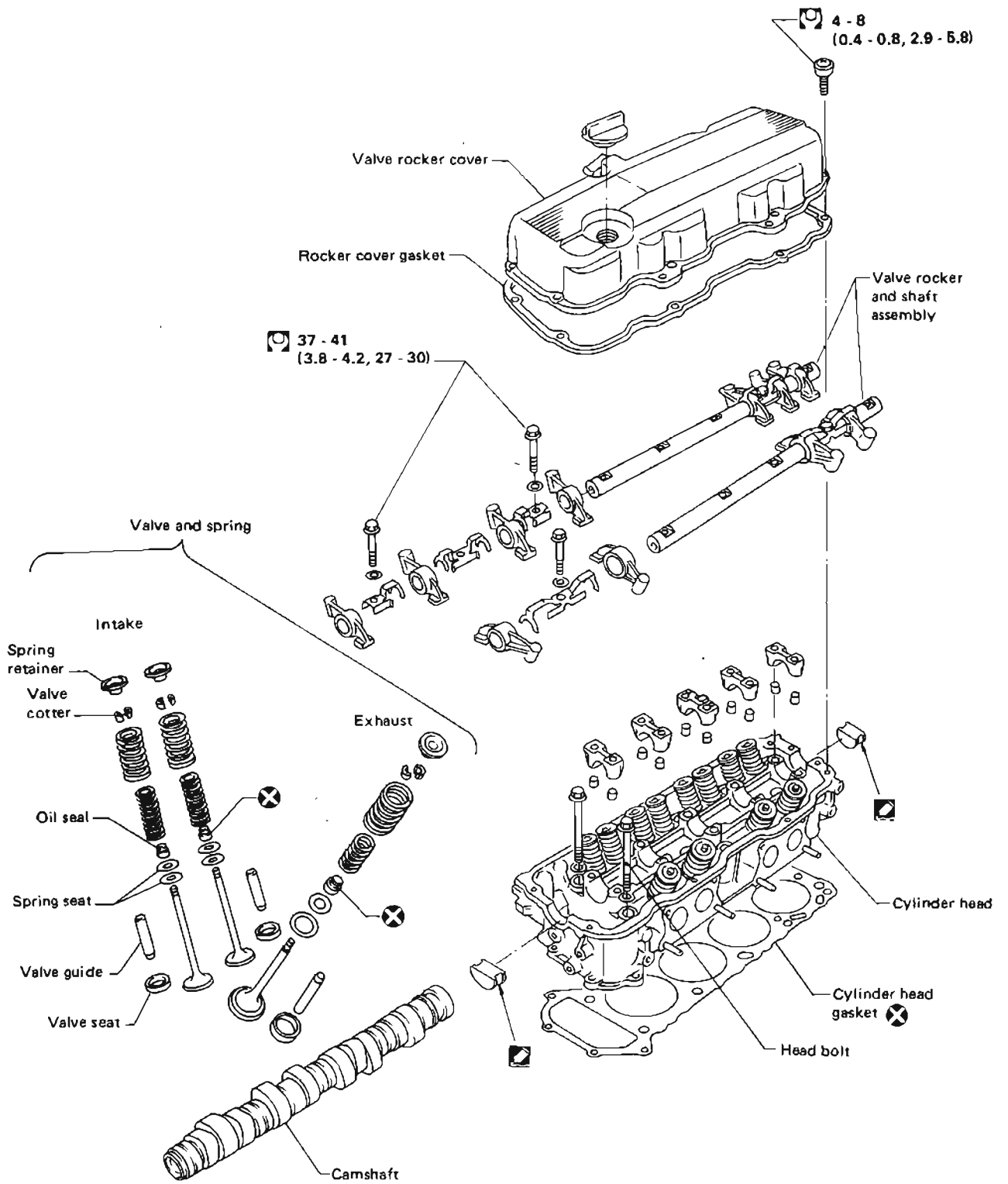


5. Apply engine oil to new oil seal and install it using suitable tool.



6. Apply liquid gasket to rear oil seal retainer.

CYLINDER HEAD



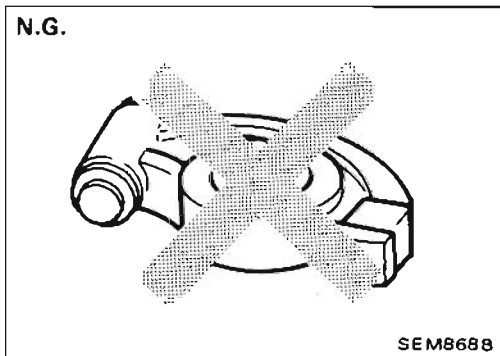
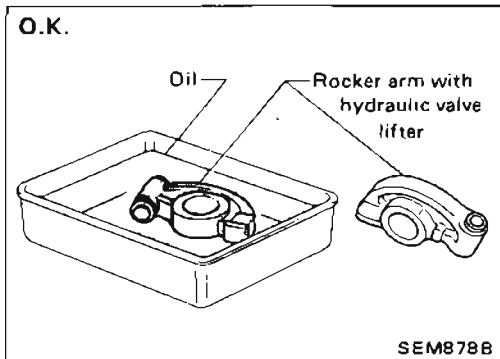
☐ : N-m (kg-m, ft-lb)

SEM215C

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

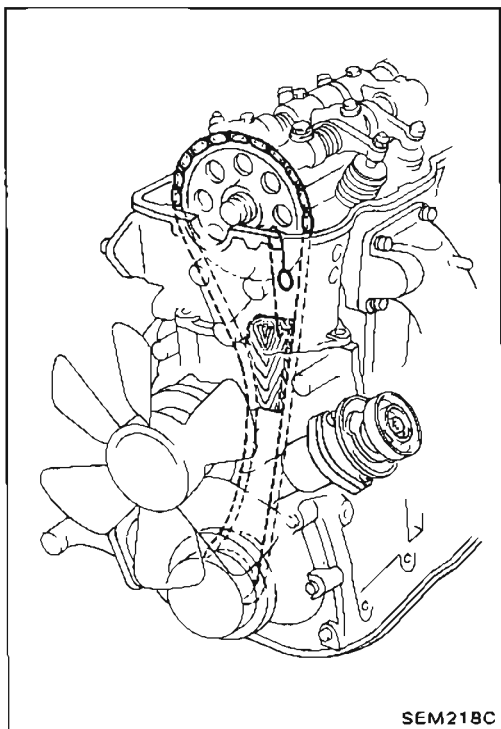
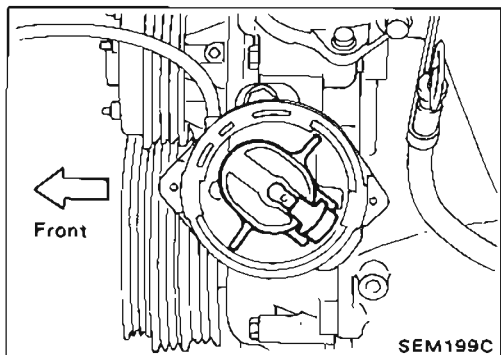
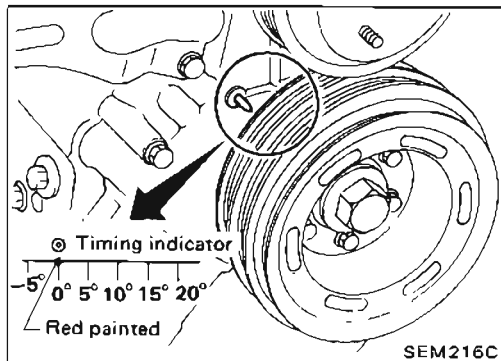
1. Drain coolant from radiator and drain plug of block.
2. Remove the following parts.
 - Power steering drive belt
 - Power steering pump, idler pulley and power steering brackets
 - Vacuum hoses of S.C.V. and pressure control solenoid valve
 - Accelerator wire bracket
3. Disconnect E.G.R. tube from exhaust manifold.
4. Remove bolts which hold intake manifold collector to intake manifold.
5. Remove bolts which hold intake manifold to cylinder head while raising collector upwards.
6. Remove rocker cover.

When removing rocker cover, do not hit rocker cover against rocker arm.

CYLINDER HEAD

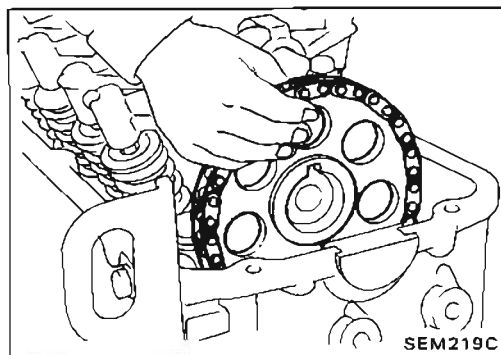
Removal (Cont'd)

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



8. Loosen camshaft sprocket bolt.

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

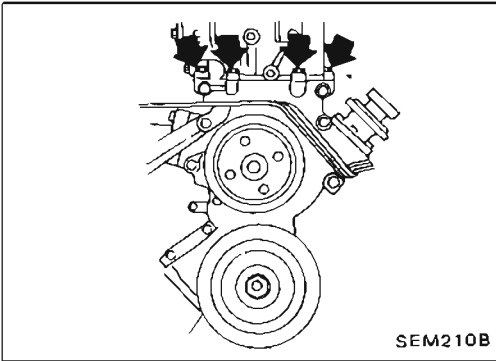


9. Remove camshaft sprocket.

CYLINDER HEAD

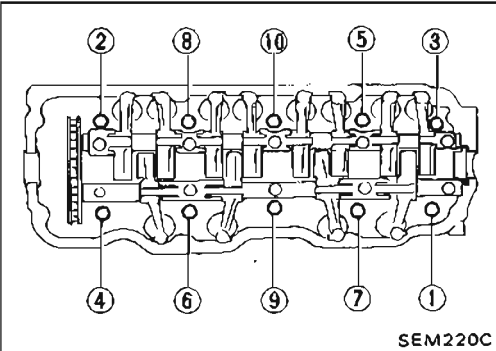
Removal (Cont'd)

10. Remove front cover tightening bolts to cylinder head.



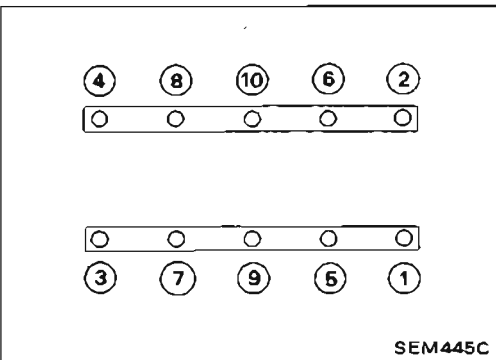
11. Remove cylinder head.

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

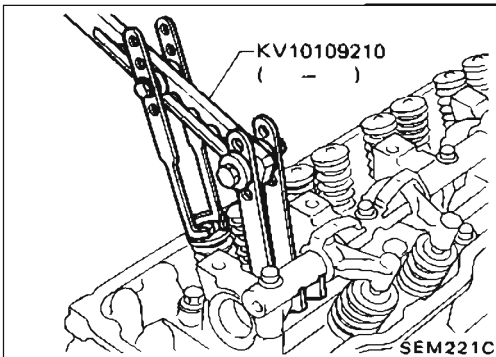


Disassembly

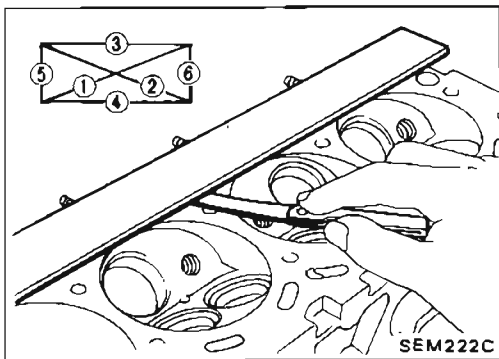
1. Remove rocker shaft assembly.
 - a. When loosening bolts, evenly loosen from outside in sequence.
 - b. Bolts should be loosened in two or three steps.
2. Remove camshaft.
 - Before removing camshaft, measure camshaft end play. (Refer to "Inspection".)



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:

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

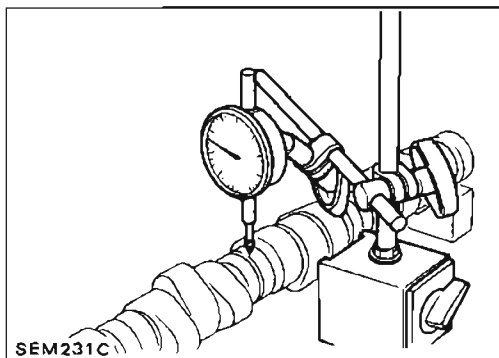
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

98.8 - 99.0 mm (3.890 - 3.898 in)

CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.



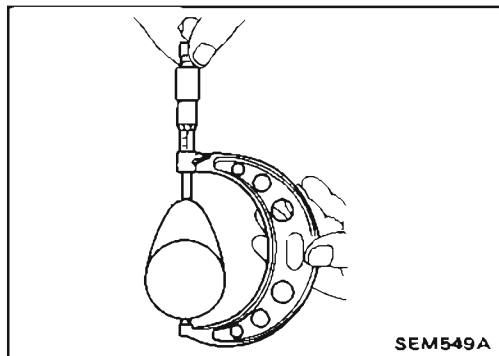
CAMSHAFT RUNOUT

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.

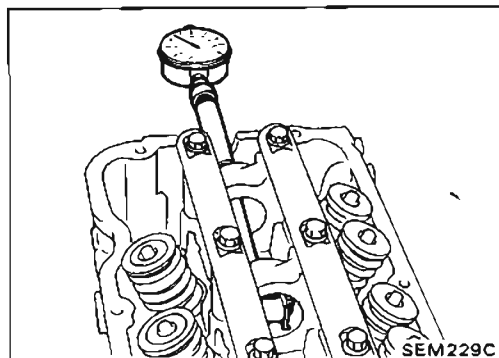
Standard cam height:

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

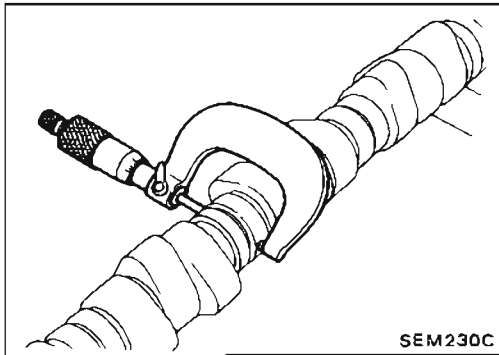
1. Install camshaft bracket and rocker shaft and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.

Standard inner diameter:

33.000 - 33.025 mm (1.2992 - 1.3002 in)

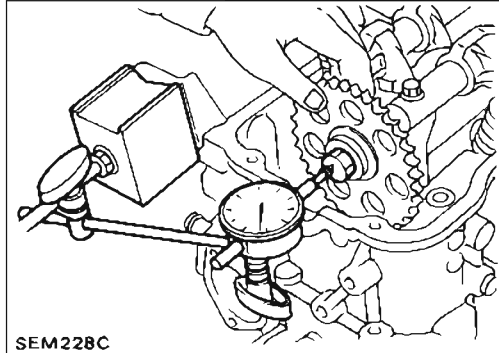
CYLINDER HEAD

Inspection (Cont'd)



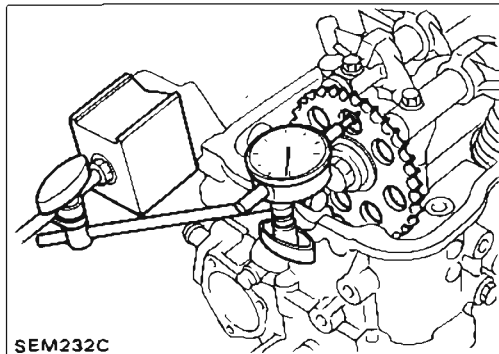
3. Measure outer diameter of camshaft journal.
Standard outer diameter:
32.935 - 32.955 mm (1.2967 - 1.2978 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
Camshaft journal clearance:
Standard
0.045 - 0.090 mm (0.0018 - 0.0035 in)
Limit
0.12 mm (0.0047 in)

CAMSHAFT END PLAY



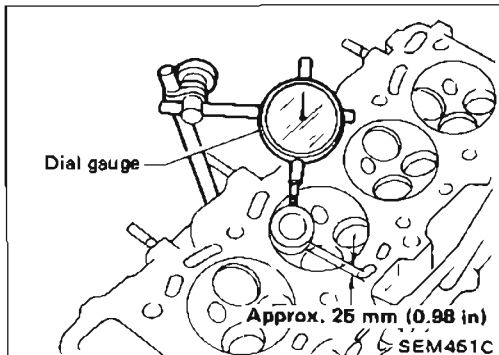
1. Install camshaft in cylinder head.
2. Measure camshaft end play.
Camshaft end play:
Standard
0.07 - 0.15 mm (0.0028 - 0.0059 in)
Limit
0.2 mm (0.008 in)

CAMSHAFT SPROCKET RUNOUT

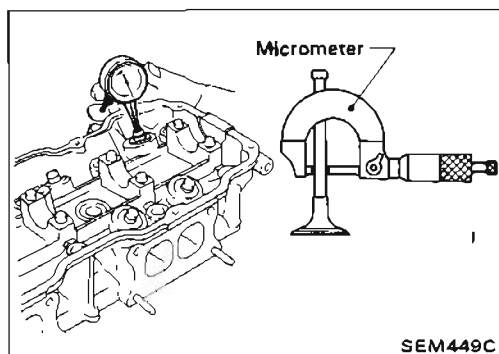


1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
Runout (Total indicator reading):
Limit 0.12 mm (0.0047 in)
3. If it exceeds the limit, replace camshaft sprocket.

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)



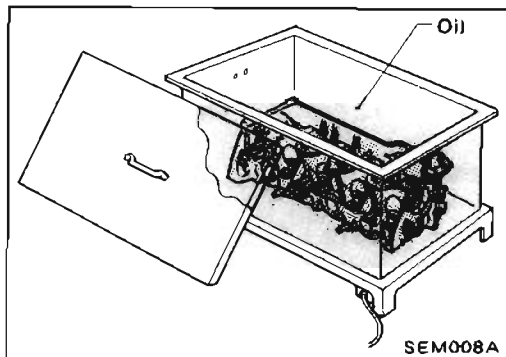
2. If it exceeds the limit, check valve to valve guide clearance.
 - a. Measure valve stem diameter and valve guide inner diameter.
 - b. Check that clearance is within specification.
Valve to valve guide clearance:
Standard
0.020 - 0.053 mm
(0.0008 - 0.0021 in) (Intake)
0.040 - 0.070 mm
(0.0016 - 0.0028 in) (Exhaust)
Limit
0.1 mm (0.004 in)
 - c. If it exceeds the limit, replace valve or valve guide.

CYLINDER HEAD

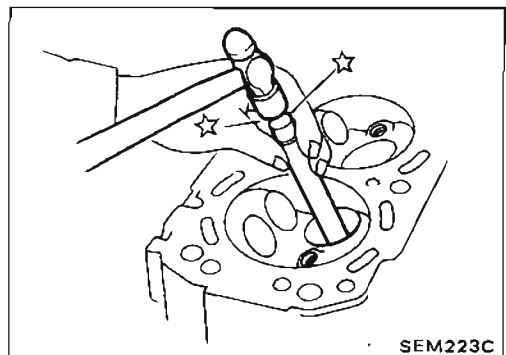
Inspection (Cont'd)

VALVE GUIDE REPLACEMENT

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



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



3. Ream cylinder head valve guide hole.

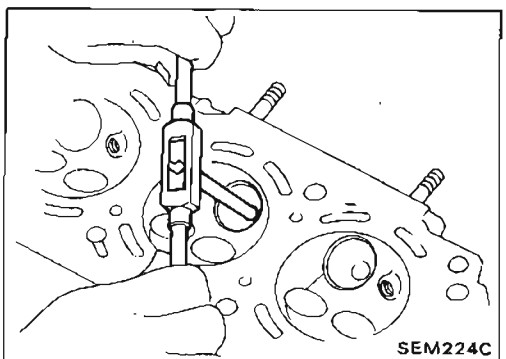
**Valve guide hole diameter
(for service parts):**

Intake

11.175 - 11.196 mm (0.4400 - 0.4408 in)

Exhaust

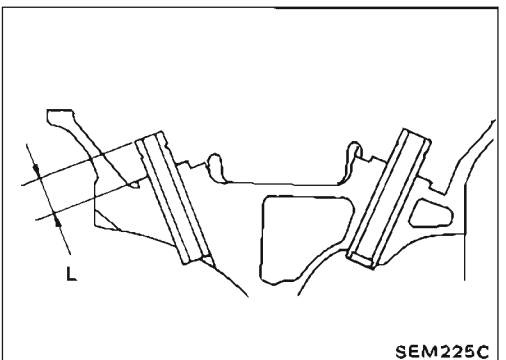
12.175 - 12.196 mm (0.4793 - 0.4802 in)



4. 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)



5. Ream valve guide.

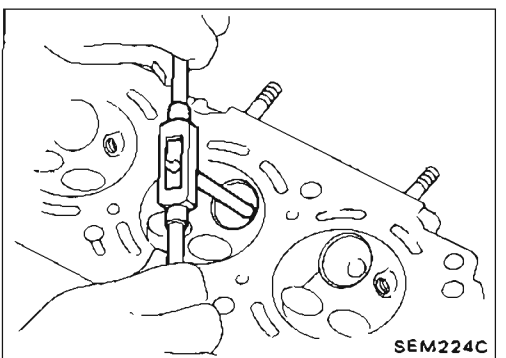
Finished size:

Intake

7.000 - 7.018 mm (0.2756 - 0.2763 in)

Exhaust

8.000 - 8.018 mm (0.3150 - 0.3157 in)



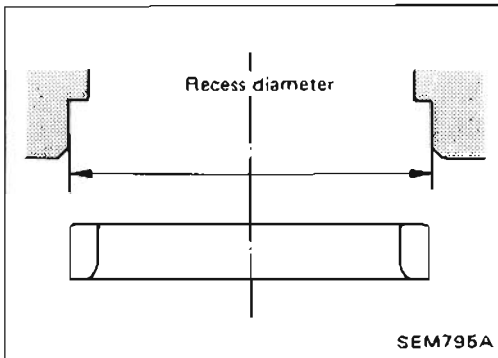
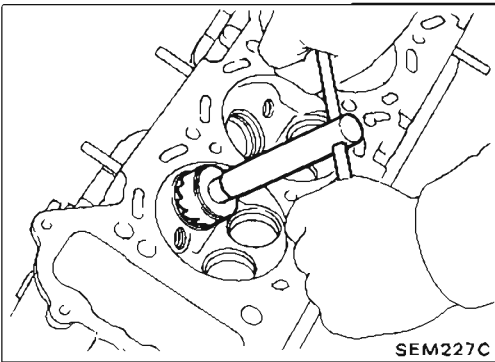
CYLINDER HEAD

Inspection (Cont'd)

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

1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.

Reaming bore for service valve seat

Oversize [0.5 mm (0.020 in)]:

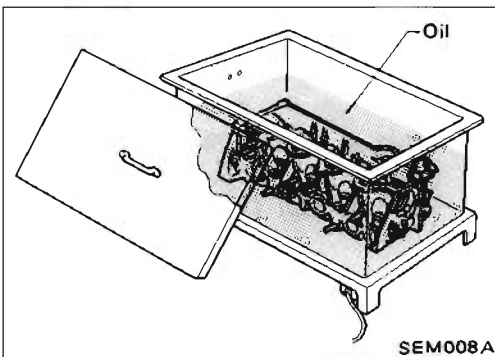
Intake

36.500 - 36.516 mm (1.4370 - 1.4376 in)

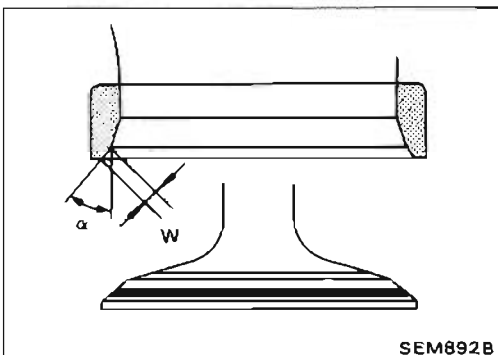
Exhaust

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.



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



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

Seat face angle " α ":

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)

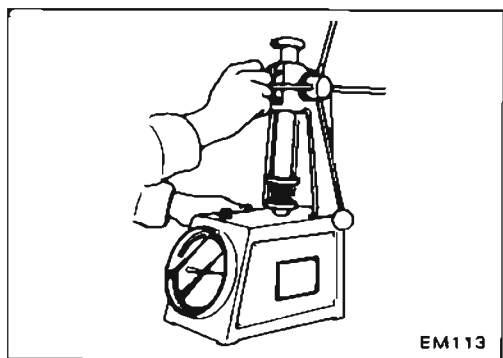
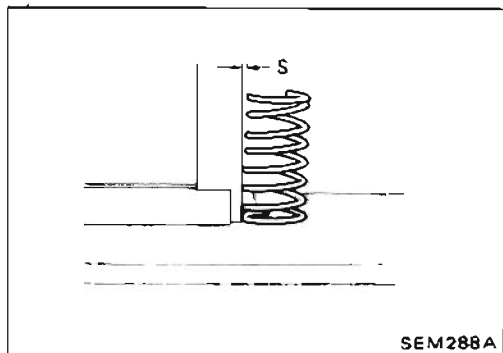
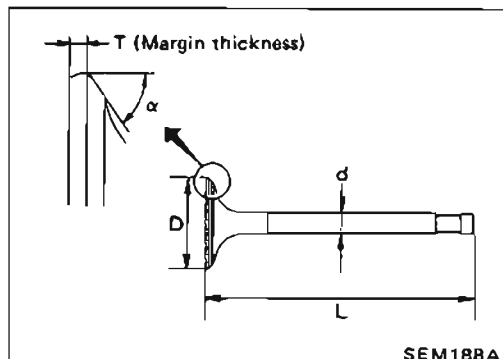
CYLINDER HEAD

Inspection (Cont'd)

VALVE DIMENSIONS

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

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



VALVE SPRING

Squareness

1. Measure "S" dimension.

Out-of-square:

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.

CYLINDER HEAD

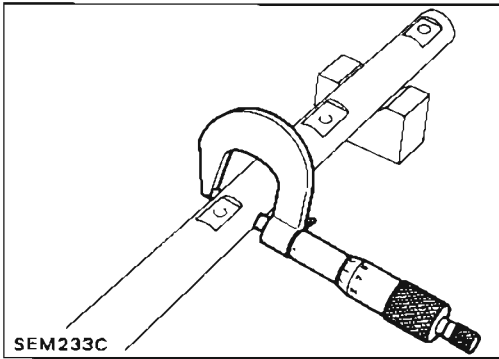
Inspection (Cont'd)

ROCKER SHAFT AND ROCKER ARM

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

Diameter mm (in):

21.979 - 22.000 mm (0.8653 - 0.8661 in)



3. Check inner diameter of rocker arm.

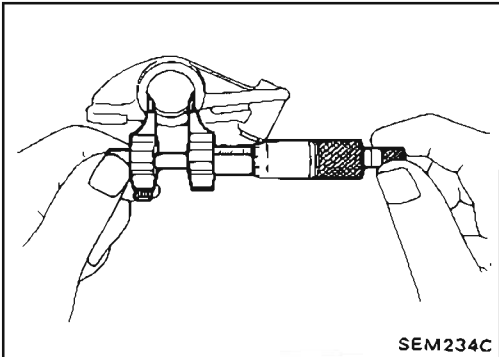
Diameter mm (in):

22.012 - 22.029 mm (0.8666 - 0.8673 in)

Rocker arm to shaft clearance mm (in):

0.012 - 0.050 mm (0.0005 - 0.0020 in)

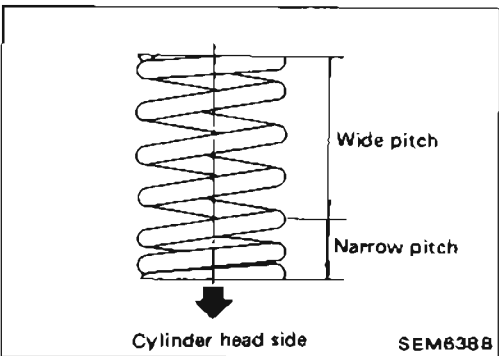
- Keep rocker arm with hydraulic valve lifter standing to prevent air from entering hydraulic valve lifter when checking.



Assembly

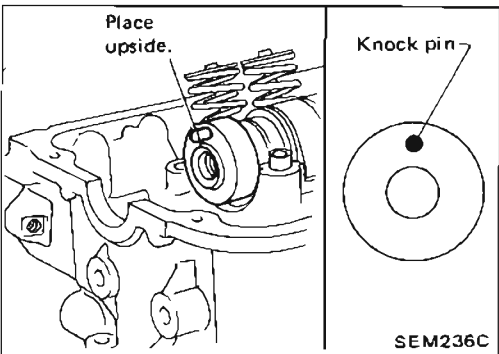
1. Install valve component parts.

- 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.



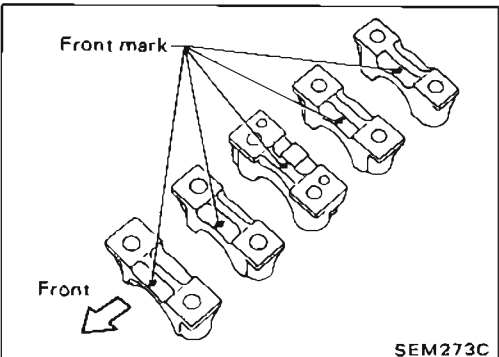
2. Mount camshaft onto cylinder head, placing knock pin at front end to top position.

Apply engine oil to camshaft when mounting onto cylinder head.



3. Install camshaft brackets.

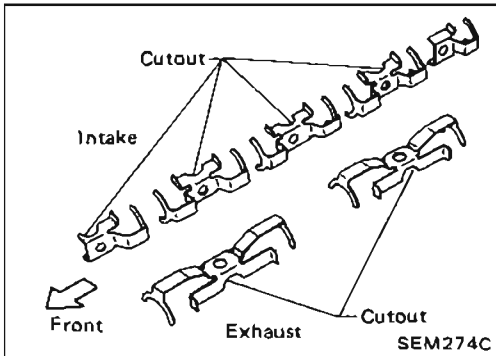
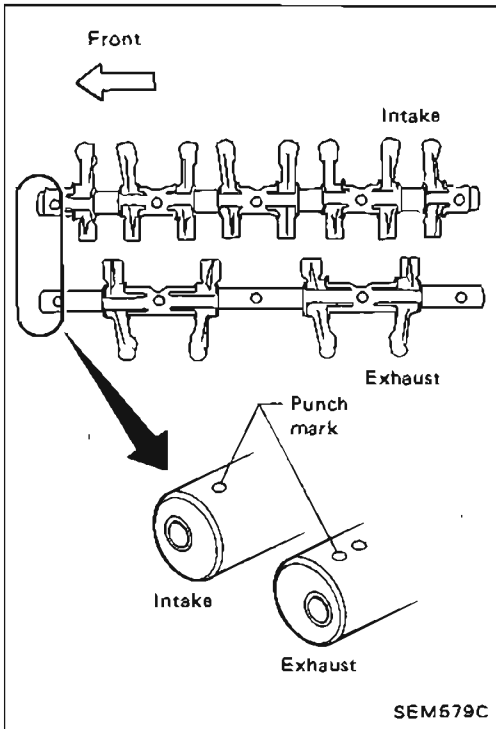
Front mark is punched on the camshaft bracket.



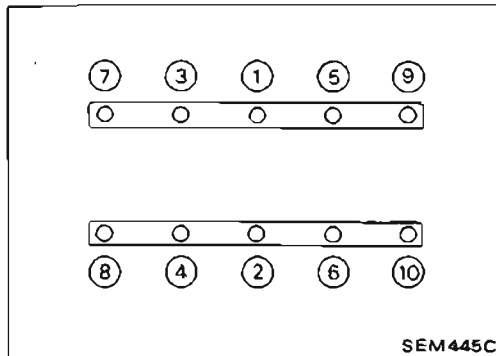
CYLINDER HEAD

Assembly (Cont'd)

4. Install rocker shaft with rocker arms.



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



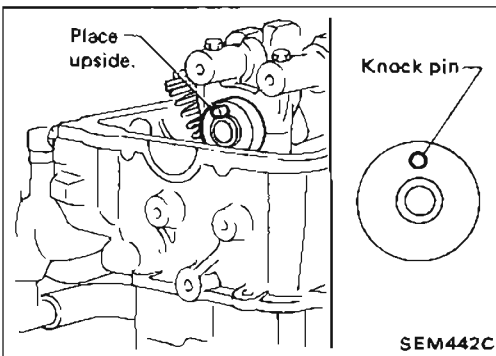
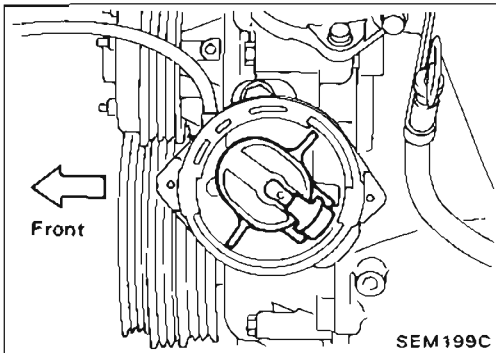
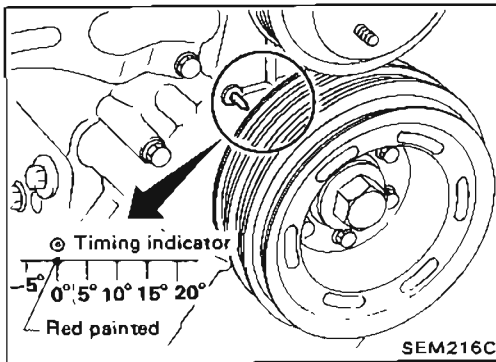
5. Tighten bolts as shown in figure at left.

CYLINDER HEAD

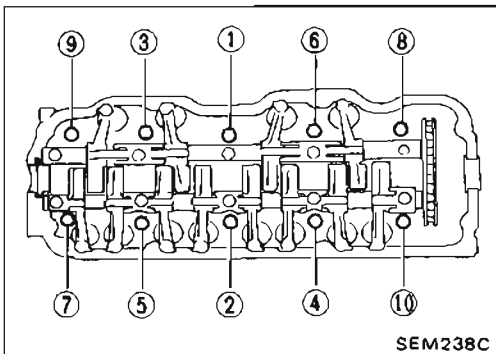
Installation

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.

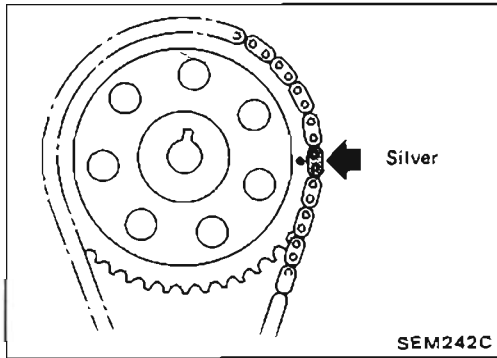
- Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.

- Tightening procedure

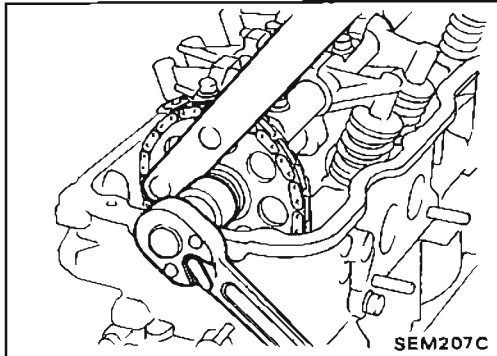
- (1) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
- (2) Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).
- (3) Loosen all bolts completely.
- (4) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
- (5) Turn all bolts 80 to 85 degrees clockwise with an angle wrench, or if an angle wrench is not available, tighten all bolts to 74 to 83 N·m (7.5 to 8.5 kg-m, 54 to 61 ft-lb).

CYLINDER HEAD

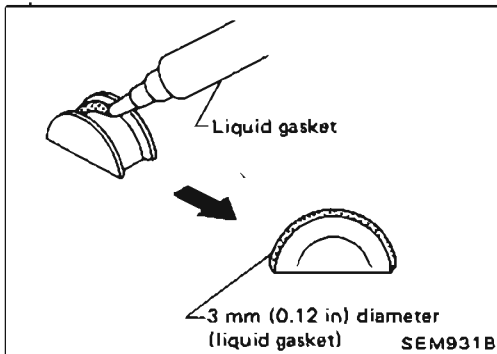
Installation (Cont'd)



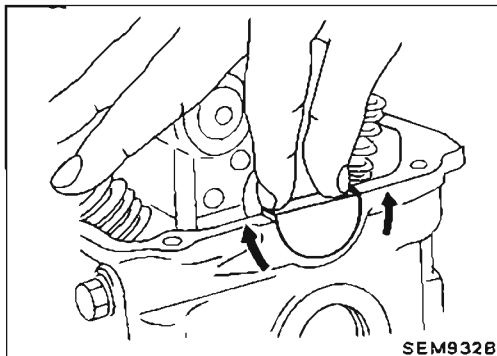
3. Set chain on camshaft sprocket by aligning each mating mark. Then install camshaft sprocket to camshaft.



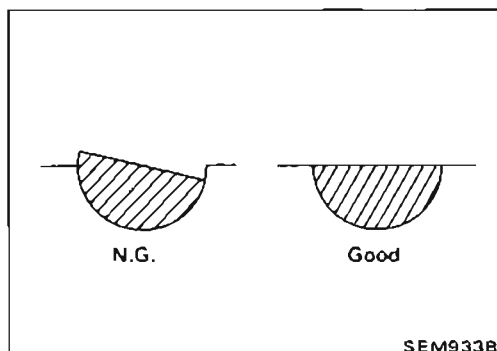
4. Tighten camshaft sprocket bolt.



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.

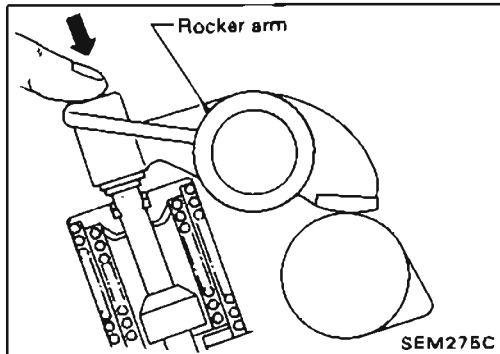


- (2) Install rubber plugs, then move them with your fingers to uniformly spread the gasket on cylinder head surface.
 - Rubber plugs should be installed flush with the surface.
 - Do not start the engine for 30 minutes after installing rocker cover.
 - Wipe clean excessive liquid gasket from cylinder head top surface.



CYLINDER HEAD

Installation (Cont'd)

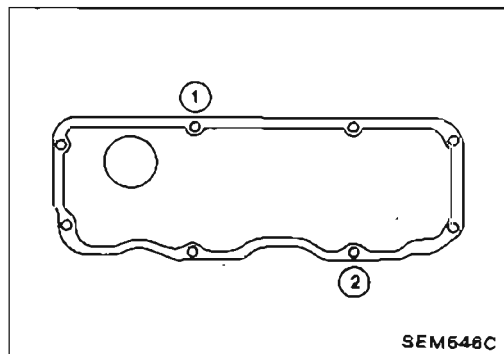


6. Check hydraulic valve lifter.

- (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).

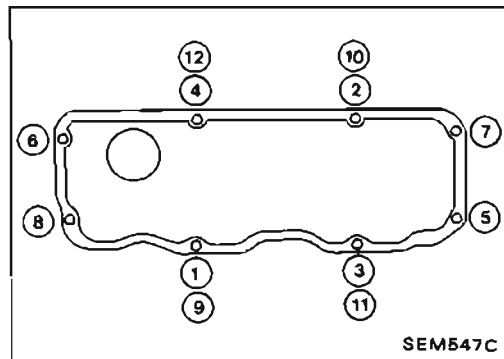
7. Install rocker cover.

- **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.

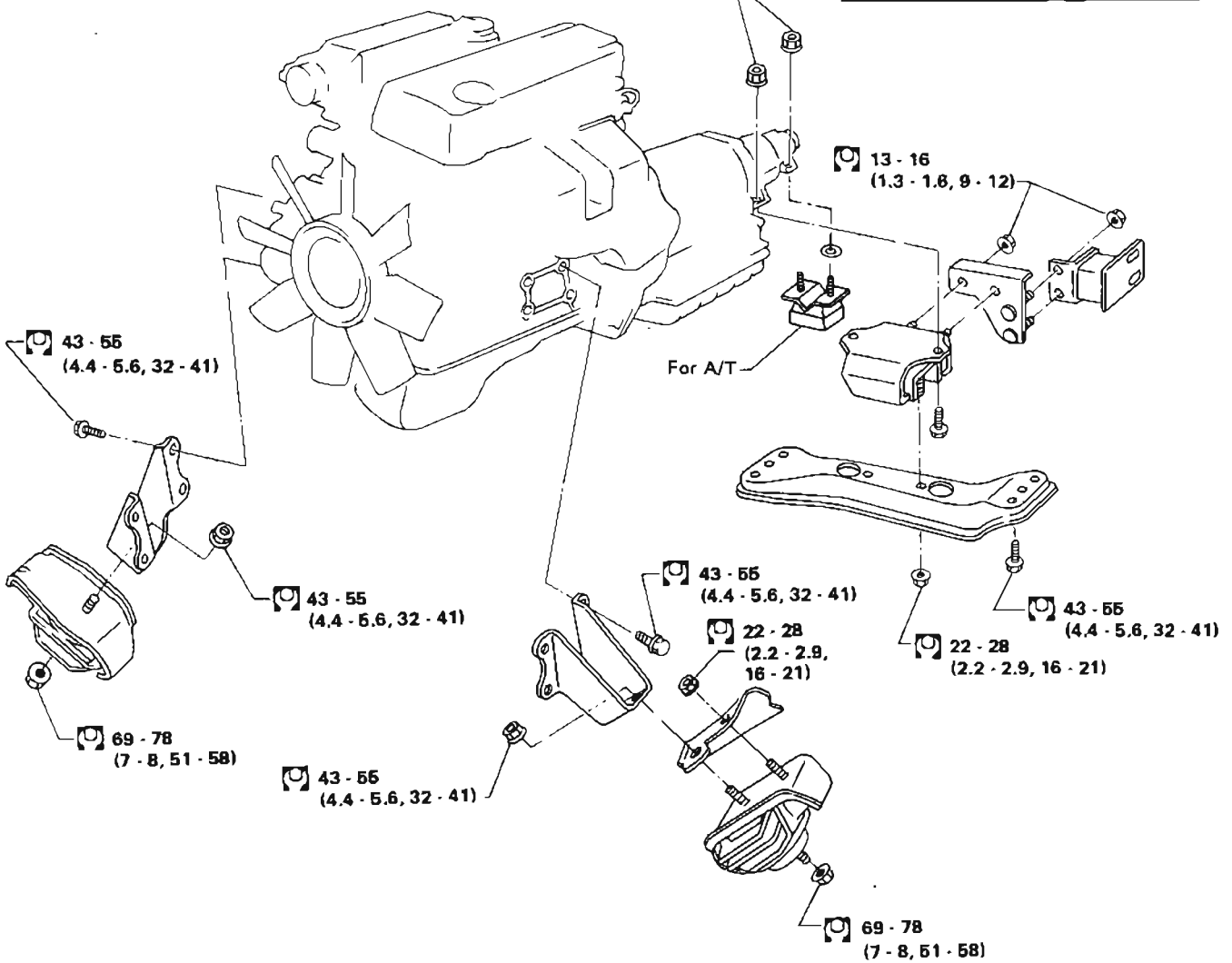
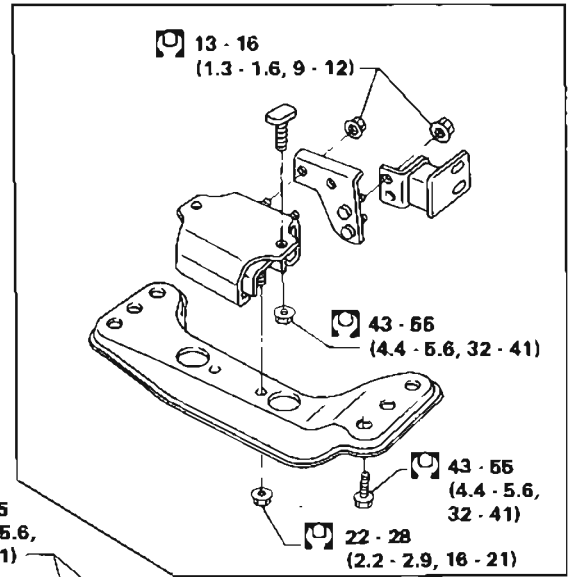


- (2) Then tighten bolts to 7 to 10 N·m (0.7 to 1.0 kg-m, 5.1 to 7.2 ft-lb) in order shown in figure.

9. Install any parts removed.

ENGINE REMOVAL

M/T model



: N·m (kg·m, ft·lb)

SEM271C

ENGINE REMOVAL

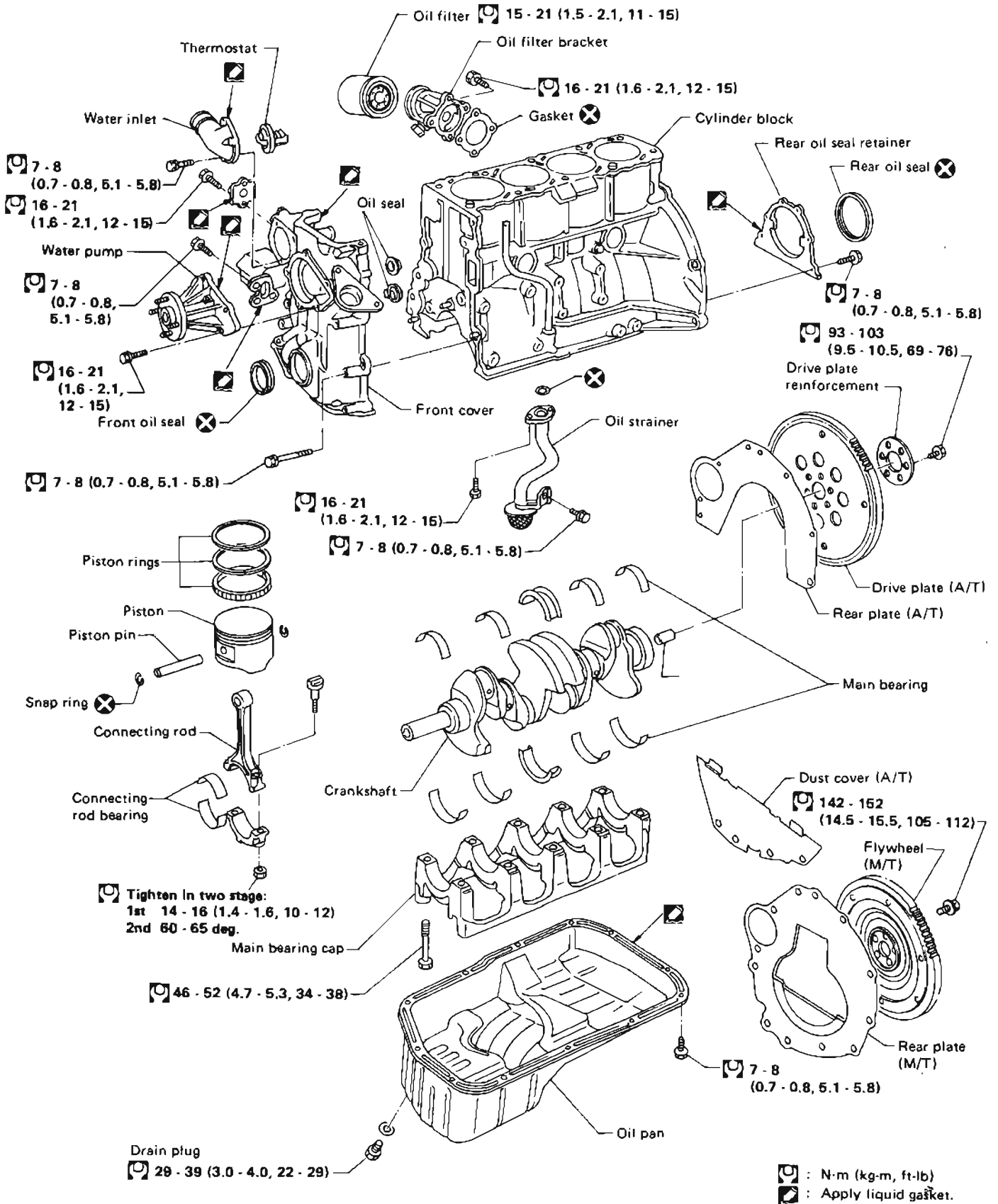
WARNING:

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

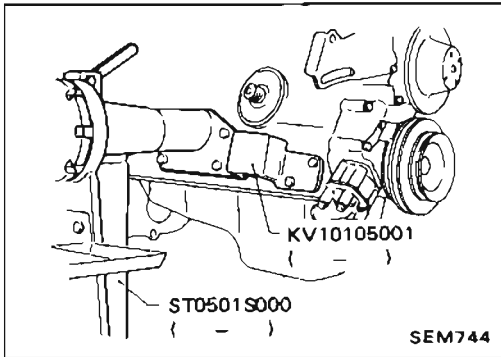
CAUTION:

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

CYLINDER BLOCK



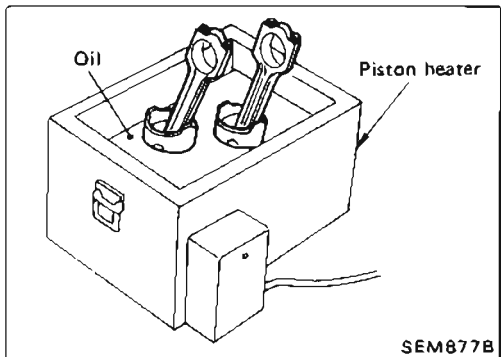
CYLINDER BLOCK



Disassembly

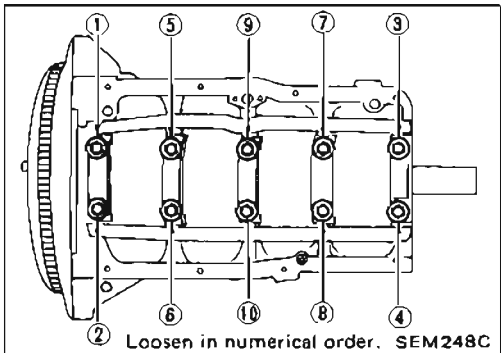
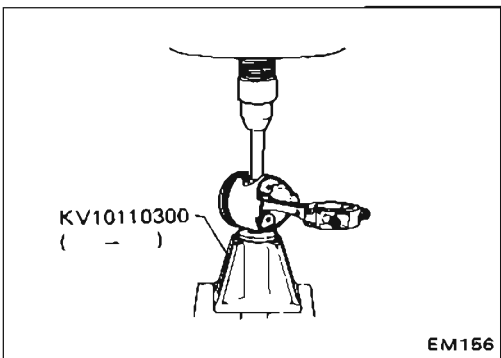
PISTON AND CRANKSHAFT

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



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.



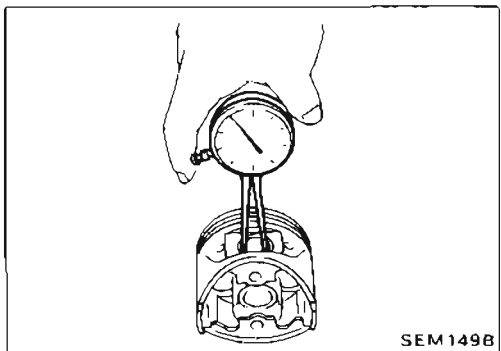
8. Remove main bearing beam and crankshaft.

- 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)

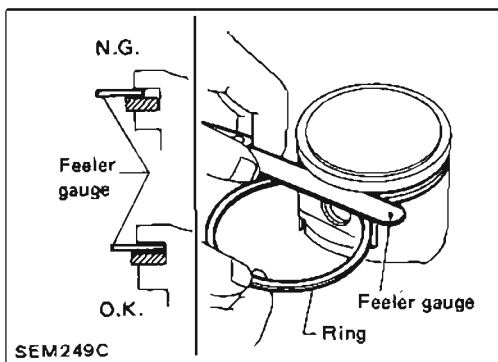
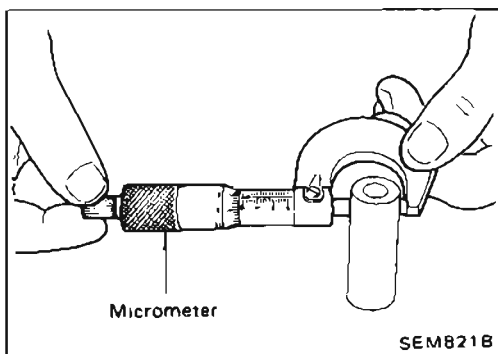


CYLINDER BLOCK

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 mm (0 - 0.0002 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)

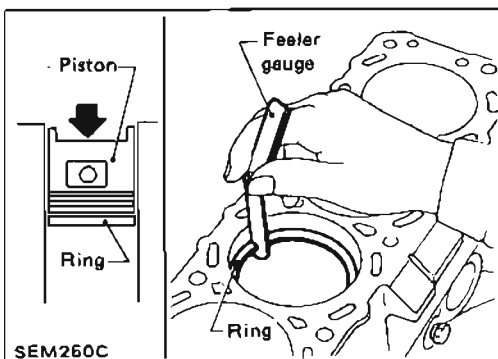
Oil ring

0.065 - 0.135 mm (0.0026 - 0.0053 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 - 0.43 mm (0.0110 - 0.0169 in)

2nd ring

0.45 - 0.60 mm (0.0177 - 0.0236 in)

(R or T is punched on the ring.)

0.55 - 0.70 mm (0.0217 - 0.0276 in)

(N is punched on the ring.)

Oil ring

0.20 - 0.60 mm (0.0079 - 0.0236 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.

CYLINDER BLOCK

Inspection (Cont'd)

CONNECTING ROD BEND AND TORSION

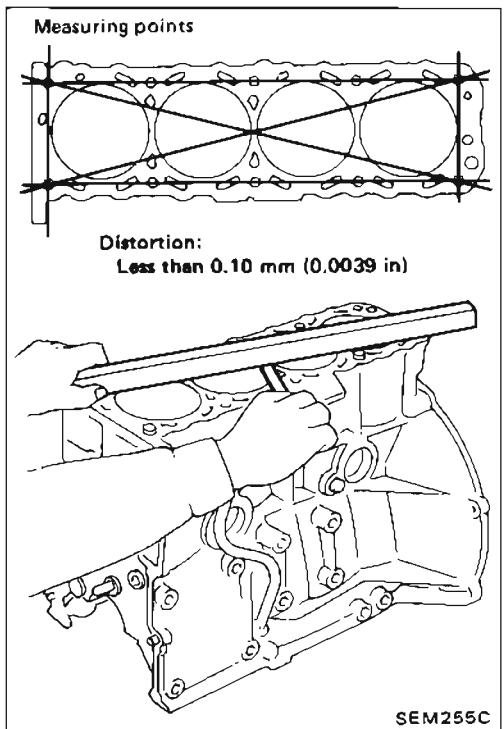
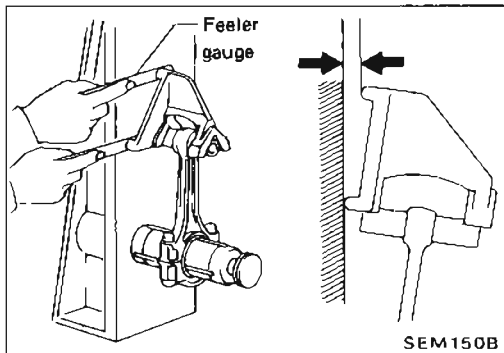
Bend:

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 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:

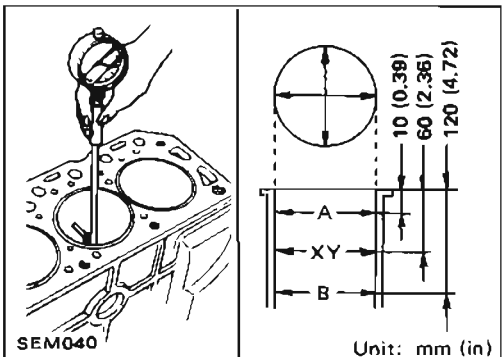
$$A + B = 0.2 \text{ mm (0.008 in)}$$

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)

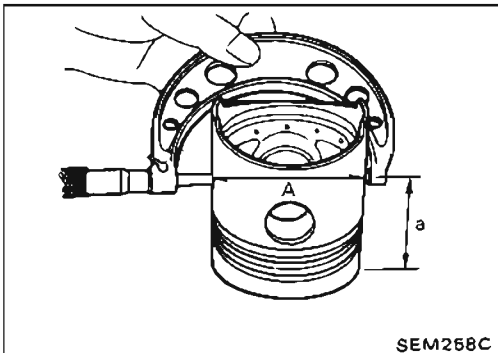
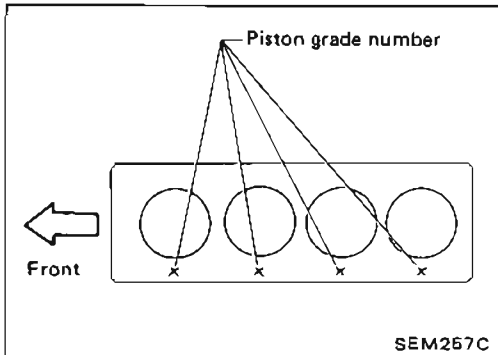
Taper (A-B) limit:

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.

CYLINDER BLOCK



Inspection (Cont'd)

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

3. Measure piston skirt diameter.

Piston diameter "A":

Refer to S.D.S.

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

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):

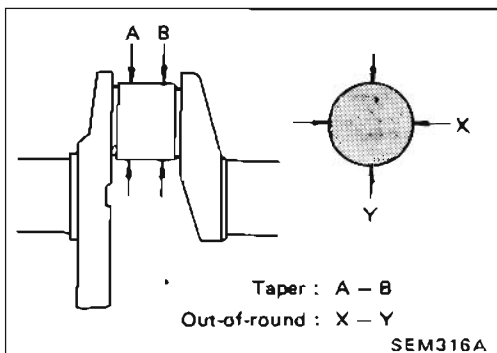
Main journal Less than 0.01 mm (0.0004 in)

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)

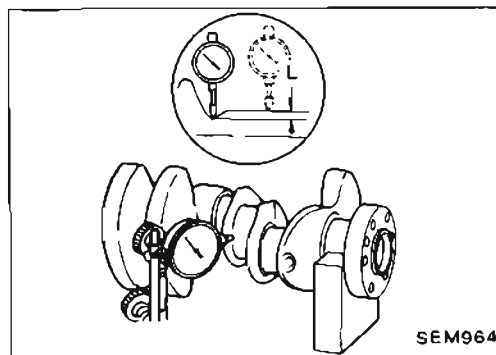
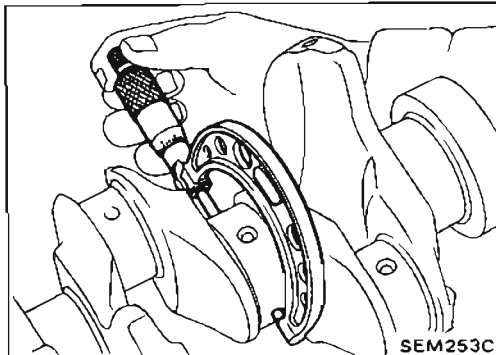
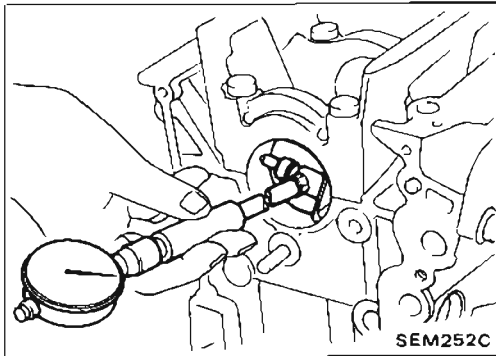
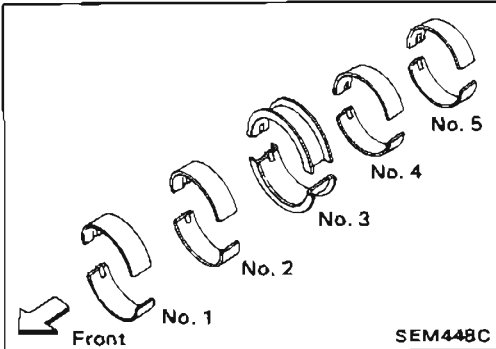
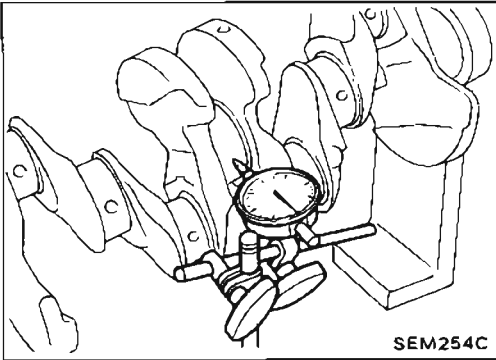


CYLINDER BLOCK

Inspection (Cont'd)

3. Measure crankshaft runout.

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



BEARING CLEARANCE

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.

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.

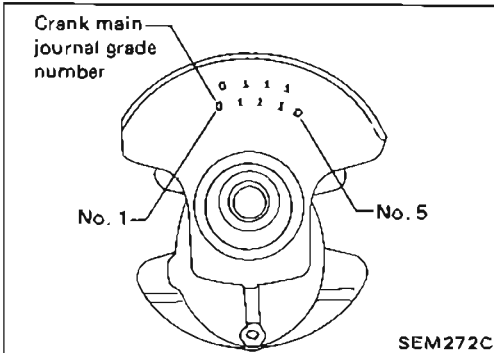
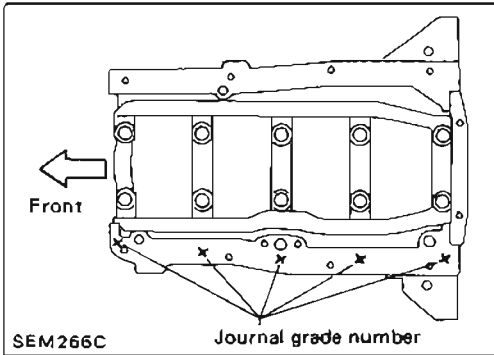
- a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.

"L": 0.1 mm (0.004 in)

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

CYLINDER BLOCK

Inspection (Cont'd)



8. If crankshaft is reused, measure main bearing clearance and select 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:

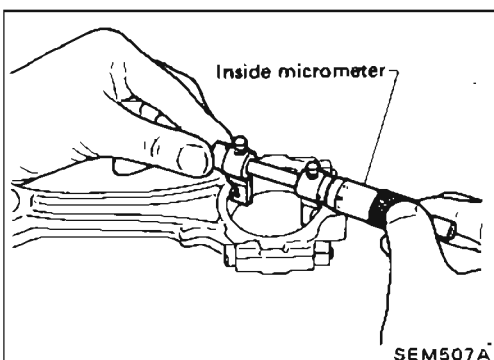
| Main journal grade number Crankshaft journal grade number | 0 | 1 | 2 |
|--|---|---|---|
| 0 | 0 | 1 | 2 |
| 1 | 1 | 2 | 3 |
| 2 | 2 | 3 | 4 |

For example:

Main journal grade number: 1

Crankshaft journal grade number: 2

Main bearing grade number = 1 + 2
= 3



Connecting rod bearing (Big end)

1. Install connecting rod bearing to connecting rod and cap.
 2. Install connecting rod cap to connecting rod.
- Tighten bolts to the specified torque.**
3. Measure inner diameter "C" of each bearing.

CYLINDER BLOCK

Inspection (Cont'd)

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)

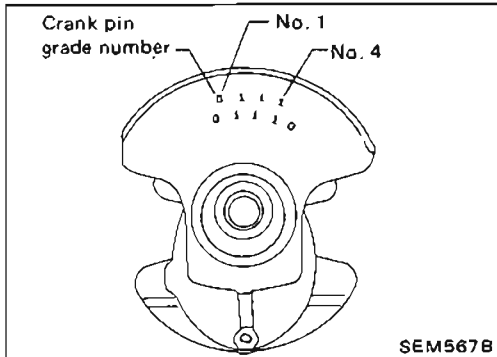
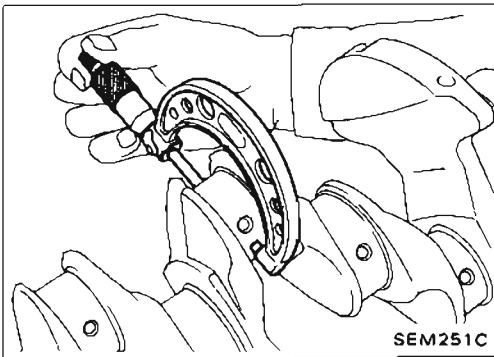
Limit: 0.09 mm (0.0035 in)

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 |



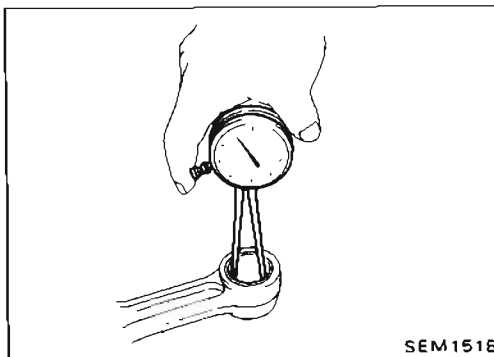
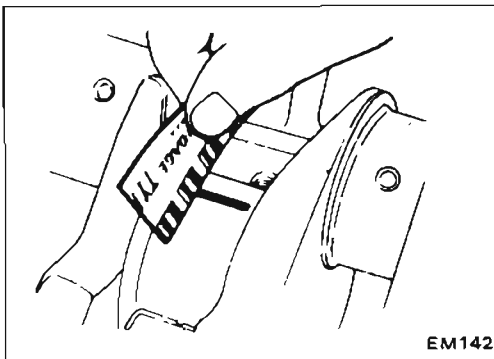
Method B (Using plastigage)

CAUTION:

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

CONNECTING ROD BUSHING CLEARANCE (Small end)

1. Measure inner diameter "C" of bushing.



CYLINDER BLOCK

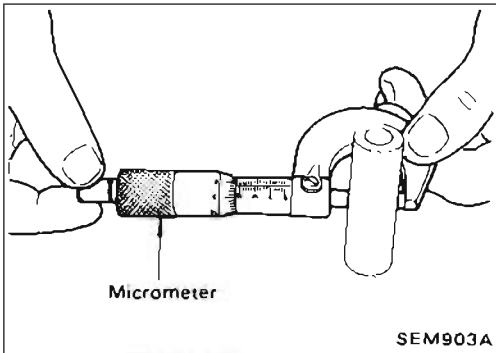
Inspection (Cont'd)

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

$$C - D_p =$$

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.



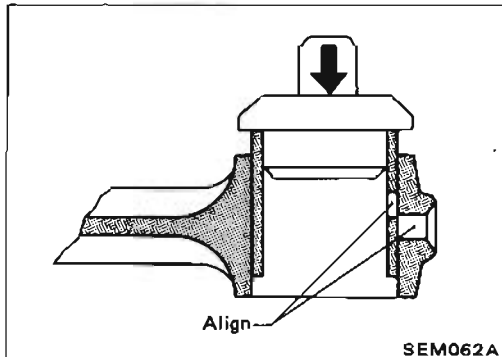
REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

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

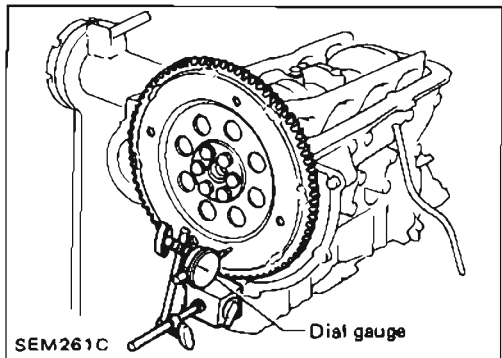
Runout (Total indicator reading):

Flywheel (M/T model)

Less than 0.1 mm (0.004 in)

Drive plate (A/T model)

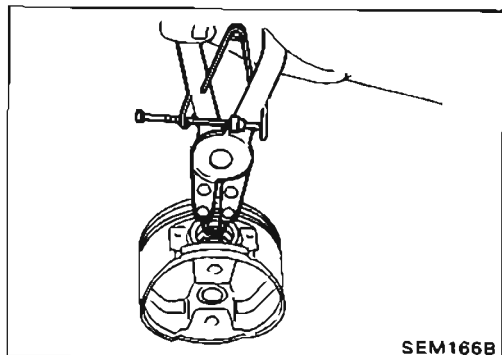
Less than 0.1 mm (0.004 in)



Assembly

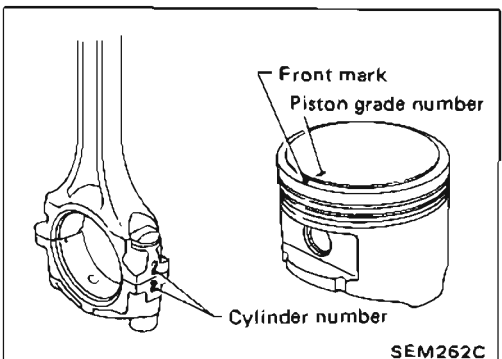
PISTON

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



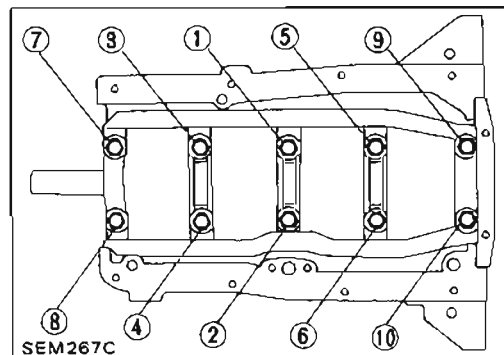
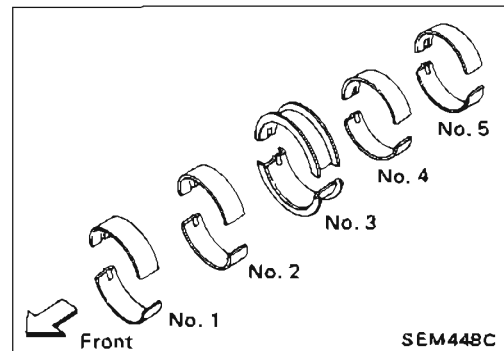
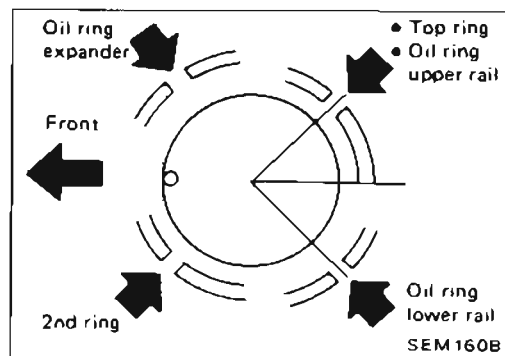
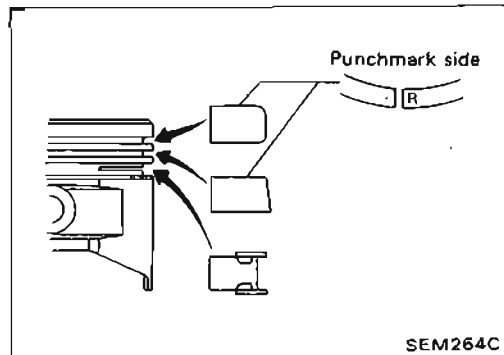
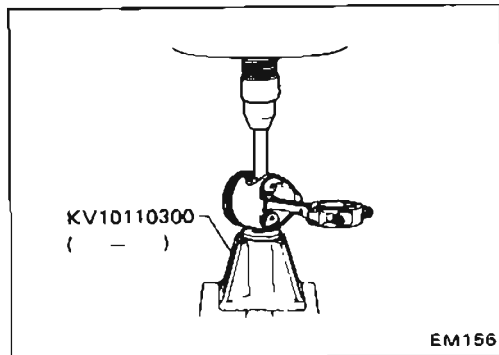
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

- **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.**



CYLINDER BLOCK

Assembly (Cont'd)



3. Set piston rings as shown.

CRANKSHAFT

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

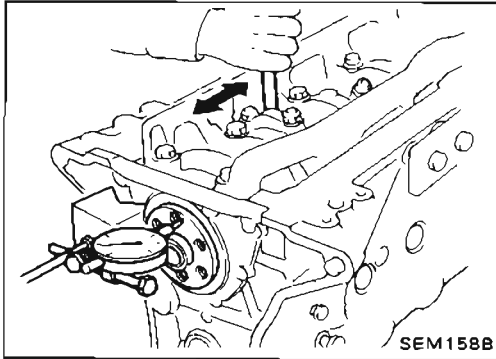
- Confirm that correct main bearings are used. Refer to "Inspection" of this section.

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.

CYLINDER BLOCK

Assembly (Cont'd)



3. Measure crankshaft end play.

Crankshaft end play:

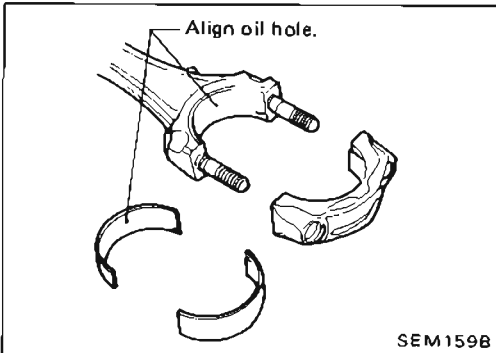
Standard

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.

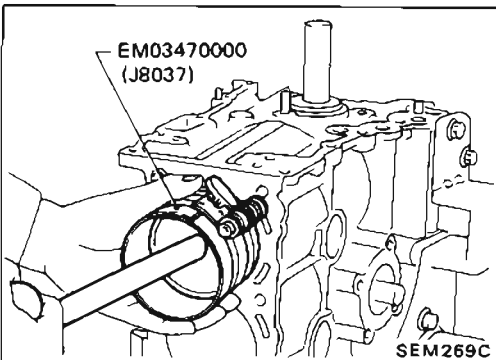


4. Install connecting rod bearings in connecting rods and connecting rod caps.

- Confirm that correct bearings are used.

Refer to "Inspection".

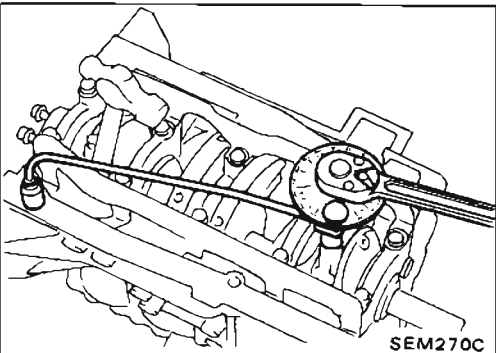
- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.



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.

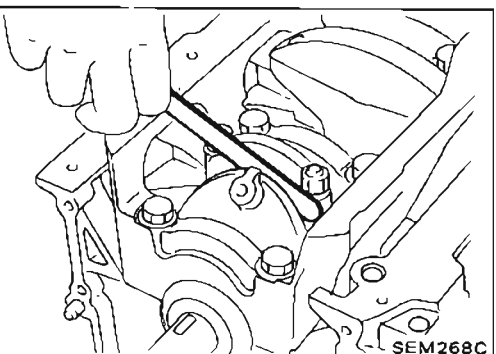
Tighten connecting rod bearing cap nuts to the specified torque.

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).



6. Measure connecting rod side clearance.

Connecting rod side clearance:

Standard

0.2 - 0.4 mm (0.008 - 0.016 in)

Limit

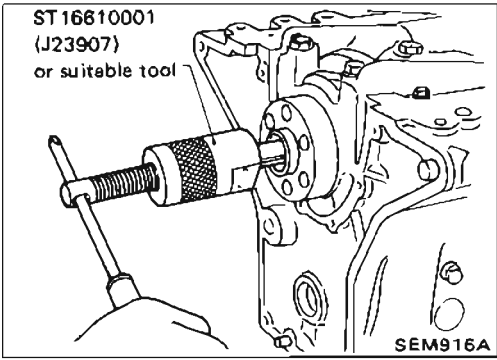
0.6 mm (0.024 in)

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

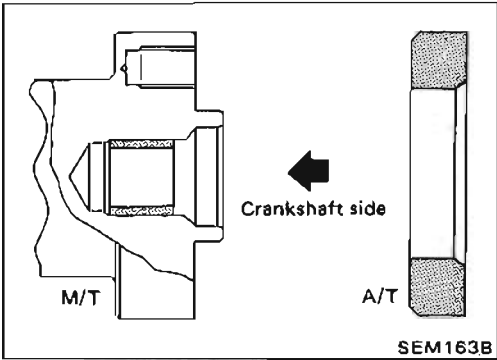
CYLINDER BLOCK

Assembly (Cont'd) REPLACING PILOT BUSHING

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



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



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

General Specifications

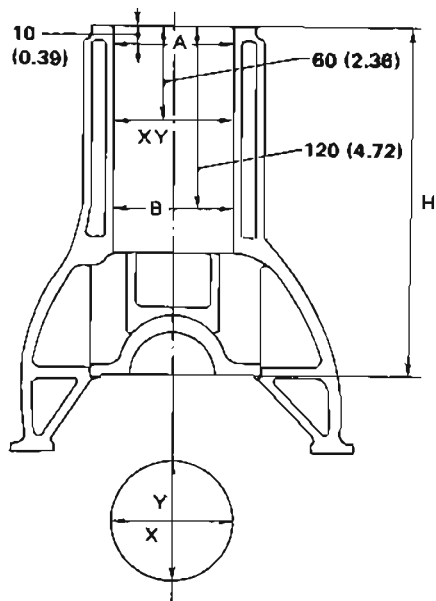
| | |
|---|-----------------------|
| Engine model | KA24E |
| Cylinder arrangement | 4, in-line |
| Displacement cm ³ (cu in) | 2,389 (145.78) |
| Bore x stroke mm (in) | 89 x 96 (3.50 x 3.78) |
| Valve arrangement | O.H.C. |
| Firing order | 1-3-4-2 |
| Number of piston rings | |
| Compression | 2 |
| Oil | 1 |
| Number of main bearings | 5 |
| Compression ratio | 9.1 |

Unit: kPa (kg/cm², psi)/rpm

| | |
|--------------------------------------|-----------------------|
| Compression pressure | |
| Standard | 1,324 (13.5, 192)/300 |
| Minimum | 981 (10, 142)/300 |
| Differential limit between cylinders | 98 (1.0, 14)/300 |

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 (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)

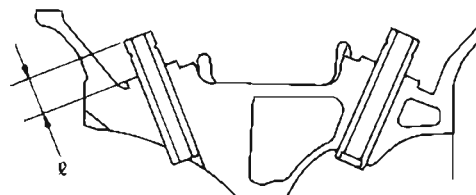
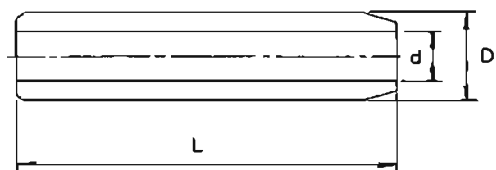
| | Standard | Limit |
|--------------------|--------------------------------|--------------|
| Height (H) | 98.8 - 99.0 (3.890 - 3.898) | 0.2 (0.008)* |
| Surface distortion | 0.03 (0.0012) | 0.1 (0.004) |

* Total amount of cylinder head resurfacing and cylinder block resurfacing

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

Inspection and Adjustment (Cont'd)

VALVE GUIDE



SEM571B

SEM225C

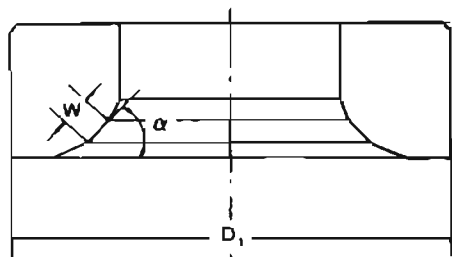
Unit: mm (in)

| | Standard | | Service | | Limit |
|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|-------------|
| | Intake | Exhaust | Intake | Exhaust | |
| Length (L) | 52.6 (2.071) | 56.0 (2.206) | 52.6 (2.071) | 56.0 (2.206) | — |
| Outer diameter (D) | 11.023 - 11.034 (0.4340 - 0.4344) | 12.023 - 12.034 (0.4733 - 0.4738) | 11.223 - 11.234 (0.4418 - 0.4423) | 12.223 - 12.234 (0.4812 - 0.4817) | — |
| Inner diameter (d) (Finished size) | 7.000 - 7.018 (0.2756 - 0.2763) | 8.000 - 8.018 (0.3150 - 0.3157) | 7.000 - 7.018 (0.2756 - 0.2763) | 8.000 - 8.018 (0.3150 - 0.3157) | — |
| Cylinder head hole diameter | 10.975 - 10.996 (0.4321 - 0.4329) | 11.975 - 11.996 (0.4715 - 0.4723) | 11.175 - 11.196 (0.4400 - 0.4408) | 12.175 - 12.196 (0.4793 - 0.4802) | — |
| Interference fit | 0.027 - 0.059 (0.0011 - 0.0023) | | | | — |
| Stem to guide clearance | 0.020 - 0.053 (0.0008 - 0.0021) | 0.040 - 0.070 (0.0016 - 0.0028) | 0.020 - 0.053 (0.0008 - 0.00209) | 0.040 - 0.070 (0.0016 - 0.0028) | 0.1 (0.004) |
| Tapping length (l) | 14.9 - 15.1 (0.587 - 0.594) | | | | — |

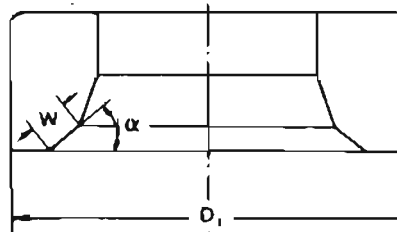
SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

Standard



Service



SEM177

SEM178

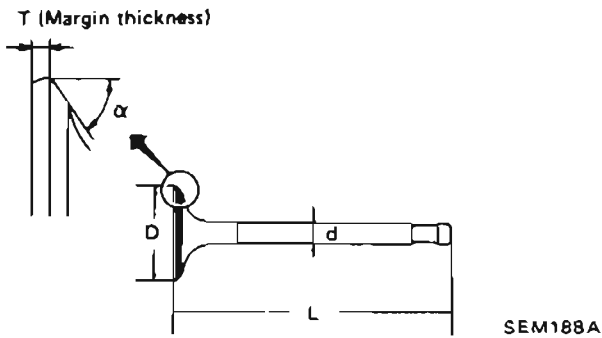
Unit: mm (in)

| | Standard | | Service | |
|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | Intake | Exhaust | Intake | Exhaust |
| Cylinder head seat recess diameter | 36.000 - 36.016 (1.4173 - 1.4179) | 42.000 - 42.016 (1.6535 - 1.6542) | 36.500 - 36.516 (1.4370 - 1.4376) | 42.500 - 42.516 (1.6732 - 1.6739) |
| Valve seat outer diameter (D_1) | 36.080 - 36.096 (1.4205 - 1.4211) | 42.080 - 42.096 (1.6567 - 1.6573) | 36.580 - 36.596 (1.4402 - 1.4408) | 42.580 - 42.596 (1.6764 - 1.6770) |
| Face angle (α) | 45° | 45° | 45° | 45° |
| Contacting width (W) | 1.6 - 1.7 (0.063 - 0.067) | 1.7 - 2.1 (0.067 - 0.083) | 1.6 - 1.7 (0.063 - 0.067) | 1.7 - 2.1 (0.067 - 0.083) |

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

Inspection and Adjustment (Cont'd)

VALVE



Unit: mm (in)

| | | Standard | Limit |
|-------------------------|-----|--------------------------------------|-------------|
| Valve head diameter (D) | In. | 34.0 - 34.2 (1.339 - 1.348) | — |
| | Ex. | 40.0 - 40.2 (1.575 - 1.583) | — |
| Valve length (L) | In. | 119.9 - 120.2 (4.720 - 4.732) | — |
| | Ex. | 120.67 - 120.97 (4.7508 - 4.7626) | — |
| Valve stem diameter (d) | In. | 6.965 - 6.980 (0.2742 - 0.2748) | — |
| | Ex. | 7.948 - 7.960 (0.3129 - 0.3134) | — |
| Valve face angle (α) | In. | 45°30' | — |
| | Ex. | 45°30' | — |
| Valve head margin (T) | In. | 1.15 - 1.46 (0.0453 - 0.0571) | 0.5 (0.020) |
| | Ex. | 1.35 - 1.65 (0.0531 - 0.0650) | |

VALVE SPRING

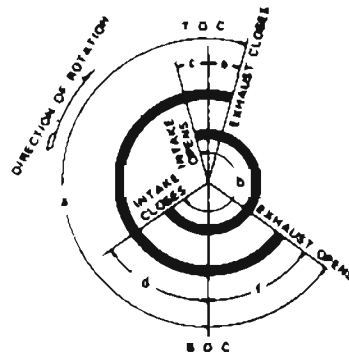
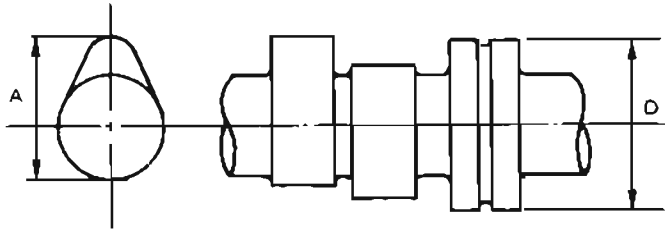
Unit: mm (in)

| | | 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 N (kg, lb) at height | Outer | 604.1 (61.6, 136.8) at 37.6 (1.480) | 640.4 (65.3, 144.0) at 34.1 (1.343) | 567.8 (57.9, 127.7) at 37.6 (1.480) | 620.8 (63.3, 139.6) at 34.1 (1.343) |
| | Inner | 284.4 (29.0, 63.9) at 32.6 (1.283) | 328.5 (33.5, 73.9) at 29.1 (1.146) | 266.8 (27.2, 60.0) at 32.6 (1.283) | 318.7 (32.5, 71.7) 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 - 0.0036) | 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 | 58 |

ROCKER ARM AND ROCKER SHAFT

Unit: mm (in)

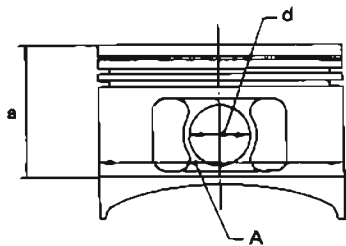
| | |
|---------------------------------------|--------------------------------------|
| Rocker arm to shaft clearance | 0.012 - 0.050 (0.0005 - 0.0020) |
| Rocker shaft diameter | 21.979 - 22.000 (0.8653 - 0.8661) |
| Rocker arm rocker shaft hole diameter | 22.012 - 22.029 (0.8666 - 0.8673) |

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

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Piston



SEM444C
Unit: mm (in)

| Piston skirt diameter (A) | Standard | Grade No. 1 | 88.970 - 88.980 (3.5027 - 3.5031) |
|-----------------------------------|-----------------------------------|--------------------------------------|--------------------------------------|
| | | Grade No. 2 | 88.980 - 88.990 (3.5031 - 3.5035) |
| Grade No. 3 | | 88.990 - 89.000 (3.5035 - 3.5039) | |
| Service (Oversize) | 0.5 (0.020) | 89.470 - 89.500 (3.5224 - 3.5236) | |
| | 1.0 (0.039) | 89.970 - 90.000 (3.5421 - 3.5433) | |
| Dimension (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) | | |

Piston pin

Unit: mm (in)

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

Piston ring

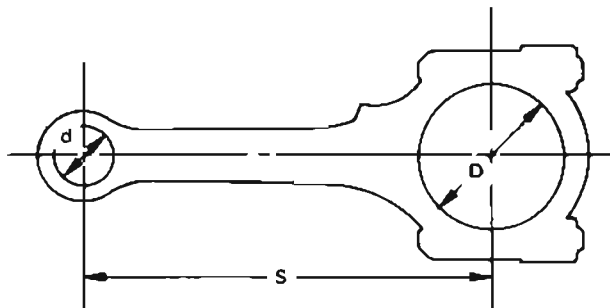
Unit: mm (in)

| | | Standard | Limit |
|----------------|-----------------|--|-------------|
| Side clearance | Top | 0.040 - 0.080 (0.0016 - 0.0031) | 0.1 (0.004) |
| | 2nd | 0.030 - 0.070 (0.0012 - 0.0028) | 0.1 (0.004) |
| | Oil | 0.065 - 0.135 (0.0026 - 0.0053) | 0.1 (0.004) |
| Ring gap | Top | 0.28 - 0.43 (0.0110 - 0.0169) | 0.5 (0.020) |
| | 2nd | 0.45 - 0.60 (0.0177 - 0.0236)*1 0.55 - 0.70 (0.0217 - 0.0276)*2 | 0.5 (0.020) |
| | Oil (rail ring) | 0.20 - 0.60 (0.0079 - 0.0238) | 0.5 (0.020) |

*1: R or T is punched on the ring.

*2: N is punched on the ring.

CONNECTING ROD



SEM570A
Unit: mm (in)

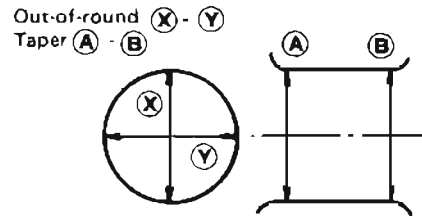
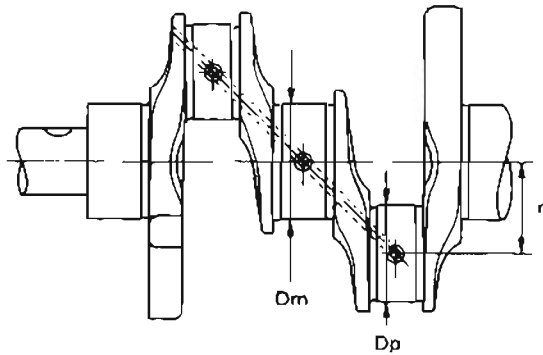
| | Standard | Limit |
|--|--------------------------------------|---------------|
| Center distance (S) | 164.95 - 165.05 (6.4941 - 6.4980) | — |
| Bend [per 100 mm (3.94 in)] | — | 0.15 (0.0059) |
| Torsion [per 100 mm (3.94 in)] | — | 0.3 (0.012) |
| Piston pin bushing inner diameter (d)* | 21.000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

* Without bearing

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

Inspection and Adjustment (Cont'd)

CRANKSHAFT



EM715

SEM394

Unit: mm (in)

| | | | | |
|---|---------|---------------------------------|-----------------------------------|----------------|
| Main journal diameter (Dm) | Grade | No. 0 | 59.967 - 59.975 (2.3809 - 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 | 49.968 - 49.974 (1.9672 - 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 roil | | | More than 0.1 (0.004) | |

* Total indicator reading

BEARING CLEARANCE

Unit: mm (in)

| | Standard | Limit |
|----------------------------------|------------------------------------|---------------|
| Main bearing clearance | 0.020 - 0.047 (0.0008 - 0.0019) | 0.1 (0.004) |
| Connecting rod bearing clearance | 0.010 - 0.035 (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 mm (in) | Identification color |
|--------------|------------------------------------|----------------------|
| 0 | 1.821 - 1.825 (0.0717 - 0.0719) | Black |
| 1 | 1.825 - 1.829 (0.0719 - 0.0720) | Brown |
| 2 | 1.829 - 1.833 (0.0720 - 0.0722) | Green |
| 3 | 1.833 - 1.837 (0.0722 - 0.0723) | Yellow |
| 4 | 1.837 - 1.841 (0.0723 - 0.0725) | Blue |

Undersize (service)

Unit: mm (in)

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

AVAILABLE CONNECTING ROD BEARING

Standard

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

Undersize (service)

Unit: mm (in)

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

MISCELLANEOUS COMPONENTS

Unit: mm (in)

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

* Total indicator reading

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION **LC**

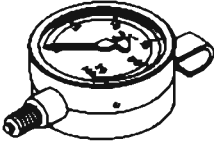
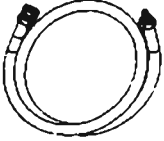
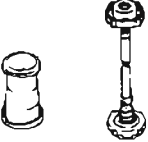
LC

CONTENTS

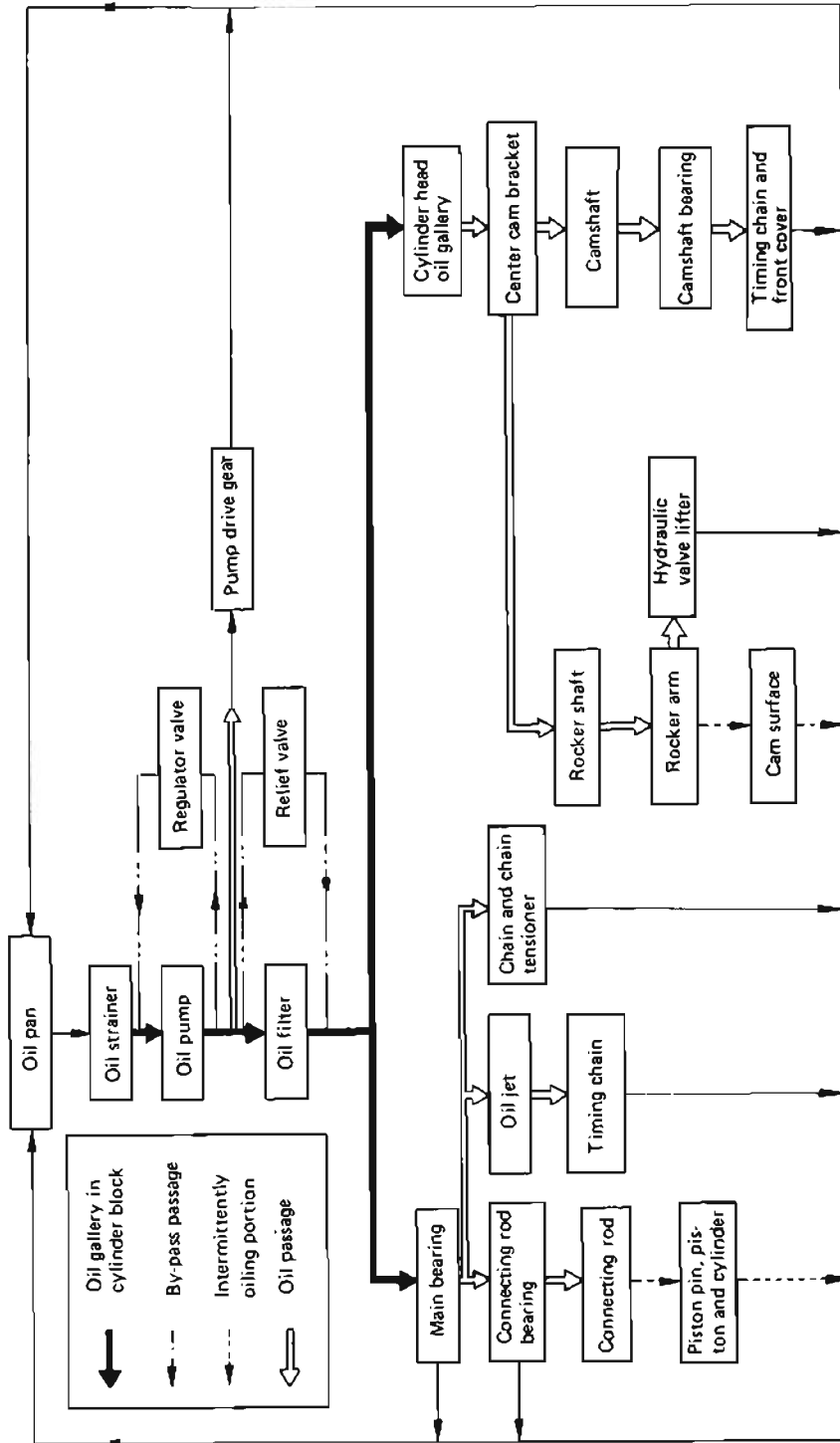
| | |
|--|-------|
| PREPARATION | LC- 2 |
| ENGINE LUBRICATION SYSTEM | LC- 3 |
| ENGINE COOLING SYSTEM | LC- 7 |
| CONDENSER FAN MOTOR ELECTRICAL CIRCUIT | LC-12 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | LC-16 |

PREPARATION

SPECIAL SERVICE TOOLS

| Tool number (Kent-Moore No.) Tool name | Description |
|---|---|
| ST25051001 (J25695-1) Oil pressure gauge |  |
| ST25052000 (J25695-2) Hose |  <p>Adapting oil pressure gauge to cylinder block</p> |
| EG17650301 (-) Radiator cap tester adapter |  <p>Adapting radiator cap tester to radiator filler neck</p> |

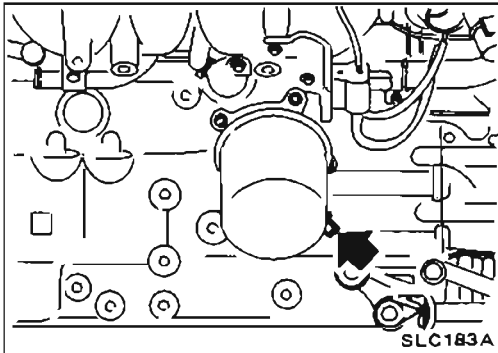
Lubrication Circuit



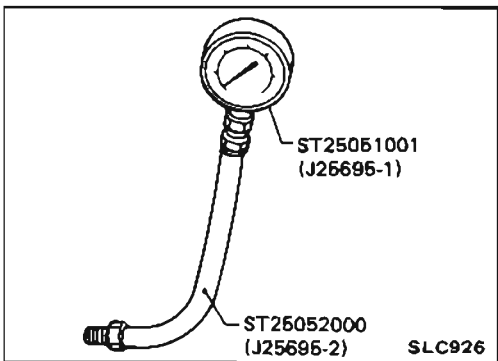
Oil Pressure Check

WARNING:

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



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



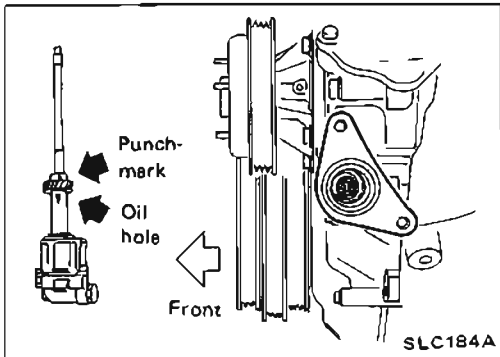
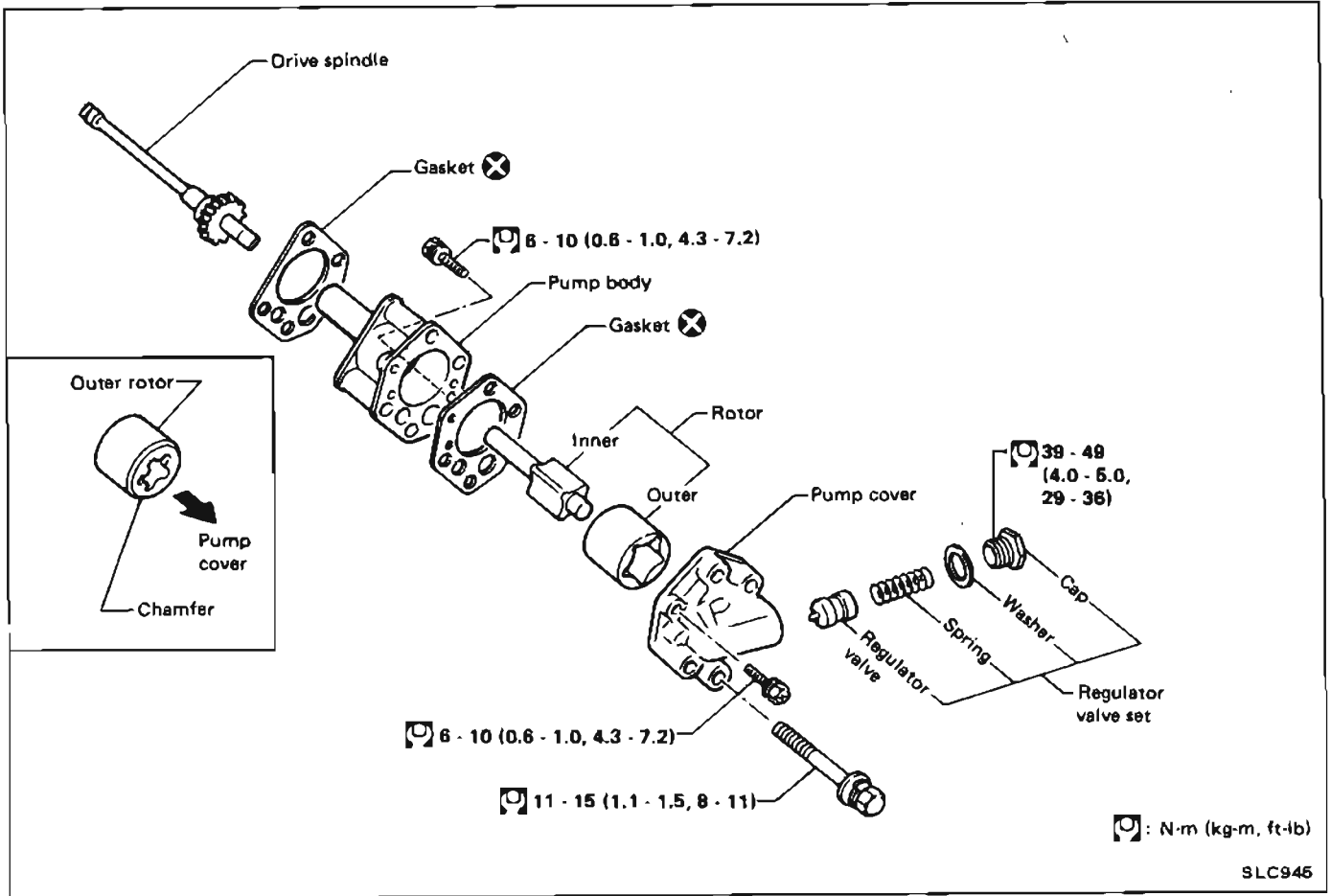
3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

| Engine rpm | Approximate discharge pressure kPa (kg/cm ² , psi) |
|---------------------|--|
| Idle speed 3,000 | More than 78 (0.8, 11) 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

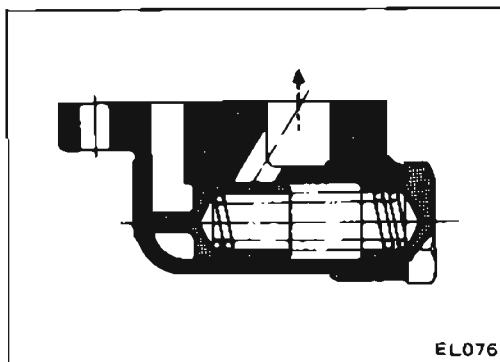


- Always replace with new oil seal and gasket.
- When removing oil pump, turn crankshaft so that No. 1 piston is at T.D.C. on its compression stroke.
- When installing oil pump, align punchmark on drive spindle and oil hole on oil pump.

REGULATOR VALVE INSPECTION

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

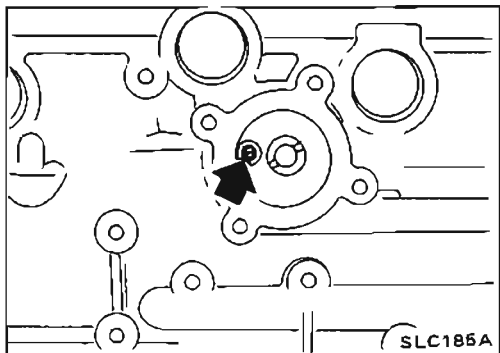
If damaged, replace regulator valve set or oil pump assembly.



Oil Pump (Cont'd)

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 suitable tool. Install a new valve in place by tapping it.



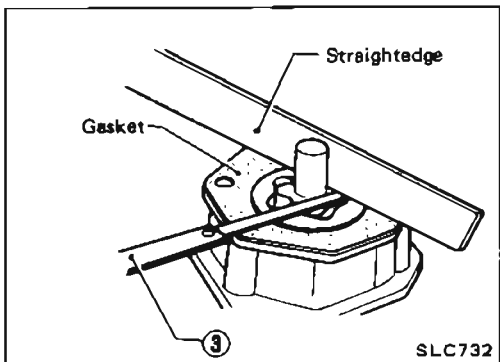
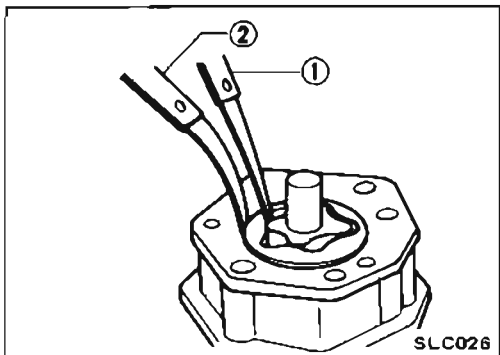
OIL PUMP INSPECTION

Using a feeler gauge, check the following clearance.

Unit: mm (in)

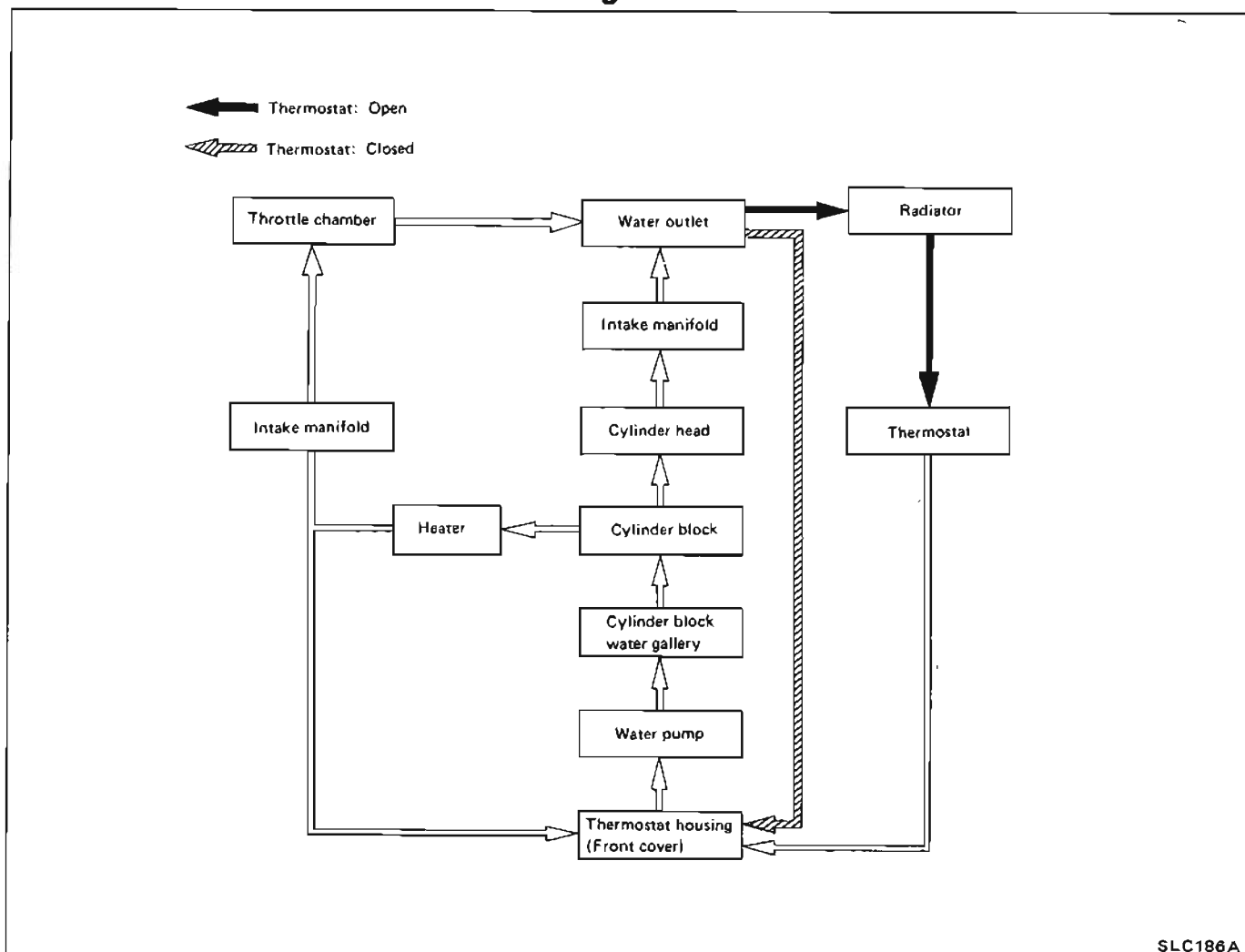
| | |
|---------------------------------|-------------------------------|
| Rotor tip clearance ① | Less than 0.12 (0.0047) |
| Outer rotor to body clearance ② | 0.15 - 0.21 (0.0059 - 0.0083) |
| Side clearance (with gasket) ③ | 0.04 - 0.08 (0.0016 - 0.0031) |

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



ENGINE COOLING SYSTEM

Cooling Circuit



System Check

WARNING:

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

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

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

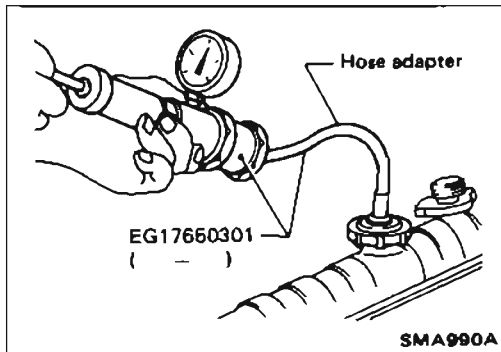
To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:

98 kPa (1.0 kg/cm², 14 psi)

CAUTION:

Higher than the specified pressure may cause radiator damage.

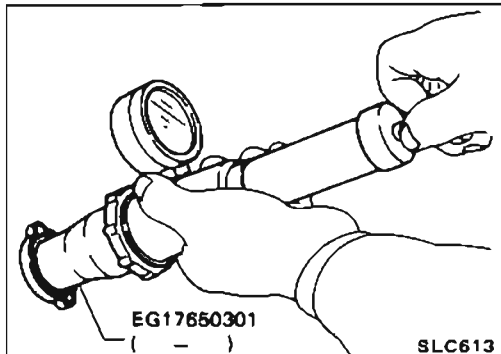


CHECKING RADIATOR CAP

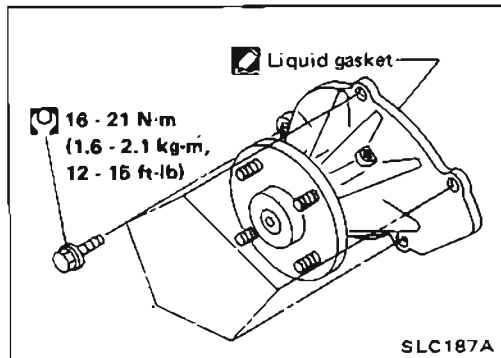
To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:

78 - 98 kPa (0.8 - 1.0 kg/cm², 11 - 14 psi)

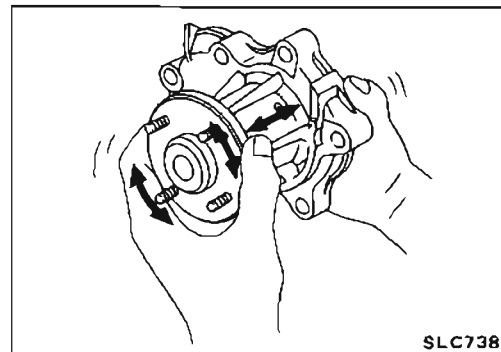


Water Pump



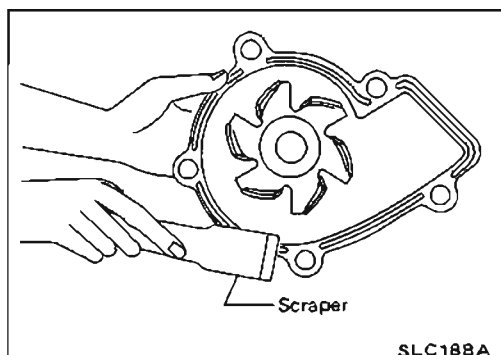
INSPECTION

Check for excessive end play and rough operation.



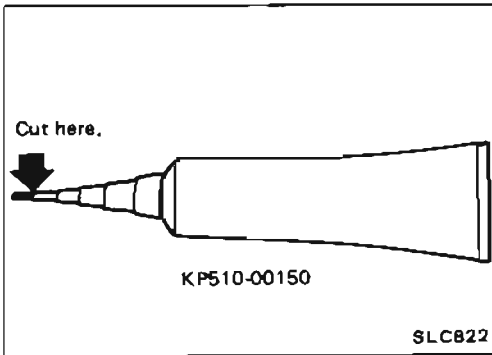
INSTALLATION

- Remove liquid gasket from mating surface of pump housing using a scraper.
Be sure liquid gasket in grooves is also removed.
- Remove liquid gasket from mating surface of cylinder block.
- Clean all traces of liquid gasket using white gasoline.

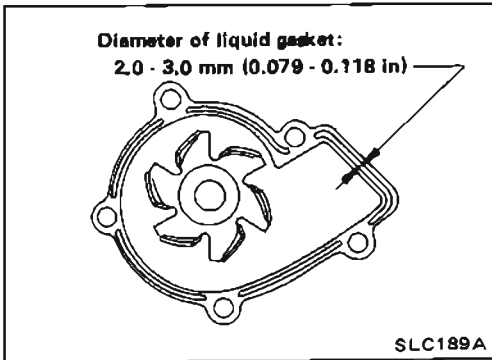


ENGINE COOLING SYSTEM

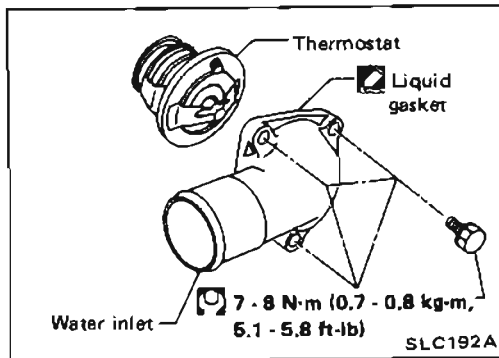
Water Pump (Cont'd)



- Cut off tip of nozzle of liquid gasket tube at point shown in figure.
- Use Genuine Liquid Gasket or equivalent.



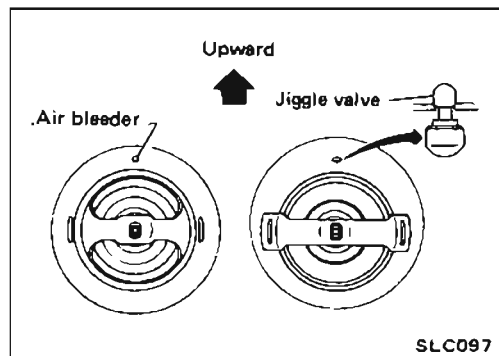
- Apply a continuous bead of liquid gasket to mating surface of pump housing as shown.
 - a. Be sure diameter of liquid gasket is within 2.0 to 3.0 mm (0.079 to 0.118 in) dia. range.
 - b. Attach pump housing to cylinder block within five minutes of applying liquid gasket.
 - c. After installing pump housing, wait at least 30 minutes before starting engine.



Thermostat

INSPECTION

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

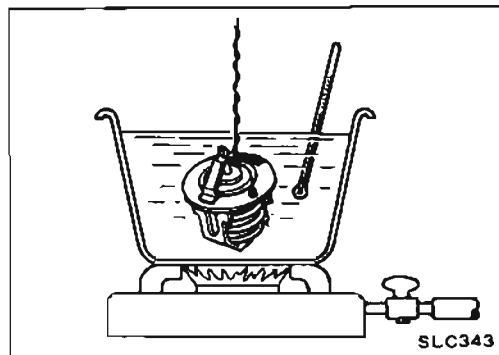


2. Check valve opening temperature and maximum valve lift.

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

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

- After installation, run engine for a few minutes, and check for leaks.

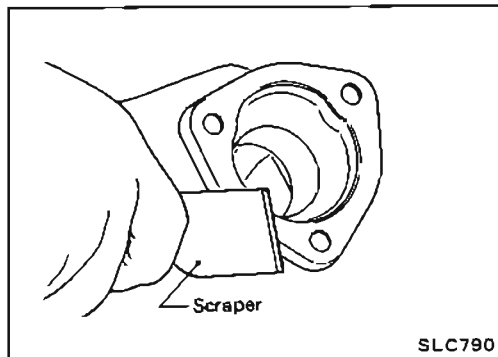


ENGINE COOLING SYSTEM

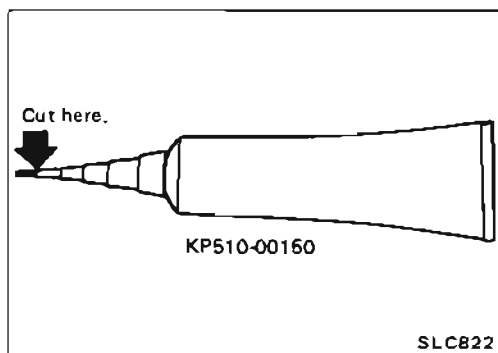
Thermostat (Cont'd)

INSTALLATION

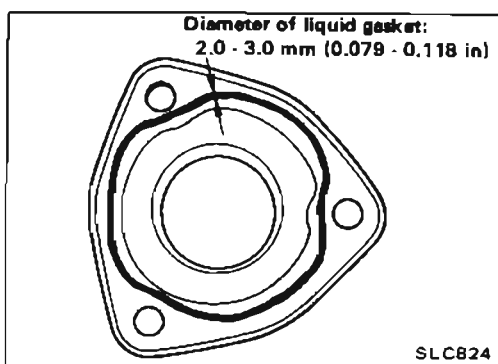
- Remove liquid gasket from mating surface of thermostat using a scraper.
- Similarly, remove liquid gasket from mating surface of cylinder block.
- Clean all traces of liquid gasket using white gasoline.



- Cut off tip of nozzle of liquid gasket tube at point shown in figure.
- Use Genuine Liquid Gasket or equivalent.

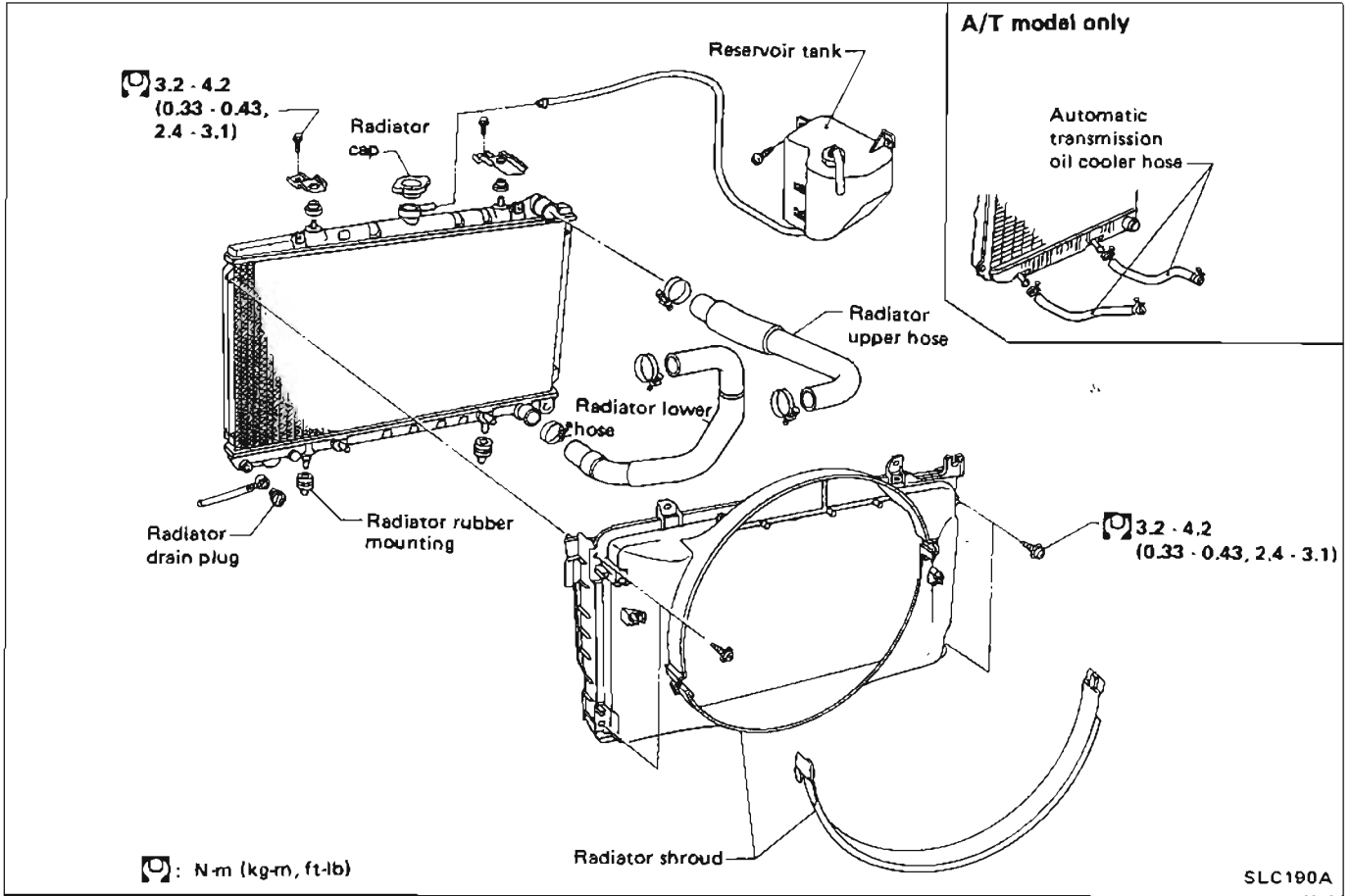


- Apply a continuous bead of liquid gasket to mating surface of water inlet.
 - a. Be sure diameter of liquid gasket is within 2.0 to 3.0 mm (0.079 to 0.118 in).
 - b. Attach water inlet to cylinder block within five minutes after applying liquid gasket.
 - c. After installing water inlet, wait at least 30 minutes before refilling coolant and starting engine.



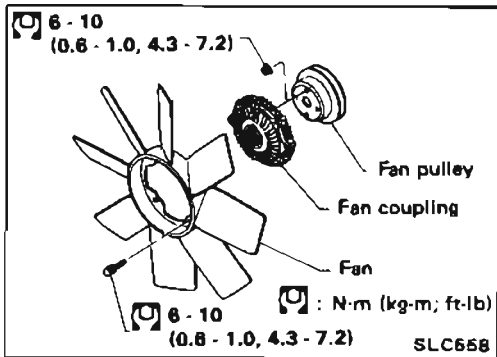
ENGINE COOLING SYSTEM

Radiator



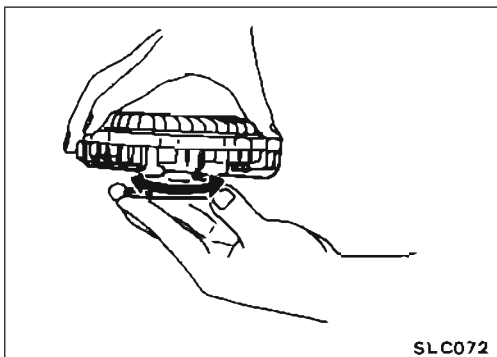
CAUTION:

When filling radiator with coolant, refer to MA section.



Cooling Fan

DISASSEMBLY AND ASSEMBLY

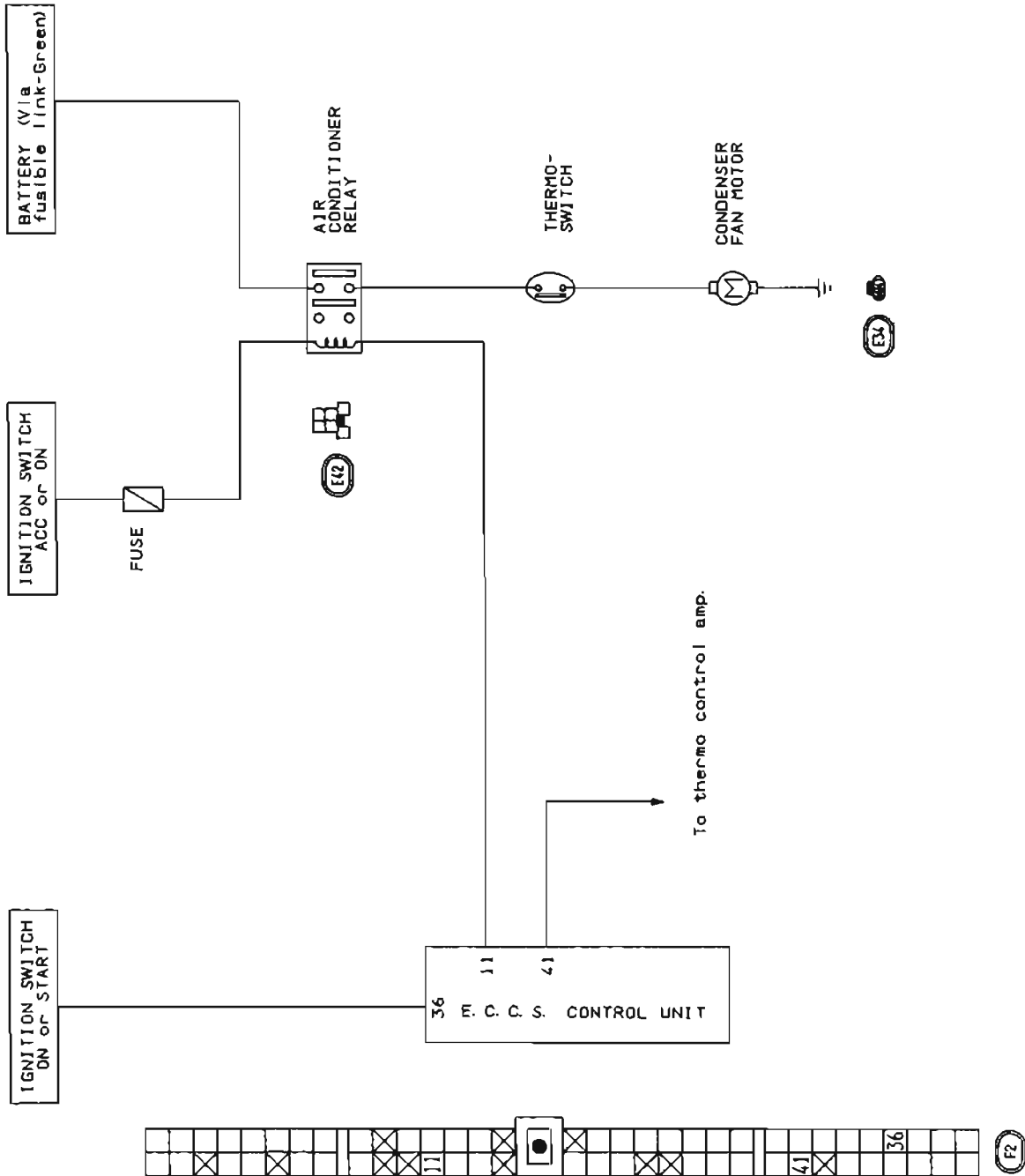


INSPECTION

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

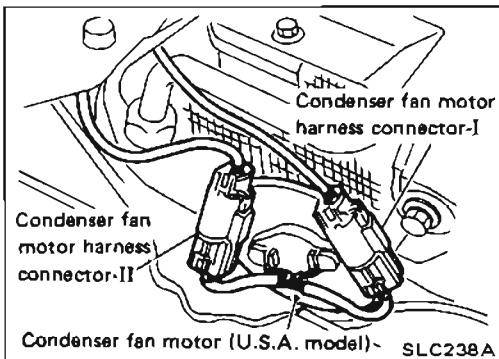
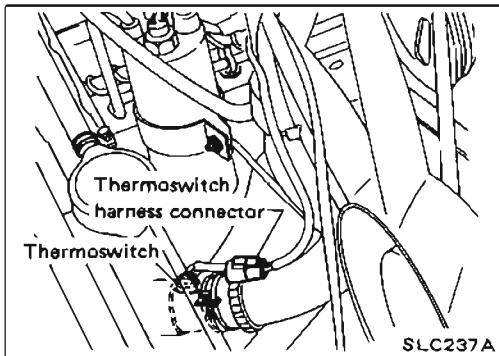
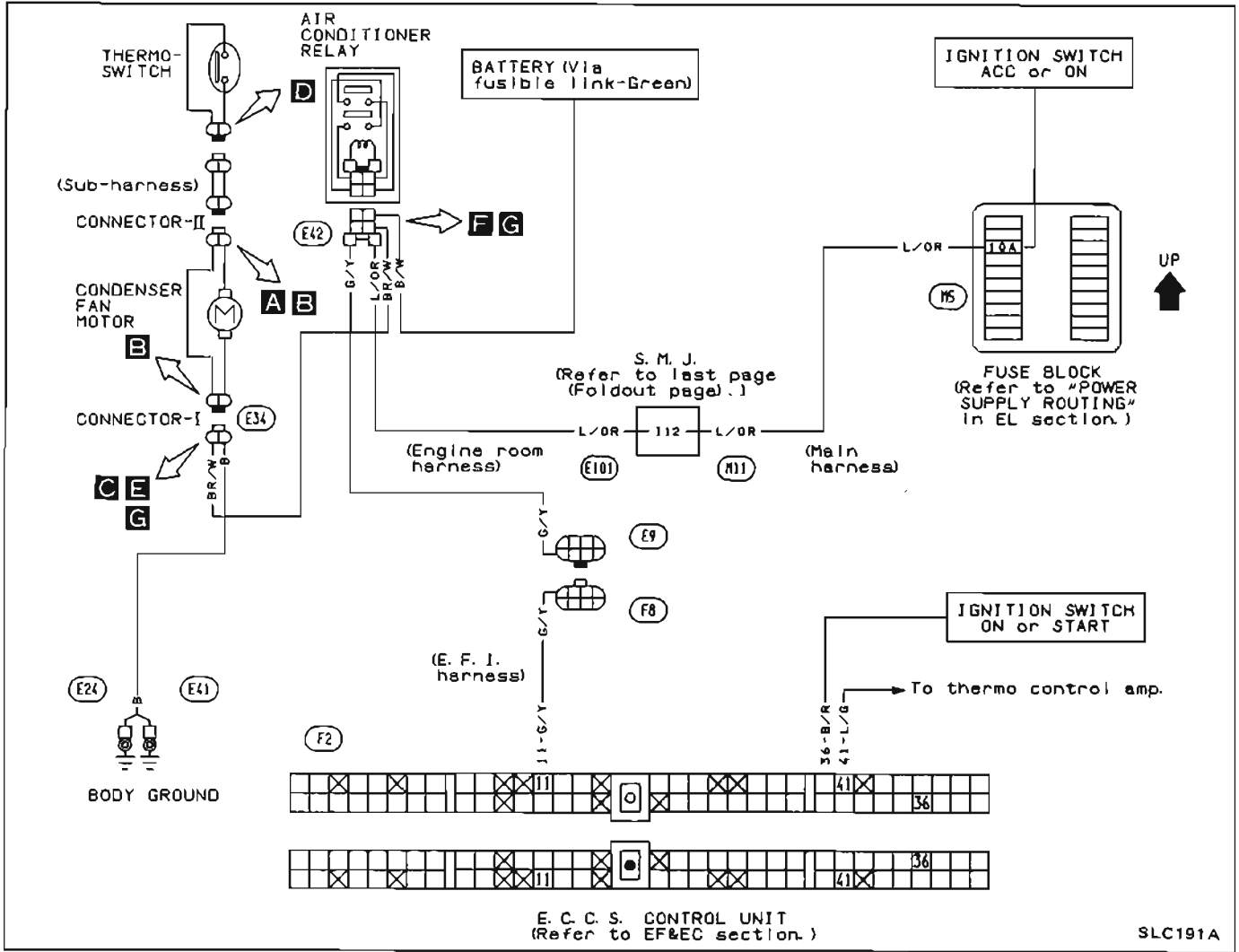
CONDENSER FAN MOTOR ELECTRICAL CIRCUIT

Schematic



CONDENSER FAN MOTOR ELECTRICAL CIRCUIT

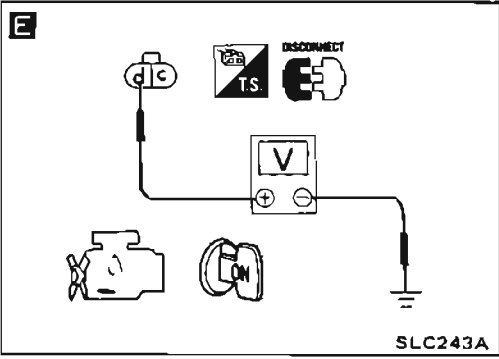
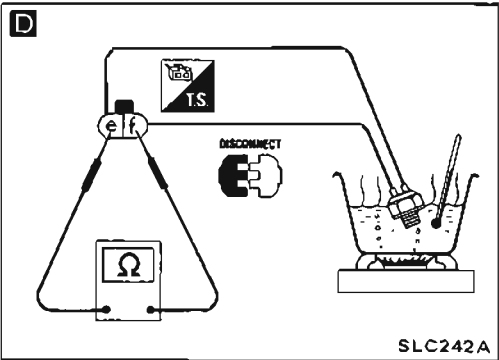
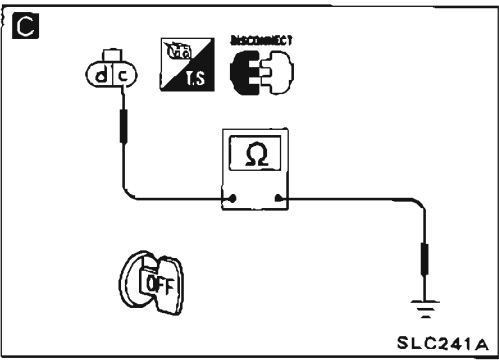
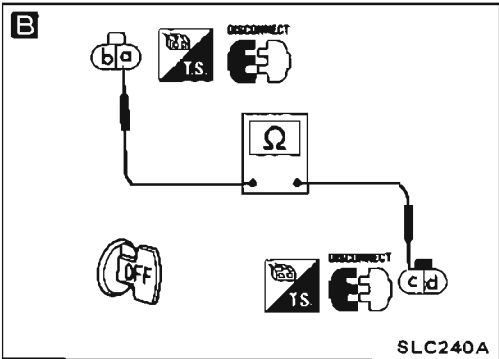
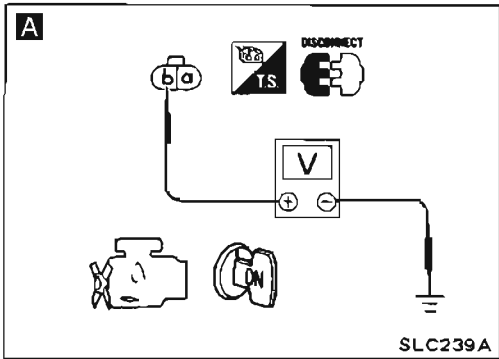
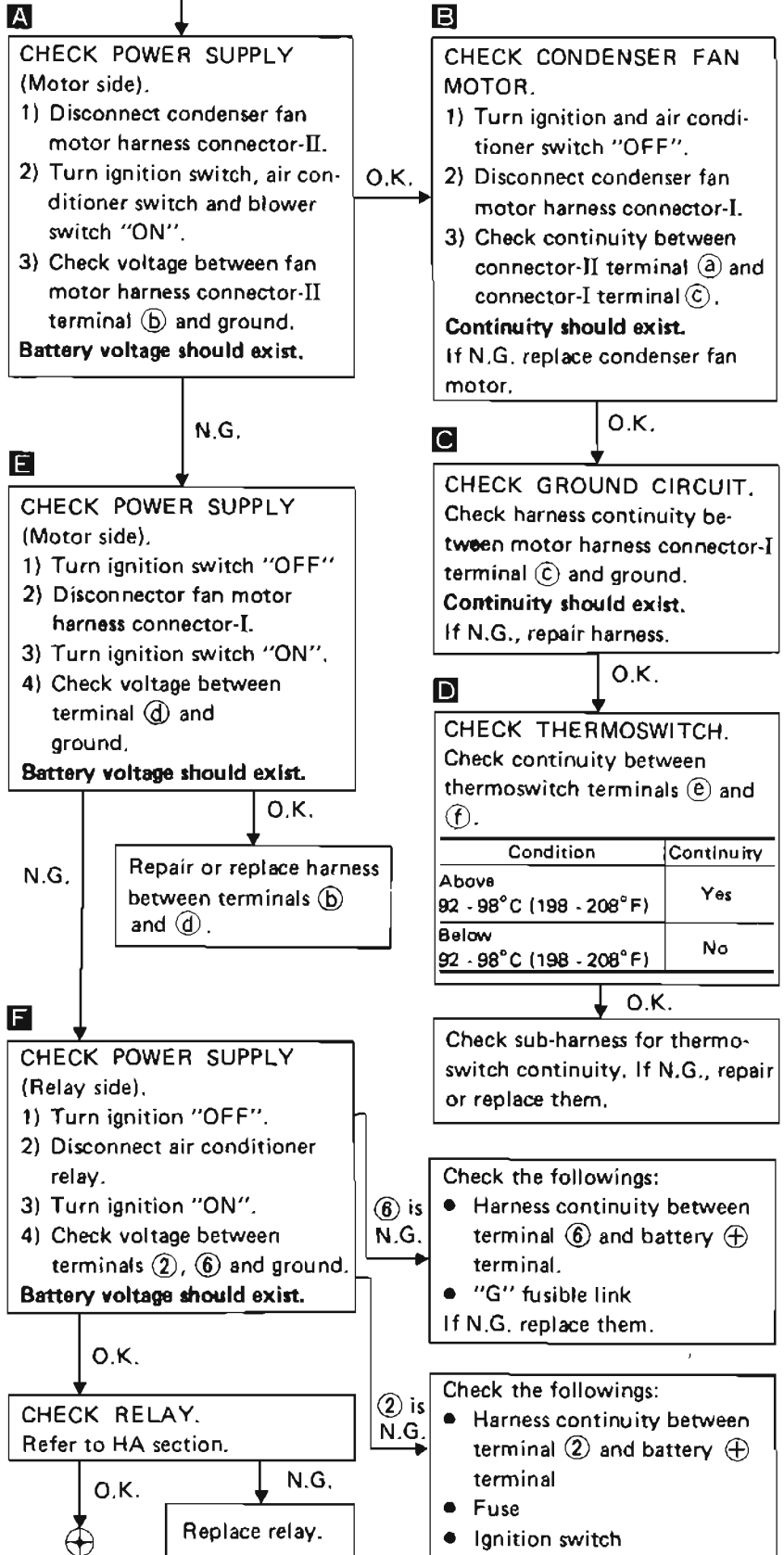
Wiring Diagram



CONDENSER FAN MOTOR ELECTRICAL CIRCUIT

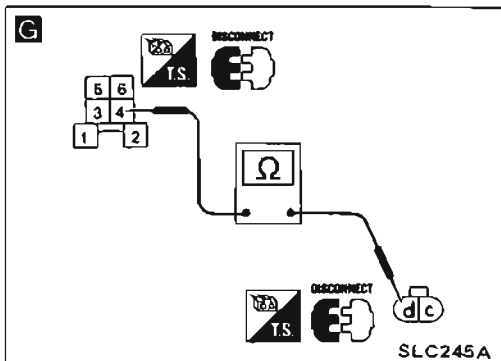
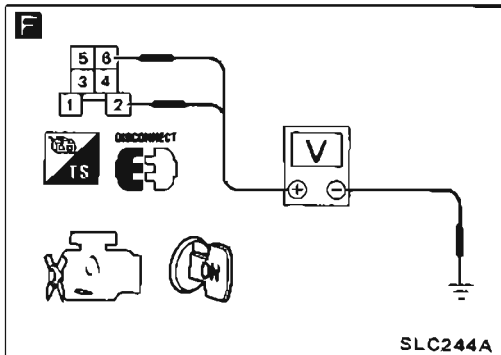
Trouble Diagnosis

Even though air conditioner operates normally under high engine temperature conditions [above 98°C (208°F)] the condenser fan motor does not rotate.



CONDENSER FAN MOTOR ELECTRICAL CIRCUIT

Trouble Diagnosis (Cont'd)



O.K.

G

CHECK HARNESS CONTINUITY.

- 1) Turn ignition switch "OFF".
- 2) Check continuity between relay harness connector terminal ④ and fan motor harness connector-I terminal ①.

Continuity should exist.

N.G.

Repair or replace harness or connectors between terminals ④ and ①.

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

Engine Lubrication System

Oil pressure check

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

Oil pump

Unit: mm (in)

| | |
|-------------------------------|-------------------------------|
| Rotor tip clearance | Less than 0.12 (0.0047) |
| Outer rotor to body clearance | 0.15 - 0.21 (0.0059 - 0.0083) |
| Side clearance (with gasket) | 0.04 - 0.08 (0.0016 - 0.0031) |

Engine Cooling System

Thermostat

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

Radiator

Unit: kPa (kg/cm², 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 |
| ENGINE AND EMISSION CONTROL OVERALL SYSTEM | EF & EC- 4 |
| ENGINE AND EMISSION CONTROL PARTS DESCRIPTION | EF & EC- 9 |
| ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION | EF & EC- 16 |
| IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION | EF & EC- 26 |
| TROUBLE DIAGNOSES | EF & EC- 31 |
| FUEL INJECTION CONTROL SYSTEM INSPECTION | EF & EC-153 |
| EVAPORATIVE EMISSION CONTROL SYSTEM | EF & EC-155 |
| CRANKCASE EMISSION CONTROL SYSTEM | EF & EC-157 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | EF & EC-158 |

When you read wiring diagrams:

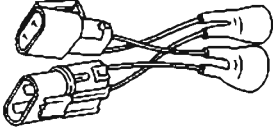
- Read G1 section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read G1 section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

E.C.C.S. Wiring Diagram — See pull-out following EL section.

PREPARATION

SPECIAL SERVICE TOOL

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

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.
- Disconnect connector by pulling it (not the harness) straight out.
- Before connecting connector, make sure all pins are straight.

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.

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.

INJECTOR

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

FUEL PUMP

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

E.C.C.S. HARNESS HANDLING

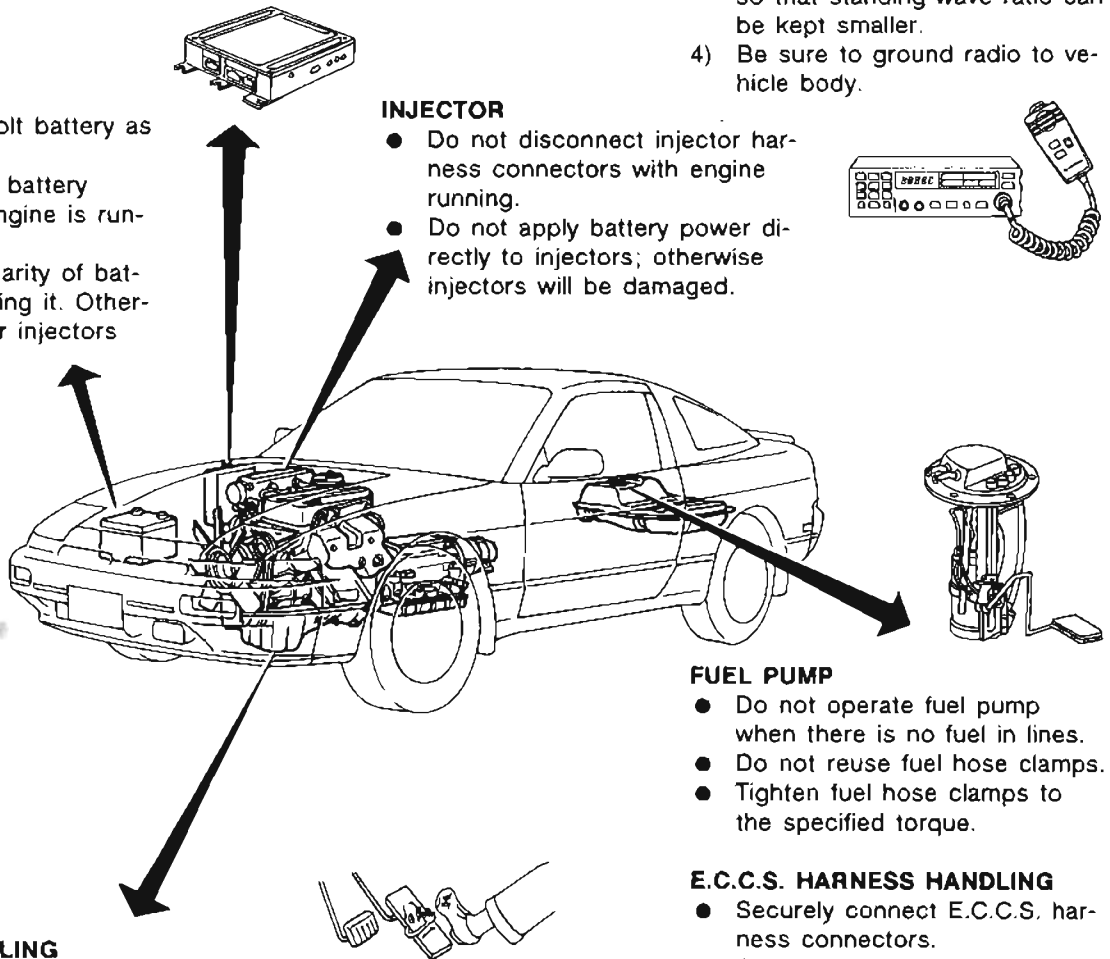
- Securely connect E.C.C.S. harness connectors. A poor connection can cause extremely high voltage to develop in the coil and condenser, resulting in damage to ICs.
- Keep E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. system malfunction due to receiving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

E.C.C.S. PARTS HANDLING

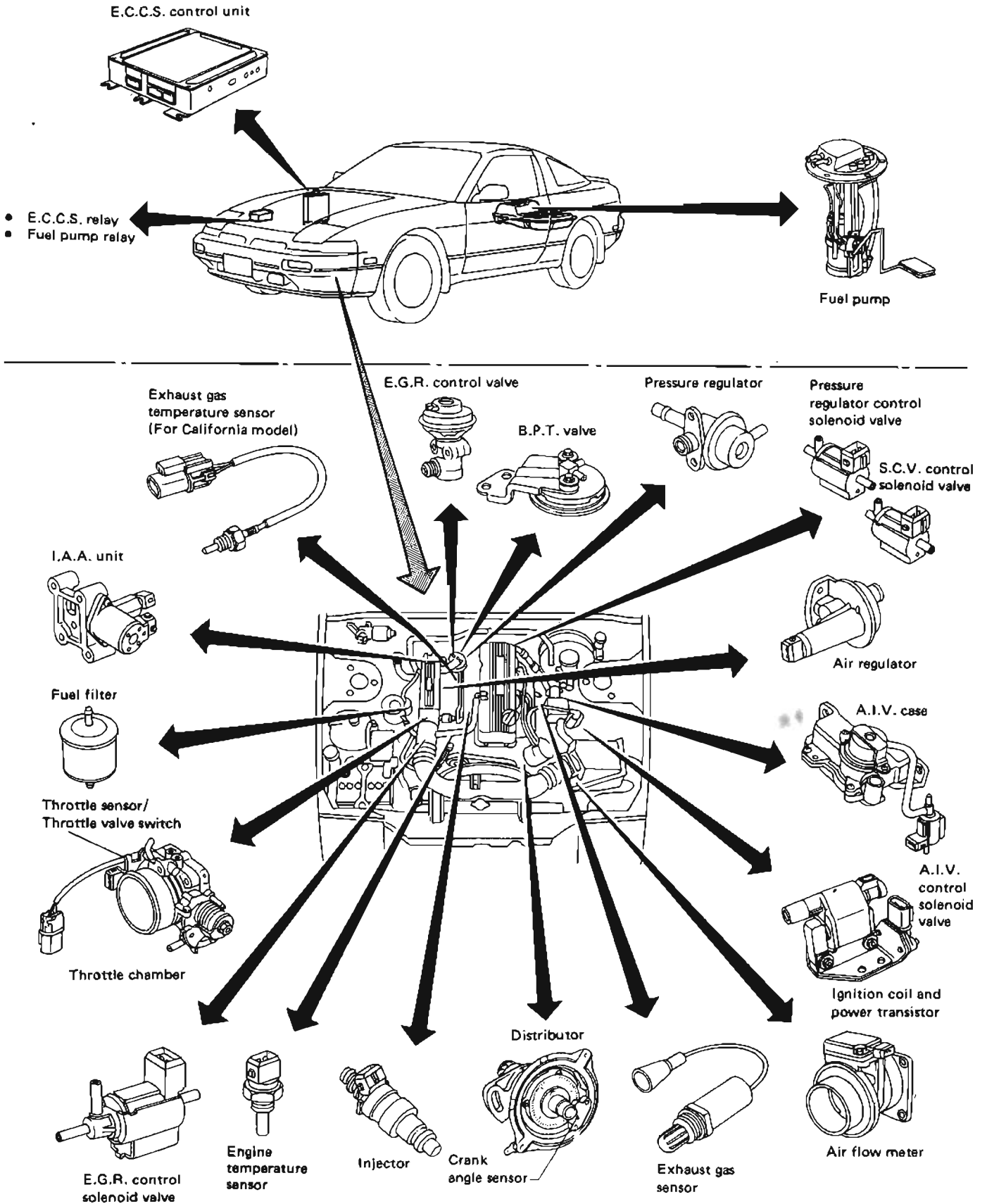
- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with detergent.
- Do not jolt or jar the crank angle sensor.

WHEN STARTING

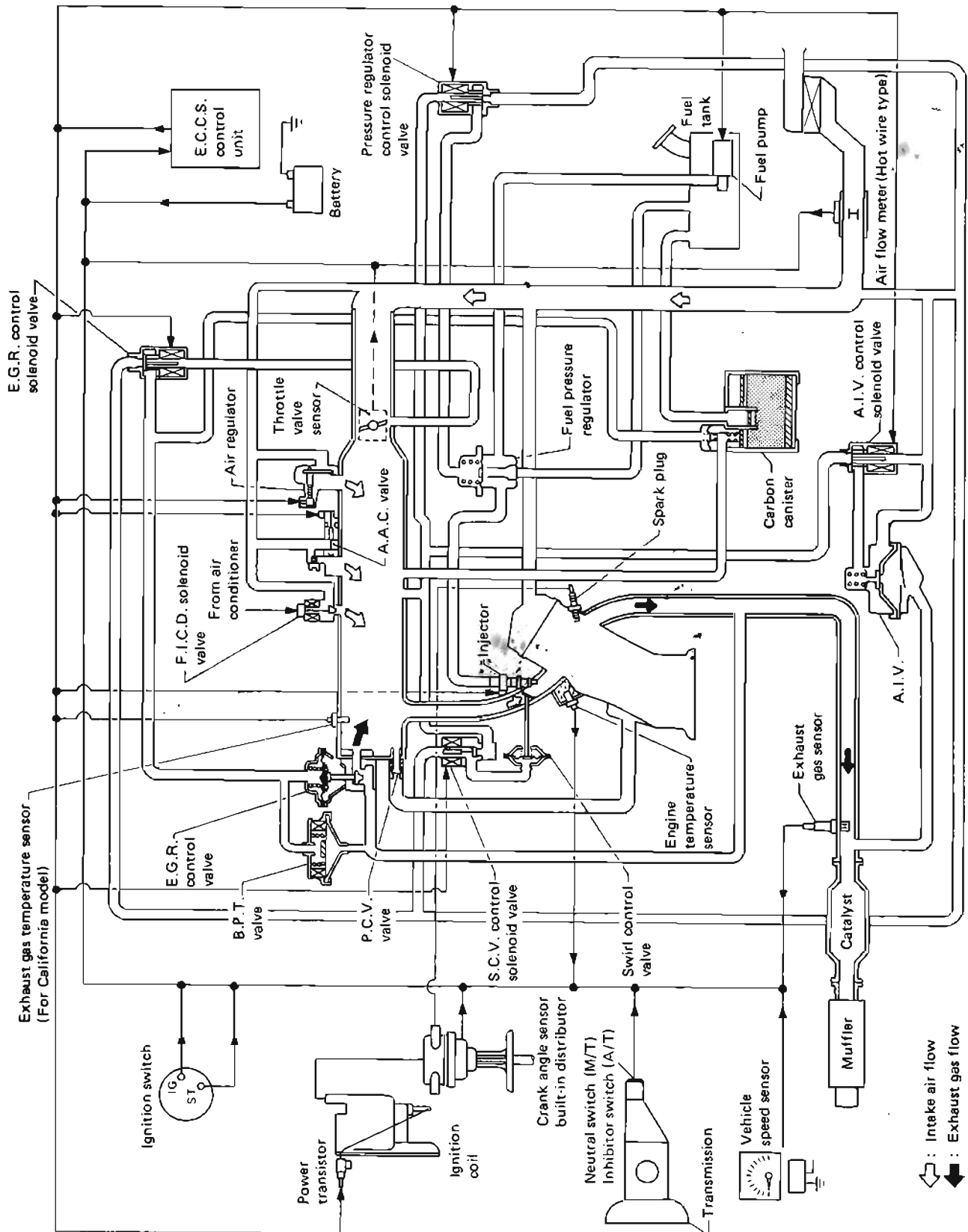
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.



E.C.C.S. Component Parts Location



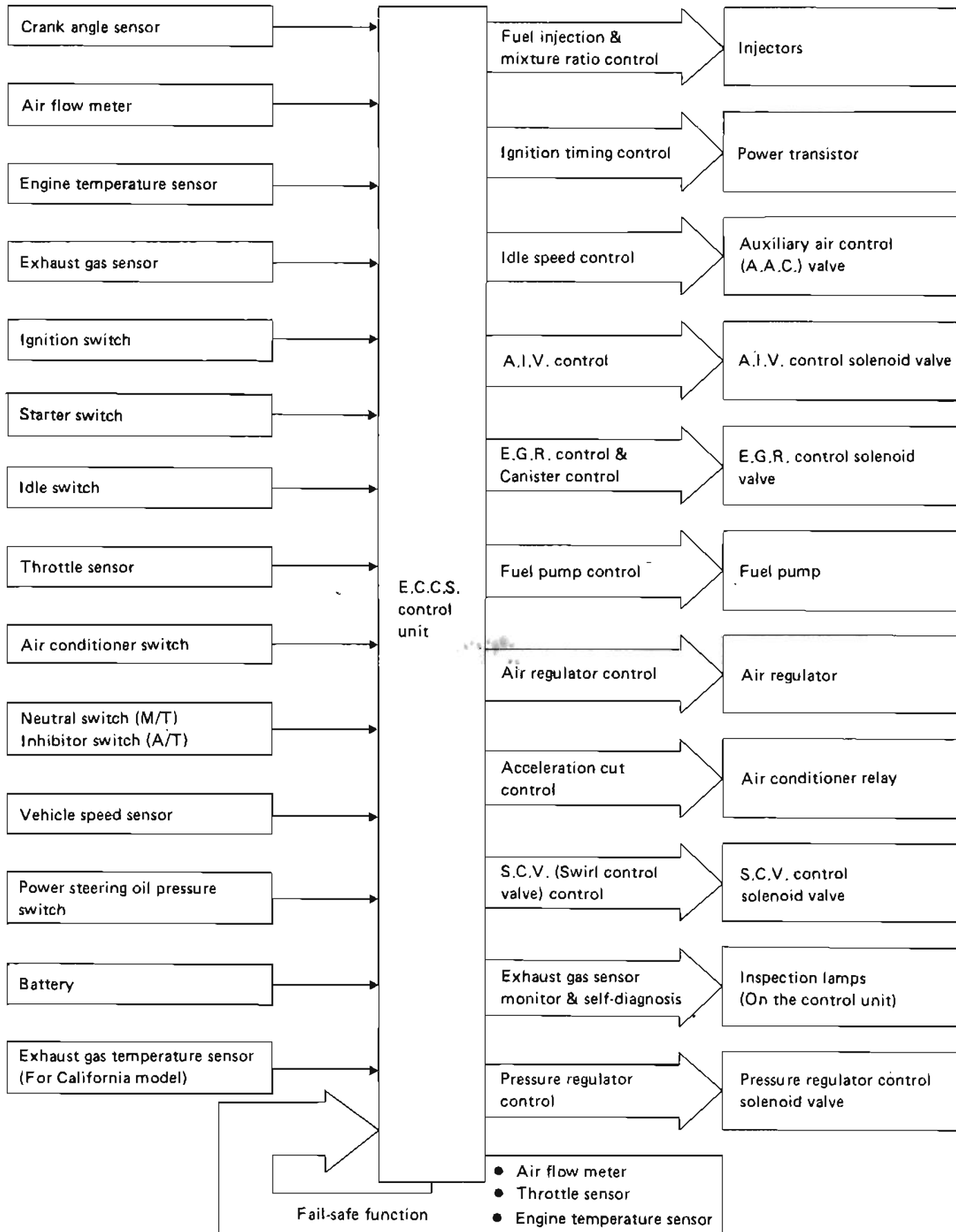
System Diagram



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

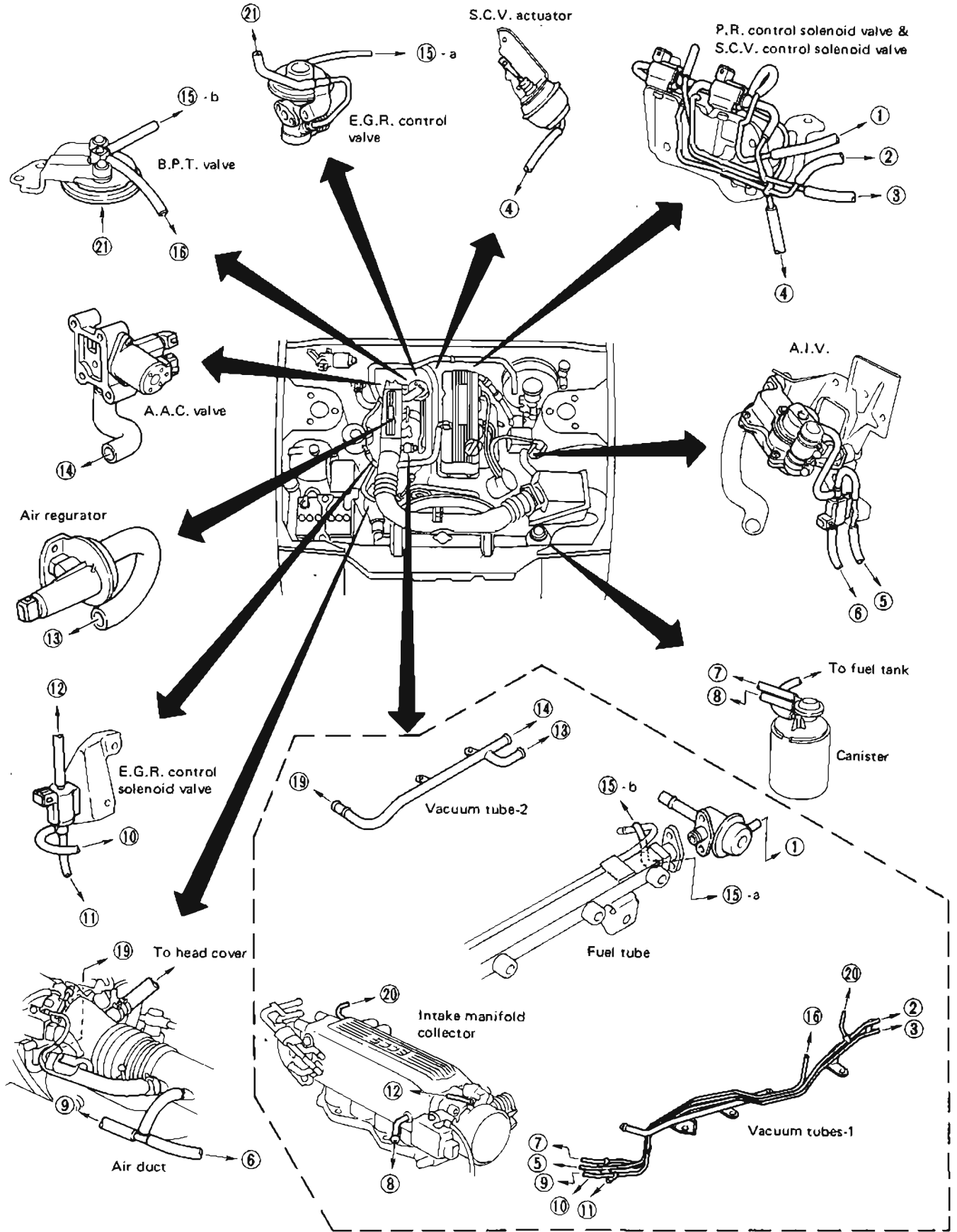
System Chart

E.C.C.S. CONTROL SYSTEM



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

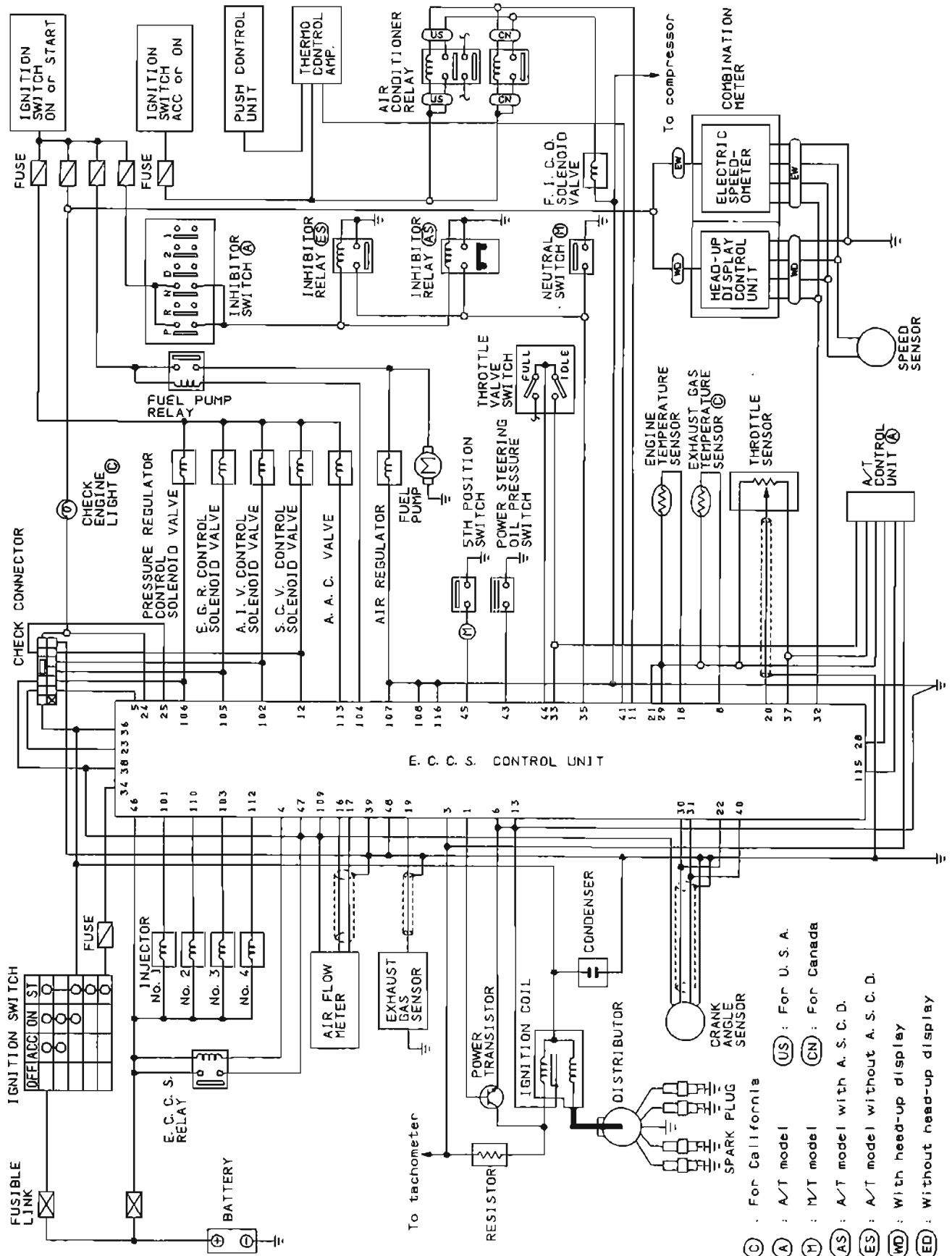
Vacuum Hose Drawing



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

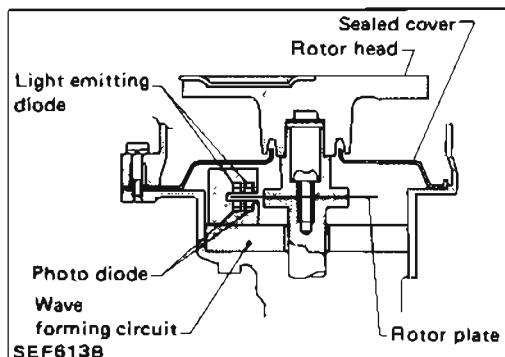
Circuit Diagram

(For Wiring Diagram — see pull-out following page EL-118.)



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.

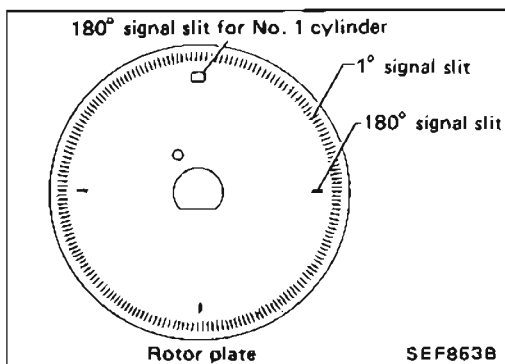


Crank Angle Sensor

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.

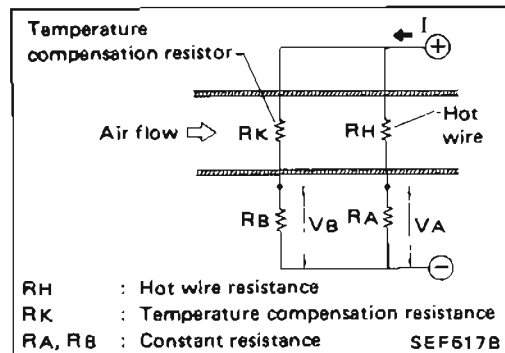
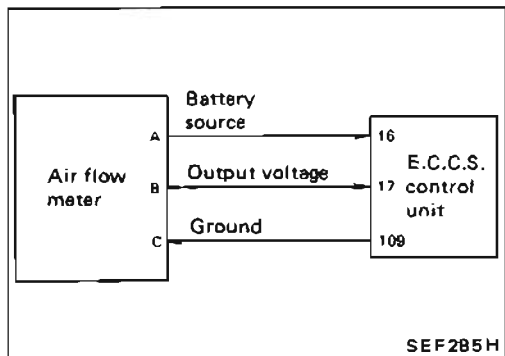
When the rotor plate passes between the L.E.D. and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the L.E.D. This generates rough-shaped pulses which are converted into on-off signals by the wave-forming circuit, which are then sent to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

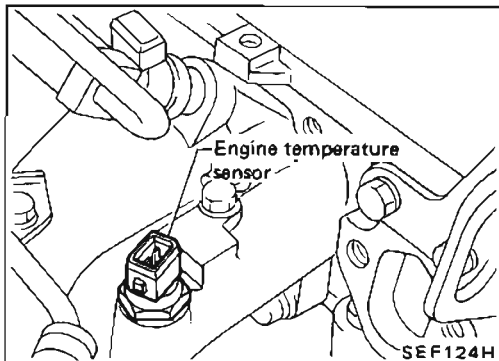


Air Flow Meter

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.

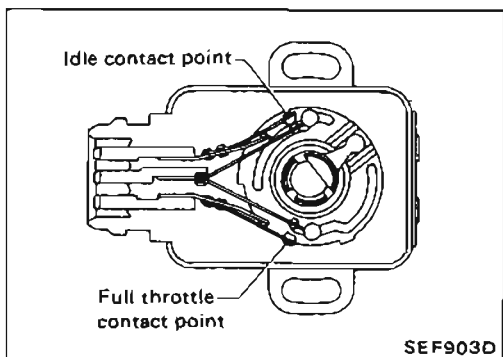




Engine Temperature Sensor

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

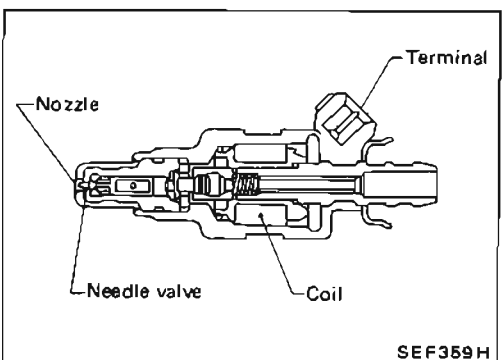
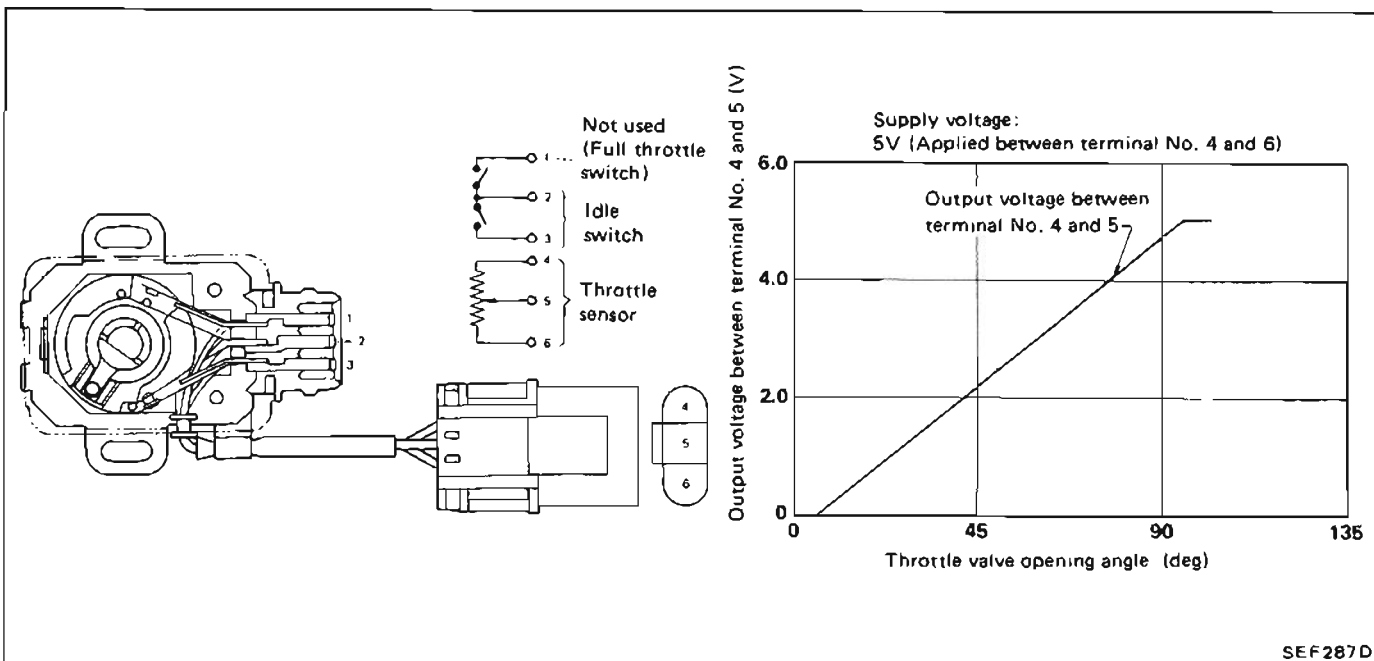
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



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.

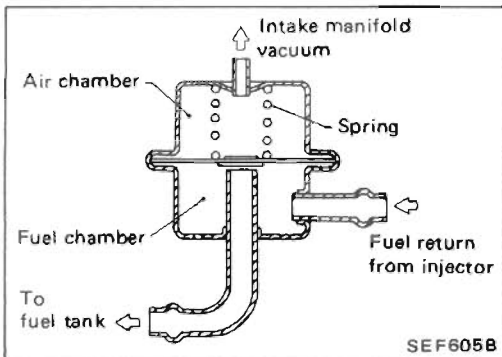
Idle position of the throttle valve is determined by the E.C.U. receiving the signal from the throttle sensor. This system is called "soft idle switch" and controls engine operation such as fuel cut. On the other hand, "hard idle switch", which is built in the throttle sensor unit, is used not for engine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



Fuel Injector

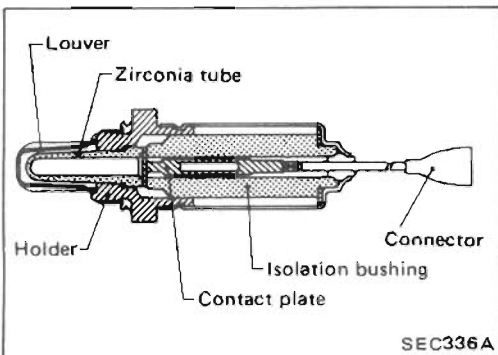
The fuel injector is a small, elaborate solenoid valve. As the E.C.U. sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the E.C.U. in terms of injection pulse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

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



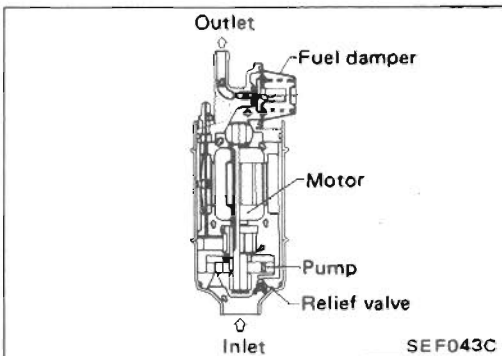
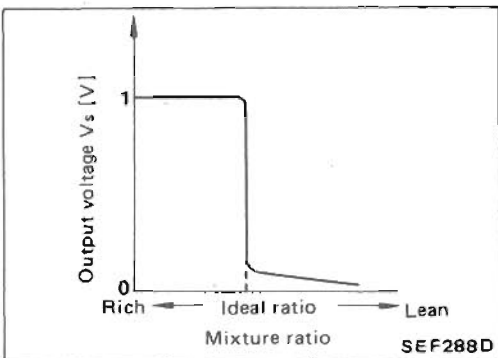
Pressure Regulator

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



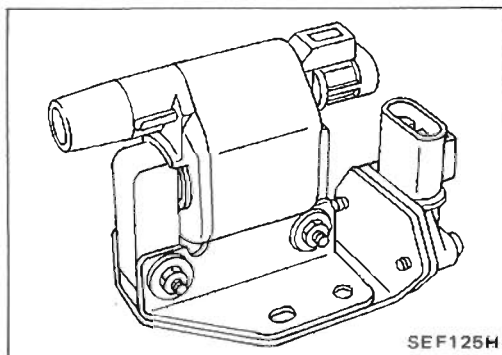
Exhaust Gas Sensor

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.



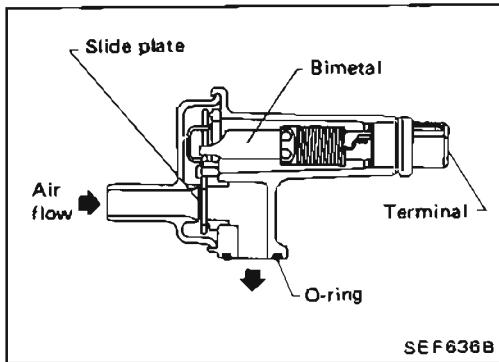
Fuel Pump

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



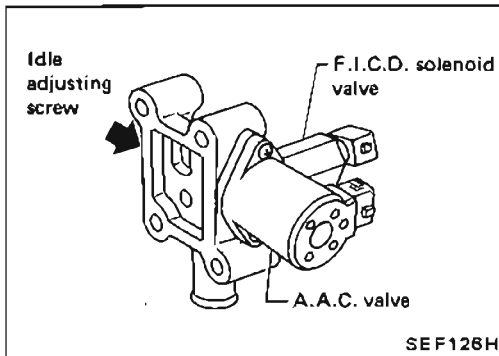
Power Transistor

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.



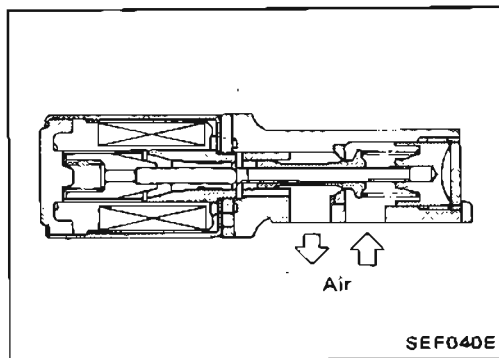
Air Regulator

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



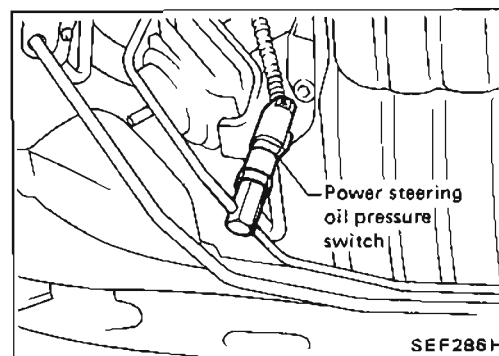
Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjust screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value. The F.I.C.D. solenoid valve compensates for changes in idle speed caused by the operation of the air compressor. A vacuum control valve is also installed in this unit to prevent an abnormal rise in intake manifold vacuum pressure during deceleration.



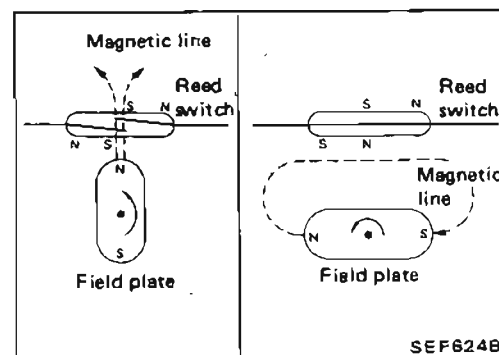
Auxiliary Air Control (A.A.C.) Valve

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.



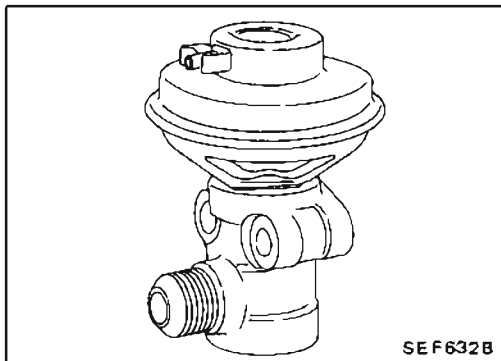
Power Steering Oil Pressure Switch

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 I.S.C. valve.



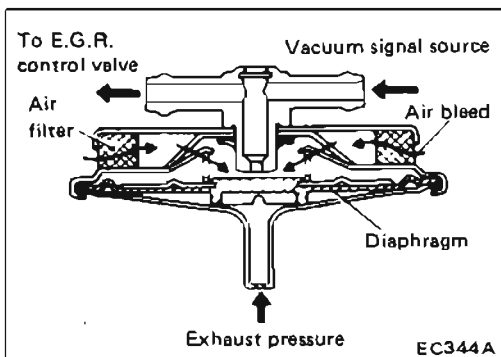
Vehicle Speed Sensor

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.



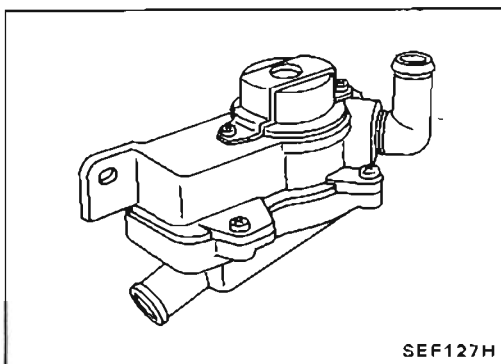
E.G.R. Control Valve

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.



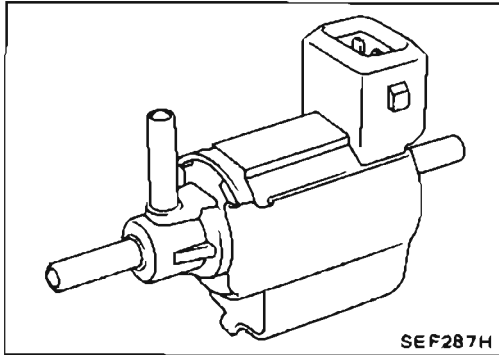
B.P.T. Valve

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

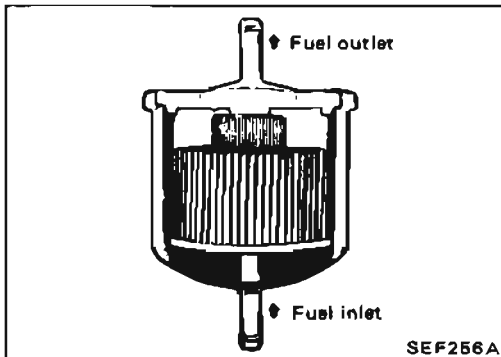
The E.G.R. system is controlled only by the E.C.U. At both low- and high-speed engine revolutions, the solenoid valve turns on and accordingly the E.G.R. valve cuts the exhaust gas leading to the intake manifold.

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

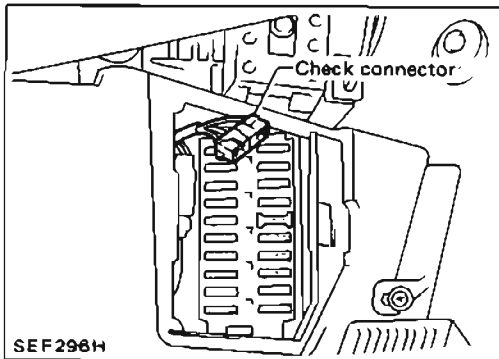
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.

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.

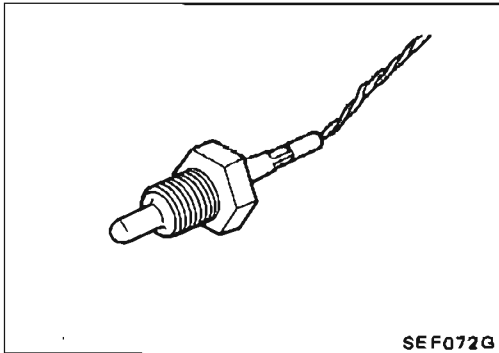
The vacuum in the intake passage upstream of the throttle valve increases in response to the amount of the intake air.

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.



Check Connector for E.C.C.S. Checker Box

The check connector for E.C.C.S. checker box is beside fuse box.

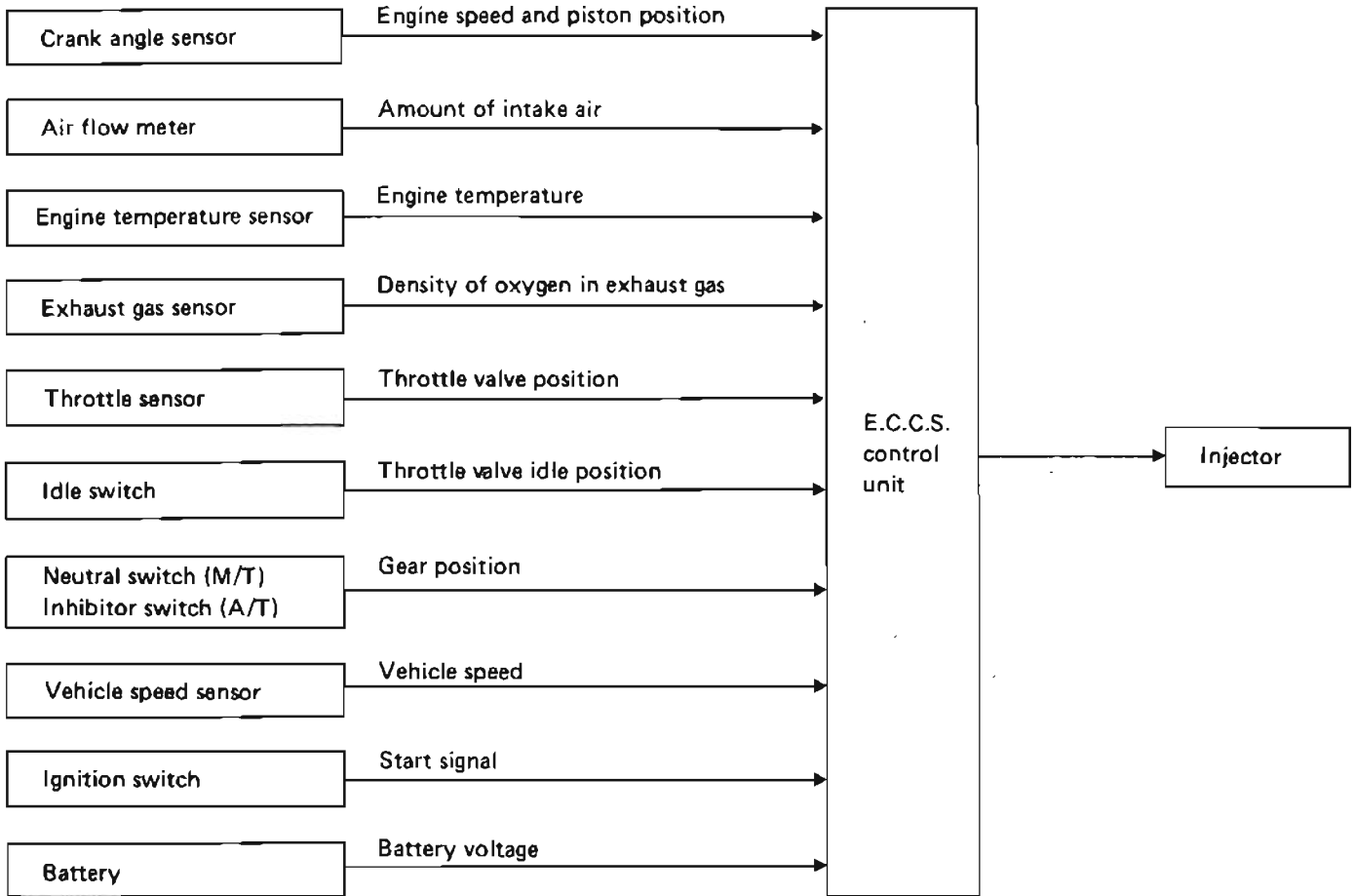


Exhaust Gas Temperature Sensor (For California model)

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.

Fuel Injection Control

INPUT/OUTPUT SIGNAL LINE



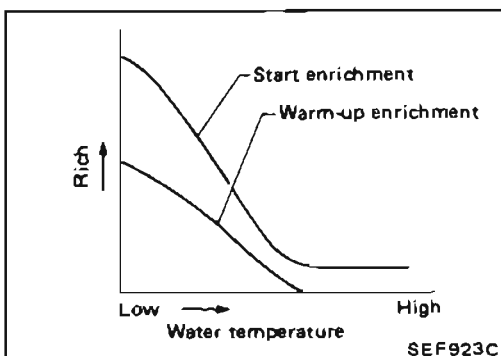
BASIC FUEL INJECTION CONTROL

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.

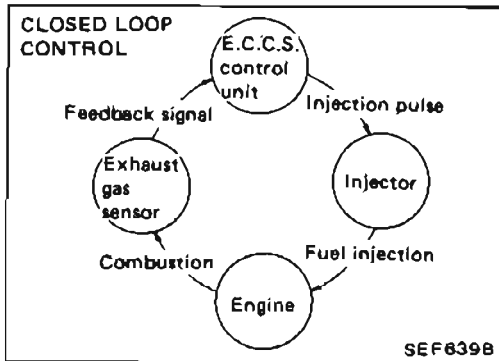
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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_x 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

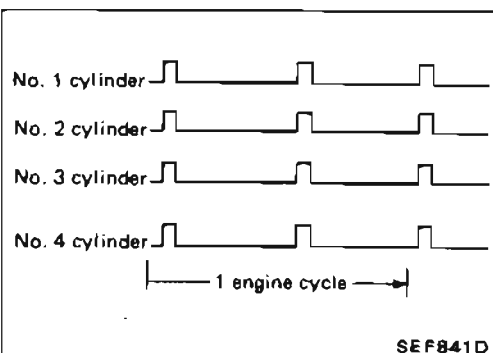
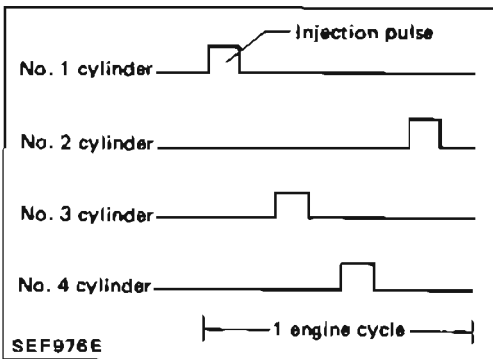
MIXTURE RATIO SELF-LEARNING CONTROL

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.

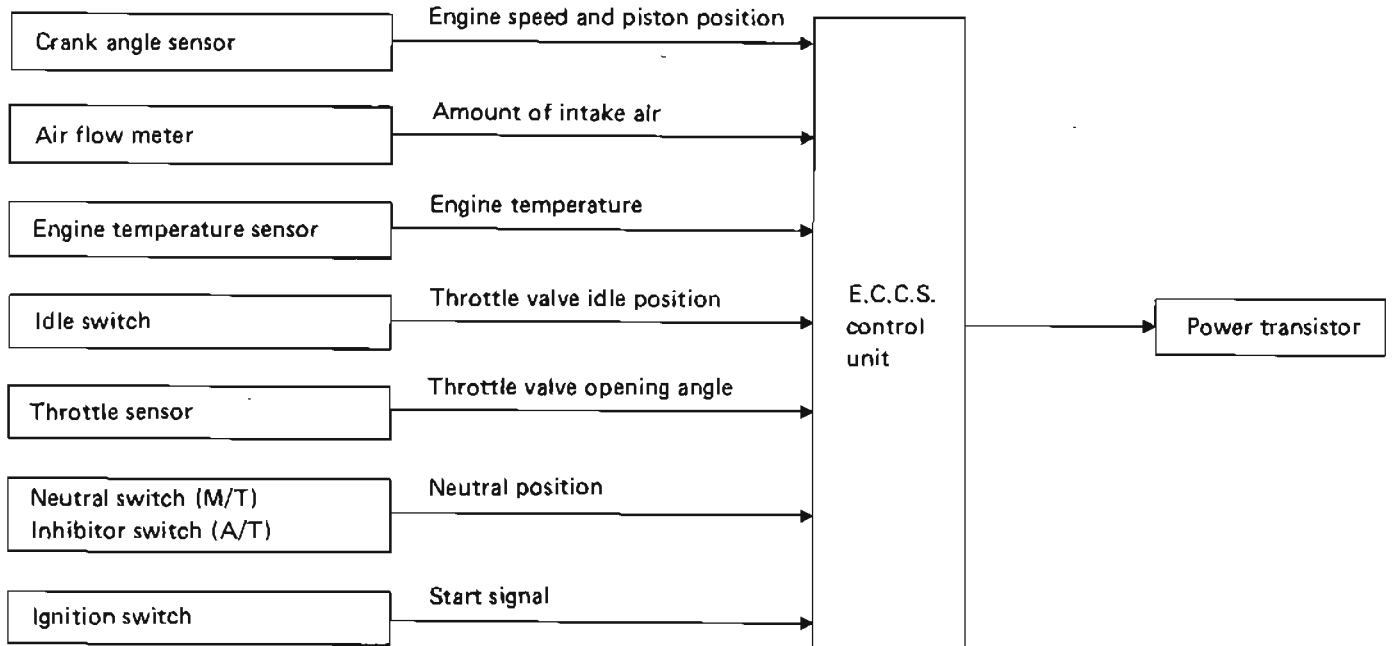
Fuel Injection Control (Cont'd)

FUEL SHUT-OFF

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

Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE



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.

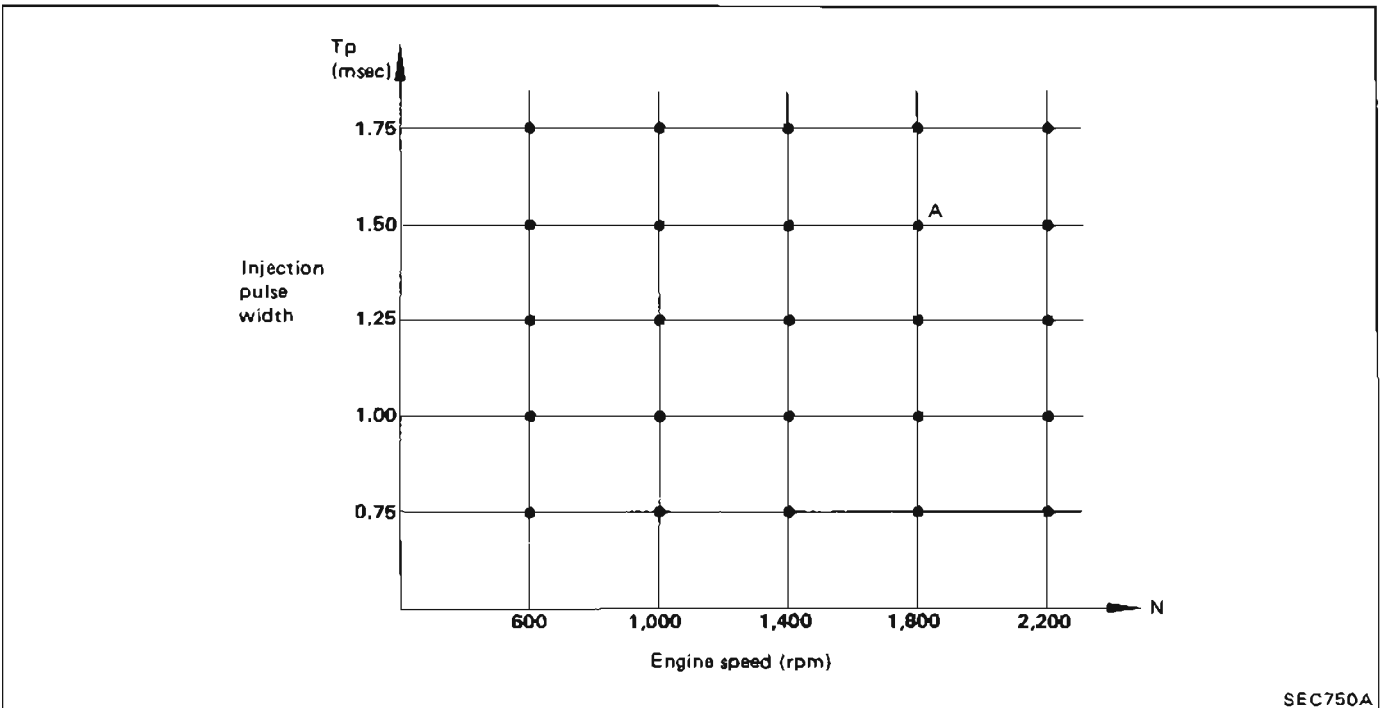
The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

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 Hot engine operation
- 7 At acceleration

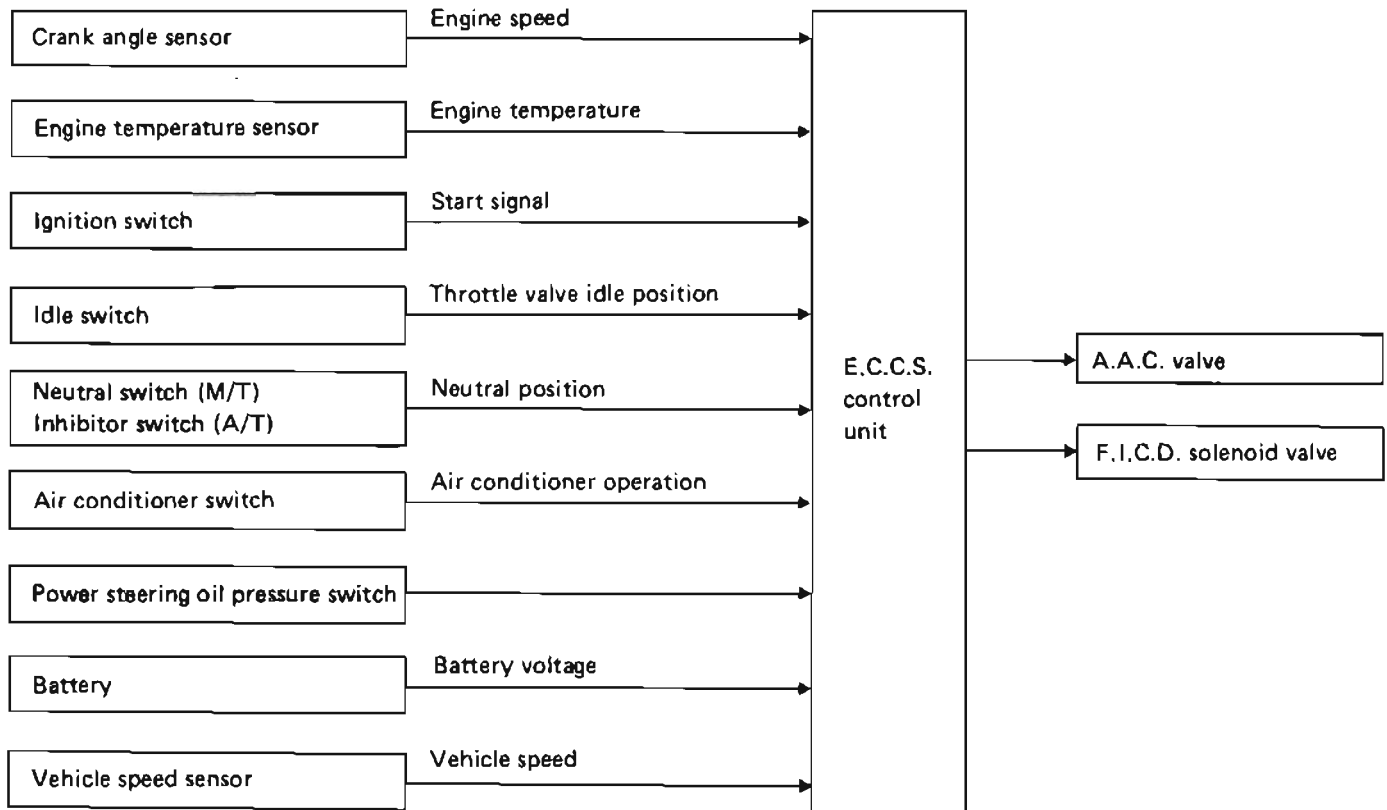
the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.



SEC750A

Idle Speed Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

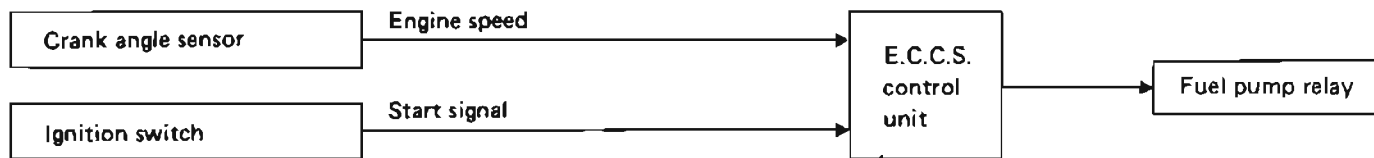
This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via A.A.C. valve. The A.A.C. valve repeats ON/OFF operation at a rate of 100 to 200 Hz according to the signal sent from 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



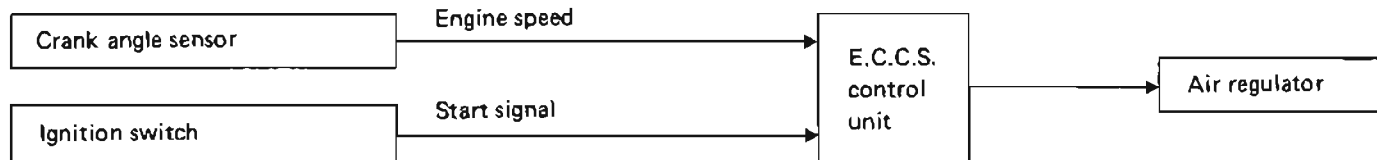
SYSTEM DESCRIPTION

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 Regulator Control

INPUT/OUTPUT SIGNAL LINE



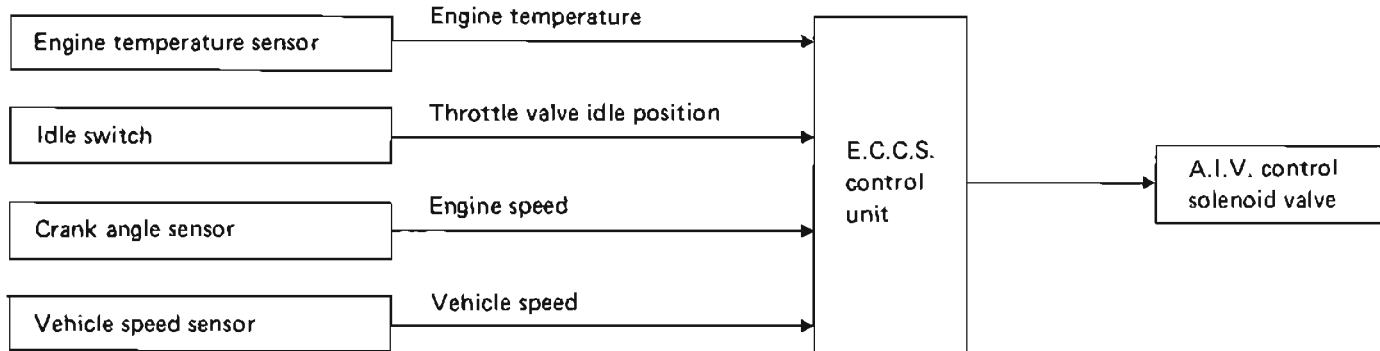
SYSTEM DESCRIPTION

The air regulator is controlled by the E.C.U. at the same time as fuel pump ON-OFF control.

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

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.

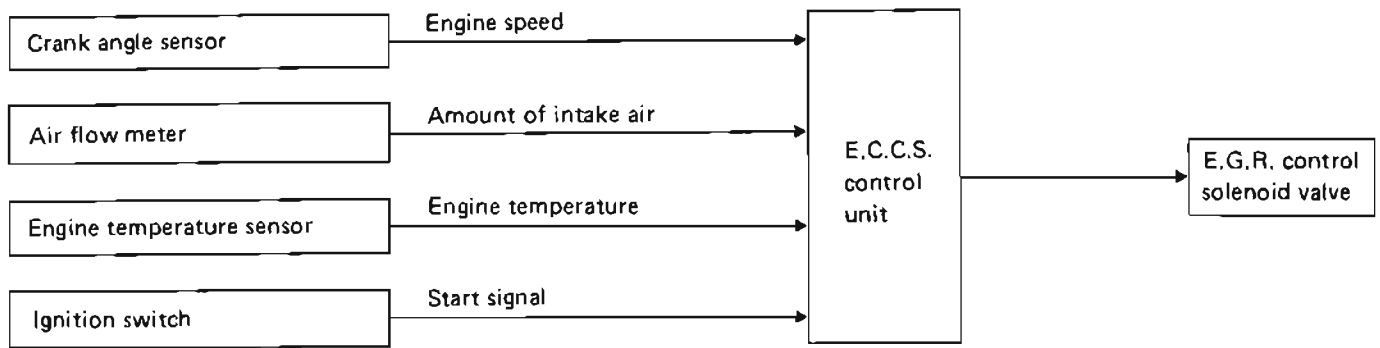
In extremely cold conditions, A.I.V. control system does not operate to reduce after-burning. This system also operates during deceleration for the purpose of blowing off water around the air induction valve.

| Engine condition | Water temperature °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 105 (221) | |
| Idle & heavy load conditions | | OFF |
| Other conditions | | |

E.G.R. system operation

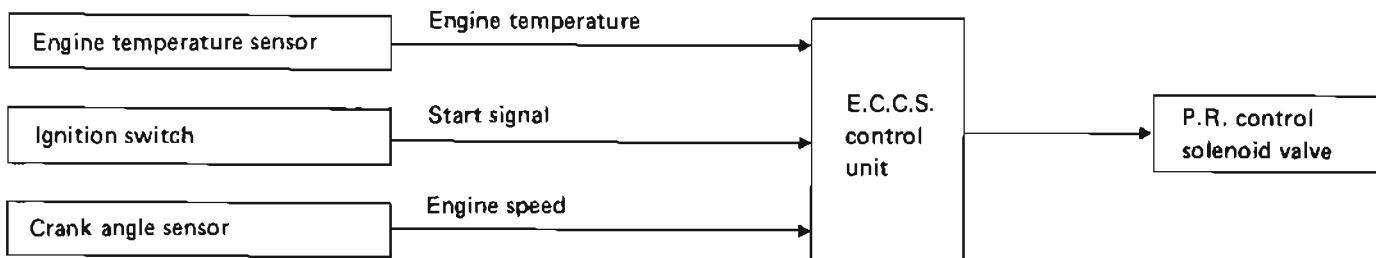
E.G.R. system operates under only the following conditions.

| Water temperature °C (°F) | B.P.T. valve | | Throttle position | E.G.R. control solenoid valve | E.G.R. system |
|-----------------------------------|----------------------|-----------|-------------------|-------------------------------|---------------|
| | Exhaust gas pressure | Operation | | | |
| Above 60 (140) Below 105 (221) | High | Closed | Partially open | OFF | Operates |

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

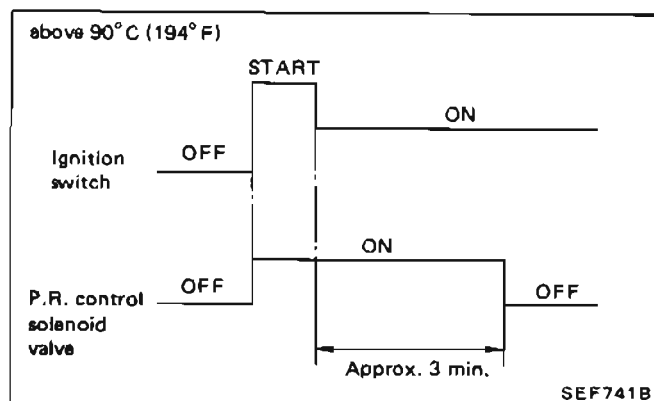
Fuel Pressure Regulator Control

INPUT/OUTPUT SIGNAL LINE



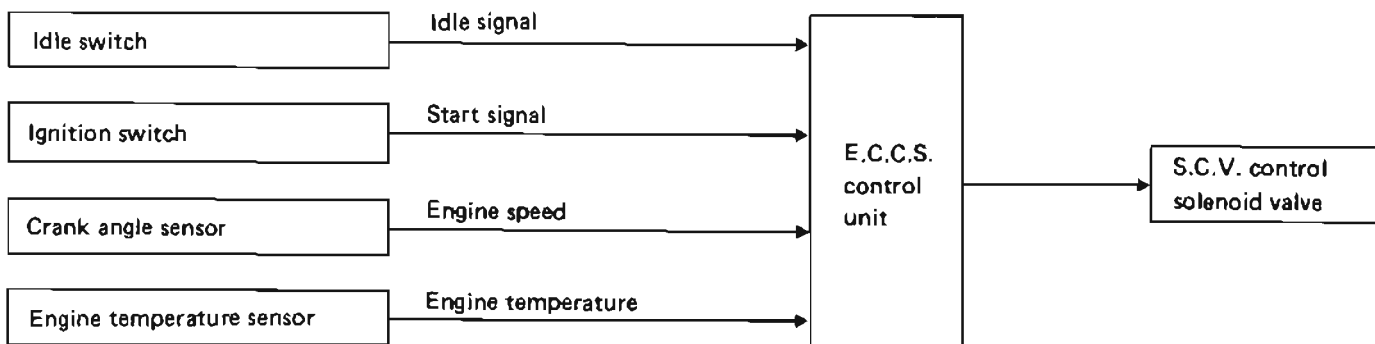
SYSTEM DESCRIPTION

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 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.

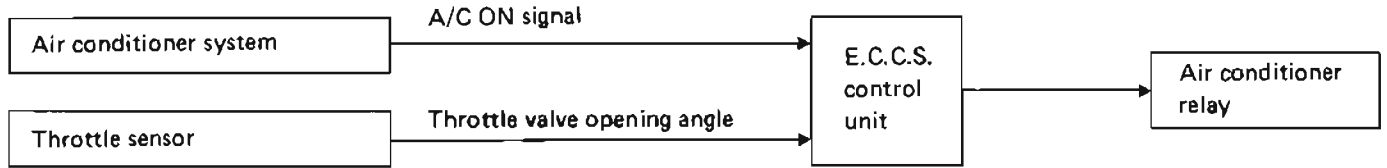
Also, except when idling, this system opens the S.C.V. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

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

| Idle switch | Water temperature | Engine rpm | Solenoid valve | S.C.V. |
|--------------|-------------------|-------------|----------------|--------|
| ON | Above 35°C (95°F) | Below 1,400 | ON | Close |
| Except above | | | OFF | Open |

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.

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. (Engine speed does not exceed 2,400 rpm.) |

ENGINE TEMPERATURE SENSOR MALFUNCTION

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

Operation

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

THROTTLE SENSOR MALFUNCTION

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

IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

PREPARATION

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

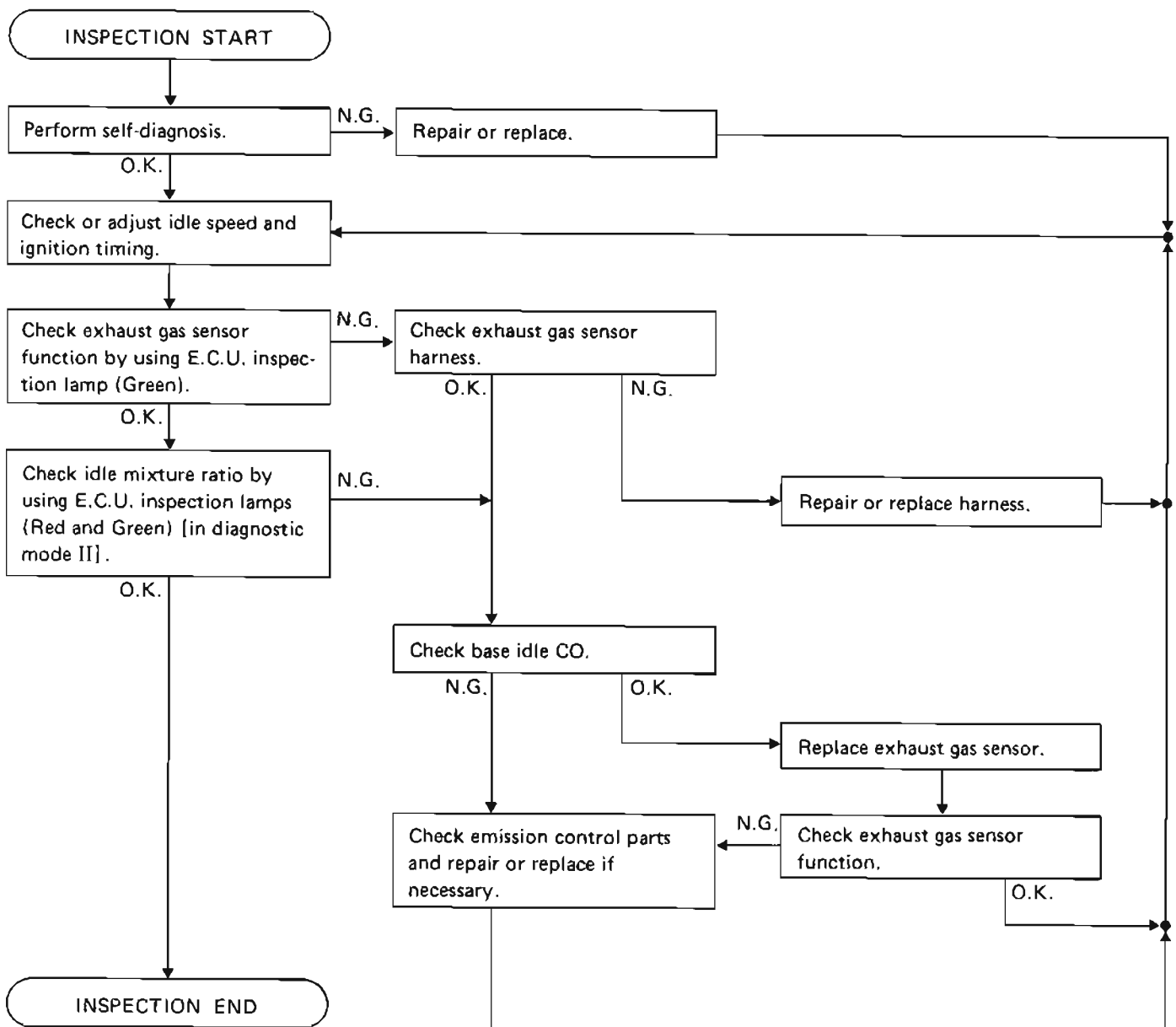
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
(Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- A.I.V. hose
- Engine compression
- E.G.R. control valve operation
- Throttle valve and throttle valve switch

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.

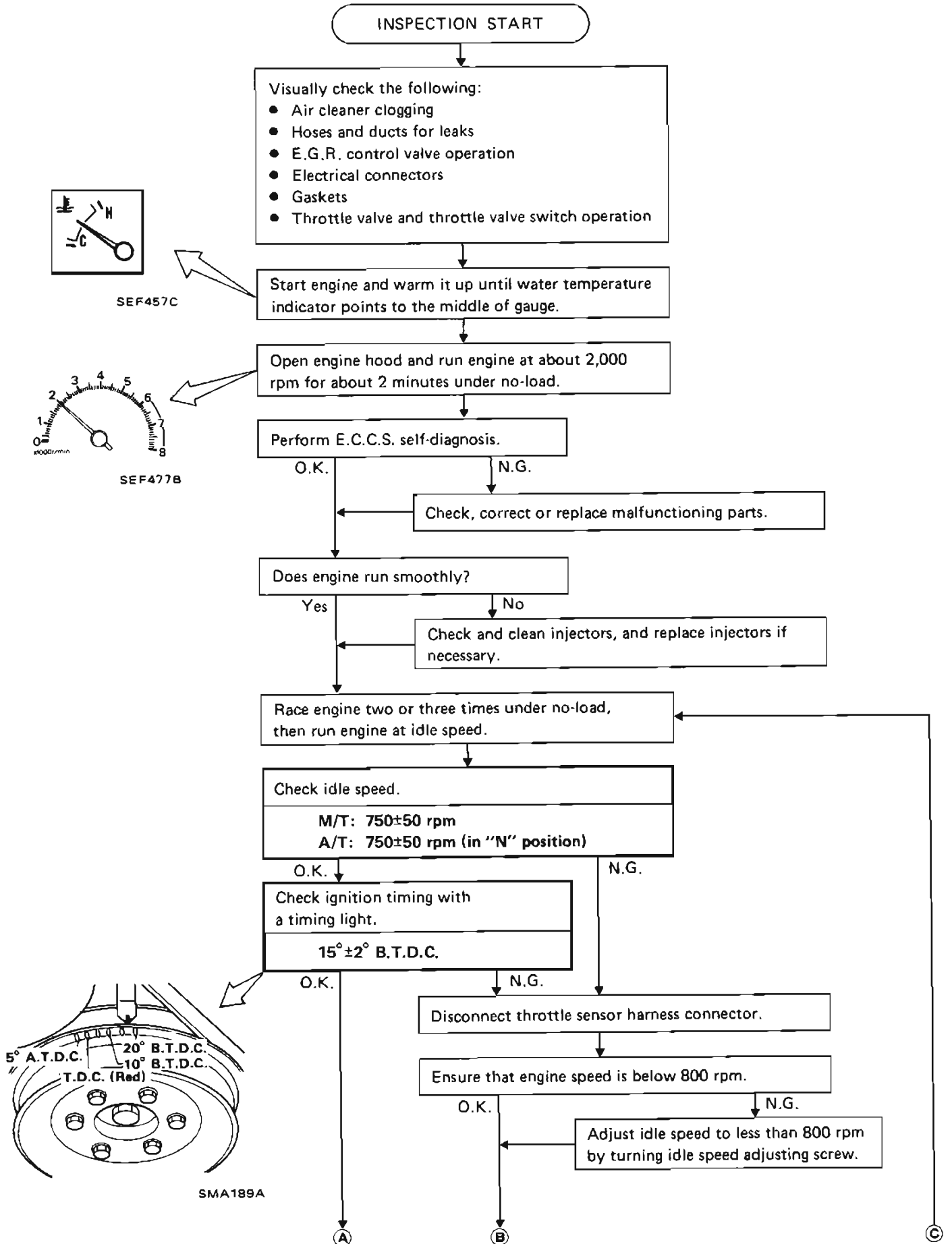
WARNING:

- a. When checking or adjustment, move selector lever to "N" position, set parking brake and chock rear wheels.
- b. After the adjustment has been made, remove wheel chocks.

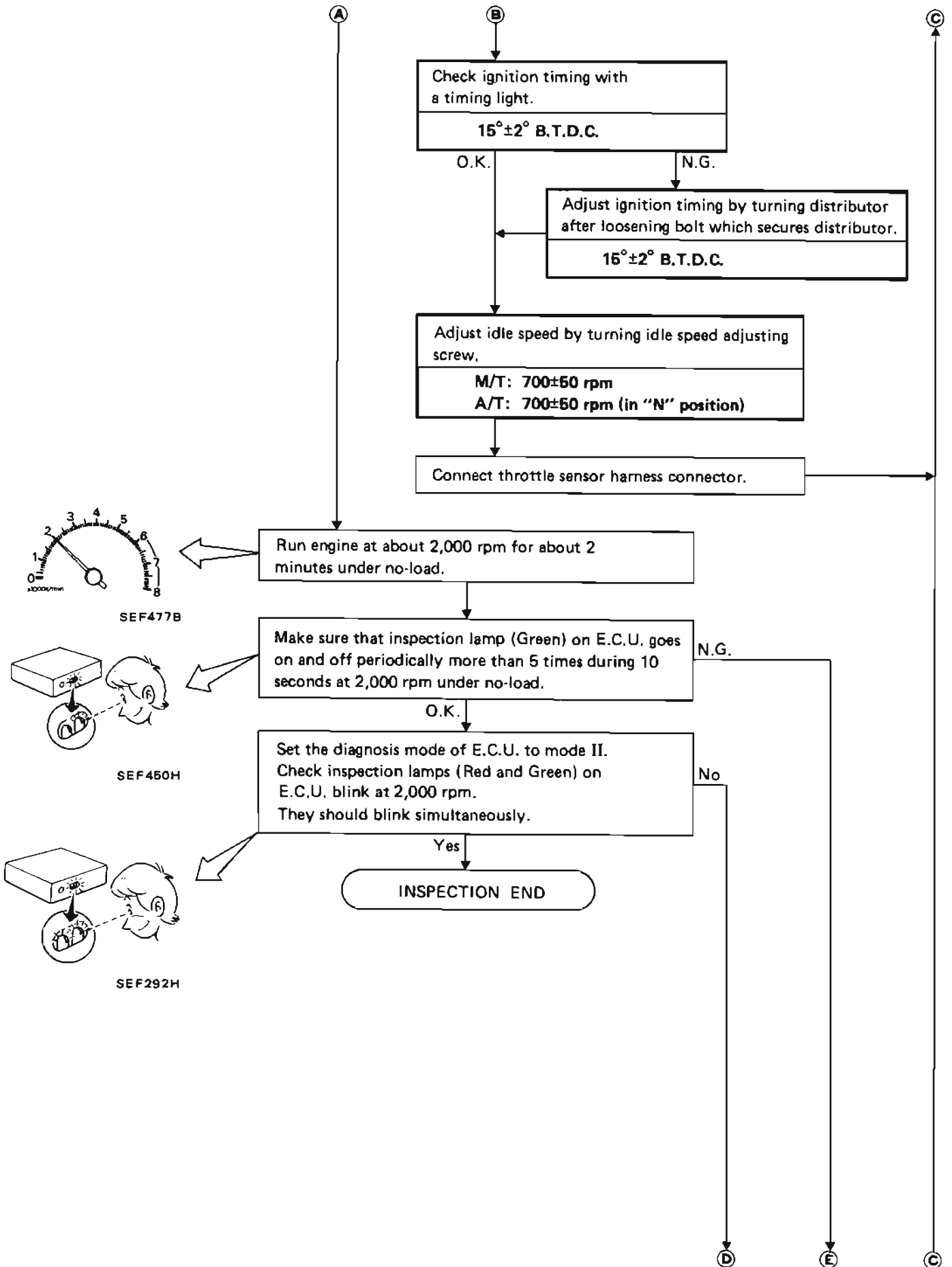
Overall inspection sequence



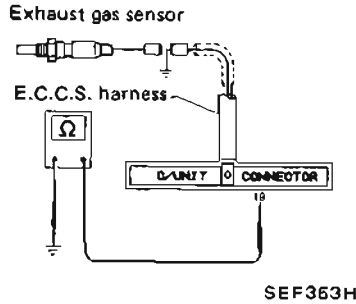
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



E

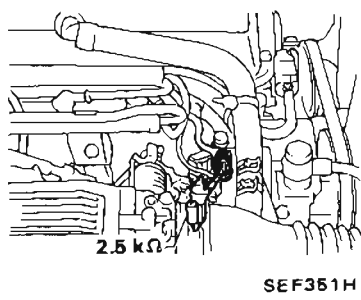
Check exhaust gas sensor harness:

- 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.

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

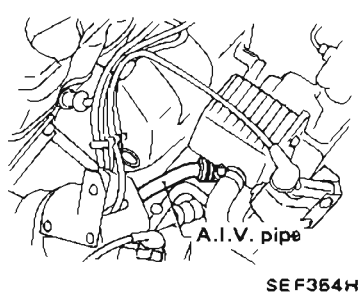
Connect harness connector to E.C.U. and disconnect jumping wire from exhaust gas sensor.



- 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.

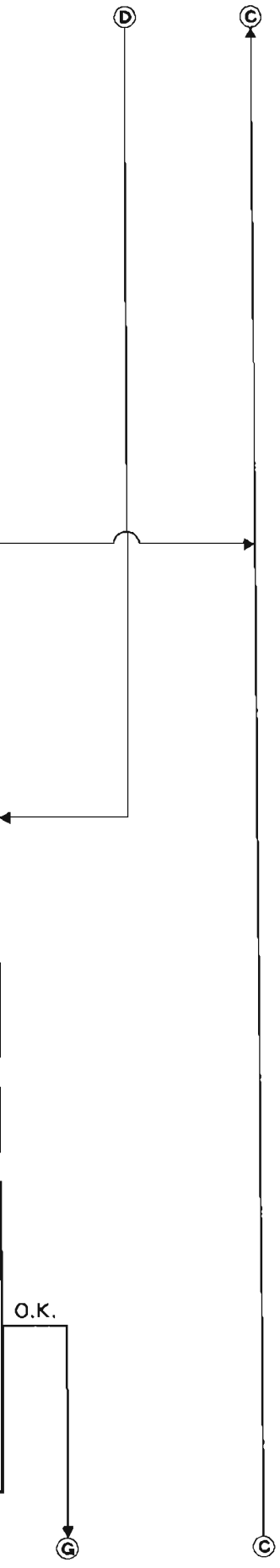


Check "CO"% and if engine runs smoothly.

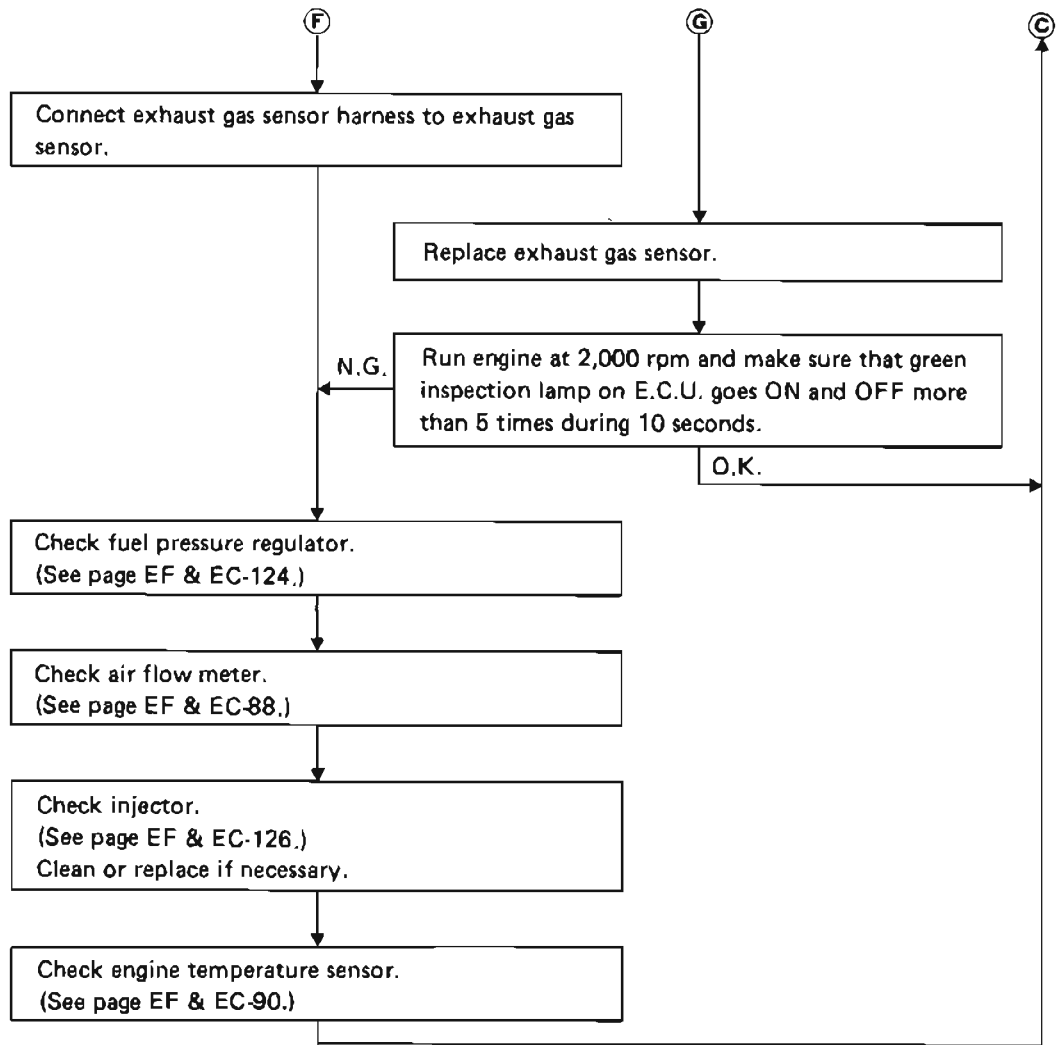
Idle CO: Less than 5%

After checking CO%

- 1) Turn off engine.
- 2) Disconnect the resistor 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.



IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION





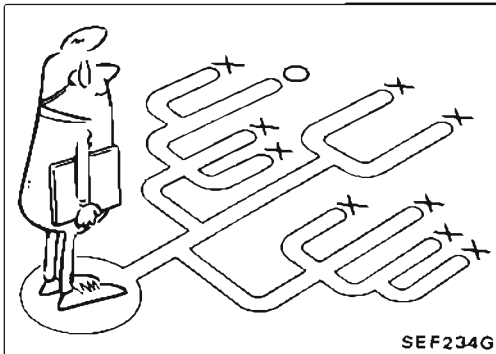
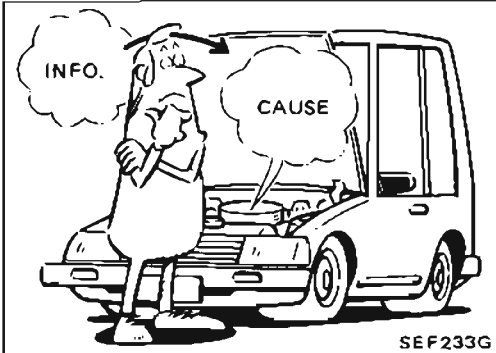
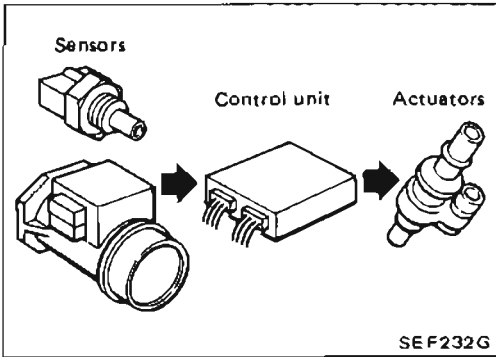
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TROUBLE DIAGNOSES

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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.

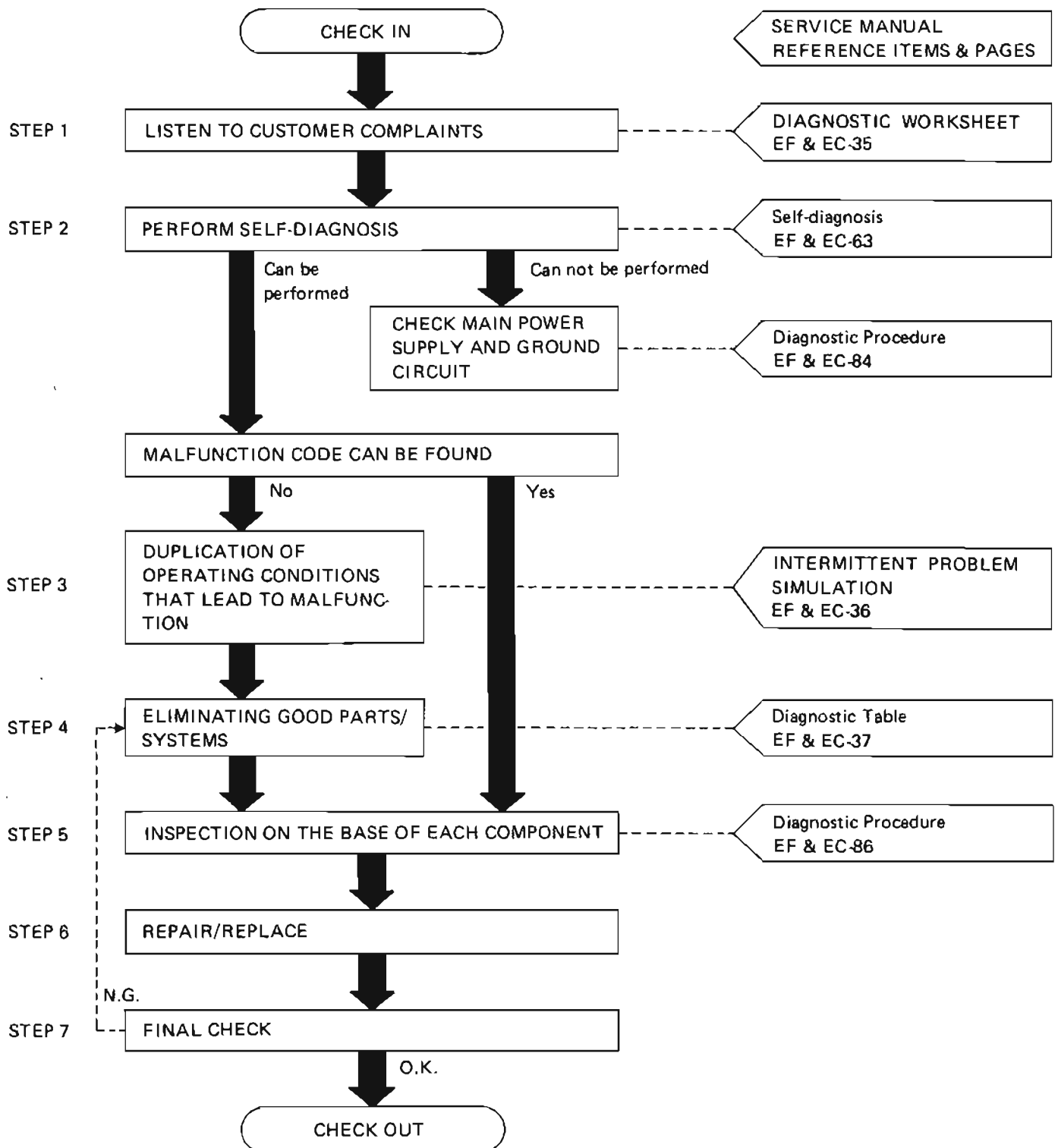
Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through the talks with the customer, find out what symptoms are present and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



TROUBLE DIAGNOSES

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

KEY POINTS

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

DIAGNOSTIC WORKSHEET

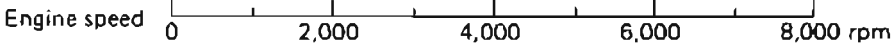
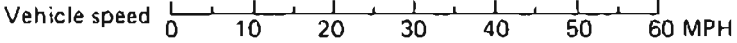
There are many kinds of operating conditions that lead to malfunctions on engine components.

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

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

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

Worksheet sample

| | | | |
|---------------------|---------------------------------------|---|-----------------|
| Customer name MR/MS | | Model & Year | VIN |
| Engine # | | Trans. | Mileage |
| Incident Date | | Manuf. Date | In Service Date |
| Symptoms | <input type="checkbox"/> Startability | <input type="checkbox"/> Impossible to start <input type="checkbox"/> No combustion <input type="checkbox"/> Partial combustion <input type="checkbox"/> Partial combustion affected by throttle position <input type="checkbox"/> Partial combustion NOT affected by throttle position <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 <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 <input type="checkbox"/> Intake backfire <input type="checkbox"/> Exhaust backfire <input type="checkbox"/> Others [] | |
| | <input type="checkbox"/> Engine stall | <input type="checkbox"/> At the time of start <input type="checkbox"/> While idling <input type="checkbox"/> While accelerating <input type="checkbox"/> While decelerating <input type="checkbox"/> Just after stopping <input type="checkbox"/> While loading | |
| Incident occurrence | | <input type="checkbox"/> Just after delivery <input type="checkbox"/> Recently <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"/> Not 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 <input type="checkbox"/> During warm-up <input type="checkbox"/> After warm-up Engine speed  rpm | |
| 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 <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH) Vehicle speed  MPH | |
| Check engine light | | <input type="checkbox"/> Turned on <input type="checkbox"/> Not turned on | |

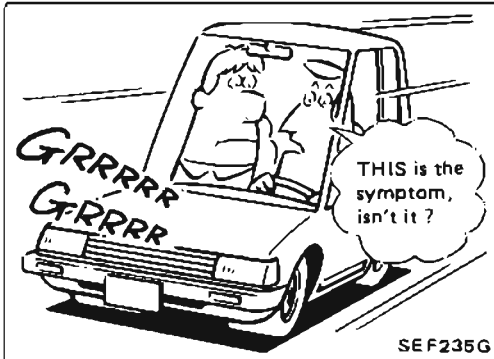
TROUBLE DIAGNOSES

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. [WARNING: Do not overheat the unit.] |
| 7 | Moisture | Electric parts | Damp | Wet. [WARNING: Do not directly pour water on components. Use a mist sprayer.] |
| 8 | Electric loads | Load switches | Loaded | Turn on head lights, 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

Diagnostic Table

To assist with your trouble diagnoses, some typical diagnostic procedures for the following symptoms are described.

REMARKS

In the following pages, the numbers such as ❶, ❷ in the above chart correspond to those in the service procedure described below.

Possible causes can be checked through the service procedure shown by the mark "○".

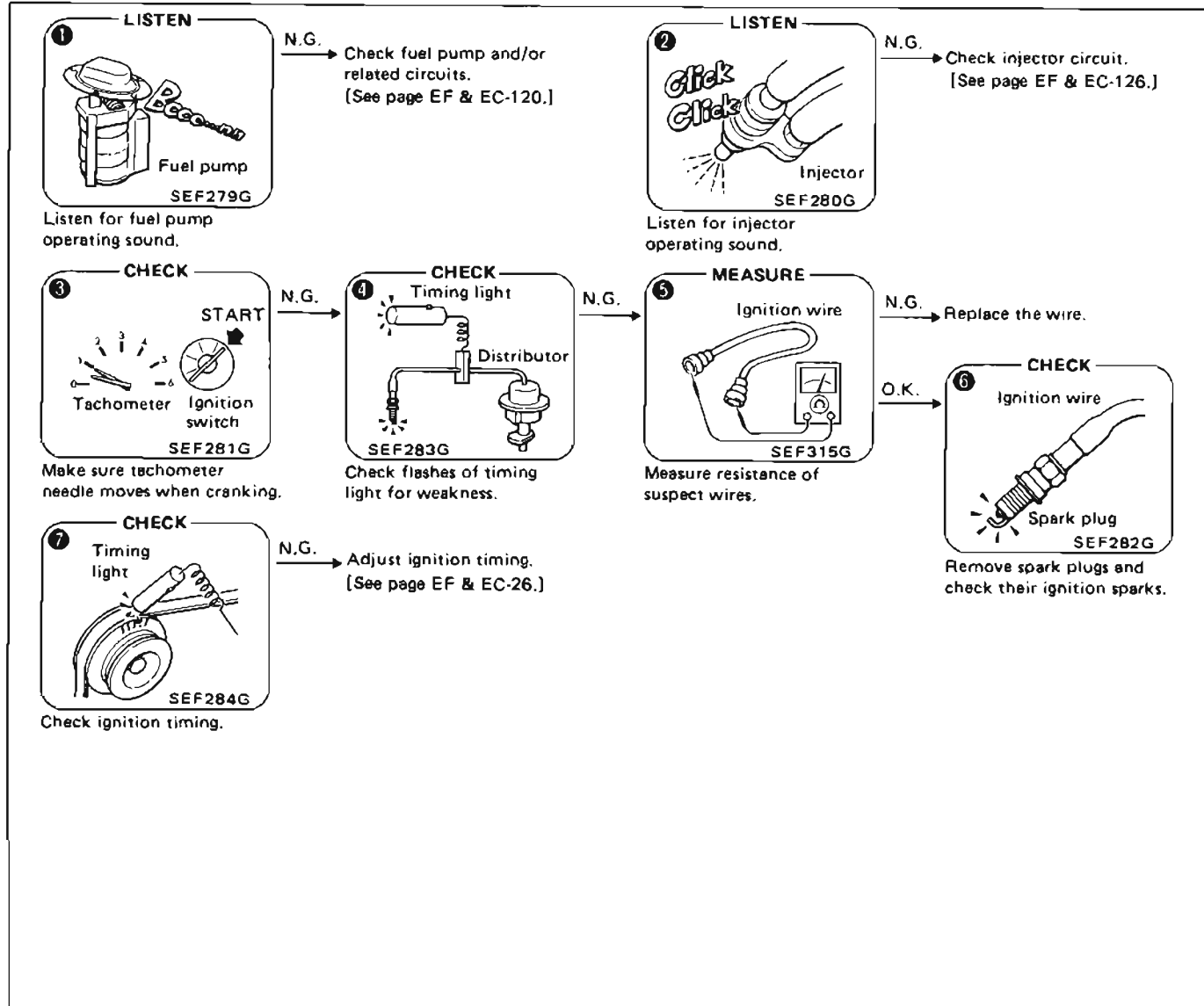
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 1 Impossible to start — no combustion

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|-----------------------------------|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio (too lean) | ○ | ○ | | | | | |
| | Ignition sparks (weak, missing) | | | | ○ | ○ | ○ | |
| | Ignition timing | | | | | | | ○ |
| FUEL SYSTEM | Fuel pump (no operation) | ○ | | | | | | |
| | Fuel pump relay (open circuited) | ○ | | | | | | |
| | Injectors (no operation, clogged) | | ○ | | | | | |
| IGNITION SYSTEM | Ignition switch | ○ | ○ | ○ | ○ | | | ○ |
| | Main relay | ○ | ○ | ○ | ○ | | | ○ |
| | Power transistor | | | ○ | ○ | | | ○ |
| | Ignition coil | | | | ○ | | | ○ |
| | Center cable (ignition leaks) | | | | ○ | | | ○ |
| | Ignition wires (ignition leaks) | | | | ○ | ○ | | |
| | Spark plugs | | | | | | ○ | |
| CONTROL SYSTEM | Crank angle sensor | ○ | ○ | | ○ | | | ○ |

SERVICE PROCEDURE



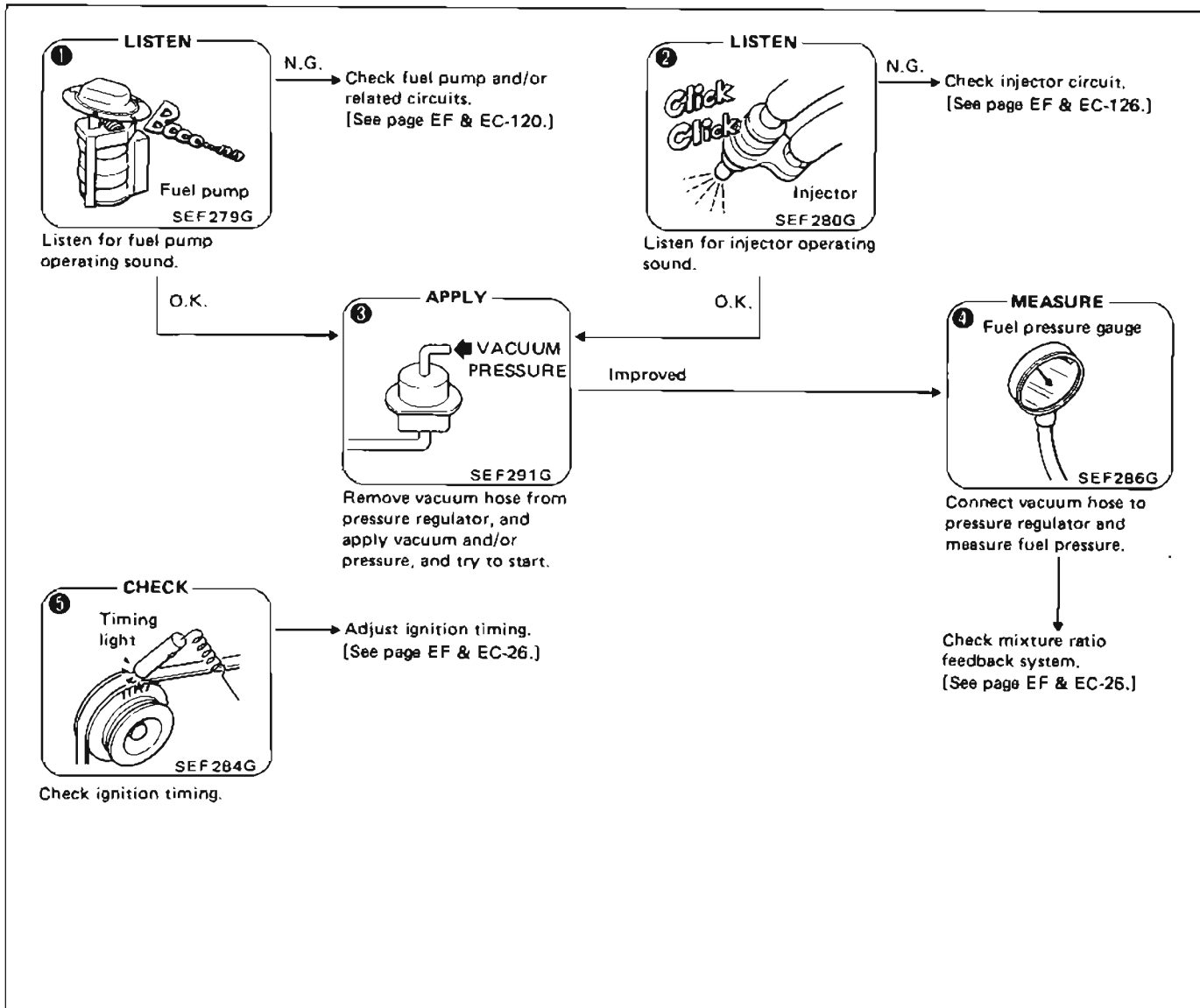
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 2 Impossible to start — partial combustion

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 |
|-----------------|----------------------------------|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | ○ | ○ | ○ | | |
| | Fuel pressure (too low) | | | | ○ | |
| | Ignition timing | | | | | ○ |
| FUEL SYSTEM | Fuel pump | ○ | | | | |
| | Fuel pump relay (open circuited) | ○ | | | | |
| | Injectors (clogged) | | ○ | | | |

SERVICE PROCEDURE



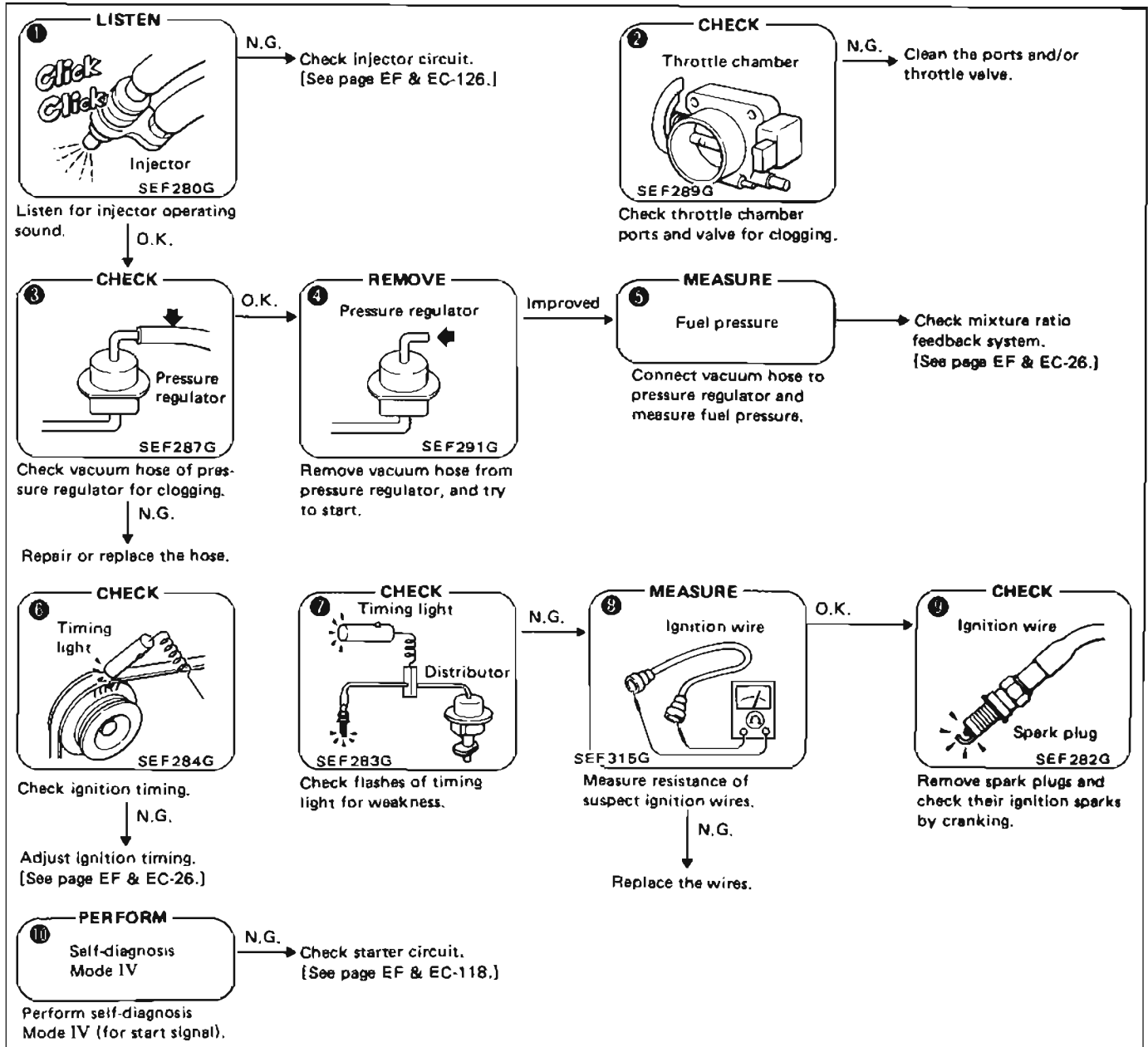
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 3 Impossible to start — partial combustion (not affected by throttle position)

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------------|--|---|---|---|---|---|---|---|---|---|----|
| SPECIFICATIONS | Mixture ratio | ○ | | ○ | ○ | | | | | | |
| | Fuel pressure (too low) | | | ○ | ○ | ○ | | | | | |
| | Ignition timing | | | | | | ○ | | | | |
| FUEL SYSTEM | Fuel filter (clogged) | | | | | | ○ | | | | |
| | Fuel line (clogged) | | | | | | ○ | | | | |
| | Injectors (clogged) | ○ | | | | | | | | | |
| | Pressure regulator | | | | ○ | | | | | | |
| | Pressure regulator vacuum hose (clogged) | | | ○ | | | | | | | |
| IGNITION SYSTEM | Ignition wires (ignition leaks) | | | | | | | ○ | ○ | | |
| | Spark plugs (wet with fuel) | | | | | | | | | ○ | |
| | Ignition switch | ○ | | | | | | ○ | | | ○ |
| INTAKE SYSTEM | Throttle chamber (with ports clogged) | | ○ | | | | | | | | |
| | Throttle valve (clogged) | | ○ | | | | | | | | |
| CONTROL SYSTEM | Engine temperature sensor | | | | | | | | | ○ | |
| | Crank angle sensor | ○ | | | | | | | | ○ | |

SERVICE PROCEDURE



TROUBLE DIAGNOSES

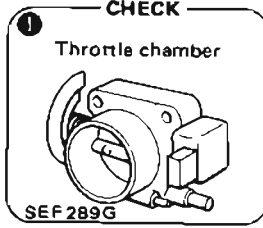
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION **4** Impossible to start — partial combustion (throttle position changes combustion quality)

| POSSIBLE CAUSES | | ① | ② | ③ | ④ |
|-----------------------|---------------------------------------|---|---|---|---|
| INTAKE SYSTEM | Throttle chamber (with ports clogged) | ○ | | | |
| | Throttle valve (clogged) | | ○ | | |
| | Air regulator (stuck closed) | | | ○ | |
| | Idle speed control valve | | | | ○ |
| CONTROL SYSTEM | Engine temperature sensor | | | | ○ |
| | Idle switch | | | | ○ |
| | Neutral switch | | | | ○ |

SERVICE PROCEDURE

① CHECK
Throttle chamber

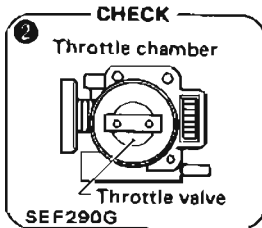


SEF289G

Check throttle chamber ports for clogging.

N.G. → Clean the ports.

② CHECK
Throttle chamber

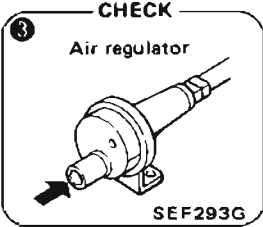


SEF290G

Check throttle valve for clogging.

N.G. → Clean the valve.

③ CHECK
Air regulator

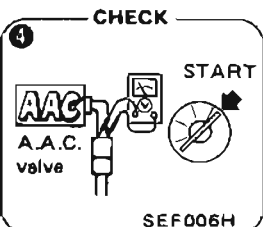


SEF293G

Make sure air regulator stays open before warm-up

N.G. → Check air regulator and/or its circuit.
[See page EF & EC-130.]

④ CHECK
A.A.C. valve



SEF006H

Check terminal voltage of A.A.C. valve while cranking.

N.G. → Check idle speed control circuit.
[See page EF & EC-134.]

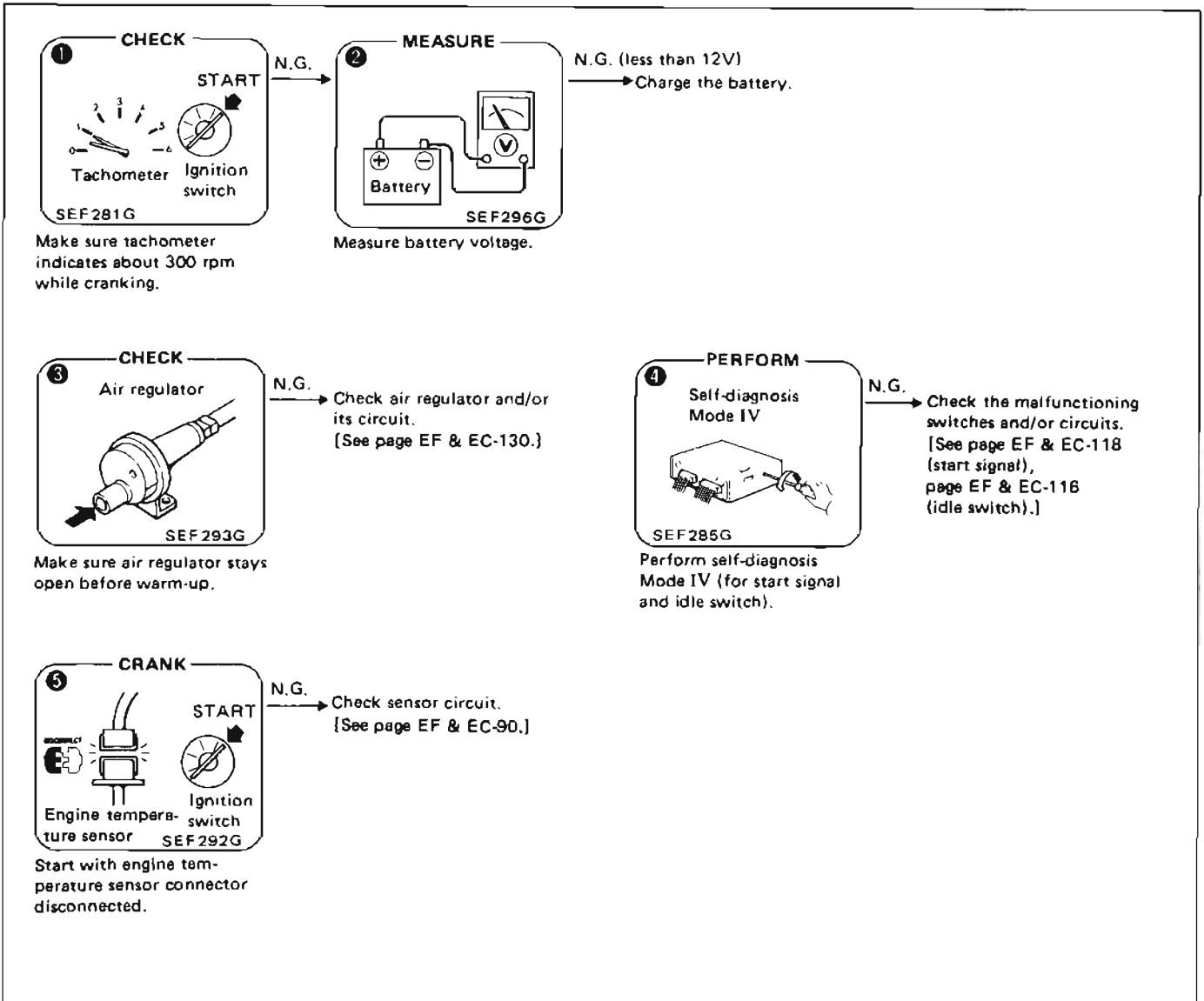
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 5 Hard to start – before warm-up

| POSSIBLE CAUSES | | ① | ② | ③ | ④ | ⑤ |
|-----------------|-----------------------------------|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | | | ○ | | ○ |
| IGNITION SYSTEM | Ignition switch (no start signal) | ○ | | | ○ | |
| INTAKE SYSTEM | Air regulator | | | ○ | | |
| CONTROL SYSTEM | Engine temperature sensor | | | | | ○ |
| | Idle switch | | | | ○ | |
| | Neutral switch | ○ | | | | |
| OTHERS | Starter (operation too slow) | ○ | | | | |
| | Battery (voltage too low) | ○ | ○ | | | |

SERVICE PROCEDURE



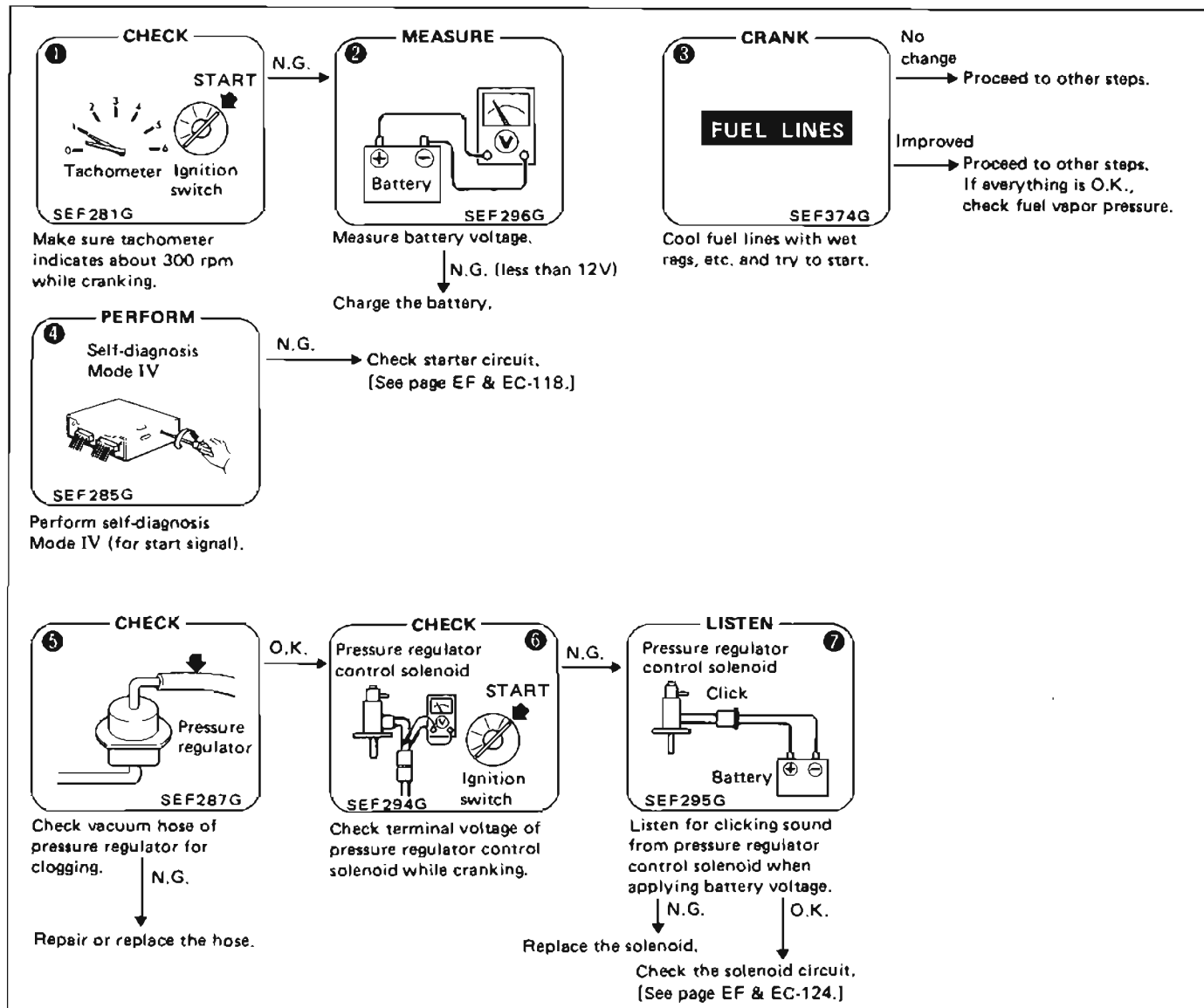
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION **6** Hard to start — after warm-up

| POSSIBLE CAUSES | | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
|-----------------|---|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | | | ○ | | ○ | | |
| | Fuel pressure | | | ○ | | ○ | ○ | |
| FUEL SYSTEM | Fuel line (hot fuel) | | | ○ | | | | |
| | Pressure regulator (low fuel pressure) | | | | | ○ | | |
| | Pressure regulator vacuum hose (clogged) | | | | | ○ | | |
| | Pressure regulator control solenoid | | | | | | ○ | ○ |
| | Pressure regulator control solenoid vacuum hose | | | | | ○ | | |
| | Fuel temperature sensor (open circuited) | | | | | | | |
| IGNITION SYSTEM | Ignition switch (no start signal) | ○ | | | ○ | | | |
| CONTROL SYSTEM | Engine temperature sensor | | | | | | | |
| | Air flow meter | | | | | | | |
| OTHERS | Starter (operation too slow) | ○ | | | | | | |
| | Battery (voltage too low) | ○ | ○ | | | | | |

SERVICE PROCEDURE



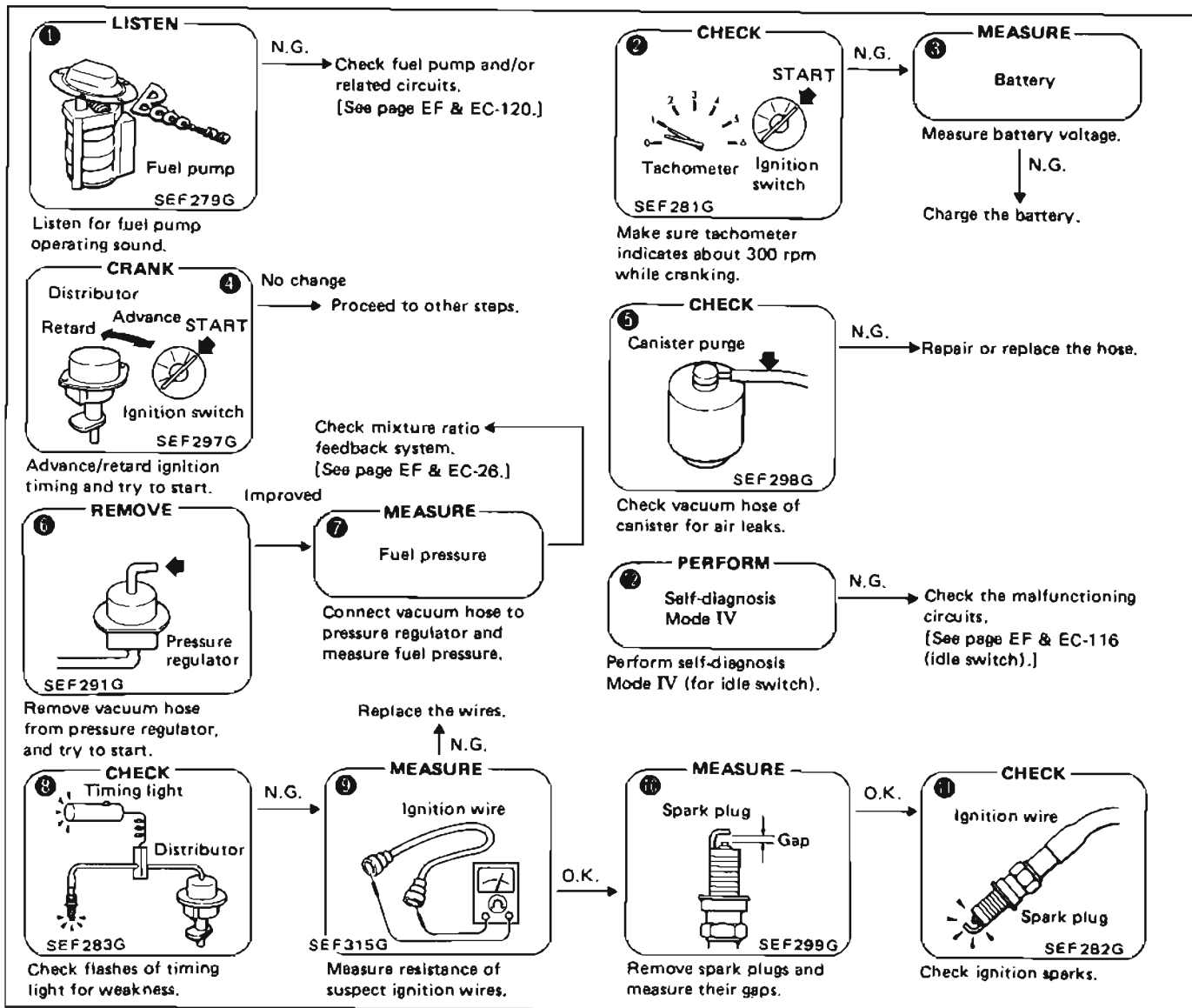
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 7 **Hard to start – every time**

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-----------------|--|---|---|---|---|---|---|---|---|---|----|----|----|----|----|
| SPECIFICATIONS | Mixture ratio | ○ | | | | ○ | ○ | | | | | | | | |
| | Fuel pressure | | | | | | ○ | ○ | | | | | | | |
| | Ignition sparks (missing) | | | | | | | | ○ | ○ | | ○ | | | |
| | Ignition timing | | | ○ | | | | | | | | | | | |
| FUEL SYSTEM | Fuel pump (improper operation) | ○ | | | | | | | | | | | | | |
| | Fuel line (clogged) | | | | | | | ○ | | | | | | | |
| | Canister (air leaks) | | | | | ○ | | | | | | | | | |
| | Pressure regulator (low fuel pressure) | | | | | | ○ | | | | | | | | |
| IGNITION SYSTEM | Ignition wires (ignition leaks) | | | | | | | | ○ | ○ | | | | | |
| | Spark plugs (improper gap) | | | | | | | | | | ○ | | | | |
| CONTROL SYSTEM | Crank angle sensor | ○ | | | | | | | | ○ | | | | | |
| | Engine temperature sensor | | | | | | | | | | | ○ | | | |
| | Idle switch | | | | | | | | | | | | | | ○ |
| | Neutral switch | | ○ | | | | | | | | | | | | |
| OTHERS | Starter (operation too slow) | | ○ | | | | | | | | | | | | |
| | Battery (voltage too low) | | ○ | ○ | | | | | | | | | | | |

SERVICE PROCEDURE



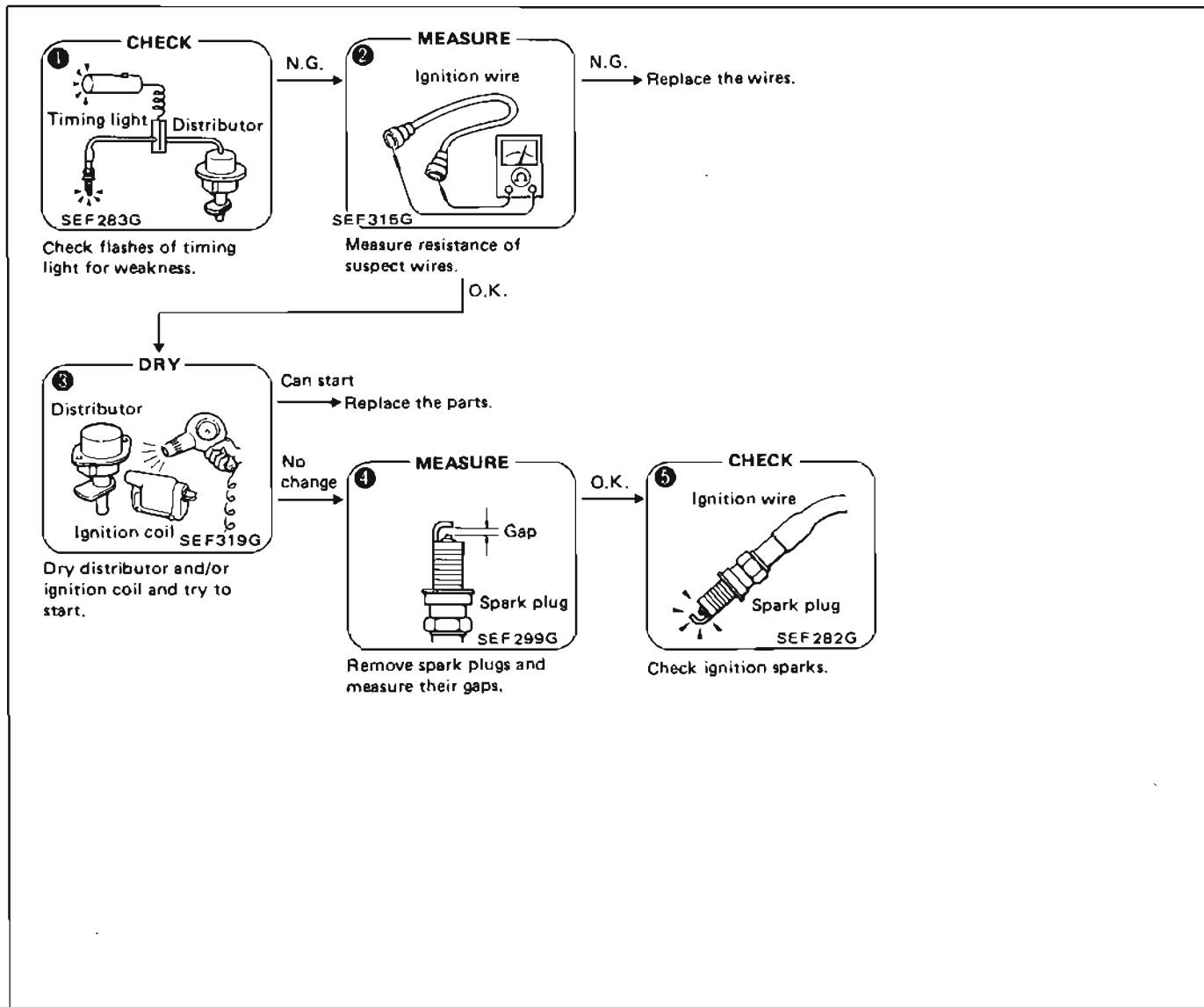
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION **8** **Hard to start – morning after a rainy day**

| POSSIBLE CAUSES | | ① | ② | ③ | ④ | ⑤ |
|------------------------|----------------------------------|---|---|---|---|---|
| SPECIFICATIONS | Ignition sparks (weak) | ○ | ○ | | | ○ |
| IGNITION SYSTEM | Power transistor | ○ | | | | ○ |
| | Ignition coil | ○ | | ○ | | ○ |
| | Center cable (ignition leaks) | ○ | | | | ○ |
| | Ignition wires (ignition leaks) | ○ | ○ | | | ○ |
| | Distributor cap (ignition leaks) | ○ | | ○ | | ○ |
| | Spark plugs (improper gap) | | | | ○ | ○ |

SERVICE PROCEDURE



TROUBLE DIAGNOSES

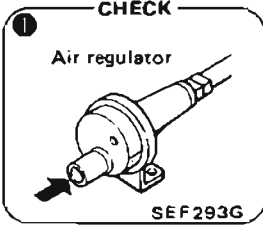
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 9 Abnormal idling – no fast idle

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 |
|-----------------|------------------------------|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | ○ | ○ | | ○ | |
| | Ignition timing | | | ○ | | |
| INTAKE SYSTEM | Blow-by hose (clogged) | | ○ | | | |
| | Air regulator (stuck closed) | ○ | | | | |
| CONTROL SYSTEM | Engine temperature sensor | | | | | ○ |

SERVICE PROCEDURE

1 CHECK

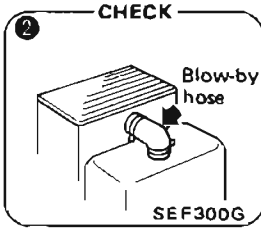


Air regulator
SEF293G

Make sure air regulator stays open before warm-up.

N.G. → Check air regulator and/or its circuit.
[See page EF & EC-130.]

2 CHECK

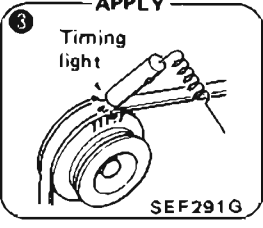


Blow-by hose
SEF300G

Check blow-by hose for clogging.

N.G. → Clean or replace the hose.

3 APPLY

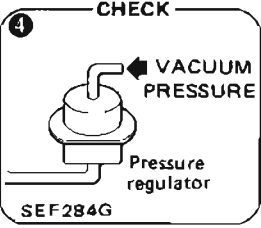


Timing light
SEF291G

Check ignition timing.

Improved → Adjust ignition timing.
[See page EF & EC-26.]

4 CHECK

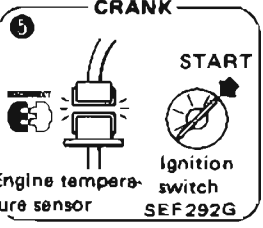


VACUUM PRESSURE
Pressure regulator
SEF284G

Apply vacuum pressure to pressure regulator after disconnecting vacuum hose, and check idling.

N.G. → Check mixture ratio feedback system.
[See page EF & EC-26.]

5 CRANK



Engine temperature sensor
Ignition switch
SEF292G

Start with engine temperature sensor connector disconnected.

N.G. → Check sensor circuit.
[See page EF & EC-90.]

TROUBLE DIAGNOSES

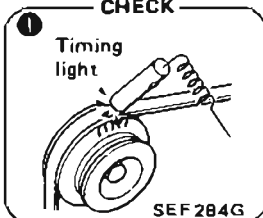
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 10 Abnormal idling – low idle (after warm-up)

| POSSIBLE CAUSES | | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
|-----------------|---------------------------------------|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | | ○ | | | ○ | | |
| | Ignition timing (too retarded) | ○ | | | | | | |
| INTAKE SYSTEM | Throttle chamber (with ports clogged) | | | ○ | | | | |
| | Throttle valve (clogged) | | | | ○ | | | |
| CONTROL SYSTEM | Crank angle sensor | | | | | | ○ | |
| | Air flow meter | | | | | | ○ | |
| | Engine temperature sensor | | | | | | | ○ |
| | Load switches (remaining OFF) | | | | | | | ○ |

SERVICE PROCEDURE

1 CHECK



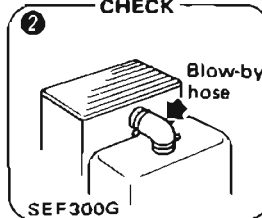
Timing light
SEF 284G

Check ignition timing.

↓ N.G.

Adjust ignition timing.
[See page EF & EC-26.]

2 CHECK



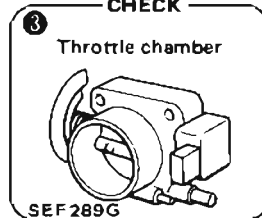
Blow-by hose
SEF 300G

Check blow-by hose for clogging.

↓ N.G.

Clean or replace the hose.

3 CHECK



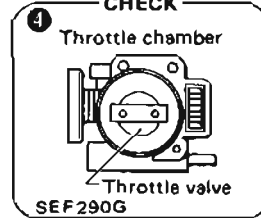
Throttle chamber
SEF 289G

Check throttle chamber ports for clogging.

↓ N.G.

Clean the ports.

4 CHECK



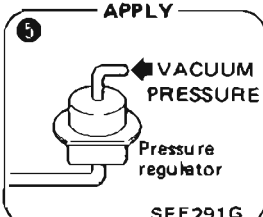
Throttle chamber
Throttle valve
SEF 290G

Check throttle valve for clogging.

↓ N.G.

Clean the valve.

5 APPLY



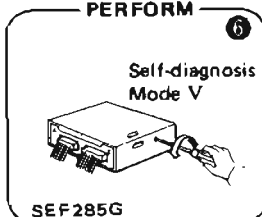
VACUUM PRESSURE
Pressure regulator
SEF 291G

Apply vacuum pressure to pressure regulator after disconnecting vacuum hose, and check idling.

Improved → Check mixture ratio feedback system.
[See page EF & EC-26.]

No change → Check load signal circuit.
[See EL section.]

PERFORM 6



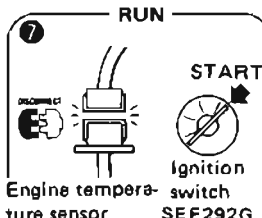
Self-diagnosis Mode V
SEF 285G

Perform self-diagnosis Mode V (for air flow meter).

↓ N.G.

Check the malfunctioning parts and/or circuits.
[See page EF & EC-88 (air flow meter), page EF & EC-90 (engine temperature sensor).]

7 RUN



Engine temperature sensor
Ignition switch
SEF 292G

Start and run engine with engine temperature sensor connector disconnected.

N.G. →

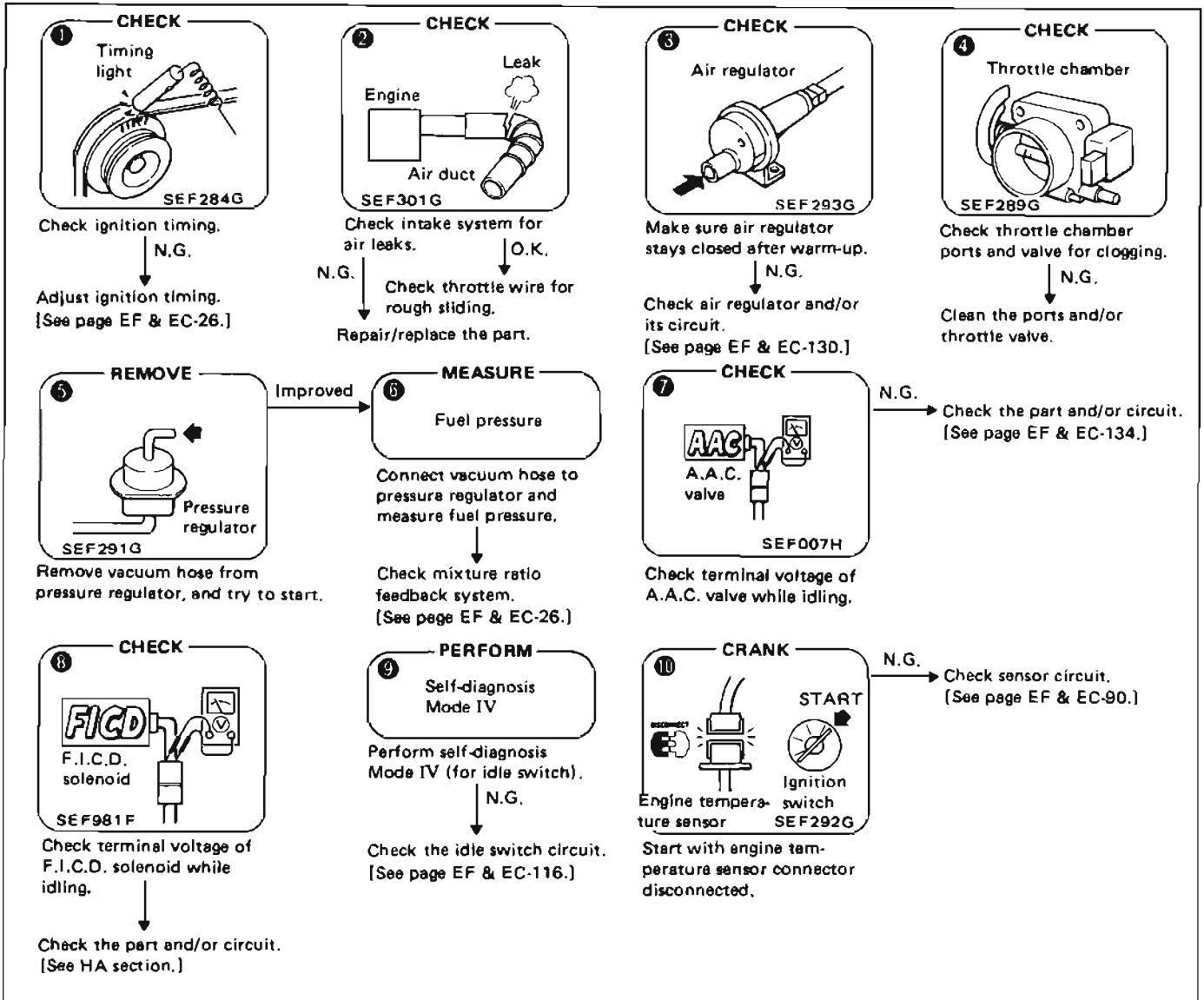
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 11 Abnormal idling -- high idle (after warm-up)

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------------------|---|---|---|---|---|---|---|---|---|---|----|
| SPECIFICATIONS | Mixture ratio | | ○ | ○ | | ○ | ○ | | | ○ | |
| | Ignition timing (too advanced) | ○ | | | | | | | | | |
| INTAKE SYSTEM | Air duct (leaks) | | ○ | | | | | | | | |
| | Throttle chamber (air leaks) | | | | ○ | | | | | | |
| | Throttle valve (stuck control wire) | | | | ○ | | | | | | |
| | Intake manifold (gasket) (air leaks) | | ○ | | | | | | | | |
| | Air regulator (stuck open) | | | ○ | | | | | | | |
| | Idle speed control valve (remaining ON) | | | | | | | ○ | | | |
| | F.I.C.D. solenoid (remaining ON) | | | | | | | | ○ | | |
| CONTROL SYSTEM | Engine temperature sensor | | | | | | | | | | ○ |
| | Idle switch (remaining OFF) | | | | | | | ○ | | ○ | |
| | Load switches (remaining ON) | | | | | | | ○ | ○ | | |
| OTHERS | Battery (voltage too low) | | | | | | | | | | |

SERVICE PROCEDURE



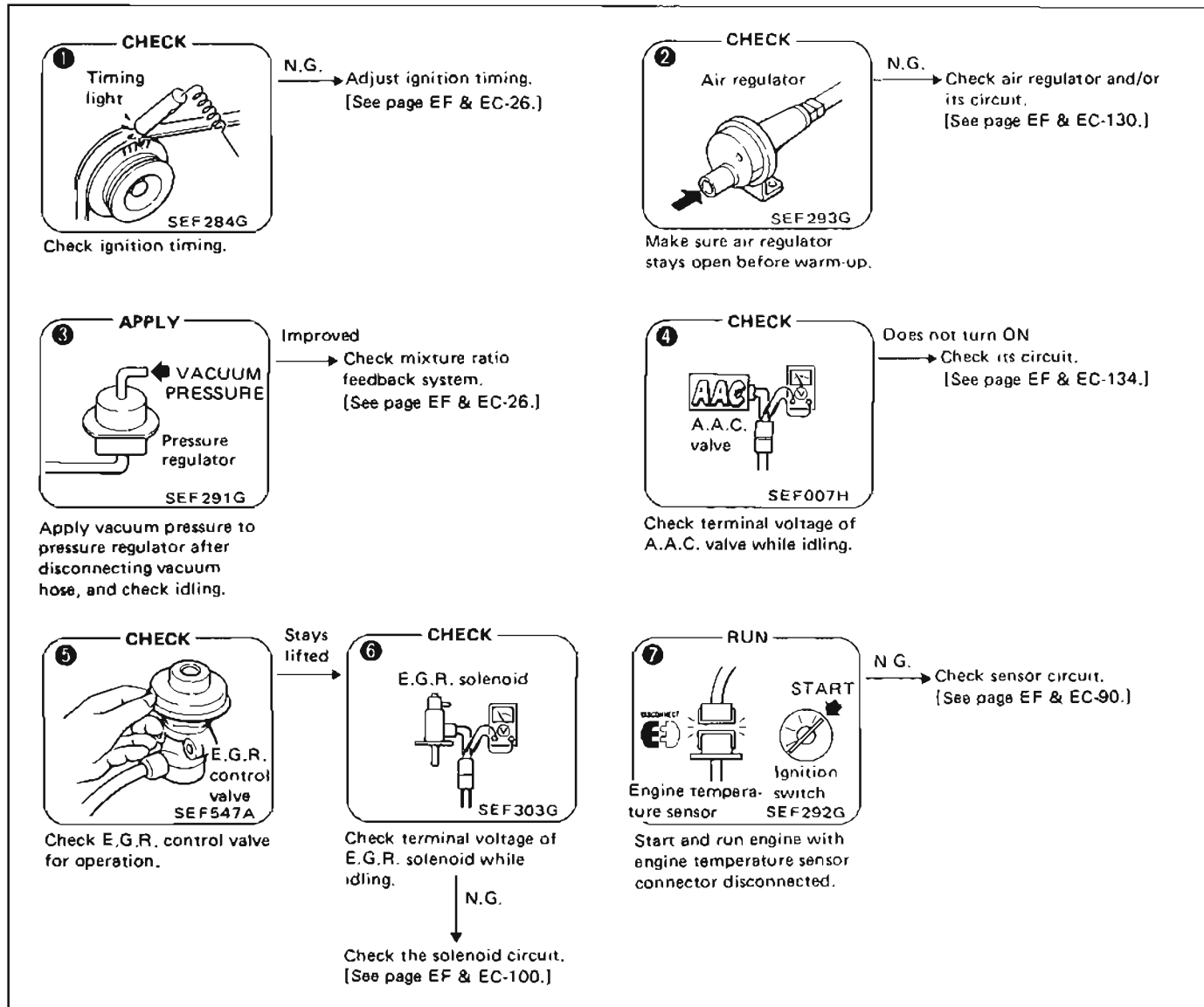
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 12 Unstable idling — before warm-up

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|--|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | | ○ | ○ | | | | |
| | Ignition timing | ○ | | | | | | |
| INTAKE SYSTEM | Air regulator (not open enough) | | ○ | | | | | |
| | Idle speed control valve (remaining OFF) | | | | ○ | | | |
| CONTROL SYSTEM | Engine temperature sensor | | | | | | | ○ |
| E.G.R. SYSTEM | E.G.R. control valve (stuck open) | | | | | ○ | | |
| | E.G.R. solenoid (remaining OFF) | | | | | ○ | ○ | |

SERVICE PROCEDURE



TROUBLE DIAGNOSES

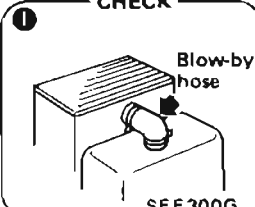
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 13 Unstable idling — after warm-up

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-----------------|-------------------------------------|---|---|---|---|---|---|---|---|---|----|----|----|
| SPECIFICATIONS | Mixture ratio | ○ | ○ | ○ | ○ | | | | | | | | |
| | Ignition sparks | | | | | ○ | ○ | ○ | | | | | |
| | Ignition timing | | | | | | | | ○ | | | | |
| | Compression pressure | | | | | | | | | ○ | | | |
| FUEL SYSTEM | Fuel line (clogged) | | | | | | | | | | | | |
| | Canister (air leaks) | | | ○ | | | | | | | | | |
| | Pressure regulator control solenoid | | | | ○ | | | | | | | | |
| IGNITION SYSTEM | Power transistor | | | | | ○ | | ○ | | | | | |
| | Ignition coil | | | | | ○ | | ○ | | | | | |
| | Ignition wires | | | | | ○ | ○ | ○ | | | | | |
| INTAKE SYSTEM | Blow-by hose (leaks) | ○ | | | | | | | | | | | |
| | Air duct (leaks) | | ○ | | | | | | | | | | |
| CONTROL SYSTEM | Idle switch | | | | | | | | | | | | ○ |
| | Load switches | | | | | | | | | | | | |
| E.G.R. SYSTEM | E.G.R. control valve | | | | | | | | | | ○ | | |
| | E.G.R. solenoid | | | | | | | | | | ○ | ○ | |

SERVICE PROCEDURE

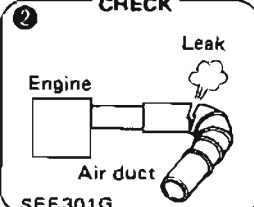
1 CHECK



SEF300G

Check blow-by hose for leaks.
↓ N.G.
Repair/replace the hose.

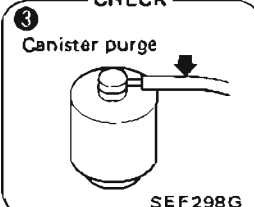
2 CHECK



SEF301G

Check intake system for air leaks.
↓ N.G.
Repair/replace the part.

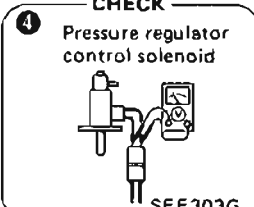
3 CHECK



SEF298G

Check purge line for leaks.
↓ N.G.
Repair/replace the hose.

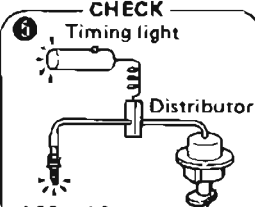
4 CHECK



SEF303G

Check terminal voltage of the solenoid while idling.
↓ N.G.
Check the solenoid circuit. [See page EF & EC-124.]

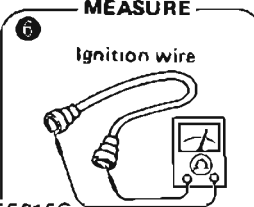
5 CHECK



SEF283G

Check flashes of timing light for weakness.
↓ N.G. →

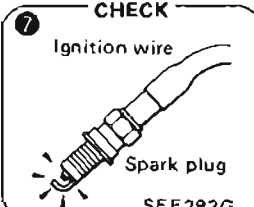
6 MEASURE



SEF315G

Measure resistance of suspect wires.
↓ N.G.
Replace the wire.

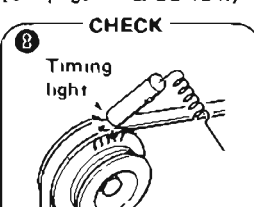
7 CHECK



SEF282G

Remove spark plugs and check their ignition sparks.

8 CHECK



SEF284G

Check ignition timing.
↓ N.G.
Adjust ignition timing. [See page EF & EC-26.]

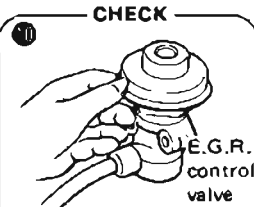
9 MEASURE

COMPRESSION PRESSURE

SEF309G

Measure compression pressure.
↓ N.G.
Check cylinder head and gasket. [See EM section.]

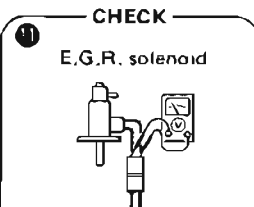
10 CHECK



SEF547A

Check E.G.R. control valve for operation.
↓ Stays lifted →

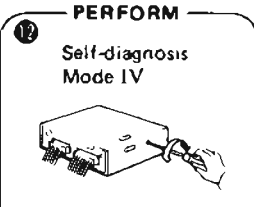
11 CHECK



SEF303G

Check terminal voltage of E.G.R. solenoid while idling.
↓ N.G.
Check the solenoid circuit. [See page EF & EC-100.]

12 PERFORM



SEF285G

Perform self-diagnosis Mode IV (for idle switch).
↓ N.G.
Check the idle switch circuit. [See page EF & EC-116.]

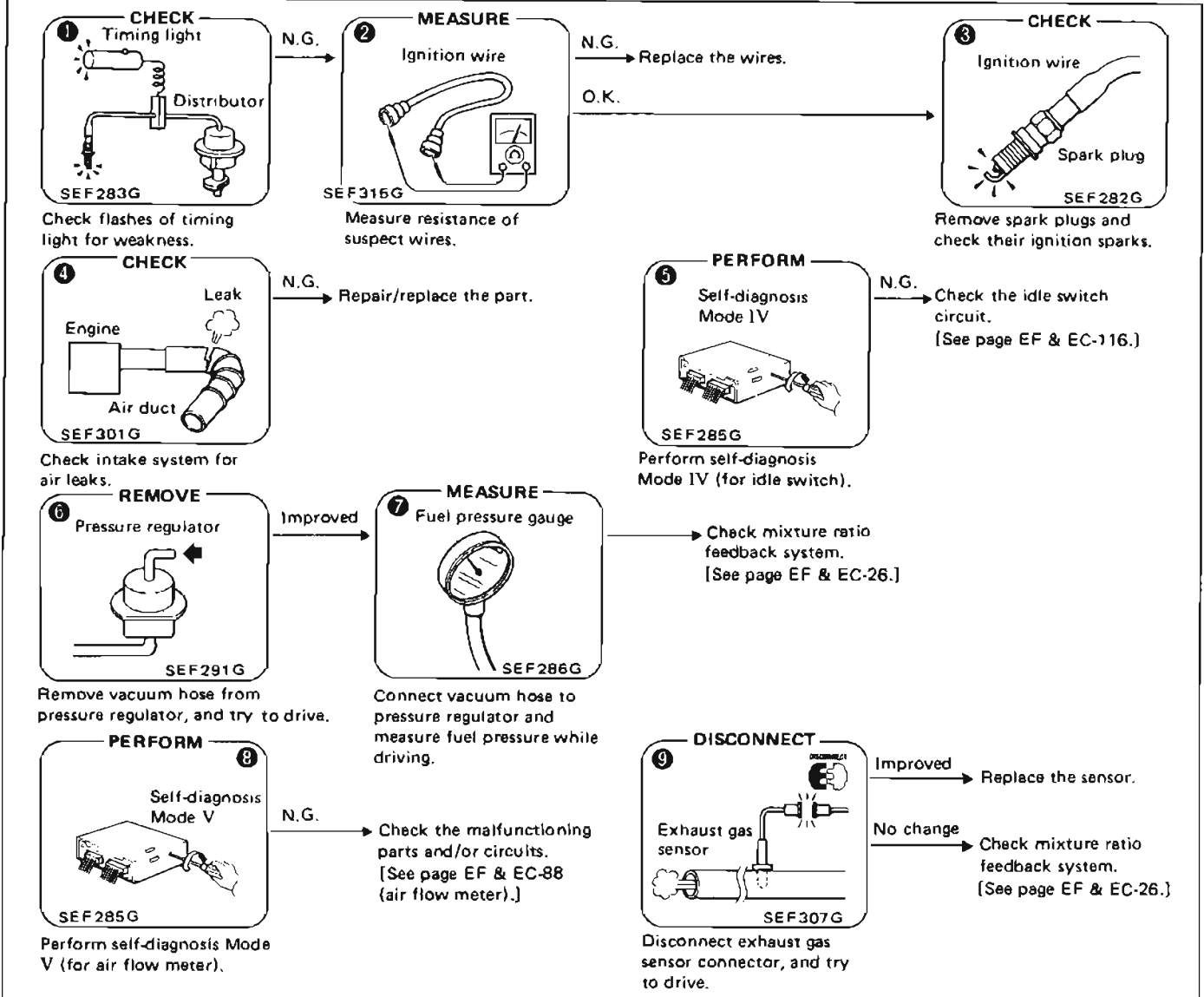
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 14 Poor driveability – stumble (while accelerating)

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------------|--|---|---|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | | | | ○ | | ○ | ○ | | ○ |
| | Fuel pressure | | | | | | ○ | ○ | | |
| FUEL SYSTEM | Fuel filter (clogged) | | | | | | | ○ | | |
| | Fuel line (clogged) | | | | | | | ○ | | |
| | Injectors (clogged) | | | | | | | ○ | | |
| IGNITION SYSTEM | Power transistor | ○ | | ○ | | | | | | |
| | Ignition coil | ○ | | ○ | | | | | | |
| | Ignition wires (ignition leaks) | ○ | ○ | ○ | | | | | | |
| | Spark plugs (ignition leaks, improper gap) | | | ○ | | | | | | |
| INTAKE SYSTEM | Air duct (leaks) | | | | ○ | | | | | |
| CONTROL SYSTEM | Crank angle sensor | ○ | | | | | | | ○ | |
| | Air flow meter | | | | | | | | ○ | |
| | Engine temperature sensor | ○ | | | | | | | ○ | |
| | Exhaust gas sensor | | | | | | | | | ○ |
| | Idle switch (remaining OFF) | | | | | ○ | | | | |
| OTHERS | Fuel (poor quality) | | | | | | | | | |

SERVICE PROCEDURE



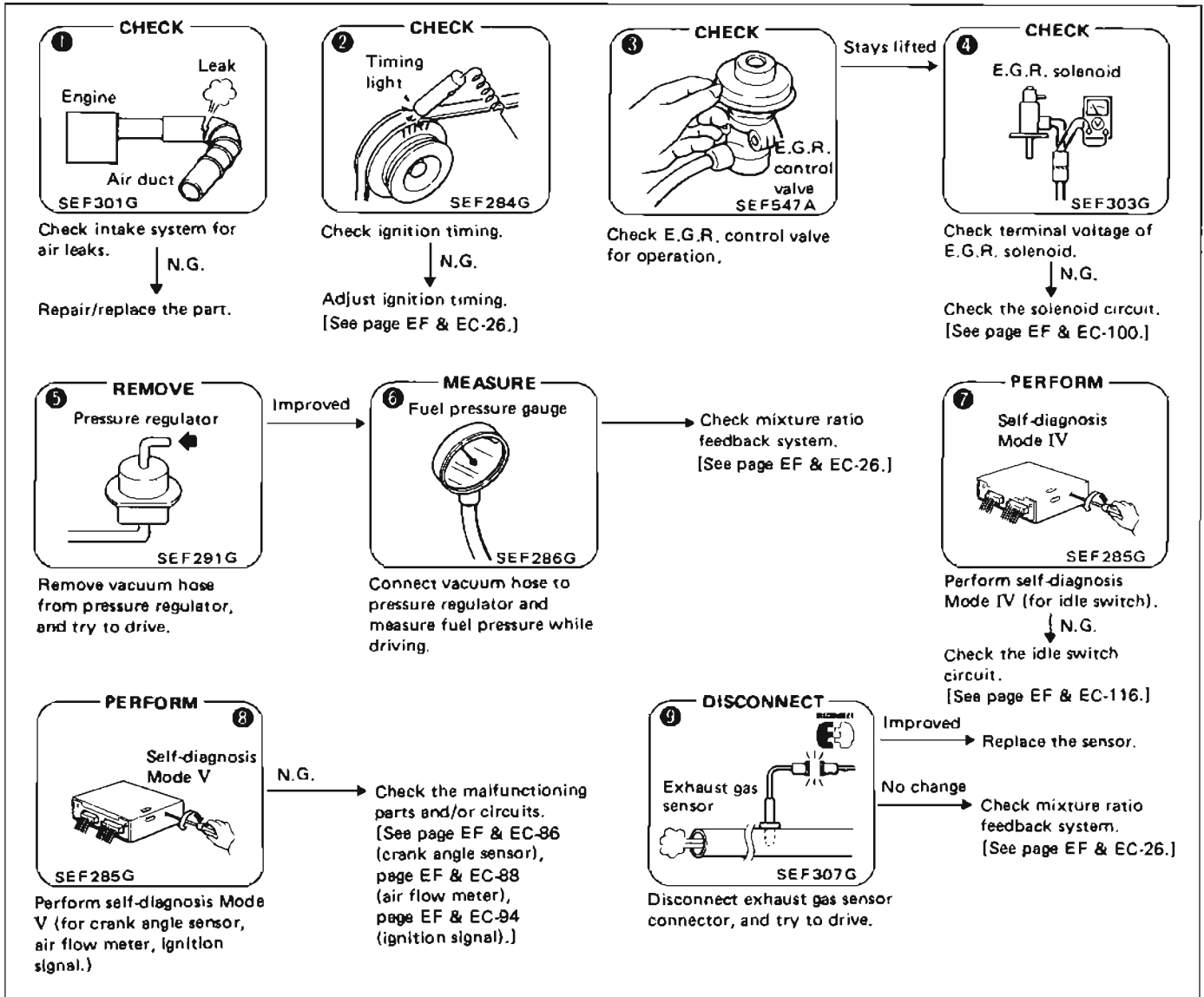
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 15 Poor driveability – surge (while cruising)

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------------|--------------------------------------|---|---|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio (too lean) | ○ | | | | ○ | ○ | | | ○ |
| | Fuel pressure (low) | | | | | ○ | ○ | | | |
| | Ignition timing | | ○ | | | | | | | |
| IGNITION SYSTEM | (missing) | | | | | | | | ○ | |
| INTAKE SYSTEM | Air duct (leaks) | ○ | | | | | | | | |
| | Throttle chamber (air leaks) | ○ | | | | | | | | |
| | Intake manifold (gasket) (air leaks) | ○ | | | | | | | | |
| CONTROL SYSTEM | Crank angle sensor | | | | | | | | | ○ |
| | Air flow meter | | | | | | | | | ○ |
| | Exhaust gas sensor | | | | | | | | | ○ |
| | Idle switch | | | | | | | ○ | | |
| E.G.R. SYSTEM | E.G.R. control valve (stuck open) | | | ○ | | | | | | |
| | E.G.R. solenoid (remaining OFF) | | | ○ | ○ | | | | | |
| | E.G.R. vacuum hose (removed) | | | ○ | | | | | | |

SERVICE PROCEDURE



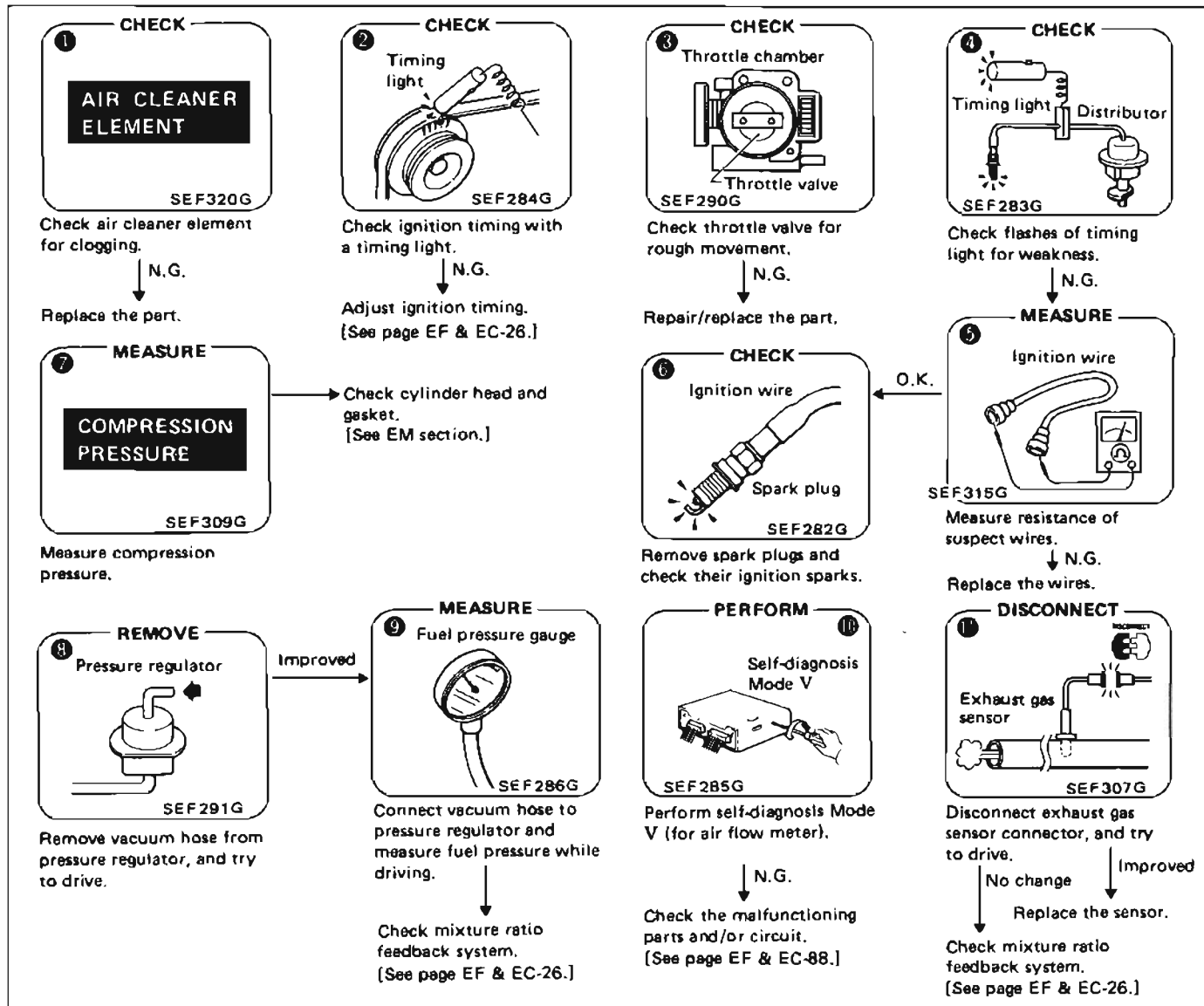
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 16 Poor driveability – lack of power

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|------------------------|----------------------------------|---|---|---|---|---|---|---|---|---|----|----|----|
| SPECIFICATIONS | Fuel pressure | | | | | | | | | | ○ | ○ | |
| | Ignition timing | | ○ | | | | | | | | | | |
| | Compression pressure (too low) | | | | | | | | ○ | | | | |
| FUEL SYSTEM | Fuel pump (low fuel output) | | | | | | | | | | | ○ | |
| | Fuel filter (clogged) | | | | | | | | | | | ○ | |
| | Fuel line (clogged) | | | | | | | | | | | ○ | |
| | Injectors (clogged) | | | | | | | | | | | ○ | |
| IGNITION SYSTEM | Ignition wires (ignition leaks) | | | | | ○ | ○ | ○ | | | | | |
| | Spark plugs (improper gap) | | | | | | | ○ | | | | | |
| INTAKE SYSTEM | Air cleaner element (clogged) | ○ | | | | | | | | | | | |
| | Throttle chamber (clogged) | | | ○ | | | | | | | | | |
| | Throttle valve (not open enough) | | | ○ | | | | | | | | | |
| CONTROL SYSTEM | Air flow meter | | | | | | | | | | | ○ | |
| | Exhaust gas sensor | | | | | | | | | | | | ○ |

SERVICE PROCEDURE



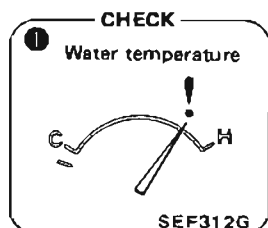
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 17 Poor driveability – detonation

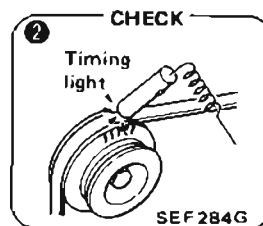
| POSSIBLE CAUSES | | ① | ② | ③ | ④ | ⑤ |
|-----------------|--|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio (too lean) | | | ○ | ○ | |
| | Fuel pressure (low) | | | ○ | | |
| | Ignition timing (too advanced) | | ○ | | | |
| FUEL SYSTEM | Fuel filter (clogged) | | | | ○ | |
| | Fuel line (clogged) | | | | ○ | |
| | Injectors (clogged) | | | | ○ | |
| CONTROL SYSTEM | Crank angle sensor (improper 1°-signals) | | | | | ○ |
| | Air flow meter | | | | | ○ |
| | Engine temperature sensor | | | | | ○ |
| OTHERS | Water temperature (too high) | ○ | | | | |
| | Fuel (low octane rating, poor quality) | | | | | |

SERVICE PROCEDURE



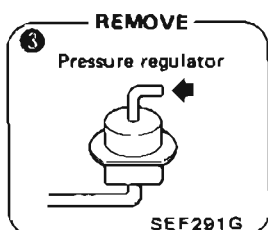
Check water temperature.

Too high
→ Check cooling system.
[See LC section.]



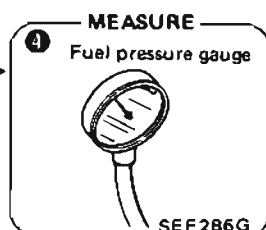
Check ignition timing.

N.G.
→ Adjust ignition timing.
(See page EF & EC-26.)

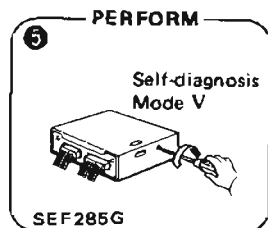


Remove vacuum hose from pressure regulator, and try to drive.

Improved →



Connect vacuum hose to pressure regulator, and measure fuel pressure while driving.



Perform self-diagnosis Mode V (for crank angle sensor and air flow meter).

N.G. → Check the malfunctioning parts.
[See page EF & EC-86 (crank angle sensor), page EF & EC-88 (air flow meter).]

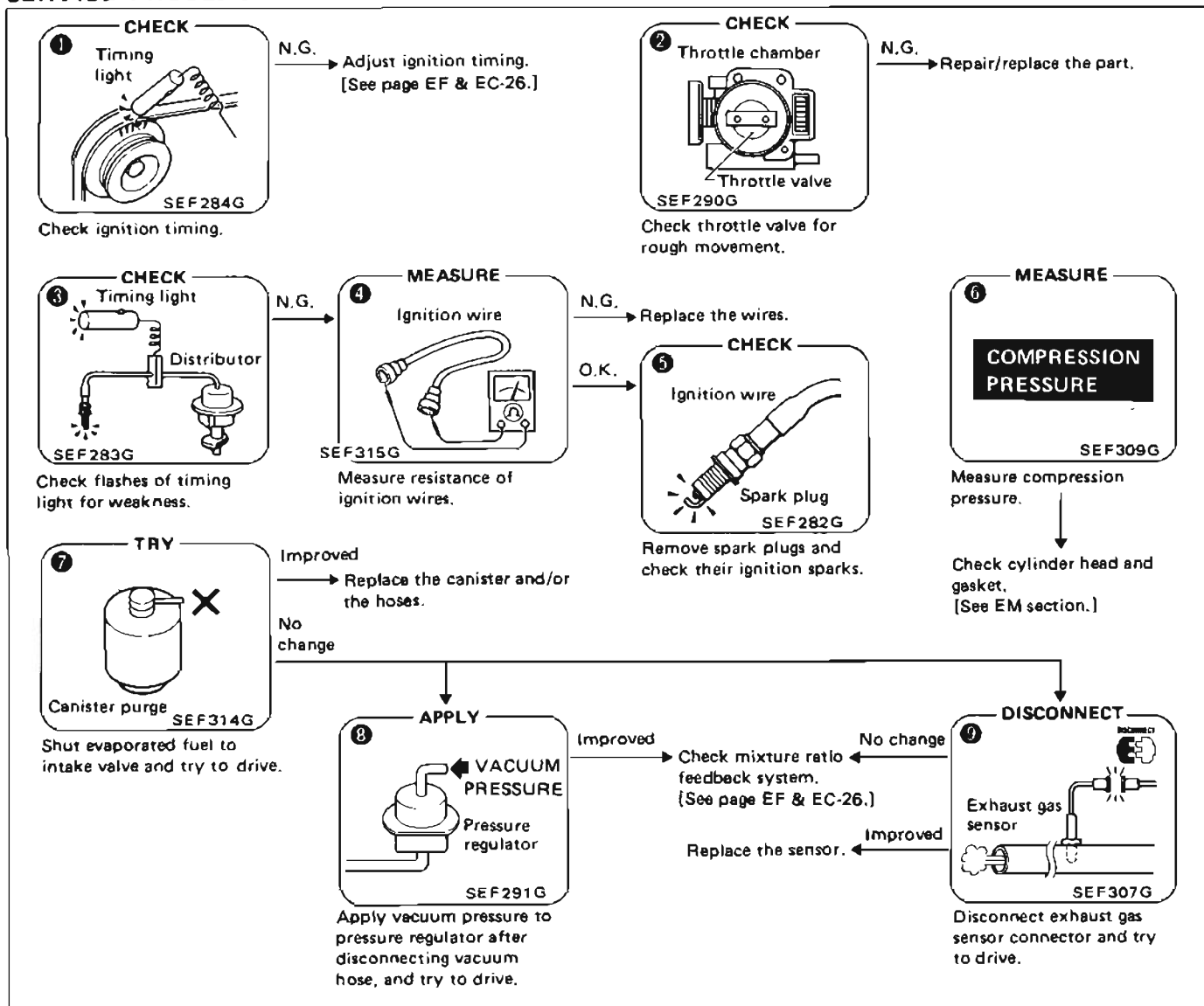
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 18 Engine stall – during start-up

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------------------|---|---|---|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio (too rich/too lean) | | | | | | | ○ | ○ | ○ |
| | Ignition sparks (weak) | | | ○ | ○ | | | | | |
| | Ignition timing | ○ | | | | | | | | |
| | Compression pressure (too low) | | | | | | ○ | | | |
| FUEL SYSTEM | Canister (too much evaporation to intake) | | | | | | | ○ | | |
| IGNITION SYSTEM | Ignition wires (ignition leaks) | | | ○ | ○ | ○ | | | | |
| | Spark plugs (wet with fuel, improper gap) | | | | | ○ | | | | |
| INTAKE SYSTEM | Throttle valve (not open enough) | | ○ | | | | | | | |

SERVICE PROCEDURE



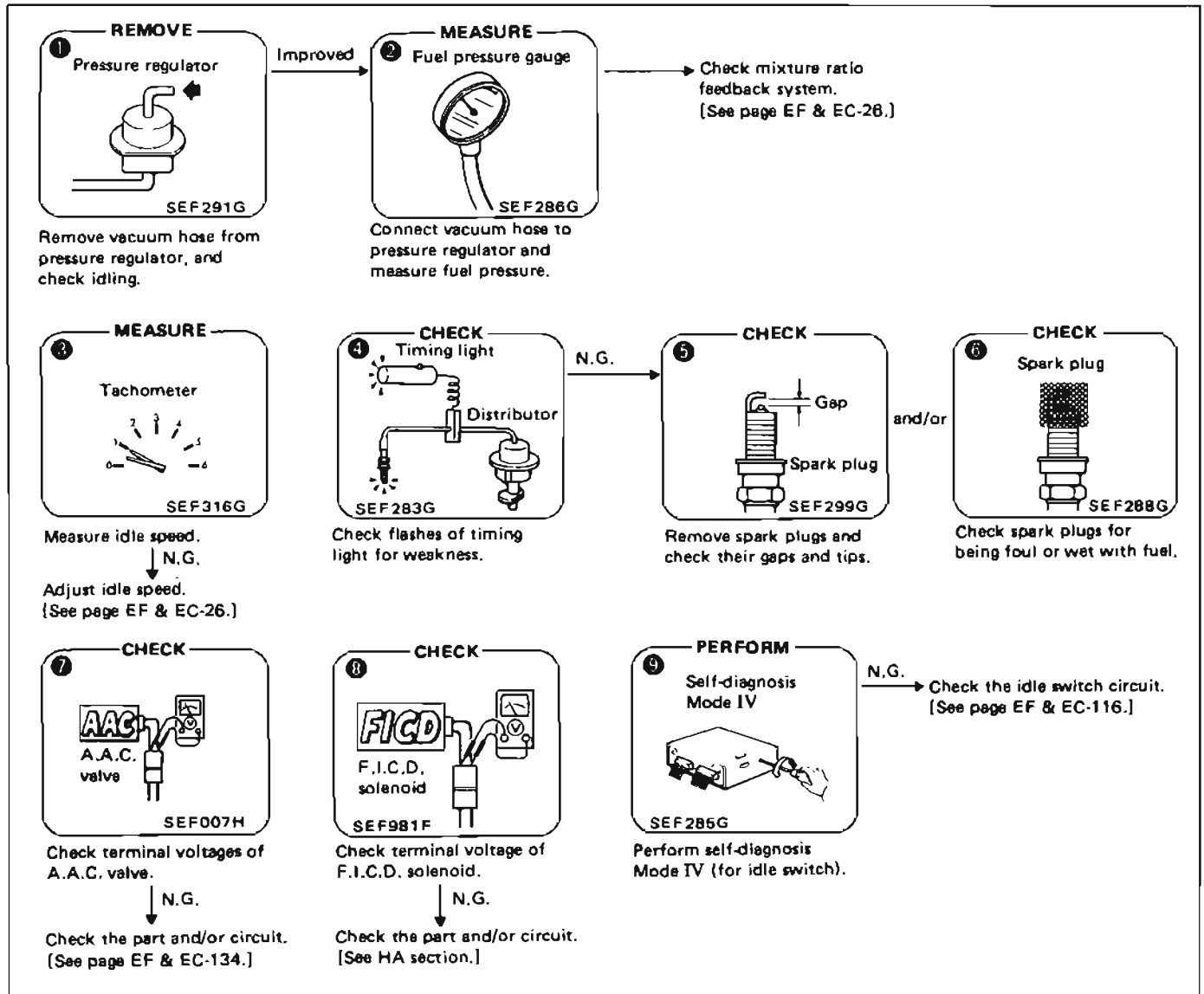
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 19 Engine stall – while idling

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------------|---|---|---|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio (too rich/too lean) | ○ | ○ | | | | | | | |
| | Fuel pressure (low) | ○ | ○ | | | | | | | |
| | Ignition sparks (weak, missing) | | | | ○ | | | | | |
| | Idle speed (low) | | | ○ | | | | | | |
| FUEL SYSTEM | Fuel line (clogged) | | ○ | | | | | | | |
| IGNITION SYSTEM | Spark plugs (wet with fuel, improper gap) | | | | ○ | ○ | | | | |
| INTAKE SYSTEM | Idle speed control valve (improper operation) | | | ○ | | | | ○ | | |
| | F.I.C.D. solenoid (improper operation) | | | ○ | | | | | ○ | |
| CONTROL SYSTEM | Idle switch (remaining OFF) | | | | | | | | | ○ |
| | Neutral switch (remaining OFF) | | | ○ | | | | | | |
| | Load switches (remaining OFF) | | | | | | | ○ | ○ | |

SERVICE PROCEDURE



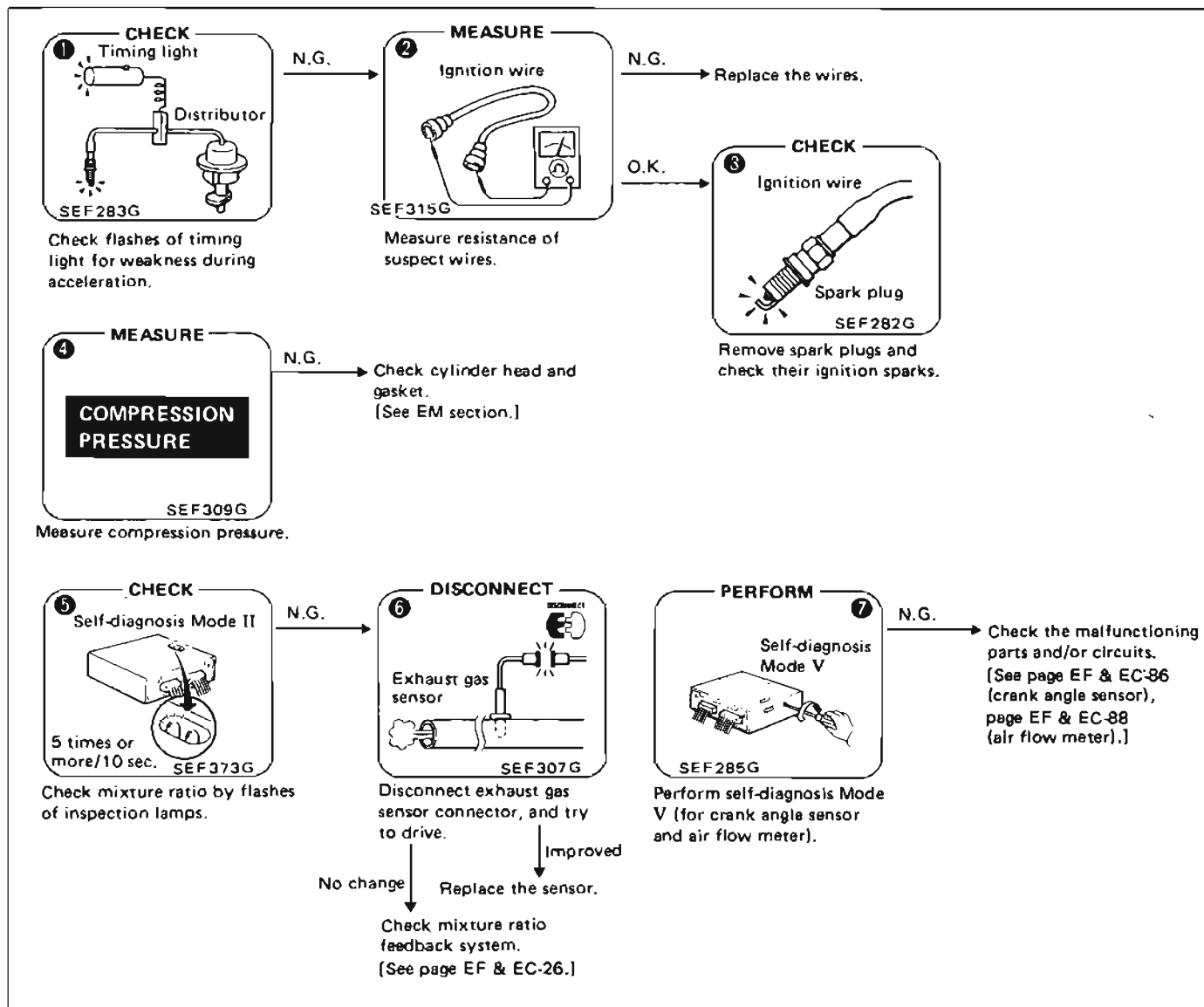
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 20 Engine stall – while accelerating

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|---------------------------------|---|---|---|---|---|---|---|
| | | | | | | | | |
| SPECIFICATIONS | Mixture ratio | | | | | ○ | ○ | |
| | Ignition sparks (weak, missing) | ○ | ○ | ○ | | | | |
| | Compression pressure (low) | | | | ○ | | | |
| CONTROL SYSTEM | Crank angle sensor | ○ | | | | | | ○ |
| | Air flow meter | | | | | | | ○ |
| | Exhaust gas sensor | | | | | ○ | ○ | |

SERVICE PROCEDURE



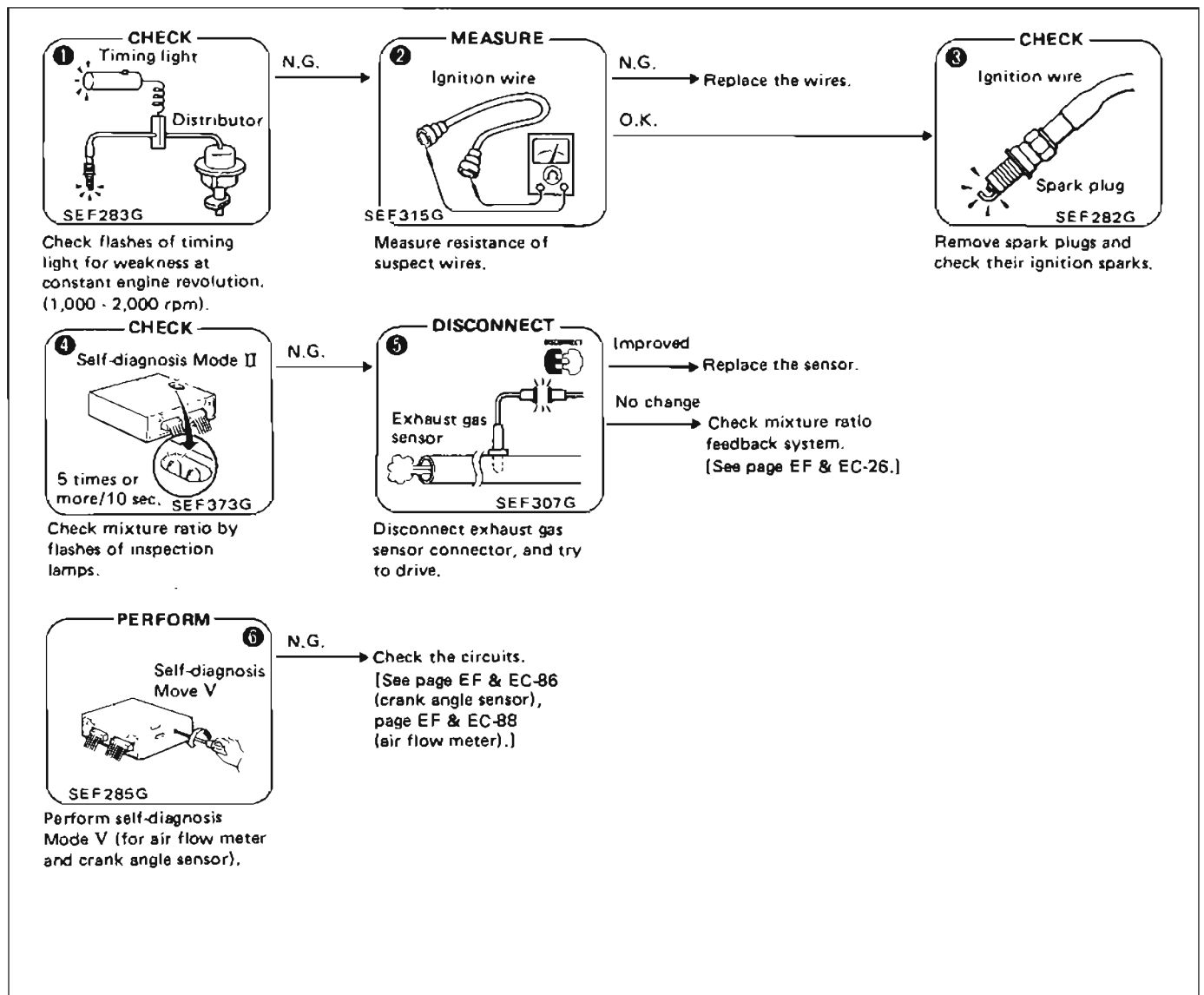
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 21 Engine stall – while cruising

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------|---------------------------------|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | | | | ○ | ○ | |
| | Ignition sparks (weak, missing) | ○ | ○ | ○ | | | |
| CONTROL SYSTEM | Crank angle sensor | | | | | | ○ |
| | Air flow meter | | | | | | ○ |

SERVICE PROCEDURE



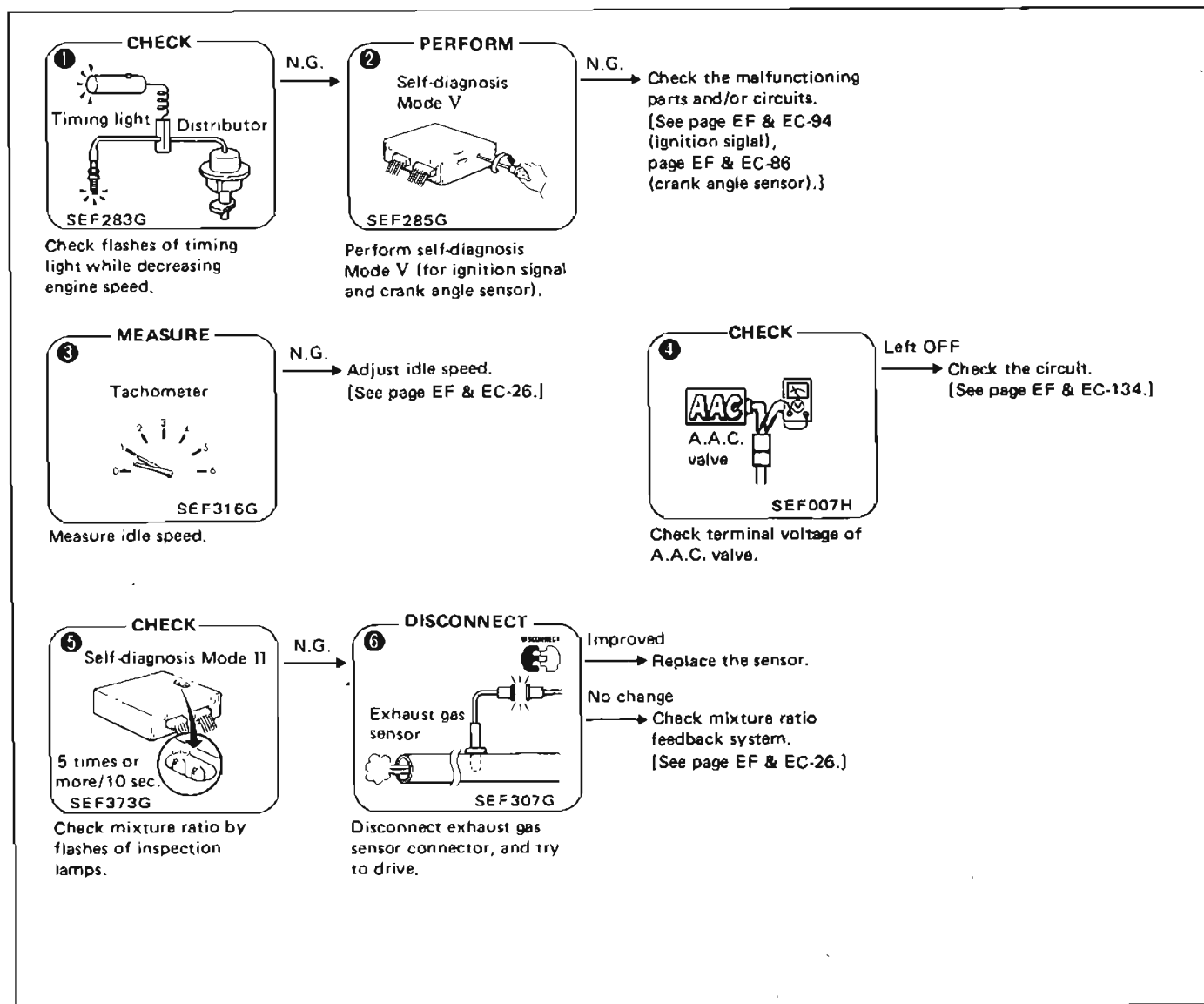
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 22 Engine stall – while decelerating/just after stopping

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------|--|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio | | | | | ○ | ○ |
| | Ignition sparks (missing) | ○ | | | | | |
| | Idle speed (too low) | | | ○ | | | |
| IGNITION SYSTEM | (missing) | ○ | ○ | | | | |
| INTAKE SYSTEM | Idle speed control valve (remaining OFF) | | | ○ | ○ | | |
| CONTROL SYSTEM | Exhaust gas sensor (malfunctioning feedback control) | | | | | ○ | ○ |
| | Crank angle sensor | | ○ | | | | |
| | Idle switch (remaining OFF) | | | ○ | | | |
| | Load switches (remaining OFF) | | | ○ | ○ | | |

SERVICE PROCEDURE



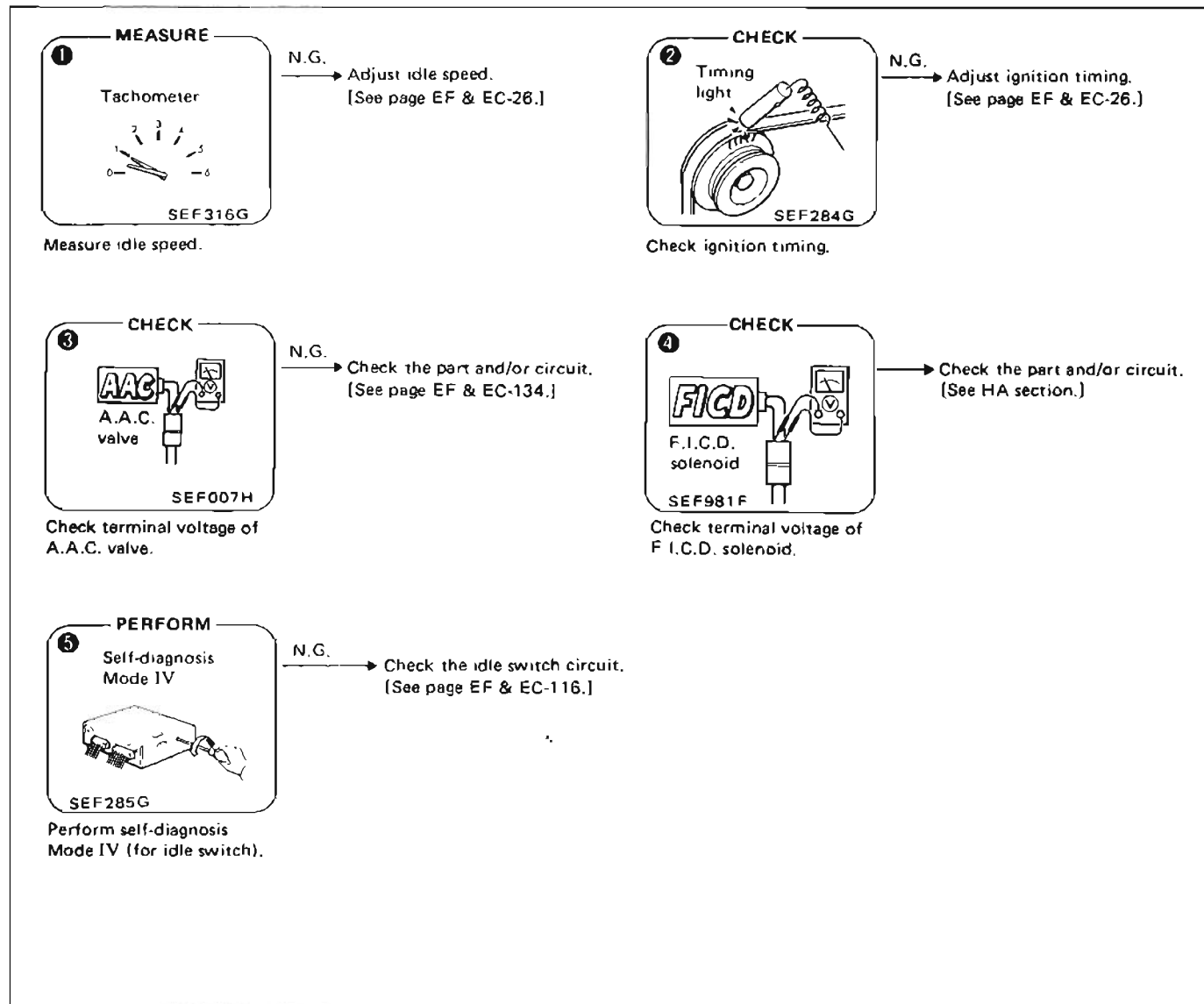
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 23 Engine stall – while loading

| POSSIBLE CAUSES | | ① | ② | ③ | ④ | ⑤ |
|-----------------|--|---|---|---|---|---|
| SPECIFICATIONS | Ignition timing | | ○ | | | |
| | Idle speed (too low) | ○ | | | | |
| INTAKE SYSTEM | Idle speed control valve (remaining OFF) | ○ | | ○ | | |
| | F.I.C.D. solenoid (remaining OFF) | ○ | | | ○ | |
| CONTROL SYSTEM | Idle switch (remaining OFF) | ○ | | | | ○ |
| | Load switches (remaining OFF) | ○ | | ○ | ○ | |

SERVICE PROCEDURE



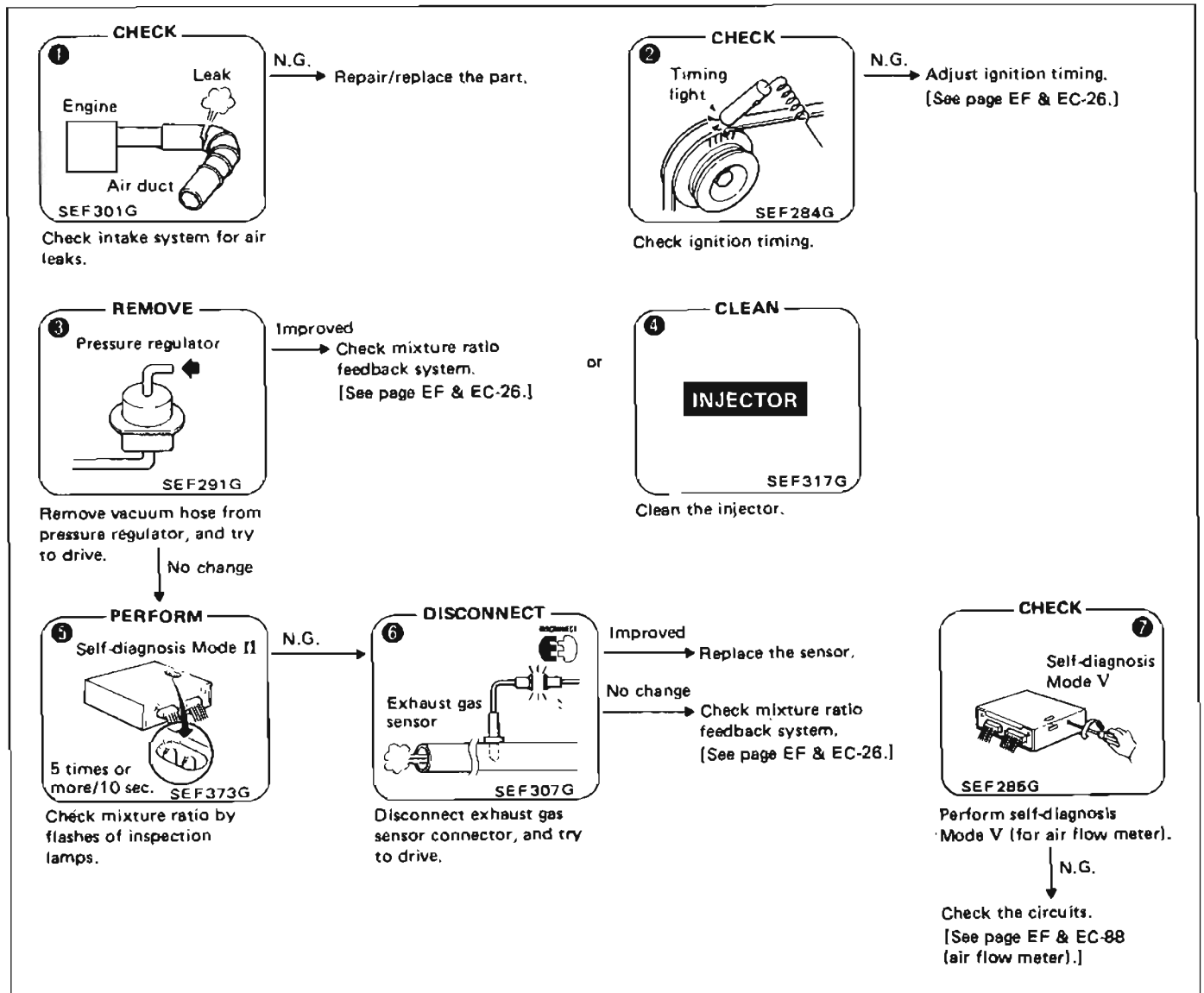
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 24 Backfire – through the intake

| POSSIBLE CAUSES | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|---------------------------------------|---|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio (too lean) | ○ | | ○ | | ○ | ○ | |
| | Ignition timing (too retarded) | | ○ | | | | | |
| FUEL SYSTEM | Injectors (clogged) | | | | ○ | | | |
| INTAKE SYSTEM | Air duct (air leaks) | ○ | | | | | | |
| | Intake manifold (gaskets) (air leaks) | ○ | | | | | | |
| CONTROL SYSTEM | Air flow meter | | | | | | | ○ |
| | Exhaust gas sensor | | | | | ○ | ○ | |

SERVICE PROCEDURE



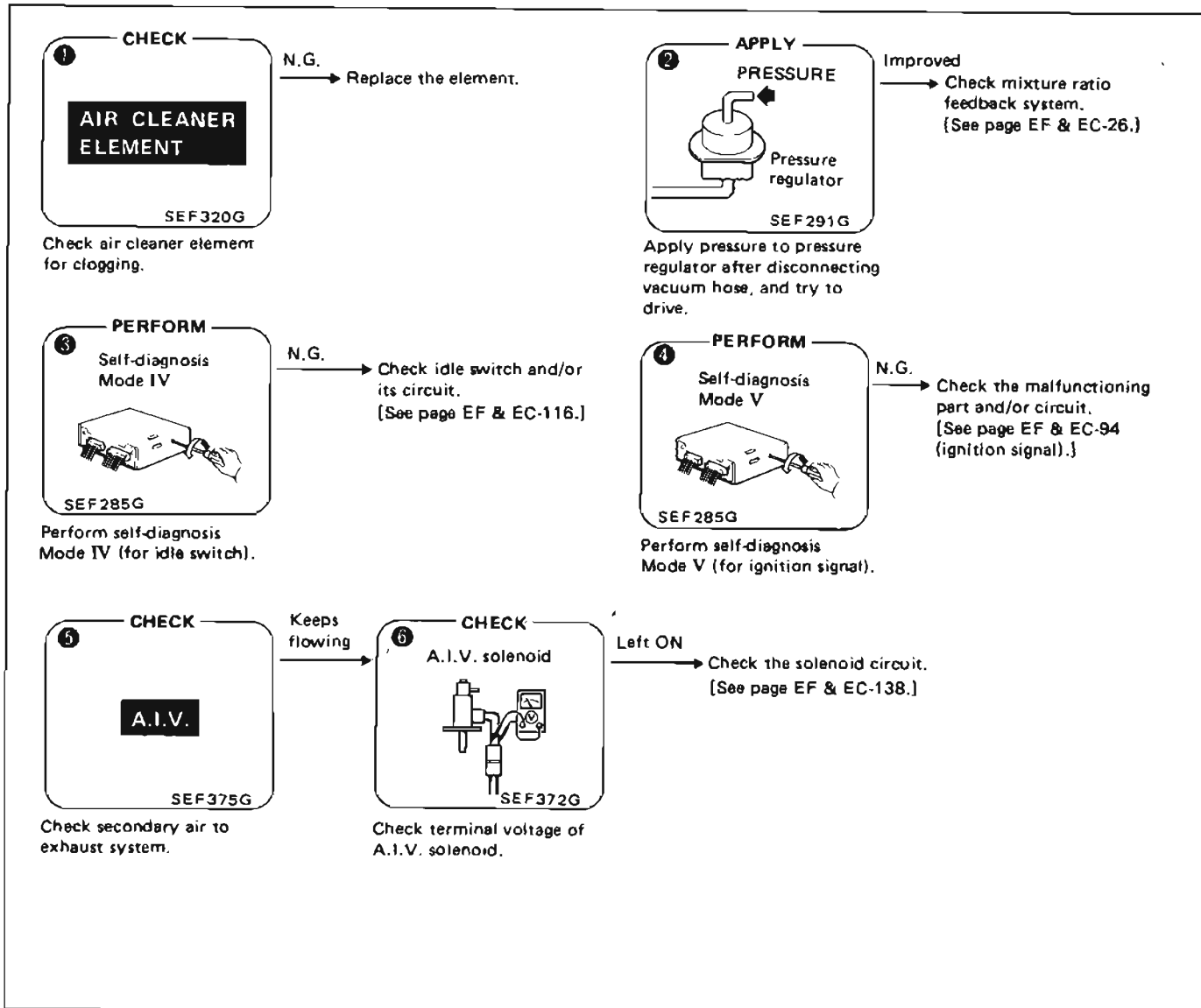
TROUBLE DIAGNOSES

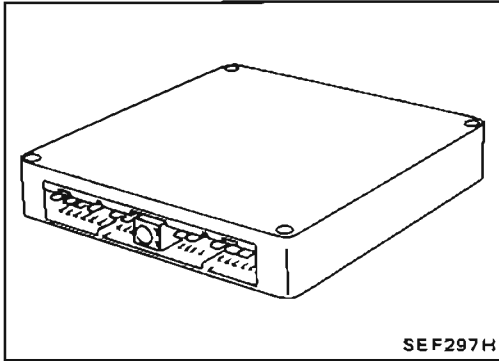
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 25 Backfire – through the exhaust

| POSSIBLE CAUSES | | ① | ② | ③ | ④ | ⑤ | ⑥ |
|------------------------|--------------------------------|---|---|---|---|---|---|
| SPECIFICATIONS | Mixture ratio (too rich) | ○ | ○ | | | | |
| FUEL SYSTEM | Injectors (fuel leaks) | | ○ | | | | |
| IGNITION SYSTEM | (missing) | | | | ○ | | |
| INTAKE SYSTEM | Air cleaner element (clogged) | ○ | | | | | |
| | A.I.V. (always operating) | | | | | ○ | |
| | A.I.V. solenoid (remaining ON) | | | | | ○ | ○ |
| CONTROL SYSTEM | Idle switch (remaining OFF) | | | ○ | | | |

SERVICE PROCEDURE





Self-diagnosis — Description

The self-diagnosis is useful to diagnose malfunctions in major sensors and actuators of the E.C.C.S. system. There are 5 modes in the self-diagnosis system.

1. Mode I (Exhaust gas sensor monitor)

- During closed-loop operation:
The green inspection lamp turns ON when a lean condition is detected and goes OFF under rich condition.
- During open-loop operation condition:
The green inspection lamp remains OFF or ON.

2. Mode II (Mixture ratio feedback control monitor)

- The green inspection lamp function is the same as Mode I.
- During closed-loop operation:
The red inspection lamp turns ON and OFF simultaneously with the green inspection lamp when the mixture ratio is controlled within the specified value.
 - During open-loop operation:
The red inspection lamp remains ON or OFF.

3. Mode III (Self-diagnostic system)

This mode is the same as the former self-diagnosis in self-diagnosis mode.

4. Mode IV (Switches ON/OFF diagnostic system)

During this mode, the inspection lamps monitor the switch ON-OFF condition.

- Idle switch
- Starter switch
- Vehicle speed sensor

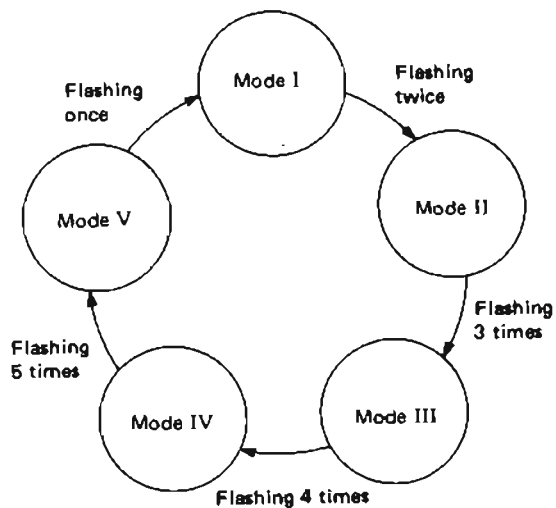
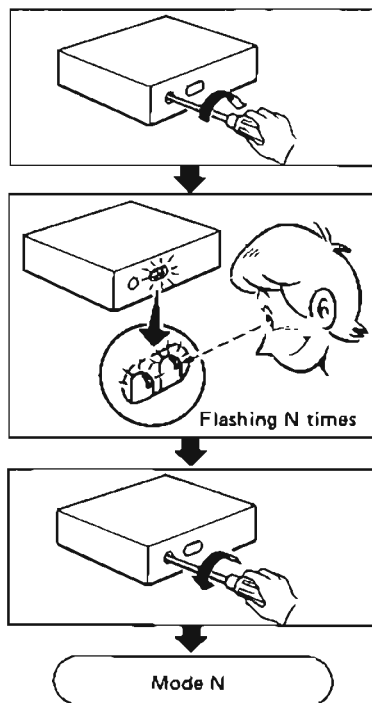
5. Mode V (Real-time diagnostic system)

The moment the malfunction is detected, the display will be presented immediately. That is, the condition at which the malfunction occurs can be found by observing the inspection lamps during driving test.

TROUBLE DIAGNOSES

Self-diagnosis — Description (Cont'd) HOW TO SWITCH THE DIAGNOSTIC MODES

1. Turn ignition switch "ON".
2. Turn diagnostic mode selector to E.C.U. (fully clockwise) and wait for inspection lamps to flash.
3. Count the number of flashes, and after the inspection lamps have flashed the number of the required mode, immediately turn diagnostic mode selector fully counterclockwise.



- When the ignition switch is turned off during diagnosis in any mode and then turned on again (after power to the E.C.U. has dropped completely), the diagnosis will automatically return to Mode I.

The stored memory will be lost if:

1. Battery terminal is disconnected.
2. After selecting Mode III, Mode IV is selected. However, if the diagnostic mode selector is kept turned fully clockwise, it will continue to change in the order of Mode I → II → III → IV → V → I ... etc., and in this state the stored memory will not be erased.

This unit serves as an idle rpm feedback control. When the diagnostic mode selector is turned within the "diagnostic mode OFF" range, a target engine speed can be selected. Mark the original position of the selector before conducting self-diagnosis. Upon completion of self-diagnosis, return the selector to the previous position. Otherwise, engine speed may change before and after conducting self-diagnosis.

TROUBLE DIAGNOSES

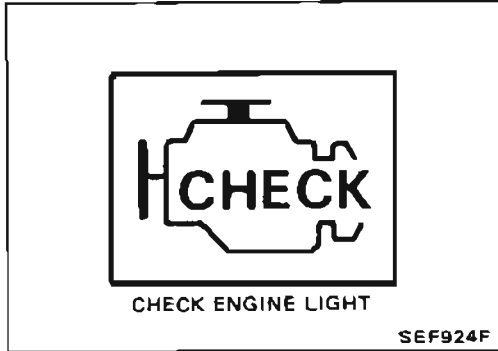
Self-diagnosis — Description (Cont'd)

CHECK ENGINE LIGHT (For California only)

This vehicle has a check engine light on the instrument panel. This light comes ON under the following conditions:

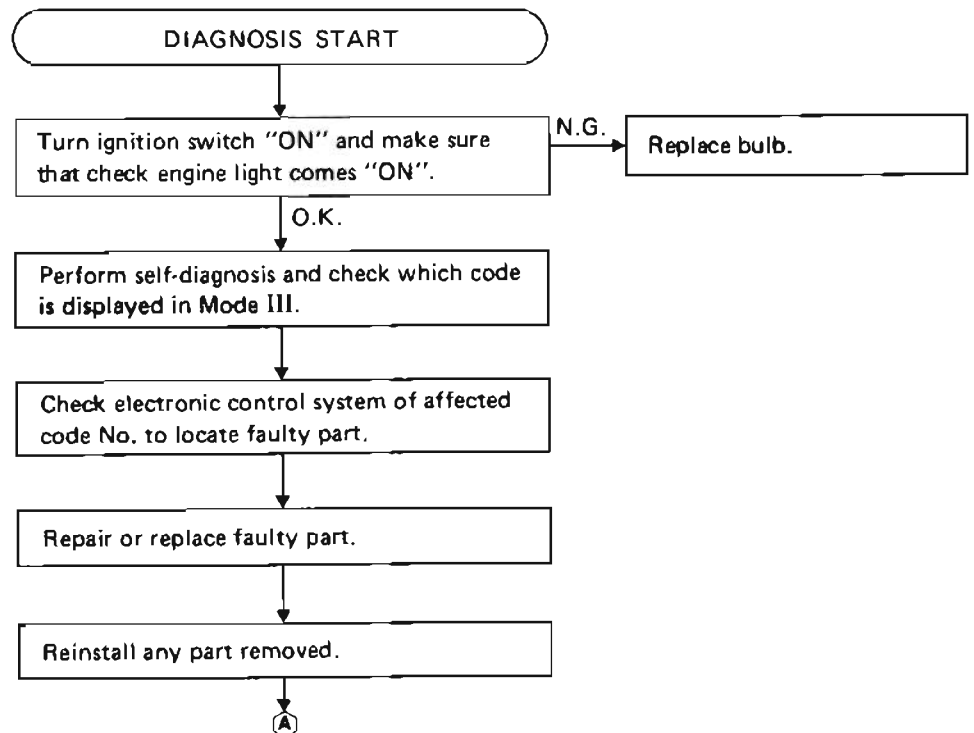
- 1) When ignition switch is turned "ON" (for bulb check).
- 2) When systems related to emission performance malfunction in Mode I (with engine running).
 - This check engine light always illuminates and is synchronous with red L.E.D.
 - Malfunction systems related to emission performance can be detected by self-diagnosis, and they are clarified as self-diagnostic codes in Mode III.
- 3) Check engine light will come "ON" only when malfunction is sensed.

The check engine light will turn off when normal operation is resumed. Mode III memory must be cleared as the contents remain stored.



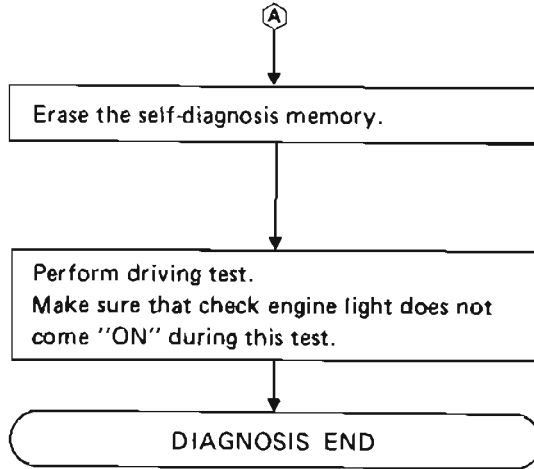
| Code No. | Malfunction |
|----------|--|
| 12 | Air flow meter circuit |
| 13 | Engine temperature sensor circuit |
| 14 | Vehicle speed sensor circuit |
| 31 | E.C.U. (E.C.C.S. control unit) |
| 32 | E.G.R. function |
| 33 | Exhaust gas sensor circuit |
| 35 | Exhaust gas temperature sensor circuit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

Use the following diagnostic flowchart to check and repair a malfunctioning system.



TROUBLE DIAGNOSES

Self-diagnosis — Description (Cont'd)



- **Methods of erasing memories differ with systems. Read the manual before diagnosing systems.**
- **After repairs, test drive to check that check engine light does not come on.**
- **Test driving modes differ with systems. Read the manual before test driving.**

TROUBLE DIAGNOSES

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

This mode checks the exhaust gas sensor for proper functioning. The operation of the E.C.U. L.E.D. in this mode differs with mixture ratio control conditions as follows:

| Mode | L.E.D. | Engine stopped (Ignition switch "ON") | Engine running | |
|-----------------------|--------|--|--------------------------------------|---|
| | | | Open loop condition | Closed loop condition |
| Mode I (Monitor A) | Green | ON | * Remains ON or OFF | Blinks |
| | Red | ON | Except for California model ● OFF | For California model ● ON: when the CHECK ENGINE LIGHT ITEMS are stored in the E.C.U. ● OFF: except for the above condition |

*: Maintains conditions just before switching to open loop

EXHAUST GAS SENSOR FUNCTION CHECK

If the number of L.E.D. blinks is less than that specified, replace the exhaust gas sensor.

If the L.E.D. does not blink, check exhaust gas sensor circuit.

EXHAUST GAS SENSOR CIRCUIT CHECK

See page EF & EC-104.

Self-diagnosis — Mode II (Mixture ratio feedback control monitor)

This mode checks, through the E.C.U. L.E.D., optimum control of the mixture ratio. The operation of the L.E.D., as shown below, differs with the control conditions of the mixture ratio (for example, richer or leaner mixture ratios, etc., which are controlled by the E.C.U.).

| Mode | L.E.D. | Engine stopped (Ignition switch "ON") | Engine running | | |
|------------------------|--------|--|--|--------------------------------|-----------------------------|
| | | | Open loop condition | Closed loop condition | |
| Mode II (Monitor B) | Green | ON | * Remains ON or OFF | Blinks | |
| | Red | OFF | * Remains ON or OFF (synchronous with green L.E.D.) | Compensating mixture ratio | |
| | | | | More than 5% rich | Between 5% lean and 5% rich |
| | | | OFF | Synchronized with green L.E.D. | Remains ON |

*: Maintains conditions just before switching to open loop

If the red L.E.D. remains on or off during the closed-loop operation, the mixture ratio may not be controlled properly. Using the following procedures, check the related components or adjust the mixture ratio.

COMPONENT CHECK OR MIXTURE RATIO ADJUSTMENT

See page EF & EC-26.

Self-diagnosis — Mode III (Self-diagnostic system)

The E.C.U. constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the E.C.U. and can be retrieved from the memory by turning on the diagnostic mode selector, located on the side of the E.C.U. When activated, the malfunction is indicated by flashing a red and a green L.E.D. (Light Emitting Diode), also located on the E.C.U. Since all the self-diagnostic results are stored in the E.C.U.'s memory even intermittent malfunctions can be diagnosed.

A malfunction is indicated by the number of both red and green flashing L.E.D.s. First, the red L.E.D. flashes and the green flashes follow. The red L.E.D. corresponds to units of ten and the green L.E.D. corresponds to units of one. For example, when the red L.E.D. flashes once and the green L.E.D. flashes twice, this signifies the number "12", showing that the air flow meter signal is malfunctioning. All problems are classified by code numbers in this way.

- **When the engine fails to start, crank it two or more seconds before beginning self-diagnosis.**
- **Before starting self-diagnosis, do not erase the stored memory before beginning self-diagnosis. If it is erased, the self-diagnosis function for intermittent malfunctions will be lost.**

DISPLAY CODE TABLE

| Code No. | Detected items | Califor- nia | Non- Califor- nia |
|----------|---|-----------------|-------------------------|
| 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 missing in primary coil | X | X |
| 31 | E.C.U. (E.C.C.S. control unit) | X | X |
| 32 | E.G.R. function | X | — |
| 33 | Exhaust gas sensor circuit | X | X |
| 35 | Exhaust gas temperature sensor circuit | X | — |
| 43 | Throttle sensor circuit | X | X |
| 45 | Injector leak | X | — |
| 55 | No malfunction in the above circuit | X | X |

X: Available —: Not available

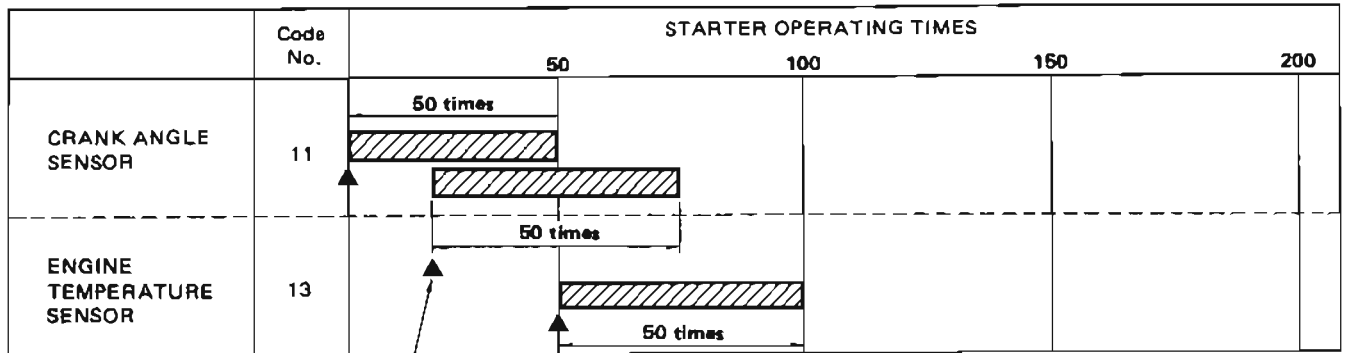
TROUBLE DIAGNOSES

Self-diagnosis — Mode III (Self-diagnostic system) (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 cancelled 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)



 : Retention term

 : Malfunction detecting point

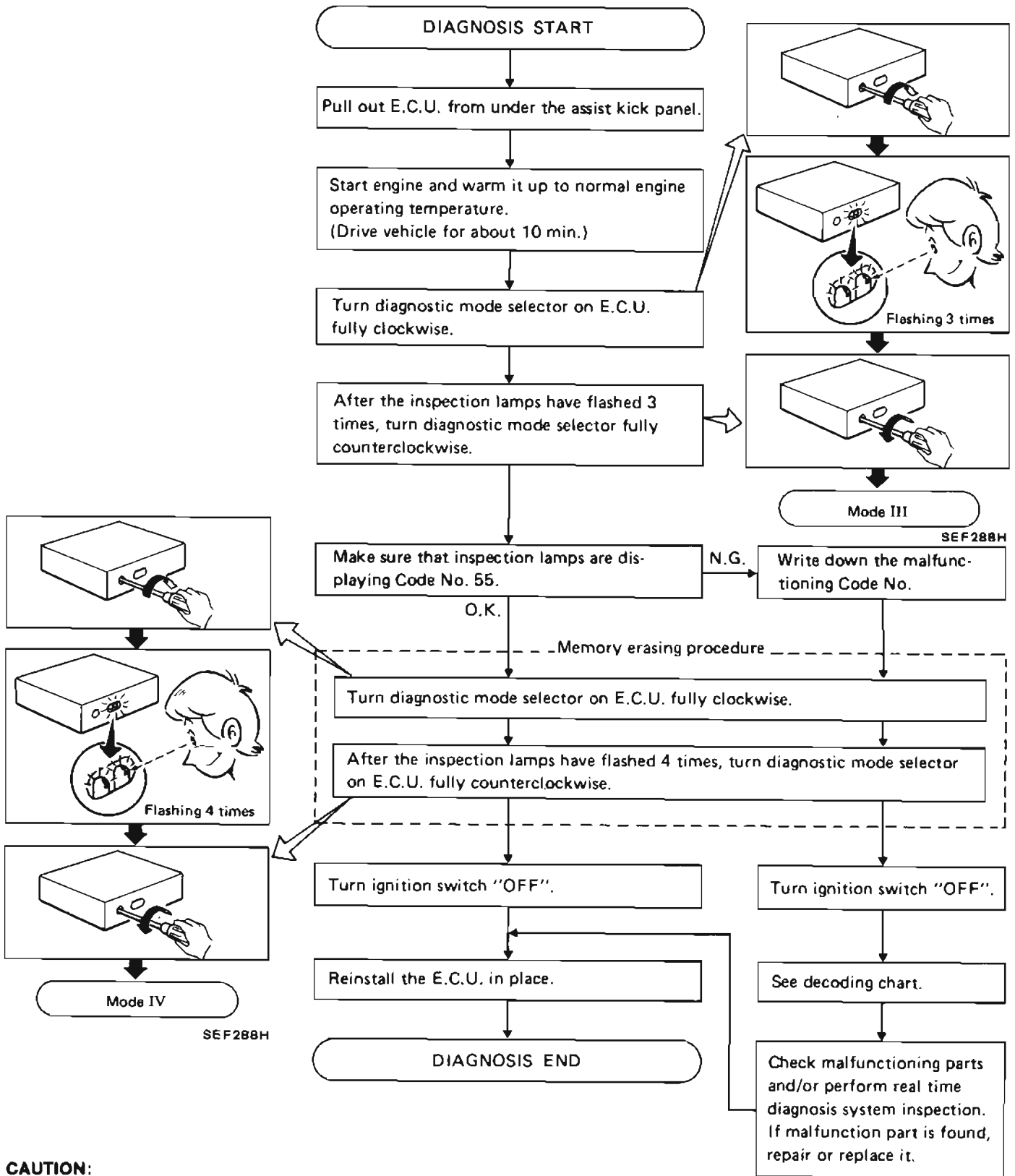
If the same diagnostic item is judged to be malfunctioning before the starter is operated fifty times, it will be stored in E.C.U. memory until the starter is operated fifty times from this point in time.

SEF793D

TROUBLE DIAGNOSES

Self-diagnosis — Mode III (Self-diagnostic system) (Cont'd)

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

- During display of a code number in self-diagnosis mode (Mode III), if another diagnostic mode is to be performed, be sure to note the malfunction code number before turning diagnostic mode selector on E.C.U. fully clockwise. When selecting an alternative, select the diagnosis mode after turning switch "OFF". Otherwise, self-diagnosis information in the E.C.U. memory will be lost. Return the DIAGNOSTIC MODE selector to the previous position.

TROUBLE DIAGNOSES

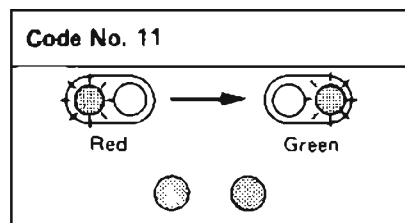
Self-diagnosis — Mode III (Self-diagnostic system) (Cont'd) DECODING CHART

DISPLAY CODE

MALFUNCTIONING CIRCUIT OR PARTS

CONTROL UNIT SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.

CRANK ANGLE SENSOR



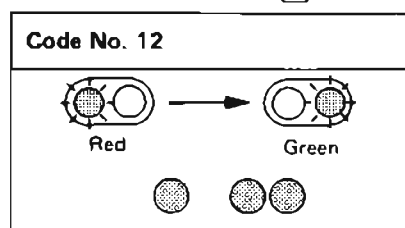
Crank angle sensor circuit

- Either 1° or 180° signal is not entered for the first few seconds during engine cranking.
- Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.

SYSTEM INSPECTION
See page EF & EC-86.

SEF042F

AIR FLOW METER



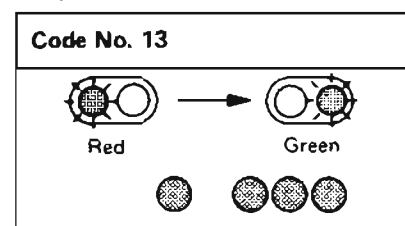
Air flow meter circuit

- The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)

SYSTEM INSPECTION
See page EF & EC-88.

SEF043F

ENGINE TEMPERATURE SENSOR



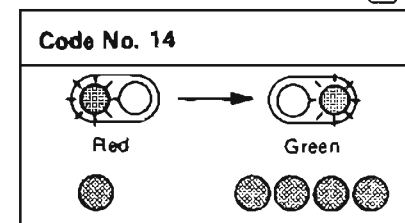
Engine temperature sensor circuit

- The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)

SYSTEM INSPECTION
See page EF & EC-90.

SEF044F

VEHICLE SPEED SENSOR



Vehicle speed sensor circuit

- Signal circuit is open.

SYSTEM INSPECTION
See page EF & EC-92.

SEF074G

TROUBLE DIAGNOSES

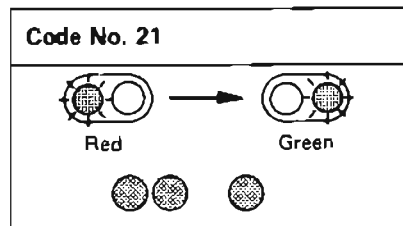
Self-diagnosis — Mode III (Self-diagnostic system) (Cont'd)

DISPLAY CODE

MALFUNCTIONING CIRCUIT OR PARTS

CONTROL UNIT SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.

IGNITION SIGNAL



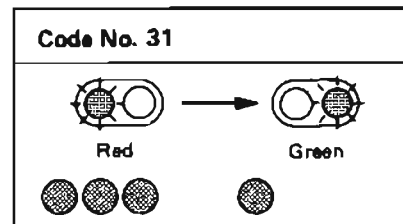
Ignition signal circuit

- The ignition signal in primary circuit does not enter to E.C.U. during engine cranking or running.

SYSTEM INSPECTION
See page EF & EC-94.

SEF045F

E.C.U. (E.C.C.S. control unit)



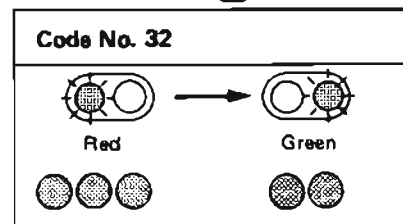
E.C.U. calculation function

- Signal is beyond "normal" range.

SYSTEM INSPECTION
See page EF & EC-98.

SEF076G

E.G.R. function



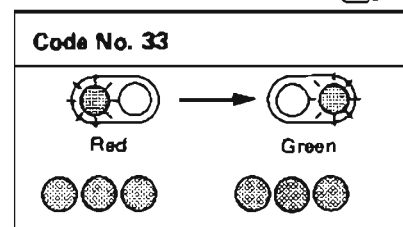
E.G.R. function

- E.G.R. valve does not operate. (E.G.R. valve spring does not lift.)

SYSTEM INSPECTION
See page EF & EC-100.

SEF077G

EXHAUST GAS SENSOR



Exhaust gas sensor circuit

- Signal circuit is open.

SYSTEM INSPECTION
See page EF & EC-104.

SEF078G

TROUBLE DIAGNOSES

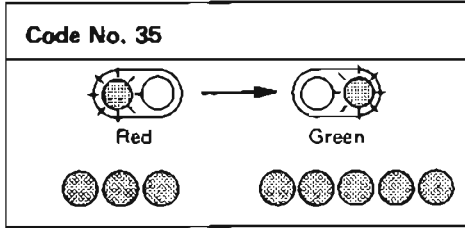
Self-diagnosis — Mode III (Self-diagnostic system) (Cont'd)

DISPLAY CODE

MALFUNCTIONING CIRCUIT OR PARTS

CONTROL UNIT SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.

EXHAUST GAS TEMPERATURE SENSOR 



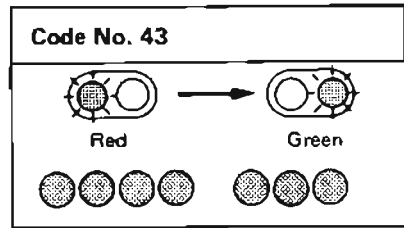
Exhaust gas temperature sensor circuit

- Signal circuit is open.

SYSTEM INSPECTION
See page EF & EC-106.

SEF393G

THROTTLE SENSOR 



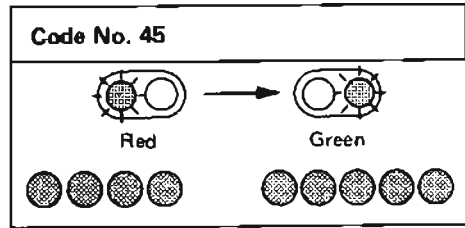
Throttle sensor circuit

- Throttle sensor circuit is open or short.
(Output voltage is too high or too low.)

SYSTEM INSPECTION
See page EF & EC-110.

SEF079G

INJECTOR LEAK 

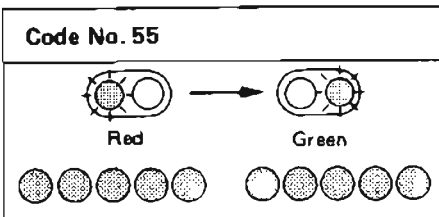


Injector leak

- Fuel leak from injector.

SYSTEM INSPECTION
See page EF & EC-114.

SEF080G



E.C.C.S.
normal
operation.

SEF984F

Self-diagnosis — Mode IV (Switches ON/OFF diagnostic system)

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously.

- Idle switch
- Starter switch
- Vehicle speed sensor

(1) Idle switch & Starter switch

The switches ON/OFF status in mode IV is stored in E.C.U. memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red L.E.D. on E.C.U. alternately comes on and goes off each time switching is performed.

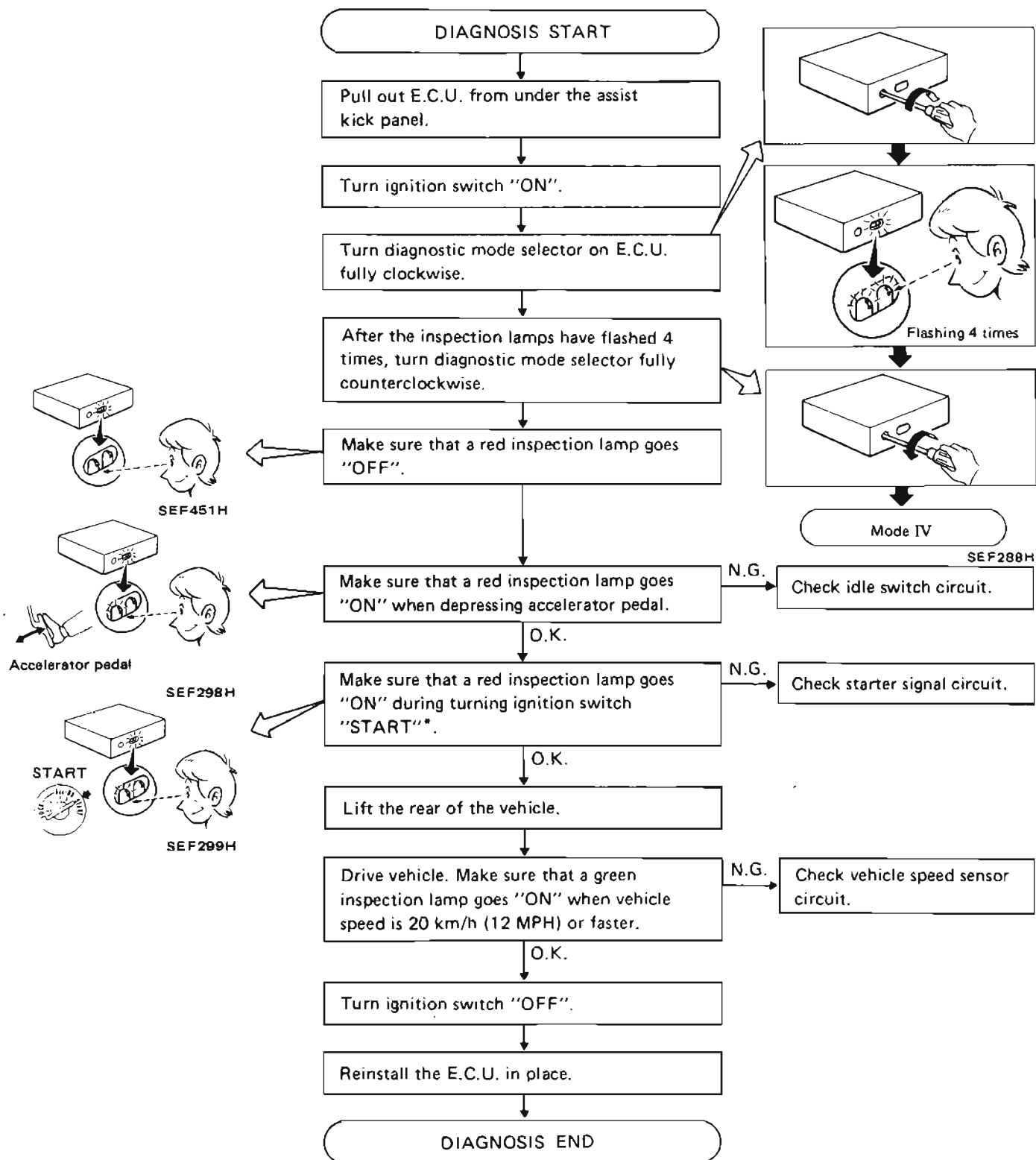
(2) Vehicle Speed Sensor

The switches ON/OFF status in mode IV is selected is stored in E.C.U. memory. The green L.E.D. on E.C.U. remains off when vehicle speed is 20 km/h (12 MPH or below), and comes ON at higher speeds.

TROUBLE DIAGNOSES

Self-diagnosis — Mode IV (Switches ON/OFF diagnostic system) (Cont'd)

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

- For safety, do not drive rear wheels at higher speed than required.

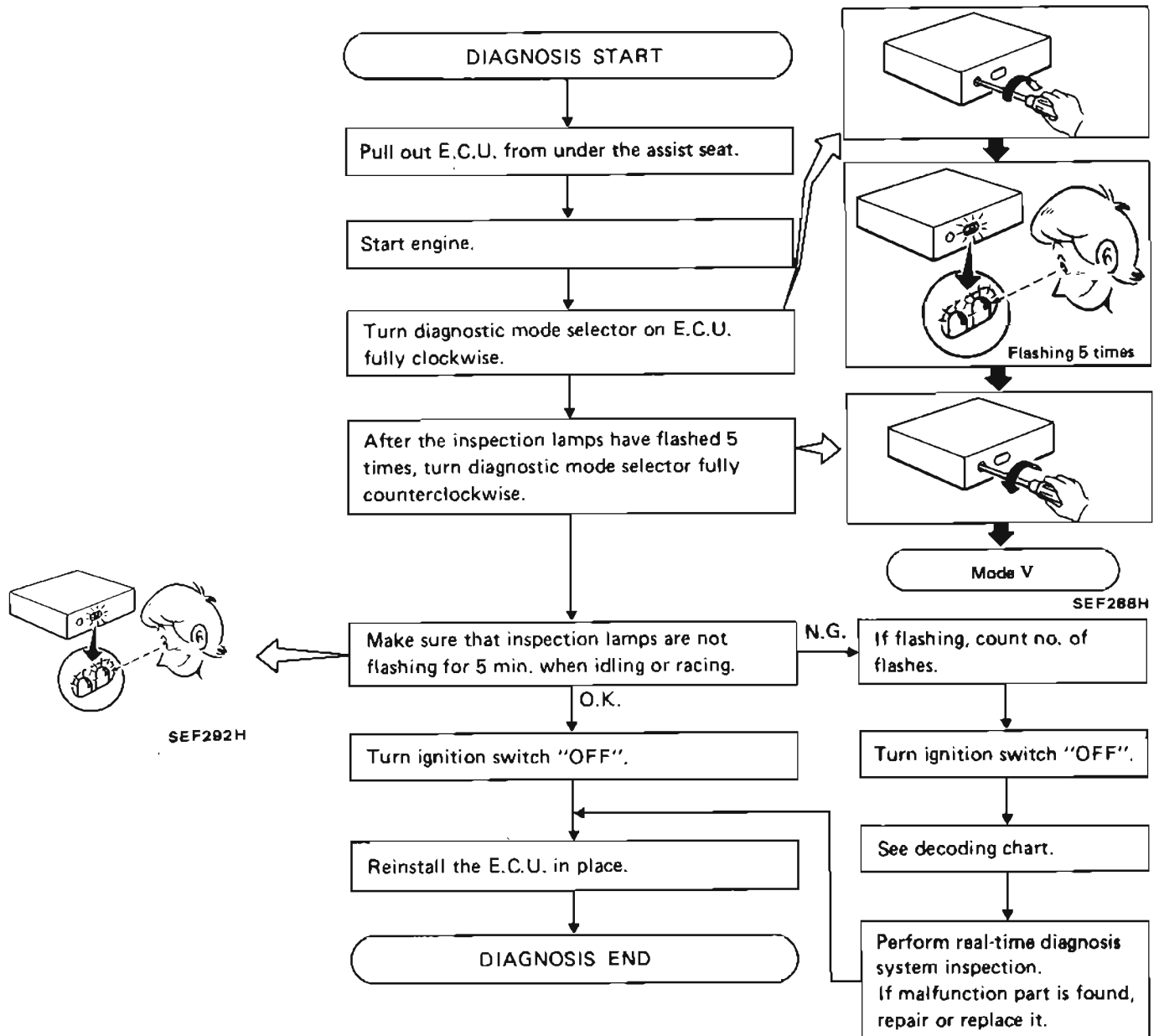
Self-diagnosis — Mode V (Real-time diagnostic system)

In real-time diagnosis, if the following items are judged to be working incorrectly, a malfunction will be indicated immediately.

- Crank angle sensor (180° signal & 1° signal) output signal
- Ignition signal
- Air flow meter output signal

Consequently, this diagnosis very effectively determines whether the above systems cause the malfunction, during driving test. Compared with self-diagnosis, real-time diagnosis is very sensitive and can detect malfunctions instantly. However, items regarded as malfunctions in this diagnosis are not stored in E.C.U. memory.

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

In real-time diagnosis, pay attention to inspection lamp flashing. E.C.U. displays the malfunction code only once and does not memorize the inspection.

TROUBLE DIAGNOSES

Self-diagnosis — Mode V (Real-time diagnostic system) (Cont'd)

DECODING CHART

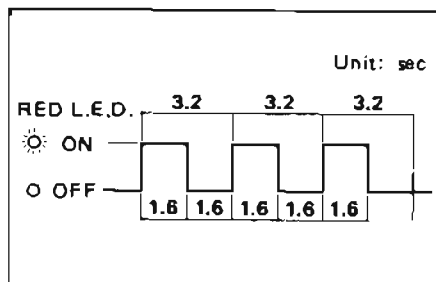
DISPLAY CODE

MALFUNCTIONING CIRCUIT OR PARTS

CONTROL UNIT SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.

(Compare with Self-diagnosis — Mode III.)

CRANK ANGLE SENSOR



Malfunction of crank angle sensor circuit

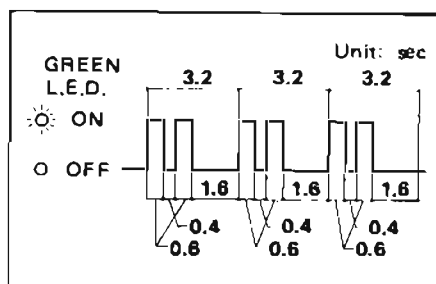
- The 1° or 180° signal is momentarily missing, or, multiple, momentary noise signals enter.

REAL-TIME DIAGNOSTIC INSPECTION

See page EF & EC-86.

SEF047F

AIR FLOW METER



Malfunction of air flow meter circuit

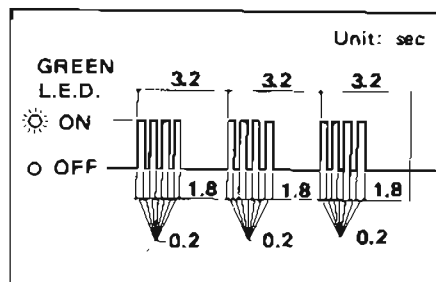
- Abnormal, momentary increase in air flow meter output signal

REAL-TIME DIAGNOSTIC INSPECTION

See page EF & EC-88.

SEF048F

IGNITION SIGNAL



Malfunction of ignition signal

- Signal from the primary ignition coil momentarily drops off.

REAL-TIME DIAGNOSTIC INSPECTION

See page EF & EC-94.

SEF049F

TROUBLE DIAGNOSES

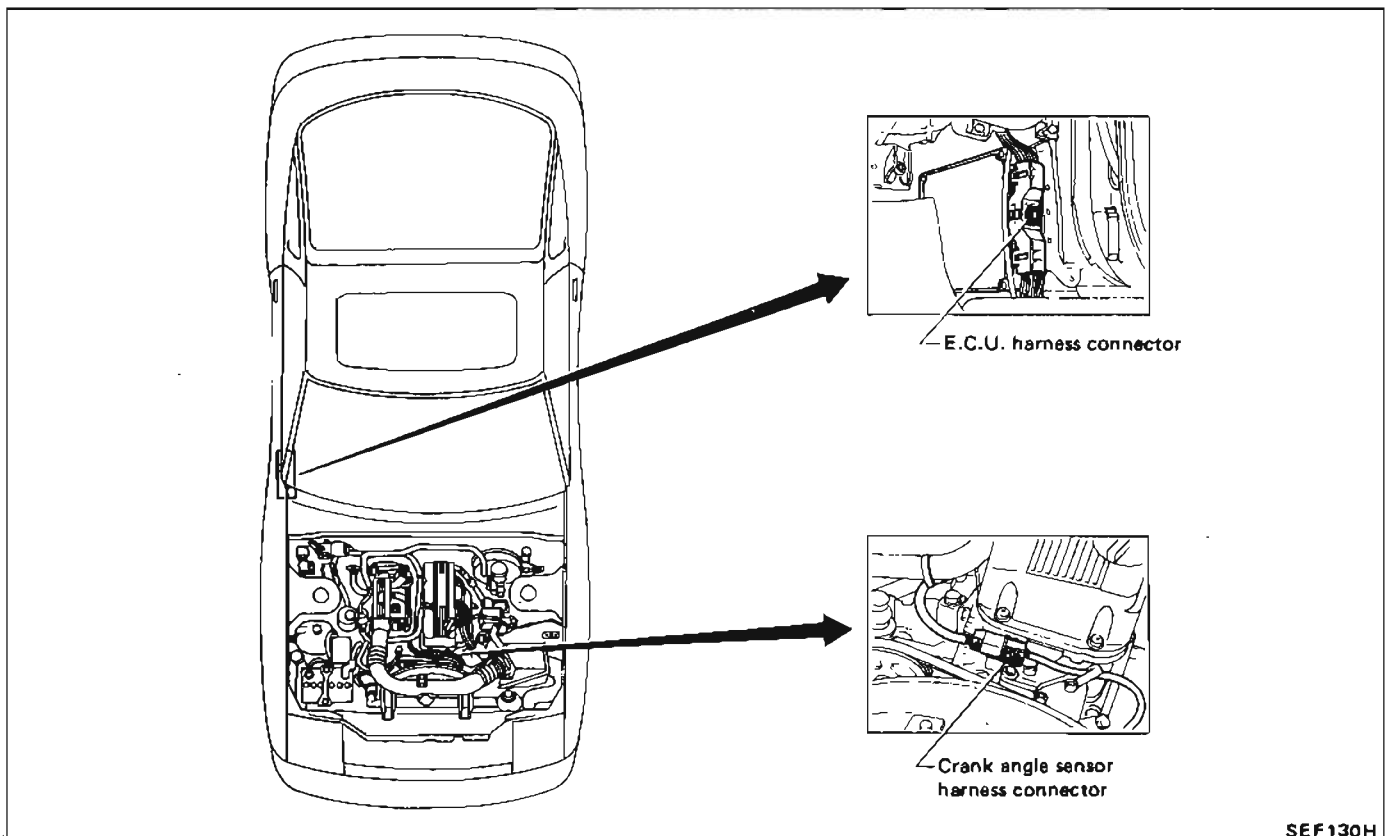
Self-diagnosis — Mode V (Real-time diagnostic system) (Cont'd)

REAL-TIME DIAGNOSTIC INSPECTION

X: Available
—: Not available

Crank Angle Sensor

| Check sequence | Check items | Check conditions | Check parts | | | If malfunction, perform the following items. |
|----------------|--|----------------------------|-------------------|-------------------|--------------------------|--|
| | | | Middle connectors | Sensor & actuator | E.C.U. harness connector | |
| 1 | Tap harness connector or component during real-time diagnosis. | During real-time diagnosis | X | X | X | Go to check item 2. |
| 2 | Check harness continuity at connector. | Engine stopped | X | — | — | Go to check item 3. |
| 3 | Disconnect harness connector, and then check dust adhesion to harness connector. | Engine stopped | X | — | X | Clean terminal surface. |
| 4 | Check pin terminal bend. | Engine stopped | — | — | X | Take out bend. |
| 5 | Reconnect harness connector and then recheck harness continuity at connector. | Engine stopped | X | — | — | Replace terminal. |
| 6 | Tap harness connector or component during real-time diagnosis. | During real-time diagnosis | X | X | X | If malfunction codes are displayed during real-time diagnosis, replace terminal. |



SEF130H

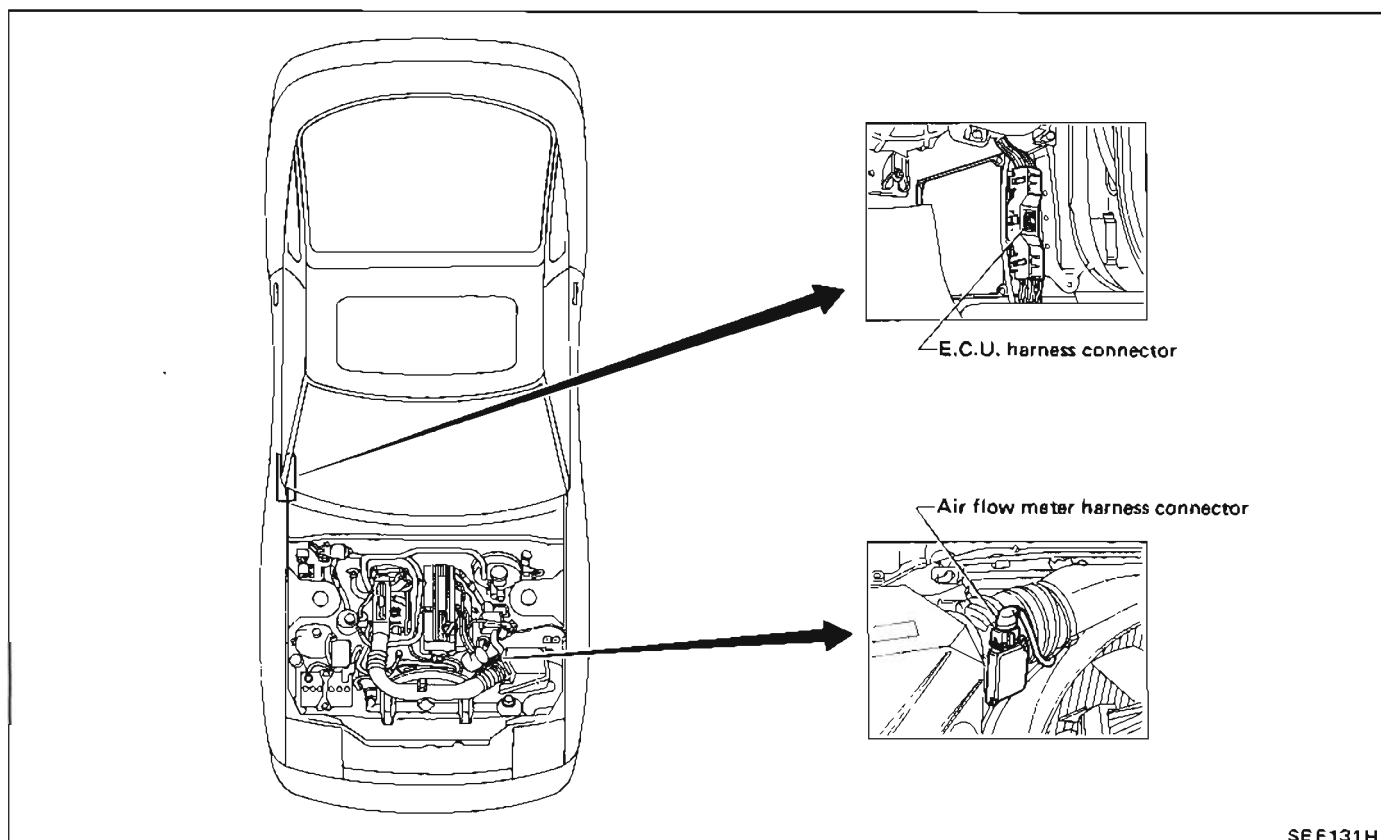
TROUBLE DIAGNOSES

Self-diagnosis — Mode V (Real-time diagnostic system) (Cont'd)

Air Flow Meter

X: Available
—: Not available

| Check sequence | Check items | Check conditions | Check parts | | | If malfunction, perform the following items. |
|----------------|--|----------------------------|-------------------|-------------------|--------------------------|--|
| | | | Middle connectors | Sensor & actuator | E.C.U. harness connector | |
| 1 | Tap harness connector or component during real-time diagnosis. | During real-time diagnosis | X | X | X | Go to check item 2. |
| 2 | Check harness continuity at connector. | Engine stopped | X | — | — | Go to check item 3. |
| 3 | Disconnect harness connector, and then check dust adhesion to harness connector. | Engine stopped | X | — | X | Clean terminal surface. |
| 4 | Check pin terminal bend. | Engine stopped | — | — | X | Take out bend. |
| 5 | Reconnect harness connector and then recheck harness continuity at connector. | Engine stopped | X | — | — | Replace terminal. |
| 6 | Tap harness connector or component during real-time diagnosis. | During real-time diagnosis | X | X | X | If malfunction codes are displayed during real-time diagnosis, replace terminal. |



SEF131H

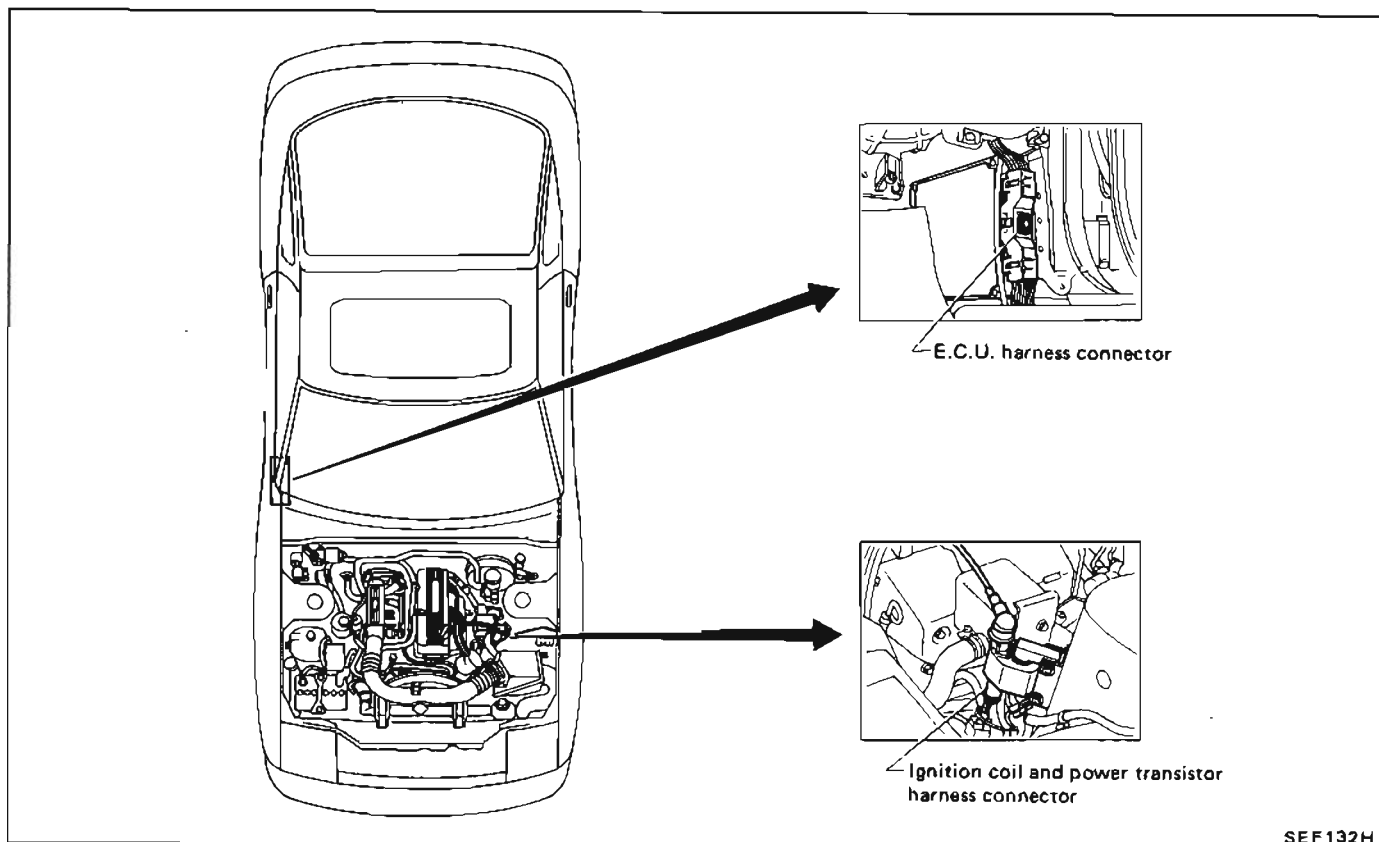
TROUBLE DIAGNOSES

Self-diagnosis — Mode V (Real-time diagnostic system) (Cont'd)

Ignition Signal

X: Available
-: Not available

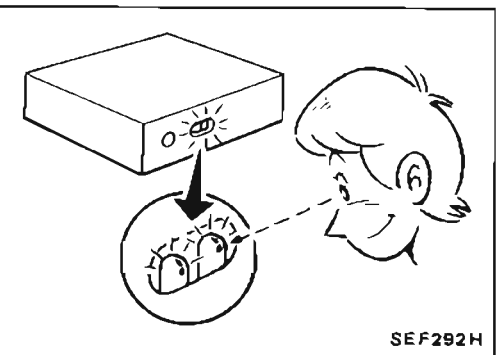
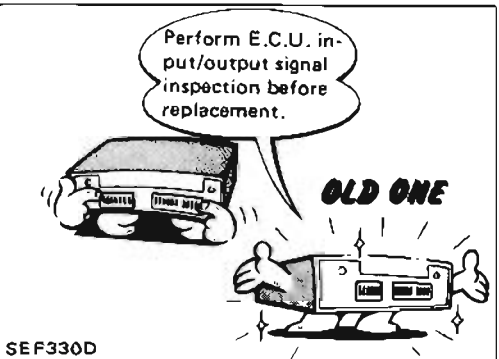
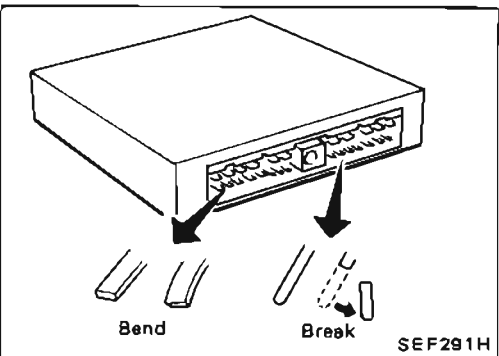
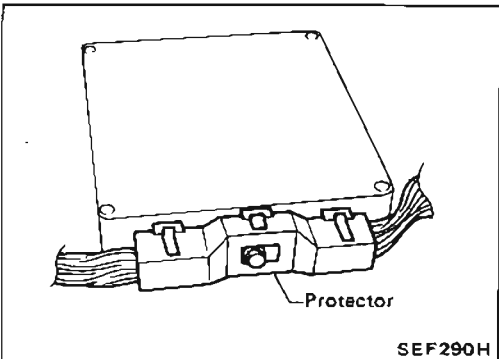
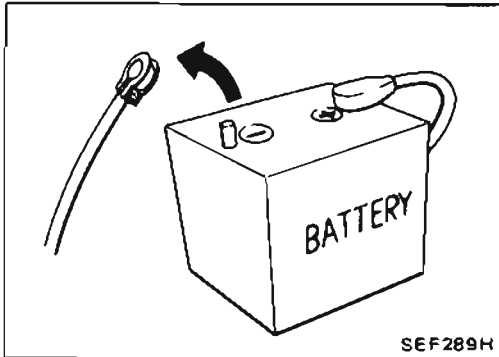
| Check sequence | Check items | Check conditions | Check parts | | | If malfunction, perform the following items. |
|----------------|--|----------------------------|-------------------|-------------------|--------------------------|--|
| | | | Middle connectors | Sensor & actuator | E.C.U. harness connector | |
| 1 | Tap harness connector or component during real-time diagnosis. | During real-time diagnosis | X | X | X | Go to check item 2. |
| 2 | Check harness continuity at connector. | Engine stopped | X | - | - | Go to check item 3. |
| 3 | Disconnect harness connector, and then check dust adhesion to harness connector. | Engine stopped | X | - | X | Clean terminal surface. |
| 4 | Check pin terminal bend. | Engine stopped | - | - | X | Take out bend. |
| 5 | Reconnect harness connector and then recheck harness continuity at connector. | Engine stopped | X | - | - | Replace terminal. |
| 6 | Tap harness connector or component during real-time diagnosis. | During real-time diagnosis | X | X | X | If malfunction codes are displayed during real-time diagnosis, replace terminal. |



SEF132H

TROUBLE DIAGNOSES

NOTE



Diagnostic Procedure

CAUTION:

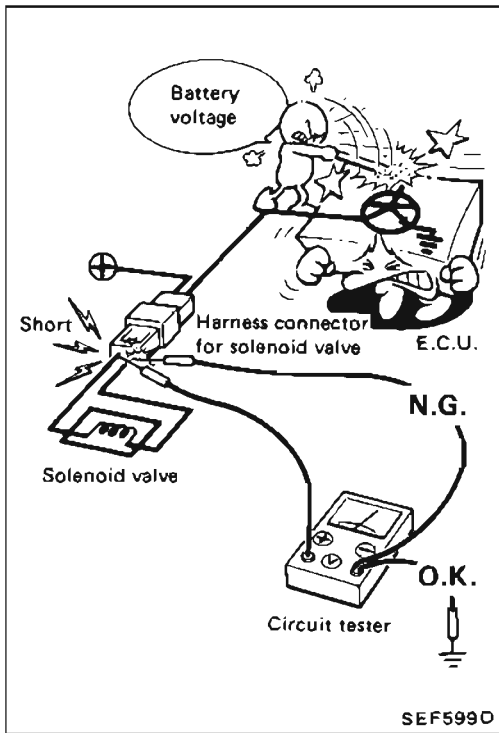
1. Before connecting or disconnecting the E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Failure to do so may damage the E.C.U.
2. When performing E.C.U. input/output signal inspection, remove connector protector to insert tester probe into connector.
3. When connecting or disconnecting pin connectors into or from E.C.U., take care not to damage pin terminals.
4. Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors.
5. Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether the E.C.U. unit functions properly or not. (See page EF & EC-142.)
6. After performing this "Diagnostic Procedure", perform E.C.C.S. self-diagnosis and driving test.

TROUBLE DIAGNOSES

Diagnostic Procedure (Cont'd)

7. When measuring E.C.U. controlled components supply voltage with a circuit tester, separate one tester probe from the other.

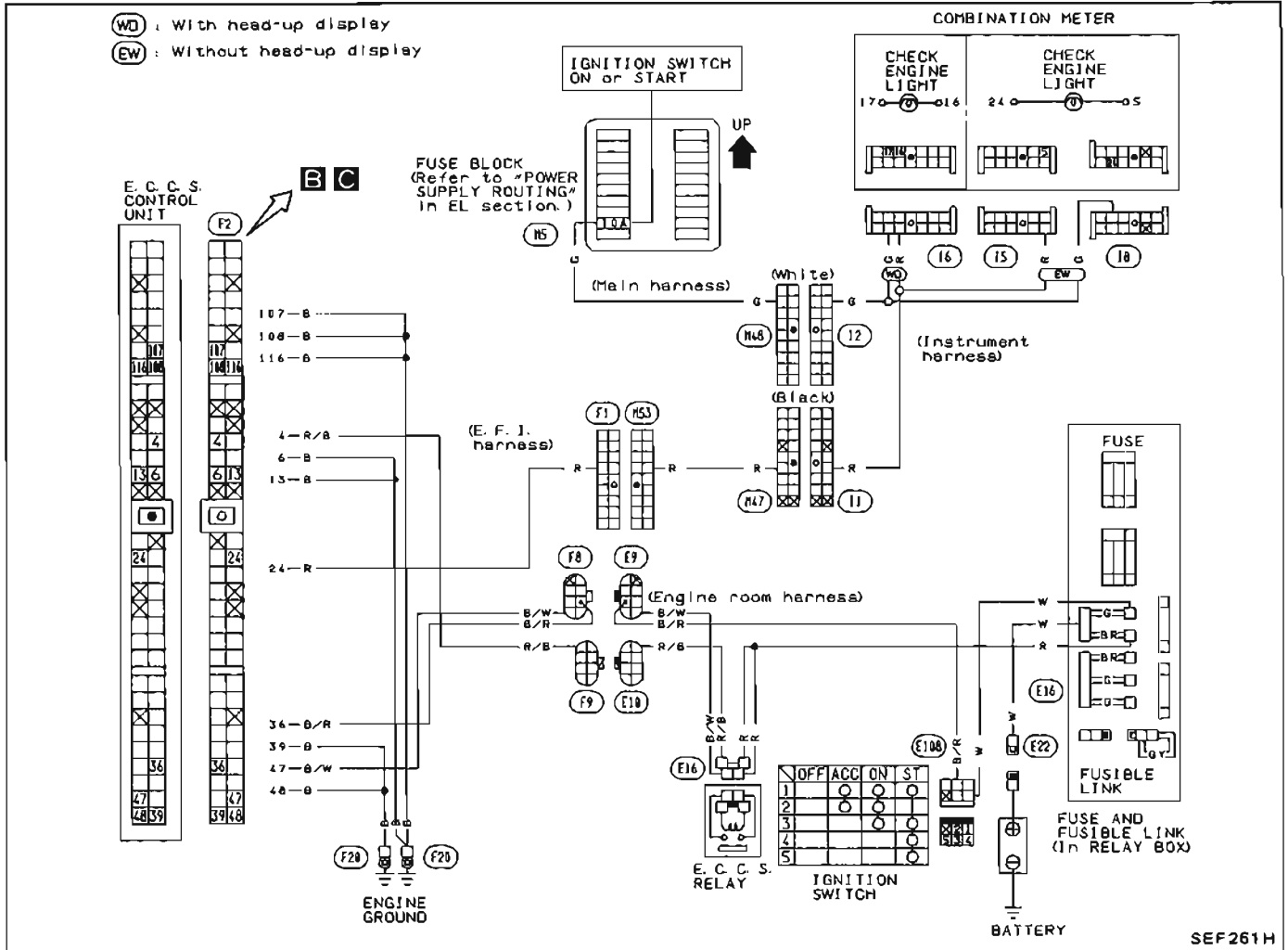
If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the control unit power transistor.



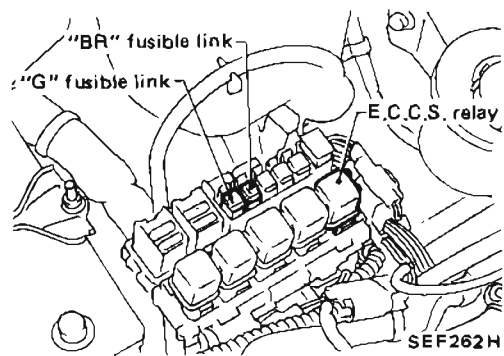
TROUBLE DIAGNOSES

Diagnostic Procedure 1

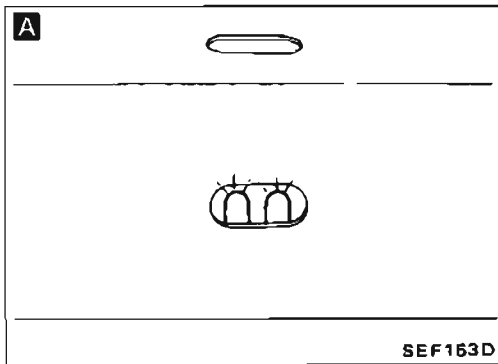
MAIN POWER SUPPLY AND GROUND CIRCUIT



Component location



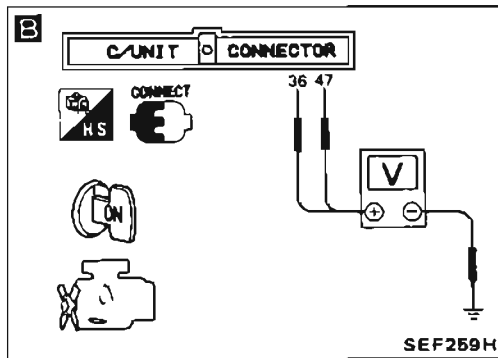
TROUBLE DIAGNOSES



INSPECTION START

↓

CHECK DIAGNOSTIC MODE ON THE E.C.U.
Verify that diagnostic mode selector on the E.C.U. is turned "OFF".



O.K.

↓

A **CHECK POWER SOURCE FOR E.C.U.**
1) Turn ignition switch "ON".
2) Verify that red and green inspection lamps on the E.C.U. illuminate.

N.G.

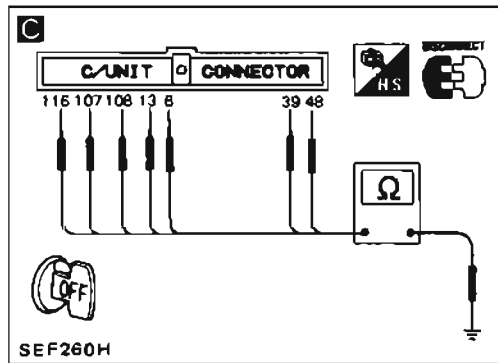
↓

B **Check voltage between E.C.U. terminals 36, 47 and ground. Battery voltage should exist.**

47 N.G. 36 N.G.

↓

Check following items.
1) "G" fusible link
2) Harness or connectors between terminal 36 and battery.
3) Ignition switch
If N.G., replace affected parts.



O.K.

↓

C **CHECK GROUND CIRCUIT.**
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check continuity between terminals 6, 13, 39, 48, 107, 108, 116 and ground. **Continuity should exist.**

N.G.

↓

Check following items.
1) "BR" fusible link
2) Harness or connectors between terminal 47 and battery
3) Harness or connectors between terminal 4 and battery
4) E.C.C.S. relay
(See page EF & EC-147.)

O.K.

↓

Reinstall any part removed.

N.G.

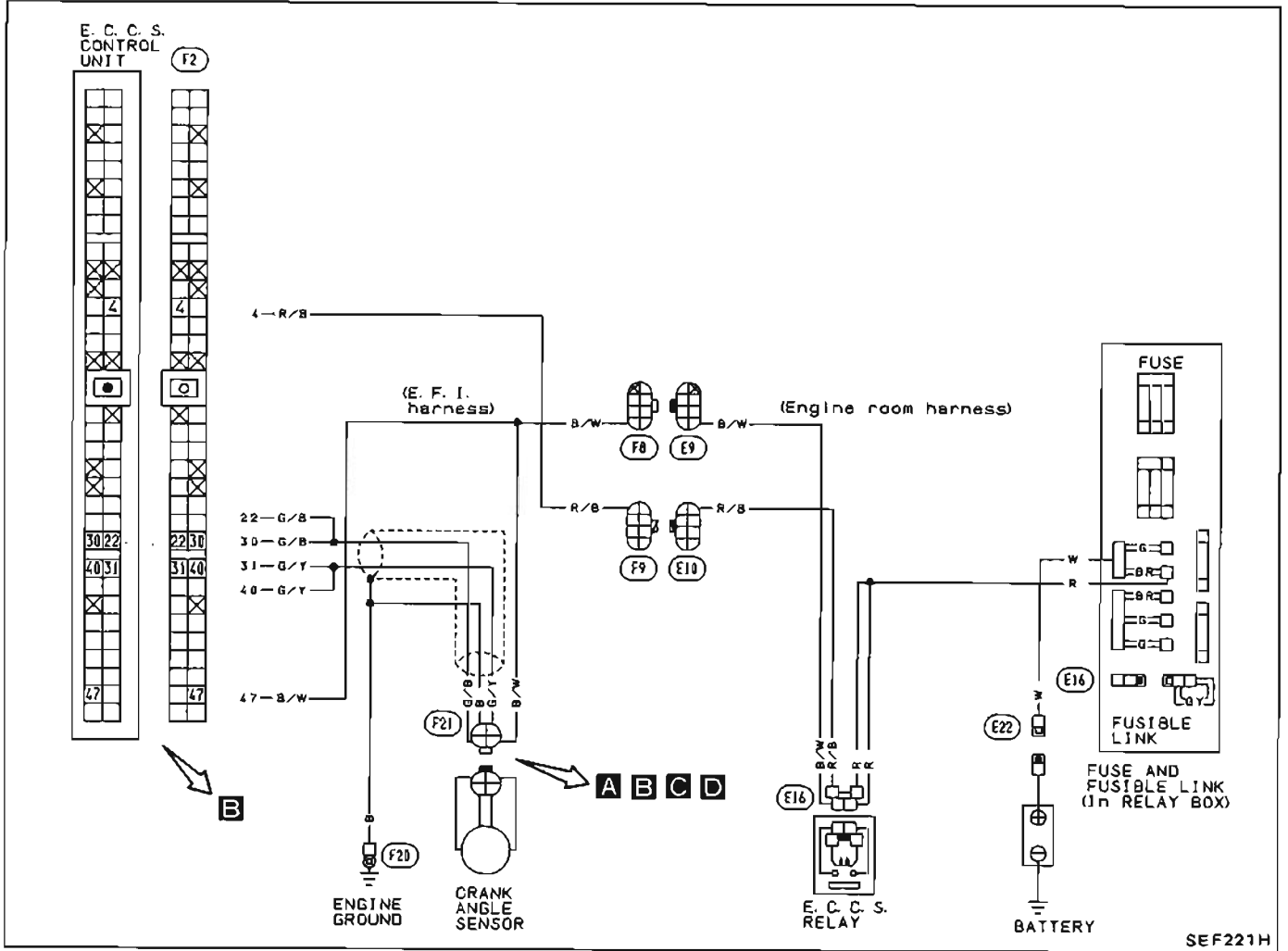
↓

Check harness continuity between E.C.U. and engine ground.

INSPECTION END

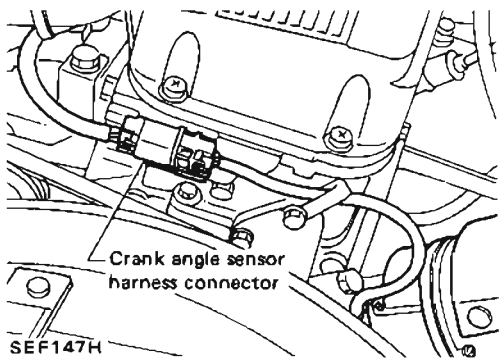
Diagnostic Procedure 2

CRANK ANGLE SENSOR (Code No. 11)



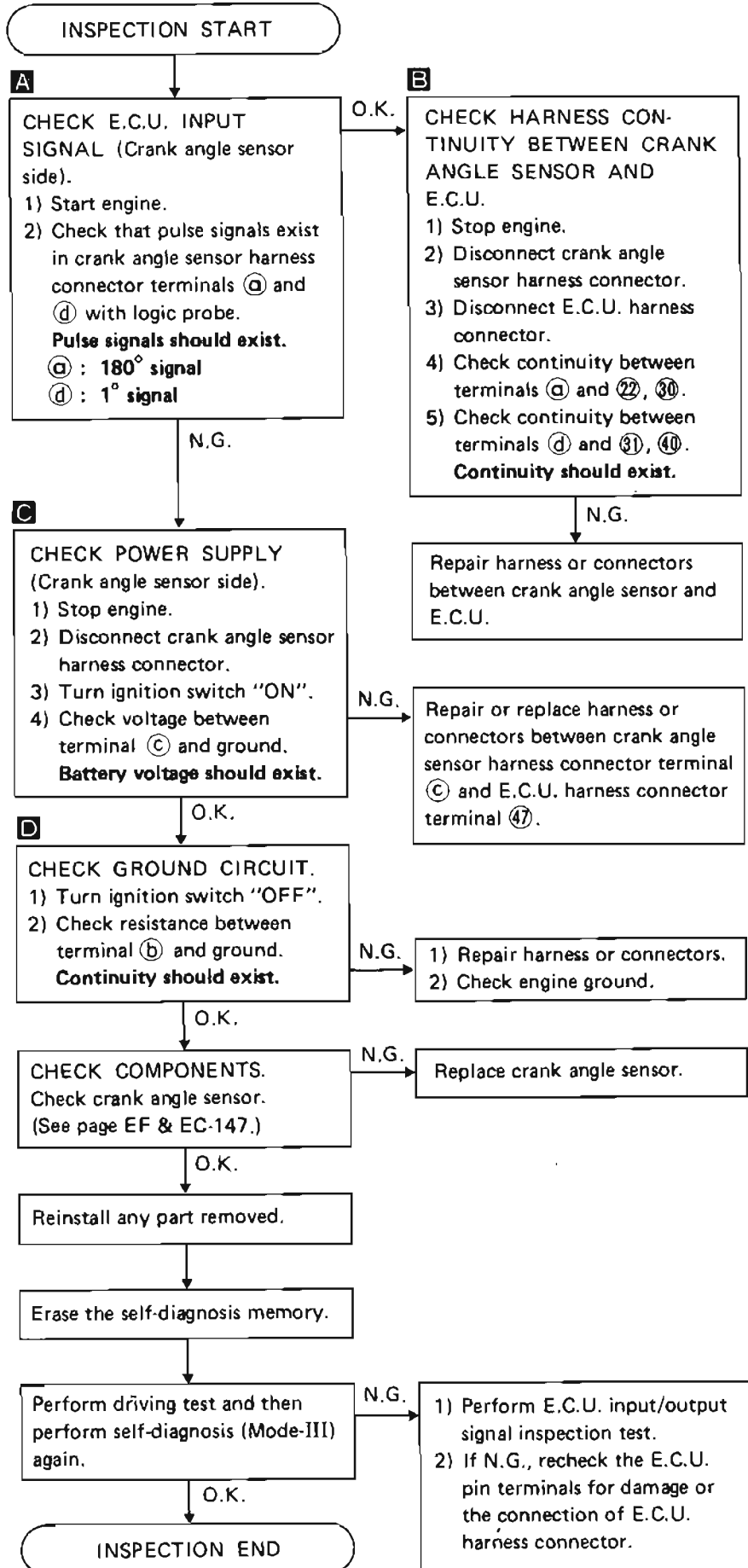
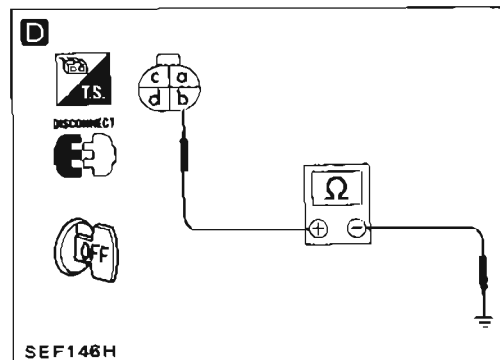
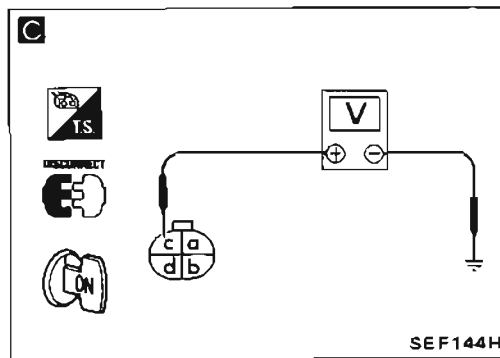
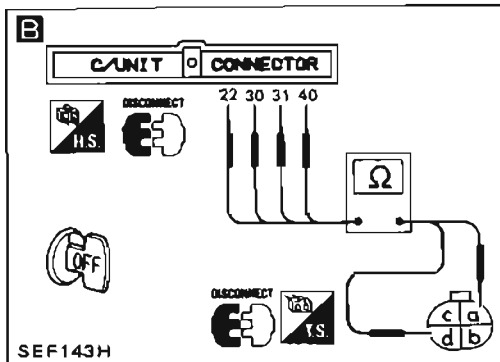
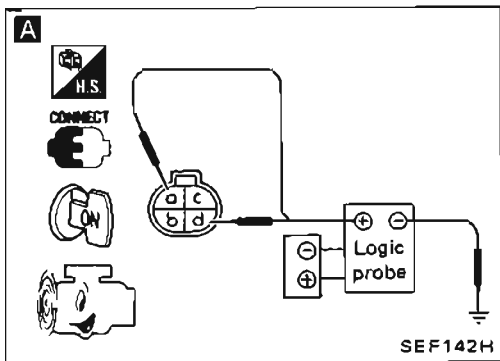
SEF221H

Component location



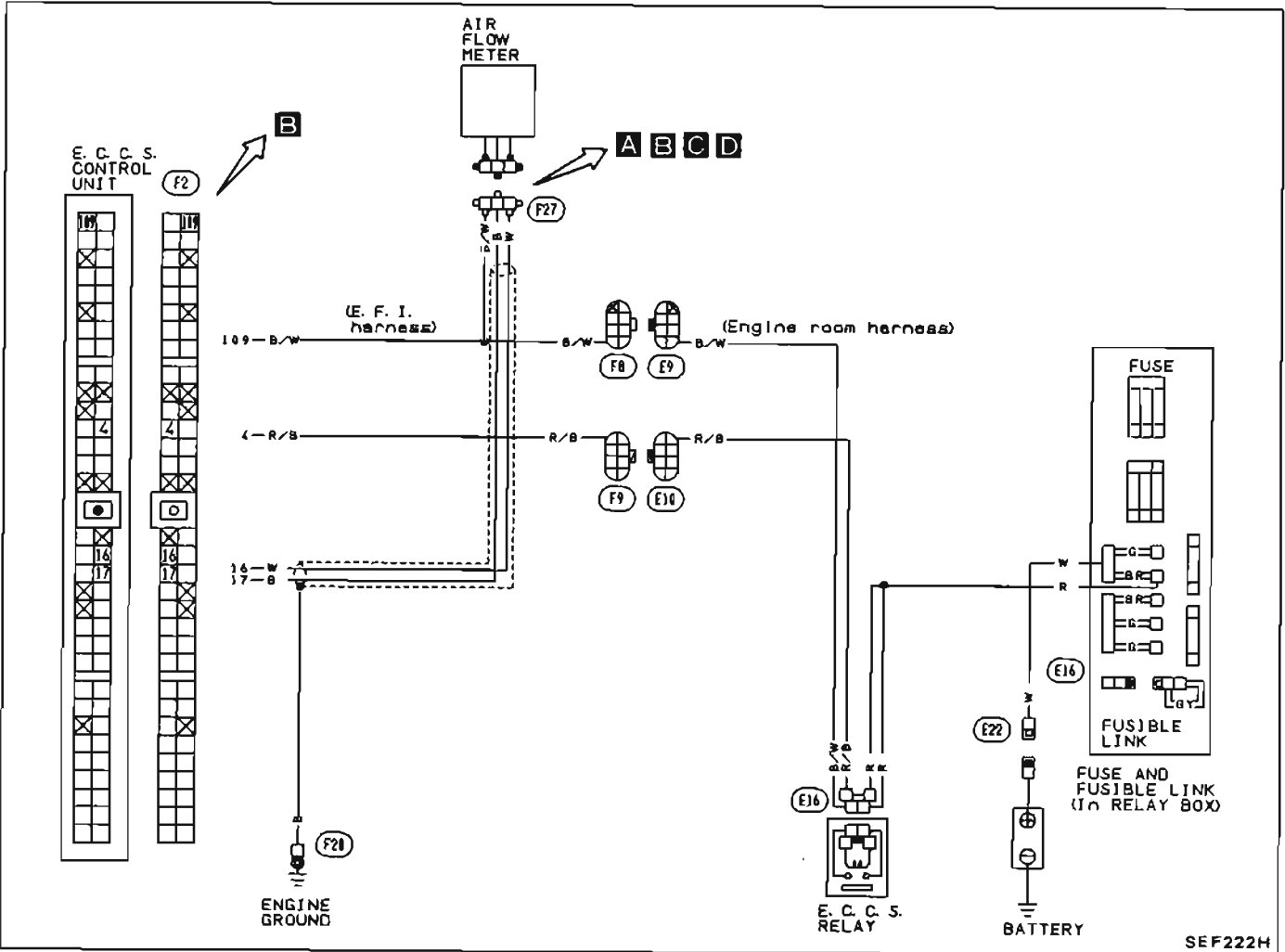
SEF147H

TROUBLE DIAGNOSES

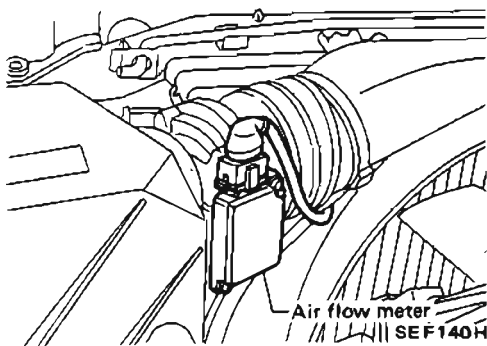


Diagnostic Procedure 3

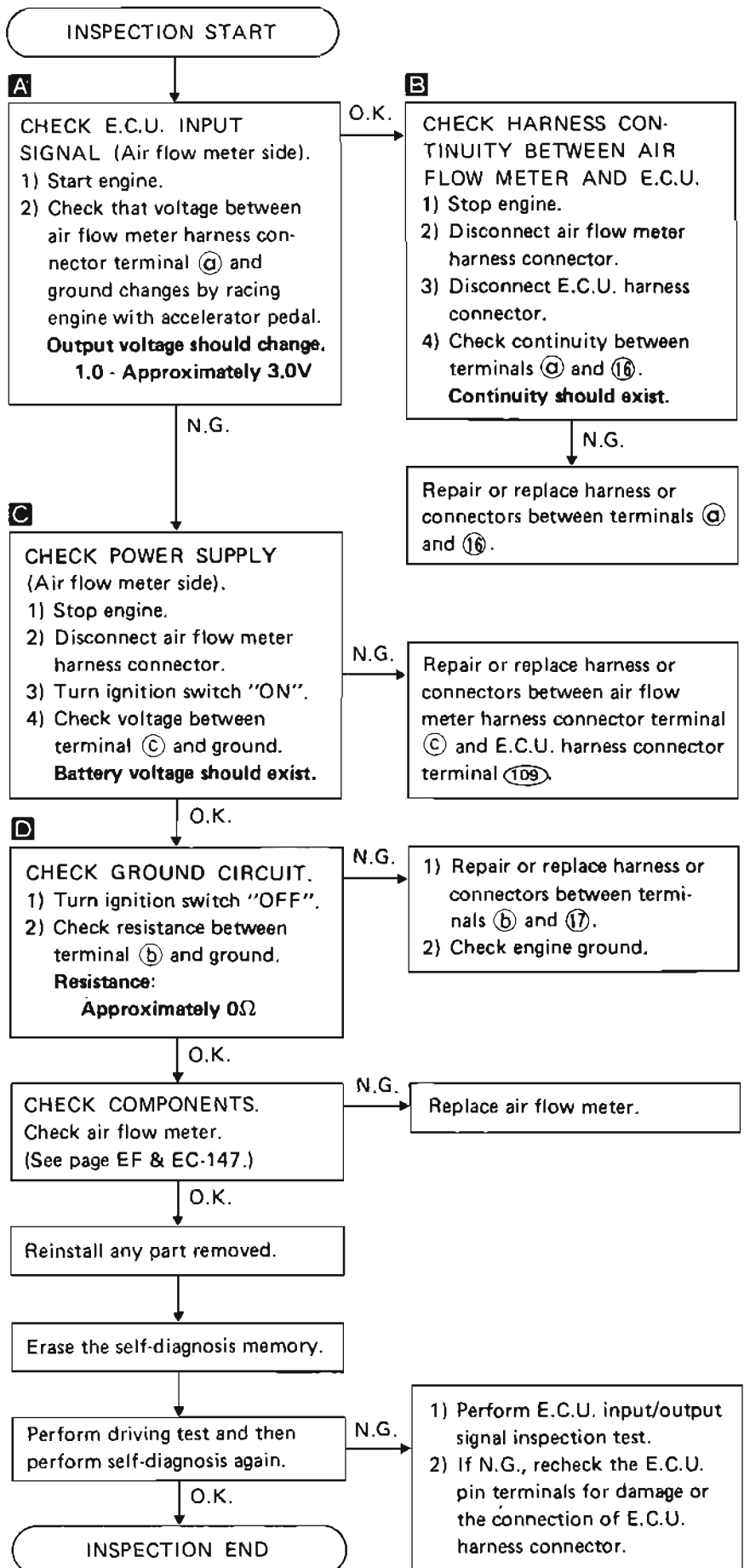
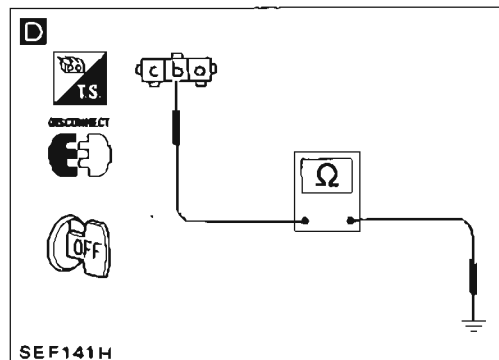
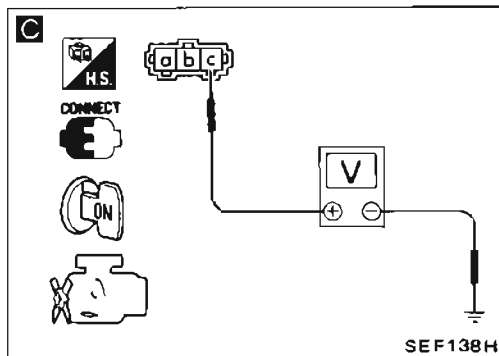
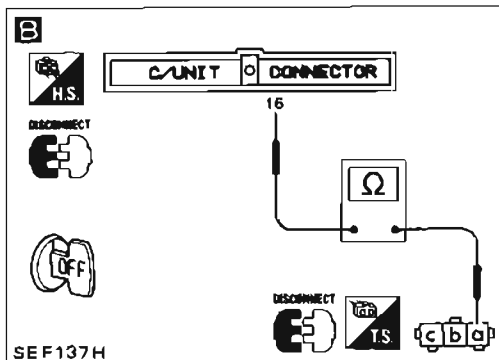
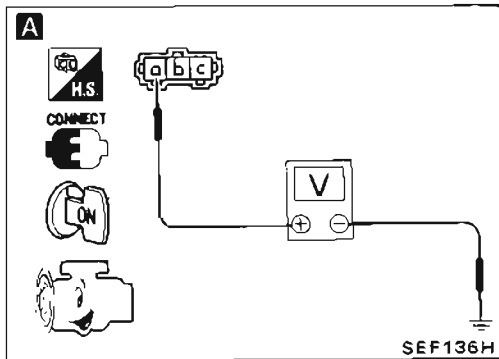
AIR FLOW METER (Code No. 12) CHECK



Component location

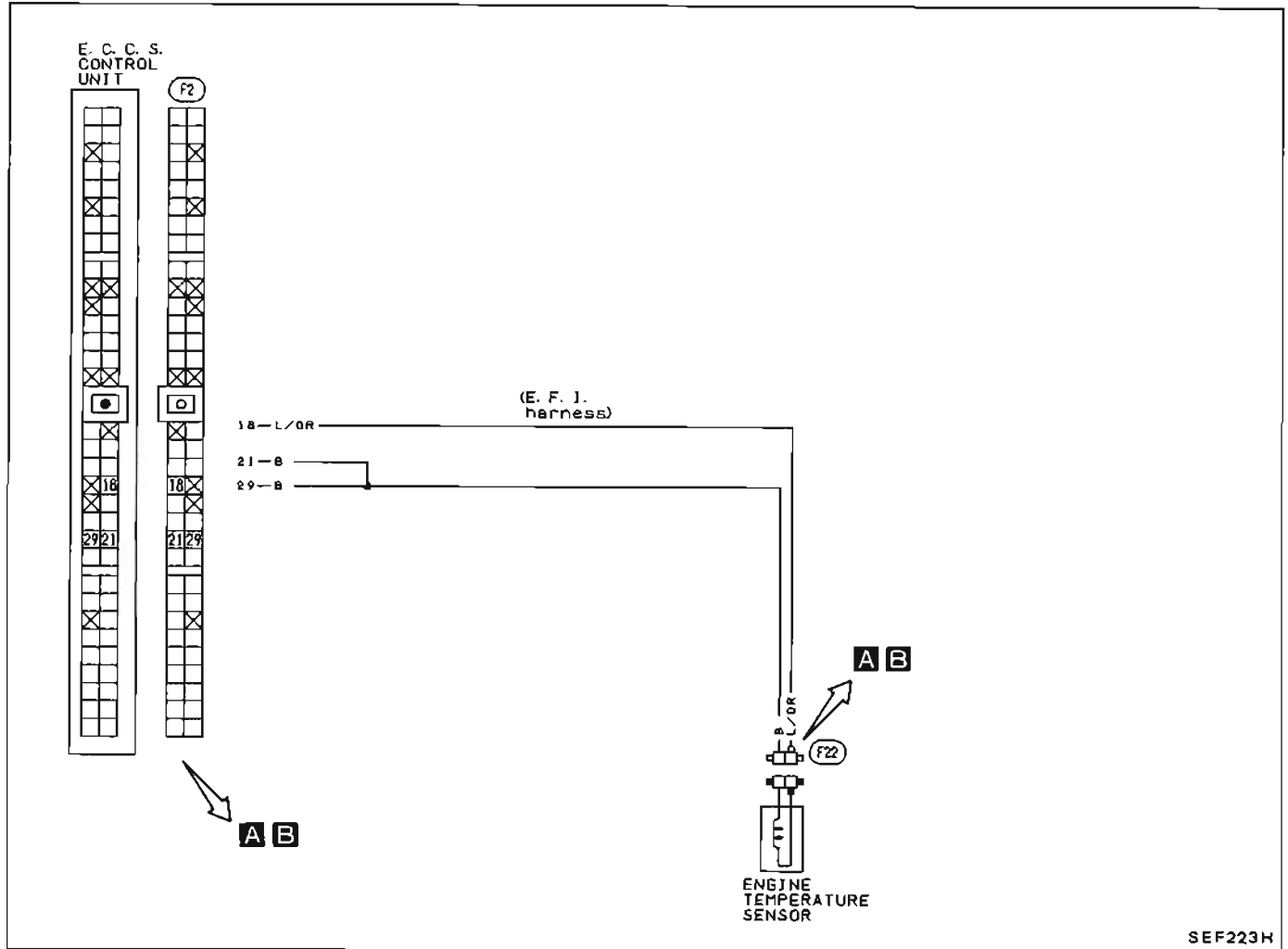


TROUBLE DIAGNOSES



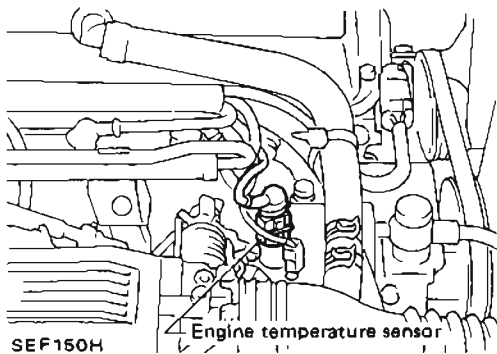
Diagnostic Procedure 4

ENGINE TEMPERATURE SENSOR (Code No. 13)

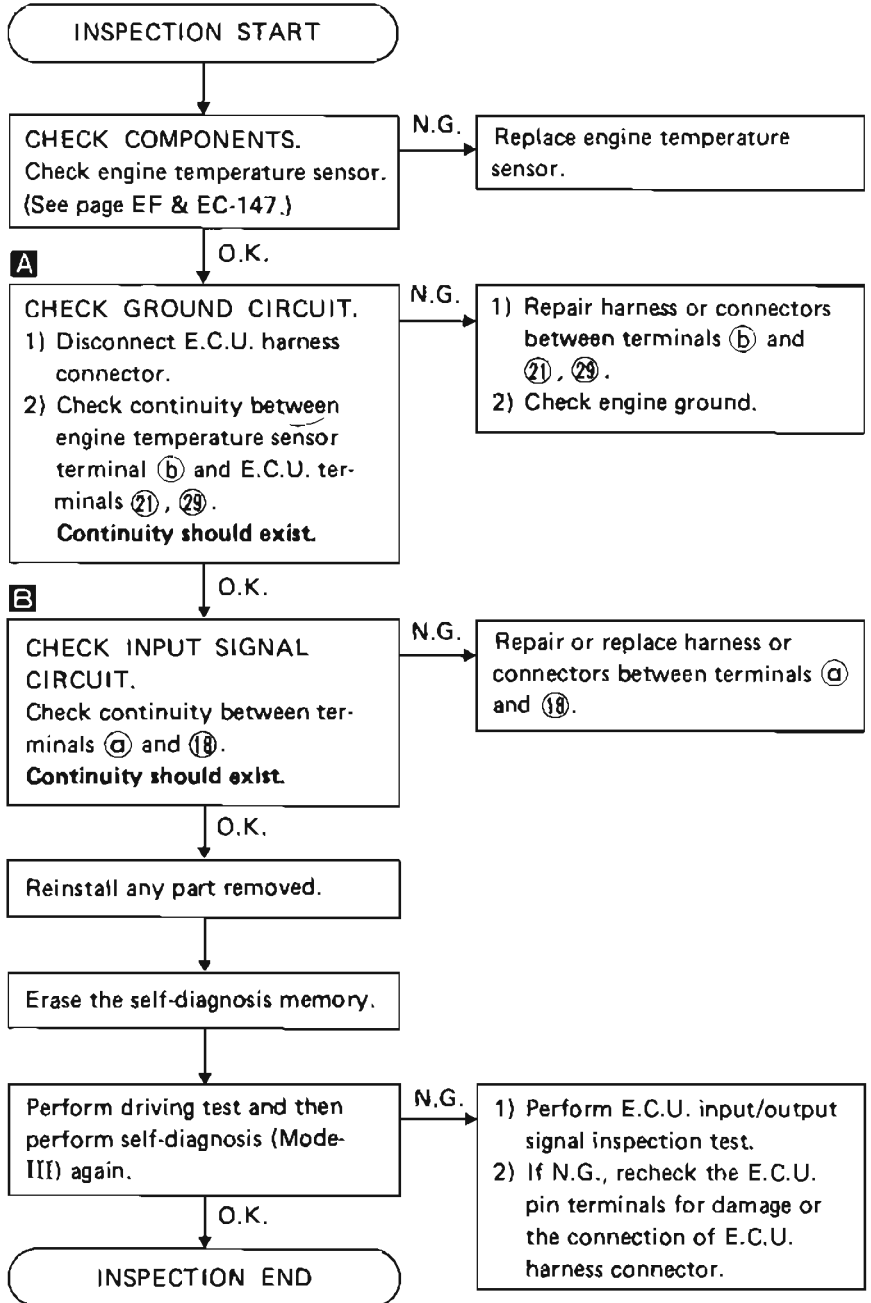
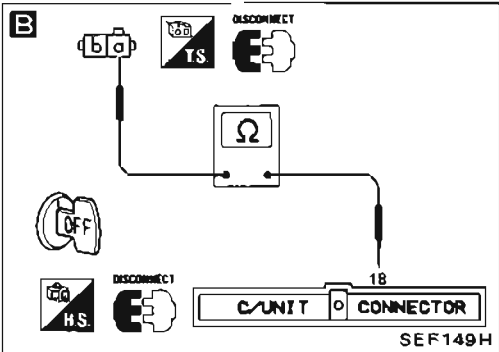
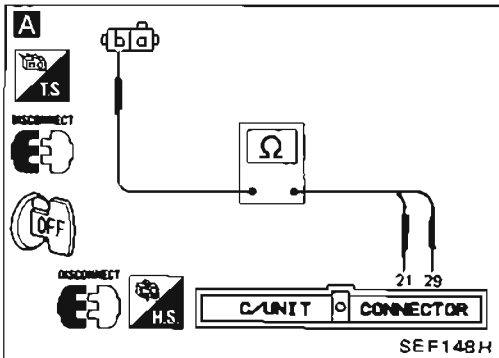


SEF223H

Component location



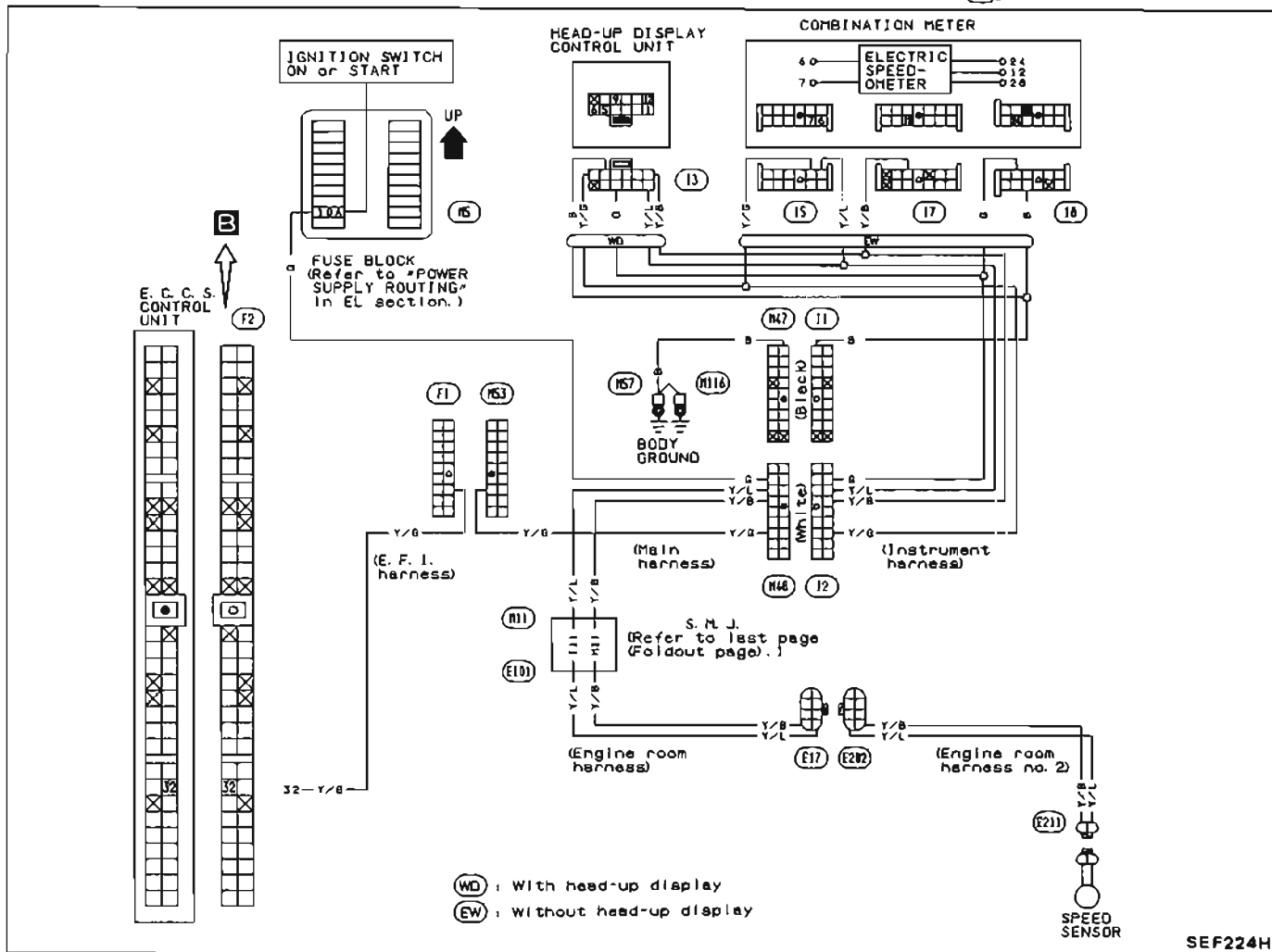
TROUBLE DIAGNOSES



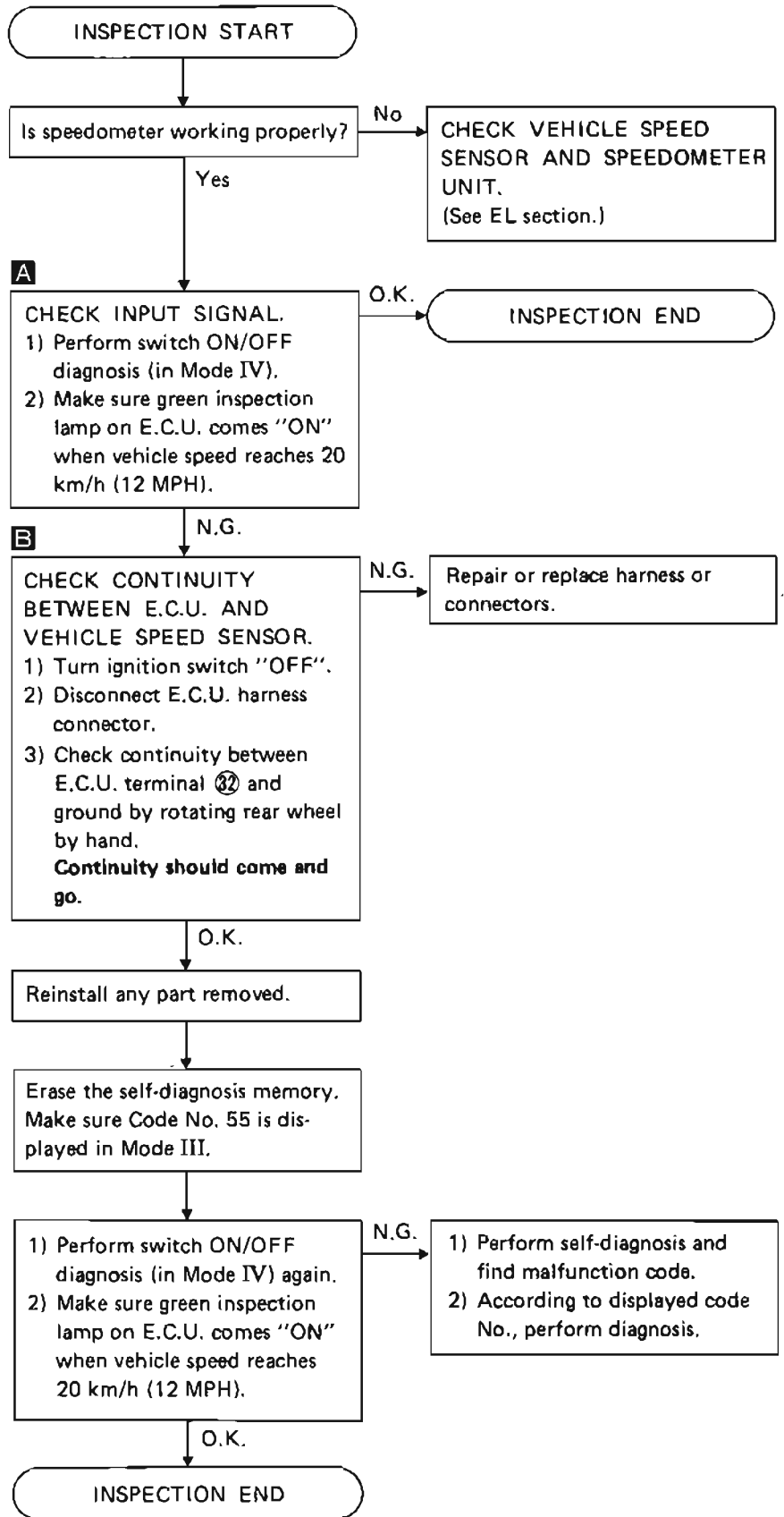
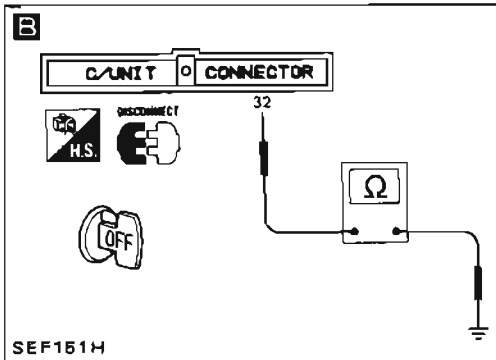
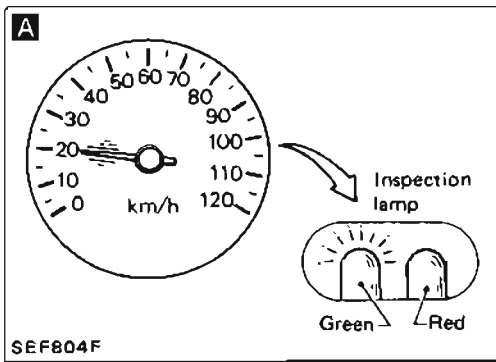
TROUBLE DIAGNOSES

Diagnostic Procedure 5

VEHICLE SPEED SENSOR (Switch ON/OFF diagnostic item) (Code No. 14) CHECK



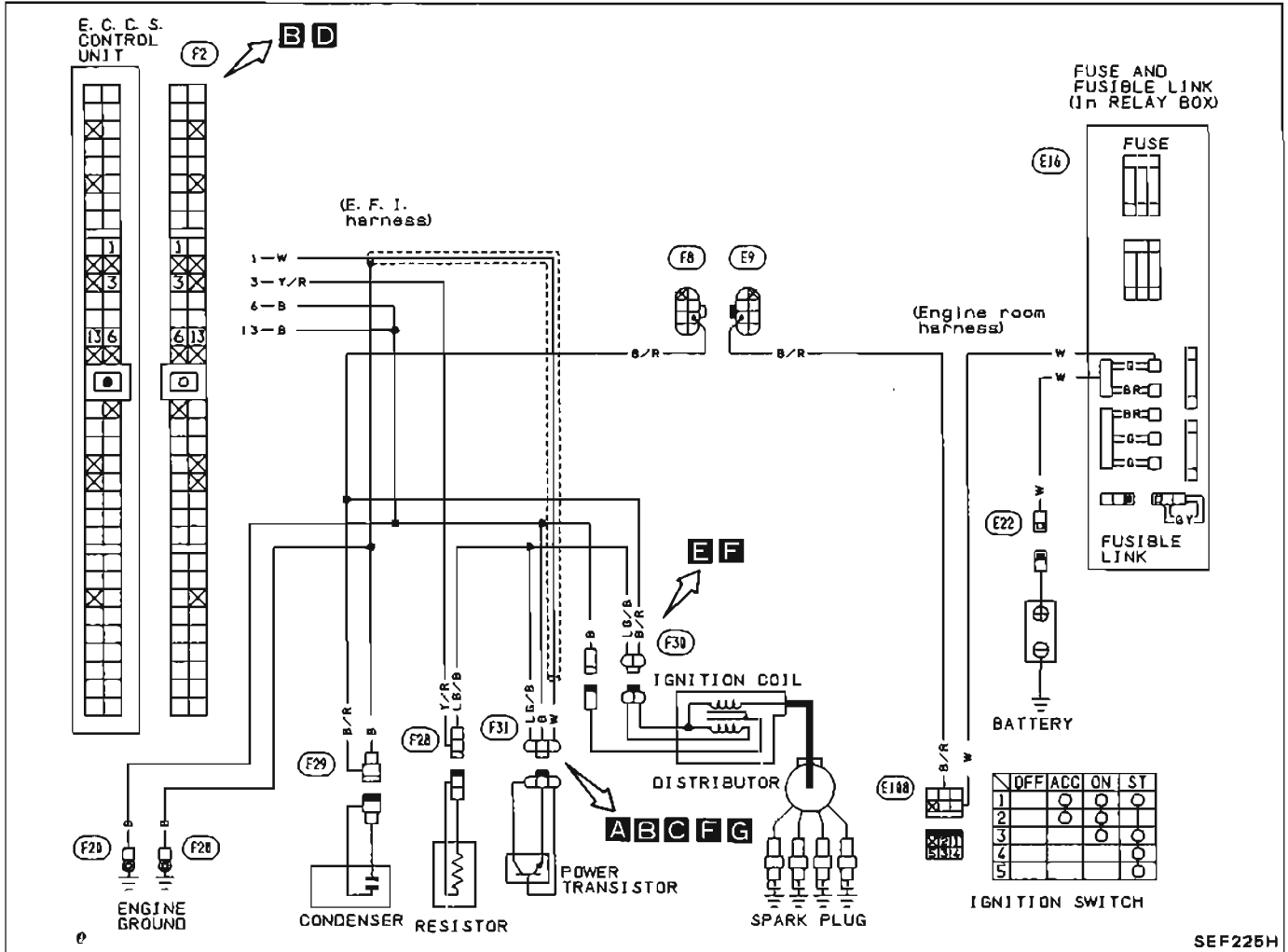
TROUBLE DIAGNOSES



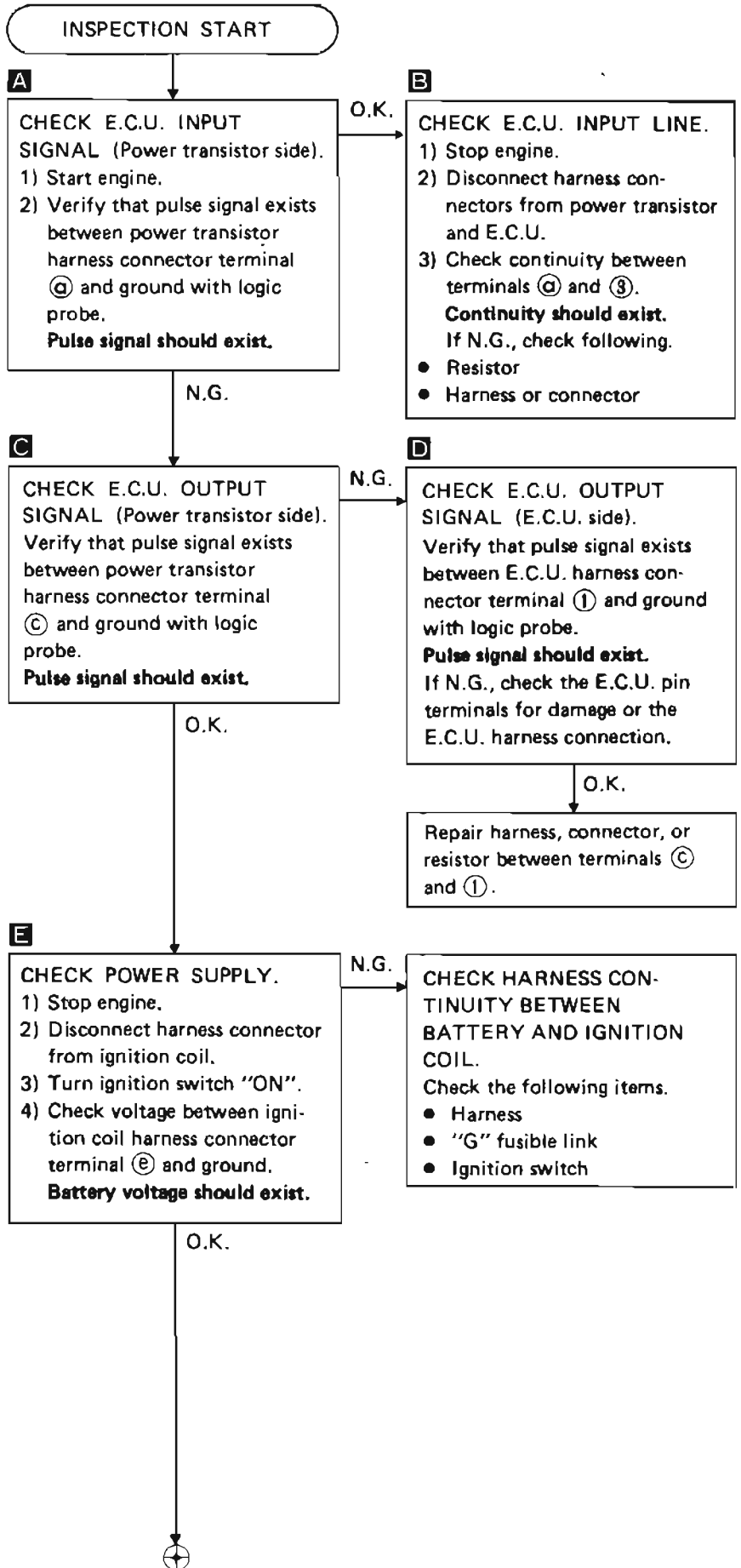
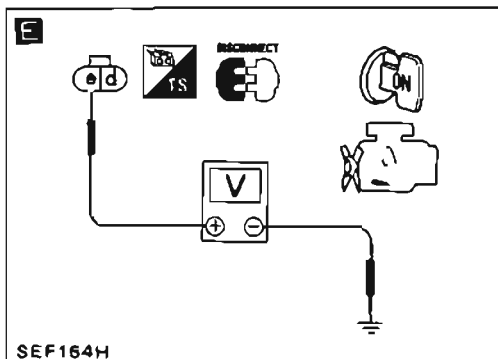
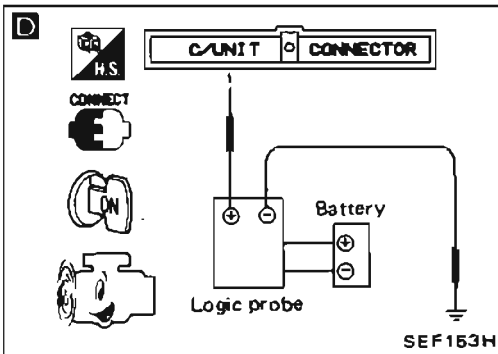
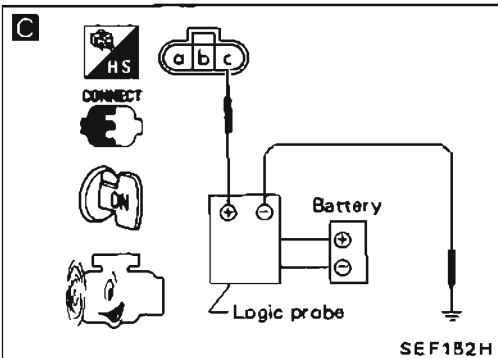
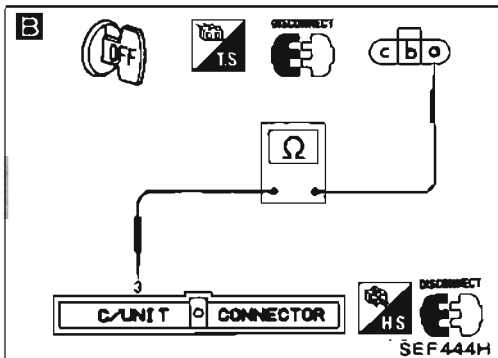
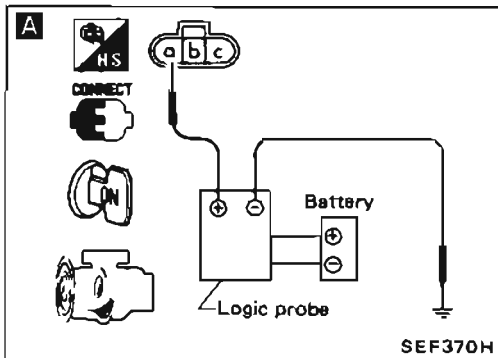
TROUBLE DIAGNOSES

Diagnostic Procedure 6

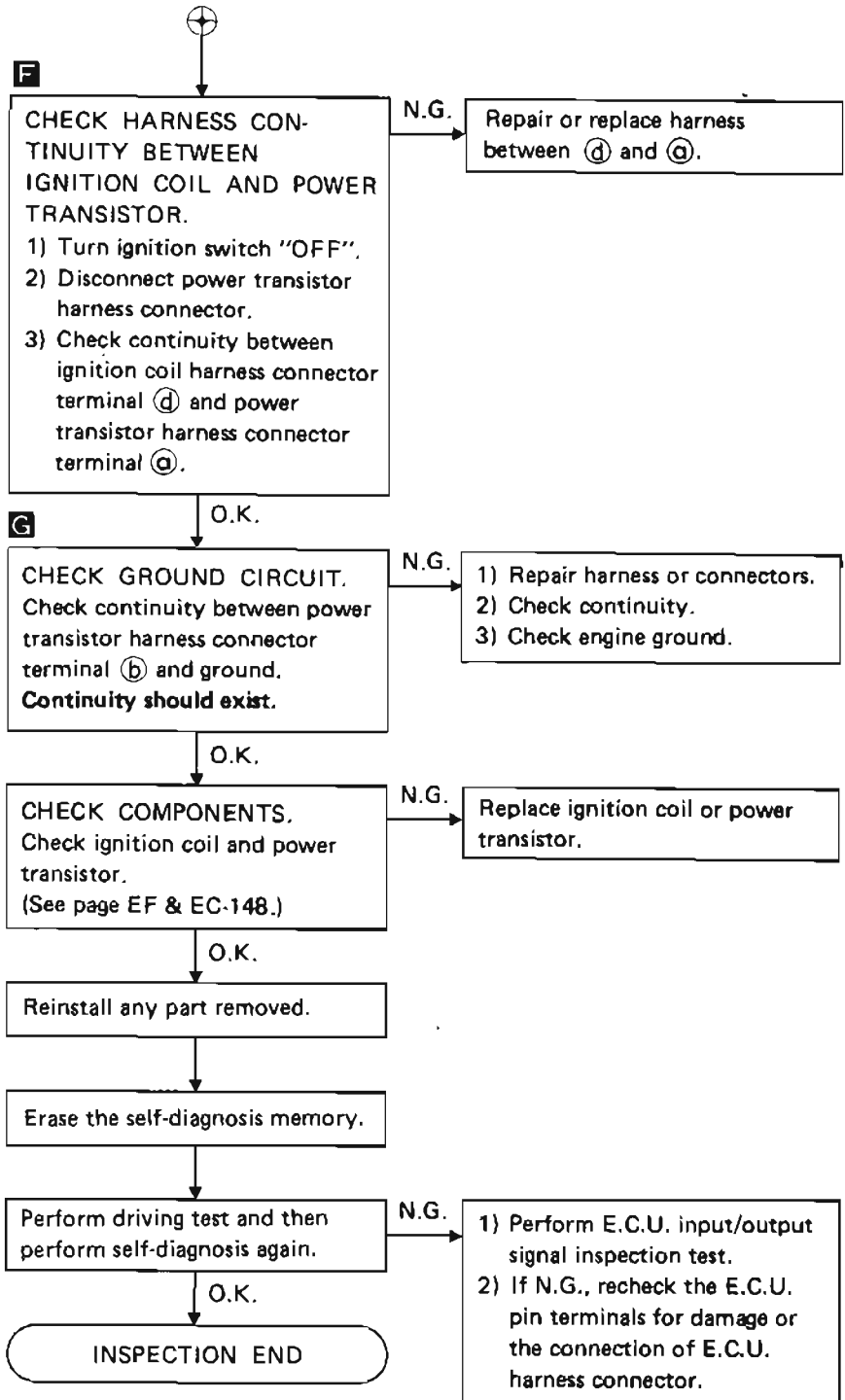
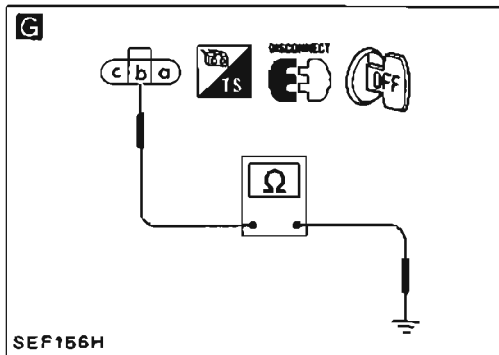
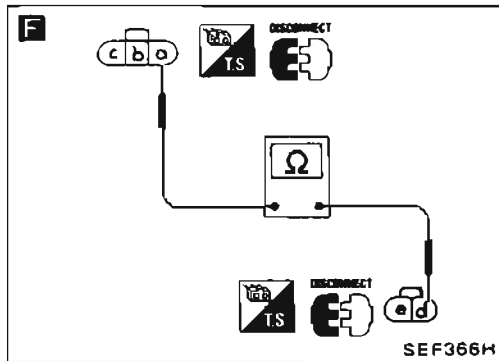
IGNITION SIGNAL (Code No. 21)



TROUBLE DIAGNOSES



TROUBLE DIAGNOSES



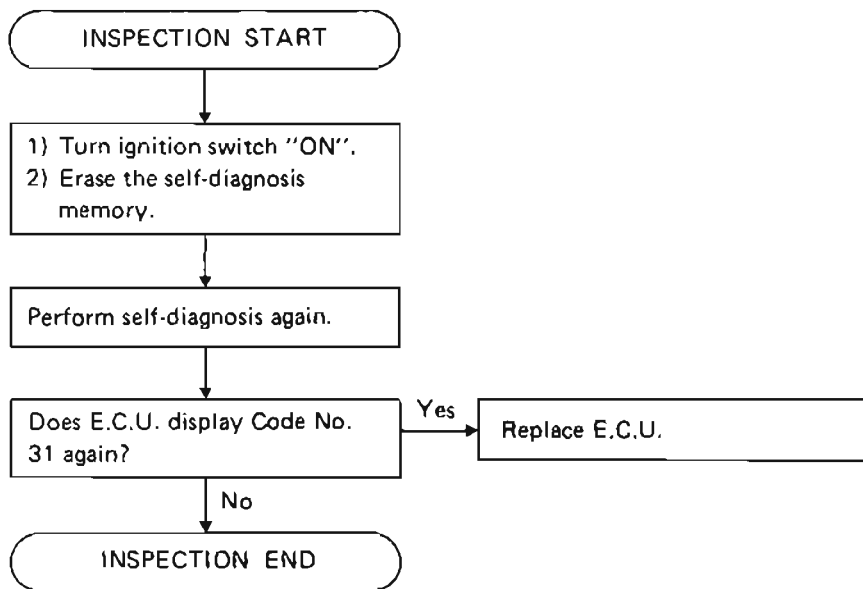
TROUBLE DIAGNOSES

NOTE

TROUBLE DIAGNOSES

Diagnostic Procedure 7

ENGINE CONTROL UNIT (Code No. 31) 




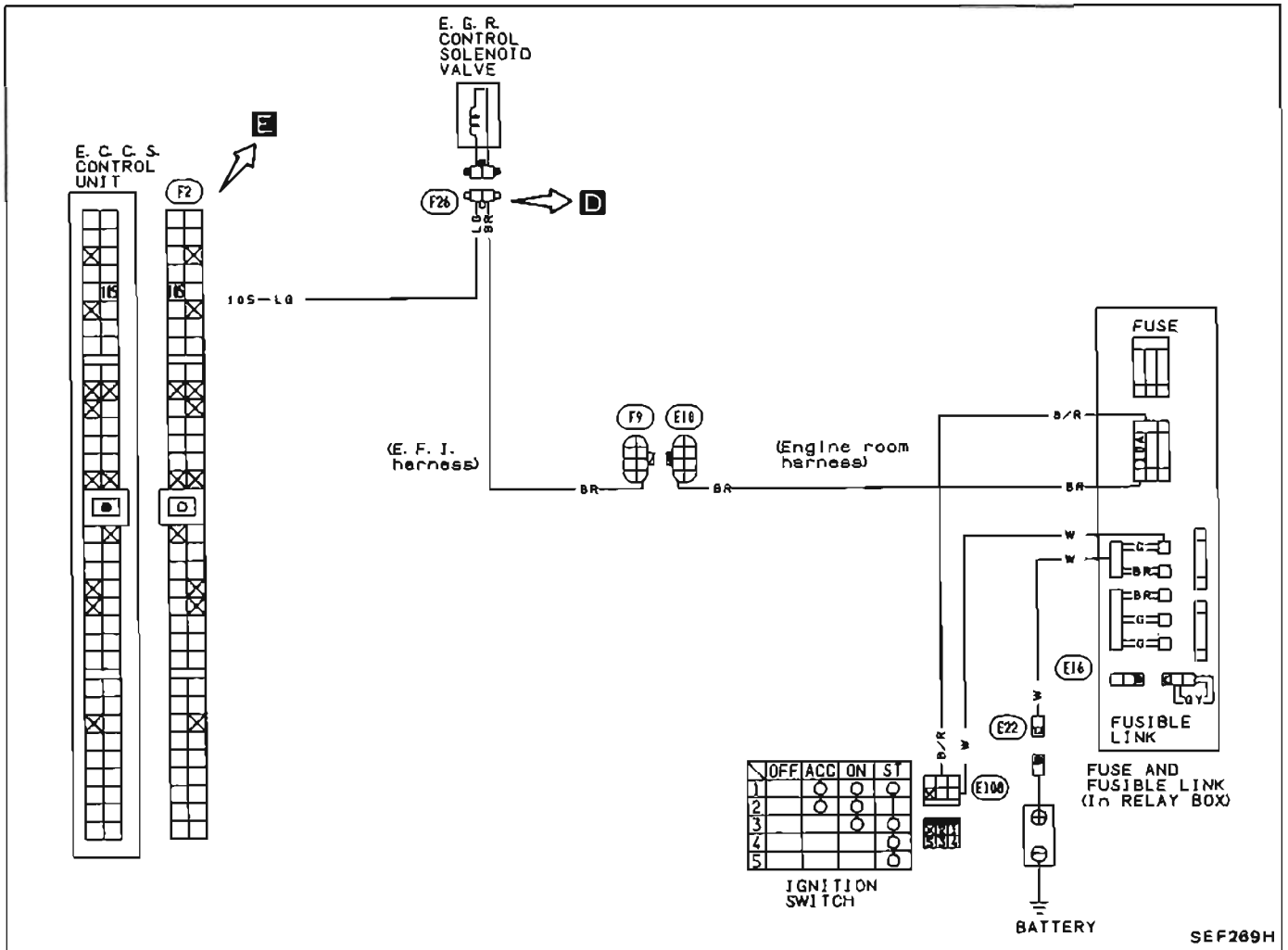
TROUBLE DIAGNOSES

NOTE

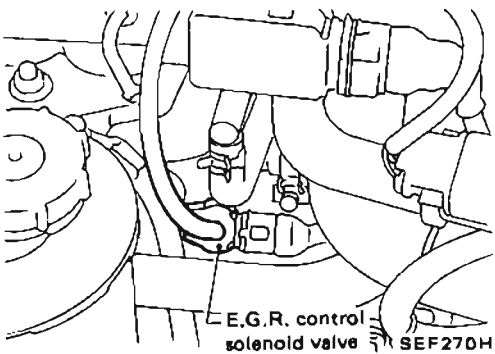
TROUBLE DIAGNOSES

Diagnostic Procedure 8

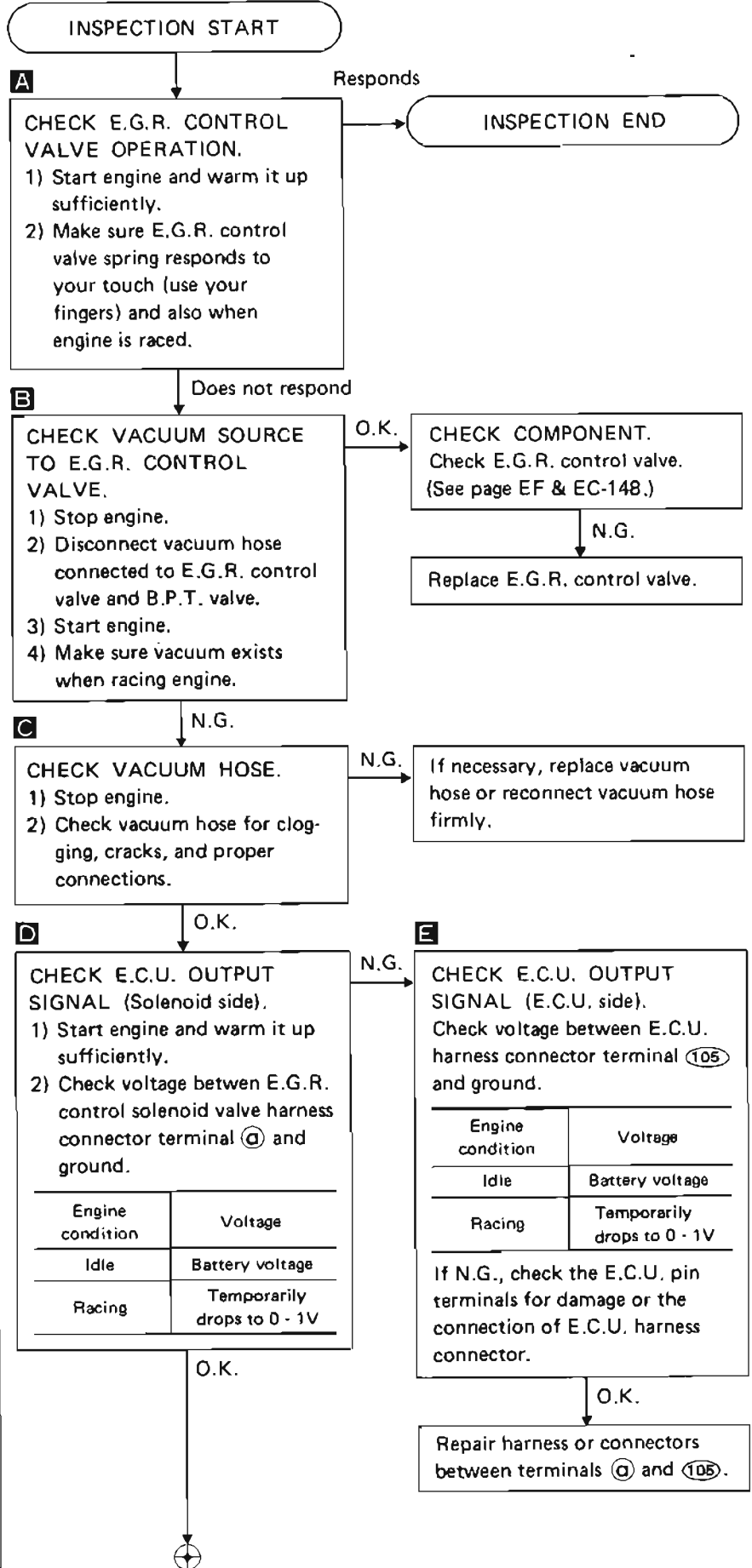
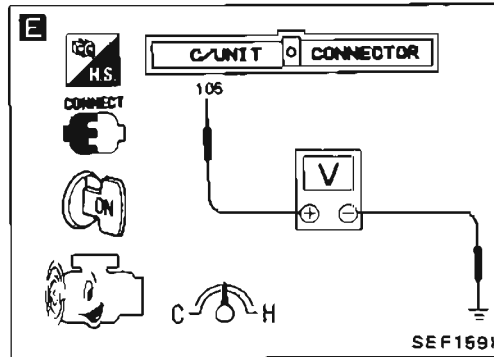
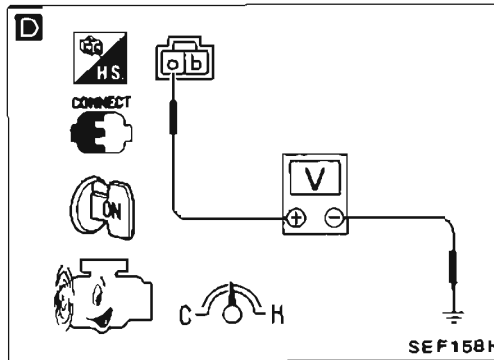
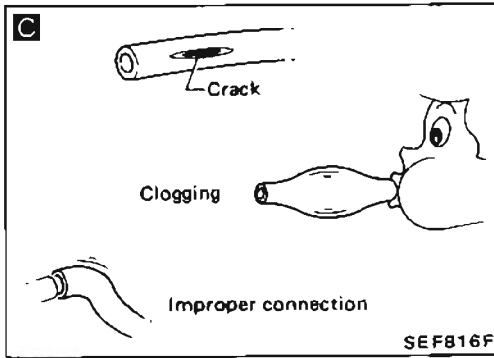
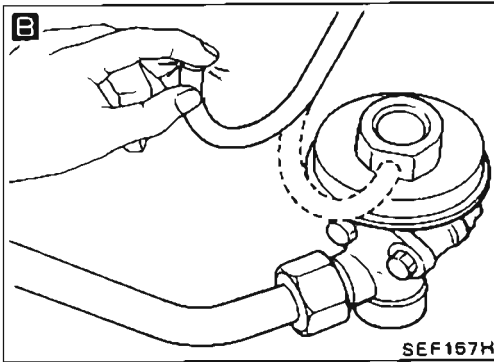
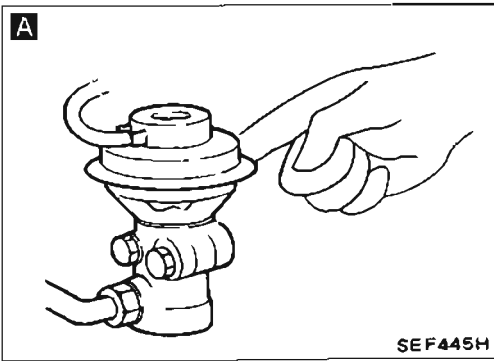
E.G.R. FUNCTION (Code No. 32)  [Not self-diagnostic item (For non-California models)]



Component location



TROUBLE DIAGNOSES



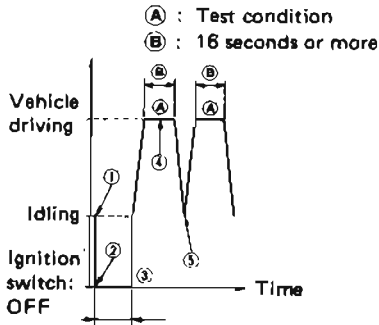
F

Test condition

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

- Engine speed:
3,100±300 rpm (A/T)
3,000±400 rpm (M/T)
- Intake manifold vacuum:
-42.7±8.0 kPa
(-320±60 mmHg, -12.60±2.38 inHg)

Driving mode

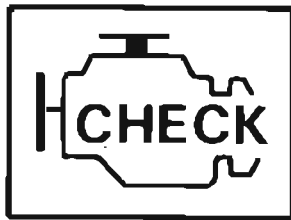


Until green and red inspection lamps go off.

- ① Start engine and warm it up sufficiently.
- ② Turn off ignition switch and keep it off until green and red inspection lamps go off.
- ③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
- ④ Shift to suitable gear position and drive in "Test condition" for at least 16 seconds.
- ⑤ Decrease engine revolution to less than 2,000 rpm.
- ⑥ Repeat steps ④ through ⑤ at least 1 time.

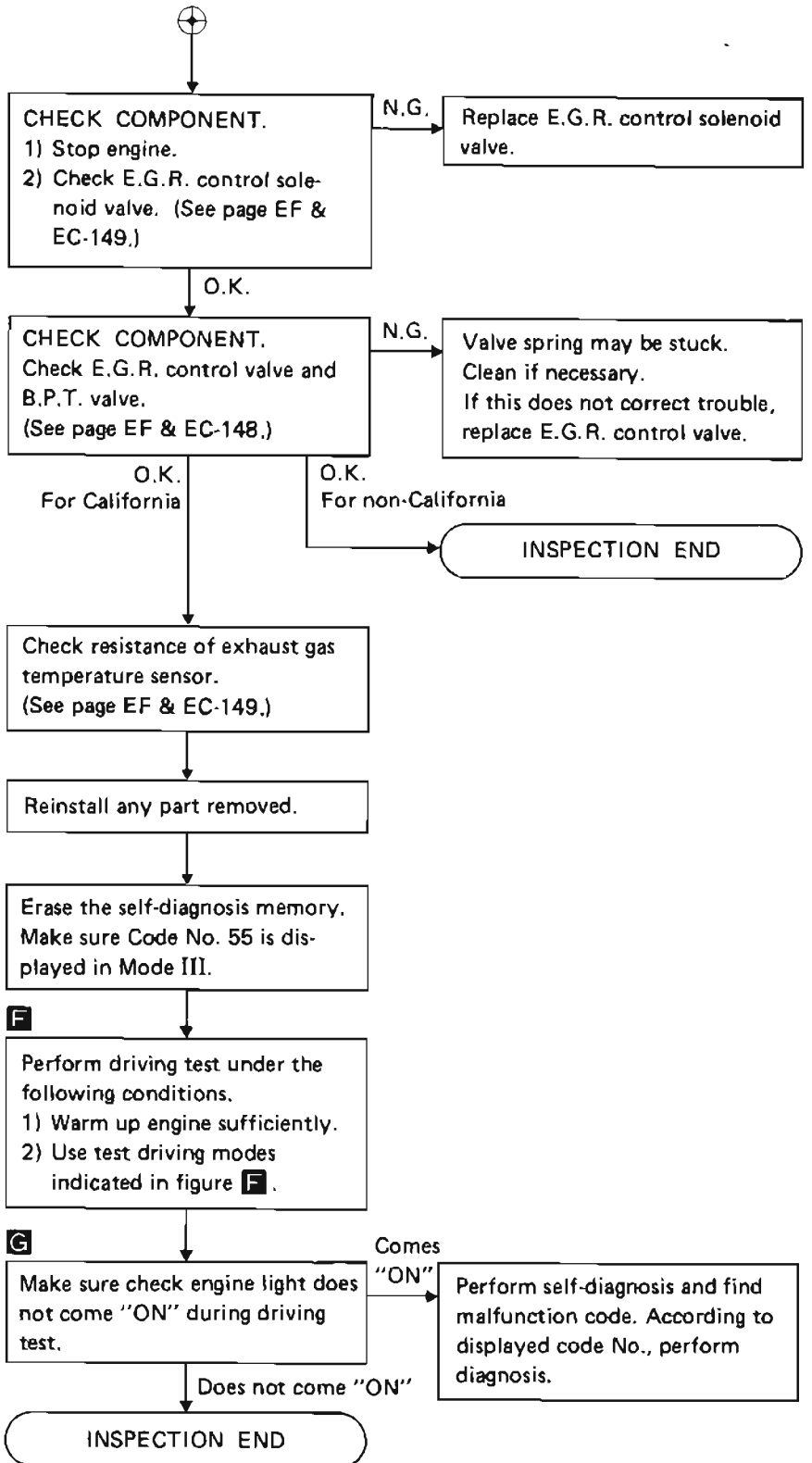
SEF037H

G



CHECK ENGINE LIGHT

SEF924F

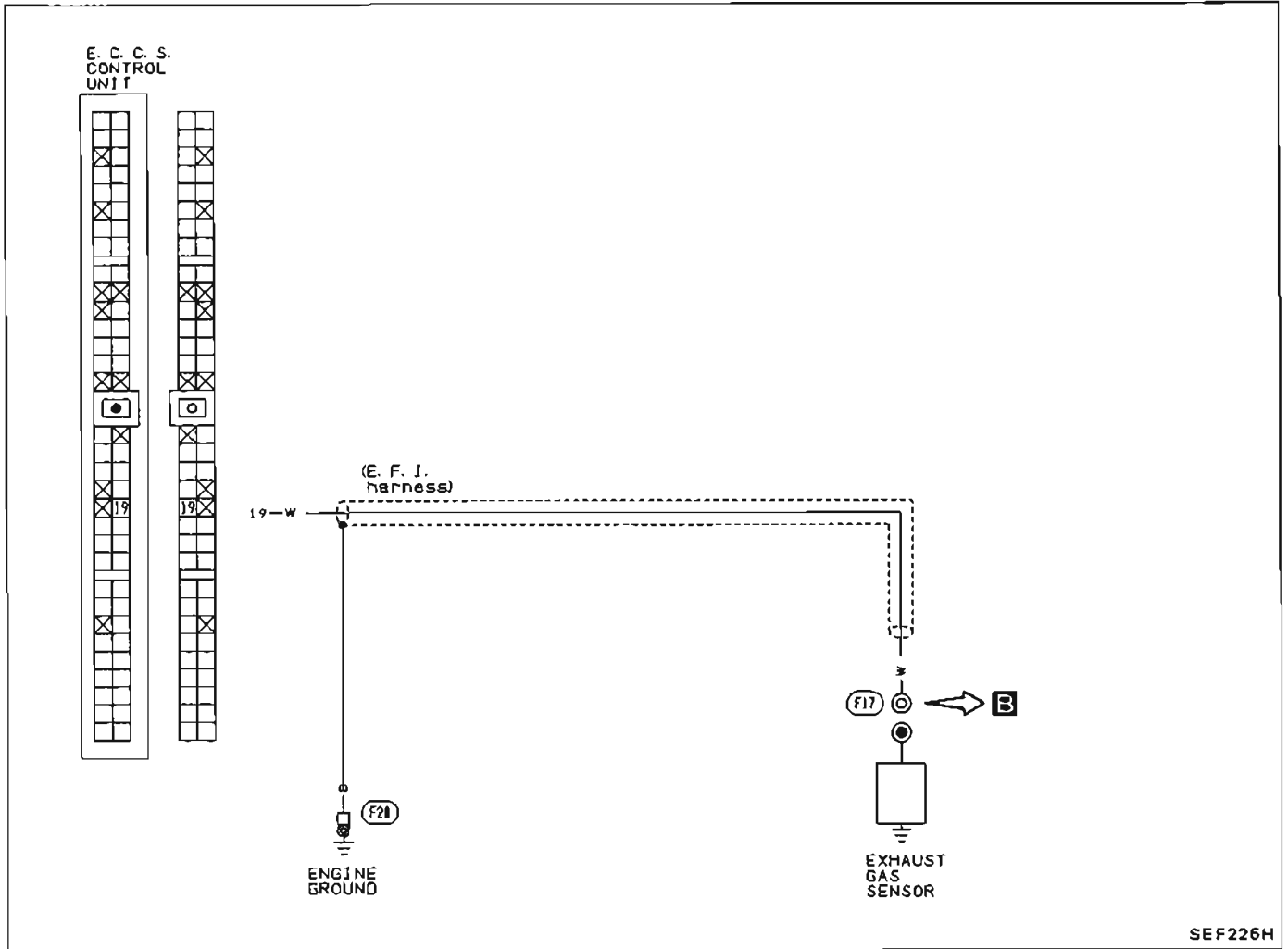


TROUBLE DIAGNOSES

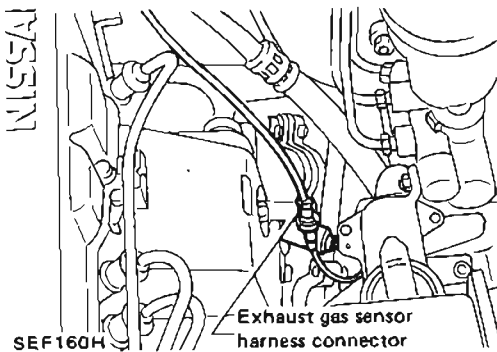
NOTE

Diagnostic Procedure 9

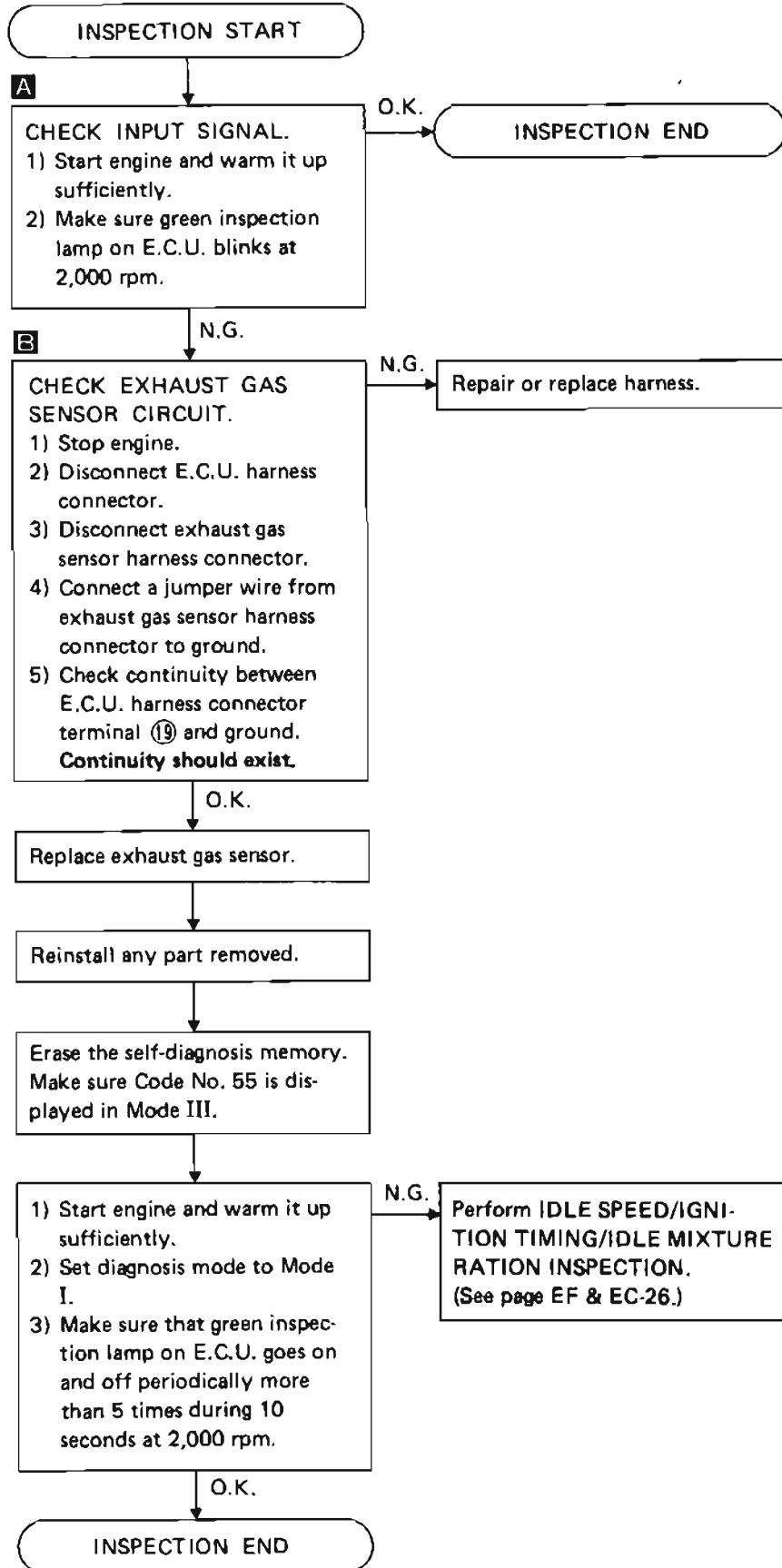
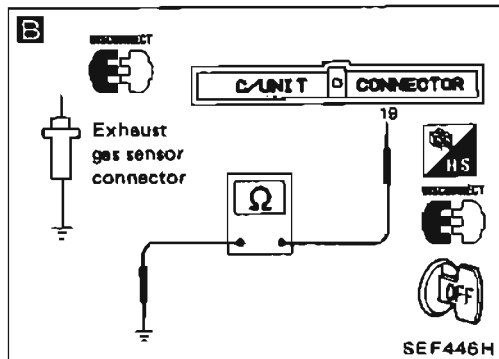
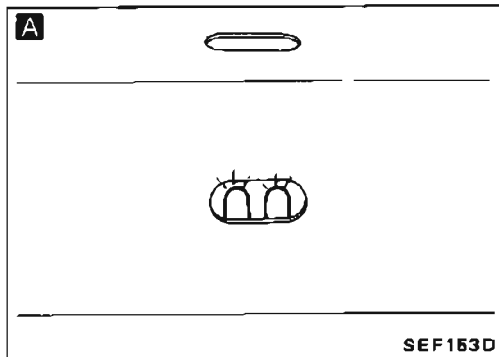
EXHAUST GAS SENSOR (Code No. 33)



Component location

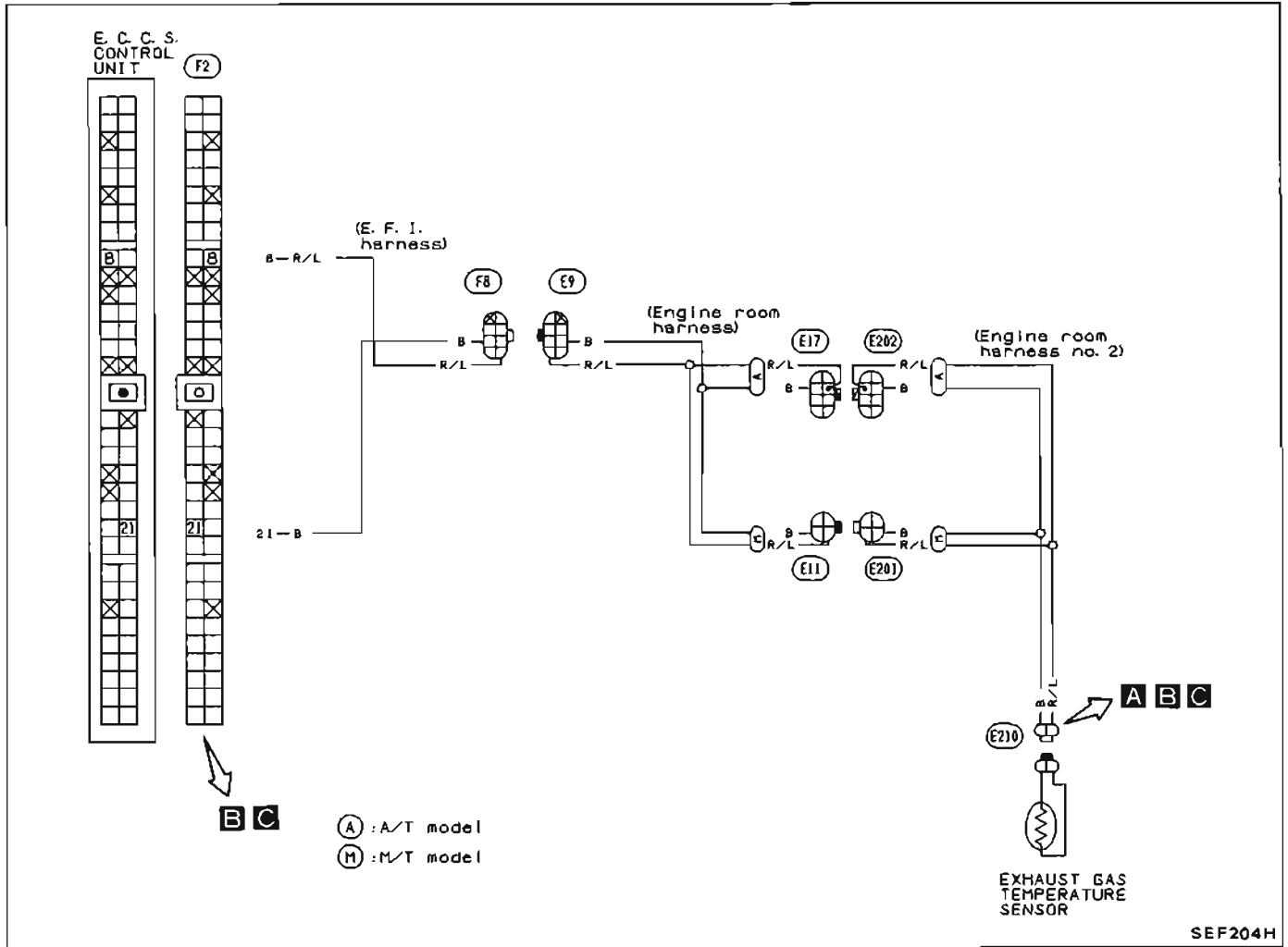


TROUBLE DIAGNOSES



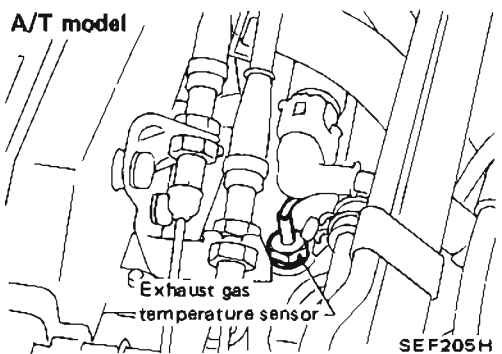
Diagnostic Procedure 10

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) CHECK

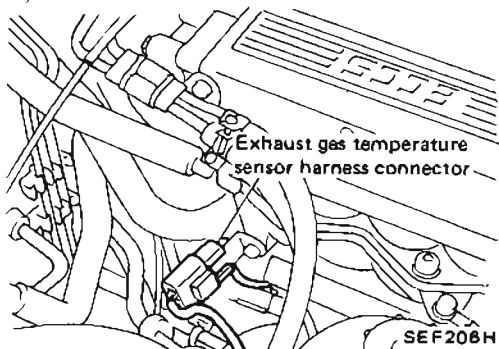
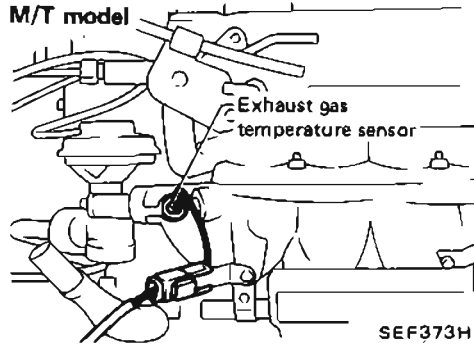


Component location

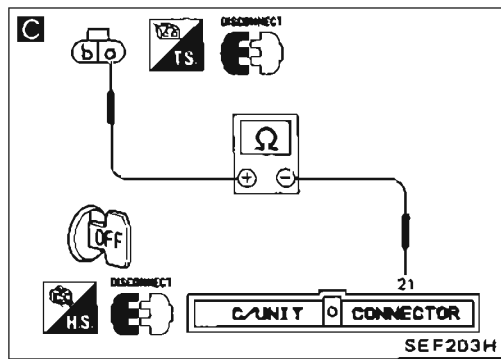
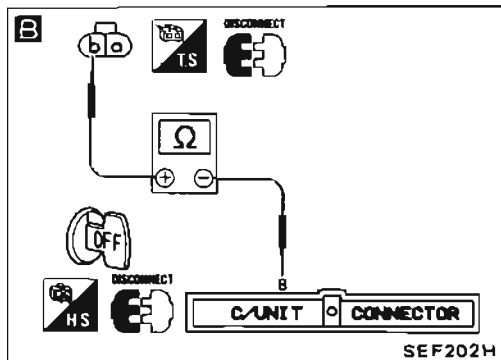
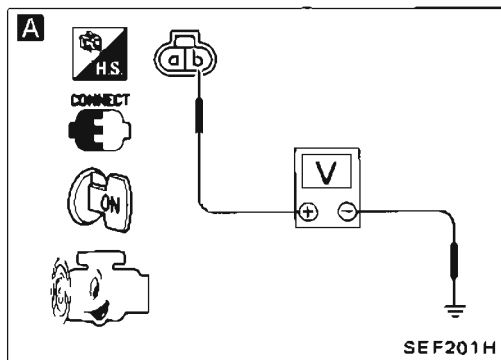
A/T model



M/T model



TROUBLE DIAGNOSES



INSPECTION START

A

CHECK INPUT SIGNAL
(Exhaust gas temperature sensor side).

- 1) Start engine and warm it up sufficiently.
- 2) Keep engine speed at approximately 2,000 rpm.
- 3) Check voltage between exhaust gas temperature sensor harness connector terminal (b) and ground under the following conditions.

| Condition | Voltage |
|--|------------|
| When vacuum is not applied to E.G.R. control valve | 1.0 - 2.0V |
| When vacuum is applied to E.G.R. control valve | 0 - 1.0V |

A sufficient vacuum applied with a hand vacuum pump may cause the engine to stall.

O.K. → ⊕ ⊕

B

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND EXHAUST GAS TEMPERATURE SENSOR.

- 1) Stop engine.
- 2) Disconnect E.C.U. harness connector.
- 3) Disconnect exhaust gas temperature sensor harness connector.
- 4) Check continuity between terminals (b) and (8).
Continuity should exist.

N.G. →

- 1) Check harness and middle harness connector connection between terminals (b) and (8).
- 2) If necessary, repair or replace harness.

C

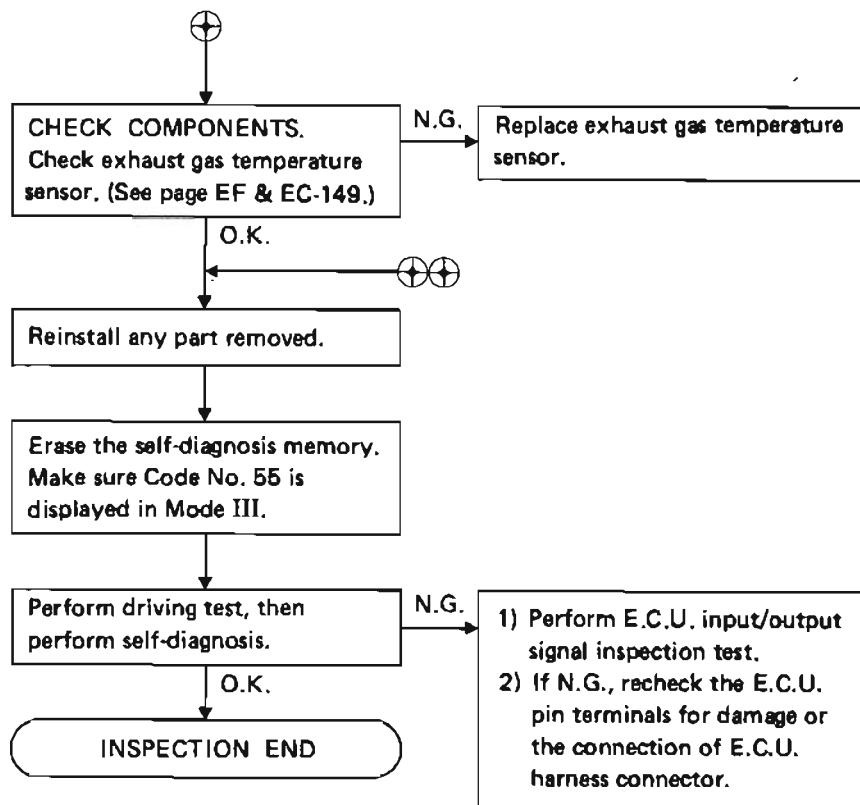
CHECK GROUND CIRCUIT.
Check continuity between terminals (a) and (21).
Continuity should exist.

N.G. →

- 1) Check middle harness connector connection.
- 2) If necessary, repair or replace harness.

O.K. → ⊕ ⊕

TROUBLE DIAGNOSES



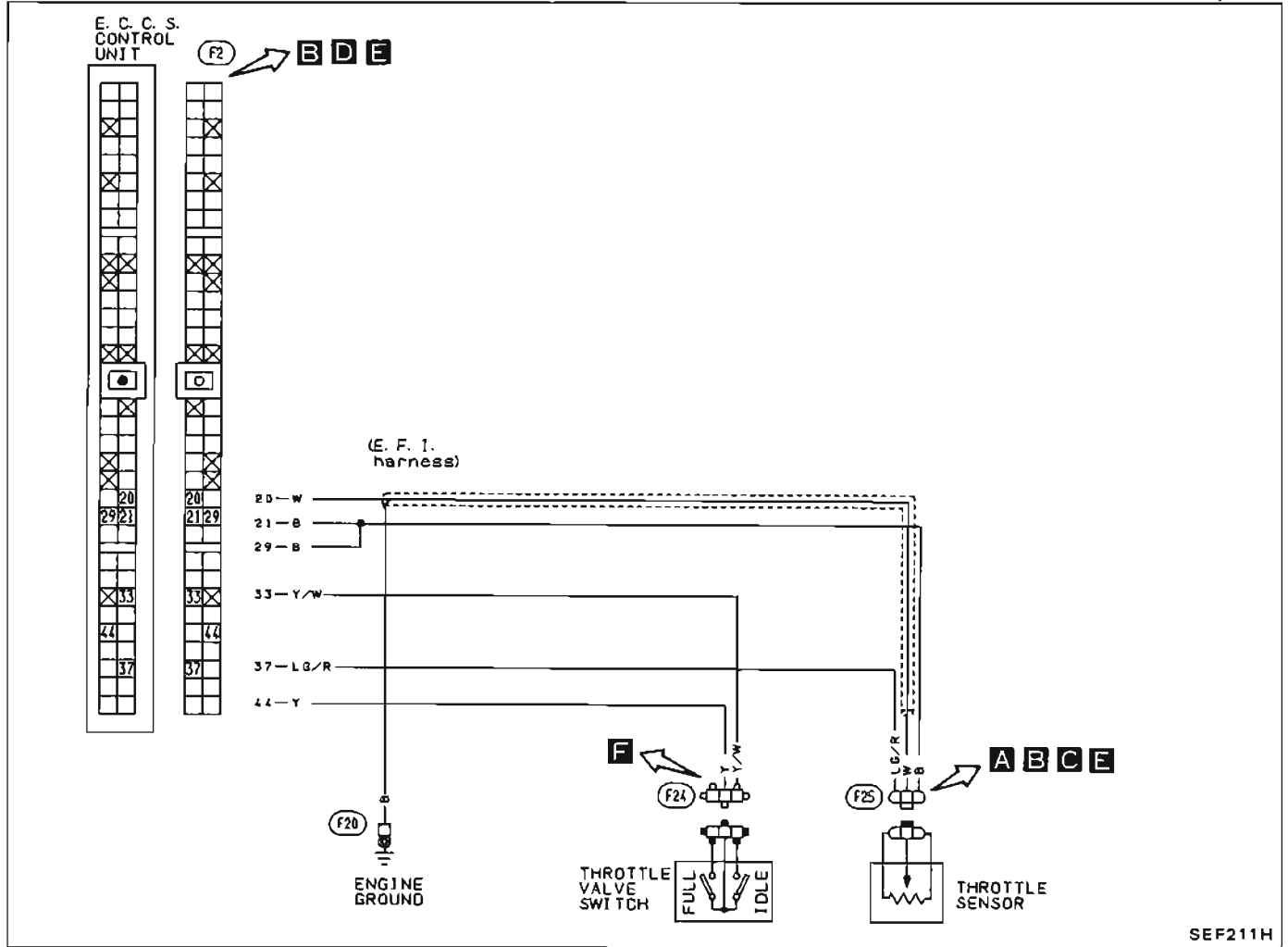
TROUBLE DIAGNOSES

NOTE

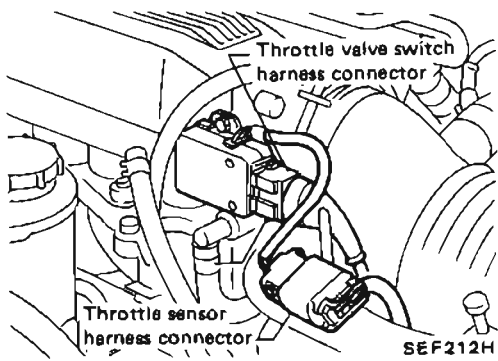
TROUBLE DIAGNOSES

Diagnostic Procedure 11

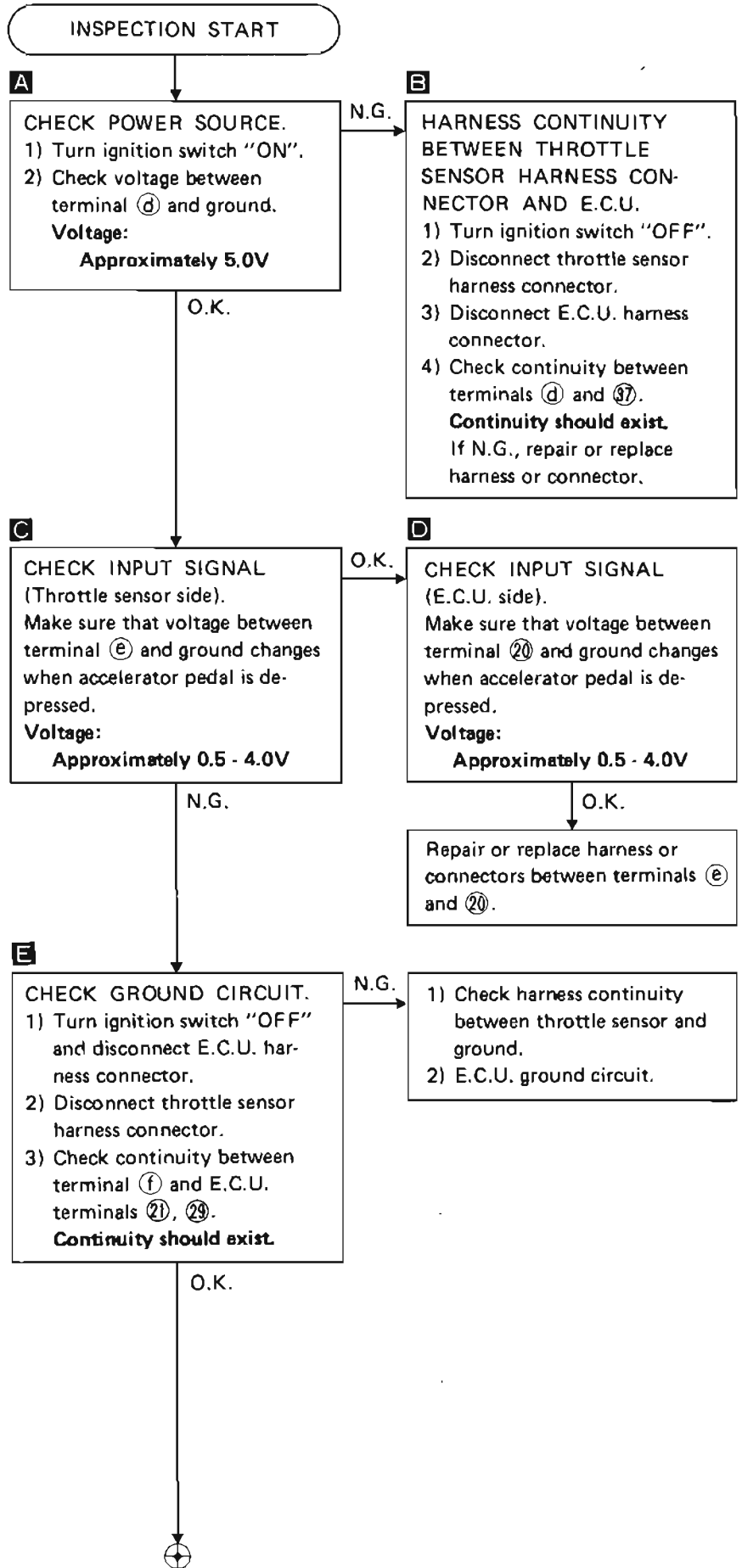
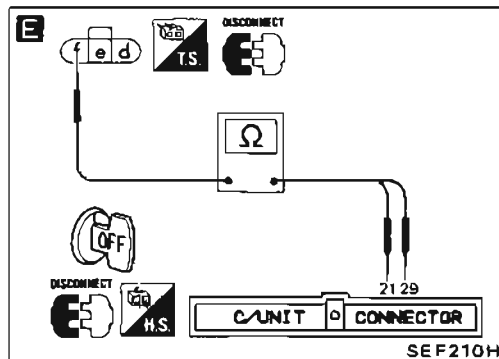
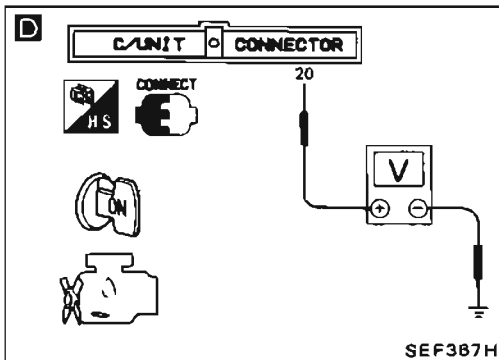
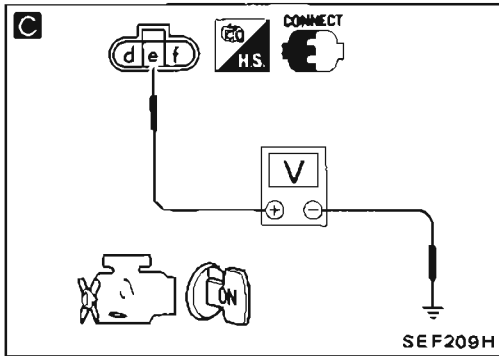
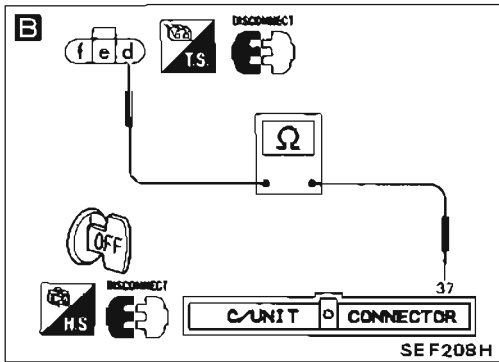
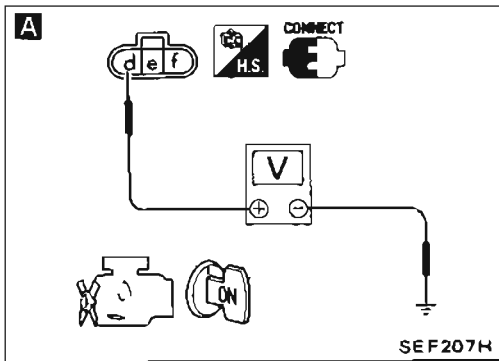
THROTTLE SENSOR (Code No. 43)



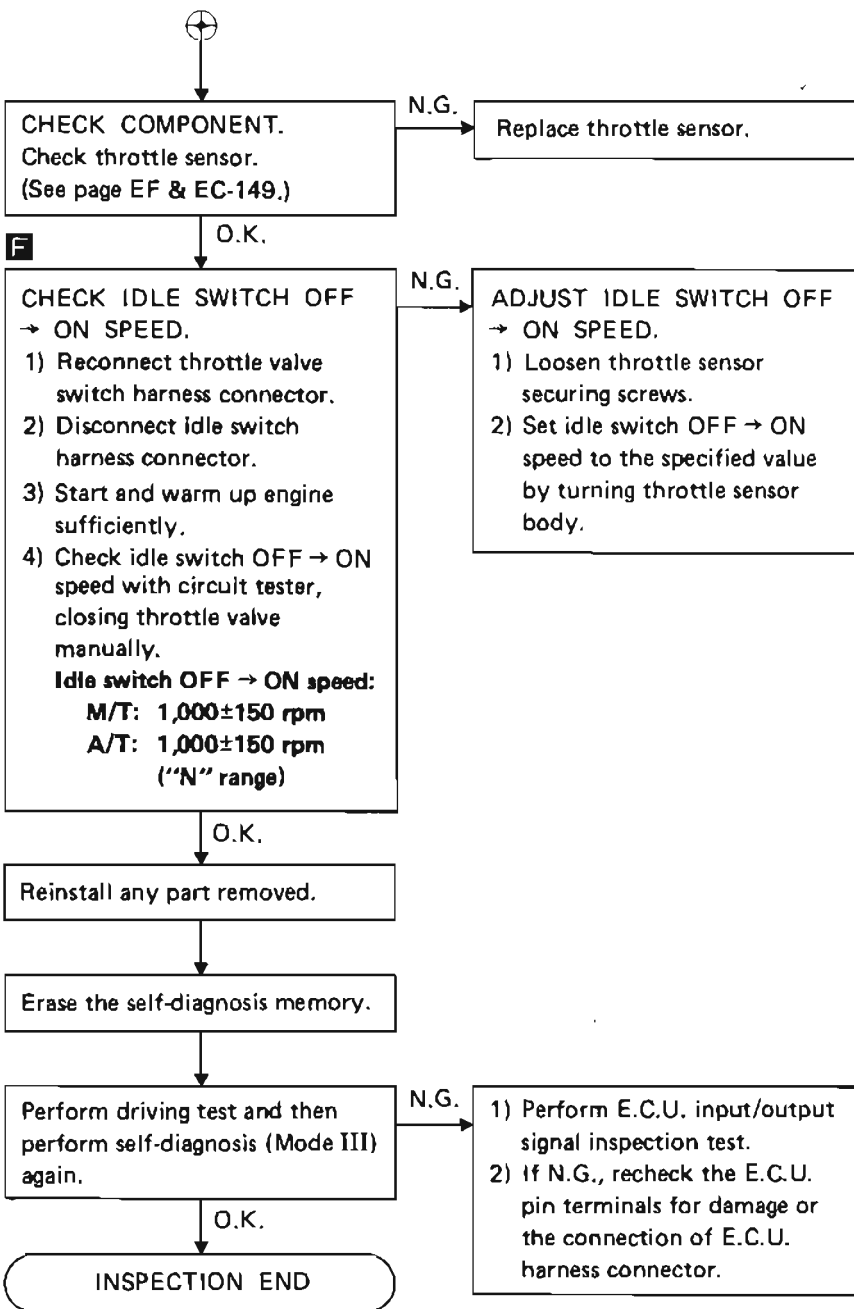
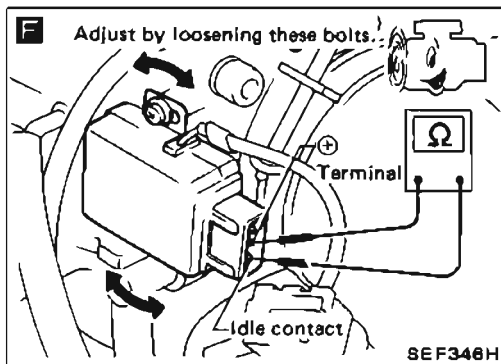
Component location



TROUBLE DIAGNOSES



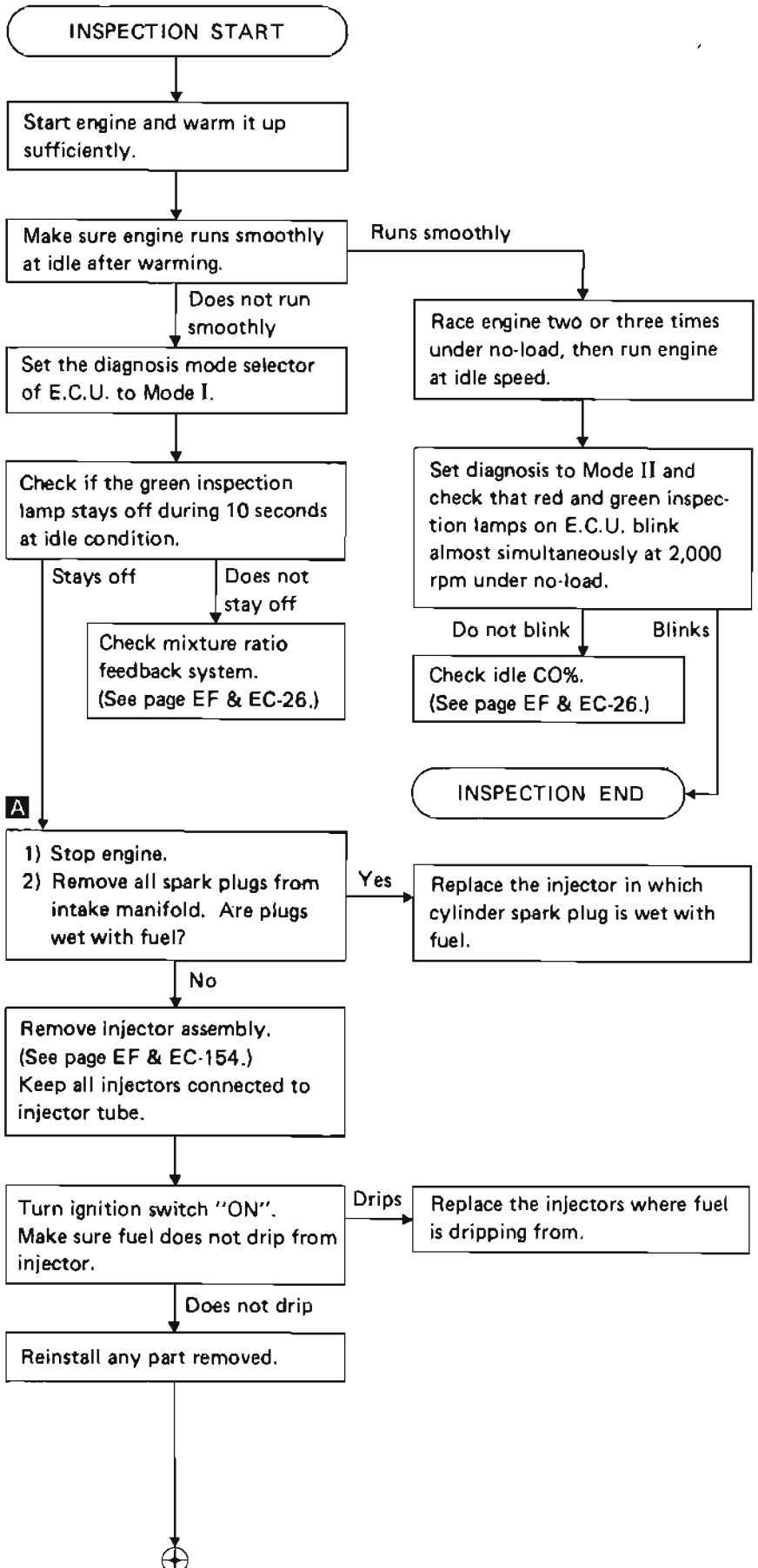
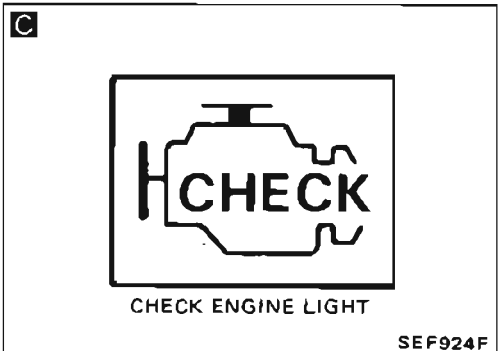
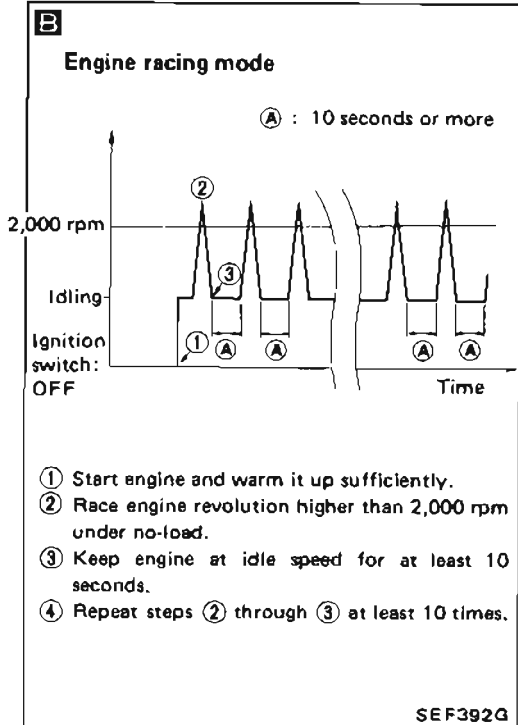
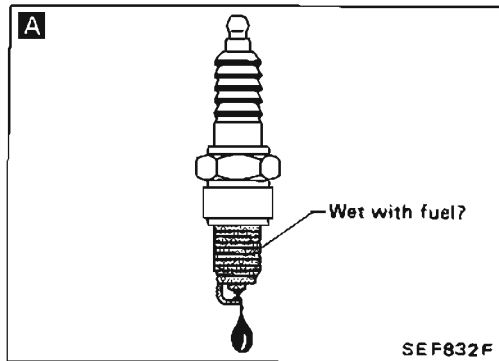
TROUBLE DIAGNOSES



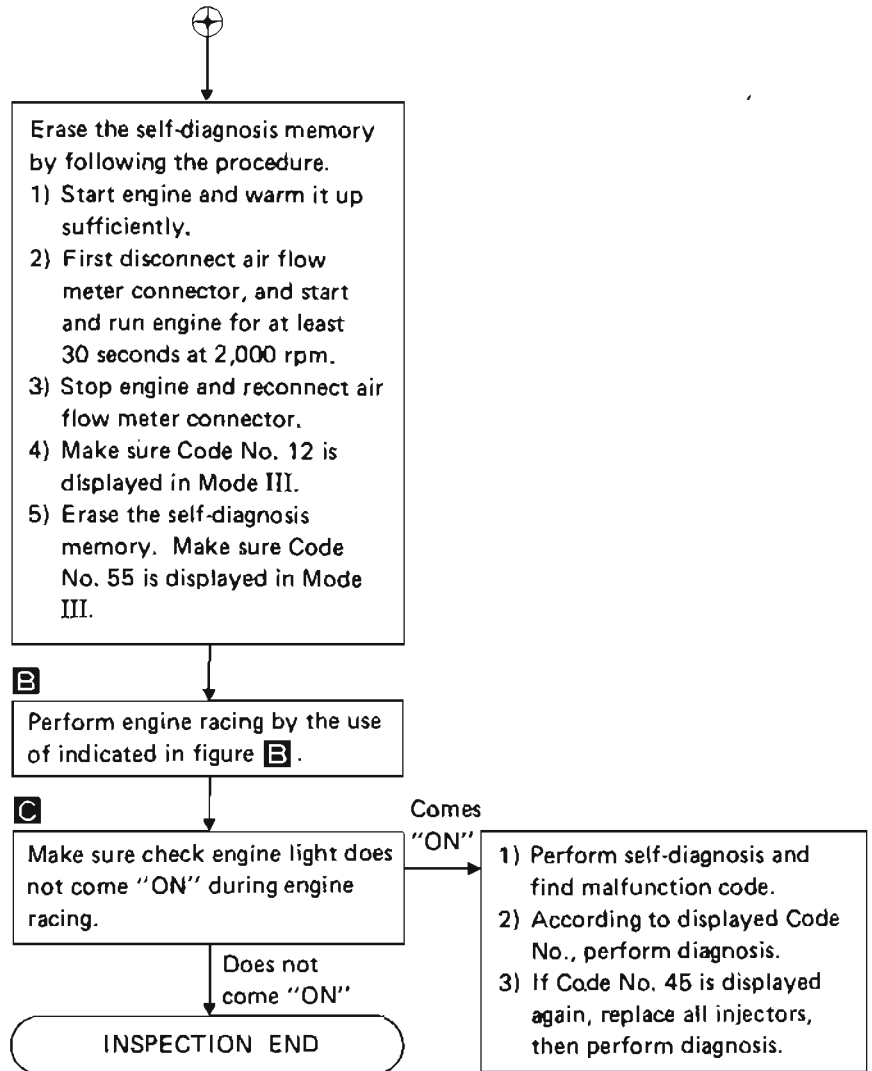
NOTE

INJECTOR LEAK (Code No. 45)

Diagnostic Procedure 12

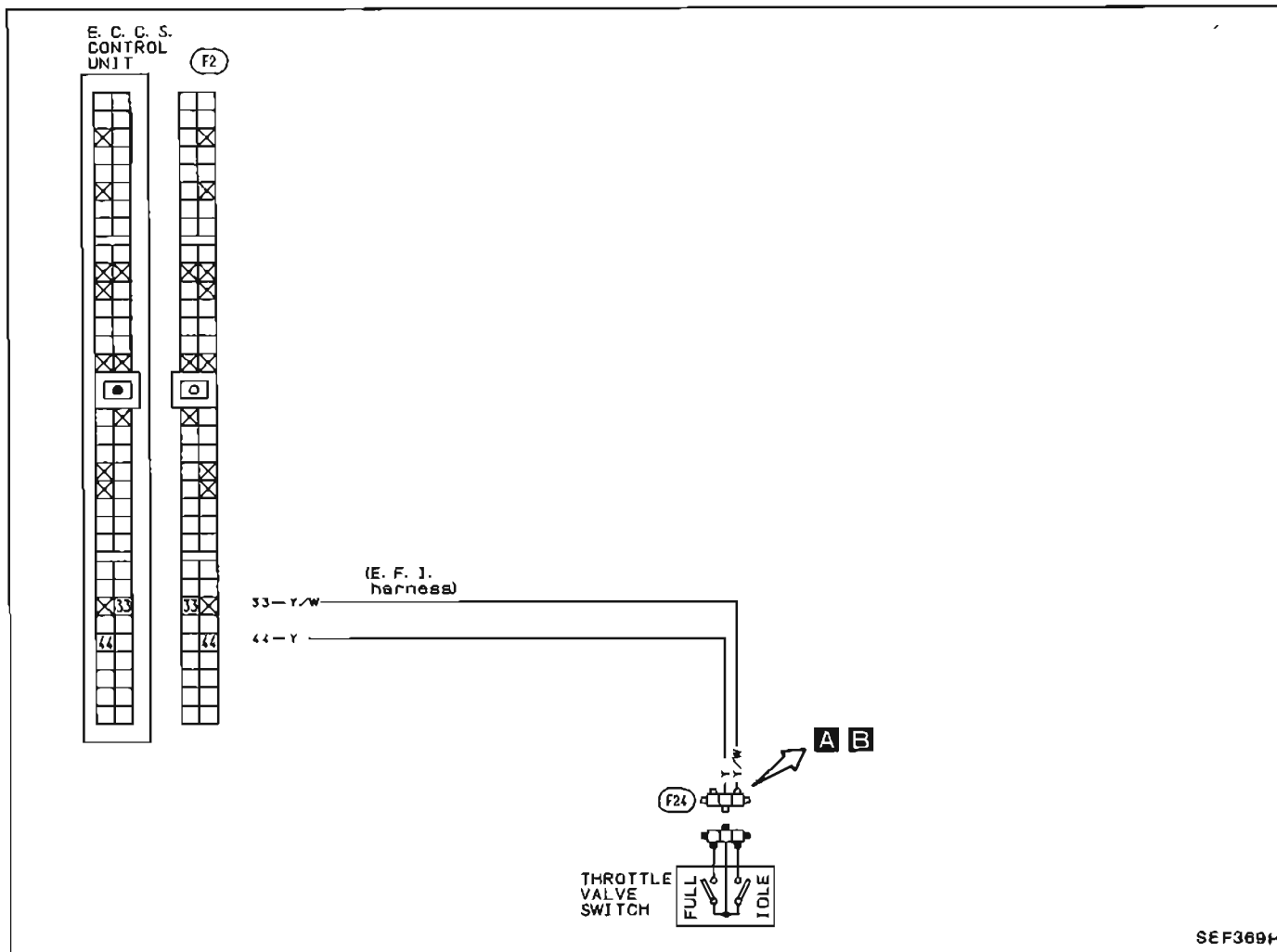


TROUBLE DIAGNOSES

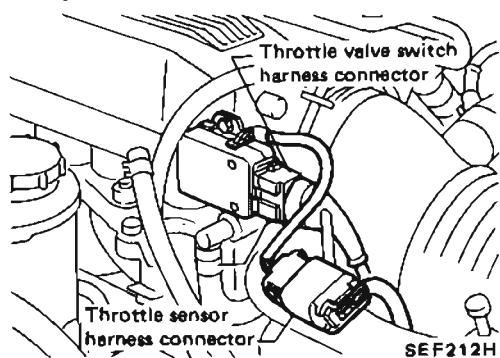


Diagnostic Procedure 13

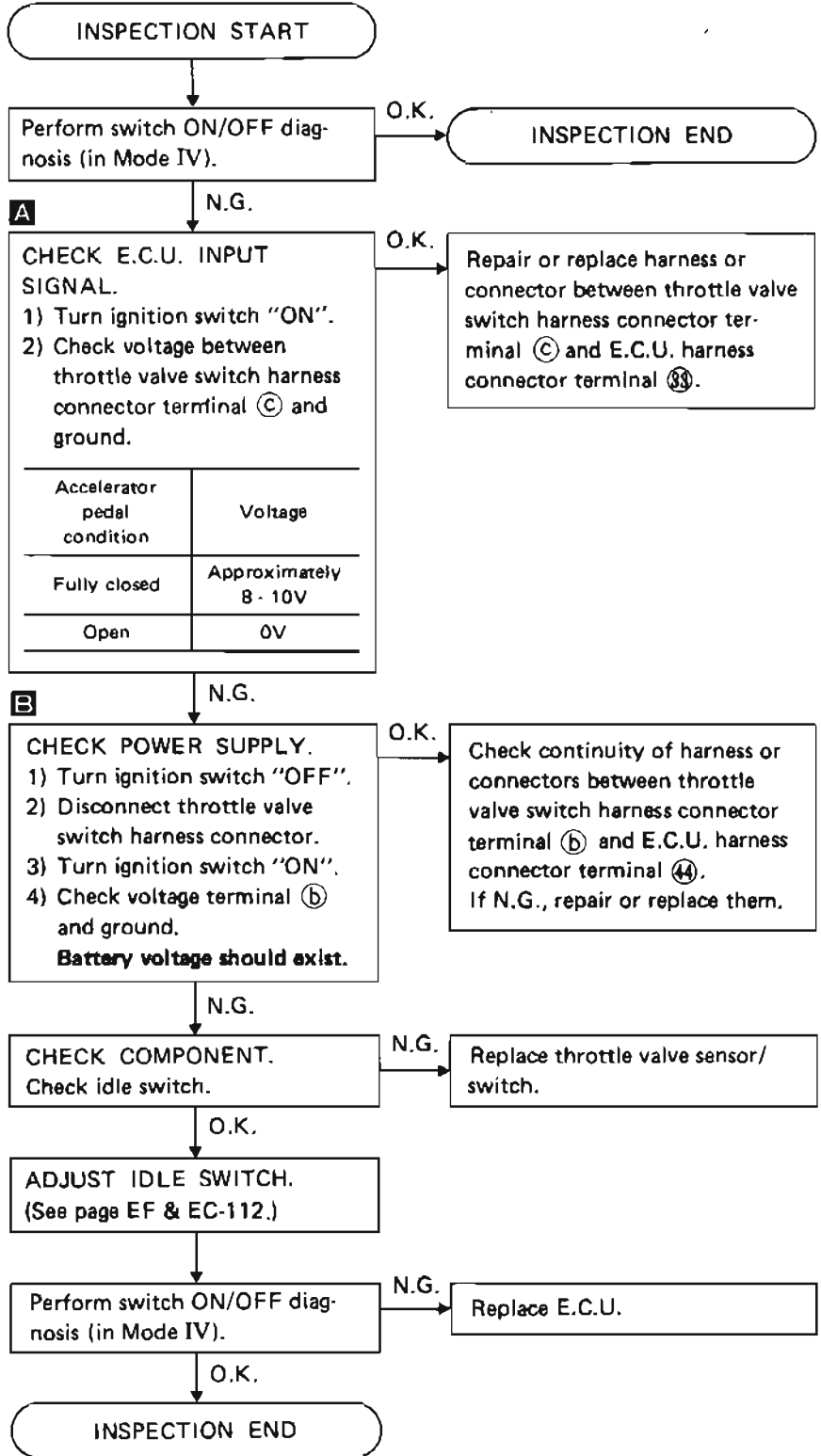
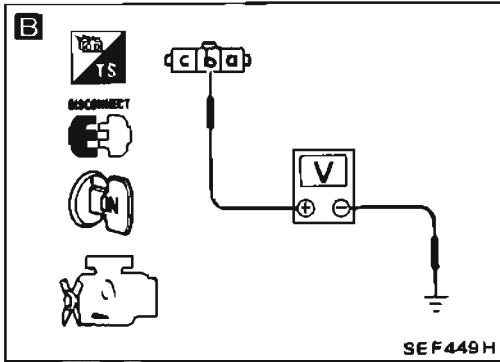
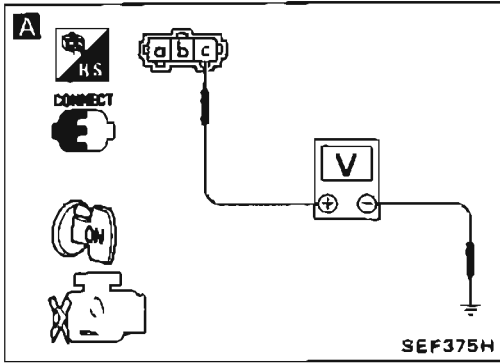
IDLE SWITCH (Switch ON/OFF diagnostic item)



Component location



TROUBLE DIAGNOSES

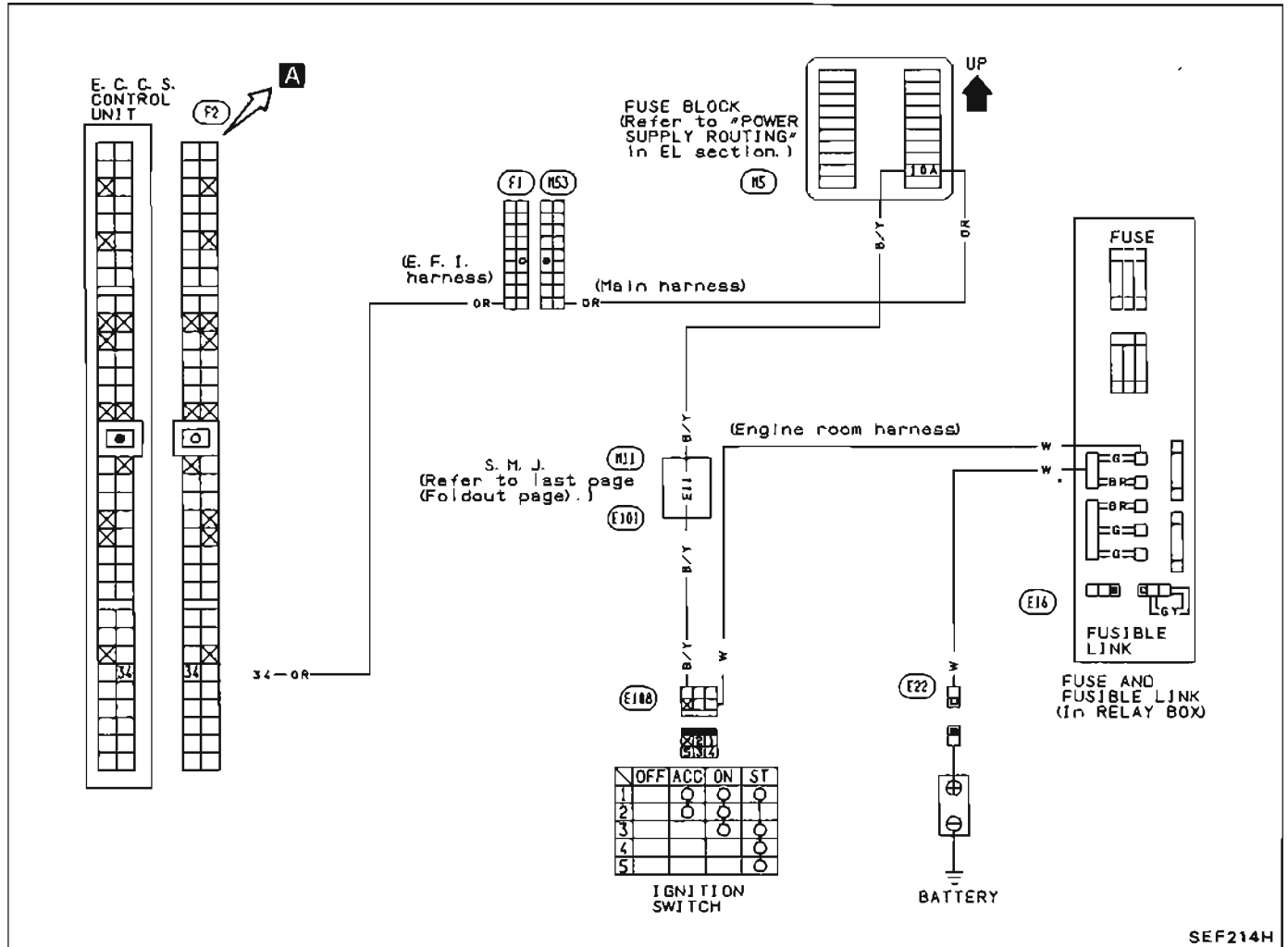


| Accelerator pedal condition | Voltage |
|-----------------------------|-----------------------|
| Fully closed | Approximately 8 - 10V |
| Open | 0V |

TROUBLE DIAGNOSES

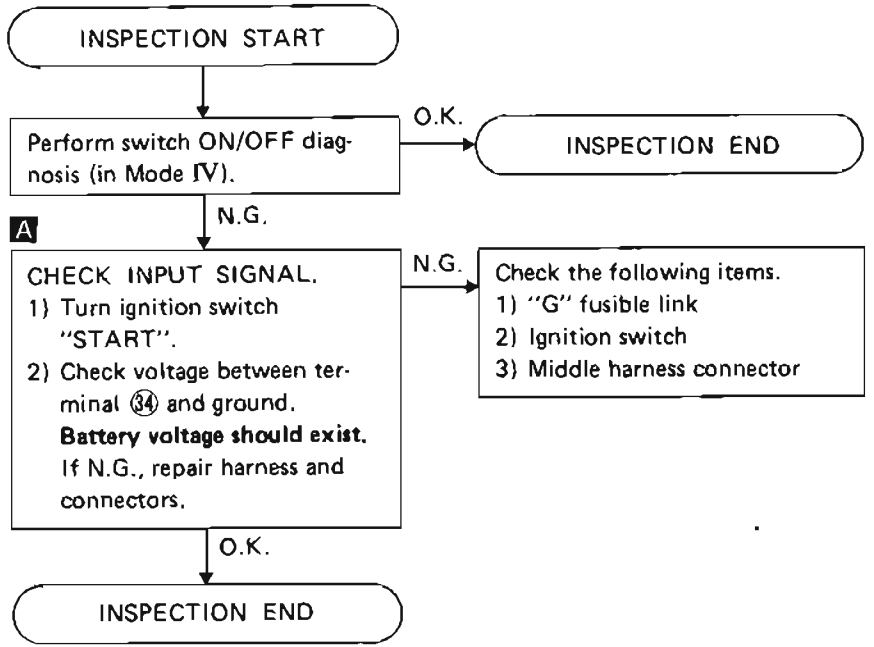
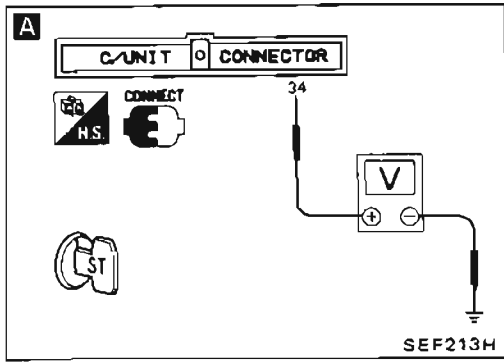
Diagnostic Procedure 14

START SIGNAL (Switch ON/OFF diagnostic item)



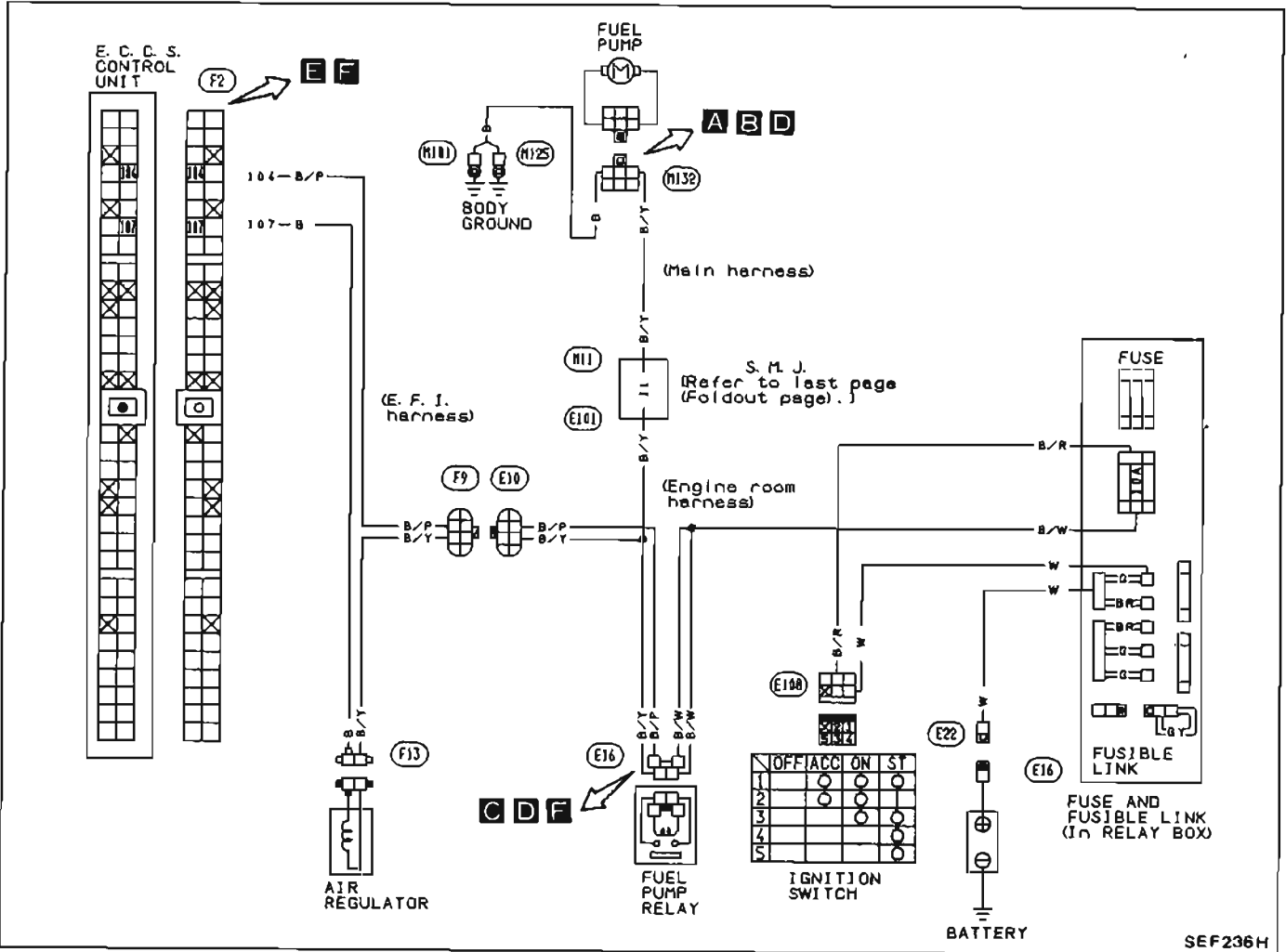
SEF214H

TROUBLE DIAGNOSES



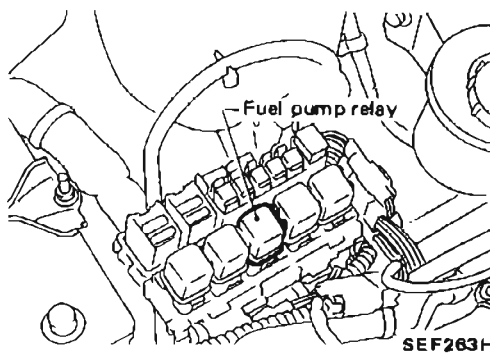
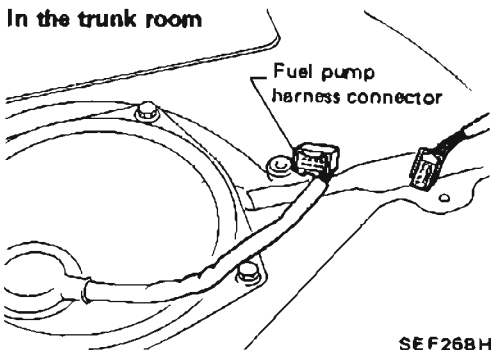
Diagnostic Procedure 15

FUEL PUMP (Not self-diagnostic item)

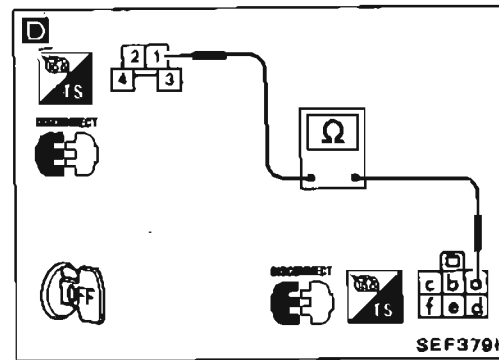
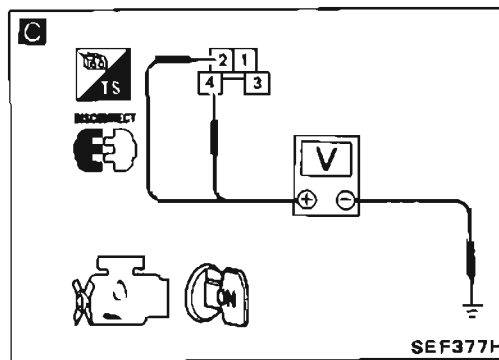
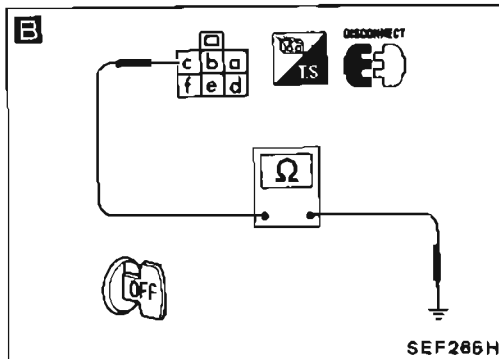
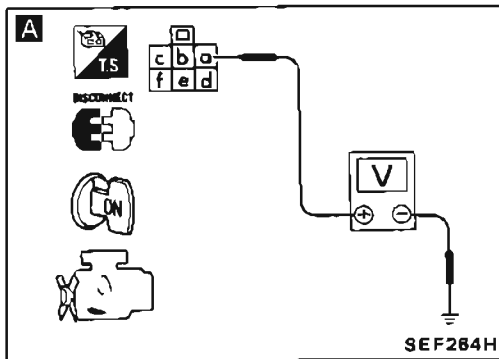


Component location

In the trunk room



TROUBLE DIAGNOSES



INSPECTION START

A

CHECK POWER SUPPLY
(Fuel pump side).

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

Battery voltage indication should appear for 5 seconds after turning ignition switch "ON".

O.K. →

CHECK COMPONENTS.

- 1) Turn ignition "OFF".
- 2) Check fuel pump.
(See page EF & EC-149.)

If N.G., replace fuel pump.

O.K. ↓

B

CHECK GROUND CIRCUIT.
Check continuity between terminal **Ⓒ** and ground.

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

N.G. ↓

C

CHECK POWER SUPPLY
(Relay side).

- 1) Turn ignition switch "OFF".
- 2) Disconnect fuel pump relay.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminals **Ⓐ** and **Ⓒ** and ground.

Battery voltage should exist.

N.G. →

CHECK HARNESS CONTINUITY BETWEEN BATTERY AND FUEL PUMP RELAY.

Check following.

- Harness or connectors
- "BR" fusible link

O.K. ↓

CHECK COMPONENTS.

- 1) Turn ignition "OFF".
- 2) Check fuel pump relay.
(See page EF & EC-150.)

N.G. →

Replace fuel pump relay.

O.K. ↓

D

CHECK HARNESS CONTINUITY.
Check continuity between relay harness connector terminal **Ⓐ** and fuel pump harness connector terminal **Ⓒ**.

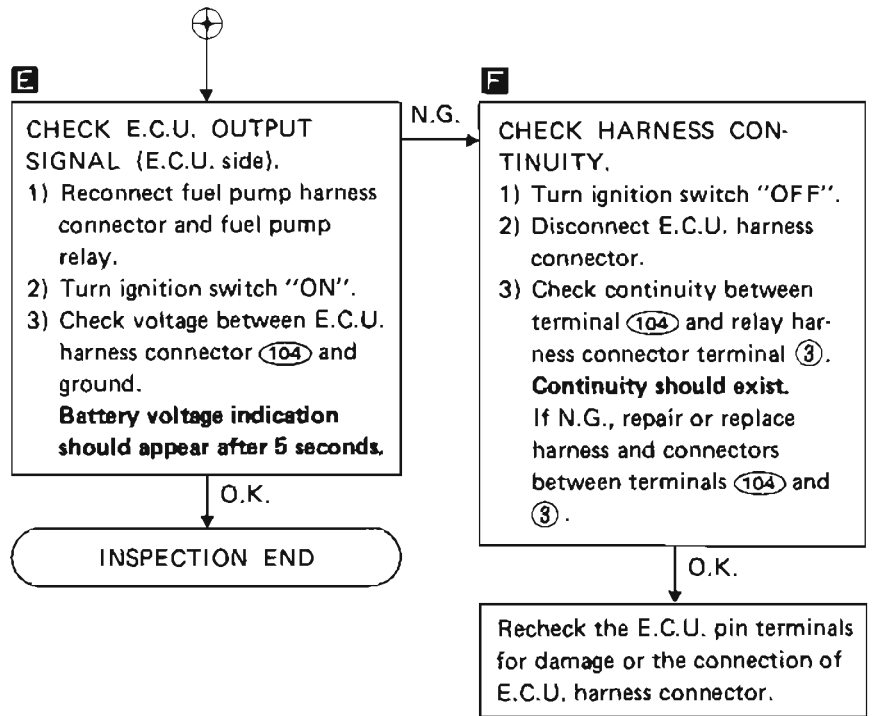
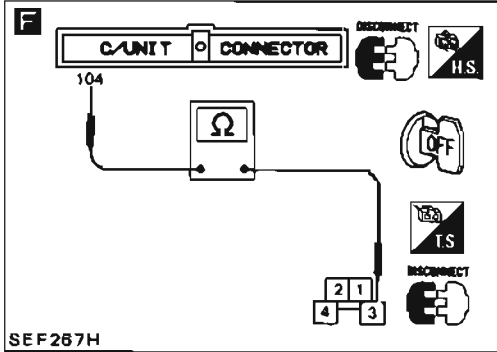
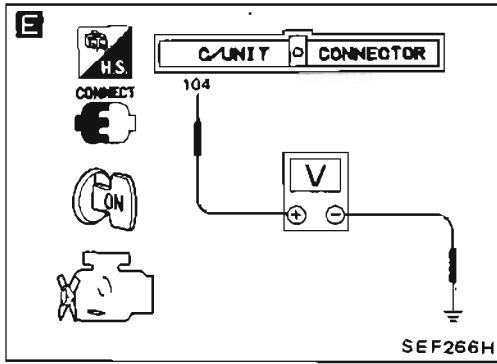
N.G. →

Repair or replace harness or connectors between terminals **Ⓐ** and **Ⓒ**.

O.K. ↓



TROUBLE DIAGNOSES



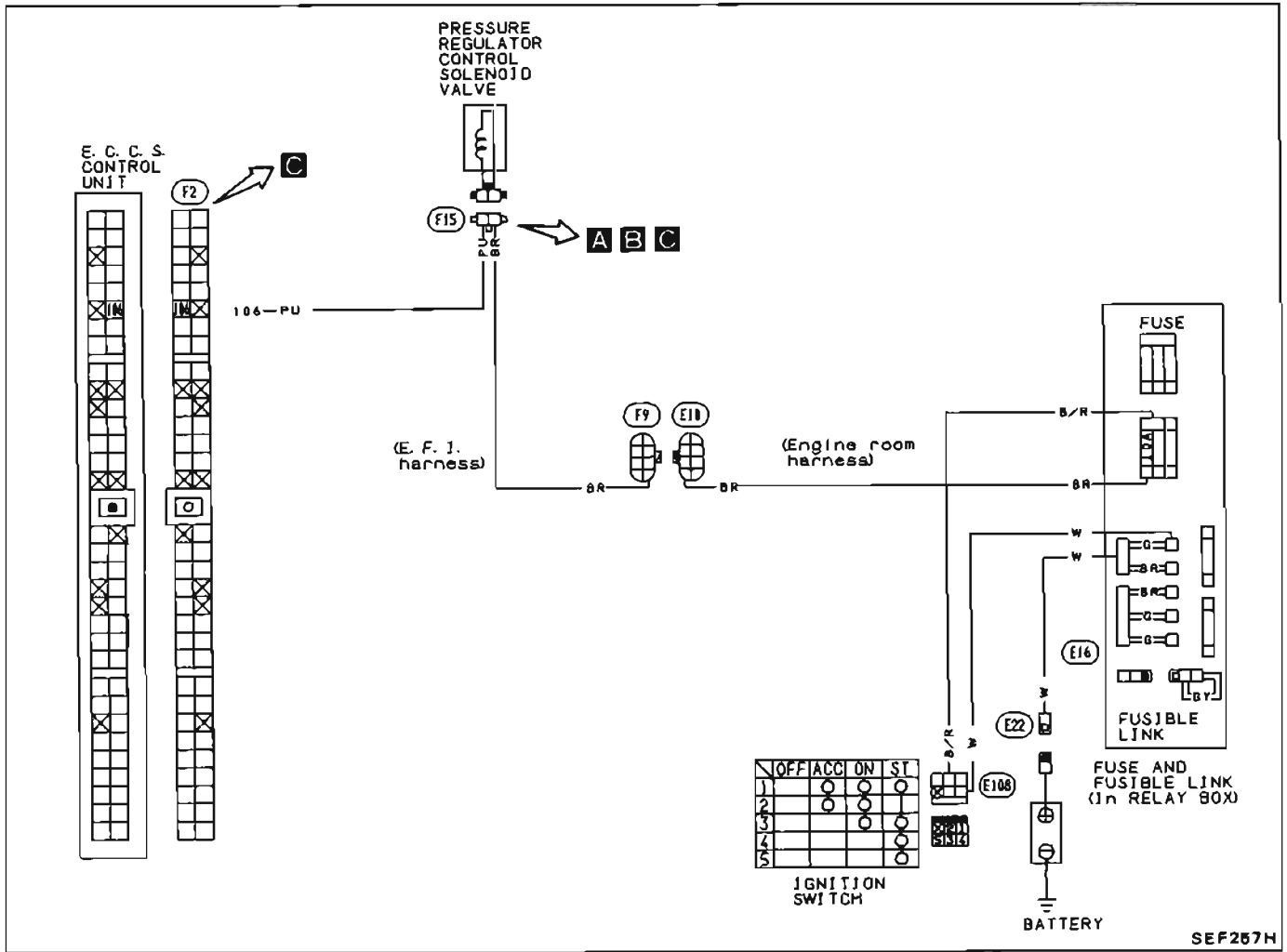
TROUBLE DIAGNOSES

NOTE

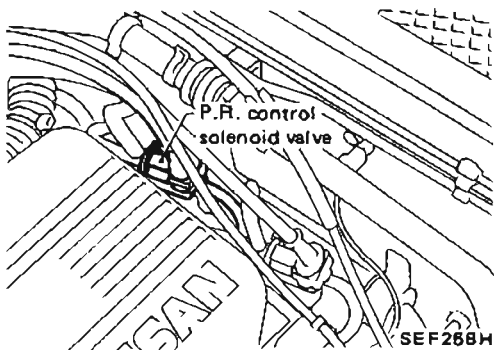
TROUBLE DIAGNOSES

Diagnostic Procedure 16

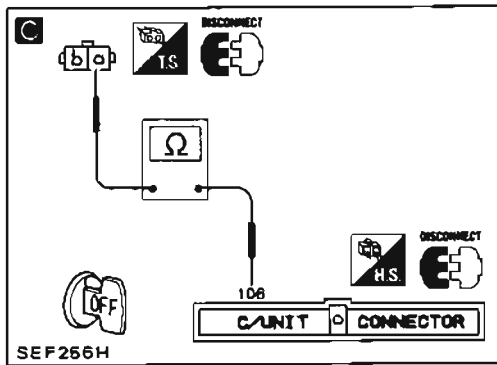
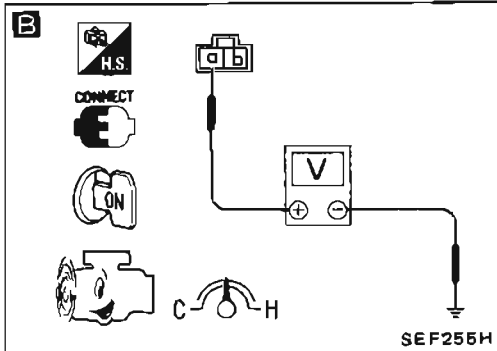
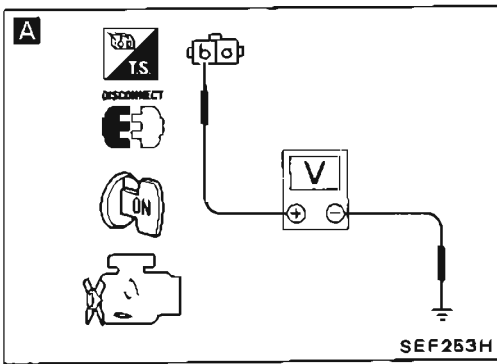
PRESSURE REGULATOR (P.R.) CONTROL SOLENOID VALVE (Not self-diagnostic item)



Component location



TROUBLE DIAGNOSES



INSPECTION START

A

CHECK POWER SOURCE.

- 1) Disconnect P.R. control solenoid valve harness connector.
- 2) Turn ignition switch "ON".
- 3) Check voltage between terminal (b) and ground.

Battery voltage should exist.

N.G.

CHECK HARNESS CONTINUITY BETWEEN P.R. CONTROL SOLENOID VALVE AND BATTERY.

Check following.

- Fuse
- Ignition switch
- Harness or connectors

O.K.

CHECK COMPONENTS.

- 1) Turn ignition switch "OFF".
- 2) Check P.R. control solenoid valve. (See page EF & EC-149.)

N.G.

Replace P.R. control solenoid valve.

O.K.

B

CHECK OUTPUT SIGNAL.

- 1) Reconnect P.R. control solenoid valve harness connector.
- 2) Start engine and warm it up sufficiently [until more than 90°C (194°F) of coolant temperature].
- 3) Turn ignition switch "OFF" and then start engine again.
- 4) Check voltage between terminals (a) and ground.

Voltage:

0.5 - 1.0V (for 3 minutes after starting)

N.G.

C

CHECK HARNESS CONTINUITY BETWEEN P.R. CONTROL SOLENOID VALVE AND E.C.U.

- 1) Stop engine.
- 2) Disconnect P.R. control solenoid valve harness connector.
- 3) Disconnect E.C.U. harness connector.
- 4) Check continuity between terminals (a) and (106).

Continuity should exist.

If N.G., repair harness or connector.

O.K.

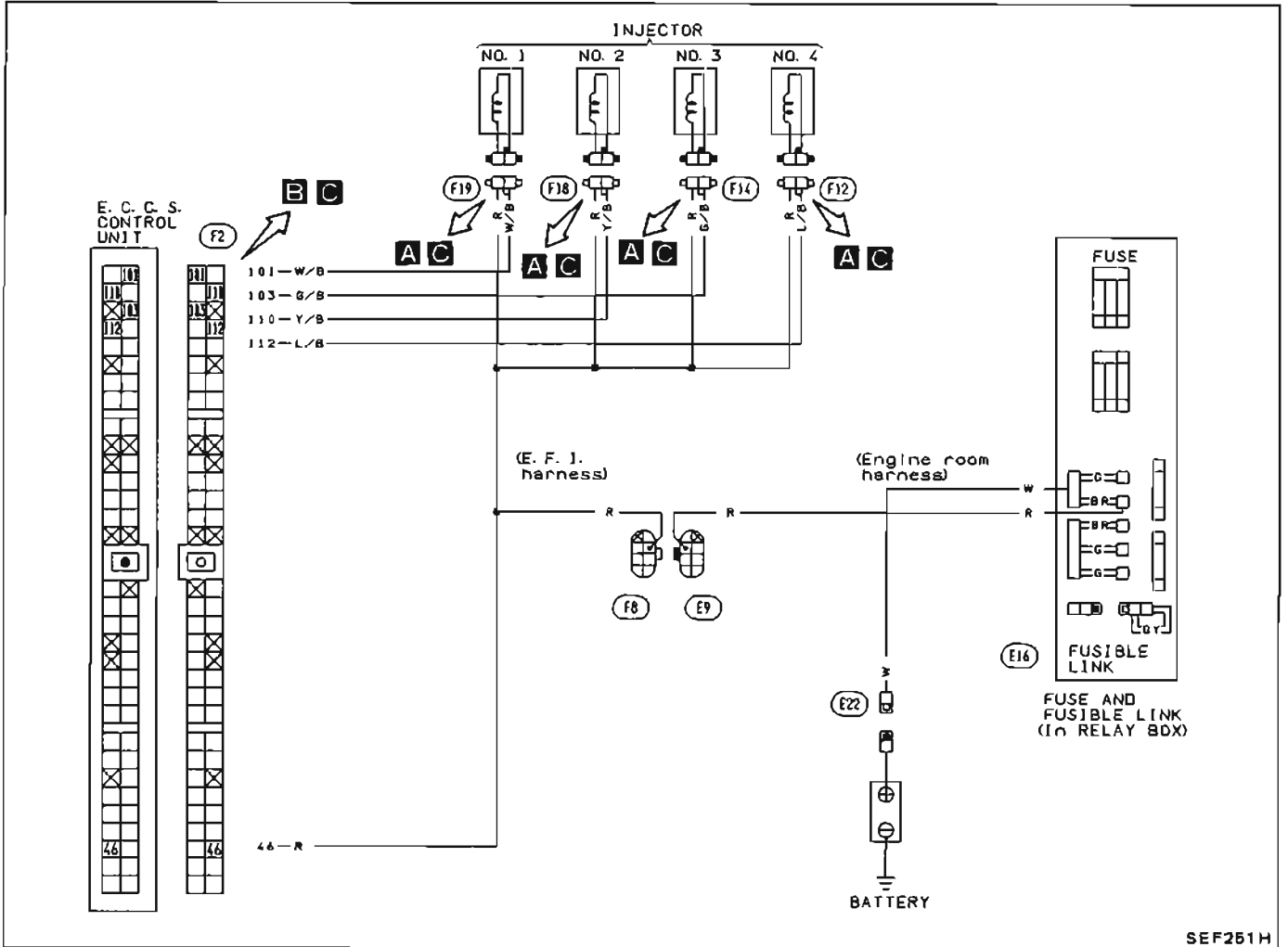
INSPECTION END

O.K.

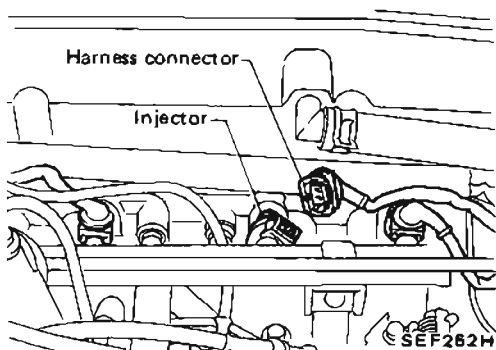
- 1) Perform E.C.U. input/output signal inspection test.
- 2) If N.G., recheck the E.C.U. pin terminal (106) for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 17

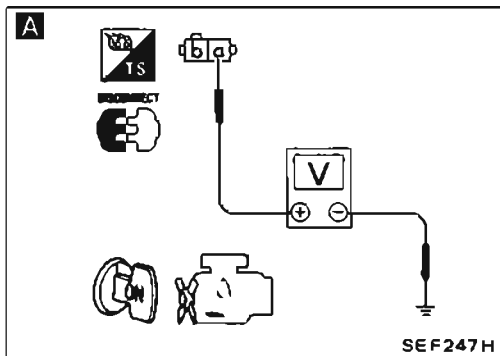
INJECTORS (Not self-diagnostic item)



Component location



TROUBLE DIAGNOSES



INSPECTION START

A

CHECK POWER SOURCE
(Injector side).

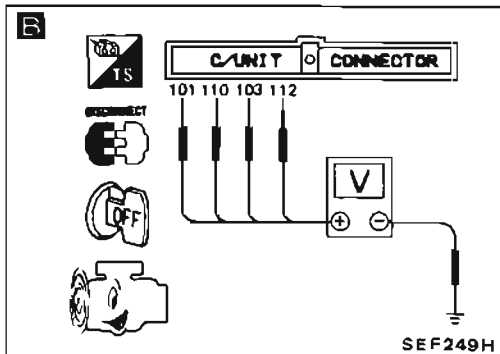
- 1) Disconnect injector harness connectors.
- 2) Turn ignition switch "ON".
- 3) Check voltage between terminal **(a)** and ground.

Battery voltage should exist.

N.G.

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND BATTERY.
Check following.

- "G" fusible link
- Harness



O.K.

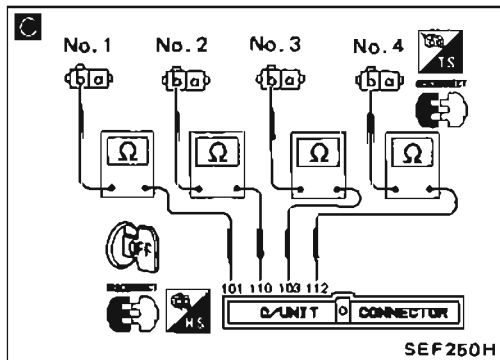
CHECK COMPONENTS.

- 1) Turn ignition "OFF".
- 2) Check injectors.

(See page EF & EC-150.)

N.G.

Replace injectors.



O.K.

CHECK OUTPUT SIGNAL.

- 1) Reconnect injector harness connector.
- 2) Start engine and warm it up sufficiently.
- 3) Check voltage between E.C.U. terminals **(101)**, **(103)**, **(110)**, **(112)** and ground.

Battery voltage should exist.

N.G.

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND E.C.U.

- 1) Stop engine.
- 2) Disconnect injector harness connectors.
- 3) Disconnect E.C.U. harness connector.
- 4) Check continuity between terminals **(b)** (No. 1) and **(101)**, **(b)** (No. 2) and **(110)**, **(b)** (No. 3) and **(103)**, **(b)** (No. 4) and **(112)**.

Continuity should exist.
If N.G., repair harness or connector.

O.K.

INSPECTION END

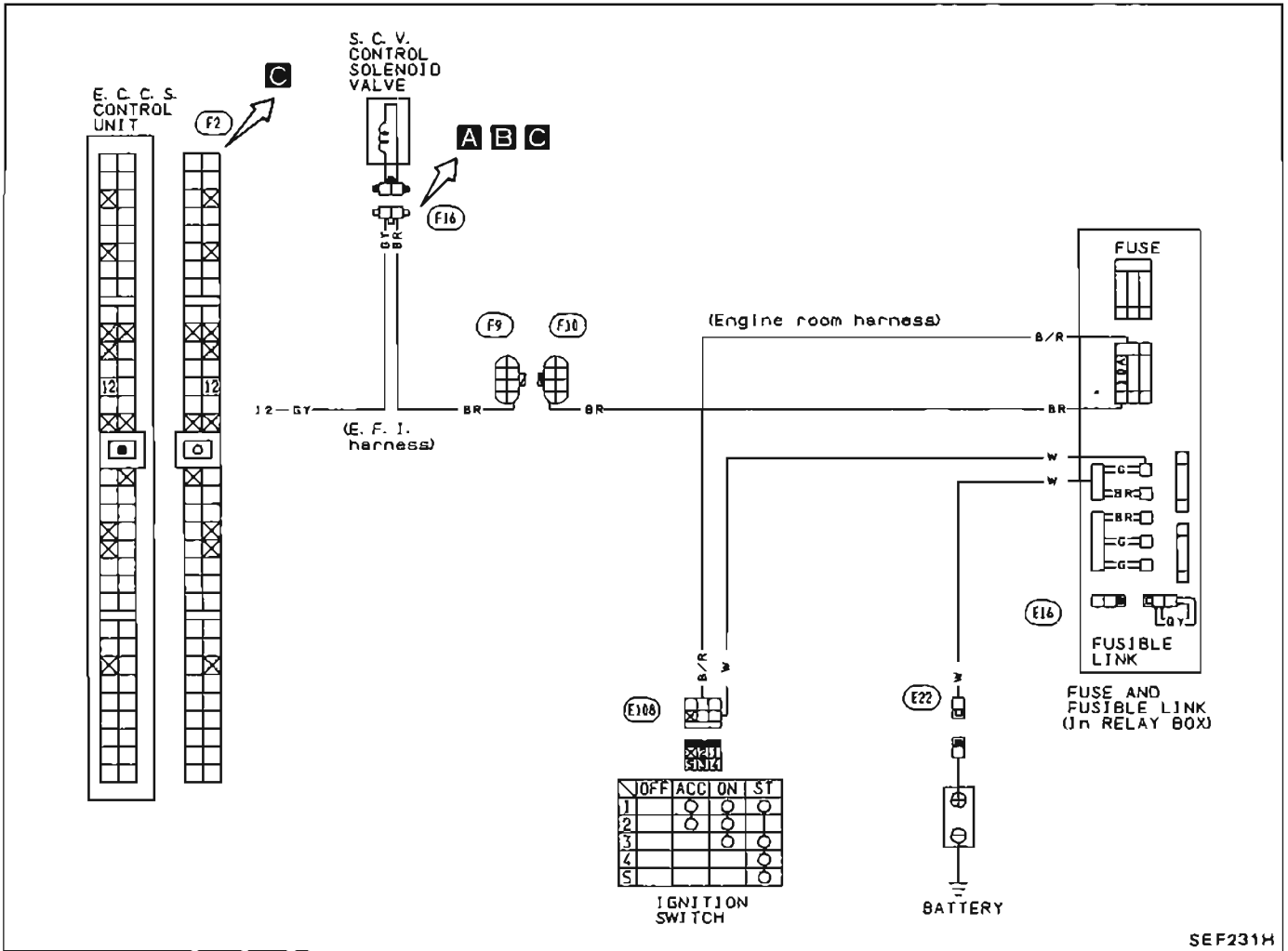
O.K.

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

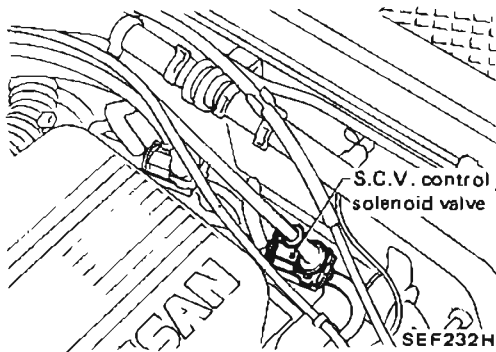
TROUBLE DIAGNOSES

Diagnostic Procedure 18

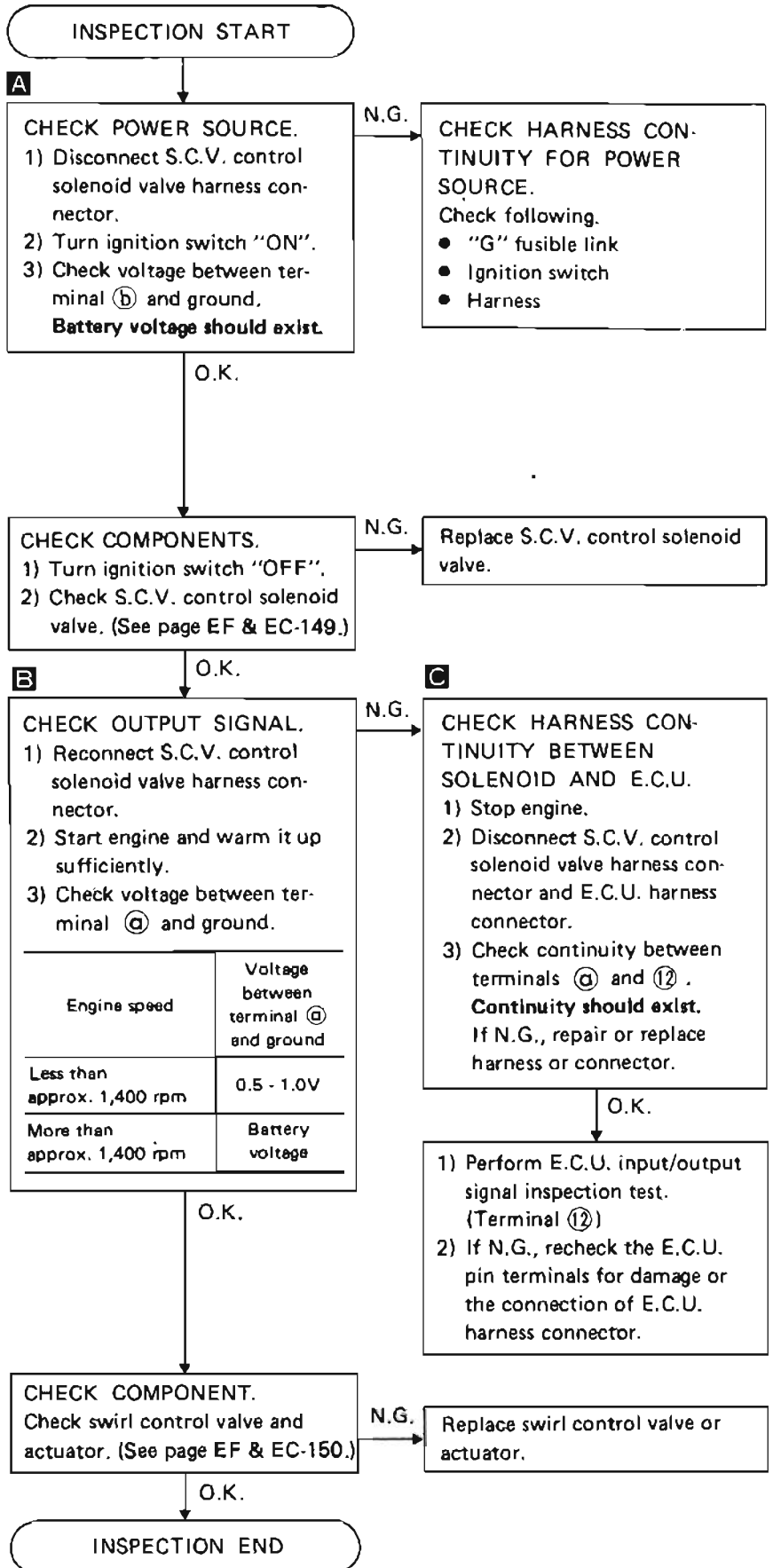
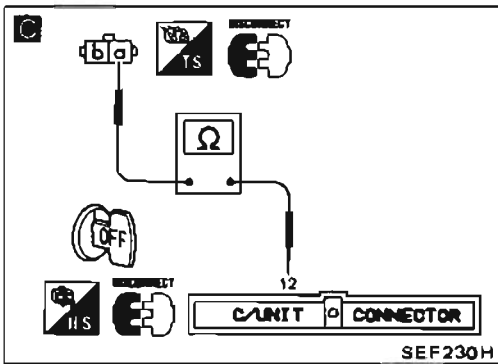
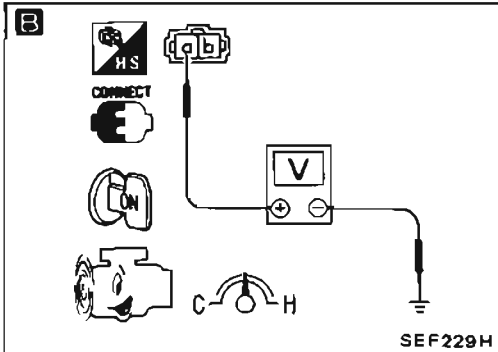
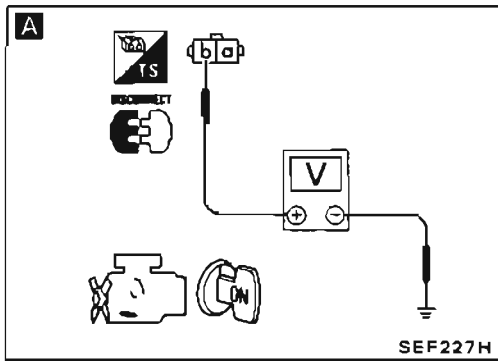
SWIRL CONTROL VALVE (S.C.V.) CONTROL SOLENOID VALVE (Not self-diagnostic item)



Component location



TROUBLE DIAGNOSES

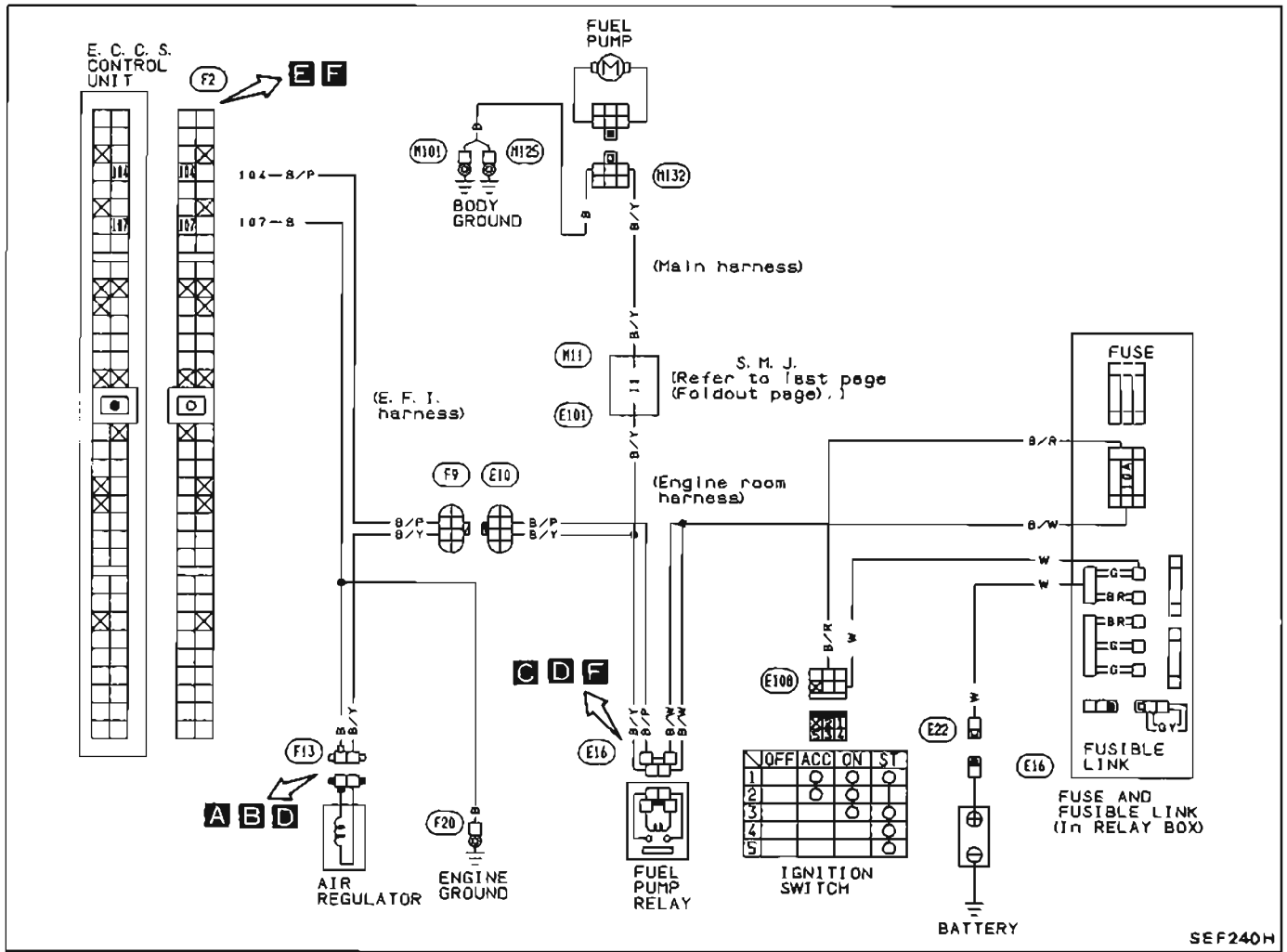


| Engine speed | Voltage between terminal (a) and ground |
|-----------------------------|---|
| Less than approx. 1,400 rpm | 0.5 - 1.0V |
| More than approx. 1,400 rpm | Battery voltage |

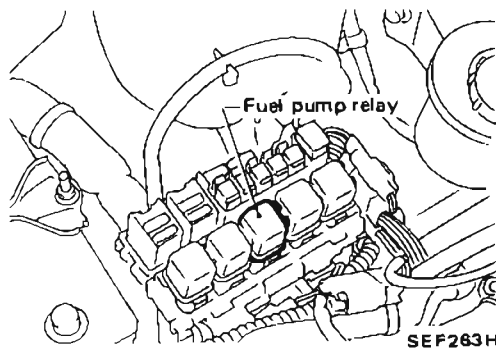
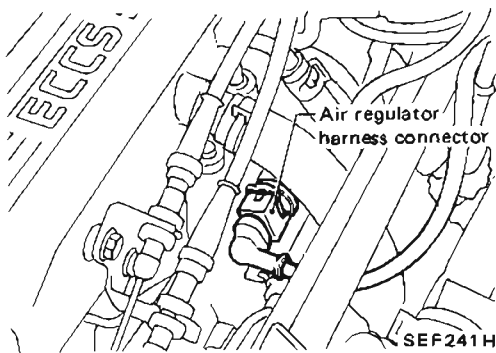
TROUBLE DIAGNOSES

Diagnostic Procedure 19

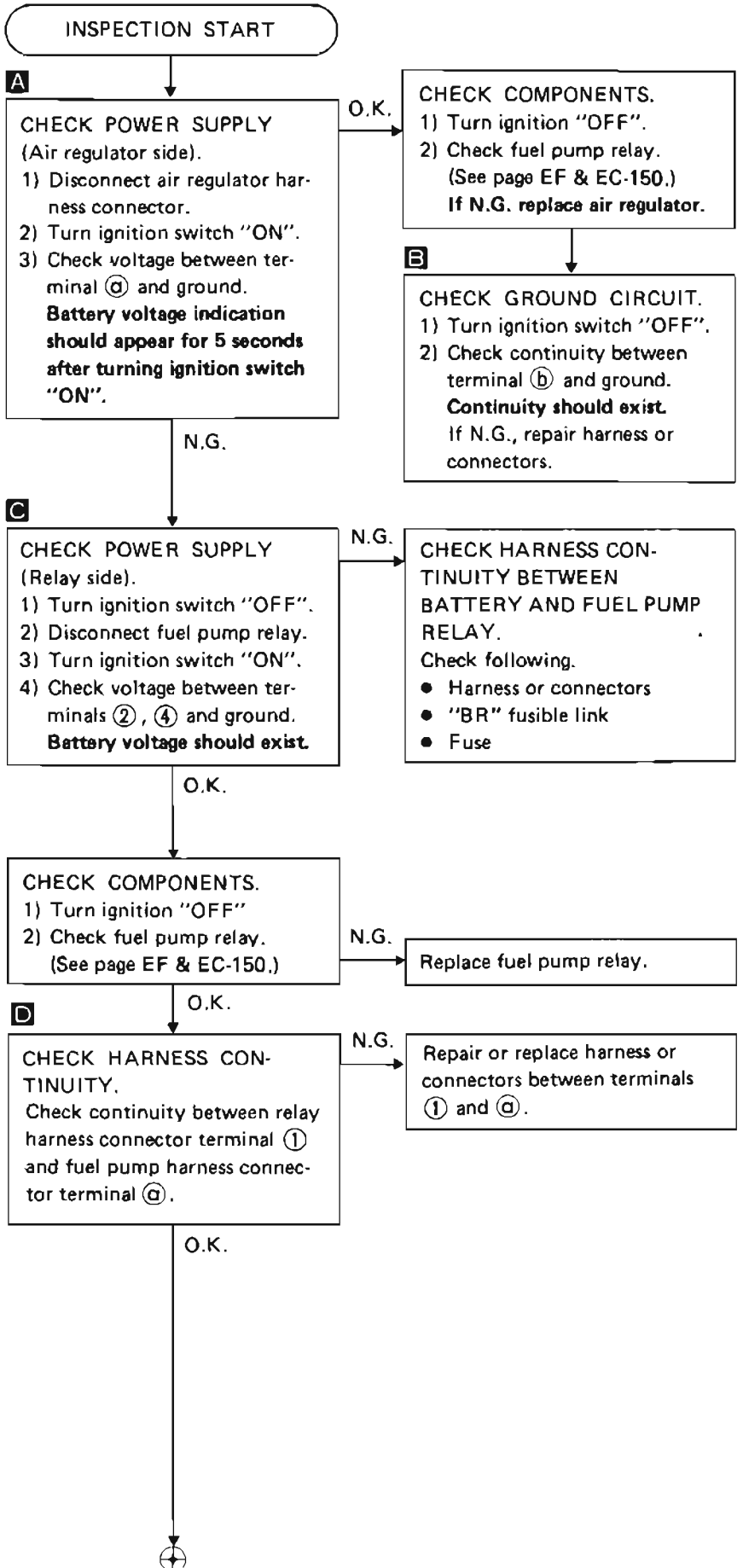
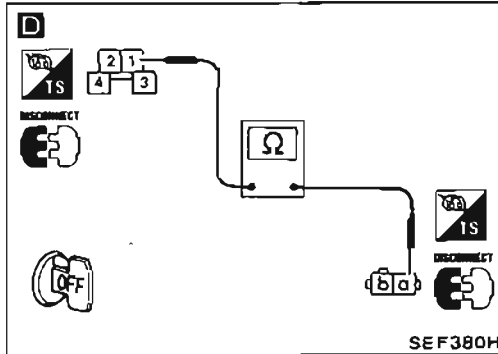
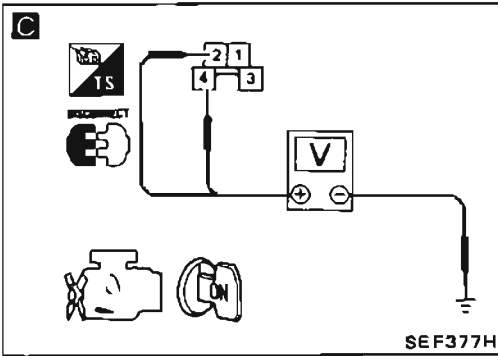
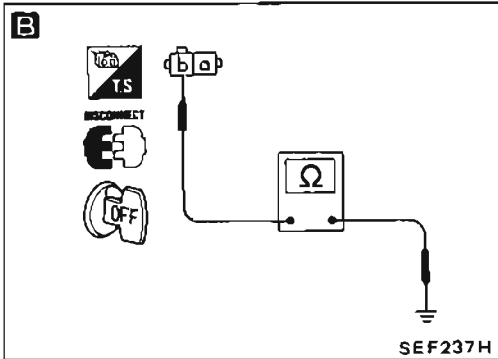
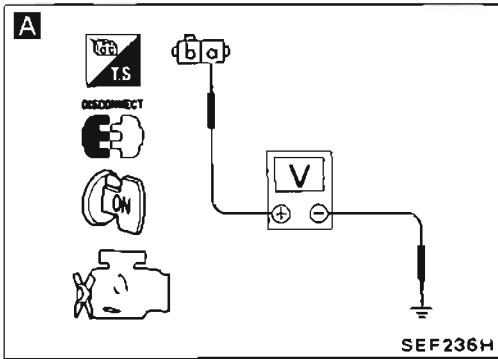
AIR REGULATOR (Not self-diagnostic item)



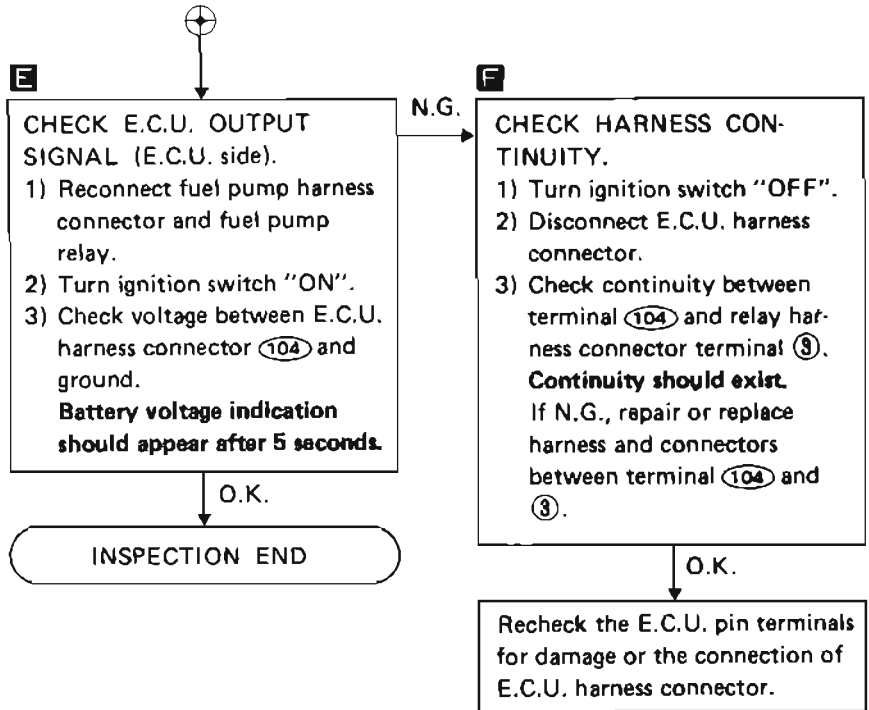
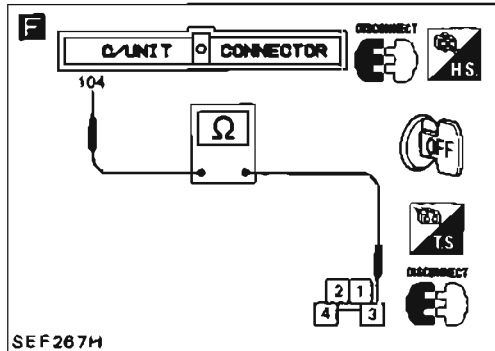
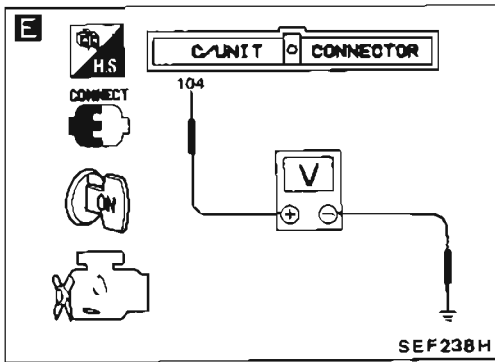
Component location



TROUBLE DIAGNOSES



TROUBLE DIAGNOSES



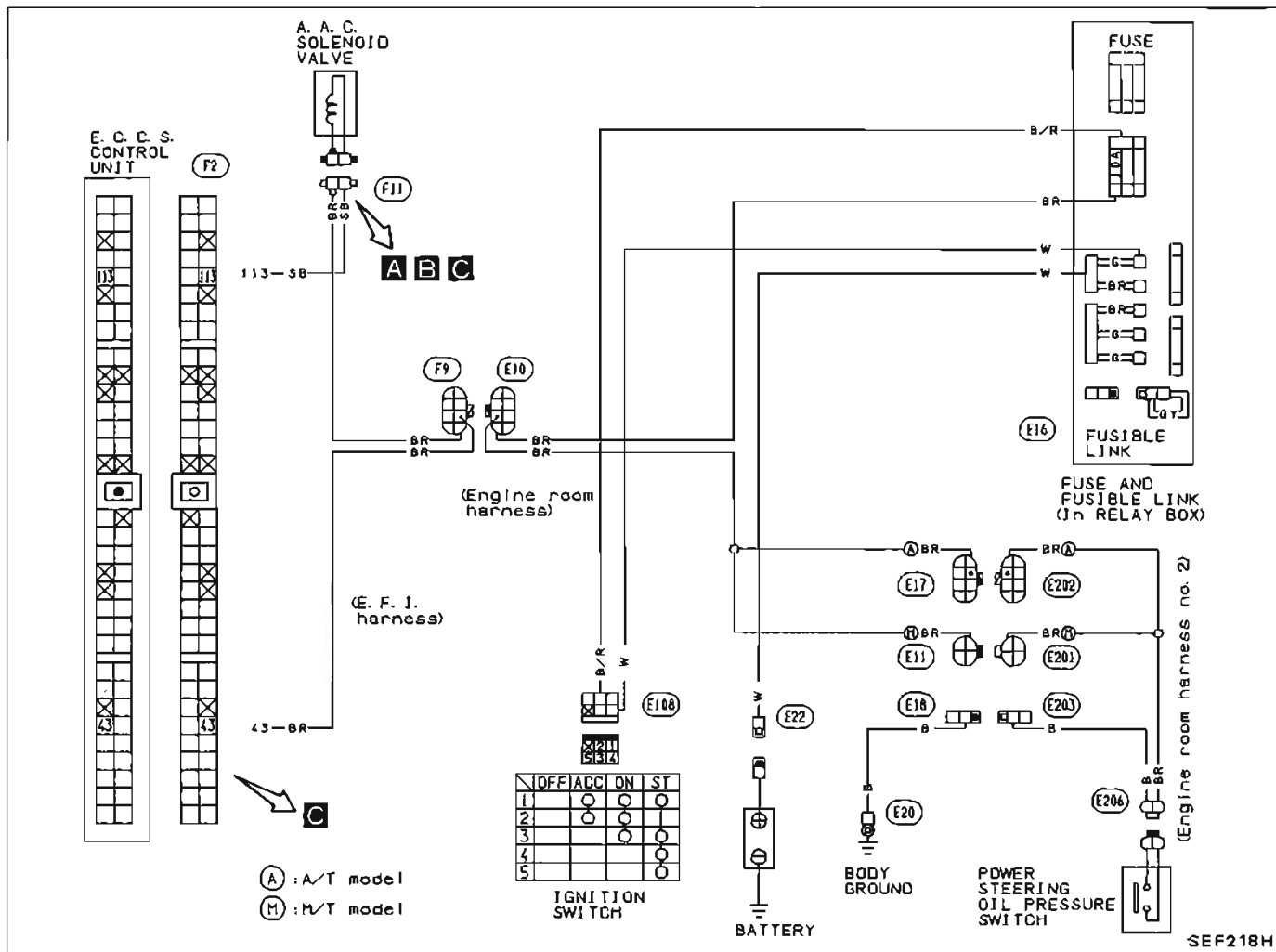
TROUBLE DIAGNOSES

NOTE

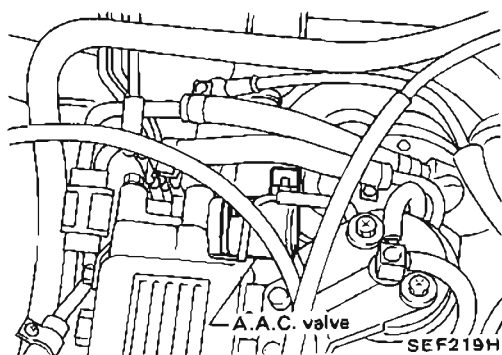
TROUBLE DIAGNOSES

Diagnostic Procedure 20

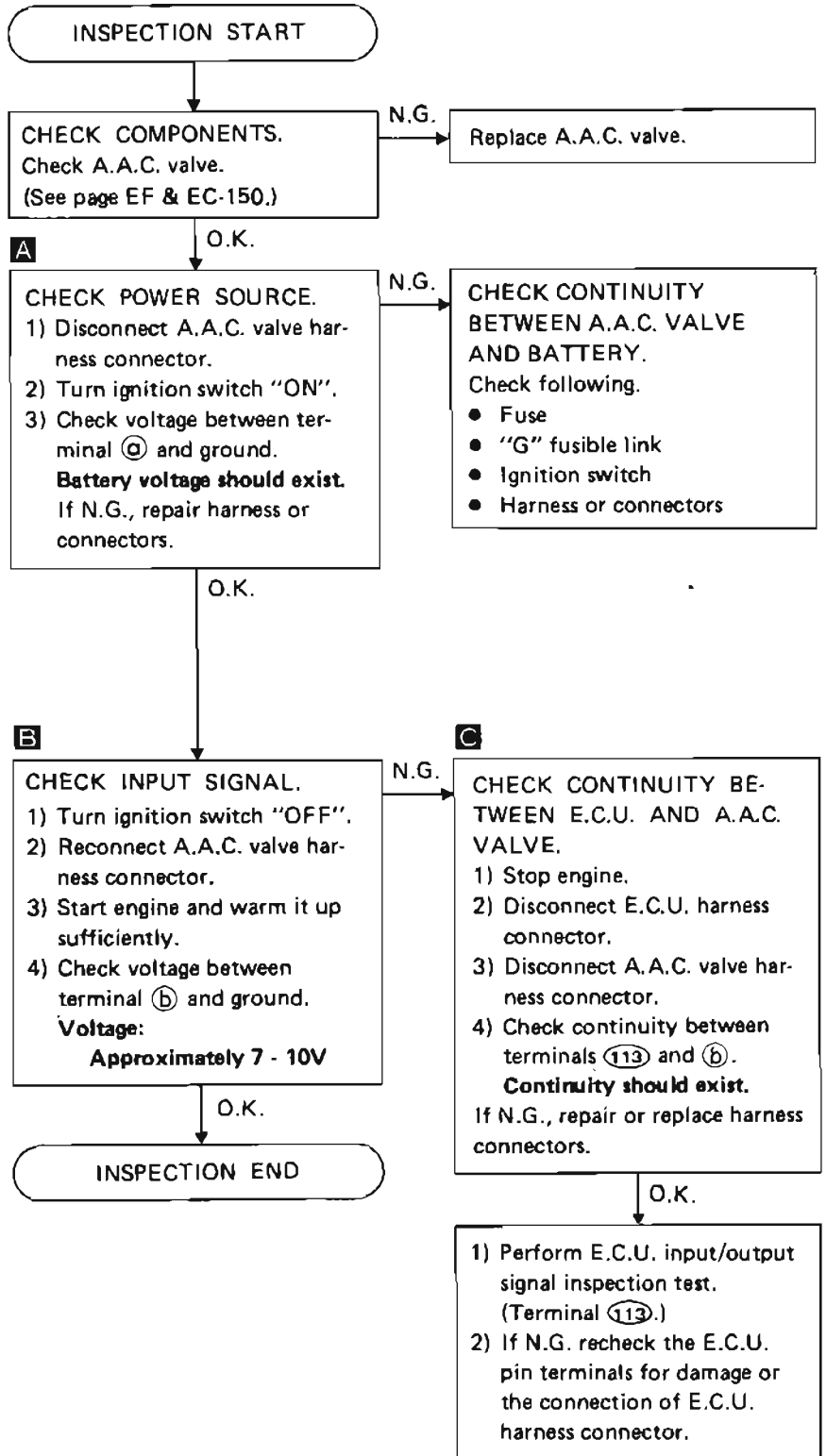
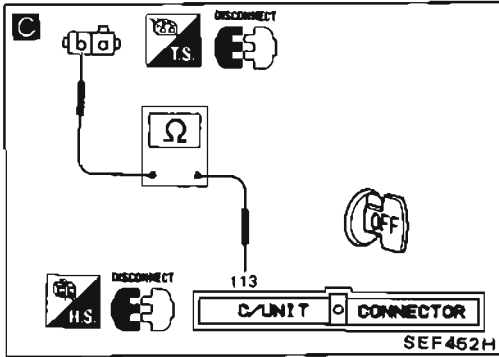
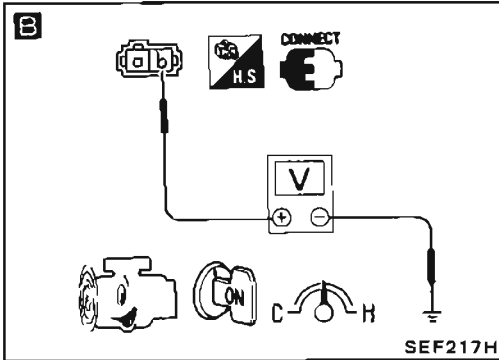
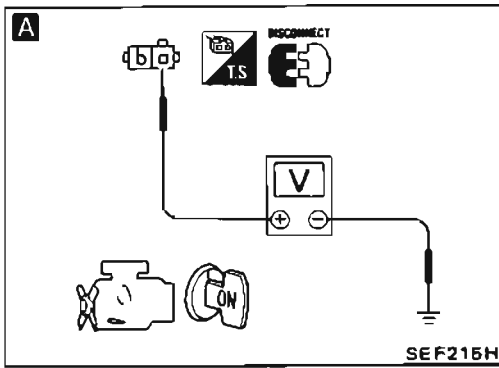
AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnostic item)



Component location



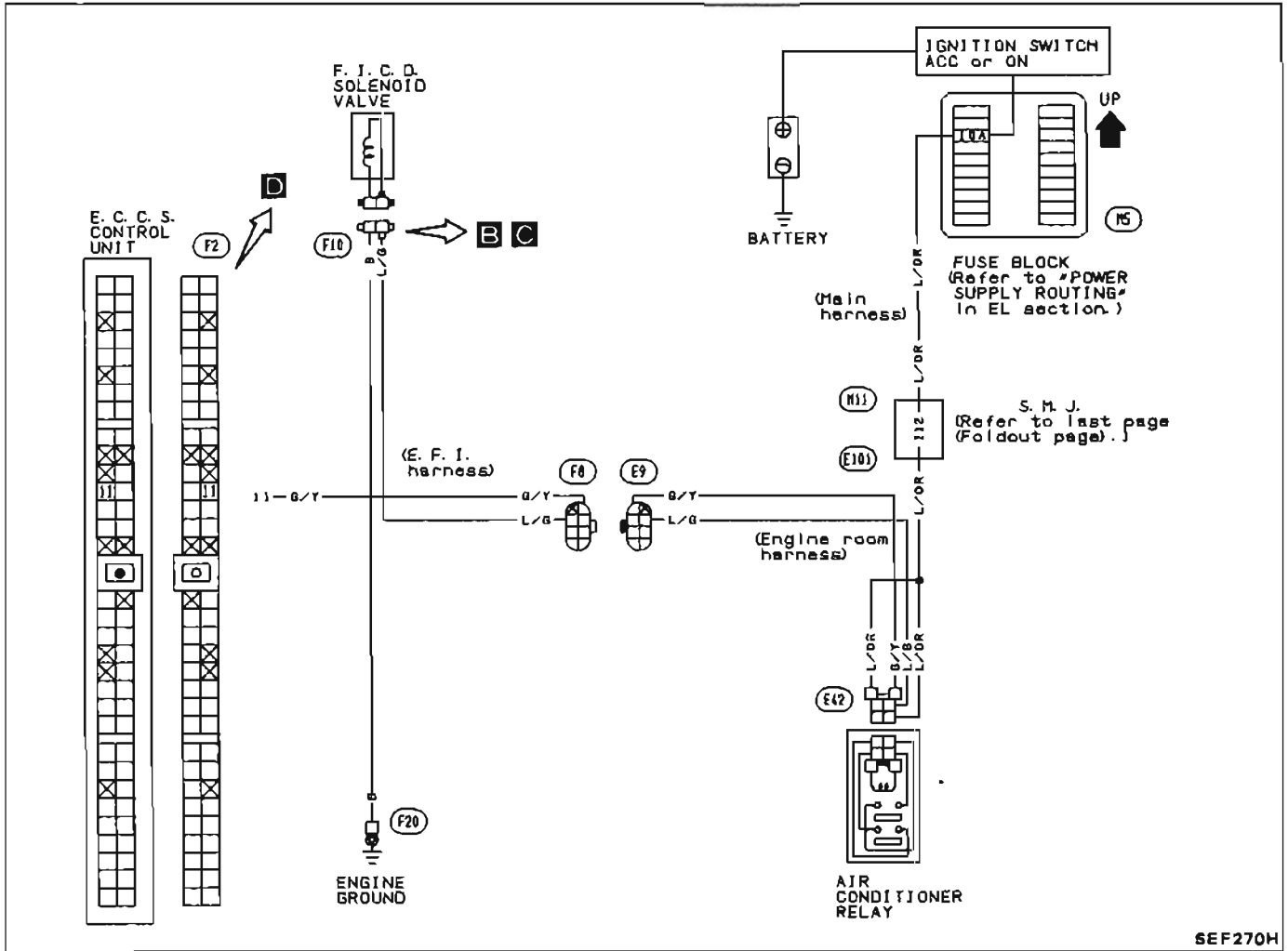
TROUBLE DIAGNOSES



TROUBLE DIAGNOSES

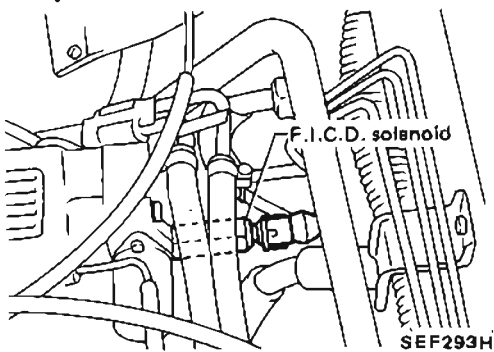
Diagnostic Procedure 21

I.A.A. CONTROL (F.I.C.D. CONTROL) (Not self-diagnostic item)

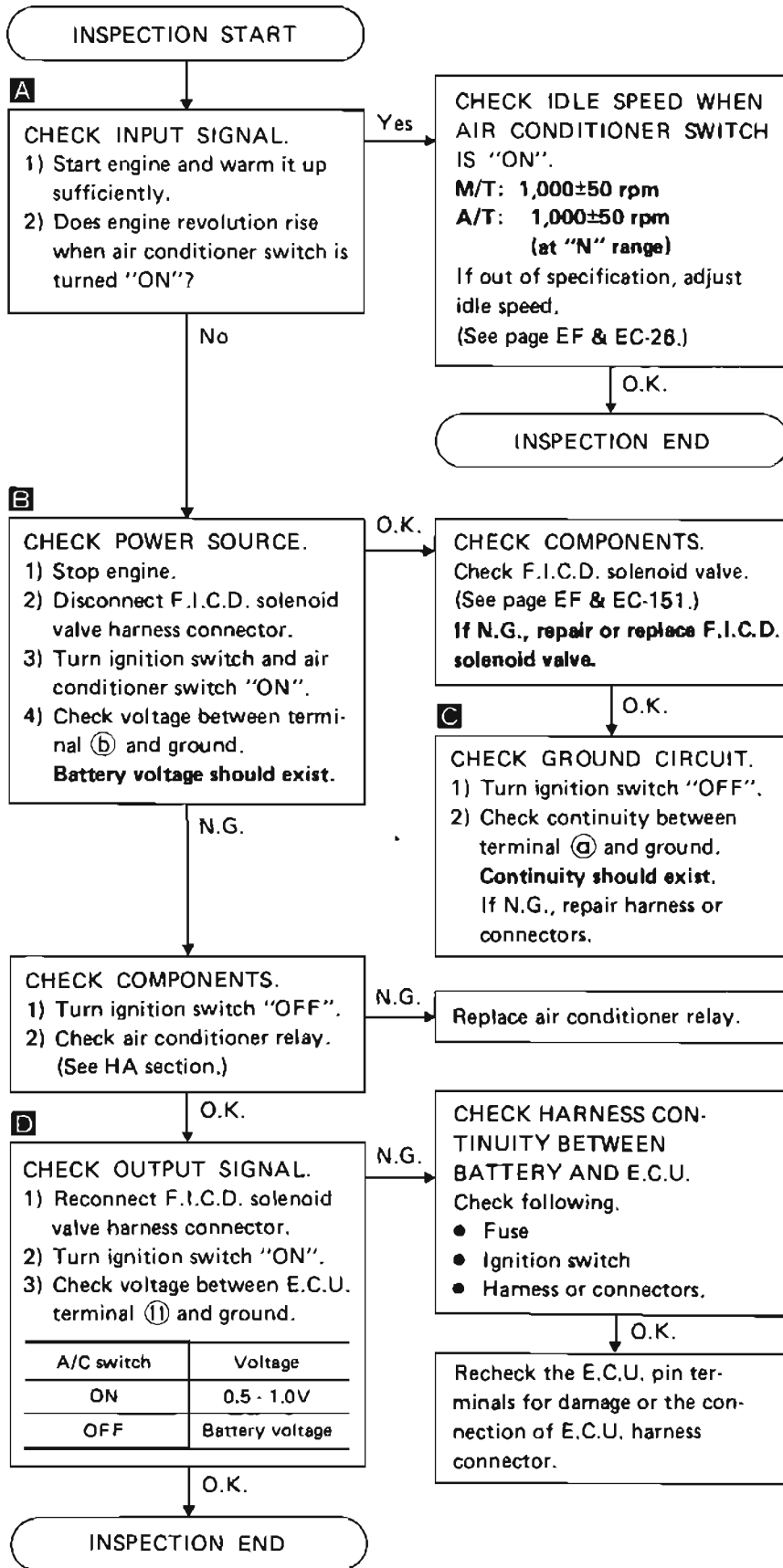
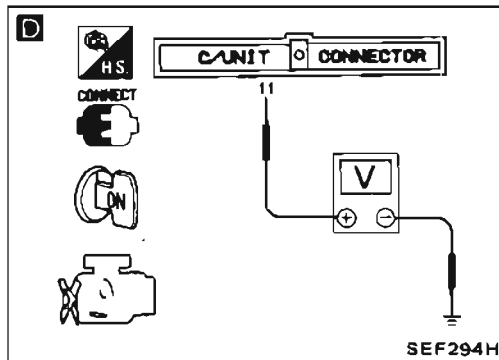
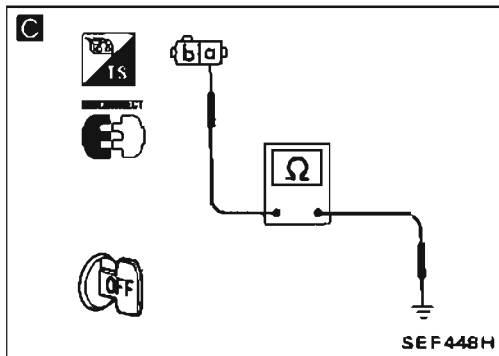
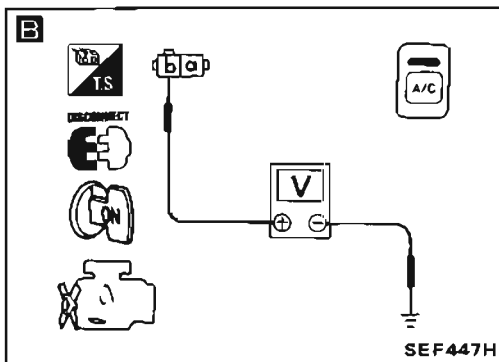
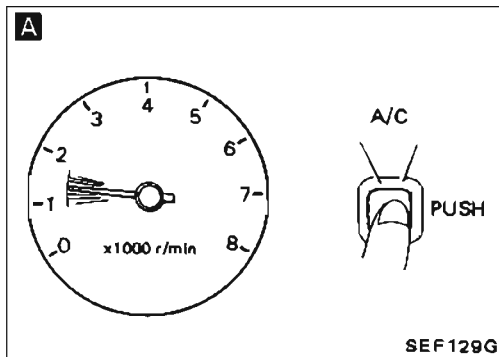


SEF270H

Component location



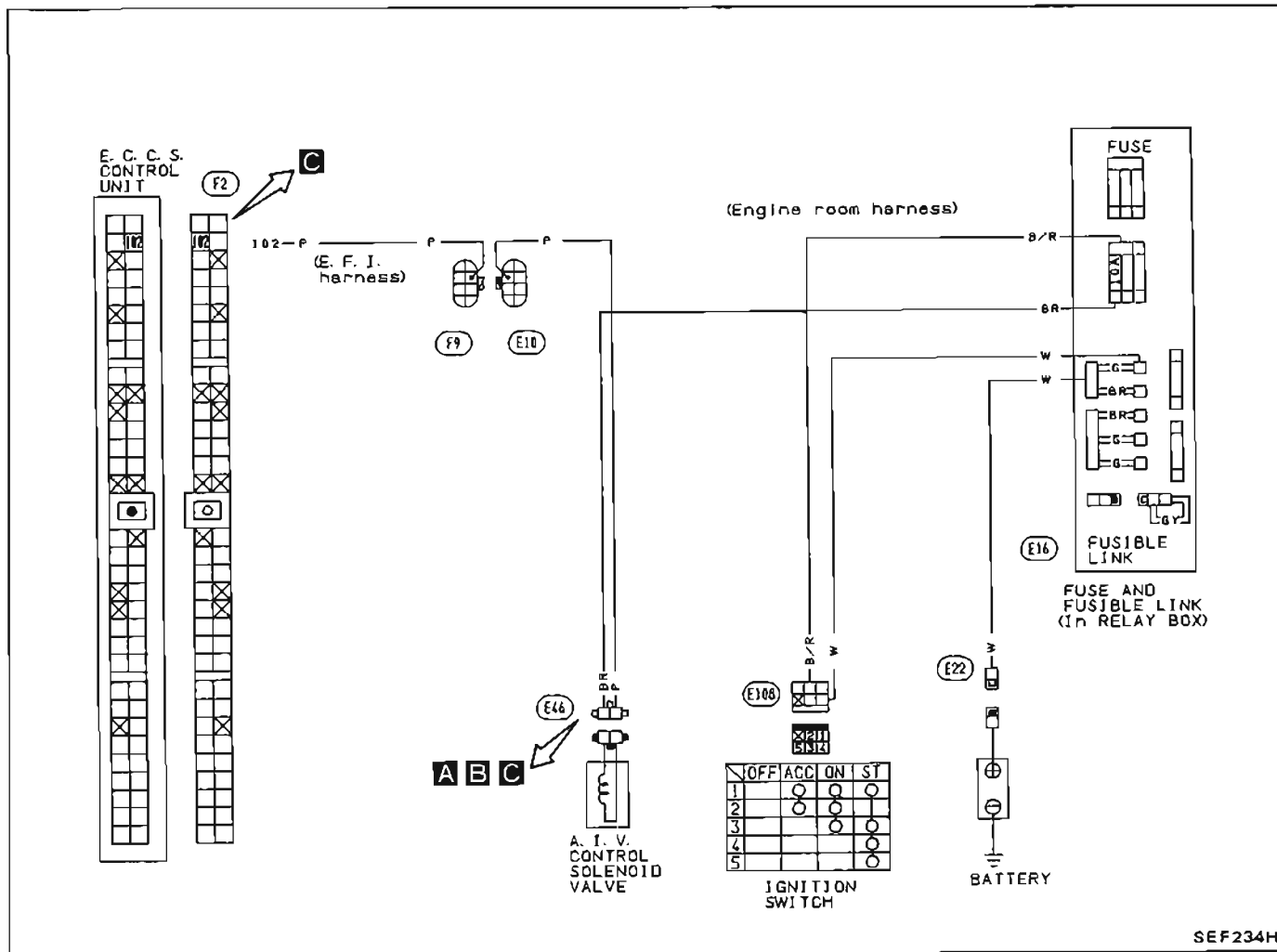
TROUBLE DIAGNOSES



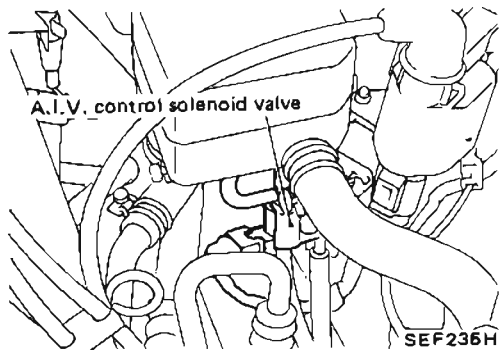
TROUBLE DIAGNOSES

Diagnostic Procedure 22

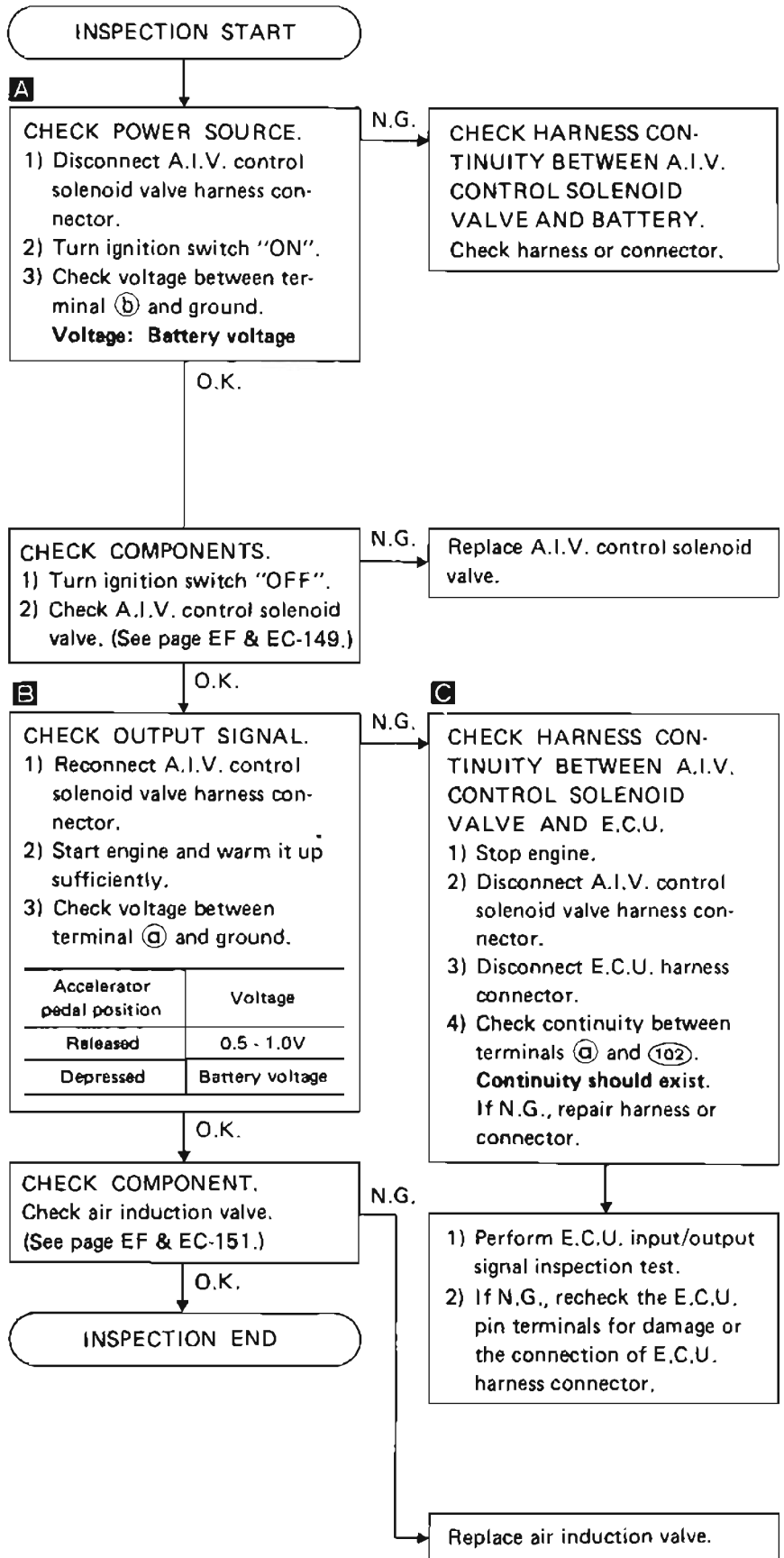
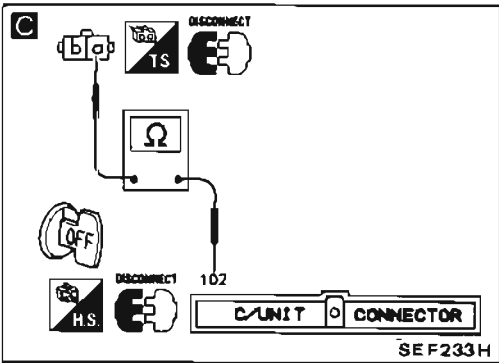
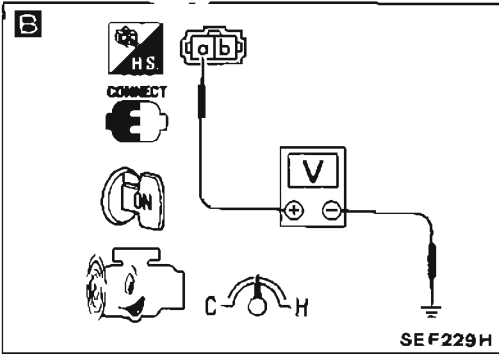
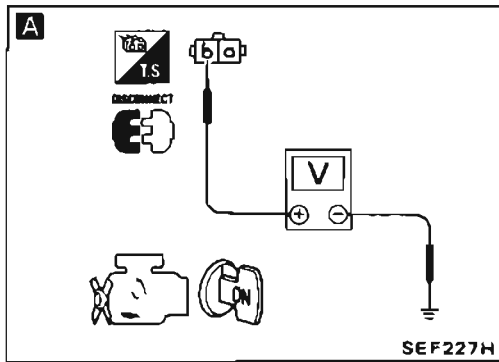
AIR INDUCTION VALVE (A.I.V.) CONTROL SOLENOID VALVE (Not self-diagnostic item)



Component location



TROUBLE DIAGNOSES

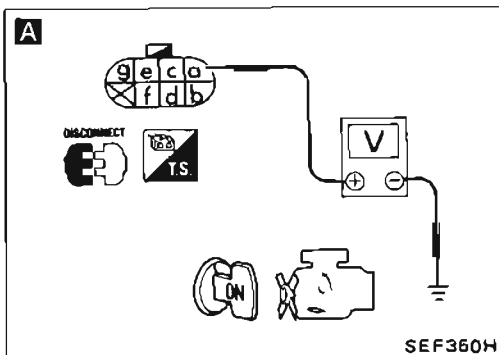
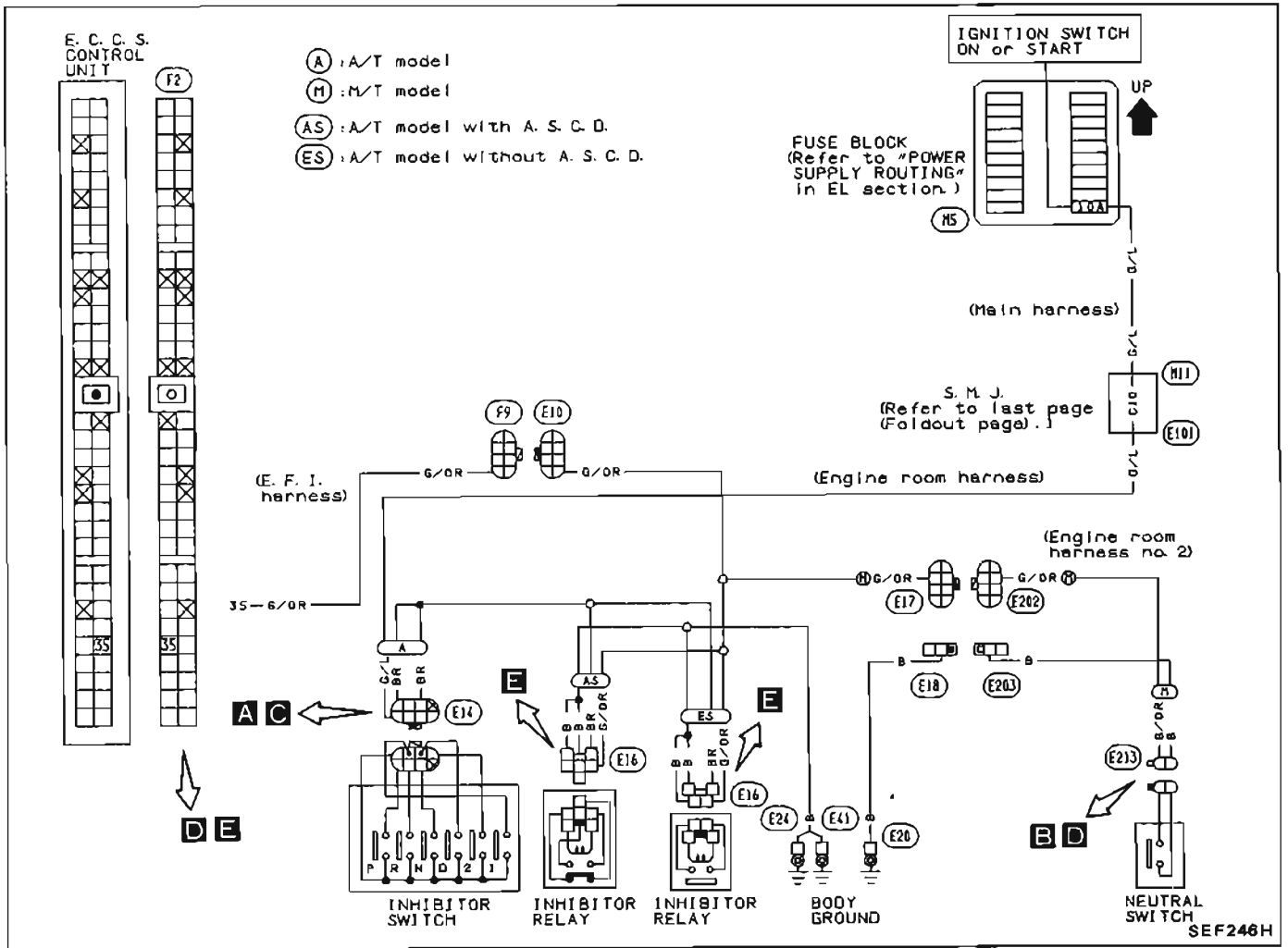


| Accelerator pedal position | Voltage |
|----------------------------|-----------------|
| Released | 0.5 - 1.0V |
| Depressed | Battery voltage |

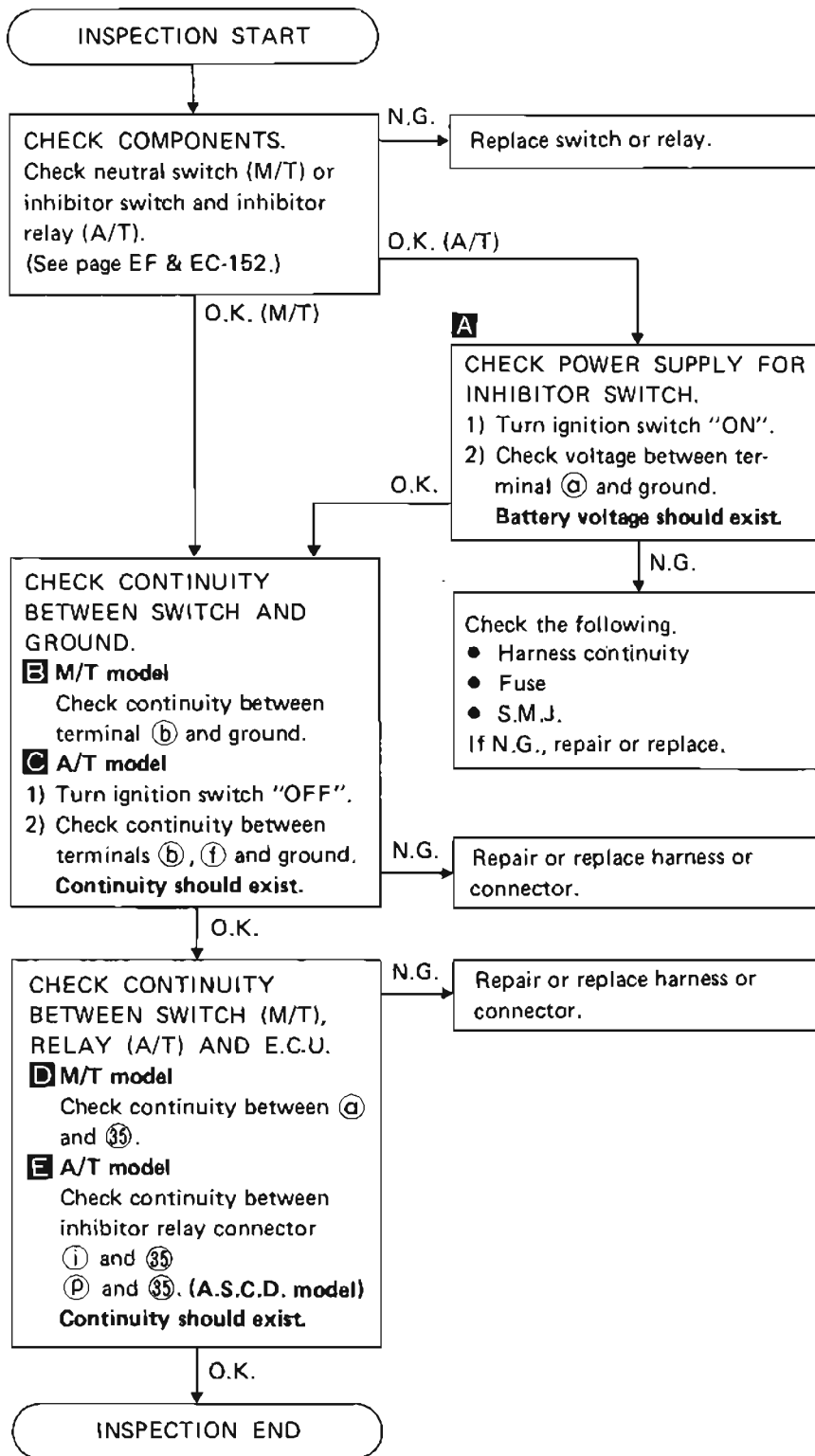
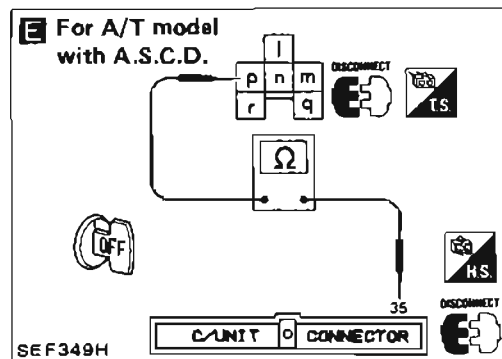
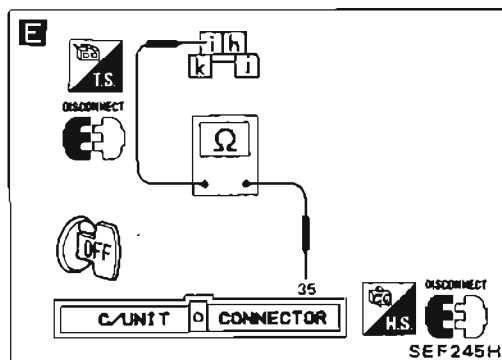
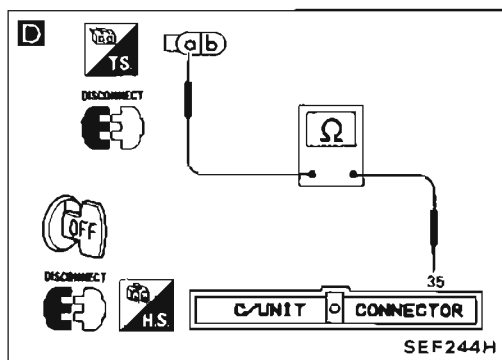
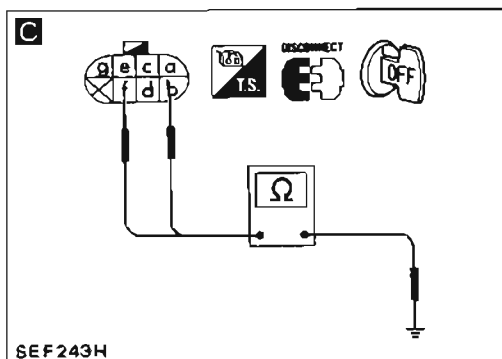
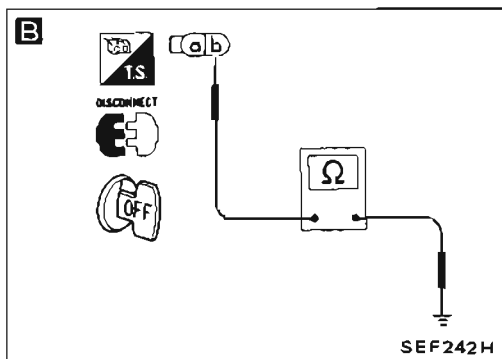
TROUBLE DIAGNOSES

Diagnostic Procedure 23

NEUTRAL SWITCH, INHIBITOR SWITCH AND INHIBITOR RELAY (Not self-diagnostic item)



TROUBLE DIAGNOSES



TROUBLE DIAGNOSES

Electrical Components Inspection

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

E.C.U. inspection table

*Data are reference values.

| TERMI- NAL NO. | ITEM | CONDITION | *DATA |
|----------------------|--|--|-------------------------------|
| 1 | Ignition signal | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed | 0.3 - 0.6V |
| | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Engine speed is 2,000 rpm | 1.2 - 1.5V |
| 3 | Ignition check | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed | 9 - 12V |
| 4 | E.C.C.S. relay (Main relay) | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> ↓ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "OFF"</div> └ Within approximately 1 second after turning ignition switch "OFF" | 0 - 1V |
| | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "OFF"</div> └ For approximately 1 second after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 8 | Exhaust gas temperature sensor (Only for California model) | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed | 1.0 - 2.0V |
| | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ E.G.R. system is operating. | 0 - 1.0V |
| 11 | Air conditioner relay | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Both A/C switch and blower switch are "ON" | 0 - 1.0V |
| | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ A/C switch is "OFF". | BATTERY VOLTAGE (11 - 14V) |
| 12 | S.C.V. control solenoid valve | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed | 0 - 1.0V |
| | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Engine speed is 2,000 rpm. | BATTERY VOLTAGE (11 - 14V) |

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

| TERMI- NAL NO. | ITEM | CONDITION | *DATA |
|----------------------|--|---|--|
| 16 | Air flow meter | Engine is running. | 1.0 - 3.0V Output voltage varies with engine revolution. |
| 18 | Engine temperature sensor | Engine is running. | 1.0 - 5.0V Output voltage varies with engine water temperature. |
| 19 | Exhaust gas sensor | Engine is running. └ After warming up sufficiently. | 0 - Approximately 1.0V |
| 20 | Throttle sensor | Ignition switch "ON" | 0.4 - Approximately 4V Output voltage varies with the throttle valve opening angle. |
| 22 30 | Crank angle sensor (Reference signal) | Engine is running. Do not run engine at high speed under no-load. | 0.2 - 0.5V |
| 28 | Throttle opening signal | Ignition switch "ON" | 0.3 - Approximately 3V |
| 31 40 | Crank angle sensor (Position signal) | Engine is running. Do not run engine at high speed under no-load. | 2.0 - 3.0V |
| 33 | Idle switch (⊖ side) | Ignition switch "ON" └ Throttle valve: idle position | Approximately 9 - 10V |
| | | Ignition switch "ON" └ Throttle valve: Any position except idle position | 0V |
| 34 | Start signal | Cranking | 8 - 12V |
| 35 | Neutral switch & Inhibitor switch | Ignition switch "ON" └ Neutral/Parking | 0V |
| | | Ignition switch "ON" └ Except the above gear position | 6 - 7V |

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

| TERMI- NAL NO. | ITEM | CONDITION | *DATA |
|----------------------|------------------------------------|---|-------------------------------|
| 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 47 | Power supply for E.C.U. | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 41 | Air conditioner switch | Engine is running. └ Both air conditioner switch and blower switch are "ON". | 0V |
| | | Engine is running. └ Air conditioner switch is "OFF". | BATTERY VOLTAGE (11 - 14V) |
| 43 | Power steering oil pressure switch | Engine is running. └ Steering wheel is being turned. | 0.1 - 0.3V |
| | | Engine is running. └ Steering wheel is not being turned. | 8 - 9V |
| 44 | Idle switch (⊕ side) | Ignition switch "ON" └ Throttle valve: idle position | Approximately 9 - 10V |
| | | Ignition switch "ON" └ Throttle valve: Except idle position | BATTERY VOLTAGE (11 - 14V) |
| 45 | 5th position switch (M/T models) | Ignition switch "ON" └ Gear is in 5th position. | 0V |
| | | Ignition switch "ON" └ Gear is except in 5th position. | 6 - 8V |
| 46 | Power supply (Back-up) | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

| TERMI- NAL NO. | ITEM | CONDITION | *DATA |
|----------------------|-------------------------------|---|-------------------------------|
| 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 | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed | 0 - 1.0V |
| | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Accelerator pedal is depressed. └ After warming up | BATTERY VOLTAGE (11 - 14V) |
| 104 | Fuel pump relay | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> └ For 5 seconds after turning ignition switch "ON" | 0.7 - 0.9V |
| | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> └ Within 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 105 | E.G.R. control solenoid valve | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Engine is cold. <div style="border: 1px solid black; padding: 2px; display: inline-block;">Water temperature is below 60°C (140°F).</div> | 0.7 - 0.9V |
| | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running. (Racing)</div> └ After warming up <div style="border: 1px solid black; padding: 2px; display: inline-block;">Water temperature is between 60°C (140°F) and 105°C (221°F).</div> | BATTERY VOLTAGE (11 - 14V) |

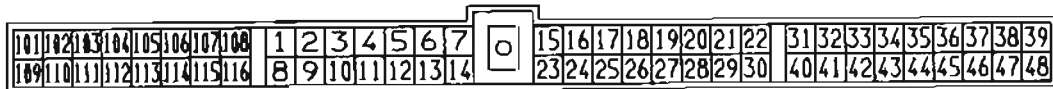
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

| TERMI- NAL NO. | ITEM | CONDITION | *DATA |
|----------------------|---|---|--|
| 106 | Pressure regulator control solenoid valve | Stop and restart engine after warming it up. └ Water temperature is above 90°C (194°F) | 0 - 1.0V (for 3 minutes after ignition switch is turned off.) |
| | | Stop and restart engine after warming it up. └ Water temperature is below 90°C (194°F) | BATTERY VOLTAGE (After 3 minutes) |
| 113 | A.A.C. valve | Engine is running. └ Idle speed | 7 - 10V |
| | | Engine is running. └ Steering wheel is being turned. └ Air conditioner is operating. └ Rear defogger is "ON". └ Headlamps are in high position. | 4 - 7V |

E.C.U. PIN CONNECTOR TERMINAL LAYOUT



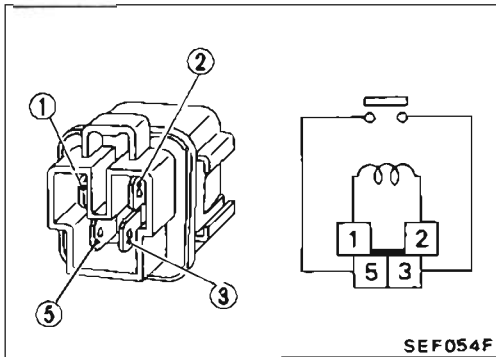
SEF419H

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

E.C.C.S. RELAY

Check continuity between terminals ③ and ⑤.

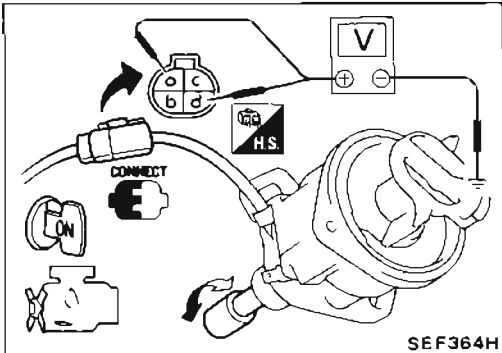


SEF054F

| Condition | Continuity |
|---|------------|
| 12V direct current supply between terminals ① and ② | Yes |
| No supply | No |

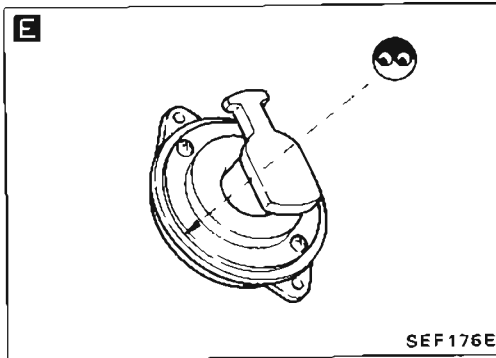
CRANK ANGLE SENSOR

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, ③ and ground.



SEF364H

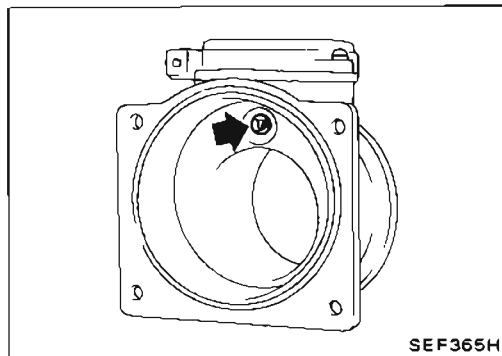
4. Visually check rotor plate for damage or dust.



SEF176E

AIR FLOW METER

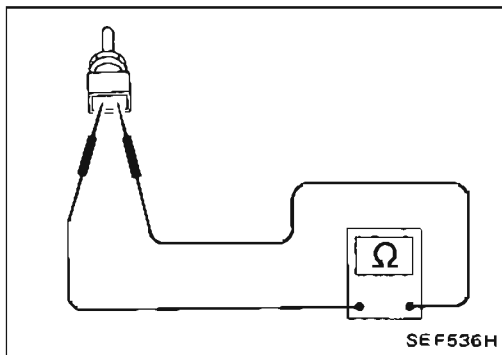
- Visually check hot wire air passage for dust.



SEF365H

ENGINE TEMPERATURE SENSOR

Check engine temperature sensor resistance.



SEF536H

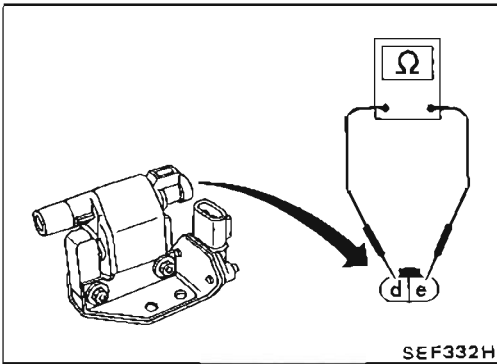
| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68) | 2.1 - 2.9 |
| 80 (176) | 0.30 - 0.33 |

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

IGNITION COIL

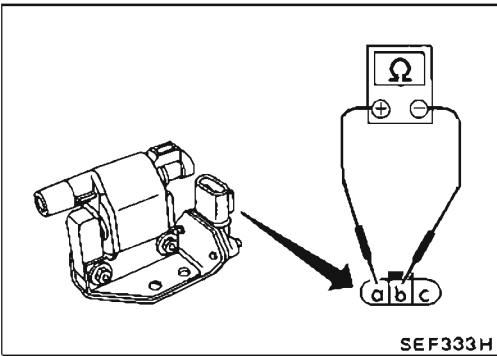
Check ignition coil resistance.



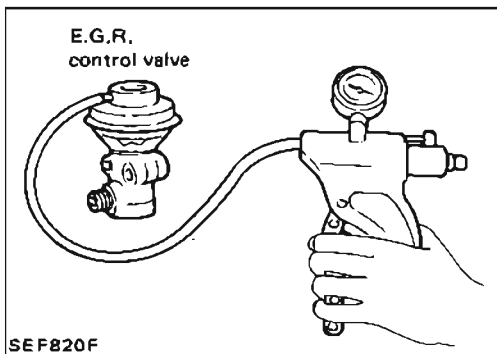
| Terminal | Resistance |
|----------|--------------------|
| ⓓ - ⓔ | Approximately 0.7Ω |

POWER TRANSISTOR

Check continuity between power transistor terminals.

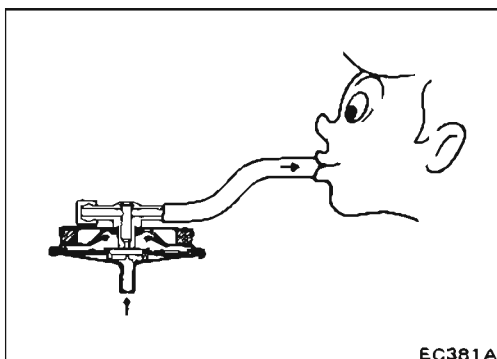


| Terminal No. | Tester polarity | Continuity |
|--------------|-----------------|------------|
| ⓐ | ⊕ | No |
| ⓑ | ⊖ | |
| ⓐ | ⊖ | Yes |
| ⓑ | ⊕ | |
| ⓐ | ⊕ | No |
| ⓒ | ⊖ | |
| ⓐ | ⊖ | Yes |
| ⓒ | ⊕ | |



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.

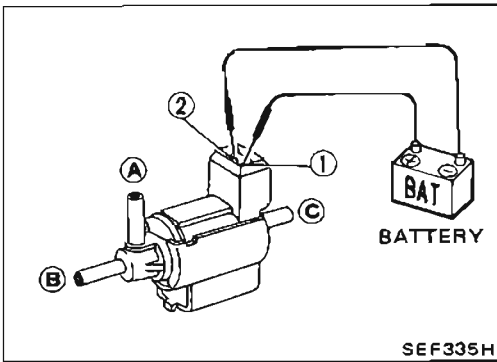
Apply a pressure above 0.490 kPa (50 mmH₂O, 1.97 inH₂O) to check for leakage. If a leak is noted, replace valve.

TROUBLE DIAGNOSES

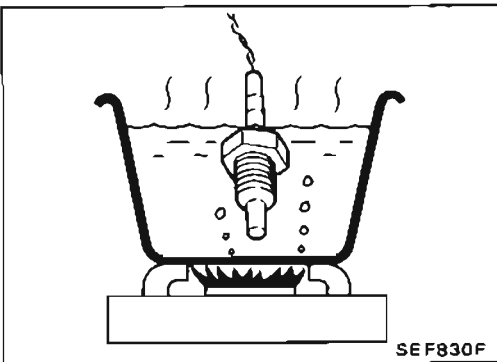
Electrical Components Inspection (Cont'd)

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 |



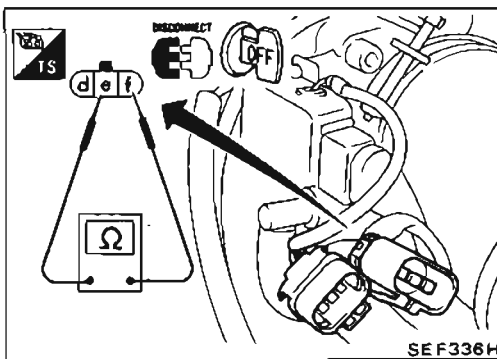
EXHAUST GAS TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

- Resistance should decrease in response to temperature increase.

Resistance: 100°C (212°F)

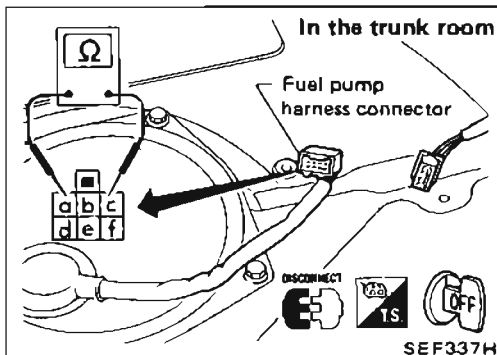
$85.3 \pm 8.53 \text{ k}\Omega$



THROTTLE SENSOR

Make sure that resistance between terminals (e) and (f) changes when opening throttle valve manually.

Resistance should change.



FUEL PUMP

Check continuity between terminals (a) and (c).

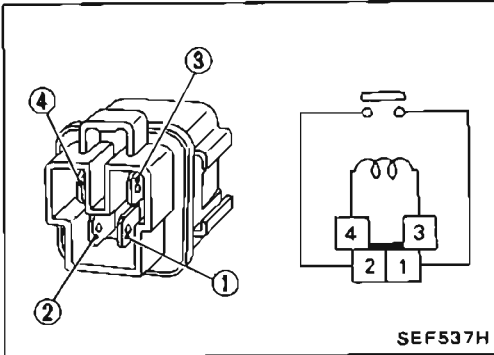
Continuity should exist.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

FUEL PUMP RELAY

Check continuity between terminals ① and ②.



| Condition | Continuity |
|---|------------|
| 12V direct current supply between terminals ③ and ④ | Yes |
| No supply | No |

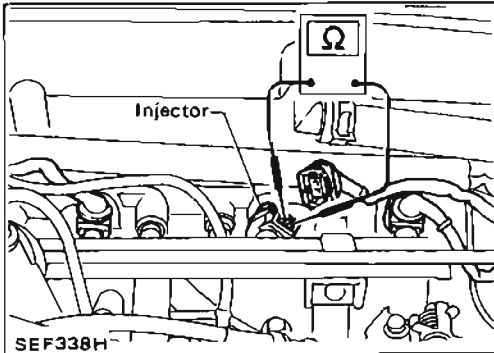
INJECTORS

- Check injector resistance.

Resistance:

Approximately 10 - 15Ω

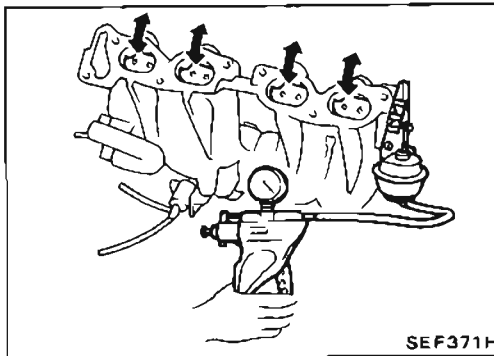
- Remove injector and check nozzle for clogging.



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 |



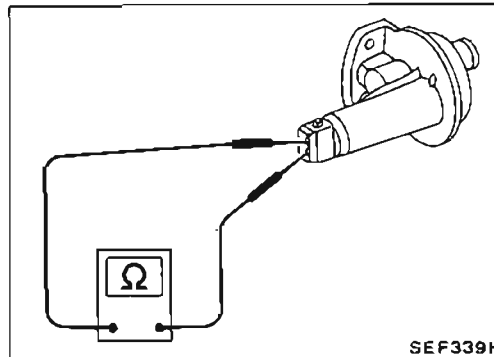
AIR REGULATOR

- Check air regulator resistance.

Resistance:

Approximately 75Ω

- Check air regulator for clogging.

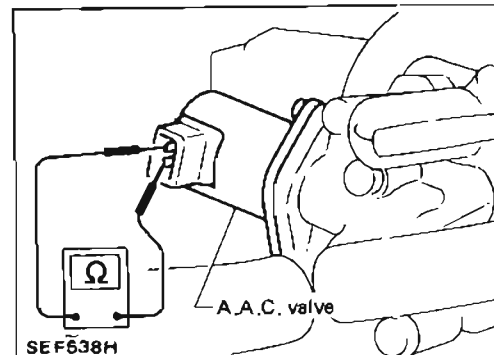


A.A.C. VALVE

- Check A.A.C. valve resistance.

Resistance:

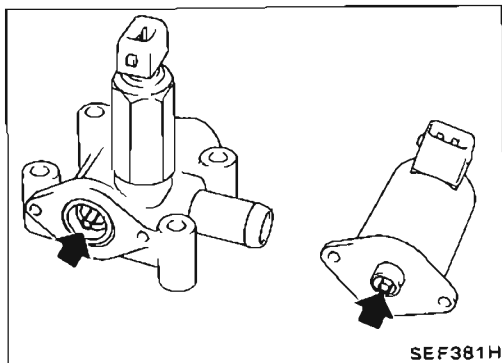
Approximately 10Ω



TROUBLE DIAGNOSES

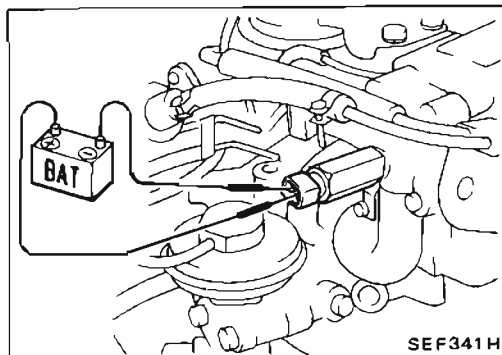
Electrical Components Inspection (Cont'd)

- Check plunger for seizure or sticking.
- Check spring for broken.

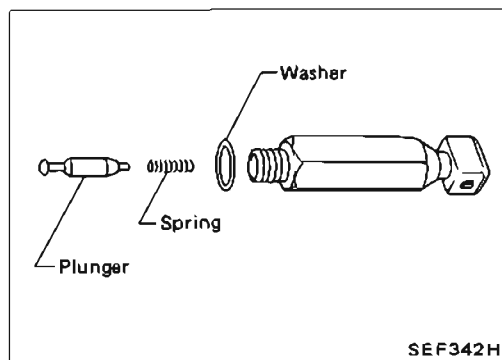


F.I.C.D. SOLENOID VALVE

- Check that clicking sound is heard when applying 12V direct current to terminals.

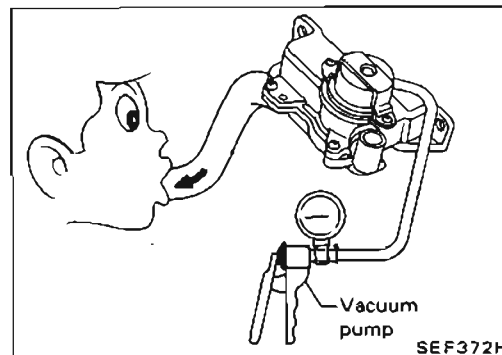


- Check plunger for seizure or sticking.
- Check for broken spring.



AIR INDUCTION VALVE

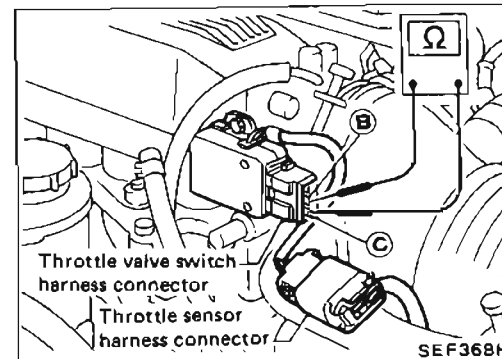
Apply vacuum to vacuum motor, suck or blow hose to make sure that air flows only towards the air induction side.



IDLE SWITCH

- Check continuity between terminals **B** and **C** while moving throttle valve.

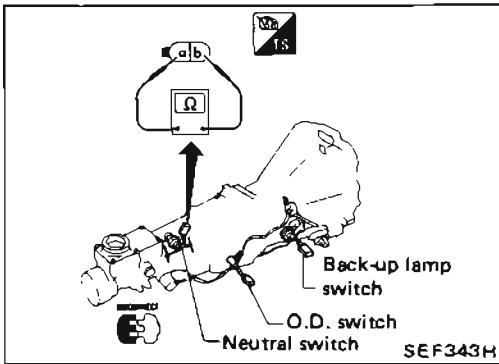
| Accelerator pedal condition | Continuity |
|-----------------------------|------------|
| Fully closed | Yes |
| Open | No |



TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd) NEUTRAL SWITCH

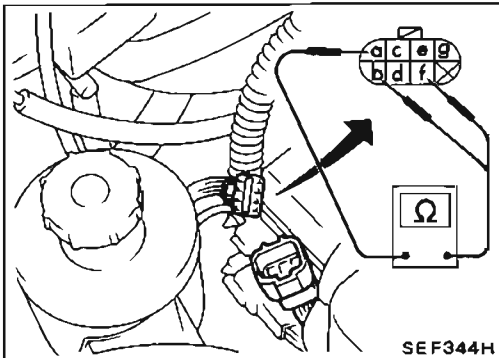
- Check continuity between terminals ① and ②.



| Conditions | Continuity |
|-------------------------|------------|
| Shift to Neutral | Yes |
| Shift to other position | No |

INHIBITOR SWITCH

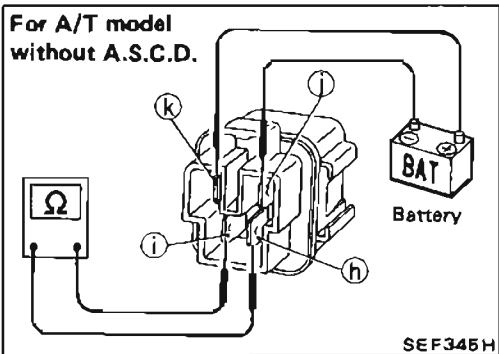
- Check continuity between terminals ① and ②, ③.



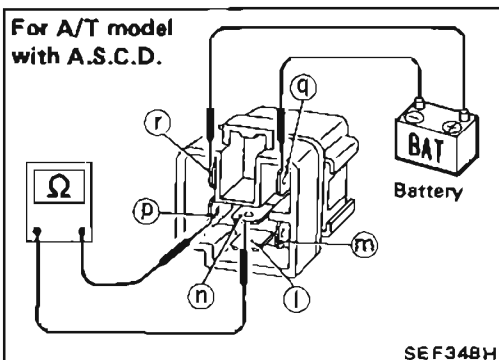
| Conditions | Continuity between terminals ① and ② | Continuity between terminals ① and ③ |
|---|--------------------------------------|--------------------------------------|
| Shift to "P" position | Yes | No |
| Shift to "N" position | No | Yes |
| Shift to positions other than "P" and "N" | No | No |

INHIBITOR RELAY

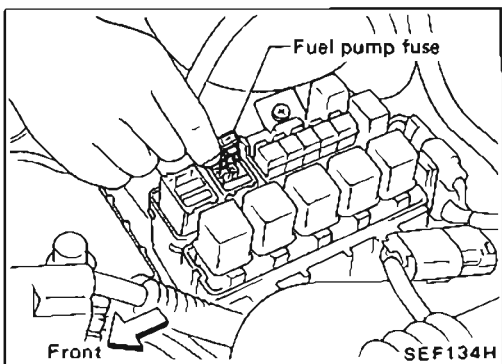
- Check continuity between terminals ① and ② (Without A.S.C.D.), ③ and ④ (With A.S.C.D.).



| Condition | Continuity between terminals ① and ② (Without A.S.C.D.), ③ and ④ (With A.S.C.D.) |
|---|--|
| 12V direct current supply between terminals ① and ② (Without A.S.C.D.), ③ and ④ (With A.S.C.D.) | Yes |
| No supply | No |



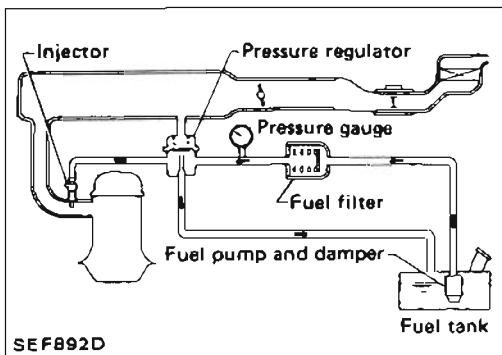
FUEL INJECTION CONTROL SYSTEM INSPECTION



Releasing Fuel Pressure

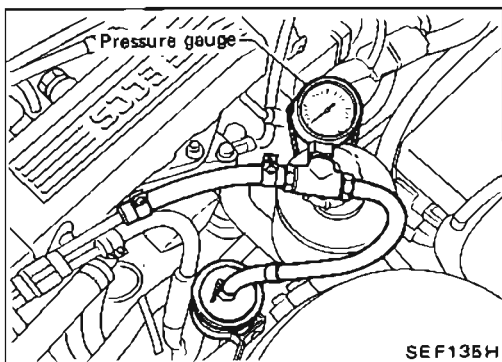
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

1. Remove fuel pump fuse.
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 fuse.



Fuel Pressure Check

- a. When reconnecting fuel line, always use new clamps.
 - b. Make sure that clamp screw does not contact adjacent parts.
 - c. Use a torque driver to tighten clamps.
 - d. Use Pressure Gauge to check fuel pressure.
 - e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.
1. Release fuel pressure to zero.
 2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
 3. Install pressure gauge between fuel filter and fuel tube.
 4. Start engine and check for fuel leakage.



5. Read the fuel pressure gauge indication.

At idling:

When fuel pressure regulator valve vacuum hose is connected.

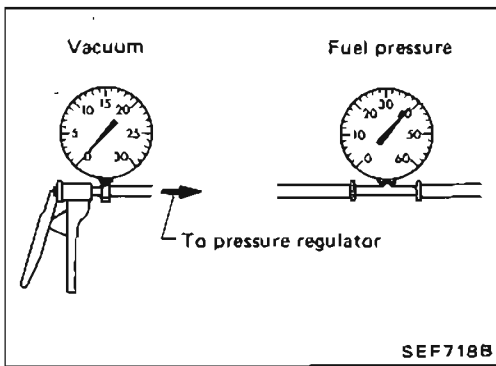
More than 226 kPa (2.3 kg/cm², 33 psi)

When fuel pressure regulator valve vacuum is disconnected.

Approximately 294 kPa (3.0 kg/cm², 43 psi)

6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.

FUEL INJECTION CONTROL SYSTEM INSPECTION



Fuel Pressure Check (Cont'd)

9. 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

1. Release fuel pressure to zero.
2. Remove or disconnect the following:
 - B.P.T. valve
 - Fuel tube securing bolts
3. Remove injectors with fuel tube assembly.
4. Remove injector from fuel tube.
5. Install injector as follows:
 - 1) Clean exterior of injector tail piece.
 - 2) Use new O-rings.

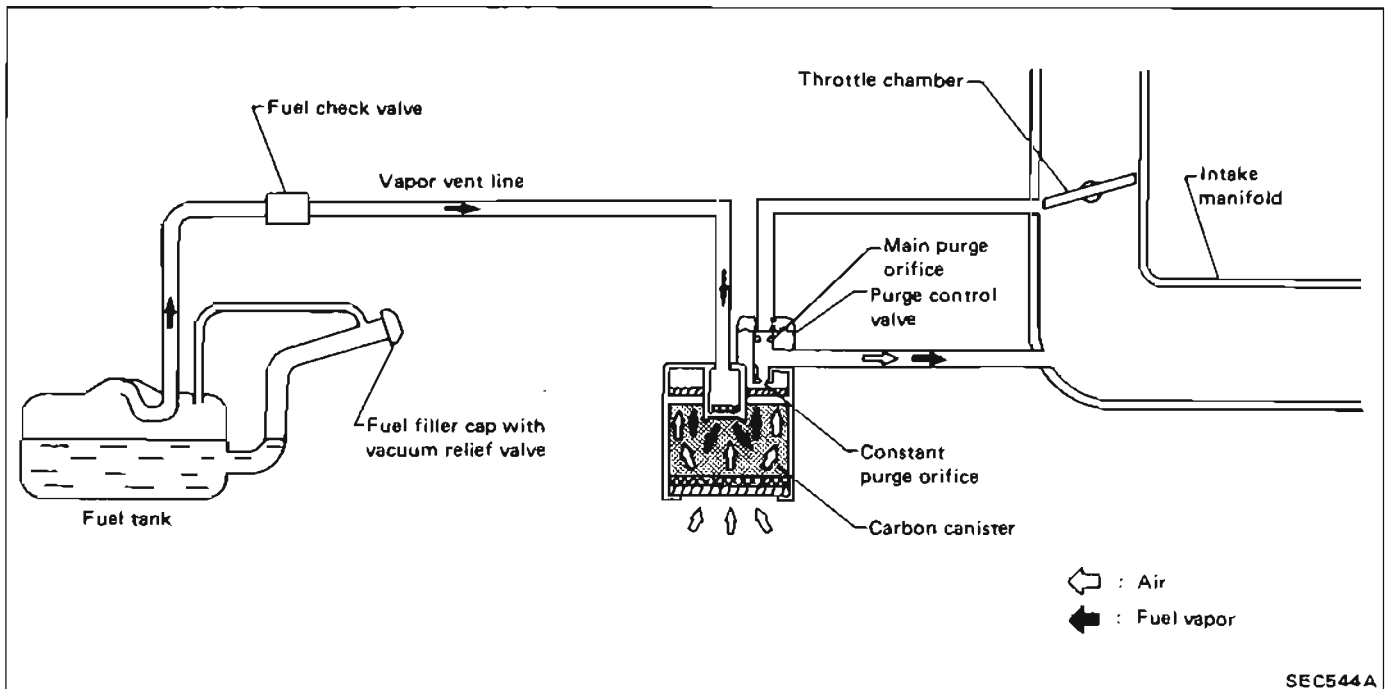
CAUTION:

After properly connecting injectors to fuel tube, check connection for fuel leakage.

6. Assemble injectors with fuel pipe to intake manifold.

EVAPORATIVE EMISSION CONTROL SYSTEM

Description

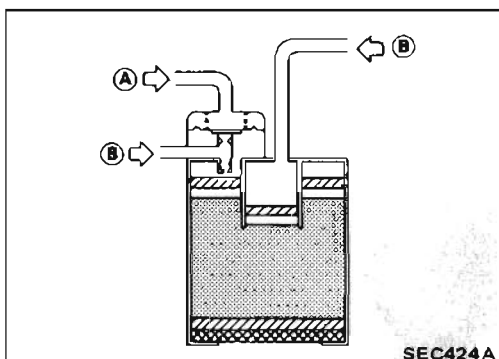


The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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:

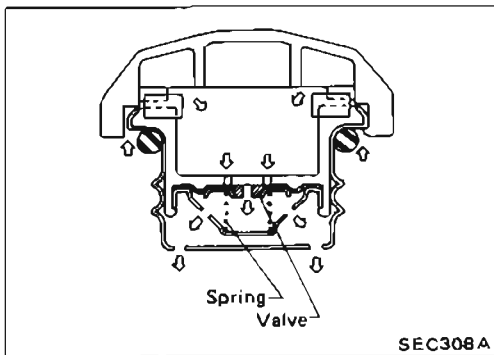
- Ⓐ : Blow air and ensure that there is no leakage.
- Ⓑ : Blow air and ensure that there is leakage.

EVAPORATIVE EMISSION CONTROL SYSTEM

Inspection (Cont'd)

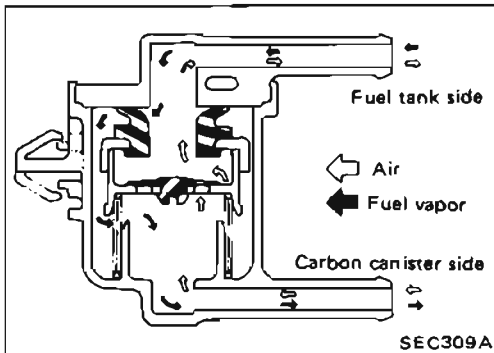
FUEL TANK VACUUM RELIEF VALVE

1. Wipe valve housing clean.
2. Inhale air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.

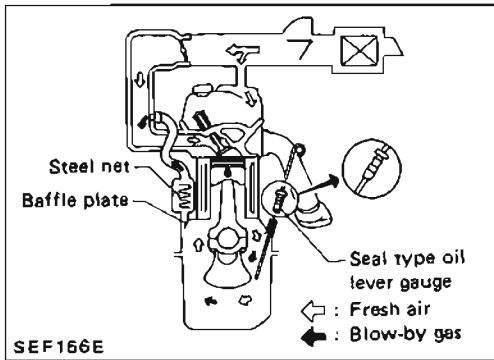


FUEL CHECK VALVE

1. Blow air through connector on fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the canister.
2. Blow air through connector on canister side. Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



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.

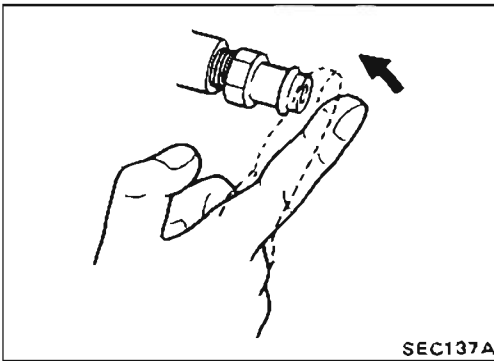
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

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.

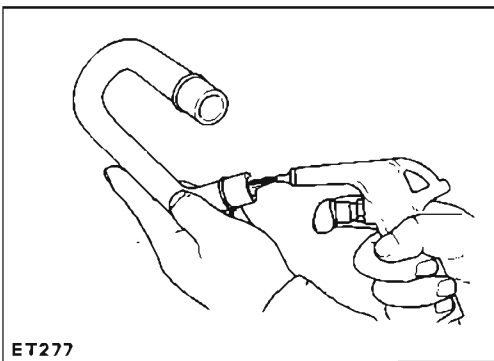
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.



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. | 16±2 |
| IDLE SPEED | rpm | M/T 750±50 A/T 750±50 (in "N" position) |

Inspection and Adjustment

| | | |
|---|----|---|
| ENGINE TEMPERATURE SENSOR | | |
| Thermistor resistance | kΩ | 20°C (68°F) |
| | | 80°C (176°F) |
| | | 2.1 - 2.9 |
| | | 0.30 - 0.33 |
| IDLE SWITCH | | |
| Engine speed when idle switch is changed from "OFF" to "ON" | | M/T 1,000±150 A/T 1,000±150 (in "N" position) |
| rpm | | |
| FUEL PRESSURE at idling (Measuring point: between fuel filter and fuel pipe) | | |
| Vacuum hose is connected | | Approximately 226 (2.3, 33) |
| kPa (kg/cm ² , psi) | | |
| Vacuum hose is disconnected | | Approximately 294 (3.0, 43) |
| kPa (kg/cm ² , psi) | | |
| FUEL INJECTOR | | |
| Coil resistance | Ω | Approximately 10 - 15 |
| AIR REGULATOR | | |
| Resistance | Ω | Approximately 75 |
| EXHAUST GAS TEMPERATURE SENSOR | | |
| Thermistor resistance | kΩ | 100°C (212°F) |
| | | 85.3±8.53 |

ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

SECTION **FE**

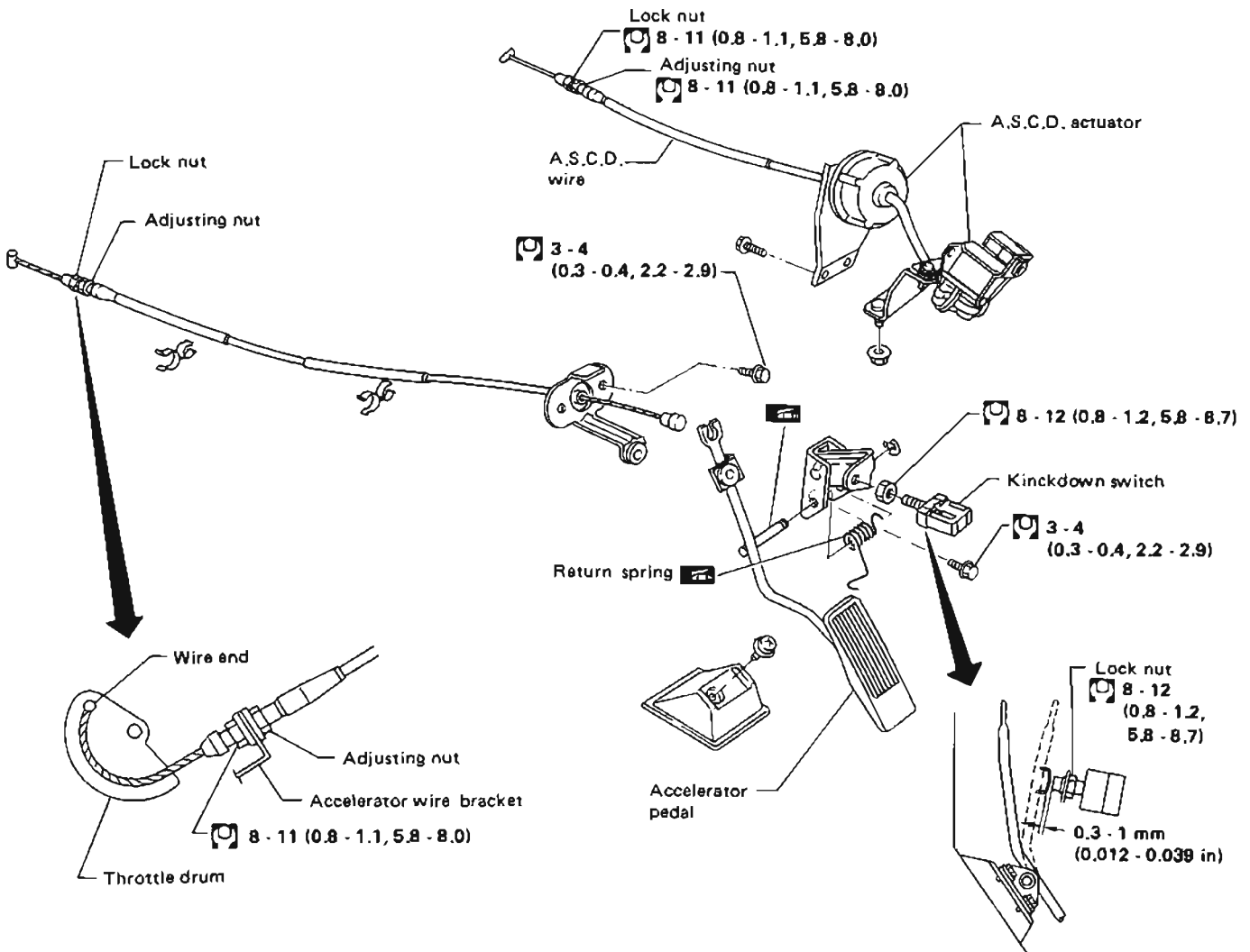
CONTENTS

| | |
|-----------------------------|------|
| ENGINE CONTROL SYSTEM | FE-2 |
| FUEL SYSTEM | FE-3 |
| EXHAUST SYSTEM | FE-4 |

FE

Accelerator Control System

- When removing accelerator wire, make a mark to indicate lock nut's initial position.
- Check that throttle valve fully opens when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.
- Adjust accelerator wire 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 wire, be careful not to twist or scratch its inner wire.



: N·m (kg·m, ft·lb)

FUEL SYSTEM

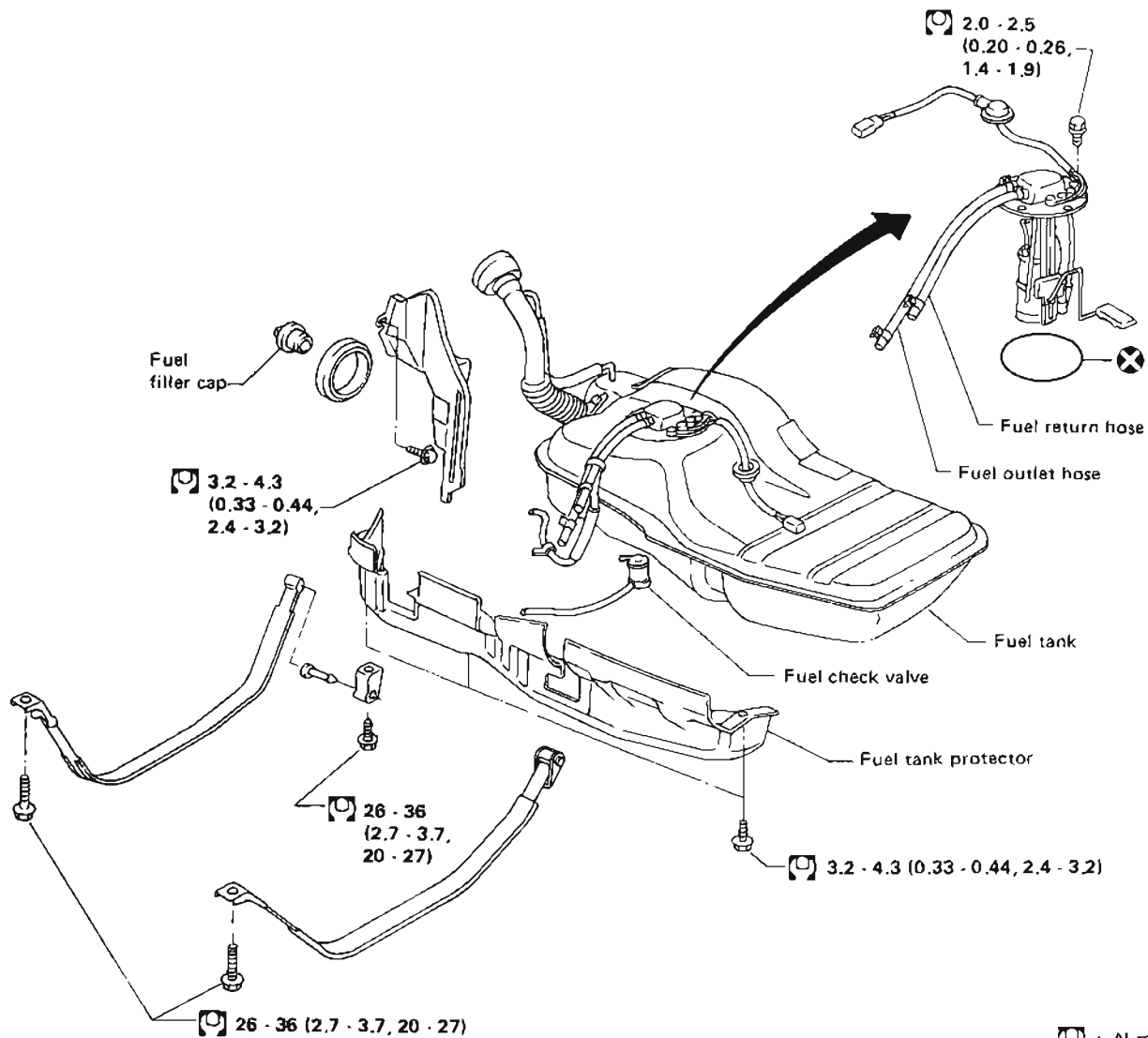
WARNING:


When replacing fuel line parts, be sure to observe the following:

- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- 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:

- For electric fuel pump model, before disconnecting fuel hose, release fuel pressure from fuel line. Refer to "Fuel Filter Replacement" in MA section.
- Do not disconnect any fuel line unless absolutely necessary.
- Plug hose and pipe openings to prevent entry of dust or dirt.
- Always replace O-ring and clamps with new ones.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose clamps excessively to avoid damaging hoses.
- When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)
- Run engine and check for leaks at connections.

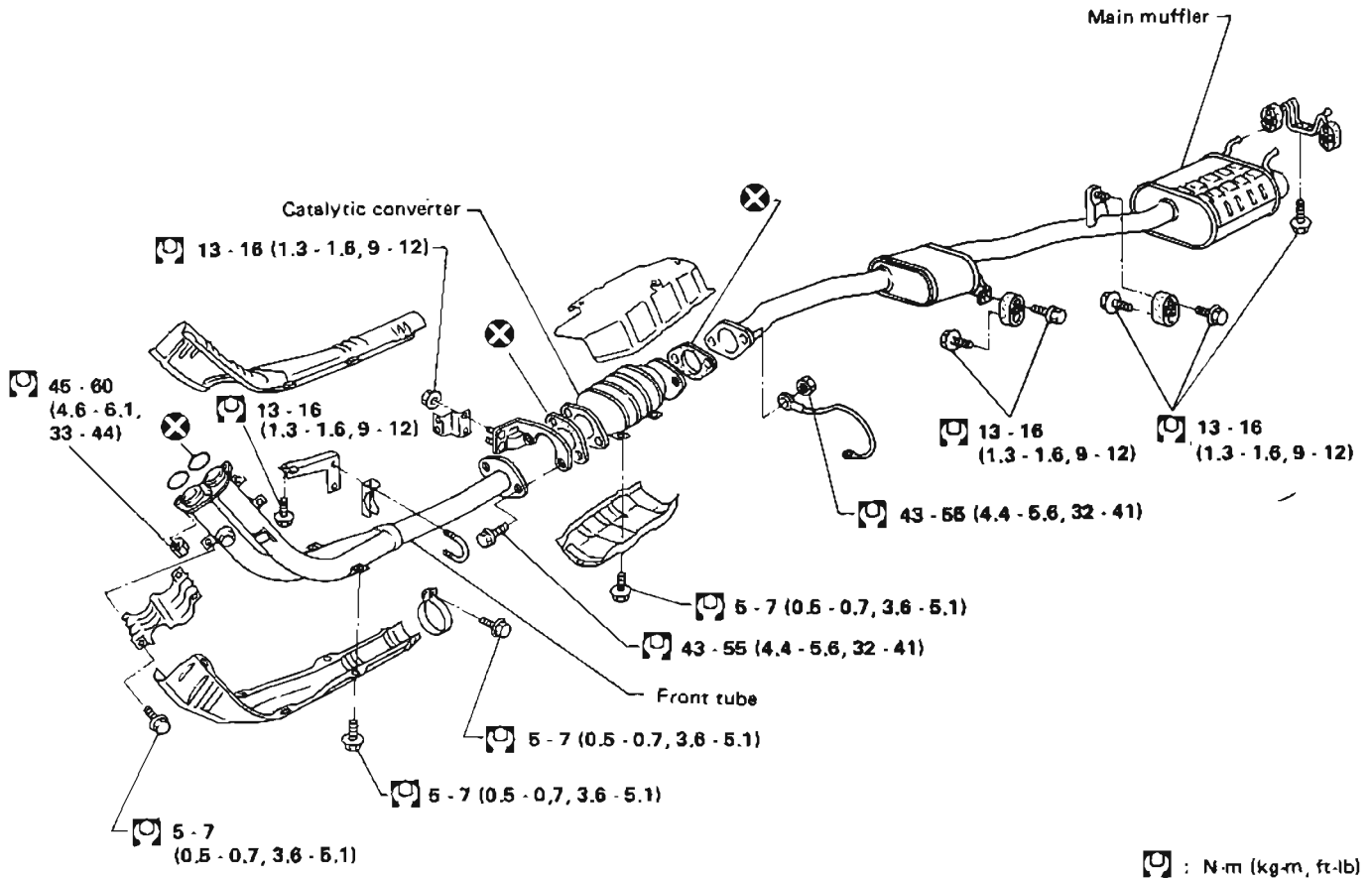


 : N·m (kg·m, ft·lb)

EXHAUST SYSTEM

CAUTION:

- Always replace exhaust gaskets with new ones when disassembling.
- Check all tube connections for exhaust gas leaks, and entire system for unusual noises, with engine running.
- After installation, check that mounting brackets and mounting insulator are free from undue stress. If any of above parts are not installed properly, excessive noise or vibration may be transmitted to vehicle body.



SFE014A

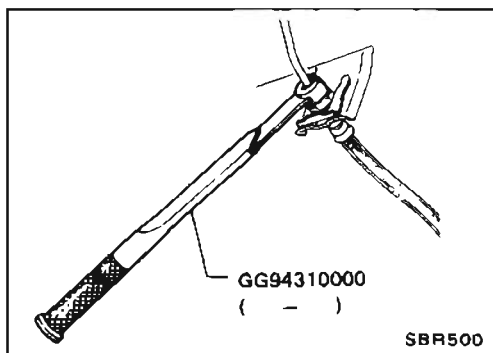
SECTION CL

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CLUTCH SYSTEM CL- 4
INSPECTION AND ADJUSTMENT CL- 5
HYDRAULIC CLUTCH CONTROL CL- 7
CLUTCH RELEASE MECHANISM CL-10
CLUTCH DISC AND CLUTCH COVER CL-12
SERVICE DATA AND SPECIFICATIONS (S.D.S.) CL-14



PRECAUTIONS AND PREPARATION



Precautions

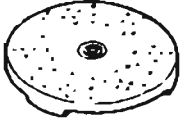
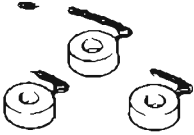

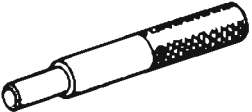

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch piping, use Tool.
- Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.
- Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.

WARNING:

After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.

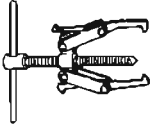
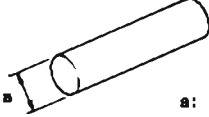
Preparation

SPECIAL SERVICE TOOLS

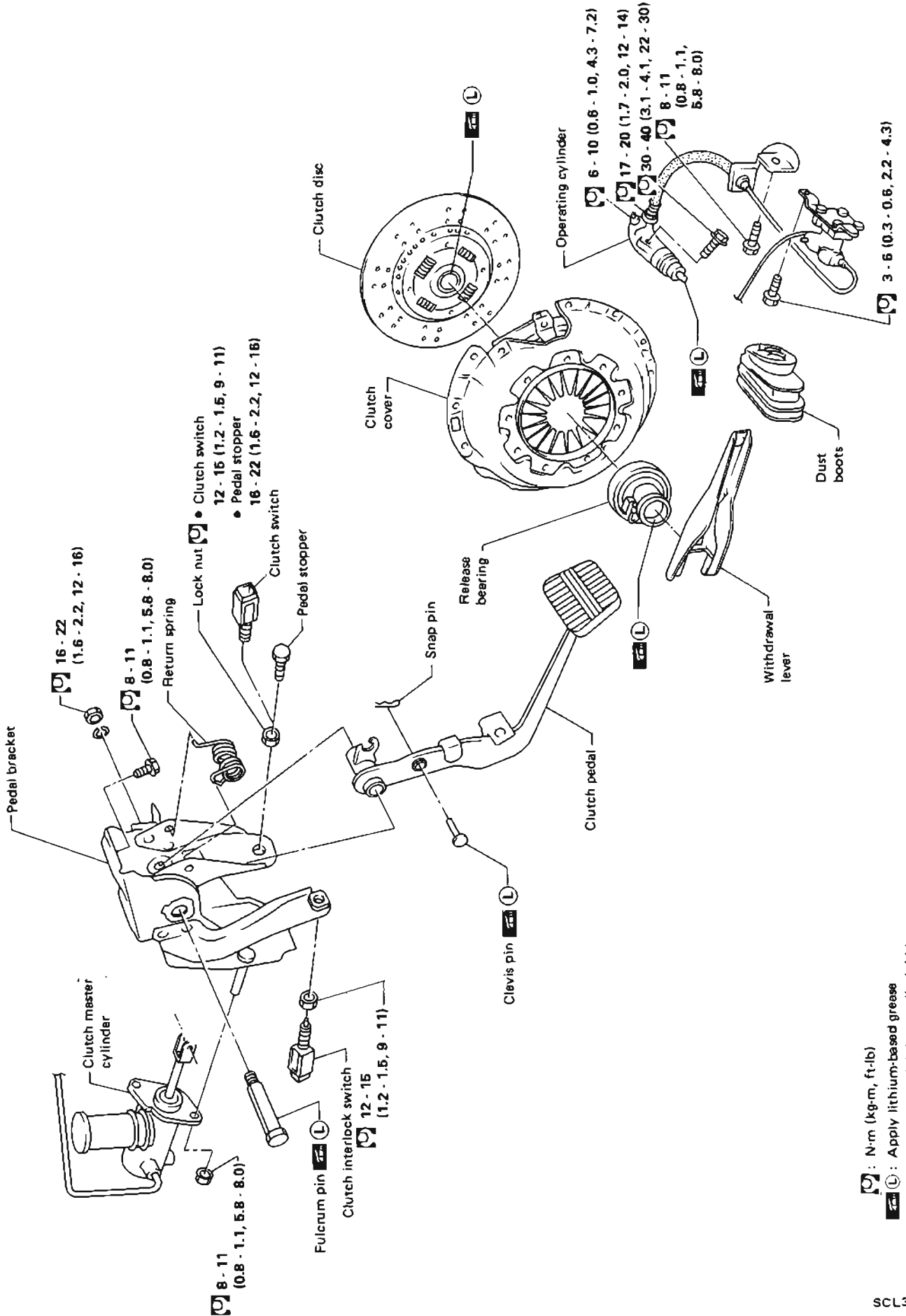
| Tool number (Kent-Moore No.) Tool name | Description |
|--|--|
| ST20050010 (-) Base plate |  <p>Inspecting diaphragm spring of clutch cover</p> |
| ST20050100 (-) Distance piece |  <p>Inspecting diaphragm spring of clutch cover</p> |
| GG94310000 (-) Flare nut torque wrench |  <p>Removing and installing each clutch piping</p> |
| ST20600000 (J26366) Clutch aligning bar |  <p>Installing clutch cover and clutch disc</p> |
| ST20050240 (-) Diaphragm spring adjusting wrench |  <p>Adjusting unevenness of diaphragm spring of clutch cover</p> |

PRECAUTIONS AND PREPARATION

Preparation (Cont'd) COMMERCIAL SERVICE TOOLS

| Tool name | Description |
|----------------|--|
| Bearing puller |  Removing release bearing |
| Bearing drift |  a: 50 mm (1.97 in) dia. |

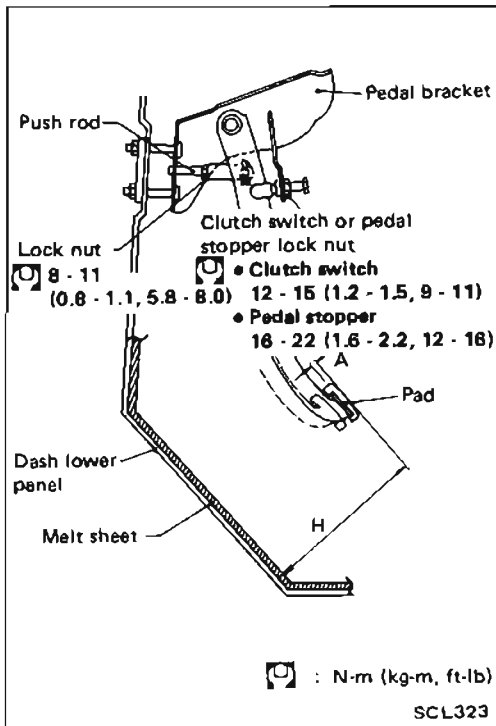
CLUTCH SYSTEM



CL-4

N·m (kg·m, ft·lb)
 Apply lithium-based grease including molybdenum disulphide.

INSPECTION AND ADJUSTMENT



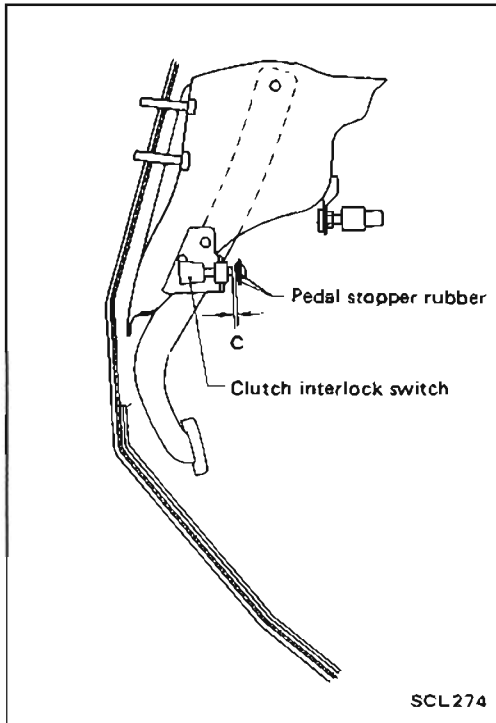
Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch switch.
Pedal height "H":
186 - 196 mm (7.32 - 7.72 in)
2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.

Pedal free play "A":
1.0 - 3.0 mm (0.039 - 0.118 in)

Pedal free play means the following total measured at position of pedal pad:

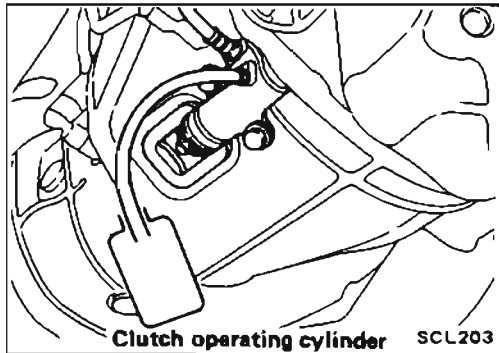
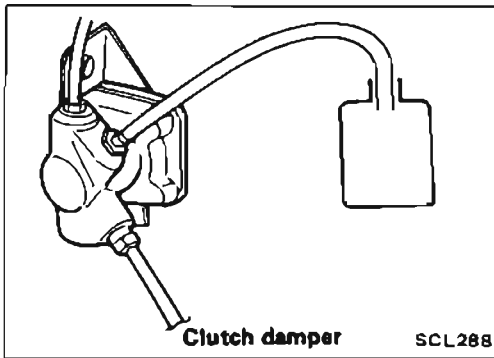
- Play due to clevis pin and clevis pin hole in clutch pedal.
- Play due to piston and push rod.



— 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:
1.0 - 2.0 mm (0.039 - 0.079 in)



Bleeding Procedure

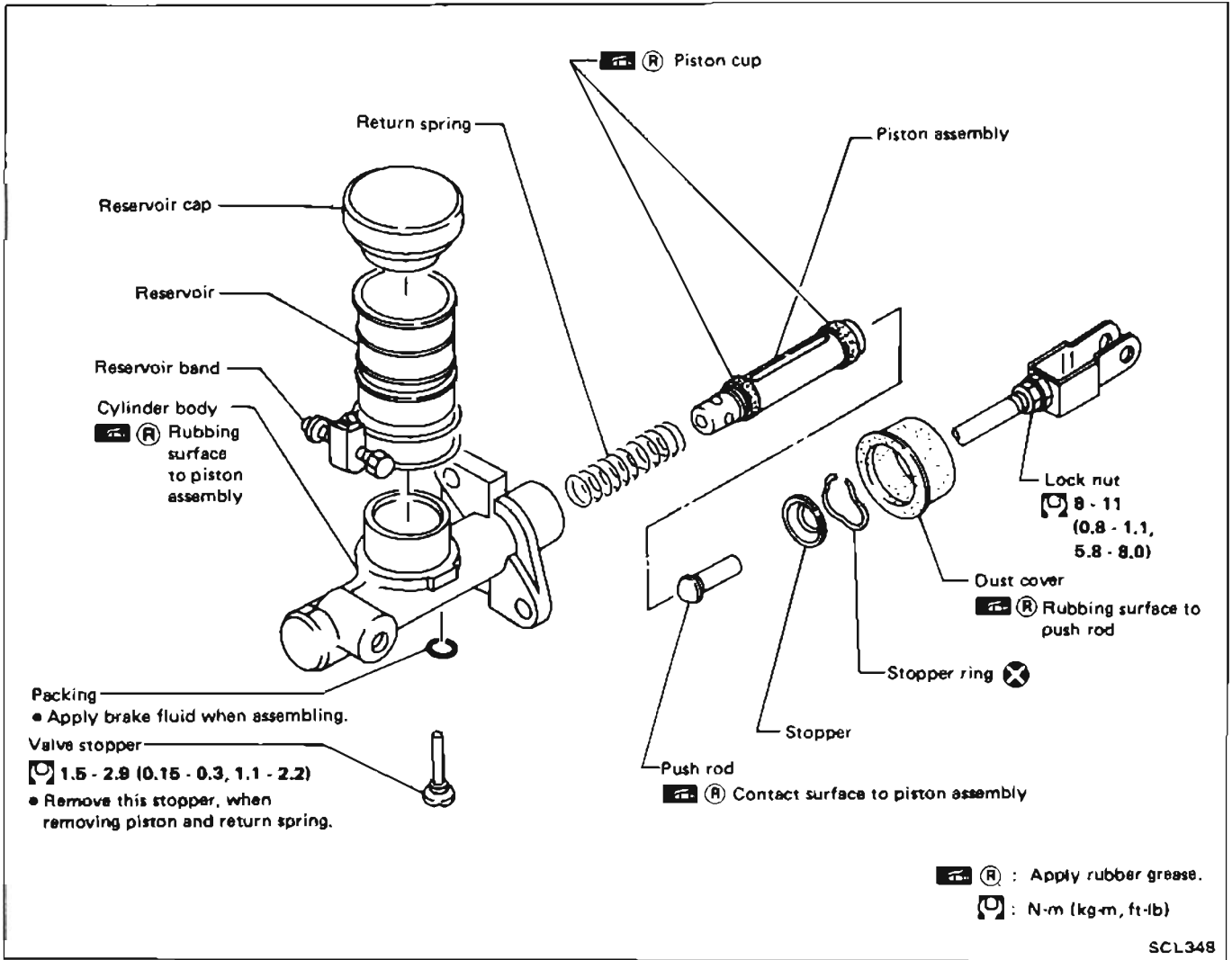
Bleed air according to the following procedure.

Clutch damper → Clutch operating cylinder

- 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.
 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 brake fluid flows from air bleeder valve without air bubbles.

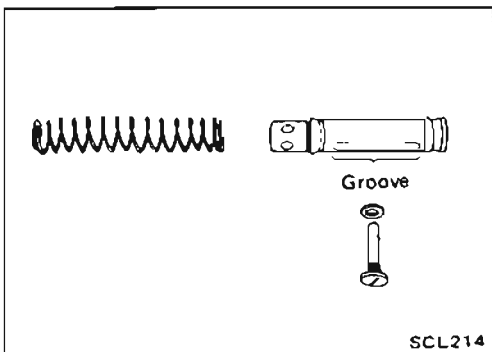
HYDRAULIC CLUTCH CONTROL

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.

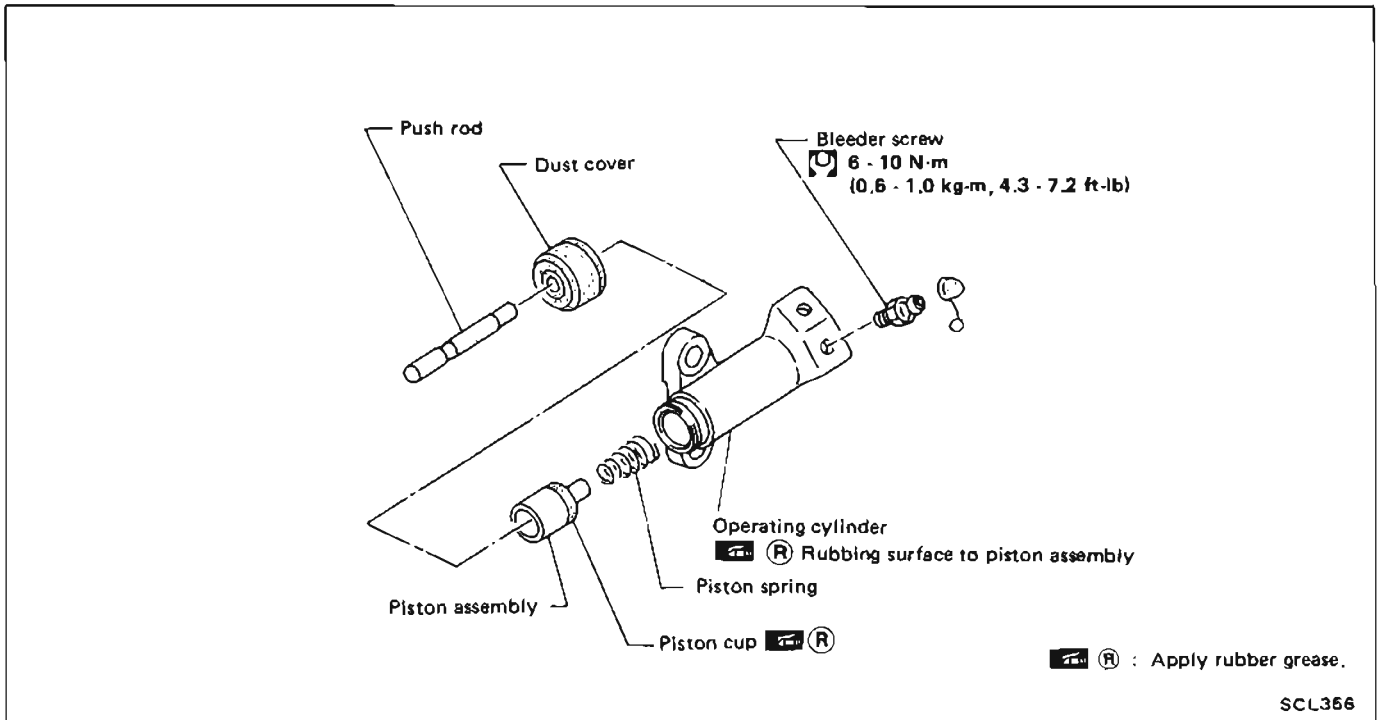
HYDRAULIC CLUTCH CONTROL

Clutch Master Cylinder (Cont'd)

INSPECTION

- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

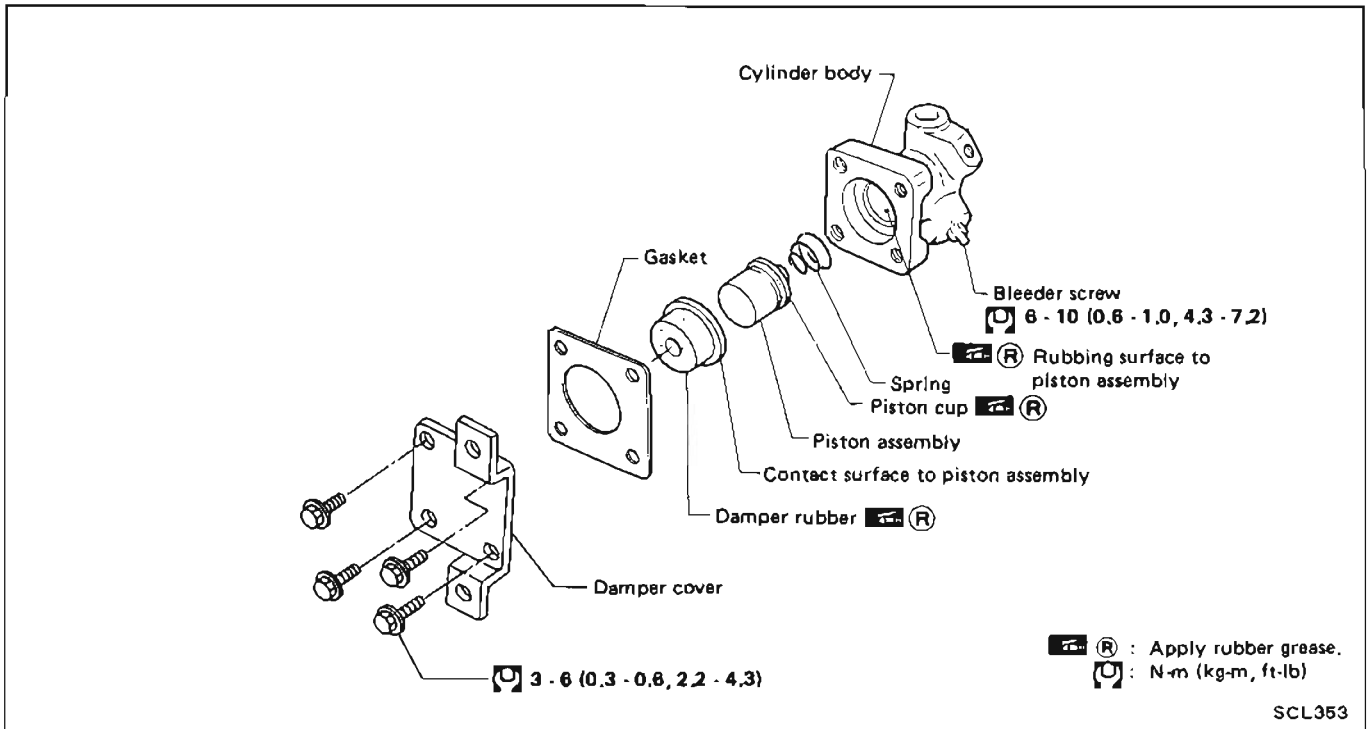
Operating Cylinder



INSPECTION

- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check piston spring for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

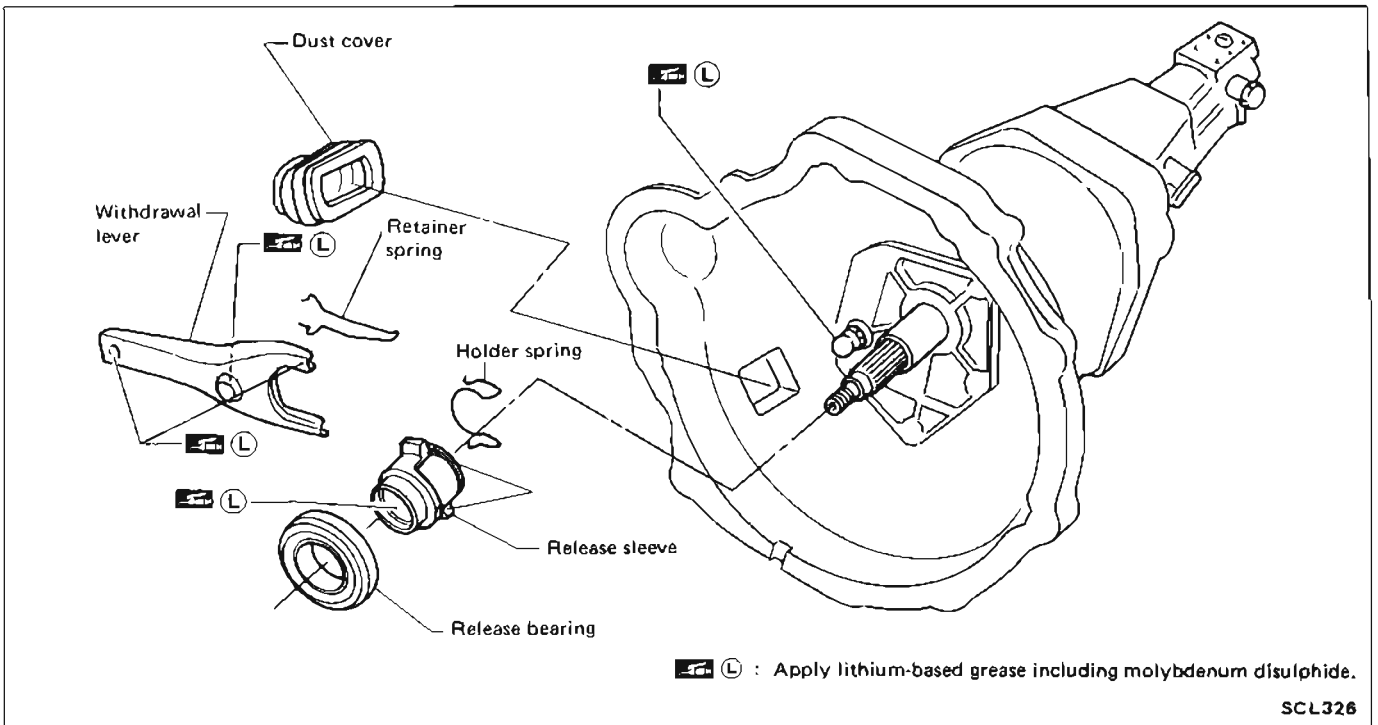
Clutch Damper



INSPECTION

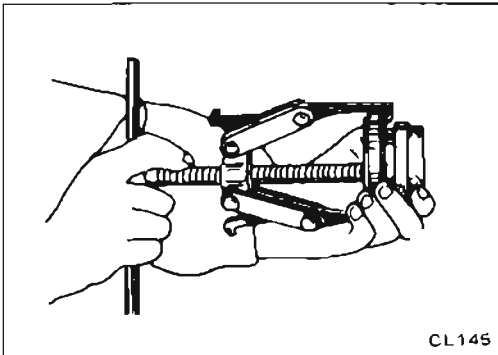
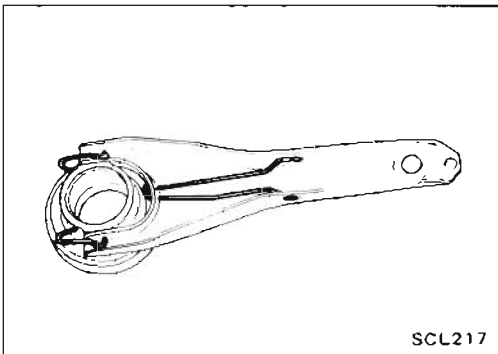
- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check damper rubber and piston cup for cracks, deformation or damage. Replace if necessary.

CLUTCH RELEASE MECHANISM

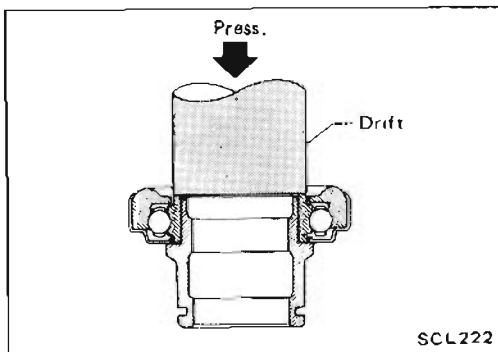


REMOVAL AND INSTALLATION

- Install retainer spring and holder spring.



- Remove release bearing.

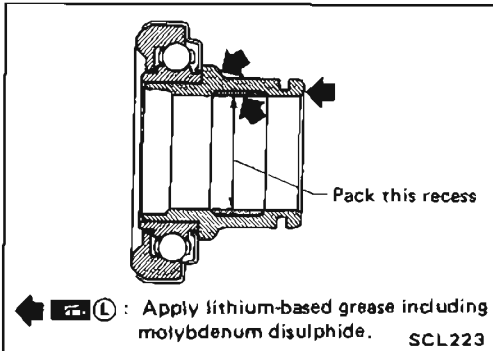


- Install release bearing with suitable drift.

CLUTCH RELEASE MECHANISM

INSPECTION

- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.

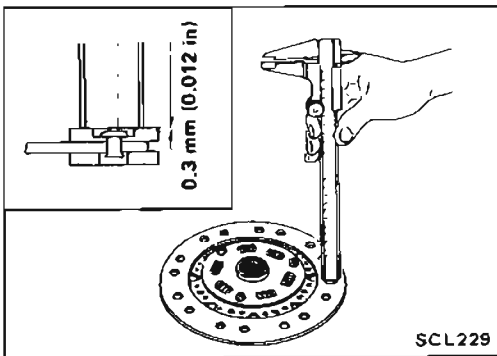
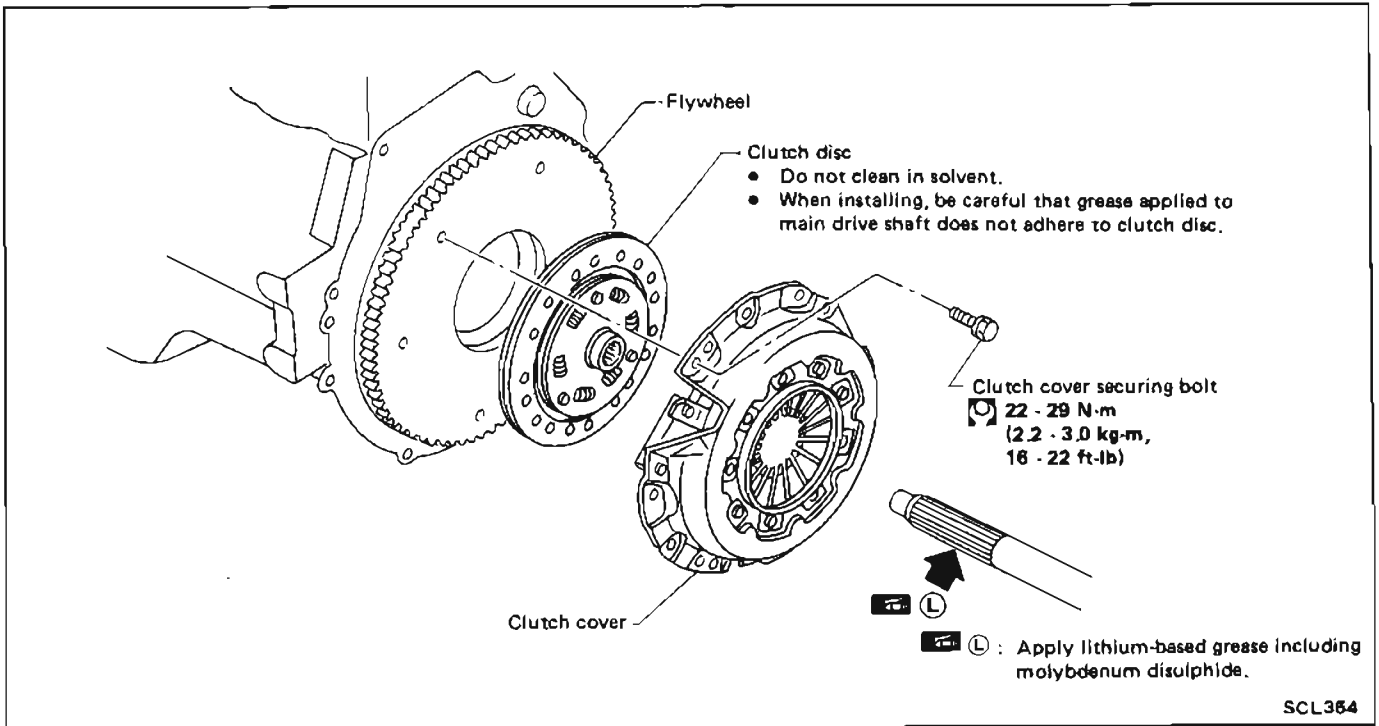


LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

Too much lubricant might damage clutch disc facing.

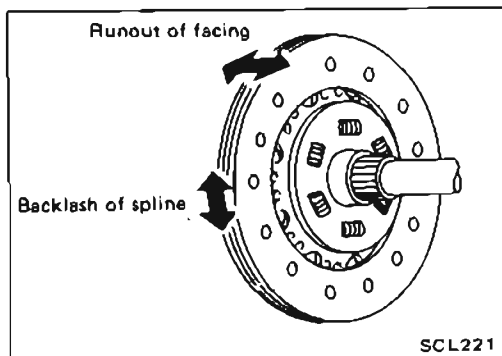
CLUTCH DISC AND CLUTCH COVER



Clutch Disc

INSPECTION

- Check clutch disc for wear of facing.
Wear limit of facing surface to rivet head:
0.3 mm (0.012 in)



- Check clutch disc for backlash of spline and runout of facing.
Maximum backlash of spline (at outer edge of disc):
0.9 mm (0.035 in)
Runout limit:
1.0 mm (0.039 in)
Distance of runout check point (from hub center):
107.5 mm (4.23 in)
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.

INSTALLATION

- Apply recommended grease to contact surface of spring portion.
Too much lubricant might damage clutch disc facing.

Clutch Cover and Flywheel INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.

Diaphragm spring height "A":

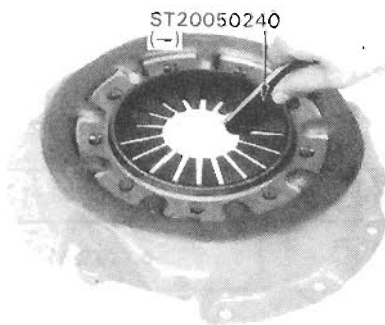
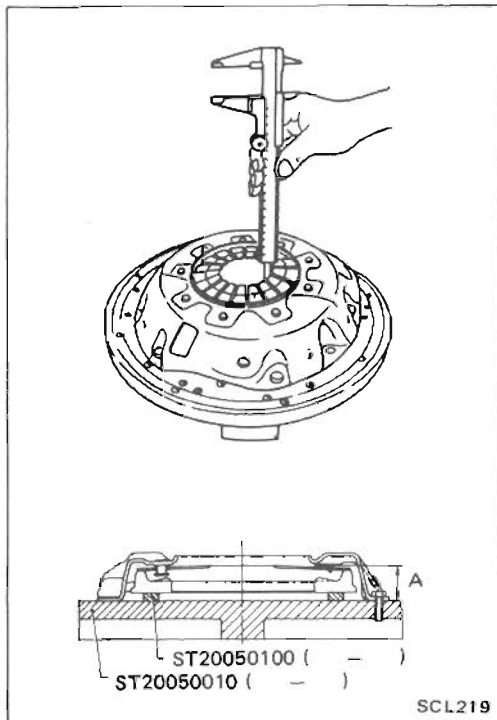
33.0 - 35.0 mm (1.299 - 1.378 in)

- 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)

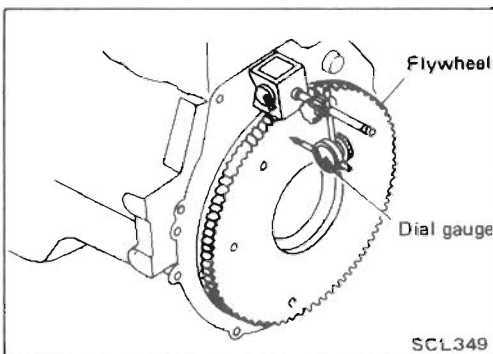


FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.

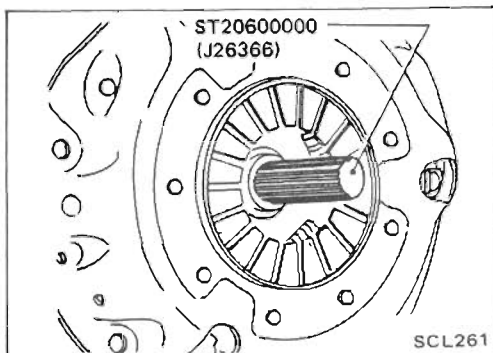
Runout (Total indicator reading):

Less than 0.15 mm (0.0059 in)



INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.



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) | 17.46 (11/16) |
|----------------|---------|---------------|

CLUTCH DAMPER

| | | |
|----------------|---------|-------------|
| Inner diameter | mm (in) | 19.05 (3/4) |
|----------------|---------|-------------|

CLUTCH DISC

| | |
|---|---|
| Model | 225LTD |
| Facing size (Outer dia. x inner dia. x thickness) mm (in) | 225 x 150 x 3.5 (8.86 x 5.91 x 0.138) |
| Thickness of disc assembly With load mm (in) | 7.6 - 8.0 (0.299 - 0.315) with 5,394 N (560 kg, 1,213 lb) |

CLUTCH COVER

| | |
|----------------------|------------------|
| Model | C225S |
| Full load N (kg, lb) | 4,413 (460, 992) |

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

| | |
|---|---------------------------|
| Pedal height "H" | 186 - 196 (7.32 - 7.72) |
| Pedal free play (Backlash at clevis) | 1.0 - 3.0 (0.039 - 0.118) |
| Clearance between pedal stopper rubber and threaded end of clutch Interlock | 1.0 - 2.0 (0.039 - 0.079) |

*: Measured from surface of melt sheet to pedal pad

CLUTCH COVER

Unit: mm (in)

| | |
|--|-----------------------------|
| Model | C225S |
| Diaphragm spring height | 33.0 - 36.0 (1.299 - 1.378) |
| Uneven limit of diaphragm spring toe height | 0.7 (0.028) |

CLUTCH DISC

Unit: mm (in)

| | |
|---|--------------|
| Model | 225LTD |
| 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 of disc) | 0.9 (0.035) |

MANUAL TRANSMISSION

SECTION **MT**

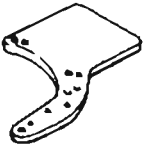
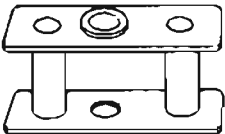
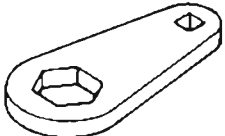

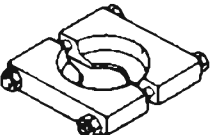
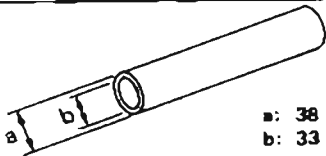
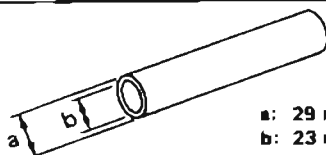
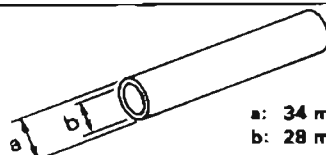
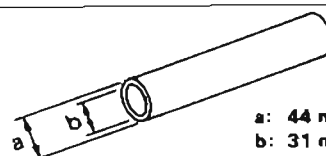
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| REMOVAL AND INSTALLATION | MT- 5 |
| MAJOR OVERHAUL | MT- 6 |
| DISASSEMBLY | MT- 9 |
| INSPECTION | MT-14 |
| ASSEMBLY | MT-16 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | MT-26 |

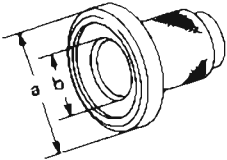

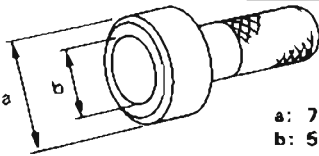
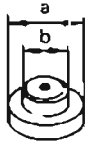
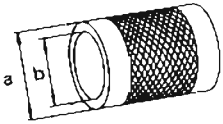


PREPARATION

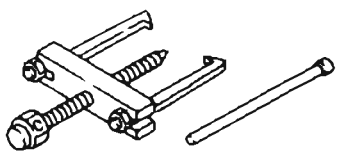
SPECIAL SERVICE TOOLS

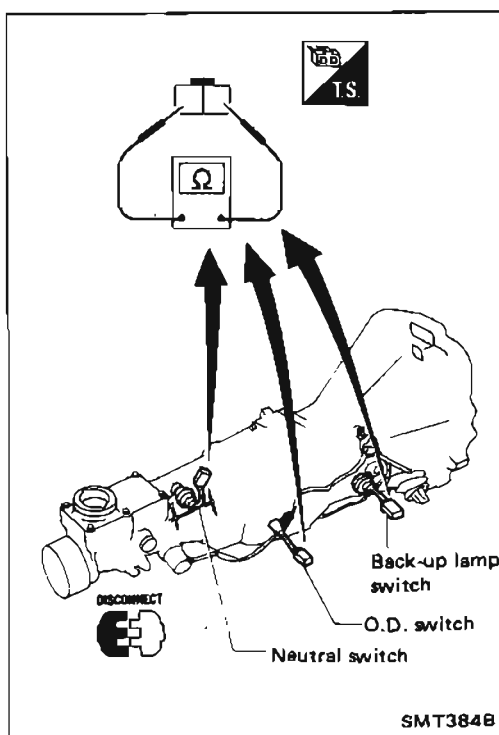
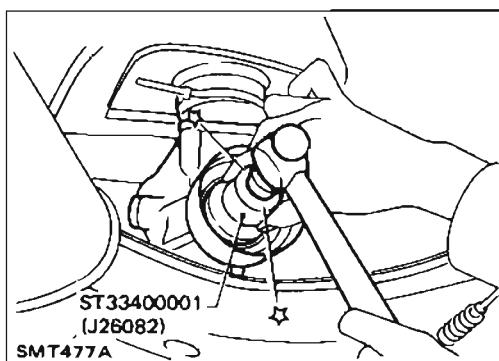
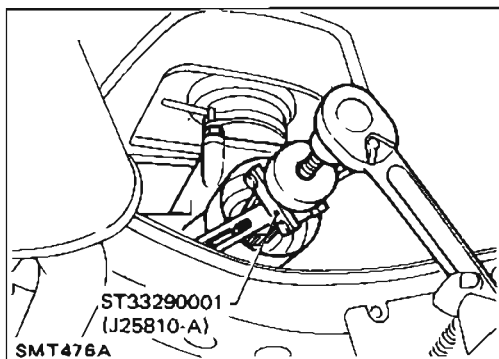
| Tool number (Kent-Moore No.) Tool name | Description | |
|---|---|---|
| ST23810001 (-) Adapter setting plate |  | Fixing adapter plate with gear assembly |
| KV31100401 (-) Transmission press stand |  | Pressing counter gear and mainshaft |
| ST22520000 (J26348) Wrench |  | Tightening mainshaft lock nut |
| ST23540000 (J25689-A) Pin punch |  | Removing and installing fork rod retaining pin |
| ST30031000 (J22912-01) Puller |  | Removing and installing 1st gear bushing Removing main drive gear bearing Measuring wear of baulk rings |
| ST23860000 (-) Drift |  <p style="margin-left: 40px;">a: 38 mm (1.50 in) dia. b: 33 mm (1.30 in) dia.</p> | Installing counter drive gear |
| ST22360002 (J25679-01) Drift |  <p style="margin-left: 40px;">a: 29 mm (1.14 in) dia. b: 23 mm (0.91 in) dia.</p> | Installing counter gear front and rear end bearings |
| ST22350000 (J25678-01) Drift |  <p style="margin-left: 40px;">a: 34 mm (1.34 in) dia. b: 28 mm (1.10 in) dia.</p> | Installing O.D. gear bushing |
| ST23800000 (J25691-01) Drift |  <p style="margin-left: 40px;">a: 44 mm (1.73 in) dia. b: 31 mm (1.22 in) dia.</p> | Installing front cover oil seal |

PREPARATION

| Tool number (Kent-Moore No.) Tool name | Description |
|--|--|
| ST33400001 (J26082) Drift |  <p>a: 60 mm (2.36 in) dia. b: 47 mm (1.85 in) dia.</p> |
| ST33290001 (J25810-A) Puller |  <p>Removing rear oil seal</p> |
| ST30720000 (-) Drift |  <p>a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.</p> |
| ST30613000 (J25742-3) Drift |  <p>a: 71.5 mm (2.815 in) dia. b: 47.5 mm (1.870 in) dia.</p> |
| ST33200000 (J26082) Drift |  <p>a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.</p> |

COMMERCIAL SERVICE TOOL

| Tool name | Description |
|-----------|--|
| Puller |  <p>Removing counter bearings, counter drive and O.D. gears</p> |



Replacing Rear Oil Seal

REMOVAL

INSTALLATION

Check of Position Switch

BACK-UP LAMP SWITCH

- Check continuity.

| Gear position | Continuity |
|----------------|------------|
| Reverse | Yes |
| Except reverse | No |

NEUTRAL SWITCH

- Check continuity.

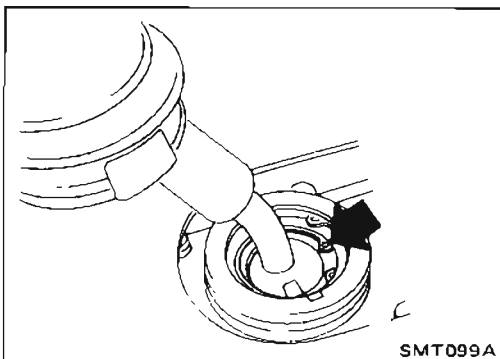
| Gear position | Continuity |
|----------------|------------|
| Neutral | Yes |
| Except neutral | No |

O.D. SWITCH

- Check continuity.

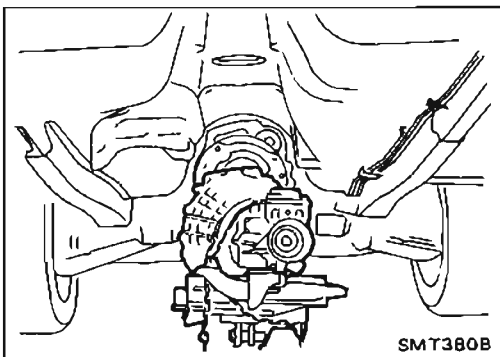
| Gear position | Continuity |
|---------------|------------|
| 5th | Yes |
| Except 5th | No |

REMOVAL AND INSTALLATION

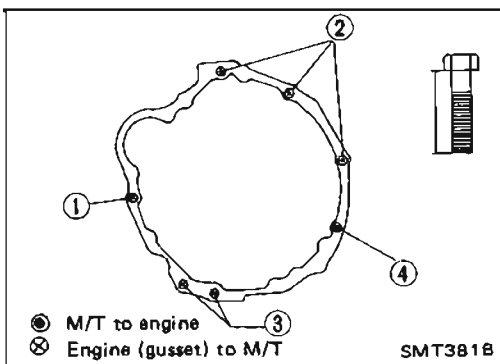


Removal

- Remove shift lever.



- Remove propeller shaft. — Refer to section PD.
- **Insert plug into rear oil seal after removing propeller shaft.**
- **Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.**
- Support engine by placing a jack under oil pan.
- **Do not place jack under oil pan drain plug.**
- Remove transmission from engine.
- **Support manual transmission, while removing it.**



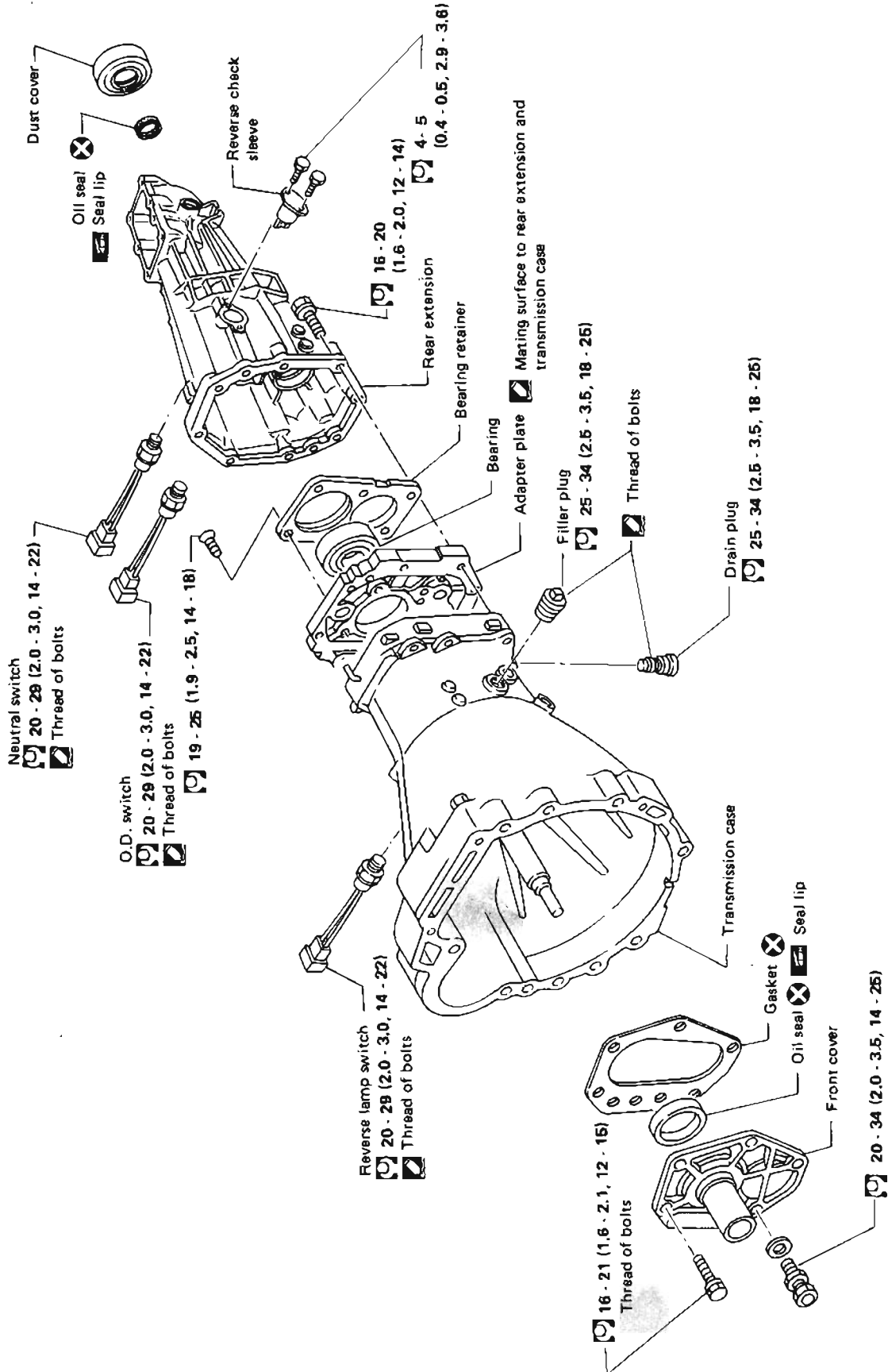
Installation

- Tighten all transmission bolts.

| Bolt No. | Tightening torque N·m (kg·m, ft·lb) | ℓ mm (in) |
|------------------|-------------------------------------|-----------|
| 1 | 39 - 49 (4.0 - 5.0, 29 - 36) | 70 (2.76) |
| 2 | 39 - 49 (4.0 - 5.0, 29 - 36) | 60 (2.36) |
| 3 | 29 - 39 (3.0 - 4.0, 22 - 29) | 30 (1.18) |
| 4 | 39 - 49 (4.0 - 5.0, 29 - 36) | 25 (0.98) |
| Gusset to engine | 29 - 39 (3.0 - 4.0, 22 - 29) | — |

MAJOR OVERHAUL

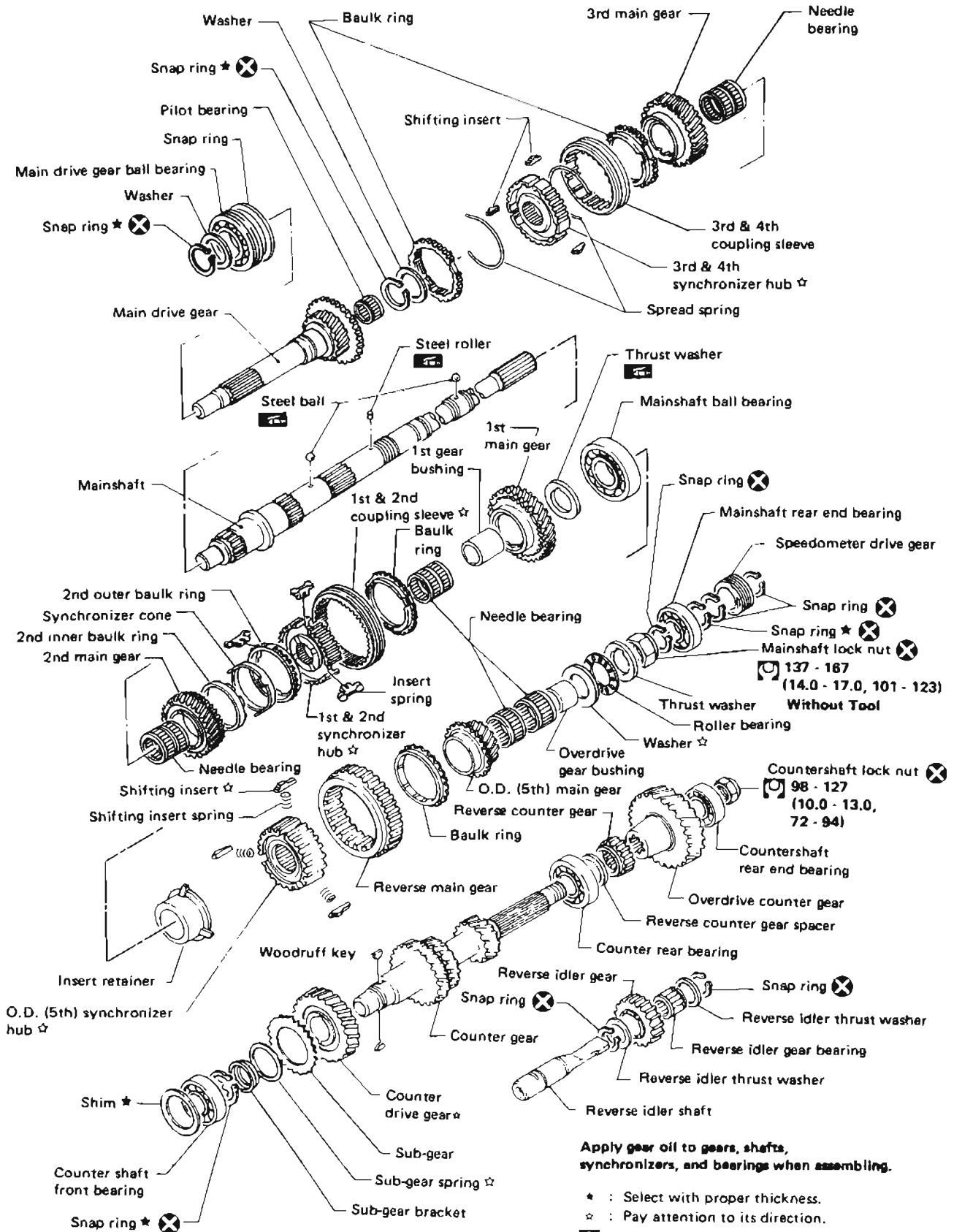
Case Components



[Torque symbol] : N·m (kg·m, ft·lb)
 [Thread symbol] : Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.

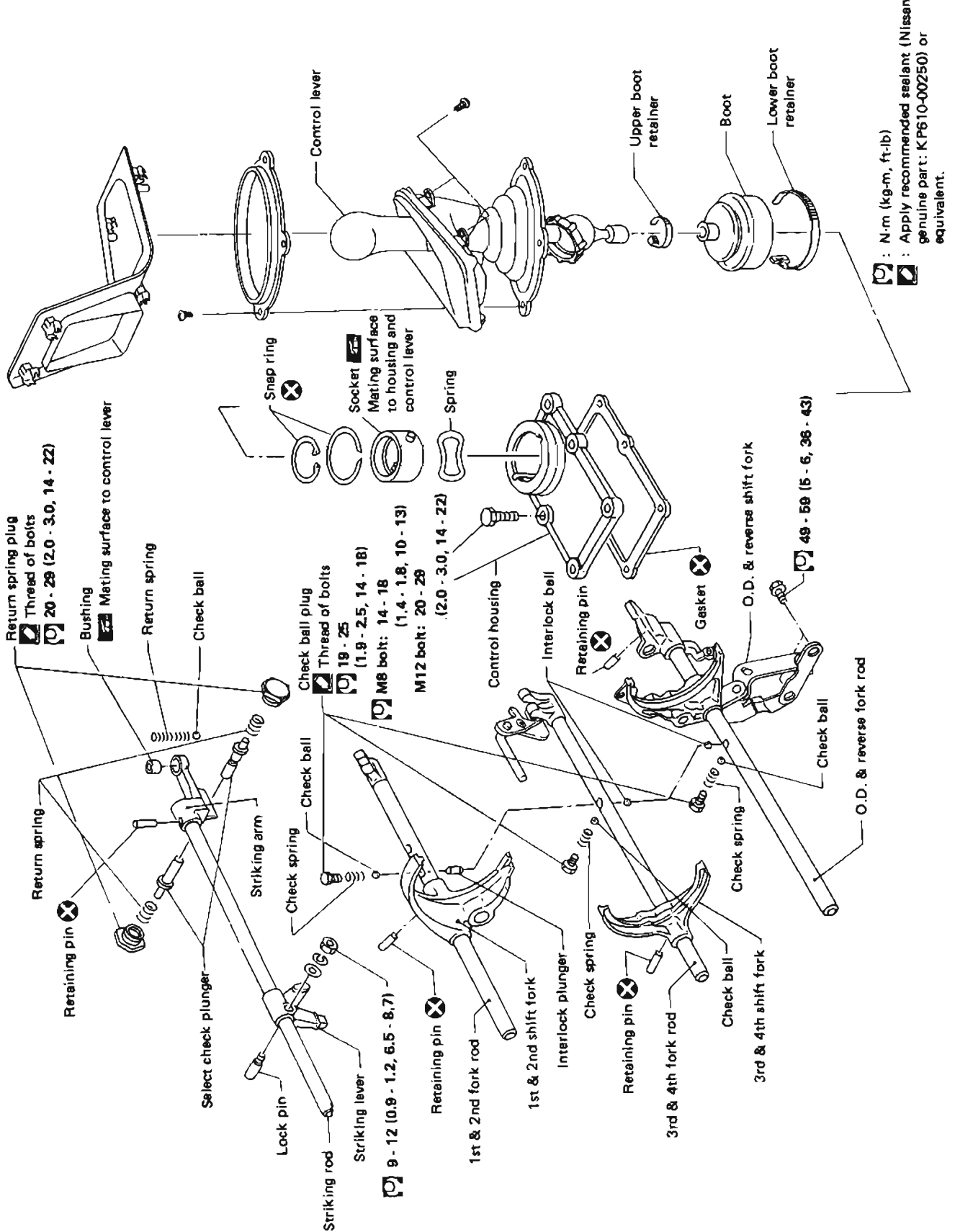
MAJOR OVERHAUL

Gear Components



SMT037B

Shift Control Components

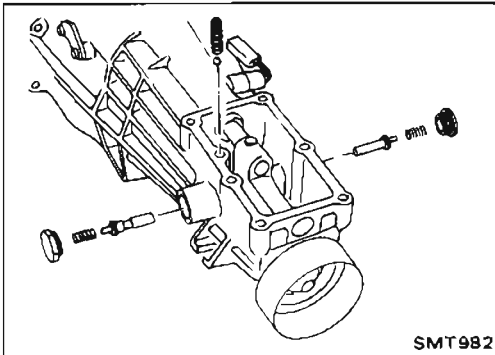


: N.m (kg-m, ft-lb)
 : Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.

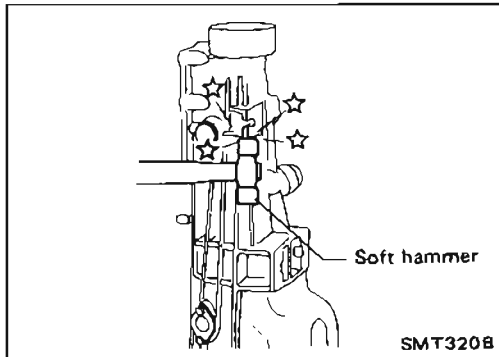
DISASSEMBLY

Case Components

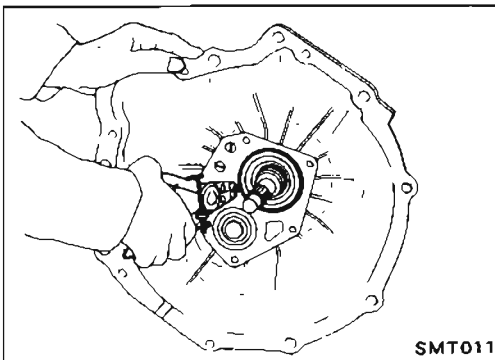
1. Remove rear extension.
 - a. Remove control housing, check ball, return spring plug, select check plunger and return springs.



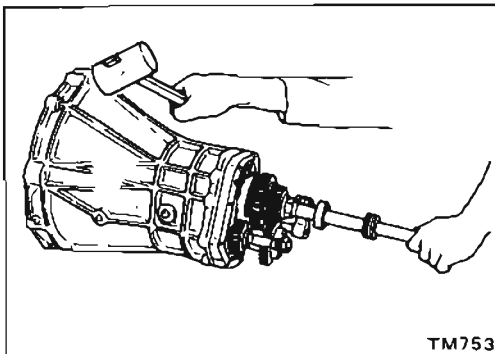
- b. Remove rear extension by lightly tapping it.



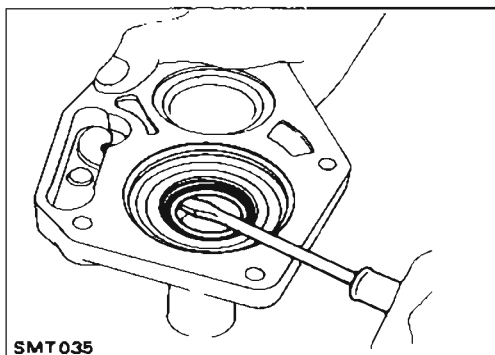
2. Remove front cover, gasket, shim of countershaft front bearing, and snap ring of main drive gear ball bearing.



3. Remove transmission case by tapping lightly.

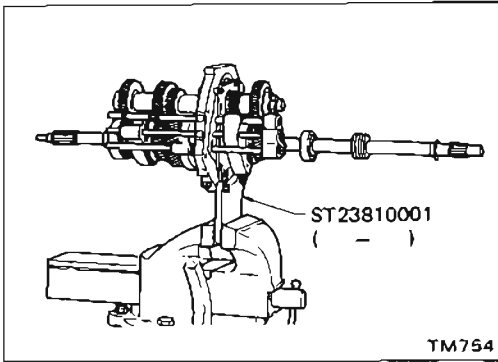


4. Remove front cover oil seal.

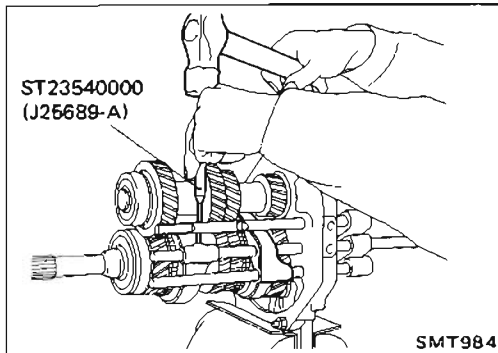


DISASSEMBLY

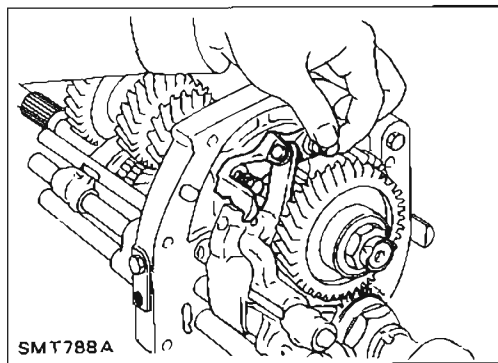
Shift Control Components



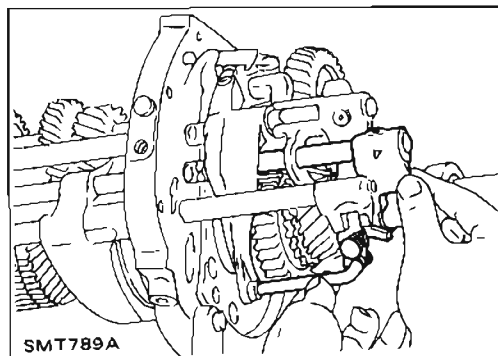
1. Set up Tool on adapter plate.
2. Remove check ball plugs, check springs, and check balls.



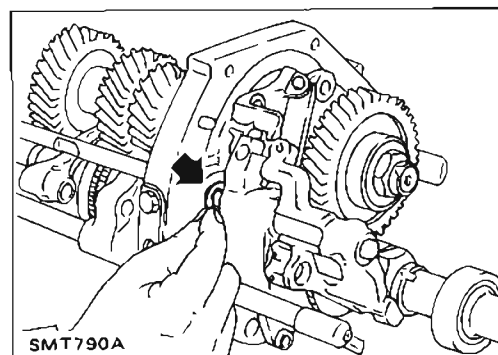
3. Drive out retaining pins. Then drive out fork rods and remove interlock balls.



4. Remove lever bracket securing bolt.



5. Draw out 3rd-4th fork rod.

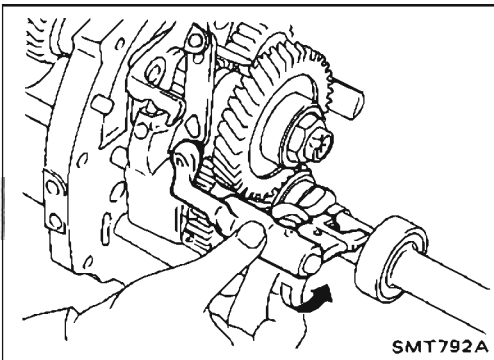


6. Remove E-ring from O.D. and reverse fork rod.

DISASSEMBLY

Shift Control Components (Cont'd)

7. Draw out O.D. and reverse fork shaft by rotating O.D. and reverse bracket counterclockwise.

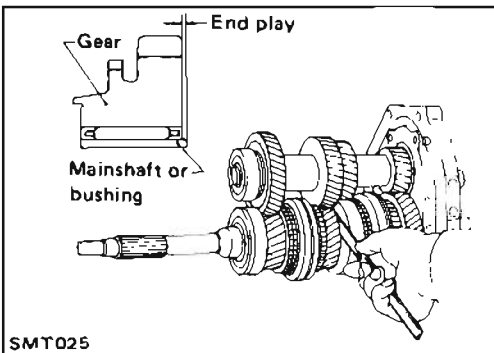


Gear Components

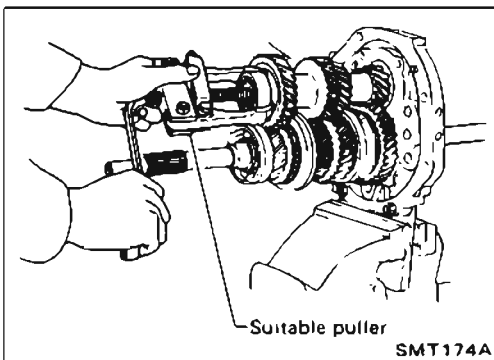
1. Before removing gears and shafts, measure each gear end play.

Gear end play: Refer to S.D.S.

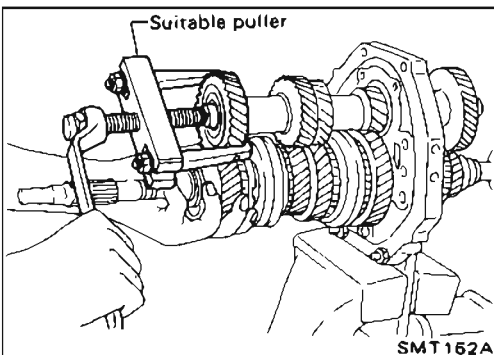
If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.



2. Mesh 2nd and reverse gear, then draw out counter front bearing with suitable puller.
3. Remove snap ring and then remove sub-gear bracket, sub-gear spring and sub-gear.

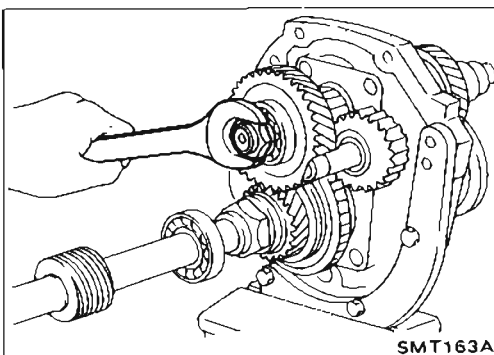


4. Draw out counter drive gear with main drive gear assembly with suitable puller.
 - When drawing out main drive gear assembly, be careful not to drop pilot bearing and baulk ring.



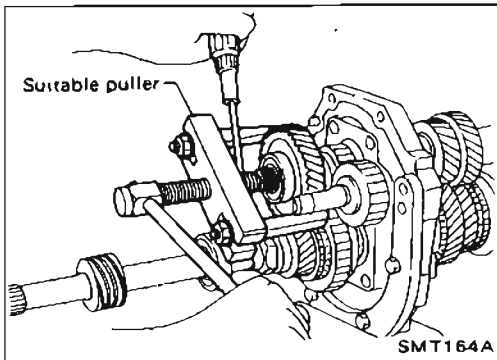
5. Remove rear side components on mainshaft and counter gear.
 - a. Release staking on countershaft nut and mainshaft nut and loosen these nuts.

Mainshaft nut: Left-hand thread

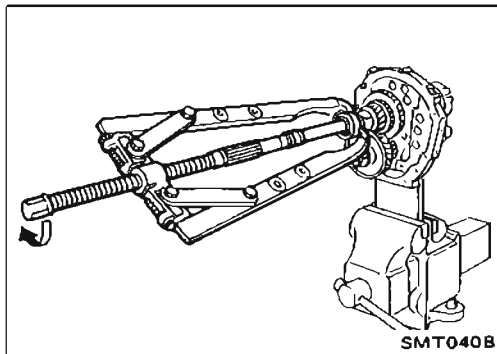


DISASSEMBLY

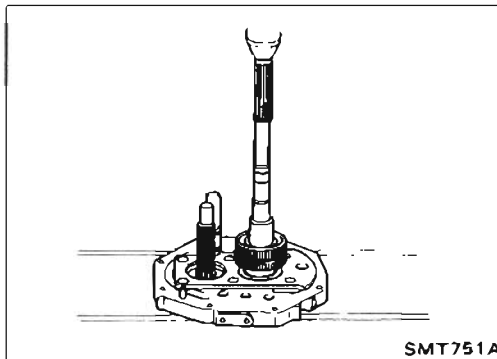
Gear Components (Cont'd)



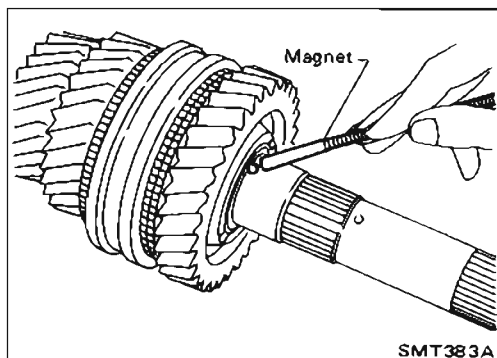
- b. Pull out O.D. counter gear with bearing with suitable puller.
- c. Draw out reverse counter gear and spacer.
- d. Remove snap rings from reverse idler shaft and draw out reverse idler gear, thrust washers and reverse idler gear bearing.
- e. Remove speedometer drive gear and steel ball.



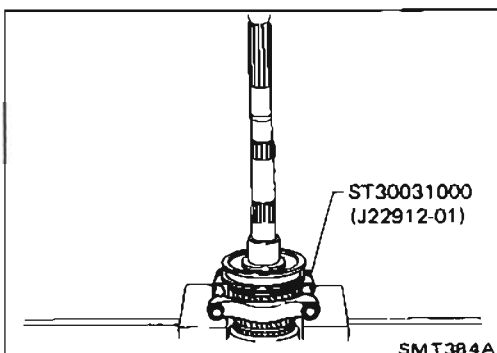
- f. Remove snap ring and pull out overdrive mainshaft bearing, then remove snap ring.
- g. Remove mainshaft nut.
- h. Remove steel roller and washer.
- i. Remove roller bearing and washer.
- j. Remove O.D. main gear, needle bearing and baulk ring (O.D.).
- k. Remove O.D. coupling sleeve, shifting inserts and shifting insert springs.



- l. Press out mainshaft and counter gear alternately.
 - **Make sure to alternate pressing of mainshaft and counter gear so as not to allow the front surface of one to contact the rear surface of the other.**



6. Remove front side components on mainshaft.
 - a. Remove 1st gear washer and steel ball.
 - b. Remove 1st main gear and 1st gear needle bearing.

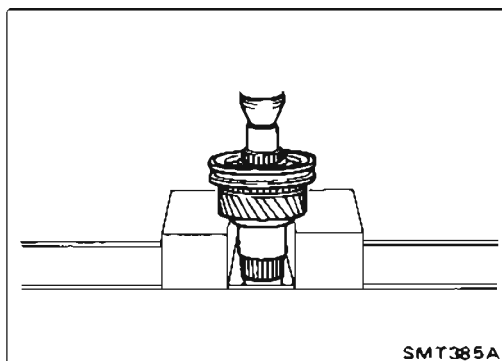


- c. Press out 2nd main gear together with 1st gear bushing and 1st & 2nd synchronizer assembly.
- d. Remove mainshaft front snap ring.

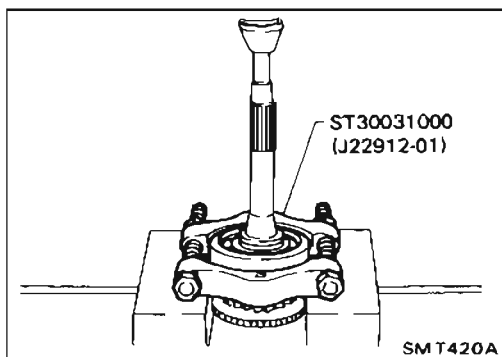
DISASSEMBLY

Gear Components (Cont'd)

- e. Press out 3rd main gear together with 3rd & 4th synchronizer assembly and 3rd gear needle bearing.

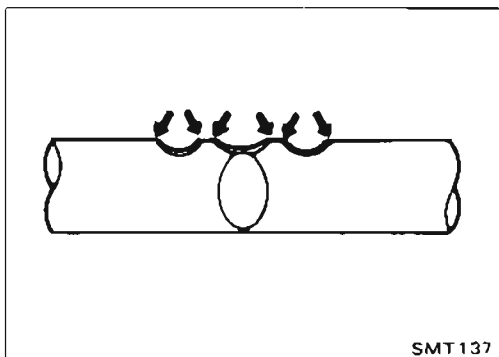


7. Remove main drive gear bearing.
 - a. Remove main drive gear snap ring and spacer.
 - b. Press out main drive gear bearing.



Shift Control Components

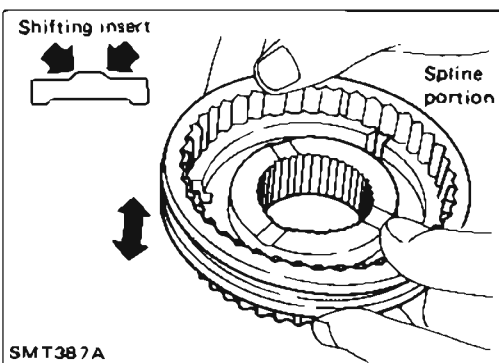
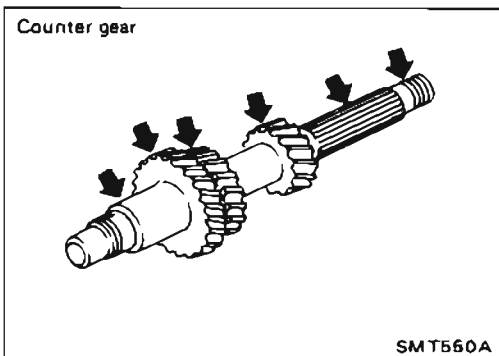
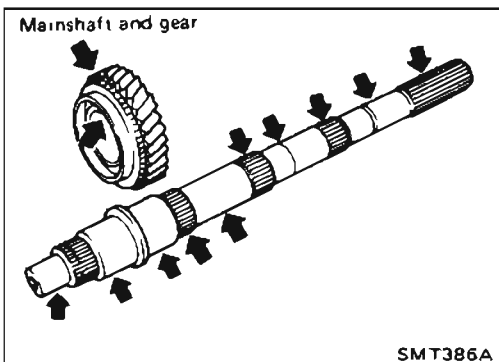
- Check contact surface and sliding surface for wear, scratches, projections or other damage.



Gear Components

GEAR AND SHAFT

- Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



SYNCHRONIZERS

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.
- Check insert springs for deformation.

INSPECTION

Gear Components (Cont'd)

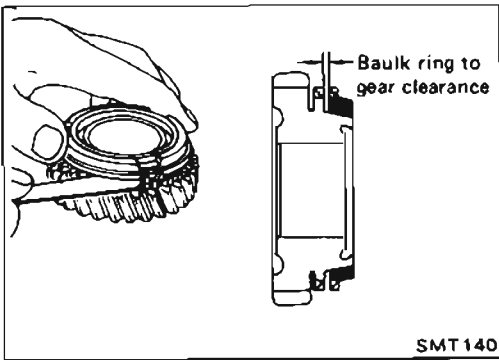
- Measure clearance between baulk ring and gear.

Clearance between baulk ring and gear (1st, 3rd, main drive and O.D. baulk ring):

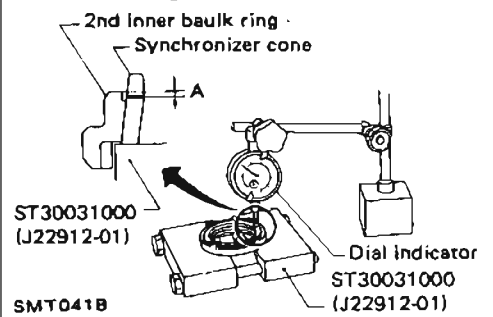
Unit: mm (in)

| Dimension | Standard | Wear limit |
|--------------------|------------------------------|-------------|
| 1st | 1.2 - 1.6 (0.047 - 0.063) | 0.8 (0.031) |
| 3rd and main drive | 1.2 - 1.6 (0.047 - 0.063) | |
| O.D. | 1.2 - 1.4 (0.047 - 0.055) | |

If the clearance is smaller than the wear limit, replace baulk ring.



Inner baulk ring



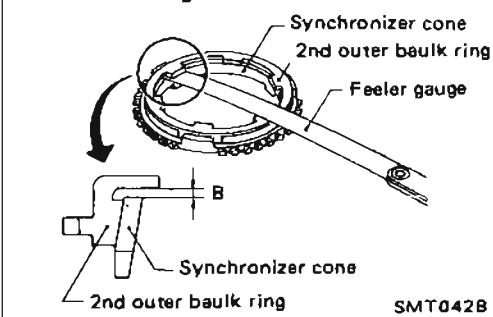
- Measure wear of 2nd baulk ring.

- Place baulk rings in position on synchronizer cone.
- While holding baulk rings against synchronizer cone as far as it will go, measure dimensions "A" and "B"

Unit: mm (in)

| Dimension | Standard | Wear limit |
|-----------|------------------------------|-------------|
| A | 0.6 - 1.1 (0.024 - 0.043) | 0.2 (0.008) |
| B | 0.7 - 0.9 (0.028 - 0.035) | |

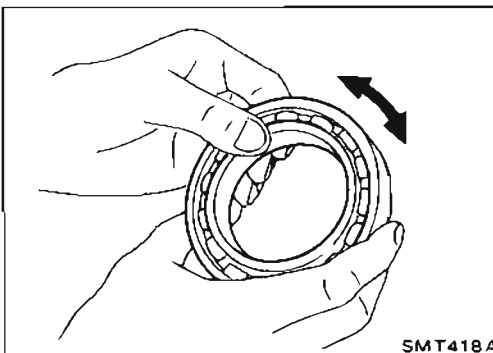
Outer baulk ring



- If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.

BEARINGS

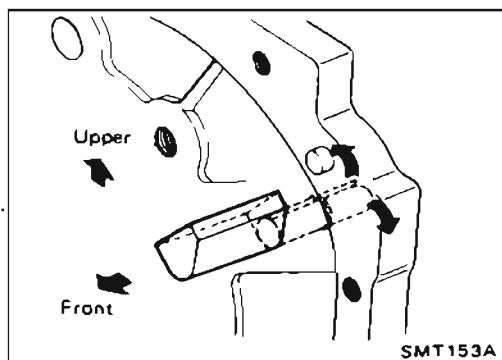
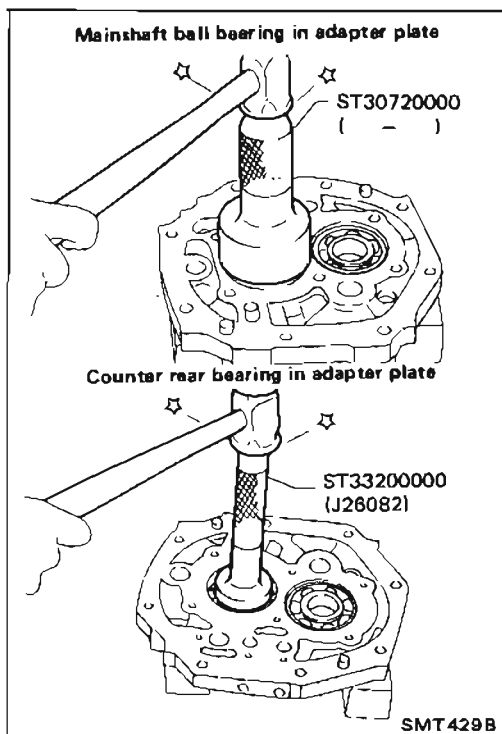
- Make sure bearings roll freely and are free from noise, crack, pitting or wear.



ASSEMBLY

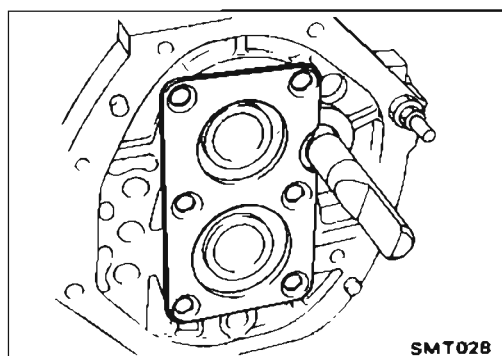
Gear Components

1. Install bearings into case components.



2. Assemble adapter plate parts.

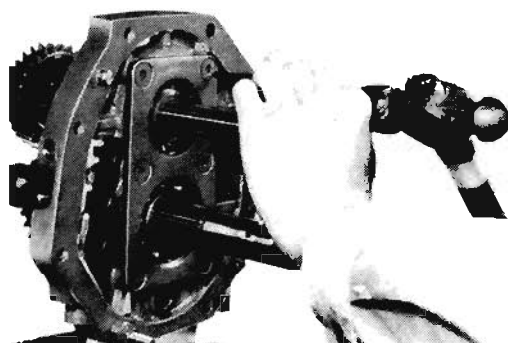
● Install oil gutter on adapter plate and expand on rear side.



● Install bearing retainer.

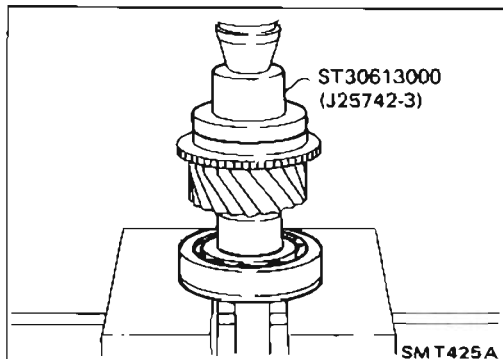
a. Insert reverse shaft, then install bearing retainer.

b. Tighten each screw, then stake each at two points.

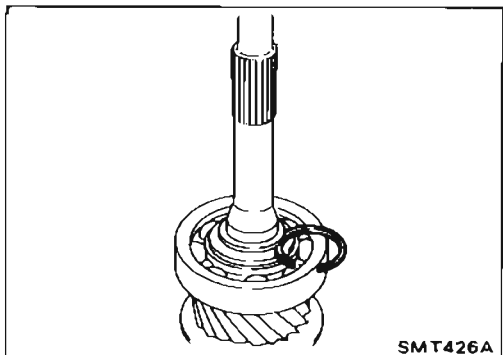


ASSEMBLY

Gear Components (Cont'd)



3. Install main drive gear bearing.
 - a. Press main drive gear bearing.
 - b. Install main drive gear spacer.



- c. Select proper main drive gear snap ring to minimize clearance of groove and install it.

Allowable clearance of groove:

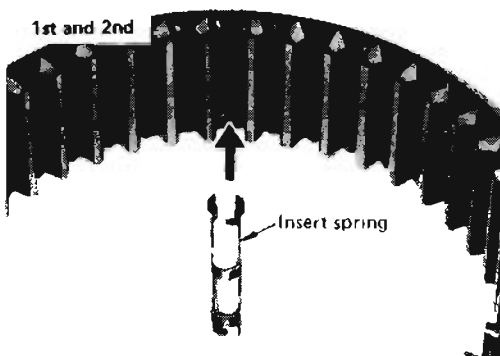
0 - 0.13 mm (0 - 0.0051 in)

Main drive gear snap ring:

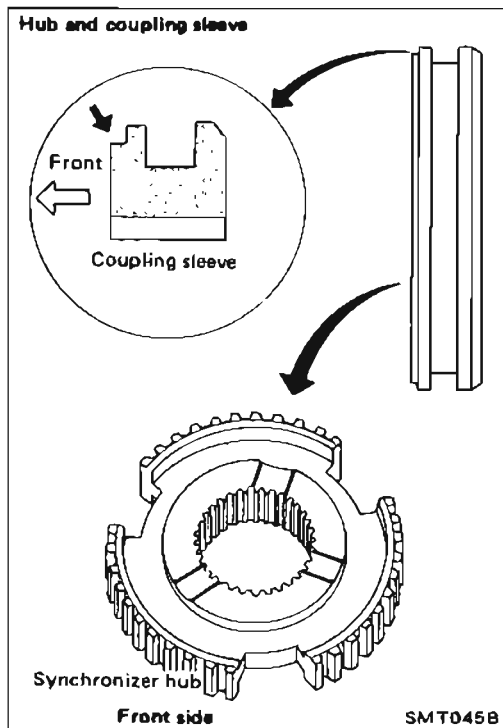
Refer to S.D.S.

4. Assemble synchronizers.

- 1st & 2nd synchronizer

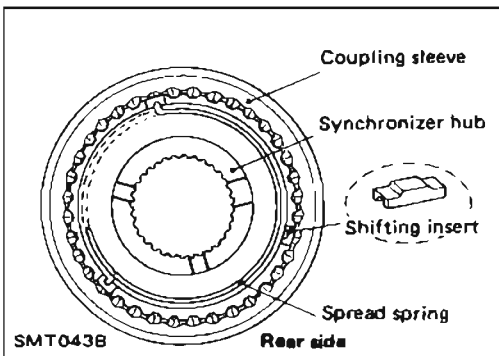
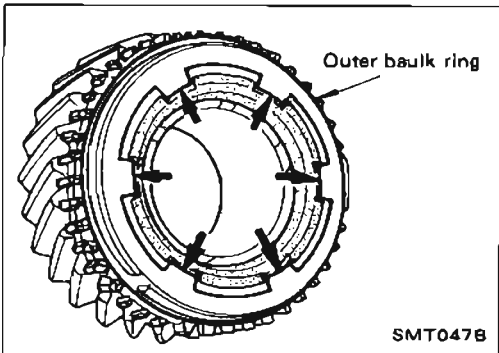
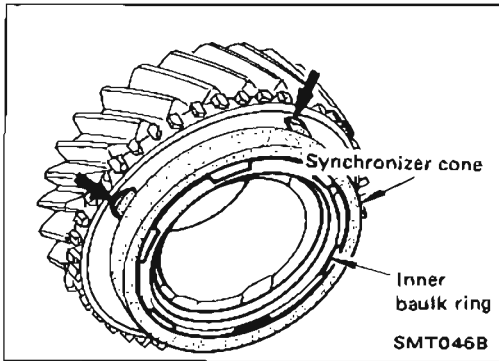


- Check coupling sleeve and synchronizer hub orientation.

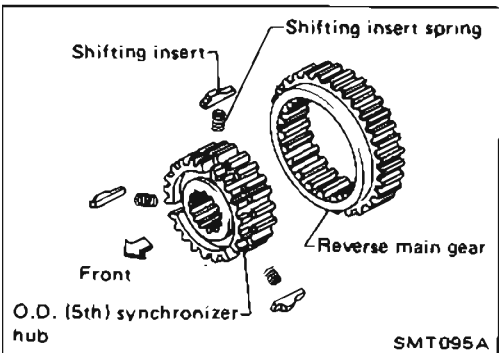


ASSEMBLY

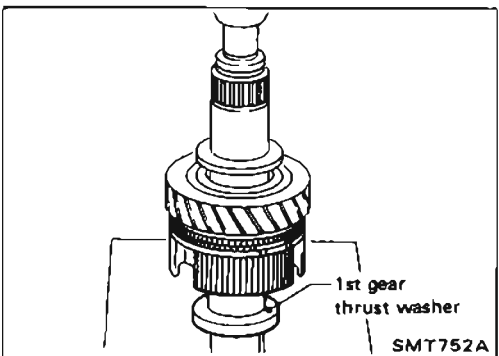
Gear Components (Cont'd)



- 3rd & 4th synchronizer



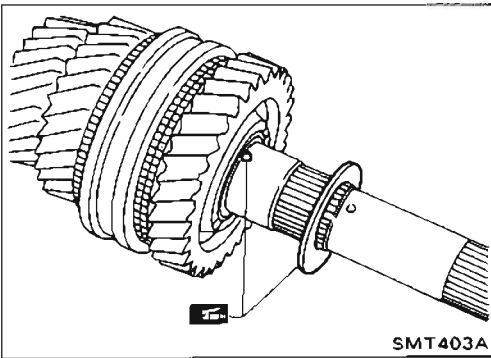
- O.D. synchronizer



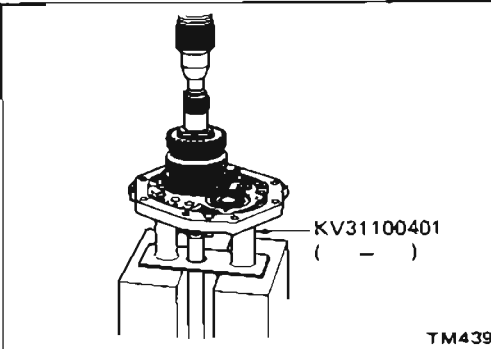
5. Install front side components on main shaft.
 - a. Assemble 2nd main gear, needle bearing and 1st & 2nd synchronizer assembly, then press 1st gear bushing on mainshaft.
 - b. Install 1st main gear.

ASSEMBLY

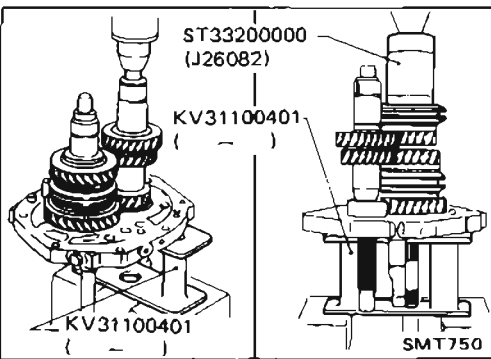
Gear Components (Cont'd)



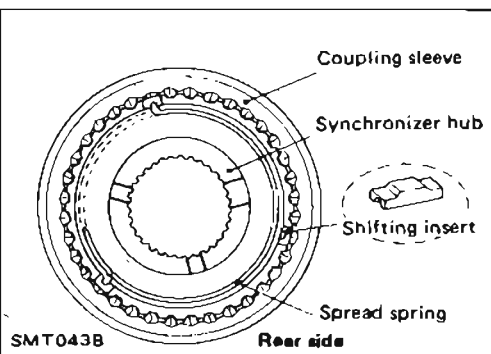
- c. Install steel ball and 1st gear washer.
Apply multi-purpose grease to steel ball and 1st gear washer before installing.



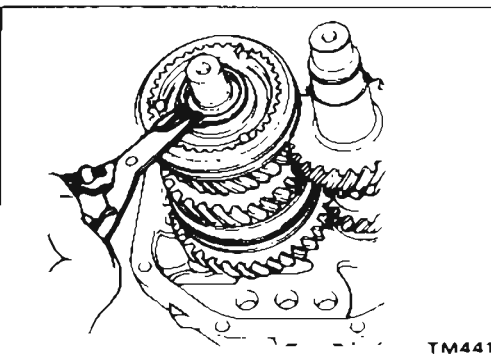
6. Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft.
 a. Press mainshaft assembly to adapter plate with Tool.



- b. Press counter gear into adapter plate with Tool.
 c. Install 3rd main gear and then press 3rd & 4th synchronizer assembly.



- Pay attention to direction of 3rd & 4th synchronizer.



- d. Install thrust washer on mainshaft and secure it with mainshaft front snap ring.
 Select proper snap ring to minimize clearance of groove in mainshaft.

Allowable clearance of groove:

0 - 0.18 mm (0 - 0.0071 in)

Mainshaft front snap ring:

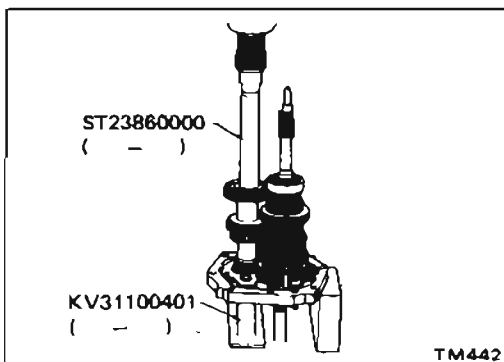
Refer to S.D.S.

- e. Apply gear oil to mainshaft pilot bearing and install it on mainshaft.

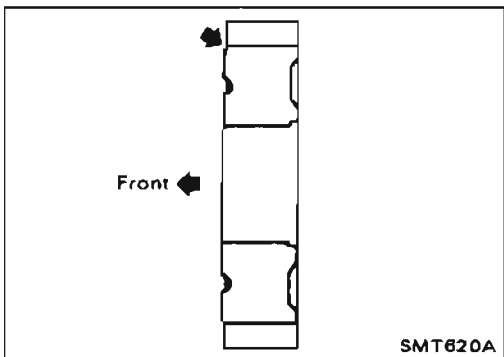
ASSEMBLY

Gear Components (Cont'd)

f. Press counter drive gear with main drive gear with Tool.



● Pay attention to direction of counter drive gear.



g. Install sub-gear components.

(1) Install sub-gear and sub-gear bracket on counter drive gear and then select proper snap ring to minimize clearance of groove in counter gear.

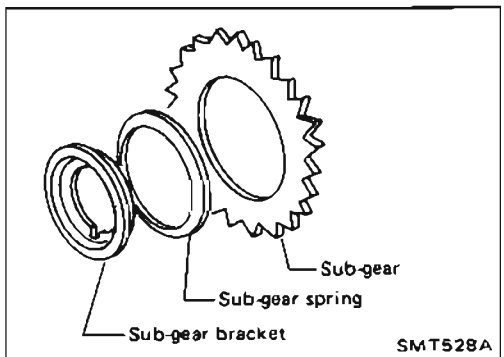
Allowable clearance of groove:

0 - 0.18 mm (0 - 0.0071 in)

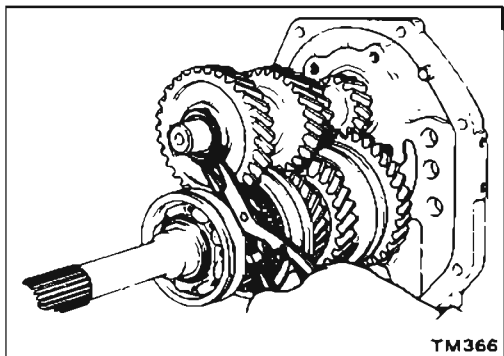
Counter drive gear snap ring: Refer to S.D.S.

(2) Remove snap ring, sub-gear bracket and sub-gear from counter gear.

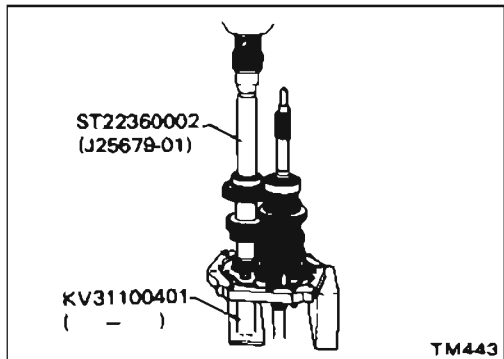
(3) Reinstall sub-gear, sub-gear spring and sub-gear bracket.



h. Install selected counter drive gear snap ring.

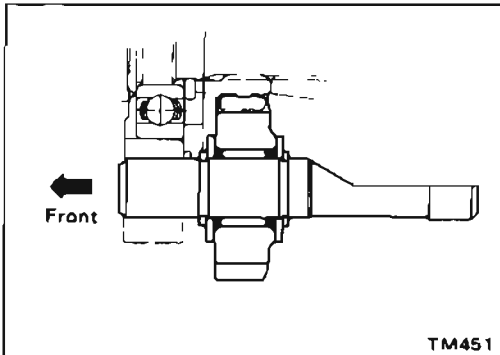


i. Press counter gear front bearing onto counter gear.

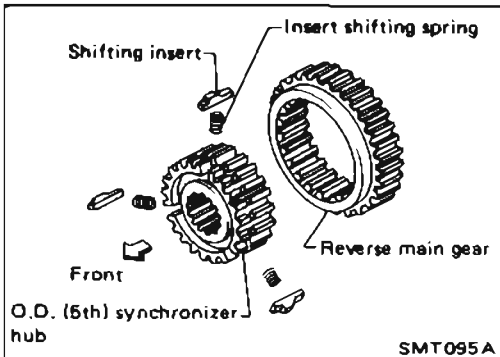


ASSEMBLY

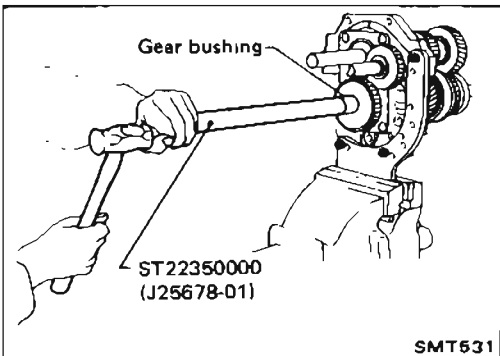
Gear Components (Cont'd)



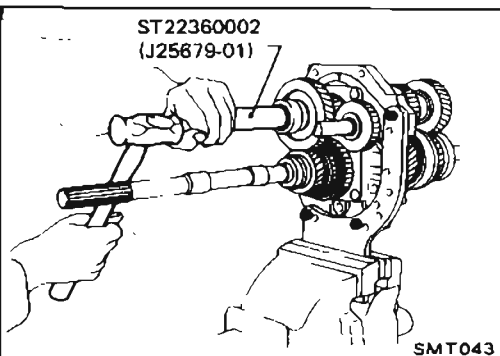
7. Install rear side components on mainshaft and counter gear.
- Install reverse idler gear to reverse idler shaft with spacers, snap rings and needle bearing.



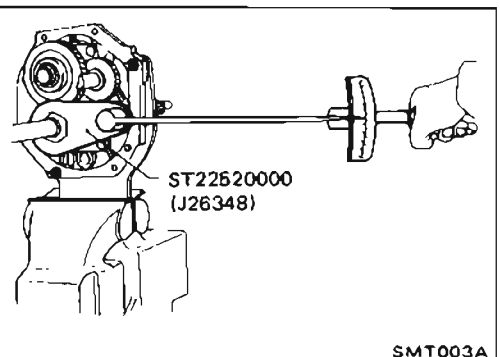
- Install insert retainer and O.D. synchronizer to mainshaft.
 - Pay attention to direction of hub.



- Install O.D. gear bushing with Tool.
- Install O.D. main gear and needle bearing.
- Install spacer, reverse counter gear and O.D. counter gear.
 - O.D. main gear and O.D. counter gear should be handled as a matched set.
- Install washer, roller bearing, steel roller and thrust washer.
- Tighten mainshaft lock nut temporarily.
 - Always use new lock nut.



- Install countershaft rear end bearing with Tool.

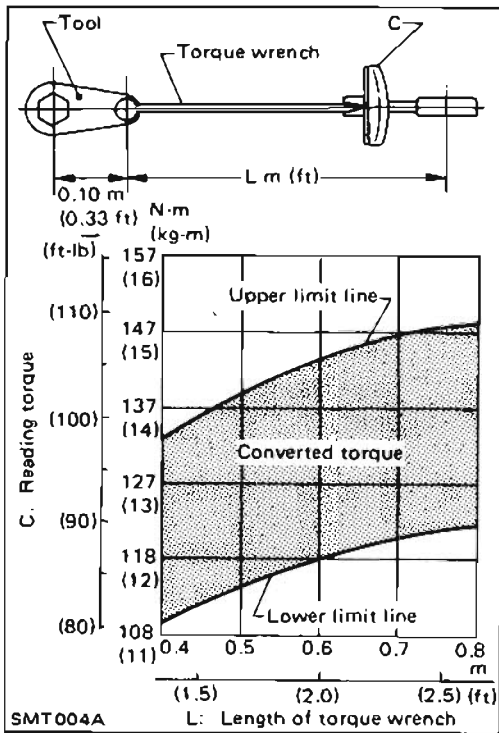


8. Mesh 2nd and reverse gears, then tighten mainshaft lock nut with Tool.

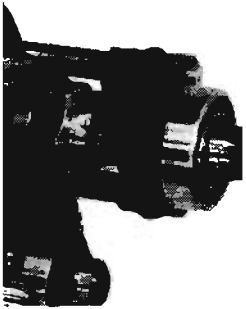
ASSEMBLY

Gear Components (Cont'd)

- Use the left chart when deciding the reading torque.
(Length of torque wrench vs. setting or reading torque)
- 9. Tighten countershaft lock nut.
- **Always use new lock nut.**



Mainshaft



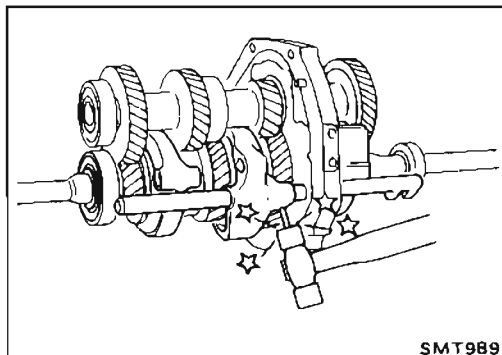
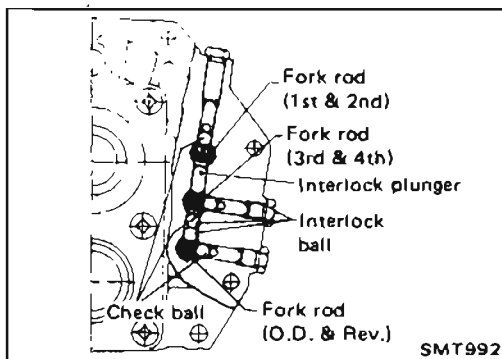
Countershaft



10. Stake mainshaft lock nut and countershaft lock nut with a punch.
11. Measure gear end play. For the description, refer to DIS-ASSEMBLY for Gear Components.

Shift Control Components

1. Install shift rods, interlock plunger, interlock balls and check balls.

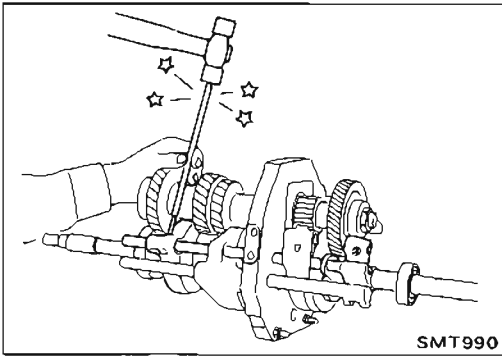


- a. 1st-2nd shift fork

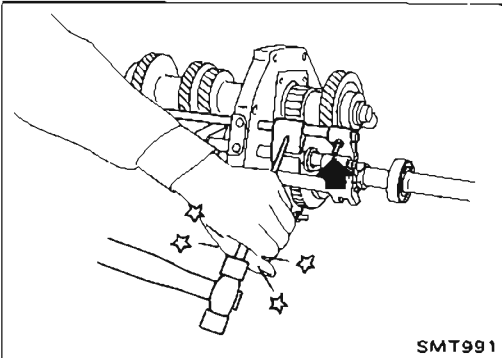
ASSEMBLY

Shift Control Components (Cont'd)

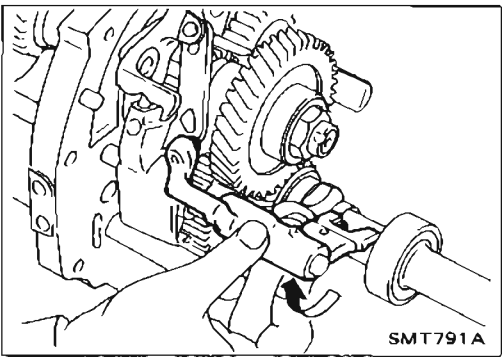
b. 3rd-4th shift fork



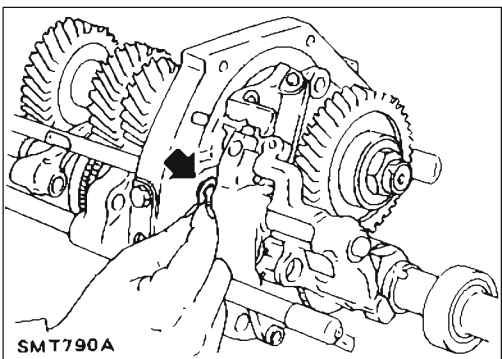
c. O.D.-reverse shift fork or reverse shift fork.



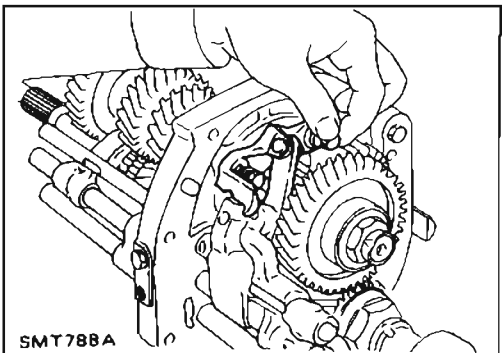
2. Install O.D. and reverse fork shaft by rotating O.D. and reverse bracket clockwise.



3. Install E-ring on O.D. and reverse fork rod.



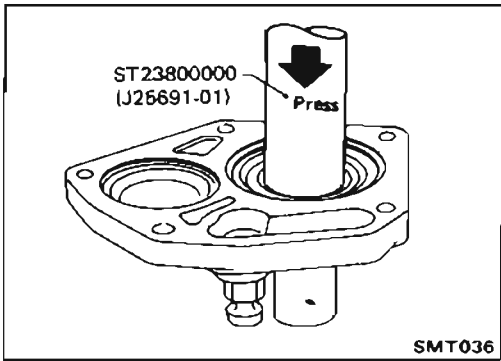
4. Install lever bracket securing bolt.



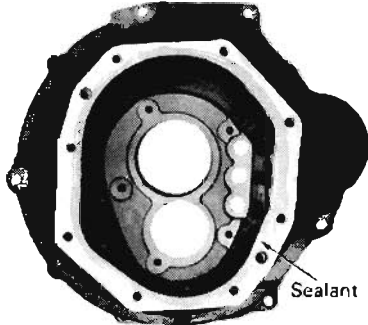
ASSEMBLY

Case Components

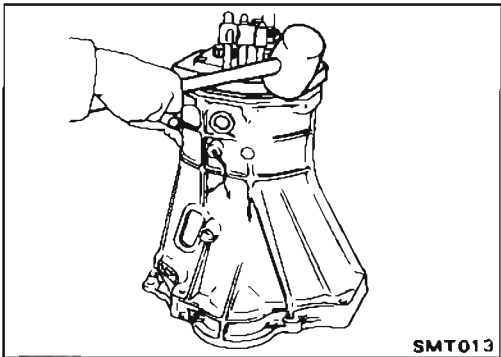
1. Install front cover oil seal.
 - Apply multi-purpose grease to seal lip of oil seal before installing.



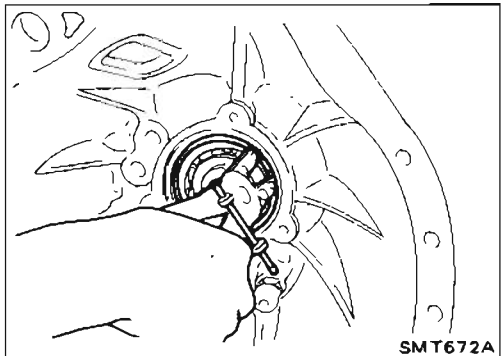
2. Apply sealant to mating surface of transmission case.



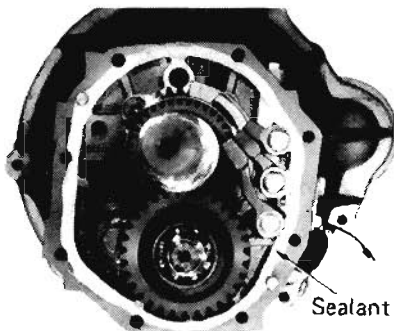
3. Install gear assembly onto transmission case.



4. Install snap ring of main drive bearing.



5. Apply sealant to mating surface of adapter plate.
6. Install rear extension.



ASSEMBLY

Case Components (Cont'd)

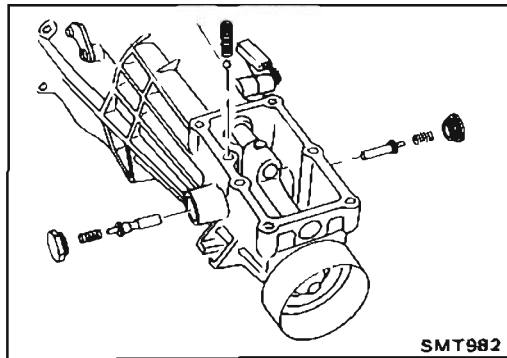
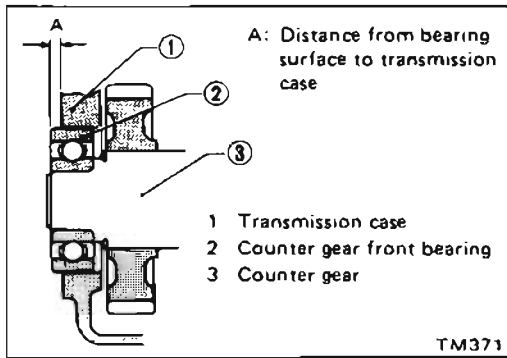
7. Select counter front bearing shim.

Counter front bearing shim: Refer to S.D.S.

8. Install gasket and front cover.

9. Install return spring plugs, check ball, return springs and select check plunger.

10. Install control housing and gasket.



SERVICE DATA AND SPECIFICATIONS (S.D.S)

General Specifications

| | | |
|--------------------|-------------------------------------|------------------|
| Transmission model | FS5W71C | |
| Number of speeds | 5 | |
| Shift pattern | | |
| Synchromesh type | Warner | |
| Gear ratio | | |
| 1st | 3.321 | |
| 2nd | 1.902 | |
| 3rd | 1.308 | |
| 4th | 1.000 | |
| O.D. | 0.759 | |
| Reverse | 3.382 | |
| Number of teeth | | |
| Mainshaft | | |
| Drive | 22 | |
| 1st | 33 | |
| 2nd | 27 | |
| 3rd | 26 | |
| O.D. | 21 | |
| Reverse | 36 | |
| Countershaft | | |
| Drive | 31 | |
| 1st | 14 | |
| 2nd | 20 | |
| 3rd | 28 | |
| O.D. | 39 | |
| Reverse | 15 | |
| Reverse idler gear | 21 | |
| Oil capacity | | |
| ℓ (US pt, Imp pt) | 2.4 (5-1/8, 4-1/4) | |
| Remarks | Sub-gear | ○ |
| | Mainshaft braking mechanism | ○ |
| | Double baulk ring type synchronizer | 2nd synchronizer |

SERVICE DATA AND SPECIFICATIONS (S.D.S)

Inspection and Adjustment

GEAR END PLAY

| Gear | End play mm (in) |
|-----------|-------------------------------|
| 1st gear | 0.31 - 0.41 (0.0122 - 0.0161) |
| 2nd gear | 0.11 - 0.21 (0.0043 - 0.0083) |
| 3rd gear | 0.11 - 0.21 (0.0043 - 0.0083) |
| O.D. gear | 0.24 - 0.41 (0.0094 - 0.0161) |

CLEARANCE BETWEEN BAULK RING AND GEAR

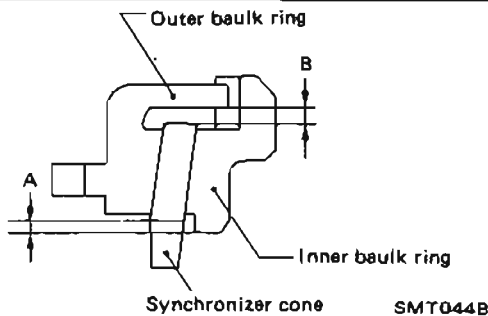
1st, 3rd, main drive and O.D. baulk ring

Unit: mm (in)

| | Standard | Wear limit |
|--------------------|------------------------------|-------------|
| 1st | 1.2 - 1.6 (0.047 - 0.063) | 0.8 (0.031) |
| 3rd and main drive | 1.2 - 1.6 (0.047 - 0.063) | |
| O.D. | 1.2 - 1.4 (0.047 - 0.055) | |

2nd baulk ring

Unit: mm (in)



| Dimension | Standard | Wear limit |
|-----------|------------------------------|-------------|
| A | 0.6 - 1.1 (0.024 - 0.043) | 0.2 (0.008) |
| B | 0.7 - 0.9 (0.028 - 0.035) | |

AVAILABLE SNAP RINGS

Main drive gear bearing

| Allowable clearance | | 0 - 0.13 mm (0 - 0.0051 in) |
|---------------------|-------------|-----------------------------|
| Thickness mm (in) | Part number | |
| 1.73 (0.0681) | 32204-78005 | |
| 1.80 (0.0709) | 32204-78000 | |
| 1.87 (0.0736) | 32204-78001 | |
| 1.94 (0.0764) | 32204-78002 | |
| 2.01 (0.0791) | 32204-78003 | |
| 2.08 (0.0819) | 32204-78004 | |

Mainshaft front

| Allowable clearance | | 0 - 0.18 mm (0 - 0.0071 in) |
|---------------------|-------------|-----------------------------|
| Thickness mm (in) | Part number | |
| 2.4 (0.094) | 32263-V5200 | |
| 2.5 (0.098) | 32263-V5201 | |
| 2.6 (0.102) | 32263-V5202 | |

Mainshaft rear end bearing

| Allowable clearance | | 0 - 0.14 mm (0 - 0.0055 in) |
|---------------------|-------------|-----------------------------|
| Thickness mm (in) | Part number | |
| 1.1 (0.043) | 32228-20100 | |
| 1.2 (0.047) | 32228-20101 | |
| 1.3 (0.051) | 32228-20102 | |
| 1.4 (0.055) | 32228-20103 | |

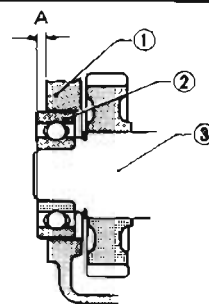
Counter drive gear

| Allowable clearance | | 0 - 0.18 mm (0 - 0.0071 in) |
|---------------------|-------------|-----------------------------|
| Thickness mm (in) | Part number | |
| 1.4 (0.055) | 32215-E9000 | |
| 1.5 (0.059) | 32215-E9001 | |
| 1.6 (0.063) | 32215-E9002 | |

AVAILABLE SHIMS

Counter front bearing

Unit: mm (in)



TM371

| "A" | Thickness of shim | Part number |
|-------------------------------|-------------------|-------------|
| 4.52 - 4.71 (0.1780 - 0.1854) | Not necessary | |
| 4.42 - 4.51 (0.1740 - 0.1776) | 0.1 (0.004) | 32218-V5000 |
| 4.32 - 4.41 (0.1701 - 0.1736) | 0.2 (0.008) | 32218-V5001 |
| 4.22 - 4.31 (0.1661 - 0.1697) | 0.3 (0.012) | 32218-V5002 |
| 4.12 - 4.21 (0.1622 - 0.1657) | 0.4 (0.016) | 32218-V5003 |
| 4.02 - 4.11 (0.1583 - 0.1618) | 0.5 (0.020) | 32218-V5004 |
| 3.92 - 4.01 (0.1543 - 0.1579) | 0.6 (0.024) | 32218-V5005 |

AUTOMATIC TRANSMISSION

SECTION **AT**

CONTENTS

| | |
|--|--------|
| PREPARATION | AT- 2 |
| PRECAUTIONS | AT- 3 |
| A/T CONTROL DIAGRAM | AT- 4 |
| ON-VEHICLE SERVICE | AT- 7 |
| TROUBLE DIAGNOSES | AT- 11 |
| REMOVAL AND INSTALLATION | AT- 85 |
| MAJOR OVERHAUL | AT- 86 |
| DISASSEMBLY | AT- 90 |
| REPAIR FOR COMPONENT PARTS | AT-101 |
| ASSEMBLY | AT-146 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | AT-165 |

AT

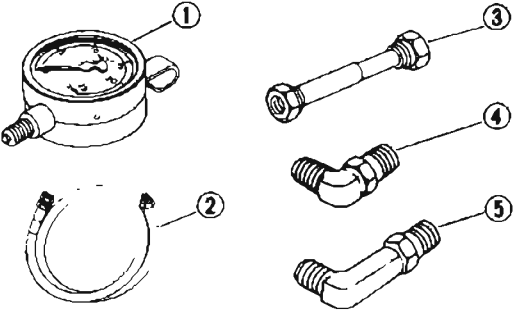
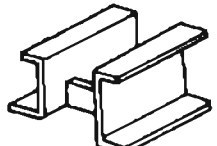
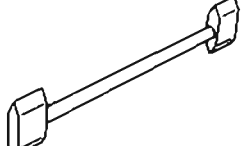
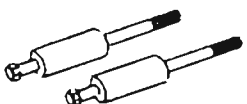
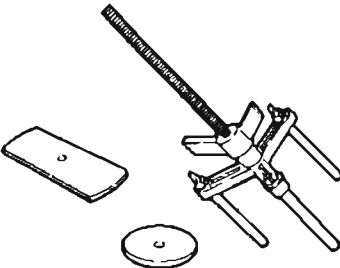
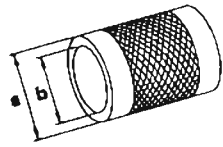
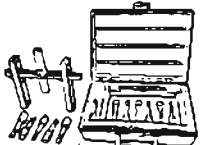
When you read wiring diagrams:

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

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

PREPARATION

SPECIAL SERVICE TOOLS

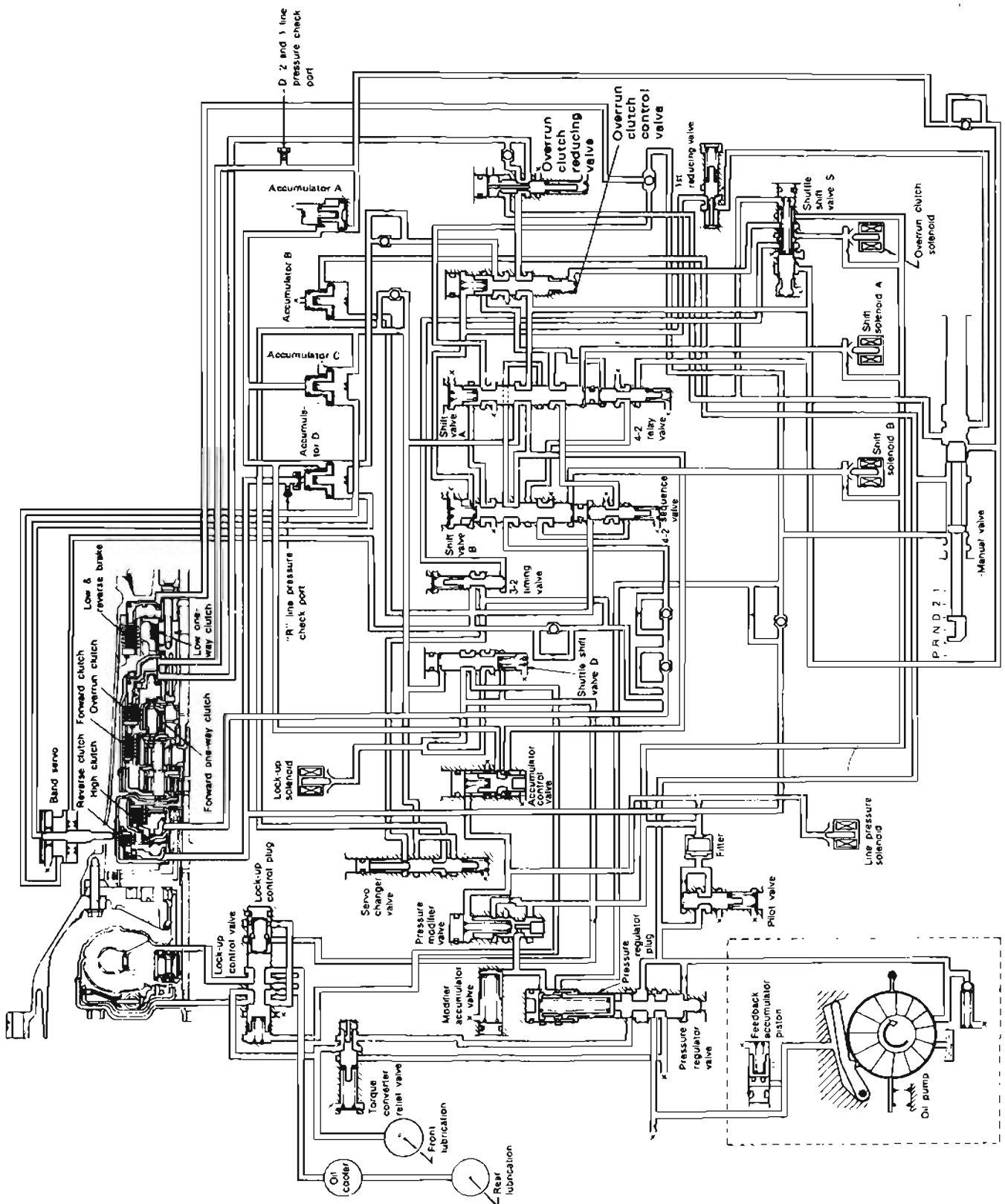
| Tool number (Kent-Moore No.) Tool name | Description |
|--|---|
| <p>ST2505S001 (J25695-A) Oil pressure gauge set</p> <p>① ST25051001 (-) Oil pressure gauge</p> <p>② ST25052000 (-) Hose</p> <p>③ ST25053000 (-) Joint pipe</p> <p>④ ST25054000 (-) Adapter</p> <p>⑤ ST25055000 (-) Adapter</p> | <p style="text-align: right;">Measuring line pressure</p>  |
| <p>ST07870000 (J37068) Transmission case stand</p> |  <p style="text-align: right;">Disassembling and assembling A/T</p> |
| <p>KV31102100 (J37065) Torque converter one-way clutch check tool</p> |  <p style="text-align: right;">Checking one-way clutch in torque converter</p> |
| <p>ST25850000 (J25721-A) Sliding hammer</p> |  <p style="text-align: right;">Removing oil pump assembly</p> |
| <p>KV31102400 (J34285 and J34285-87) Clutch spring compressor</p> |  <p style="text-align: right;">Removing and installing clutch return springs</p> |
| <p>ST33200000 (J37067) Drift</p> |  <p style="text-align: right;">Installing oil pump housing oil seal Installing rear oil seal</p> <p>a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.</p> |
| <p>(J34291) Shim setting gauge set</p> |  <p style="text-align: right;">Selecting oil pump cover bearing race and oil pump thrust washer</p> |

PRECAUTIONS

Service Notice

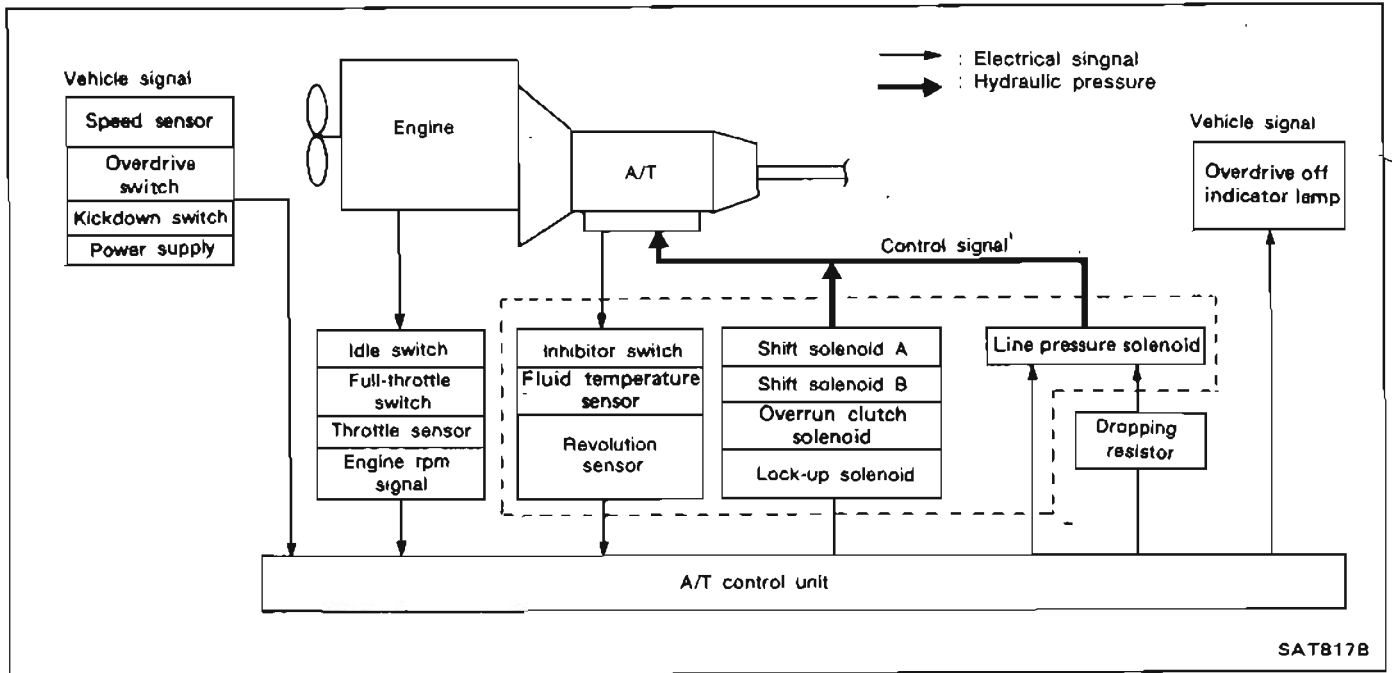
- Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transmission.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transmission is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during re-assembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transmission with new A.T.F.

Hydraulic Control Circuits



A/T CONTROL DIAGRAM

Electrical Control Chart



Mechanical Operation

| Shift position | Reverse clutch | High clutch | Forward clutch | Overrun clutch | Band servo | | | Forward one-way clutch | Low one-way clutch | Low & reverse brake | Lock-up | Remarks |
|----------------|----------------|-------------|----------------|----------------|------------|-------------|-----------|------------------------|--------------------|---------------------|---------|---|
| | | | | | 2nd apply | 3rd release | 4th apply | | | | | |
| P | | | | | | | | | | | | PARK |
| R | ○ | | | | | | | | | ○ | | REVERSE |
| N | | | | | | | | | | | | NEUTRAL |
| D *4 | 1st | | ○ | ⊗ | | | | ● | ● | | | Automatic shift 1 → 2 → 3 → 4 |
| | 2nd | | ○ | ⊗ | ○ | | | ● | | | | |
| | 3rd | | ○ | ○ | ⊗ | ⊗ | | ● | | | | |
| | 4th | | ○ | ⊗ | | ⊗ | ○ | | | | ○ | |
| 2 | 1st | | ○ | ⊗ | | | | ● | ● | | | Automatic shift 1 → 2 |
| | 2nd | | ○ | ○ | ○ | | | ● | | | | |
| 1 | 1st | | ○ | ○ | | | | ● | | ○ | | Locks (held stationary) in 1st speed 1 → 2 |
| | 2nd | | ○ | ○ | ○ | | | ● | | | | |

*1. Operates when overdrive switch is set to "OFF".

*2. Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, because oil pressure area on the "release" side is greater than that on the "apply" side, brake band does not contract.

*3. Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts.

*4. A/T will not shift to 4th when overdrive switch is set to "OFF" position.

○ : Operates.

● : Operates when throttle opening is less than 1/16. Engine brake activates.

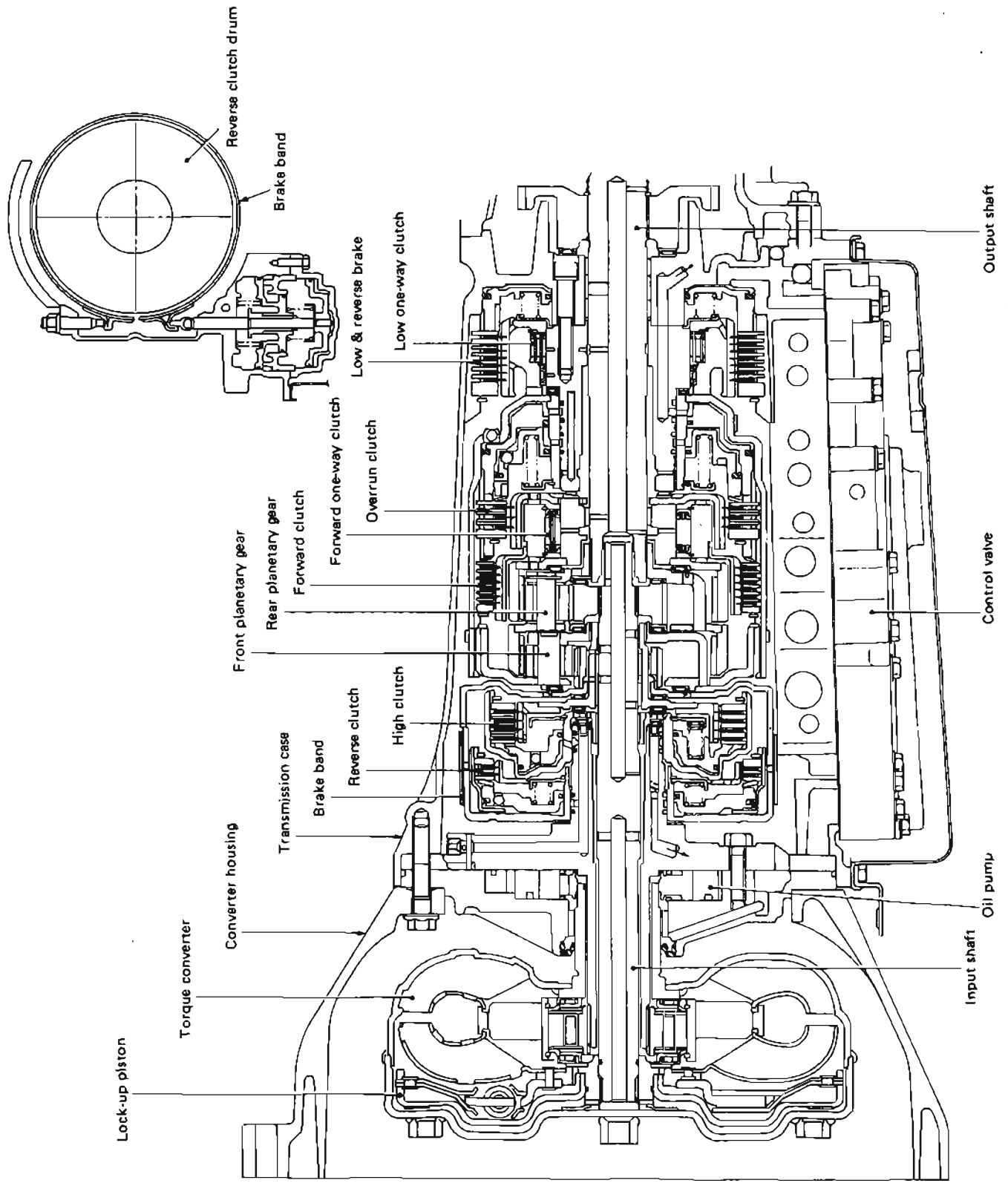
● : Operates during "progressive" acceleration.

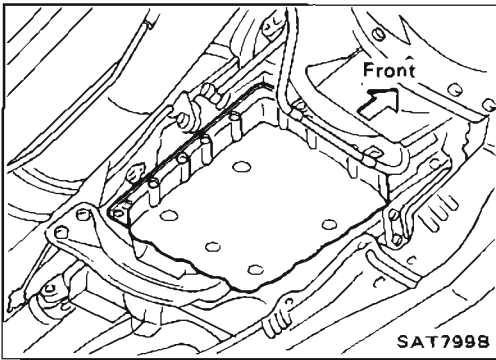
⊗ : Operates but does not affect power transmission.

⊗ : Operates when throttle opening is less than 1/16 but does not affect engine brake.

A/T CONTROL DIAGRAM

Cross-Sectional View





Control Valve Assembly and Accumulators Inspection

1. Remove oil pan and gasket and drain A.T.F.

2. Remove oil strainer.

3. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

Bolt length and location

| Bolt symbol | Length mm (in) |
|-------------|----------------|
| (A) | 37 (1.46) |
| (B) | 50 (1.97) |

4. Remove solenoids and valves from valve body if necessary.

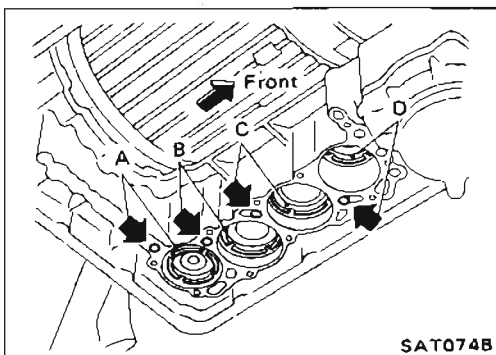
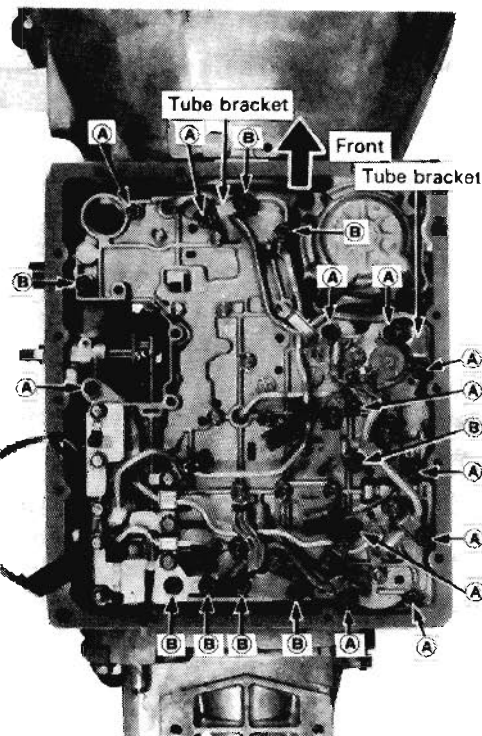
5. Remove terminal cord assembly if necessary.

6. Remove accumulator A, B, C and D by applying compressed air if necessary.

● Hold each piston with rag.

7. Reinstall any part removed.

● Always use new sealing parts.



Revolution Sensor Replacement

1. Remove rear engine mounting member from body panel while supporting A/T with jack.
2. Lower A/T assembly as much as possible.

3. Remove revolution sensor from A/T assembly.
4. Reinstall any part removed.

● **Always use new sealing parts.**

Rear Oil Seal Replacement

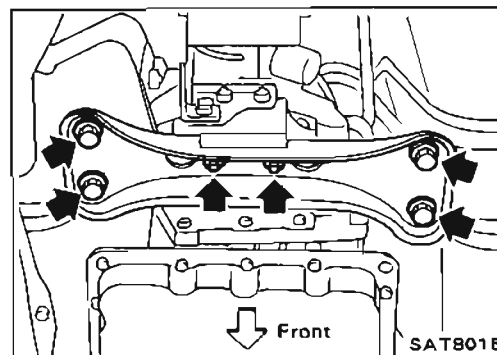
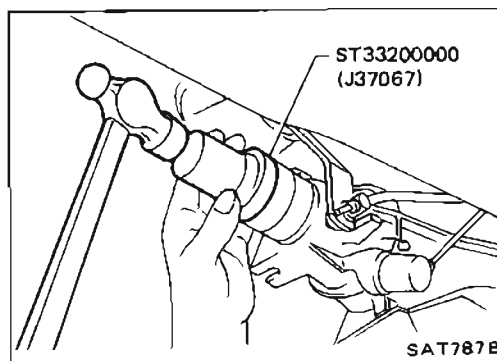
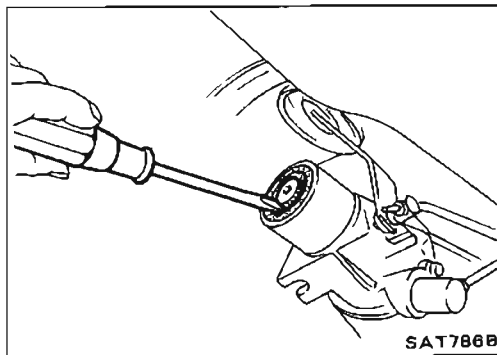
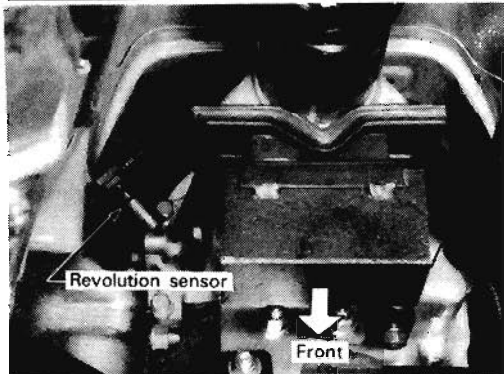
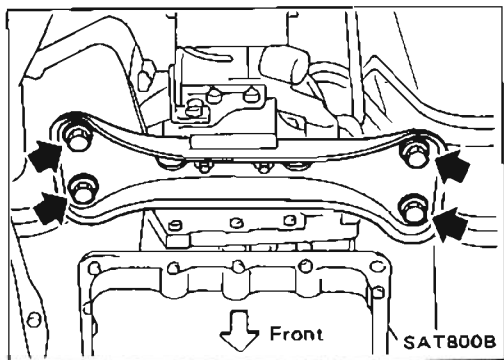
1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear oil seal.

3. Install rear oil seal.
4. Reinstall any part removed.

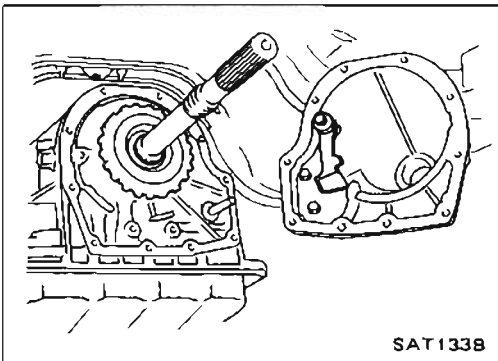
● **Apply A.T.F. before installing.**

Parking Components Inspection

1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear engine mounting member from A/T assembly.

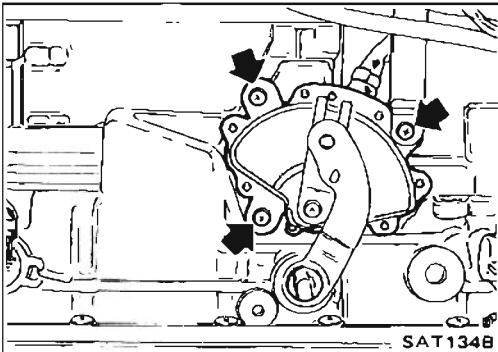


Parking Components Inspection (Cont'd)

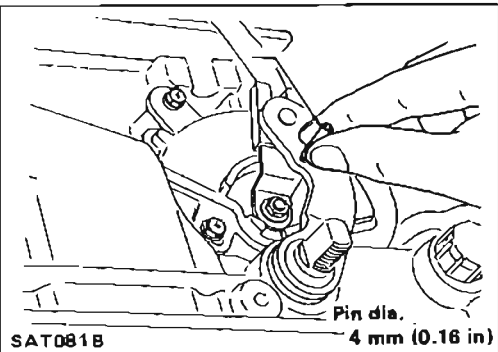


3. Remove rear extension from transmission case.
 4. Replace parking components if necessary.
 5. Reinstall any part removed.
- Always use new sealing parts.

Inhibitor Switch Adjustment

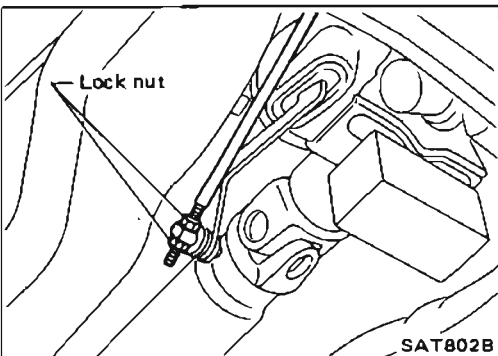


1. Remove manual control linkage from manual shaft of A/T assembly.
2. Set manual shaft of A/T assembly in "N" position.
3. Loosen inhibitor switch fixing bolts.



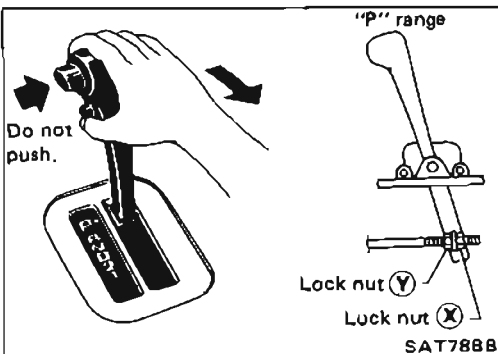
4. Insert pin into adjustment holes in both inhibitor switch and manual shaft of A/T assembly as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".

Manual Control Linkage Adjustment



Move selector lever from "P" range to "1" range. You should be able to feel the detents in each range. If the detents cannot be felt or the pointer indicating the range is improperly aligned, the linkage needs adjustment.

1. Place selector lever in "P" range.
2. Loosen lock nuts.



3. Tighten lock nut (X) until it touches trunnion pulling selector lever toward "R" range side without pushing button.
4. Back off lock nut (X) 1 turn and tighten lock nut (Y) to the specified torque.

Lock nut:

☐: 11 - 15 N·m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)

5. Move selector lever from "P" range to "1" range. Make sure that selector lever can move smoothly.

NOTE

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TROUBLE DIAGNOSES

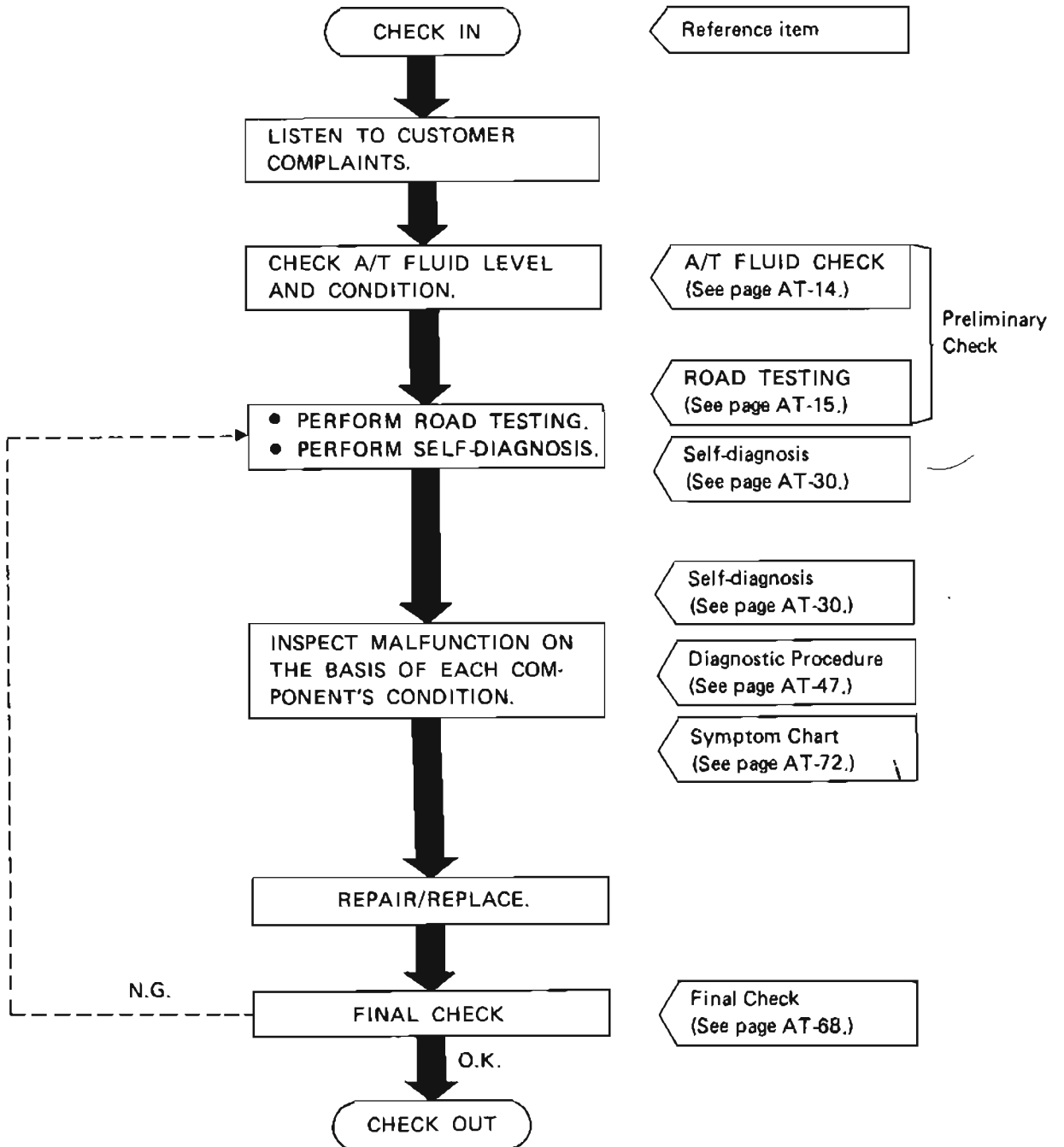
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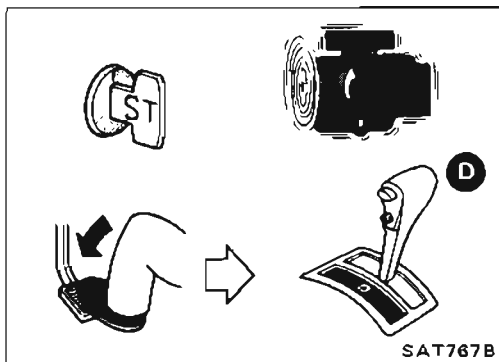
TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



TROUBLE DIAGNOSES



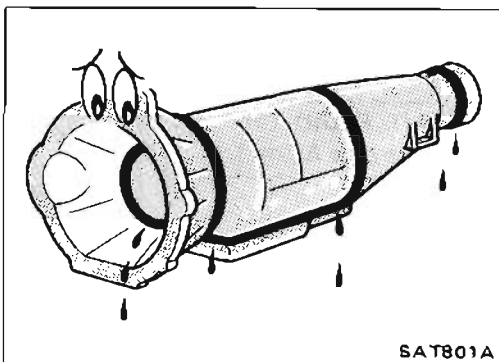
Preliminary Check

A/T FLUID CHECK

Fluid leakage check

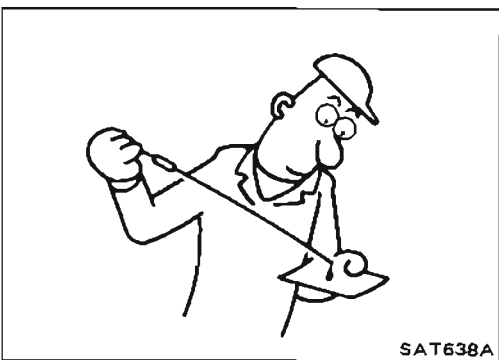
1. Clean area suspected of leaking, — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in "D" range and wait a few minutes.
3. Stop engine.

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 — Road water entering through filler tube or breather |
| Varnished fluid, light to dark brown and tacky | Oxidation — Over or under filling — Overheating |



Fluid level check

Refer to section MA.

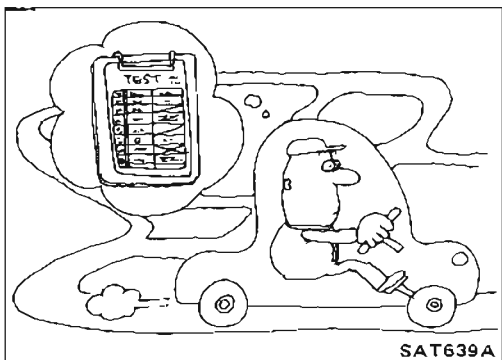
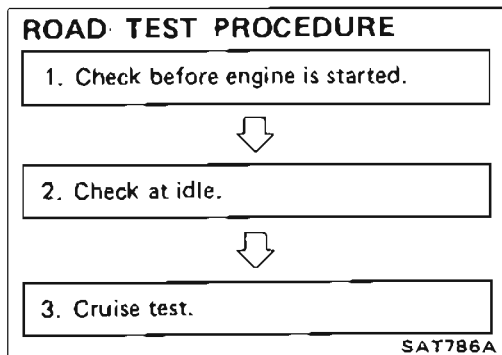
TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

ROAD TESTING

Description

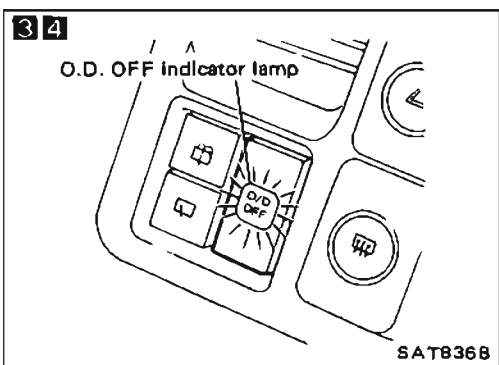
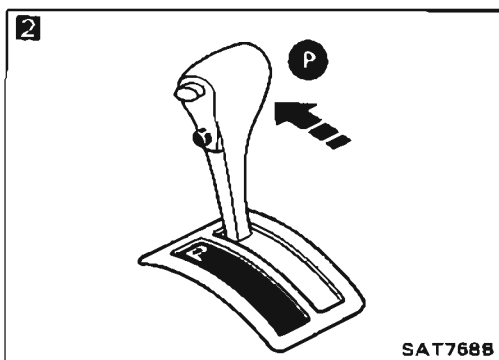
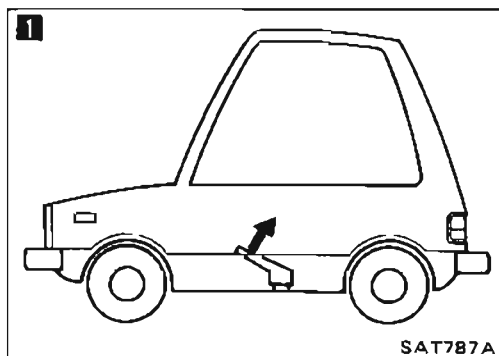
- The purpose of this road test is to determine overall performance of automatic transmission and analyze causes of problems.
- The road test consists of the following three parts:
 1. Check before engine is started
 2. Check at idle
 3. Cruise test
- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis" and "Diagnostic Procedure".



TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

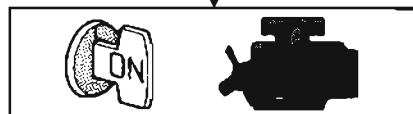
1. Check before engine is started



1
Park vehicle on flat surface.



2
Move selector lever to "P" range.

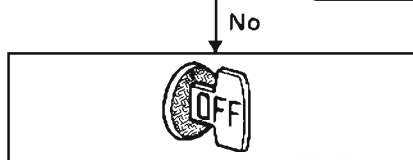


3
Does O.D. OFF indicator lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

Yes
4
Does O.D. OFF indicator lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis.
— Refer to SELF-DIAGNOSIS PROCEDURE.



Perform self-diagnosis.
— Refer to SELF-DIAGNOSIS PROCEDURE and note N.G. items.

Go to "ROAD TESTING
— 2. Check at idle".

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 2.

Yes



3

Move selector lever to "D", "1", "2" or "R" range.



Is engine started?

Yes

Go to Diagnostic Procedure 2.

No



4

Move selector lever to "P" range.



5

Push vehicle forward or backward.

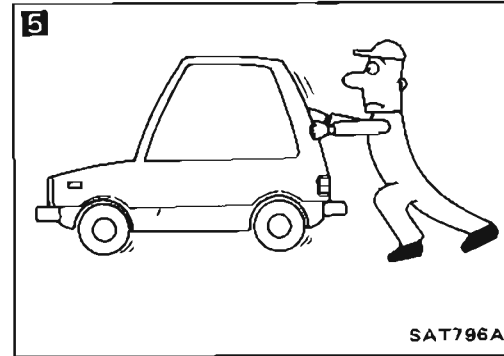
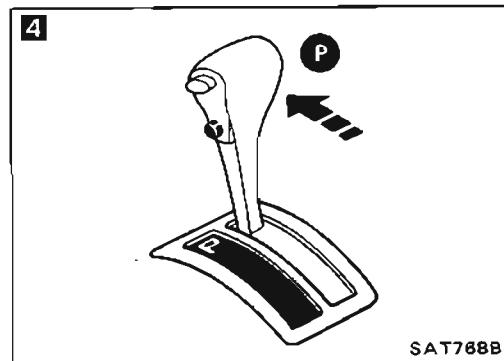
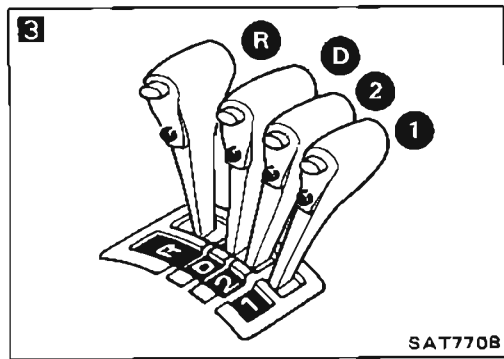
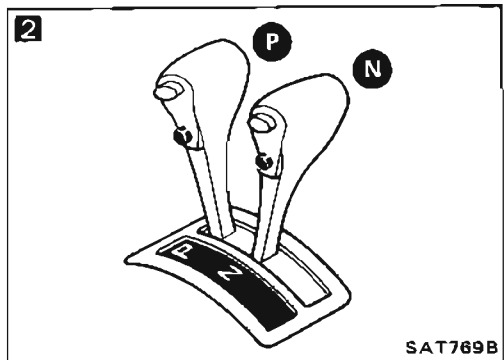
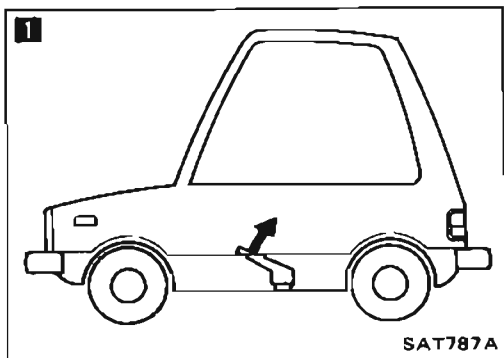
Does vehicle move when it is pushed forward or backward?

Yes

Go to Diagnostic Procedure 3.

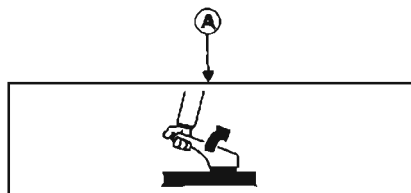
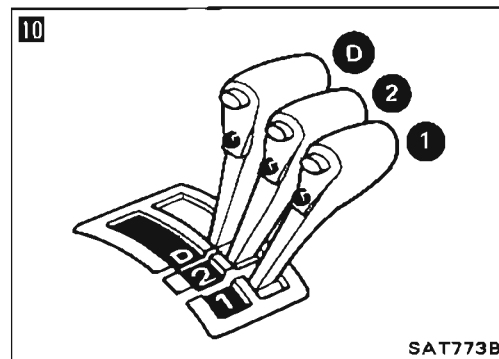
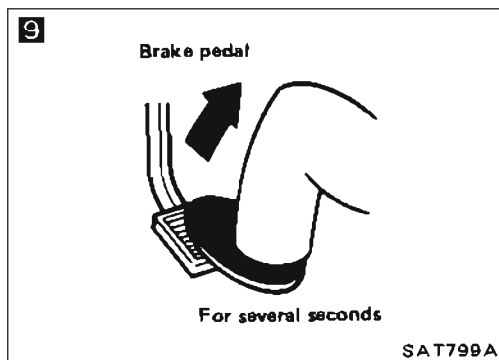
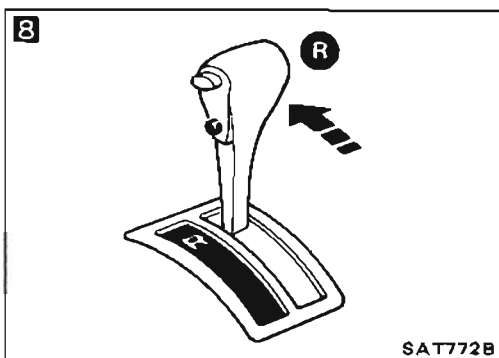
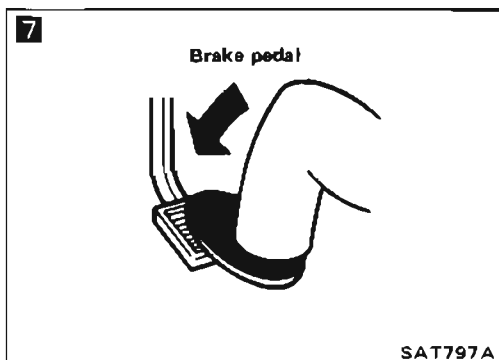
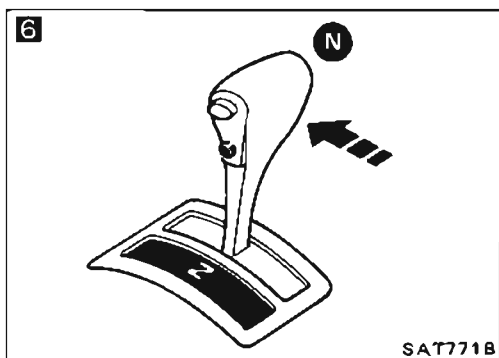
No

A

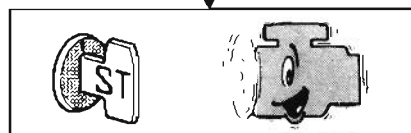


TROUBLE DIAGNOSES

Preliminary Check (Cont'd)



6 Move selector lever to "N" range.



Does vehicle move forward or backward? Yes → Go to Diagnostic Procedure 4.

7 No
Apply foot brake.

8 Move selector lever to "R" range.

Is there large shock when changing from "N" to "R" range? Yes → Go to Diagnostic Procedure 5.

9 No
Release foot brake for several seconds.

Does vehicle creep backward when foot brake is released? No → Go to Diagnostic Procedure 6.

10 Yes
Move selector lever to "D", "1" and "2" range and check if vehicle creeps forward.

Does vehicle creep forward in all three ranges? Yes → Go to Cruise test.

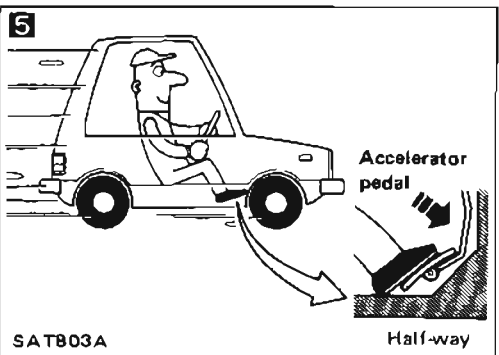
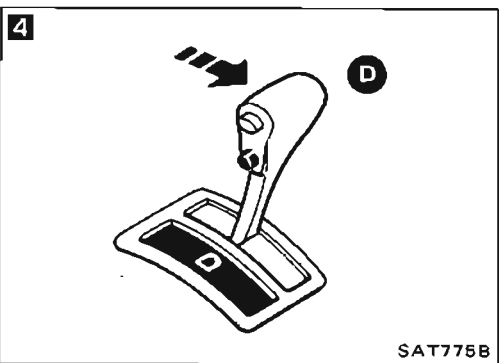
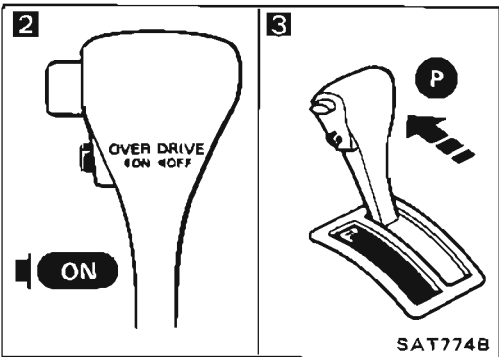
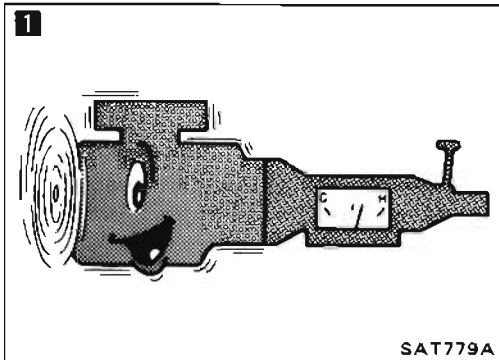
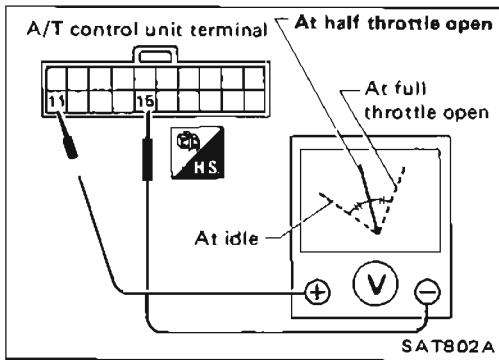
No
Go to Diagnostic Procedure 7.

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

3. Cruise test

- Check all items listed in Parts 1 through 3.
- Throttle position can be controlled by voltage across terminals ① and ⑮ of A/T control unit.



Cruise test – Part 1

1

Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

A.T.F. operating temperature:
50 - 80°C (122 - 176°F)

Park vehicle on flat surface.

2

Set overdrive switch to "ON" position.

3

Move selector lever to "P" range.

4

Move selector lever to "D" range.

5

Accelerate vehicle by constantly depressing accelerator pedal half-way.

Does vehicle start from D₁?

No

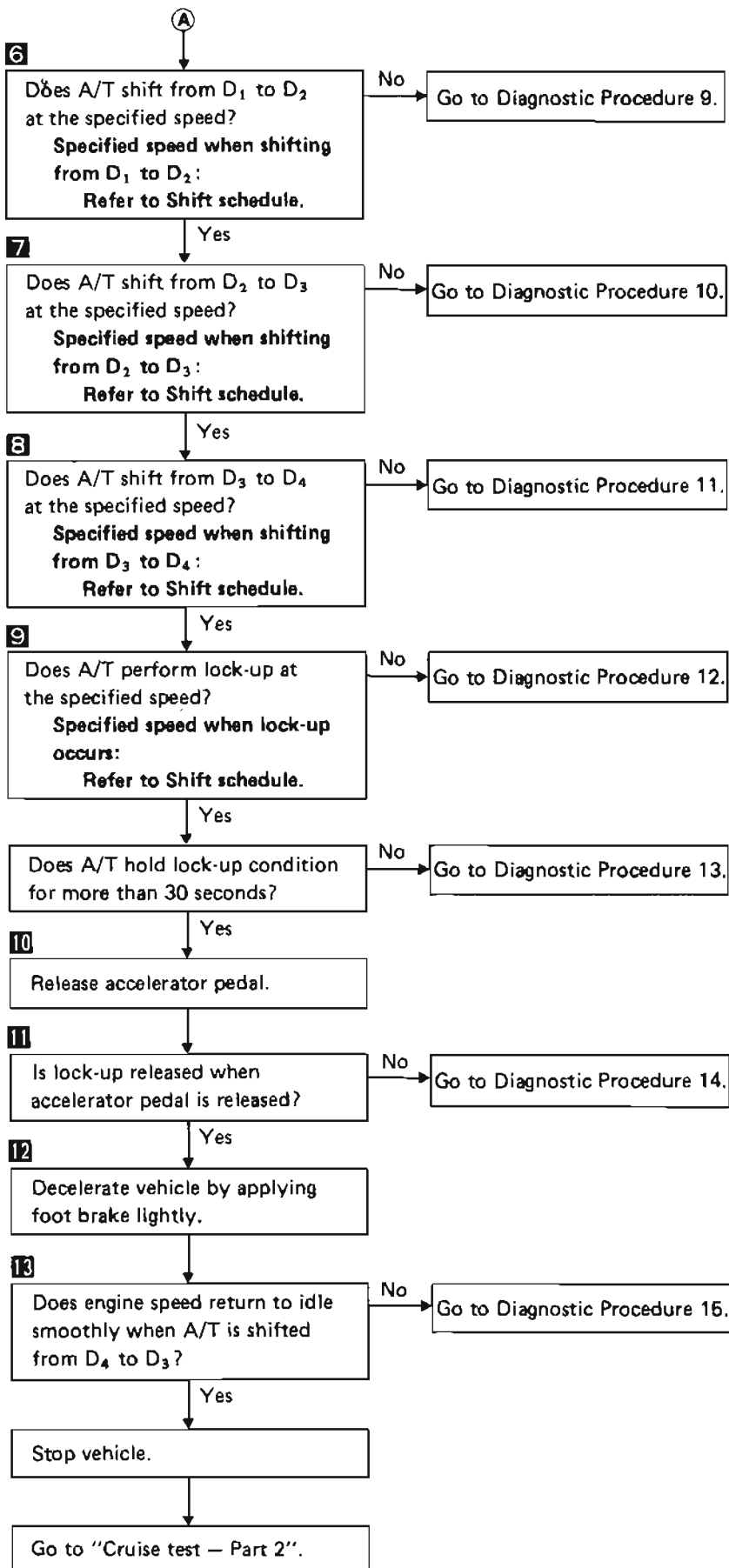
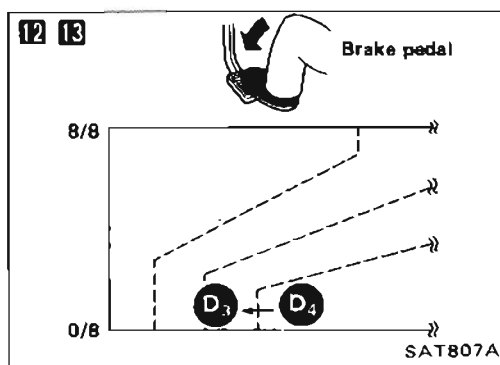
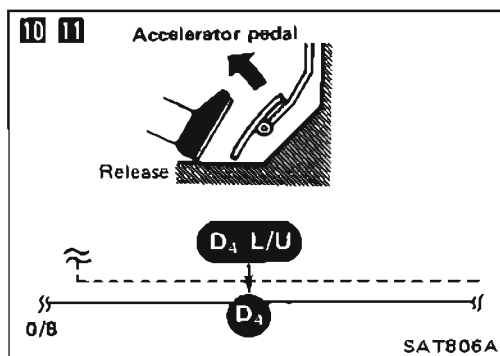
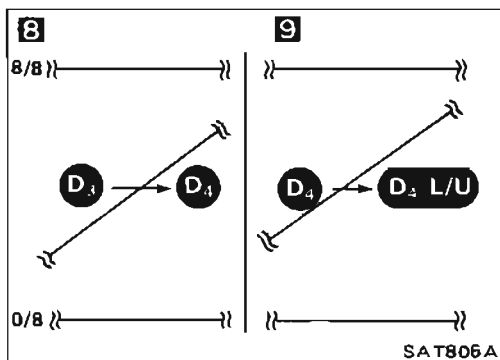
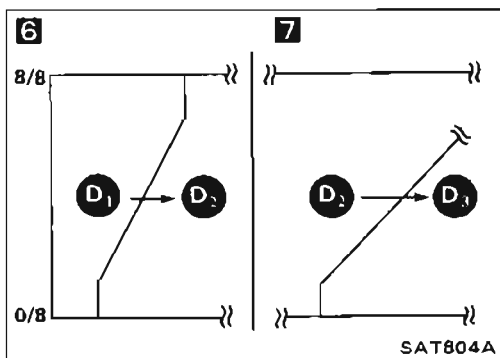
Go to Diagnostic Procedure 8.

Yes

A

TROUBLE DIAGNOSES

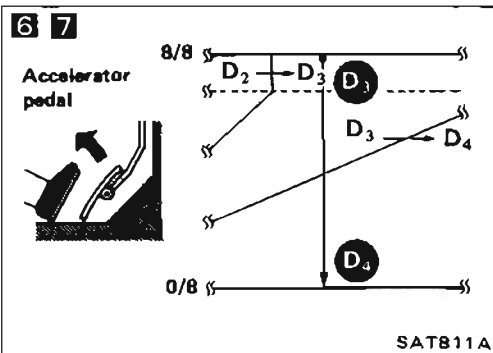
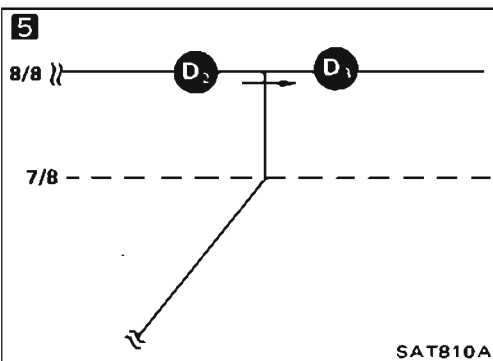
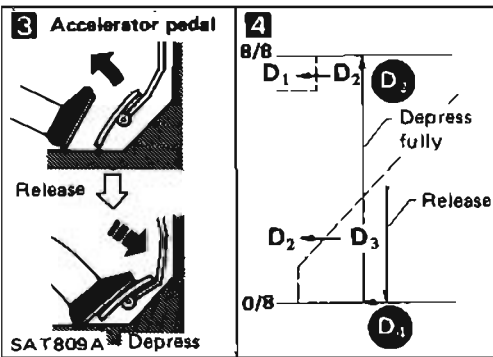
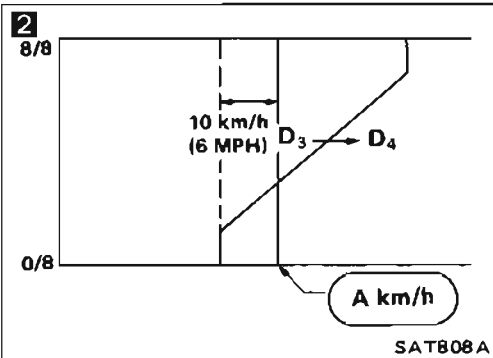
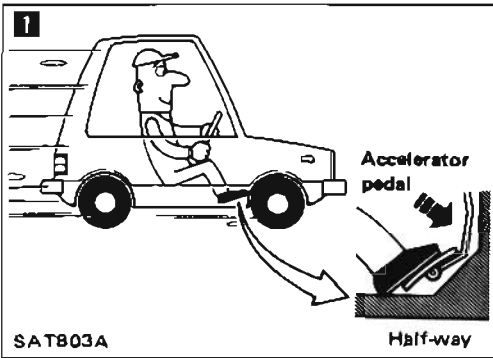
Preliminary Check (Cont'd)



TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

Cruise test – Part 2



Confirm overdrive switch is in "ON" position.

Confirm selector lever is in "D" range.

1 Accelerate vehicle by half throttle again.

Does vehicle start from D₁? No → Go to Diagnostic Procedure 16.

2 Accelerate vehicle to A km/h as shown in illustration.

3 Release accelerator pedal and then quickly depress it fully.

4 Does A/T shift from D₄ to D₂ as soon as accelerator pedal is depressed fully? No → Go to Diagnostic Procedure 9.

5 Does A/T shift from D₂ to D₃ at the specified speed?
Specified speed when shifting from D₂ to D₃:
Refer to Shift schedule. No → Go to Diagnostic Procedure 10.

6 Release accelerator pedal after shifting from D₂ to D₃.

7 Does A/T shift from D₃ to D₄ and does vehicle decelerate by engine brake? No → Go to Diagnostic Procedure 11.

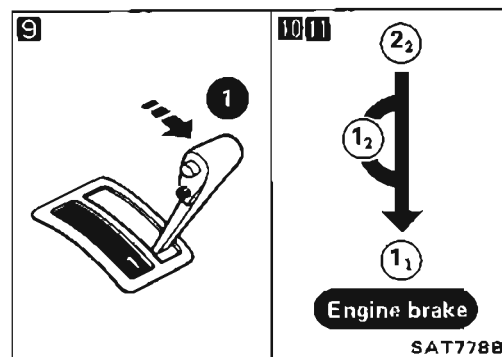
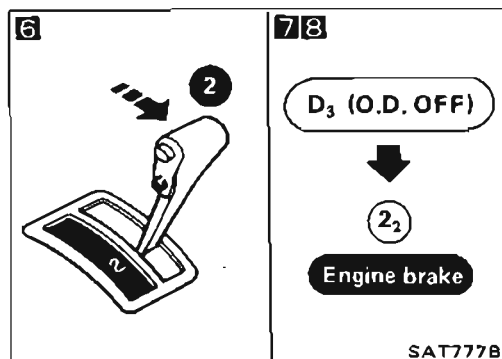
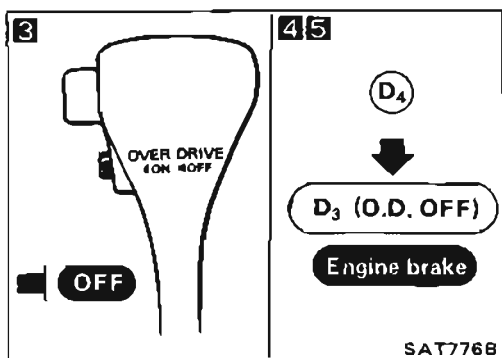
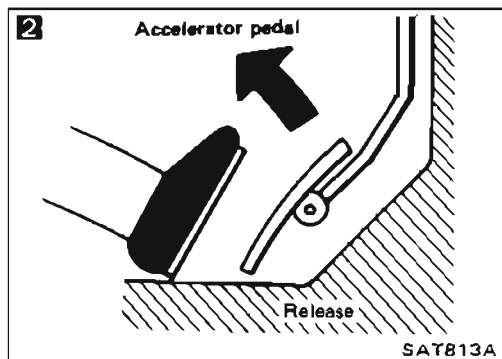
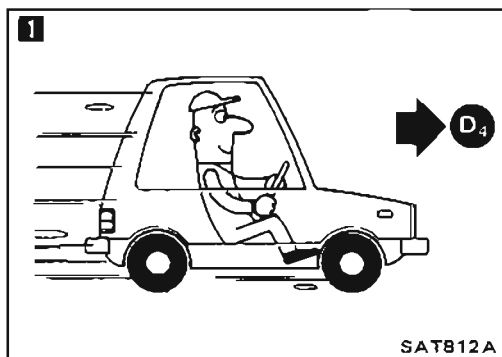
Yes
Stop vehicle.

Go to "Cruise test – Part 3".

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

Cruise test – Part 3



1 Confirm overdrive switch is in "ON" position.

Confirm selector lever is in "D" range.

1 Accelerate vehicle using half-throttle to D₄.

2 Release accelerator pedal.

3 Set overdrive switch to "OFF" position while driving in D₄ range.

4 Does A/T shift from D₄ to D₃? No → Go to Diagnostic Procedure 17.

5 Does vehicle decelerate by engine brake? No → Go to Diagnostic Procedure 15.

6 Move selector lever from "D" to "2" range while driving in D₃.

7 Does A/T shift from D₃ to 2₂? No → Go to Diagnostic Procedure 18.

8 Does vehicle decelerate by engine brake? No → Go to Diagnostic Procedure 15.

9 Move selector lever from "2" to "1" range while driving in 2₂.

10 Does A/T shift from 2₂ to 1₁ range? No → Go to Diagnostic Procedure 19.

11 Does vehicle decelerate by engine brake? No → Go to Diagnostic Procedure 20.

Stop vehicle.

Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

Vehicle speed when shifting gears

| Throttle position | Vehicle speed km/h (MPH) | | | | | | |
|-------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | D ₁ → D ₂ | D ₂ → D ₃ | D ₃ → D ₄ | D ₄ → D ₅ | D ₅ → D ₃ | D ₅ → D ₁ | 1 ₅ → 1 ₁ |
| Full throttle | 52 - 56 (32 - 35) | 95 - 101 (59 - 63) | 146 - 156 (91 - 97) | 140 - 150 (87 - 93) | 89 - 95 (55 - 59) | 40 - 44 (25 - 27) | 53 - 57 (33 - 35) |
| Half throttle | 38 - 42 (24 - 26) | 72 - 78 (45 - 48) | 111 - 121 (69 - 75) | 56 - 65 (34 - 40) | 33 - 39 (21 - 24) | 10 - 14 (6 - 9) | 53 - 57 (33 - 35) |

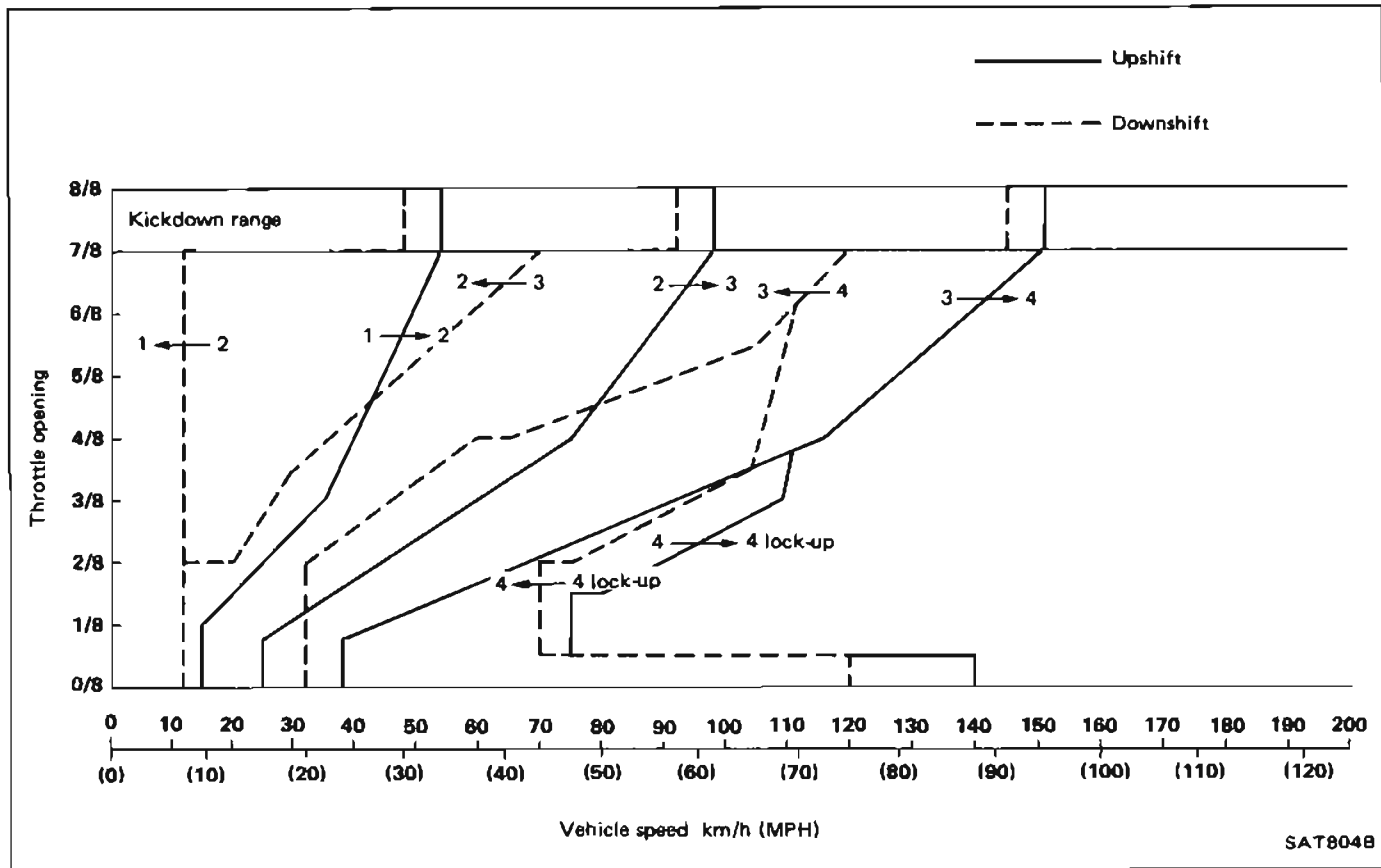
Vehicle speed when performing and releasing lock-up

| Throttle position | O.D. switch [Shift range] | Vehicle speed km/h (MPH) | |
|-------------------|------------------------------|--------------------------|------------------------|
| | | Lock-up "ON" | Lock-up "OFF" |
| Full throttle | ON [D ₄] | 146 - 156 (91 - 97) | 140 - 150 (87 - 93) |
| | OFF [D ₅] | 95 - 101 (59 - 63) | 89 - 95 (55 - 59) |
| Half throttle | ON [D ₄] | 112 - 120 (70 - 75) | 102 - 110 (63 - 68) |
| | OFF [D ₅] | 76 - 84 (47 - 52) | 71 - 79 (44 - 49) |

TROUBLE DIAGNOSES

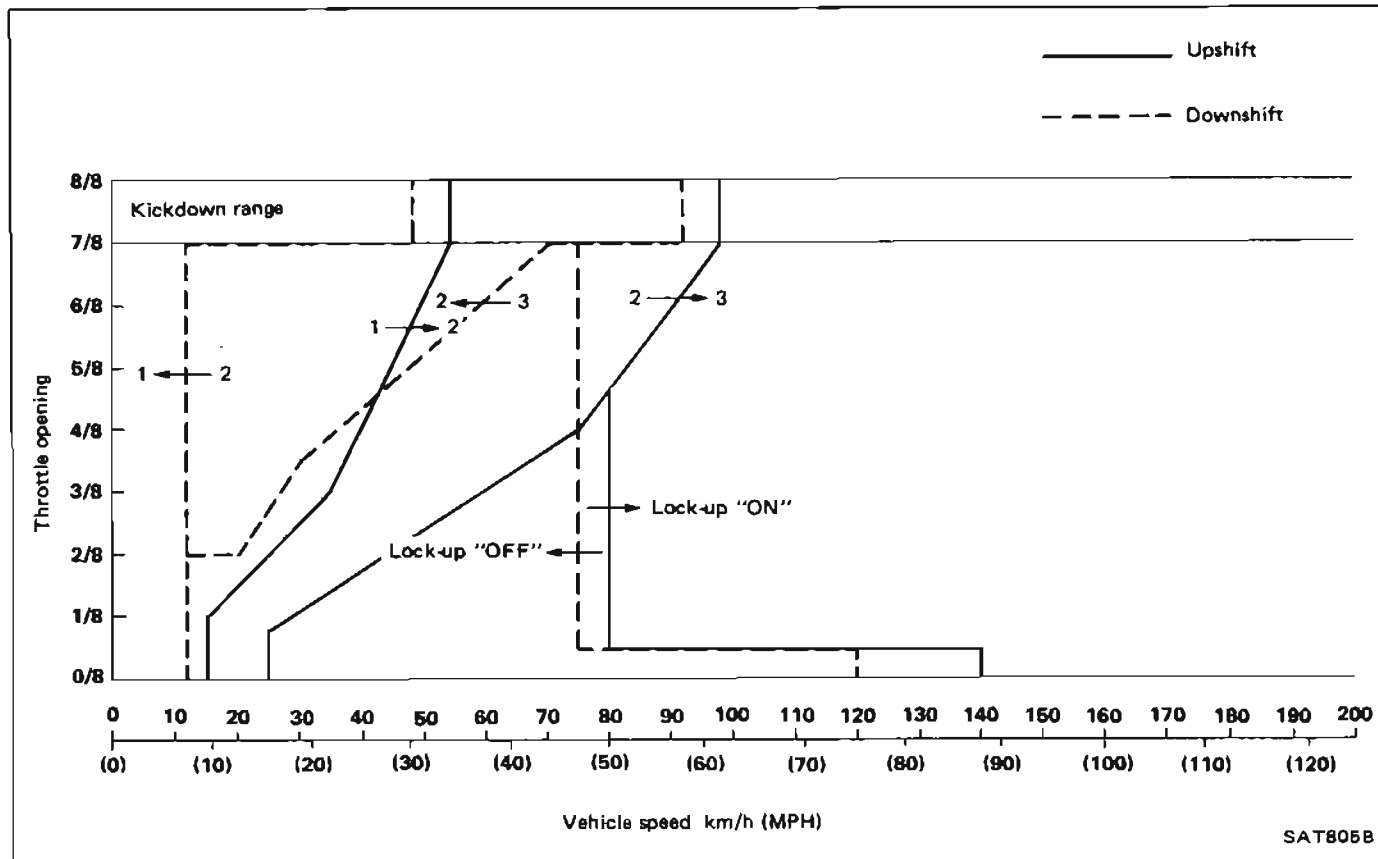
Preliminary Check (Cont'd)

Shift schedule (Overdrive ON)



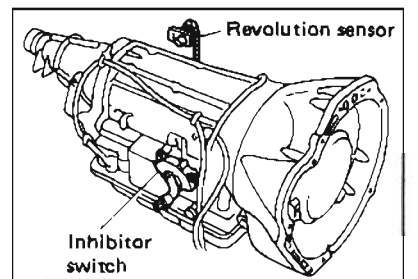
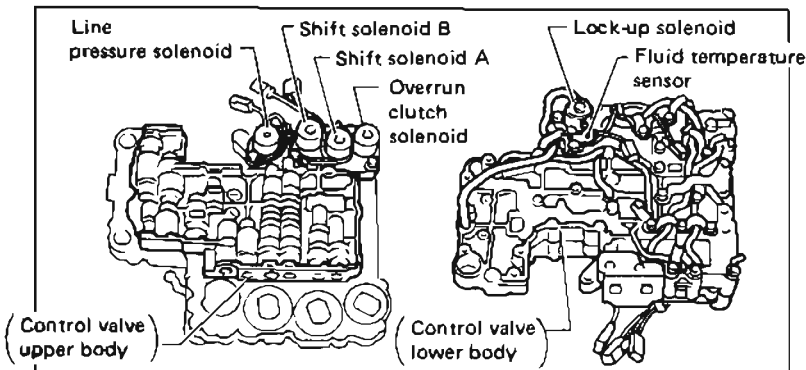
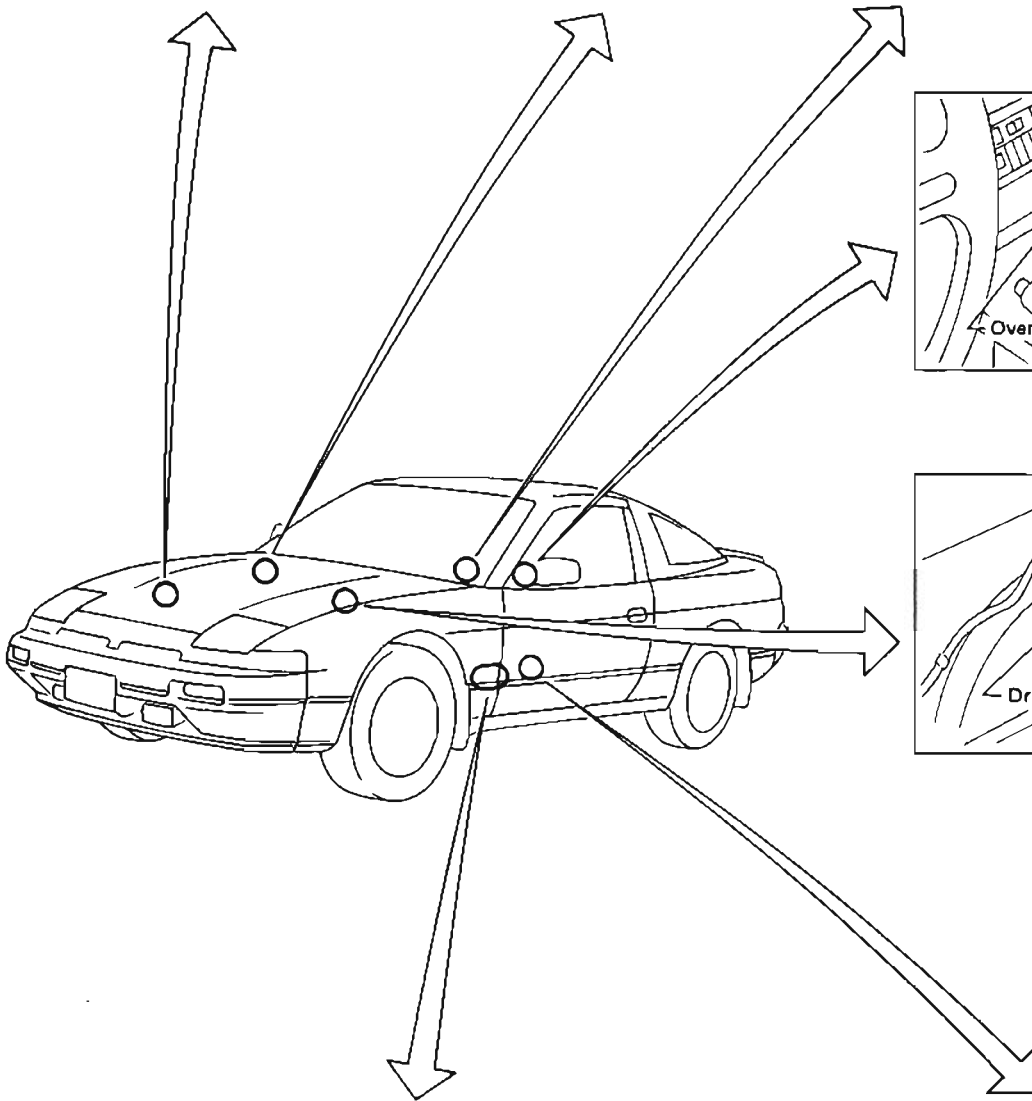
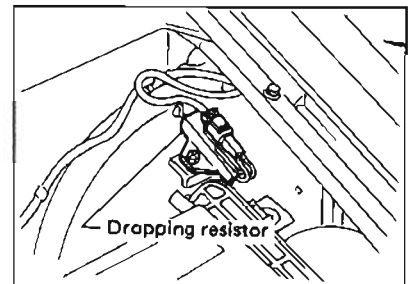
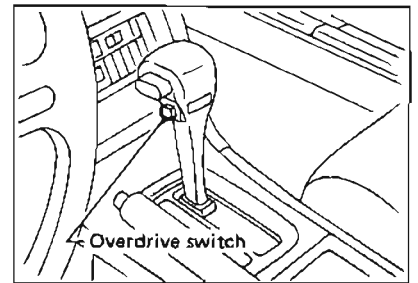
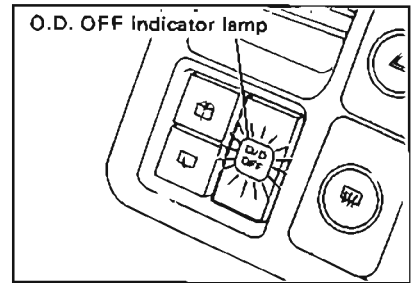
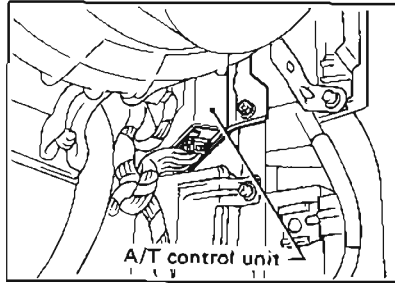
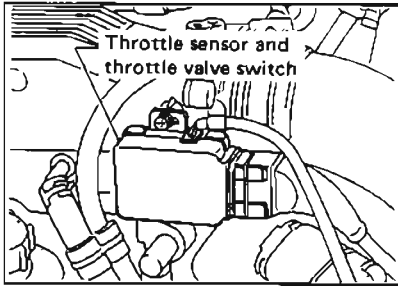
SAT804B

Shift schedule (Overdrive OFF)



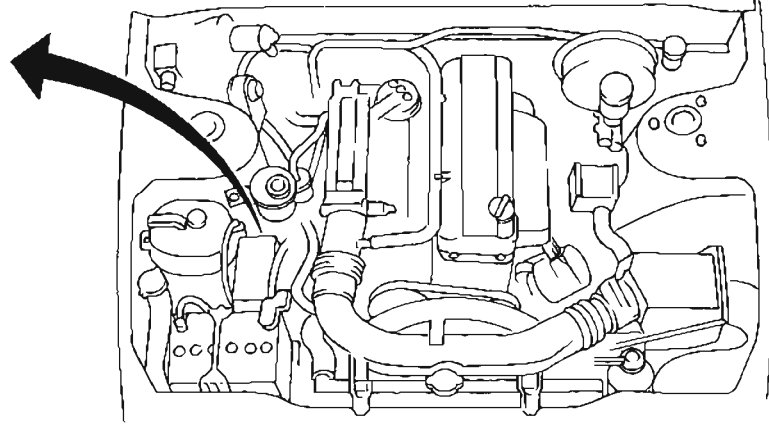
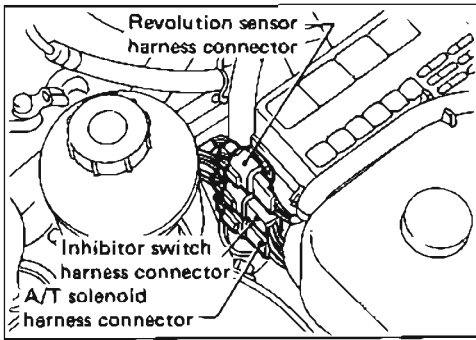
SAT805B

A/T Electrical Parts Location



TROUBLE DIAGNOSES

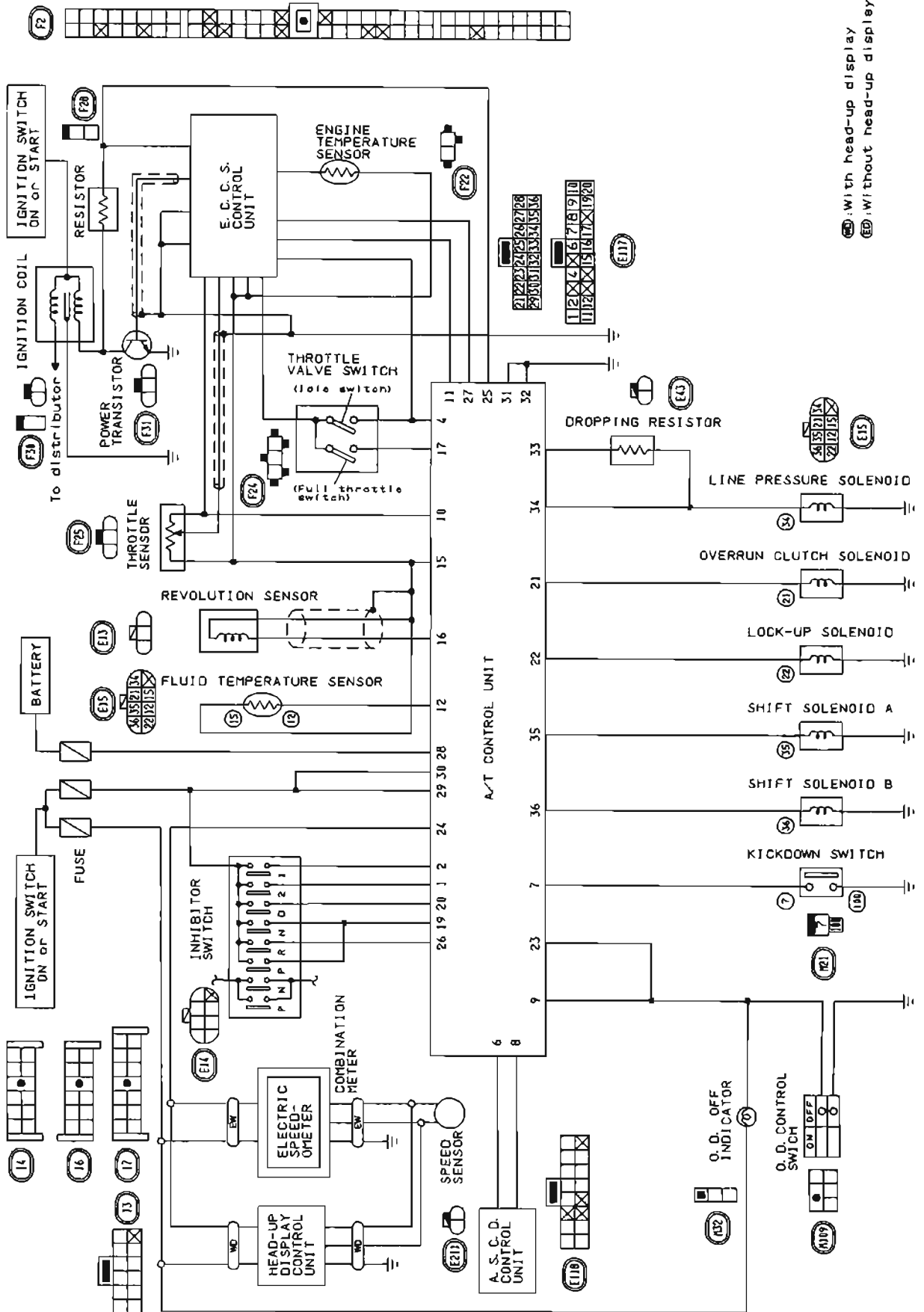
A/T Electrical Parts Location (Cont'd)



SAT825B

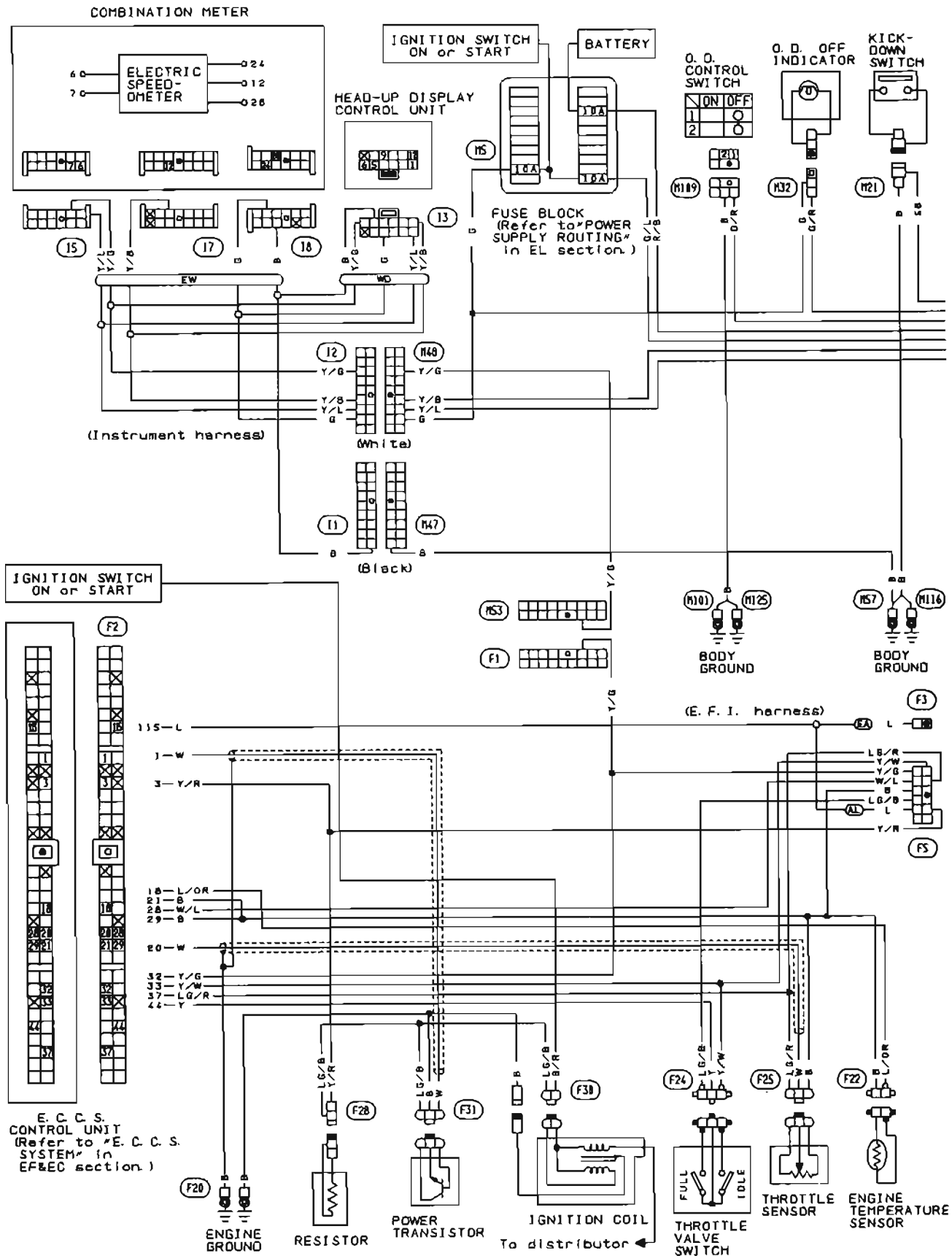
TROUBLE DIAGNOSES

Circuit Diagram for Quick Pin Point Check



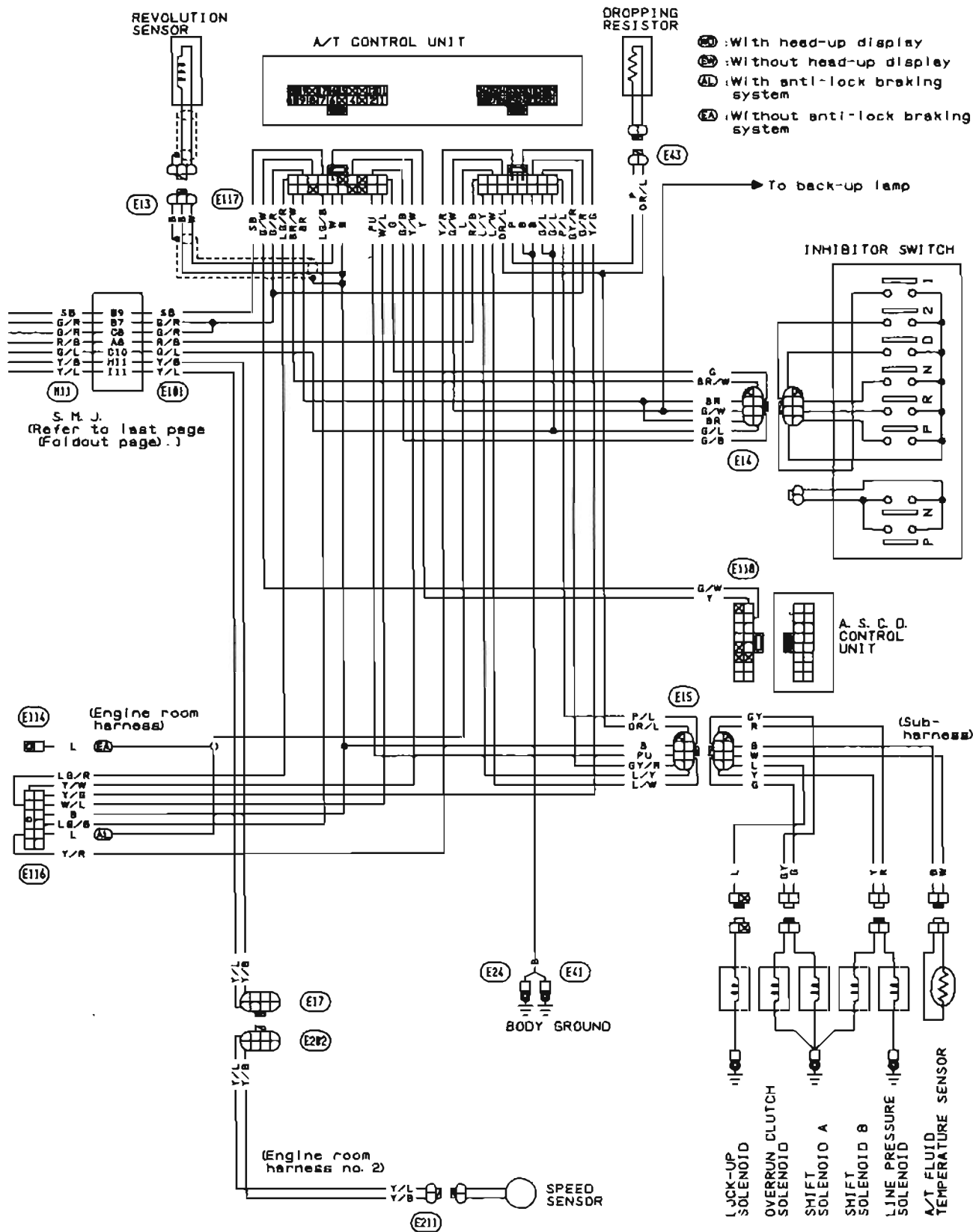
TROUBLE DIAGNOSES

Wiring Diagram

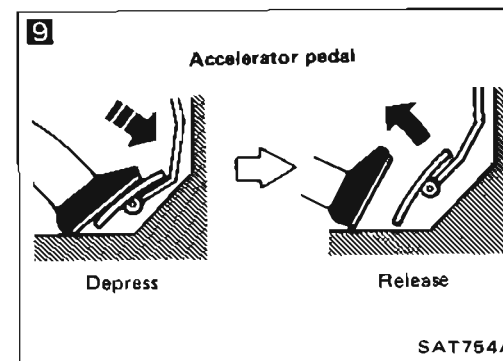
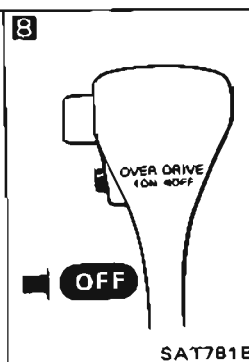
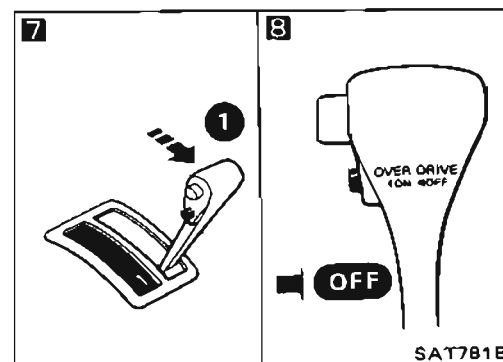
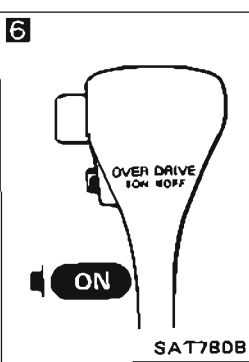
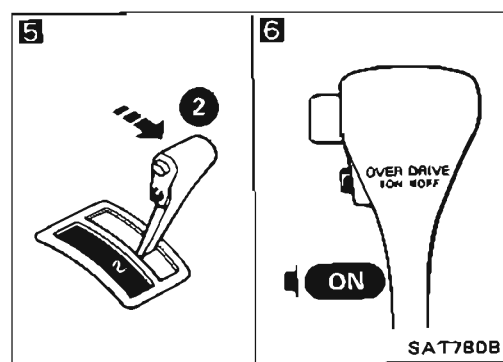
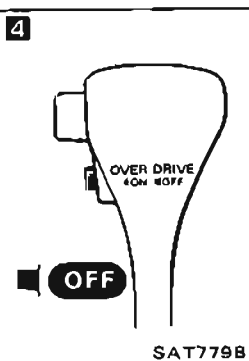
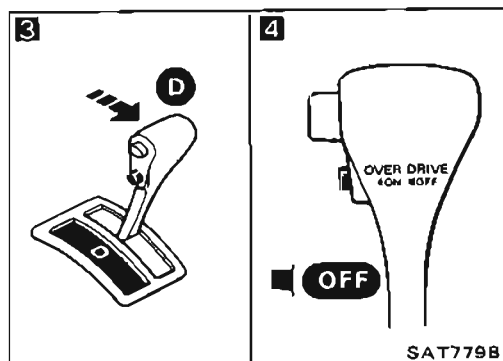
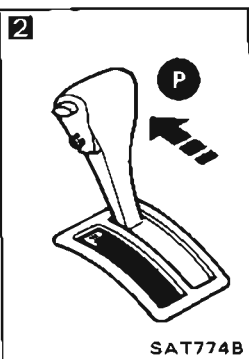
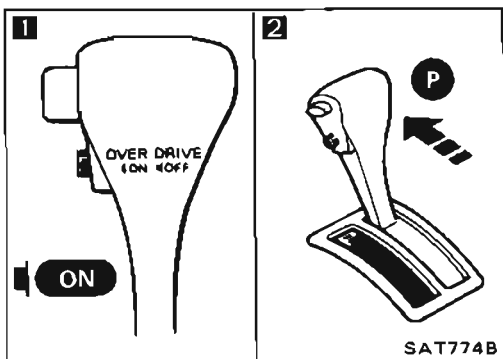


TROUBLE DIAGNOSES

Wiring Diagram (Cont'd)

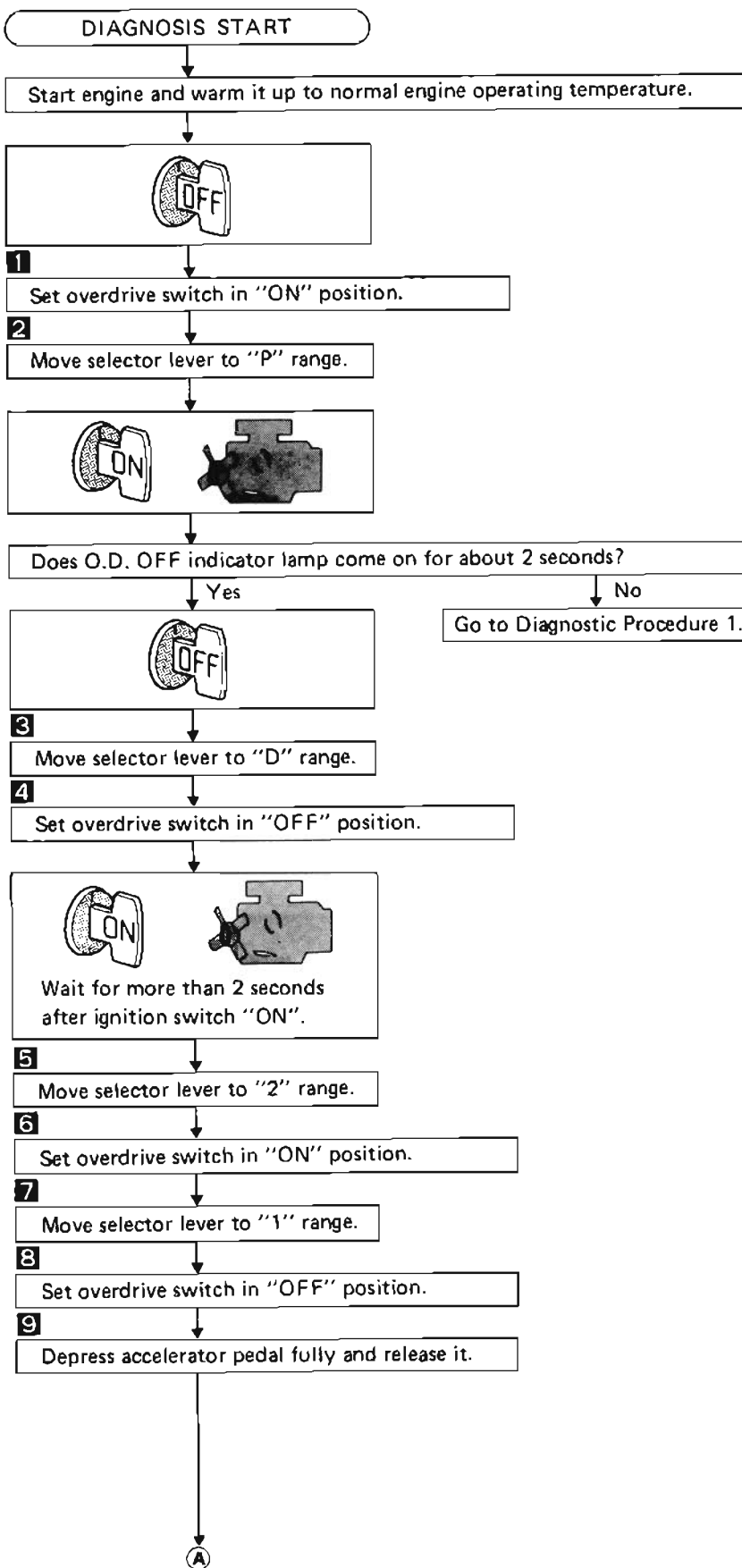


TROUBLE DIAGNOSES



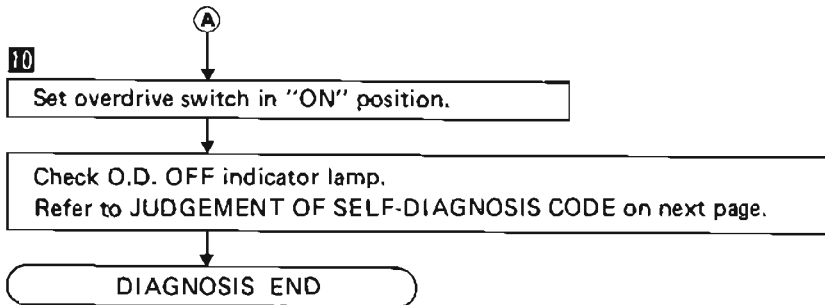
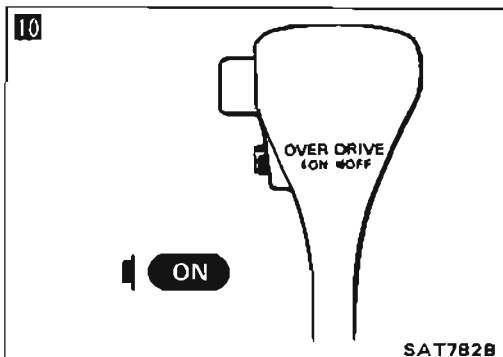
Self-diagnosis

SELF-DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSES

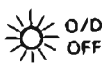
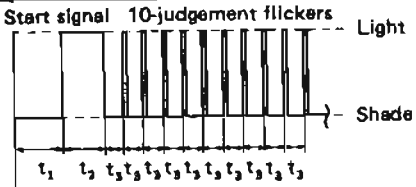
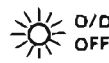
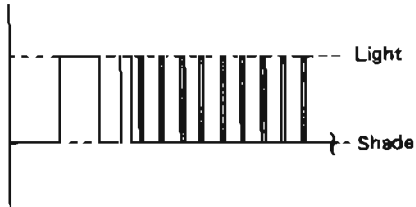
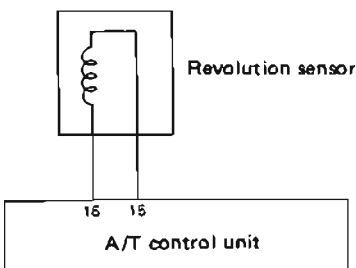


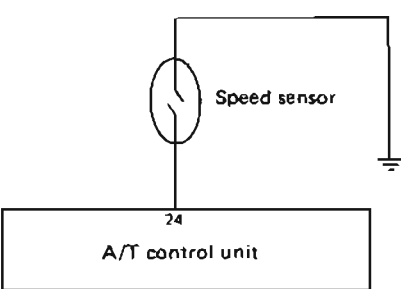

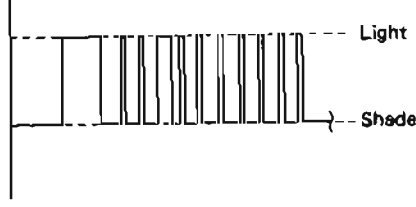
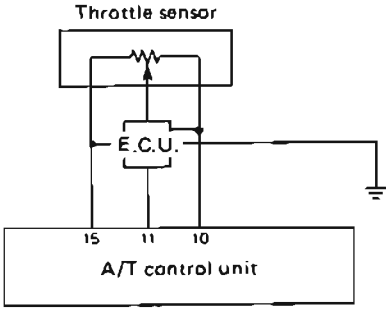
Self-diagnosis (Cont'd)



TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

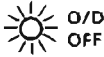
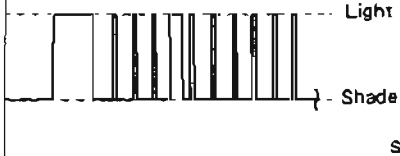
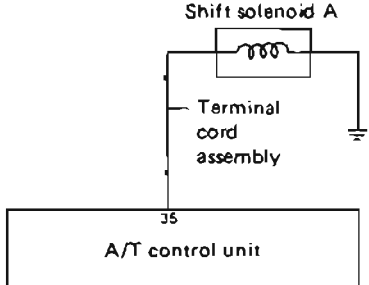

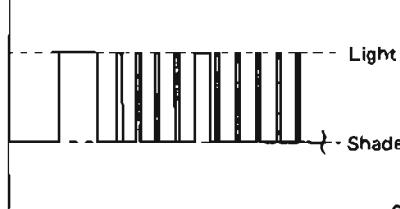
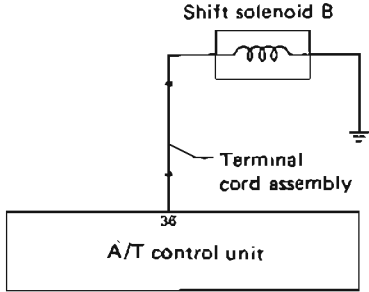

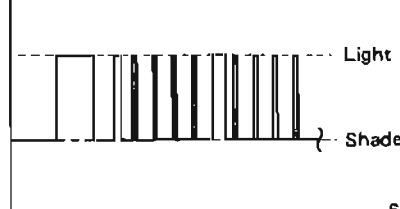
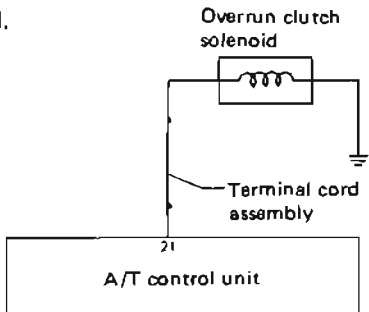

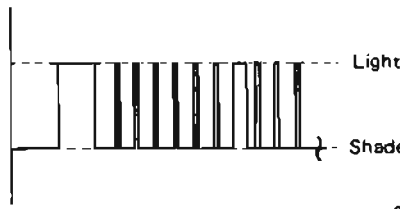
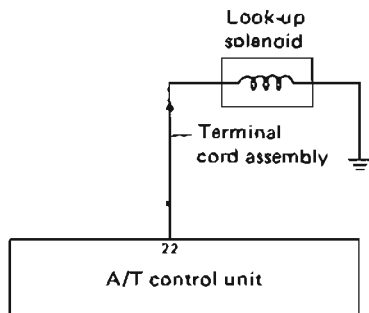
JUDGEMENT OF SELF-DIAGNOSIS CODE

| O.D. OFF indicator lamp: | Damaged circuit |
|---|--|
| <p style="text-align: center;">All judgement flickers are same.</p> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">Self-diagnosis start</div> <div style="margin-top: 10px;"> <p>Start signal 10-judgement flickers</p>  </div> <p style="text-align: right;">SAT723B</p> | <p>All circuits that can be confirmed by self-diagnosis are O.K.</p> |
| <p style="text-align: center;">1st judgement flicker is longer than others.</p> <div style="text-align: center;">  </div>  <p style="text-align: right;">SAT724B</p> | <p>Revolution sensor circuit is short-circuited or disconnected.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">➔ Go to REVOLUTION SENSOR CIRCUIT CHECK.</p> <p style="text-align: right;">SAT140B</p> |
| <p style="text-align: center;">2nd judgement flicker is longer than others.</p> <div style="text-align: center;">  </div>  <p style="text-align: right;">SAT726B</p> | <p>Speed sensor circuit is short-circuited or disconnected.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">➔ Go to SPEED SENSOR CIRCUIT CHECK.</p> <p style="text-align: right;">SAT760A</p> |
| <p style="text-align: center;">3rd judgement flicker is longer than others.</p> <div style="text-align: center;">  </div>  <p style="text-align: right;">SAT726B</p> | <p>Throttle sensor circuit is short-circuited or disconnected.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">➔ Go to THROTTLE SENSOR CIRCUIT CHECK.</p> <p style="text-align: right;">SAT761A</p> |

$t_1 = 2.5$ seconds $t_2 = 2.0$ seconds $t_3 = 1.0$ second



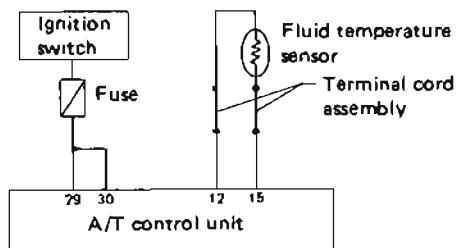
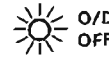
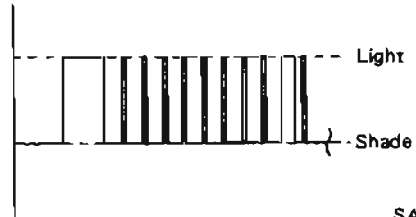
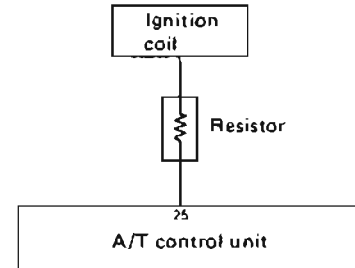

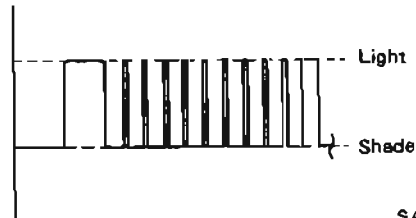
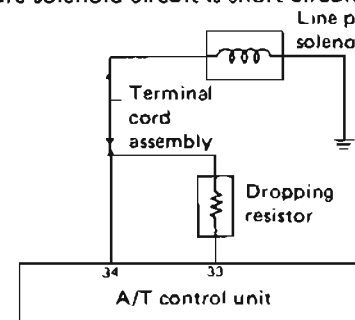

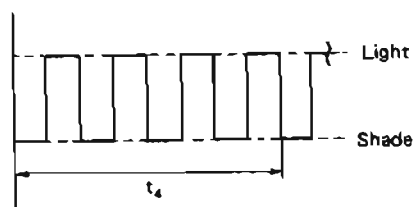
TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

| O.D. OFF indicator lamp: | Damaged circuit |
|--|--|
| <p style="text-align: center;">4th judgement flicker is longer than others.</p> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 10px auto;">Self-diagnosis start</div>  <p style="text-align: right;">Light Shade</p> <p style="text-align: right;">SAT727B</p> | <p style="text-align: center;">Shift solenoid A circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">35 A/T control unit</p> <p style="text-align: center;">➡ Go to SHIFT SOLENOID A CIRCUIT CHECK.</p> <p style="text-align: right;">SAT766A</p> |
| <p style="text-align: center;">5th judgement flicker is longer than others.</p> <div style="text-align: center;">  </div>  <p style="text-align: right;">Light Shade</p> <p style="text-align: right;">SAT728B</p> | <p style="text-align: center;">Shift solenoid B circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">36 A/T control unit</p> <p style="text-align: center;">➡ Go to SHIFT SOLENOID B CIRCUIT CHECK.</p> <p style="text-align: right;">SAT767A</p> |
| <p style="text-align: center;">6th judgement flicker is longer than others.</p> <div style="text-align: center;">  </div>  <p style="text-align: right;">Light Shade</p> <p style="text-align: right;">SAT729B</p> | <p style="text-align: center;">Overrun clutch solenoid circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">21 A/T control unit</p> <p style="text-align: center;">➡ Go to VERRUN CLUTCH SOLENOID CIRCUIT CHECK.</p> <p style="text-align: right;">SAT768A</p> |
| <p style="text-align: center;">7th judgement flicker is longer than others.</p> <div style="text-align: center;">  </div>  <p style="text-align: right;">Light Shade</p> <p style="text-align: right;">SAT730B</p> | <p style="text-align: center;">Lock-up solenoid circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">22 A/T control unit</p> <p style="text-align: center;">➡ Go to LOCK-UP SOLENOID CIRCUIT CHECK.</p> <p style="text-align: right;">SAT769A</p> |

TROUBLE DIAGNOSES

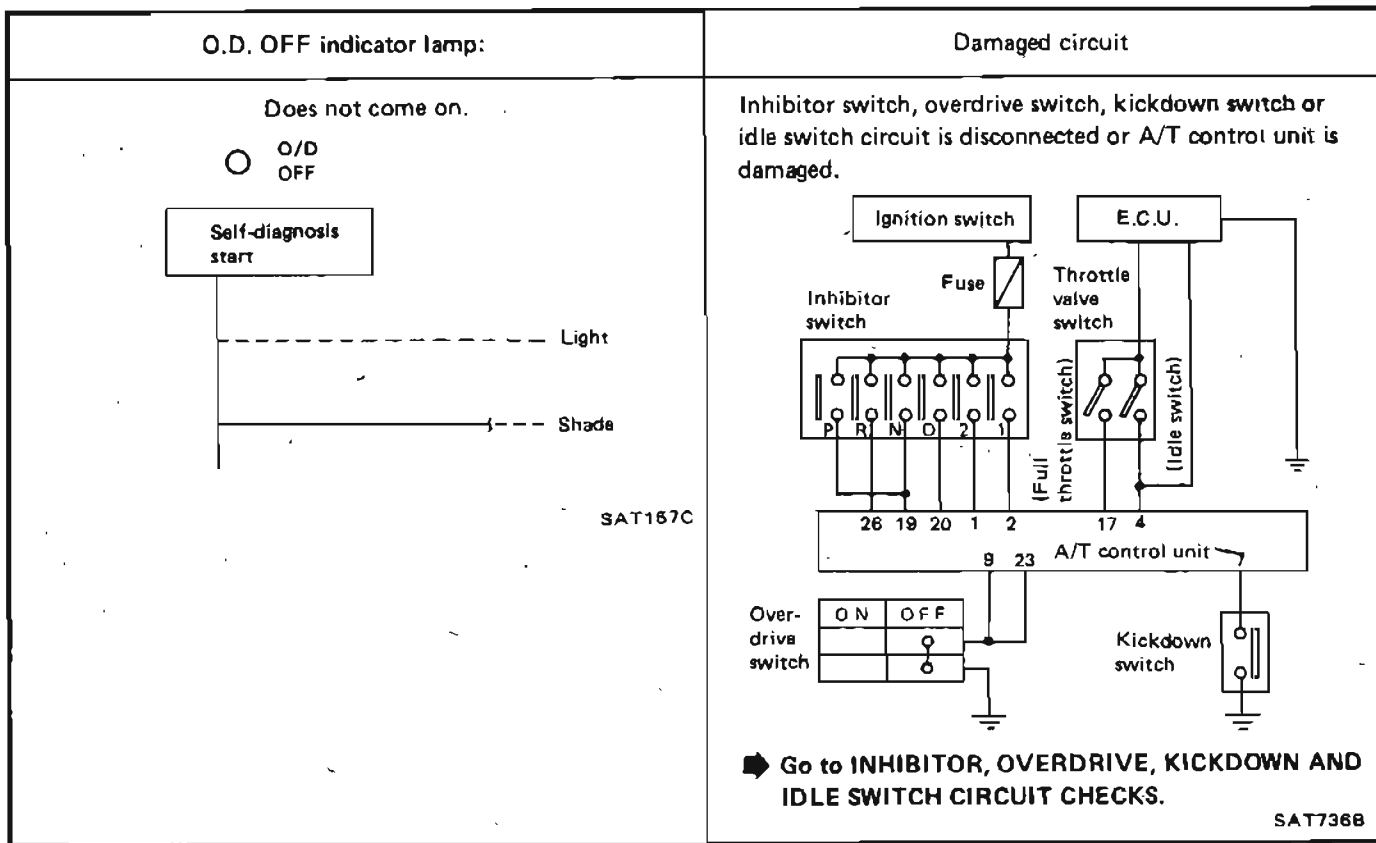
Self-diagnosis (Cont'd)

| O.D. OFF indicator lamp: | Damaged circuit |
|---|---|
| <p style="text-align: center;">8th judgement flicker is longer than others.</p> <div style="text-align: center;">  <p>O/D OFF</p> </div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Self-diagnosis start</div>  <p style="text-align: right;">Light Shade</p> <p style="text-align: right;">SAT731B</p> | <p>Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.</p>  <p style="text-align: center;">A/T control unit</p> <p>➡ Go to FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECK.</p> <p style="text-align: right;">SAT143B</p> |
| <p style="text-align: center;">9th judgement flicker is longer than others.</p> <div style="text-align: center;">  <p>O/D OFF</p> </div>  <p style="text-align: right;">Light Shade</p> <p style="text-align: right;">SAT733B</p> | <p>Engine revolution signal circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">A/T control unit</p> <p>➡ Go to ENGINE REVOLUTION SIGNAL CIRCUIT CHECK.</p> <p style="text-align: right;">SAT624B</p> |
| <p style="text-align: center;">10th judgement flicker is longer than others.</p> <div style="text-align: center;">  <p>O/D OFF</p> </div>  <p style="text-align: right;">Light Shade</p> <p style="text-align: right;">SAT732B</p> | <p>Line pressure solenoid circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">A/T control unit</p> <p>➡ Go to LINE PRESSURE SOLENOID CIRCUIT CHECK.</p> <p style="text-align: right;">SAT776A</p> |
| <p style="text-align: center;">Flickers as shown below:</p> <div style="text-align: center;">  <p>O/D OFF</p> </div>  <p style="text-align: right;">Light Shade</p> <p style="text-align: right;">SAT734B</p> | <p>Battery power is low. Battery has been disconnected for a long time. Battery is connected conversely. (When reconnecting A/T control unit connectors. — This is not a problem.)</p> |

$t_4 = 1.0$ second

TROUBLE DIAGNOSES

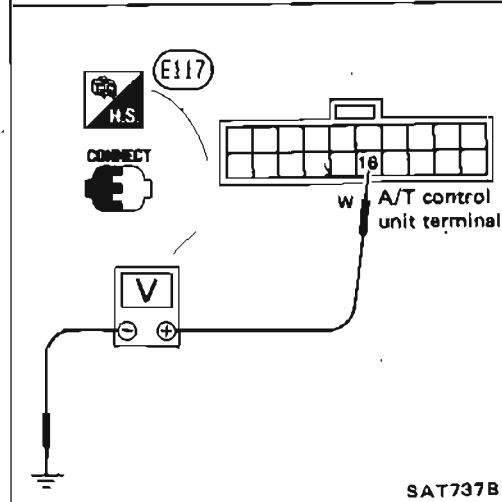
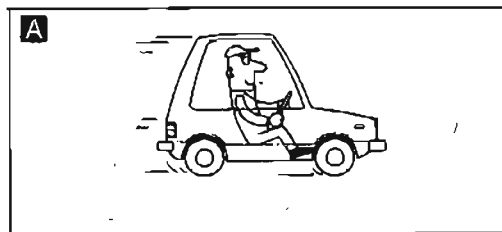
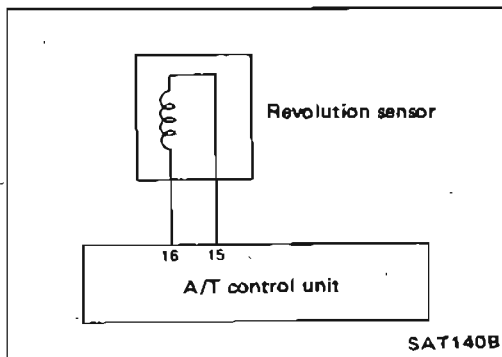
Self-diagnosis (Cont'd)



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. Check voltage between A/T control unit terminal ①⑥ 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)

N.G.

Check the following items.

- Harness continuity between A/T control unit and revolution sensor (Main harness)
- Harness continuity between revolution sensor and E.C.U. (Main harness)
- Ground circuit for E.C.U. — Refer to section EF & EC.

O.K.

Perform self-diagnosis again after driving for a while.

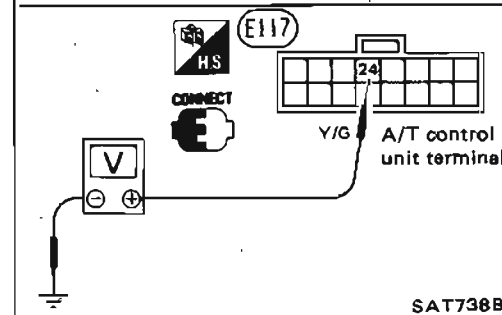
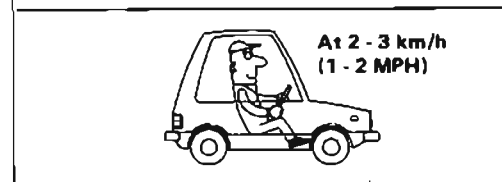
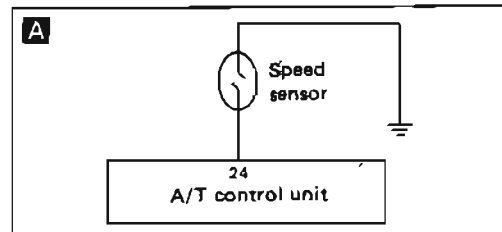
N.G.

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

SPEED SENSOR CIRCUIT CHECK



CHECK INPUT SIGNAL.

1.



2. Check voltage between A/T control unit terminal ②④ and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.

Voltage: Varies from 0V to 5V

N.G.

Check the following items.

- Speed sensor and ground circuit for speed sensor — Refer to section EL.
- Harness continuity between A/T control unit and speed sensor (Main harness)

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.

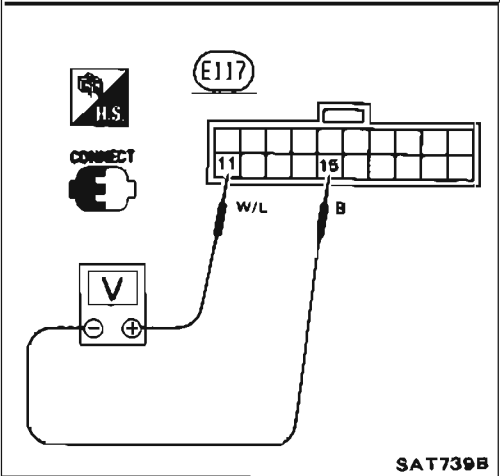
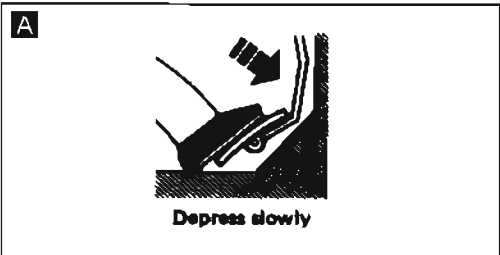
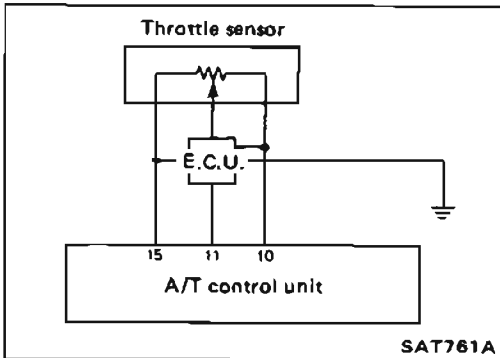
O.K.

INSPECTION END

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

THROTTLE SENSOR CIRCUIT CHECK



Perform self-diagnosis (Mode III) for engine control.

N.G.

Check throttle sensor circuit for engine control. — Refer to section EF & EC.

O.K.

A

CHECK INPUT SIGNAL

-
- Check voltage between A/T control unit terminals ⑪ and ⑮ while accelerator pedal is depressed slowly.
Voltage:
Fully-closed throttle: 0.2 - 0.6V
Fully-open throttle: 2.9 - 3.9V
(Voltage rises gradually in response to throttle valve opening.)

N.G.

Check harness continuity between E.C.U. and A/T control unit regarding throttle sensor circuit. (Main harness)

O.K.

Perform self-diagnosis again after driving for a while.

N.G.

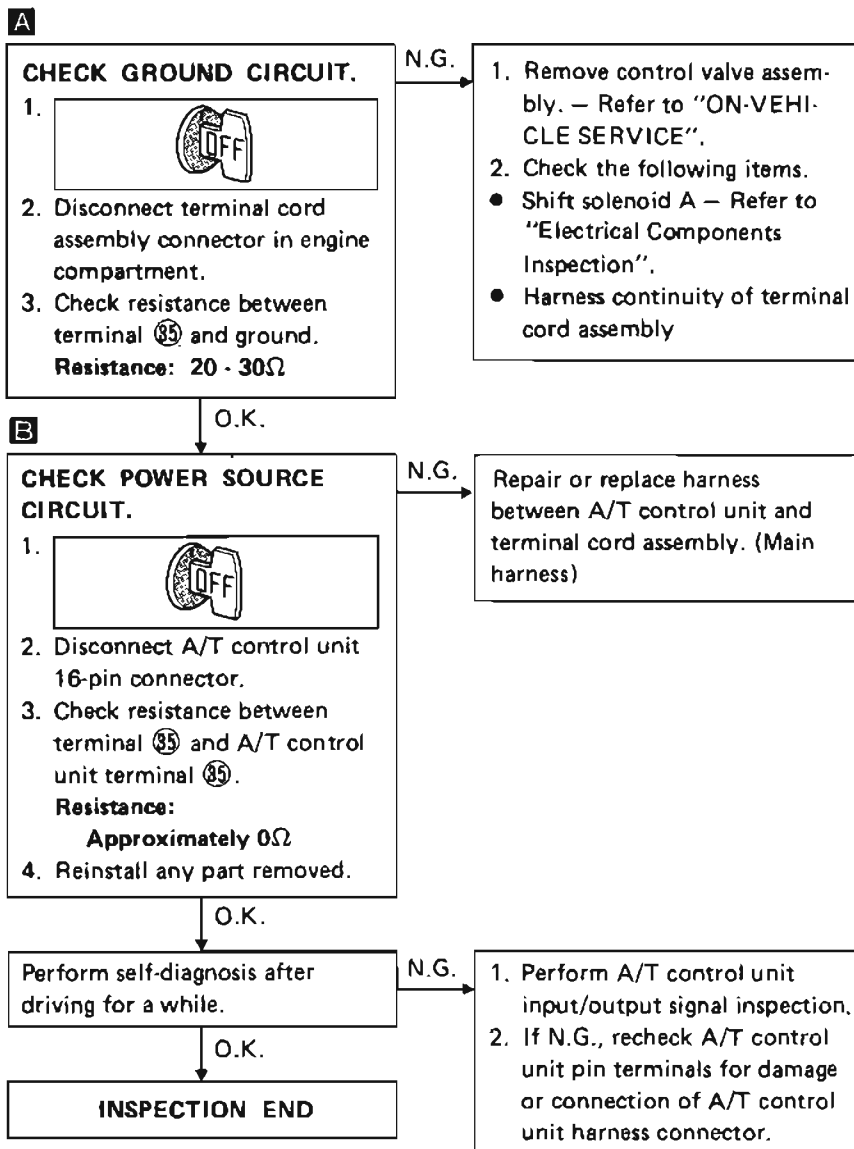
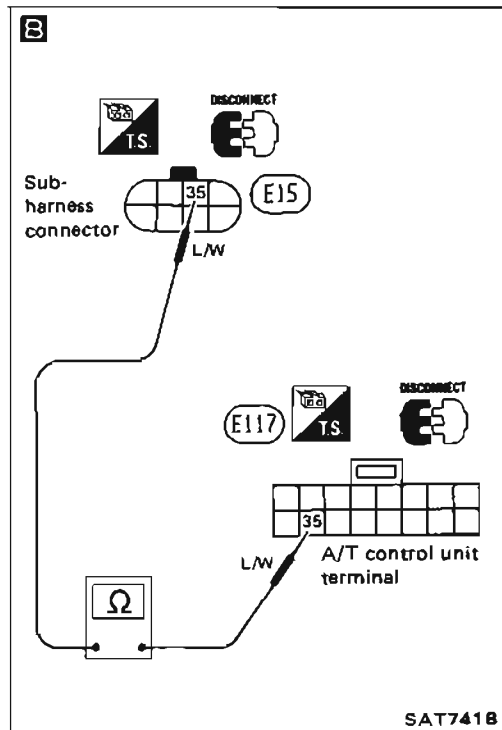
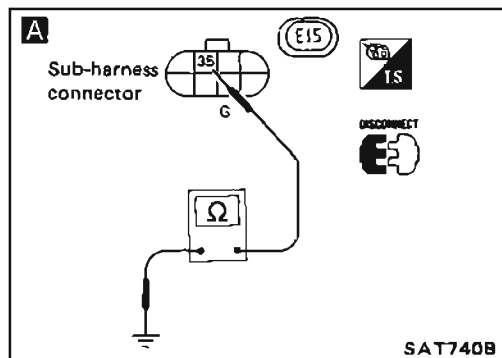
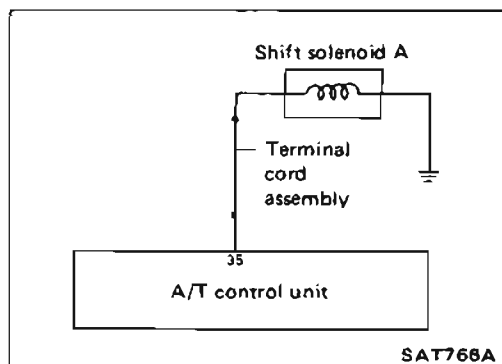
- Perform A/T control unit input/output signal inspection.
- If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

INSPECTION END

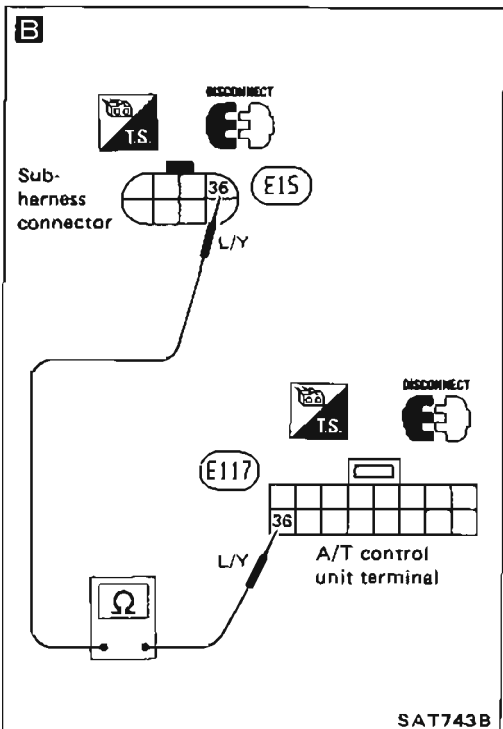
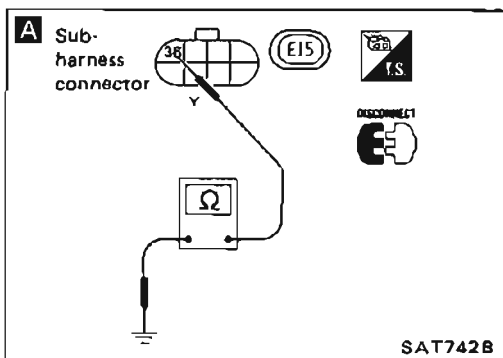
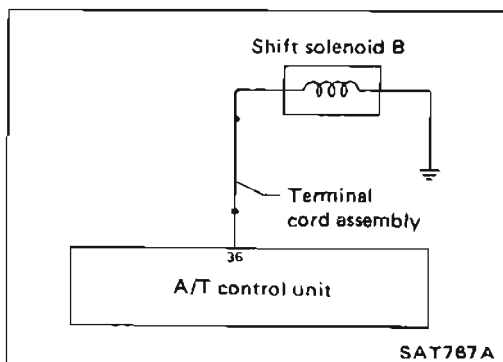
TROUBLE DIAGNOSES

Self-diagnosis (Cont'd) SHIFT SOLENOID A CIRCUIT CHECK




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 36 and ground.
Resistance: 20 - 30Ω

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 16-pin connector.
3. Check resistance between terminal 36 and A/T control unit terminal 36.
Resistance: Approximately 0Ω
4. Reinstall any part removed.

N.G.

- Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

O.K.

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.

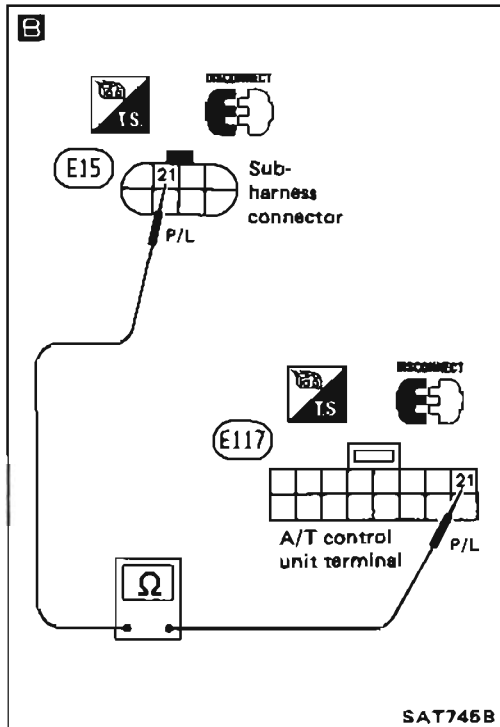
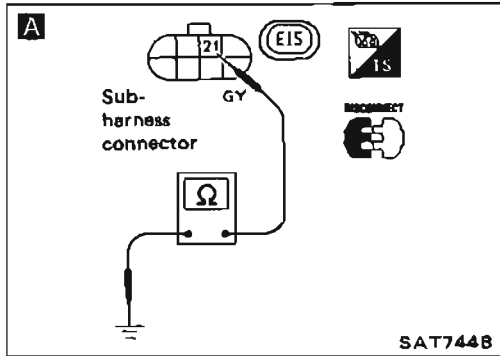
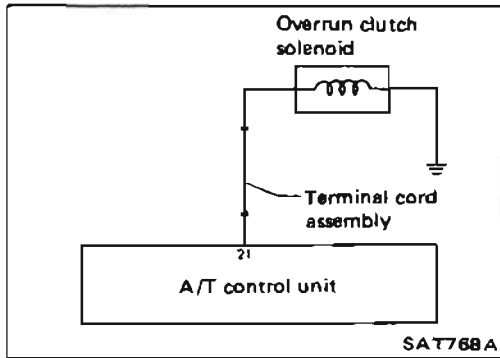
O.K.

INSPECTION END

TROUBLE DIAGNOSES


Self-diagnosis (Cont'd)

VERRUN CLUTCH SOLENOID CIRCUIT CHECK



A

CHECK GROUND CIRCUIT.

1. 
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ②① and ground.
Resistance: 20 - 30Ω


N.G.

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
 - Overrun clutch solenoid. — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

O.K.

B

CHECK POWER SOURCE CIRCUIT.

1. 
2. Disconnect A/T control unit 16-pin connector.
3. Check resistance between terminal ②① and A/T control unit terminal ②①.
Resistance:
Approximately 0Ω
4. Reinstall any part removed.

N.G.

- Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

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.

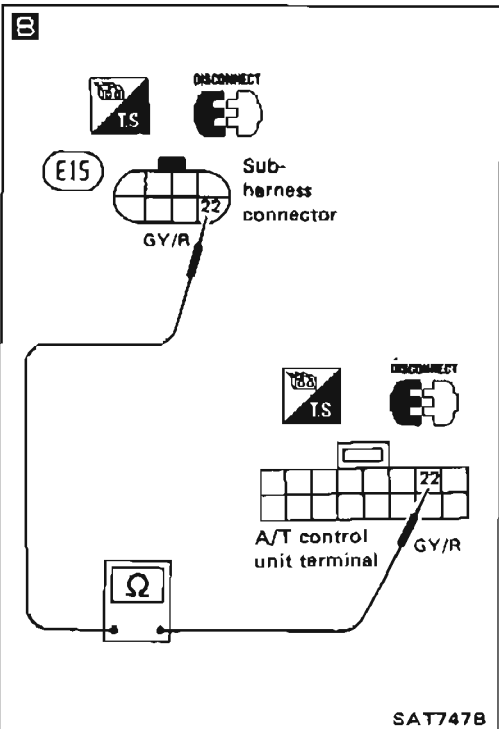
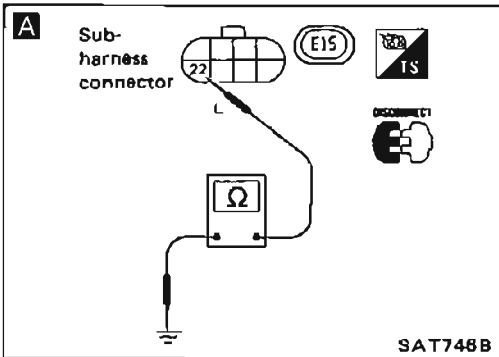
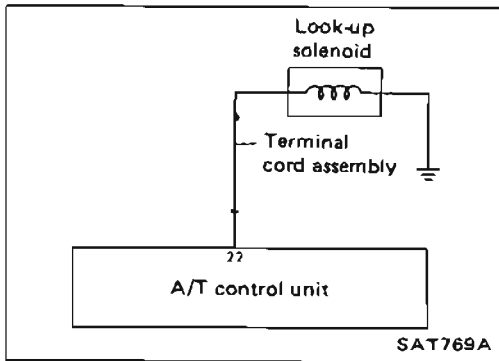
O.K.

INSPECTION END

TROUBLE DIAGNOSES


Self-diagnosis (Cont'd)

LOCK-UP SOLENOID CIRCUIT CHECK



A

CHECK GROUND CIRCUIT.

1. 
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal 22 and ground.
Resistance: 2.5 - 5Ω


N.G.

1. Remove oil pan. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
 - Lock-up solenoid — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

O.K.

B

CHECK POWER SOURCE CIRCUIT.

1. 
2. Disconnect A/T control unit 16-pin connector.
3. Check resistance between terminal 22 and A/T control unit terminal 22.
Resistance:
Approximately 0Ω
4. Reinstall any part removed.

N.G.

- Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

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.

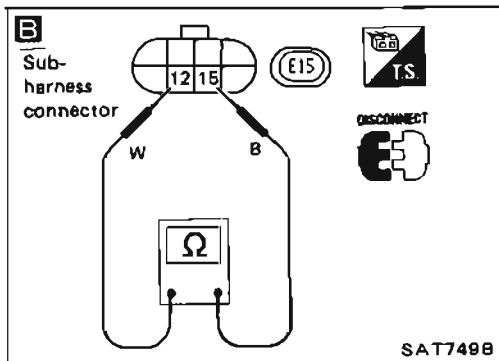
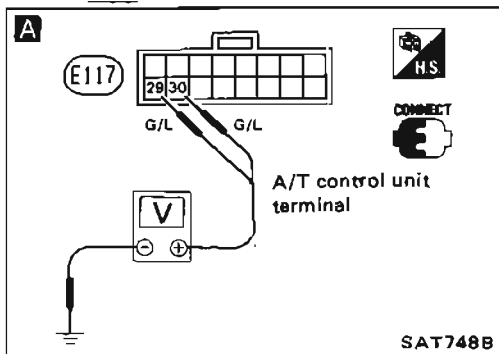
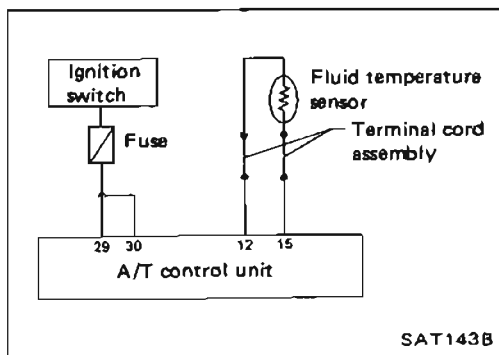
O.K.

INSPECTION END

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS



A

CHECK A/T CONTROL UNIT POWER SOURCE.

-
- Check voltage between A/T control unit terminals ②⑨, ③① and ground.
Battery voltage should exist.

N.G.

Check the following items.

- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch and fuse – Refer to section EL.

B

CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY

-
- Disconnect terminal cord assembly connector in engine compartment.
- Check resistance between terminals ⑫ and ⑮ when A/T is cold.
Resistance:
Cold [20°C (68°F)]
Approximately 2.5 kΩ
- Reinstall any part removed.

N.G.

1. Remove oil pan.
2. Check the following items.
 - Fluid temperature sensor – Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

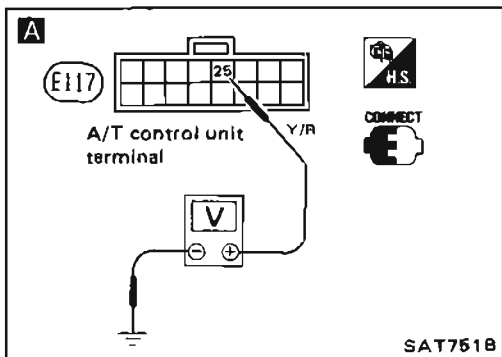
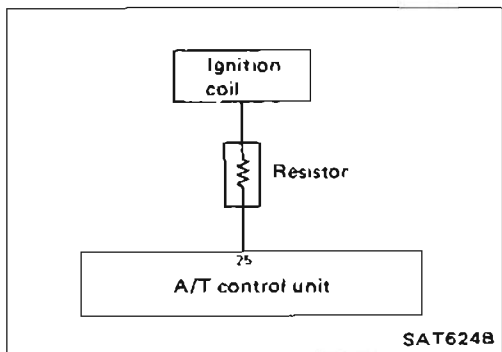
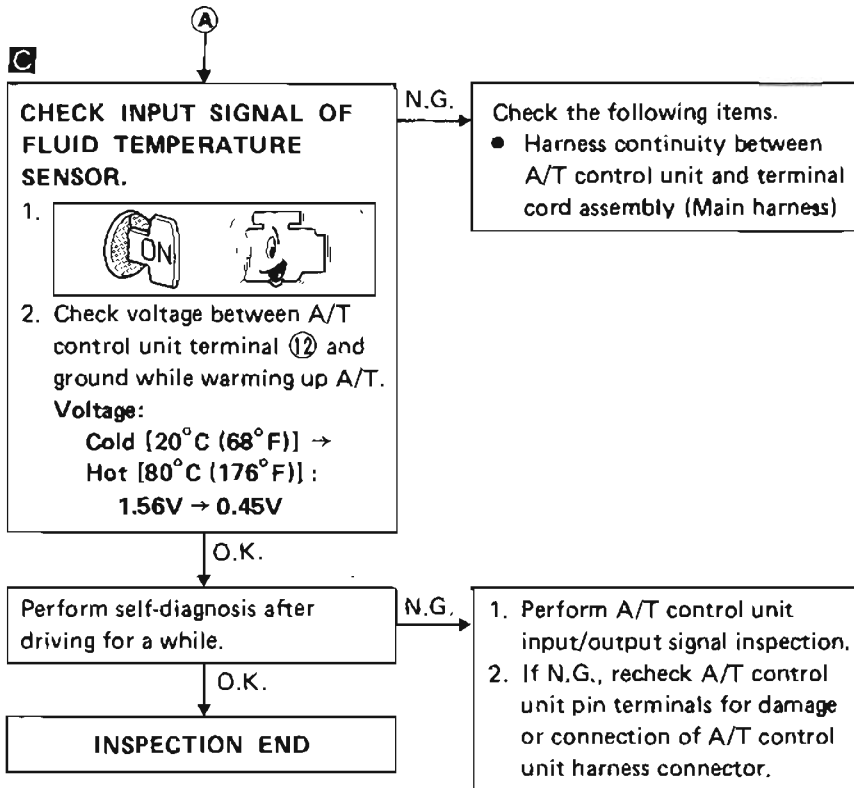
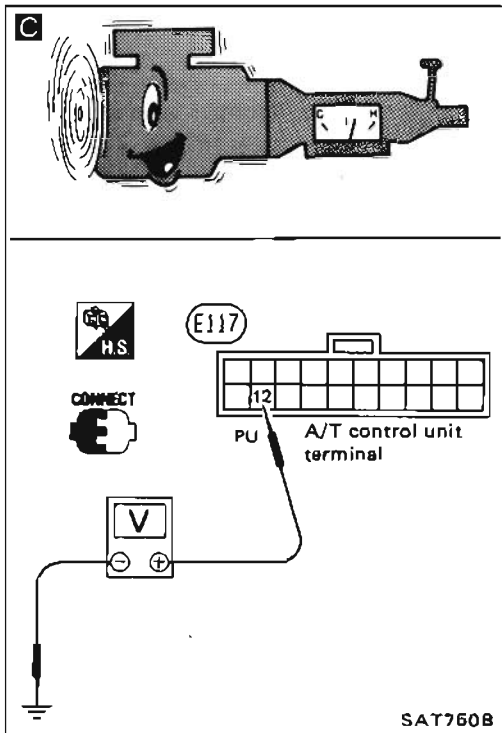
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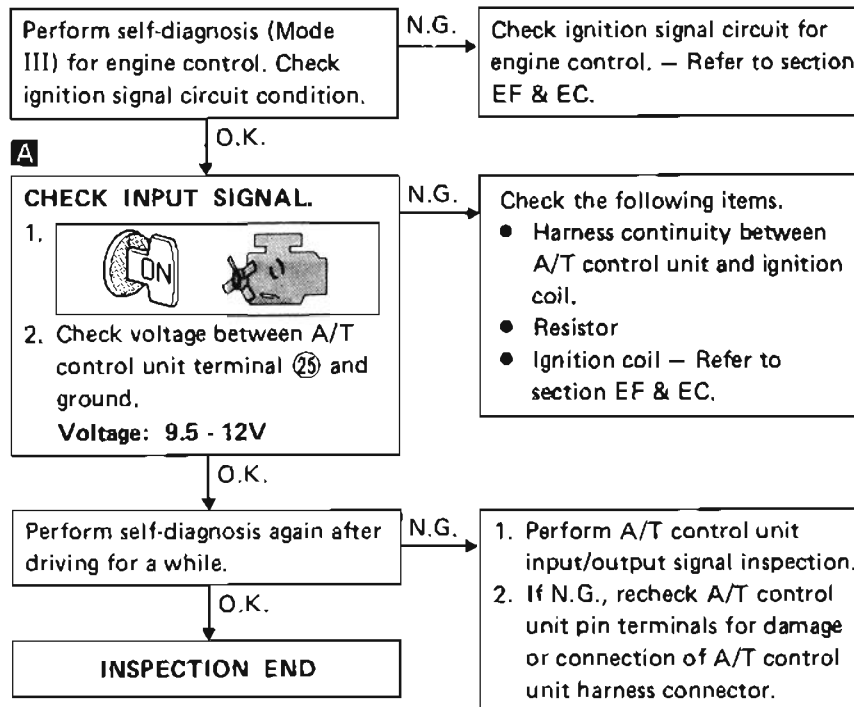
Ⓐ

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)



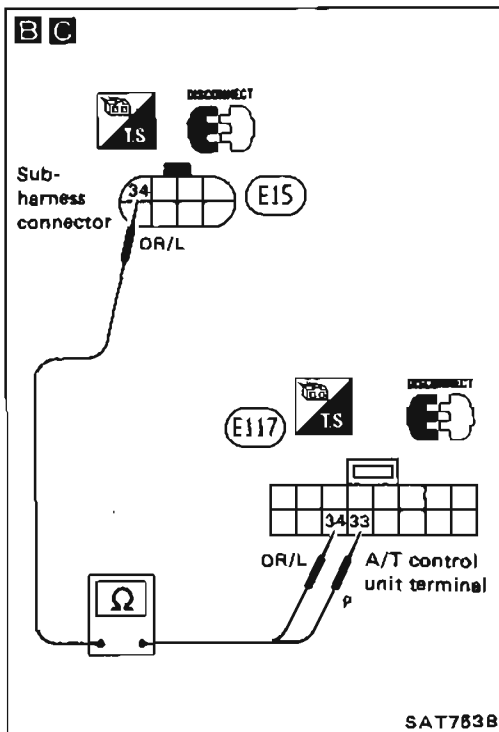
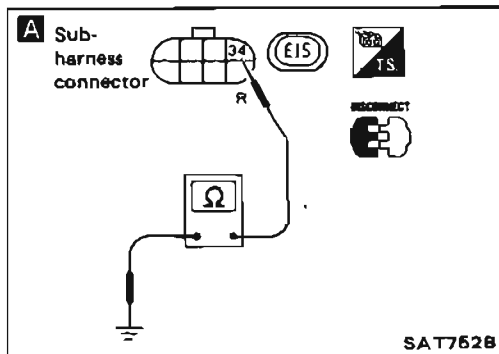
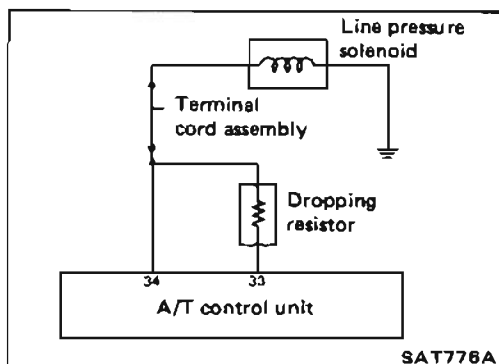
ENGINE REVOLUTION SIGNAL CIRCUIT CHECK



TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

LINE PRESSURE SOLENOID CIRCUIT CHECK



A

CHECK GROUND CIRCUIT.

1.

2. Disconnect terminal cord assembly connector in engine compartment.

3. Check resistance between terminal 34 and ground.
Resistance: 2.5 - 5Ω

- N.G.
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
 2. Check the following items.
 - Line pressure solenoid — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

B

CHECK POWER SOURCE CIRCUIT.

1.

2. Disconnect A/T control unit 16-pin connector.

3. Check resistance between terminal 34 and A/T control unit terminal 33.
Resistance: 11.2 - 12.8Ω

- N.G.
- Check the following items.
- Dropping resistor — Refer to "Electrical Components Inspection".
 - Harness continuity between A/T control unit 33 and terminal cord assembly (Main harness)

C

CHECK POWER SOURCE CIRCUIT

1.

2. Check resistance between terminal 34 and A/T control unit terminal 34.
Resistance:
Approximately 0Ω

3. Reinstall any part removed.

- N.G.
- Repair or replace harness between A/T control unit 34 and terminal cord assembly.

Perform self-diagnosis after driving for a while.

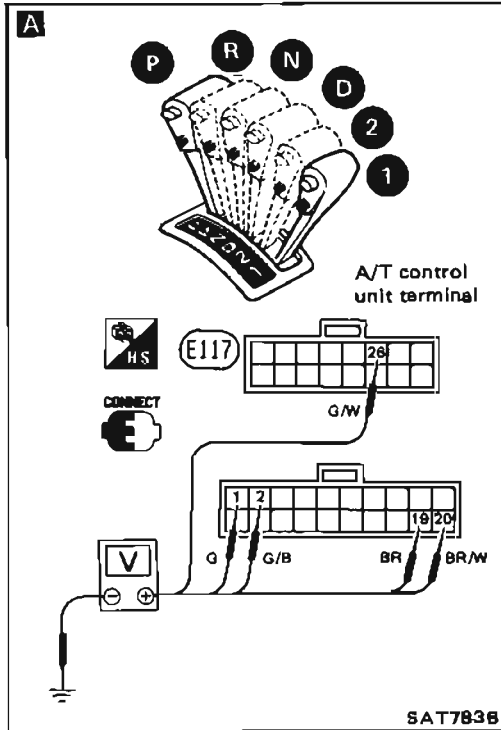
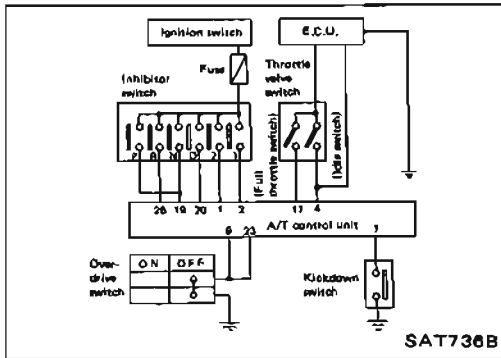
- N.G.
1. Perform A/T control unit input/output signal inspection.
 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

INSPECTION END

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS



A

CHECK INHIBITOR SWITCH CIRCUIT.

-
- Check voltage between A/T control unit terminals ①, ②, ⑱, ⑳, ㉖ and ground while moving selector lever through each range.

Voltage:
B: Battery voltage
0: 0V

| Terminal No. | ⑱ | ㉖ | ⑳ | ① | ② |
|----------------|---|---|---|---|---|
| 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 |

- N.G.
- Check the following items.
- Inhibitor switch – Refer to "Electrical Components Inspection".
 - Harness continuity between ignition switch and inhibitor switch (Main harness)
 - Harness continuity between inhibitor switch and A/T control unit (Main harness)

B

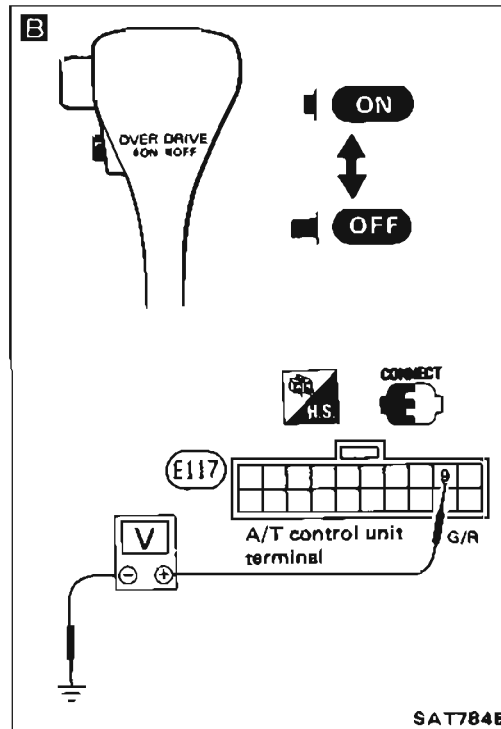
O.K.

CHECK OVERDRIVE SWITCH CIRCUIT.

-
- Check voltage between A/T control unit terminal ⑨ 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 (Main harness)
 - Harness continuity of ground circuit for overdrive switch (Main harness)

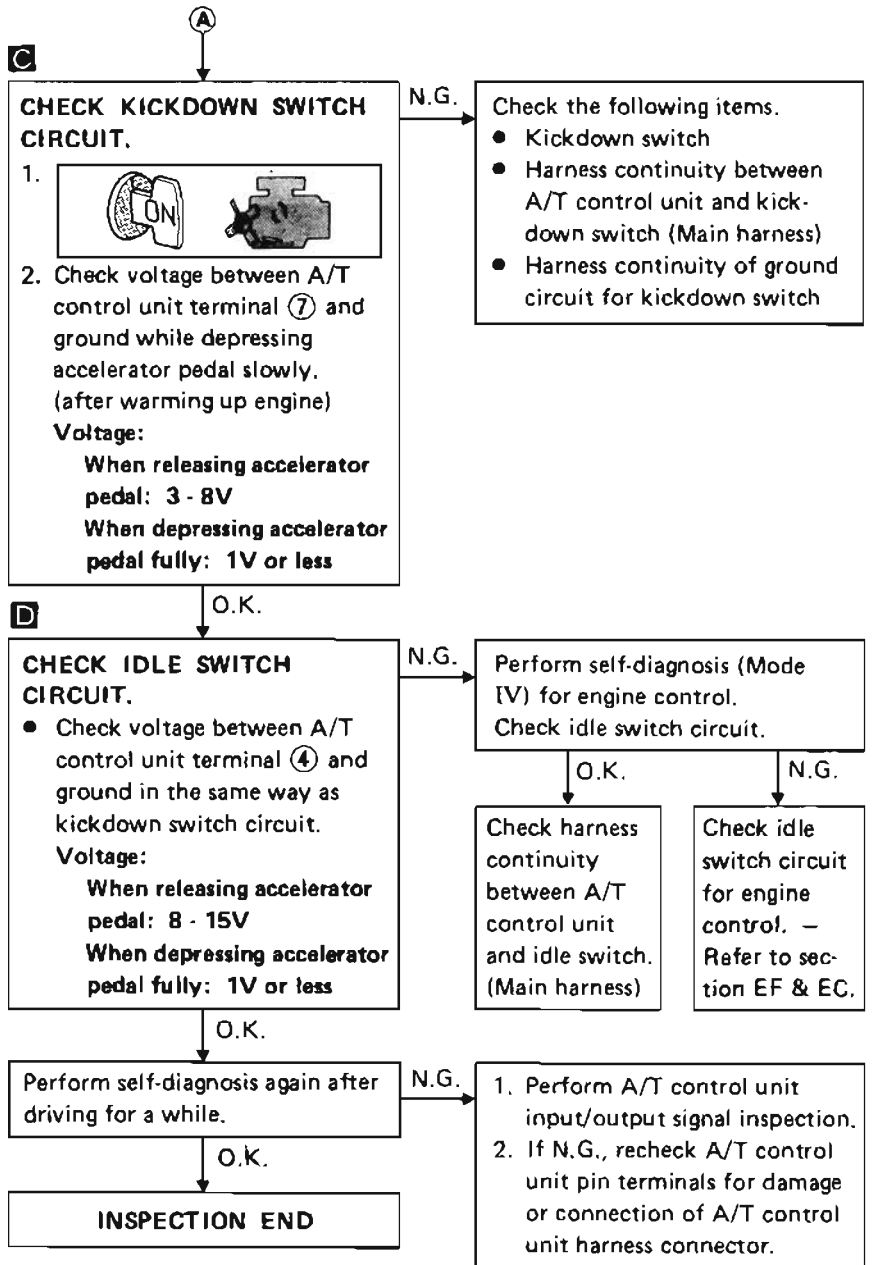
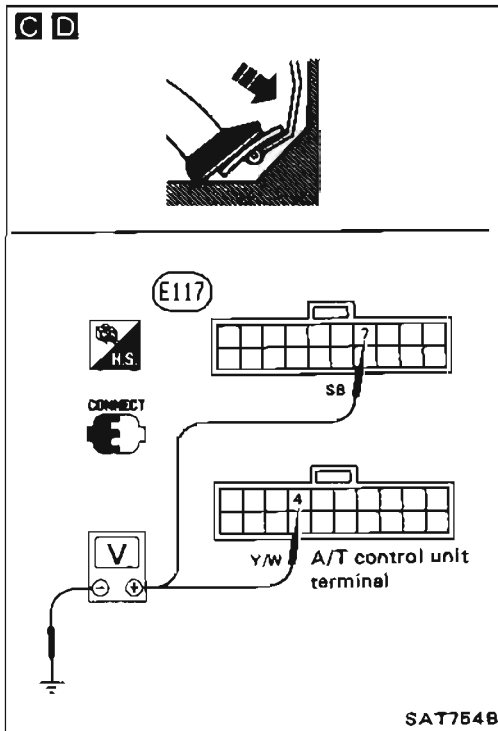


O.K.

A

TROUBLE DIAGNOSES

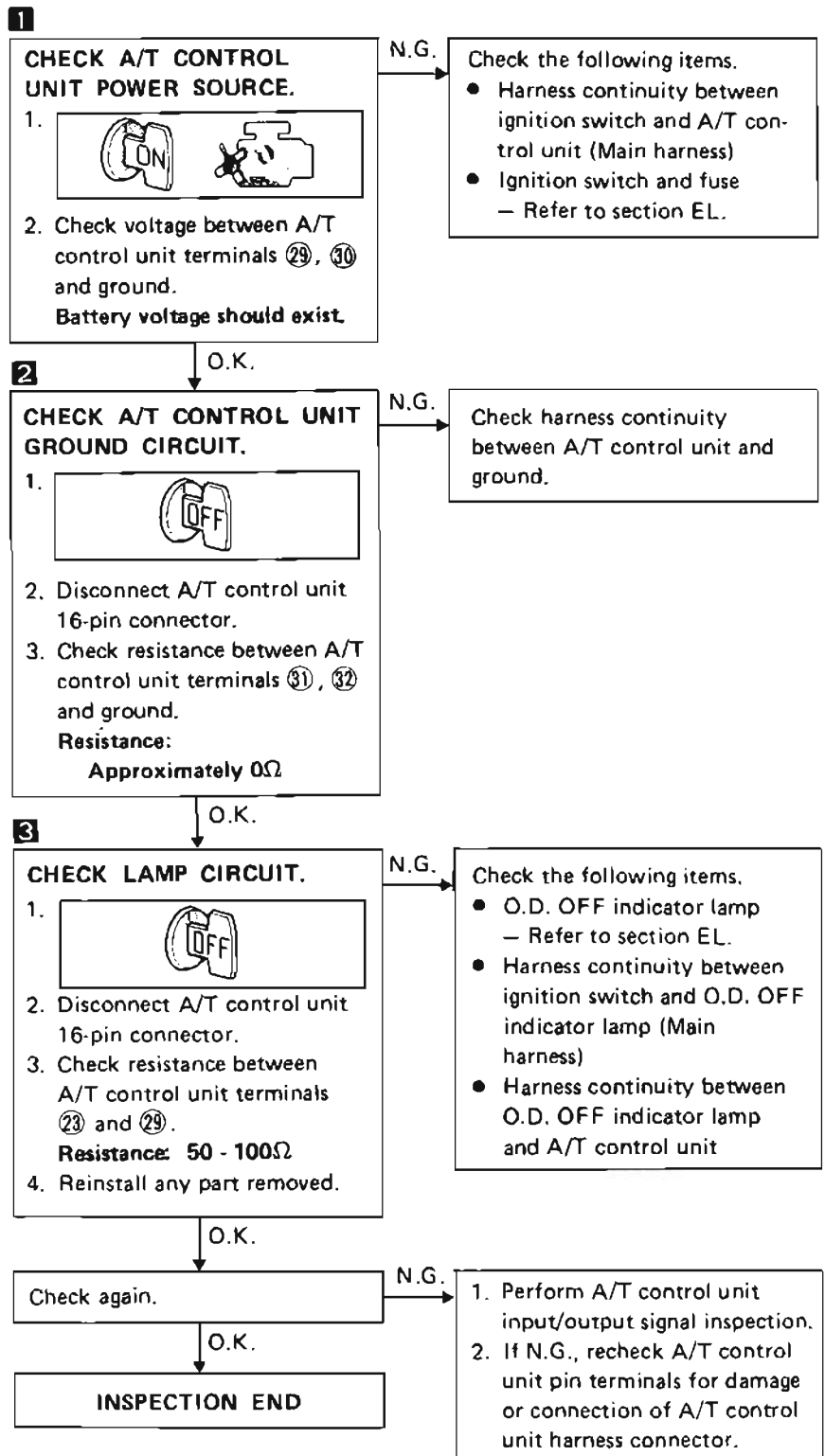
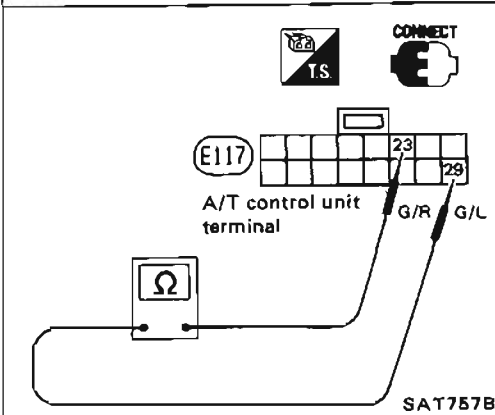
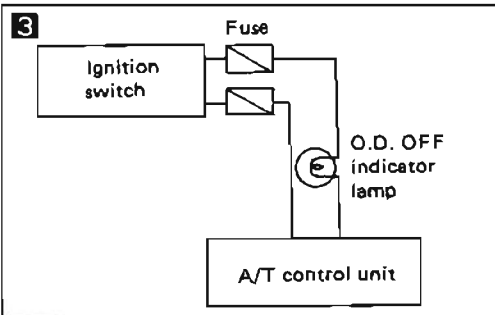
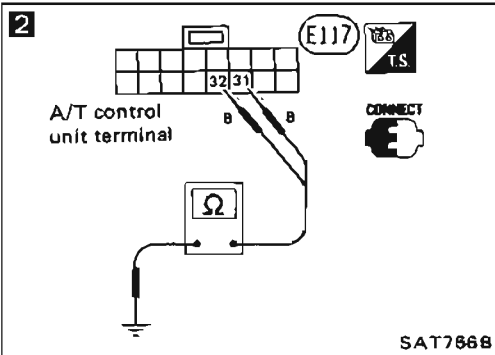
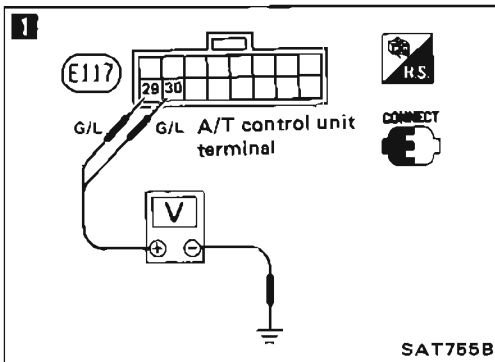
Self-diagnosis (Cont'd)

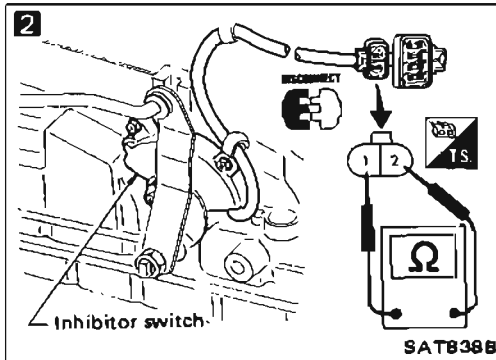
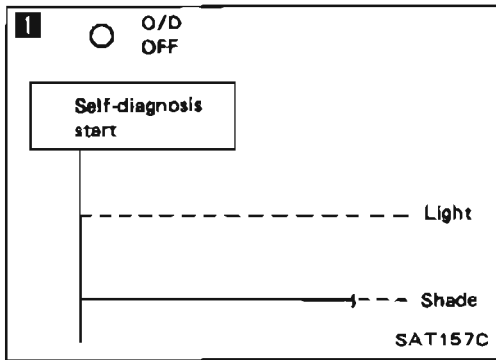


TROUBLE DIAGNOSES

Diagnostic Procedure 1

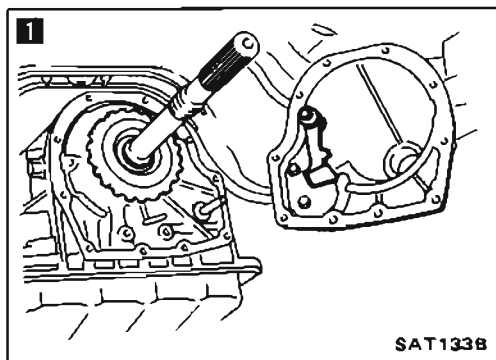
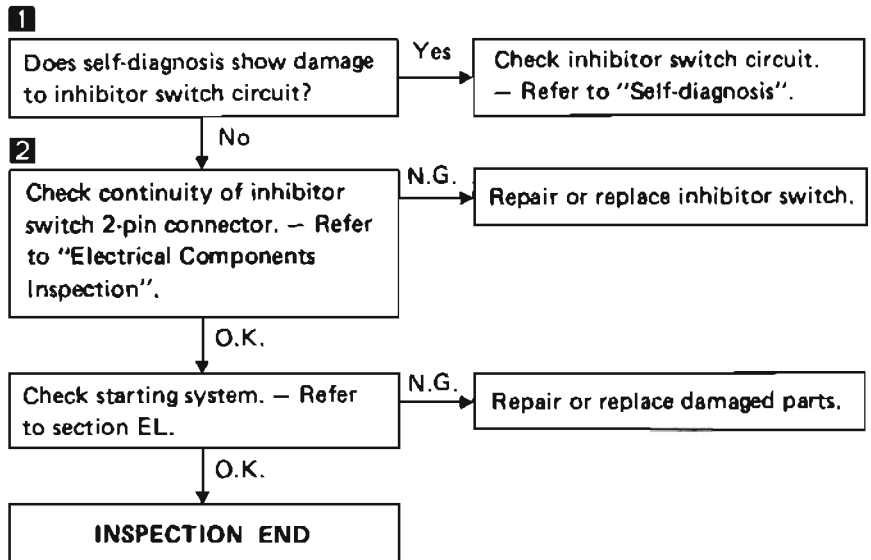
SYMPTOM: O.D. OFF indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".





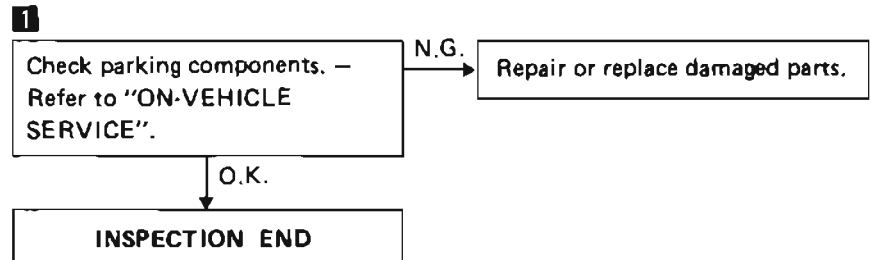
Diagnostic Procedure 2

SYMPTOM: Engine cannot be started with selector lever in "P" or "N" range or engine can be started with selector lever in "D", "2", "1" or "R" range.



Diagnostic Procedure 3

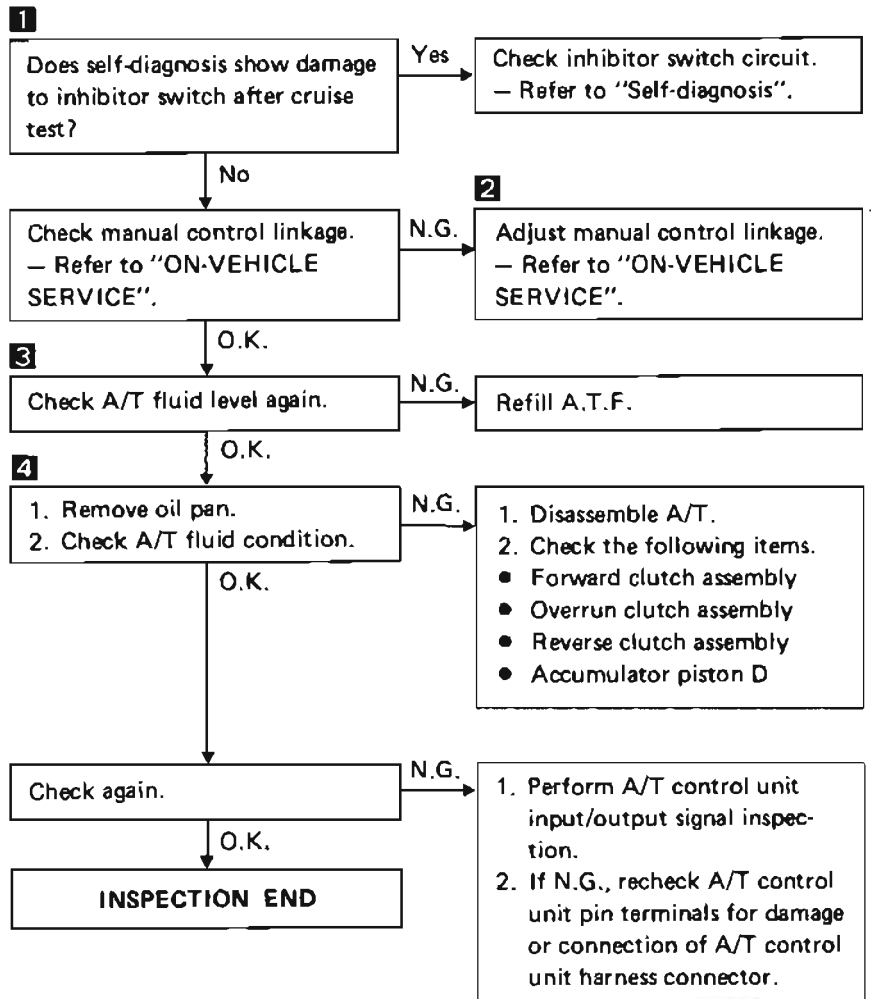
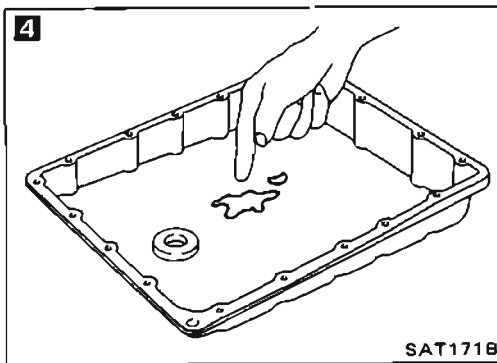
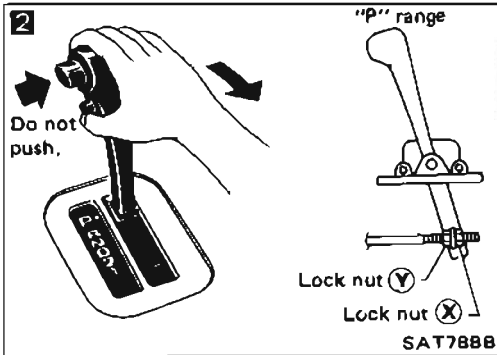
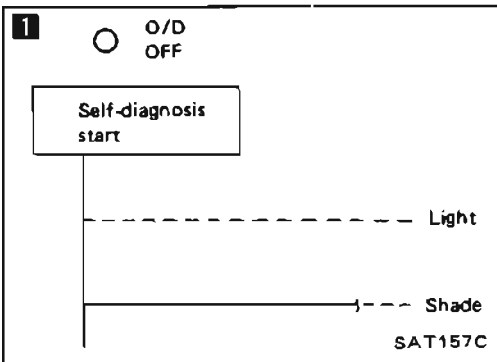
SYMPTOM: Vehicle moves when it is pushed forward or backward with selector lever in "P" range.



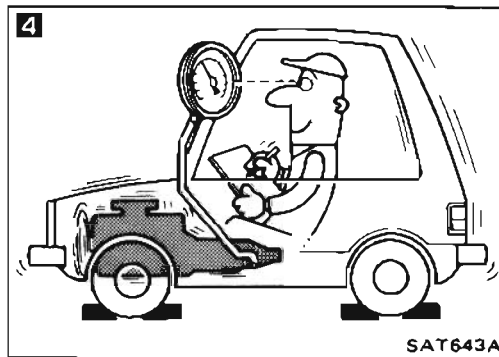
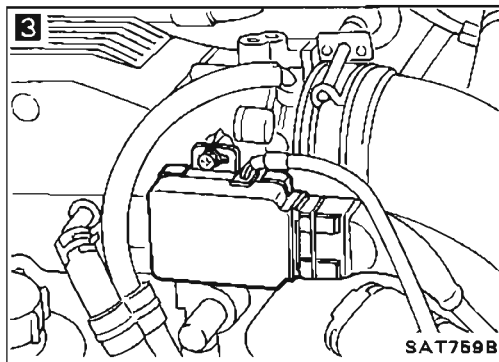
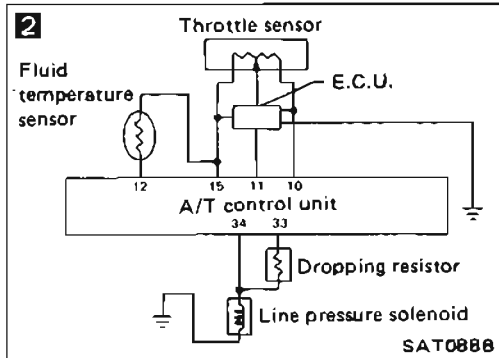
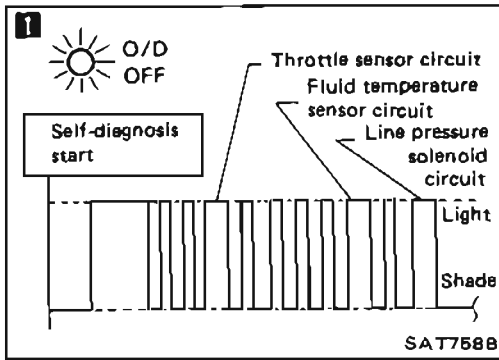
TROUBLE DIAGNOSES

Diagnostic Procedure 4

SYMPTOM: Vehicle moves forward or backward when selecting "N" range.

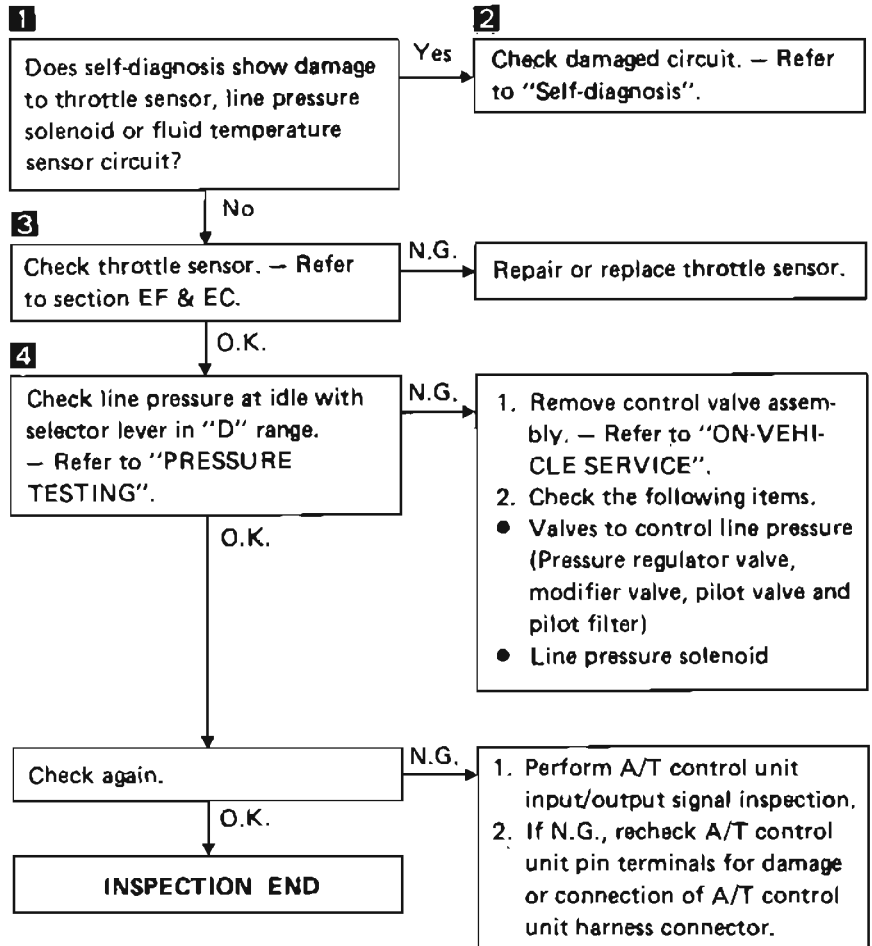


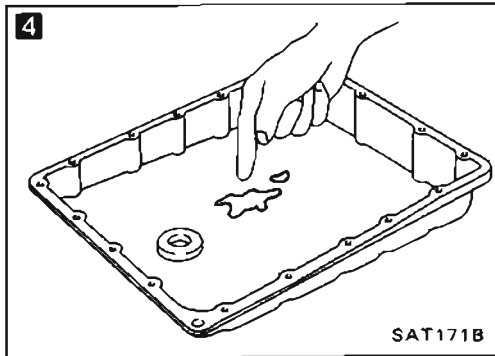
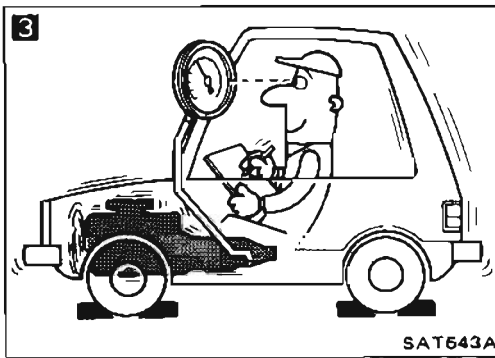
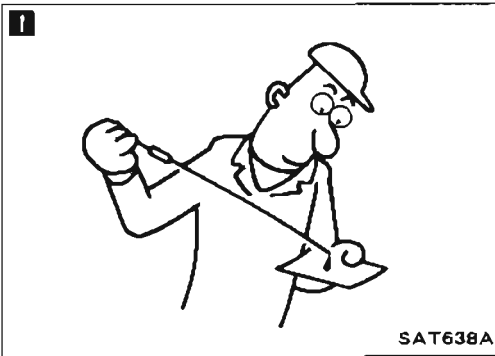
TROUBLE DIAGNOSES



Diagnostic Procedure 5

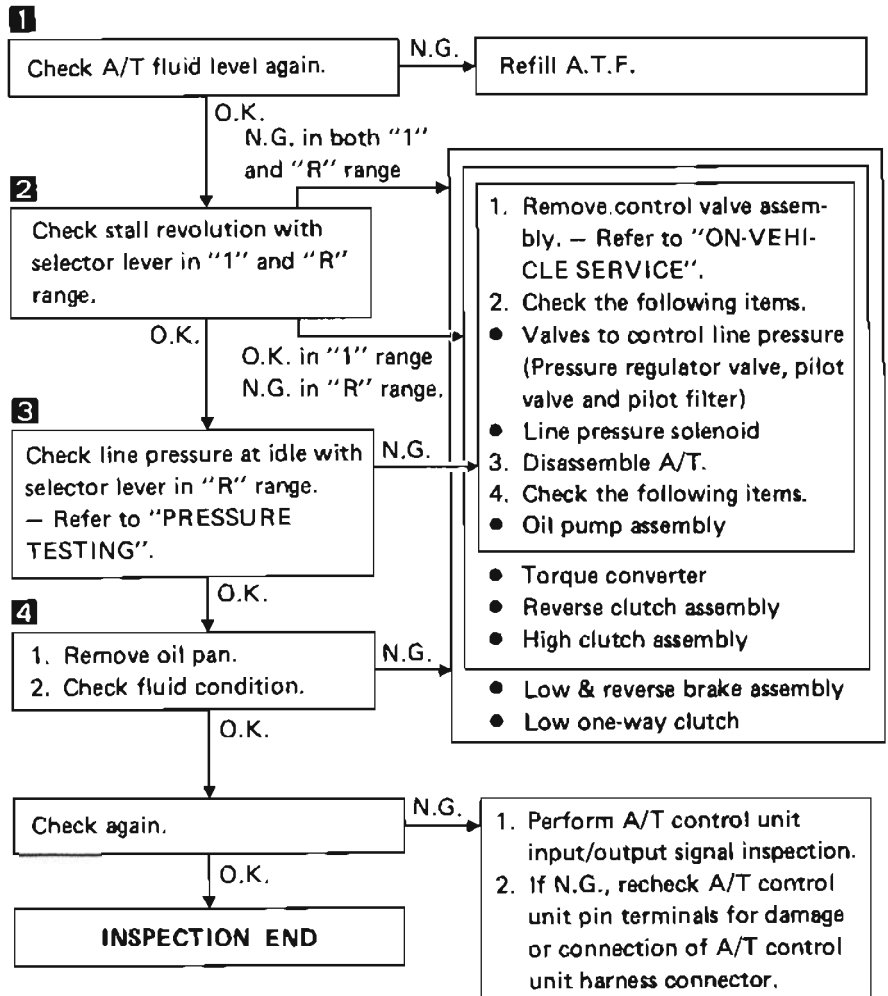
SYMPTOM: There is large shock when changing from "N" to "R" range.

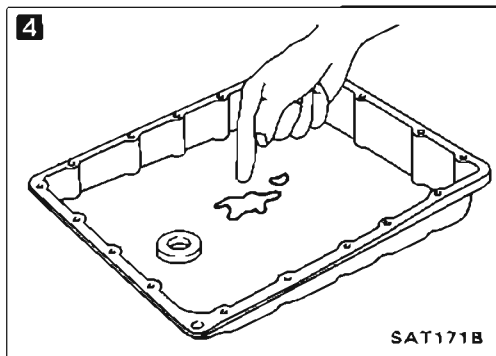
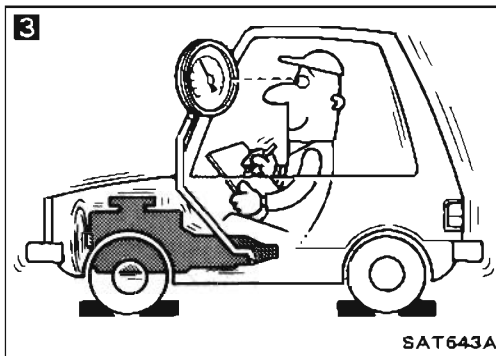
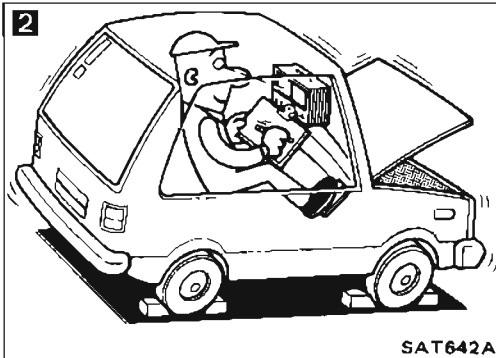
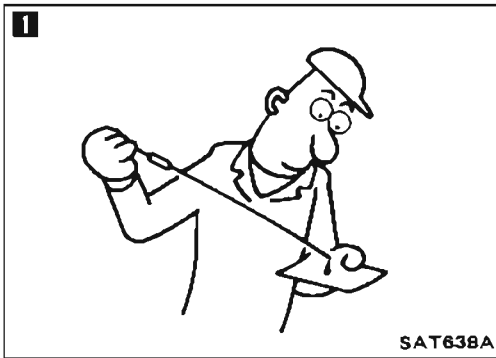




Diagnostic Procedure 6

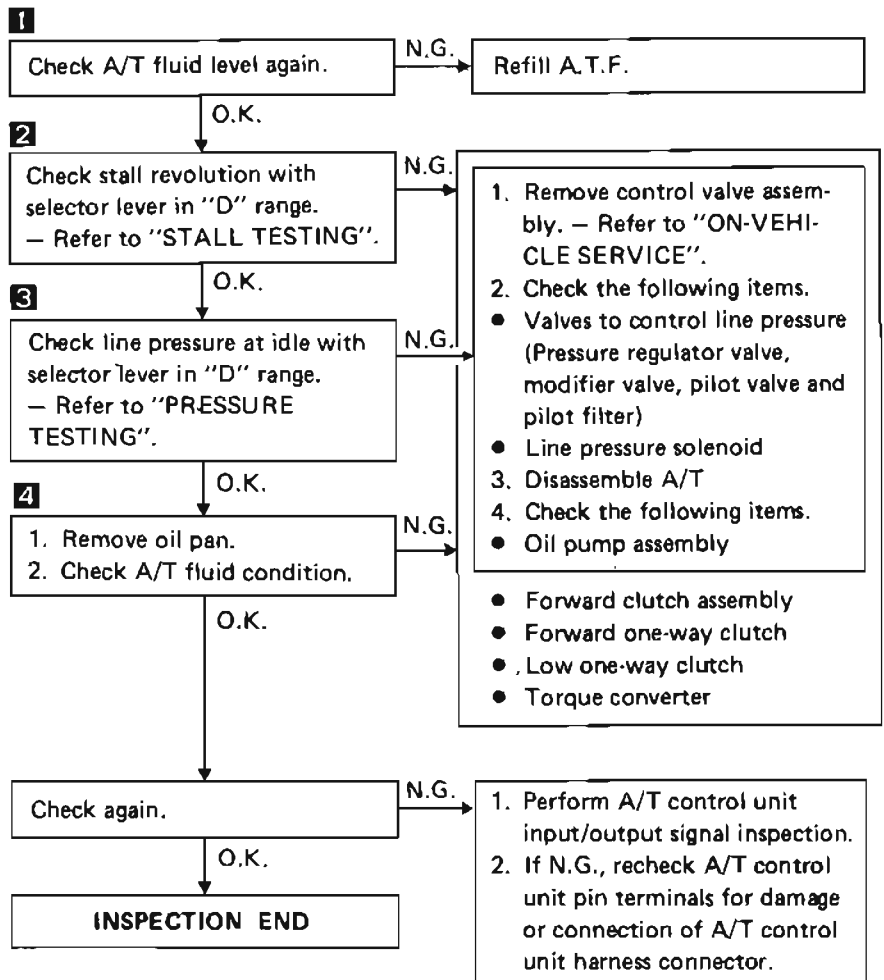
SYMPTOM: Vehicle does not creep backward when selecting "R" range.

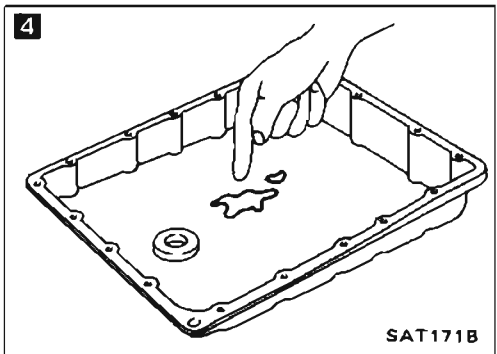
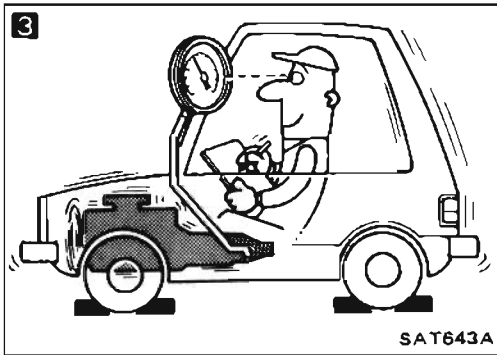
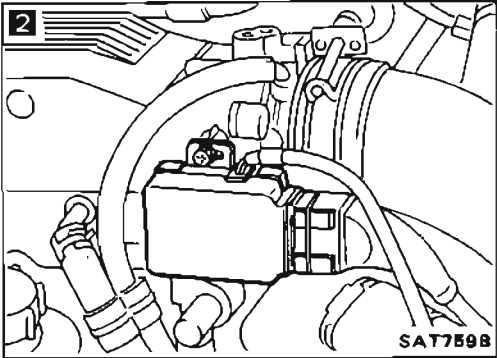
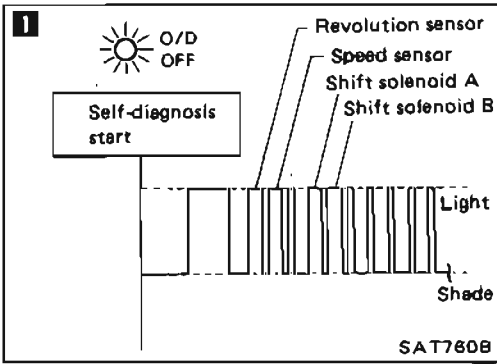




Diagnostic Procedure 7

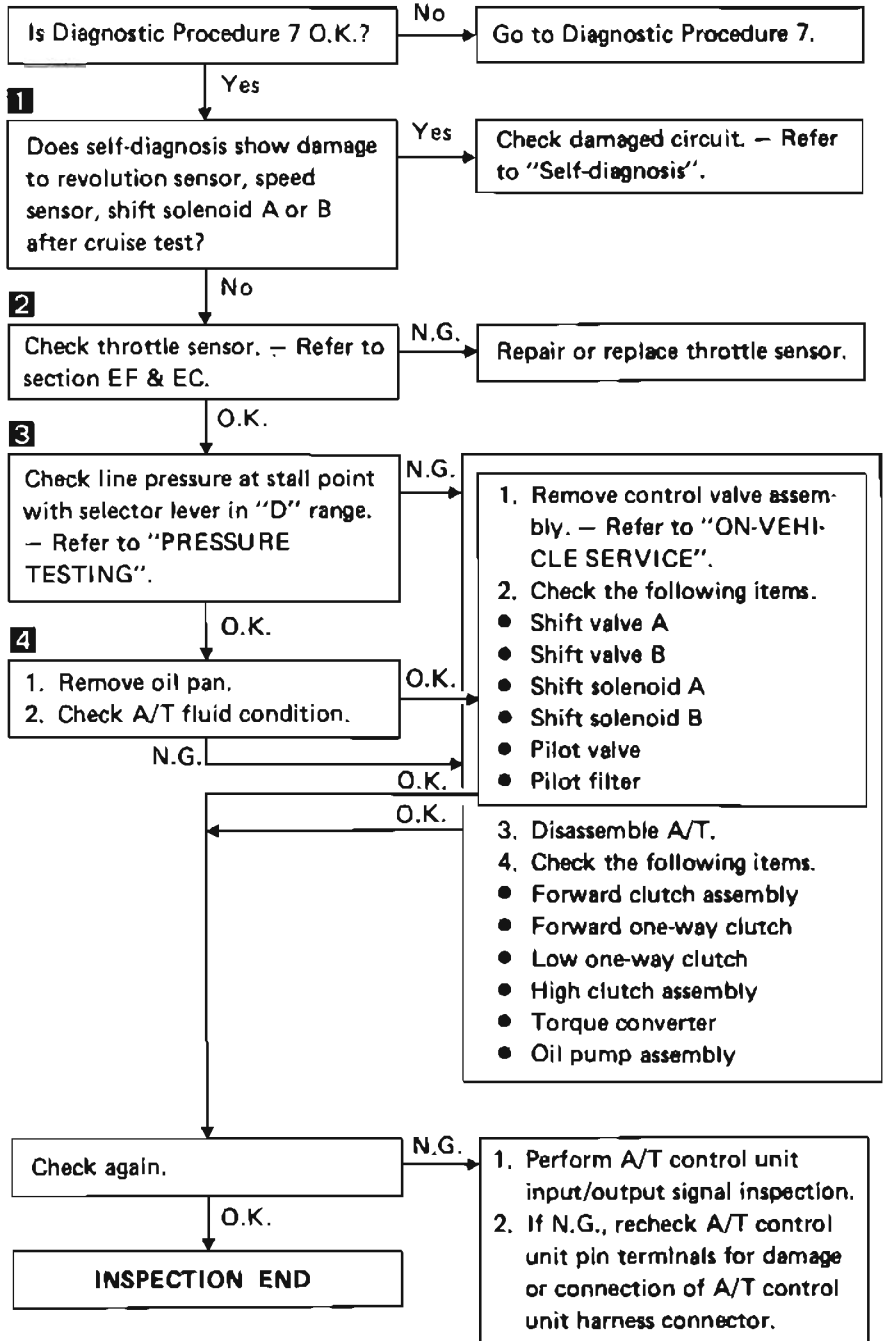
SYMPTOM: Vehicle does not creep forward when selecting "D", "2" and "1" range.



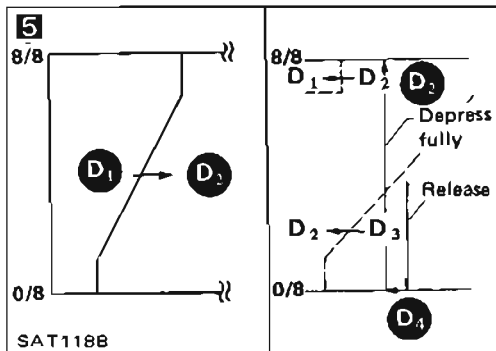
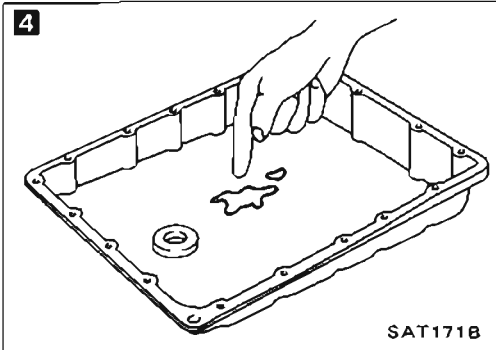
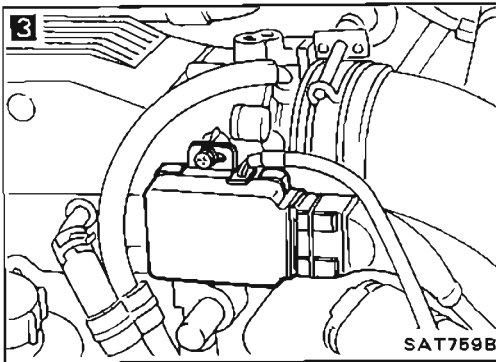
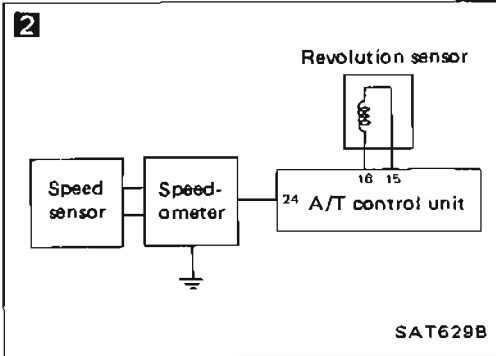
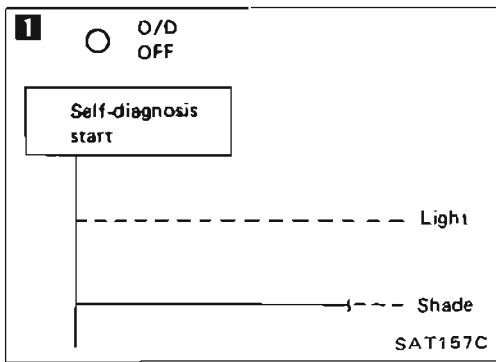


Diagnostic Procedure 8

SYMPTOM: Vehicle cannot be started from D₁ on Cruise test — Part 1.



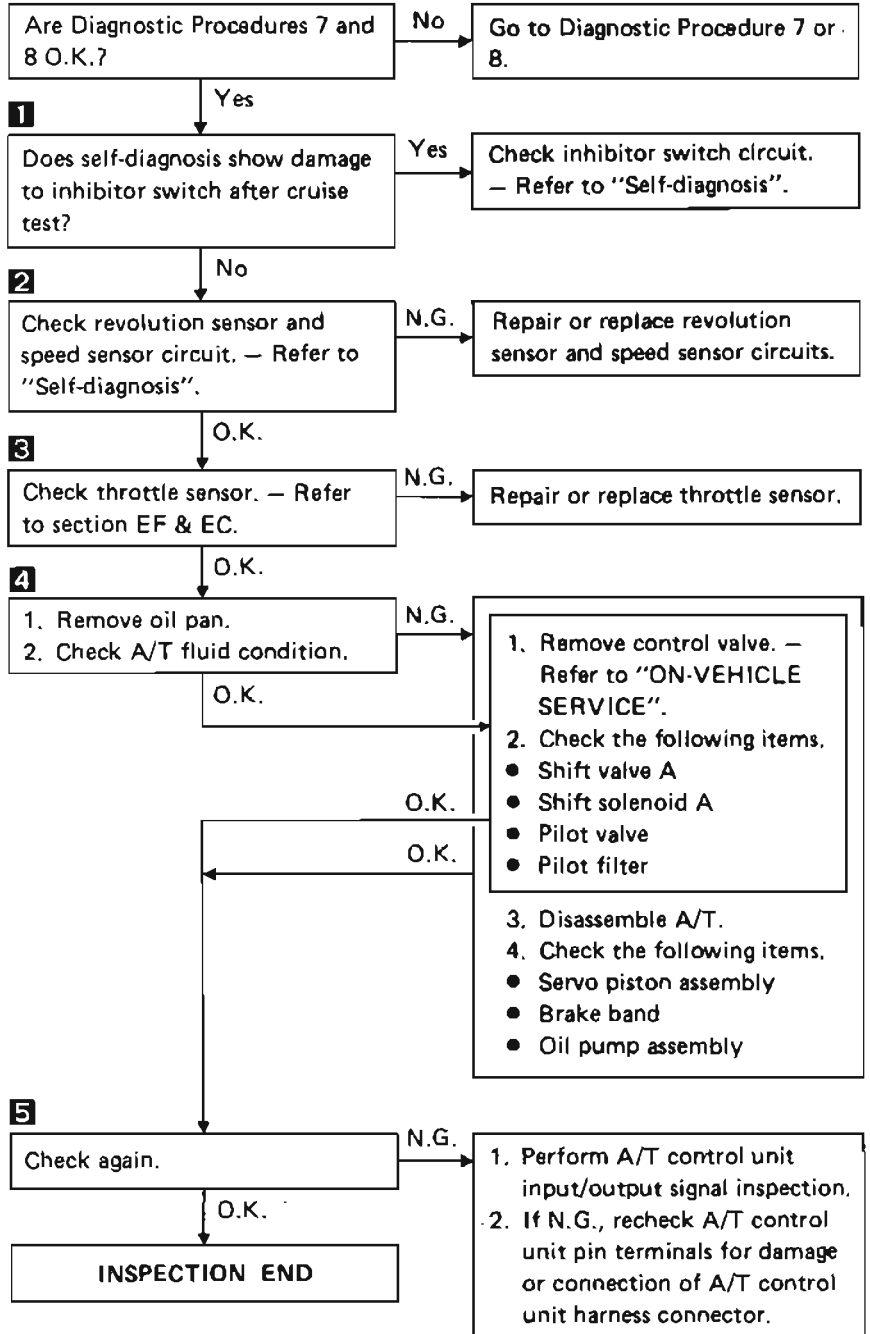
TROUBLE DIAGNOSES

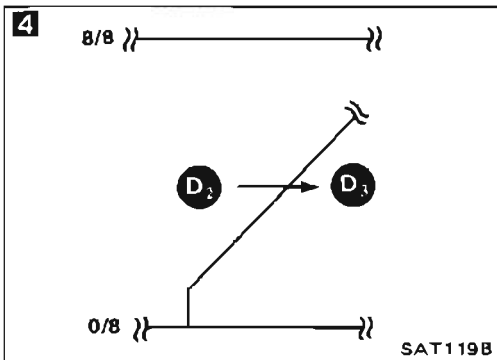
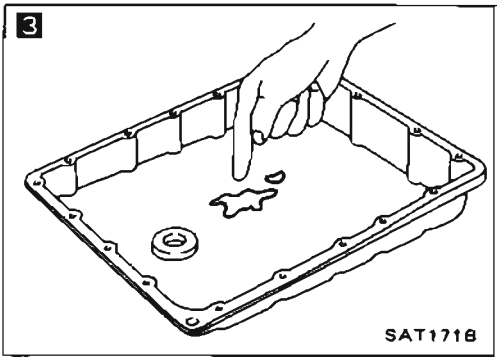
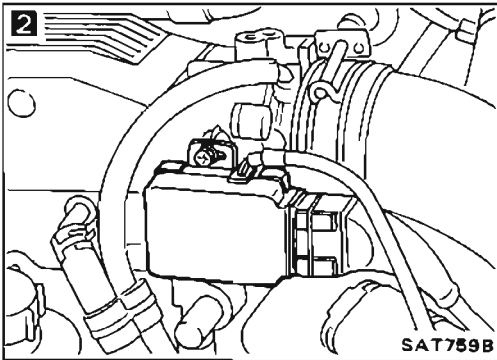
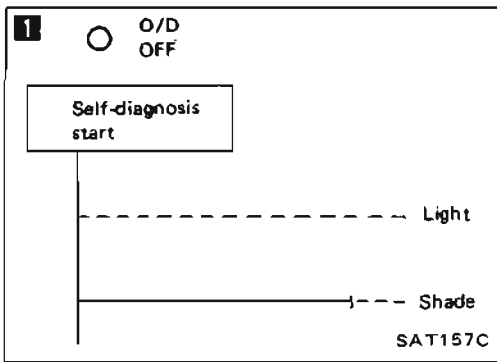


Diagnostic Procedure 9

SYMPTOM: A/T does not shift from D₁ to D₂ at the specified speed.

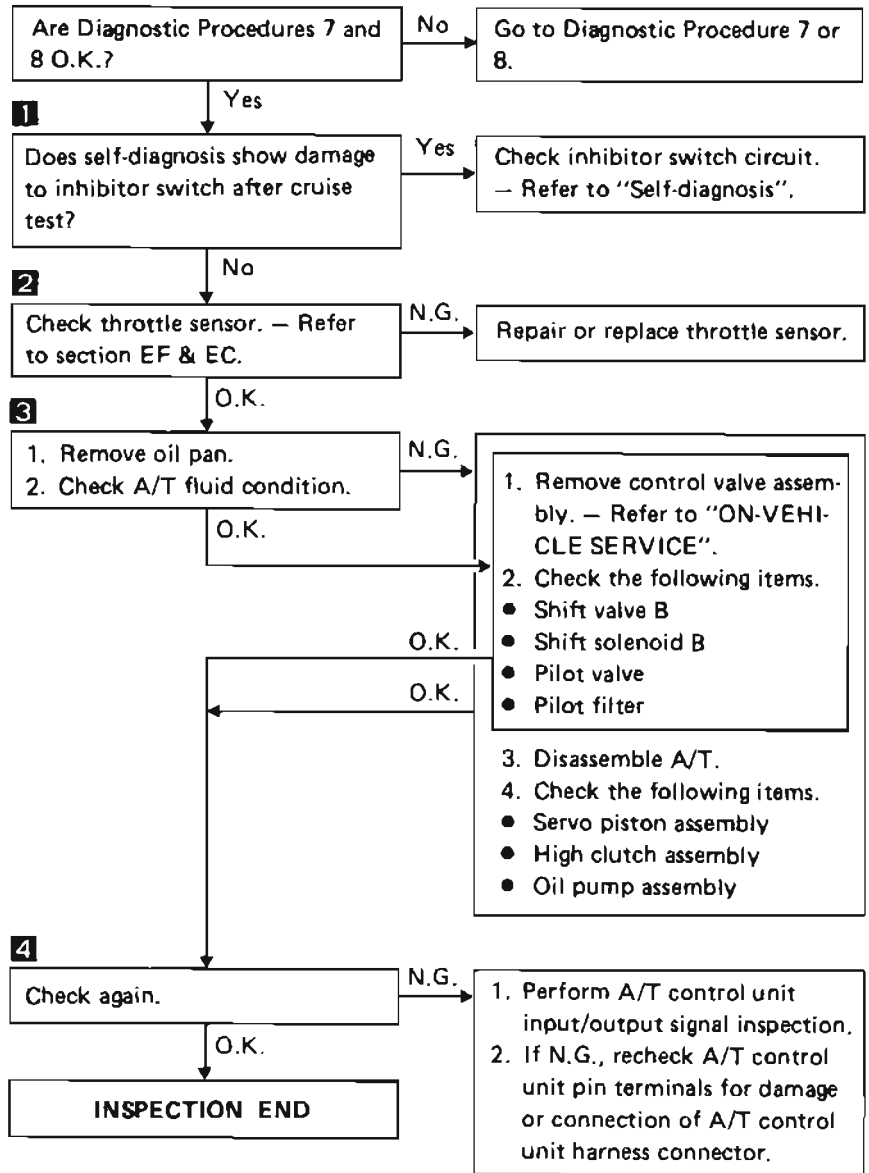
A/T does not shift from D₄ to D₂ when depressing accelerator pedal fully at the specified speed.





Diagnostic Procedure 10

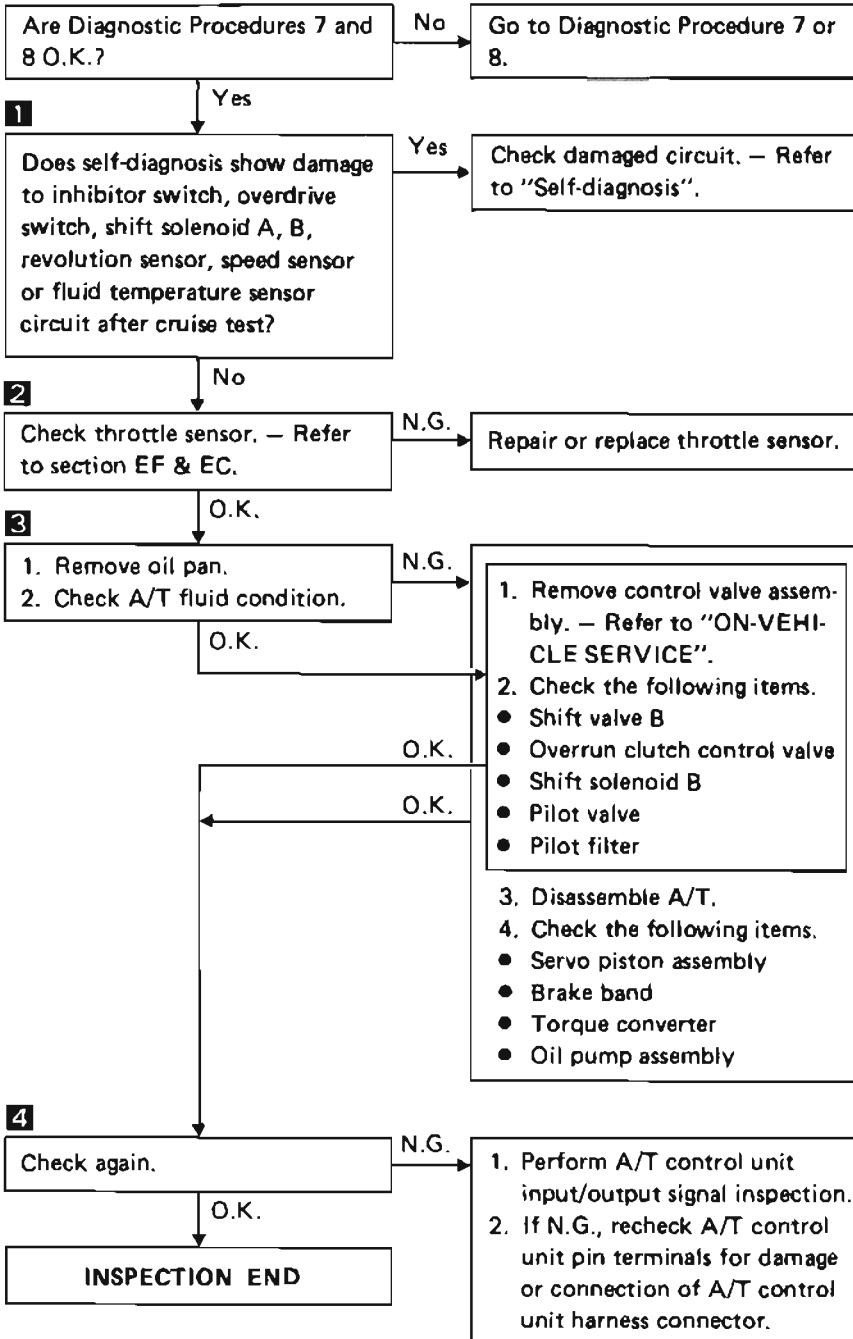
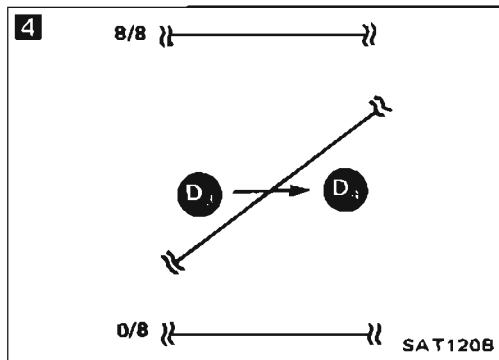
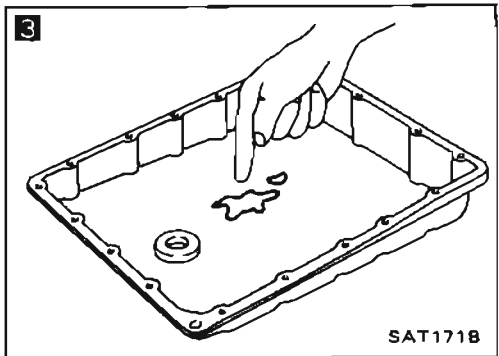
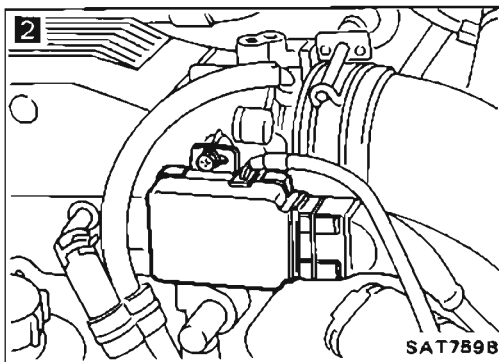
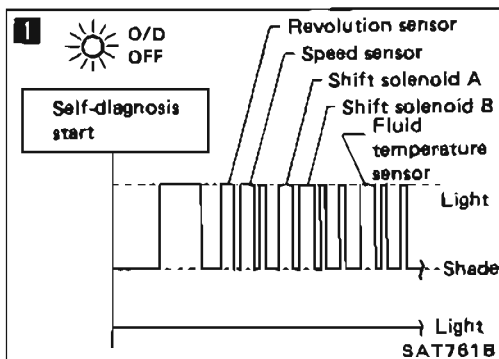
SYMPTOM: A/T does not shift from D₂ to D₃ at the specified speed.



TROUBLE DIAGNOSES

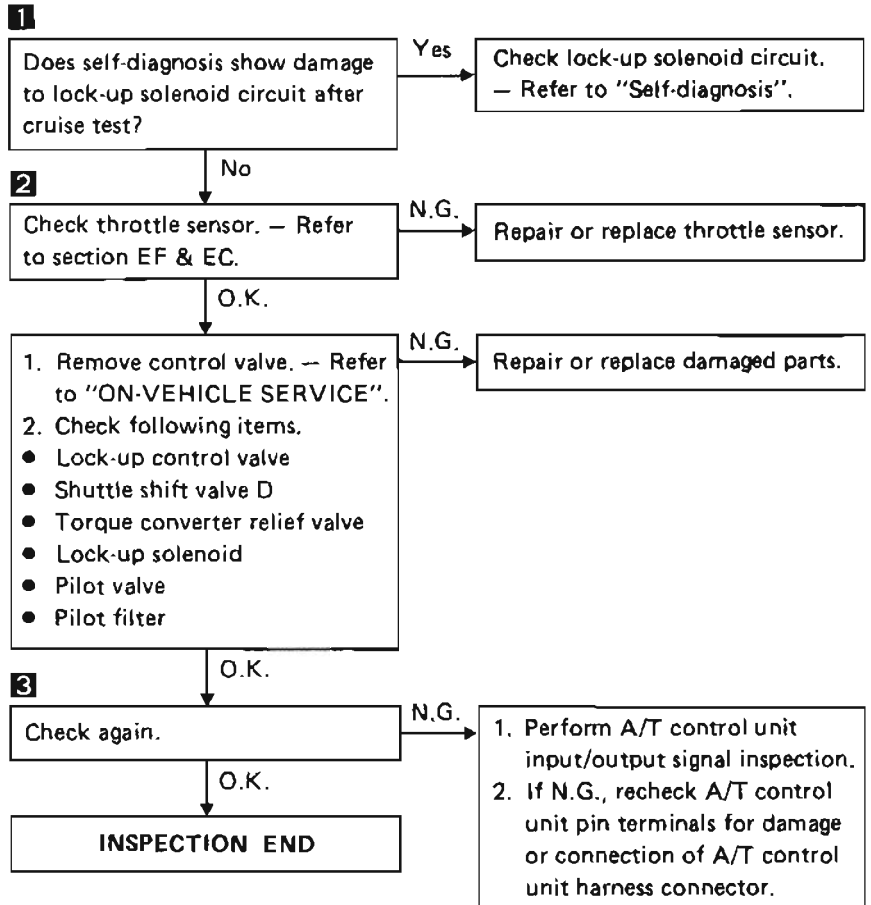
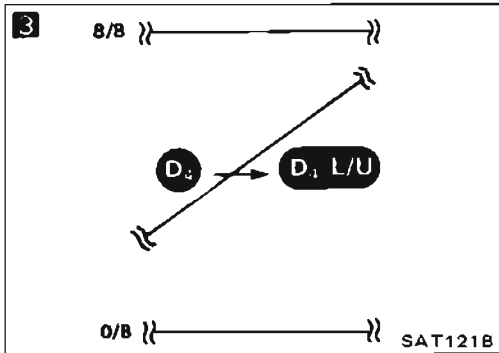
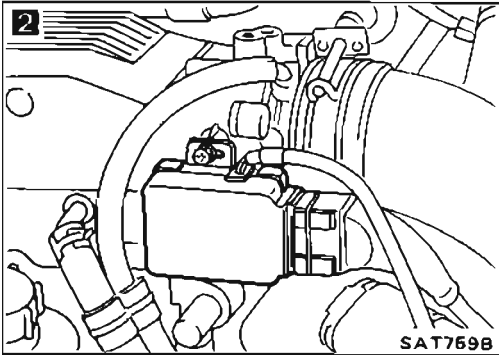
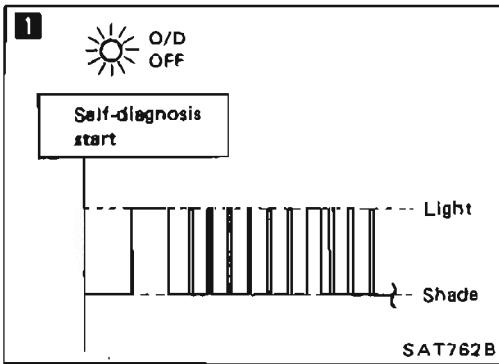
Diagnostic Procedure 11

SYMPTOM: A/T does not shift from D₂ to D₃ at the specified speed.

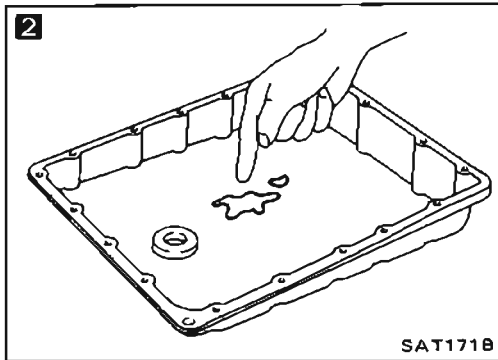
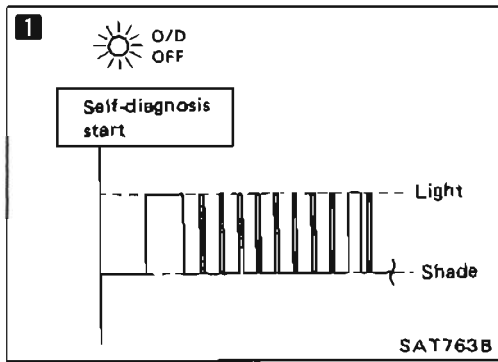


Diagnostic Procedure 12

SYMPTOM: A/T does not perform lock-up at the specified speed.

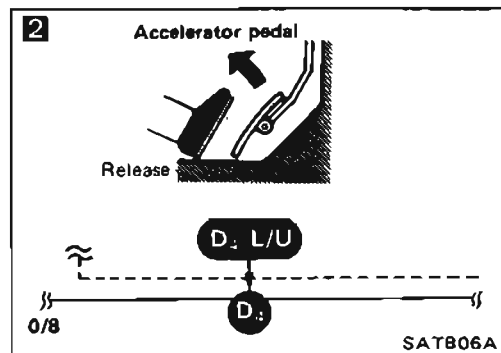
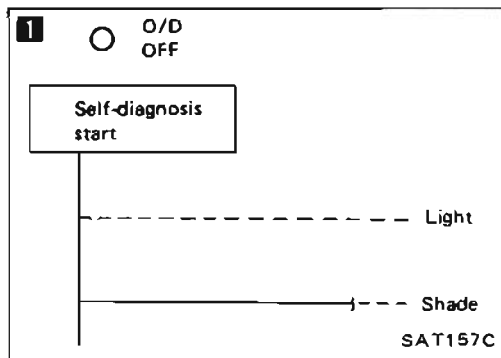
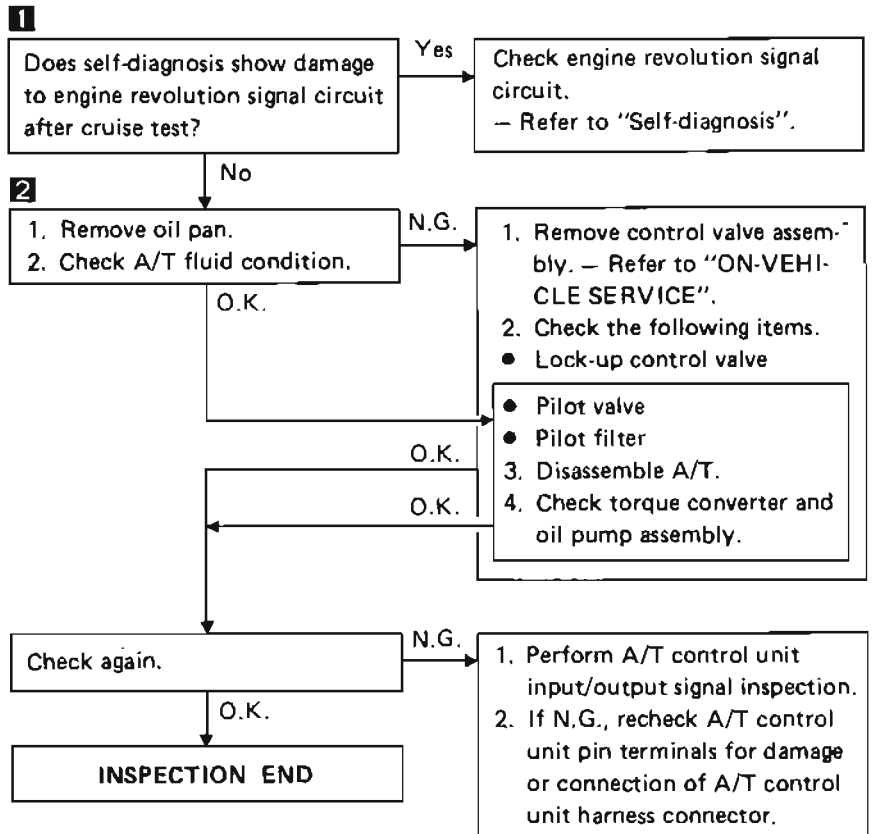


TROUBLE DIAGNOSES



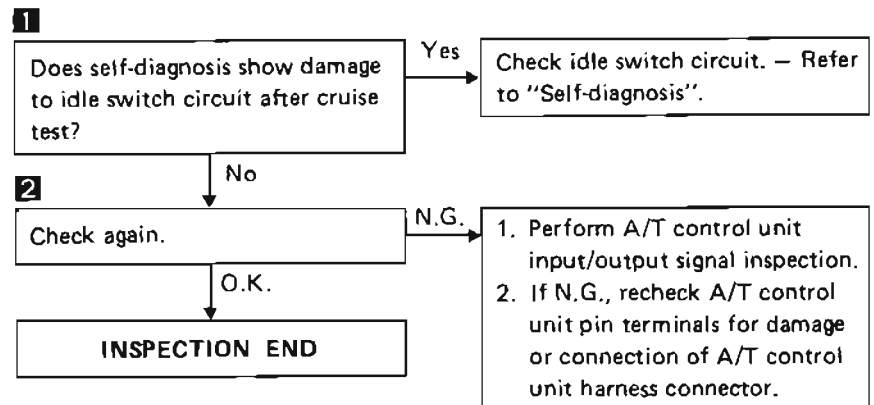
Diagnostic Procedure 13

SYMPTOM: A/T does not hold lock-up condition for more than 30 seconds.

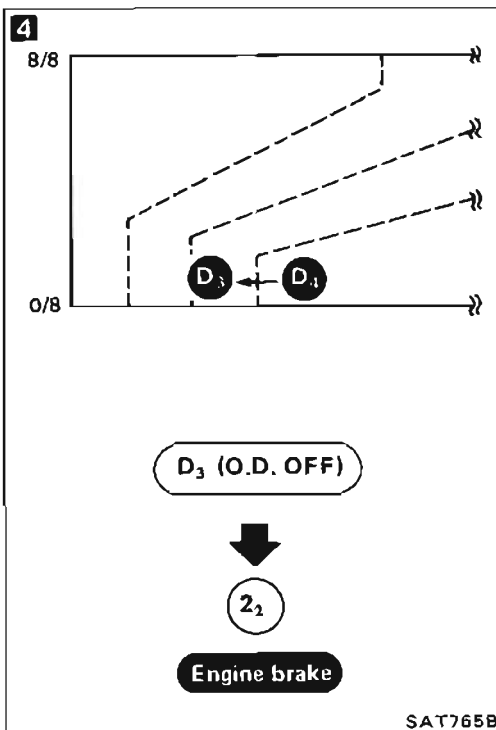
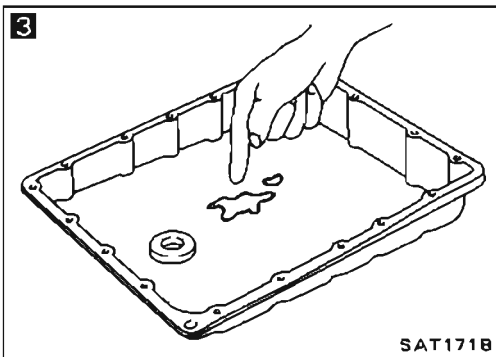
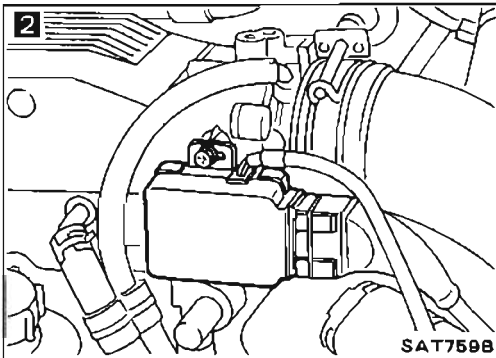
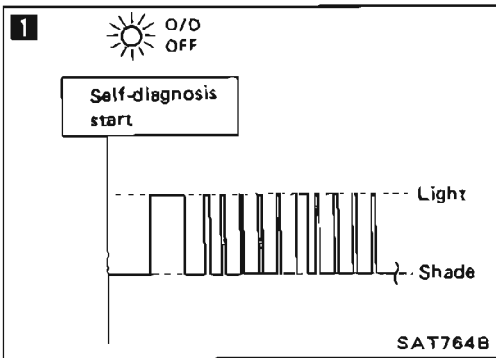


Diagnostic Procedure 14

SYMPTOM: Lock-up is not released when accelerator pedal is released.

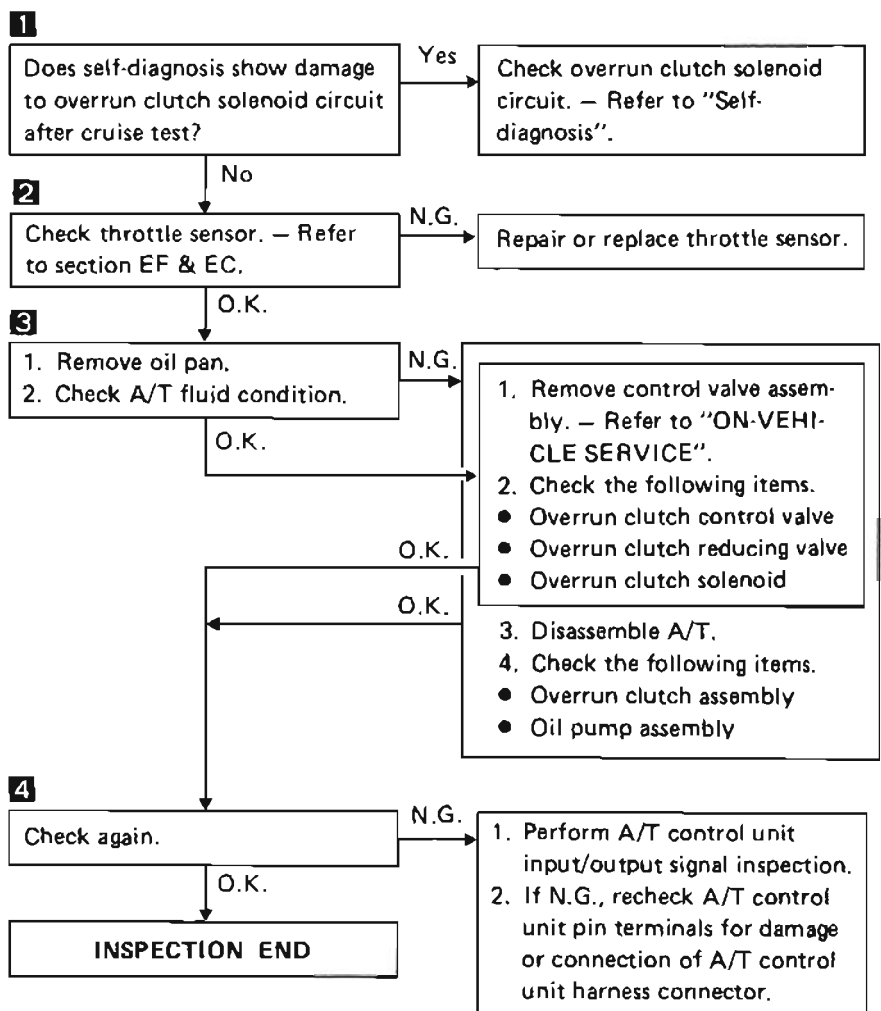


TROUBLE DIAGNOSES

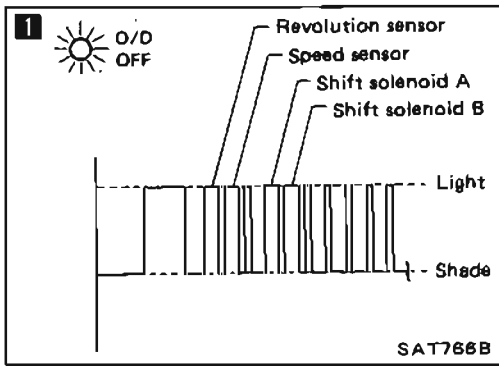


Diagnostic Procedure 15

SYMPTOM: Engine speed does not return to idle smoothly when A/T is shifted from D₃ to D₂ with accelerator pedal released. Vehicle does not decelerate by engine brake when changing overdrive switch to "OFF" position with accelerator pedal released. Vehicle does not decelerate by engine brake when changing selector lever from "D" to "2" range with accelerator pedal released.

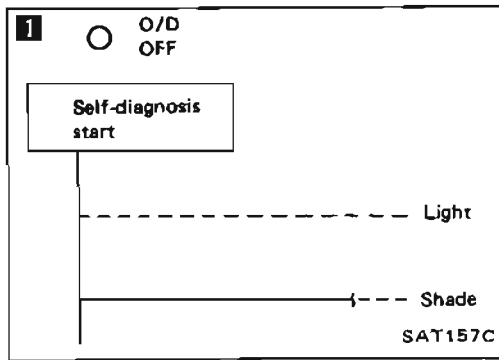
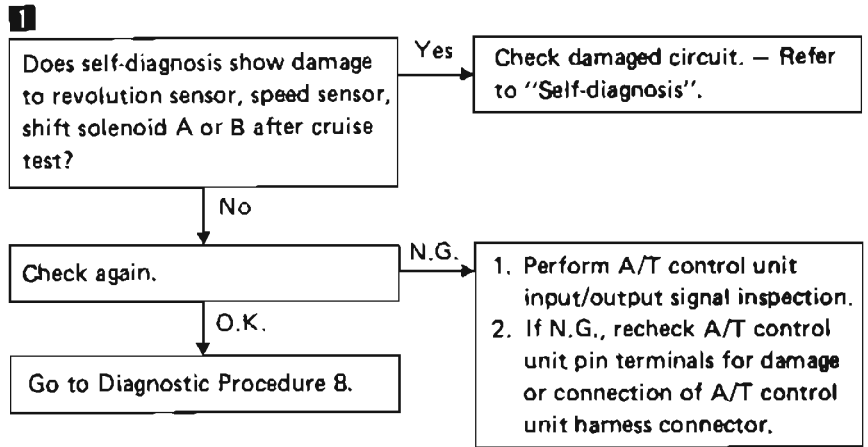


TROUBLE DIAGNOSES



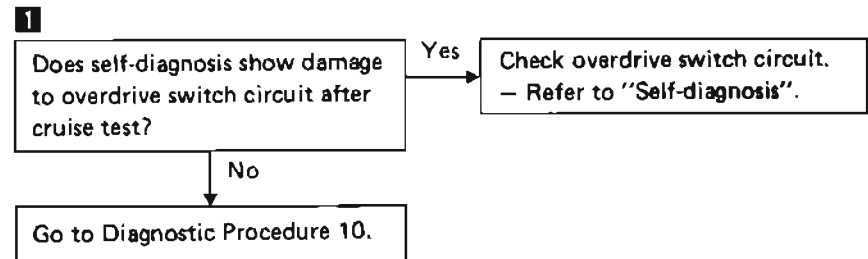
Diagnostic Procedure 16

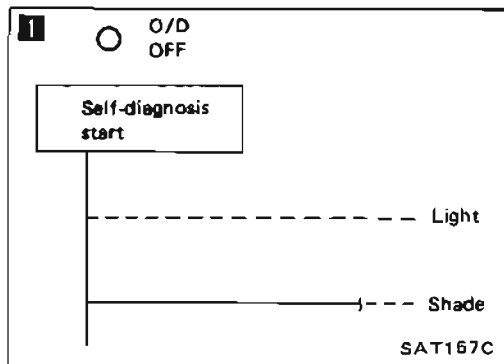
SYMPTOM: Vehicle does not start from D₁ on Cruise test — Part 2.



Diagnostic Procedure 17

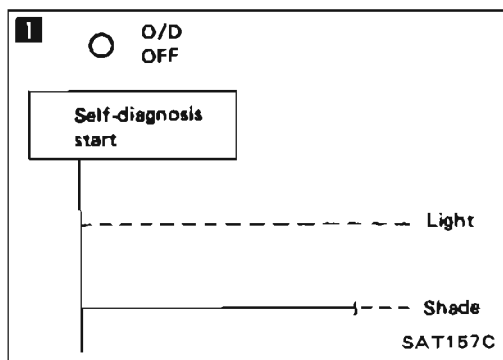
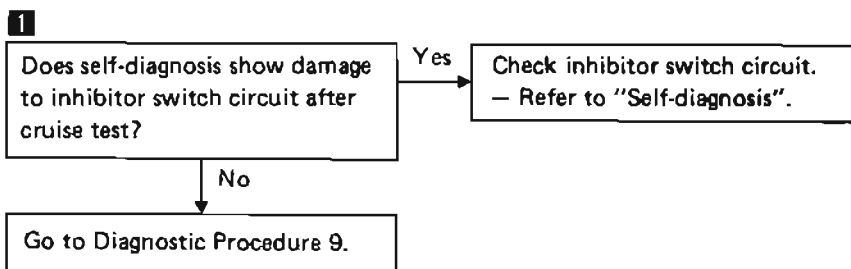
SYMPTOM: A/T does not shift from D₁ to D₂ when changing overdrive switch to "OFF" position.





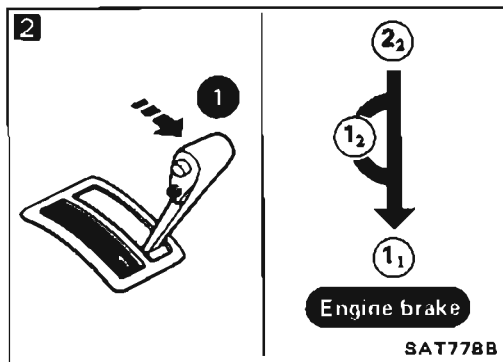
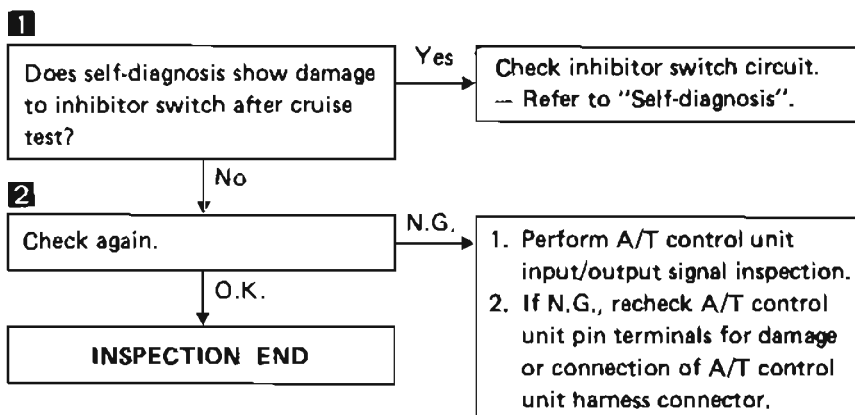
Diagnostic Procedure 18

SYMPTOM: A/T does not shift from D_3 to 2_2 when changing selector lever from "D" to "2" range.



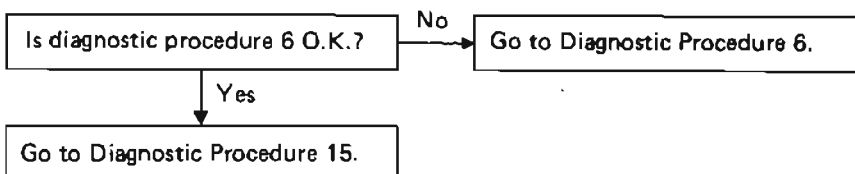
Diagnostic Procedure 19

SYMPTOM: A/T does not shift from 2_2 to 1_1 , when changing selector lever from "2" to "1" range.

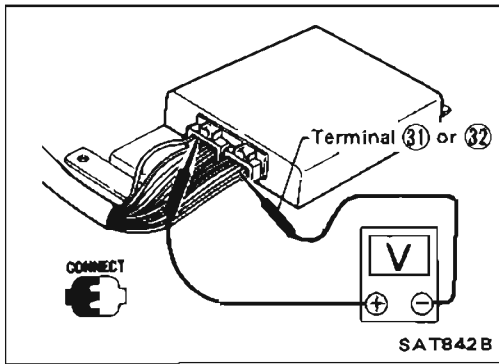


Diagnostic Procedure 20

SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 2_2 (1_2) to 1_1 .



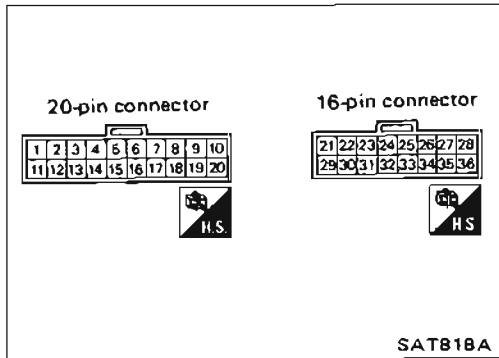
TROUBLE DIAGNOSES



Electrical Components Inspection

INSPECTION OF A/T CONTROL UNIT

- Measure voltage between each terminal and terminal ① or ② by following "A/T CONTROL UNIT INSPECTION TABLE".



- Pin connector terminal layout.






A/T CONTROL UNIT INSPECTION TABLE

(Data are reference values.)

| Terminal No. | Item | Condition | Judgement standard |
|--------------|--|--|--------------------|
| 1 | Inhibitor "2" range switch | When setting selector lever to "D" range. | Battery voltage |
| | | When setting selector lever to other ranges. | 1V or less |
| 2 | Inhibitor "1" range switch | When setting selector lever to "1" range. | Battery voltage |
| | | When setting selector lever to other ranges. | 1V or less |
| 3 | — | — | — |
| 4 | Idle switch (in throttle valve switch) | When releasing accelerator pedal after warming up engine. | 8 - 15V |
| | | When depressing accelerator pedal after warming up engine. | 1V or less |
| 5 | — | — | — |
| 6 | A.S.C.D. O.D. cut signal | When releasing "ACCEL" set switch on A.S.C.D. cruise. | 5 - 8V |
| | | When applying "ACCEL" set switch on A.S.C.D. cruise. | 1V or less |






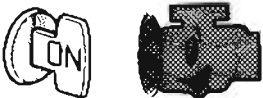

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

| Terminal No. | Item | Condition | Judgement standard | |
|--------------|---|---|---|--|
| 7 | Kickdown switch |  | When releasing accelerator pedal after warming up engine. | 3 - 8V |
| | | | When depressing accelerator pedal fully after warming up engine. | 1V or less |
| 8 | A.S.C.D. cruise signal |  | When performing A.S.C.D. cruise. ("CRUISE" light comes on.) | Battery voltage |
| | | | When not performing A.S.C.D. cruise. ("CRUISE" light does not come on.) | 1V or less |
| 9 | Overdrive switch | | When setting overdrive switch in "ON" position. | Battery voltage |
| | | | When setting overdrive switch in "OFF" position. | 1V or less |
| 10 | Throttle sensor (Power source) |  | - | 4.5 - 5.5V |
| 11 | Throttle sensor |  | When depressing accelerator pedal slowly after warming up engine. | Fully-closed throttle: 0.2 - 0.6V |
| | | | Voltage rises gradually in response to throttle opening angle. | Fully-open throttle: 2.9 - 3.9V |
| 12 | Fluid temperature sensor | | When A.T.F. temperature is 20°C (68°F). | 1.56V |
| | | | When A.T.F. temperature is 80°C (176°F). | 0.45V |
| 13 | - | | - | - |
| 14 | - | | - | - |
| 15 | Throttle sensor (Ground) | | - | - |
| 16 | Revolution sensor (Measure in AC range) |  | When vehicle cruises at 30 km/h (19 MPH). | (1V or more Voltage rises gradually in response to vehicle speed.) |
| | | | When vehicle parks. | 0V |

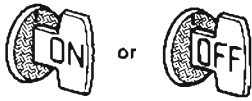





TROUBLE DIAGNOSES

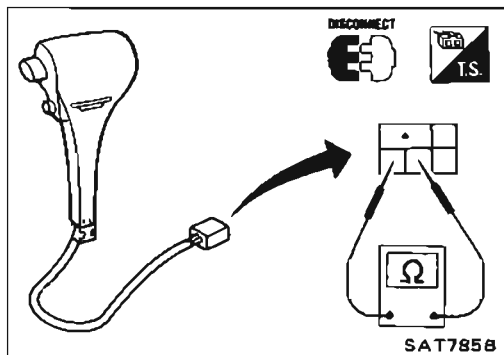
Electrical Components Inspection (Cont'd)

| Terminal No. | Item | Condition | Judgement standard | |
|--------------|------------------------------------|---|---|-------------------|
| 17 | Full throttle switch |  | When depressing accelerator pedal more than half-way after warming up engine. | 8 - 15V |
| | | | When releasing accelerator pedal after warming up engine. | 1V or less |
| 18 | — | — | — | |
| 19 | Inhibitor "N" and "P" range switch |  | When setting selector lever to "N" or "P" range. | Battery voltage |
| | | | When setting selector lever to other ranges. | 1V or less |
| 20 | Inhibitor "D" range switch | | When setting selector lever to "2" range. | Battery voltage |
| | | | When setting selector lever to other ranges. | 1V or less |
| 21 | Overrun clutch solenoid |  | When overrun clutch solenoid operates. | Battery voltage |
| | | | When overrun clutch solenoid does not operate. | 1V or less |
| 22 | Lock-up solenoid | | When A/T performs lock-up. | 8 - 15V |
| | | | When A/T does not perform lock-up. | 1V or less |
| 23 | O.D. OFF indicator lamp |  | When setting overdrive switch to "ON" position. | Battery voltage |
| | | | When setting overdrive switch to "OFF" position. | 1V or less |
| 24 | Speed sensor |  | When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more. | Vary from 0 to 5V |
| 25 | Engine revolution signal |  | When engine runs at idle speed. | 9.5 - 12V |
| | | | When engine runs at 2,500 rpm. | Approximately 10V |
| 26 | Inhibitor "R" range switch |  | When setting selector lever to "R" range. | Battery voltage |
| | | | When setting selector lever to other ranges. | 1V or less |
| 27 | — | — | — | |

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

| Terminal No. | Item | Condition | Judgement standard | |
|--------------|---|--|---|-----------------|
| 28 | Power source (Back-up) |  or | When turning ignition switch to "OFF". | Battery voltage |
| | | | When turning ignition switch to "ON". | Battery voltage |
| 29 30 | Power source |  | When turning ignition switch to "ON". | Battery voltage |
| | | | When turning ignition switch to "OFF". | 1V or less |
| 31 32 | Ground | — | — | |
| 33 | Line pressure solenoid (with dropping resistor) |  | When releasing accelerator pedal after warming up engine. | 5 - 14V |
| | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 34 | Line pressure solenoid |  | When releasing accelerator pedal after warming up engine. | 1.5 - 2.5V |
| | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 35 | Shift solenoid A |  | When shift solenoid A operates. (When driving in "D ₁ " or "D ₄ ".) | Battery voltage |
| | | | When shift solenoid A does not operate. (When driving in "D ₂ " or "D ₃ ".) | 1V or less |
| 36 | Shift solenoid B |  | When shift solenoid B operates. (When driving in "D ₁ " or "D ₂ ".) | Battery voltage |
| | | | When shift solenoid B does not operate. (When driving in "D ₃ " or "D ₄ ".) | 1V or less |



OVERDRIVE SWITCH

- Check continuity between two terminals.

| O.D. switch position | Continuity |
|----------------------|------------|
| ON | No |
| OFF | Yes |

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

INHIBITOR SWITCH

1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each range.

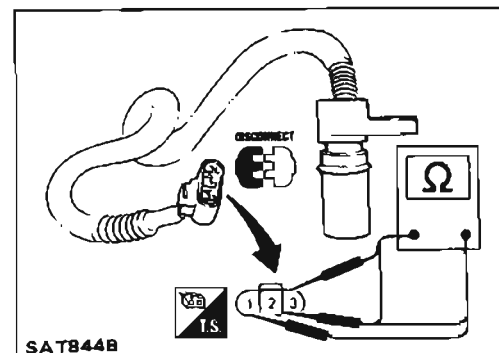
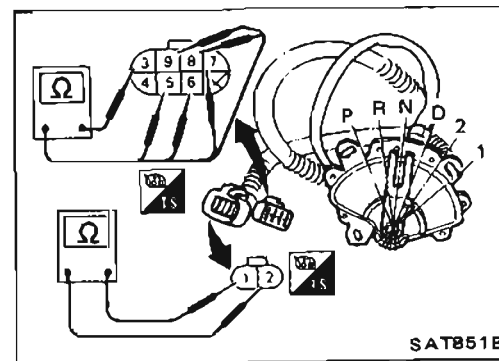
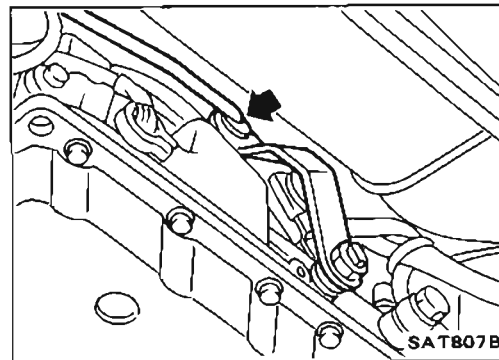
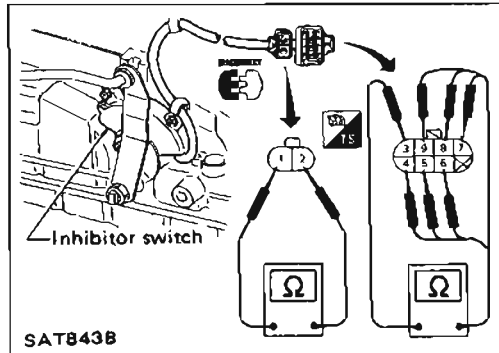
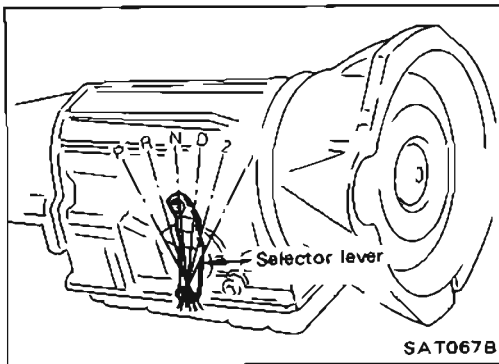
| Terminal No. | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |
|----------------|-----|---|-----|-----|-----|-----|-----|-----|---|
| Lever position | | | | | | | | | |
| P | ○—○ | | ○—○ | | | | | | |
| R | | | ○—○ | ○—○ | | | | | |
| N | ○—○ | | ○—○ | ○—○ | ○—○ | | | | |
| D | | | ○—○ | ○—○ | ○—○ | ○—○ | | | |
| 2 | | | ○—○ | ○—○ | ○—○ | ○—○ | ○—○ | | |
| 1 | | | ○—○ | ○—○ | ○—○ | ○—○ | ○—○ | ○—○ | |

2. If N.G., check again with manual control linkage disconnected from manual shaft of A/T assembly. — Refer to step 1.
3. If O.K. on step 2, adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".
4. If N.G. on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminal. — Refer to step 1.
5. If O.K. on step 4, adjust inhibitor switch. — Refer to "ON-VEHICLE SERVICE".
6. If N.G. on step 4, replace inhibitor switch.

REVOLUTION SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals ①, ② and ③.

| Terminal No. | | Resistance |
|--------------|---|---------------|
| ① | ② | 500 - 650Ω |
| ② | ③ | No continuity |
| ① | ③ | No continuity |



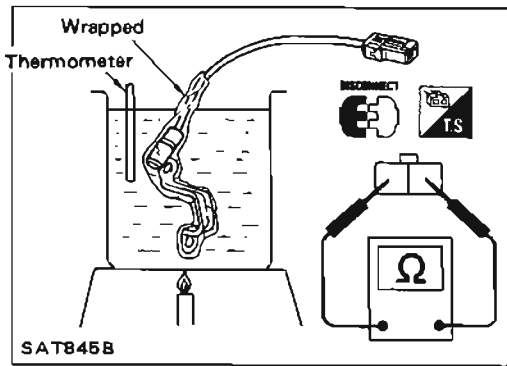
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

FLUID TEMPERATURE SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals while changing temperature as shown at left.

| Temperature °C (°F) | Resistance |
|---------------------|----------------------|
| 20 (68) | Approximately 2.5 kΩ |
| 80 (176) | Approximately 0.3 kΩ |



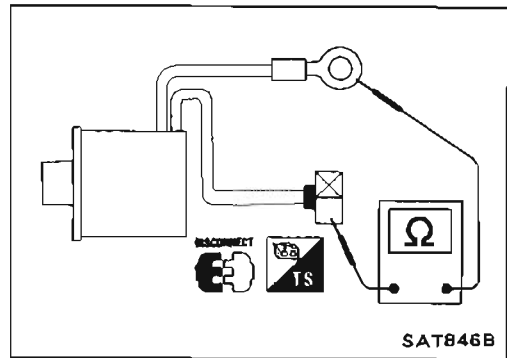
LOCK-UP SOLENOID AND LINE PRESSURE SOLENOID

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

Resistance:

Lock-up solenoid 10 - 16Ω

Line pressure solenoid 2.5 - 5Ω



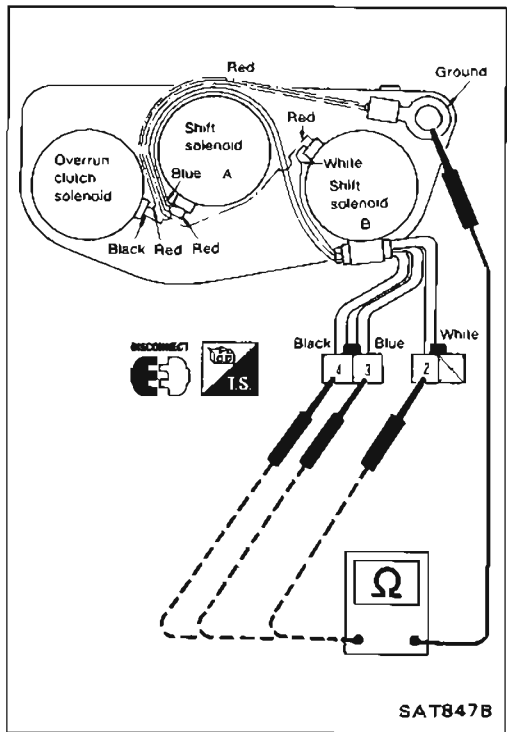
3-UNIT SOLENOID ASSEMBLY

(Shift solenoid A, B and overrun clutch solenoid)

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.

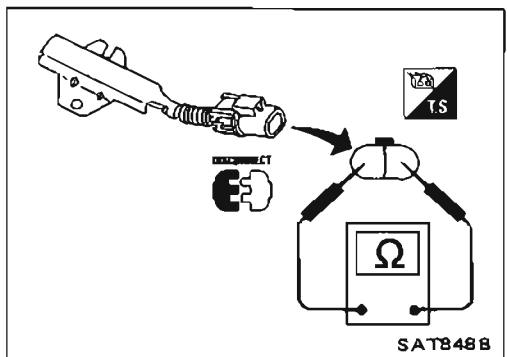
| Solenoid | Terminal No. | Resistance |
|-------------------------|--------------|------------|
| Shift solenoid A | ③ | 20 - 30Ω |
| Shift solenoid B | ② | |
| Overrun clutch solenoid | ④ | |

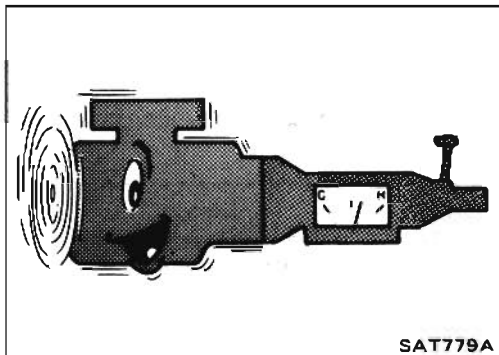
Ground terminal



DROPPING RESISTOR

- Check resistance between two terminals.
- Resistance: 11.2 - 12.8Ω**





Final Check

STALL TESTING

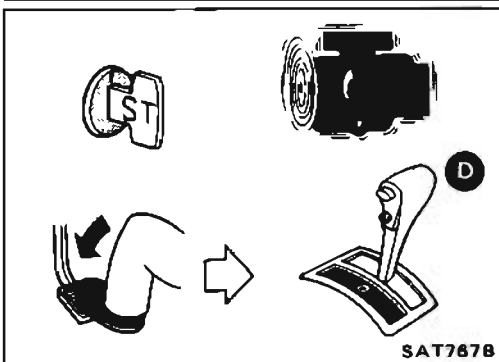
Stall test procedure

1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

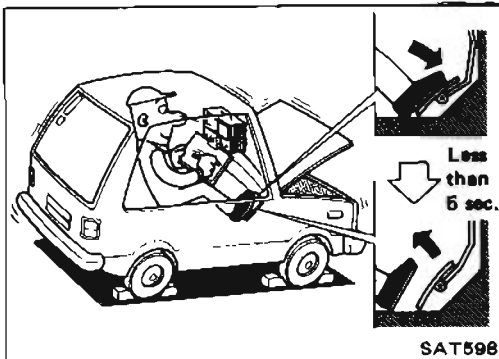
A.T.F. operating temperature:
50 - 80°C (122 - 176°F)



3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.
 - It is good practice to put a mark on point of specified engine rpm on indicator.



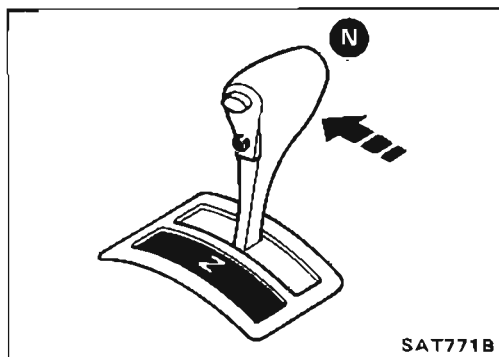
5. Start engine, apply foot brake, and place selector lever in "D" range.



6. Accelerate to wide-open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- During test, never hold throttle wide-open for more than 5 seconds.

Stall revolution:
2,050 - 2,250 rpm



8. Shift selector lever to "N".
9. Cool off A.T.F.
 - Run engine at idle for at least one minute.
10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

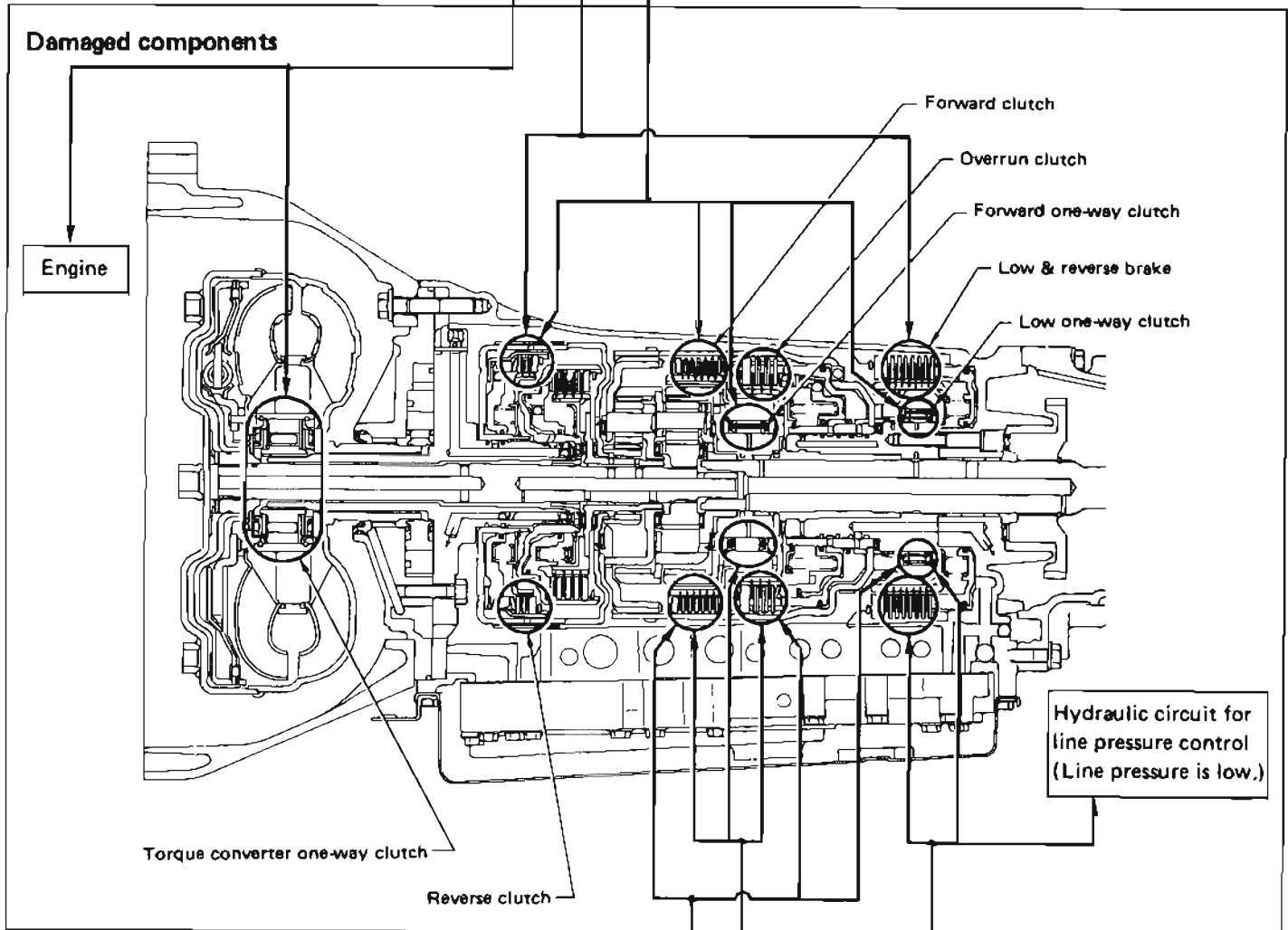
TROUBLE DIAGNOSES

Final Check (Cont'd)

Judgement of stall test

| Selector lever position | Judgement | | |
|-------------------------|-----------|---|---|
| D | L | O | H |
| 2 | L | O | H |
| 1 | L | O | O |
| R | L | H | H |

- O : Stall revolution is normal.
- H : Stall revolution is higher than specified.
- L : Stall revolution is lower than specified.



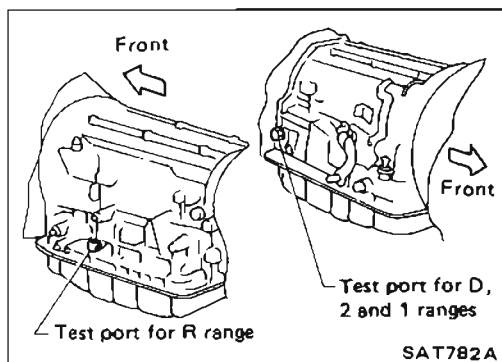
| D | H | H | H | O |
|-------------------------|-----------|---|---|---|
| 2 | H | H | H | O |
| 1 | O | H | H | O |
| R | O | O | H | O |
| Selector lever position | Judgement | | | |

TROUBLE DIAGNOSES

Final Check (Cont'd)

PRESSURE TESTING

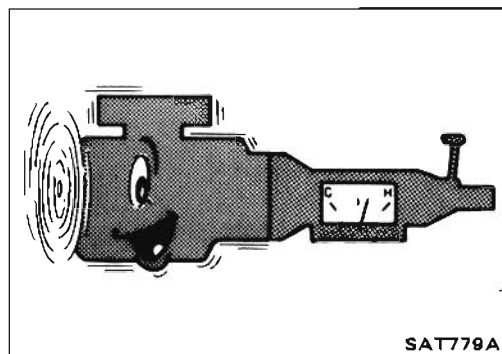
- Location of line pressure test port
- Line pressure plugs are hexagon headed bolts.
- Always replace line pressure plugs as they are self-sealing bolts.



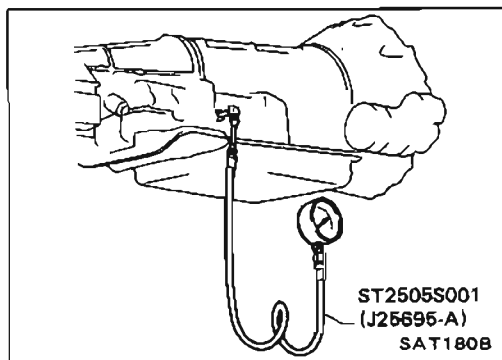
Line pressure test procedure

1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

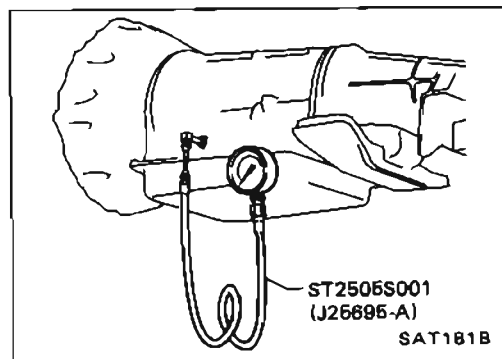
A.T.F. operating temperature:
50 - 80°C (122 - 176°F)



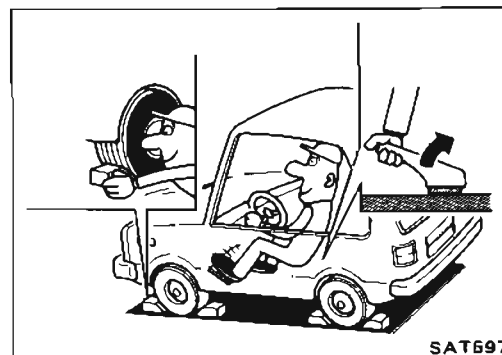
3. Install pressure gauge to line pressure port.
— D, 2 and 1 ranges —



— R range —

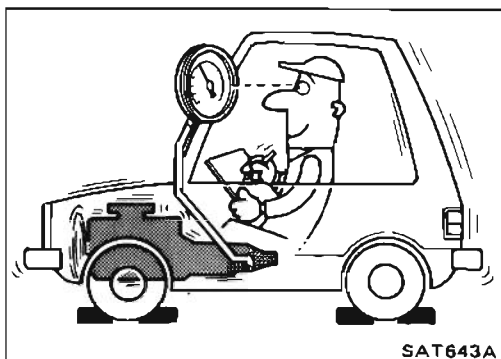


4. Set parking brake and block wheels.
 - Continue to depress brake pedal fully while line pressure test at stall speed is performed.



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 rpm | Line pressure kPa (kg/cm ² , psi) | |
|------------------|--|---|
| | D, 2 and 1 ranges | R range |
| Idle | 471 - 510 (4.8 - 5.2, 68 - 74) | 657 - 696 (6.7 - 7.1, 95 - 101) |
| Stall | 1,020 - 1,098 (10.4 - 11.2, 148 - 159) | 1,422 - 1,500 (14.5 - 15.3, 206 - 218) |

JUDGEMENT OF LINE PRESSURE TEST

| Judgement | | Suspected parts |
|----------------|---|--|
| At idle | Line pressure is low in all ranges. | <ul style="list-style-type: none"> ● Oil pump wear ● Control piston damage ● Pressure regulator valve or plug sticking ● Spring for pressure regulator valve damaged ● Fluid pressure leakage between oil strainer and pressure regulator valve |
| | Line pressure is low in particular range. | <ul style="list-style-type: none"> ● Fluid pressure leakage between manual valve and particular clutch. ● For example; If line pressure is low in "R" and "1" ranges but is normal in "D" and "2" range, fluid leakage exists at or around low & reverse brake circuit. |
| | Line pressure is high. | <ul style="list-style-type: none"> ● Mal-adjustment of throttle sensor ● Fluid temperature sensor damaged ● Line pressure solenoid sticking ● Short circuit of line pressure solenoid circuit ● Pressure modifier valve sticking ● Pressure regulator valve or plug sticking |
| At stall speed | Line pressure is low. | <ul style="list-style-type: none"> ● Mal-adjustment of throttle sensor ● Control piston damaged ● Line pressure solenoid sticking ● Short circuit of line pressure solenoid circuit ● Pressure regulator valve or plug sticking ● Pressure modifier valve sticking ● Pilot valve sticking |

TROUBLE DIAGNOSES

Symptom Chart

| Reference page (AT-) | Reference page (AT-) | ON vehicle | | | | | | | | | | OFF vehicle | | | | | |
|-----------------------|---|--------------------------------|--|--|------------------------------------|--|--|---|---|------------------------------------|--|------------------------------|-------------------------------|--|--------------------------------------|-----------------------------------|--------------------|
| | | 9, 14 | 66 | 66 | 70 | 67, 106 | 67 | 67 | 7, 67 | 7 | 7 | 90, 101 | 120, 124 | 126, 137 | 126, 134 | 130 | 144 |
| | Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transmission must be removed from the vehicle. | Fluid level Control linkage | Inhibitor switch Throttle sensor (Adjustment) | Revolution sensor and speed sensor Engine revolution signal | Engine idling rpm Line pressure | Control valve assembly Shift solenoid A | Shift solenoid B Line pressure solenoid | Lock-up solenoid Overrun clutch solenoid | Fluid temperature sensor Accumulator N-D | Accumulator 1-2 Accumulator 2-3 | Accumulator 3-4 (N-R) Ignition switch and starter | Torque converter Oil pump | Reverse clutch High clutch | Forward clutch Forward one-way clutch | Overrun clutch Low one-way clutch | Low & reverse brake Brake band | Parking components |
| 48 | Engine does not start in "N", "P" ranges. | 2 | 3 | | | | | | | | 1 | | | | | | |
| 48 | Engine starts in range other than "N" and "P". | 1 | 2 | | | | | | | | | | | | | | |
| - | Transmission noise in "P" and "N" ranges. | 1 | 3 | 4 | 5 | 2 | | | | | 7 | 6 | | | | | |
| 48 | Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range. | 1 | | | | | | | | | | | | | | 2 | |
| 48 | Vehicle runs in "N" range. | 1 | | | | | | | | 4 | | 8 | 2 | 4 | | | |
| 51 | 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 | 7 | 8 | 9 | |
| - | Vehicle braked when shifting into "R" range. | 1 | 2 | | 3 | 5 | 4 | | | | | 6 | 8 | 9 | 7 | | |
| - | Sharp shock in shifting from "N" to "D" range. | | 2 | 5 | 1 | 3 | 7 | 6 | 4 | 8 | | | 9 | | | | |
| - | Vehicle will not run in "D" and "2" ranges (but runs in "1" and "R" range). | 1 | | | | | | | | | | | | | 2 | | |
| 52 | Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration. | 1 | | | 2 | 4 | 3 | | 5 | | | 6 | 7 | 8 | 9 | 10 | |
| - | Clutches or brakes slip somewhat in starting. | 1 | 2 | 3 | 4 | 6 | 5 | | 7 | 8 | 11 | 12 | 14 | 9 | 11 | | |
| - | Excessive creep. | | | | 1 | | | | | | | | | | | | |
| 51, 52 | No creep at all. | 1 | | | 2 | 3 | | | | | | 6 | 5 | 4 | | | |
| - | Failure to change gear from "D ₁ " to "D ₂ ". | 2 | 1 | 5 | | 4 | 3 | | | | | | | | | 6 | |
| - | Failure to change gear from "D ₂ " to "D ₃ ". | 2 | 1 | 5 | | 4 | 3 | | | | | 6 | | | | 7 | |
| - | Failure to change gear from "D ₃ " to "D ₄ ". | 2 | 1 | 4 | | 3 | | 5 | | | | | | | | 6 | |
| 54, 55, 56 | Too high a gear change point from "D ₁ " to "D ₂ ", from "D ₂ " to "D ₃ ", from "D ₃ " to "D ₄ ". | | 1 | 2 | | 3 | 4 | | | | | | | | | | |
| - | Gear change directly from "D ₁ " to "D ₃ " occurs. | 1 | | | | | | | 2 | | | | | | | 3 | |
| - | Engine stops when shifting lever into "R", "D", "2" and "1". | | | | 1 | 3 | | 2 | | | 4 | | | | | | |
| - | Too sharp a shock in change from "D ₁ " to "D ₂ ". | | 1 | | 2 | 4 | | | 5 | 3 | | | | | | 6 | |
| - | Too sharp a shock in change from "D ₂ " to "D ₃ ". | | 1 | | 2 | 4 | | | | 3 | | | 5 | | | 6 | |

TROUBLE DIAGNOSES

Symptom Chart (Cont'd)

| Reference page (AT-) | Reference page (AT-) | ON vehicle | | | | | | | | | | OFF vehicle | | | | | | | | | | | | | | | | | | | |
|-----------------------|--|-------------|-----------------|------------------|------------------------------|------------------------------------|--------------------------|-------------------|---------------|------------------------|------------------|------------------|------------------------|------------------|-------------------------|--------------------------|-----------------|-----------------|-----------------|---|------------------|----------|----------------|-------------|----------------|------------------------|----------------|--------------------|---------------------|------------|--------------------|
| | | 9, 14 | 66 | 68 | 70 | 67, 106 | 67 | 87 | 7, 67 | 7 | 7 | 90, 101 | 120, 124 | 126, 137 | 128, 134 | 130 | 144 | | | | | | | | | | | | | | |
| | | Fluid level | Control linkage | Inhibitor switch | Throttle sensor (Adjustment) | Revolution sensor and speed sensor | Engine revolution signal | Engine idling rpm | Line pressure | Control valve assembly | Shift solenoid A | Shift solenoid B | Line pressure solenoid | Lock-up solenoid | Overrun clutch solenoid | Fluid temperature sensor | Accumulator N-D | Accumulator 1-2 | Accumulator 2-3 | Accumulator 3-4 (N-R) ignition switch and starter | Torque converter | Oil pump | Reverse clutch | High clutch | Forward clutch | Forward one-way clutch | Overrun clutch | Low one-way clutch | Low & reverse brake | Brake band | Parking components |
| - | Too sharp a shock in change from "D ₂ " to "D ₄ ". | . | . | 1 | . | . | 2 | 4 | . | . | . | . | . | . | . | . | . | . | 3 | . | . | . | . | . | . | 6 | . | 5 | . | . | |
| - | Almost no shock or clutches slipping in change from "D ₁ " to "D ₃ ". | 1 | . | 2 | . | . | 3 | 5 | . | . | . | . | . | . | . | . | . | 4 | . | . | . | . | . | . | . | . | . | . | 6 | . | |
| - | Almost no shock or slipping in change from "D ₂ " to "D ₃ ". | 1 | . | 2 | . | . | 3 | 5 | . | . | . | . | . | . | . | . | . | . | 4 | . | . | . | 6 | . | . | . | . | . | 7 | . | |
| - | Almost no shock or slipping in change from "D ₃ " to "D ₄ ". | 1 | . | 2 | . | . | 3 | 5 | . | . | . | . | . | . | . | . | . | . | . | 4 | . | . | 6 | . | . | . | . | . | 7 | . | |
| - | Vehicle braked by gear change from "D ₃ " to "D ₁ ". | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | 4 | . | . | 5 | 3 | . | . | |
| - | Vehicle braked by gear change from "D ₂ " to "D ₃ ". | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . | |
| - | Vehicle braked by gear change from "D ₁ " to "D ₄ ". | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 4 | . | 3 | 2 | . | . | . | . | |
| - | Maximum speed not attained. Acceleration poor. | 1 | . | 2 | . | . | . | 5 | 3 | 4 | . | . | . | . | . | . | . | . | . | . | 11 | 10 | 6 | 7 | . | . | . | 8 | 8 | | |
| - | Failure to change gear from "D ₄ " to "D ₃ ". | 1 | . | 2 | . | . | . | 6 | 4 | . | 5 | 3 | . | . | . | . | . | . | . | . | . | . | . | . | . | 8 | . | 7 | . | | |
| - | Failure to change gear from "D ₃ " to "D ₁ " or from "D ₄ " to "D ₁ ". | 1 | . | 2 | . | . | . | 5 | 3 | 4 | . | . | . | . | . | . | . | . | . | . | . | . | 6 | . | . | . | . | 7 | . | | |
| - | Failure to change gear from "D ₂ " to "D ₁ " or from "D ₃ " to "D ₁ ". | 1 | . | 2 | . | . | . | 5 | 3 | 4 | . | . | . | . | . | . | . | . | . | . | . | . | 7 | . | . | 6 | . | 8 | . | | |
| - | Gear change shock felt during deceleration by releasing accelerator pedal. | . | . | 1 | . | . | 2 | 4 | . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | |
| - | Too high a change point from "D ₄ " to "D ₃ ", from "D ₃ " to "D ₁ ", from "D ₄ " to "D ₁ ". | . | . | 1 | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | |
| - | Kickdown does not operate when depressing pedal in "D ₄ " within kickdown vehicle speed. | . | . | 1 | 2 | . | . | 3 | 4 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | |
| - | Kickdown operates or engine overruns when depressing pedal in "D ₄ " beyond kickdown vehicle speed limit. | . | . | 2 | 1 | . | . | 3 | 4 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | |
| - | Races extremely fast or slips in changing from "D ₂ " to "D ₃ " when depressing pedal. | 1 | . | 2 | . | . | 3 | 5 | . | 4 | . | . | . | . | . | . | . | . | . | . | . | . | 6 | 7 | . | . | . | . | . | | |
| - | Races extremely fast or slips in changing from "D ₄ " to "D ₁ " when depressing pedal. | 1 | . | 2 | . | . | 3 | 6 | 5 | 4 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 8 | . | . | 7 | . | | |
| - | Races extremely fast or slips in changing from "D ₃ " to "D ₁ " when depressing pedal. | 1 | . | 2 | . | . | 3 | 5 | . | 4 | . | . | 8 | . | 0 | . | . | . | . | . | . | . | 9 | 7 | . | . | . | 6 | . | | |
| - | Races extremely fast or slips in changing from "D ₂ " or "D ₃ " to "D ₁ " when depressing pedal. | 1 | . | 2 | . | . | 3 | 5 | . | 4 | . | . | . | . | . | . | . | . | . | . | . | . | . | 6 | 7 | . | 8 | . | . | | |
| - | Vehicle will not run in any range. | 1 | 2 | . | . | . | 3 | . | . | 4 | . | . | . | . | . | . | . | . | . | . | 9 | 5 | 6 | . | . | . | 8 | 7 | 14 | | |
| - | Transmission noise in "D", "2", "1" and "R" ranges. | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | . | . | |

TROUBLE DIAGNOSES

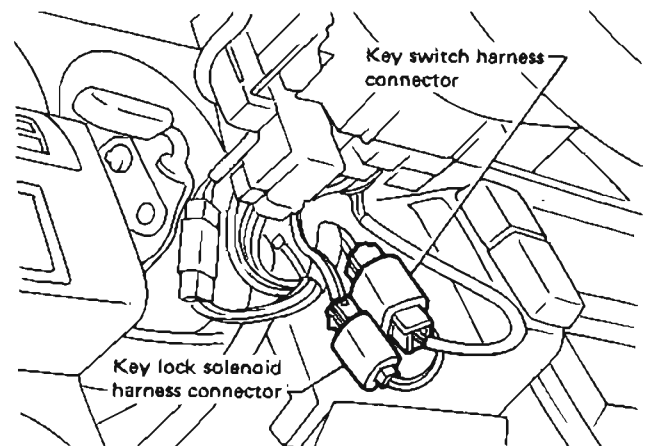
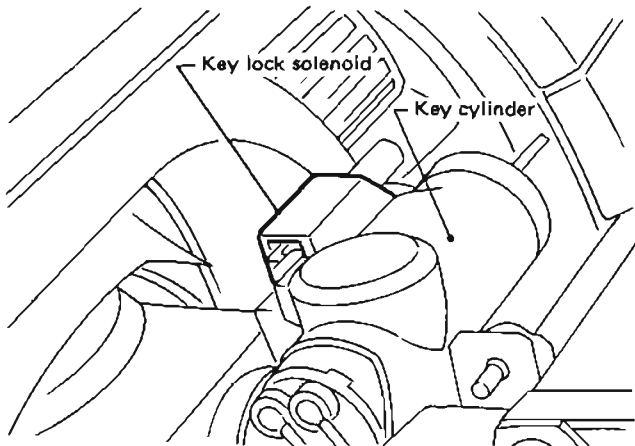
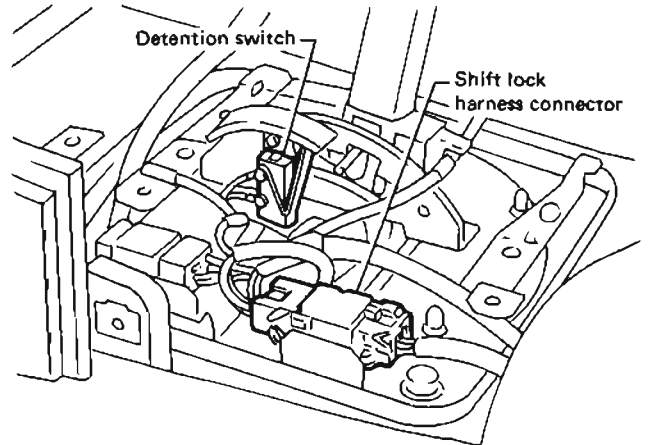
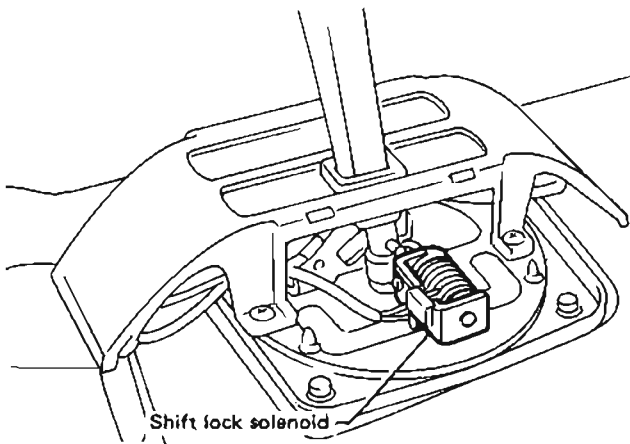
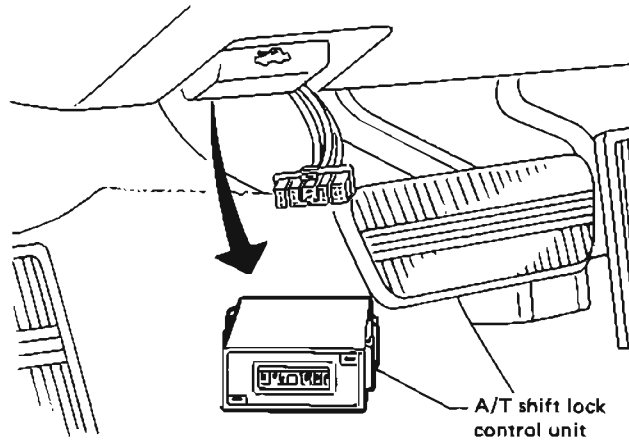
Symptom Chart (Cont'd)

| | Reference page (AT-) | ON vehicle | | | | | | | | | | OFF vehicle | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---|-------------|-----------------|------------------|------------------------------|------------------------------------|--------------------------|-------------------|---------------|------------------------|------------------|------------------|------------------------|------------------|-------------------------|--------------------------|-----------------|-----------------|-----------------|-----------------------|-----------------------------|------------------|----------|----------------|-------------|----------------|------------------------|----------------|--------------------|---------------------|------------|--------------------|--|--|--|
| | | 9, 14 | 66 | 66 | 70 | 67, 106 | 67 | 67 | 7, 67 | 7 | 7 | 90, 101 | 120, 124 | 126, 137 | 126, 134 | 130 | 144 | | | | | | | | | | | | | | | | | | |
| Reference page (AT.) | Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transmission must be removed from the vehicle. | Fluid level | Control linkage | Inhibitor switch | Throttle sensor (Adjustment) | Revolution sensor and speed sensor | Engine revolution signal | Engine idling rpm | Line pressure | Control valve assembly | Shift solenoid A | Shift solenoid B | Line pressure solenoid | Lock-up solenoid | Overrun clutch solenoid | Fluid temperature sensor | Accumulator N-D | Accumulator 1-2 | Accumulator 2-3 | Accumulator 3-4 (N-R) | Ignition switch and starter | Torque converter | Oil pump | Reverse clutch | High clutch | Forward clutch | Forward one-way clutch | Overrun clutch | Low one-way clutch | Low & reverse brake | Brake band | Parking components | | | |
| 61 | Failure to change from "D ₃ " to "2" when changing lever into "2" range. | 7 | 1 | 2 | | | | | 6 | 6 | 4 | | 3 | | | | | | | | | | | | | | | | | | | | | | |
| - | Gear change from "2" to "2 ₁ " in "2" range. | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 61 | Engine brake does not operate in "1" range. | 2 | 1 | 3 | 4 | | | | 6 | 5 | | | 7 | | | | | | | | | | | | | | | | 8 | | 9 | | | | |
| - | Gear change from "1 ₁ " to "1 ₂ " in "1" range. | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - | Does not change from "1 ₁ " to "1 ₂ " in "1" range. | | 1 | | 2 | | | | 4 | 3 | | | 5 | | | | | | | | | | | | | | | 6 | | 7 | | | | | |
| - | Large shock changing from "1 ₁ " to "1 ₂ " in "1" range. | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | 2 | | | | | |
| - | Transmission overheats. | 1 | | 3 | | | 2 | 4 | 6 | | | 5 | | | | | | | | | | 11 | 7 | 8 | 9 | 11 | | 12 | | 13 | 10 | | | | |
| - | A.T.F. shoots out during operation. White smoke emitted from exhaust pipe during operation. | 1 | | | | | | | | | | | | | | | | | | | | | 2 | 3 | 5 | | 6 | | 7 | 4 | | | | | |
| - | Offensive smell at fluid charging pipe. | 1 | | | | | | | | | | | | | | | | | | | | 2 | 3 | 4 | 5 | 7 | | 8 | | 9 | 6 | | | | |
| - | Torque converter is not locked up. | | 3 | 1 | 2 | 4 | | 6 | 8 | | | | 7 | | 5 | | | | | | | 9 | | | | | | | | | | | | | |
| - | Lock-up piston slip | 1 | | 2 | | | 3 | 6 | | 5 | 4 | | | | | | | | | | | 7 | | | | | | | | | | | | | |
| 57 | Lock-up point is extremely high or low. | | | 1 | 2 | | | 4 | | | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| - | A/T does not shift to "D ₄ " when driving with overdrive switch "ON". | | 2 | 1 | 3 | | 8 | 6 | 4 | | | 5 | 7 | | | | | | | | | | | | | | | 10 | | 9 | | | | | |
| - | Engine is stopped at "R", "D", "2" and "1" ranges. | 1 | | | | | | 5 | 4 | 3 | 2 | | | | | | | | | | | | | | | | | | | | | | | | |

TROUBLE DIAGNOSES

A/T Shift Lock System

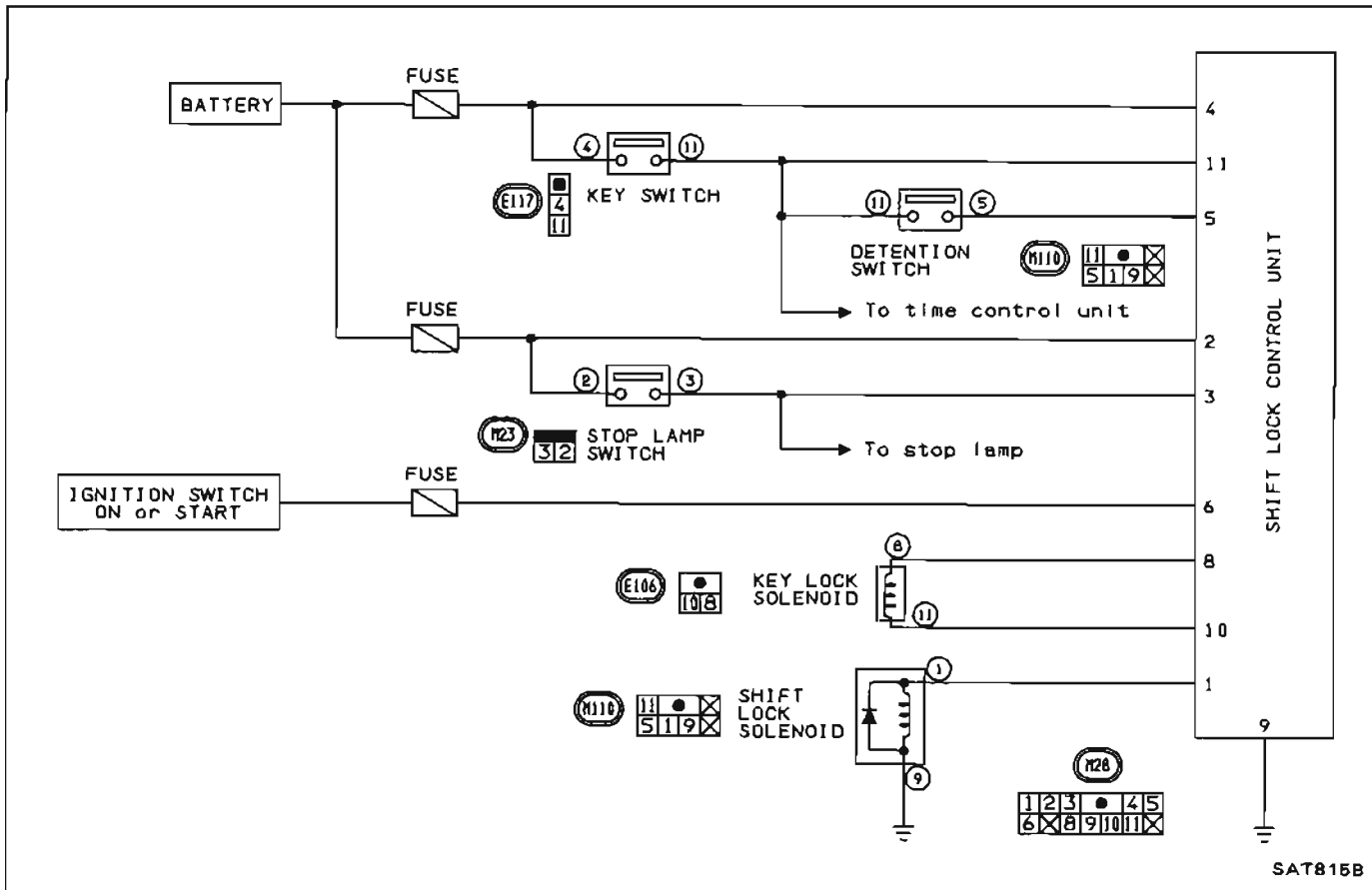
SHIFT LOCK SYSTEM ELECTRICAL PARTS LOCATION



TROUBLE DIAGNOSES

A/T Shift Lock System (Cont'd)

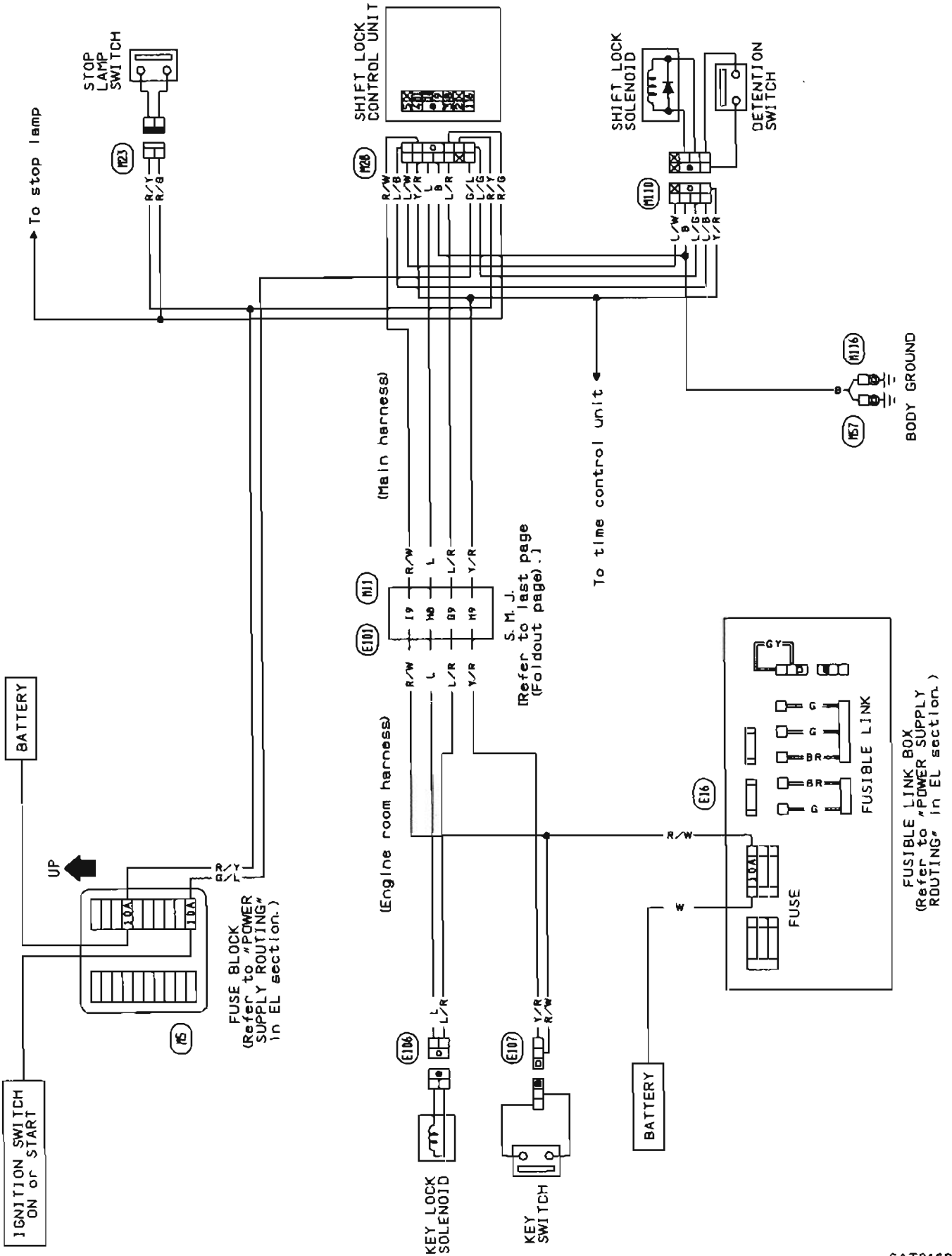
CIRCUIT DIAGRAM FOR QUICK PIN POINT CHECK



TROUBLE DIAGNOSES

A/T Shift Lock System (Cont'd)

WIRING DIAGRAM

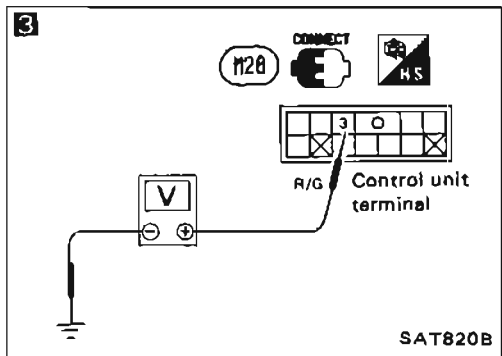
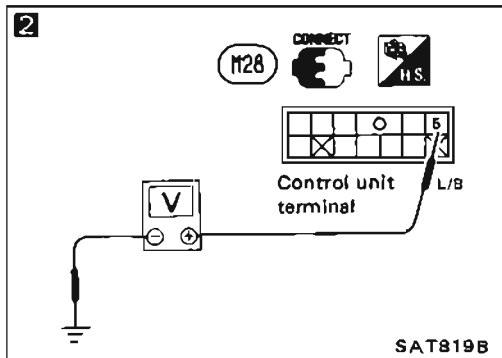
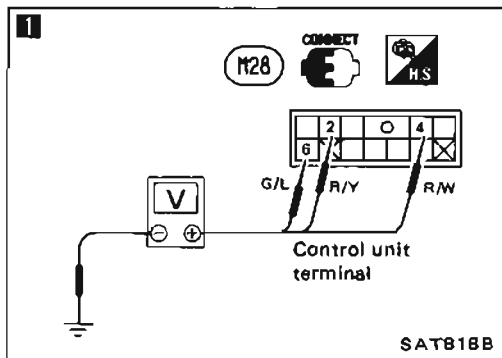


TROUBLE DIAGNOSES

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.



1

CHECK POWER SOURCE.

-
- Check voltage between control unit terminals ②, ④, ⑥ and ground.
Battery voltage should exist.

N.G.

- Check the following items:
- Harness continuity between battery and control unit
 - Fuse
 - Ignition switch

2

CHECK INPUT SIGNAL (Detention switch).

-
- Check voltage between control unit terminal ⑤ and ground while setting selector lever in "P" position.

| Selector lever release button | Voltage |
|-------------------------------|-----------------|
| Not pressed | Battery voltage |

N.G.

- Check the following items:
- Detention switch – Refer to "COMPONENT CHECK".
 - Key switch – Refer to "COMPONENT CHECK".
 - Harness continuity between detention switch and control unit.

3

CHECK INPUT SIGNAL (STOP LAMP SWITCH).

-
- Check voltage between control unit terminal ③ and ground while applying brake pedal.
Battery voltage should exist.

N.G.

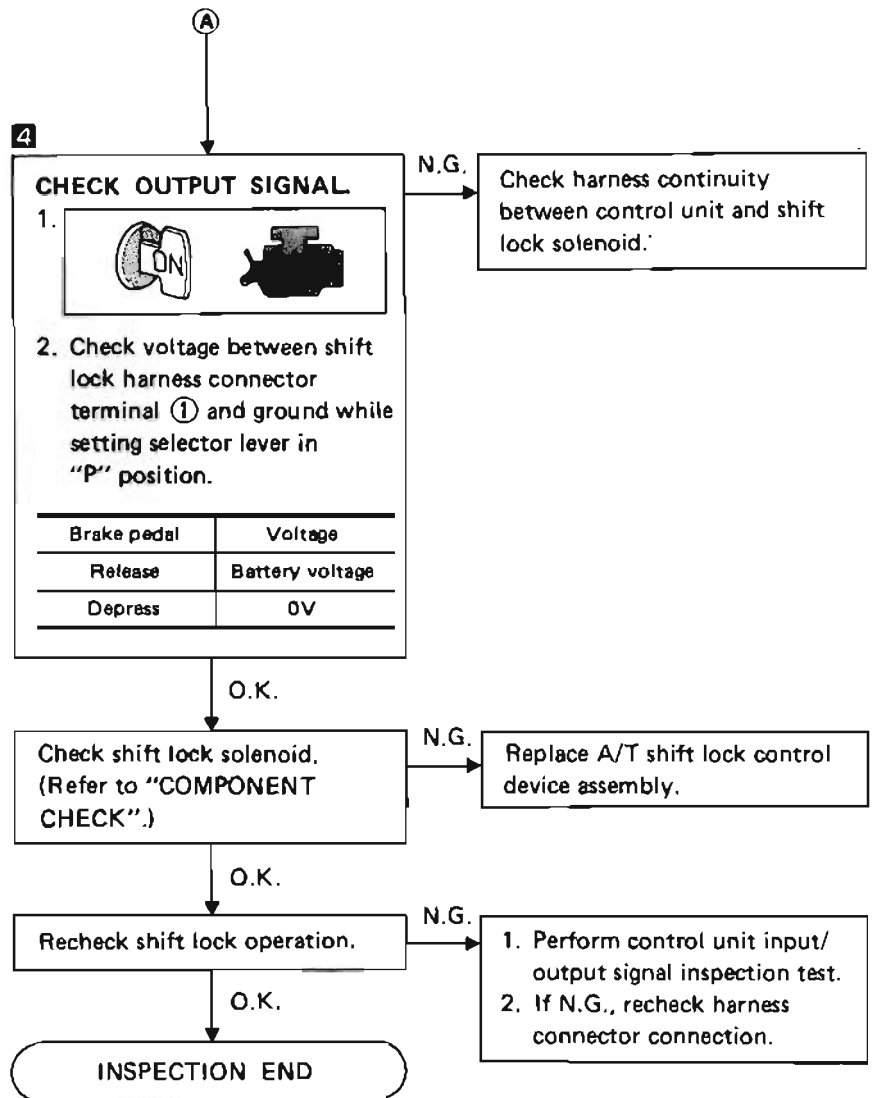
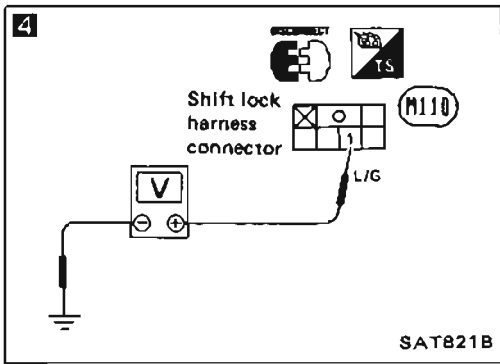
- Check the following items:
- Stop lamp switch
 - Harness continuity between stop lamp switch and control unit

O.K.

A

TROUBLE DIAGNOSES

A/T Shift Lock System (Cont'd)

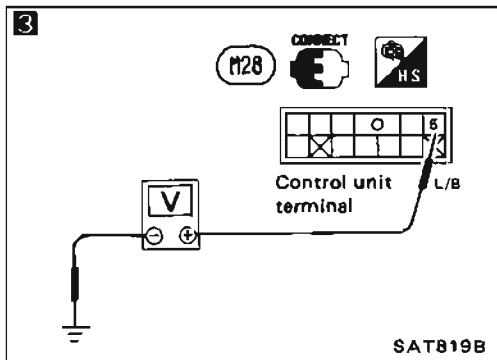
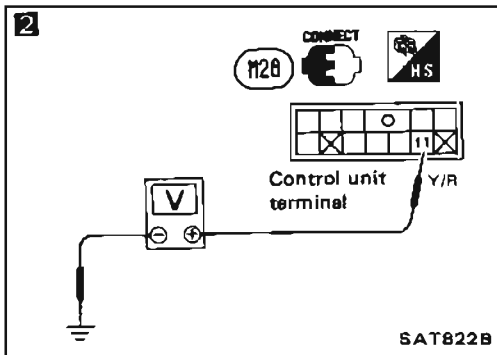
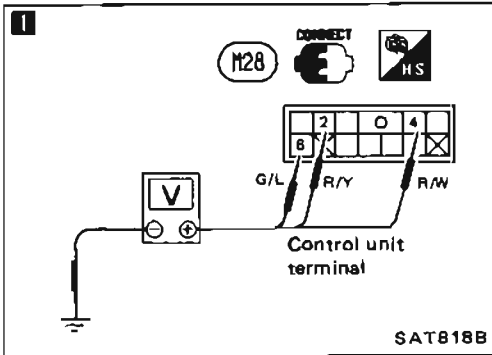


TROUBLE DIAGNOSES

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".



1

CHECK POWER SOURCE.

1.

2. Check voltage between control unit terminals ②, ④, ⑥ and ground.
Battery voltage should exist.

N.G. → Check the following items:

- Harness continuity between battery and control unit
- Fuse
- Ignition switch

O.K. ↓

2

CHECK INPUT SIGNAL (Key switch).

1. Insert ignition key into ignition switch.

2. Check voltage between control unit terminal ⑪ and ground.
Battery voltage should exist.

N.G. → Check the following items:

- Key switch – Refer to "COMPONENT CHECK".
- Harness continuity between key switch and control unit.

O.K. ↓

3

CHECK INPUT SIGNAL (Detention switch).

1.

2. Check voltage between control unit terminal ⑤ and ground while setting selector lever in "P" position.

| Selector lever release button | Voltage |
|-------------------------------|-----------------|
| Release | Battery voltage |

3. Check voltage between control unit terminal ⑤ and ground while setting selector lever in any position except "P".
0V

N.G. → Check the following items:

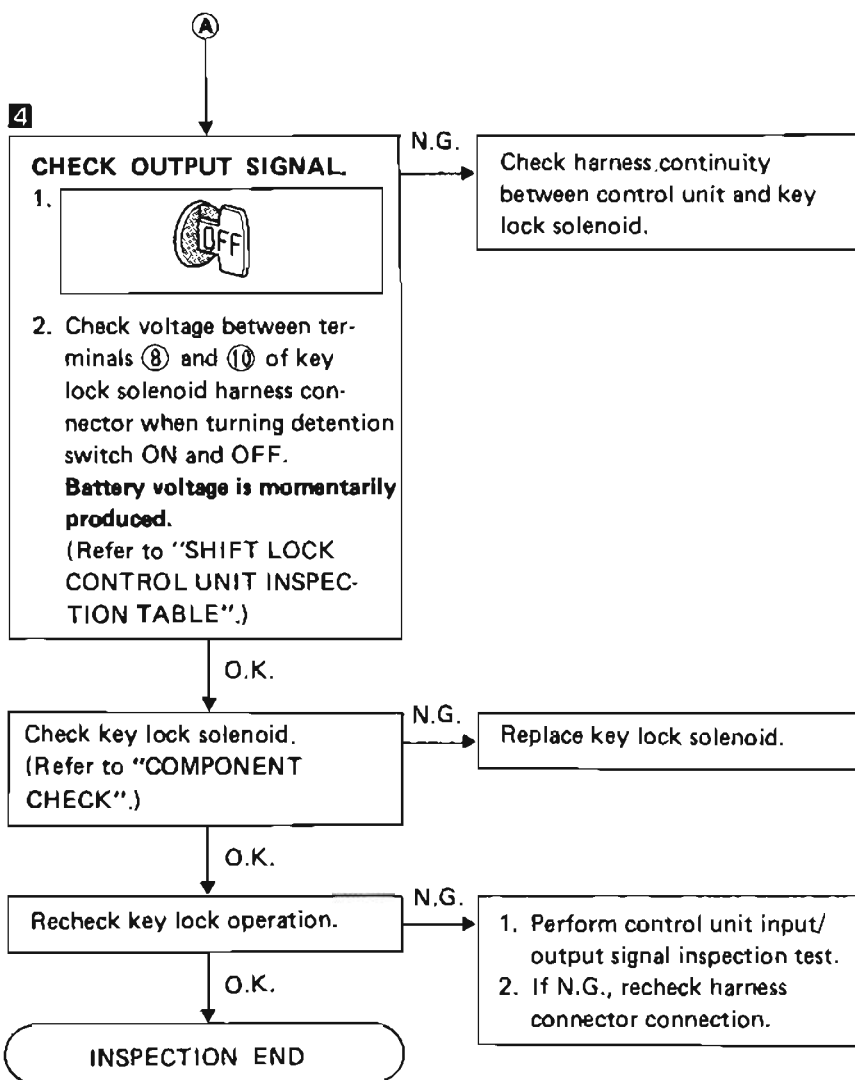
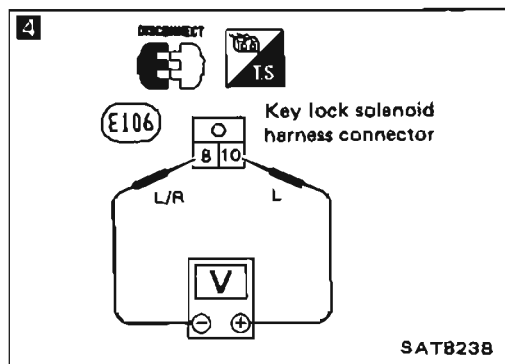
- Detention switch – Refer to "COMPONENT CHECK".
- Harness continuity between detention switch and control unit.

O.K. ↓



TROUBLE DIAGNOSES

A/T Shift Lock System (Cont'd)

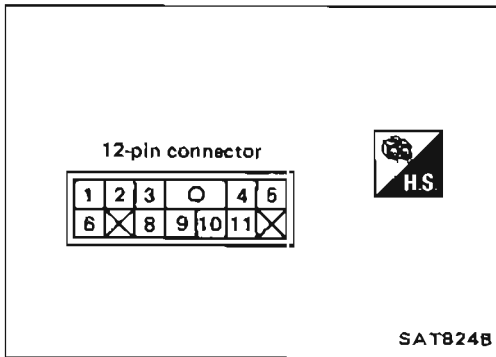


TROUBLE DIAGNOSES

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 | | Judgement standard |
|--------------|----|-------------------|---|---|---|
| ⊕ | ⊖ | | | | |
| 1 | | Shift lock signal |  | When setting selector lever in "P" position and releasing brake pedal | Battery voltage |
| | | | | Except above | 0V |
| 2 | | Power source |  | | Battery voltage |
| 3 | 9 | Stop lamp switch | | When depressing brake pedal | Battery voltage |
| | | | | When releasing brake pedal | 0V |
| 4 | | Power source |  | | Battery voltage |
| 5 | | Detention switch | | When setting selector lever in "P" position and releasing selector lever release button | Battery voltage |
| | | | | When setting selector lever in "P" position and pushing selector lever release button | 0V |
| 6 | | Ignition signal |  | | Battery voltage |
| 8 | 10 | Key lock signal | | When turning detention switch OFF with ignition switch set to LOCK, OFF or ACC | Battery voltage (Approximately 0.1 seconds) |
| | | | | Except above | 0V |
| 9 | - | Ground | - | - | - |
| 10 | 8 | Key unlock signal | | When turning detention switch ON with ignition switch set to LOCK, OFF or ACC | Battery voltage (Approximately 0.1 seconds) |
| | | | | Except above | 0V |
| 11 | 9 | Key switch | | When inserting key to key cylinder | Battery voltage |
| | | | | When removing key from key cylinder | 0V |

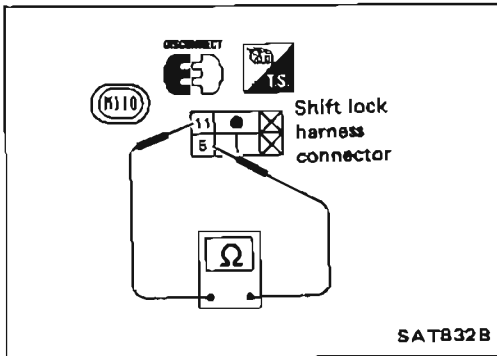
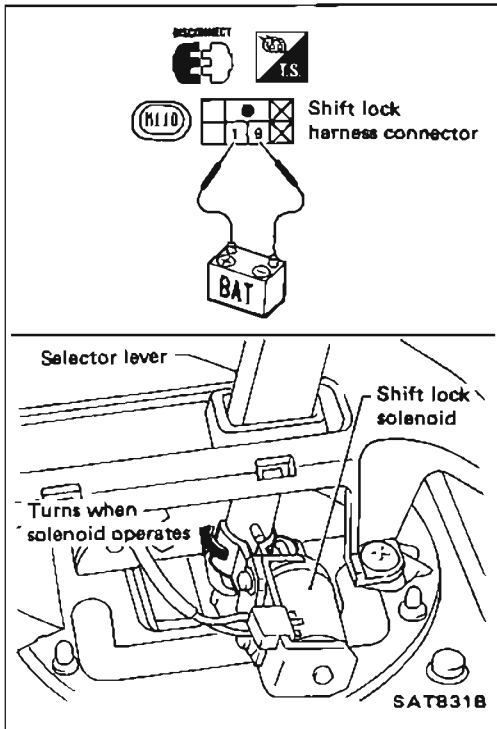
TROUBLE DIAGNOSES

A/T Shift Lock System (Cont'd)

COMPONENT CHECK

Shift lock solenoid

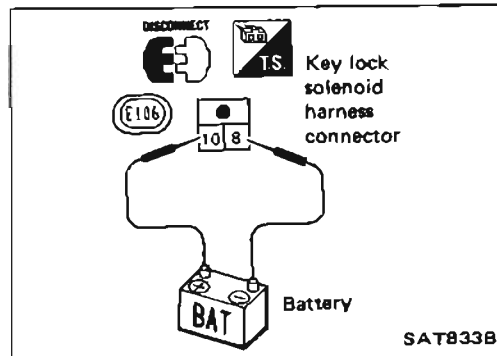
- Check operation by applying battery voltage to shift lock harness connector.



Detention switch

- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.

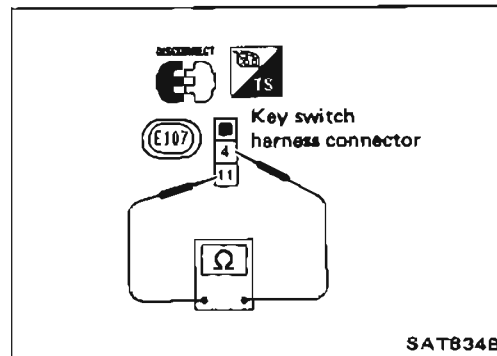
| Condition | Continuity |
|--|------------|
| When setting shift lever to "P" position with release button released. | Yes |
| Except the above | No |



Key lock solenoid

- Check operation by applying battery voltage to key lock solenoid harness connector.

Operating sound must be emitted.

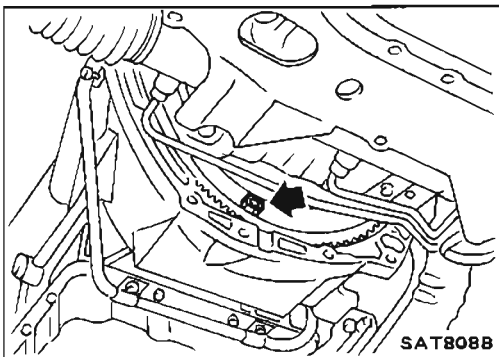


Key switch

- Check continuity between terminals ④ and ⑪ of key switch harness connector.

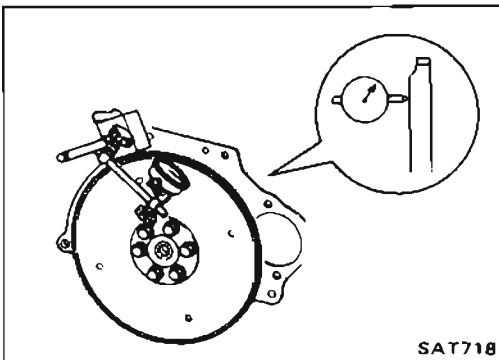
| Condition | Continuity |
|--------------------------------------|------------|
| When inserting key into key cylinder | Yes |
| When removing key from key cylinder | No |

REMOVAL AND INSTALLATION



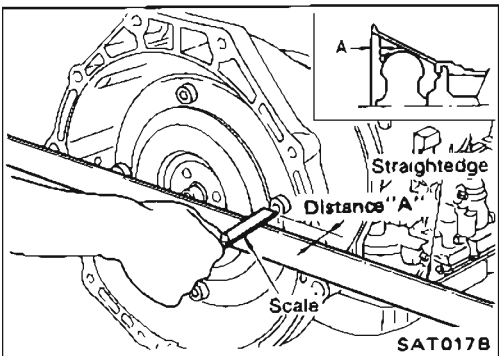
Removal

- Remove fluid charging pipe from A/T assembly.
- Remove bolts securing torque converter to drive plate.
- **Remove those bolts by turning crankshaft.**
- Plug up opening such as oil charging pipe hole, etc.

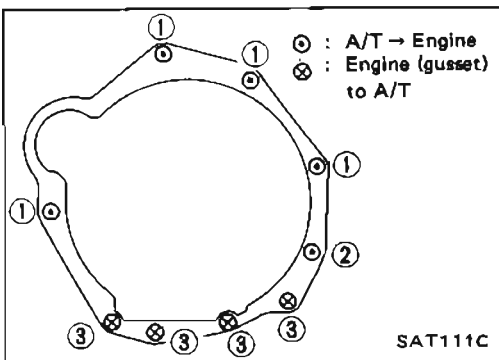


Installation

- Drive plate runout
Maximum allowable runout:
0.5 mm (0.020 in)
 If this runout is out of allowance, replace drive plate with ring gear.



- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.
Distance "A":
26 mm (1.02 in) or more
- Install converter to drive plate.
- Reinstall any part removed.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.**



- Tighten bolts securing transmission.

| Bolt No. | Tightening torque N·m (kg·m, ft·lb) | Bolt length "L" mm (in) |
|------------------|-------------------------------------|-------------------------|
| 1 | 39 - 49 (4.0 - 5.0, 29 - 36) | 40 (1.57) |
| 2 | 39 - 49 (4.0 - 5.0, 29 - 36) | 50 (1.97) |
| 3 | 29 - 39 (3.0 - 4.0, 22 - 29) | 25 (0.98) |
| Gusset to engine | 29 - 39 (3.0 - 4.0, 22 - 29) | 20 (0.79) |



- Reinstall any part removed.
- Check fluid level in transmission.
- Move selector lever through all positions to be sure that transmission operates correctly.
 With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. — Refer to "ROAD TESTING".

MAJOR OVERHAUL

: N·m (kg·m, ft·lb)

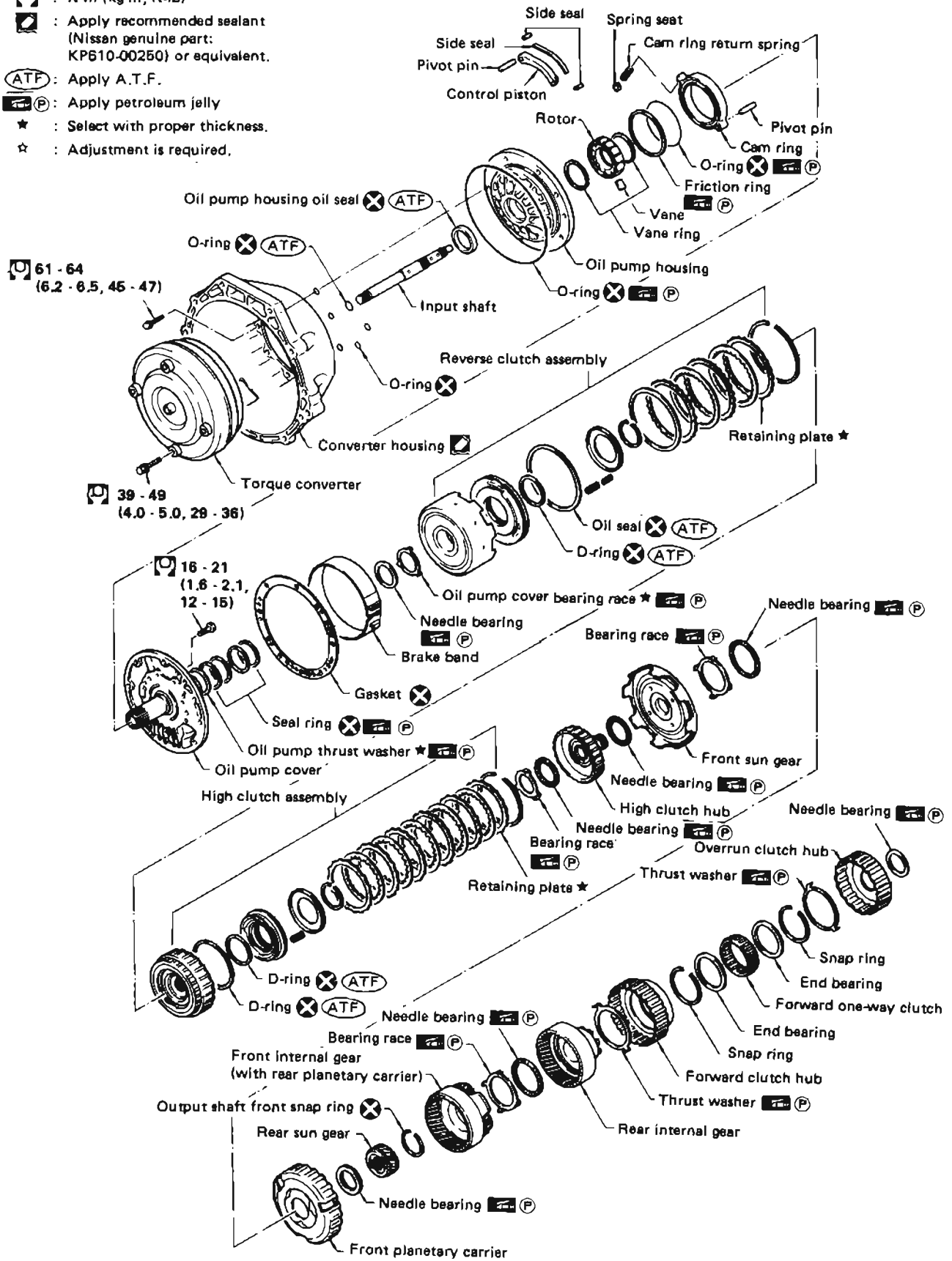
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.

: Apply A.T.F.

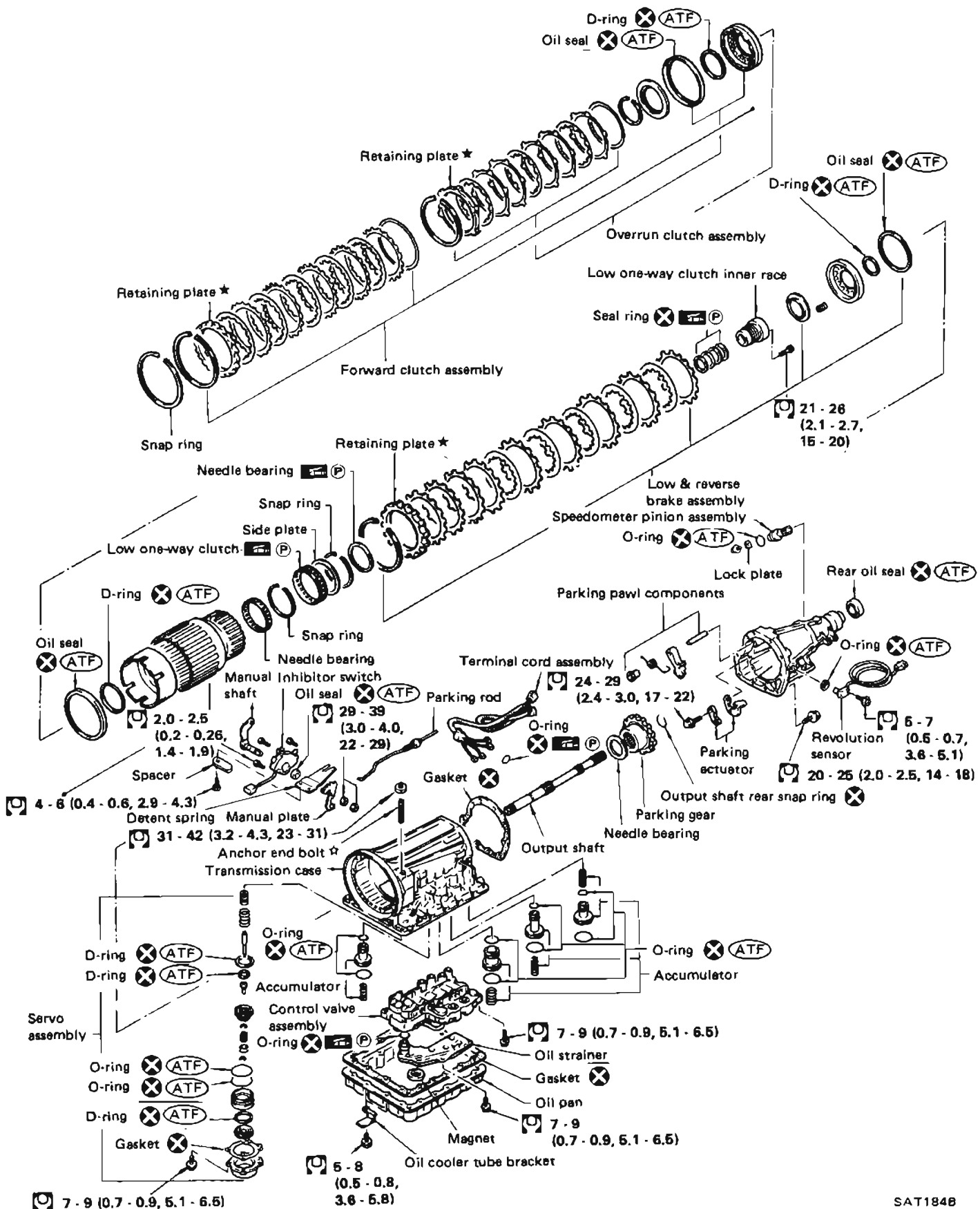
: Apply petroleum jelly

★ : Select with proper thickness.

☆ : Adjustment is required.

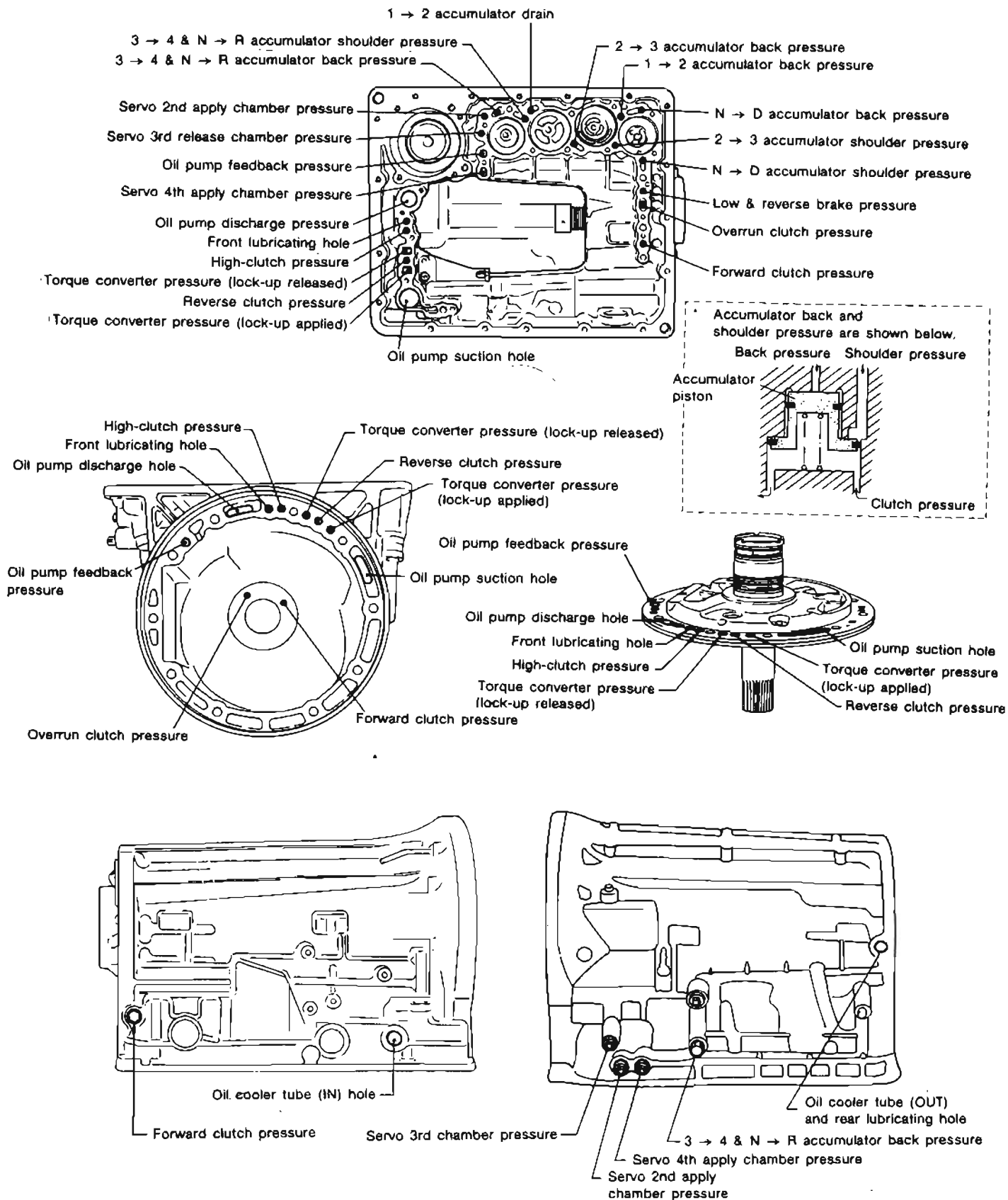


MAJOR OVERHAUL



MAJOR OVERHAUL

Oil Channel



MAJOR OVERHAUL

Locations of Needle Bearings, Thrust Washers and Snap Rings

Outer diameter of snap rings

| Item number | Outer diameter mm (in) |
|-------------|------------------------|
| ② | 161.0 (6.34) |
| ③ | 140.1 (5.52) |
| ④ | 156.4 (6.16) |
| ⑤ | 142.0 (5.59) |
| ⑦ | 159.2 (6.27) |

Thrust washers

| Item number | Color |
|-------------|-------|
| ① | Black |
| ⑤ | White |

Outer diameter of needle bearings

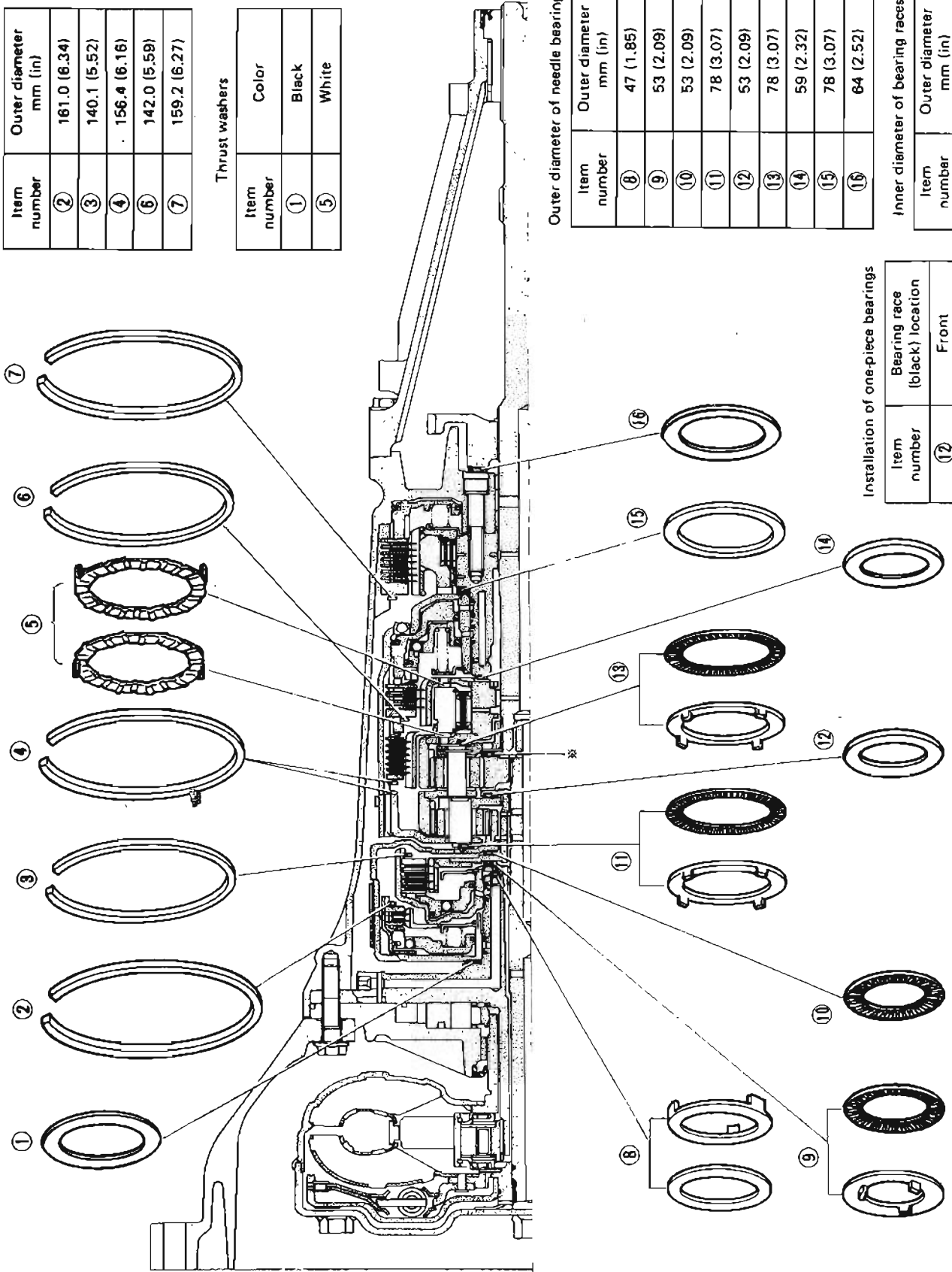
| Item number | Outer diameter mm (in) |
|-------------|------------------------|
| ⑧ | 47 (1.85) |
| ⑨ | 53 (2.09) |
| ⑩ | 53 (2.09) |
| ⑪ | 78 (3.07) |
| ⑫ | 53 (2.09) |
| ⑬ | 78 (3.07) |
| ⑭ | 59 (2.32) |
| ⑮ | 78 (3.07) |
| ⑯ | 64 (2.52) |

Inner diameter of bearing races

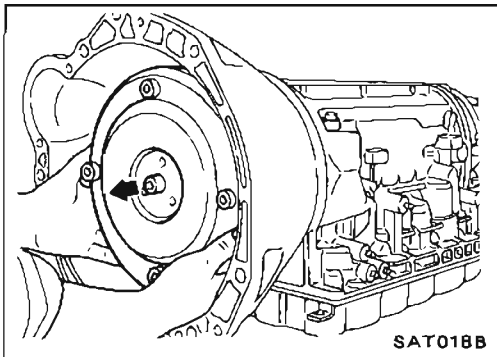
| Item number | Outer diameter mm (in) |
|-------------|------------------------|
| ⑪ | 58 (2.28) |
| ⑬ | 58.8 (2.315) |

Installation of one-piece bearings

| Item number | Bearing race (black) location |
|-------------|-------------------------------|
| ⑫ | Front |
| ⑮ | Rear side |
| ⑯ | Rear side |

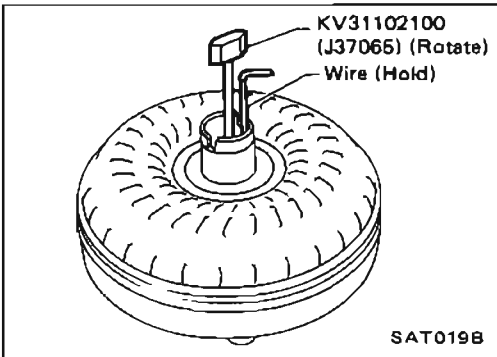


DISASSEMBLY

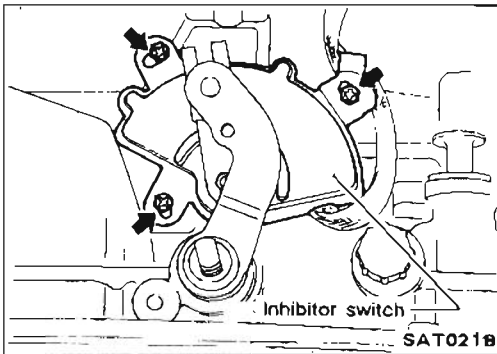


Disassembly

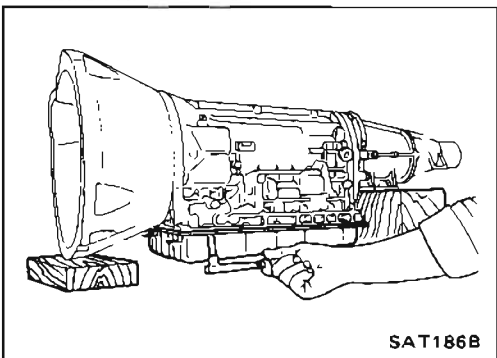
1. Remove torque converter by holding it firmly and turning while pulling straight out.



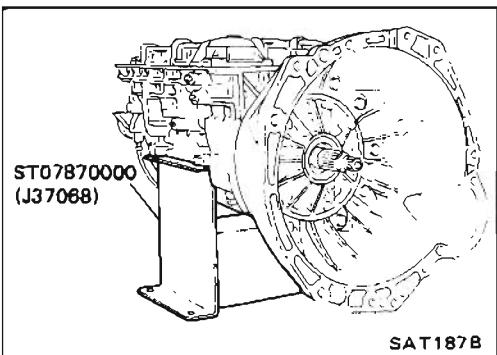
2. Check torque converter one-way clutch.
 - a. Insert Tool into spline of one-way clutch inner race.
 - b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
 - c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.



3. Remove inhibitor switch from transmission case.



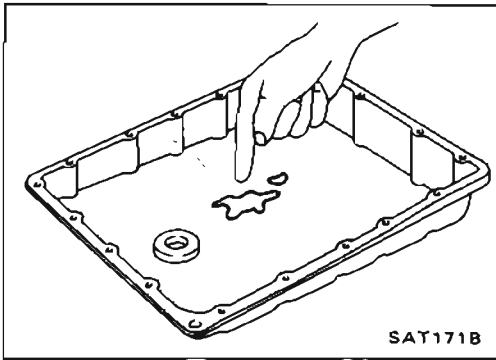
4. Remove oil pan.
 - a. Drain A.T.F. from rear extension.
 - b. Raise oil pan by placing wooden blocks under converter housing and rear extension.
 - c. Separate the oil pan and transmission case.
 - Always place oil pan straight down so that foreign particles inside will not move.



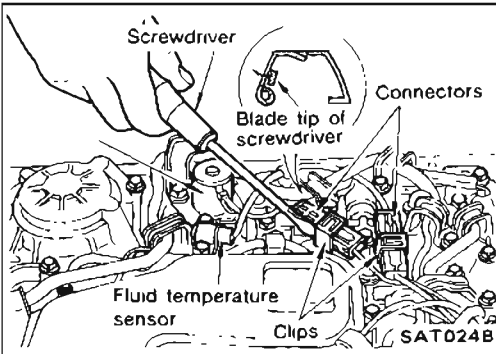
5. Place transmission into Tool with the control valve facing up.

DISASSEMBLY

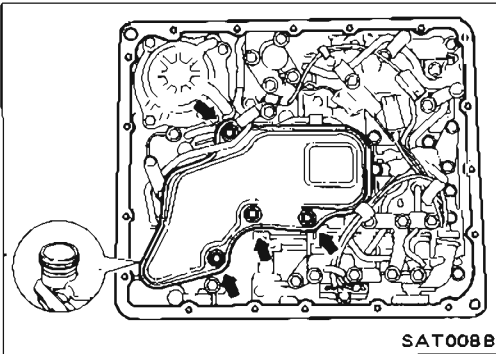
Disassembly (Cont'd)



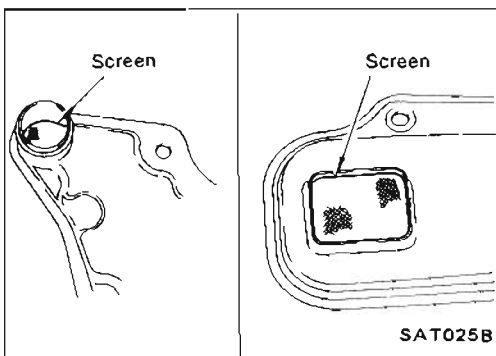
6. Check oil pan and oil strainer for accumulation of foreign particles.
 - If materials of clutch facing are found, clutch plates may be worn.
 - If metal filings are found, clutch plates, brake bands, etc. may be worn.
 - If aluminum filings are found, bushings or aluminum cast parts may be worn.In above cases, replace torque converter and check unit for cause of particle accumulation.



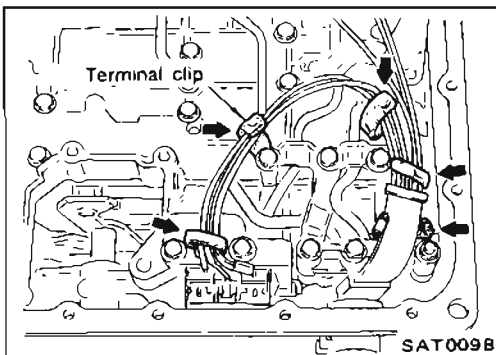
7. Remove lock-up solenoid and fluid temperature sensor connectors.
 - **Be careful not to damage connector.**



8. Remove oil strainer.
 - a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.



- b. Check oil strainer screen for damage.



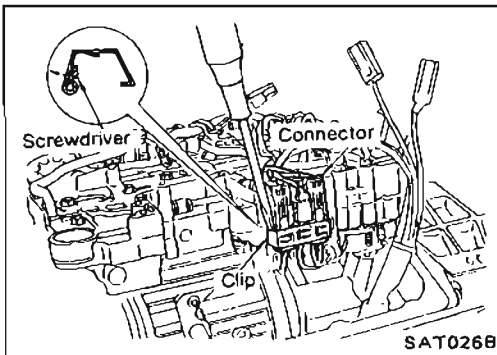
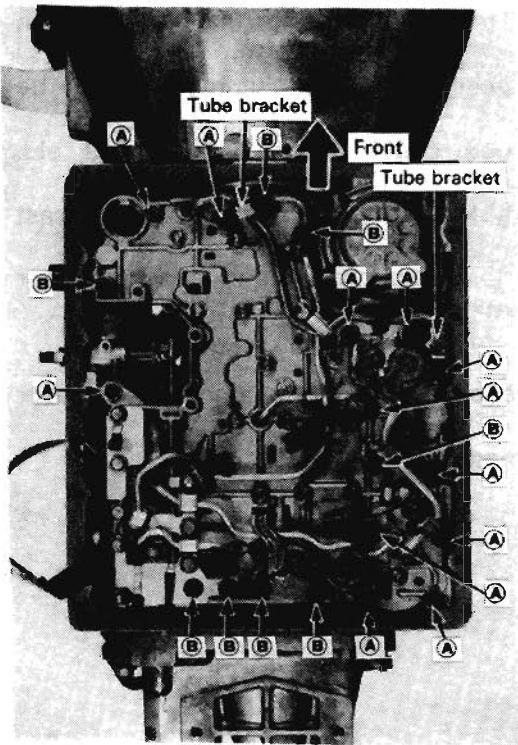
9. Remove control valve assembly.
 - a. Straighten terminal clips to free terminal cords then remove terminal clips.

DISASSEMBLY

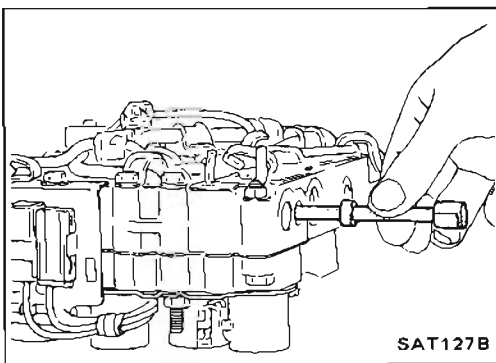
Disassembly (Cont'd)

- b. Remove bolts **(A)** and **(B)**, and remove control valve assembly from transmission.

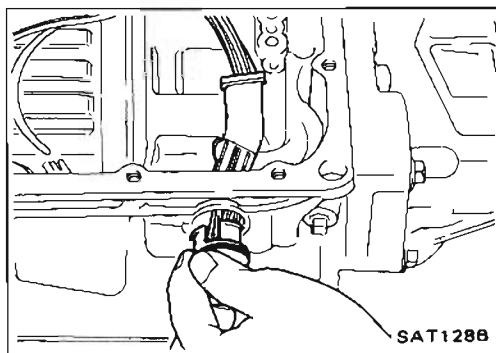
| Bolt | Length |
|------------|-----------------|
| (A) | 37 mm (1.46 in) |
| (B) | 50 mm (1.97 in) |



- c. Remove solenoid connector.
 ● Be careful not to damage connector.



- d. Remove manual valve from control valve assembly.

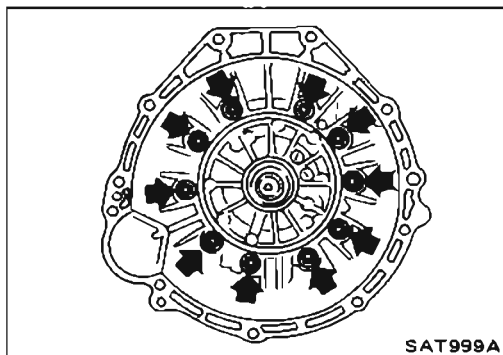


10. Remove terminal cord assembly from transmission case while pushing on stopper.
 ● Be careful not to damage cord.
 ● Do not remove terminal cord assembly unless it is damaged.

DISASSEMBLY

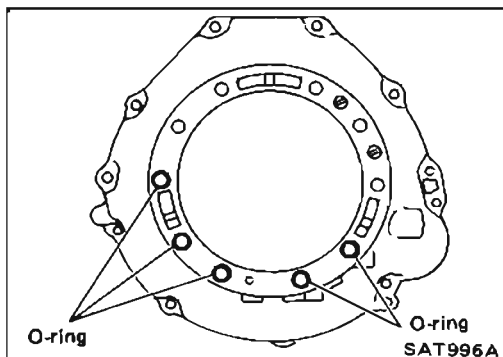
Disassembly (Cont'd)

11. Remove converter housing.
 - a. Remove converter housing from transmission case.

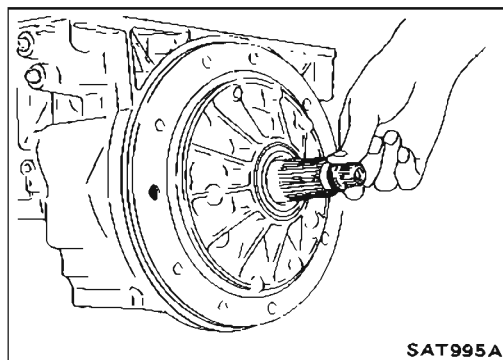


- b. Remove O-rings from converter housing.
 - c. Remove traces of sealant.

- **Be careful not to scratch converter housing.**

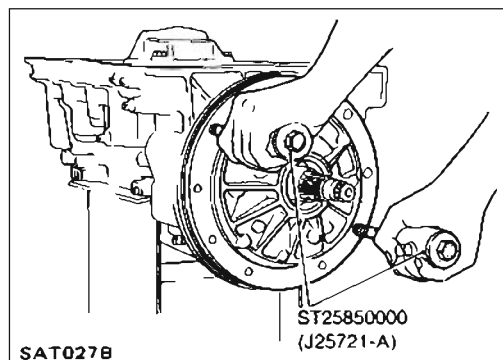


12. Remove O-ring from input shaft.



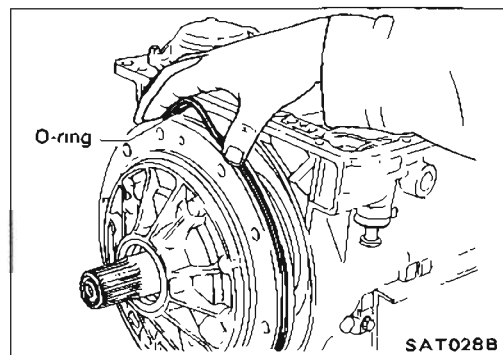
13. Remove oil pump assembly.

- a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



- b. Remove O-ring from oil pump assembly.
 - c. Remove traces of sealant from oil pump housing.

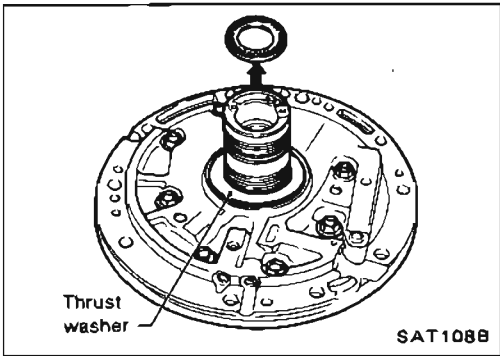
- **Be careful not to scratch pump housing.**



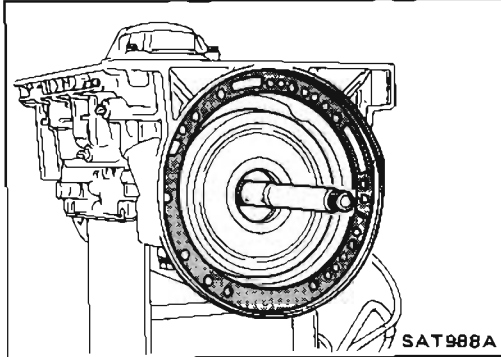
DISASSEMBLY

Disassembly (Cont'd)

- d. Remove needle bearing and thrust washer from oil pump assembly.

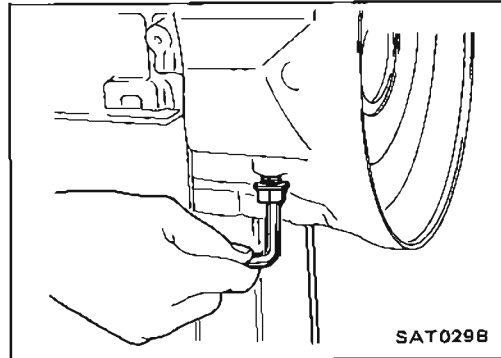


14. Remove input shaft and oil pump gasket.

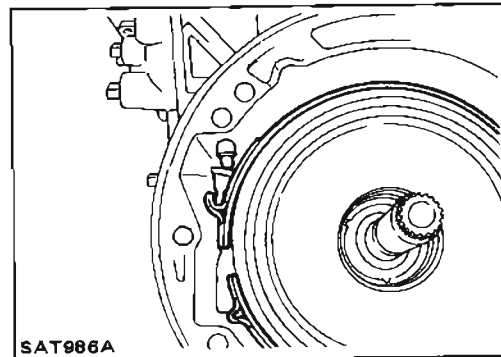


15. Remove brake band and band strut.

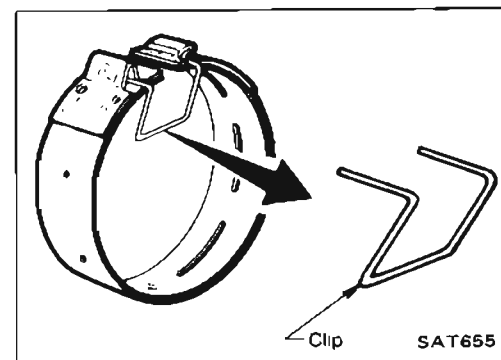
- a. Loosen lock nut and remove band servo anchor end pin from transmission case.



- b. Remove brake band and band strut from transmission case.



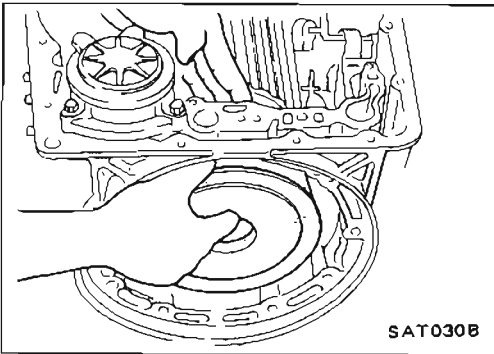
- c. Hold brake band in a circular shape with clip.



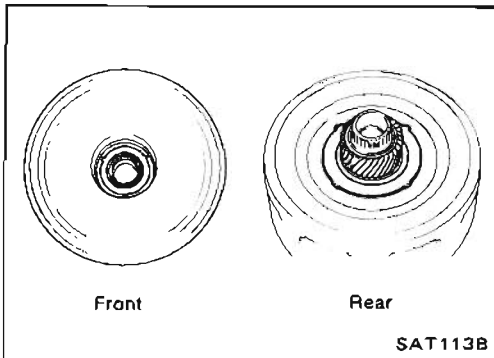
DISASSEMBLY

Disassembly (Cont'd)

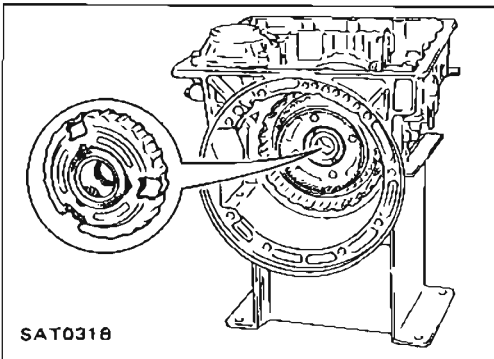
16. Remove front side clutch and gear components.
- Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.



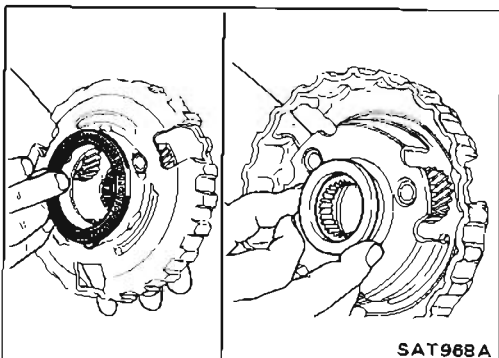
- Remove front bearing race from clutch pack.
- Remove rear bearing race from clutch pack.



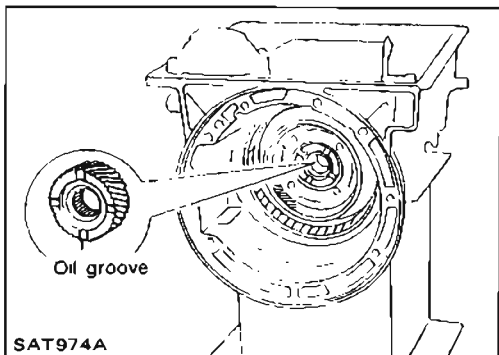
- Remove front planetary carrier from transmission case.



- Remove front needle bearing from front planetary carrier.
- Remove rear bearing from front planetary carrier.

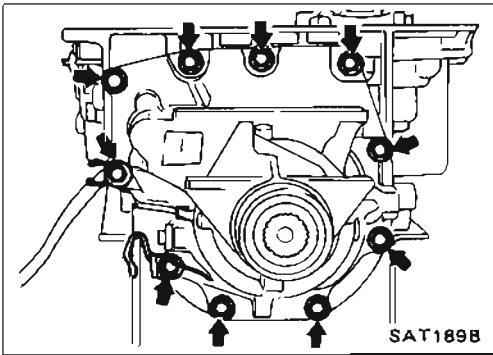


- Remove rear sun gear from transmission case.



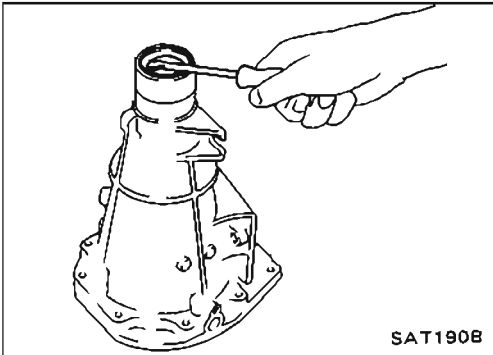
DISASSEMBLY

Disassembly (Cont'd)



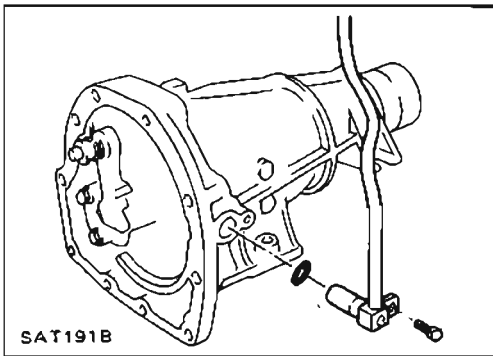
17. Remove rear extension.

- a. Remove rear extension from transmission case.
- b. Remove rear extension gasket from transmission case.



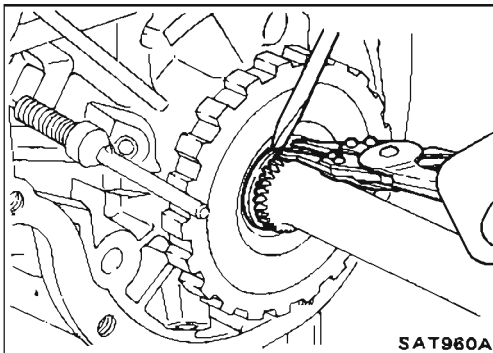
c. Remove oil seal from rear extension.

- Do not remove oil seal unless it is to be replaced.



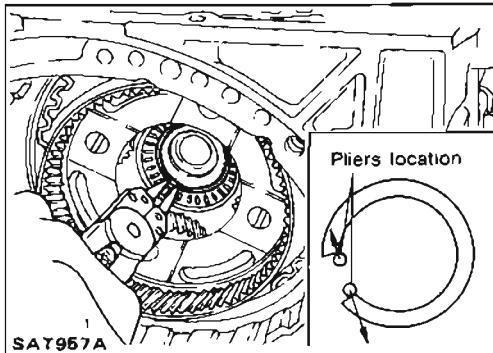
d. Remove revolution sensor from rear extension.

e. Remove O-ring from revolution sensor.



18. Remove output shaft and parking gear.

- a. Remove rear snap ring from output shaft.



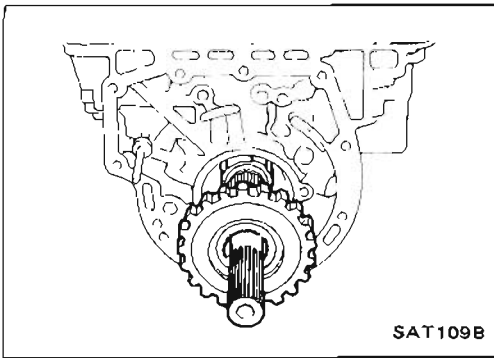
b. Slowly push output shaft all the way forward.

- Do not use excessive force.

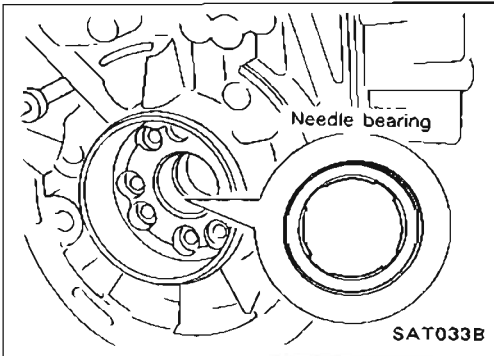
c. Remove snap ring from output shaft.

DISASSEMBLY

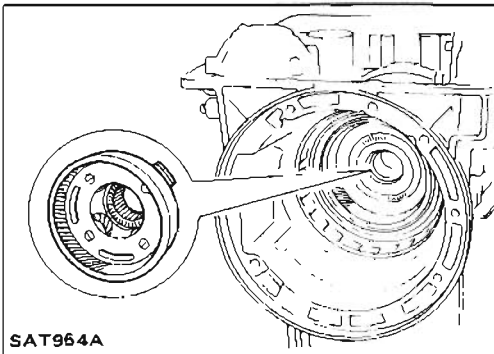
Disassembly (Cont'd)



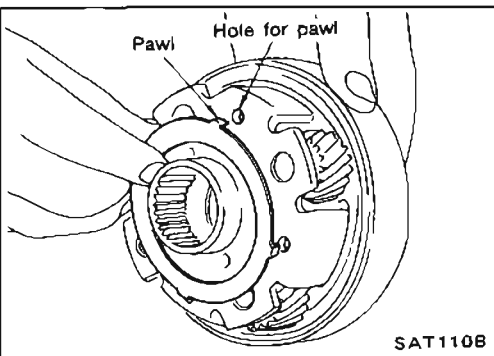
- d. Remove output shaft and parking gear as a unit from transmission case.
- e. Remove parking gear from output shaft.



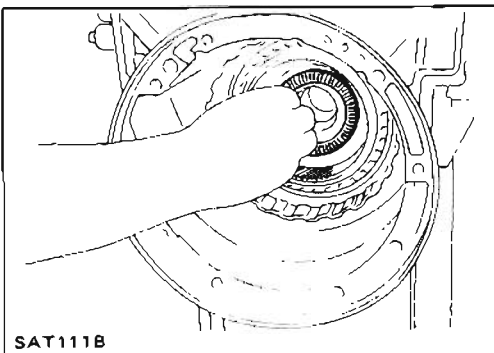
- f. Remove needle bearing from transmission case.



- 19. Remove rear side clutch and gear components.
 - a. Remove front internal gear.



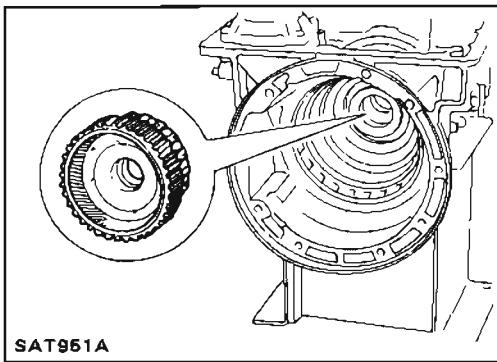
- b. Remove bearing race from front internal gear.



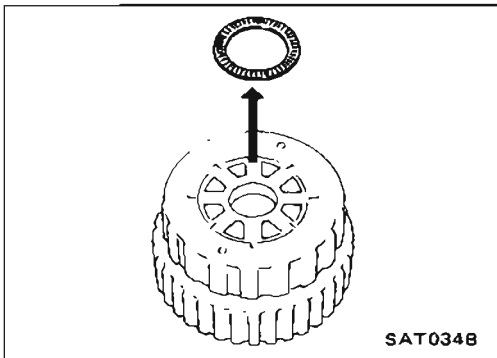
- c. Remove needle bearing from rear internal gear.

DISASSEMBLY

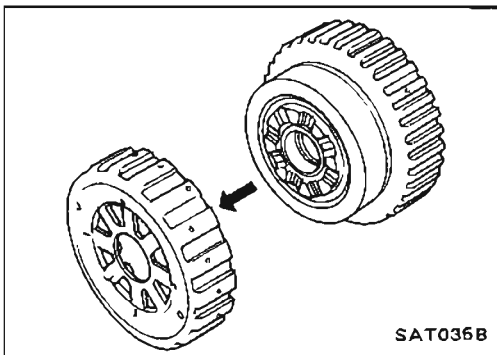
Disassembly (Cont'd)



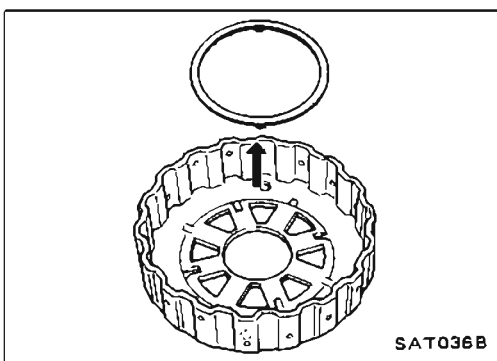
- d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.



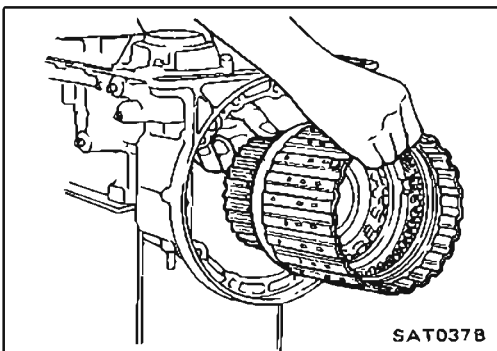
- e. Remove needle bearing from overrun clutch hub.



- f. Remove overrun clutch hub from rear internal gear and forward clutch hub.



- g. Remove thrust washer from overrun clutch hub.

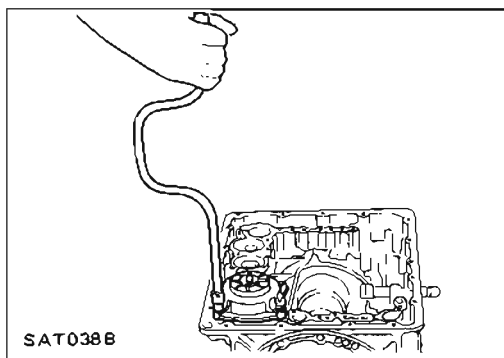


- h. Remove forward clutch assembly from transmission case.

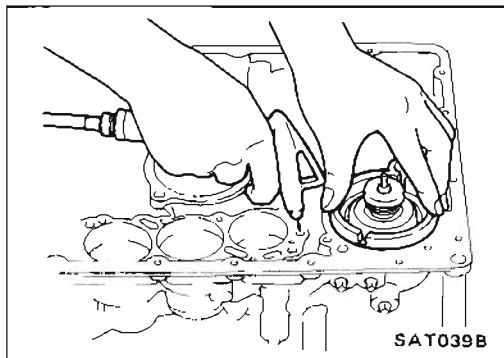
DISASSEMBLY

Disassembly (Cont'd)

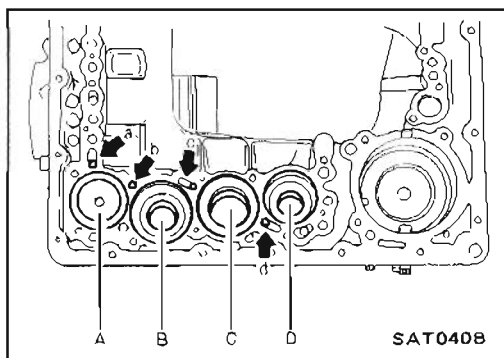
20. Remove band servo and accumulator components.
- Remove band servo retainer from transmission case.



- Apply compressed air to oil hole until band servo piston comes out of transmission case.
 - Hold piston with a rag and gradually direct air to oil hole.
- Remove return springs.

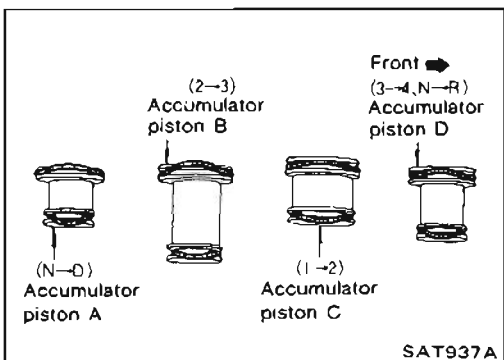


- Remove springs from accumulator pistons B, C and D.
- Apply compressed air to each oil hole until piston comes out.
 - Hold piston with a rag and gradually direct air to oil hole.

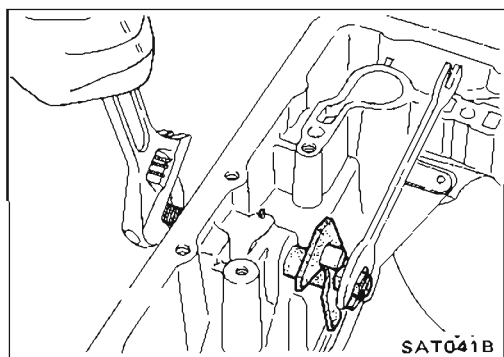


| | | | | |
|---------------------------------------|---|---|---|---|
| Identification of accumulator pistons | A | B | C | D |
| Identification of oil holes | a | b | c | d |

- Remove O-ring from each piston.



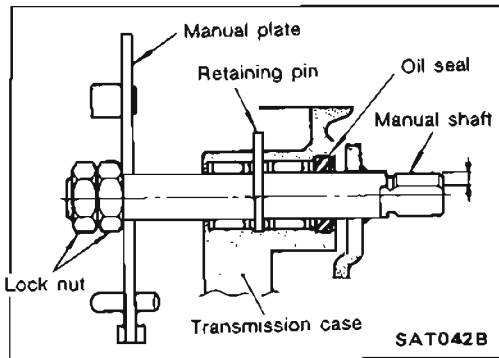
21. Remove manual shaft components, if necessary.
- Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.



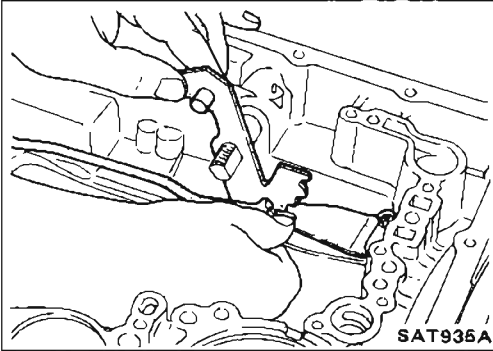
DISASSEMBLY

Disassembly (Cont'd)

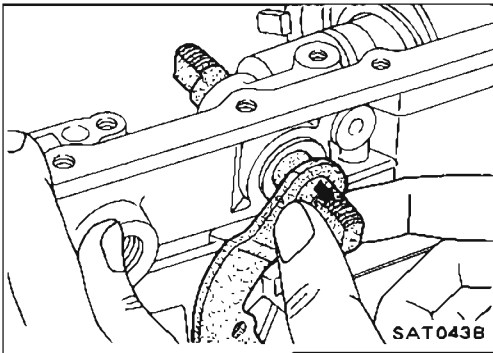
b. Remove retaining pin from transmission case.



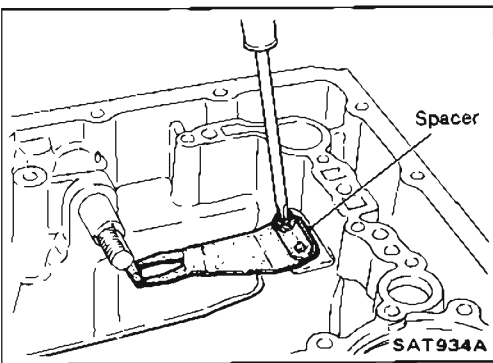
c. While pushing detent spring down, remove manual plate and parking rod from transmission case.



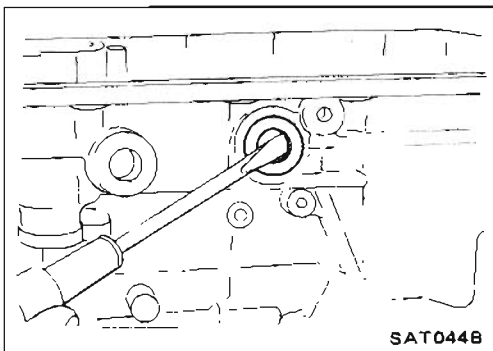
d. Remove manual shaft from transmission case.



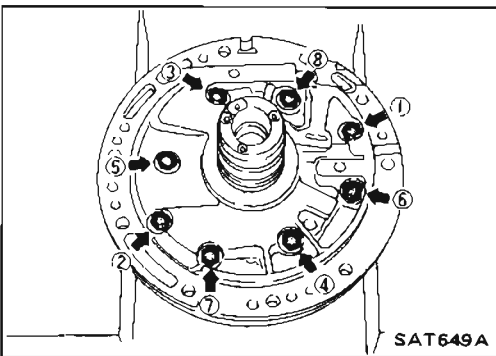
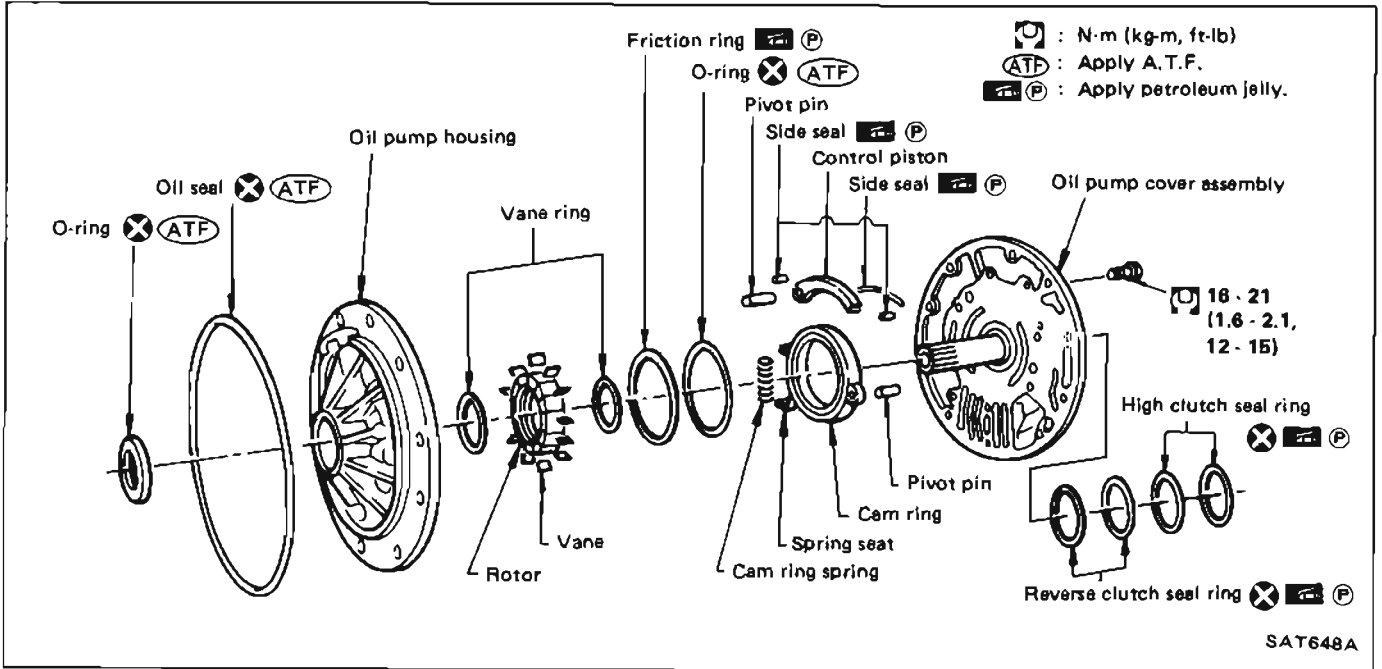
e. Remove spacer and detent spring from transmission case.



f. Remove oil seal from transmission case.

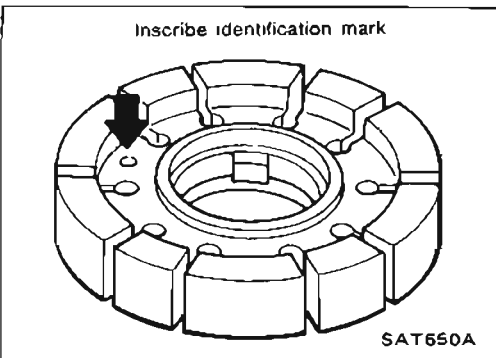


Oil Pump



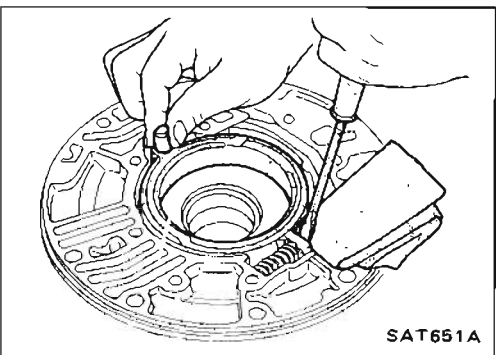
DISASSEMBLY

1. Loosen bolts in numerical order and remove oil pump cover.



2. Remove rotor, vane rings and vanes.

- Inscribe a mark on back of rotor for identification of fore-aft direction when reassembling rotor. Then remove rotor.

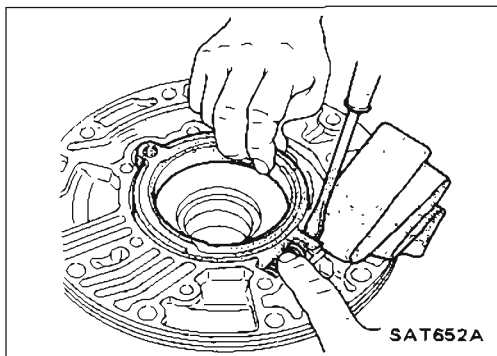


3. While pushing on cam ring remove pivot pin.

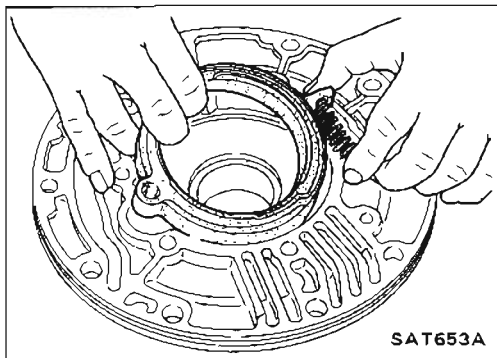
- Be careful not to scratch oil pump housing.

REPAIR FOR COMPONENT PARTS

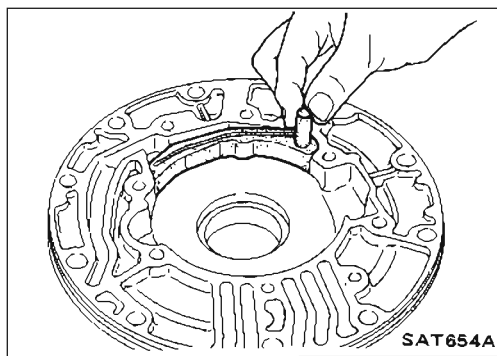
Oil Pump (Cont'd)



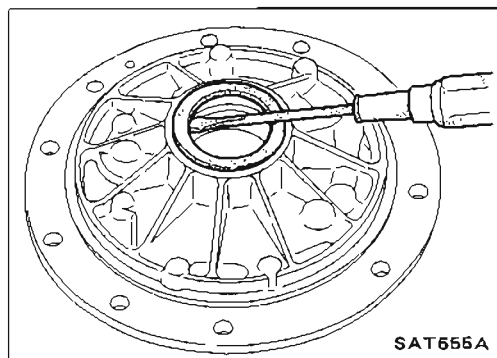
4. While holding cam ring and spring lift out cam ring spring.
 - Be careful not to damage oil pump housing.
 - Hold cam ring spring to prevent it from jumping.



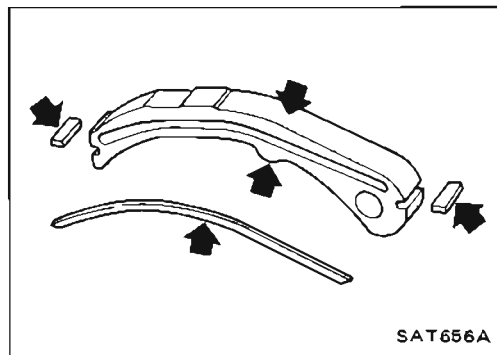
5. Remove cam ring and cam ring spring from oil pump housing.



6. Remove pivot pin from control piston and remove control piston assembly.



7. Remove oil seal from oil pump housing.
 - Be careful not to scratch oil pump housing.



INSPECTION

Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring

- Check for wear or damage.

Oil Pump (Cont'd)

Side clearances

- Measure side clearances between end of oil pump housing and cam ring, rotor, vanes and control piston in at least four places along their circumferences. Maximum measured values should be within specified ranges.
- **Before measuring side clearance, check that friction rings, O-ring, control piston side seals and cam ring spring are removed.**

Standard clearance:

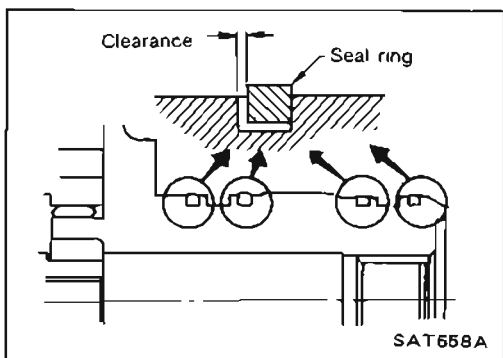
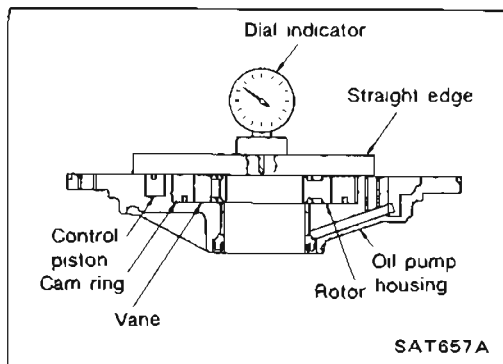
Cam ring

0.01 - 0.024 mm (0.0004 - 0.0009 in)

Rotor, vanes, control piston

0.03 - 0.044 mm (0.0012 - 0.0017 in)

- If not within standard clearance, replace oil pump assembly except oil pump cover assembly.



Seal ring clearance

- Measure clearance between seal ring and ring groove.

Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Wear limit:

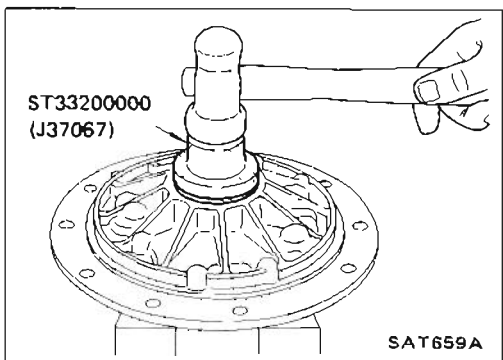
0.25 mm (0.0098 in)

- If not within wear limit, replace oil pump cover assembly.

ASSEMBLY

1. Drive oil seal into oil pump housing.

- **Apply A.T.F. to outer periphery and lip surface.**



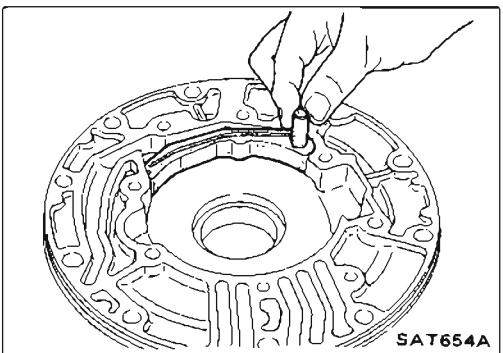
2. Install cam ring in oil pump housing by the following steps.

- a. Install side seal on control piston.

- **Pay attention to its direction — Black surface goes toward control piston.**

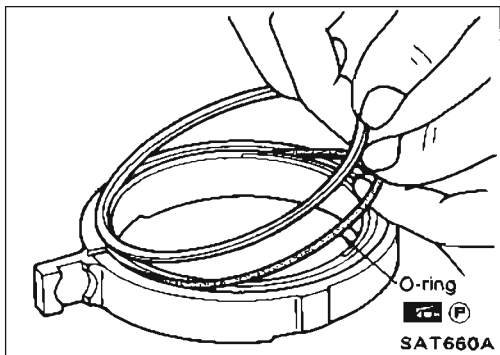
- **Apply petroleum jelly to side seal.**

- b. Install control piston on oil pump

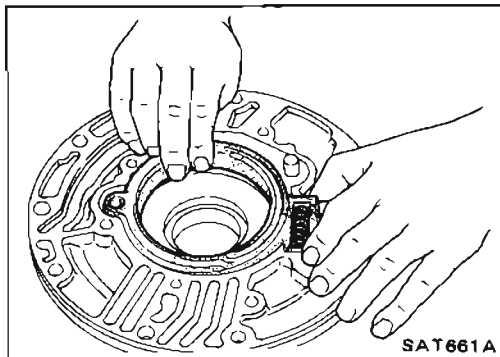


REPAIR FOR COMPONENT PARTS

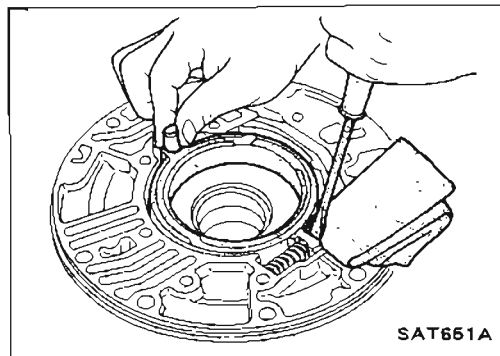
Oil Pump (Cont'd)



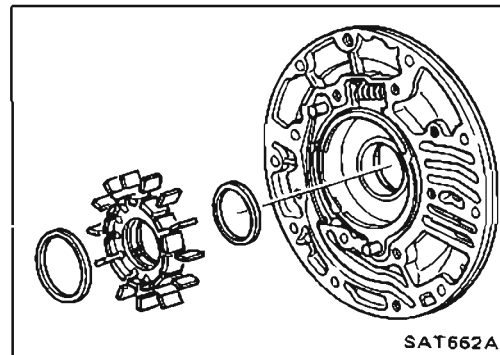
- c. Install O-ring and friction ring on cam ring.
● Apply petroleum jelly to O-ring.



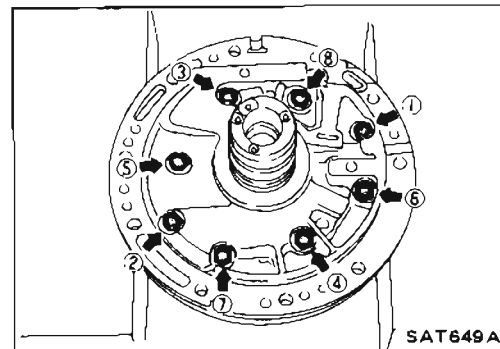
- d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.



- e. While pushing on cam ring install pivot pin.



3. Install rotor, vanes and vane rings.
● Pay attention to direction of rotor.



4. Install oil pump housing and oil pump cover.
a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.
b. Tighten bolts in a criss-cross pattern.

REPAIR FOR COMPONENT PARTS

Oil Pump (Cont'd)

5. Install seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.

- Seal rings come in two different diameters. Check fit carefully in each groove.

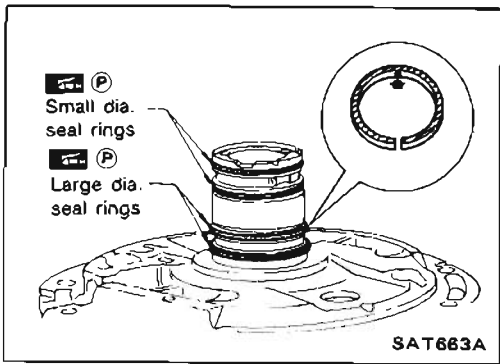
Small dia. seal ring:

No mark

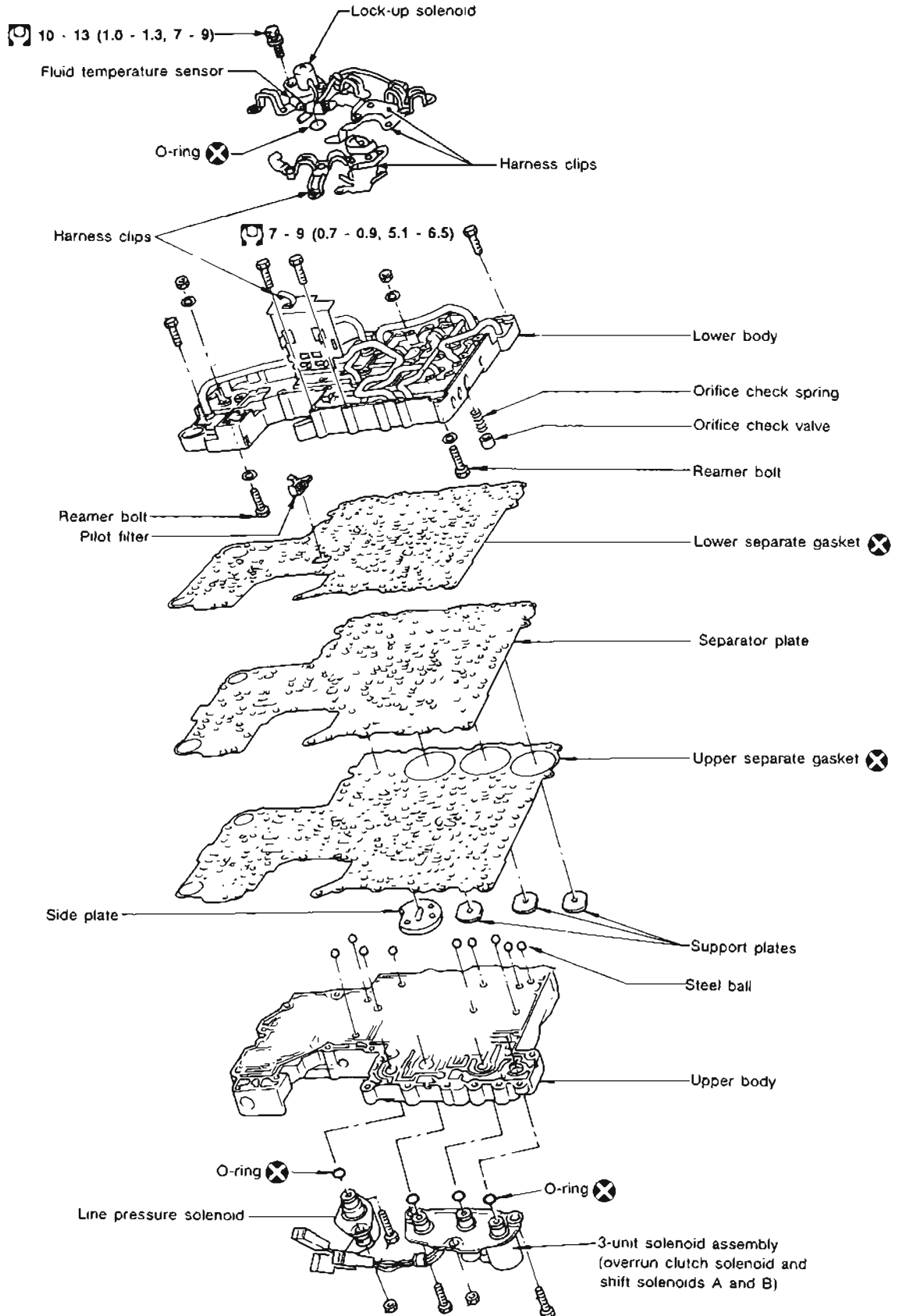
Large dia. seal ring:

Yellow mark in area shown by arrow

- Do not spread gap of seal ring excessively while installing. It may deform ring.



Control Valve Assembly

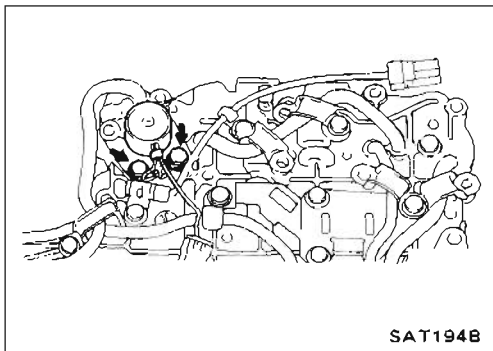


· N·m (kg·m, ft·lb)

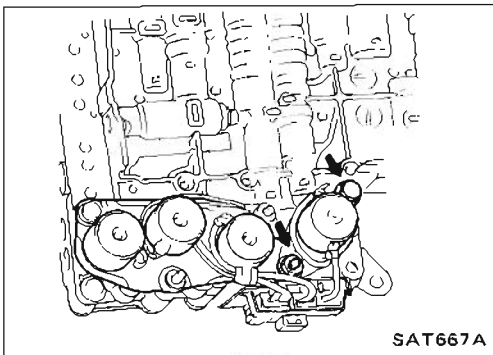
SAT193B

Control Valve Assembly (Cont'd)

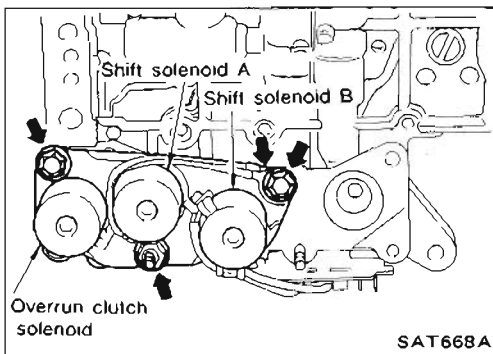
DISASSEMBLY



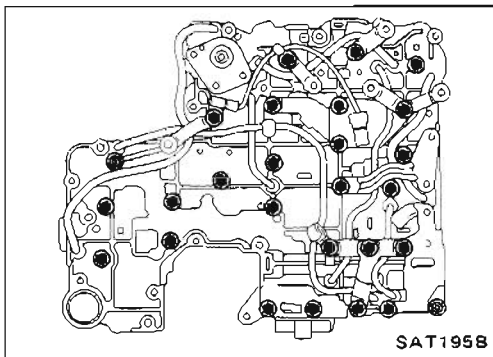
1. Remove solenoids.
 - a. Remove lock-up solenoid and side plate from lower body.
 - b. Remove O-ring from solenoid.



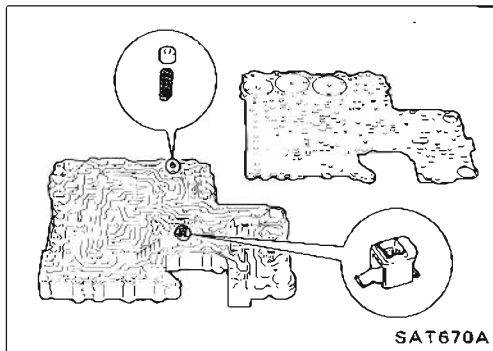
- c. Remove line pressure solenoid from upper body.
- d. Remove O-ring from solenoid.



- e. Remove 3-unit solenoid assembly from upper body.
- f. Remove O-rings from solenoids.



2. Disassemble upper and lower bodies.
 - a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
 - b. Remove lower body, separator plate and separate gasket as a unit from upper body.
 - **Be careful not to drop pilot filter, orifice check valve, spring and steel balls.**

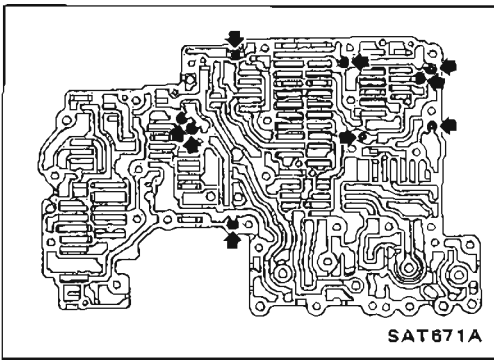


- c. Place lower body facedown, and remove separate gasket and separator plate.
- d. Remove pilot filter, orifice check valve and orifice check spring.

REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

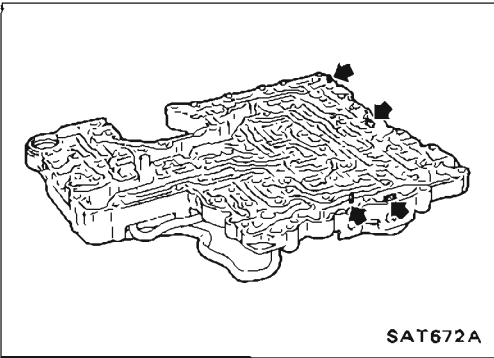
- e. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.



INSPECTION

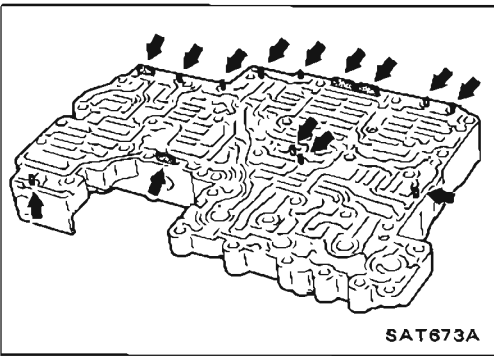
Lower and upper bodies

- Check to see that there are pins and retainer plates in lower body.



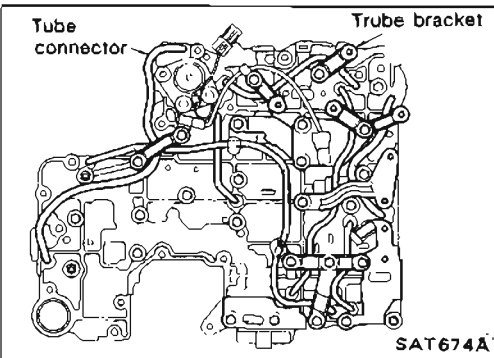
- Check to see that there are pins and retainer plates in upper body.

- **Be careful not to lose these parts.**



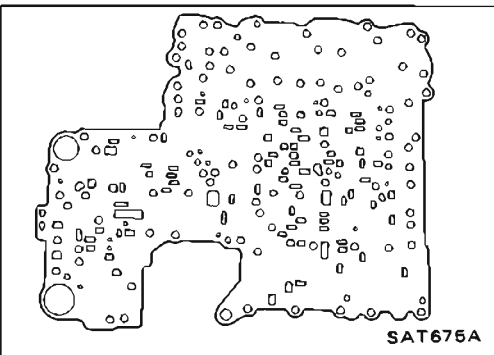
- Check to make sure that oil circuits are clean and free from damage.

- Check tube brackets and tube connectors for damage.



Separator plates

- Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.

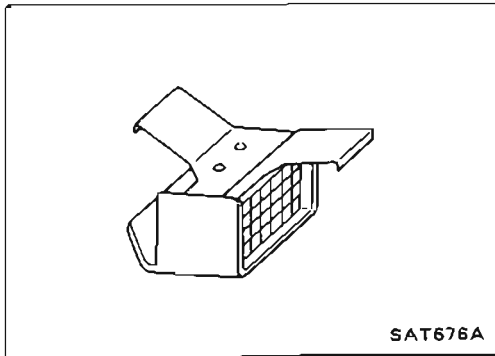


REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

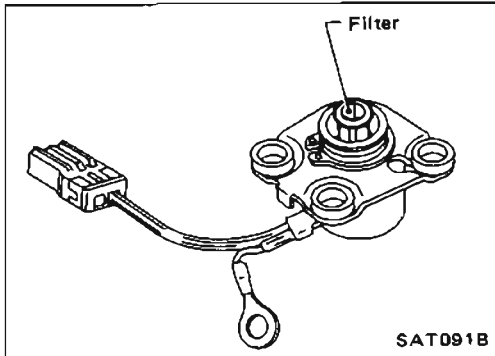
Pilot filter

- Check to make sure that filter is not clogged or damaged.



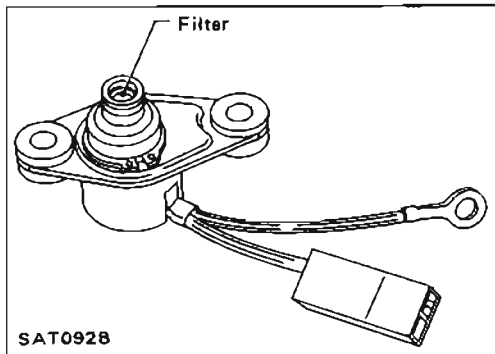
Lock-up solenoid

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



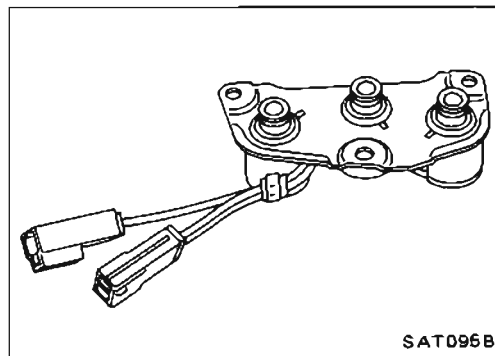
Line pressure solenoid

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



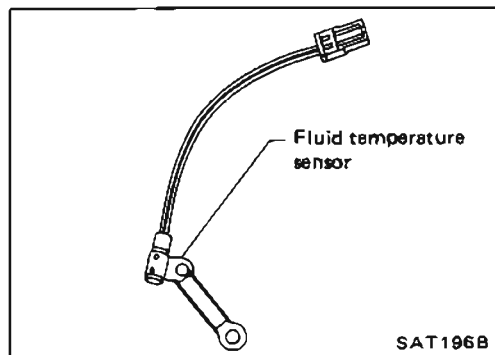
3-unit solenoid assembly (Overrun clutch solenoid and shift solenoids A and B)

- Measure resistance of each solenoid. — Refer to "Electrical Components Inspection".



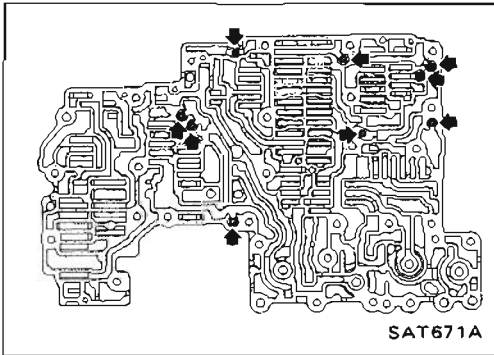
Fluid temperature sensor

- Measure resistance. — Refer to "Electrical Components Inspection".

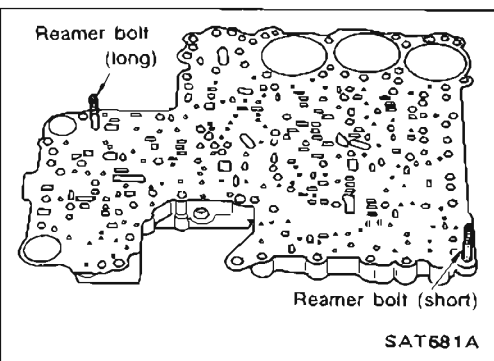


REPAIR FOR COMPONENT PARTS

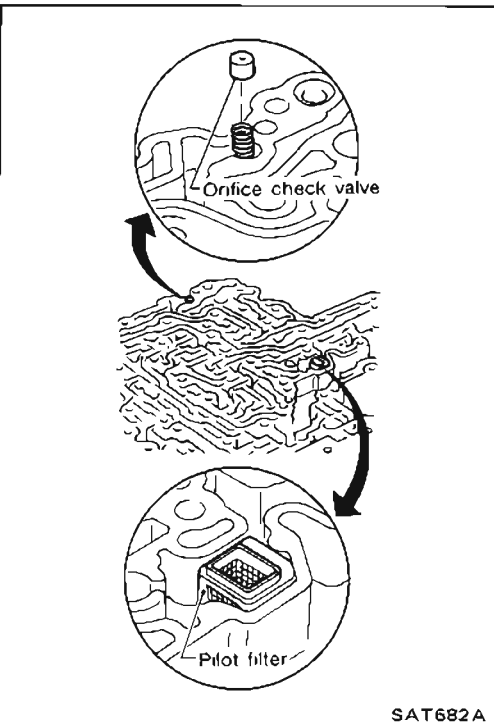
Control Valve Assembly (Cont'd) ASSEMBLY



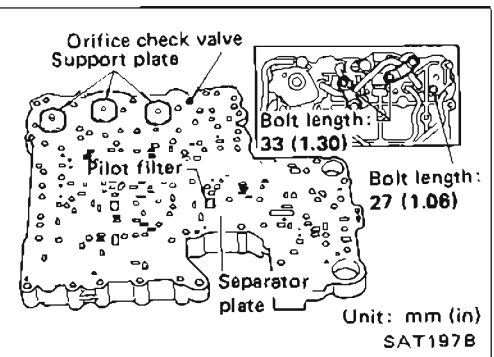
1. Install upper and lower bodies.
 - a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



- b. Install reamer bolts from bottom of upper body and install separate gaskets.



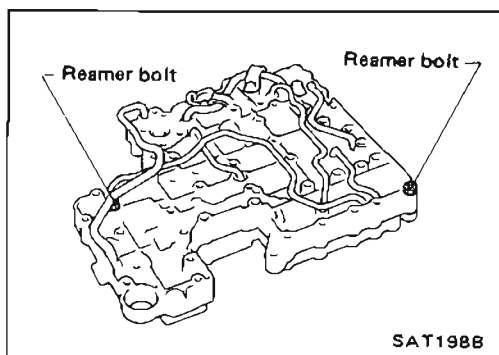
- c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.



- d. Install lower separate gaskets and separator plates on lower body.
 - e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.

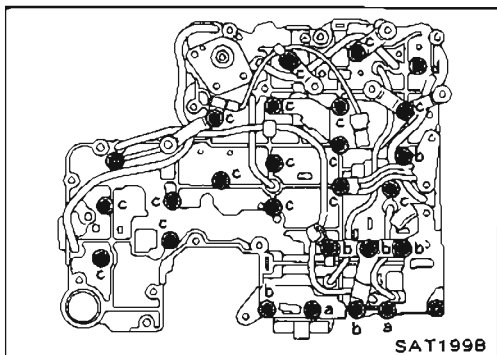
REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)



f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

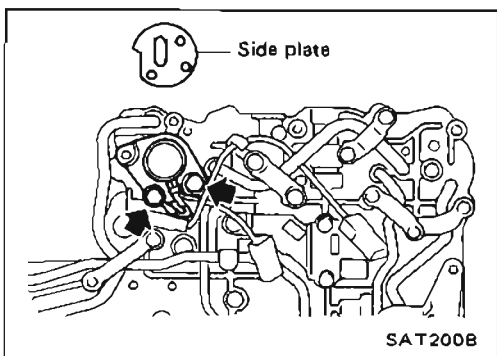
- Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.



g. Install and temporarily tighten bolts and tube brackets in their proper locations.

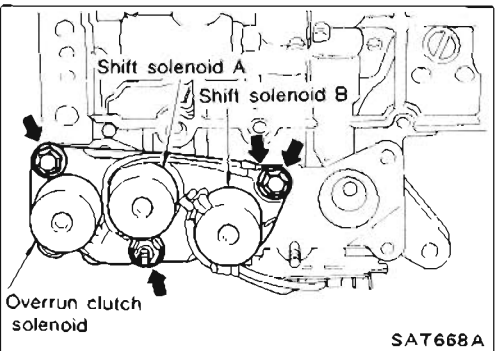
Bolt length and location:

| Item | Bolt symbol | a | b | c | d |
|------|-------------|-------------|---------|--------------|--------------|
| | | Bolt length | mm (in) | 70 (2.76) | 50 (1.97) |

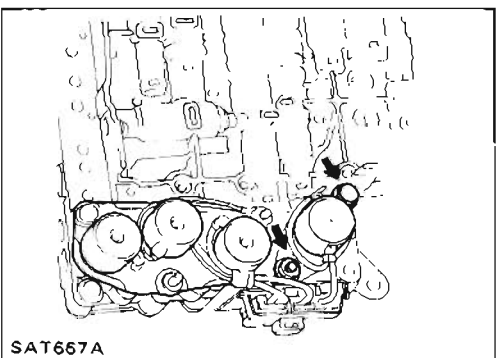


2. Install solenoids.

a. Attach O-ring and install lock-up solenoid and side plates onto lower body.



b. Attach O-rings and install 3-unit solenoids assembly onto upper body.



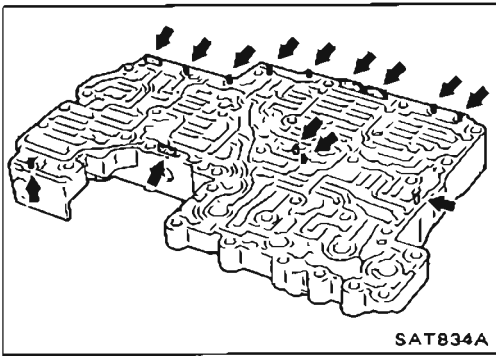
c. Attach O-ring and install line pressure solenoid onto upper body.

3. Tighten all bolts.

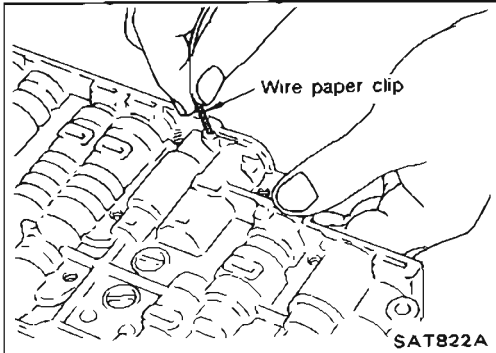
REPAIR FOR COMPONENT PARTS

Control Valve Upper Body (Cont'd) DISASSEMBLY

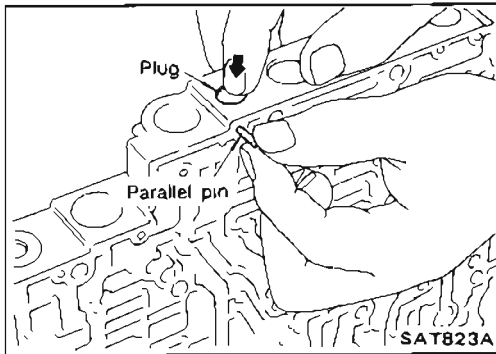
1. Remove valves at parallel pins.
 - Do not use a magnetic hand.



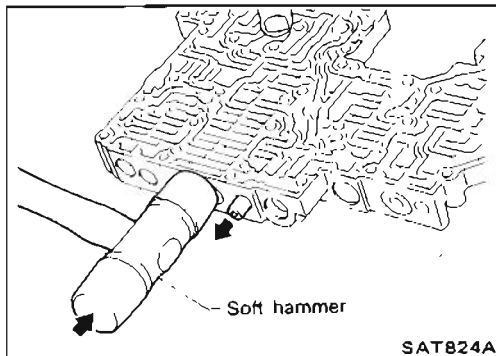
- a. Use a wire paper clip to push out parallel pins.



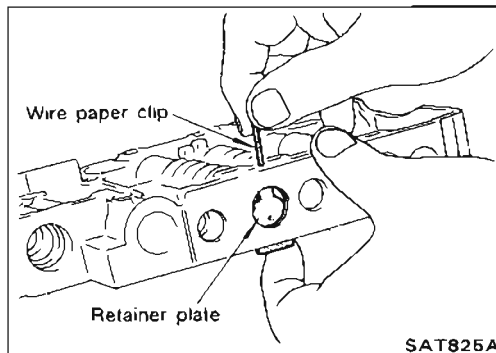
- b. Remove parallel pins while pressing their corresponding plugs and sleeves.
 - Remove plug slowly to prevent internal parts from jumping out.



- c. Place mating surface of valve facedown, and remove internal parts.
 - If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.
 - Be careful not to drop or damage valves and sleeves.



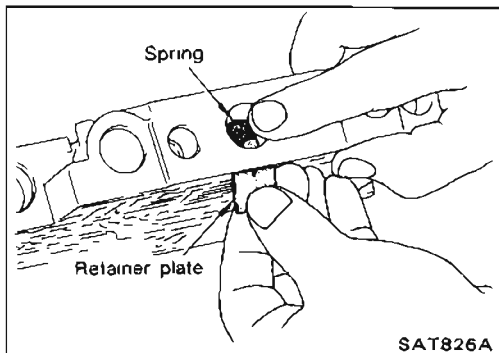
2. Remove valves at retainer plates.
 - a. Pry out retainer plate with wire paper clip.



REPAIR FOR COMPONENT PARTS

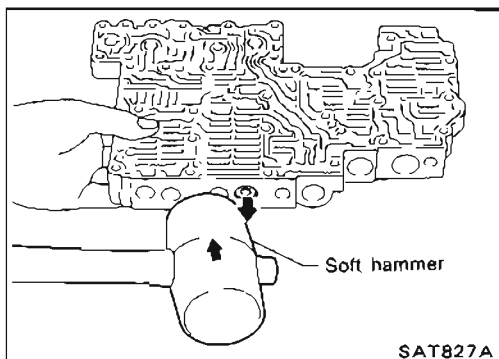
Control Valve Upper Body (Cont'd)

b. Remove retainer plates while holding spring.



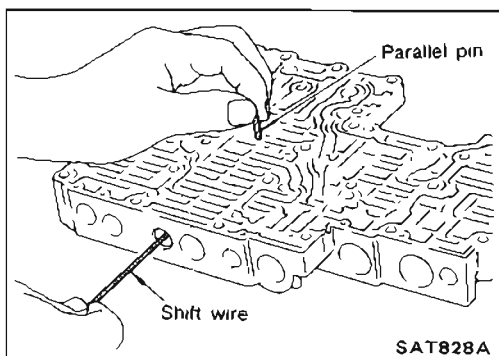
c. Place mating surface of valve facedown, and remove internal parts.

- If a valve is hard to remove, lightly tap valve body with a soft hammer.
- Be careful not to drop or damage valves, sleeves, etc.



● 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.

- Be careful not to scratch sliding surface of valve with wire.



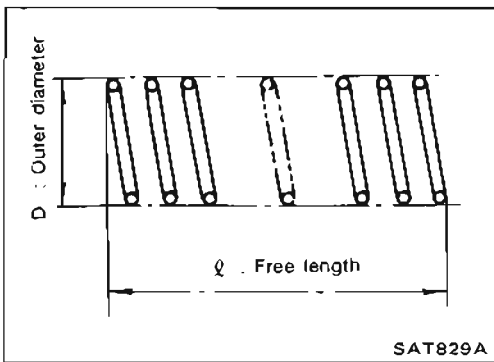
REPAIR FOR COMPONENT PARTS

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 AT-112.



Inspection standard

Unit: mm (in)

| Parts | Item | Part No. | ℓ | D |
|-------|--------------------------------------|-------------|----------------|---------------|
| ① | Torque converter relief valve spring | 31742-41X18 | 32.3 (1.272) | 9.0 (0.354) |
| ② | Pressure regulator valve spring | 31742-41X16 | 61.5 (2.421) | 8.9 (0.350) |
| ③ | Pressure modifier valve spring | 31742-41X19 | 31.95 (1.2579) | 6.8 (0.268) |
| ④ | Shuttle shift valve D spring | 31762-41X00 | 26.5 (1.043) | 6.0 (0.236) |
| ⑤ | 4-2 sequence valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| ⑥ | Shift valve B spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| ⑦ | 4-2 relay valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| ⑧ | Shift valve A spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| ⑨ | Overrun clutch control valve spring | 31762-41X03 | 23.6 (0.929) | 7.0 (0.276) |
| ⑩ | Overrun clutch reducing valve spring | 31742-41X20 | 32.5 (1.280) | 7.0 (0.276) |
| ⑪ | Shuttle shift valve S spring | 31762-41X04 | 51.0 (2.008) | 5.65 (0.2224) |
| ⑫ | Pilot valve spring | 31742-41X13 | 25.7 (1.012) | 9.1 (0.358) |
| ⑬ | Lock-up control valve spring | 31742-41X22 | 18.5 (0.728) | 13.0 (0.512) |

- Replace valve springs if deformed or fatigued.

Control valves

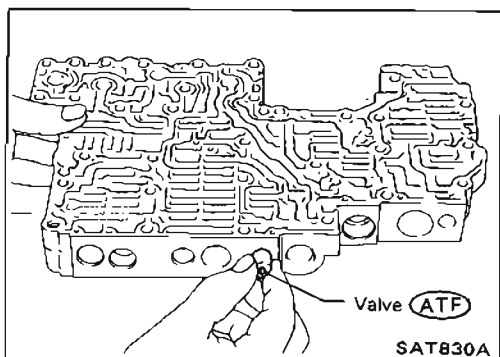
- Check sliding surfaces of valves, sleeves and plugs.

REPAIR FOR COMPONENT PARTS

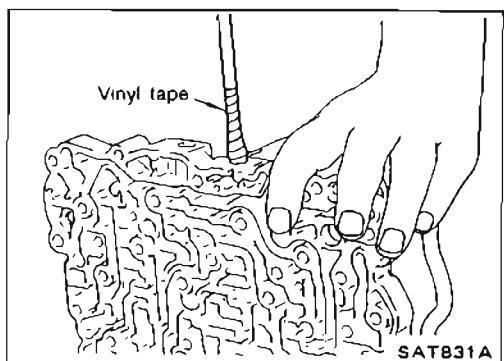
Control Valve Upper Body (Cont'd) ASSEMBLY

1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

- Be careful not to scratch or damage valve body.

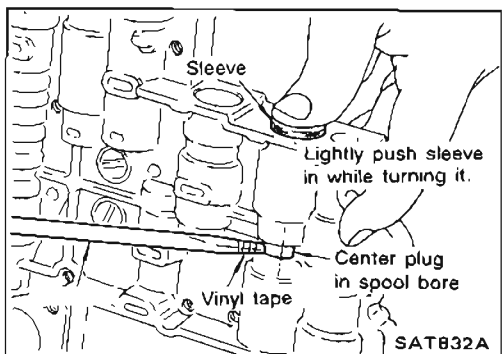


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.



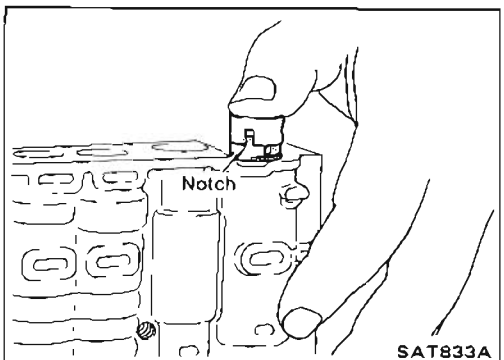
Pressure regulator valve

- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body. If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.

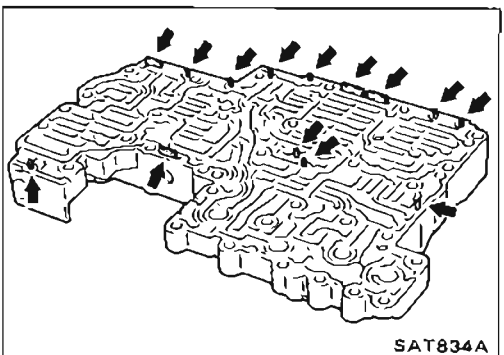


Accumulator control plug

- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



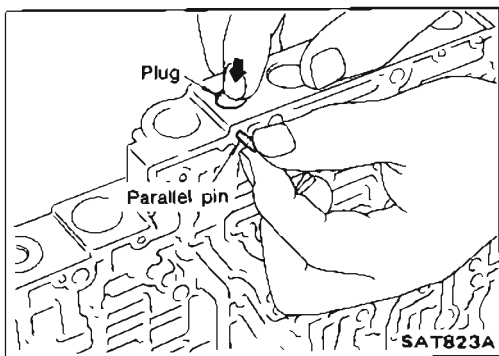
2. Install parallel pins and retainer plates.



REPAIR FOR COMPONENT PARTS

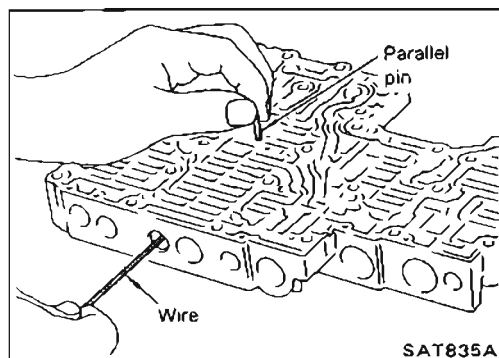
Control Valve Upper Body (Cont'd)

- While pushing plug, install parallel pin.

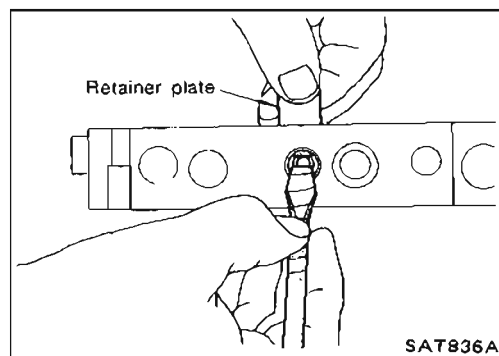


4-2 sequence valve and relay valve

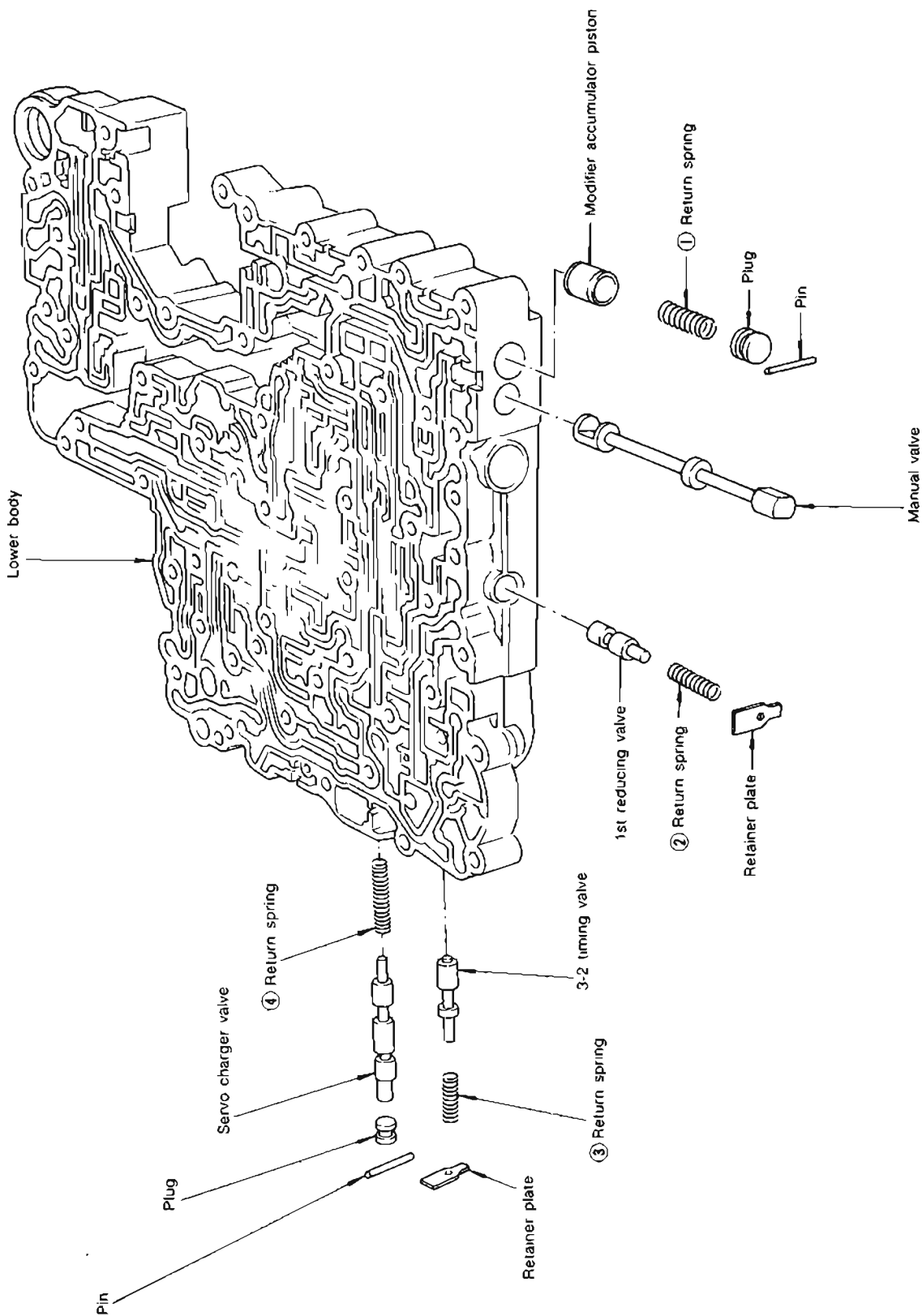
- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.



- Insert retainer plate while pushing spring.



Control Valve Lower Body



Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-119.

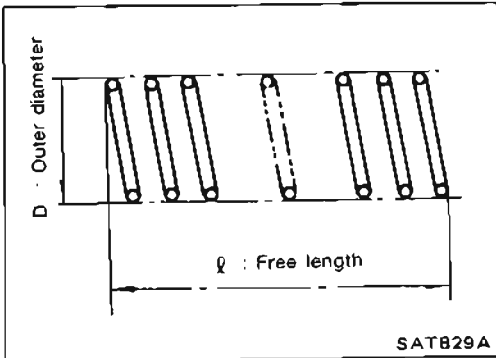
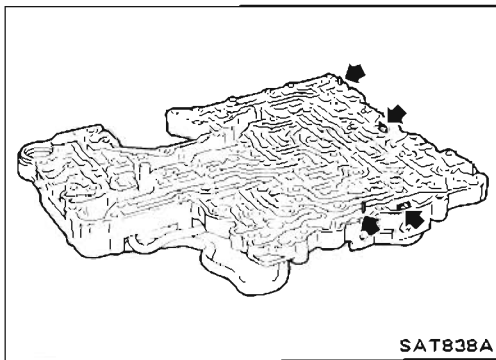
Apply A.T.F. to all components before their installation.

REPAIR FOR COMPONENT PARTS

Control Valve Lower Body (Cont'd)

DISASSEMBLY

1. Remove valves at parallel pins.
 2. Remove valves at retainer plates.
- For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-118.

Inspection standard:

Unit: mm (in)

| Parts | Item | Part No. | ℓ | D |
|-------|------------------------------------|-------------|----------------|---------------|
| ① | Modifier accumulator piston spring | 31742-41X15 | 30.5 (1.201) | 9.8 (0.386) |
| ② | 1st reducing valve spring | 31756-41X05 | 25.4 (1.000) | 6.75 (0.2657) |
| ③ | 3-2 timing valve spring | 31742-41X08 | 20.55 (0.8091) | 6.75 (0.2657) |
| ④ | Servo charger valve spring | 31742-41X06 | 23.0 (0.906) | 6.7 (0.264) |

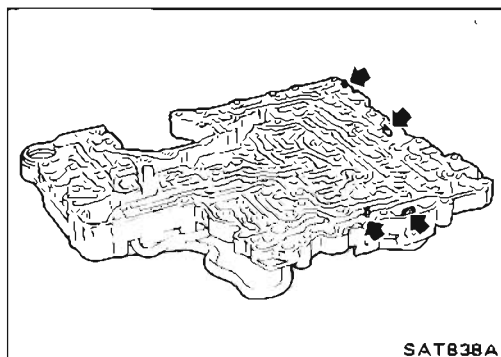
- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

ASSEMBLY

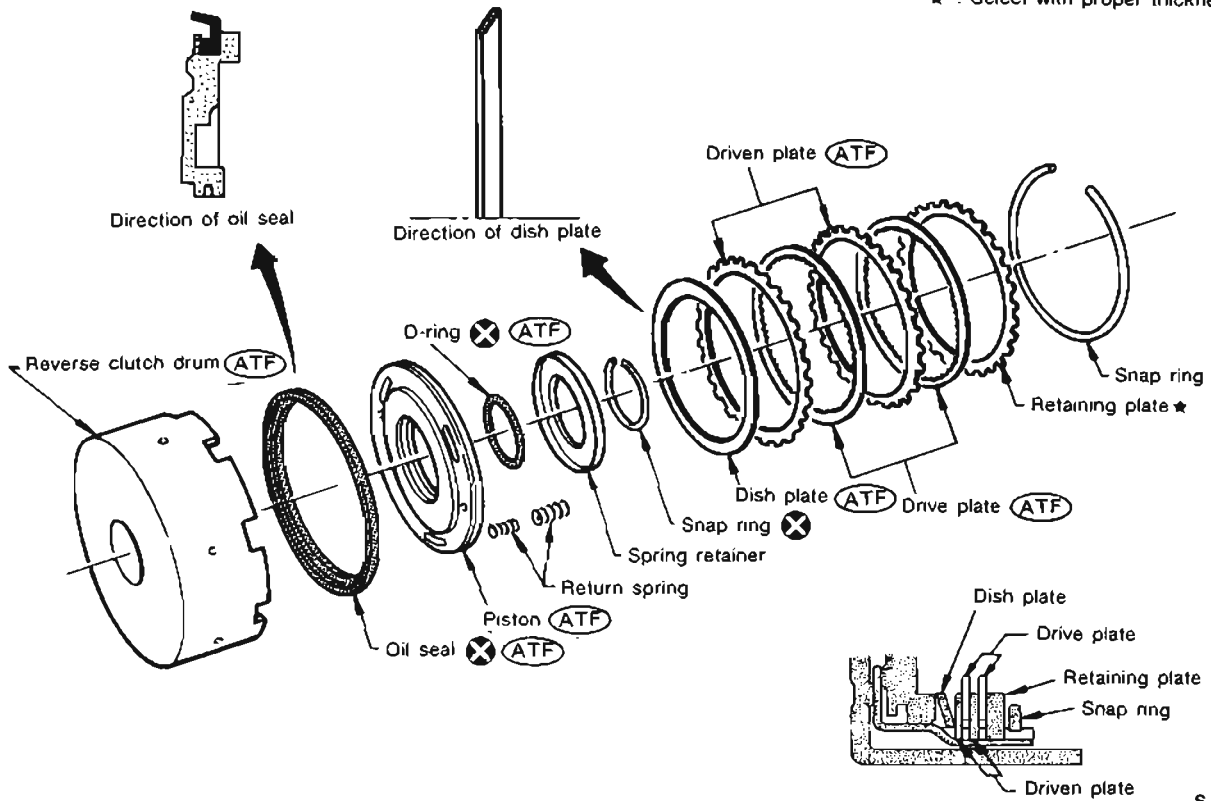
- Install control valves.
For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.



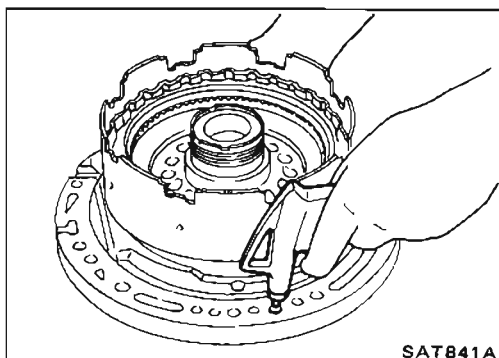
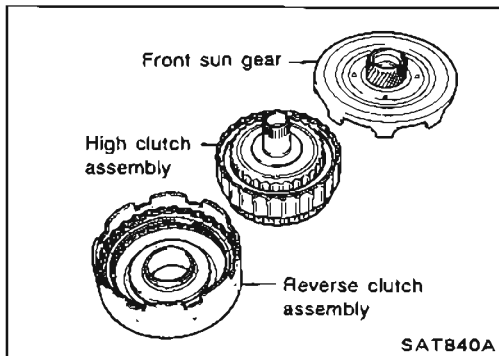
Reverse Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

(ATF) : Apply A.T.F.
 ★ : Select with proper thickness.



SATB39A



DISASSEMBLY

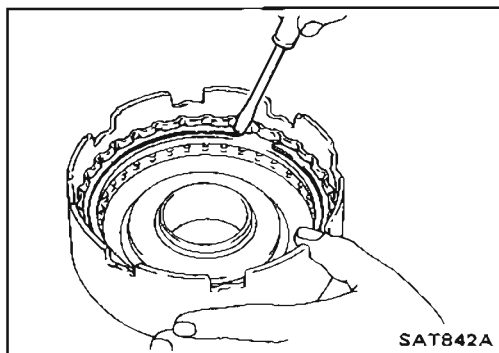
1. Remove reverse clutch assembly from clutch pack.

2. Check operation of reverse clutch.

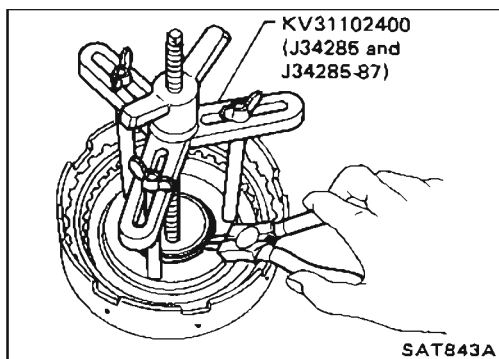
- a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
- b. Check to see that retaining plate moves to snap ring.
- c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

REPAIR FOR COMPONENT PARTS

Reverse Clutch (Cont'd)



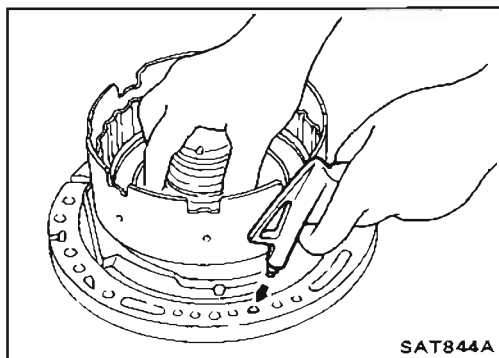
- Remove drive plates, driven plates, retaining plate, dish plate and snap ring.



- Remove snap ring from clutch drum while compressing clutch springs.

- Do not expand snap ring excessively.

- Remove spring retainer and return spring.



- Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.

- Do not apply compressed air abruptly.

- Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.

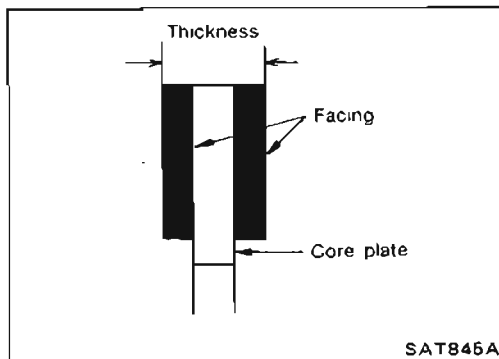
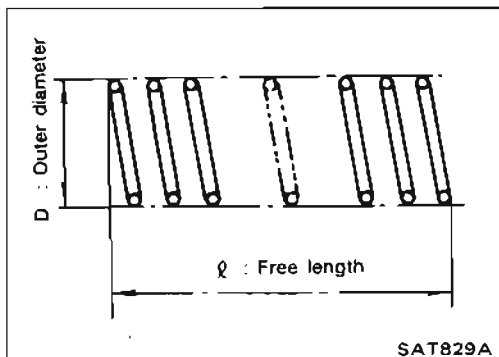
Reverse clutch return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

| Parts | Part No. | ℓ | D |
|--------|-------------|----------------|--------------|
| Spring | 30505-41X02 | 19.69 (0.7752) | 11.6 (0.457) |



Reverse clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Standard value: 2.0 mm (0.079 in)

Wear limit: 1.8 mm (0.071 in)

- If not within wear limit, replace.

Reverse clutch dish plate

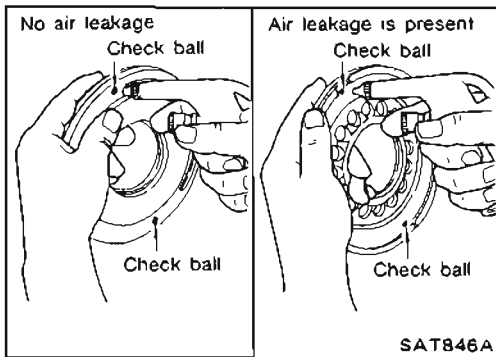
- Check for deformation or damage.

REPAIR FOR COMPONENT PARTS

Reverse Clutch (Cont'd)

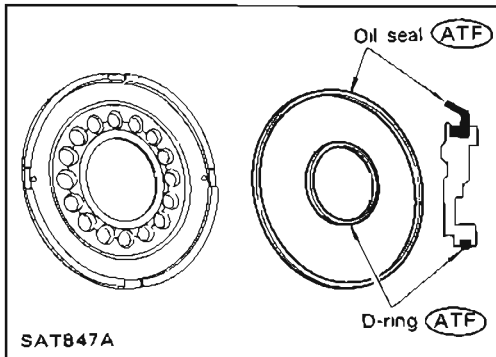
Reverse clutch piston

- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring to assure that there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

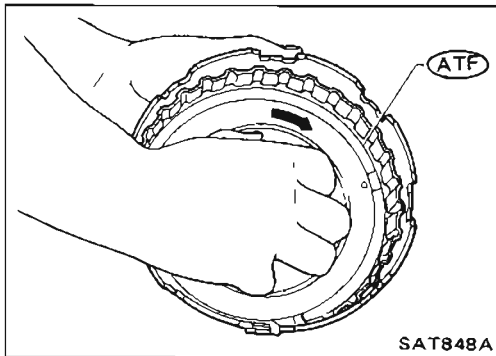


ASSEMBLY

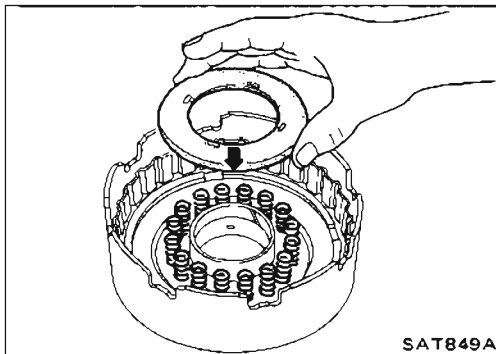
1. Install D-ring and oil seal on piston.
 - Apply A.T.F. to both parts.



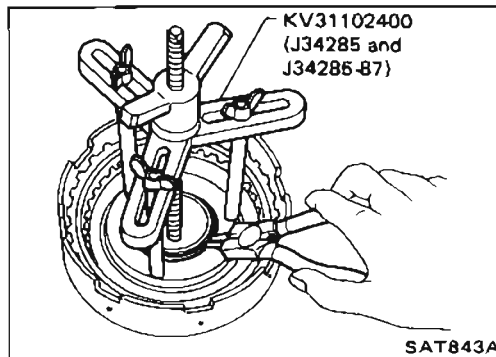
2. Install piston assembly by turning it slowly and evenly.
 - Apply A.T.F. to inner surface of drum.



3. Install return springs and spring retainer.



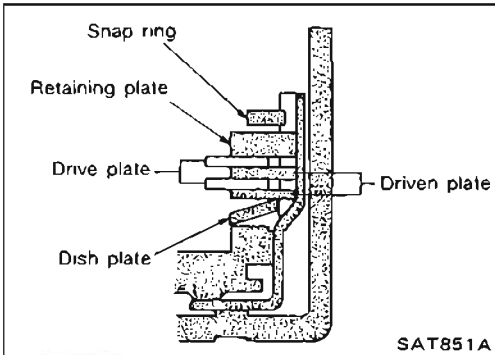
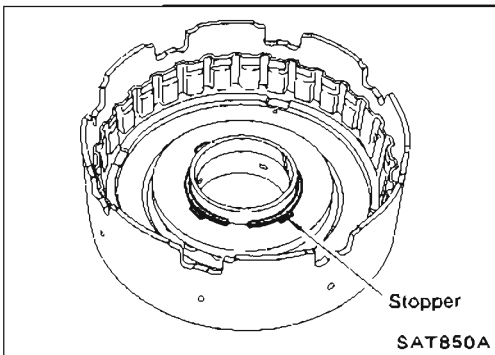
4. Install snap ring while compressing clutch springs.



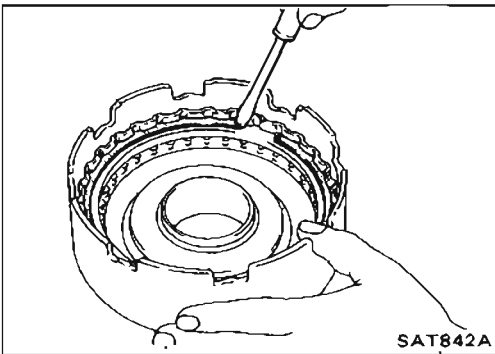
REPAIR FOR COMPONENT PARTS

Reverse Clutch (Cont'd)

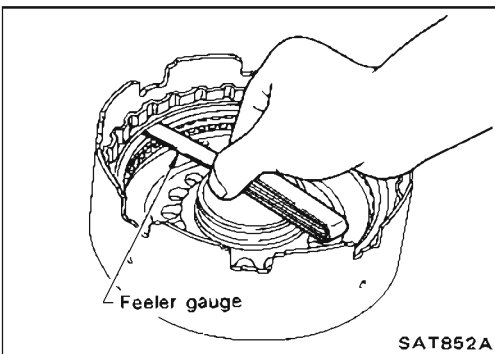
- Do not align snap ring gap with spring retainer stopper.



5. Install drive plates, driven plates, retaining plate and dish plate.



6. Install snap ring.



7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard

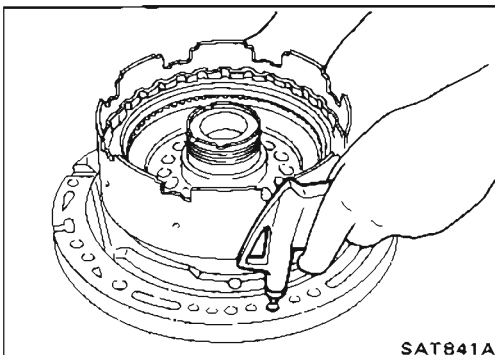
0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.2 mm (0.047 in)

Retaining plate:

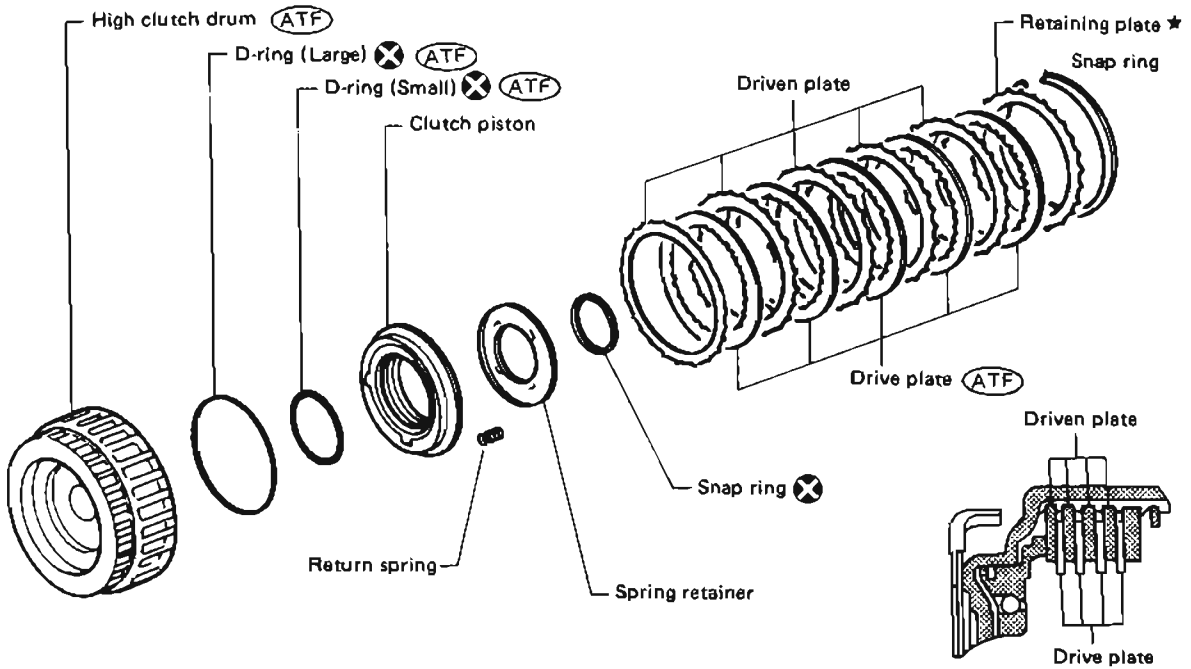
Refer to S.D.S.



8. Check operation of reverse clutch.
Refer to "DISASSEMBLY" of Reverse Clutch.

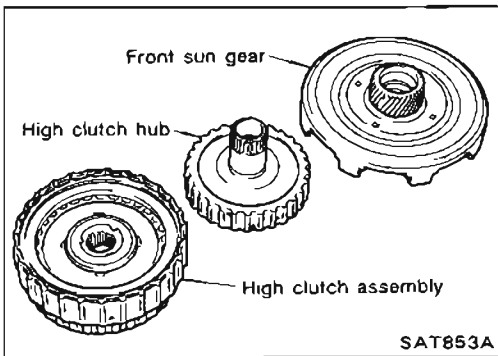
High Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



(ATF) : Apply A.T.F.
 ★ : Select with proper thickness.

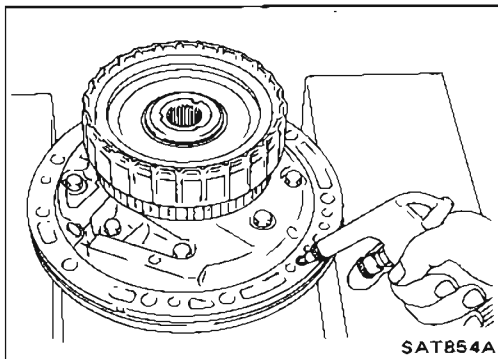
SAT809B



SAT853A

Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

- Check of high clutch operation

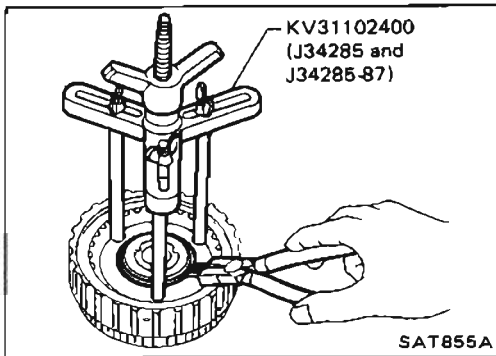


SAT854A

REPAIR FOR COMPONENT PARTS

High Clutch (Cont'd)

- Removal and installation of return spring

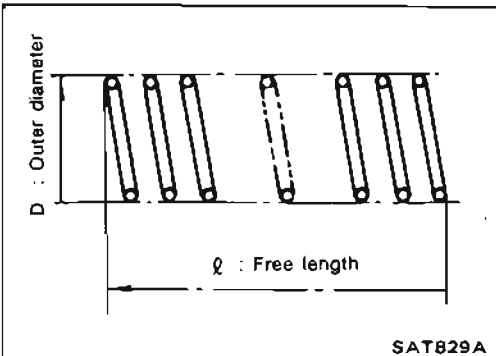


- Inspection of high clutch return springs

Inspection standard:

Unit: mm (in)

| Part No. | ℓ | D |
|-------------|----------------|--------------|
| 31505-21X03 | 22.06 (0.8685) | 11.6 (0.457) |



- Inspection of high clutch drive plate

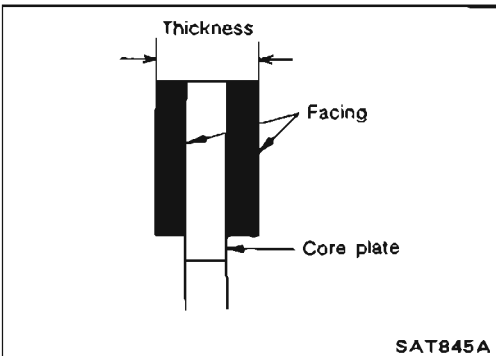
Thickness of drive plate:

Standard

1.6 mm (0.063 in)

Wear limit

1.4 mm (0.055 in)



- Measurement of clearance between retaining plate and snap ring

Specified clearance:

Standard

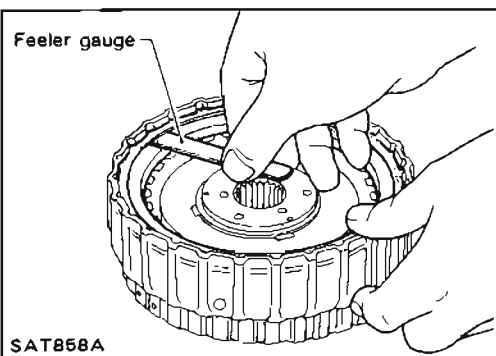
1.8 - 2.2 mm (0.071 - 0.087 in)

Allowable limit

3.0 mm (0.118 in)

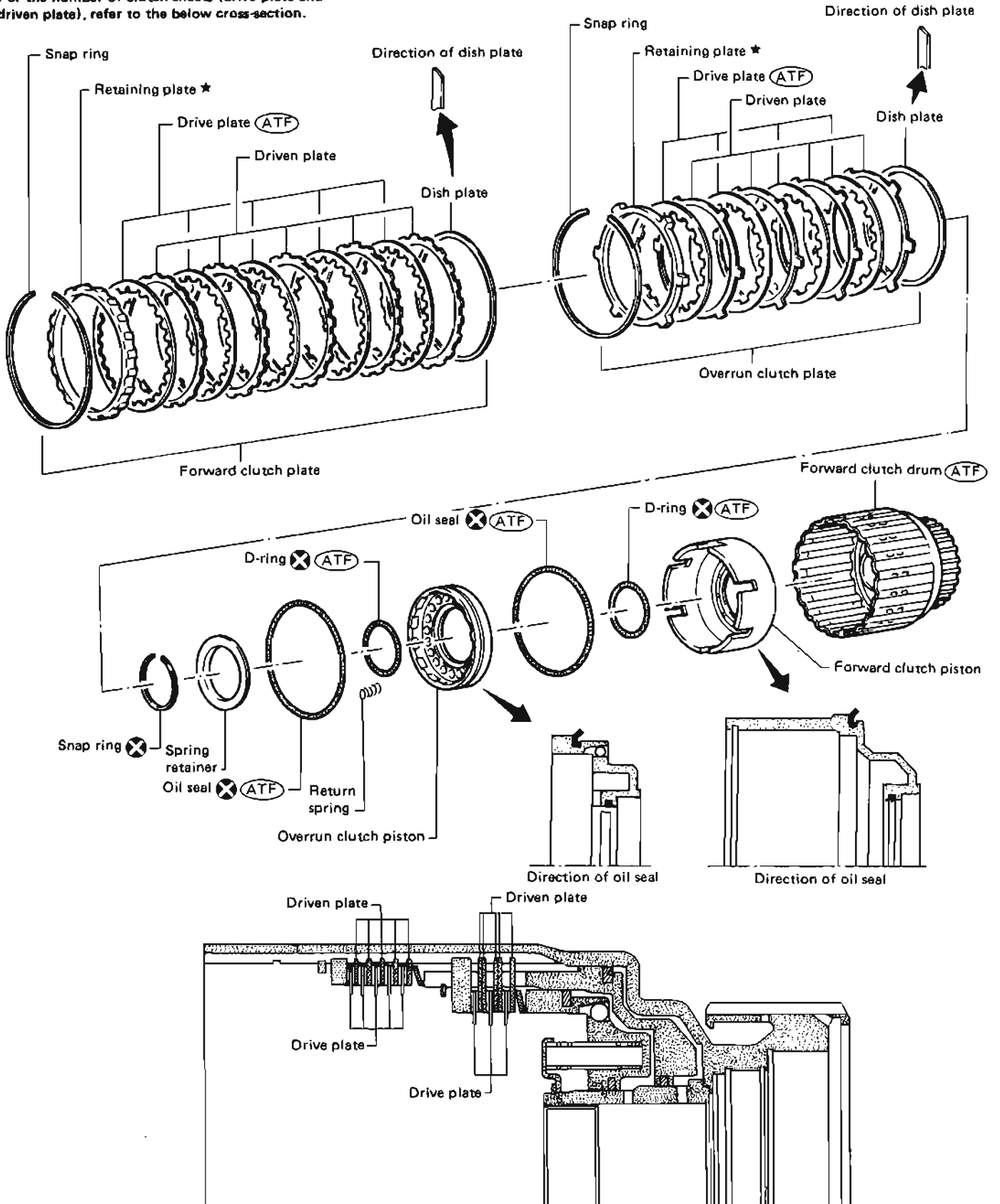
Retaining plate:

Refer to S.D.S.



Forward and Overrun Clutches

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



(ATF) : Apply A.T.F.

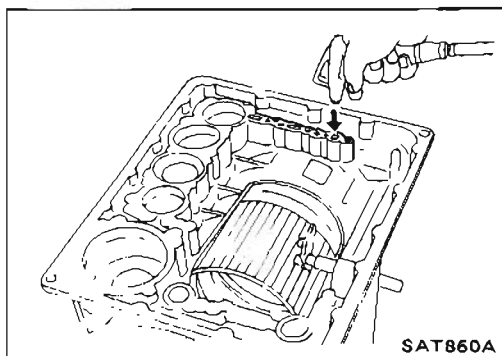
★ : Select with proper thickness.

REPAIR FOR COMPONENT PARTS

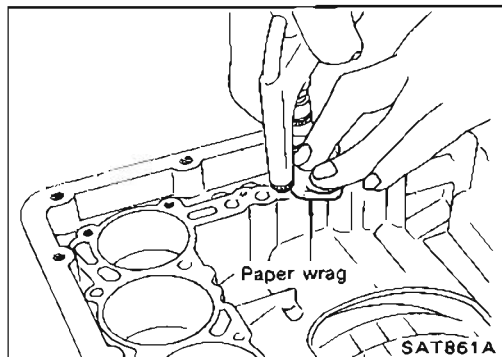
Forward and Overrun Clutches (Cont'd)

Service procedures for forward and overrun clutches are essentially the same as those for reverse clutch, with the following exception:

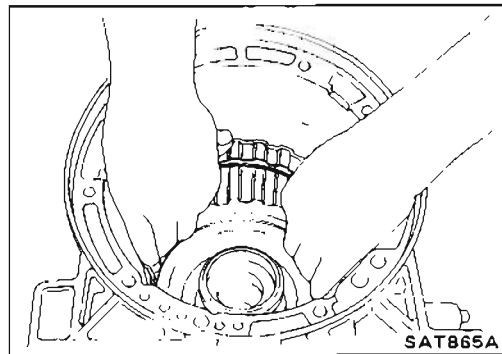
- Check of forward clutch operation.



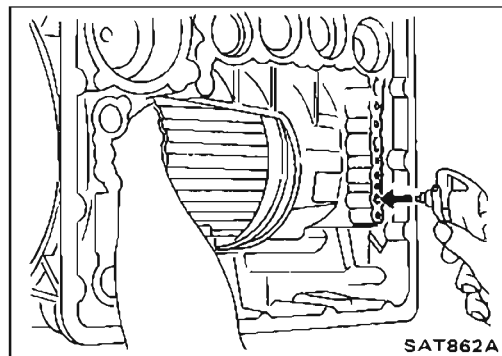
- Check of overrun clutch operation.



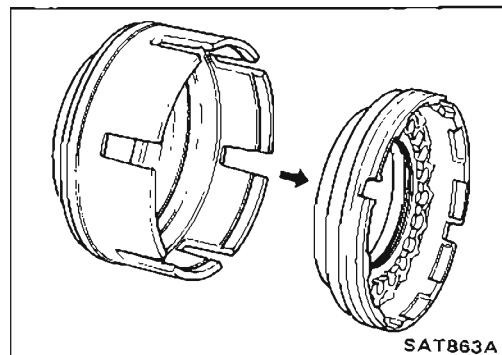
- Removal of forward clutch drum
Remove forward clutch drum from transmission case by holding snap ring.



- Removal of forward clutch and overrun clutch pistons
1. While holding overrun clutch piston, gradually apply compressed air to oil hole.



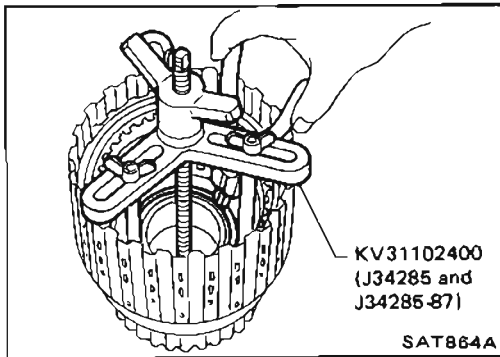
2. Remove overrun clutch from forward clutch.



REPAIR FOR COMPONENT PARTS

Forward and Overrun Clutches (Cont'd)

- Removal and installation of return springs

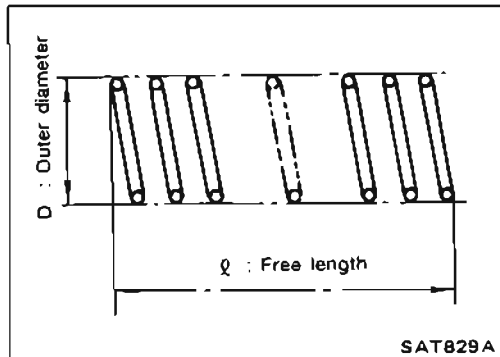


- Inspection of forward clutch and overrun clutch return springs

Inspection standard:

Unit: mm (in)

| Part No. | ℓ | D |
|-------------|----------------|-------------|
| 31505-41X01 | 35.77 (1.4083) | 9.7 (0.382) |



- Inspection of forward clutch drive plates

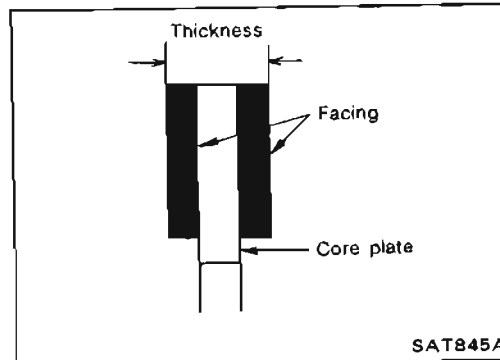
Thickness of drive plate:

Standard

2.0 mm (0.079 in)

Wear limit

1.8 mm (0.071 in)



- Inspection of overrun clutch drive plates

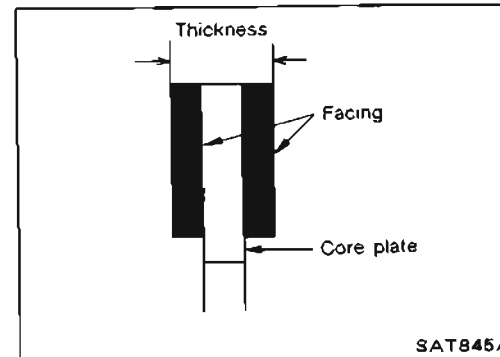
Thickness of drive plate:

Standard

2.0 mm (0.079 in)

Wear limit

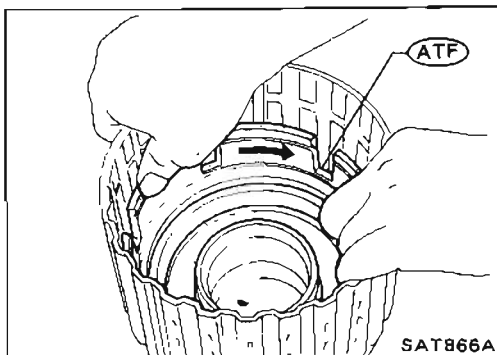
1.8 mm (0.071 in)



- Installation of forward clutch piston and overrun clutch piston

1. Install forward clutch piston by turning it slowly and evenly.

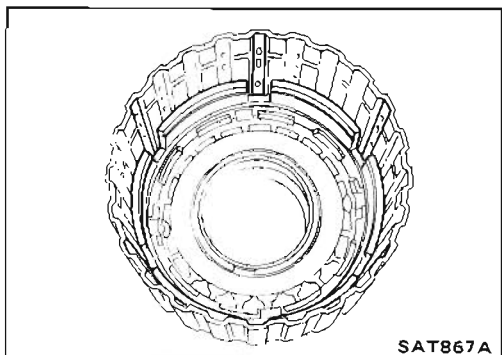
- Apply A.T.F. to inner surface of clutch drum.



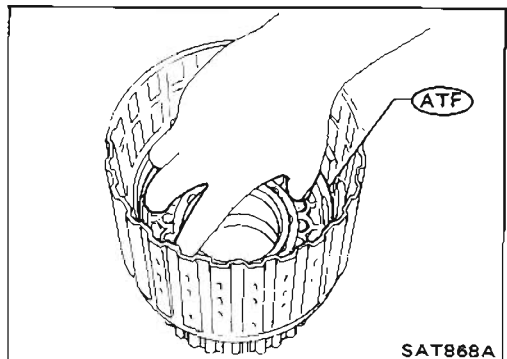
REPAIR FOR COMPONENT PARTS

Forward and Overrun Clutches (Cont'd)

- Align notch in forward clutch piston with groove in forward clutch drum.



2. Install overrun clutch by turning it slowly and evenly.
- Apply A.T.F. to inner surface of forward clutch piston.



- Measurement of clearance between retaining plate and snap ring of overrun clutch

Specified clearance:

Standard

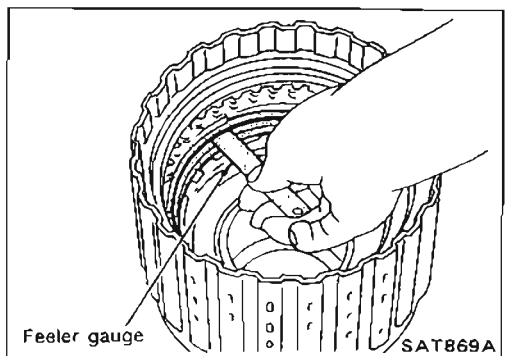
1.0 - 1.4 mm (0.039 - 0.055 in)

Allowable limit

2.0 mm (0.079 in)

Retaining plate:

Refer to S.D.S.



- Measurement of clearance between retaining plate and snap ring of forward clutch

Specified clearance:

Standard

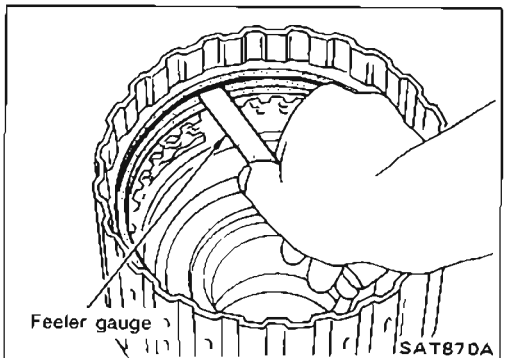
0.45 - 0.85 mm (0.0177 - 0.0335 in)

Allowable limit

1.85 mm (0.0728 in)

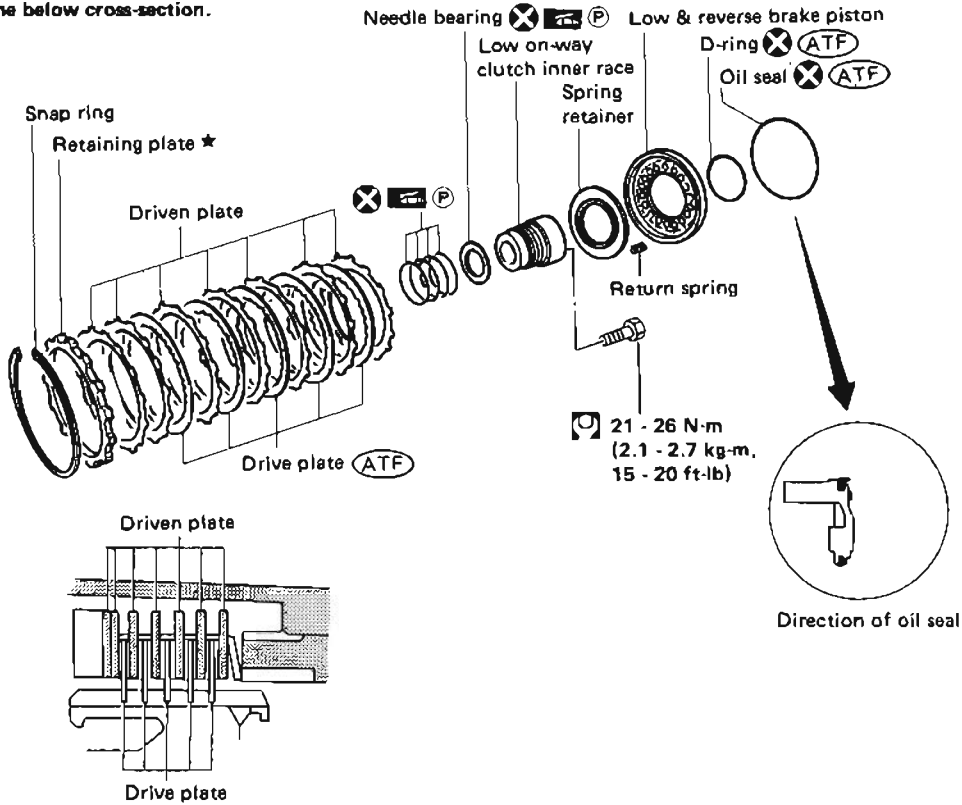
Retaining plate:

Refer to S.D.S.



Low & Reverse Brake

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

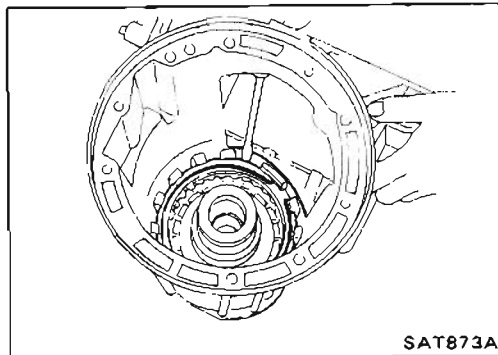
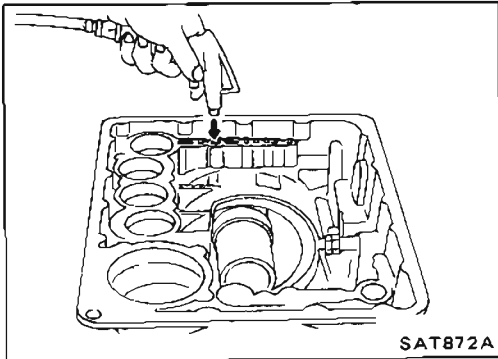


(ATF) : Apply A.T.F.

(X) (P) : Apply petroleum jelly.

(★) : Select with proper thickness.

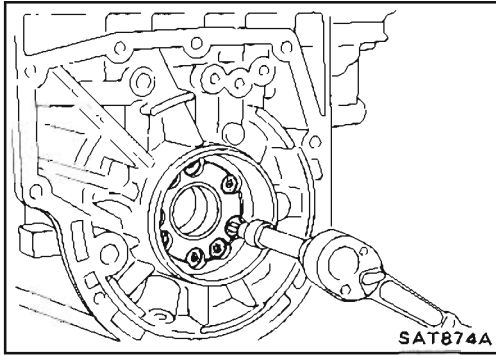
SAT811B



DISASSEMBLY

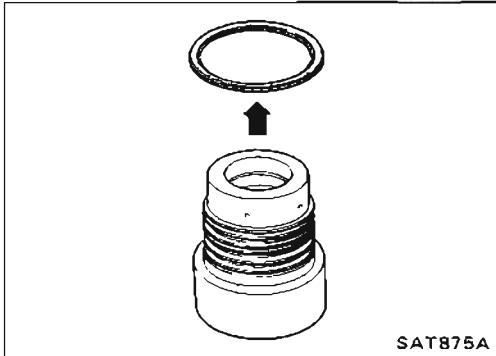
1. Check operation of low and reverse brake.
 - a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
 - b. Check to see that retaining plate moves to snap ring.
 - c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.
2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

REPAIR FOR COMPONENT PARTS



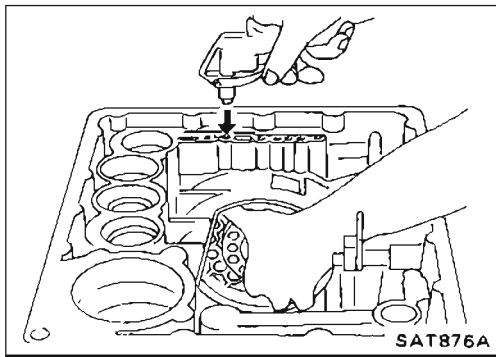
Low & Reverse Brake (Cont'd)

3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.



4. Remove seal rings from low one-way clutch inner race.

5. Remove needle bearing from low one-way clutch inner race.



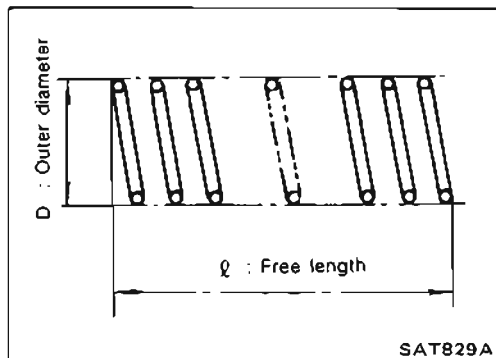
6. Remove low and reverse brake piston using compressed air.

7. Remove oil seal and D-ring from piston.

INSPECTION

Low and reverse brake snap ring and spring retainer

- Check for deformation, or damage.



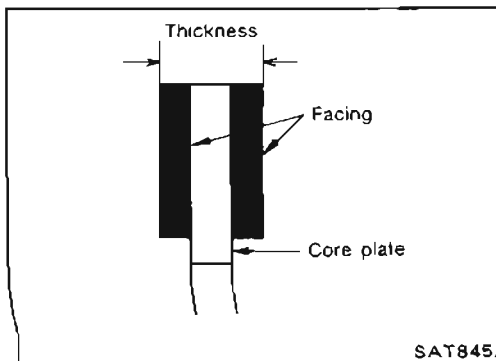
Low and reverse brake return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

| Part No. | ℓ | D |
|-------------|--------------|--------------|
| 31521-21X00 | 23.7 (0.933) | 11.6 (0.457) |



Low and reverse brake drive plates

- Check facing for burns, cracks or damage.

- Measure thickness of facing.

Thickness of drive plate:

Standard value

2.0 mm (0.079 in)

Wear limit

1.8 mm (0.071 in)

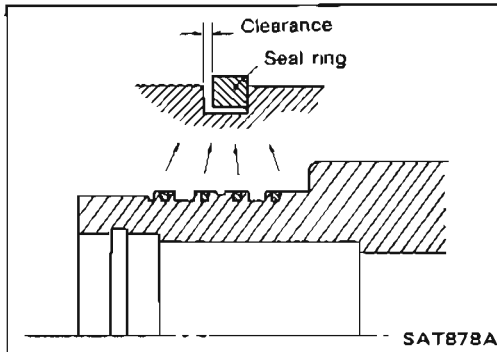
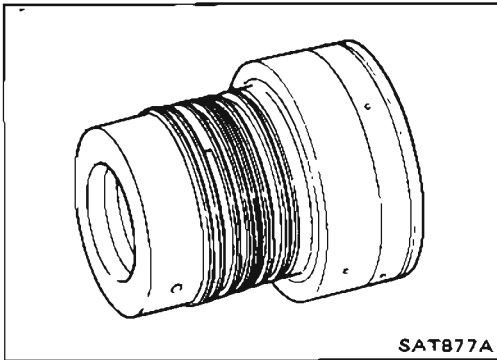
- If not within wear limit, replace.

REPAIR FOR COMPONENT PARTS

Low & Reverse Brake (Cont'd)

Low one-way clutch inner race

- Check frictional surface of inner race for wear or damage.



- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.

Inspection standard:

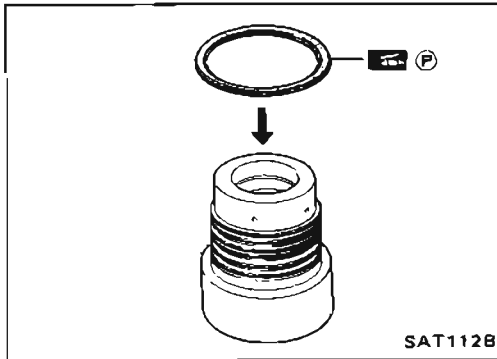
Standard value: 0.10 - 0.25 mm (0.0039 - 0.0098 in)

Allowable limit: 0.25 mm (0.0098 in)

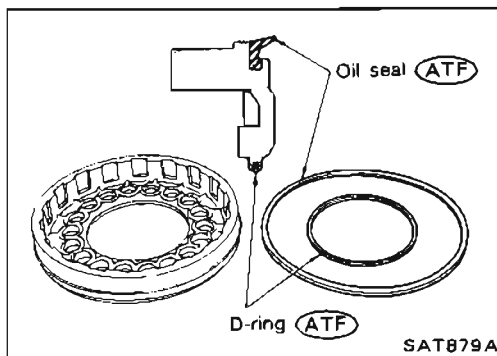
- If not within allowable limit, replace low one-way clutch inner race.

ASSEMBLY

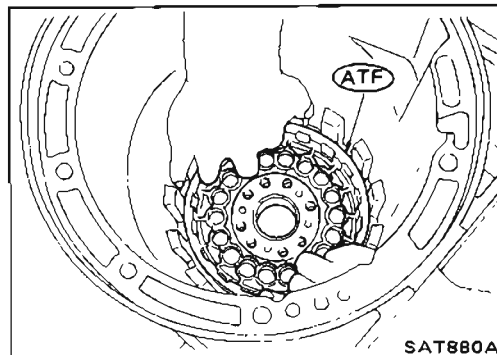
1. Install bearing onto one-way clutch inner race.
 - Pay attention to its direction — Black surface goes to rear side.
 - Apply petroleum jelly to needle bearing.



2. Install oil seal and D-ring onto piston.
 - Apply A.T.F. to oil seal and D-ring.

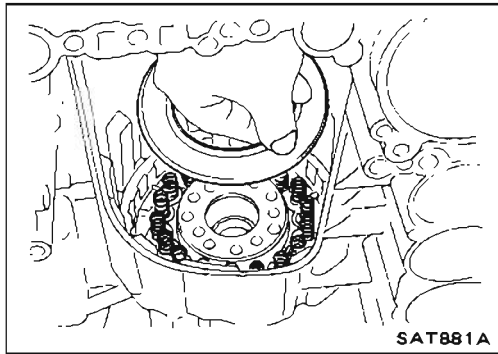


3. Install piston by rotating it slowly and evenly.
 - Apply A.T.F. to inner surface of transmission case.

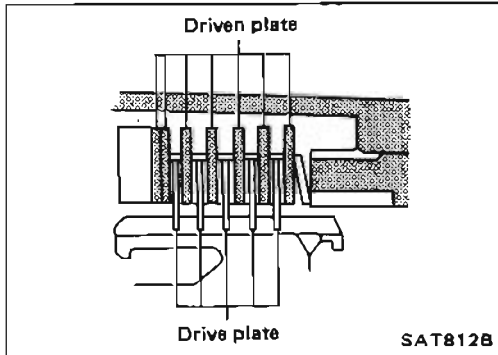


REPAIR FOR COMPONENT PARTS

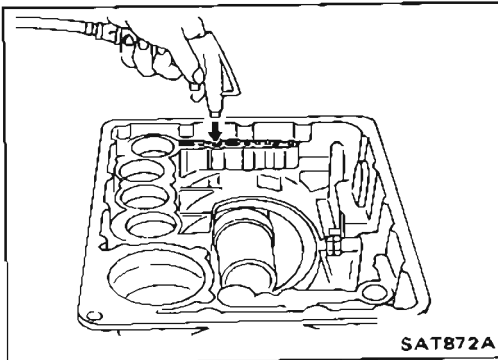
Low & Reverse Brake (Cont'd)



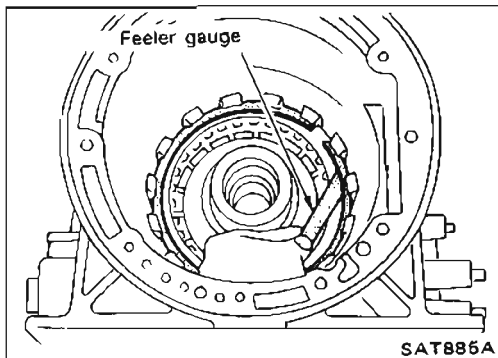
4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.



5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.
6. Install snap ring on transmission case.



7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY".



8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard

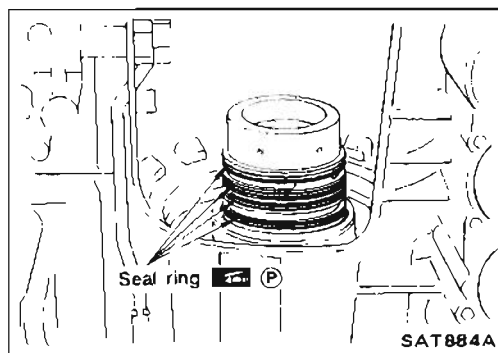
1.1 - 1.5 mm (0.043 - 0.059 in)

Allowable limit

2.5 mm (0.098 in)

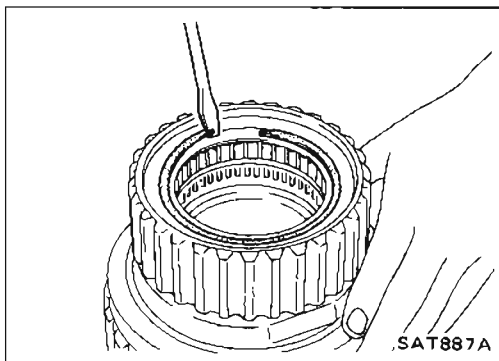
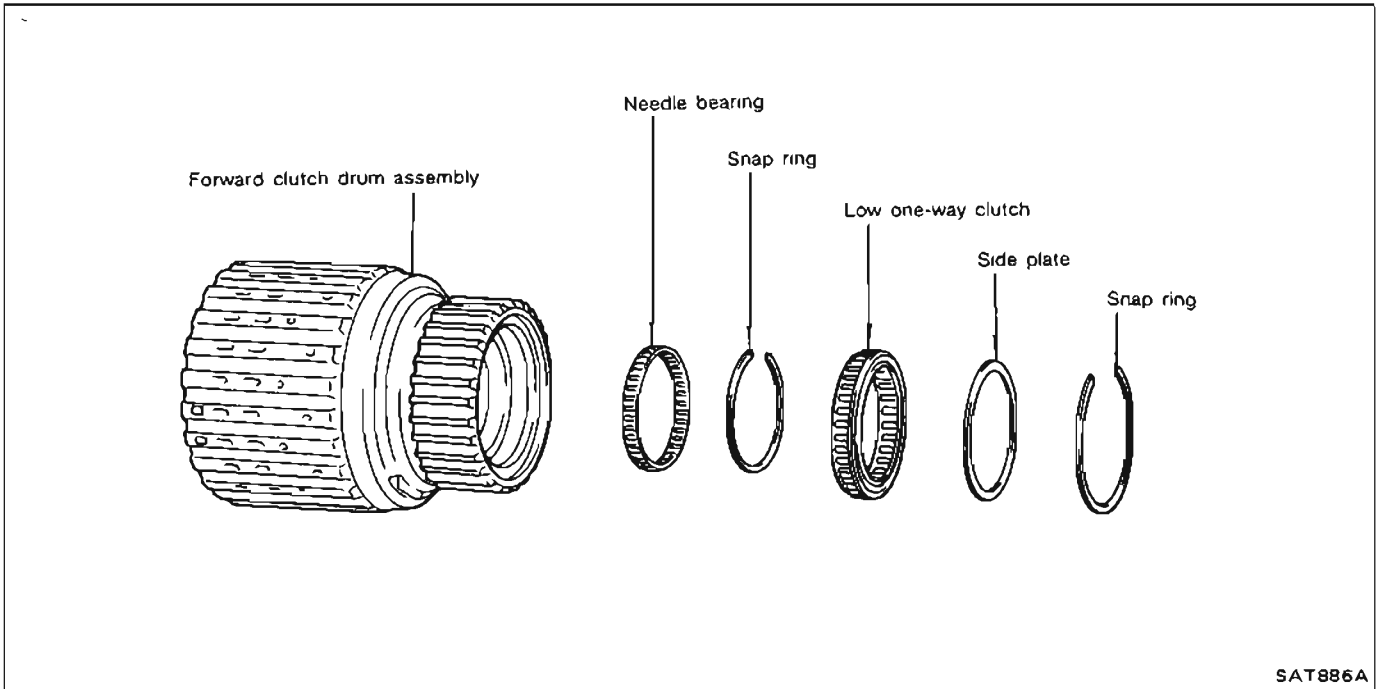
Retaining plate:

Refer to S.D.S.



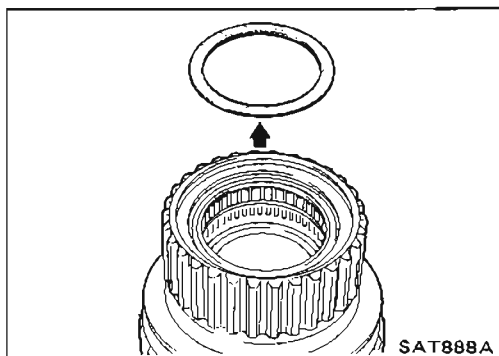
9. Install low one-way clutch inner race seal ring.
 - Apply petroleum jelly to seal ring.
 - Make sure seal rings are pressed firmly into place and held by petroleum jelly.

Forward Clutch Drum Assembly

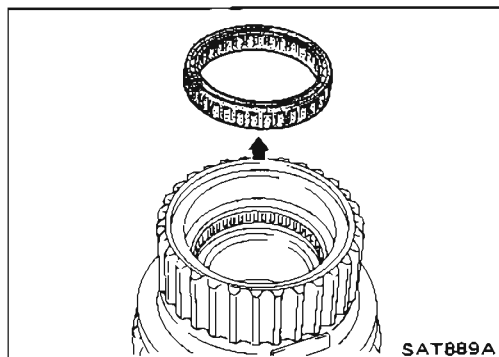


DISASSEMBLY

1. Remove snap ring from forward clutch drum.



2. Remove side plate from forward clutch drum.

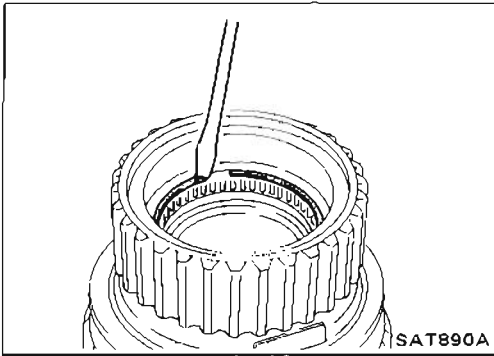


3. Remove low one-way clutch from forward clutch drum.

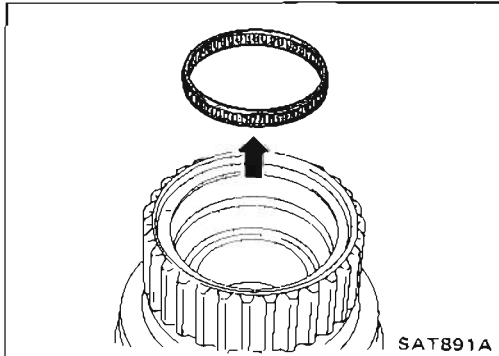
REPAIR FOR COMPONENT PARTS

Forward Clutch Drum Assembly (Cont'd)

4. Remove snap ring from forward clutch drum.



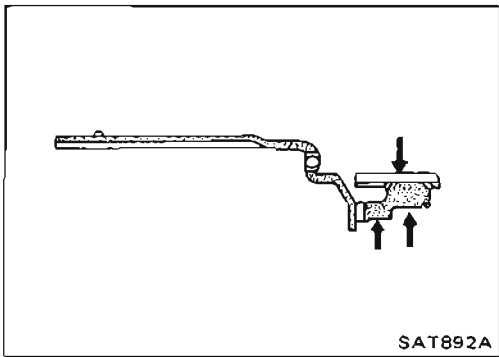
5. Remove needle bearing from forward clutch drum.



INSPECTION

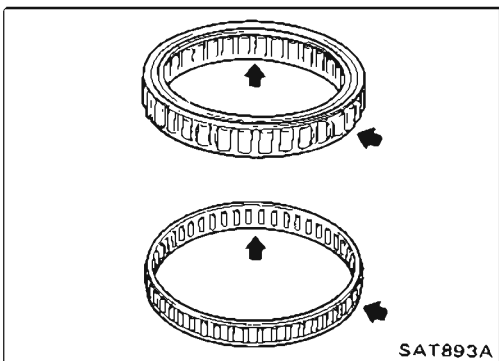
Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.



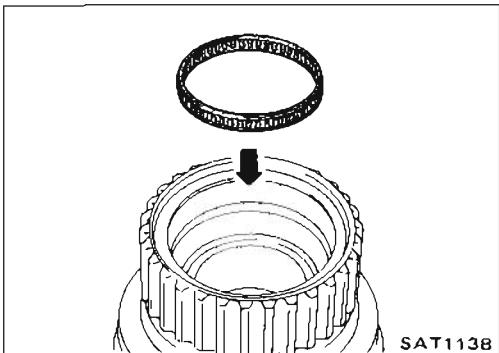
Needle bearing and low one-way clutch

- Check frictional surface for wear or damage.



ASSEMBLY

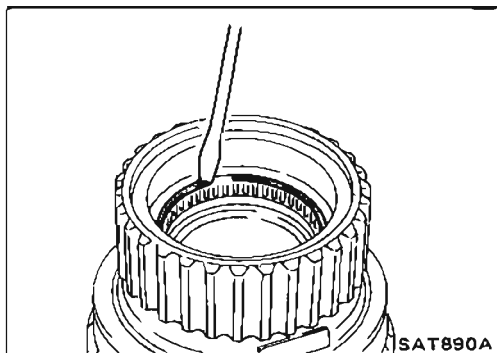
1. Install needle bearing in forward clutch drum.



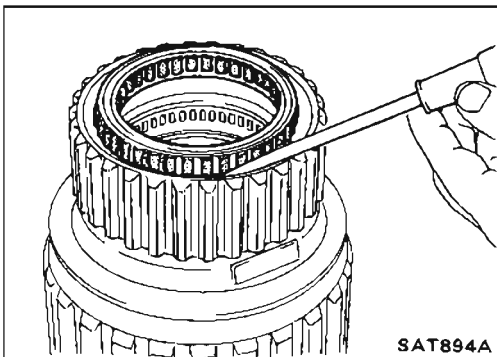
REPAIR FOR COMPONENT PARTS

Forward Clutch Drum Assembly (Cont'd)

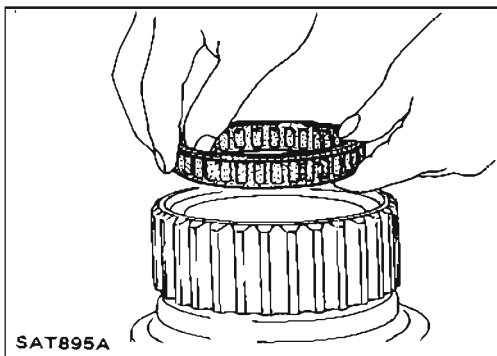
2. Install snap ring onto forward clutch drum.



3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.

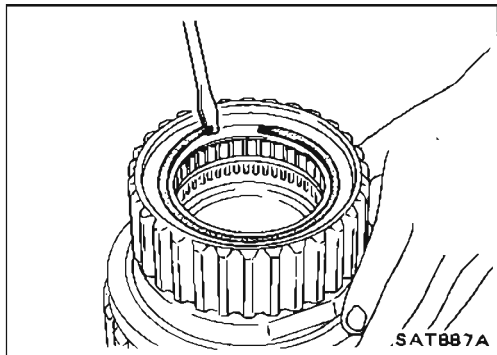


● Install low one-way clutch with flange facing rearward.

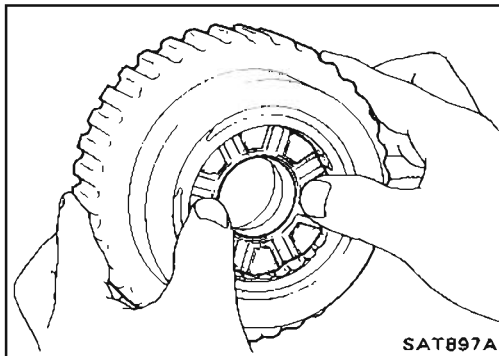
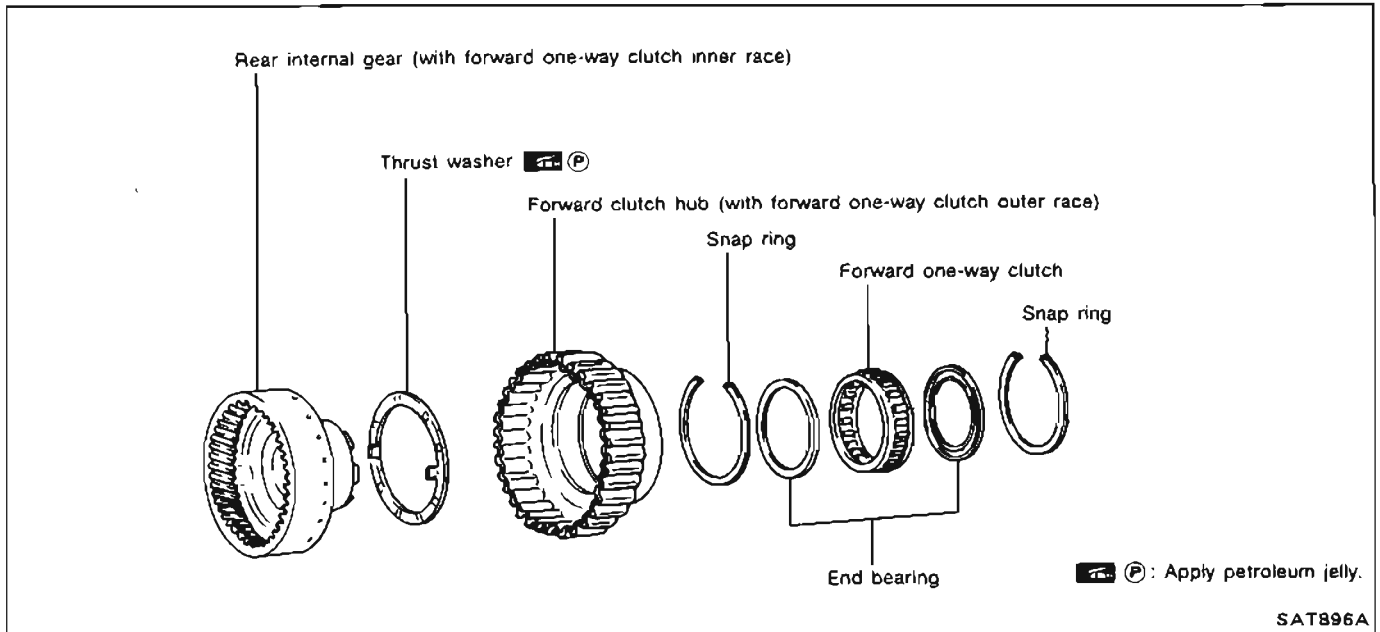


4. Install side plate onto forward clutch drum.

5. Install snap ring onto forward clutch drum.

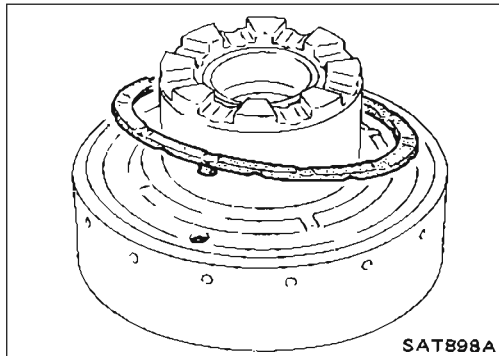


Rear Internal Gear and Forward Clutch Hub

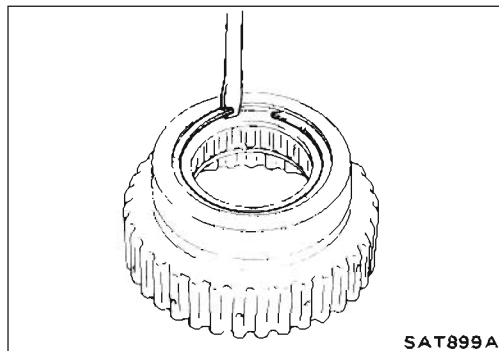


DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.



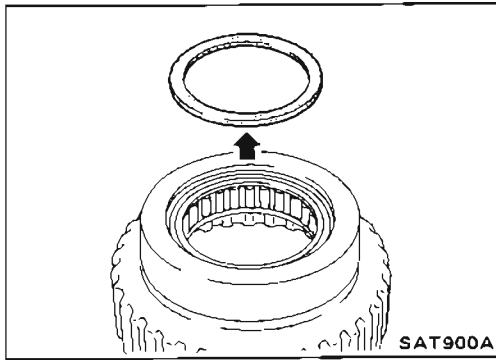
2. Remove thrust washer from rear internal gear.



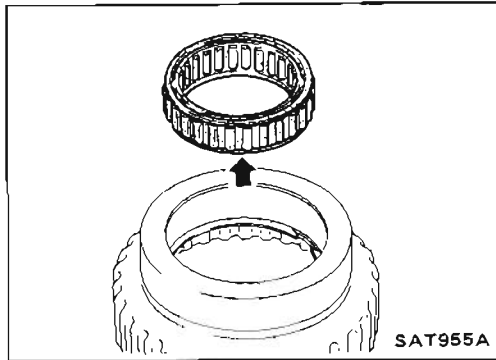
3. Remove snap ring from forward clutch hub.

REPAIR FOR COMPONENT PARTS

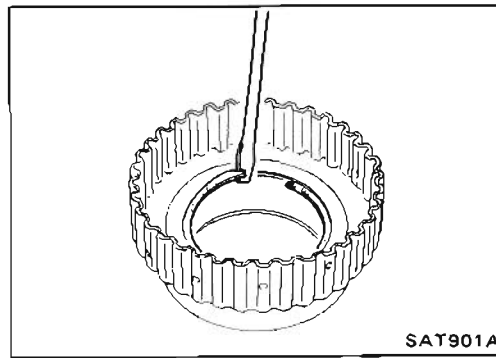
Rear Internal Gear and Forward Clutch Hub (Cont'd)



4. Remove end bearing.



5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.

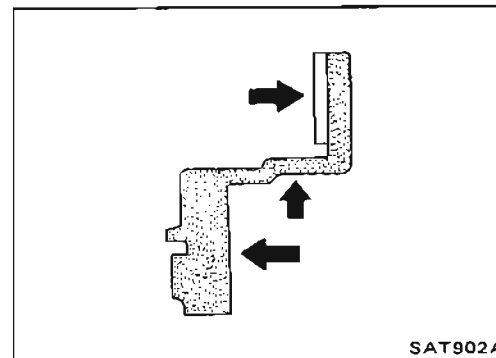


6. Remove snap ring from forward clutch hub.

INSPECTION

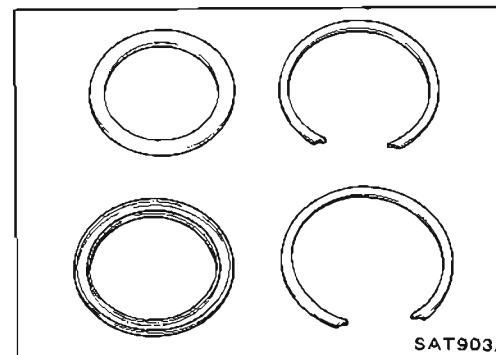
Rear internal gear and forward clutch hub

- Check gear for excessive wear, chips or cracks.
- Check frictional surfaces of forward one-way clutch and thrust washer for wear or damage.
- Check spline for wear or damage.



Snap ring and end bearing

- Check for deformation or damage.

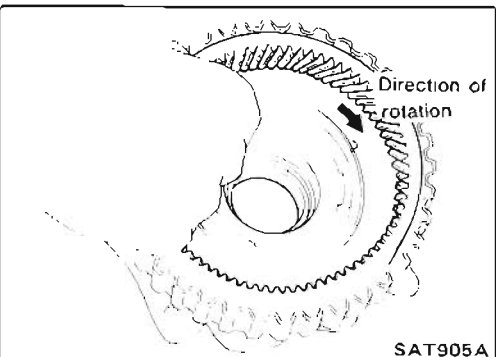
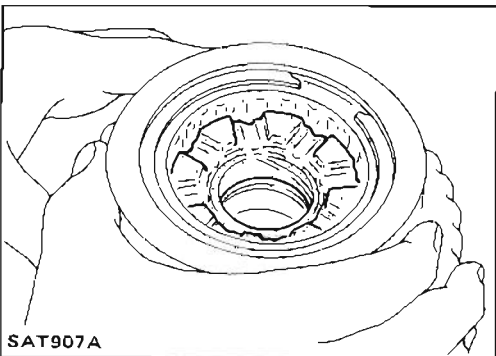
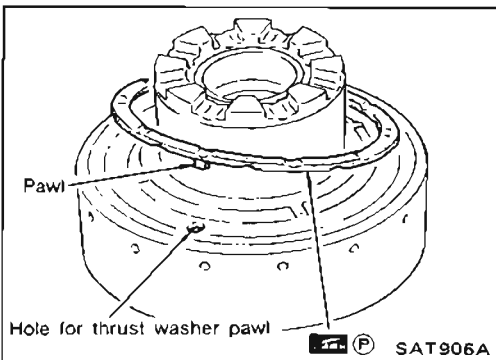
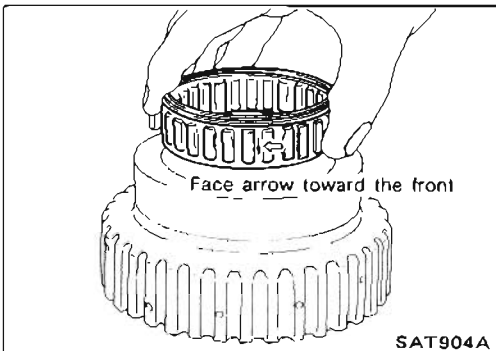
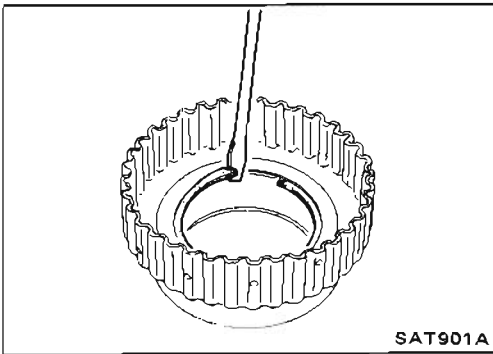


REPAIR FOR COMPONENT PARTS

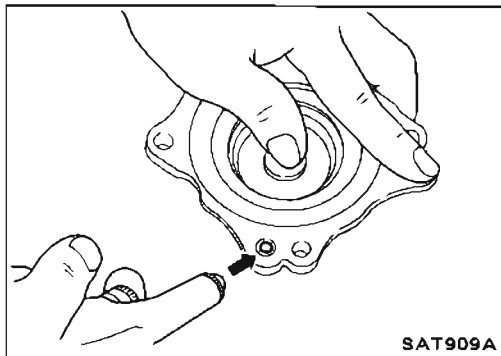
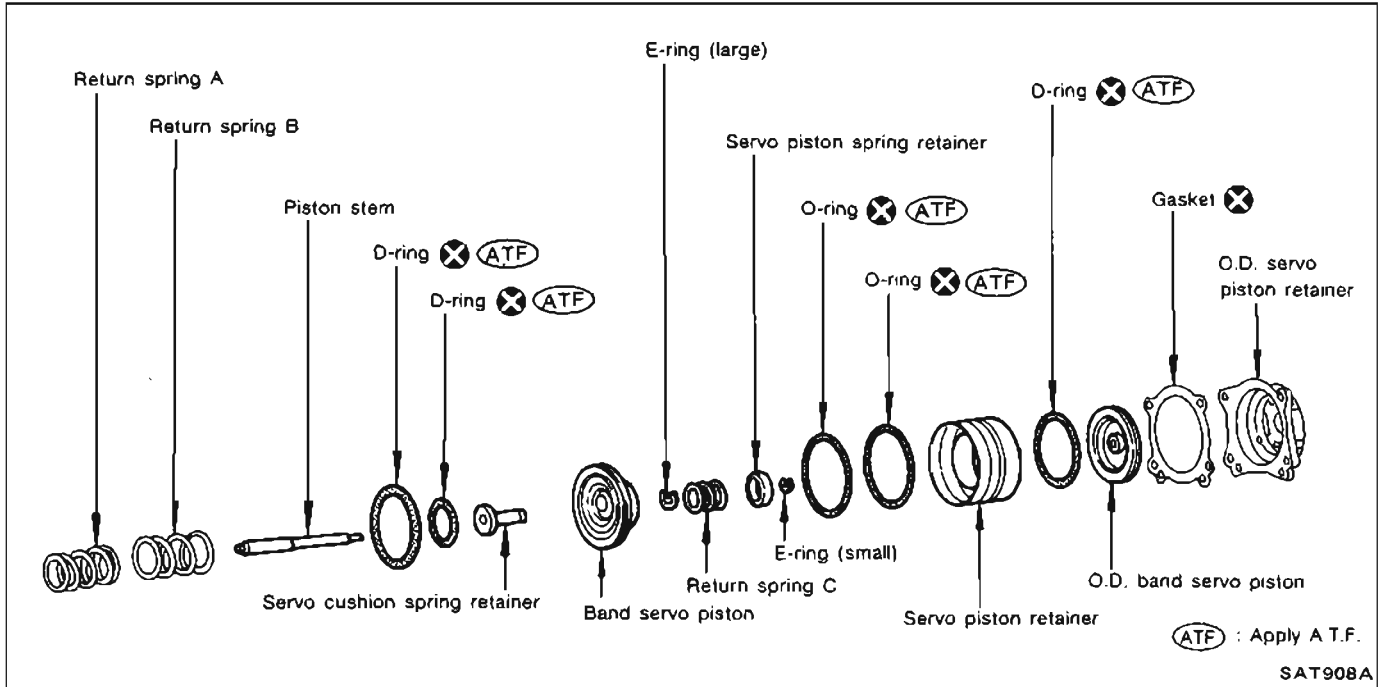
Rear Internal Gear and Forward Clutch Hub (Cont'd)

ASSEMBLY

1. Install snap ring onto forward clutch hub.
2. Install end bearing.
3. Install forward one-way clutch onto clutch hub.
 - **Install forward one-way clutch with flange facing rearward.**
4. Install end bearing.
5. Install snap ring onto forward clutch hub.
6. Install thrust washer onto rear internal gear.
 - **Apply petroleum jelly to thrust washer.**
 - **Securely insert pawls of thrust washer into holes in rear internal gear.**
7. Position forward clutch hub in rear internal gear.
8. After installing, check to assure that forward clutch hub rotates clockwise.

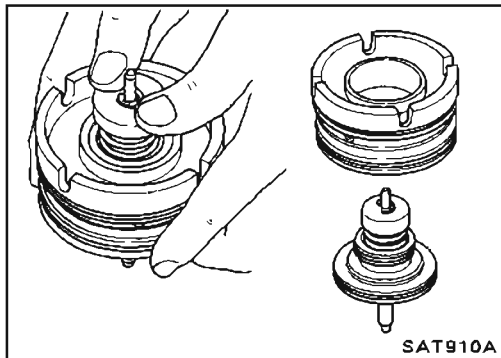


Band Servo Piston Assembly

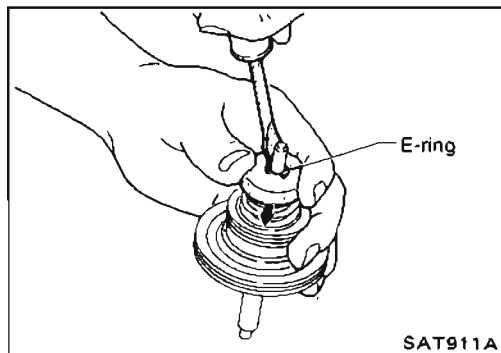


DISASSEMBLY

1. Block one oil hole in O.D. servo piston retainer and the center hole in O.D. band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove O.D. band servo piston from retainer.
3. Remove D-ring from O.D. band servo piston.



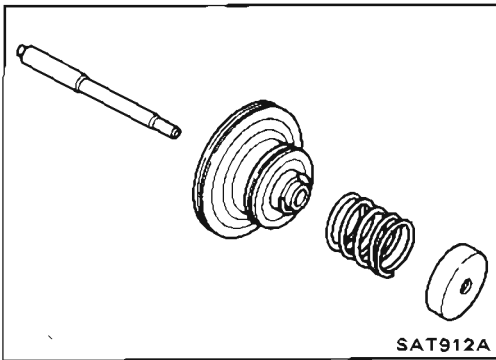
4. Remove band servo piston assembly from servo piston retainer by pushing it forward.



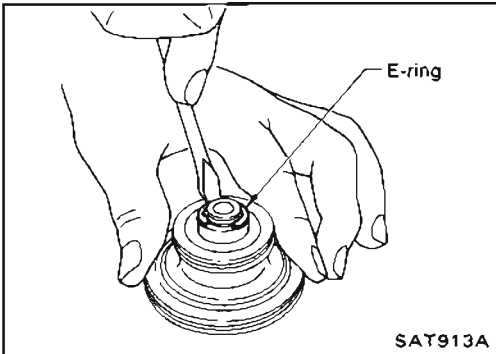
5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

REPAIR FOR COMPONENT PARTS

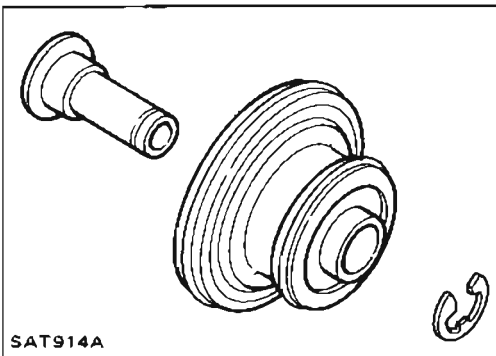
Band Servo Piston Assembly (Cont'd)



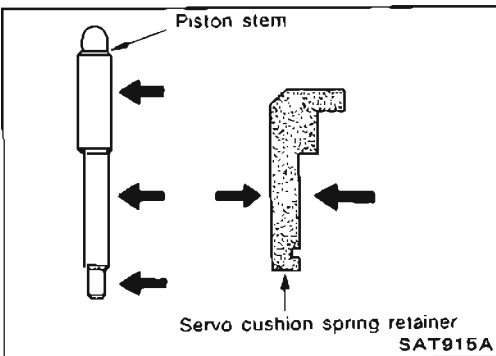
6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.



7. Remove E-ring from band servo piston.



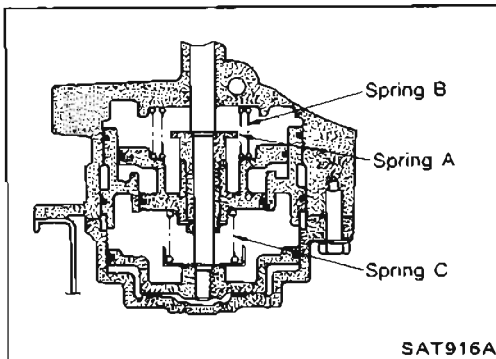
8. Remove servo cushion spring retainer from band servo piston.
 9. Remove D-rings from band servo piston.
 10. Remove O-rings from servo piston retainer.



INSPECTION

Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



Return springs

- Check for deformation or damage. Measure free length and outer diameter.

Inspection standard:

Unit: mm (in)

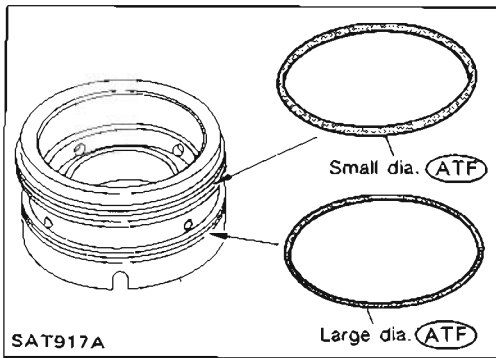
| Parts | Free length | Outer diameter |
|----------|--------------|----------------|
| Spring A | 45.6 (1.795) | 34.3 (1.350) |
| Spring B | 53.8 (2.118) | 40.3 (1.587) |
| Spring C | 29.0 (1.142) | 27.6 (1.087) |

REPAIR FOR COMPONENT PARTS

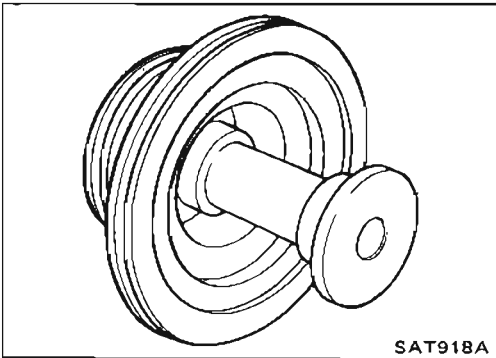
Band Servo Piston Assembly (Cont'd)

ASSEMBLY

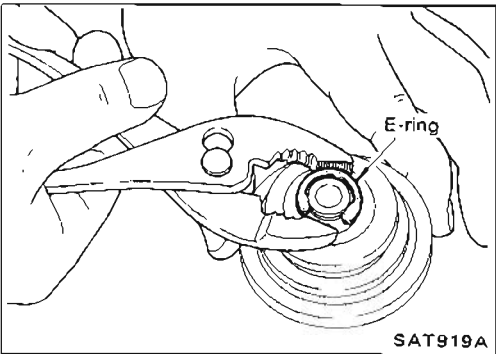
1. Install O-rings onto servo piston retainer.
 - Apply A.T.F. to O-rings.
 - Pay attention to position of each O-ring.



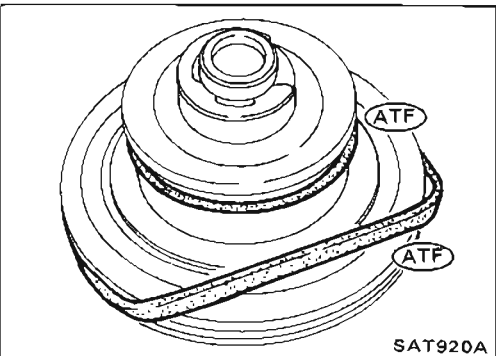
2. Install servo cushion spring retainer onto band servo piston.



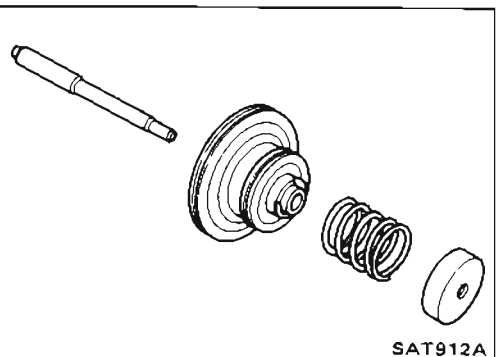
3. Install E-ring onto servo cushion spring retainer.



4. Install D-rings onto band servo piston.
 - Apply A.T.F. to D-rings.



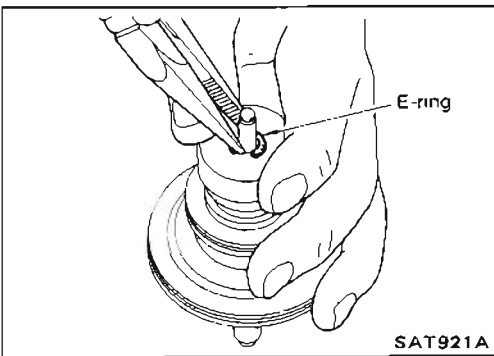
5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.



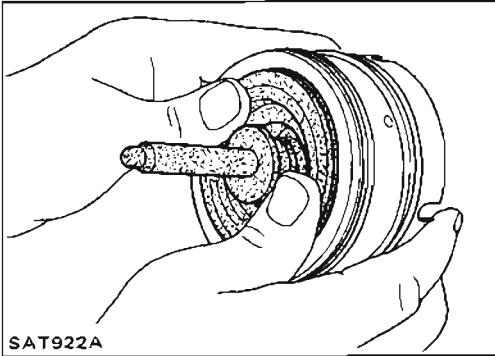
REPAIR FOR COMPONENT PARTS

Band Servo Piston Assembly (Cont'd)

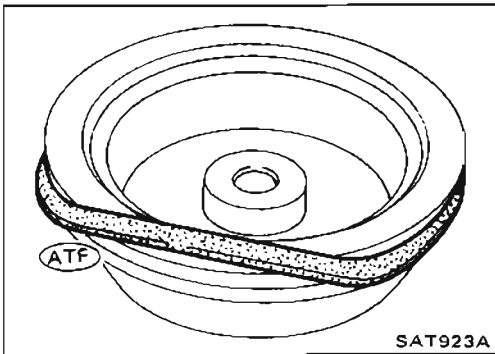
6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



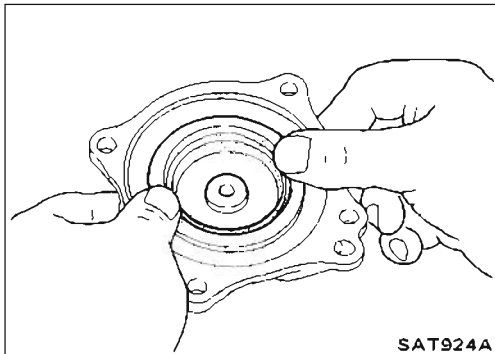
7. Install band servo piston assembly onto servo piston retainer by pushing it inward.



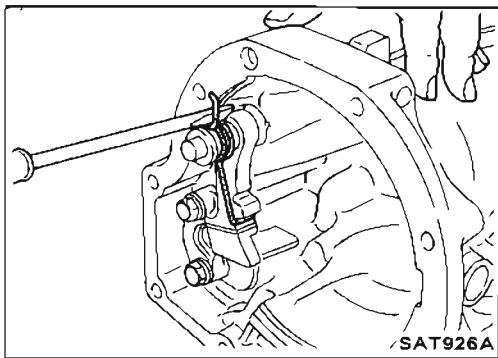
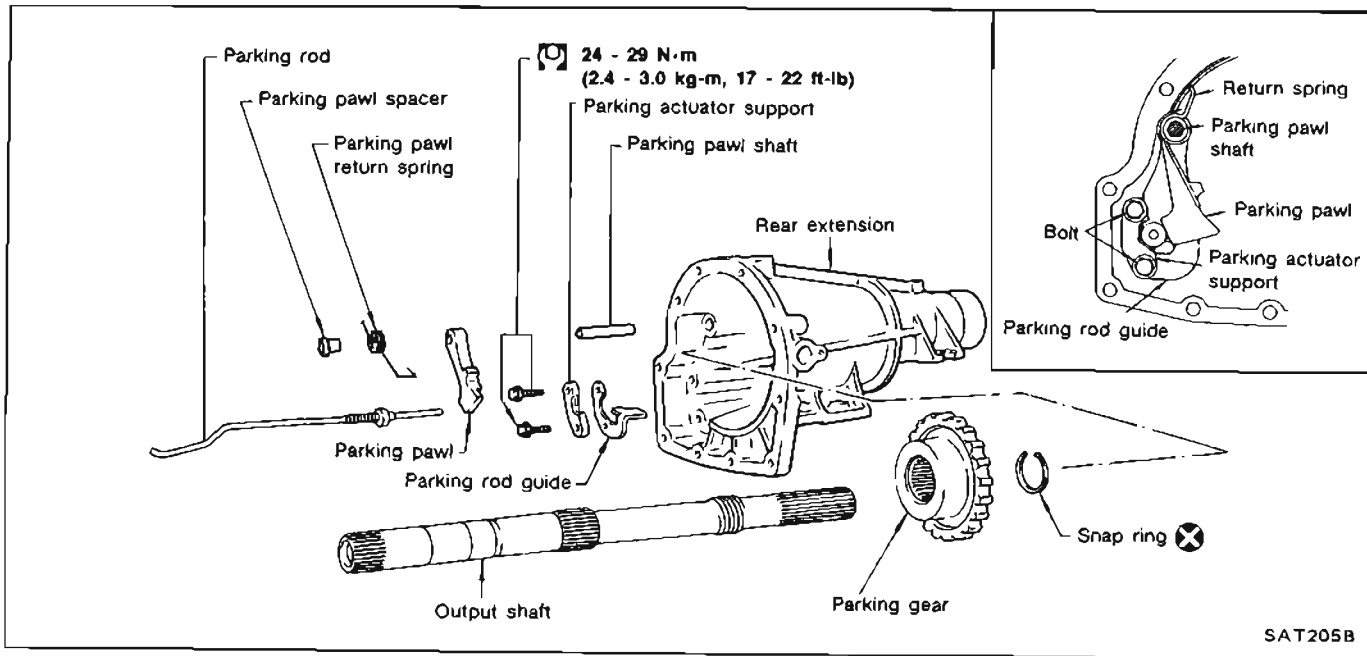
8. Install D-ring on O.D. band servo piston.
● Apply A.T.F. to D-ring.



9. Install O.D. band servo piston onto servo piston retainer by pushing it inward.

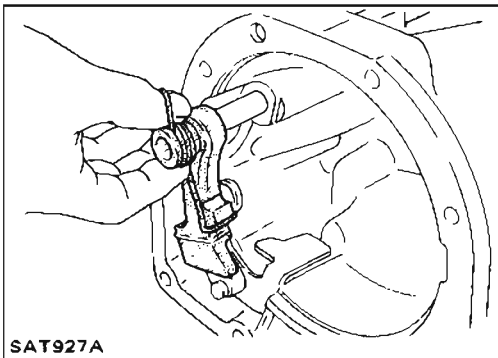


Parking Pawl Components

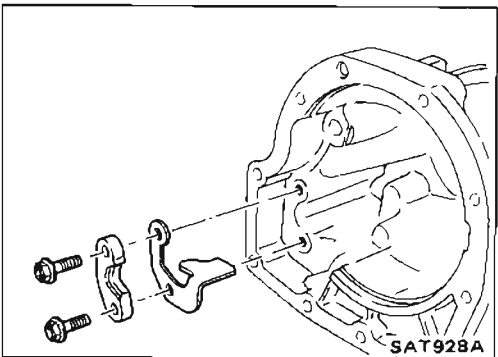


DISASSEMBLY

1. Slide return spring to the front of rear extension flange.



2. Remove return spring, pawl spacer and parking pawl from rear extension.
3. Remove parking pawl shaft from rear extension.



4. Remove parking actuator support and rod guide from rear extension.

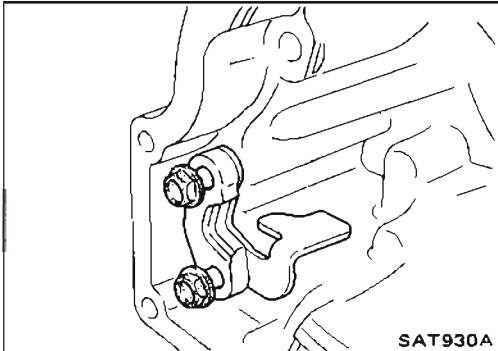
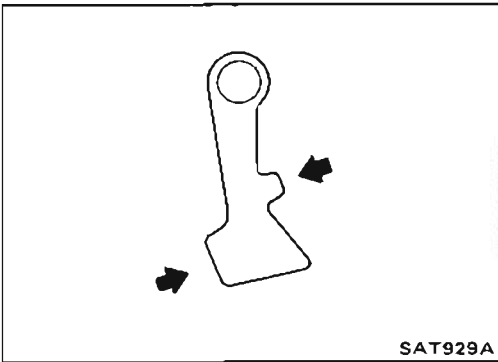
REPAIR FOR COMPONENT PARTS

Parking Pawl Components (Cont'd)

INSPECTION

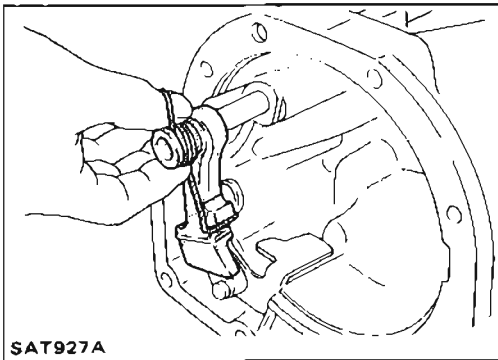
Parking pawl and parking actuator support

- Check contact surface of parking rod for wear.

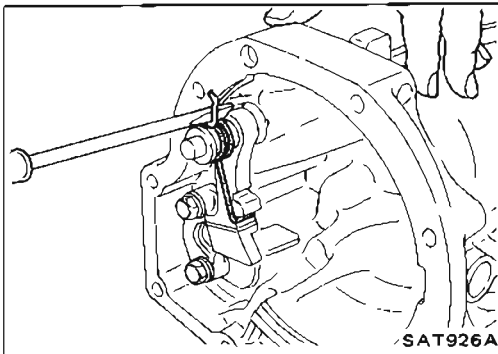


ASSEMBLY

1. Install rod guide and parking actuator support onto rear extension.
2. Insert parking pawl shaft into rear extension.



3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.

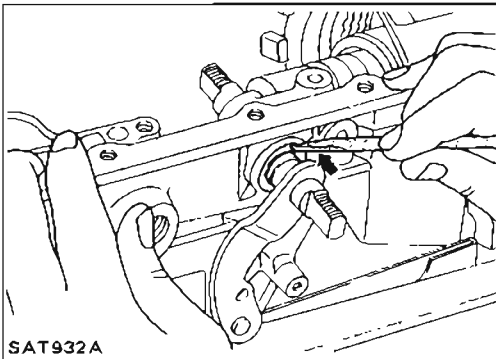
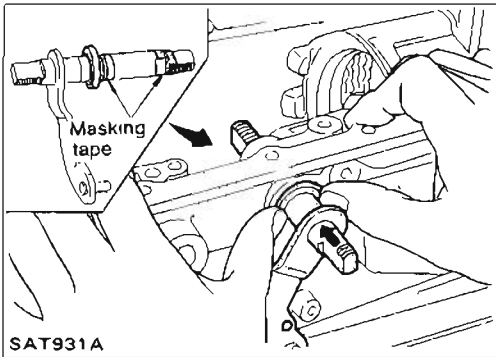


4. Bend return spring upward and install it onto rear extension.

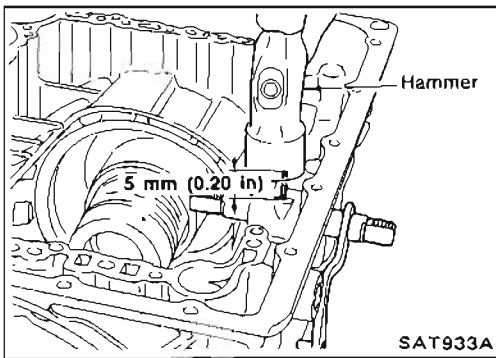
ASSEMBLY

Assembly

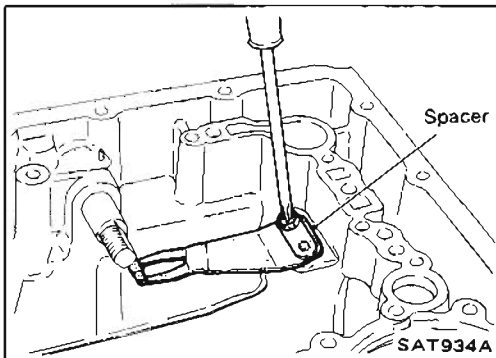
1. Install manual shaft components.
 - a. Install oil seal onto manual shaft.
 - Apply A.T.F. to oil seal.
 - Wrap threads of manual shaft with masking tape.
 - b. Insert manual shaft and oil seal as a unit into transmission case.
 - c. Remove masking tape.
- d. Push oil seal evenly and install it onto transmission case.



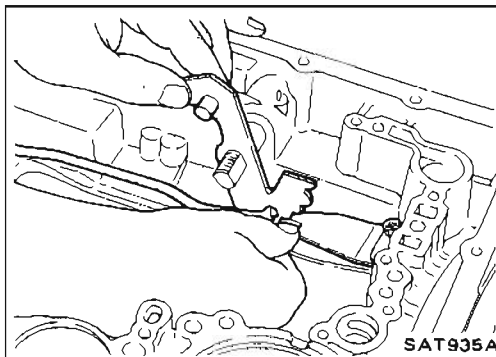
- e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.



- f. Install detent spring and spacer.



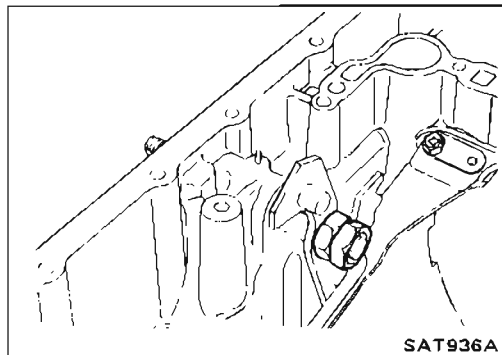
- g. While pushing detent spring down, install manual plate onto manual shaft.



ASSEMBLY

Assembly (Cont'd)

h. Install lock nuts onto manual shaft.



2. Install accumulator piston.
 - a. Install O-rings onto accumulator piston.
 - Apply A.T.F. to O-rings.

Accumulator piston O-rings:

Unit: mm (in)

| Accumulator | A | B | C | D |
|--------------------|-----------|-----------|-----------|-----------|
| Small diameter end | 29 (1.14) | 32 (1.26) | 45 (1.77) | 29 (1.14) |
| Large diameter end | 45 (1.77) | 50 (1.97) | 50 (1.97) | 45 (1.77) |

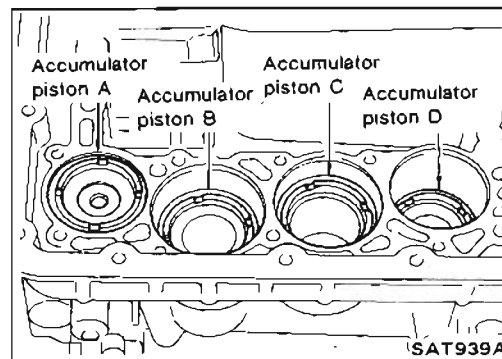
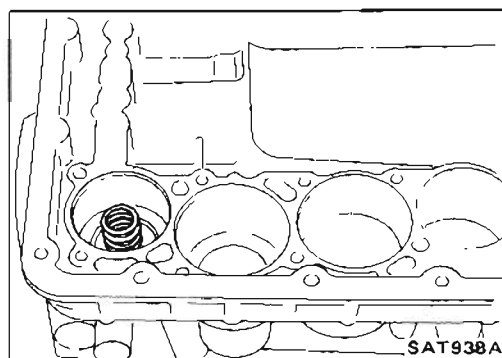
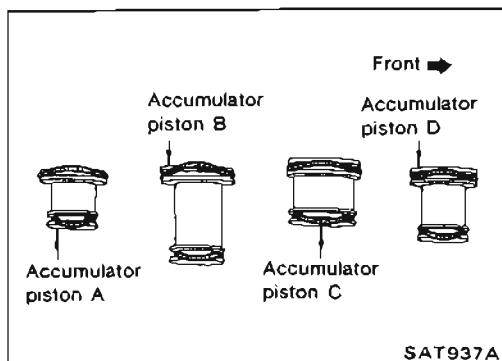
- b. Install return spring for accumulator A onto transmission case.

Free length of return spring:

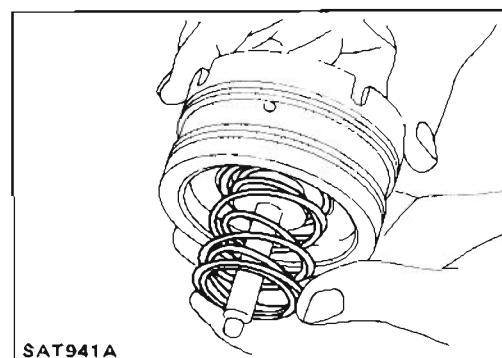
Unit: mm (in)

| Accumulator | A |
|-------------|-----------|
| Free length | 43 (1.69) |

- c. Install accumulator pistons A, B, C and D.
 - Apply A.T.F. to transmission case.

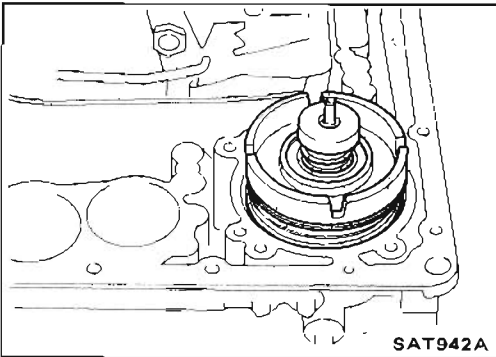


3. Install band servo piston.
 - a. Install return springs onto servo piston.

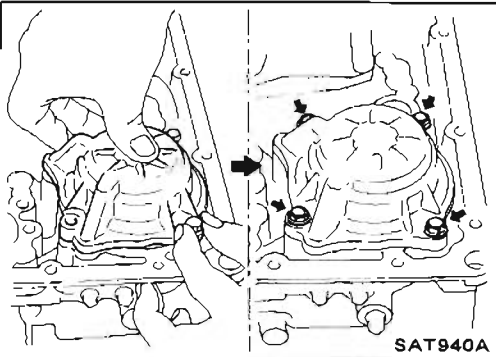


ASSEMBLY

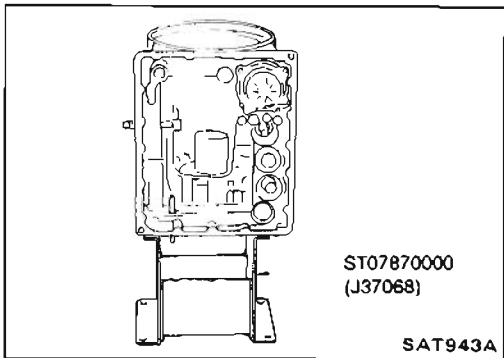
Assembly (Cont'd)



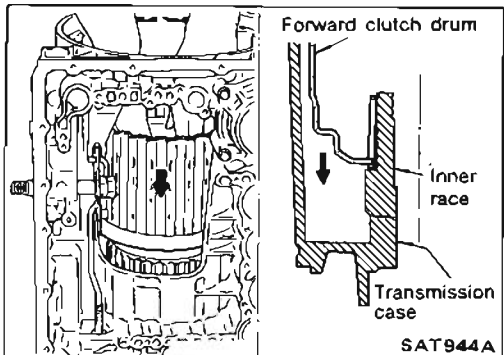
- b. Install band servo piston onto transmission case.
 - Apply A.T.F. to O-ring of band servo piston and transmission case.
- c. Install gasket for band servo onto transmission case.



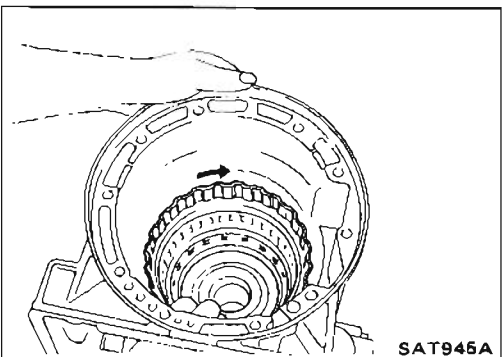
- d. Install band servo retainer onto transmission case.



4. Install rear side clutch and gear components.
 - a. Place transmission case in vertical position.



- b. Slightly lift forward clutch drum assembly and slowly rotate it clockwise until its hub passes fully over the clutch inner race inside transmission case.

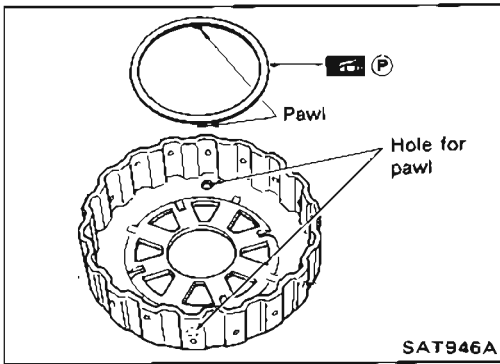


- c. Check to be sure that rotation direction of forward clutch assembly is correct.

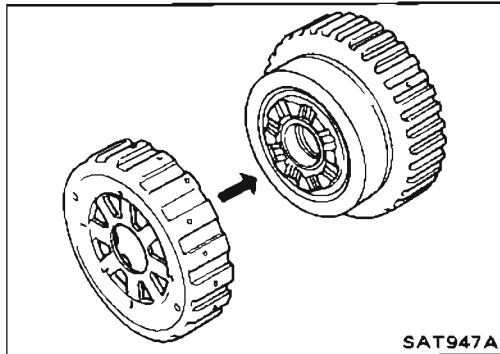
ASSEMBLY

Assembly (Cont'd)

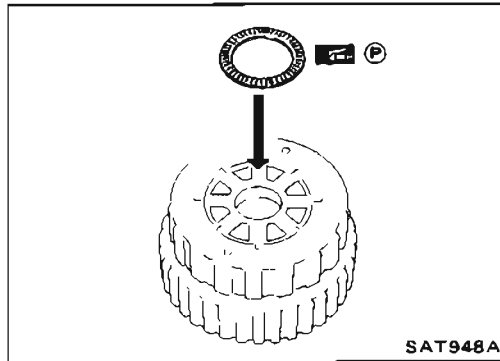
- d. Install thrust washer onto front of overrun clutch hub.
- Apply petroleum jelly to the thrust washer.
 - Insert pawls of thrust washer securely into holes in overrun clutch hub.



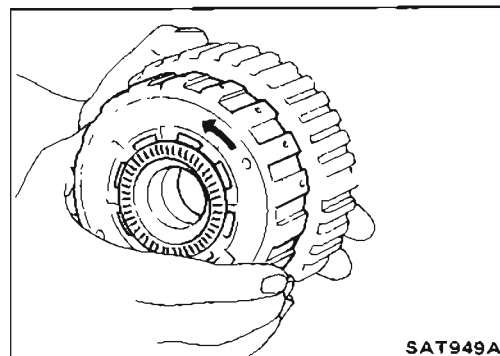
- e. Install overrun clutch hub onto rear internal gear assembly.



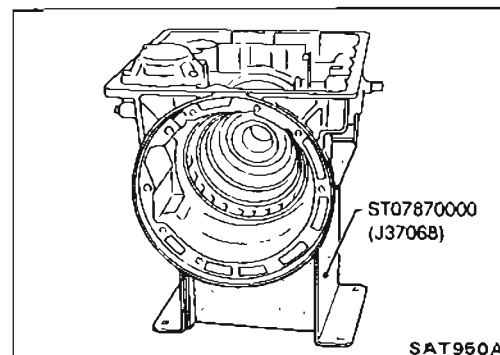
- f. Install needle bearing onto rear of overrun clutch hub.
- Apply petroleum jelly to needle bearing.



- g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.



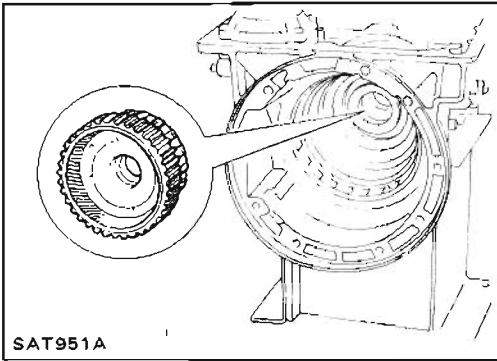
- h. Place transmission case into horizontal position.



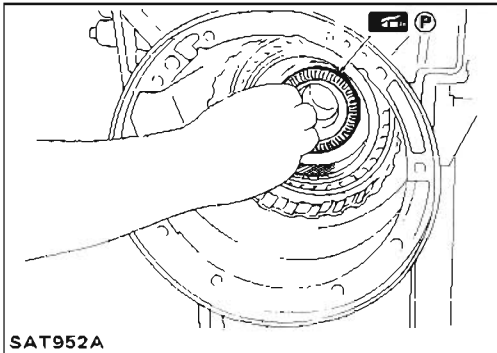
ASSEMBLY

Assembly (Cont'd)

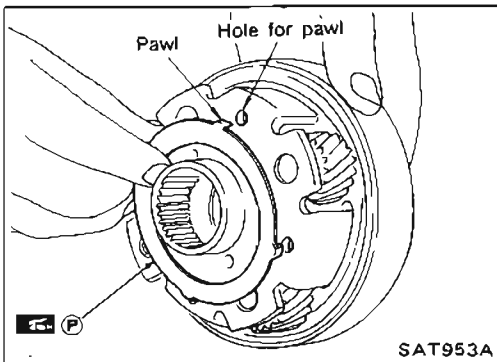
- i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.



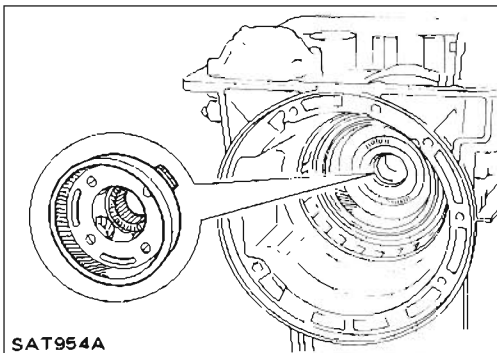
- j. Install needle bearing onto rear internal gear.
● Apply petroleum jelly to needle bearing.



- k. Install bearing race onto rear of front internal gear.
● Apply petroleum jelly to bearing race.
● Securely engage pawls of bearing race with holes in front internal gear.



- l. Install front internal gear on transmission case.

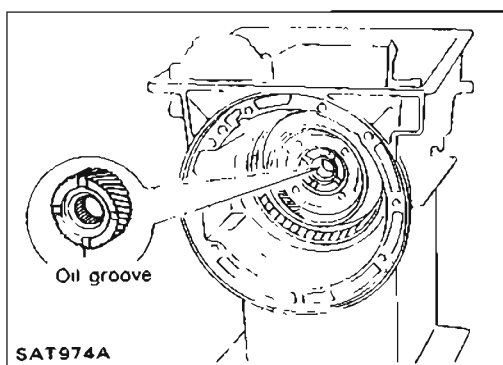


ASSEMBLY

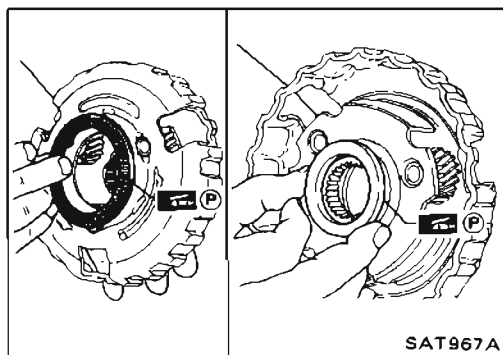
Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

| Part name \ Item | Total end play | Reverse clutch end play |
|-------------------------------|----------------|-------------------------|
| Transmission case | ● | ● |
| Low one-way clutch inner race | ● | ● |
| Overrun clutch hub | ● | ● |
| Rear internal gear | ● | ● |
| Rear planetary carrier | ● | ● |
| Rear sun gear | ● | ● |
| Front planetary carrier | ● | ● |
| Front sun gear | ● | ● |
| High clutch hub | ● | ● |
| High clutch drum | ● | ● |
| Oil pump cover | ● | ● |
| Reverse clutch drum | — | ● |



1. Install front side clutch and gear components.
 - a. Install rear sun gear on transmission case.
 - **Pay attention to its direction.**

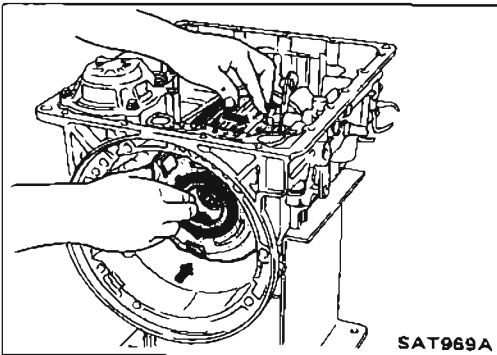


- b. Install needle bearing on front of front planetary carrier.
 - **Apply petroleum jelly to needle bearing.**
 - c. Install needle bearing on rear of front planetary carrier.
 - **Apply petroleum jelly to bearing.**
 - **Pay attention to its direction — Black side goes to front.**

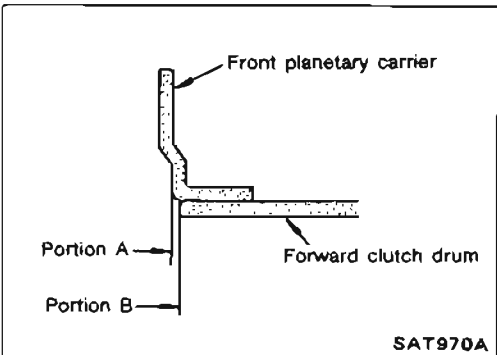
ASSEMBLY

Adjustment (Cont'd)

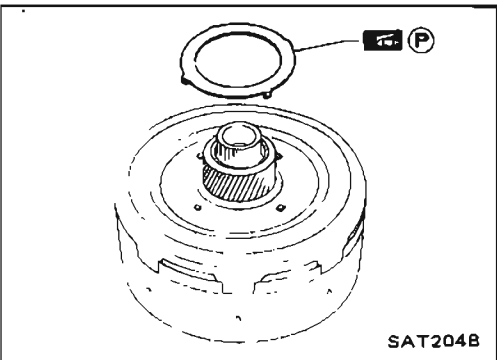
- d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



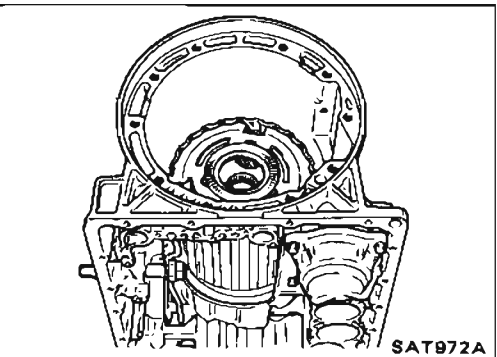
- Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.



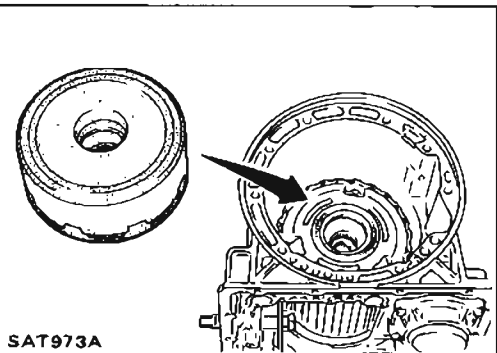
- e. Install bearing races on rear of clutch pack.
- Apply petroleum jelly to bearing races.
 - Securely engage pawls of bearing race with hole in clutch pack.



- f. Place transmission case in vertical position.



- g. Install clutch pack into transmission case.



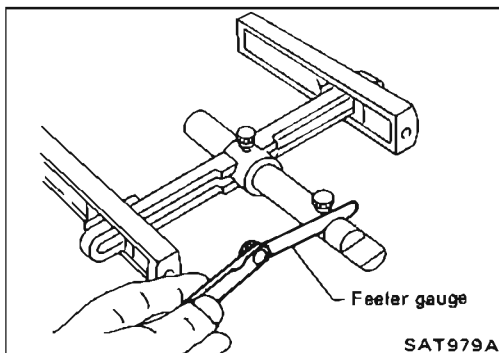
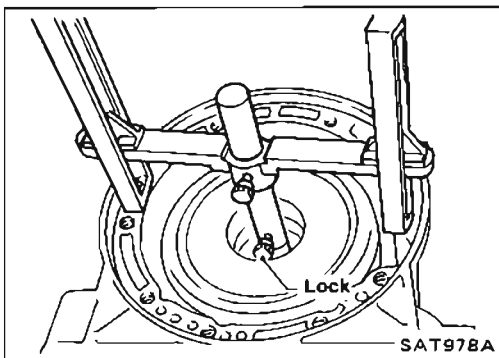
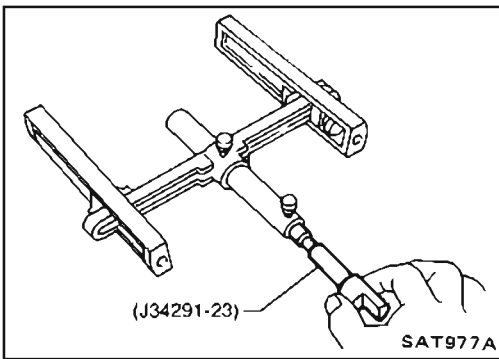
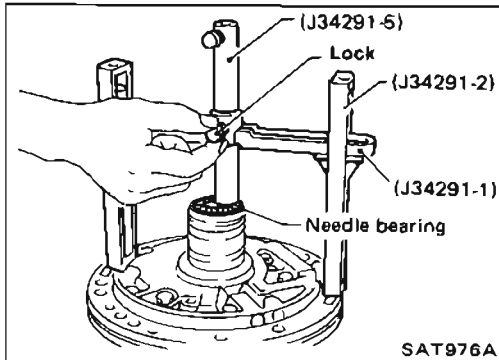
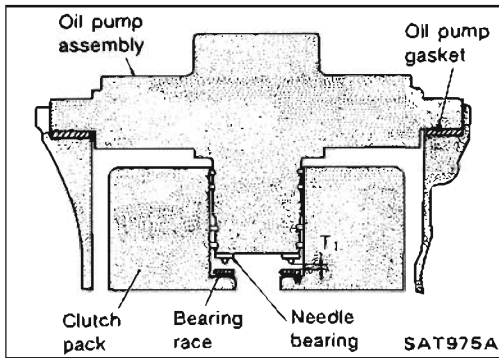
ASSEMBLY

Adjustment (Cont'd)

2. Adjust total end play.

Total end play "T₁":

0.25 - 0.55 mm (0.0098 - 0.0217 in)



a. With needle bearing installed, place J34291-1 (bridge), J34291-2 (legs) and the J34291-5 (gauging cylinder) onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly and gauging cylinder should rest on top of the needle bearing. Lock gauging cylinder in place with set screw.

b. Install J34291-23 (gauging plunger) into gauging cylinder.

c. With original bearing race installed inside reverse clutch drum, place shim selecting gauge with its legs on machined surface of transmission case (no gasket) and allow gauging plunger to rest on bearing race. Lock gauging plunger in place with set screw.

d. Remove Tool and use feeler gauge to measure gap between gauging cylinder and gauging plunger. This measurement should give exact total end play.

Total end play "T₁":

0.25 - 0.55 mm (0.0098 - 0.0217 in)

- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

Available oil pump cover bearing race:

Refer to S.D.S.

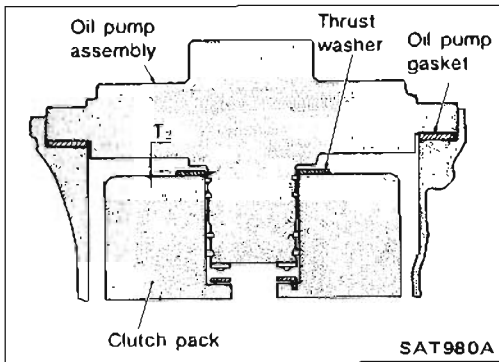
ASSEMBLY

Adjustment (Cont'd)

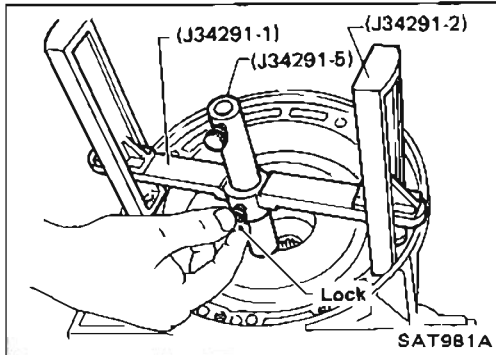
3. Adjust reverse clutch drum end play.

Reverse clutch drum end play "T₂":

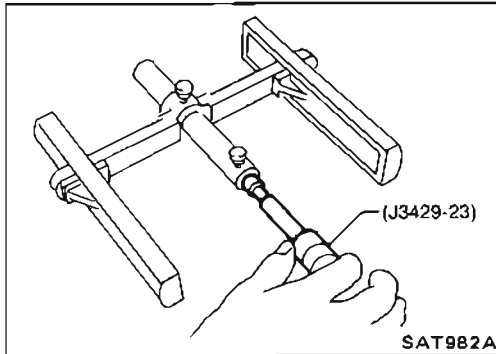
0.55 - 0.90 mm (0.0217 - 0.0354 in)



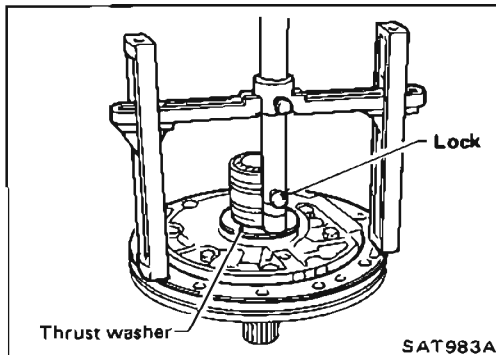
a. Place J34291-1 (bridge), J34291-2 (legs) and J34291-5 (gauging cylinder) on machined surface of transmission case (no gasket) and allow gauging cylinder to rest on front thrust surface of reverse clutch drum. Lock cylinder in place with set screw.



b. Install J34291-23 (gauging plunger) into gauging cylinder.



c. With original thrust washer installed on oil pump, place shim setting gauge legs onto machined surface of oil pump assembly and allow gauging plunger to rest on thrust washer. Lock plunger in place with set screw.



d. Use feeler gauge to measure gap between gauging plunger and gauging cylinder. This measurement should give you exact reverse clutch drum end play.

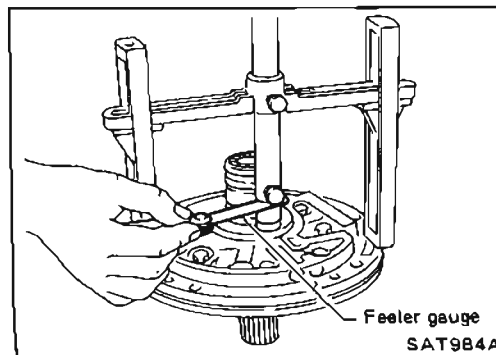
Reverse clutch drum end play "T₂":

0.55 - 0.90 mm (0.0217 - 0.0354 in)

- If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.

Available oil pump thrust washer:

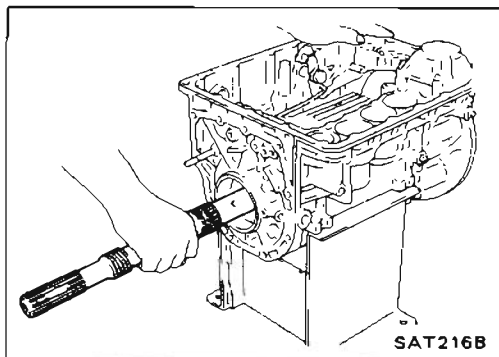
Refer to S.D.S.



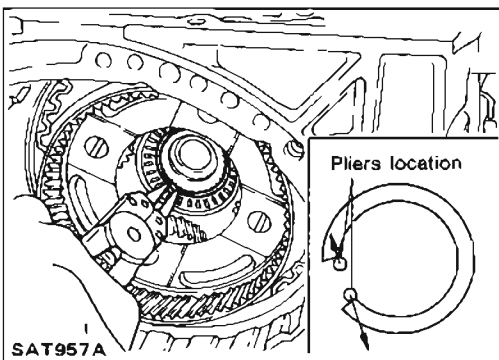
ASSEMBLY

Assembly

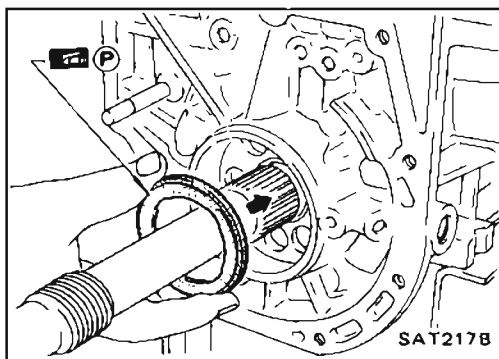
1. Install output shaft and parking gear.
 - a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.
 - Do not force output shaft against front of transmission case.



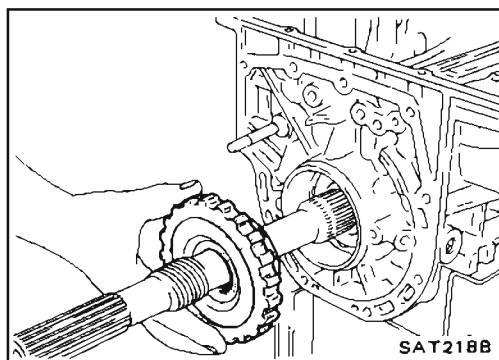
- b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.
 - Check to be sure output shaft cannot be removed in rear direction.



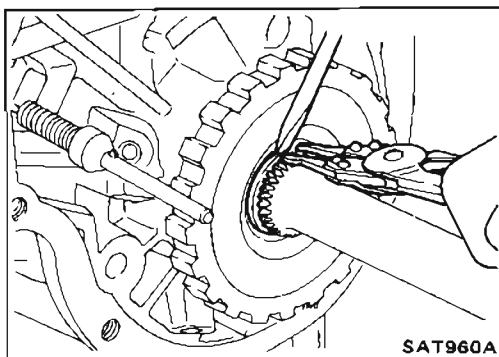
- c. Install needle bearing on transmission case.
 - Pay attention to its direction — Black side goes to front.
 - Apply petroleum jelly to needle bearing.



- d. Install parking gear on transmission case.



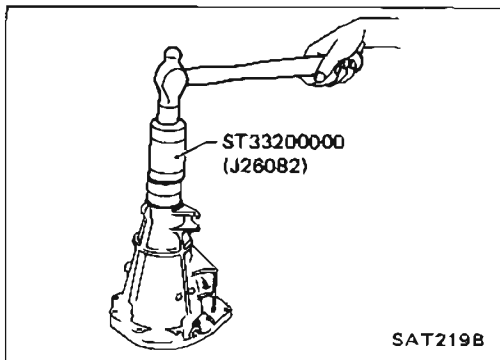
- e. Install snap ring on rear of output shaft.
 - Check to be sure output shaft cannot be removed in forward direction.



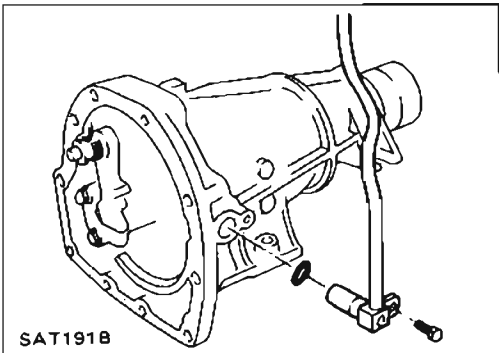
ASSEMBLY

Assembly (Cont'd)

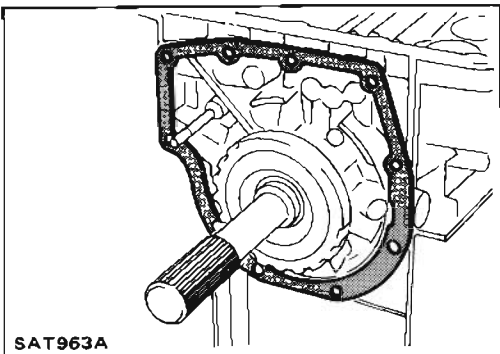
2. Install rear extension.
 - a. Install oil seal on rear extension.
 - Apply A.T.F. to oil seal.



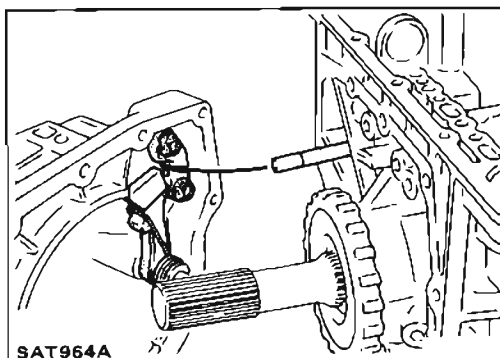
- b. Install O-ring on revolution sensor.
 - Apply A.T.F. to O-ring.
 - c. Install revolution sensor on rear extension.



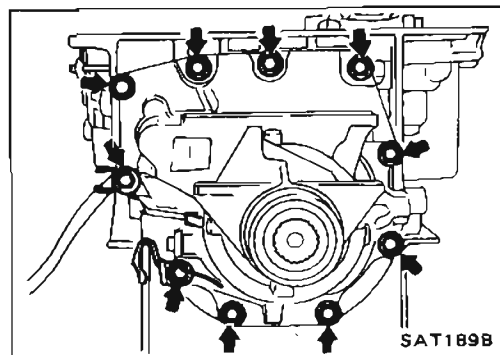
- d. Install rear extension gasket on transmission case.



- e. Install parking rod on transmission case.



- f. Install rear extension on transmission case.



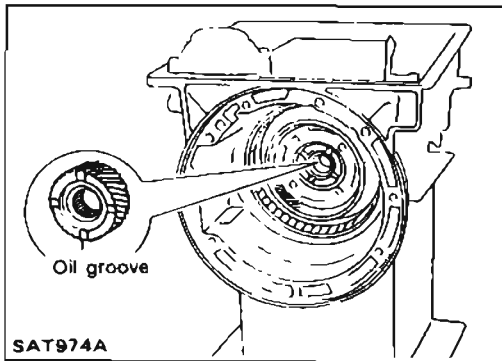
ASSEMBLY

Assembly (Cont'd)

3. Install front side clutch and gear components.

a. Install rear sun gear on transmission case.

- Pay attention to its direction.



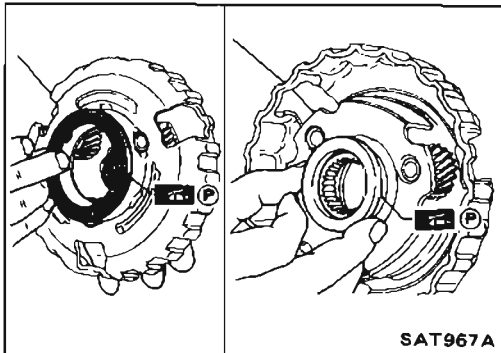
b. Make sure needle bearing is on front of front planetary carrier.

- Apply petroleum jelly to needle bearing.

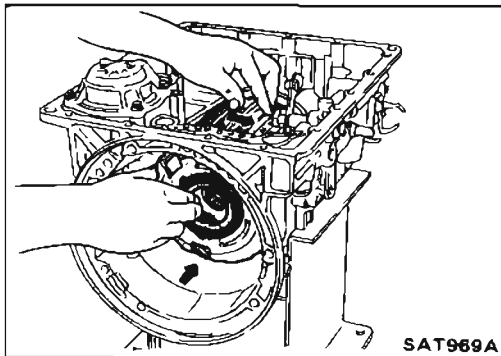
c. Make sure needle bearing is on rear of front planetary carrier.

- Apply petroleum jelly to bearing.

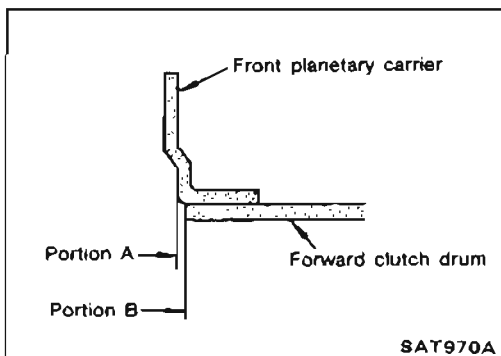
- Pay attention to its direction — Black side goes to front.



d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



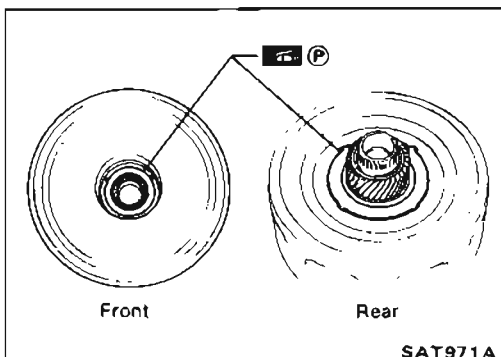
- Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.



e. Make sure bearing races are on front and rear of clutch pack.

- Apply petroleum jelly to bearing races.

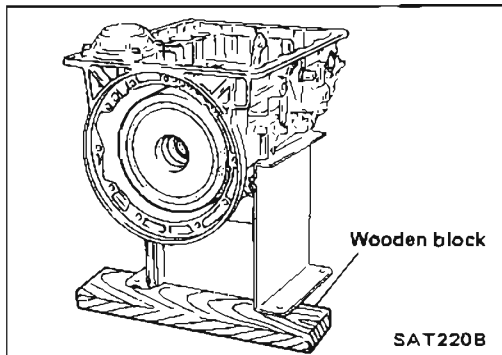
- Securely engage pawls of bearing races with holes in clutch pack.



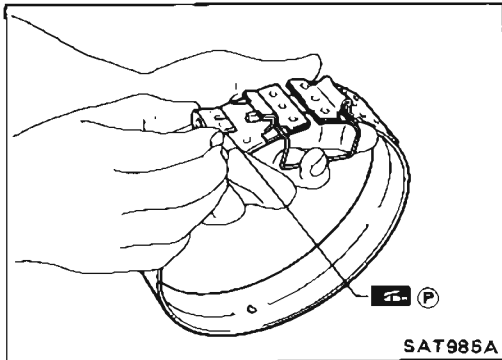
ASSEMBLY

Assembly (Cont'd)

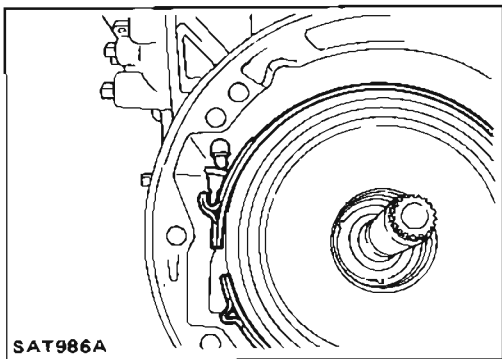
- f. Install clutch pack into transmission case.



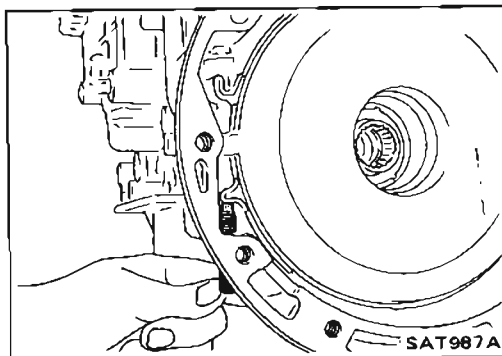
4. Install brake band and band strut.
a. Install band strut on brake band.
● **Apply petroleum jelly to band strut.**



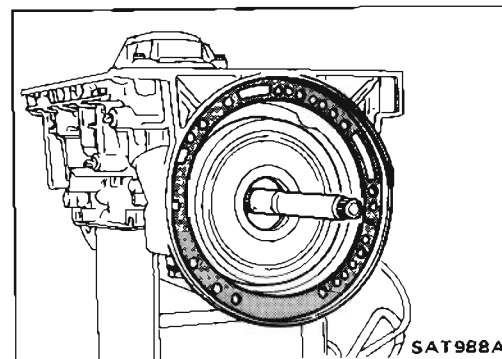
- b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.



- c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.

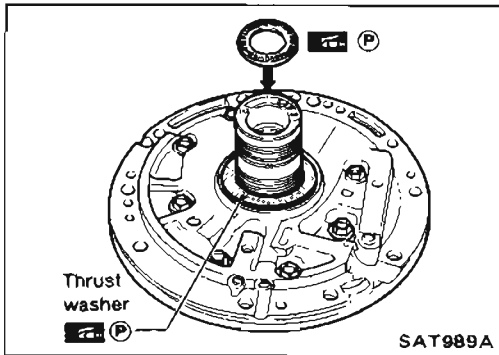


5. Install input shaft on transmission case.
● **Pay attention to its direction — O-ring groove side is front.**
6. Install gasket on transmission case.

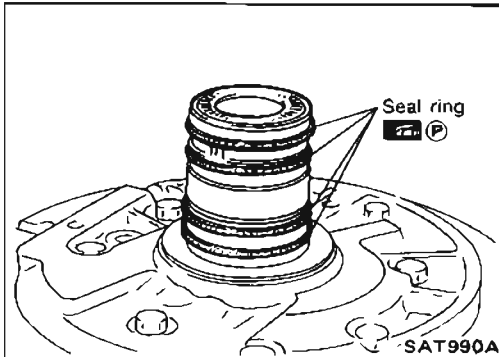


ASSEMBLY

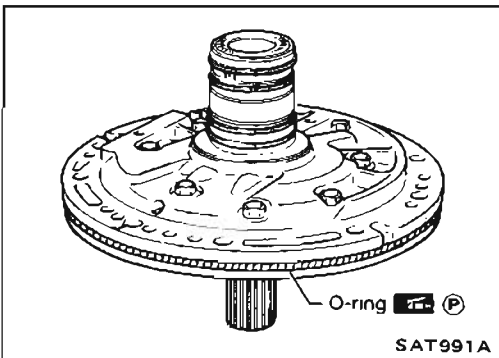
Assembly (Cont'd)



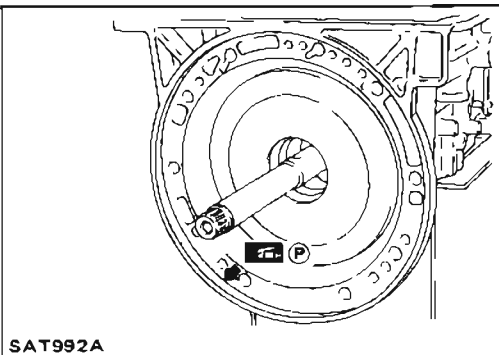
7. Install oil pump assembly.
 - a. Install needle bearing on oil pump assembly.
 - **Apply petroleum jelly to the needle bearing.**
 - b. Install selected thrust washer on oil pump assembly.
 - **Apply petroleum jelly to thrust washer.**



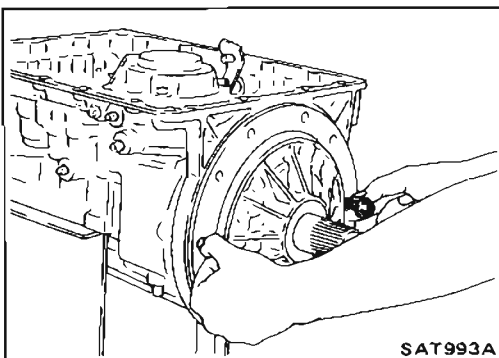
- c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.



- d. Install O-ring on oil pump assembly.
 - **Apply petroleum jelly to O-ring.**



- e. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.

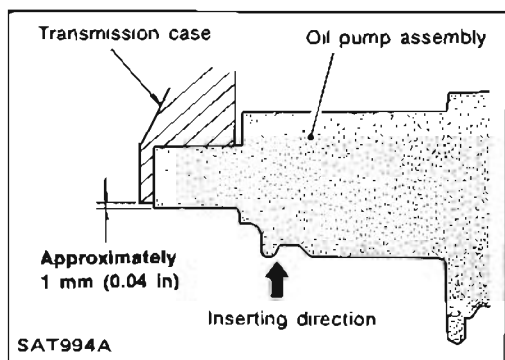


- f. Install oil pump assembly.
 - **Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.**

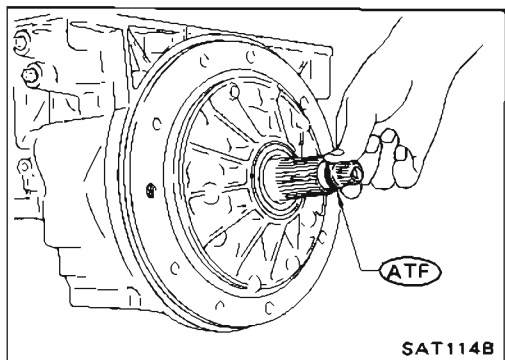
ASSEMBLY

Assembly (Cont'd)

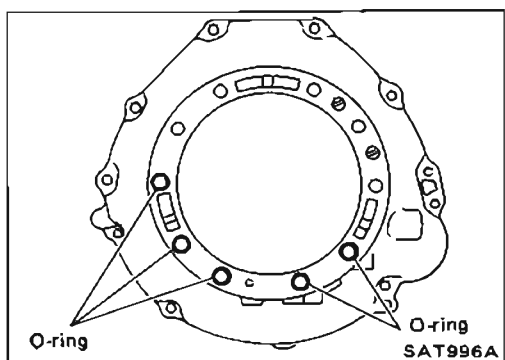
- Insert oil pump assembly to the specified position in transmission, as shown at left.



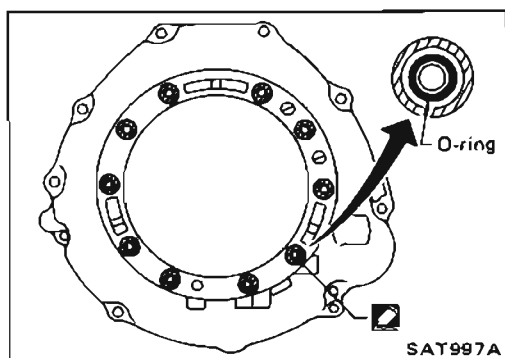
8. Install O-ring on input shaft.
- Apply A.T.F. to O-rings.



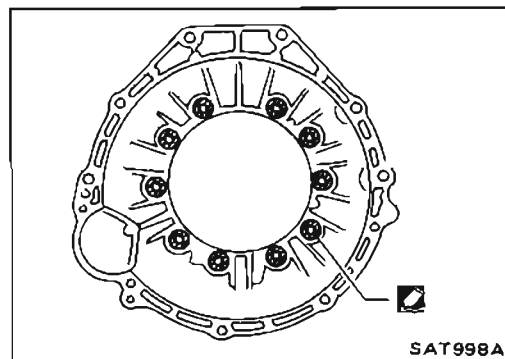
9. Install converter housing.
- a. Install O-rings on converter housing.



- b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.
- Do not apply too much sealant.



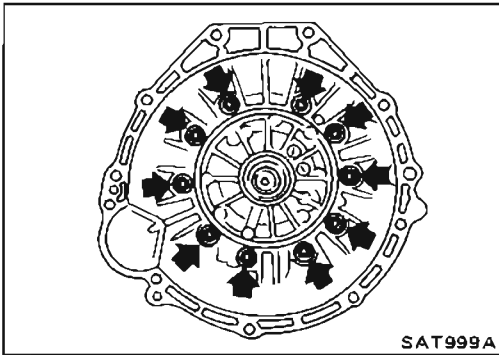
- c. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.



ASSEMBLY

Assembly (Cont'd)

d. Install converter housing on transmission case.



SAT999A

10. Adjust brake band.

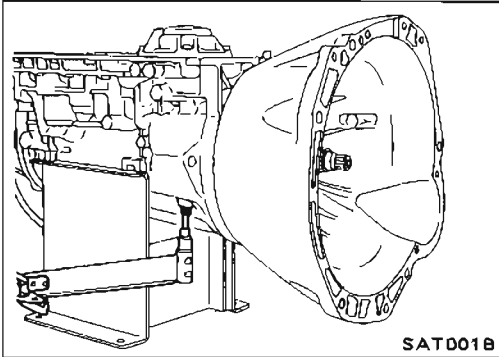
a. Tighten anchor end bolt to specified torque.

Anchor end bolt:

☞: 4 - 6 N·m

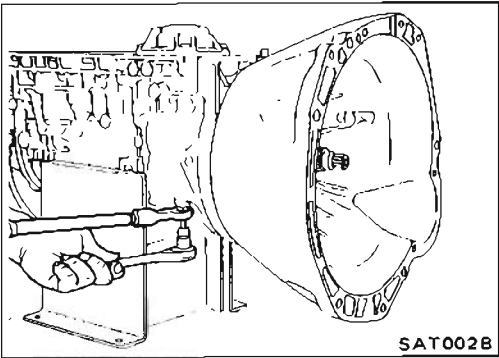
(0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)

b. Back off anchor end bolt two and a half turns.



SAT001B

c. While holding anchor end pin, tighten lock nut.



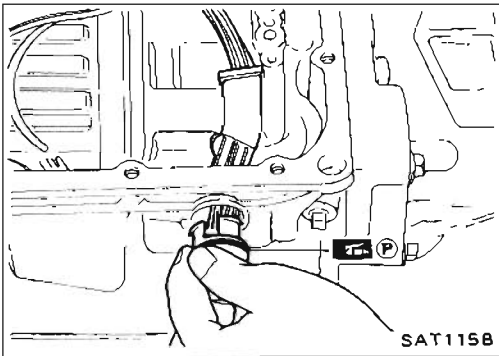
SAT002B

11. Install terminal cord assembly.

a. Install O-ring on terminal cord assembly.

● **Apply petroleum jelly to O-ring.**

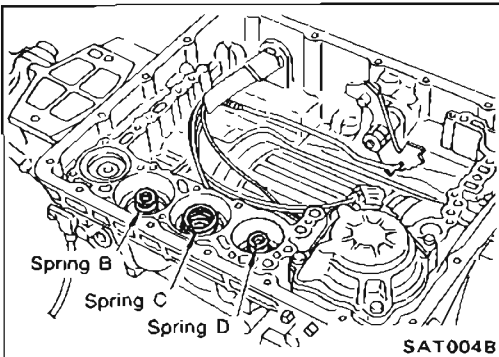
b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.



SAT115B

12. Install control valve assembly.

a. Install accumulator piston return springs B, C and D.



SAT004B

Free length of return springs:

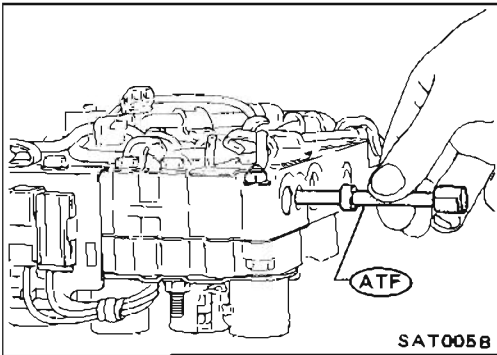
Unit: mm (in)

| Item | Accumulator | B | C | D |
|-------------|-------------|-----------|-----------|--------------|
| Free length | | 66 (2.60) | 45 (1.77) | 58.4 (2.299) |

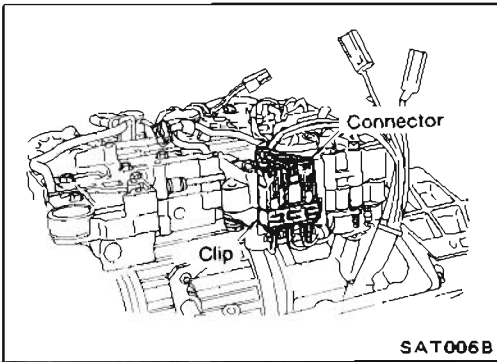
ASSEMBLY

Assembly (Cont'd)

- b. Install manual valve on control valve.
 ● **Apply A.T.F. to manual valve.**

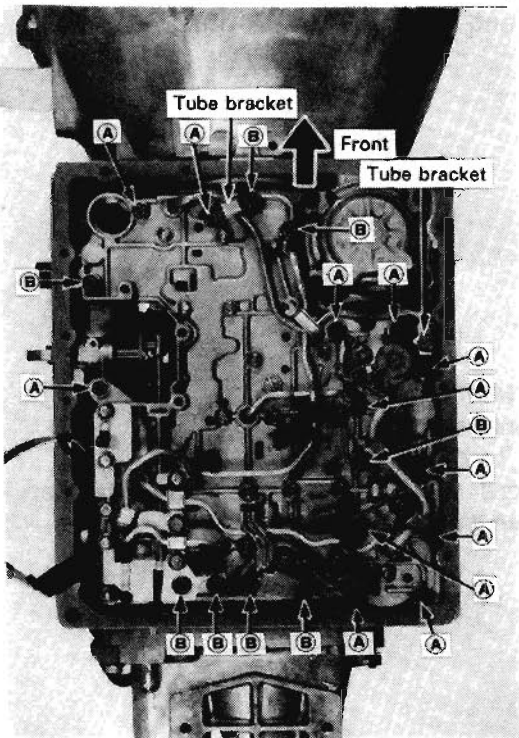


- c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
 d. Install connector clip.

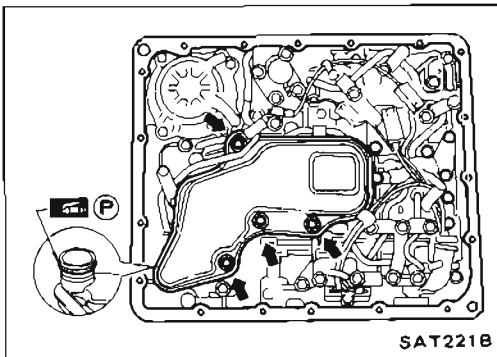


- e. Install control valve assembly on transmission case.
 f. Install connector tube brackets and tighten bolts (A) and (B).
 ● **Check that terminal assembly harness does not catch.**

| Bolt | Length |
|------|-----------------|
| (A) | 37 mm (1.46 in) |
| (B) | 50 mm (1.97 in) |



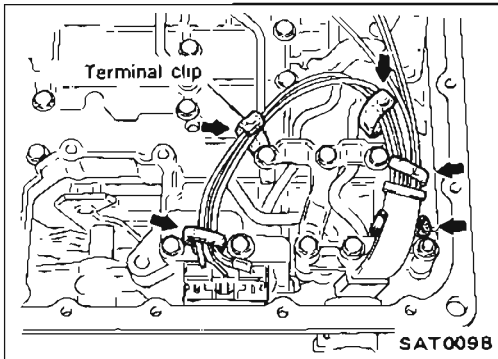
- g. Install O-ring on oil strainer.
 ● **Apply petroleum jelly to O-ring.**
 h. Install oil strainer on control valve.



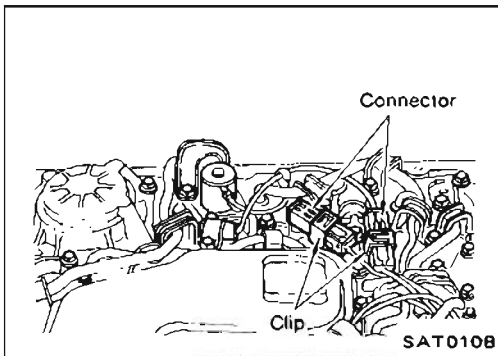
ASSEMBLY

Assembly (Cont'd)

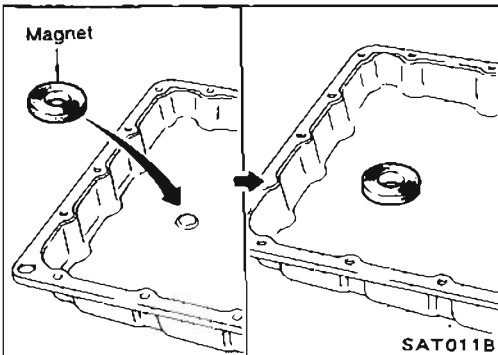
- i. Securely fasten terminal harness with clips.



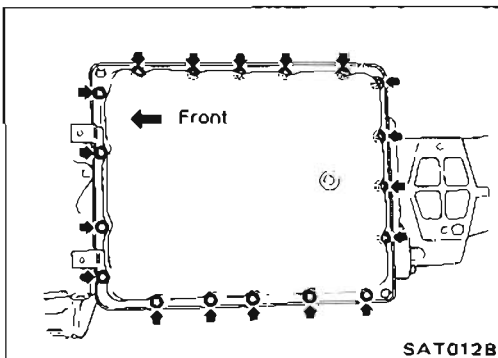
- j. Install lock-up solenoid and fluid temperature sensor connectors.



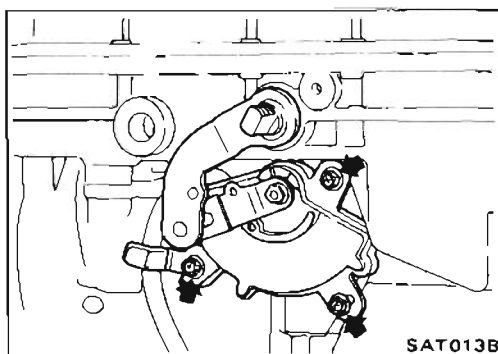
13. Install oil pan.
 - a. Attach a magnet to oil pan.



- b. Install oil pan gasket on transmission case.
 - c. Install oil pan and bracket on transmission case.
 - **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

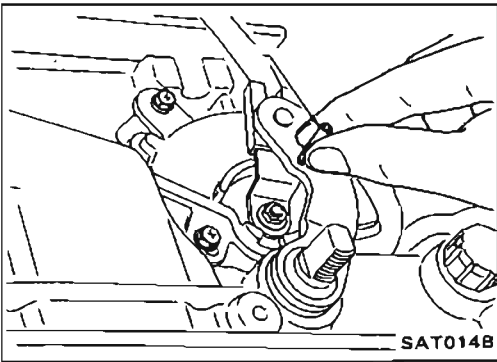


14. Install inhibitor switch.
 - a. Check that manual shaft is in "1" range.
 - b. Temporarily install inhibitor switch on manual shaft.
 - c. Move manual shaft to "N".

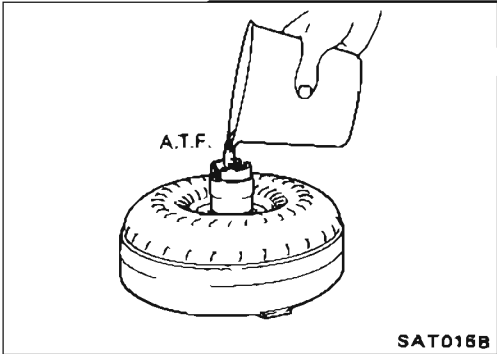


ASSEMBLY

Assembly (Cont'd)



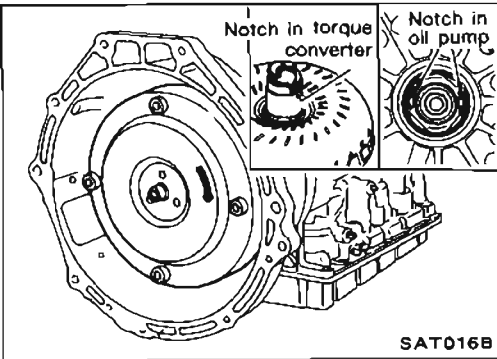
- d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.



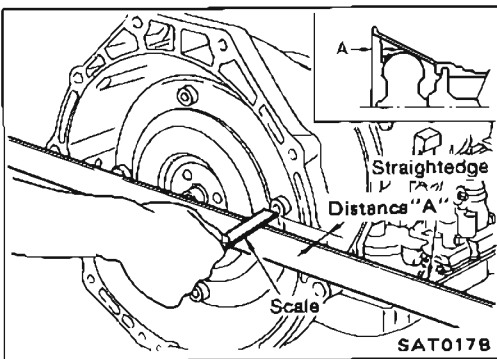
15. Install torque converter.

- a. Pour A.T.F. into torque converter.

- Approximately 2 liters (2-1/8 US qt, 1-3/4 Imp qt) of fluid are required for a new torque converter.
- When reusing old torque converter, add the same amount of fluid as was drained.



- b. Install torque converter while aligning notches and oil pump.



- c. Measure distance A to check that torque converter is in proper position.

Distance "A":

26 mm (1.02 In) or more

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

General Specifications

| | |
|----------------------------------|---|
| Engine | KA24E |
| Automatic transmission model | RE4R01A |
| Transmission model code number | 45X06 |
| Stall torque ratio | 2.0 : 1 |
| Transmission gear ratio | |
| 1st | 2.786 |
| 2nd | 1.645 |
| Top | 1.000 |
| O.D. | 0.694 |
| Reverse | 2.272 |
| Recommended oil | Automatic transmission fluid Type DEXRON™ |
| Oil capacity ℓ (US qt, Imp qt) | 8.3 (8-3/4, 7-1/4) |

Specifications and Adjustment

VEHICLE SPEED WHEN SHIFTING GEARS

| Throttle position | Vehicle speed km/h (MPH) | | | | | | |
|-------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | D ₁ → D ₂ | D ₂ → D ₃ | D ₃ → D ₄ | D ₄ → D ₅ | D ₅ → D ₆ | D ₆ → D ₇ | 1 ₁ → 1 ₂ |
| Full throttle | 62 - 66 (32 - 35) | 95 - 101 (59 - 63) | 146 - 156 (91 - 97) | 140 - 150 (87 - 93) | 89 - 95 (55 - 59) | 40 - 44 (25 - 27) | 63 - 67 (33 - 35) |
| Half throttle | 38 - 42 (24 - 26) | 72 - 78 (45 - 48) | 111 - 121 (69 - 75) | 65 - 65 (34 - 40) | 33 - 39 (21 - 24) | 10 - 14 (6 - 9) | 63 - 67 (33 - 35) |

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

| Throttle position | O.D. switch [Shift range] | Vehicle speed km/h (MPH) | |
|-------------------|---------------------------|--------------------------|------------------------|
| | | Lock-up "ON" | Lock-up "OFF" |
| Full throttle | ON [D ₄] | 146 - 156 (91 - 97) | 140 - 150 (87 - 93) |
| | OFF [D ₅] | 95 - 101 (59 - 63) | 89 - 95 (55 - 59) |
| Half throttle | ON [D ₄] | 112 - 120 (70 - 75) | 102 - 110 (63 - 68) |
| | OFF [D ₅] | 76 - 84 (47 - 52) | 71 - 79 (44 - 49) |

STALL REVOLUTION

| Stall revolution rpm |
|----------------------|
| 2,050 - 2,250 |

LINE PRESSURE

| Engine speed rpm | Line pressure kPa (kg/cm ² , psi) | |
|------------------|--|---|
| | D, 2 and 1 ranges | R range |
| Idle | 471 - 510 (4.8 - 5.2, 68 - 74) | 657 - 696 (6.7 - 7.1, 95 - 101) |
| Stall | 1,020 - 1,098 (10.4 - 11.2, 148 - 169) | 1,422 - 1,500 (14.5 - 15.3, 206 - 218) |

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

Specifications and Adjustment (Cont'd)

RETURN SPRINGS

Unit: mm (in)

| Parts | Item | Part No. | Free length | Outer diameter | |
|---------------------------------|---------------|--------------------------------------|----------------|----------------|---------------|
| Control valve | Upper body | Torque converter relief valve spring | 31742-41X18 | 32.3 (1.272) | 9.0 (0.354) |
| | | Pressure regulator valve spring | 31742-41X16 | 61.5 (2.421) | 8.9 (0.350) |
| | | Pressure modifier valve spring | 31742-41X19 | 31.95 (1.2579) | 6.8 (0.268) |
| | | Shuttle shift valve D spring | 31762-41X00 | 26.5 (1.043) | 6.0 (0.236) |
| | | 4-2 sequence valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| | | Shift valve B spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | 4-2 relay valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| | | Shift valve A spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | Overrun clutch control valve spring | 31762-41X03 | 23.6 (0.929) | 7.0 (0.276) |
| | | Overrun clutch reducing valve spring | 31742-41X20 | 32.5 (1.280) | 7.0 (0.276) |
| | | Shuttle shift valve S spring | 31762-41X04 | 51.0 (2.008) | 5.65 (0.2224) |
| | | Pilot valve spring | 31742-41X13 | 25.7 (1.012) | 9.1 (0.358) |
| | | Lock-up control valve spring | 31742-41X22 | 18.5 (0.728) | 13.0 (0.512) |
| | Lower body | Modifier accumulator piston spring | 31742-41X15 | 30.5 (1.201) | 9.8 (0.386) |
| | | 1st reducing valve spring | 31756-41X05 | 25.4 (1.000) | 6.75 (0.2657) |
| 3-2 timing valve spring | | 31742-41X08 | 20.55 (0.8091) | 6.75 (0.2657) | |
| Servo charger valve spring | | 31742-41X06 | 23.0 (0.906) | 6.7 (0.264) | |
| Reverse clutch | 16 pcs | 30505-41X02 | 19.69 (0.7752) | 11.6 (0.457) | |
| High clutch | 16 pcs | 31505-21X03 | 22.08 (0.8686) | 11.6 (0.457) | |
| Forward clutch (Overrun clutch) | 20 pcs | 31505-41X01 | 35.77 (1.4083) | 9.7 (0.382) | |
| Low & reverse brake | 18 pcs | 31521-21X00 | 23.7 (0.933) | 11.6 (0.457) | |
| Band servo | Spring A | 31605-41X05 | 45.6 (1.795) | 34.3 (1.350) | |
| | Spring B | 31605-41X00 | 53.8 (2.118) | 40.3 (1.587) | |
| | Spring C | 31605-41X01 | 29.0 (1.142) | 27.6 (1.087) | |
| Accumulator | Accumulator A | 31605-41X02 | 43.0 (1.693) | | |
| | Accumulator B | 31605-41X10 | 66.0 (2.598) | | |
| | Accumulator C | 31605-41X09 | 45.0 (1.772) | | |
| | Accumulator D | 31605-41X06 | 58.0 (2.283) | | |

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

Specifications and Adjustment (Cont'd)

ACCUMULATOR O-RING

| Accumulator | Diameter mm (in) | | | |
|--------------------|------------------|-----------|-----------|-----------|
| | A | B | C | D |
| Small diameter end | 29 (1.14) | 32 (1.26) | 45 (1.77) | 29 (1.14) |
| Large diameter end | 45 (1.77) | 50 (1.97) | 60 (1.97) | 45 (1.77) |

CLUTCHES AND BRAKES

| Reverse clutch | | |
|-------------------------------------|--|-------------|
| Number of drive plates | 2 | |
| Number of driven plates | 2 | |
| Thickness of drive plate mm (in) | 2.0 (0.079) 1.8 (0.071) | |
| Standard Wear limit | | |
| Clearance mm (in) | 0.5 - 0.8 (0.020 - 0.031) 1.2 (0.047) | |
| Standard Allowable limit | | |
| Thickness of retaining plate | Thickness mm (in) | Part number |
| | 4.6 (0.181) | 31537-21X00 |
| | 4.8 (0.189) | 31537-21X01 |
| | 5.0 (0.197) | 31537-21X02 |
| | 5.2 (0.205) | 31537-21X03 |
| | 5.4 (0.213) | 31537-21X04 |
| | 5.6 (0.220) | 31567-41X13 |
| 5.8 (0.228) | 31567-41X14 | |
| High clutch | | |
| Number of drive plates | 4 | |
| Number of driven plates | 4 | |
| Thickness of drive plate mm (in) | 1.6 (0.063) 1.4 (0.055) | |
| Standard Wear limit | | |
| Clearance mm (in) | 1.8 - 2.2 (0.071 - 0.087) 3.0 (0.118) | |
| Standard Allowable limit | | |
| Thickness of retaining plate | Thickness 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 | |

| Forward clutch | | |
|-------------------------------------|--|-------------|
| Number of drive plates | 5 | |
| Number of driven plates | 5 | |
| Thickness of drive plate mm (in) | 2.0 (0.079) 1.8 (0.071) | |
| Standard Wear limit | | |
| Clearance mm (in) | 0.45 - 0.85 (0.0177 - 0.0335) 1.85 (0.0728) | |
| Standard Allowable limit | | |
| Thickness of retaining plate | Thickness mm (in) | Part number |
| | 8.0 (0.315) | 31537-41X00 |
| | 8.2 (0.323) | 31537-41X01 |
| | 8.4 (0.331) | 31537-41X02 |
| | 8.6 (0.339) | 31537-41X03 |
| | 8.8 (0.346) | 31537-41X04 |
| | 9.0 (0.354) | 31537-41X05 |
| 9.2 (0.362) | 31537-41X06 | |
| Overrun clutch | | |
| Number of drive plates | 3 | |
| Number of driven plates | 5 | |
| Thickness of drive plate mm (in) | 2.0 (0.079) 1.8 (0.071) | |
| Standard Wear limit | | |
| Clearance mm (in) | 1.0 - 1.4 (0.039 - 0.055) 2.0 (0.079) | |
| Standard Allowable limit | | |
| Thickness of retaining plate | Thickness mm (in) | Part number |
| | 4.0 (0.157) | 31537-41X79 |
| | 4.2 (0.165) | 31537-41X80 |
| | 4.4 (0.173) | 31537-41X81 |
| | 4.6 (0.181) | 31537-41X82 |
| | 4.8 (0.189) | 31537-41X83 |
| | 5.0 (0.197) | 31537-41X84 |
| 5.2 (0.205) | 31537-41X20 | |

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

Specifications and Adjustment (Cont'd)

| | | |
|---|---------------------------------|-------------|
| Low & reverse brake | | |
| Number of drive plates | 5 | |
| Number of driven plates | 7 | |
| Thickness of drive plate mm (in) | | |
| Standard | 2.0 (0.079) | |
| Wear limit | 1.8 (0.071) | |
| Clearance mm (in) | | |
| Standard | 1.1 - 1.5 (0.043 - 0.059) | |
| Allowable limit | 2.5 (0.098) | |
| Thickness of retaining plate | Thickness mm (in) | Part number |
| | 8.6 (0.339) | 31667-41X03 |
| | 8.8 (0.346) | 31667-41X04 |
| | 9.0 (0.354) | 31667-41X06 |
| | 9.2 (0.362) | 31667-41X06 |
| | 9.4 (0.370) | 31667-41X09 |
| 9.6 (0.378) | 31667-41X10 | |
| Brake band | | |
| Anchor end bolt tightening torque N-m (kg-m, ft-lb) | 4 - 6 (0.4 - 0.6, 2.9 - 4.3) | |
| Number of returning revolutions for anchor end bolt | 2.5 | |

OIL PUMP AND LOW ONE-WAY CLUTCH

| | |
|---|--------------------------------|
| Oil pump clearance mm (in) | |
| Cam ring — oil pump housing Standard | 0.01 - 0.024 (0.0004 - 0.0009) |
| Rotor, vanes and control piston — oil pump housing Standard | 0.03 - 0.044 (0.0012 - 0.0017) |
| Seal ring clearance mm (in) | |
| Standard | 0.10 - 0.25 (0.0039 - 0.0098) |
| Allowable limit | 0.25 (0.0098) |

TOTAL END PLAY

| | | |
|---|--|-------------|
| Total end play "T," | 0.25 - 0.55 mm (0.0098 - 0.0217 in) | |
| Thickness of oil pump cover bearing race | Thickness mm (in) | Part number |
| | 0.8 (0.031) | 31429-21X00 |
| | 1.0 (0.039) | 31429-21X01 |
| | 1.2 (0.047) | 31429-21X02 |
| | 1.4 (0.055) | 31429-21X03 |
| | 1.6 (0.063) | 31429-21X04 |
| | 1.8 (0.071) | 31429-21X05 |
| 2.0 (0.079) | 31429-21X06 | |

REVERSE CLUTCH DRUM END PLAY

| | | |
|---|--|-------------|
| Reverse clutch drum end play "T ₂ " | 0.65 - 0.90 mm (0.0217 - 0.0354 in) | |
| Thickness of oil pump thrust washer | Thickness mm (in) | Part number |
| | 0.7 (0.028) | 31528-21X00 |
| | 0.9 (0.036) | 31528-21X01 |
| | 1.1 (0.043) | 31528-21X02 |
| | 1.3 (0.051) | 31528-21X03 |
| | 1.5 (0.059) | 31528-21X04 |
| | 1.7 (0.067) | 31528-21X05 |
| 1.9 (0.075) | 31528-21X06 | |

REMOVAL AND INSTALLATION

| | |
|---|---|
| Manual control linkage Number of returning revolutions for lock nut | 1 |
| Lock nut tightening torque | 11 - 15 N-m (1.1 - 1.5 kg-m, 8 - 11 ft-lb) |
| Distance between end of clutch housing and torque converter | 26.0 mm (1.024 in) or more |
| Drive plate runout limit | 0.5 mm (0.020 in) |

PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION **PD**


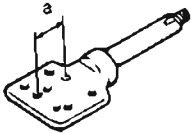
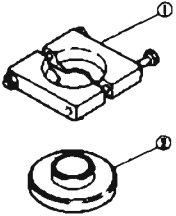
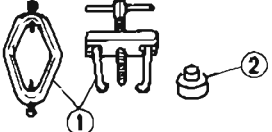
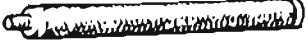
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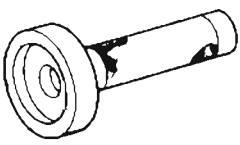
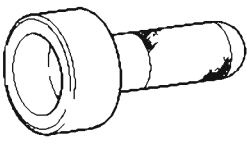
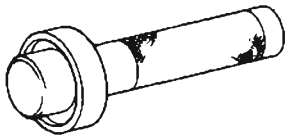

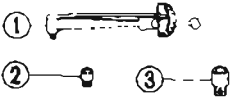

PD

PREPARATION




SPECIAL SERVICE TOOLS

| Tool number (Kent-Moore No.) Tool name | Description | |
|---|--|--|
| ST38060002 (J34311) Drive pinion flange wrench |  | Removing and installing propeller shaft lock nut, and drive pinion lock nut. |
| KV38100800 (-) Equivalent tool (J25604-01) Differential attachment |  a: 152 mm (5.98 in) | Mounting final drive (To use, make a new hole.) |
| ST3090S000 (-) Drive pinion rear inner race puller set ① ST30031000 (J22912-01) Puller ② ST30901000 (-) Equivalent tool (J26010-01) Base |  | Removing and installing drive pinion rear cone |
| ST3306S001 (-) Differential side bearing puller set ① ST33051001 (-) Equivalent tool (J22888) Body ② ST33061000 (J8107-2) Equivalent tool (J26010-01) Adapter |  | Removing and installing differential side bearing inner cone |
| ST30611000 (J25742-1) Drift |  | Installing pinion rear bearing outer race |

PREPARATION

| Tool number (Kent-Moore No.) Tool name | Description | |
|--|---|--|
| ST30613000 (J25742-3) Drift |  | Installing pinion rear bearing outer race |
| ST30701000 (J25742-2) Drift |  | Installing pinion front bearing outer race |
| KV38100200 (J26233) Gear carrier side oil seal drift |  | Installing side oil seal |
| KV38100500 (-) Gear carrier front oil seal drift |  | Installing front oil seal |
| KV38100300 (J25523) Differential side bearing inner cone |  | Installing side bearing inner cone |
| KV38100600 (J25267) Side bearing spacer drift |  | Installing side bearing spacer |
| ST3127S000 (See J25765-A) Preload gauge ① GG91030000 (J25765) Torque wrench ② HT62940000 (-) Socket adapter ③ HT62900000 (-) Socket adapter |  | Measuring pinion bearing preload and total preload |
| HT72400000 (-) Slide hammer |  | Removing differential case assembly |

PREPARATION

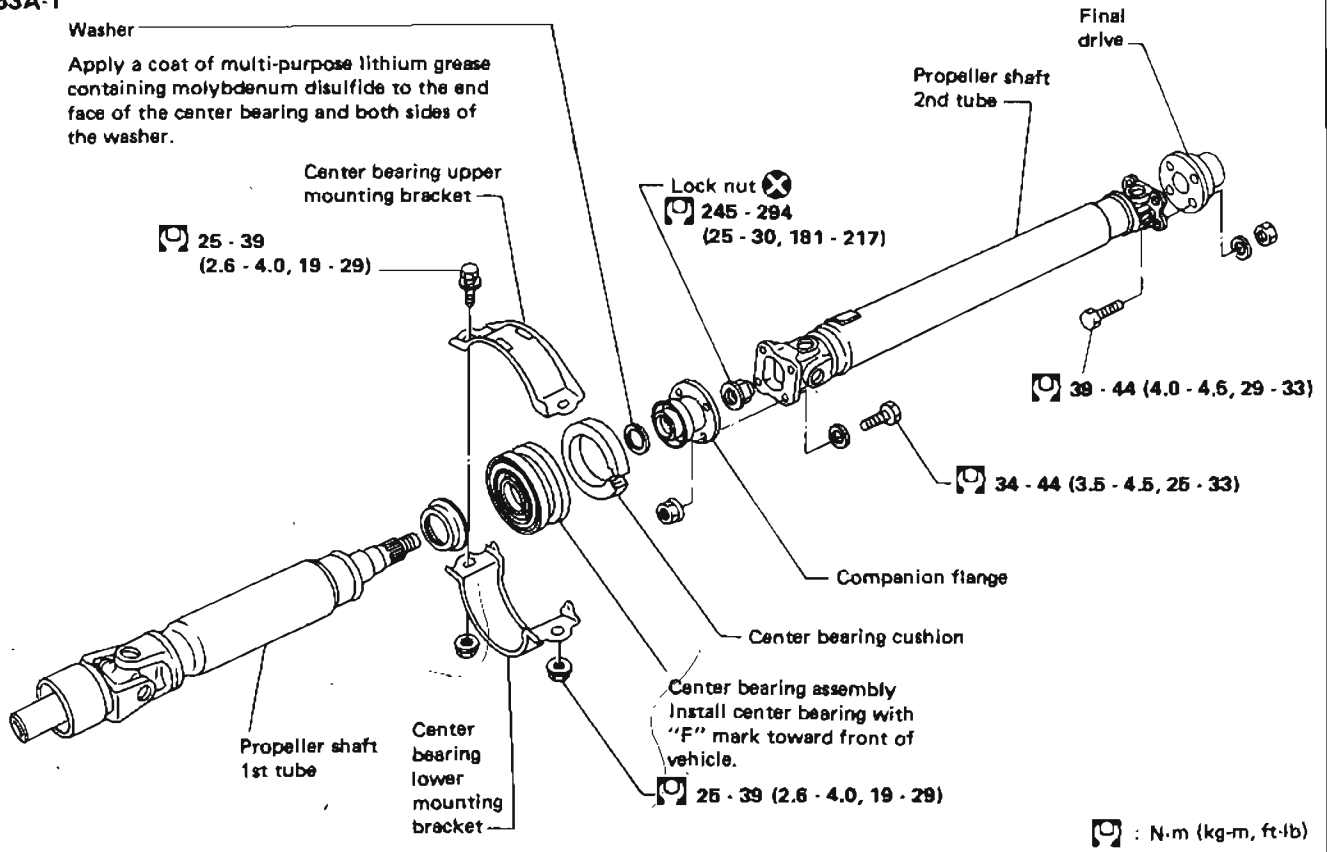
| Tool number (Kent-Moore No.) Tool name | Description |
|---|---|
| (J34309) Differential shim selector |  <p>Adjusting bearing preload and gear height</p> |
| (J25269-4) Side bearing discs (2 Req'd) |  <p>Selecting pinion height adjusting washer</p> |
| (J8129) Spring gauge |  <p>Measuring carrier turning torque</p> |

PROPELLER SHAFT

3S63A-T

Washer

Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.

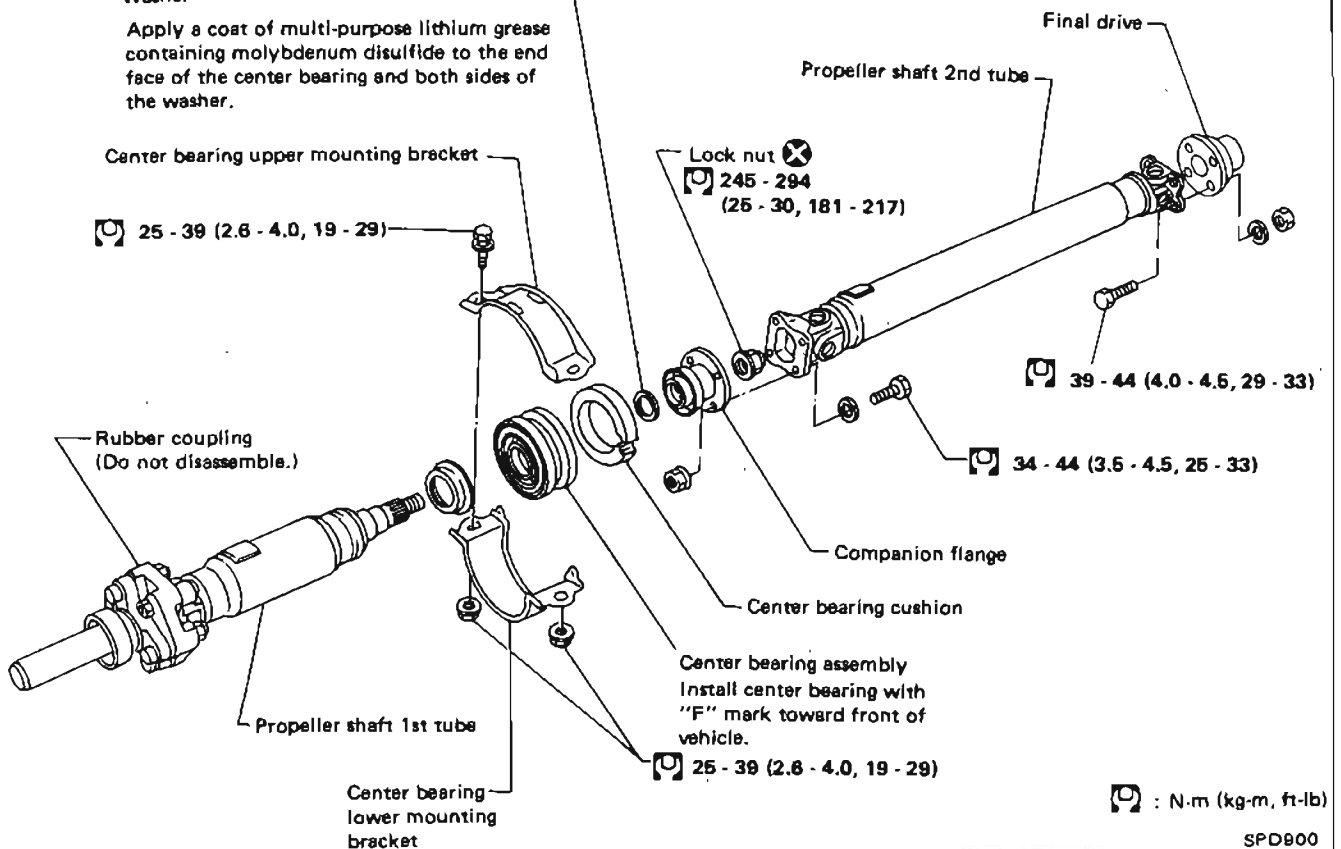


SPD899

3S63A-R

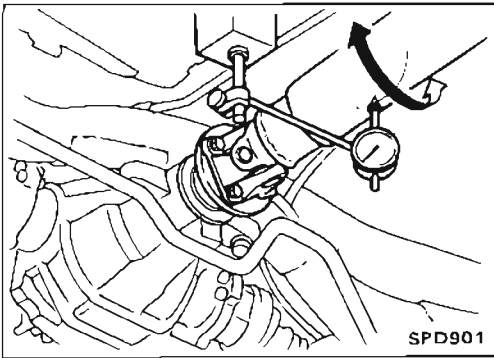
Washer

Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.



SPD900

PROPELLER SHAFT



On-vehicle Service

PROPELLER SHAFT VIBRATION

If vibration is present at high speed, inspect propeller shaft runout first.

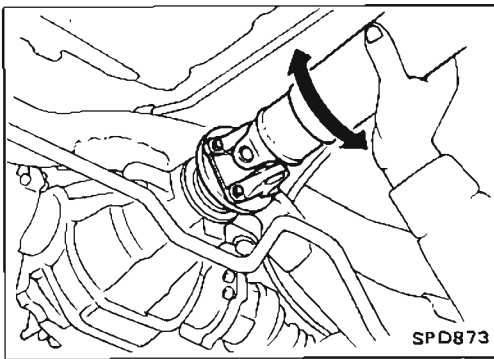
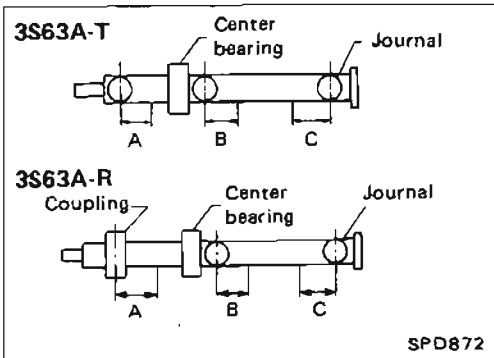
1. Raise rear wheels.
2. Measure propeller shaft runout at indicated points by rotating final drive companion flange with hands.

Runout limit: 0.6 mm (0.024 in)

Propeller shaft runout measuring points:

Unit: mm (in)

| Distance | Model | 3S63A-T | 3S63A-R |
|----------|-------|------------|------------|
| | A | | 175 (6.89) |
| B | | 165 (6.50) | 165 (6.50) |
| C | | 185 (7.28) | 185 (7.28) |



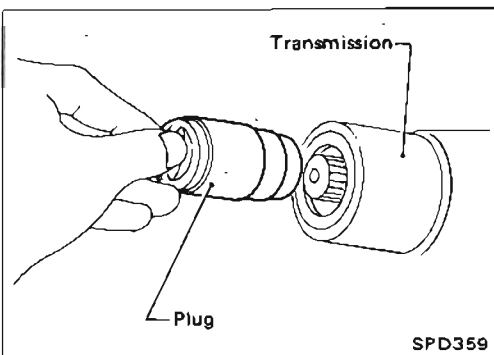
3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange; then rotate companion flange 180 degrees and reconnect propeller shaft.

Runout limit: 0.6 mm (0.024 in)

4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.

APPEARANCE CHECKING

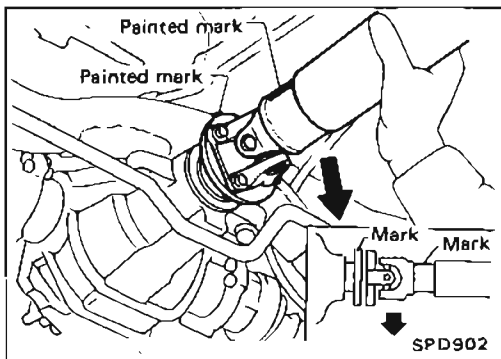
- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.



Removal

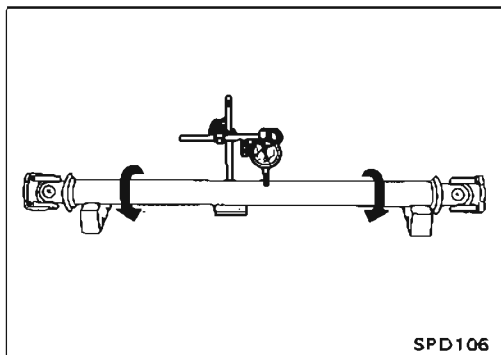
- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.

PROPELLER SHAFT



Installation

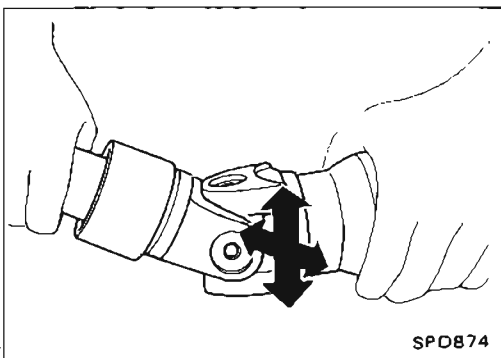
- Temporarily install differential companion flange and flange yoke so that their alignment marks are located as close to each other as possible.
- Turn propeller shaft until alignment marks face straight upward. Securely fasten propeller shaft so that lower side wall of concave flange yoke will touch lower side wall of convex companion flange.



Inspection

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.

Runout limit: 0.6 mm (0.024 in)

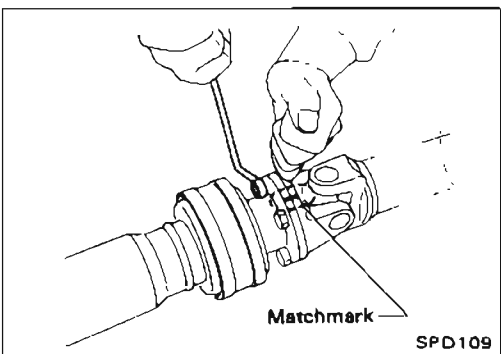


- Inspect journal axial play.

If the play exceeds specifications, replace propeller shaft assembly.

Journal axial play:

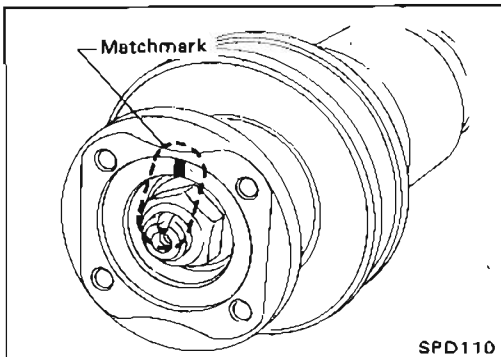
0 mm (0 in)



Disassembly

CENTER BEARING

1. Put matchmarks on flanges, and separate 2nd tube from 1st tube.



2. Put matchmarks on the flange and shaft.

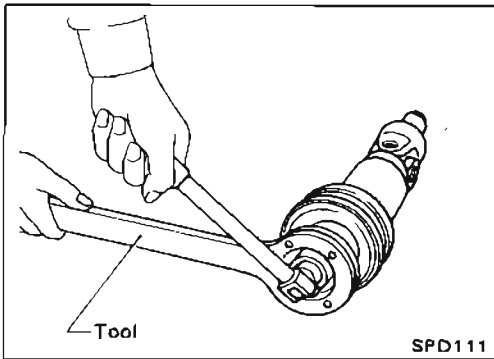
PROPELLER SHAFT

Disassembly (Cont'd)

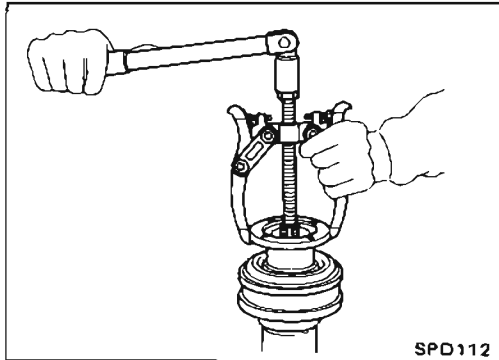
3. Remove locking nut with Tool.

Tool number:

ST38060002 (J34311)

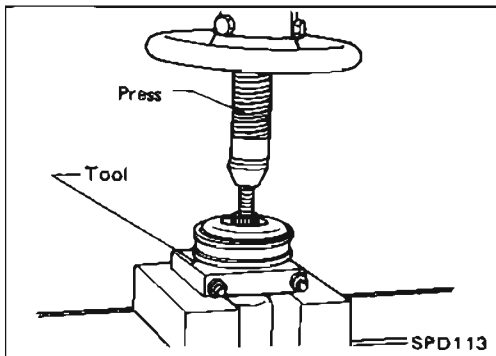


4. Remove companion flange with puller.



5. Remove center bearing with Tool and press.

Tool number: ST30031000 (J22912-01)

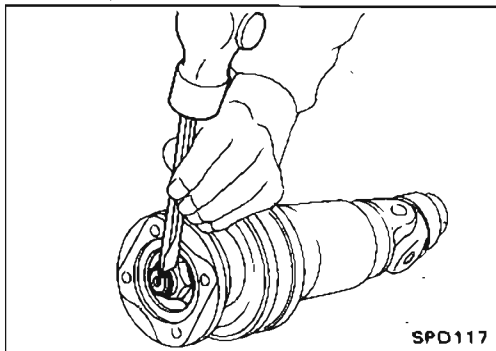
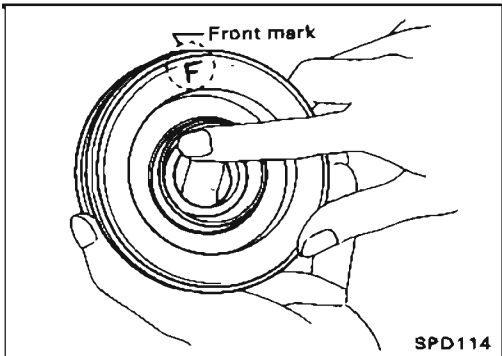


Assembly

CENTER BEARING

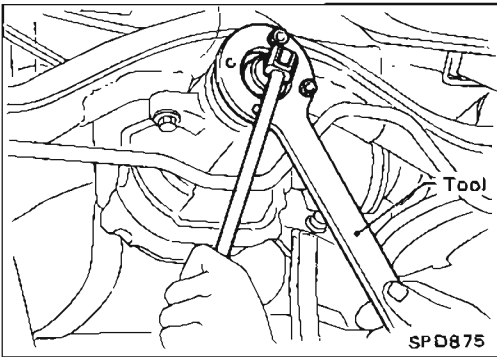
- When installing center bearing, position the "F" mark on center bearing toward front of vehicle.
- Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.

- Stake the nut. Always use new one.
- Align matchmarks when assembling tubes.

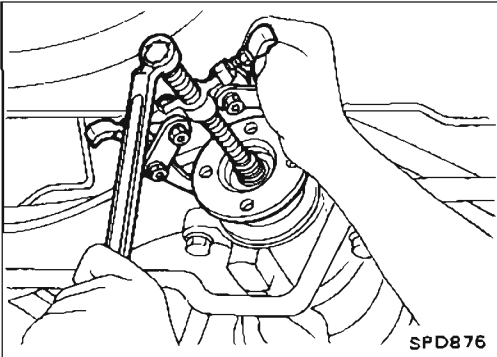


Front Oil Seal Replacement

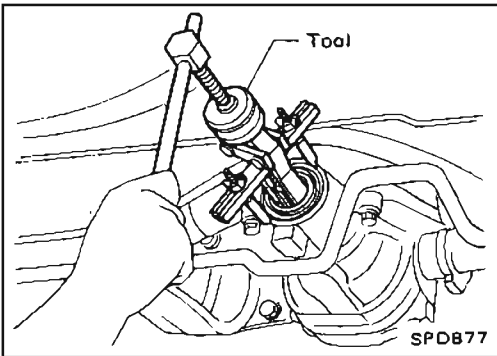
1. Remove propeller shaft.
2. Loosen drive pinion nut with Tool.
Tool number: ST38060002 (J34311)



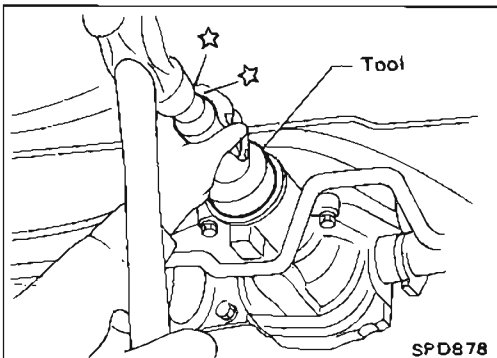
3. Remove companion flange.



4. Remove front oil seal.

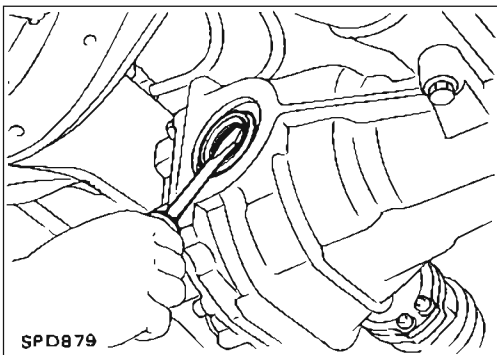


5. Apply multi-purpose grease to sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.

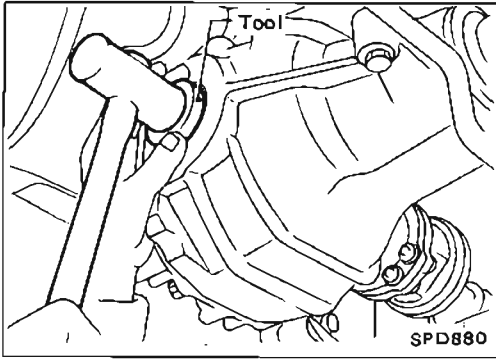


Side Oil Seal Replacement

1. Remove drive shafts.
Refer to RA section.
2. Remove oil seal.

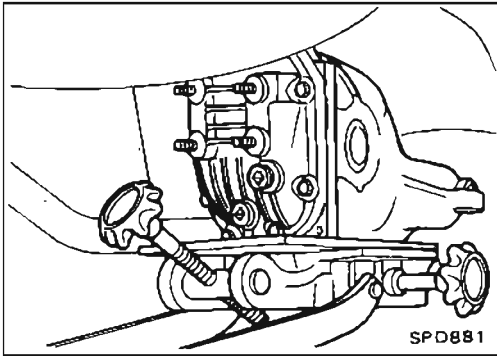


Side Oil Seal Replacement (Cont'd)



3. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.
Tool number: KV38100200 (J26233)
4. Install drive shafts.

REMOVAL AND INSTALLATION



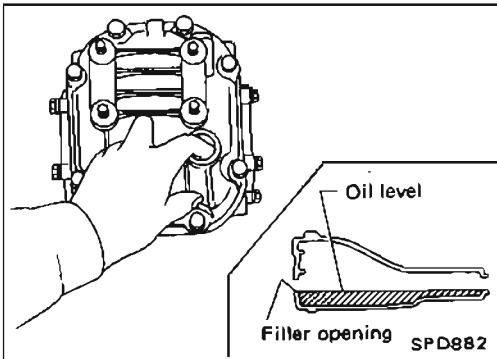
Removal

- Remove propeller shaft.
Insert plug into rear oil seal after removing propeller shaft.

- Remove drive shafts.
Refer to RA section.
- Pull off final drive backward together with jack.

CAUTION:

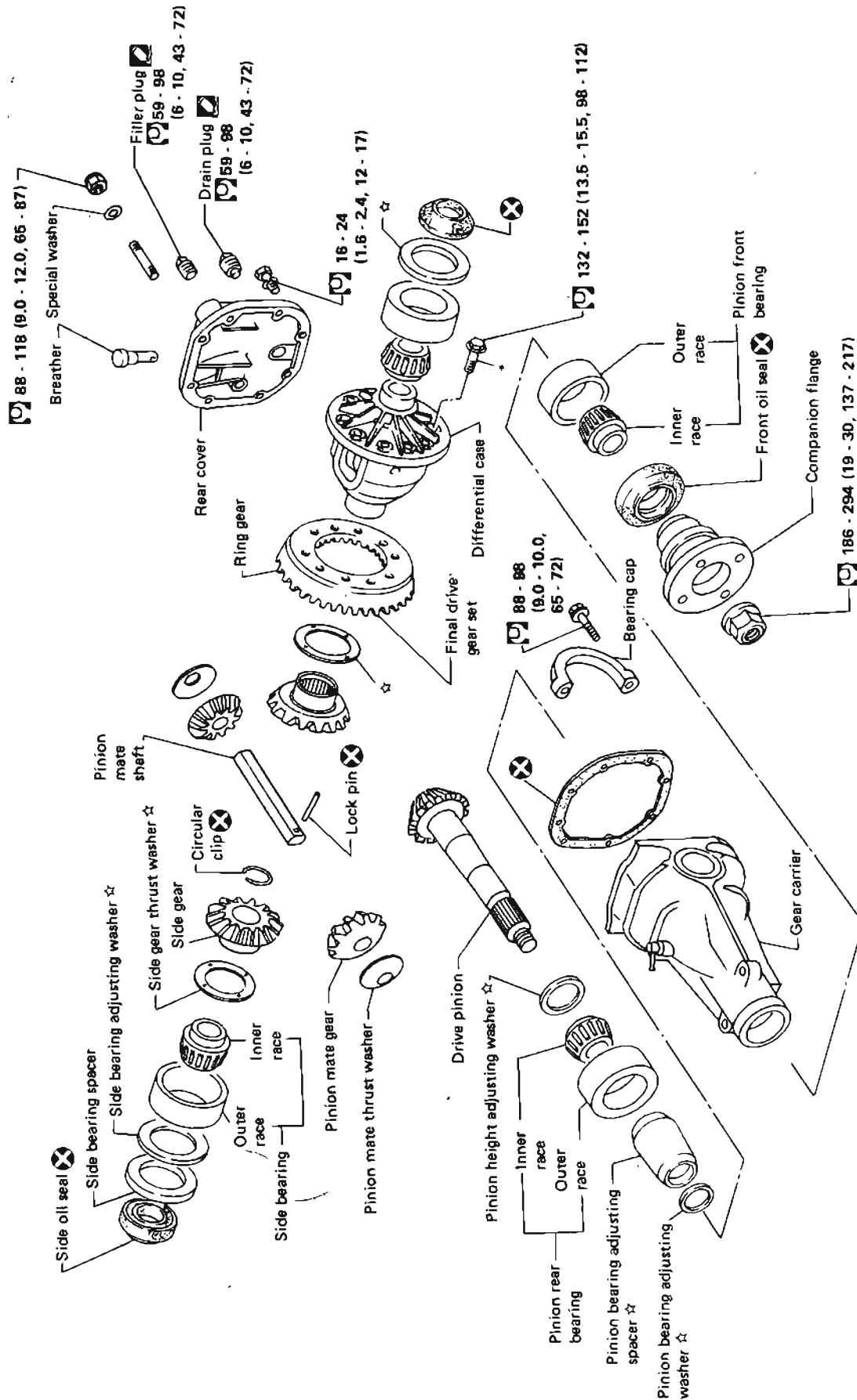
- Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.
- After final drive is removed, support suspension member on a stand to prevent its insulators from being twisted or damaged.



Installation

- Fill final drive with recommended gear oil.

FRONT FINAL DRIVE

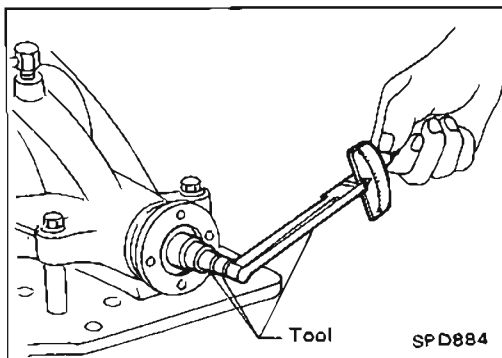


☆ : Adjustment is required.

* : Using locking agent (Loctite (stud lock) or equivalent)

☞ : N.m (kg-m, ft-lb)

DISASSEMBLY



Pre-inspection

Before disassembling final drive, perform the following inspection.

- Total preload
 - 1) Turn drive pinion in both directions several times to set bearing rollers.
 - 2) Check total preload with Tool.

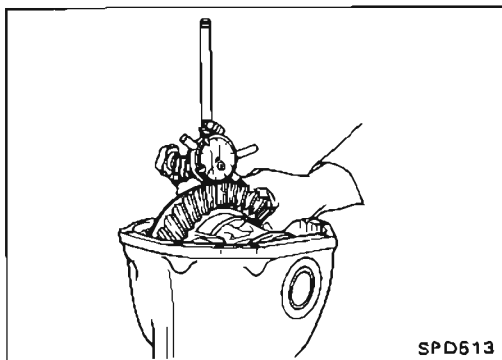
Tool number: ST3127S000 (See J25765-A.)

Total preload:

**1.4 - 1.7 N·m
(14 - 17 kg-cm, 12 - 15 in-lb)**

- Ring gear to drive pinion backlash
Check ring gear-to-drive pinion backlash with a dial indicator at several points.

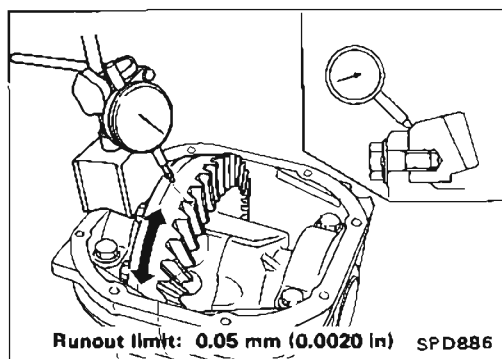
**Ring gear-to-drive pinion backlash:
0.10 - 0.15 mm (0.0039 - 0.0059 in)**



- Ring gear runout
Check runout of ring gear with a dial indicator.

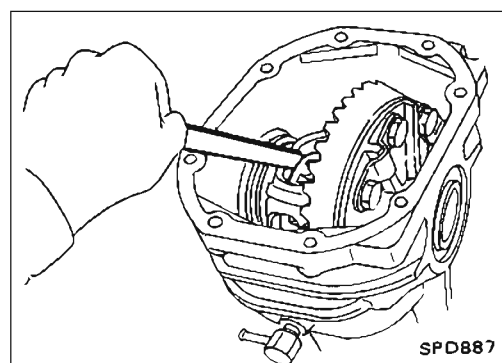
**Runout limit:
0.05 mm (0.0020 in)**

- Tooth contact
Check tooth contact. (Refer to Adjustment.)



- Side gear to pinion mate gear backlash
Measure clearance between side gear thrust washer and differential case with a feeler gauge.

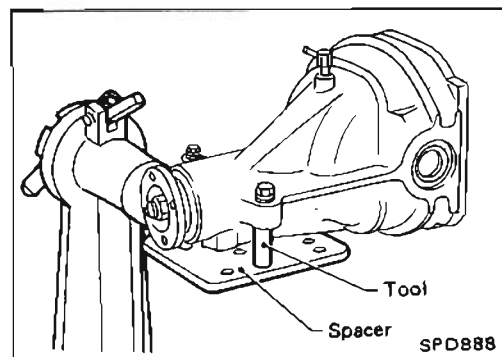
**Clearance between side gear thrust washer and differential case:
0.1 - 0.2 mm (0.004 - 0.008 in)**



Differential Carrier

1. Using two 45 mm (1.77 in) spacers, mount carrier on Tool.

Tool number: KV38100800 (—)

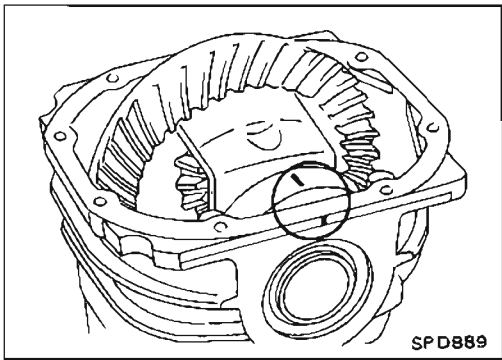


DISASSEMBLY

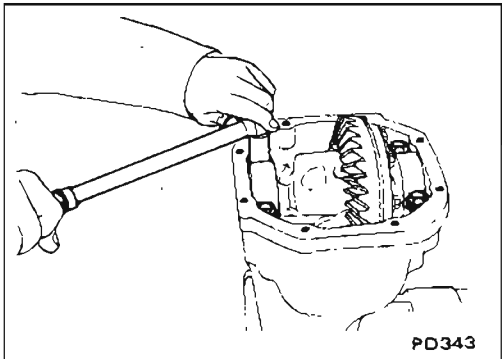
Differential Carrier (Cont'd)

2. Paint or punch matchmarks on one side of the side bearing cap so it can be properly reinstalled.

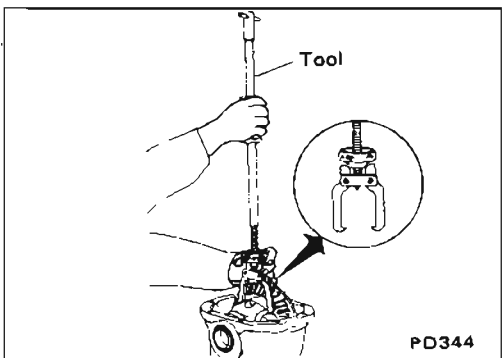
Bearing caps are line-board during manufacture. Replace them in their proper positions.



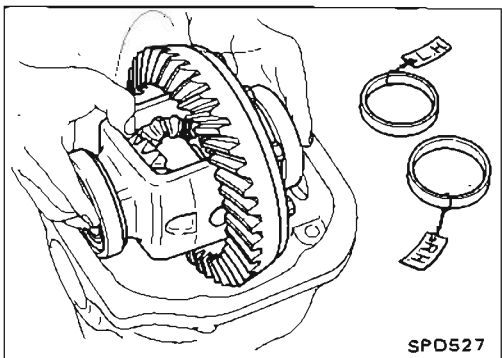
3. Remove side bearing caps.



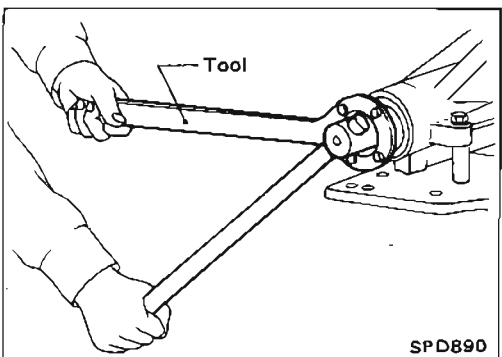
4. Lift differential case assembly out with Tool.
Tool number: HT72400000 (—)



Keep the side bearing outer races together with inner cone — do not mix them up.

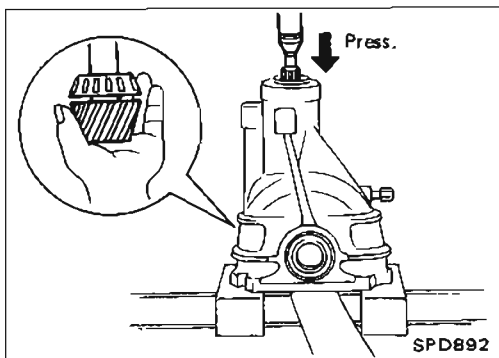
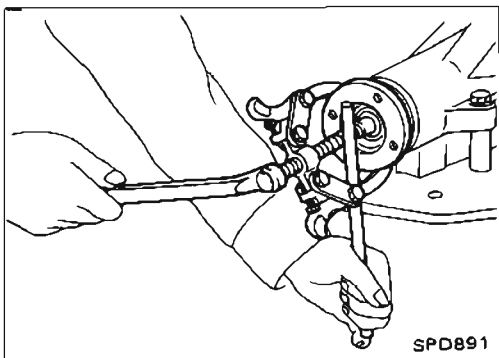


5. Loosen drive pinion nut and pull off companion flange.

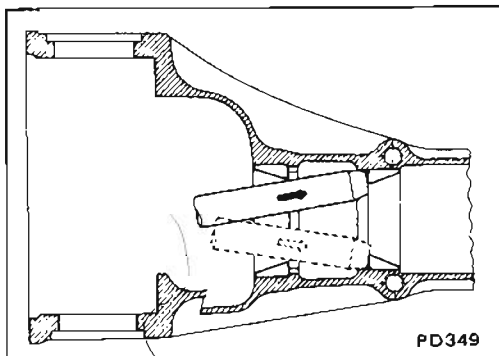


DISASSEMBLY

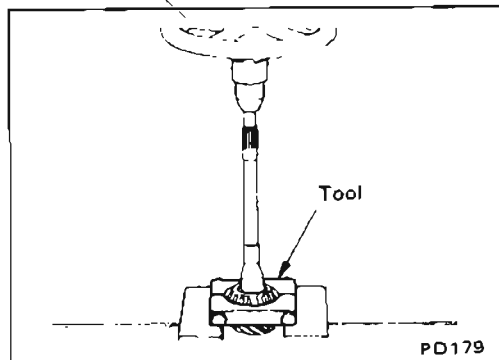
Differential Carrier (Cont'd)



6. Take out drive pinion (together with rear bearing inner race, bearing spacer and adjusting washer).
7. Remove oil seal.
8. Remove front bearing inner race.
9. Remove side oil seal.

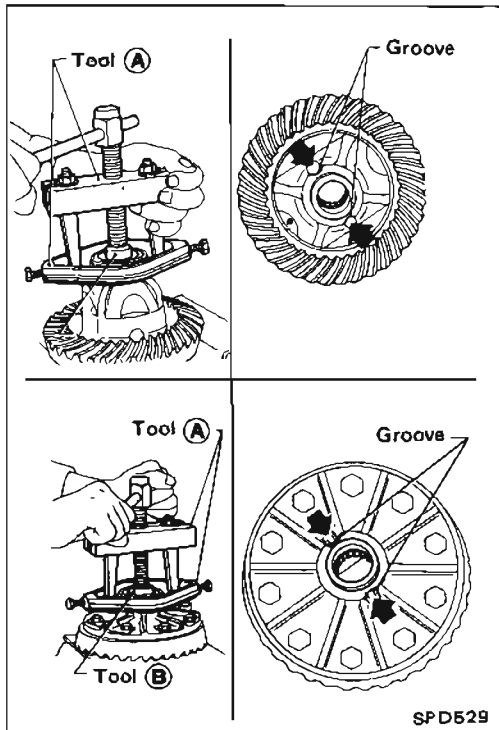


10. Remove pinion bearing outer races with a brass drift.



11. Remove pinion rear bearing inner race and drive pinion height adjusting washer with suitable tool.

DISASSEMBLY



Differential Case

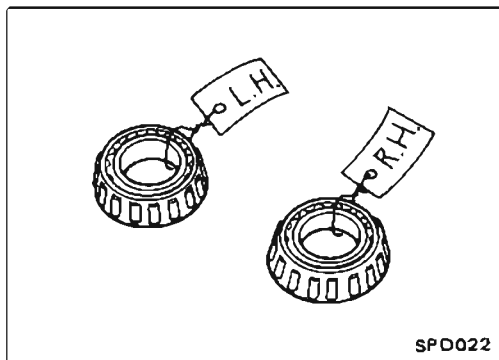
1. Remove side bearing inner cones.

To prevent damage to bearing, engage puller jaws in groove.

Tool number:

- (A) ST33051001 (—)
Equivalent tool (J22888)
- (B) ST33061000 (J8107-2)

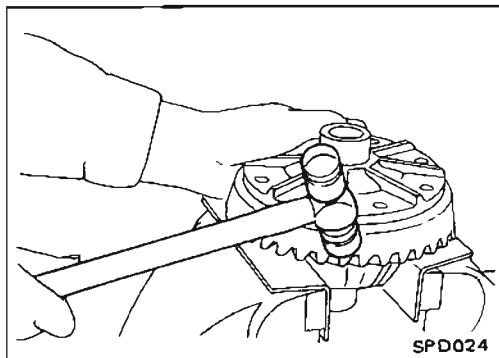
Be careful not to confuse left- and right-hand parts.



2. Loosen ring gear bolts in a criss-cross fashion.

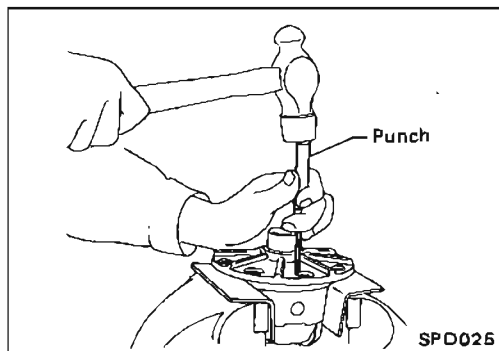
3. Tap ring gear off the differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



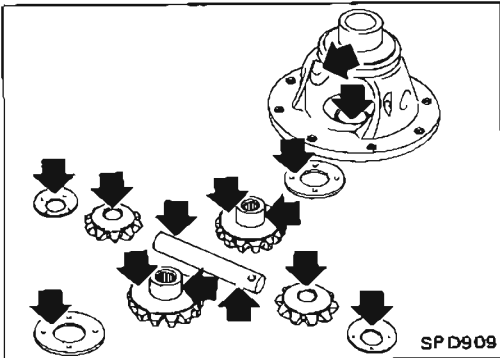
4. Drive out pinion mate shaft lock pin, with punch from ring gear side.

Lock pin is calked at pin hole mouth on differential case.



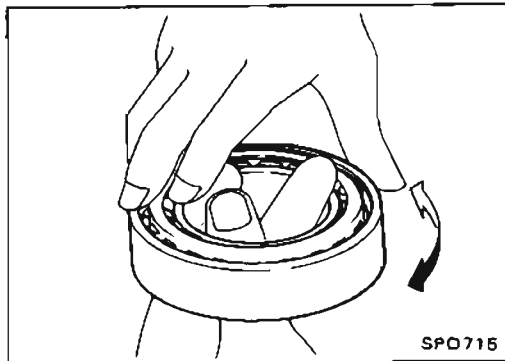
Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping. If any part is damaged, replace ring gear and drive pinion as a set (hypoid gear set).



Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft and thrust washers.



Bearing

1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking. Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

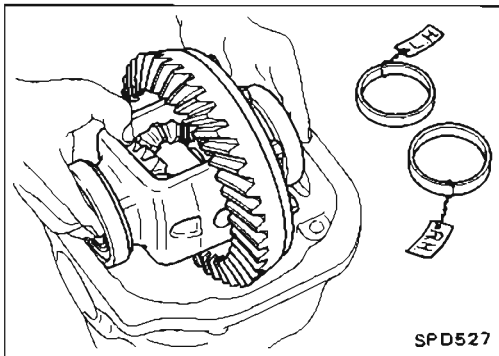
ADJUSTMENT

For quiet and reliable final drive operation, the following five adjustments must be made correctly.

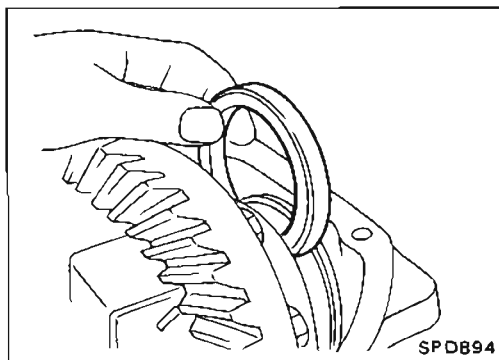
1. Side bearing preload
2. Pinion gear height
3. Pinion bearing preload
4. Ring gear-to-pinion backlash (Refer to ASSEMBLY.)
5. Ring and pinion gear tooth contact pattern

Side Bearing Preload

A selection of carrier side bearing preload shims is required for successful completion of this procedure.



1. Make sure all parts are clean and that the bearings are well lubricated with light oil or Dexron™ type automatic transmission fluid.
2. Place the differential carrier, with side bearings and bearing races installed, into the final drive housing.



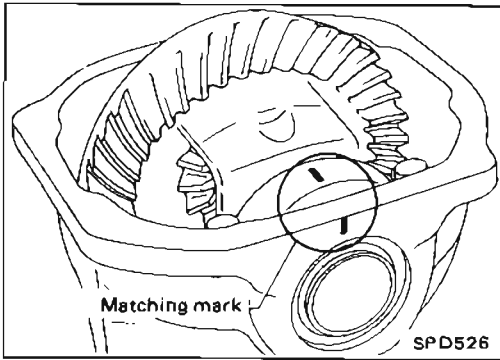
3. Put the side bearing spacer in place on the ring gear end of the carrier.



4. Using the J-25267 side bearing spacer drift, place both of the original carrier side bearing preload shims on the carrier end, opposite the ring gear.

ADJUSTMENT

Side Bearing Preload (Cont'd)



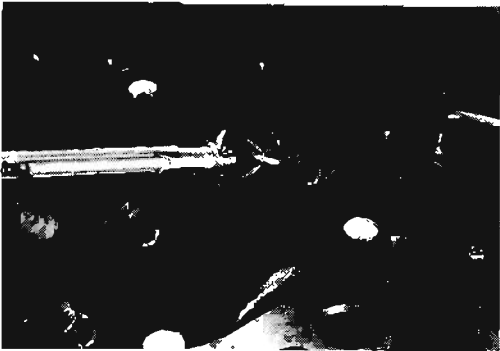
5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.

Specification:

88 - 98 N·m

(9 - 10 kg-m, 65 - 72 ft-lb)

6. Turn the carrier several times to seat the bearings.



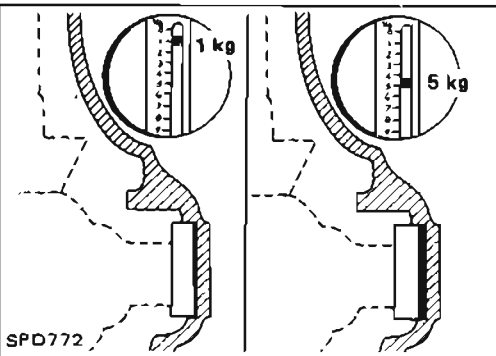
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J-8129.

Specification:

34.3 - 39.2 N

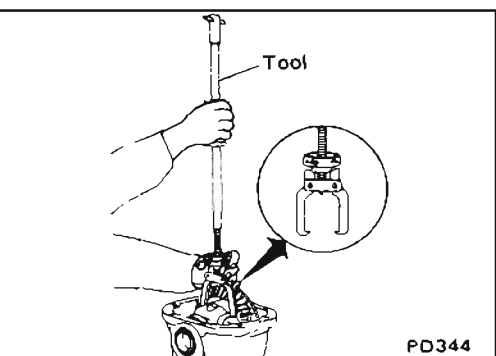
(3.5 - 4 kg, 7.7 - 8.8 lb)

of pulling force at the ring gear bolt.

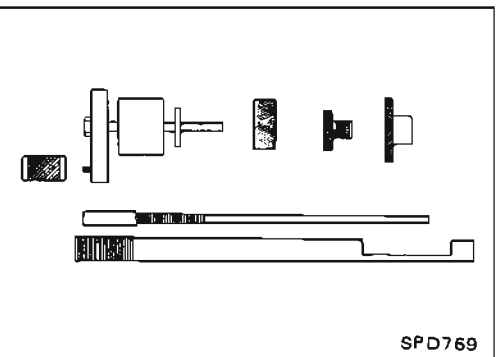


8. If the carrier turning torque is not within the specification range, increase or decrease the total thickness of the side bearing adjusting washers until the turning torque is correct. If the turning torque is less than the specified range, install washers of greater thickness; if the turning torque is greater than the specification, install thinner washers. See the S.D.S. section for washer dimensions and part numbers.

9. Record the total amount of washer thickness required for the correct carrier side bearing preload.



10. Remove the carrier from the final drive housing, saving the selected preload washers for later use during the assembly of the final drive unit.

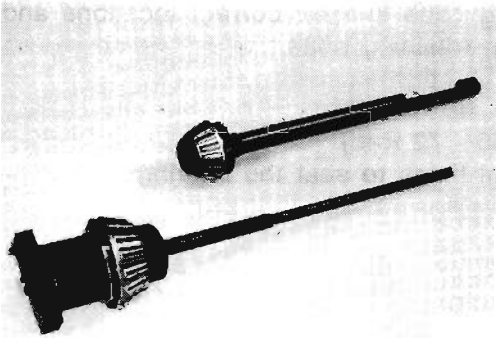


Pinion Gear Height and Pinion Bearing Preload

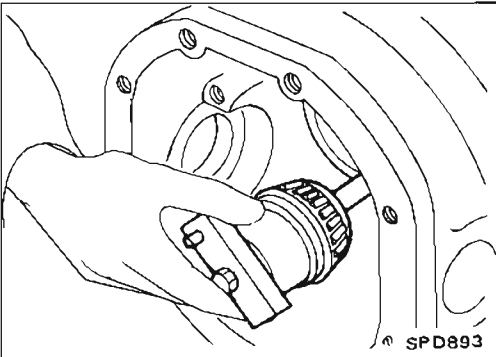
1. Make sure all parts are clean and that the bearings are well lubricated.
2. Assemble the pinion gear bearings into the pinion preload shim selector Tool, J-34309.

ADJUSTMENT

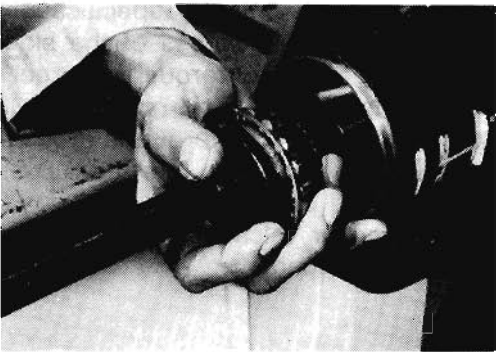
Pinion Gear Height and Pinion Bearing Preload (Cont'd)



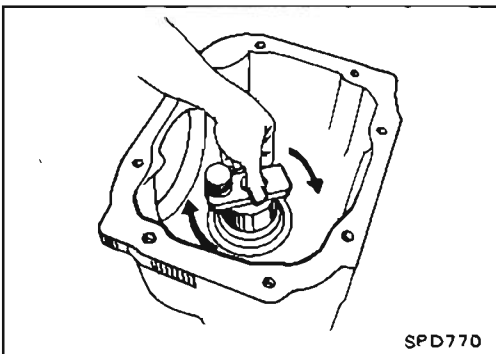
- **Front pinion bearing** — make sure the J-34309-3 front pinion bearing seat is secured tightly against the J-34309-2 gauge anvil. Then turn the front pinion bearing pilot, J-34309-5, to secure the bearing in its proper position.
- **Rear pinion bearing** — the rear pinion bearing pilot, J-34309-8, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J-34309-4, is used to lock the bearing to the assembly.



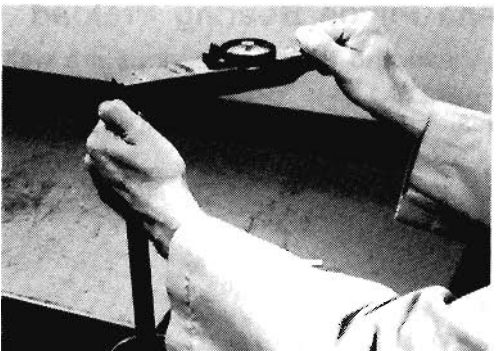
3. Place the pinion preload shim selector Tool, J-34309-1, gauge screw assembly with the pinion rear bearing inner cone installed into the final drive housing.



4. Assemble the front pinion bearing inner cone and the J-34309-2 gauge anvil together with the J-34309-1 gauge screw in the final drive housing. Make sure that the pinion height gauge plate, J-34309-16, will turn a full 360 degrees, and tighten the two sections together by hand.



5. Turn the assembly several times to seat the bearings.



6. Measure the turning torque at the end of the J-34309-2 gauge anvil using torque wrench J-25765A.

Turning torque specification:

1.0 - 1.3 N·m

(10 - 13 kg-cm, 8.7 - 11.3 in-lb)

ADJUSTMENT

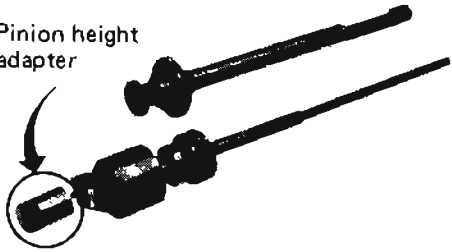
Pinion Gear Height and Pinion Bearing Preload (Cont'd)

- Place the J-34309-11 "R200A" pinion height adapter onto the gauge plate and tighten it by hand.

CAUTION:

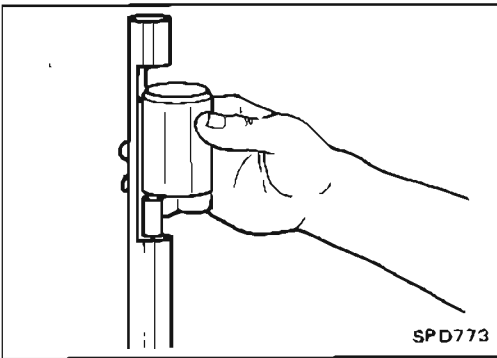
Make sure all machined surfaces are clean.

Pinion height adapter



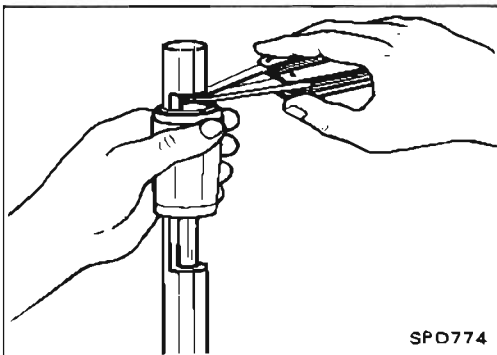
— PINION BEARING PRELOAD WASHER SELECTION —

- Place the solid pinion bearing spacer, small end first, over the J-34309-2 gauge anvil and seat the small end squarely against the tip of the J-34309-1 gauge screw in the tool recessed portion.



- Select the correct thickness of pinion bearing preload adjusting washer using a standard gauge of 3.5 mm (0.138 in) and your J-34309-101 feeler gauge. *The exact measure you get with your gauges is the thickness of the adjusting washer required.* Select the correct washer from the following chart.

**Drive pinion bearing preload adjusting washer:
Refer to S.D.S.**



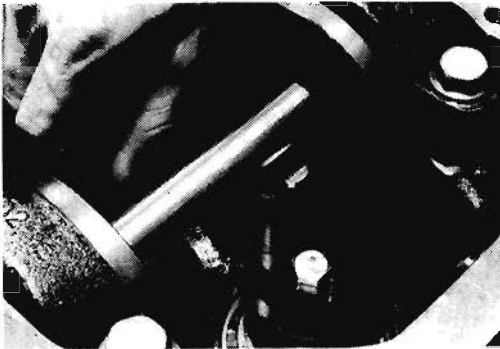
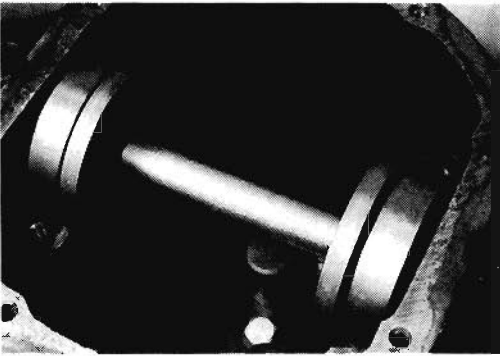
- Set your selected, correct pinion bearing preload adjusting washer aside for use when assembling the pinion gear and bearings into the final drive.

ADJUSTMENT

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

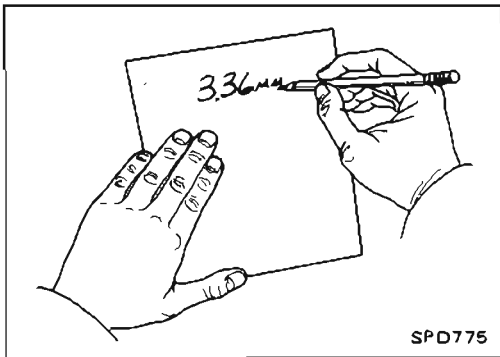
— PINION HEIGHT ADJUSTING WASHER SELECTION —

11. Now, position the side bearing discs, J-25269-4, and arbor firmly into the side bearing bores.
Install the side bearing caps and tighten the cap bolts to proper torque.



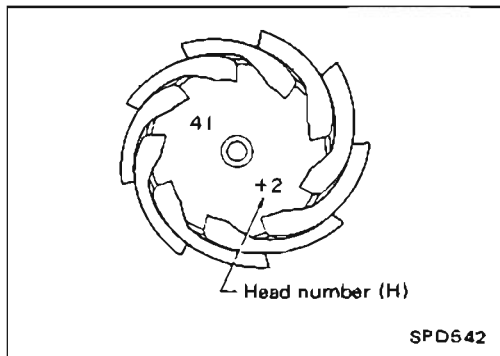
12. Select the correct *standard* pinion height adjusting washer thickness using a standard gauge of 3 mm (0.12 in) and your J-34309-101 feeler gauge. Measure the distance between the J-34309-10 pinion height adapter and the arbor.

13. Write down your exact total measurement.



14. Correct the pinion height washer size by referring to the "pinion head number."

There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number," and it refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.



ADJUSTMENT

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

| Pinion head height number | Add or remove from the standard pinion height washer thickness measurement |
|---------------------------|--|
| -6 | Add 0.06 mm (0.0024 in) |
| -5 | Add 0.05 mm (0.0020 in) |
| -4 | Add 0.04 mm (0.0016 in) |
| -3 | Add 0.03 mm (0.0012 in) |
| -2 | Add 0.02 mm (0.0008 in) |
| -1 | Add 0.01 mm (0.0004 in) |
| 0 | Use the selected washer thickness |
| +1 | Subtract 0.01 mm (0.0004 in) |
| +2 | Subtract 0.02 mm (0.0008 in) |
| +3 | Subtract 0.03 mm (0.0012 in) |
| +4 | Subtract 0.04 mm (0.0016 in) |
| +5 | Subtract 0.05 mm (0.0020 in) |
| +6 | Subtract 0.06 mm (0.0024 in) |

15. Select the correct pinion height washer from the following chart.

Drive pinion height adjusting washer (R200):

| Thickness mm (in) | Part No. |
|-------------------|-------------|
| 3.09 (0.1217) | 38154-P6017 |
| 3.12 (0.1228) | 38154-P6018 |
| 3.15 (0.1240) | 38154-P6019 |
| 3.18 (0.1252) | 38154-P6020 |
| 3.21 (0.1264) | 38154-P6021 |
| 3.24 (0.1276) | 38154-P6022 |
| 3.27 (0.1287) | 38154-P6023 |
| 3.30 (0.1299) | 38154-P6024 |
| 3.33 (0.1311) | 38154-P6025 |
| 3.36 (0.1323) | 38154-P6026 |
| 3.39 (0.1335) | 38154-P6027 |
| 3.42 (0.1346) | 38154-P6028 |
| 3.45 (0.1358) | 38154-P6029 |
| 3.48 (0.1370) | 38154-P6030 |
| 3.51 (0.1382) | 38154-P6031 |
| 3.54 (0.1394) | 38154-P6032 |
| 3.57 (0.1406) | 38154-P6033 |
| 3.60 (0.1417) | 38154-P6034 |
| 3.63 (0.1429) | 38154-P6035 |
| 3.66 (0.1441) | 38154-P6036 |



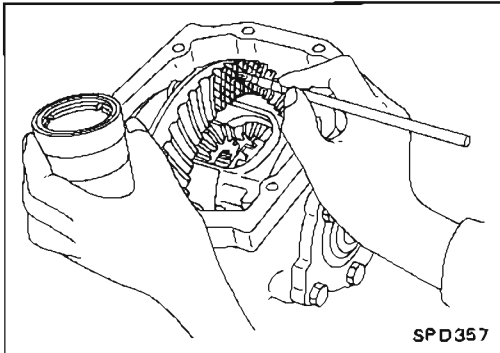
16. Remove the J-34309 pinion preload shim selector Tool from the final drive housing and disassemble to retrieve the pinion bearings.

ADJUSTMENT

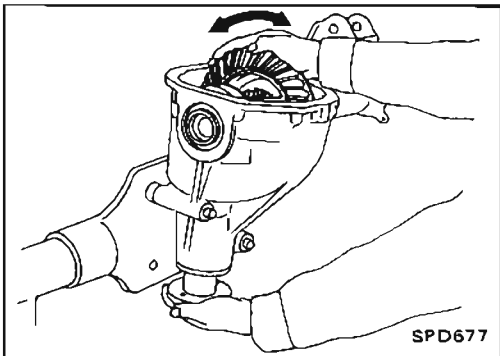
Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.

Hypoid gear sets which are not positioned properly may be noisy, or have short life, or both. Low noise and a long life can be assured with a pattern check.

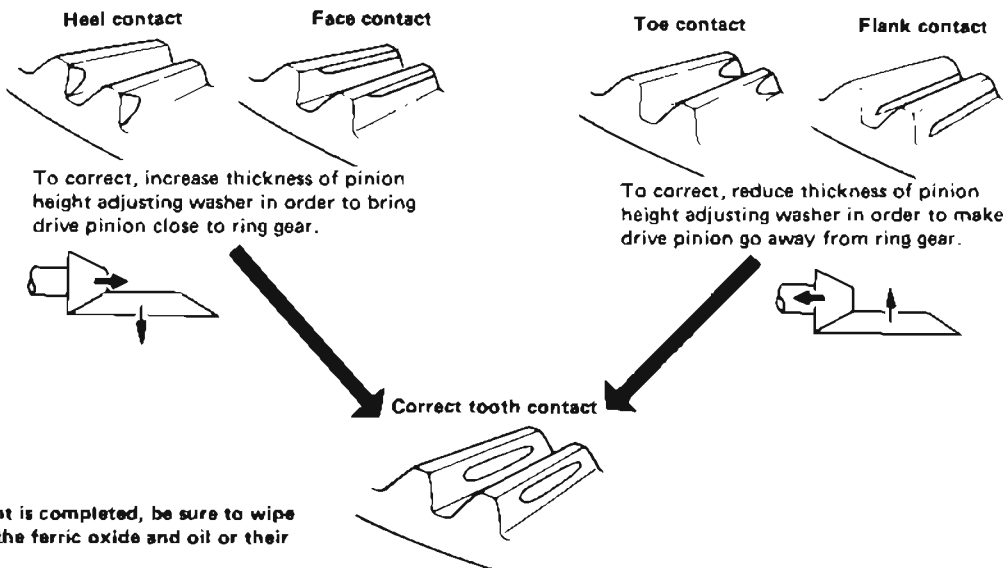


1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.



3. Hold companion flange steady and turn the ring gear in both directions.

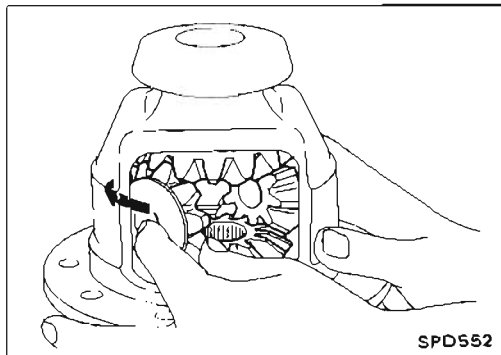
Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct. However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern. The tooth pattern is the best indication of how well a differential has been set up.



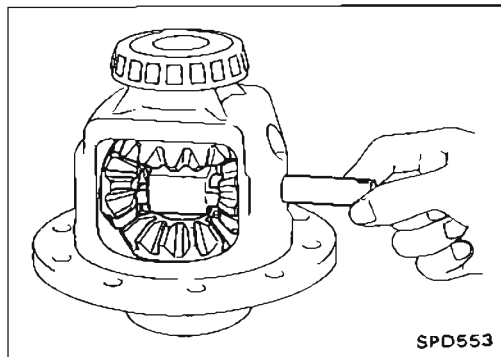
SPD007

Differential Case

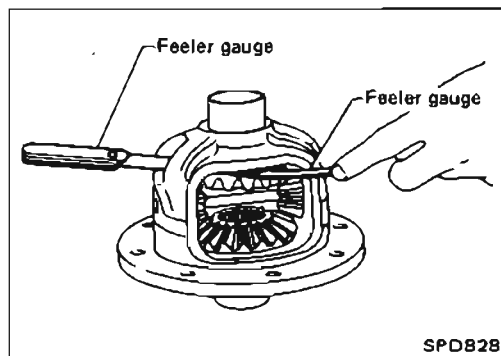
1. Install side gears, pinion mate gears, thrust washers and thrust block into differential case.



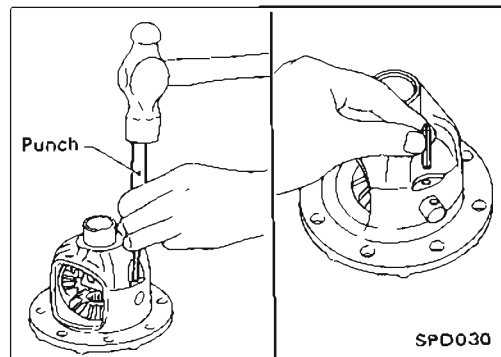
2. Fit pinion mate shaft to differential case so that it meets lock pin holes.



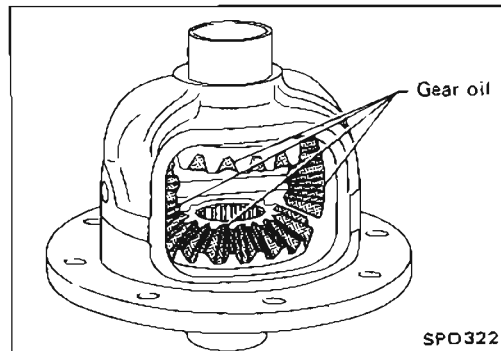
3. Adjust clearance between rear face of side gear and thrust washer by selecting side gear thrust washer. Refer to S.D.S.
Clearance between side gear thrust washer and differential case:
0.10 - 0.20 mm (0.0039 - 0.0079 in)



4. Install pinion mate shaft lock pin with a punch.
Make sure lock pin is flush with case.

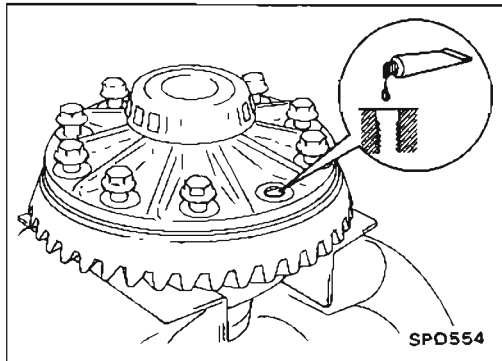


5. Apply oil to gear tooth surfaces and thrust surfaces and check that they turn properly.

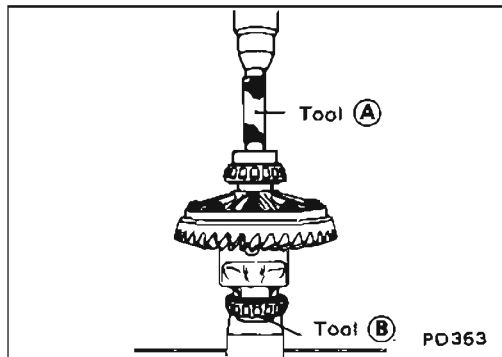


ASSEMBLY

Differential Case (Cont'd)



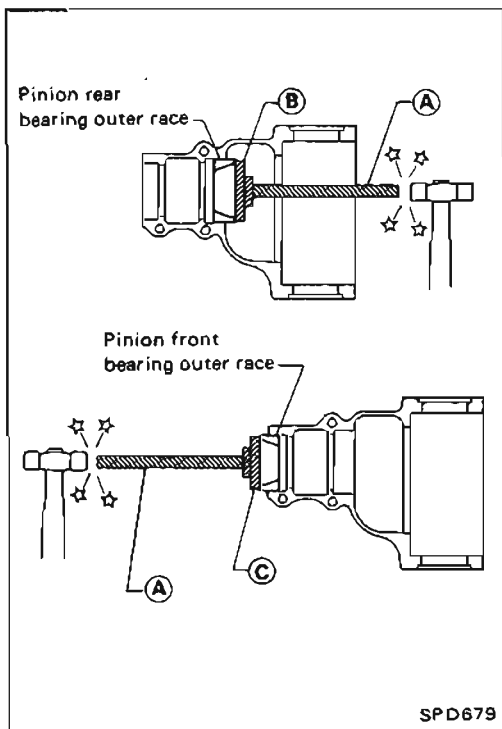
6. Apply locking sealant to ring gear bolts, and install them. Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.



7. Press-fit side bearing inner cones on differential case with Tool.

Tool number:

- Ⓐ KV38100300 (J25523)
- Ⓑ ST33061000 (J8107-2)



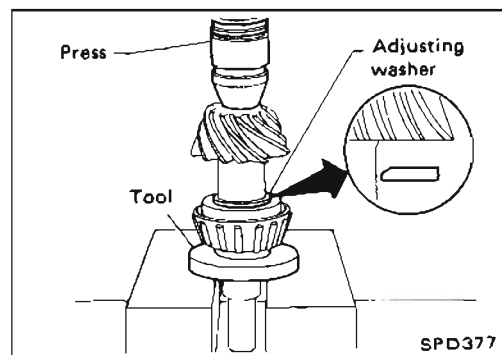
Differential Carrier

1. Press-fit front and rear bearing outer races with Tools.

Tool number:

- Ⓐ ST30611000 (J25742-1)
- Ⓑ ST30613000 (J25742-3)
- Ⓒ ST30701000 (J25742-2)

2. Select pinion bearing adjusting washer and drive pinion bearing spacer, referring to Adjustment.



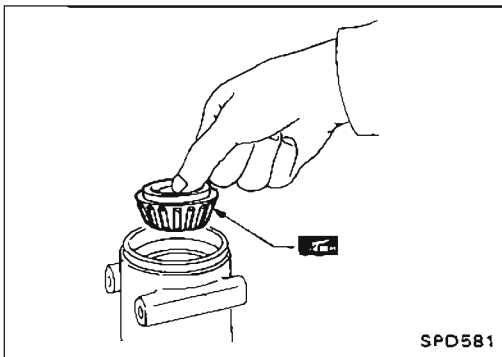
3. Install drive pinion height adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, using press and Tool.

Tool number: ST30901000 (—)

ASSEMBLY

Differential Carrier (Cont'd)

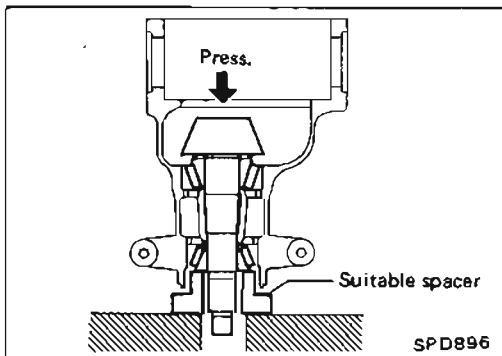
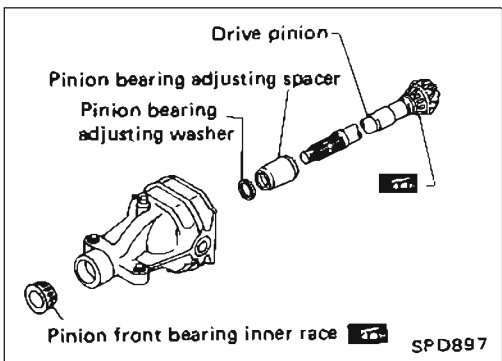
4. Place pinion front bearing inner cone in final drive housing.



5. Set drive pinion assembly (as shown in figure at left) in differential carrier and install drive pinion, with press and suitable tool.

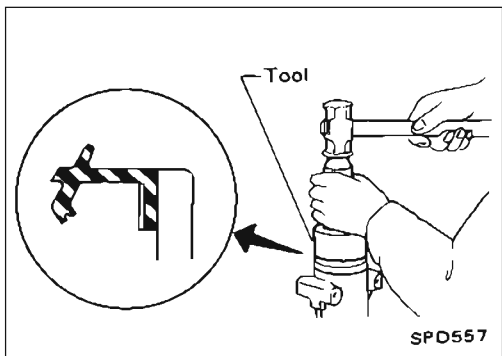
Stop when drive pinion touches bearing.

Apply multi-purpose grease to pinion rear bearing inner race, pinion front bearing inner race and front pilot bearing.



6. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal with Tool.

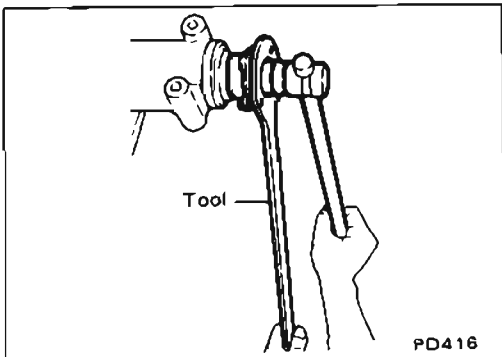
Tool number: KV38100500 (—)



7. Install companion flange, and tighten pinion nut to specified torque with Tool.

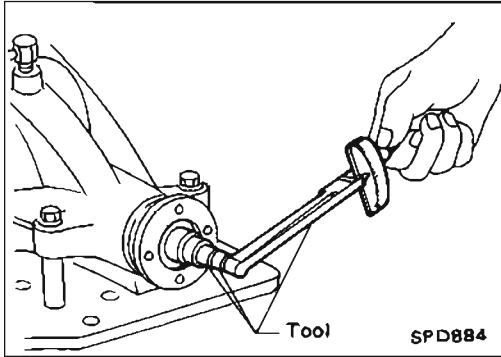
Ascertain that threaded portion of drive pinion and pinion nut are free from oil or grease.

Tool number: ST38060002 (J34311)



ASSEMBLY

Differential Carrier (Cont'd)



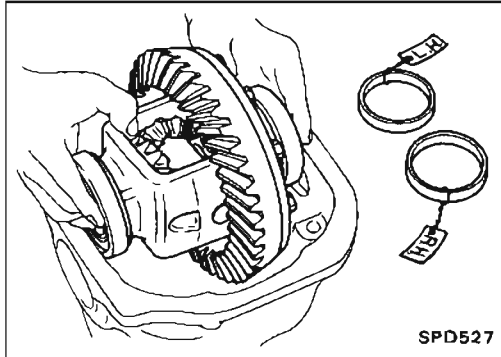
8. Turn drive pinion in both directions several times, and measure pinion bearing preload.

Pinion bearing preload:

1.1 - 1.4 N·m

(11 - 14 kg-cm, 9.5 - 12.2 in-lb)

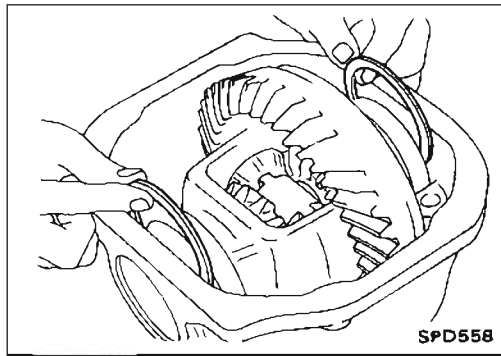
When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.



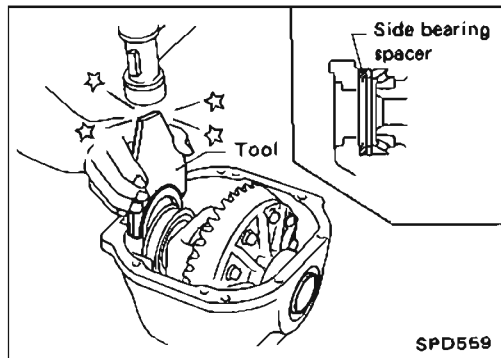
9. Select side bearing adjusting washer.

Refer to Adjustment.

10. Install differential case assembly with side bearing outer races into gear carrier.

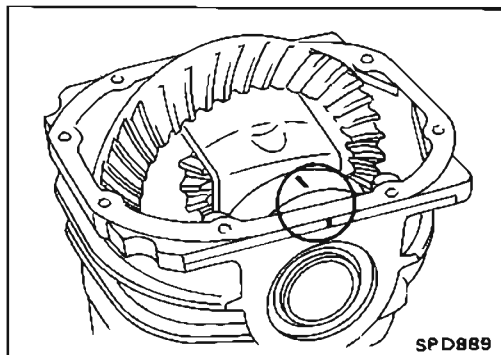


11. Insert left and right side bearing adjusting washers in place between side bearings and carrier.



12. Drive in side bearing spacer with Tool.

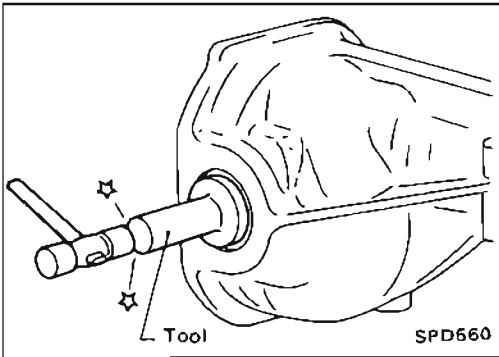
Tool number: KV38100600 (J25267)



13. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.

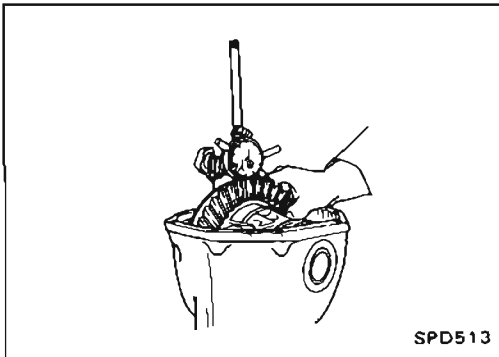
ASSEMBLY

Differential Carrier (Cont'd)



14. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.

Tool number: KV38100200 (J26233)



15. Measure ring gear-to-drive pinion backlash with a dial indicator.

Ring gear-to-drive pinion backlash:

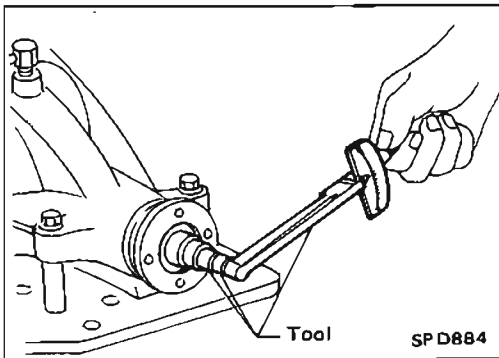
0.10 - 0.15 mm

(0.0039 - 0.0059 in)

- If backlash is too small, decrease thickness of left shim and increase thickness of right shim by the same amount.

If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.



16. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.

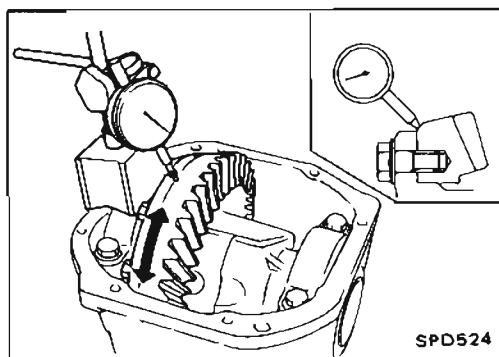
Total preload:

Value more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on measured value of drive pinion preload

- If preload is too great, remove the same amount of shim to each side.
- If preload is too small, add the same amount of shim to each side.

Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.

17. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.



18. Check runout of ring gear with a dial indicator.

Runout limit:

0.05 mm (0.0020 in)

- If backlash varies excessively in different places, foreign matter may be caught between the ring gear and the differential case.
- If the backlash varies greatly when the ring gear runout is within a specified range, replace the hypoid gear set or differential case.

19. Check tooth contact.

Refer to Adjustment.

20. Install rear cover and gasket.

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

Propeller Shaft

GENERAL SPECIFICATIONS

Unit: mm (in)

| | | |
|---------------------------------------|-----------------------------------|--|
| Applied model Transmission type | M/T | A/T |
| Propeller shaft model | 3S63A-R | 3S63A-T |
| Number of joints | 3 | |
| Coupling method with transmission | Sleeve type | |
| Type of journal bearings | Shell type (Non-disassembly type) | |
| Distance between yokes | 63.0 (2.480) | |
| Shaft length (Spider to spider) | | |
| 1st | 395.0 (15.55) | 432.0 (17.01) |
| 2nd | 605.0 (23.82) | 605.0 (23.82) |
| Shaft outer diameter | | |
| 1st | 75.0 (2.953) | |
| 2nd | 75.0 (2.953) | 75.0 (2.953) ... Large side 63.6 (2.500) ... Small side |

SPECIFICATIONS AND ADJUSTMENT

Unit: mm (in)

| | | |
|------------------------------|-------------|---------|
| Propeller shaft model | 3S63A-R | 3S63A-T |
| Propeller shaft runout limit | 0.6 (0.024) | |
| Journal axial play | 0 (0) | |

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

Final Drive

GENERAL SPECIFICATIONS

| | |
|---|--------------------|
| Final drive model | R200 |
| Ring gear pitch diameter mm (in) | 205 (8.07) |
| Gear ratio | 4.083 |
| Number of teeth (Ring gear/Drive pinion) | 49/12 |
| Oil capacity (approx.) ℓ (US pt, Imp pt) | 1.8 (3-7/8, 3-1/8) |

SPECIFICATIONS AND ADJUSTMENT (R200)

Drive pinion adjustment

| | |
|---|---------------------------------|
| Drive pinion bearing adjusting method | Pinion bearing adjusting washer |
| Drive pinion to ring gear backlash mm (in) | 0.10 - 0.15 (0.0039 - 0.0059) |

Available pinion height adjusting washer

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 3.09 (0.1217) | 38154-P6017 |
| 3.12 (0.1228) | 38154-P6018 |
| 3.15 (0.1240) | 38154-P6019 |
| 3.18 (0.1252) | 38154-P6020 |
| 3.21 (0.1264) | 38154-P6021 |
| 3.24 (0.1276) | 38154-P6022 |
| 3.27 (0.1287) | 38154-P6023 |
| 3.30 (0.1299) | 38154-P6024 |
| 3.33 (0.1311) | 38154-P6025 |
| 3.36 (0.1323) | 38154-P6026 |
| 3.39 (0.1335) | 38154-P6027 |
| 3.42 (0.1346) | 38154-P6028 |
| 3.45 (0.1358) | 38154-P6029 |
| 3.48 (0.1370) | 38154-P6030 |
| 3.51 (0.1382) | 38154-P6031 |
| 3.54 (0.1394) | 38154-P6032 |
| 3.57 (0.1406) | 38154-P6033 |
| 3.60 (0.1417) | 38154-P6034 |
| 3.63 (0.1429) | 38154-P6035 |
| 3.66 (0.1441) | 38154-P6036 |

Drive pinion preload adjustment

| | |
|--|---------------------------------|
| Drive pinion preload N·m (kg·cm, in·lb) | 1.1 - 1.4 (11 - 14, 9.5 - 12.2) |
| With front oil seal | |

Available drive pinion bearing preload adjusting washer

| Thickness mm (in) | Part number |
|-------------------------------|-------------|
| 3.80 - 3.82 (0.1496 - 0.1504) | 38125-61001 |
| 3.82 - 3.84 (0.1504 - 0.1512) | 38126-61001 |
| 3.84 - 3.86 (0.1512 - 0.1520) | 38127-61001 |
| 3.86 - 3.88 (0.1520 - 0.1528) | 38128-61001 |
| 3.88 - 3.90 (0.1528 - 0.1535) | 38129-61001 |
| 3.90 - 3.92 (0.1535 - 0.1543) | 38130-61001 |
| 3.92 - 3.94 (0.1543 - 0.1551) | 38131-61001 |
| 3.94 - 3.96 (0.1551 - 0.1559) | 38132-61001 |
| 3.96 - 3.98 (0.1559 - 0.1567) | 38133-61001 |
| 3.98 - 4.00 (0.1567 - 0.1575) | 38134-61001 |
| 4.00 - 4.02 (0.1575 - 0.1583) | 38135-61001 |
| 4.02 - 4.04 (0.1583 - 0.1591) | 38136-61001 |
| 4.04 - 4.06 (0.1591 - 0.1598) | 38137-61001 |
| 4.06 - 4.08 (0.1598 - 0.1606) | 38138-61001 |
| 4.08 - 4.10 (0.1606 - 0.1614) | 38139-61001 |

Available drive pinion bearing preload adjusting spacer

| Length mm (in) | Part number |
|----------------|-------------|
| 55.10 (2.1693) | 38165-84002 |
| 55.40 (2.1811) | 38165-84003 |
| 55.70 (2.1929) | 38165-84004 |
| 56.00 (2.2047) | 38165-61001 |
| 56.25 (2.2146) | 38166-61001 |

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

Final Drive (Cont'd)

Total preload adjustment

| | |
|---------------|--|
| Total preload | Value more than 0.29 N-m (3.0 kg-cm, 2.6 in-lb) added on measured value of drive pinion preload |
|---------------|--|

Available side bearing adjusting washer

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 2.00 (0.0787) | 38453-N3100 |
| 2.05 (0.0807) | 38453-N3101 |
| 2.10 (0.0827) | 38453-N3102 |
| 2.15 (0.0848) | 38453-N3103 |
| 2.20 (0.0866) | 38453-N3104 |
| 2.25 (0.0886) | 38453-N3105 |
| 2.30 (0.0906) | 38453-N3106 |
| 2.35 (0.0925) | 38453-N3107 |
| 2.40 (0.0945) | 38453-N3108 |
| 2.45 (0.0965) | 38453-N3109 |
| 2.50 (0.0984) | 38453-N3110 |
| 2.55 (0.1004) | 38453-N3111 |
| 2.60 (0.1024) | 38453-N3112 |
| 2.65 (0.1043) | 38453-N3113 |

Side bearing adjustment

| | |
|--|-------------------------------|
| Side bearing adjusting method | Adjusting shim |
| Side gear to pinion mate gear backlash (Clearance between side gear to differential case) mm (in) | 0.03 - 0.09 (0.0012 - 0.0035) |

Available side gear thrust washer

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.80 (0.0315) | 38424-40F00 |
| 0.85 (0.0335) | 38424-40F08 |
| 0.90 (0.0354) | 38424-40F01 |
| 0.95 (0.0374) | 38424-40F09 |
| 1.00 (0.0394) | 38424-40F02 |
| 1.05 (0.0413) | 38424-40F10 |
| 1.10 (0.0433) | 38424-40F03 |
| 1.15 (0.0453) | 38424-40F11 |
| 1.20 (0.0472) | 38424-40F04 |
| 1.25 (0.0492) | 38424-40F12 |
| 1.30 (0.0512) | 38424-40F05 |
| 1.35 (0.0531) | 38424-40F13 |
| 1.40 (0.0551) | 38424-40F06 |
| 1.45 (0.0571) | 38424-40F14 |
| 1.50 (0.0591) | 38424-40F07 |

Ring gear runout

| | | |
|------------------------|---------|---------------|
| Ring gear runout limit | mm (in) | 0.05 (0.0020) |
|------------------------|---------|---------------|

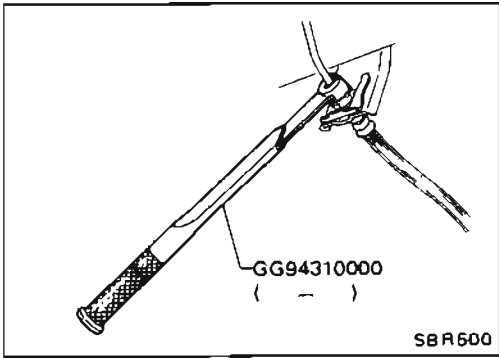
FRONT AXLE & FRONT SUSPENSION

SECTION **FA**

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| | |
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| PRECAUTIONS AND PREPARATION | FA- 2 |
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| FRONT AXLE | FA- 9 |
| FRONT AXLE — Wheel Hub and Knuckle | FA-10 |
| FRONT AXLE — Baffle Plate | FA-13 |
| FRONT SUSPENSION | FA-14 |
| FRONT SUSPENSION — Coil Spring and Strut Assembly | FA-15 |
| FRONT SUSPENSION — Tension Rod and Stabilizer Bar | FA-17 |
| FRONT SUSPENSION — Transverse Link and Lower Ball Joint | FA-18 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | FA-19 |

PRECAUTIONS AND PREPARATION

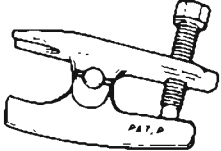
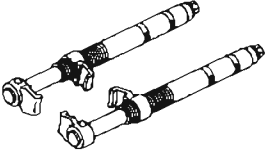
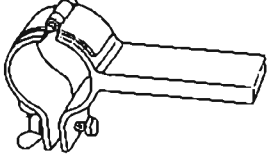
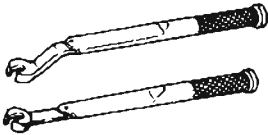


Precautions

- 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.

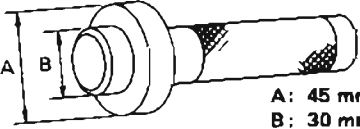
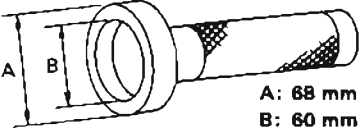
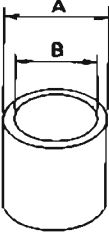
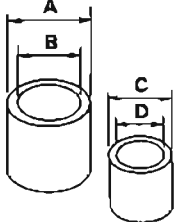
Preparation

SPECIAL SERVICE TOOLS

| Tool number (Kent-Moore No.) Tool name | Description |
|--|--|
| HT72520000 (J25730-A) Ball joint remover |  <p>Removing tie-rod outer end and lower ball joint</p> |
| HT71780000 (-) Spring compressor |  <p>Removing and installing coil spring</p> |
| ST35652000 (-) Strut attachment |  <p>Fixing strut assembly</p> |
| GG94310000 (-) Flare nut torque wrench |  <p>Removing and installing brake piping</p> |

PRECAUTIONS AND PREPARATION

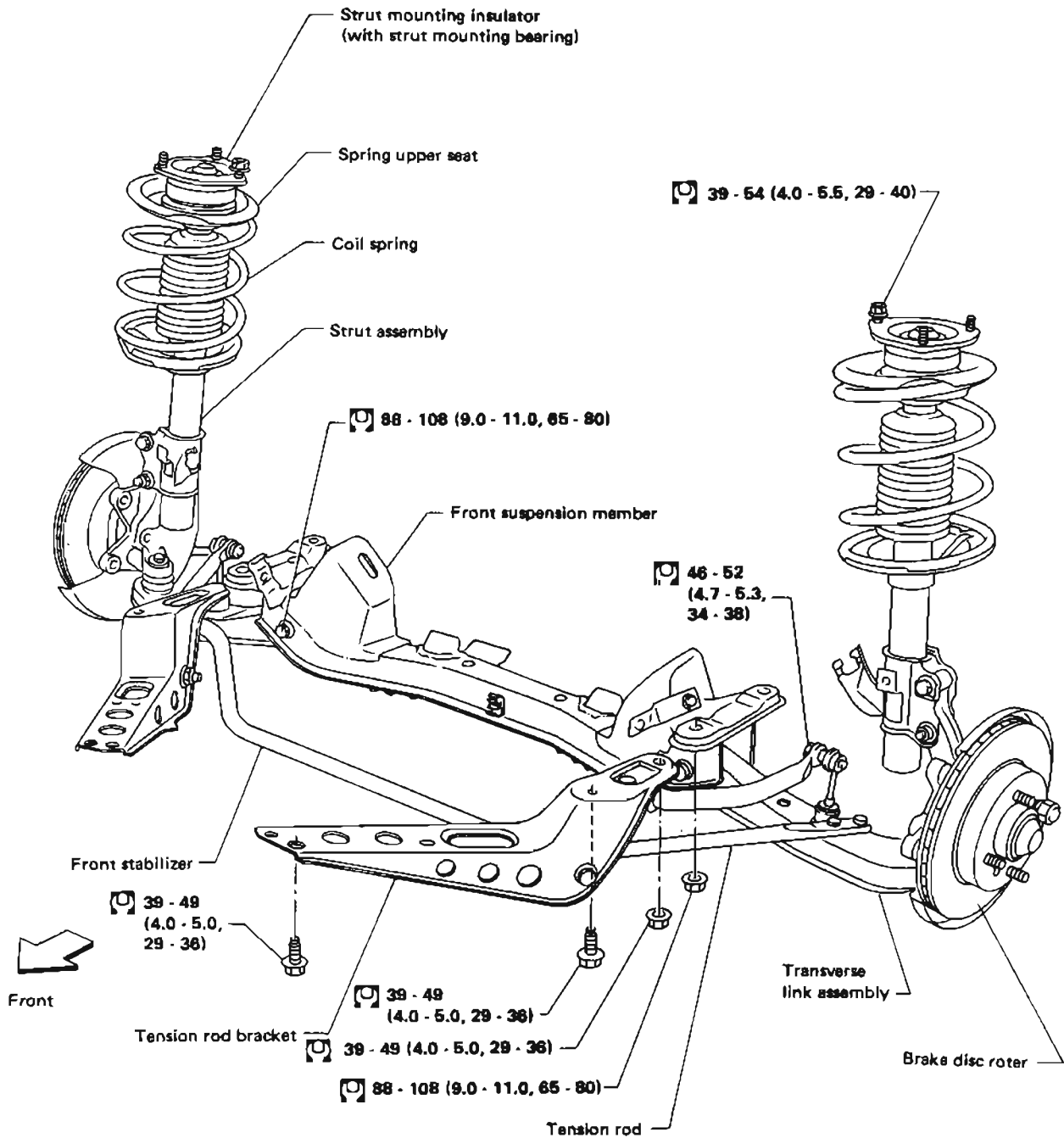
Preparation (Cont'd) COMMERCIAL SERVICE TOOLS

| Tool name | Description |
|---------------------------|--|
| Wheel bearing drift | <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>A: 45 mm (1.77 in) dia. B: 30 mm (1.18 in) dia.</p> </div> </div> <p style="text-align: right;">Removing wheel bearing</p> |
| Wheel bearing drift | <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>A: 68 mm (2.68 in) dia. B: 60 mm (2.36 in) dia.</p> </div> </div> <p style="text-align: right;">Installing wheel bearing</p> |
| Baffle plate drift | <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>A: 88 mm (3.46 in) dia. B: 68 mm (2.68 in) dia.</p> </div> </div> <p style="text-align: right;">Installing baffle plate</p> |
| Tension rod bushing drift | <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>A: 75 mm (2.95 in) dia. B: 66 mm (2.60 in) dia. C: 62 mm (2.44 in) dia. D: 25 - 65 mm (0.98 - 2.17 in) dia.</p> </div> </div> <p style="text-align: right;">Removing and installing tension rod bushing</p> |

FRONT AXLE AND FRONT SUSPENSION

Final tightening for rubber parts requires to be carried out under unladen condition* with tires on ground.

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



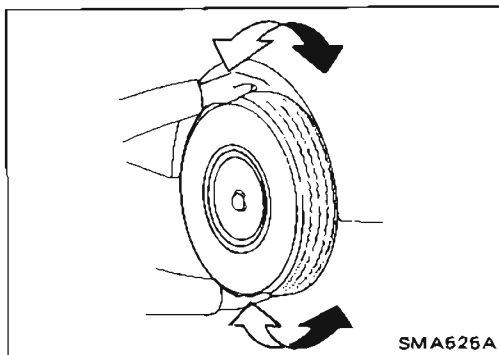
: N-m (kg-m, ft-lb)

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Front Axle and Front Suspension Parts

- Check front axle and front suspension parts for looseness, cracks, wear or other damage.

(1) Shake each front wheel.

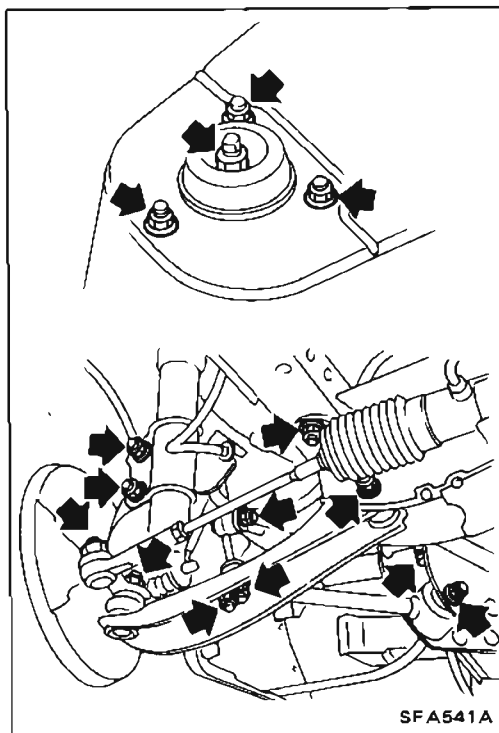


(2) Retighten all nuts and bolts to the specified torque.

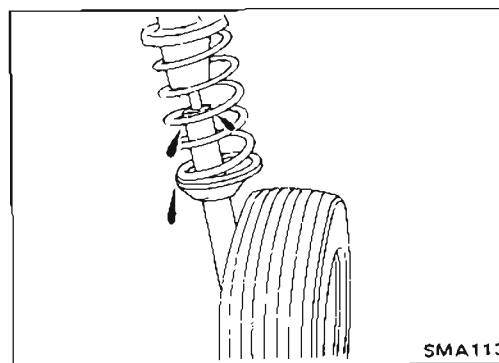
Tightening torque: Refer to S.D.S.

(3) Make sure that cotter pin is inserted.

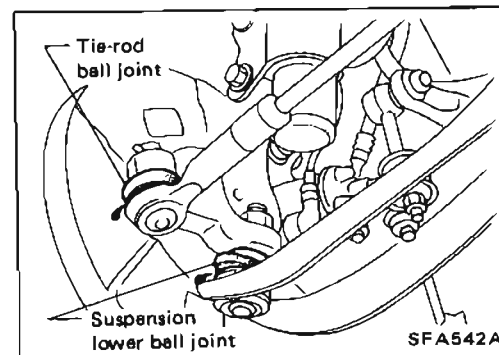
(4) Check front axle and front suspension parts for wear, cracks or other damage.

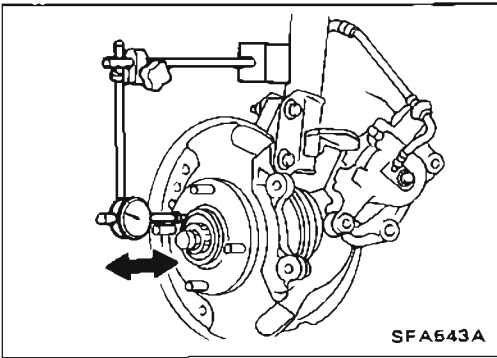


- Check strut (shock absorber) for oil leakage or other damage.



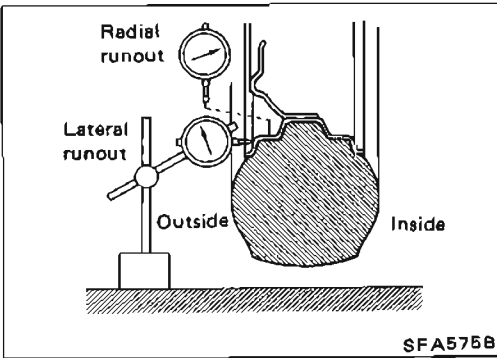
- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.





Front Wheel Bearing

- Check tightening torque of wheel bearing lock nut.
 [T]: 147 - 216 N·m
 (15 - 22 kg-m, 108 - 159 ft-lb)
- Check that wheel bearings operate smoothly.
- Check axial end play.
Axial end play: 0.03 mm (0.0012 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.

PRELIMINARY INSPECTION

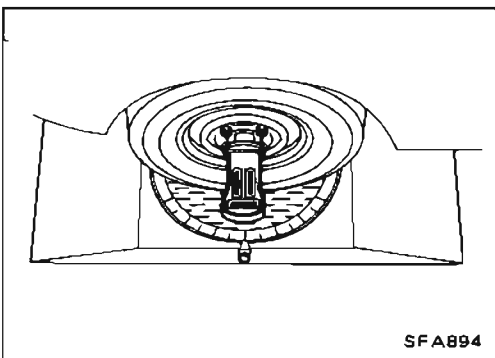
Make following checks. Adjust, repair or replace if necessary.

- Check tires for wear and improper inflation.
- Check front wheel bearings for looseness.
- Check wheel runout.

Refer to S.D.S.

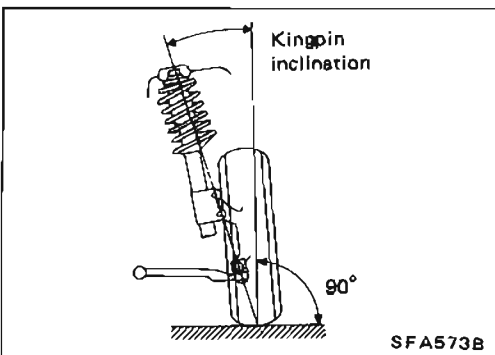
- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen):
 "Unladen"

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



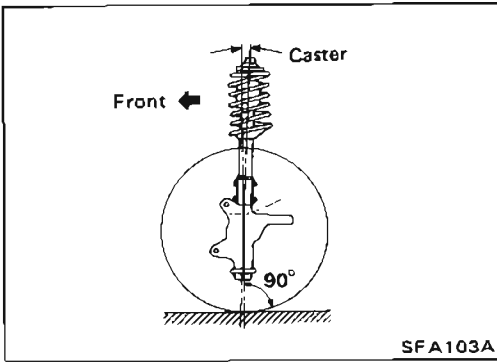
CAMBER, CASTER AND KINGPIN INCLINATION

- Caster and kingpin inclination are preset at factory and cannot be adjusted.
- Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge, and adjust in accordance with the following procedures.

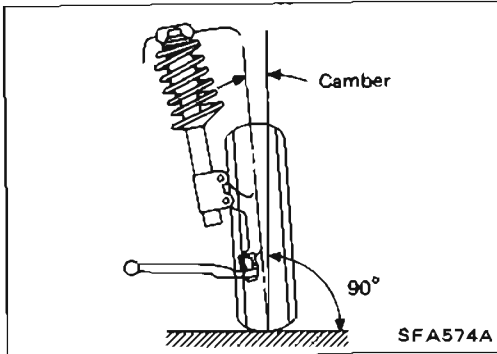


Kingpin inclination:
 12°30' - 14°00'

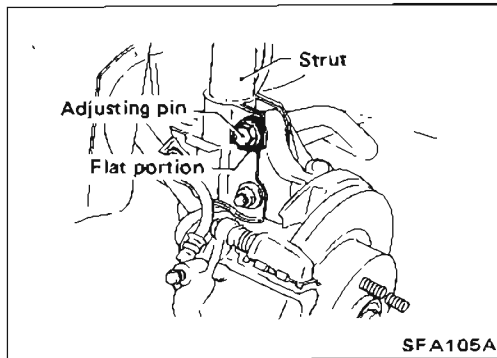
Front Wheel Alignment (Cont'd)



Caster:
6°00' - 7°30'



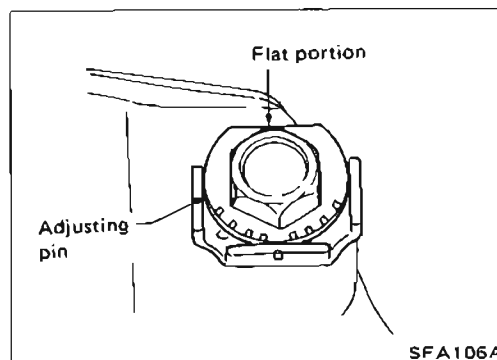
Camber:
-1°30' to 0°



If camber is not within specification, adjust by turning adjusting pin as follows:

- (1) Remove adjusting pin

Adjusting pin is installed with flat portion facing downward.



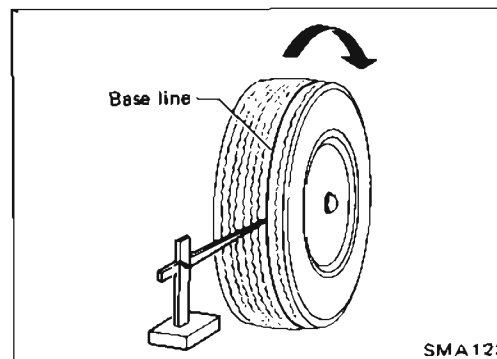
- (2) Next replace adjusting pin with flat portion facing upward.

- (3) Turn adjusting pin to adjust.

Camber changes about 5' with each graduation of adjusting pin.

- (4) Tighten adjusting pin to specified torque.

⚠: 124 - 143 N·m (12.6 - 14.6 kg-m, 91 - 106 ft-lb)



TOE-IN

1. Draw a base line on tread surface of tires.

After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight-ahead position.

Front Wheel Alignment (Cont'd)

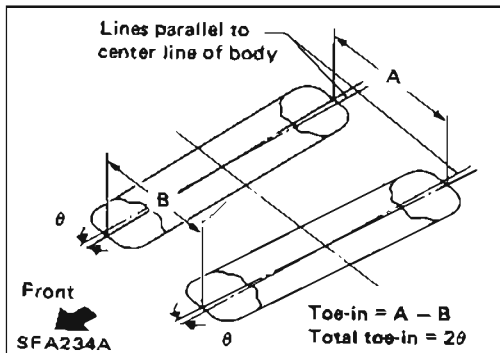
2. Measure toe-in.

Measure distance "A" and "B" at same height as hub center.

Toe-in:

$$A - B \quad 0.3 - 2.3 \text{ mm (0.012 - 0.091 in)}$$

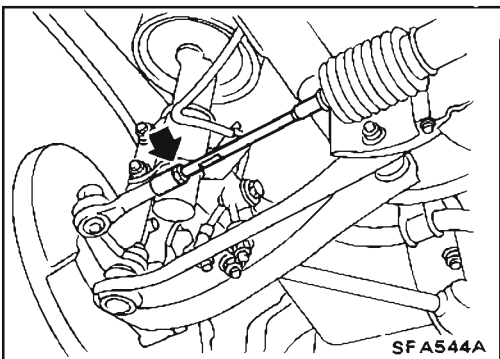
$$2\theta \quad (\text{Total toe-in}) \quad 1' - 6.5'$$



3. Adjust toe-in by varying length of steering tie-rods.

(1) Loosen lock nuts.

(2) Adjust toe-in by turning forward and reverse tie-rod.



Make sure both tie-rods are the same length.

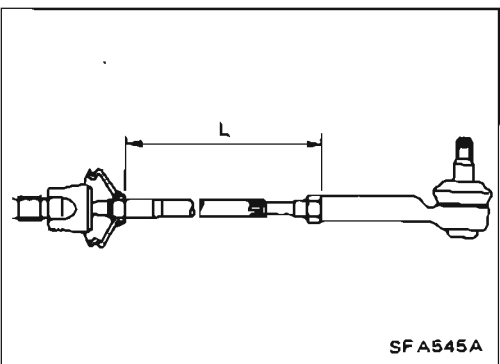
Standard length "L" — reference data:

$$174.8 \text{ mm (6.88 in)}$$

(3) Fix lock nuts, then tighten them designed torque.

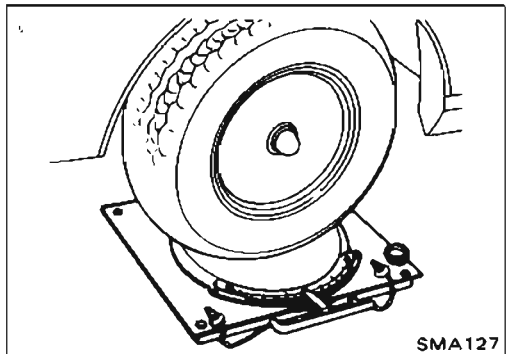
$$\square: 37 - 46 \text{ N}\cdot\text{m}$$

$$(3.8 - 4.7 \text{ kg}\cdot\text{m, } 27 - 34 \text{ ft}\cdot\text{lb})$$



FRONT WHEEL TURNING ANGLE

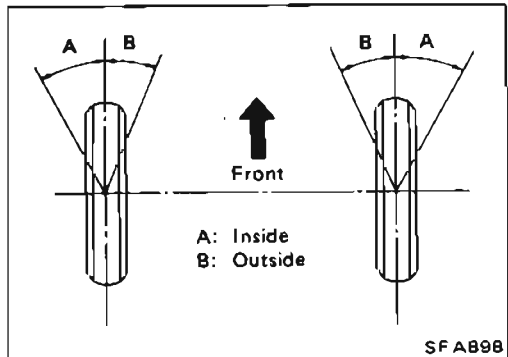
1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.



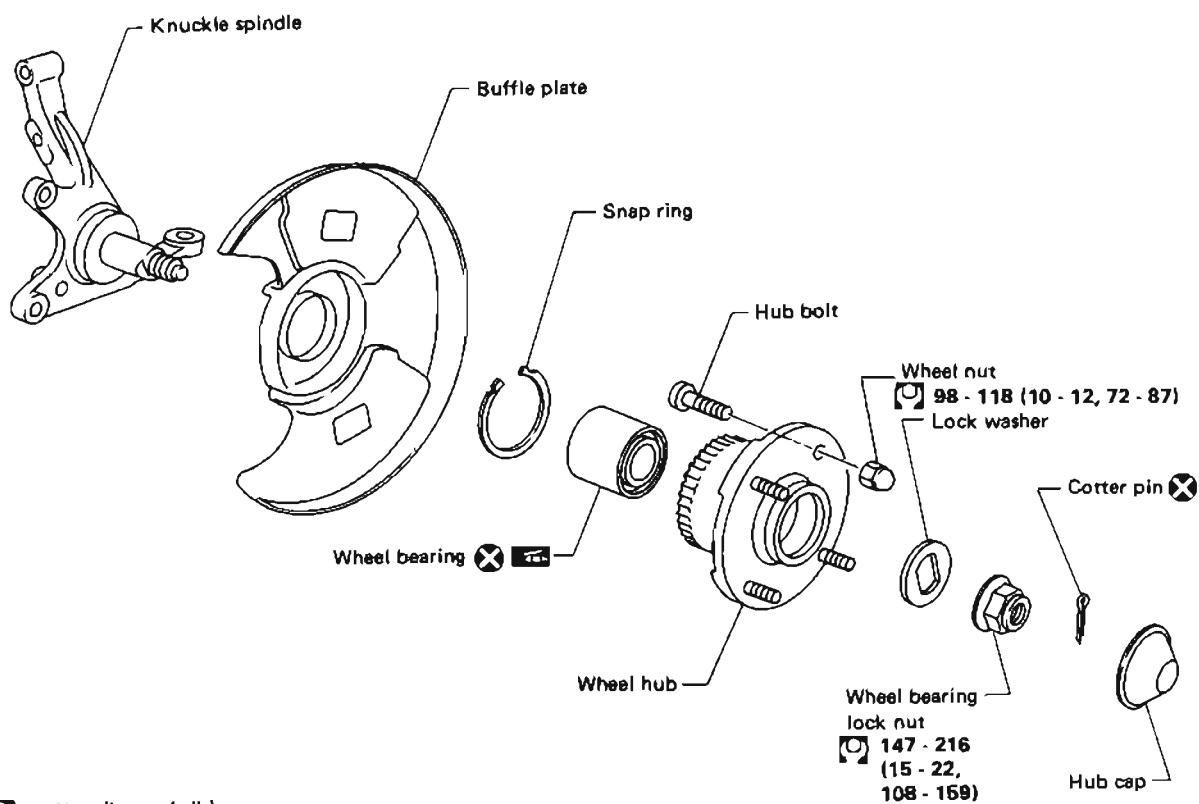
2. Rotate fully steering wheel to the right or left; measure turning angle.


Wheel turning angle:

| | | |
|------------|------------------|-----------|
| Full turns | Inside wheel: A | 39° - 43° |
| | Outside wheel: B | 33° |

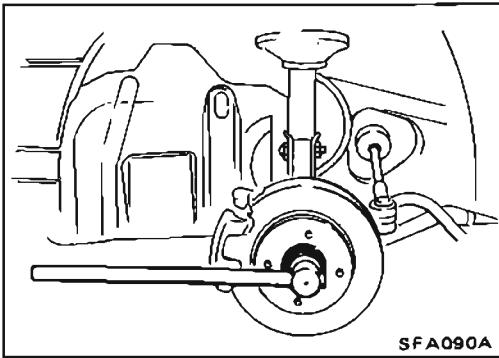


FRONT AXLE



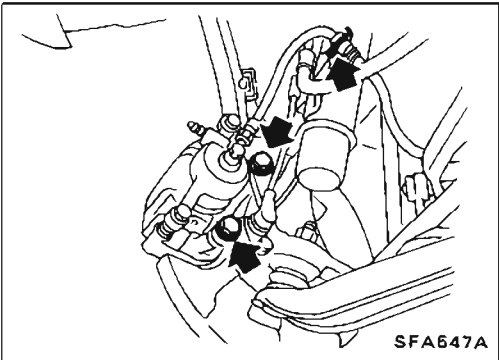
 : N·m (kg·m, ft·lb)

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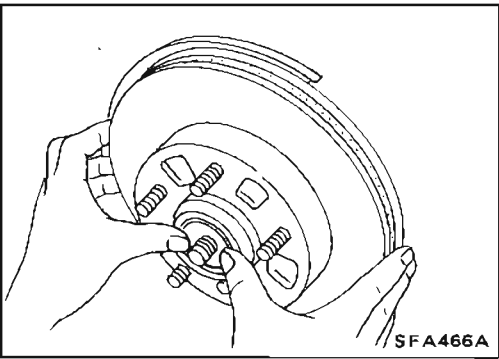


Removal

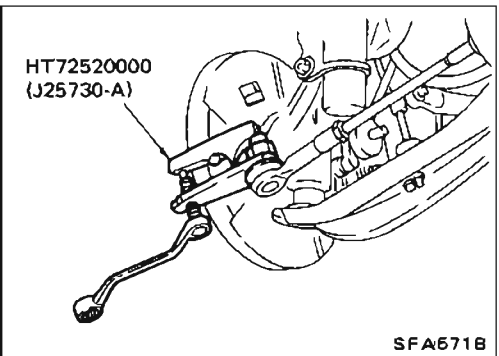
- Remove wheel bearing lock nut.



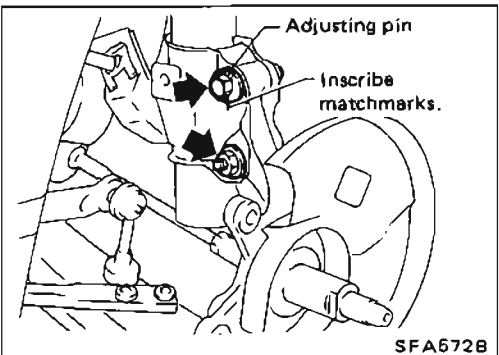
- Remove brake caliper assembly. **Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.**



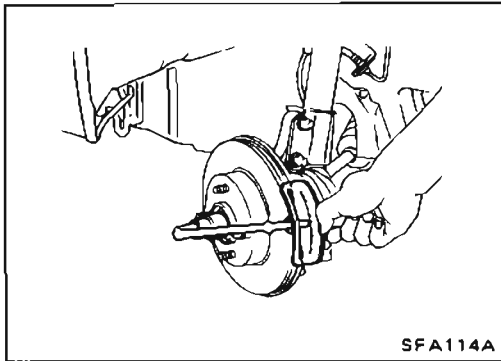
- Remove rotor and wheel hub from spindle.



- Remove tie-rod ball joint and lower ball joint.

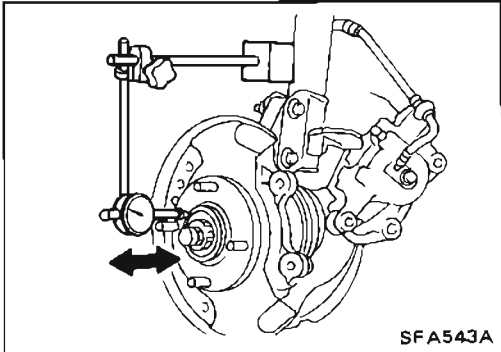


- Remove bolts and nuts as shown at left. **Make matchmarks before removing adjusting pin.**

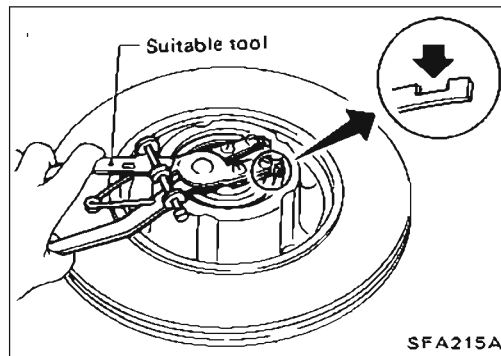


Installation

- Install wheel hub.
- Tighten wheel bearing lock nut.
□: 147 - 216 N·m
(15 - 22 kg-m, 108 - 159 ft-lb)



- Check wheel bearing axial end play.
Axial end play: 0.03 mm (0.0012 in) or less

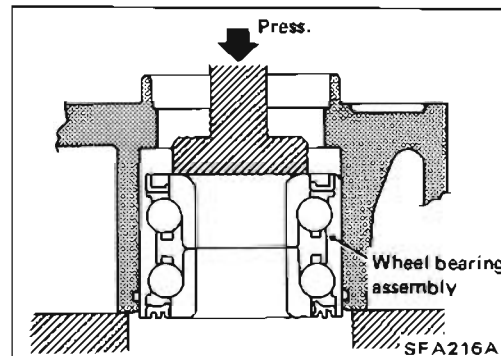


Disassembly

CAUTION:

When removing wheel bearing from wheel hub, replace wheel bearing assembly (outer race, inner races and grease seal) with a new one.

- Remove circular clip with suitable tool.



- Press out wheel bearing assembly from wheel hub.

Inspection

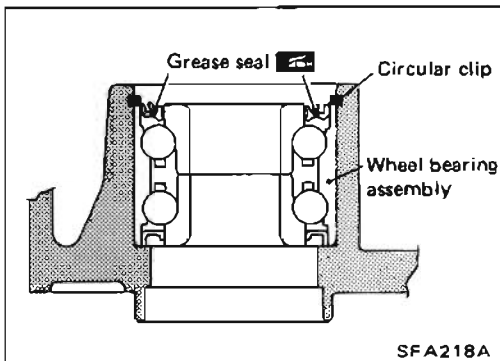
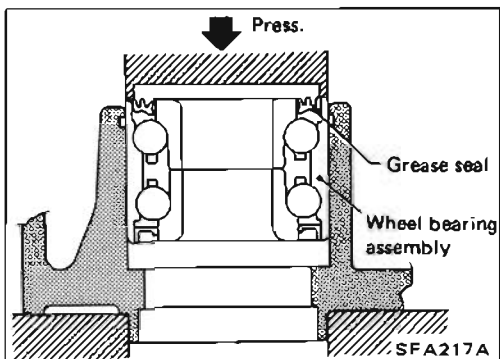
WHEEL HUB

- Check wheel hub for any cracks by using a magnetic exploration or dyeing test.

CIRCULAR CLIP

- Check circular clip for wear or cracks. Replace if necessary.

FRONT AXLE — Wheel Hub and Knuckle



Assembly

1. Press new wheel bearing assembly into wheel hub from inside of rotor disc (with wheel hub).

Maximum load P:

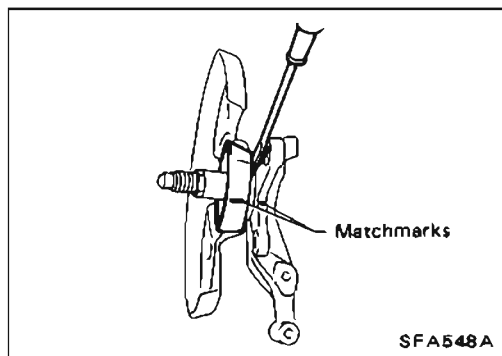
29 kN (3 t, 3.3 US ton, 3.0 Imp ton)

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 wheel hub.
- Be careful not to damage grease seal.**

2. Install circular clip into groove of wheel hub.
3. Apply multi-purpose grease to sealing lip.

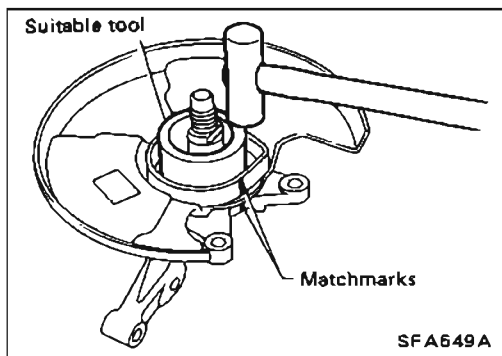
FRONT AXLE — Baffle Plate



Removal

- Mark matchmarks on baffle plate before removing.
- If baffle plate replacement requires removal of knuckle spindle, separate it equally using a screwdriver.

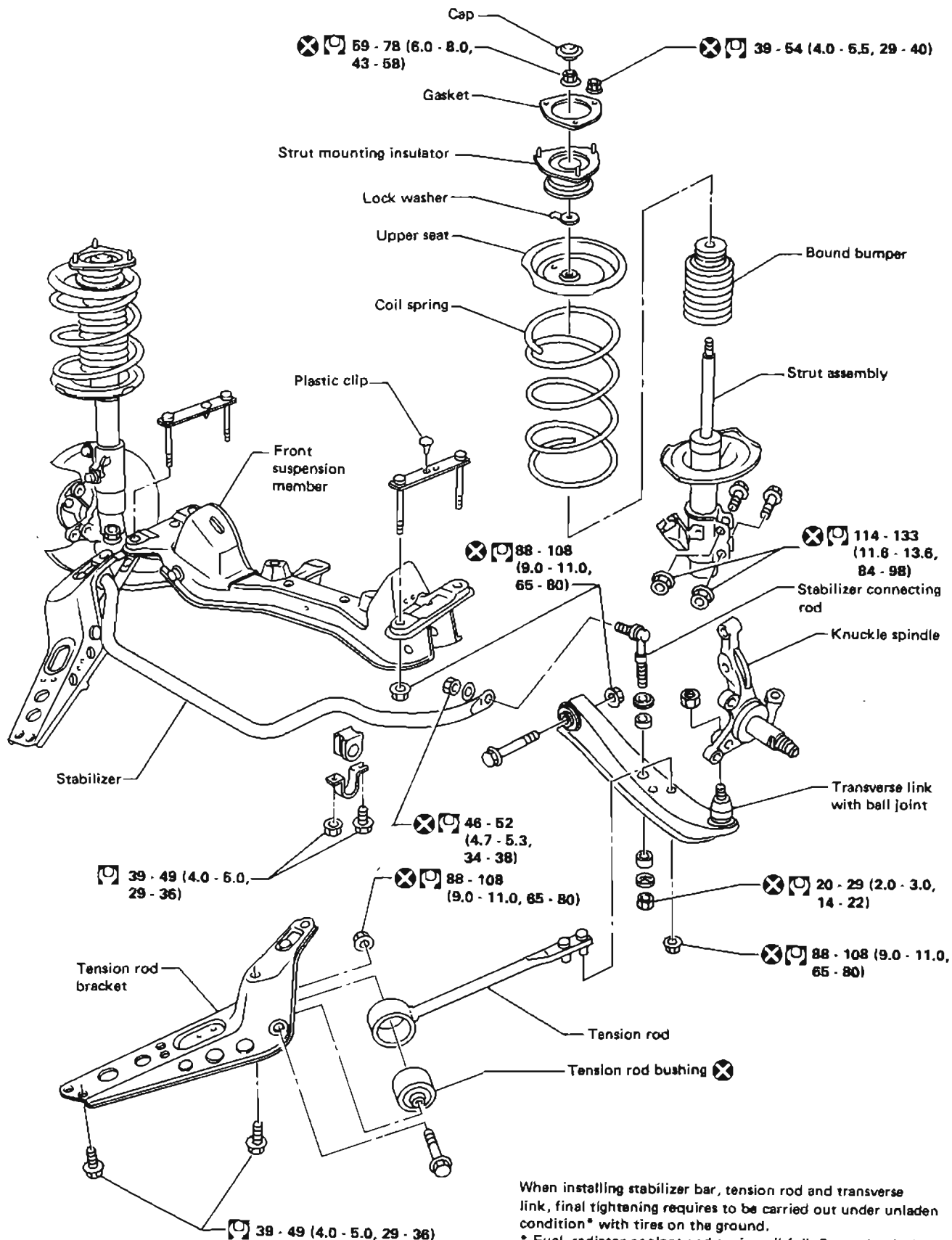
Be careful not to scratch knuckle spindle.



Installation

- Align matchmarks previously marked on baffle plate and install baffle plate by lightly tapping with a copper hammer and suitable tool.

FRONT SUSPENSION



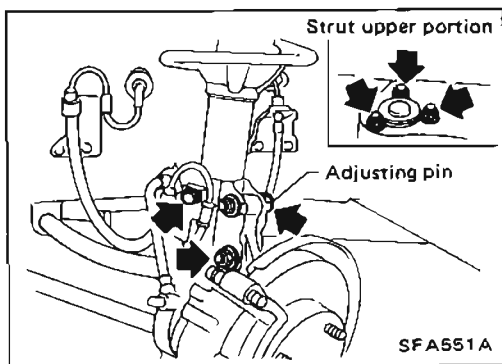
When installing stabilizer bar, tension rod and transverse link, final tightening requires to be carried out under unladen condition* with tires on the ground.

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

: N·m (kg-m, ft-lb)

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FRONT SUSPENSION — Coil Spring and Strut Assembly



Removal

- Remove strut assembly fixing bolts and nuts (to hoodledge).
- Do not remove piston rod lock nut on vehicle.
- Put matchmarks on strut lower bracket and camber adjusting pin.

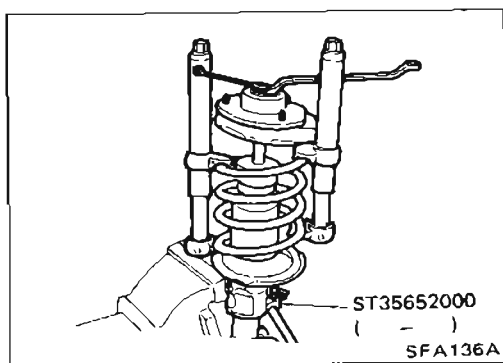
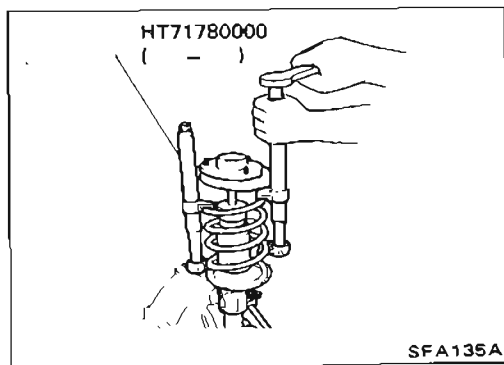
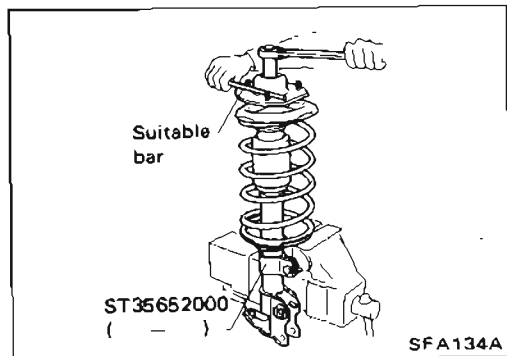
Disassembly

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 a Tool so that 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.

Inspection (Cont'd)

STRUT MOUNTING INSULATOR

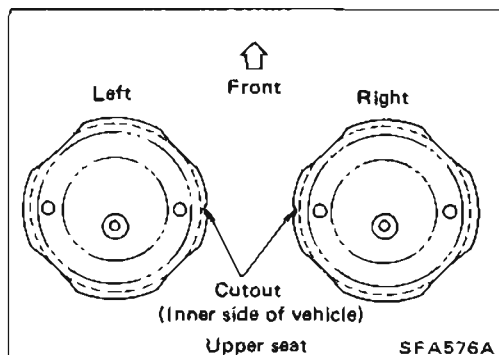
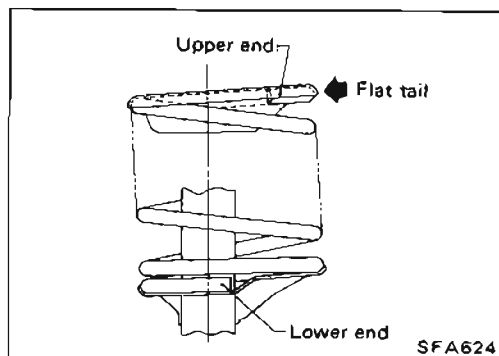
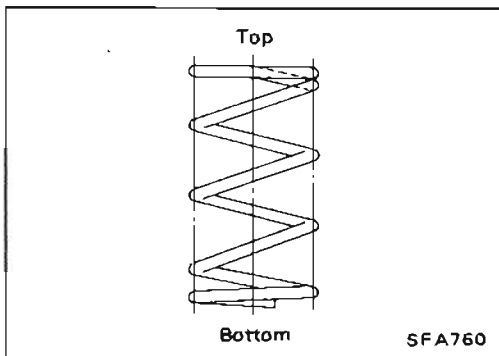
- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration.
- Check thrust bearing parts for abnormal noise or excessive rattle in axial direction.
Replace if necessary.

LOCK WASHER

- Check for cracks, deformation or other damage. Replace if necessary.

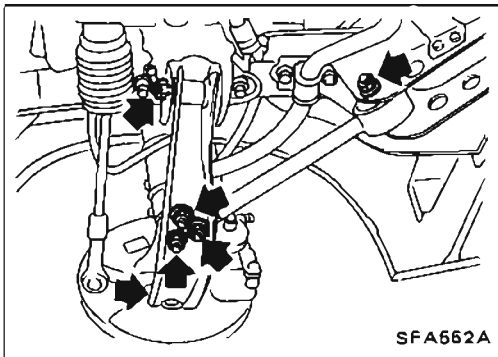
COIL SPRING

- Check for cracks, deformation or other damage. Replace if necessary.



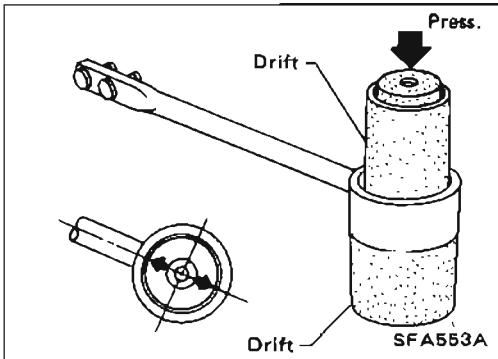
Assembly

- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)
- When installing coil spring on strut, it must be positioned as shown in figure at left.
- Install upper spring seat with its cutout facing the inner side of vehicle.

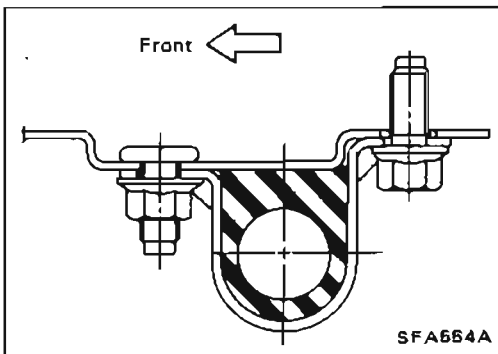


Removal and Installation

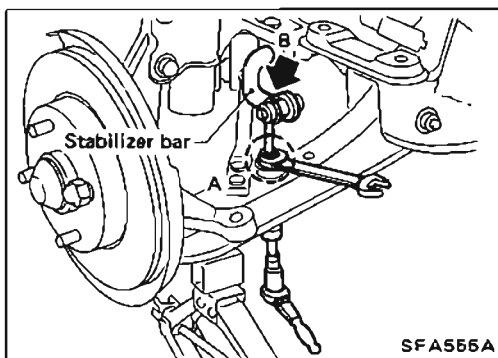
- Remove tension rod and stabilizer bar.



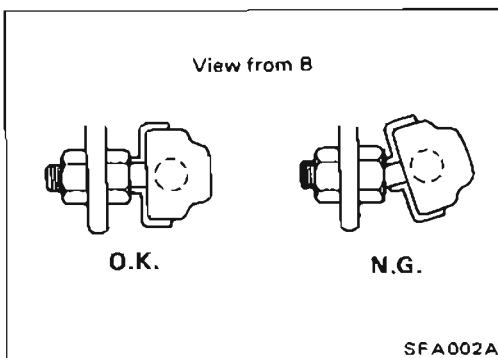
- When removing tension rod bushing, place one drift on lower side of bushing and the other on upper side, as shown at left, and press bushing out.
- Place arrow mark on bushing facing tension rod before installing bushing.



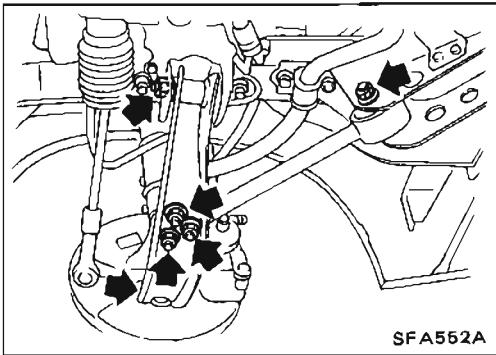
- Install stabilizer rear side bushings, then install front side bushings.
- When installing stabilizer bar clamp, make sure direction is correct (as shown at left.)**



- When removing and installing stabilizer bar, fix portion A.



- Install stabilizer bar with ball joint socket properly placed.



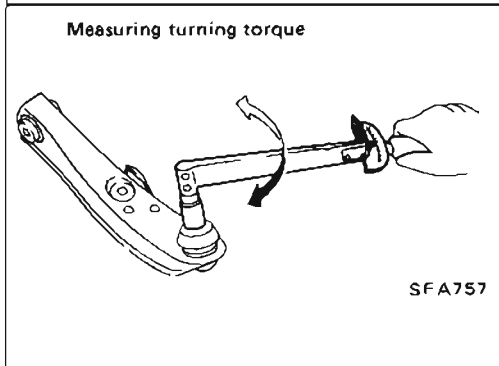
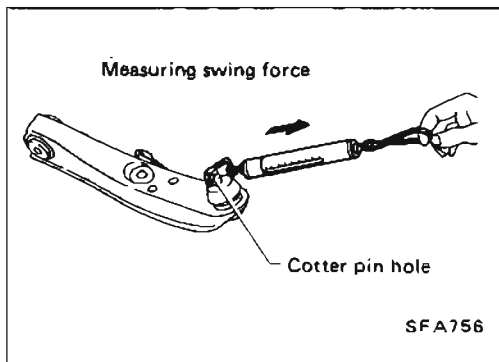
Removal and Installation

- Remove stabilizer, tension rod, ball joint and transverse link assembly.
- During installation, final tightening must be carried out at curb weight with tires on ground.
- After installation, check wheel alignment. Refer to "Front Wheel Alignment" of CHECK AND ADJUSTMENT — On-vehicle.

Inspection

TRANSVERSE LINK

- Check transverse link for damage, cracks or deformation. Replace it if necessary.
- Check rubber bushing for damage, cracks and deformation. Replace transverse link if necessary.



LOWER BALL JOINT

- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link assembly if necessary.

Swing force and turning torque

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

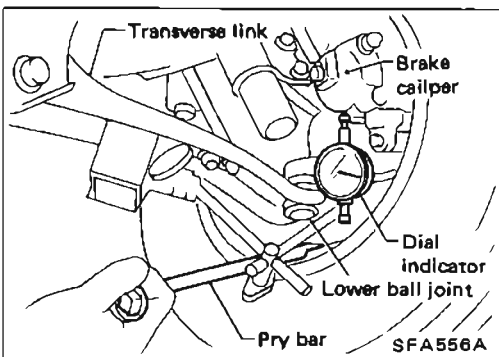
Swing force:

(measure point: cotter pin hole of ball stud)

7.8 - 55.9 N (0.8 - 5.7 kg, 1.8 - 12.6 lb)

Turning torque:

0.49 - 3.43 N·m (5.0 - 35 kg-cm, 4.3 - 30.4 in-lb)



Vertical end play (On-vehicle)

- (1) Jack up front of vehicle and set the stands.
- (2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
- (3) Make sure front wheels are straight and brake pedal is depressed.
- (4) Place a pry bar between transverse link and inner rim of road wheel.
- (5) While pushing and releasing pry bar, observe maximum dial indicator value.

Vertical end play: 0 mm (0 in)

- (6) If not within above specification, replace transverse link.

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

General Specifications

COIL SPRING

| Model | | Except Sports package | | Sports package | |
|----------------------|---------------------|---------------------------|--|-------------------------|--|
| | | Item | | Item | |
| Wire diameter | mm (in) | 13.3 (0.524) | | 13.5 (0.531) | |
| Coil diameter | mm (in) | 170 (6.69) | | 170 (6.69) | |
| Free length | mm (in) | 326 (12.83) | | 311 (12.24) | |
| Spring constant | N/mm (kg/mm, lb/in) | 19.6 (2.0, 112) | | 21.6 (2.2, 123) | |
| | | | | | |
| Identification color | | Orange x 1, Purple x 1 | | Pink x 1, Purple x 1 | |

FRONT STABILIZER BAR

| Model | | Except Sports package | | Sports package | |
|----------------------|---------|-----------------------|--|----------------|--|
| | | Item | | Item | |
| Stabilizer diameter | mm (in) | 24 (0.94) | | 25 (0.98) | |
| Identification color | | White | | Orange | |

STRUT

| Model | | Except Sports package | | Sports package | |
|---|---------|-----------------------------------|--|-----------------------------------|--|
| | | Item | | Item | |
| Piston rod diameter | mm (in) | 20.0 (0.787) | | | |
| Stroke | mm (in) | 160 (6.30) | | | |
| Damping force [at 0.1 m (0.3 ft)/sec.] N (kg, lb) | | | | | |
| Expansion | | 412 - 608 (42 - 62, 93 - 137) | | 471 - 706 (48 - 72, 106 - 159) | |
| Compression | | 206 - 304 (21 - 31, 46 - 68) | | 235 - 363 (24 - 36, 53 - 79) | |
| Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb) | | | | | |
| Expansion | | 912 - 1,245 (93 - 127, 205 - 280) | | | |
| Compression | | 392 - 588 (40 - 60, 88 - 132) | | | |

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

| | | |
|---------------------------|---------|---------------------------|
| Camber | degree | -1°30' to 0° |
| Caster | degree | 6°00' - 7°30' |
| Toe-in (Total) | mm (in) | 0.3 - 2.3 (0.012 - 0.091) |
| | degree | 1' - 6.5' |
| Kingpin inclination | degree | 12°30' - 14°00' |
| Front wheel turning angle | | |
| Full turn*2 | degree | 39° - 43°/33° |
| inside/outside | | |

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

*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

WHEEL BEARING

| | | |
|------------------------------|-------------------|--------------------------------|
| Wheel bearing axial end play | mm (in) | 0.03 (0.0012) or less |
| Wheel bearing lock nut | | |
| Tightening torque | N·m (kg·m, ft·lb) | 147 - 216 (15 - 22, 108 - 159) |

LOWER BALL JOINT

| | | |
|--|--------------------|---------------------------------------|
| Swing force (Measuring point: cotter pin hole of ball stud) | N (kg, lb) | 7.8 - 55.9 (0.8 - 5.7, 1.8 - 12.6) |
| Turning torque | N·m (kg·cm, in·lb) | 0.49 - 3.43 (5.0 - 35, 4.3 - 30.4) |
| Vertical end play | mm (in) | 0 (0) |

WHEEL RUNOUT (Radial and lateral)

| Wheel type | Radial runout | Lateral runout |
|---------------------------|---------------------|---------------------|
| Aluminum wheel mm (in) | 0.3 (0.012) or less | |
| Steel wheel mm (in) | 0.5 (0.020) or less | 0.8 (0.031) or less |

REAR AXLE & REAR SUSPENSION

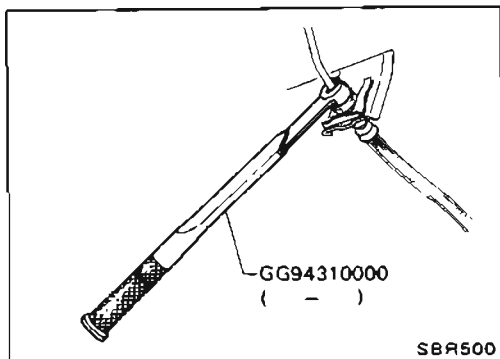
SECTION **RA**

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| PRECAUTIONS AND PREPARATION | RA- 2 |
| REAR AXLE AND REAR SUSPENSION | RA- 4 |
| CHECK AND ADJUSTMENT — On-vehicle | RA- 5 |
| REAR AXLE AND REAR SUSPENSION ASSEMBLY | RA- 8 |
| REAR AXLE — Wheel Hub and Axle Housing | RA- 9 |
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| REAR SUSPENSION | RA-19 |
| REAR SUSPENSION — Coil Spring and Shock Absorber | RA-20 |
| REAR SUSPENSION — Stabilizer Bar | RA-22 |
| REAR SUSPENSION — Multi-link and Lower Ball Joint | RA-23 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | RA-24 |

RA

PRECAUTIONS AND PREPARATION

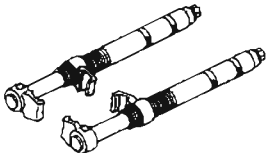
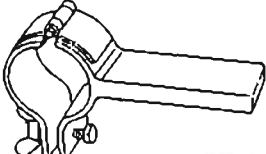
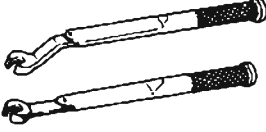
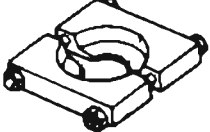
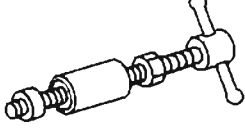


Precautions

- 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 lower arm.

Preparation

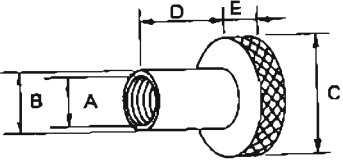
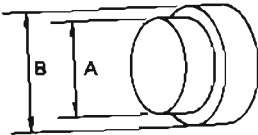
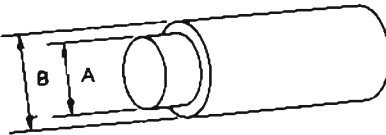
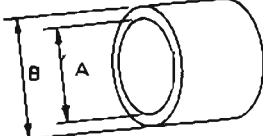
SPECIAL SERVICE TOOLS

| Tool number (Kent-Moore No.) Tool name | Description |
|--|---|
| HT71780000 (-) Spring compressor |  <p>Removing and installing coil spring</p> |
| ST35652000 (-) Strut attachment |  <p>Fixing strut assembly</p> |
| GG94310000 (-) Flare nut torque wrench |  <p>Removing and installing brake piping</p> |
| ST30031000 (J22912-01) Bearing puller |  <p>Removing inner race of wheel bearing</p> |
| ST38280000 (-) Arm bushing remover |  <p>Removing and installing bushing of rear axle housing</p> |

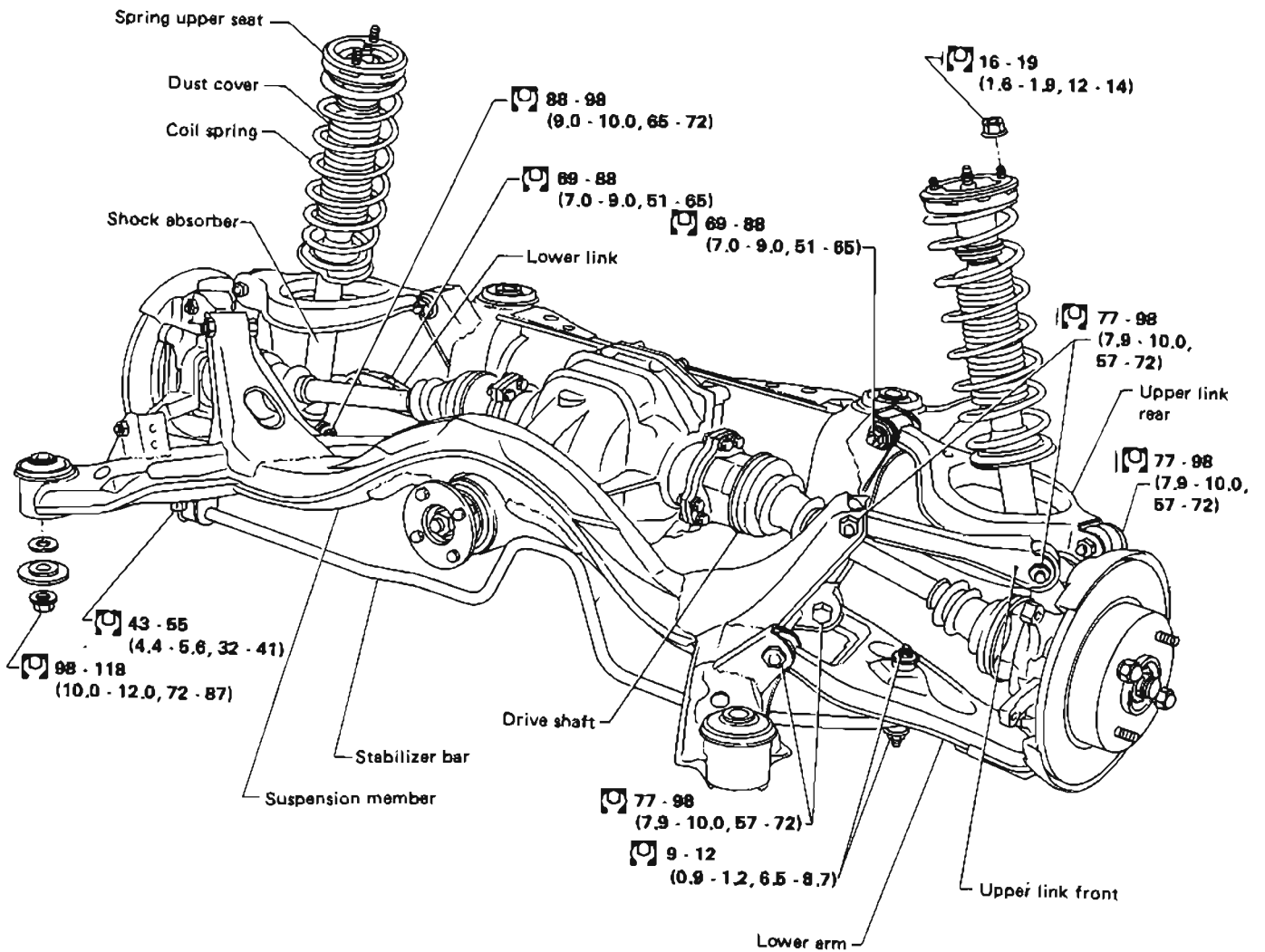
PRECAUTIONS AND PREPARATION

Precautions (Cont'd)

COMMERCIAL SERVICE TOOLS

| Tool name | Description |
|----------------------------------|--|
| Attachment Wheel alignment |  <p style="text-align: right;">Measure rear wheel alignment A: Screw M24 x 1.5 B: 35 (1.38) dia. C: 65 (2.56) dia. D: 56 (2.20) E: 12 (0.47) Unit: mm (in)</p> |
| Rear wheel hub drift |  <p style="text-align: right;">Installing wheel bearing A: 41 mm (1.61 in) dia. B: 49 mm (1.93 in) dia.</p> |
| Wheel bearing drift |  <p style="text-align: right;">Removing rear wheel hub A: 26 mm (1.02 in) dia. B: 40 mm (1.57 in) dia.</p> |
| Rear drive shaft plug seal drift |  <p style="text-align: right;">Installing rear drive shaft plug seal A: 67 mm (2.64 in) dia. B: 85 mm (3.35 in) dia.</p> |

REAR AXLE AND REAR SUSPENSION



Final tightening for rubber parts requires to be carried out under unladen condition* with tires on ground.

* Fuel, radiator coolant and engine oil full.

Spare tire, jack, hand tools and mats in designated positions.

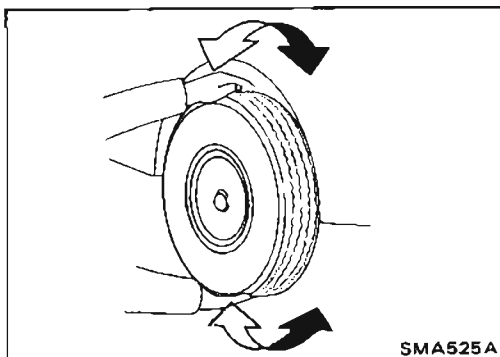
: N-m (kg-m, ft-lb)

SRA093A

Rear Axle and Rear Suspension Parts

- Check axle and suspension parts for looseness, wear or damage.

(1) Shake each rear wheel.



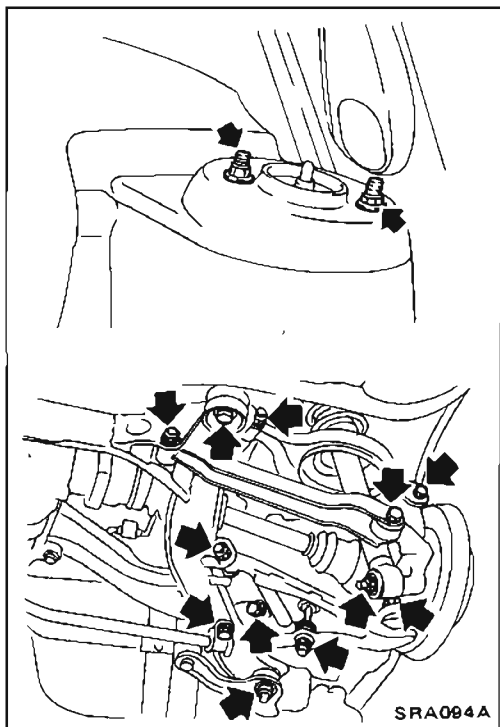
(2) Retighten all nuts and bolts to the specified torque.

Tightening torque:

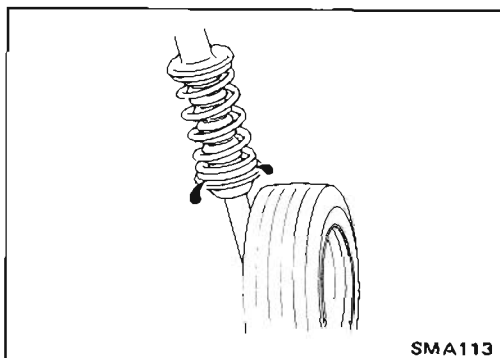
Refer to S.D.S.

(3) Make sure that cotter pin is inserted.

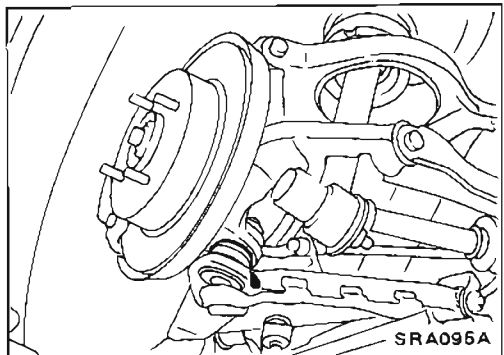
(4) Check rear axle and rear suspension parts for wear, cracks or other damage.

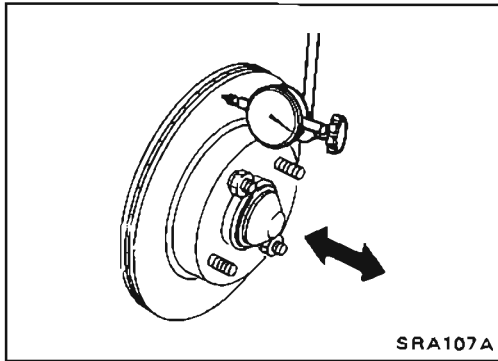


(5) Check shock absorber for oil leakage or other damage.



- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.



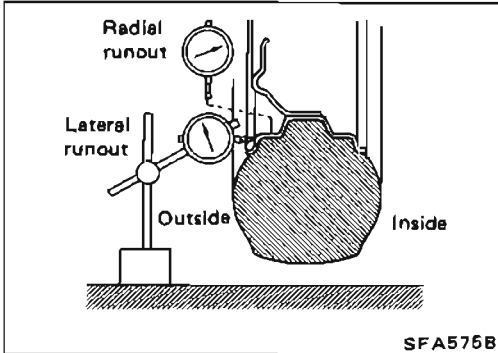


Rear Wheel Bearing

- Check tightening torque of wheel bearing lock nut.
 \square : 235 - 314 N·m
 (24 - 32 kg-m, 174 - 231 ft-lb)
- Check that wheel bearings operates 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 REAR AXLE — Wheel Hub and Axle Housing.



Rear Wheel Alignment

Before checking rear wheel alignment, be sure to make a preliminary inspection.

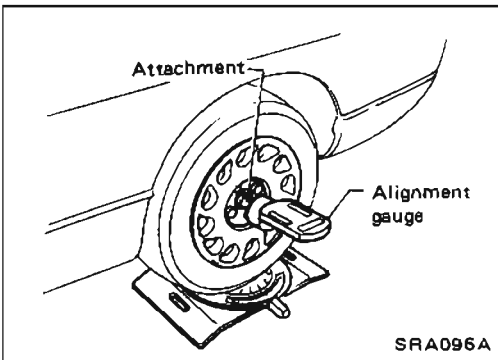
PRELIMINARY INSPECTION

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.
- Refer to S.D.S.
- Check that rear shock absorber works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen).

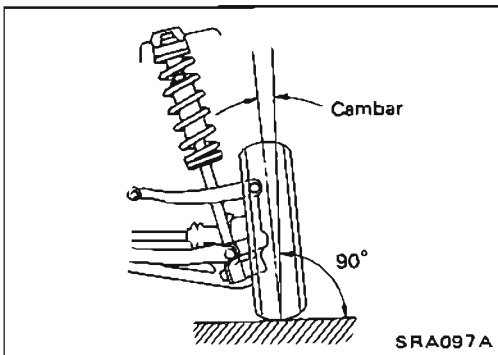
“Unladen”:

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



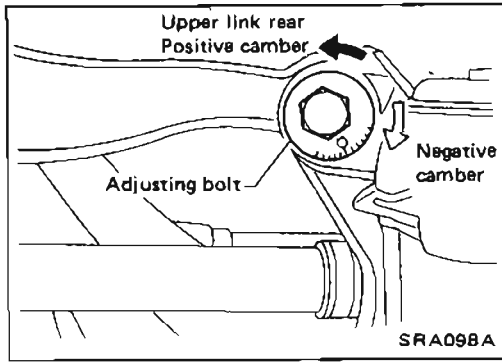
CAMBER

- Measure camber of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.



Camber:
 -1°36' to -0°36'

Rear Wheel Alignment (Cont'd)



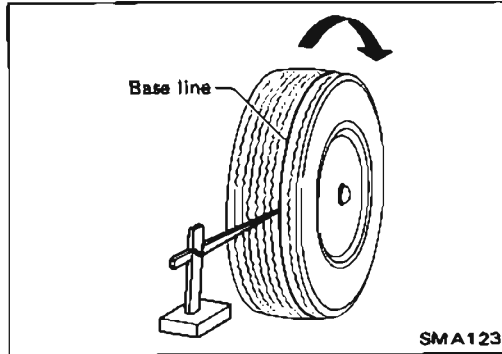
If camber is not within specification, adjust by turning the adjusting pin.

(1) Turn the adjusting pin to adjust.

Camber changes about 5' with each graduation of the adjusting pin.

(2) Tighten to the specified torque.

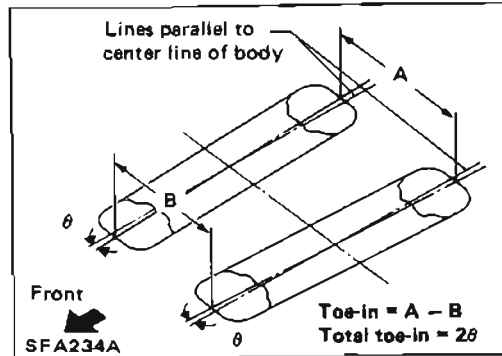
**Ⓜ: 69 - 88 N·m
(7.0 - 9.0 kg-m, 51 - 65 ft-lb)**



TOE-IN

1. Draw a base line across the tread.

After lowering rear of vehicle, move it up and down to eliminate friction.



2. Measure toe-in.

Measure distance "A" and "B" at the same height as hub center.

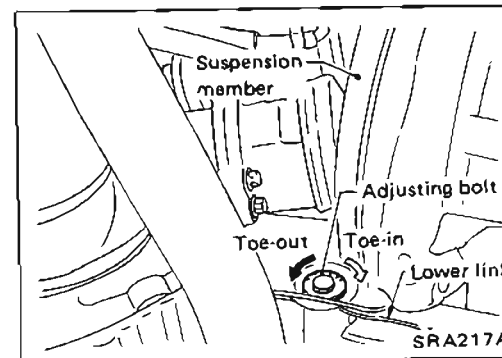
Toe-in:

A - B

0.5 - 4.5 mm (0.020 - 0.177 in)

2 θ (Total toe-in)

1.5' - 12.5'

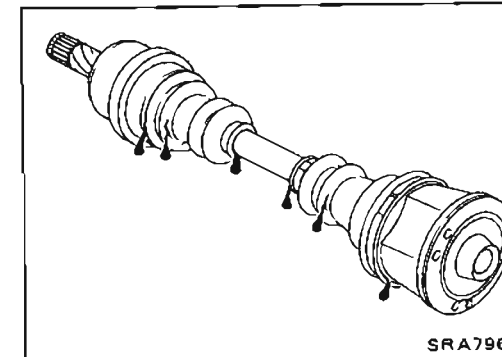


3. Adjust toe-in by turning adjusting pins.

Toe changes about 1.5 mm (0.059 in) [One side] with each graduation of the adjusting pin.

4. Tighten to the specified torque.

**Ⓜ: 69 - 88 N·m
(7.0 - 9.0 kg-m, 51 - 65 ft-lb)**

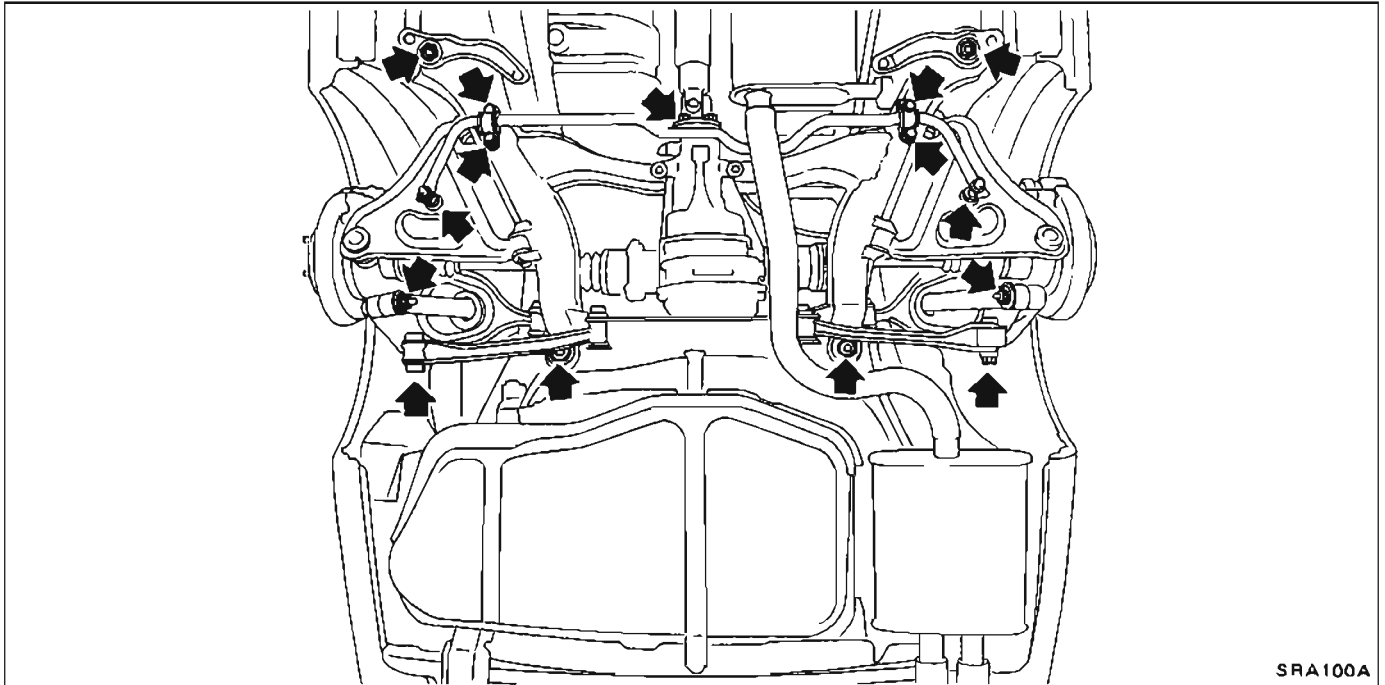


Drive Shaft

Check boot and drive shaft for cracks, wear, damage or grease leakage.

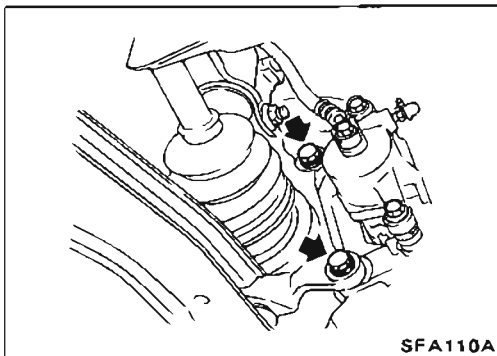
REAR AXLE AND REAR SUSPENSION ASSEMBLY

Removal and Installation



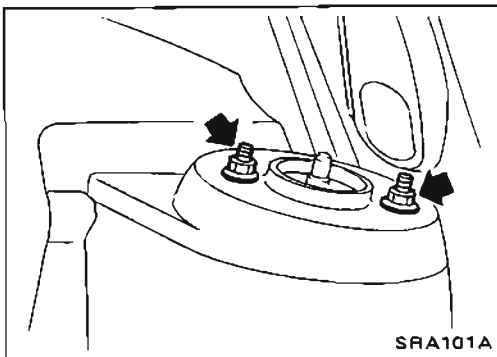
SRA100A

- Remove exhaust tube.
- Disconnect propeller shaft rear end.



SFA110A

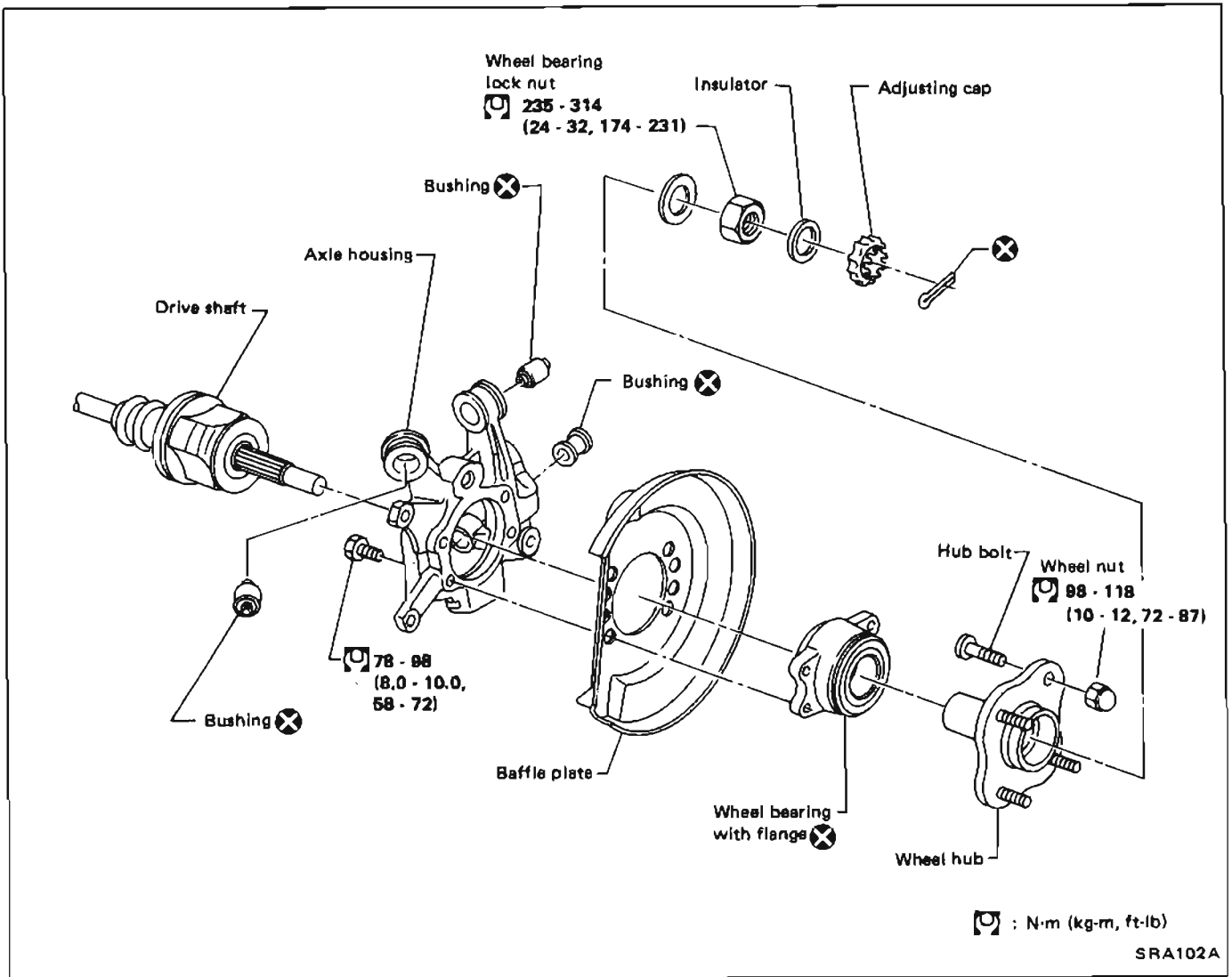
- Remove brake caliper assembly.
Brake hose need not be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.



SRA101A

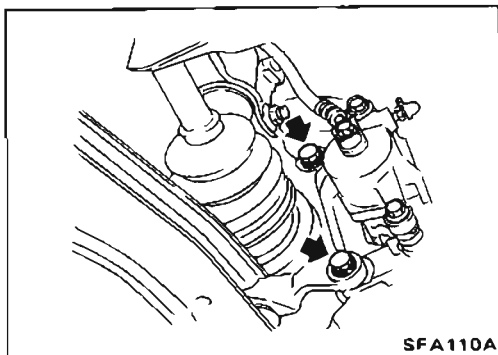
- Remove upper end nuts of shock absorber.
Do not remove piston rod lock nut.
- Remove suspension member fixing nuts. Then draw out rear axle and rear suspension assembly.

REAR AXLE — Wheel Hub and Axle Housing



Removal

- Remove wheel bearing lock nut.

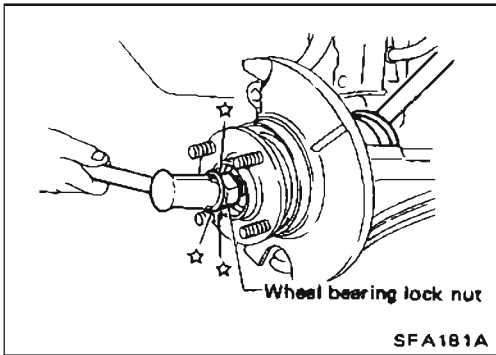


- Remove brake caliper assembly and rotor. **Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.**

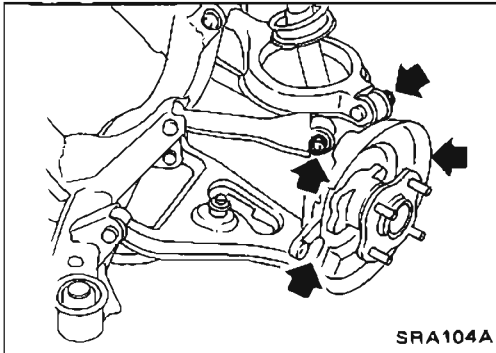
REAR AXLE — Wheel Hub and Axle Housing

Removal (Cont'd)

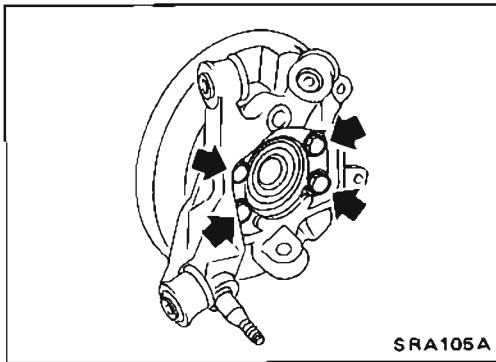
- Separate drive shaft from axle housing by slightly tapping it. **When removing drive shaft, cover boots with waste cloth to prevent them from being damaged.**



- Remove axle housing.

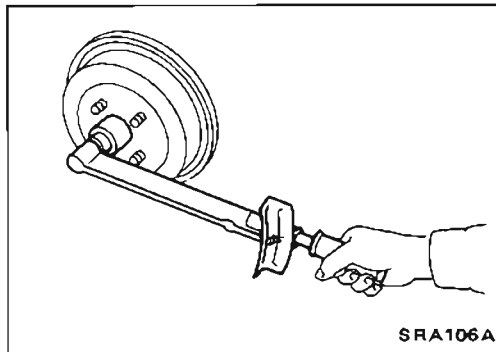


- Remove wheel bearing with flange, and wheel hub from axle housing.

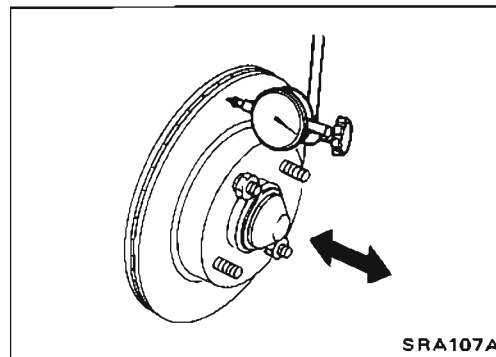


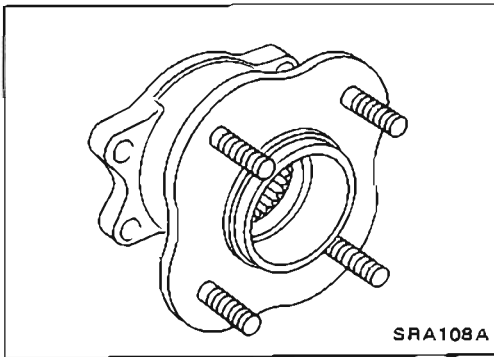
Installation

- Install axle housing with wheel hub.
- Tighten wheel bearing lock nut.
[C]: 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

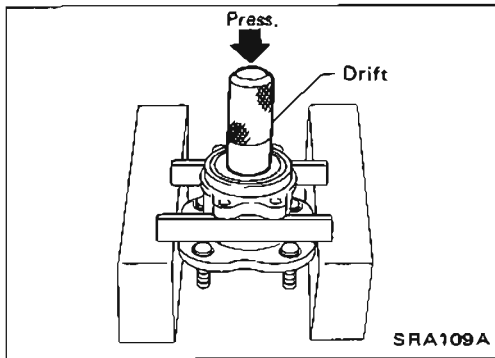
CAUTION:

Wheel bearing with flange usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly (including flange, and inner and outer seals).

- Growling noise is emitted from wheel bearing during operation.
- Wheel bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.
- After wheel bearing is removed from hub.

WHEEL HUB

- Remove wheel bearing (with flange) and wheel hub as one unit from axle housing before disassembling.



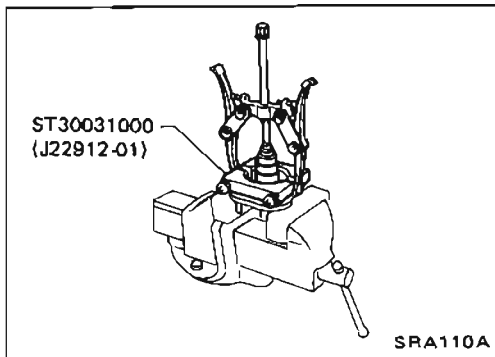
WHEEL BEARING

- Using a press and drift as shown in figure at left, press wheel bearing out.
- Discard old wheel bearing assembly. Replace with a new wheel assembly.

- Remove inner race from hub using a bearing replacer/puller.

CAUTION:

- Do not reuse old inner race although it is of the same brand as the bearing assembly.
- Do not replace grease seals as single parts.



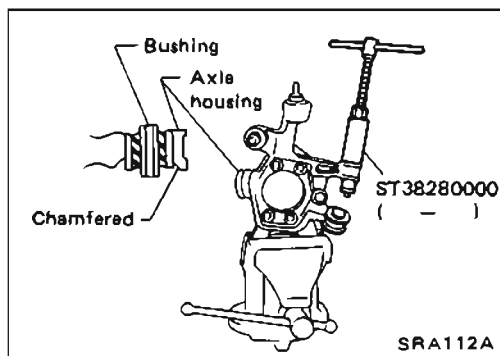
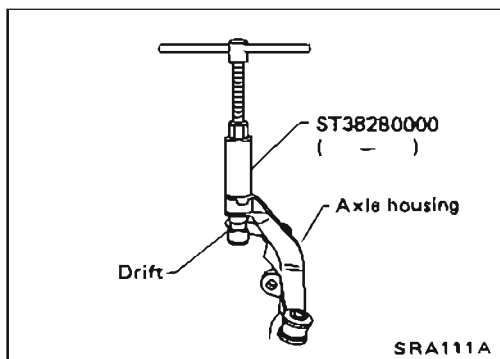
REAR AXLE — Wheel Hub and Axle Housing

Disassembly (Cont'd)

AXLE HOUSING

- Attach a drift on outer shell of bushing as shown in figure at left, remove bushing using arm bushing remover.

When placing axle housing in a vise, use wooden blocks or copper plates as pads.



- Ensure axle housing bore is free from scratches or deformities before pressing bushing into it.
- Attach bushing to chamfered bore end of axle housing and press it until it is flush with end face of axle housing.

Inspection

WHEEL HUB AND AXLE HOUSING

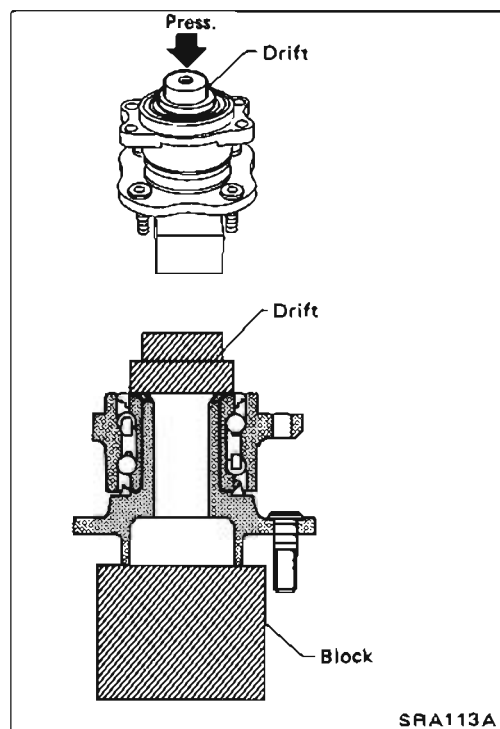
- Check wheel hub and axle housing for cracks by using a magnetic exploration or dyeing test.
- Check wheel bearing for damage, seizure, rust or rough operation.
- Check rubber bushing for wear or other damage.

Replace if necessary.

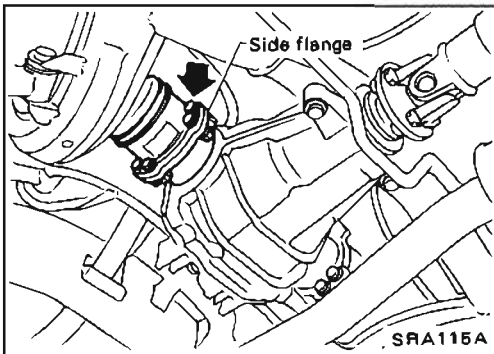
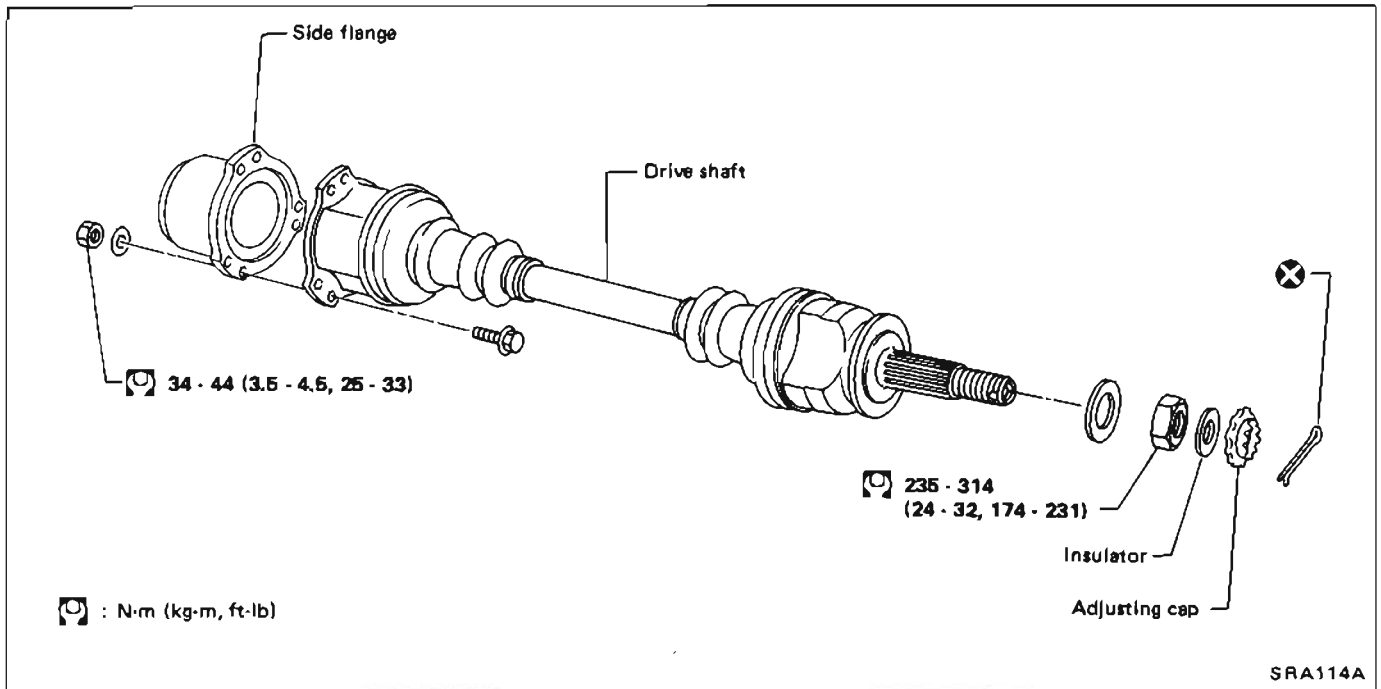
Assembly

- Place hub on a block. Attach a drift to inner race of wheel bearing and press it into hub as shown in figure at left.

Be careful not to damage grease seal.



REAR AXLE — Drive Shaft



Removal

When removing drive shaft, cover boots with waste cloth to prevent damage to them.

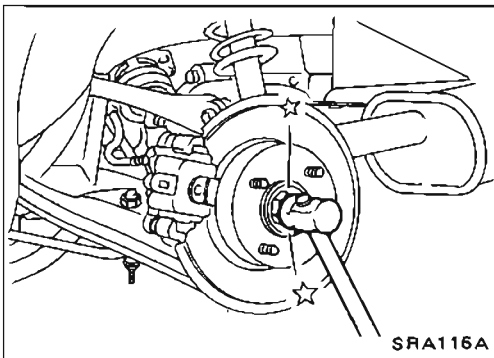
FINAL DRIVE SIDE

- Remove side flange mounting bolt and separate shaft.

WHEEL SIDE

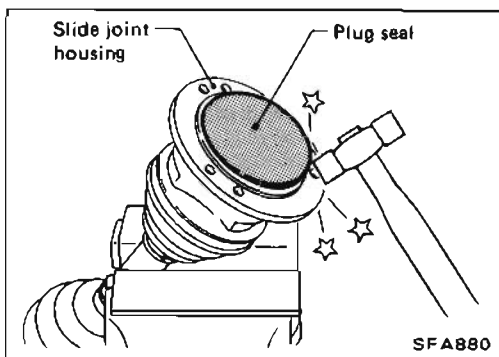
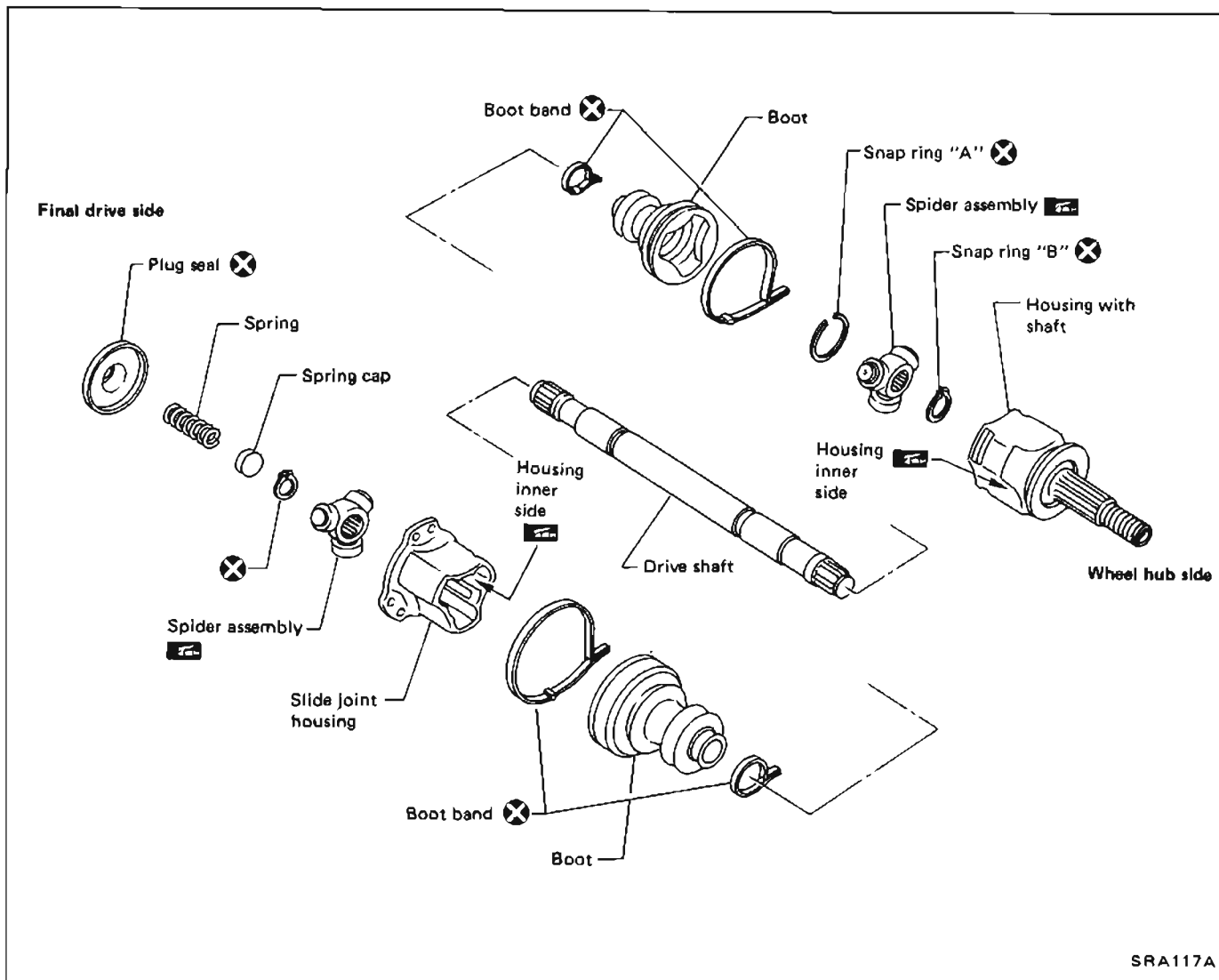
- Remove drive shaft by lightly tapping it with a copper hammer.

To avoid damaging threads of drive shaft, install a nut while removing drive shaft.



Installation

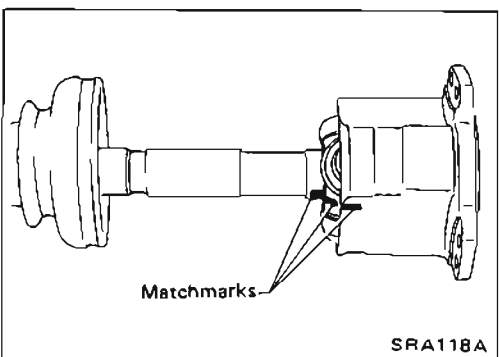
- Insert drive shaft from wheel hub and temporarily tighten wheel bearing lock nut.
- Tighten side flange mounting bolts to specified torque.
- Tighten wheel bearing lock nut to specified torque.



Disassembly

FINAL DRIVE SIDE

1. Remove plug seal from slide joint housing by lightly tapping around slide joint housing.



2. Remove boot bands.
3. Put matchmarks on slide joint housing and drive shaft before separating joint assembly.
4. Put matchmarks on spider assembly and drive shaft.

REAR AXLE — Drive Shaft

Disassembly (Cont'd)

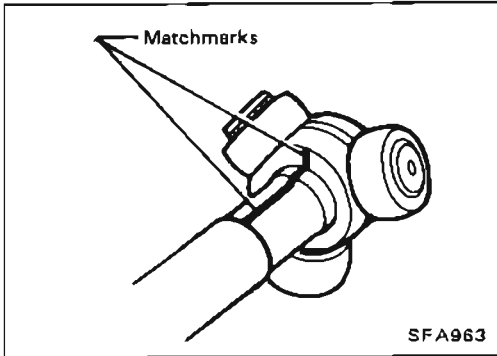
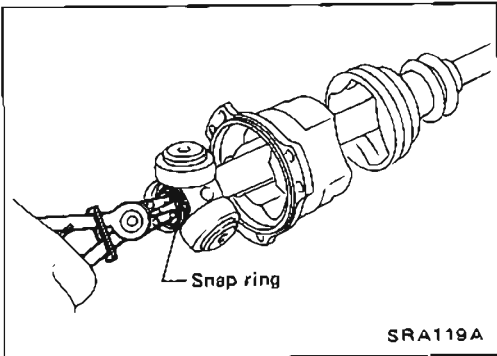
5. Pry off snap ring, then remove spider assembly.

CAUTION:

Do not disassemble spider assembly.

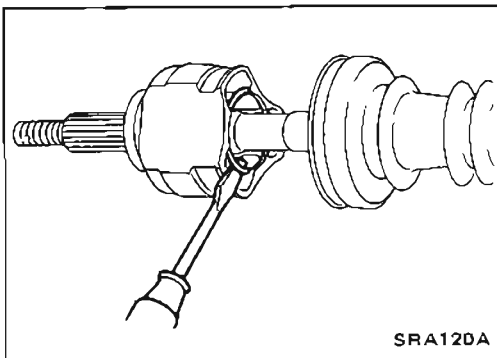
6. Draw out slide joint housing.
7. Draw out boot.

Cover drive shaft serration with tape to prevent damage to the boot.

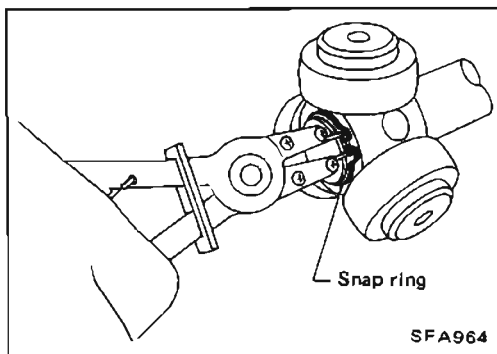


WHEEL SIDE

1. Remove boot bands.
2. Put matchmarks on housing together with shaft and drive shaft before separating joint assembly.
3. Put matchmarks on spider assembly and drive shaft.



4. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



5. Pry off snap ring "B", then remove spider assembly.

CAUTION:

Do not disassemble spider assembly.

6. Draw out boot.

Cover drive shaft serration with tape to prevent damage to the boot.

Inspection

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for deformation or other damage.

DRIVE SHAFT

Replace drive shaft if it is twisted or cracked.

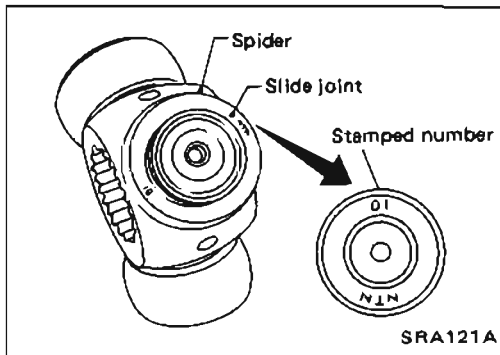
BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

Inspection (Cont'd)

JOINT ASSEMBLY

- Check spider assembly for bearing, roller and washer damage. Replace spider assembly if necessary.
- Check housing for any damage. Replace housing set and spider assembly, if necessary.



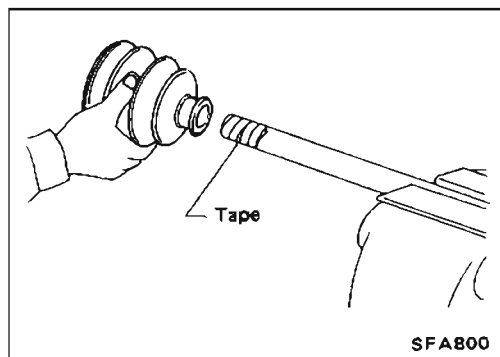
- When replacing only spider assembly, select a new spider assembly from among those listed in table below. Ensure the number stamped on sliding joint is the same as that stamped on new part.

Housing alone cannot be replaced. It must be replaced together with spider assembly.

| Stamped number | Part No. |
|----------------|-------------|
| 00 | 39720 10V10 |
| 01 | 39720 10V11 |
| 02 | 39720 10V12 |

Assembly

- After drive shaft has been assembled, make sure it moves smoothly over its entire range without binding.
- Use Nissan Genuine Grease or equivalent after every overhaul.

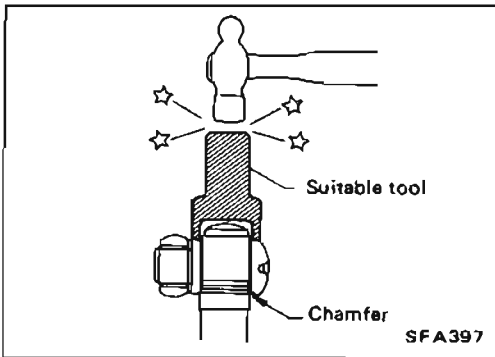


FINAL DRIVE SIDE

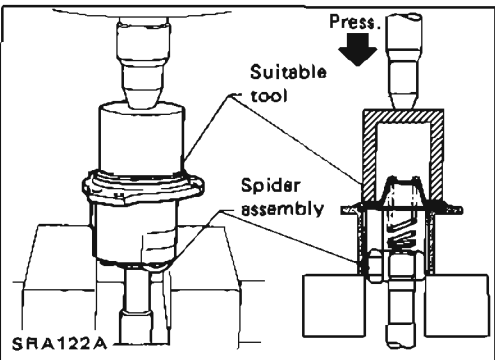
1. Install new small boot band, boot and slide joint housing to drive shaft.

Cover drive shaft serration with tape to prevent damage to boot during installation.

Assembly (Cont'd)



2. Install spider assembly securely, making sure marks are properly aligned.
 - Press-fit with spider assembly serration chamfer facing shaft.
3. Install new snap ring.

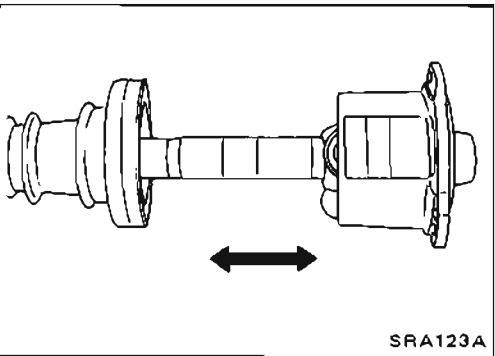


4. Install coil spring, spring cap and new plug seal to slide joint housing. Press plug seal.

Apply sealant to mating surface of plug seal.

CAUTION:

- a. When pressing plug seal into place, hold it horizontal so that spring inside it does not tilt or fall down.
- b. Move shaft in axial direction to ensure that spring is installed properly. If shaft drags or if spring is not installed properly, remove plug seal and install a new one. Discard plug seal after removal.



5. Pack drive shaft with specified amount of grease.

Specified amount of grease:

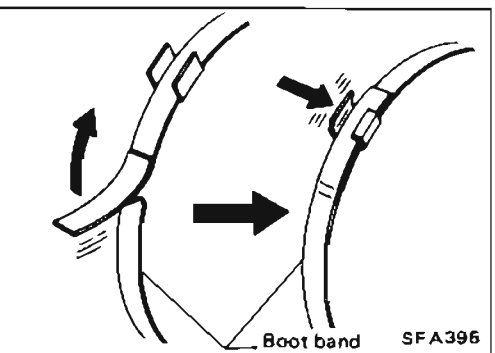
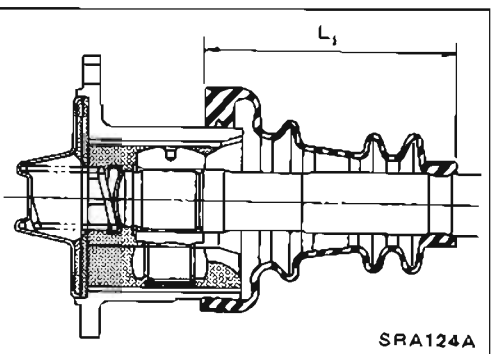
185 - 195 g (6.52 - 6.88 oz)

6. Set boot so that it does not swell and deform when its length is "L₁".

Length "L₁":

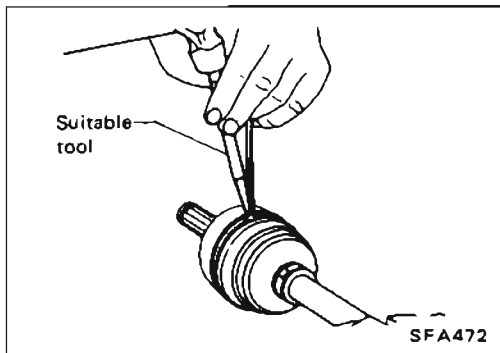
110.5 - 112.5 mm (4.35 - 4.43 in)

Make sure that boot is properly installed on the drive shaft groove.



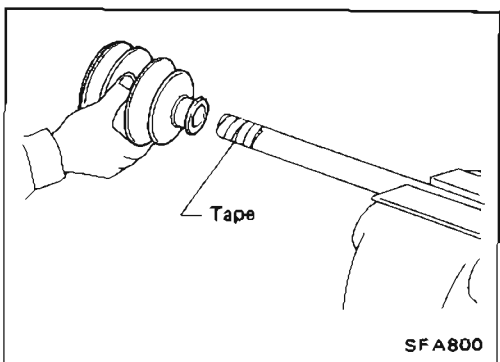
Assembly (Cont'd)

- Lock new larger boot band securely with a suitable tool, then lock new smaller boot band.

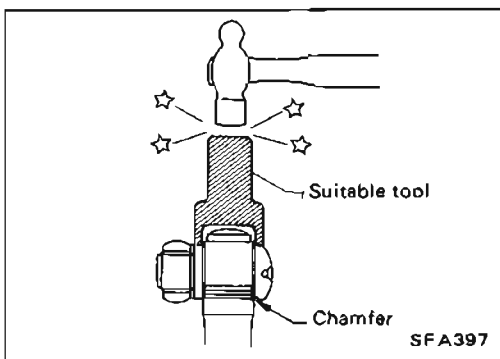


WHEEL SIDE

- Install new small boot band and boot on drive shaft. **Cover drive shaft serration with tape to prevent damage to boot during installation.**



- Install spider assembly securely, making sure marks are properly aligned.
 - Press-fit with spider assembly serration chamfer facing shaft.
- Install new snap ring.



- Pack drive shaft with specified amount of grease.

Specified amount of grease:

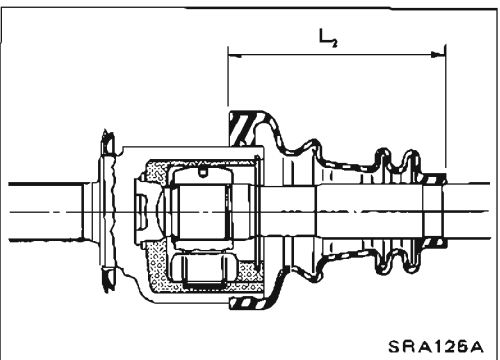
145 - 155 g (5.11 - 5.47 oz)

- Install slide joint housing, then install new snap ring "A".
- Set boot so that it does not swell and deform when its length is "L₂".

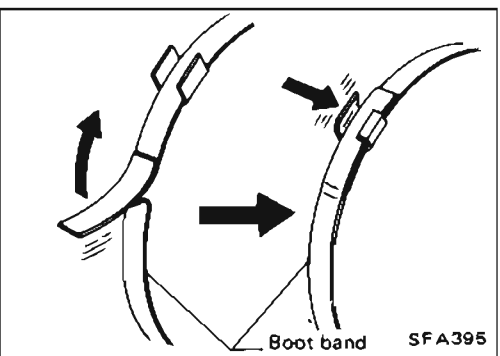
Length "L₂":

110.5 - 112.5 mm (4.35 - 4.43 in)

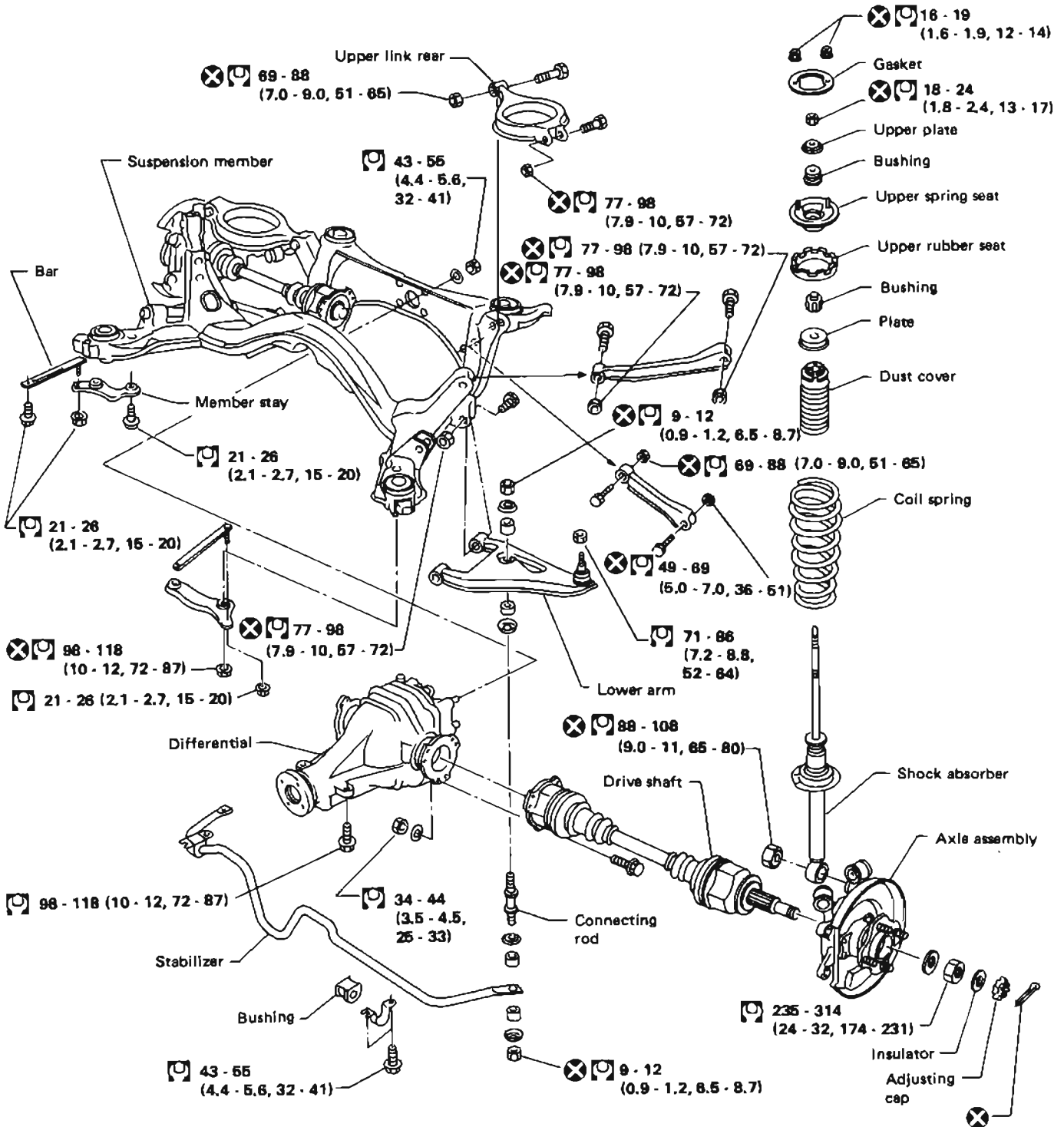
Make sure that boot is properly installed on the drive shaft groove.



- Lock new larger and smaller boot bands securely with a suitable tool.



REAR SUSPENSION



CAUTION:

Do not jack up at lower arm.

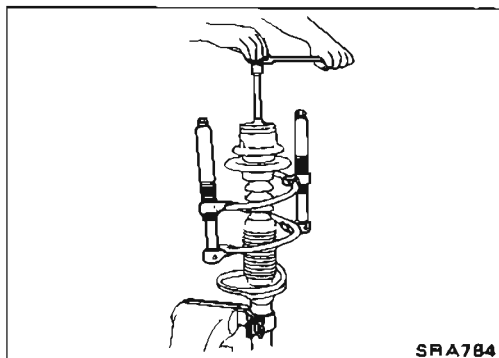
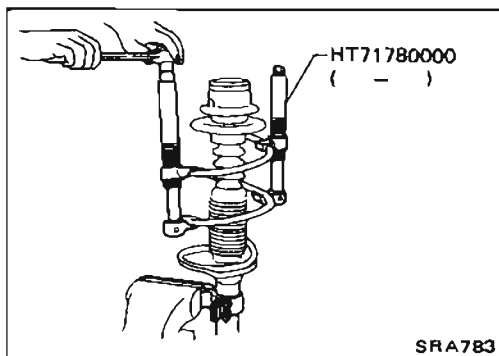
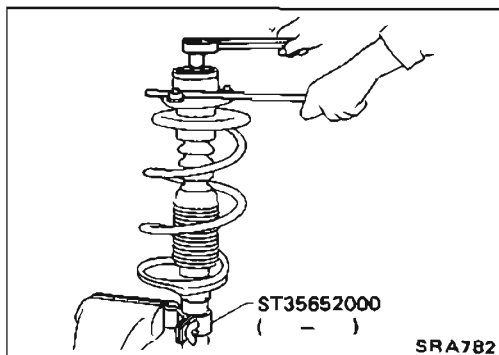
When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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

: N·m (kg·m, ft·lb)

Removal

- Remove shock absorber upper and lower fixing nuts.
- Do not remove piston rod lock nut on vehicle.



Disassembly

1. Set shock absorber on vise with attachment, then loosen piston rod lock nut.
 - Do not remove piston rod lock nut.
2. Compress spring with Tool so that the strut upper spring seat can be turned by hand.
3. Remove piston rod lock nut.

Inspection

SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portion.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

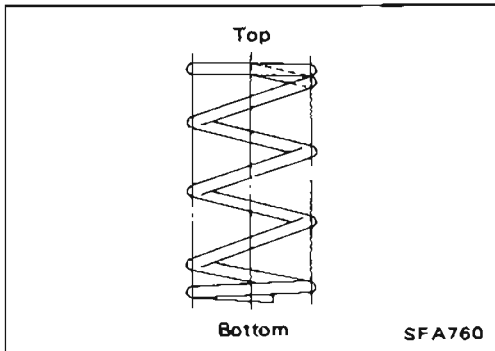
UPPER RUBBER SEAT AND BUSHING

- Check rubber parts for deterioration or cracks. Replace if necessary.

Inspection (Cont'd)

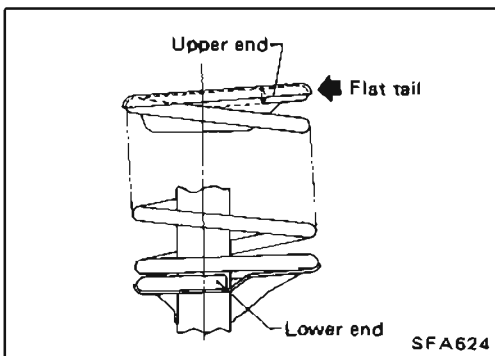
COIL SPRING

- Check for cracks, deformation or other damage. Replace if necessary.

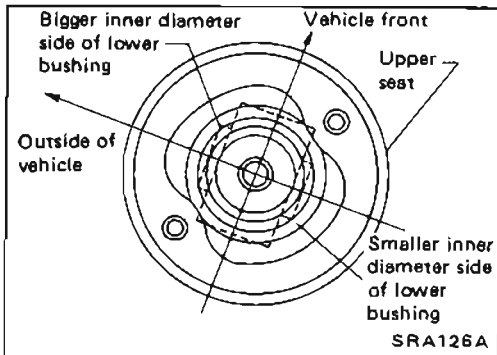


Assembly

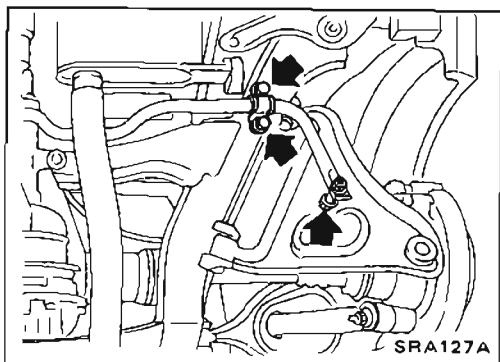
- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)



- When installing coil spring on strut, it must be positioned as shown in figure at left.



- When installing upper spring seat, make sure that it is positioned as shown.



Removal

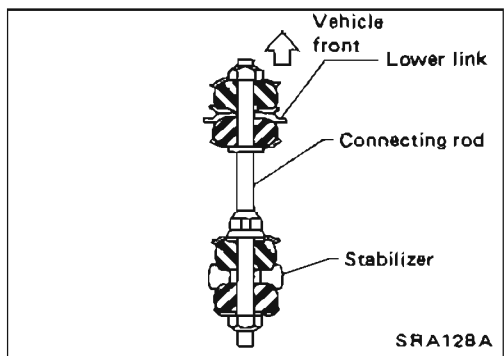
- Remove connecting rod and clamp.

Inspection

- Check stabilizer bar for deformation or cracks. Replace if necessary.
- Check rubber bushings for deterioration or cracks. Replace if necessary.

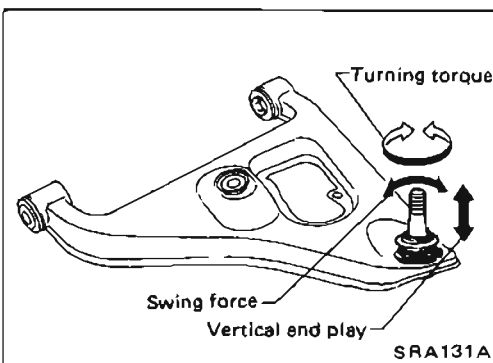
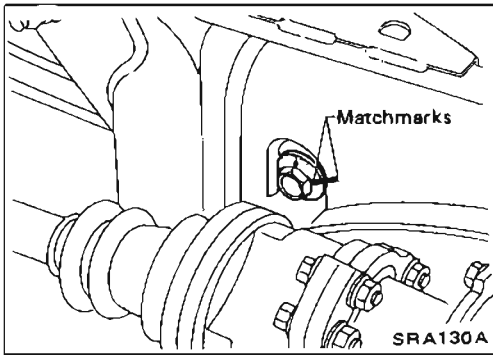
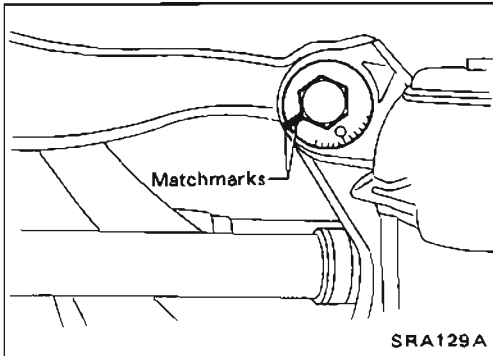
Installation

- When installing connecting rod, make sure direction is correct (as shown at left).



Removal and Installation

- Refer to "Removal and Installation" of REAR AXLE AND REAR SUSPENSION ASSEMBLY.



Before removing, put matchmarks on adjusting pin.

- When installing, final tightening must be carried out at curb weight with tires on ground.
- After installation, check wheel alignment. Refer to "Rear Wheel Alignment" of CHECK AND ADJUSTMENT — On vehicle.

Inspection

REAR SUSPENSION MEMBER

- Replace suspension member assembly if cracked or deformed or if any part (insulator, for example) is damaged.

UPPER AND LOWER LINKS

- Replace upper or lower link as required if cracked or deformed or if bushing is damaged.

SUSPENSION LOWER BALL JOINT

- Measure swing force, turning torque and vertical end play in axial direction. (Use same measurement procedures as that of FA section.)
- If ball stud is worn, play in axial direction is excessive, or joint is hard to swing, replace lower arm.

| | | |
|---------------------------|-------------------|---|
| Ball joint specifications | Swing force | 12.7 - 90.2 N (1.3 - 9.2 kg, 2.9 - 20.3 lb) |
| | Turning torque | 0.5 - 3.4 N·m (5 - 35 kg·cm, 4.3 - 30.4 in·lb) |
| | Vertical end play | 0 mm (0 in) |

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

General Specifications

COIL SPRING

| Item | Model | |
|--|-----------------------|-----------------------------------|
| | Except Sports package | Sports package |
| Wire diameter | mm (in) | 11.0 (0.433) / 11.3 (0.446) |
| Coil diameter | mm (in) | 90 - 100 (3.54 - 3.94) |
| Free length | mm (in) | 367.5 (14.47) / 355 (13.98) |
| Spring constant N/mm (kg/mm, lb/in) | | 19.6 (2.0, 112) / 21.6 (2.2, 123) |
| Identification color | | Pink x 2 / Light green x 2 |

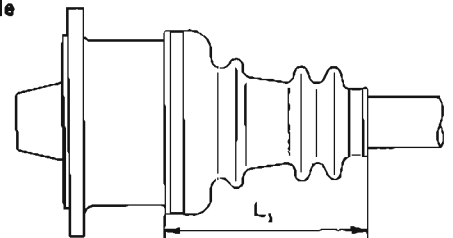
SHOCK ABSORBER

| Item | Model | |
|---|-----------------------|---|
| | Except Sports package | Sports package |
| Piston rod diameter | mm (in) | 12.5 (0.492) |
| Stroke | mm (in) | 155 (6.10) |
| Damping force [at 0.1 m (0.3 ft)/sec.] | N (kg, lb) | |
| Expansion | | 314 - 471 (32 - 48, 71 - 106) / 392 - 588 (40 - 60, 88 - 132) |
| Compression | | 157 - 236 (16 - 24, 35 - 53) / 196 - 294 (20 - 30, 44 - 66) |
| Damping force [at 0.3 m (1.0 ft)/sec.] | N (kg, lb) | |
| Expansion | | 647 - 902 (66 - 92, 146 - 203) |
| Compression | | 363 - 539 (37 - 55, 82 - 121) |

DRIVE SHAFT

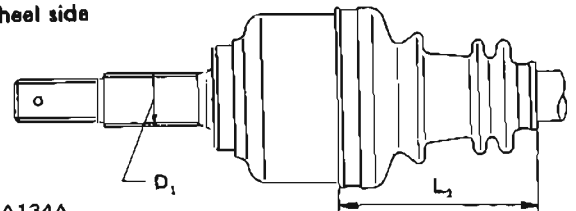
| | | |
|----------------------------|---------|-------------------------------------|
| Joint type | | TS82F |
| Final drive side | | |
| Wheel side | | TS82C |
| Diameter | mm (in) | |
| Wheel side D_1 | | 30 (1.18) |
| Grease name | | |
| Final drive side | | Nissan genuine grease or equivalent |
| Wheel side | | Nissan genuine grease or equivalent |
| Specified amount of grease | g (oz) | |
| Final drive side | | 185 - 195 (6.52 - 6.88) |
| Wheel side | | 145 - 165 (5.11 - 5.47) |
| Boot length | mm (in) | |
| Final drive side (L_1) | | 110.5 - 112.5 (4.35 - 4.43) |
| Wheel side (L_2) | | |

Final drive side



SRA133A

Wheel side



SRA134A

REAR STABILIZER BAR

| Item | Model | |
|----------------------|-----------------------|--------------------------|
| | Except Sports package | Sports package |
| Stabilizer diameter | mm (in) | 15 (0.59) / 17 (0.67) |
| Identification color | | Light green / Light blue |

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

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

| | | |
|---------|----------------|---------------------------|
| Camber | degree | -1°36' to -0°36' |
| Toe-out | mm (in) | 0.5 - 4.5 (0.020 - 0.177) |
| | (Total) degree | 1.5' - 12.5' |

* Tankful of fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, mats in designated position.

WHEEL BEARING

| | | |
|---|-------------------|--------------------------------|
| Wheel bearing axial end play | mm (in) | 0.05 (0.0020) or less |
| Wheel bearing lock nut Tightening torque | N·m (kg·m, ft·lb) | 235 - 314 (24 - 32, 174 - 231) |

WHEEL RUNOUT (Radial and lateral)

| Wheel type | | Radial runout | Lateral runout |
|----------------|---------|---------------------|---------------------|
| Aluminum wheel | mm (in) | 0.3 (0.012) or less | |
| Steel wheel | mm (in) | 0.5 (0.020) or less | 0.8 (0.031) or less |

LOWER BALL JOINT

| | | |
|---|--------------------|--|
| Swing force (Measuring point: cotter pin hole of ball stud) | N (kg, lb) | 12.7 - 90.2 (1.3 - 9.2, 2.9 - 20.3) |
| Turning torque | N·m (kg·cm, in·lb) | 0.5 - 3.4 (6 - 36, 4.3 - 30.4) |
| Vertical end play | mm (in) | 0 (0) |

BRAKE SYSTEM

SECTION **BR**

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| | |
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| BRAKE HYDRAULIC LINE | BR- 4 |
| BRAKE PEDAL AND BRACKET | BR- 6 |
| BRAKE BOOSTER | BR- 8 |
| VACUUM PIPING | BR-10 |
| MASTER CYLINDER | BR-12 |
| FRONT DISC BRAKE (CL22VB, CL25VA) — Caliper | BR-13 |
| FRONT DISC BRAKE (CL22VB, CL25VA) — Rotor | BR-17 |
| REAR DISC BRAKE (CL9H) — Caliper | BR-18 |
| REAR DISC BRAKE (CL9H) — Rotor | BR-22 |
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| ANTI-LOCK BRAKING SYSTEM | BR-25 |
| TROUBLE DIAGNOSES | BR-29 |
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PRECAUTIONS AND PREPARATION

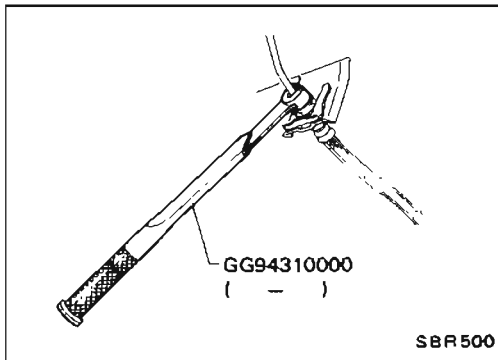
Precautions

- 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 hydraulic system.

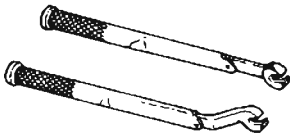
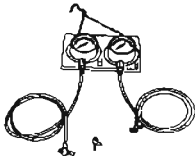
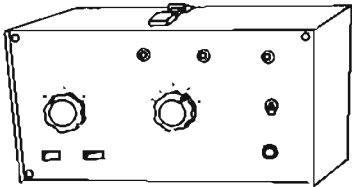
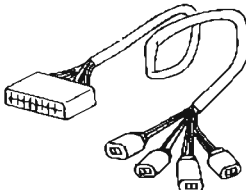
- Use Tool when removing and installing brake tube.

WARNING:

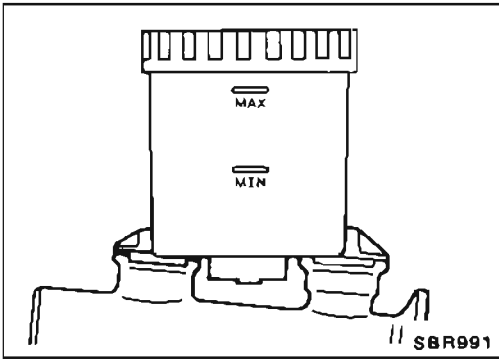
- Clean brake pads and shoes with a waste cloth, then collect dust with a dust collector.



Preparation SPECIAL SERVICE TOOL

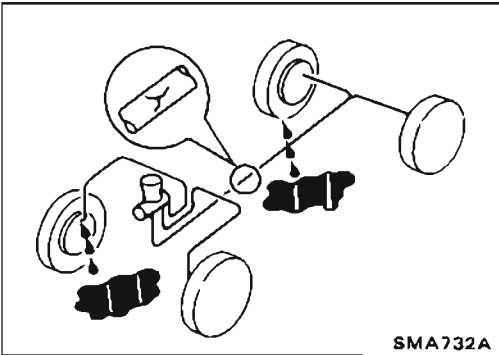
| Tool number (Kent-Moore No.) Tool name | Description |
|---|---|
| GG94310000 (-) Flare nut torque wrench |  <p>Removing and installing each brake piping</p> |
| KV991V0010 (-) Brake fluid pressure gauge |  <p>Measuring brake fluid pressure</p> |
| KV999P1000 (-) A.B.S. checker |  <p>Checking brake fluid pressure of A.B.S. actuator</p> |
| KV999P1010 (-) A.B.S. checker adapter harness |  <p>Checking brake fluid pressure of A.B.S. actuator</p> |

CHECK AND ADJUSTMENT



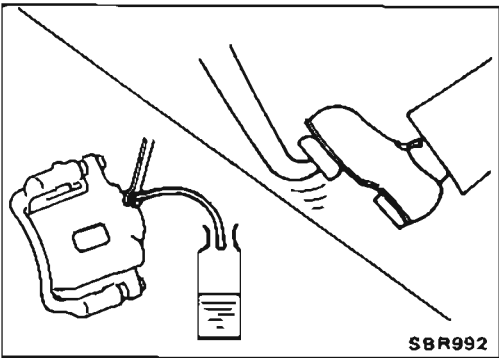
Checking Brake Fluid Level

- 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

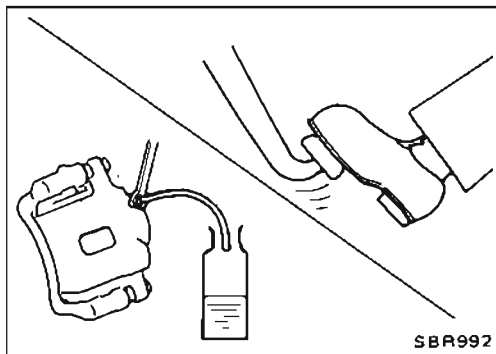
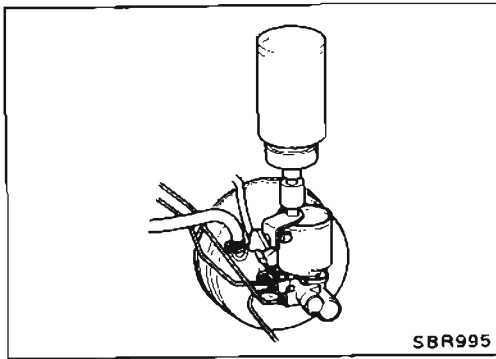
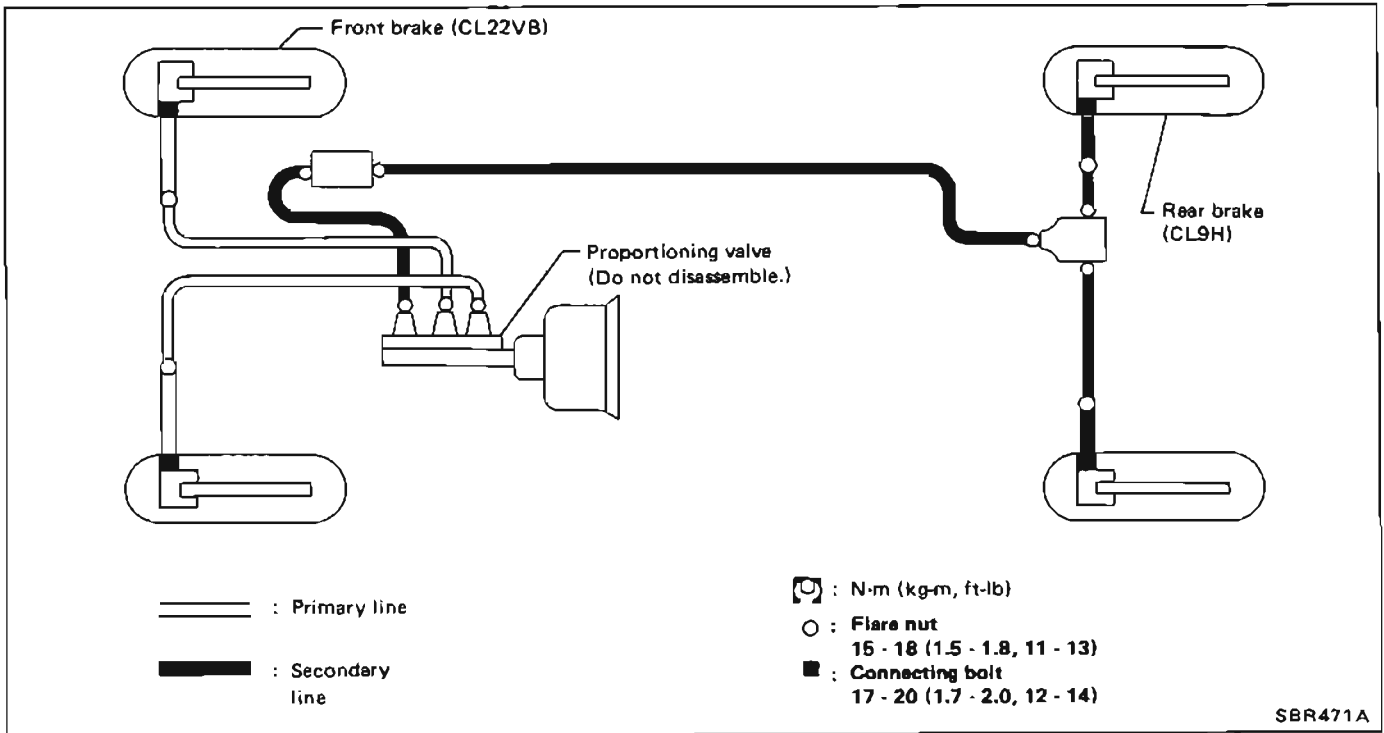
- Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts. If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Check for oil leakage by fully depressing brake pedal.



Changing Brake Fluid

1. Drain brake fluid in each air bleeder valve.
 2. Refill until new brake fluid comes out of each air bleeder valve.
Use same procedure as in bleeding hydraulic system to refill brake fluid.
Refer to Bleeding Procedure.
- **Refill with recommended brake fluid "DOT 3".**
 - **Never reuse drained brake fluid.**
 - **Be careful not to splash brake fluid on painted areas.**

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 procedure.

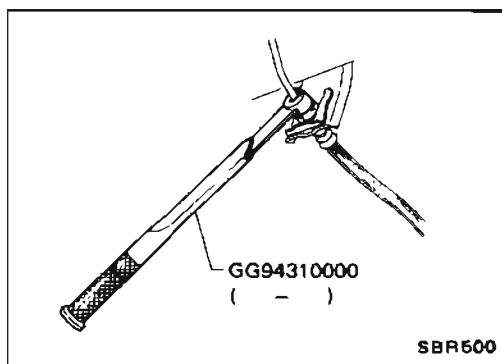
Without Anti-lock Braking System:

- Left rear caliper
- ↓
- Right rear caliper
- ↓
- Left front caliper
- ↓
- Right front caliper

With Anti-lock Braking System:

- Left rear caliper
- ↓
- Right rear caliper
- ↓
- Left front caliper
- ↓
- Right front caliper
- ↓
- Front side air bleeder on A.B.S. actuator
- ↓
- Rear side air bleeder on A.B.S. actuator

BRAKE HYDRAULIC LINE



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.

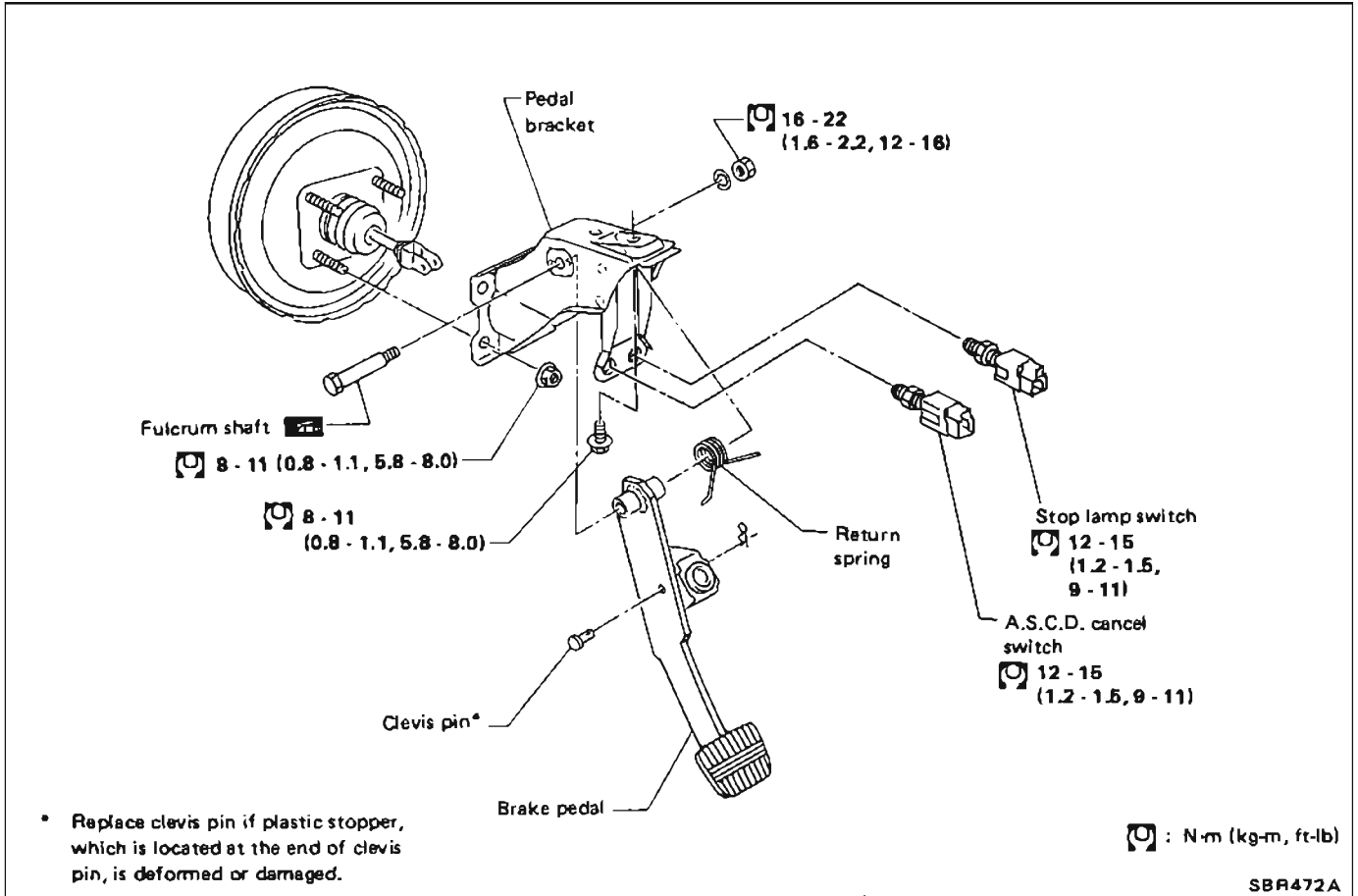
Inspection

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

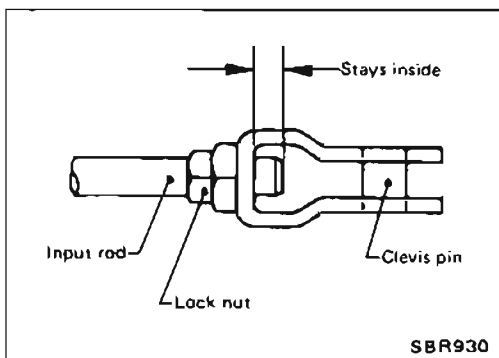
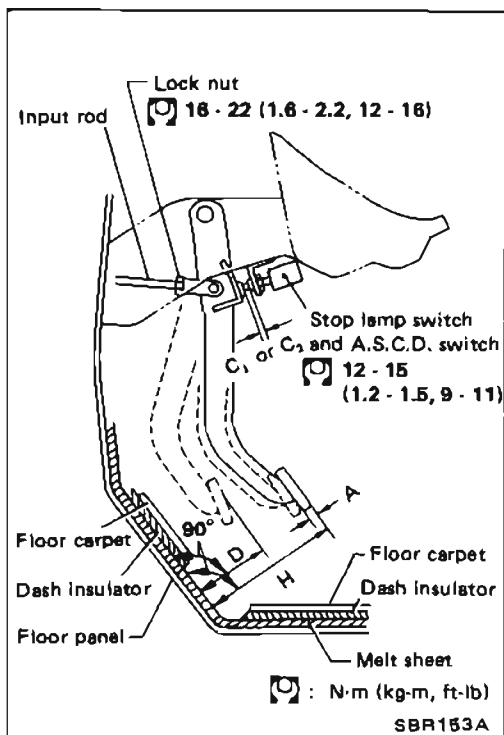


Inspection

Check brake pedal for following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion

BRAKE PEDAL AND BRACKET



Adjustment

Check brake pedal free height from dash reinforcement panel. Adjust if necessary.

- H: Free height
Refer to S.D.S.
- D: Depressed height
Refer to S.D.S.
Under force of 490 N (50 kg, 110 lb)
with engine running
- C₁: Clearance between pedal stopper and threaded end of stop lamp switch
0.3 - 1.0 mm (0.012 - 0.039 in)
- C₂: Clearance between pedal stopper and threaded end of A.S.C.D. switch
0.3 - 1.0 mm (0.012 - 0.039 in)
- A: Pedal free play
1 - 3 mm (0.04 - 0.12 in)

1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

Make sure that tip of input rod stays inside.

2. Adjust clearance "C₁" and "C₂" with stop lamp switch and A.S.C.D. switch respectively. Then tighten lock nuts.

3. Check pedal free play.

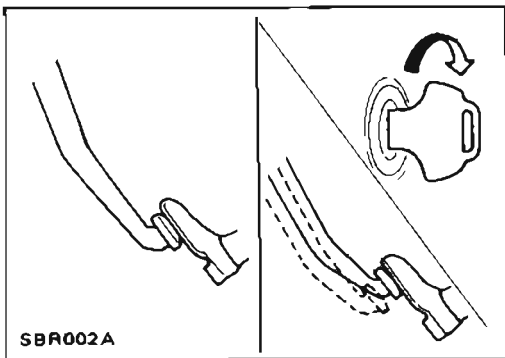
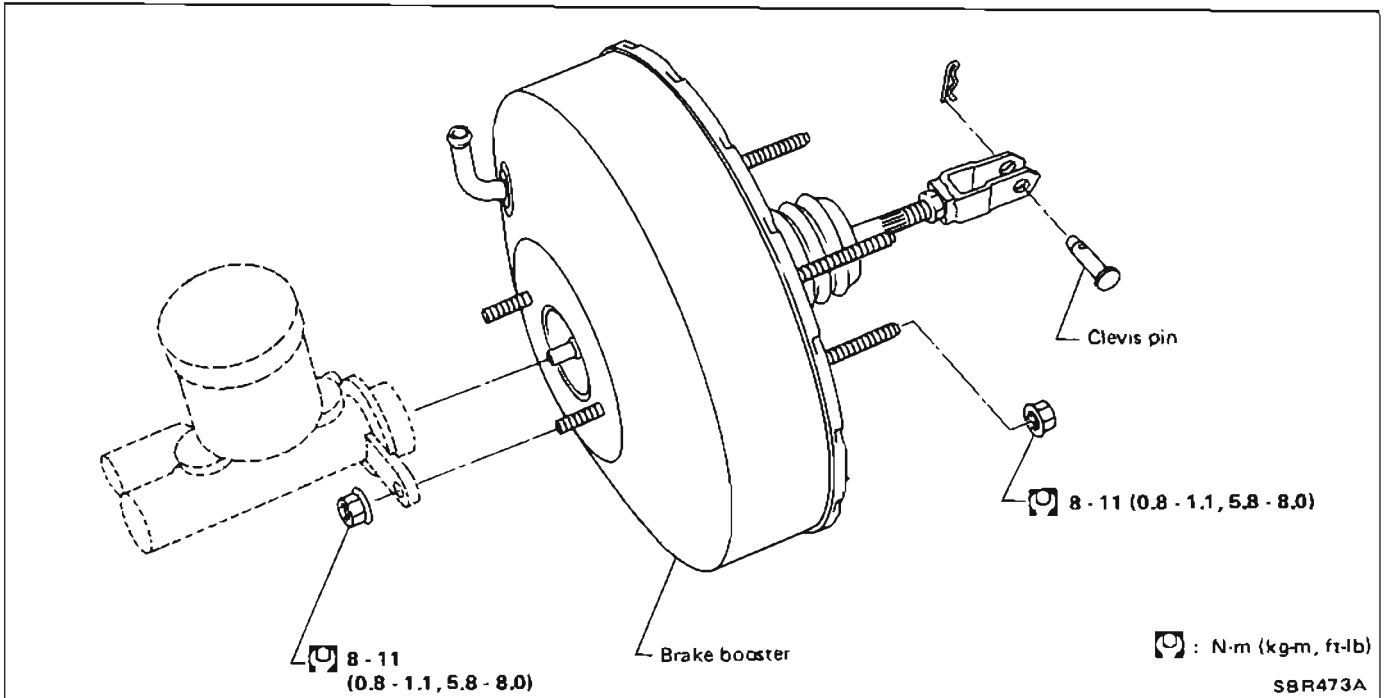
Make sure that stop lamp is off when pedal is released.

4. Check brake pedal's depressed height while engine is running.

If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.

BRAKE BOOSTER

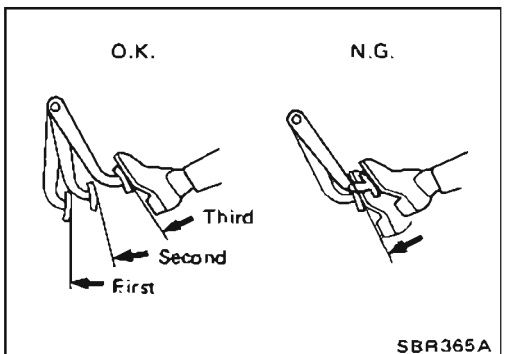
Removal and Installation



Inspection

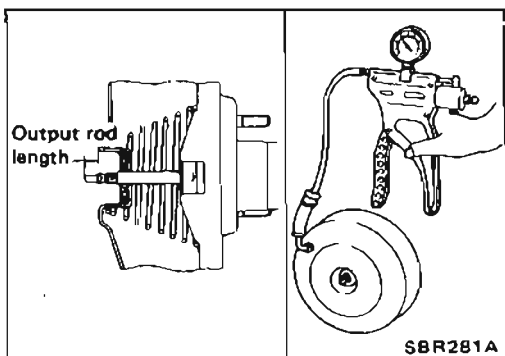
OPERATING CHECK

- 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 kPa (-500 mmHg, -19.69 inHg) using a handy vacuum pump.
2. Check output rod length.

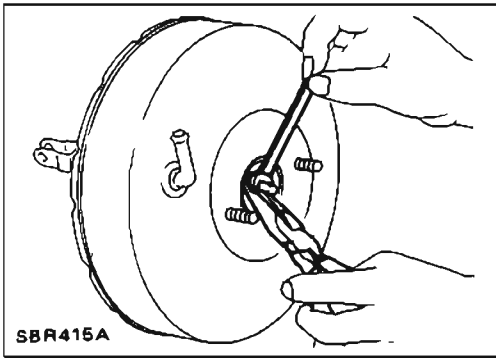
Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)

BRAKE BOOSTER

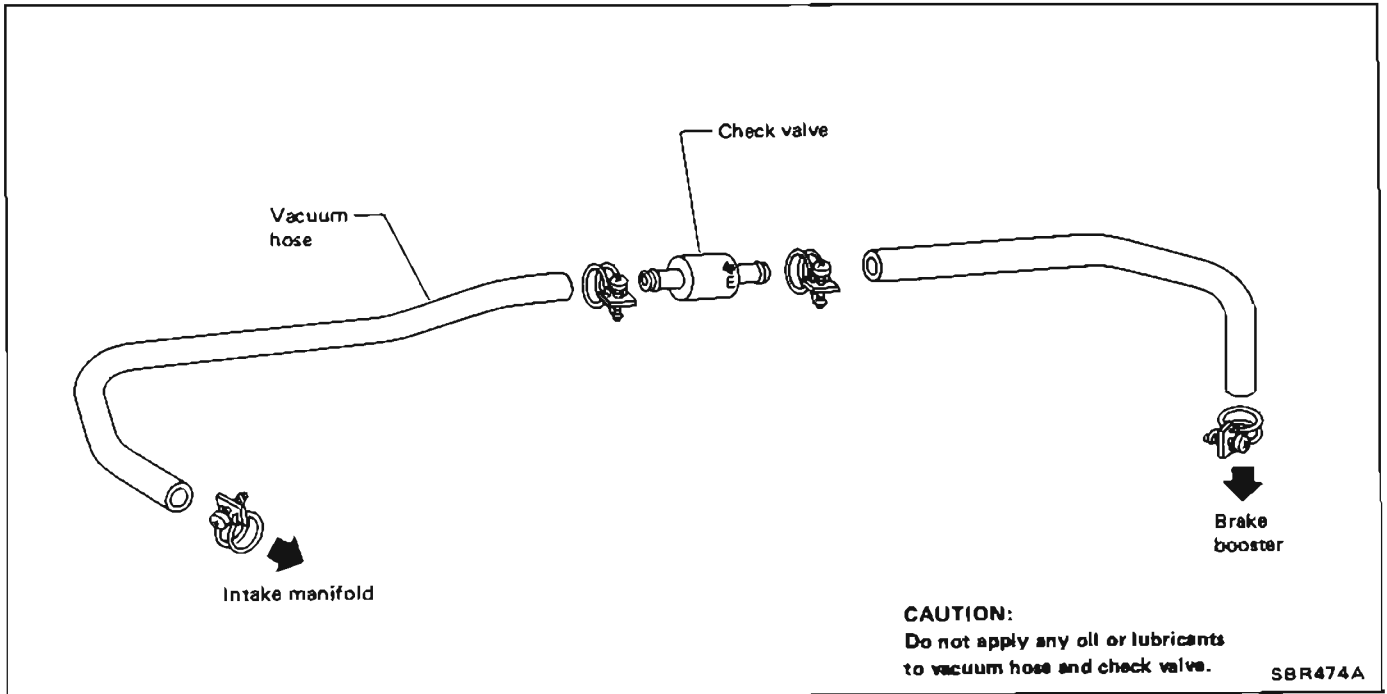
Inspection (Cont'd)

3. Adjust rod length if necessary.
4. If rod length is without specification, replace brake booster.

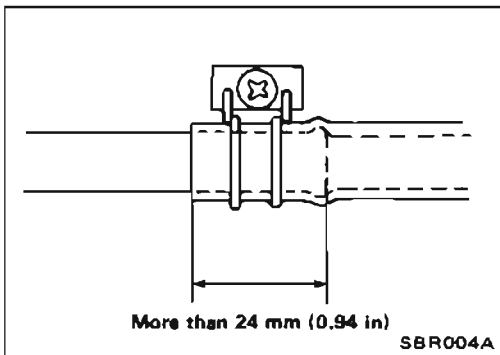


VACUUM PIPING

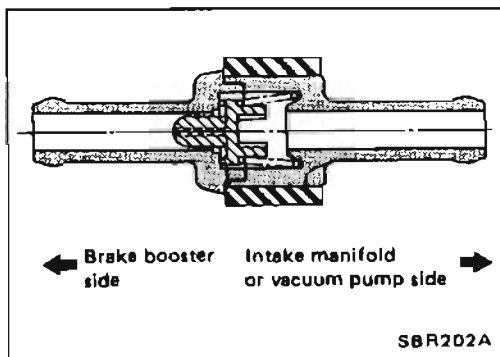
Removal and Installation



- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).



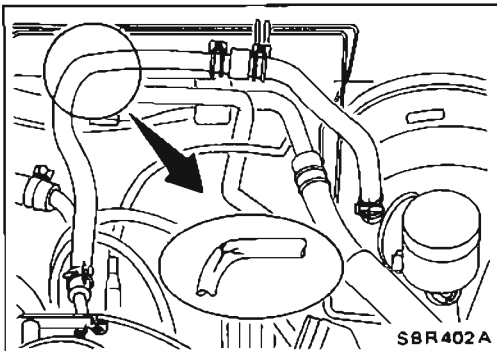
- Install check valve, paying attention to its direction.



Inspection

HOSES AND CONNECTORS

- Check vacuum lines, connections and check valve for airtightness, improper attachment chafing and deterioration.

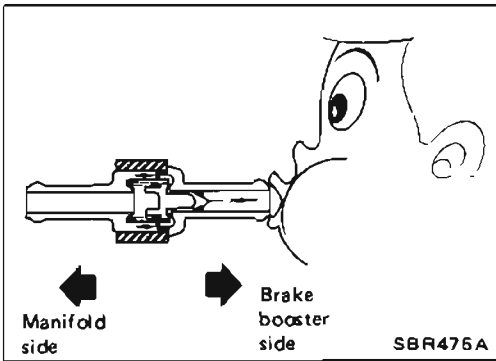


VACUUM PIPING

Inspection (Cont'd)

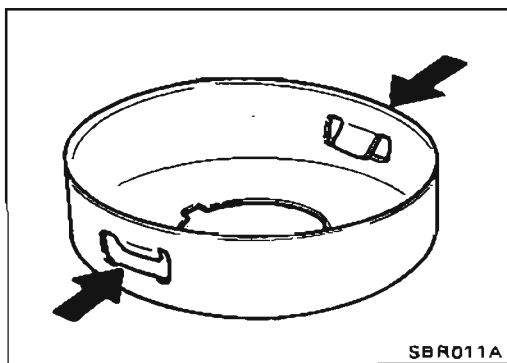
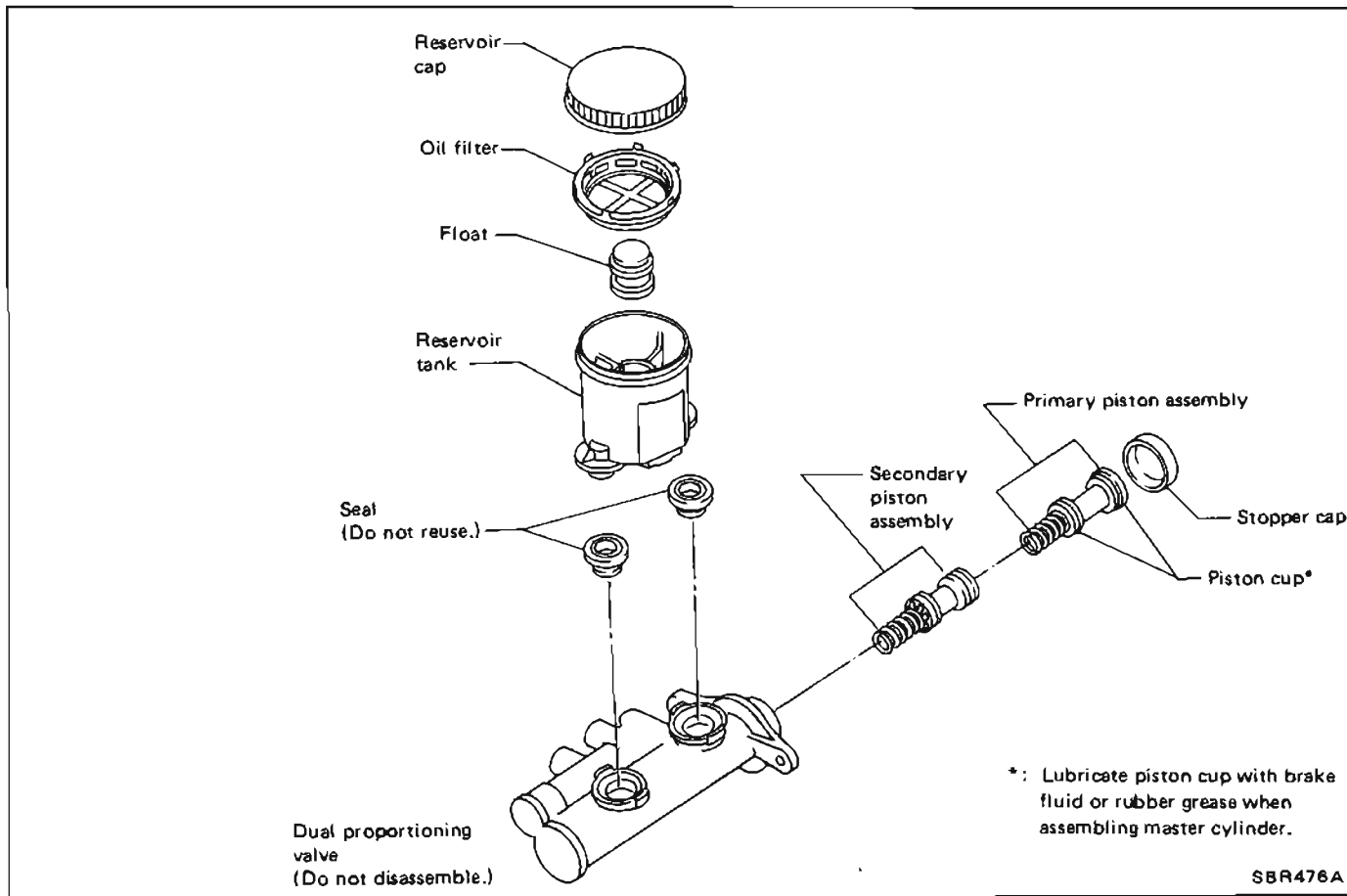
CHECK VALVE

- When pressure is applied to brake booster side of check valve and valve does not open, replace check valve with a new one.

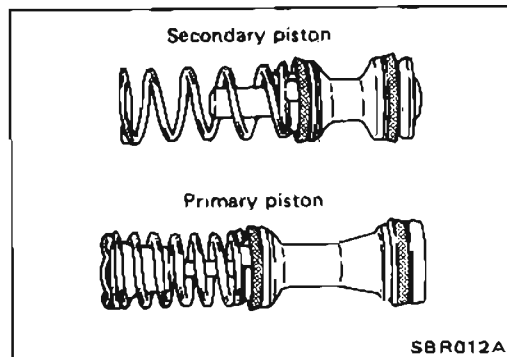


MASTER CYLINDER

Removal and Installation



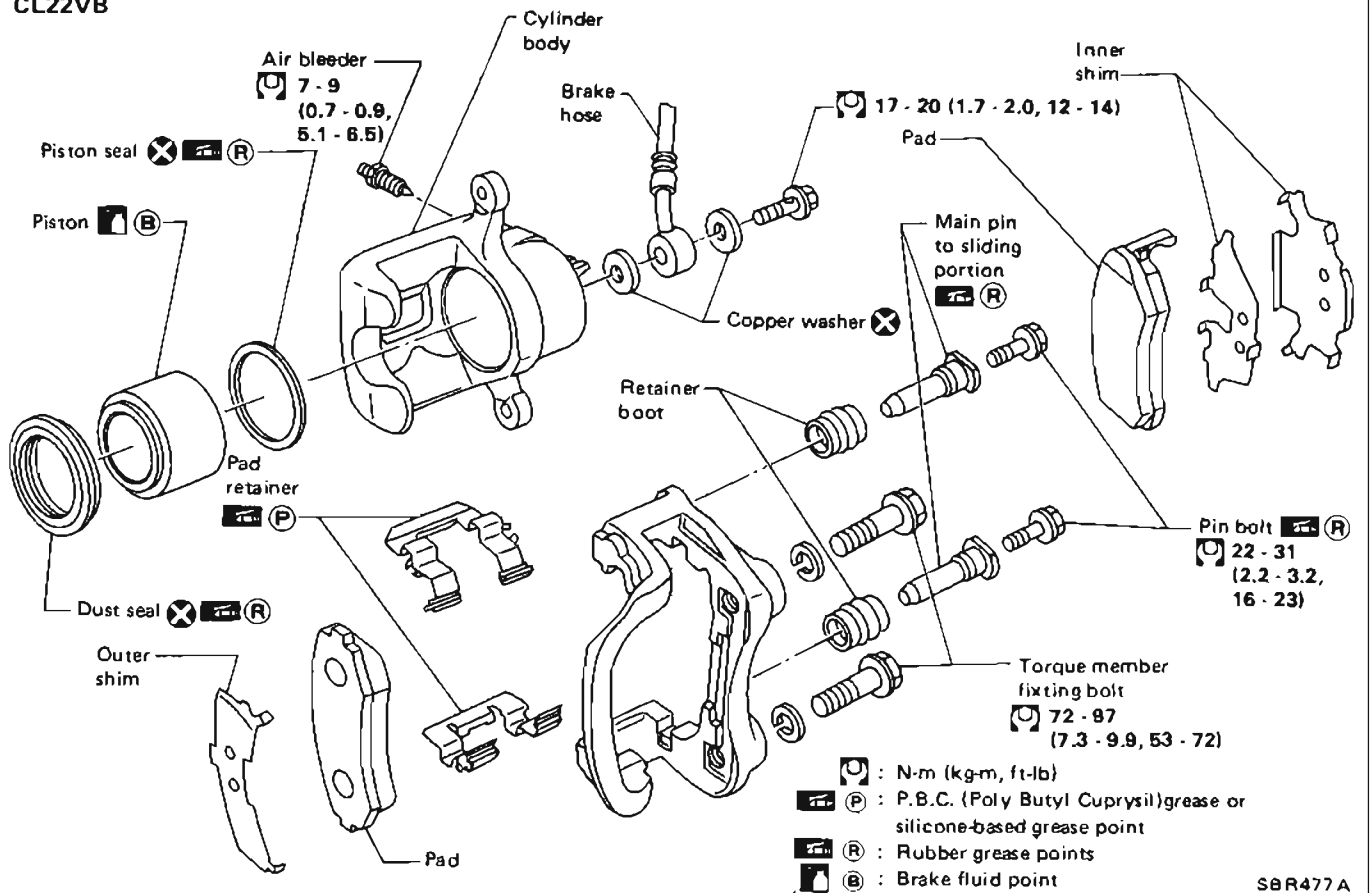
- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.



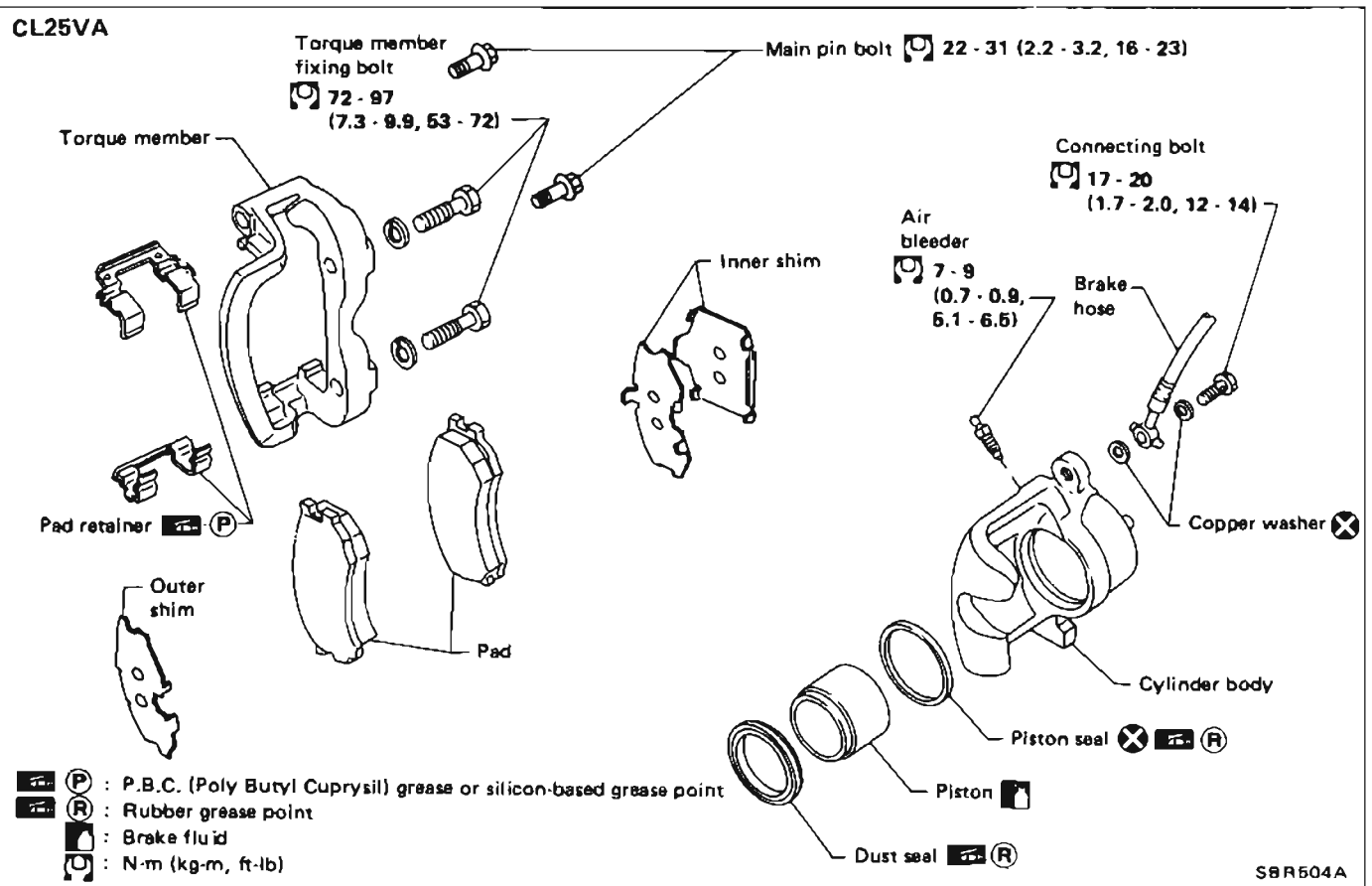
- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.

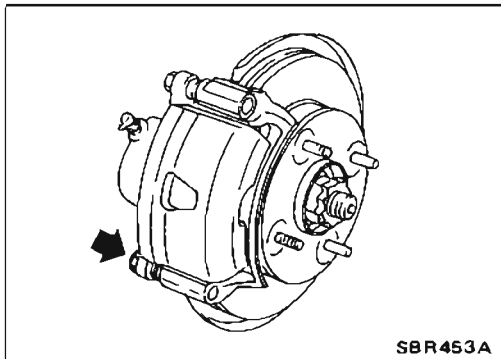
FRONT DISC BRAKE (CL22VB, CL25VA) — Caliper

CL22VB



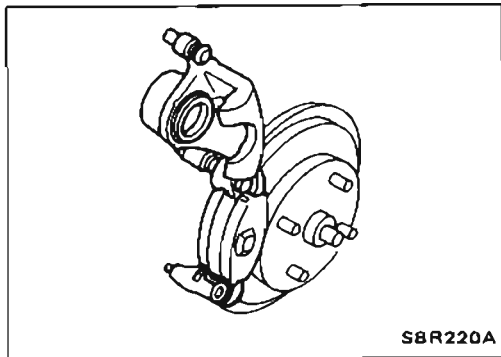
CL25VA





Pad Replacement

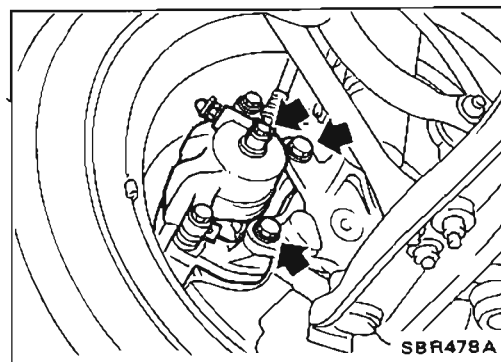
1. Remove pin bolt.



2. Swing cylinder body upward. Then remove pad retainer, and inner and outer shims.

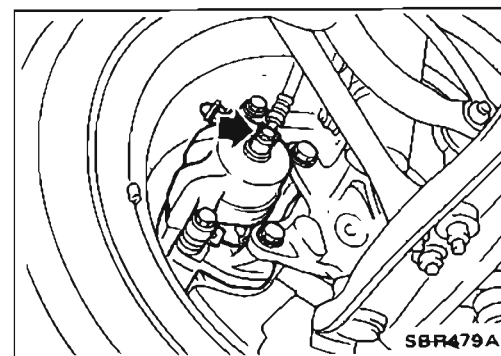
CAUTION:

- 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.

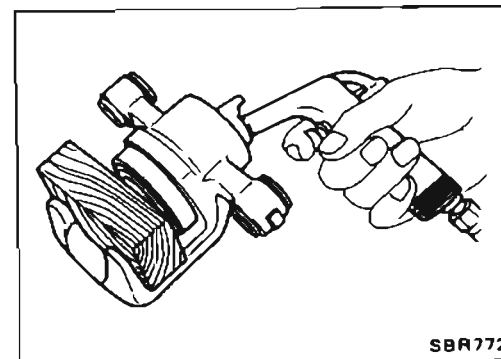


Removal and Installation

- Remove torque member fixing bolts and union bolt.



- Install brake hose to caliper at protrusions securely.



Disassembly

Push out piston with dust seal using compressed air.

Inspection

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

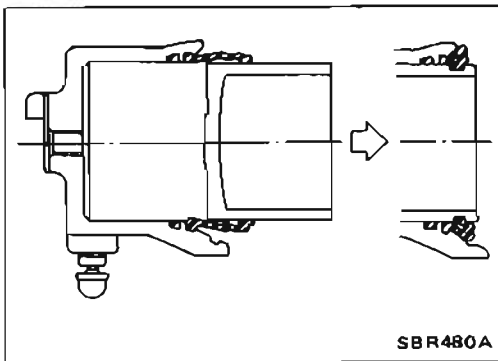
Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

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

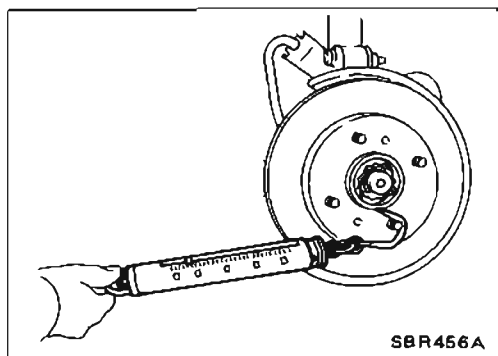
Check for wear, cracks or other damage. Replace if any condition exists.



SBR480A

Assembly

- Place piston boot over rear of piston. Fit piston boot's lip properly in corresponding groove on cylinder body.
- Insert piston into cylinder body and fit boot's lip properly in corresponding groove on piston.

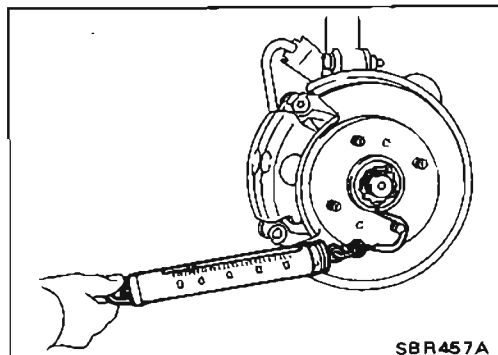


SBR456A

Inspection (On-vehicle)

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).



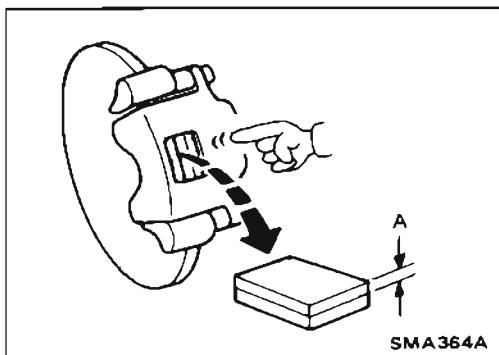
SBR457A

4. Install caliper with pads to 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 ($F_2 - F_1$):

59.8 N (6.1 kg, 13.5 lb)

If it is not within specification, check main pins and retainer boots in caliper.



DISC PAD

Check disc pad for wear or damage.

Pad standard thickness (A):

10.0 mm (0.394 in)

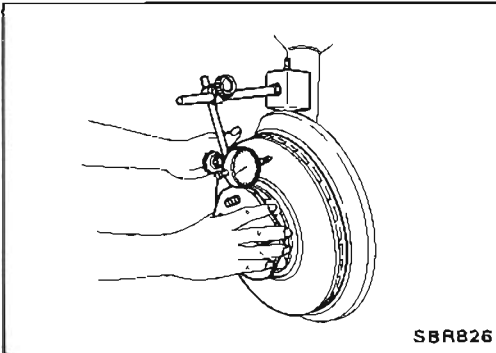
Pad wear limit (A):

2.0 mm (0.079 in)

Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.



RUNOUT

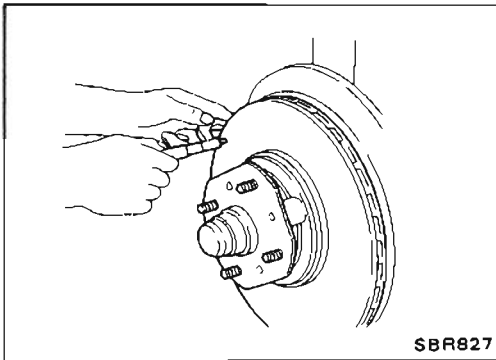
Adjust wheel bearing preload. Check runout using a dial indicator.

Rotor repair limit:

Maximum runout

(Total indicator reading at center of rotor pad contact surface)

0.07 mm (0.0028 in)



THICKNESS

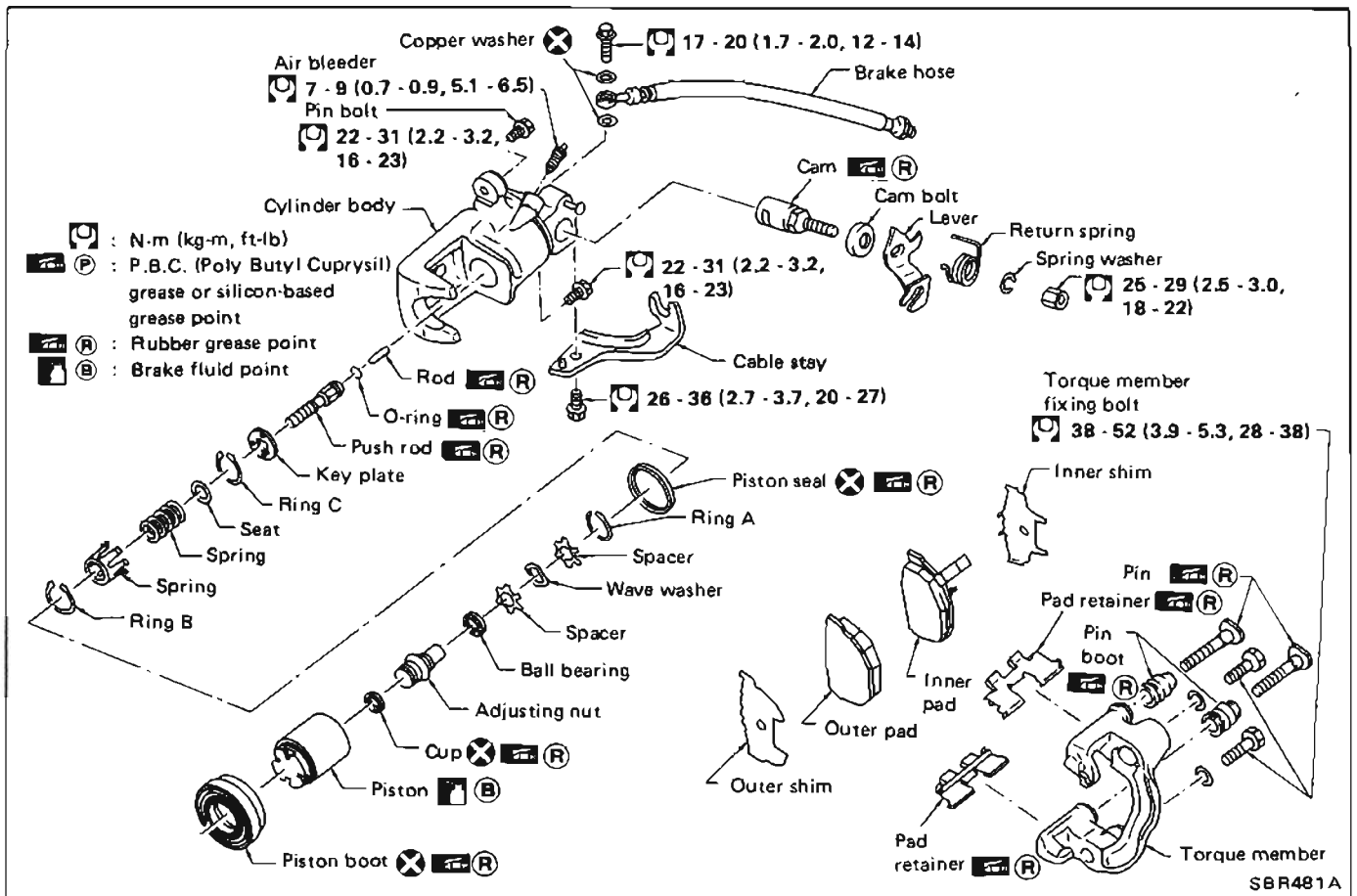
Standard thickness:

20.0 mm (0.787 in)

Minimum thickness:

18.0 mm (0.709 in)

REAR DISC BRAKE (CL9H) — Caliper



SBR481A

Pad Replacement

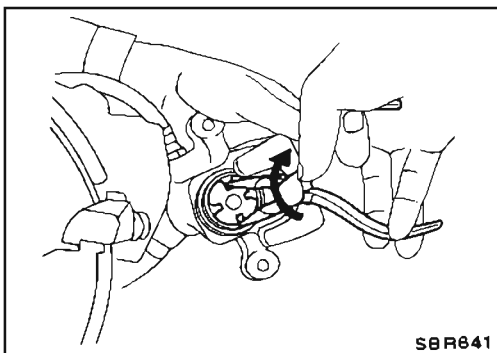
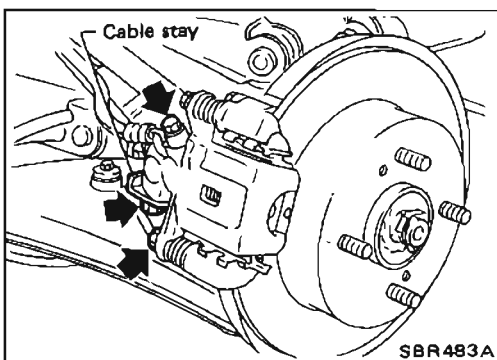
CAUTION:

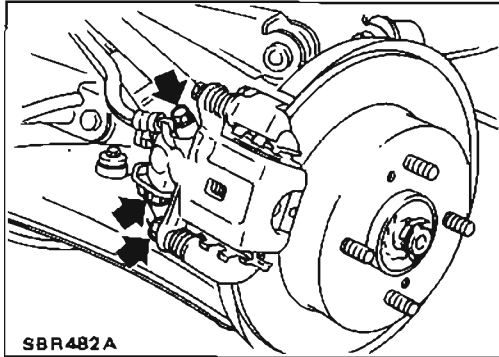
When cylinder body is swung up, do not depress brake pedal because piston will pop out.

- Remove parking cable stay fixing bolt, pin bolts and lock spring. Then remove pad retainers, pads and shims.

- When installing pads, retract piston into cylinder body by turning it clockwise.

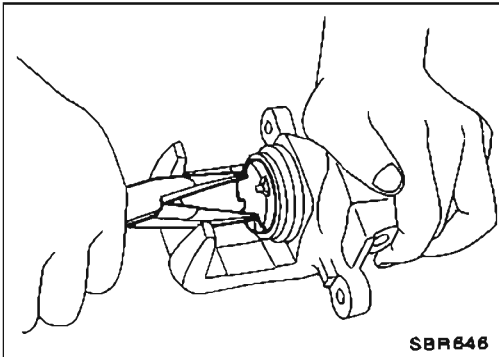
Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.





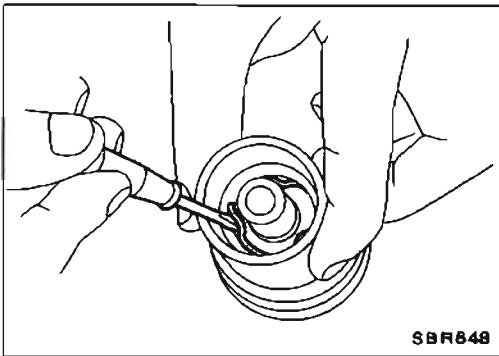
Removal and Installation

Disconnect parking brake cable and brake hose, then remove caliper assembly.

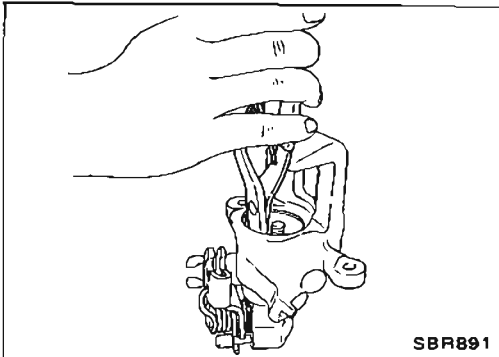


Disassembly

1. Remove piston by turning it counterclockwise with suitable longnose pliers.

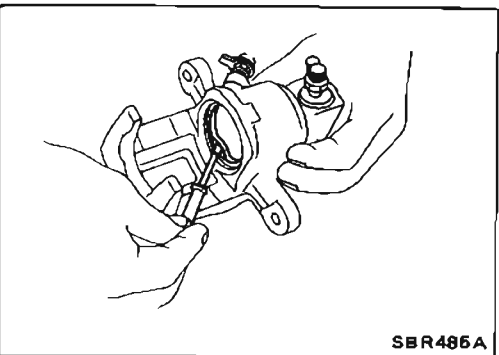


2. Pry off ring A from piston with suitable pliers and remove adjusting nut.



3. Disassemble cylinder body.

- Pry off rings B and C with pliers, then remove spring cover, spring and seat.

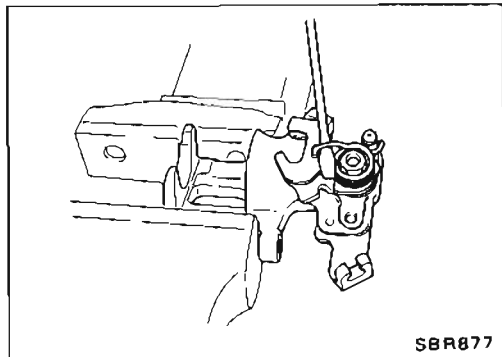


- Remove piston seal.

Be careful not to damage cylinder body.

Disassembly (Cont'd)

4. Remove return spring and lever.



Inspection

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear or other damage.
- Minor damage from rust of foreign materials may be eliminated by polishing surface with a fine emery paper. Replace if necessary.

CAUTION:

Use brake fluid to clean.

TORQUE MEMBER

Check for wear, cracks or other damage. Replace if necessary.

PISTON

Check piston for score, rust, wear or other damage. Replace if necessary.

CAUTION:

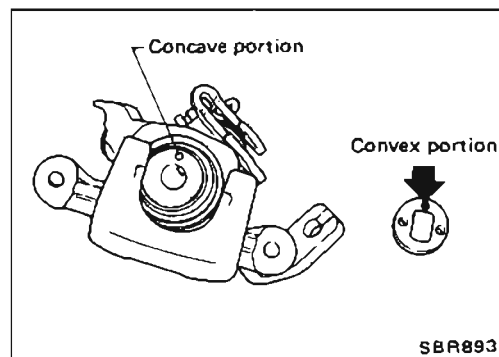
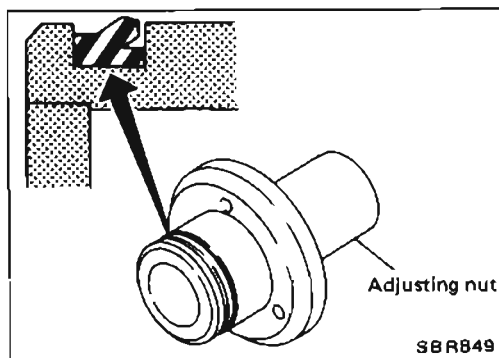
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

PIN AND PIN BOOT

Check for wear, cracks or other damage. Replace if necessary.

Assembly

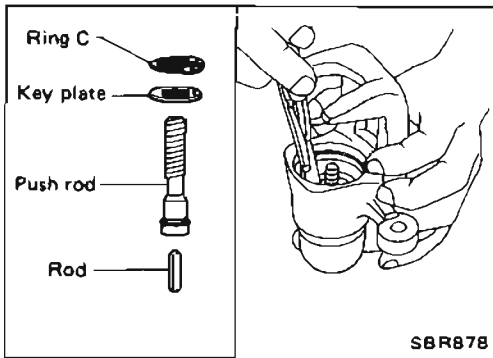
- Install cup securely in the specified direction.



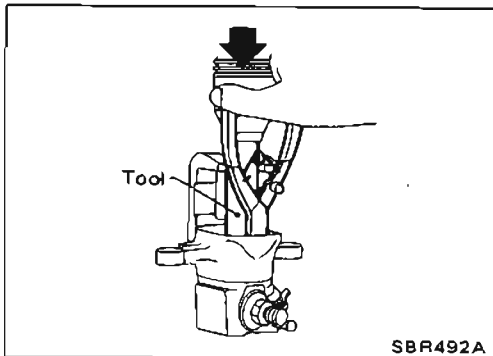
- Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.

REAR DISC BRAKE (CL9H) — Caliper

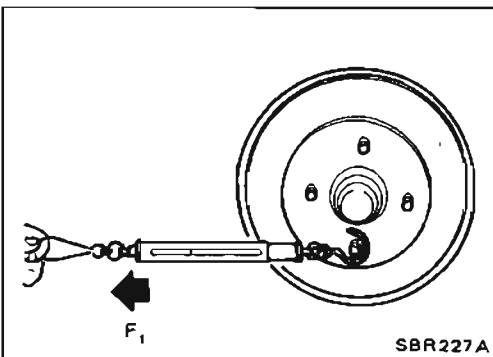
Assembly (Cont'd)



- Install ring C with suitable tool.



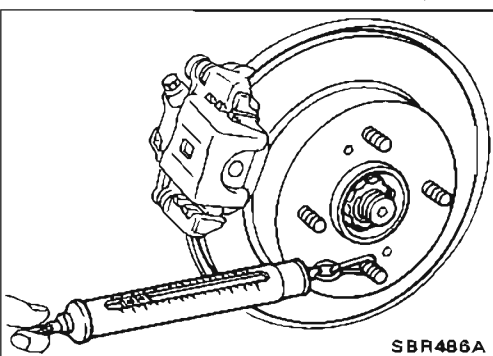
- Install seat, spring, spring cover and ring B with suitable press and drift.



Inspection (On-vehicle)

INSPECTION OF BRAKE DRAG FORCE

1. Swing cylinder body upward.
2. Make sure that wheel bearing is adjusted properly. Refer to section RA.
3. Measure rotating force (F_1).

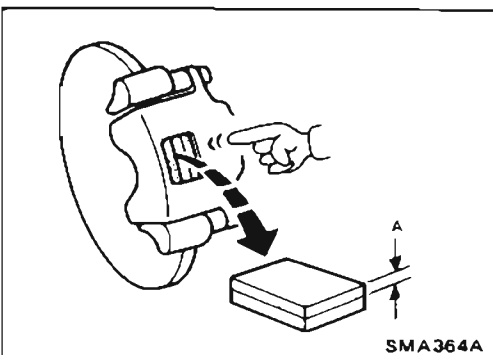


4. Install caliper with pads to original position.
5. Depress brake pedal for 5 seconds.
6. Release brake pedal, rotate disc rotor 10 revolutions.
7. Measure rotating force (F_2).
8. Calculate brake drag force by subtracting F_1 from F_2 .

Maximum brake drag force ($F_2 - F_1$):

86.3 N (8.8 kg, 19.4 lb)

If it is not within specification, check pins and pin boots in caliper.



DISC PAD

Check disc pad for wear or damage.

Standard thickness (A):

9.5 mm (0.374 in)

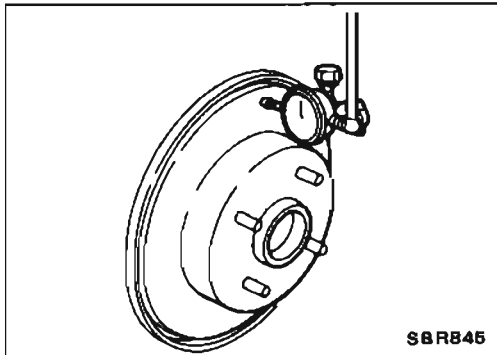
Pad wear limit (A):

2.0 mm (0.079 in)

Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.



RUNOUT

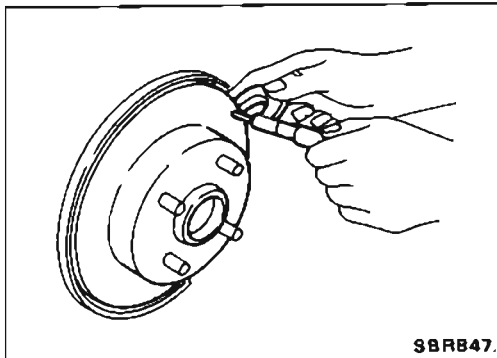
- Check runout using a dial indicator.
- Make sure that axial end play is within the specifications before measuring. Refer to section RA.

Rotor repair limit:

Maximum runout

(Total indicator reading at center of rotor pad contact surface)

0.07 mm (0.0028 in)



THICKNESS

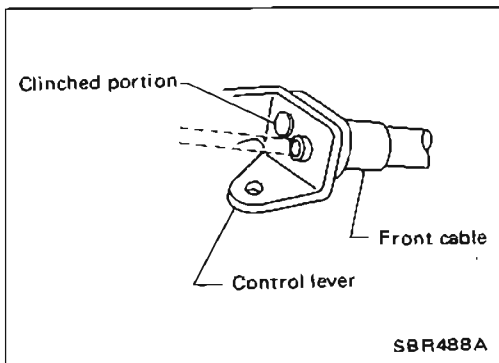
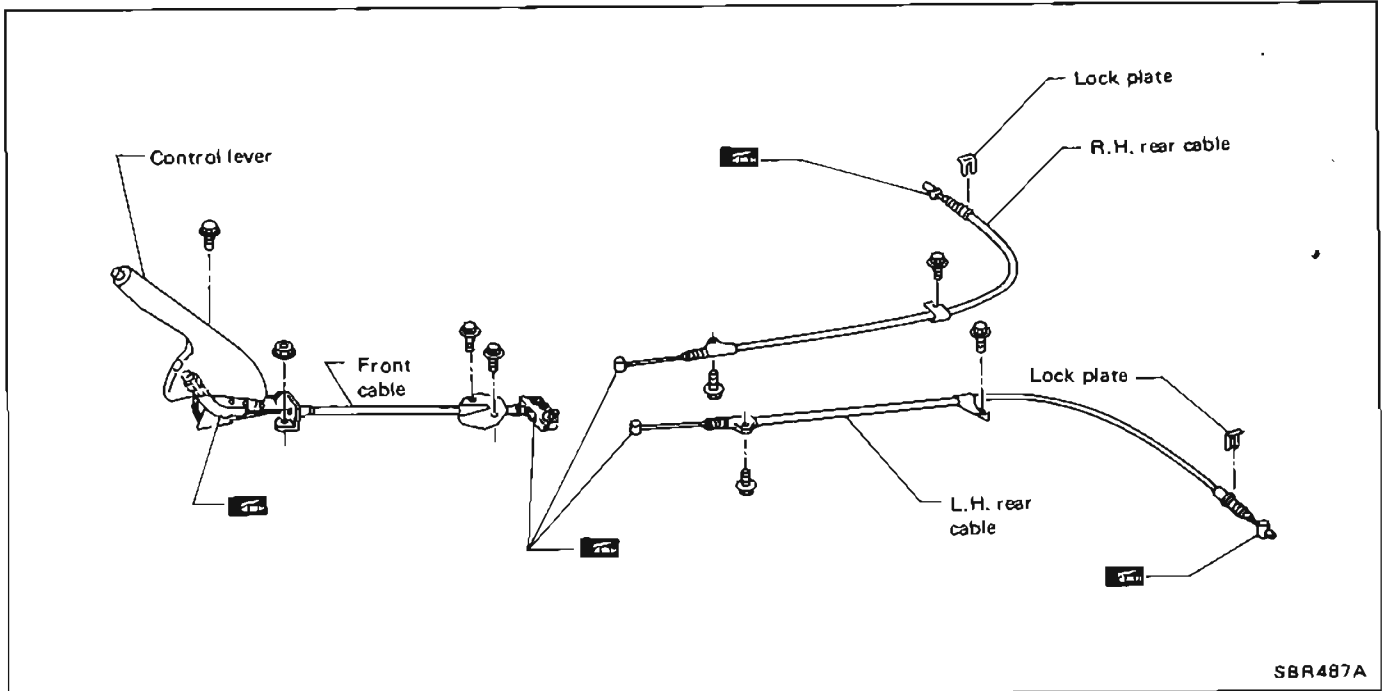
Rotor repair limit:

Minimum thickness

8.0 mm (0.315 in)

PARKING BRAKE CONTROL

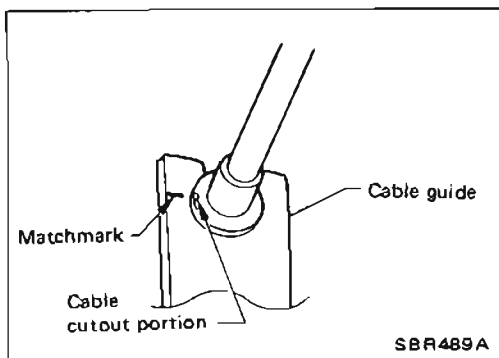
Removal and Installation



REMOVAL

- Before removing parking brake control, remove console box.
- Loosen cable using control lever adjuster, and separate front and rear cables.
- Break clinched portion of control lever using a hammer and chisel as shown in figure at left, and replace cables with new parts.

Apply multi-purpose grease to areas between control lever drum and cables.



INSTALLATION

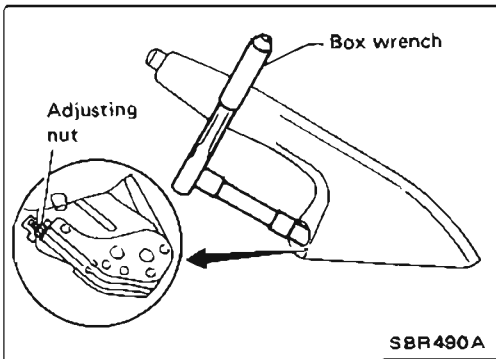
Be careful not to damage boot and inner cable.

- When installing parking brake cable at rear caliper, make sure to align matchmark on parking cable stay and cable.

Inspection

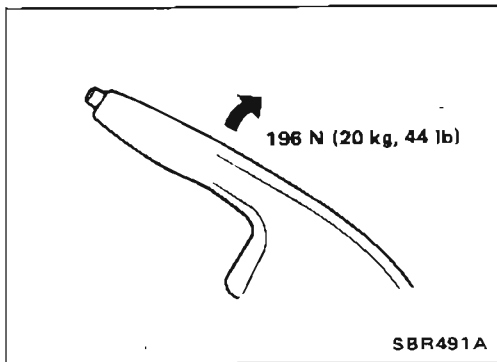
1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables, lamp and switch. Replace if necessary.
3. Check parts at each connecting portion for deformation or damage. If found, replace.

PARKING BRAKE CONTROL



Adjustment

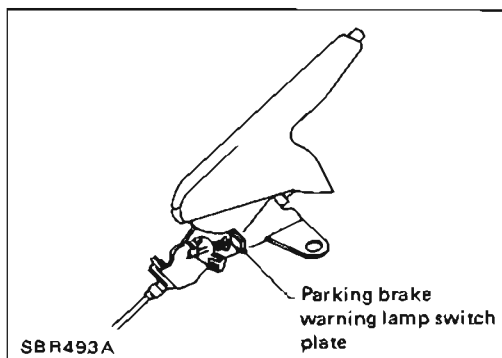
1. Ensure that parking brake releases when control lever is pulled down completely. If control lever does not release parking brake, proceed as follows:
 - Pull control lever up by 4 or 5 notches.
 - Insert a box wrench into opening in control lever and loosen self-lock adjusting nut to slacken cables. Completely push control lever down.
2. Forcefully depress brake pedal about five times (so that caliper is automatically set in position.).
3. Pull lever up by 4 or 5 notches.
4. Turn adjusting nut as shown in figure at left and adjust lever stroke to specified value.
5. Completely push control lever down and ensure that:
 - Parking brake is released completely.
 - Rear brakes are free from dragging.



6. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.

Number of notches:

Center lever type 6 - 8

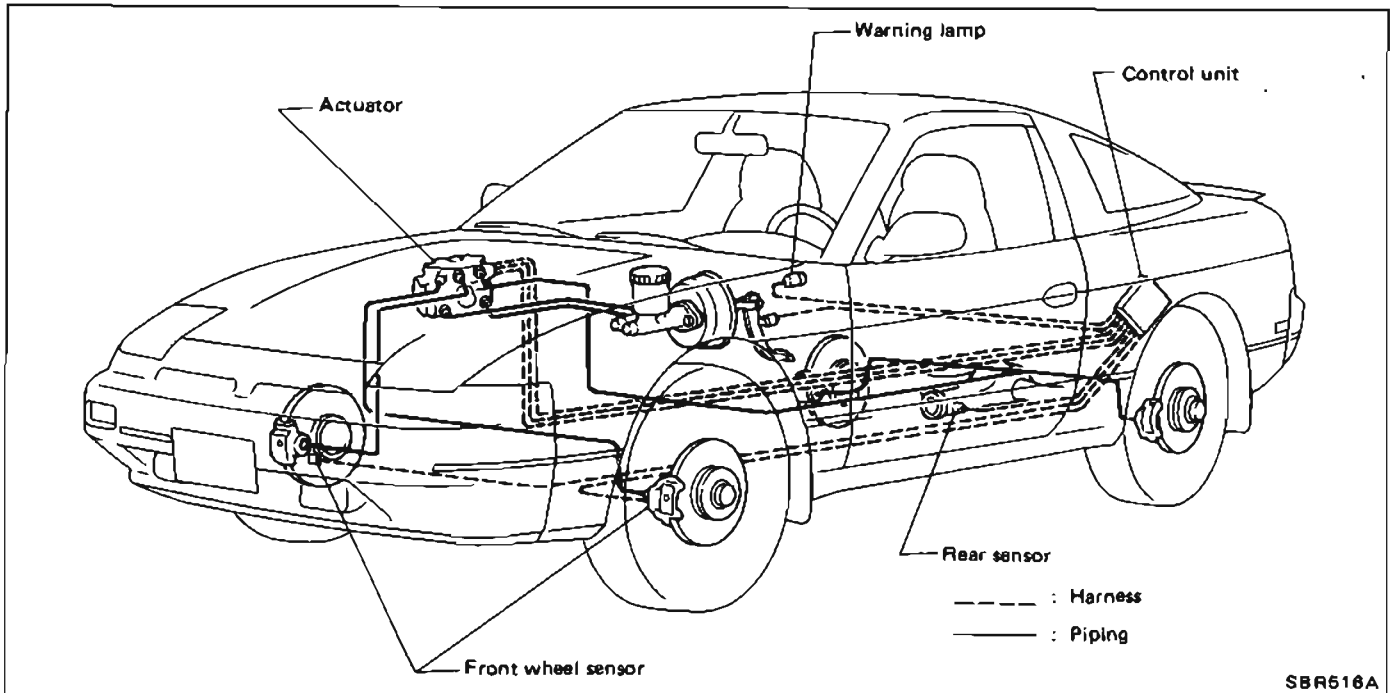


7. Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.

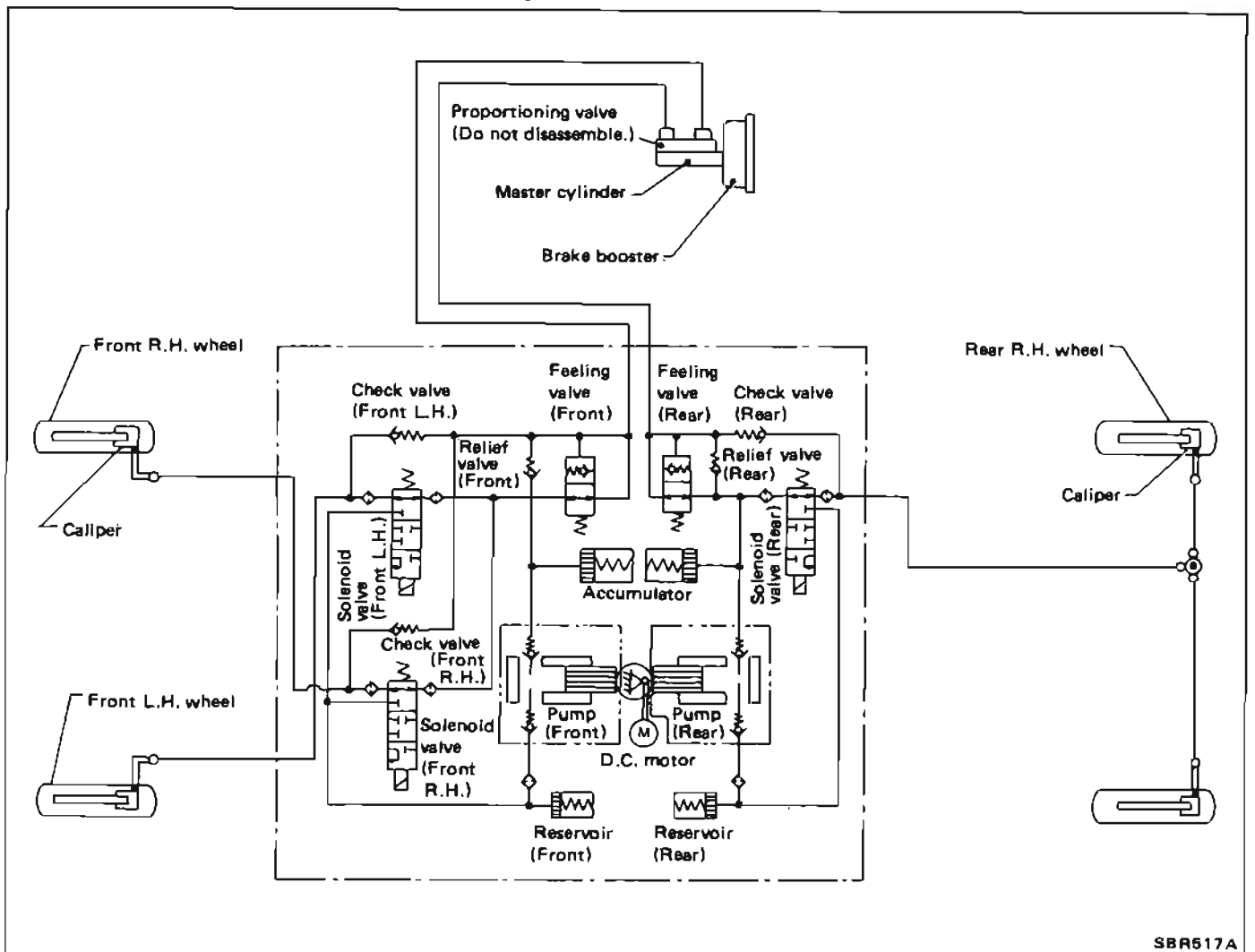
Number of "A" notches: 1

ANTI-LOCK BRAKING SYSTEM

System Components

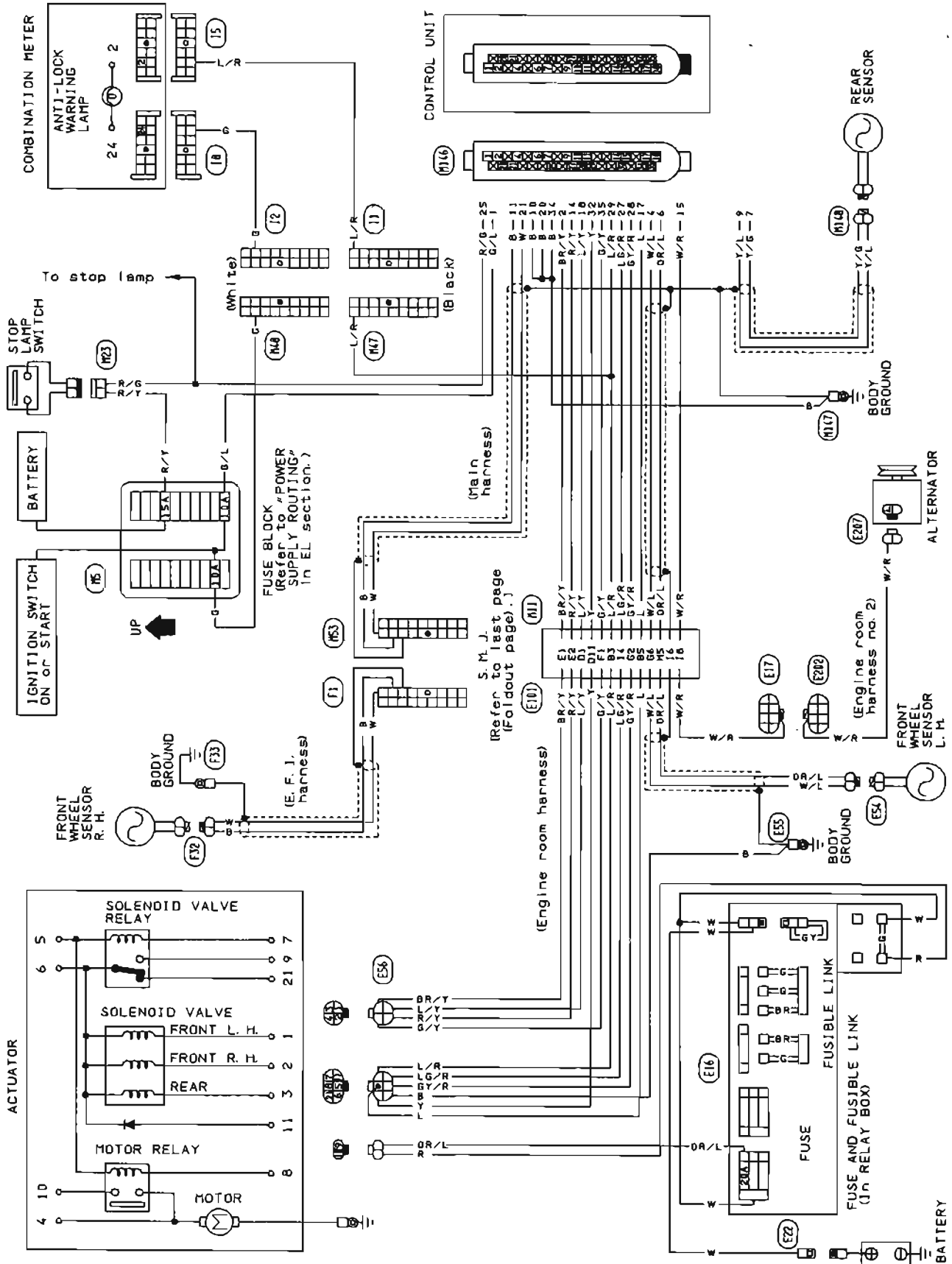


Hydraulic Circuit



ANTI-LOCK BRAKING SYSTEM

Wiring Diagram



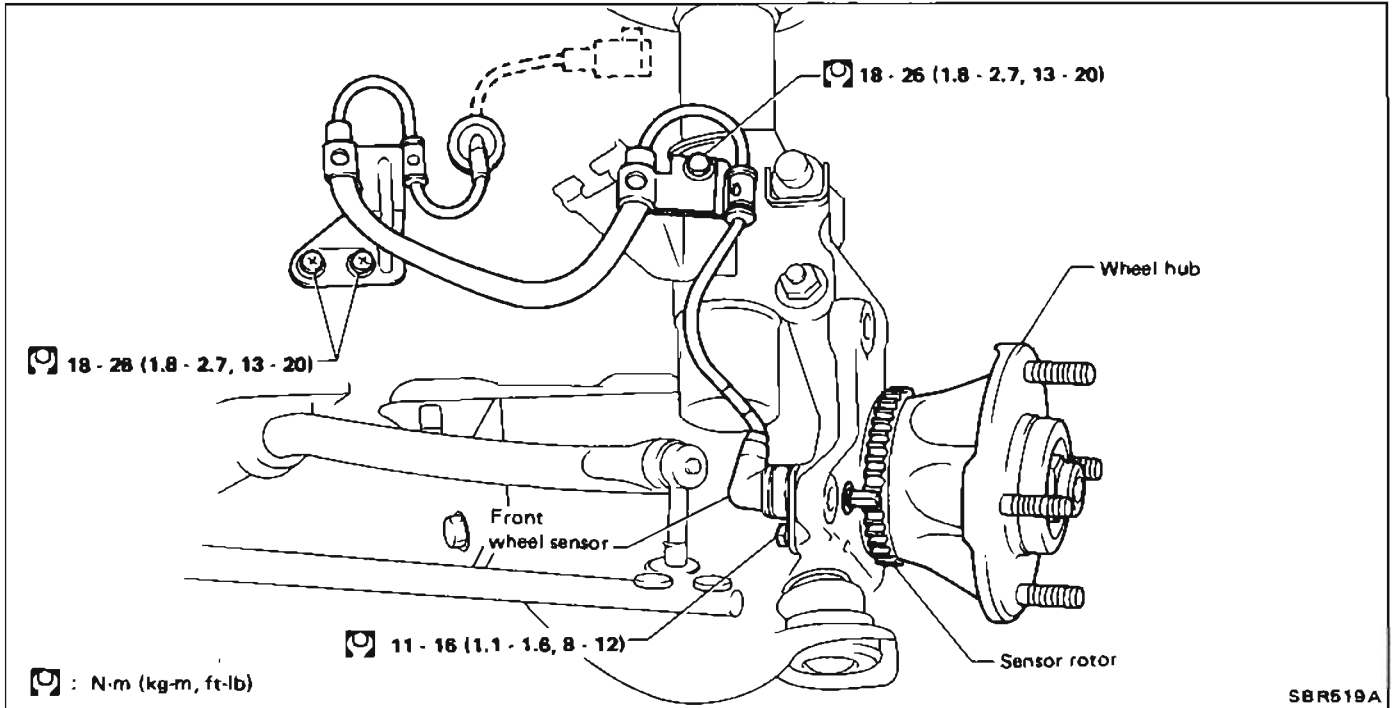
ANTI-LOCK BRAKING SYSTEM

Removal and Installation

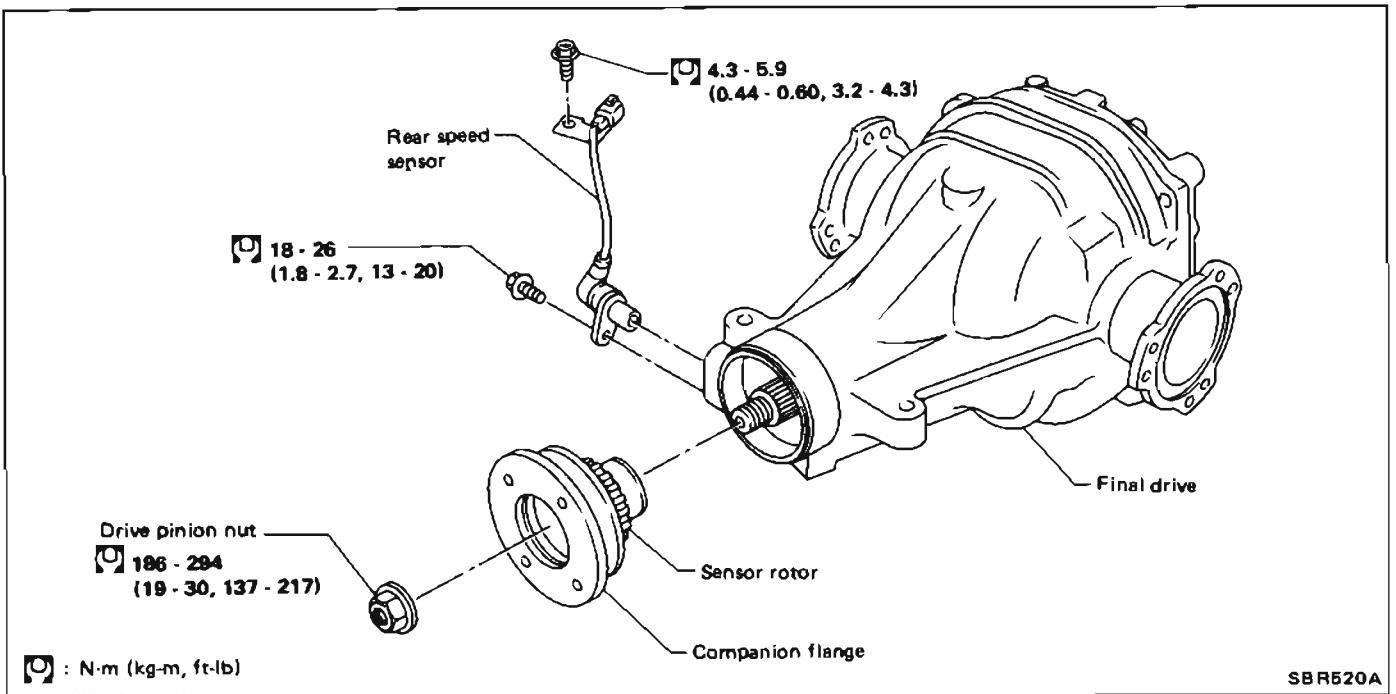
CAUTION:

Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR



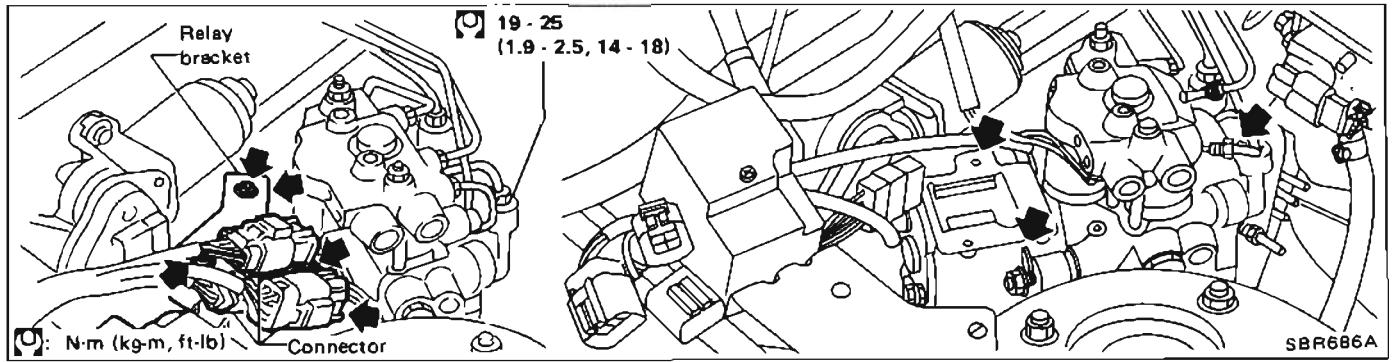
REAR SENSOR



- Remove rear sensor rotor with companion flange after propeller shaft removal. Refer to PD section.

ANTI-LOCK BRAKING SYSTEM

Removal and Installation (Cont'd) ACTUATOR

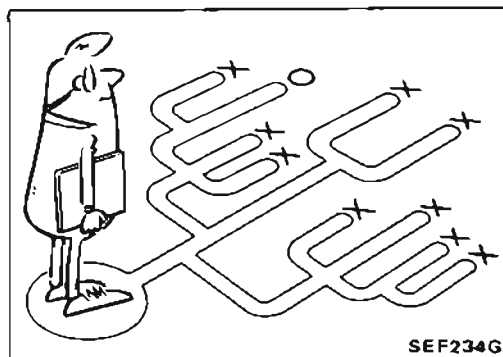
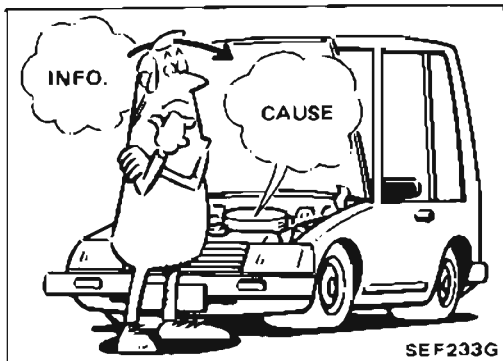


- Disconnect 3 connectors and brake tubes.
- Remove relay bracket.
- Remove actuator by removing 3 nuts fixing actuator to bracket.

TROUBLE DIAGNOSES

Contents

| | |
|--|-------|
| How to Perform Trouble Diagnoses for Quick and Accurate Repair | BR-30 |
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| Preliminary Check 1 | BR-34 |
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| Ground Circuit Check | BR-40 |
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| Diagnostic Procedure 8 | BR-47 |
| Diagnostic Procedure 9 | BR-48 |
| Diagnostic Procedure 10 | BR-49 |
| Diagnostic Procedure 11 | BR-50 |
| Diagnostic Procedure 12 | BR-51 |
| Electrical Components Inspection | BR-52 |



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.

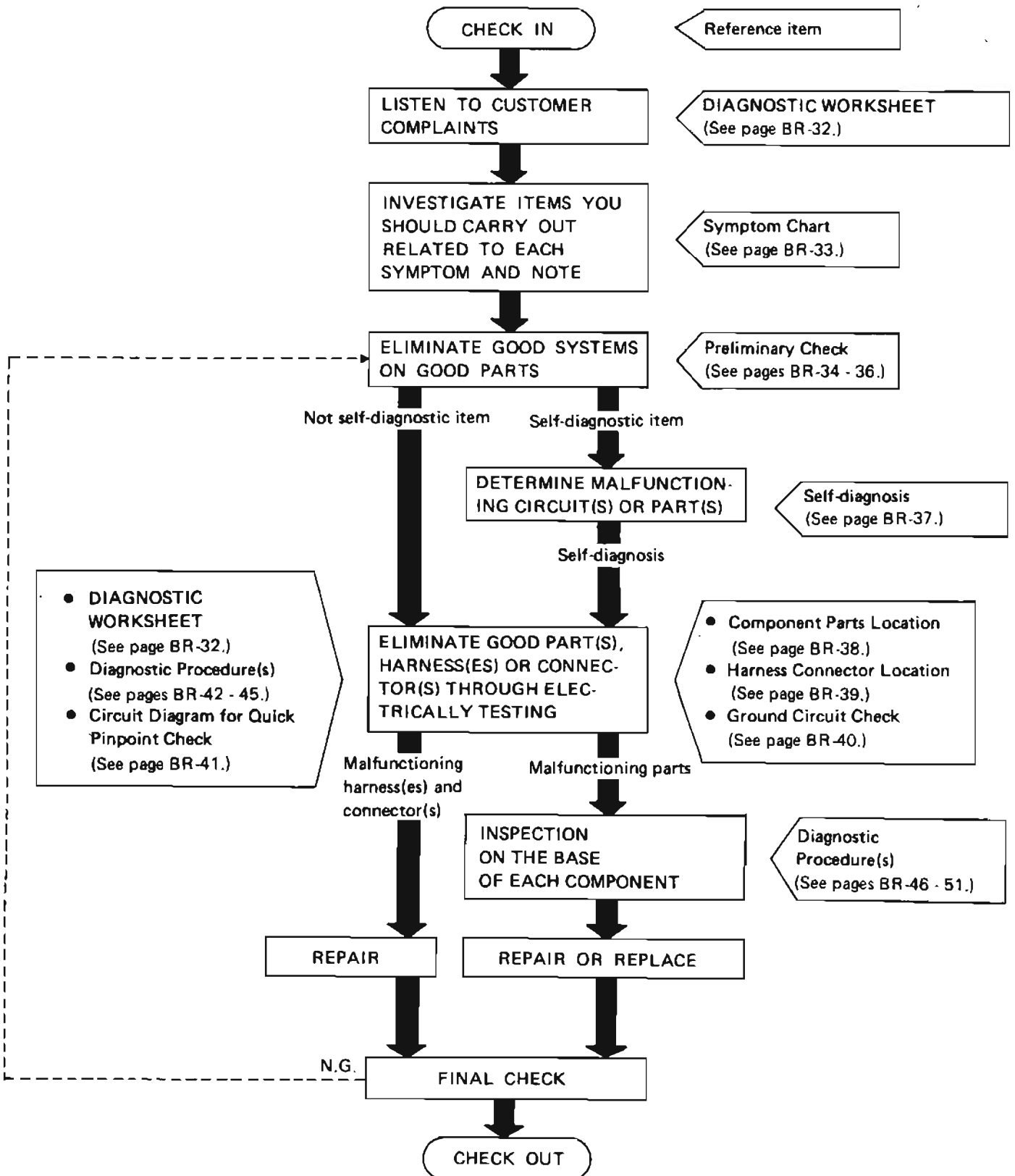
Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a A.B.S. complaint. The customer is a very good source of information on such problems; especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under 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)

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 | | |
| | | <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) | | | | | |
| | | <input type="checkbox"/> Protrusion | | | | | |
| Driving conditions | | <input type="checkbox"/> High speed cornering | | | | | |
| | | <input type="checkbox"/> Vehicle speed: Greater than 10 km/h (6 MPH) | | | | | |
| | | <input type="checkbox"/> Vehicle speed: 10 km/h (6 MPH) or less | | | | | |
| | | <input type="checkbox"/> Vehicle is stopped | | | | | |
| Applying brake conditions | | <input type="checkbox"/> Suddenly | | | | | |
| | | <input type="checkbox"/> Gradually | | | | | |
| Other conditions | | <input type="checkbox"/> Operation of electrical equipment | | | | | |
| | | <input type="checkbox"/> Large pedal stroke | | | | | |
| | | <input type="checkbox"/> Operation of clutch | | | | | |

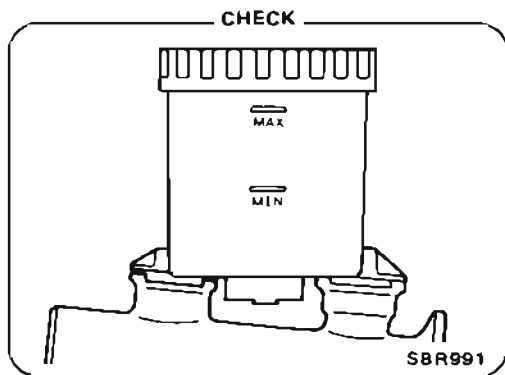
TROUBLE DIAGNOSES

Symptom Chart

| PROCEDURE | Preliminary Check | Diagnostic Procedure | | | | | | Diagnostic Procedure (Select inspection with L.E.D.) flashing No. | | | Ground Circuit Check | Electrical Com- ponents Inspec- tion | | | | |
|----------------|------------------------------------|------------------------|------------------------|--|--|--|--|---|--|--|----------------------------|--|--|--|--|--|
| REFERENCE PAGE | BR-34 | Preliminary Check 1 | | | | | | | | | | | | | | |
| | BR-35 | Preliminary Check 2 | | | | | | | | | | | | | | |
| | BR-36 | Preliminary Check 3 | | | | | | | | | | | | | | |
| | BR-36 | Preliminary Check 4 | | | | | | | | | | | | | | |
| SYMPTOM | | Diagnostic Procedure 1 | | | | | | | | | | | | | | |
| | 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 | | | | | | | | | | | | | | | |
| | | | Diagnostic Procedure 2 | | | | | | | | | | | | | |
| | | | Diagnostic Procedure 3 | | | | | | | | | | | | | |
| | | Diagnostic Procedure 4 | | | | | | | | | | | | | | |
| | | Diagnostic Procedure 5 | | | | | | | | | | | | | | |
| | | Diagnostic Procedure 6 | | | | | | | | | | | | | | |
| | | L.E.D. flashing 1 - 4 | | | | | | | | | | | | | | |
| | | L.E.D. flashing 5 - 8 | | | | | | | | | | | | | | |
| | | L.E.D. flashing 9 | | | | | | | | | | | | | | |
| | | L.E.D. flashing 10 | | | | | | | | | | | | | | |
| | | L.E.D. flashing 16 | | | | | | | | | | | | | | |
| | | L.E.D. goes off | | | | | | | | | | | | | | |
| | | Sensor shield | | | | | | | | | | | | | | |
| | | Motor ground | | | | | | | | | | | | | | |
| | | Actuator inspection | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

TROUBLE DIAGNOSES

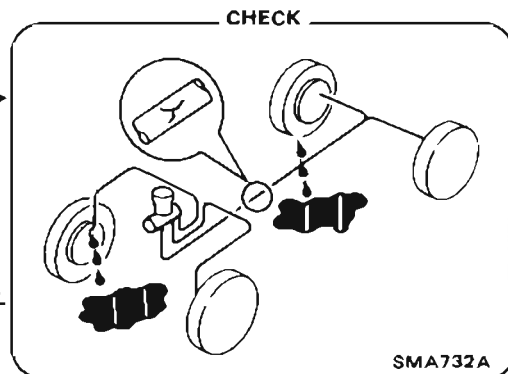
Preliminary Check 1



Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

O.K. →

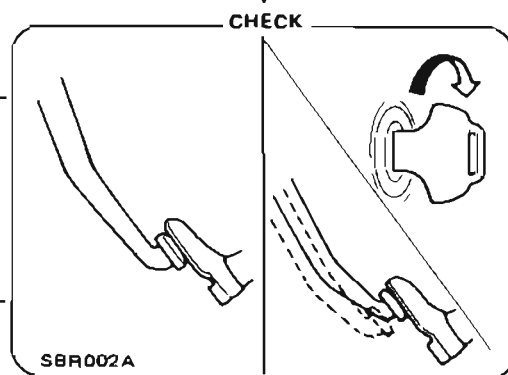


Check brake system.
Refer to CHECK AND ADJUSTMENT.

Repair brake system. ← N.G.

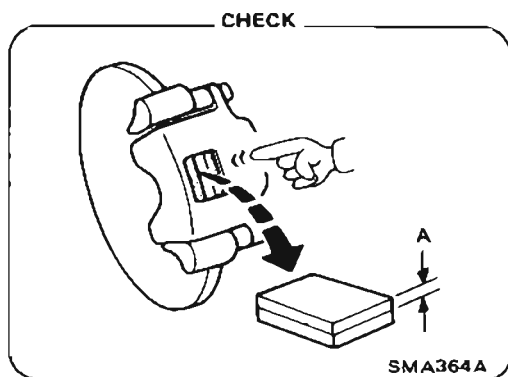
O.K. ↓

Repair or replace booster system. ← N.G.



Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

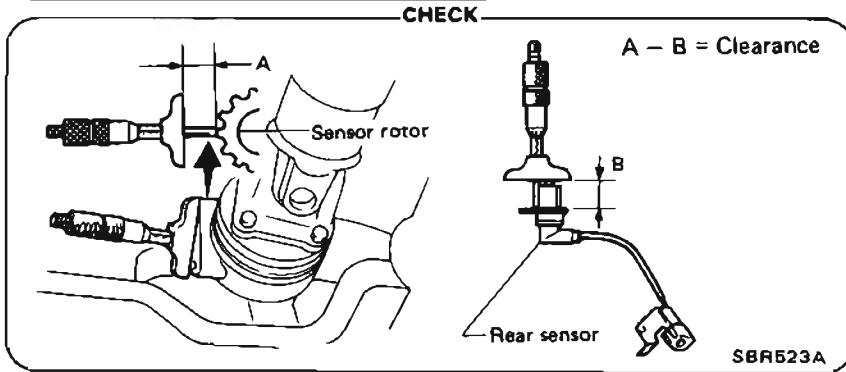
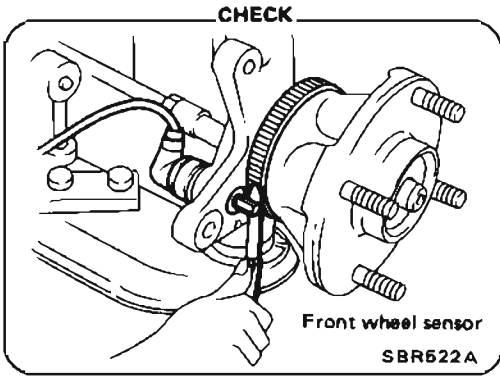
O.K. →



Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

Replace malfunctioning parts. ← N.G.

Preliminary Check 2



Check sensor clearance.

| | Clearance mm (in) |
|--------------------|-----------------------------------|
| Front wheel sensor | 0.275 - 0.75 (0.0108 - 0.0295) |
| Rear sensor | 0.35 - 0.625 (0.0138 - 0.0246) |

N.G.

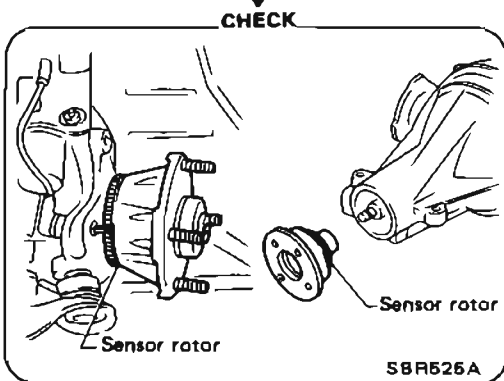
Check sensor for the following items:

- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K.

N.G.

Repair or replace malfunctioning sensor.



N.G.

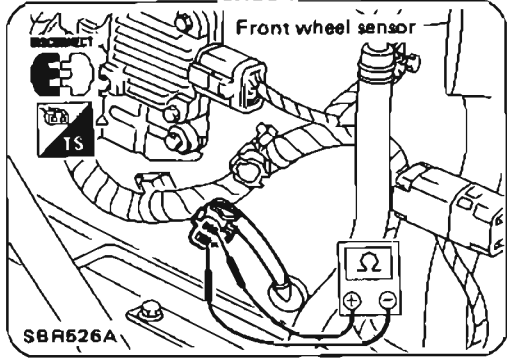
Replace sensor rotor with wheel hub or companion flange as a set.

Check sensor rotor for teeth damage.

TROUBLE DIAGNOSES

Preliminary Check 3

CHECK



Measure each sensor resistance.
0.8 - 1.2 kΩ

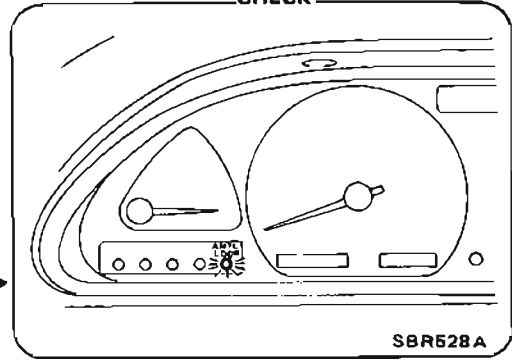
N.G. → Replace.

O.K. →

Preliminary Check 3, 4

Preliminary Check 4

CHECK



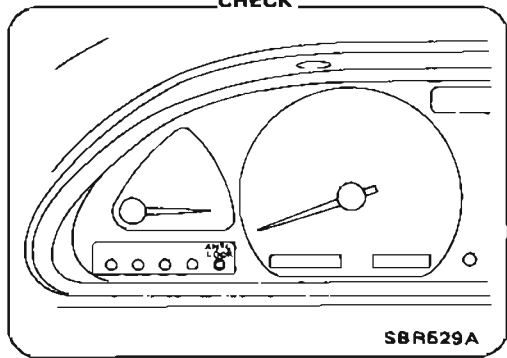
Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K. →

N.G. ↓

Check fuse.
Check bulb condition and remedy.

CHECK

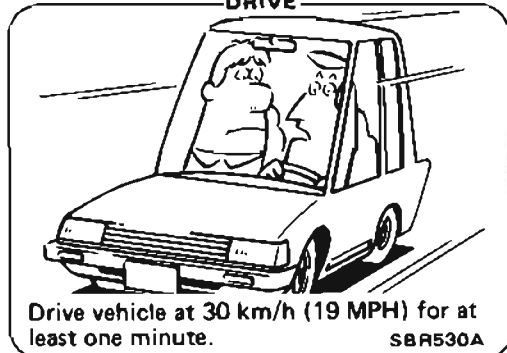


Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

N.G. →

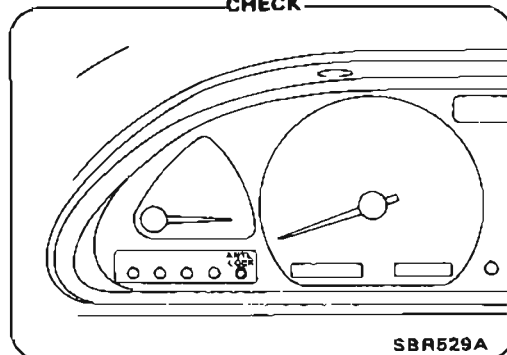
O.K. ↓

DRIVE



Drive vehicle at 30 km/h (19 MPH) for at least one minute.

CHECK



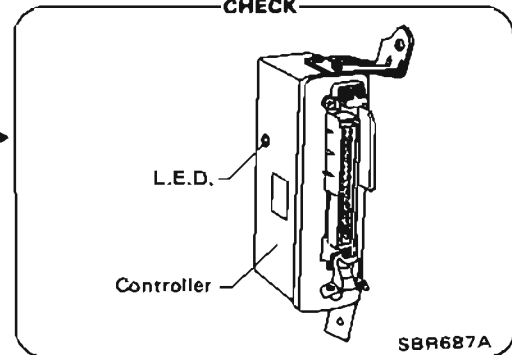
Ensure warning lamp remains off while driving.

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.
- Remove rear side finisher.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

Go to Self-diagnosis.
(See page BR-37.)

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.

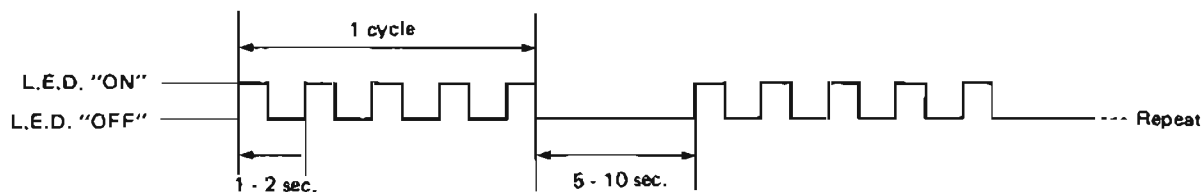
The L.E.D. is located on the control unit, identifying a malfunctioning part or unit by the number of flashes. Both the warning light and the L.E.D. persistently activate, even after a malfunctioning part or unit has been repaired, unless the ignition switch is turned "OFF". After repairs, turn the ignition 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 or 4 | Rear actuator solenoid circuit |
| 5 | Left front rotor sensor circuit |
| 6 | Right front rotor sensor circuit |
| 7 or 8 | Rear rotor sensor circuit |
| 9 | Actuator motor, motor relay circuit |
| 10 | Actuator solenoid valve relay |
| 16 | Control unit |
| Warning activates and L.E.D. "OFF" | Power supply or ground circuit for control unit |

Example

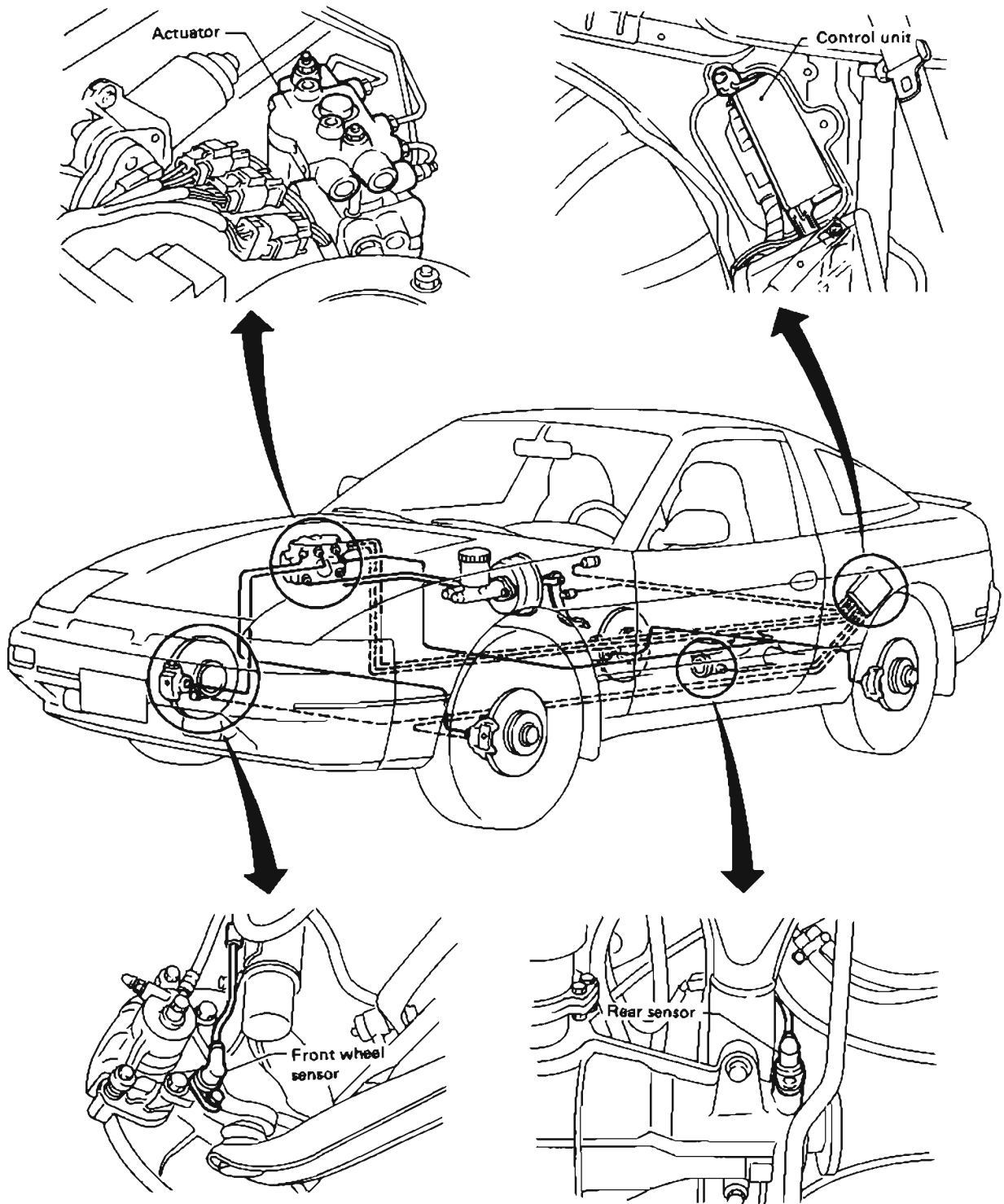
Improper operation of left front rotor sensor circuit



SBR531A

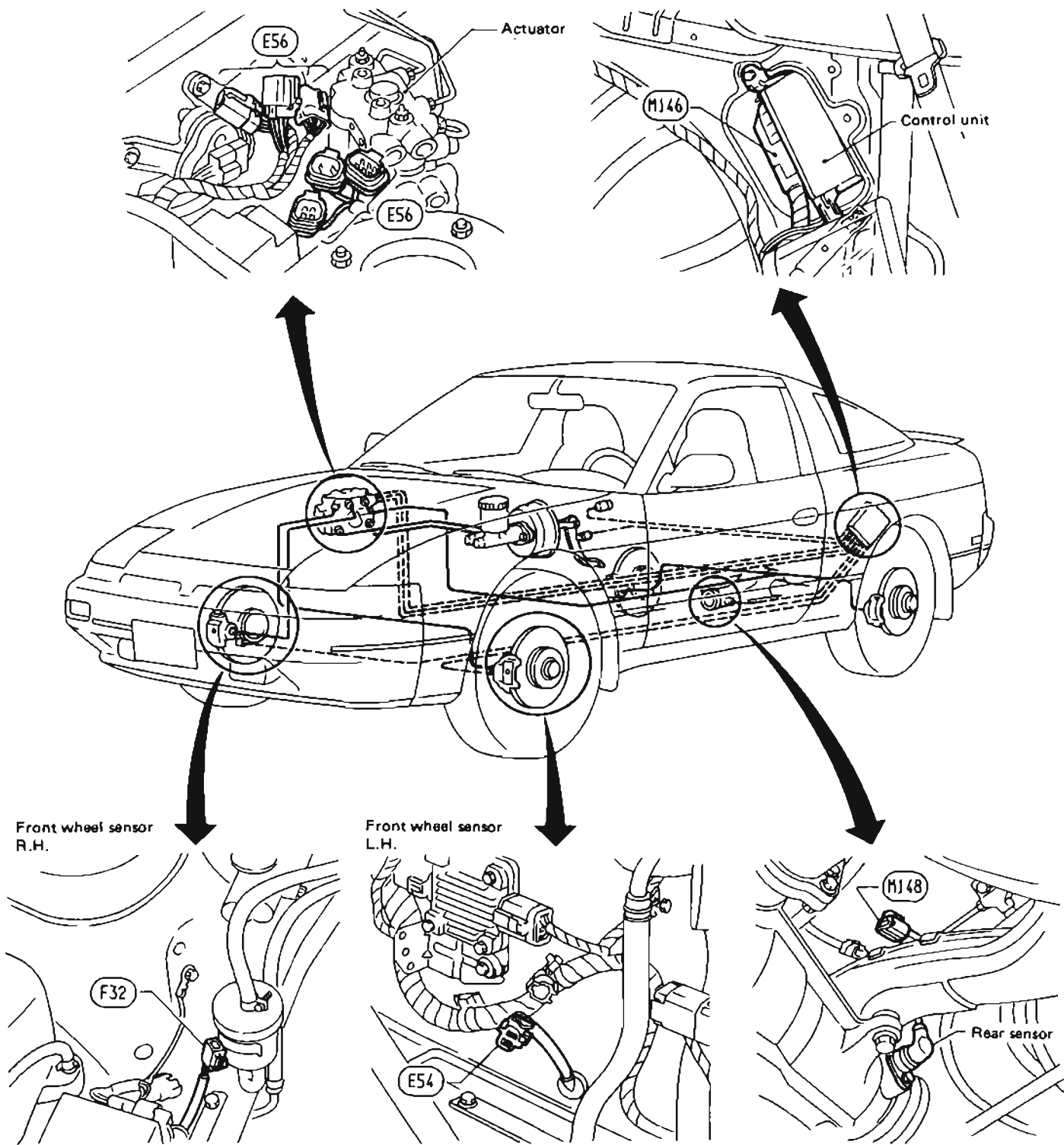
Go to Diagnostic Procedure from 7 to 10, where malfunction portion is concerned.

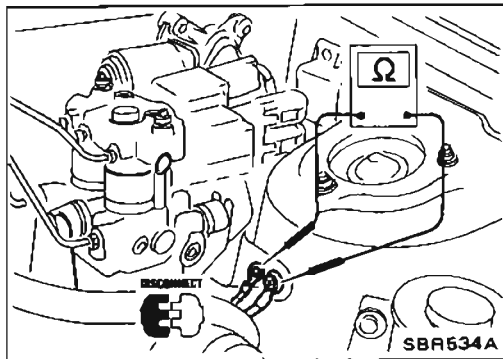
Component Parts Location



TROUBLE DIAGNOSES

Harness Connector Location

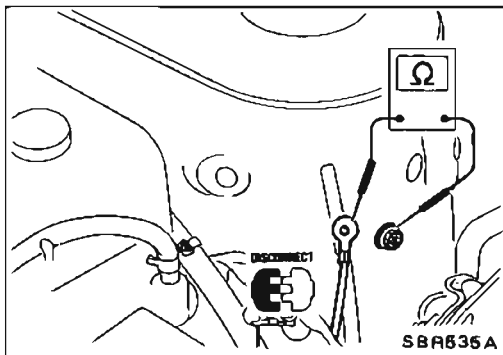




Ground Circuit Check

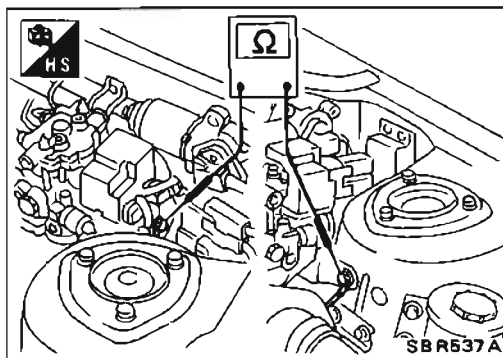
FRONT WHEEL SENSOR L.H. SHIELDED WIRE GROUND

- Check resistance between both terminals.
Resistance: $0\ \Omega$



FRONT WHEEL SENSOR R.H. SHIELDED WIRE GROUND

- Check resistance between both terminals.
Resistance: $0\ \Omega$

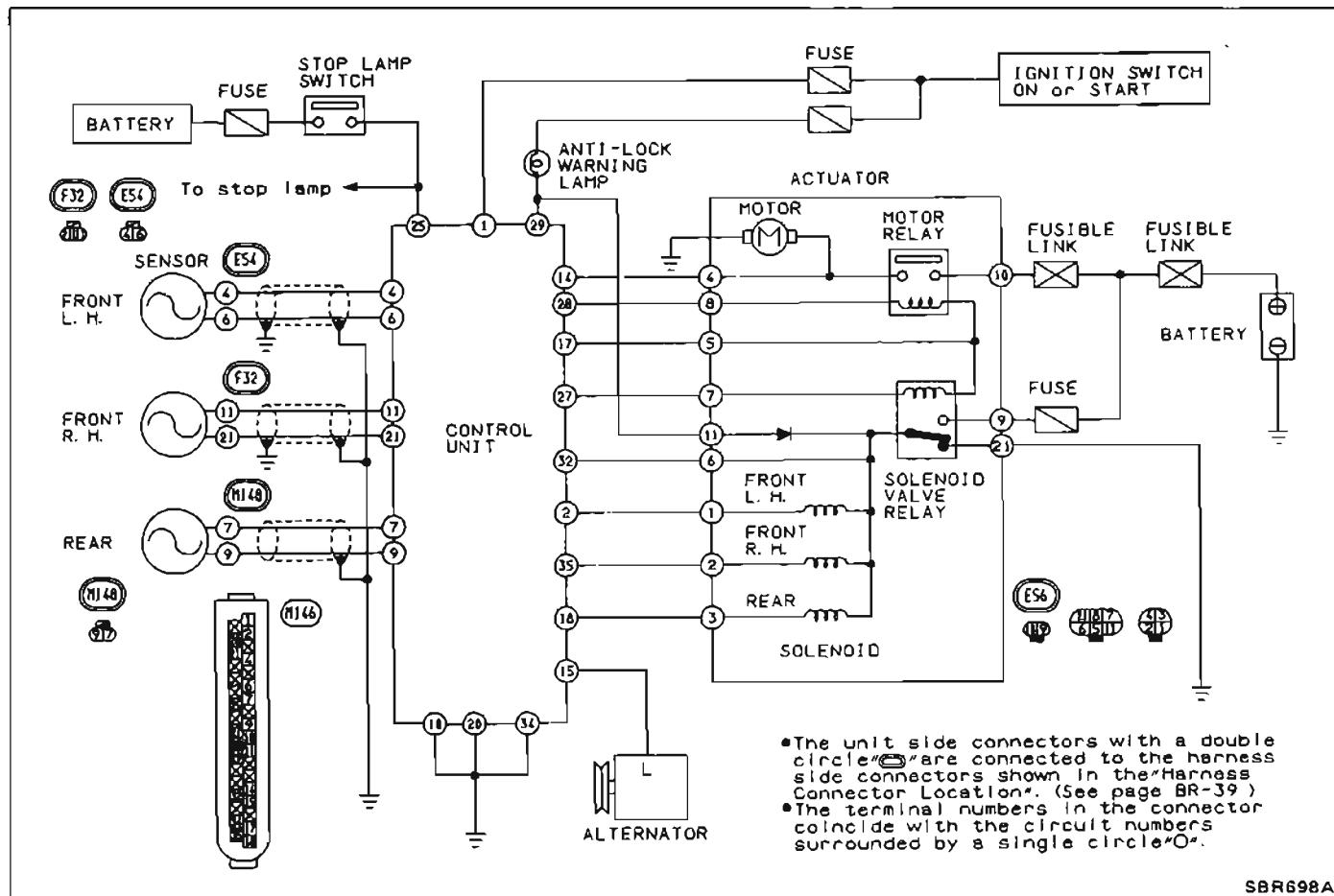


ACTUATOR MOTOR GROUND

- Check resistance between both terminals.
Resistance: $0\ \Omega$

TROUBLE DIAGNOSES

Circuit Diagram for Quick Pinpoint Check

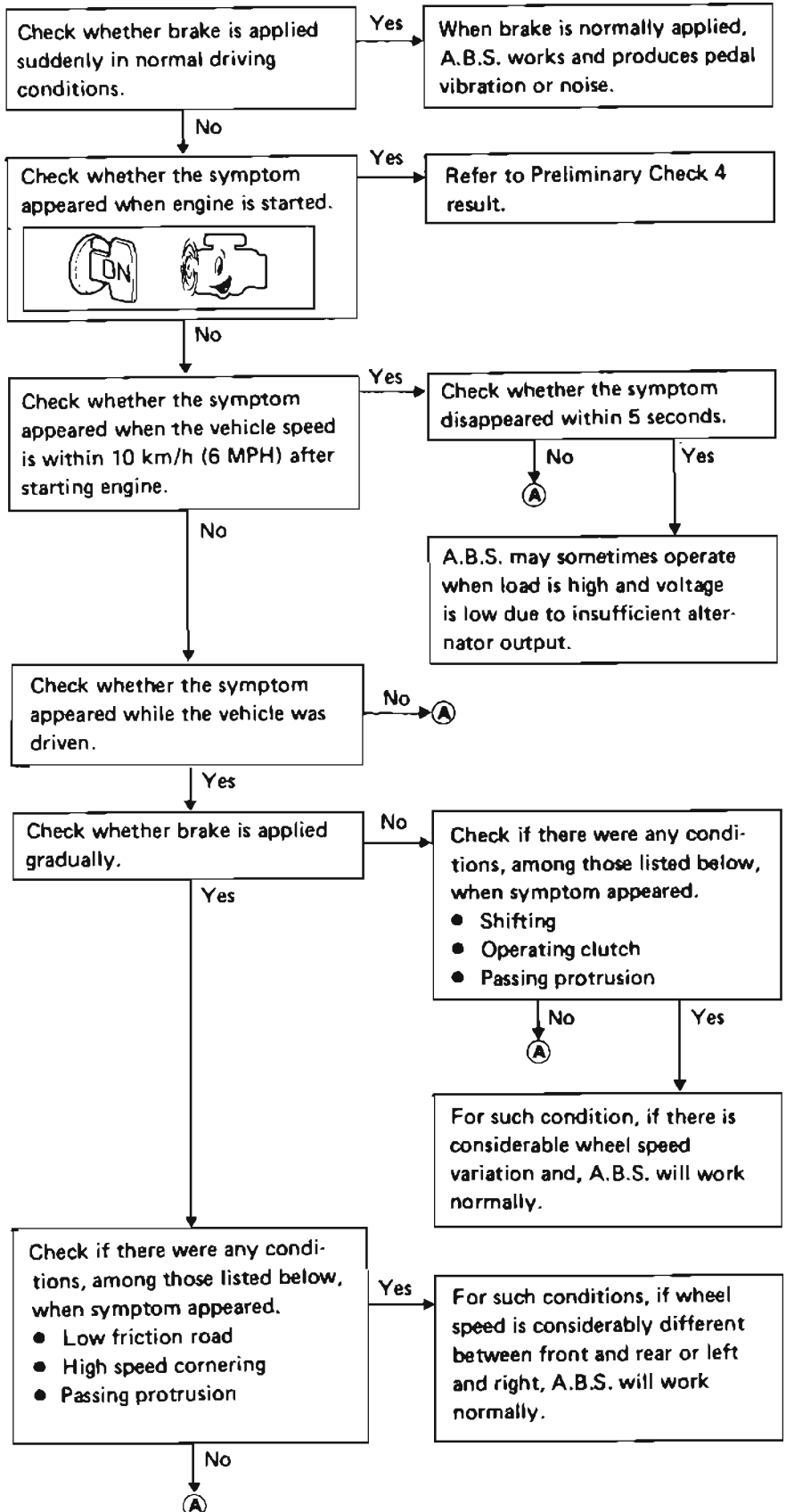
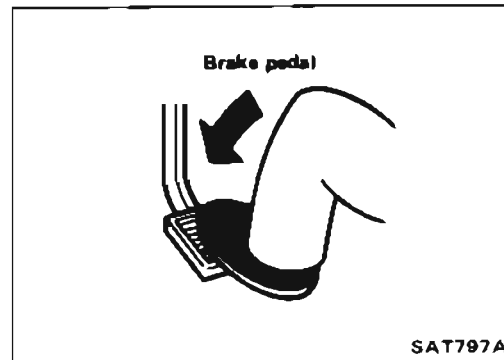
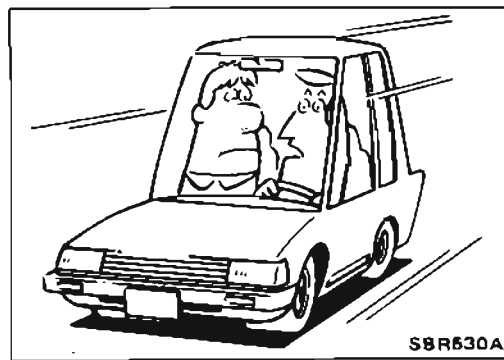
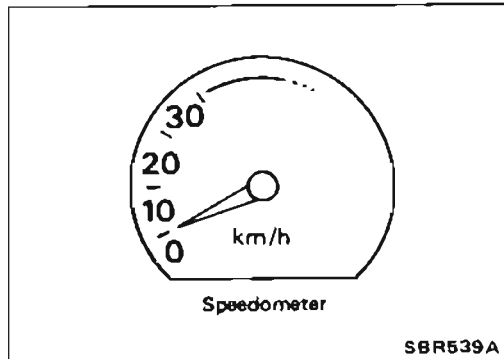
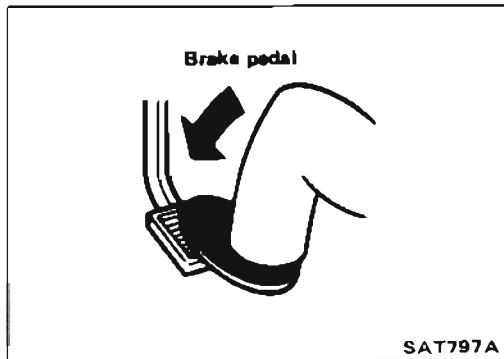


SBR698A

Diagnostic Procedure 1

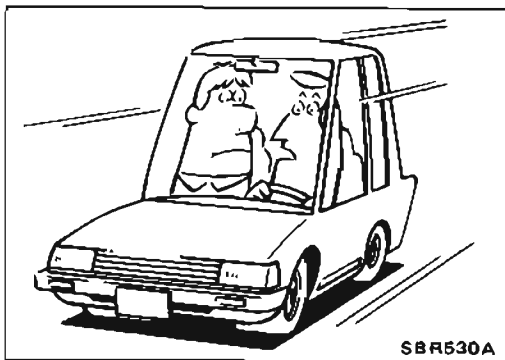
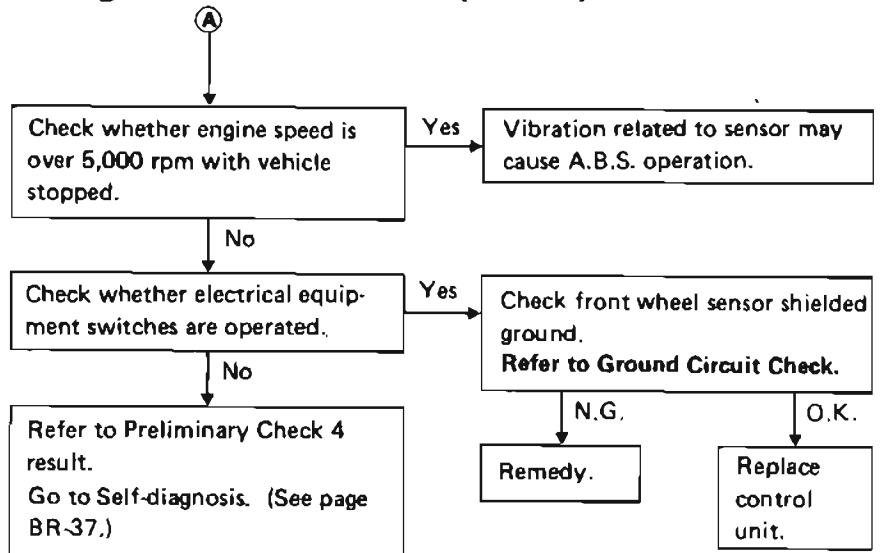
SYMPTOM: Pedal vibration and noise

Refer to worksheet results.



TROUBLE DIAGNOSES

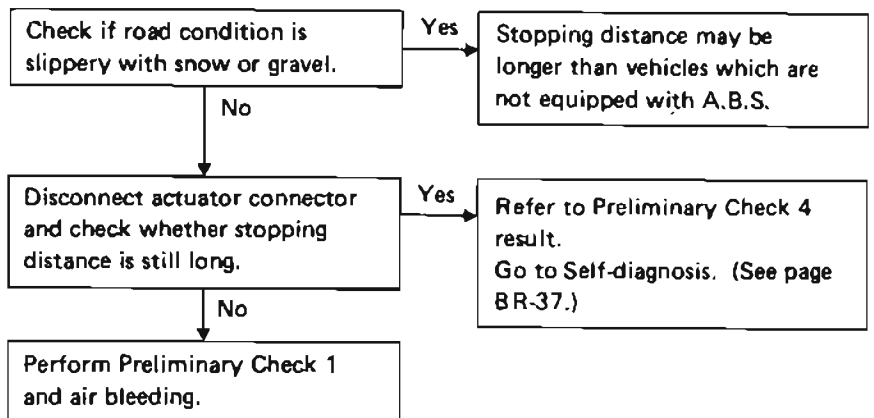
Diagnostic Procedure 1 (Cont'd)



Diagnostic Procedure 2

SYMPTOM: Long stopping distance

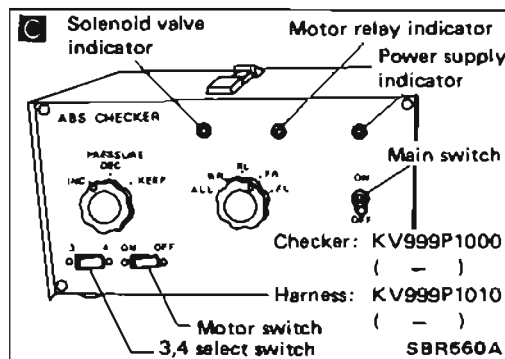
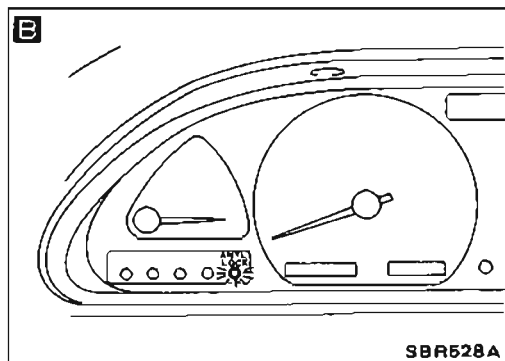
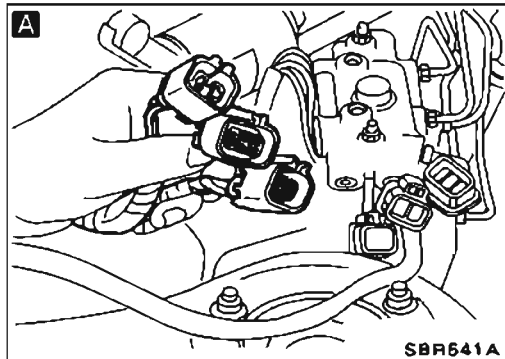
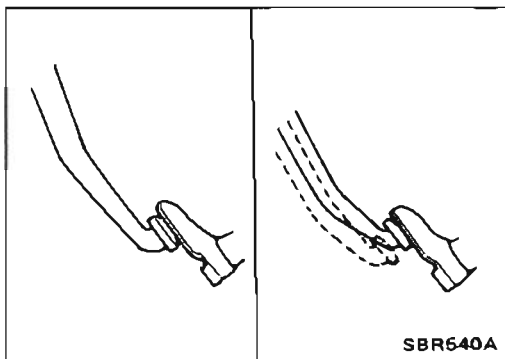
Refer to worksheet results.



Diagnostic Procedure 3

SYMPTOM: Abnormal pedal action

Refer to worksheet results.



Check whether brake pedal stroke is abnormally large.

Yes

Vehicle equipped with A.B.S. may have a tendency for large pedal strokes.

No

Check that brake pedal force is firm but brake is effective.

Yes

Normal condition.

No

Disconnect actuator connector and check whether brake is effective.

Yes

Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-37.)

No

Perform Preliminary Check 1.

Diagnostic Procedure 4

SYMPTOM: A.B.S. doesn't work.

Refer to worksheet results.

Check whether warning activates.

Yes

Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-37.)

No

Check whether vehicle speed is under 10 km/h (6 MPH).

Yes

A.B.S. doesn't work in this condition.

No

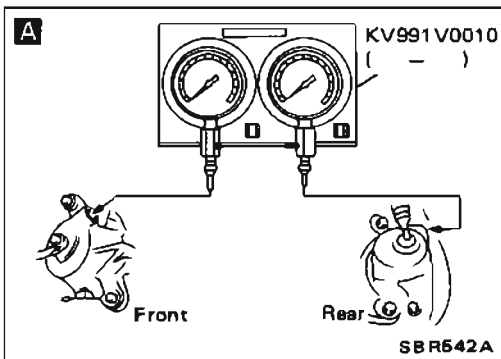
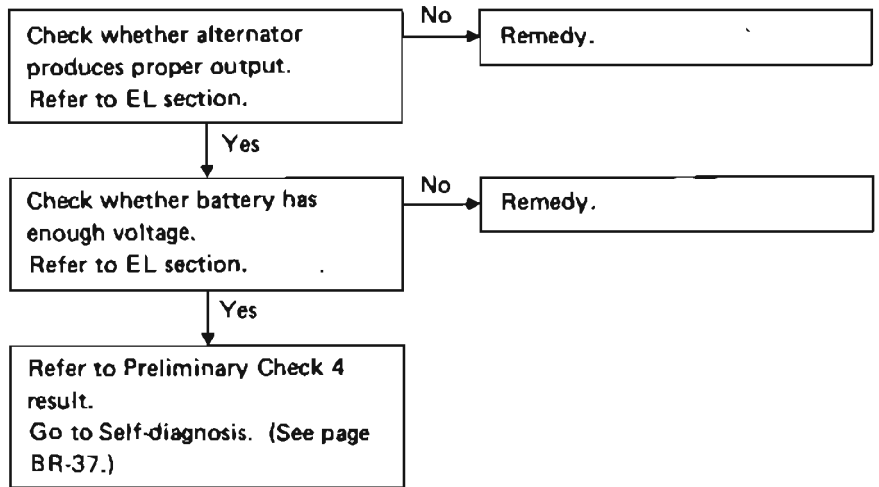
Refer to Preliminary Check 2 result.

O.K. but A.B.S. still doesn't work.

Check actuator by referring to Electrical Components Inspection - ACTUATOR. (See page BR-52.)

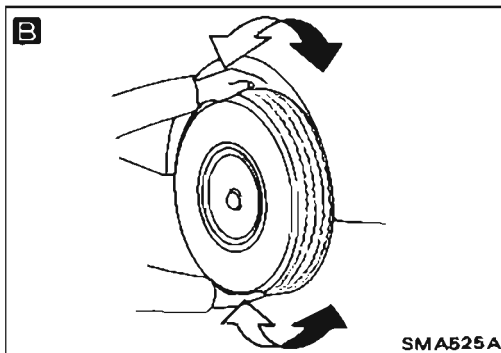
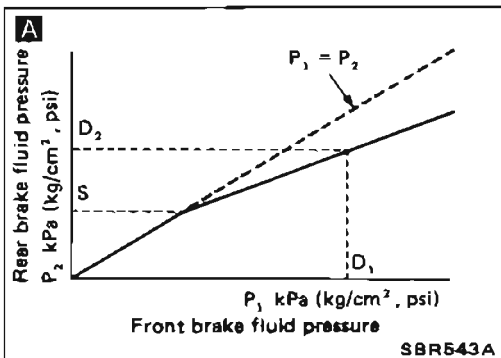
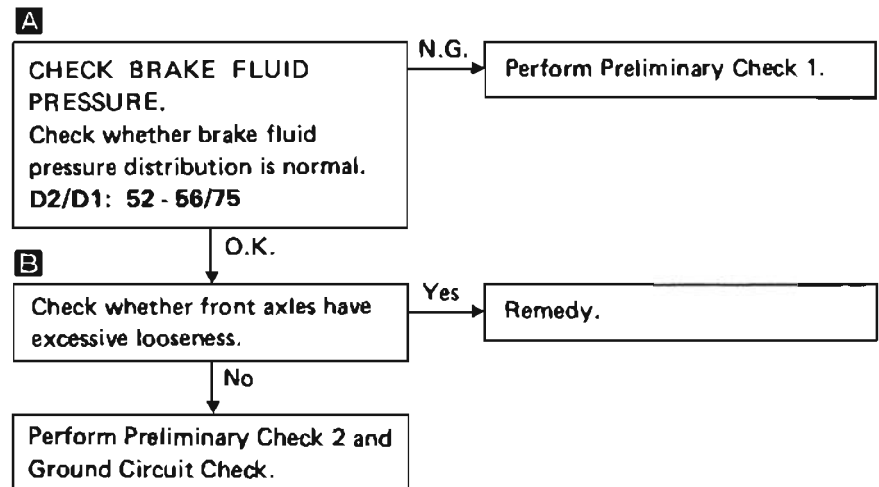
Diagnostic Procedure 5

SYMPTOM: A.B.S. works but warning activates.



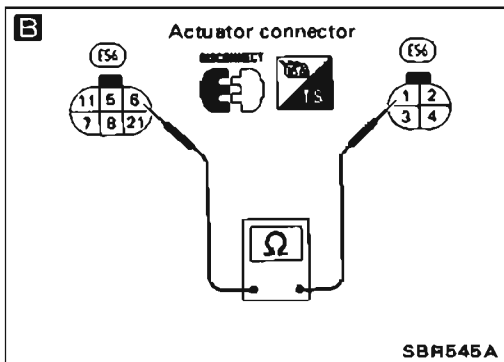
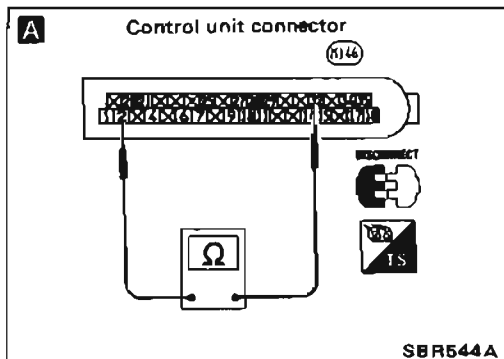
Diagnostic Procedure 6

SYMPTOM: A.B.S. works frequently.



Diagnostic Procedure 7

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)



INSPECTION START
Remove battery negative
terminal connector.

A

CHECK SOLENOID VALVE RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.

Flashing number 1:
Terminals ② and ⑱

Flashing number 2:
Terminals ② and ③

Flashing number 3 or 4:
Terminals ② and ⑩

Resistance: 0.7 - 1.6Ω

O.K.

Replace control unit.

B

Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals.

Flashing number 1:
Terminals ⑥ and ①

Flashing number 2:
Terminals ⑥ and ②

Flashing number 3 or 4:
Terminals ⑥ and ③

Resistance: 0.7 - 1.6Ω

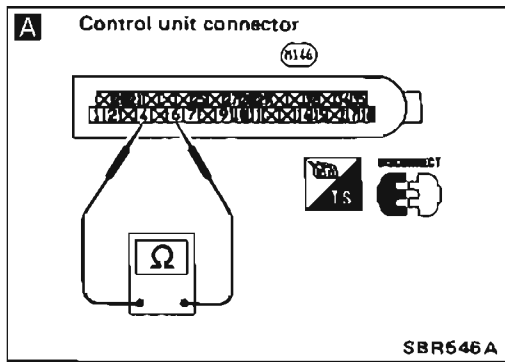
O.K.

Repair harness between actuator connector and control unit connector.

N.G.

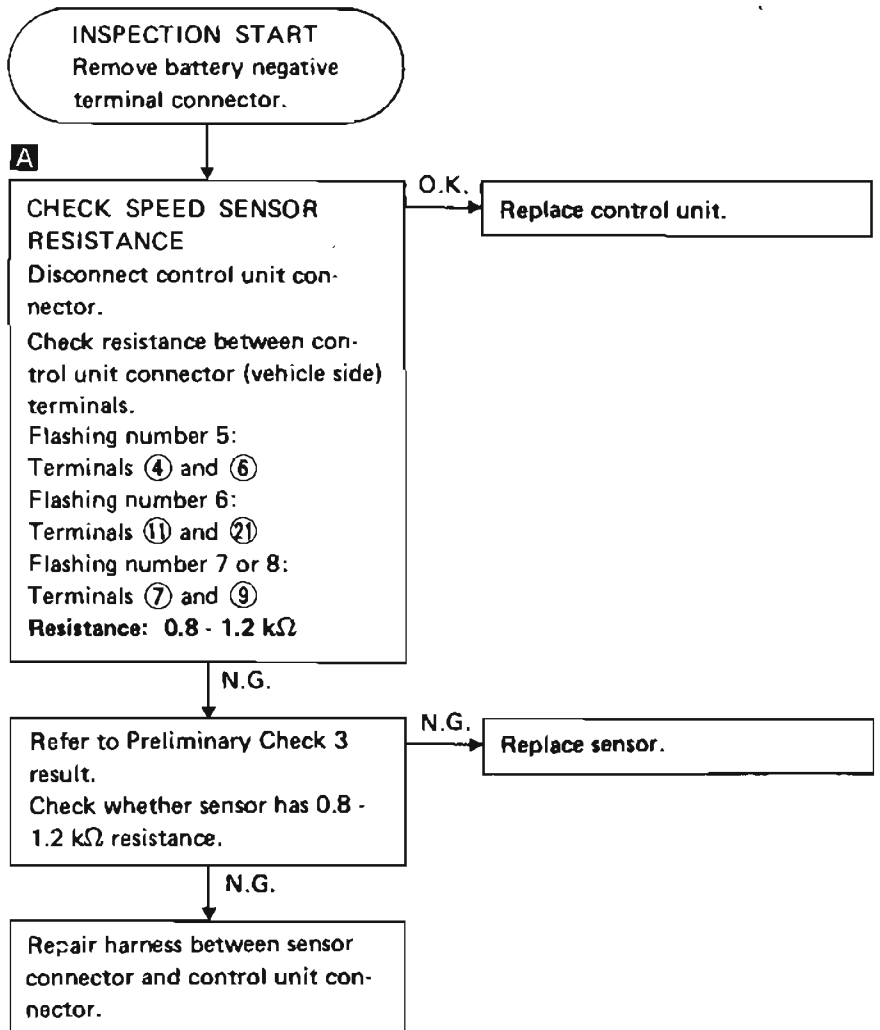
N.G.

Replace actuator.



Diagnostic Procedure 8

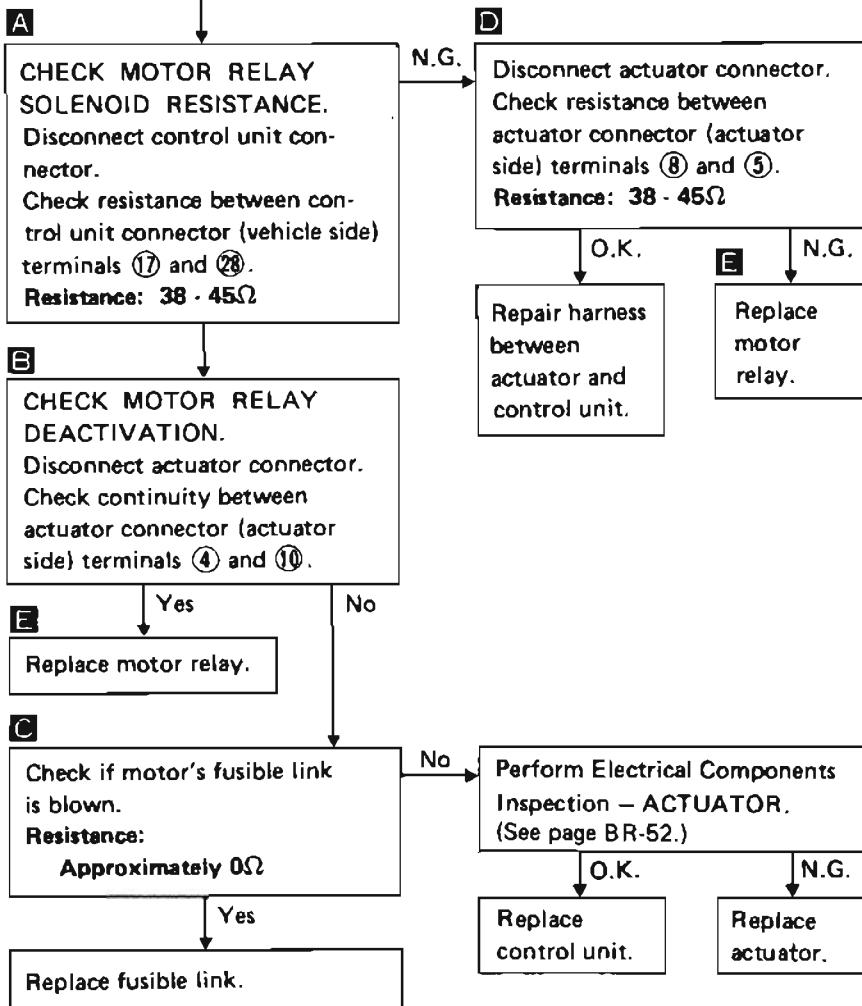
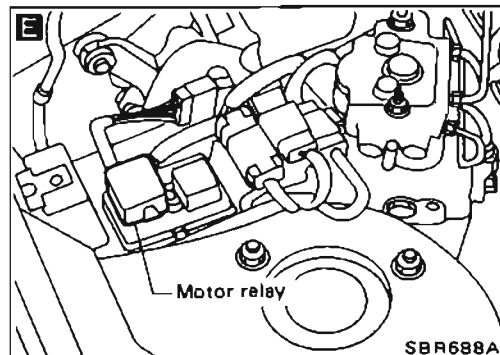
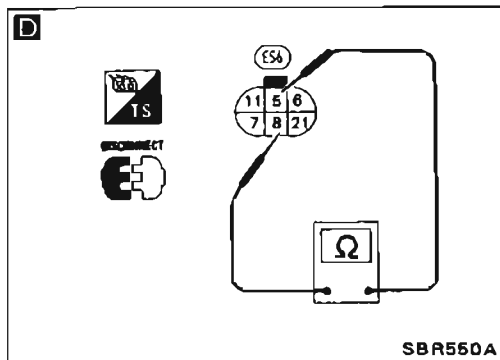
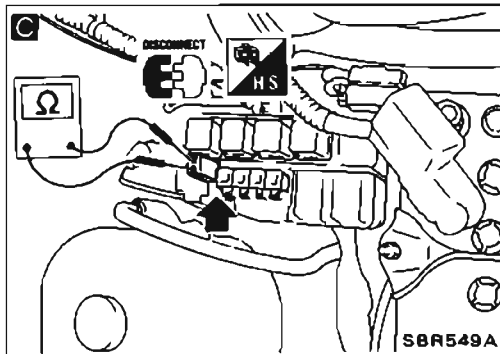
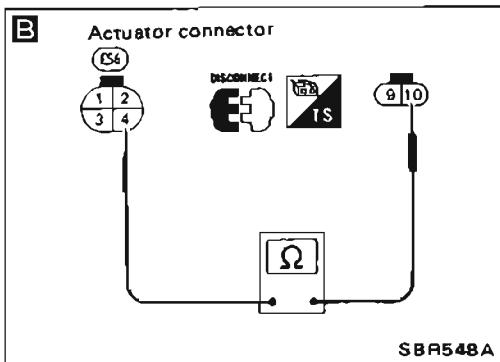
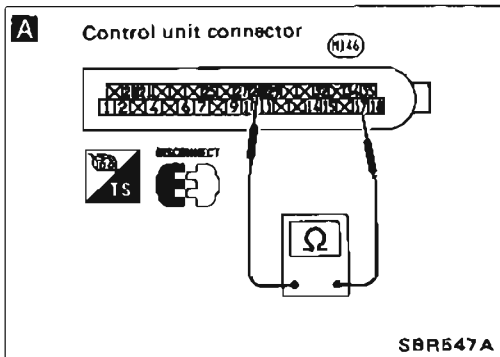
WHEEL SPEED SENSOR (L.E.D. flashing number 5 - 8)



Diagnostic Procedure 9

ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)

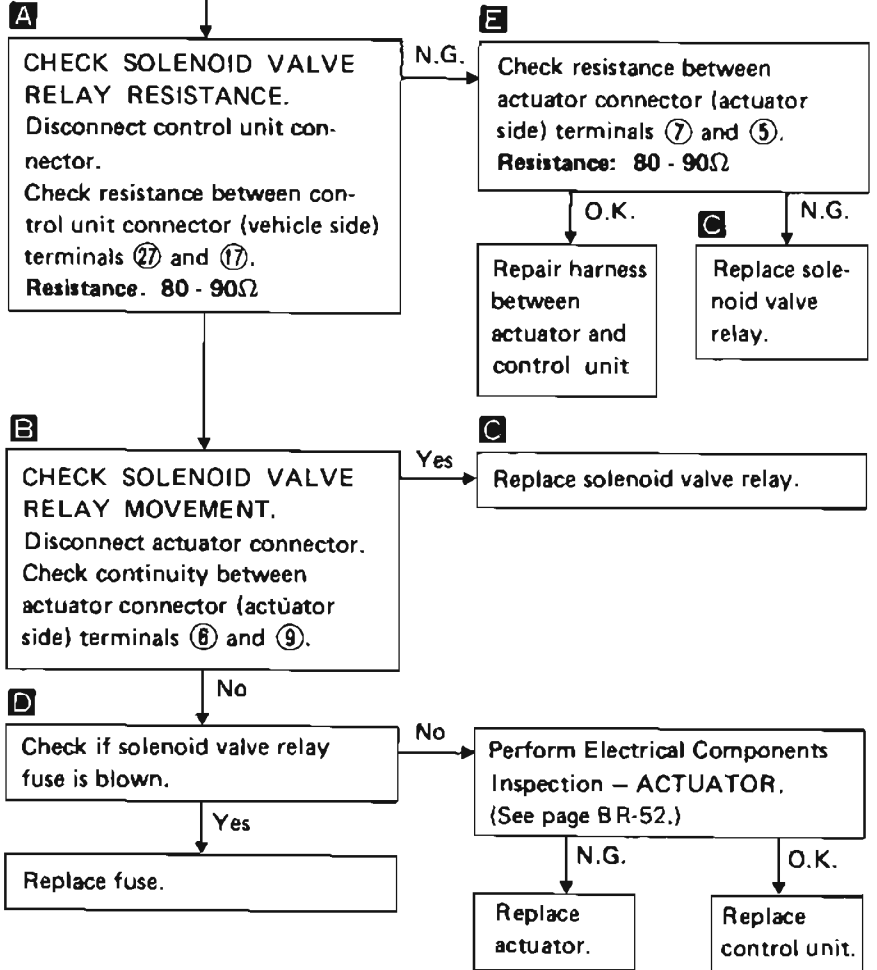
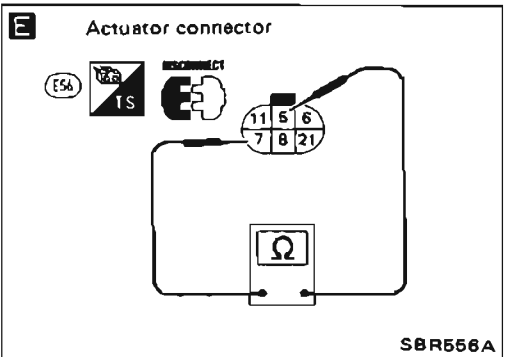
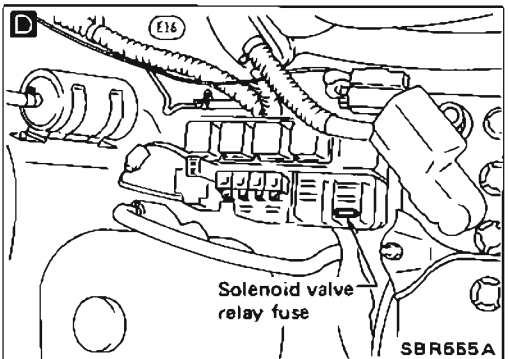
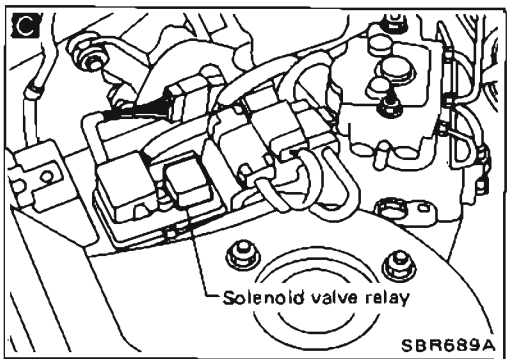
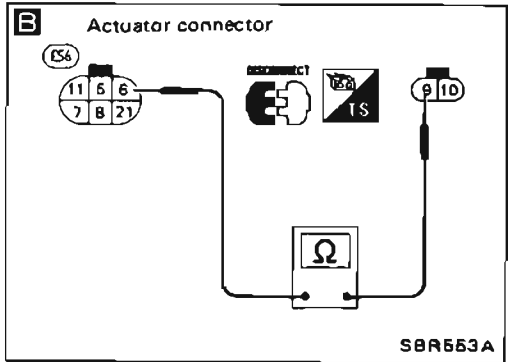
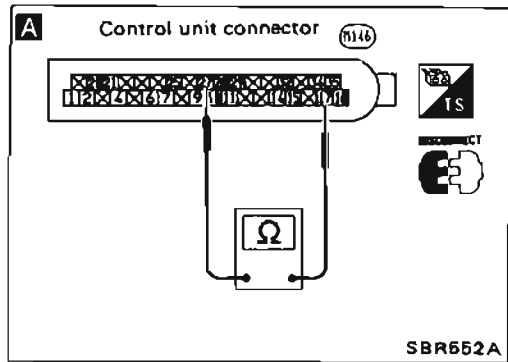
INSPECTION START
Remove battery negative terminal connector.



Diagnostic Procedure 10

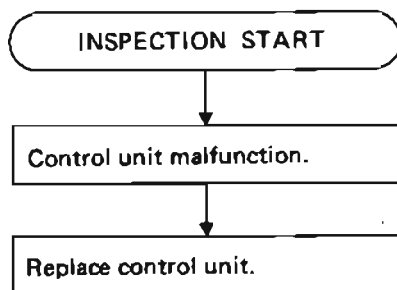
ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)

INSPECTION START
Remove battery negative terminal connector.



TROUBLE DIAGNOSES

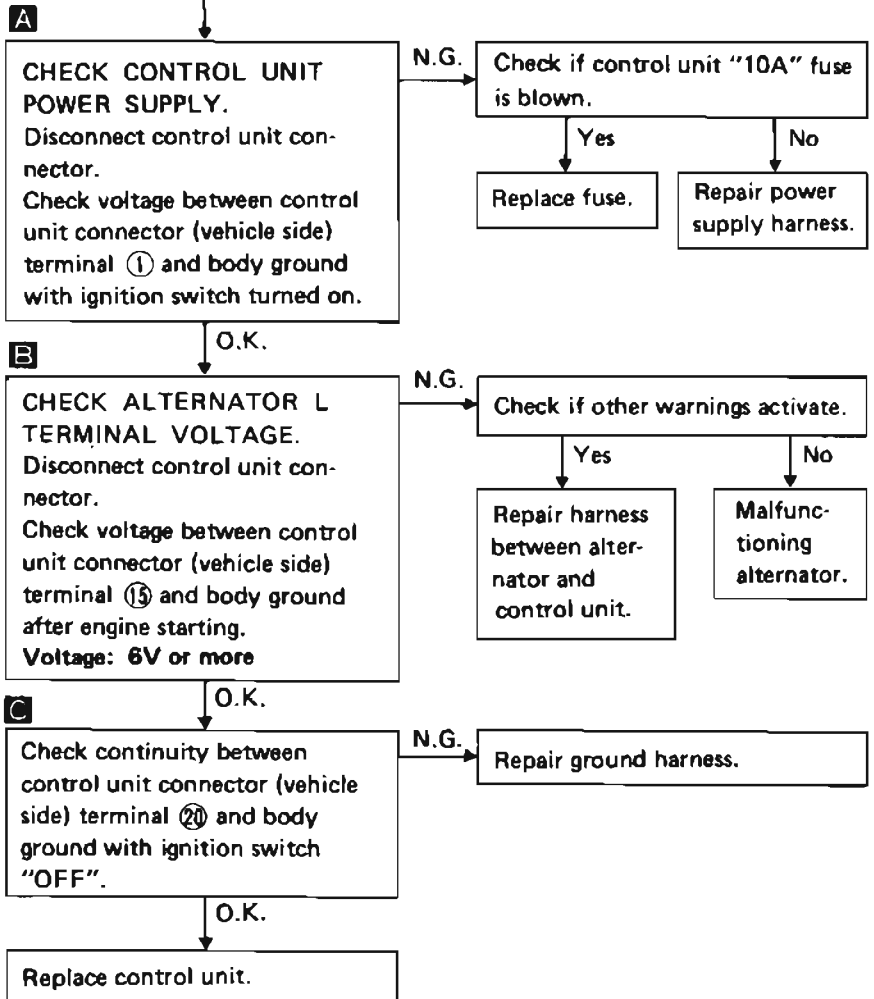
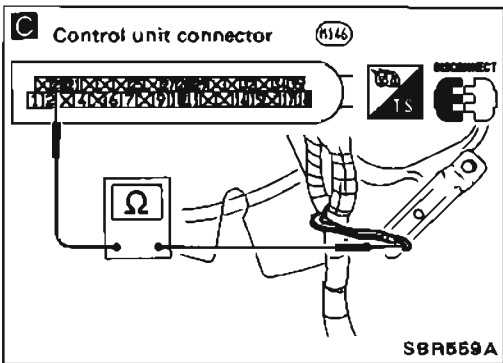
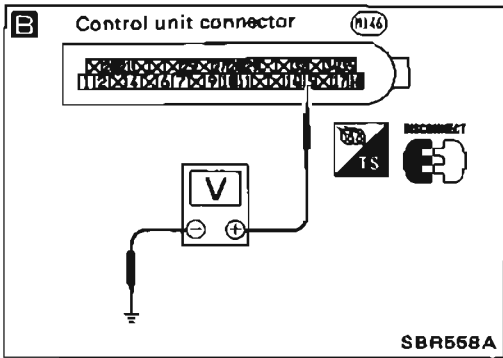
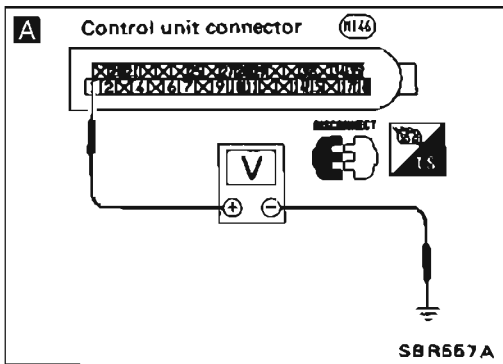
Diagnostic Procedure 11 CONTROL UNIT (L.E.D. flashing number 16)



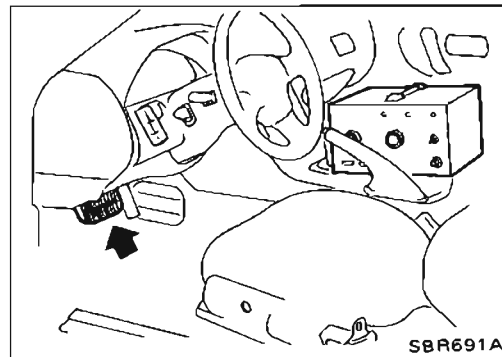
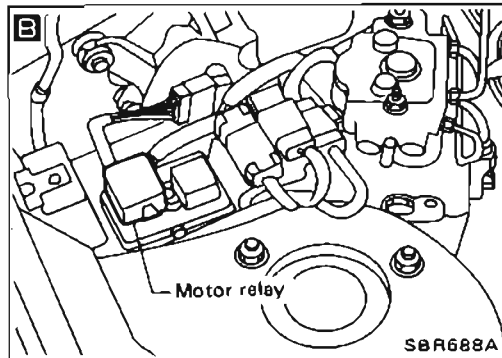
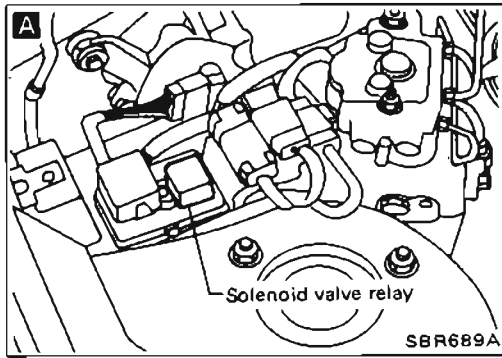
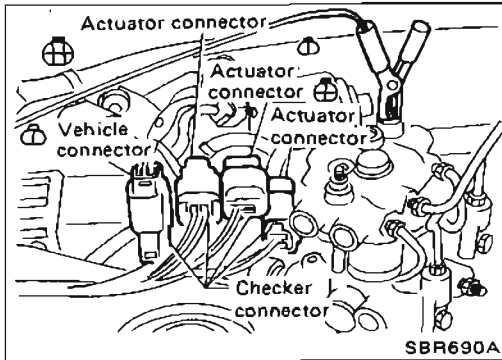
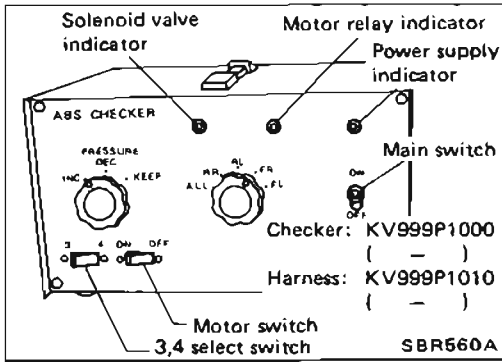
Diagnostic Procedure 12

CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)

INSPECTION START



Electrical Components Inspection ACTUATOR (Not self-diagnostic item)



INSPECTION START

Connect A.B.S. checker to actuator connector and vehicle harness with battery terminal connected and all checker switch turning off. Check that battery voltage is at least 12 volts. Use harness for 3 channel. Set select switch to 3 channel.

Turn checker power supply switch on. Check power supply indicator for coming on.

No → Replace battery with fully charged new one, if checker connection is correct.

Yes → Check checker valve relay indicator for coming on.

No → **A** Replace solenoid valve relay, if checker connection is correct.

Select one valve. Select pressure decreasing position by switch then turn motor switch on. Turn motor switch off. Select pressure increasing position.

CAUTION:
Do not hold switch at the pressure decreasing position for more than 5 seconds. Otherwise, solenoid valve may be overheated and damaged.

Repeat so that all valve will be performed.

Check motor relay indicator for coming on while motor switch is turned on.

No → **B** Replace motor relay, if checker connection is correct.

Check motor for operational sound beside the actuator in a quiet place.

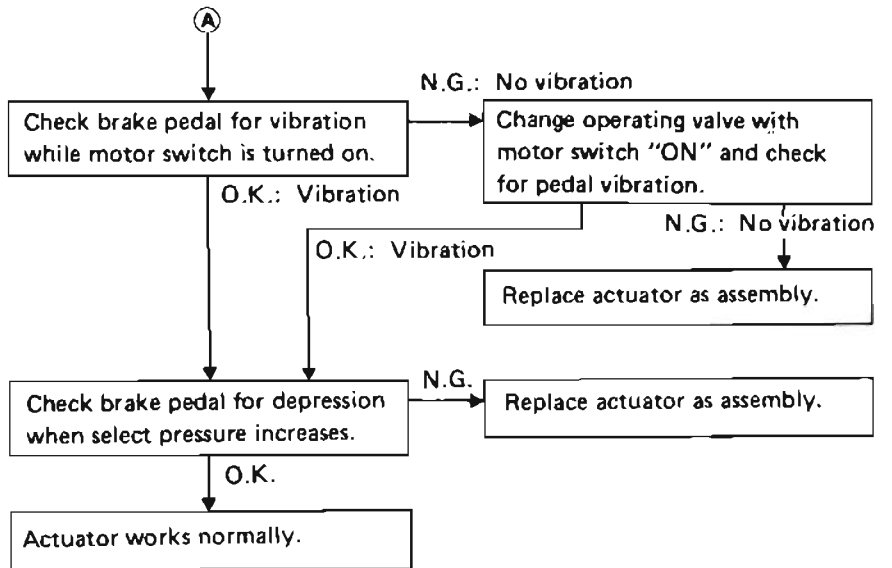
No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.

Bring checker in the vehicle and depress the brake pedal. Repeat step **A**.

Valve select switch position RR is used for 4 channel checking. In the case of 3 channels, brake pedal vibration or depression will not occur in position RR. It will occur, however, in position RL.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)



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

General Specifications

| | | | |
|----------------------------------|--------------------------------|---|---|
| Front brake | | | |
| Brake model | | CL22VB | CL26VA |
| Cylinder bore diameter | mm (in) | 54.0 (2.126) | 57.2 (2.252) |
| Pad length x width x thickness | mm (in) | 112.8 x 44.8 x 10.0 (4.44 x 1.764 x 0.394) | 134.1 x 45.3 x 11.0 (5.28 x 1.783 x 0.433) |
| Rotor outer diameter x thickness | mm (in) | 252 x 20 (9.92 x 0.79) | 257 x 22 (10.12 x 0.87) |
| Rear brake | | | |
| Brake model | | CL9H | |
| Cylinder bore diameter | mm (in) | 33.98 (1.3370) | |
| Pad length x width x thickness | mm (in) | 75.0 x 40.0 x 9.5 (2.953 x 1.575 x 0.374) | |
| Rotor outer diameter x thickness | mm (in) | 258 x 9 (10.16 x 0.35) | |
| Master cylinder | | | |
| Cylinder bore diameter | mm (in) | 22.22 (7/8) | 23.81 (15/16) |
| Control valve | | | |
| Valve model | | Proportioning valve (within master cylinder) | |
| Sprint point x reducing ratio | kPa (kg/cm ² , psi) | 3,923 (40, 569) x 0.4 | |
| Brake booster | | | |
| Booster model | | M23 | M195T |
| Diaphragm diameter | mm (in) | 230 (9.06) | Primary 205 (8.07) Secondary 180 (7.09) |
| Brake fluid | | | |
| Recommended brake fluid | | DOT 3 | |
| Parking brake | | | |
| Control type | | Center lever | |

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

Inspection and Adjustment

FRONT DISC BRAKE

| Item \ Brake model | CL22VB | CL25VA |
|--|---------------|--------------|
| Pad wear limit Minimum thickness mm (in) | 2.0 (0.079) | |
| Rotor repair limit Minimum thickness mm (in) | 18.0 (0.709) | 20.0 (0.787) |
| Maximum runout mm (in) | 0.07 (0.0028) | |

BRAKE PEDAL

| | |
|---|-----------------------------|
| Free height M/T mm (in) | 177.0 - 187.0 (6.97 - 7.36) |
| A/T mm (in) | 186.0 - 196.0 (7.32 - 7.72) |
| Depressed height [under force of 490 N (50 kg, 110 lb) with engine running] mm (in) | 100 (3.94) or more |
| Clearance between pedal stopper and threaded end of stop lamp switch mm (in) | 0.3 - 1.0 (0.012 - 0.039) |
| Clearance between pedal stopper and threaded end of A.S.C.D. switch mm (in) | 0.3 - 1.0 (0.012 - 0.039) |
| Pedal free play at clevis mm (in) | 1 - 3 (0.04 - 0.12) |

REAR DISC BRAKE

| Item \ Brake model | CL9H |
|--|---------------|
| Pad wear limit Minimum thickness mm (in) | 2.0 (0.079) |
| Rotor repair limit Minimum thickness mm (in) | 8.0 (0.315) |
| Maximum runout mm (in) | 0.07 (0.0028) |

PARKING BRAKE

| Item \ Control type | Center lever |
|---|--------------|
| Number of notches (under force of 196 N (20 kg, 44 lb)) | 6 - 8 |
| Number of notches (when warning switch comes on) | 1 |

STEERING SYSTEM

SECTION **ST**

CONTENTS

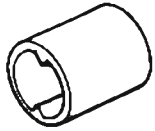
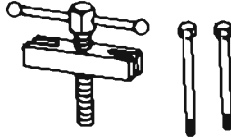
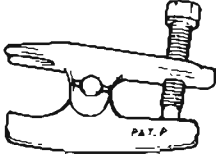
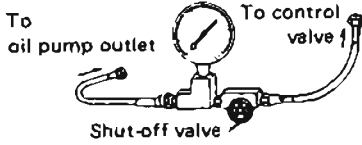
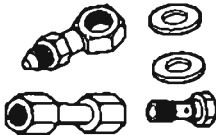
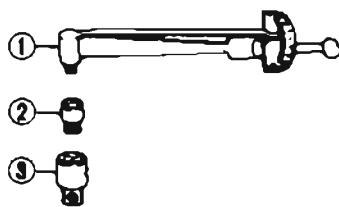
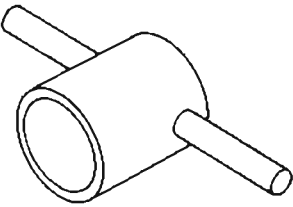
| | |
|--|-------|
| PRECAUTIONS | ST- 2 |
| PREPARATION | ST- 3 |
| ON-VEHICLE INSPECTION | ST- 5 |
| ON-VEHICLE INSPECTION (Power steering) | ST- 7 |
| STEERING WHEEL AND STEERING COLUMN | ST-10 |
| POWER STEERING GEAR AND LINKAGE (Model PR24SC) | ST-14 |
| POWER STEERING OIL PUMP | ST-27 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | ST-31 |

PRECAUTIONS

- Before disassembly, thoroughly clean the outside of the unit.
 - Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
 - When disassembling parts, be sure to place them in order in a parts rack so they can be reinstalled in their proper positions.
 - Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.
 - Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
 - Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
 - Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.
- *: Automatic transmission fluid

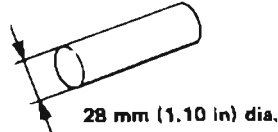
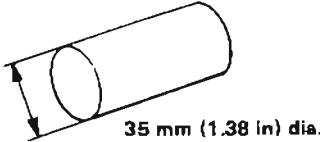
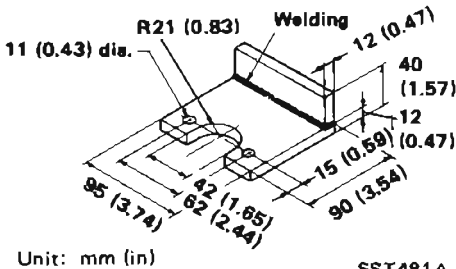
PREPARATION

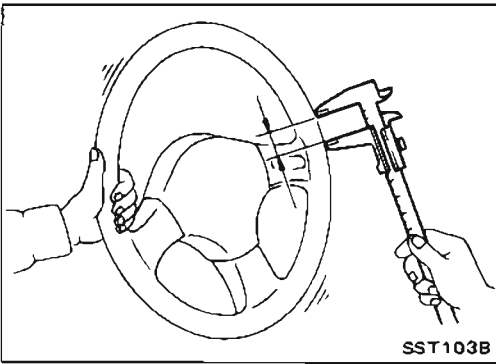
SPECIAL SERVICE TOOLS

| Tool number (Kent-Moore No.) Tool name | Description |
|---|--|
| KV48100700 (J26364) Torque adapter |  <p style="text-align: right;">Measuring pinion rotating torque</p> |
| ST27180001 (J25726-A) Steering wheel puller |  <p style="text-align: right;">Removing and installing steering wheel</p> |
| HT72520000 (J25730-A) Ball joint remover |  <p style="text-align: right;">Removing ball joint</p> |
| ST27091000 (J26357) Pressure gauge |  <p style="text-align: right;">Measuring oil pressure</p> |
| KV48102500 (-) Pressure gauge adapter |  <p style="text-align: right;">Measuring oil pressure</p> |
| ST3127S000 (See J25765-A) ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (-) Socket adapter ③ HT62900000 (-) Socket adapter |  <p style="text-align: right;">Measuring turning torque</p> |
| KV48104400 (-) Rack seal ring reformer |  <p style="text-align: right;">Reforming teflon ring</p> |

PREPARATION

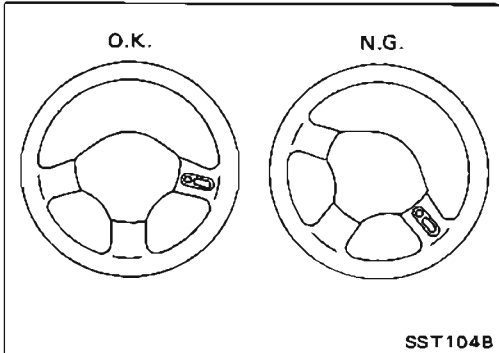
COMMERCIAL SERVICE TOOLS

| Tool name | Description |
|-----------------------|--|
| Rear oil seal drift |  <p style="text-align: center;">28 mm (1.10 in) dia.</p> <p style="text-align: right;">Installing rear oil seal</p> |
| Pinion oil seal drift |  <p style="text-align: center;">35 mm (1.38 in) dia.</p> <p style="text-align: right;">Installing pinion oil seal</p> |
| Oil pump attachment |  <p style="text-align: right;">Disassembling and assembling oil pump</p> <p style="text-align: center;">Unit: mm (in) SST481A</p> |



Checking Steering Wheel Play

- With wheels in a straight-ahead position, check steering wheel play.
Steering wheel play:
35 mm (1.38 in) or less
- If it is not within specification, check rack and pinion assembly.



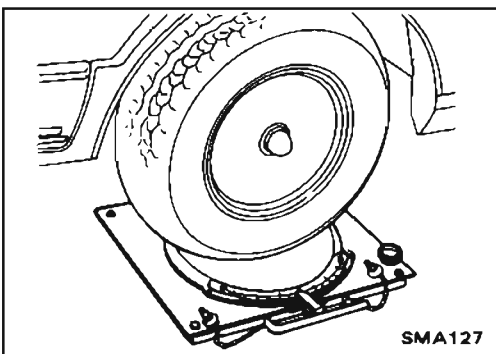
Checking Neutral Position on Steering Wheel

Pre-checking

- Verify that the steering gear is centered before removing the steering wheel.

Checking

- Check that the steering wheel is in the neutral position when driving straight ahead.
- If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
- 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.

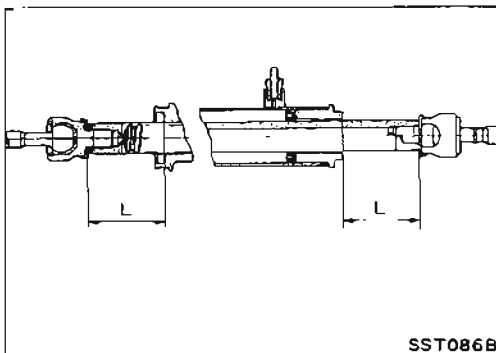


Front Wheel Turning Angle

- Rotate steering wheel all the way right and left; measure turning angle.

Turning angle of full turns:

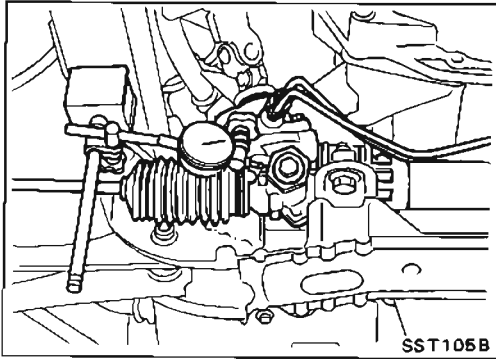
Refer to section FA for S.D.S.



- If it is not within specification, check rack stroke.

Measured length "L":

Refer to S.D.S.



Checking Gear Housing Movement

- Check the movement of steering gear housing during stationary steering. The maximum allowable movement is as follows:

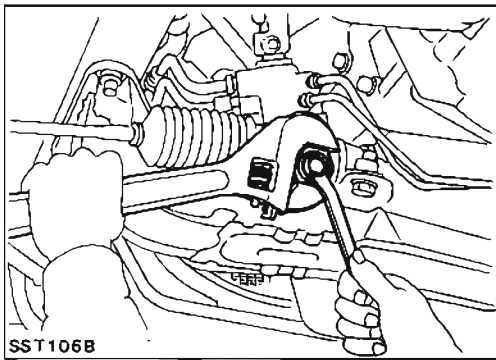
Movement of gear housing:

± 2 mm (± 0.08 in) (on dry paved surface) or less

Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.

On models equipped with power steering, turn off ignition key while checking.

- If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.

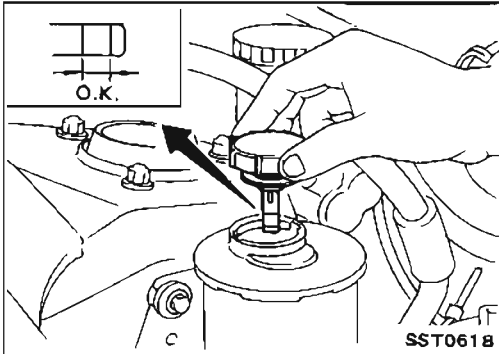


Adjusting Rack Retainer

- Perform this driving test on a flat road.
1. Check whether vehicle moves in a straight line when steering wheel is released.
 2. Check whether steering wheel returns to neutral position when steering wheel is released from a slightly turned (approx. 20°) position.
- If any abnormality is found, correct it by resetting adjusting screw.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.

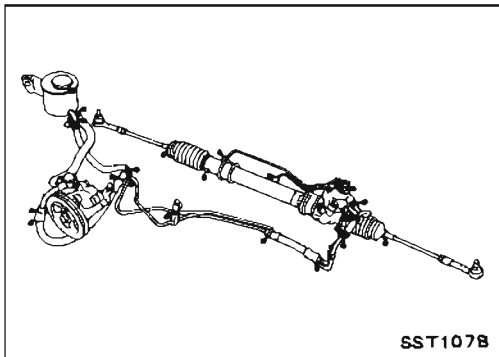


Checking Fluid Level

Check the level when the fluid is cold.

CAUTION:

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



Checking Fluid Leakage

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

1. Run engine at idle speed or 1,000 rpm.

Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

Do not overtighten connector as this can damage O-ring, washer and connector.

Bleeding Hydraulic System

1. Raise front end of vehicle until wheels clear ground.
2. Add fluid into oil tank to specified level. Meanwhile, quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
Repeat step 2 above.
 - Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

Bleeding Hydraulic System (Cont'd)

- Generation of air bubbles in reservoir tank
- Generation of clicking noise in oil pump
- Excessive buzzing in oil pump

While the vehicle is stationary or while turning the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.

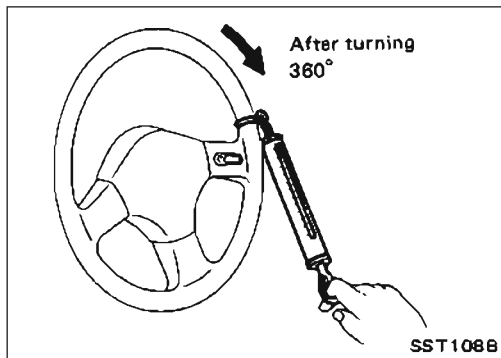
Checking Steering Wheel Turning Force

- Park vehicle on a level, dry surface and set parking brake.
- Start engine.
- Warm up power steering fluid to adequate operating temperature.

Temperature of fluid:

Approximately 60 - 80°C (140 - 176°F).

Tires need to be inflated to normal pressure.



- Check steering wheel turning force with engine idling when steering wheel has been turned 360° from neutral position.

Steering wheel turning force:

39 N (4 kg, 9 lb) or less

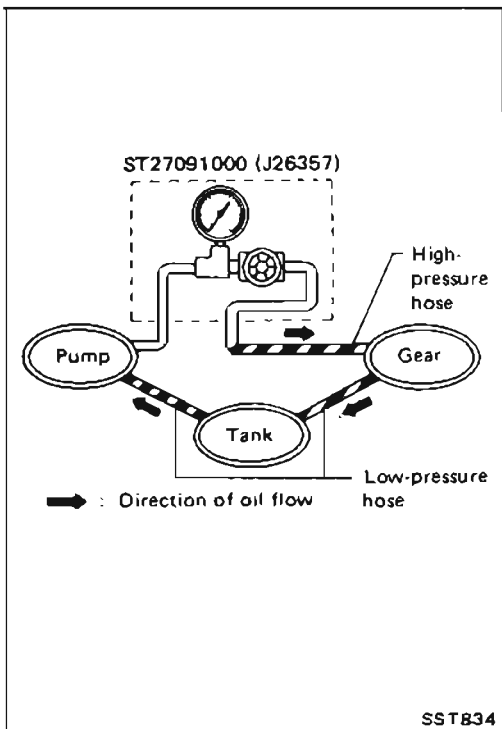
Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

- Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
- Run engine.

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).

Checking Hydraulic System (Cont'd)



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:
6,865 kPa (70 kg/cm², 995 psi)
at idling

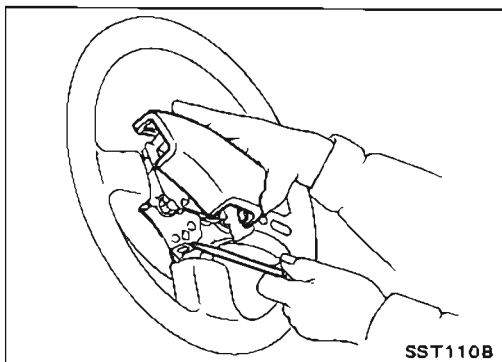
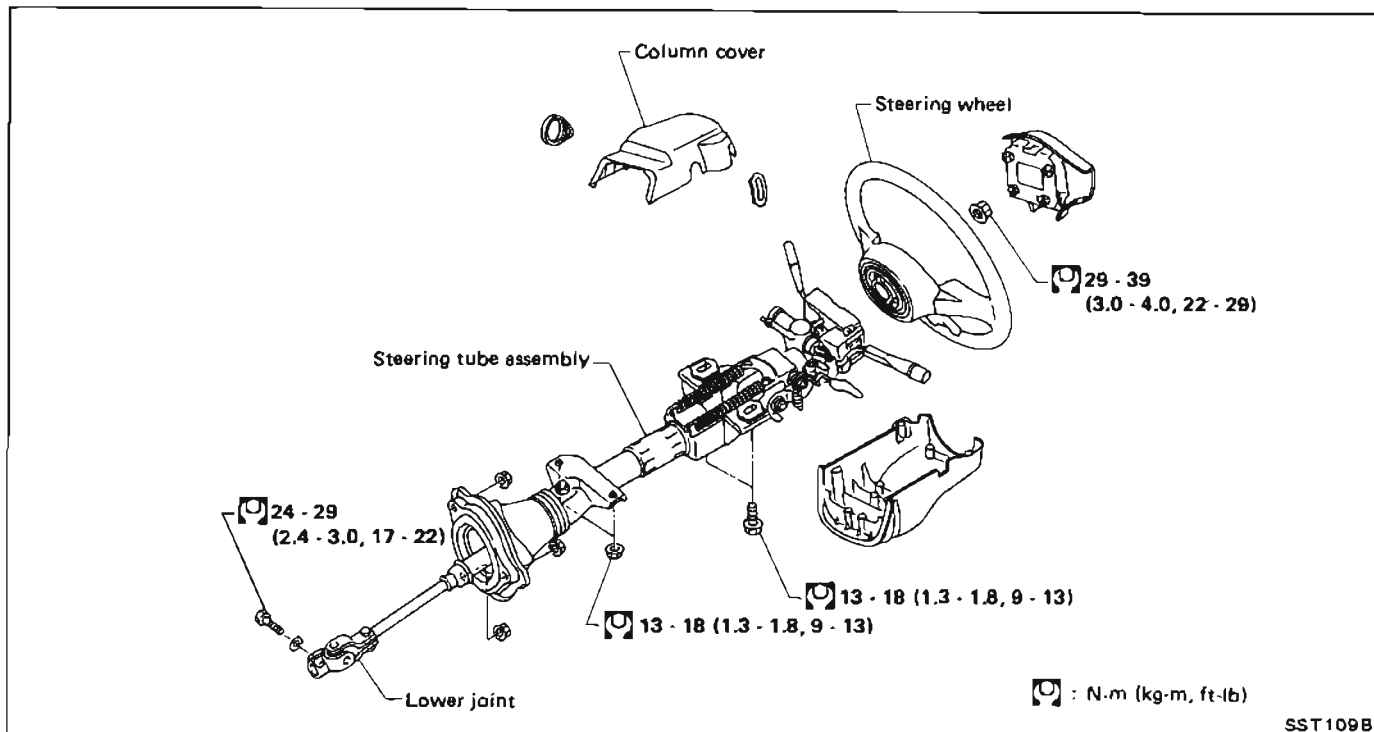
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.
 - When pressure reaches standard pressure, gear is damaged.
 - When pressure remains below standard pressure, pump is damaged.

CAUTION:

Do not close shut-off valve for more than 15 seconds.

5. If oil pressure is higher than standard pressure, pump is damaged.
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

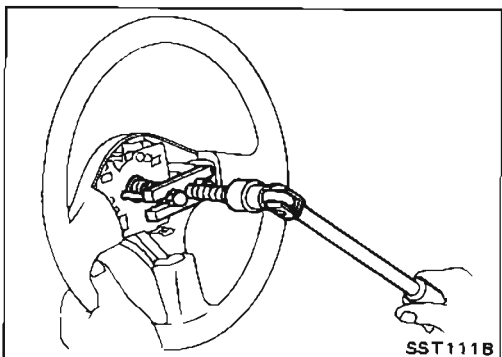
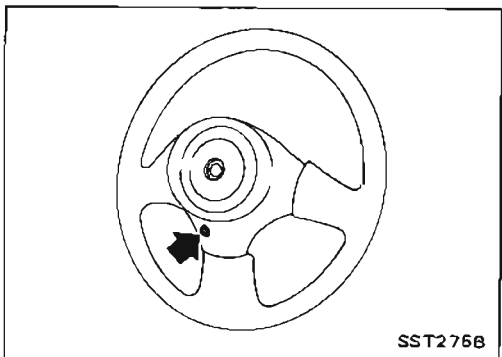
STEERING WHEEL AND STEERING COLUMN



Removal

STEERING WHEEL

- Pull out horn pad.
If it is hard to pull out horn pad, temporarily loosen fixing screw of horn pad retaining spring.



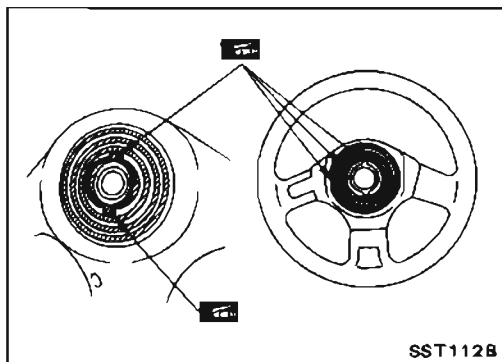
- Remove steering wheel with Tool.

STEERING WHEEL AND STEERING COLUMN

Installation

STEERING WHEEL

- When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.



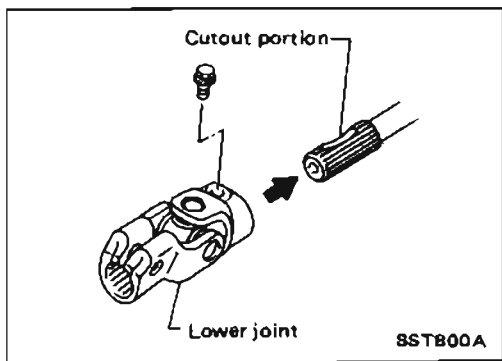
STEERING COLUMN

- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.

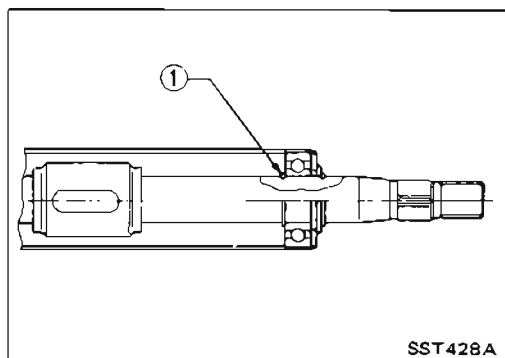
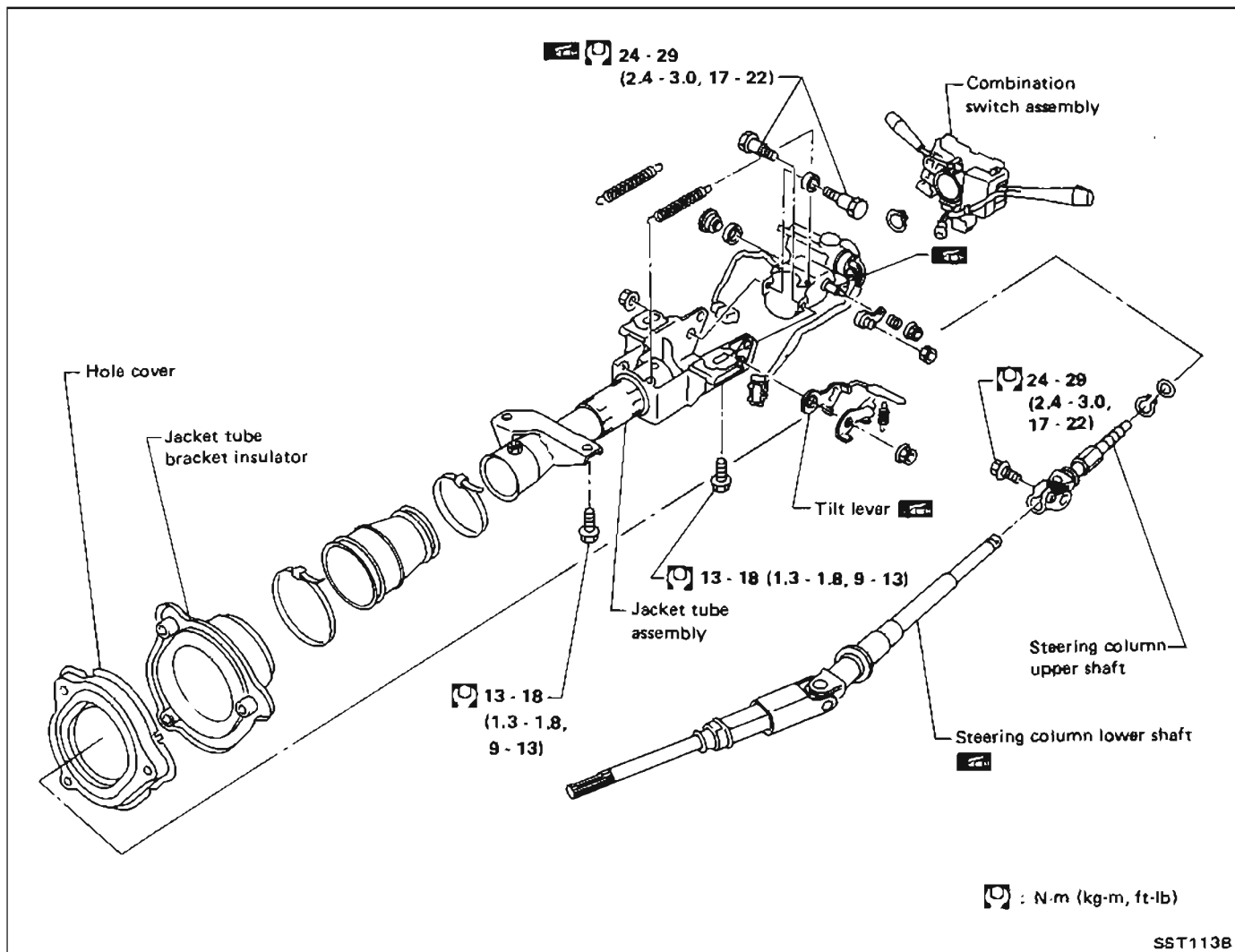
- When attaching coupling joint, be sure tightening bolt faces cutout portion.

CAUTION:

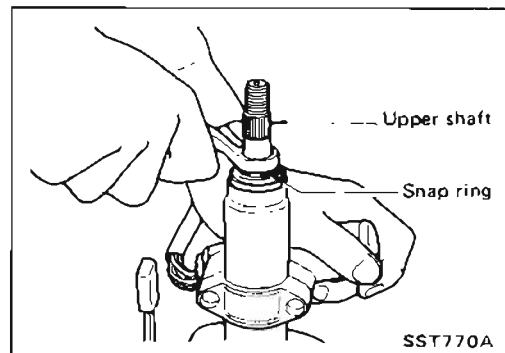
After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.



Disassembly and Assembly



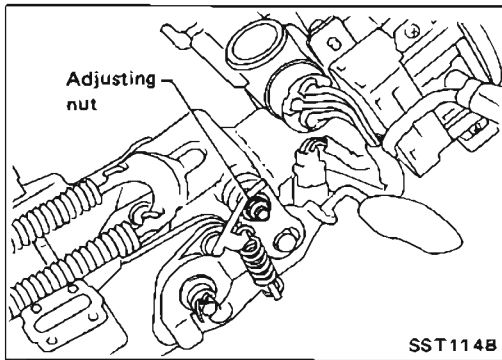
- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring ① before inserting shaft into jacket tube.



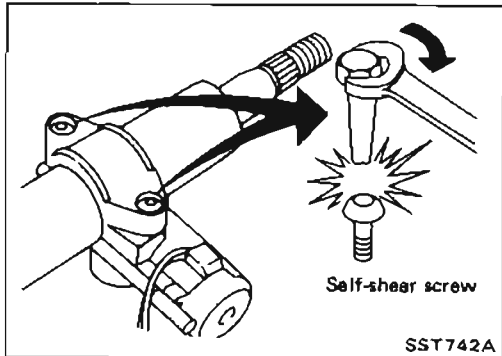
- Install snap ring on upper shaft with box wrench.

STEERING WHEEL AND STEERING COLUMN

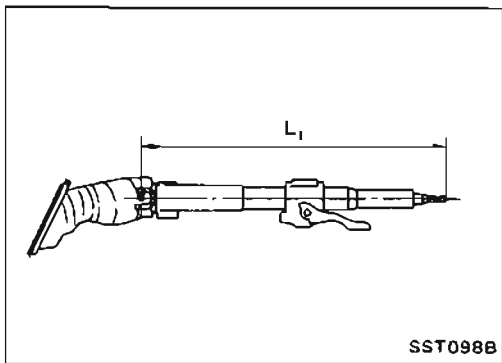
Disassembly and Assembly (Cont'd)



- Tilt mechanism
Tighten adjusting nut to specification.
⌘: 4 - 5 N·m
(0.4 - 0.5 kg-m, 2.9 - 3.6 ft-lb)



- Steering lock
 - a) Break self-shear type screws with a drill or other appropriate tool.
 - b) Install self-shear type screws and then cut off self-shear type screw heads.



Inspection

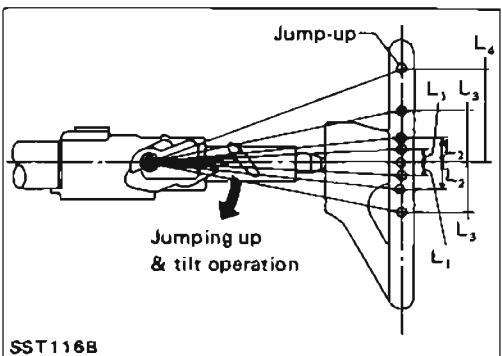
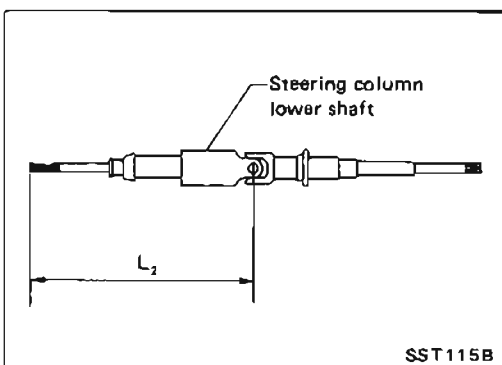
- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.
 - a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
 - b. Check steering column lower shaft for deformation or breakage. Replace if necessary.
- When the vehicle is involved in a light collision, check steering column length " L_1 " and steering column lower shaft length " L_2 ". If it is not within specifications, replace steering column as an assembly.

Steering column length " L_1 ":

653.1 - 654.5 mm (25.71 - 25.77 in)

Steering column lower shaft length " L_2 ":

323.7 - 325.3 mm (12.74 - 12.81 in)



- After installing steering column, check tilt mechanism operation.

L_1 : 9.8 mm (0.386 in)

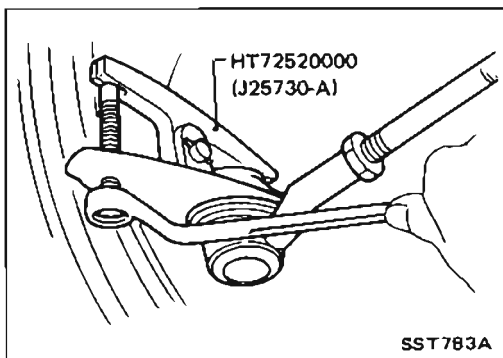
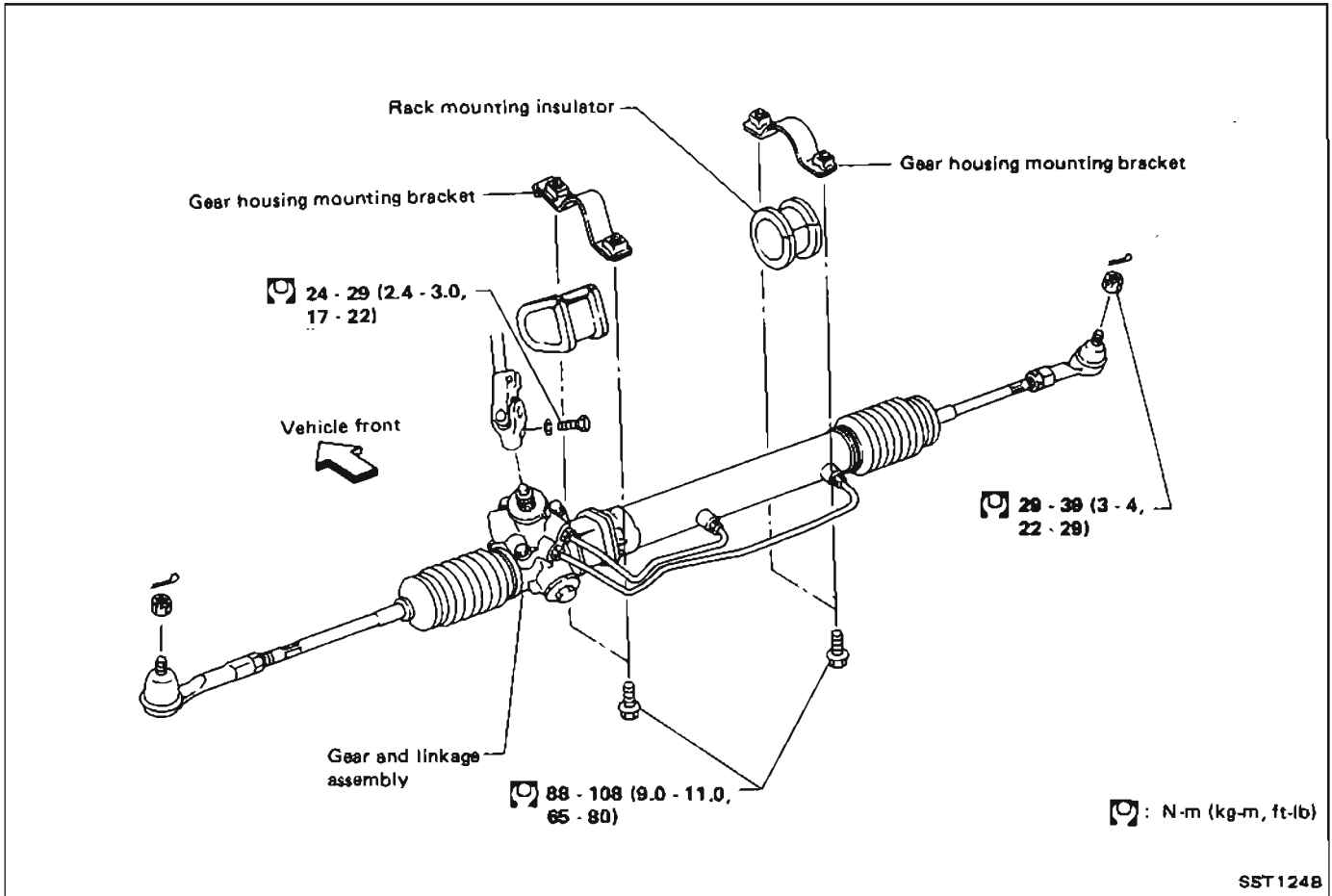
L_2 : 19.5 mm (0.768 in)

L_3 : 29.3 mm (1.154 in)

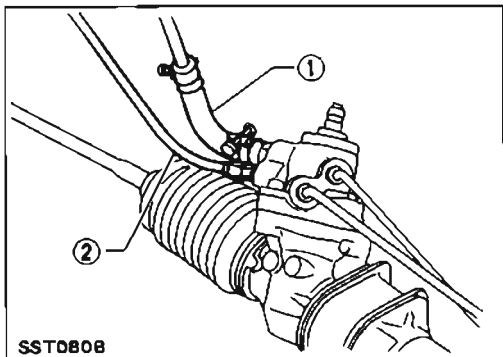
L_4 : 58.2 mm (2.291 in)

POWER STEERING GEAR AND LINKAGE (Model PR24SC)

Removal and Installation



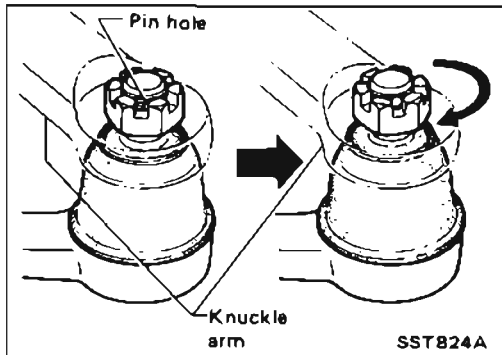
- Detach tie-rod outer sockets from knuckle arms with Tool.



- Install pipe connector.
 - ① Low-pressure side
Ⓜ: 27 - 39 N·m (2.8 - 4.0 kg·m, 20 - 29 ft·lb)
 - ② High-pressure side
Ⓜ: 15 - 25 N·m (1.5 - 2.5 kg·m, 11 - 18 ft·lb)

Removal and Installation (Cont'd)

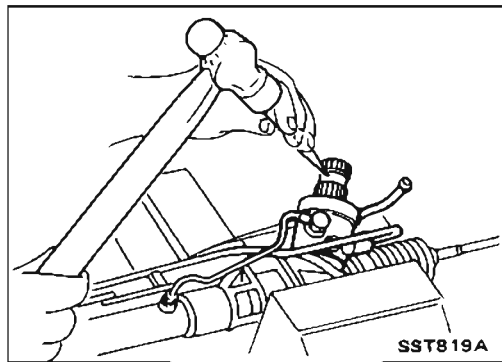
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.



- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:

Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



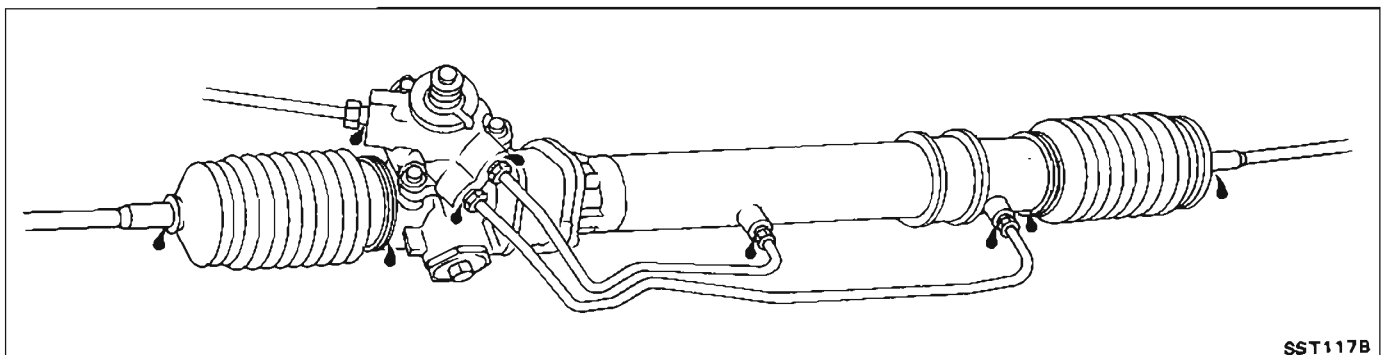
- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matching marks of pinion shaft and pinion housing.

POWER STEERING GEAR AND LINKAGE (Model PR24SC)

Disassembly and Assembly

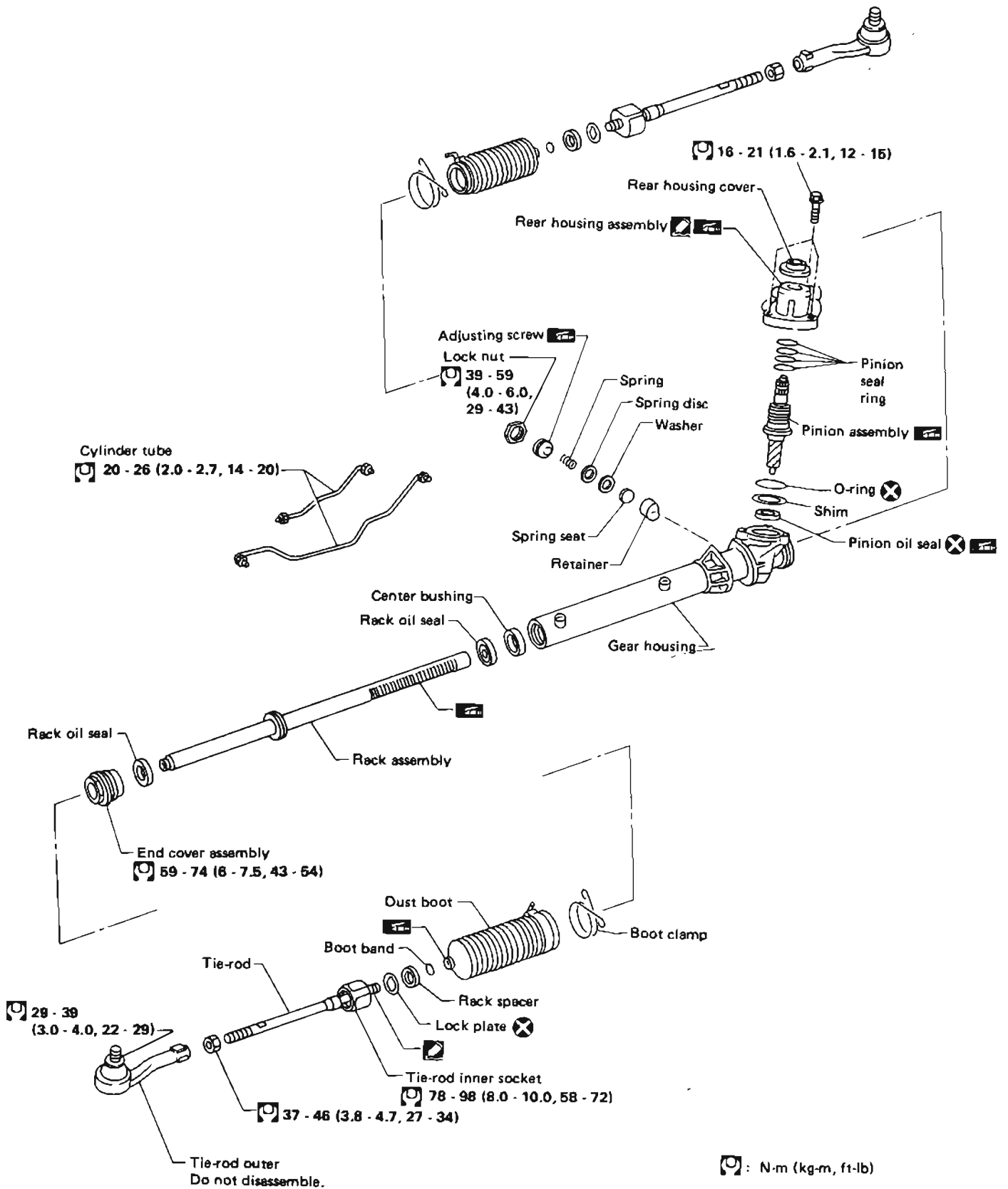
The table below lists four ways to repair oil leaks in the steering gear, depending on the location of the leak. See the following figure for oil leak locations.

| Position of oil leak Item | ① Rear housing cover and rear housing | ② Boot | ③ Boot | ④ Cylinder tube |
|------------------------------|---|--|--|---|
| Operation | <ul style="list-style-type: none"> ■ Replacement ● Rear oil seal ● Pinion oil seal ● O-ring ● Snap ring | <ul style="list-style-type: none"> ■ Replacement ● Rack oil seal ● Boot clamp | <ul style="list-style-type: none"> ● Replacement ● Rack oil seals ● Rack oil seal ● O-ring ● Back-up collar ● Boot clamp | <ul style="list-style-type: none"> ■ Replacement ● Cylinder tube ● Copper washer |
| Procedure | <div style="text-align: center;"> <p>Remove gear from vehicle.</p> <p>Measure rack starting force and pinion rotating torque.</p> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 20%;">Replace parts described above.</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">Replace rack oil seal.</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">Replace parts described above.</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">Replace cylinder tube.</div> </div> <div style="text-align: center; margin-top: 10px;"> <p>Measure pinion rotating torque.</p> <p>Adjust adjusting screw.</p> <p>Measure rack starting force and pinion rotating torque.</p> </div> | | | |
| Service parts to be prepared | <ul style="list-style-type: none"> ● Pinion seal kit | <ul style="list-style-type: none"> ● Gear housing seal kit | <ul style="list-style-type: none"> ● Rack oil seal ● Pinion seal kit | <ul style="list-style-type: none"> ● Gear housing seal kit |

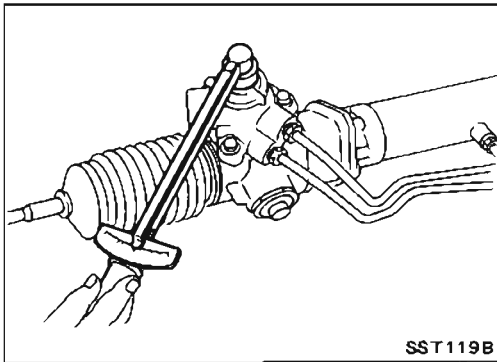


SST117B

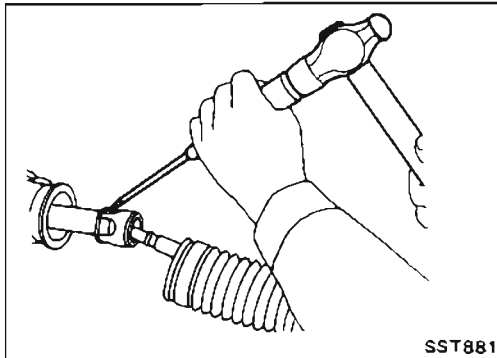
POWER STEERING GEAR AND LINKAGE (Model PR24SC)



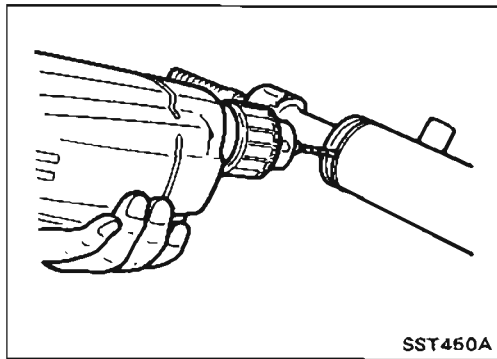
Disassembly



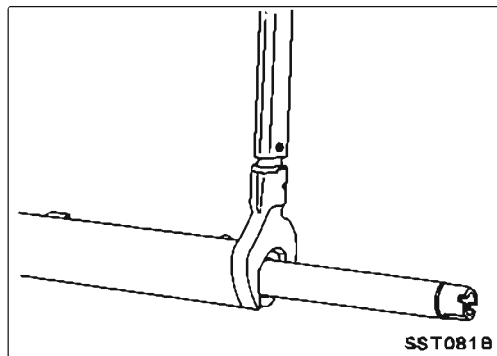
SST119B



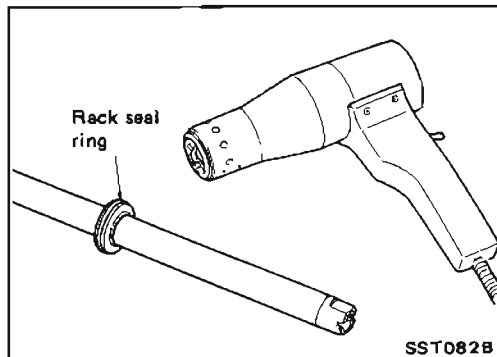
SST881



SST460A



SST081B



SST082B

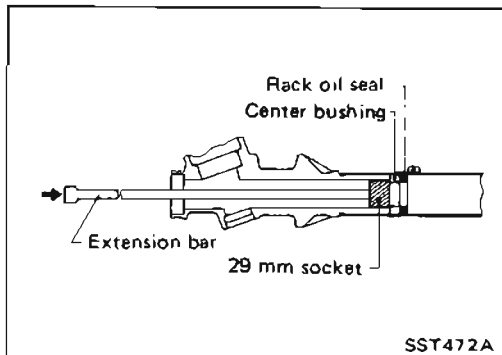
1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.
 - Before measuring, disconnect cylinder tube and drain fluid.
 - Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.
2. Remove pinion gear.
 - Be careful not to damage pinion gear when removing pinion seal ring.
3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.
7. Drill staked portion of cylinder end cover with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.
8. Remove gear housing end cover assembly with Tool.
9. Draw out rack assembly.
10. Remove rack seal ring.
 - Using a heat gun, heat rack seal to approximately 40°C (104°F).
 - Remove rack seal ring. Be careful not to damage rack.
 - Replace rack seal ring and O-ring with new ones.

POWER STEERING GEAR AND LINKAGE (Model PR24SC)

Disassembly (Cont'd)

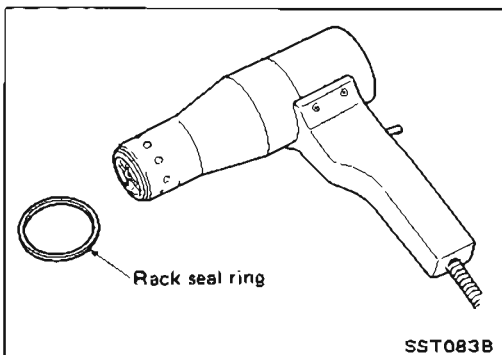
11. Remove center bushing and rack oil seal using tape wrapped socket and extension bar.

Do not scratch inner surfaces of pinion housing.



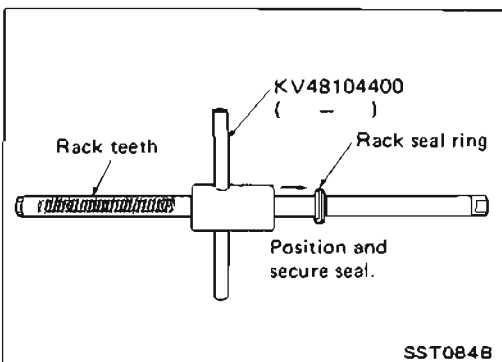
Assembly

1. Using a heat gun, heat rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.



● Using Tool, compress periphery of rack seal ring (made of Teflon) to position and secure it on rack.

Always insert the tool from the rack gear side.

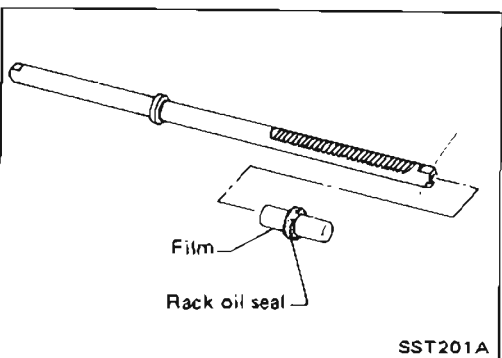


2. Insert rack oil seal.

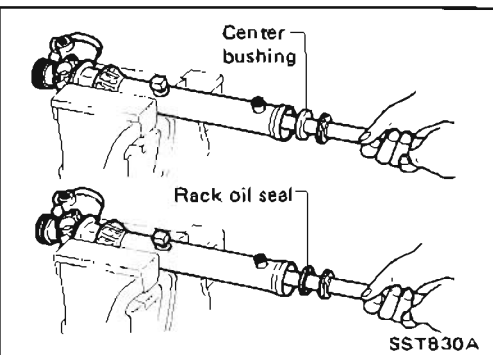
● Place plastic film into rack oil seal to prevent damage by rack teeth.

● Always remove plastic film after rack oil seal is positioned properly.

● Make sure lips of rack oil seal face each other.

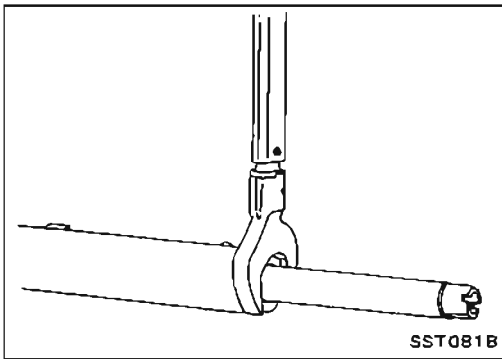


3. Install center bushing and rack oil seal with rack assembly.

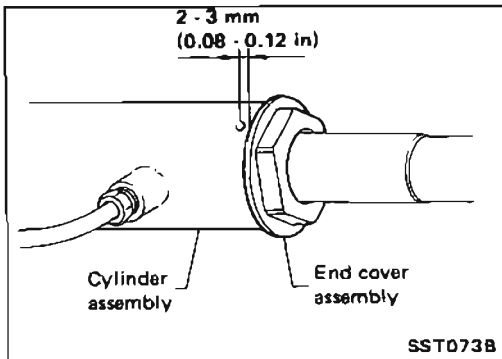


POWER STEERING GEAR AND LINKAGE (Model PR24SC)

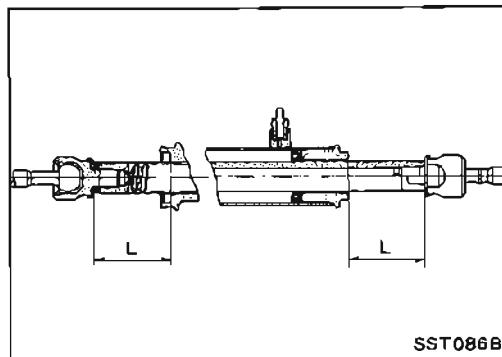
Assembly (Cont'd)



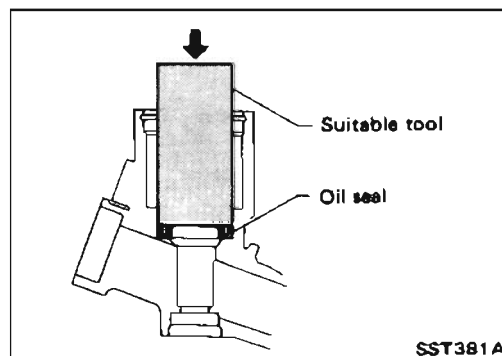
4. Tighten cylinder end cover assembly with Tool.



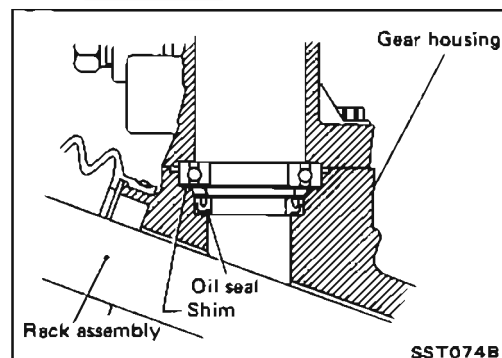
5. Fasten cylinder end cover assembly to gear housing by staking.



6. Set rack gear in neutral position.
Measured length "L":
Refer to S.D.S.



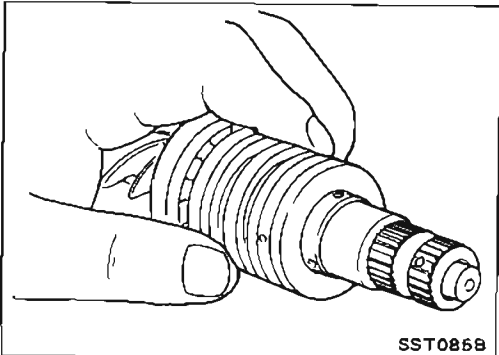
7. Coat seal lip of oil seal with multi-purpose grease and install new pinion oil seal to pinion housing with suitable tool.
 - Make sure lip of oil seal faces up when installed.



8. Install pinion bearing adjusting shim(s).
 - Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.

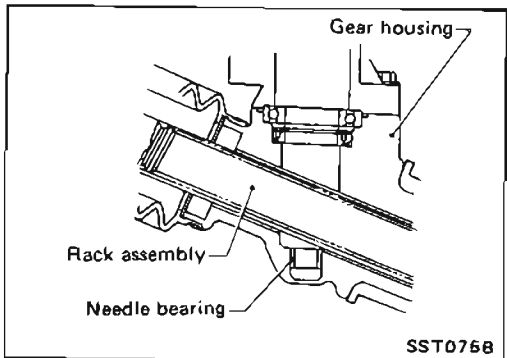
POWER STEERING GEAR AND LINKAGE (Model PR24SC)

Assembly (Cont'd)



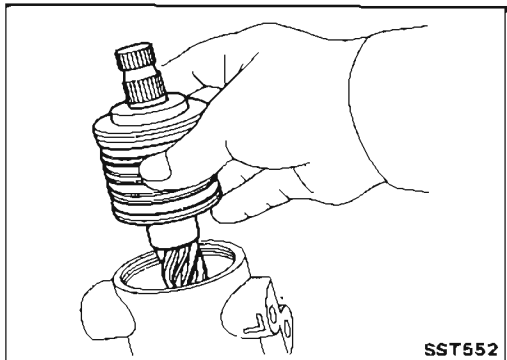
SST085B

9. Install pinion seal ring on pinion gear assembly.
 - Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
 - Make sure pinion seal ring is properly settled in valve groove.



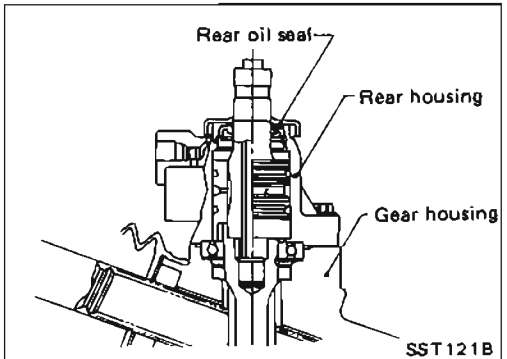
SST075B

10. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



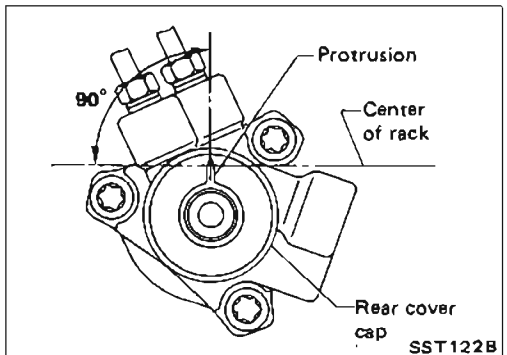
SST552

11. Install pinion assembly to pinion housing.
Be careful not to damage pinion oil seal.



SST121B

12. Apply a coat of multi-purpose grease to rear oil seal lip before installing rear housing.



SST122B

13. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left.
Be careful not to damage worm ring and oil seal.

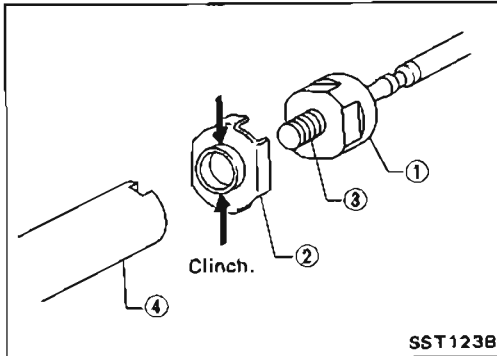
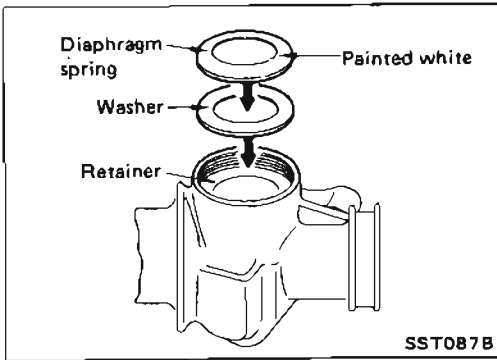
POWER STEERING GEAR AND LINKAGE (Model PR24SC)

Assembly (Cont'd)

14. Install diaphragm spring at retainer.

- Always install retainer, spring washer and diaphragm spring in that order.
- Make sure convex end (painted white) of diaphragm spring faces outward when installing.

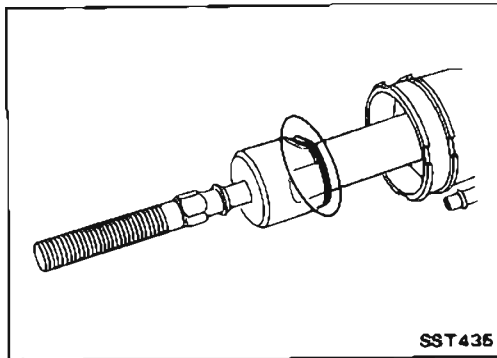
15. Install retainer spring and adjusting screw temporarily.



- 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.

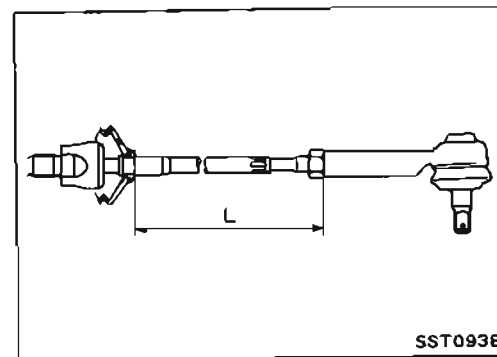
CAUTION:

To prevent scratching the boot, remove burrs from lock plate.



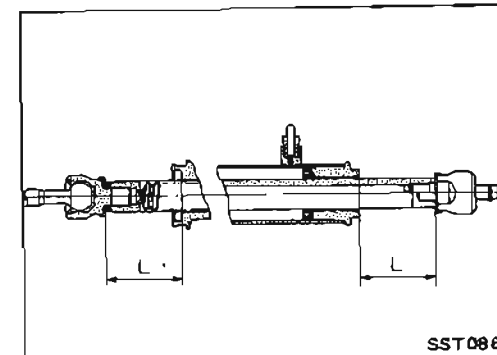
16. Tighten inner socket and securely bend lock plate at 2 cutout portions of inner socket.

To prevent damage to boot, remove burrs after bending lock plate.



17. Tighten outer socket lock nut.

Tie-rod length "L":
Refer to S.D.S.



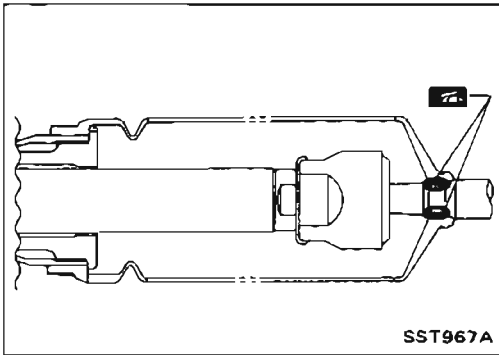
18. Measure rack stroke.

Measured length "L":
Refer to S.D.S.

POWER STEERING GEAR AND LINKAGE (Model PR24SC)

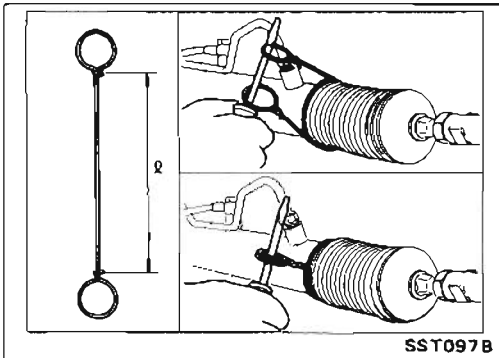
Assembly (Cont'd)

19. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

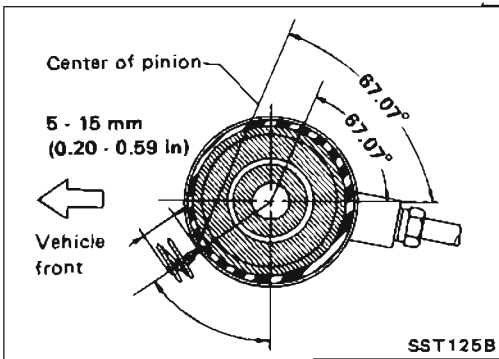


20. Install boot clamps.

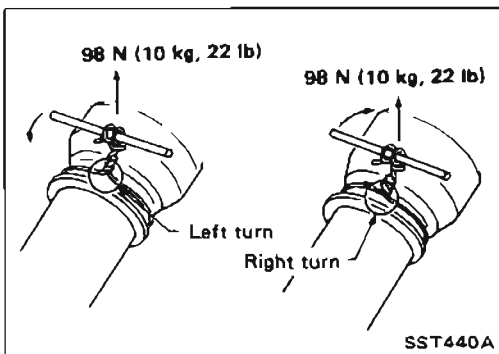
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).



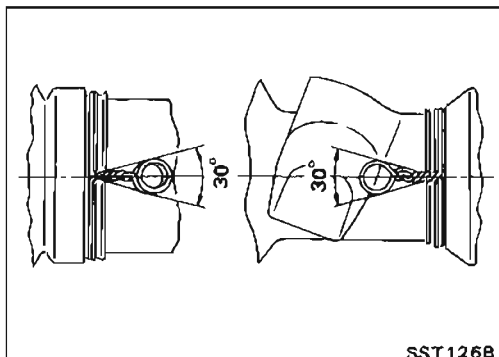
- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will prevent interference with other parts.)

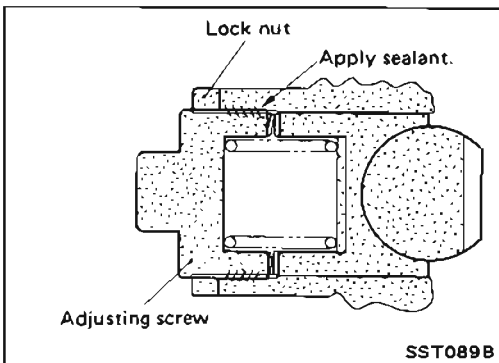


- Twist boot clamp in the direction shown in figure at left.



- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.

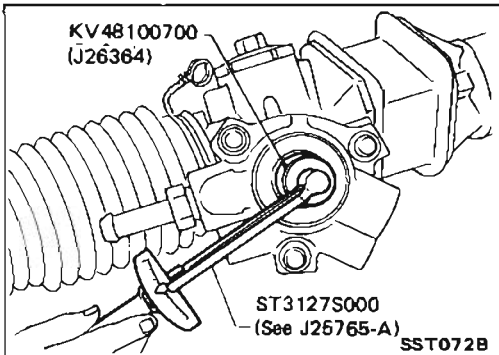




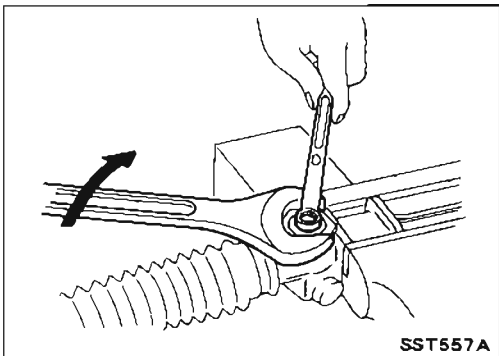
Adjustment

Adjust pinion rotating torque as follows:

1. Set gears to Neutral without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.05 to 0.20 N·m (0.5 to 2 kg-cm, 0.43 to 1.74 in-lb).
6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of 180° from neutral position.
Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
9. Loosen adjusting screw by 40° to 60°.



10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.



11. Check steering gear for rack sliding frictional force.

Around neutral point of rack stroke

± 5.5 mm (± 0.217 in):

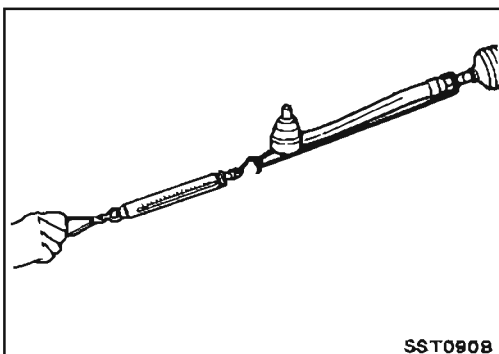
122.6 - 166.7 N (12.5 - 17 kg, 27.6 - 37.5 lb)

Except for neutral point:

122.6 - 186.3 N (12.5 - 19 kg, 27.6 - 41.9 lb)

If sliding frictional force is out of specification, repeat the adjustment procedure, starting from No. 4.

After the readjustment, if sliding force is still out of specification, steering gear is damaged.



12. Measure pinion rotating torque within the range of ± 100° from the neutral point.

Average rotating torque

[(Max. measured value + Min. measured value) x 0.5]:

0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)

Maximum torque increment:

Less than 0.4 N·m (4 kg-cm, 3.5 in-lb)

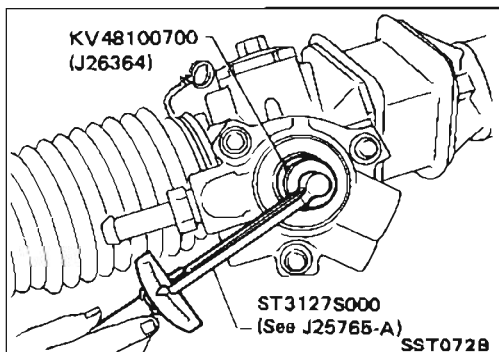
Except for above mentioned measuring range:

Maximum rotating torque

1.9 N·m (19 kg-cm, 16 in-lb)

Maximum torque increment

Less than 0.6 N·m (6 kg-cm, 5.2 in-lb)



Adjustment (Cont'd)

- If pinion rotating torque is not within specification, readjust it.
- After the readjustment, if pinion rotating torque is still out of specification, steering gear is damaged.

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "DEXRON™ Type", and blow dry with compressed air, if available.

BOOT

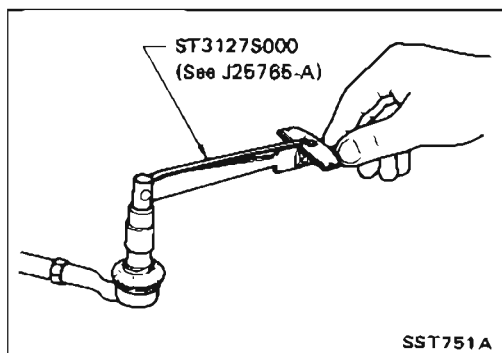
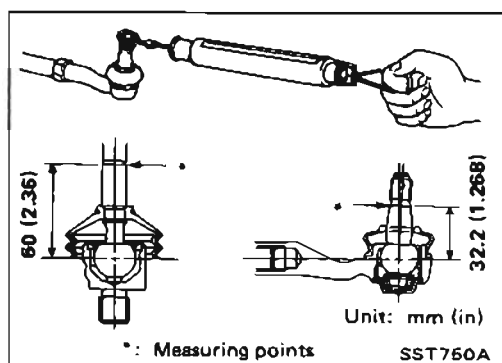
Check condition of boot. If cracked excessively, replace it.

RACK

Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

PINION ASSEMBLY

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.



TIE-ROD OUTER AND INNER SOCKET

- Check ball joint for swinging force.

Tie-rod outer ball joint:

9.12 - 91.30 N

(0.93 - 9.31 kg, 2.05 - 20.53 lb)

Tie-rod inner ball joint:

8.14 - 122.6 N

(0.83 - 12.5 kg, 1.83 - 27.6 lb)

- Check ball joint for rotating torque.

Tie-rod outer ball joint:

0.29 - 2.94 N·m

(3.0 - 30.0 kg·cm, 2.6 - 26.0 in·lb)

Tie-rod inner ball joint:

7.4 N·m (75 kg·cm, 65 in·lb) or less

Inspection (Cont'd)

- Check ball joint for axial end play.

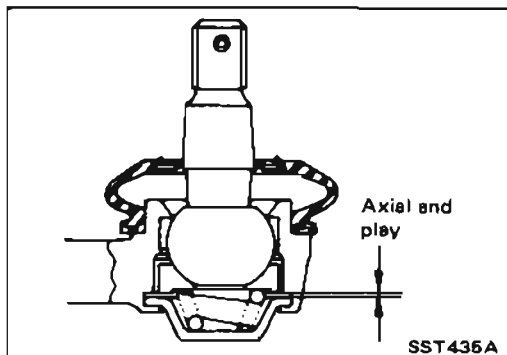
Tie-rod outer ball joint:

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.

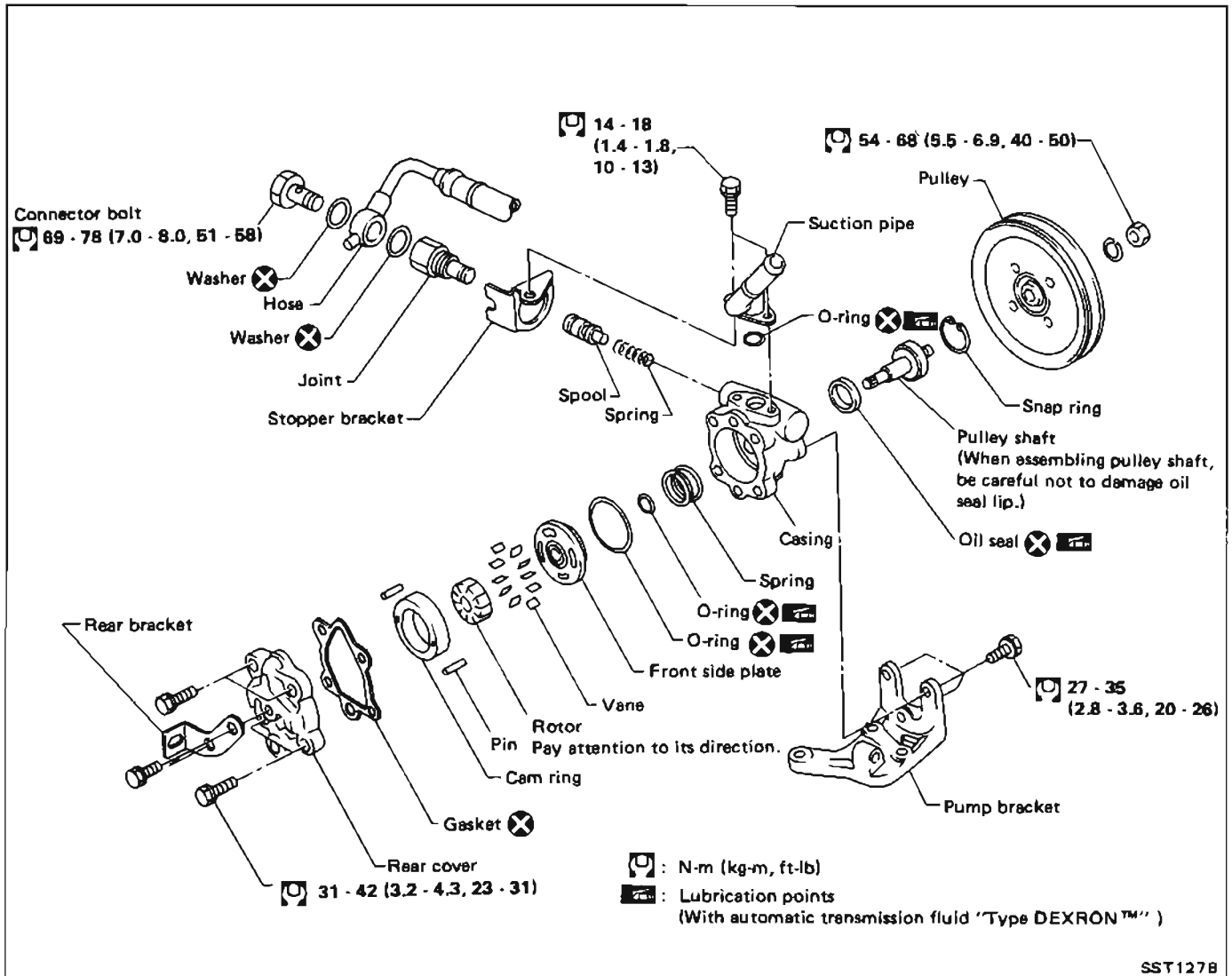


CYLINDER TUBES

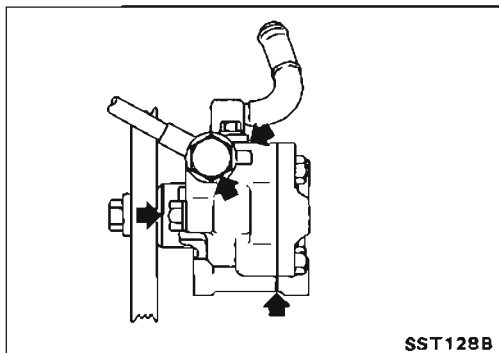
Check cylinder tubes for scratches or other damage. Replace if necessary.

POWER STEERING OIL PUMP

Disassembly and Assembly



SST127B



SST128B

Pre-disassembly Inspection

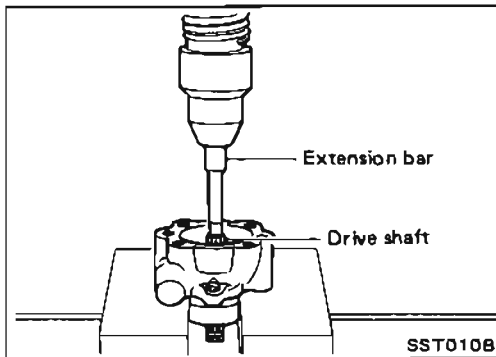
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.

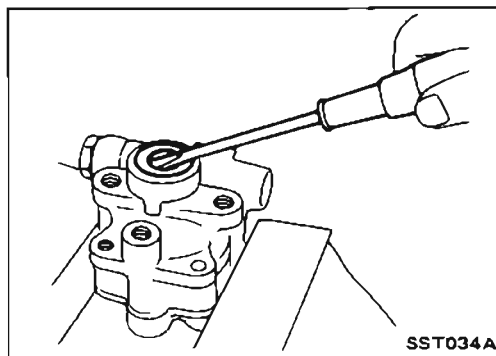
Disassembly

CAUTION:

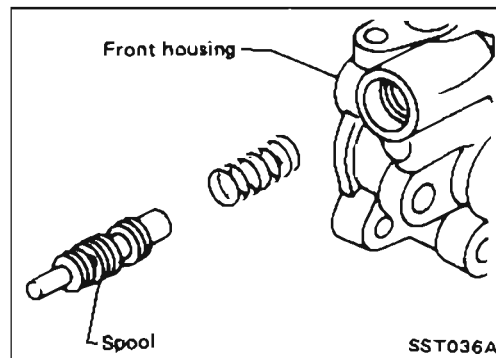
- Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.
- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- Follow the procedures and cautions in the Service Manual.
- When disassembling and reassembling, do not let foreign matter enter or contact the parts.



- Remove snap ring, then draw pulley shaft out. Be careful not to drop pulley shaft.



- Remove oil seal. Be careful not to damage front housing.



- Remove connector. Be careful not to drop spool.

Inspection

PULLEY AND PULLEY SHAFT

- If pulley is cracked or deformed, replace it.
- If an oil leak is found around pulley shaft oil seal, replace the seal.
- If serration of pulley or pulley shaft is deformed or worn, replace it.

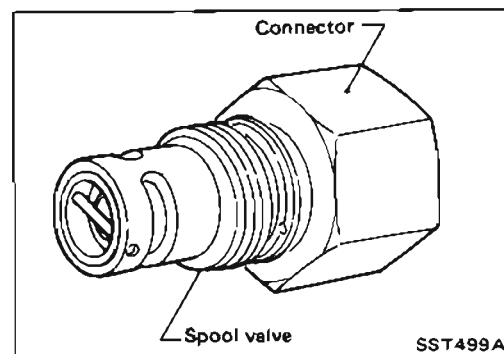
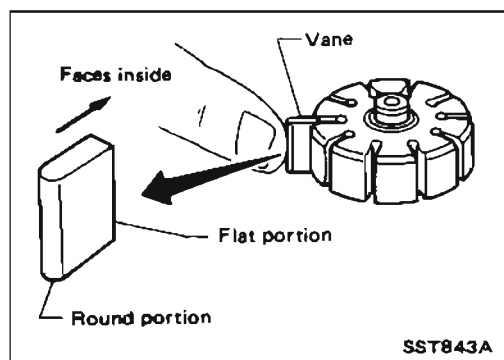
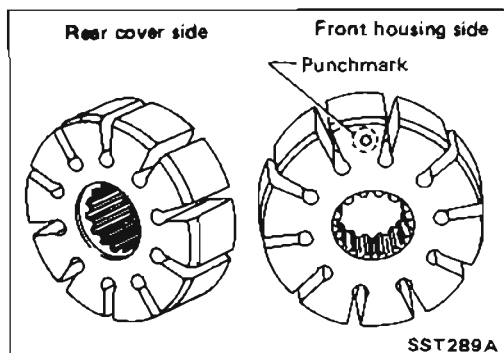
Assembly

Assemble oil pump in the reverse order of disassembly, noting the following instructions.

- Before installation, coat the O-rings and oil seal with A.T.F.*
 - Make sure O-rings and oil seal are properly installed.
 - When assembling vanes to rotor, rounded surfaces of vanes must face cam case side.
 - Always install new O-rings and oil seal.
 - Be careful of oil seal direction.
- *: Automatic Transmission Fluid

- Pay attention to the direction of rotor.

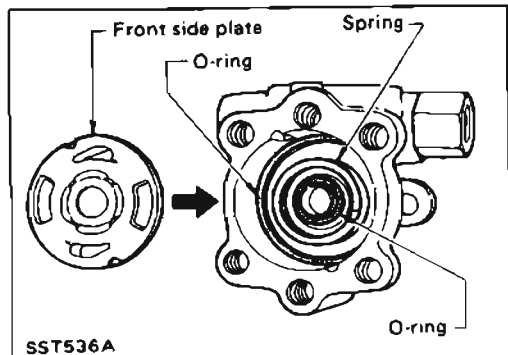
- Install vanes properly.



CAUTION:

Do not remove spool valve from connector.

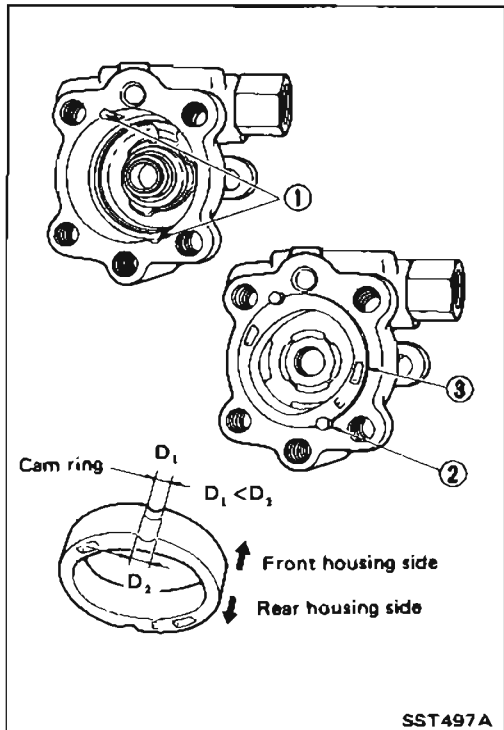
- Apply A.T.F.* to O-ring.
- *: Automatic Transmission Fluid



POWER STEERING OIL PUMP

Assembly (Cont'd)

- Insert pin ② into pin groove ① of front housing and rotor. Then install cam ring ③ as shown at left.



General Specifications

| | |
|--|-------------------|
| Steering model | Power steering |
| Steering gear type | PR24SC |
| Steering overall gear ratio | 16.8 |
| Turn of steering wheel (Lock to lock) | 3.1 |
| Steering column type | Collapsible, tilt |

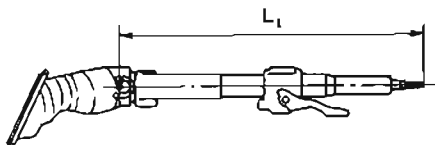
Inspection and Adjustment

GENERAL

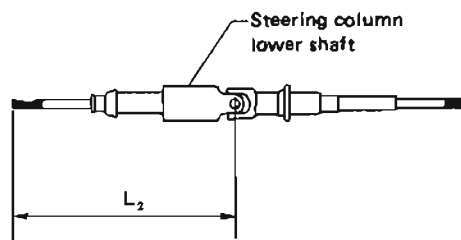
| | |
|--------------------------------------|-------------------|
| Steering wheel axial play mm (in) | 0 (0) |
| Steering wheel play mm (in) | 0 - 35 (0 - 1.38) |

STEERING COLUMN

| | |
|--|-------------------------------|
| Steering column length "L ₁ " mm (in) | 653.1 - 654.5 (25.71 - 25.77) |
| Steering column lower shaft length "L ₂ " mm (in) | 323.7 - 325.3 (12.74 - 12.81) |



SST098B

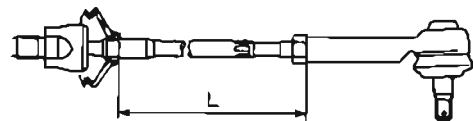


SST115B

STEERING GEAR AND LINKAGE

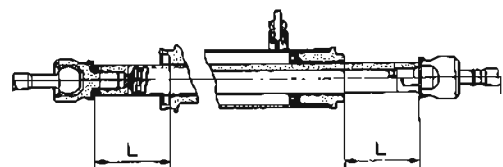
| Item | Steering gear type | PR24SC |
|-----------------------------|----------------------------|-----------------------------|
| Tie-rod outer ball joint | | 9.12 - 91.30 |
| | N (kg, lb) | (0.93 - 9.31; 2.05 - 20.63) |
| Rotating torque | | 0.29 - 2.94 |
| | N·m (kg-cm, in-lb) | (3.0 - 30.0, 2.6 - 26.0) |
| Axial end play | mm (in) | 0.5 (0.020) |
| Tie-rod inner ball joint | | 8.14 - 122.6 |
| | Swinging force* N (kg, lb) | (0.83 - 12.5, 1.83 - 27.6) |
| Rotating torque | | 7.4 (75, 65) or less |
| | N·m (kg-cm, in-lb) | |
| Axial end play | mm (in) | 0 (0) |
| Tie-rod standard length "L" | mm (in) | 176.8 (6.96) |

*: Measuring point



SST093B

| | | |
|-------------------------------|--------------------|--------------------------|
| Pinion gear preload (Average) | | 0.78 - 1.27 |
| | N·m (kg-cm, in-lb) | (8.0 - 13.0, 6.9 - 11.3) |
| Rack stroke "L" | mm (in) | 68.5 (2.697) |



SST086B

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

Inspection and Adjustment (Cont'd)

POWER STEERING

| | |
|---|---|
| Rack sliding force N (kg, lb) | 166.7 - 255.6 (17.0 - 23.0, 37.5 - 50.7) |
| Steering wheel turning force (Measured at one full turn from neutral) N (kg, lb) | 39 (4, 9) or less |
| Normal operating temperature of power steering fluid °C (°F) | 60 - 80 (140 - 176) |
| Fluid capacity (Approximate) ℓ (US qt, Imp qt) | 0.9 (1, 3/4) |
| Oil pump maximum pressure kPa (kg/cm ² , psi) | 6,865 (70, 995) |

SECTION BF**CONTENTS**

| | |
|--|-------|
| GENERAL SERVICING | |
| (Including all clips & fasteners) | BF- 2 |
| BODY END | BF- 6 |
| DOOR | |
| (Including "Power Window" & "Power Door Lock") | BF-12 |
| INSTRUMENT PANEL | BF-18 |
| INTERIOR AND EXTERIOR | |
| (In EXTERIOR, including "Weatherstrips") | BF-20 |
| SEAT | BF-30 |
| AUTOMATIC SEAT BELT SYSTEM | BF-32 |
| TROUBLE DIAGNOSES | BF-39 |
| SUN ROOF | BF-66 |
| WINDSHIELD AND WINDOWS | BF-70 |
| MIRROR – Door Mirror | BF-77 |
| REAR COMBINATION LAMP | BF-78 |
| FRONT AND REAR AIR SPOILER | BF-79 |
| BODY ALIGNMENT | BF-80 |

When you read wiring diagrams:

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

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

★ For conventional seat belt, refer to MA section.



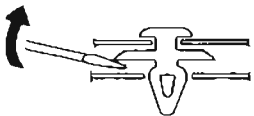

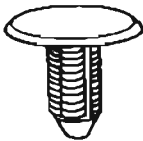
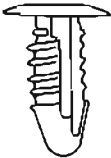
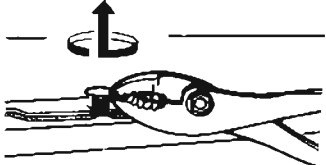
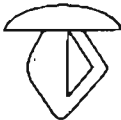
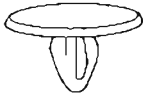
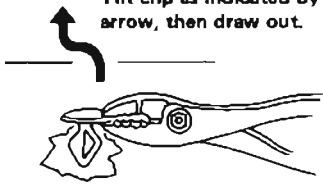
GENERAL SERVICING

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.

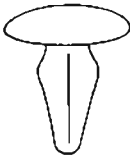

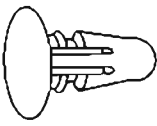
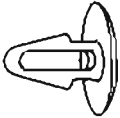

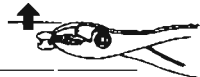


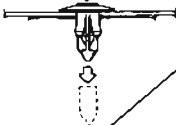
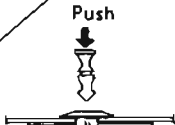

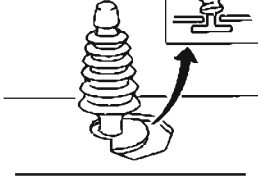
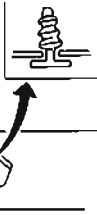
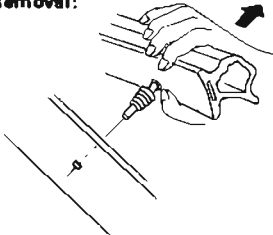
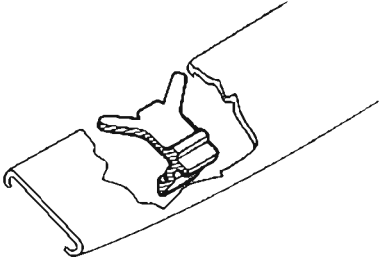
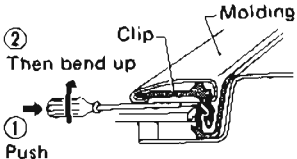
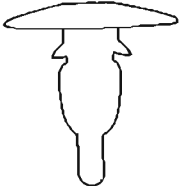
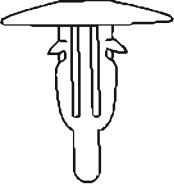
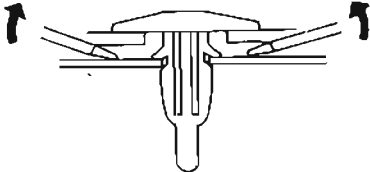
Clip and Fastener

- 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 |  SBF092B |  SBF109B | <p>Removal: Remove by bending up with a flat-bladed screwdriver.</p>  SBF094B |
| C102 |  SBF113B |  SBF114B  SBF137B |  <p>Removal: Pull up by rotating.</p> <p>SBF115B</p> |
| C105 |  SBF141B |  SBF142B | <p>Removal: Tilt clip as indicated by arrow, then draw out.</p>  SBF143B |

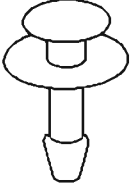
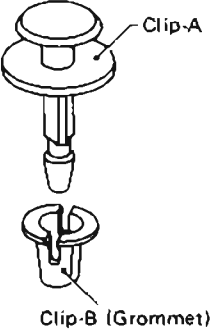
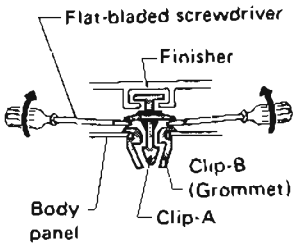
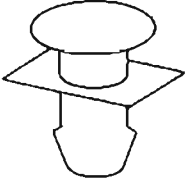
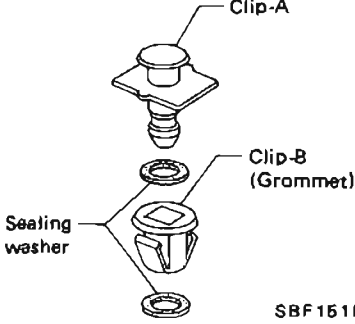
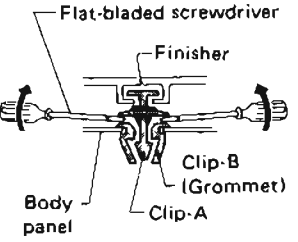
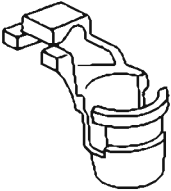
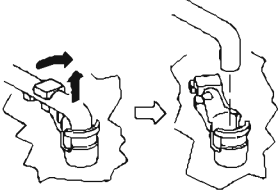

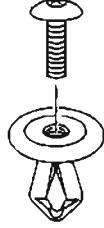

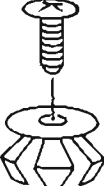
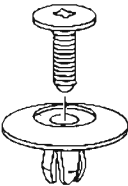
GENERAL SERVICING

Clip and Fastener (Cont'd)

| No. | Symbol | Shape | Shape | Removal & Installation |
|-------|--|--|--|---|
| C106 |  SBF089B |  |   SBF090B | <p>Removal: Remove with a flat-bladed screwdrivers or plier.</p>   SBF091B |
| C203 |  SBF318C |  SBF319C |  Push | <p>Push center pin to catching position. (Do not remove center pin by hitting it.)</p>  Push Installation: SBF320C |
| CE103 |  SBF103B |  SBF104B |  | <p>Removal:</p>  SBF147B |
| CE106 |  SBF653B | | | <p>Removal:</p>  SBF654B |
| CE117 |  SBF173D |  SBF174D | | <p>Removal: Remove with a flat-bladed screwdriver or pliers.</p>  SBF175D |

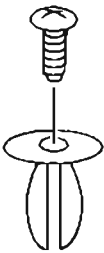
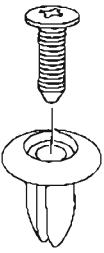
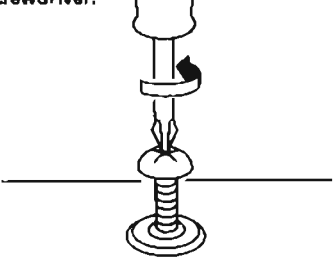
GENERAL SERVICING

Clip and Fastener (Cont'd)

| No. | Symbol | Shape | Removal & Installation |
|--|--|--|--|
| <p style="text-align: center;">(CF113)</p> |  <p style="text-align: center;">SBF036C</p> |  <p style="text-align: center;">SBF036C</p> | <p>Removal:</p>  <p style="text-align: right;">SBF652B</p> |
| <p style="text-align: center;">(CF118)</p> |  <p style="text-align: center;">SBF150D</p> |  <p style="text-align: center;">SBF151D</p> | <p>Removal:</p>  <p style="text-align: right;">SBF652B</p> |
| <p style="text-align: center;">(CR103)</p> |  <p style="text-align: center;">SBF768B</p> | | <p>Removal: Holder portion of clip must be spread out to remove rod.</p>  <p style="text-align: right;">SBF770B</p> |
| <p style="text-align: center;">(CS102)</p> |  <p style="text-align: center;">SBF138B</p> |  <p style="text-align: center;">SBF139B</p> | <p>Removal: Screw out with a Phillips screwdriver.</p>  <p style="text-align: right;">SBF140B</p> |
| <p style="text-align: center;">(CS103)</p> |  <p style="text-align: center;">SBF363B</p> |  <p style="text-align: center;">SBF364B</p> | |

GENERAL SERVICING

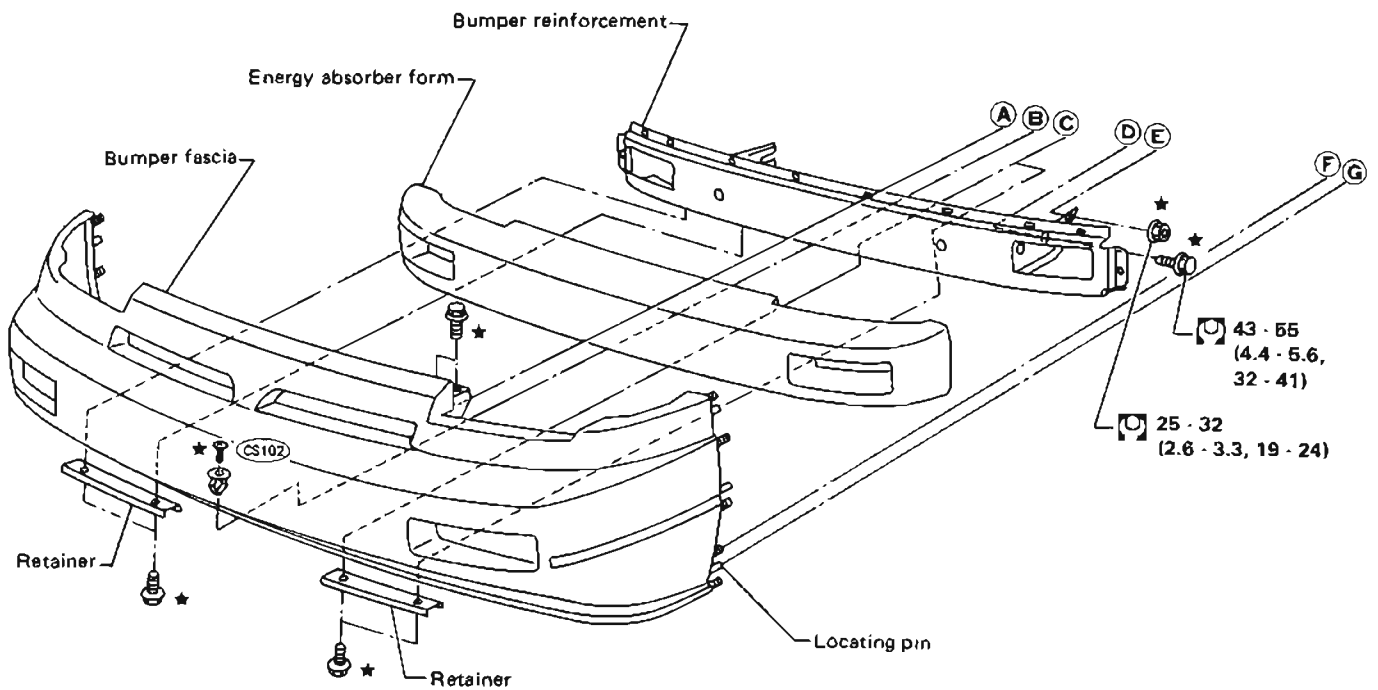
Clip and Fastener (Cont'd)

| No. | Symbol | Shape | Removal & Installation |
|-------|--|--|--|
| CS104 |  <p>SBF361B</p> |  <p>SBF362B</p> | <p>Removal: Screw out with a Phillips screwdriver.</p>  <p>SBF140B</p> |

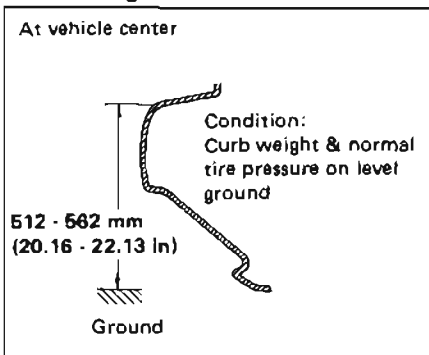
BODY END

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.



Bumper height



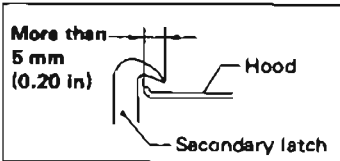
BODY END

Body Front End (Cont'd)

Hood lock adjustment

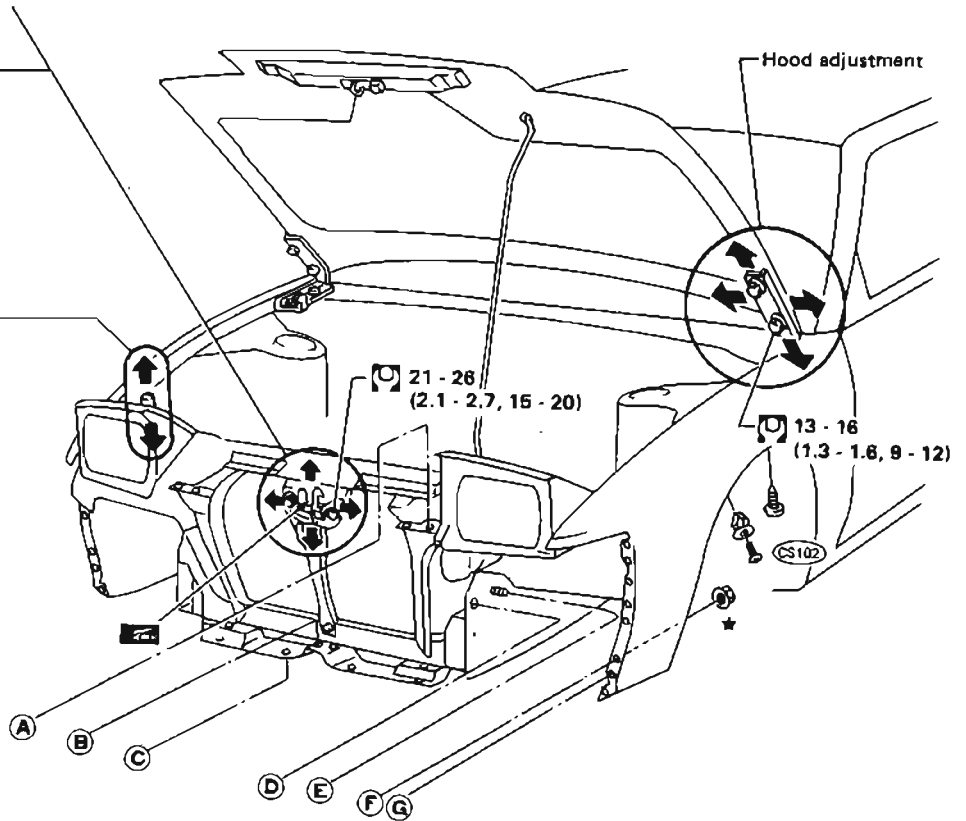
- Adjust lock so that hood primary lock meshes at a position where hood is 1 to 1.5 mm (0.039 to 0.069 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length



Bumper rubber adjustment

- Adjust so that hood is aligned with fender. [Bumper rubber free height is approx. 20 mm (0.79 in).]



- ★ : Bumper assembly mounting bolts and nuts
- ⊕ : N·m (kg·m, ft·lb)

SBF174E

Body Rear End and Opener

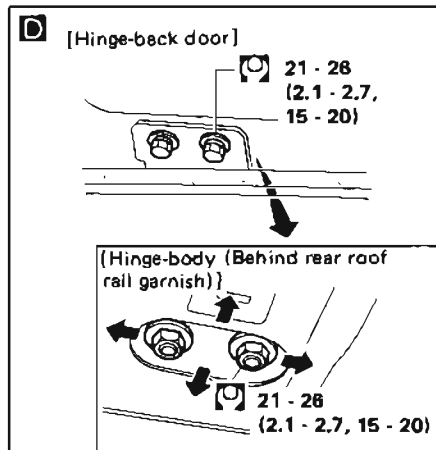
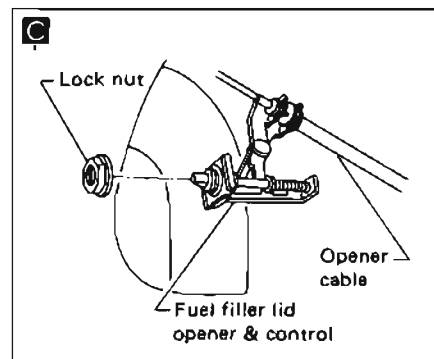
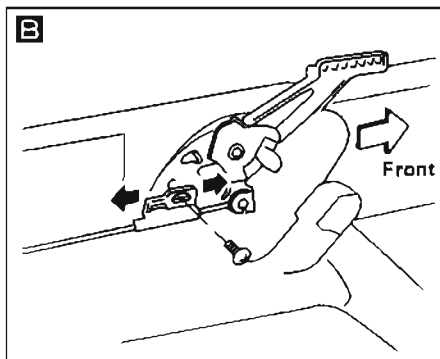
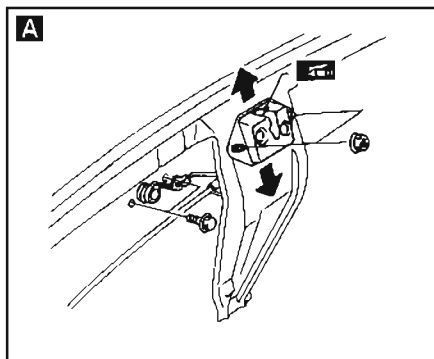
- Back door adjustment: Adjust at hinge-body portion for proper back door fit.
- Back door lock system adjustment: Adjust lock & striker so that they are in the center. After adjustment, check back door lock operation.
- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.

WARNING:

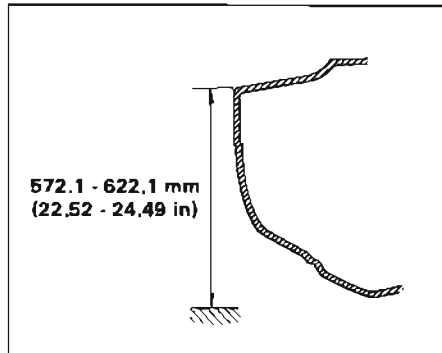
- Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.**
 - The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.**
- Opener cable: do not attempt to bend cable using excessive force.
 - After installation, make sure that trunk lid/back door and fuel filler lid open smoothly.

FASTBACK

- Before removing rear bumper, remove right drafter which is secured with two upper nuts and butyl seal.

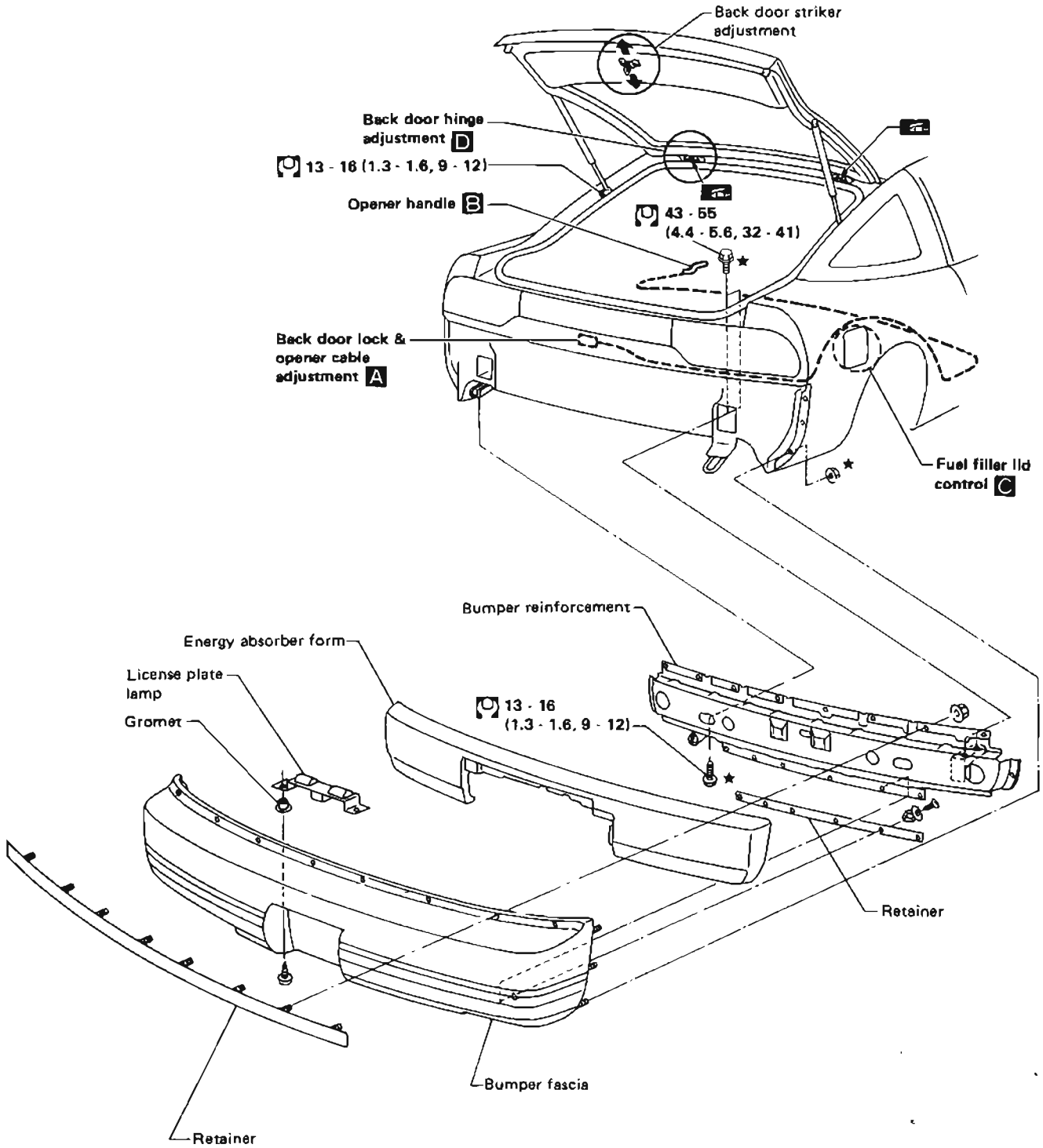


Bumper height



BODY END

Body Rear End and Opener (Cont'd)



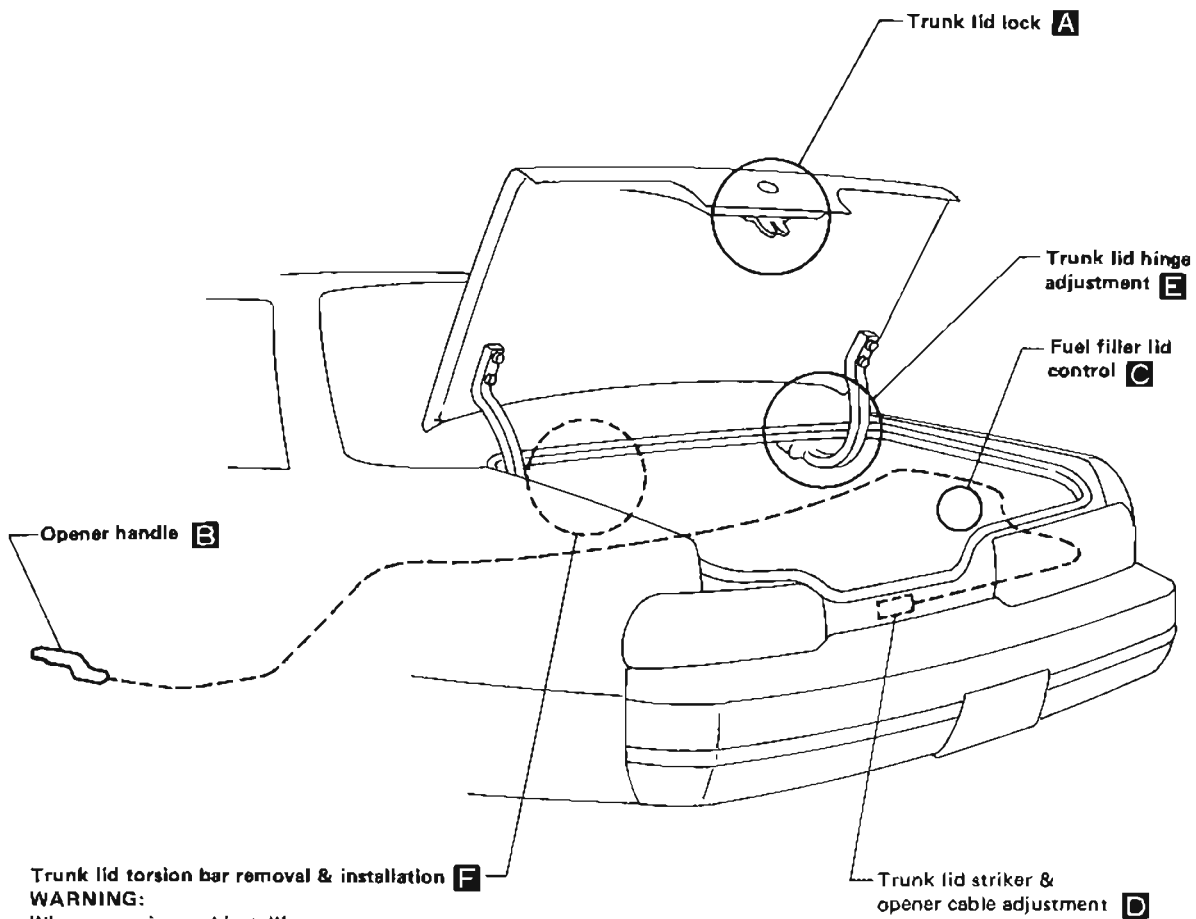
★ : Bumper assembly mounting bolts and nuts

☐ : N·m (kg·m, ft·lb)

BODY END

Body Rear End and Opener (Cont'd)

COUPE



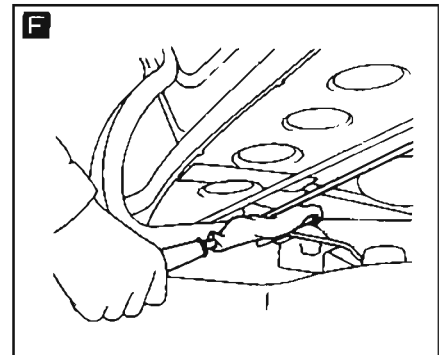
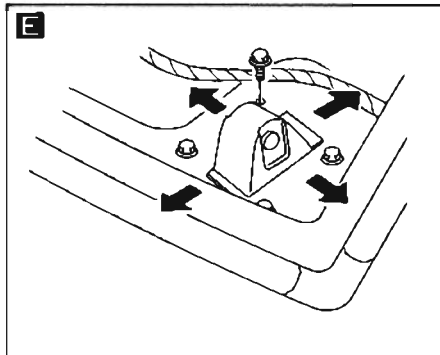
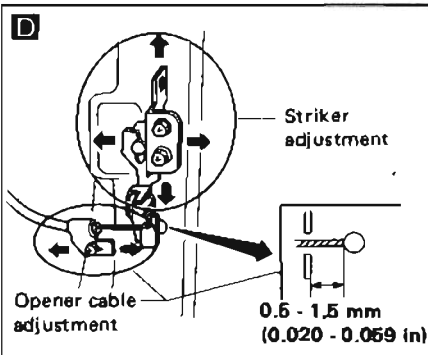
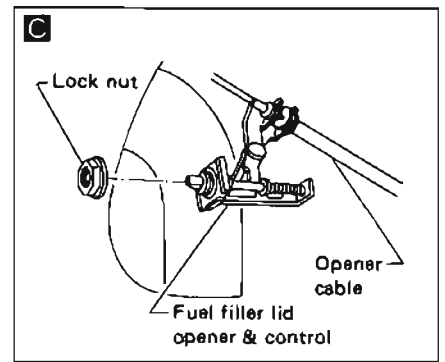
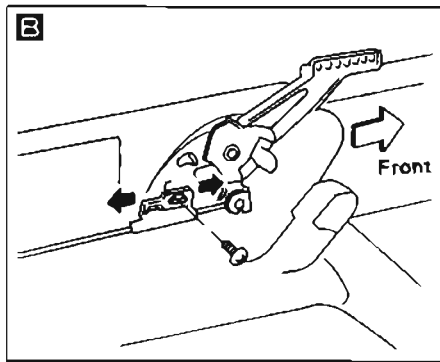
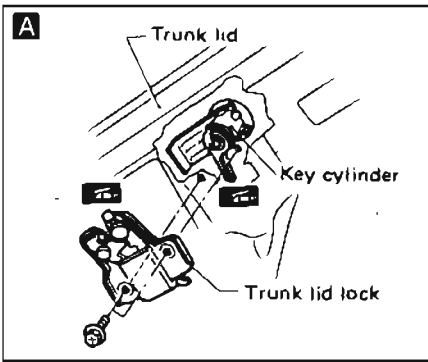
Trunk lid torsion bar removal & installation **F**

WARNING:
When removing and installing
torsion bar, be careful as it is
under tension.

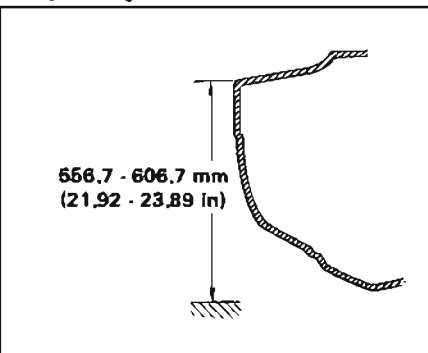
Trunk lid striker &
opener cable adjustment **D**

BODY END

Body Rear End and Opener (Cont'd)

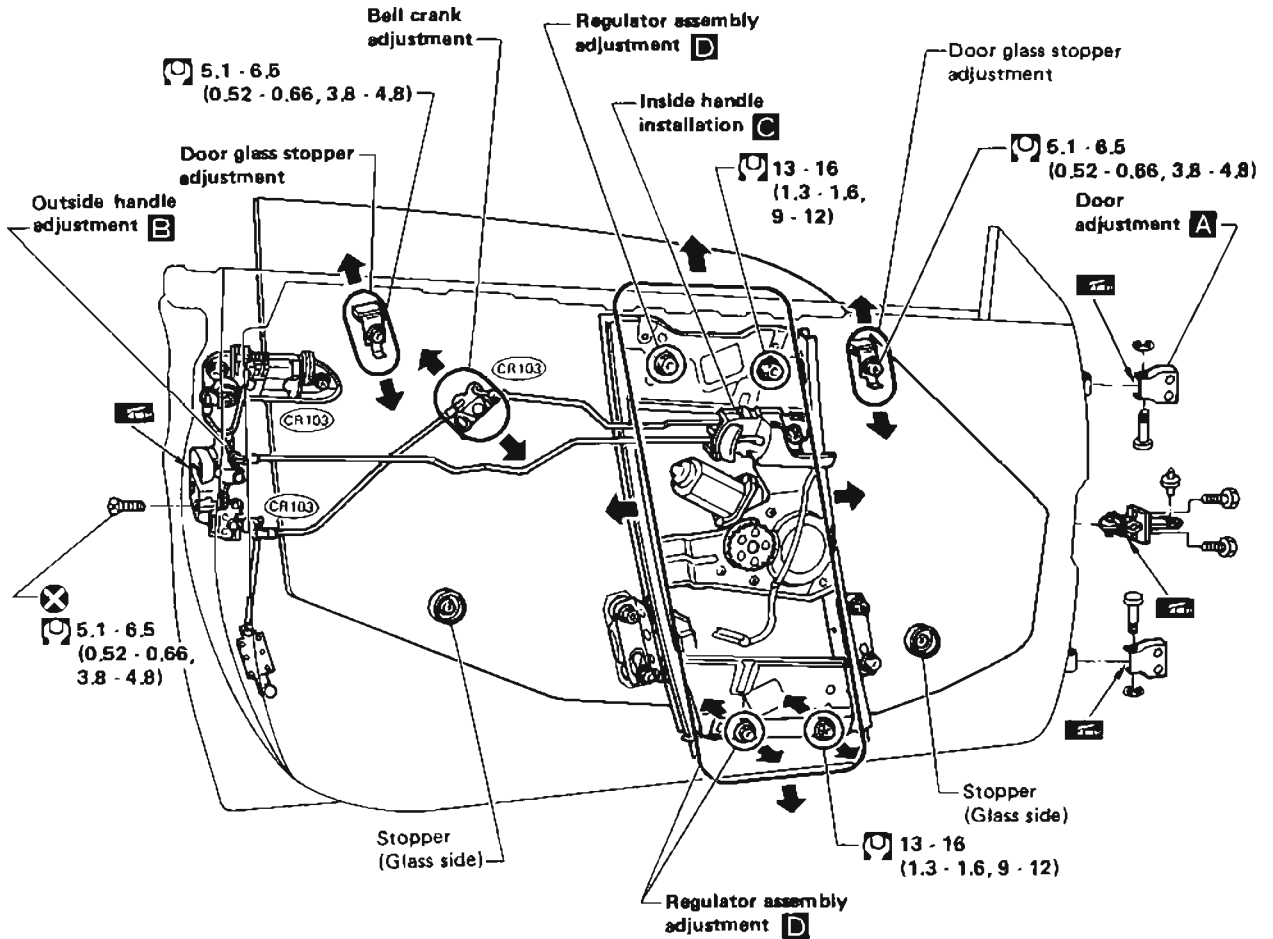



Bumper height



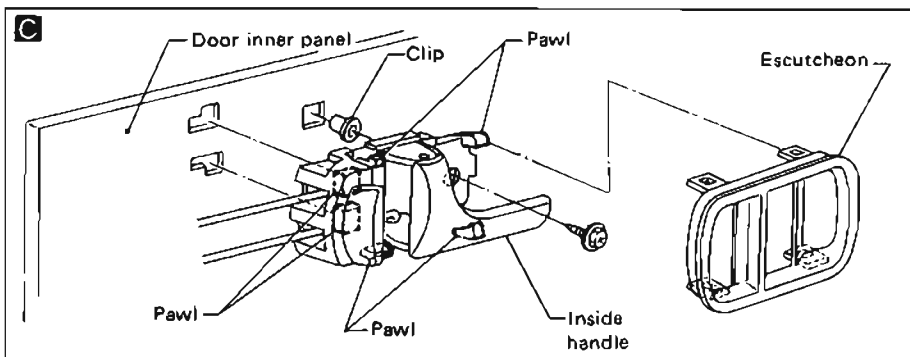
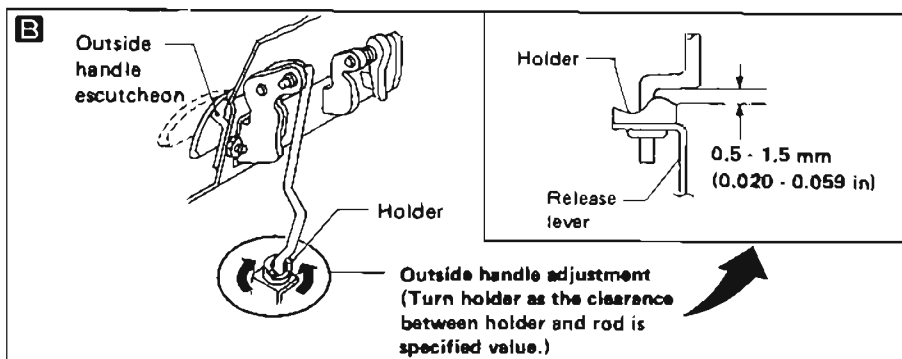
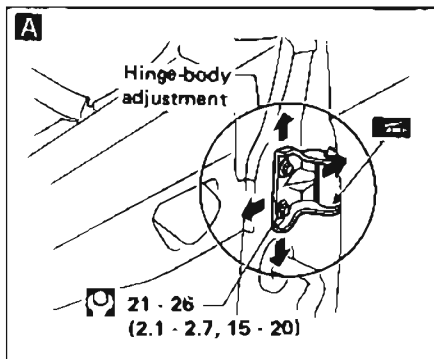
DOOR

- After adjusting door or door lock, check door lock operation.

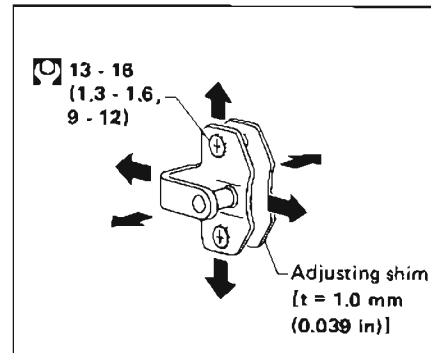


 : N-m (kg-m, ft-lb)

DOOR

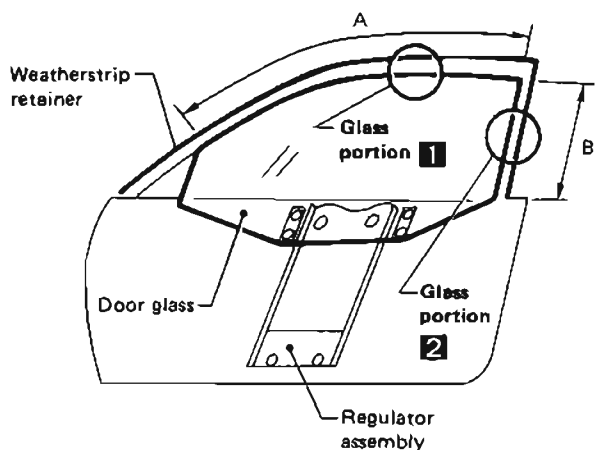


Striker adjustment



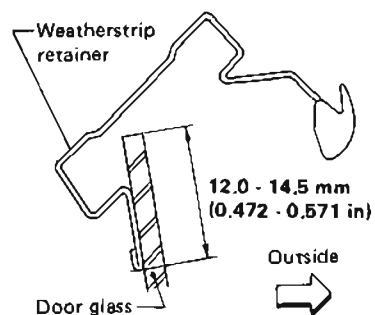
- D**
- Remove weatherstrip from retainer.

- Door glass-to-retainer clearances A and B. Adjust so that clearances A and B are equal.
- Ensure door glass is not tilted.

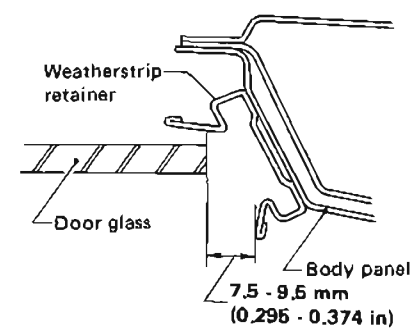


Glass portion 1

- Adjust to provide proper light surface contact of glass and retainer.

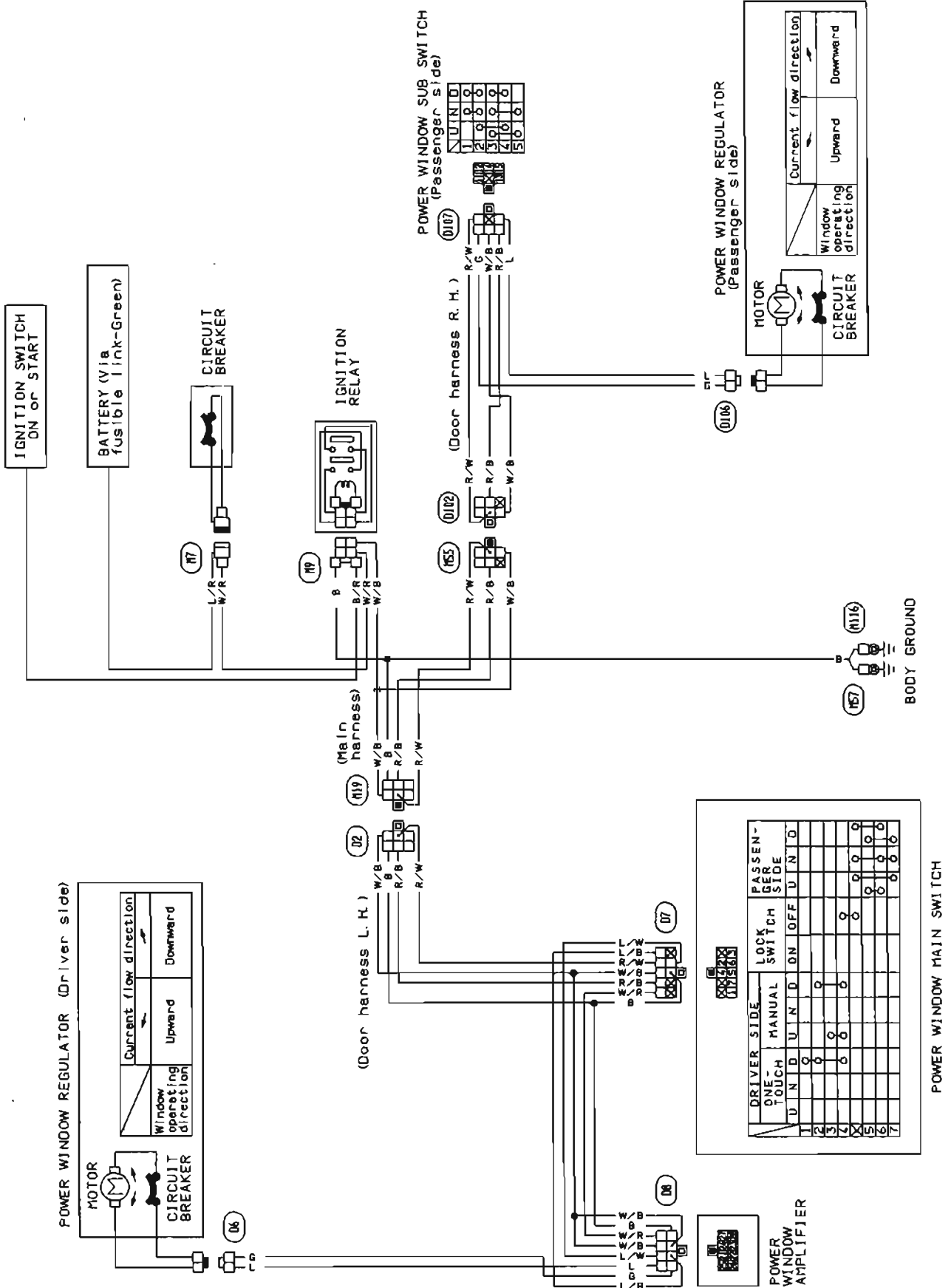


Glass portion 2



Power Window

WIRING DIAGRAM



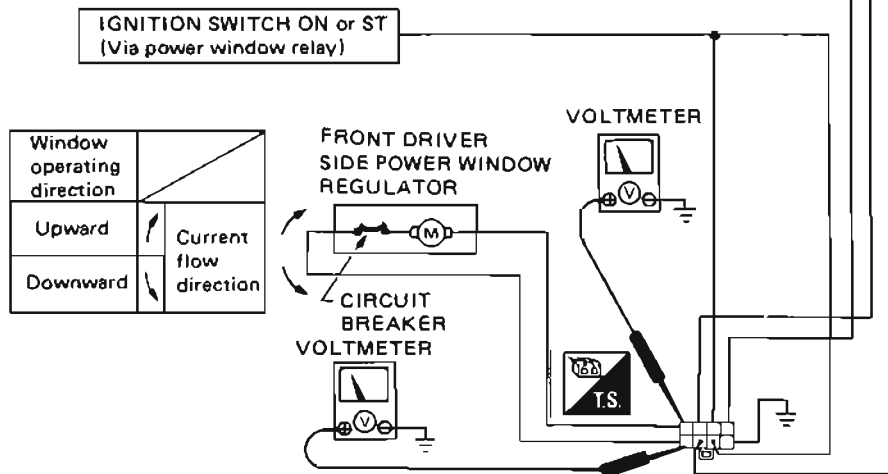
DOOR

Power Window (Cont'd)

POWER WINDOW AMP. INSPECTION

FRONT DRIVER SIDE POWER WINDOW SWITCH

| | FR Drive side | | | | Connections |
|---|------------------|---|--------|---|--------------------------|
| | One-touch (Auto) | | Manual | | |
| | U | N | D | D | |
| 1 | | | | | From power window AMP 58 |
| 2 | | | | | From power window AMP 58 |
| 3 | | | | | From power window AMP 59 |
| 4 | | | | | Ground |



AMP. OPERATION

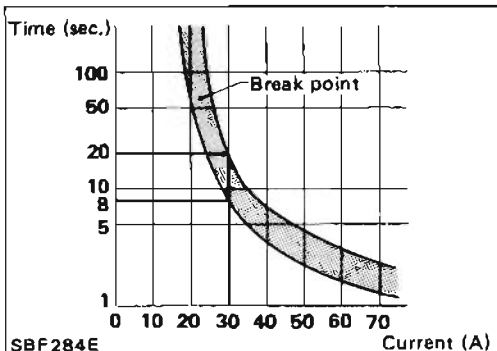
| Connections | Operations | | | | | |
|---|------------------|-----------------|-----------------|----------------------------|-----------------|-----------------|
| | Manual operation | | | One-touch (Auto) Operation | | |
| | ON or ST | ON or ST | ON or ST | ON or ST | ON or ST | ON or ST |
| 51 Power source (IGN) | 12V | 12V | 12V | 12V | 12V | 12V |
| 52 Ground | Ground | Ground | Ground | Ground | Ground | Ground |
| 53 From ignition SW (ON or ST) | ON or ST | ON or ST | ON or ST | ON or ST | ON or ST | ON or ST |
| 54 To FR driver side power window SW (AUTO) ① | OFF | OFF | OFF | OFF | ON | OFF |
| 55 To FR driver side power window SW (UP) ③ | OFF | ON | OFF | OFF | OFF | OFF |
| 56 To FR driver side power window SW (DOWN) ② | OFF | OFF | ON | OFF | ON | OFF |
| 57 Output signal FR driver side regulator (Upward power source) | Approx. 0V | Approx. over 9V | Approx. 0V | Approx. 0V | Approx. 0V | Approx. 0V |
| 58 Output signal FR driver side regulator (Downward power source) | Approx. 0V | Approx. 0V | Approx. over 9V | Approx. 0V | Approx. over 9V | Approx. over 9V |

| Regulator Operating Condition | Stop | Upward operation | Downward operation | Stop | Starting | Keeping operation until fully open, then stops automatically |
|-------------------------------|------|------------------|--------------------|------|--------------------|--|
| | | | | | Downward operation | |
| | | | | | | |

Carry out this operation check in this chart from left to right continuously.

POWER WINDOW AMP. - Front driver side door (Behind door trim)

SBF789C



SBF284E

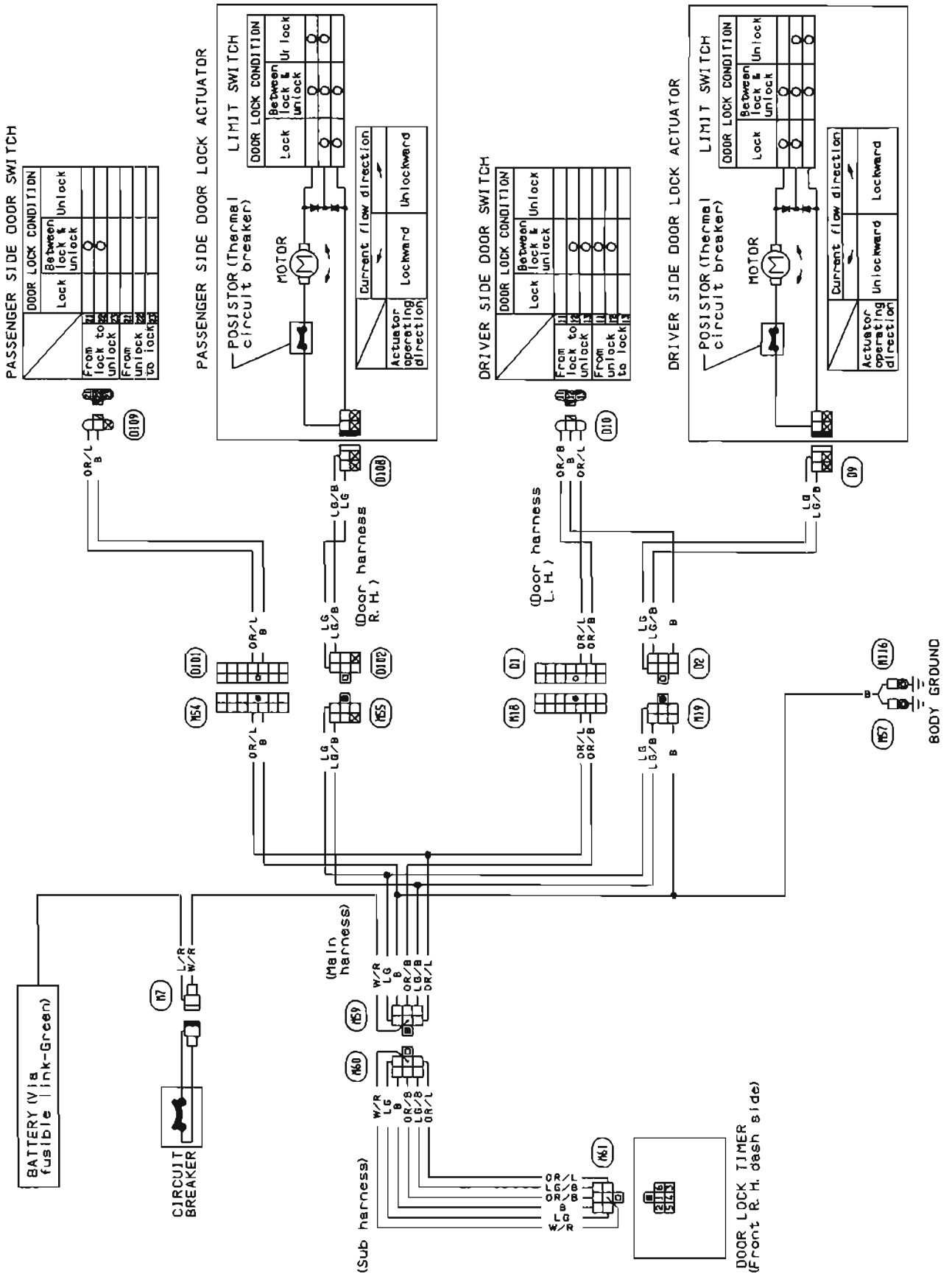
CIRCUIT BREAKER INSPECTION

For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

This circuit breaker is also used in the power door lock system.

Power Door Lock

WIRING DIAGRAM



DOOR

Power Door Lock (Cont'd)

DOOR LOCK TIMER INSPECTION

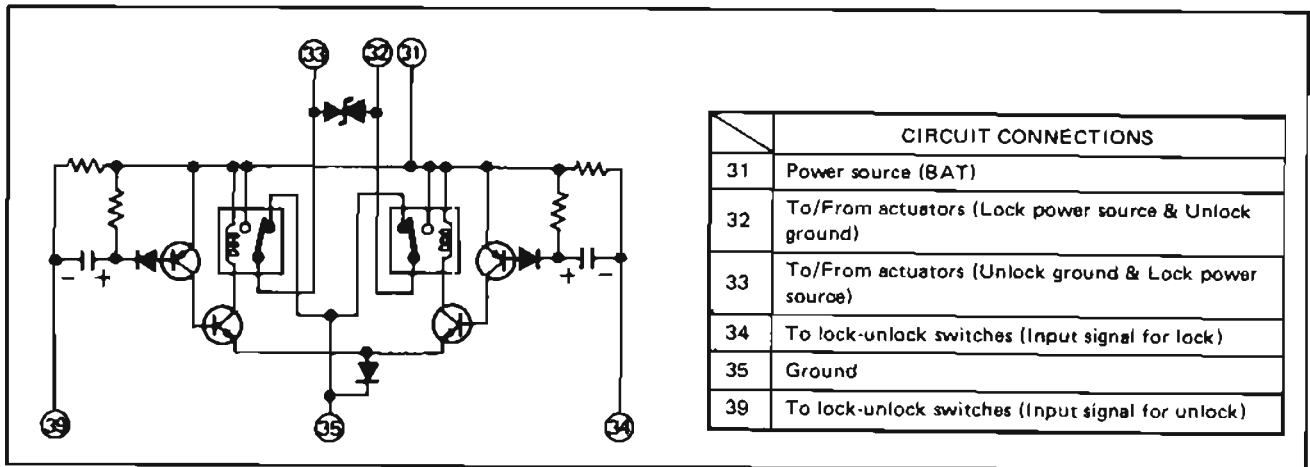
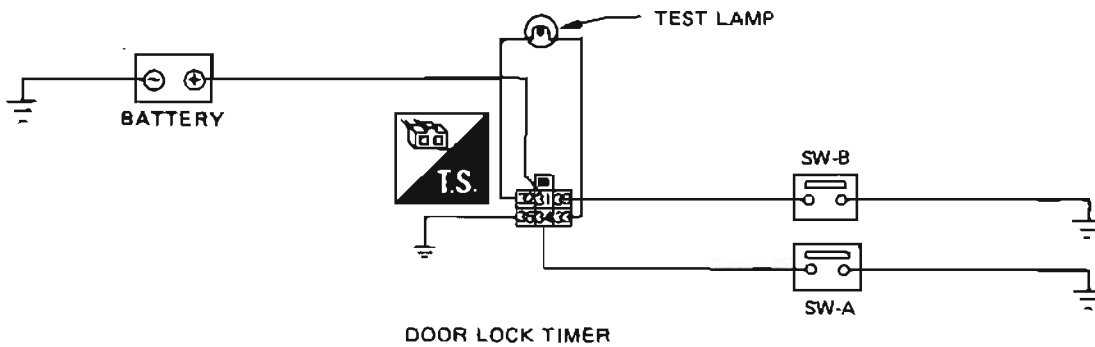
TESTING OPERATION

| | | | | | | | | | | |
|---------------|---------------------|-----|-----------------------------|-----|-----------|-----------------------------|-----|-----------|--|-----------|
| Input signal | SW-A operation | OFF | Turns ON | ON | Turns OFF | OFF | OFF | OFF | Turns ON | Turns OFF |
| | SW-B operation | OFF | OFF | OFF | OFF | Turns ON | ON | Turns OFF | After SW-A operation, immediately turns ON | Turns OFF |
| Output signal | Test lamp operation | OFF | ON (Approx. 1.0 sec.) → OFF | OFF | OFF | ON (Approx. 1.0 sec.) → OFF | OFF | OFF | ON → OFF → ON → OFF | OFF |

- Carry out the complete inspection in this chart from left to right.
- Do not carry out any switch operations that are not described in the above chart so as to avoid breaking the door lock timer.

Lighting period of test lamp differs according to SW-B operation. Moreover, test lamp may come on once or it may not come on at all. If this occurs, do not judge it faulty solely from this step.

INSPECTION CIRCUIT (This test circuit must be wired by the technician.)



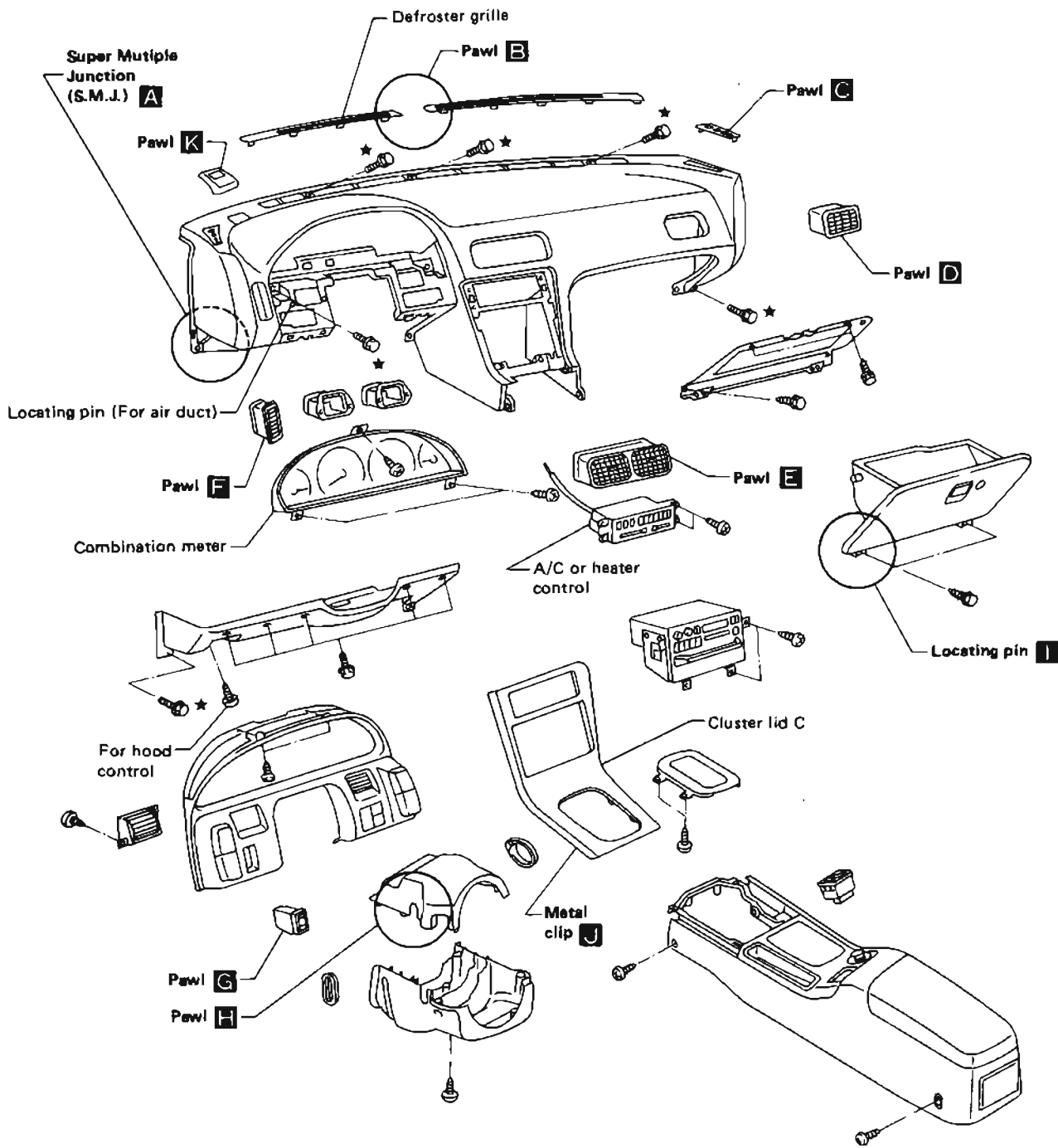
SBF377E

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.

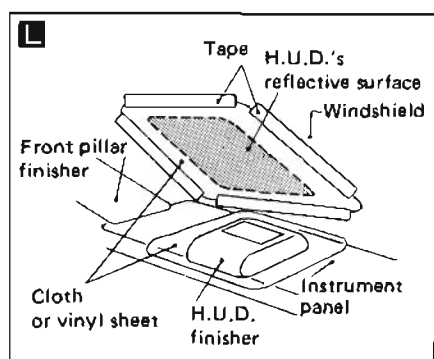
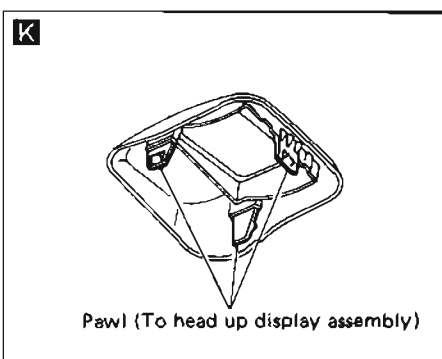
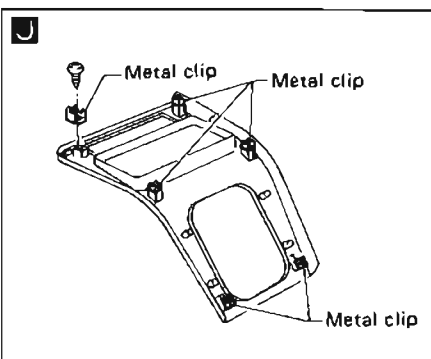
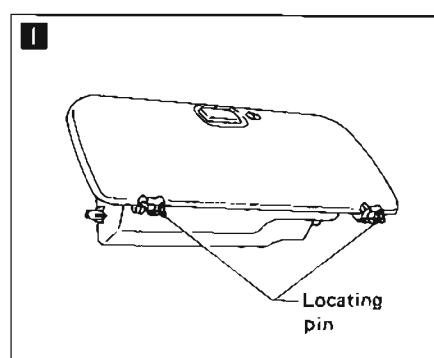
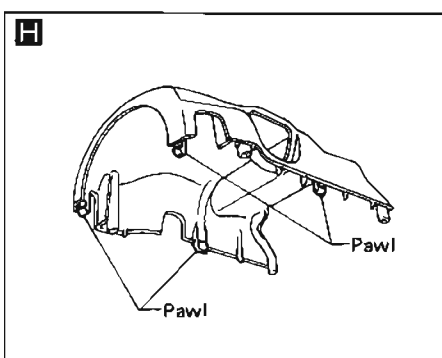
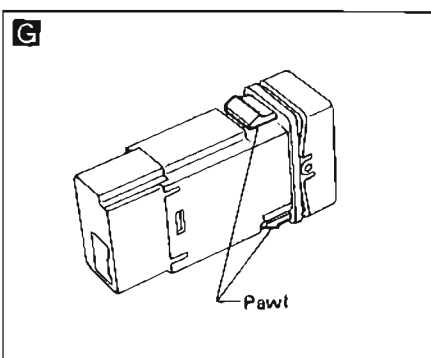
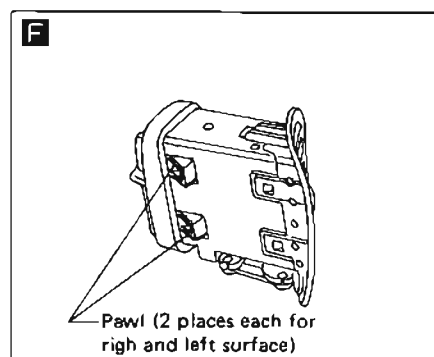
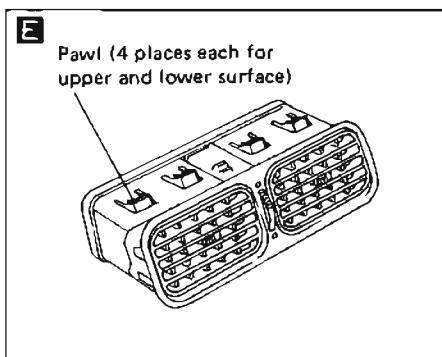
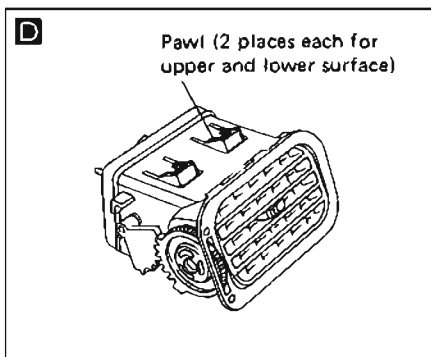
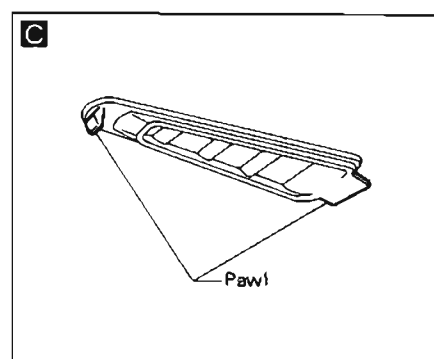
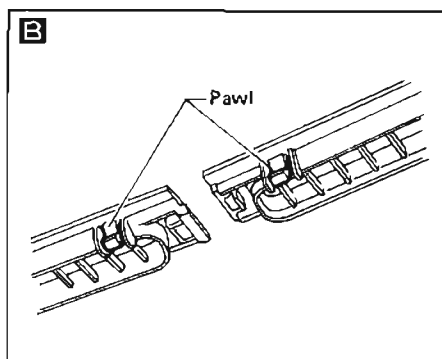
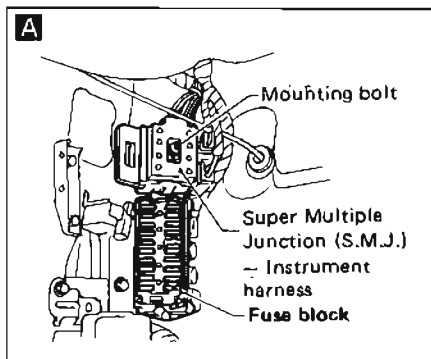
HEAD-UP DISPLAY (H.U.D.)

- When removing H.U.D. finisher, be extremely careful not to scratch H.U.D.'s reflective surface. To avoid scratching, cover H.U.D.'s reflective surface or finisher with a cloth or vinyl sheet. **L**



★ : Instrument panel assembly mounting bolts

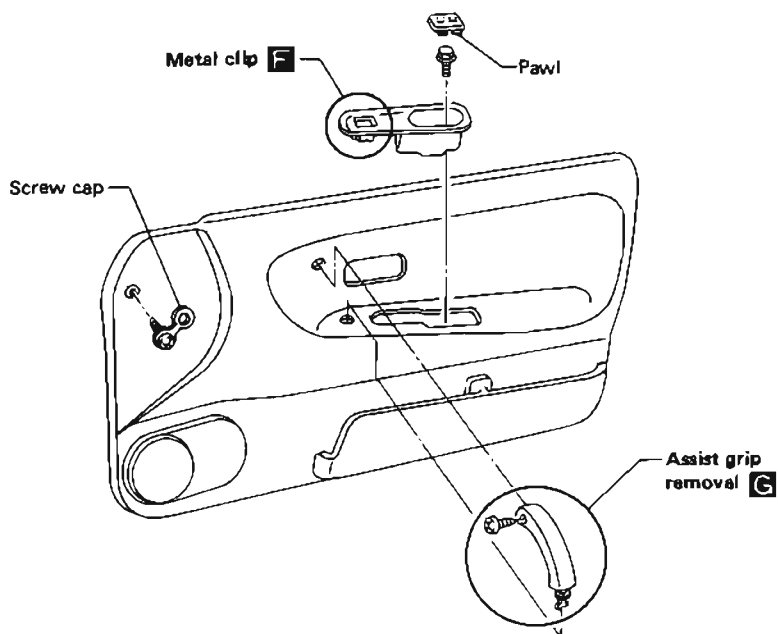
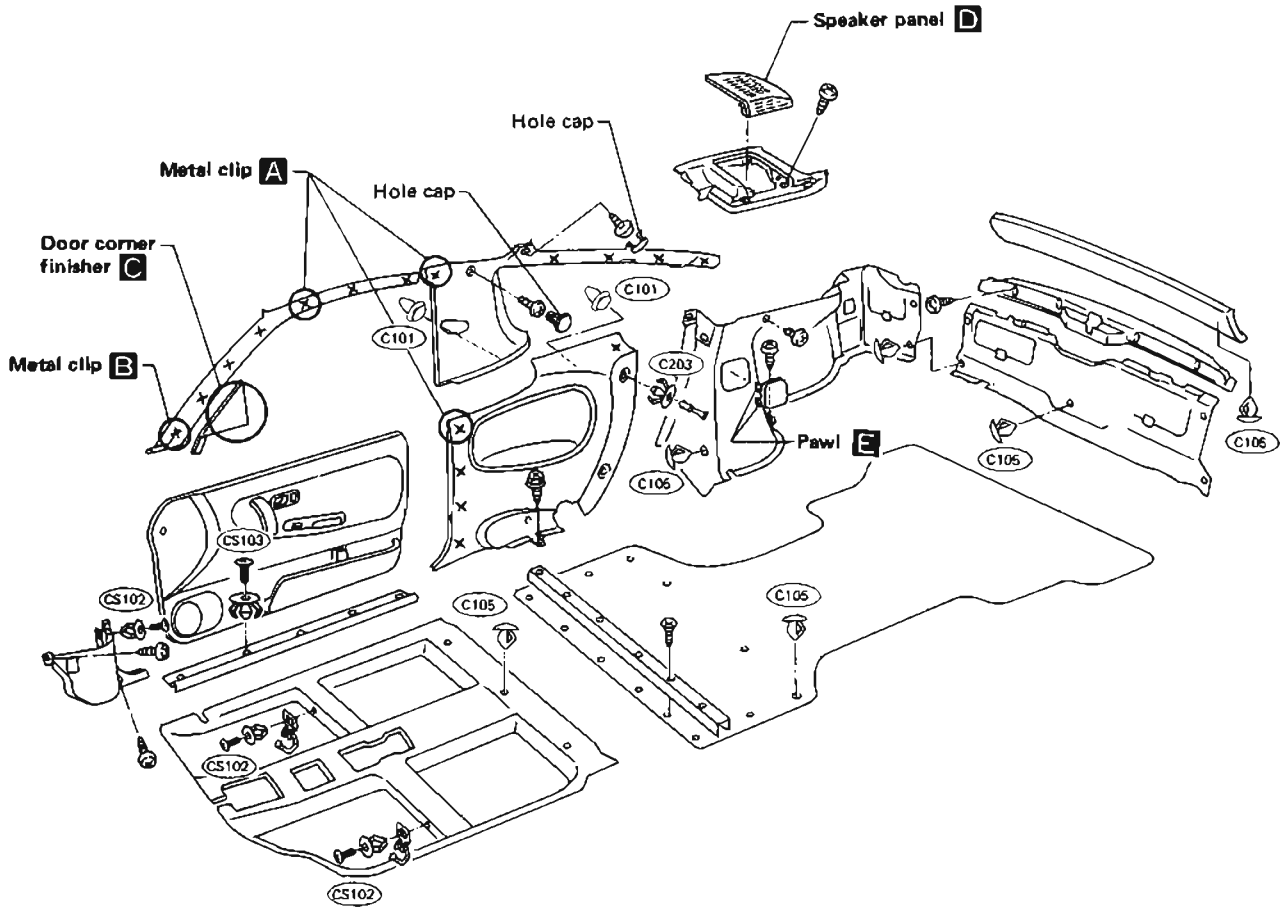
INSTRUMENT PANEL



INTERIOR AND EXTERIOR

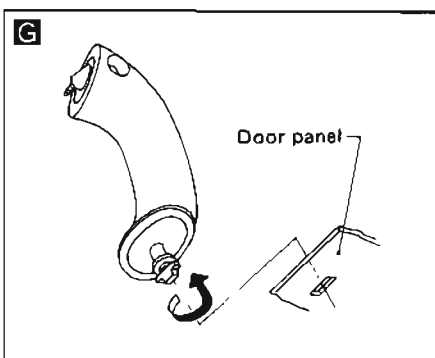
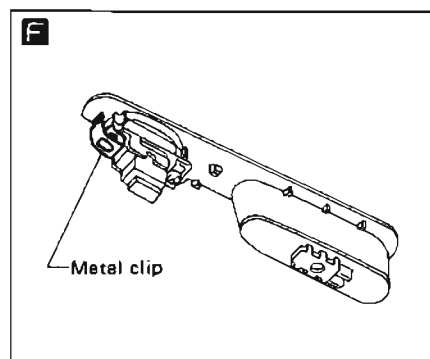
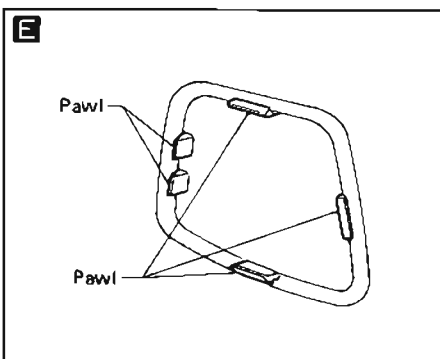
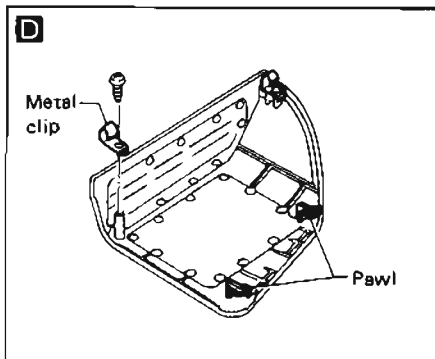
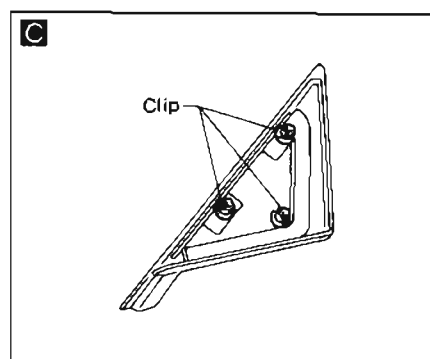
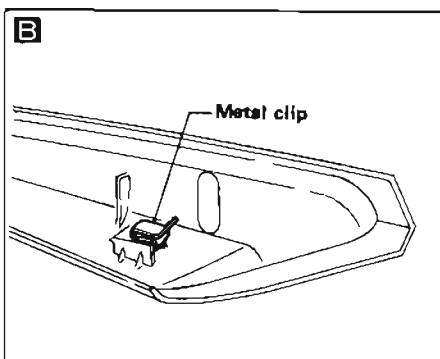
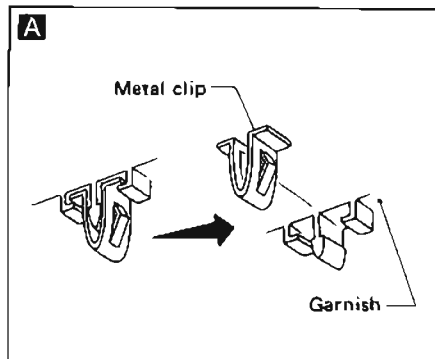
Interior

SIDE, LUGGAGE AND FLOOR TRIM – Fastback



INTERIOR AND EXTERIOR

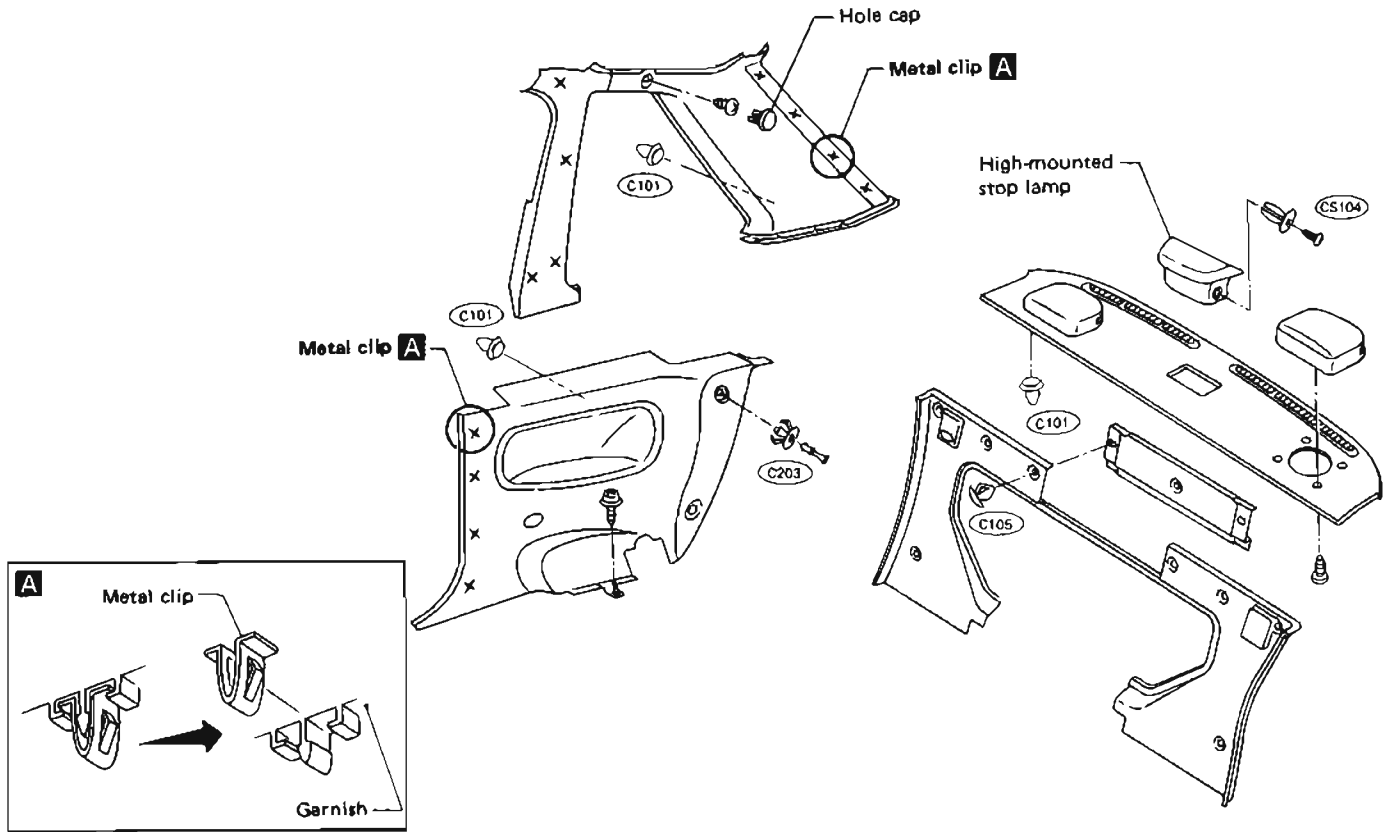
Interior (Cont'd)



INTERIOR AND EXTERIOR

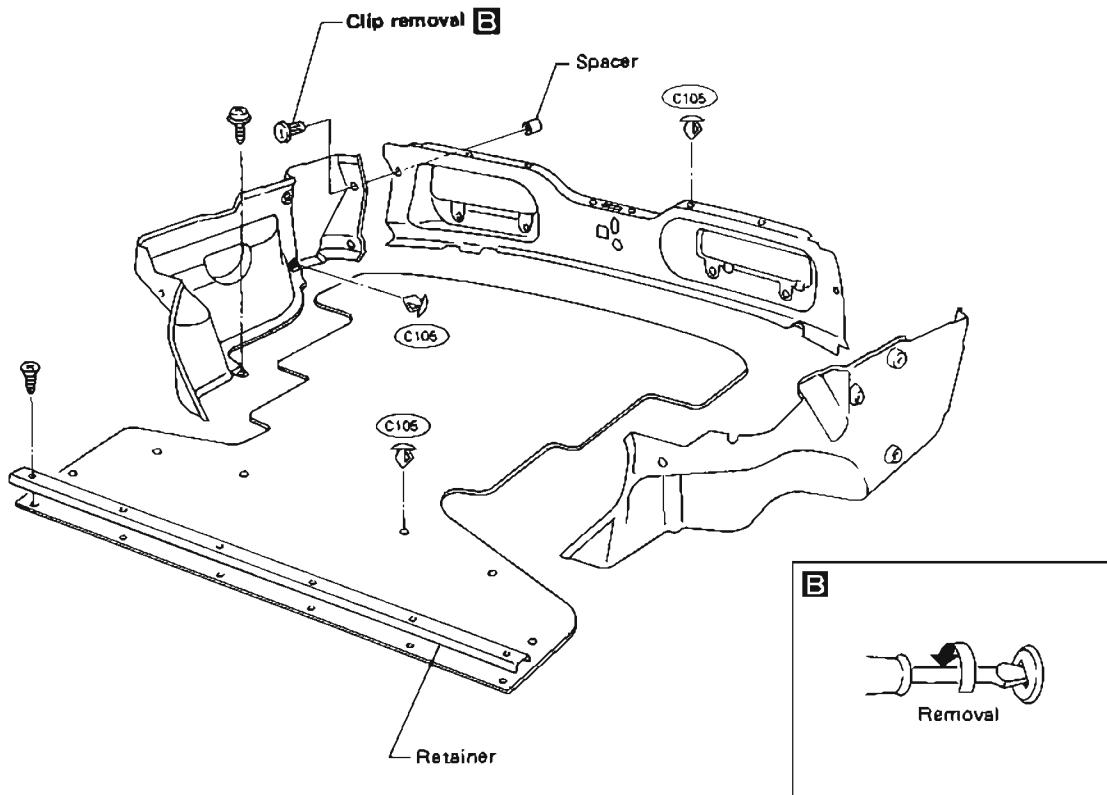
Interior (Cont'd)

SIDE TRIM – Coupe



SBF180E

LUGGAGE ROOM TRIM – Coupe



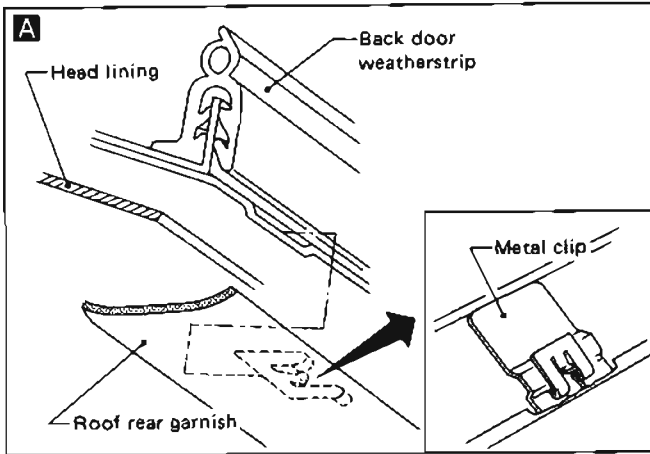
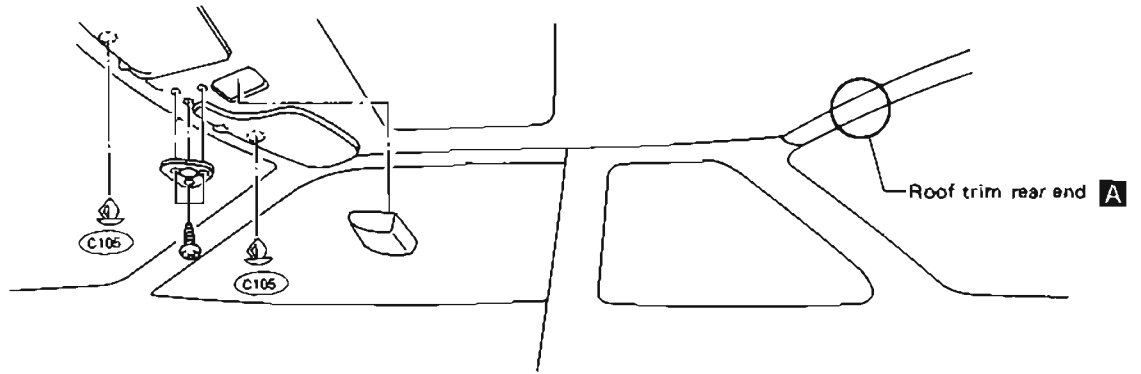
SBF181E

INTERIOR AND EXTERIOR

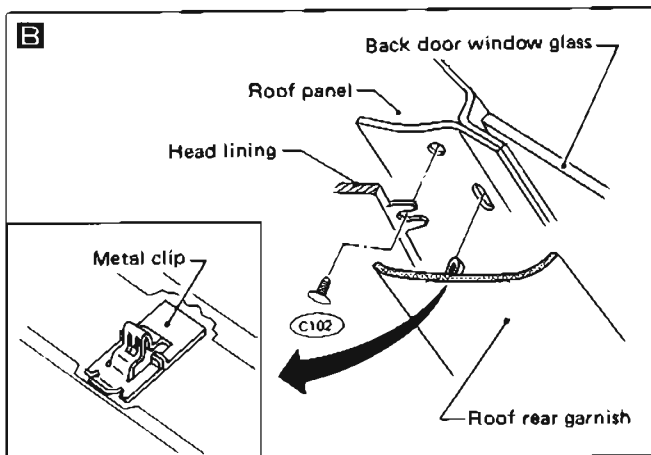
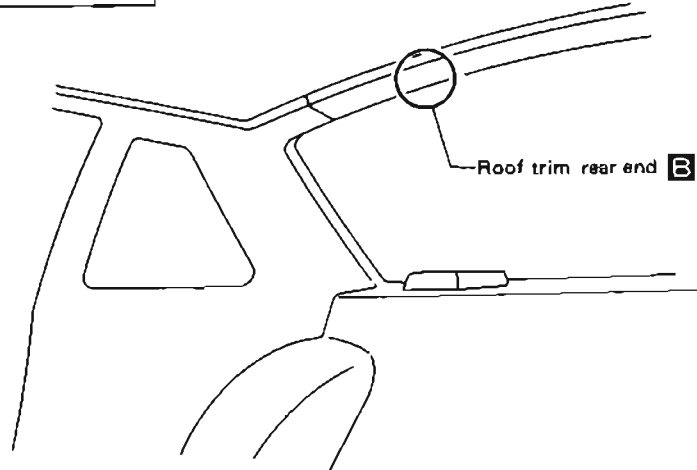
Interior (Cont'd)

ROOF TRIM

Fastback

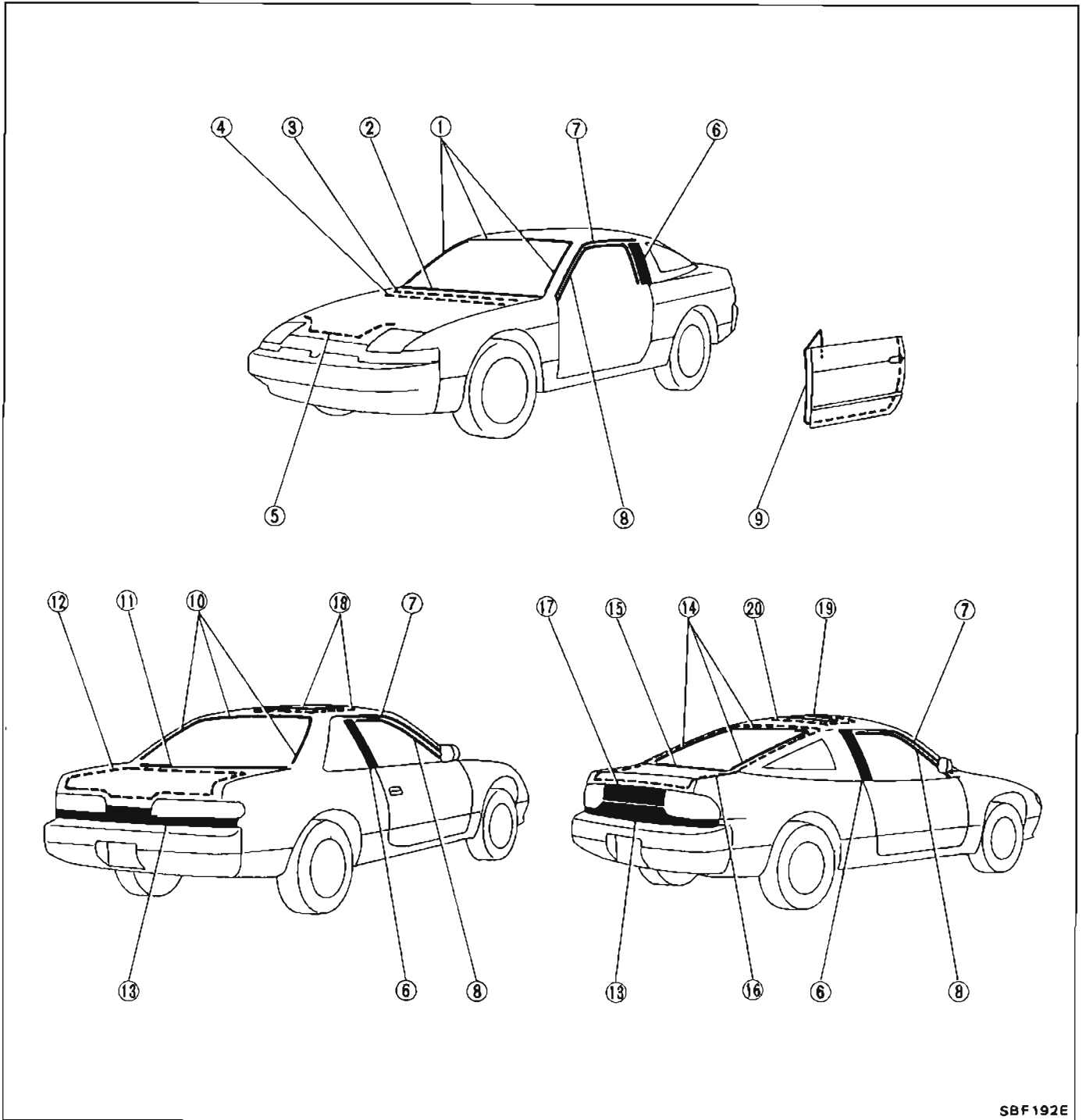


Coupe



INTERIOR AND EXTERIOR

Exterior



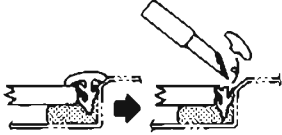
SBF192E

Exterior (Cont'd)

① Windshield upper and side molding

Method 1

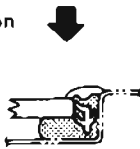
Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.



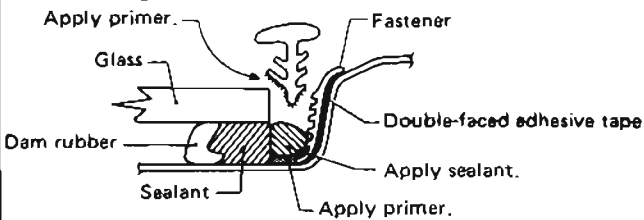
Cut off lower portion of new molding.



Finish well to give it a good appearance.

Method 2

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant & primer to body panel, and apply primer to molding.

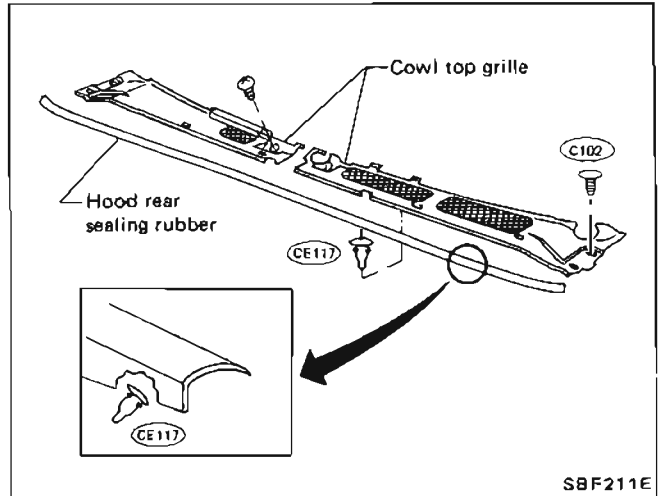


4. Install molding by aligning the molding mark located on center with vehicle center. Be sure to install tightly so that there is no gap around the corner.

S8F519B

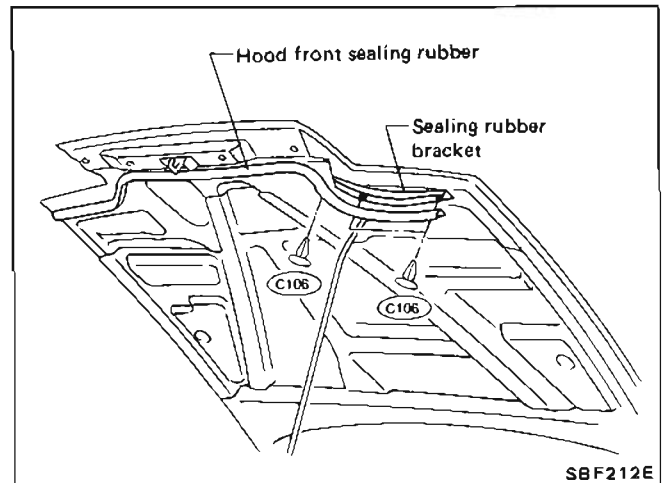
② Windshield lower molding It is mounted with screws.

③, ④ Cowl top grille and hood rear sealing rubber



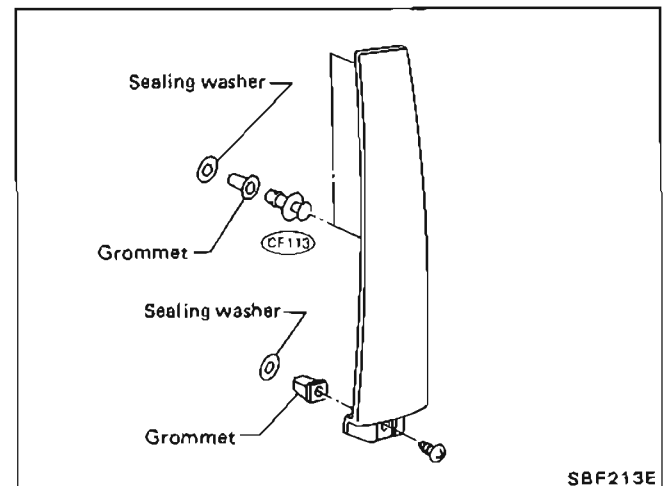
S8F211E

⑤ Hood front sealing rubber



S8F212E

⑥ Center pillar finisher

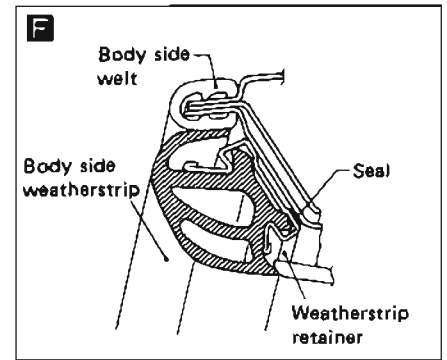
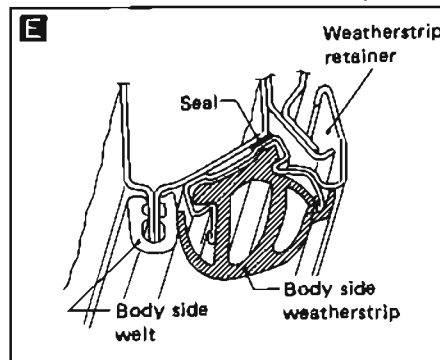
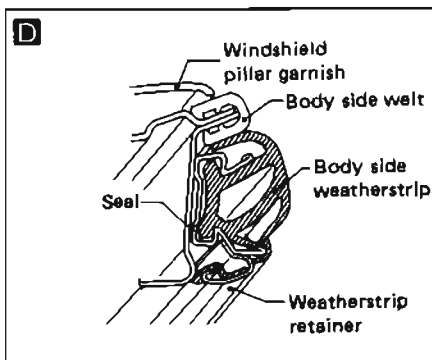
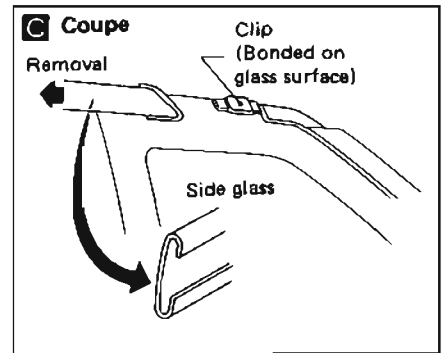
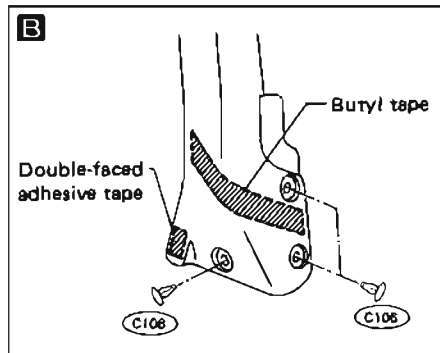
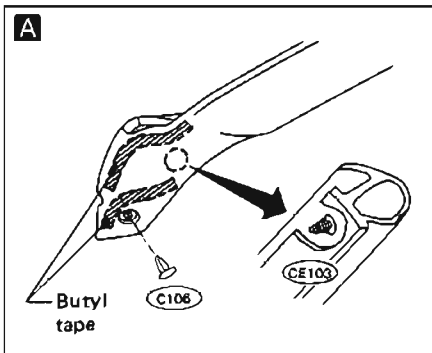
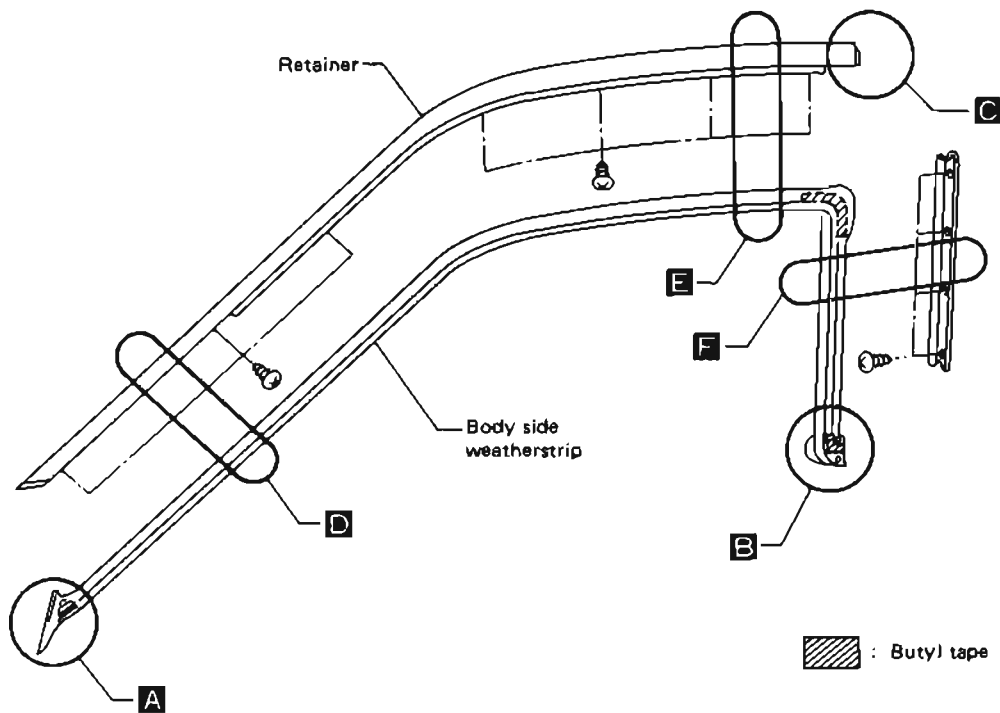


S8F213E

INTERIOR AND EXTERIOR

Exterior (Cont'd)

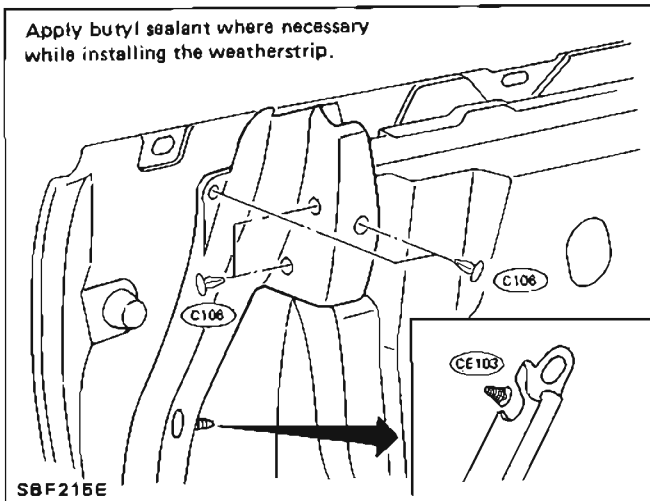
⑦, ⑧ Body side weatherstrip and weatherstrip retainer



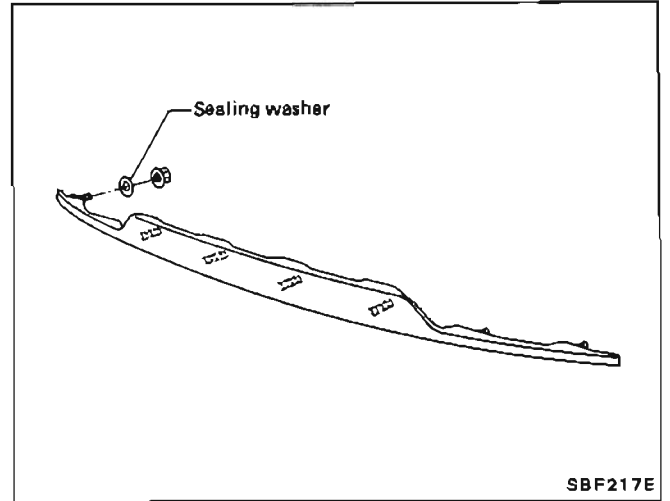
INTERIOR AND EXTERIOR

Exterior (Cont'd)

⑨ Door weatherstrip



⑬ Rear sight shield



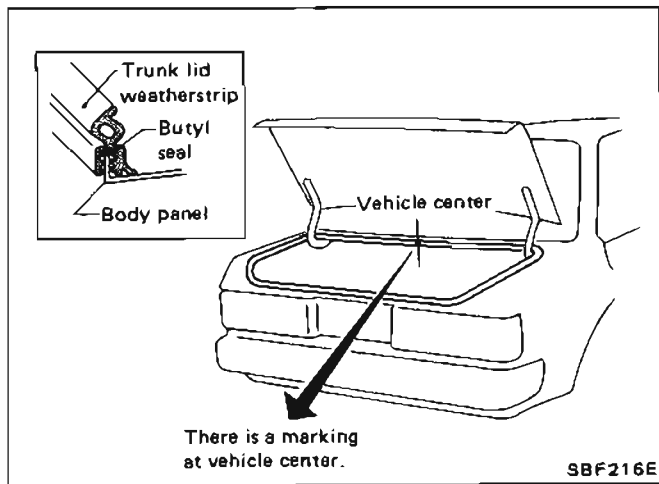
⑩ Back window upper and side molding (Coupe)

Basically the same as windshield upper and side molding.

⑪ Back window lower molding (Coupe)

It is mounted with screws.

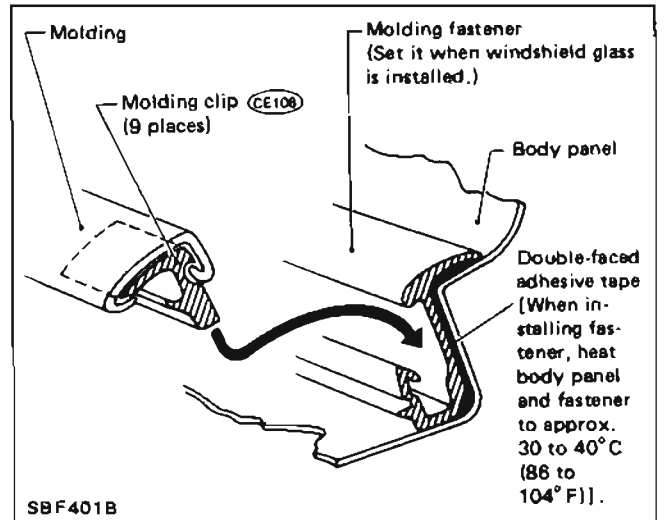
⑫ Trunk lid weatherstrip



⑭ Back door window upper and side molding (Fastback)

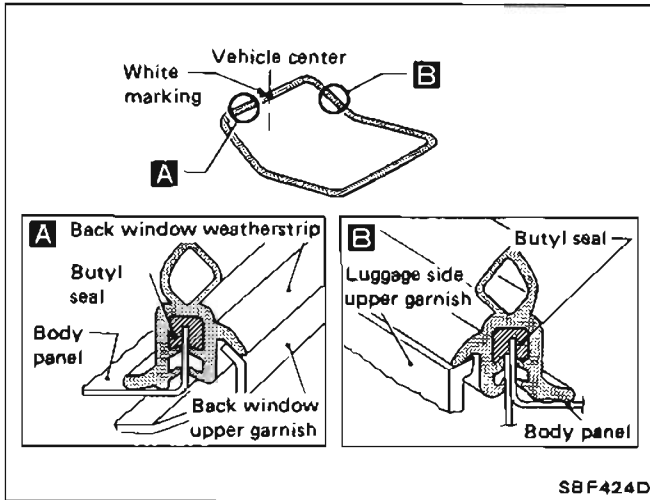
Bonded on back door glass side.

⑮ Back door window lower molding (Fastback)

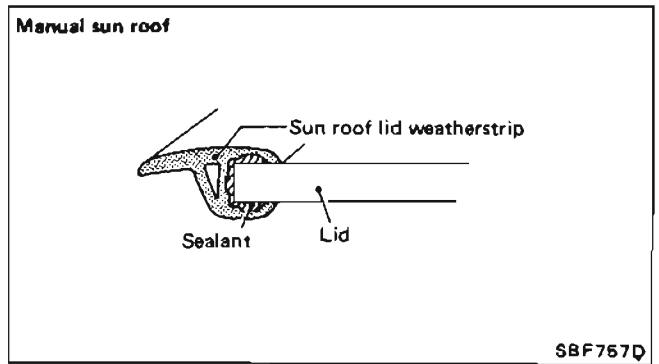


Exterior (Cont'd)

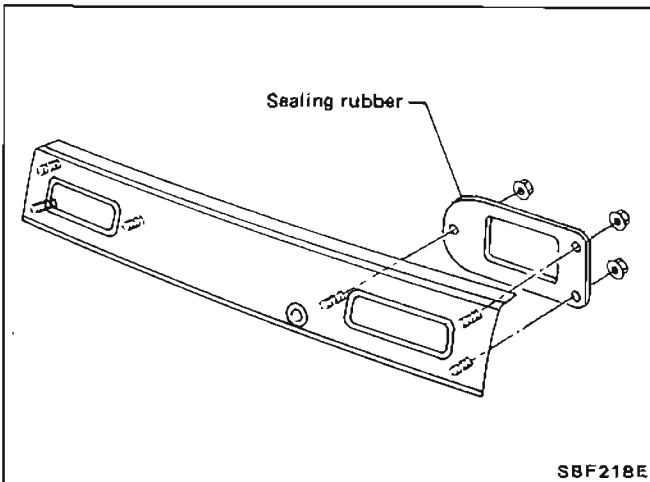
16 Back door weatherstrip



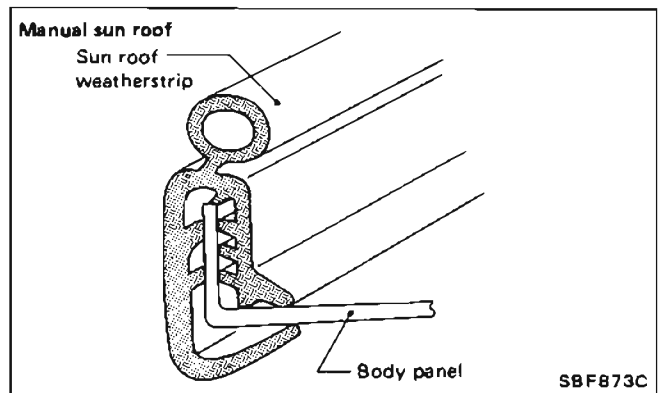
19 Sun roof lid weatherstrip



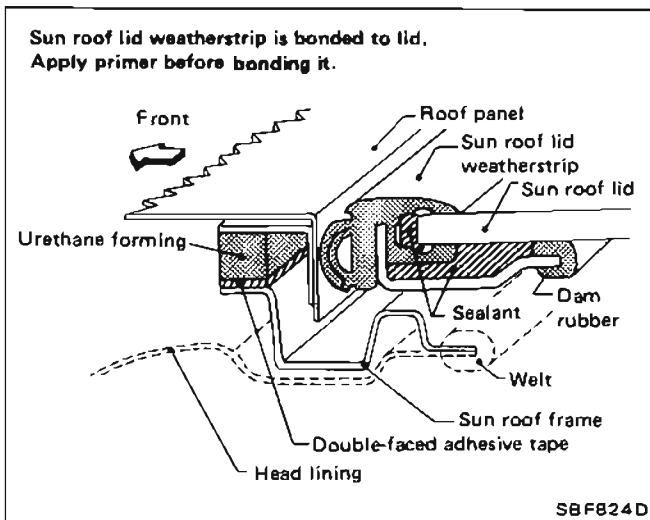
17 Rear panel finisher (Fastback)



20 Sun roof weatherstrip



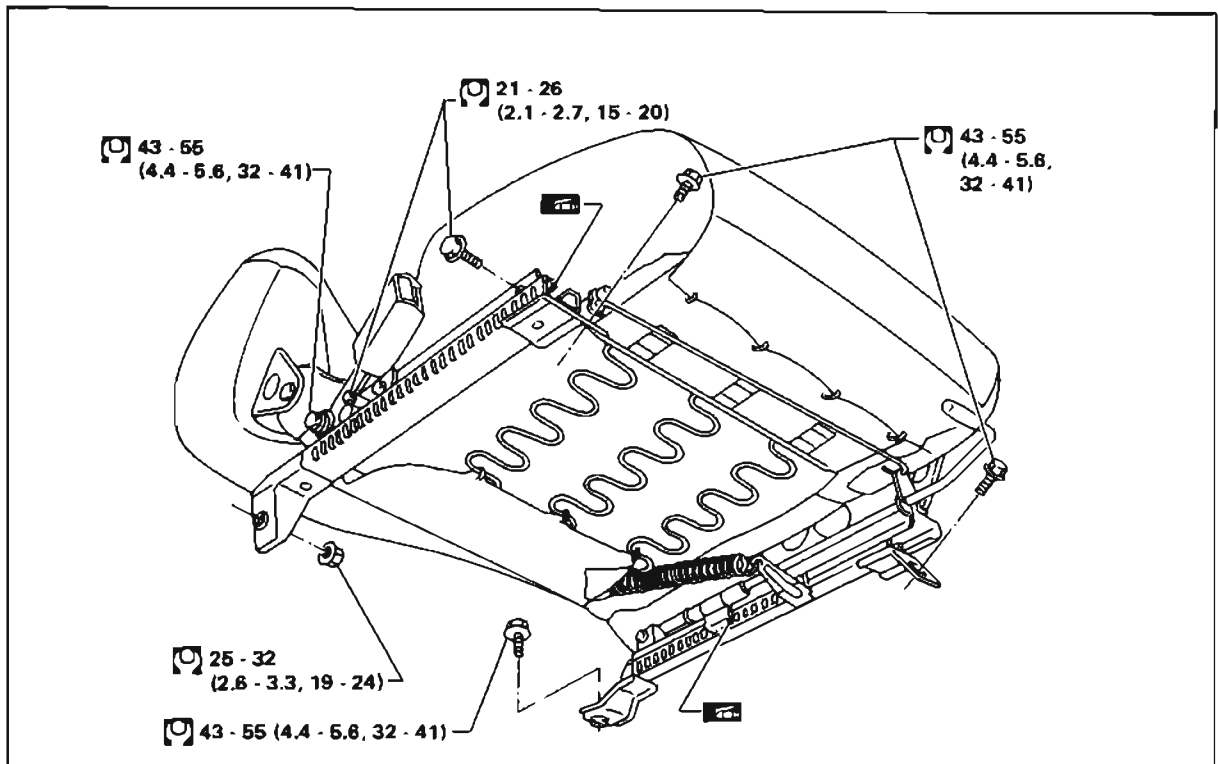
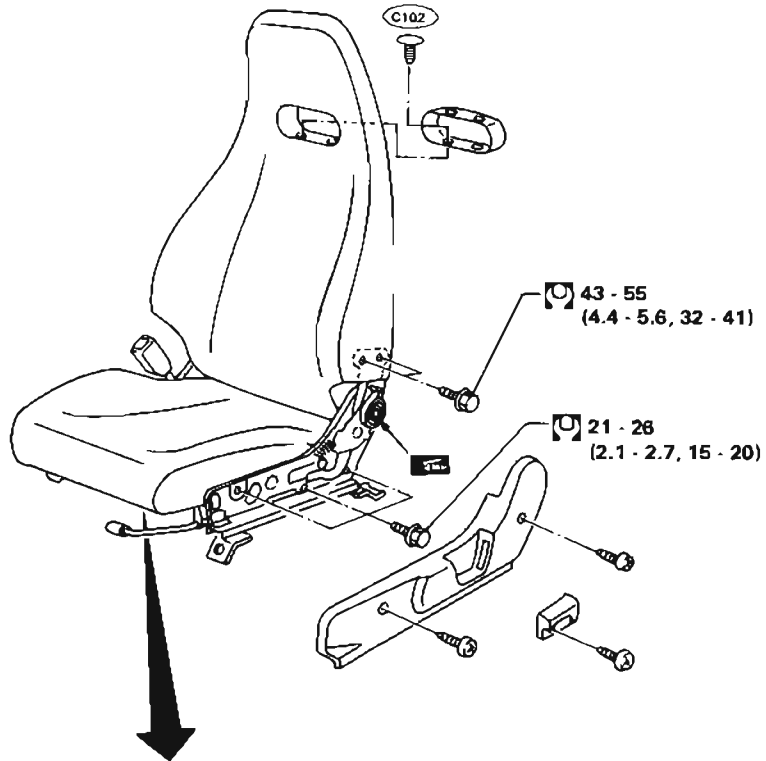
18 Sun roof lid weatherstrip and sun roof frame weatherstrip (Coupe)




NOTE

SEAT

Front Seat



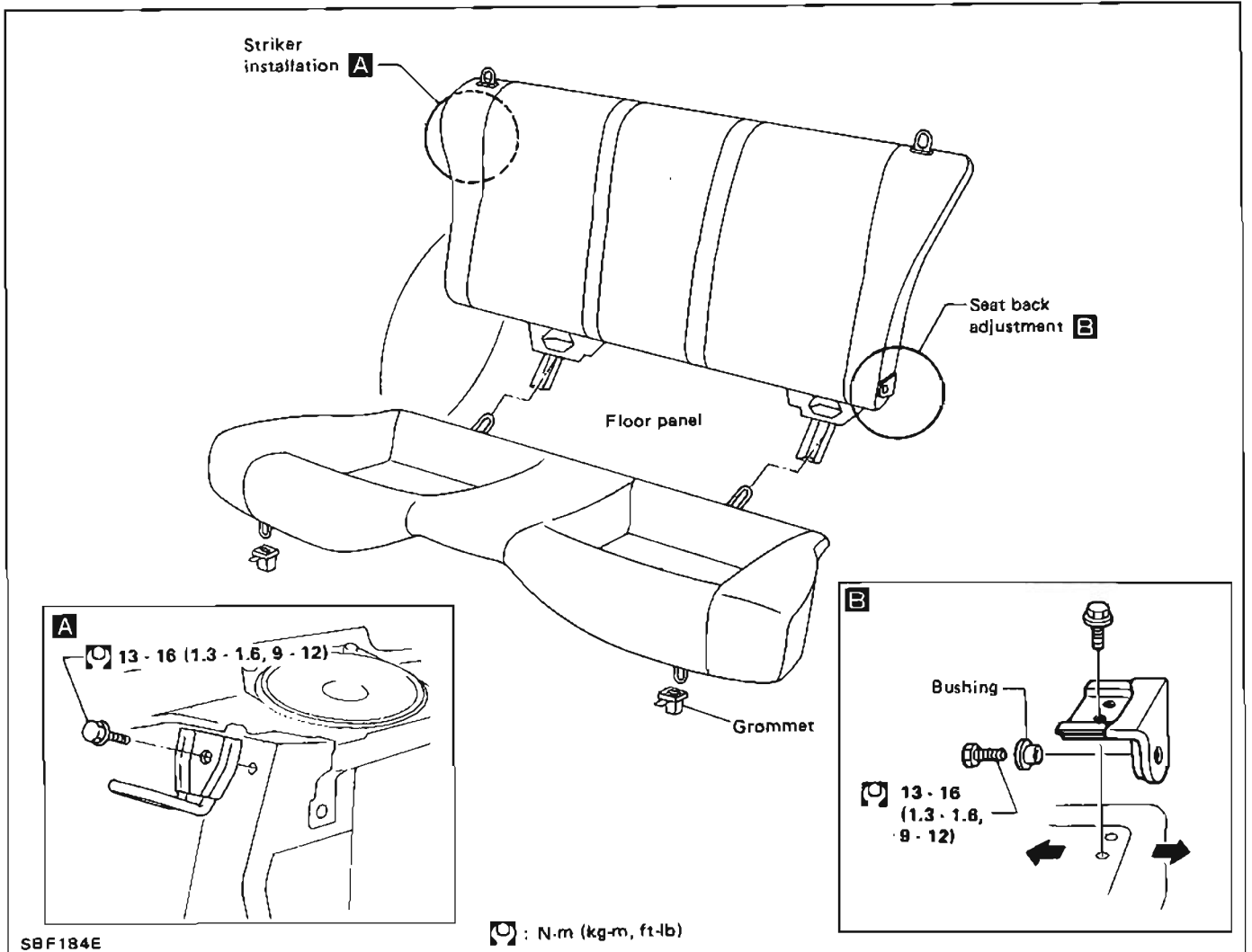
 : N·m (kg·m, ft·lb)

SBF183E

BF-30

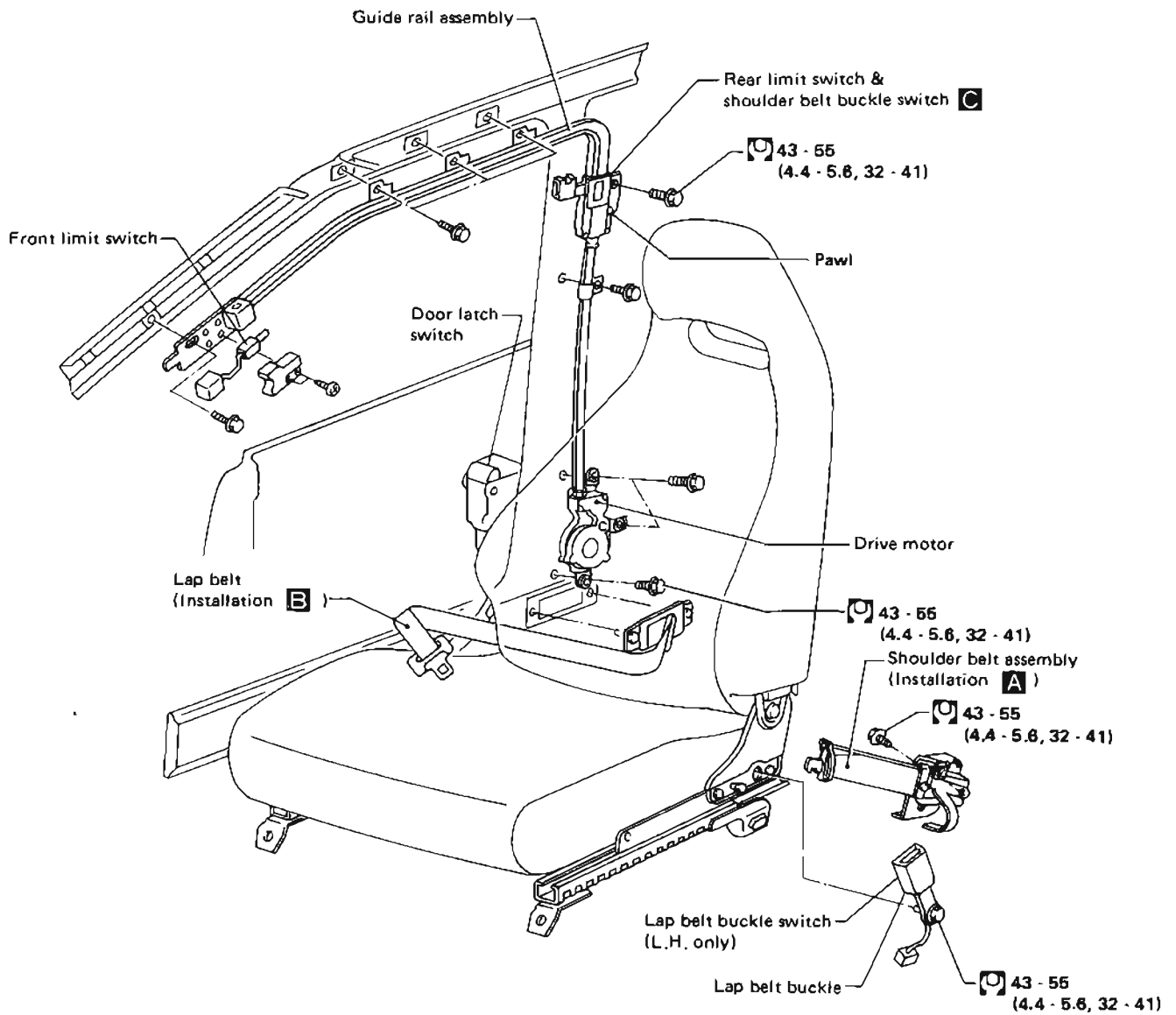
SEAT

Rear Seat

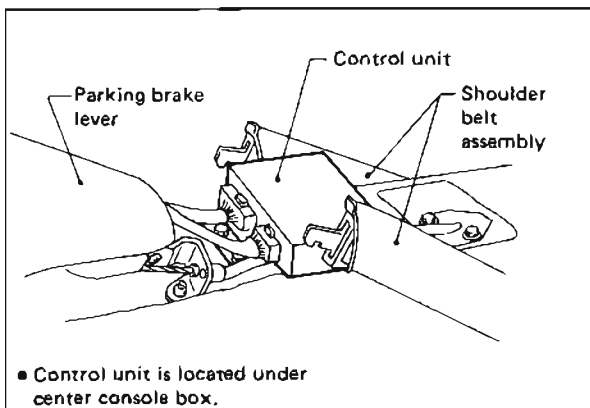


AUTOMATIC SEAT BELT SYSTEM

Unit Location

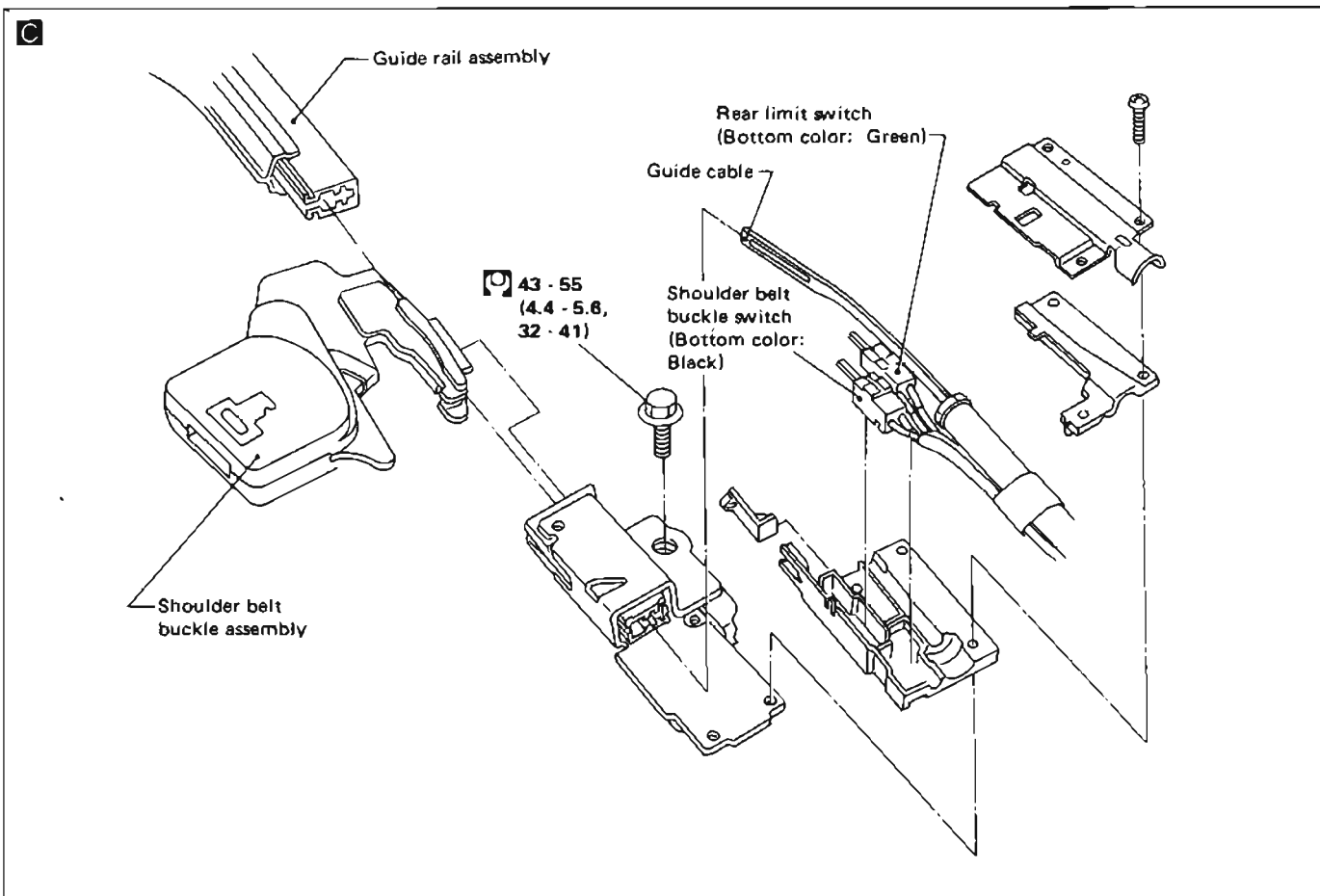
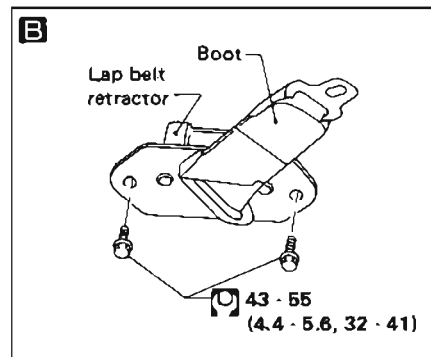
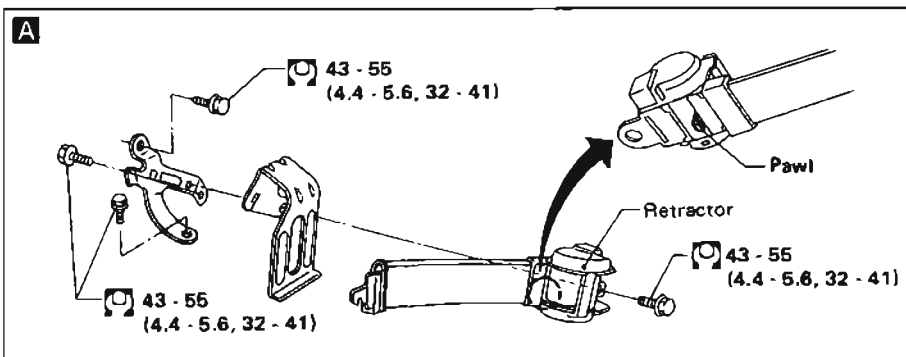



Control unit



AUTOMATIC SEAT BELT SYSTEM

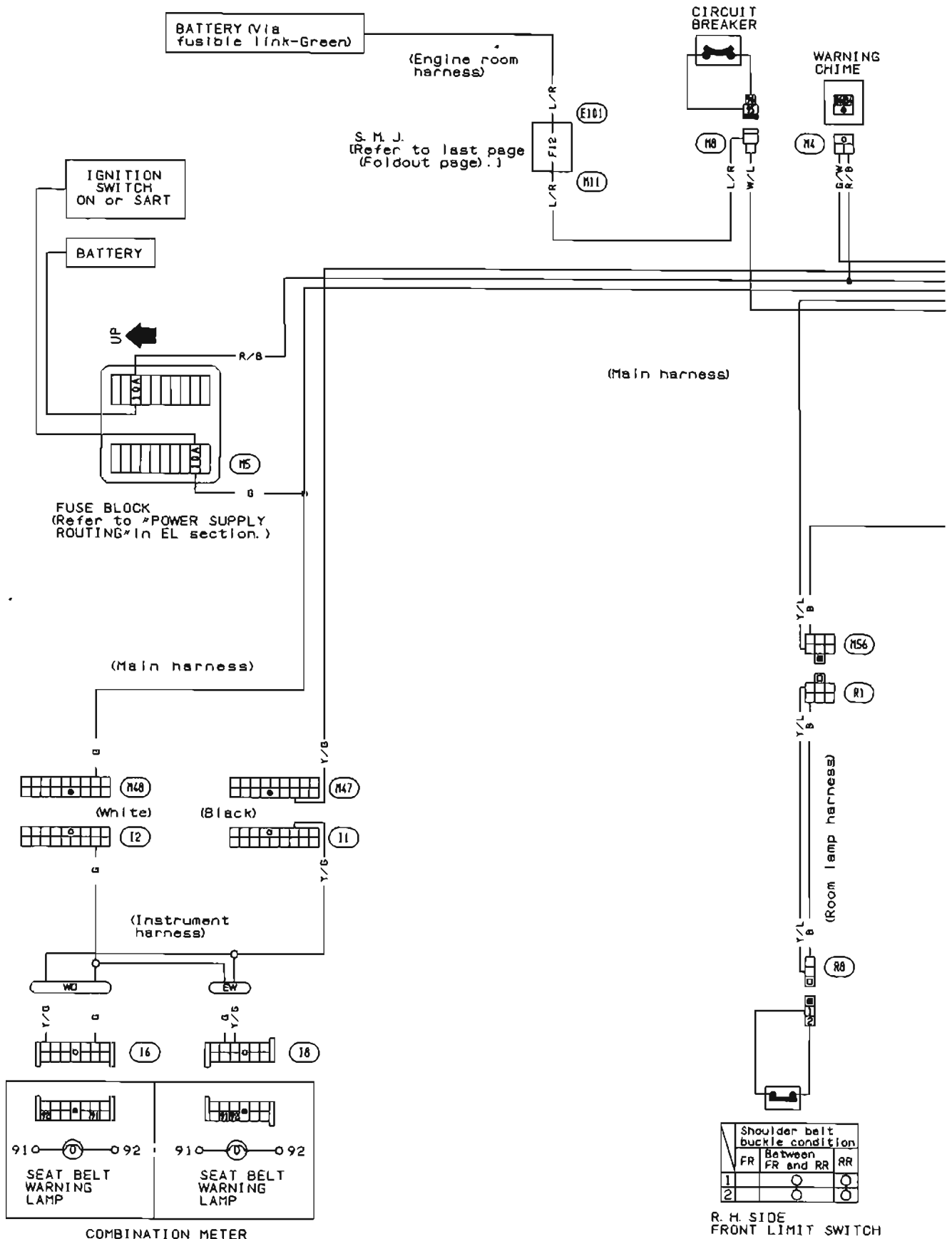
Unit Location (Cont'd)



 : N·m (kg·m, ft·lb)

AUTOMATIC SEAT BELT SYSTEM

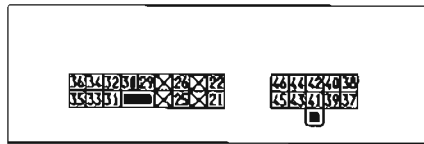
Wiring Diagram



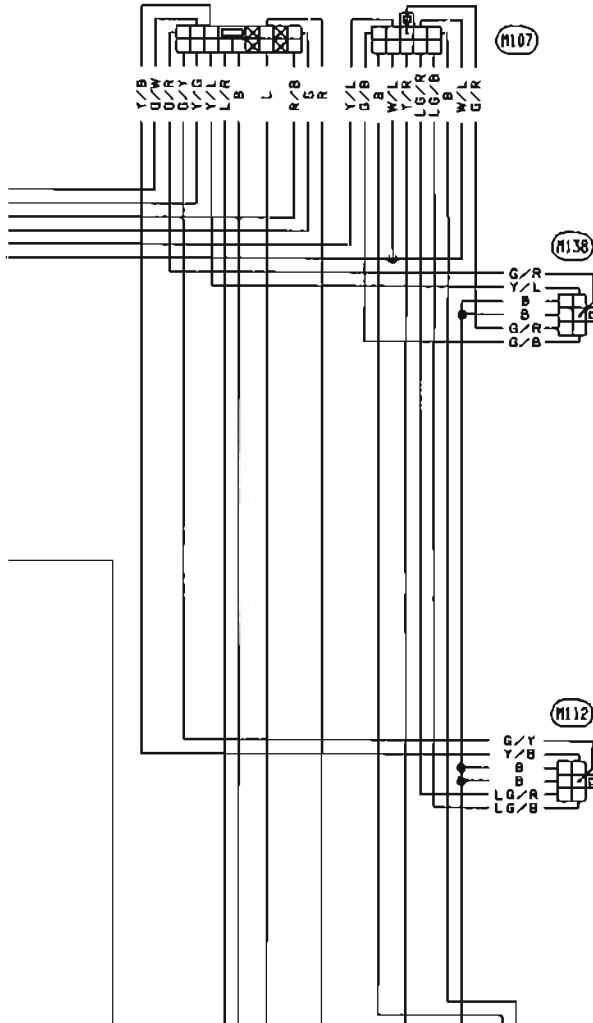
AUTOMATIC SEAT BELT SYSTEM

Wiring Diagram (Cont'd)

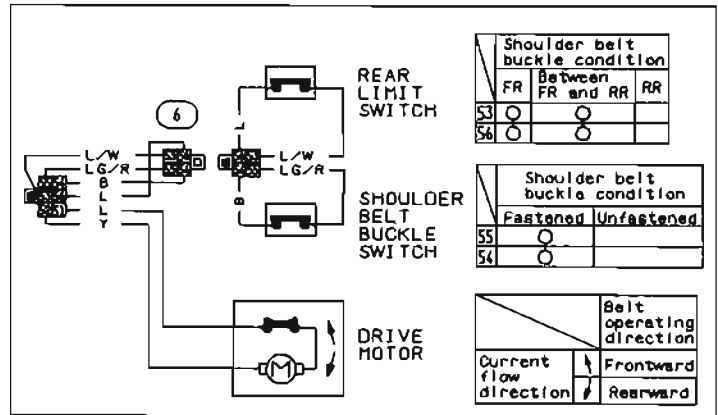
AUTOMATIC SEAT BELT CONTROL UNIT



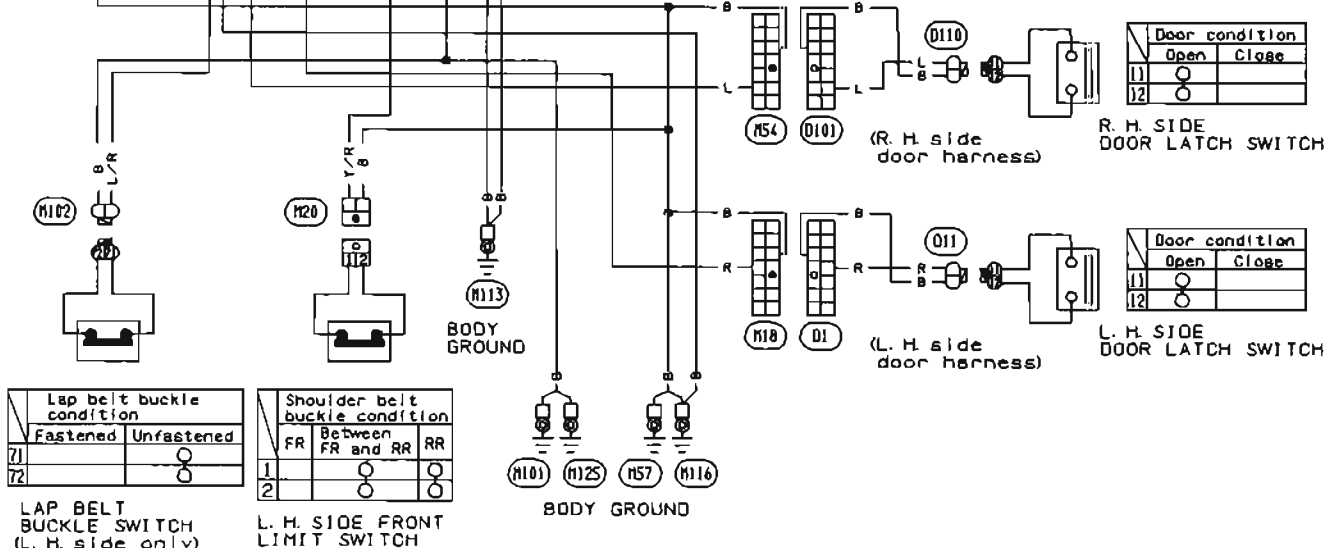
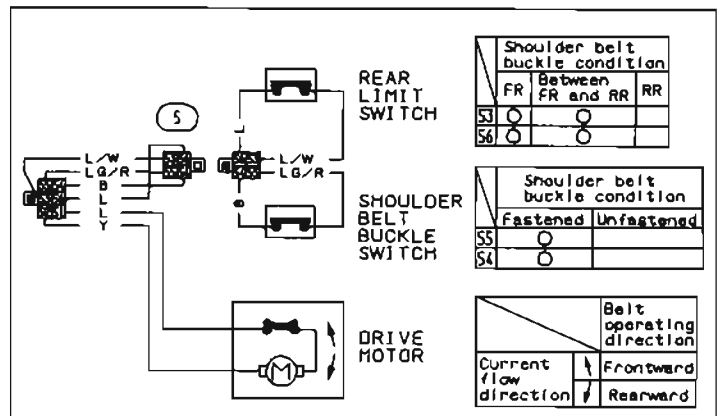
(M): With head-up display
 (E): Without head-up display



R. H. SIDE



L. H. SIDE



| Lap belt buckle condition | |
|---------------------------|------------|
| Fastened | Unfastened |
| Z1 | O |
| Z2 | O |

LAP BELT BUCKLE SWITCH (L. H. side only)

| Shoulder belt buckle condition | | |
|--------------------------------|-------------------|----|
| FR | Between FR and RR | RR |
| 1 | O | O |
| 2 | O | O |

L. H. SIDE FRONT LIMIT SWITCH

AUTOMATIC SEAT BELT SYSTEM

Description

FUNCTION

Shoulder belt buckle is mainly operated while ignition switch is "ON".

Condition (A): Ignition switch is "ON".

When door is opened, shoulder belt buckle is moved frontward and when door is closed, buckle is moved rearward.

Condition (B): Ignition switch is "OFF".

When door is opened, shoulder belt buckle is moved frontward. When the door is closed, buckle will remain in this position.

(Voltage of output signal is approximate value.)

| | | | | | | | | | | | | | | | | | |
|----------------------|--|-------|-------|---------------|----------------------|------|---------------|----------------------|-------|---------------|----------------------|------|------|---------------|----------------------|-------|-------|
| Input signal | Ignition switch | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF |
| | Door latch switch | OFF | ON | OFF | OFF | OFF | ON | ON | ON | OFF | OFF | OFF | OFF | ON | ON | ON | OFF |
| | Front limit switch | OFF | OFF | OFF | ON | ON | ON | ON | OFF | OFF | ON | ON | ON | ON | ON | OFF | OFF |
| | Rear limit switch | ON | ON | ON | ON | OFF | OFF | ON | ON | ON | ON | OFF | OFF | OFF | ON | ON | ON |
| Output signal | Drive motor power source for frontward operation | 0V | 0V | 0V | 0V | 0V | 12V | 12V | 0V | 0V | 0V | 0V | 0V | 12V | 12V | 0V | 0V |
| | Drive motor power source for rearward operation | 0V | 0V | 12V | 12V | 0V | 0V | 0V | 0V | 12V | 12V | 0V | 0V | 0V | 0V | 0V | 0V |
| Shoulder belt buckle | Function | Stop | Stop | Start to move | Moving | Stop | Start to move | Moving | Stop | Start to move | Moving | Stop | Stop | Start to move | Moving | Stop | Stop |
| | Position | Front | Front | Front | Between Front & Rear | Rear | Rear | Between Front & Rear | Front | Front | Between Front & Rear | Rear | Rear | Rear | Between Front & Rear | Front | Front |

TIMER (Ignition switch either "ON" or "OFF")

If limit switch does not operate (when accomplishing frontward operation, front limit switch can not be turned "OFF" or when accomplishing rearward operation, rear limit switch can not be turned "OFF"), control unit will continue to supply power to drive motor for 15 seconds and control unit will stop supplying power.

QUICK WARNING (Ignition switch "ON")

If front limit switch is not turned "OFF" after accomplishing frontward operation, control unit will stop supplying power 15 seconds later and warning lamp will flash and chime will operate rapidly for approximately 6 seconds.

REAR LOCK

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 function is canceled when ignition switch is "OFF".

AUTOMATIC SEAT BELT SYSTEM

NOTE

Contents

| | |
|--|-------|
| Symptom Chart | BF-40 |
| Preliminary Check | BF-41 |
| Main Power Supply and Ground Circuit Check | BF-45 |
| Harness Layout | BF-46 |
| Circuit Diagram for Quick Pin Point Check | BF-48 |
| Diagnostic Procedure 1 (Check motor circuit and stop signals.) | BF-49 |
| Diagnostic Procedure 2 (Check door switch circuit.) | BF-52 |
| Diagnostic Procedure 3 (Check front limit switch circuit.) | BF-54 |
| Diagnostic Procedure 4 (Check rear limit switch circuit.) | BF-56 |
| Diagnostic Procedure 5 (Check shoulder belt switch circuit.) | BF-58 |
| Diagnostic Procedure 6 (Check lap belt switch circuit.) | BF-60 |
| Diagnostic Procedure 7 (Check warning chime circuit.) | BF-62 |
| Diagnostic Procedure 8 (Check warning lamp circuit.) | BF-63 |
| Electrical Components Inspection | BF-64 |

Since left and right component parts are basically the same, harness layout and methods for electronic components inspection are shown for one side only.

Although methods for checking component parts on both sides are described in the flow chart, making it easier to trouble-shoot, apply checking procedures to either side that have problems during trouble diagnoses. For those methods enclosed by double rectangles, however, component parts on both sides must be checked as problems occurring on either side cannot be easily determined by a symptom.

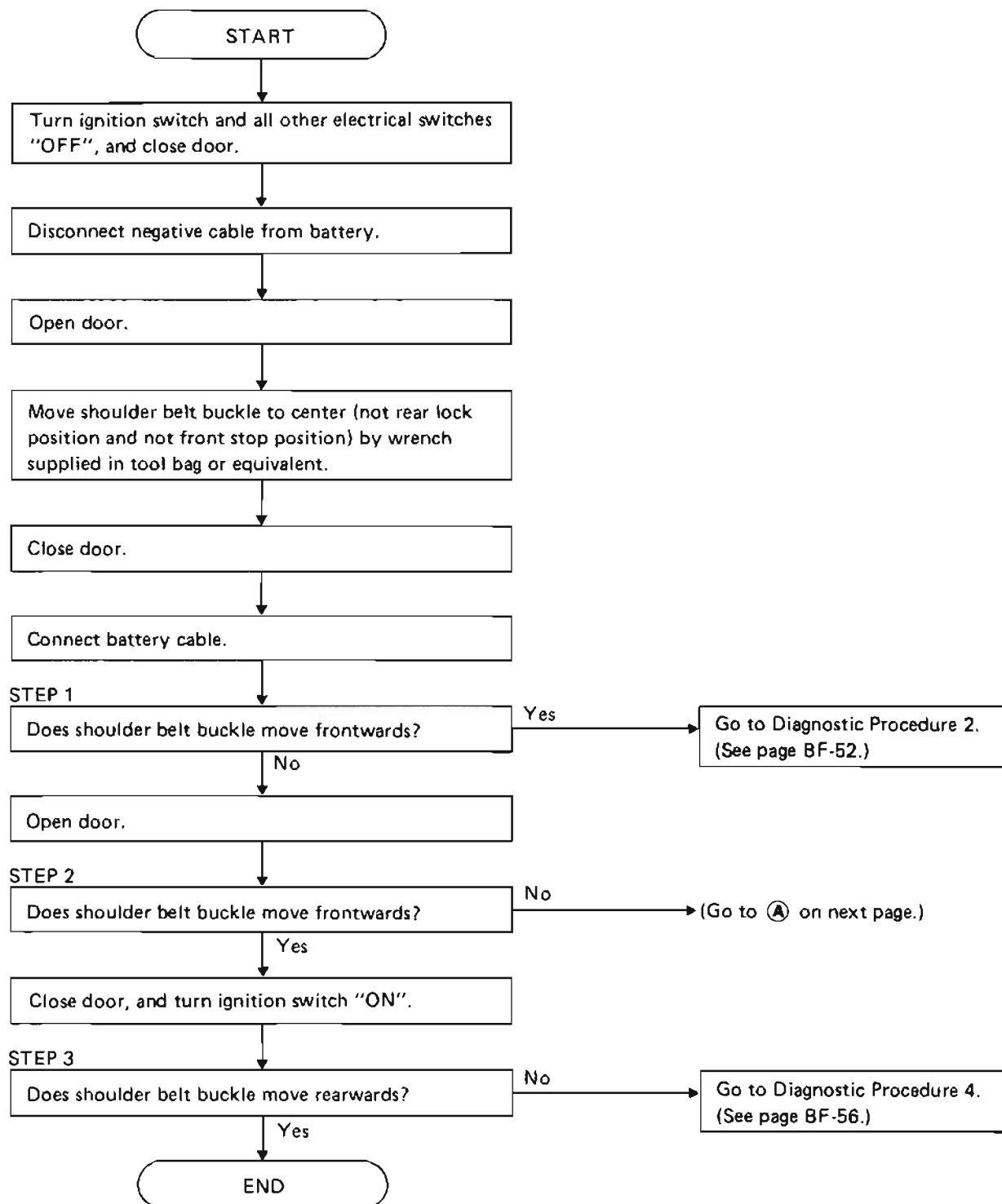
TROUBLE DIAGNOSES

Symptom Chart

| Procedure | Reference page | SYMPTOM | No operation has made. (No warning indicated and no buckles movement performed) | Shoulder belt buckle in L.H. or R.H. side does not move. | Shoulder belt buckle moves frontwards only. (not rearwards) | Shoulder belt buckle moves rearwards only. (not frontwards) | Warnings indicate incorrectly or do not function. | Quick warning operates. | |
|--|----------------------|--|--|--|---|---|---|-------------------------|--|
| Electrical Components Inspection | BF-64 | Motor | <input type="radio"/> | <input type="radio"/> | | | | | |
| | BF-64 | Shoulder belt buckle switch | <input type="radio"/> | | | | <input type="radio"/> | | |
| | BF-64 | Door latch switch | <input type="radio"/> | | <input type="radio"/> | <input type="radio"/> | | | |
| | BF-64 | Rear limit switch | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | | <input type="radio"/> | | |
| | BF-64 | Front limit switch | <input type="radio"/> | <input type="radio"/> | | <input type="radio"/> | | <input type="radio"/> | |
| | BF-65 | Lap belt switch | <input type="radio"/> | | | | <input type="radio"/> | | |
| | BF-64 | Motor | <input type="radio"/> | <input type="radio"/> | | | | | |
| | BF-64 | Shoulder belt buckle switch | <input type="radio"/> | | | | <input type="radio"/> | | |
| | BF-64 | Door latch switch | <input type="radio"/> | | <input type="radio"/> | <input type="radio"/> | | | |
| | BF-64 | Rear limit switch | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | | <input type="radio"/> | | |
| | BF-64 | Front limit switch | <input type="radio"/> | <input type="radio"/> | | <input type="radio"/> | | <input type="radio"/> | |
| | BF-65 | Warning chime | <input type="radio"/> | | | | | <input type="radio"/> | |
| | - | Warning lamp | <input type="radio"/> | | | | | <input type="radio"/> | |
| | Diagnostic Procedure | BF-63 | Procedure 8 | | | | | <input type="radio"/> | |
| BF-62 | | Procedure 7 | | | | | <input type="radio"/> | | |
| BF-60 | | Procedure 6 | | | | | <input type="radio"/> | | |
| BF-58 | | Procedure 5 | | | | | <input type="radio"/> | | |
| BF-56 | | Procedure 4 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | | <input type="radio"/> | | |
| BF-54 | | Procedure 3 | <input type="radio"/> | <input type="radio"/> | | <input type="radio"/> | | <input type="radio"/> | |
| BF-52 | | Procedure 2 | | | <input type="radio"/> | <input type="radio"/> | | | |
| BF-49 | | Procedure 1 | <input type="radio"/> | <input type="radio"/> | | | | | |
| Main Power Supply and Ground Circuit Check | BF-45 | Procedure 2 | | <input type="radio"/> | | | | | |
| | BF-45 | Procedure 1 | <input type="radio"/> | | | | | | |
| Preliminary Check | BF-43 | Procedure 2 | | | | | <input type="radio"/> | | |
| | BF-41 | Procedure 1 | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | | | |
| | | SYMPTOM | | | | | | | |
| | | No operation has made. (No warning indicated and no buckles movement performed) | | | | | | | |
| | | Shoulder belt buckle in L.H. or R.H. side does not move. | | | | | | | |
| | | Shoulder belt buckle moves frontwards only. (not rearwards) | | | | | | | |
| | | Shoulder belt buckle moves rearwards only. (not frontwards) | | | | | | | |
| | | Warnings indicate incorrectly or do not function. | | | | | | | |
| | | Quick warning operates. | | | | | | | |

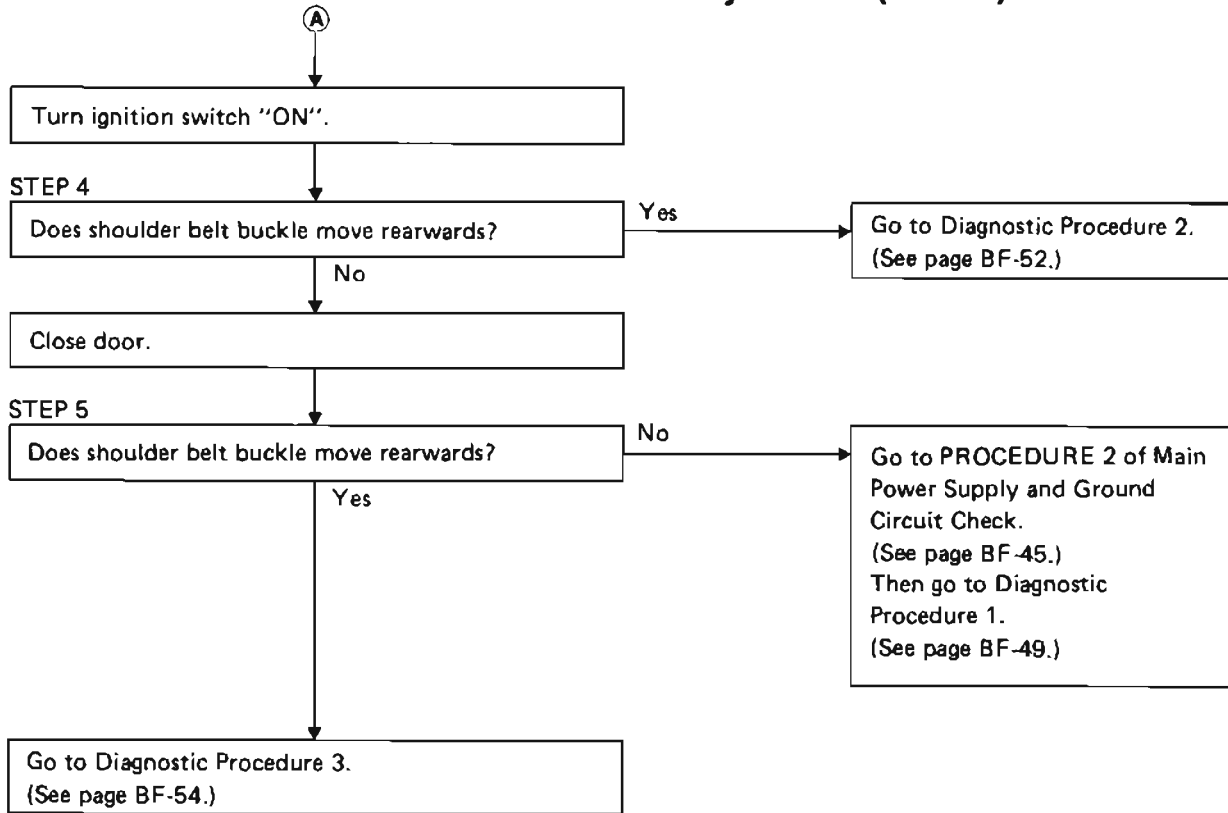
Preliminary Check

PROCEDURE 1



TROUBLE DIAGNOSES

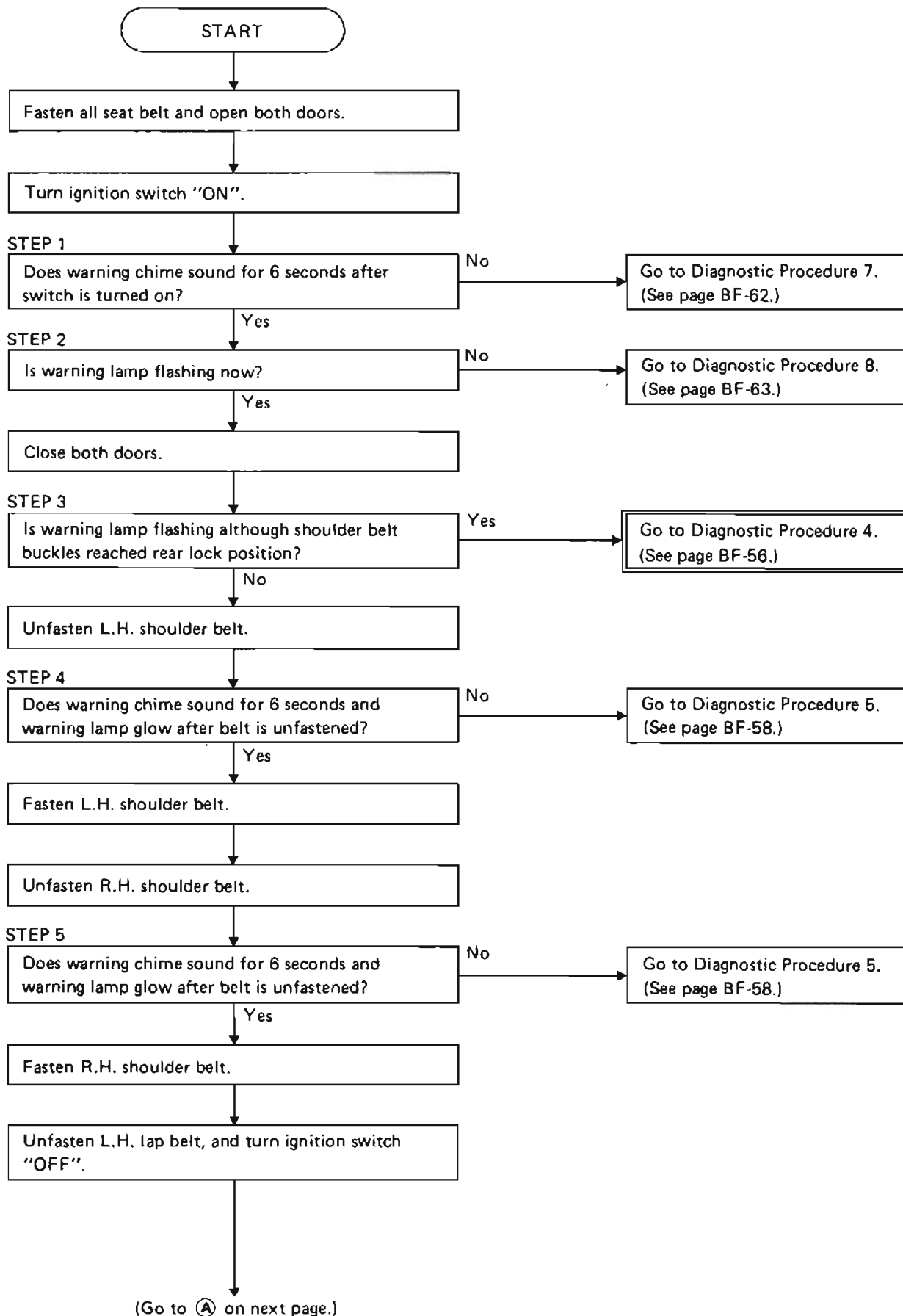
Preliminary Check (Cont'd)



TROUBLE DIAGNOSES

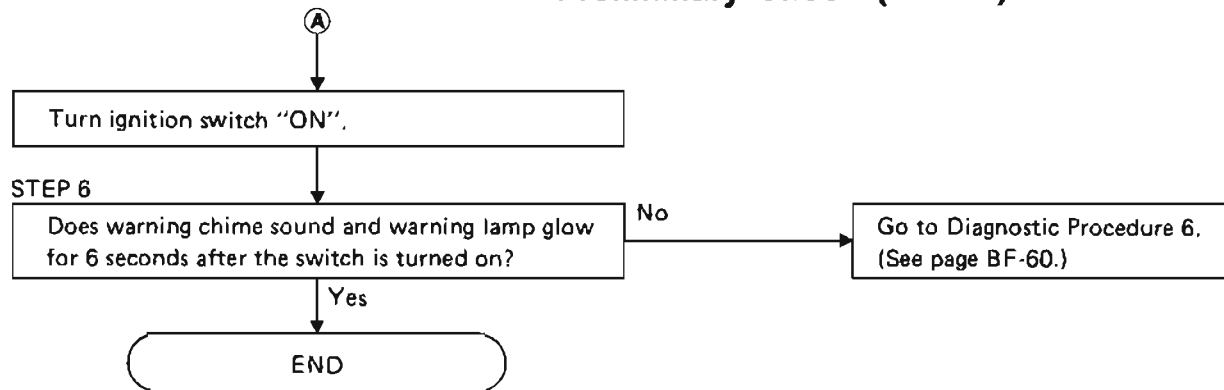
Preliminary Check (Cont'd)

PROCEDURE 2

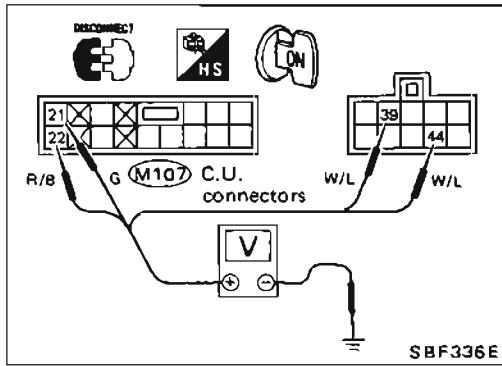


TROUBLE DIAGNOSES

Preliminary Check (Cont'd)



TROUBLE DIAGNOSES

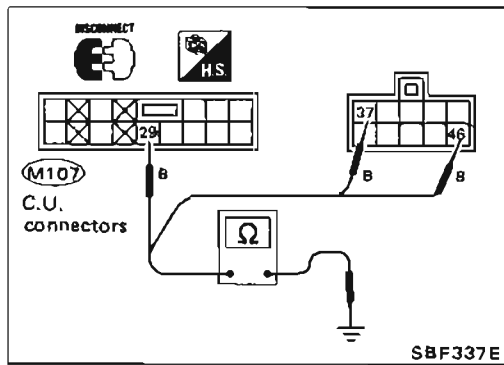


Main Power Supply and Ground Circuit Check

PROCEDURE 1

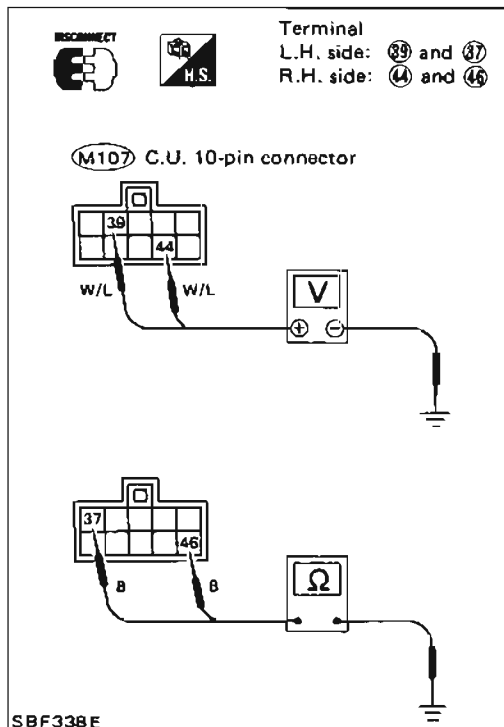
Main power supply

| 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

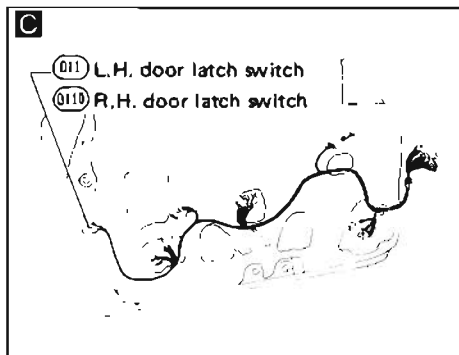
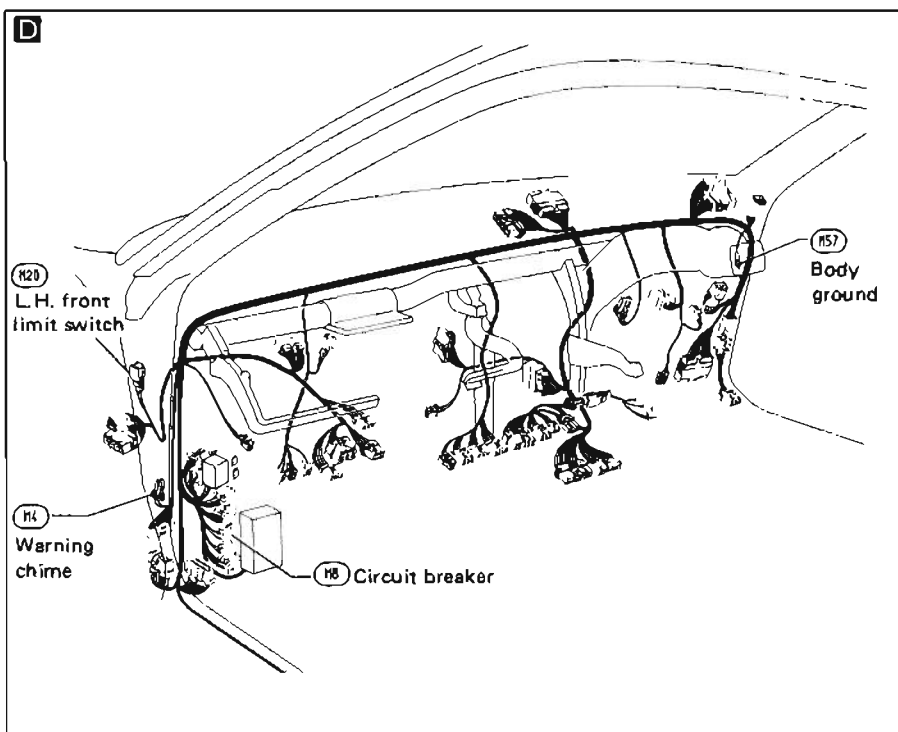
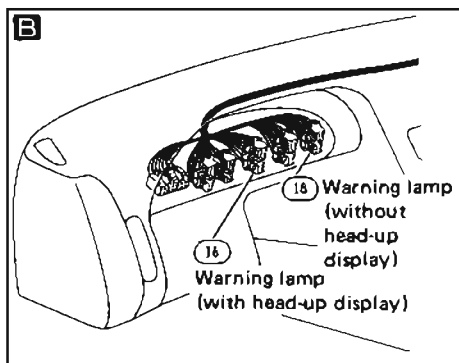
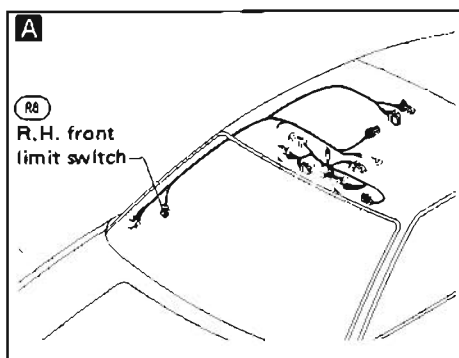
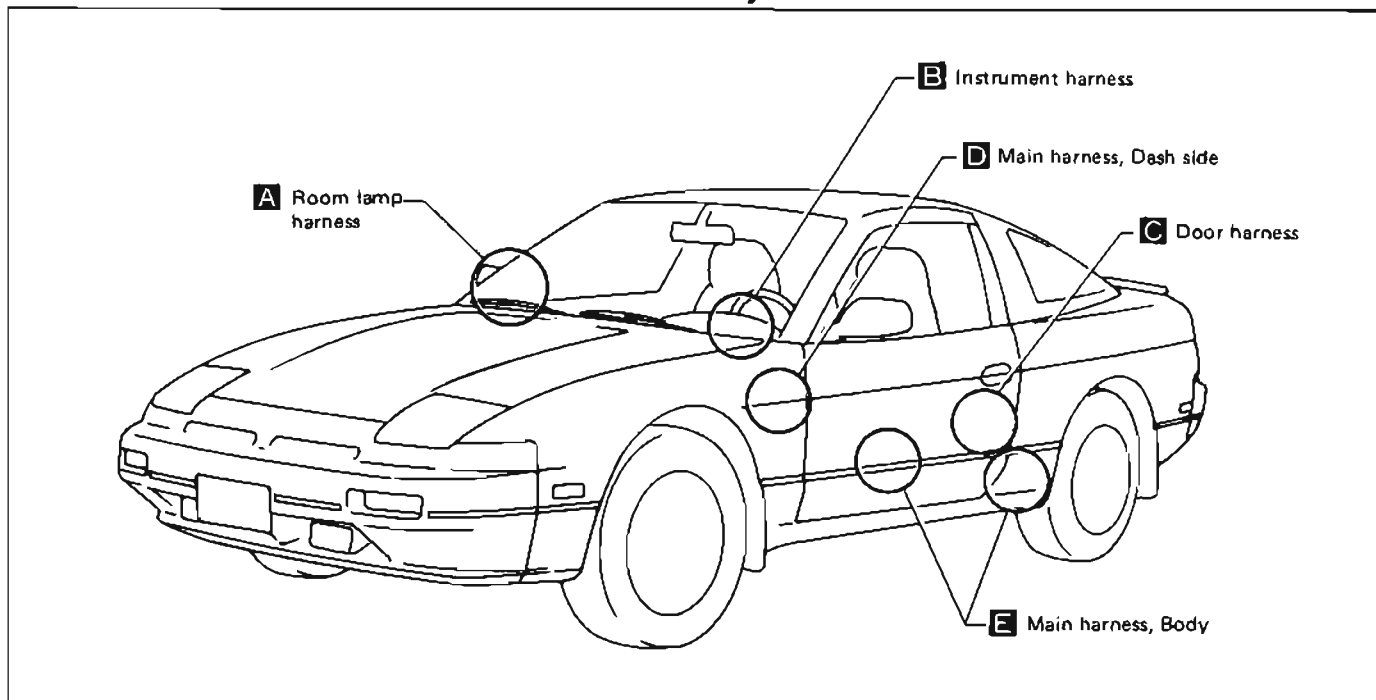
| | Terminals | Battery voltage existence |
|-----------|-------------|---------------------------|
| L.H. side | ③9 - Ground | Yes |
| R.H. side | ④4 - Ground | Yes |

Ground circuit for motor drive

| | Terminals | Continuity |
|-----------|-------------|------------|
| L.H. side | ③7 - Ground | Yes |
| R.H. side | ④6 - Ground | Yes |

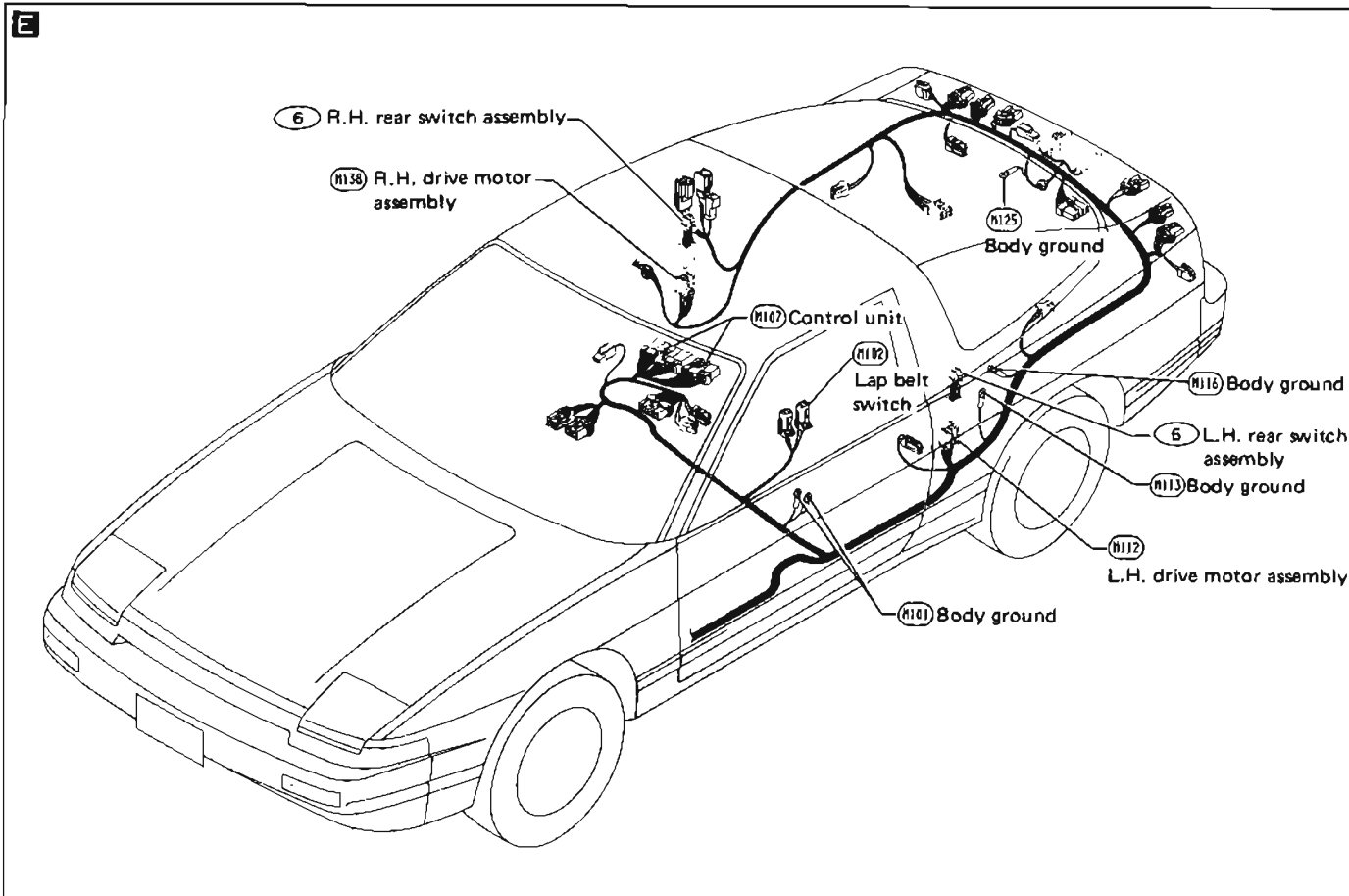
TROUBLE DIAGNOSES

Harness Layout



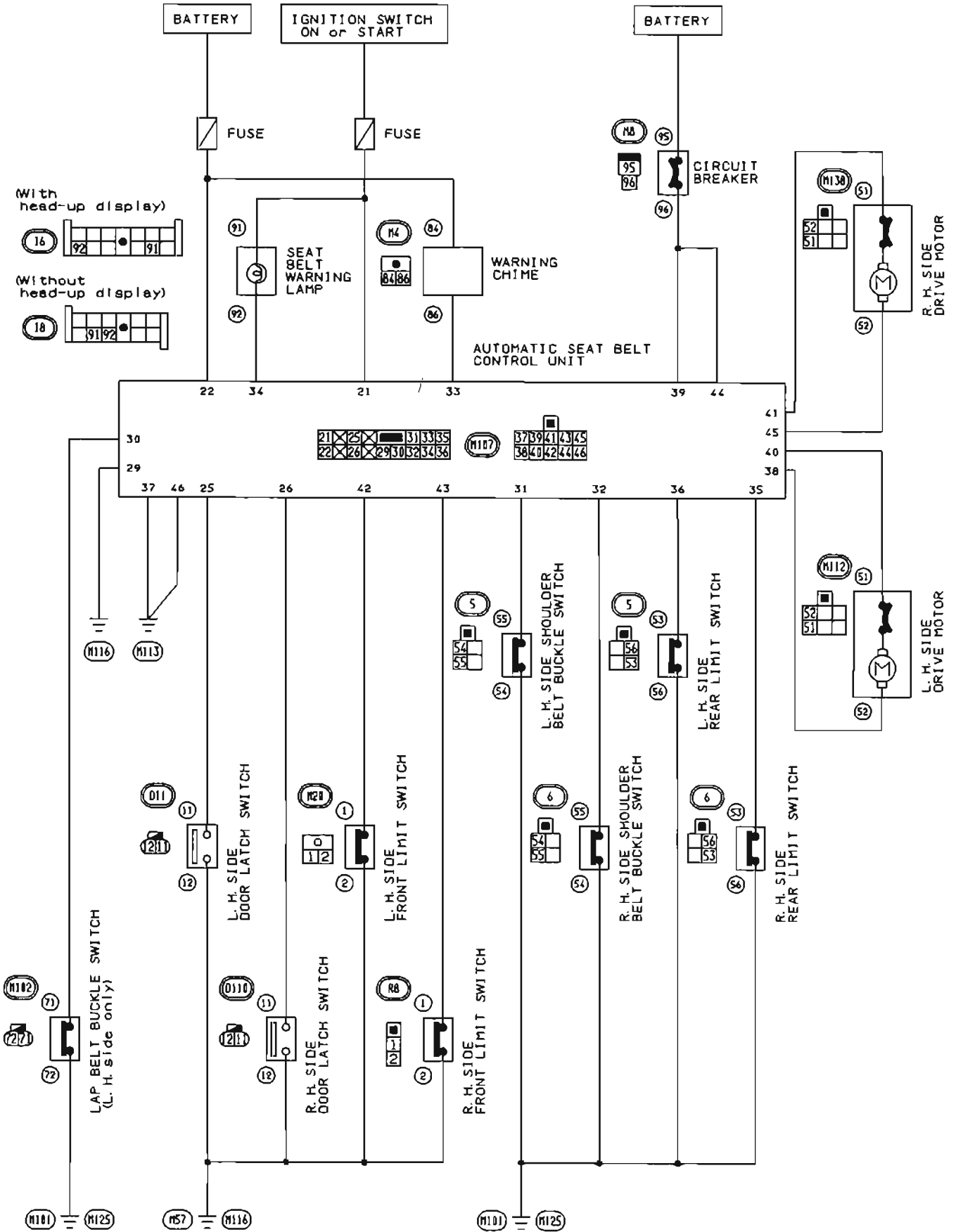
TROUBLE DIAGNOSES

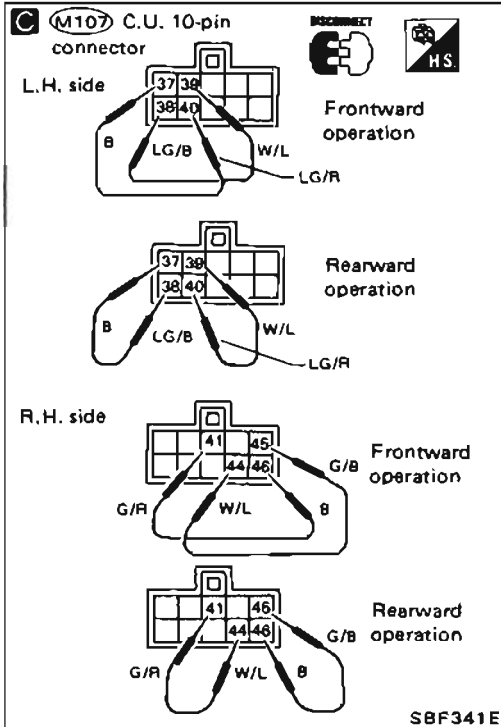
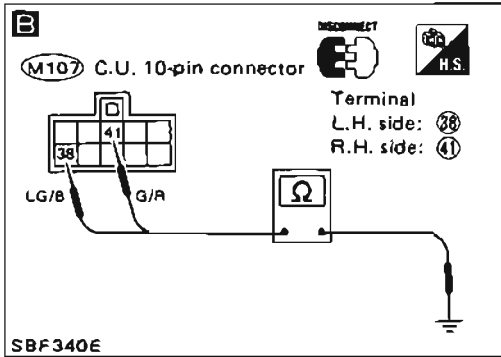
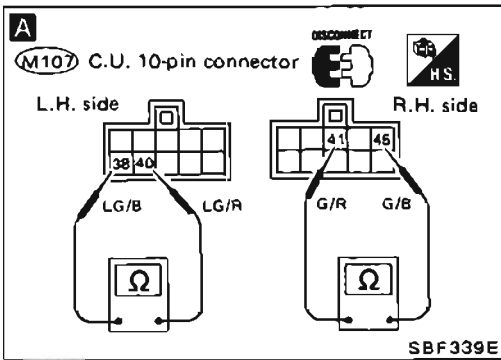
Harness Layout (Cont'd)



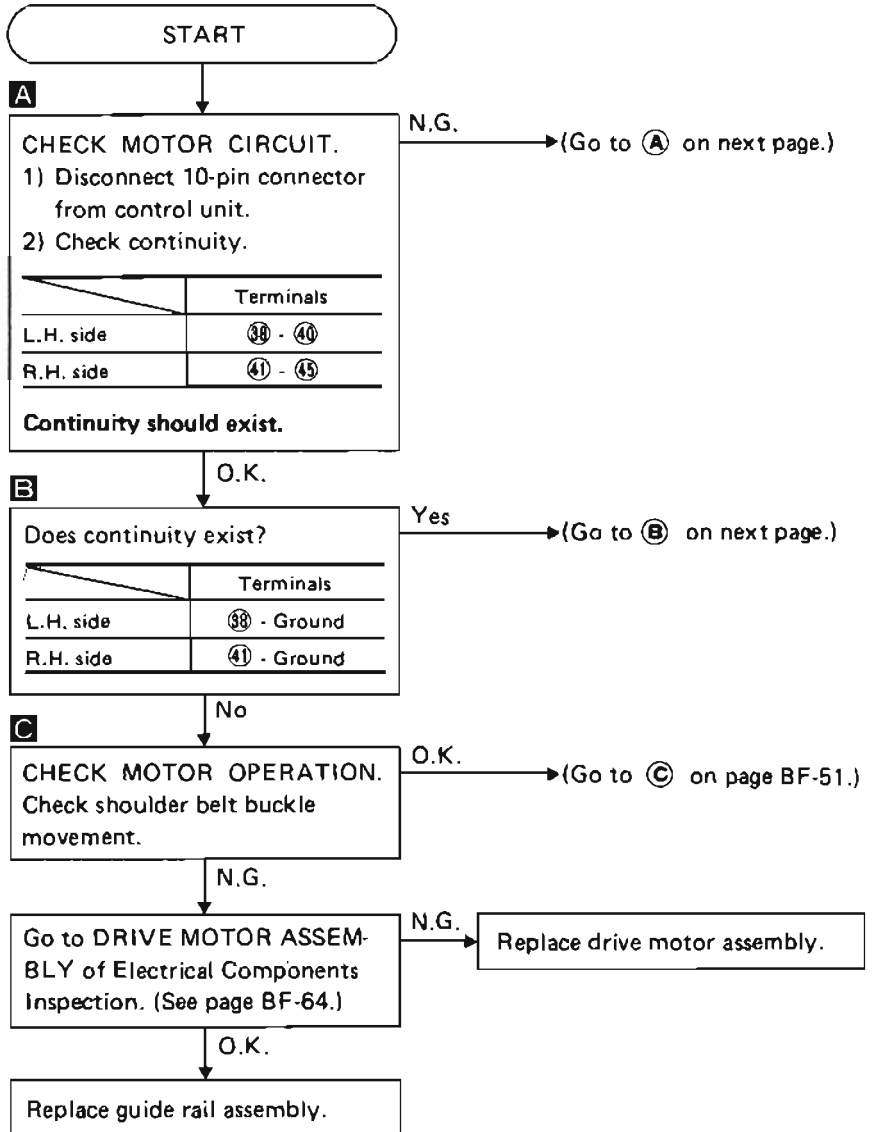
TROUBLE DIAGNOSES

Circuit Diagram for Quick Pin Point Check



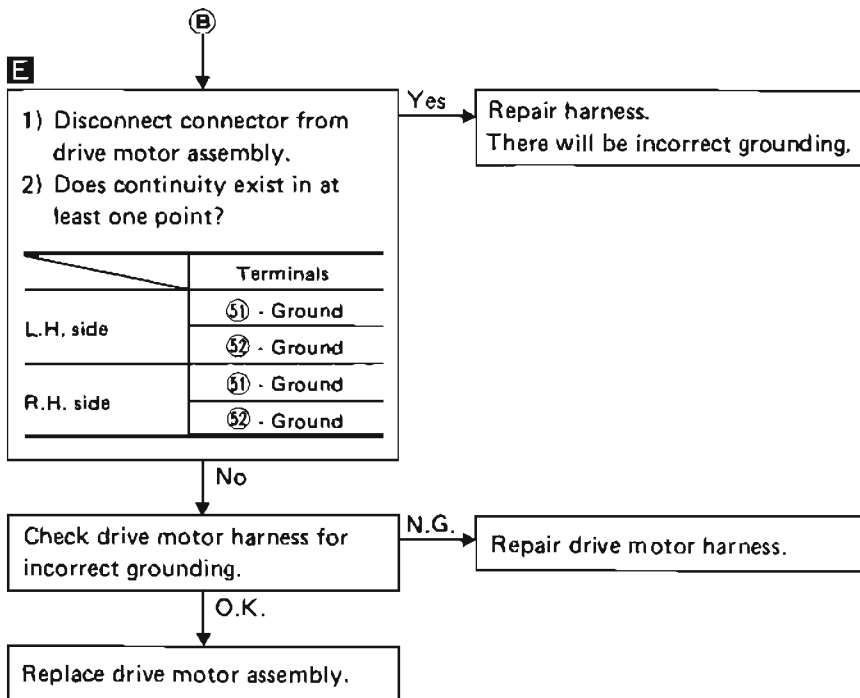
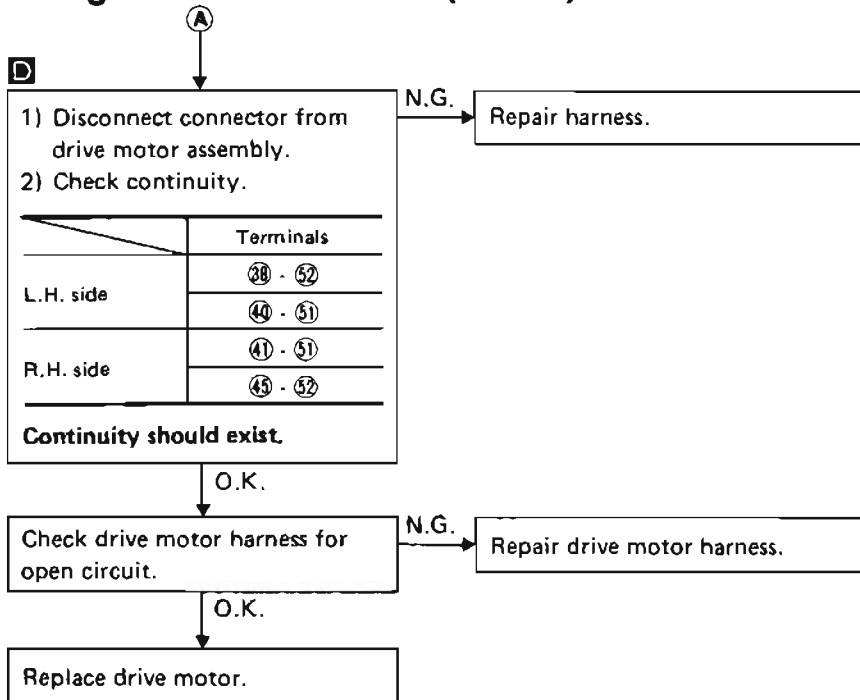
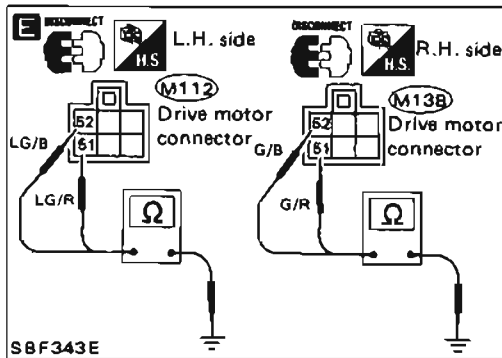
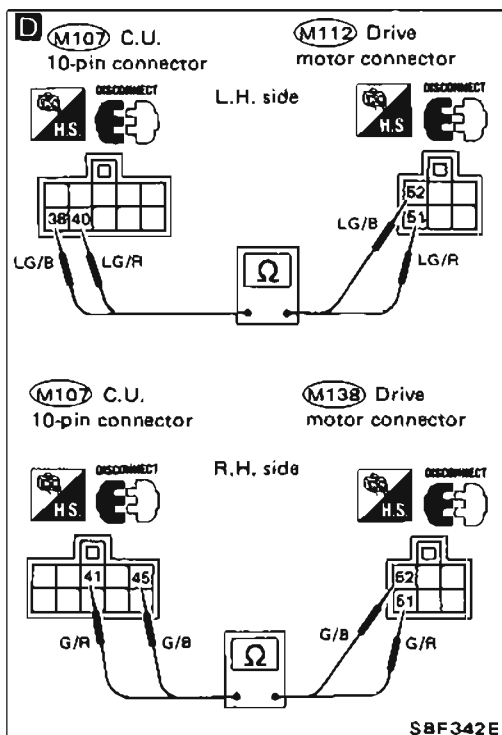


Diagnostic Procedure 1



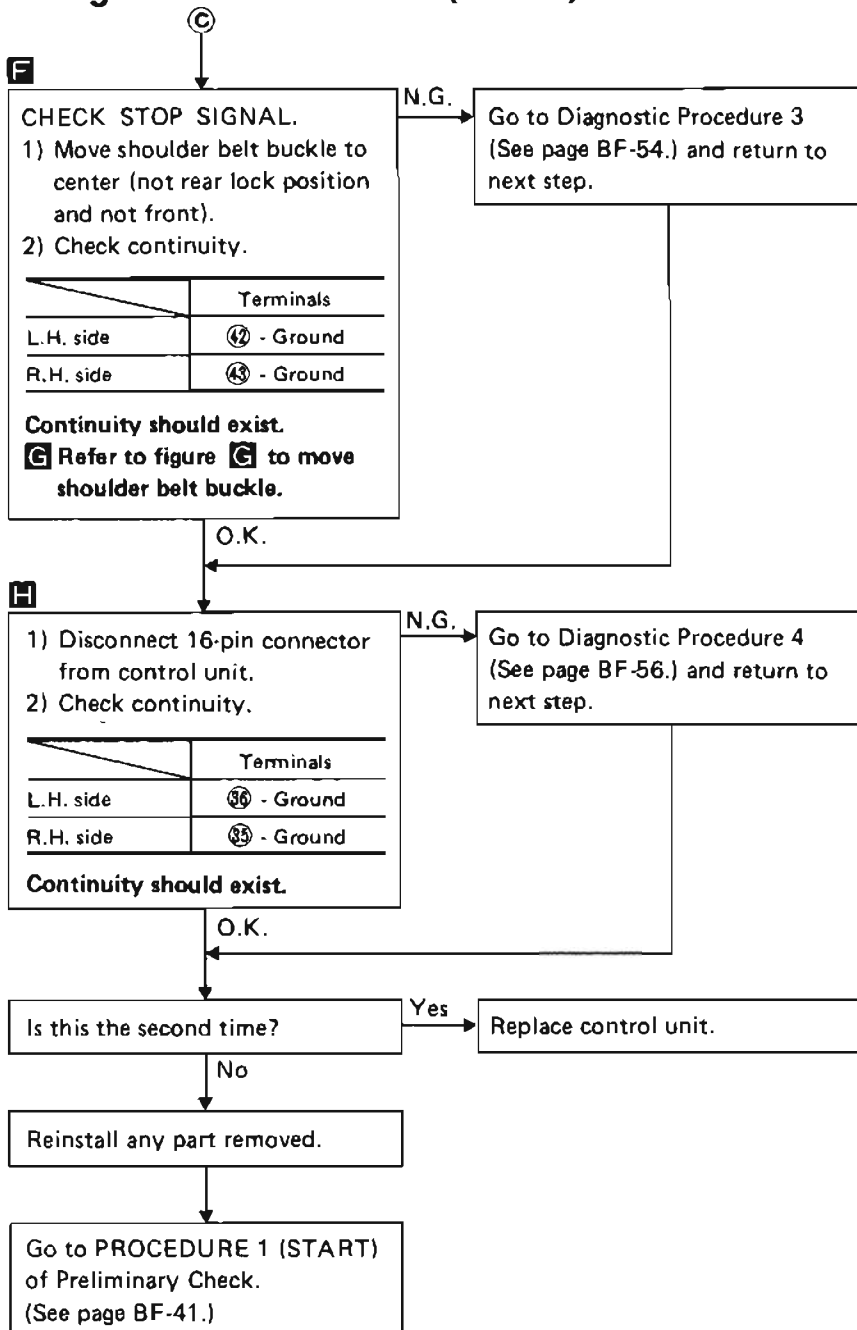
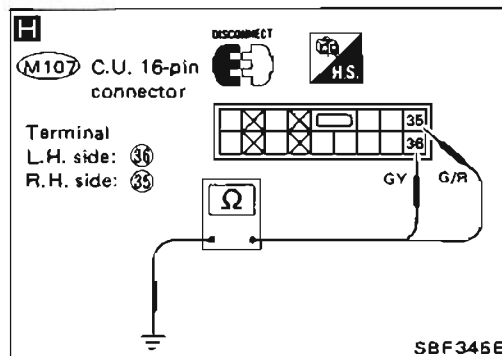
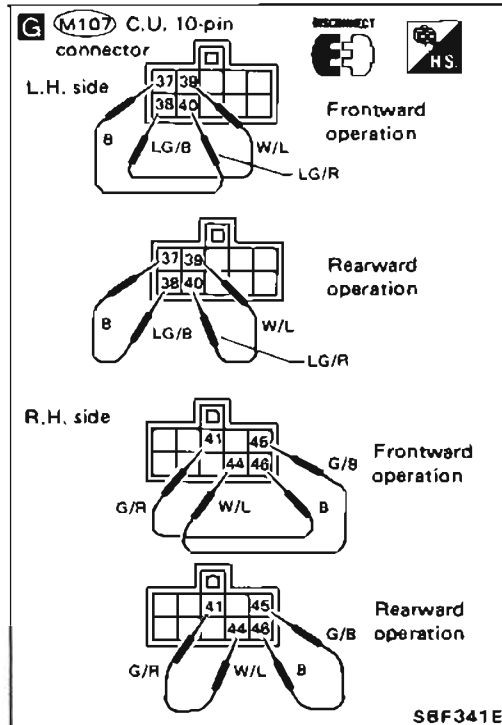
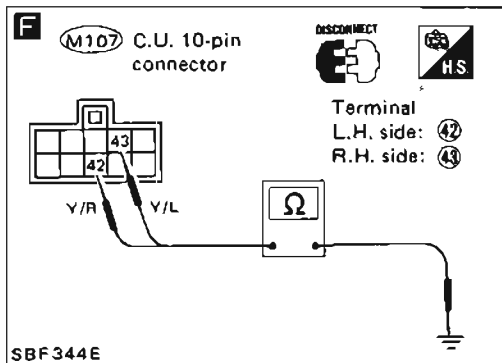
TROUBLE DIAGNOSES

Diagnostic Procedure 1 (Cont'd)

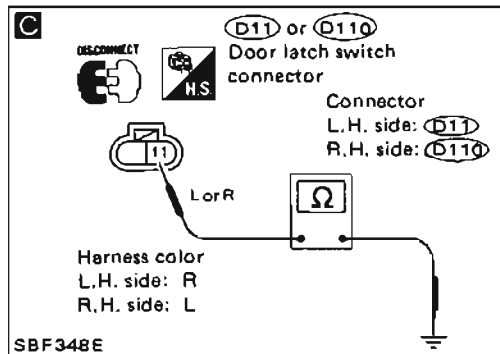
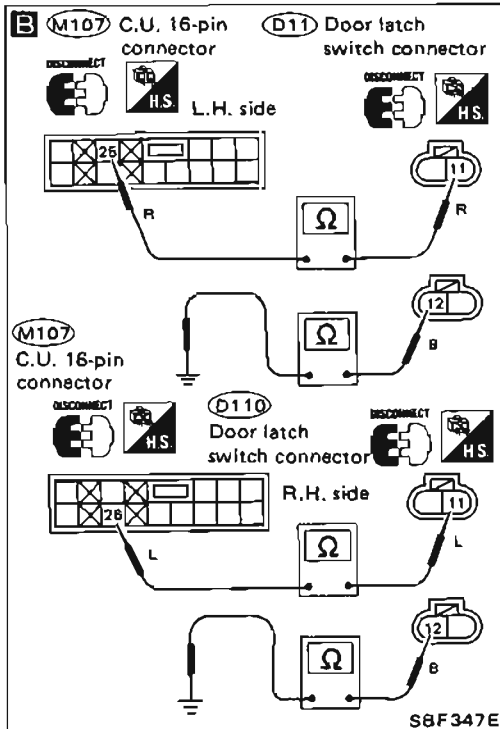
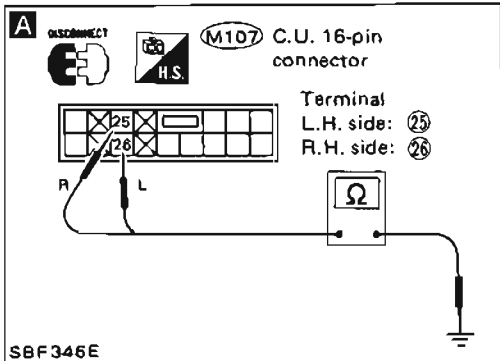


TROUBLE DIAGNOSES

Diagnostic Procedure 1 (Cont'd)



Diagnostic Procedure 2



START

A

CHECK DOOR SWITCH CIRCUIT.

1) Disconnect 16-pin connector from control unit.

2) Check continuity.

O.K. → (Go to **A** on next page.)

| | Ter- mi- nals | Door con- di- tion | Con- tinu- ity |
|--------------|---------------------|-----------------------------|----------------------|
| L.H. side | 25 - Ground | Open | Yes |
| | | Close | No |
| R.H. side | 26 - Ground | Open | Yes |
| | | Close | No |

N.G.

B

1) Disconnect door latch switch connector.

2) Check continuity.

N.G. → Repair harness.

| | Terminals |
|--------------|--|
| L.H. side | 25 - 11 |
| | 12 - Ground (M57 , M116) |
| R.H. side | 26 - 11 |
| | 12 - Ground (M57 , M116) |

Continuity should exist.

O.K.

C

Does continuity exist?

| | Connector | Terminals |
|-----------|-------------|-------------|
| L.H. side | D11 | 11 - Ground |
| R.H. side | D110 | 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 of Electrical Components Inspection. (See page BF-64.)

O.K. → Reinstall any part removed.

N.G.

Go to PROCEDURE 1 (START) of Preliminary Check. (See page BF-41.)

N.G.

Check door latch switch harness for open and short circuit.

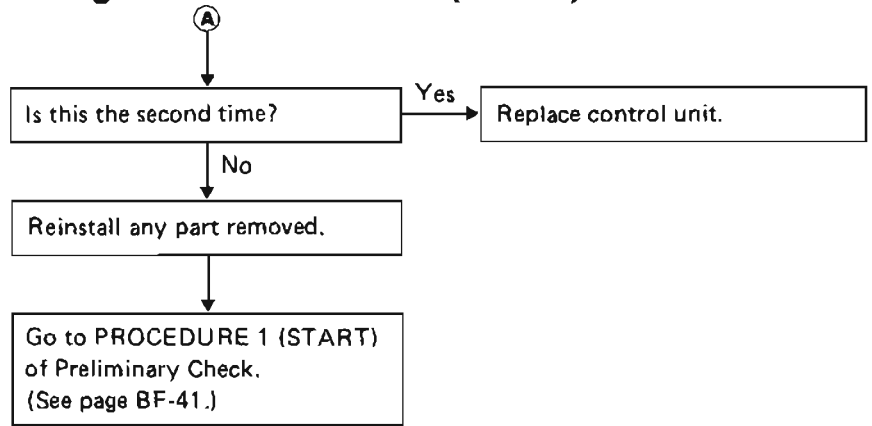
Repair door latch switch harness.

O.K.

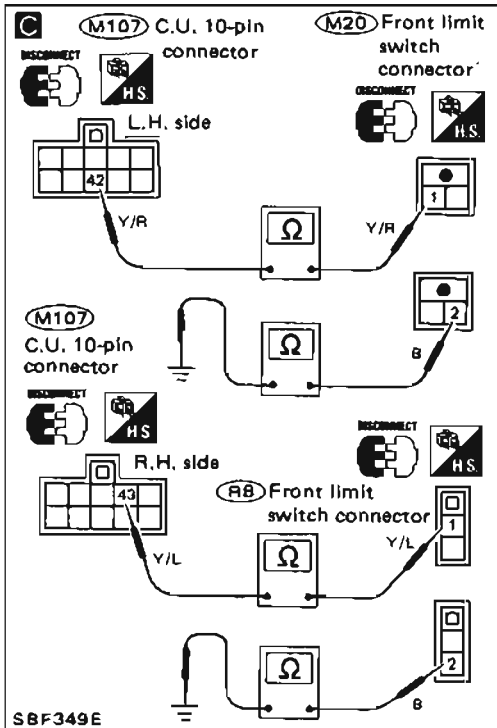
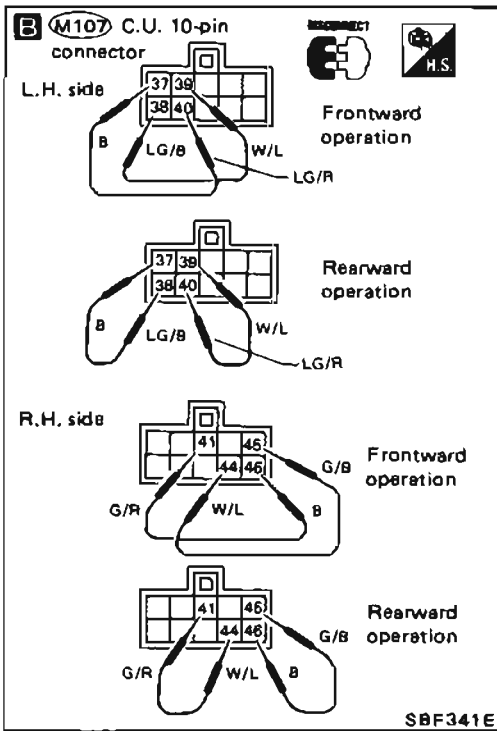
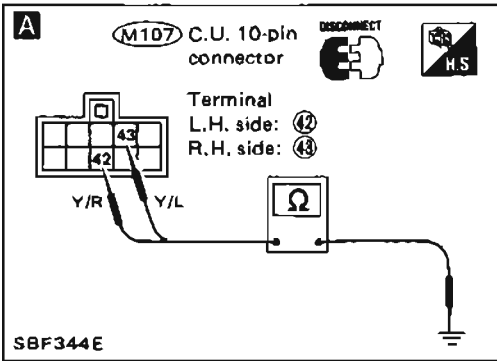
Replace door lock assembly.

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.

| | Terminals | Shoulder belt buckle position | Continuity |
|-----------|------------|-------------------------------|------------|
| L.H. side | ④ - Ground | At front | No |
| | | Not at front | Yes |
| R.H. side | ④ - Ground | At front | No |
| | | Not at front | Yes |

B Refer to figure B to move shoulder belt buckle.

O.K. (Go to B on next page.)

C

- 1) Disconnect connector from front limit switch.
- 2) Check continuity.

| | Terminals |
|-----------|------------------------|
| L.H. side | ④ - ① |
| | ② - Ground (M57, M116) |
| R.H. side | ④ - ① |
| | ② - Ground (M57, M116) |

Continuity should exist.

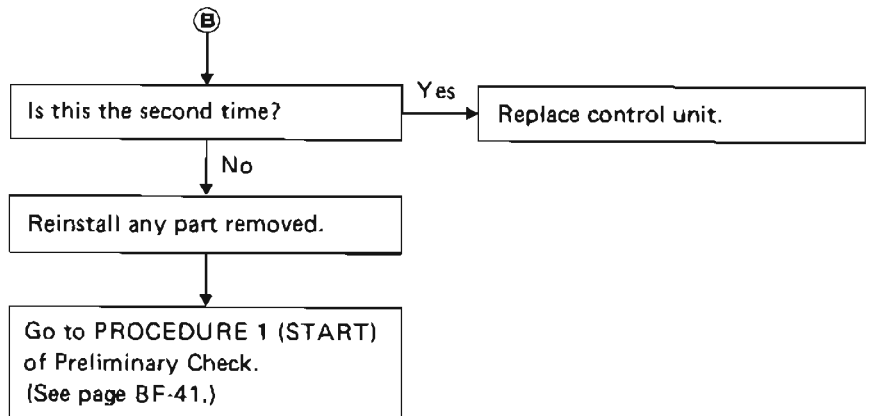
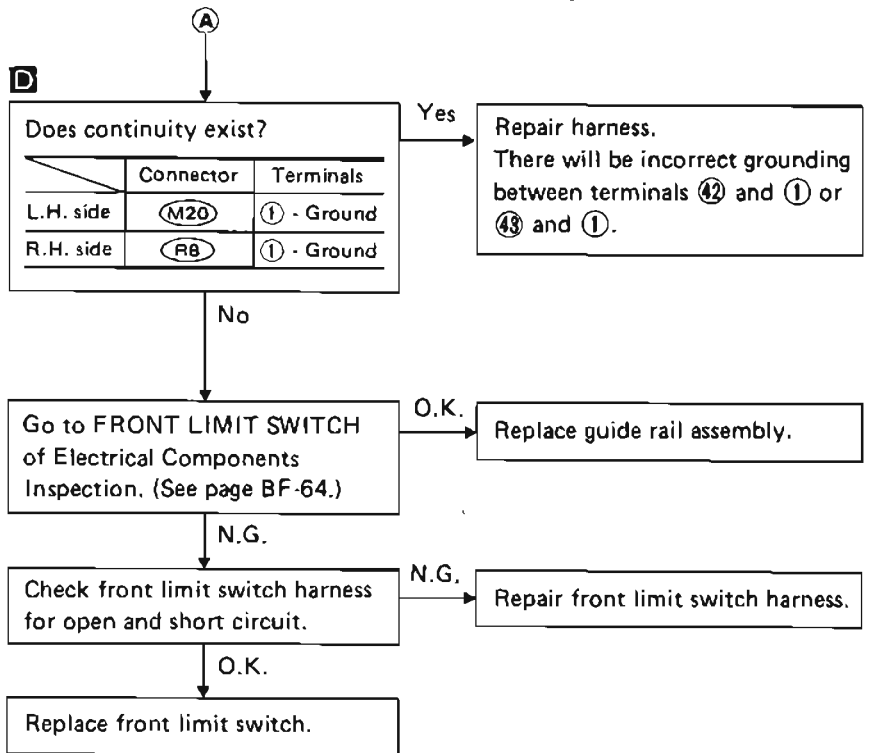
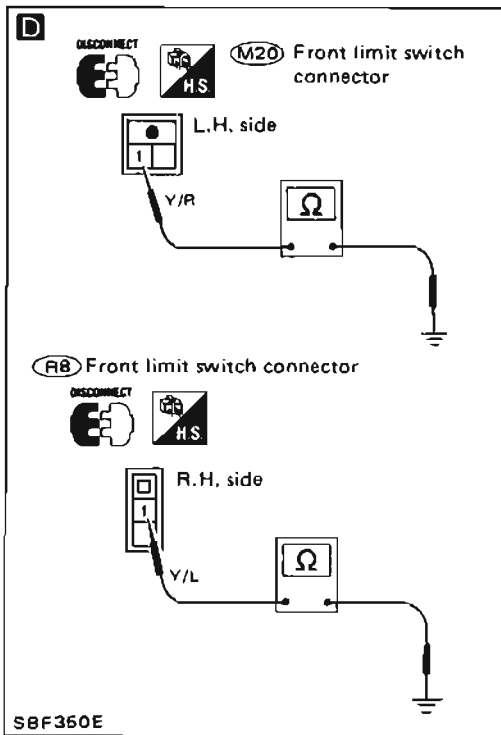
N.G. Repair harness.

O.K.

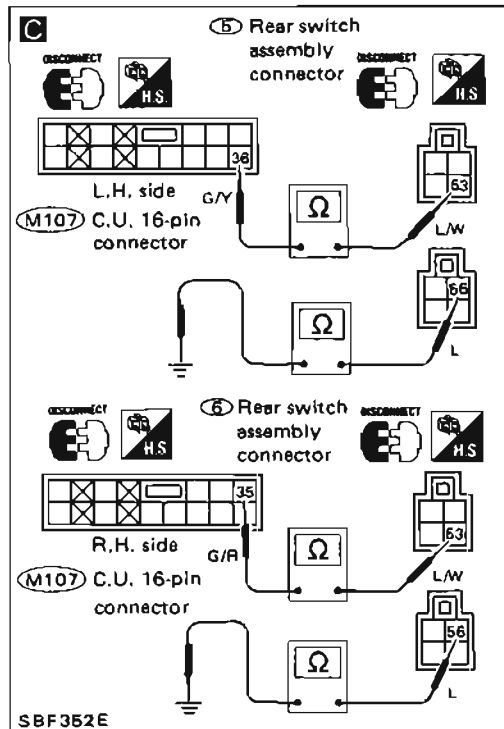
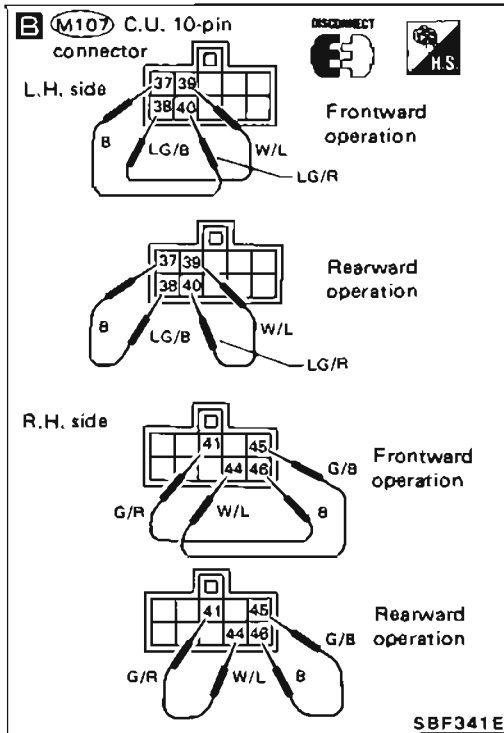
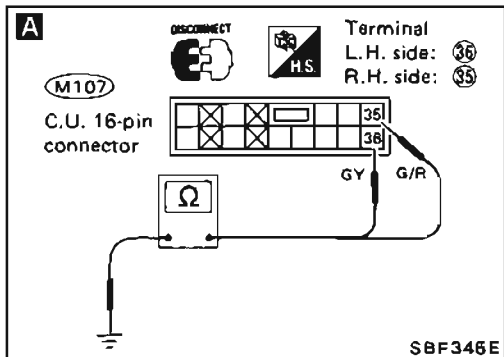
(Go to A on next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 3 (Cont'd)



Diagnostic Procedure 4



A

CHECK REAR LIMIT SWITCH CIRCUIT.

1) Disconnect 16-pin connector from control unit.

2) Check continuity.

O.K. → (Go to **B** on next page.)

| | Ter- min- als | Shoulder belt buckle position | Con- tinu- ity |
|--------------|---------------------|--|----------------------|
| L.H. side | ③⑥ - Ground | At rear | No |
| | | Not at rear | Yes |
| R.H. side | ③⑤ - Ground | At rear | No |
| | | Not at rear | Yes |

B Refer to figure **B** to move shoulder belt buckle.

C

1) Disconnect connector from rear switch assembly.

2) Check continuity.

N.G. → Repair harness.

| | Terminals |
|--------------|---|
| L.H. side | ③⑥ - ⑤③ ⑤⑥ - Ground ((M107) , (M125)) |
| | ③⑤ - ⑤③ ⑤⑤ - Ground ((M107) , (M125)) |

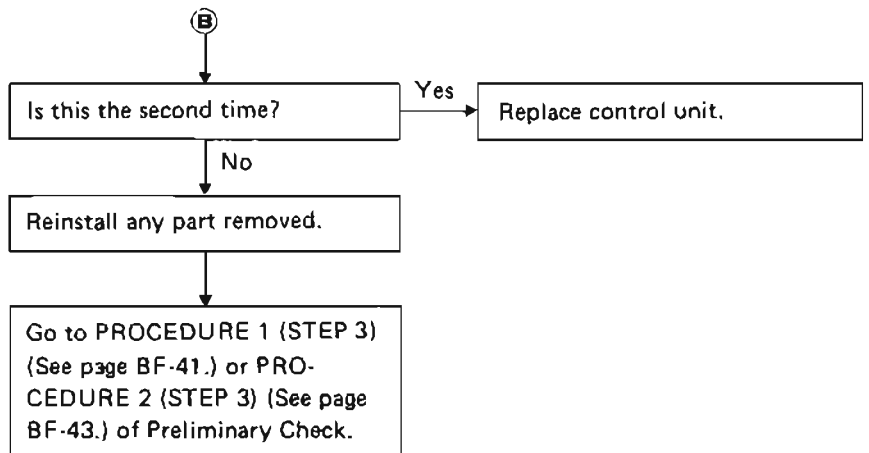
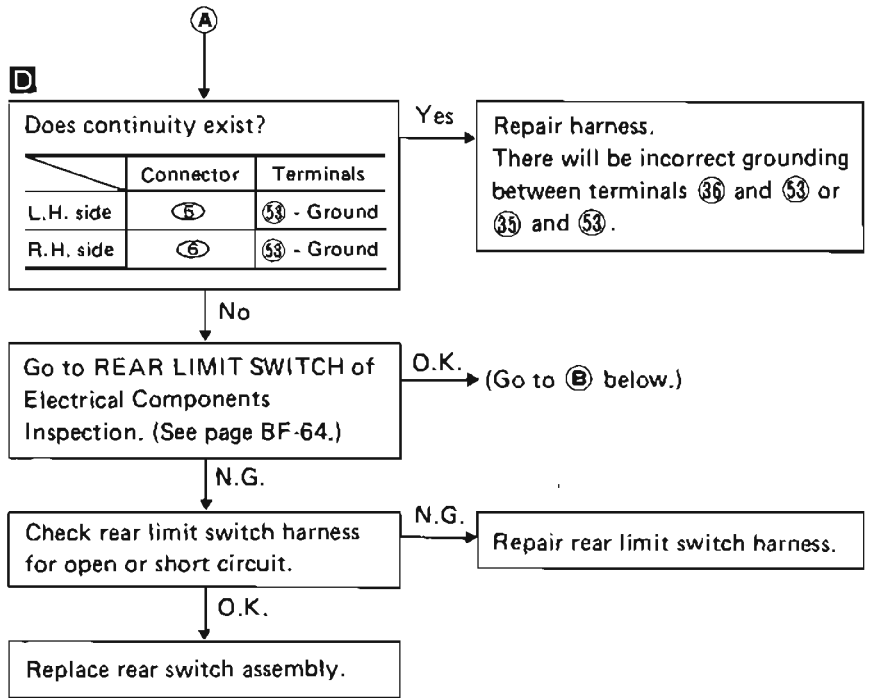
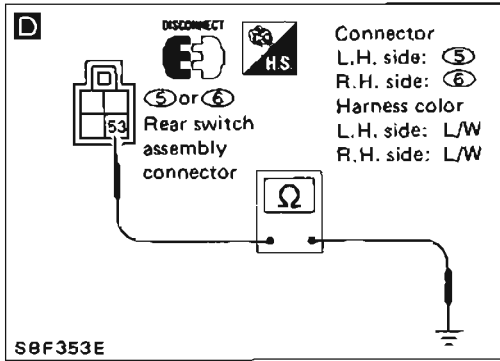
Continuity should exist.

O.K.

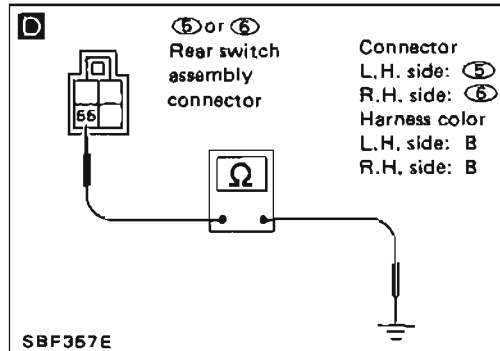
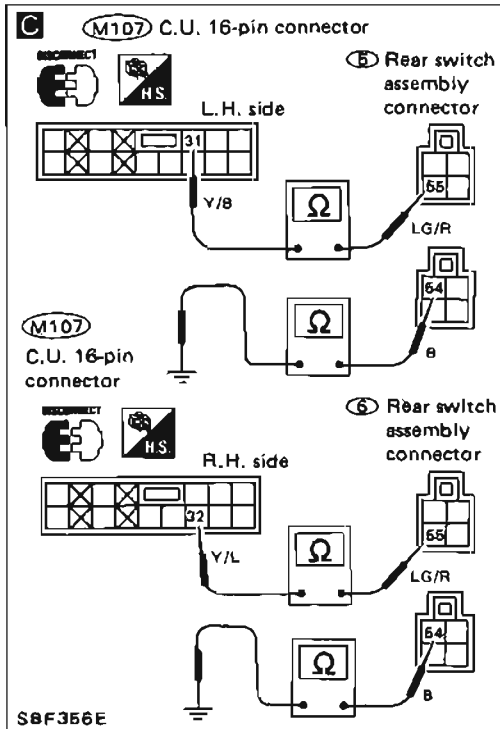
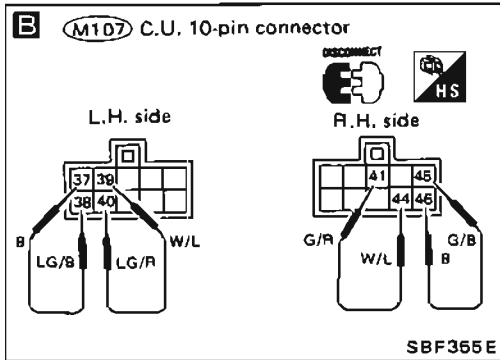
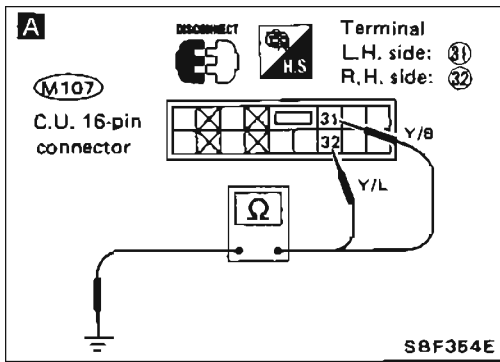
(Go to **A** on next page.)

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- minals | Shoulder belt | Con- tinuity |
|--------------|----------------|------------------|-----------------|
| L.H. side | ③① - Ground | Fasten | Yes |
| | | Unfasten | No |
| R.H. side | ③② - Ground | Fasten | Yes |
| | | Unfasten | No |

B If shoulder belt buckle is not rear lock position, do as figure **B** to move it to rear.

N.G.

C 1) Disconnect connector from rear switch assembly.
2) Check continuity.

N.G. Repair harness.

| | Terminals |
|--------------|--|
| L.H. side | ③① - ⑤⑤ ⑤④ - Ground (M101, M125) |
| | |
| R.H. side | ③② - ⑤⑤ ⑤④ - Ground (M101, M125) |
| | |

Continuity should exist.

O.K.

D Does continuity exist?

| | Connector | Terminals |
|-----------|-----------|-------------|
| L.H. side | ⑤ | ⑤⑤ - Ground |
| R.H. side | ⑥ | 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 of Electrical Components Inspection. (See page BF-64.)

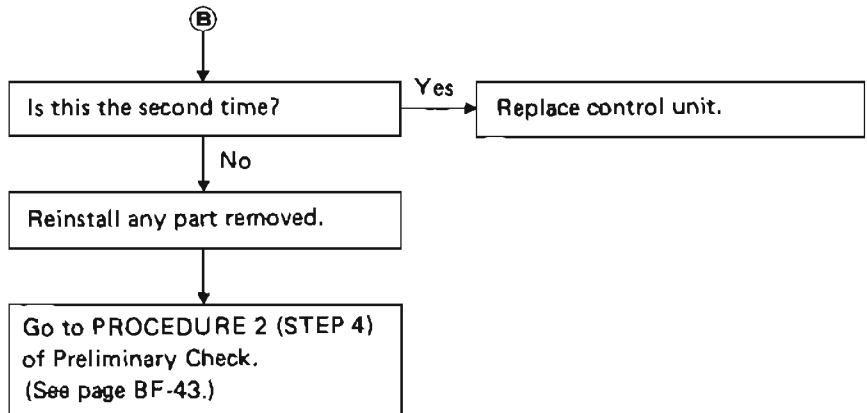
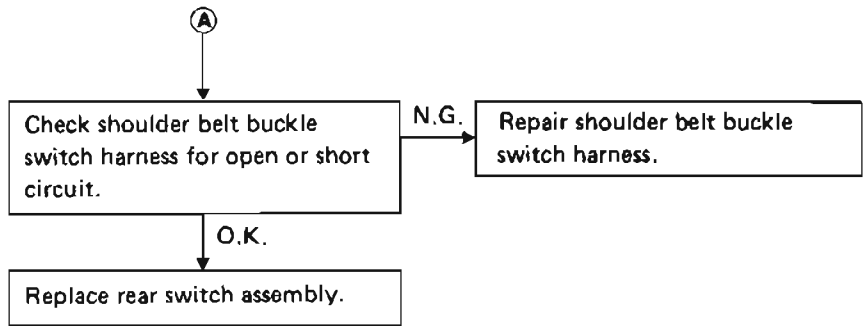
O.K. (Go to **B** on next page.)

N.G.

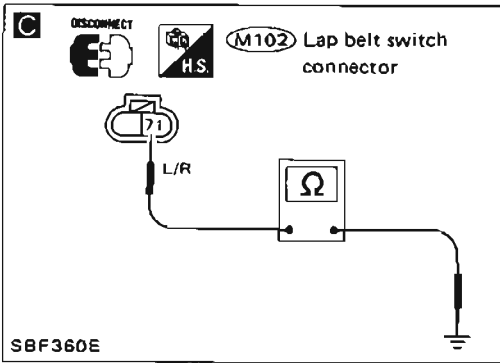
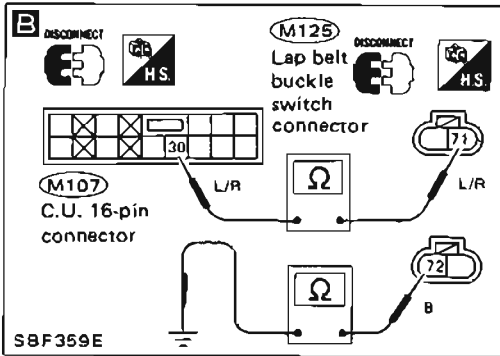
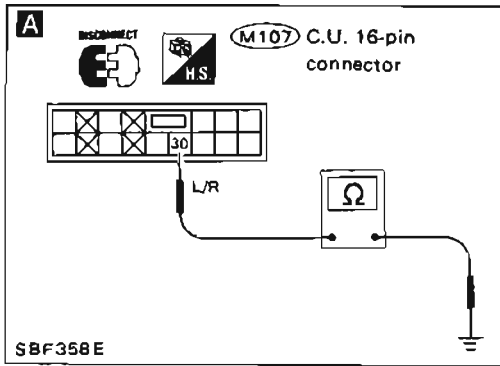
(Go to **A** on next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)



Diagnostic Procedure 6



START

A CHECK LAP BELT BUCKLE SWITCH CIRCUIT (L.H. only).
 1) Disconnect 16-pin connector from control unit.
 2) Check continuity.

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

| Terminals | Lap belt | Continuity |
|-------------|----------|------------|
| 30 - Ground | Fasten | No |
| | Unfasten | Yes |

N.G.

B 1) Disconnect lap belt switch connector.
 2) Check continuity.

N.G. Repair harness.

| Terminals |
|--------------------------|
| 30 - 71 |
| 72 - Ground (M101, M125) |

Continuity should exist.

O.K.

C Does continuity exist?

| Terminals |
|-------------|
| 71 - Ground |

Yes Repair harness. There will be incorrect grounding.

No

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

Go to LAP BELT BUCKLE SWITCH of Electrical Components Inspection. (See page BF-65.)

N.G.

N.G. Repair lap belt buckle switch harness.

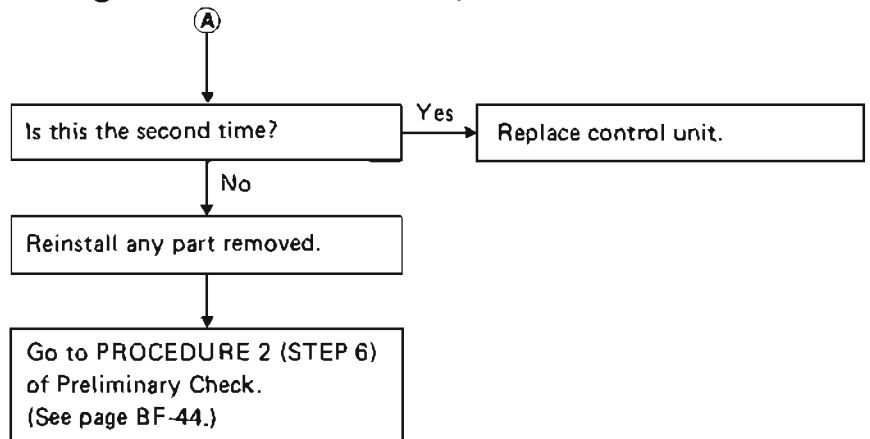
Check lap belt buckle switch harness for open and short circuit.

O.K.

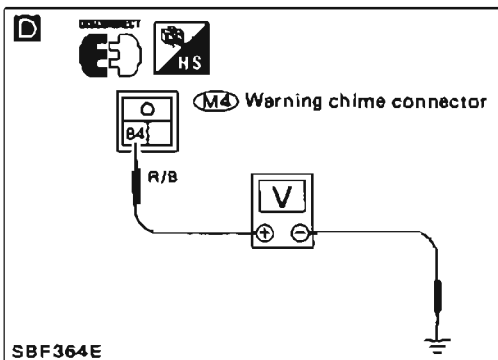
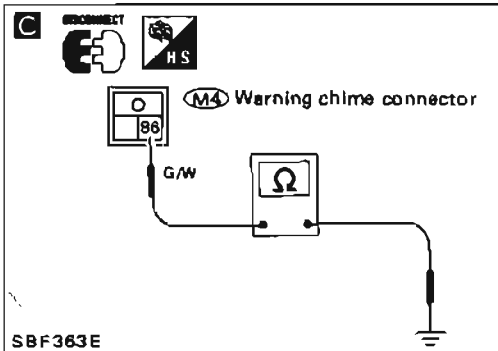
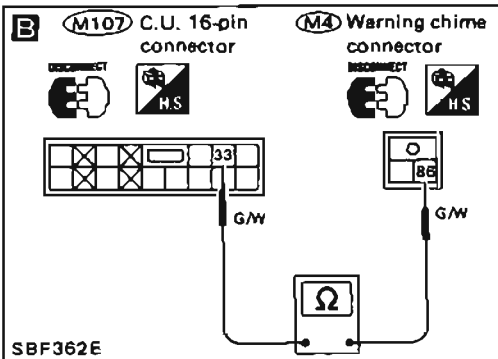
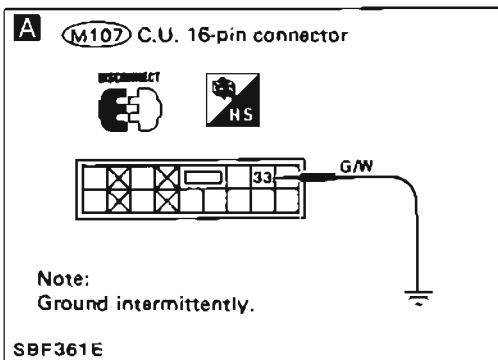
Replace shoulder belt buckle assembly.

TROUBLE DIAGNOSES

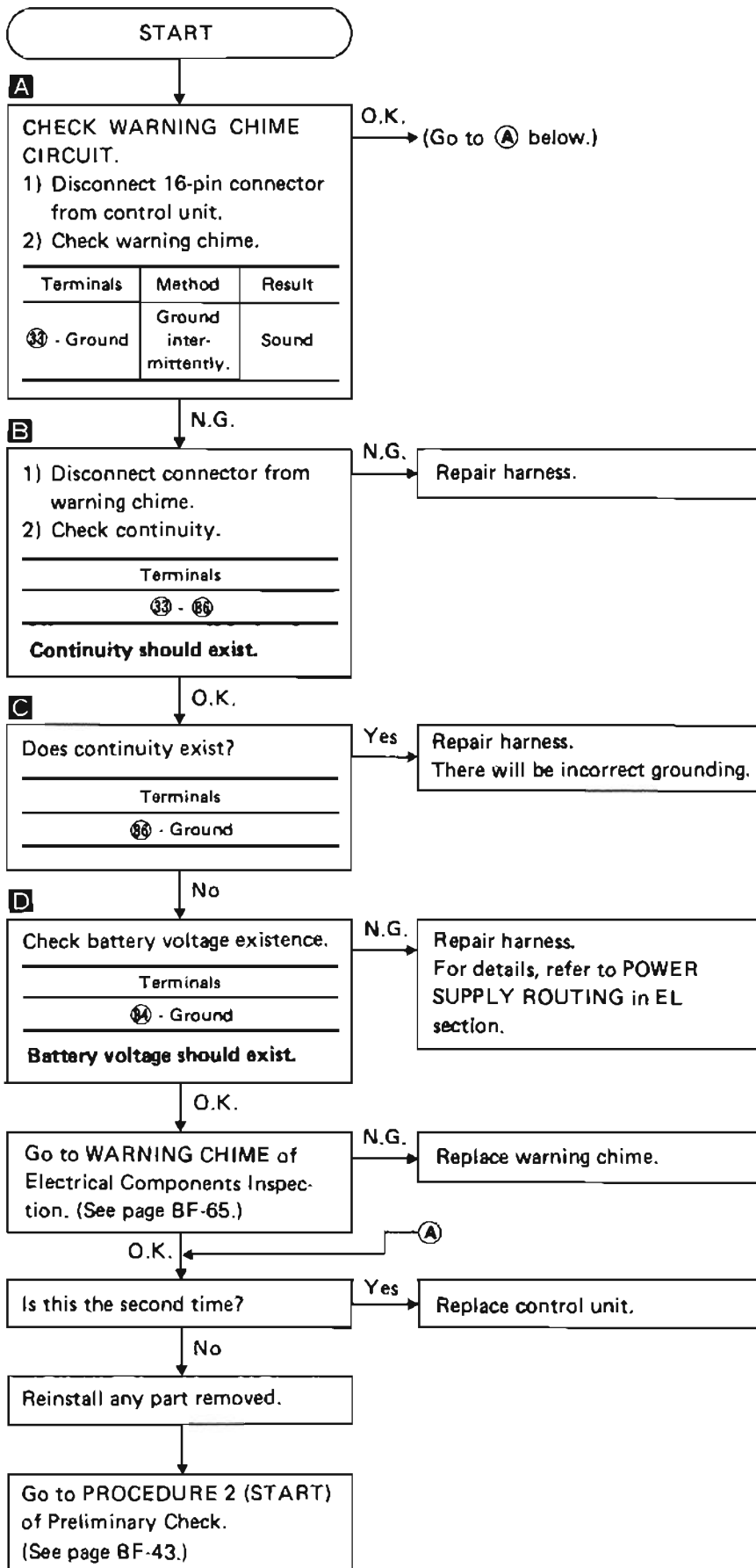
Diagnostic Procedure 6 (Cont'd)

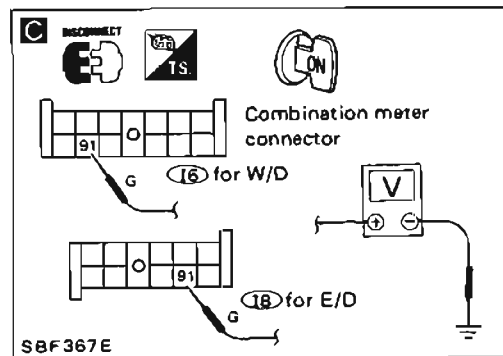
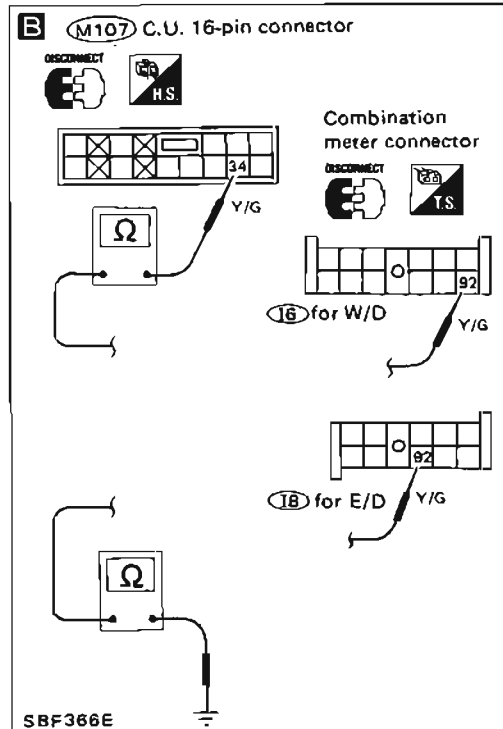
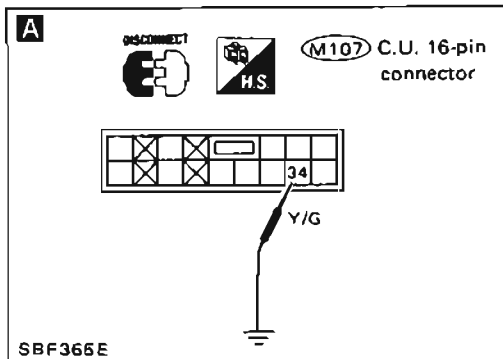


TROUBLE DIAGNOSES



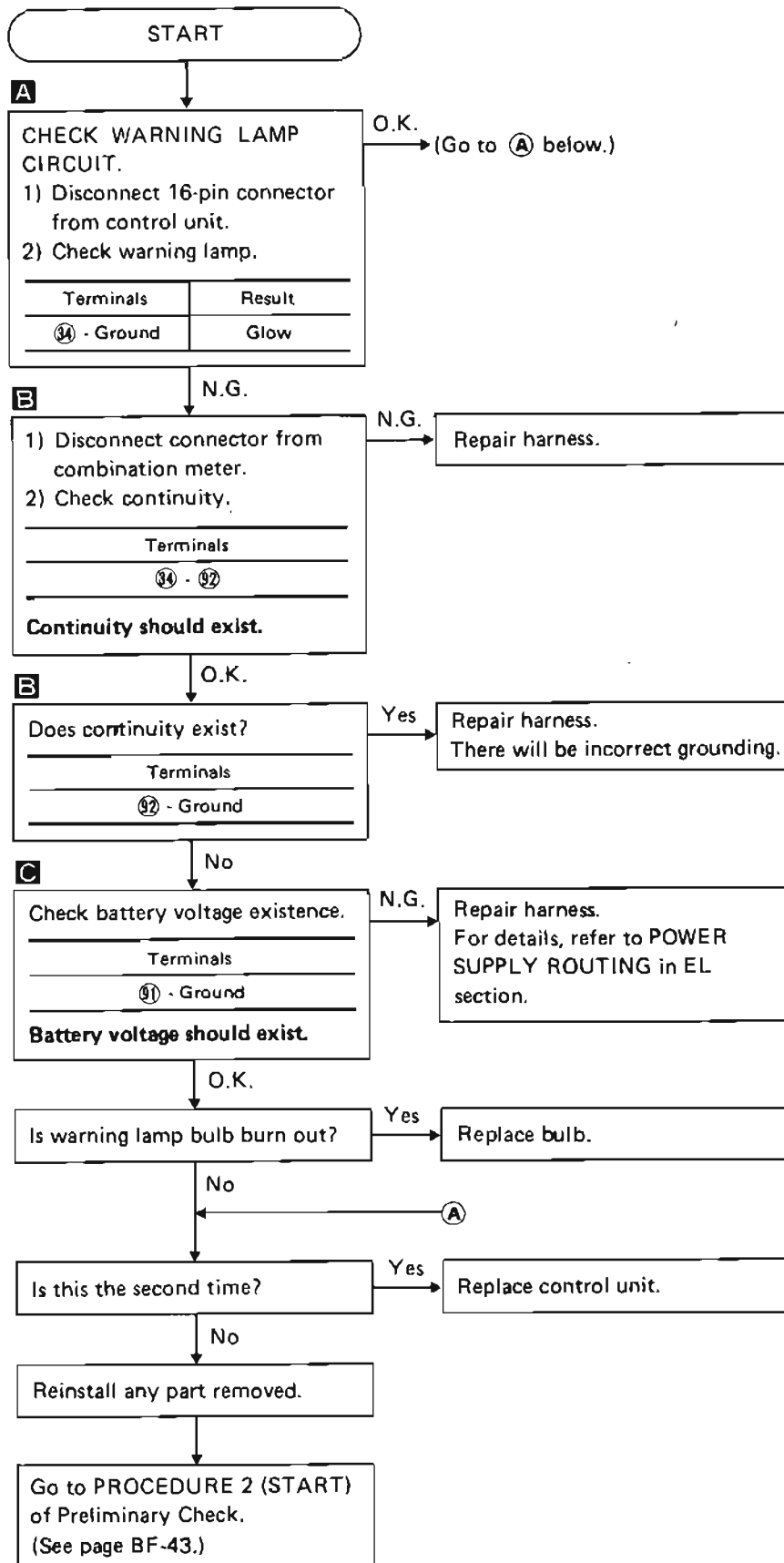
Diagnostic Procedure 7



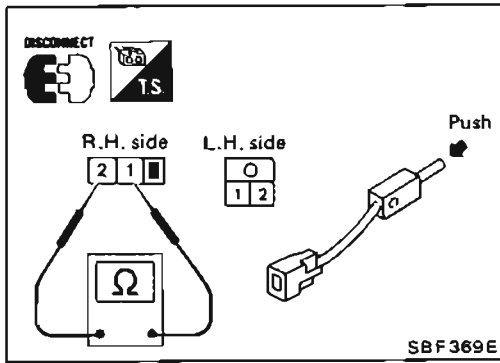


W/D: With Head-up Display
E/D: Without Head-up Display

Diagnostic Procedure 8



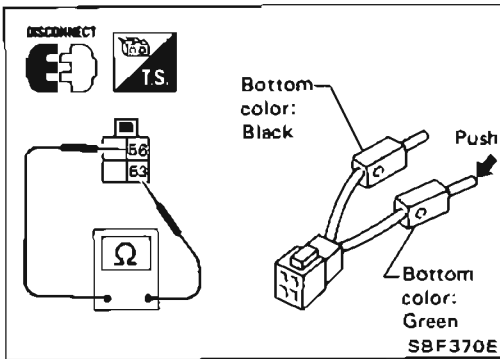
TROUBLE DIAGNOSES



Electrical Components Inspection

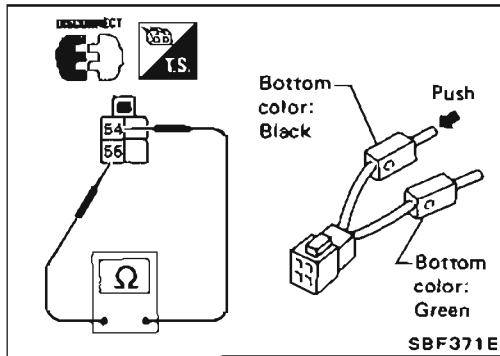
FRONT LIMIT SWITCH

| Condition | Continuity |
|-----------|------------|
| Pushed | No |
| Released | Yes |



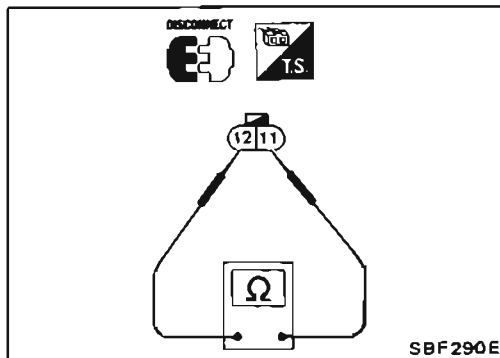
REAR LIMIT SWITCH

| Condition | Continuity |
|-----------|------------|
| Pushed | No |
| Released | Yes |



SHOULDER BELT BUCKLE SWITCH

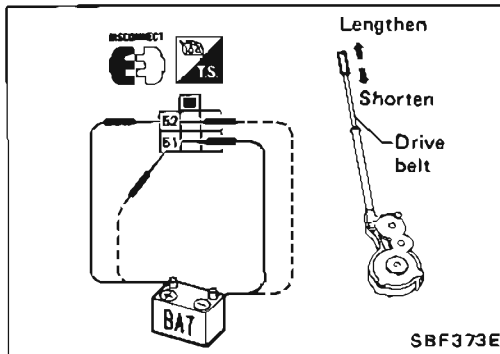
| Condition | Continuity |
|-----------|------------|
| Pushed | Yes |
| Released | No |



DOOR LATCH SWITCH

(Built-in door lock assembly)

| Door condition | Continuity |
|----------------|------------|
| Open | Yes |
| Closed | No |

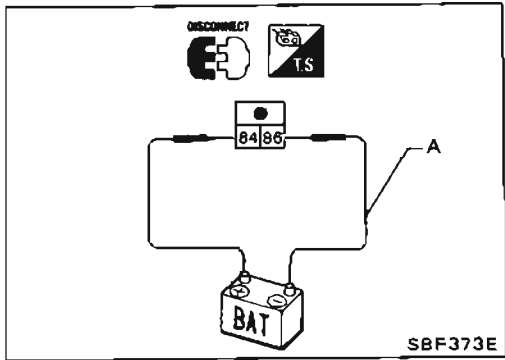


DRIVE MOTOR ASSEMBLY

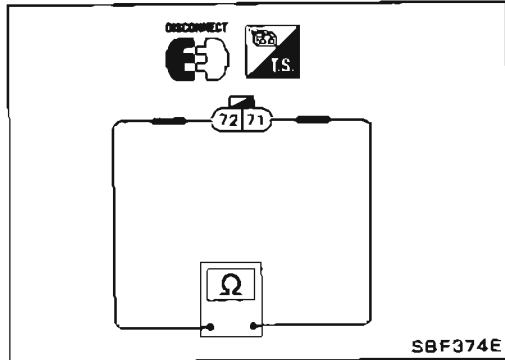
| Terminals | | Drive belt operation |
|-----------|----|----------------------|
| + | - | |
| 52 | 51 | Lengthen |
| 51 | 52 | Shorten |

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd) WARNING CHIME



| Condition | Operation |
|---|-----------|
| Connect and disconnect harness A as shown at left | Sounds |



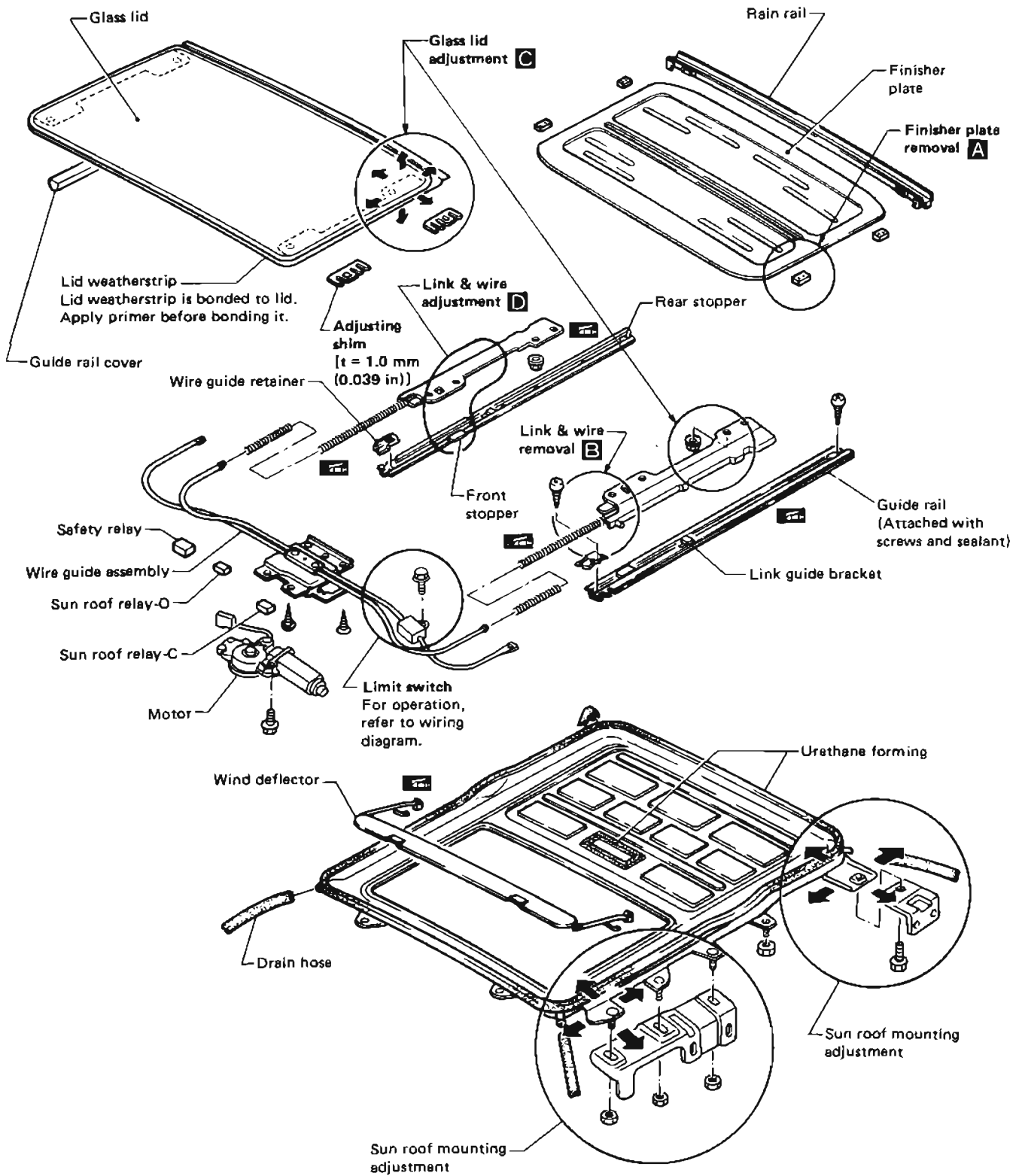
LAP BELT BUCKLE SWITCH (Built-in lap belt buckle for L.H. side)

| Condition | Continuity |
|------------|------------|
| Fastened | No |
| Unfastened | Yes |

SUN ROOF

Electrical Sun Roof

- Do not move or remove limit switch unless it is necessary.
- After any adjustment, check sun roof operation and lid alignment.



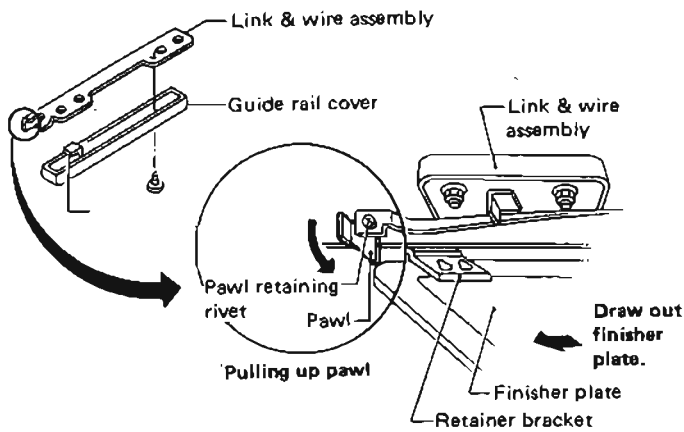
: Grease-up points

SUN ROOF

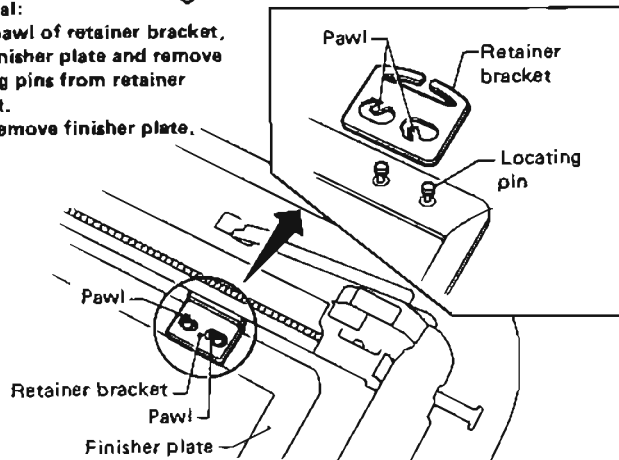
Electrical Sun Roof (Cont'd)

Finisher plate removal & installation

- A** Remove guide rail cover and pull up pawl, then draw out finisher plate with sun roof lid open.

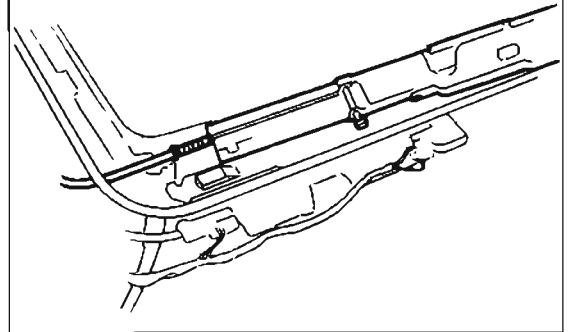


Removal:
Raise pawl of retainer bracket, shift finisher plate and remove locating pins from retainer bracket. Then remove finisher plate.

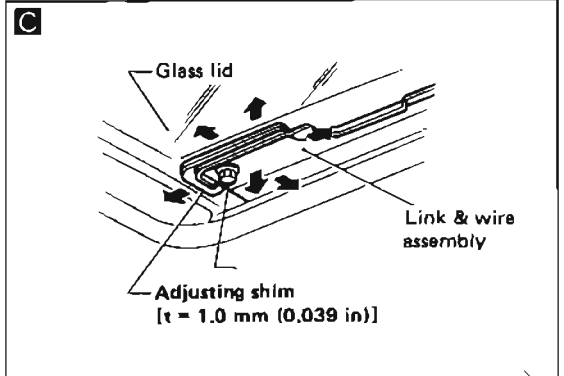


Link & wire removal & installation

- B**
- When replacing wire, remove rail first and then link & wire assembly.
 - Be sure to lubricate.

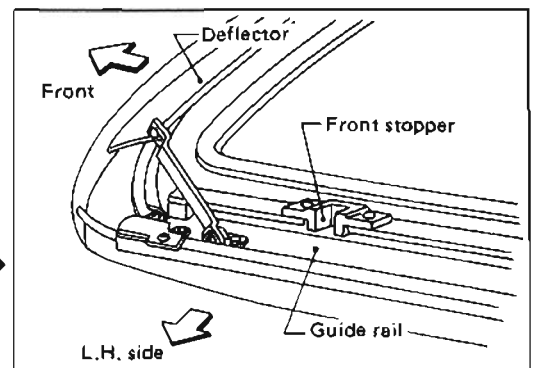
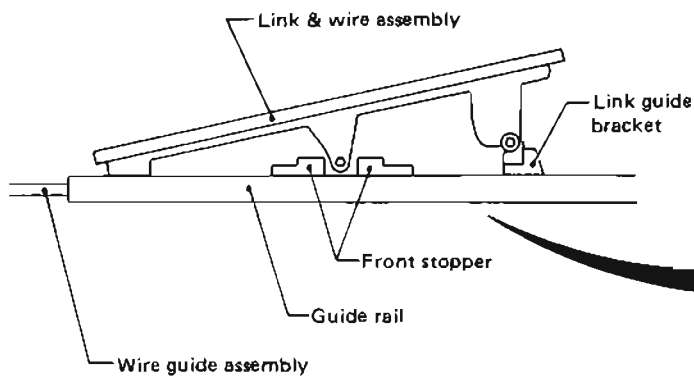


Glass lid adjustment



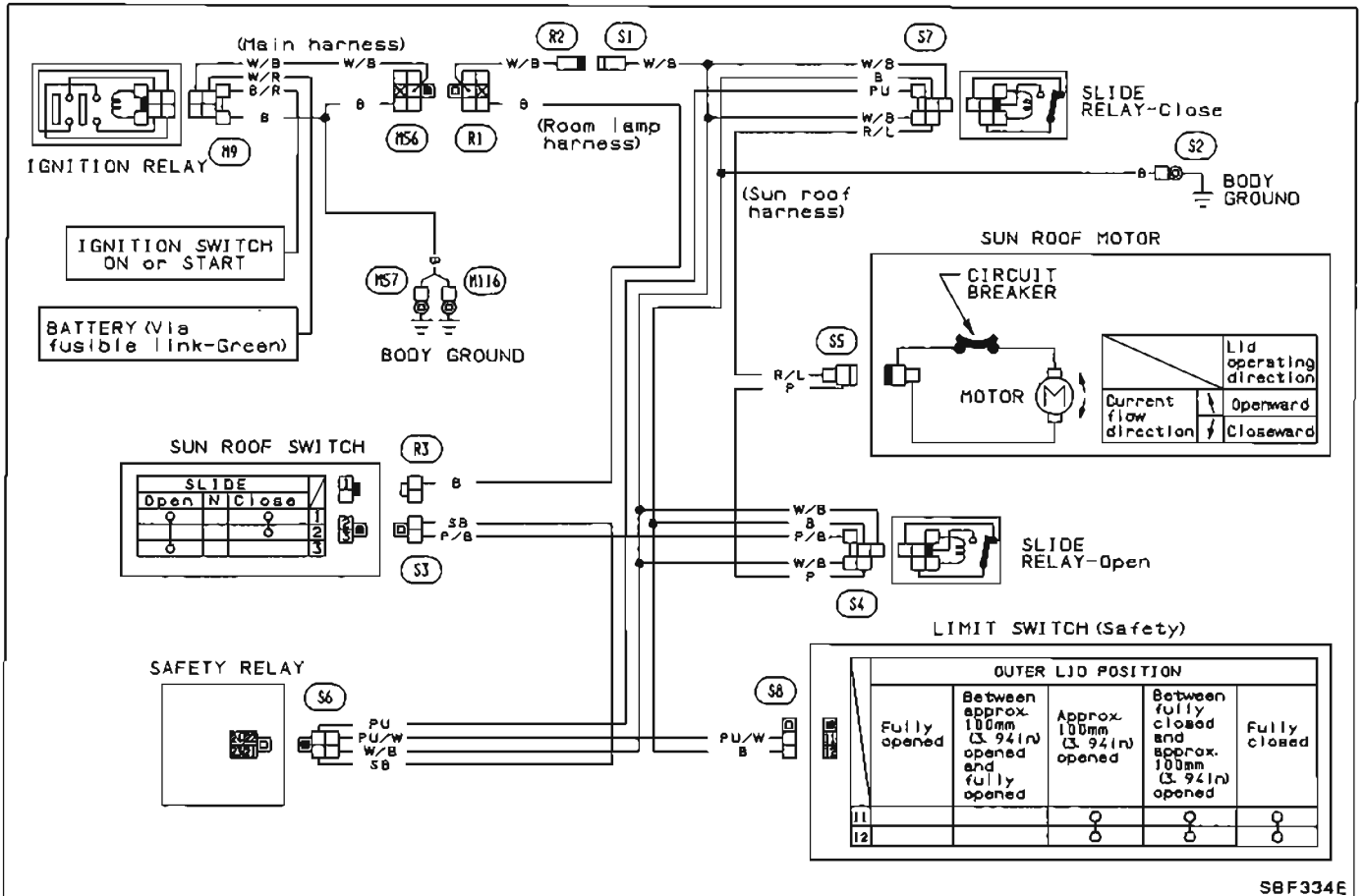
Link & wire adjustment

- D** Move link & wire assembly to closed lid position and after closing fully (as shown in figure below), install motor.



SUN ROOF

Wiring Diagram

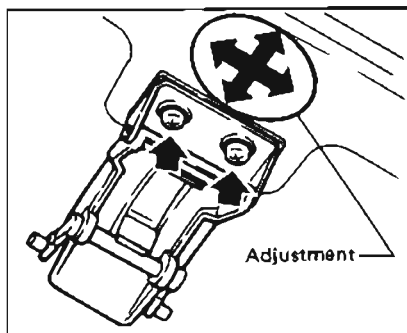


S8F334E

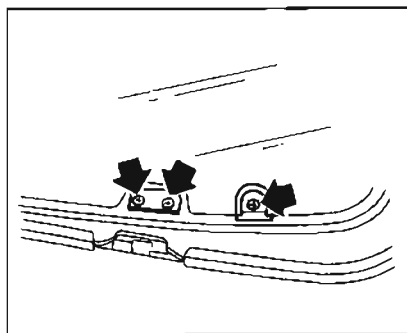
SUN ROOF

Manual Sun Roof

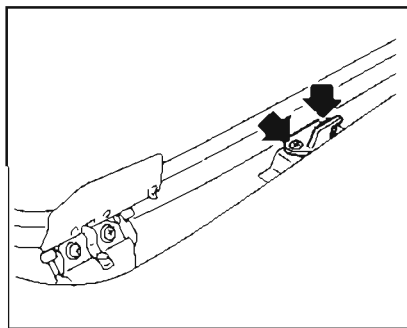
Handle adjustment



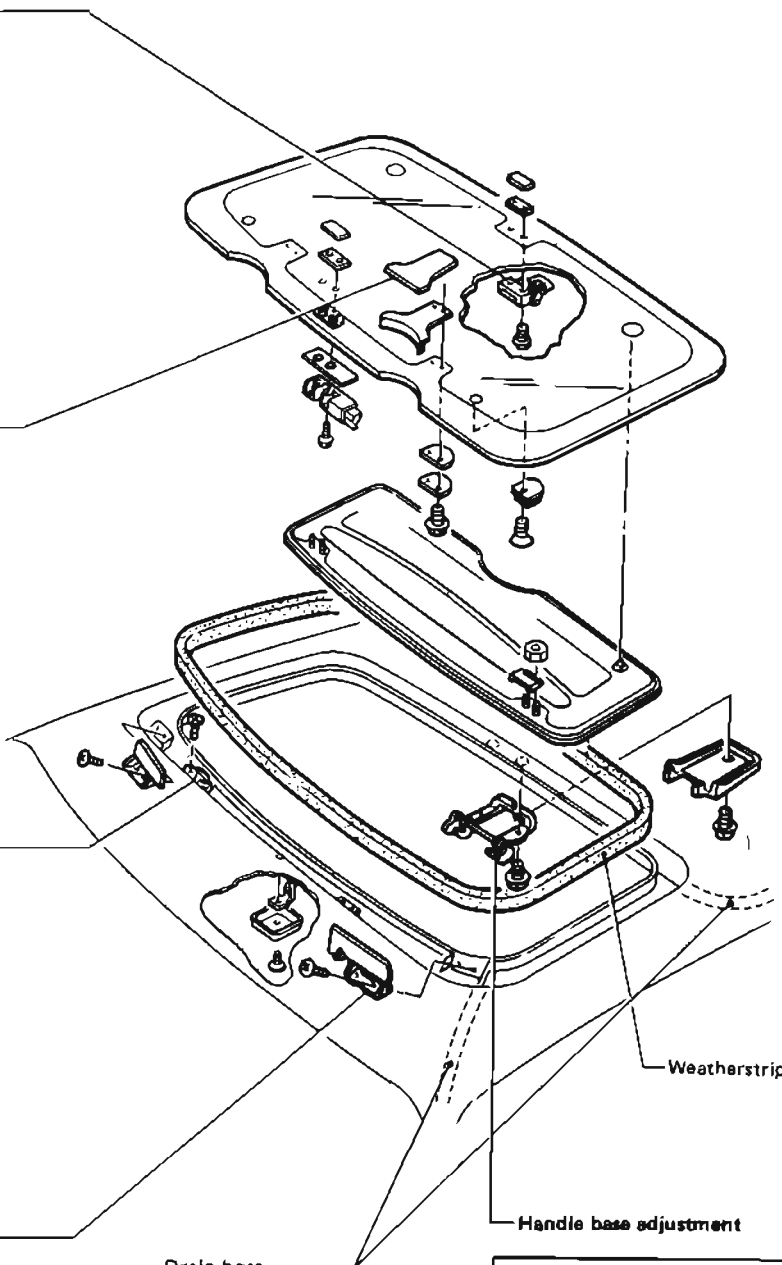
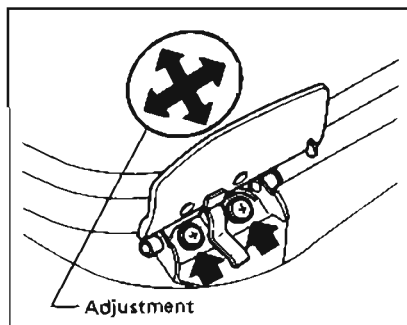
Female hinge



Hinge bracket

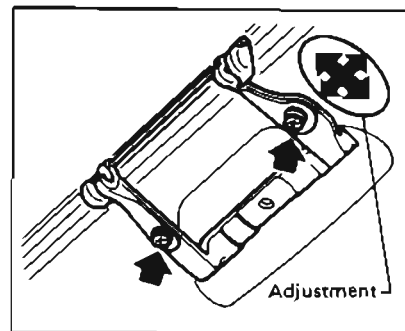


Air deflector adjustment



Drain hose

- After installation of drain hoses, make sure water drains smoothly.

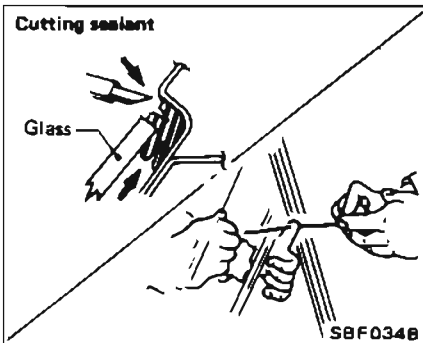


WINDSHIELD AND WINDOWS

Windshield

REMOVAL

After removing moldings, remove glass.



CAUTION:

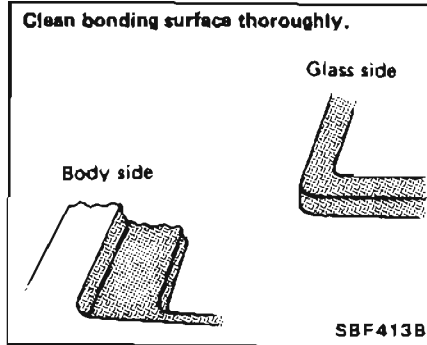
Be careful not to scratch glass when removing.

INSTALLATION

- Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.
- After installation, the vehicle should remain stationary for about 24 hours.
- 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. Nissan recommends that they are stored in a refrigerator.
- Be sure to install moldings.

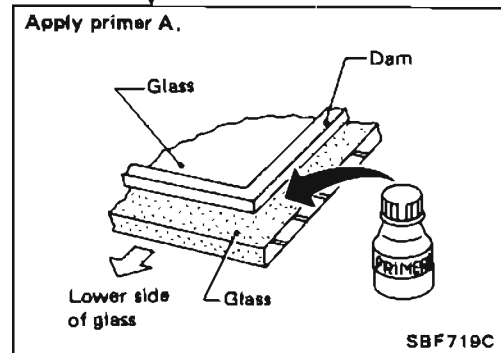
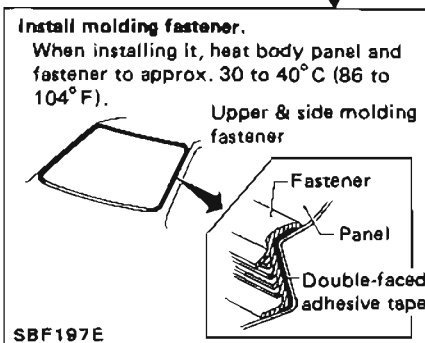
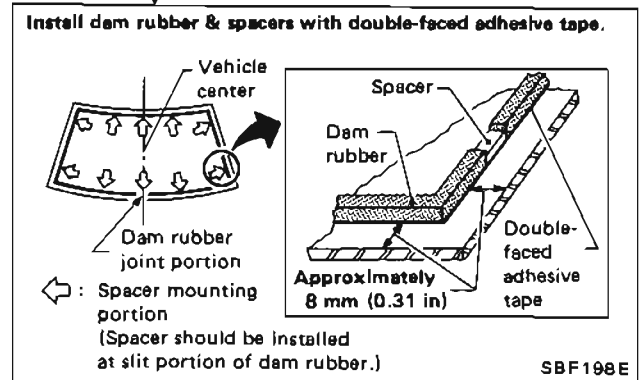
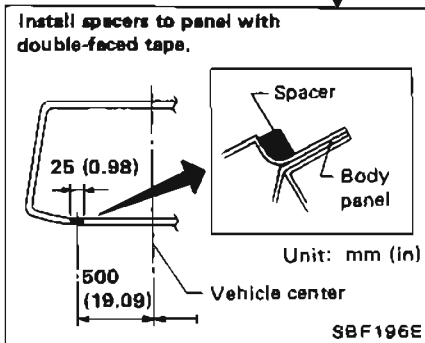
WARNING:

Keep heat or open flames away as primers are flammable.



Body side

Glass side



CAUTION:

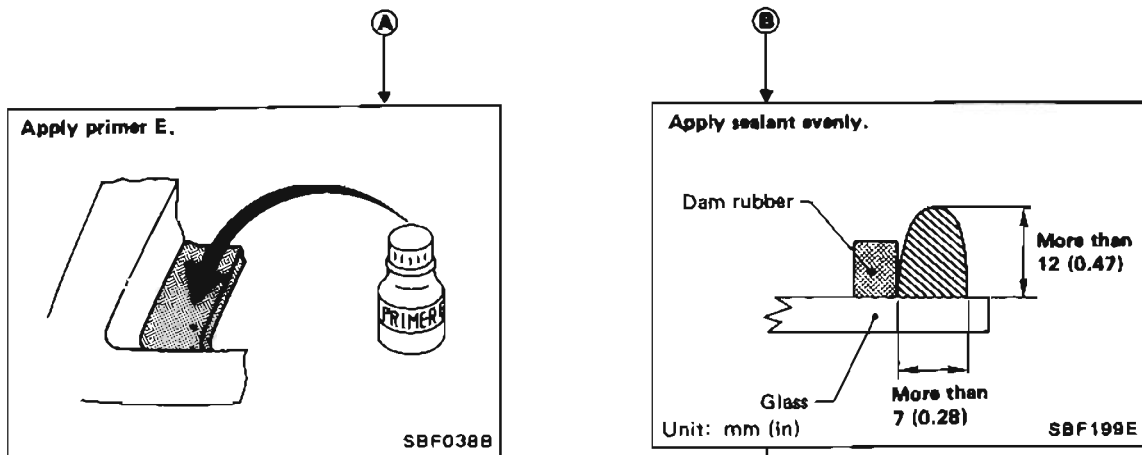
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

A

B

WINDSHIELD AND WINDOWS

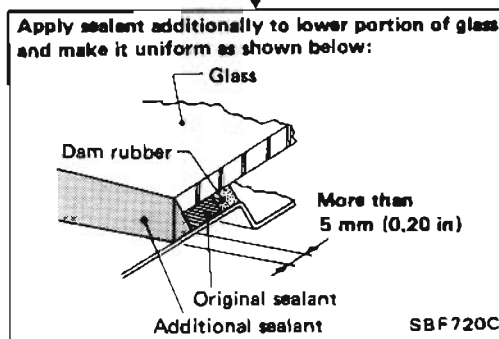
Windshield (Cont'd)



CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

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.

CAUTION:
For sealant drying time, refer to "Drying Time for Sealant".

Apply sealant to upper & side molding fixing portion.

Install moldings.
(For details, refer to "Exterior".)

CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

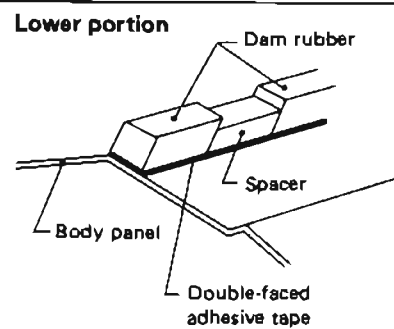
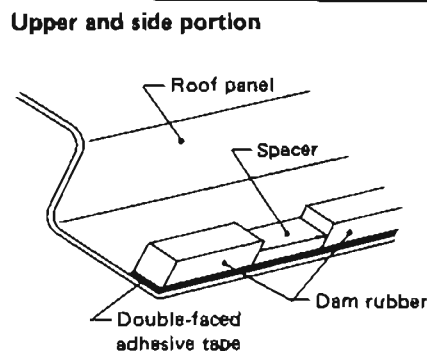
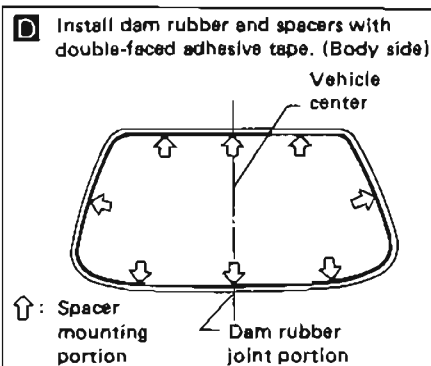
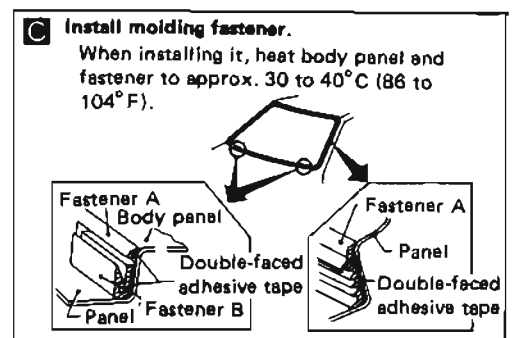
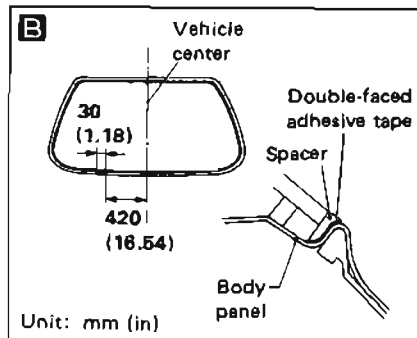
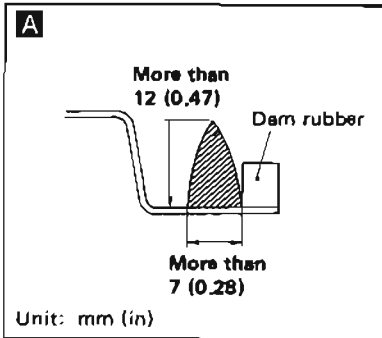
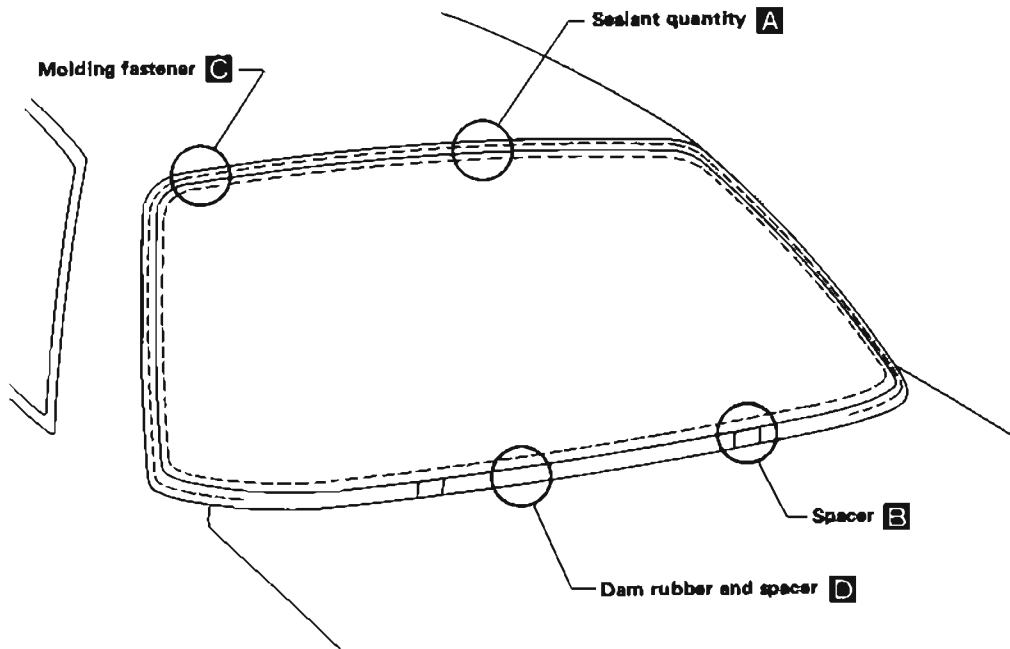
WINDSHIELD AND WINDOWS

Back Window—Coupe

- Construction and removal/reinstallation methods of back window are basically the same as those of windshield.

For details of service procedures, refer to "Windshield".

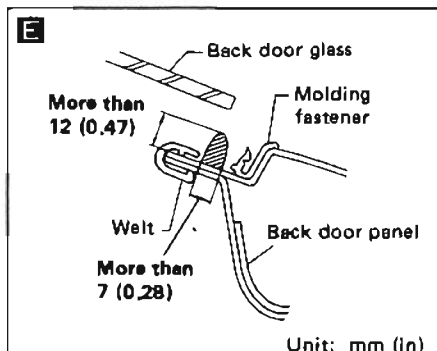
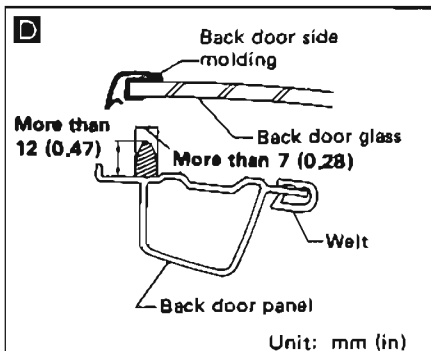
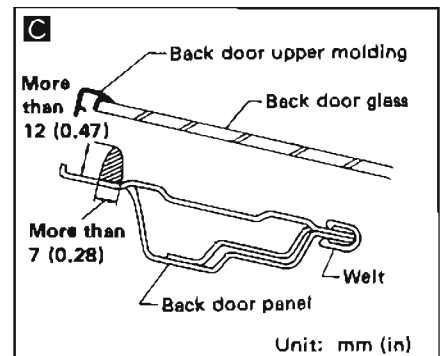
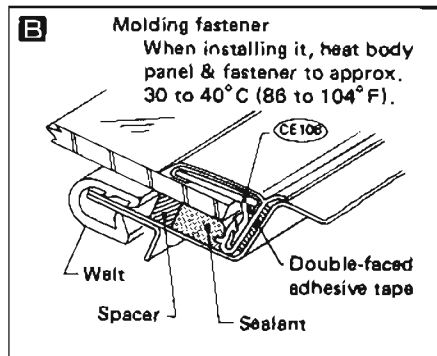
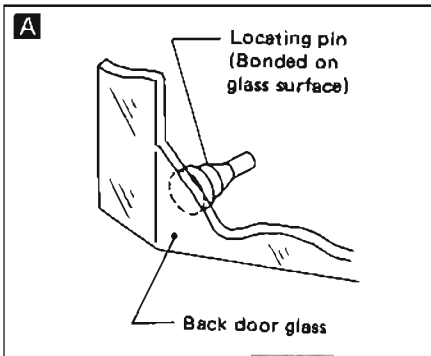
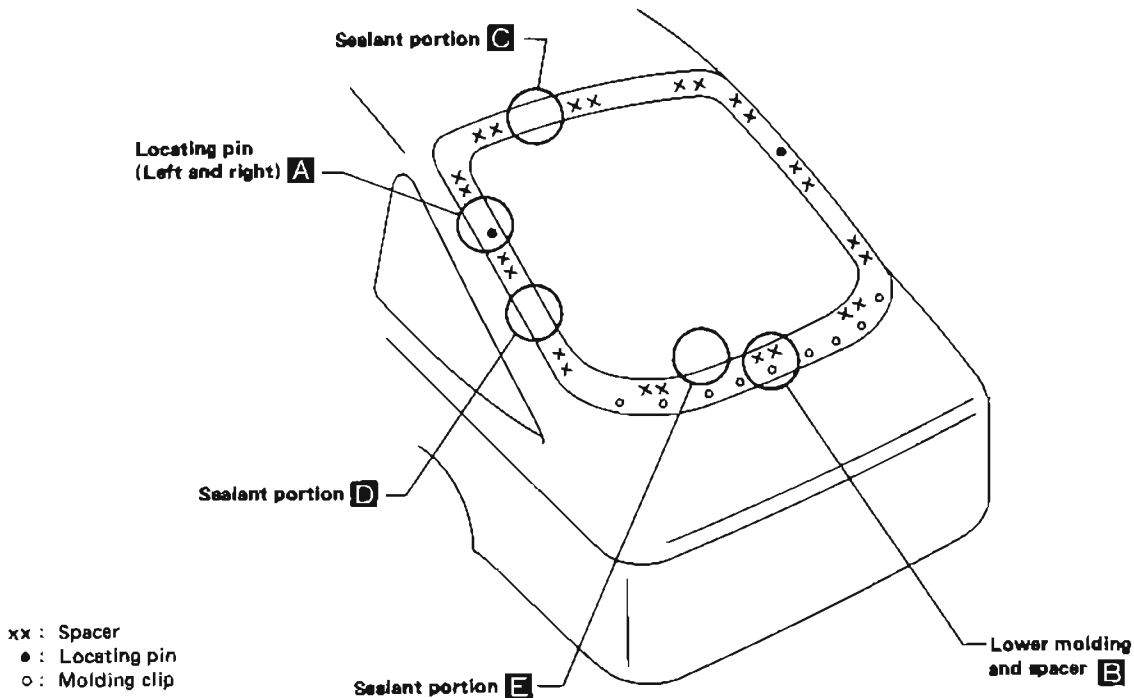
- The difference between windshield and back window is as follows:
- For sealant drying period, refer to "Drying Time for Sealant".
- For details of moldings, refer to "Exterior".



WINDSHIELD AND WINDOWS

Back Door Window—Fastback

- Construction and removal/reinstallation method of back door window are basically the same as those of windshield.
- Major differences are that sealant & dam rubber are installed to back door panel instead of glass surface. Spacer position is also changed. Moreover, there are locating pins in lower portion of glass. For details, refer to following figure.
- For sealant drying period, refer to "Drying Time for Sealant".
- For details of moldings, refer to "Exterior".

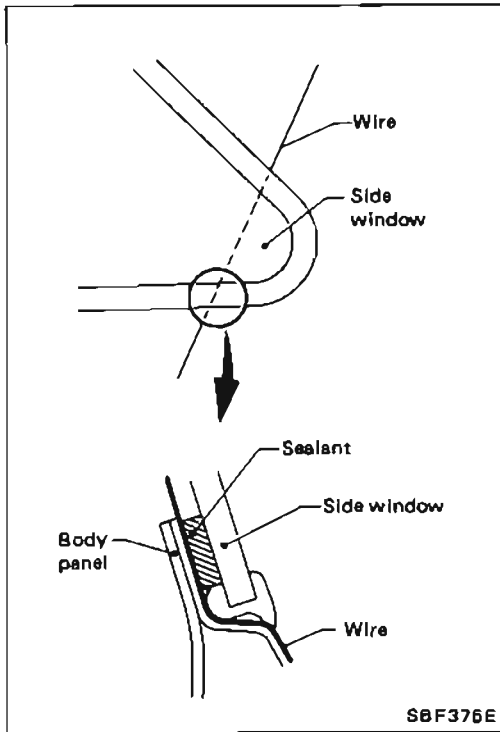


WINDSHIELD AND WINDOWS

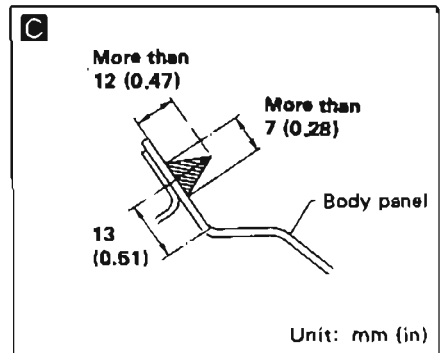
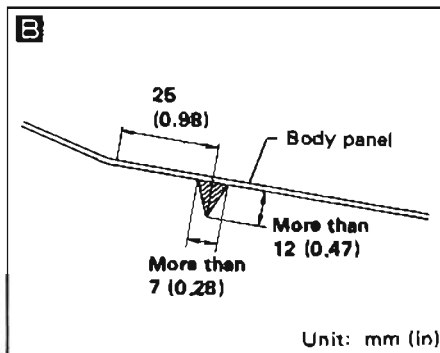
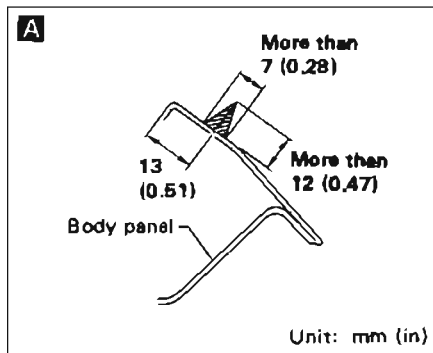
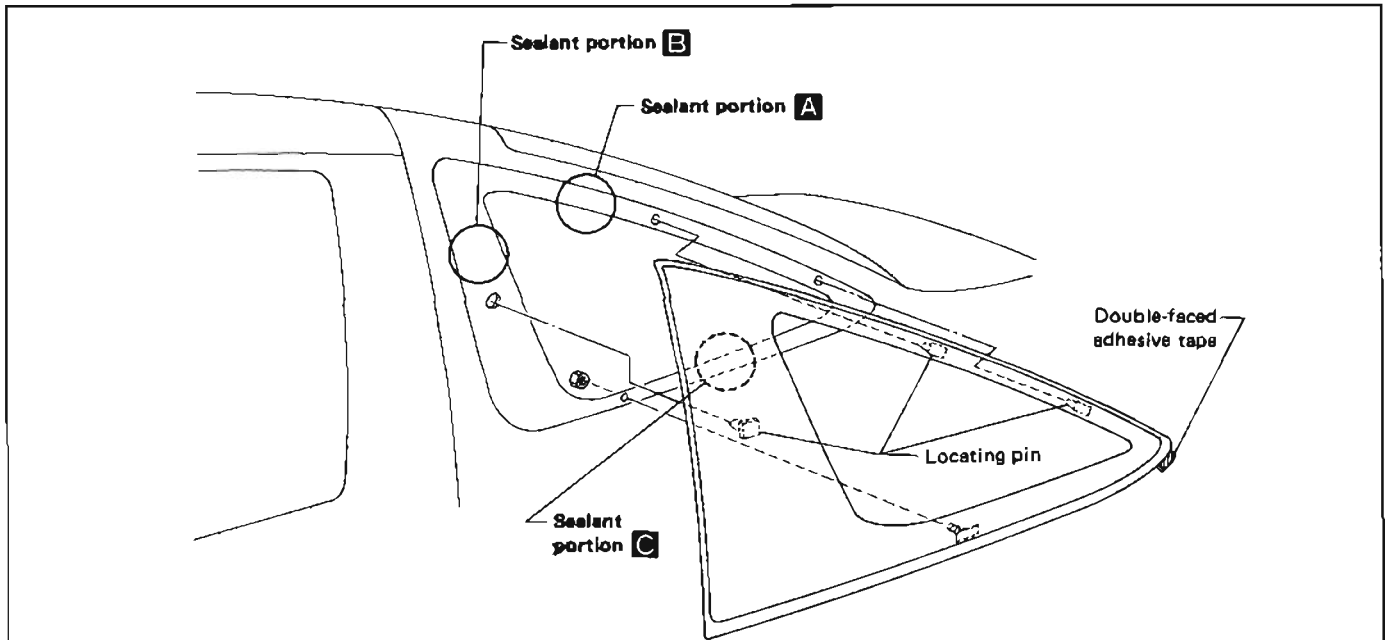
Side Window

Side window is a molded type. During removal or installation, observe the following instructions.

1. Cut sealant in the same manner as that outlined under "Windshield."
2. Be careful not to scratch molding when cutting sealant. If molding is scratched, repair.
3. Remove clips and locating pins which have been exposed from vehicle body.



FASTBACK

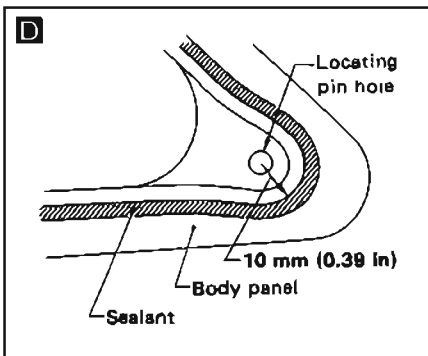
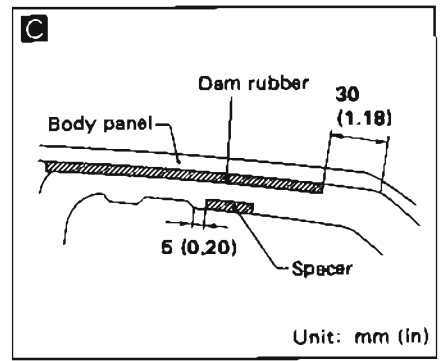
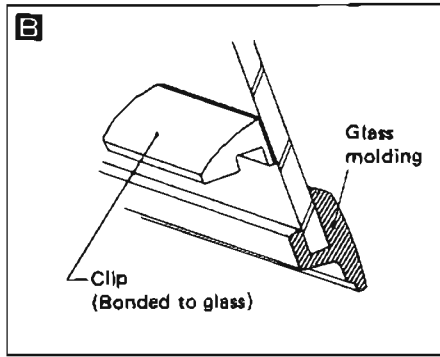
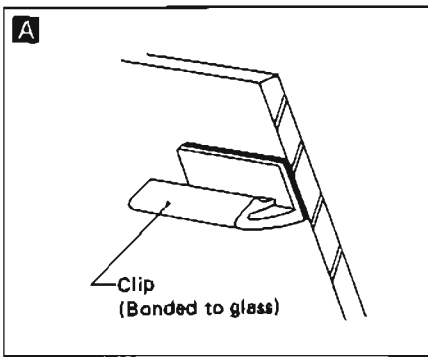
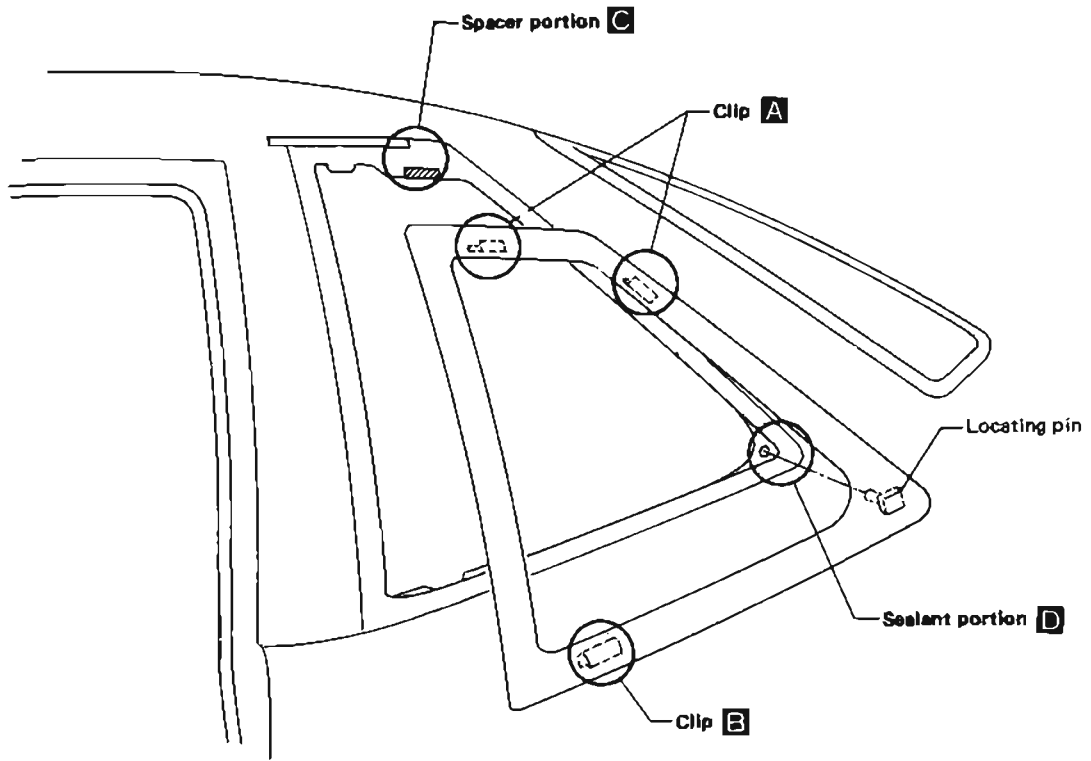


SBF203E

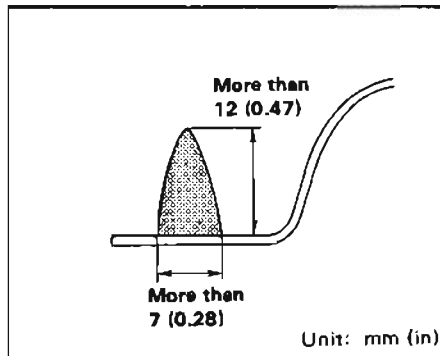
WINDSHIELD AND WINDOWS

Side Window (Cont'd)

COUPE



Sealant quantity



WINDSHIELD AND WINDOWS

Drying Time for Sealant

Reference: Time required for sealant to dry to desired hardness.

Unit: days

| Relative humidity % \ Temperature °C (°F) | 90 | 50 | 25 |
|---|-----|------|------|
| 40 (104) | 1.5 | 2.5 | 5.0 |
| 25 (77) | 2.5 | 4.0 | 7.5 |
| 5 (41) | 5.0 | 13.0 | 20.5 |

CAUTION:

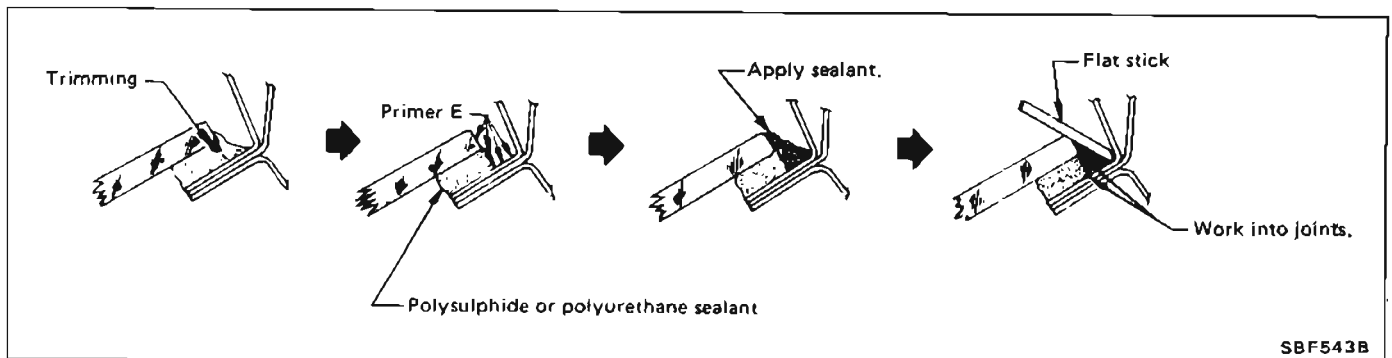
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repairing Water Leaks for Windshield and Back Window (Coupe)/Back Door Window (Fastback)

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.

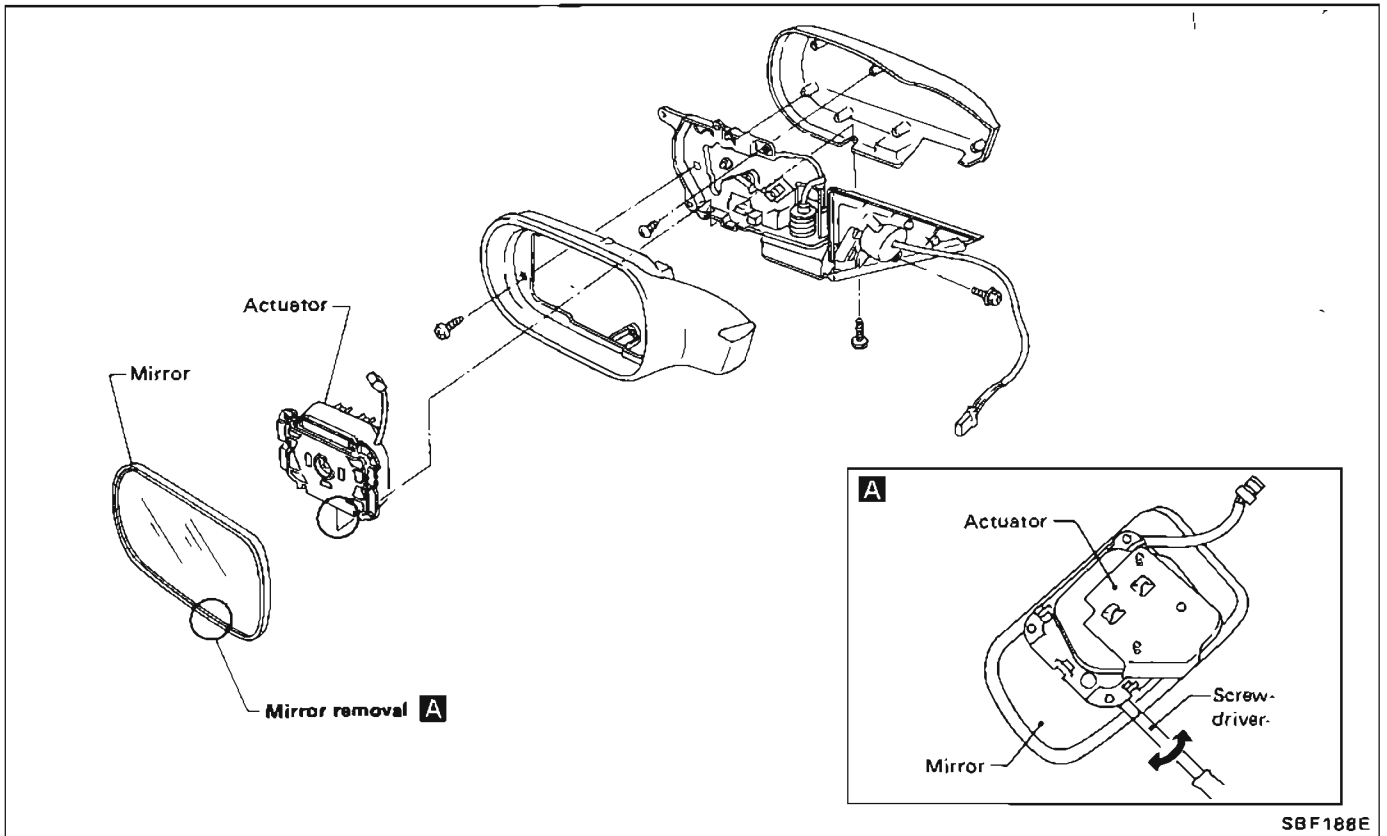
To stop the leak, apply primer and then sealant to the leak point.



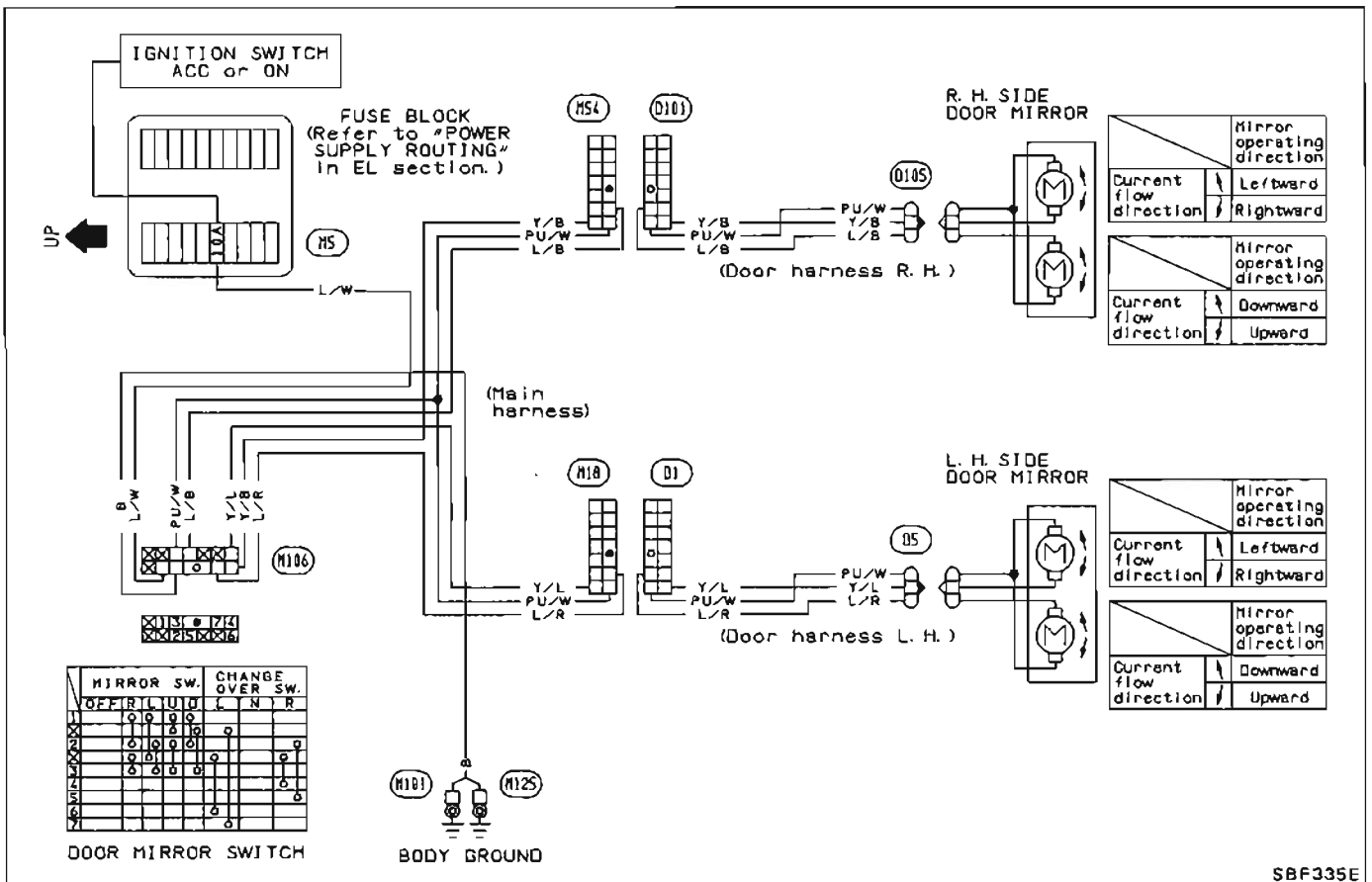
Afterwards, install molding securely.

MIRROR

Door Mirror

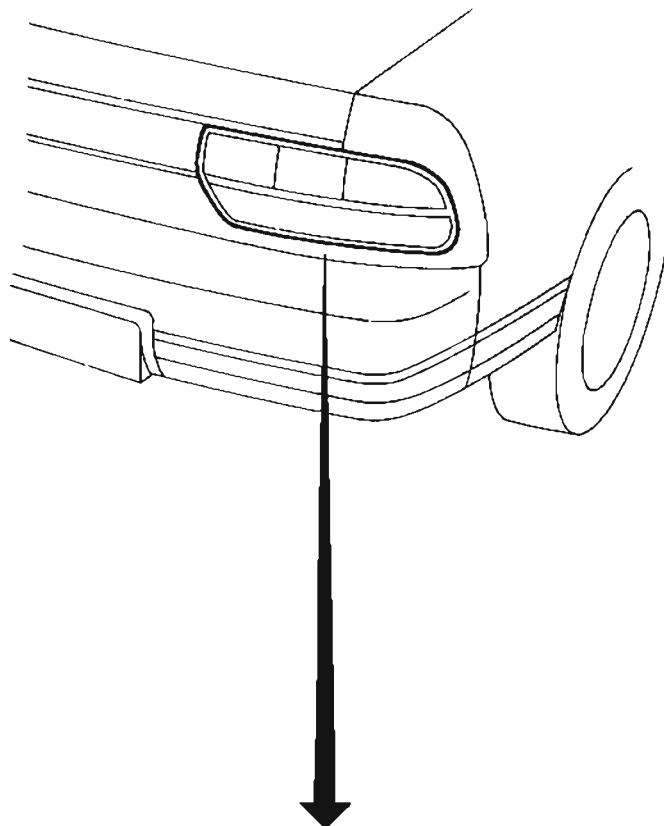


WIRING DIAGRAM

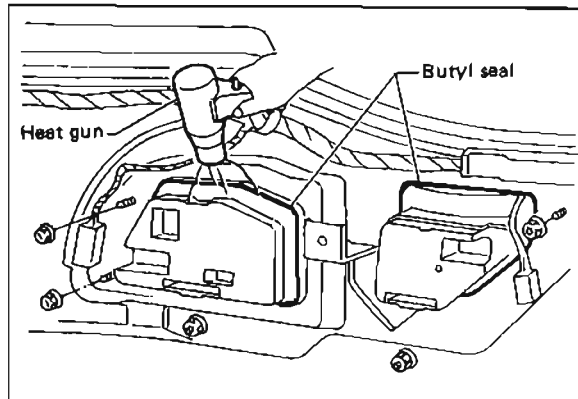


REAR COMBINATION LAMP

- Rear combination lamps are installed with nuts and butyl sealant.

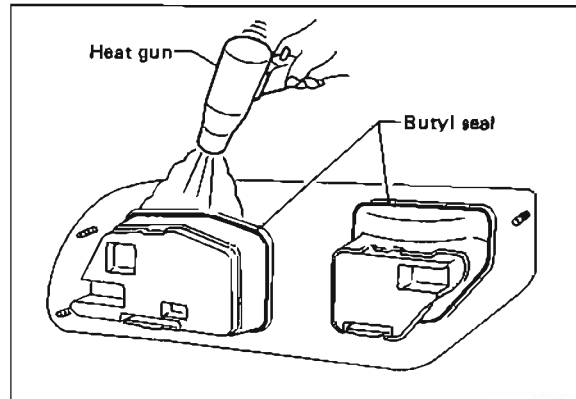


Removal



- Warm up lamp assembly area to a temperature of a little below 60°C (140°F).

Installation



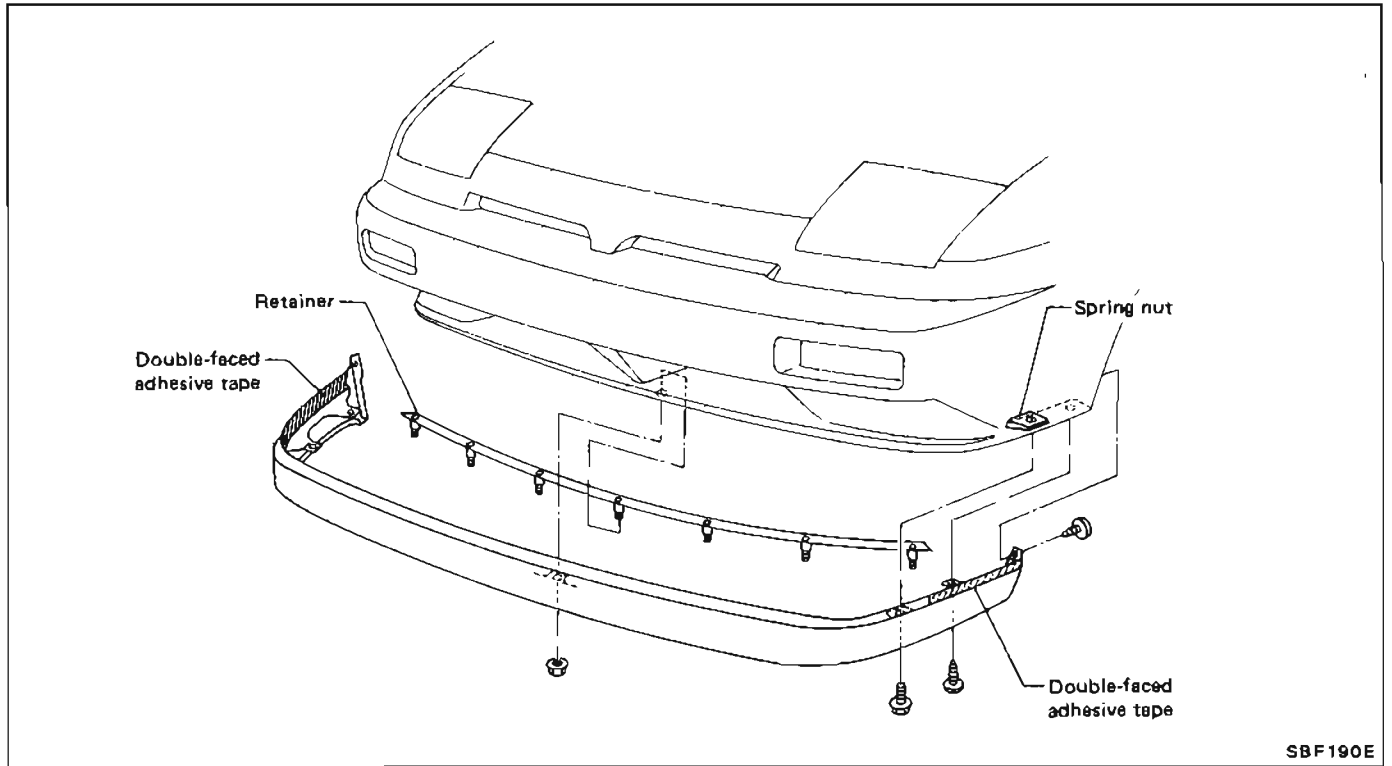
- Apply butyl seal evenly as it tends to become thin in the corners.
- Warm up lamp assembly area to a temperature of a little below 60°C (140°F).

SBF189E

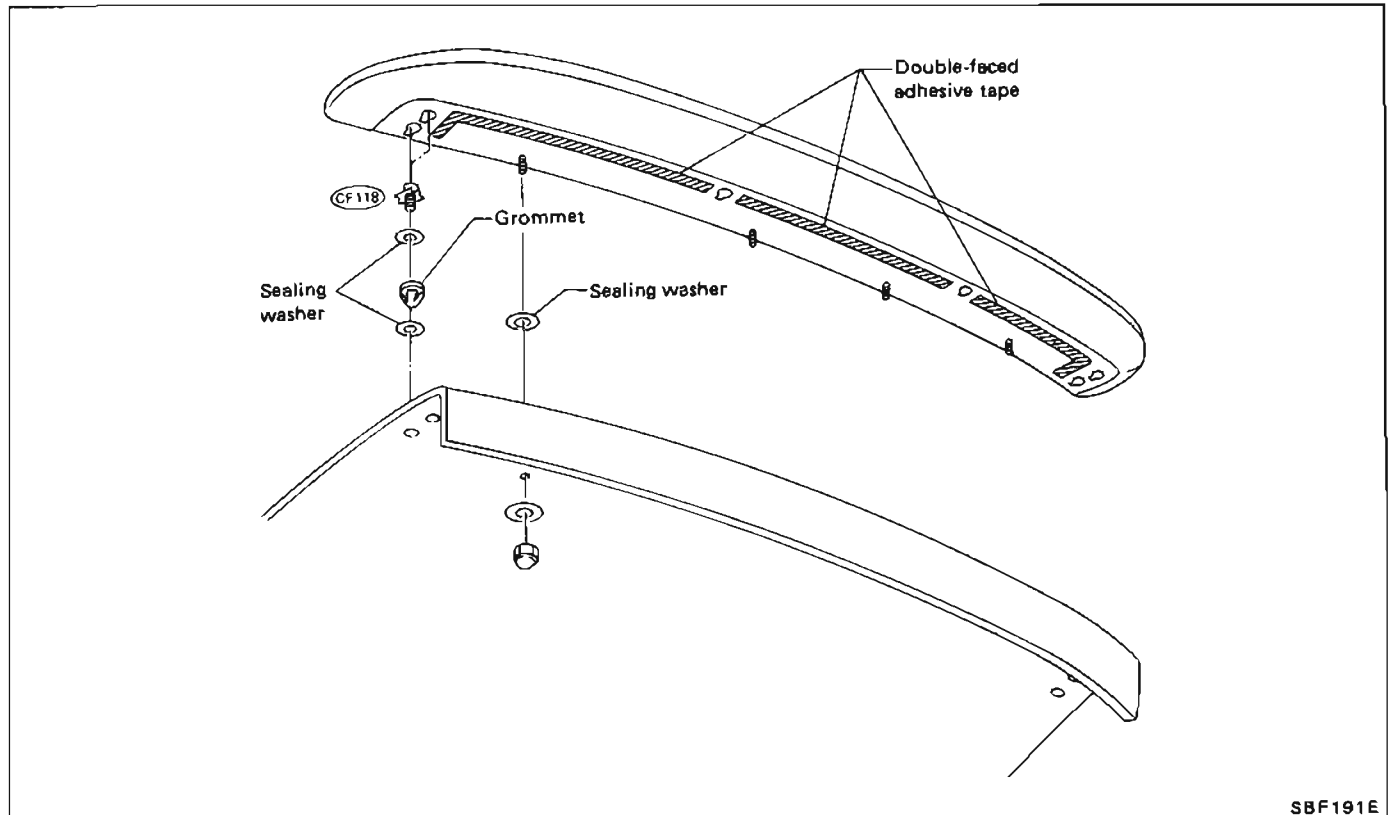
FRONT AND REAR AIR SPOILER

- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

FRONT AIR SPOILER

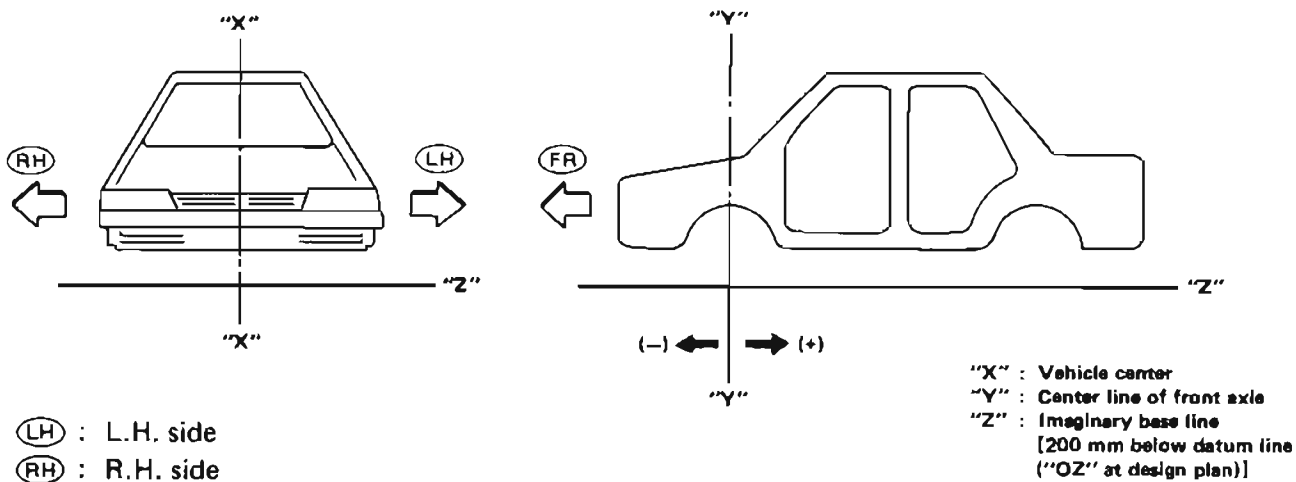


REAR AIR SPOILER – Fastback



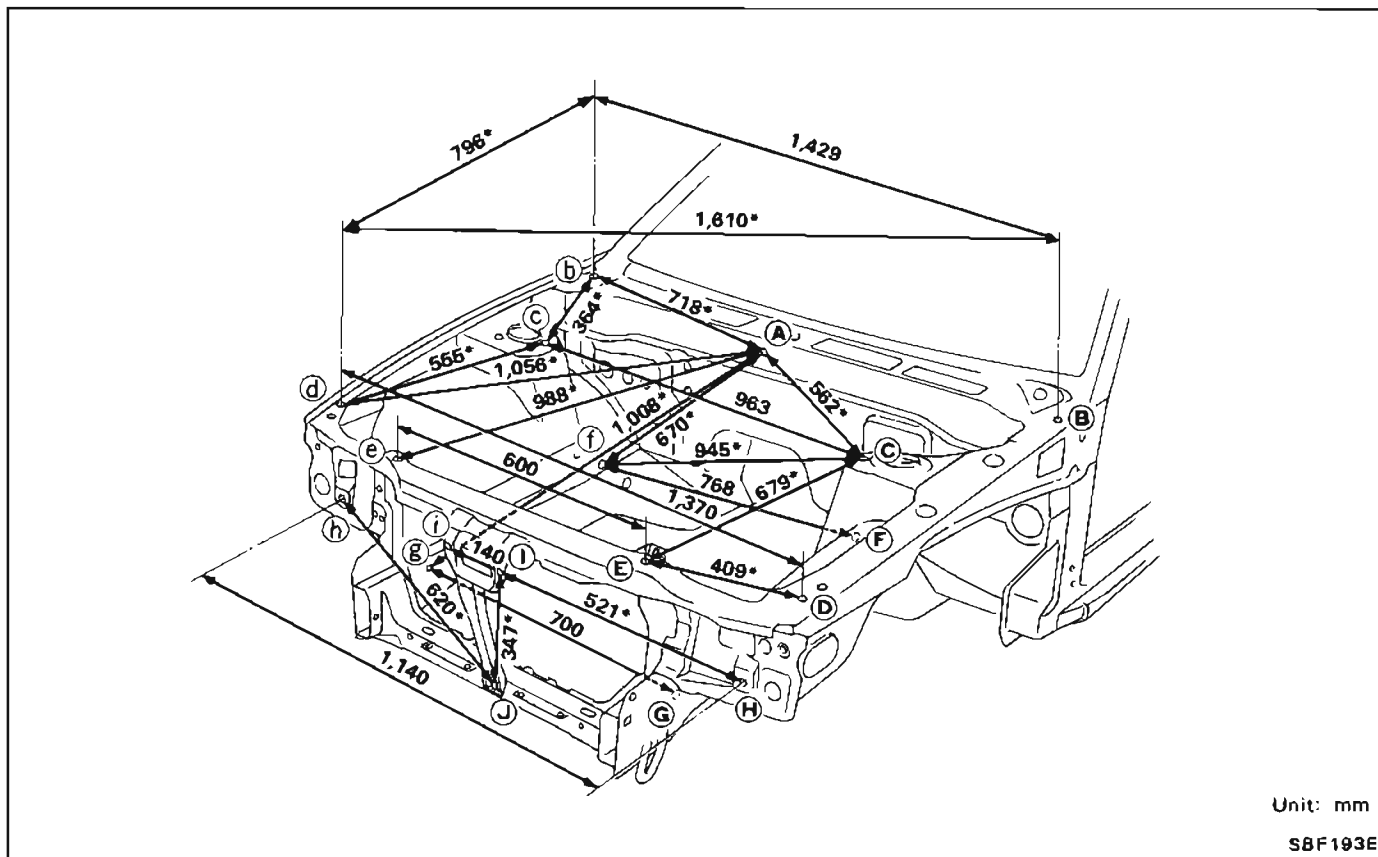
BODY ALIGNMENT

- 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

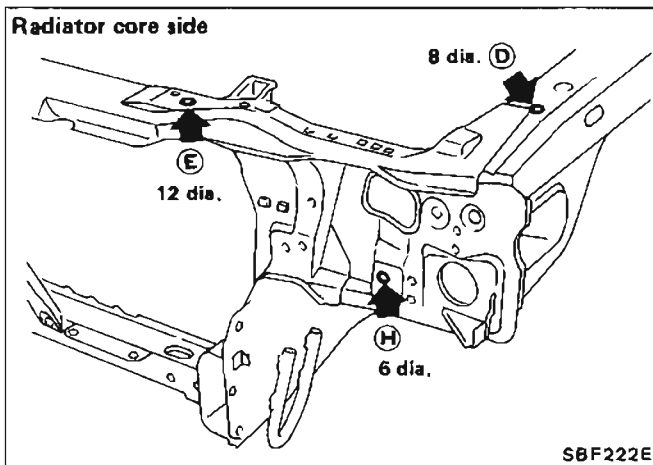
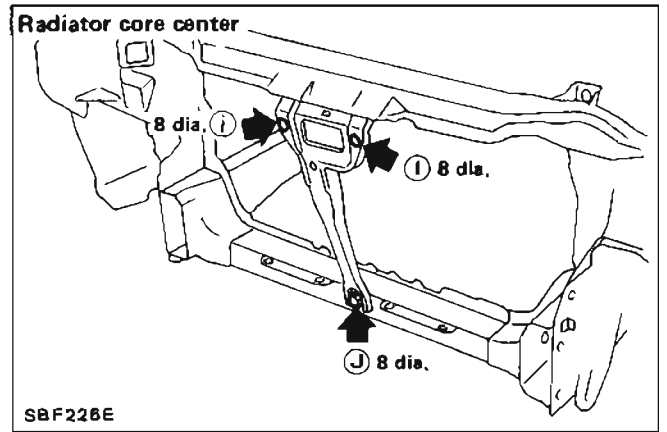
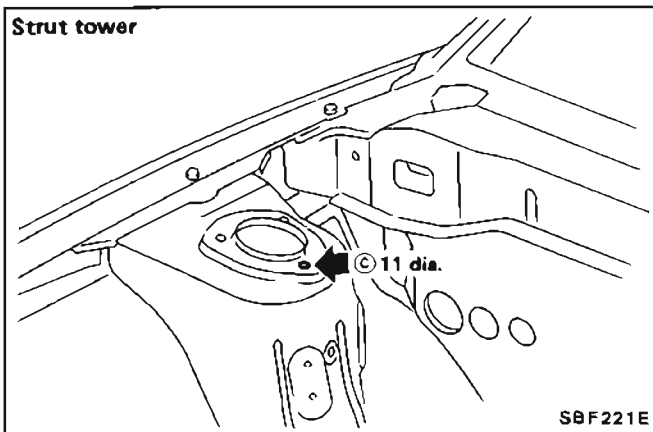
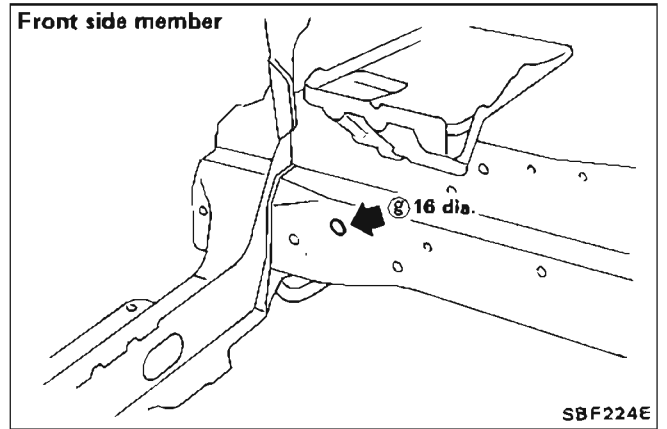
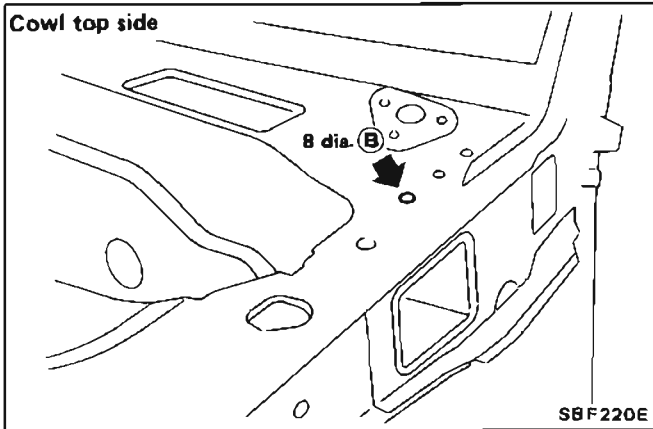
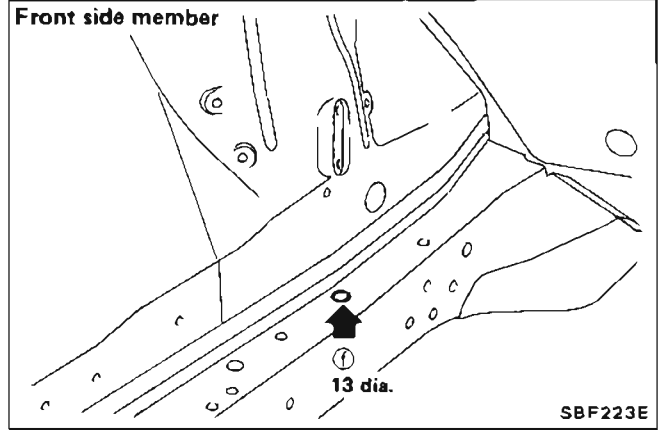
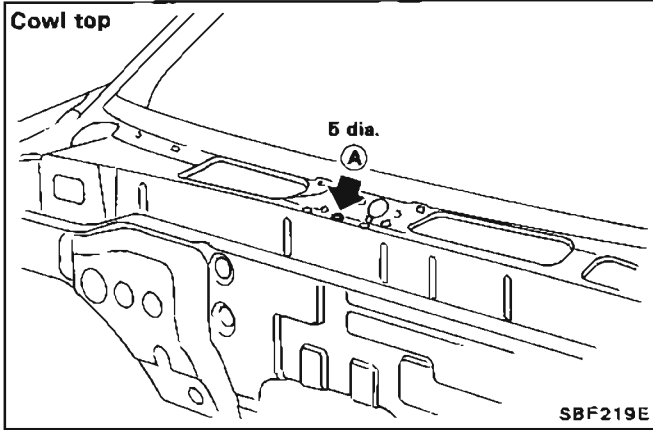


BODY ALIGNMENT

Engine Compartment (Cont'd)

MEASUREMENT POINTS

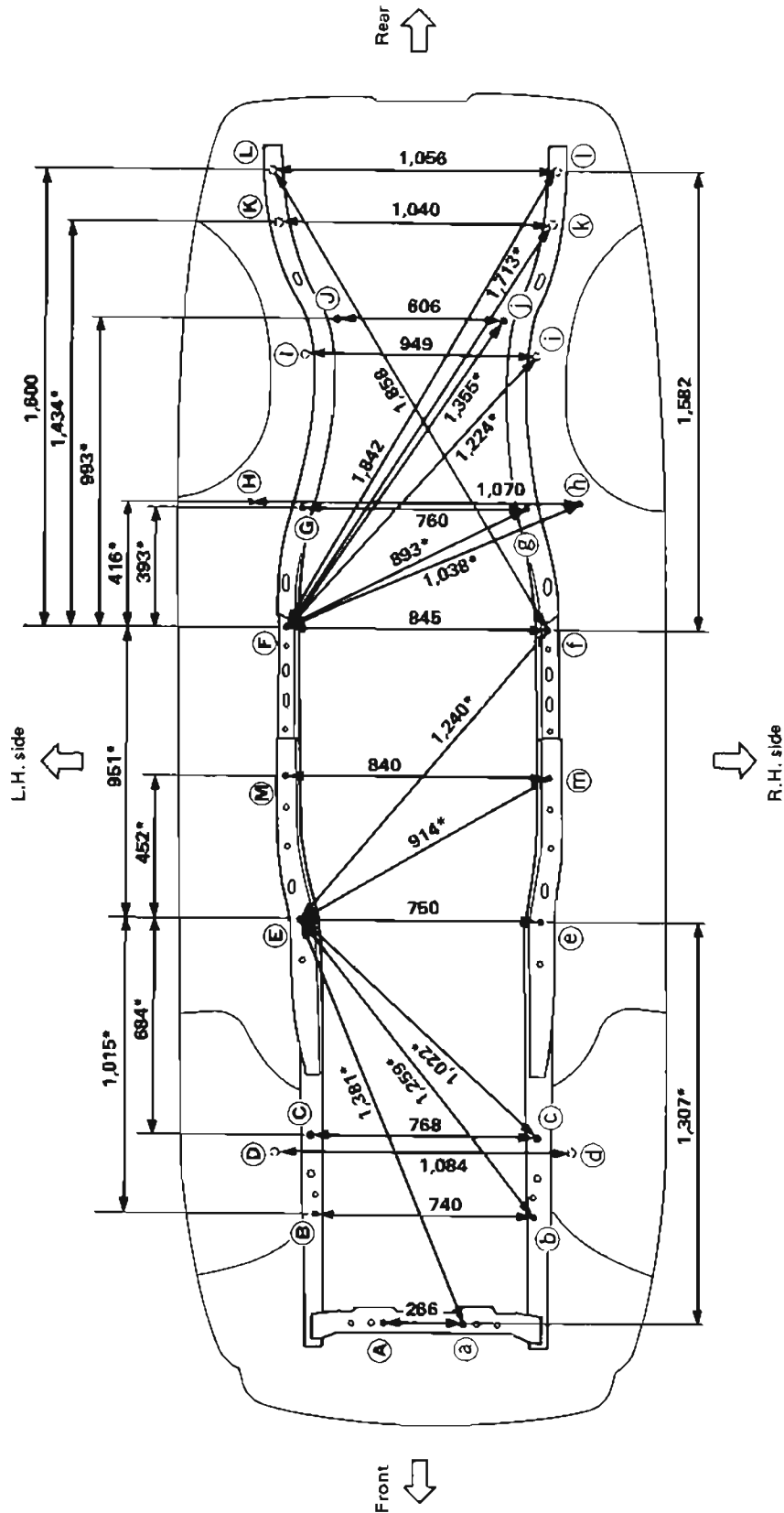
Unit: mm



BODY ALIGNMENT

Underbody

MEASUREMENT

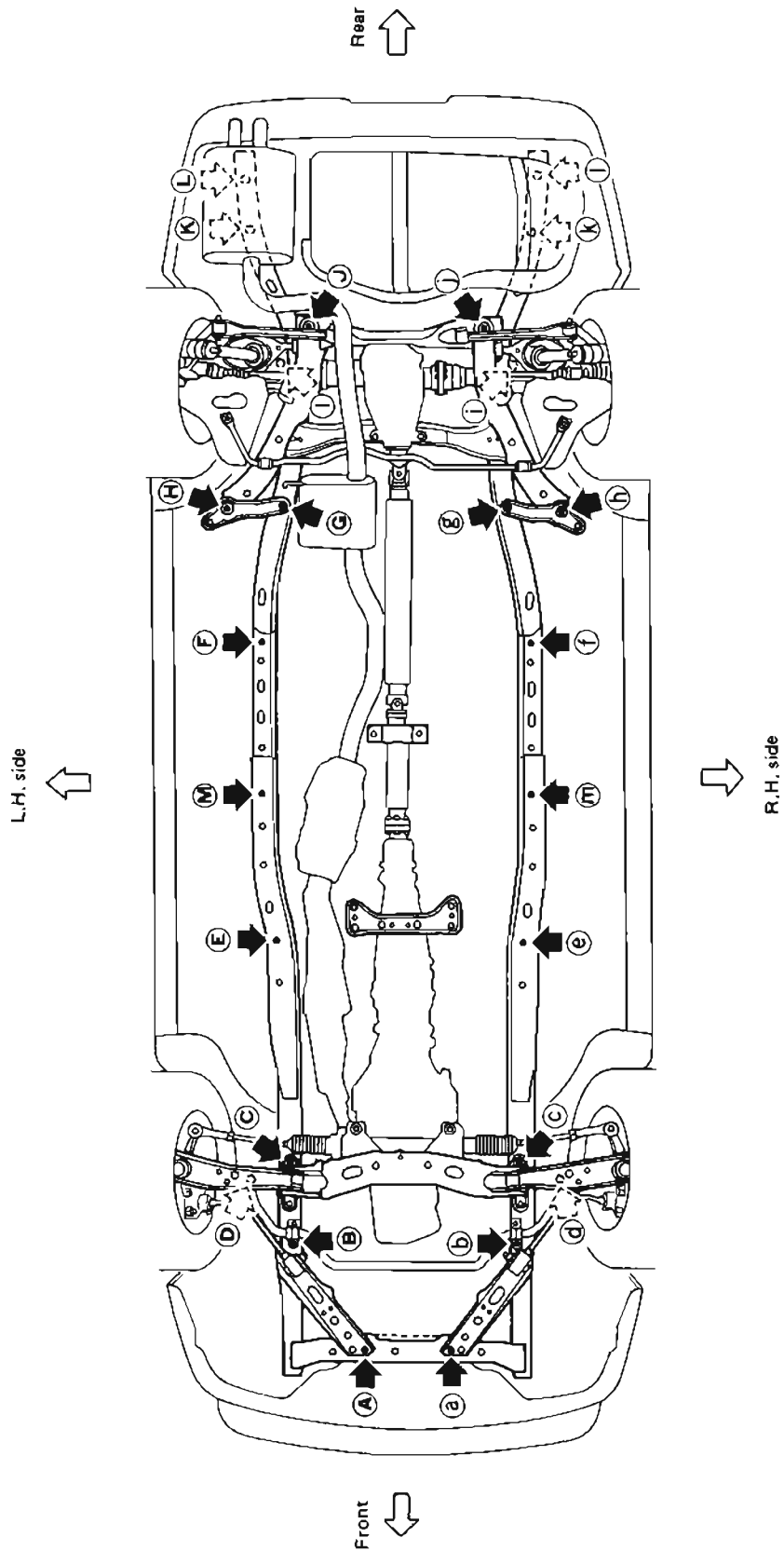


Unit: mm

BODY ALIGNMENT

Underbody (Cont'd)

MEASUREMENT POINTS



BODY ALIGNMENT

Underbody (Cont'd)

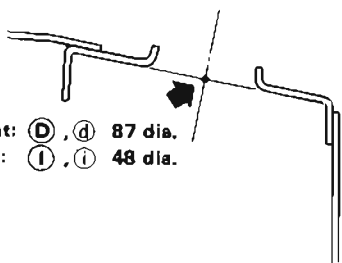
Unit: mm

Front and rear strut tower centers

Coordinates:

(D), (d)
 X: 542.2
 Y: 63.5
 Z: 725.7
(I), (i)
 X: 474.5
 Y: 2,500
 Z: 658.9

Front: **(D), (d)** 87 dia.
 Rear: **(I), (i)** 48 dia.

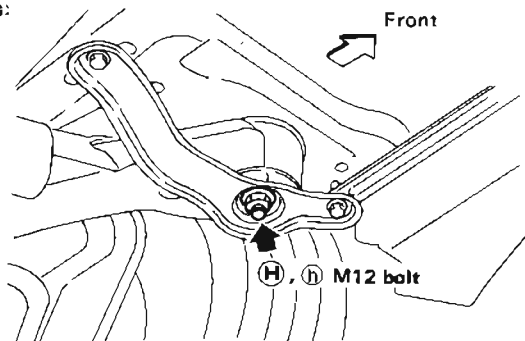


SBF119C

Rear suspension member front mounting bolt threaded end

Coordinates:

(H), (h)
 X: 635
 Y: 2,050
 Z: 116.3

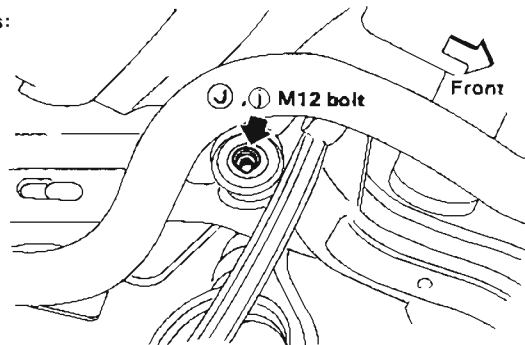


SBF226E

Rear suspension member rear mounting bolt threaded end

Coordinates:

(J), (j)
 X: 303
 Y: 2,635
 Z: 65.8

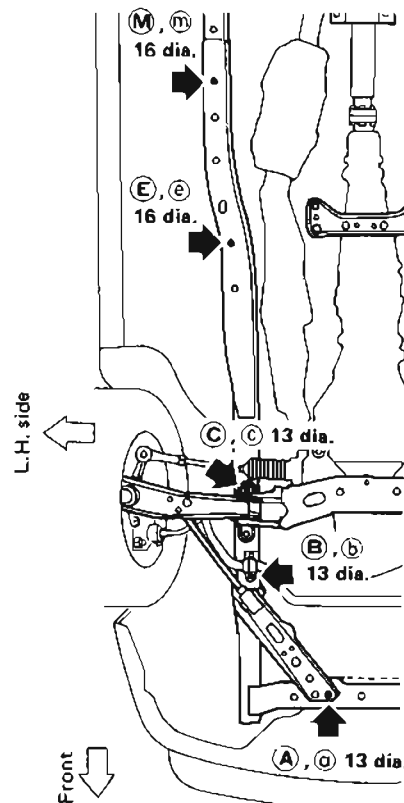


SBF227E

Front side member and front extension

Coordinates:

(A), (a)
 X: 132.9
 Y: -582
 Z: 189
(B), (b)
 X: 370
 Y: -304
 Z: 255
(C), (c)
 X: 384.2
 Y: 32
 Z: 255
(E), (e)
 X: 375
 Y: 700
 Z: 106.2
(M), (m)
 X: 420
 Y: 1,150
 Z: 106.2

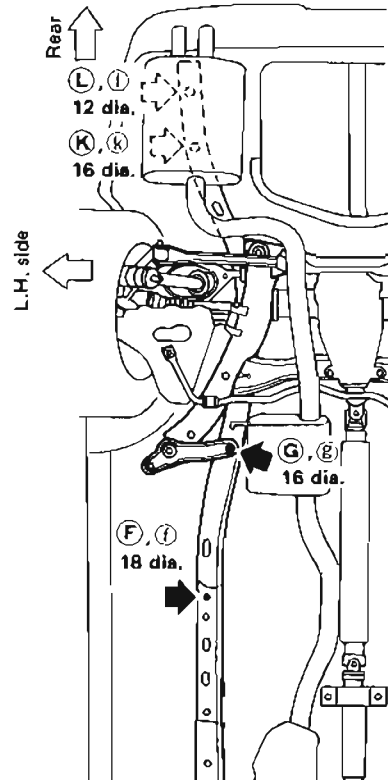


SBF271E

Center side member, rear side member and rear extension

Coordinates:

(F), (f)
 X: 422.5
 Y: 1,650
 Z: 104
(G), (g)
 X: 380
 Y: 2,030
 Z: 195.8
(K), (k)
 X: 520
 Y: 3,050
 Z: 398.8
(L), (l)
 X: 528
 Y: 3,221
 Z: 386
(I), (i)
 X: 628
 Y: 3,200
 Z: 400



SBF272E

HEATER & AIR CONDITIONER

SECTION **HA**

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| AIR FLOW AND COMPONENT LAYOUT | HA- 2 |
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| DESCRIPTION – Push Control | HA- 7 |
| PUSH CONTROL UNIT | HA- 9 |
| HEATER ELECTRICAL CIRCUIT | HA-12 |
| PRECAUTIONS | HA-13 |
| PRECAUTIONS FOR REFRIGERANT CONNECTION | HA-14 |
| PREPARATION | HA-15 |
| DISCHARGING, EVACUATING, CHARGING AND CHECKING | HA-17 |
| DESCRIPTION OF AIR CONDITIONER | HA-24 |
| SERVICE PROCEDURES | HA-25 |
| A/C PERFORMANCE TEST | HA-28 |
| COMPRESSOR OIL – For NVR 140S (ATSUGI make) | HA-33 |
| COMPRESSOR – Model NVR 140S (ATSUGI make) | HA-35 |
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| A/C COMPONENT LAYOUT | HA-42 |
| TROUBLE DIAGNOSES | HA-44 |
| SERVICE DATA AND SPECIFICATIONS (S.D.S.) | HA-73 |

When you read wiring diagrams:

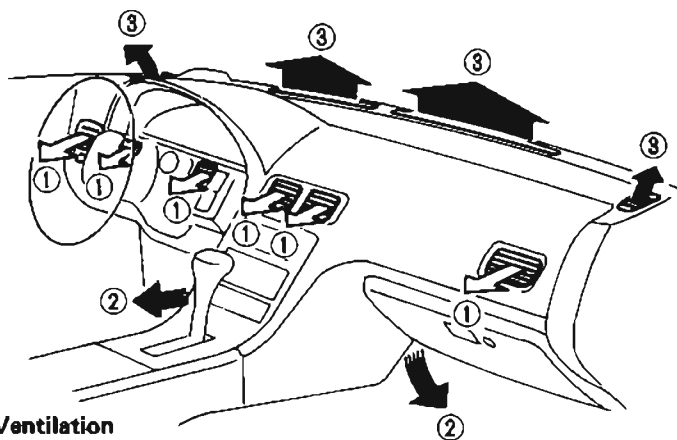
- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

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

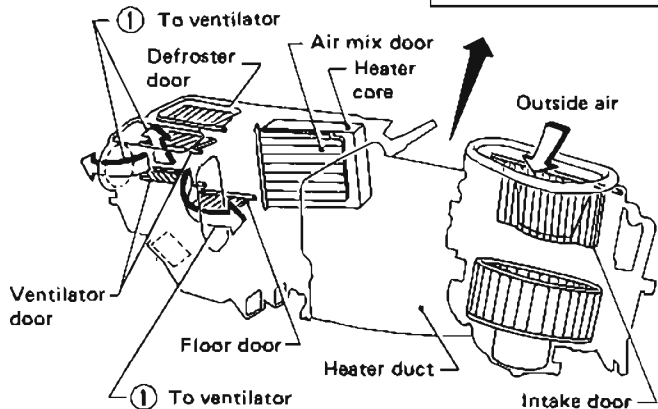
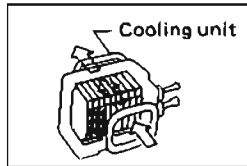
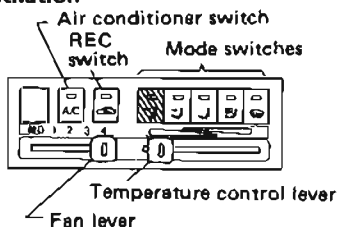
HA

AIR FLOW AND COMPONENT LAYOUT

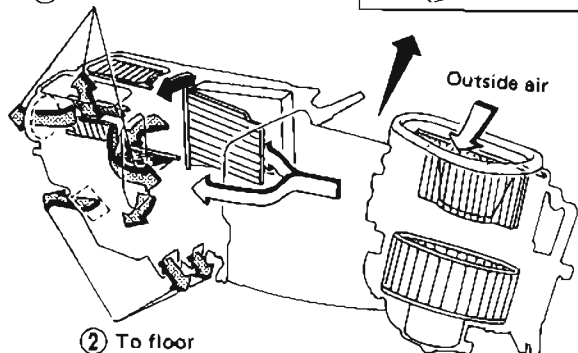
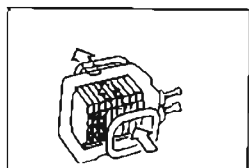
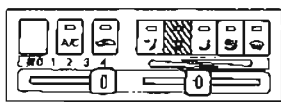
Air Flow



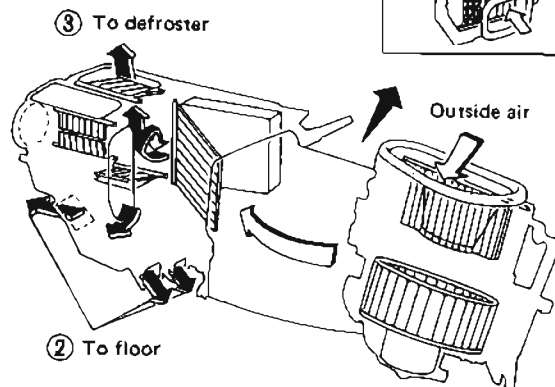
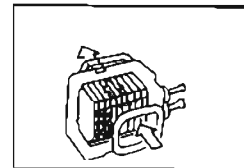
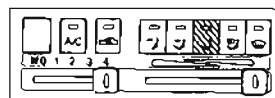
Ventilation



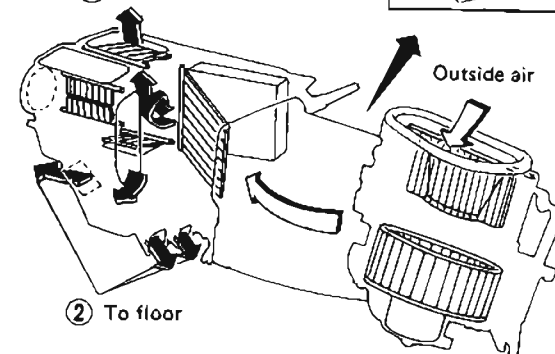
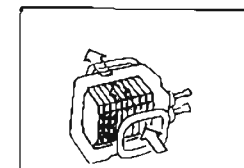
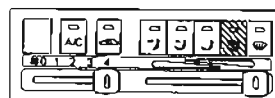
Bi-level



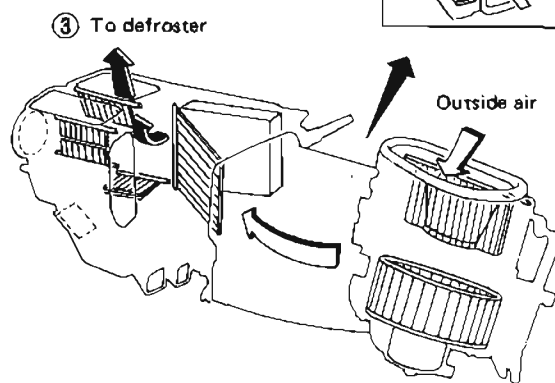
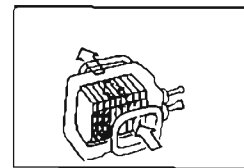
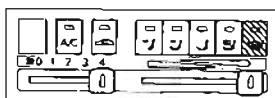
Floor



Floor and defroster



Defroster



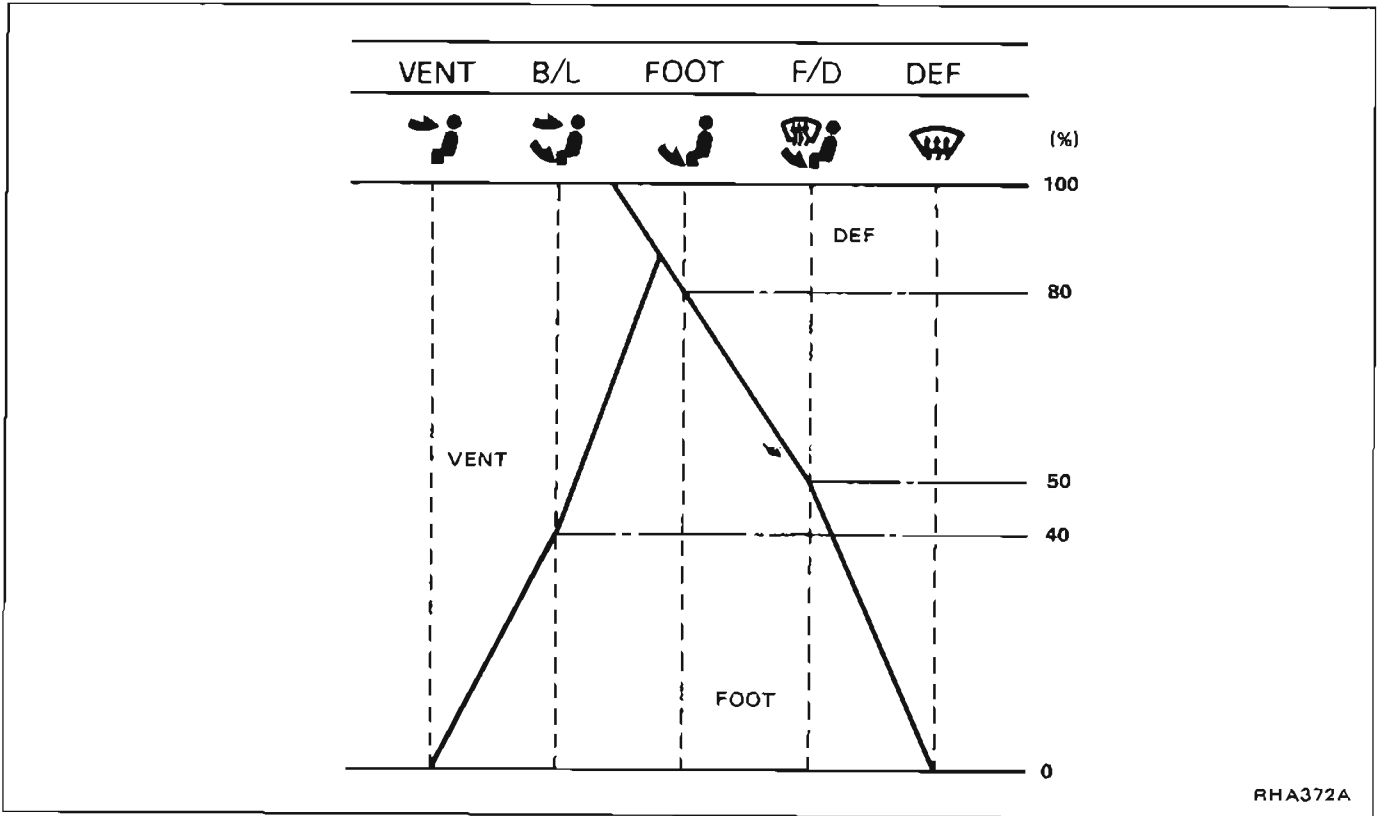
- ← : Air passed through heater core
- ← + ← : Mixed air (← + ←)
- ← : Air not passed through heater core

RHA371A

AIR FLOW AND COMPONENT LAYOUT

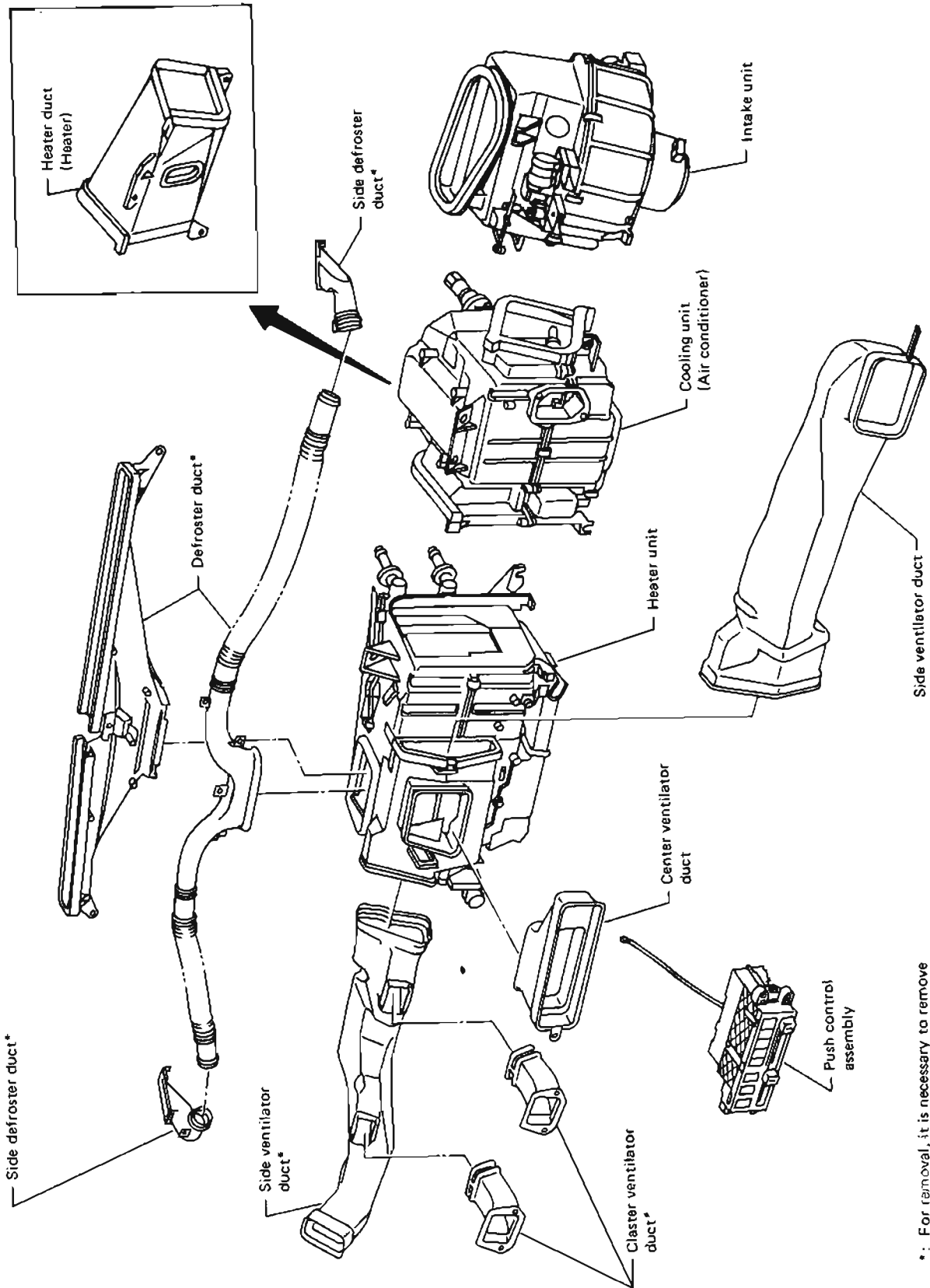
Air Flow (Cont'd)

AIR DISTRIBUTION RATIOS



RHA372A

Component Layout

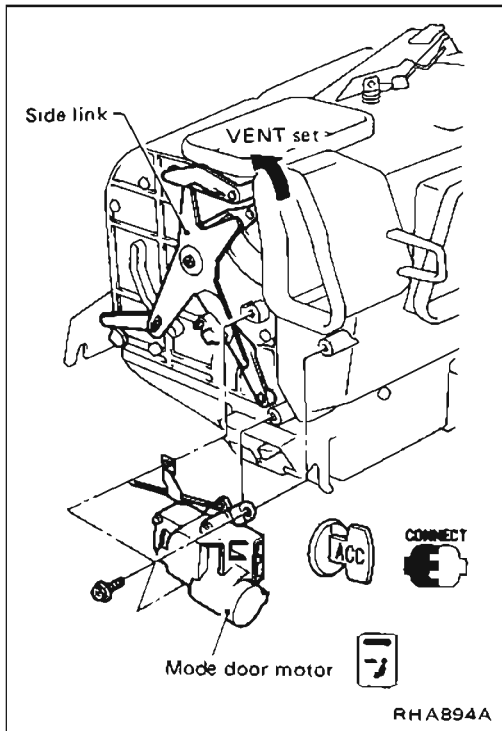


*: For removal, it is necessary to remove instrument assembly.

DOOR CONTROL

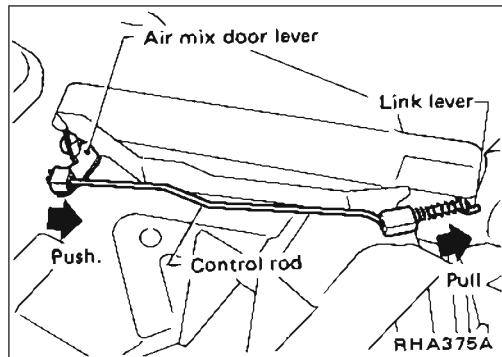
Control Cable Adjustment

- When disconnecting control cable, remove E-ring and take off cable while pushing cable outer.



MODE DOOR

1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ACC.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.

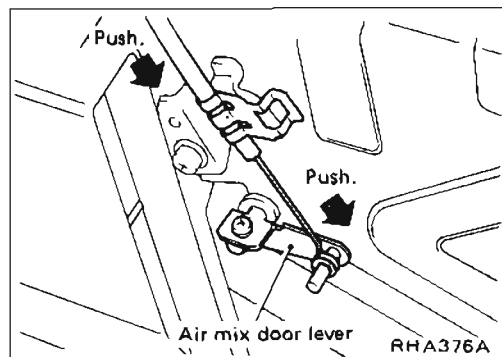


WATER COCK CONTROL ROD

- When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever. Re-connect and readjust temperature control cable.

1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to give a clearance of about 2 mm (0.08 in) between ends of rod and link lever. Connect control rod to door lever.

After connecting control rod, check it operates properly.



TEMPERATURE CONTROL CABLE

- Clamp cable while pushing cable outer and air mix door lever in direction of arrow.

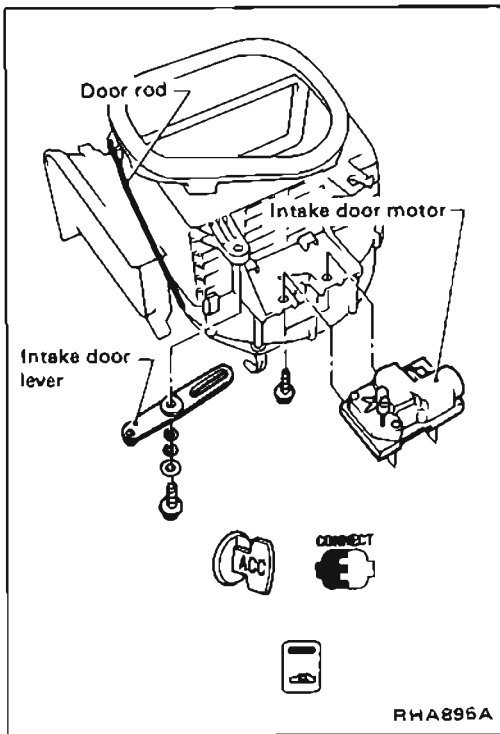
After positioning control cable, check it operates properly.

DOOR CONTROL

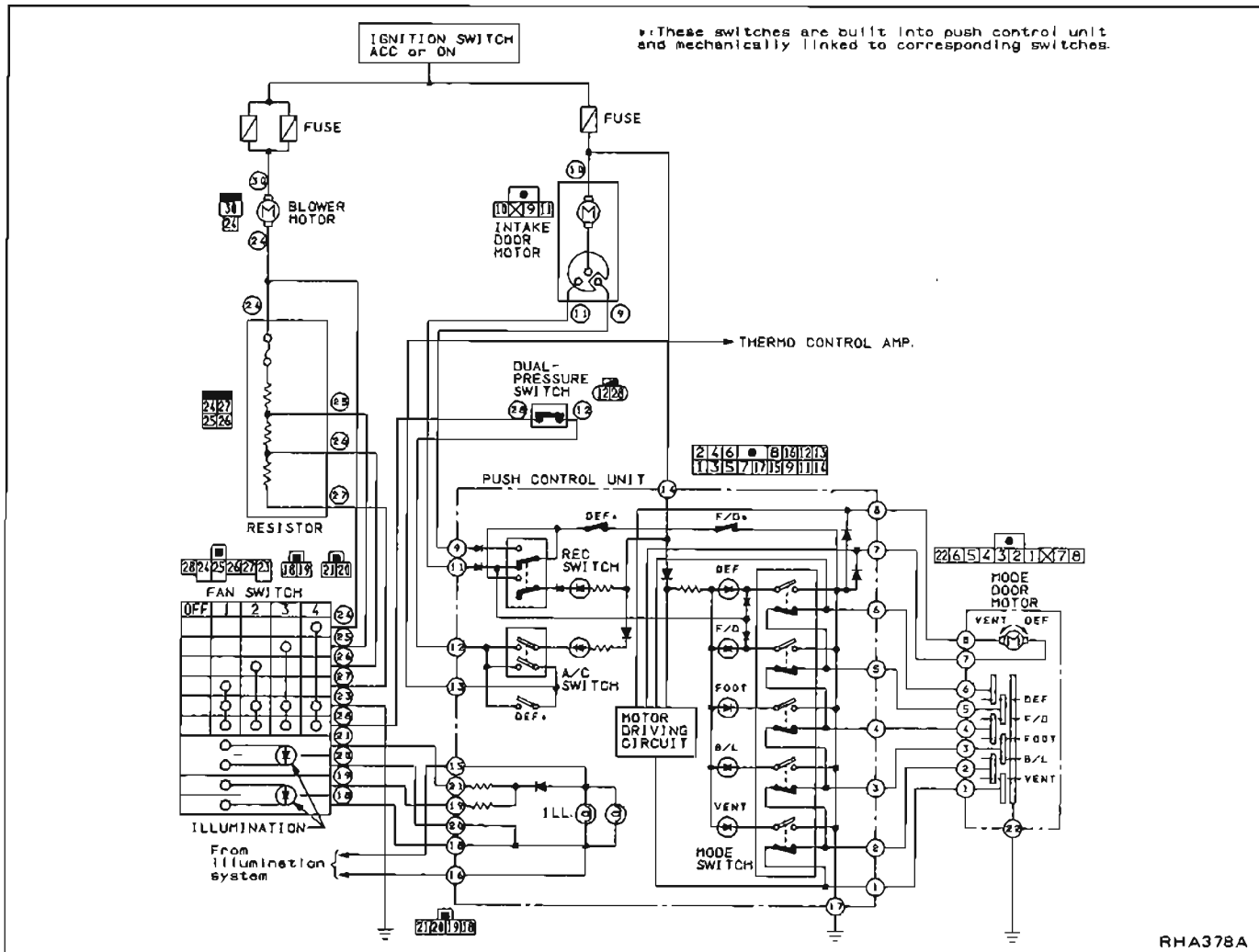
Control Cable Adjustment (Cont'd)

INTAKE DOOR

1. Connect intake door motor harness connector before installing on intake door motor.
2. Turn ignition switch to ACC.
3. Turn REC switch ON.
4. Install intake door lever.
5. Set intake door rod in REC and secure door rod to holder.
6. Check that intake door operates properly when REC switch is turned ON and OFF.



Push Control System



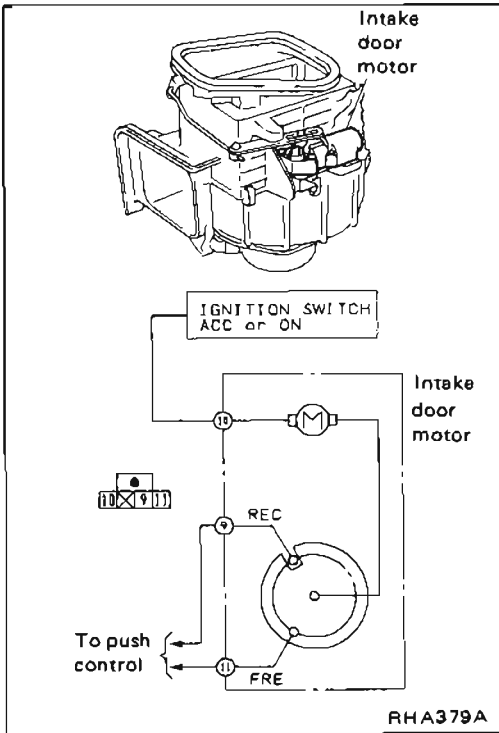
This push control system operates the intake and mode door motors to activate their corresponding doors.

SWITCHES AND THEIR CONTROL FUNCTIONS

| Switch | Indicator illuminates | | | | | | | Air outlet | Intake air | Compressor |
|--------|-----------------------|---|---|---|---|---|-----|------------|------------|------------|
| | A/C | | | | | | | | | |
| A/C | ○ | | | | | | | | | ON*1 |
| Mode | | ○ | | | | | | VENT | | |
| | | | ○ | | | | | B/L | | |
| | | | | ○ | | | | FOOT | | |
| | | | | | ○ | | | F/D | FRE | |
| | | | | | | ○ | | DEF | FRE | ON*1 |
| | | | | | | | ○*2 | | REC | |

*1: Compressor is operated by thermo control amp.

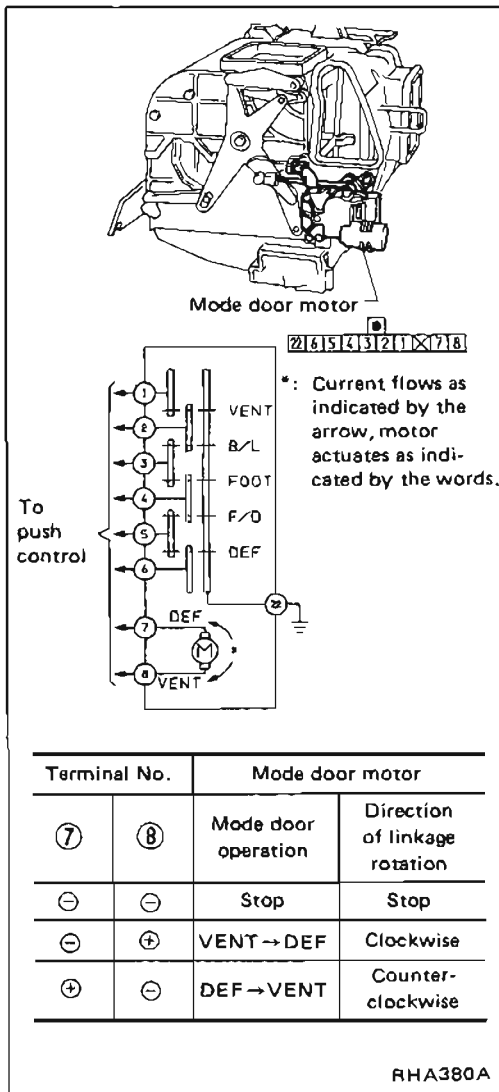
*2: It depends on mode switch position.



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.

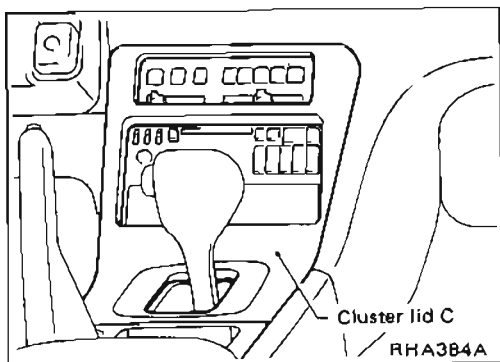
When one mode switch is pushed, the position switch built into it reads the corresponding mode to determine the direction of motor rotation. As soon as the desired mode is set, the position switch stops the motor.

| Terminal No. | | Mode door motor | |
|--------------|---|---------------------|-------------------------------|
| ⑦ | ⑧ | Mode door operation | Direction of linkage rotation |
| ⊖ | ⊖ | Stop | Stop |
| ⊖ | ⊕ | VENT → DEF | Clockwise |
| ⊕ | ⊖ | DEF → VENT | Counter-clockwise |

PUSH CONTROL UNIT

Removal and Installation

1. Remove cluster lid C.



2. Remove audio (radio).

3. Remove four screws of push control unit.

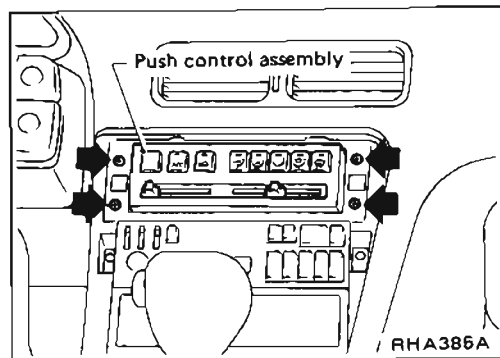
4. Remove temperature control cable.

5. Disconnect push control unit harness connectors.

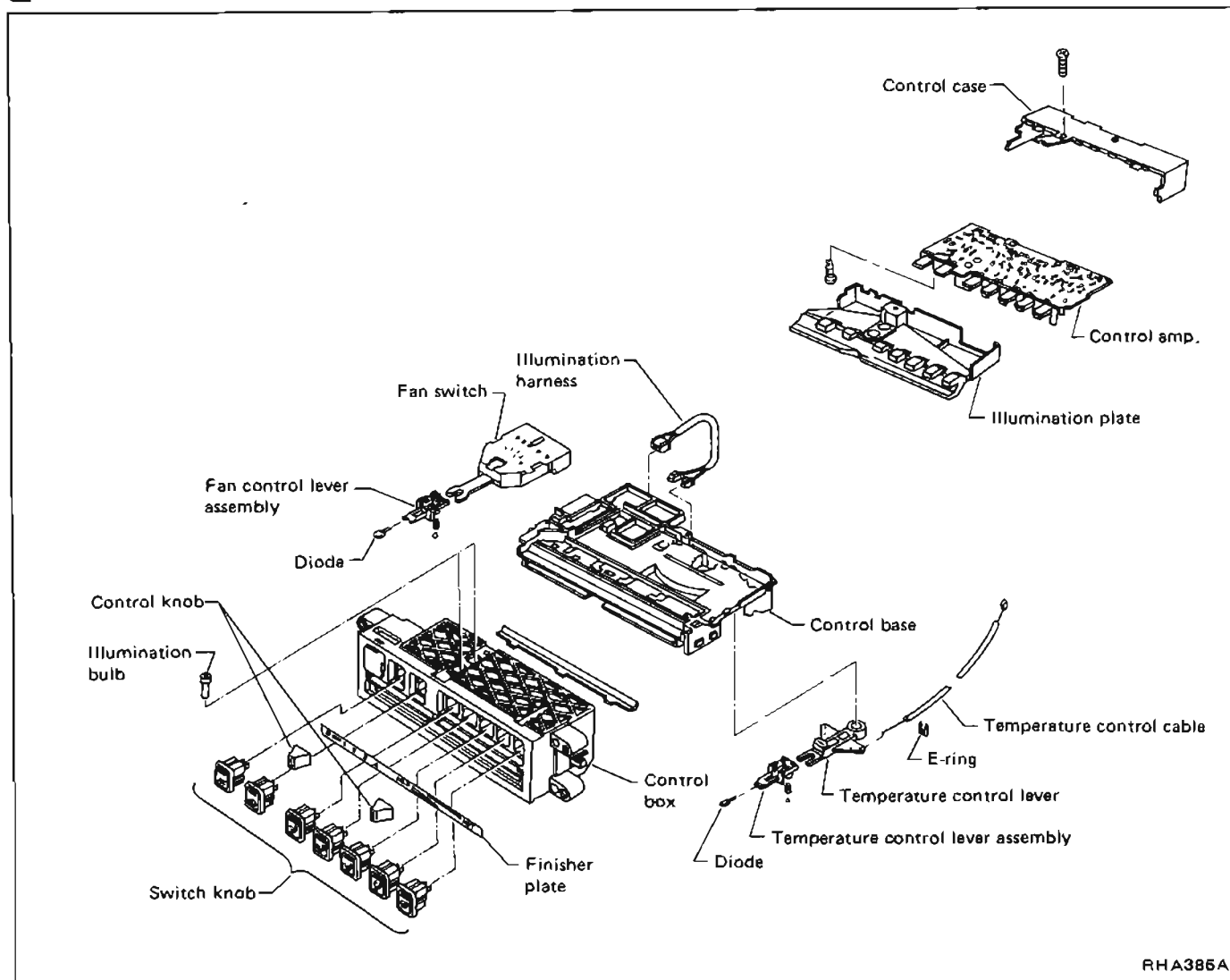
6. Remove push control unit.

7. Installation is in the reverse order of removal.

Refer to Control Cable Adjustment for temperature control cable.



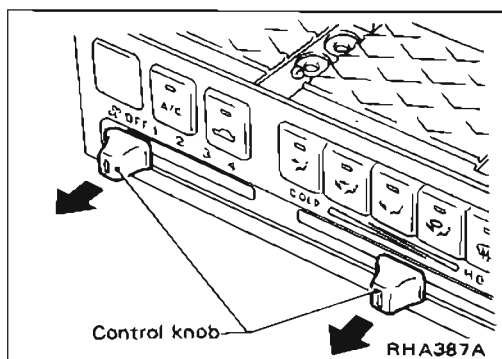
Overhaul — Push control unit assembly



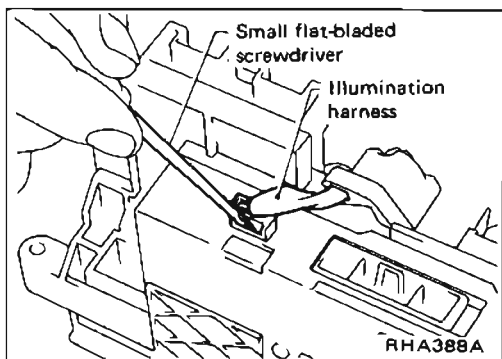
PUSH CONTROL UNIT

Overhaul — Push control unit assembly (Cont'd)

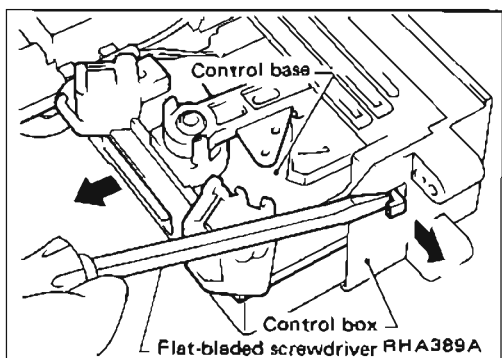
1. Remove control knobs.
Wrap knobs with a cloth and pull in direction indicated by arrow as shown in figure at left. Be careful not to scratch knobs during removal.



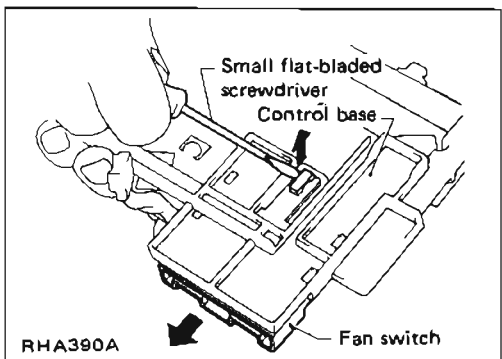
2. Disconnect illumination harness connectors.



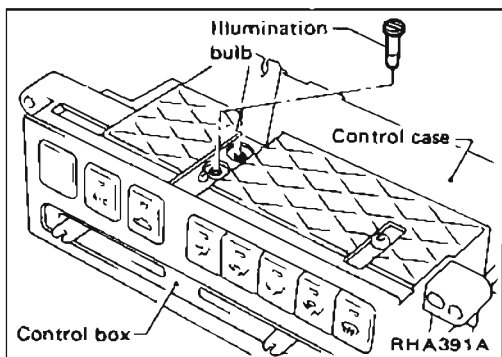
3. Remove control base.
Undo hook at each end of control box and remove control base from control box by moving it in direction indicated by arrow.



4. Remove fan switch.



5. Remove illumination bulb.



PUSH CONTROL UNIT

Overhaul — Push control unit assembly (Cont'd)

6. Remove control knobs.

Wrap finisher with a cloth and remove knobs using pliers or similar tool. Be careful not to scratch finisher's surface.

7. Remove control case.

8. Remove illumination plate.

Be careful not to scratch control amp. when removing illumination plate.

9. Remove finisher plate.

10. Remove control amp.

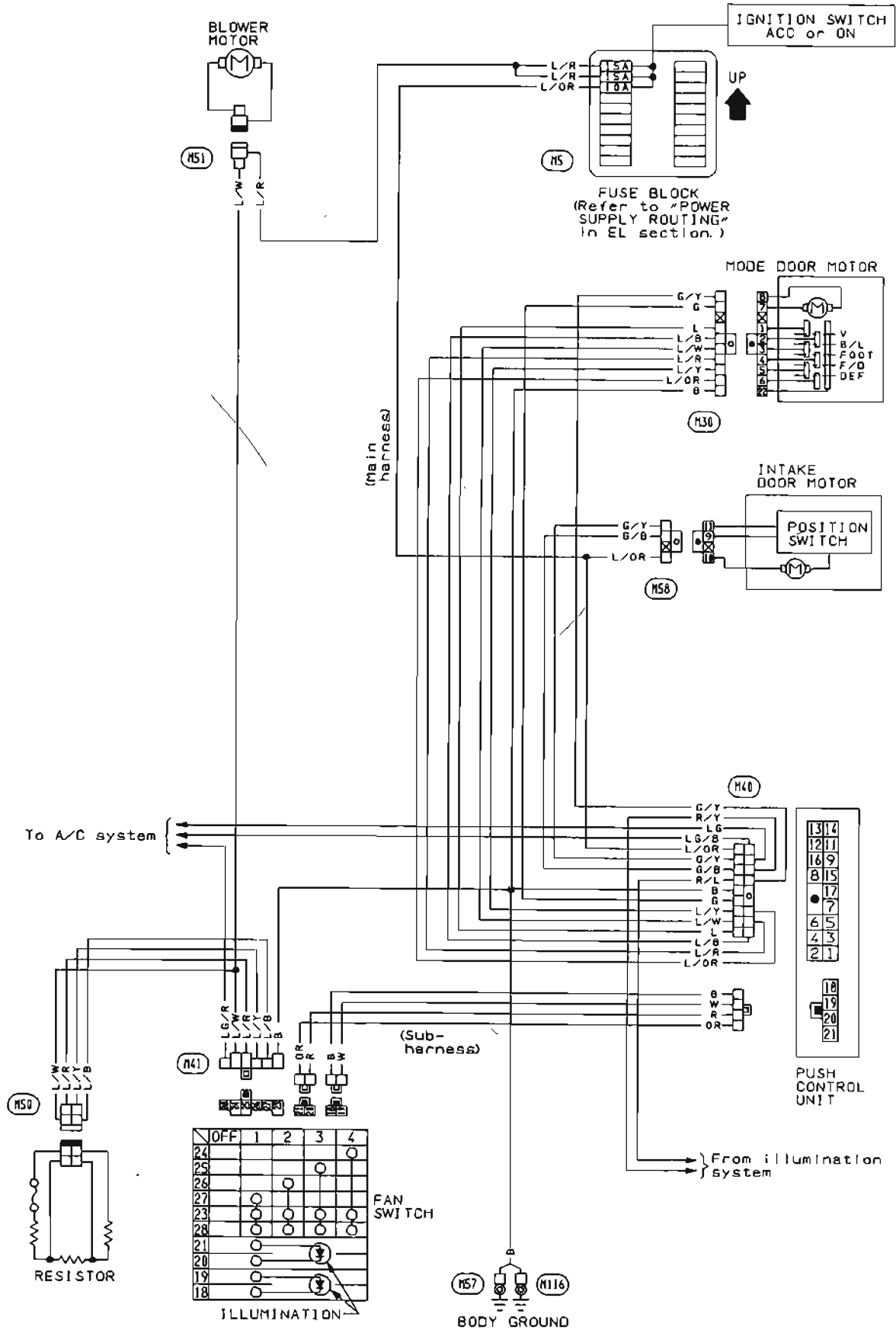
Be careful not to damage substrate when removing.

11. Disconnect temperature control cable.

12. Installation is in reverse order of removal.

HEATER ELECTRICAL CIRCUIT

Wiring Diagram



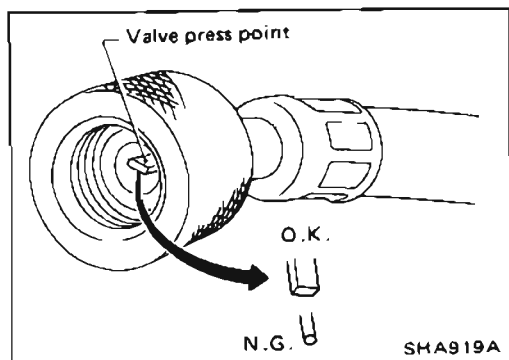
PRECAUTIONS

WARNING:

- Always wear eye protection when working around the system.
- Always be careful that refrigerant does not come in contact with your skin.
- Keep refrigerant containers stored below 40°C (104°F) and never drop them from high places.
- Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to 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 can with an open flame. There is a danger that can will explode.

CAUTION:

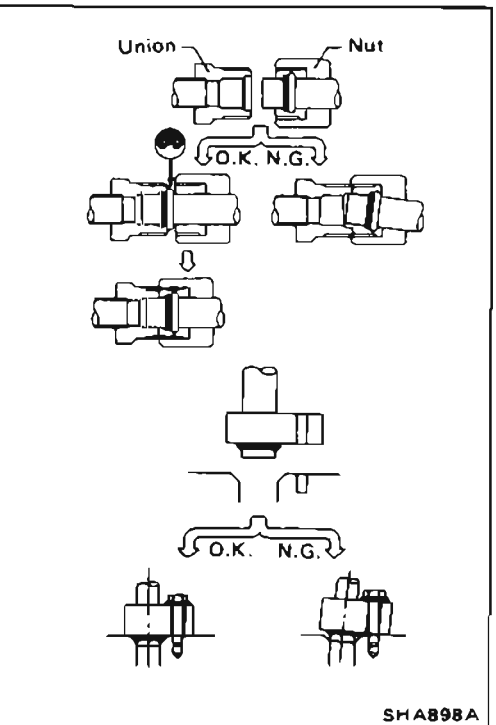
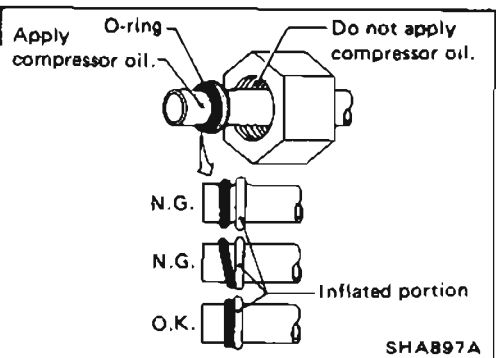
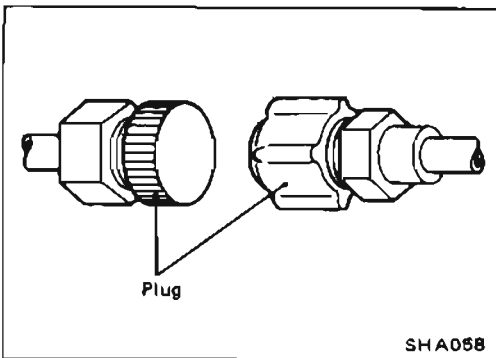
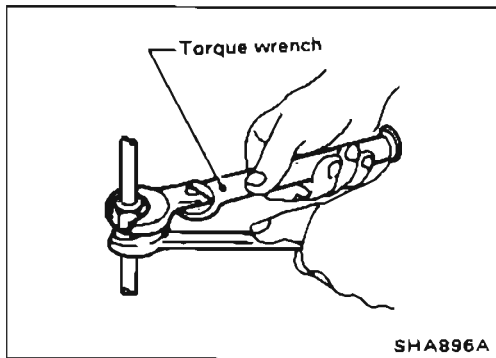
- Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.
- Compressed air must never be used to clean a dirty line. Clean with refrigerant gas.



- Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuation may occur.

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

PRECAUTIONS FOR REFRIGERANT CONNECTION



WARNING:

Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

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.
- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.

- Always replace used O-rings.

- When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.

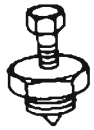


- O-ring must be closely attached to inflated portion of tube.

- After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.

- After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.


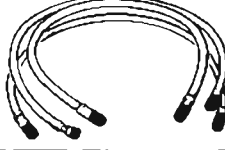
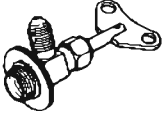

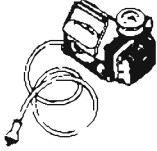

PREPARATION

SPECIAL SERVICE TOOLS

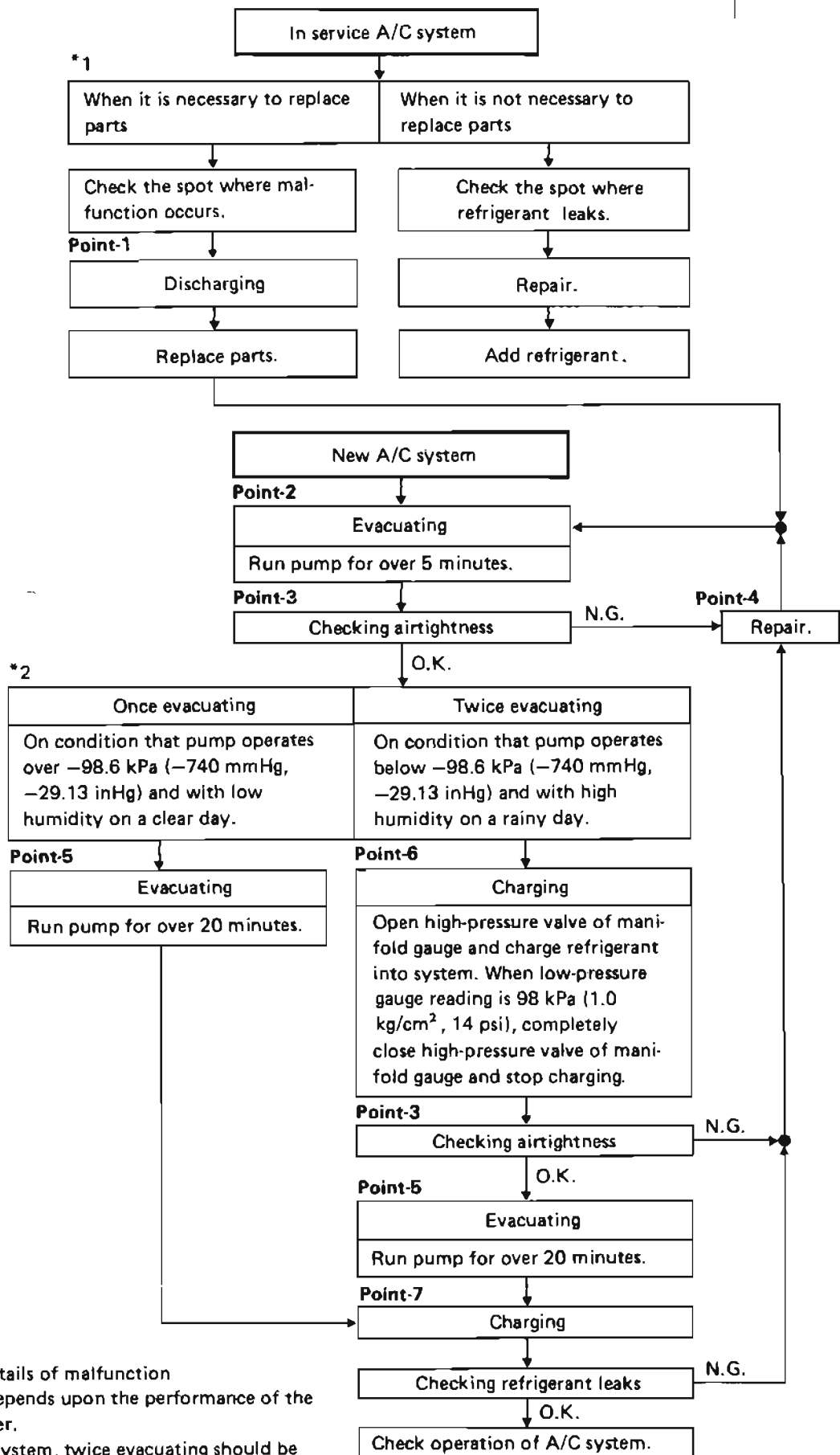
| Tool number (Kent-Moore No.) Tool name | Description |
|--|--|
| KV998VR001 (-) Clutch disc puller |  Removing clutch disc |
| KV99231010 (-) Clutch disc wrench |  Removing shaft nut and clutch disc |
| KV99235160 (J29751) Nut wrench |  Removing lock nut |

PREPARATION

SERVICE TOOLS

| Tool name | Description |
|------------------------|---|
| Manifold gauge |  Discharging and charging refrigerant |
| Charging hose |  Discharging, evacuating and checking refrigerant |
| Charge valve |  Discharging and charging refrigerant |
| Thermometer |  Checking temperature |
| Vacuum pump |  Evacuating refrigerant |
| Electric leak detector | <p>Nominal sensitivity: 15 - 25 g (0.53 - 0.88 oz)/year</p>  Checking refrigerant leaks |

DISCHARGING, EVACUATING, CHARGING AND CHECKING



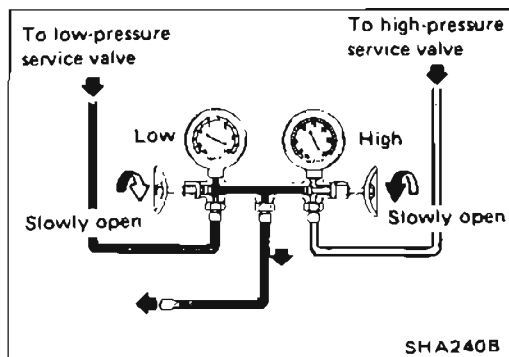
*1: Depending on the details of malfunction
 *2: Working operation depends upon the performance of the pump and the weather.
 When servicing A/C system, twice evacuating should be done under any condition.

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Point-1

Discharging

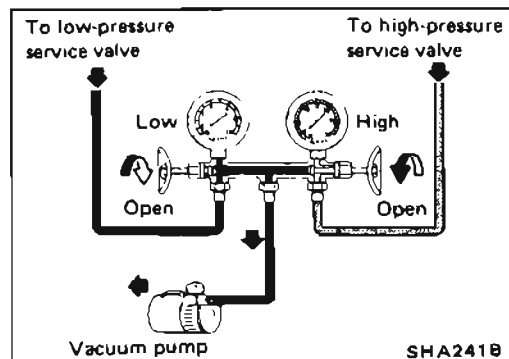
Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.



Point-2

Evacuating the System

1. Start pump, then open both valves and run pump for over 5 minutes.
2. When low gauge has reached approx. 98.6 to 101.3 kPa (740 to 760 mmHg, 29.13 to 29.92 inHg), completely close both valves of gauge and stop vacuum pump.
 - a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.
 - b. The rate ascension of the low-pressure gauge should be less than 3.3 kPa (25 mmHg, 0.98 inHg) in 5 minutes.



| Elevation m (ft) | Vacuum of system* kPa (mmHg, inHg) |
|---------------------|---------------------------------------|
| 0 (0) | 101.3 (760, 29.92) |
| 300 (1,000) | 98.0 (735, 28.94) |
| 600 (2,000) | 94.6 (710, 27.95) |
| 900 (3,000) | 91.3 (685, 26.97) |

*: Values show reading of the low-pressure gauge.

Point-3

Checking Airtightness

1. Close both low and high-pressure valves and leave them unattended for approx. 5 to 10 minutes.
2. Make sure the pointer of the low-pressure gauge does not deflect toward the "0" direction.
3. If the pointer deflects, gas leakage is present. Repair as outlined under [Point-4](#).

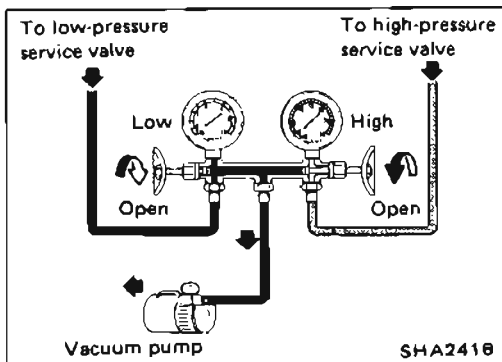
Point-4

Repair

If a problem is noticed under [Point-3](#) above, locate and repair the leaking point using the following table as a guide.

| Leak at/around pipe connection | Leak at/around gauge manifold |
|---|--|
| <ul style="list-style-type: none"> ● O-ring fouled, damaged or deformed ● Oil not applied to pipe connections during installation ● Pipe connections not properly tightened (too tight or too loose) | <ul style="list-style-type: none"> ● Malfunctioning charging hose ● Gauge improperly installed ● Malfunctioning valve ● Malfunctioning packing, etc. |

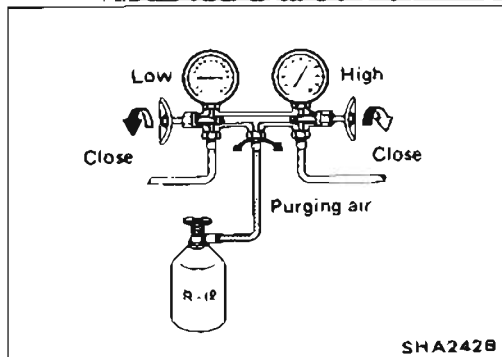
DISCHARGING, EVACUATING, CHARGING AND CHECKING



Point-5

Evacuating the System

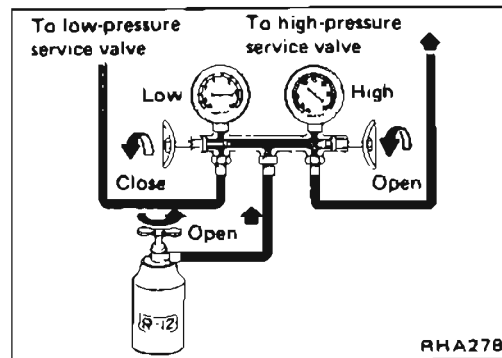
1. Close manifold gauge valve securely and disconnect charging hose from refrigerant can.
2. Connect center charging hose to vacuum pump.
3. Start pump, then open both valves and run pump for over 20 minutes.



Point-6

Charging

1. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
2. Purge air from center charging hose.
 - 1) Connect center charging hose to refrigerant can through charge valve.
 - 2) Break seal of refrigerant can and purge air.

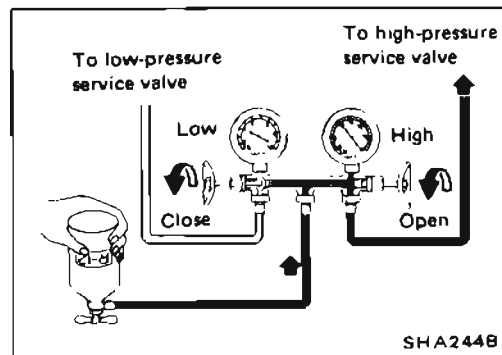


3. Charge refrigerant into system.

WARNING:

Ensure that engine is off.

- 1) Open high-pressure valve of manifold gauge and charge refrigerant into system.



CAUTION:

If charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high-pressure (discharge) service valve. After charging, the compressor should always be turned several times manually.

- 2) When low-pressure gauge reading is 98 kPa (1.0 kg/cm², 14 psi), completely close high-pressure valve of manifold gauge and stop charging.

Point-7

Charging

1. Open manifold gauge low-pressure valve and charge refrigerant into system.

WARNING:

Ensure that engine is off.

2. When refrigerant charging speed slows down, start engine — air conditioning system ON, maximum cold temperature set, maximum blower speed set, can in upright position. Monitor sight glass. Charge is complete when sight glass is clear.

Cycling clutch systems will produce bubbles in sight glass when clutch engages. Therefore, allow 5 seconds after clutch engages to determine if bubbles continue, and, if so, add refrigerant to clear sight glass.

WARNING:

Never charge refrigerant through high-pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and it may explode.

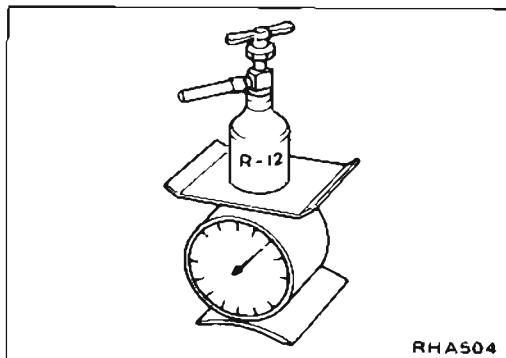
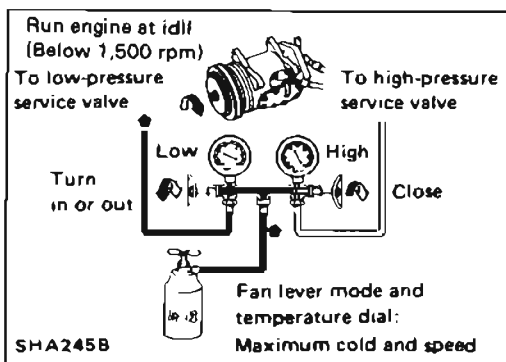
3. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm², 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- **Be sure to purge air from charging hose when replacing can with a new one.**

4. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

Refrigerant amount:

0.9 - 1.0 kg (2.0 - 2.2 lb)



Point-7

Charging (Cont'd)

The state of the bubbles in the sight glass can only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant should be correctly judged by means of the discharge pressure.

5. After charging, be sure to install valve cap on service valve.
 6. Confirm that there are no leaks in system by checking with a leak detector.
- When refrigerant charging is performed with a charging cylinder, charging station, or automatic charging equipment with engine off, charge only through high pressure side. After specified refrigerant amount has entered the system, close high-pressure valve on gauge set. Start engine, return to idle speed, operate A/C at maximum temperature setting, high blower. Observe sight glass to confirm complete charge.

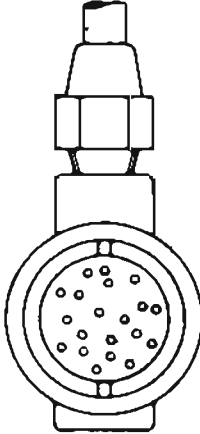
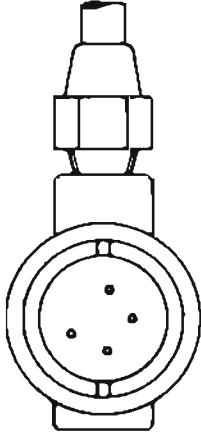
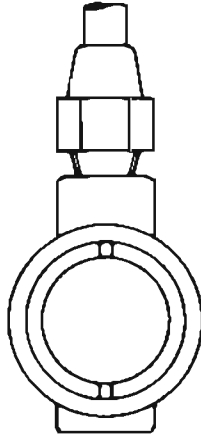
Overcharging will result in increased high pressures, and reduced performance.

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Checking Refrigerant Level

CONDITION

- Door window: Open
- A/C switch: ON
- TEMP. lever position: Max. COLD
- FAN lever position: 4
- Check sight glass after a lapse of about five minutes.

| Amount of refrigerant | Almost no refrigerant | Insufficient | Suitable | Too much refrigerant |
|--|---|--|--|--|
| Check item | | | | |
| Temperature of high-pressure and low-pressure lines. | Almost no difference between high-pressure and low-pressure side temperature. | High-pressure side is warm and low-pressure side is fairly cold. | High-pressure side is hot and low-pressure side is cold. | High-pressure side is abnormally hot. |
| State in sight glass. | Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.  AC256 | The bubbles are seen at intervals of 1 - 2 seconds.  AC257 | Almost transparent. Bubbles may appear when engine speed is raised and lowered. No clear difference exists between these two conditions.  AC258 | No bubbles can be seen. |
| Pressure of system. | High-pressure side is abnormally low. | Both pressures on high and low-pressure sides are slightly low. | Both pressures on high and low-pressure sides are normal. | Both pressures on high and low-pressure sides are abnormally high. |
| Repair. | Stop compressor immediately and conduct an overall check. | Check for gas leakage, repair as required, replenish and charge system. | | Discharge refrigerant from service valve of low-pressure side. |

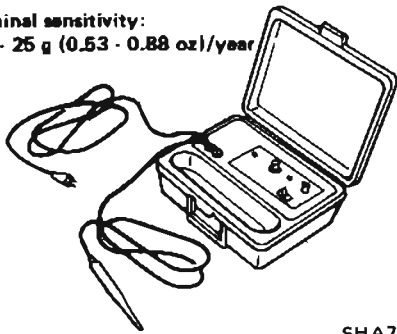
a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Recheck the amount when it

exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount or refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Nominal sensitivity:
15 - 25 g (0.53 - 0.88 oz)/year



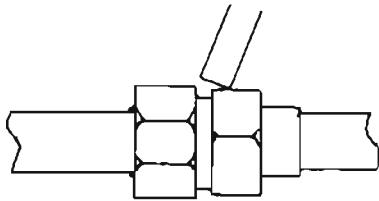
Checking Refrigerant Leaks

ELECTRIC LEAK DETECTOR

The leak detector is a delicate device that detects small amounts of halogen.

To use the device properly, read the manufacturer's manuals. Also perform the specified maintenance and inspections.

UNION TYPE



RHA279

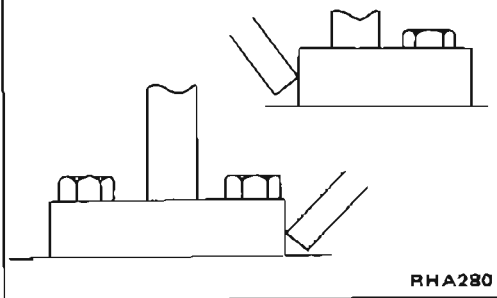
GENERAL PRECAUTIONS FOR HANDLING LEAK DETECTOR

Place the probe on connection fitting and wait for 5 seconds or more.

To check cooling unit, wait for 10 seconds or more.

If a leak is detected, keep the probe as still as possible for one more minute.

PLATE TYPE



RHA280

When testing single-bolt flange, place the probe on the opposite side of the fitting.

MEASUREMENT STANDARD

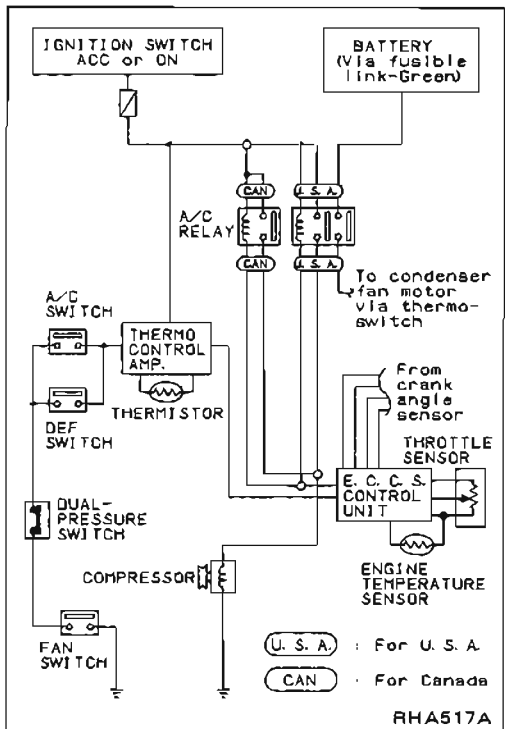
If any leak is noted with a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that leak must be repaired.

- The nominal sensitivity of the detector is determined under the assumption that all the leaking gas is collected by the detector. Accordingly, the quantity of gas actually leaking can amount to five to ten times the indicated value. Generally speaking, leakage of 150 to 200 g (5.29 to 7.05 oz) of refrigerant can cause insufficient cooling.
- Oil deposited during assembling must be wiped off before inspection. Refrigerant easily dissolves in oil, and the presence of oil can cause an error in measurement. This precaution is important when checking a used car for refrigerant leakage.
- If oil is noted at or around connections, it indicates that refrigerant is leaking.

DESCRIPTION OF AIR CONDITIONER

Acceleration Cut System

This system is controlled by the E.C.C.S. control unit. When the engine is heavily over loaded (throttle sensor judges that throttle valve is at full throttle position), the compressor is turned off for approx. 4 seconds to reduce overloading. Additionally when the temperature of engine coolant rises above approx. 113°C (235°F), the compressor is turned off.



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

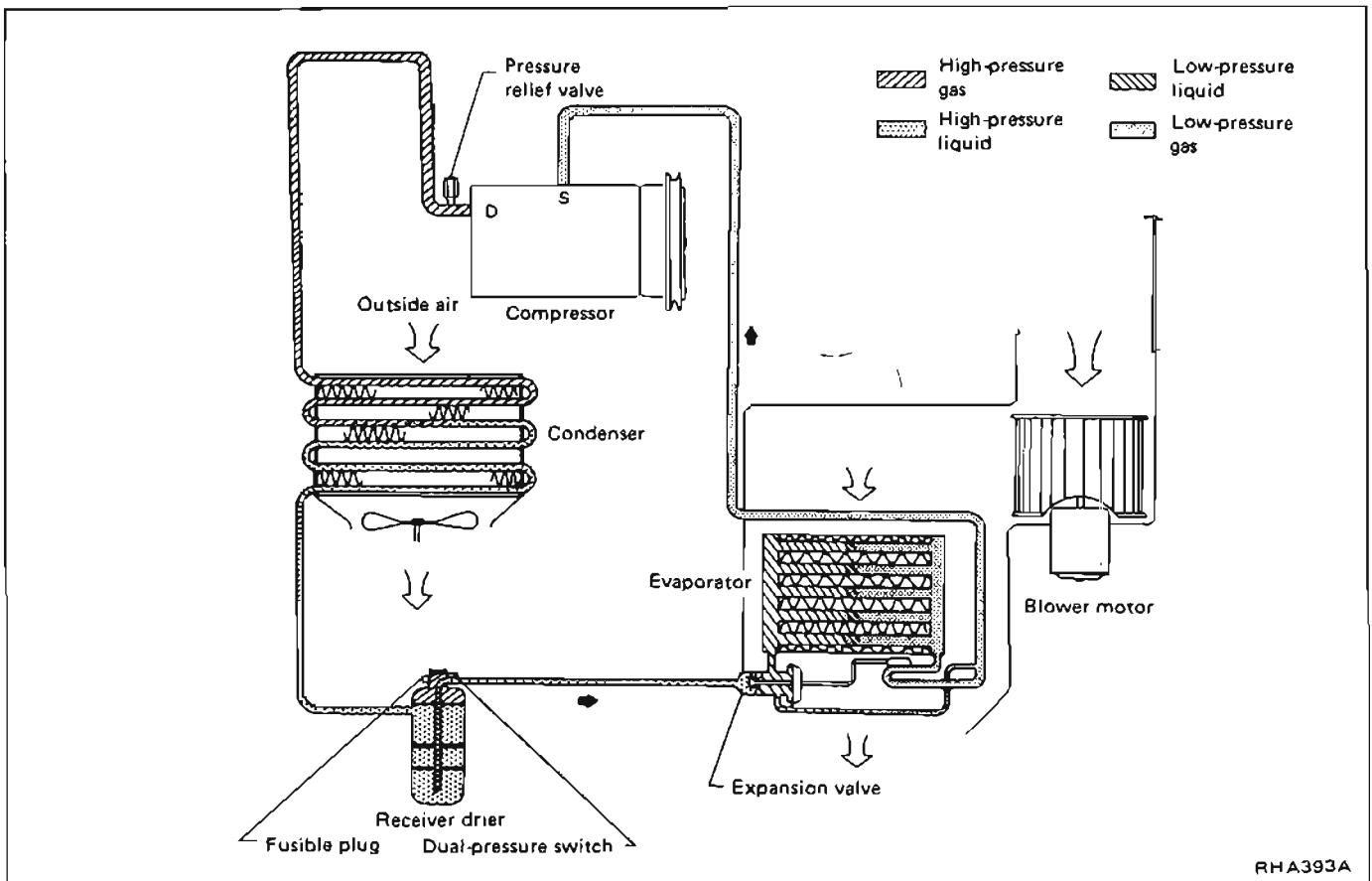
The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

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.

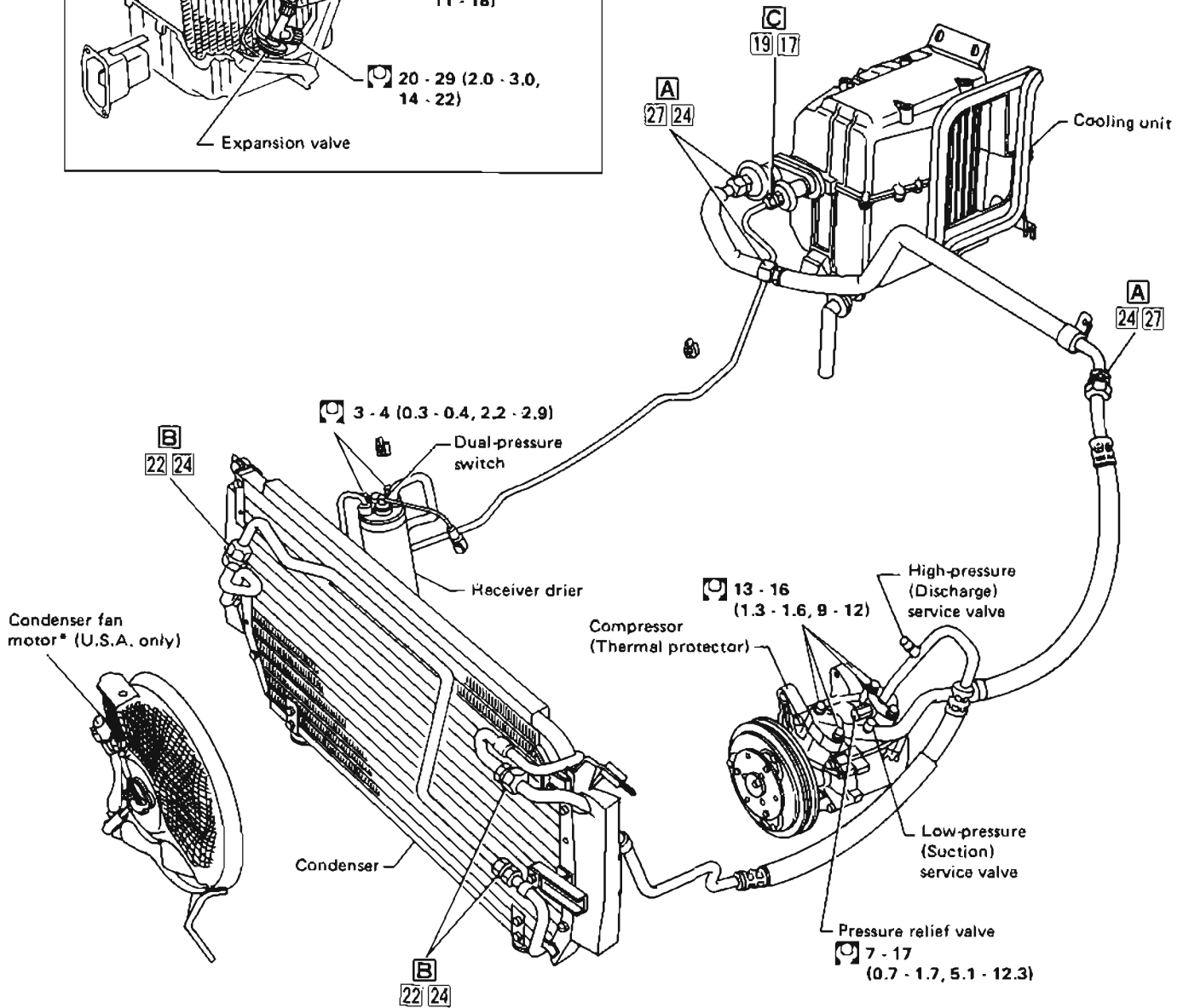
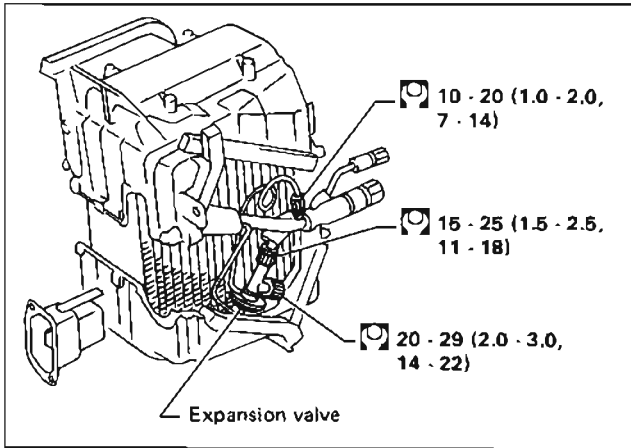
Pressure relief valve

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/cm², 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



SERVICE PROCEDURES

Refrigerant Lines



*: For removal, it is necessary to remove condenser.

☐ (Tightening torque)

☐☐ (Wrench size)

A 20 - 29 (2.0 - 3.0, 14 - 22)

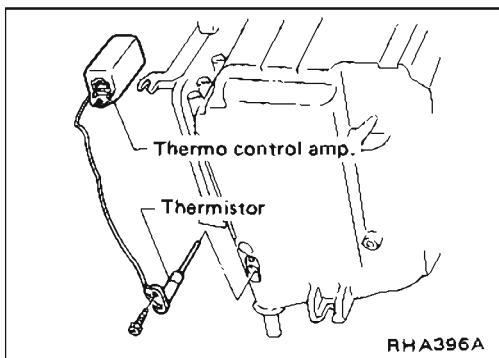
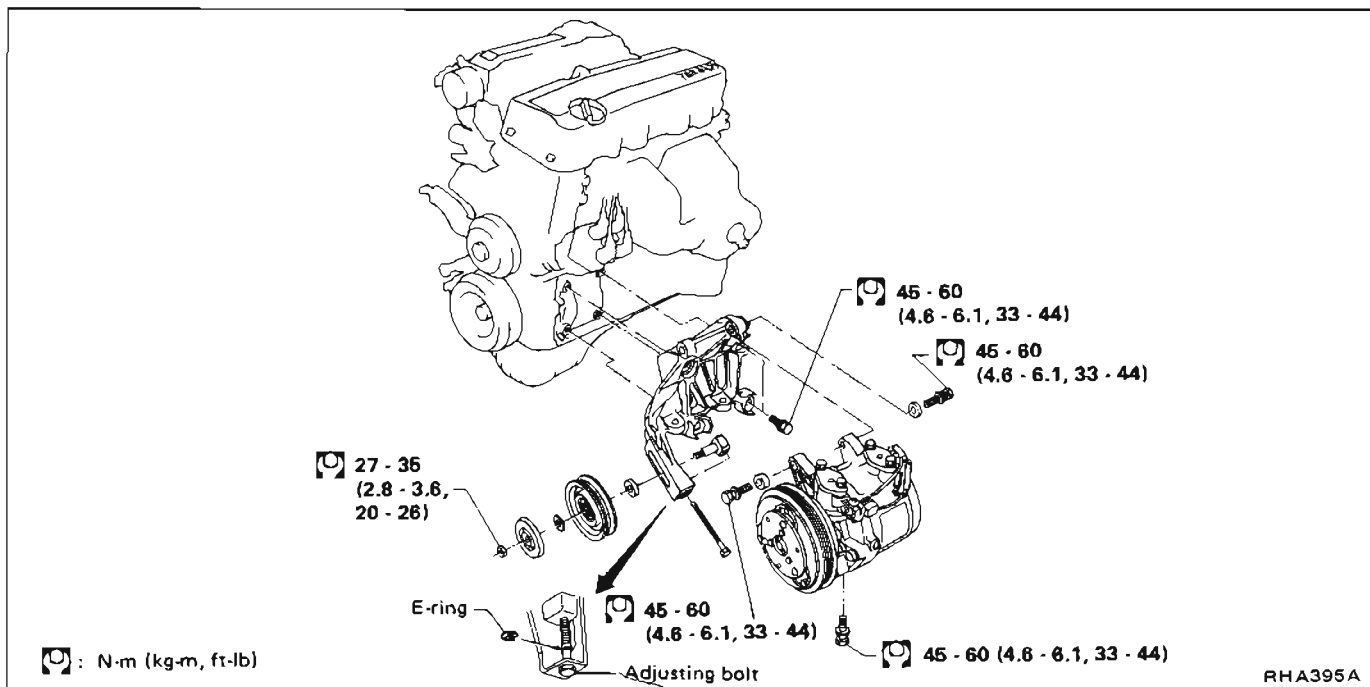
B 15 - 25 (1.5 - 2.5, 11 - 18)

C 10 - 20 (1.0 - 2.0, 7 - 14)

☐☐ : N·m (kg·m, ft·lb)

RHA394A

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. (Without removing cooling unit, thermo control amp. can be replace.)

Belt Tension

- Refer to MA section.

Fast Idle Control Device (F.I.C.D.)

- Refer to EF & EC section.

A/C PERFORMANCE TEST

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

MODE switch:  (Ventilation) set

REC switch:  (Recirculation) set

FAN lever position: Max. position

Engine speed: 1,500 rpm

Time required before starting testing after air conditioner starts operating: More than 10 minutes

For U.S.A. model, make sure that condenser fan motor does not operate during the following tests.

TEST READING

Recirculating-to-discharge air temperature table

| Inside air (Recirculating air) at blower assembly inlet | | Discharge air temperature at center ventilator °C (°F) |
|--|----------------------------|---|
| Relative humidity % | Air temperature °C (°F) | |
| 50 - 60 | 20 (68) | 1.6 - 2.7 (35 - 37) |
| | 25 (77) | 4.4 - 6.0 (40 - 43) |
| | 30 (86) | 9.2 - 11.3 (49 - 52) |
| | 35 (95) | 14.8 - 17.0 (59 - 63) |
| | 40 (104) | 18.1 - 20.3 (65 - 69) |
| 60 - 70 | 20 (68) | 2.7 - 4.3 (37 - 40) |
| | 25 (77) | 6.0 - 8.2 (43 - 47) |
| | 30 (86) | 11.3 - 13.8 (52 - 57) |
| | 35 (95) | 17.0 - 19.5 (63 - 67) |
| | 40 (104) | 20.3 - 22.8 (69 - 73) |

Ambient air temperature-to-compressor pressure table

| Ambient air | | High-pressure (Discharge side) kPa (kg/cm ² , psi) | Low-pressure (Suction side) kPa (kg/cm ² , psi) |
|------------------------|----------------------------|--|---|
| Relative humidity % | Air temperature °C (°F) | | |
| 50 - 70 | 20 (68) | 1,030 - 1,255 (10.5 - 12.8, 149 - 182) | 98.1 - 142.2 (1.0 - 1.45, 14.2 - 20.6) |
| | 25 (77) | 1,196 - 1,471 (12.2 - 15.0, 173 - 213) | 122.6 - 171.6 (1.25 - 1.75, 17.8 - 24.9) |
| | 30 (86) | 1,402 - 1,706 (14.3 - 17.4, 203 - 247) | 161.8 - 210.9 (1.65 - 2.15, 23.5 - 30.6) |
| | 35 (95) | 1,608 - 1,971 (16.4 - 20.1, 233 - 286) | 205.9 - 259.9 (2.1 - 2.65, 29.9 - 37.7) |
| | 40 (104) | 1,844 - 2,256 (18.8 - 23.0, 267 - 327) | 259.9 - 318.7 (2.65 - 3.25, 37.7 - 46.2) |

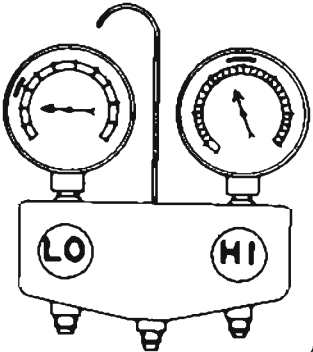
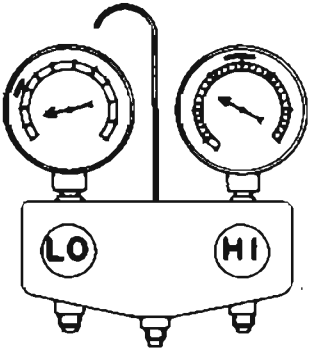
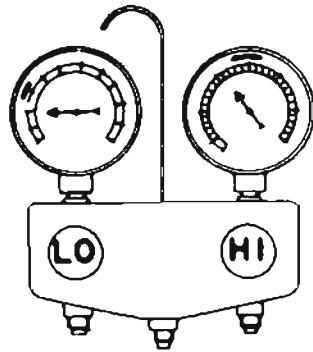
A/C PERFORMANCE TEST

Performance Test Diagnoses

Characteristics revealed by the manifold gauge readings for the air conditioning system are shown in the following table.

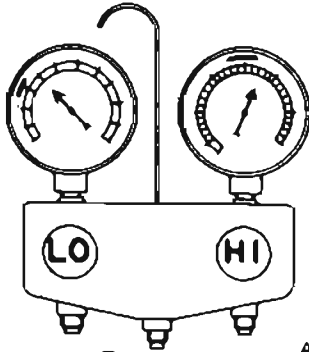
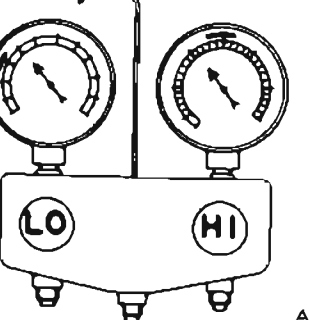
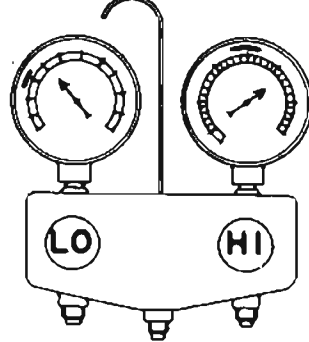
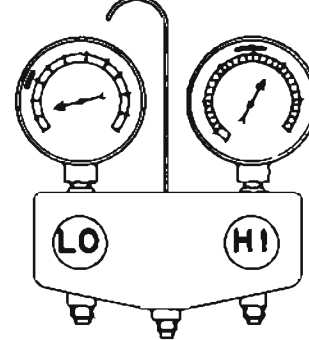
For how to do the performance test, refer to the item "Performance Chart".

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 |
|--|---|--|
| <p>INSUFFICIENT REFRIGERANT CHARGE</p>  <p>AC352A</p> <p>Insufficient cooling. Bubbles appear in sight glass.</p> | <p>Refrigerant is low, or leaking slightly.</p> | <ol style="list-style-type: none"> 1. Leak test. 2. Repair leak. 3. Charge system. <p>Evacuate, as necessary, and recharge system.</p> |
| <p>ALMOST NO REFRIGERANT</p>  <p>AC363A</p> <p>No cooling action. A lot of bubbles or something like mist appears in sight glass.</p> | <p>Serious refrigerant leak.</p> | <p>Stop compressor immediately.</p> <ol style="list-style-type: none"> 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system. |
| <p>MALFUNCTIONING EXPANSION VALVE</p>  <p>AC354A</p> <p>Slight cooling. Sweat or frosting on expansion valve inlet.</p> | <p>Expansion valve restricts refrigerant flow.</p> <ul style="list-style-type: none"> • Expansion valve is clogged. • Expansion valve is inoperative. <p>Valve stuck closed. Thermal bulb has lost charge.</p> | <p>If valve inlet reveals sweat or frost:</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. <p>If valve does not operate:</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system. |

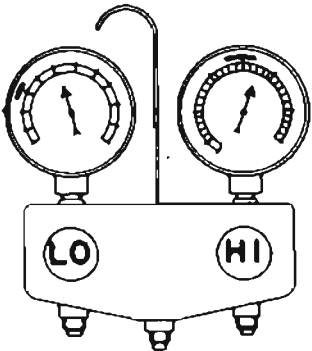
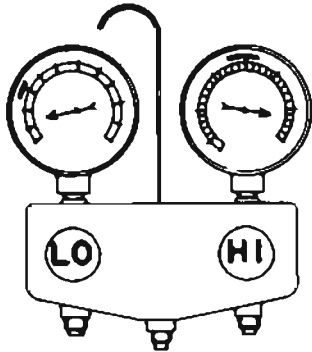
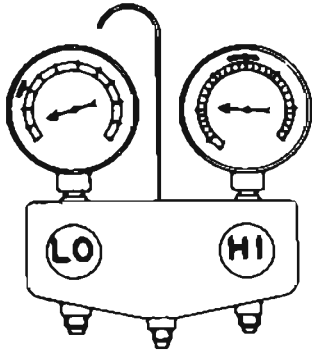
A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

| Condition | Probable cause | Corrective action |
|--|--|---|
|  <p>AC365A</p> | <p>Insufficient cooling. 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. Sweat or frosting on suction line.</p> | <p>Malfunctioning expansion valve.</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system. |
| <p>AIR IN SYSTEM</p>  <p>AC359A</p> | <p>Insufficient cooling. Sight glass shows occasional bubbles.</p> | <p>Air mixed with refrigerant in system.</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system. |
| <p>MOISTURE IN SYSTEM</p>  <p>AC360A</p> | <p>After short operation, suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As a warning of this, reading vibrates around 39 kPa (0.4 kg/cm², 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"> 1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minutes evacuating three times.) 4. Recharge system. |

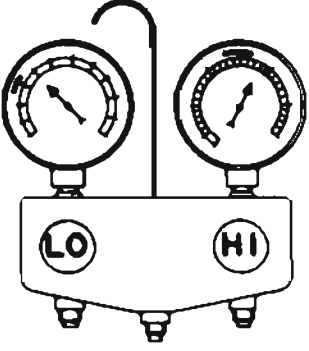
A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

| Condition | Probable cause | Corrective action |
|---|---|---|
| <p>MALFUNCTIONING CONDENSER</p> <p>No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.</p>  <p>AC361A</p> | <p>Usually a malfunctioning condenser.</p> | <ul style="list-style-type: none"> ● Check fan belt and fluid coupling ● Check condenser fan motor. (U.S.A. model only) ● Check condenser for dirt accumulation. ● Check engine cooling system for overheating. ● Check for refrigerant overcharging. <p>If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.</p> |
| <p>HIGH PRESSURE LINE BLOCKED</p> <p>Insufficient cooling. Frosted high-pressure liquid line.</p>  <p>AC362A</p> | <p>Drier clogged, or restriction in high-pressure line.</p> | <ol style="list-style-type: none"> 1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system. |
| <p>MALFUNCTIONING COMPRESSOR</p> <p>Insufficient cooling.</p>  <p>AC363A</p> | <p>Internal problem in compressor, or damaged gasket and valve.</p> | <ol style="list-style-type: none"> 1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system. |

A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

| Condition | Probable cause | Corrective action | |
|---|--|---|---|
| <p>TOO MUCH OIL IN SYSTEM (Excessive)</p>  <p>AC364A</p> | <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> |

Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.

Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

OIL CAPACITY

Unit: mL (US fl oz, Imp fl oz)

| Applied model | All models |
|--|-------------------------|
| Capacity | |
| Total in system | 200 (6.8, 7.0) |
| Amount of oil which can be drained | Approx. 100 (3.4, 3.5)* |
| Compressor (Service parts) charging amount | 200 (6.8, 7.0) |

*: All oil cannot be drained from system.

OIL RETURN OPERATION

Before checking and adjusting oil level, operate compressor at engine idling speed, with controls set for maximum cooling and high blower speed, for 20 to 30 minutes in order to return oil to compressor.

CHECKING AND ADJUSTING FOR USED COMPRESSOR

1. After oil return operation, stop the engine and discharge refrigerant, and then remove compressor from the vehicle.
2. Drain compressor oil from compressor discharge port and measure the amount.

Oil is sometimes hard to extract when compressor is cooled. Remove oil while compressor is warm [maintained to 40 to 50°C (104 to 122°F)].

3. If the amount is less than 90 mL (3.0 US fl oz, 3.2 Imp fl oz), some refrigerant may have leaked out. Conduct leak tests on connections of each system, and if necessary, repair or replace malfunctioning parts.

4. Check the purity of the oil and then adjust oil level following the procedure below.
 - (a) When oil is clean;

Unit: mL (US fl oz, Imp fl oz)

| Amount of oil drained | Adjusting procedure |
|-----------------------|--|
| Above 90 (3.0, 3.2)* | Oil level is right. Pour in same amount of oil as was drained out. |
| Below 90 (3.0, 3.2) | Oil level may be low. Pour in 90 mL (3.0 US fl oz, 3.2 Imp fl oz) of oil. |

*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then pour in 200 mL (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

- (b) When oil contains chips or other foreign material;

After air conditioner system has been flushed with refrigerant, replace receiver drier. Then pour in 200 mL (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

CHECKING AND ADJUSTING FOR COMPRESSOR REPLACEMENT

200 mL (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor (service parts). So it is necessary to drain the proper amount of oil from new compressor. Follow the procedure below.

1. After oil return operation, drain compressor oil from used compressor and measure the amount.

(It is the same procedure as CHECKING AND ADJUSTING FOR USED COMPRESSOR.)

COMPRESSOR OIL — For NVR 140S (ATSUGI make)

Checking and Adjusting (Cont'd)

2. Check the purity of the oil and then adjust oil level following the procedure below.

(a) When oil is clean;

Unit: mL (US fl oz, Imp fl oz)

| Amount of oil drained from used compressor | Draining amount of oil from new compressor |
|--|--|
| Above 90 (3.0, 3.2)* | 200 (6.8, 7.0) — [Amount of oil drained + 20 (0.7, 0.7)] |
| Below 90 (3.0, 3.2) | 90 (3.0, 3.2) |

*: If amount of oil drained is greater than under normal circumstances, flush air conditioner system with refrigerant. Then install new compressor. [200 mL (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged compressor service parts.]

Example:

Unit: mL (US fl oz, Imp fl oz)

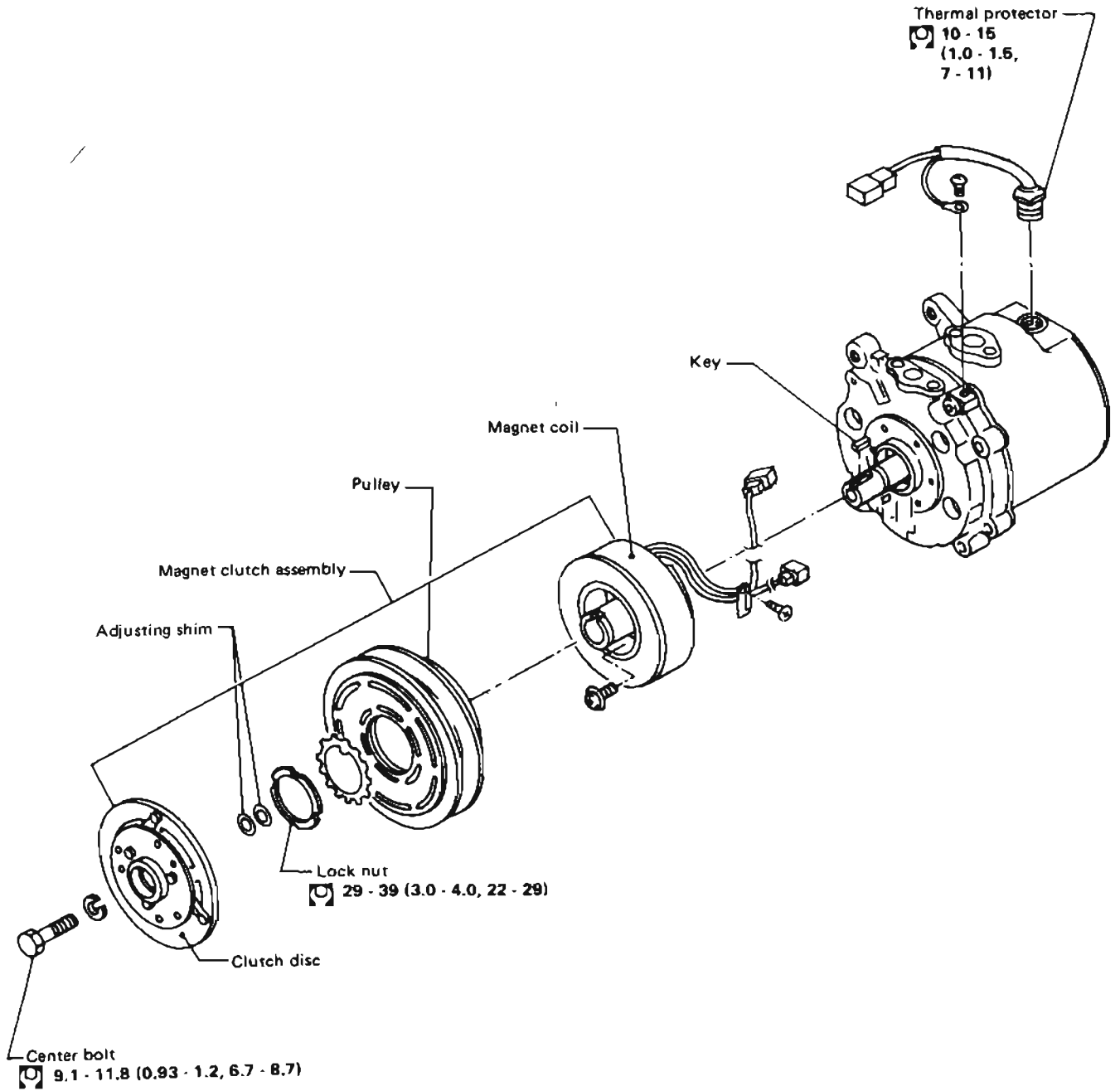
| Amount of oil drained from used compressor | Draining amount of oil from new compressor |
|--|--|
| 110 (3.7, 3.9) | 70 (2.4, 2.5) |
| 70 (2.4, 2.5) | 90 (3.0, 3.2) |

- (b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then install new compressor. [200 mL (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor service parts.]

Precautions

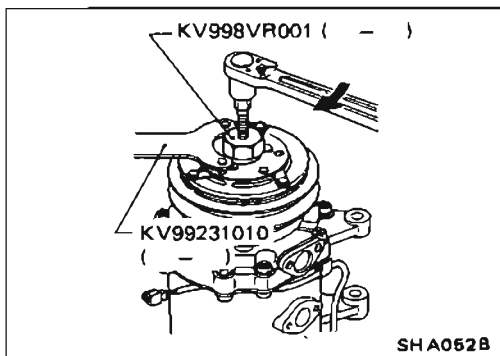
- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new compressor. Refer to COMPRESSOR OIL.
- Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.
- When replacing compressor clutch, be careful not to scratch shaft or bend pulley.
- When replacing compressor clutch assembly, do not forget BREAK-IN OPERATION.
- When storing a compressor, be sure to fill it with refrigerant to prevent rust formation. Add refrigerant at the low-pressure side and purge air at the high-pressure side, while rotating shaft by hand.

COMPRESSOR — Model NVR 140S (ATSUGI make)



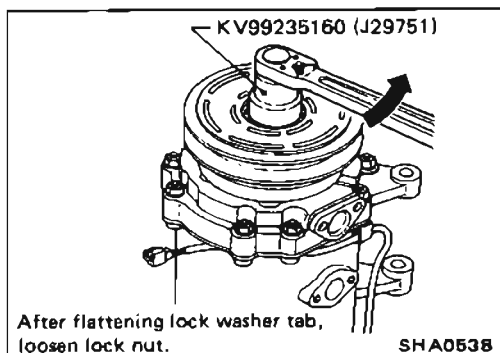
: N·m (kg·m, ft·lb)

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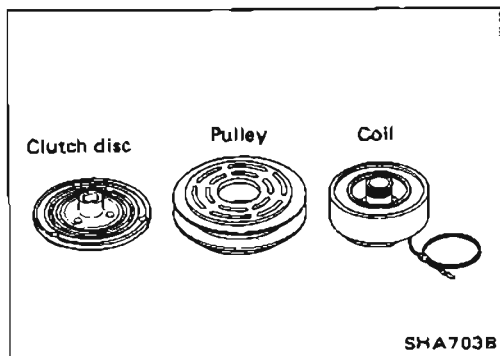


Compressor Clutch REPLACEMENT

- 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

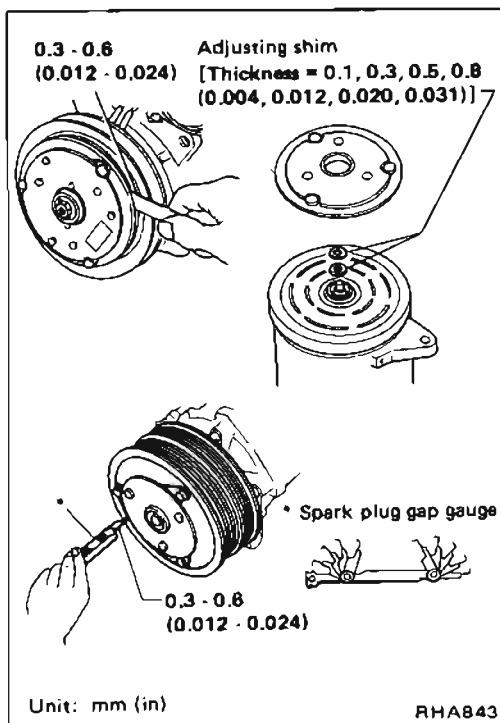
If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

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.



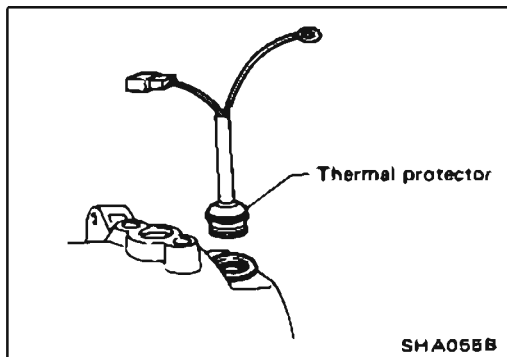
ADJUSTMENT

- 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.



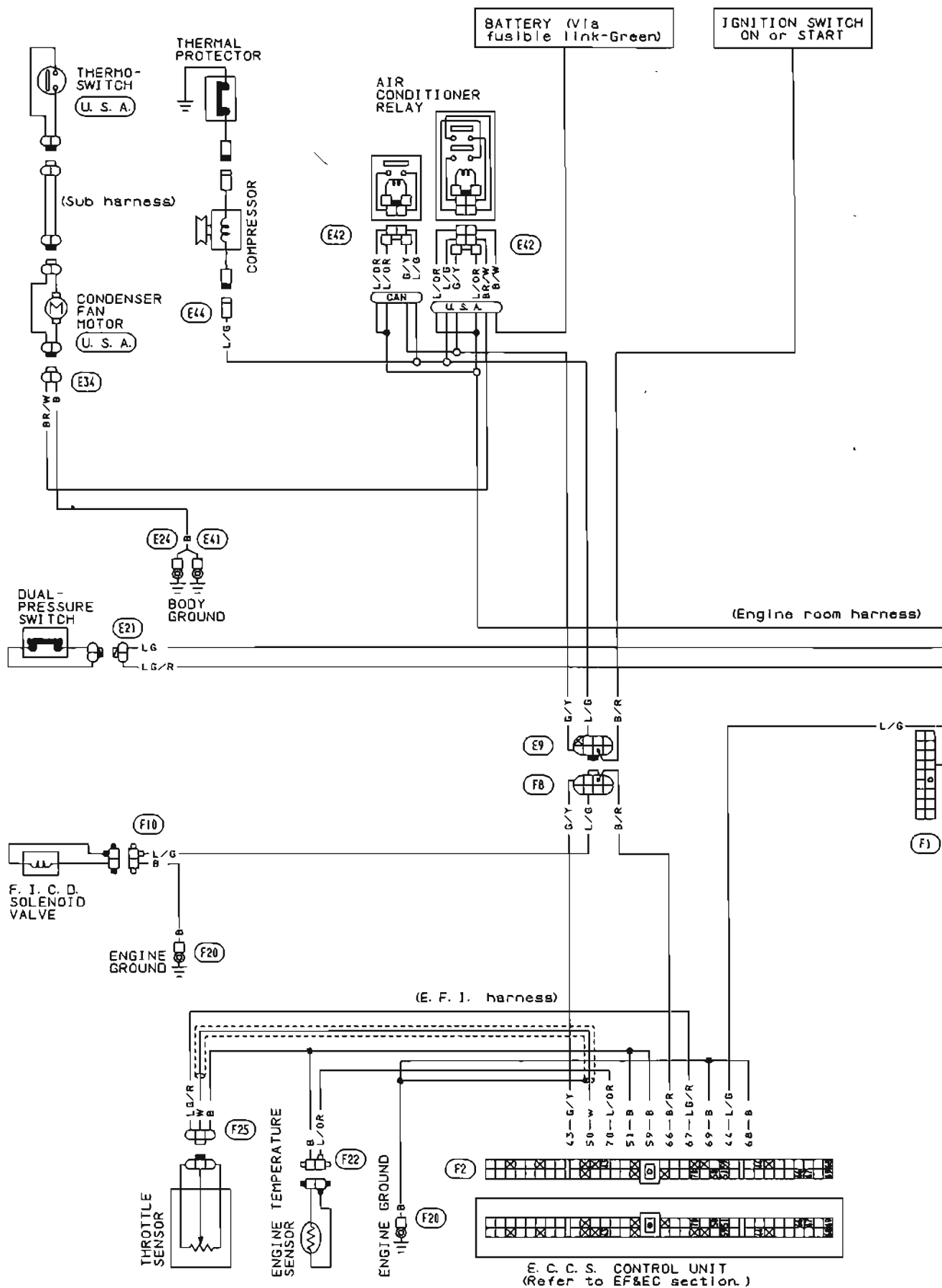
Thermal Protector

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.

NOTE

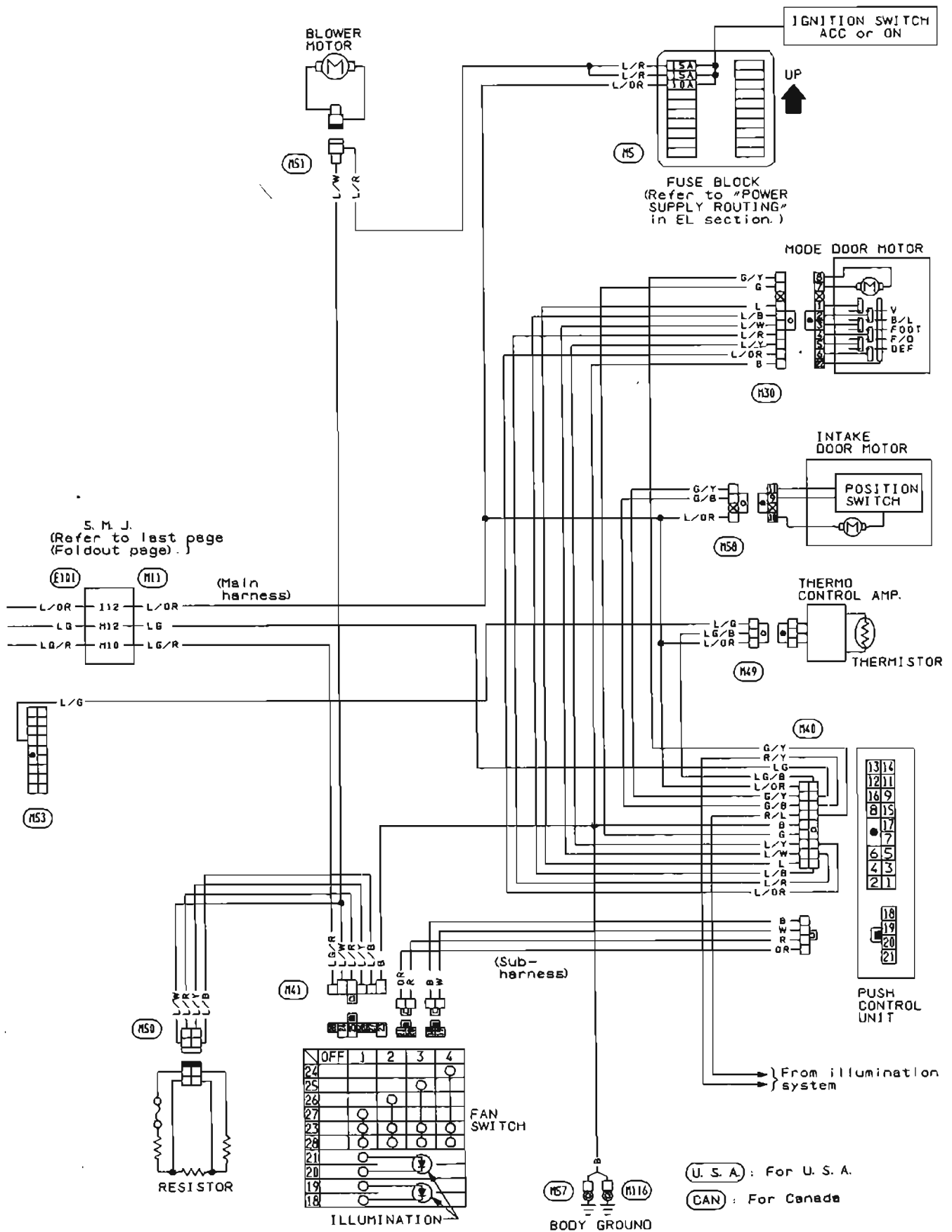
A/C ELECTRICAL CIRCUIT

Wiring Diagram



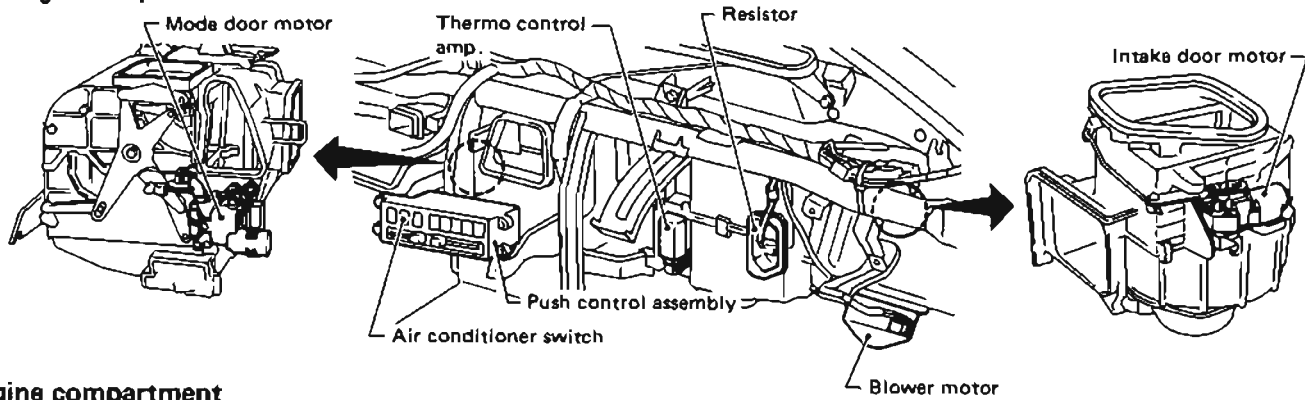
A/C ELECTRICAL CIRCUIT

Wiring Diagram (Cont'd)

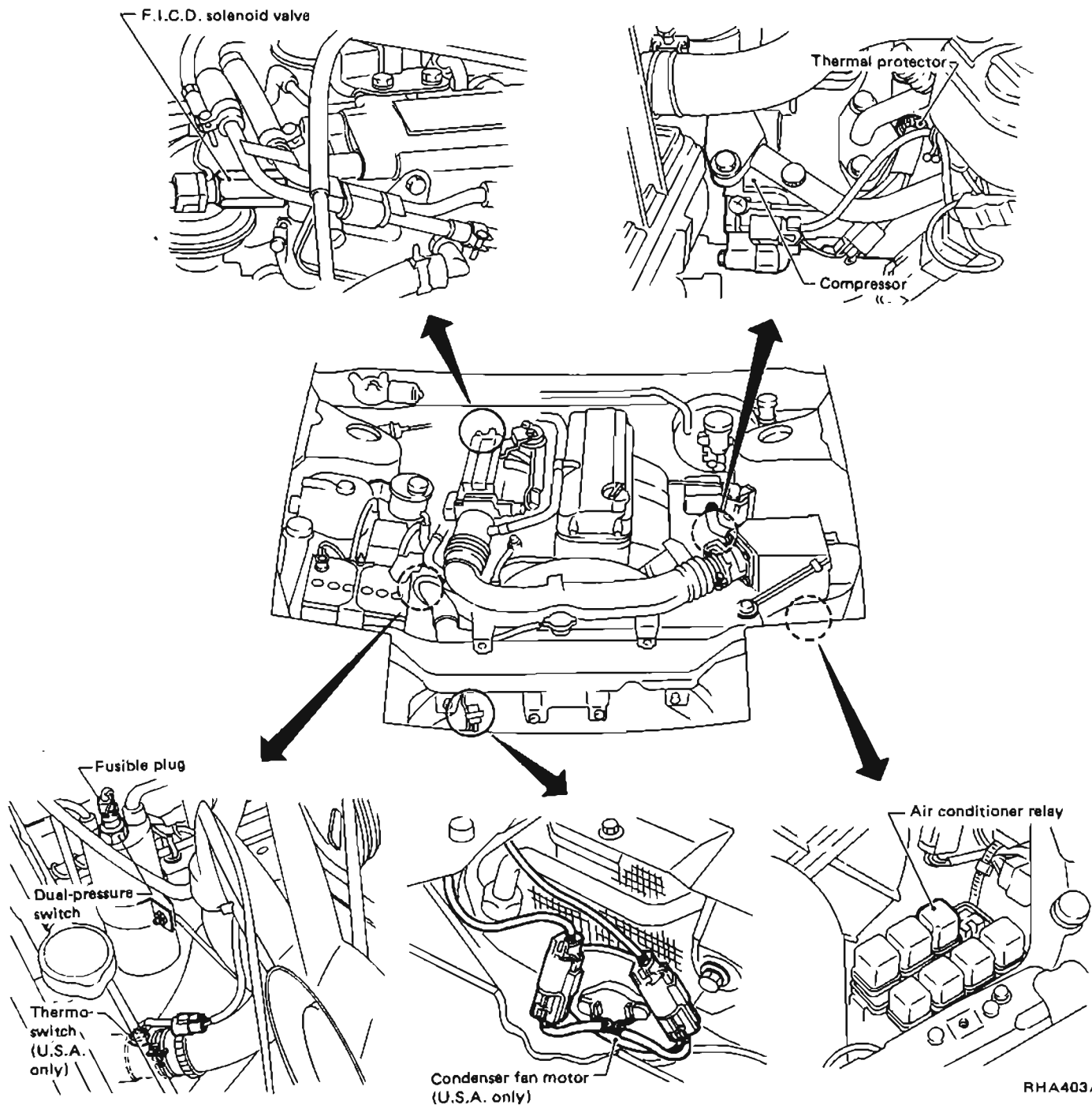


A/C COMPONENT LAYOUT

Passenger compartment



Engine compartment



RHA403A

A/C COMPONENT LAYOUT

NOTE

TROUBLE DIAGNOSES

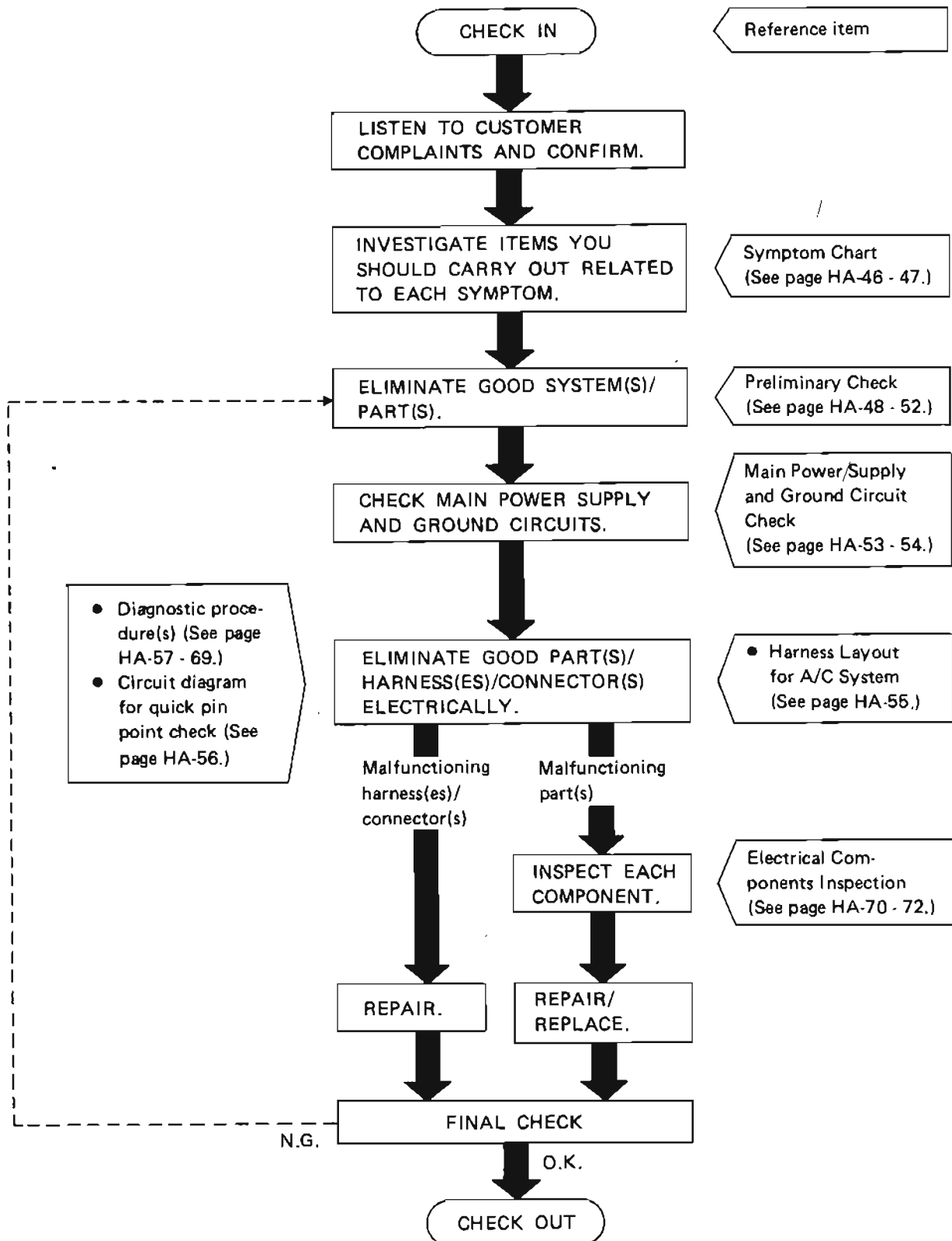
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TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



TROUBLE DIAGNOSES

Symptom Chart

DIAGNOSTIC TABLE

| PROCEDURE | Preliminary Check | | | | | Diagnostic Procedure | | | | | Main Power Supply and Ground Circuit Check | | | |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--|----------|-------------------|---------------------|
| | HA-48 | HA-49 | HA-50 | HA-61 | HA-52 | HA-57 -58 | HA-59 -60 | HA-61 | HA-62 -65 | HA-66 | HA-53 | HA-53 | HA-54 | HA-53 |
| REFERENCE PAGE | | | | | | | | | | | | | | |
| SYMPTOM | Preliminary check 1 | Preliminary check 2 | Preliminary check 3 | Preliminary check 4 | Preliminary check 5 | Diagnostic procedure 1 | Diagnostic procedure 2 | Diagnostic procedure 3 | Diagnostic procedure 4 | Diagnostic procedure 5 | 15A Fuses | 10A 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. | | | | | | | | ① | | | | ○ | ○ | |
| Intake door is not set at "FRESH" in DEF or FOOT mode. | ① | | | | | | | ○ | | | | ○ | ○ | |
| Magnet clutch does not engage when A/C switch and fan switch are ON. | | ① | | | | | | | ② | | | ○ | | ○ |
| Magnet clutch does not engage 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.

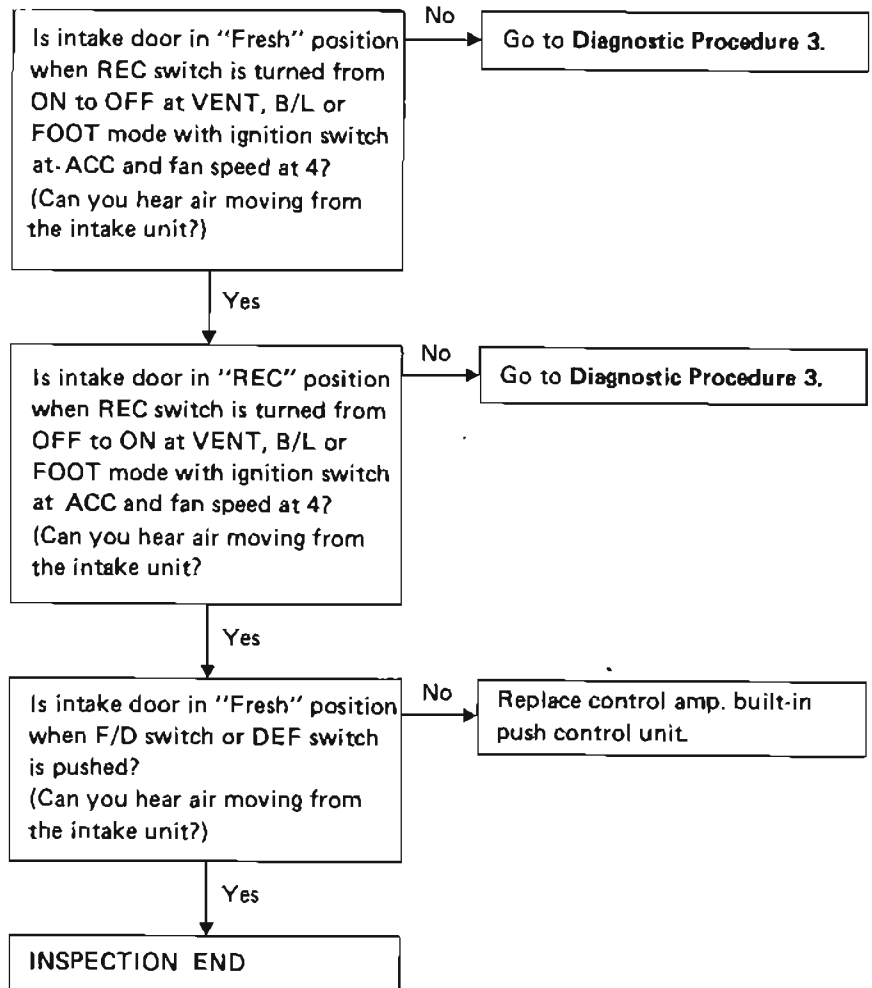
○ : As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

TROUBLE DIAGNOSES

Preliminary Check

PRELIMINARY CHECK 1

Intake door is set at "FRESH" in DEF or F/D mode.

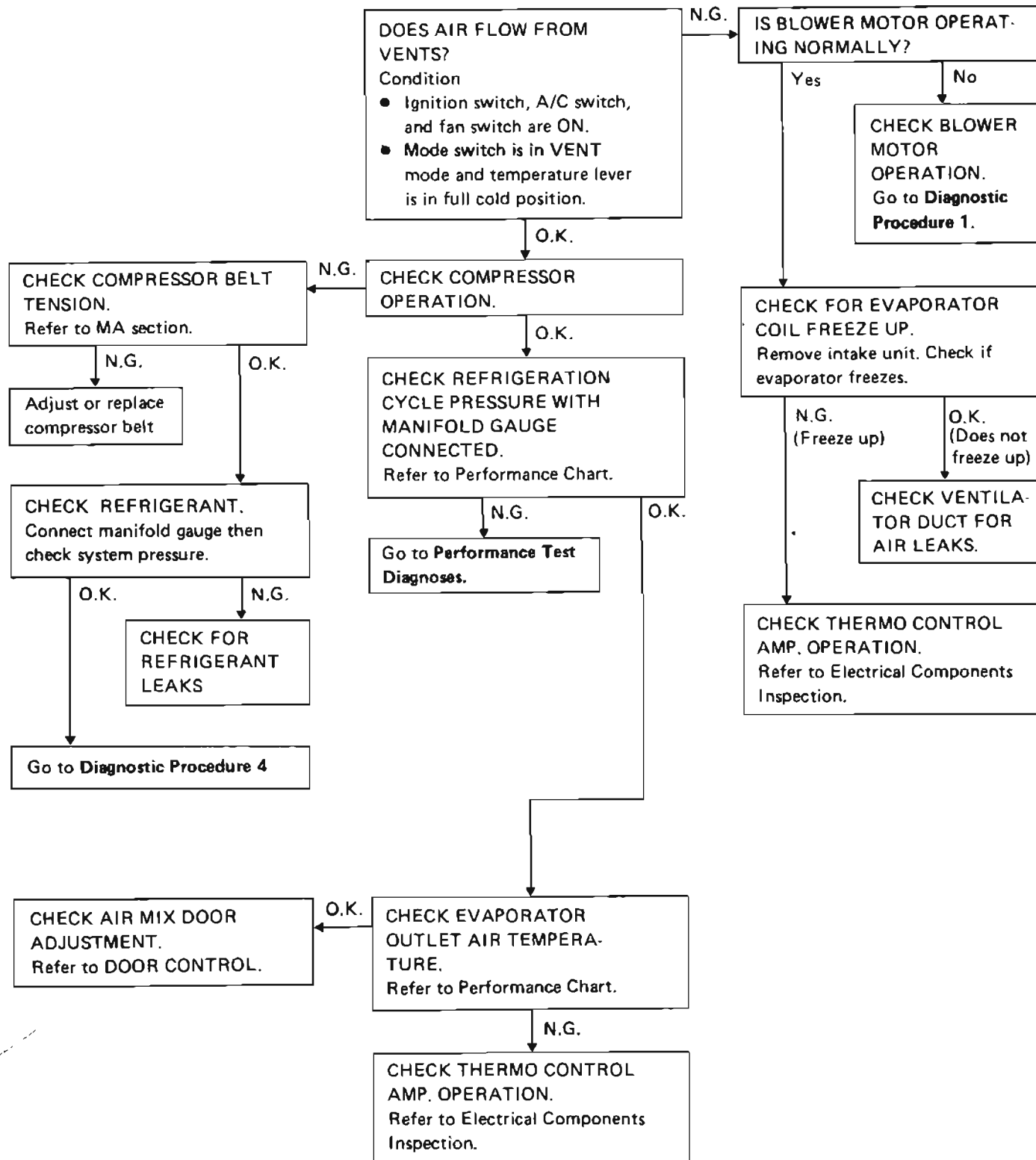


TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.



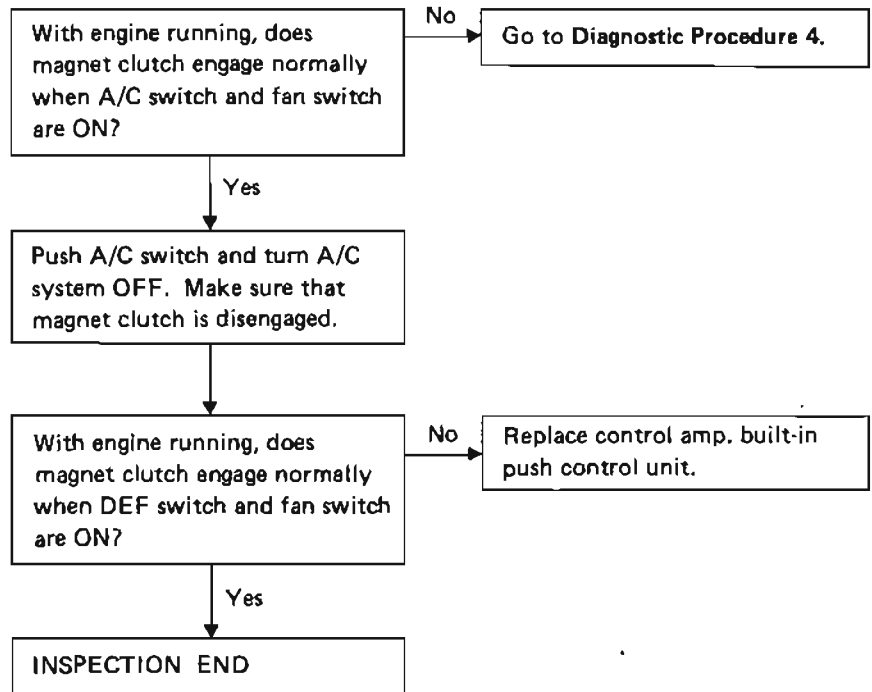
TROUBLE DIAGNOSES

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.

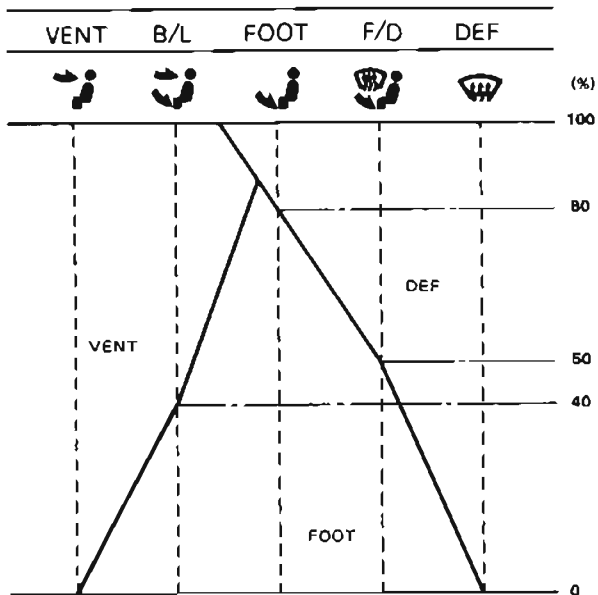
DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS PUSHED WITH IGNITION SWITCH AT ACC?

No

Go to Diagnostic Procedure 2.

| Switch | | Indicator illuminates | | | | | Air outlet |
|--------|---|---|---|---|---|---|-------------|
| | |  |  |  |  |  | |
| Mode |  | ○ | | | | | VENT |
| |  | | ○ | | | | FOOT & VENT |
| |  | | | ○ | | | FOOT & DEF |
| |  | | | | ○ | | FOOT & DEF |
| |  | | | | | ○ | DEF |

Air distribution ratios



Yes

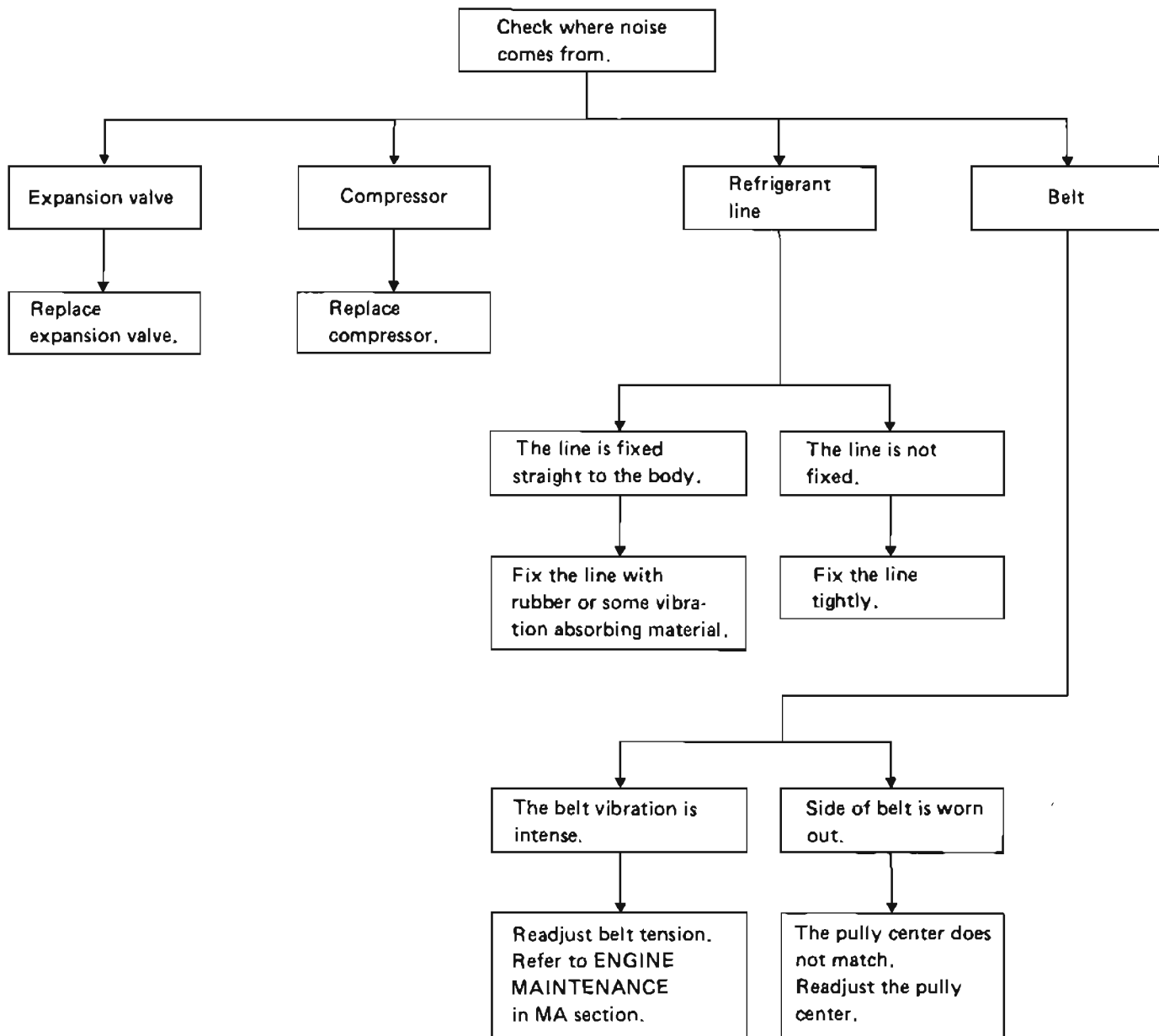
INSPECTION END

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

Noise

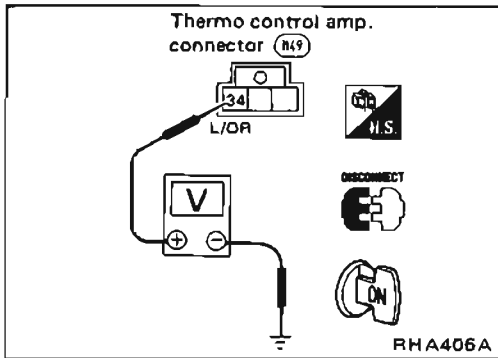


TROUBLE DIAGNOSES

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.

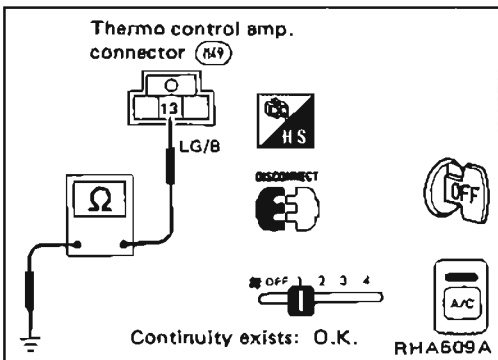


THERMO CONTROL AMP. CHECK

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 |

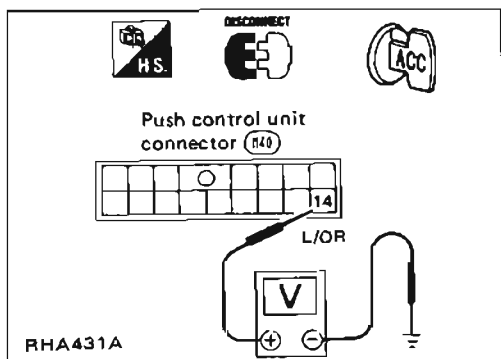
TROUBLE DIAGNOSES

Main Power Supply and Ground Circuit Check (Cont'd)

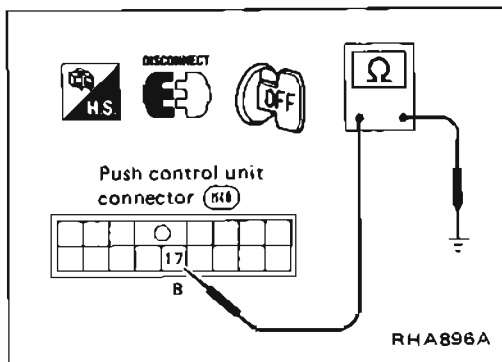
PUSH CONTROL UNIT CHECK

Check power supply circuit for push control unit with ignition switch at ACC.

1. Disconnect push control unit harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑭ and body ground.



| Voltmeter terminal | | Voltage |
|--------------------|-------------|-------------|
| ⊕ | ⊖ | |
| ⑭ | Body ground | Approx. 12V |



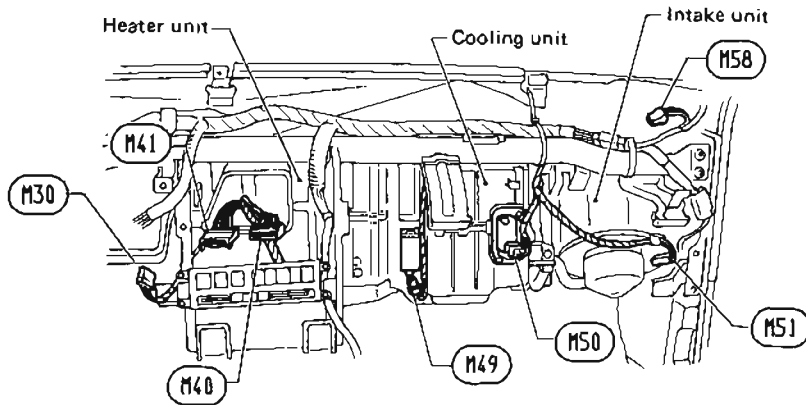
Check body ground circuit for push control unit with ignition switch OFF.

1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑰ and body ground.

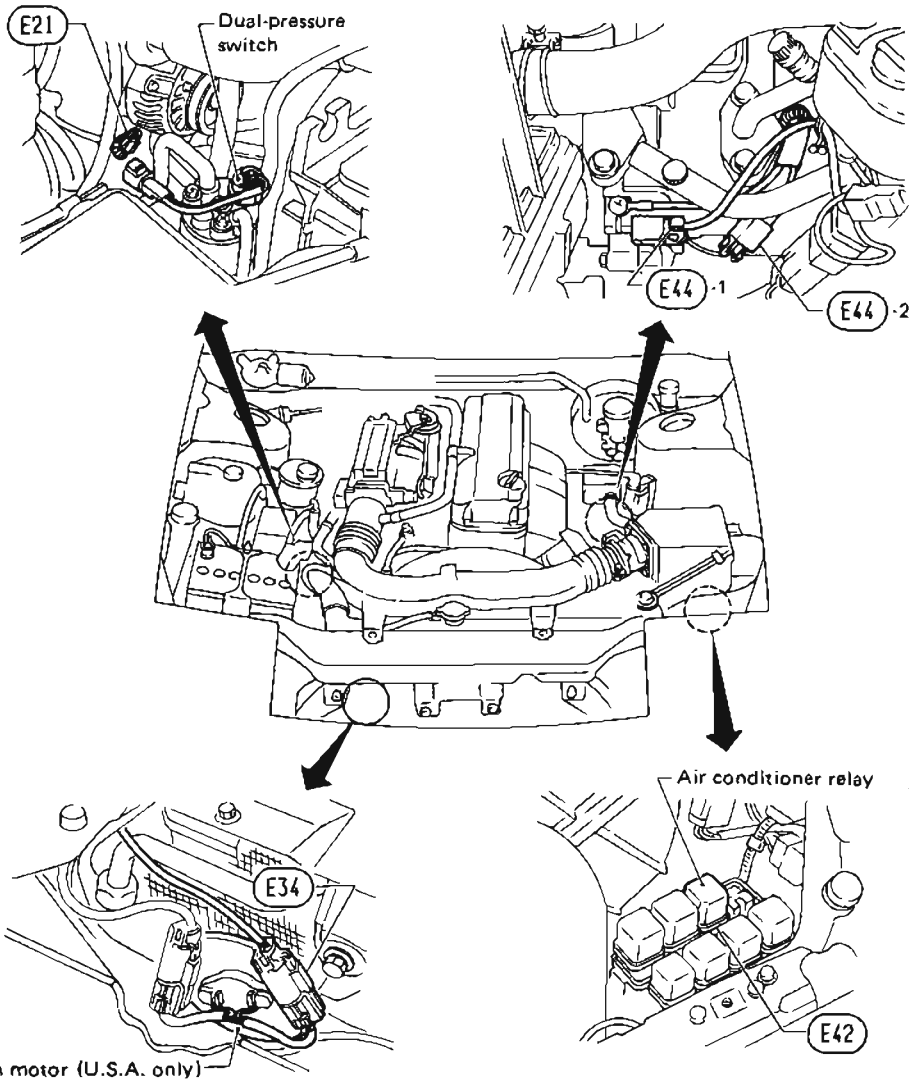
TROUBLE DIAGNOSES

Harness Layout for A/C System

Passenger compartment



Engine compartment



Engine room harness

- (E21) : Dual-pressure switch
- (E34) : Condenser fan motor
- (E42) : A/C relay
- (E44-1) : Compressor (Magnet clutch)
- (E44-2) : Compressor (Thermal protector)

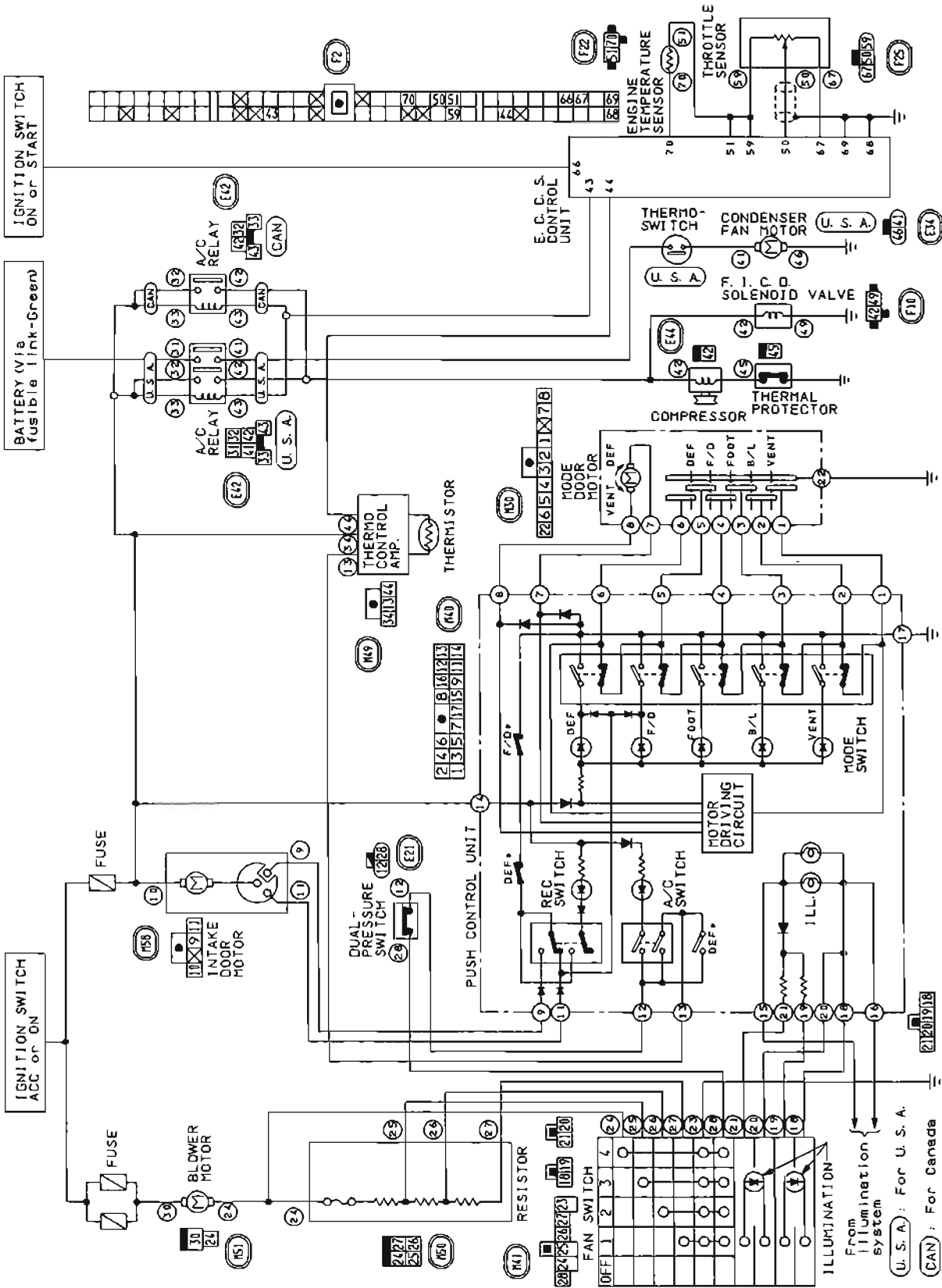
Main harness

- (M30) : Mode door motor
- (M40) : Push control unit
- (M41) : Fan switch
- (M49) : Thermo control amp.
- (M50) : Resistor
- (M51) : Blower motor
- (M58) : Intake door motor

RHA404A

TROUBLE DIAGNOSES

Circuit Diagram for Quick Pin Point Check



- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle "⊖" are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See page HA-55.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".
- : These switches are built in push control unit and mechanically linked to corresponding switches.

(U.S.A.): For U.S.A.
(CAN): For Canada

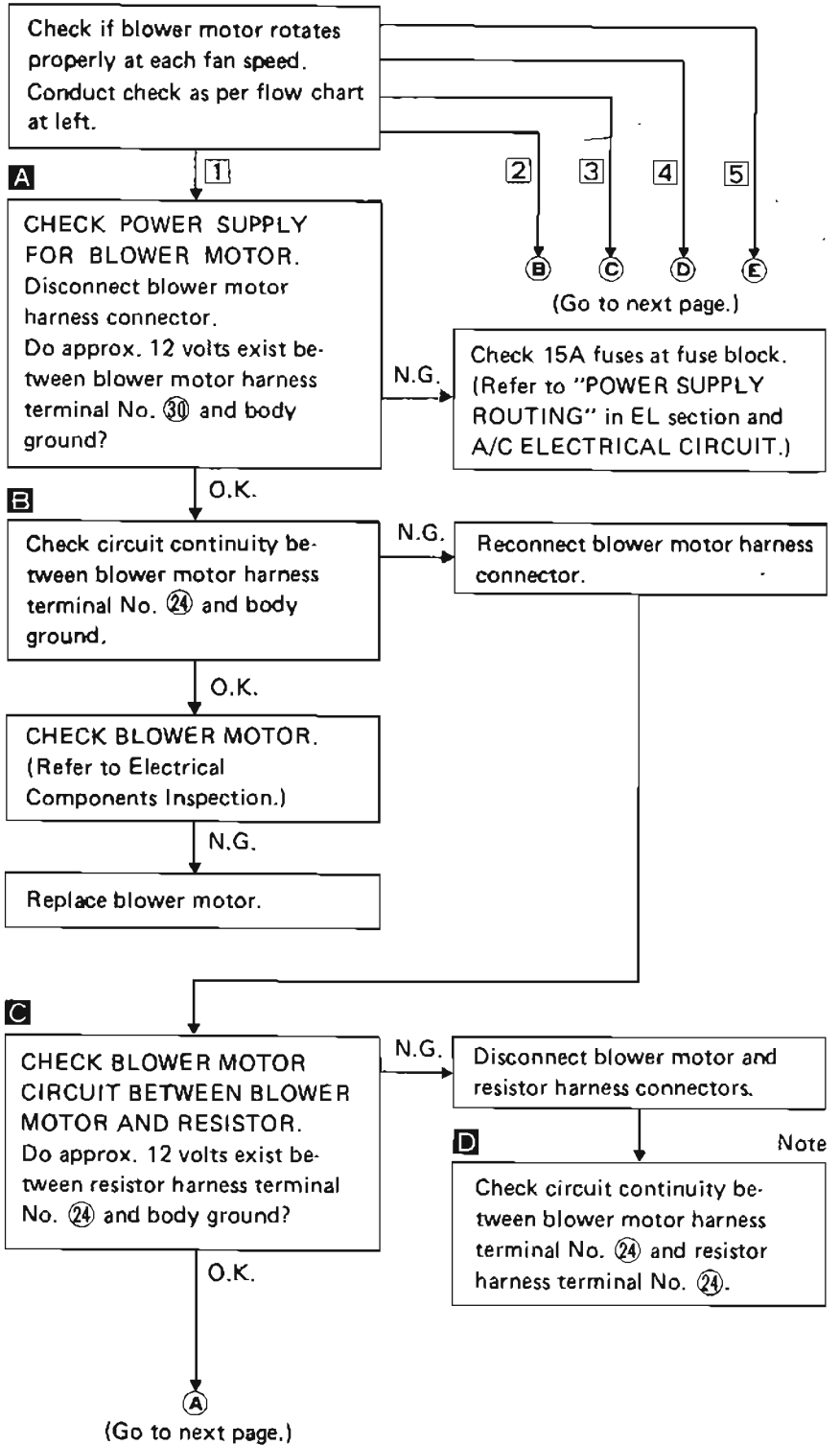
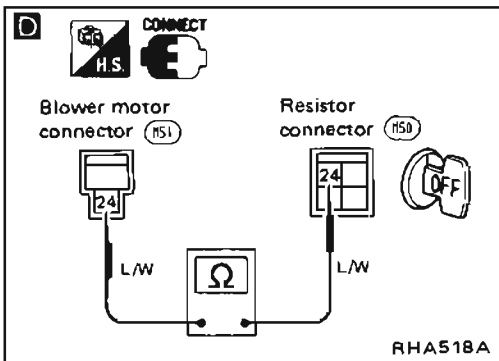
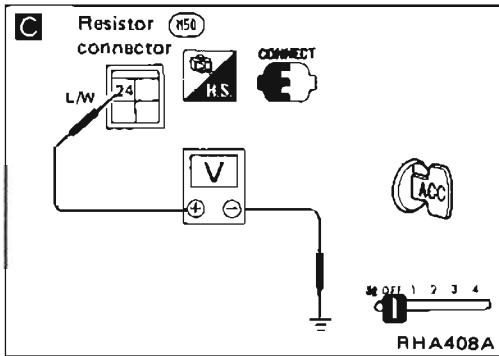
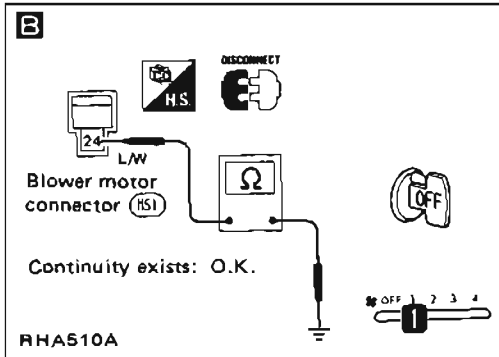
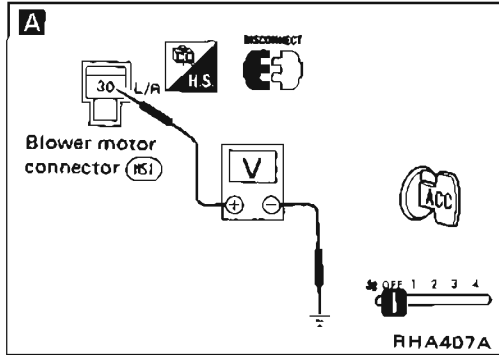
TROUBLE DIAGNOSES

Diagnostic Procedure 1

SYMPTOM: Blower motor does not rotate.

- Perform **PRELIMINARY CHECK 2** before referring to the following flow chart.

| | 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 |

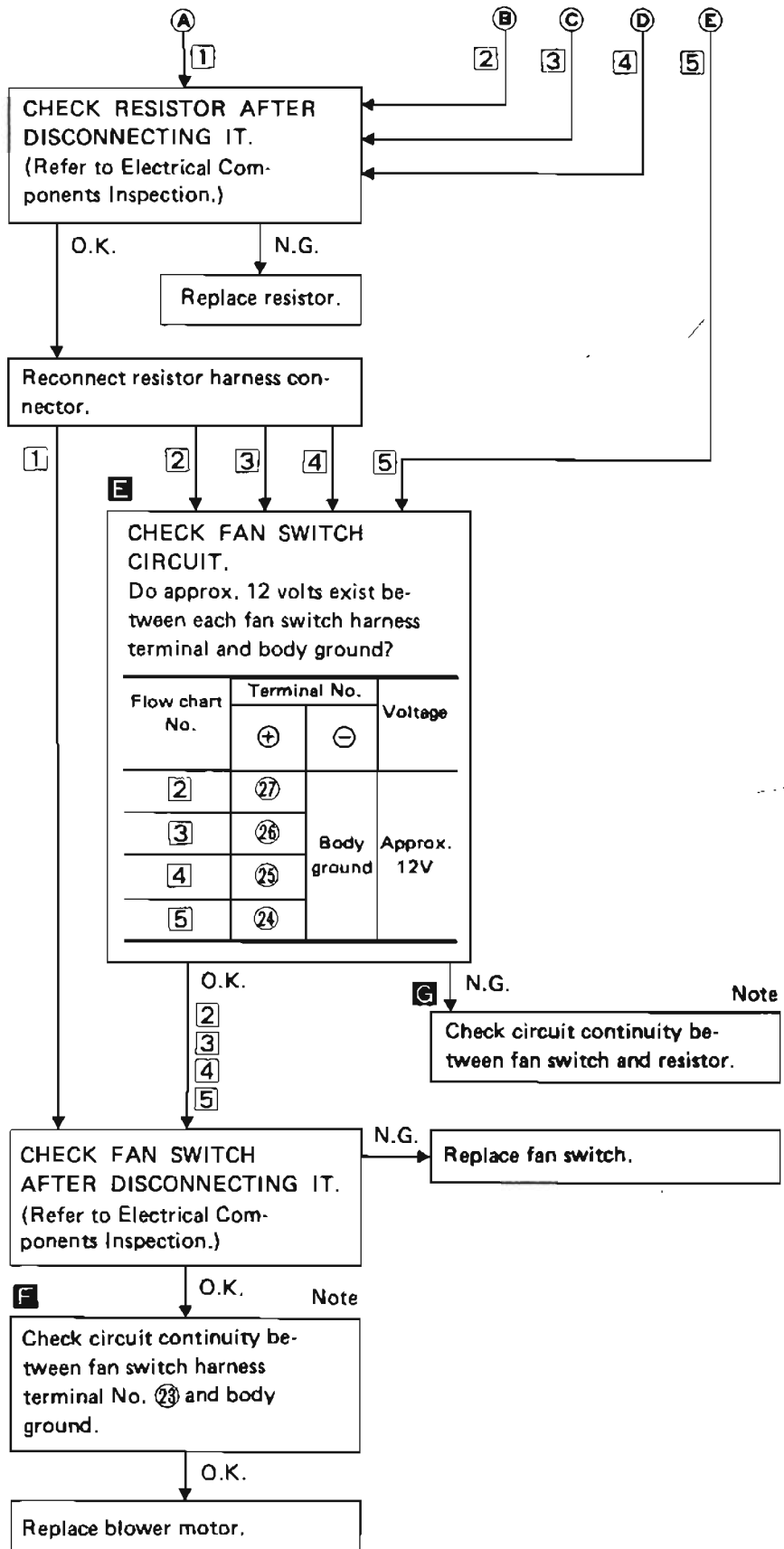
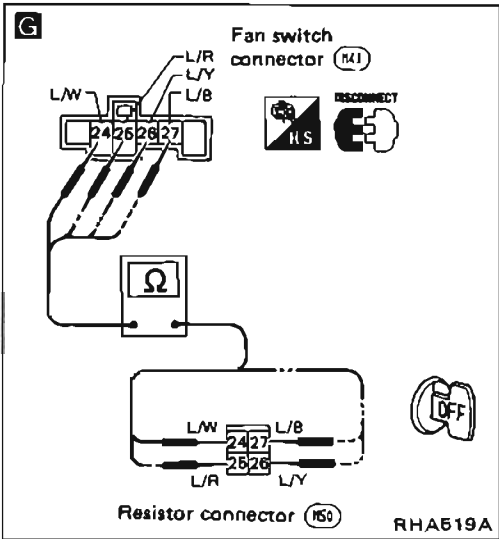
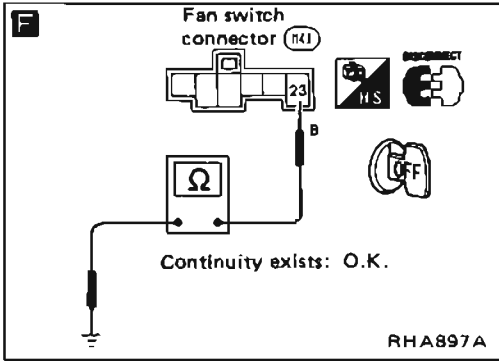
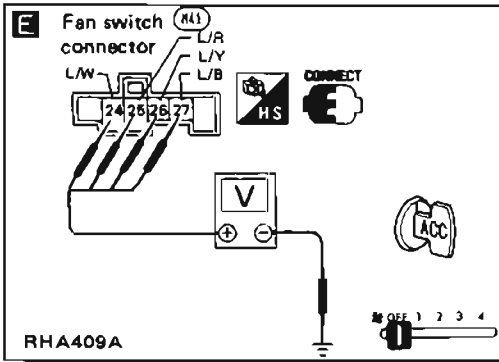


Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 1 (Cont'd)



Note:

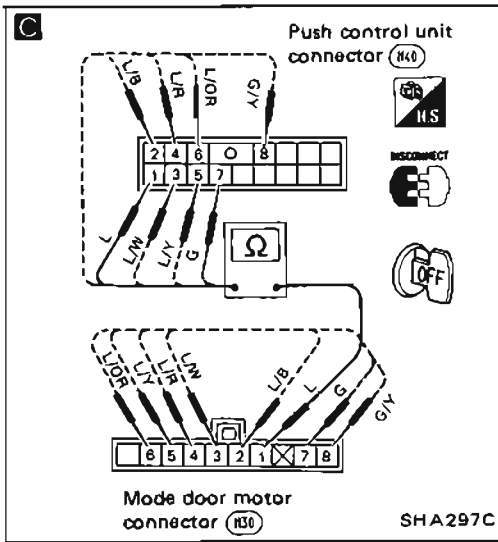
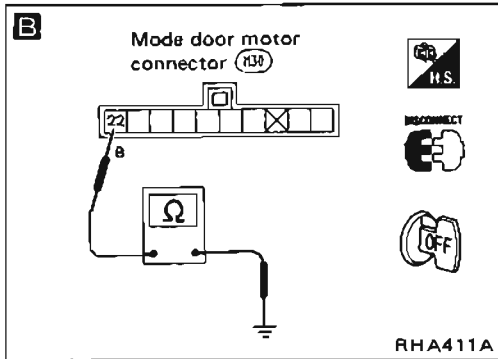
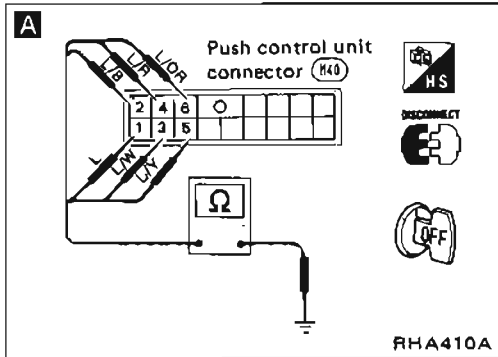
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 2

SYMPTOM: Air outlet does not change.

- Perform **PRELIMINARY CHECK 4** and **Main Power Supply and Ground Circuit Check** before referring to the following flow chart.



- A**
- CHECK MODE DOOR MOTOR POSITION SWITCH.**
1. Turn VENT switch ON with ignition switch at ACC position.
 2. Turn ignition switch OFF. Disconnect push control unit connector.
 3. Check if continuity exists between terminal No. ① or ② of push control unit harness connector and body ground.
 4. Using above procedures, check for continuity in any other mode, as indicated in chart.

| Mode switch | Terminal No. | | Continuity |
|-------------|--------------|-------------|------------|
| | ⊕ | ⊖ | |
| VENT | ① or ② | Body ground | Yes |
| B/L | ② or ③ | | |
| FOOT | ③ or ④ | | |
| F/D | ④ or ⑤ | | |
| DEF | ⑤ or ⑥ | | |

O.K.

CHECK SIDE LINK.
Refer to **DOOR CONTROL.**

N.G. → Disconnect mode door motor harness connector.

B Note

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness terminal No. ②② and body ground?

O.K. Note

C Check circuit continuity between each terminal on push control unit and on mode door motor.

| Terminal No. | | Continuity |
|-------------------|-----------------|------------|
| ⊕ | ⊖ | |
| Push control unit | Mode door motor | Yes |
| ① | ① | |
| ② | ② | |
| ③ | ③ | |
| ④ | ④ | |
| ⑤ | ⑤ | |
| ⑥ | ⑥ | |
| ⑦ | ⑦ | |
| ⑧ | ⑧ | |

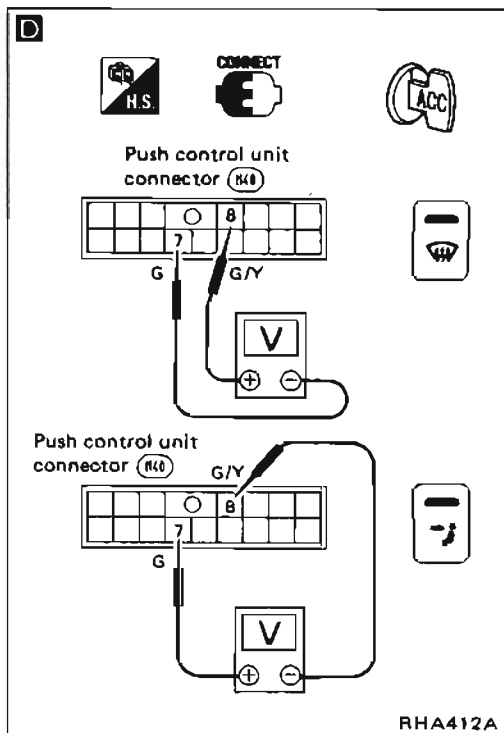
Ⓐ
(Go to next page.)

Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 2 (Cont'd)



A

Reconnect push control unit and mode door motor harness connectors.

D

CHECK FOR OUTPUT OF PUSH CONTROL UNIT. Do approx. 12 volts exist between push control unit harness terminal No. ⑦ and ⑧ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

| Terminal No. | | Mode door motor | |
|--------------|---|---------------------|-------------------------------|
| ⑦ | ⑧ | Mode door operation | Direction of linkage rotation |
| ⊖ | ⊖ | Stop | Stop |
| ⊖ | ⊕ | VENT → DEF | Clockwise |
| ⊕ | ⊖ | DEF → VENT | Counterclockwise |

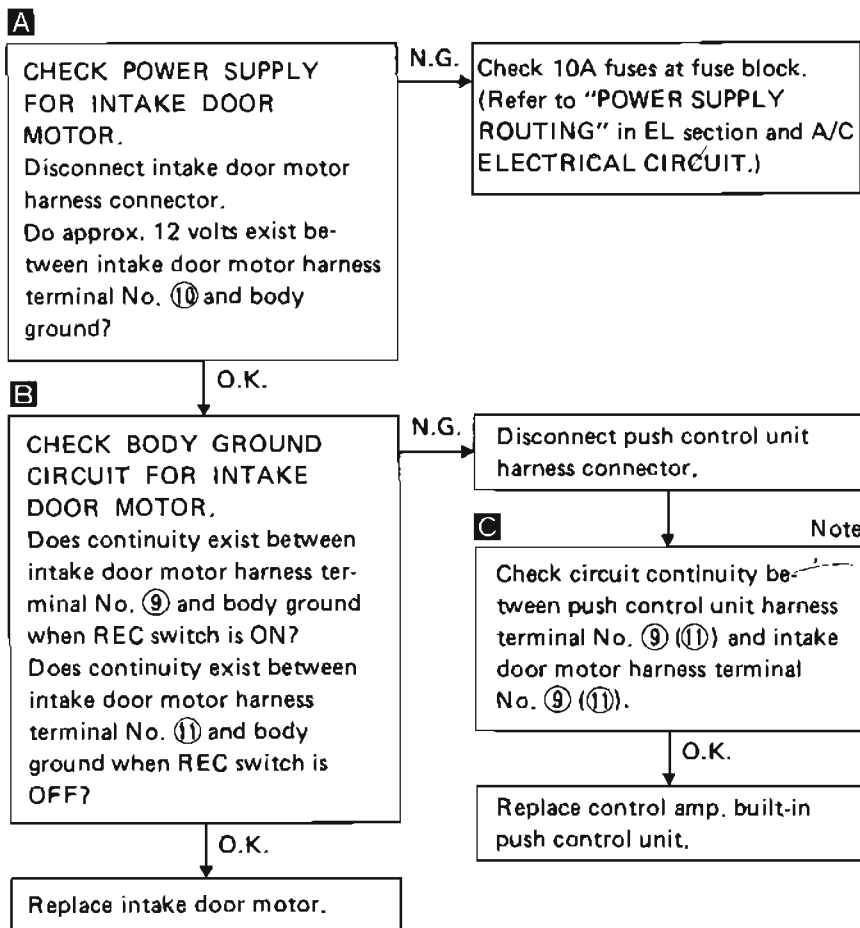
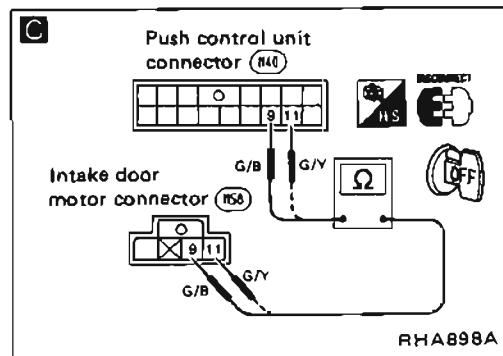
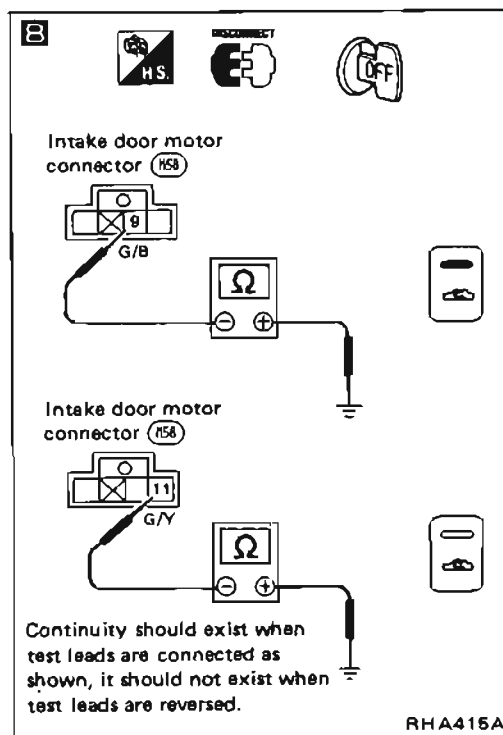
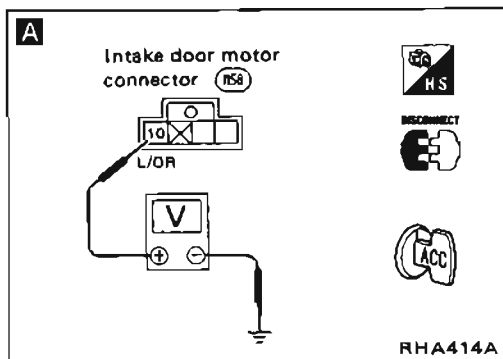
N.G. → Replace control amp. built-in push control unit.

O.K. → Replace mode door motor.

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:

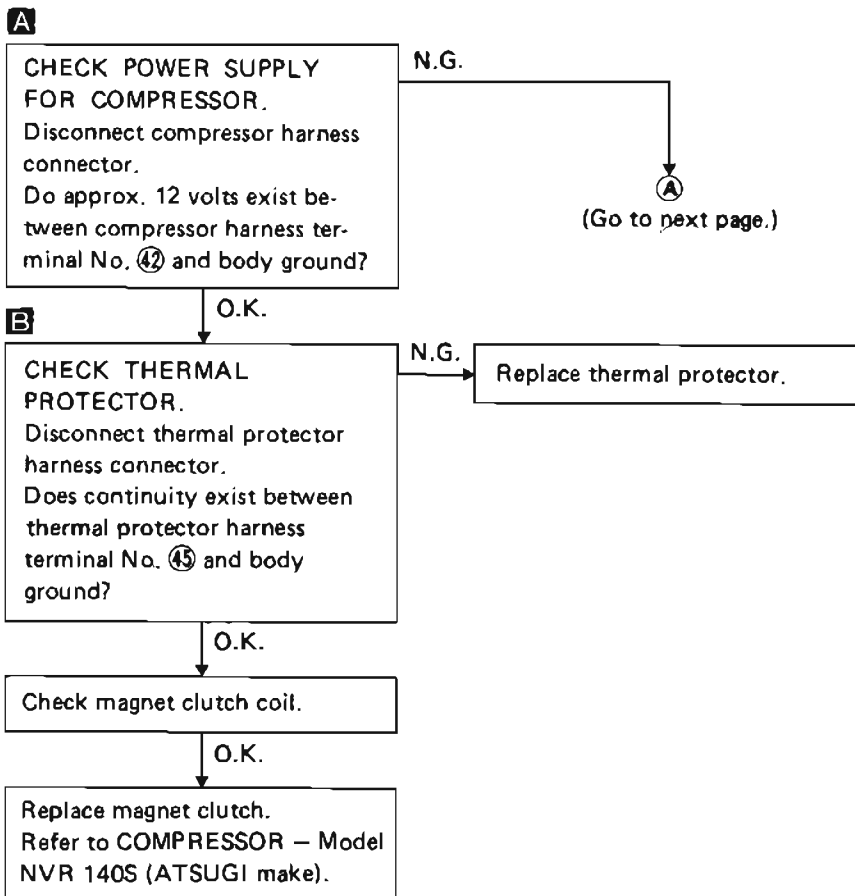
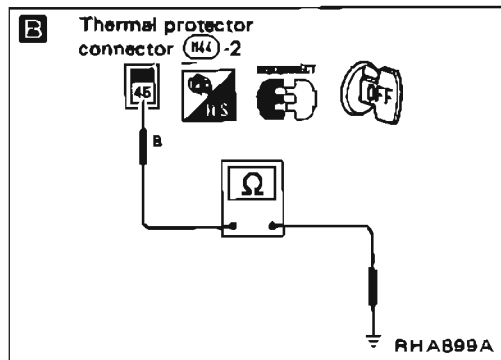
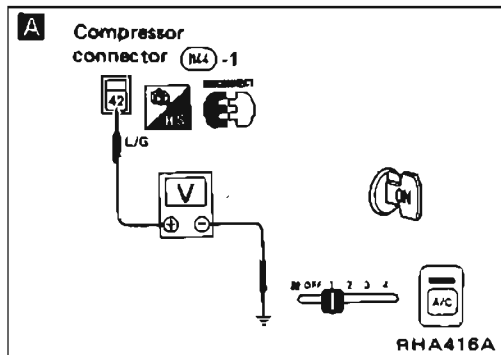
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 4

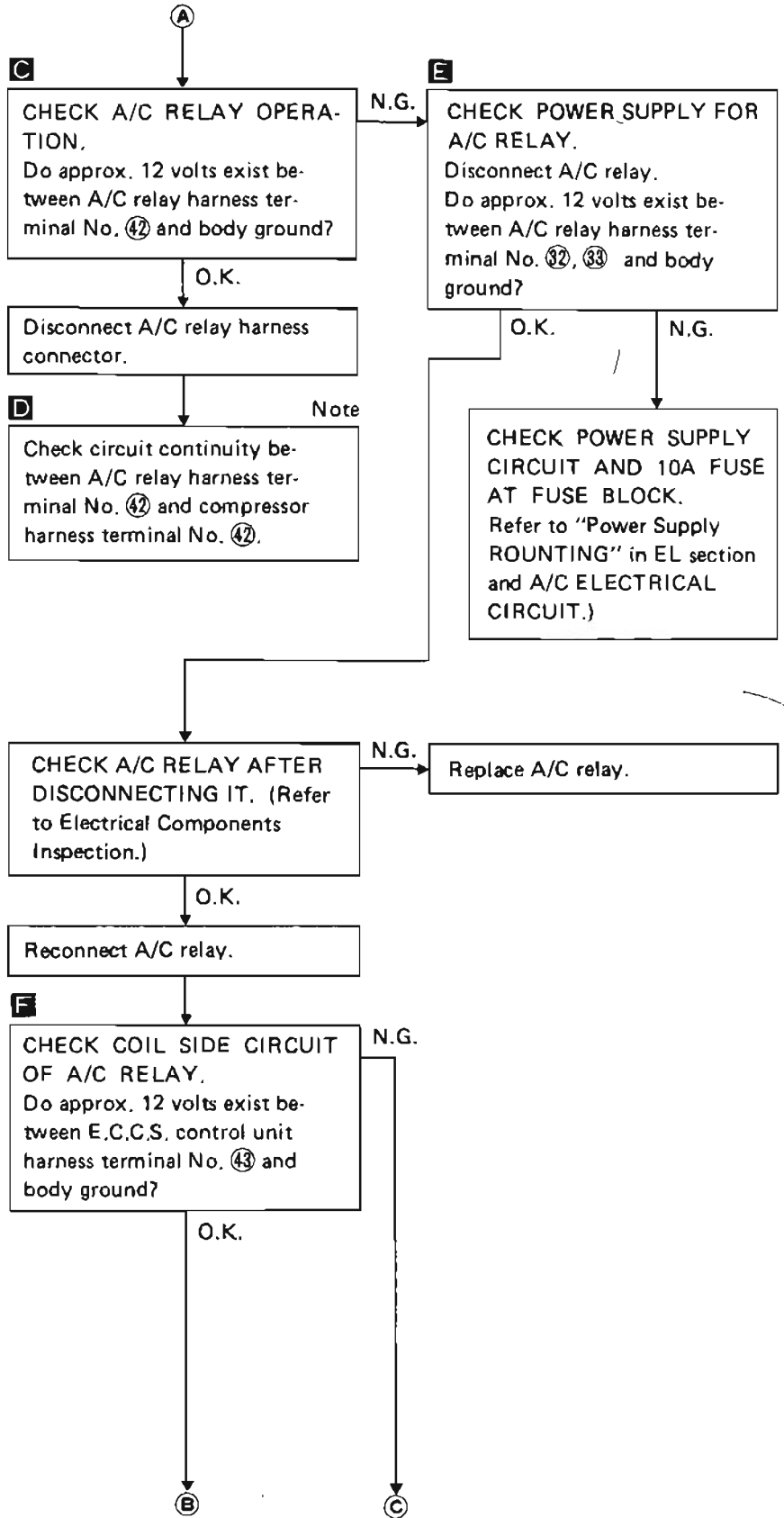
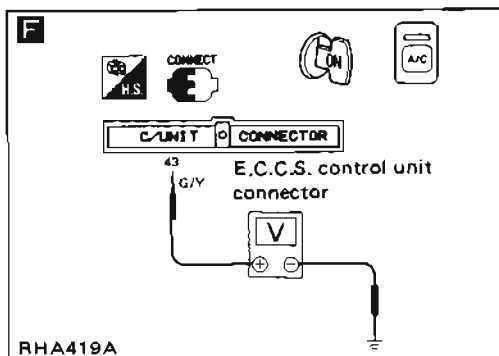
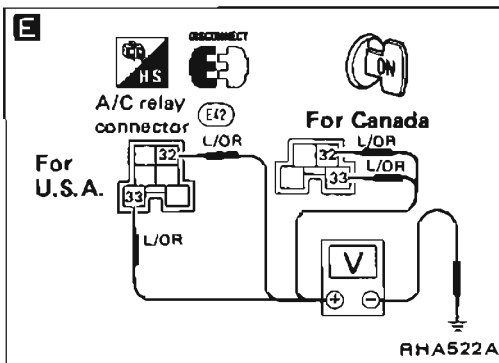
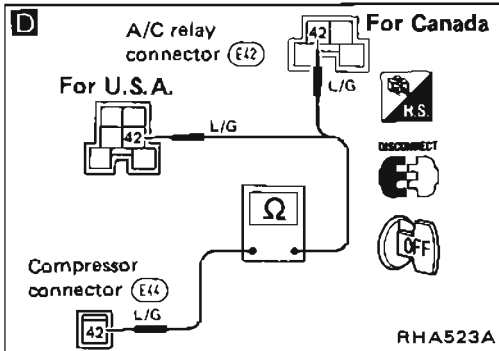
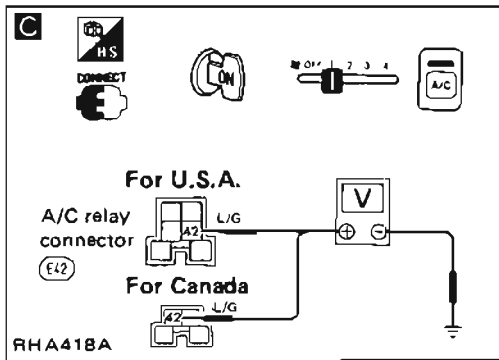
SYMPTOM: Magnet clutch does not operate when A/C switch and fan switch are ON.

- Perform PRELIMINARY CHECK 2 before referring to the following flow chart.



TROUBLE DIAGNOSES

Diagnostic Procedure 4 (Cont'd)

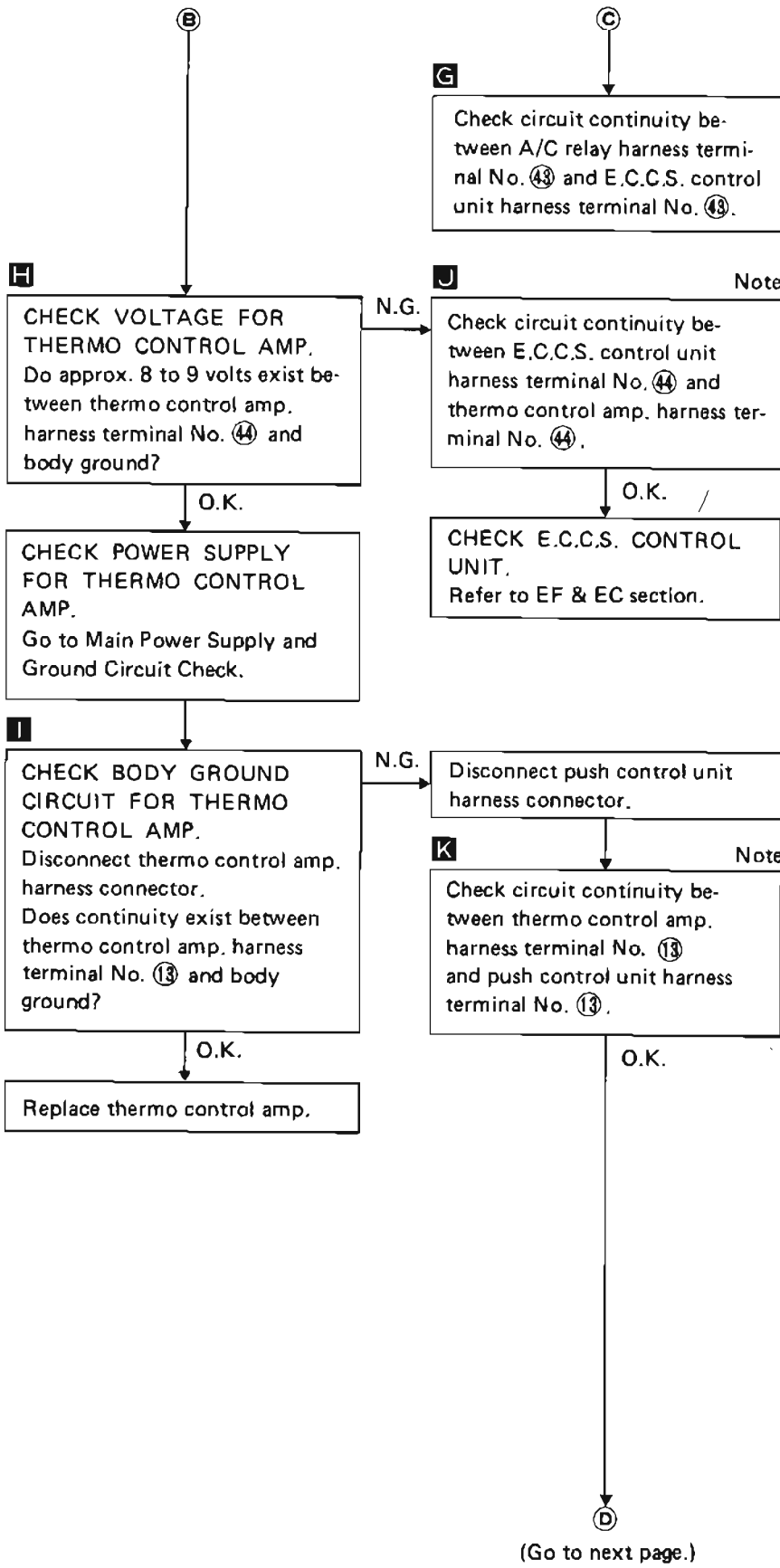
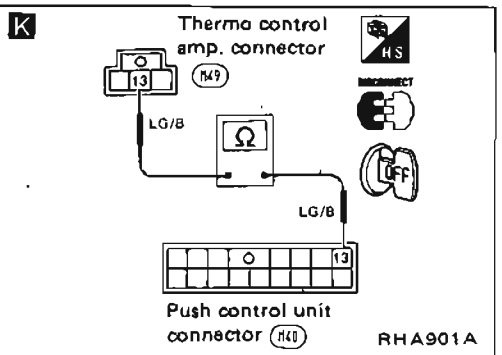
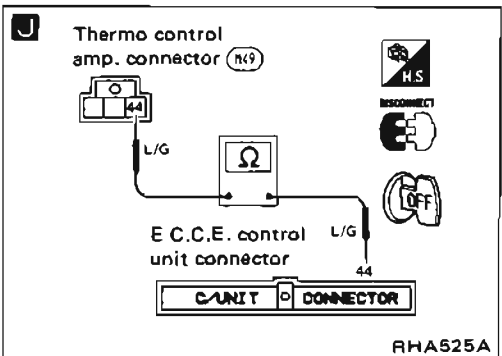
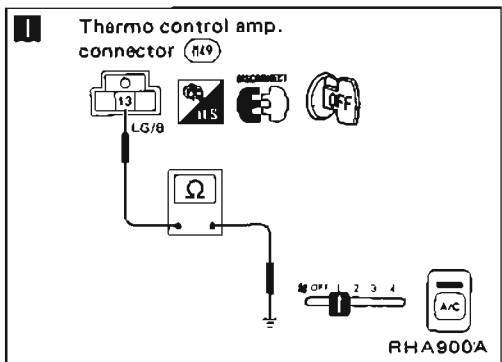
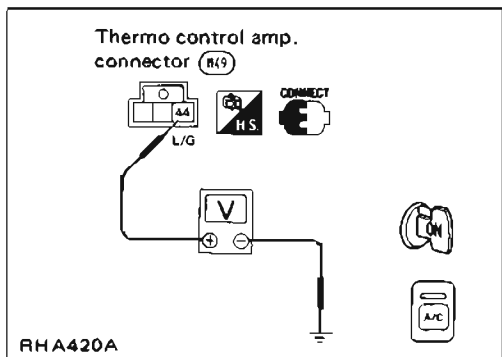
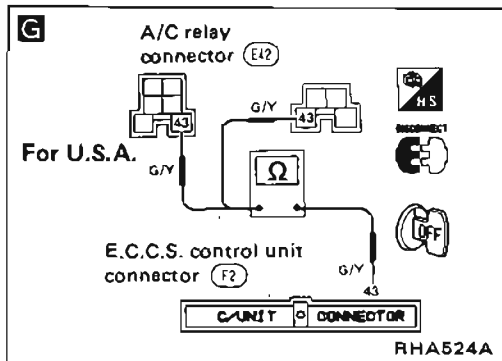


Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

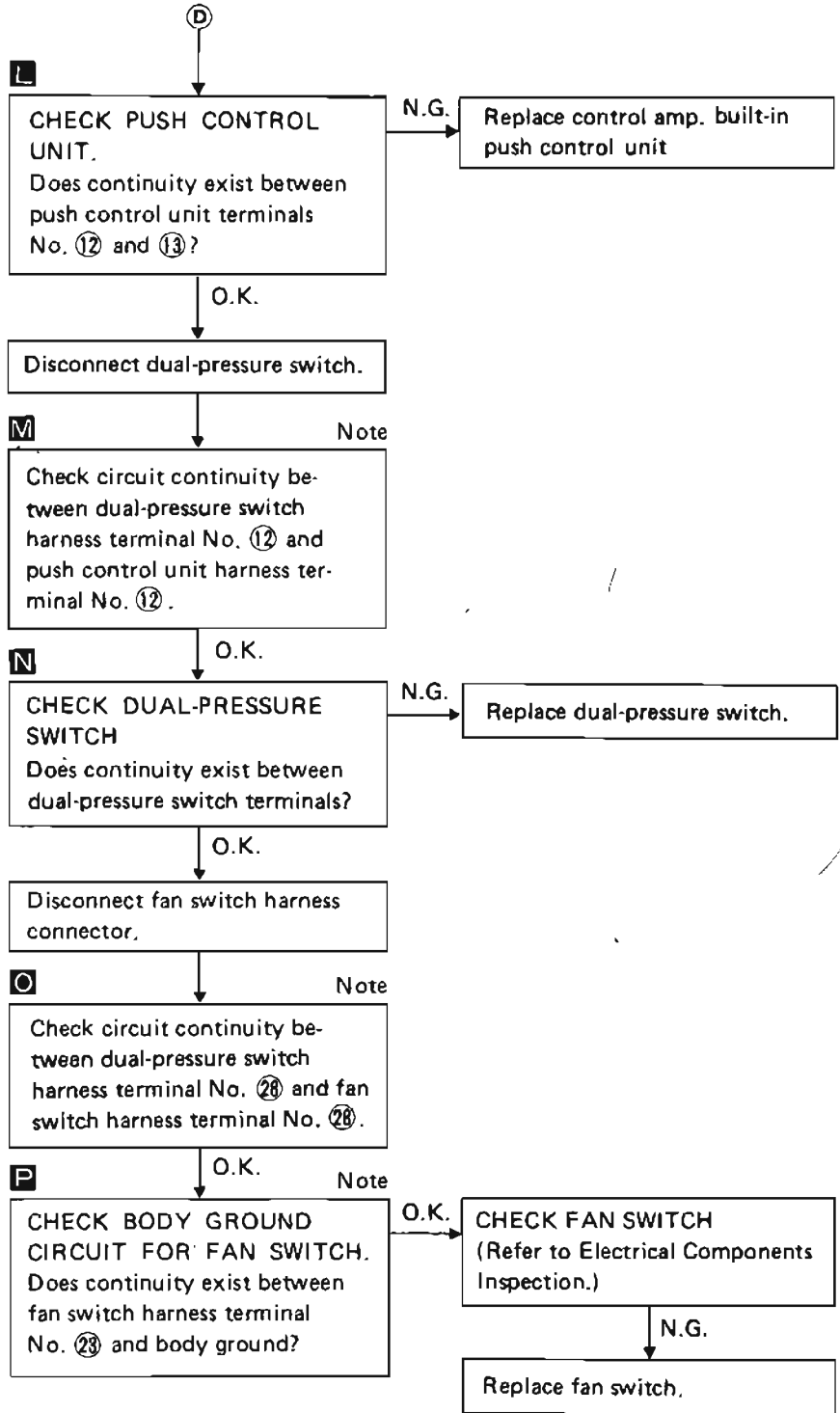
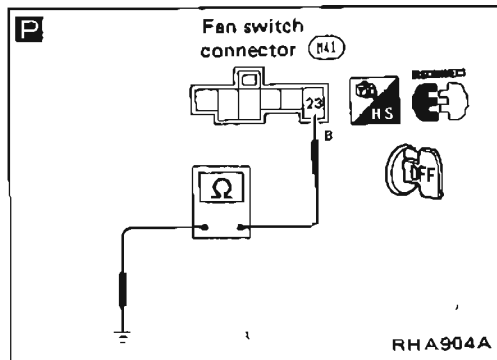
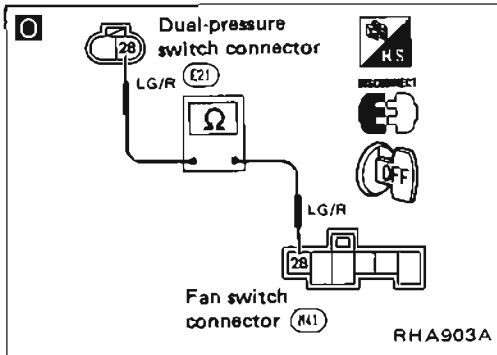
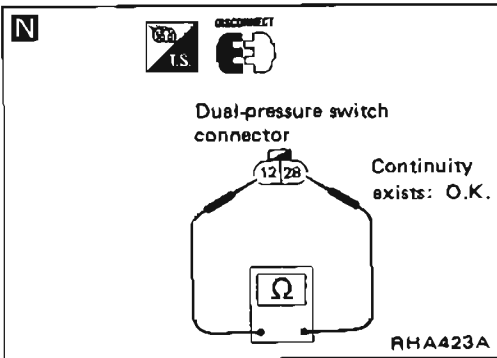
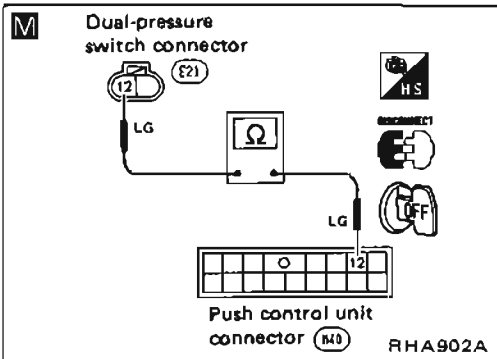
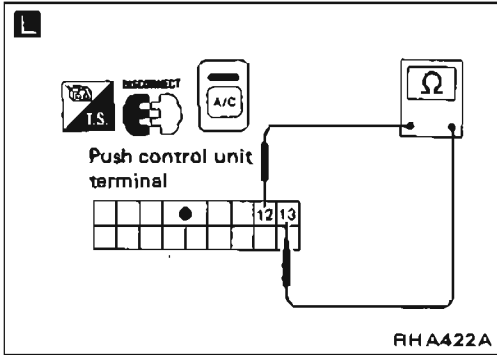
Diagnostic Procedure 4 (Cont'd)



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 4 (Cont'd)



Note:

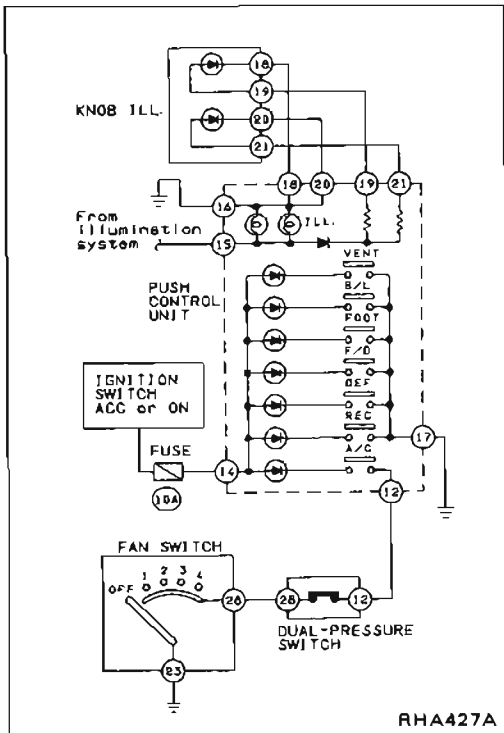
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 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.

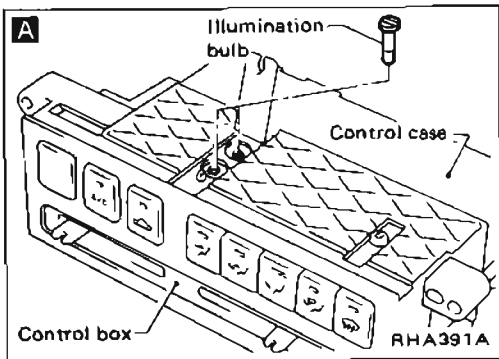
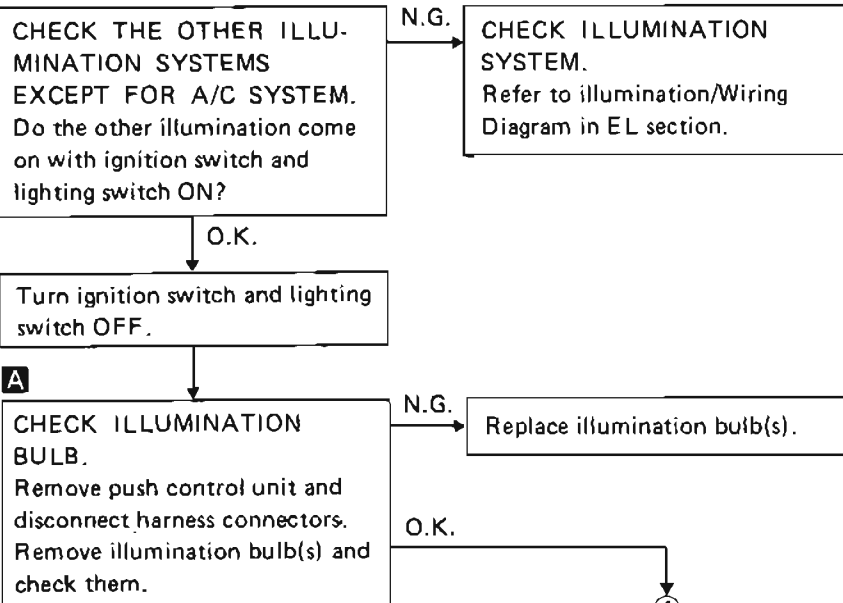
CHECK ILLUMINATION AND INDICATORS.

- 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 | | |
| X | ○ | ○ | ○ | ○ | ○ | ○ | △ | Go to DIAGNOSTIC PROCEDURE 5-1. | |
| △ | ○ | ○ | ○ | ○ | ○ | ○ | X | Go to DIAGNOSTIC PROCEDURE 5-2. | |
| ○ | X | X | X | X | X | X | △ | Go to DIAGNOSTIC PROCEDURE 5-3. | |
| △ | △ | | | | | | | △ | Replace control amp. built-in push control unit. |
| ○ | X | X | X | X | X | X | ○ | Replace control amp. built-in push control nit. | |
| △ | X | X | X | X | X | X | ○ | Go to DIAGNOSTIC PROCEDURE 5-4. | |

○: Illumination or indicator comes on.
 X: Illumination or indicator does not come on.
 △: Some indicators for VENT, B/L, FOOT, F/D, DEF or REC come on.

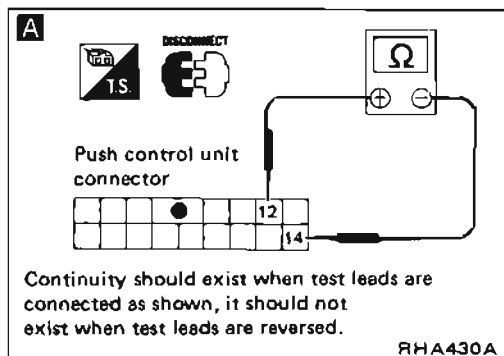
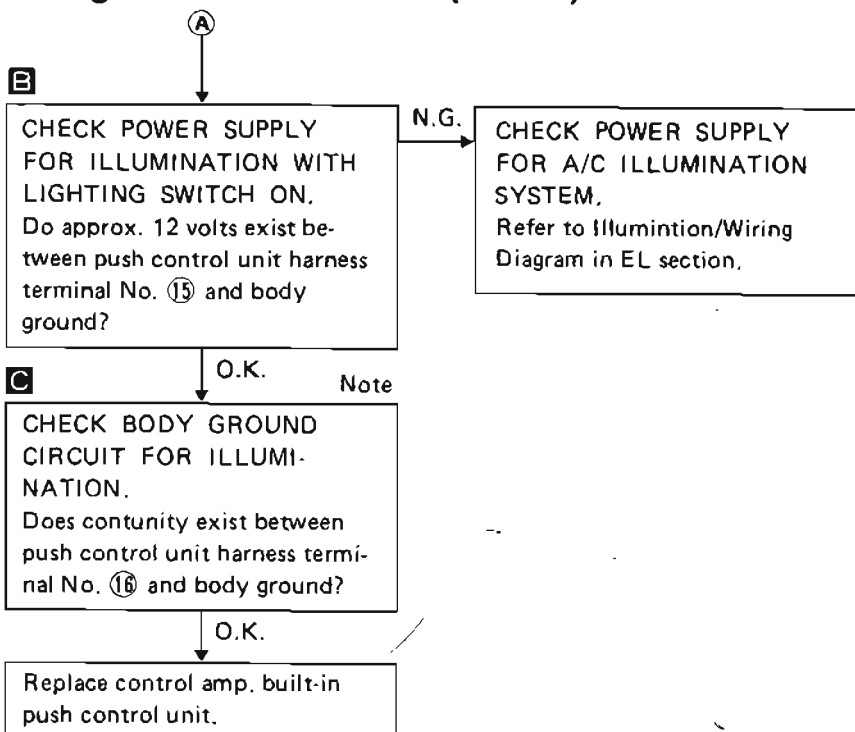
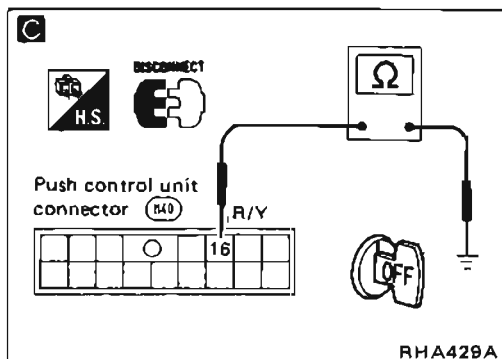
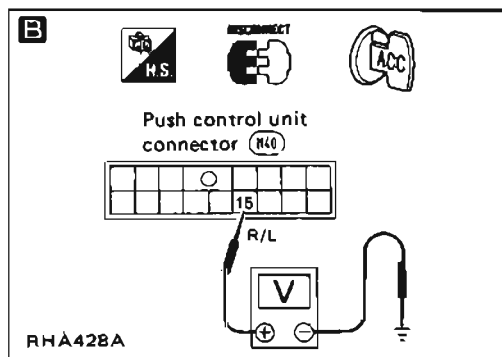
DIAGNOSTIC PROCEDURE 5-1



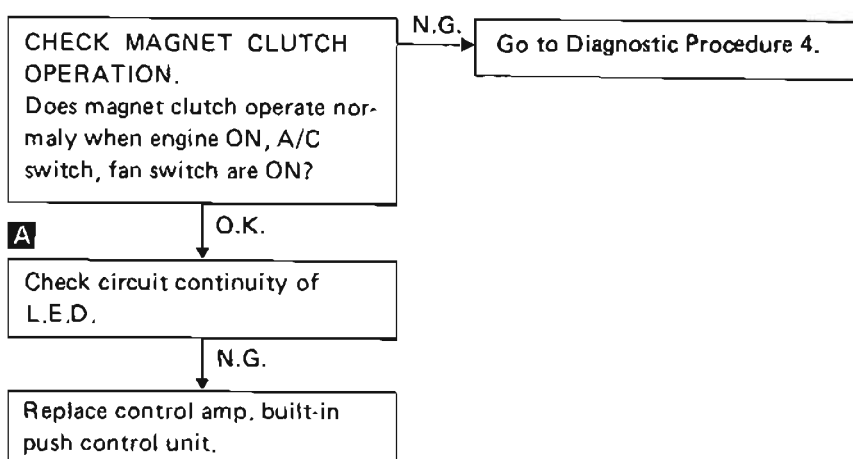
(Go to next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)



DIAGNOSTIC PROCEDURE 5-2



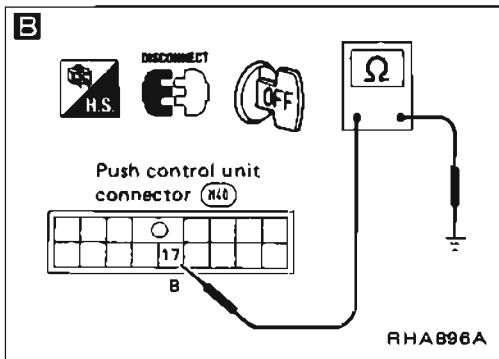
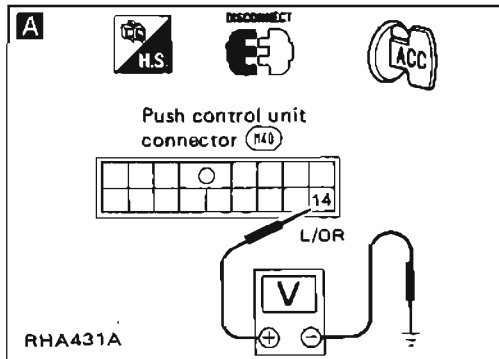
Note:

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



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.)

B

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT. Does continuity exist between push control unit harness terminal No. 17 and body ground?

Replace control amp. built-in push control unit.

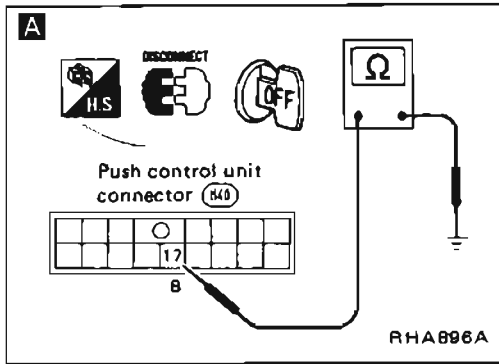
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-4



Turn ignition switch and lighting switch OFF.

Disconnect push control unit harness connector.

A Note

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

O.K.

Replace control amp. built-in push control unit.

Note:

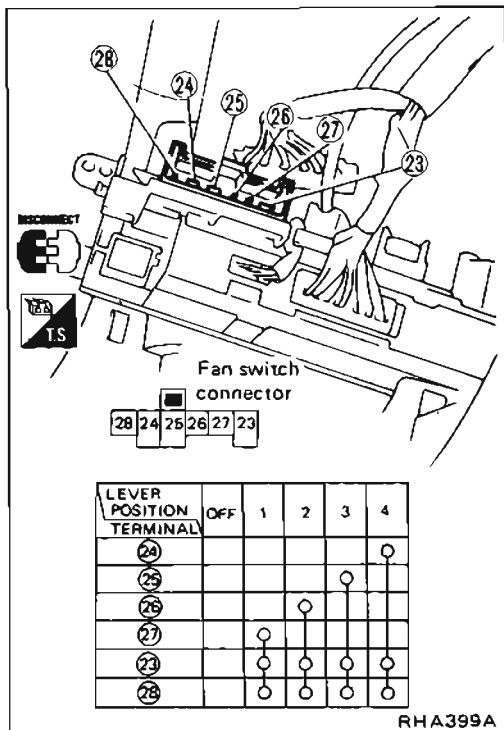
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Electrical Components Inspection

FAN SWITCH

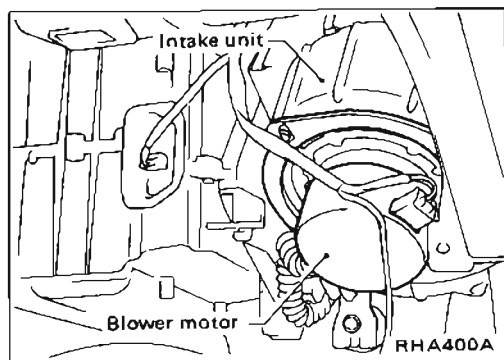
Check continuity between terminals at each switch position.



BLOWER MOTOR

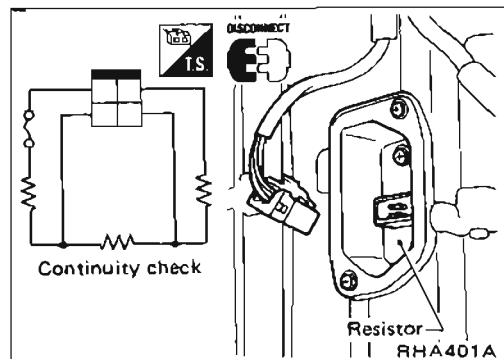
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.



TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

A/C SWITCH

Check continuity between terminals at each switch position.

| Switch condition | | Terminal No. | | Continuity |
|------------------|-----|--------------|---|------------|
| A/C | DEF | ⊕ | ⊖ | |
| ON | ON | | | Yes |
| ON | OFF | ⑬ | ⑫ | |
| OFF | ON | | | |

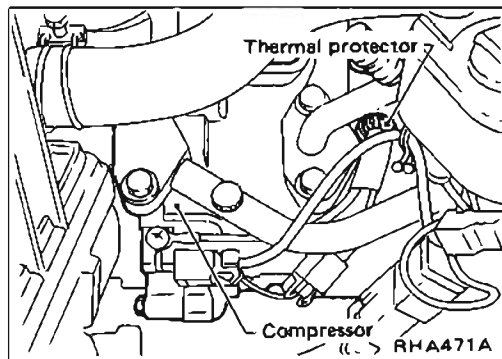
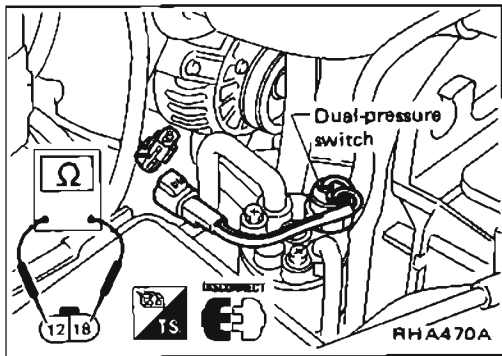
RHA469A

DUAL-PRESSURE SWITCH

| High-pressure side line pressure kPa (kg/cm ² , psi) | Operation | Continuity |
|--|-----------|----------------|
| Decreasing to 177 - 216 (1.8 - 2.2, 26 - 31) Increasing to 2,452 - 2,844 (25 - 29, 356 - 412) | Turn OFF | Does not exist |
| Increasing to 177 - 235 (1.8 - 2.4, 26 - 34) Decreasing to 1,863 - 2,256 (19 - 23, 270 - 327) | Turn ON | Exists |

THERMAL PROTECTOR

| Temperature of compressor °C (°F) | Operation |
|---|-----------|
| Increasing to approx. 135 - 145 (275 - 293) | Turn OFF |
| Decreasing to approx. 120 - 130 (248 - 266) | Turn ON |



TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

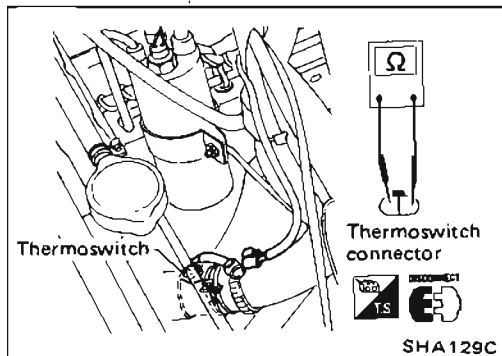
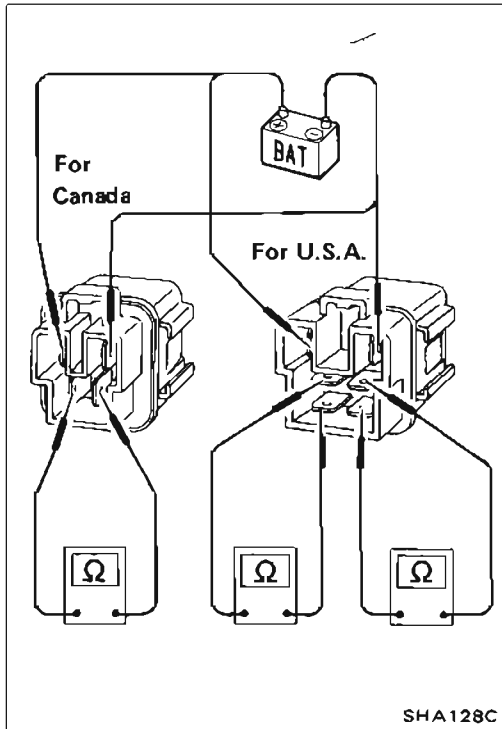
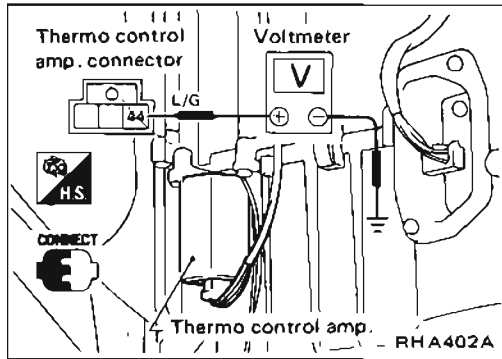
THERMO CONTROL AMP.

1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

| Evaporator outlet air temperature °C (°F) | Thermo amp. operation | Tester |
|--|--------------------------|-------------|
| Decreasing to 1.5 - 2.5 (35 - 37) | Turn OFF | Approx. 12V |
| Increasing to 3.0 - 4.0 (37 - 39) | Turn ON | Approx. 0V |

A/C RELAY

Check circuit continuity between terminals by supplying 12 volts to coil side terminal of A/C relay.



THERMOSWITCH

| Water temperature °C (°F) | Operation | Continuity |
|--------------------------------------|-----------|----------------|
| Decreasing to 85 - 91 (185 - 196) | Turn OFF | Does not exist |
| Increasing to 92 - 98 (198 - 208) | Turn ON | Exists |

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

General Specifications

COMPRESSOR

| | |
|---|--------------------------------------|
| Model | ATSUGI make NVR 140S |
| Type | Vane rotary |
| Displacement cm ³ (cu in)/Rev. | 140 (8.54) |
| Direction of rotation | Clockwise (Viewed from drive end) |
| Drive belt | Poly V |

LUBRICATION OIL

| | |
|---|-------------------------|
| Model | ATSUGI make NVR 140S |
| Type | SUNISO 6GS |
| Capacity ml (US fl oz, Imp fl oz) Total in system | 200 (6.8, 7.0) |
| Amount of oil which can be drained | Approx. 100 (3.4, 3.5) |
| Compressor (Service parts) charging amount | 200 (6.8, 7.0) |

REFRIGERANT

| | |
|------------------|-----------------------|
| Type | R-12 |
| Capacity kg (lb) | 0.9 - 1.0 (2.0 - 2.2) |

Inspection and Adjustment

ENGINE IDLING SPEED (When A/C Is ON.)

- Refer to EF & EC section.

BELT TENSION

- Refer to Checking Drive Belts (MA section).

COMPRESSOR

| | |
|---|------------------------------|
| Model | NVR 140S |
| Clutch disc-pulley clearance mm (in) | 0.3 - 0.6 (0.012 - 0.024) |

ELECTRICAL SYSTEM

SECTION **EL**

When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".

CONTENTS

| | |
|---|--------|
| HARNESS CONNECTOR | EL- 2 |
| STANDARDIZED RELAY | EL- 3 |
| POWER SUPPLY ROUTING | EL- 5 |
| BATTERY | EL- 7 |
| STARTING SYSTEM | EL- 15 |
| STARTING SYSTEM — Starter — | EL- 17 |
| CHARGING SYSTEM | EL- 23 |
| CHARGING SYSTEM — Alternator — | EL- 25 |
| COMBINATION SWITCH | EL- 33 |
| HEADLAMP | EL- 35 |
| EXTERIOR LAMP | EL- 46 |
| INTERIOR LAMP | EL- 52 |
| METER AND GAUGES | EL- 54 |
| WARNING LAMPS AND CHIME | EL- 61 |
| TIME CONTROL SYSTEM | EL- 65 |
| WIPER AND WASHER | EL- 75 |
| HORN, CIGARETTE LIGHTER AND CLOCK | EL- 81 |
| REAR WINDOW DEFOGGER | EL- 82 |
| AUDIO AND ANTENNA | EL- 85 |
| AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.) | EL- 88 |
| LOCATION OF ELECTRICAL UNITS | EL- 97 |
| HARNESS LAYOUT | EL- 99 |
| SUPER MULTIPLE JUNCTION (S.M.J.) | EL-117 |

WIRING DIAGRAM REFERENCE CHART

| | |
|--|--------------------------------|
| E.C.C.S. | PULL-OUT FOLLOWING PAGE EL-118 |
| LOCK-UP CONTROL | AT SECTION |
| Q.D. CONTROL | AT SECTION |
| ELECTRIC DOOR MIRROR, SUN ROOF, DOOR LOCK, POWER WINDOW AND AUTOMATIC SEAT BELT | BF SECTION |
| HEATER AND AIR CONDITIONER | HA SECTION |

HARNESS CONNECTOR

Description

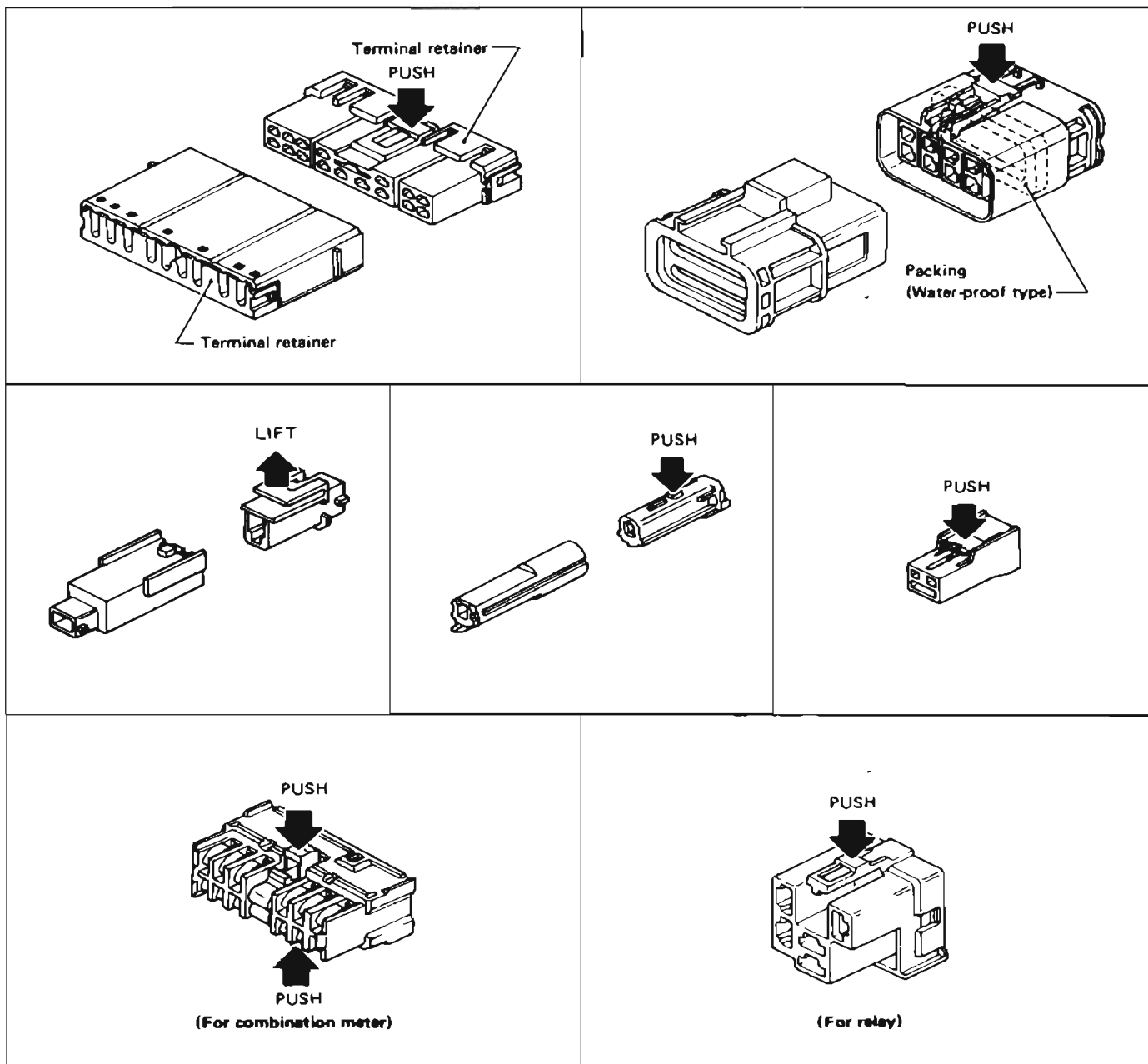
HARNESS CONNECTOR

- 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}



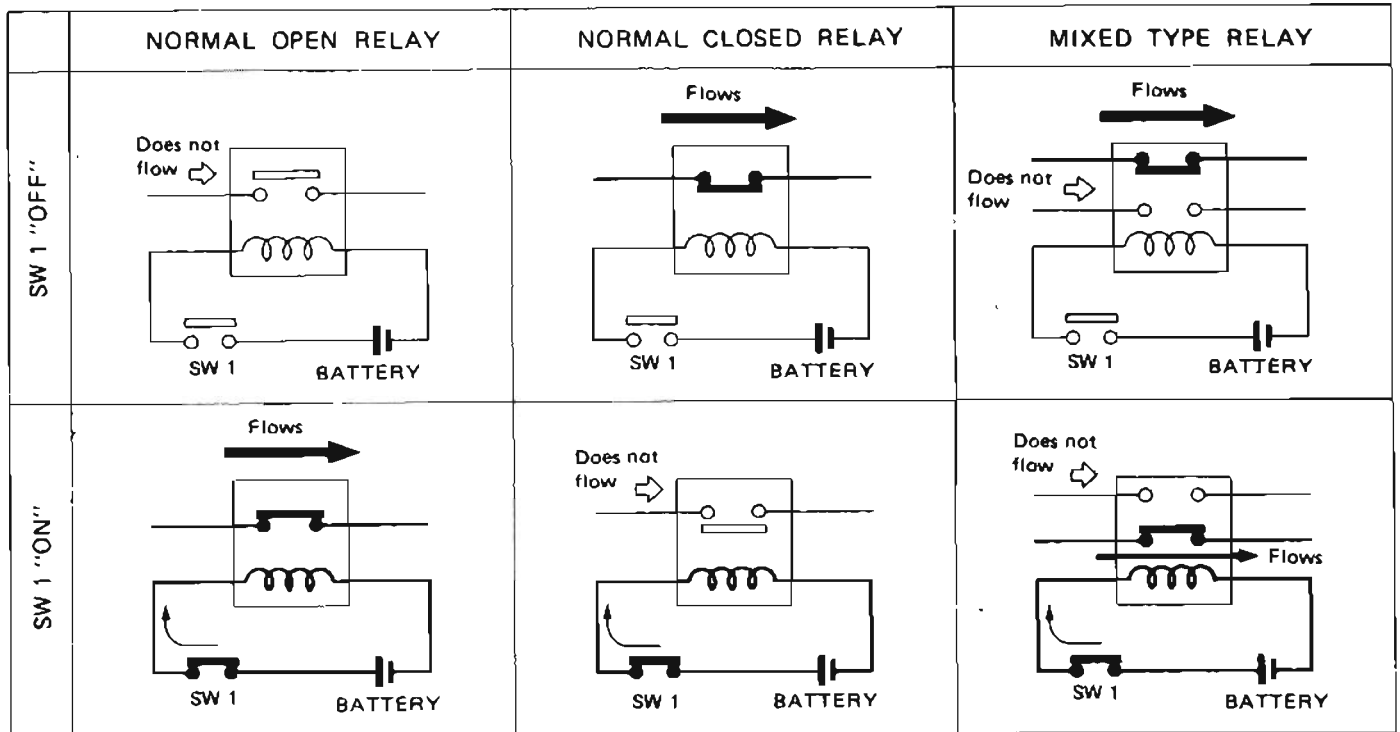
SEL769D

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

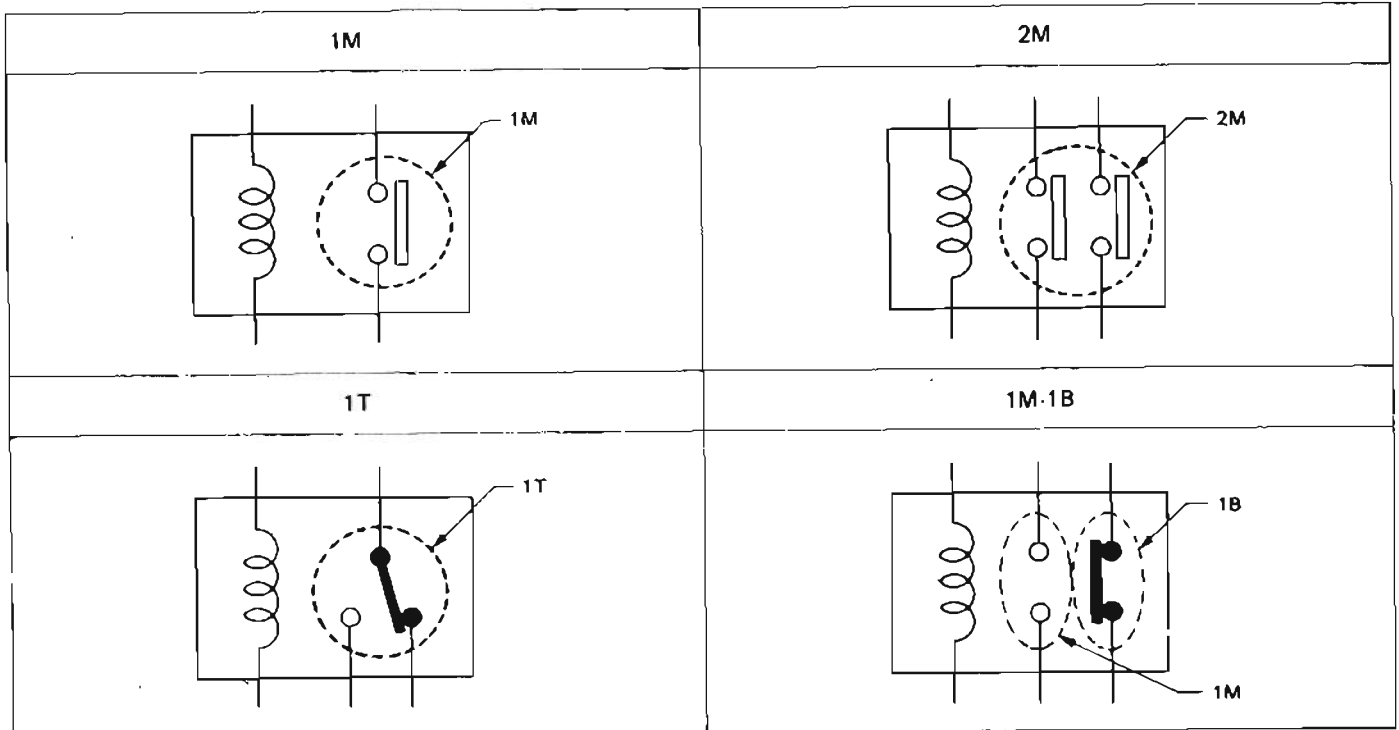
TYPE OF STANDARDIZED RELAYS

1M 1 Make

2M 2 Make

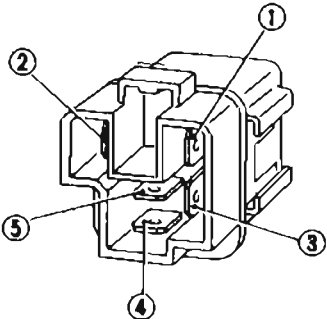
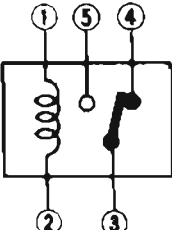
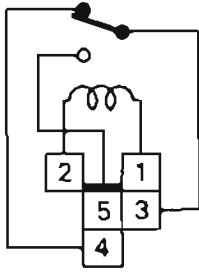
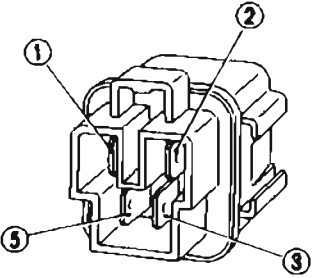
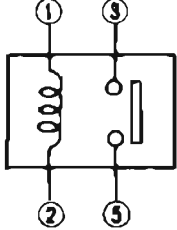
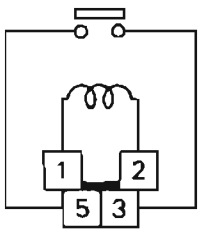
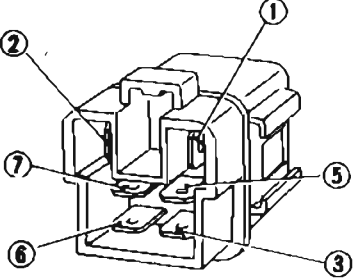
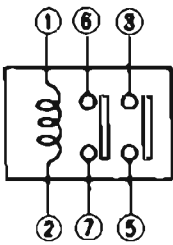
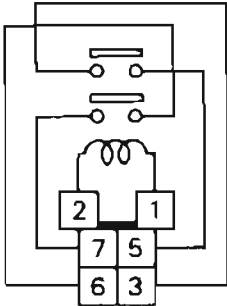
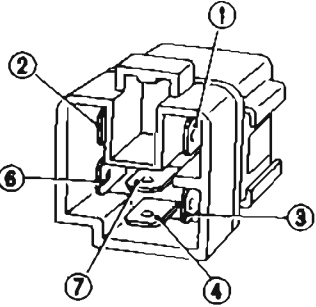
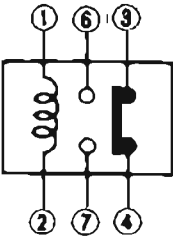
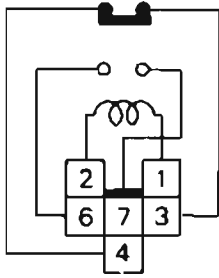
1T 1 Transfer

1M·1B 1 Make 1 Break



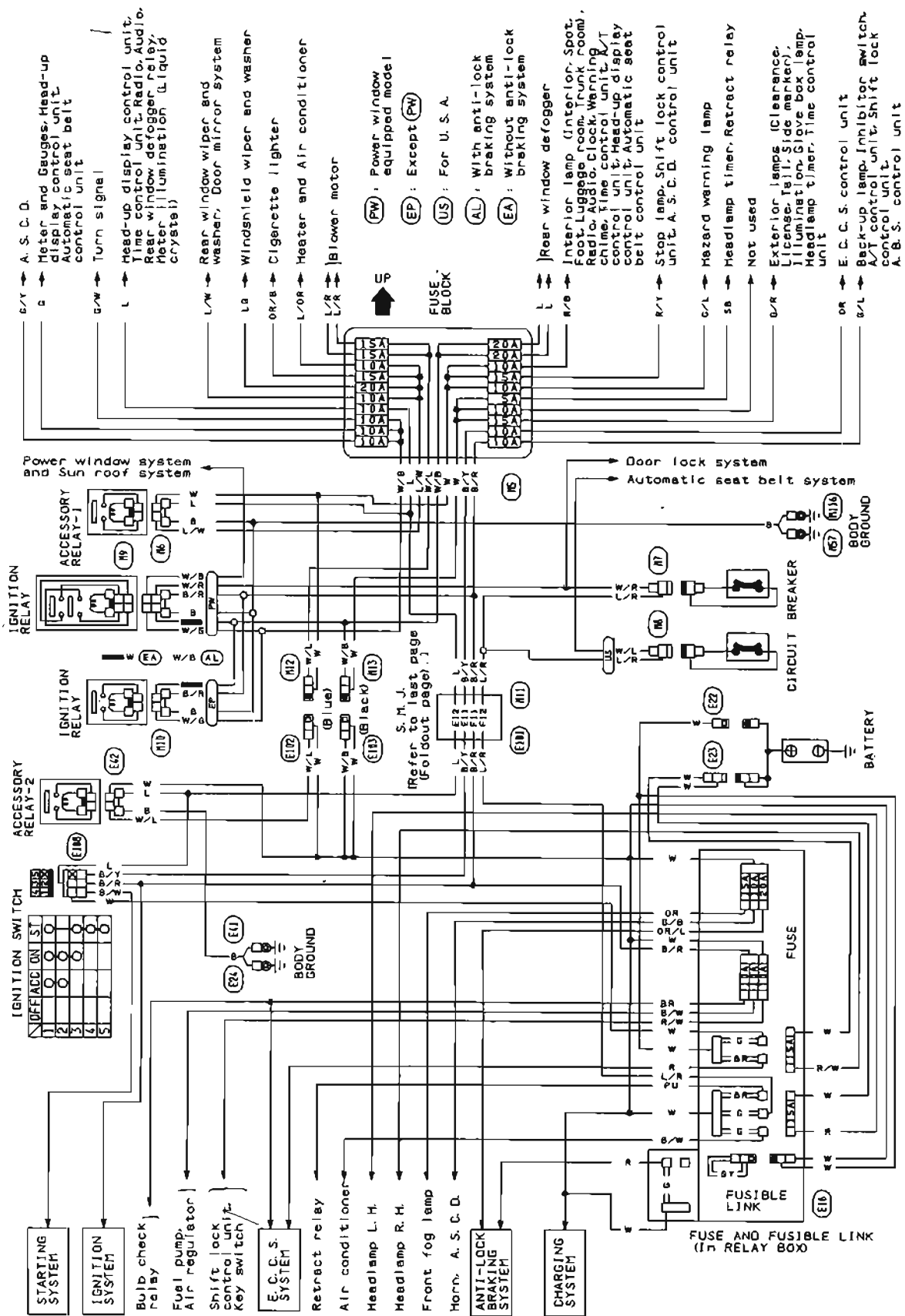
SEL882H

STANDARDIZED RELAY

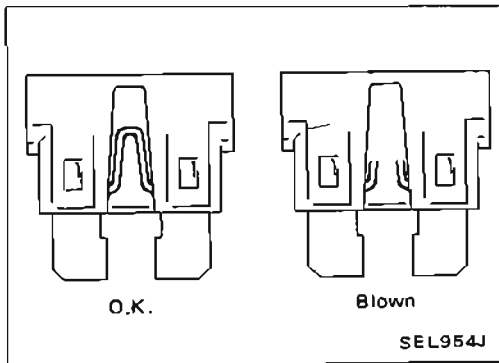
| Type | Outer view | Circuit | Connector symbol and connection | Case color |
|-------|---|---|--|------------|
| 1T |  |  |  | BLACK |
| 1M |  |  |  | BLUE |
| 2M |  |  |  | BROWN |
| 1M-1B |  |  |  | GRAY |

SEL883H

Wiring Diagram



POWER SUPPLY ROUTING



Fuse

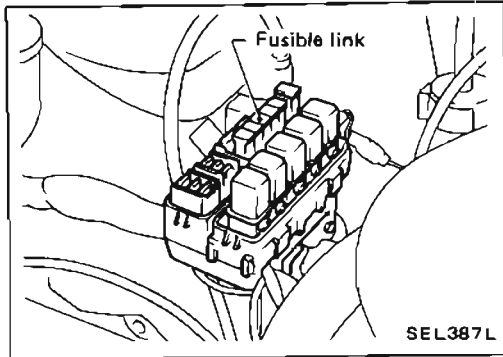
- If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
- Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not install fuse in oblique direction; always insert it into fuse holder properly.
- Remove fuse for clock if vehicle is not used for a long period of time.

Fusible Link

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. 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 VARIATION

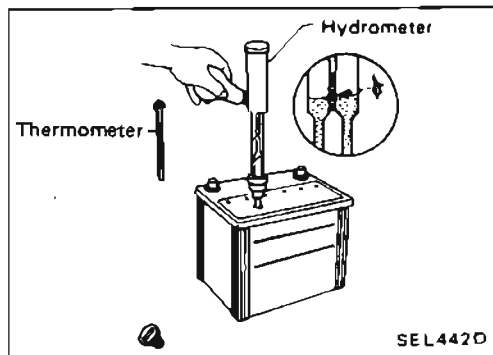
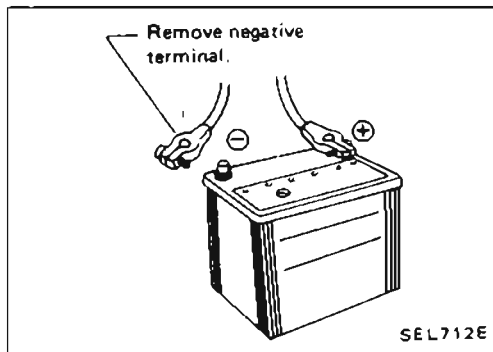
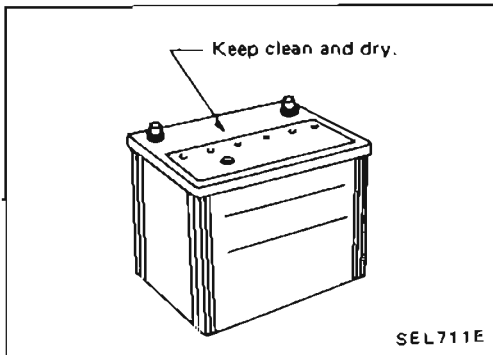
| Color | Maximum amperage (A) |
|-------|----------------------|
| Brown | 15 |
| Green | 20 |
| Red | 30 |
| Black | 35 |
| Gray | 40 |

*Temperature condition: Less than 80°C (176°F)

BATTERY

CAUTION:

- a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- c. Never add distilled water through the hole used to check specific gravity.



How to Handle Battery

METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.
- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)
- Check the charge condition of the battery.
Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

BATTERY

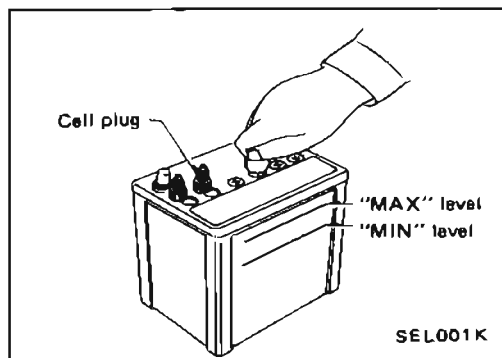
How to Handle Battery (Cont'd)

CHECKING ELECTROLYTE LEVEL

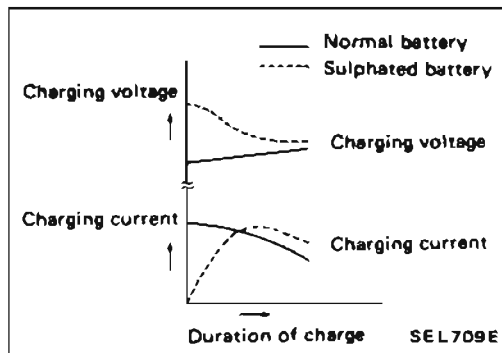
WARNING:

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.



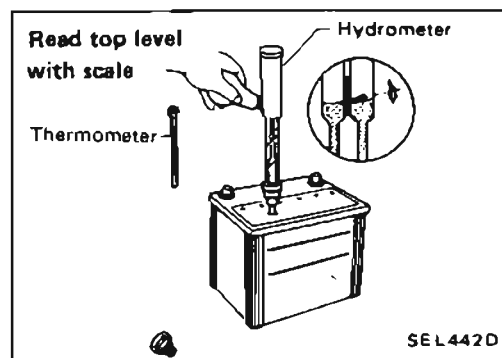
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



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.

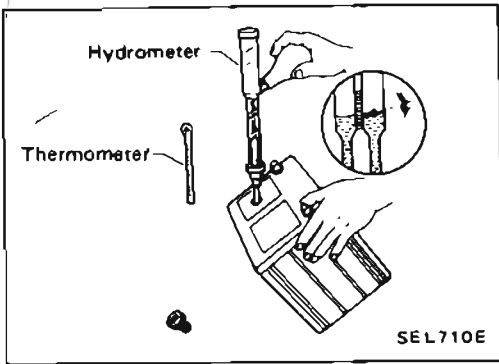


SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.

BATTERY

How to Handle Battery (Cont'd)

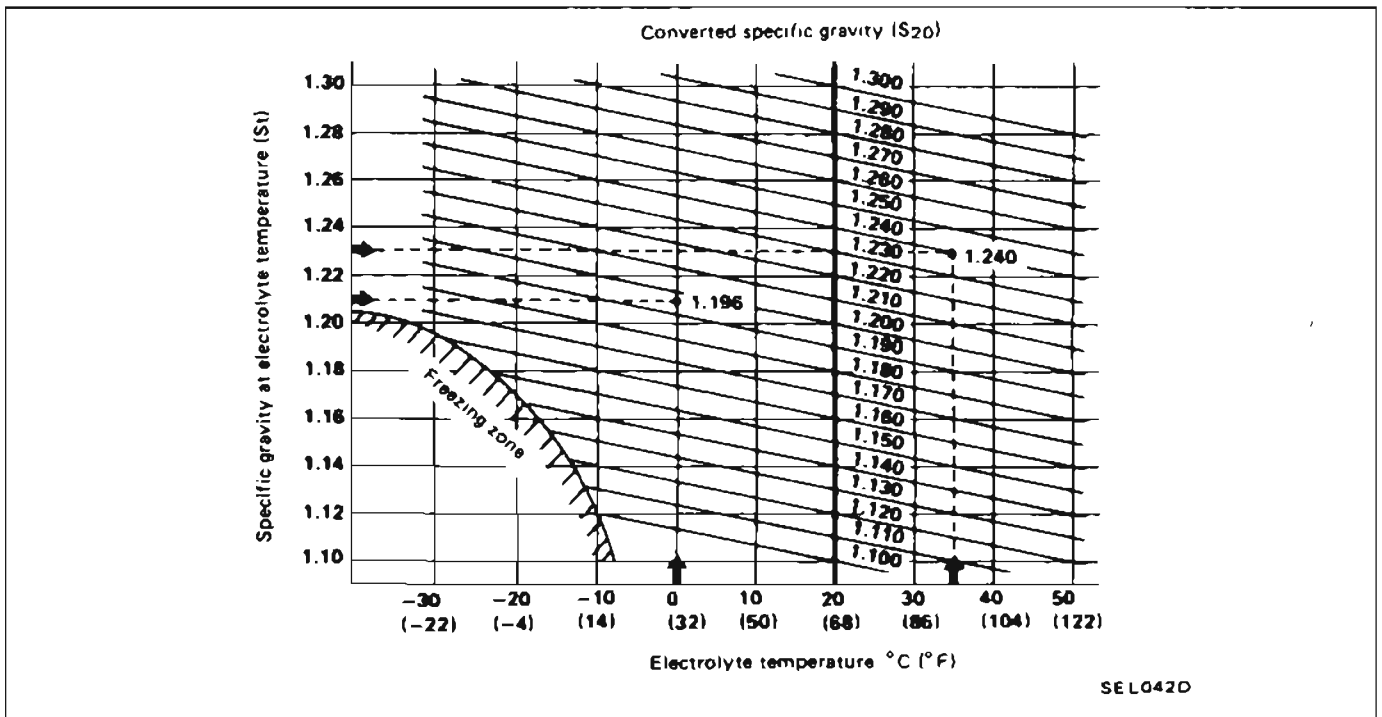


- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

2. Convert into specific gravity at 20°C (68°F).

Example:

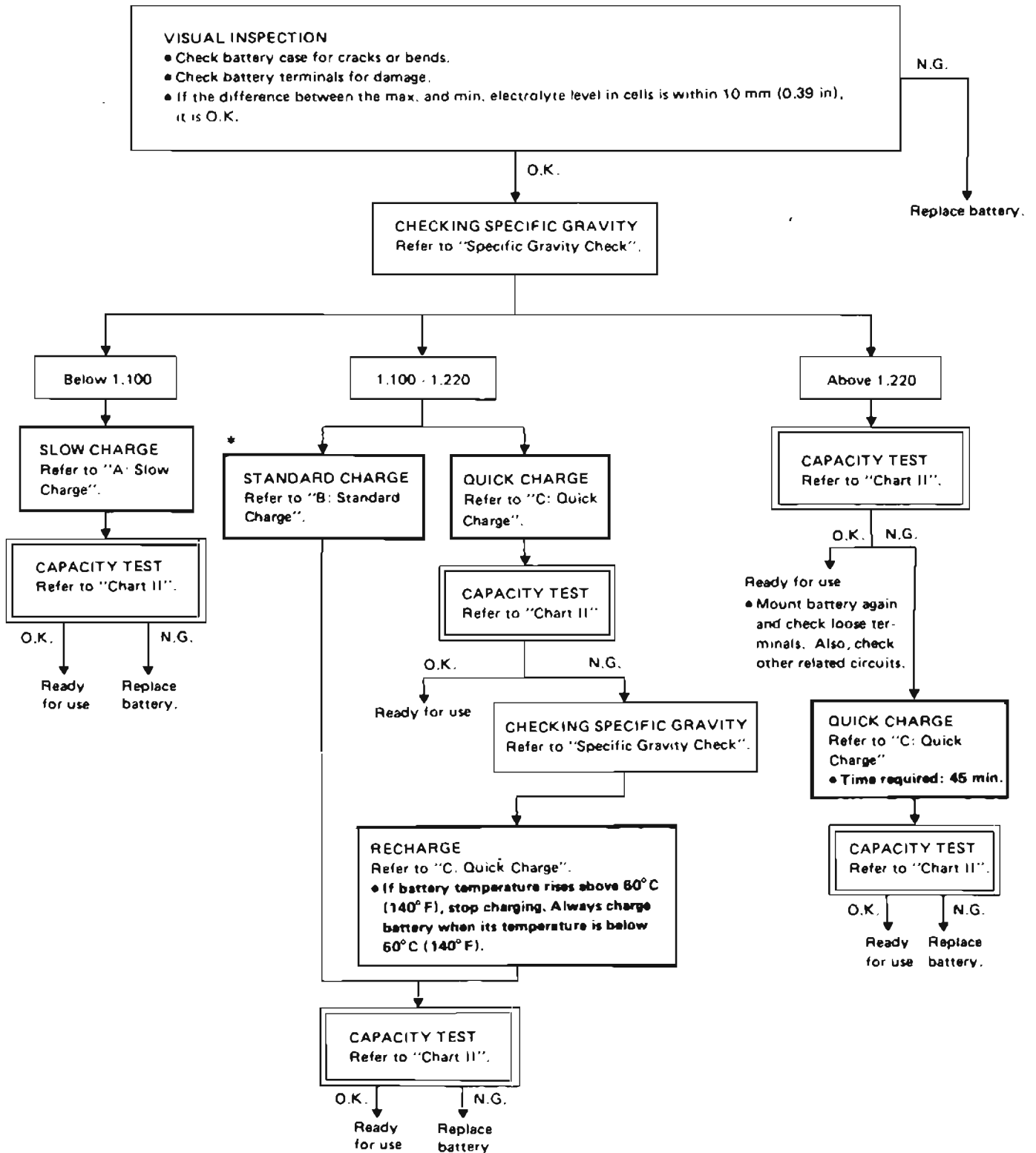
- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



BATTERY

Battery Test and Charging Chart

Chart I

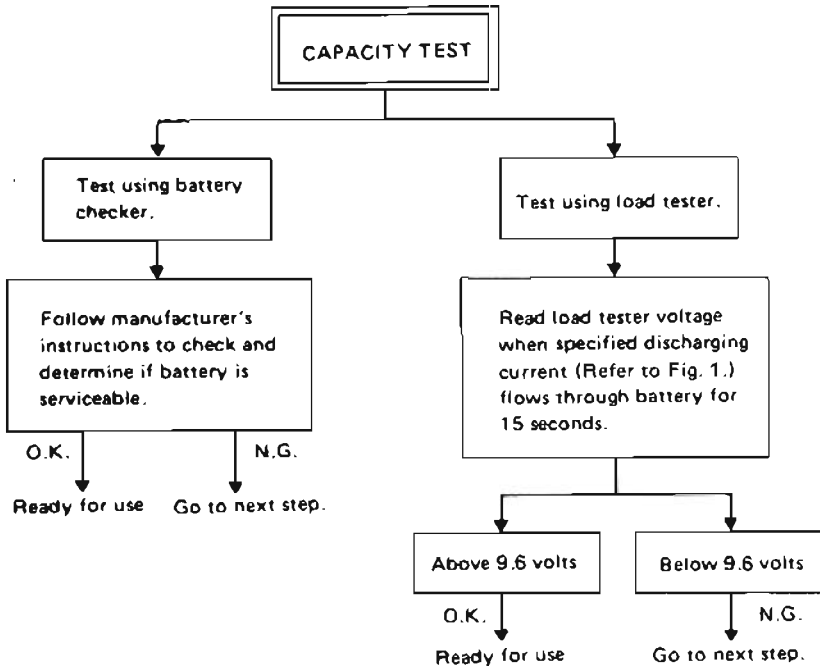


* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

BATTERY

Battery Test and Charging Chart (Cont'd)

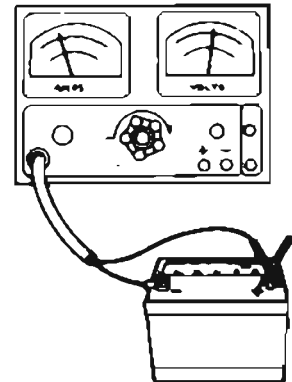
Chart II



- 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 |
| 56B24R(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 |



SEL6978

BATTERY

Battery Test and Charging Chart (Cont'd)

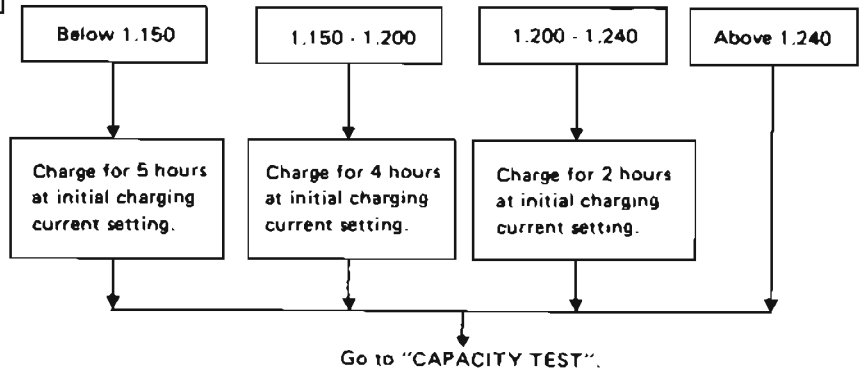
A: SLOW CHARGE

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

| BATTERY TYPE CON- VERTED SPECIFIC GRAVITY | 28B19R(L) | 34B19R(L) | 46B24R(L) | 55B24R(L) | 50D23R(L) | 56D23R(L) | 66D26R(L) | 80D26R(L) | 75D31R(L) | 95D31R(L) | 95E41R(L) | 130E41R(L) |
|---|-------------|------------|------------|------------|------------|------------|-------------|-------------|-----------|-----------|-----------|------------|
| | Below 1.100 | 4.0 (A) | 5.0 (A) | 7.0 (A) | 8.0 (A) | 9.0 (A) | 10.0 (A) | 14.0 (A) | | | | |

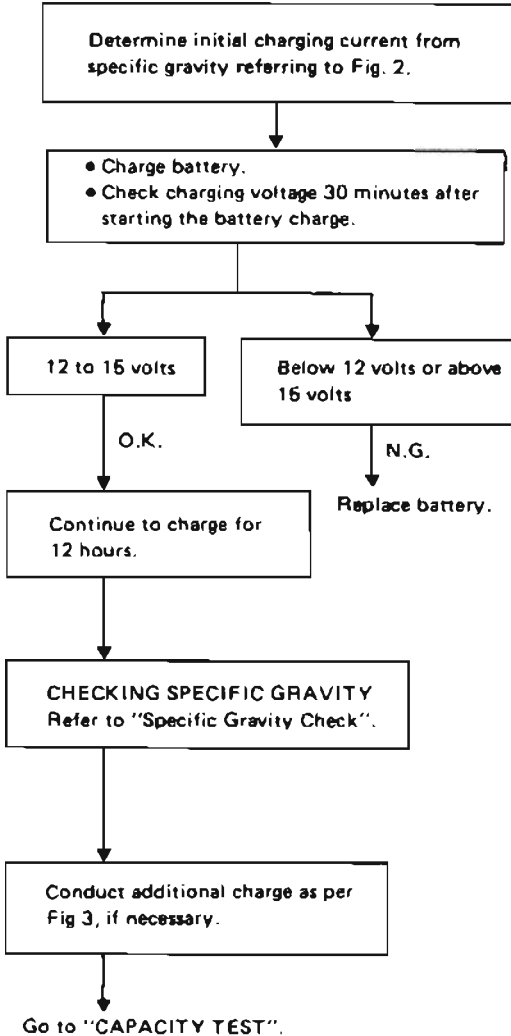
- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 3 ADDITIONAL CHARGE (Slow charge)



CAUTION:

- 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

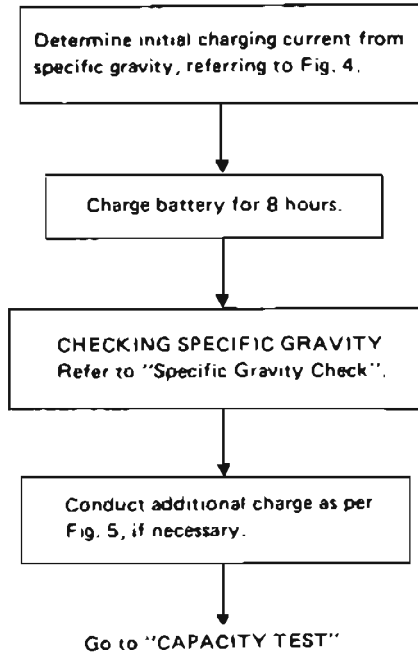
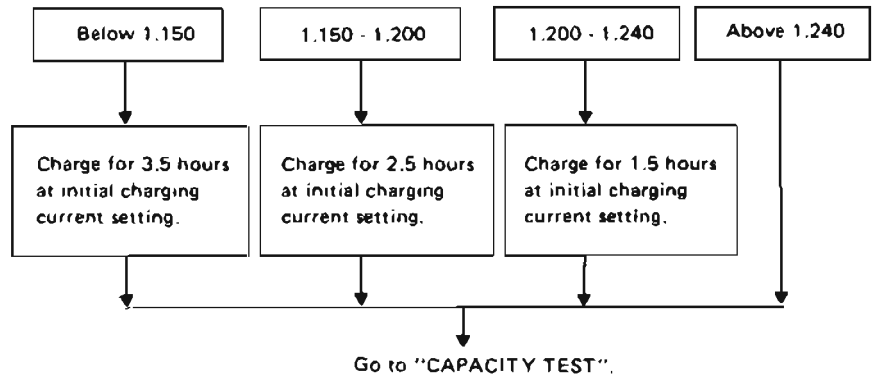


Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

| BATTERY TYPE CON- VERTED SPECIFIC GRAVITY | 28B19R(L) 34B19R(L) | 46B24R(L) 55B24R(L) | 50D23R(L) 65D23R(L) | 65D26R(L) 80D26R(L) | 76D31R(L) | 95D31R(L) 96E41R(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

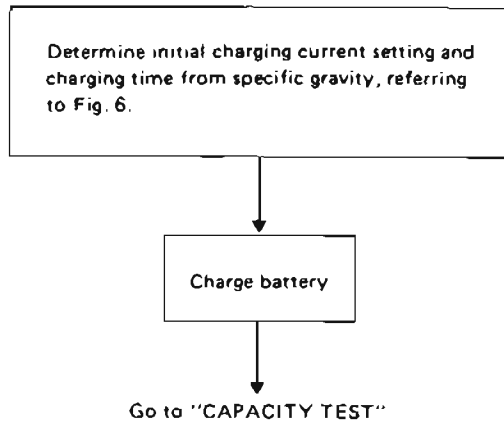


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

| CON- VERTED SPECIFIC GRAVITY | BATTERY TYPE | | CUR- RENT (A) | | 130E41R(L) |
|---------------------------------------|------------------------|------------------------|---------------------|-------------------------------------|------------|
| | 28B19R(L) 34B19R(L) | 46B24R(L) 55B24R(L) | 50D23R(L) | 65D23R(L) 65D26R(L) 80D26R(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.

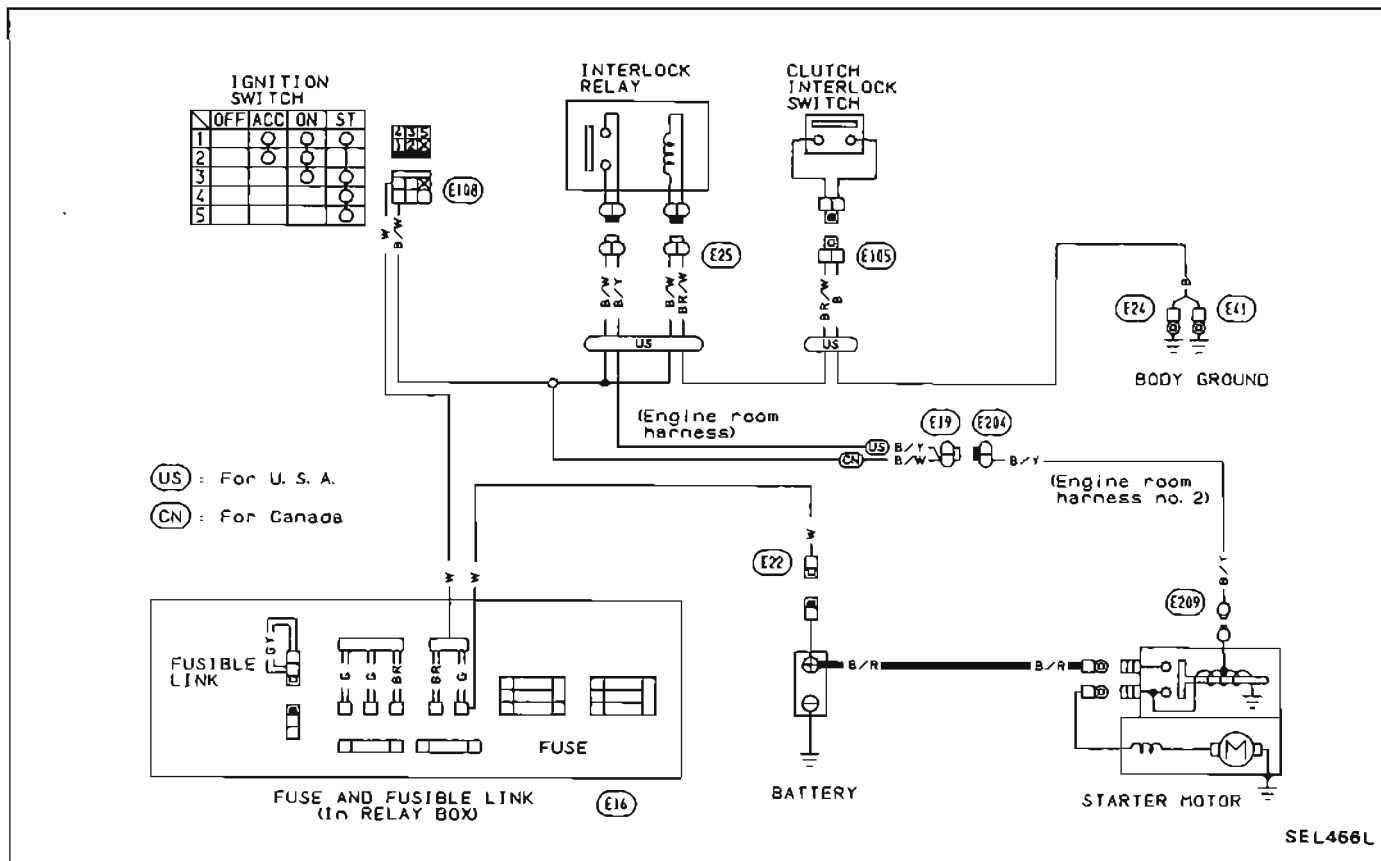
Service Data and Specifications (S.D.S.)

| Applied area | U.S.A. | | Canada |
|--------------|--------|-------|--------|
| Type | 55D23R | | 65D26R |
| Capacity | V-AH | 12-60 | 12-65 |

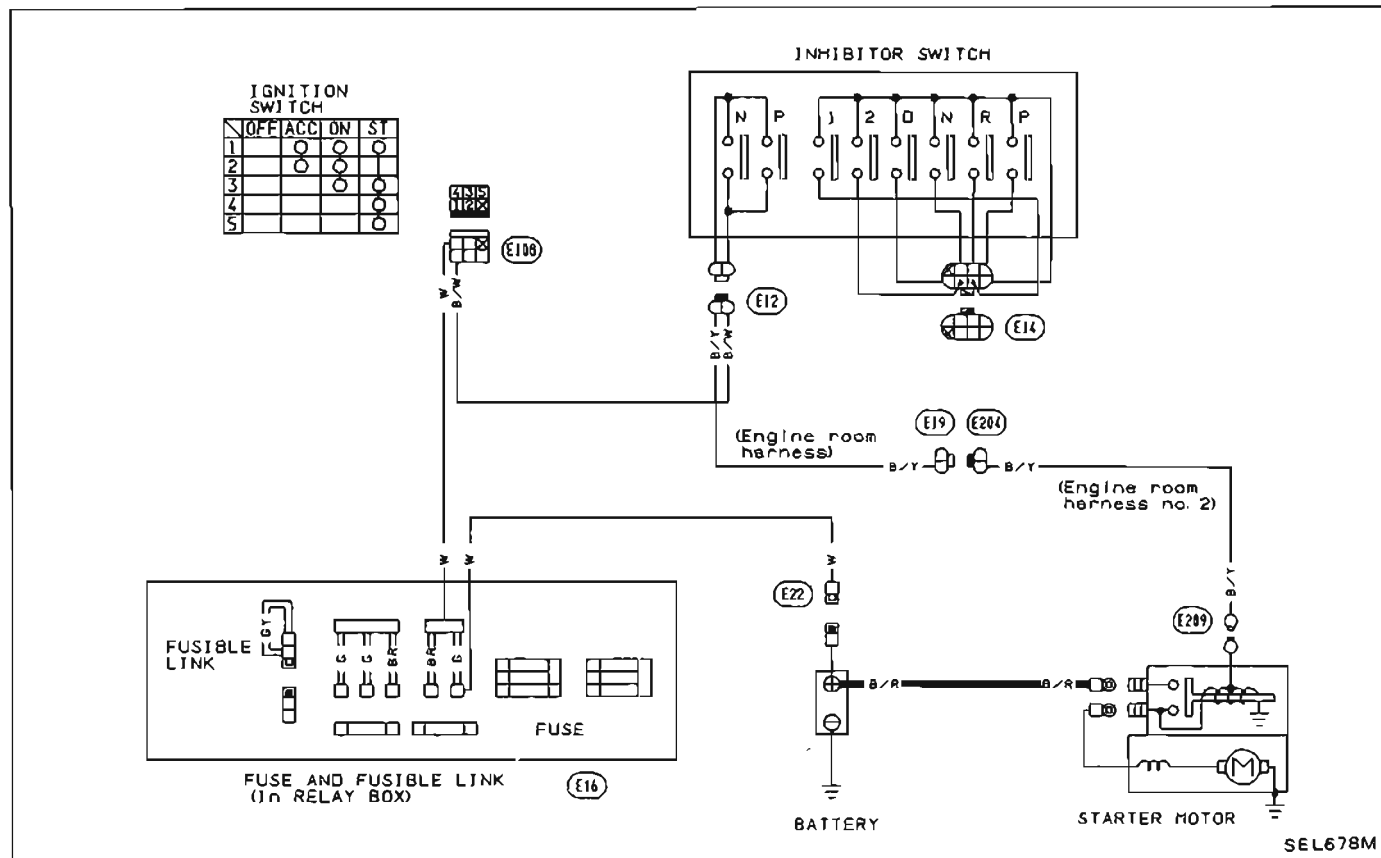
STARTING SYSTEM

Wiring Diagram

M/T MODEL

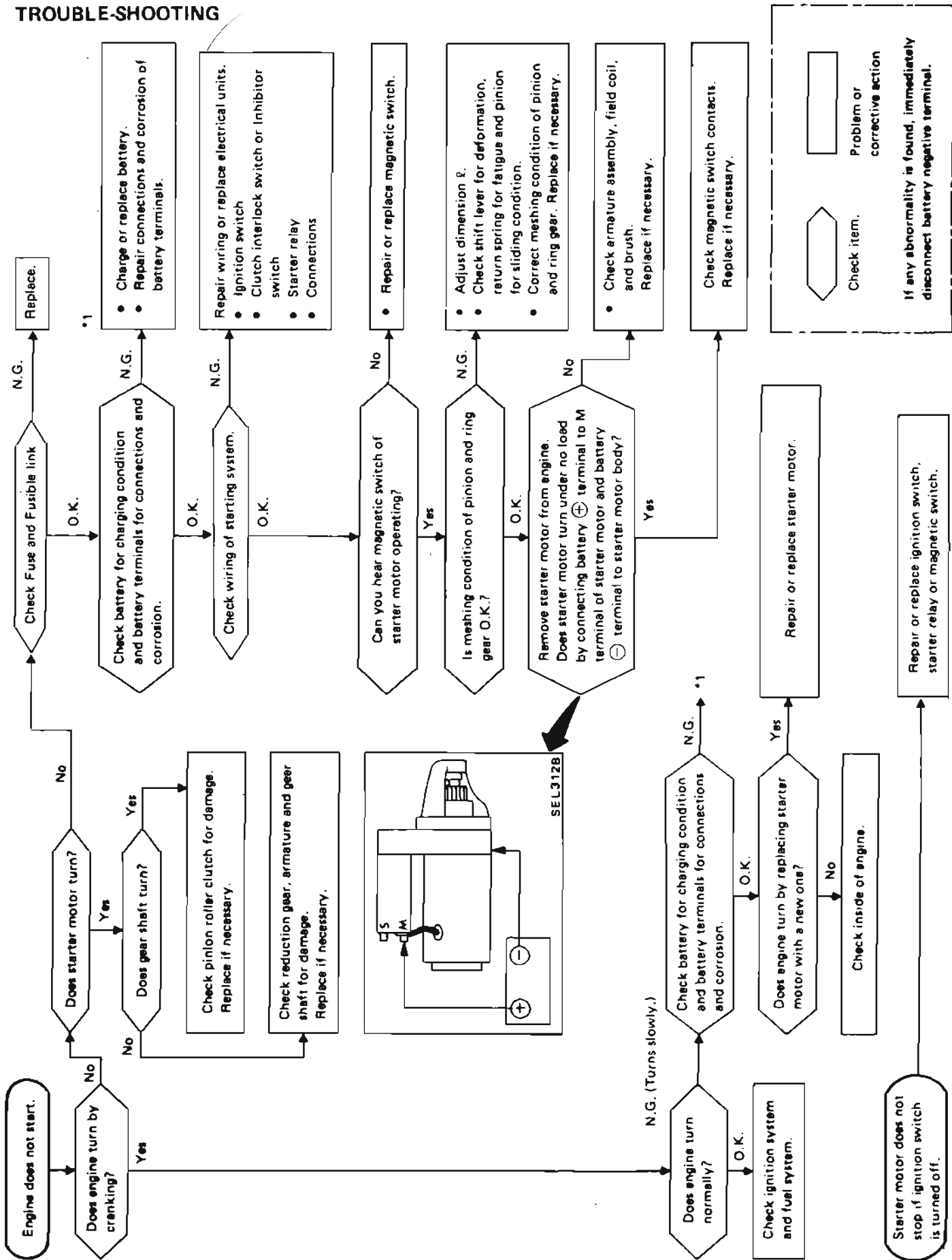


A/T MODEL



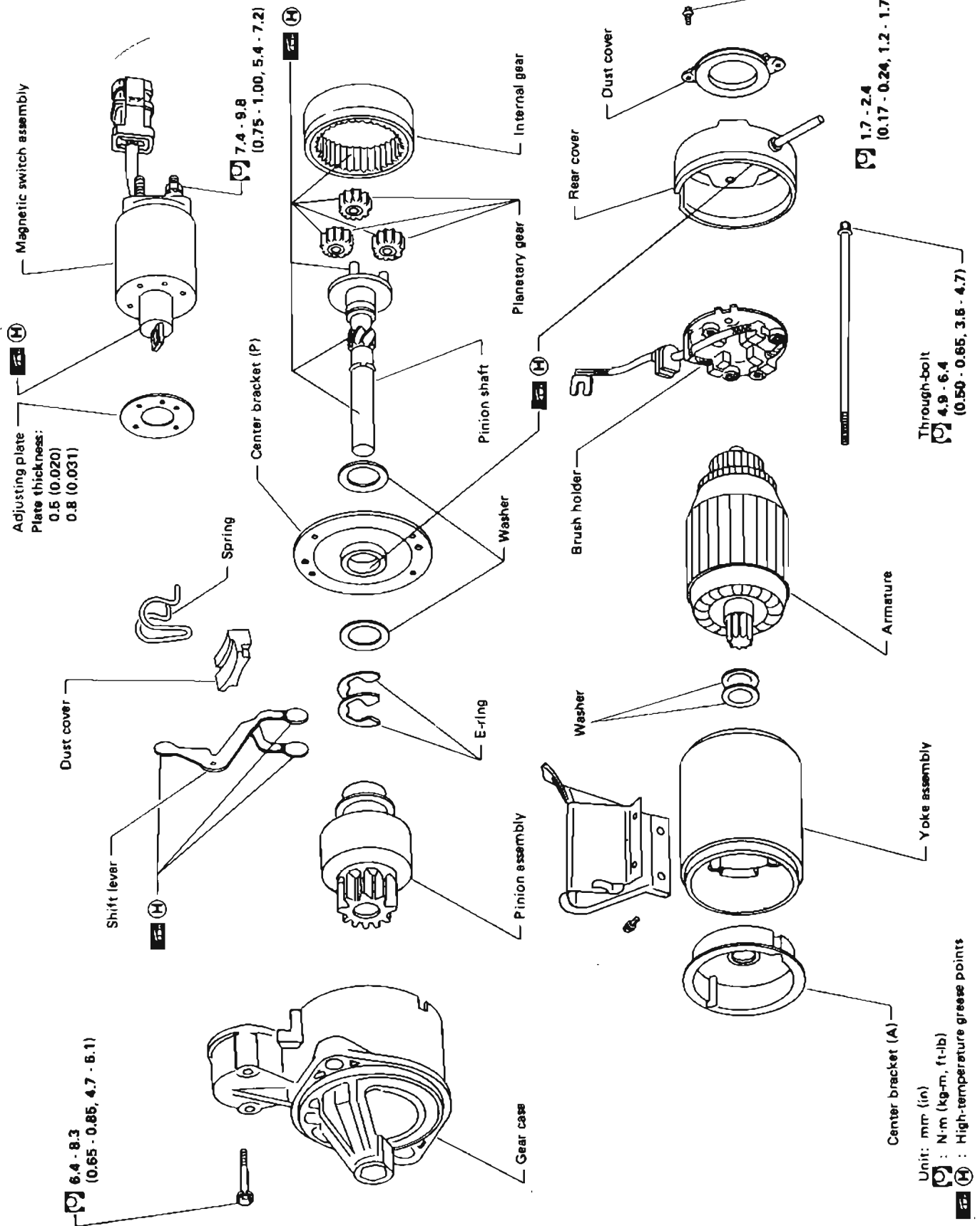
STARTING SYSTEM

TROUBLE-SHOOTING



Construction

S114-519A



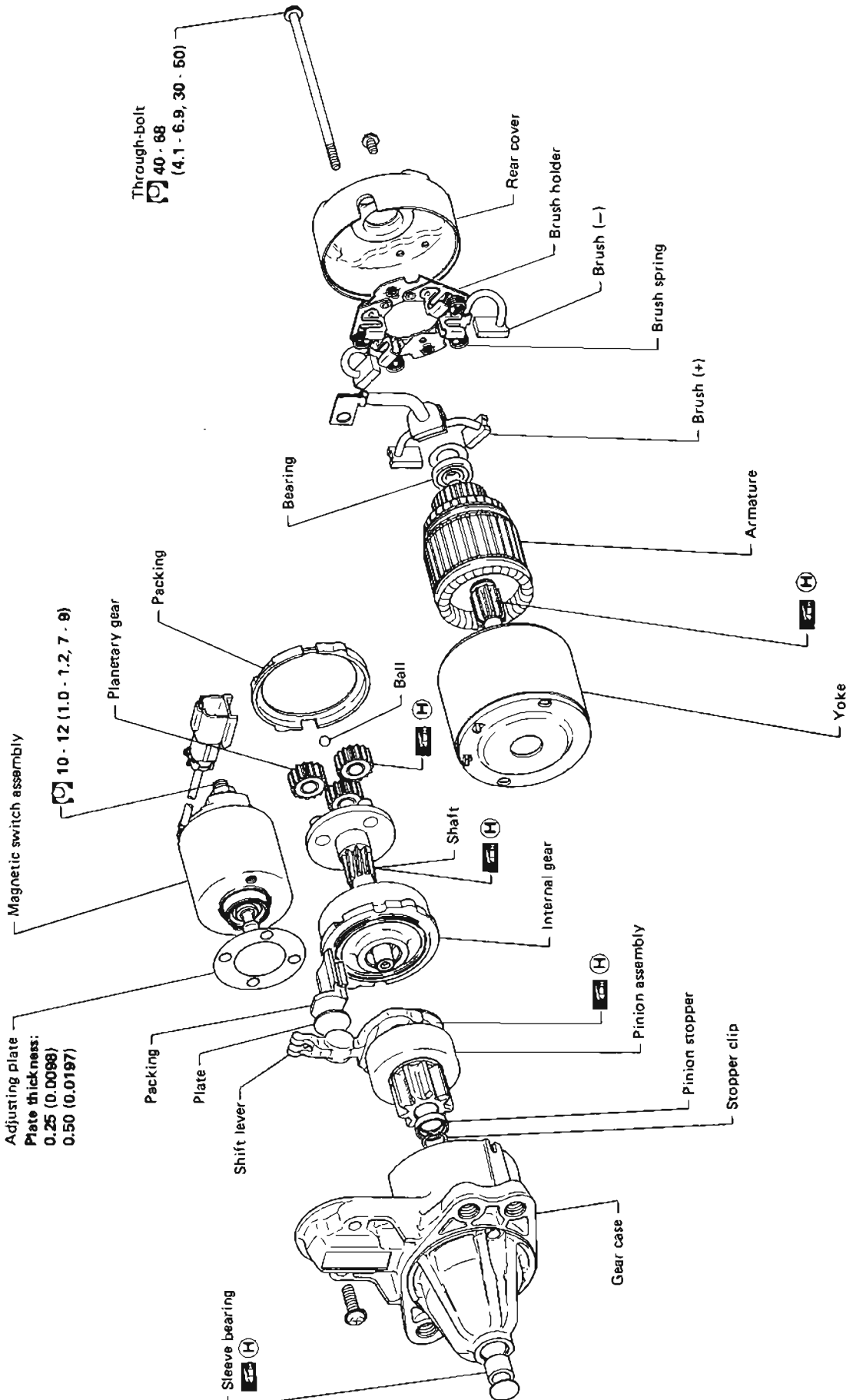
Unit: mm (in)
 : N·m (kg·m, ft·lb)
 : High-temperature grease points

SEL647J

STARTING SYSTEM — Starter —

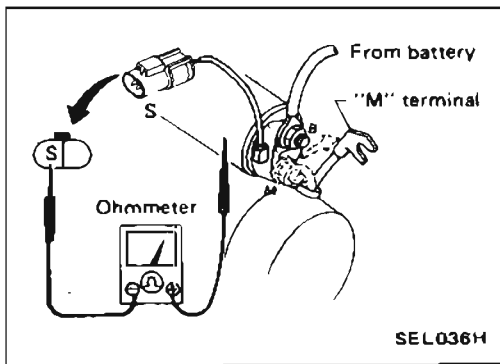
Construction (Cont'd)

M1T72781



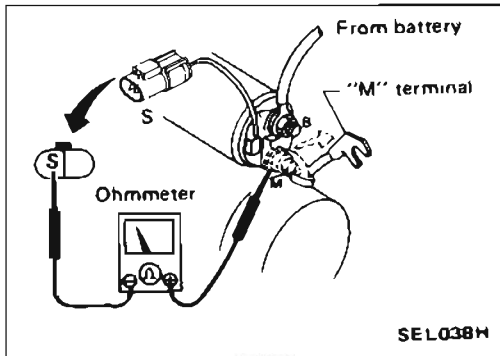
Unit: mm (in)
 : N-m (kg-m, ft-lb)
 : High-temperature grease point

SFL628L

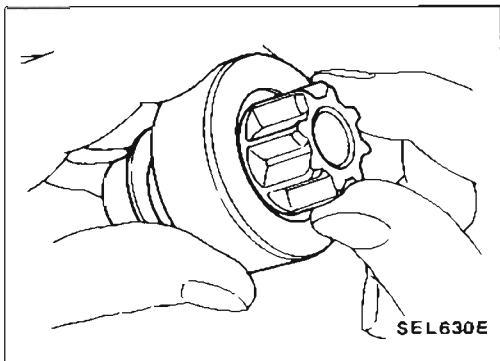


Magnetic Switch Check

- 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.

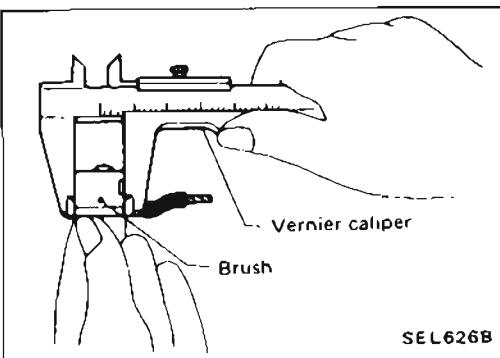


2. Continuity test (between "S" terminal and "M" terminal).
- No continuity ... Replace.



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.



Brush Check

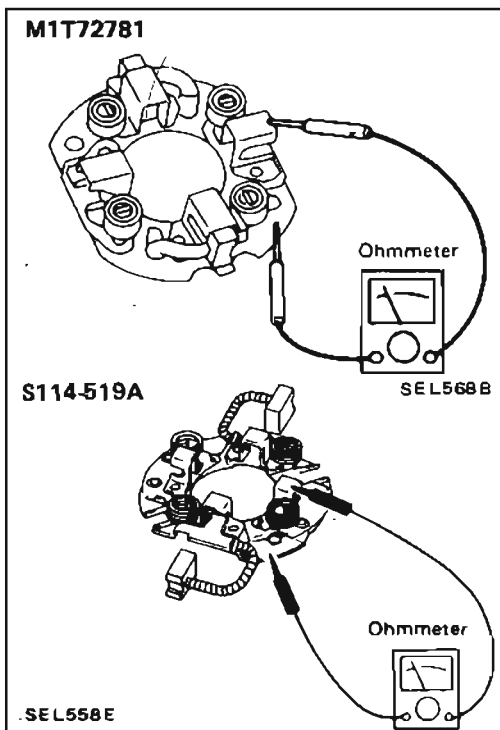
BRUSH

Check wear of brush.

Wear limit length:

Refer to S.D.S.

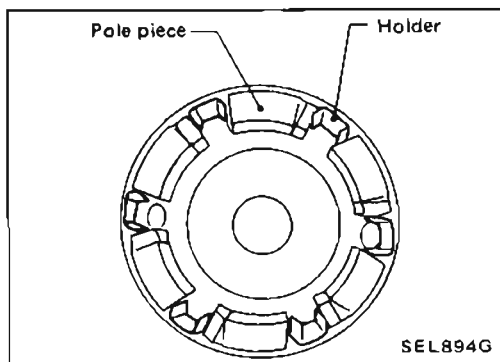
- Excessive wear ... Replace.



Brush Check (Cont'd)

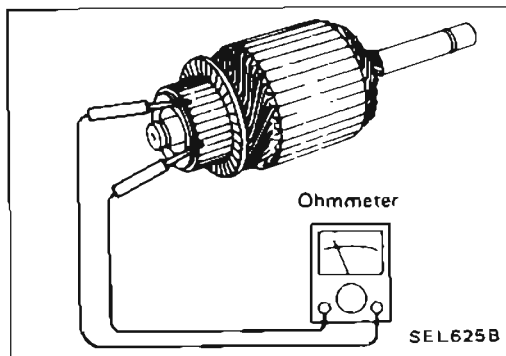
BRUSH HOLDER

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.



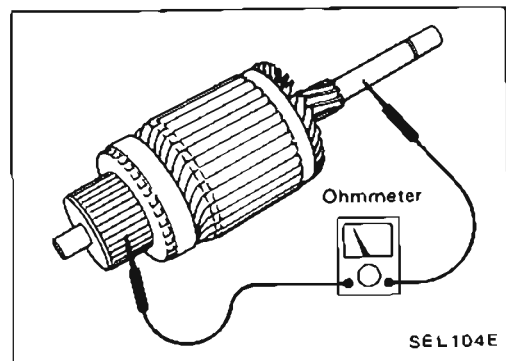
Pole Piece Check

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.



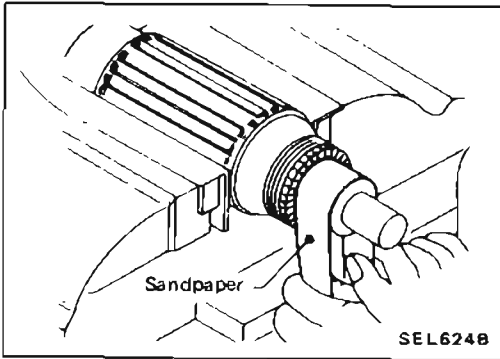
Armature Check

1. Continuity test (between two segments side by side).
 - No continuity ... Replace.

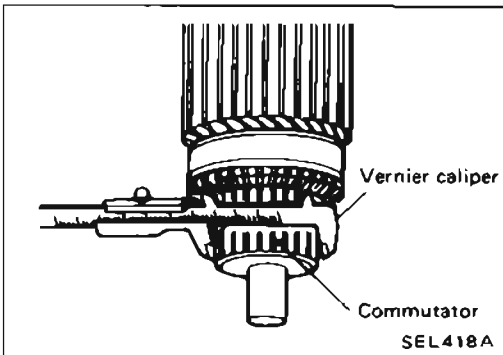


2. Insulation test (between each commutator bar and shaft).
 - Continuity exists. ... Replace.

Armature Check (Cont'd)



3. Check commutator surface.
 - Rough ... Sand lightly with No. 500 to 600 sandpaper.

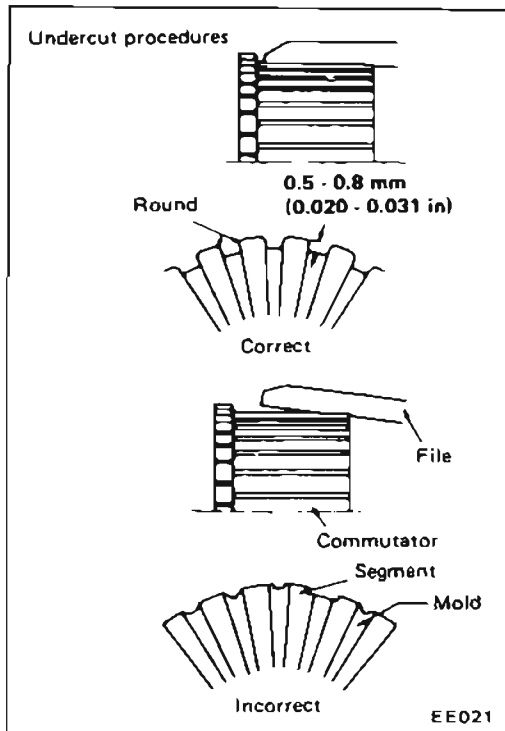


4. Check diameter of commutator.

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.

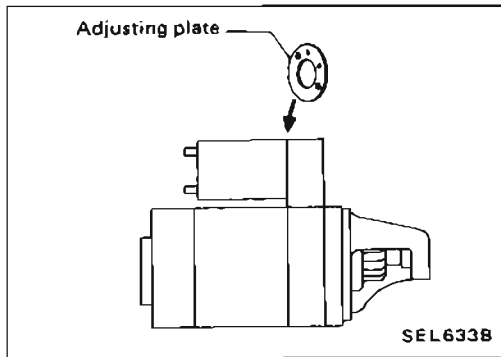
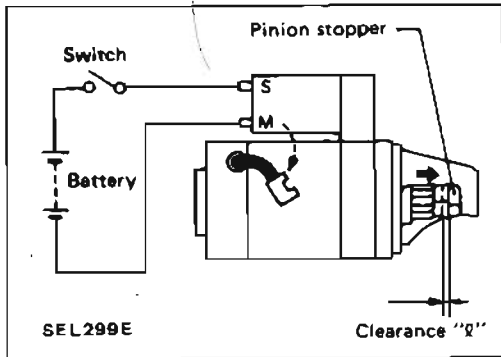
- Gear case metal
- Moving portion of shift lever
- Plunger of magnetic switch
- Internal gear
- Planetary gear
- Shaft

Assembly (Cont'd)

PINION PROTRUSION LENGTH ADJUSTMENT

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 by adjusting plate.

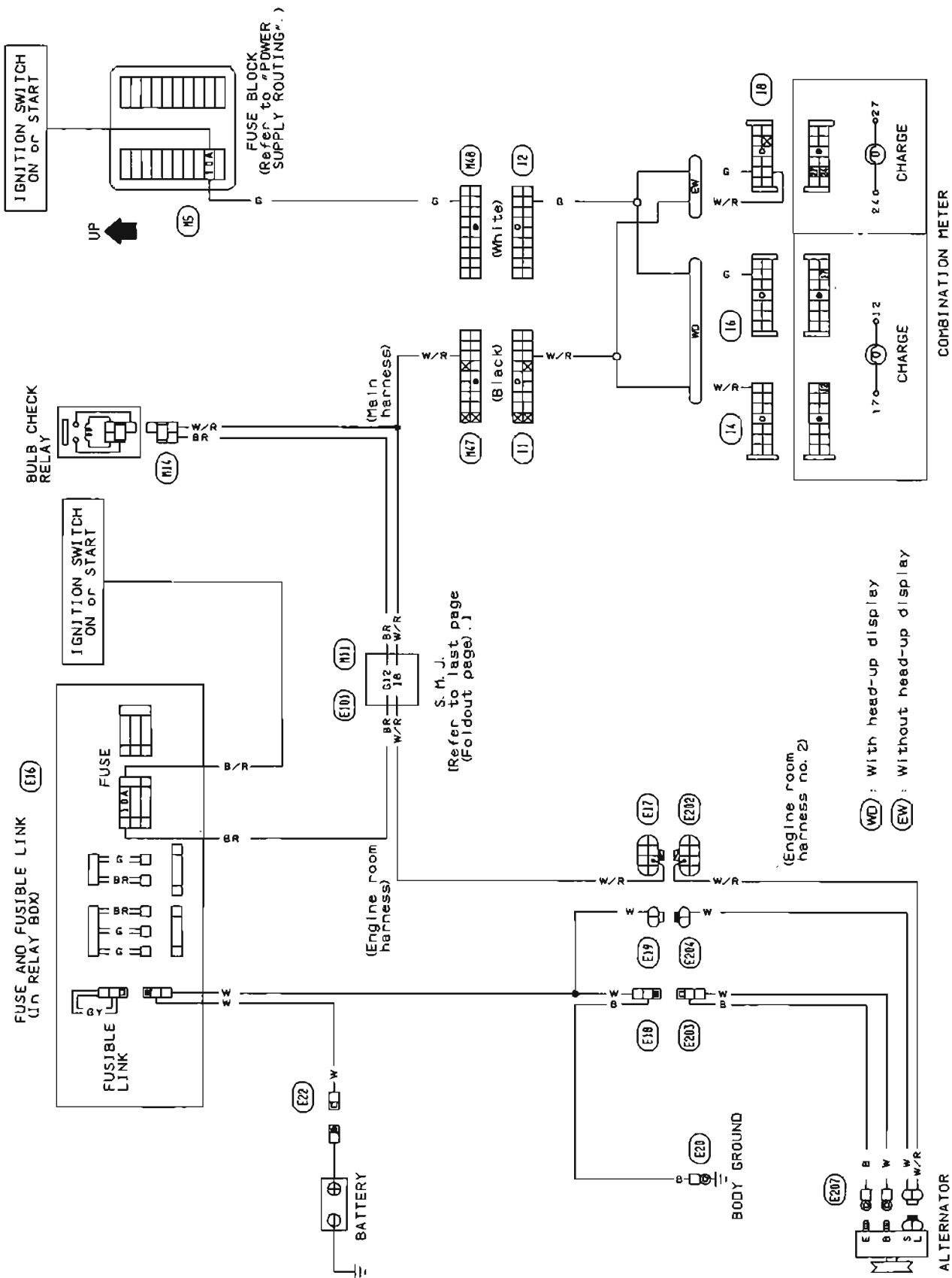
Service Data and Specifications (S.D.S.)

STARTER

| Type | S114-519A | | M1T72781 | |
|--|---------------------|---------------------------------------|---------------------------------------|--|
| | HITACHI make | | MITSUBISHI make | |
| | Reduction gear type | | | |
| Applied model | All | | | |
| System voltage | V | 12 | | |
| No-load Terminal voltage | V | 11.0 | | |
| Current | A | Less than 85 | 50 - 75 | |
| Revolution | rpm | More than 2,750 | 3,000 - 4,000 | |
| Minimum diameter of commutator | mm (in) | 32.0 (1.260) | 28.8 (1.134) | |
| Minimum length of brush | mm (in) | 11.0 (0.433) | 12.0 (0.472) | |
| Brush spring tension | N (kg, lb) | 17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9) | 13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7) | |
| Clearance of bearing metal and armature shaft | mm (in) | 0.2 (0.008) | — | |
| Clearance "ℓ" between pinion front edge and pinion stopper | mm (in) | 0.3 - 1.5 (0.012 - 0.059) | 0.5 - 2.0 (0.020 - 0.079) | |

CHARGING SYSTEM

Wiring Diagram



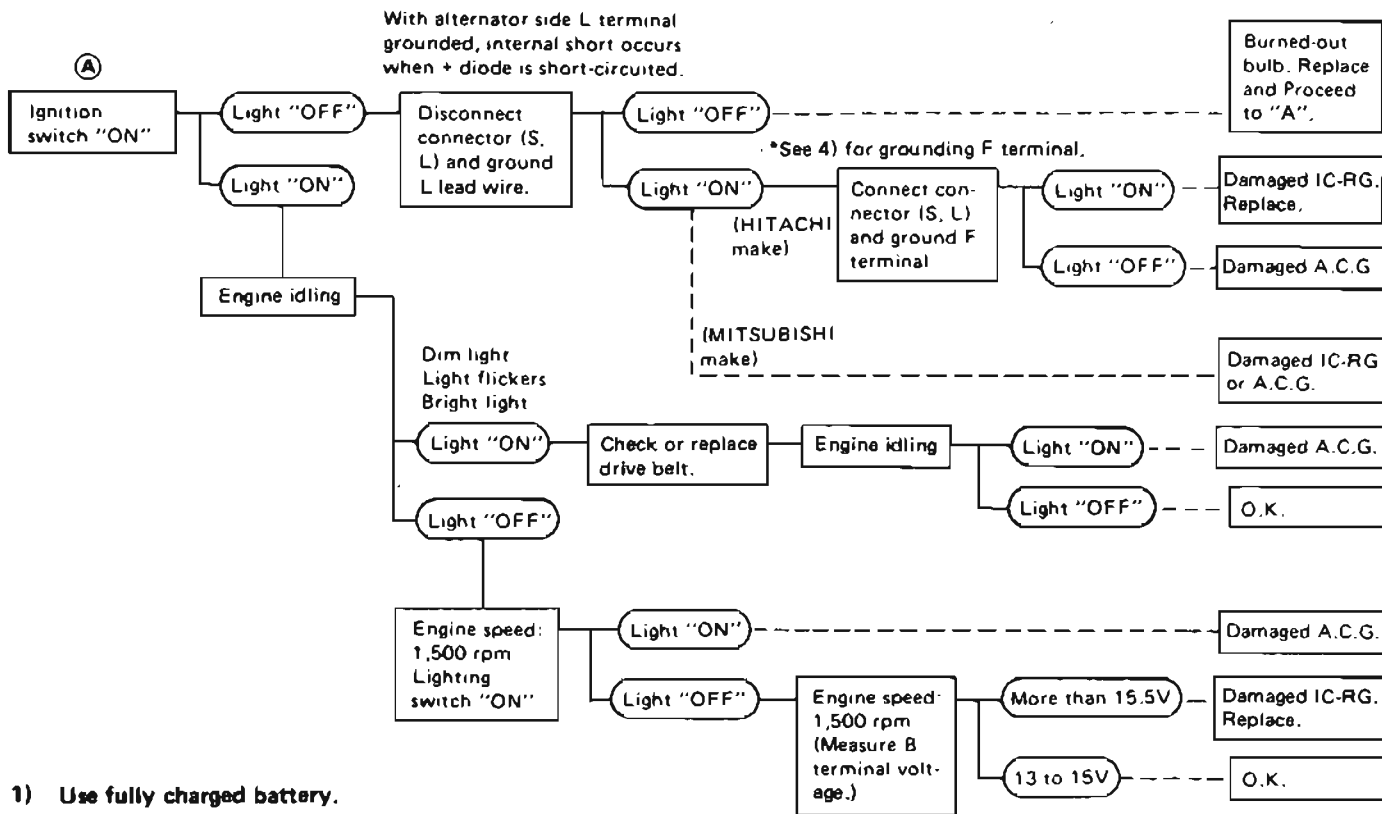
CHARGING SYSTEM

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.

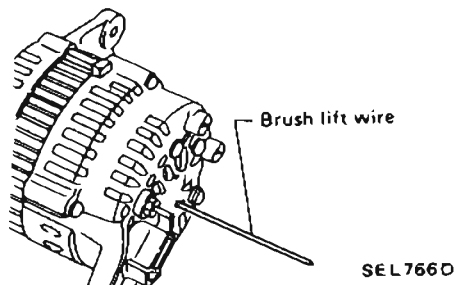
WITH IC REGULATOR



- 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)

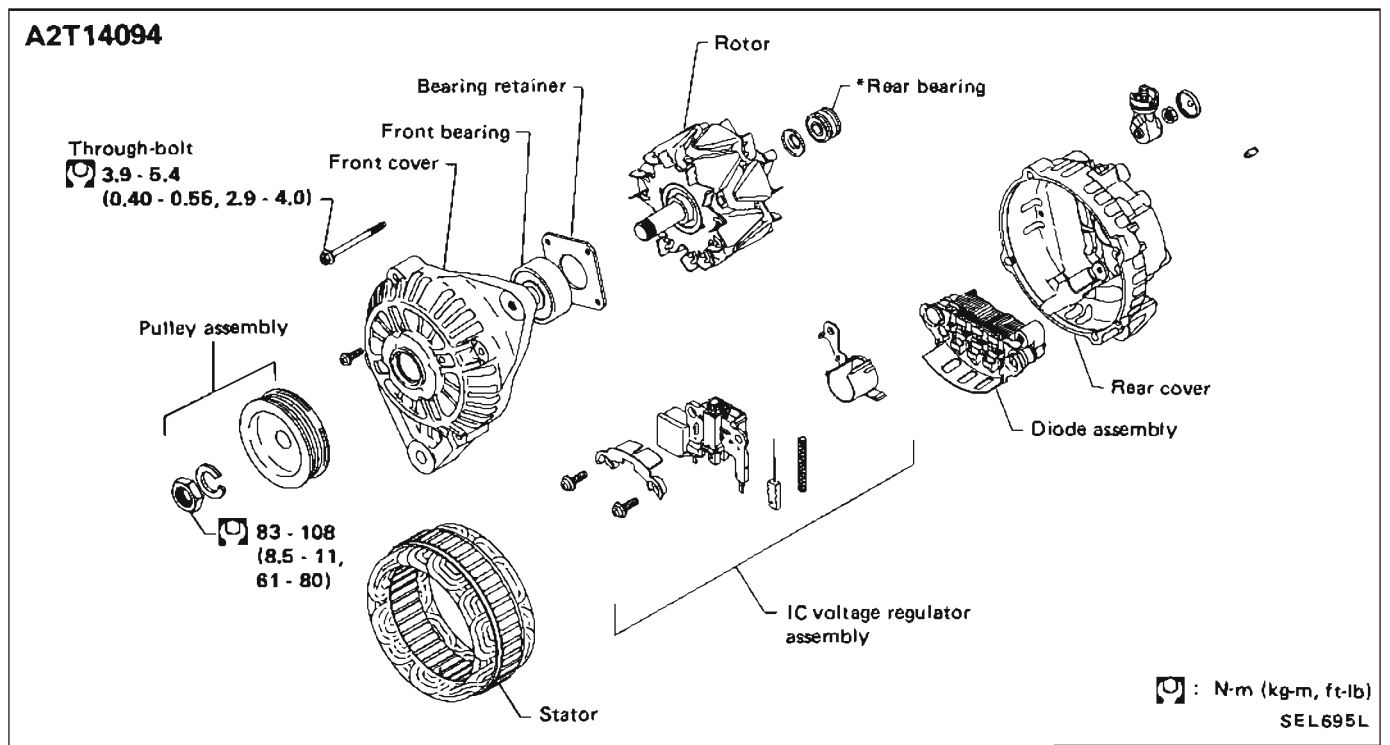
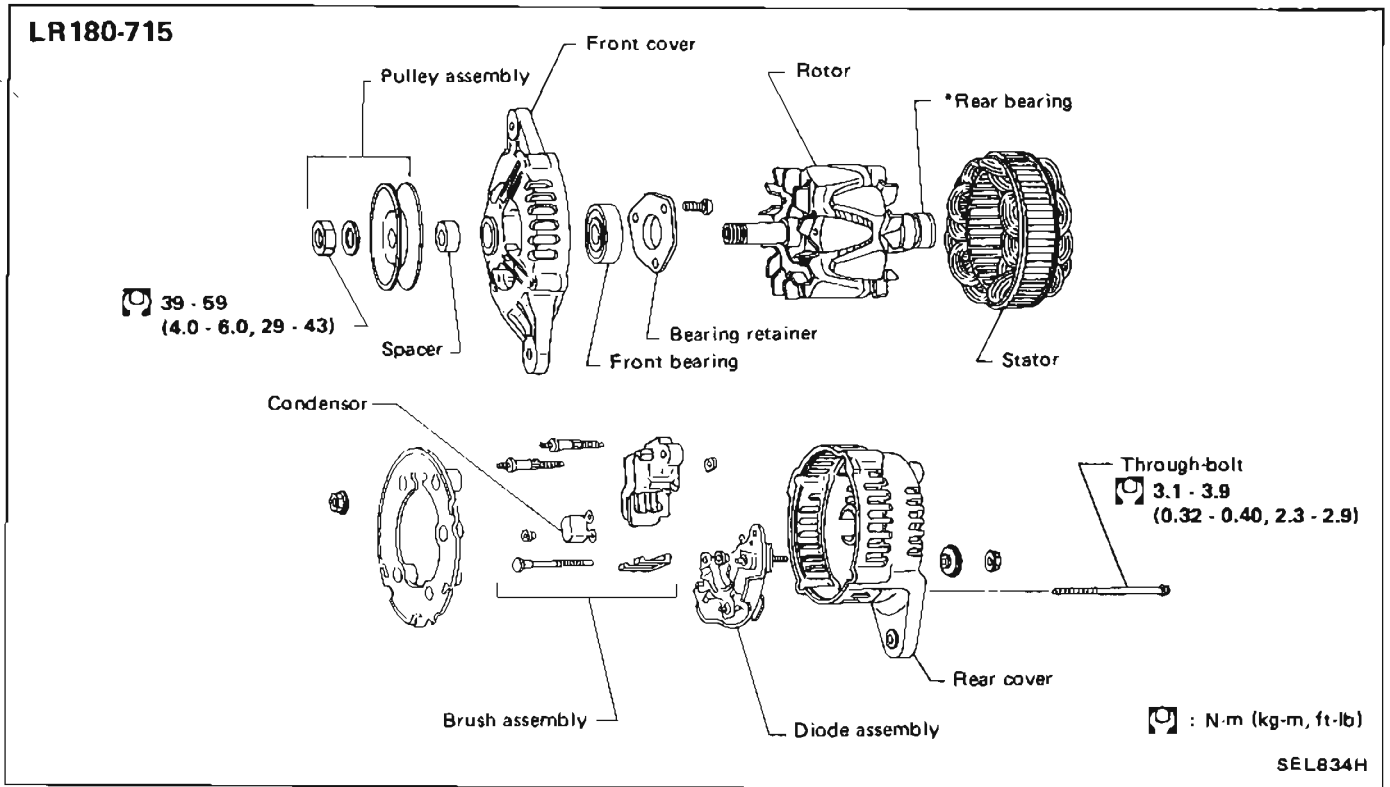
Gasoline engine model

Contact tip of wire with brush and attach wire to alternator body.



- 5) Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.

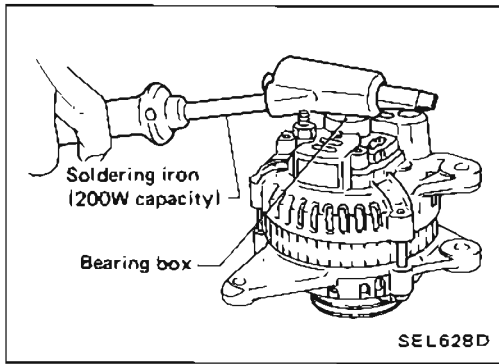
Construction



*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.



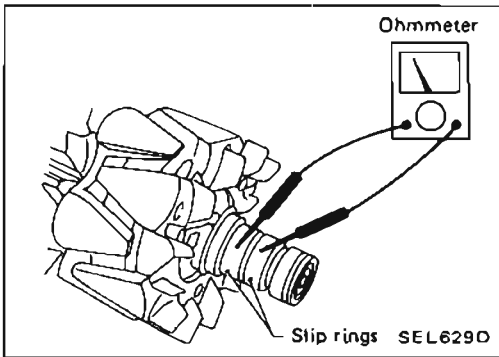
Disassembly

REAR COVER REMOVAL

CAUTION:

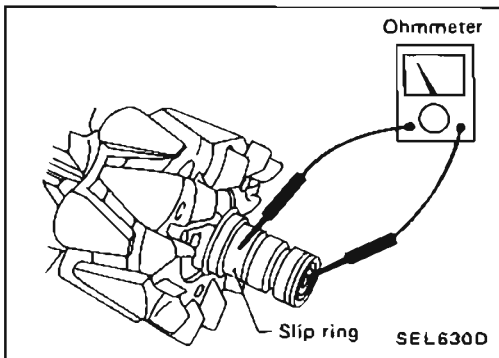
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron.

Do not use a heat gun, as it can damage diode assembly.

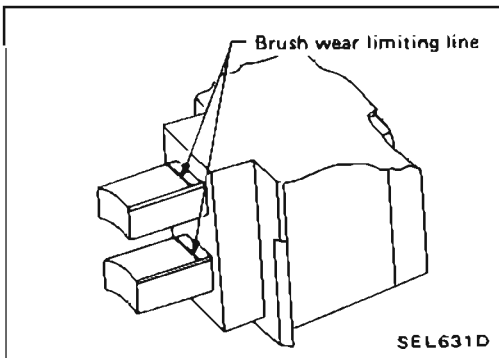


Rotor Slip Ring Check

1. Continuity test
 - No continuity ... Replace rotor.

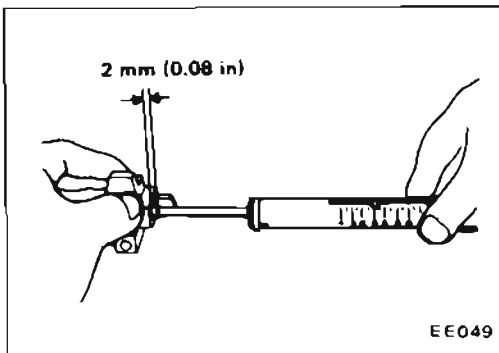


2. Insulator test
 - Continuity exists. ... Replace rotor.
3. Check slip ring for wear.
 - Slip ring minimum outer diameter:
Refer to S.D.S.



Brush Check

1. Check smooth movement of brush.
 - Not smooth ... Check brush holder and clean.
2. Check brush for wear.
 - Replace brush if it is worn down to the limit line.



3. Check brush lead wire for damage.
 - Damaged ... Replace.
4. Check brush spring pressure.
 - Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

Spring pressure:

Refer to S.D.S.

- Not within the specified values ... Replace.

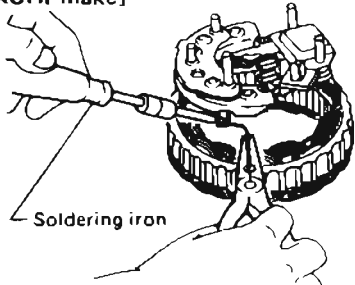
Stator Check

To test the stator or diode, 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.

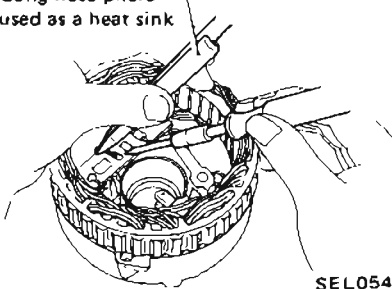
[HITACHI make]



SEL587A

[MITSUBISHI make]

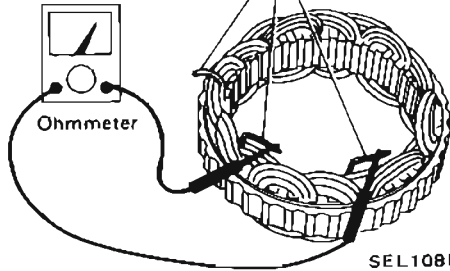
Long nose pliers
used as a heat sink



SEL054D

[HITACHI make]

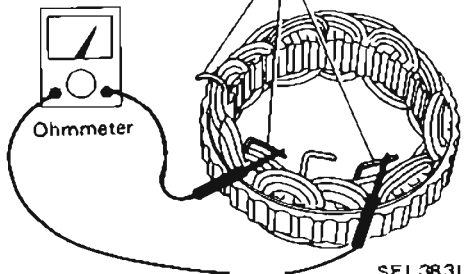
Lead wire



SEL108E

[MITSUBISHI make]

Lead wire



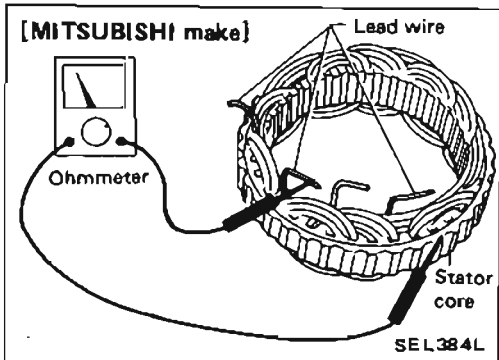
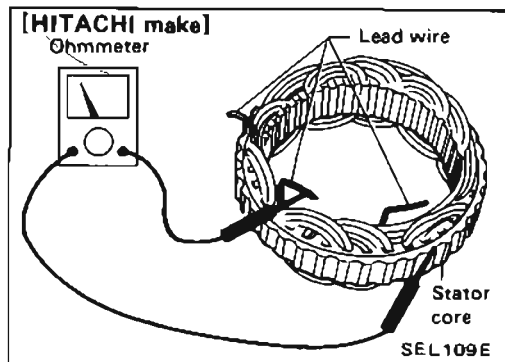
SEL383L

1. Continuity test

- No continuity ... Replace stator.

Stator Check (Cont'd)

2. Ground test
 - Continuity exists. ... Replace stator.



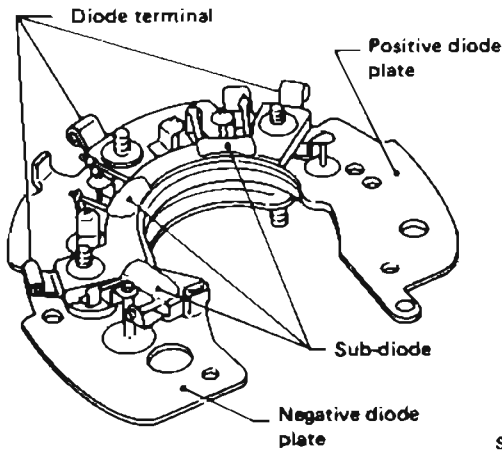
Diode Check

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.

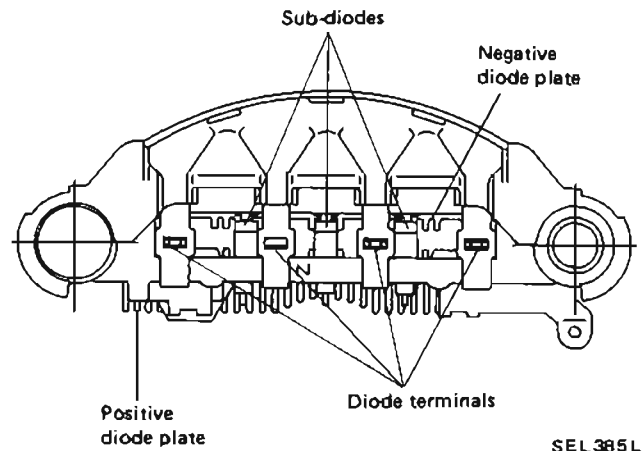
| | Ohmmeter probes | | Continuity |
|------------------------------|----------------------|----------------------|------------|
| | Positive ⊕ | Negative ⊖ | |
| Diodes check (Positive side) | Positive diode plate | Diode terminals | Yes |
| | Diode terminals | Positive diode plate | No |
| Diodes check (Negative side) | Negative diode plate | Diode terminals | No |
| | Diode terminals | Negative diode plate | Yes |

[HITACHI make]

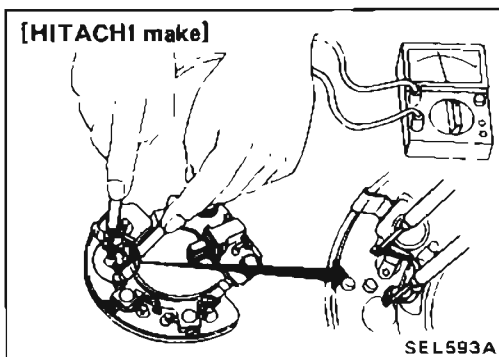
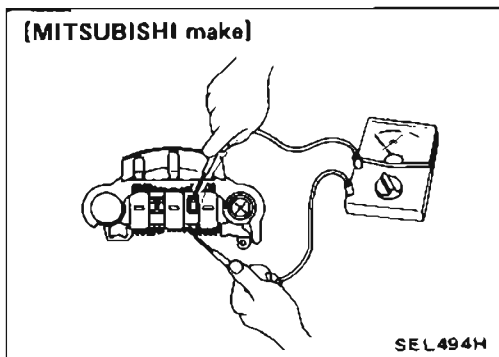


SEL768D

[MITSUBISHI make]



SEL385L



Diode Check (Cont'd)

SUB-DIODES

- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

Assembly

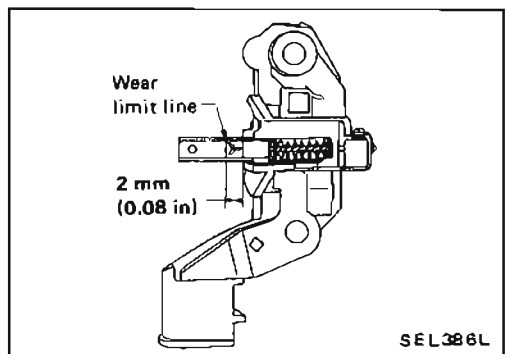
Carefully observe the following instructions.

- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.

WHEN SOLDERING BRUSH LEAD WIRE

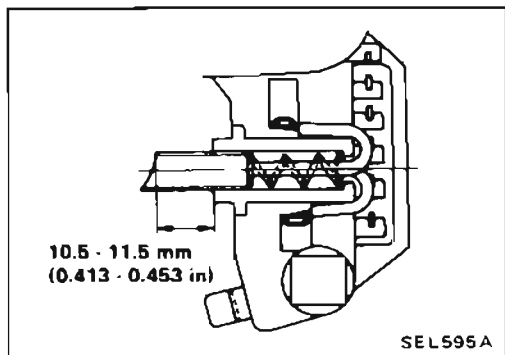
[MITSUBISHI make]

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.



[HITACHI make]

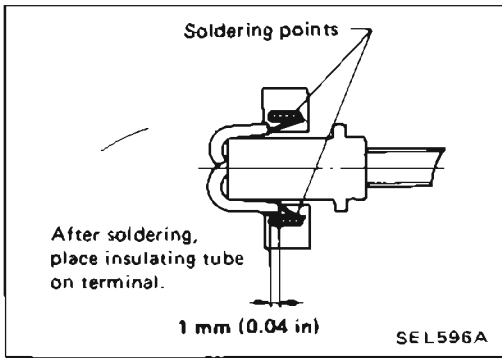
- (1) Position brush so that it extends 10.5 to 11.5 mm (0.413 to 0.453 in) from brush holder.



Assembly (Cont'd)

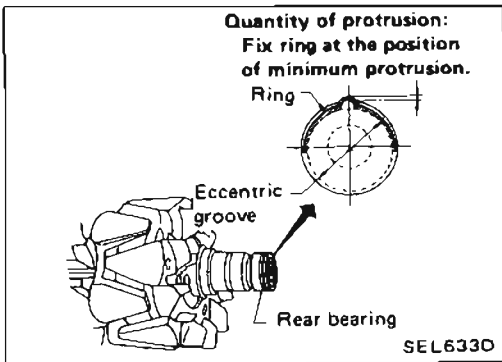
(2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.



RING FITTING IN REAR BEARING

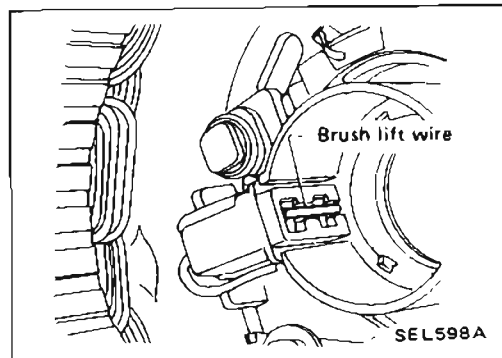
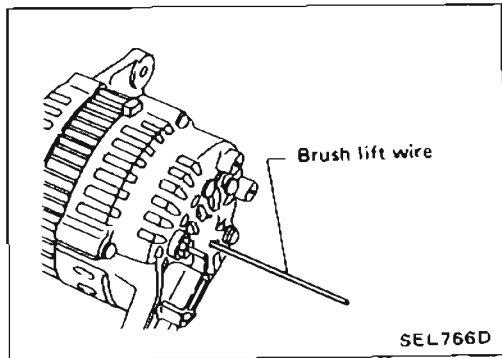
- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.



REAR COVER INSTALLATION

- (1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.
- (2) After installing front and rear sides of alternator, pull brush lift wire by pushing toward the center.

Do not pull brush lift wire by pushing toward outside of rear cover as it will damage slip ring sliding surface.



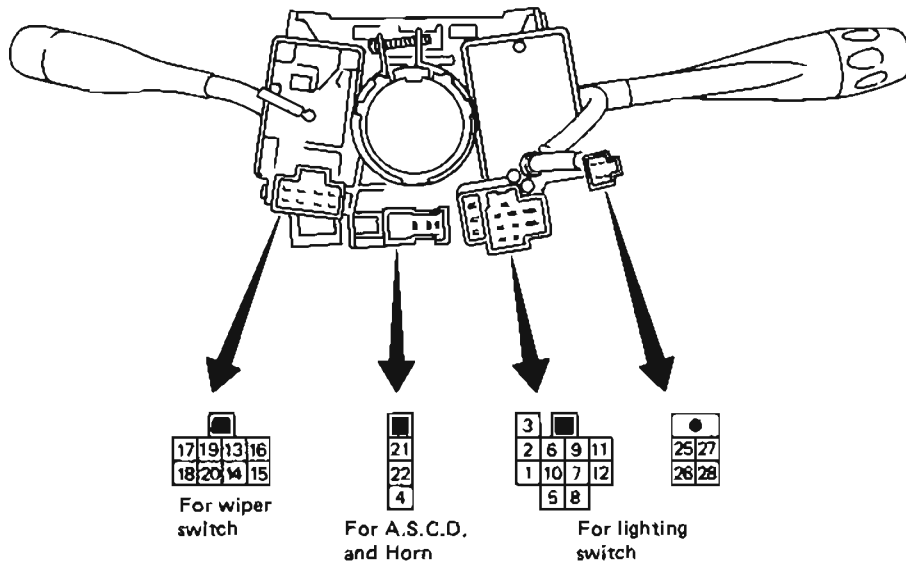
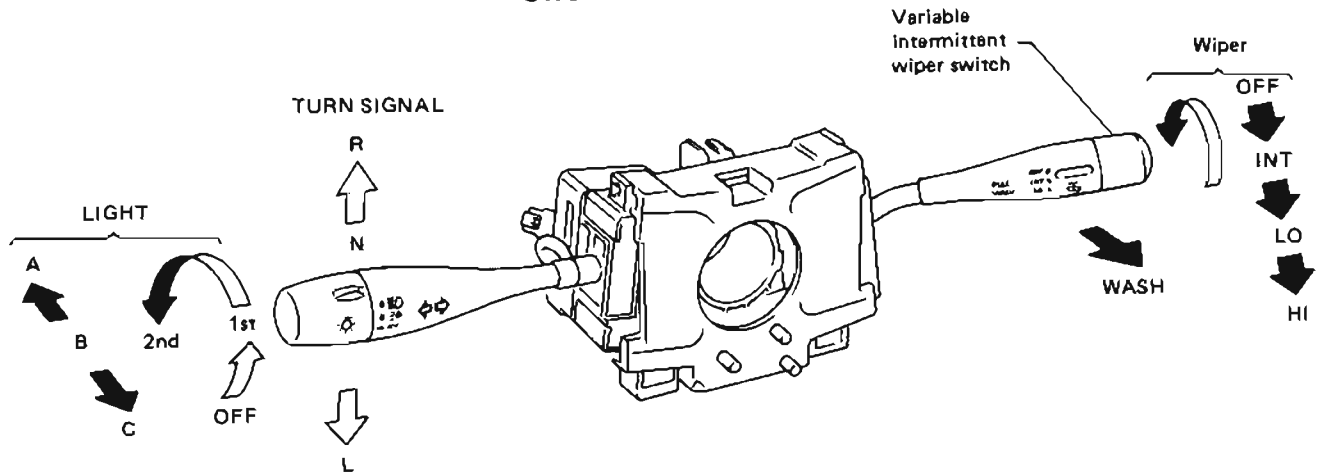
Service Data and Specifications (S.D.S.)

ALTERNATOR

| | | | |
|--|-----------|--|--|
| Type | | LR180-715 | A2T14094 |
| Applied model | | All | |
| Nominal rating | V-A | 12-80 | |
| Ground polarity | | Negative | |
| Minimum revolution under no-load (When 13.5 volts is applied) | rpm | Less than 950 | Less than 1,100 |
| Hot output current | A/rpm | More than 22/1,300 More than 58/2,500 More than 77/5,000 | More than 21/1,300 More than 60/2,500 |
| Regulated output voltage | V | 14.1 - 14.7 | |
| Minimum length of brush | mm (in) | 6.0 (0.236) | 8.0 (0.315) |
| Brush spring pressure | N (g, oz) | 1.471 - 3.334 (150 - 340, 5.29 - 11.99) | 3.040 - 4.217 (310 - 430, 10.93 - 15.17) |
| Slip ring minimum outer diameter | mm (in) | 26.8 (1.056) | 22.1 (0.870) |

COMBINATION SWITCH

Check



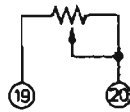
LIGHTING SWITCH

| | OFF | | | 1 | | | 2 | | |
|----|-----|---|---|---|---|---|---|---|---|
| | A | B | C | A | B | C | A | B | C |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| 11 | | | | | | | | | |
| 12 | | | | | | | | | |
| 25 | | | | | | | | | |
| 26 | | | | | | | | | |
| 27 | | | | | | | | | |
| 28 | | | | | | | | | |

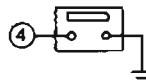
WIPER SWITCH

| | OFF | INT | LO | HI | WASH |
|----|-----|-----|----|----|------|
| | 13 | | | | |
| 14 | | | | | |
| 15 | | | | | |
| 16 | | | | | |
| 17 | | | | | |
| 18 | | | | | |

INTERMITTENT WIPER VOLUME



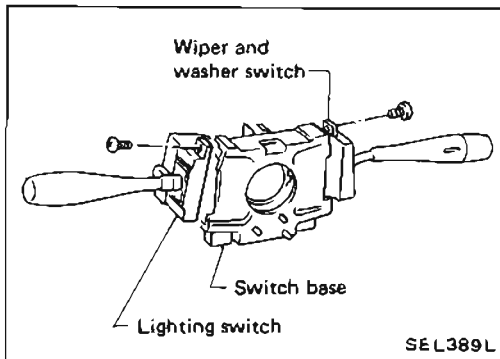
HORN SWITCH



| | R | N | L |
|---|---|---|---|
| | 1 | | |
| 2 | | | |
| 3 | | | |

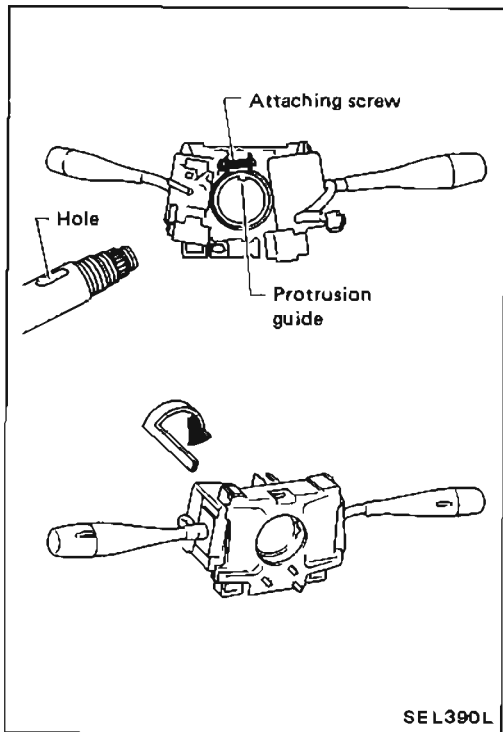
TURN SIGNAL SWITCH

COMBINATION SWITCH



Replacement

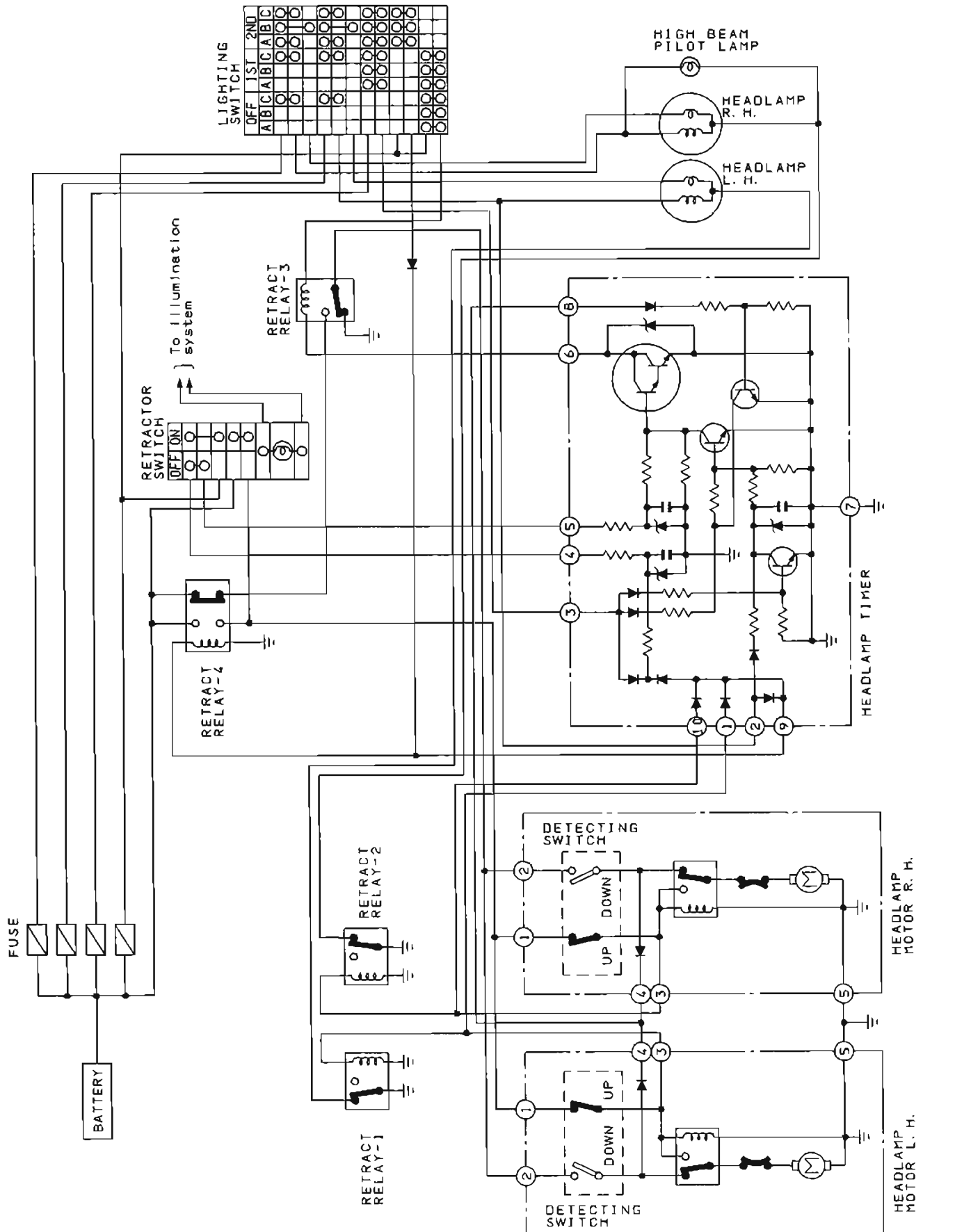
- Each switch can be replaced without removing combination switch base.



- To remove combination switch base, remove base attaching screw and turn after pushing on it.

HEADLAMP

Schematic



SEL469L

HEADLAMP

Description

BASIC OPERATION

| Condition | | Operation | | |
|-------------------------------|------------------|-----------|---|--|
| Lighting switch | Retractor switch | C/O* | Headlamp motor | Headlamps |
| OFF → 1ST | OFF | | No operation | OFF |
| 1ST → 2ND | OFF | [A] | Open | ON after headlamp motor reaches fully open position. |
| 2ND → 1ST | OFF | | Held to open position | OFF |
| 1ST → OFF | OFF | [B] | Closed | OFF |
| Momentarily turned to PASSING | OFF | [C] | Opened and closed after headlamps go off. | Momentarily ON after headlamp motor reaches fully open position, and go off. |
| OFF | ON | [D] | Open | OFF |

*: Refer to CIRCUIT OPERATION.

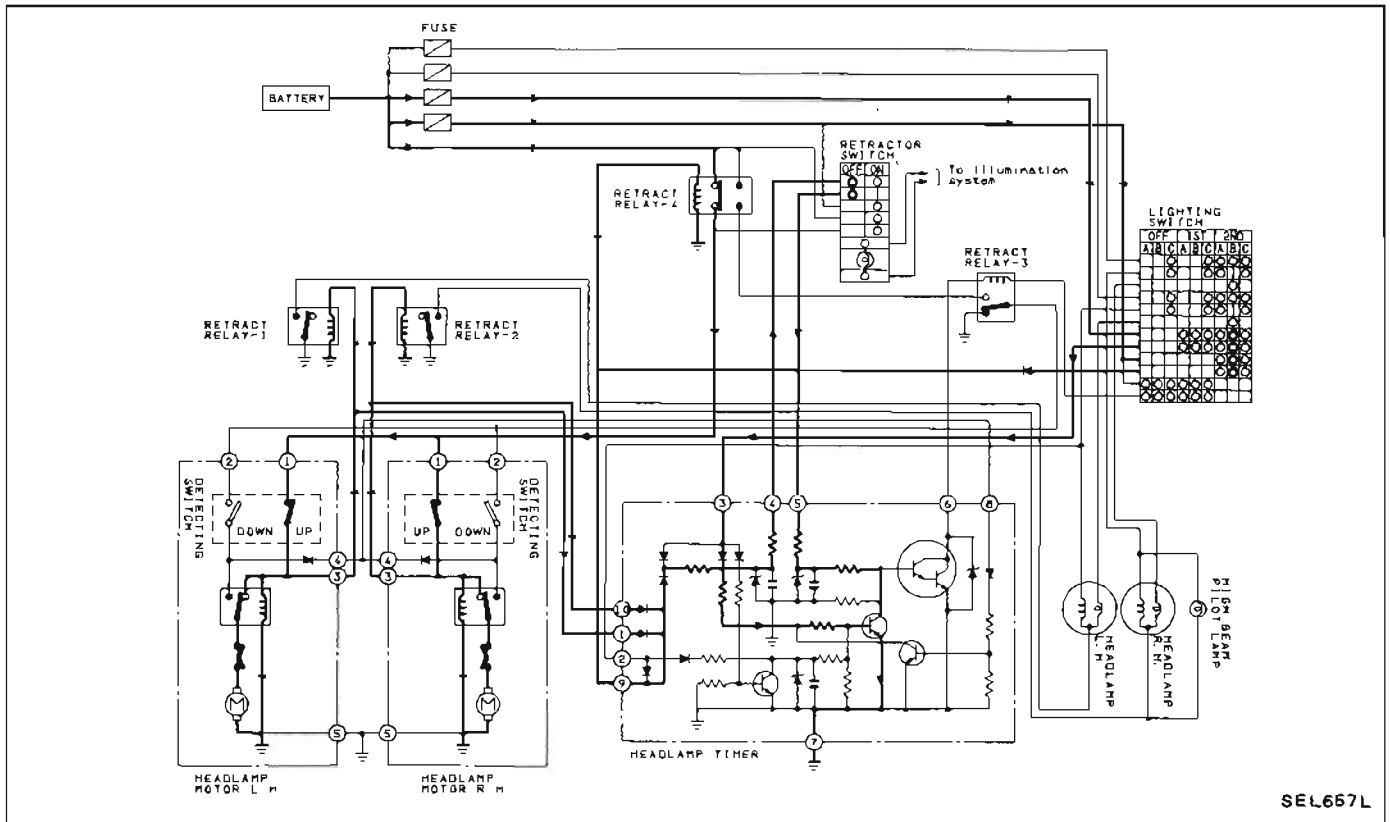
HEADLAMP

Description (Cont'd)

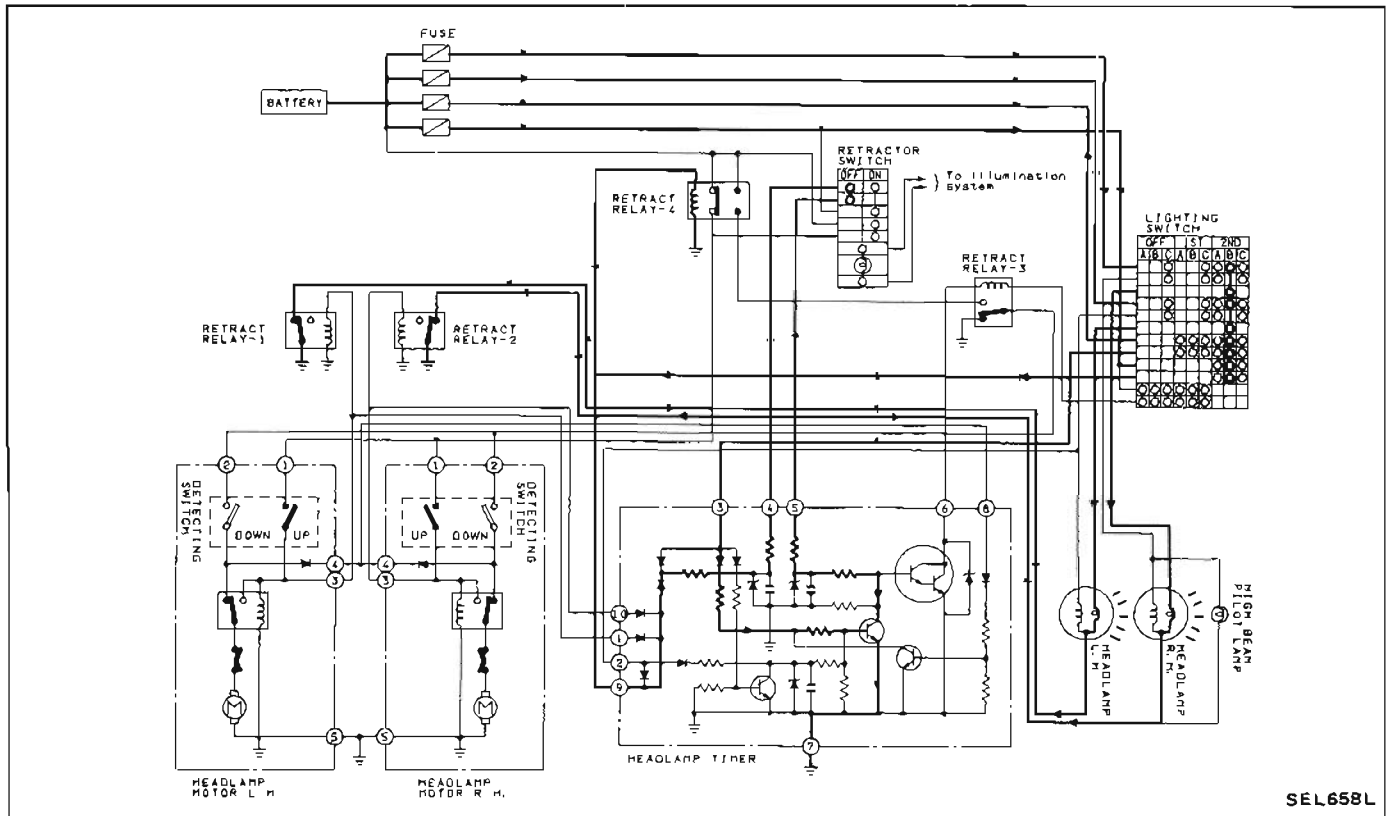
CIRCUIT OPERATION

[A] When lighting switch is switched from "1ST" → "2ND"

A-1: While operating the headlamp motor to open position



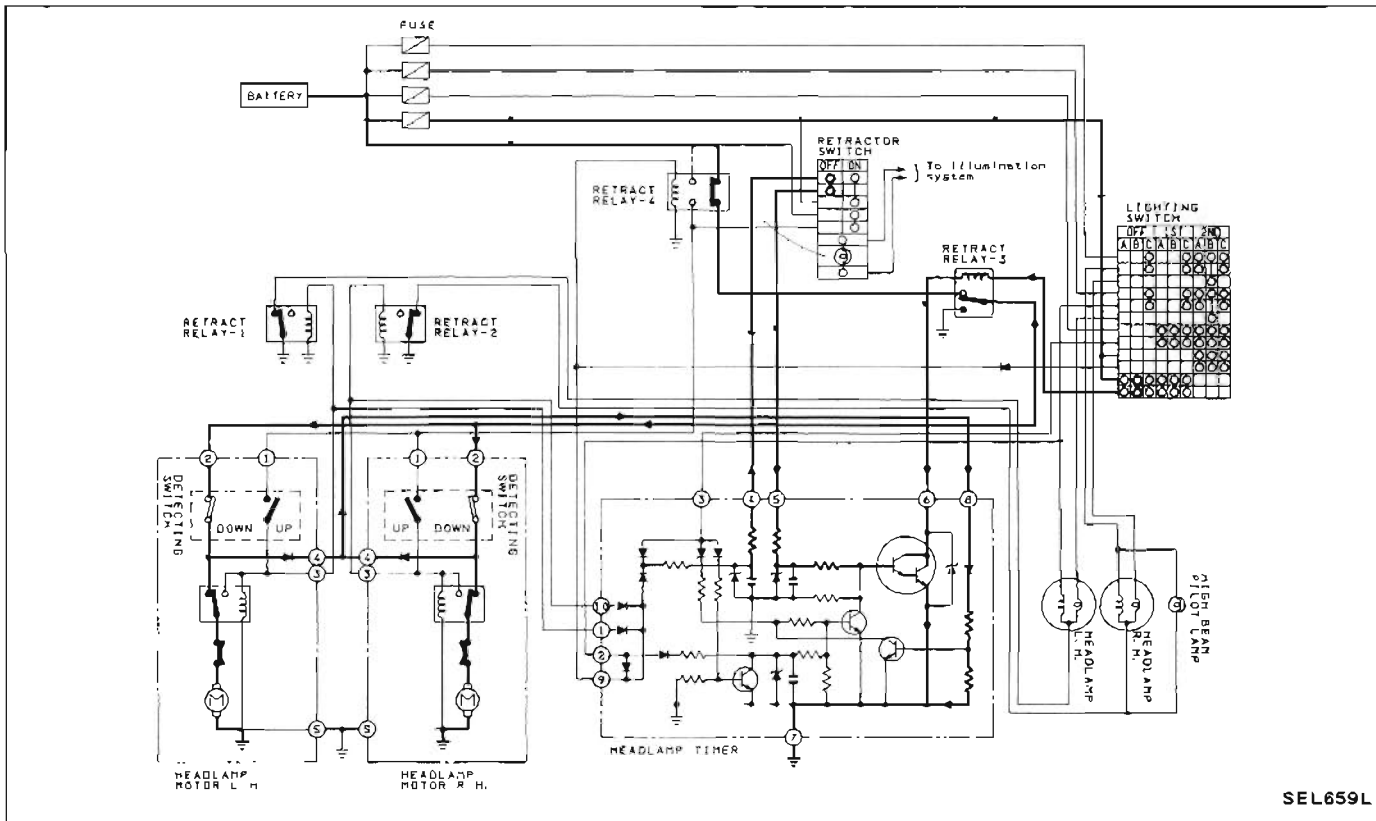
A-2: After the headlamp motor reaches fully open position



HEADLAMP

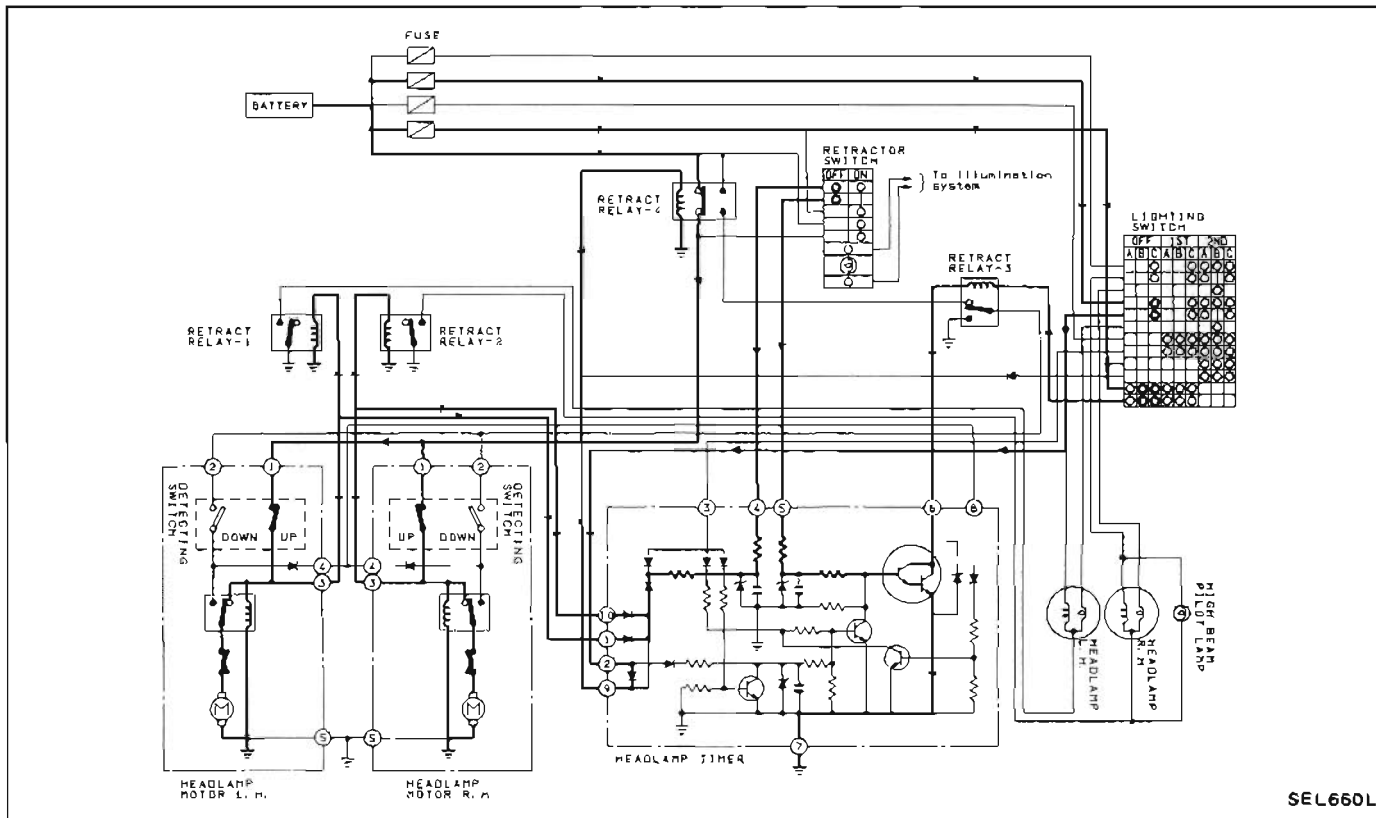
Description (Cont'd)

[B] When lighting switch is switched from "1ST" → "OFF"
(While operating the headlamp motor to closed position)



SEL659L

[C] When lighting switch is switched to "PASSING"
C-1: While operating the headlamp motor to open position

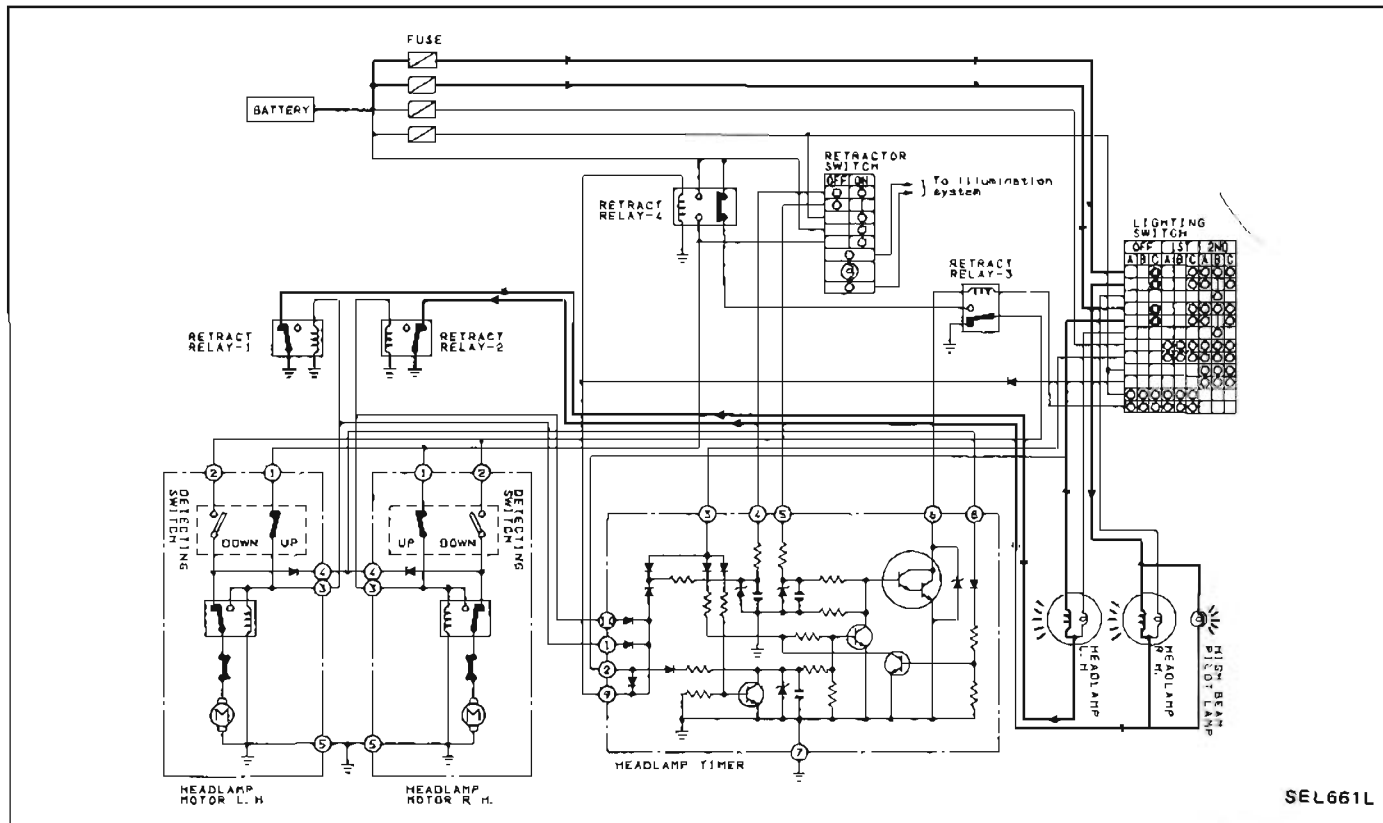


SEL660L

HEADLAMP

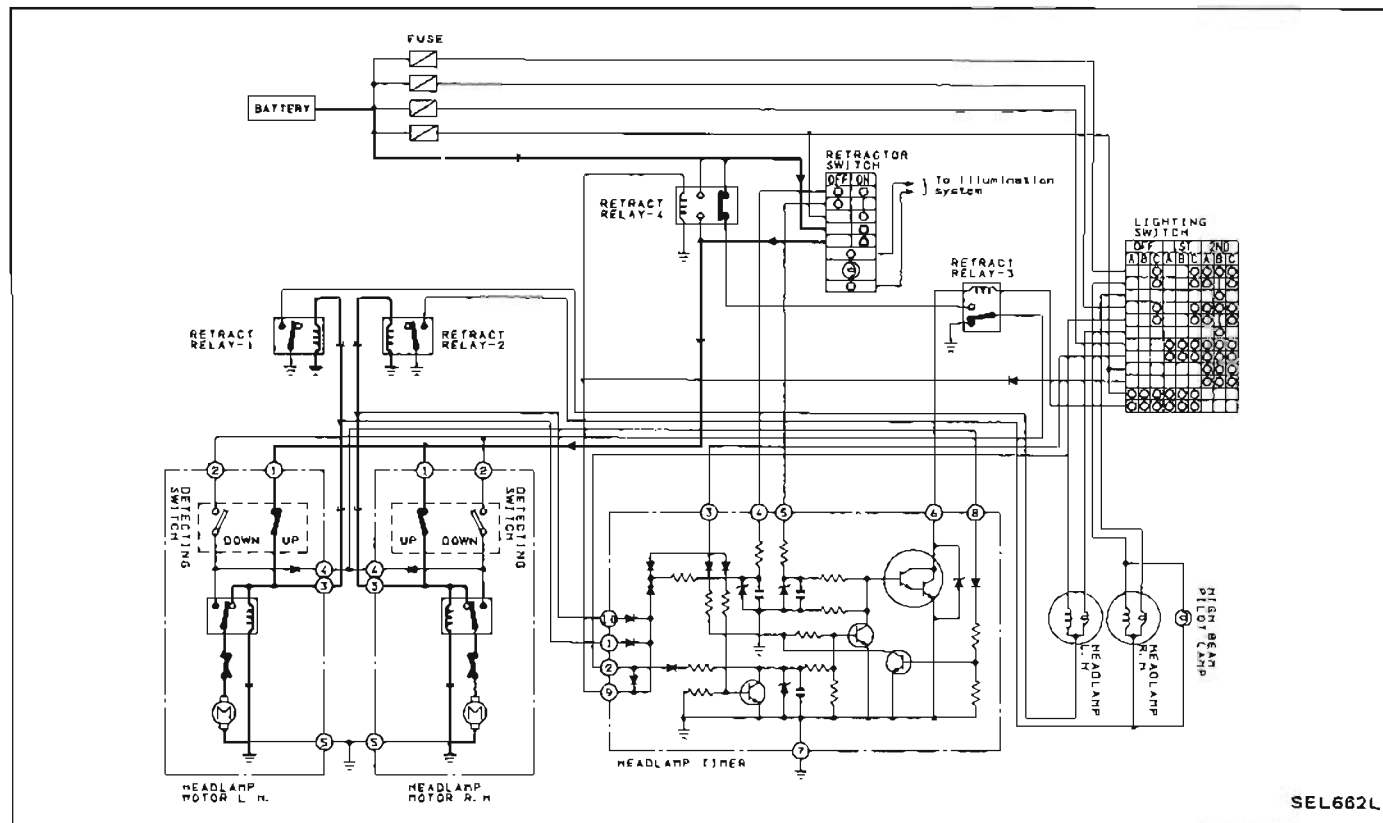
Description (Cont'd)

C-2: After the headlamp reaches fully open position



SEL661L

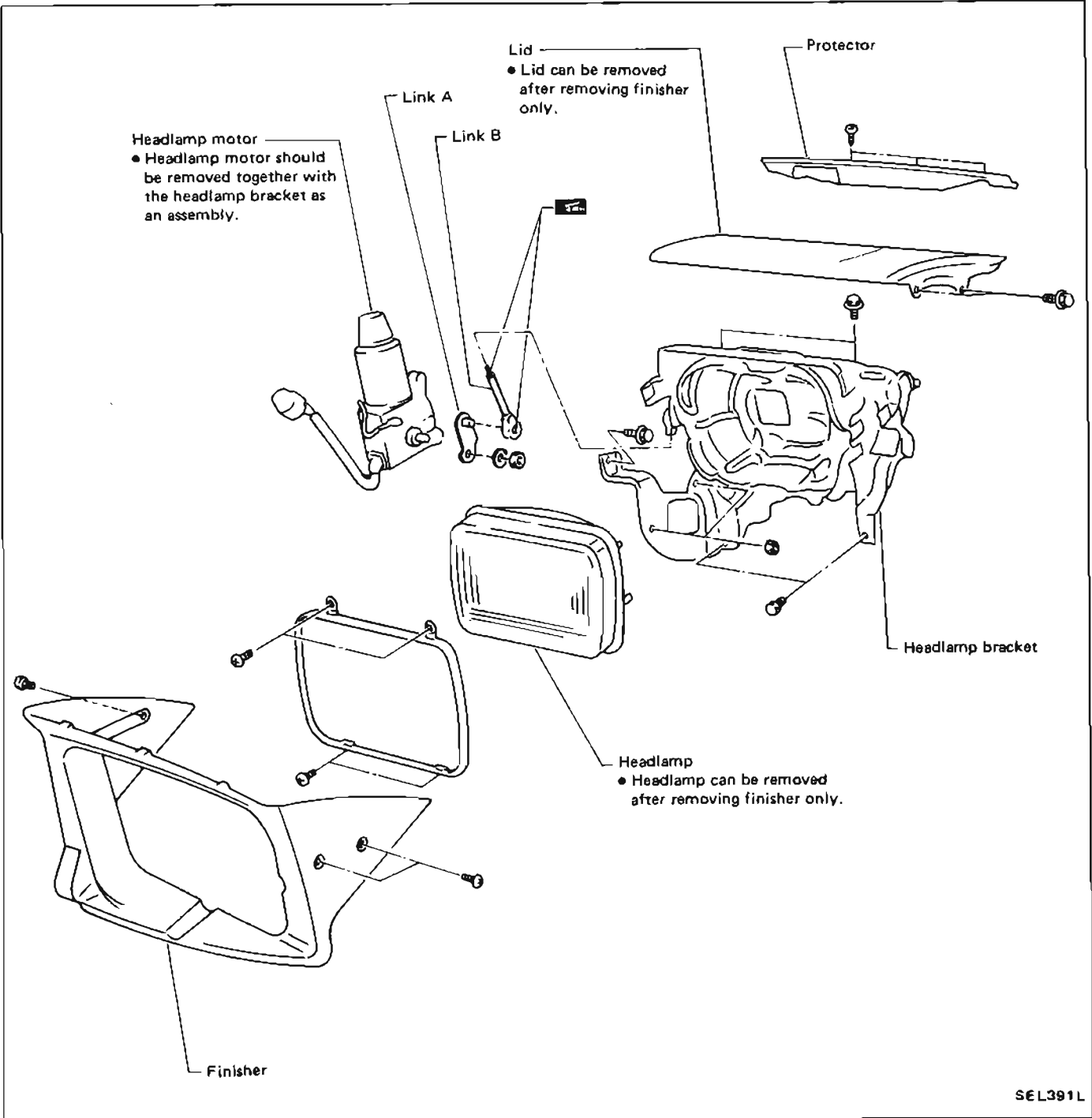
[D] When retractor switch is turned ON (While operating the headlamp motor to open position)



SEL662L

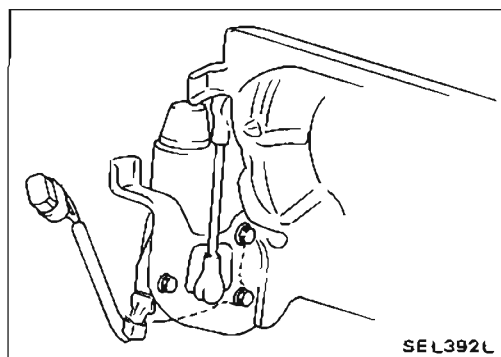
HEADLAMP

Constructions



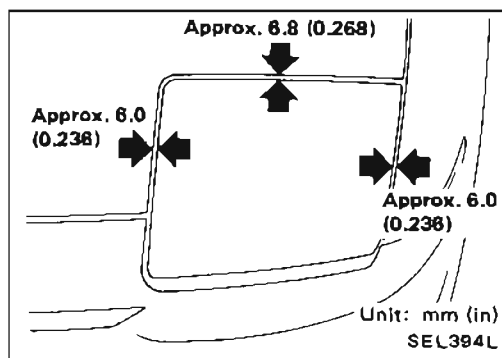
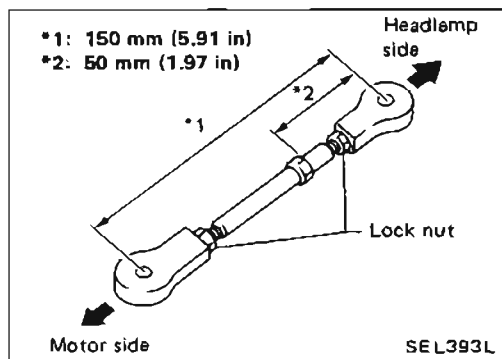
SEL391L

HEADLAMP



Assembly

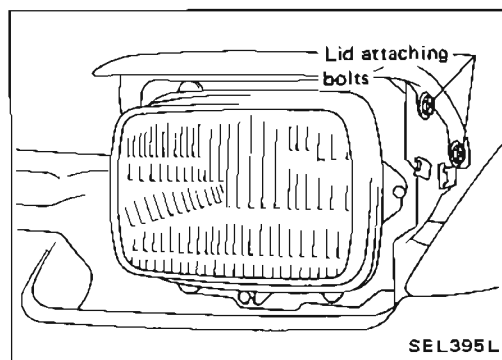
1. Install headlamp motor, ball joint and link A (as one unit) on headlamp bracket.
2. While turning link B, install link A's ball joint on headlamp housing's ball joint.
3. Set distance between centers of upper and lower ball joints as shown in figure at left, and tighten lock nuts.
4. Assemble headlamp, finisher and lid.



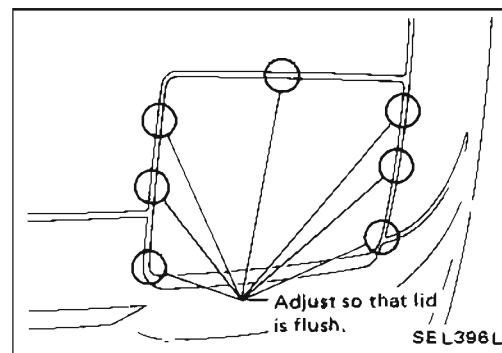
Installation and Adjustment

Before doing this, be sure to disconnect battery ground cable.

1. Install headlamp bracket to body temporarily.
 - 1) Determine headlamp bracket location on body so that alignment between lid, hood, and fender looks straight.
 - 2) After adjusting alignment, tighten headlamp bracket to body.

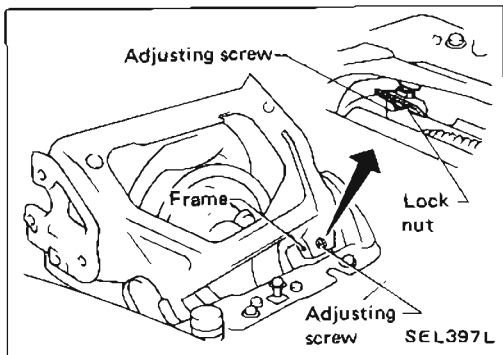


2. Adjust lid alignment.
 - Adjust lid, hood and fender for alignment while opening and closing headlamp with motor manual knob.
Use motor manual knob to open and close headlamp, and adjust alignment while checking that lid is not interfering with hood.

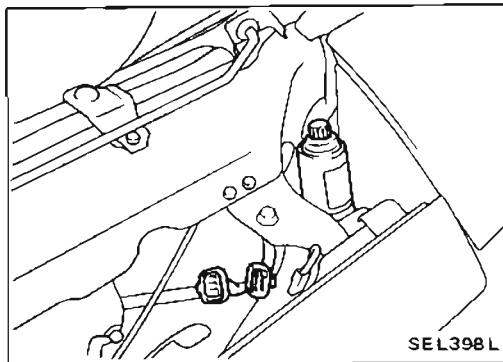


HEADLAMP

Installation and Adjustment (Cont'd)

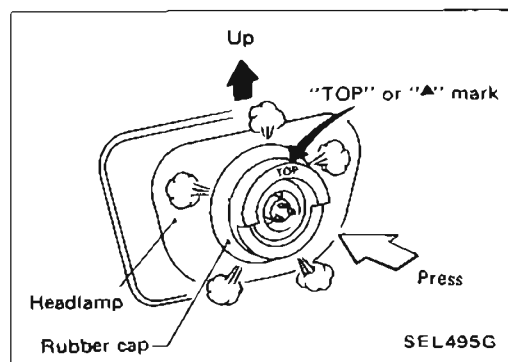
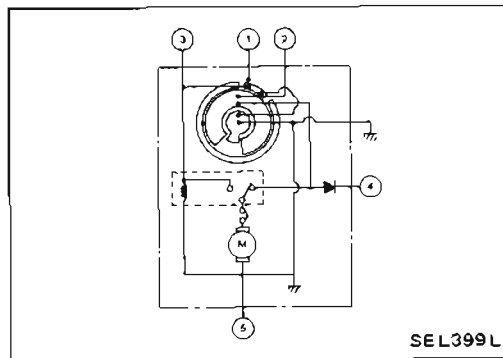


3. Adjust stopper.
 - 1) Loosen lock nut on stopper.
 - 2) Turn motor manual knob to open headlamp assembly completely.
 - 3) Adjust stopper screw.



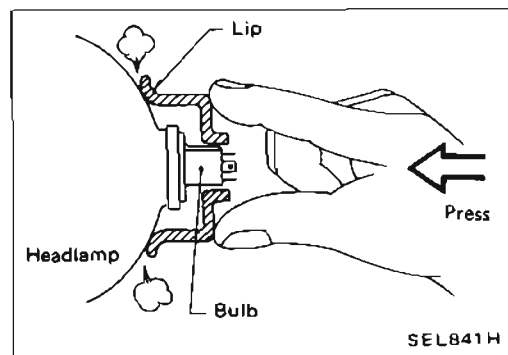
Headlamp Motor Check

1. Disconnect battery ground cable.
2. Disconnect the headlamp motor connector.
3. Use an ohmmeter to check for continuity in headlamp motor circuit while rotating motor with manual knob.



INSTALLING HEADLAMP RUBBER CAP

When installing the rubber cap, set the "TOP" or "▲" mark so that it is facing up.



Press the rubber cap firmly so that the lip makes contact with the headlamp body.

HEADLAMP

Aiming Adjustment

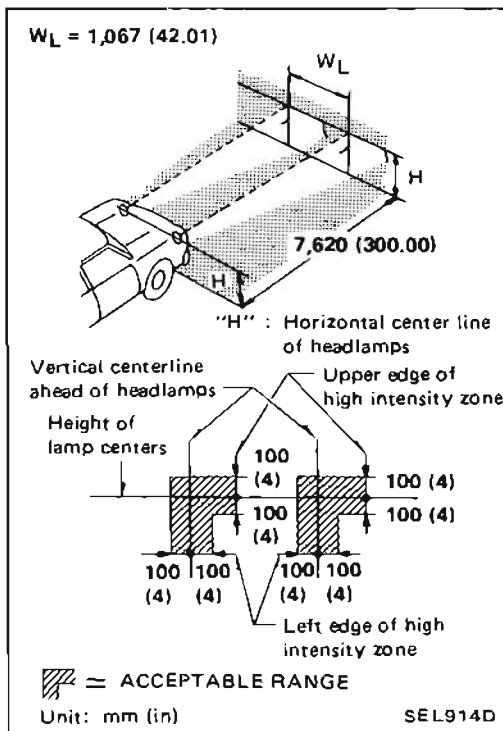
When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

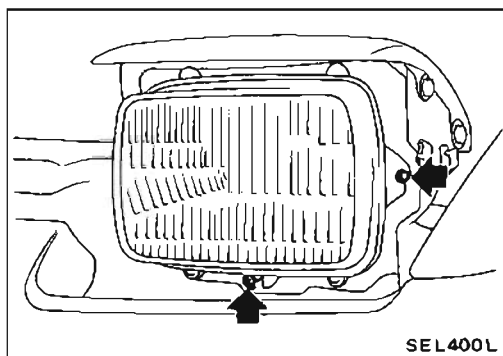
For details, refer to the regulations in your own country.

CAUTION:

- Keep all tires inflated to correct pressures.
- Place vehicle and tester on one and same flat surface.
- 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).



- Adjust headlamps so that upper edge and left edge of high intensity zone are within the acceptable range as shown.
- Dotted lines in illustration show center of headlamp.



ADJUSTING SCREWS

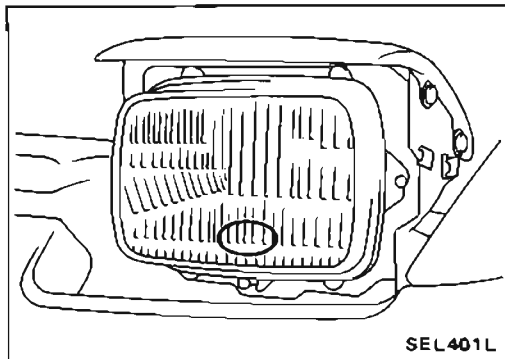
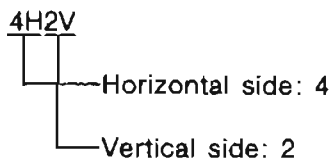
HEADLAMP

Aiming Adjustment (Cont'd)

AIMER ADJUSTMENT MARK

When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

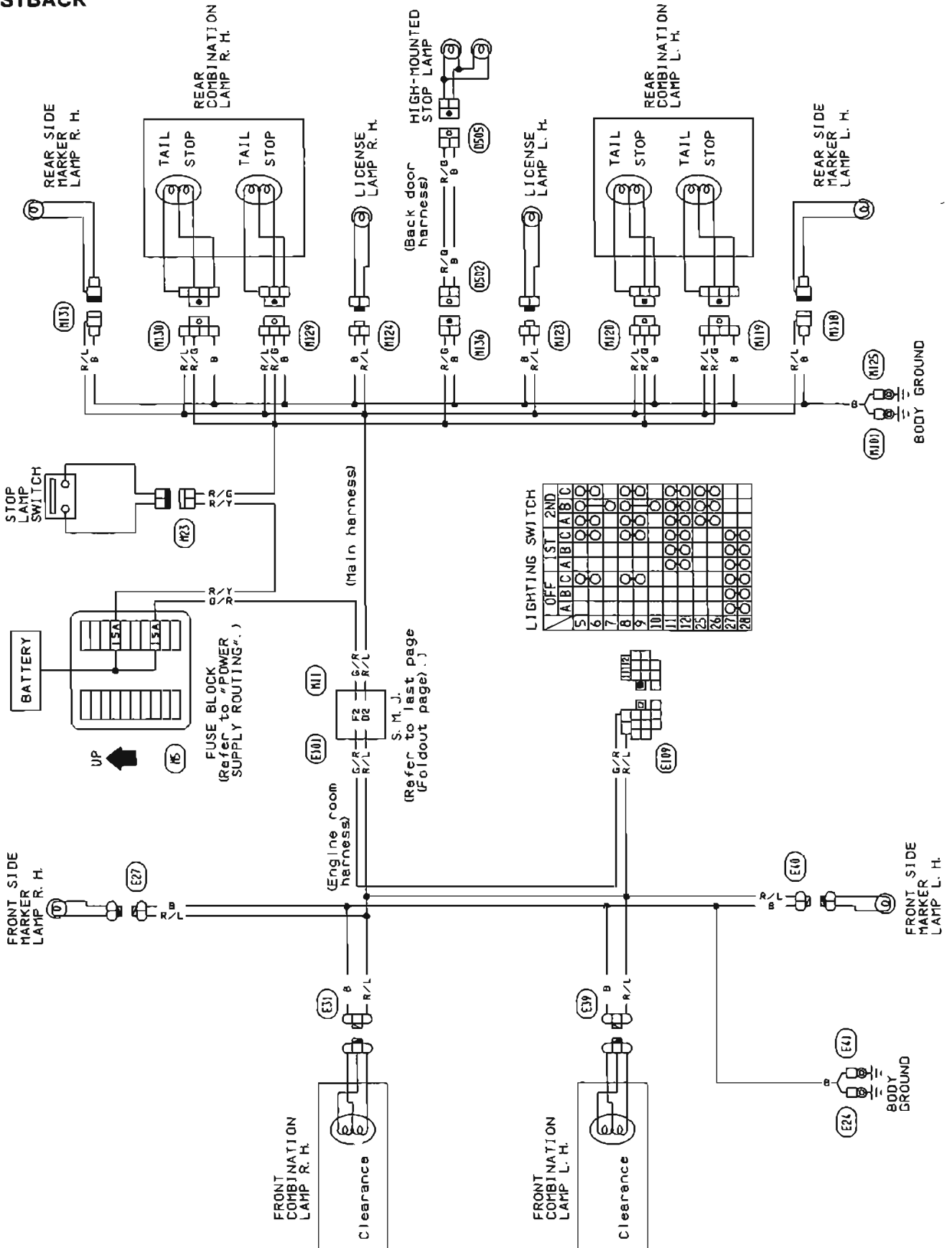
Example:



EXTERIOR LAMP

Clearance, License, Tail and Stop Lamps/Wiring Diagram

FASTBACK

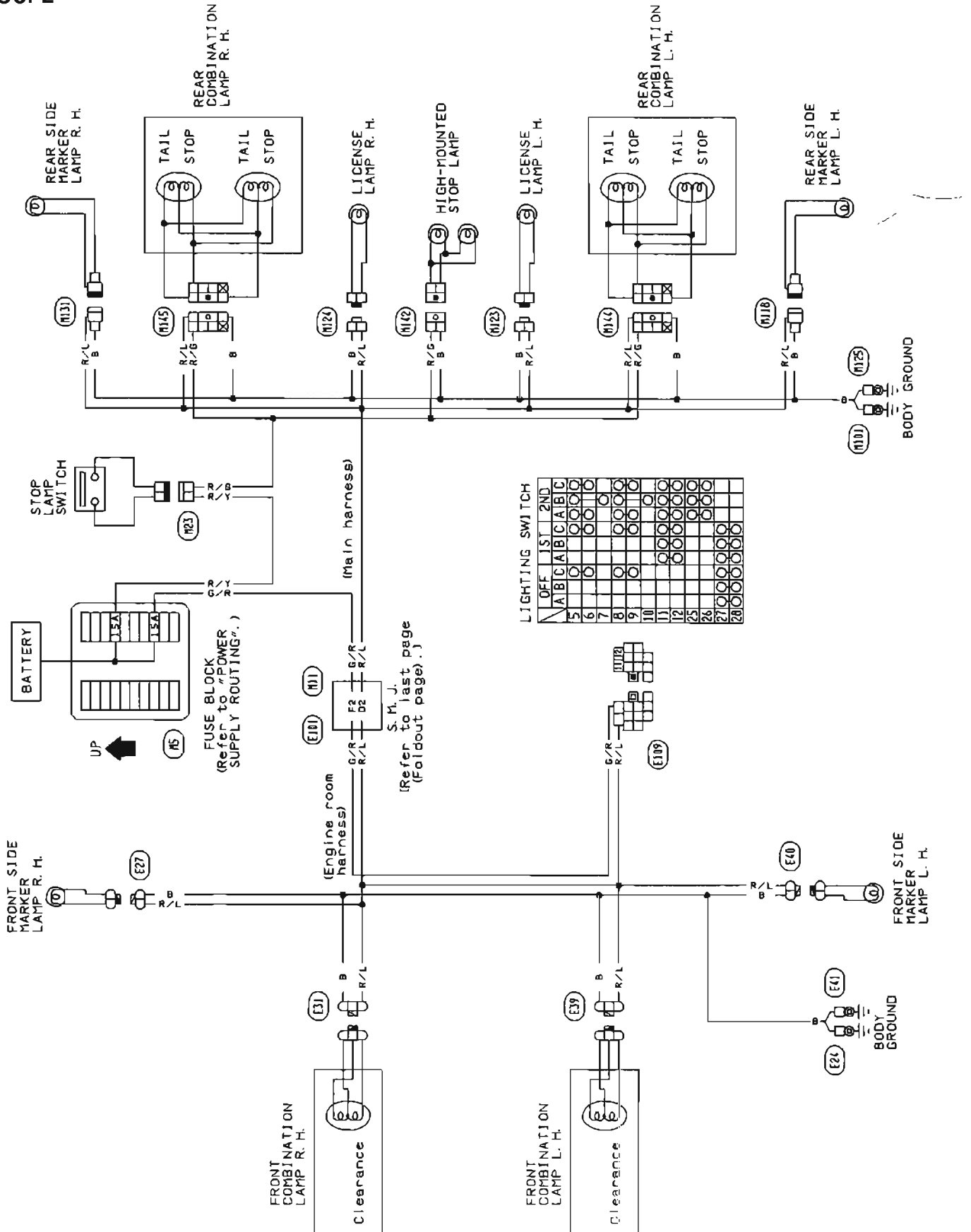


SEL471L

EXTERIOR LAMP

Clearance, License, Tail and Stop Lamps/Wiring Diagram (Cont'd)

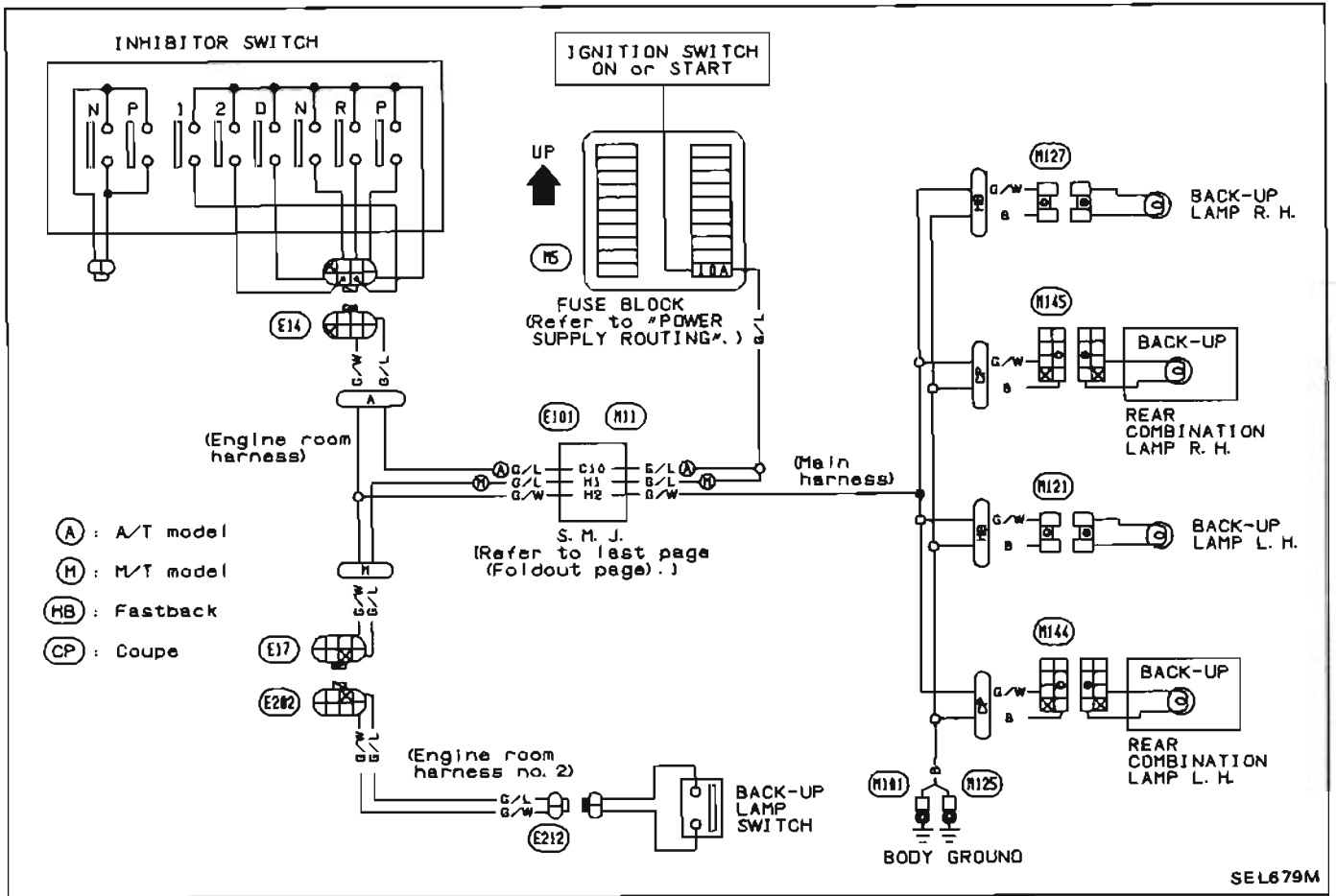
COUPE



SEL472L

EXTERIOR LAMP

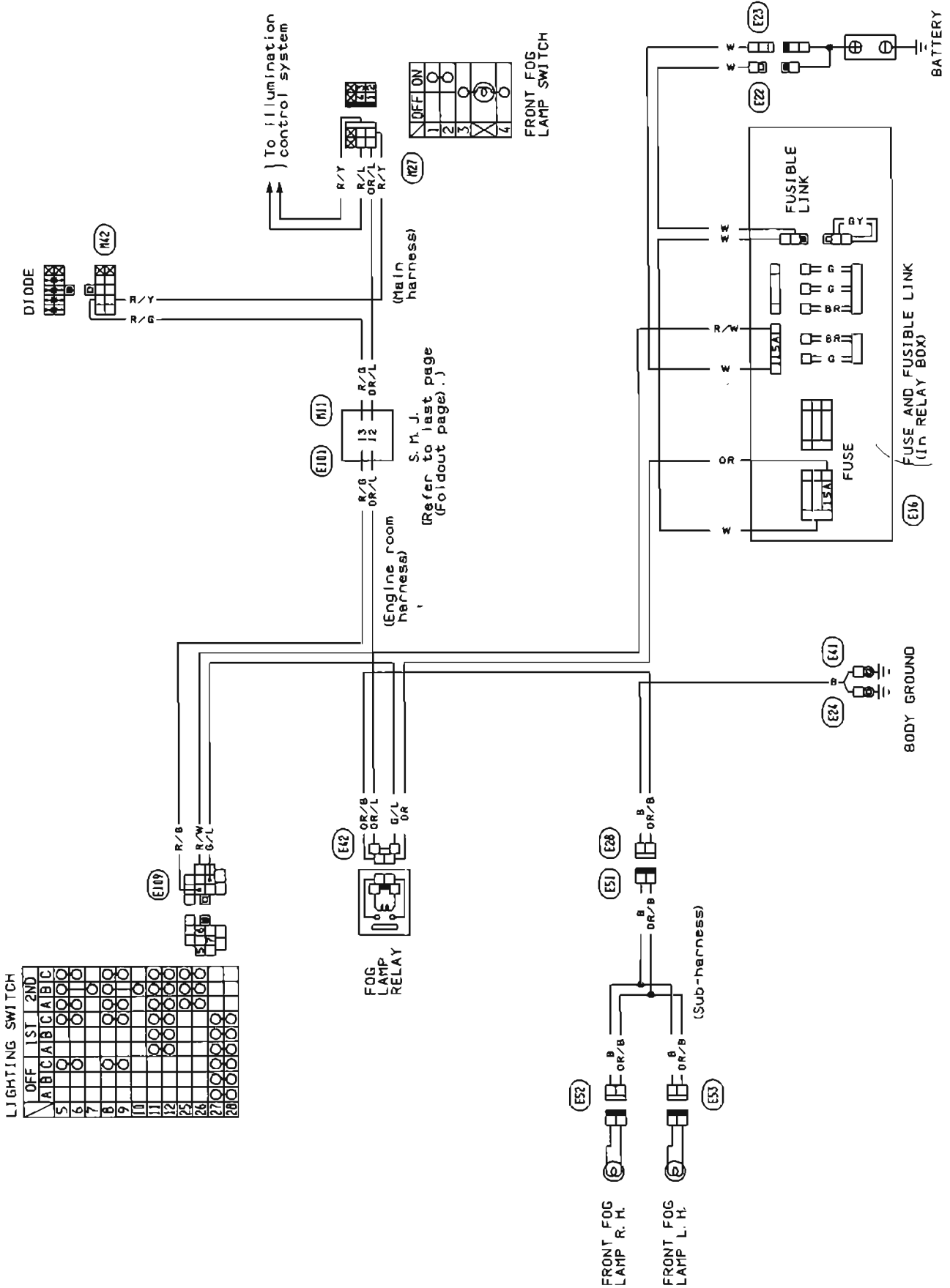
Back-up Lamp/Wiring Diagram



SEL679M

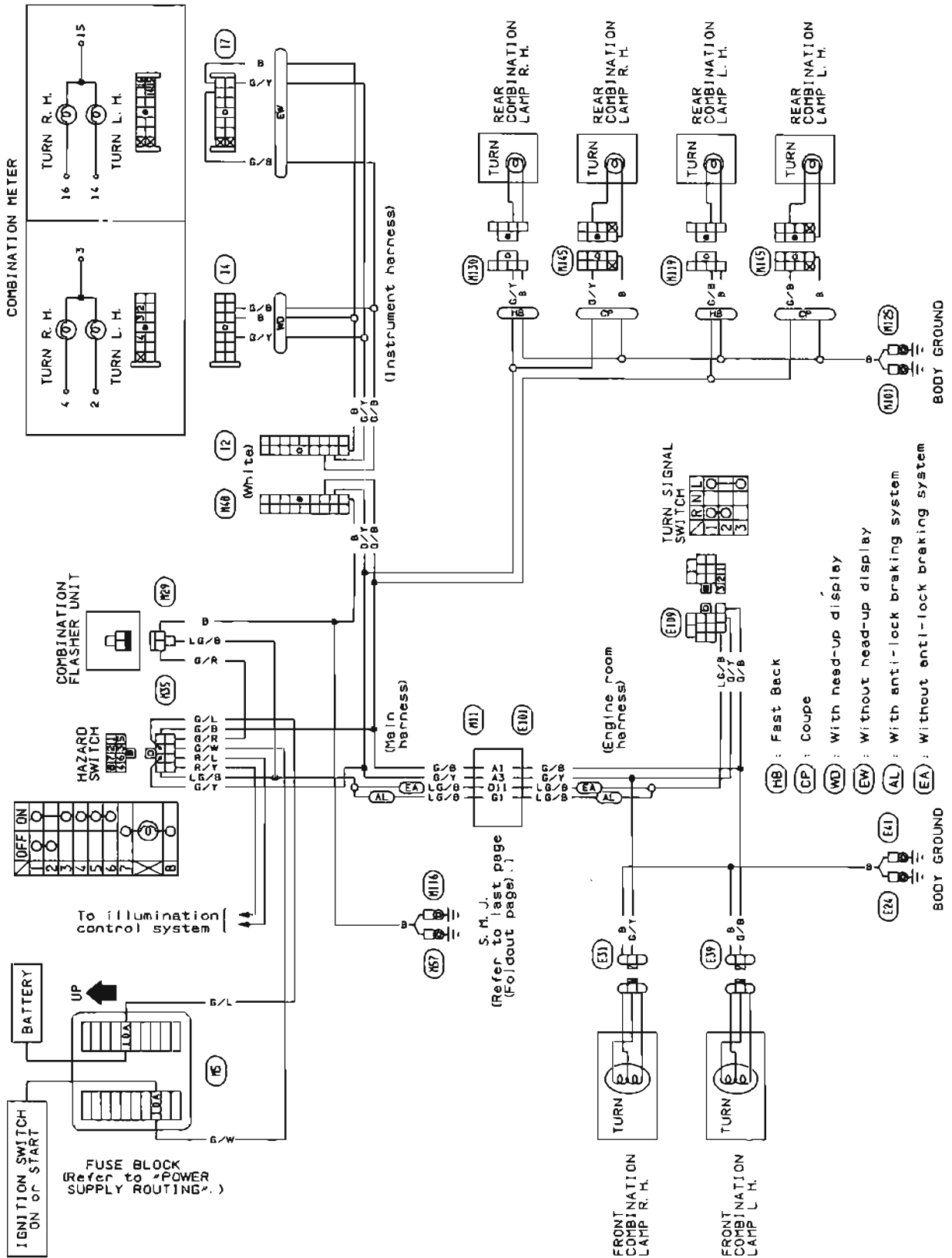
EXTERIOR LAMP

Front Fog Lamp/Wiring Diagram

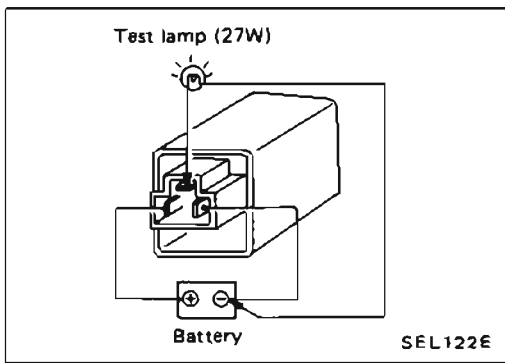


EXTERIOR LAMP

Turn Signal and Hazard Warning Lamps/Wiring Diagram



EXTERIOR LAMP



Combination Flasher Unit Check

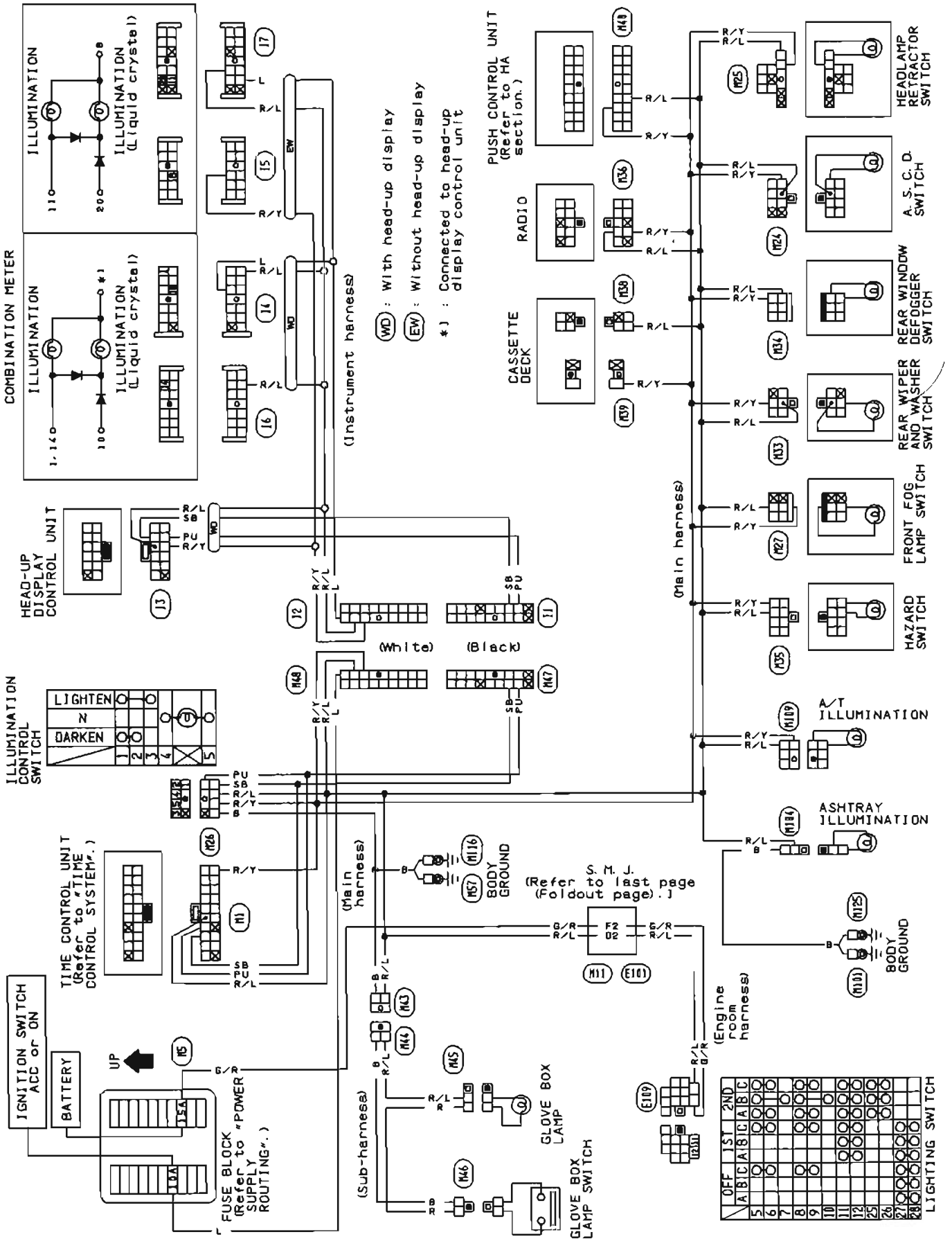
- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

Bulb Specifications

| Item | Wattage (W) |
|--------------------------|-------------|
| Headlamp (Sealed) | 65/35 |
| Front clearance lamp | 8 |
| Front turn signal lamp | 27 |
| Front side marker lamp | 3.8 |
| Rear side marker lamp | 3.8 |
| Turn signal lamp | 27 |
| Stop/Tail lamp | 27/8 |
| Back-up lamp | 27 |
| License plate lamp | 7.5 |
| Interior lamp | 10 |
| Spot lamp | 8 |
| Trunk room lamp | 3.4 |
| Foot well lamp | 3 |
| Luggage compartment lamp | 5 |
| High-mounted stop lamp | 18 |

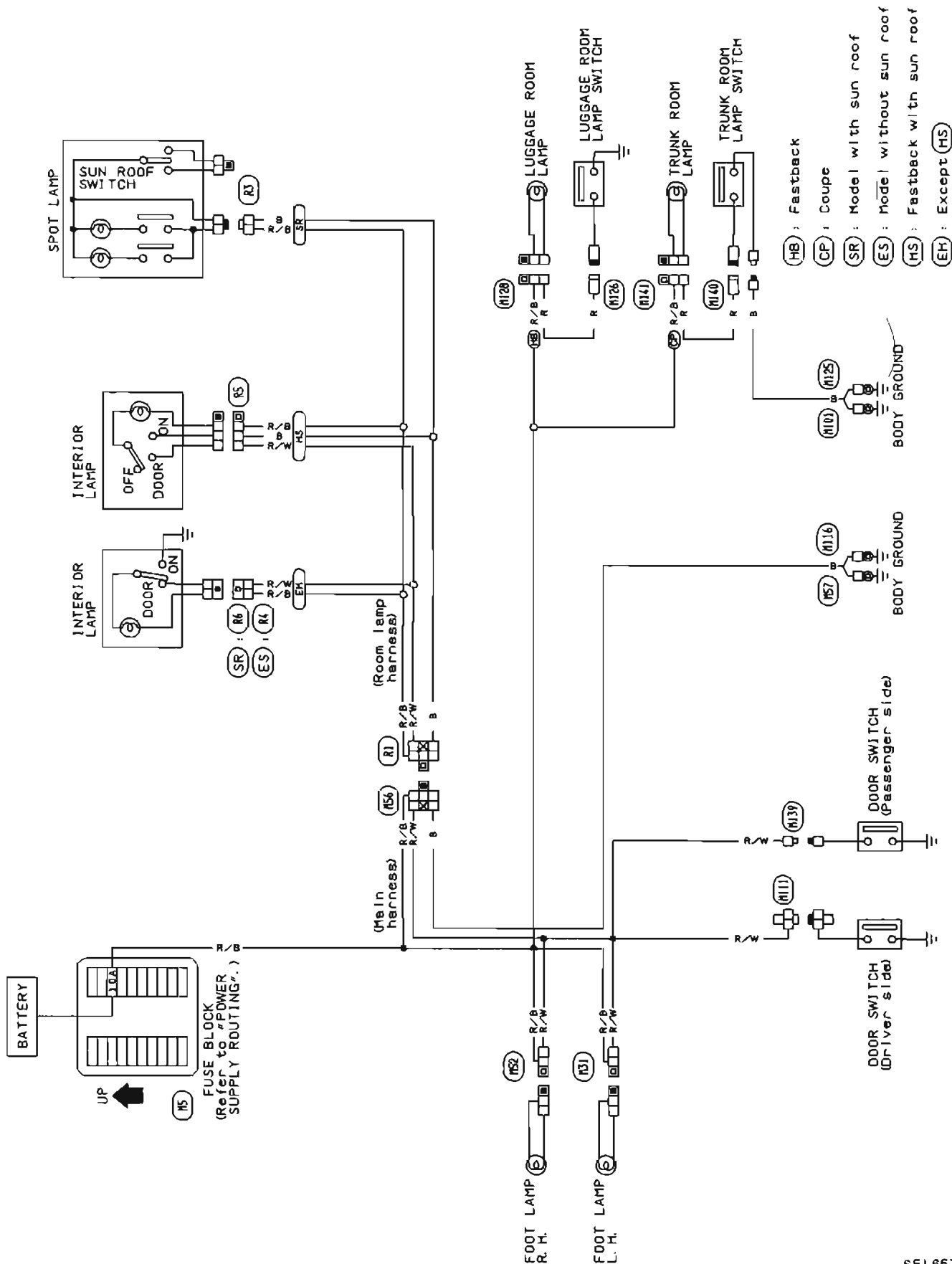
INTERIOR LAMP

Illumination/Wiring Diagram



INTERIOR LAMP

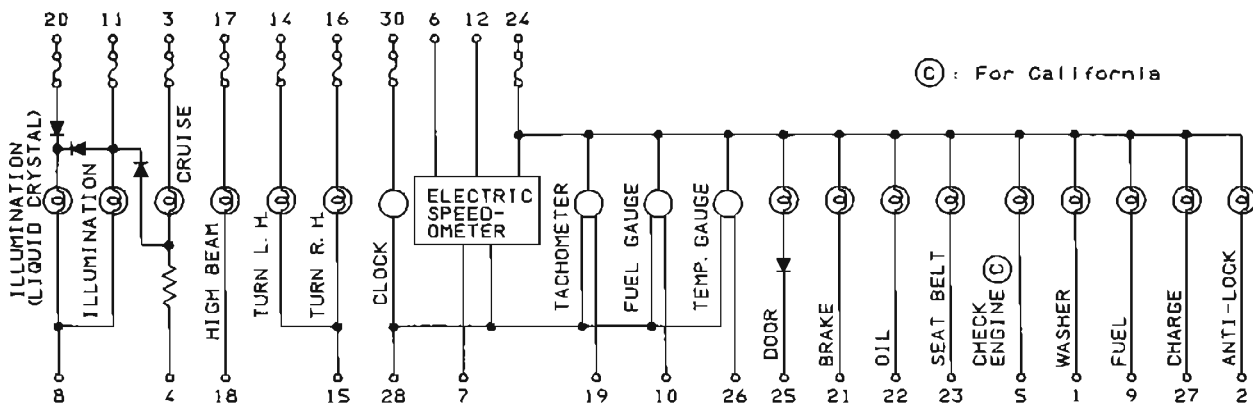
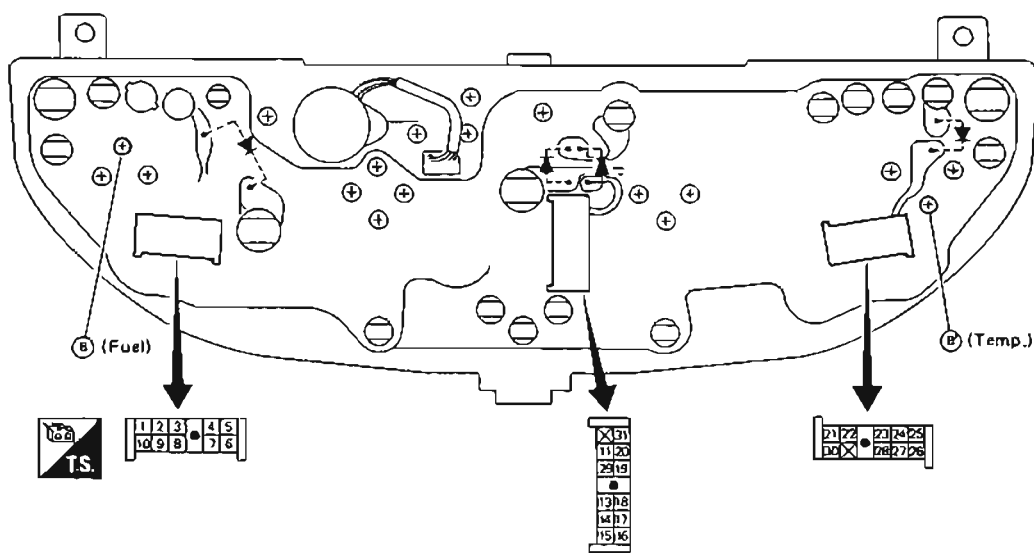
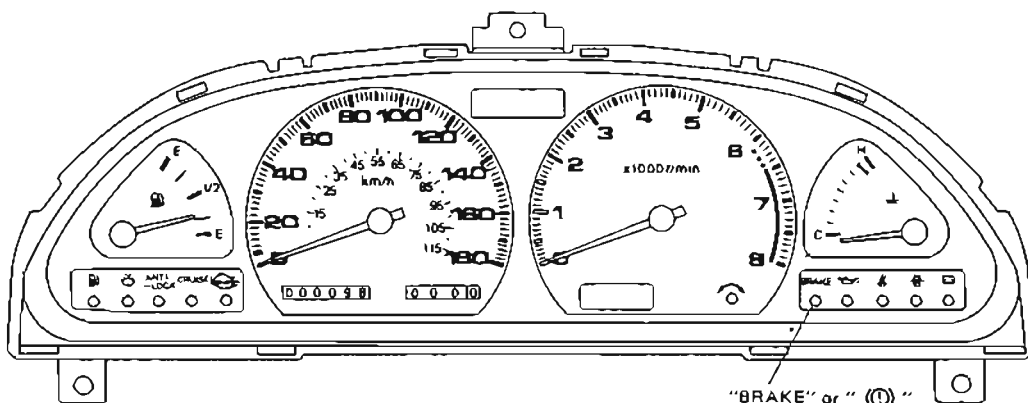
Interior Lamp/Wiring Diagram



METER AND GAUGES

Combination Meter

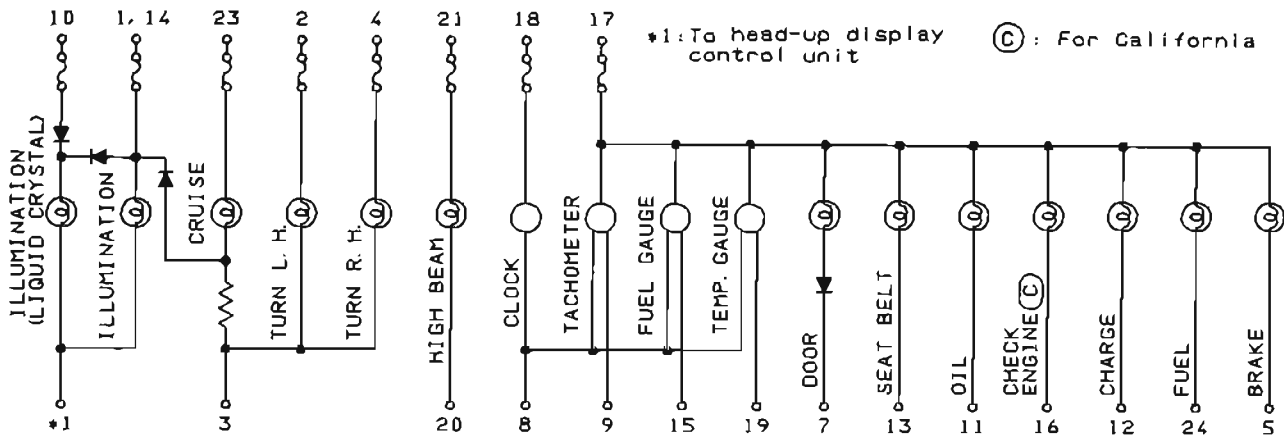
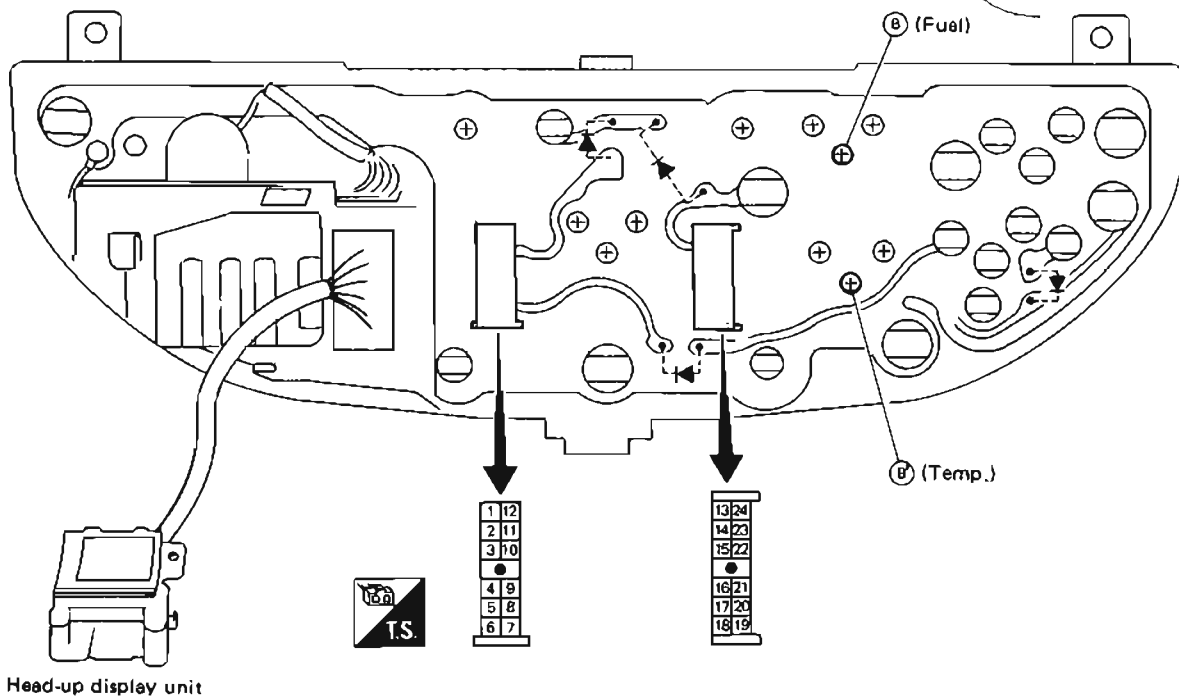
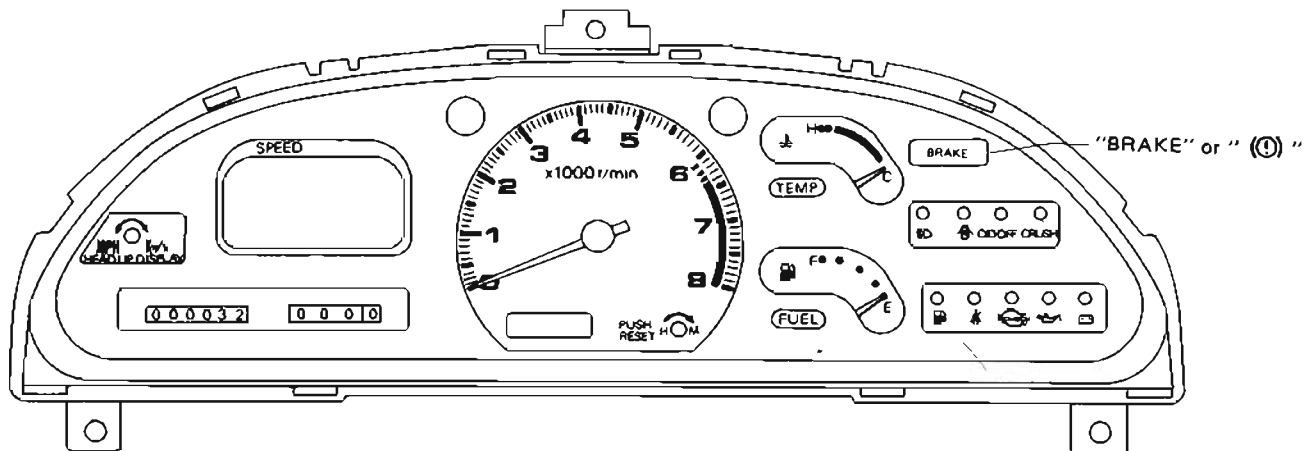
NEEDLE TYPE



METER AND GAUGES

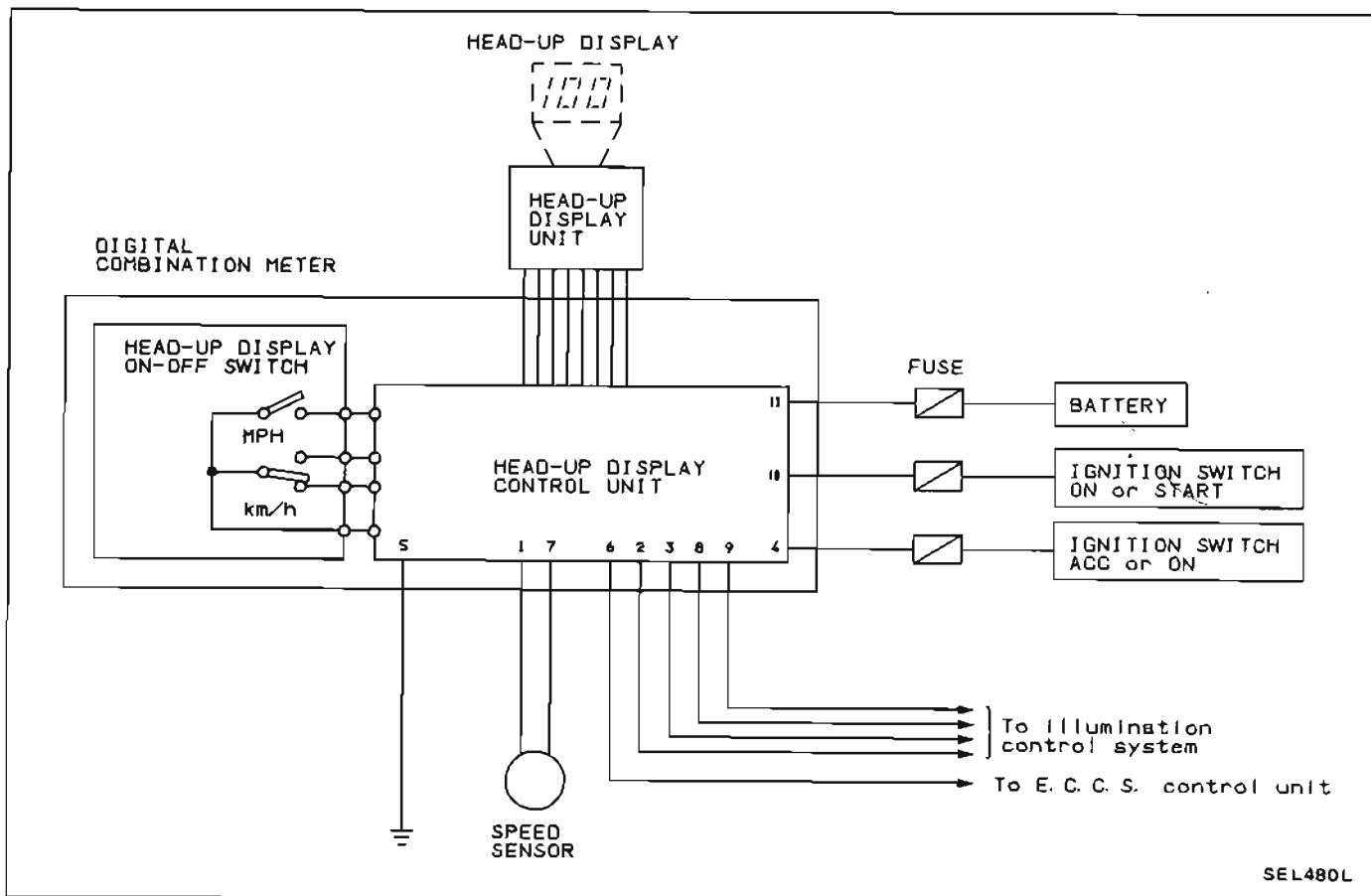
Combination Meter (Cont'd)

DIGITAL TYPE

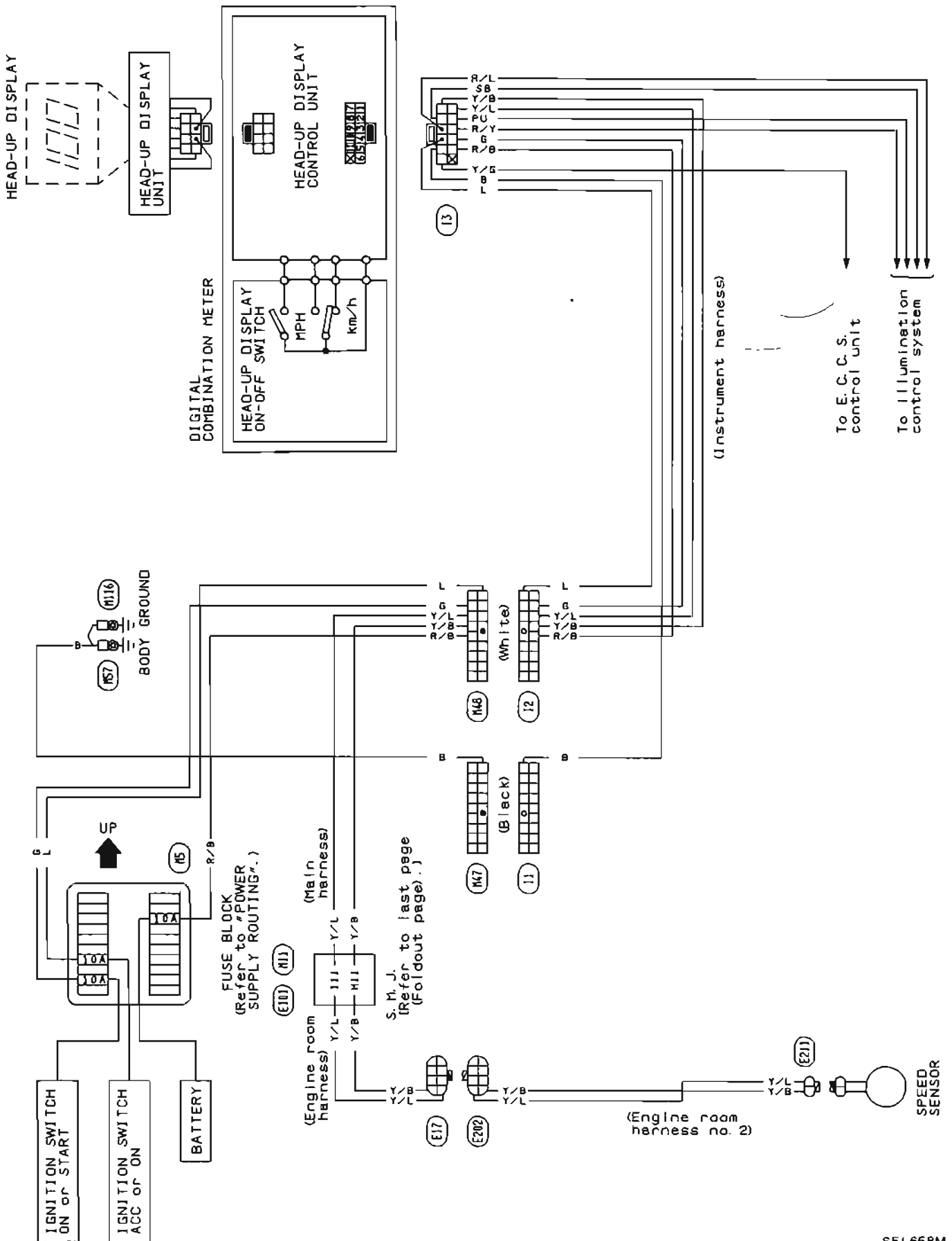


METER AND GAUGES

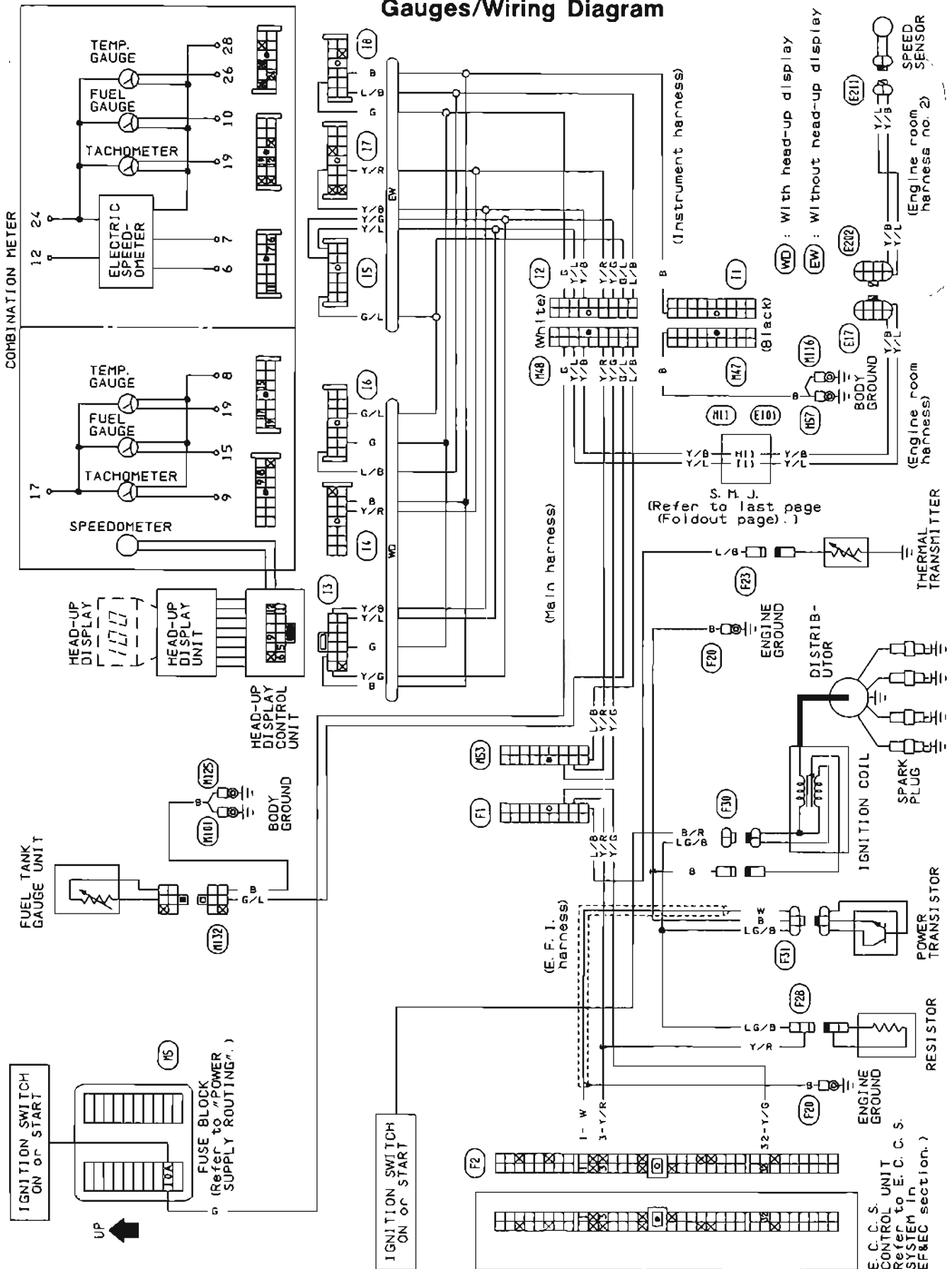
Combination Meter (Cont'd)



Combination Meter/Wiring Diagram

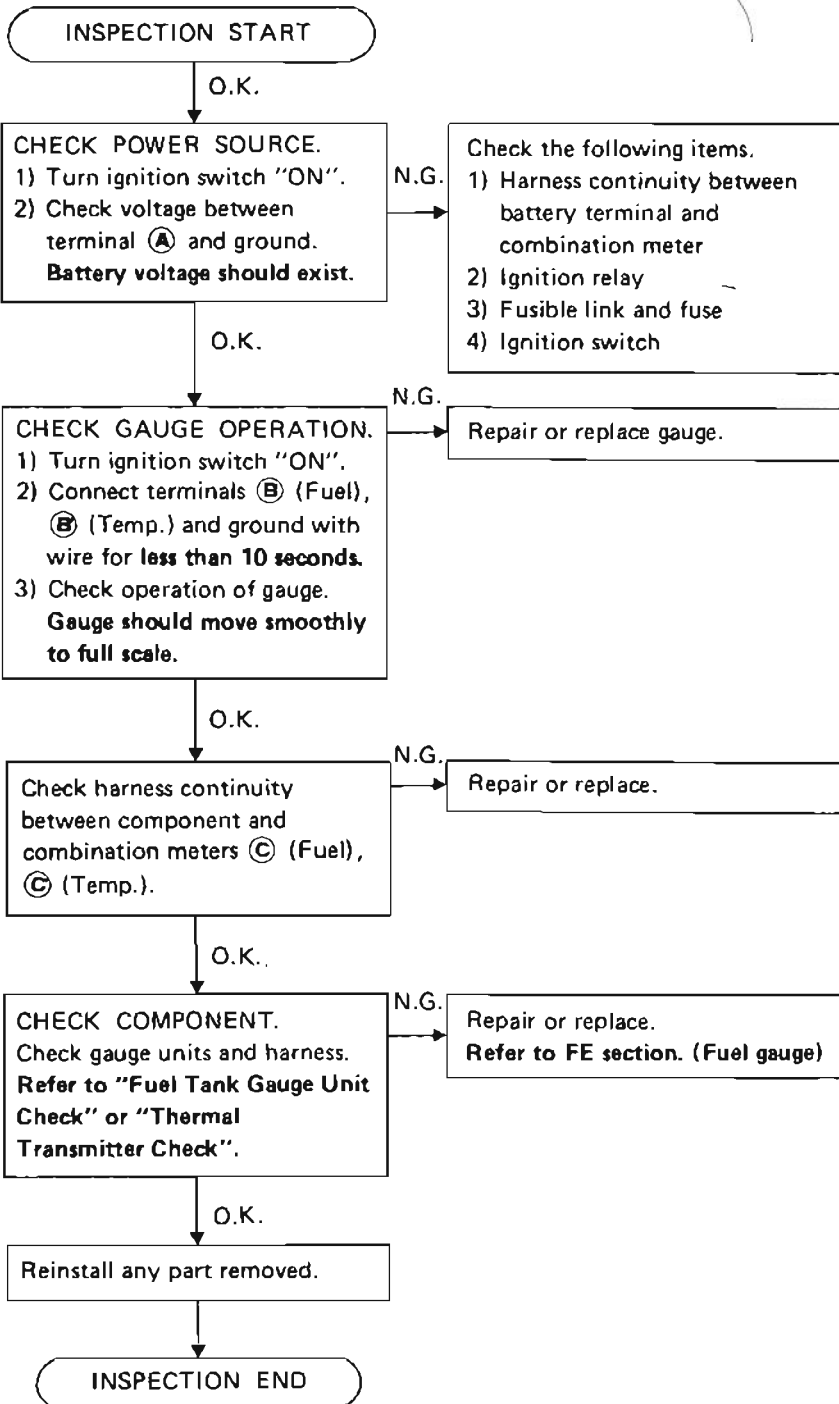
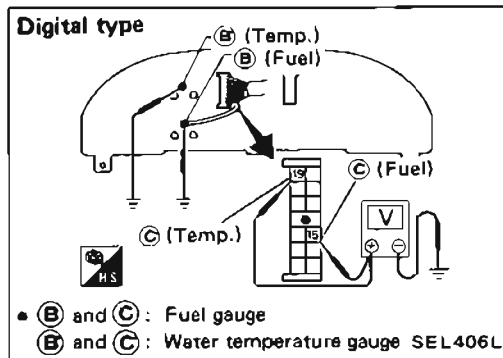
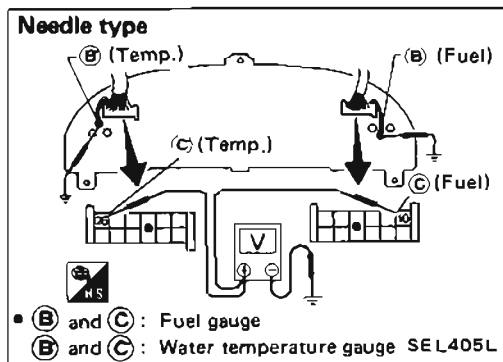
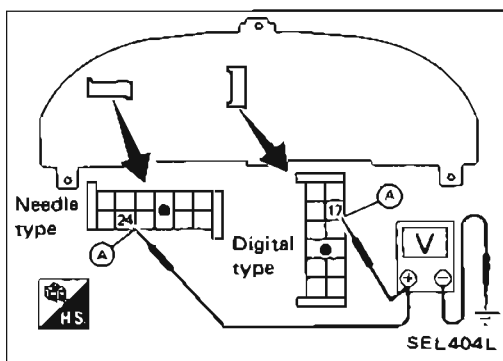


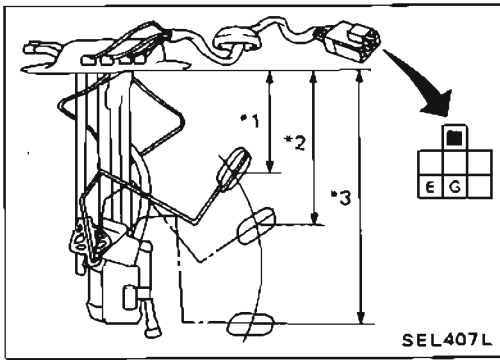
Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram



E.C.S. UNIT
(Refer to E. C. S.
SYSTEM in
EF&E section.)

Inspection/Fuel Gauge and Water Temperature Gauge

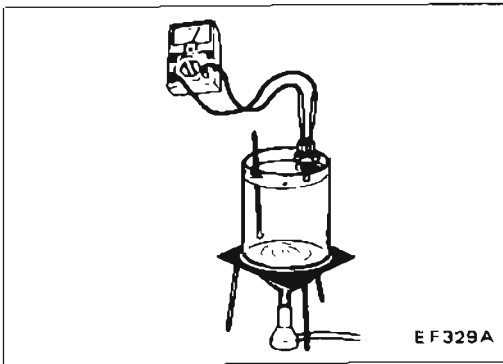




Fuel Tank Gauge Unit Check

● For removal, refer to FE section.
Check the resistance between terminals **(G)** and **(E)**.

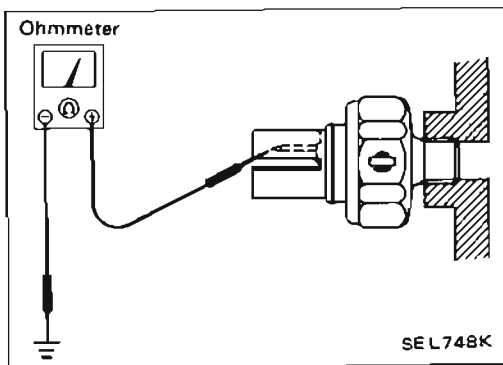
| Ohmmeter | | Float position | | Resistance Ω | Fuel value ℓ (US gal, Imp gal) |
|----------|-----|----------------|---------|------------------------|--|
| (+) | (-) | | mm (in) | | |
| G | E | *1 | Full | Approx. 64 (2.52) | 4.3 - 6.3 57.6 (15-1/4, 12-5/8) |
| | | *2 | 1/2 | Approx. 137 (5.39) | 27.7 - 34.3 32.9 (8-3/4, 7-1/4) |
| | | *3 | Empty | Approx. 210 (8.27) | 73.3 - 84.8 7.2 (1-7/8, 1-5/8) |



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

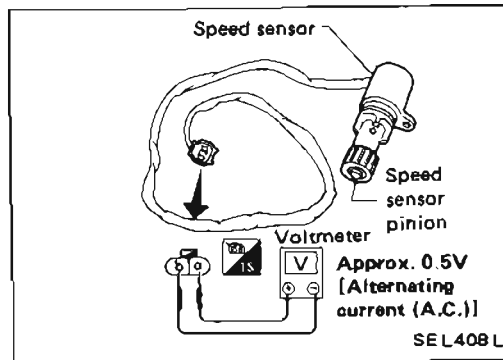
| Water temperature | Resistance |
|-------------------|--------------------------|
| 60°C (140°F) | Approx. 70 - 90 Ω |
| 100°C (212°F) | Approx. 21 - 24 Ω |



Oil Pressure Switch Check

Check the continuity between the terminals of oil pressure switch and body ground.

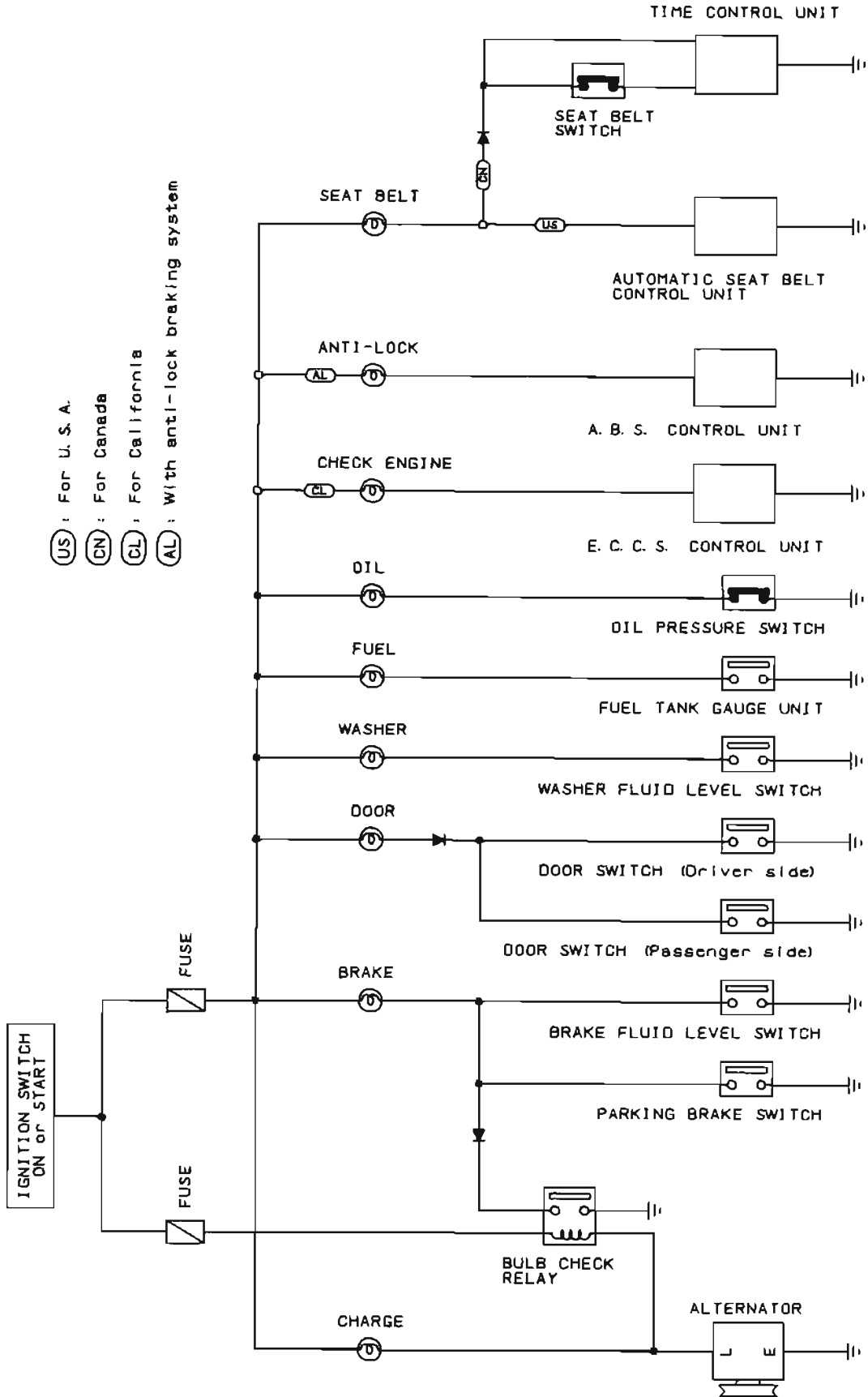
| | Oil pressure kPa (kg/cm ² , psi) | Continuity |
|--------------|--|------------|
| Engine start | More than 10 - 20 (0.1 - 0.2, 1.4 - 2.8) | NO |
| Engine stop | Less than 10 - 20 (0.1 - 0.2, 1.4 - 2.8) | YES |



Speed Sensor Signal Check

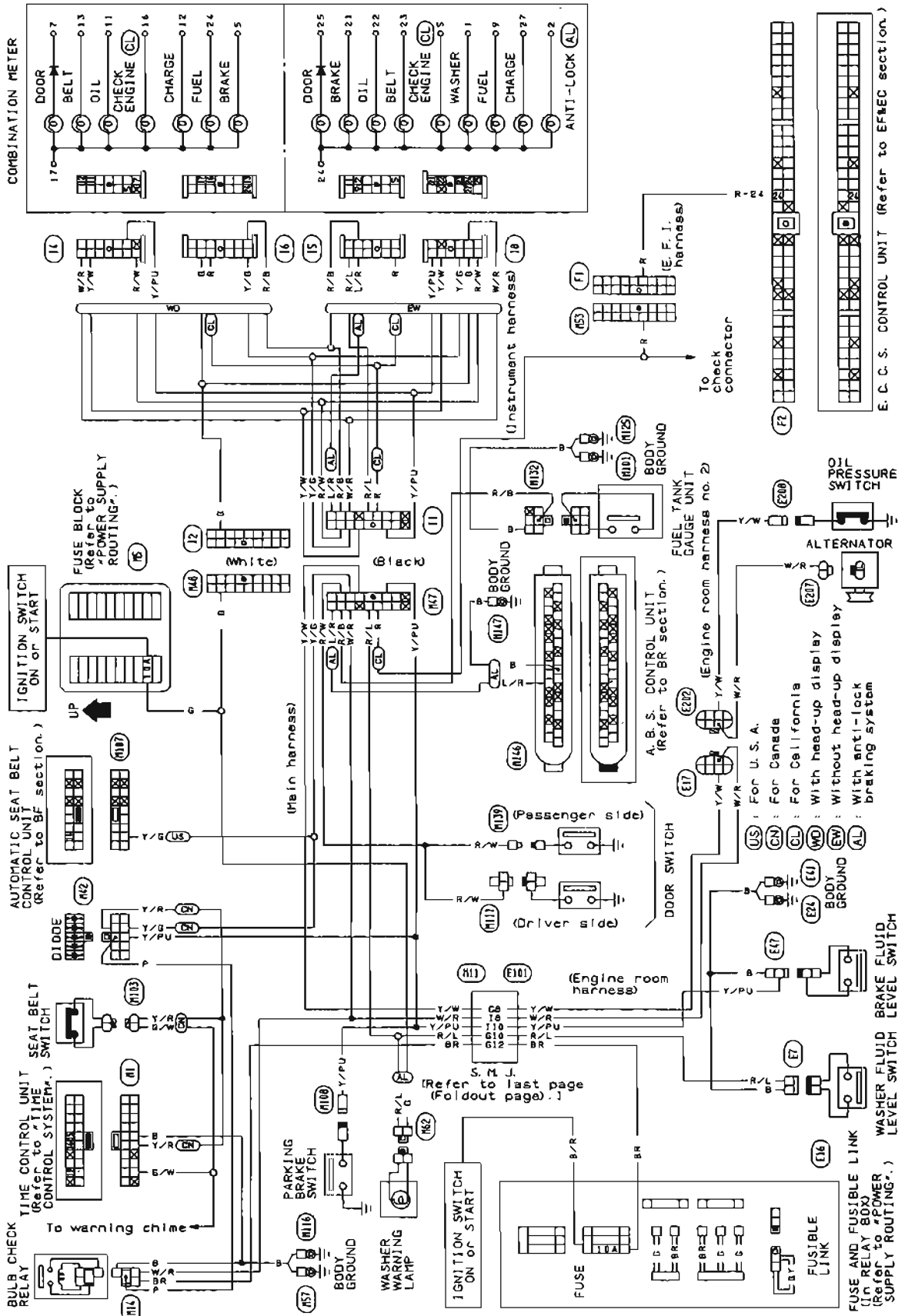
1. Remove speed sensor from transmission.
Location: Refer to "Location of Electrical Units".
2. Turn speedometer pinion quickly and measure voltage across **(a)** and **(b)**.

Warning Lamps/Schematic

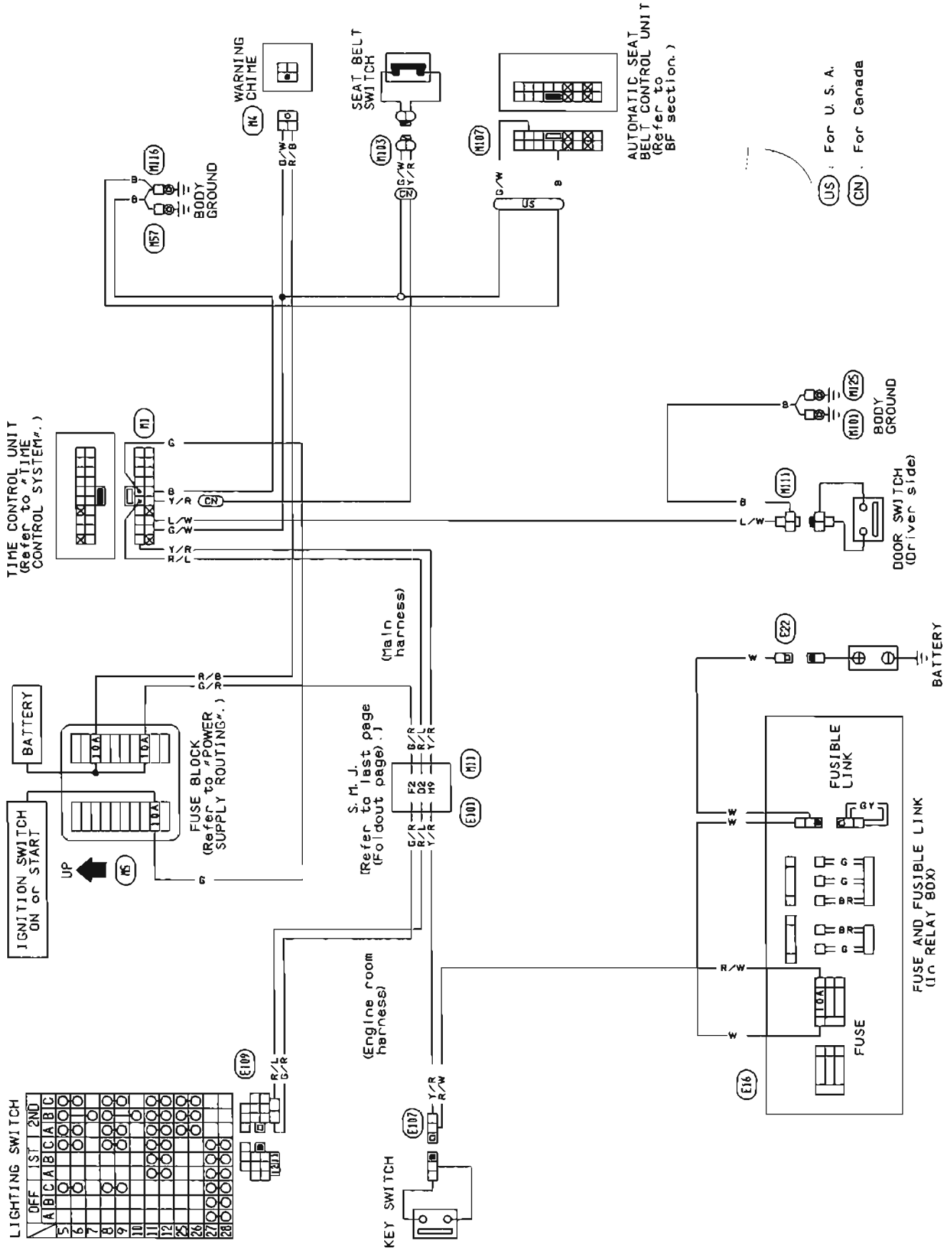


WARNING LAMPS AND CHIME

Warning Lamps/Wiring Diagram

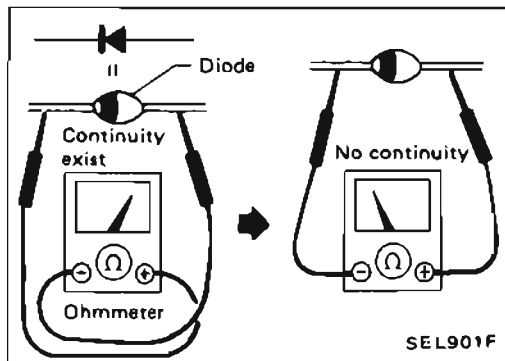


Warning Chime/Wiring Diagram



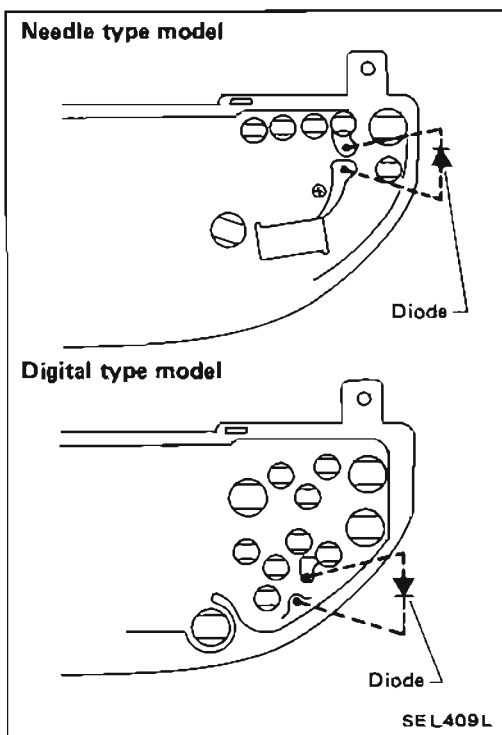
US : For U. S. A.
 CN : For Canada

AUTOMATIC SEAT BELT CONTROL UNIT (Refer to BF section.)

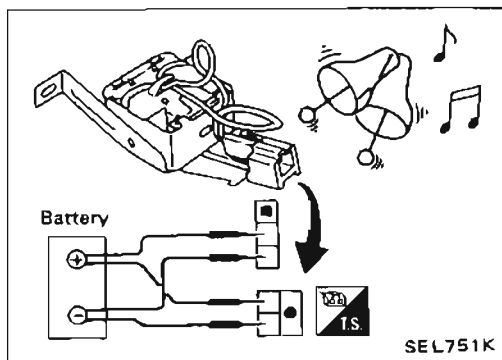


Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.



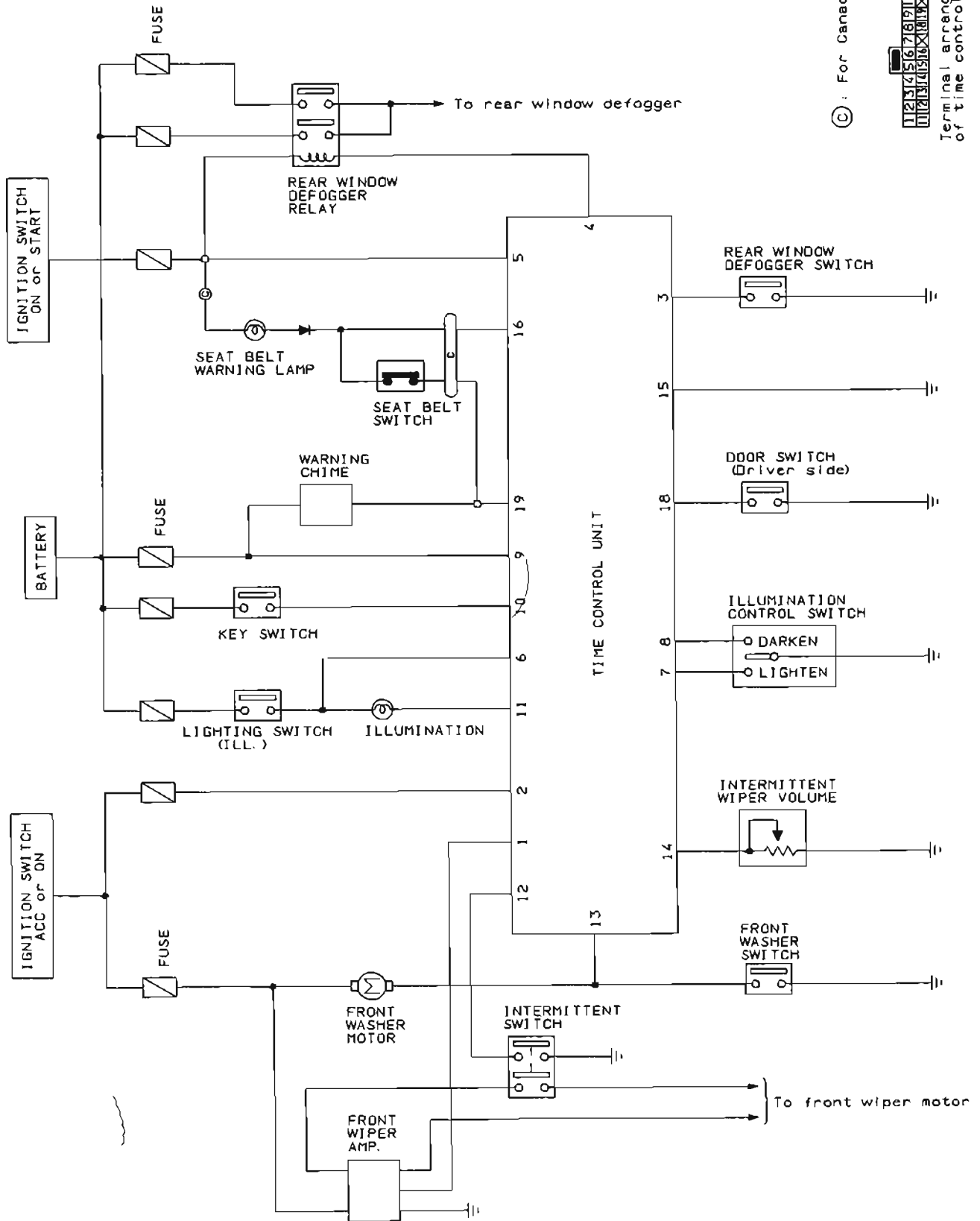
- Diodes for warning lamps are built into the combination meter printed circuit.



Warning Chime Check

TIME CONTROL SYSTEM

Schematic

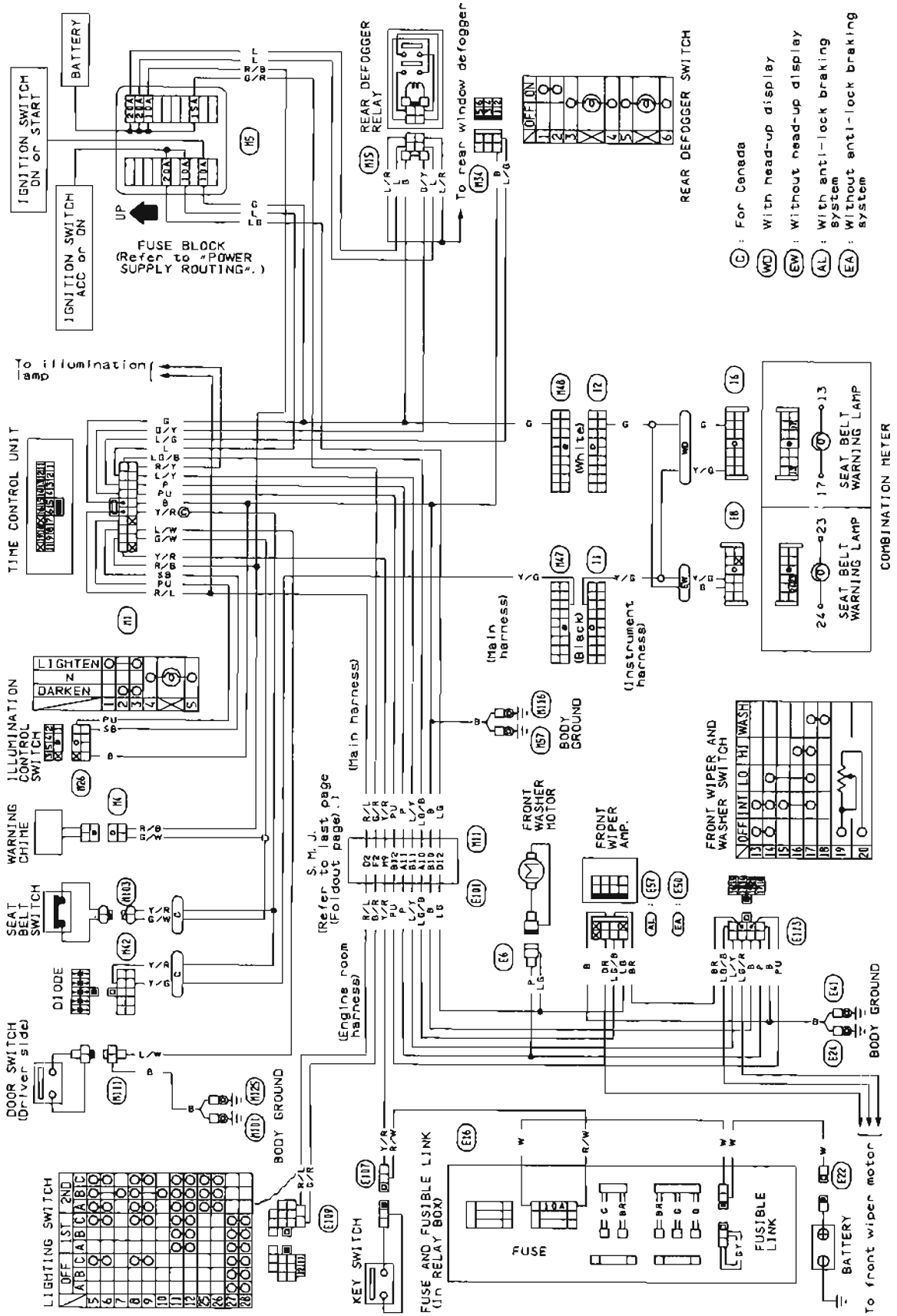


© : For Canada



Terminal arrangement
of time control unit

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 | | | | | | | | |
| | | ⑨ | ② or ⑤ | ⑥ | ⑫ | ⑬ | ⑱ | ⑰ | ⑦ or ⑧ |
| 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 | ⑰ | ON | OFF or ACC → ON | | | | | | |
| Seat belt warning chime timer | ⑲ | ON | OFF or ACC → ON | | | | | ON | |

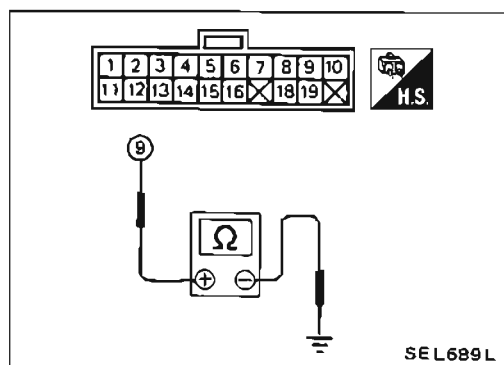
*1 Door switch is turned ON when door is opened.

*2 Seat belt switch is turned ON when driver's side seat belt is unfastened.

TIME CONTROL SYSTEM

Trouble-shooting

| 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 |



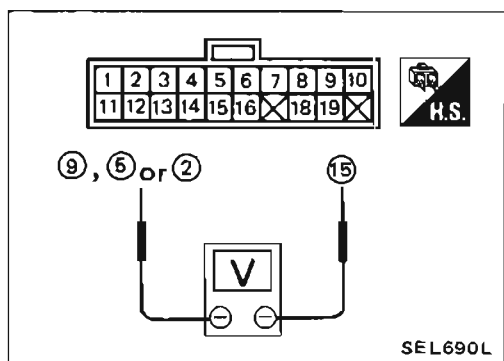
PREPARATION FOR TROUBLE-SHOOTING

1. Remove driver's side dash side cover.
2. Remove time control unit with harness connected.

POWER SUPPLY CIRCUIT CHECK

1. Connect ohmmeter from harness side.
2. Check continuity between terminal ⑨ and body ground.

| Ohmmeter terminals | | Continuity |
|--------------------|-------------|------------|
| (+) | (-) | |
| ⑨ | Body ground | Yes |



3. Connect voltmeter from harness side.
4. Measure voltage across terminal ⑬ and terminals ②, ⑤ or ⑨.

| Voltmeter terminals | | Ignition switch position | | |
|---------------------|-----|--------------------------|-------------|-------------|
| (+) | (-) | OFF | ACC | ON |
| ⑨ | ⑬ | Approx. 12V | Approx. 12V | Approx. 12V |
| ⑤ | ⑬ | 0V | 0V | Approx. 12V |
| ② | ⑬ | 0V | Approx. 12V | Approx. 12V |

TIME CONTROL SYSTEM

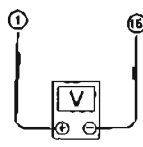
Trouble-shooting (Cont'd)

DIAGNOSTIC PROCEDURE-1

Intermittent wiper does not operate.

A T.C.U. OUTPUT FOR WIPER RELAY CIRCUIT CHECK

Measure voltage across ① and ⑮.



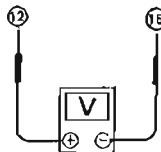
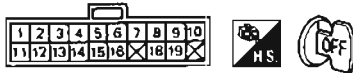
Wiper switch → "INT"

Needle swings from 0 to 12V every 3 to 12 seconds.

SEL652L

B WIPER SWITCH CIRCUIT CHECK

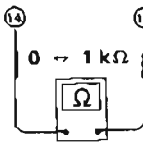
Check continuity between ⑫ and ⑮.



Wiper switch → "INT"

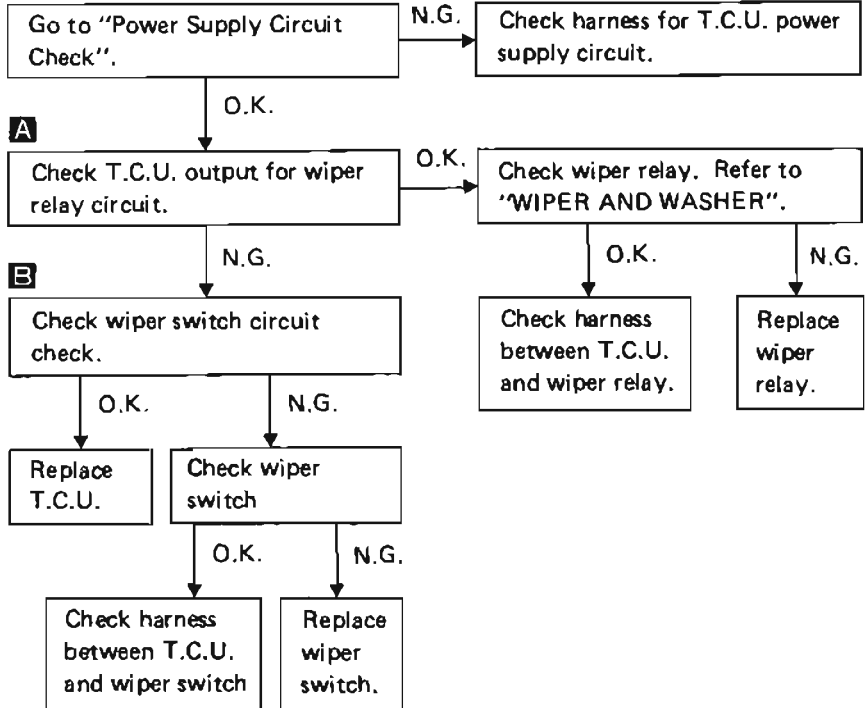
SEL653L

Measure resistance between ⑭ and ⑮ while turning intermittent wiper volume.



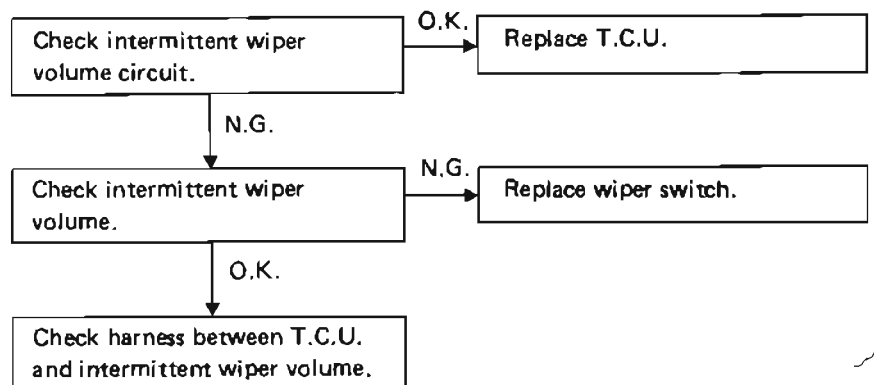
0 Ω at "S" position
Approx.

1 k Ω at "L" position SEL654L



DIAGNOSTIC PROCEDURE-2

Intermittent time of wiper cannot be adjusted.

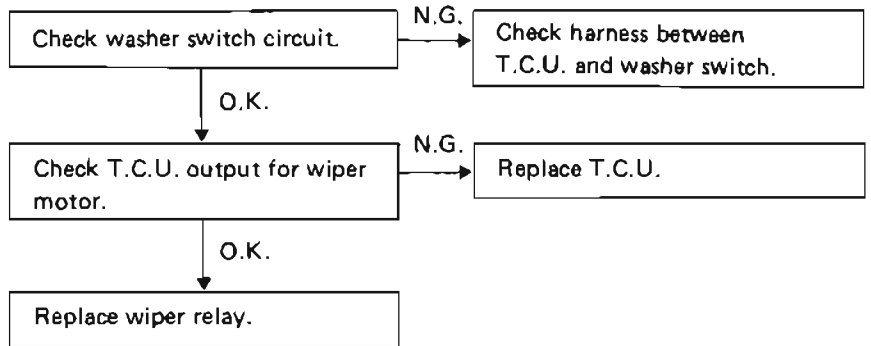


TIME CONTROL SYSTEM

Trouble-shooting (Cont'd)

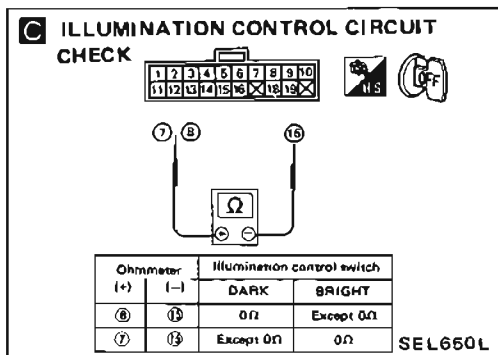
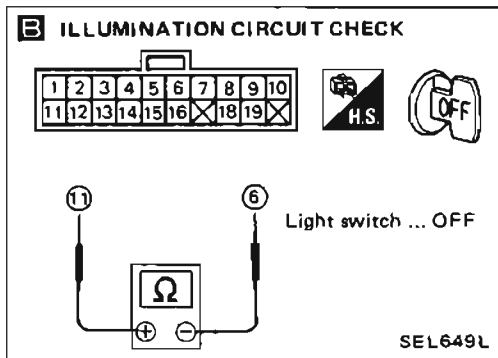
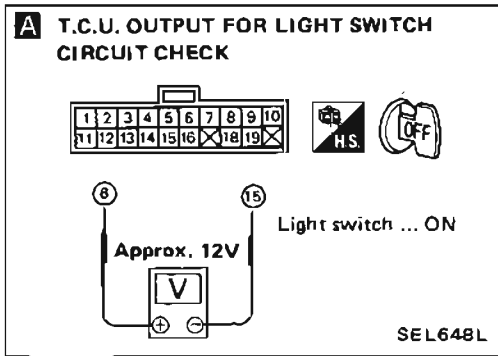
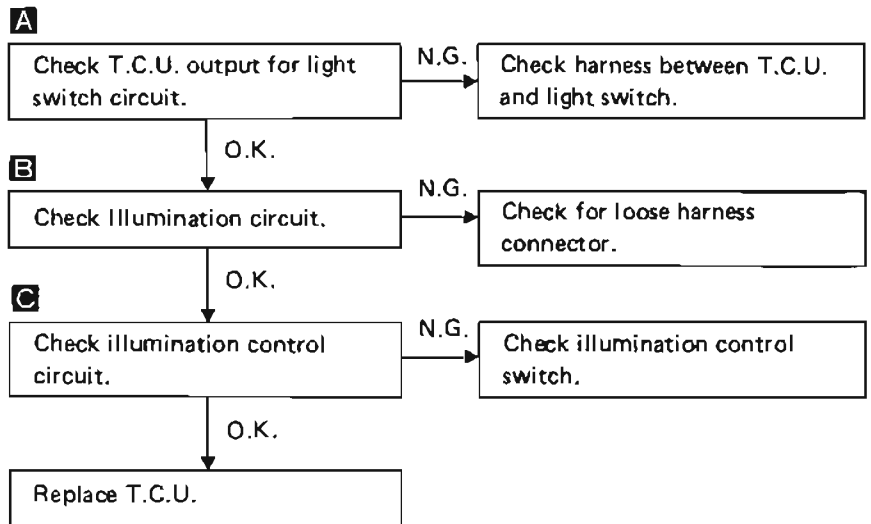
DIAGNOSTIC PROCEDURE-3

Wiper and washer activate individually but not in combination.



DIAGNOSTIC PROCEDURE-4

Illumination control system does not actuate.

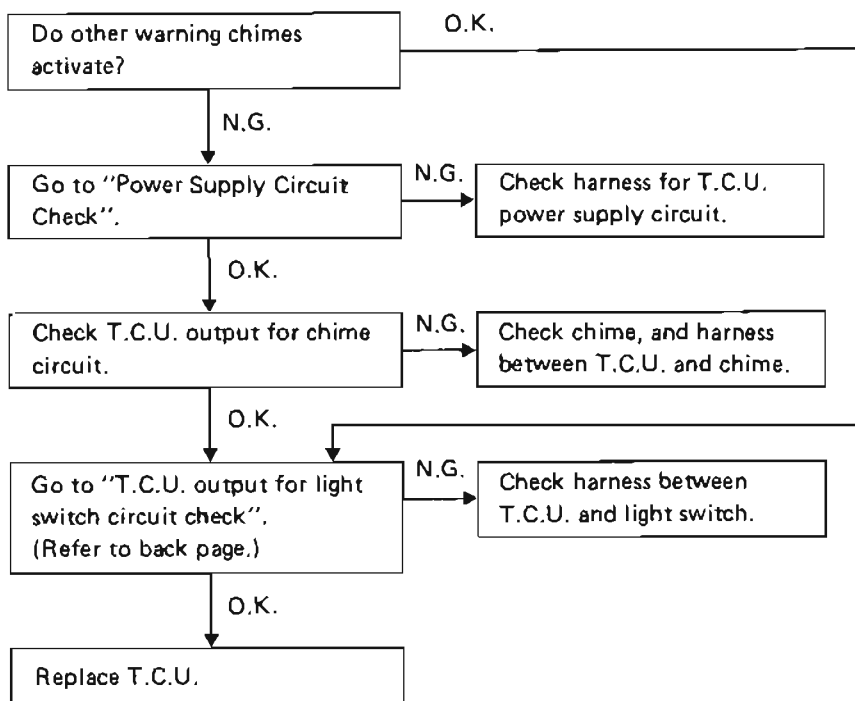


TIME CONTROL SYSTEM

Trouble-shooting (Cont'd)

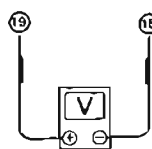
DIAGNOSTIC PROCEDURE-5

Light warning chime does not activate.



T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

Measure voltage across (19) and (15) when driver's door is opened and closed.



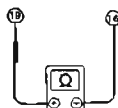
Light switch ... 1ST

- Approx. 12V when driver's side door is closed.
- Voltmeter needle swings (0 → 12V) when driver's side door is opened.

SEL642L

SEAT BELT SWITCH CIRCUIT CHECK

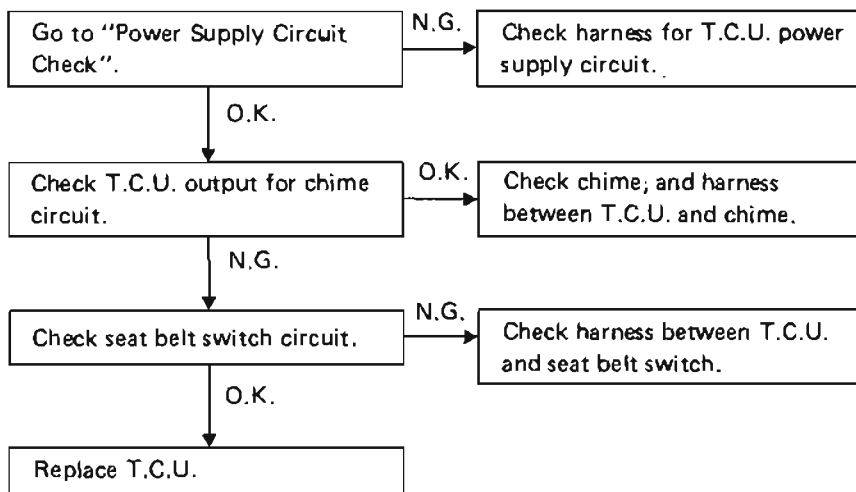
1. Unfasten driver's seat belt.
2. Check continuity between (19) and (16).
3. Fasten driver's seat belt.
4. Check to determine if continuity does not exist between (19) and (16).



SEL643L

DIAGNOSTIC PROCEDURE-6

Seat belt warning chime does not activate.

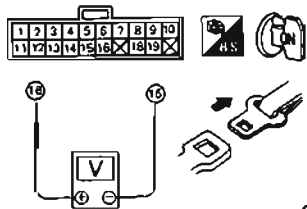


TIME CONTROL SYSTEM

Trouble-shooting (Cont'd)

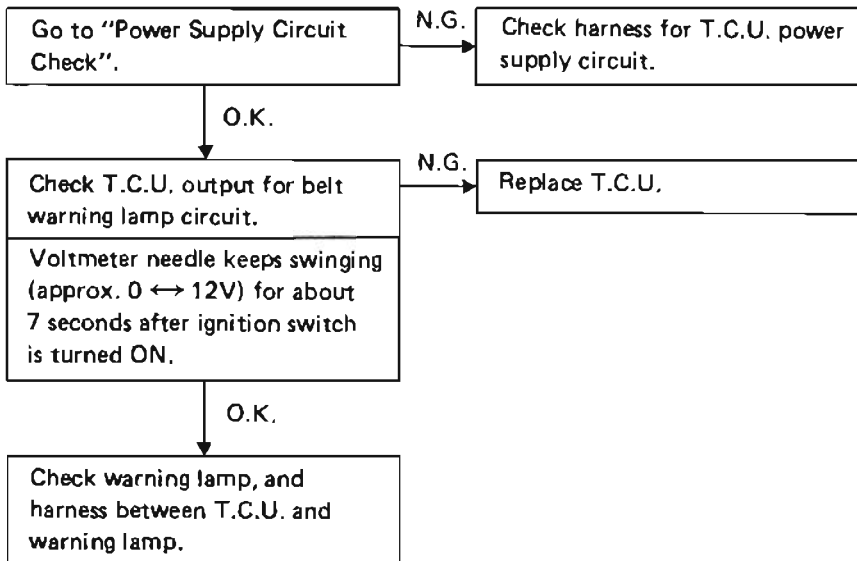
T.C.U. OUTPUT FOR BELT WARNING LAMP CIRCUIT CHECK

Measure voltage across ⑮ and ⑰ when
ignition switch is "ON".



DIAGNOSTIC PROCEDURE-7

Seat belt warning lamp does not go off nor comes on.



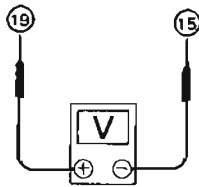
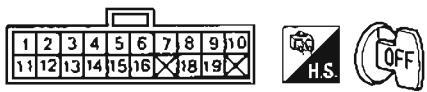
TIME CONTROL SYSTEM

Trouble-shooting (Cont'd)

DIAGNOSTIC PROCEDURE-8

Ignition key warning chime does not activate.

T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK
Measure voltage across ⑲ and ⑮ when driver's door is opened and closed.

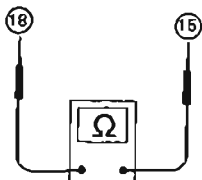
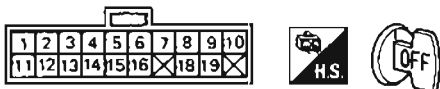


- Approx. 12V when driver's side door is opened.

SEL639L

DRIVER'S DOOR SWITCH CIRCUIT CHECK

Check continuity between ⑱ and ⑮.

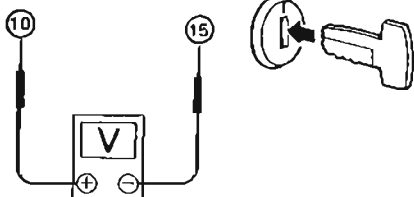
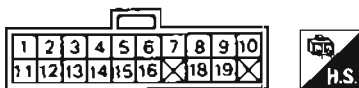


Driver's side door ... Open

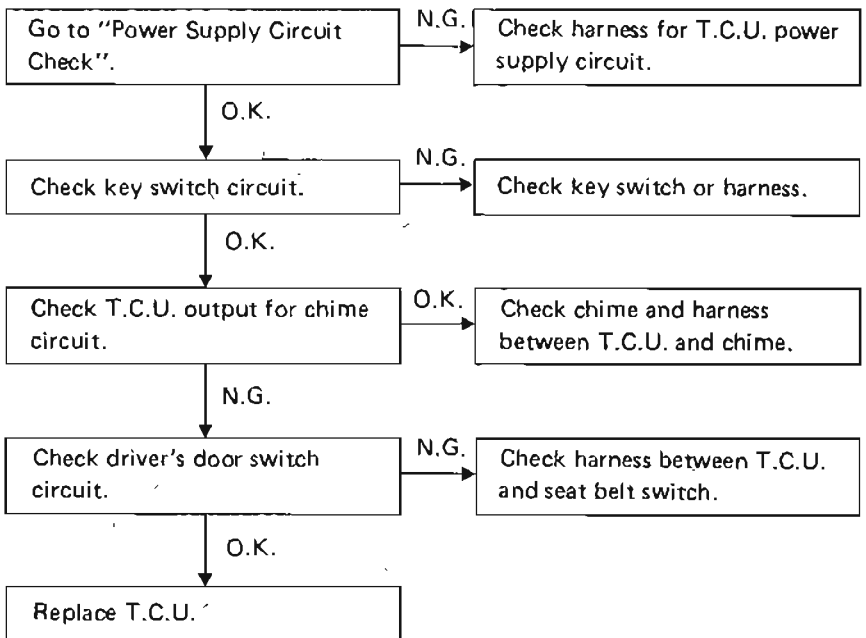
SEL640L

KEY SWITCH CIRCUIT CHECK

Measure voltage across ⑩ and ⑮.



SEL641L



TIME CONTROL SYSTEM

Trouble-shooting (Cont'd)

DIAGNOSTIC PROCEDURE-9

Rear defogger does not activate, or does not go off.

T.C.U. OUTPUT FOR REAR DEFOGGER CIRCUIT CHECK

Measure voltage across ④ and ⑮ while operating rear defogger switch.

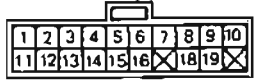


Rear defogger switch → ON

- Rear defogger switch "N": Approx. 12V
- Rear defogger switch "TIMER": Approx. 0V

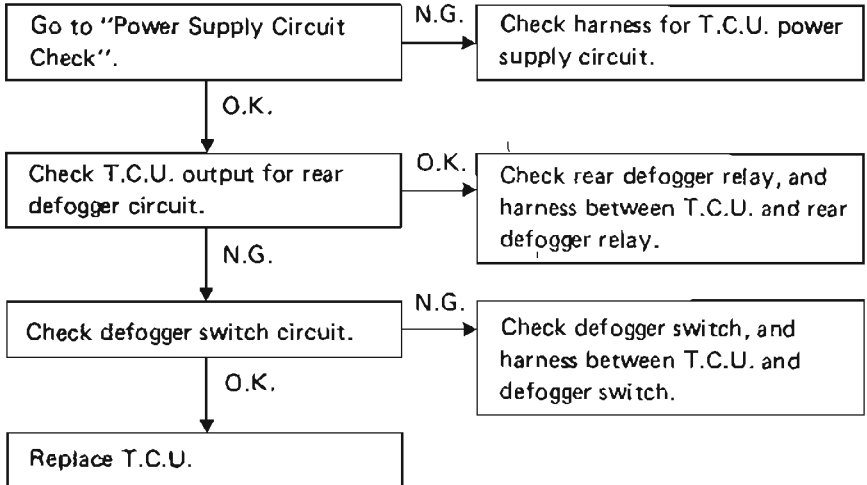
SEL644L

DEFOGGER SWITCH CIRCUIT CHECK



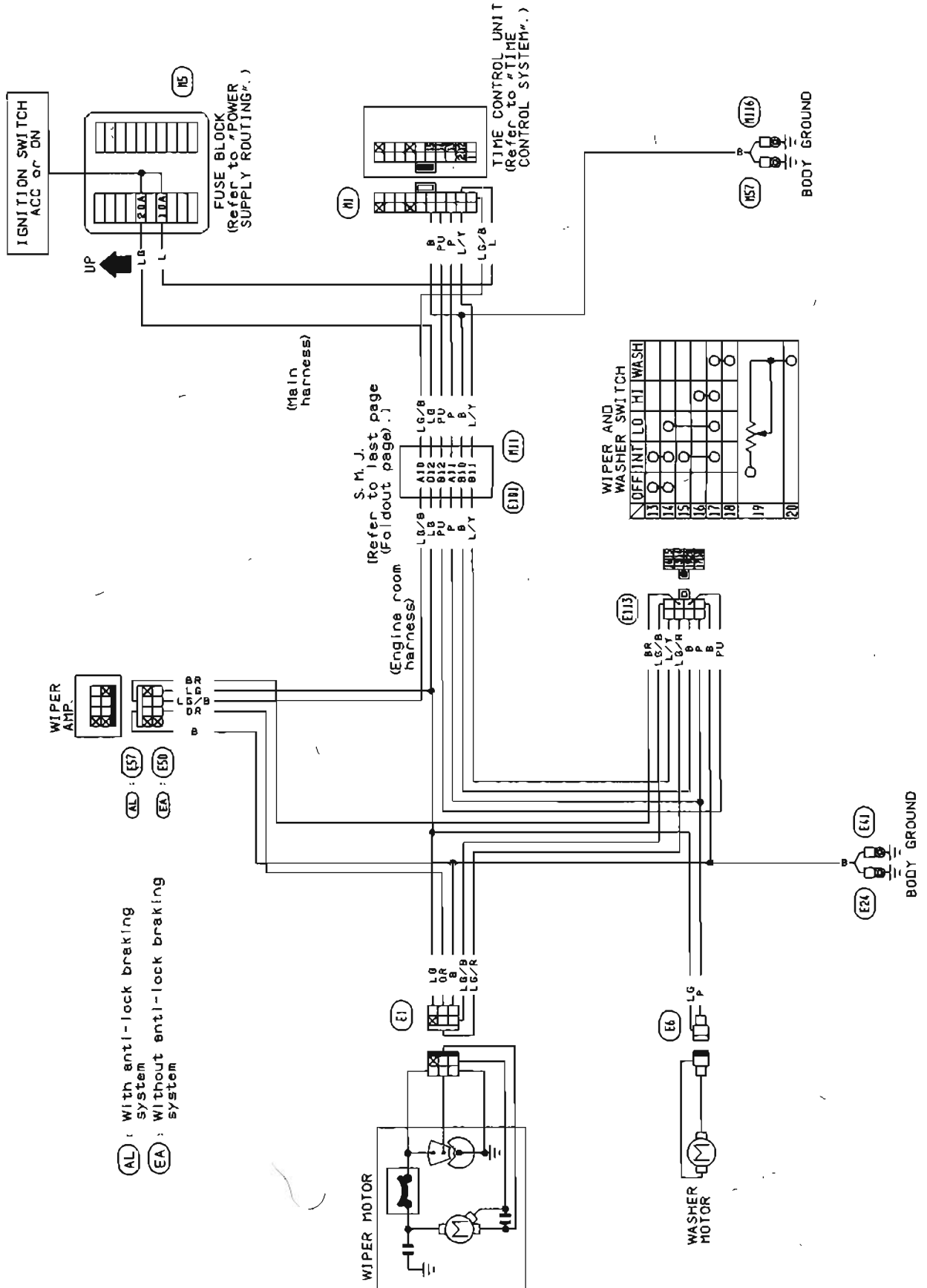
- Rear defogger switch "OFF": Except 0Ω
- Rear defogger switch "TIMER": 0Ω

SEL645L



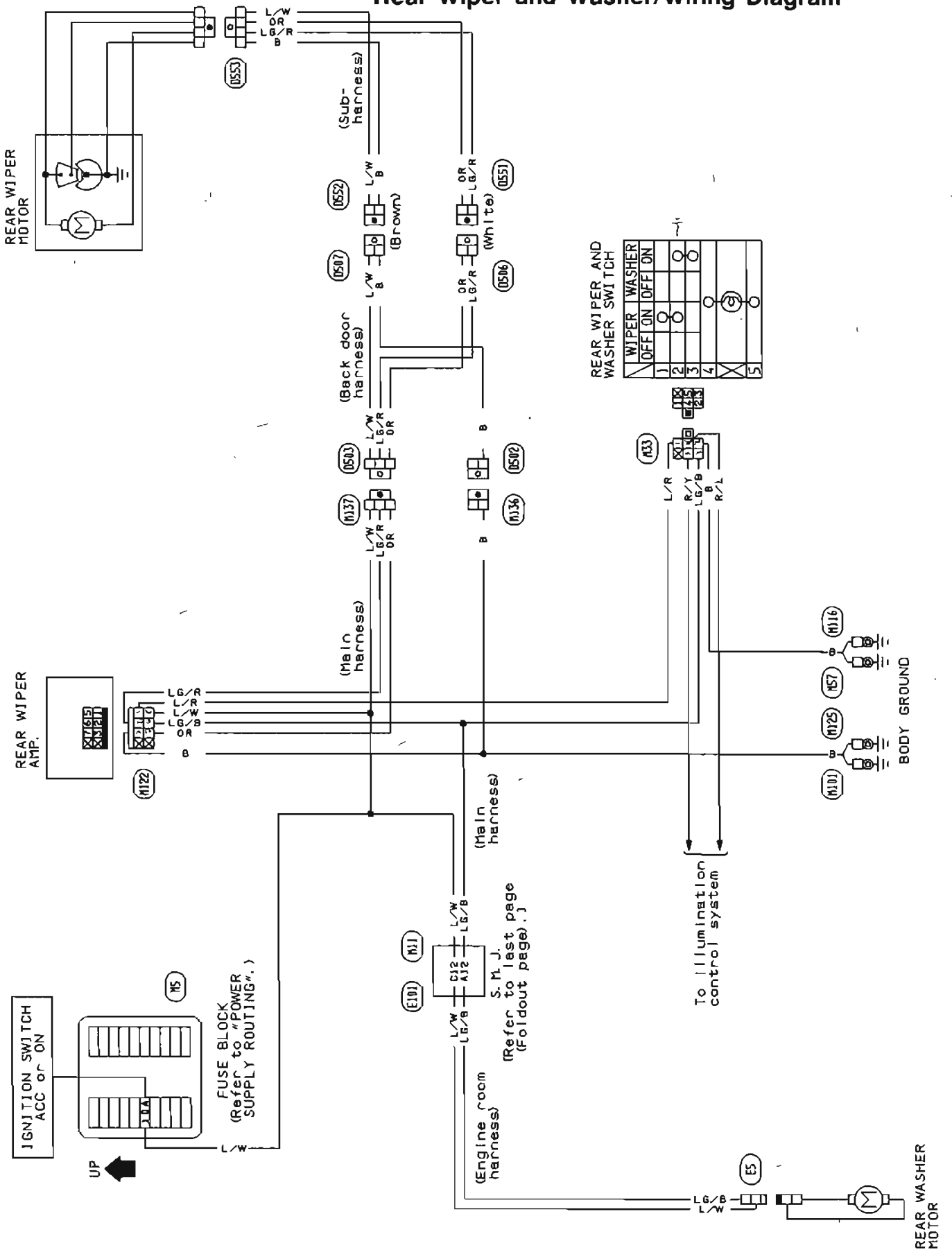
WIPER AND WASHER

Front Wiper and Washer/Wiring Diagram

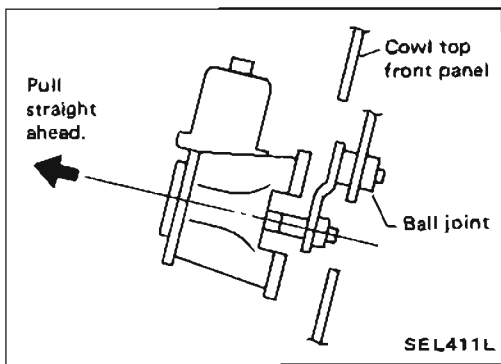
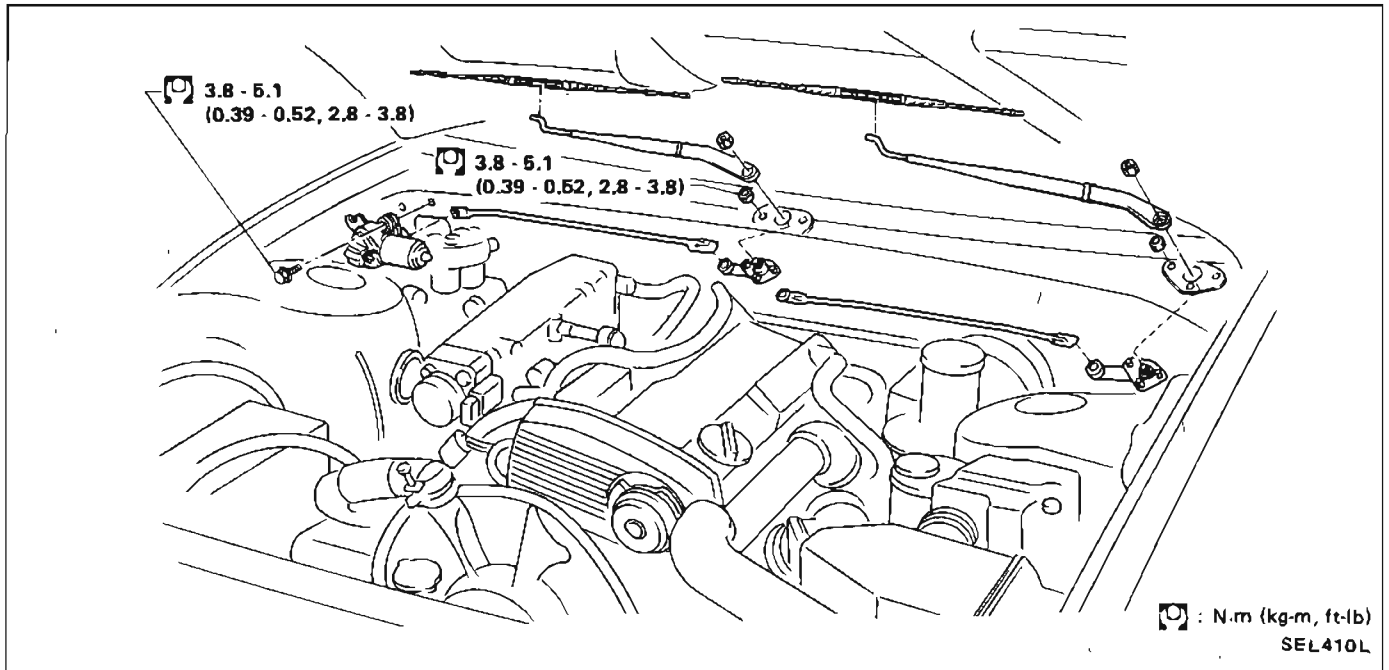


- (AL) : With anti-lock braking system
- (EA) : Without anti-lock braking system

Rear Wiper and Washer/Wiring Diagram



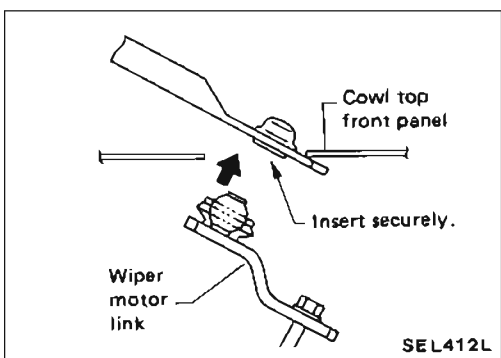
Wiper Removal and Installation



FRONT WIPER REMOVAL

Before removing front wiper motor link, turn wiper switch OFF and disconnect motor leads at connectors.

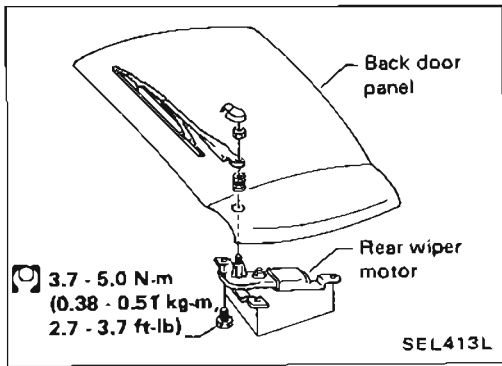
1. Remove wiper arm.
2. Remove cowl cover.
3. Remove bolts which secure wiper motor.
4. Extract wiper motor so that wiper motor link comes out of hole in front cowl top panel. Then, pull motor straight out to disconnect ball joint which connects motor link and wiper link. Wiper motor can then be removed.
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 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.

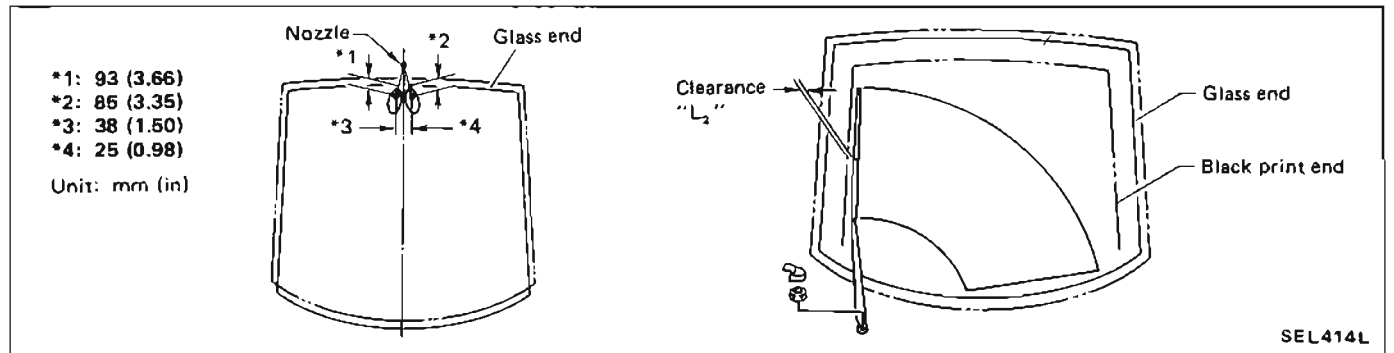
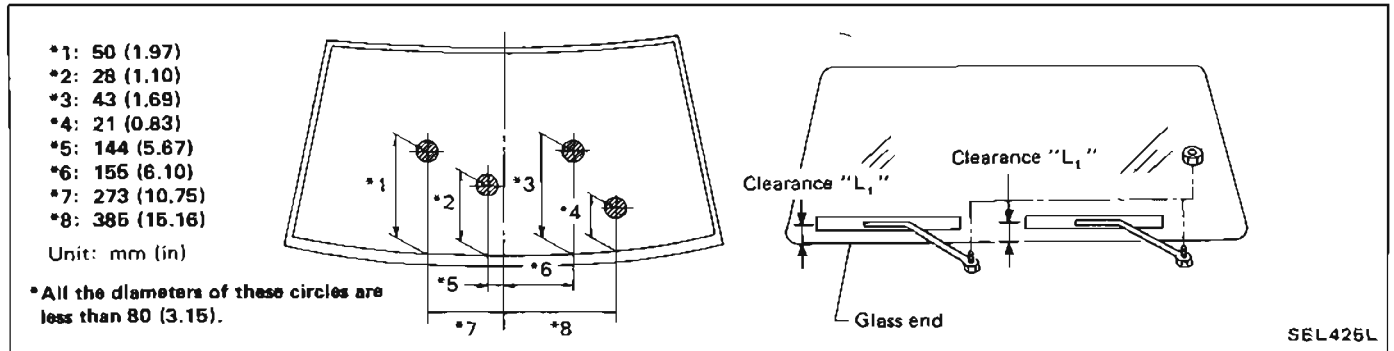
WIPER AND WASHER



Wiper and Washer Adjustment

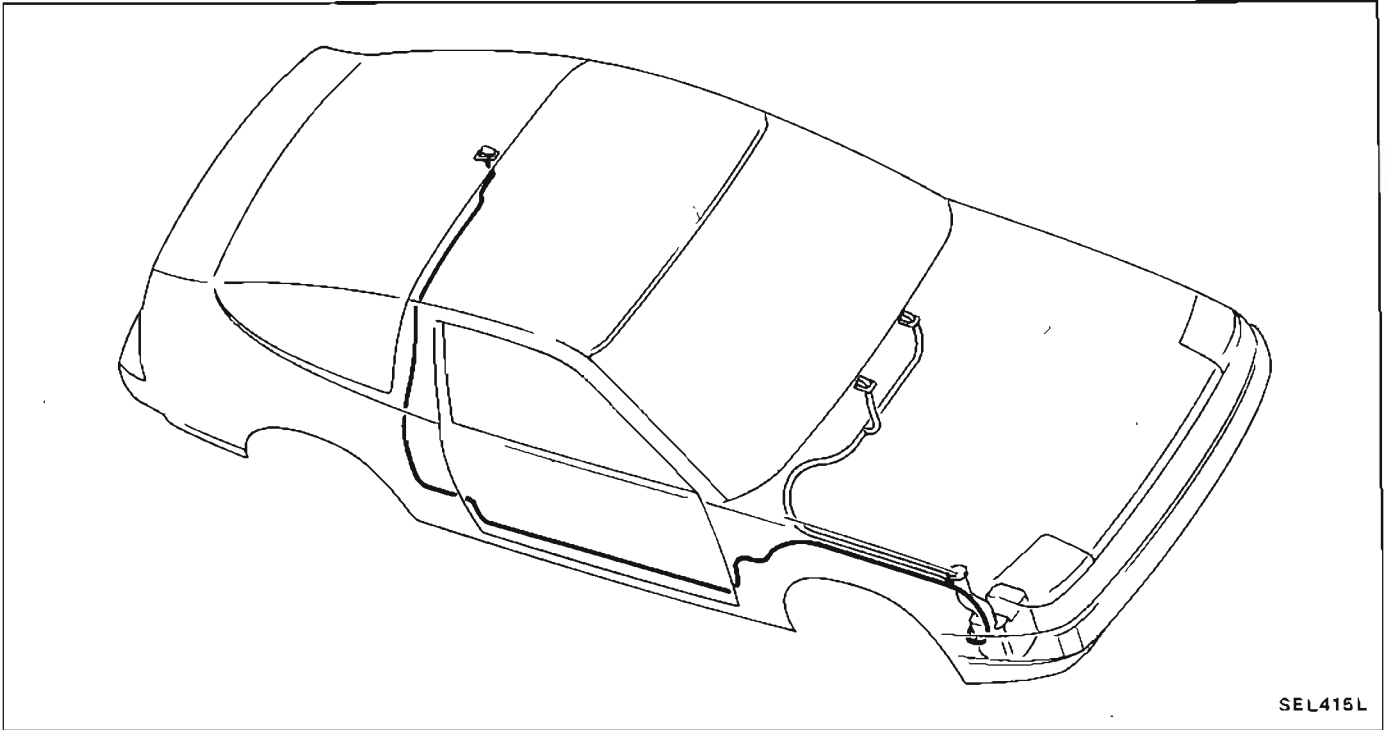
INSTALLATION

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 "L₁" & "L₂" 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 "L₁" & "L₂".
 - Clearance "L₁": 17.5 - 32.5 mm (0.689 - 1.280 in)
 - Clearance "L₂": 25 - 35 mm (0.98 - 1.38 in)
- Tighten wiper arm nuts to specified torque.
 - Front wiper: 17 - 23 N·m (1.7 - 2.3 kg·m, 12 - 17 ft·lb)
 - Rear wiper: 13 - 18 N·m (1.3 - 1.8 kg·m, 9 - 13 ft·lb)



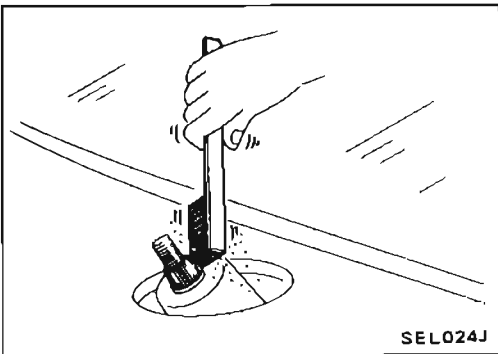
WIPER AND WASHER

Wiper and Washer Adjustment (Cont'd)



SEL415L

- Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.



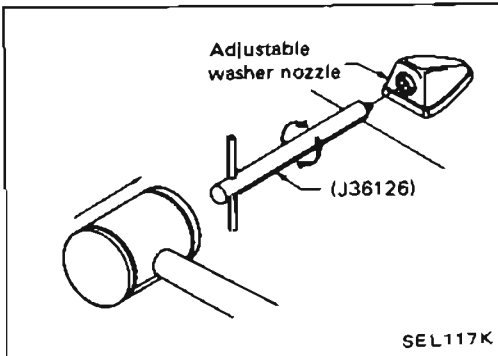
SEL024J

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.

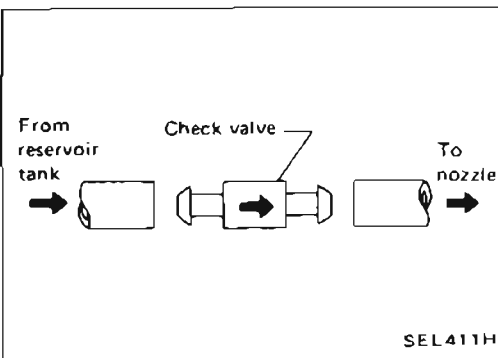
This will prevent "rounding out" the small female square in the center of the nozzle.



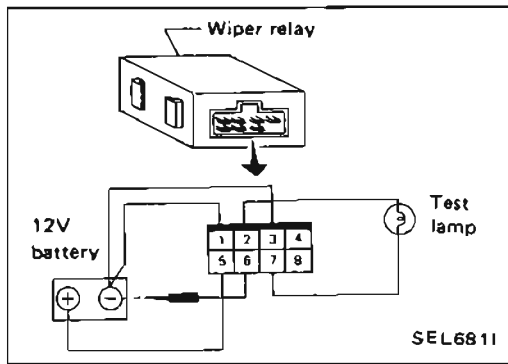
SEL117K

Check Valve

- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.



SEL411H

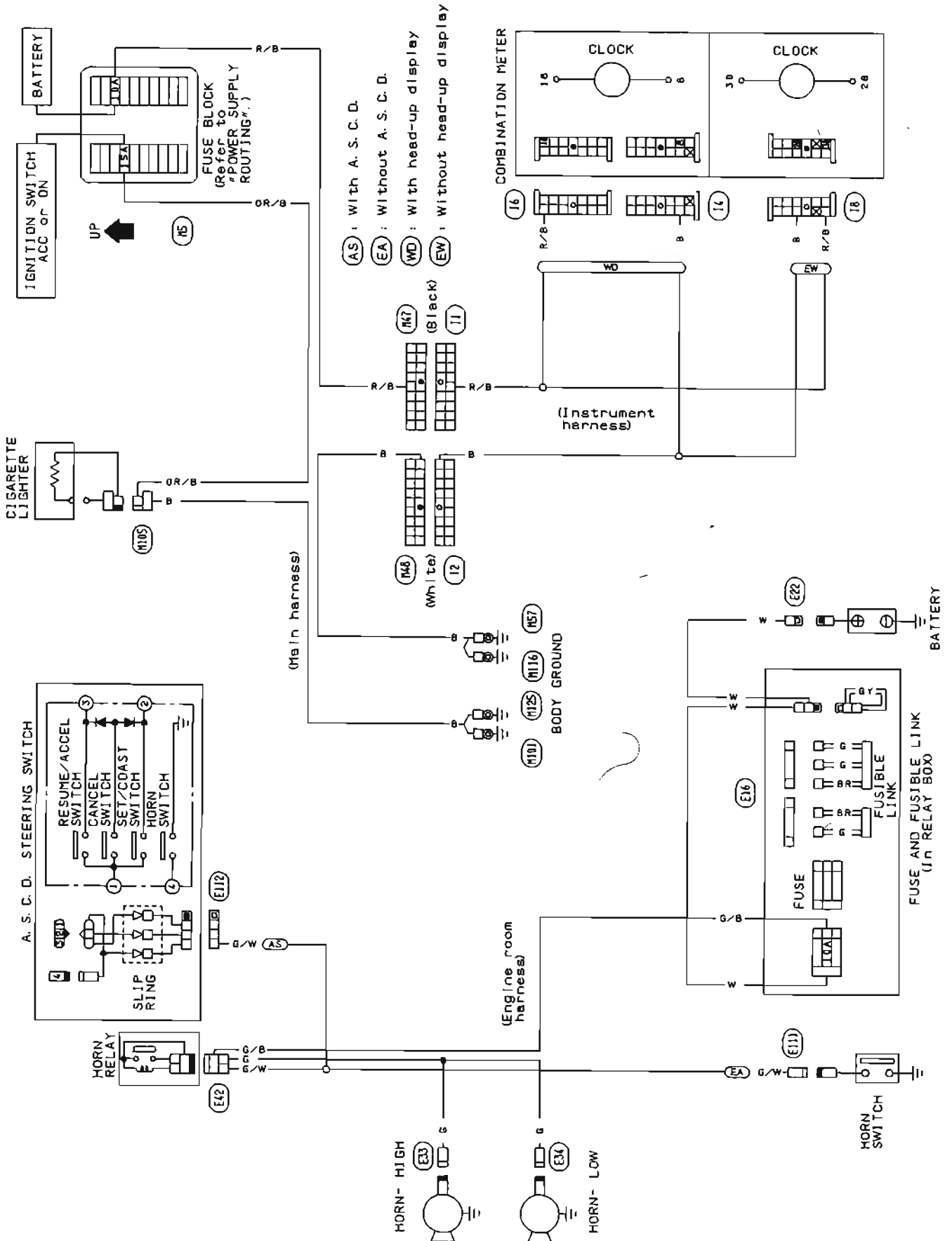


Wiper Amplifier Check

1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ⑥ and battery ground, wiper relay is normal.

HORN, CIGARETTE LIGHTER AND CLOCK

Wiring Diagram



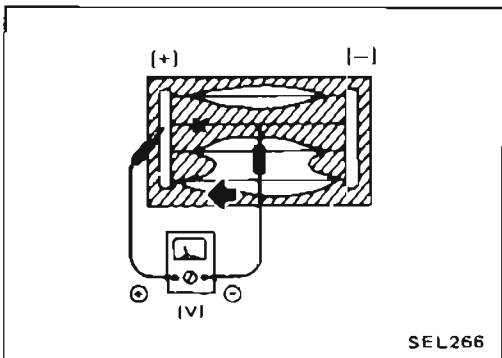
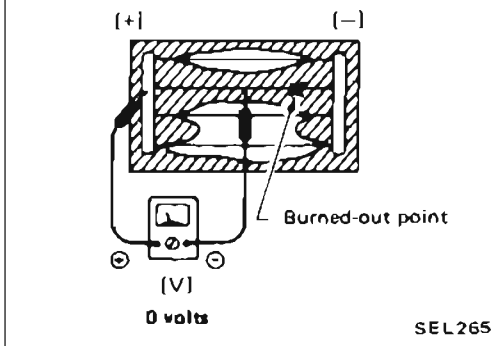
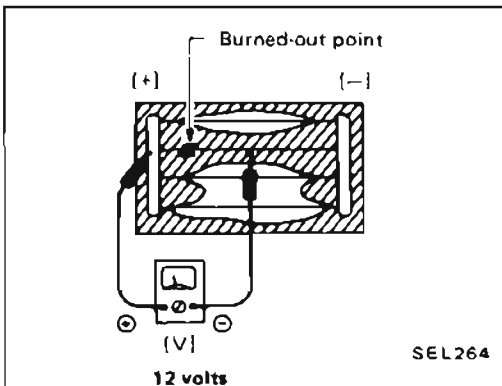
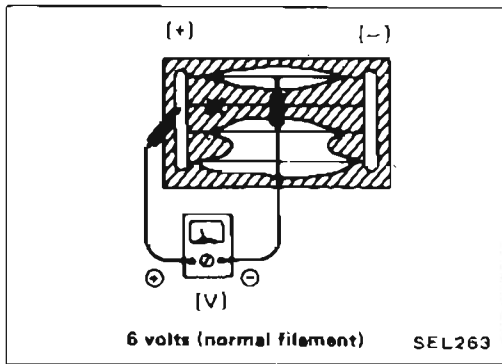
REAR WINDOW DEFOGGER

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

REPAIRING PROCEDURE

1. Wiper 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.

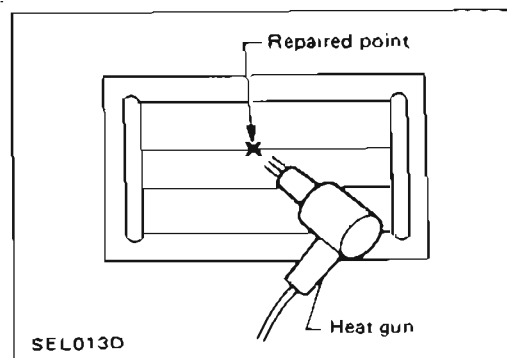
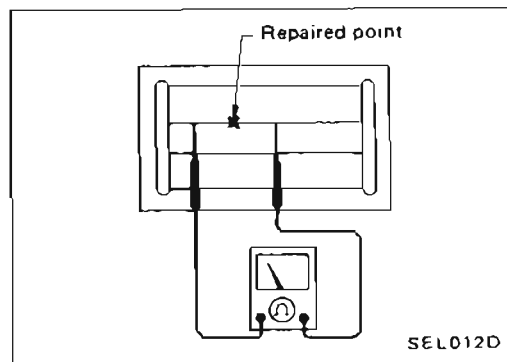
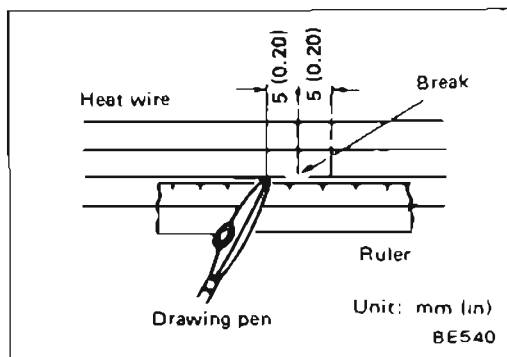
Shake silver composition container before use.

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.

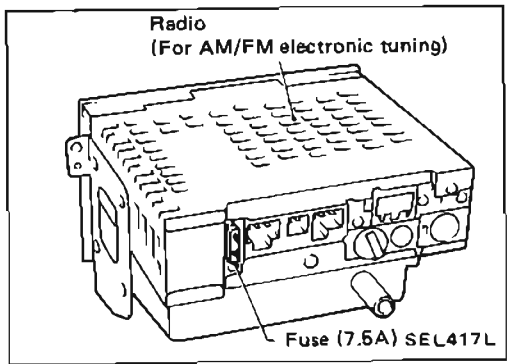
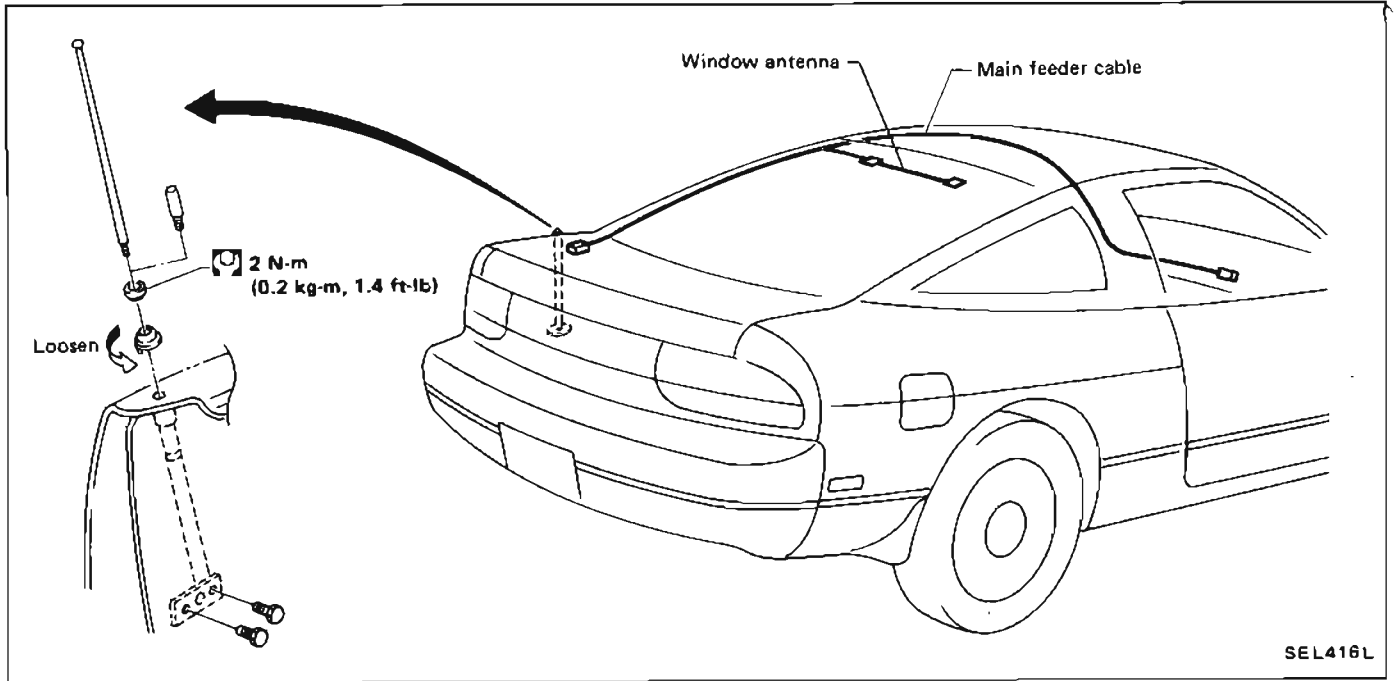
Do not touch repaired area while test is being conducted.

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 ANTENNA

Location of Antenna

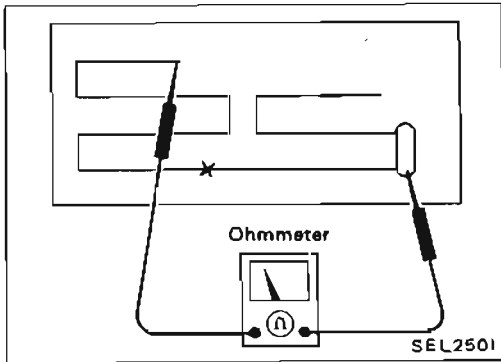


Radio Fuse Check

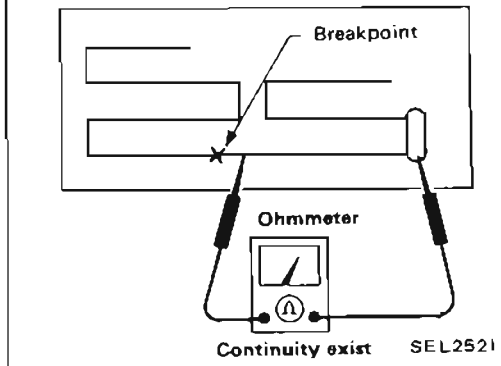
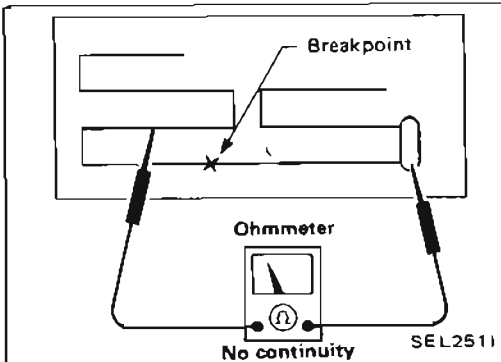
Window Antenna Repair

ELEMENT CHECK

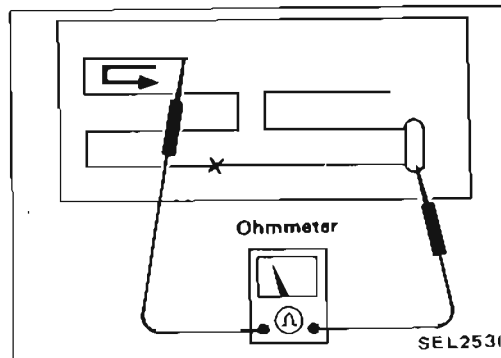
1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



2. If an element is broken, no continuity will exist.



3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

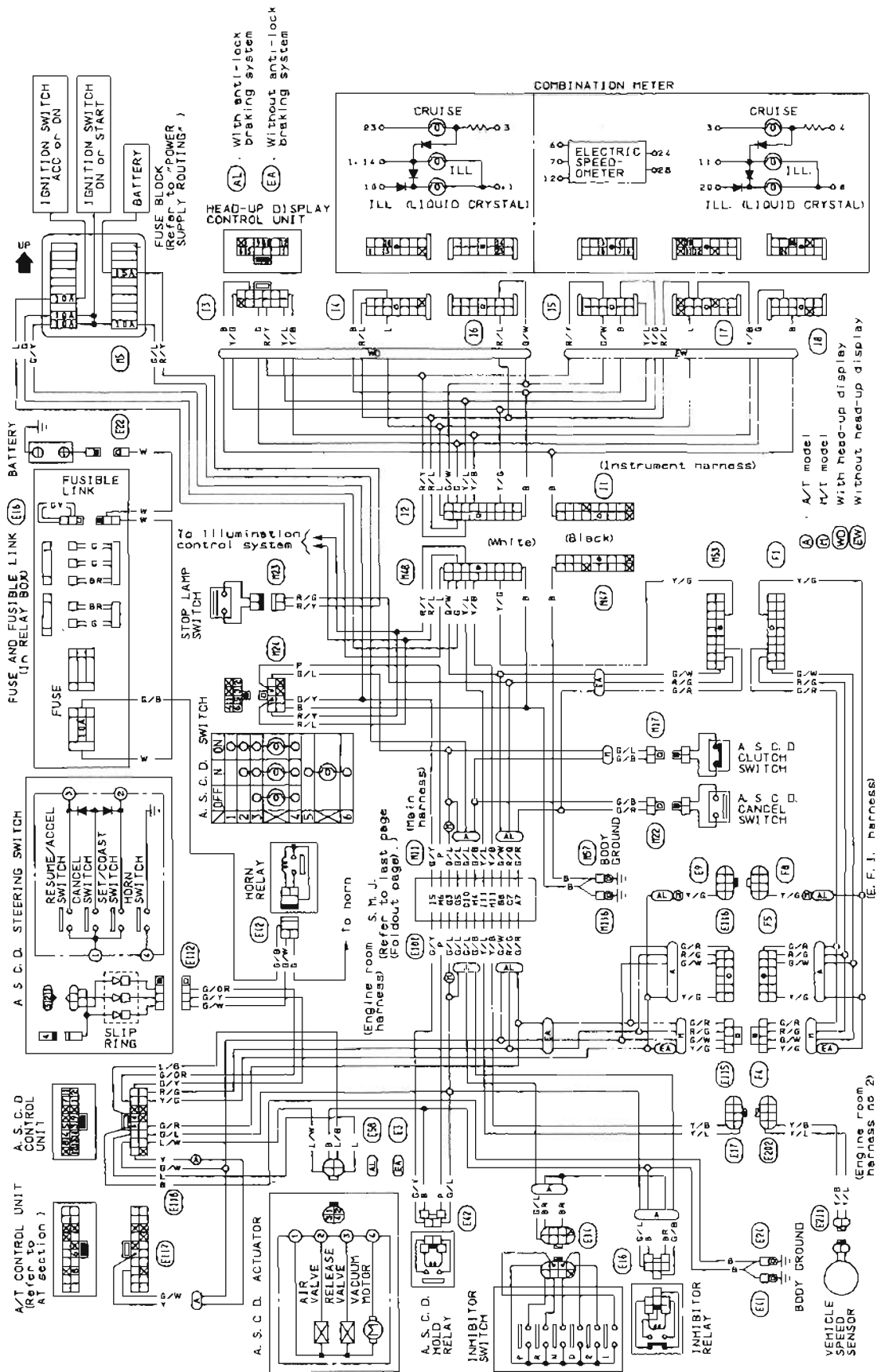


ELEMENT REPAIR

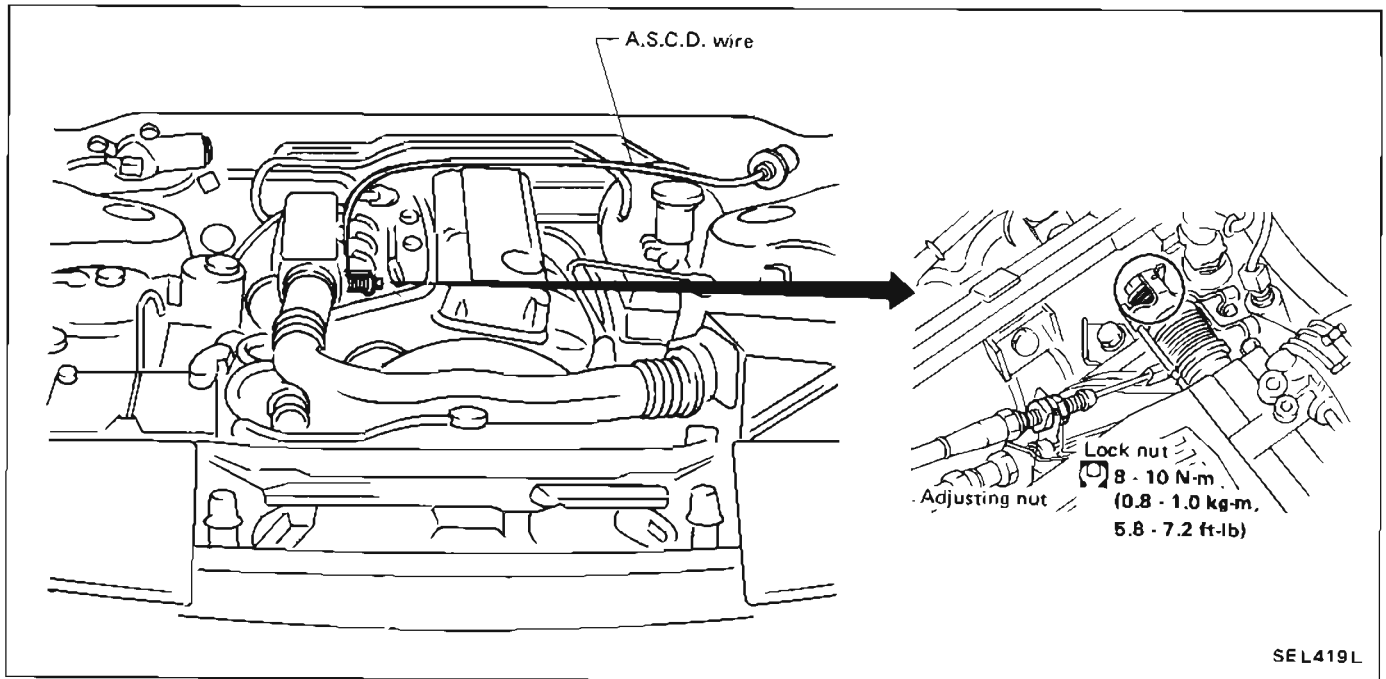
Refer to REAR WINDOW DEFOGGER "Filament Repair".

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

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. stop switch and clutch switch adjustment, refer to BR and CL sections.

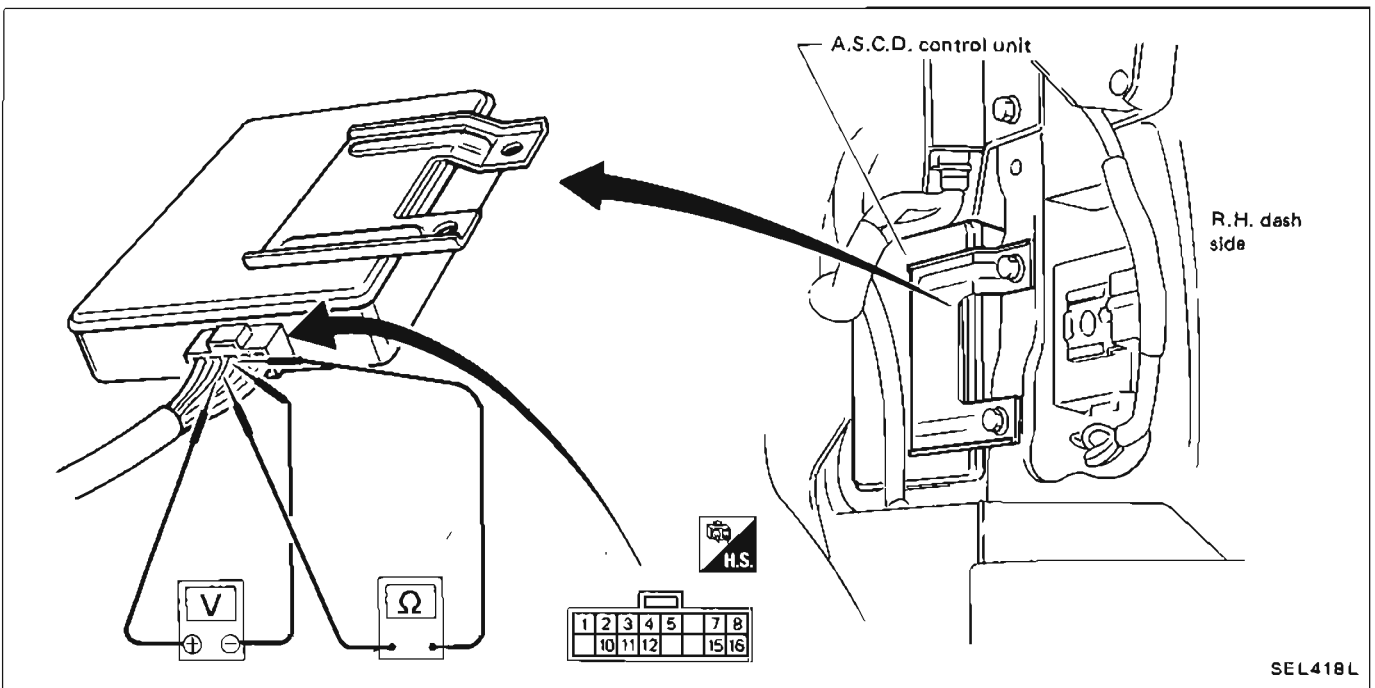
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

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 cancelled. | 6 |
| A/T model only | <ul style="list-style-type: none"> ● When A.S.C.D. is set while vehicle is operating in "O.D." range, O.D. will be cancelled and shifting to O.D. cannot be made thereafter. ● O.D. will not be cancelled 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 cancelled even if accelerator switch is turned "ON". |
| | 7 |

PREPARATION FOR TROUBLE-SHOOTING

1. Remove R.H. dash side cover.
2. Remove A.S.C.D. control unit with harness connected.
3. Perform check from harness side using circuit tester, with harness connector connected.



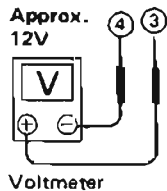
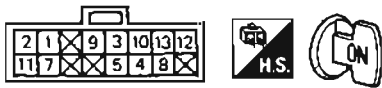
GROUND CIRCUIT CHECK

- Check continuity between ③ and body ground.

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

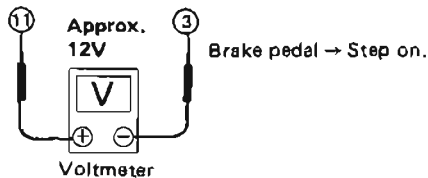
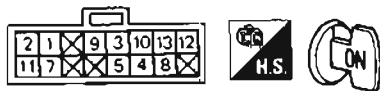
POWER SUPPLY CIRCUIT CHECK

1. Turn A.S.C.D. main switch to "ON".
2. Check voltage between ④ and ③.



CUT-OFF CIRCUIT CHECK

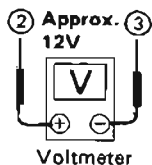
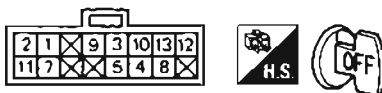
1. Step on brake pedal.
2. Turn A.S.C.D. main switch to "ON".
3. Check voltage between ① and ③.



SEL629L

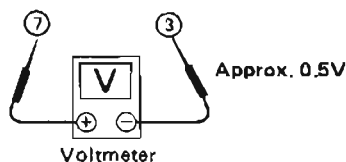
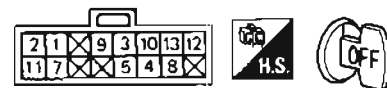
SET SWITCH CIRCUIT CHECK

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.

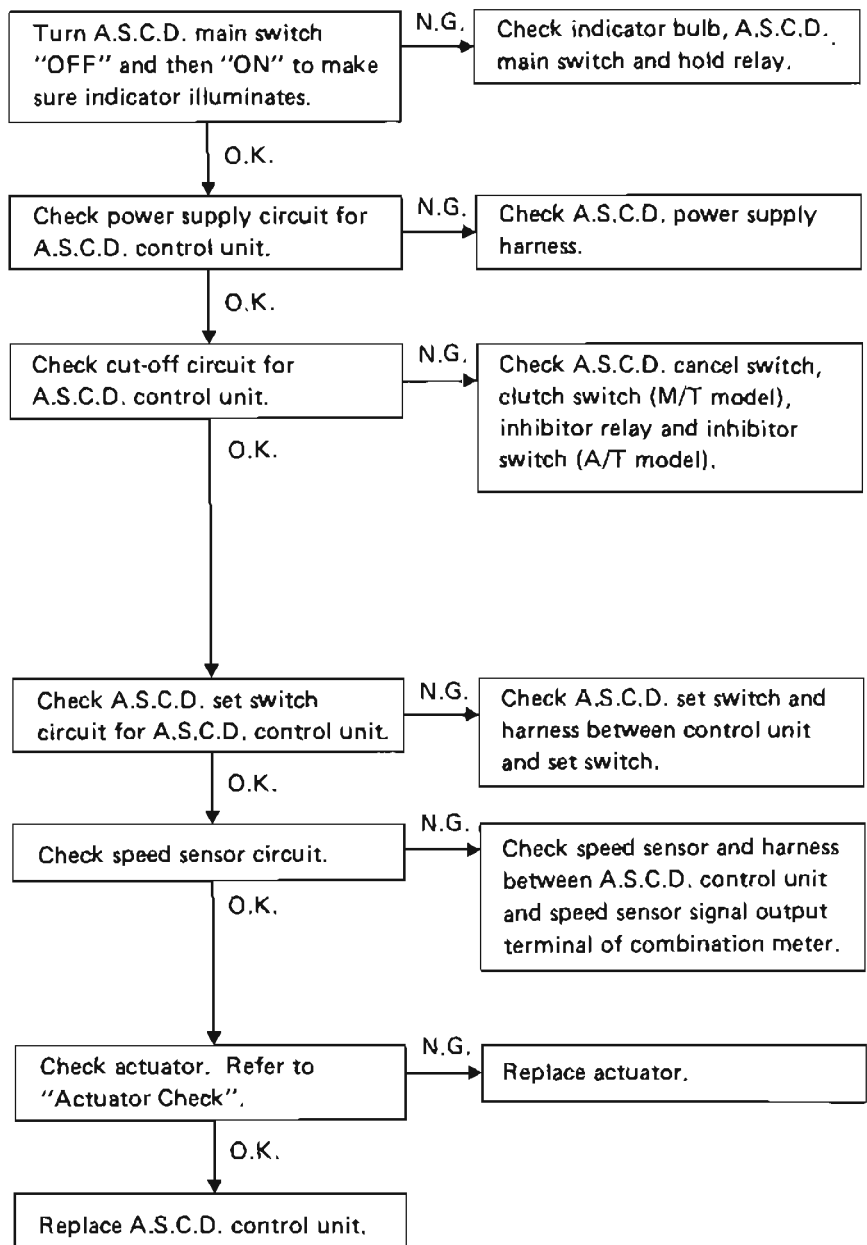


SEL630L

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE-1

A.S.C.D. control unit cannot be set properly.



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE-2

Resume switch will not operate.

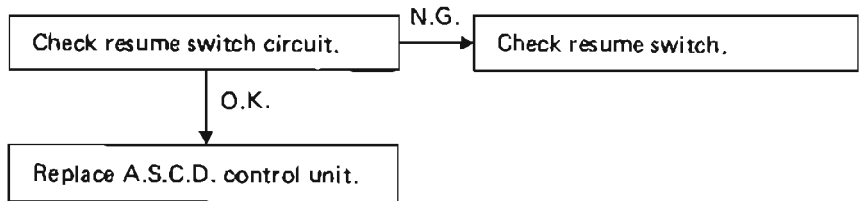
PRESUME SWITCH CIRCUIT CHECK

1. Turn resume switch to "ON".
2. Check voltage between ① and ③.

Approx. 12V
Voltmeter

Resume switch — ON

SEL636L



CANCEL SWITCH CIRCUIT CHECK

1. Turn cancel switch to "ON".
2. Check voltage between ② and ③ or ① and ③.

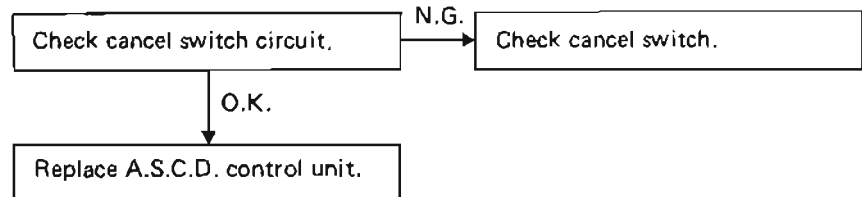
Approx. 12V
Voltmeter

Cancel switch → ON

SEL637L

DIAGNOSTIC PROCEDURE-3

Cancel switch will not operate.

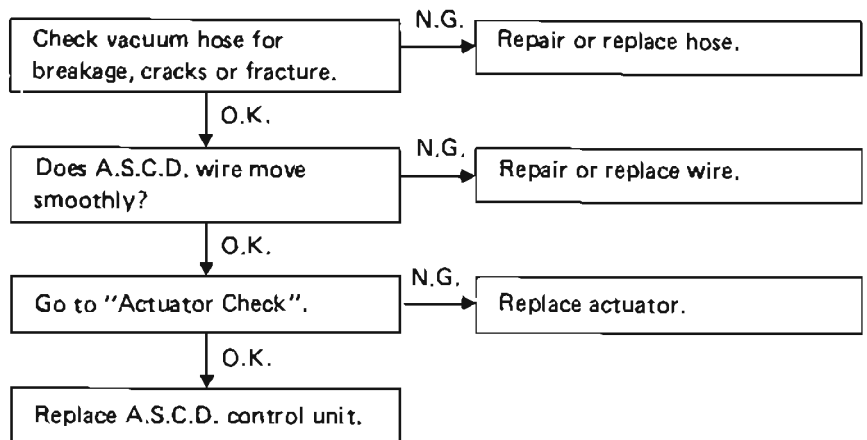


AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

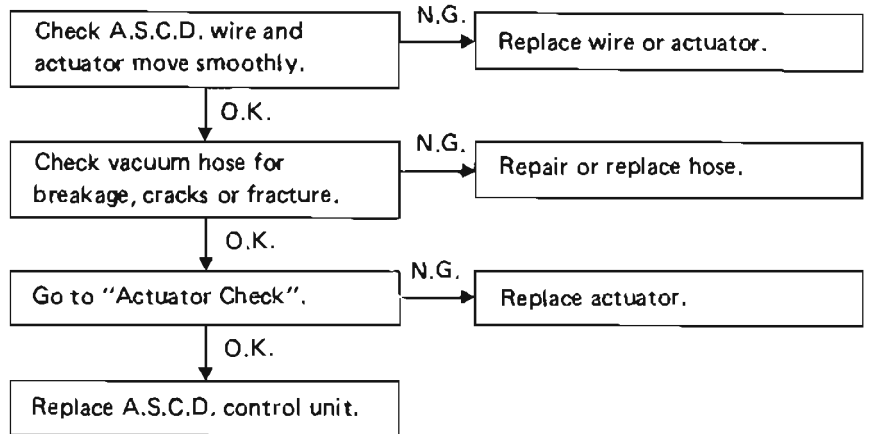
DIAGNOSTIC PROCEDURE-4

Engine hunts.



DIAGNOSTIC PROCEDURE-5

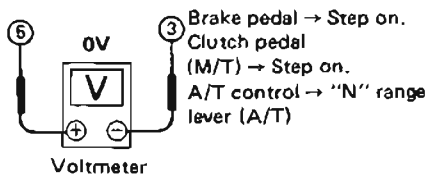
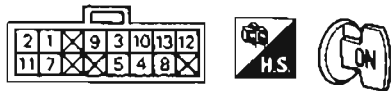
Large difference between set vehicle speed and actual speed.



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

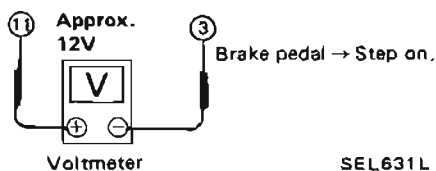
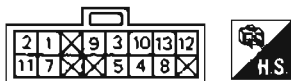
CUT-OFF CIRCUIT CHECK

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.

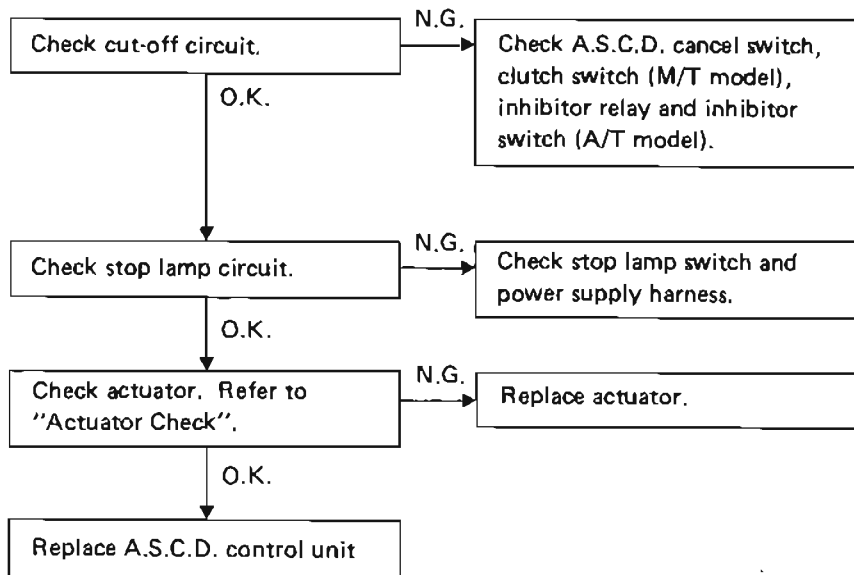


SEL631L

Trouble Diagnoses (Cont'd)

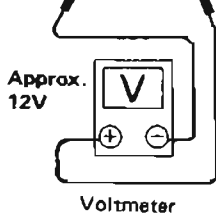
DIAGNOSTIC PROCEDURE-6

Set speed cannot be canceled.



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.



O.D. control switch → ON

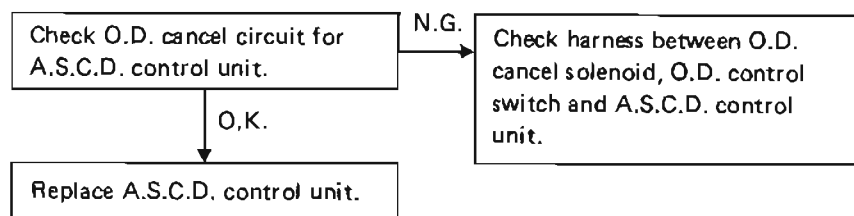
Voltmeter

SEL640M

DIAGNOSTIC PROCEDURE-7

A/T model only:

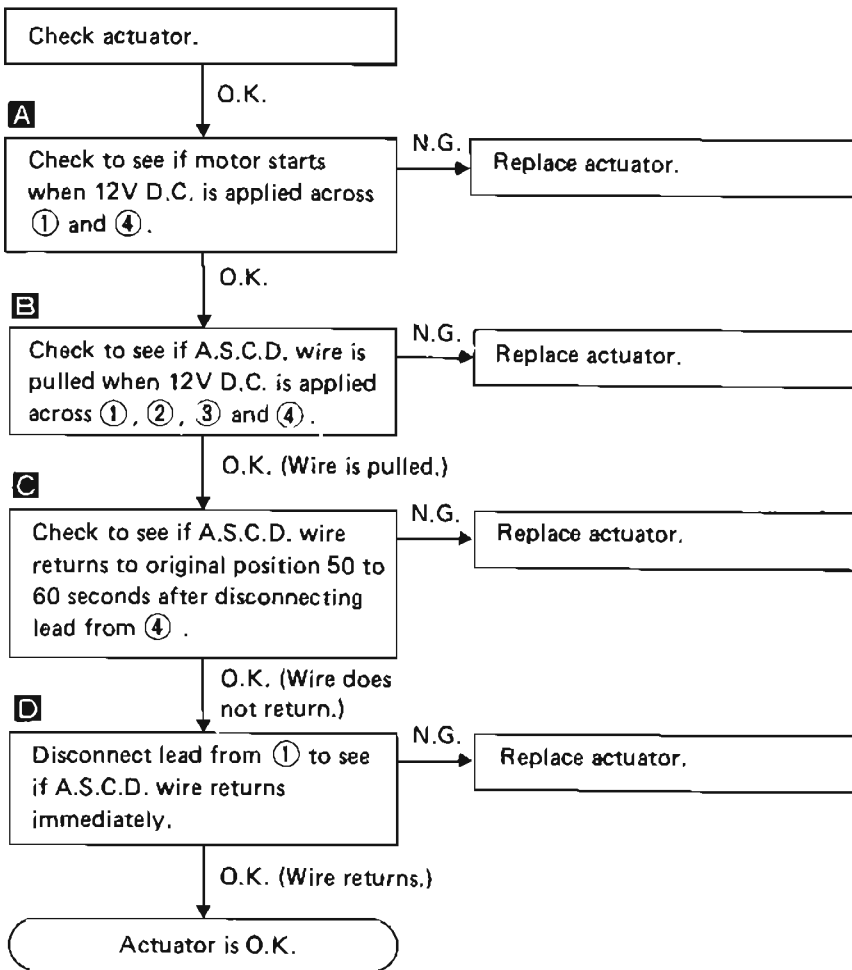
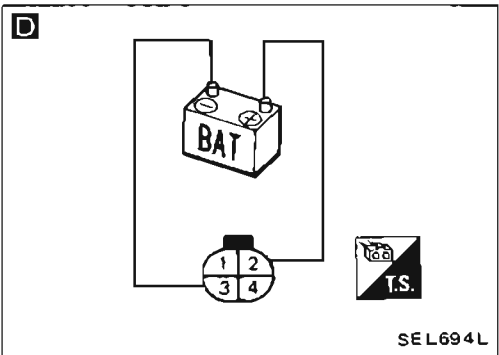
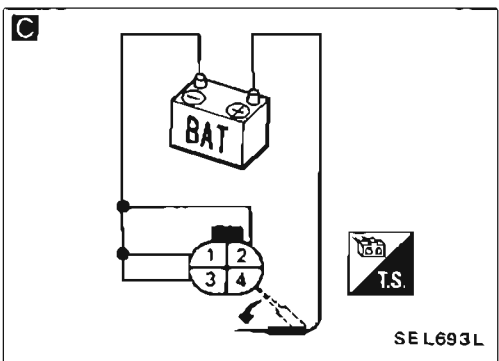
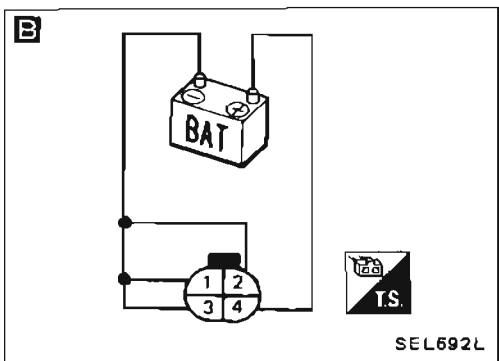
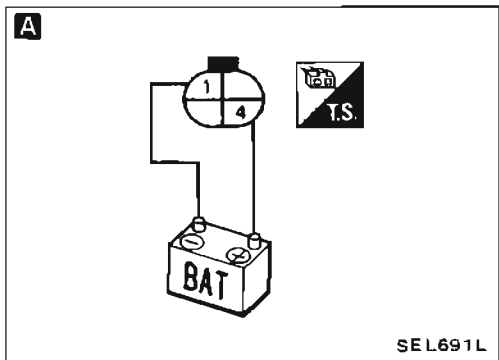
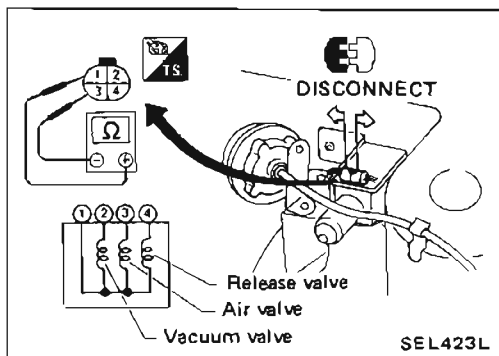
- When A.S.C.D. is set while vehicle is operating in "O.D." range, O.D. will be cancelled and shifting to O.D. cannot be made thereafter.
- O.D. will not be cancelled even if actual vehicle speed is 6 km/h (4 MPH) lower than set speed. (Set speed cannot be maintained.)
- O.D. will not be cancelled even if accelerator switch is turned "ON".



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

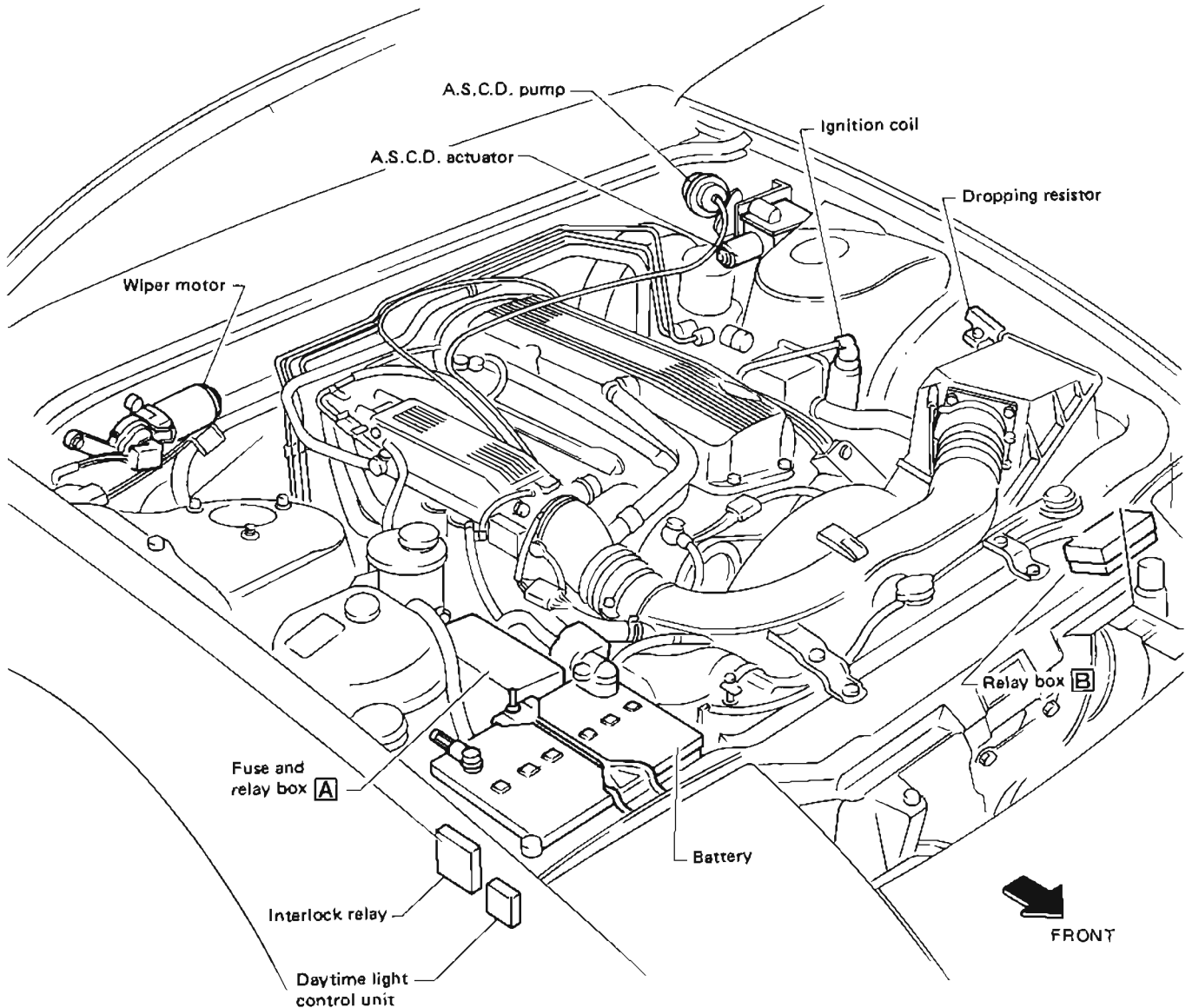
Actuator Check

1. Disconnect connector of actuator from main harness.
2. Check actuator operations as shown.

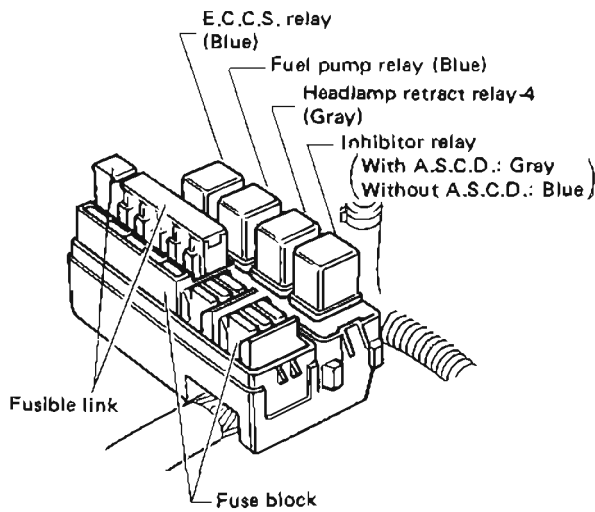


LOCATION OF ELECTRICAL UNITS

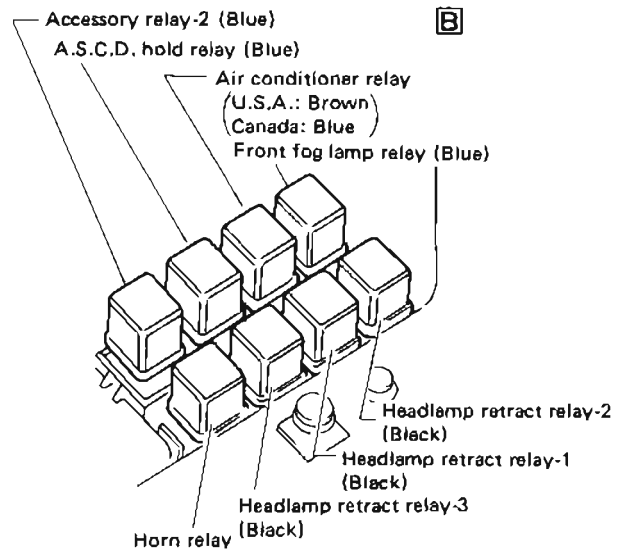
Engine Compartment



A



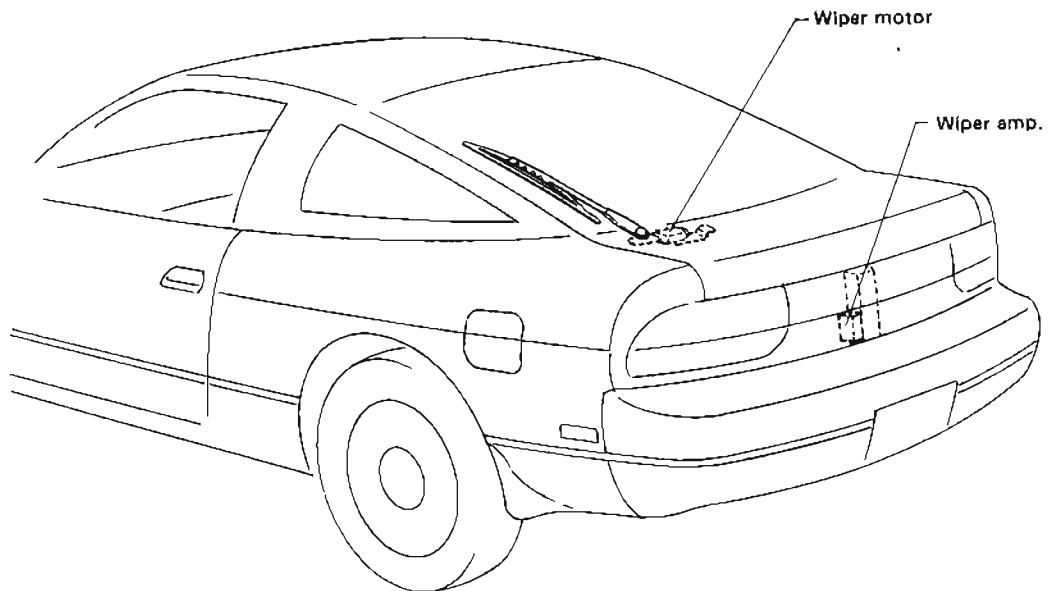
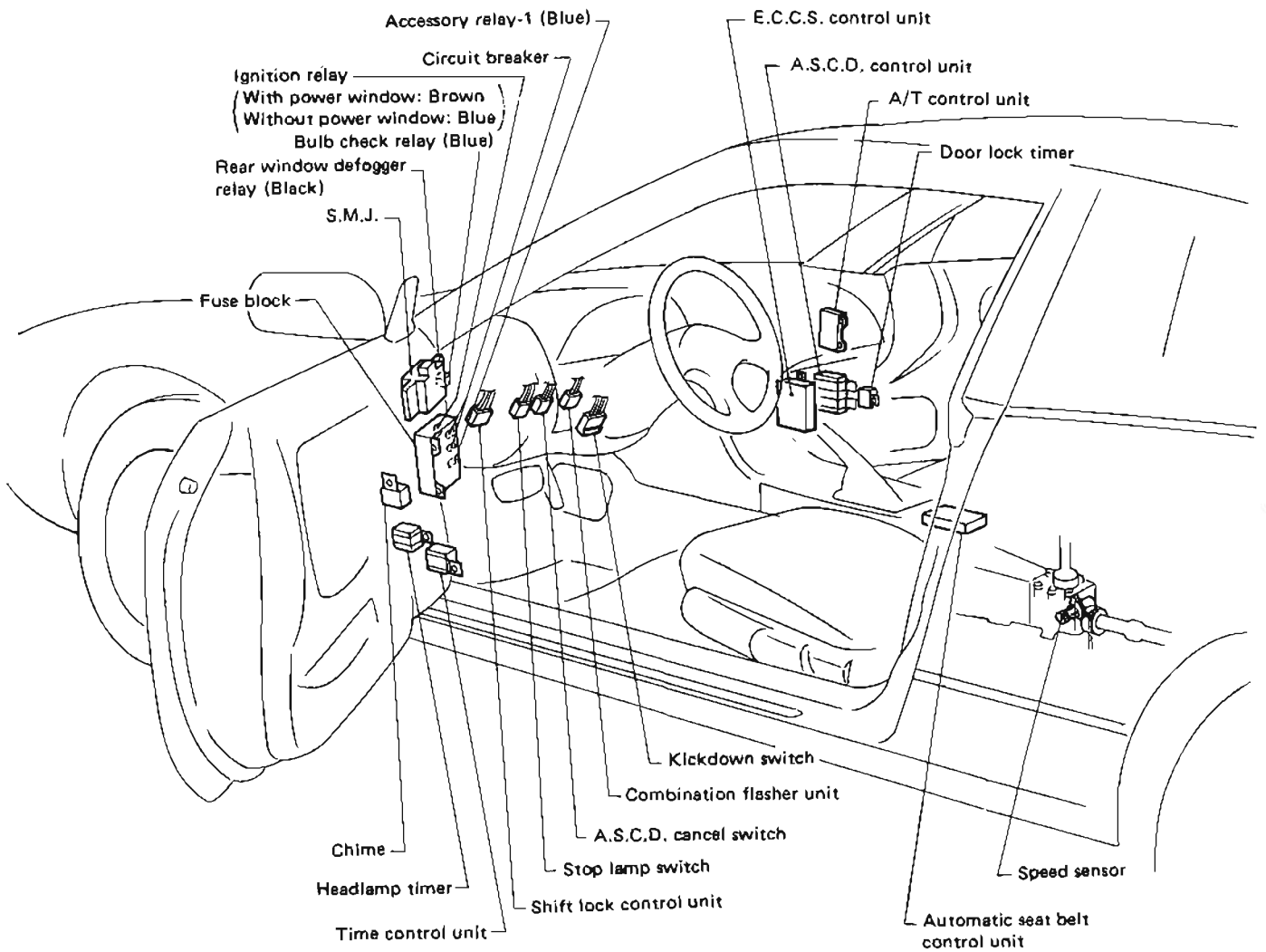
B



SEL420L

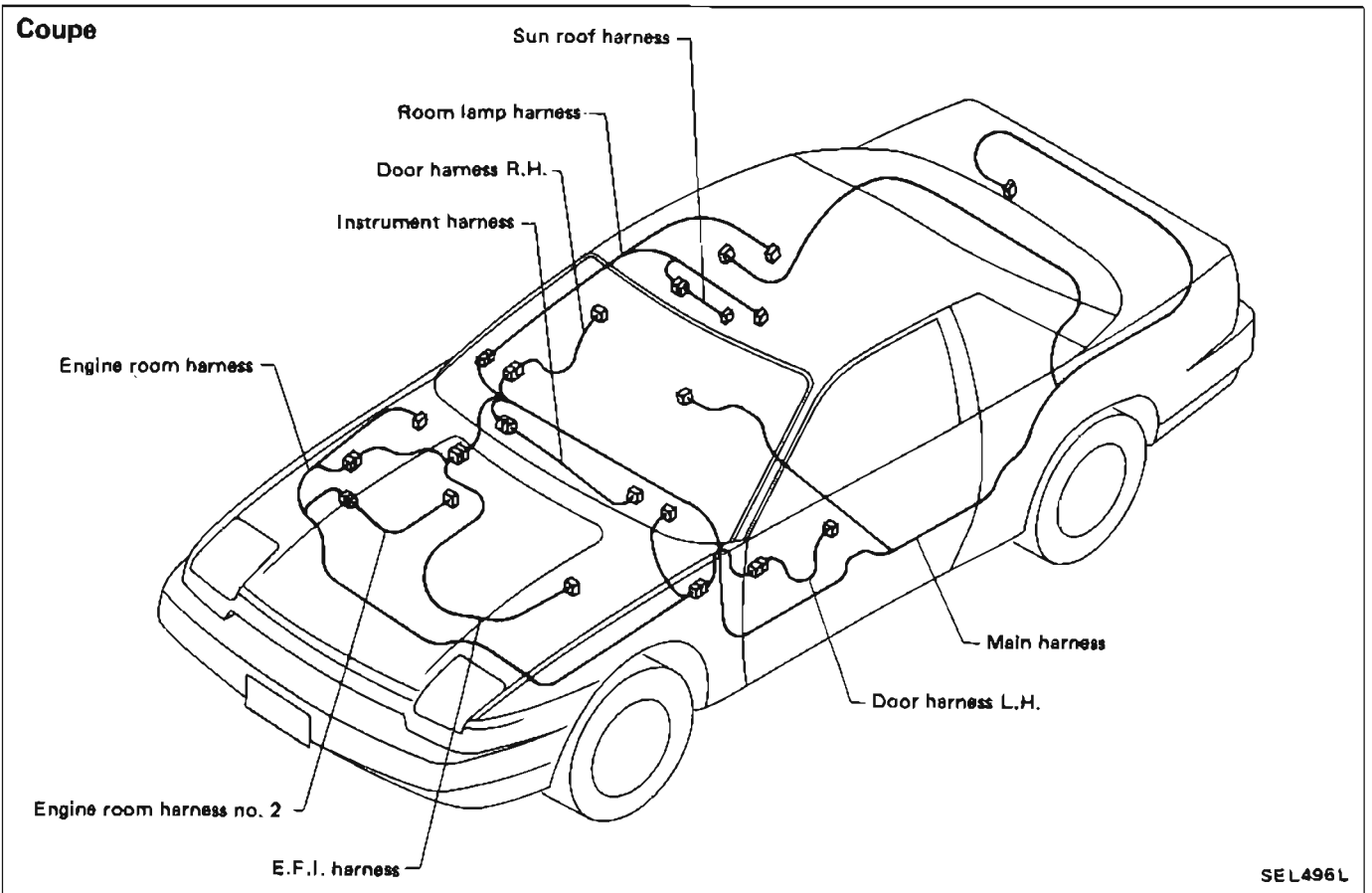
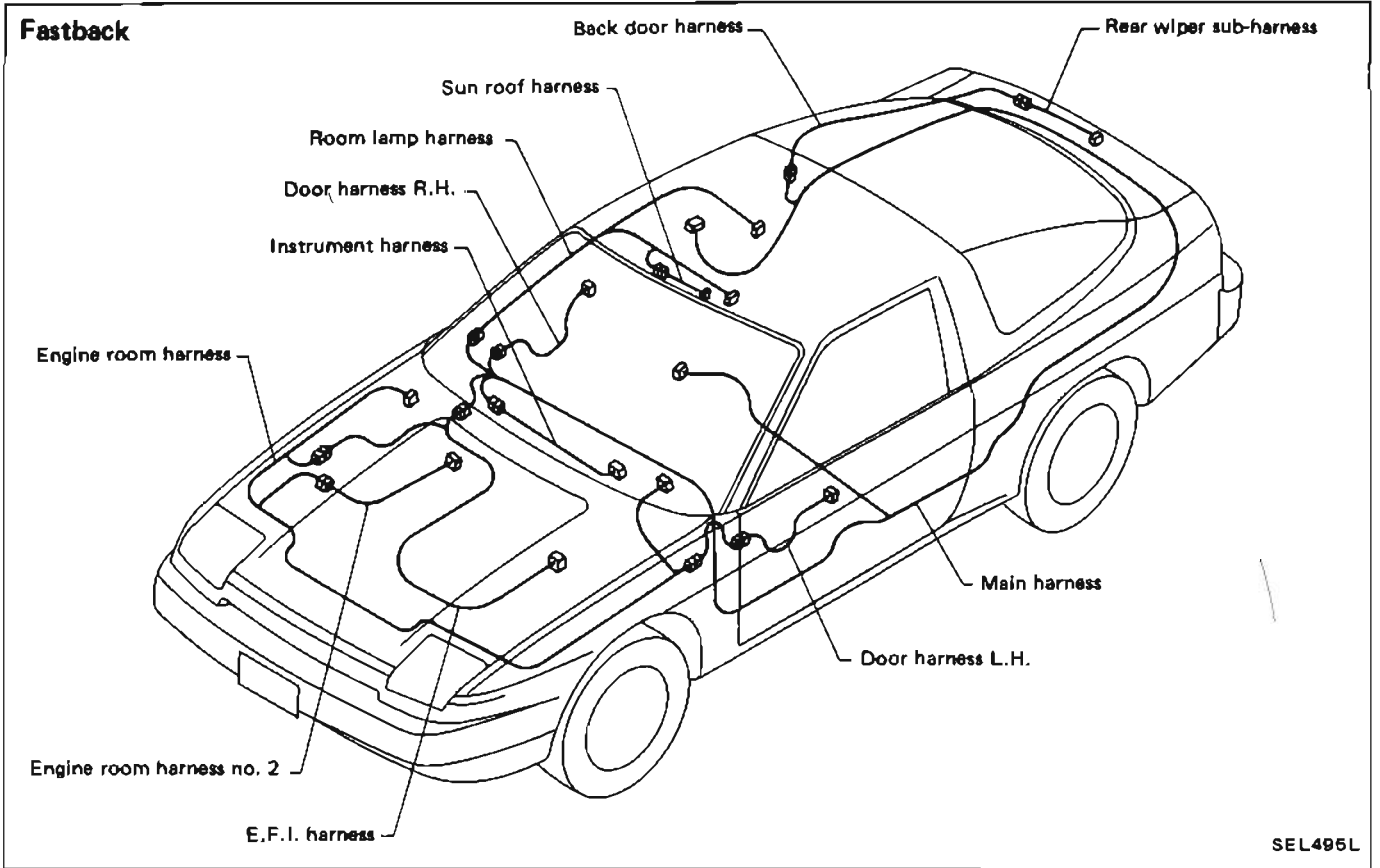
LOCATION OF ELECTRICAL UNITS

Passenger Compartment



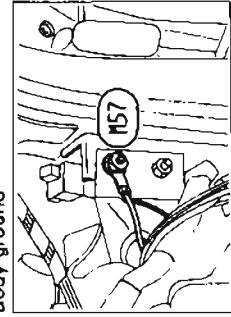
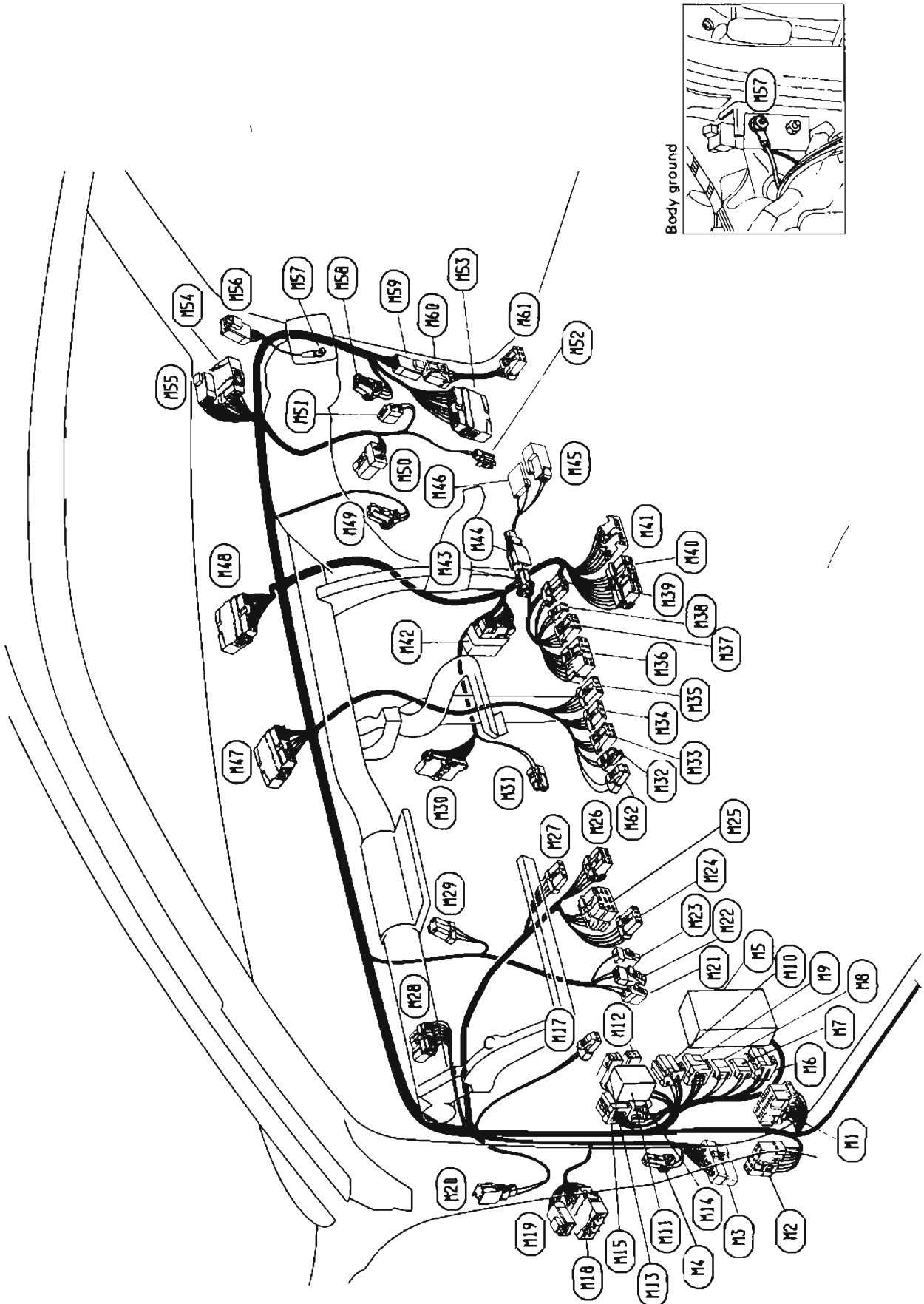
HARNES LAYOUT

Outline



HARNESS LAYOUT

Main Harness



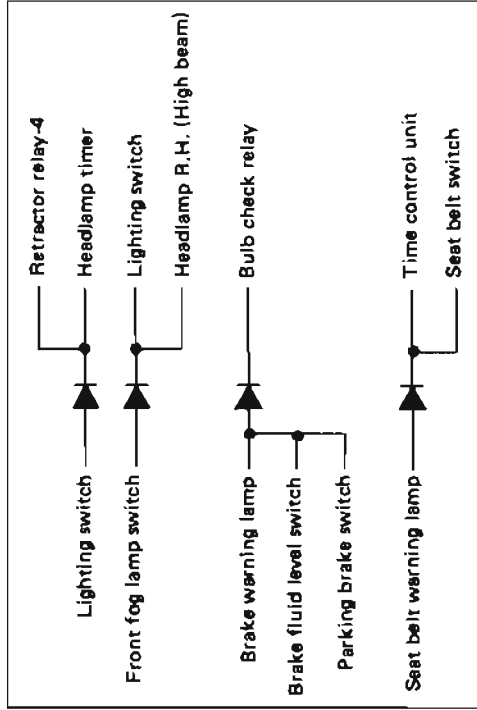
HARNES LAYOUT

Main Harness (Cont'd)

- (11) : Time control unit
- (12) : Headlamp timer
- (13) : Check connector
- (14) : Warning chime
- (15) : Fuse block
- (16) : Accessory relay-1
- (17) : Circuit breaker (Model with power window system)
- (18) : Circuit breaker (For U.S.A.)
- (19) : Ignition relay (Model with power window system)
- (20) : Ignition relay (Model without power window system)
- (21) : To engine room harness (E10)
- (22) : To engine room harness (E10) (Blue)
- (23) : To engine room harness (E10) (Black)
- (24) : Bulb check relay
- (25) : Rear window defogger relay
- (26) : A.S.C.D. clutch switch (M/T model with A.S.C.D.)
- (27) : To door harness L.H. (2)
- (28) : To door harness L.H. (2)
- (29) : Driver side front limit switch (For U.S.A.)
- (30) : Kickdown switch (A/T model)
- (31) : A.S.C.D. cancel switch (Model with A.S.C.D.)
- (32) : Stop lamp switch
- (33) : A.S.C.D. main switch (Model with A.S.C.D.)
- (34) : Headlamp retractor switch
- (35) : Illumination control switch
- (36) : Front fog lamp switch
- (37) : Shift lock control unit (A/T model)
- (38) : Combination flasher unit
- (39) : Mode door motor
- (40) : Foot lamp L.H.
- (41) : O.D. off indicator lamp (A/T model)
- (42) : Rear wiper and washer switch
- (43) : Rear window defogger switch
- (44) : Hazard switch
- (45) : Radio
- (46) : Radio
- (47) : Cassette deck
- (48) : Cassette deck
- (49) : Push control unit
- (50) : Fan switch
- (51) : Diode
- (52) : To sub-harness (14)
- (53) : To main harness (13)
- (54) : Glove box lamp
- (55) : Glove box lamp switch

- (117) : To instrument harness (11) (Black)
- (118) : To instrument harness (12) (White)
- (119) : Thermo control amplifier
- (120) : Heater resistor
- (121) : Blower motor
- (122) : Foot lamp R.H.
- (123) : To E.F.I. harness (1)
- (124) : To door harness R.H. (11)
- (125) : To door harness R.H. (10)
- (126) : To room lamp harness (1)
- (127) : Body ground
- (128) : Intake door motor
- (129) : To sub-harness (16)
- (130) : To main harness (15)
- (131) : Door lock timer
- (132) : Washer warning lamp (Model with Anti-lock Braking System)

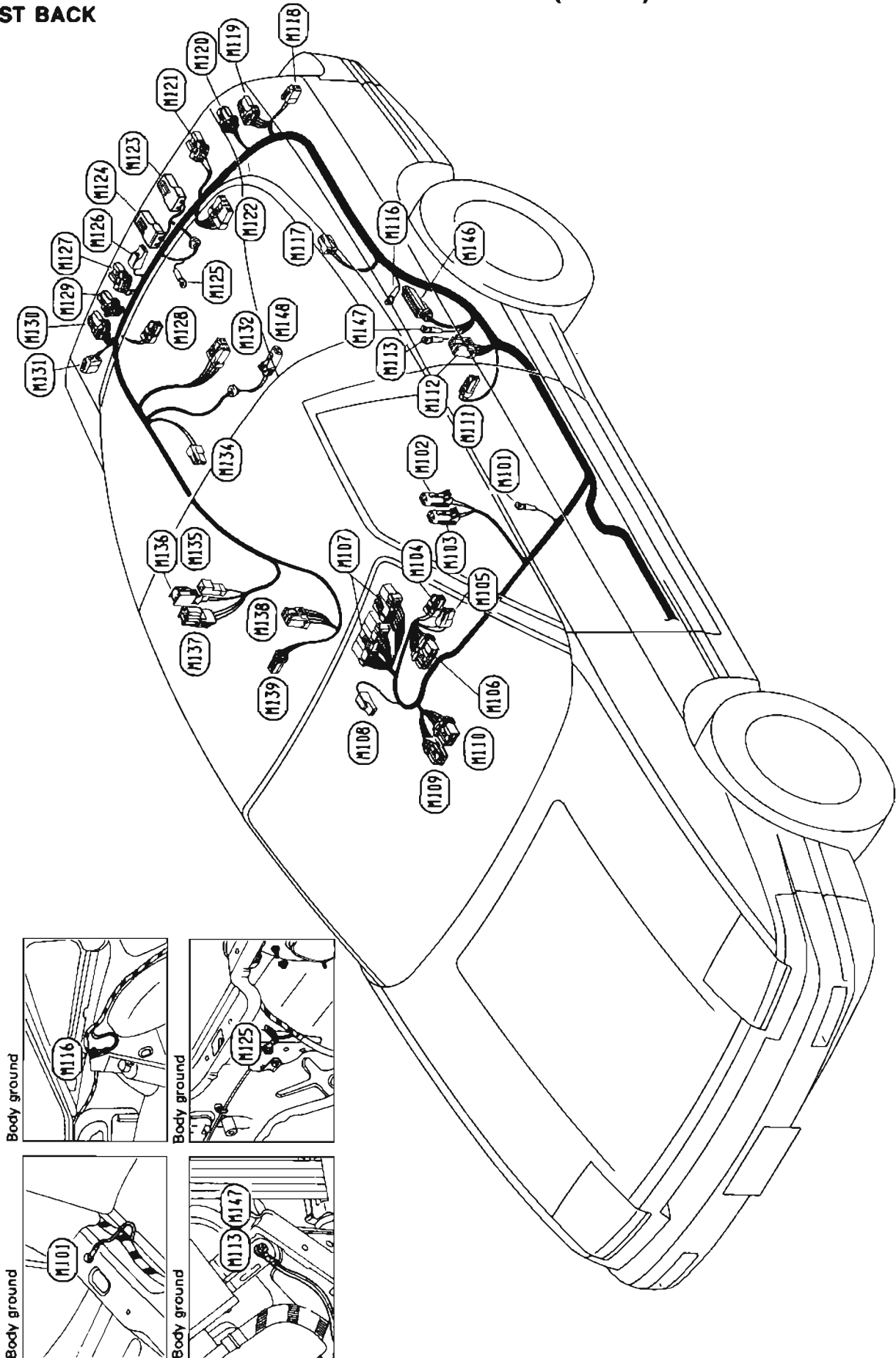
Diode (142)



HARNES LAYOUT

Main Harness (Cont'd)

FAST BACK



HARNES LAYOUT

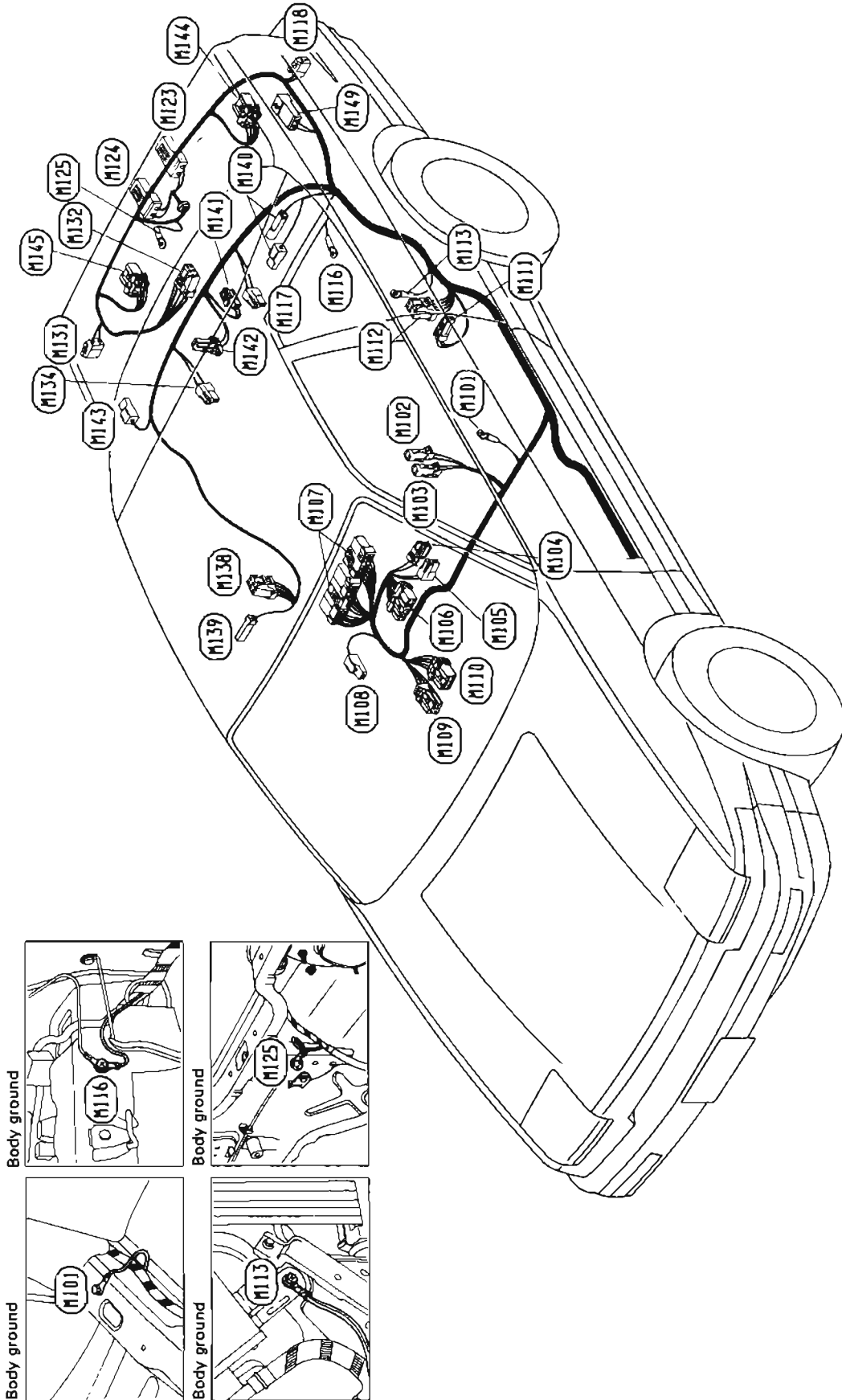
Main Harness (Cont'd)

- (N11) : Body ground
- (N12) : Lap belt buckle switch (For U.S.A.)
- (N13) : Seat belt switch (For Canada)
- (N14) : Ash tray illumination
- (N15) : Cigarette lighter
- (N16) : Door mirror control switch
- (N17) : Automatic seat belt control unit (For U.S.A.)
- (N18) : Parking brake switch
- (N19) : A/T device (A/T illumination and O.D. control switch) (A/T model)
- (N20) : Shift lock solenoid (A/T model)
- (N21) : Door switch L.H.
- (N22) : Automatic seat belt motor assembly L.H. (For U.S.A.)
- (N23) : Body ground (For U.S.A.)
- (N24) : Body ground
- (N25) : Rear speaker L.H.
- (N26) : Rear side marker lamp L.H.
- (N27) : Rear combination lamp L.H.
- (N28) : Rear combination lamp L.H.
- (N29) : Fuel tank gauge unit
- (N30) : Rear speaker R.H.
- (N31) : To back door harness (050)
- (N32) : To back door harness (052)
- (N33) : To back door harness (053)
- (N34) : Automatic seat belt motor assembly R.H. (For U.S.A.)
- (N35) : Door switch R.H.
- (N36) : A.B.S. control unit (For Anti-lock Braking System)
- (N37) : Body ground (For Anti-lock Braking System)
- (N38) : Rear sensor (For Anti-lock Braking System)
- (N39) : Rear combination lamp L.H.
- (N40) : Back-up lamp L.H.
- (N41) : Rear wiper amplifier
- (N42) : License lamp L.H.
- (N43) : License lamp R.H.
- (N44) : Body ground
- (N45) : Luggage room lamp switch
- (N46) : Back-up lamp R.H.
- (N47) : Luggage room lamp
- (N48) : Rear combination lamp R.H.
- (N49) : Rear side marker lamp R.H.
- (N50) : Fuel tank gauge unit
- (N51) : Rear speaker R.H.
- (N52) : To back door harness (050)
- (N53) : To back door harness (052)
- (N54) : To back door harness (053)
- (N55) : Automatic seat belt motor assembly R.H. (For U.S.A.)
- (N56) : Door switch R.H.
- (N57) : A.B.S. control unit (For Anti-lock Braking System)
- (N58) : Body ground (For Anti-lock Braking System)
- (N59) : Rear sensor (For Anti-lock Braking System)

HARNESS LAYOUT

Main Harness (Cont'd)

COUPE



HARNES LAYOUT

Main Harness (Cont'd)

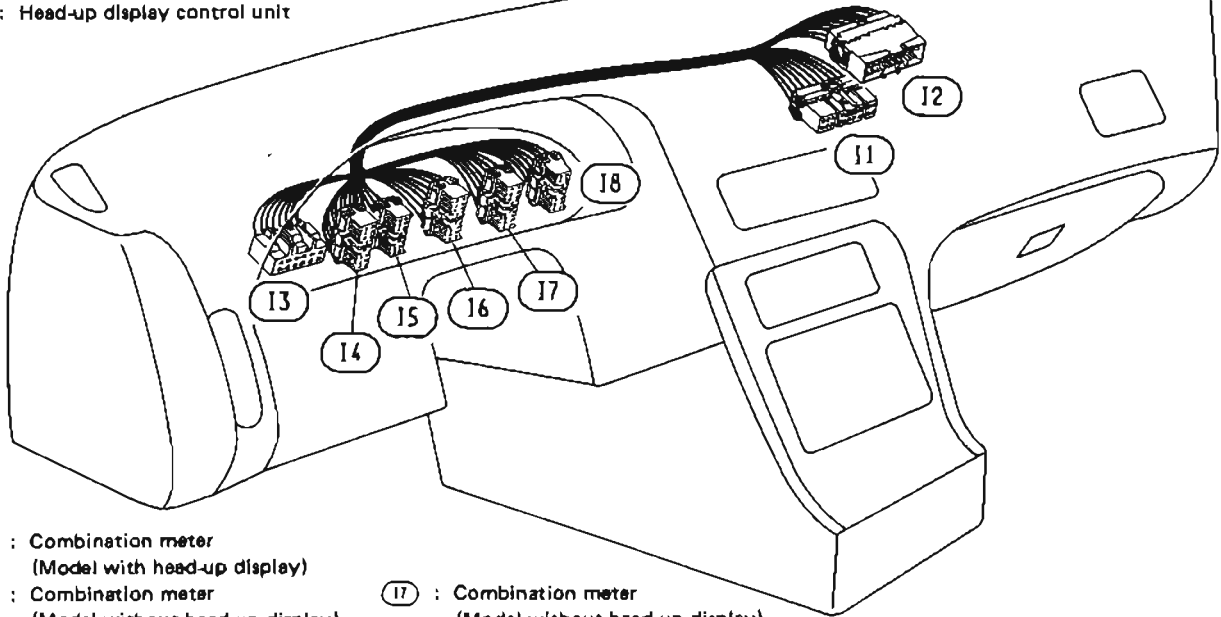
- (N118) : Body ground
- (N119) : Lap belt buckle switch (For U.S.A.)
- (N120) : Seat belt switch (For Canada)
- (N121) : Ash tray illumination
- (N122) : Cigarette lighter
- (N123) : Door mirror control switch
- (N124) : Automatic seat belt control unit (For U.S.A.)
- (N125) : Parking brake switch
- (N126) : A/T device (A/T illumination and O.D. control switch) (A/T model)
- (N127) : Shift lock solenoid (A/T model)
- (N128) : Door switch L.H.
- (N129) : Automatic seat belt motor assembly L.H. (For U.S.A.)
- (N130) : Body ground (For U.S.A.)
- (N131) : Body ground
- (N132) : Rear speaker L.H.

- (N116) : Rear side marker lamp L.H.
- (N117) : License lamp L.H.
- (N118) : License lamp R.H.
- (N119) : Body ground
- (N120) : Rear side marker lamp R.H.
- (N121) : Fuel tank gauge unit
- (N122) : Rear speaker R.H.
- (N123) : Automatic seat belt motor assembly R.H. (For U.S.A.)
- (N124) : Door switch R.H.
- (N125) : Trunk room lamp switch
- (N126) : Trunk room lamp
- (N127) : High-mounted stop lamp
- (N128) : Rear window defogger
- (N129) : Rear combination lamp L.H.
- (N130) : Rear combination lamp R.H.
- (N131) : Not used

HARNESS LAYOUT

Instrument Harness

- ⑪ : To main harness (H47) (Black)
- ⑫ : To main harness (H48) (White)
- ⑬ : Head-up display control unit



- ⑭ : Combination meter
(Model with head-up display)
- ⑮ : Combination meter
(Model without head-up display)
- ⑯ : Combination meter
(Model with head-up display)
- ⑰ : Combination meter
(Model without head-up display)
- ⑱ : Combination meter
(Model without head-up display)

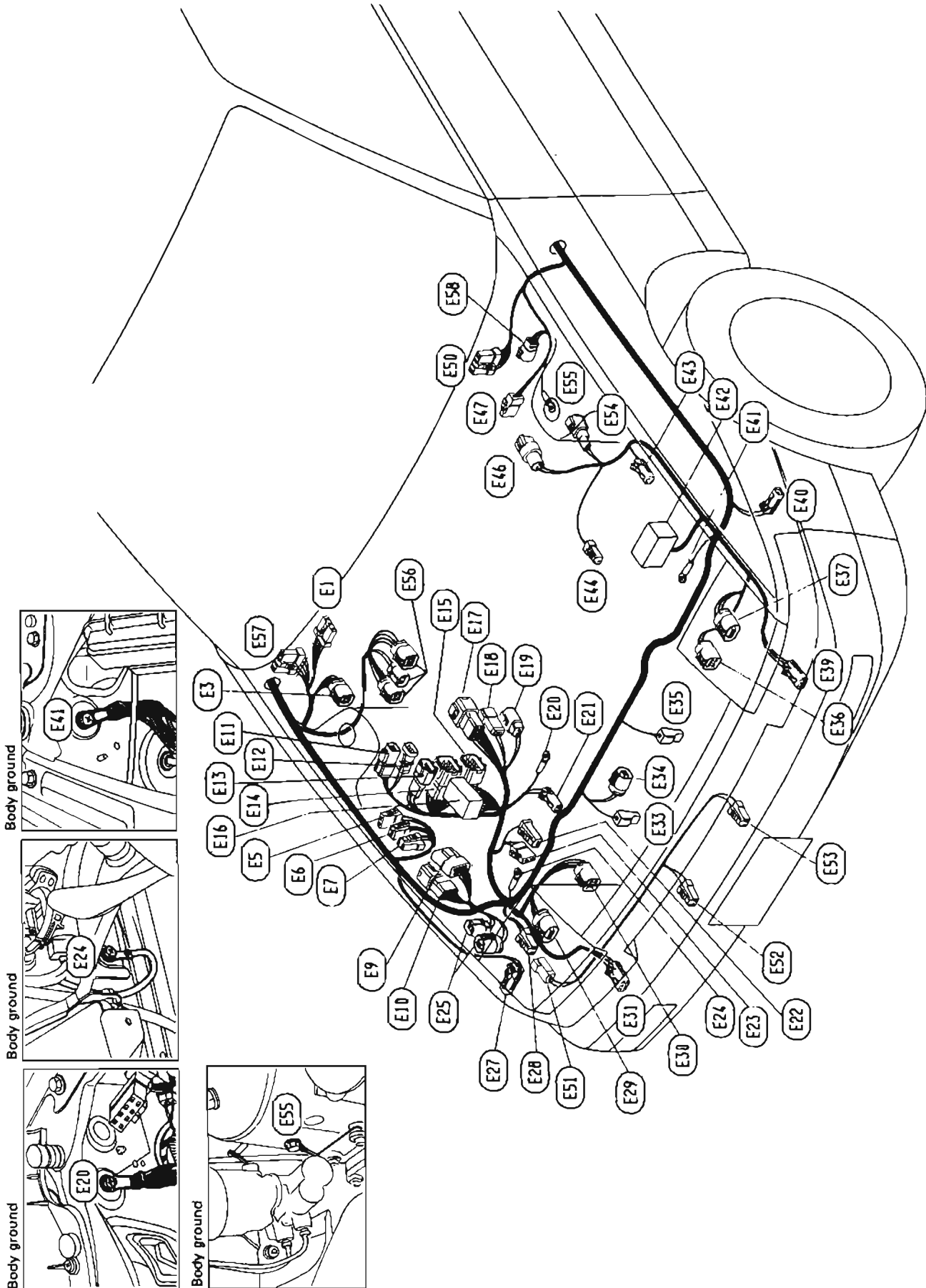
SEL601L

HARNESS LAYOUT

NOTE

HARNESS LAYOUT

Engine Room Harness



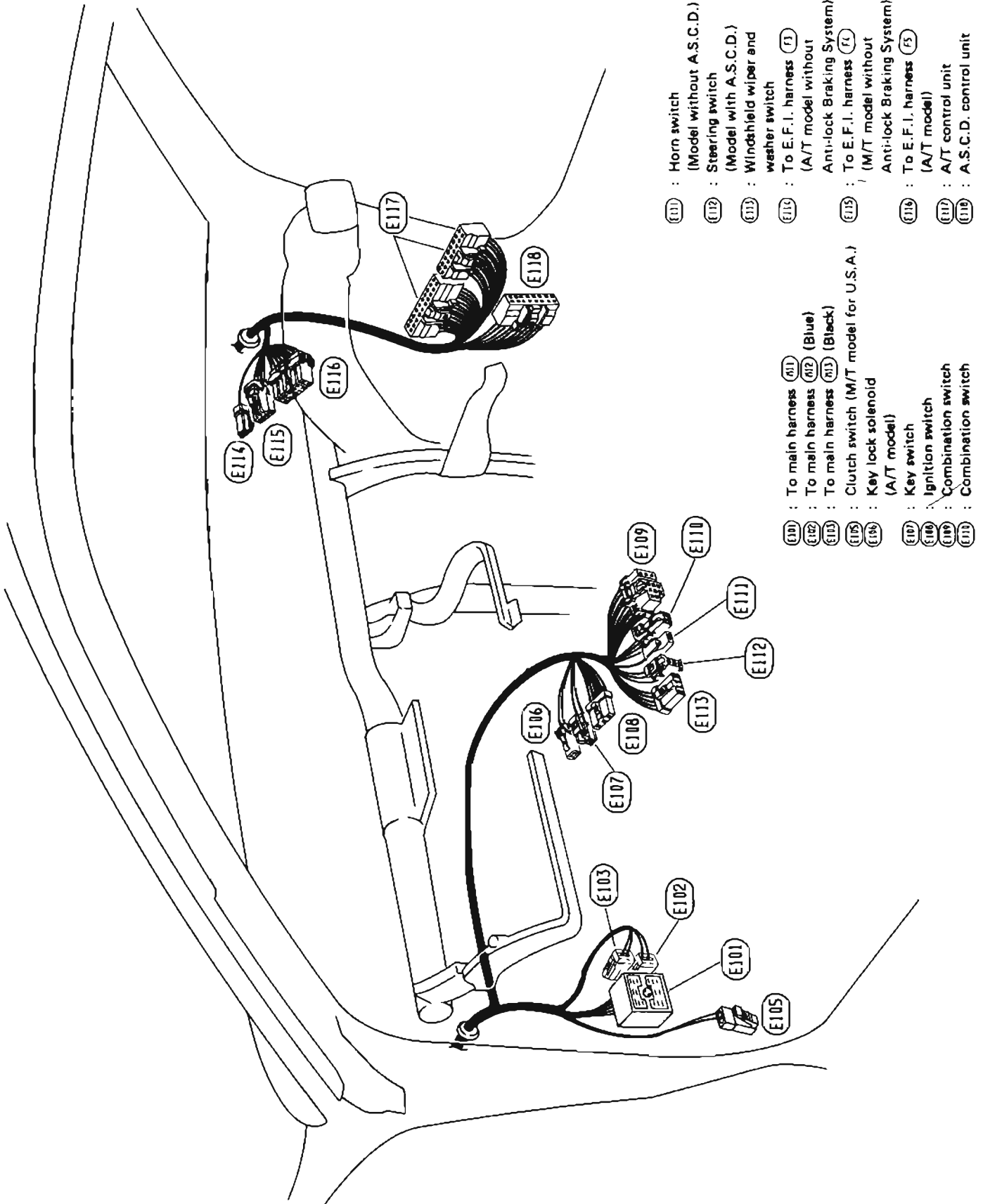
HARNES LAYOUT

Engine Room Harness (Cont'd)

- (E13) : Windshield wiper motor
- (E14) : A.S.C.D. actuator (Model without Anti-lock Braking System)
- (E15) : Rear washer motor
- (E16) : Front washer motor
- (E17) : Washer fluid level switch
- (E18) : To E.F.I. harness (F8) (White)
- (E19) : To E.F.I. harness (F9) (Brown)
- (E20) : To engine room harness no. 2 (E201) (M/T model)
- (E21) : Inhibitor switch (A/T model)
- (E22) : Revolution sensor (A/T model)
- (E23) : Inhibitor switch (A/T model) (Grey)
- (E24) : To solenoid valve sub-harness (A/T model) (Brown)
- (E25) : Relay box (Refer to page EL-97.)
- (E26) : To engine room harness no. 2 (E202)
- (E27) : To engine room harness no. 2 (E203)
- (E28) : To engine room harness no. 2 (E204)
- (E29) : Body ground
- (E30) : Low-pressure switch
- (E31) : Battery
- (E32) : Battery
- (E33) : Body ground
- (E34) : Clutch interlock relay (M/T model for U.S.A.)
- (E35) : Front side marker lamp R.H.
- (E36) : To front fog lamp sub-harness (E51)
- (E37) : Headlamp R.H.
- (E38) : Headlamp motor R.H.
- (E39) : Front combination lamp R.H.
- (E40) : Horn-high
- (E41) : Condenser fan motor
- (E42) : Horn-low
- (E43) : Headlamp motor L.H.
- (E44) : Headlamp L.H.
- (E45) : Front combination lamp L.H.
- (E46) : Front side marker lamp L.H.
- (E47) : Body ground
- (E48) : Relay box (Refer to page EL-97.)
- (E49) : Dropping resistor (A/T model.)
- (E50) : Compressor
- (E51) : A.I.V. control solenoid valve
- (E52) : Brake fluid level switch
- (E53) : Windshield wiper amplifier (Model without Anti-lock Braking System)
- (E54) : To engine room harness (E28)
- (E55) : Front fog lamp R.H.
- (E56) : Front fog lamp L.H.
- (E57) : Front wheel sensor L.H. (For Anti-lock Braking System)
- (E58) : Body ground (For Anti-lock Braking System)
- (E59) : Actuator (For Anti-lock Braking System)
- (E60) : Windshield wiper amplifier (Model with Anti-lock Braking System)
- (E61) : A.S.C.D. actuator (Model with Anti-lock Braking System)

HARNES LAYOUT

Engine Room Harness (Cont'd)



- (E11) : Horn switch (Model without A.S.C.D.)
- (E112) : Steering switch (Model with A.S.C.D.)
- (E113) : Windshield wiper and washer switch
- (E114) : To E.F.I. harness (FI)
- (E115) : A/T model without Anti-lock Braking System
- (E116) : To E.F.I. harness (FL) (M/T model without Anti-lock Braking System)
- (E117) : To E.F.I. harness (FS) (A/T model)
- (E118) : A/T control unit

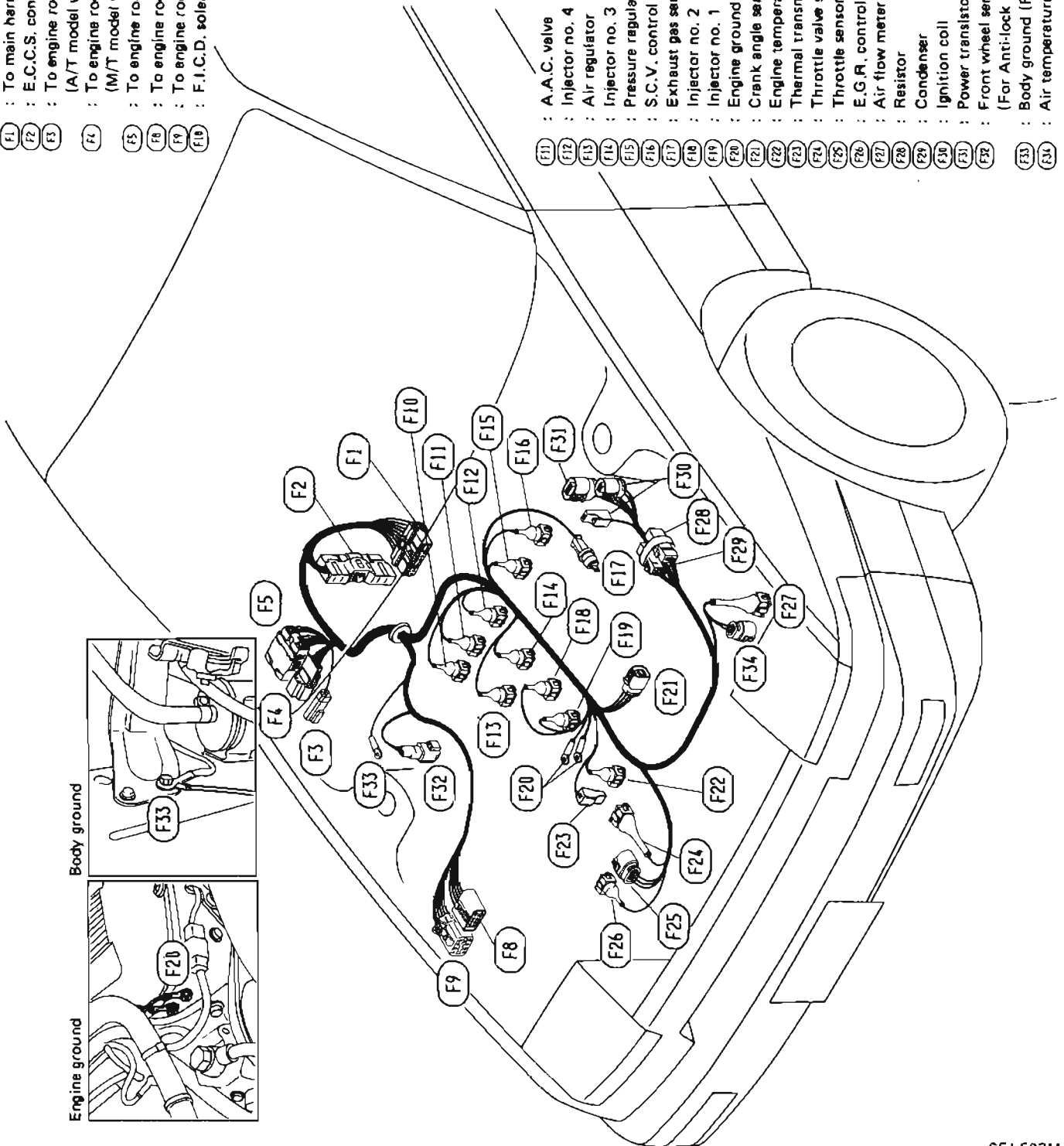
- (E101) : To main harness (611)
- (E102) : To main harness (612) (Blue)
- (E103) : To main harness (613) (Black)
- (E105) : Clutch switch (M/T model for U.S.A.)
- (E106) : Key lock solenoid (A/T model)
- (E107) : Key switch
- (E108) : Ignition switch
- (E109) : Combination switch
- (E110) : Combination switch

HARNESS LAYOUT

E.F.I. Harness

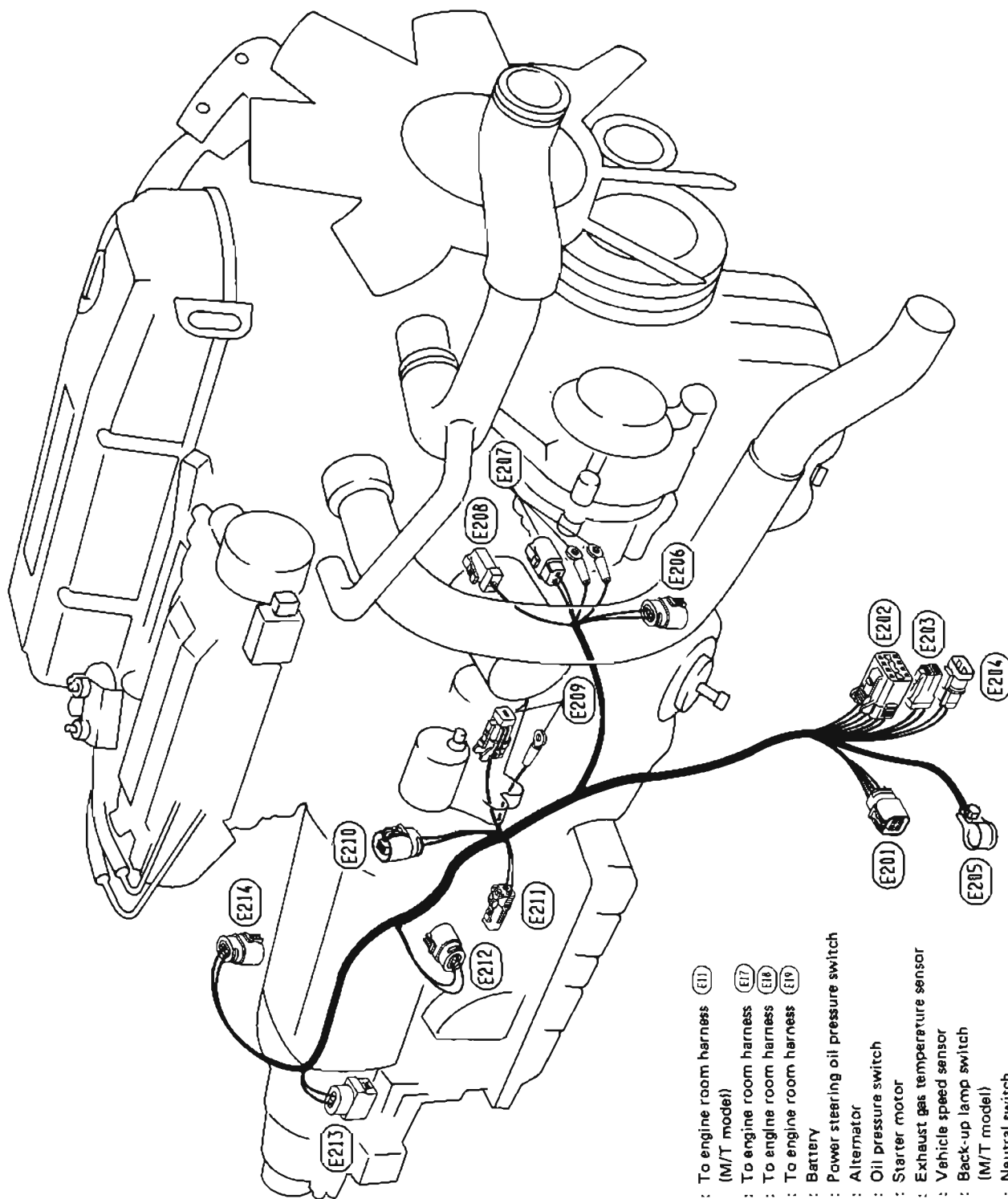
- F1 : To main harness (E5)
- F2 : E.C.C.S. control unit
- F3 : To engine room harness (E19)
- F4 : To engine room harness (E19) (A/T model without Anti-lock Braking System)
- F5 : To engine room harness (E19) (M/T model without Anti-lock Braking System)
- F6 : To engine room harness (E19) (A/T model)
- F7 : To engine room harness (E9) (White)
- F8 : To engine room harness (E10) (Brown)
- F9 : F.I.C.D. solenoid valve

- F11 : A.A.C. valve
- F12 : Injector no. 4
- F13 : Air regulator
- F14 : Injector no. 3
- F15 : Pressure regulator control solenoid valve
- F16 : S.C.V. control solenoid valve
- F17 : Exhaust gas sensor
- F18 : Injector no. 2
- F19 : Injector no. 1
- F20 : Engine ground
- F21 : Crank angle sensor
- F22 : Engine temperature sensor
- F23 : Thermal transmitter
- F24 : Throttle valve switch
- F25 : Throttle sensor
- F26 : E.G.R. control solenoid valve
- F27 : Air flow meter
- F28 : Resistor
- F29 : Condenser
- F30 : Ignition coil
- F31 : Power transistor
- F32 : Front wheel sensor R.H. (For Anti-lock Braking System)
- F33 : Body ground (For Anti-lock Braking System)
- F34 : Air temperature sensor



HARNESS LAYOUT

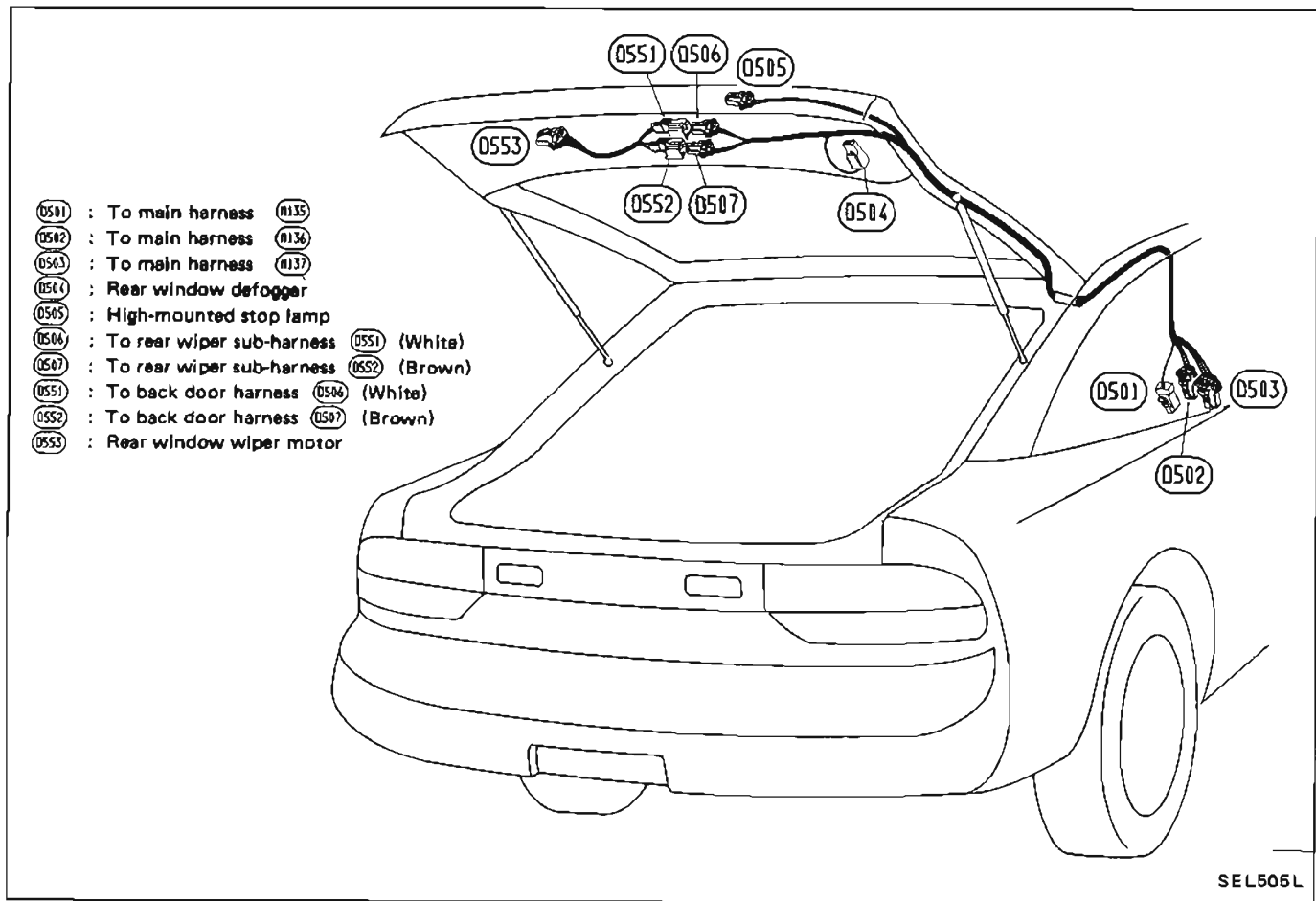
Engine Room Harness no. 2



- (E20) : To engine room harness (E11)
(M/T model)
- (E202) : To engine room harness (E17)
- (E203) : To engine room harness (E18)
- (E204) : To engine room harness (E19)
- (E205) : Battery
- (E206) : Power steering oil pressure switch
- (E207) : Alternator
- (E208) : Oil pressure switch
- (E209) : Starter motor
- (E210) : Exhaust gas temperature sensor
- (E211) : Vehicle speed sensor
- (E212) : Back-up lamp switch
(M/T model)
- (E213) : Neutral switch
(M/T model)
- (E214) : 5th position switch
(M/T model)

HARNES LAYOUT

Back Door Harness



HARNES LAYOUT

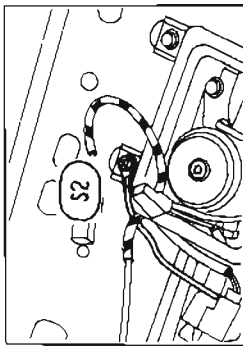
Room Lamp and Sun Roof Harness



- Sun roof harness**
- (R1) : To room lamp harness (R2)
 - (S1) : Body ground
 - (S2) : Sun roof switch
 - (S3) : Slide relay — open
 - (S4) : Sun roof motor
 - (S5) : Safety relay
 - (S6) : Slide relay — close
 - (S7) : Safety limit switch
 - (S8)

- Room lamp harness**
- (R1) : To main harness (R6)
 - (R2) : To sun roof harness (S1)
 - (R3) : Spot lamp (Model with sun roof)
 - (R4) : Interior lamp (Model without sun roof)
 - (R5) : Interior lamp (Fastback with sun roof)
 - (R6) : Interior lamp (Coupe with sun roof)
 - (R8) : Automatic seat belt front limit switch (For U.S.A.)

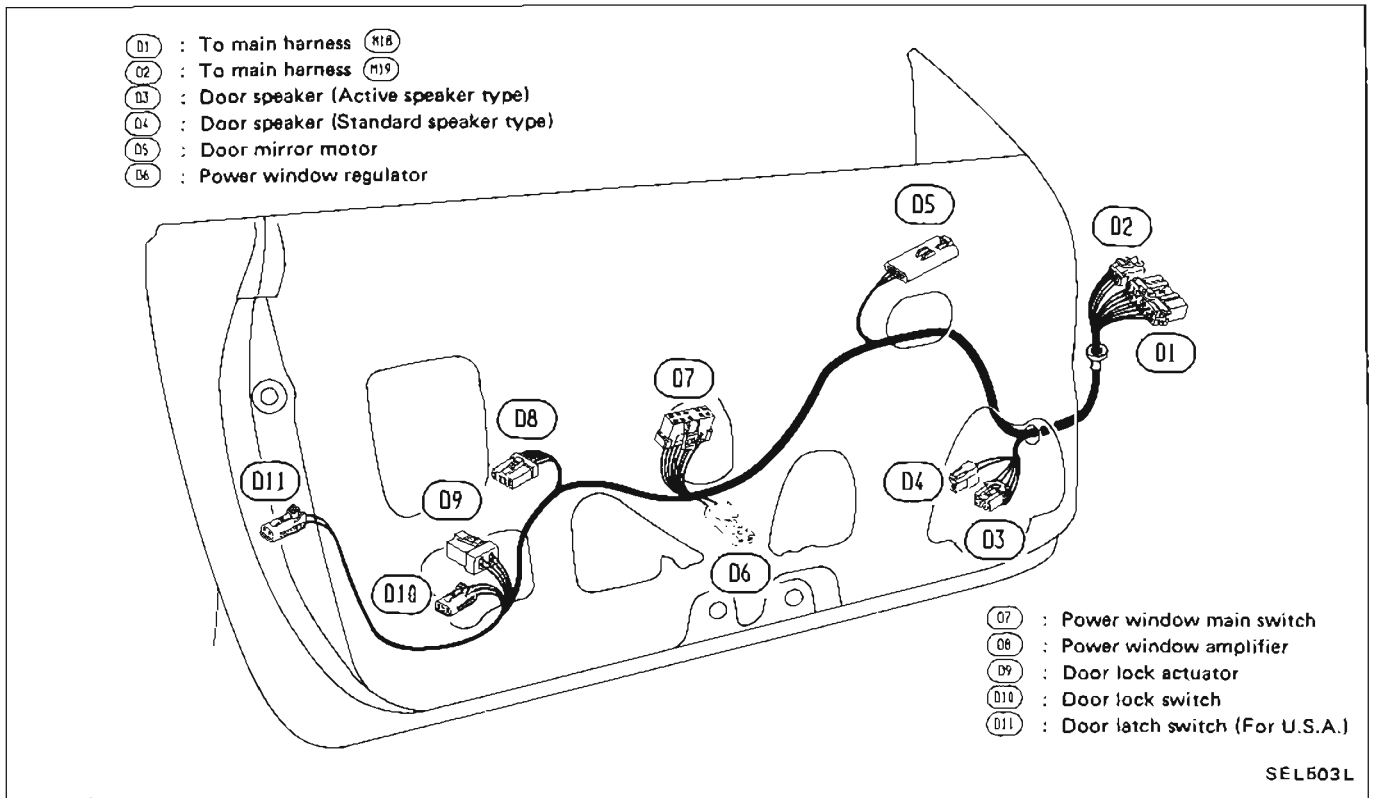
Body ground



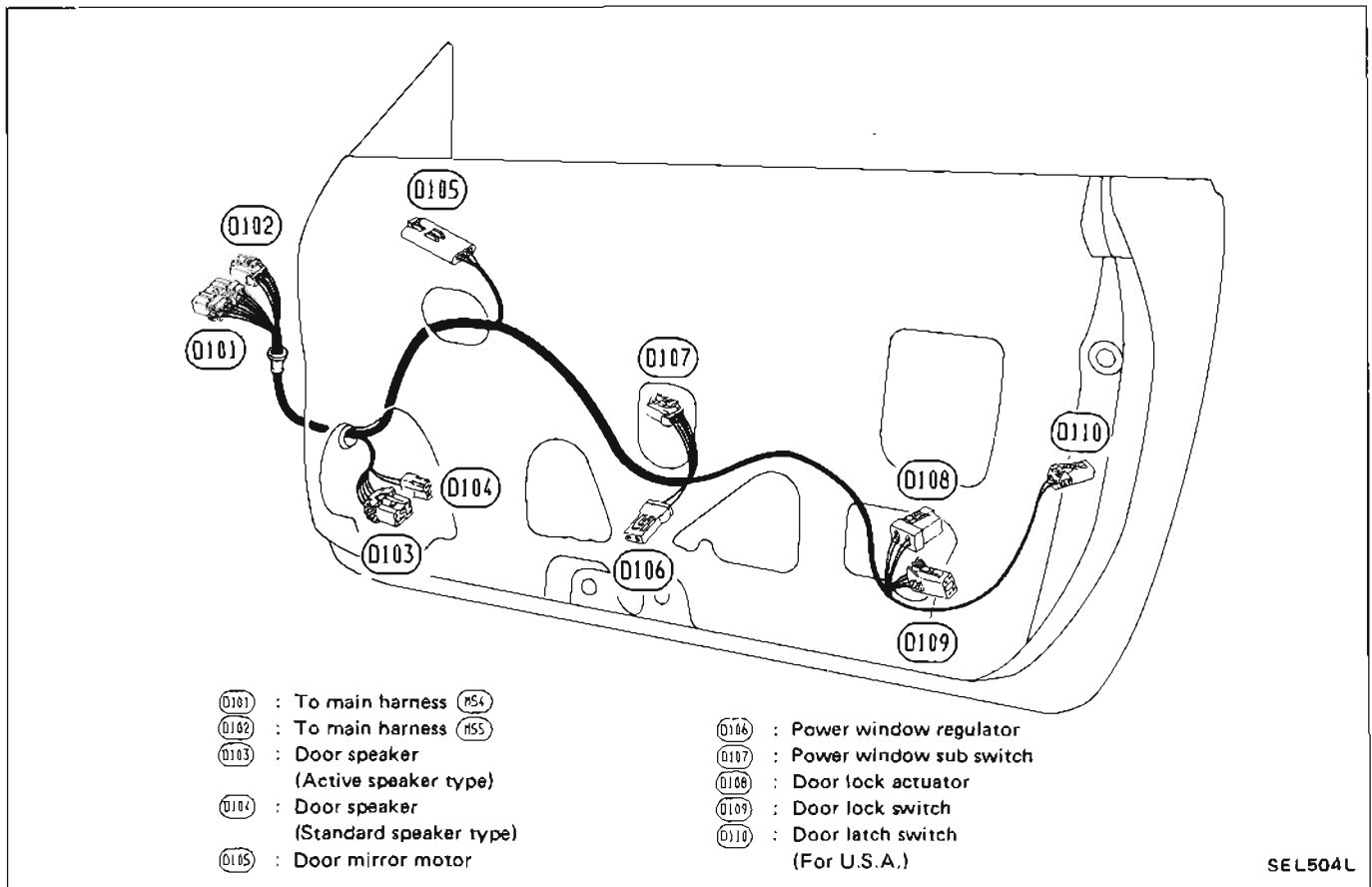
HARNES LAYOUT

Door Harness

L.H.



R.H.



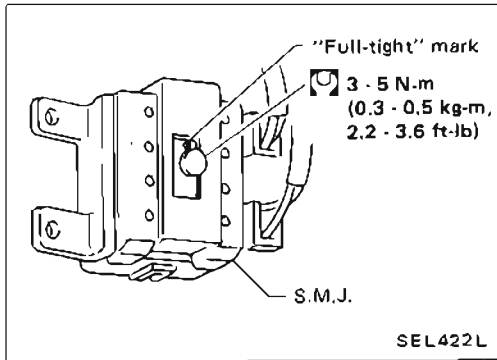
HARNES LAYOUT

NOTE

SUPER MULTIPLE JUNCTION (S.M.J.)

Disconnecting and Connecting

- S.M.J. is located on left side of dash.
- To disconnect S.M.J., loosen fixing bolt.



- To install S.M.J., tighten bolts until orange "full-tight" mark appears and then retighten to specified torque as required.

□: 3 - 5 N·m

(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

CAUTION:

Do not overtighten bolts, otherwise, they may be damaged.

SUPER MULTIPLE JUNCTION (S.M.J.)

Terminal Arrangement

MAIN HARNESS

| | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|-----|-----|
| A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 |
| B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 | B11 | B12 |
| C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 |
| D1 | D2 | | | | | | | | D11 | D12 | |
| E1 | E2 | | | | | | | | E11 | E12 | |
| F1 | F2 | | | | | | | | F11 | F12 | |
| G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | G9 | G10 | G11 | G12 |
| H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 | H9 | H10 | H11 | H12 |
| I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 | I12 |



| | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|-----|-----|
| I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 | I12 |
| H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 | H9 | H10 | H11 | H12 |
| G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | G9 | G10 | G11 | G12 |
| F1 | F2 | | | | | | | | F11 | F12 | |
| E1 | E2 | | | | | | | | E11 | E12 | |
| D1 | D2 | | | | | | | | D11 | D12 | |
| C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 |
| B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 | B11 | B12 |
| A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 |

ENGINE ROOM HARNESS

E.C.C.S. CONTROL UNIT

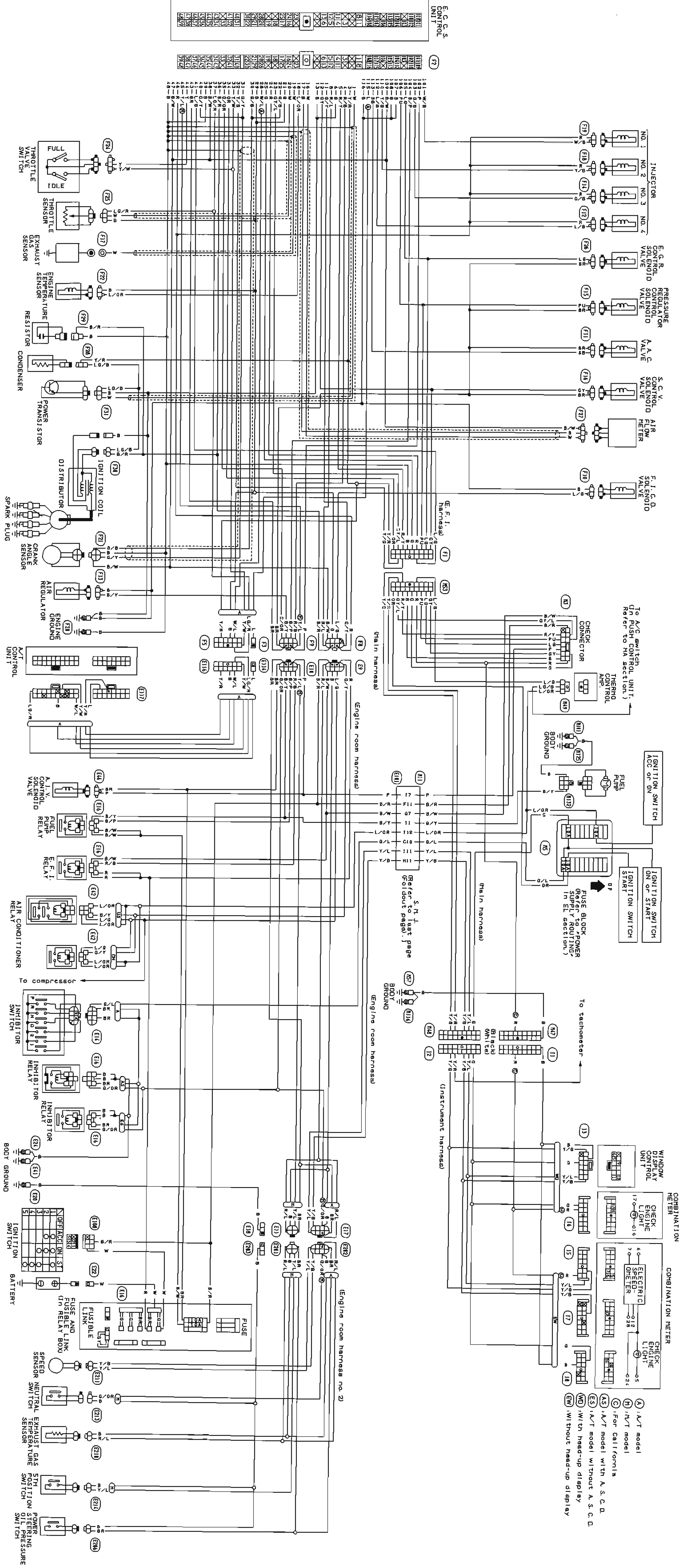
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 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

1989 NISSAN 240SX E. C. C. S. WIRING DIAGRAM

| | |
|--|--|
| E. C. C. S. CONTROL UNIT | (2) |
| 101-102 103-104 105-106 107-108 109-110 111-112 113-114 115-116 117-118 119-120 121-122 123-124 125-126 127-128 129-130 131-132 133-134 135-136 137-138 139-140 | 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 |



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 |

ENGINE TUNE-UP DATA

| | | | |
|---|---|---------------------------|---------------------|
| Engine model | KA24E | | |
| Firing order | 1-3-4-2 | | |
| Idle speed | rpm | 750±50 | |
| M/T | | 750±50 | |
| A/T (in "N" position) | | 750±50 | |
| Ignition timing (degree B.T.D.C. at idle speed) | 16±2 | | |
| Idle "CO" (% at idle speed) | Idle mixture screw is preset and sealed at factory. | | |
| Valve clearance (Hot) | mm (in) | Non-adjustable | |
| High tension cable resistance | kΩ | Less than 30 | |
| Spark plug | | | |
| Standard | ZFR5D-11 | | |
| Hot | ZFR4D-11 | | |
| Cold | ZFR6D-11 | | |
| Gap | mm (in) | 1.0 - 1.1 (0.039 - 0.043) | |
| Drive belt deflection (Cold) | mm (in) | Used belt deflection | |
| | | Limit | Adjusted deflection |
| Alternator | | Limit | Adjusted deflection |
| | | 11 (0.43) | 7 - 8 (0.28 - 0.31) |
| Air conditioner compressor | | Limit | Adjusted deflection |
| | | 12 (0.47) | 7 - 8 (0.28 - 0.31) |
| Power steering pump | | Limit | Adjusted deflection |
| | | 13 (0.51) | 8 - 9 (0.31 - 0.36) |
| Applied pressed force | N (kg, lb) | 98 (10, 22) | |
| Tightening torque | | N-m | kg-m |
| | | ft-lb | |
| Spark plug | | 20 - 29 | 2.0 - 3.0 |
| Oil pan drain plug | | 29 - 39 | 3.0 - 4.0 |

FRONT WHEEL BEARING

| | | |
|------------------------|-------------------|--------------------------------|
| Wheel bearing lock nut | | |
| Tightening torque | N-m (kg-m, ft-lb) | 147 - 216 (15 - 22, 108 - 159) |
| Wheel bearing end play | mm (in) | 0.03 (0.0012) or less |

REAR WHEEL ALIGNMENT (Unladen*)

| | | |
|--------|---------|---------------------------|
| Camber | degree | -1°36' to -0°36' |
| Toe-in | mm (in) | 0.5 - 4.5 (0.020 - 0.177) |
| | degree | 1.5° - 12.6° |

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

REAR WHEEL BEARING

| | | |
|------------------------|-------------------|--------------------------------|
| Wheel bearing lock nut | | |
| Tightening torque | N-m (kg-m, ft-lb) | 235 - 314 (24 - 32, 174 - 231) |
| Wheel bearing end play | mm (in) | 0.05 (0.0020) or less |

BRAKE

| | | |
|--------------------------|-------------------------|--------------|
| Unit: mm (in) | | |
| Disc brake | | |
| Pad repair limit | 2.0 (0.079) | |
| Rotor thickness | Front side | 18.0 (0.709) |
| | Rear side | 8.0 (0.315) |
| Pedal free height | | |
| M/T model | 177 - 187 (6.97 - 7.36) | |
| A/T model | 186 - 196 (7.32 - 7.72) | |
| Pedal depressed height*1 | 100 (3.94) or more | |
| Parking brake | | |
| Number of notches*2 | 6 - 8 | |

*1: Under force of 490 N (50 kg, 110 lb) with engine running
*2: At pulling force: 196 N (20 kg, 44 lb)

CLUTCH PEDAL

Unit: mm (in)

| | |
|-----------------|-------------------------|
| Pedal height | 186 - 196 (7.32 - 7.72) |
| Pedal free play | 1 - 3 (0.04 - 0.12) |

FRONT WHEEL ALIGNMENT (Unladen*)

| | | |
|-------------|-----------|---------------------------|
| Camber | degree | -1°30' to 0° |
| Caster | degree | 8°00' - 7°30' |
| Toe-in | mm (in) | 0.3 - 2.3 (0.012 - 0.091) |
| | degree | 1° - 8.5' (Total toe-in) |
| Full turns | | |
| Inner wheel | 38° - 43° | |
| Outer wheel | 33° | |

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

REFILL CAPACITIES

| | | | |
|-------------------------|----------------------|--------------|--------------|
| | Unit | Liter | US measure |
| Engine model | KA24E | | |
| Fuel tank | | 60 | 16-7/8 gal |
| Coolant | With reservoir tank | 6.7 | 7-1/8 qt |
| | With oil filter | 3.5 | 3-3/4 qt |
| Engine | Without oil filter | 3.2 | 3-3/8 qt |
| | M/T | 2.4 | 5-1/8 pt |
| Transmission | A/T | 8.3 | 8-3/4 pt |
| | Differential carrier | R200 | 1.3 |
| Power steering system | | 0.9 | 1 qt |
| Air conditioning system | Refrigerant | 0.9 - 1.0 kg | 2.0 - 2.2 lb |



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SERVICE BULLETIN

| | | |
|---|--|-----------------------|
| Classification: EF&EC89-004 | Section: Engine Fuel & Emission Control | Models: 1989 240SX |
| Reference: TECHNICAL BULLETIN TS89-072 | | Date: May 18, 1989 |

KA24E ENGINE CHANGE

APPLIED MODEL: 1989 240SX (S13) from engine number KA24-012039*

SERVICE INFORMATION

To improve driveability the KA24E engine on the applied model has been changed as follows:

- Compression ratio has been changed (9.1 to 8.6).
- Air temperature sensor has been added.
- E.C.U. has been changed.
- Idle speed.
- Self-diagnosis for E.G.R.

The following pages reflect these changes.

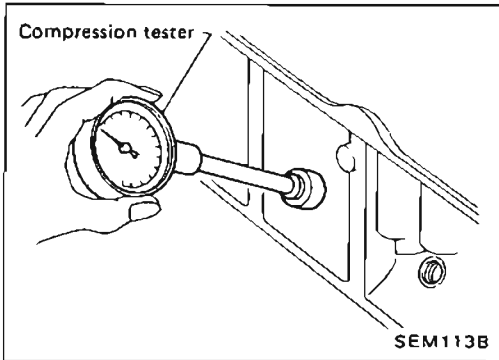
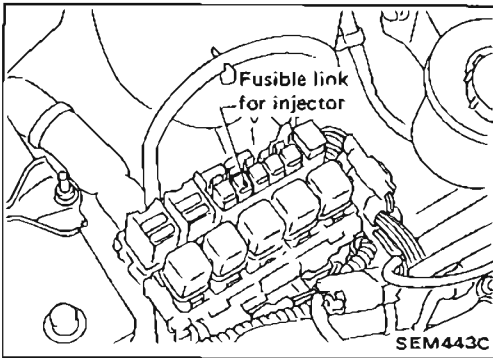
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Please reference this Bulletin on the Contents pages of the EM and EF&EC Sections of the 1989 240SX Service Manual.

*Vehicles with an Air Temperature Sensor on the air cleaner box have the modified engine.

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/cm², 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.**

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

General Specifications

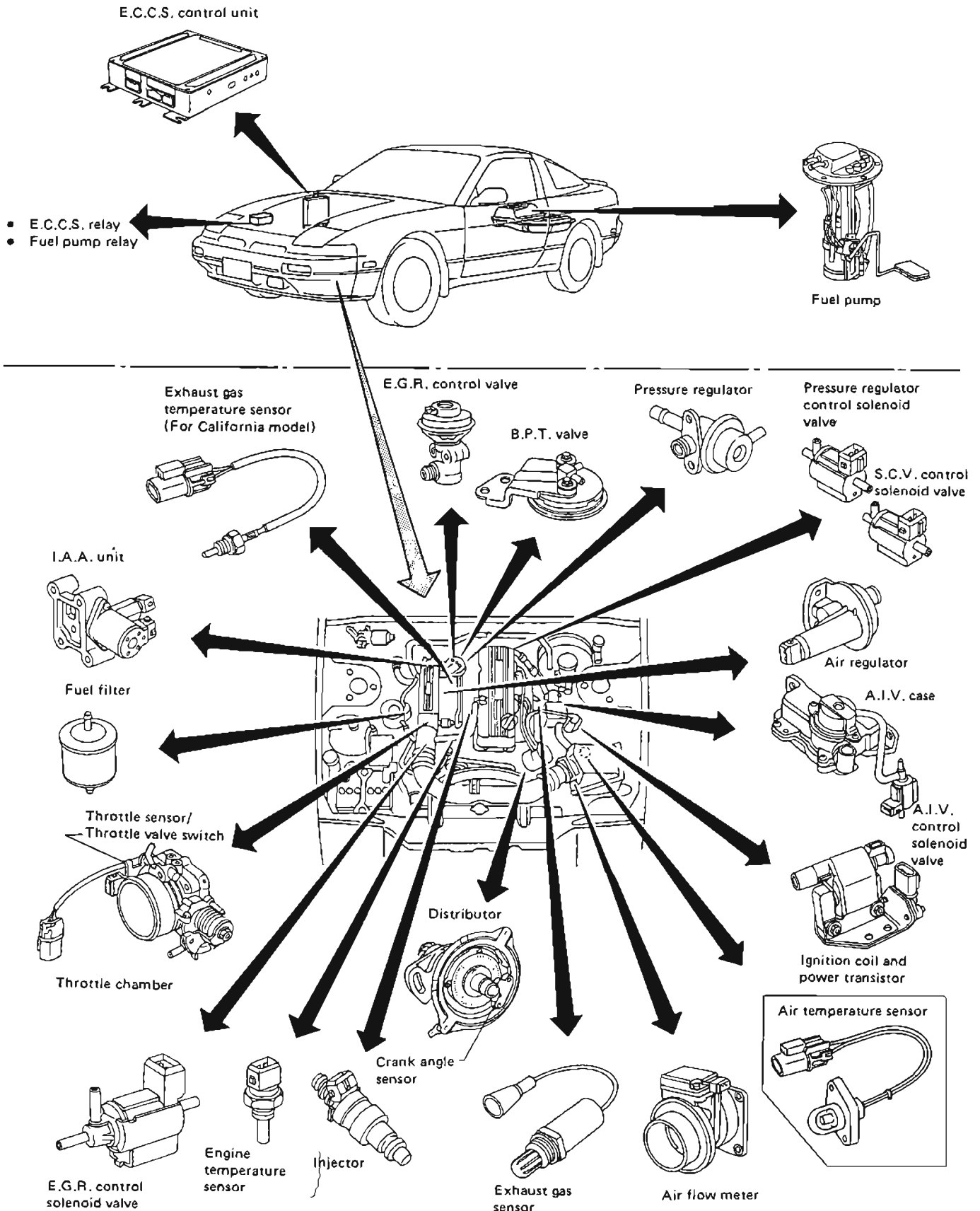
| | |
|---|-----------------------|
| Engine model | KA24E |
| Cylinder arrangement | 4, in-line |
| Displacement cm ³ (cu in) | 2,389 (145.78) |
| Bore x stroke mm (in) | 89 x 96 (3.50 x 3.78) |
| Valve arrangement | O.H.C. |
| Firing order | 1-3-4-2 |
| Number of piston rings Compression | 2 |
| Oil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

Unit: kPa (kg/cm², 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 |

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

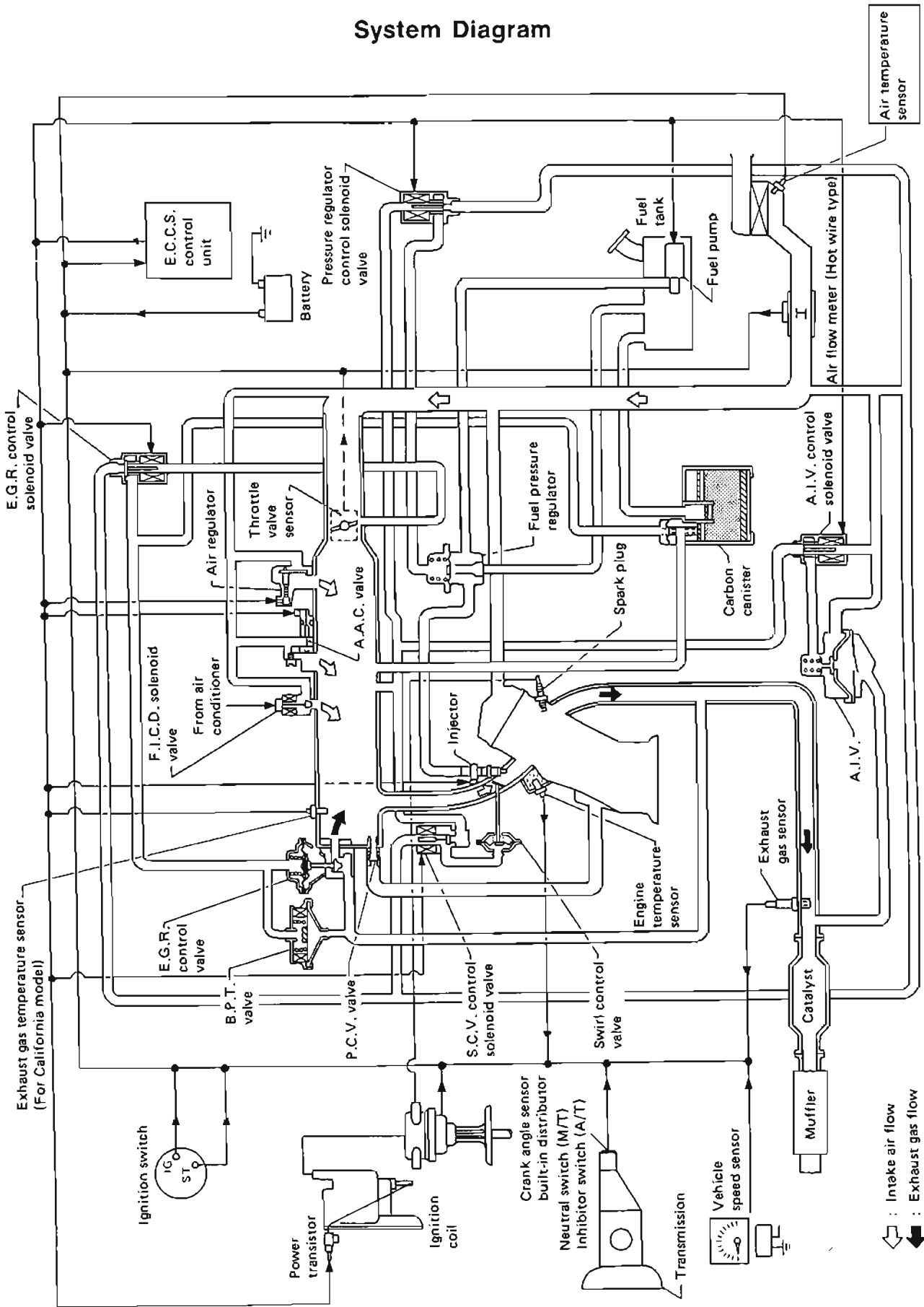
E.C.C.S. Component Parts Location



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ENGINE AND EMISSION CONTROL OVERALL SYSTEM

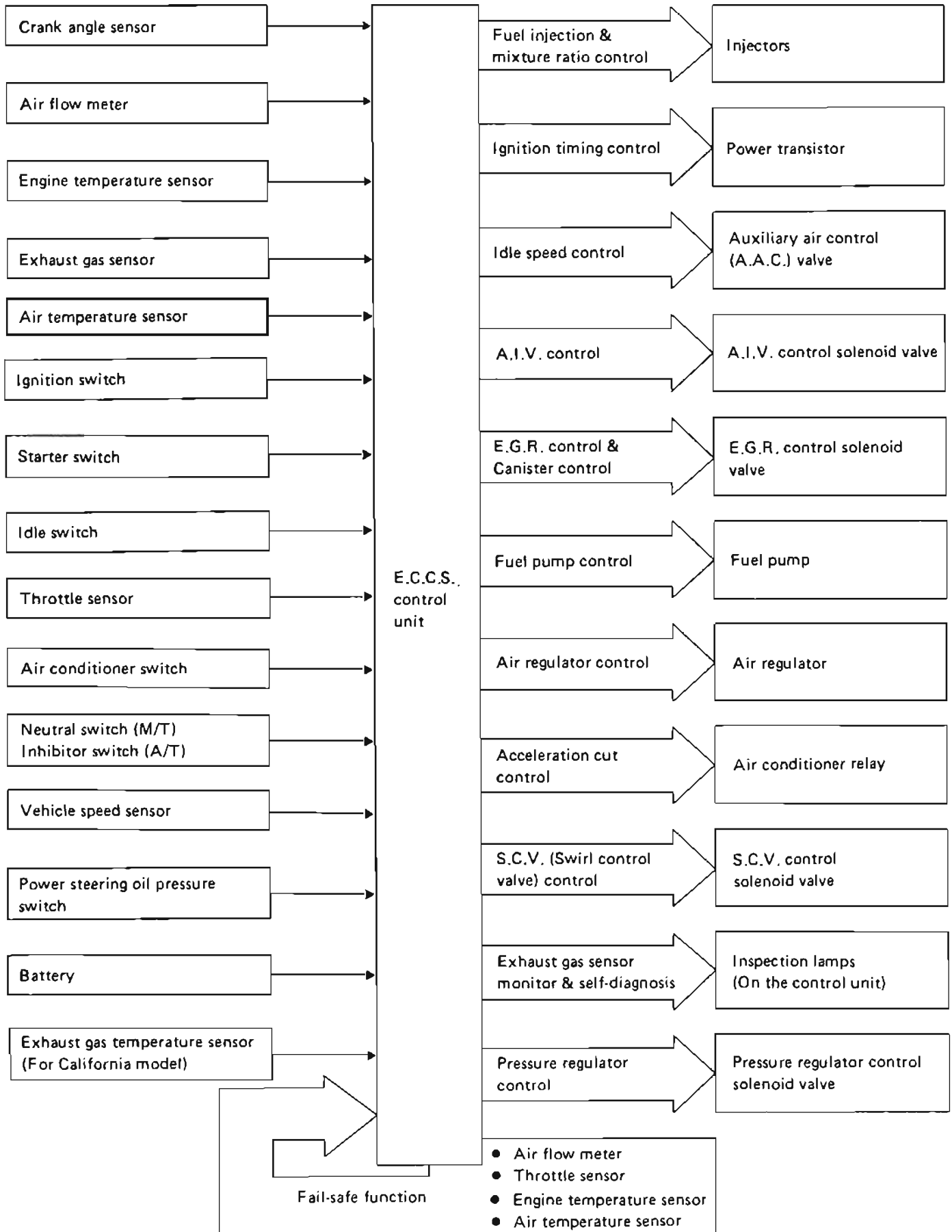
System Diagram



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

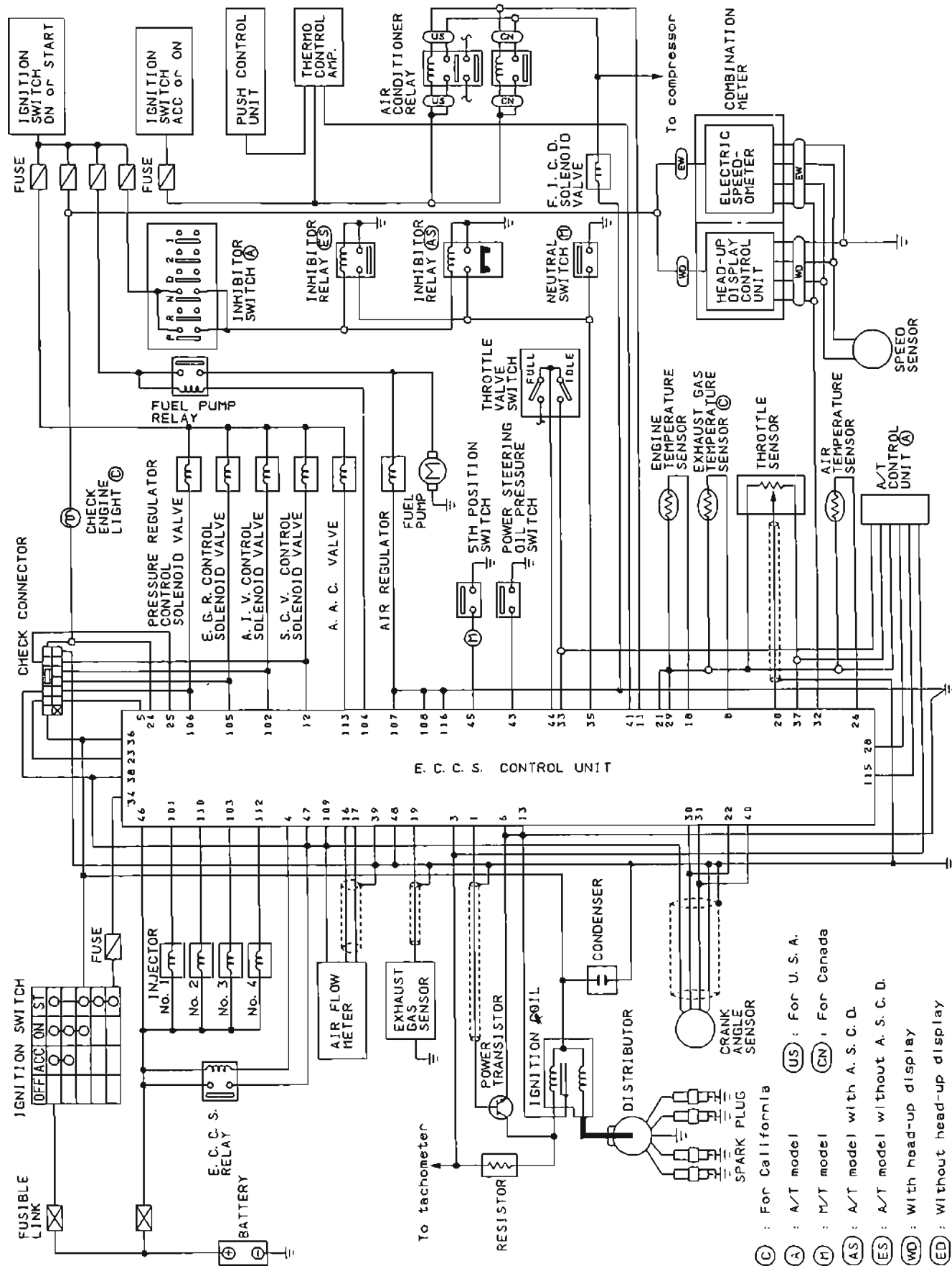
System Chart

E.C.C.S. CONTROL SYSTEM

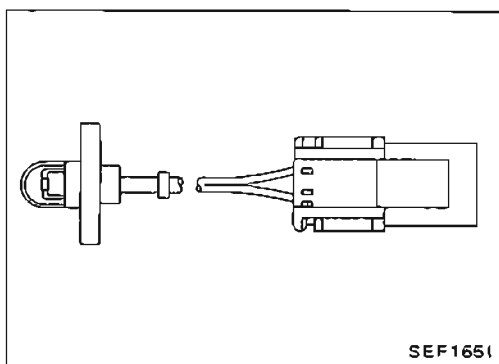


ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Circuit Diagram



- (C) : For California
- (A) : A/T model (US) : For U. S. A.
- (H) : M/T model (CN) : For Canada
- (AS) : A/T model with A. S. C. D.
- (ES) : A/T model without A. S. C. D.
- (WD) : With head-up display
- (ED) : Without head-up display

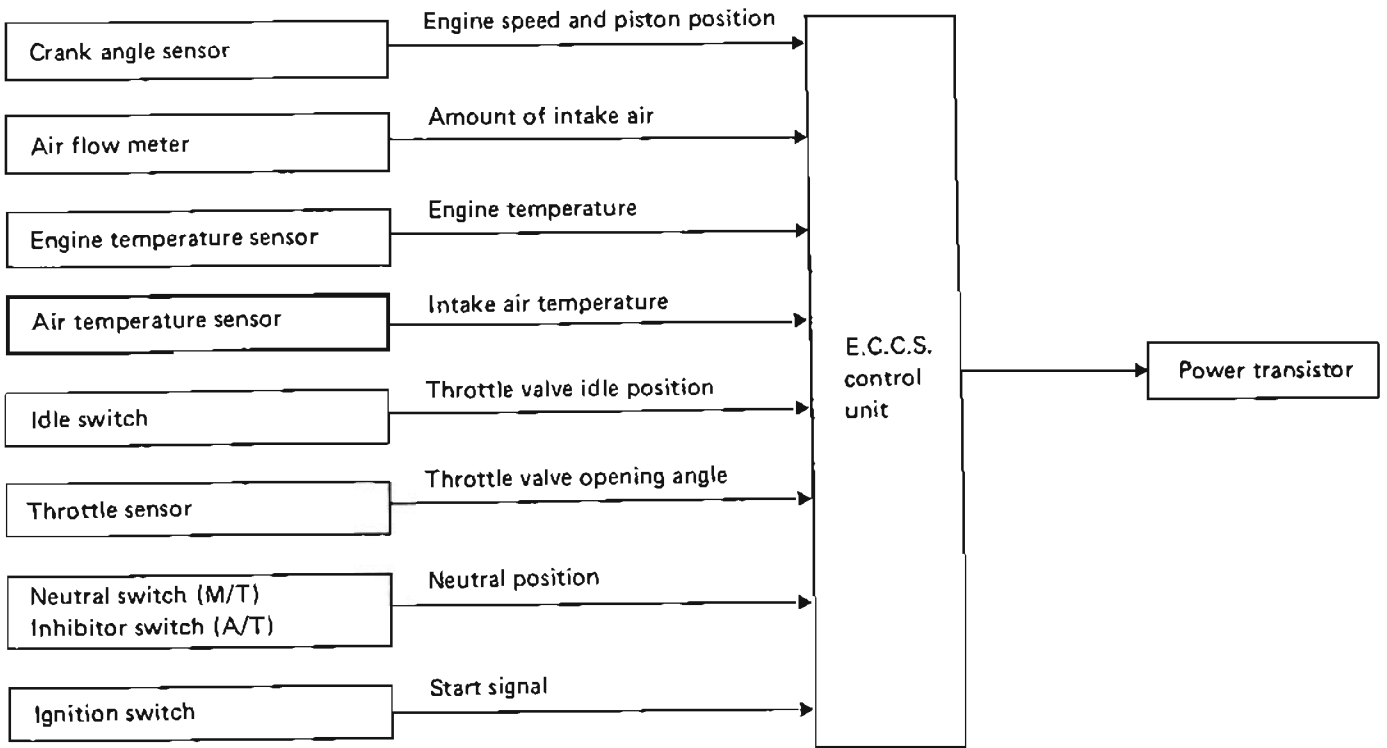


Air Temperature Sensor

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

Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE



ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Ignition Timing Control (Cont'd)

SYSTEM DESCRIPTION

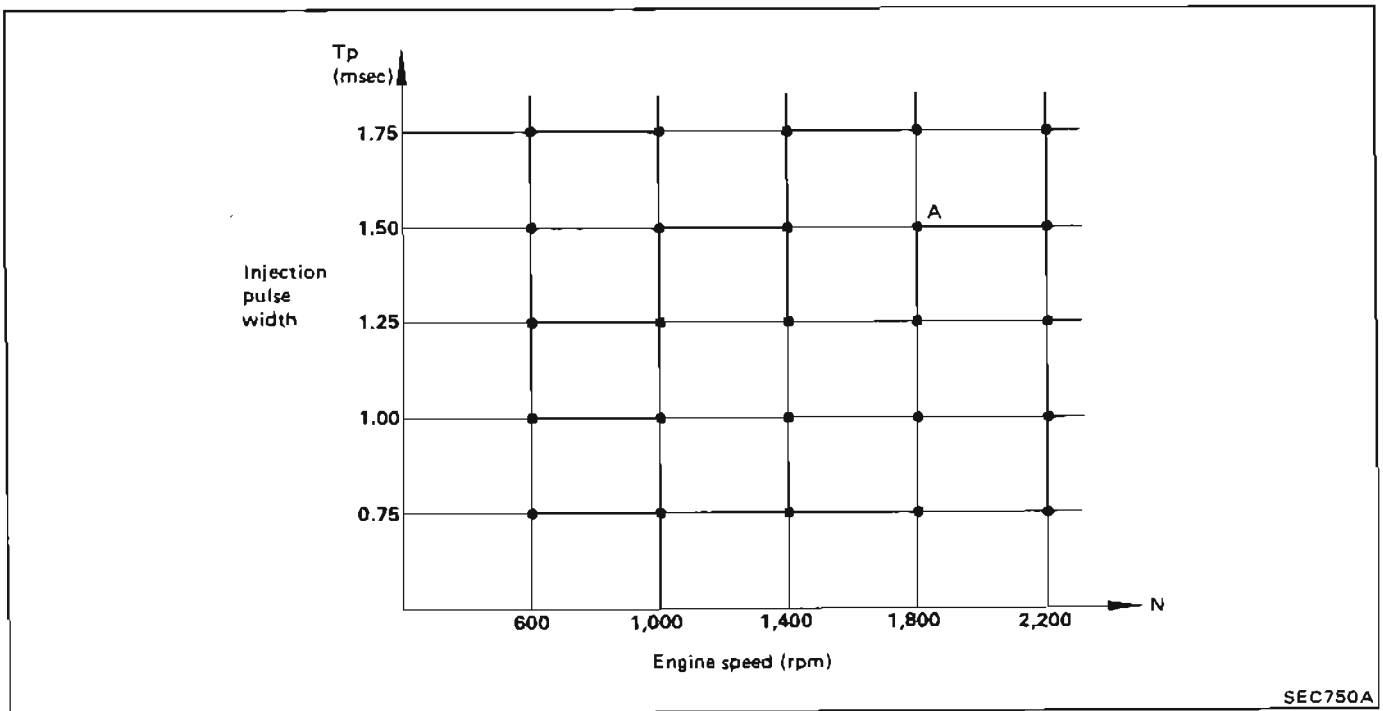
The ignition timing is controlled by the E.C.U. in order to maintain the best air-fuel ratio in response to every running condition of the engine. The ignition timing data is stored in the ROM located in the E.C.U., in the form of the map shown below.

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,

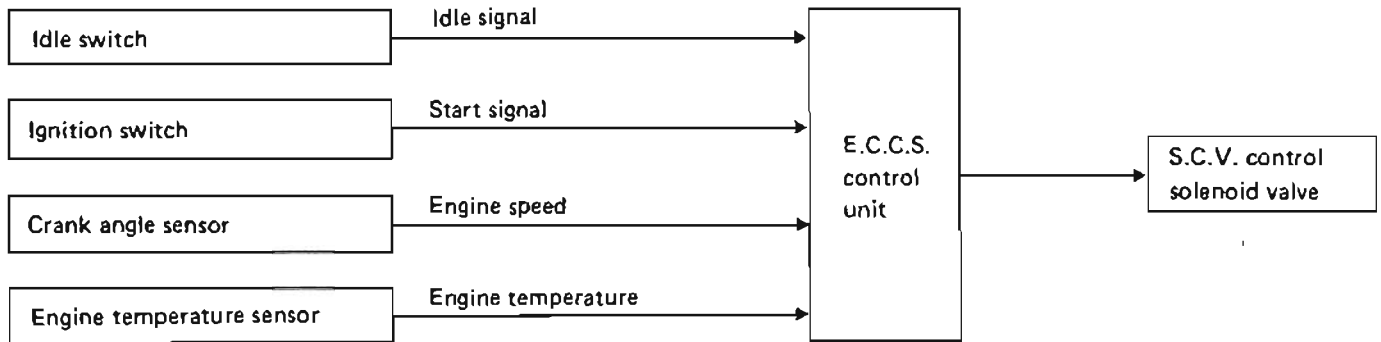
- 1 At starting
- 2 During warm-up
- 3 At idle
- 4 At low battery voltage
- 5 During swirl control valve operates
- 6 Hot engine operation
- 7 At acceleration
- 8 When intake air temperature is extremely high the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.



ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

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 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.

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

| Idle switch | Water temperature | Engine rpm | Solenoid valve | S.C.V. |
|--------------|-------------------|-------------|----------------|--------|
| ON | Above 35°C (95°F) | Below 1,800 | ON | Close |
| Except above | | | OFF | Open |

- This table shows the control when starting engine temperature is above 10°C (50°F).

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. (Engine speed does not exceed 2,400 rpm.) |

ENGINE TEMPERATURE SENSOR MALFUNCTION

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

Operation

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

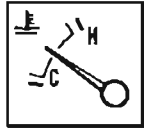
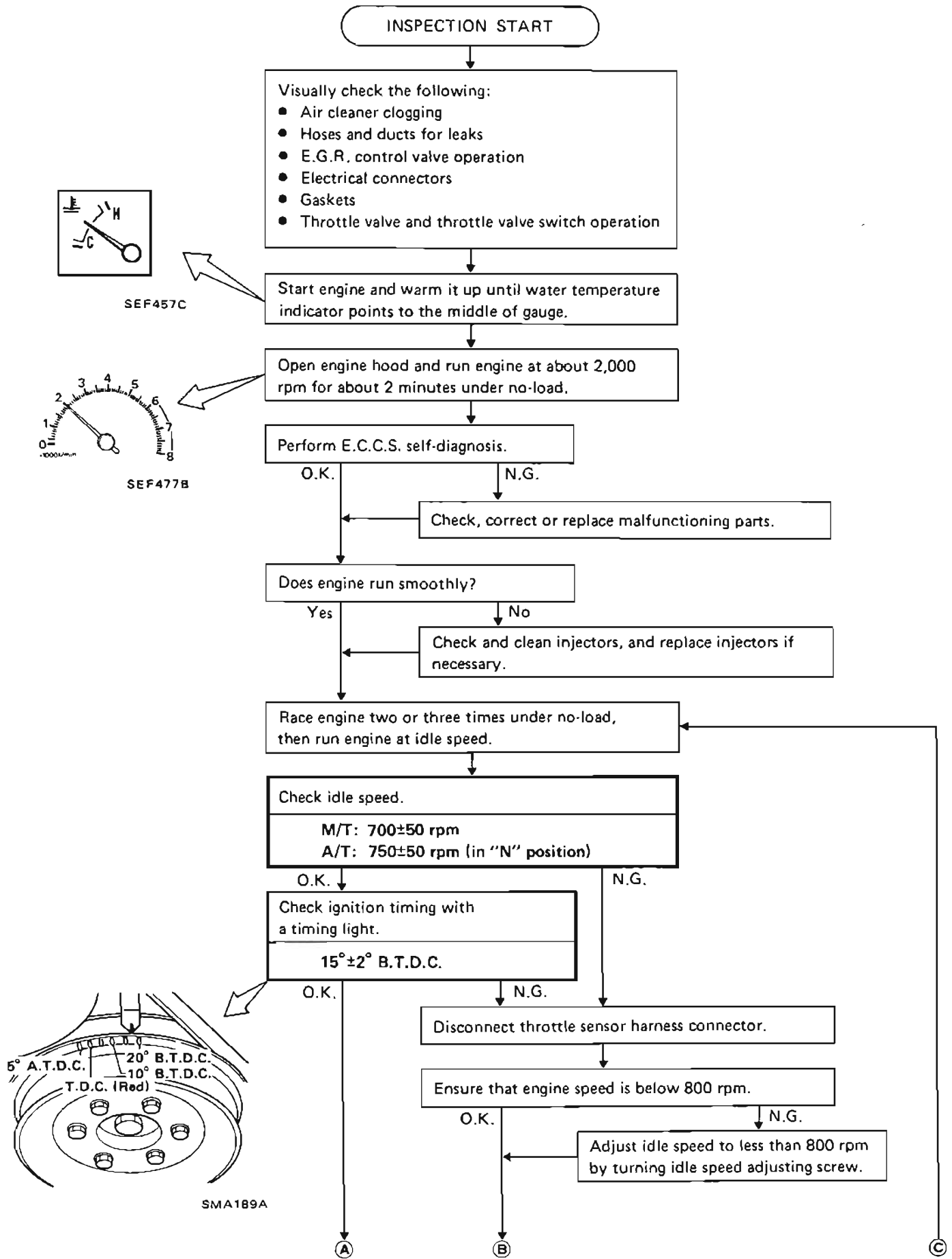
THROTTLE SENSOR MALFUNCTION

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)].

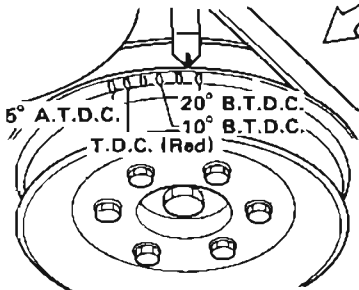
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



SEF457C

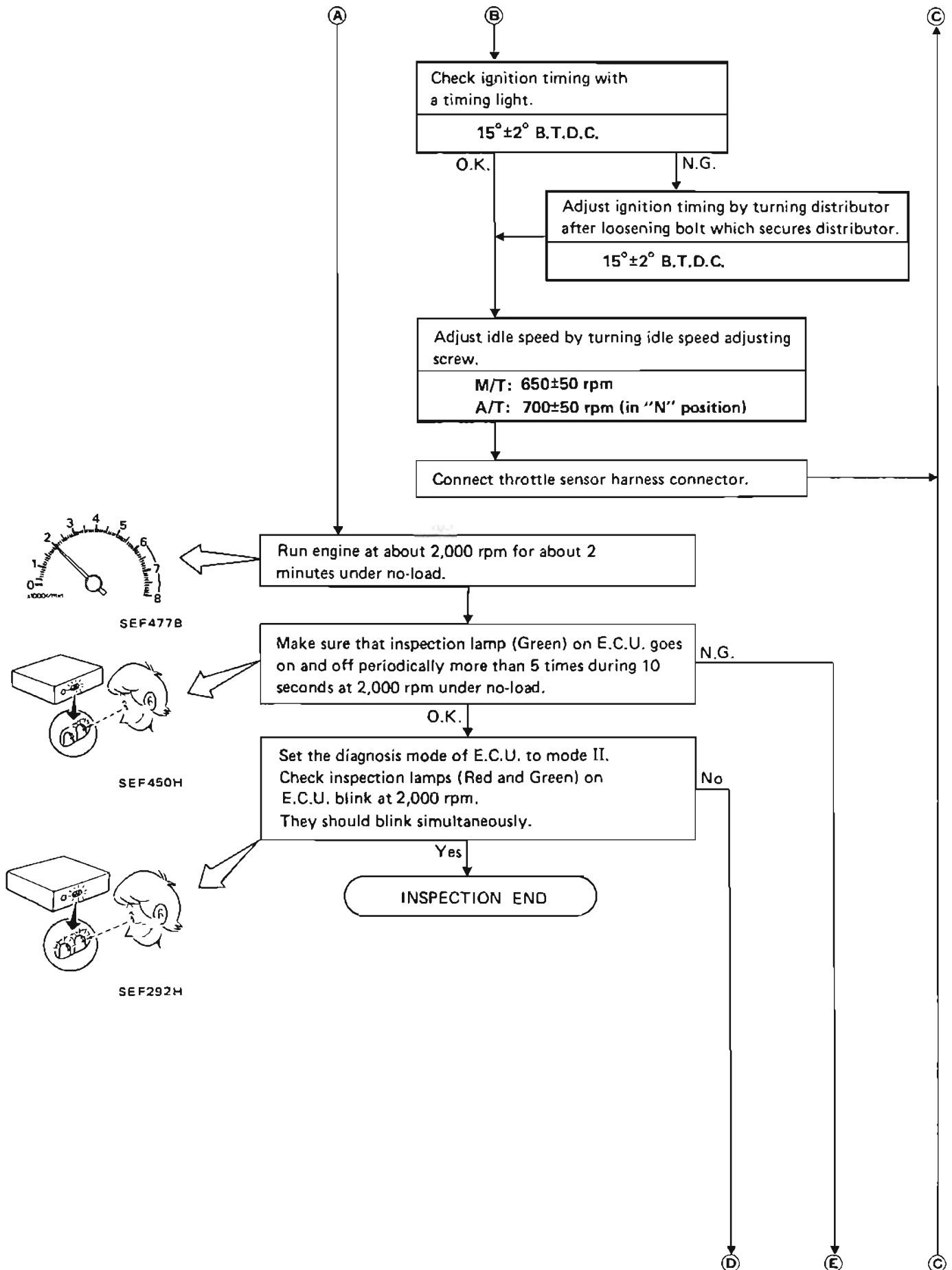


SEF477B



SMA189A

IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



TROUBLE DIAGNOSES

Self-diagnosis — Mode III (Self-diagnostic system)

The E.C.U. constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the E.C.U. and can be retrieved from the memory by turning on the diagnostic mode selector, located on the side of the E.C.U. When activated, the malfunction is indicated by flashing a red and a green L.E.D. (Light Emitting Diode), also located on the E.C.U. Since all the self-diagnostic results are stored in the E.C.U.'s memory even intermittent malfunctions can be diagnosed.

A malfunction is indicated by the number of both red and green flashing L.E.D.s. First, the red L.E.D. flashes and the green flashes follow. The red L.E.D. corresponds to units of ten and the green L.E.D. corresponds to units of one. For example, when the red L.E.D. flashes once and the green L.E.D. flashes twice, this signifies the number "12", showing that the air flow meter signal is malfunctioning. All problems are classified by code numbers in this way.

- **When the engine fails to start, crank it two or more seconds before beginning self-diagnosis.**
- **Before starting self-diagnosis, do not erase the stored memory before beginning self-diagnosis. If it is erased, the self-diagnosis function for intermittent malfunctions will be lost.**


DISPLAY CODE TABLE

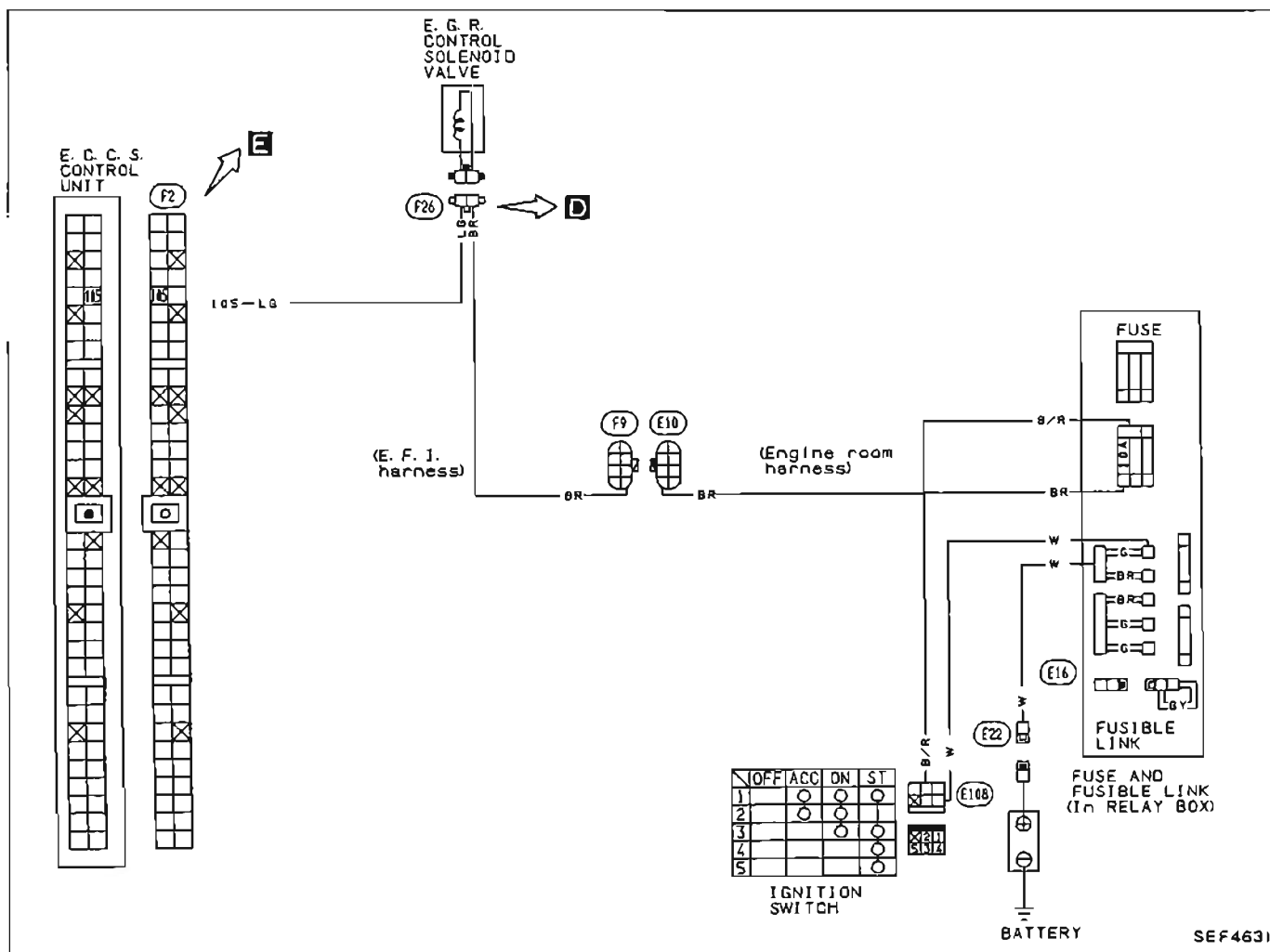
| Code No. | Detected items | California | Non-California |
|----------|---|------------|----------------|
| 11 | Crank angle sensor circuit | X | X |
| 12 | Air flow meter circuit | X | X |
| 13 | Engine temperature sensor circuit | X | X |
| 14 | Vehicle speed sensor circuit | X | X |
| 21 | Ignition signal missing in primary coil | X | X |
| 31 | E.C.U. (E.C.C.S. control unit) | 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 circuit | X | X |

X: Available —: Not available

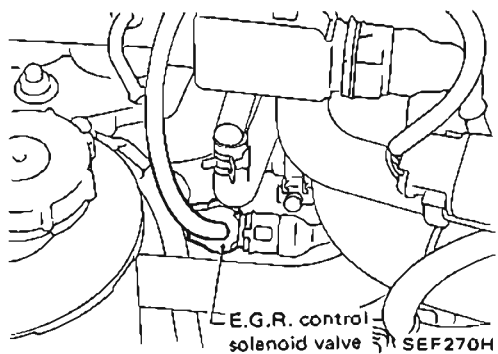
TROUBLE DIAGNOSES

Diagnostic Procedure 8

E.G.R. FUNCTION (Code No. 32)  [Not self-diagnostic item (For non-California models)]

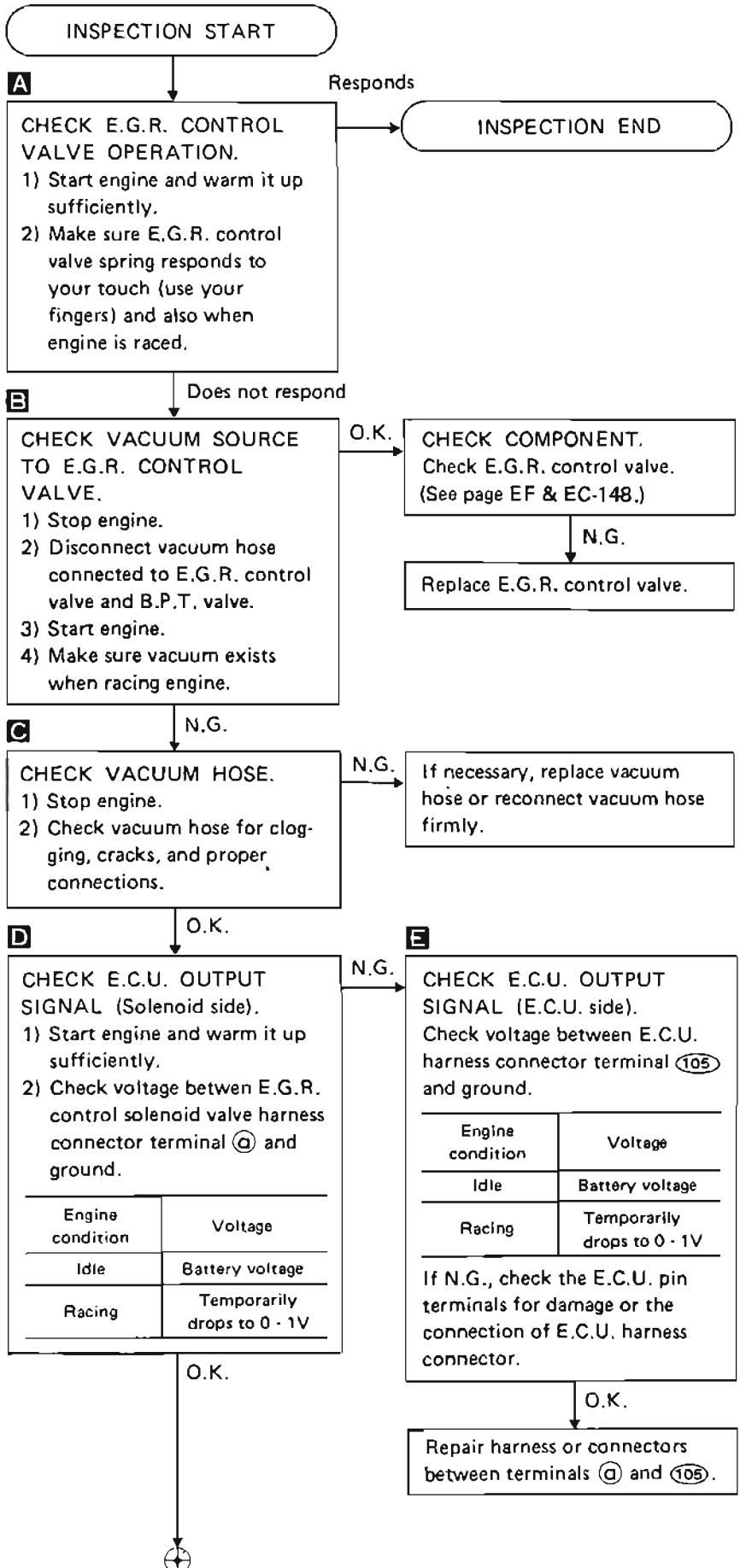
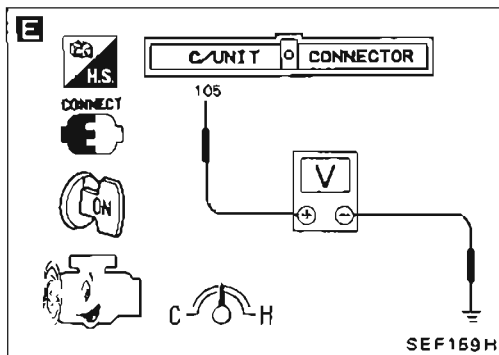
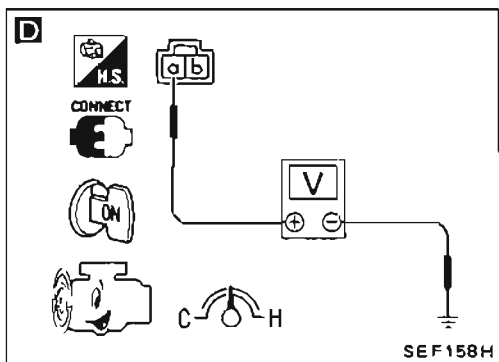
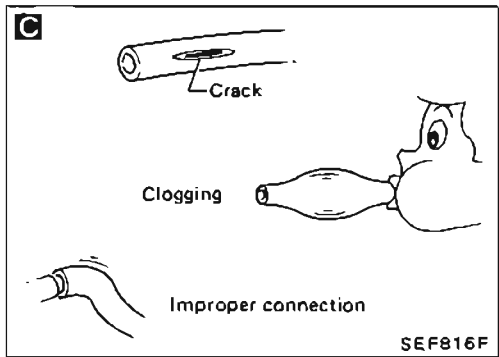
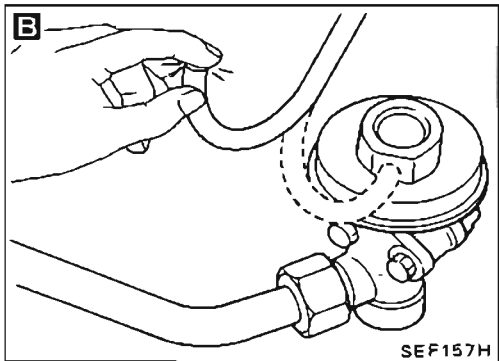
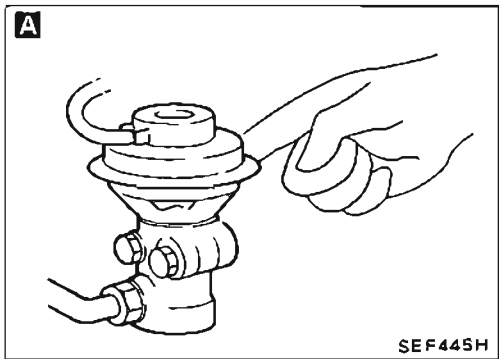


Component location



TROUBLE DIAGNOSES

Diagnostic Procedure 8 (Cont'd)



| Engine condition | Voltage |
|------------------|-----------------------------|
| Idle | Battery voltage |
| Racing | Temporarily drops to 0 - 1V |

| Engine condition | Voltage |
|------------------|-----------------------------|
| Idle | Battery voltage |
| Racing | Temporarily drops to 0 - 1V |

TROUBLE DIAGNOSES

Diagnostic Procedure 8 (Cont'd)

F

Test condition

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

• Engine speed:

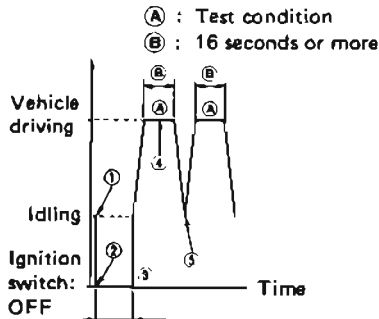
3,200±400 rpm

• Intake manifold vacuum:

-42.7±8.0 kPa

(-320±60 mmHg, -12.60±2.36 inHg)

Driving mode

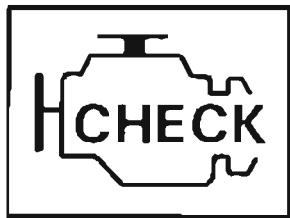


Until green and red inspection lamps go off.

- ① Start engine and warm it up sufficiently.
- ② Turn off ignition switch and keep it off until green and red inspection lamps go off.
- ③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
- ④ Shift to suitable gear position and drive in "Test condition" for at least 16 seconds.
- ⑤ Decrease engine revolution to less than 2,000 rpm.
- ⑥ Repeat steps ④ through ⑤ at least 1 time.

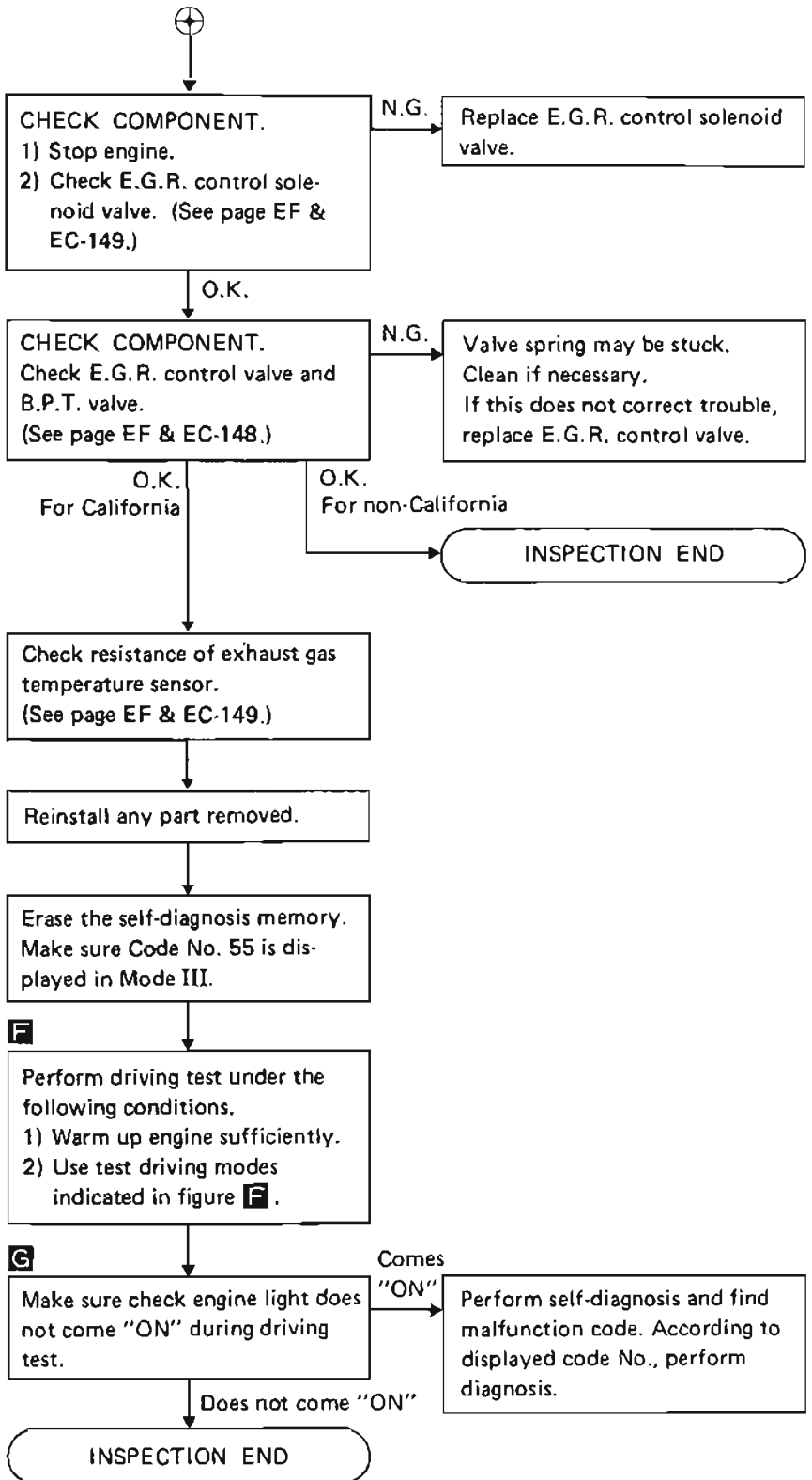
SEF037H

G



CHECK ENGINE LIGHT

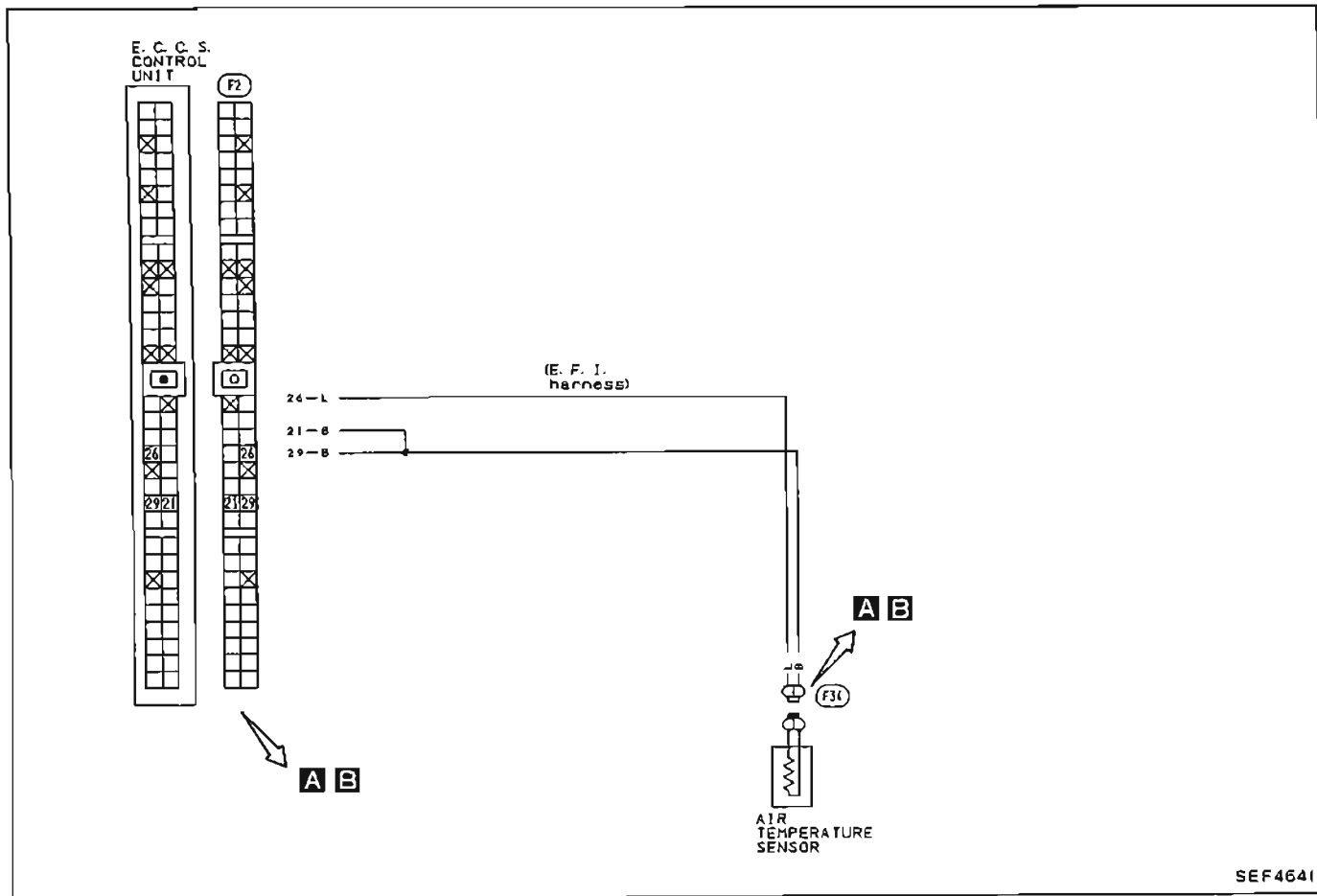
SEF924F



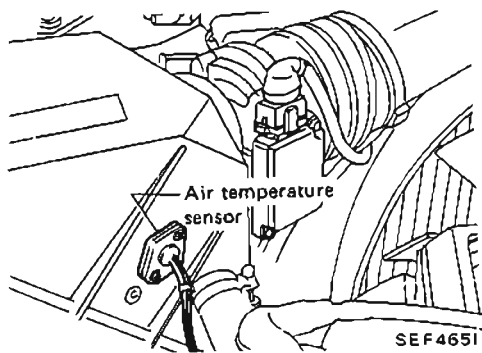
TROUBLE DIAGNOSES

Diagnostic Procedure 24

AIR TEMPERATURE SENSOR (Code No. 41)

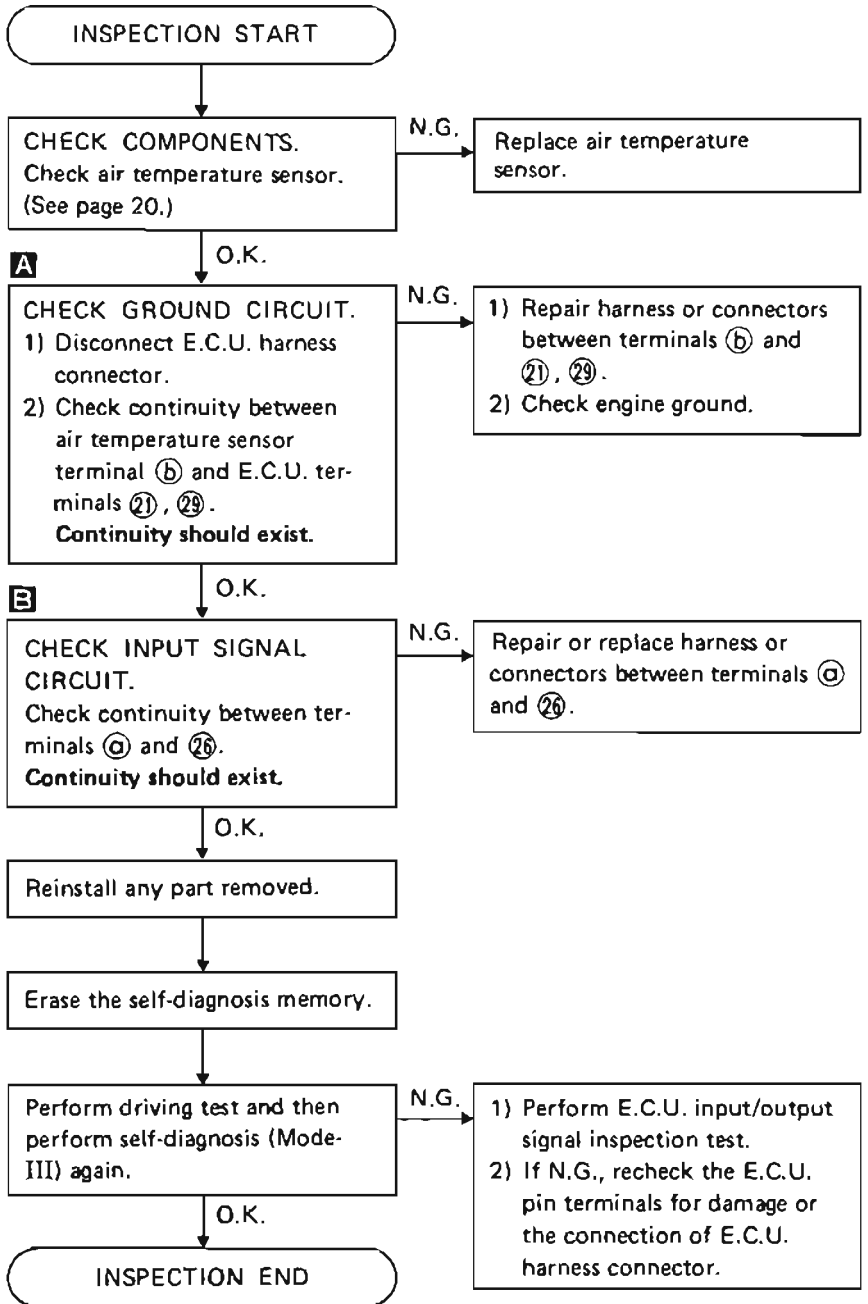
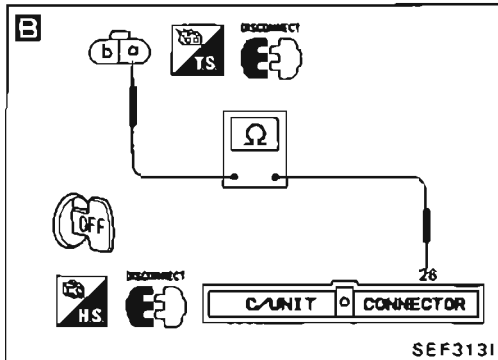
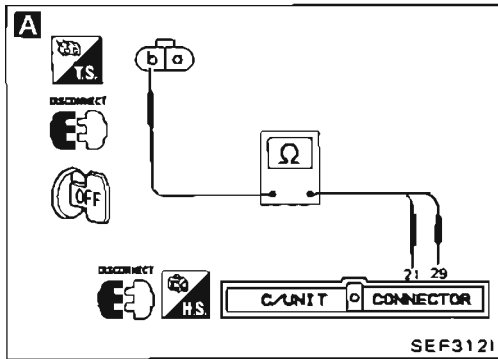


Component location



TROUBLE DIAGNOSES

Diagnostic Procedure 24 (Cont'd)



TROUBLE DIAGNOSES

Electrical Components Inspection

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

E.C.U. inspection table

*Data are reference values.

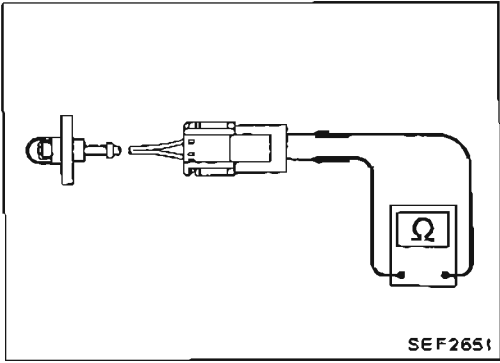
| TERMI- NAL NO. | ITEM | CONDITION | *DATA |
|----------------------|--|--|--|
| 16 | Air flow meter | Engine is running. | 1.0 - 3.0V Output voltage varies with engine revolution. |
| 18 | Engine temperature sensor | Engine is running. | 1.0 - 5.0V Output voltage varies with engine water temperature. |
| 19 | Exhaust gas sensor | Engine is running. └ After warming up sufficiently. | 0 - Approximately 1.0V |
| 20 | Throttle sensor | Ignition switch "ON" | 0.4 - Approximately 4V Output voltage varies with the throttle valve opening angle. |
| 22 30 | Crank angle sensor (Reference signal) | Engine is running. Do not run engine at high speed under no-load. | 0.2 - 0.5V |
| 26 | Air temperature sensor | Ignition switch "ON" └ Air temperature is 20°C (68°F). | 1.0 - 1.5V |
| | | Ignition switch "ON" └ Air temperature is 80°C (176°F). | Approximately 0.3V |
| 28 | Throttle opening signal | Ignition switch "ON" | 0.3 - Approximately 3V |
| 31 40 | Crank angle sensor (Position signal) | Engine is running. Do not run engine at high speed under no-load. | 2.0 - 3.0V |
| 33 | Idle switch (⊖ side) | Ignition switch "ON" └ Throttle valve: idle position | Approximately 9 - 10V |
| | | Ignition switch "ON" └ Throttle valve: Any position except idle position | 0V |
| 34 | Start signal | Cranking | 8 - 12V |
| 35 | Neutral switch & Inhibitor switch | Ignition switch "ON" └ Neutral/Parking | 0V |
| | | Ignition switch "ON" └ Except the above gear position | 6 - 7V |

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd) 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 |



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

General Specifications

| | | |
|-----------------|-----------|--|
| IGNITION TIMING | °B.T.D.C. | 15±2 |
| IDLE SPEED | rpm | M/T 700±50 A/T 750±50 (in "N" position) |

Inspection and Adjustment

| | | |
|---|----|---|
| ENGINE TEMPERATURE SENSOR | | |
| Thermistor resistance | kΩ | 20°C (68°F) 80°C (176°F) |
| | | 2.1 - 2.9 0.30 - 0.33 |
| AIR TEMPERATURE SENSOR | | |
| Resistance | kΩ | 20°C (68°F) 80°C (176°F) |
| | | 2.1 - 2.9 0.27 - 0.38 |
| IDLE SWITCH Engine speed when idle switch is changed from "OFF" to "ON" | | M/T 1,000±150 A/T 1,000±150 (in "N" position) |
| FUEL PRESSURE at idling (Measuring point: between fuel filter and fuel pipe) Vacuum hose is connected | | Approximately 226 (2.3, 33) |
| kPa (kg/cm ² , psi) | | |
| Vacuum hose is disconnected | | Approximately 294 (3.0, 43) |
| kPa (kg/cm ² , psi) | | |
| FUEL INJECTOR Coil resistance | | Ω |
| | | Approximately 10 - 15 |
| AIR REGULATOR Resistance | | Ω |
| | | Approximately 75 |
| EXHAUST GAS TEMPERATURE SENSOR | | |
| Thermistor resistance | kΩ | 100°C (212°F) |
| | | 85.3±8.53 |

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