NISSAN
240SX
1989

SERVICE MANUAL
<table>
<thead>
<tr>
<th>QUICK REFERENCE INDEX</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL INFORMATION</td>
<td>GI</td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>MA</td>
</tr>
<tr>
<td>ENGINE MECHANICAL</td>
<td>EM</td>
</tr>
<tr>
<td>ENGINE LUBRICATION &amp; COOLING SYSTEMS</td>
<td>LC</td>
</tr>
<tr>
<td>ENGINE FUEL &amp; EMISSION CONTROL SYSTEM</td>
<td>EF &amp; EC</td>
</tr>
<tr>
<td>ENGINE CONTROL, FUEL &amp; EXHAUST SYSTEM</td>
<td>FE</td>
</tr>
<tr>
<td>CLUTCH</td>
<td>CL</td>
</tr>
<tr>
<td>MANUAL TRANSMISSION</td>
<td>MT</td>
</tr>
<tr>
<td>AUTOMATIC TRANSMISSION</td>
<td>AT</td>
</tr>
<tr>
<td>PROPPELLER SHAFT &amp; DIFFERENTIAL CARRIER</td>
<td>PD</td>
</tr>
<tr>
<td>FRONT AXLE &amp; FRONT SUSPENSION</td>
<td>FA</td>
</tr>
<tr>
<td>REAR AXLE &amp; REAR SUSPENSION</td>
<td>RA</td>
</tr>
<tr>
<td>BRAKE SYSTEM</td>
<td>BR</td>
</tr>
<tr>
<td>STEERING SYSTEM</td>
<td>ST</td>
</tr>
<tr>
<td>BODY</td>
<td>BF</td>
</tr>
<tr>
<td>HEATER &amp; AIR CONDITIONER</td>
<td>HA</td>
</tr>
<tr>
<td>ELECTRICAL SYSTEM</td>
<td>EL</td>
</tr>
</tbody>
</table>
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.
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
IDENTIFICATION INFORMATION ............................................................................ GI-13
LIFTING POINTS AND TOW TRUCK TOWING ......................................................... GI-17
TIGHTENING TORQUE OF STANDARD BOLTS ....................................................... GI-20
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.
6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers. Take caution that keys, buckles or buttons on your person do not scratch the paint.

7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.

8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.

9. Replace inner and outer races of tapered roller bearings and needle bearings as a set.

10. Arrange the disassembled parts in accordance with their assembled locations and sequence.

11. Do not touch the terminals of electrical components which use microcomputers (such as electronic control units). Static electricity may damage internal electronic components.

12. After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.

13. Use only the lubricants specified in MA section.

14. Use approved bonding agent, sealants or their equivalents when required.

15. Use tools and recommended special tools where specified for safe and efficient service repairs.

16. When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.

17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.

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

1. Before connecting or disconnecting E.F.I. or E.C.C.S. harness connector to or from any E.F.I. or E.C.C.S. control unit, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal. Otherwise, there may be damage to control unit.

2. Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.

3. Be careful not to jar components such as control unit and air flow meter.
Precautions for Catalyst
If a large amount of unburned fuel flows into the converter, the converter temperature will be excessively high. To prevent this, follow the procedure below:
1. Use unleaded gasoline only. Leaded gasoline will seriously damage the catalytic converter.
2. When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
3. Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing damage to the converter.
4. Do not place the vehicle on inflammable material. Keep inflammable material off the exhaust pipe.

Precautions for Fuel

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-5) 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
- Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.
- Should be lubricated with oil.
- Sealing point
- Checking point
- Always replace after every disassembly.
- Apply petroleum jelly.
- Apply A.T.F.
- Select with proper thickness.
- Adjustment is required.
- Service Data and Specifications
- Left-Hand, Right-Hand

M/T: Manual Transaxle/Transmission
A/T: Automatic Transaxle/Transmission
Tool: Special Service Tools
L.H.D.: Left-Hand Drive
R.H.D.: Right-Hand Drive
A.T.F.: Automatic Transmission Fluid
D₁: Drive range 1st gear
D₂: Drive range 2nd gear
D₃: Drive range 3rd gear
D₄: Drive range 4th gear
O.D.: Overdrive
2₁: 2nd range 2nd gear
2₂: 2nd range 1st gear
1₂: 1st range 2nd gear
1₁: 1st range 1st gear
8. The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system. 
   **Example**
   
   Tightening torque:
   
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.

10. **SERVICE DATA AND SPECIFICATIONS** 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:

Example

CONNECTOR
This shows that these connectors are white 8 terminal connectors.

POWER SUPPLY
- This shows the ignition switch position in which the system can be operated.
- See POWER SUPPLY ROUTING in EL section for the detailed wiring diagram.

IGNITION SWITCH
ACC or ON

SWITCH
This shows that continuity exists between terminals (1) and (3), when the switch is turned to ON position.

FUSE BLOCK

WIRE COLOR CODING
B = Black     BR = Brown
W = White     OR = Orange
R = Red       P = Pink
G = Green     PU = Purple
L = Blue      GY = Grey
Y = Yellow    SB = Sky Blue
LG = Light Green

When the wire color is striped, the base color is given first, followed by the stripe color as shown below:
Example: L/W = Blue with White Stripe

LOCATION NUMBER
This number shows where the connector is located. See HARNESS LAYOUT in EL section. The number is identical with the one in HARNESS LAYOUT.

BODY GROUND

LOCATION NUMBER

I: Instrument
M: Main harness

ABBREVIATIONS

M/T model
A/T model

Example: L/W = Blue with White Stripe

SWITCH POSITIONS
Wiring diagram switches are shown with the vehicle in the following condition.
- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.
CONNECTOR SYMBOLS

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

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

MULTIPLE SWITCH

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

Example: Wiper switch 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

STARTING SYSTEM
Wiring Diagram

SUPER MULTIPLE JUNCTION (S.M.J.)
Terminal Arrangement

Check

S.M.J.
Refer to last page
(Foldout page).

R
B1
L
D0
BR
(Main harness)
(Instrument harness)

R
A1 B1 C1 D1 E1 F1 G1
A2 B2 C2 D2 E2 F2 G2
A3 B3 C3 D3 E3 F3 G3
A4 B4 C4 D4 E4 F4 G4
A5 B5 C5 D5 E5 F5 G5
A6 B6 C6 D6 E6 F6 G6
A7 B7 C7 D7 E7 F7 G7
A8 B8 C8 D8 E8 F8 G8
A9 B9 C9 D9 E9 F9 G9
A0 B0 C0 D0 E0 F0 G0

G1 F1 E1 D1 C1 B1 A1
G2 F2 E2 D2 C2 B2 A2
G3 F3 E3 D3 C3 B3 A3
G4 F4 E4 D4 C4 B4 A4
G5 F5 E5 D5 C5 B5 A5
G6 F6 E6 D6 C6 B6 A6
G7 F7 E7 D7 C7 B7 A7
G8 F8 E8 D8 C8 B8 A8
G9 F9 E9 D9 C9 B9 A9
G0 F0 E0 D0 C0 B0 A0

B

(Instruction harness)

8R

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 FLOW CHART IN TROUBLE DIAGNOSES

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

   CHECK POWER SUPPLY.
   1) Turn ignition switch “ON”.
   2) Check voltage between terminal (b) and ground.
      Battery voltage should exist.

   O.K.

2 Measurement results
   Required results are indicated in bold type in the corresponding block, as shown below.
   These have the following meanings:
   Battery voltage → 11 - 14V or approximately 12V
   Voltage: Approximately 0V → Less than 1V

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

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

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

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

   - View from harness side ... H.S.
   - All connector symbols shown from the harness side are enclosed by a double line.
### Key to symbols signifying measurements or procedures

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Symbol explanation</th>
<th>Symbol</th>
<th>Symbol explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Disconnect" /></td>
<td>Check after disconnecting the connector to be measured.</td>
<td><img src="image2.png" alt="A/C switch" /></td>
<td>A/C switch is &quot;OFF&quot;.</td>
</tr>
<tr>
<td><img src="image3.png" alt="Connect" /></td>
<td>Check after connecting the connector to be measured.</td>
<td><img src="image4.png" alt="A/C switch" /></td>
<td>A/C switch is &quot;ON&quot;.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Insert key" /></td>
<td>Insert key into ignition switch.</td>
<td><img src="image6.png" alt="REC switch" /></td>
<td>REC switch is &quot;ON&quot;.</td>
</tr>
<tr>
<td><img src="image7.png" alt="OFF" /></td>
<td>Turn ignition switch to &quot;OFF&quot; position.</td>
<td><img src="image8.png" alt="REC switch" /></td>
<td>REC switch is &quot;OFF&quot;.</td>
</tr>
<tr>
<td><img src="image9.png" alt="ON" /></td>
<td>Turn ignition switch to &quot;ON&quot; position.</td>
<td><img src="image10.png" alt="DEF switch" /></td>
<td>DEF switch is &quot;ON&quot;.</td>
</tr>
<tr>
<td><img src="image11.png" alt="ST" /></td>
<td>Turn ignition switch to &quot;START&quot; position.</td>
<td><img src="image12.png" alt="VENT switch" /></td>
<td>VENT switch is &quot;ON&quot;.</td>
</tr>
<tr>
<td><img src="image13.png" alt="OFF-ACC" /></td>
<td>Turn ignition switch from &quot;OFF&quot; to &quot;ACC&quot; position.</td>
<td><img src="image14.png" alt="Fan switch" /></td>
<td>Fan switch is &quot;ON&quot;. (At any position except for &quot;OFF&quot; position)</td>
</tr>
<tr>
<td><img src="image15.png" alt="OFF-ACC" /></td>
<td>Turn ignition switch from &quot;ACC&quot; to &quot;OFF&quot; position.</td>
<td><img src="image16.png" alt="Fan switch" /></td>
<td>Fan switch is &quot;OFF&quot;.</td>
</tr>
<tr>
<td><img src="image17.png" alt="OFF-ON" /></td>
<td>Turn ignition switch from &quot;OFF&quot; to &quot;ON&quot; position.</td>
<td><img src="image18.png" alt="Apply battery" /></td>
<td>Apply battery voltage directly to components.</td>
</tr>
<tr>
<td><img src="image19.png" alt="OFF-ON" /></td>
<td>Turn ignition switch from &quot;ON&quot; to &quot;OFF&quot; position.</td>
<td><img src="image20.png" alt="Drive vehicle" /></td>
<td>Drive vehicle.</td>
</tr>
<tr>
<td><img src="image21.png" alt="Do not start" /></td>
<td>Do not start engine, or check with engine stopped.</td>
<td><img src="image22.png" alt="Disconnect battery" /></td>
<td>Disconnect battery negative cable.</td>
</tr>
<tr>
<td><img src="image23.png" alt="Start engine" /></td>
<td>Start engine, or check with engine running.</td>
<td><img src="image24.png" alt="Depress brake" /></td>
<td>Depress brake pedal.</td>
</tr>
<tr>
<td><img src="image25.png" alt="Apply parking brake" /></td>
<td>Apply parking brake.</td>
<td><img src="image26.png" alt="Release brake" /></td>
<td>Release brake pedal.</td>
</tr>
<tr>
<td><img src="image27.png" alt="Release parking brake" /></td>
<td>Release parking brake.</td>
<td><img src="image28.png" alt="Depress accelerator" /></td>
<td>Depress accelerator pedal.</td>
</tr>
<tr>
<td><img src="image29.png" alt="Check after engine" /></td>
<td>Check after engine is warmed up sufficiently.</td>
<td><img src="image30.png" alt="Release accelerator" /></td>
<td>Release accelerator pedal.</td>
</tr>
<tr>
<td><img src="image31.png" alt="Voltage should be measured" /></td>
<td>Voltage should be measured with a voltmeter.</td>
<td><img src="image32.png" alt="Pin terminal check" /></td>
<td>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.</td>
</tr>
<tr>
<td><img src="image33.png" alt="Circuit resistance should be measured" /></td>
<td>Circuit resistance should be measured with an ohmmeter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image34.png" alt="Current should be measured" /></td>
<td>Current should be measured with an ammeter.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GI-12**
## Model Variation

<table>
<thead>
<tr>
<th>Destination</th>
<th>Body</th>
<th>Model</th>
<th>Engine</th>
<th>Transmission</th>
<th>Differential carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-California</td>
<td>Coupe</td>
<td>HLS13FU</td>
<td></td>
<td>FS5W71C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fastback</td>
<td>RHLS13FU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coupe</td>
<td>HLS13AU</td>
<td></td>
<td>RE4R01A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fastback</td>
<td>RHLS13AU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>Coupe</td>
<td>HLS13FV</td>
<td>KA24E</td>
<td>FS5W71C</td>
<td>R200</td>
</tr>
<tr>
<td></td>
<td>Fastback</td>
<td>RHLS13FV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coupe</td>
<td>HLS13AV</td>
<td></td>
<td>RE4R01A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fastback</td>
<td>RHLS13AV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>Coupe</td>
<td>HLS13FN</td>
<td></td>
<td>FS5W71C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fastback</td>
<td>RHLS13FN</td>
<td></td>
<td>RE4R01A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coupe</td>
<td>HLS13AN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fastback</td>
<td>RHLS13AN</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Prefix and suffix designations:

- **R**: Coupe
- **H**: Fastback
- **L**: KA24E engine
- **S13**: L.H. drive
- **(R)**: With A.B.S.
- **N**: Canada
- **V**: California
- **U**: Non-California
- **A**: Automatic transmission
- **F**: 5-speed manual transmission

☐ means no indication.
IDENTIFICATION INFORMATION

Identification Number

Vehicle identification plate
Vehicle identification number (Chassis number)
Emission control information label
F.M.V.S.S. certification label
Vehicle identification number plate

VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

Manufacturer
JN1: Nissan passenger vehicle

Engine type
H: KA24E

Vehicle line
S: NISSAN 240SX

Model change (0 to 9)

Body type
4: Coupe
6: Fastback

Vehicle serial number

Manufacture plant
W: Kyushu

Model year
K: 1989 year model

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

Restraint system
S: Standard
P: Automatic

GI-14
IDENTIFICATION INFORMATION

Identification Number (Cont’d)

IDENTIFICATION PLATE

NISSAN MOTOR CO., LTD. JAPAN

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

KA24E engine

MANUAL TRANSMISSION NUMBER

AUTOMATIC TRANSMISSION NUMBER

GI-15
### Dimensions

<table>
<thead>
<tr>
<th></th>
<th>Coupe</th>
<th>Fastback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall length</td>
<td>4,520 (178.0)</td>
<td>4,520 (178.0)</td>
</tr>
<tr>
<td>Overall width</td>
<td>1,690 (66.5)</td>
<td>1,690 (66.5)</td>
</tr>
<tr>
<td>Overall height</td>
<td>1,290 (50.8)</td>
<td>1,290 (50.8)</td>
</tr>
<tr>
<td>Front tread</td>
<td>1,465 (57.7)</td>
<td>1,465 (57.7)</td>
</tr>
<tr>
<td>Rear tread</td>
<td>1,460 (57.5)</td>
<td>1,460 (57.5)</td>
</tr>
<tr>
<td>Wheelbase</td>
<td>2,475 (97.4)</td>
<td>2,475 (97.4)</td>
</tr>
</tbody>
</table>

### Wheels and Tires

<table>
<thead>
<tr>
<th>Road wheel</th>
<th>Steel</th>
<th>Aluminum</th>
<th>Offset (mm)</th>
<th>Wheel size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6JJx15</td>
</tr>
<tr>
<td>Tire size</td>
<td>Conventional</td>
<td></td>
<td></td>
<td>195/60R15 86H</td>
</tr>
<tr>
<td></td>
<td>Spare</td>
<td></td>
<td></td>
<td>T125/70D15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>205/60R15 89H*</td>
</tr>
</tbody>
</table>

*: 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.

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

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

Tow Truck Towing

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

NISSAN recommends that vehicle be towed with the driving (rear) wheels off the ground as illustrated.
Tow Truck Towing (Cont'd)

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

Observe the following restricted towing speeds and distances.

Speed:
- Below 50 km/h (30 MPH)

Distance:
- Less than 65 km (40 miles)

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

TOWING POINT

Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.
# TIGHTENING TORQUE OF STANDARD BOLTS

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

### Grade Mark

- **4T**
- **7T**
- **9T**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Bolt size</th>
<th>Bolt diameter* mm</th>
<th>Pitch mm</th>
<th>Tightening torque (Without lubricant)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hexagon head bolt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N·m</td>
</tr>
<tr>
<td>M6</td>
<td>6.0</td>
<td>1.0</td>
<td>5.1</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>13</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M8</td>
<td>8.0</td>
<td>1.0</td>
<td>13</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>25</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M10</td>
<td>10.0</td>
<td>1.5</td>
<td>25</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>25</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M12</td>
<td>12.0</td>
<td>1.75</td>
<td>42</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>46</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M14</td>
<td>14.0</td>
<td>1.5</td>
<td>74</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>74</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M6</td>
<td>6.0</td>
<td>1.0</td>
<td>8.4</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>21</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M8</td>
<td>8.0</td>
<td>1.0</td>
<td>22</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5</td>
<td>41</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>43</td>
<td>4.4</td>
</tr>
<tr>
<td>M10</td>
<td>10.0</td>
<td>1.75</td>
<td>71</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>77</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M12</td>
<td>12.0</td>
<td>1.5</td>
<td>127</td>
<td>13.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>62</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M14</td>
<td>14.0</td>
<td>1.5</td>
<td>177</td>
<td>18.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25</td>
<td>108</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

- **4T**
- **7T**
- **9T**

---

M 6

Nominal diameter of bolt threads (Unit: mm)

* Metric screw threads

---

GI-20
CONTENTS

PERIODIC MAINTENANCE ................................................................. MA- 2
GENERAL MAINTENANCE ............................................................... MA- 4
RECOMMENDED LUBRICANTS AND FLUIDS ......................................... MA- 6
ENGINE MAINTENANCE ................................................................. MA- 8
CHASSIS AND BODY MAINTENANCE ............................................... MA-14
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ................................. MA-20
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**

<table>
<thead>
<tr>
<th>MAINTENANCE OPERATION</th>
<th>MAINTENANCE INTERVAL</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive belts</td>
<td>Replace every 30,000 miles (48,000 km).</td>
<td>MA-10</td>
</tr>
<tr>
<td>Air cleaner filter</td>
<td>Replace every 30,000 miles (48,000 km).</td>
<td>MA-10</td>
</tr>
<tr>
<td>Vapor lines</td>
<td>Then replace every 7,500 miles (12,000 km) or 6 months.</td>
<td>MA-11</td>
</tr>
<tr>
<td>Fuel lines</td>
<td>Then replace every second oil change.</td>
<td>MA-11</td>
</tr>
<tr>
<td>Fuel filter</td>
<td>Replace every 30,000 miles (48,000 km).</td>
<td>MA-12</td>
</tr>
<tr>
<td>Engine coolant</td>
<td>Inspect every 3 years.</td>
<td>MA-12</td>
</tr>
<tr>
<td>Engine oil filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Use Nissan PREMIUM type or equivalent.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spark plugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition wires</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CHASSIS AND BODY MAINTENANCE**

<table>
<thead>
<tr>
<th>MAINTENANCE OPERATION</th>
<th>MAINTENANCE INTERVAL</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break lines &amp; cables</td>
<td></td>
<td>MA-16</td>
</tr>
<tr>
<td>Brake pads &amp; discs</td>
<td></td>
<td>MA-17</td>
</tr>
<tr>
<td>Manual and automatic transmission &amp; differential gear oil</td>
<td></td>
<td>MA-14, 15, 16</td>
</tr>
<tr>
<td>Steering gear &amp; linkage, and axle &amp; suspension parts</td>
<td></td>
<td>MA-18, FA-4, RA-4</td>
</tr>
<tr>
<td>Exhaust system</td>
<td></td>
<td>MA-14</td>
</tr>
</tbody>
</table>

**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.
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

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

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OUTSIDE THE VEHICLE</strong></td>
<td></td>
</tr>
<tr>
<td>The maintenance items listed here should be performed from time to time, unless otherwise specified.</td>
<td></td>
</tr>
<tr>
<td><strong>Tires</strong> 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.</td>
<td></td>
</tr>
<tr>
<td><strong>Wheel nuts</strong> When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.</td>
<td></td>
</tr>
<tr>
<td><strong>Tire rotation</strong> Tires should be rotated every 12,000 km (7,500 miles.)</td>
<td>MA-18</td>
</tr>
<tr>
<td><strong>Wheel alignment and balance</strong> 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.</td>
<td>MA-17</td>
</tr>
<tr>
<td><strong>Windshield wiper blades</strong> Check for cracks or wear if they do not wipe properly.</td>
<td></td>
</tr>
<tr>
<td><strong>Doors and engine hood</strong> 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. When driving in areas using road salt or other corrosive materials, check lubrication frequently.</td>
<td>MA-19</td>
</tr>
</tbody>
</table>

<p>| <strong>INSIDE THE VEHICLE</strong>                     |                |
| The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc. |                |
| <strong>Lights</strong> Make sure that the headlights, stop lights, taillights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim. |                |
| <strong>Warning lights and buzzers/chimes</strong> Make sure that all warning lights and buzzers/chimes are operating properly. |                |
| <strong>Windshield wiper and washer</strong> Check that the wipers and washer operate properly and that the wipers do not streak. |                |
| <strong>Windshield defroster</strong> Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner. |                |
| <strong>Steering wheel</strong> 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) |                |
| <strong>Seats</strong> Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restraints move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks. |                |
| <strong>Seat belts</strong> 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          |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clutch pedal</strong> Make sure the pedal operates smoothly and check that it has the proper free travel.</td>
<td>CL-5</td>
</tr>
<tr>
<td><strong>Brakes</strong> Check that the brake does not pull the vehicle to one side when applied.</td>
<td></td>
</tr>
<tr>
<td><strong>Brake pedal</strong> Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function.</td>
<td>BR-7</td>
</tr>
<tr>
<td><strong>Parking brake</strong> 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.</td>
<td>BR-23</td>
</tr>
<tr>
<td><strong>Automatic transmission “Park” mechanism</strong> 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.</td>
<td></td>
</tr>
<tr>
<td><strong>UNDER THE HOOD AND VEHICLE</strong> The maintenance items listed here should be checked periodically (e.g. each time you check the engine oil or refuel).</td>
<td></td>
</tr>
<tr>
<td><strong>Windshield washer fluid</strong> Check that there is adequate fluid in the tank.</td>
<td></td>
</tr>
<tr>
<td><strong>Engine coolant level</strong> Check the coolant level when the engine is cold.</td>
<td>MA-9</td>
</tr>
<tr>
<td><strong>Radiator and hoses</strong> 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.</td>
<td></td>
</tr>
<tr>
<td><strong>Brake and clutch fluid levels</strong> Make sure that the brake and clutch fluid levels are between the “MAX” and “MIN” lines on the reservoir.</td>
<td>MA-14, 16</td>
</tr>
<tr>
<td><strong>Engine drive belts</strong> Make sure that no belt is frayed, worn, cracked or oily.</td>
<td>MA-8</td>
</tr>
<tr>
<td><strong>Engine oil level</strong> Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.</td>
<td>MA-11</td>
</tr>
<tr>
<td><strong>Power steering fluid level and lines</strong> Check the level when the fluid is cold and the engine is turned off. Check the lines for proper attachment, leaks, cracks, etc.</td>
<td>MA-18</td>
</tr>
<tr>
<td><strong>Automatic transmission fluid level</strong> Check the level on the dipstick after putting the selector lever in “P” with the engine idling.</td>
<td>MA-15</td>
</tr>
<tr>
<td><strong>Exhaust system</strong> 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.</td>
<td>MA-14</td>
</tr>
<tr>
<td><strong>Underbody</strong> 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.</td>
<td></td>
</tr>
<tr>
<td><strong>Fluid leaks</strong> 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.</td>
<td></td>
</tr>
</tbody>
</table>
## Lubricants and Fluids

<table>
<thead>
<tr>
<th>Capacity (Approximate)</th>
<th>US measure</th>
<th>Imp measure</th>
<th>Liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine oil (Refill)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With oil filter</td>
<td>3-3/4 qt</td>
<td>3-1/8 qt</td>
<td>3.5</td>
</tr>
<tr>
<td>Without oil filter</td>
<td>3-3/8 qt</td>
<td>2-7/8 qt</td>
<td>3.2</td>
</tr>
<tr>
<td>Cooling system (with reservoir tank)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservoir tank</td>
<td>7-1/8 qt</td>
<td>5-7/8 qt</td>
<td>6.7</td>
</tr>
<tr>
<td>Manual transmission oil</td>
<td>6-1/8 pt</td>
<td>4-1/4 pt</td>
<td>2.4</td>
</tr>
<tr>
<td>Differential gear oil</td>
<td>2-3/4 pt</td>
<td>2-1/4 pt</td>
<td>1.3</td>
</tr>
<tr>
<td>Automatic transmission fluid</td>
<td>8-3/4 qt</td>
<td>7-1/4 qt</td>
<td>8.3</td>
</tr>
<tr>
<td>Power steering fluid</td>
<td>1 qt</td>
<td>3/4 qt</td>
<td>0.9</td>
</tr>
<tr>
<td>Brake fluid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-purpose grease</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recommended lubricants and fluids:
- **Genuine Nissan Motor Oil** *1 or equivalent
- **Anti-freeze coolant** (Ethylene glycol base)
- **API GL-4** *2
- **API GL-5** *2
- **Genuine Nissan ATF** *1 or equivalent
- **Genuine Nissan Brake Fluid** *1 or equivalent

---

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

80W-90 is preferable if the ambient temperature is below \(40^\circ C (104^\circ F)\).
ENGINE MAINTENANCE

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.

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

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.
   - $\tau$: 34 - 44 N\(\cdot\)m
     - (3.5 - 4.5 kg\(\cdot\)m, 25 - 33 ft\(\cdot\)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 $\ell$ (7-1/8 US qt, 5-7/8 Imp qt)
    - Pour coolant through coolant filler neck slowly to allow air in system to escape.
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.
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):**

<table>
<thead>
<tr>
<th></th>
<th>Unit: liter (US qt, Imp qt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>With oil filter change</td>
<td>3.5 (3-3/4, 3-1/8)</td>
</tr>
<tr>
<td>Without oil filter change</td>
<td>3.2 (3-3/8, 2-7/8)</td>
</tr>
</tbody>
</table>

**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:
   $\tau$: 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 k$\Omega$
   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:
   - $25 - 34 \text{ N\cdot m} \ (2.5 - 3.5 \text{ kg\cdot m}, \ 18 - 25 \text{ ft\cdot lb})$

Changing M/T Oil
1. Drain oil and refill with new gear oil.
2. Check oil level.

   Oil capacity:
   - $2.4 \ \text{ US pt} \ (4-1/4 \text{ Imp pt})$

   Drain plug:
   - $25 - 34 \text{ N\cdot m} \ (2.5 - 3.5 \text{ kg\cdot m}, \ 18 - 25 \text{ ft\cdot lb})$
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:
   $\bullet$: 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 $\ell$ (2-3/4 US pt, 2-1/4 Imp pt)
   Drain plug:
   $\bullet$: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)

Checking Brake Fluid Level and Leaks
$\bullet$ If fluid level is extremely low, check brake system for leaks.

Checking Brake Lines and Cables
$\bullet$ 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.

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc brake type</td>
<td>CL22VB</td>
<td>CL9H</td>
</tr>
<tr>
<td>Standard thickness</td>
<td>20.0 (0.787)</td>
<td>9.0 (0.354)</td>
</tr>
<tr>
<td>Minimum thickness</td>
<td>18.0 (0.709)</td>
<td>8.0 (0.315)</td>
</tr>
</tbody>
</table>

**CALIPER**
- Check operation and for leakage.

**PAD**
- Check for wear or damage.

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc brake type</td>
<td>CL22VB</td>
<td>CL9H</td>
</tr>
<tr>
<td>Standard thickness</td>
<td>10.0 (0.394)</td>
<td>9.5 (0.374)</td>
</tr>
<tr>
<td>Minimum thickness</td>
<td>2.0 (0.079)</td>
<td></td>
</tr>
</tbody>
</table>

**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

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 seat belt assembly.
3. If webbing is cut, frayed, or damaged, replace belt assembly.
4. Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.
5. Use a NISSAN genuine seat belt assembly.
6. Anchor bolt
   24 - 31 N-m
   (2.4 - 3.2 kg-m, 17 - 23 ft-lb)
   For automatic seat belt, refer to BF section.
Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

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

Oil capacity (Refill)

Unit: l (US qt, Imp qt)

<table>
<thead>
<tr>
<th></th>
<th>With oil filter</th>
<th>Without oil filter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.5 (3-3/4, 3-1/8)</td>
<td>3.2 (3-3/8, 2-7/8)</td>
</tr>
</tbody>
</table>

Coolant capacity

Unit: l (US qt, Imp qt)

<table>
<thead>
<tr>
<th></th>
<th>With reservoir tank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.7 (7-1/8, 5-7/8)</td>
</tr>
</tbody>
</table>

Spark plug

<table>
<thead>
<tr>
<th></th>
<th>Standard type ZFR5D-11</th>
<th>Hot type ZFR4D-11</th>
<th>Cold type ZFR6D-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug gap</td>
<td>1.0 - 1.1 mm (0.039 - 0.043 in)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ignition wire

<table>
<thead>
<tr>
<th></th>
<th>Resistance kΩ</th>
<th>Less than 30</th>
</tr>
</thead>
</table>

TIGHTENING TORQUE

<table>
<thead>
<tr>
<th></th>
<th>N-m</th>
<th>kg-m</th>
<th>ft-lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spark plug</td>
<td>20 - 29</td>
<td>2.0 - 3.0</td>
<td>14 - 22</td>
</tr>
<tr>
<td>Drain plug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine block</td>
<td>34 - 44</td>
<td>3.5 - 4.5</td>
<td>25 - 33</td>
</tr>
<tr>
<td>Oil pan</td>
<td>29 - 39</td>
<td>3.0 - 4.0</td>
<td>22 - 29</td>
</tr>
</tbody>
</table>

MA-20
### Chassis and Body Maintenance

#### INSPECTION AND ADJUSTMENT

**Clutch**

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Pedal free height &quot;H&quot;</th>
<th>186 - 196 (7.32 - 7.72)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedal free play &quot;A&quot;</td>
<td>1.0 - 3.0 (0.039 - 0.118)</td>
<td></td>
</tr>
</tbody>
</table>

**Brake**

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Disc brake Pad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard thickness</td>
<td>10.0 (0.394)</td>
</tr>
<tr>
<td>CL22VB</td>
<td>10.0 (0.394)</td>
</tr>
<tr>
<td>CL9H</td>
<td>9.5 (0.374)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Minimum thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard thickness</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>CL22VB</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>CL9H</td>
<td>2.0 (0.079)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Rotator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard thickness</td>
<td>20.0 (0.787)</td>
</tr>
<tr>
<td>CL22VB</td>
<td>20.0 (0.787)</td>
</tr>
<tr>
<td>CL9H</td>
<td>9.0 (0.354)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Minimum thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard thickness</td>
<td>18.0 (0.709)</td>
</tr>
<tr>
<td>CL22VB</td>
<td>18.0 (0.709)</td>
</tr>
<tr>
<td>CL9H</td>
<td>8.0 (0.316)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Pedal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free height M/T</td>
<td>177 - 187 (6.97 - 7.36)</td>
</tr>
<tr>
<td>A/T</td>
<td>186 - 196 (7.32 - 7.72)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Free play</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3 (0.04 - 0.12)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Depressed height (under force of 490 N (50 kg, 110 lb) with engine running)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 (3.94) or more</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Parking brake Number of notches (at pulling force 196 N (20 kg, 44 lb))</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 - 8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Wheel balance Wheel balance (Maximum allowable unbalance at rim flange)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (0.35)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Tire balance weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 60 (0.18 - 2.12)</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Degree</th>
<th>Camber</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1°30' - 0°</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>Caster</th>
</tr>
</thead>
<tbody>
<tr>
<td>6°00' - 7°30'</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Toe-in</th>
<th>0 - 2 (0.08)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>Toe-out</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5 (0.20)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>Kingpin inclination</th>
</tr>
</thead>
<tbody>
<tr>
<td>12°30' - 14°00'</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>Front wheel turning angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>39° - 43°/33°</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Kingpin inclination</th>
</tr>
</thead>
<tbody>
<tr>
<td>0° - 12'</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Pedal Free height</th>
</tr>
</thead>
<tbody>
<tr>
<td>177 - 187 (6.97 - 7.36)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Pedal Free play</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3 (0.04 - 0.12)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Parking brake Depressed height (under force of 490 N (50 kg, 110 lb) with engine running)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 (3.94) or more</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Parking brake Number of notches (at pulling force 196 N (20 kg, 44 lb))</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 - 8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Wheel bearing Wheel bearing axle and play</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.03 (0.0012) or less</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Wheel bearing lock nut</th>
</tr>
</thead>
<tbody>
<tr>
<td>147 - 216 (15 - 22, 108 - 159)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>235 - 314 (24 - 32, 174 - 231)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millimeter (inches)</th>
<th>Tire balance weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 60 (0.18 - 2.12)</td>
<td></td>
</tr>
</tbody>
</table>

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

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

### Wheel balance

- Maximum allowable unbalance at rim flange: 10 (0.35)

- Tire balance weight: 5 - 60 (0.18 - 2.12) Specifying 5 (0.18)

- Kingpin inclination: 0° - 12'
### Tightening Torque

<table>
<thead>
<tr>
<th>Unit</th>
<th>N·m</th>
<th>kg·m</th>
<th>ft-lb</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clutch</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedal stopper lock nut</td>
<td>16 - 22</td>
<td>1.6 - 2.2</td>
<td>12 - 16</td>
</tr>
<tr>
<td>Clutch switch lock nut</td>
<td>12 - 15</td>
<td>1.2 - 1.5</td>
<td>9 - 11</td>
</tr>
<tr>
<td><strong>Manual transmission</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain and filler plugs</td>
<td>25 - 34</td>
<td>2.5 - 3.5</td>
<td>18 - 25</td>
</tr>
<tr>
<td><strong>Manual transmission</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain plug</td>
<td>59 - 98</td>
<td>6 - 10</td>
<td>43 - 72</td>
</tr>
<tr>
<td>Filler plug</td>
<td>59 - 98</td>
<td>6 - 10</td>
<td>43 - 72</td>
</tr>
<tr>
<td><strong>Front axle and front suspension</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tie-rod lock nut</td>
<td>37 - 46</td>
<td>3.8 - 4.7</td>
<td>27 - 34</td>
</tr>
<tr>
<td>Camber adjusting pin</td>
<td>124 - 143</td>
<td>12.6 - 14.6</td>
<td>91 - 106</td>
</tr>
<tr>
<td><strong>Rear axle and rear suspension</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toe adjusting pin</td>
<td>69 - 88</td>
<td>7.0 - 9.0</td>
<td>51 - 65</td>
</tr>
<tr>
<td>Camber adjusting pin</td>
<td>69 - 88</td>
<td>7.0 - 9.0</td>
<td>51 - 65</td>
</tr>
<tr>
<td><strong>Brake system</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air bleed valve</td>
<td>7 - 9</td>
<td>0.7 - 0.9</td>
<td>5.1 - 6.5</td>
</tr>
<tr>
<td>Brake lamp switch lock nut</td>
<td>12 - 15</td>
<td>1.2 - 1.5</td>
<td>9 - 11</td>
</tr>
<tr>
<td>Brake booster input rod lock nut</td>
<td>16 - 22</td>
<td>1.6 - 2.2</td>
<td>12 - 16</td>
</tr>
<tr>
<td><strong>Wheel and tire</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheel nut</td>
<td>98 - 118</td>
<td>10.0 - 12.0</td>
<td>72 - 87</td>
</tr>
</tbody>
</table>
CONTENTS

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
LIQUID GASKET APPLICATION PROCEDURE

a. Before applying liquid gasket, remove all traces of old liquid gasket from mating surface using a scraper.

b. Apply a continuous bead of liquid gasket to mating surface.
   (Use Genuine Liquid Gasket or equivalent.)

c. 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).

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

e. Wait at least 30 minutes before refilling engine oil and engine coolant.
### SPECIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST0501S000</td>
<td>Disassembling and assembling engine stand assembly</td>
</tr>
<tr>
<td>KV10105001</td>
<td>Engine attachment</td>
</tr>
<tr>
<td>KV10109250</td>
<td>Disassembling and assembling valve components</td>
</tr>
<tr>
<td>KV10980010</td>
<td>Installing valve oil seal</td>
</tr>
<tr>
<td>KV10110300</td>
<td>Disassembling and assembling piston with connecting rod</td>
</tr>
</tbody>
</table>

### Tool number (Kent-Moore No.)

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine stand assembly</td>
<td></td>
</tr>
<tr>
<td>Engine stand (\text{ST05011000})</td>
<td></td>
</tr>
<tr>
<td>Base (\text{ST05012000})</td>
<td></td>
</tr>
<tr>
<td>Valve oil seal drift (\text{KV10109210})</td>
<td></td>
</tr>
<tr>
<td>Compressor (\text{KV10109220})</td>
<td></td>
</tr>
<tr>
<td>Adapter (\text{KV10110310})</td>
<td></td>
</tr>
<tr>
<td>Piston pin press stand assembly</td>
<td></td>
</tr>
<tr>
<td>Cap (\text{KV10110310})</td>
<td></td>
</tr>
<tr>
<td>Spacer (\text{ST13030020})</td>
<td></td>
</tr>
<tr>
<td>Press stand (\text{ST13030030})</td>
<td></td>
</tr>
<tr>
<td>Spring (\text{KV10110340})</td>
<td></td>
</tr>
<tr>
<td>Drift (\text{KV10110320})</td>
<td></td>
</tr>
<tr>
<td>Center shaft</td>
<td></td>
</tr>
<tr>
<td>Tool number</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>EM03470000</td>
<td>Installing piston assembly into cylinder bore</td>
</tr>
<tr>
<td>(J8037)</td>
<td></td>
</tr>
<tr>
<td>Piston ring</td>
<td></td>
</tr>
<tr>
<td>compressor</td>
<td></td>
</tr>
<tr>
<td>(J38467)</td>
<td>Displacement valve oil seal</td>
</tr>
<tr>
<td>Valve oil</td>
<td></td>
</tr>
<tr>
<td>seal remover</td>
<td></td>
</tr>
<tr>
<td>KV10111100</td>
<td>Removing oil pan</td>
</tr>
<tr>
<td>( - )</td>
<td></td>
</tr>
<tr>
<td>Seal cutter</td>
<td></td>
</tr>
<tr>
<td>WS39930000</td>
<td>Pressing the tube of liquid gasket</td>
</tr>
<tr>
<td>( - )</td>
<td></td>
</tr>
<tr>
<td>Tube presser</td>
<td></td>
</tr>
<tr>
<td>ST16610001</td>
<td></td>
</tr>
<tr>
<td>(J23907)</td>
<td></td>
</tr>
<tr>
<td>Pilot bushing</td>
<td></td>
</tr>
<tr>
<td>puller</td>
<td></td>
</tr>
</tbody>
</table>
## COMMERCIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spark plug wrench</td>
<td>Removing and installing spark plug</td>
</tr>
<tr>
<td>Pulley holder</td>
<td>Holding camshaft pulley while tightening or loosening camshaft bolt</td>
</tr>
<tr>
<td>Valve seat cutter set</td>
<td>Finishing valve seat dimensions</td>
</tr>
<tr>
<td>Piston ring expander</td>
<td>Removing and installing piston ring</td>
</tr>
<tr>
<td>Valve guide drift</td>
<td>Removing and installing valve guide</td>
</tr>
<tr>
<td></td>
<td><strong>Diameter:</strong> ( \text{mm (in)} )</td>
</tr>
<tr>
<td></td>
<td>Intake                      Exhaust</td>
</tr>
<tr>
<td></td>
<td>A  10.5 (0.413)           11.5 (0.453)</td>
</tr>
<tr>
<td></td>
<td>B  6.6 (0.260)             7.6 (0.299)</td>
</tr>
<tr>
<td>Valve guide reamer</td>
<td>Rearing valve guide (1) or hole for oversize valve guide (2)</td>
</tr>
<tr>
<td></td>
<td><strong>Diameter:</strong> ( \text{mm (in)} )</td>
</tr>
<tr>
<td></td>
<td>Intake                      Exhaust</td>
</tr>
<tr>
<td></td>
<td>( D_1 ) 7 (0.28)           8 (0.31)</td>
</tr>
<tr>
<td></td>
<td>( D_2 ) 11.2 (0.441)       12.2 (0.480)</td>
</tr>
</tbody>
</table>
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:

\[
\text{kPa (kg/cm}^2, \text{ psi)/rpm}
\]

- 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.
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.

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

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

5. Install oil pan.
   - Wait at least 30 minutes before refilling engine oil.
CAUTION:
- After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.
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.

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
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.
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.
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.
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.
Valve rocker cover

Rocker cover gasket

Valve rocker and shaft assembly

Intake

Spring retainer

Valve guide

Valve seat

Exhaust

Oil seal

Spring seat

Valve seat

Camshaft
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.
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.
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.)
Inspection

CYLINDER HEAD DISTORTION

Head surface flatness:
Less than 0.1 mm (0.004 in)
If beyond the specified limit, replace it or resurface it.

Resurfacing limit:
The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine. Amount of cylinder head resurfacing is "A"
Amount of cylinder block resurfacing is "B"
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:
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.
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)
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.

<table>
<thead>
<tr>
<th>Pressure: N (kg, lb) at height mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
</tr>
<tr>
<td>Outer</td>
</tr>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>604.1 (61.6, 135.8) at 37.6 (1.480)</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
<tr>
<td>640.4 (65.3, 144.0) at 34.1 (1.343)</td>
</tr>
<tr>
<td>Inner</td>
</tr>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>284.4 (29.0, 63.9) at 32.6 (1.283)</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
<tr>
<td>328.5 (33.5, 73.9) at 29.1 (1.146)</td>
</tr>
<tr>
<td>Limit</td>
</tr>
<tr>
<td>Outer</td>
</tr>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>567.8 (57.9, 127.7) at 37.6 (1.480)</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
<tr>
<td>620.8 (63.3, 139.6) at 34.1 (1.343)</td>
</tr>
<tr>
<td>Inner</td>
</tr>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>266.8 (27.2, 60.0) at 32.6 (1.283)</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
<tr>
<td>318.7 (32.5, 71.7) at 29.1 (1.146)</td>
</tr>
</tbody>
</table>

If it exceeds the limit, replace spring.
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.
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.
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).
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.
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.

   ![Diagram of bolts order](SEM646C)

   (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.
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.
Drain plug: 29-39 (3.0-4.0, 22-29)

Crankshaft:
- Snap ring
- Connecting rod
- Connecting rod bearing
- Main bearing cap
- Main bearing

Water pump:
- 7-8 (0.7-0.8, 5.1-5.8)
- 16-21 (1.6-2.1, 12-15)

Oil strainer:
- Oil seal
- Thermostat

Front cover:
- Oil filter
- Oil filter bracket

Cylinder block:
- Gasket
- Rear oil seal retainer
- Rear oil seal

Drive plate reinforcement:
- Drive plate (A/T)
- Rear plate (A/T)

Main bearing cap:
- 46-52 (4.7-5.3, 34-38)

N·m (kg·m, ft·lb):
- Apply liquid gasket.
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)
Inspection (Cont'd)

2. Measure outer diameter of piston pin "Dp".
   **Standard diameter "Dp":**
   20.989 - 21.001 mm (0.8263 - 0.8268 in)
3. Calculate interference fit of piston pin to piston.
   \( dp - Dp = 0 - 0.004 \text{ mm (0 - 0.0002 in)} \)
   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.)
- **Oil ring**: 0.55 - 0.70 mm (0.0217 - 0.0276 in)
  (N is punched on the ring.)
   *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”**
   - The maximum limit is as follows:
     - A + B = 0.2 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)
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.
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.

<table>
<thead>
<tr>
<th>Crankshaft journal grade number</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

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

Connecting rod bearing (Big end)
1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.
   **Tighten bolts to the specified torque.**
3. Measure inner diameter “C” of each bearing.
Inspection (Cont'd)

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

5. Calculate connecting rod bearing clearance.
   \[
   \text{Connecting rod bearing clearance} = C - Dp
   \]
   Standard:
   \[
   0.010 - 0.035 \text{ mm (0.0004 - 0.0014 in)}
   \]
   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:**

<table>
<thead>
<tr>
<th>Crank pin grade number</th>
<th>Connecting rod bearing grade number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Method B (Using plastigauge)

**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.

\[
C - Dp = \\
0.005 - 0.017 \text{ mm (0.0002 - 0.0007 in) (Standard)} \\
0.023 \text{ mm (0.0009 in) (Limit)} 
\]

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:*

\[
0.005 - 0.017 \text{ mm (0.0002 - 0.0007 in)} 
\]

**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.**
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.
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.
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).
## General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine model</td>
<td>KA24E</td>
</tr>
<tr>
<td>Cylinder arrangement</td>
<td>4, in-line</td>
</tr>
<tr>
<td>Displacement cm³ (cu in)</td>
<td>2,389 (145.78)</td>
</tr>
<tr>
<td>Bore x stroke mm (in)</td>
<td>89 x 96 (3.50 x 3.78)</td>
</tr>
<tr>
<td>Valve arrangement</td>
<td>O.H.C.</td>
</tr>
<tr>
<td>Firing order</td>
<td>1-3-4-2</td>
</tr>
<tr>
<td>Number of piston rings</td>
<td></td>
</tr>
<tr>
<td>Compression</td>
<td>2</td>
</tr>
<tr>
<td>Oil</td>
<td>1</td>
</tr>
<tr>
<td>Number of main bearings</td>
<td>5</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>9.1</td>
</tr>
</tbody>
</table>

### Compression Pressure

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Standard</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,324 (13.5, 192)/300</td>
<td>981 (10, 142)/300</td>
</tr>
<tr>
<td>Differential limit between cylinders</td>
<td>98 (1.0, 14)/300</td>
<td></td>
</tr>
</tbody>
</table>
SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment

CYLINDER BLOCK

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
</tr>
<tr>
<td>Distortion</td>
</tr>
</tbody>
</table>

| 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) |

| 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) |

* Wear limit
** Total amount of cylinder head resurfacing and cylinder block resurfacing

---

CYLINDER HEAD

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
</tr>
<tr>
<td>Height (H)</td>
</tr>
</tbody>
</table>

| Surface distortion | 0.03 (0.0012) |

* Total amount of cylinder head resurfacing and cylinder block resurfacing
## Inspection and Adjustment (Cont'd)

### VALVE GUIDE

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Service</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intake</td>
<td>Exhaust</td>
<td>Intake</td>
</tr>
<tr>
<td><strong>Length (L)</strong></td>
<td>52.6 (2.071)</td>
<td>56.0 (2.206)</td>
<td>52.6 (2.071)</td>
</tr>
<tr>
<td></td>
<td>(0.4340 - 0.4344)</td>
<td>(0.4733 - 0.4738)</td>
<td>(0.4418 - 0.4423)</td>
</tr>
<tr>
<td><strong>Inner diameter (d)</strong></td>
<td>7.000 - 7.018</td>
<td>8.000 - 8.018</td>
<td>7.000 - 7.018</td>
</tr>
<tr>
<td>(Finished size)</td>
<td>(0.2756 - 0.2763)</td>
<td>(0.3150 - 0.3157)</td>
<td>(0.2756 - 0.2763)</td>
</tr>
<tr>
<td><strong>Cylinder head hole diameter</strong></td>
<td>10.975 - 10.996</td>
<td>11.975 - 11.996</td>
<td>11.175 - 11.196</td>
</tr>
<tr>
<td></td>
<td>(0.4321 - 0.4329)</td>
<td>(0.4715 - 0.4723)</td>
<td>(0.4400 - 0.4408)</td>
</tr>
<tr>
<td><strong>Interference fit</strong></td>
<td></td>
<td>0.027 - 0.056</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0011 - 0.0023)</td>
<td></td>
</tr>
<tr>
<td><strong>Stem to guide clearance</strong></td>
<td>0.020 - 0.053</td>
<td>0.040 - 0.070</td>
<td>0.020 - 0.053</td>
</tr>
<tr>
<td></td>
<td>(0.0008 - 0.0021)</td>
<td>(0.0016 - 0.0028)</td>
<td>(0.0008 - 0.0029)</td>
</tr>
<tr>
<td><strong>Tapping length (l)</strong></td>
<td></td>
<td>14.9 - 15.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.587 - 0.594)</td>
<td></td>
</tr>
</tbody>
</table>

**Unit:** mm (in)
### Standard Service

<table>
<thead>
<tr>
<th></th>
<th>Intake</th>
<th>Exhaust</th>
<th>Intake</th>
<th>Exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder head seat recess diameter</td>
<td>36.000 - 36.016 (1.4170 - 1.4179)</td>
<td>42.000 - 42.016 (1.6535 - 1.6542)</td>
<td>36.500 - 36.516 (1.4370 - 1.4376)</td>
<td>42.500 - 42.516 (1.6732 - 1.6739)</td>
</tr>
<tr>
<td>Valve seat outer diameter ($D_1$)</td>
<td>36.080 - 36.096 (1.4205 - 1.4211)</td>
<td>42.080 - 42.096 (1.6567 - 1.6573)</td>
<td>36.580 - 36.596 (1.4402 - 1.4408)</td>
<td>42.580 - 42.596 (1.6764 - 1.6770)</td>
</tr>
<tr>
<td>Face angle ($\alpha$)</td>
<td>45°</td>
<td>45°</td>
<td>45°</td>
<td>45°</td>
</tr>
<tr>
<td>Contacting width ($W$)</td>
<td>1.6 - 1.7 (0.063 - 0.067)</td>
<td>1.7 - 2.1 (0.067 - 0.083)</td>
<td>1.6 - 1.7 (0.063 - 0.067)</td>
<td>1.7 - 2.1 (0.067 - 0.083)</td>
</tr>
</tbody>
</table>

### Service

Unit: mm (in)
VALVE

T (Margin thickness)

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In.</td>
<td></td>
</tr>
<tr>
<td>Valve head diameter (D)</td>
<td>34.0 - 34.2</td>
<td>(1.339 - 1.346)</td>
</tr>
<tr>
<td></td>
<td>Ex.</td>
<td>40.0 - 40.2</td>
</tr>
<tr>
<td>Valve length (L)</td>
<td>In.</td>
<td>119.9 - 120.2</td>
</tr>
<tr>
<td></td>
<td>Ex.</td>
<td>120.67 - 120.97</td>
</tr>
<tr>
<td>Valve stem diameter (d)</td>
<td>In.</td>
<td>6.965 - 6.980</td>
</tr>
<tr>
<td></td>
<td>Ex.</td>
<td>7.948 - 7.960</td>
</tr>
<tr>
<td>Valve face angle (α)</td>
<td>In.</td>
<td>45°30'</td>
</tr>
<tr>
<td></td>
<td>Ex.</td>
<td>45°30'</td>
</tr>
<tr>
<td>Valve head margin (T)</td>
<td>In.</td>
<td>1.15 - 1.45</td>
</tr>
<tr>
<td></td>
<td>Ex.</td>
<td>1.35 - 1.65</td>
</tr>
</tbody>
</table>

Unit: mm (in)

VALVE SPRING

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intake</td>
<td>Exhaust</td>
</tr>
<tr>
<td>Free height (H)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer</td>
<td>57.44 (2.2614)</td>
<td>53.21 (2.0949)</td>
</tr>
<tr>
<td>Inner</td>
<td>53.34 (2.1000)</td>
<td>47.95 (1.8878)</td>
</tr>
<tr>
<td>Pressure N (kg, lb)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at height</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer</td>
<td>604.1 (61.6, 136.8)</td>
<td>640.4 (65.3, 144.0)</td>
</tr>
<tr>
<td></td>
<td>at 37.6 (1.480)</td>
<td>at 34.1 (1.343)</td>
</tr>
<tr>
<td>Inner</td>
<td>284.4 (29.0, 63.9)</td>
<td>328.5 (33.5, 73.9)</td>
</tr>
<tr>
<td></td>
<td>at 32.6 (1.283)</td>
<td>at 29.1 (1.146)</td>
</tr>
<tr>
<td>Out-of-square</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer</td>
<td>2.5 (0.098)</td>
<td>2.3 (0.091)</td>
</tr>
<tr>
<td>Inner</td>
<td>2.3 (0.091)</td>
<td>2.1 (0.083)</td>
</tr>
</tbody>
</table>

Unit: mm (in)
CAMSHAFT AND CAMSHAFT BEARING

### Inspection and Adjustment (Cont'd)

#### Camshaft and Camshaft Bearing

<table>
<thead>
<tr>
<th>Specification</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cam height (A)</td>
<td>44.839 - 45.029 (1.7653 - 1.7728)</td>
<td></td>
</tr>
<tr>
<td>Valve lift (h)</td>
<td>10.4 (0.409)</td>
<td></td>
</tr>
<tr>
<td>Wear limit of cam height</td>
<td></td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td>Camshaft journal to bearing clearance</td>
<td>0.045 - 0.090 (0.0018 - 0.0035)</td>
<td>0.12 (0.0047)</td>
</tr>
<tr>
<td>Inner diameter of camshaft bearing</td>
<td>33.000 - 33.025 (1.2992 - 1.3002)</td>
<td></td>
</tr>
<tr>
<td>Outer diameter of camshaft journal (D)</td>
<td>32.935 - 32.955 (1.2967 - 1.2974)</td>
<td></td>
</tr>
<tr>
<td>Camshaft runout</td>
<td>0 - 0.02 (0 - 0.0008)</td>
<td></td>
</tr>
<tr>
<td>Camshaft end play</td>
<td>0.07 - 0.15 (0.0028 - 0.0058)</td>
<td>0.2 (0.008)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Character</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>248</td>
</tr>
<tr>
<td>b</td>
<td>240</td>
</tr>
<tr>
<td>c</td>
<td>3</td>
</tr>
<tr>
<td>d</td>
<td>57</td>
</tr>
<tr>
<td>e</td>
<td>12</td>
</tr>
<tr>
<td>f</td>
<td>56</td>
</tr>
</tbody>
</table>

#### Valve Timing (Degree on Crankshaft)

- a: 248
- b: 240
- c: 3
- d: 57
- e: 12
- f: 56

### Rocker Arm and Rocker Shaft

<table>
<thead>
<tr>
<th>Specification</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocker arm to shaft clearance</td>
<td>0.012 - 0.050 (0.0005 - 0.0020)</td>
<td></td>
</tr>
<tr>
<td>Rocker shaft diameter</td>
<td>21.979 - 22.000 (0.8653 - 0.8661)</td>
<td></td>
</tr>
<tr>
<td>Rocker arm rocker shaft hole diameter</td>
<td>22.012 - 22.029 (0.8666 - 0.8673)</td>
<td></td>
</tr>
</tbody>
</table>
PISTON, PISTON RING AND PISTON PIN

Piston

PISTON, PISTON RING AND PISTON PIN

Piston

**Piston ring**

<table>
<thead>
<tr>
<th>Component</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>0.040 - 0.080 (0.0016 - 0.0031)</td>
<td>0.1 (0.004)</td>
</tr>
<tr>
<td>2nd</td>
<td>0.030 - 0.070 (0.0012 - 0.0028)</td>
<td>0.1 (0.004)</td>
</tr>
<tr>
<td>Oil</td>
<td>0.085 - 0.135 (0.0033 - 0.0053)</td>
<td>0.1 (0.004)</td>
</tr>
<tr>
<td>Top</td>
<td>0.28 - 0.43 (0.0110 - 0.0169)</td>
<td>0.5 (0.020)</td>
</tr>
<tr>
<td>Ring gap</td>
<td>Top</td>
<td>0.45 - 0.60 (0.0177 - 0.0236)</td>
</tr>
<tr>
<td>Oil</td>
<td>0.20 - 0.60 (0.0079 - 0.0236)</td>
<td>0.5 (0.020)</td>
</tr>
</tbody>
</table>

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

**CONNECTING ROD**

**Piston pin**

<table>
<thead>
<tr>
<th>Component</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston pin outer diameter</td>
<td>20.989 - 21.001 (0.8263 - 0.8267)</td>
<td></td>
</tr>
<tr>
<td>Interference fit of piston pin to piston pin hole</td>
<td>0.0 - 0.004 (0 - 0.002)</td>
<td></td>
</tr>
<tr>
<td>Piston pin to connecting rod bearing clearance</td>
<td>0.005 - 0.017 (0.0002 - 0.0007)</td>
<td>0.023 (0.0009)</td>
</tr>
</tbody>
</table>

**SEM444C**

<table>
<thead>
<tr>
<th>Grade No. 1</th>
<th>Grade No. 2</th>
<th>Grade No. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>88.970 - 88.980 (3.5027 - 3.5031)</td>
<td>88.980 - 88.990 (3.5031 - 3.5036)</td>
<td>88.990 - 88.000 (3.5036 - 3.5039)</td>
</tr>
<tr>
<td>89.470 - 89.500 (3.5224 - 3.5236)</td>
<td>89.970 - 90.000 (3.5421 - 3.5433)</td>
<td></td>
</tr>
</tbody>
</table>

**SEM570A**

<table>
<thead>
<tr>
<th>Component</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center distance (S)</td>
<td>164.96 - 165.05 (6.4941 - 6.4980)</td>
<td></td>
</tr>
<tr>
<td>Bend [per 100 mm (3.94 in)]</td>
<td></td>
<td>0.16 (0.0069)</td>
</tr>
<tr>
<td>Torsion [per 100 mm (3.94 in)]</td>
<td></td>
<td>0.3 (0.012)</td>
</tr>
<tr>
<td>Piston pin bushing inner diameter (d)*</td>
<td>21.000 - 21.012 (0.8268 - 0.8272)</td>
<td></td>
</tr>
<tr>
<td>Connecting rod big end inner diameter (D)*</td>
<td>53.000 - 53.013 (2.0866 - 2.0871)</td>
<td></td>
</tr>
<tr>
<td>Side clearance</td>
<td>0.2 - 0.4 (0.008 - 0.016)</td>
<td>0.6 (0.024)</td>
</tr>
</tbody>
</table>

* Without bearing
CRANKSHAFT

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

Inspection and Adjustment (Cont’d)

CRANKSHAFT

Out-of-round @ Ci

Taper @ .@ @ @ .

EM715

SEM384

Main journal diameter (Dm)   |
Grade      |  No. 0  |  No. 1  |  No. 2  |
---        |        |        |        |
          |        | 59.967 - 59.975 (2.3609 - 2.3612) | 59.969 - 59.976 (2.3606 - 2.3609) |
          |        |        | 59.951 - 59.959 (2.3603 - 2.3606) |
Pin journal diameter (Dp)    |
Grade      |  No. 0  |  No. 1  |  No. 2  |
---        |        |        |        |
          |        | 49.968 - 49.974 (1.9672 - 1.9675) | 49.962 - 49.968 (1.9670 - 1.9672) |
          |        |        | 49.956 - 49.962 (1.9668 - 1.9670) |
Center distance (r)          |
              | 47.97 - 48.03 (1.8886 - 1.8909) |

Standard Limit

Journal - 0.01 (0.0004)  
Pin - 0.005 (0.0002)  
Taper of journal and pin (A - B)  
Out-of-round of journal and pin (X - Y)  
Runout [T.I.R.]  
Free end play 0.05 - 0.18 (0.0020 - 0.0071)  0.3 (0.012)  
Fillet roll More than 0.1 (0.004)  

* Total indicator reading

BEARING CLEARANCE

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)  

Unit: mm (in)
### AVAILABLE MAIN BEARING

<table>
<thead>
<tr>
<th>Grade number</th>
<th>Thickness (mm (in))</th>
<th>Identification color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.821 - 1.825 (0.0717 - 0.0719)</td>
<td>Black</td>
</tr>
<tr>
<td>1</td>
<td>1.825 - 1.829 (0.0719 - 0.0720)</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>1.829 - 1.833 (0.0720 - 0.0722)</td>
<td>Green</td>
</tr>
<tr>
<td>3</td>
<td>1.833 - 1.837 (0.0722 - 0.0723)</td>
<td>Yellow</td>
</tr>
<tr>
<td>4</td>
<td>1.837 - 1.841 (0.0723 - 0.0725)</td>
<td>Blue</td>
</tr>
</tbody>
</table>

### AVAILABLE CONNECTING ROD BEARING

<table>
<thead>
<tr>
<th>Grade number</th>
<th>Thickness (mm (in))</th>
<th>Identification color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.25 (0.0098)</td>
<td></td>
</tr>
</tbody>
</table>

### Undersize (service)

<table>
<thead>
<tr>
<th>Thickness (mm (in))</th>
<th>Main journal diameter &quot;Dm&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.08 (0.0031)</td>
<td>Grind so that bearing clearance is the specified value.</td>
</tr>
<tr>
<td>0.12 (0.0047)</td>
<td>Grind so that bearing clearance is the specified value.</td>
</tr>
<tr>
<td>0.25 (0.0098)</td>
<td>Grind so that bearing clearance is the specified value.</td>
</tr>
</tbody>
</table>

### MISCELLANEOUS COMPONENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camshaft sprocket runout</td>
<td>Less than 0.12 (0.0047)</td>
</tr>
<tr>
<td>Flywheel runout</td>
<td>Less than 0.1 (0.004)</td>
</tr>
<tr>
<td>Drive plate runout</td>
<td>Less than 0.1 (0.004)</td>
</tr>
</tbody>
</table>

* Total indicator reading
ENGINE LUBRICATION & COOLING SYSTEMS

SECTION 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
<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST25051001 (J25695-1)</td>
<td>Oil pressure gauge</td>
<td>Adapting oil pressure gauge to cylinder block</td>
</tr>
<tr>
<td>ST25052000 (J25695-2)</td>
<td>Hose</td>
<td></td>
</tr>
<tr>
<td>EG17650301 ( - )</td>
<td>Radiator cap tester adapter</td>
<td>Adapting radiator cap tester to radiator filler neck</td>
</tr>
</tbody>
</table>
Oil Pressure Check

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

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

<table>
<thead>
<tr>
<th>Engine rpm</th>
<th>Approximate discharge pressure kPa (kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle speed</td>
<td>More than 78 (0.8, 11)</td>
</tr>
<tr>
<td>3,000</td>
<td>412 - 481 (4.2 - 4.9, 60 - 70)</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th></th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor tip clearance (1)</td>
<td>Less than 0.12 (0.0047)</td>
</tr>
<tr>
<td>Outer rotor to body clearance (2)</td>
<td>0.15 - 0.21 (0.0059 - 0.0083)</td>
</tr>
<tr>
<td>Side clearance (with gasket) (3)</td>
<td>0.04 - 0.08 (0.0016 - 0.0031)</td>
</tr>
</tbody>
</table>

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

Cooling Circuit

Thermostat: Open
Thermostat: Closed

Throttle chamber → Intake manifold → Cylinder head → Cylinder block → Water pump → Thermostat housing (Front cover) → Water outlet → Radiator

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.
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.
**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.

<table>
<thead>
<tr>
<th>Valve opening temperature °C (°F)</th>
<th>76.5 (170)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. valve lift mm°C (in°F)</td>
<td>8/90 (0.31/194)</td>
</tr>
</tbody>
</table>

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.
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
CONEXENDER FAN MOTOR ELECTRICAL CIRCUIT

Wiring Diagram

IGNITION SWITCH
ACC or ON

BATTERY (Via fusible link-Green)

CONNECTOR-I

(Engine room harness)

CONNECTOR-II

(Engine harness)

CONNECTOR-I

(Main harness)

FUSE BLOCK
(Refer to "POWER SUPPLY ROUTING" in EL section.)

IGNITION SWITCH
ON or START

To thermo control amp.

E. F. I. harness

E. C. C. S. CONTROL UNIT
(Refer to EF&EC section.)

SLC191A

SLC237A

SLC238A

LC-13
Even though air conditioner operates normally under high engine temperature conditions [above 98°C (208°F)] the condenser fan motor does not rotate.

**Trouble Diagnosis**

**A**

**CHECK POWER SUPPLY** (Motor side).
1) Disconnect condenser fan motor harness connector-II.
2) Turn ignition switch, air conditioner switch and blower switch “ON”.
3) Check voltage between fan motor harness connector-II terminal @ and ground.
   *Continuity should exist. Battery voltage should exist.*

**B**

**CHECK CONDENSER FAN MOTOR.**
1) Turn ignition and air conditioner switch “OFF”.
2) Disconnect condenser fan motor harness connector-I.
3) Check continuity between connector-II terminal @ and connector-I terminal @.
   *Continuity should exist. If N.G. replace condenser fan motor.*

**C**

**CHECK GROUND CIRCUIT.**
Check harness continuity between motor harness connector-I terminal @ and ground.
   *Continuity should exist. If N.G., repair harness.*

**D**

**CHECK THERMOSWITCH.**
Check continuity between thermoswitch terminals @ and @.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 92 - 98°C (198 - 208°F)</td>
<td>Yes</td>
</tr>
<tr>
<td>Below 92 - 98°C (198 - 208°F)</td>
<td>No</td>
</tr>
</tbody>
</table>

**E**

**CHECK THERMOSWITCH.**
Check sub-harness for thermoswitch continuity. If N.G., repair or replace them.

**F**

**CHECK POWER SUPPLY** (Relay side).
1) Turn ignition “OFF”.
2) Disconnect air conditioner relay.
3) Turn ignition “ON”.
4) Check voltage between terminals @, @ and @.
   *Battery voltage should exist.*

**G**

**CHECK RELAY.**
Refer to HA section.

**H**

Check the followings:
- Harness continuity between terminal @ and battery terminal.
- “G” fusible link.
- If N.G. replace them.

**I**

Check the followings:
- Harness continuity between terminal @ and battery terminal.
- Fuse.
- Ignition switch.
Trouble Diagnosis (Cont'd)

CHECK HARNESS CONTINUITY,
1) Turn ignition switch "OFF".
2) Check continuity between relay harness connector terminal ④ and fan motor harness connector-I terminal ④.
Continuity should exist.

Repair or replace harness or connectors between terminals ④ and (④).
# Service Data and Specifications (S.D.S.)

## Engine Lubrication System

### Oil Pressure Check

<table>
<thead>
<tr>
<th>Engine rpm</th>
<th>Approximate discharge pressure kPa (kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle speed</td>
<td>More than 78 (0.8, 11)</td>
</tr>
<tr>
<td>3,000</td>
<td>412 - 481 (4.2 - 4.9, 60 - 70)</td>
</tr>
</tbody>
</table>

### Oil Pump

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor tip clearance</td>
</tr>
<tr>
<td>Outer rotor to body clearance</td>
</tr>
<tr>
<td>Side clearance (with gasket)</td>
</tr>
</tbody>
</table>

## Engine Cooling System

### Thermostat

<table>
<thead>
<tr>
<th>Valve opening temperature °C (°F)</th>
<th>76.5 (170)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. valve lift mm/°C (in/°F)</td>
<td>8/90 (0.31/194)</td>
</tr>
</tbody>
</table>

### Radiator

<table>
<thead>
<tr>
<th>Unit: kPa (kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cap relief pressure</td>
</tr>
<tr>
<td>Leakage test pressure</td>
</tr>
</tbody>
</table>
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 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".

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

## SPECIAL SERVICE TOOL

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG11160000 ( - )</td>
<td>Ignition coil adapter harness</td>
<td>Measuring engine speed</td>
</tr>
</tbody>
</table>
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.

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.

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.

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

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

FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines.
- 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.

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.
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

E.C.C.S. Component Parts Location

- E.C.C.S. relay
- Fuel pump relay

Fuel pump

Exhaust gas temperature sensor (For California model)

I.A.A. unit

Fuel filter

Throttle sensor/Throttle valve switch

Throttle chamber

E.G.R. control valve

Pressure regulator

S.C.V. control solenoid valve

Air regulator

A.I.V. case

A.I.V. control solenoid valve

Ignition coil and power transistor

Air flow meter

Engine temperature sensor

Injector

Crank angle sensor

Exhaust gas sensor

Distributor

E.G.R. control solenoid valve

SEF122H

EF & EC-4
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

E.C.C.S. CONTROL SYSTEM

Crank angle sensor
Air flow meter
Engine temperature sensor
Exhaust gas sensor
Ignition switch
Starter switch
Idle switch
Throttle sensor
Air conditioner switch
Neutral switch (M/T)
Inhibitor switch (A/T)
Vehicle speed sensor
Power steering oil pressure switch
Battery
Exhaust gas temperature sensor (For California model)

System Chart

Fuel injection & mixture ratio control
Ignition timing control
Idle speed control
A.I.V. control
E.G.R. control & Canister control
Fuel pump control
Air regulator control
Acceleration cut control
S.C.V. (Swirl control valve) control
Exhaust gas sensor monitor & self-diagnosis
Pressure regulator control

Fail-safe function

- Air flow meter
- Throttle sensor
- Engine temperature sensor

EF & EC-6
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 (Rw) so that VA always equals VB. The air flow meter transmits a voltage value VA 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 submersible 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.
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION

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 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**

- Crank angle sensor
  - Engine speed and piston position
- Air flow meter
  - Amount of intake air
- Engine temperature sensor
  - Engine temperature
- Exhaust gas sensor
  - Density of oxygen in exhaust gas
- Throttle sensor
  - Throttle valve position
- Idle switch
  - Throttle valve idle position
- Neutral switch (M/T)
- Inhibitor switch (A/T)
  - Gear position
- Vehicle speed sensor
  - Vehicle speed
- Ignition switch
  - Start signal
- Battery
  - Battery voltage

**E.C.C.S. control unit**

**Injectors**

---

**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

---

**EF & EC-16**
Fuel Injection Control (Cont’d)

MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NOx emissions. This system uses an exhaust gas sensor in the exhaust manifold to check the air-fuel ratio. The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

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

1) Deceleration
2) High-load, high-speed operation
3) Engine idling
4) 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**

- Crank angle sensor
- Air flow meter
- Engine temperature sensor
- Idle switch
- Throttle sensor
- Neutral switch (M/T)
- Inhibitor switch (A/T)
- Ignition switch

- Engine speed and piston position
- Amount of intake air
- Engine temperature
- Throttle valve idle position
- Throttle valve opening angle
- Neutral position
- Start signal

---

- E.C.C.S. control unit
- Power transistor
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.

\[ \text{e.g. } N: 1,800 \text{ rpm, } Tp: 1.50 \text{ msec} \]

A \textdegree\ B.T.D.C.

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

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

---

MyDiag1.png

---

EF & EC-19
**ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION**

**Idle Speed Control**

**INPUT/OUTPUT SIGNAL LINE**

- Crank angle sensor → Engine speed
- Engine temperature sensor → Engine temperature
- Ignition switch → Start signal
- Idle switch → Throttle valve idle position
- Neutral switch (M/T) → Neutral position
- Inhibitor switch (A/T) → Air conditioner operation
- Air conditioner switch → E.C.C.S. control unit
- Power steering oil pressure switch → Battery voltage
- Battery → Vehicle speed
- Vehicle speed sensor → E.C.C.S. control unit

**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.

EF & EC-20
Fuel Pump Control

**INPUT/OUTPUT SIGNAL LINE**

- Crank angle sensor → Engine speed → E.C.C.S. control unit → Fuel pump relay
- Ignition switch → Start signal

**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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Fuel pump operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition switch is turned to ON.</td>
<td>Operates for 5 seconds</td>
</tr>
<tr>
<td>Engine running and cranking</td>
<td>Operates</td>
</tr>
<tr>
<td>When engine is stopped</td>
<td>Stops in 1 second</td>
</tr>
<tr>
<td>Except as shown above</td>
<td>Stops</td>
</tr>
</tbody>
</table>

Air Regulator Control

**INPUT/OUTPUT SIGNAL LINE**

- Crank angle sensor → Engine speed → E.C.C.S. control unit → Air regulator
- Ignition switch → Start signal

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

<table>
<thead>
<tr>
<th>Condition</th>
<th>Air regulator operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition switch is turned to ON</td>
<td>Operates for 5 seconds</td>
</tr>
<tr>
<td>While engine is running and cranking</td>
<td>Operates</td>
</tr>
<tr>
<td>When engine is stopped</td>
<td>OFF in 1 second</td>
</tr>
<tr>
<td>Except as shown above</td>
<td>OFF</td>
</tr>
</tbody>
</table>
**Air Induction Valve (A.I.V.) Control**

**INPUT/OUTPUT SIGNAL LINE**

- Engine temperature sensor
- Idle switch
- Crank angle sensor
- Vehicle speed sensor

**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.

<table>
<thead>
<tr>
<th>Engine condition</th>
<th>Water temperature °C (°F)</th>
<th>A.I.V. control solenoid valve</th>
<th>A.I.V. control system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle or deceleration</td>
<td>Between 28 (82) and 115 (239)</td>
<td>ON</td>
<td>Operates</td>
</tr>
</tbody>
</table>

**Diagram:**

- Engine temperature
- Throttle valve idle position
- Engine speed
- Vehicle speed

**Chart:**

- E.C.C.S. control unit
- A.I.V. control solenoid valve

**Table:**

- Engine condition
- Water temperature
- A.I.V. control solenoid valve
- A.I.V. control system
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

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

**INPUT/OUTPUT SIGNAL LINE**

- Crank angle sensor
- Air flow meter
- Engine temperature sensor
- Ignition switch
- Engine speed
- Amount of intake air
- Engine temperature
- Start signal
- E.C.C.S. control unit
- E.G.R. control solenoid valve

**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.

1. Low engine temperature
2. Engine starting
3. High-speed engine operation
4. Engine idling

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

<table>
<thead>
<tr>
<th>Condition</th>
<th>E.G.R. control solenoid valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>When starting</td>
<td></td>
</tr>
<tr>
<td>Water temperature °C (°F)</td>
<td>Below 60 (140)</td>
</tr>
<tr>
<td></td>
<td>Above 105 (221)</td>
</tr>
<tr>
<td>Idle &amp; heavy load conditions</td>
<td>OFF</td>
</tr>
<tr>
<td>Other conditions</td>
<td>OFF</td>
</tr>
</tbody>
</table>

**E.G.R. system operation**

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

<table>
<thead>
<tr>
<th>Water temperature °C (°F)</th>
<th>B.P.T. valve</th>
<th>Throttle position</th>
<th>E.G.R. control solenoid valve</th>
<th>E.G.R. system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 60 (140) Below 105 (221)</td>
<td>High</td>
<td>Closed</td>
<td>Partially open</td>
<td>OFF</td>
</tr>
</tbody>
</table>
**Fuel Pressure Regulator Control**

**INPUT/OUTPUT SIGNAL LINE**
- Engine temperature sensor: Engine temperature
- Ignition switch: Start signal
- Crank angle sensor: Engine speed

**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**
- Idle switch: Idle signal
- Ignition switch: Start signal
- Crank angle sensor: Engine speed
- Engine temperature sensor: Engine temperature

**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.

<table>
<thead>
<tr>
<th>Idle switch</th>
<th>Water temperature</th>
<th>Engine rpm</th>
<th>Solenoid valve</th>
<th>S.C.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Above 35°C (95°F)</td>
<td>Below 1,400</td>
<td>ON</td>
<td>Close</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OFF</td>
<td>Open</td>
</tr>
</tbody>
</table>

*Except above*
Acceleration Cut Control

**INPUT/OUTPUT SIGNAL LINE**

<table>
<thead>
<tr>
<th>Air conditioner system</th>
<th>A/C ON signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throttle sensor</td>
<td>Throttle valve opening angle</td>
</tr>
</tbody>
</table>

**E.C.C.S. control unit**

| Air conditioner relay |

**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.

**Opertation**

<table>
<thead>
<tr>
<th>System</th>
<th>Fixed condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.G.R. control system</td>
<td>OFF</td>
</tr>
<tr>
<td>Idle speed control system</td>
<td>A duty ratio is fixed at the preprogrammed value.</td>
</tr>
<tr>
<td>Fuel injection control system</td>
<td>Fuel is shut off above 2,400 rpm. (Engine speed does not exceed 2,400 rpm.)</td>
</tr>
</tbody>
</table>

**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:

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

**THROTTLE SENSOR MALFUNCTION**

When throttle sensor output voltage is below or above the specified value, throttle sensor output is fixed at the preset value.
PREPARATION
1. Make sure that the following parts are in good order.
   • Battery
   • Ignition system
   • Engine oil and coolant levels
   • Fuses
   • E.C.U. harness connector
   • Vacuum hoses
   • Air intake system
     (Oil filler cap, oil level gauge, etc.)
   • Fuel pressure
   • 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

---

EF & EC-26
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

INSPECTION START

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

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

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

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

O.K. →
Check, correct or replace malfunctioning parts.

N.G. →
Check, correct or replace malfunctioning parts.

Does engine run smoothly?

Yes →
Check and clean injectors, and replace injectors if necessary.

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

Check idle speed.

M/T: 750±50 rpm
A/T: 750±50 rpm (in "N" position)

Check ignition timing with a timing light.

15°±2° B.T.D.C.

Disconnect throttle sensor harness connector.

Ensure that engine speed is below 800 rpm.

Adjust idle speed to less than 800 rpm by turning idle speed adjusting screw.

EF & EC-27
Check ignition timing with a timing light.

15°±2° B.T.D.C.

O.K. N.G.

Adjust ignition timing by turning distributor after loosening bolt which secures distributor.

15°±2° B.T.D.C.

Adjust idle speed by turning idle speed adjusting screw.

M/T: 700±50 rpm
A/T: 700±50 rpm (in "N" position)

Connect throttle sensor harness connector.

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

Make sure that inspection lamp (Green) on E.C.U. goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm under no-load.

Set the diagnosis mode of E.C.U. to mode II.
Check inspection lamps (Red and Green) on E.C.U. blink at 2,000 rpm. They should blink simultaneously.

INSPECTION END
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.

<table>
<thead>
<tr>
<th>Continuity exists</th>
<th>O.K.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuity does not exist</td>
<td>N.G.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Idle CO:</th>
<th>Less than 5%</th>
</tr>
</thead>
</table>

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.
Connect exhaust gas sensor harness to exhaust gas sensor.

Replace exhaust gas sensor.

Run engine at 2,000 rpm and make sure that green inspection lamp on E.C.U. goes ON and OFF more than 5 times during 10 seconds.

Check fuel pressure regulator.  
(See page EF & EC-124.)

Check air flow meter.  
(See page EF & EC-88.)

Check injector.  
(See page EF & EC-126.)  
Clean or replace if necessary.

Check engine temperature sensor.  
(See page EF & EC-90.)
Trouble Diagnoses

Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair ........................................ EF & EC- 33
Diagnostic Table .......................................................................................................................... EF & EC- 37
  1. Impossible to start — no combustion ......................................................................................... EF & EC- 38
  2. Impossible to start — partial combustion .................................................................................. EF & EC- 39
  3. Impossible to start — partial combustion (not affected by throttle position) ......................... EF & EC- 40
  4. Impossible to start — partial combustion (throttle position changes combustion quantity) .................................................................................................................. EF & EC- 41
  5. Hard to start — before warm-up ............................................................................................... EF & EC- 42
  6. Hard to start — after warm-up .................................................................................................. EF & EC- 43
  7. Hard to start — every time ......................................................................................................... EF & EC- 44
  8. Hard to start — morning after a rainy day ................................................................................ EF & EC- 45
  9. Abnormal idling — no fast idle .................................................................................................. EF & EC- 46
 10. Abnormal idling — low idle (after warm-up) ........................................................................... EF & EC- 47
 11. Abnormal idling — high idle (after warm-up) ........................................................................ EF & EC- 48
 12. Unstable idling — before warm-up ............................................................................................ EF & EC- 49
 13. Unstable idling — after warm-up ............................................................................................... EF & EC- 50
 14. Poor driveability — stumble (while accelerating) .................................................................... EF & EC- 51
 15. Poor driveability — surge (while cruising) ............................................................................... EF & EC- 52
 16. Poor driveability — lack of power ............................................................................................. EF & EC- 53
 17. Poor driveability — detonation .................................................................................................. EF & EC- 54
 18. Engine stall — during start-up .................................................................................................. EF & EC- 55
 19. Engine stall — while idling ......................................................................................................... EF & EC- 56
 20. Engine stall — while accelerating .............................................................................................. EF & EC- 57
 21. Engine stall — while cruising .................................................................................................... EF & EC- 58
 22. Engine stall — while decelerating/just after stopping ............................................................... EF & EC- 59
 23. Engine stall — while loading (power steering, air conditioner, headlamps, etc.) .................... EF & EC- 60
 24. Backfire — through the intake ................................................................................................ EF & EC- 61
 25. Backfire — through the exhaust ............................................................................................... EF & EC- 62
Self-diagnosis — Description ........................................................................................................ EF & EC- 63
Self-diagnosis — Mode I (Exhaust gas sensor monitor) .............................................................. EF & EC- 67
Self-diagnosis — Mode II (Mixture ratio feedback control monitor) ........................................ EF & EC- 67
Self-diagnosis — Mode III (Self-diagnostic system) .................................................................. EF & EC- 68
Self-diagnosis — Mode IV (Switches ON/OFF diagnostic system) ........................................ EF & EC- 74
Self-diagnosis — Mode V (Real-time diagnostic system) .......................................................... EF & EC- 76
Diagnostic Procedure .................................................................................................................. EF & EC- 82
Diagnostic Procedure 1
  MAIN POWER SUPPLY AND GROUND CIRCUIT ................................................................... EF & EC- 84
Self-diagnostic item
Diagnostic Procedure 2
  CRANK ANGLE SENSOR ........................................................................................................ EF & EC- 86
Diagnostic Procedure 3
  AIR FLOW METER .................................................................................................................. EF & EC- 88
Diagnostic Procedure 4
  ENGINE TEMPERATURE SENSOR .......................................................................................... EF & EC- 90
Diagnostic Procedure 5
  VEHICLE SPEED SENSOR .................................................................................................... EF & EC- 92
Diagnostic Procedure 6
  IGNITION SIGNAL ................................................................................................................. EF & EC- 94
Diagnostic Procedure 7
  ENGINE CONTROL UNIT ........................................................................................................ EF & EC- 98
Diagnostic Procedure 8
  E.G.R. FUNCTION ................................................................................................................... EF & EC-100
Diagnostic Procedure 9
  EXHAUST GAS SENSOR ........................................................................................................ EF & EC-104
Diagnostic Procedure 10
  EXHAUST GAS TEMPERATURE SENSOR ............................................................................. EF & EC-106
## TROUBLE DIAGNOSES
### Contents (Cont'd)

<table>
<thead>
<tr>
<th>Diagnostic Procedure 11</th>
<th>THROTTLE SENSOR</th>
<th>EF &amp; EC-110</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic Procedure 12</td>
<td>INJECTOR LEAK</td>
<td>EF &amp; EC-114</td>
</tr>
<tr>
<td><strong>Switch ON/OFF diagnostic item</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 13</td>
<td>IDLE SWITCH</td>
<td>EF &amp; EC-116</td>
</tr>
<tr>
<td>Diagnostic Procedure 14</td>
<td>START SWITCH</td>
<td>EF &amp; EC-118</td>
</tr>
<tr>
<td><strong>Not self-diagnostic item</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 15</td>
<td>FUEL PUMP</td>
<td>EF &amp; EC-120</td>
</tr>
<tr>
<td>Diagnostic Procedure 16</td>
<td>PRESSURE REGULATOR (P.R.) CONTROL SOLENOID VALVE</td>
<td>EF &amp; EC-124</td>
</tr>
<tr>
<td>Diagnostic Procedure 17</td>
<td>INJECTORS</td>
<td>EF &amp; EC-126</td>
</tr>
<tr>
<td>Diagnostic Procedure 18</td>
<td>SWIRL CONTROL VALVE (S.C.V.) CONTROL SOLENOID VALVE</td>
<td>EF &amp; EC-128</td>
</tr>
<tr>
<td>Diagnostic Procedure 19</td>
<td>AIR REGULATOR</td>
<td>EF &amp; EC-130</td>
</tr>
<tr>
<td>Diagnostic Procedure 20</td>
<td>AUXILIARY AIR CONTROL (A.A.C.) VALVE</td>
<td>EF &amp; EC-134</td>
</tr>
<tr>
<td>Diagnostic Procedure 21</td>
<td>I.A.A. CONTROL (F.I.C.D. CONTROL)</td>
<td>EF &amp; EC-136</td>
</tr>
<tr>
<td>Diagnostic Procedure 22</td>
<td>AIR INDUCTION VALVE (A.I.V.) CONTROL SOLENOID VALVE</td>
<td>EF &amp; EC-138</td>
</tr>
<tr>
<td>Diagnostic Procedure 23</td>
<td>NEUTRAL SWITCH, INHIBITOR SWITCH AND INHIBITOR RELAY</td>
<td>EF &amp; EC-140</td>
</tr>
<tr>
<td><strong>Electrical Components Inspection</strong></td>
<td></td>
<td>EF &amp; EC-142</td>
</tr>
</tbody>
</table>

**EF & EC-32**
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

STEP 1
LISTEN TO CUSTOMER COMPLAINTS

STEP 2
PERFORM SELF-DIAGNOSIS
Can be performed

CHECK MAIN POWER SUPPLY AND GROUND CIRCUIT

STEP 3
MALFUNCTION CODE CAN BE FOUND
No

DUPLICATION OF OPERATING CONDITIONS THAT LEAD TO MALFUNCTION

Yes

STEP 4
ELIMINATING GOOD PARTS/SYSTEMS

STEP 5
INSPECTION ON THE BASE OF EACH COMPONENT

STEP 6
REPAIR/REPLACE

STEP 7
FINAL CHECK

STEP 8
O.K.

CHECK OUT

SERVICE MANUAL REFERENCE ITEMS & PAGES

DIAGNOSTIC WORKSHEET EF & EC-35

Self-diagnosis EF & EC-63

Diagnostic Procedure EF & EC-84

INTERMITTENT PROBLEM SIMULATION EF & EC-36

Diagnostic Table EF & EC-37

Diagnostic Procedure EF & EC-86

EF & EC-34
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

**DIAGNOSTIC WORKSHEET**

There are many kinds of operating conditions that lead to malfunctions on engine components. A good grasp of such conditions can make trouble-shooting faster and more accurate.

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

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

**Worksheet sample**

<table>
<thead>
<tr>
<th>Customer name</th>
<th>MR/MS</th>
<th>Model &amp; Year</th>
<th>VIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine #</td>
<td>Trans.</td>
<td>Mileage</td>
<td></td>
</tr>
<tr>
<td>Incident Date</td>
<td>Manuf. Date</td>
<td>In Service Date</td>
<td></td>
</tr>
</tbody>
</table>

**Symptoms**

<table>
<thead>
<tr>
<th></th>
<th>□ Impossible to start</th>
<th>□ No combustion</th>
<th>□ Partial combustion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ Partial combustion affected by throttle position</td>
<td>□ Partial combustion NOT affected by throttle position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Possible but hard to start</td>
<td>□ Others [</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>□ Startability</th>
<th>□ No fast idle</th>
<th>□ Unstable</th>
<th>□ High idle</th>
<th>□ Low idle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ Others [</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>□ Idling</th>
<th>□ Stumble</th>
<th>□ Surge</th>
<th>□ Detonation</th>
<th>□ Lack of power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ Intake backfire</td>
<td>□ Exhaust backfire</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Others [</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>□ Driveability</th>
<th>□ At the time of start</th>
<th>□ While idling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ While accelerating</td>
<td>□ While decelerating</td>
</tr>
<tr>
<td></td>
<td>□ Just after stopping</td>
<td>□ While loading</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>□ Engine stall</th>
<th>□ Just after delivery</th>
<th>□ Recently</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ In the morning</td>
<td>□ At night</td>
</tr>
</tbody>
</table>

| □ Frequency           | □ All the time        | □ Under certain conditions | □ Sometimes |

| □ Weather conditions  | □ Not affected        | □ Fine | □ Raining | □ Snowing | □ Others [       | |
|-----------------------|-----------------------|--------|-----------|-----------|-----------------| |

| □ Weather              | □ Hot                  | □ Warm | □ Cool    | □ Cold    | □ Humid "F"     | |

<table>
<thead>
<tr>
<th>□ Engine conditions</th>
<th>□ Cold</th>
<th>□ During warm-up</th>
<th>□ After warm-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine speed</td>
<td>[ ]</td>
<td>2,000 rpm</td>
<td>4,000 rpm</td>
</tr>
</tbody>
</table>

| □ Road conditions      | □ In town | □ In suburbs | □ Highway | □ Off road (up/down) |

<table>
<thead>
<tr>
<th>□ Driving conditions</th>
<th>□ Not affected</th>
<th>□ At starting</th>
<th>□ While idling</th>
<th>□ At racing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ While accelerating</td>
<td>□ While cruising</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ While decelerating</td>
<td>□ While turning (RH/LH)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| □ Vehicle speed        | [ ] | 10 MPH | 20 MPH | 30 MPH | 40 MPH | 50 MPH | 60 MPH |

| □ Check engine light   | □ Turned on | □ Not turned on | |

EF & EC-35
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.

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

#### Diagnostic Table (Cont'd)

<table>
<thead>
<tr>
<th>SYMPTOM &amp; CONDITION</th>
<th>Impossible to start – no combustion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POSSIBLE CAUSES</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>SPECIFICATIONS</strong></td>
<td>Mixture ratio (too lean)</td>
</tr>
<tr>
<td></td>
<td>(ignition sparks (weak, missing)</td>
</tr>
<tr>
<td></td>
<td>Ignition timing</td>
</tr>
<tr>
<td><strong>FUEL SYSTEM</strong></td>
<td>Fuel pump (no operation)</td>
</tr>
<tr>
<td></td>
<td>Fuel pump relay (open circuited)</td>
</tr>
<tr>
<td></td>
<td>Injectors (no operation, clogged)</td>
</tr>
<tr>
<td><strong>IGNITION SYSTEM</strong></td>
<td>Ignition switch</td>
</tr>
<tr>
<td></td>
<td>Main relay</td>
</tr>
<tr>
<td></td>
<td>Power transistor</td>
</tr>
<tr>
<td></td>
<td>Ignition coil</td>
</tr>
<tr>
<td></td>
<td>Center cable (ignition leaks)</td>
</tr>
<tr>
<td></td>
<td>Ignition wires (ignition leaks)</td>
</tr>
<tr>
<td></td>
<td>Spark plugs</td>
</tr>
<tr>
<td><strong>CONTROL SYSTEM</strong></td>
<td>Crank angle sensor</td>
</tr>
</tbody>
</table>

#### SERVICE PROCEDURE

1. **LISTEN**
   - **N.G.** Check fuel pump and/or related circuits. (See page EF & EC-120.)
   - **CHECK** Fuel pump SEF279G
     - Listen for fuel pump operating sound.

2. **LISTEN**
   - **N.G.** Check injector circuit. (See page EF & EC-126.)
   - **CHECK** Injector SEF280G
     - Listen for injector operating sound.

3. **CHECK**
   - **N.G.** Check flashes of timing light for weakness.
   - **CHECK** Timing light SEF283G
     - Make sure the tachometer needle moves when cranking.

4. **CHECK**
   - **N.G.** Adjust ignition timing. (See page EF & EC-26.)
   - **CHECK** Timing light SEF284G
     - Check ignition timing.

5. **MEASURE**
   - **O.K.** Replace the wire.
   - **MEASURE** Ignition wire SEF315G
     - Measure resistance of suspect wires.

6. **CHECK**
   - **N.G.** Remove spark plugs and check their ignition sparks.
   - **CHECK** Ignition wire SEF282G
     - Spark plug SEF282G

---

**EF & EC-38**
SYMPTOM & CONDITION 2
Impossible to start — partial combustion

POSSIBLE CAUSES

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixture ratio</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pressure (too low)</td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Ignition timing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>FUEL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pump</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pump relay (open circuited)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Injectors (clogged)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
</tbody>
</table>

SERVICE PROCEDURE

1. **LISTEN**
   - Fuel pump
   - [SEF 279G]
   - Check fuel pump and/or related circuits.
   - [See page EF & EC-120.]
   - N.G.
   - [SEF 291G]
   - Connect vacuum hose to pressure regulator, and measure fuel pressure.
   - Improved
   - [SEF 286G]
   - Check mixture ratio feedback system.
   - [See page EF & EC-26.]

2. **LISTEN**
   - Injector
   - [SEF 280G]
   - Listen for injector operating sound.
   - N.G.
   - [SEF 286G]
   - Connect vacuum hose to pressure regulator and measure fuel pressure.
   - Check mixture ratio feedback system.
   - [See page EF & EC-26.]

3. **CHECK**
   - Timing light
   - [SEF 284G]
   - Check ignition timing.
   - [See page EF & EC-26.]

4. **APPLY**
   - Vacuum pressure
   - [SEF 291G]
   - Remove vacuum hose from pressure regulator, and apply vacuum and/or pressure, and try to start.
   - O.K.

5. **MEASURE**
   - Fuel pressure gauge
### TROUBLE DIAGNOSES

#### Diagnostic Table (Cont’d)

**Symptom & Condition:** Impossible to start – partial combustion (not affected by throttle position)

<table>
<thead>
<tr>
<th>Possible Causes</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specifications</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture ratio</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pressure (too low)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fuel System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel filter (clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel line (clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injectors (clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure regulator</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure regulator vacuum hose (clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ignition System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition wires (ignition leaks)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spark plugs (wet with fuel)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition switch</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intake System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle chamber (with ports clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle valve (clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine temperature sensor</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crank angle sensor</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Service Procedure

1. **Listen**
   - **Check Injector Circuit**
     - [See page EF & EC-126.]
     - Check injector circuit.
   - **Check Injector Operating Sound**
     - [Refer to page EF & EC-280G]
     - Listen for injector operating sound.

2. **Check**
   - **Check Throttle Chamber Ports and Valve for Clogging**
     - [Refer to page EF & EC-289G]
     - Check throttle chamber ports and valve for clogging.

3. **Remove**
   - **Remove Vacuum Hose from Pressure Regulator**
     - [Refer to page EF & EC-287G]
     - Remove vacuum hose from pressure regulator, and try to start.

4. **Measure**
   - **Check Mixture Ratio Feedback System**
     - [Refer to page EF & EC-291G]
     - Connect vacuum hose to pressure regulator and measure fuel pressure.

5. **Check**
   - **Check Ignition Timing**
     - [Refer to page EF & EC-284G]
     - Check ignition timing.
   - **Check Flash of Timing Light for Weakness**
     - [Refer to page EF & EC-283G]
     - Check flashes of timing light for weakness.

6. **Perform**
   - **Self-diagnosis Mode IV**
     - [Refer to page EF & EC-118.]
     - Perform self-diagnosis Mode IV (for start signal).
TROUBLE DIAGNOSES

Diagnostic Table (Cont’d)

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

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTAKE SYSTEM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle chamber (with ports clogged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle valve (clogged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air regulator (stuck closed)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle speed control valve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine temperature sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral switch</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SERVICE PROCEDURE

1. **CHECK**
   - Throttle chamber
   - Throttle chamber ports for clogging.
   - Clean the ports.
   - SEF289G

2. **CHECK**
   - Throttle chamber
   - Throttle valve for clogging.
   - Clean the valve.
   - SEF290G

3. **CHECK**
   - Air regulator
   - Check air regulator and/or its circuit.
   - Make sure air regulator stays open before warm-up.
   - SEF293G

4. **CHECK**
   - Check idle speed control circuit.
   - Check terminal voltage of A.A.C. valve while cranking.
   - SEF006H

EF & EC-41
**TROUBLE DIAGNOSIS**

Diagnostic Table (Cont'd)

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

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFICATIONS</td>
<td>Mixture ratio</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IGNITION SYSTEM</td>
<td>Ignition switch (no start signal)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>INTAKE SYSTEM</td>
<td>Air regulator</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td>Engine temperature sensor</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Idle switch</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Neutral switch</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>OTHERS</td>
<td>Starter (operation too slow)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Battery (voltage too low)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**SERVICE PROCEDURE**

1. **CHECK**
   - Tachometer
   - Ignition switch
   
   **START**
   
   **MEASURE**
   
   **CHECK**
   
   **PERFORM**

2. **CHECK**
   - Make sure tachometer indicates about 300 rpm while cranking.
   - Measure battery voltage.
   - Make sure tachometer indicates about 300 rpm while cranking.
   - Check the malfunctioning switches and/or circuits. [See page EF & EC-116 (start signal).
   - Perform self-diagnosis Mode IV (for start signal and idle switch).
   - Check air regulator and/or its circuit. [See page EF & EC-130.]

3. **CHECK**
   - Air regulator
   - Make sure air regulator stays open before warm-up.
   - Perform self-diagnosis Mode IV (for start signal and idle switch).

4. **CRANK**
   - Engine temperature sensor
   - Ignition switch
   
   **START**
   
   **CHECK**
   
   **PERFORM**

- Check sensor circuit. [See page EF & EC-90.]
**TROUBLE DIAGNOSES**

**Diagnostic Table (Cont’d)**

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

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPECIFICATIONS</strong></td>
<td>Mixture ratio</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuel pressure</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FUEL SYSTEM</strong></td>
<td>Fuel line (hot fuel)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure regulator (low fuel pressure)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure regulator vacuum hose (clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure regulator control solenoid</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure regulator control solenoid vacuum hose</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuel temperature sensor (open circuited)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IGNITION SYSTEM</strong></td>
<td>Ignition switch (no start signal)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CONTROL SYSTEM</strong></td>
<td>Engine temperature sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air flow meter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OTHERS</strong></td>
<td>Starter (operation too slow)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Battery (voltage too low)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SERVICE PROCEDURE**

1. **CHECK**
   - **START**
   - SEF281G
   - Make sure tachometer indicates about 300 rpm while cranking.

2. **MEASURE**
   - SEF296G
   - Measure battery voltage.
   - N.G. (less than 12V)
   - Charge the battery.

3. **CRANK**
   - SEF374G
   - Cool fuel lines with wet rags, etc. and try to start.

4. **PERFORM**
   - Self-diagnosis Mode IV
   - SEF285G
   - Perform self-diagnosis Mode IV (for start signal).

5. **CHECK**
   - SEF287G
   - Check vacuum hose of pressure regulator for clogging.
   - N.G.
   - Repair or replace the hose.

6. **CHECK**
   - SEF294G
   - Check terminal voltage of pressure regulator control solenoid while cranking.
   - N.G.
   - Replace the solenoid.
   - Check the solenoid circuit.

7. **LISTEN**
   - SEF295G
   - Listen for clicking sound from pressure regulator control solenoid when applying battery voltage.
   - N.G.
   - O.K.
   - Replace the solenoid.
   - Check the solenoid circuit.

---

**NOTE**: If everything is O.K., check fuel vapor pressure.

*EF & EC-43*
### TROUBLE DIAGNOSES

#### Diagnostic Table (Cont’d)

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

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFICATIONS</td>
<td><strong>Mixture ratio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Fuel pressure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Ignition sparks (missing)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Ignition timing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUEL SYSTEM</td>
<td><strong>Fuel pump (improper operation)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Fuel line (clogged)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Canister (air leaks)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Pressure regulator (low fuel pressure)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGNITION SYSTEM</td>
<td><strong>Ignition wires (ignition leaks)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Spark plugs (improper gap)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td><strong>Crank angle sensor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Engine temperature sensor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Idle switch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Neutral switch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHERS</td>
<td><strong>Starter (operation too slow)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Battery (voltage too low)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SERVICE PROCEDURE

1. **LISTEN**  
   - Fuel pump operating sound.  
   - Listen for fuel pump operating sound.  
   - Check fuel pump and/or related circuits.  
   - [See page EF & EC-120.]

2. **CHECK**  
   - Tachometer  
   - Ignition switch  
   - Check mixture ratio feedback system.  
   - [See page EF & EC-26.]

3. **MEASURE**  
   - Battery  
   - Measure battery voltage.  
   - Charge the battery.

4. **CHECK**  
   - Canister purge  
   - Check vacuum hose of canister for air leaks.  
   - Repair or replace the hose.

5. **PERFORM**  
   - Self-diagnosis Mode IV  
   - Perform self-diagnosis Mode IV (for idle switch).  
   - [See page EF & EC-116 (idle switch).]

6. **CHECK**  
   - Timing light  
   - Check flashes of timing light for weakness.

7. **MEASURE**  
   - Spark plug  
   - Measure resistance of suspect ignition wires.  
   - Remove spark plugs and measure their gaps.

8. **CHECK**  
   - Ignition wire  
   - Check ignition sparks.
### TROUBLE DIAGNOSES

#### Diagnostic Table (Cont’d)

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

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPECIFICATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition sparks (weak)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IGNITION SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power transistor</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition coil</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center cable (ignition leaks)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition wires (ignition leaks)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distributor cap (ignition leaks)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Spark plugs (improper gap)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SERVICE PROCEDURE

1. **CHECK**
   - Timing light
   - Distributor
   - **SEF283G**
   - Check flashes of timing light for weakness.

2. **MEASURE**
   - Ignition wire
   - **SEF316G**
   - Measure resistance of suspect wires.
   - O.K.

3. **DRY**
   - Distributor
   - Ignition coil
   - **SEF319G**
   - Dry distributor and/or ignition coil and try to start.

4. **MEASURE**
   - Gap
   - **SEF299G**
   - Remove spark plugs and measure their gaps.
   - O.K.

5. **CHECK**
   - Ignition wire
   - **SEF282G**
   - Check ignition sparks.

---

**POSSIBLE CAUSES**

- Ignition sparks (weak)
- Power transistor
- Ignition coil
- Center cable (ignition leaks)
- Ignition wires (ignition leaks)
- Distributor cap (ignition leaks)
- Spark plugs (improper gap)
## Diagnostic Table (Cont’d)

### Overview

**SYMPTOM & CONDITION:** Abnormal idling – no fast idle

### Possible Causes

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixture ratio</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing</td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>INTAKE SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Blow-by hose (clogged)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air regulator (stuck closed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Engine temperature sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Service Procedure

**CHECK**

1. **Air regulator**
   - Check air regulator and/or its circuit.
   - [See page EF & EC-130.]
   - SEF293G
   - Make sure air regulator stays open before warm-up.

2. **Blow-by hose**
   - Check blow-by hose for clogging.
   - SEF300G
   - Clean or replace the hose.

3. **Timing light**
   - Check ignition timing.
   - SEF291G
   - Improved
   - Adjust ignition timing.
   - [See page EF & EC-26.]

**CHECK**

1. **Pressure regulator**
   - Apply vacuum pressure to pressure regulator after disconnecting vacuum hose, and check idling.
   - SEF284G
   - Check mixture ratio feedback system.
   - [See page EF & EC-26.]

2. **Engine temperature sensor**
   - Start with engine temperature sensor connector disconnected.
   - SEF282G
   - Check sensor circuit.
   - [See page EF & EC-90.]
Diagnostic Table (Cont’d)

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

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFICATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture ratio</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing (too retarded)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTAKE SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle chamber (with ports clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle valve (clogged)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crank angle sensor</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air flow meter</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine temperature sensor</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load switches (remaining OFF)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SERVICE PROCEDURE

1. **CHECK**
   - Timing light
   - Check ignition timing.
   - N.G.
   - Adjust ignition timing.
   - [See page EF & EC-26.]

2. **CHECK**
   - Blow-by hose
   - Check blow-by hose for clogging.
   - N.G.
   - Clean or replace the hose.

3. **CHECK**
   - Throttle chamber
   - Check throttle chamber ports for clogging.
   - N.G.
   - Clean the ports.

4. **CHECK**
   - Throttle valve
   - Check throttle valve for clogging.
   - N.G.
   - Clean the valve.

5. **APPLY**
   - Vacuum pressure
   - Apply vacuum pressure to pressure regulator after disconnecting vacuum hose, and check idling.

6. **PERFORM**
   - Self-diagnosis Mode V
   - Perform self-diagnosis Mode V (for air flow meter).
   - N.G.

7. **RUN**
   - Engine temperature sensor
   - Start and run engine with engine temperature sensor connector disconnected.
## TROUBLE DIAGNOSES

### Diagnostic Table (Cont’d)

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

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

### SERVICE PROCEDURE

1. **CHECK Timing light**
   - SEF284G
   - Check ignition timing.
   - N.G.
   - Adjust ignition timing. [See page EF & EC-26.]

2. **CHECK**
   - SEF301G
   - Check intake system for air leaks.
   - O.K.
   - Check throttle wire for rough sliding.
   - Repair/replace the part.

3. **REPLACE Pressure regulator**
   - SEF291G
   - Improve vacuum hose from pressure regulator, and try to start.

4. **MEASURE Fuel pressure**
   - Connect vacuum hose to pressure regulator and measure fuel pressure.
   - Check mixture ratio feedback system. [See page EF & EC-26.]

5. **PERFORM**
   - SEF981F
   - Check terminal voltage of F.I.C.D. solenoid while idling.
   - Check the part and/or circuit. [See HA section.]

6. **CHECK**
   - SEF982G
   - Perform self-diagnosis Mode IV
   - N.G.
   - Check the idle switch circuit. [See page EF & EC-116.]

7. **CHECK Throttle chamber**
   - SEF293G
   - Check throttle chamber ports and valve for clogging.
   - N.G.
   - Clean the ports and/or throttle valve.

8. **CHECK A.A.C. valve**
   - SEF007H
   - Check terminal voltage of A.A.C. valve while idling.

9. **PERFORM**
   - N.G.
   - Check the sensor circuit. [See page EF & EC-90.]

10. **START Ignition switch**
    - SEF292G
    - Start with engine temperature sensor disconnected.
TROUBLE DIAGNOSES

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 12 Unstable idling — before warm-up

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixture ratio</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTAKE SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air regulator (not open enough)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle speed control valve (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine temperature sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.G.R. SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.G.R. control valve (stuck open)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.G.R. solenoid (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SERVICE PROCEDURE

1. **CHECK**
   - Timing light
   - Description: Check ignition timing.
   - Action: N.G.
   - Next: Adjust ignition timing. [See page EF & EC-26.]

2. **CHECK**
   - Air regulator
   - Description: Make sure air regulator stays open before warm-up.
   - Action: N.G.
   - Next: Check air regulator and/or its circuit. [See page EF & EC-130.]

3. **APPLY**
   - Vacuum pressure
   - Description: Apply vacuum pressure to pressure regulator after disconnecting vacuum hose, and check idling.
   - Action: Improved
   - Next: Check mixture ratio feedback system. [See page EF & EC-26.]

4. **CHECK**
   - A.A.C. valve
   - Description: Check terminal voltage of A.A.C. valve while idling.
   - Action: Does not turn ON
   - Next: Check its circuit. [See page EF & EC-134.]

5. **CHECK**
   - E.G.R. control valve
   - Description: Check E.G.R. control valve for operation.
   - Action: Stays lifted
   - Next: Check terminal voltage of E.G.R. solenoid while idling.

6. **CHECK**
   - E.G.R. solenoid
   - Description: Check terminal voltage of E.G.R. solenoid while idling.
   - Action: N.G.
   - Next: Check the solenoid circuit. [See page EF & EC-100.]

7. **RUN**
   - Engine temperature sensor
   - Description: Start and run engine with engine temperature sensor connector disconnected.
   - Action: N.G.
   - Next: Check sensor circuit. [See page EF & EC-90.]
### Diagnostic Table (Cont’d)

#### SYMPTOM & CONDITION

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFICATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIXTURE RATIO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGNITION SPARKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGNITION TIMING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPRESSION PRESSURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUEL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUEL LINE (CLOGGED)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANISTER (AIR LEAKS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGNITION SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER TRANSISTOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGNITION COIL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGNITION WIRES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTAKE SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLOW-BY HOSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIR DUCT (LEAKS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDLE SWITCH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOAD SWITCHES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.G.R. SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.G.R. CONTROL VALVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.G.R. SOLENOID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SERVICE PROCEDURE

1. **CHECK**
   - **Blow-by hose**
   - Check blow-by hose for leaks.
   - N.G.
   - Repair/replace the hose.

2. **CHECK**
   - **Leak**
   - Check intake system for air leaks.
   - N.G.
   - Repair/replace the part.

3. **CHECK**
   - **Timing light**
   - Check flashes of timing light for weakness.
   - N.G.
   - Replace the wire.

4. **CHECK**
   - **Canister purge**
   - Check purge line for leaks.
   - N.G.
   - Repair/replace the hose.

5. **CHECK**
   - **Timing light**
   - Check ignition timing.
   - N.G.
   - Adjust ignition timing.

6. **CHECK**
   - **Spark plug**
   - Remove spark plugs and check their ignition sparks.
   - N.G.

7. **CHECK**
   - **E.G.R. control valve**
   - Check terminal voltage of E.G.R. solenoid while idling.
   - N.G.
   - Check the solenoid circuit.

8. **CHECK**
   - **Pressure regulator control solenoid**
   - Check terminal voltage of the solenoid while idling.
   - N.G.
   - Check the solenoid circuit.

9. **CHECK**
   - **Self-diagnosis Mode IV**
   - Perform self-diagnosis Mode IV (for idle switch).
   - N.G.
   - Check the idle switch circuit.

---

### POSSIBLE CAUSES

- **SPECFICATIONS**
  - 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
### TROUBLE DIAGNOSIS

#### Diagnostic Table (Cont’d)

<table>
<thead>
<tr>
<th>SYMPTOM &amp; CONDITION</th>
<th>Poor driveability — stumble (while accelerating)</th>
</tr>
</thead>
</table>

#### POSSIBLE CAUSES

<table>
<thead>
<tr>
<th>Specification</th>
<th>Mixture ratio</th>
<th>Fuel pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUEL SYSTEM</td>
<td>Fuel filter (clogged)</td>
<td>Fuel line (clogged)</td>
</tr>
<tr>
<td>IGNITION SYSTEM</td>
<td>Power transistor</td>
<td>Ignition coil</td>
</tr>
<tr>
<td>INLET SYSTEM</td>
<td>Air duct (leaks)</td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td>Crank angle sensor</td>
<td>Air flow meter</td>
</tr>
<tr>
<td></td>
<td>Engine temperature sensor</td>
<td>Exhaust gas sensor</td>
</tr>
<tr>
<td>OTHERS</td>
<td>Fuel (poor quality)</td>
<td></td>
</tr>
</tbody>
</table>

#### SERVICE PROCEDURE

1. **CHECK** Timing light
   - **CHECK** Timing light
   - **CHECK** Ignition wire
   - **CHECK** Spark plug
   - **CHECK** Exhaust gas sensor
   - **CHECK** Fuel (poor quality)

2. **MEASURE** Ignition wire
   - Measure resistance of suspect wires.
   - Replace the wires.
   - Replace the sensor.

3. **PERFORM** Self-diagnosis Mode IV
   - Perform self-diagnosis Mode IV (for idle switch).
   - Check the idle switch circuit.

4. **REMOVE** Pressure regulator
   - Remove vacuum hose from pressure regulator, and try to drive.

5. **DISCONNECT** Exhaust gas sensor
   - Disconnect exhaust gas sensor connector, and try to drive.

6. **CHECK** Self-diagnosis Mode V
   - Perform self-diagnosis Mode V (for air flow meter).
   - Check the malfunctioning parts and/or circuits.
   - Replace the sensor.

7. **MEASURE** Fuel pressure gauge
   - Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

8. **CHECK** Mixture ratio feedback system
   - [See page EF & EC-26.]
**SYMPTOM & CONDITION**: Poor driveability — surge (while cruising)

**POSSIBLE CAUSES**

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixture ratio (too lean)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pressure (low)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IGNITION SYSTEM</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(missing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INTAKE SYSTEM</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air duct (leaks)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle chamber (air leaks)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake manifold (gasket) (air leaks)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTROL SYSTEM</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Crank angle sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Air flow meter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Exhaust gas sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Idle switch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E.G.R. SYSTEM</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E.G.R. control valve</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(stuck open)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.G.R. solenoid (remaining OFF)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.G.R. vacuum hose (removed)</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SERVICE PROCEDURE**

1. **CHECK**
   - **LEAK**
     - **ENGINE**
     - **CHECK**
     - **Air duct**
     - **SEF301G**
     - Check intake system for air leaks.
     - N.G.
     - Repair/replace the part.

2. **CHECK**
   - **Timing light**
     - **SEF284G**
     - Check ignition timing.
     - N.G.
     - Adjust ignition timing.
     - [See page EF & EC-26.]

3. **CHECK**
   - **E.G.R. control valve**
     - **SEF547A**
     - Check E.G.R. control valve for operation.
     - Stays lifted

4. **CHECK**
   - **E.G.R. solenoid**
     - **SEF303G**
     - Check terminal voltage of E.G.R. solenoid.
     - N.G.
     - Check the solenoid circuit.
     - [See page EF & EC-100.]

5. **REMOVE**
   - **Pressure regulator**
     - **SEF291G**
     - Remove vacuum hose from pressure regulator, and try to drive.
     - Improved

6. **MEASURE**
   - **Fuel pressure gauge**
     - **SEF286G**
     - Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

7. **PERFORM**
   - **Self-diagnosis Mode IV**
     - **SEF285G**
     - Perform self-diagnosis Mode IV (for idle switch).
     - N.G.
     - Check the idle switch circuit.
     - [See page EF & EC-116.]

8. **DISCONNECT**
   - **Exhaust gas sensor**
     - **SEF307G**
     - Disconnect exhaust gas sensor connector, and try to drive.
     - Improved
     - Replace the sensor.

**POSSIBLE CAUSES**

- 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)
**TROUBLE DIAGNOSES**

**Diagnostic Table (Cont’d)**

**SYMPTOM & CONDITION 16** Poor driveability — lack of power

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFICATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pressure</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Ignition timing</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Compression pressure (too low)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>FUEL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pump (low fuel output)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Fuel filter (clogged)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Fuel line (clogged)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Injectors (clogged)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>IGNITION SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition wires (ignition leaks)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Spark plugs (improper gap)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>INTAKE SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air cleaner element (clogged)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Throttle chamber (clogged)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Throttle valve (not open enough)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air flow meter</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Exhaust gas sensor</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**SERVICE PROCEDURE**

1. **CHECK**
   - **AIR CLEANER ELEMENT**
     - Check air cleaner element for clogging.
     - N.G.
     - Replace the part.
   - **CHECK**
     - **Timing light**
     - SEF284G
     - Check ignition timing with a timing light.
     - N.G.
     - Adjust ignition timing. [See page EF & EC-26.]
2. **MEASURE**
   - **COMPRESSION PRESSURE**
     - SEF309G
     - Check cylinder head and gasket. [See EM section.]
3. **REMOVE**
   - **Pressure regulator**
     - SEF291G
     - Remove vacuum hose from pressure regulator, and try to drive.
     - Improved
4. **MEASURE**
   - **Fuel pressure gauge**
     - SEF286G
     - Connect vacuum hose to pressure regulator and measure fuel pressure while driving.
     - Check mixture ratio feedback system. [See page EF & EC-26.]
5. **CHECK**
   - **THROTTLE CHAMBER**
     - SEF280G
     - Check throttle valve for rough movement.
     - N.G.
     - Repair/replace the part.
6. **CHECK**
   - **Ignition wire**
     - SEF282G
     - Remove spark plugs and check their ignition sparks.
     - O.K.
7. **CHECK**
   - **Distributor**
     - SEF283G
     - Check flashes of timing light for weakness.
     - N.G.
8. **MEASURE**
   - **Ignition wire**
     - SEF316G
     - Measure resistance of suspect wires.
     - N.G.
     - Replace the wires.
9. **DISCONNECT**
   - **Exhaust gas sensor**
     - SEF307G
     - Disconnect exhaust gas sensor connector, and try to drive.
     - No change
     - Improved
     - Replace the sensor.
10. **CHECK**
    - **Self-diagnosis Mode V**
     - SEF285G
     - Perform self-diagnosis Mode V (for air flow meter).
     - N.G.
     - Check the malfunctioning parts and/or circuit. [See page EF & EC-88.]

---

**EF & EC-53**
## TROUBLE DIAGNOSES

### Diagnostic Table (Cont’d)

#### SYMPTOM & CONDITION

**17** Poor driveability – detonation

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

### SERVICE PROCEDURE

1. **CHECK**
   - **Water temperature**
     - Too high
     - Check water temperature.

2. **CHECK**
   - **Timing light**
     - N.G. Adjust ignition timing.

3. **REMOVE**
   - **Pressure regulator**
     - Improved
   - Remove vacuum hose from pressure regulator, and try to drive.

4. **MEASURE**
   - **Fuel pressure gauge**
     - Connect vacuum hose to pressure regulator, and measure fuel pressure while driving.

5. **PERFORM**
   - **Self-diagnosis Mode V**
     - N.G. Check the malfunctioning parts.
     - Perform self-diagnosis Mode V (for crank angle sensor and air flow meter).

---

EF & EC-54
Diagnostic Table (Cont’d)

**SYMPTOM & CONDITION 18 Engine stall – during start-up**

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPECIFICATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture ratio (too rich/too lean)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition sparks (weak)</td>
<td></td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Compression pressure (too low)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td><strong>FUEL SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Canister (too much evaporation to intake)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td><strong>IGNITION SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Ignition wires (ignition leaks)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spark plugs (wet with fuel, improper gap)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td><strong>INTAKE SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Throttle valve (not open enough)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
</tbody>
</table>

**SERVICE PROCEDURE**

1. **CHECK**
   - Timing light
   - N.G. → Adjust ignition timing. [See page EF & EC-26.]

2. **CHECK**
   - Throttle chamber
   - N.G. → Repair/replace the part.

3. **CHECK**
   - Timing light
   - N.G. → Repair the wires.

4. **MEASURE**
   - Ignition wire
   - N.G. → Measure resistance of ignition wires.

5. **CHECK**
   - Ignition wire
   - O.K. → Replace the spark plugs and check their ignition sparks.

6. **MEASURE**
   - Compression pressure
   - Check cylinder head and gasket. [See EM section.]

7. **DISCONNECT**
   - Exhaust gas sensor
   - Improved → Disconnect exhaust gas sensor connector and try to drive.
### TROUBLE DIAGNOSES

#### Diagnostic Table (Cont’d)

**SYMPTOM & CONDITION** 19

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

#### SERVICE PROCEDURE

**REMOVE**

1. Pressure regulator
   - Improved
   - Remove vacuum hose from pressure regulator, and check idling.

**MEASURE**

2. Fuel pressure gauge
   - Check mixture ratio feedback system. [See page EF & EC-26.]

3. Tachometer
   - Measure idle speed.
   - N.G.
   - Adjust idle speed. [See page EF & EC-26.]

**CHECK**

4. Timing light
   - Check flashes of timing light for weakness.

5. Spark plug
   - N.G.
   - Check spark plugs for being foul or wet with fuel.

6. Self-diagnosis Mode IV
   - N.G.
   - Check the idle switch circuit. [See page EF & EC-116.]

### POSSIBLE CAUSES

- Mixture ratio (too rich/too lean)
- Fuel pressure (low)
- Ignition sparks (weak, missing)
-Idle speed (low)
- Fuel line (clogged)
- Spark plugs (wet with fuel, improper gap)
- Idle speed control valve (improper operation)
- F.I.C.D. solenoid (improper operation)
- Idle switch (remaining OFF)
- Neutral switch (remaining OFF)
- Load switches (remaining OFF)

### SPECIFICATIONS

- Mixture ratio (too rich/too lean)
- Fuel pressure (low)
- Ignition sparks (weak, missing)
- Idle speed (low)
- Fuel line (clogged)
- Spark plugs (wet with fuel, improper gap)
- Idle speed control valve (improper operation)
- F.I.C.D. solenoid (improper operation)
- Idle switch (remaining OFF)
- Neutral switch (remaining OFF)
- Load switches (remaining OFF)
### TROUBLE DIAGNOSES

#### Diagnostic Table (Cont'd)

**SYMPTOM & CONDITION**

**20** Engine stall — while accelerating

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPECIFICATIONS</strong></td>
<td>Mixture ratio</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Ignition sparks (weak, missing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Compression pressure (low)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>CONTROL SYSTEM</strong></td>
<td>Crank angle sensor</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Air flow meter</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Exhaust gas sensor</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### SERVICE PROCEDURE

1. **CHECK**
   - Timing light
   - [SEF283G](#)
   - Check flashes of timing light for weakness during acceleration.

2. **MEASURE**
   - Ignition wire
   - [SEF315G](#)
   - Measure resistance of suspect wires.

3. **CHECK**
   - Ignition wire
   - [SEF282G](#)
   - Remove spark plugs and check their ignition sparks.

4. **MEASURE**
   - Compression pressure
   - [SEF309G](#)
   - Measure compression pressure.

5. **CHECK**
   - Self-diagnosis Mode II
   - [SEF273G](#)
   - Check mixture ratio by flashes of inspection lamps.

6. **DISCONNECT**
   - Exhaust gas sensor
   - [SEF307G](#)
   - Disconnect exhaust gas sensor connector, and try to drive.
   - Improved
   - Check mixture ratio feedback system.
   - [See page EF & EC-26.](#)

7. **PERFORM**
   - Self-diagnosis Mode V
   - [SEF285G](#)
   - Perform self-diagnosis Mode V (for crank angle sensor and air flow meter).

---

**POSSIBLE CAUSES**

- **Mixture ratio**
- **Ignition sparks (weak, missing)**
- **Compression pressure (low)**
- **Crank angle sensor**
- **Air flow meter**
- **Exhaust gas sensor**

---

**SPECIFICATIONS**

- Mixture ratio
- Ignition sparks (weak, missing)
- Compression pressure (low)

---

**CONTROL SYSTEM**

- Crank angle sensor
- Air flow meter
- Exhaust gas sensor
### Diagnostic Table (Cont’d)

#### SYMPTOM & CONDITION

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFICATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture ratio</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition sparks (weak, missing)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crank angle sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o</td>
</tr>
<tr>
<td>Air flow meter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SERVICE PROCEDURE

1. **CHECK**
   - **Timing light**
     - SEF283G
     - Check flashes of timing light for weakness at constant engine revolution, (1,000 - 2,000 rpm).
     - N.G.

2. **MEASURE**
   - **Ignition wire**
     - SEF315G
     - Measure resistance of suspect wires.
     - N.G.
     - Replace the wires.

3. **CHECK**
   - **Self-diagnosis Mode II**
     - SEF373G
     - Check mixture ratio by flashes of inspection lamps.
     - N.G.

4. **DISCONNECT**
   - **Exhaust gas sensor**
     - SEF307G
     - Disconnect exhaust gas sensor connector, and try to drive.
     - Improved
     - Replace the sensor.
     - No change
     - Check mixture ratio feedback system. [See page EF & EC-26.]

5. **CHECK**
   - **Ignition wire**
     - SEF282G
     - Remove spark plugs and check their ignition sparks.
     - N.G.

6. **PERFORM**
   - **Self-diagnosis Move V**
     - SEF285G
     - Perform self-diagnosis Mode V (for air flow meter and crank angle sensor).
     - N.G.
     - Check the circuits.
     - [See page EF & EC-86 (crank angle sensor), page EF & EC-88 (air flow meter).]
### TROUBLE DIAGNOSES

#### Diagnostic Table (Cont’d)

**SYMPTOM & CONDITION**

**Engine stall – while decelerating/just after stopping**

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPECIFICATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture ratio</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition sparks (missing)</td>
<td></td>
<td></td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle speed (too low)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td><strong>IGNITION SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(missing)</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>INTAKE SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle speed control valve (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>CONTROL SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust gas sensor (malfunctioning feedback control)</td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Crank angle sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Idle switch (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Load switches (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

### SERVICE PROCEDURE

1. **CHECK**
   - Timing light
   - Distributor
   - SEF283G
   - Check flashes of timing light while decreasing engine speed.

2. **PERFORM**
   - Self-diagnosis Mode V
   - SEF285G
   - Perform self-diagnosis Mode V (for ignition signal and crank angle sensor).

3. **MEASURE**
   - Tachometer
   - SEF316G
   - Measure idle speed.

4. **CHECK**
   - A.A.C. valve
   - SEF007H
   - Check terminal voltage of A.A.C. valve.

5. **CHECK**
   - Self-diagnosis Mode II
   - SEF373G
   - Check mixture ratio by flashes of inspection lamps.

6. **DISCONNECT**
   - Exhaust gas sensor
   - SEF307G
   - Disconnect exhaust gas sensor connector, and try to drive.

---

**POSIBLE CAUSES**

- **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)**

---

**SPECIFICATIONS**

- **Mixture ratio**
- **Ignition sparks (missing)**
- **Idle speed (too low)**

---

**EF & EC-59**
### TROUBLE DIAGNOSES

#### Diagnostic Table (Cont'd)

**SYMPTOM & CONDITION**

23 Engine stall – while loading

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPECIFICATIONS</strong></td>
<td>Ignition timing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Idle speed (too low)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>INTAKE SYSTEM</strong></td>
<td>Idle speed control valve (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F.I.C.D. solenoid (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CONTROL SYSTEM</strong></td>
<td>Idle switch (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Load switches (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SERVICE PROCEDURE

1. **MEASURE**
   - Tachometer
   - Measure idle speed.
   - N.G. → Adjust idle speed. [See page EF & EC-26.]

2. **CHECK**
   - Timing light
   - Check ignition timing.
   - N.G. → Adjust ignition timing. [See page EF & EC-26.]

3. **CHECK**
   - A.A.C. valve
   - Check terminal voltage of A.A.C. valve.
   - N.G. → Check the part and/or circuit. [See page EF & EC-134.]

4. **CHECK**
   - F.I.C.D. solenoid
   - Check terminal voltage of F.I.C.D. solenoid.
   - N.G. → Check the part and/or circuit. [See HA section.]

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

---

EF & EC-60
TROUBLE DIAGNOSIS

Diagnostic Table (Cont’d)

SYMPTOM & CONDITION 24  Backfire - through the intake

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFICATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture ratio (too lean)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing (too retarded)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>FUEL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injectors (clogged)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>INTAKE SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air duct (air leaks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake manifold (gaskets) (air leaks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air flow meter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust gas sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

SERVICE PROCEDURE

CHECK

1. Engine
   - Leak
   - Air duct
   - Check intake system for air leaks.
   - SEF301G
   - N.G.
   - Repair/replace the part.

2. Pressure regulator
   - Remove vacuum hose from pressure regulator, try to drive.
   - SEF291G
   - Improved
   - Check mixture ratio feedback system.
   - SEF284G
   - N.G.
   - Adjust ignition timing.
   - [See page EF & EC-26.]

3. Self-diagnosis Mode II
   - Check mixture ratio by flashes of inspection lamps.
   - SEF373G
   - 5 times or more/10 sec.
   - SEF375G
   - N.G.

4. Exhaust gas sensor
   - Disconnect exhaust gas sensor connector, try to drive.
   - SEF307G
   - Improved
   - Replace the sensor.
   - No change
   - Check mixture ratio feedback system.
   - SEF307G
   - [See page EF & EC-26.]

5. Self-diagnosis Mode V
   - Perform self-diagnosis Mode V (for air flow meter).
   - SEF286G
   - N.G.
   - Check the circuits.
   - SEF286G
   - [See page EF & EC-88 (air flow meter).]
**TROUBLE DIAGNOSES**

**Diagnostic Table (Cont'd)**

<table>
<thead>
<tr>
<th>SYMPTOM &amp; CONDITION</th>
<th>Backfire — through the exhaust</th>
</tr>
</thead>
</table>

**POSSIBLE CAUSES**

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>Mixture ratio (too rich)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUEL SYSTEM</td>
<td>Injectors (fuel leaks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGNITION SYSTEM</td>
<td>(missing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTAKE SYSTEM</td>
<td>Air cleaner element (clogged)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A.I.V. (always operating)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A.I.V. solenoid (remaining ON)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTROL SYSTEM</td>
<td>Idle switch (remaining OFF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SERVICE PROCEDURE**

1. **CHECK**
   - **AIR CLEANER ELEMENT**
   - SEF320G
   - Check air cleaner element for clogging.

2. **PERFORM**
   - Self-diagnosis Mode IV
   - SEF285G
   - Perform self-diagnosis Mode IV (for idle switch).

3. **CHECK**
   - A.I.V.
   - SEF375G
   - Check secondary air to exhaust system.

4. **APPLY**
   - Pressure regulator
   - SEF291G
   - Apply pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

5. **PERFORM**
   - Self-diagnosis Mode V
   - SEF285G
   - Perform self-diagnosis Mode V (for ignition signal).

6. **CHECK**
   - A.I.V. solenoid
   - SEF372G
   - Left ON
   - Check the solenoid circuit.
   - (See page EF & EC-138.)

**POSSIBLE CAUSES**

- **8 Improved**
  - Check mixture ratio feedback system.
  - (See page EF & EC-26.)

- **Check the malfunctioning part and/or circuit.**
  - (See page EF & EC-94 (ignition signal).)

**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)**
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.
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.
Self-diagnosis — Description (Cont'd)

CHECK ENGINE LIGHT \( \text{\ding{178}} \) (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.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Malfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Air flow meter circuit</td>
</tr>
<tr>
<td>13</td>
<td>Engine temperature sensor circuit</td>
</tr>
<tr>
<td>14</td>
<td>Vehicle speed sensor circuit</td>
</tr>
<tr>
<td>31</td>
<td>E.C.U. (E.C.C.S. control unit)</td>
</tr>
<tr>
<td>32</td>
<td>E.G.R. function</td>
</tr>
<tr>
<td>33</td>
<td>Exhaust gas sensor circuit</td>
</tr>
<tr>
<td>35</td>
<td>Exhaust gas temperature sensor circuit</td>
</tr>
<tr>
<td>43</td>
<td>Throttle sensor circuit</td>
</tr>
<tr>
<td>45</td>
<td>Injector leak</td>
</tr>
</tbody>
</table>

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

**DIAGNOSIS START**

- Turn ignition switch “ON” and make sure that check engine light comes “ON”.
- Perform self-diagnosis and check which code is displayed in Mode III.
- Check electronic control system of affected code No. to locate faulty part.
- Repair or replace faulty part.
- Reinstall any part removed.

EF & EC-65
Erase the self-diagnosis memory.

Perform driving test. Make sure that check engine light does not come "ON" during this test.

DIAGNOSIS END

- 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.
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:

<table>
<thead>
<tr>
<th>Mode (Monitor A)</th>
<th>L.E.D.</th>
<th>Engine stopped (Ignition switch “ON”)</th>
<th>Engine running</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green</td>
<td>ON</td>
<td>Open loop condition</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>ON</td>
<td>*Remains ON or OFF</td>
</tr>
</tbody>
</table>

Except 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.).

<table>
<thead>
<tr>
<th>Mode (Monitor B)</th>
<th>L.E.D.</th>
<th>Engine stopped (Ignition switch “ON”)</th>
<th>Engine running</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green</td>
<td>ON</td>
<td>Open loop condition</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>OFF</td>
<td>*Remains ON or OFF</td>
</tr>
</tbody>
</table>

Compensating mixture ratio

<table>
<thead>
<tr>
<th></th>
<th>More than 5% rich</th>
<th>Between 5% lean and 5% rich</th>
<th>More</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OFF</td>
<td>Synchronized with green L.E.D.</td>
<td>Remains ON</td>
</tr>
</tbody>
</table>

*: 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

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**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Detected items</th>
<th>California</th>
<th>Non-California</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Crank angle sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Air flow meter circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Engine temperature sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>14</td>
<td>Vehicle speed sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>21</td>
<td>Ignition signal missing in primary coil</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>31</td>
<td>E.C.U. (E.C.C.S. control unit)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>32</td>
<td>E.G.R. function</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>33</td>
<td>Exhaust gas sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>35</td>
<td>Exhaust gas temperature sensor circuit</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>43</td>
<td>Throttle sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>45</td>
<td>Injector leak</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>55</td>
<td>No malfunction in the above circuit</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Code No.</th>
<th>STARTER OPERATING TIMES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
</tr>
<tr>
<td>CRANK ANGLE SENSOR</td>
<td></td>
</tr>
<tr>
<td>ENGINE TEMPERATURE SENSOR</td>
<td>11</td>
</tr>
<tr>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

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

: Retention term

: Malfunction detecting point
Self-diagnosis — Mode III (Self-diagnostic system) (Cont’d)

TROUBLE DIAGNOSES

SELF-DIAGNOSTIC PROCEDURE

DIAGNOSIS START

1. Pull out E.C.U. from under the assist kick panel.
2. Start engine and warm it up to normal engine operating temperature.
   (Drive vehicle for about 10 min.)
3. Turn diagnostic mode selector on E.C.U. fully clockwise.

After the inspection lamps have flashed 3 times, turn diagnostic mode selector fully counterclockwise.

Make sure that inspection lamps are displaying Code No. 55.

Write down the malfunctioning Code No.

--- Memory erasing procedure ---

1. Turn diagnostic mode selector on E.C.U. fully clockwise.
2. After the inspection lamps have flashed 4 times, turn diagnostic mode selector on E.C.U. fully counterclockwise.
3. Turn ignition switch “OFF”.
4. Reinstall the E.C.U. in place.

Check malfunctioning parts and/or perform real time diagnosis system inspection.

If malfunction part is found, repair or replace it.

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.

EF & EC-70
TROUBLE DIAGNOSES

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

DECODING CHART

<table>
<thead>
<tr>
<th>DISPLAY CODE</th>
<th>MALFUNCTIONING CIRCUIT OR PARTS</th>
<th>CONTROL UNIT SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CRANK ANGLE SENSOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code No. 11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| ![Crank Angle Sensor](image) | 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. |
| **AIR FLOW METER** | | |
| ![Air Flow Meter](image) | Air flow meter circuit | - The air flow meter circuit is open or shorted.  
- (An abnormally high or low voltage is entered.) |
| **ENGINE TEMPERATURE SENSOR** | | |
| ![Engine Temperature Sensor](image) | Engine temperature sensor circuit | - The engine temperature sensor circuit is open or shorted.  
- (An abnormally high or low output voltage is entered.) |
| **VEHICLE SPEED SENSOR** | | |
| ![Vehicle Speed Sensor](image) | Vehicle speed sensor circuit | - Signal circuit is open. |

SYSTEM INSPECTION
See page EF & EC-88.
### TROUBLE DIAGNOSES

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

<table>
<thead>
<tr>
<th>DISPLAY CODE</th>
<th>MALFUNCTIONING CIRCUIT OR PARTS</th>
<th>CONTROL UNIT SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IGNITION SIGNAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code No. 21</td>
<td><img src="Image" alt="Ignition Signal" /></td>
<td>• The ignition signal in primary circuit does not enter to E.C.U. during engine cranking or running.</td>
</tr>
<tr>
<td><img src="Image" alt="Ignition Signal" /></td>
<td></td>
<td><strong>SYSTEM INSPECTION</strong></td>
</tr>
<tr>
<td></td>
<td>See page EF &amp; EC-94.</td>
<td></td>
</tr>
<tr>
<td><strong>E.C.U. (E.C.S. control unit)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code No. 31</td>
<td><img src="Image" alt="E.C.U. Calculation Function" /></td>
<td>• Signal is beyond &quot;normal&quot; range.</td>
</tr>
<tr>
<td><img src="Image" alt="E.C.U. Calculation Function" /></td>
<td></td>
<td><strong>SYSTEM INSPECTION</strong></td>
</tr>
<tr>
<td></td>
<td>See page EF &amp; EC-98.</td>
<td></td>
</tr>
<tr>
<td><strong>E.G.R. function</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code No. 32</td>
<td><img src="Image" alt="E.G.R. Function" /></td>
<td>• E.G.R. valve does not operate. (E.G.R. valve spring does not lift.)</td>
</tr>
<tr>
<td><img src="Image" alt="E.G.R. Function" /></td>
<td></td>
<td><strong>SYSTEM INSPECTION</strong></td>
</tr>
<tr>
<td></td>
<td>See page EF &amp; EC-100.</td>
<td></td>
</tr>
<tr>
<td><strong>EXHAUST GAS SENSOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code No. 33</td>
<td><img src="Image" alt="Exhaust Gas Sensor Circuit" /></td>
<td>• Signal circuit is open.</td>
</tr>
<tr>
<td><img src="Image" alt="Exhaust Gas Sensor Circuit" /></td>
<td></td>
<td><strong>SYSTEM INSPECTION</strong></td>
</tr>
<tr>
<td></td>
<td>See page EF &amp; EC-104.</td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Code No. 35</th>
<th>Exhaust gas temperature sensor circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>✗</td>
</tr>
<tr>
<td>Green</td>
<td>✗</td>
</tr>
</tbody>
</table>

THROTTLE SENSOR

<table>
<thead>
<tr>
<th>Code No. 43</th>
<th>Throttle sensor circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>✗</td>
</tr>
<tr>
<td>Green</td>
<td>✗</td>
</tr>
</tbody>
</table>

INJECTOR LEAK

<table>
<thead>
<tr>
<th>Code No. 45</th>
<th>Injector leak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>✗</td>
</tr>
<tr>
<td>Green</td>
<td>✗</td>
</tr>
</tbody>
</table>

INJECTOR LEAK

<table>
<thead>
<tr>
<th>Code No. 55</th>
<th>E.C.C.S. normal operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>✗</td>
</tr>
<tr>
<td>Green</td>
<td>✗</td>
</tr>
</tbody>
</table>

SYSTEM INSPECTION
See page EF & EC-106.

SEF393G

SYSTEM INSPECTION
See page EF & EC-110.

SEF078G

SYSTEM INSPECTION
See page EF & EC-114.

SEF068G

EF & EC-73
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

DIAGNOSIS START

Pull out E.C.U. from under the assist kick panel.

Turn ignition switch "ON".

Turn diagnostic mode selector on E.C.U. fully clockwise.

After the inspection lamps have flashed 4 times, turn diagnostic mode selector fully counterclockwise.

Make sure that a red inspection lamp goes "OFF".

Make sure that a red inspection lamp goes "ON" when depressing accelerator pedal.

Make sure that a red inspection lamp goes "ON" during turning ignition switch "START".

Lift the rear of the vehicle.

Drive vehicle. Make sure that a green inspection lamp goes "ON" when vehicle speed is 20 km/h (12 MPH) or faster.

Turn ignition switch "OFF".

Reinstall the E.C.U. in place.

DIAGNOSIS END

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

1. **DIAGNOSIS START**
   - Pull out E.C.U. from under the assist seat.
   - Start engine.
   - Turn diagnostic mode selector on E.C.U. fully clockwise.
   - After the inspection lamps have flashed 5 times, turn diagnostic mode selector fully counterclockwise.

2. **If flashing, count no. of flashes.**
   - Make sure that inspection lamps are not flashing for 5 min. when idling or racing.
   - Turn ignition switch "OFF".
   - Reinstall the E.C.U. in place.

3. **Perform real-time diagnosis system inspection.**
   - If malfunction part is found, repair or replace it.

**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.
CONTROL UNIT SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.
(Compare with Self-diagnosis — Mode III.)

**CRANK ANGLE SENSOR**

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

**AIR FLOW METER**

- Abnormal, momentary increase in air flow meter output signal

**IGNITION SIGNAL**

- Signal from the primary ignition coil momentarily drops off.
## TROUBLE DIAGNOSES

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

#### REAL-TIME DIAGNOSTIC INSPECTION

**Check parts**
- Middle connectors
- Sensor & actuator
- E.C.U. harness connector

<table>
<thead>
<tr>
<th>Check sequence</th>
<th>Check items</th>
<th>Check conditions</th>
<th>If malfunction, perform the following items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tap harness connector or component during real-time diagnosis.</td>
<td>During real-time diagnosis</td>
<td>Go to check item 2.</td>
</tr>
<tr>
<td>2</td>
<td>Check harness continuity at connector.</td>
<td>Engine stopped</td>
<td>Go to check item 3.</td>
</tr>
<tr>
<td>3</td>
<td>Disconnect harness connector, and then check dust adhesion to harness connector.</td>
<td>Engine stopped</td>
<td>Clean terminal surface.</td>
</tr>
<tr>
<td>4</td>
<td>Check pin terminal bend.</td>
<td>Engine stopped</td>
<td>Take out bend.</td>
</tr>
<tr>
<td>5</td>
<td>Reconnect harness connector and then recheck harness continuity at connector.</td>
<td>Engine stopped</td>
<td>Replace terminal.</td>
</tr>
<tr>
<td>6</td>
<td>Tap harness connector or component during real-time diagnosis.</td>
<td>During real-time diagnosis</td>
<td>If malfunction codes are displayed during real-time diagnosis, replace terminal.</td>
</tr>
</tbody>
</table>

---

**Diagram:**
- E.C.U. harness connector
- Crank angle sensor harness connector
## TROUBLE DIAGNOSES

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

### Air Flow Meter

<table>
<thead>
<tr>
<th>Check sequence</th>
<th>Check items</th>
<th>Check conditions</th>
<th>Check parts</th>
<th>If malfunction, perform the following items.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Middle connectors</td>
<td>Sensor &amp; actuator</td>
</tr>
<tr>
<td>1</td>
<td>Tap harness connector or component during real-time diagnosis.</td>
<td>During real-time diagnosis</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Check harness continuity at connector.</td>
<td>Engine stopped</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Disconnect harness connector, and then check dust adhesion to harness connector.</td>
<td>Engine stopped</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Check pin terminal bend.</td>
<td>Engine stopped</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Reconnect harness connector and then recheck harness continuity at connector.</td>
<td>Engine stopped</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Tap harness connector or component during real-time diagnosis.</td>
<td>During real-time diagnosis</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

---

![Diagram](image_url)
### TROUBLE DIAGNOSES

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

<table>
<thead>
<tr>
<th>Check sequence</th>
<th>Check items</th>
<th>Check conditions</th>
<th>Check parts</th>
<th>If malfunction, perform the following items.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tap harness connector or component during real-time diagnosis.</td>
<td>During real-time diagnosis</td>
<td>X X X</td>
<td>Go to check item 2.</td>
</tr>
<tr>
<td>2</td>
<td>Check harness continuity at connector.</td>
<td>Engine stopped</td>
<td>X - -</td>
<td>Go to check item 3.</td>
</tr>
<tr>
<td>3</td>
<td>Disconnect harness connector, and then check dust adhesion to harness connector.</td>
<td>Engine stopped</td>
<td>X - -</td>
<td>Clean terminal surface.</td>
</tr>
<tr>
<td>4</td>
<td>Check pin terminal bend.</td>
<td>Engine stopped</td>
<td>- - X</td>
<td>Take out bend.</td>
</tr>
<tr>
<td>5</td>
<td>Reconnect harness connector and then recheck harness continuity at connector.</td>
<td>Engine stopped</td>
<td>X - -</td>
<td>Replace terminal.</td>
</tr>
<tr>
<td>6</td>
<td>Tap harness connector or component during real-time diagnosis.</td>
<td>During real-time diagnosis</td>
<td>X X X</td>
<td>If malfunction codes are displayed during real-time diagnosis, replace terminal.</td>
</tr>
</tbody>
</table>

**Ignition Signal**

- **X**: Available
- **-**: Not available

---

**EF & EC-80**
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.)

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.
Diagnostic Procedure 1

MAIN POWER SUPPLY AND GROUND CIRCUIT

**Component location**

- "BR" fusible link
- "G" fusible link
- E.C.C.S. relay

**EF & EC-84**
INSPECTION START

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

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.

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

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

Reinstall any part removed.

INSPECTION END
Diagnostic Procedure 2

CRANK ANGLE SENSOR (Code No. 11)

Component location

Crank angle sensor harness connector

EF & EC-86
INSPECTION START

A

CHECK E.C.U. INPUT SIGNAL (Crank angle sensor side).
1) Start engine.
2) Check that pulse signals exist in crank angle sensor harness connector terminals @ and @ with logic probe.
   Pulse signals should exist.
   @: 180° signal
   @: 1° signal

INSPECTION END

B

CHECK HARNESS CONTINUITY BETWEEN CRANK ANGLE SENSOR AND E.C.U.
1) Stop engine.
2) Disconnect crank angle sensor harness connector.
4) Check continuity between terminals @ and @, @.
5) Check continuity between terminals @ and @, @.
   Continuity should exist.

C

CHECK POWER SUPPLY (Crank angle sensor side).
1) Stop engine.
2) Disconnect crank angle sensor harness connector.
3) Turn ignition switch “ON”.
4) Check voltage between terminal @ and ground.
   Battery voltage should exist.

D

CHECK GROUND CIRCUIT.
1) Turn ignition switch “OFF”.
2) Check resistance between terminal @ and ground.
   Continuity should exist.

CHECK COMPONENTS.
Check crank angle sensor.
(See page EF & EC-147.)

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode-III) again.

2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.
TROUBLE DIAGNOSES

Diagnostic Procedure 3

AIR FLOW METER (Code No. 12) CHECK

Component location

Air flow meter

EF & EC-88
TROUBLE DIAGNOSES

INSPECTION START

A

CHECK E.C.U. INPUT SIGNAL (Air flow meter side).
1) Start engine.
2) Check that voltage between air flow meter harness connector terminal @ and ground changes by racing engine with accelerator pedal.
Output voltage should change.
1.0 - Approximately 3.0V

O.K.

CHECK HARNESS CONTINUITY BETWEEN AIR FLOW METER AND E.C.U.
1) Stop engine.
2) Disconnect air flow meter harness connector.
4) Check continuity between terminals @ and @. Continuity should exist.

N.G.

B

CHECK POWER SUPPLY (Air flow meter side).
1) Stop engine.
2) Disconnect air flow meter harness connector.
3) Turn ignition switch “ON”.
4) Check voltage between terminal @ and ground.
Battery voltage should exist.

O.K.

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch “OFF”.
2) Check resistance between terminal @ and ground.
Resistance: Approximately 0Ω

O.K.

D

CHECK COMPONENTS.
Check air flow meter.
(See page EF & EC-147.)

O.K.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis again.

O.K.

INSPECTION END

N.G.

1) Repair or replace harness or connectors between terminals @ and @.

N.G.

Repair or replace harness or connectors between air flow meter harness connector terminal @ and E.C.U. harness connector terminal @.

N.G.

1) Repair or replace harness or connectors between terminals @ and @.
2) Check engine ground.

N.G.

Replace air flow meter.

N.G.

2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

EF & EC-89
INSPECTION START

CHECK COMPONENTS.
Check engine temperature sensor. (See page EF & EC-147.)

O.K.

CHECK GROUND CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check continuity between engine temperature sensor terminal (b) and E.C.U. terminals (1), (2).
Continuity should exist.

O.K.

CHECK INPUT SIGNAL CIRCUIT.
Check continuity between terminals (4) and (B).
Continuity should exist.

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode-III) again.

O.K.

INSPECTION END

N.G.
Replace engine temperature sensor.

N.G.
1) Repair harness or connectors between terminals (b) and (2), (2).
2) Check engine ground.

N.G.
1) Repair harness or connectors between terminals (4) and (B).

N.G.
2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.
Diagnostic Procedure 5

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

IGNITION SWITCH ON or START

HEAD-UP DISPLAY CONTROL UNIT

COMBINATION METER

FUSE BLOCK (Refer to "POWER SUPPLY ROUTING" in EL section.)

E.C.C.S. CONTROL UNIT

BODY GROUND

Main harness

(E.F.I. harness)

With head-up display

Without head-up display

EF & EC-92
INJECTION START

Is speedometer working properly?

Yes

No

CHECK VEHICLE SPEED SENSOR AND SPEEDOMETER UNIT.
(See EL section.)

CHECK INPUT SIGNAL.
1) Perform switch ON/OFF diagnosis (in Mode IV).
2) Make sure green inspection lamp on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

O.K.

N.G.

CHECK CONTINUITY BETWEEN E.C.U. AND VEHICLE SPEED SENSOR.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check continuity between E.C.U. terminal and ground by rotating rear wheel by hand.
   Continuity should come and go.

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.
Make sure Code No. 55 is displayed in Mode III.

1) Perform switch ON/OFF diagnosis (in Mode IV) again.
2) Make sure green inspection lamp on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

O.K.

N.G.

1) Perform self-diagnosis and find malfunction code.
2) According to displayed code No., perform diagnosis.

INSPECTION END
Diagnostic Procedure 6

IGNITION SIGNAL (Code No. 21)

Component location

Power transistor - harness connector

Ignition coil - harness connector

Resistor

EF & EC-94
**TROUBLE DIAGNOSES**

**INSPECTION START**

**A**
- CHECK E.C.U. INPUT SIGNAL (Power transistor side).
  1) Start engine.
  2) Verify that pulse signal exists between power transistor harness connector terminal and ground with logic probe.
  Pulse signal should exist.

**B**
- CHECK E.C.U. INPUT LINE.
  1) Stop engine.
  2) Disconnect harness connectors from power transistor and E.C.U.
  3) Check continuity between terminals ① and ③.
  *Continuity should exist.*
  If N.G., check following.
  - Resistor
  - Harness or connector

**C**
  Verify that pulse signal exists between power transistor harness connector terminal and ground with logic probe.
  Pulse signal should exist.

**D**
  Verify that pulse signal exists between E.C.U. harness connector terminal and ground with logic probe.
  Pulse signal should exist.
  If N.G., check the E.C.U. pin terminals for damage or the E.C.U. harness connection.

**E**
- CHECK POWER SUPPLY.
  1) Stop engine.
  2) Disconnect harness connector from ignition coil.
  3) Turn ignition switch "ON".
  4) Check voltage between ignition coil harness connector terminal and ground.
  *Battery voltage should exist.*

**F**
- CHECK HARNESS CONTINUITY BETWEEN BATTERY AND IGNITION COIL.
  Check the following items.
  - Harness
  - "G" fusible link
  - Ignition switch
CHECK HARNESS CONTINUITY BETWEEN IGNITION COIL AND POWER TRANSISTOR.
1) Turn ignition switch “OFF”.
2) Disconnect power transistor harness connector.
3) Check continuity between ignition coil harness connector terminal @ and power transistor harness connector terminal @.

CHECK GROUND CIRCUIT.
Check continuity between power transistor harness connector terminal @ and ground. Continuity should exist.

CHECK COMPONENTS.
Check ignition coil and power transistor.
(See page EF & EC-148.)

Reinstall any part removed.
Erase the self-diagnosis memory.
Perform driving test and then perform self-diagnosis again.

2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

INSPECTION END
**Diagnostic Procedure 7**

**ENGINE CONTROL UNIT (Code No. 31)**

**INSPECTION START**

1) Turn ignition switch "ON".
2) Erase the self-diagnosis memory.

Perform self-diagnosis again.

Does E.C.U. display Code No. 31 again?

- **Yes** Replace E.C.U.
- **No**

**INSPECTION END**
NOTE
Diagnostic Procedure 8
E.G.R. FUNCTION (Code No. 32) [Not self-diagnostic item (For non-California models)]

Component location

EF & EC-100
**TROUBLE DIAGNOSES**

**INSPECTION START**

**CHECK E.G.R. CONTROL VALVE OPERATION.**
1) Start engine and warm it up sufficiently.
2) Make sure E.G.R. control valve spring responds to your touch (use your fingers) and also when engine is raced.

**INSPECTION END**

**CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.**
1) Stop engine.
2) Disconnect vacuum hose connected to E.G.R. control valve and B.P.T. valve.
3) Start engine.
4) Make sure vacuum exists when racing engine.

**CHECK VACUUM HOSE.**
1) Stop engine.
2) Check vacuum hose for clogging, cracks, and proper connections.

**CHECK E.C.U. OUTPUT SIGNAL (Solenoid side).**
1) Start engine and warm it up sufficiently.
2) Check voltage between E.G.R. control solenoid valve harness connector terminal @ and ground.

<table>
<thead>
<tr>
<th>Engine condition</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle</td>
<td>Battery voltage</td>
</tr>
<tr>
<td>Racing</td>
<td>Temporarily drops to 0 - 1V</td>
</tr>
</tbody>
</table>

If N.G., check the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

**CHECK E.C.U. OUTPUT SIGNAL (E.C.U. side).**
Check voltage between E.C.U. harness connector terminal 105 and ground.

<table>
<thead>
<tr>
<th>Engine condition</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle</td>
<td>Battery voltage</td>
</tr>
<tr>
<td>Racing</td>
<td>Temporarily drops to 0 - 1V</td>
</tr>
</tbody>
</table>

If N.G., check the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

**CONNECT**

**EF & EC-101**
TROUBLE DIAGNOSES

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, -12.6±2.36 inHg)

Driving mode

- Vehicle driving
- Idling
- Ignition switch: OFF

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.

Check component
1. Stop engine.
2. Check E.G.R. control solenoid valve. (See page EF & EC-149.)

Check component.
Check E.G.R. control valve and B.P.T. valve. (See page EF & EC-148.)

O.K.

For California

O.K.

For non-California

N.G.

Valve spring may be stuck.
Clean if necessary.
If this does not correct trouble, replace E.G.R. control valve.

Check resistance of exhaust gas temperature sensor.
(See page EF & EC-149.)

Reinstall any part removed.

Erase the self-diagnosis memory.
Make sure Code No. 55 is displayed in Mode III.

Perform driving test under the following conditions.
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure F.

Make sure check engine light does not come "ON" during driving test.

Does not come "ON"

Perform self-diagnosis and find malfunction code. According to displayed code No., perform diagnosis.

INSPECTION END
Diagnostic Procedure 9

EXHAUST GAS SENSOR (Code No. 33)

Component location
TROUBLE DIAGNOSES

INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Make sure green inspection lamp on E.C.U. blinks at 2,000 rpm.
O.K.

B

CHECK EXHAUST GAS SENSOR CIRCUIT.
1) Stop engine.
2) Disconnect E.C.U. harness connector.
3) Disconnect exhaust gas sensor harness connector.
4) Connect a jumper wire from exhaust gas sensor harness connector to ground.
5) Check continuity between E.C.U. harness connector terminal and ground.
Continuity should exist.
O.K.

Replace exhaust gas sensor.

N.G.

Repair or replace harness.

Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

1) Start engine and warm it up sufficiently.
2) Set diagnosis mode to Mode I.
3) Make sure green inspection lamp on E.C.U. goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm.
O.K.

Perform IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATION INSPECTION. (See page EF & EC-26.)

INSPECTION END

EF & EC-105
Diagnostic Procedure 10

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35)

Component location

A/T model

M/T model
**TROUBLE DIAGNOSES**

**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 and ground under the following conditions.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>When vacuum is not applied to E.G.R. control valve</td>
<td>1.0 - 2.0V</td>
</tr>
<tr>
<td>When vacuum is applied to E.G.R. control valve</td>
<td>0 - 1.0V</td>
</tr>
</tbody>
</table>

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

**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 and . Continuity should exist.

**CHECK GROUND CIRCUIT.**
Check continuity between terminals and . Continuity should exist.

**EF & EC-107**
TROUBLE DIAGNOSES

CHECK COMPONENTS.
Check exhaust gas temperature sensor. (See page EF & EC-149.)

Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

Perform driving test, then perform self-diagnosis.

2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

INSPECTION END
Diagnostic Procedure 11

THROTTLE SENSOR (Code No. 43)

Component location

Throttle valve switch harness connector

Throttle sensor harness connector
TROUBLE DIAGNOSES

INSPECTION START

A
CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ① and ground.
Voltage: Approximately 5.0V

B
HARNESS CONTINUITY BETWEEN THROTTLE SENSOR HARNESS CONNECTOR AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect throttle sensor harness connector.
4) Check continuity between terminals ⑤ and ⑥.
   Continuity should exist.
   If N.G., repair or replace harness or connector.

C
CHECK INPUT SIGNAL (Throttle sensor side).
Make sure that voltage between terminal ③ and ground changes when accelerator pedal is depressed.
Voltage: Approximately 0.5 - 4.0V

D
CHECK INPUT SIGNAL (E.C.U. side).
Make sure that voltage between terminal ⑦ and ground changes when accelerator pedal is depressed.
Voltage: Approximately 0.5 - 4.0V

E
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF" and disconnect E.C.U. harness connector.
2) Disconnect throttle sensor harness connector.
3) Check continuity between terminal ① and E.C.U. terminals ⑤, ⑥.
   Continuity should exist.

EF & EC-111
TROUBLE DIAGNOSES

CHECK COMPONENT.
Check throttle sensor.
(See page EF & EC-149.)

F

CHECK IDLE SWITCH OFF → ON SPEED.
1) Reconnect throttle valve switch harness connector.
2) Disconnect idle switch harness connector.
3) Start and warm up engine sufficiently.
4) Check idle switch OFF → ON speed with circuit tester, closing throttle valve manually.

Idle switch OFF → ON speed:
M/T: 1,000±150 rpm
A/T: 1,000±150 rpm
("N" range)

SEF346H

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode III) again.

2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

INSPECTION END

N.G.

Replace throttle sensor.

N.G.

ADJUST IDLE SWITCH OFF → ON SPEED.
1) Loosen throttle sensor securing screws.
2) Set idle switch OFF → ON speed to the specified value by turning throttle sensor body.

O.K.

N.G.

N.G.

REPLACE THROTTLE SENSOR.

ADJUST IDLE SWITCH OFF → ON SPEED.
1) Loosen throttle sensor securing screws.
2) Set idle switch OFF → ON speed to the specified value by turning throttle sensor body.

O.K.

INSPECTION END

EF & EC-112
**Diagnostic Procedure 12**

**INSPECTION START**

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

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

Set diagnosis to Mode II and check that red and green inspection lamps on E.C.U. blink almost simultaneously at 2,000 rpm under no-load.

Check idle CO%. (See page EF & EC-26.)

1) Stop engine.
2) Remove all spark plugs from intake manifold. Are plugs wet with fuel?

Remove injector assembly. (See page EF & EC-154.) Keep all injectors connected to injector tube.

Turn ignition switch "ON". Make sure fuel does not drip from injector.

Replace the injectors where fuel is dripping from.

Do not drip

Yes

Replace the injector in which cylinder spark plug is wet with fuel.

No

Drips

Reinstall any part removed.

Stays off

Does not stay off

Check mixture ratio feedback system. (See page EF & EC-26.)

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

Check if the green inspection lamp stays off during 10 seconds at idle condition.

Does not run smoothly

Run smoothly

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

Set diagnosis to Mode II and check that red and green inspection lamps on E.C.U. blink almost simultaneously at 2,000 rpm under no-load.

Check idle CO%. (See page EF & EC-26.)

Does not drip

Reinstall any part removed.

Engine racing mode

A : 10 seconds or more

2,000 rpm

Idling

Ignition switch: OFF

Start engine and warm it up sufficiently.

Race engine revolution higher than 2,000 rpm under no-load.

Keep engine at idle speed for at least 10 seconds.

Repeat steps 2 through 3 at least 10 times.

Stop engine.

Remove all spark plugs from intake manifold. Are plugs wet with fuel?

Remove injector assembly. (See page EF & EC-154.) Keep all injectors connected to injector tube.

Turn ignition switch "ON". Make sure fuel does not drip from injector.

Replace the injector in which cylinder spark plug is wet with fuel.

Does not drip

Reinstall any part removed.

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

Set diagnosis to Mode II and check that red and green inspection lamps on E.C.U. blink almost simultaneously at 2,000 rpm under no-load.

Check idle CO%. (See page EF & EC-26.)

Drips

Replace the injectors where fuel is dripping from.

Run smoothly

Does not run smoothly

Yes

Replace the injector in which cylinder spark plug is wet with fuel.

Reinstall any part removed.

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

Run smoothly

Does not run smoothly

Set diagnosis to Mode II and check that red and green inspection lamps on E.C.U. blink almost simultaneously at 2,000 rpm under no-load.

Check idle CO%. (See page EF & EC-26.)

Drips

Replace the injectors where fuel is dripping from.

Run smoothly

Does not run smoothly

Set diagnosis to Mode II and check that red and green inspection lamps on E.C.U. blink almost simultaneously at 2,000 rpm under no-load.

Check idle CO%. (See page EF & EC-26.)

Drips

Replace the injectors where fuel is dripping from.
Erase the self-diagnosis memory by following the procedure.
1) Start engine and warm it up sufficiently.
2) First disconnect air flow meter connector, and start and run engine for at least 30 seconds at 2,000 rpm.
3) Stop engine and reconnect air flow meter connector.
4) Make sure Code No. 12 is displayed in Mode III.
5) Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

Perform engine racing by the use of indicated in figure B.

Make sure check engine light does not come "ON" during engine racing.

1) Perform self-diagnosis and find malfunction code.
2) According to displayed Code No., perform diagnosis.
3) If Code No. 45 is displayed again, replace all injectors, then perform diagnosis.
Diagnostic Procedure 13

IDLE SWITCH (Switch ON/OFF diagnostic item)
TROUBLE DIAGNOSES

INSPECTION START

Perform switch ON/OFF diagnosis (in Mode IV).

A  N.G.

CHECK E.C.U. INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Check voltage between throttle valve switch harness connector terminal @ and ground.

<table>
<thead>
<tr>
<th>Accelerator pedal condition</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully closed</td>
<td>Approximately 8 - 10V</td>
</tr>
<tr>
<td>Open</td>
<td>0V</td>
</tr>
</tbody>
</table>

B  N.G.

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect throttle valve switch harness connector.
3) Turn ignition switch "ON".
4) Check voltage terminal @ and ground.

Battery voltage should exist.

N.G.

CHECK COMPONENT.
Check idle switch.

N.G.

O.K.

ADJUST IDLE SWITCH.
(See page EF & EC-112.)

Perform switch ON/OFF diagnosis (in Mode IV).

N.G.

O.K.

INSPECTION END

O.K.

Repair or replace harness or connector between throttle valve switch harness connector terminal @ and E.C.U. harness connector terminal @.

O.K.

Check continuity of harness or connectors between throttle valve switch harness connector terminal @ and E.C.U. harness connector terminal @. If N.G., repair or replace them.

O.K.

Replace throttle valve sensor/sensor.

N.G.

Replace E.C.U.

EF & EC-117
TROUBLE DIAGNOSES

Diagnostic Procedure 14

START SIGNAL (Switch ON/OFF diagnostic item)

| E. C. C. S. CONTROL UNIT | FUSE BLOCK
|--------------------------|------------------
| (Refer to "POWER SUPPLY ROUTING" in EL section.) |

- FUSE (Refer to last page (Foldout page).)
- BATTERY

SEF214H
TROUBLE DIAGNOSES

INSPECTION START

Perform switch ON/OFF diagnosis (in Mode IV).

O.K.

INSPECTION END

N.G.

CHECK INPUT SIGNAL.
1) Turn ignition switch "START".
2) Check voltage between terminal 34 and ground.
   Battery voltage should exist.
   If N.G., repair harness and connectors.

O.K.

INSPECTION END

N.G.

Check the following items.
1) 'G' fusible link
2) Ignition switch
3) Middle harness connector
Diagnostic Procedure 15

FUEL PUMP (Not self-diagnostic item)

Component location

In the trunk room

Fuel pump harness connector

Fuel pump relay

EF & EC-120
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.

N.G.

B

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 ground. Battery voltage should exist.

N.G.

CHECK COMPONENTS.
1) Turn ignition "OFF".
2) Check fuel pump relay.
(See page EF & EC-149.) If N.G., replace fuel pump.

O.K.

C

CHECK HARNESS CONTINUITY BETWEEN BATTERY AND FUEL PUMP RELAY.
Check following.
- Harness or connectors
- "BR" fusible link

N.G.

D

CHECK GROUND CIRCUIT.
Check continuity between terminal @ and ground. Continuity should exist. If N.G., repair harness or connectors.

O.K.

CHECK HARNESS CONTINUITY BETWEEN BATTERY AND FUEL PUMP RELAY.
Check following.
- Harness or connectors
- "BR" fusible link

O.K.

CHECK HARNESS CONTINUITY BETWEEN RELAY CONNECTOR TERMINAL @ and FUEL PUMP HARNESS CONNECTOR TERMINAL @.

O.K.

EF & EC-121
1) Reconnect fuel pump harness connector and fuel pump relay.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. harness connector and ground.
   Battery voltage indication should appear after 5 seconds.

O.K.

INSPECTION END

CHECK HARNESS CONTINUITY.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check continuity between terminal and relay harness connector terminal.
   Continuity should exist.
   If N.G., repair or replace harness and connectors between terminals and.

O.K.

Recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.
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 @ and ground.
   Battery voltage should exist.

B

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

C

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 @ and ground.
   Voltage: 0.5 - 1.0V (for 3 minutes after starting)

D

CHECK HARNESS CONTINUITY BETWEEN P.R. CONTROL SOLENOID VALVE AND BATTERY.
Check following.
- Fuse
- Ignition switch
- Harness or connectors

E

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.
4) Check continuity between terminals @ and @.
   Continuity should exist.
   If N.G., repair harness or connector.

F

INSPECTION END

2) If N.G., recheck the E.C.U. pin terminal @ of E.C.U. harness connector.

EF & EC-125
Diagnostic Procedure 17

INJECTORS (Not self-diagnostic item)

Component location

Harness connector

Injector

EF & EC-126
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 (②) and ground.
   Battery voltage should exist.
   O.K.

B
CHECK OUTPUT SIGNAL.
1) Reconnect injector harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between E.C.U. terminals (①), (②), (③), (④) and ground.
   Battery voltage should exist.
   O.K.

C
CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND E.C.U.
1) Stop engine.
2) Disconnect injector harness connectors.
4) Check continuity between terminals (①) (No. 1) and (①), (②) (No. 2) and (③), (④) (No. 3) and (④) (No. 4) and (④).
   Continuity should exist.
   If N.G., repair harness or connector.
   O.K.

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND BATTERY.
Check following.
• “G” fusible link
• Harness

N.G.

Check components.
1) Turn ignition “OFF”.
2) Check injectors.
   (See page EF & EC-150.)
   O.K.

N.G.

Replace injectors.

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

EF & EC-127
Diagnostic Procedure 18

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

Component location
TROUBLE DIAGNOSES

INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect S.C.V. control solenoid valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal [5] and ground.
   Battery voltage should exist.

O.K.

CHECK COMPONENTS.
1) Turn ignition switch "OFF".
2) Check S.C.V. control solenoid valve. (See page EF & EC-149.)
   O.K.

CHECK OUTPUT SIGNAL.
1) Reconnect S.C.V. control solenoid valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between terminal [6] and ground.

<table>
<thead>
<tr>
<th>Engine speed</th>
<th>Voltage between terminal [6] and ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than approx. 1,400 rpm</td>
<td>0.5 - 1.0V</td>
</tr>
<tr>
<td>More than approx. 1,400 rpm</td>
<td>Battery voltage</td>
</tr>
</tbody>
</table>

O.K.

CHECK COMPONENT.
Check swirl control valve and actuator. (See page EF & EC-150.)

O.K.

N.G.

CHECK HARNESS CONTINUITY FOR POWER SOURCE.
Check following.
- "G" fusible link
- Ignition switch
- Harness

N.G.

CHECK HARNESS CONTINUITY BETWEEN SOLENOID AND E.C.U.
1) Stop engine.
3) Check continuity between terminals [6] and [7].
   Continuity should exist.
   If N.G., repair or replace harness or connector.

O.K.

   (Terminal [2])
2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

N.G.

Replace swirl control valve or actuator.

INSPECTION END

EF & EC-129
Diagnostic Procedure 19

AIR REGULATOR (Not self-diagnostic item)

Component location
TROUBLE DIAGNOSES

INSPECTION START

A

CHECK POWER SUPPLY
(Air regulator side).
1) Disconnect air regulator 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".

B

CHECK COMPONENTS.
1) Turn ignition "OFF".
2) Check fuel pump relay.
   (See page EF & EC-150.)
   If N.G. replace air regulator.

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 ground.
   Battery voltage should exist.

D

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

E

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check continuity between terminal @ and ground.
   Continuity should exist.
   If N.G., repair harness or connectors.

CHECK HARNESS CONTINUITY BETWEEN BATTERY AND FUEL PUMP RELAY.
Check following.
- Harness or connectors
- "BR" fusible link
- Fuse

N.G.

CHECK HARNESS CONTINUITY BETWEEN RELAY HARNESS CONNECTOR TERMINAL ① AND FUEL PUMP HARNESS CONNECTOR TERMINAL ②.

N.G.

Replace fuel pump relay.

N.G.

Repair or replace harness or connectors between terminals ① and ②.

O.K.

EF & EC-131
1) Reconnect fuel pump harness connector and fuel pump relay.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. harness connector (104) and ground.
   Battery voltage indication should appear after 5 seconds.

O.K.

INSPECTION END

CHECK HARNESS CONTINUITY.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check continuity between terminal (104) and relay harness connector terminal (3).
   Continuity should exist.
   If N.G., repair or replace harness and connectors between terminal (104) and (3).

O.K.

Recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.
NOTE
Diagnostic Procedure 20
AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnostic item)

Component location
TROUBLE DIAGNOSES

INSPECTION START

CHECK COMPONENTS.
Check A.A.C. valve.
(See page EF & EC-150.)

CHECK POWER SOURCE.
1) Disconnect A.A.C. valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ② and ground.
   Battery voltage should exist.
   If N.G., repair harness or connectors.

CHECK INPUT SIGNAL.
1) Turn ignition switch "OFF".
2) Reconnect A.A.C. valve harness connector.
3) Start engine and warm it up sufficiently.
4) Check voltage between terminal ⑥ and ground.
   Voltage:
   Approximately 7 - 10V

INSPECTION END

CHECK CONTINUITY BETWEEN A.A.C. VALVE AND BATTERY.
Check following:
- Fuse
- "G" fusible link
- Ignition switch
- Harness or connectors

CHECK CONTINUITY BETWEEN E.C.U. AND A.A.C. VALVE.
1) Stop engine.
2) Disconnect E.C.U. harness connector.
3) Disconnect A.A.C. valve harness connector.
4) Check continuity between terminals ⑬ and ⑫.
   Continuity should exist.
   If N.G., repair or replace harness connectors.

   (Terminal ⑬.)
2) If N.G. recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.
Diagnostic Procedure 21
I.A.A. CONTROL (F.I.C.D. CONTROL) (Not self-diagnostic item)

Component location

EF & EC-136
TROUBLE DIAGNOSES

INSPECTION START

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Does engine revolution rise when air conditioner switch is turned “ON”?

Yes

CHECK Idle SPEED WHEN
AIR CONDITIONER SWITCH
IS “ON”.
M/T: 1,000±50 rpm
A/T: 1,000±50 rpm
(at “N” range)
If out of specification, adjust idle speed.
(See page EF & EC-26.)

No

O.K.

INSPECTION END

CHECK POWER SOURCE.
1) Stop engine.
2) Disconnect F.I.C.D.
3) Turn ignition switch and air
4) Check voltage between terminal and ground.

N.G.

CHECK COMPONENTS.
Check F.I.C.D. solenoid valve.
(See page EF & EC-151.)
IF N.G., repair or replace F.I.C.D.

O.K.

CHECK GROUND CIRCUIT.
1) Turn ignition switch “OFF”.
2) Check continuity between terminal and ground.
Continuity should exist.
If N.G., repair harness or connectors.

N.G.

CHECK COMPONENTS.
1) Turn ignition switch “OFF”.
2) Check air conditioner relay.
(See HA section.)

O.K.

CHECK HARNESS CONTINuity BETWEEN BATTERY AND E.C.U.
Check following.
- Fuse
- Ignition switch
- Harness or connectors,

O.K.

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

O.K.

INSPECTION END
Diagnostic Procedure 22
AIR INDUCTION VALVE (A.I.V.) CONTROL SOLENOID VALVE (Not self-diagnostic item)
**TROUBLE DIAGNOSES**

**INSPECTION START**

**A**

**CHECK POWER SOURCE.**
1) Disconnect A.I.V. control solenoid valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal (2) and ground.

Voltage: Battery voltage

**B**

**CHECK COMPONENTS.**
1) Turn ignition switch "OFF".
2) Check A.I.V. control solenoid valve. (See page EF & EC-149.)

**C**

**CHECK OUTPUT SIGNAL.**
1) Reconnect A.I.V. control solenoid valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between terminal (3) and ground.

<table>
<thead>
<tr>
<th>Accelerator pedal position</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Released</td>
<td>0.5 - 1.0V</td>
</tr>
<tr>
<td>Depressed</td>
<td>Battery voltage</td>
</tr>
</tbody>
</table>

**CHECK COMPONENT.**
Check air induction valve. (See page EF & EC-151.)

**N.G.**

**CHECK HARNESS CONTINUITY BETWEEN A.I.V. CONTROL SOLENOID VALVE AND BATTERY.**
Check harness or connector.

**N.G.**

Replace A.I.V. control solenoid valve.

**C**

**CHECK HARNESS CONTINUITY BETWEEN A.I.V. CONTROL SOLENOID VALVE AND E.C.U.**
1) Stop engine.
2) Disconnect A.I.V. control solenoid valve harness connector.
4) Check continuity between terminals (2) and (102).

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

**N.G.**

2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Replace air induction valve.
Diagnostic Procedure 23
NEUTRAL SWITCH, INHIBITOR SWITCH AND INHIBITOR RELAY (Not self-diagnostic item)

- E.C.C.S. CONTROL UNIT
- IGNITION SWITCH ON or START
- FUSE BLOCK (Refer to "POWER SUPPLY ROUTING" in EL section)
- S.M.J. (Refer to last page (Foldout page))
- Main harness
- S.W.H. (Refer to last page (Foldout page))
- Engine room harness
- Engine room harness no. 2
- Body ground
- Neutral switch

A: A/T model
B: M/T model
C: A/T model with A.S.C.D.
D: A/T model without A.S.C.D.

DIAGNOSTIC
V
SEF350H
TROUBLE DIAGNOSES

INSPECTION START

CHECK COMPONENTS.
Check neutral switch (M/T) or inhibitor switch and inhibitor relay (A/T).
(See page EF & EC-152.)

O.K. (M/T)

CHECK POWER SUPPLY FOR INHIBITOR SWITCH.
1) Turn ignition switch "ON".
2) Check voltage between terminal @ and ground.
   Battery voltage should exist.

N.G.

CHECK CONTINUITY BETWEEN SWITCH AND GROUND.
M/T model
Check continuity between terminal @ and ground.
A/T model
1) Turn ignition switch "OFF".
2) Check continuity between terminals @, CD and ground.
   Continuity should exist.

O.K.

CHECK CONTINUITY BETWEEN SWITCH (M/T), RELAY (A/T) AND E.C.U.
M/T model
Check continuity between @ and @.
A/T model
Check continuity between inhibitor relay connector CD and @ @ and @. (A.S.C.D. model)
Continuity should exist.

O.K.

INSPECTION END

N.G.

Replace switch or relay.

O.K. (A/T)

Check the following.
- Harness continuity
- Fuse
- S.M.J.
If N.G., repair or replace.

Repair or replace harness or connector.

Repair or replace harness or connector.
## TROUBLE DIAGNOSES

### Electrical Components Inspection

**E.C.U. INPUT/OUTPUT SIGNAL INSPECTION**

**E.C.U. inspection table**

*Data are reference values.*

<table>
<thead>
<tr>
<th>TERMINAL NO.</th>
<th>ITEM</th>
<th>CONDITION</th>
<th>*DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ignition signal</td>
<td>Engine is running. Idle speed</td>
<td>0.3 - 0.6V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running. Engine speed is 2,000 rpm</td>
<td>1.2 - 1.5V</td>
</tr>
<tr>
<td>3</td>
<td>Ignition check</td>
<td>Engine is running. Idle speed</td>
<td>9 - 12V</td>
</tr>
<tr>
<td>4</td>
<td>E.C.C.S. relay (Main relay)</td>
<td>Engine is running. Ignition switch &quot;OFF&quot;</td>
<td>0 - 1V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Within approximately 1 second after turning ignition switch &quot;OFF&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch &quot;OFF&quot; For approximately 1 second after turning ignition switch &quot;OFF&quot;</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>8</td>
<td>Exhaust gas temperature sensor (Only for California model)</td>
<td>Engine is running. Idle speed</td>
<td>1.0 - 2.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running. E.G.R. system is operating.</td>
<td>0 - 1.0V</td>
</tr>
<tr>
<td>11</td>
<td>Air conditioner relay</td>
<td>Engine is running. Both A/C switch and blower switch are &quot;ON&quot;</td>
<td>0 - 1.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A/C switch is &quot;OFF&quot;</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>S.C.V. control solenoid valve</td>
<td>Engine is running. Idle speed</td>
<td>0 - 1.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running. Engine speed is 2,000 rpm.</td>
<td></td>
</tr>
</tbody>
</table>

**EF & EC-142**
<table>
<thead>
<tr>
<th>TERMINAL NO.</th>
<th>ITEM</th>
<th>CONDITION</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Air flow meter</td>
<td>Engine is running.</td>
<td>1.0 - 3.0V Output voltage varies with engine revolution.</td>
</tr>
<tr>
<td>18</td>
<td>Engine temperature sensor</td>
<td>Engine is running.</td>
<td>1.0 - 5.0V Output voltage varies with engine water temperature.</td>
</tr>
<tr>
<td>19</td>
<td>Exhaust gas sensor</td>
<td>Engine is running.</td>
<td>0 - Approximately 1.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After warming up sufficiently.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Throttle sensor</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>0.4 - Approximately 4V Output voltage varies with the throttle valve opening angle.</td>
</tr>
<tr>
<td>22/30</td>
<td>Crank angle sensor</td>
<td>Engine is running.</td>
<td>0.2 - 0.5V</td>
</tr>
<tr>
<td></td>
<td>(Reference signal)</td>
<td>Do not run engine at high speed under no-load.</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Throttle opening signal</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>0.3 - Approximately 3V</td>
</tr>
<tr>
<td>31/40</td>
<td>Crank angle sensor</td>
<td>Engine is running.</td>
<td>2.0 - 3.0V</td>
</tr>
<tr>
<td></td>
<td>(Position signal)</td>
<td>Do not run engine at high speed under no-load.</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Idle switch ( ⊗ side)</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>Approximately 9 - 10V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Throttle valve: idle position</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch &quot;ON&quot;</td>
<td>0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Throttle valve: Any position except idle position</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Start signal</td>
<td>Cranking</td>
<td>8 - 12V</td>
</tr>
<tr>
<td>35</td>
<td>Neutral switch &amp; Inhibitor switch</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neutral/Parking</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch &quot;ON&quot;</td>
<td>6 - 7V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Except the above gear position</td>
<td></td>
</tr>
</tbody>
</table>
# TROUBLE DIAGNOSES

## Electrical Components Inspection (Cont'd)

*Data are reference values.

<table>
<thead>
<tr>
<th>TERMINAL NO.</th>
<th>ITEM</th>
<th>CONDITION</th>
<th>*DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Ignition switch</td>
<td>Ignition switch “OFF”</td>
<td>0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch “ON”</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Throttle sensor power supply</td>
<td>Ignition switch “ON”</td>
<td>Approximately 5V</td>
</tr>
<tr>
<td>38</td>
<td>Power supply for E.C.U.</td>
<td>Ignition switch “ON”</td>
<td>BATTERY VOLTAGE</td>
</tr>
<tr>
<td>47</td>
<td></td>
<td></td>
<td>(11 - 14V)</td>
</tr>
<tr>
<td>41</td>
<td>Air conditioner switch</td>
<td>Engine is running</td>
<td>0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Both air conditioner switch and blower switch are “ON”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running</td>
<td>BATTERY VOLTAGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air conditioner switch is “OFF”.</td>
<td>(11 - 14V)</td>
</tr>
<tr>
<td>43</td>
<td>Power steering oil pressure switch</td>
<td>Engine is running</td>
<td>0.1 - 0.3V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steering wheel is being turned.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running</td>
<td>8 - 9V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steering wheel is not being turned.</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Idle switch (⊕ side)</td>
<td>Ignition switch “ON”</td>
<td>Approximately 9 - 10V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Throttle valve: idle position</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch “ON”</td>
<td>BATTERY VOLTAGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Throttle valve: Except idle position</td>
<td>(11 - 14V)</td>
</tr>
<tr>
<td>45</td>
<td>5th position switch (M/T models)</td>
<td>Ignition switch “ON”</td>
<td>0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gear is in 5th position.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch “ON”</td>
<td>6 - 8V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gear is except in 5th position.</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Power supply (Back-up)</td>
<td>Ignition switch “OFF”</td>
<td>BATTERY VOLTAGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(11 - 14V)</td>
</tr>
</tbody>
</table>
**TROUBLE DIAGNOSES**

**Electrical Components Inspection (Cont’d)**

*Data are reference values.*

<table>
<thead>
<tr>
<th>TERMINAL NO.</th>
<th>ITEM</th>
<th>CONDITION</th>
<th>*DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Injector No. 1</td>
<td>Engine is running.</td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>Injector No. 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>Injector No. 2</td>
<td>Engine is running.</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>112</td>
<td>Injector No. 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>A.I.V. control solenoid valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Fuel pump relay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>E.G.R. control solenoid valve</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Data are reference values.*

**EF & EC-145**
<table>
<thead>
<tr>
<th>TERMINAL NO.</th>
<th>ITEM</th>
<th>CONDITION</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>106</td>
<td>Pressure regulator control solenoid valve</td>
<td>Stop and restart engine after warming it up. Water temperature is above 90°C (194°F)</td>
<td>0 - 1.0V (for 3 minutes after ignition switch is turned off.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BATTERY VOLTAGE (After 3 minutes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stop and restart engine after warming it up. Water temperature is below 90°C (194°F)</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>113</td>
<td>A.A.C. valve</td>
<td>Engine is running. Idle speed</td>
<td>7 - 10V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running. Steering wheel is being turned. Air conditioner is operating. Rear defogger is &quot;ON&quot;. Headlamps are in high position.</td>
<td>4 - 7V</td>
</tr>
</tbody>
</table>

E.C.U. PIN CONNECTOR TERMINAL LAYOUT

```
[123456789017] 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
```

SEF419H
**TROUBLE DIAGNOSES**

**Electrical Components Inspection (Cont'd)**

**E.C.C.S. RELAY**
Check continuity between terminals ③ and ⑤.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V direct current supply between terminals ① and ②</td>
<td>Yes</td>
</tr>
<tr>
<td>No supply</td>
<td>No</td>
</tr>
</tbody>
</table>

**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 @④ and ground.
4. Visually check rotor plate for damage or dust.

**AIR FLOW METER**
- Visually check hot wire air passage for dust.

**ENGINE TEMPERATURE SENSOR**
Check engine temperature sensor resistance.

<table>
<thead>
<tr>
<th>Temperature °C (°F)</th>
<th>Resistance kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 (68)</td>
<td>2.1 - 2.9</td>
</tr>
<tr>
<td>80 (176)</td>
<td>0.30 - 0.33</td>
</tr>
</tbody>
</table>
**TROUBLE DIAGNOSES**

**Electrical Components Inspection (Cont’d)**

**IGNITION COIL**
Check ignition coil resistance.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-c</td>
<td>Approximately 0.7Ω</td>
</tr>
</tbody>
</table>

**POWER TRANSISTOR**
Check continuity between power transistor terminals.

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Tester polarity</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>+</td>
<td>No</td>
</tr>
<tr>
<td>b</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>b</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>+</td>
<td>No</td>
</tr>
<tr>
<td>c</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>c</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

**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.
**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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Air passage continuity between A and B</th>
<th>Air passage continuity between A and C</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V direct current supply between terminals ① and ②</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>No supply</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**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 ⑤ and ⑩ changes when opening throttle valve manually.

Resistance should change.

**FUEL PUMP**

Check continuity between terminals ① and ⑥.

Continuity should exist.
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

FUEL PUMP RELAY

Check continuity between terminals ① and ②.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V direct current supply between terminals ③ and ④</td>
<td>Yes</td>
</tr>
<tr>
<td>No supply</td>
<td>No</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Swirl control valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply vacuum to actuator</td>
<td>Close</td>
</tr>
<tr>
<td>No supply</td>
<td>Open</td>
</tr>
</tbody>
</table>

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
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.

<table>
<thead>
<tr>
<th>Accelerator pedal condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully closed</td>
<td>Yes</td>
</tr>
<tr>
<td>Open</td>
<td>No</td>
</tr>
</tbody>
</table>
**TROUBLE DIAGNOSES**

**Electrical Components Inspection (Cont'd)**

**NEUTRAL SWITCH**
- Check continuity between terminals ③ and ④.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift to Neutral</td>
<td>Yes</td>
</tr>
<tr>
<td>Shift to other position</td>
<td>No</td>
</tr>
</tbody>
</table>

**INHIBITOR SWITCH**
- Check continuity between terminals ③ and ④.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Continuity between terminals ③ and ④</th>
<th>Continuity between terminals ③ and ⑦</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift to &quot;P&quot; position</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Shift to &quot;N&quot; position</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Shift to positions other than &quot;P&quot; and &quot;N&quot;</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**INHIBITOR RELAY**
- Check continuity between terminals ⑦ and ⑩ (Without A.S.C.D.), ⑪ and ⑭ (With A.S.C.D.).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity between terminals ⑦ and ⑩ (Without A.S.C.D.), ⑪ and ⑭ (With A.S.C.D.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V direct current supply</td>
<td>Yes</td>
</tr>
<tr>
<td>between terminals ⑪ and ⑭</td>
<td>Yes</td>
</tr>
<tr>
<td>⑩ and ⑭ (Without A.S.C.D.)</td>
<td>Yes</td>
</tr>
<tr>
<td>No supply</td>
<td>No</td>
</tr>
</tbody>
</table>

EF & EC-152
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 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.
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:

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

IGNITION TIMING °B.T.D.C. 15±2

IDLE SPEED rpm

<table>
<thead>
<tr>
<th></th>
<th>M/T 750±50</th>
<th>A/T 750±50 (in &quot;N&quot; position)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Inspection and Adjustment

<table>
<thead>
<tr>
<th>ENGINE TEMPERATURE SENSOR</th>
<th>20°C (68°F)</th>
<th>80°C (176°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermistor resistance kΩ</td>
<td>2.1 - 2.9</td>
<td>0.30 - 0.33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IDLE SWITCH</th>
<th>Engine speed when idle switch is changed from &quot;OFF&quot; to &quot;ON&quot; rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/T</td>
<td>1,000±100</td>
</tr>
<tr>
<td>A/T</td>
<td>1,000±100</td>
</tr>
</tbody>
</table>

FUEL PRESSURE at idling (Measuring point: between fuel filter and fuel pipe)

<table>
<thead>
<tr>
<th>Vacuum hose is connected kPa (kg/cm², psi)</th>
<th>Approximately 226 (2.3, 33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum hose is disconnected kPa (kg/cm², psi)</td>
<td>Approximately 294 (3.0, 43)</td>
</tr>
</tbody>
</table>

FUEL INJECTOR

<table>
<thead>
<tr>
<th>Coil resistance Ω</th>
<th>Approximately 10 - 15</th>
</tr>
</thead>
</table>

AIR REGULATOR

<table>
<thead>
<tr>
<th>Resistance Ω</th>
<th>Approximately 75</th>
</tr>
</thead>
</table>

EXHAUST GAS TEMPERATURE SENSOR

<table>
<thead>
<tr>
<th>Thermistor resistance kΩ</th>
<th>100°C (212°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>85.3±8.53</td>
</tr>
</tbody>
</table>
CONTENTS

ENGINE CONTROL SYSTEM ........................................................................................................... FE-2
FUEL SYSTEM ............................................................................................................................ FE-3
EXHAUST SYSTEM .................................................................................................................... FE-4
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.
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.
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.
CONTENTS

PRECAUTIONS AND PREPARATION ................................................................. CL- 2
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**

- 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

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST20050010</td>
<td>Base plate</td>
<td>Inspecting diaphragm spring of clutch cover</td>
</tr>
<tr>
<td>ST20050100</td>
<td>Distance piece</td>
<td>Inspecting diaphragm spring of clutch cover</td>
</tr>
<tr>
<td>GG94310000</td>
<td>Flare nut torque wrench</td>
<td>Removing and installing each clutch piping</td>
</tr>
<tr>
<td>ST20600000</td>
<td>Clutch aligning bar</td>
<td>Installing clutch cover and clutch disc</td>
</tr>
<tr>
<td>ST20050240</td>
<td>Diaphragm spring adjusting wrench</td>
<td>Adjusting unevenness of diaphragm spring of clutch cover</td>
</tr>
</tbody>
</table>
### COMMERCIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing puller</td>
<td>Removing release bearing</td>
</tr>
<tr>
<td>Bearing drift</td>
<td>Installing release bearing</td>
</tr>
</tbody>
</table>

* a: 50 mm (1.97 in) dia.
N·m (kg·m, ft·lb)  
L: Apply lithium-based grease including molybdenum disulphide.
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.
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.

- Packing
  - Apply brake fluid when assembling.

- Valve stopper
  - 1.5 - 2.9 (0.15 - 0.3, 1.1 - 2.2)
  - Remove this stopper when removing piston and return spring.

- Rubber grease:
  - Apply rubber grease.
  - N·m (kg·m, ft·lb)

SCL348

SCL214

CL-7
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.

**SP** : Apply rubber grease,

**N-m (kg-m, ft-lb)**
CLUTCH RELEASE MECHANISM

- Apply lithium-based grease including molybdenum disulphide.

**REMOVAL AND INSTALLATION**

- Install retainer spring and holder spring.

- Remove release bearing.

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

LUBRICATION
- Apply recommended grease to contact surface and rubbing surface.
Too much lubricant might damage clutch disc facing.

Pack this recess

Apply lithium-based grease including molybdenum disulphide.
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.
### 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) |

### Inspections 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 - 0.078) |

*\(H^*\): Measured from surface of melt sheet to pedal pad

#### CLUTCH COVER

| Unit: mm (in) | Model | C225S |
| Full load | N (kg, lb) | 4,413 (460, 992) |

#### CLUTCH DISC

| Unit: mm (in) | 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) (550 kg, 1,213 lb) |

#### CLUTCH DISC

| 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) |
CONTENTS

PREPARATION .................................................................................................................. MT-2
ON-VEHICLE SERVICE .................................................................................................. MT-4
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
### SPECIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST23810001</td>
<td>Fixing adapter plate with gear assembly</td>
</tr>
<tr>
<td>Adapter setting plate</td>
<td></td>
</tr>
<tr>
<td>KV31100401</td>
<td>Pressing counter gear and mainshaft</td>
</tr>
<tr>
<td>Transmission press stand</td>
<td></td>
</tr>
<tr>
<td>ST22520000</td>
<td>Tightening mainshaft lock nut</td>
</tr>
<tr>
<td>(J26348) Wrench</td>
<td></td>
</tr>
<tr>
<td>ST23540000</td>
<td>Removing and installing fork rod retaining pin</td>
</tr>
<tr>
<td>(J25689-A) Pin punch</td>
<td></td>
</tr>
<tr>
<td>ST23860000</td>
<td>Installing counter drive gear</td>
</tr>
</tbody>
</table>
| Drift             | a: 36 mm (1.50 in) dia.  
|                   | b: 33 mm (1.30 in) dia.                                 |
| ST22360002        | Installing counter gear front and rear end bearings  |
| (J25679-01) Drift | a: 29 mm (1.14 in) dia.  
|                   | b: 23 mm (0.91 in) dia.                                 |
| ST22350000        | Installing O.D. gear bushing                         |
| (J25678-01) Drift | a: 34 mm (1.34 in) dia.  
|                   | b: 28 mm (1.10 in) dia.                                 |
| ST23800000        | Installing front cover oil seal                       |
| (J25691-01) Drift | a: 44 mm (1.73 in) dia.  
|                   | b: 31 mm (1.22 in) dia.                                 |
### PREPARATION

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST33400001</td>
<td>Installing rear oil seal</td>
</tr>
<tr>
<td>(J26082)</td>
<td>a: 60 mm (2.36 in) dia.</td>
</tr>
<tr>
<td>Drift</td>
<td>b: 47 mm (1.85 in) dia.</td>
</tr>
<tr>
<td>ST33290001</td>
<td>Removing rear oil seal</td>
</tr>
<tr>
<td>(J25810-A)</td>
<td>Puller</td>
</tr>
<tr>
<td>ST30720000</td>
<td>Installing mainshaft ball bearing</td>
</tr>
<tr>
<td>( )</td>
<td>a: 77 mm (3.03 in) dia.</td>
</tr>
<tr>
<td>Drift</td>
<td>b: 55.5 mm (2.185 in) dia.</td>
</tr>
<tr>
<td>ST30613000</td>
<td>Installing main drive gear bearing</td>
</tr>
<tr>
<td>(J25742-3)</td>
<td>a: 71.5 mm (2.815 in) dia.</td>
</tr>
<tr>
<td>Drift</td>
<td>b: 47.5 mm (1.870 in) dia.</td>
</tr>
<tr>
<td>ST33200000</td>
<td>Installing counter rear bearing</td>
</tr>
<tr>
<td>(J26082)</td>
<td>Installing 3rd &amp; 4th synchronizer assembly</td>
</tr>
<tr>
<td>Drift</td>
<td>a: 60 mm (2.36 in) dia.</td>
</tr>
<tr>
<td></td>
<td>b: 44.5 mm (1.752 in) dia.</td>
</tr>
</tbody>
</table>

### COMMERCIAL SERVICE TOOL

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puller</td>
<td>Removing counter bearings, counter drive and O.D. gears</td>
</tr>
</tbody>
</table>
Replacing Rear Oil Seal

REMOVAL

INSTALLATION

Check of Position Switch

BACK-UP LAMP SWITCH
- Check continuity.

<table>
<thead>
<tr>
<th>Gear position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse</td>
<td>Yes</td>
</tr>
<tr>
<td>Except reverse</td>
<td>No</td>
</tr>
</tbody>
</table>

NEUTRAL SWITCH
- Check continuity.

<table>
<thead>
<tr>
<th>Gear position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>Yes</td>
</tr>
<tr>
<td>Except neutral</td>
<td>No</td>
</tr>
</tbody>
</table>

O.D. SWITCH
- Check continuity.

<table>
<thead>
<tr>
<th>Gear position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5th</td>
<td>Yes</td>
</tr>
<tr>
<td>Except 5th</td>
<td>No</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Bolt No.</th>
<th>Tightening torque N·m (kg-m, ft-lb)</th>
<th>ℓ mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39 - 49 (4.0 - 5.0, 29 - 36)</td>
<td>70 (2.76)</td>
</tr>
<tr>
<td>2</td>
<td>39 - 49 (4.0 - 5.0, 29 - 36)</td>
<td>60 (2.36)</td>
</tr>
<tr>
<td>3</td>
<td>29 - 39 (3.0 - 4.0, 22 - 29)</td>
<td>30 (1.18)</td>
</tr>
<tr>
<td>4</td>
<td>39 - 49 (4.0 - 5.0, 29 - 36)</td>
<td>25 (0.98)</td>
</tr>
</tbody>
</table>

Gusset to engine
- 29 - 39 (3.0 - 4.0, 22 - 29) —
Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.
MAJOR OVERHAUL

Gear Components

Apply gear oil to gears, shafts, synchronizers, and bearings when assembling.

- Select with proper thickness.
- Pay attention to its direction.

SMT037B
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.
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.
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)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Standard</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>1.2 - 1.6</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td></td>
<td>(0.047 - 0.063)</td>
<td></td>
</tr>
<tr>
<td>3rd and main drive</td>
<td>1.2 - 1.4</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td></td>
<td>(0.047 - 0.055)</td>
<td></td>
</tr>
<tr>
<td>O.D.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

- Measure wear of 2nd baulk ring.
  a. Place baulk rings in position on synchronizer cone.
  b. While holding baulk rings against synchronizer cone as far as it will go, measure dimensions “A” and “B”

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Standard</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.6 - 1.1</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td></td>
<td>(0.024 - 0.043)</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0.7 - 0.9</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td></td>
<td>(0.028 - 0.035)</td>
<td></td>
</tr>
</tbody>
</table>

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.
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.
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.
   a. Install reverse idler gear to reverse idler shaft with spacers, snap rings and needle bearing.

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

c. Install O.D. gear bushing with Tool.

d. Install O.D. main gear and needle bearing.

e. 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.

f. Install washer, roller bearing, steel roller and thrust washer.

g. Tighten mainshaft lock nut temporarily.
   ● Always use new lock nut.

h. 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)
- Tighten countershaft lock nut.
- Always use new lock nut.

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
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.
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.
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.
### General Specifications

<table>
<thead>
<tr>
<th>Transmission model</th>
<th>FS5W71C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of speeds</td>
<td>5</td>
</tr>
<tr>
<td>Shift pattern</td>
<td>![Shift Pattern Diagram]</td>
</tr>
<tr>
<td></td>
<td><img src="https://via.placeholder.com/150" alt="" /></td>
</tr>
<tr>
<td>Synchromesh type</td>
<td>Warner</td>
</tr>
<tr>
<td>Gear ratio</td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>3.321</td>
</tr>
<tr>
<td>2nd</td>
<td>1.902</td>
</tr>
<tr>
<td>3rd</td>
<td>1.308</td>
</tr>
<tr>
<td>4th</td>
<td>1.000</td>
</tr>
<tr>
<td>O.D.</td>
<td>0.759</td>
</tr>
<tr>
<td>Reverse</td>
<td>3.382</td>
</tr>
<tr>
<td>Number of teeth</td>
<td></td>
</tr>
<tr>
<td>Mainshaft</td>
<td></td>
</tr>
<tr>
<td>Drive</td>
<td>22</td>
</tr>
<tr>
<td>1st</td>
<td>33</td>
</tr>
<tr>
<td>2nd</td>
<td>27</td>
</tr>
<tr>
<td>3rd</td>
<td>26</td>
</tr>
<tr>
<td>O.D.</td>
<td>21</td>
</tr>
<tr>
<td>Reverse</td>
<td>36</td>
</tr>
<tr>
<td>Countershaft</td>
<td></td>
</tr>
<tr>
<td>Drive</td>
<td>31</td>
</tr>
<tr>
<td>1st</td>
<td>14</td>
</tr>
<tr>
<td>2nd</td>
<td>20</td>
</tr>
<tr>
<td>3rd</td>
<td>28</td>
</tr>
<tr>
<td>O.D.</td>
<td>39</td>
</tr>
<tr>
<td>Reverse</td>
<td>15</td>
</tr>
<tr>
<td>Reverse idler gear</td>
<td>21</td>
</tr>
<tr>
<td>Oil capacity</td>
<td>£ (US pt, Imp pt)</td>
</tr>
<tr>
<td></td>
<td>2.4 (5-1/8, 4-1/4)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
</tr>
<tr>
<td>Sub-gear</td>
<td>○</td>
</tr>
<tr>
<td>Mainshaft braking mechanism</td>
<td>○</td>
</tr>
<tr>
<td>Double baulk ring type synchronizer</td>
<td>2nd synchronizer</td>
</tr>
</tbody>
</table>
## Gear End Play

<table>
<thead>
<tr>
<th>Gear</th>
<th>End play mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st gear</td>
<td>0.31 - 0.41 (0.0122 - 0.0161)</td>
</tr>
<tr>
<td>2nd gear</td>
<td>0.11 - 0.21 (0.0043 - 0.0083)</td>
</tr>
<tr>
<td>3rd gear</td>
<td>0.11 - 0.21 (0.0043 - 0.0083)</td>
</tr>
<tr>
<td>O.D. gear</td>
<td>0.24 - 0.41 (0.0094 - 0.0161)</td>
</tr>
</tbody>
</table>

### Clearance Between Baulk Ring and Gear

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

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Standard</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>1.2 - 1.6 (0.047 - 0.063)</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>3rd and main drive</td>
<td>1.2 - 1.6 (0.047 - 0.063)</td>
<td></td>
</tr>
<tr>
<td>O.D.</td>
<td>1.2 - 1.4 (0.047 - 0.055)</td>
<td></td>
</tr>
</tbody>
</table>

#### 2nd baulk ring

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer baulk ring</td>
</tr>
<tr>
<td>Inner baulk ring</td>
</tr>
</tbody>
</table>

### Available Snap Rings

#### Main drive gear bearing

<table>
<thead>
<tr>
<th>Allowable clearance</th>
<th>0 - 0.13 mm (0 - 0.0051 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness mm (in)</td>
<td>Part number</td>
</tr>
<tr>
<td>1.73 (0.0681)</td>
<td>32204-78005</td>
</tr>
<tr>
<td>1.80 (0.0709)</td>
<td>32204-78000</td>
</tr>
<tr>
<td>1.87 (0.0736)</td>
<td>32204-78001</td>
</tr>
<tr>
<td>1.94 (0.0764)</td>
<td>32204-78002</td>
</tr>
<tr>
<td>2.01 (0.0791)</td>
<td>32204-78003</td>
</tr>
<tr>
<td>2.08 (0.0819)</td>
<td>32204-78004</td>
</tr>
</tbody>
</table>

### Available Shims

#### Counter front bearing

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Standard</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.5 - 1.1 (0.024 - 0.043)</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td>B</td>
<td>0.7 - 0.9 (0.028 - 0.035)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thickness of shim</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.52 - 4.71 (0.1780 - 0.1854)</td>
<td>Not necessary</td>
</tr>
<tr>
<td>4.42 - 4.51 (0.1740 - 0.1776)</td>
<td>0.1 (0.004) 32218-V5000</td>
</tr>
<tr>
<td>4.32 - 4.41 (0.1701 - 0.1726)</td>
<td>0.2 (0.008) 32218-V5001</td>
</tr>
<tr>
<td>4.22 - 4.31 (0.1661 - 0.1697)</td>
<td>0.3 (0.012) 32218-V5002</td>
</tr>
<tr>
<td>4.12 - 4.21 (0.1622 - 0.1657)</td>
<td>0.4 (0.016) 32218-V5003</td>
</tr>
<tr>
<td>4.02 - 4.11 (0.1583 - 0.1618)</td>
<td>0.5 (0.020) 32218-V5004</td>
</tr>
<tr>
<td>3.92 - 4.01 (0.1543 - 0.1579)</td>
<td>0.6 (0.024) 32218-V5005</td>
</tr>
</tbody>
</table>

#### Counter drive gear

<table>
<thead>
<tr>
<th>Allowable clearance</th>
<th>0 - 0.18 mm (0 - 0.0071 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness mm (in)</td>
<td>Part number</td>
</tr>
<tr>
<td>1.4 (0.055)</td>
<td>32215-E90000</td>
</tr>
<tr>
<td>1.5 (0.059)</td>
<td>32215-E90001</td>
</tr>
<tr>
<td>1.6 (0.063)</td>
<td>32215-E90002</td>
</tr>
</tbody>
</table>

#### Mainshaft rear end bearing

<table>
<thead>
<tr>
<th>Allowable clearance</th>
<th>0 - 0.14 mm (0 - 0.0055 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness mm (in)</td>
<td>Part number</td>
</tr>
<tr>
<td>1.1 (0.043)</td>
<td>32228-20100</td>
</tr>
<tr>
<td>1.2 (0.047)</td>
<td>32228-20101</td>
</tr>
<tr>
<td>1.3 (0.051)</td>
<td>32228-20102</td>
</tr>
<tr>
<td>1.4 (0.055)</td>
<td>32228-20103</td>
</tr>
</tbody>
</table>

#### Mainshaft front

<table>
<thead>
<tr>
<th>Allowable clearance</th>
<th>0 - 0.18 mm (0 - 0.0071 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness mm (in)</td>
<td>Part number</td>
</tr>
<tr>
<td>2.4 (0.094)</td>
<td>32263-V5200</td>
</tr>
<tr>
<td>2.5 (0.098)</td>
<td>32263-V5201</td>
</tr>
<tr>
<td>2.6 (0.102)</td>
<td>32263-V5202</td>
</tr>
</tbody>
</table>
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

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".
<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST25055001 (J25695-A)</td>
<td>Measuring line pressure</td>
</tr>
<tr>
<td>Oil pressure gauge set</td>
<td></td>
</tr>
<tr>
<td>1   ST25051001 ( - )</td>
<td></td>
</tr>
<tr>
<td>Oil pressure gauge</td>
<td></td>
</tr>
<tr>
<td>2   ST25052000 ( - )</td>
<td></td>
</tr>
<tr>
<td>Hose</td>
<td></td>
</tr>
<tr>
<td>3   ST25053000 ( - )</td>
<td></td>
</tr>
<tr>
<td>Joint pipe</td>
<td></td>
</tr>
<tr>
<td>4   ST25054000 ( - )</td>
<td></td>
</tr>
<tr>
<td>Adapter</td>
<td></td>
</tr>
<tr>
<td>5   ST25055000 ( - )</td>
<td></td>
</tr>
<tr>
<td>Adapter</td>
<td></td>
</tr>
<tr>
<td>ST07870000 (J37068)</td>
<td>Disassembling and assembling A/T</td>
</tr>
<tr>
<td>Transmission case stand</td>
<td></td>
</tr>
<tr>
<td>KV31102100 (J37065)</td>
<td>Checking one-way clutch in torque converter</td>
</tr>
<tr>
<td>Torque converter one-way clutch check tool</td>
<td></td>
</tr>
<tr>
<td>ST25850000 (J25721-A)</td>
<td>Removing oil pump assembly</td>
</tr>
<tr>
<td>Sliding hammer</td>
<td></td>
</tr>
<tr>
<td>KV31102400 (J34285 and J34285-87)</td>
<td>Removing and installing clutch return springs</td>
</tr>
<tr>
<td>Clutch spring compressor</td>
<td></td>
</tr>
<tr>
<td>ST33200000 (J37067)</td>
<td>Installing oil pump housing oil seal</td>
</tr>
<tr>
<td>Drift</td>
<td></td>
</tr>
<tr>
<td>a: 60 mm (2.36 in) dia.</td>
<td>Installing rear oil seal</td>
</tr>
<tr>
<td>b: 44.5 mm (1.752 in) dia.</td>
<td></td>
</tr>
<tr>
<td>Shim setting gauge set</td>
<td>Selecting oil pump cover bearing race and oil pump thrust washer</td>
</tr>
<tr>
<td>(J34291)</td>
<td></td>
</tr>
</tbody>
</table>
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.
**Mechanical Operation**

<table>
<thead>
<tr>
<th>Shift position</th>
<th>Reverse clutch</th>
<th>High clutch</th>
<th>Forward clutch</th>
<th>Overrun clutch</th>
<th>2nd apply</th>
<th>3rd release</th>
<th>4th apply</th>
<th>Forward one-way clutch</th>
<th>Low one-way clutch</th>
<th>Low &amp; reverse brake</th>
<th>Lock-up</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PARK</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>REVERSE</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEUTRAL</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*4 1st</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Automatic shift 1 → 2 → 3 → 4</td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Automatic shift 1 → 2</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*4 1st</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Locks (held stationary) in 1st speed 1 → 2</td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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.
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.

<table>
<thead>
<tr>
<th>Bolt symbol</th>
<th>Length mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>37 (1.46)</td>
</tr>
<tr>
<td>B</td>
<td>50 (1.97)</td>
</tr>
</tbody>
</table>

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.
   • Apply A.T.F. before installing.
4. Reinstall any part removed.

Parking Components Inspection
1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear engine mounting member from A/T assembly.
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:
   \[ \text{\(7\):} \ 11 - 15 \text{ 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.
TROUBLE DIAGNOSES

Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair .................................................. AT-13
Preliminary Check .................................................................................................................................. AT-14
A/T Electrical Parts Location .................................................................................................................. AT-25
Circuit Diagram for Quick Pin Point Check .......................................................................................... AT-27
Wiring Diagram ........................................................................................................................................ AT-28
Self-diagnosis ........................................................................................................................................... AT-30

SELF-DIAGNOSTIC PROCEDURE ........................................................................................................ AT-30
JUDGEMENT OF SELF-DIAGNOSIS CODE ......................................................................................... AT-32
REvolution SENSOR CIRCUIT CHECK ............................................................................................... AT-36
SPEED SENSOR CIRCUIT CHECK ......................................................................................................... AT-36
THROTTLE SENSOR CIRCUIT CHECK ................................................................................................ AT-37
SHIFT SOLENOID A CIRCUIT CHECK ...................................................................................................... AT-38
SHIFT SOLENOID B CIRCUIT CHECK ...................................................................................................... AT-39
OVERRUN CLUTCH CIRCUIT CHECK .................................................................................................. AT-40
LOCK-UP SOLENOID CIRCUIT CHECK ................................................................................................. AT-41
FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT .................................................. AT-42
POWER SOURCE CIRCUIT CHECKS .................................................................................................... AT-43
ENGINE REVOLUTION SIGNAL CIRCUIT CHECK ............................................................................. AT-43
LINE PRESSURE SOLENOID CIRCUIT CHECK ...................................................................................... AT-44
INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS ................................. AT-45

Diagnostic Procedure 1
(SYMPTOM: O.D. OFF indicator lamp does not come on for about 2 seconds
turning ignition switch to "ON".) ........................................................................................................ AT-47

Diagnostic Procedure 2
(SYMPTOM: Engine cannot be started with selector lever in "P" or "N" range or
eight can be started with selector lever in "D", "2", "1" or "R" range.) .............................................. AT-48

Diagnostic Procedure 3
(SYMPTOM: Vehicle moves when it is pushed forward or backward
with selector lever in "P" range.) ........................................................................................................ AT-48

Diagnostic Procedure 4
(SYMPTOM: Vehicle moves forward when setting "N" range.) ............................................................ AT-49

Diagnostic Procedure 5
(SYMPTOM: There is large shock when changing from "N" to "R" range.) .......................................... AT-50

Diagnostic Procedure 6
(SYMPTOM: Vehicle does not creep backward when selecting "R" range.) .................................... AT-51

Diagnostic Procedure 7
(SYMPTOM: Vehicle does not creep forward when selecting "D", "2" and "1" range.) .................... AT-52

Diagnostic Procedure 8
(SYMPTOM: Vehicle cannot be started from D1 on Cruise test—Part 1.) ........................................ AT-53

Diagnostic Procedure 9
(SYMPTOM: A/T does not shift from D1 to D2 at specified speed.
A/T does not shift from D1 to D2 when depressing accelerator pedal fully at
the specified speed.) ........................................................................................................................ AT-54

Diagnostic Procedure 10
(SYMPTOM: A/T does not shift from D2 to D1 at the specified speed.) ........................................ AT-55

Diagnostic Procedure 11
(SYMPTOM: A/T does not shift from D2 to D1 at the specified speed.) ........................................ AT-56

Diagnostic Procedure 12
(SYMPTOM: A/T does not perform lock-up at the specified speed.) ................................................. AT-57

Diagnostic Procedure 13
(SYMPTOM: A/T does not hold lock-up condition for more than 30 seconds.) ............................. AT-58

Diagnostic Procedure 14
(SYMPTOM: Lock-up is not released when accelerator pedal is released.) .................................. AT-58
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.) AT-59

Diagnostic Procedure 16
(SYMPTOM: Vehicle does not start from D1 on Cruise test — Part 2.) AT-60

Diagnostic Procedure 17
(SYMPTOM: Vehicle does not shift from D3 on D2 when changing overdrive switch to "OFF" position.) AT-60

Diagnostic Procedure 18
(SYMPTOM: A/T does not shift from D3 on D2 when changing selector lever from "D" to "2" range.) AT-61

Diagnostic Procedure 19
(SYMPTOM: Vehicle does not shift from 2 to 1 when changing selector lever from "2" to "1" range.) AT-61

Diagnostic Procedure 20
(SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 2 (11) to 1.) AT-61

Electrical Components Inspection
AT-62

Final Check
AT-68

Symptom Chart
AT-72

A/T Shift Lock System
AT-75

SHIFT LOCK SYSTEM ELECTRICAL PARTS LOCATION
AT-75

CIRCUIT DIAGRAM FOR QUICK PIN POINT CHECK
AT-76

WIRING DIAGRAM
AT-77

DIAGNOSTIC PROCEDURE 1
(SYMPTOM: Selector lever cannot be moved from "P" range when applying brake pedal or can be moved when releasing brake pedal.) AT-78

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"). AT-80

SHIFT LOCK CONTROL UNIT INSPECTION
AT-82

SHIFT LOCK CONTROL UNIT INSPECTION TABLE
AT-83

COMPONENT CHECK
AT-84
How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW

1. CHECK IN
2. LISTEN TO CUSTOMER COMPLAINTS.
3. CHECK A/T FLUID LEVEL AND CONDITION.
4. PERFORM ROAD TESTING.
5. PERFORM SELF-DIAGNOSIS.
6. INSPECT MALFUNCTION ON THE BASIS OF EACH COMPONENT'S CONDITION.
7. REPAIR/REPLACE.
   - N.G.
   - FINAL CHECK
     - O.K.
8. CHECK OUT

- Reference item
- A/T FLUID CHECK (See page AT-14.)
- ROAD TESTING (See page AT-15.)
- Self-diagnosis (See page AT-30.)
- Self-diagnosis (See page AT-30.)
- Diagnostic Procedure (See page AT-47.)
- Symptom Chart (See page AT-72.)
- Final Check (See page AT-68.)
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

<table>
<thead>
<tr>
<th>Fluid color</th>
<th>Suspected problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark or black with burned odor</td>
<td>Wear of frictional material</td>
</tr>
<tr>
<td>Milky pink</td>
<td>Water contamination&lt;br&gt;— Road water entering through filler tube or breather</td>
</tr>
<tr>
<td>Varnished fluid, light to dark brown and tacky</td>
<td>Oxidation&lt;br&gt;— Over or under filling&lt;br&gt;— Overheating</td>
</tr>
</tbody>
</table>

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”.

ROAD TEST PROCEDURE

1. Check before engine is started.
2. Check at idle.
3. Cruise test.
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?
   - Yes
     - Does O.D. OFF indicator lamp flicker for about 8 seconds?
       - Yes
         - Perform self-diagnosis.
         - Refer to SELF-DIAGNOSIS PROCEDURE.
       - No
         - Perform self-diagnosis.
         - Refer to SELF-DIAGNOSIS PROCEDURE and note N.G. items.
   - No
     - Go to Diagnostic Procedure 1.

Go to “ROAD TESTING”
- 2. Check at idle”.
Preliminary Check (Cont’d)

2. Check at idle

1. Park vehicle on flat surface.

2. Move selector lever to "P" or "N" range.

Is engine started?  
- Yes  
  Go to Diagnostic Procedure 2.

  No  
  Go to Diagnostic Procedure 2.

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

Is engine started?  
- Yes  
  Go to Diagnostic Procedure 2.

  No  
  Go to Diagnostic Procedure 2.

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
Preliminary Check (Cont’d)

6 Move selector lever to “N” range.

7 Does vehicle move forward or backward?
   No Apply foot brake.
   Move selector lever to “R” range.
   Is there large shock when changing from “N” to “R” range?
   No Release foot brake for several seconds.
   Does vehicle creep backward when foot brake is released?
   No Go to Diagnostic Procedure 6.
   Yes Move selector lever to “D”, “1” and “2” range and check if vehicle creeps forward.
   Does vehicle creep forward in all three ranges?
   No Go to Diagnostic Procedure 7.
   Yes Go to Cruise test.

AT-18
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)

2. Park vehicle on flat surface.

3. Set overdrive switch to “ON” position.

4. Move selector lever to “P” range.

5. Move selector lever to “D” range.

6. Accelerate vehicle by constantly depressing accelerator pedal halfway.

7. Does vehicle start from D₁?
   - Yes → Go to Diagnostic Procedure 8.
   - No → Go to Diagnostic Procedure 8.
Preliminary Check (Cont'd)

6. Does A/T shift from D₁ to D₂ at the specified speed?
   Specified speed when shifting from D₁ to D₂:
   Refer to Shift schedule.
   Yes → Go to Diagnostic Procedure 9.
   No → Go to Diagnostic Procedure 10.

7. Does A/T shift from D₂ to D₃ at the specified speed?
   Specified speed when shifting from D₂ to D₃:
   Refer to Shift schedule.
   Yes → Go to Diagnostic Procedure 11.
   No → Go to Diagnostic Procedure 12.

8. Does A/T shift from D₃ to D₄ at the specified speed?
   Specified speed when shifting from D₃ to D₄:
   Refer to Shift schedule.
   Yes → Go to Diagnostic Procedure 13.
   No → Go to Diagnostic Procedure 14.

9. Does A/T perform lock-up at the specified speed?
   Specified speed when lock-up occurs:
   Refer to Shift schedule.
   Yes → Go to Diagnostic Procedure 15.
   No → Go to Diagnostic Procedure 16.

11. Is lock-up released when accelerator pedal is released?
    Yes → Go to Diagnostic Procedure 17.
    No → Go to Diagnostic Procedure 18.

12. Decelerate vehicle by applying foot brake lightly.
13. Does engine speed return to idle smoothly when A/T is shifted from D₄ to D₃?
    Yes → Stop vehicle.
    No → Go to "Cruise test — Part 2".
TROUBLE DIAGNOSES

Preliminary Check (Cont'd)
Cruise test – Part 2

1. Confirm overdrive switch is in "ON" position.
2. Confirm selector lever is in "D" range.
3. Accelerate vehicle by half throttle again.
4. Does vehicle start from D₁?
   - Yes
   - No Go to Diagnostic Procedure 16.
5. Accelerate vehicle to A km/h as shown in illustration.
6. Release accelerator pedal and then quickly depress it fully.
7. Does A/T shift from D₄ to D₂ as soon as accelerator pedal is depressed fully?
   - Yes
   - No Go to Diagnostic Procedure 9.
8. Does A/T shift from D₂ to D₃ at the specified speed?
   - Yes
   - No Go to Diagnostic Procedure 10.
9. Specified speed when shifting from D₂ to D₃:
   - Refer to Shift schedule.
10. Release accelerator pedal after shifting from D₂ to D₃.
11. Does A/T shift from D₃ to D₄ and does vehicle decelerate by engine brake?
   - Yes
   - No Go to Diagnostic Procedure 11.
12. Stop vehicle.
13. Go to "Cruise test – Part 3".
TROUBLE DIAGNOSES

Preliminary Check (Cont’d)
Cruise test – Part 3

1. Confirm overdrive switch is in “ON” position.
2. Confirm selector lever is in “D” range.
3. Accelerate vehicle using half-throttle to D₄.
4. Release accelerator pedal.
5. Set overdrive switch to “OFF” position while driving in D₄ range.
6. Does A/T shift from D₄ to D₃? No → Go to Diagnostic Procedure 17.
7. Yes → Go to Diagnostic Procedure 15.
9. Yes → Go to Diagnostic Procedure 15.
10. Move selector lever from “D” to “2” range while driving in D₃.
11. Does A/T shift from D₃ to 2? No → Go to Diagnostic Procedure 19.
12. Yes → Go to Diagnostic Procedure 20.
14. Yes → Go to Diagnostic Procedure 15.
15. Move selector lever from “2” to “1” range while driving in 2.
17. Yes → Go to Diagnostic Procedure 20.
18. Does vehicle decelerate by engine brake? No → Go to Diagnostic Procedure 15.
19. Yes → Go to Diagnostic Procedure 15.
20. Stop vehicle.
21. Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.
## TROUBLE DIAGNOSES

### Preliminary Check (Cont'd)

### Vehicle speed when shifting gears

<table>
<thead>
<tr>
<th>Throttle position</th>
<th>O.D. switch [-][Shift range]</th>
<th>D₁ → D₂</th>
<th>D₂ → D₃</th>
<th>D₃ → D₄</th>
<th>D₄ → D₅</th>
<th>D₅ → D₆</th>
<th>D₆ → D₇</th>
<th>D₇ → D₈</th>
<th>1₁ → 1₈</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full throttle</td>
<td></td>
<td>52 - 56</td>
<td>95 - 101</td>
<td>146 - 156</td>
<td>140 - 150</td>
<td>89 - 95</td>
<td>40 - 44</td>
<td>53 - 57</td>
<td></td>
</tr>
<tr>
<td>Half throttle</td>
<td></td>
<td>38 - 42</td>
<td>72 - 78</td>
<td>111 - 121</td>
<td>56 - 65</td>
<td>33 - 39</td>
<td>10 - 14</td>
<td>63 - 57</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(24 - 26)</td>
<td>(45 - 48)</td>
<td>(69 - 75)</td>
<td>(34 - 40)</td>
<td>(21 - 24)</td>
<td>(6 - 9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Vehicle speed when performing and releasing lock-up

<table>
<thead>
<tr>
<th>Throttle position</th>
<th>O.D. switch [-][Shift range]</th>
<th>Lock-up &quot;ON&quot;</th>
<th>Lock-up &quot;OFF&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full throttle</td>
<td></td>
<td>146 - 156</td>
<td>140 - 150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(91 - 97)</td>
<td>(87 - 93)</td>
</tr>
<tr>
<td></td>
<td>OFF [D₅]</td>
<td>95 - 101</td>
<td>89 - 95</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(59 - 63)</td>
<td>(55 - 59)</td>
</tr>
<tr>
<td>Half throttle</td>
<td>ON [D₄]</td>
<td>112 - 120</td>
<td>102 - 110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(70 - 75)</td>
<td>(63 - 68)</td>
</tr>
<tr>
<td></td>
<td>OFF [D₃]</td>
<td>76 - 84</td>
<td>71 - 79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(47 - 52)</td>
<td>(44 - 49)</td>
</tr>
</tbody>
</table>
Shift schedule (Overdrive ON)

Shift schedule (Overdrive OFF)
TROUBLE DIAGNOSES

A/T Electrical Parts Location

- Throttle sensor and throttle valve switch
- Control valve (upper body)
- O.D. OFF indicator lamp
- A/T control unit
- Overdrive switch
- Dropping resistor
- Line pressure solenoid
- Shift solenoid B
- Shift solenoid A
- Overrun clutch solenoid
- Lock-up solenoid
- Fluid temperature sensor
- Revolution sensor
- Control valve (lower body)
- Inhibitor switch
Circuit Diagram for Quick Pin Point Check

TROUBLE DIAGNOSES

AT-27
Self-diagnosis

SELF-DIAGNOSTIC PROCEDURE

1. **DIAGNOSIS START**
   - Start engine and warm it up to normal engine operating temperature.

2. **Set overdrive switch in "ON" position.**
3. **Move selector lever to "P" range.**

   - **Does O.D. OFF indicator lamp come on for about 2 seconds?**
     - **Yes**
       - Go to Diagnostic Procedure 1.
     - **No**

4. **Move selector lever to "D" range.**
5. **Set overdrive switch in "OFF" position.**

   - Wait for more than 2 seconds after ignition switch "ON".

6. **Move selector lever to "2" range.**
7. **Set overdrive switch in "ON" position.**

   - Move selector lever to "1" range.
8. **Set overdrive switch in "OFF" position.**
9. **Depress accelerator pedal fully and release it.**

---

AT-30
Self-diagnosis (Cont'd)

A

Set overdrive switch in "ON" position.

Check O.D. OFF indicator lamp.
Refer to JUDGEMENT OF SELF-DIAGNOSIS CODE on next page.

DIAGNOSIS END
## JUDGEMENT OF SELF-DIAGNOSIS CODE

<table>
<thead>
<tr>
<th>O/D, OFF indicator lamp:</th>
<th>Damaged circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>All judgement flickers are same.</td>
<td>All circuits that can be confirmed by self-diagnosis are O.K.</td>
</tr>
<tr>
<td><img src="image" alt="Self-diagnosis start" /></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="1st judgement flicker" /></td>
<td>Revolution sensor circuit is short-circuited or disconnected.</td>
</tr>
<tr>
<td><img src="image" alt="2nd judgement flicker" /></td>
<td>Speed sensor circuit is short-circuited or disconnected.</td>
</tr>
<tr>
<td><img src="image" alt="3rd judgement flicker" /></td>
<td>Throttle sensor circuit is short-circuited or disconnected.</td>
</tr>
</tbody>
</table>

\[ t_1 = 2.5 \text{ seconds} \quad t_2 = 2.0 \text{ seconds} \quad t_3 = 1.0 \text{ second} \]
## TROUBLE DIAGNOSES

### Self-diagnosis (Cont'd)

<table>
<thead>
<tr>
<th>O.D. OFF indicator lamp:</th>
<th>Damaged circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4th judgement flicker is longer than others.</strong></td>
<td>Shift solenoid A circuit is short-circuited or disconnected.</td>
</tr>
<tr>
<td><img src="image" alt="O/D OFF" /></td>
<td><img src="image" alt="Shift solenoid A" /></td>
</tr>
<tr>
<td><img src="image" alt="Self-diagnosis start" /></td>
<td><img src="image" alt="Terminal cord assembly" /></td>
</tr>
<tr>
<td><img src="image" alt="Light Shade" /></td>
<td><img src="image" alt="A/T control unit" /></td>
</tr>
<tr>
<td><img src="image" alt="SAT727B" /></td>
<td><img src="image" alt="Go to SHIFT SOLENOID A CIRCUIT CHECK." /></td>
</tr>
<tr>
<td><strong>5th judgement flicker is longer than others.</strong></td>
<td>Shift solenoid B circuit is short-circuited or disconnected.</td>
</tr>
<tr>
<td><img src="image" alt="O/D OFF" /></td>
<td><img src="image" alt="Shift solenoid B" /></td>
</tr>
<tr>
<td><img src="image" alt="Light Shade" /></td>
<td><img src="image" alt="Terminal cord assembly" /></td>
</tr>
<tr>
<td><img src="image" alt="A/T control unit" /></td>
<td><img src="image" alt="Go to SHIFT SOLENOID B CIRCUIT CHECK." /></td>
</tr>
<tr>
<td><strong>6th judgement flicker is longer than others.</strong></td>
<td>Overrun clutch solenoid circuit is short-circuited or disconnected.</td>
</tr>
<tr>
<td><img src="image" alt="O/D OFF" /></td>
<td><img src="image" alt="Overrun clutch solenoid" /></td>
</tr>
<tr>
<td><img src="image" alt="Light Shade" /></td>
<td><img src="image" alt="Terminal cord assembly" /></td>
</tr>
<tr>
<td><img src="image" alt="A/T control unit" /></td>
<td><img src="image" alt="Go to OVERRUN CLUTCH SOLENOID CIRCUIT CHECK." /></td>
</tr>
<tr>
<td><strong>7th judgement flicker is longer than others.</strong></td>
<td>Lock-up solenoid circuit is short-circuited or disconnected.</td>
</tr>
<tr>
<td><img src="image" alt="O/D OFF" /></td>
<td><img src="image" alt="Lock-up solenoid" /></td>
</tr>
<tr>
<td><img src="image" alt="Light Shade" /></td>
<td><img src="image" alt="Terminal cord assembly" /></td>
</tr>
<tr>
<td><img src="image" alt="A/T control unit" /></td>
<td><img src="image" alt="Go to LOCK-UP SOLENOID CIRCUIT CHECK." /></td>
</tr>
</tbody>
</table>

**AT-33**
## TROUBLE DIAGNOSES

### Self-diagnosis (Cont'd)

### O.D. OFF indicator lamp:

<table>
<thead>
<tr>
<th>8th judgement flicker is longer than others.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O/D OFF</strong></td>
</tr>
<tr>
<td><strong>Light</strong></td>
</tr>
<tr>
<td><strong>Shade</strong></td>
</tr>
</tbody>
</table>

### Damaged circuit:

- Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.

### Diagram:

![Diagram of fluid temperature sensor circuit and A/T control unit power source circuit check.]

Go to **FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECK.**

<table>
<thead>
<tr>
<th>9th judgement flicker is longer than others.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O/D OFF</strong></td>
</tr>
<tr>
<td><strong>Light</strong></td>
</tr>
<tr>
<td><strong>Shade</strong></td>
</tr>
</tbody>
</table>

### Diagram:

![Diagram of engine revolution signal circuit.]

Go to **ENGINE REVOLUTION SIGNAL CIRCUIT CHECK.**

<table>
<thead>
<tr>
<th>10th judgement flicker is longer than others.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O/D OFF</strong></td>
</tr>
<tr>
<td><strong>Light</strong></td>
</tr>
<tr>
<td><strong>Shade</strong></td>
</tr>
</tbody>
</table>

### Diagram:

![Diagram of line pressure solenoid circuit.]

Go to **LINE PRESSURE SOLENOID CIRCUIT CHECK.**

<table>
<thead>
<tr>
<th>Flickers as shown below:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O/D OFF</strong></td>
</tr>
<tr>
<td><strong>Light</strong></td>
</tr>
<tr>
<td><strong>Shade</strong></td>
</tr>
</tbody>
</table>

### Diagram:

![Diagram of battery power.]

- Battery power is low.
- Battery has been disconnected for a long time.
- Battery is connected incorrectly.
  (When reconnecting A/T control unit connectors. — This is not a problem.)

\[ t_4 = 1.0 \text{ second} \]
**TROUBLE DIAGNOSES**

**Self-diagnosis (Cont’d)**

<table>
<thead>
<tr>
<th>O.D. OFF indicator lamp:</th>
<th>Damaged circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Does not come on.</strong></td>
<td>Inhibitor switch, overdrive switch, kickdown switch or idle switch circuit is disconnected or A/T control unit is damaged.</td>
</tr>
<tr>
<td>O/D OFF</td>
<td></td>
</tr>
<tr>
<td>Self-diagnosis start</td>
<td>Ignition switch</td>
</tr>
<tr>
<td></td>
<td>E.C.U.</td>
</tr>
<tr>
<td>Light</td>
<td>Fuse</td>
</tr>
<tr>
<td>Shade</td>
<td>Throttle valve switch</td>
</tr>
<tr>
<td></td>
<td>(Full throttle switch)</td>
</tr>
<tr>
<td></td>
<td>(Idle switch)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>26 19 20 1 2 17 4</td>
</tr>
<tr>
<td></td>
<td>8 23</td>
</tr>
<tr>
<td></td>
<td>A/T control unit</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overdrive switch</td>
</tr>
<tr>
<td></td>
<td>On</td>
</tr>
<tr>
<td></td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Kickdown switch</td>
</tr>
</tbody>
</table>

*Go to INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS.*

SAT736B
TROUBLE DIAGNOSES

Self-diagnosis (Cont’d)
REVOLUTION SENSOR CIRCUIT CHECK

CHECK REVOLUTION SENSOR. Refer to “Electrical Components Inspection”.

A

CHECK INPUT SIGNAL
1. 

2. Check voltage between A/T control unit terminal @ and ground while driving.
   (Measure with A.C. range.)
   Voltage:
   - At 0 km/h (0 MPH): 0V
   - At 30 km/h (19 MPH): 1V or more
   (Voltage rises gradually in response to vehicle speed)

O.K.

Perform self-diagnosis again after driving for a while.

O.K.

INSPECTION END

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.

N.G.

Check the following items.
- Harness continuity between A/T control unit and speed sensor (Main harness)

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.

N.G.

SPEED SENSOR CIRCUIT CHECK

A

CHECK INPUT SIGNAL
1. 

2. Check voltage between A/T control unit terminal @ and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.
   Voltage: Varies from 0V to 5V

O.K.

Perform self-diagnosis again after driving for a while.

O.K.

INSPECTION END

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)

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

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.

CHECK INPUT SIGNAL.

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

N.G.

2. Check voltage between A/T control unit terminals ① and ⑤ 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.)

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.

INSPECTION END
### Self-diagnosis (Cont’d)

#### SHIFT SOLENOID A CIRCUIT CHECK

**A**

**CHECK GROUND CIRCUIT.**

1. Disconnect terminal cord assembly connector in engine compartment.
2. Check the following items.
   - Shift solenoid A – Refer to “Electrical Components Inspection”.
   - Harness continuity of terminal cord assembly

Resistance: 20 - 30Ω

**CHECK POWER SOURCE CIRCUIT.**

1. Disconnect A/T control unit 16-pin connector.
2. Check resistance between terminal 35 and A/T control unit terminal 35.
   - Resistance: Approximately 0Ω
3. Reinstall any part removed.

**B**

Perform self-diagnosis after driving for a while.

1. Remove control valve assembly. – Refer to “ON-VEHICLE SERVICE”.
2. Check the following items.
   - Shift solenoid A – Refer to “Electrical Components Inspection”.
   - Harness continuity of terminal cord assembly

Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)
Self-diagnosis (Cont'd)
SHIFT SOLENOID B CIRCUIT CHECK

**A**

CHECK GROUND CIRCUIT.
1. Disconnect terminal cord assembly connector in engine compartment.
2. Check the following items.
   - Shift solenoid B — Refer to "Electrical Components Inspection".
   - Harness continuity of terminal cord assembly
3. Check resistance between terminal @ and ground.
   Resistance: 20 - 30Ω

**B**

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

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

**O.K.**
1. Perform self-diagnosis after driving for a while.

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

Self-diagnosis (Cont'd)
OVERRUN CLUTCH SOLENOID CIRCUIT CHECK

A

CHECK GROUND CIRCUIT.
1. Disconnect terminal cord assembly connector in engine compartment.
2. Check the following items.
   - Overrun clutch solenoid. Refer to "Electrical Components Inspection".
   - Harness continuity of terminal cord assembly

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

B

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

N.G.

1. Perform self-diagnosis after driving for a while.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

N.G.

Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)
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 ② and ground. Resistance: 2.5 - 5Ω

B

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

Perform self-diagnosis after driving for a while.

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. 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.

N.G. Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)
TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)
FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS

A

CHECK A/T CONTROL UNIT POWER SOURCE.

1. Check voltage between A/T control unit terminals 29, 30 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.

O.K.

B

CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY

1. Disconnect terminal cord assembly connector in engine compartment.
2. Check resistance between terminals 12 and 15 when A/T is cold.
   Resistance:
   Cold [20°C (68°F)]
   Approximately 2.5 kΩ
3. 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

O.K.
**TROUBLE DIAGNOSES**

**Self-diagnosis (Cont'd)**

**CHECK INPUT SIGNAL OF FLUID TEMPERATURE SENSOR.**

1. ![Diagram](image1)

2. Check voltage between A/T control unit terminal 12 and ground while warming up A/T.
   - Voltage:
     - Cold [20°C (68°F)] → Hot [80°C (176°F)]: 1.56V → 0.45V

   O.K.

   Perform self-diagnosis after driving for a while.

   N.G.

   Check the following items.
   - Harness continuity between A/T control unit and terminal cord assembly (Main harness)

**CHECK INPUT SIGNAL.**

1. ![Diagram](image2)

2. Check voltage between A/T control unit terminal 12 and ground.
   - Voltage: 9.5 - 12V

   O.K.

   Perform self-diagnosis again after driving for a while.

   N.G.

   Check ignition signal circuit for engine control. — Refer to section EF & EC.

**ENGINE REVOLUTION SIGNAL CIRCUIT CHECK**

Perform self-diagnosis (Mode III) for engine control. Check ignition signal circuit condition.

O.K.

Check the following items.
- Harness continuity between A/T control unit and ignition coil.
- Resistor
- Ignition coil — Refer to section EF & EC.

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.

**ENGINE REVOLUTION SIGNAL CIRCUIT CHECK**

Perform self-diagnosis (Mode III) for engine control. Check ignition signal circuit condition.

O.K.

Check the following items.
- Harness continuity between A/T control unit and ignition coil.
- Resistor
- Ignition coil — Refer to section EF & EC.

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.
Self-diagnosis (Cont'd)
LINE PRESSURE SOLENOID CIRCUIT CHECK

**CHECK GROUND CIRCUIT.**
1. Disconnect terminal cord assembly connector in engine compartment.
2. Check resistance between terminal of terminal cord assembly and ground.
   Resistance: 2.5 - 5\(\Omega\)

**CHECK POWER SOURCE CIRCUIT.**
1. Disconnect A/T control unit 16-pin connector.
2. Check resistance between terminal of terminal cord assembly and A/T control unit terminal.
   Resistance: 11.2 - 12.8\(\Omega\)
3. Reinstall any part removed.

Perform self-diagnosis after driving for a while.

**INSPECTION END**
TROUBLE DIAGNOSES

Self-diagnosis (Cont’d)

INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH
CIRCUIT CHECKS

A

CHECK INHIBITOR SWITCH CIRCUIT.

1. 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)

2. Check voltage between A/T control unit terminals 1, 2, 3, 4, 5 and ground while moving selector lever through each range.

   Voltage:
   - B: Battery voltage
   - 0: 0V

<table>
<thead>
<tr>
<th>Terminal</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>P, N</td>
<td>B</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>R</td>
<td>0</td>
<td>B</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>0</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>B</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>B</td>
</tr>
</tbody>
</table>

O.K.

B

CHECK OVERDRIVE SWITCH CIRCUIT.

1. 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)

2. Check voltage between A/T control unit terminal 9 and ground when overdrive switch is in “ON” position and in “OFF” position.

<table>
<thead>
<tr>
<th>Switch position</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Battery voltage</td>
</tr>
<tr>
<td>OFF</td>
<td>1V or less</td>
</tr>
</tbody>
</table>

O.K.
Self-diagnosis (Cont'd)

CHECK KICKDOWN SWITCH CIRCUIT.

1. Check voltage between A/T control unit terminal (7) and ground while depressing accelerator pedal slowly. (after warming up engine)
   Voltage:
   - When releasing accelerator pedal: 3 - 8V
   - When depressing accelerator pedal fully: 1V or less

2. Check voltage between A/T control unit terminal (7) and ground while depressing accelerator pedal slowly.
   Voltage:
   - When releasing accelerator pedal: 3 - 8V
   - When depressing accelerator pedal fully: 1V or less

CHECK IDLE SWITCH CIRCUIT.

- Check voltage between A/T control unit terminal (4) and ground in the same way as kickdown switch circuit.
  Voltage:
  - When releasing accelerator pedal: 8 - 15V
  - When depressing accelerator pedal fully: 1V or less

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.

Check the following items.
- Kickdown switch
- Harness continuity between A/T control unit and kickdown switch (Main harness)
- Harness continuity of ground circuit for kickdown switch

Perform self-diagnosis again after driving for a while.

Check harness continuity between A/T control unit and idle switch. (Main harness)
Check idle switch circuit for engine control.
Refer to section EF & EC.

INSPECTION END
Diagnostic Procedure 1

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

1. Check A/T CONTROL UNIT POWER SOURCE.
   1. Battery voltage should exist.
   2. Check voltage between A/T control unit terminals and ground.

2. Check A/T CONTROL UNIT GROUND CIRCUIT.
   1. Disconnect A/T control unit 16-pin connector.
   2. Check resistance between A/T control unit terminals and ground.
   3. Reinstall any part removed.

3. Check LAMP CIRCUIT.
   1. Disconnect A/T control unit 16-pin connector.
   2. Check resistance between A/T control unit terminals and ground.
   3. Reinstall any part removed.

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

Check harness continuity between A/T control unit and ground.

Check the following items.
- O.D. OFF indicator lamp
- Harness continuity between ignition switch and O.D. OFF indicator lamp (Main harness)
- Harness continuity between O.D. OFF indicator lamp and A/T control unit

Check again.

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
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.

1. Does self-diagnosis show damage to inhibitor switch circuit?
   - Yes: Check inhibitor switch circuit. — Refer to "Self-diagnosis".
   - No: Check continuity of inhibitor switch 2-pin connector. — Refer to "Electrical Components Inspection".

2. Check starting system. — Refer to section EL.
   - O.K.: INSPECTION END
   - N.G.: Repair or replace inhibitor switch.

Diagnostic Procedure 3

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

1. Check parking components. — Refer to "ON-VEHICLE SERVICE".
   - N.G.: Repair or replace damaged parts.
   - O.K.: INSPECTION END
Diagnostic Procedure 4

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

1. Does self-diagnosis show damage to inhibitor switch after cruise test?
   - Yes: Check inhibitor switch circuit. Refer to "Self-diagnosis.
   - No: Check manual control linkage. Refer to "ON-VEHICLE SERVICE".

2. Check A/T fluid level again.
   - O.K.: Check again.
   - N.G.: Refill A.T.F.

3. 1. Remove oil pan.
            2. Check A/T fluid condition.
   - O.K.: Check again.
   - N.G.: Perform A/T control unit input/output signal inspection.

4. 1. Disassemble A/T.
            2. If N.G., recheck A/T control unit harness connector.

   - O.K.: INSPECTION END

   - N.G.: Refer to "Self-diagnosis".
TROUBLE DIAGNOSES

Diagnostic Procedure 5

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

Does self-diagnosis show damage to throttle sensor, line pressure solenoid or fluid temperature sensor circuit?

Yes  No

1. Check damaged circuit. – Refer to “Self-diagnosis”.

2. Check throttle sensor. – Refer to section EF & EC.

3. Check line pressure at idle with selector lever in “D” range. – Refer to “PRESSURE TESTING”.

4. Check again.

O.K.

N.G.

1. Remove control valve assembly. – Refer to “ON-VEHICLE SERVICE”.
2. Check the following items.
   • Valves to control line pressure (Pressure regulator valve, modifier valve, pilot valve and pilot filter)
   • Line pressure solenoid

O.K.

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
Diagnostic Procedure 6

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

1. Check A/T fluid level again.
   - N.G. → Refill A.T.F.
   - O.K. → N.G. in both "1" and "R" range

2. Check stall revolution with selector lever in "1" and "R" range.
   - O.K. → N.G. in "1" range
   - N.G. in "R" range

3. Check line pressure at idle with selector lever in "R" range.
   - O.K. → N.G.
   - N.G. → 1. Remove control valve assembly.
   - Remove control valve assembly.
   - Refer to "ON-VEHICLE SERVICE".

   2. Check the following items.
   - Valves to control line pressure
     (Pressure regulator valve, pilot valve and pilot filter)
   - Line pressure solenoid
   - Disassemble A/T.
   - Check the following items.
   - Oil pump assembly
   - Torque converter
   - Reverse clutch assembly
   - High clutch assembly
   - Low & reverse brake assembly
   - Low one-way clutch

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

INSPECTION END
Diagnostic Procedure 7

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

1. Remove oil pan.
2. Check A/T fluid condition.
   O.K.
3. Check line pressure at idle with selector lever in "D" range.
   - Refer to "PRESSURE TESTING".
   O.K.
4. Perform A/T control unit input/output signal inspection.
   1. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

   1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
   2. Check the following items.
      • Valves to control line pressure (Pressure regulator valve, modifier valve, pilot valve and pilot filter)
      • Line pressure solenoid
   3. Disassemble A/T
   4. Check the following items.
      • Oil pump assembly
      • Forward clutch assembly
      • Forward one-way clutch
      • Low one-way clutch
      • Torque converter

   1. Refill A.T.F.
**Diagnostic Procedure 8**

**SYMPTOM:** Vehicle cannot be started from D, on Cruise test — Part 1.

1. **Is Diagnostic Procedure 7 O.K.**
   - Yes
   - No

2. **Does self-diagnosis show damage to revolution sensor, speed sensor, shift solenoid A or B after cruise test?**
   - Yes
   - Check damaged circuit. — Refer to “Self-diagnosis”.
   - No

3. **Check throttle sensor. — Refer to section EF & EC.**
   - O.K.
   - N.G.

4. **Check line pressure at stall point with selector lever in “D” range. — Refer to “PRESSURE TESTING”**.
   - O.K.
   - N.G.

5. **Remove oil pan.**
   - O.K.
   - N.G.

6. **Check A/T fluid condition.**
   - O.K.
   - N.G.

7. **Disassemble A/T.**
   - O.K.
   - N.G.

8. **Check the following items.**
   - Shift valve A
   - Shift valve B
   - Shift solenoid A
   - Shift solenoid B
   - Pilot valve
   - Pilot filter

9. **Perform A/T control unit input/output signal inspection.**
   - O.K.
   - N.G.

   If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
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.

Are Diagnostic Procedures 7 and 8 O.K.?

Yes

No

Go to Diagnostic Procedure 7 or 8.

Does self-diagnosis show damage to inhibitor switch after cruise test?

Yes

Check inhibitor switch circuit.
- Refer to "Self-diagnosis".

No

Repair or replace revolution sensor and speed sensor circuits.

Check revolution sensor and speed sensor circuit. — Refer to "Self-diagnosis".

Check throttle sensor. — Refer to section EF & EC.

Check throttle sensor.

Repair or replace throttle sensor.

Remove oil pan.

Check A/T fluid condition.

Check again.

1. Remove control valve. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Shift valve A
   - Shift solenoid A
   - Pilot valve
   - Pilot filter

3. Disassemble A/T.
4. Check the following items.
   - Servo piston assembly
   - Brake band
   - Oil pump assembly

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
Diagnostic Procedure 10
SYMPTOM: A/T does not shift from D₂ to D₃ at the specified speed.

1. Are Diagnostic Procedures 7 and 8 O.K.?  
   - Yes  
   - No  
   - Go to Diagnostic Procedure 7 or 8.

2. Does self-diagnosis show damage to inhibitor switch after cruise test?  
   - Yes  
   - Check inhibitor switch circuit. – Refer to “Self-diagnosis”.  
   - No  
   - Repair or replace throttle sensor.

3. Check throttle sensor. – Refer to section EF & EC.
   - N.G.  
   - O.K.  
   - 1. Remove oil pan.  
   - 2. Check A/T fluid condition.

4. Check again.  
   - N.G.  
   - O.K.  
   - 1. Remove control valve assembly. – Refer to “ON-VEHICLE SERVICE”.  
   - 2. Check the following items.  
     - Shift valve B  
     - Shift solenoid B  
     - Pilot valve  
     - Pilot filter  
   - 3. Disassemble A/T.  
   - 4. Check the following items.  
     - Servo piston assembly  
     - High clutch assembly  
     - Oil pump assembly  
   - INSPECTION END

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

Diagnostic Procedure 11

Symptom: A/T does not shift from D3 to D4 at the specified speed.

1. Are Diagnostic Procedures 7 and 8 O.K.? 
   - Yes: Go to Diagnostic Procedure 7 or 8.
   - No: Does self-diagnosis show damage to inhibitor switch, overdrive switch, shift solenoid A, B, revolution sensor, speed sensor or fluid temperature sensor circuit after cruise test?
     - Yes: Check damaged circuit. — Refer to "Self-diagnosis".
     - No: Check throttle sensor. — Refer to section EF & EC.

2. Check throttle sensor. — Refer to section EF & EC.
   - N.G.: Repair or replace throttle sensor.
           2. Check A/T fluid condition.

3. 1. Remove oil pan.
     2. Check A/T fluid condition.
    - O.K.:
      - O.K.: 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
      2. Check the following items.
         - Shift valve B
         - Overrun clutch control valve
         - Shift solenoid B
         - Pilot valve
         - Pilot filter
      3. Disassemble A/T.
      4. Check the following items.
         - Servo piston assembly
         - Brake band
         - Torque converter
         - Oil pump assembly

4. Check again.
           2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
   - O.K.: Inspection End
Diagnostic Procedure 12

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

1. Does self-diagnosis show damage to lock-up solenoid circuit after cruise test?
   - Yes → Check lock-up solenoid circuit. — Refer to “Self-diagnosis”.
   - No →

2. Check throttle sensor. — Refer to section EF & EC.
   - O.K. → O.K.
   - N.G. → Repair or replace throttle sensor.

3. 1. Remove control valve. — Refer to “ON-VEHICLE SERVICE”.
     2. Check following items.
        - Lock-up control valve
        - Shuttle shift valve D
        - Torque converter relief valve
        - Lock-up solenoid
        - Pilot valve
        - Pilot filter
     - O.K. → O.K.
     - N.G. → Repair or replace damaged parts.

4. 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
**Diagnostic Procedure 13**

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

1. **Self-diagnosis start**
   - Light
   - Shade

2. **Diagnostic Procedure**
   - **SYMPTOM:** A/T fluid condition.
     - **O.K.**
     - **N.G.**

3. **SAT171B**
   - **Check again.**
   - **O.K.**

4. **INSPECTION END**

---

**Diagnostic Procedure 14**

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

1. **Self-diagnosis start**
   - Light
   - Shade

2. **Diagnostic Procedure**
   - **SYMPTOM:** Accelerator pedal.
     - **Release**

3. **SAT157C**
   - **Check again.**
   - **O.K.**

4. **INSPECTION END**

---

**AT-58**
Diagnostic Procedure 15

SYMPTOM: Engine speed does not return to idle smoothly when A/T is shifted from D₄ to D₃ with accelerator pedal released. Vehicle does not decelerate by engine brake when changing overdrive switch to “OFF” position with accelerator pedal released. Vehicle does not decelerate by engine brake when changing selector lever from “D” to “2” range with accelerator pedal released.

1. Does self-diagnosis show damage to overrun clutch solenoid circuit after cruise test? Yes → Check overrun clutch solenoid circuit. – Refer to “Self-diagnosis”.

2. No → Check throttle sensor. – Refer to section EF & EC.


4. 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.

5. O.K. → INSPECTION END
Diagnostic Procedure 16
SYMPTOM: Vehicle does not start from D1 on Cruise test -- Part 2.

- Does self-diagnosis show damage to revolution sensor, speed sensor, shift solenoid A or B after cruise test?
  - Yes
  - Check damaged circuit. — Refer to "Self-diagnosis".
  - No
  - Check again.
  - O.K.
  - Go to Diagnostic Procedure 8.
  - 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.

Diagnostic Procedure 17
SYMPTOM: A/T does not shift from D1 to D2 when changing overdrive switch to "OFF" position.

- Does self-diagnosis show damage to overdrive switch circuit after cruise test?
  - Yes
  - Check overdrive switch circuit. — Refer to "Self-diagnosis".
  - No
  - Go to Diagnostic Procedure 10.
Diagnostic Procedure 18
SYMPTOM: A/T does not shift from D3 to 22 when changing selector lever from "D" to "2" range.

1. Does self-diagnosis show damage to inhibitor switch circuit after cruise test?
   - Yes: Check inhibitor switch circuit. — Refer to "Self-diagnosis".
   - No: Go to Diagnostic Procedure 9.

Diagnostic Procedure 19
SYMPTOM: A/T does not shift from 22 to 11 when changing selector lever from "2" to "1" range.

1. Does self-diagnosis show damage to inhibitor switch after cruise test?
   - Yes: Check inhibitor switch circuit. — Refer to "Self-diagnosis".
   - No: Check again.

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

Diagnostic Procedure 20
SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 22 (12) to 11.

Is diagnostic procedure 6 O.K.?
- No: Go to Diagnostic Procedure 6.
- Yes: Go to Diagnostic Procedure 15.
Electrical Components Inspection

INSPECTION OF A/T CONTROL UNIT

- Measure voltage between each terminal and terminal 31 or 32 by following "A/T CONTROL UNIT INSPECTION TABLE".

- Pin connector terminal layout.

A/T CONTROL UNIT INSPECTION TABLE
(Data are reference values.)

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Item</th>
<th>Condition</th>
<th>Judgement standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inhibitor &quot;2&quot; range switch</td>
<td>When setting selector lever to &quot;D&quot; range.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When setting selector lever to other ranges.</td>
<td>1V or less</td>
</tr>
<tr>
<td>2</td>
<td>Inhibitor &quot;1&quot; range switch</td>
<td>When setting selector lever to &quot;1&quot; range.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When setting selector lever to other ranges.</td>
<td>1V or less</td>
</tr>
<tr>
<td>3</td>
<td>Idle switch</td>
<td>When releasing accelerator pedal after warming up engine.</td>
<td>8 - 15V</td>
</tr>
<tr>
<td></td>
<td>(in throttle valve switch)</td>
<td>When depressing accelerator pedal after warming up engine.</td>
<td>1V or less</td>
</tr>
<tr>
<td>5</td>
<td>A.S.C.D. O.D. cut signal</td>
<td>When releasing &quot;ACCEL&quot; set switch on A.S.C.D. cruise.</td>
<td>5 - 8V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When applying &quot;ACCEL&quot; set switch on A.S.C.D. cruise.</td>
<td>1V or less</td>
</tr>
</tbody>
</table>
## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont’d)

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Item</th>
<th>Condition</th>
<th>Judgement standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Kickdown switch</td>
<td>When releasing accelerator pedal after warming up engine.</td>
<td>3 - 8V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When depressing accelerator pedal fully after warming up engine.</td>
<td>1V or less</td>
</tr>
<tr>
<td>8</td>
<td>A.S.C.D. cruise signal</td>
<td>When performing A.S.C.D. cruise. (&quot;CRUISE&quot; light comes on.)</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When not performing A.S.C.D. cruise. (&quot;CRUISE&quot; light does not come on.)</td>
<td>1V or less</td>
</tr>
<tr>
<td>9</td>
<td>Overdrive switch</td>
<td>When setting overdrive switch in &quot;ON&quot; position.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When setting overdrive switch in &quot;OFF&quot; position.</td>
<td>1V or less</td>
</tr>
<tr>
<td>10</td>
<td>Throttle sensor (Power source)</td>
<td></td>
<td>4.5 - 5.5V</td>
</tr>
<tr>
<td>11</td>
<td>Throttle sensor</td>
<td>When depressing accelerator pedal slowly after warming up engine.</td>
<td>Fully-closed throttle: 0.2 - 0.6V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Voltage rises gradually in response to throttle opening angle.</td>
<td>Fully-open throttle: 2.9 - 3.9V</td>
</tr>
<tr>
<td>12</td>
<td>Fluid temperature sensor</td>
<td>When A.T.F. temperature is 20°C (68°F).</td>
<td>1.56V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When A.T.F. temperature is 80°C (176°F).</td>
<td>0.45V</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Throttle sensor (Ground)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Revolution sensor (Measure in AC range)</td>
<td>When vehicle cruises at 30 km/h (19 MPH).</td>
<td>1V or more Voltage rises gradually in response to vehicle speed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When vehicle parks.</td>
<td>0V</td>
</tr>
<tr>
<td>Terminal No.</td>
<td>Item</td>
<td>Condition</td>
<td>Judgement standard</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>17</td>
<td>Full throttle switch</td>
<td>When depressing accelerator pedal more than half-way after warming up engine.</td>
<td>8 - 15V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When releasing accelerator pedal after warming up engine.</td>
<td>1V or less</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Inhibitor &quot;N&quot; and &quot;P&quot; range switch</td>
<td>When setting selector lever to &quot;N&quot; or &quot;P&quot; range.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When setting selector lever to other ranges.</td>
<td>1V or less</td>
</tr>
<tr>
<td>20</td>
<td>Inhibitor &quot;D&quot; range switch</td>
<td>When setting selector lever to &quot;2&quot; range.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When setting selector lever to other ranges.</td>
<td>1V or less</td>
</tr>
<tr>
<td>21</td>
<td>Overrun clutch solenoid</td>
<td>When overrun clutch solenoid operates.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When overrun clutch solenoid does not operate.</td>
<td>1V or less</td>
</tr>
<tr>
<td>22</td>
<td>Lock-up solenoid</td>
<td>When A/T performs lock-up.</td>
<td>8 - 15V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When A/T does not perform lock-up.</td>
<td>1V or less</td>
</tr>
<tr>
<td>23</td>
<td>O.D. OFF indicator lamp</td>
<td>When setting overdrive switch to &quot;ON&quot; position.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When setting overdrive switch to &quot;OFF&quot; position.</td>
<td>1V or less</td>
</tr>
<tr>
<td>24</td>
<td>Speed sensor</td>
<td>When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.</td>
<td>Vary from 0 to 5V</td>
</tr>
<tr>
<td>25</td>
<td>Engine revolution signal</td>
<td>When engine runs at idle speed.</td>
<td>9.5 - 12V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When engine runs at 2,500 rpm.</td>
<td>Approximately 10V</td>
</tr>
<tr>
<td>26</td>
<td>Inhibitor &quot;R&quot; range switch</td>
<td>When setting selector lever to &quot;R&quot; range.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When setting selector lever to other ranges.</td>
<td>1V or less</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Item</th>
<th>Condition</th>
<th>Judgement standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>Power source (Back-up)</td>
<td>When turning ignition switch to &quot;OFF&quot;.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning ignition switch to &quot;ON&quot;.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td>29, 30</td>
<td>Power source</td>
<td>When turning ignition switch to &quot;ON&quot;.</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning ignition switch to &quot;OFF&quot;.</td>
<td>1V or less</td>
</tr>
<tr>
<td>31, 32</td>
<td>Ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Line pressure solenoid (with dropping resistor)</td>
<td>When releasing accelerator pedal after warming up engine.</td>
<td>5 - 14V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When depressing accelerator pedal fully after warming up engine.</td>
<td>0.5V or less</td>
</tr>
<tr>
<td>34</td>
<td>Line pressure solenoid</td>
<td>When releasing accelerator pedal after warming up engine.</td>
<td>1.5 - 2.5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When depressing accelerator pedal fully after warming up engine.</td>
<td>0.5V or less</td>
</tr>
<tr>
<td>35</td>
<td>Shift solenoid A</td>
<td>When shift solenoid A operates. (When driving in &quot;D1&quot; or &quot;D4&quot;.)</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When shift solenoid A does not operate. (When driving in &quot;D2&quot; or &quot;D3&quot;.)</td>
<td>1V or less</td>
</tr>
<tr>
<td>36</td>
<td>Shift solenoid B</td>
<td>When shift solenoid B operates. (When driving in &quot;D1&quot; or &quot;D4&quot;.)</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When shift solenoid B does not operate. (When driving in &quot;D2&quot; or &quot;D4&quot;.)</td>
<td>1V or less</td>
</tr>
</tbody>
</table>

### OVERDRIVE SWITCH
- Check continuity between two terminals.

<table>
<thead>
<tr>
<th>O.D. switch position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>No</td>
</tr>
<tr>
<td>OFF</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**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.

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lever position</td>
<td>P</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>O</td>
<td></td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500 - 650Ω</td>
</tr>
<tr>
<td>2</td>
<td>No continuity</td>
</tr>
<tr>
<td>1</td>
<td>No continuity</td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Temperature °C (°F)</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 (68)</td>
<td>Approximately 2.5 kΩ</td>
</tr>
<tr>
<td>80 (176)</td>
<td>Approximately 0.3 kΩ</td>
</tr>
</tbody>
</table>

#### 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.

<table>
<thead>
<tr>
<th>Solenoid</th>
<th>Terminal No.</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift solenoid A</td>
<td>3</td>
<td>Ground terminal</td>
</tr>
<tr>
<td>Shift solenoid B</td>
<td>2</td>
<td>Ground terminal</td>
</tr>
<tr>
<td>Overrun clutch solenoid</td>
<td>4</td>
<td>Ground terminal</td>
</tr>
</tbody>
</table>

#### 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.
Judgement of stall test

<table>
<thead>
<tr>
<th>Selector lever position</th>
<th>Judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>L</td>
</tr>
<tr>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>1</td>
<td>L</td>
</tr>
<tr>
<td>R</td>
<td>L</td>
</tr>
</tbody>
</table>

O: Stall revolution is normal.
H: Stall revolution is higher than specified.
L: Stall revolution is lower than specified.

Damaged components:
- Forward clutch
- Overrun clutch
- Forward one-way clutch
- Low & reverse brake
- Low one-way clutch

Engine

Torque converter one-way clutch

Reverse clutch

Hydraulic circuit for line pressure control (Line pressure is low.)

Clutches and brakes except high clutch and brake band are O.K. (Condition of high clutch and brake band cannot be confirmed by stall test.)

<table>
<thead>
<tr>
<th>Selector lever position</th>
<th>Judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>H</td>
</tr>
<tr>
<td>2</td>
<td>H</td>
</tr>
<tr>
<td>1</td>
<td>O</td>
</tr>
<tr>
<td>R</td>
<td>O</td>
</tr>
</tbody>
</table>
Final Check (Cont'd)
PRESSURE TESTING
- Location of line pressure test port
- Line pressure plugs are hexagon headed bolts.
- Always replace line pressure plugs as they are self-sealing bolts.

Line pressure test procedure
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.
   A.T.F. operating temperature:
   50 - 80°C (122 - 176°F)
3. Install pressure gauge to line pressure port.
   - D, 2 and 1 ranges —

   — R range —
4. Set parking brake and block wheels.
   - Continue to depress brake pedal fully while line pressure test at stall speed is performed.
Final Check (Cont'd)

5. Start engine and measure line pressure at idle and stall speed.
- When measuring line pressure at stall speed, follow the stall test procedure.

<table>
<thead>
<tr>
<th>Engine speed rpm</th>
<th>D, 2 and 1 ranges</th>
<th>R range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle</td>
<td>471 - 510</td>
<td>657 - 696</td>
</tr>
<tr>
<td></td>
<td>(4.8 - 5.2, 68 - 74)</td>
<td>(6.7 - 7.1, 95 - 101)</td>
</tr>
<tr>
<td>Stall</td>
<td>1,020 - 1,098</td>
<td>1,422 - 1,500</td>
</tr>
<tr>
<td></td>
<td>(10.4 - 11.2, 148 - 159)</td>
<td>(14.5 - 15.3, 206 - 218)</td>
</tr>
</tbody>
</table>

JUDGEMENT OF LINE PRESSURE TEST

<table>
<thead>
<tr>
<th>Judgement</th>
<th>Suspected parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line pressure is low in all ranges.</td>
<td>• Oil pump wear</td>
</tr>
<tr>
<td></td>
<td>• Control piston damage</td>
</tr>
<tr>
<td></td>
<td>• Pressure regulator valve or plug sticking</td>
</tr>
<tr>
<td></td>
<td>• Spring for pressure regulator valve damaged</td>
</tr>
<tr>
<td></td>
<td>• Fluid pressure leakage between oil strainer and pressure regulator valve</td>
</tr>
<tr>
<td>Line pressure is low in particular range.</td>
<td>• Fluid pressure leakage between manual valve and particular clutch.</td>
</tr>
<tr>
<td></td>
<td>• For example;</td>
</tr>
<tr>
<td></td>
<td>If line pressure is low in “R” and “1” ranges but is normal in “D” and “2” range, fluid leakage exists at or around low &amp; reverse brake circuit.</td>
</tr>
<tr>
<td>Line pressure is high.</td>
<td>• Mal-adjustment of throttle sensor</td>
</tr>
<tr>
<td></td>
<td>• Fluid temperature sensor damaged</td>
</tr>
<tr>
<td></td>
<td>• Line pressure solenoid sticking</td>
</tr>
<tr>
<td></td>
<td>• Short circuit of line pressure solenoid circuit</td>
</tr>
<tr>
<td></td>
<td>• Pressure modifier valve sticking</td>
</tr>
<tr>
<td></td>
<td>• Pressure regulator valve or plug sticking</td>
</tr>
<tr>
<td>Line pressure is low.</td>
<td>• Mal-adjustment of throttle sensor</td>
</tr>
<tr>
<td>At idle</td>
<td>• Control piston damaged</td>
</tr>
<tr>
<td></td>
<td>• Line pressure solenoid sticking</td>
</tr>
<tr>
<td></td>
<td>• Short circuit of line pressure solenoid circuit</td>
</tr>
<tr>
<td></td>
<td>• Pressure regulator valve or plug sticking</td>
</tr>
<tr>
<td></td>
<td>• Pressure modifier valve sticking</td>
</tr>
<tr>
<td>At stall speed</td>
<td>• Pilot valve sticking</td>
</tr>
</tbody>
</table>
TROUBLE DIAGNOSES

Symptom Chart

<table>
<thead>
<tr>
<th>Reference page (AT-)</th>
<th>9, 14</th>
<th>68</th>
<th>68</th>
<th>70</th>
<th>67, 108</th>
<th>67</th>
<th>67</th>
<th>7</th>
<th>7</th>
<th>90, 101</th>
<th>120, 124</th>
<th>128, 137</th>
<th>134</th>
<th>130</th>
<th>144</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ON vehicle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 Engine does not start in &quot;N&quot;, &quot;P&quot; ranges.</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 Engine starts in range other than &quot;N&quot; and &quot;P&quot;, transmission noise in &quot;P&quot; and &quot;N&quot; ranges</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Vehicle moves when changing into &quot;P&quot; range or parking gear does not disengage when shifted out of &quot;P&quot; range</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49 Vehicle runs in &quot;N&quot; range.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51 Vehicle will not run in &quot;R&quot; range (but runs in &quot;D&quot;, &quot;2&quot;, and &quot;1&quot; ranges). Clutch slips. Very poor acceleration.</td>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Vehicle braked when shifting into &quot;R&quot; range.</td>
<td>1</td>
<td></td>
<td>3</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Sharp shock in shifting from &quot;N&quot; to &quot;D&quot; range.</td>
<td></td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Vehicle will not run in &quot;D&quot; and &quot;2&quot; ranges (but runs in &quot;1&quot; and &quot;R&quot; range).</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52 Vehicle will not run in &quot;D&quot;, &quot;1&quot;, &quot;2&quot; ranges (but runs in &quot;R&quot; range). Clutch slips. Very poor acceleration.</td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Clutches or brakes slip somewhat in starting.</td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Excessive creep.</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51, 52 No creep at all.</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Failure to change gear from &quot;D&quot; to &quot;D&quot;.</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Failure to change gear from &quot;D&quot; to &quot;D&quot;.</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Failure to change gear from &quot;D&quot; to &quot;D&quot;.</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54, 55, 56 Too high gear change point from &quot;D&quot; to &quot;D&quot;. from &quot;D&quot; to &quot;D&quot;. from &quot;D&quot; to &quot;D&quot;.</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Gear change directly from &quot;D&quot; to &quot;D&quot; occurs.</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Engine stops when shifting lever into &quot;R&quot;, &quot;D&quot;, &quot;2&quot;, and &quot;1&quot;.</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Too sharp a shock in change from &quot;D&quot; to &quot;D&quot;.</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Too sharp a shock in change from &quot;D&quot; to &quot;D&quot;.</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
### TROUBLE DIAGNOSES

#### Symptom Chart (Cont'd)

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.

<table>
<thead>
<tr>
<th>Reference page (AT-73)</th>
<th>Fluid level</th>
<th>Torque converter</th>
<th>Inhibitor switch (Adjustment)</th>
<th>Resevoir filter and fuel sensor</th>
<th>Engine oil pressure</th>
<th>Caisserion valve assembly</th>
<th>Shift solenoid B</th>
<th>Fluid line pressure</th>
<th>Lock-up clutch solenoid</th>
<th>Transmissiun control oil</th>
<th>Accumulator 1-2</th>
<th>Accumulator 3-4 (AT-73)</th>
<th>Accumulator 4-5</th>
<th>Transmission control switch and meter</th>
<th>Parking components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference page (AT-73)</td>
<td>ON vehicle</td>
<td>OFF vehicle</td>
<td>Number</td>
<td>0</td>
<td>14</td>
<td>06</td>
<td>08</td>
<td>07</td>
<td>106</td>
<td>07</td>
<td>07</td>
<td>7</td>
<td>7</td>
<td>90, 101</td>
<td>120, 124</td>
</tr>
<tr>
<td>- Too sharp shock on change from &quot;D1&quot; to &quot;D3&quot;.</td>
<td>...</td>
<td>1...</td>
<td>1...</td>
<td>2</td>
<td>4...</td>
<td>...</td>
<td>...</td>
<td>3</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>- Almost no shock or clutches slipping on change from &quot;D3&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>2...</td>
<td>3</td>
<td>5...</td>
<td>...</td>
<td>4</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Almost no shock or slipping in change from &quot;D3&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>2...</td>
<td>3</td>
<td>5...</td>
<td>...</td>
<td>4</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Almost no shock or slipping in change from &quot;D3&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>2...</td>
<td>3</td>
<td>5...</td>
<td>...</td>
<td>4</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Vehicle brake by gear change from &quot;D3&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Vehicle brake by gear change from &quot;D5&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Vehicle brake by gear change from &quot;D5&quot; to &quot;D5&quot;.</td>
<td>1...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Vehicle brake by gear change from &quot;D5&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Maximum speed not attained. Acceleration poor.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>5</td>
<td>3...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>- Failure to change gear from &quot;D1&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>6</td>
<td>4...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>- Failure to change gear from &quot;D1&quot; to &quot;D3&quot;. or from &quot;D3&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>5</td>
<td>3...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>- Failure to change gear from &quot;D1&quot; to &quot;D3&quot;. or from &quot;D3&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>5</td>
<td>3...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>3</td>
</tr>
<tr>
<td>- Gear change shock felt during deceleration by releasing accelerator pedal.</td>
<td>1...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Too high a change point from &quot;D3&quot; to &quot;D3&quot;, from &quot;D3&quot; to &quot;D3&quot;, from &quot;D3&quot; to &quot;D3&quot;.</td>
<td>1...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Kickdown does not operate when depressing pedal in &quot;D3&quot; within kickdown vehicle speed.</td>
<td>1...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Kickdown operates or engine overruns when depressing pedal in &quot;D3&quot; beyond kickdown vehicle speed limit.</td>
<td>2...</td>
<td>...</td>
<td>...</td>
<td>3</td>
<td>4...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Races extremely fast or slips in changing from &quot;D3&quot; to &quot;D3&quot; when depressing pedal.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>3</td>
<td>5...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>- Races extremely fast or slips in changing from &quot;D3&quot; to &quot;D3&quot; when depressing pedal.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>3</td>
<td>6...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>3</td>
</tr>
<tr>
<td>- Races extremely fast or slips in changing from &quot;D3&quot; to &quot;D3&quot; when depressing pedal.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>3</td>
<td>6...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Races extremely fast or slips in changing from &quot;D3&quot; to &quot;D3&quot; when depressing pedal.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>3</td>
<td>5...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Races extremely fast or slips in changing from &quot;D1&quot; to &quot;D1&quot; when depressing pedal.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>3</td>
<td>5...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Vehicle will not run in any range.</td>
<td>1...</td>
<td>2...</td>
<td>...</td>
<td>3</td>
<td>4...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>- Transmission noise in &quot;D&quot;, &quot;2&quot;, &quot;1&quot; and &quot;R&quot; ranges.</td>
<td>1...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
### Troubleshooting Symptom Chart (Cont'd)

Reference page (A.T. 74)

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.

<table>
<thead>
<tr>
<th>Reference page (A.T. 74)</th>
<th>ON vehicle</th>
<th>OFF vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>61</td>
<td>7 1 2</td>
<td></td>
</tr>
<tr>
<td>Gear change from &quot;2,&quot; to &quot;2,&quot; in &quot;2&quot; range.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Engine brake does not operate in &quot;1&quot; range.</td>
<td>2 1 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Gear change from &quot;1,&quot; to &quot;1,&quot; in &quot;1&quot; range.</td>
<td>2 1</td>
<td></td>
</tr>
<tr>
<td>Large shock changing from &quot;1,&quot; to &quot;1,&quot; in &quot;1&quot; range.</td>
<td>4 3 5</td>
<td></td>
</tr>
<tr>
<td>Transmission overheats.</td>
<td>1 2 4 6 5</td>
<td>1 1 1 2 4 5 6 7 8 9</td>
</tr>
<tr>
<td>A.T.F. shoots out during operation.</td>
<td>1</td>
<td>1 2 3</td>
</tr>
<tr>
<td>White smoke emitted from exhaust pipe during operation.</td>
<td>1</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Offensive smell at fluid charging pipe.</td>
<td>1</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Torque converter is not locked up.</td>
<td>3 1 2 4 5 6</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Lock-up piston slip</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Lock-up point is extremely high or low.</td>
<td>1 2 3 4 5</td>
<td>1 2 3</td>
</tr>
<tr>
<td>A/T does not shift to &quot;D,&quot; when driving with overdrive switch &quot;ON.&quot;</td>
<td>2 1 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Engine is stopped at &quot;R,&quot; &quot;D,&quot; &quot;2,&quot; and &quot;1&quot; ranges.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

Symptom Chart (Cont'd)

Reference page (A.T. 74)

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.

<table>
<thead>
<tr>
<th>Reference page (A.T. 74)</th>
<th>ON vehicle</th>
<th>OFF vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>61</td>
<td>7 1 2</td>
<td></td>
</tr>
<tr>
<td>Gear change from &quot;2,&quot; to &quot;2,&quot; in &quot;2&quot; range.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Engine brake does not operate in &quot;1&quot; range.</td>
<td>2 1 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Gear change from &quot;1,&quot; to &quot;1,&quot; in &quot;1&quot; range.</td>
<td>2 1</td>
<td></td>
</tr>
<tr>
<td>Large shock changing from &quot;1,&quot; to &quot;1,&quot; in &quot;1&quot; range.</td>
<td>4 3 5</td>
<td></td>
</tr>
<tr>
<td>Transmission overheats.</td>
<td>1 2 4 6 5</td>
<td>1 1 1 2 4 5 6 7 8 9</td>
</tr>
<tr>
<td>A.T.F. shoots out during operation.</td>
<td>1</td>
<td>1 2 3</td>
</tr>
<tr>
<td>White smoke emitted from exhaust pipe during operation.</td>
<td>1</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Offensive smell at fluid charging pipe.</td>
<td>1</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Torque converter is not locked up.</td>
<td>3 1 2 4 5 6</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Lock-up piston slip</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Lock-up point is extremely high or low.</td>
<td>1 2 3 4 5</td>
<td>1 2 3</td>
</tr>
<tr>
<td>A/T does not shift to &quot;D,&quot; when driving with overdrive switch &quot;ON.&quot;</td>
<td>2 1 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Engine is stopped at &quot;R,&quot; &quot;D,&quot; &quot;2,&quot; and &quot;1&quot; ranges.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
A/T Shift Lock System

SHIFT LOCK SYSTEM ELECTRICAL PARTS LOCATION

- Key switch harness connector
- Key lock solenoid harness connector
- Key cylinder
- Detent switch
- Shift lock harness connector
- Key lock solenoid
- A/T shift lock control unit
- Shift lock solenoid
TROUBLE DIAGNOSES

A/T Shift Lock System (Cont'd)

WIRING DIAGRAM

To stop lamp

STOPLAMP SWITCH

FUSE BLOCK (Refer to "POWER SUPPLY ROUTING" in EL section.)

KEY LOCK

SOLENOID L/R

G/FUSIBLE LINK BOX

BODY GROUND

To time control unit

SHIFT LOCK SOLNOLD

FUSE

S.M.J.

UP

ENGINE ROOM HARNES.

ENG RTN HARNES.

SHIFIT LOCK CONTROL UNIT

STOP SWITCH

BATTERY

UP

FUSE BLOCK (Refer to "POWER SUPPLY ROUTING" in EL section.)

IGNITION SWITCH OR START

FUSE

BATTERY

SAT8158

AT-77
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.

Check Power Source.

1. Check the following items:
   - Harness continuity between battery and control unit
   - Fuse
   - Ignition switch

2. Check voltage between control unit terminals @, @, @, and ground.
   Battery voltage should exist.

Check Input Signal (Detention switch).

1. Check the following items:
   - Detention switch - Refer to "Component Check".
   - Key switch - Refer to "Component Check".
   - Harness continuity between detention switch and control unit.

2. Check voltage between control unit terminal and ground while setting selector lever in "P" position.
   Battery voltage should exist.

Check Input Signal (Stop Lamp Switch).

1. Check the following items:
   - Stop lamp switch
   - Harness continuity between stop lamp switch and control unit

2. Check voltage between control unit terminal and ground while applying brake pedal.
   Battery voltage should exist.

O.K.
A/T Shift Lock System (Cont’d)

A: CHECK OUTPUT SIGNAL.

1. Check voltage between shift lock harness connector terminal 1 and ground while setting selector lever in "P" position.

<table>
<thead>
<tr>
<th>Brake pedal</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release</td>
<td>Battery voltage</td>
</tr>
<tr>
<td>Depress</td>
<td>0V</td>
</tr>
</tbody>
</table>

- O.K.
- N.G. Check harness continuity between control unit and shift lock solenoid.

2. Check shift lock solenoid. (Refer to "COMPONENT CHECK").

- O.K.
- N.G. Replace A/T shift lock control device assembly.

Recheck shift lock operation.

- O.K.
- N.G. 1. Perform control unit input/output signal inspection test.
         2. If N.G., recheck harness connector connection.

INSPECTION END
A/T Shift Lock System (Cont’d)

DIAGNOSTIC PROCEDURE 2

SYMPTOM: Ignition key cannot be removed when selector lever is set to “P” position or can be removed when selector lever is set to any position except “P”.

1. CHECK POWER SOURCE.
   1. Check the following items:
      - Harness continuity between battery and control unit
      - Fuse
      - Ignition switch

2. Check voltage between control unit terminals 2, 4, 6 and ground.
   Battery voltage should exist.

3. CHECK INPUT SIGNAL (Key switch).
   1. Insert ignition key into ignition switch.
   2. Check voltage between control unit terminal 1 and ground.
      Battery voltage should exist.

4. CHECK INPUT SIGNAL (Detention switch).
   1. Check the following items:
      - Key switch – Refer to “COMPONENT CHECK”.
      - Harness continuity between key switch and control unit.

   2. Check voltage between control unit terminal 5 and ground while setting selector lever in “P” position.

   3. Check voltage between control unit terminal 5 and ground while setting selector lever in any position except “P”.
      0V

O.K.
A/T Shift Lock System (Cont'd)

**CHECK OUTPUT SIGNAL.**

1. Check voltage between terminals ⑧ and ⑨ of key lock solenoid harness connector when turning detention switch ON and OFF. Battery voltage is momentarily produced.
   (Refer to "SHIFT LOCK CONTROL UNIT INSPECTION TABLE").

   - **O.K.**
     - Check key lock solenoid.
       (Refer to "COMPONENT CHECK").
       - **O.K.**
         - Recheck key lock operation.
         - **O.K.**
           - **INSPECTION END**
   - **N.G.**
     - Replace key lock solenoid.
        - **N.G.**
          - 1. Perform control unit input/output signal inspection test.
          - 2. If N.G., recheck harness connector connection.
A/T Shift Lock System (Cont’d)

SHIFT LOCK CONTROL UNIT INSPECTION
- Measure voltage between each terminal and terminal 3 by following “SHIFT LOCK CONTROL UNIT INSPECTION TABLE”.
- Pin connector terminal layout.
### SHIFT LOCK CONTROL UNIT INSPECTION TABLE
(Data are reference values.)

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Item</th>
<th>Condition</th>
<th>Judgement standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shift lock signal</td>
<td>When setting selector lever in &quot;P&quot; position and releasing brake pedal</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Except above</td>
<td>0V</td>
</tr>
<tr>
<td>2</td>
<td>Power source</td>
<td></td>
<td>Battery voltage</td>
</tr>
<tr>
<td>3</td>
<td>Stop lamp switch</td>
<td>When depressing brake pedal</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When releasing brake pedal</td>
<td>0V</td>
</tr>
<tr>
<td>4</td>
<td>Power source</td>
<td></td>
<td>Battery voltage</td>
</tr>
<tr>
<td>5</td>
<td>Detention switch</td>
<td>When setting selector lever in &quot;P&quot; position and releasing selector lever release button</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When setting selector lever in &quot;P&quot; position and pushing selector lever release button</td>
<td>0V</td>
</tr>
<tr>
<td>6</td>
<td>Ignition signal</td>
<td></td>
<td>Battery voltage</td>
</tr>
<tr>
<td>8</td>
<td>Key lock signal</td>
<td>When turning detention switch OFF with ignition switch set to LOCK, OFF or ACC</td>
<td>Battery voltage (Approximately 0.1 seconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Except above</td>
<td>0V</td>
</tr>
<tr>
<td>9</td>
<td>Ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Key unlock signal</td>
<td>When turning detention switch ON with ignition switch set to LOCK, OFF or ACC</td>
<td>Battery voltage (Approximately 0.1 seconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Except above</td>
<td>0V</td>
</tr>
<tr>
<td>11</td>
<td>Key switch</td>
<td>When inserting key to key cylinder</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When removing key from key cylinder</td>
<td>0V</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>When setting shift lever to &quot;P&quot; position with release button released.</td>
<td>Yes</td>
</tr>
<tr>
<td>Except the above</td>
<td>No</td>
</tr>
</tbody>
</table>

**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 ⑧ of key switch harness connector.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>When inserting key into key cylinder</td>
<td>Yes</td>
</tr>
<tr>
<td>When removing key from key cylinder</td>
<td>No</td>
</tr>
</tbody>
</table>

AT-84
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.

<table>
<thead>
<tr>
<th>Bolt No.</th>
<th>Tightening torque N·m (kg-m, ft-lb)</th>
<th>Bolt length &quot;L&quot; mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39 - 49 (4.0 - 5.0, 29 - 38)</td>
<td>40 (1.57)</td>
</tr>
<tr>
<td>2</td>
<td>39 - 49 (4.0 - 5.0, 29 - 38)</td>
<td>50 (1.97)</td>
</tr>
<tr>
<td>3</td>
<td>29 - 39 (3.0 - 4.0, 22 - 29)</td>
<td>25 (0.98)</td>
</tr>
<tr>
<td>Gusset to engine</td>
<td>29 - 39 (3.0 - 4.0, 22 - 29)</td>
<td>20 (0.79)</td>
</tr>
</tbody>
</table>

- 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".

AT-85
MAJOR OVERHAUL

- N·m (kg·m, ft·lb)
- Apply recommended sealant
  (Nissan genuine part: KP510-00250) or equivalent.
- Apply A.T.F.
- Apply petroleum jelly
- Select with proper thickness.
- Adjustment is required.

[Diagram of engine components]

- Oil pump housing oil seal
- O-ring

- Torque converter
- Oil pump cover bearing race
- Needle bearing
- Bearing race

- High clutch assembly
- Output shaft front snap ring
- Front planetary carrier

- Rear internal gear
- rear sun gear
- Needle bearing

- Forward clutch hub
- Thrust washer

- Output shaft front snap ring
- Rear sun gear
- Needle bearing

- D-ring
- Bearing race

- Needle bearing
- Thrust washer
- Snap ring
- End bearing

- Front sun gear
- Needle bearing

- Front internal gear (with rear planetary carrier)
- Output shaft front snap ring

AT-86
Locations of Needle Bearings, Thrust Washers and Snap Rings

<table>
<thead>
<tr>
<th>Item number</th>
<th>Bearing race (black) location</th>
<th>Outer diameter of needle bearings mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Front</td>
<td>47 (1.85)</td>
</tr>
<tr>
<td>2</td>
<td>Rear side</td>
<td>53 (2.09)</td>
</tr>
<tr>
<td>3</td>
<td>Rear side</td>
<td>53 (2.09)</td>
</tr>
<tr>
<td>4</td>
<td>Rear side</td>
<td>78 (3.07)</td>
</tr>
<tr>
<td>5</td>
<td>Rear side</td>
<td>59 (2.32)</td>
</tr>
<tr>
<td>6</td>
<td>Rear side</td>
<td>78 (3.07)</td>
</tr>
<tr>
<td>7</td>
<td>Rear side</td>
<td>64 (2.52)</td>
</tr>
<tr>
<td>8</td>
<td>Rear side</td>
<td>58 (2.28)</td>
</tr>
<tr>
<td>9</td>
<td>Rear side</td>
<td>58 (2.28)</td>
</tr>
<tr>
<td>10</td>
<td>Rear side</td>
<td>53 (2.09)</td>
</tr>
<tr>
<td>11</td>
<td>Rear side</td>
<td>53 (2.09)</td>
</tr>
<tr>
<td>12</td>
<td>Rear side</td>
<td>78 (3.07)</td>
</tr>
<tr>
<td>13</td>
<td>Rear side</td>
<td>64 (2.52)</td>
</tr>
<tr>
<td>14</td>
<td>Rear side</td>
<td>58 (2.28)</td>
</tr>
<tr>
<td>15</td>
<td>Rear side</td>
<td>53 (2.09)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item number</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Black</td>
</tr>
<tr>
<td>2</td>
<td>White</td>
</tr>
</tbody>
</table>
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.
b. Remove bolts A and B, and remove control valve assembly from transmission.

<table>
<thead>
<tr>
<th>Bolt</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>37 mm (1.46 in)</td>
</tr>
<tr>
<td>B</td>
<td>50 mm (1.97 in)</td>
</tr>
</tbody>
</table>

c. Remove solenoid connector.
   - Be careful not to damage connector.

d. Remove manual valve from control valve assembly.

10. Remove terminal cord assembly from transmission case while pushing on stopper.
   - Be careful not to damage cord.
   - Do not remove terminal cord assembly unless it is damaged.
Disassembly (Cont'd)

11. Remove converter housing.
   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.
16. Remove front side clutch and gear components.
   a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

   b. Remove front bearing race from clutch pack.
   c. Remove rear bearing race from clutch pack.

   d. Remove front planetary carrier from transmission case.

   e. Remove front needle bearing from front planetary carrier.
   f. Remove rear bearing from front planetary carrier.

   g. Remove rear sun gear from transmission case.
17. Remove rear extension.
   a. Remove rear extension from transmission case.
   b. Remove rear extension gasket from transmission case.
   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 (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 (Cont'd)
20. Remove band servo and accumulator components.
   a. Remove band servo retainer from transmission case.

   b. Apply compressed air to oil hole until band servo piston comes out of transmission case.
   - Hold piston with a rag and gradually direct air to oil hole.
   c. Remove return springs.

   d. Remove springs from accumulator pistons B, C and D.
   e. Apply compressed air to each oil hole until piston comes out.
   - Hold piston with a rag and gradually direct air to oil hole.

   f. Remove O-ring from each piston.

21. Remove manual shaft components, if necessary.
   a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.
DISASSEMBLY

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 springs 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 stops.
   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

- Lock-up solenoid
- Fluid temperature sensor
- O-ring
- Harness clips
- Reamer bolt
- Pilot filter
- Lower body
- Orifice check spring
- Orifice check valve
- Lower separate gasket
- Separator plate
- Upper separate gasket
- Support plates
- Steel ball
- Upper body
- O-ring
- Line pressure solenoid
- 3-unit solenoid assembly (overrun clutch solenoid and shift solenoids A and B)

Units: N·m (kg·m, ft·lb)

AT-106
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.
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.
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".
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.
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:

<table>
<thead>
<tr>
<th>Item</th>
<th>Bolt symbol</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt length</td>
<td>mm (in)</td>
<td>70</td>
<td>50</td>
<td>33</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.76)</td>
<td>(1.97)</td>
<td>(1.30)</td>
<td>(1.06)</td>
</tr>
</tbody>
</table>

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.
Apply A.T.F. to all components before their installation.

Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-115.
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.
Control Valve Upper Body (Cont’d)

b. Remove retainer plates while holding spring.

c. Place mating surface of valve facedown, and remove internal parts.
   • If a valve is hard to remove, lightly tap valve body with a soft hammer.
   • Be careful not to drop or damage valves, sleeves, etc.

- 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.
   • Be careful not to scratch sliding surface of valve with wire.
Control Valve Upper Body (Cont’d)

**INSPECTION**

Valve springs
- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-112.

### Inspection standard

<table>
<thead>
<tr>
<th>Parts</th>
<th>Item</th>
<th>Part No.</th>
<th>( \ell )</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Torque converter relief valve spring</td>
<td>31742-41X18</td>
<td>32.3 (1.272)</td>
<td>9.0 (0.354)</td>
</tr>
<tr>
<td>2</td>
<td>Pressure regulator valve spring</td>
<td>31742-41X16</td>
<td>61.5 (2.421)</td>
<td>8.9 (0.350)</td>
</tr>
<tr>
<td>3</td>
<td>Pressure modifier valve spring</td>
<td>31742-41X19</td>
<td>31.95 (1.2579)</td>
<td>6.8 (0.268)</td>
</tr>
<tr>
<td>4</td>
<td>Shuttle shift valve D spring</td>
<td>31762-41X00</td>
<td>26.5 (1.043)</td>
<td>6.0 (0.236)</td>
</tr>
<tr>
<td>5</td>
<td>4-2 sequence valve spring</td>
<td>31756-41X00</td>
<td>29.1 (1.146)</td>
<td>6.95 (0.2736)</td>
</tr>
<tr>
<td>6</td>
<td>Shift valve B spring</td>
<td>31762-41X01</td>
<td>25.0 (0.984)</td>
<td>7.0 (0.276)</td>
</tr>
<tr>
<td>7</td>
<td>4-2 relay valve spring</td>
<td>31756-41X00</td>
<td>29.1 (1.146)</td>
<td>6.95 (0.2736)</td>
</tr>
<tr>
<td>8</td>
<td>Shift valve A spring</td>
<td>31762-41X01</td>
<td>25.0 (0.984)</td>
<td>7.0 (0.276)</td>
</tr>
<tr>
<td>9</td>
<td>Overrun clutch control valve spring</td>
<td>31762-41X03</td>
<td>23.6 (0.929)</td>
<td>7.0 (0.276)</td>
</tr>
<tr>
<td>10</td>
<td>Overrun clutch reducing valve spring</td>
<td>31742-41X20</td>
<td>32.5 (1.280)</td>
<td>7.0 (0.276)</td>
</tr>
<tr>
<td>11</td>
<td>Shuttle shift valve S spring</td>
<td>31762-41X04</td>
<td>51.0 (2.008)</td>
<td>5.65 (0.2224)</td>
</tr>
<tr>
<td>12</td>
<td>Pilot valve spring</td>
<td>31742-41X13</td>
<td>25.7 (1.012)</td>
<td>9.1 (0.358)</td>
</tr>
<tr>
<td>13</td>
<td>Lock-up control valve spring</td>
<td>31742-41X22</td>
<td>18.5 (0.728)</td>
<td>13.0 (0.612)</td>
</tr>
</tbody>
</table>

- Replace valve springs if deformed or fatigued.

**Control valves**
- Check sliding surfaces of valves, sleeves and plugs.
Control Valve Upper Body (Cont'd)

ASSEMBLY

1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.
   - Be careful not to scratch or damage valve body.

   - Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.

Pressure regulator valve
- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body. If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.

Accumulator control plug
- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.

2. Install parallel pins and retainer plates.
Control Valve Upper Body (Cont'd)

- While pushing plug, install parallel pin.

4-2 sequence valve and relay valve

- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.

- Insert retainer plate while pushing spring.
Apply A.T.F. to all components before their installation.

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.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.

Apply A.T.F. to all components before their installation.
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.

<table>
<thead>
<tr>
<th>Parts</th>
<th>Item</th>
<th>Part No.</th>
<th>( \ell )</th>
<th>( D )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Modifier accumulator piston spring</td>
<td>31742-41X15</td>
<td>30.5 (1.201)</td>
<td>9.8 (0.386)</td>
</tr>
<tr>
<td>2</td>
<td>1st reducing valve spring</td>
<td>31756-41X05</td>
<td>25.4 (1.000)</td>
<td>6.75 (0.2657)</td>
</tr>
<tr>
<td>3</td>
<td>3-2 timing valve spring</td>
<td>31742-41X08</td>
<td>20.55 (0.8091)</td>
<td>6.75 (0.2657)</td>
</tr>
<tr>
<td>4</td>
<td>Servo charger valve spring</td>
<td>31742-41X06</td>
<td>23.0 (0.906)</td>
<td>6.7 (0.264)</td>
</tr>
</tbody>
</table>

- 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.

DISASSEMBLY

1. Remove reverse clutch assembly from clutch pack.

2. Check operation of reverse clutch.
   a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
   b. Check to see that retaining plate moves to snap ring.
   c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.
**Reverse Clutch (Cont'd)**

3. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.

4. Remove snap ring from clutch drum while compressing clutch springs.
   - **Do not expand snap ring excessively.**

5. Remove spring retainer and return spring.

6. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
   - **Do not apply compressed air abruptly.**

7. Remove D-ring and oil seal from piston.

**INSPECTION**

**Reverse clutch snap ring and spring retainer**
- Check for deformation, fatigue or damage.

**Reverse clutch return springs**
- Check for deformation or damage. Also measure free length and outside diameter.

**Inspection standard:**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Part No.</th>
<th>( \ell ) (in)</th>
<th>( D ) (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>30505-41X02</td>
<td>0.7752</td>
<td>0.457</td>
</tr>
</tbody>
</table>

**Reverse clutch drive plates**
- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  - **Thickness of drive plate:**
    - Standard value: 2.0 mm (0.079 in)
    - Wear limit: 1.8 mm (0.071 in)
  - If not within wear limit, replace.

**Reverse clutch dish plate**
- Check for deformation or damage.
Reverse Clutch (Cont’d)

Reverse clutch piston
- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring to assure that there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

ASSEMBLY

1. Install D-ring and oil seal on piston.
   - Apply A.T.F. to both parts.

2. Install piston assembly by turning it slowly and evenly.
   - Apply A.T.F. to inner surface of drum.

3. Install return springs and spring retainer.

4. Install snap ring while compressing clutch springs.
Reverse Clutch (Cont’d)

- Do not align snap ring gap with spring retainer stopper.

5. Install drive plates, driven plates, retaining plate and dish plate.

6. Install snap ring.

7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

   Specified clearance:
   - Standard
     0.5 - 0.8 mm (0.020 - 0.031 in)
   - Allowable limit
     1.2 mm (0.047 in)
   - Retaining plate:
     Refer to S.D.S.

8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch.
High Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

- High clutch drum
- D-ring (Large) [ATF]
- D-ring (Small) [ATF]
- Clutch piston
- Drive plate [ATF]
- Retaining plate *
- Snap ring
- Spring retainer
- Spring retainer

ATF : Apply A.T.F.
* : Select with proper thickness.

Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

- Check of high clutch operation
High Clutch (Cont’d)

- Removal and installation of return spring

- Inspection of high clutch return springs

**Inspection standard:**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>( l )</th>
<th>( D )</th>
</tr>
</thead>
<tbody>
<tr>
<td>31505-21X03</td>
<td>22.06 (0.8685)</td>
<td>11.6 (0.457)</td>
</tr>
</tbody>
</table>

- 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.

Snap ring

Retaining plate *

Drive plate (ATF)

Driven plate

Dish plate

Direction of dish plate

Dish plate

Overrun clutch plate

D-ring (ATF)

Oil seal (ATF)

Snap ring

Spring retainer

Oil seal (ATF)

Return spring

Overrun clutch piston

Direction of oil seal

Driven plate

Driven plate

Drive plate

Drive plate

Forward clutch plate
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.
Forward and Overrun Clutches (Cont'd)

- Removal and installation of return springs

- Inspection of forward clutch and overrun clutch return springs

<table>
<thead>
<tr>
<th>Inspection standard:</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part No.</td>
<td>L</td>
</tr>
<tr>
<td>31505-41X01</td>
<td>35.77 (1.4083)</td>
</tr>
</tbody>
</table>

- 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.
  2. Apply A.T.F. to inner surface of clutch drum.
Forward and Overrun Clutches (Cont’d)

- Align notch in forward clutch piston with groove in forward clutch drum.

2. Install overrun clutch by turning it slowly and evenly.
- Apply A.T.F. to inner surface of forward clutch piston.

- Measurement of clearance between retaining plate and snap ring of overrun clutch
  Specified clearance:
  - Standard
    1.0 - 1.4 mm (0.039 - 0.055 in)
  - Allowable limit
    2.0 mm (0.079 in)
  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.

![Diagram of Low & Reverse Brake components]

**ATF**: Apply A.T.F.
**P**: Apply petroleum jelly.
**★**: Select with proper thickness.

**Low & Reverse Brake Piston**

- Needle bearing
- D-ring
- Oil seal

**Driveplate**: Apply A.T.F.

**Retaining plate ★**: Select with proper thickness.

**Driven plate**: Apply petroleum jelly.

**21 - 26 N·m (2.1 - 2.7 kg·m, 15 - 20 ft·lb)**

**Direction of oil seal**

**DISASSEMBLY**

1. Check operation of low and reverse brake.
   a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
   b. Check to see that retaining plate moves to snap ring.
   c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.
Low & Reverse Brake (Cont’d)
3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.

4. Remove seal rings from low one-way-clutch inner race.
5. Remove needle bearing from low one-way clutch inner race.

6. Remove low and reverse brake piston using compressed air.
7. Remove oil seal and D-ring from piston.

INSPECTION
Low and reverse brake snap ring and spring retainer
- Check for deformation, or damage.

Low and reverse brake return springs
- Check for deformation or damage. Also measure free length and outside diameter.

<table>
<thead>
<tr>
<th>Inspection standard:</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part No.</td>
<td>$l$</td>
</tr>
<tr>
<td>31521-21X00</td>
<td>23.7 (0.933)</td>
</tr>
</tbody>
</table>

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.
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.
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.
DISASSEMBLY

1. Remove snap ring from forward clutch drum.

2. Remove side plate from forward clutch drum.

3. Remove low one-way clutch from forward clutch drum.
Forward Clutch Drum Assembly (Cont’d)

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.
REPAIR FOR COMPONENT PARTS

Rear Internal Gear and Forward Clutch Hub

DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.

2. Remove thrust washer from rear internal gear.

3. Remove snap ring from forward clutch hub.
Rear Internal Gear and Forward Clutch Hub (Cont'd)

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.
Rear Internal Gear and Forward Clutch Hub (Cont'd)

ASSEMBLY
1. Install snap ring onto forward clutch hub.
2. Install end bearing.
3. Install forward one-way clutch onto clutch hub.
   - Install forward one-way clutch with flange facing rearward.
4. Install end bearing.
5. Install snap ring onto forward clutch hub.
6. Install thrust washer onto rear internal gear.
   - Apply petroleum jelly to thrust washer.
   - Securely insert pawls of thrust washer into holes in rear internal gear.
7. Position forward clutch hub in rear internal gear.
8. After installing, check to assure that forward clutch hub rotates clockwise.
Band Servo Piston Assembly

DISASSEMBLY

1. Block one oil hole in O.D. servo piston retainer and the center hole in O.D. band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove O.D. band servo piston from retainer.
3. Remove D-ring from O.D. band servo piston.
4. Remove band servo piston assembly from servo piston retainer by pushing it forward.
5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.
Band Servo Piston Assembly (Cont’d)

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 O-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.

<table>
<thead>
<tr>
<th>Inspection standard:</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts</td>
<td>Free length</td>
</tr>
<tr>
<td>Spring A</td>
<td>45.6 (1.795)</td>
</tr>
<tr>
<td>Spring B</td>
<td>53.8 (2.118)</td>
</tr>
<tr>
<td>Spring C</td>
<td>29.0 (1.142)</td>
</tr>
</tbody>
</table>
Band Servo Piston Assembly (Cont’d)

ASSEMBLY

1. Install O-rings onto servo piston retainer.
   • Apply A.T.F. to O-rings.
   • Pay attention to position of each O-ring.

2. Install servo cushion spring retainer onto band servo piston.

3. Install E-ring onto servo cushion spring retainer.

4. Install D-rings onto band servo piston.
   • Apply A.T.F. to D-rings.

5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.
Band Servo Piston Assembly (Cont'd)

6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.

7. Install band servo piston assembly onto servo piston retainer by pushing it inward.

8. Install D-ring on O.D. band servo piston.
   - Apply A.T.F. to D-ring.

9. Install O.D. band servo piston onto servo piston retainer by pushing it inward.
Parking Pawl Components

**DISASSEMBLY**

1. Slide return spring to the front of rear extension flange.

2. Remove return spring, pawl spacer and parking pawl from rear extension.

3. Remove parking pawl shaft from rear extension.

4. Remove parking actuator support and rod guide from rear extension.

---

**Component Parts**

- Parking rod
- Output shaft
- Parking rod return spring
- Parking pawl spacer
- Parking pawl return spring
- Parking actuator support
- Parking pawl shaft
- Rear extension
- Bolt
- Parking pawl
- Parking actuator support
- Parking rod guide
- Snap ring

**Specifications**

- 24 - 29 N·m
- 2.4 - 3.0 kg·m
- 17 - 22 ft·lb

**Identification Codes**

- SAT927A
- SAT205B
- AT-144
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

1. Install manual shaft components.
   a. Install oil seal onto manual shaft.
   - Apply A.T.F. to oil seal.
   - Wrap threads of manual shaft with masking tape.
   b. Insert manual shaft and oil seal as a unit into transmission case.
   c. Remove masking tape.
   d. Push oil seal evenly and install it onto transmission case.
   e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.
   f. Install detent spring and spacer.
   g. While pushing detent spring down, install manual plate onto manual shaft.
Assembly (Cont'd)

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.

<table>
<thead>
<tr>
<th>Accumulator piston O-rings:</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulator</td>
<td>A</td>
</tr>
<tr>
<td>Small diameter end</td>
<td>29 (1.14)</td>
</tr>
<tr>
<td>Large diameter end</td>
<td>45 (1.77)</td>
</tr>
</tbody>
</table>

b. Install return spring for accumulator A onto transmission case.

Free length of return spring:

<table>
<thead>
<tr>
<th>Accumulator</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free length</td>
<td>43 (1.69)</td>
</tr>
</tbody>
</table>

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 (Cont'd)
b. Install band servo piston onto transmission case.
- Apply A.T.F. to O-ring of band servo piston and transmission case.
c. Install gasket for band servo onto transmission case.

d. Install band servo retainer onto transmission case.

4. Install rear side clutch and gear components.
a. Place transmission case in vertical position.

b. Slightly lift forward clutch drum assembly and slowly rotate it clockwise until its hub passes fully over the clutch inner race inside transmission case.

c. Check to be sure that rotation direction of forward clutch assembly is correct.
Assembly (Cont’d)

d. Install thrust washer onto front of overrun clutch hub.
   - Apply petroleum jelly to the thrust washer.
   - Insert pawls of thrust washer securely into holes in overrun clutch hub.

e. Install overrun clutch hub onto rear internal gear assembly.

f. Install needle bearing onto rear of overrun clutch hub.
   - Apply petroleum jelly to needle bearing.

g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.

h. Place transmission case into horizontal position.
ASSEMBLY

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.
Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

<table>
<thead>
<tr>
<th>Part name</th>
<th>Item</th>
<th>Total end play</th>
<th>Reverse clutch end play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission case</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Low one-way clutch inner race</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Overrun clutch hub</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Rear internal gear</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Rear planetary carrier</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Rear sun gear</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Front planetary carrier</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Front sun gear</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>High clutch hub</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>High clutch drum</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Oil pump cover</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Reverse clutch drum</td>
<td></td>
<td></td>
<td>●</td>
</tr>
</tbody>
</table>

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.
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.
Adjustment (Cont'd)

2. Adjust total end play.

**Total end play “T,”:**

\[ 0.25 - 0.55 \text{ mm} \left( 0.0098 - 0.0217 \text{ in} \right) \]

a. With needle bearing installed, place J34291-1 (bridge), J34291-2 (legs) and the J34291-5 (gauging cylinder) onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly and gauging cylinder should rest on top of the needle bearing. Lock gauging cylinder in place with set screw.

b. Install J34291-23 (gauging plunger) into gauging cylinder.

c. With original bearing race installed inside reverse clutch drum, place shim selecting gauge with its legs on machined surface of transmission case (no gasket) and allow gauging plunger to rest on bearing race. Lock gauging plunger in place with set screw.

d. Remove Tool and use feeler gauge to measure gap between gauging cylinder and gauging plunger. This measurement should give exact total end play.

**Total end play “T,”:**

\[ 0.25 - 0.55 \text{ mm} \left( 0.0098 - 0.0217 \text{ in} \right) \]

- 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 "Tc":
0.55 - 0.90 mm (0.0217 - 0.0354 in)

- 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.

- Install J34291-23 (gauging plunger) into gauging cylinder.

- 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.

- Use feeler gauge to measure gap between gauging plunger and gauging cylinder. This measurement should give you exact reverse clutch drum and play.

Reverse clutch drum end play "Tc":
0.55 - 0.90 mm (0.0217 - 0.0354 in)

- If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.

Available oil pump thrust washer:
Refer to S.D.S.
Assembly

1. Install output shaft and parking gear.
   a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.
      • Do not force output shaft against front of transmission case.
   b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.
      • Check to be sure output shaft cannot be removed in rear direction.
   c. Install needle bearing on transmission case.
      • Pay attention to its direction — Black side goes to 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 (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 (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.
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 (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 (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.
d. Install converter housing on transmission case.

10. Adjust brake band.
   a. Tighten anchor end bolt to specified torque.
      Anchor end bolt:
      $\text{Anchor end bolt: } 4 - 6 \text{ N-m }$
      $(0.4 - 0.6 \text{ kg-m, } 2.9 - 4.3 \text{ ft-lb})$
   b. Back off anchor end bolt two and a half turns.
   c. While holding anchor end pin, tighten lock nut.

11. Install terminal cord assembly.
   a. Install O-ring on terminal cord assembly.
      - **Apply petroleum jelly to O-ring.**
   b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.

12. Install control valve assembly.
   a. Install accumulator piston return springs B, C and D.

<table>
<thead>
<tr>
<th>Item</th>
<th>Accumulator</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free length</td>
<td>66 (2.60)</td>
<td>45 (1.77)</td>
<td>58.4 (2.299)</td>
<td></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Bolt</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>37 mm (1.46 in)</td>
</tr>
<tr>
<td>B</td>
<td>50 mm (1.97 in)</td>
</tr>
</tbody>
</table>

g. Install O-ring on oil strainer.
- Apply petroleum jelly to O-ring.
h. Install oil strainer on control valve.
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.

   a. Check that manual shaft is in "1" range.
   b. Temporarily install inhibitor switch on manual shaft.
   c. Move manual shaft to "N".
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
General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine</td>
<td>KA24E</td>
</tr>
<tr>
<td>Automatic transmission model</td>
<td>RE4R01A</td>
</tr>
<tr>
<td>Transmission model code number</td>
<td>45X06</td>
</tr>
<tr>
<td>Stall torque ratio</td>
<td>2.0 : 1</td>
</tr>
<tr>
<td>Transmission gear ratio</td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>2.785</td>
</tr>
<tr>
<td>2nd</td>
<td>1.545</td>
</tr>
<tr>
<td>Top</td>
<td>1.000</td>
</tr>
<tr>
<td>O.D.</td>
<td>0.694</td>
</tr>
<tr>
<td>Reverse</td>
<td>2.272</td>
</tr>
<tr>
<td>Recommended oil</td>
<td>Automatic transmission fluid Type DEXRON™</td>
</tr>
<tr>
<td>Oil capacity</td>
<td>2 (US qt, Imp qt) 8.3 (8-3/4, 7-1/4)</td>
</tr>
</tbody>
</table>

Specifications and Adjustment

**VEHICLE SPEED WHEN SHIFTING GEARS**

<table>
<thead>
<tr>
<th>Throttle position</th>
<th>D₁ → D₂</th>
<th>D₂ → D₃</th>
<th>D₃ → D₄</th>
<th>D₄ → D₂</th>
<th>D₄ → D₃</th>
<th>D₄ → D₄</th>
<th>D₅ → D₆</th>
<th>D₁ → D₆</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full throttle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP**

<table>
<thead>
<tr>
<th>Throttle position</th>
<th>O.D. switch [Shift range]</th>
<th>Lock-up &quot;ON&quot;</th>
<th>Lock-up &quot;OFF&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full throttle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full throttle</td>
<td>ON [D₄]</td>
<td>146 - 156 (91 - 97)</td>
<td>140 - 150 (87 - 93)</td>
</tr>
<tr>
<td></td>
<td>OFF [D₄]</td>
<td>95 - 101 (59 - 63)</td>
<td>89 - 95 (55 - 59)</td>
</tr>
<tr>
<td>Half throttle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Half throttle</td>
<td>ON [D₄]</td>
<td>112 - 120 (70 - 75)</td>
<td>102 - 110 (63 - 68)</td>
</tr>
<tr>
<td></td>
<td>OFF [D₄]</td>
<td>76 - 84 (47 - 52)</td>
<td>71 - 79 (44 - 49)</td>
</tr>
</tbody>
</table>

**STALL REVOLUTION**

| Stall Revolution rpm       | 2,060 - 2,260 |

**LINE PRESSURE**

<table>
<thead>
<tr>
<th>Engine speed rpm</th>
<th>Line pressure kPa (kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D₁, 2 and 1 ranges</td>
</tr>
<tr>
<td>Idle</td>
<td>471 - 510 (65 - 75)</td>
</tr>
<tr>
<td>Stall</td>
<td>1,020 - 1,098 (145 - 155)</td>
</tr>
</tbody>
</table>
### RETURN SPRINGS

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Free length (mm)</th>
<th>Outer diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque converter relief valve spring</td>
<td>31742-41X18</td>
<td>32.3 (1.272)</td>
<td>9.0 (0.354)</td>
</tr>
<tr>
<td>Pressure regulator valve spring</td>
<td>31742-41X16</td>
<td>61.5 (2.421)</td>
<td>8.9 (0.350)</td>
</tr>
<tr>
<td>Pressure modifier valve spring</td>
<td>31742-41X19</td>
<td>31.95 (1.2579)</td>
<td>6.8 (0.268)</td>
</tr>
<tr>
<td>Shuttle shift valve D spring</td>
<td>31762-41X00</td>
<td>26.5 (1.043)</td>
<td>6.0 (0.236)</td>
</tr>
<tr>
<td>4-2 sequence valve spring</td>
<td>31756-41X00</td>
<td>29.1 (1.146)</td>
<td>6.95 (0.2736)</td>
</tr>
<tr>
<td>Shift valve B spring</td>
<td>31762-41X01</td>
<td>25.0 (0.984)</td>
<td>7.0 (0.276)</td>
</tr>
<tr>
<td>4-2 relay valve spring</td>
<td>31756-41X00</td>
<td>29.1 (1.146)</td>
<td>6.95 (0.2736)</td>
</tr>
<tr>
<td>Shift valve A spring</td>
<td>31762-41X01</td>
<td>25.0 (0.984)</td>
<td>7.0 (0.276)</td>
</tr>
<tr>
<td>Overrun clutch control valve spring</td>
<td>31762-41X03</td>
<td>23.6 (0.929)</td>
<td>7.0 (0.276)</td>
</tr>
<tr>
<td>Overrun clutch reducing valve spring</td>
<td>31742-41X20</td>
<td>32.5 (1.280)</td>
<td>7.0 (0.276)</td>
</tr>
<tr>
<td>Shuttle shift valve S spring</td>
<td>31762-41X04</td>
<td>51.0 (2.008)</td>
<td>5.65 (0.2224)</td>
</tr>
<tr>
<td>Pilot valve spring</td>
<td>31742-41X13</td>
<td>25.7 (1.012)</td>
<td>9.1 (0.358)</td>
</tr>
<tr>
<td>Lock-up control valve spring</td>
<td>31742-41X22</td>
<td>18.5 (0.728)</td>
<td>13.0 (0.512)</td>
</tr>
<tr>
<td>Modifier accumulator piston spring</td>
<td>31742-41X15</td>
<td>30.5 (1.201)</td>
<td>9.8 (0.386)</td>
</tr>
<tr>
<td>1st reducing valve spring</td>
<td>31756-41X05</td>
<td>25.4 (1.000)</td>
<td>6.75 (0.2657)</td>
</tr>
<tr>
<td>3-2 timing valve spring</td>
<td>31742-41X08</td>
<td>20.55 (0.8091)</td>
<td>6.75 (0.2657)</td>
</tr>
<tr>
<td>Servo charger valve spring</td>
<td>31742-41X06</td>
<td>23.0 (0.906)</td>
<td>6.7 (0.264)</td>
</tr>
<tr>
<td>Reverse clutch</td>
<td>16 pcs</td>
<td>30605-41X02</td>
<td>19.69 (0.7752)</td>
</tr>
<tr>
<td>High clutch</td>
<td>16 pcs</td>
<td>31505-21X03</td>
<td>22.06 (0.8685)</td>
</tr>
<tr>
<td>Forward clutch</td>
<td>20 pcs</td>
<td>31505-41X01</td>
<td>35.77 (1.4083)</td>
</tr>
<tr>
<td>Low &amp; reverse brake</td>
<td>16 pcs</td>
<td>31621-21X00</td>
<td>23.7 (0.933)</td>
</tr>
<tr>
<td>Band servo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring A</td>
<td>31605-41X05</td>
<td>45.6 (1.795)</td>
<td>34.3 (1.350)</td>
</tr>
<tr>
<td>Spring B</td>
<td>31605-41X00</td>
<td>53.8 (2.118)</td>
<td>40.3 (1.587)</td>
</tr>
<tr>
<td>Spring C</td>
<td>31605-41X01</td>
<td>29.0 (1.142)</td>
<td>27.6 (1.087)</td>
</tr>
<tr>
<td>Accumulator A</td>
<td>31605-41X02</td>
<td>43.0 (1.683)</td>
<td>10.0 (1.000)</td>
</tr>
<tr>
<td>Accumulator B</td>
<td>31605-41X10</td>
<td>66.0 (2.598)</td>
<td>10.0 (1.000)</td>
</tr>
<tr>
<td>Accumulator C</td>
<td>31605-41X09</td>
<td>45.0 (1.772)</td>
<td></td>
</tr>
<tr>
<td>Accumulator D</td>
<td>31605-41X06</td>
<td>68.0 (2.283)</td>
<td></td>
</tr>
</tbody>
</table>
### ACCUMULATOR O-RING

<table>
<thead>
<tr>
<th>Accumulator</th>
<th>Diameter mm (in)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Small diameter end</td>
<td>29 (1.14) 32 (1.26) 45 (1.77) 29 (1.14)</td>
<td></td>
</tr>
<tr>
<td>Large diameter end</td>
<td>45 (1.77) 50 (1.97) 50 (1.97) 45 (1.77)</td>
<td></td>
</tr>
</tbody>
</table>

### CLUTCHES AND BRAKES

#### Reverse clutch

<table>
<thead>
<tr>
<th>Number of drive plates</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of driven plates</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Thickness of drive plate mm (in)

- Standard: 2.0 (0.079)
- Wear limit: 1.8 (0.071)

#### Clearance mm (in)

- Standard: 0.5 - 0.8 (0.020 - 0.031)
- Allowable limit: 1.2 (0.047)

#### Thickness of retaining plate

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.6 (0.181)</td>
<td>31537-21X00</td>
</tr>
<tr>
<td>4.8 (0.189)</td>
<td>31537-21X01</td>
</tr>
<tr>
<td>5.0 (0.197)</td>
<td>31537-21X02</td>
</tr>
<tr>
<td>5.2 (0.205)</td>
<td>31537-21X03</td>
</tr>
<tr>
<td>5.4 (0.213)</td>
<td>31537-21X04</td>
</tr>
<tr>
<td>5.6 (0.220)</td>
<td>31567-41X13</td>
</tr>
<tr>
<td>5.8 (0.228)</td>
<td>31567-41X14</td>
</tr>
</tbody>
</table>

#### High clutch

<table>
<thead>
<tr>
<th>Number of drive plates</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of driven plates</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Thickness of drive plate mm (in)

- Standard: 1.6 (0.063)
- Wear limit: 1.4 (0.055)

#### Clearance mm (in)

- Standard: 1.8 - 2.2 (0.071 - 0.087)
- Allowable limit: 3.0 (0.118)

#### Thickness of retaining plate

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6 (0.142)</td>
<td>31537-41X61</td>
</tr>
<tr>
<td>3.8 (0.150)</td>
<td>31537-41X62</td>
</tr>
<tr>
<td>4.0 (0.157)</td>
<td>31537-41X63</td>
</tr>
<tr>
<td>4.2 (0.165)</td>
<td>31537-41X64</td>
</tr>
<tr>
<td>4.4 (0.173)</td>
<td>31537-41X65</td>
</tr>
<tr>
<td>4.6 (0.181)</td>
<td>31537-41X66</td>
</tr>
<tr>
<td>4.8 (0.189)</td>
<td>31537-41X67</td>
</tr>
<tr>
<td>5.0 (0.197)</td>
<td>31537-41X68</td>
</tr>
</tbody>
</table>

#### Forward clutch

<table>
<thead>
<tr>
<th>Number of drive plates</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of driven plates</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Thickness of drive plate mm (in)

- Standard: 2.0 (0.079)
- Wear limit: 1.8 (0.071)

#### Clearance mm (in)

- Standard: 0.45 - 0.85 (0.0177 - 0.0335)
- Allowable limit: 1.85 (0.0728)

#### Thickness of retaining plate

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.0 (0.315)</td>
<td>31537-41X00</td>
</tr>
<tr>
<td>8.2 (0.323)</td>
<td>31537-41X01</td>
</tr>
<tr>
<td>8.4 (0.331)</td>
<td>31537-41X02</td>
</tr>
<tr>
<td>8.6 (0.339)</td>
<td>31537-41X03</td>
</tr>
<tr>
<td>8.8 (0.346)</td>
<td>31537-41X04</td>
</tr>
<tr>
<td>9.0 (0.354)</td>
<td>31537-41X05</td>
</tr>
<tr>
<td>9.2 (0.362)</td>
<td>31537-41X06</td>
</tr>
</tbody>
</table>

#### Overrun clutch

<table>
<thead>
<tr>
<th>Number of drive plates</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of driven plates</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Thickness of drive plate mm (in)

- Standard: 2.0 (0.079)
- Wear limit: 1.8 (0.071)

#### Clearance mm (in)

- Standard: 1.0 - 1.4 (0.039 - 0.055)
- Allowable limit: 2.0 (0.079)

#### Thickness of retaining plate

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 (0.157)</td>
<td>31537-41X79</td>
</tr>
<tr>
<td>4.2 (0.165)</td>
<td>31537-41X80</td>
</tr>
<tr>
<td>4.4 (0.173)</td>
<td>31537-41X81</td>
</tr>
<tr>
<td>4.6 (0.181)</td>
<td>31537-41X82</td>
</tr>
<tr>
<td>4.8 (0.189)</td>
<td>31537-41X83</td>
</tr>
<tr>
<td>5.0 (0.197)</td>
<td>31537-41X84</td>
</tr>
<tr>
<td>5.2 (0.205)</td>
<td>31537-41X20</td>
</tr>
</tbody>
</table>
### Specifications and Adjustment (Cont'd)

#### Oil Pump and Low One-Way Clutch

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
<th>Wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cam ring - oil pump housing</td>
<td>0.01 - 0.024 (0.0004 - 0.0009)</td>
<td>0.01 - 0.024 (0.0004 - 0.0009)</td>
</tr>
<tr>
<td>Rotor, vanes and control piston - oil pump housing</td>
<td>0.03 - 0.044 (0.0012 - 0.0017)</td>
<td>0.03 - 0.044 (0.0012 - 0.0017)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
<th>Allowable limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal ring clearance mm (in)</td>
<td>0.10 - 0.25 (0.0039 - 0.0098)</td>
<td>0.25 (0.0098)</td>
</tr>
</tbody>
</table>

#### Total End Play

<table>
<thead>
<tr>
<th>Parameter</th>
<th>0.25 - 0.55 mm (0.0098 - 0.0217 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness mm (in)</td>
<td>Part number</td>
</tr>
<tr>
<td>0.8 (0.031)</td>
<td>31429-21X00</td>
</tr>
<tr>
<td>1.0 (0.039)</td>
<td>31429-21X01</td>
</tr>
<tr>
<td>1.2 (0.047)</td>
<td>31429-21X02</td>
</tr>
<tr>
<td>1.4 (0.055)</td>
<td>31429-21X03</td>
</tr>
<tr>
<td>1.6 (0.063)</td>
<td>31429-21X04</td>
</tr>
<tr>
<td>1.8 (0.071)</td>
<td>31429-21X05</td>
</tr>
<tr>
<td>2.0 (0.079)</td>
<td>31429-21X06</td>
</tr>
</tbody>
</table>

#### Reverse Clutch Drum End Play

<table>
<thead>
<tr>
<th>Reverse clutch drum end play &quot;T_2&quot;</th>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.55 - 0.90 mm</td>
<td>0.0217 - 0.0364 in</td>
<td>31528-21X00, 31528-21X01, 31528-21X02, 31528-21X03, 31528-21X04, 31528-21X05, 31528-21X06</td>
</tr>
</tbody>
</table>

#### Removal and Installation

<table>
<thead>
<tr>
<th>Manual control linkage</th>
<th>Number of returning revolutions for lock nut</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lock nut tightening torque</th>
<th>11 - 15 N-m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1.1 - 1.5 kg-m, 8 - 11 ft-lb)</td>
</tr>
</tbody>
</table>

| 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) |

---

**Notes:**

- Oil pump cover bearing race thicknesses and part numbers are listed for specific measurements.
- Reverse clutch drum end play clearance values and part numbers are specified.
- Manual control linkage requirements and return revolutions for lock nut.
- Lock nut tightening torque values are provided.
- Distance and runout limits for clutch housing and torque converter.

**AT-168**
CONTENTS

PREPARATION .................................................................................................................. PD- 2
PROPELLER SHAFT ........................................................................................................ PD- 5
ON-VEHICLE SERVICE (Final drive) ............................................................................ PD- 9
REMOVAL AND INSTALLATION .................................................................................. PD-11
FRONT FINAL DRIVE .................................................................................................... PD-12
DISASSEMBLY ................................................................................................................ PD-13
INSPECTION .................................................................................................................... PD-17
ADJUSTMENT .................................................................................................................. PD-18
ASSEMBLY ....................................................................................................................... PD-25
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .................................................... PD-30
## SPECIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST38060002</td>
<td>Removing and installing propeller shaft lock nut, and drive pinion lock nut.</td>
</tr>
<tr>
<td>KV38100800</td>
<td>Mounting final drive (To use, make a new hole.)</td>
</tr>
<tr>
<td>ST30905000</td>
<td>Removing and installing drive pinion rear cone</td>
</tr>
<tr>
<td>ST3306S001</td>
<td>Removing and installing differential side bearing inner cone</td>
</tr>
<tr>
<td>ST30611000</td>
<td>Installing pinion rear bearing outer race</td>
</tr>
</tbody>
</table>

### Driv pinion flange wrench

![Driv pinion flange wrench](image1.png)

### Equivalent tool (J25604-01) Differential attachment

![Equivalent tool (J25604-01) Differential attachment](image2.png)

- **a**: 152 mm (5.98 in)

### Drive pinion rear inner race puller set

1. **ST30031000** (J22912-01) Puller
2. **ST30901000** (J26010-01) Base

### Differential side bearing puller set

1. **ST33051001** (J22888) Body
2. **ST33061000** (J8107-2) Adapter

### Equivalent tool (J26010-01) Adapter

![Equivalent tool (J26010-01) Adapter](image3.png)
<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST30613000 (J25742-3)</td>
<td>Drift</td>
<td>Installing pinion rear bearing outer race</td>
</tr>
<tr>
<td>ST30701000 (J25742-2)</td>
<td>Drift</td>
<td>Installing pinion front bearing outer race</td>
</tr>
<tr>
<td>KV38100200 (J26233)</td>
<td>Gear carrier side oil seal drift</td>
<td>Installing side oil seal</td>
</tr>
<tr>
<td>KV38100500 ( - )</td>
<td>Gear carrier front oil seal drift</td>
<td>Installing front oil seal</td>
</tr>
<tr>
<td>KV38100300 (J25523)</td>
<td>Differential side bearing inner cone</td>
<td>Installing side bearing inner cone</td>
</tr>
<tr>
<td>KV38100600 (J25267)</td>
<td>Side bearing spacer drift</td>
<td>Installing side bearing spacer</td>
</tr>
<tr>
<td>ST31275000 (See J25765-A)</td>
<td>Preload gauge</td>
<td>Measuring pinion bearing preload and total preload</td>
</tr>
<tr>
<td>GG91030000 (J25765)</td>
<td>Torque wrench</td>
<td></td>
</tr>
<tr>
<td>HT62940000 ( - )</td>
<td>Socket adapter</td>
<td></td>
</tr>
<tr>
<td>HT62900000 ( - )</td>
<td>Socket adapter</td>
<td></td>
</tr>
<tr>
<td>HT72400000 ( - )</td>
<td>Slide hammer</td>
<td>Removing differential case assembly</td>
</tr>
<tr>
<td>Tool number (Kent-Moore No.)</td>
<td>Tool name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>(J34309)</td>
<td>Differential shim selector</td>
<td>Adjusting bearing preload and gear height</td>
</tr>
<tr>
<td>(J25269-4)</td>
<td>Side bearing discs (2 Req'd)</td>
<td>Selecting pinion height adjusting washer</td>
</tr>
<tr>
<td>(J8129)</td>
<td>Spring gauge</td>
<td>Measuring carrier turning torque</td>
</tr>
</tbody>
</table>
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.

Center bearing upper mounting bracket

Center bearing lower mounting bracket

Propeller shaft 1st tube

Propeller shaft 2nd tube

Companion flange

Center bearing assembly

Install center bearing with "F" mark toward front of vehicle.

Center bearing cushion

Lock nut

25 - 39 (2.6 - 4.0, 19 - 29)

(25 - 30, 191 - 217)

39 - 44 (4.0 - 4.6, 29 - 33)

34 - 44 (3.5 - 4.5, 25 - 33)

Companion flange

Center bearing assembly

Install center bearing with "F" mark toward front of vehicle.

Center bearing cushion

Lock nut

25 - 39 (2.6 - 4.0, 19 - 29)

245 - 294 (25 - 30, 181 - 217)

39 - 44 (4.0 - 4.6, 29 - 33)

34 - 44 (3.5 - 4.5, 25 - 33)

Companion flange

Center bearing assembly

Install center bearing with "F" mark toward front of vehicle.

Center bearing cushion

Lock nut

25 - 39 (2.6 - 4.0, 19 - 29)

245 - 294 (25 - 30, 181 - 217)

39 - 44 (4.0 - 4.6, 29 - 33)

34 - 44 (3.5 - 4.5, 25 - 33)

Companion flange

Center bearing assembly

Install center bearing with "F" mark toward front of vehicle.

Center bearing cushion

Lock nut

25 - 39 (2.6 - 4.0, 19 - 29)
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:**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Model</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3S63A-T</td>
<td>175 (6.89)</td>
</tr>
<tr>
<td>B</td>
<td>3S63A-R</td>
<td>165 (6.50)</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>185 (7.28)</td>
</tr>
</tbody>
</table>

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.
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.
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**
- 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.
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 match marks 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.
6. Take out drive pinion (together with rear bearing inner race, bearing spacer and adjusting washer).
7. Remove oil seal.
8. Remove front bearing inner race.
9. Remove side oil seal.

10. Remove pinion bearing outer races with a brass drift.

11. Remove pinion rear bearing inner race and drive pinion height adjusting washer with suitable tool.
Differential Case

1. Remove side bearing inner cones.
   To prevent damage to bearing, engage puller jaws in groove.
   Tool number:
   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.
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 then 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:**
   
   \[ 1.0 - 1.3 \text{ N-m} \]
   \[ (10 - 13 \text{ kg-cm}, 8.7 - 11.3 \text{ in-lb}) \]
7. Place the J-34309-11 "R200A" pinion height adapter onto the gauge plate and tighten it by hand.

**CAUTION:**
Make sure all machined surfaces are clean.

---

**PINION BEARING PRELOAD WASHER SELECTION**

8. Place the solid pinion bearing spacer, small end first, over the J-34309-2 gauge anvil and seat the small end squarely against the tip of the J-34309-1 gauge screw in the tool recessed portion.

9. Select the correct thickness of pinion bearing preload adjusting washer using a standard gauge of 3.5 mm (0.138 in) and your J-34309-101 feeler gauge. *The exact 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.

10. Set your selected, correct pinion bearing preload adjusting washer aside for use when assembling the pinion gear and bearings into the final drive.
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)

<table>
<thead>
<tr>
<th>Pinion head height number</th>
<th>Add or remove from the standard pinion height washer thickness measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6</td>
<td>Add 0.06 mm (0.0024 in)</td>
</tr>
<tr>
<td>-5</td>
<td>Add 0.05 mm (0.0020 in)</td>
</tr>
<tr>
<td>-4</td>
<td>Add 0.04 mm (0.0016 in)</td>
</tr>
<tr>
<td>-3</td>
<td>Add 0.03 mm (0.0012 in)</td>
</tr>
<tr>
<td>-2</td>
<td>Add 0.02 mm (0.0008 in)</td>
</tr>
<tr>
<td>-1</td>
<td>Add 0.01 mm (0.0004 in)</td>
</tr>
<tr>
<td>0</td>
<td>Use the selected washer thickness</td>
</tr>
<tr>
<td>+1</td>
<td>Subtract 0.01 mm (0.0004 in)</td>
</tr>
<tr>
<td>+2</td>
<td>Subtract 0.02 mm (0.0008 in)</td>
</tr>
<tr>
<td>+3</td>
<td>Subtract 0.03 mm (0.0012 in)</td>
</tr>
<tr>
<td>+4</td>
<td>Subtract 0.04 mm (0.0016 in)</td>
</tr>
<tr>
<td>+5</td>
<td>Subtract 0.05 mm (0.0020 in)</td>
</tr>
<tr>
<td>+6</td>
<td>Subtract 0.06 mm (0.0024 in)</td>
</tr>
</tbody>
</table>

15. Select the correct pinion height washer from the following chart.

**Drive pinion height adjusting washer (R200):**

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.09 (0.1217)</td>
<td>38154-P6017</td>
</tr>
<tr>
<td>3.12 (0.1228)</td>
<td>38154-P6018</td>
</tr>
<tr>
<td>3.15 (0.1240)</td>
<td>38154-P6019</td>
</tr>
<tr>
<td>3.18 (0.1252)</td>
<td>38154-P6020</td>
</tr>
<tr>
<td>3.21 (0.1264)</td>
<td>38154-P6021</td>
</tr>
<tr>
<td>3.24 (0.1276)</td>
<td>38154-P6022</td>
</tr>
<tr>
<td>3.27 (0.1287)</td>
<td>38154-P6023</td>
</tr>
<tr>
<td>3.30 (0.1299)</td>
<td>38154-P6024</td>
</tr>
<tr>
<td>3.33 (0.1311)</td>
<td>38154-P6025</td>
</tr>
<tr>
<td>3.36 (0.1323)</td>
<td>38154-P6026</td>
</tr>
<tr>
<td>3.39 (0.1335)</td>
<td>38154-P6027</td>
</tr>
<tr>
<td>3.42 (0.1346)</td>
<td>38154-P6028</td>
</tr>
<tr>
<td>3.45 (0.1358)</td>
<td>38154-P6029</td>
</tr>
<tr>
<td>3.48 (0.1370)</td>
<td>38154-P6030</td>
</tr>
<tr>
<td>3.51 (0.1382)</td>
<td>38154-P6031</td>
</tr>
<tr>
<td>3.54 (0.1394)</td>
<td>38154-P6032</td>
</tr>
<tr>
<td>3.57 (0.1406)</td>
<td>38154-P6033</td>
</tr>
<tr>
<td>3.60 (0.1417)</td>
<td>38154-P6034</td>
</tr>
<tr>
<td>3.63 (0.1429)</td>
<td>38154-P6035</td>
</tr>
<tr>
<td>3.66 (0.1441)</td>
<td>38154-P6036</td>
</tr>
</tbody>
</table>

16. Remove the J-34309 pinion preload shim selector Tool from the final drive housing and disassemble to retrieve the pinion bearings.
Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion. Hypoid gear sets which are not positioned properly may be noisy, or have short life, or both. Low noise and a long life can be assured with a pattern check.

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.

Heel contact

Face contact

Toe contact

Flank contact

To correct, increase thickness of pinion height adjusting washer in order to bring drive pinion close to ring gear.

To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion go away from ring gear.

Correct tooth contact

When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.
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:
   \[0.10 - 0.20 \text{ mm} (0.0039 - 0.0079 \text{ in})\]

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.
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:
   A. KV38100300 (J25523)
   B. ST33061000 (J81072)

Differential Carrier

1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   A. ST30611000 (J25742-1)
   B. ST30613000 (J25742-3)
   C. ST30701000 (J25742-2)

2. Select pinion bearing adjusting washer and drive pinion bearing spacer, referring to Adjustment.

   Tool number: ST30901000 ( — )
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)
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.

PD-28
ASSEMBLY

Differential Carrier (Cont'd)

   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.
# Propeller Shaft

## GENERAL SPECIFICATIONS  
Unit: mm (in)

<table>
<thead>
<tr>
<th>Applied model Transmission type</th>
<th>M/T</th>
<th>A/T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propeller shaft model</td>
<td>3S63A-R</td>
<td>3S63A-T</td>
</tr>
<tr>
<td>Number of joints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coupling method with transmission</td>
<td></td>
<td>Sleeve type</td>
</tr>
<tr>
<td>Type of journal bearings</td>
<td></td>
<td>Shell type (Non-disassembly type)</td>
</tr>
<tr>
<td>Distance between yokes</td>
<td></td>
<td>63.0 (2.480)</td>
</tr>
<tr>
<td>Shaft length (Spider to spider)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>395.0 (15.55)</td>
<td>432.0 (17.01)</td>
</tr>
<tr>
<td>2nd</td>
<td>606.0 (23.82)</td>
<td>606.0 (23.82)</td>
</tr>
<tr>
<td>Shaft outer diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>75.0 (2.953)</td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>75.0 (2.953)</td>
<td>75.0 (2.953)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>... Large side 63.5 (2.500)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>... Small side</td>
</tr>
</tbody>
</table>

## SPECIFICATIONS AND ADJUSTMENT  
Unit: mm (in)

<table>
<thead>
<tr>
<th>Propeller shaft model</th>
<th>3S63A-R</th>
<th>3S63A-T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propeller shaft runout limit</td>
<td>0.6 (0.024)</td>
<td></td>
</tr>
<tr>
<td>Journal axial play</td>
<td>0 (0)</td>
<td></td>
</tr>
</tbody>
</table>

PD-30
Final Drive

**GENERAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final drive model</td>
<td>R200</td>
</tr>
<tr>
<td>Ring gear pitch diameter mm (in)</td>
<td>205 (8.07)</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>4.083</td>
</tr>
<tr>
<td>Number of teeth (Ring gear/Drive pinion)</td>
<td>49/12</td>
</tr>
<tr>
<td>Oil capacity (approx.) q (US pt, Imp pt)</td>
<td>1.8 (3-7/8, 3-1/8)</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS AND ADJUSTMENT (R200)**

**Drive pinion adjustment**

<table>
<thead>
<tr>
<th>Pinion bearing adjusting method</th>
<th>Pinion bearing adjusting washer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive pinion to ring gear backlash mm (in)</td>
<td>0.10 - 0.15 (0.0039 - 0.0059)</td>
</tr>
</tbody>
</table>

**Available pinion height adjusting washer**

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.09 (0.1217)</td>
<td>38154-P6017</td>
</tr>
<tr>
<td>3.12 (0.1228)</td>
<td>38154-P6018</td>
</tr>
<tr>
<td>3.16 (0.1240)</td>
<td>38154-P6019</td>
</tr>
<tr>
<td>3.18 (0.1252)</td>
<td>38154-P6020</td>
</tr>
<tr>
<td>3.21 (0.1264)</td>
<td>38154-P6021</td>
</tr>
<tr>
<td>3.24 (0.1276)</td>
<td>38154-P6022</td>
</tr>
<tr>
<td>3.27 (0.1287)</td>
<td>38154-P6023</td>
</tr>
<tr>
<td>3.30 (0.1299)</td>
<td>38154-P6024</td>
</tr>
<tr>
<td>3.33 (0.1311)</td>
<td>38154-P6025</td>
</tr>
<tr>
<td>3.36 (0.1323)</td>
<td>38154-P6026</td>
</tr>
<tr>
<td>3.39 (0.1335)</td>
<td>38154-P6027</td>
</tr>
<tr>
<td>3.42 (0.1346)</td>
<td>38154-P6028</td>
</tr>
<tr>
<td>3.46 (0.1358)</td>
<td>38154-P6029</td>
</tr>
<tr>
<td>3.48 (0.1370)</td>
<td>38154-P6030</td>
</tr>
<tr>
<td>3.51 (0.1382)</td>
<td>38154-P6031</td>
</tr>
<tr>
<td>3.54 (0.1394)</td>
<td>38154-P6032</td>
</tr>
<tr>
<td>3.57 (0.1406)</td>
<td>38154-P6033</td>
</tr>
<tr>
<td>3.60 (0.1417)</td>
<td>38154-P6034</td>
</tr>
<tr>
<td>3.63 (0.1429)</td>
<td>38154-P6035</td>
</tr>
<tr>
<td>3.66 (0.1441)</td>
<td>38154-P6036</td>
</tr>
</tbody>
</table>

**Drive pinion preload adjustment**

<table>
<thead>
<tr>
<th>Drive pinion preload</th>
<th>N·m (kg·cm, in-lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>With front oil seal</td>
<td>1.1 - 1.4 (11 - 14, 9.5 - 12.2)</td>
</tr>
</tbody>
</table>

**Available drive pinion bearing preload adjusting washer**

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.80 - 3.82 (0.1496 - 0.1504)</td>
<td>38125-61001</td>
</tr>
<tr>
<td>3.82 - 3.84 (0.1504 - 0.1512)</td>
<td>38126-61001</td>
</tr>
<tr>
<td>3.84 - 3.86 (0.1512 - 0.1520)</td>
<td>38127-61001</td>
</tr>
<tr>
<td>3.86 - 3.88 (0.1520 - 0.1528)</td>
<td>38128-61001</td>
</tr>
<tr>
<td>3.88 - 3.90 (0.1528 - 0.1536)</td>
<td>38129-61001</td>
</tr>
<tr>
<td>3.90 - 3.92 (0.1535 - 0.1543)</td>
<td>38130-61001</td>
</tr>
<tr>
<td>3.92 - 3.94 (0.1543 - 0.1551)</td>
<td>38131-61001</td>
</tr>
<tr>
<td>3.94 - 3.96 (0.1551 - 0.1569)</td>
<td>38132-61001</td>
</tr>
<tr>
<td>3.96 - 3.98 (0.1559 - 0.1567)</td>
<td>38133-61001</td>
</tr>
<tr>
<td>3.98 - 4.00 (0.1567 - 0.1575)</td>
<td>38134-61001</td>
</tr>
<tr>
<td>4.00 - 4.02 (0.1575 - 0.1583)</td>
<td>38135-61001</td>
</tr>
<tr>
<td>4.02 - 4.04 (0.1583 - 0.1591)</td>
<td>38136-61001</td>
</tr>
<tr>
<td>4.04 - 4.06 (0.1591 - 0.1598)</td>
<td>38137-61001</td>
</tr>
<tr>
<td>4.06 - 4.08 (0.1598 - 0.1606)</td>
<td>38138-61001</td>
</tr>
<tr>
<td>4.08 - 4.10 (0.1606 - 0.1614)</td>
<td>38139-61001</td>
</tr>
</tbody>
</table>

**Available drive pinion bearing preload adjusting spacer**

<table>
<thead>
<tr>
<th>Length mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>55.10 (2.1693)</td>
<td>38165-84002</td>
</tr>
<tr>
<td>55.40 (2.1811)</td>
<td>38165-84003</td>
</tr>
<tr>
<td>56.0 (2.1929)</td>
<td>38165-84004</td>
</tr>
<tr>
<td>56.00 (2.2047)</td>
<td>38165-81001</td>
</tr>
<tr>
<td>56.25 (2.2146)</td>
<td>38165-61001</td>
</tr>
<tr>
<td>56.29 (2.2246)</td>
<td>38166-61001</td>
</tr>
</tbody>
</table>
**Final Drive (Cont’d)**

### Total preload adjustment

<table>
<thead>
<tr>
<th>Total preload</th>
<th>Value more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on measured value of drive pinion preload</th>
</tr>
</thead>
</table>

### Side bearing adjustment

<table>
<thead>
<tr>
<th>Side bearing adjusting method</th>
<th>Adjusting shim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side gear to pinion mate gear backlash (Clearance between side gear to differential case)</td>
<td>mm (in)</td>
</tr>
<tr>
<td>0.03 - 0.09 (0.0012 - 0.0035)</td>
<td></td>
</tr>
</tbody>
</table>

### Available side bearing adjusting washer

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00 (0.0787)</td>
<td>38453-N3100</td>
</tr>
<tr>
<td>2.05 (0.0807)</td>
<td>38453-N3101</td>
</tr>
<tr>
<td>2.10 (0.0827)</td>
<td>38453-N3102</td>
</tr>
<tr>
<td>2.15 (0.0848)</td>
<td>38453-N3103</td>
</tr>
<tr>
<td>2.20 (0.0866)</td>
<td>38453-N3104</td>
</tr>
<tr>
<td>2.25 (0.0886)</td>
<td>38453-N3105</td>
</tr>
<tr>
<td>2.30 (0.0906)</td>
<td>38453-N3106</td>
</tr>
<tr>
<td>2.35 (0.0925)</td>
<td>38453-N3107</td>
</tr>
<tr>
<td>2.40 (0.0945)</td>
<td>38453-N3108</td>
</tr>
<tr>
<td>2.45 (0.0965)</td>
<td>38453-N3109</td>
</tr>
<tr>
<td>2.50 (0.0984)</td>
<td>38453-N3110</td>
</tr>
<tr>
<td>2.55 (0.1004)</td>
<td>38453-N3111</td>
</tr>
<tr>
<td>2.60 (0.1024)</td>
<td>38453-N3112</td>
</tr>
<tr>
<td>2.65 (0.1043)</td>
<td>38453-N3113</td>
</tr>
</tbody>
</table>

### Available side gear thrust washer

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.80 (0.0315)</td>
<td>38424-40F00</td>
</tr>
<tr>
<td>0.85 (0.0335)</td>
<td>38424-40F01</td>
</tr>
<tr>
<td>0.90 (0.0354)</td>
<td>38424-40F02</td>
</tr>
<tr>
<td>0.95 (0.0374)</td>
<td>38424-40F03</td>
</tr>
<tr>
<td>1.00 (0.0394)</td>
<td>38424-40F04</td>
</tr>
<tr>
<td>1.05 (0.0413)</td>
<td>38424-40F05</td>
</tr>
<tr>
<td>1.10 (0.0433)</td>
<td>38424-40F06</td>
</tr>
<tr>
<td>1.15 (0.0453)</td>
<td>38424-40F07</td>
</tr>
<tr>
<td>1.20 (0.0472)</td>
<td>38424-40F08</td>
</tr>
<tr>
<td>1.25 (0.0492)</td>
<td>38424-40F09</td>
</tr>
<tr>
<td>1.30 (0.0512)</td>
<td>38424-40F10</td>
</tr>
<tr>
<td>1.35 (0.0531)</td>
<td>38424-40F11</td>
</tr>
<tr>
<td>1.40 (0.0551)</td>
<td>38424-40F12</td>
</tr>
<tr>
<td>1.45 (0.0571)</td>
<td>38424-40F13</td>
</tr>
<tr>
<td>1.50 (0.0591)</td>
<td>38424-40F14</td>
</tr>
</tbody>
</table>

### Ring gear runout

<table>
<thead>
<tr>
<th>Ring gear runout limit</th>
<th>mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 (0.0020)</td>
<td></td>
</tr>
</tbody>
</table>
CONTENTS

PRECAUTIONS AND PREPARATION ................................................................. FA- 2
FRONT AXLE AND FRONT SUSPENSION ......................................................... FA- 4
CHECK AND ADJUSTMENT — On-vehicle ...................................................... FA- 5
FRONT AXLE .................................................................................................. FA- 9
FRONT AXLE — Wheel Hub and Knuckle ...................................................... FA-10
FRONT AXLE — Baffle Plate ......................................................................... FA-13
FRONT AXLE ................................................................................................. 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

- 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

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT72520000 (J25730-A)</td>
<td>Ball joint remover</td>
<td>Removing tie-rod outer end and lower ball joint</td>
</tr>
<tr>
<td>HT71780000 ( - )</td>
<td>Spring compressor</td>
<td>Removing and installing coil spring</td>
</tr>
<tr>
<td>ST35652000 ( - )</td>
<td>Strut attachment</td>
<td>Fixing strut assembly</td>
</tr>
<tr>
<td>GG94310000 ( - )</td>
<td>Flare nut torque wrench</td>
<td>Removing and installing brake piping</td>
</tr>
</tbody>
</table>
## PRECAUTIONS AND PREPARATION

### Preparation (Cont’d)

#### COMMERCIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel bearing drift</td>
<td>[Diagram]</td>
</tr>
<tr>
<td><em>A: 45 mm (1.77 in) dia.</em></td>
<td>Removing wheel bearing</td>
</tr>
<tr>
<td><em>B: 30 mm (1.18 in) dia.</em></td>
<td></td>
</tr>
<tr>
<td>Wheel bearing drift</td>
<td>[Diagram]</td>
</tr>
<tr>
<td><em>A: 88 mm (2.68 in) dia.</em></td>
<td>Installing wheel bearing</td>
</tr>
<tr>
<td><em>B: 60 mm (2.36 in) dia.</em></td>
<td></td>
</tr>
<tr>
<td>Baffle plate drift</td>
<td>[Diagram]</td>
</tr>
<tr>
<td><em>A: 88 mm (3.46 in) dia.</em></td>
<td>Installing baffle plate</td>
</tr>
<tr>
<td><em>B: 68 mm (2.68 in) dia.</em></td>
<td></td>
</tr>
<tr>
<td>Tension rod bushing drift</td>
<td>[Diagram]</td>
</tr>
<tr>
<td><em>A: 75 mm (2.96 in) dia.</em></td>
<td>Removing and installing tension rod bushing</td>
</tr>
<tr>
<td><em>B: 66 mm (2.60 in) dia.</em></td>
<td></td>
</tr>
<tr>
<td><em>C: 62 mm (2.44 in) dia.</em></td>
<td></td>
</tr>
<tr>
<td><em>D: 25.55 mm (0.98 in) dia.</em></td>
<td></td>
</tr>
</tbody>
</table>
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.

**Diagram of Front Axle and Front Suspension**

- Strut mounting insulator (with strut mounting bearing)
- Spring upper seat
- Coil spring
- Strut assembly
- Front suspension member
- Transverse link assembly
- Brake disc rotor
- Tension rod bracket
- Tension rod

**Specifications**

- Strut: 39 - 54 (4.0 - 5.5, 29 - 40)
- Spring: 68 - 108 (9.0 - 11.0, 85 - 90)
- Transverse link: 46 - 52 (4.7 - 6.3, 34 - 38)
- Tension rod and bracket: 39 - 49 (4.0 - 5.0, 29 - 36)
- Tension rod: 39 - 49 (4.0 - 5.0, 29 - 36)
- Tension rod: 88 - 108 (9.0 - 11.0, 65 - 80)

**Notes:**

- N·m (kg·m, ft·lb)
**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.
  - $\tau$: 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.
- 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:**

- $12^\circ30' - 14^\circ00'$
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.
   \[
   \text{Toe-in:} \quad A - B \quad 0.3 - 2.3 \text{ mm (0.012 - 0.091 in)}
   \]
   \[
   2\theta \text{ (Total toe-in)} \quad 1' - 6.5'
   \]

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 mm (6.88 in)
(3) Fix lock nuts, then tighten them designed torque.
   \[
   \tau : 37 - 46 \text{ N-m}
   \]
   \[
   (3.8 - 4.7 \text{ kg-m, 27 - 34 ft-lb})
   \]

FRONT WHEEL TURNING ANGLE

1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

2. Rotate fully steering wheel to the right or left; measure turning angle.

Wheel turning angle:

<table>
<thead>
<tr>
<th>Full turns</th>
<th>Inside wheel: A</th>
<th>39° - 43°</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outside wheel: B</td>
<td>33°</td>
</tr>
</tbody>
</table>
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.
  
  \[ \text{Torque: } 147 \text{ - } 216 \text{ N}\cdot\text{m} \]
  
  \( (15 \text{ - } 22 \text{ kg}\cdot\text{m}, 108 \text{ - } 159 \text{ ft}\cdot\text{lb}) \)

- 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.
Assembly

1. Press new wheel bearing assembly into wheel hub from inside of rotor disc (with wheel hub).
   Maximum load P:
   \[ 29 \text{ kN (3 t, 3.3 US ton, 3.0 Imp ton)} \]

   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.
**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.
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.
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.
FRONT SUSPENSION — Coil Spring and Strut Assembly

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.
### General Specifications

#### COIL SPRING

<table>
<thead>
<tr>
<th>Item</th>
<th>Wire diameter mm (in)</th>
<th>Coi diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>Spring constant N/mm (kg/mm, lb/in)</th>
<th>Identification color</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.3 (0.524)</td>
<td>170 (6.69)</td>
<td>326 (12.83)</td>
<td>19.6 (2.0, 112)</td>
<td>Orange x 1, Purple x 1</td>
</tr>
<tr>
<td>Exceptions</td>
<td>13.5 (0.531)</td>
<td>170 (6.69)</td>
<td>311 (12.24)</td>
<td>21.6 (2.2, 123)</td>
<td>Pink x 1, Purple x 1</td>
</tr>
</tbody>
</table>

#### STRUT

<table>
<thead>
<tr>
<th>Item</th>
<th>Piston rod diameter mm (in)</th>
<th>Stroke mm (in)</th>
<th>Damping force [at 0.1 m (0.3 ft)/sec.] N (kg, lb)</th>
<th>Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20.0 (0.787)</td>
<td>160 (6.30)</td>
<td>Expansion</td>
<td>Compression</td>
</tr>
<tr>
<td>Compression</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion</td>
<td></td>
<td></td>
<td>912 - 1,245 (93 - 127, 205 - 280)</td>
<td>392 - 588 (40 - 80, 88 - 132)</td>
</tr>
<tr>
<td>Compression</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### FRONT STABILIZER BAR

<table>
<thead>
<tr>
<th>Item</th>
<th>Stabilizer diameter mm (in)</th>
<th>Identification color</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 (0.94)</td>
<td>White</td>
</tr>
<tr>
<td>Exceptions</td>
<td>25 (0.98)</td>
<td>Orange</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Except Sports package</th>
<th>Sports package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 (0.94)</td>
<td>25 (0.98)</td>
</tr>
<tr>
<td>Identification color</td>
<td>White</td>
<td>Orange</td>
</tr>
</tbody>
</table>
**SERVICE DATA AND SPECIFICATIONS (S.D.S.)**

**Inspection and Adjustment**

### WHEEL ALIGNMENT (Unladen*1)

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camber</td>
<td>degree -1°30' to 0°</td>
</tr>
<tr>
<td>Caster</td>
<td>degree 6° 00’ - 7° 30’</td>
</tr>
<tr>
<td>Toe-in (Total)</td>
<td>mm (in) 0.3 - 2.3 (0.012 - 0.091)</td>
</tr>
<tr>
<td></td>
<td>degree 1’ - 6.5’</td>
</tr>
<tr>
<td>Kingpin inclination</td>
<td>degree 12° 30’ - 14° 00’</td>
</tr>
<tr>
<td>Front wheel turning angle</td>
<td>Full turn*2 inside/outside degree 39° - 43°/33°</td>
</tr>
</tbody>
</table>

*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.

### LOWER BALL JOINT

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swing force</td>
<td>N (kg, lb) 7.8 - 55.9</td>
</tr>
<tr>
<td></td>
<td>(0.8 - 5.7, 1.8 - 12.6)</td>
</tr>
<tr>
<td>Turning torque</td>
<td>N.m (kg-cm, in-lb) 0.49 - 3.43</td>
</tr>
<tr>
<td></td>
<td>(5.0 - 35, 4.3 - 30.4)</td>
</tr>
<tr>
<td>Vertical end play</td>
<td>mm (in) 0 (0)</td>
</tr>
</tbody>
</table>

### WHEEL BEARING

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel bearing axial end play</td>
<td>mm (in) 0.03 (0.0012) or less</td>
</tr>
<tr>
<td>Wheel bearing lock nut Tightening torque</td>
<td>N·m (kg-m, ft-lb) 147 - 218 (15 - 22, 108 - 159)</td>
</tr>
</tbody>
</table>

### WHEEL RUNOUT (Radial and lateral)

<table>
<thead>
<tr>
<th>Wheel type</th>
<th>Radial runout</th>
<th>Lateral runout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum wheel</td>
<td>0.3 (0.012) or less</td>
<td></td>
</tr>
<tr>
<td>Steel wheel</td>
<td>0.5 (0.020) or less</td>
<td>0.8 (0.031) or less</td>
</tr>
</tbody>
</table>
CONTENTS

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
REAR AXLE — Drive Shaft ............................................................................................. RA-13
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
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

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT71780000</td>
<td>Spring compressor</td>
<td>Removing and installing coil spring</td>
</tr>
<tr>
<td>ST35652000</td>
<td>Strut attachment</td>
<td>Fixing strut assembly</td>
</tr>
<tr>
<td>GG94310000</td>
<td>Flare nut torque wrench</td>
<td>Removing and installing brake piping</td>
</tr>
<tr>
<td>ST30031000 (J22912-01)</td>
<td>Bearing puller</td>
<td>Removing inner race of wheel bearing</td>
</tr>
<tr>
<td>ST38280000</td>
<td>Arm bushing remover</td>
<td>Removing and installing bushing of rear axle housing</td>
</tr>
<tr>
<td>Tool name</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Attachment Wheel alignment</td>
<td>Measure rear wheel alignment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A: Screw M24 x 1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B: 35 (1.38) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: 65 (2.56) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: 56 (2.20)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E: 12 (0.47)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unit: mm (in)</td>
<td></td>
</tr>
<tr>
<td>Rear wheel hub drift</td>
<td>Installing wheel bearing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A: 41 mm (1.61 in) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B: 49 mm (1.93 in) dia.</td>
<td></td>
</tr>
<tr>
<td>Wheel bearing drift</td>
<td>Removing rear wheel hub</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A: 26 mm (1.02 in) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B: 40 mm (1.57 in) dia.</td>
<td></td>
</tr>
<tr>
<td>Rear drive shaft plug seal drift</td>
<td>Installing rear drive shaft plug seal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A: 67 mm (2.64 in) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B: 85 mm (3.35 in) dia.</td>
<td></td>
</tr>
</tbody>
</table>
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)
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.
CHECK AND ADJUSTMENT — On-vehicle

**Rear Wheel Bearing**
- Check tightening torque of wheel bearing lock nut.
  - : 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:
  - $-1^\circ36'$ to $-0^\circ36'$
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.
   \[ 69 \text{ - } 88 \text{ N} \cdot \text{m} \]
   \[ (7.0 \text{ - } 9.0 \text{ kg-m, } 51 \text{ - } 65 \text{ ft-lb}) \]

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.
   \[
   \text{Toe-in: } A - B \\
   0.5 \text{ - } 4.5 \text{ mm (0.020 - 0.177 in)} \\
   2 \theta \text{ (Total toe-in)} \\
   1.5' \text{ - } 12.5' 
   \]

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.
   \[ 69 \text{ - } 88 \text{ N} \cdot \text{m} \]
   \[ (7.0 \text{ - } 9.0 \text{ kg-m, } 51 \text{ - } 65 \text{ ft-lb}) \]

Drive Shaft
Check boot and drive shaft for cracks, wear, damage or grease leakage.
- Remove exhaust tube.
- Disconnect propeller shaft rear end.

- 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 upper end nuts of shock absorber.
  **Do not remove piston rod lock nut.**
- Remove suspension member fixing nuts. Then draw out rear axle and rear suspension assembly.
**Removal**

- Remove wheel bearing lock nut.

- Remove brake caliper assembly and rotor. 
  
  *Brake 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.*
**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.
  
  - 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:
a. Do not reuse old inner race although it is of the same brand as the bearing assembly.
b. Do not replace grease seals as single parts.
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.
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.
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.

<table>
<thead>
<tr>
<th>Stamped number</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>39720 10V10</td>
</tr>
<tr>
<td>01</td>
<td>39720 10V11</td>
</tr>
<tr>
<td>02</td>
<td>39720 10V12</td>
</tr>
</tbody>
</table>

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.


REAR AXLE — Drive Shaft

Assembly (Cont’d)

7. Lock new larger boot band securely with a suitable tool, then lock new smaller boot band.

WHEEL SIDE

1. Install new small boot band and boot on drive shaft. Cover drive shaft serration with tape to prevent damage to boot during installation.

2. Install spider assembly securely, making sure marks are properly aligned.
   - Press-fit with spider assembly serration chamfer facing shaft.
3. Install new snap ring.

4. Pack drive shaft with specified amount of grease.
   **Specified amount of grease:**
   145 - 155 g (5.11 - 5.47 oz)
5. Install slide joint housing, then install new snap ring “A”.
6. Set boot so that it does not swell and deform when its length is “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.

7. Lock new larger and smaller boot bands securely with a suitable tool.
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)
REAR SUSPENSION — Coil Spring and Shock Absorber

Removal
- Remove shock absorber upper and lower fixing nuts.
- Do not remove piston rod lock nut on vehicle.

Disassembly
1. Set shock absorber on vise with attachment, then loosen piston rod lock nut.
   - Do not remove piston rod lock nut.

2. Compress spring with Tool so that the strut upper spring seat can be turned by hand.

3. Remove piston rod lock nut.

Inspection
SHOCK ABSORBER ASSEMBLY
- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing 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.

<table>
<thead>
<tr>
<th>Ball joint specifications</th>
<th>Swing force</th>
<th>Turning torque</th>
<th>Vertical end play</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12.7 - 90.2 N</td>
<td>0.5 - 3.4 N·m</td>
<td>0 mm (0 in)</td>
</tr>
<tr>
<td></td>
<td>(1.3 - 9.2 kg, 2.9 - 20.3 lb)</td>
<td>(5 - 35 kg-cm, 4.3 - 30.4 in-lb)</td>
<td></td>
</tr>
</tbody>
</table>
**SERVICE DATA AND SPECIFICATIONS (S.D.S.)**

### COIL SPRING

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Except Sports package</th>
<th>Sports package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire diameter</td>
<td>mm (in)</td>
<td>11.0 (0.433)</td>
<td>11.3 (0.445)</td>
</tr>
<tr>
<td>Coi1 diameter</td>
<td>mm (in)</td>
<td>90 - 100 (3.54 - 3.94)</td>
<td>80 - 85 (3.15 - 3.35)</td>
</tr>
<tr>
<td>Free length</td>
<td>mm (in)</td>
<td>367.5 (14.47)</td>
<td>365 (13.98)</td>
</tr>
<tr>
<td>Spring constant</td>
<td>N/mm (kg/mm, lb/in)</td>
<td>19.6 (2.0, 112)</td>
<td>21.6 (2.2, 123)</td>
</tr>
<tr>
<td>Identification color</td>
<td></td>
<td>Pink x 2</td>
<td>Light green x 2</td>
</tr>
</tbody>
</table>

### SHOCK ABSORBER

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Except Sports package</th>
<th>Sports package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston rod diameter</td>
<td>mm (in)</td>
<td>12.5 (0.492)</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>mm (in)</td>
<td>155 (6.10)</td>
<td></td>
</tr>
<tr>
<td>Damping force</td>
<td>N (kg, lb)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[at 0.1 m (0.3 ft/sec.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expansion</td>
<td>Compression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>314 - 471 (57 - 84)</td>
<td>392 - 588 (70 - 105)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(32 - 48, 71 - 106)</td>
<td>(40 - 60, 88 - 132)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(33 - 50, 72 - 106)</td>
<td>(40 - 60, 88 - 132)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>157 - 236 (26 - 40)</td>
<td>196 - 294 (33 - 50)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16 - 24, 35 - 53)</td>
<td>(20 - 30, 44 - 66)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>647 - 902 (46 - 60)</td>
<td>146 - 203 (90 - 132)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(66 - 92, 146 - 203)</td>
<td></td>
</tr>
</tbody>
</table>

### DRIVE SHAFT

<table>
<thead>
<tr>
<th>Joint type</th>
<th>Final drive side</th>
<th>Wheel side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>mm (in)</td>
<td>30 (1.18)</td>
</tr>
<tr>
<td>Wheel side D1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grease name</td>
<td>Final drive side</td>
<td>Nissan genuine grease or equivalent</td>
</tr>
<tr>
<td></td>
<td>Wheel side</td>
<td>Nissan genuine grease or equivalent</td>
</tr>
<tr>
<td>Specified amount of grease</td>
<td>Final drive side</td>
<td>185 - 195 (6.52 - 6.88)</td>
</tr>
<tr>
<td></td>
<td>Wheel side</td>
<td>145 - 165 (5.11 - 5.47)</td>
</tr>
<tr>
<td>Boot length</td>
<td>mm (in)</td>
<td>Final drive side (L1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>110.5 - 112.5 (4.36 - 4.43)</td>
</tr>
</tbody>
</table>

### REAR STABILIZER BAR

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Except Sports package</th>
<th>Sports package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stabilizer diameter</td>
<td>mm (in)</td>
<td>15 (0.59)</td>
<td>17 (0.67)</td>
</tr>
<tr>
<td>Identification color</td>
<td>Light green</td>
<td>Light blue</td>
<td></td>
</tr>
</tbody>
</table>
**SERVICE DATA AND SPECIFICATIONS (S.O.S.)**

---

### WHEEL ALIGNMENT (Unladen*)

<table>
<thead>
<tr>
<th>Camber</th>
<th>degree</th>
<th>1°36' to 0°36'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toe-out</td>
<td>mm (in)</td>
<td>0.5 - 4.5 (0.020 - 0.177)</td>
</tr>
<tr>
<td>(Total) degree</td>
<td></td>
<td>1.5' - 12.5'</td>
</tr>
</tbody>
</table>

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

### WHEEL BEARING

<table>
<thead>
<tr>
<th>Wheel bearing axial end play</th>
<th>mm (in)</th>
<th>0.06 (0.0020) or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel bearing lock nut</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tightening torque</td>
<td>N·m (kg·m, ft·lb)</td>
<td>235 - 314 (24 - 32, 174 - 231)</td>
</tr>
</tbody>
</table>

### WHEEL RUNOUT (Radial and lateral)

<table>
<thead>
<tr>
<th>Wheel type</th>
<th>Radial runout</th>
<th>Lateral runout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum wheel</td>
<td>mm (in)</td>
<td>0.3 (0.012) or less</td>
</tr>
<tr>
<td>Steel wheel</td>
<td>mm (in)</td>
<td>0.5 (0.020) or less</td>
</tr>
</tbody>
</table>

### LOWER BALL JOINT

<table>
<thead>
<tr>
<th>Swing force (Measuring point: cotter pin hole of ball stud)</th>
<th>N (kg, lb)</th>
<th>12.7 - 90.2 (1.3 - 9.2, 2.9 - 20.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turning torque</td>
<td>N·m (kg·cm, in-lb)</td>
<td>0.5 - 3.4 (6 - 36, 4.3 - 30.4)</td>
</tr>
<tr>
<td>Vertical end play</td>
<td>mm (in)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>
CONTENTS

PRECAUTIONS AND PREPARATION ................................................................. BR- 2
CHECK AND ADJUSTMENT ........................................................................ BR- 3
BRAKE HYDRAULIC LINE ........................................................................... BR- 4
BRAKE PEDAL AND BRACKET .................................................................... BR- 6
BRAKE BOOSTER ......................................................................................... BR- 8
VACUUM PIPING ........................................................................................ BR-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
PARKING BRAKE CONTROL ................................................................. BR-23
ANTI-LOCK BRAKING SYSTEM ........................................................... BR-25
TROUBLE DIAGNOSES ........................................................................... BR-29
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .............................. BR-54
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

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GG94310000</td>
<td>Flare nut torque wrench</td>
</tr>
<tr>
<td>KV991V0010</td>
<td>Brake fluid pressure gauge</td>
</tr>
<tr>
<td>KV999P1000</td>
<td>A.B.S. checker</td>
</tr>
<tr>
<td>KV999P1010</td>
<td>A.B.S. checker adapter harness</td>
</tr>
</tbody>
</table>

Removing and installing each brake piping
Measuring brake fluid pressure
Checking brake fluid pressure of A.B.S. actuator
Checking brake fluid pressure of A.B.S. actuator
Checking Brake Fluid Level
- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.

Checking Brake System
- Check brake lines (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.
Removal and Installation

Replacement:
- Replace clevis pin if plastic stopper, which is located at the end of clevis pin, is deformed or damaged.

Inspection
- Check brake pedal for following items:
  - Brake pedal bend
  - Clevis pin deformation
  - Crack of any welded portion
Adjustment

Check brake pedal free height from dash reinforcement panel. Adjust if necessary.

H: Free height
   Refer to S.D.S.

D: Depressed height
   Refer to S.D.S.
   Under force of 490 N (50 kg, 110 lb) with engine running

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.**


3. Check pedal free play.
   **Make sure that stop lamp is off when pedal is released.**

4. Check brake pedal’s depressed height while engine is running.
   If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.
Removal and Installation

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.
**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.
CHECK VALVE

- When pressure is applied to brake booster side of check valve and valve does not open, replace check valve with a new one.
**Removal and Installation**

- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.

- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.
Pad Replacement
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.

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.

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 ($F_1$).
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)
**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.
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.
7. Measure rotating force \( F_2 \).
8. Calculate brake drag force by subtracting \( F_1 \) from \( F_2 \).

\[ \text{Maximum brake drag force (} F_2 - F_1 \text{)}: \]
\[ 86.3 \text{ N (8.8 kg, 19.4 lb)} \]

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.
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

- Warning lamp
- Control unit
- Rear sensor
- Front wheel sensor

Hydraulic Circuit

- Proportioning valve (Do not disassemble.)
- Master cylinder
- Brake booster
- Front R.H. wheel
- Rear R.H. wheel
- Front L.H. wheel
- Caliper
- Check valve (Front L.H.)
- Feeling valve (Front)
- Feeling valve (Rear)
- Check valve (Rear)
- Relief valve (Front)
- Relief valve (Rear)
- Solenoid valve (Front L.H.)
- Solenoid valve (Front R.H.)
- Accumulator
- Pump (Front)
- Pump (Rear)
- Reservoir (Front)
- Reservoir (Rear)
- D.C. motor
- Harness
- Piping

SBR516A

SBR517A
Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR

- Remove rear sensor rotor with companion flange after propeller shaft removal.
  Refer to PD section.

REAR SENSOR
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.
## Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair ................................................. BR-30
Symptom Chart ................................................................................................................................. BR-33
Preliminary Check 1 .......................................................................................................................... BR-34
Preliminary Check 2 .......................................................................................................................... BR-35
Preliminary Check 3, 4 ....................................................................................................................... BR-36
Self-diagnosis ..................................................................................................................................... BR-37
Component Parts Location ............................................................................................................... BR-38
Harness Connector Location ............................................................................................................. BR-39
Ground Circuit Check ....................................................................................................................... BR-40
Circuit Diagram for Quick Pinpoint Check ....................................................................................... BR-41
Diagnostic Procedure 1 .................................................................................................................... BR-42
Diagnostic Procedure 2 .................................................................................................................... BR-43
Diagnostic Procedure 3 .................................................................................................................... BR-44
Diagnostic Procedure 4 .................................................................................................................... BR-44
Diagnostic Procedure 5 .................................................................................................................... BR-45
Diagnostic Procedure 6 .................................................................................................................... BR-45
Diagnostic Procedure 7 .................................................................................................................... BR-46
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.
**KEY POINTS**

<table>
<thead>
<tr>
<th>WHAT</th>
<th>WHEN</th>
<th>WHERE</th>
<th>HOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle model</td>
<td>Date, Frequencies</td>
<td>Road conditions</td>
<td>Operating conditions, Weather conditions, Symptoms</td>
</tr>
</tbody>
</table>

---

**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**

<table>
<thead>
<tr>
<th>Customer name</th>
<th>MR/MS</th>
<th>Model &amp; Year</th>
<th>VIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine #</td>
<td>Trans.</td>
<td>Mileage</td>
<td></td>
</tr>
<tr>
<td>Incident Date</td>
<td>Manuf. Date</td>
<td>In Service Date</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Pedal vibration and noise</th>
<th>Warning activates</th>
<th>Long stopping distance</th>
<th>Abnormal pedal action</th>
<th>A.B.S. doesn't work</th>
<th>A.B.S. works but warning activates</th>
<th>A.B.S. works frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Engine conditions</th>
<th>When starting</th>
<th>After starting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Engine speed: 5,000 rpm or more</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Road conditions</th>
<th>Low friction road (Snow, Gravel, Other)</th>
<th>Protrusion</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Driving conditions</th>
<th>High speed cornering</th>
<th>Vehicle speed: Greater than 10 km/h (6 MPH)</th>
<th>Vehicle speed: 10 km/h (6 MPH) or less</th>
<th>Vehicle is stopped</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Applying brake conditions</th>
<th>Suddenly</th>
<th>Gradually</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other conditions</th>
<th>Operation of electrical equipment</th>
<th>Large pedal stroke</th>
<th>Operation of clutch</th>
</tr>
</thead>
</table>

BR-32
## Symptom Chart

### Electrical Components Inspection

<table>
<thead>
<tr>
<th>BR</th>
<th>Symptom</th>
<th>Diagnostic Procedure No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Motor Ground</td>
<td>BR-45</td>
</tr>
<tr>
<td>40</td>
<td>Sensor Shield</td>
<td>BR-45</td>
</tr>
</tbody>
</table>

### Ground Circuit Check

<table>
<thead>
<tr>
<th>BR</th>
<th>Symptom</th>
<th>Diagnostic Procedure No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>L.E.D. goes off</td>
<td>BR-45</td>
</tr>
<tr>
<td>50</td>
<td>L.E.D. Flashing 16</td>
<td>BR-45</td>
</tr>
<tr>
<td>49</td>
<td>L.E.D. Flashing 10</td>
<td>BR-45</td>
</tr>
<tr>
<td>48</td>
<td>L.E.D. Flashing 9</td>
<td>BR-45</td>
</tr>
<tr>
<td>47</td>
<td>L.E.D. Flashing 5 - 8</td>
<td>BR-45</td>
</tr>
<tr>
<td>46</td>
<td>L.E.D. Flashing 1 - 4</td>
<td>BR-45</td>
</tr>
</tbody>
</table>

### Diagnostic Procedure with L.E.D.

<table>
<thead>
<tr>
<th>BR</th>
<th>Symptom</th>
<th>Diagnostic Procedure No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>Diagnostic Procedure 6</td>
<td>BR-45</td>
</tr>
<tr>
<td>45</td>
<td>Diagnostic Procedure 5</td>
<td>BR-45</td>
</tr>
<tr>
<td>44</td>
<td>Diagnostic Procedure 4</td>
<td>BR-45</td>
</tr>
<tr>
<td>44</td>
<td>Diagnostic Procedure 3</td>
<td>BR-45</td>
</tr>
<tr>
<td>43</td>
<td>Diagnostic Procedure 2</td>
<td>BR-45</td>
</tr>
<tr>
<td>42</td>
<td>Diagnostic Procedure 1</td>
<td>BR-45</td>
</tr>
</tbody>
</table>

### Preliminary Check

<table>
<thead>
<tr>
<th>BR</th>
<th>Symptom</th>
<th>Diagnostic Procedure No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Preliminary Check 4</td>
<td>BR-45</td>
</tr>
<tr>
<td>36</td>
<td>Preliminary Check 3</td>
<td>BR-45</td>
</tr>
<tr>
<td>35</td>
<td>Preliminary Check 2</td>
<td>BR-45</td>
</tr>
<tr>
<td>34</td>
<td>Preliminary Check 1</td>
<td>BR-45</td>
</tr>
</tbody>
</table>

### Pedestrian

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian vibration &amp; noise</td>
<td>BR-34</td>
</tr>
<tr>
<td>Long stopping distance</td>
<td>BR-34</td>
</tr>
<tr>
<td>Abnormal pedal action</td>
<td>BR-34</td>
</tr>
<tr>
<td>A.B.S. works but warning activates</td>
<td>BR-34</td>
</tr>
<tr>
<td>A.B.S. works frequently</td>
<td>BR-34</td>
</tr>
</tbody>
</table>
Preliminary Check 1

Check brake fluid level in reservoir tank.

CHECK

N.G. → Fill up brake fluid.

O.K.

Repair brake system. N.G.

CHECK

SMA732A

Check brake system.
Refer to CHECK AND ADJUSTMENT.

O.K.

Repair or replace booster system. N.G.

CHECK

SBR002A

Check brake booster operation and airtightness.
Refer to “Inspection” of BRAKE BOOSTER.

O.K.

N.G. → Replace malfunctioning parts.

CHECK

SMA364A

Check brake pads and rotor.
Refer to “Inspection” of FRONT and REAR DISC BRAKE.
TROUBLE DIAGNOSES

Preliminary Check 2

Check sensor clearance.

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Clearance mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front wheel sensor</td>
<td>0.275 - 0.75 (0.0108 - 0.0295)</td>
</tr>
<tr>
<td>Rear sensor</td>
<td>0.35 - 0.625 (0.0138 - 0.0248)</td>
</tr>
</tbody>
</table>

N.G. Check sensor for the following items:
- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K. Repair or replace malfunctioning sensor.

Check sensor rotor for teeth damage.

N.G. Replace sensor rotor with wheel hub or companion flange as a set.
Preliminary Check 3

**CHECK**

Measure each sensor resistance.
0.8 - 1.2 kΩ

---

Preliminary Check 4

**CHECK**

N.G. → Replace.

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.

---

SBR528A

L.E.D.

SBR681A

---

SBR529A

SBR530A

Ensure warning lamp remains off while driving.
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.

<table>
<thead>
<tr>
<th>No. of L.E.D. flashes</th>
<th>Malfunctioning part or unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Left front actuator solenoid circuit</td>
</tr>
<tr>
<td>2</td>
<td>Right front actuator solenoid circuit</td>
</tr>
<tr>
<td>3 or 4</td>
<td>Rear actuator solenoid circuit</td>
</tr>
<tr>
<td>5</td>
<td>Left front rotor sensor circuit</td>
</tr>
<tr>
<td>6</td>
<td>Right front rotor sensor circuit</td>
</tr>
<tr>
<td>7 or 8</td>
<td>Rear rotor sensor circuit</td>
</tr>
<tr>
<td>9</td>
<td>Actuator motor, motor relay circuit</td>
</tr>
<tr>
<td>10</td>
<td>Actuator solenoid valve relay</td>
</tr>
<tr>
<td>16</td>
<td>Control unit</td>
</tr>
</tbody>
</table>

Warning activates and L.E.D. “OFF”

Power supply or ground circuit for control unit

Example

Improper operation of left front rotor sensor circuit

Go to Diagnostic Procedure from 7 to 10, where malfunction portion is concerned.
TROUBLE DIAGNOSES

Harness Connector Location

Front wheel sensor R.H.

Front wheel sensor L.H.

Rear sensor
Ground Circuit Check

FRONT WHEEL SENSOR L.H. SHIELDED WIRE GROUND
- Check resistance between both terminals.
  Resistance: 0Ω

FRONT WHEEL SENSOR R.H. SHIELDED WIRE GROUND
- Check resistance between both terminals.
  Resistance: 0Ω

ACTUATOR MOTOR GROUND
- Check resistance between both terminals.
  Resistance: 0Ω
The unit side connectors with a double circle "O" are connected to the harness side connectors shown in the Harness Connector Location. (See page BR-39.)

The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "O".

SBR698A
Diagnostic Procedure 1
SYMPTOM: Pedal vibration and noise
Refer to worksheet results.

Check whether brake is applied suddenly in normal driving conditions.
Yes
When brake is normally applied, A.B.S. works and produces pedal vibration or noise.

No
Check whether the symptom appeared when engine is started.
Yes
Refer to Preliminary Check 4 result.

No
Check whether the symptom appeared when the vehicle speed is within 10 km/h (6 MPH) after starting engine.
Yes
Check whether the symptom disappeared within 5 seconds.
Yes
A.B.S. may sometimes operate when load is high and voltage is low due to insufficient alternator output.

No
Check whether the symptom appeared while the vehicle was driven.
Yes
Check if there were any conditions, among those listed below, when symptom appeared.

- Shifting
- Operating clutch
- Passing protrusion

No
For such condition, if there is considerable wheel speed variation and, A.B.S. will work normally.

A
Yes
For such conditions, if wheel speed is considerably different between front and rear or left and right, A.B.S. will work normally.

No
Check whether brake is applied gradually.
Yes

No
Check if there were any conditions, among those listed below, when symptom appeared.
- Low friction road
- High speed cornering
- Passing protrusion

A
Yes
For such conditions, if wheel speed is considerably different between front and rear or left and right, A.B.S. will work normally.
Diagnostic Procedure 1 (Cont'd)

A

Check whether engine speed is over 5,000 rpm with vehicle stopped.

Yes

Vibration related to sensor may cause A.B.S. operation.

No

Check whether electrical equipment switches are operated.

Yes

Check front wheel sensor shielded ground. Refer to Ground Circuit Check.

No

Refer to Preliminary Check 4 result.

Refer to Preliminary Check 4 result.

Go to Self-diagnosis. (See page BR-37.)

N.G.

O.K.

Remedy.

Replace control unit.

Diagnostic Procedure 2

SYMPTOM: Long stopping distance

Refer to worksheet results.

Check if road condition is slippery with snow or gravel.

Yes

Stopping distance may be longer than vehicles which are not equipped with A.B.S.

No

Disconnect actuator connector and check whether stopping distance is still long.

Yes

Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-37.)

No

Perform Preliminary Check 1 and air bleeding.
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.

Check whether alternator produces proper output.
Refer to EL section.

Yes

Check whether battery has enough voltage.
Refer to EL section.

Yes

Refer to Preliminary Check 4 result.
Go to Self-diagnosis. (See page BR-37.)

No

Remedy.

No

Remedy.

Diagnostic Procedure 6
SYMPTOM: A.B.S. works frequently.

CHECK BRAKE FLUID PRESSURE.
Check whether brake fluid pressure distribution is normal.
D2/D1: 52 - 56/75

N.G.

Perform Preliminary Check 1.

O.K.

Check whether front axles have excessive looseness.

Yes

Remedy.

No

Perform Preliminary Check 2 and Ground Circuit Check.
Diagnostic Procedure 7

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK SOLENOID VALVE
RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 1:
Terminals ② and ③
Flashing number 2:
Terminals ② and ④
Flashing number 3 or 4:
Terminals ② and ③
Resistance: 0.7 - 1.6Ω

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

C

Replace actuator.

O.K. Replace control unit.

O.K. Repair harness between actuator connector and control unit connector.

N.G.

BR-46
TROUBLE DIAGNOSES

Diagnostic Procedure 8
WHEEL SPEED SENSOR (L.E.D. flashing number 5 - 8)

INSPECTION START
Remove battery negative terminal connector.

CHECK SPEED SENSOR RESISTANCE
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.
- Flashing number 5: Terminals ④ and ⑥
- Flashing number 6: Terminals ① and ⑦
- Flashing number 7 or 8: Terminals ⑦ and ⑨
Resistance: 0.8 - 1.2 kΩ

Refer to Preliminary Check 3 result.
Check whether sensor has 0.8 - 1.2 kΩ resistance.

Repair harness between sensor connector and control unit connector.

N.G. Replace sensor.

OK Replace control unit.

N.G. Replace sensor.

N.G. Replace sensor.

O.K. Replace control unit.
Diagnostic Procedure 9
ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)

**INSPECTION START**
Remove battery negative terminal connector.

A
CHECK MOTOR RELAY SOLENOID RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals and .
Resistance: 38 - 45Ω

B
CHECK MOTOR RELAY DEACTIVATION.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals and .
Check if motor's fusible link is blown.
Resistance: Approximately 0Ω

C
Replace motor relay.

D
Perform Electrical Components Inspection - ACTUATOR.
(See page BR-52.)

E
Replace control unit.

F
Replace actuator.
Diagnostic Procedure 10
ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)

INSPECTION START
Remove battery negative terminal connector.

A
CHECK SOLENOID VALVE RELAY RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals (7) and (17).
Resistance: 80 - 90Ω

B
CHECK SOLENOID VALVE RELAY MOVEMENT.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals (6) and (5).

C
Check if solenoid valve relay fuse is blown.
Yes
Replace solenoid valve relay.
No
Check resistance between actuator connector (actuator side) terminals (6) and (5).
Resistance: 80 - 90Ω

D
No
Perform Electrical Components Inspection - ACTUATOR.
(See page BR-52.)

E
O.K.
Replace actuator.
N.G.
Replace control unit.

Repair harness between actuator and control unit.
Replace solenoid valve relay.
Diagnostic Procedure 11
CONTROL UNIT (L.E.D. flashing number 16)

INSPECTION START

Control unit malfunction.

Replace control unit.
**Diagnostic Procedure 12**

**CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT** (Warning activates but L.E.D. comes off.)

**INSPECTION START**

**A**

CHECK CONTROL UNIT POWER SUPPLY.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal (1) and body ground with ignition switch turned on.

- **O.K.**

**B**

CHECK ALTERNATOR L TERMINAL VOLTAGE.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal (13) and body ground after engine starting.
Voltage: 6V or more

- **O.K.**

- **N.G.**
  - Check if control unit "10A" fuse is blown.
  - **Yes**
    - Replace fuse.
  - **No**
    - Repair power supply harness.
  - Check if other warnings activate.
  - **Yes**
    - Repair harness between alternator and control unit.
  - **No**
    - Malfunctioning alternator.

**C**

Check continuity between control unit connector (vehicle side) terminal (20) and body ground with ignition switch "OFF".

- **O.K.**

- **N.G.**
  - Repair ground harness.

- **O.K.**

Replace control unit.
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. Yes

Check checker valve relay indicator for coming on. Yes

Select one valve. Select pressure decreasing position by switch then turn motor switch on. Turn motor switch off. Select pressure increasing position.

Repeat so that all valve will be performed.

Check motor relay indicator for coming on while motor switch is turned on. Yes

Check motor for operational sound beside the actuator in a quiet place.

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.
Electrical Components Inspection (Cont'd)

Check brake pedal for vibration while motor switch is turned on.

- O.K.: Vibration
- N.G.: No vibration

Change operating valve with motor switch "ON" and check for pedal vibration.

- O.K.: Vibration
- N.G.: No vibration

Replace actuator as assembly.

Check brake pedal for depression when select pressure increases.

- O.K.
- N.G.

Replace actuator as assembly.

Actuator works normally.
### General Specifications

<table>
<thead>
<tr>
<th></th>
<th>CL22VB</th>
<th>CL25VA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Front brake</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brake model</td>
<td>CL22VB</td>
<td>CL25VA</td>
</tr>
<tr>
<td>Cylinder bore diameter mm (in)</td>
<td>54.0 (2.126)</td>
<td>57.2 (2.252)</td>
</tr>
<tr>
<td>Pad length x width x thickness mm (in)</td>
<td>112.8 x 44.8 x 10.0 (4.44 x 1.784 x 0.394)</td>
<td>134.1 x 45.3 x 11.0 (5.28 x 1.783 x 0.433)</td>
</tr>
<tr>
<td>Rotor outer diameter x thickness mm (in)</td>
<td>252 x 20 (9.92 x 0.79)</td>
<td>257 x 22 (10.12 x 0.87)</td>
</tr>
<tr>
<td><strong>Rear brake</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brake model</td>
<td>CL9H</td>
<td></td>
</tr>
<tr>
<td>Cylinder bore diameter mm (in)</td>
<td>33.96 (1.3370)</td>
<td></td>
</tr>
<tr>
<td>Pad length x width x thickness mm (in)</td>
<td>75.0 x 40.0 x 9.5 (2.953 x 1.575 x 0.374)</td>
<td></td>
</tr>
<tr>
<td>Rotor outer diameter x thickness mm (in)</td>
<td>258 x 9 (10.16 x 0.35)</td>
<td></td>
</tr>
<tr>
<td><strong>Master cylinder</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cylinder bore diameter mm (in)</td>
<td>22.22 (7/8)</td>
<td>23.81 (15/16)</td>
</tr>
<tr>
<td><strong>Control valve</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve model</td>
<td>Proportioning valve (within master cylinder)</td>
<td></td>
</tr>
<tr>
<td>Sprit point x reducing ratio kPa (kg/cm², psi)</td>
<td>3,923 (40,569 x 0.4)</td>
<td></td>
</tr>
<tr>
<td><strong>Brake booster</strong></td>
<td>M23</td>
<td>M195T</td>
</tr>
<tr>
<td>Diaphragm diameter mm (in)</td>
<td>230 (9.06)</td>
<td>Primary 206 (8.07) Secondary 180 (7.09)</td>
</tr>
<tr>
<td><strong>Brake fluid</strong></td>
<td>DOT 3</td>
<td></td>
</tr>
<tr>
<td><strong>Parking brake</strong></td>
<td>Center lever</td>
<td></td>
</tr>
</tbody>
</table>
### Service Data and Specifications (S.D.S.)

#### Front Disc Brake

<table>
<thead>
<tr>
<th>Item</th>
<th>CL22VB</th>
<th>CL25VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pad wear limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum thickness (mm (in))</td>
<td>2.0 (0.079)</td>
<td></td>
</tr>
<tr>
<td>Rotor repair limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum thickness (mm (in))</td>
<td>18.0 (0.709)</td>
<td>20.0 (0.787)</td>
</tr>
<tr>
<td>Maximum runout (mm (in))</td>
<td>0.07 (0.0028)</td>
<td></td>
</tr>
</tbody>
</table>

#### Rear Disc Brake

<table>
<thead>
<tr>
<th>Brake model</th>
<th>CL9H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td></td>
</tr>
<tr>
<td>Pad wear limit</td>
<td></td>
</tr>
<tr>
<td>Minimum thickness (mm (in))</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>Rotor repair limit</td>
<td></td>
</tr>
<tr>
<td>Minimum thickness (mm (in))</td>
<td>8.0 (0.315)</td>
</tr>
<tr>
<td>Maximum runout (mm (in))</td>
<td>0.07 (0.0028)</td>
</tr>
</tbody>
</table>

### Inspection and Adjustment

#### BRAKE PEDAL

<table>
<thead>
<tr>
<th>Free height</th>
<th>mm (in)</th>
<th>M/T</th>
<th>177.0 - 187.0 (6.97 - 7.36)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A/T</td>
<td></td>
<td>186.0 - 196.0 (7.32 - 7.72)</td>
</tr>
<tr>
<td>Depressed height</td>
<td></td>
<td></td>
<td>100 (3.94) or more</td>
</tr>
<tr>
<td>Clearance between pedal stopper and threaded end of stop lamp switch</td>
<td></td>
<td></td>
<td>0.3 - 1.0 (0.012 - 0.039)</td>
</tr>
<tr>
<td>Clearance between pedal stopper and threaded end of A.S.C.D. switch</td>
<td></td>
<td></td>
<td>0.3 - 1.0 (0.012 - 0.039)</td>
</tr>
<tr>
<td>Pedal free play at clevis</td>
<td></td>
<td></td>
<td>1 - 3 (0.04 - 0.12)</td>
</tr>
</tbody>
</table>

#### PARKING BRAKE

<table>
<thead>
<tr>
<th>Control type</th>
<th>Center lever</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of notches (under force of 196 N (20 kg, 44 lb))</td>
<td>6 - 8</td>
</tr>
<tr>
<td>Number of notches (when warning switch comes on)</td>
<td>1</td>
</tr>
</tbody>
</table>
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
### SPECIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV48100700 (J26364)</td>
<td>Torque adapter</td>
<td>Measuring pinion rotating torque</td>
</tr>
<tr>
<td>ST27180001 (J25726-A)</td>
<td>Steering wheel puller</td>
<td>Removing and installing steering wheel</td>
</tr>
<tr>
<td>HT72520000 (J25730-A)</td>
<td>Ball joint remover</td>
<td>Removing ball joint</td>
</tr>
<tr>
<td>ST27091000 (J26357)</td>
<td>Pressure gauge</td>
<td>Measuring oil pressure</td>
</tr>
<tr>
<td>KV48102500</td>
<td>Pressure gauge adapter</td>
<td>Measuring oil pressure</td>
</tr>
<tr>
<td>ST3127S000</td>
<td>(See J25765-A)</td>
<td>Measuring turning torque</td>
</tr>
<tr>
<td>① GG91030000 (J25765-A)</td>
<td>Torque wrench</td>
<td></td>
</tr>
<tr>
<td>② HT62940000</td>
<td>Socket adapter</td>
<td></td>
</tr>
<tr>
<td>③ HT62900000</td>
<td>Socket adapter</td>
<td></td>
</tr>
<tr>
<td>KV48104400</td>
<td>Rack seal ring reformer</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reforming teflon ring</td>
</tr>
</tbody>
</table>
## PREPARATION

### COMMERCIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear oil seal drift</td>
<td>Installing rear oil seal</td>
</tr>
<tr>
<td>[Diagram: 28 mm (1.10 in) dia.]</td>
<td></td>
</tr>
<tr>
<td>Pinion oil seal drift</td>
<td>Installing pinion oil seal</td>
</tr>
<tr>
<td>[Diagram: 35 mm (1.38 in) dia.]</td>
<td></td>
</tr>
<tr>
<td>Oil pump attachment</td>
<td>Disassembling and assembling oil pump</td>
</tr>
<tr>
<td>[Diagram: Various dimensions with welding]</td>
<td></td>
</tr>
</tbody>
</table>

Unit: mm (in)

ST-481A
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.
   Repeat step 2 above.
   - Incomplete air bleeding will cause the following to occur.
     When this happens, bleed air again.
Bleeding Hydraulic System (Cont'd)

a. Generation of air bubbles in reservoir tank
b. Generation of clicking noise in oil pump
c. Excessive buzzing in oil pump

While the vehicle is stationary or while turning the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.

Checking Steering Wheel Turning Force

1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. 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.
4. 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.
1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.
   Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).
ON-VEHICLE INSPECTION (Power steering)

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.

ST-9
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.
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 straigh forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.
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 before inserting shaft into jacket tube.

Install snap ring on upper shaft with box wrench.
Disassembly and Assembly (Cont'd)

- **Tilt mechanism**
  
  Tighten adjusting nut to specification.
  
  \[
  \begin{align*}
  \tau & : 4 - 5 \text{ N-m} \\
  & (0.4 - 0.5 \text{ kg-m, } 2.9 - 3.6 \text{ ft-lb})
  \end{align*}
  \]

- **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 "L₁" and steering column lower shaft length "L₂". If it is not within specifications, replace steering column as an assembly.
  
  **Steering column length "L₁":**
  
  653.1 - 654.5 mm (25.71 - 25.77 in)
  
  **Steering column lower shaft length "L₂":**
  
  323.7 - 325.3 mm (12.74 - 12.81 in)

- After installing steering column, check tilt mechanism operation.
  
  \[
  \begin{align*}
  L₁ & : 9.8 \text{ mm (0.386 in)} \\
  L₂ & : 19.5 \text{ mm (0.768 in)} \\
  L₃ & : 29.3 \text{ mm (1.154 in)} \\
  L₄ & : 58.2 \text{ mm (2.291 in)}
  \end{align*}
  \]
Removal and Installation

- Detach tie-rod outer sockets from knuckle arms with Tool.

- Install pipe connector.
  1. Low-pressure side
     - Torque: 27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)
  2. High-pressure side
     - Torque: 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.
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.

<table>
<thead>
<tr>
<th>Position of oil leak</th>
<th>1 Rear housing cover and rear housing</th>
<th>2 Boot</th>
<th>3 Boot</th>
<th>4 Cylinder tube</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Replacement</td>
<td>Replacement</td>
<td>Replacement</td>
<td>Replacement</td>
</tr>
<tr>
<td></td>
<td>Rear oil seal</td>
<td>Rack oil seal</td>
<td>Rack oil seals</td>
<td>Cylinder tube</td>
</tr>
<tr>
<td></td>
<td>Pinion oil seal</td>
<td>Boot clamp</td>
<td>Rack oil seal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O-ring</td>
<td>O-ring</td>
<td>O-ring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Snap ring</td>
<td>Back-up collar</td>
<td>Back-up collar</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boot clamp</td>
<td>Boot clamp</td>
<td></td>
</tr>
</tbody>
</table>

**Procedure**

1. Remove gear from vehicle.
2. Measure rack starting force and pinion rotating torque.
3. Replace parts described above.
4. Replace rack oil seal.
5. Replace parts described above.
6. Measure rack starting force and pinion rotating torque.
7. Adjust adjusting screw.
8. Measure pinion rotating torque.
9. Replace cylinder tube.
10. Gear housing seal kit
11. Rack oil seal
12. Pinion seal kit
13. Gear housing seal kit

**Service parts to be prepared**

- Pinion seal kit
- Gear housing seal kit
- Rack oil seal
- Pinion seal kit
- Gear housing seal kit

*ST-16*
Disassembly
1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.
   - Before measuring, disconnect cylinder tube and drain fluid.
   - Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.
2. Remove pinion gear.
   - Be careful not to damage pinion gear when removing pinion seal ring.
3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.
7. Drill staked portion of cylinder end cover with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.
8. Remove gear housing end cover assembly with Tool.
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.

ST-18
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.
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.
Assembly (Cont'd)

9. Install pinion seal ring on pinion gear assembly.
   - Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
   - Make sure pinion seal ring is properly settled in valve groove.

10. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.

11. Install pinion assembly to pinion housing.
    Be careful not to damage pinion oil seal.

12. Apply a coat of multi-purpose grease to rear oil seal lip before installing rear housing.

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.
Assembly (Cont'd)
   - 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.
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**
   \[\pm 5.5 \text{ mm } (\pm 0.217 \text{ in})\]:
   
   \[122.6 - 166.7 \text{ N (12.5 - 17 kg, 27.6 - 37.5 lb)}\]
   
   **Except for neutral point:**
   
   \[122.6 - 186.3 \text{ N (12.5 - 19 kg, 27.6 - 41.9 lb)}\]
   
   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**
   \[\frac{\text{[(Max. measured value} + \text{ Min. measured value)} \times 0.5]}{]}\]:
   
   \[0.8 - 1.3 \text{ N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)}\]
   
   **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.
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.
- Pay attention to the direction of rotor.

*: Automatic Transmission Fluid

CAUTION:
Do not remove spool valve from connector.

- Install vanes properly.

*: Automatic Transmission Fluid
Assembly (Cont'd)

- Insert pin 2 into pin groove 1 of front housing and rotor. Then install cam ring 3 as shown at left.
# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## General Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering model</td>
<td>Power steering</td>
</tr>
<tr>
<td>Steering gear type</td>
<td>PR24SC</td>
</tr>
<tr>
<td>Steering overall gear ratio</td>
<td>16.8</td>
</tr>
<tr>
<td>Turn of steering wheel (Lock to lock)</td>
<td>3.1</td>
</tr>
<tr>
<td>Steering column type</td>
<td>Collapsible, tilt</td>
</tr>
</tbody>
</table>

## Inspection and Adjustment

### GENERAL

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering wheel axial play mm (in)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Steering wheel play mm (in)</td>
<td>0 - 35 (0 - 1.38)</td>
</tr>
</tbody>
</table>

### STEERING COLUMN

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering column length “L1” mm (in)</td>
<td>653.1 - 654.5 (26.71 - 25.77)</td>
</tr>
<tr>
<td>Steering column lower shaft length “L2” mm (in)</td>
<td>323.7 - 326.3 (12.74 - 12.81)</td>
</tr>
</tbody>
</table>

### STEERING GEAR AND LINKAGE

<table>
<thead>
<tr>
<th>Item</th>
<th>Steering gear type</th>
<th>PR24SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tie-rod outer ball joint</td>
<td></td>
<td>9.12 - 91.30 (0.93 - 9.31; 2.06 - 20.53)</td>
</tr>
<tr>
<td>Rotating torque N-m (kg-cm, in-lb)</td>
<td></td>
<td>0.29 - 2.94 (3.0 - 30.0, 2.6 - 26.0)</td>
</tr>
<tr>
<td>Axial end play mm (in)</td>
<td></td>
<td>0.5 (0.020)</td>
</tr>
<tr>
<td>Tie-rod inner ball joint</td>
<td></td>
<td>8.14 - 122.6 (0.83 - 12.5, 1.83 - 27.8)</td>
</tr>
<tr>
<td>Swinging force N (kg)</td>
<td></td>
<td>7.4 (75, 86) or less</td>
</tr>
<tr>
<td>Rotating torque N-m (kg-cm, in-lb)</td>
<td></td>
<td>0.78 - 1.27 (8.0 - 13.0, 6.9 - 11.3)</td>
</tr>
<tr>
<td>Axial end play mm (in)</td>
<td></td>
<td>0 (0)</td>
</tr>
<tr>
<td>Tie-rod standard length “L” mm (in)</td>
<td></td>
<td>176.8 (6.96)</td>
</tr>
</tbody>
</table>

*: Measuring point
### POWER STEERING

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rack sliding force N (kg, lb)</td>
<td>166.7 - 255.6 (17.0 - 23.0, 37.5 - 50.7)</td>
</tr>
<tr>
<td>Steering wheel turning force (Measured at one full turn from neutral) N (kg, lb)</td>
<td>39 (4, 9) or less</td>
</tr>
<tr>
<td>Normal operating temperature of power steering fluid °C (°F)</td>
<td>60 - 80 (140 - 176)</td>
</tr>
<tr>
<td>Fluid capacity (Approximate) qt (US qt, Imp qt)</td>
<td>0.9 (1, 3/4)</td>
</tr>
<tr>
<td>Oil pump maximum pressure kPa (kg/cm², psi)</td>
<td>6,865 (70, 995)</td>
</tr>
</tbody>
</table>
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.
**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.

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Shape</th>
<th>Removal &amp; Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C101</td>
<td><img src="SBF092B" alt="Symbol" /></td>
<td><img src="SBF109B" alt="Shape" /></td>
<td><strong>Removal:</strong> Remove by bending up with a flat-bladed screwdriver.</td>
</tr>
<tr>
<td></td>
<td><img src="SBF094B" alt="Symbol" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="SBF094B" alt="Symbol" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C102</td>
<td><img src="SBF114B" alt="Symbol" /></td>
<td><img src="SBF113B" alt="Shape" /></td>
<td><strong>Removal:</strong> Pull up by rotating.</td>
</tr>
<tr>
<td></td>
<td><img src="SBF115B" alt="Symbol" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="SBF113B" alt="Symbol" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C105</td>
<td><img src="SBF141B" alt="Symbol" /></td>
<td><img src="SBF142B" alt="Shape" /></td>
<td><strong>Removal:</strong> Tilt clip as indicated by arrow, then draw out.</td>
</tr>
<tr>
<td></td>
<td><img src="SBF143B" alt="Symbol" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### General Servicing
Clip and Fastener (Cont'd)

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Shape</th>
<th>Removal &amp; Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C106</td>
<td><img src="image1" alt="C106 Symbol" /></td>
<td><img src="image2" alt="C106 Shape" /></td>
<td>Removal: Remove with a flat-bladed screwdriver or plier. Push center pin to catching position. (Do not remove center pin by hitting it.)</td>
</tr>
<tr>
<td>C203</td>
<td><img src="image3" alt="C203 Symbol" /></td>
<td><img src="image4" alt="C203 Shape" /></td>
<td>Removal: Push center pin to catching position. (Do not remove center pin by hitting it.) Installation:</td>
</tr>
<tr>
<td>CE103</td>
<td><img src="image5" alt="CE103 Symbol" /></td>
<td><img src="image6" alt="CE103 Shape" /></td>
<td>Removal:</td>
</tr>
<tr>
<td>CE106</td>
<td><img src="image7" alt="CE106 Symbol" /></td>
<td><img src="image8" alt="CE106 Shape" /></td>
<td>Removal: Push center pin to catching position. Then bend up.</td>
</tr>
<tr>
<td>CE117</td>
<td><img src="image9" alt="CE117 Symbol" /></td>
<td><img src="image10" alt="CE117 Shape" /></td>
<td>Removal: Remove with a flat-bladed screwdriver or pliers.</td>
</tr>
</tbody>
</table>

BF-3
## GENERAL SERVICING

### Clip and Fastener (Cont’d)

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Shape</th>
<th>Removal &amp; Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF113</td>
<td><img src="image1" alt="Clip-A" /></td>
<td>Clip-A</td>
<td>Removal: Flat-bladed screwdriver</td>
</tr>
<tr>
<td></td>
<td><img src="image2" alt="SBF035C" /></td>
<td>SBF035C</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image3" alt="Clip-B (Grommet)" /></td>
<td>SBF036C</td>
<td>Body panel</td>
</tr>
<tr>
<td>CF118</td>
<td><img src="image4" alt="Clip-A" /></td>
<td>Clip-A</td>
<td>Removal: Flat-bladed screwdriver</td>
</tr>
<tr>
<td></td>
<td><img src="image5" alt="Clip-B (Grommet)" /></td>
<td>SBF150D</td>
<td>Body panel</td>
</tr>
<tr>
<td></td>
<td><img src="image6" alt="Sealing washer" /></td>
<td>SBF151D</td>
<td></td>
</tr>
<tr>
<td>CR103</td>
<td><img src="image7" alt="Clip-A" /></td>
<td>Clip-A</td>
<td>Removal: Holder portion of clip must be spread out to remove rod.</td>
</tr>
<tr>
<td></td>
<td><img src="image8" alt="SBF768B" /></td>
<td>SBF768B</td>
<td></td>
</tr>
<tr>
<td>CS102</td>
<td><img src="image9" alt="Clip-A" /></td>
<td>Clip-A</td>
<td>Removal: Screw out with a Phillips screwdriver.</td>
</tr>
<tr>
<td></td>
<td><img src="image10" alt="SBF138B" /></td>
<td>SBF138B</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image11" alt="SBF139B" /></td>
<td>SBF139B</td>
<td></td>
</tr>
<tr>
<td>CS103</td>
<td><img src="image12" alt="Clip-A" /></td>
<td>Clip-A</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image13" alt="SBF363B" /></td>
<td>SBF363B</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image14" alt="SBF364B" /></td>
<td>SBF364B</td>
<td></td>
</tr>
</tbody>
</table>
## Clip and Fastener (Cont’d)

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Shape</th>
<th>Removal &amp; Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS104</td>
<td><img src="image1.png" alt="Symbol" /></td>
<td><img src="image2.png" alt="Shape" /></td>
<td><strong>Removal:</strong> Screw out with a Phillips screwdriver.</td>
</tr>
</tbody>
</table>

**BF-5**
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 reinforcement

Energy absorber form

Bumper fascia

Retainer

Locating pin

Bumber height

At vehicle center

Condition: Curb weight & normal tire pressure on level ground

512 - 562 mm (20.16 - 22.13 in)

Ground
Hood lock adjustment
- Adjust lock so that hood primary lock meshes at a position where hood is 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length

More than 5 mm (0.20 in)

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
\( \times \) : N.m (kg-m, ft-lb)
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:
- a. Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.
- b. The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.
- Opener cable: do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid/back door and fuel filler lid open smoothly.

FASTBACK
- Before removing rear bumper, remove right drafter which is secured with two upper nuts and butyl seal.
Energy absorber form

License plate lamp
Grommet

Bumper reinforcement

13 - 16 (1.3 - 1.6, 9 - 12)

Back door hinge adjustment D

Opener handle E

43 - 55 (4.4 - 5.6, 32 - 41)

Back door lock & opener cable adjustment A

Back door striker adjustment

Fuel filler lid control C

Bumper fascia

Retainer

Retainer
"~ iii // ~~' // I/

WARNING:
When removing and installing torsion bar, be careful as it is under tension.

Trunk lid torsion bar removal & installation  

Trunk lid lock  

Trunk lid hinge adjustment  

Fuel filler lid control  

Opener handle  

Trunk lid striker & opener cable adjustment  

BF-10
Body Rear End and Opener (Cont'd)

A. Trunk lid lock
B. Key cylinder

D. Striker adjustment
   Opener cable adjustment
   0.5 - 1.5 mm (0.020 - 0.069 in)

Bumper height
556.7 - 606.7 mm (21.92 - 23.89 in)

C. Lock nut
   Fuel filler lid opener & control
   Opener cable

F.
DOOR

- After adjusting door or door lock, check door lock operation.
Hinge-body adjustment

Outside handle adjustment
(Turn holder as the clearance between holder and rod is specified value.)

Outside handle escutcheon

Holder

Release lever

0.5 - 1.5 mm
(0.020 - 0.059 in)

Outside handle adjustment

• 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.

Striker adjustment

Adjusting shim
[t = 1.0 mm]
(0.039 in)

Glass portion 1
• Adjust to provide proper light surface contact of glass and retainer.

Weatherstrip retainer

12.0 - 14.5 mm
(0.472 - 0.571 in)

Outside

Glass portion 2

Weatherstrip retainer

Door glass

Body panel

7.5 - 9.6 mm
(0.295 - 0.374 in)
POWER WINDOW AMP. INSPECTION

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.
DOOR LOCK TIMER INSPECTION

TESTING OPERATION

<table>
<thead>
<tr>
<th>Input signal</th>
<th>SW-A operation</th>
<th>SW-B operation</th>
<th>Output signal</th>
<th>Test lamp operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF (Approx. 1.0 sec.) → OFF</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF (Approx. 1.0 sec.) → OFF</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF (Approx. 1.0 sec.) → OFF</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF (Approx. 1.0 sec.) → OFF</td>
</tr>
</tbody>
</table>

- 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.)

CIRCUIT CONNECTIONS

<table>
<thead>
<tr>
<th></th>
<th>CIRCUIT CONNECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Power source (BAT)</td>
</tr>
<tr>
<td>32</td>
<td>To/From actuators (Lock power source &amp; Unlock ground)</td>
</tr>
<tr>
<td>33</td>
<td>To/From actuators (Unlock ground &amp; Lock power source)</td>
</tr>
<tr>
<td>34</td>
<td>To lock-unlock switches (Input signal for lock)</td>
</tr>
<tr>
<td>35</td>
<td>Ground</td>
</tr>
<tr>
<td>39</td>
<td>To lock-unlock switches (Input signal for unlock)</td>
</tr>
</tbody>
</table>
- 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.

* : Instrument panel assembly mounting bolts
A. Mounting bolt
Super Multiple Junction (S.M.J.)
- Instrument harness
- Fuse block

B. Pawl

C. Pawl

D. Pawl (2 places each for upper and lower surface)

E. Pawl (4 places each for upper and lower surface)

F. Pawl (2 places each for right and left surface)

G. Metal clip

H. Pawl

I. Locating pin

J. Metal clip

K. Pawl (To head up display assembly)

L. Tape
- H.U.D.'s reflective surface
- Windshield
- Front pillar finisher
- Cloth or vinyl sheet
- H.U.D. panel
- Instrument panel

SBF178E
INTERIOR AND EXTERIOR

Interior

SIDE, LUGGAGE AND FLOOR TRIM – Fastback

BF-20
INTERIOR AND EXTERIOR

Interior (Cont'd)

SIDE TRIM – Coupe

LUGGAGE ROOM TRIM – Coupe

BF-22
ROOF TRIM
Fastback

Coupe

Back door window glass
Roof panel
Head lining
Metal clip
Roof rear garnish

Back door weatherstrip
Head lining
Roof rear garnish
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.

2 Windshield lower molding

It is mounted with screws.

3, 4 Cowl top grille and hood rear sealing rubber

5 Hood front sealing rubber

6 Center pillar finisher
Exterior (Cont'd)

1, 3 Body side weatherstrip and weatherstrip retainer

- Body side weatherstrip retainer
- Windshield pillar garnish
- Body side welt
- Seal
- Weatherstrip retainer

Butyl tape
Double-faced adhesive tape
clip
(Bonded on glass surface)
9. Door weatherstrip

Apply butyl sealant where necessary while installing the weatherstrip.

10. Rear sight shield

11. Back window upper and side molding (Coupe)
   Basically the same as windshield upper and side molding.

12. Back window lower molding (Coupe)
   It is mounted with screws.

13. Trunk lid weatherstrip

There is a marking at vehicle center.

14. Back door window upper and side molding (Fastback)
   Bonded on back door glass side.

15. Back door window lower molding (Fastback)

Double-faced adhesive tape [When installing fastener, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F)].
Interiors and Exteriors

16. Back door weatherstrip

17. Rear panel finisher (Fastback)

18. Sun roof lid weatherstrip and sun roof frame weatherstrip (Coupe)

19. Sun roof lid weatherstrip
Rear Seat

Striker installation A

Seat back adjustment E

Floor panel

Grommet

Bushing

13 - 16 (1.3 - 1.6, 9 - 12)

N.m (kg-m, ft-lb)
AUTOMATIC SEAT BELT SYSTEM

Unit Location

Guide rail assembly

Front limit switch

Door latch switch

Pawl

Drive motor

Lap belt (Installation B)

Shoulder belt assembly (Installation A)

Lap belt buckle switch (L.H. only)

Lap belt buckle

Rear limit switch & shoulder belt buckle switch

Control unit

Control unit is located under center console box.
AUTOMATIC SEAT BELT SYSTEM

Unit Location (Cont'd)

A

Lap belt retractor

B

Rear limit switch
(Bottom color: Green)

Guide rail assembly

Rear limit switch
(Bottom color: Green)

Guide cable

Shoulder belt buckle assembly

Shoulder belt buckle switch
(Bottom color: Black)

C

N·m (kg·m, ft·lb)
**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.

**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”.

<table>
<thead>
<tr>
<th>Input Signal</th>
<th>OFF</th>
<th>OFF</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>OFF</th>
<th>OFF</th>
<th>OFF</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition switch</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Door latch switch</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>Front limit switch</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>Rear limit switch</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

| Output Signal | 0V | 0V | 0V | 0V | 12V | 12V | 0V | 0V | 0V | 0V | 12V | 12V | 0V | 0V | 0V | 0V | 0V |
|---------------|----|----|----|----|-----|-----|----|----|----|----|-----|-----|----|----|----|----|----|----|
| Drive motor power source for frontward operation | 0V | 0V | 0V | 0V | 12V | 12V | 0V | 0V | 0V | 0V | 12V | 12V | 0V | 0V | 0V | 0V | 0V |
| Drive motor power source for rearward operation | 0V | 0V | 12V | 12V | 0V | 0V | 0V | 12V | 0V | 0V | 0V | 12V | 0V | 0V | 0V | 0V | 0V |

<table>
<thead>
<tr>
<th>Shoulder belt buckle</th>
<th>Function</th>
<th>Stop</th>
<th>Stop</th>
<th>Start to move</th>
<th>Moving</th>
<th>Stop</th>
<th>Start to move</th>
<th>Moving</th>
<th>Stop</th>
<th>Start to move</th>
<th>Moving</th>
<th>Stop</th>
<th>Start to move</th>
<th>Moving</th>
<th>Stop</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
<td>Front</td>
</tr>
</tbody>
</table>

| Position | Front | Front | Front | Rear | Rear | Rear | Front | Front | Rear | Rear | Rear | Rear | Front | Front | Front | Front | Front |

BF-36
### WARNING

<table>
<thead>
<tr>
<th>Priority</th>
<th>Warning item</th>
<th>Ignition switch</th>
<th>Indication of warning (Indicating time is approximate value.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shoulder anchors are not at rear lock position.</td>
<td>ON</td>
<td><img src="chart" alt="Warning Indication" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF → ON</td>
<td><img src="chart" alt="Warning Indication" /></td>
</tr>
<tr>
<td>2</td>
<td>Shoulder belts are not fastened.</td>
<td>ON</td>
<td><img src="chart" alt="Warning Indication" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF → ON</td>
<td><img src="chart" alt="Warning Indication" /></td>
</tr>
<tr>
<td>3</td>
<td>Driver side lap belt is not fastened.</td>
<td>OFF → ON</td>
<td><img src="chart" alt="Warning Indication" /></td>
</tr>
<tr>
<td>4</td>
<td>Normal (All belts are fastened and shoulder anchors are in rear lock position.)</td>
<td>OFF → ON</td>
<td><img src="chart" alt="Warning Indication" /></td>
</tr>
</tbody>
</table>
**TROUBLE DIAGNOSES**

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom Chart</td>
<td>BF-40</td>
</tr>
<tr>
<td>Preliminary Check</td>
<td>BF-41</td>
</tr>
<tr>
<td>Main Power Supply and Ground Circuit Check</td>
<td>BF-45</td>
</tr>
<tr>
<td>Harness Layout</td>
<td>BF-46</td>
</tr>
<tr>
<td>Circuit Diagram for Quick Pin Point Check</td>
<td>BF-48</td>
</tr>
<tr>
<td>Diagnostic Procedure 1</td>
<td>BF-49</td>
</tr>
<tr>
<td>(Check motor circuit and stop signals.)</td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 2</td>
<td>BF-52</td>
</tr>
<tr>
<td>(Check door switch circuit.)</td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 3</td>
<td>BF-54</td>
</tr>
<tr>
<td>(Check front limit switch circuit.)</td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 4</td>
<td>BF-56</td>
</tr>
<tr>
<td>(Check rear limit switch circuit.)</td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 5</td>
<td>BF-58</td>
</tr>
<tr>
<td>(Check shoulder belt switch circuit.)</td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 6</td>
<td>BF-60</td>
</tr>
<tr>
<td>(Check lap belt switch circuit.)</td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 7</td>
<td>BF-62</td>
</tr>
<tr>
<td>(Check warning chime circuit.)</td>
<td></td>
</tr>
<tr>
<td>Diagnostic Procedure 8</td>
<td>BF-63</td>
</tr>
<tr>
<td>(Check warning lamp circuit.)</td>
<td></td>
</tr>
<tr>
<td>Electrical Components Inspection</td>
<td>BF-64</td>
</tr>
</tbody>
</table>

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 rectangulars, 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

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Symptom Description</th>
<th>L.H. Side</th>
<th>R.H. Side</th>
<th>Reference Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>BF-64</td>
<td>Motor</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-64</td>
<td>Shoulder belt buckle switch</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-64</td>
<td>Door latch switch</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-64</td>
<td>Rear limit switch</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-64</td>
<td>Front limit switch</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-65</td>
<td>Lap belt switch</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-65</td>
<td>Motor</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-64</td>
<td>Shoulder belt buckle switch</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-64</td>
<td>Door latch switch</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-64</td>
<td>Rear limit switch</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-64</td>
<td>Front limit switch</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-65</td>
<td>Warning chime</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-64</td>
<td>Warning lamp</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-63</td>
<td>Procedure 8</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-62</td>
<td>Procedure 7</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-60</td>
<td>Procedure 6</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-68</td>
<td>Procedure 5</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-56</td>
<td>Procedure 4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-64</td>
<td>Procedure 3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-52</td>
<td>Procedure 2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-49</td>
<td>Procedure 1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-45</td>
<td>Procedure 2</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-45</td>
<td>Procedure 1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BF-43</td>
<td>Procedure 2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF-41</td>
<td>Procedure 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Diagnostic Procedure

- BF-63 Procedure 8
- BF-62 Procedure 7
- BF-60 Procedure 6
- BF-68 Procedure 5
- BF-56 Procedure 4
- BF-64 Procedure 3
- BF-52 Procedure 2
- BF-49 Procedure 1

#### Main Power Supply and Control Circuit Check

- BF-45 Procedure 2
- BF-45 Procedure 1

#### Preliminary Check

- BF-43 Procedure 2
- BF-41 Procedure 1

#### Reference Page

- SYMPTOM: No operation has made. (No warning indicated and no buckle movement performed).
- Shoulder belt buckle in L.H. or R.H. side does not move.
- Shoulder belt buckle only moves (not forwards).
- Warnings indicate incorrectly or do not function.
- Quick warning operation.
PROCEDURE 1

START

Turn ignition switch and all other electrical switches "OFF", and close door.

Disconnect negative cable from battery.

Open door.

Move shoulder belt buckle to center (not rear lock position and not front stop position) by wrench supplied in tool bag or equivalent.

Close door.

Connect battery cable.

STEP 1

Does shoulder belt buckle move frontwards?

Yes → Go to Diagnostic Procedure 2. (See page BF-52.)

No → (Go to A on next page.)

STEP 2

Does shoulder belt buckle move frontwards?

No → (Go to A on next page.)

Yes → Close door, and turn ignition switch "ON".

STEP 3

Does shoulder belt buckle move rearwards?

No → Go to Diagnostic Procedure 4. (See page BF-56.)

Yes → END

END
TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

Turn ignition switch “ON”.

STEP 4
Does shoulder belt buckle move rearwards?
Yes
Go to Diagnostic Procedure 2.
(See page BF-52.)

No
Close door.

STEP 5
Does shoulder belt buckle move rearwards?
Yes
Go to PROCEDURE 2 of Main Power Supply and Ground Circuit Check.
(See page BF-45.)
Then go to Diagnostic Procedure 1.
(See page BF-49.)

No
Go to Diagnostic Procedure 3.
(See page BF-54.)
PROCEDURE 2

Preliminary Check (Cont'd)

START

Fasten all seat belt and open both doors.

Turn ignition switch "ON".

STEP 1

Does warning chime sound for 6 seconds after switch is turned on?

No  Go to Diagnostic Procedure 7. (See page BF-62.)

Yes

STEP 2

Is warning lamp flashing now?

No  Go to Diagnostic Procedure 8. (See page BF-63.)

Yes

Close both doors.

STEP 3

Is warning lamp flashing although shoulder belt buckles reached rear lock position?

No

Unfasten L.H. shoulder belt.

Yes  Go to Diagnostic Procedure 4. (See page BF-56.)

STEP 4

Does warning chime sound for 6 seconds and warning lamp glow after belt is unfastened?

No  Go to Diagnostic Procedure 5. (See page BF-58.)

Yes  Fasten L.H. shoulder belt.

STEP 5

Does warning chime sound for 6 seconds and warning lamp glow after belt is unfastened?

No  Go to Diagnostic Procedure 5. (See page BF-58.)

Yes  Fasten R.H. shoulder belt.

Unfasten L.H. lap belt, and turn ignition switch "OFF".

(Go to A on next page.)
Preliminary Check (Cont'd)

A

- Turn ignition switch “ON”.

STEP 6

- Does warning chime sound and warning lamp glow for 6 seconds after the switch is turned on?
  - No: Go to Diagnostic Procedure 6. (See page BF-60.)
  - Yes: END
Main Power Supply and Ground Circuit Check

PROCEDURE 1
Main power supply

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Battery voltage existence condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ignition switch “ON”</td>
</tr>
<tr>
<td>21 - Ground</td>
<td>Yes</td>
</tr>
<tr>
<td>22 - Ground</td>
<td>Yes</td>
</tr>
<tr>
<td>33 - Ground</td>
<td>Yes</td>
</tr>
<tr>
<td>44 - Ground</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Ground circuit

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 - Ground</td>
<td>Yes</td>
</tr>
<tr>
<td>37 - Ground</td>
<td>Yes</td>
</tr>
<tr>
<td>40 - Ground</td>
<td>Yes</td>
</tr>
</tbody>
</table>

PROCEDURE 2
Power supply for motor drive

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Battery voltage existence</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>39 - Ground</td>
</tr>
<tr>
<td>R.H. side</td>
<td>40 - Ground</td>
</tr>
</tbody>
</table>

Ground circuit for motor drive

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>37 - Ground</td>
</tr>
<tr>
<td>R.H. side</td>
<td>40 - Ground</td>
</tr>
</tbody>
</table>
TROUBLE DIAGNOSES

Harness Layout

A Room lamp harness

B Instrument harness

C Door harness

D Main harness, Dash side

E Main harness, Body

---

R.H. front limit switch

Warning lamp (without head-up display)

Warning lamp (with head-up display)

L.H. front limit switch

Warning chime

Circuit breaker

L.H. door latch switch

R.H. door latch switch
TROUBLE DIAGNOSES

Circuit Diagram for Quick Pin Point Check

With head-up display

Without head-up display

AUTOMATIC SEAT BELT CONTROL UNIT

BF-48
TROUBLE DIAGNOSES

Diagnostic Procedure 1

START

A

CHECK MOTOR CIRCUIT.
1) Disconnect 10-pin connector from control unit.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>L.H. side</th>
<th>R.H. side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>39 - 40</td>
<td>41 - 44</td>
</tr>
</tbody>
</table>

Continuity should exist.

B

Does continuity exist?

<table>
<thead>
<tr>
<th>Terminals</th>
<th>L.H. side</th>
<th>R.H. side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>39 - Ground</td>
<td>41 - Ground</td>
</tr>
</tbody>
</table>

Yes

(Go to B on next page.)

N.G.

(Go to A on next page.)

O.K.

(Go to C on page BF-51.)

C

Check shoulder belt buckle movement.

N.G.

Replace drive motor assembly.

O.K.

Replace guide rail assembly.

Go to DRIVE MOTOR ASSEMBLY of Electrical Components Inspection. (See page BF-64.)
### Diagnostic Procedure 1 (Cont'd)

| D | 1) Disconnect connector from drive motor assembly.  
2) Check continuity. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terminals</td>
</tr>
<tr>
<td></td>
<td>L.H. side</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>G/B</td>
<td>4</td>
</tr>
<tr>
<td>G/B</td>
<td>6</td>
</tr>
<tr>
<td>G/B</td>
<td>6</td>
</tr>
<tr>
<td>Continuity should exist.</td>
<td></td>
</tr>
</tbody>
</table>

| E | 1) Disconnect connector from drive motor assembly.  
2) Does continuity exist in at least one point? |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terminals</td>
</tr>
<tr>
<td></td>
<td>L.H. side</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>50</td>
<td>Ground</td>
</tr>
<tr>
<td>51</td>
<td>Ground</td>
</tr>
<tr>
<td>R.H. side</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Ground</td>
</tr>
</tbody>
</table>

N.G. Repair harness.

Yes Repair harness. There will be incorrect grounding.

N.G. Repair drive motor harness.

O.K. Replace drive motor assembly.

O.K. Replace drive motor harness.

O.K. Replace drive motor assembly.
Diagnostic Procedure 1 (Cont'd)

CHECK STOP SIGNAL.
1) Move shoulder belt buckle to center (not rear lock position and not front).
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>L.H. side</th>
<th>R.H. side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>@ - Ground</td>
<td>@ - Ground</td>
</tr>
</tbody>
</table>

Continuity should exist.

Refer to figure G to move shoulder belt buckle.

O.K.

1) Disconnect 16-pin connector from control unit.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>L.H. side</th>
<th>R.H. side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>@ - Ground</td>
<td>@ - Ground</td>
</tr>
</tbody>
</table>

Continuity should exist.

Is this the second time?

No

Replace control unit.

Yes

Reinstall any part removed.

Go to PROCEDURE 1 (START) of Preliminary Check.
(See page BF-41.)

N.G. Go to Diagnostic Procedure 3 (See page BF-54.) and return to next step.

N.G. Go to Diagnostic Procedure 4 (See page BF-56.) and return to next step.

O.K.
### Diagnostic Procedure 2

**START**

**CHECK DOOR SWITCH CIRCUIT.**
1) Disconnect 16-pin connector from control unit.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Door condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>Open</td>
<td>Yes</td>
</tr>
<tr>
<td>R.H. side</td>
<td>Closed</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Door condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>Open</td>
<td>Yes</td>
</tr>
<tr>
<td>R.H. side</td>
<td>Closed</td>
<td>No</td>
</tr>
</tbody>
</table>

**CHECK DOOR SWITCH CONNECTOR.**
1) Disconnect door latch switch connector.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Door condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>Ground</td>
<td>Yes</td>
</tr>
<tr>
<td>R.H. side</td>
<td>Ground</td>
<td>No</td>
</tr>
</tbody>
</table>

** Does continuity exist?**

- **Yes:**
  - Repair harness. There will be incorrect grounding between terminals 29 and 1 or 28 and 1.

- **No:**
  - Go to DOOR LATCH SWITCH of Electrical Components Inspection. (See page BF-64.)

**Repair door latch switch harness.**

**Go to PROCEDURE 1 (START) of Preliminary Check.** (See page BF-41.)

**Check door latch switch harness for open and short circuit.**

**O.K.**

**Replace door lock assembly.**
Diagnostic Procedure 2 (Cont’d)

Is this the second time?

Yes → Replace control unit.

No → Reinstall any part removed.

Go to PROCEDURE 1 (START) of Preliminary Check.
(See page BF-41.)
Diagnostic Procedure 3

START

A CHECK FRONT LIMIT SWITCH CIRCUIT.
1) Disconnect 10-pin connector from control unit.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Shoulder belt buckle position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>2 Ground</td>
<td>At front</td>
</tr>
<tr>
<td>R.H. side</td>
<td>3 Ground</td>
<td>At front</td>
</tr>
</tbody>
</table>

B Refer to figure B to move shoulder belt buckle.

C 1) Disconnect connector from front limit switch.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>1 - 3 Ground (M57, M115)</td>
</tr>
<tr>
<td>R.H. side</td>
<td>1 - 3 Ground (M57, M115)</td>
</tr>
</tbody>
</table>

O.K.

Repair harness.

N.G.

(If repair harness.)
Diagnostic Procedure 3 (Cont'd)

A) Does continuity exist?

<table>
<thead>
<tr>
<th>Connector</th>
<th>L.H. side</th>
<th>R.H. side</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>(M20)</td>
<td>1 - Ground</td>
</tr>
<tr>
<td>R.H. side</td>
<td>(RB)</td>
<td>1 - Ground</td>
</tr>
</tbody>
</table>

- **Yes**
  - Repair harness. There will be incorrect grounding between terminals 43 and 1 or 43 and 1.
- **No**
  - Go to FRONT LIMIT SWITCH of Electrical Components Inspection. (See page BF-64.)
  
  - **O.K.**
    - Replace guide rail assembly.
  
  - **N.G.**
    - Check front limit switch harness for open and short circuit.
      
      - **O.K.**
        - Repair front limit switch harness.
      
      - **N.G.**
        - Replace front limit switch.

- **Yes**
  - Is this the second time?
    
    - **No**
      - Reinstall any part removed.
      
      - Go to PROCEDURE 1 (START) of Preliminary Check. (See page BF-41.)
    
    - **Yes**
      - Replace control unit.
**Diagnostic Procedure 4**

**START**

A

CHECK REAR LIMIT SWITCH CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Shoulder belt buckle position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>☐ - ☒ Ground At rear</td>
<td>No</td>
</tr>
<tr>
<td>R.H. side</td>
<td>☐ - ☒ Ground</td>
<td>No</td>
</tr>
<tr>
<td>L.H. side</td>
<td>☐ - ☒ Ground Not at rear</td>
<td>Yes</td>
</tr>
<tr>
<td>R.H. side</td>
<td>☐ - ☒ Ground Not at rear</td>
<td>Yes</td>
</tr>
</tbody>
</table>

B Refer to figure B to move shoulder belt buckle.

C

1) Disconnect connector from rear switch assembly.
2) Check continuity.

**SBF346E**

N.G. Repair harness.

**SBF341E**

O.K. (Go to A on next page.)

**SBF352E**

(Go to A on next page.)
Diagnostic Procedure 4 (Cont'd)

D

Does continuity exist?

<table>
<thead>
<tr>
<th>Connector</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td>付</td>
</tr>
<tr>
<td>R.H. side</td>
<td>付</td>
</tr>
</tbody>
</table>

Yes

Repair harness. There will be incorrect grounding between terminals 付 and 付 or 付 and 付.

No

Go to REAR LIMIT SWITCH of Electrical Components Inspection. (See page BF-64.)

O.K.

( Go to B below.)

N.G.

Check rear limit switch harness for open or short circuit.

O.K.

Replace rear switch assembly.

B

Is this the second time?

Yes

Replace control unit.

No

Reinstall any part removed.

Go to PROCEDURE 1 (STEP 3) (See page BF-41.) or PROCEDURE 2 (STEP 3) (See page BF-43.) of Preliminary Check.
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.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Shoulder belt</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td></td>
<td>Fasten</td>
</tr>
<tr>
<td>R.H. side</td>
<td></td>
<td>Unfasten</td>
</tr>
</tbody>
</table>

If shoulder belt buckle is not rear lock position, do as figure A to move it to rear.

B

C

1) Disconnect connector from rear switch assembly.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Shoulder belt</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td></td>
</tr>
<tr>
<td>R.H. side</td>
<td></td>
</tr>
</tbody>
</table>

Continuity should exist.

D

Does continuity exist?

<table>
<thead>
<tr>
<th>Connector</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. side</td>
<td></td>
</tr>
<tr>
<td>R.H. side</td>
<td></td>
</tr>
</tbody>
</table>

Yes: Repair harness. There will be incorrect grounding between terminals and .

O.K. (Go to B on next page.)

No

Go to SHOULDER BELT BUCKLE SWITCH of Electrical Components Inspection.
(See page BF-64.)

O.K. (Go to A on next page.)

N.G.

(Go to A on next page.)
Diagnostic Procedure 5 (Cont'd)

(A)

Check shoulder belt buckle switch harness for open or short circuit.

- O.K.
  - Replace rear switch assembly.
- N.G.
  - Repair shoulder belt buckle switch harness.

(B)

Is this the second time?

- Yes
  - Replace control unit.
- No
  - Reinstall any part removed.

Go to PROCEDURE 2 (STEP 4) of Preliminary Check.
(See page BF-43.)
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.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Lap belt</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>@ - Ground</td>
<td>Fasten</td>
<td>No</td>
</tr>
<tr>
<td>@ - Ground</td>
<td>Unfasten</td>
<td>Yes</td>
</tr>
</tbody>
</table>

N.G. (Go to A on next page.)

B

1) Disconnect lap belt switch connector.
2) Check continuity.

Continuity should exist.

N.G. Repair harness.

C

Does continuity exist?

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>@ - @</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Yes Repair harness. There will be incorrect grounding.

No

Go to LAP BELT BUCKLE SWITCH of Electrical Components Inspection. (See page BF-65.)

O.K. (Go to A on next page.)

N.G.

Check lap belt buckle switch harness for open and short circuit.

N.G. Repair lap belt buckle switch harness.

O.K.

Replace shoulder belt buckle assembly.
Diagnostic Procedure 6 (Cont'd)

A

Is this the second time?

No

Reinstall any part removed.

Yes

Replace control unit.

Go to PROCEDURE 2 (STEP 6) of Preliminary Check. (See page BF-44.)
Diagnostic Procedure 7

START

A

CHECK WARNING CHIME CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check warning chime.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Method</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - Ground</td>
<td>Ground</td>
<td>Sound</td>
</tr>
<tr>
<td></td>
<td>intermittently</td>
<td></td>
</tr>
</tbody>
</table>

O.K. → (Go to A below.)

B

1) Disconnect connector from warning chime.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Continuity should exist.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N.G. → Repair harness.

C

Does continuity exist?

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

O.K. → Repair harness.

Yes

Repair harness.

There will be incorrect grounding.

D

Check battery voltage existence.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Battery voltage should exist.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N.G. → Repair harness.

Repair harness.

For details, refer to POWER SUPPLY ROUTING in EL section.

O.K.

Go to WARNING CHIME of Electrical Components Inspection. (See page BF-65.)

N.G. → Replace warning chime.

A

O.K.

Is this the second time?

Yes → Replace control unit.

No

Reinstall any part removed.

Go to PROCEDURE 2 (START) of Preliminary Check. (See page BF-43.)
TROUBLE DIAGNOSES

Diagnostic Procedure 8

START

A

CHECK WARNING LAMP CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check warning lamp.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 - Ground</td>
<td>Glow</td>
</tr>
</tbody>
</table>

O.K. (Go to A below.)

B

1) Disconnect connector from combination meter.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Continuity should exist.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 - 15</td>
<td></td>
</tr>
</tbody>
</table>

N.G. Repair harness.

C

Check battery voltage existence.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Battery voltage should exist.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 - Ground</td>
<td></td>
</tr>
</tbody>
</table>

O.K.

Is warning lamp bulb burn out? (Go to A below.)

| Yes | Replace bulb. |

No

Is this the second time? (Go to A below.)

| Yes | Replace control unit. |

No

Reinstall any part removed.

Go to PROCEDURE 2 (START) of Preliminary Check.
(See page BF-43.)
**Electrical Components Inspection**

**FRONT LIMIT SWITCH**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushed</td>
<td>No</td>
</tr>
<tr>
<td>Released</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**REAR LIMIT SWITCH**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushed</td>
<td>No</td>
</tr>
<tr>
<td>Released</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**SHOULDER BELT BUCKLE SWITCH**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushed</td>
<td>Yes</td>
</tr>
<tr>
<td>Released</td>
<td>No</td>
</tr>
</tbody>
</table>

**DOOR LATCH SWITCH**
*(Built-in door lock assembly)*

<table>
<thead>
<tr>
<th>Door condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>Yes</td>
</tr>
<tr>
<td>Closed</td>
<td>No</td>
</tr>
</tbody>
</table>

**DRIVE MOTOR ASSEMBLY**

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Drive belt operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>+</td>
<td>–</td>
</tr>
</tbody>
</table>

BF-64
**WARNING CHIME**

<table>
<thead>
<tr>
<th>Condition Operation</th>
<th>Connect and disconnect harness A as shown at left</th>
<th>Sounds</th>
</tr>
</thead>
</table>

**LAP BELT BUCKLE SWITCH**
*(Built-in lap belt buckle for L.H. side)*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fastened</td>
<td>No</td>
</tr>
<tr>
<td>Unfastened</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Electrical Sun Roof

- Do not move or remove limit switch unless it is necessary.
- After any adjustment, check sun roof operation and lid alignment.

---

BF-66
Finisher plate removal & installation

A Remove guide rail cover and pull up pawl, then draw out finisher plate with sun roof lid open.

B When replacing wire, remove rail first and then link & wire assembly.

C Be sure to lubricate.

Glass lid 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

- IGNITION RELAY
- IGNITION SWITCH ON or START
- BATTERY (Via fusible link-Green)
- SUN ROOF SWITCH
- SAFETY RELAY
- LIMIT SWITCH (Safety)

<table>
<thead>
<tr>
<th>OUTER LID POSITION</th>
<th>Fully opened</th>
<th>Between approx. 135mm (3.94in) opened and fully opened</th>
<th>Between fully closed and approx. 135mm (3.94in) opened</th>
<th>Fully closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BF-68
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.

CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

WARNING:
Keep heat or open flames away as primers are flammable.

 WARNING:
Keep heat or open flames away as primers are flammable.
Windshield (Cont’d)

CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Set glass in position and press glass lightly and evenly.

Apply sealant additionally to lower portion of glass and make it uniform as shown below:

CAUTION:
Windshield glass should be installed within 15 minutes of applying sealant; sealant starts to harden 15 minutes after it is applied.

Check for water leakage.

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.

CAUTION:
For sealant drying time, refer to “Drying Time for Sealant”.

BF-71
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".

**Sealant quantity**

- More than 12 (0.47) mm
- More than 7 (0.28) mm

**Unit:** mm (in)

**Install dam rubber and spacers with double-faced adhesive tape. (Body side)**

**Upper and side portion**

- Vehicle center

**Lower portion**

- Dam rubber
- Double-faced adhesive tape
- Body panel
- Spacer
- Roof panel

**Install molding fastener.**

When installing it, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F).

**Fastener A**
- Body panel
- Panel
- Double-faced adhesive tape
- Fastener B

**BF-72**

SBF200E
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".

![Diagram of Back Door Window—Fastback](image)

**Sealant portion C**

**Locating pin (Left and right) A**

**Sealant portion E**

**Lower molding and spacer B**

XX: Spacer
- : Locating pin
○: Molding clip

**A** Locating pin (Bonded on glass surface)

**B** Molding fastener
When installing it, heat body panel & fastener to approx. 30 to 40°C (86 to 104°F).

**C** More than 12 (0.47) More than 7 (0.28)

**D** Back door side molding

**E** More than 12 (0.47) More than 7 (0.28)

Unit: mm (in)
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

- Sealant portion A
- Sealant portion B
- Sealant portion C
- Double-faced adhesive tape
- Locating pin

**Unit:** mm (in)
WINDSHIELD AND WINDOWS

Side Window (Cont'd)

COUPE

Clip A

Spacer portion C

Locating pin

Sealant portion D

Clip B

Clip (Bonded to glass)

Glass molding

Clip (Bonded to glass)

Dam rubber 30

(1.18)

5 (0.20)

Spacer

Unit: mm (in)

Sealant quantity

More than 12 (0.47)

More than 7 (0.28)

Unit: mm (in)

Locating pin hole

10 mm (0.39 in)

Body panel

Sealant
Drying Time for Sealant
Reference: Time required for sealant to dry to desired hardness.

<table>
<thead>
<tr>
<th>Temperature °C (°F)</th>
<th>Relative humidity %</th>
<th>90</th>
<th>50</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 (104)</td>
<td></td>
<td>1.5</td>
<td>2.5</td>
<td>5.0</td>
</tr>
<tr>
<td>25 (77)</td>
<td></td>
<td>2.5</td>
<td>4.0</td>
<td>7.5</td>
</tr>
<tr>
<td>5 (41)</td>
<td></td>
<td>5.0</td>
<td>13.0</td>
<td>20.5</td>
</tr>
</tbody>
</table>

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.
Door Mirror

WIRING DIAGRAM

IGNITION SWITCH
ACC or ON

FUSE BLOCK
(Refer to "POWER
SUPPLY ROUTING"
In EL section.)

R. H. SIDE
DOOR MIRROR
Mirror operating
direction
Current flow
direction
Leftward
Rightward

L. H. SIDE
DOOR MIRROR
Mirror operating
direction
Current flow
direction
Leftward
Rightward

DOOR MIRROR SWITCH
BODY GROUND

BF-77
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).
- 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**

![Diagram of Front Air Spoiler](image)

**REAR AIR SPOILER - Fastback**

![Diagram of Rear Air Spoiler - Fastback](image)
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".

```
@: L.H. side
RH: R.H. side
```

**Engine Compartment**

**MEASUREMENT**

```
796*  1,420  1,610*
```

**Unit:** mm

BF-80
MEASUREMENT POINTS

**Cowl top**
- Point A: 5 diameters

**Cowl top side**
- Point B: 8 diameters

**Strut tower**
- Point C: 11 diameters

**Radiator core side**
- Point D: 8 diameters
- Point E: 12 diameters
- Point H: 6 diameters

**Front side member**
- Point F: 13 diameters
- Point G: 16 diameters

**Radiator core center**
- Points I: 8 diameters

Unit: mm
BODY ALIGNMENT

Underbody

MEASUREMENT

Unit: mm

BF-82
Front and rear strut tower centers
Coordinates:

Front: D, D 87 dia.
X: 542.2
Y: 63.5
Z: 725.7

Rear: 0, 0 48 dia.
X: 474.5
Y: 2,500
Z: 658.9

Rear suspension member front mounting bolt threaded end
Coordinates:

H, H
X: 635
Y: 2,650
Z: 116.3

Front: M12 bolt

Rear suspension member rear mounting bolt threaded end
Coordinates:

0, 0
X: 303
Y: 1,580
Z: 65.8

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

H, H
X: 520
Y: 3,050
Z: 398.8

I
X: 628
Y: 3,200
Z: 400

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

D, D
X: 375
Y: 700
Z: 106.2

M, M
X: 420
Y: 1,150
Z: 106.2

Front: M12 bolt

Unit: mm
CONTENTS

AIR FLOW AND COMPONENT LAYOUT ........................................... HA-2
DOOR CONTROL ................................................................. HA-5
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
A/C ELECTRICAL CIRCUIT .................................................. HA-40
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”.

When you read wiring diagrams:
AIR FLOW AND COMPONENT LAYOUT

Air Flow

Floor

Floor and defroster

Defroster

Bi-level

Ventilation

Air conditioner switch
Rec switch
Mode switches
Fan lever

Temperature control lever

Ventilator door

Defroster door

Air mix door

Heater core

Outside air

Floor door

Heater duct

Intake door

To ventilator

To floor

To defroster

Mixed air

Air not passed through heater core

Air passed through heater core

HA-2
AIR DISTRIBUTION RATIOS

<table>
<thead>
<tr>
<th>VENT</th>
<th>B/L</th>
<th>FOOT</th>
<th>F/D</th>
<th>DEF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RHA372A
For removal, it is necessary to remove instrument assembly.
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. Reconnect and readjust temperature control cable.

1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to 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.
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.
This push control system operates the intake and mode door motors to activate their corresponding doors.

**SWITCHES AND THEIR CONTROL FUNCTIONS**

<table>
<thead>
<tr>
<th>Switch</th>
<th>A/C</th>
<th>Mode</th>
<th>Indicator illuminates</th>
<th>Air outlet</th>
<th>Intake air</th>
<th>Compressor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ON*1</td>
</tr>
<tr>
<td>Foot</td>
<td>O</td>
<td></td>
<td></td>
<td>VENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/L</td>
<td>O</td>
<td></td>
<td></td>
<td>B/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td>O</td>
<td></td>
<td></td>
<td>FOOT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/D</td>
<td>O</td>
<td></td>
<td></td>
<td>F/D</td>
<td>FRE</td>
<td>ON*1</td>
</tr>
<tr>
<td>DEF</td>
<td>O²</td>
<td></td>
<td></td>
<td>DEF</td>
<td>FRE</td>
<td>REC</td>
</tr>
</tbody>
</table>

*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.

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Mode door motor</th>
<th>Direction of linkage rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>&lt;br&gt;8 Mode door operation</td>
<td>Stop &lt;br&gt;Stop</td>
</tr>
<tr>
<td></td>
<td>Stop</td>
<td>Stop</td>
</tr>
<tr>
<td></td>
<td>VENT → DEF</td>
<td>Clockwise</td>
</tr>
<tr>
<td></td>
<td>DEF → VENT</td>
<td>Counter-clockwise</td>
</tr>
</tbody>
</table>
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
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.
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.
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 it 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.
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.
## SPECIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool number (Kent-Moore No.)</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV998VR001</td>
<td>Clutch disc puller</td>
<td>Removing clutch disc</td>
</tr>
<tr>
<td>KV99231010</td>
<td>Clutch disc wrench</td>
<td>Removing shaft nut and clutch disc</td>
</tr>
<tr>
<td>KV99235160 (J29751)</td>
<td>Nut wrench</td>
<td>Removing lock nut</td>
</tr>
</tbody>
</table>
## SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manifold gauge</td>
<td>Discharging and charging refrigerant</td>
</tr>
<tr>
<td>Charging hose</td>
<td>Discharging, evacuating and checking refrigerant</td>
</tr>
<tr>
<td>Charge valve</td>
<td>Discharging and charging refrigerant</td>
</tr>
<tr>
<td>Thermometer</td>
<td>Checking temperature</td>
</tr>
<tr>
<td>Vacuum pump</td>
<td>Evacuating refrigerant</td>
</tr>
<tr>
<td>Electric leak detector</td>
<td>Nominal sensitivity: 15 - 25 g (0.53 - 0.88 oz)/year</td>
</tr>
</tbody>
</table>
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.

When it is necessary to replace parts
Check the spot where malfunction occurs.
Discharging
Replace parts.

When it is not necessary to replace parts
Check the spot where refrigerant leaks.
Repair.
Add refrigerant.

When servicing A/C system
In service A/C system

Point-1

Point-2
Evacuating
Run pump for over 5 minutes.

Point-3
Checking airtightness

Once evacuating
Twice evacuating

On condition that pump operates over $-98.6$ kPa ($-740$ mmHg, $-29.13$ inHg) and with low humidity on a clear day.
On condition that pump operates below $-98.6$ kPa ($-740$ mmHg, $-29.13$ inHg) and with high humidity on a rainy day.

Point-5
Evacuating
Run pump for over 20 minutes.

Point-6
Charging
Open high-pressure valve of manifold gauge and charge refrigerant into system. 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-3
Checking airtightness

Point-5
Evacuating
Run pump for over 20 minutes.

Point-7
Charging
Checking refrigerant leaks

Point-1

Point-2

Point-3

Point-4
N.G.
Repair.

Point-5

Point-6

Point-7

N.G.
O.K.
N.G.
O.K.

New A/C system

HA-17
**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.

**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.

<table>
<thead>
<tr>
<th>Leak at/around pipe connection</th>
<th>Leak at/around gauge manifold</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-ring fouled, damaged or deformed</td>
<td>Malfunctioning charging hose</td>
</tr>
<tr>
<td>Oil not applied to pipe connections during installation</td>
<td>Gauge improperly installed</td>
</tr>
<tr>
<td>Pipe connections not properly tightened (too tight or too loose)</td>
<td>Malfunctioning valve</td>
</tr>
<tr>
<td></td>
<td>Malfunctioning packing, etc.</td>
</tr>
</tbody>
</table>
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.
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)
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.
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.

<table>
<thead>
<tr>
<th>Amount of refrigerant</th>
<th>Almost no refrigerant</th>
<th>Insufficient</th>
<th>Suitable</th>
<th>Too much refrigerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check item</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature of high-pressure and low-pressure lines.</td>
<td>Almost no difference between high-pressure and low-pressure side temperature.</td>
<td>High-pressure side is warm and low-pressure side is fairly cold.</td>
<td>High-pressure side is hot and low-pressure side is cold.</td>
<td>High-pressure side is abnormally hot.</td>
</tr>
<tr>
<td>State in sight glass.</td>
<td>Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.</td>
<td>The bubbles are seen at intervals of 1 - 2 seconds.</td>
<td>Almost transparent. Bubbles may appear when engine speed is raised and lowered.</td>
<td>No bubbles can be seen.</td>
</tr>
<tr>
<td>Pressure of system.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repair.</td>
<td>Stop compressor immedi-</td>
<td>Check for gas leakage, repair as required, replenish and change system.</td>
<td></td>
<td>Discharge refrigerant from service valve of low-pressure side.</td>
</tr>
</tbody>
</table>

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.
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.

**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.

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.
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.
Refrigerant Lines

* For removal, it is necessary to remove condenser.
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**

<table>
<thead>
<tr>
<th>Relative humidity</th>
<th>Inside air (Recirculating air) at blower assembly inlet</th>
<th></th>
<th>Discharge air temperature at center ventilator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Air temperature</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - 60</td>
<td>20 (68)</td>
<td>1.6 - 2.7 (35 - 37)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25 (77)</td>
<td>4.4 - 6.0 (40 - 43)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 (86)</td>
<td>9.2 - 11.3 (49 - 52)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 (95)</td>
<td>14.8 - 17.0 (59 - 63)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 (104)</td>
<td>18.1 - 20.3 (65 - 69)</td>
<td></td>
</tr>
<tr>
<td>60 - 70</td>
<td>20 (68)</td>
<td>2.7 - 4.3 (37 - 40)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25 (77)</td>
<td>6.0 - 8.2 (43 - 47)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 (86)</td>
<td>11.3 - 13.8 (52 - 57)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 (95)</td>
<td>17.0 - 19.5 (63 - 67)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 (104)</td>
<td>20.3 - 22.8 (69 - 73)</td>
<td></td>
</tr>
</tbody>
</table>

**Ambient air temperature-to-compressor pressure table**

<table>
<thead>
<tr>
<th>Relative humidity</th>
<th>Ambient air</th>
<th>High-pressure (Discharge side) kPa (kg/cm², psi)</th>
<th>Low-pressure (Suction side) kPa (kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>°C (°F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - 70</td>
<td>20 (68)</td>
<td>1,030 - 1,255 (10.5 - 12.8, 149 - 182)</td>
<td>98.1 - 142.2 (1.0 - 1.45, 14.2 - 20.8)</td>
</tr>
<tr>
<td></td>
<td>25 (77)</td>
<td>1,196 - 1,471 (12.2 - 15.0, 173 - 213)</td>
<td>122.6 - 171.6 (1.25 - 1.75, 17.8 - 24.9)</td>
</tr>
<tr>
<td></td>
<td>30 (86)</td>
<td>1,402 - 1,706 (14.3 - 17.4, 203 - 247)</td>
<td>161.8 - 210.9 (1.65 - 2.15, 23.5 - 30.6)</td>
</tr>
<tr>
<td></td>
<td>35 (95)</td>
<td>1,608 - 1,971 (16.4 - 20.1, 233 - 286)</td>
<td>205.9 - 259.9 (2.1 - 2.65, 29.9 - 37.7)</td>
</tr>
<tr>
<td></td>
<td>40 (104)</td>
<td>1,844 - 2,256 (18.8 - 23.0, 267 - 327)</td>
<td>259.9 - 318.7 (2.65 - 3.25, 37.7 - 46.2)</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Probable cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INSUFFICIENT REFRIGERANT CHARGE</strong></td>
<td>Insufficient cooling. Bubbles appear in sight glass.</td>
<td>Refrigerant is low, or leaking slightly. 1. Leak test. 2. Repair leak. 3. Charge system. Evacuate, as necessary, and recharge system.</td>
</tr>
<tr>
<td><img src="image1.png" alt="AC352A" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ALMOST NO REFRIGERANT</strong></td>
<td>No cooling action. A lot of bubbles or something like mist appears in sight glass.</td>
<td>Serious refrigerant leak. 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.</td>
</tr>
<tr>
<td><img src="image2.png" alt="AC353A" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MALFUNCTIONING EXPANSION VALVE</strong></td>
<td>Slight cooling. Sweat or frosting on expansion valve inlet.</td>
<td>Expansion valve restricts refrigerant flow. 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. If valve inlet reveals sweat or frost: 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.</td>
</tr>
<tr>
<td><img src="image3.png" alt="AC354A" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>Probable cause</td>
<td>Corrective action</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Insufficient cooling. Sweat on suction line.</td>
<td>Expansion valve allows too much refrigerant through evaporator.</td>
<td>Check valve for operation. If suction side does not show a pressure decrease, replace valve.</td>
</tr>
<tr>
<td>No cooling. Sweat or frosting on suction line.</td>
<td>Malfunctioning expansion valve.</td>
<td>1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.</td>
</tr>
<tr>
<td>Insufficient cooling. Sight glass shows occasional bubbles.</td>
<td>Air mixed with refrigerant in system.</td>
<td>1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.</td>
</tr>
<tr>
<td>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).</td>
<td>Drier is saturated with moisture. Moisture has frozen in expansion valve. Refrigerant flow is restricted.</td>
<td>1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minutes evacuating three times.) 4. Recharge system.</td>
</tr>
<tr>
<td>Condition</td>
<td>Probable cause</td>
<td>Corrective action</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **MALFUNCTIONING CONDENSER**    | No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot. | Usually a malfunctioning condenser.  
- 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.  
If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging. |
| **HIGH PRESSURE LINE BLOCKED**  | Insufficient cooling. Frosted high-pressure liquid line. | Drier clogged, or restriction in high-pressure line.  
1. Discharge system.  
2. Remove receiver drier or strainer and replace it.  
3. Evacuate and charge system. |
| **MALFUNCTIONING COMPRESSOR**   | Insufficient cooling. Internal problem in compressor, or damaged gasket and valve. | 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. |
### Condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Probable cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOO MUCH OIL IN SYSTEM (Excessive)</td>
<td>Insufficient cooling.</td>
<td>Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.</td>
</tr>
</tbody>
</table>

![Pressure Gauges Diagram](AC364A)
COMPRESSOR OIL — For NVR 140S (ATSUGI make)

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

<table>
<thead>
<tr>
<th>Applied model</th>
<th>All models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>Total in system</td>
<td>200 (6.8, 7.0)</td>
</tr>
<tr>
<td>Amount of oil which can be drained</td>
<td>Approx. 100 (3.4, 3.5)*</td>
</tr>
<tr>
<td>Compressor (Service parts) charging amount</td>
<td>200 (6.8, 7.0)</td>
</tr>
</tbody>
</table>

*: 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;

<table>
<thead>
<tr>
<th>Amount of oil drained</th>
<th>Adjusting procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 90 (3.0, 3.2)*</td>
<td>Oil level is right. Pour in same amount of oil as was drained out.</td>
</tr>
<tr>
<td>Below 90 (3.0, 3.2)</td>
<td>Oil level may be low. Pour in 90 mL (3.0 US fl oz, 3.2 Imp fl oz) of oil.</td>
</tr>
</tbody>
</table>

*: 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.)
2. Check the purity of the oil and then adjust oil level following the procedure below.

(a) When oil is clean:

<table>
<thead>
<tr>
<th>Unit: mL (US fl oz, Imp fl oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of oil drained from used compressor</td>
</tr>
<tr>
<td>Above 90 (3.0, 3.2)*</td>
</tr>
<tr>
<td>Below 90 (3.0, 3.2)</td>
</tr>
</tbody>
</table>

*: 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 in compressor service parts.]

Example:

<table>
<thead>
<tr>
<th>Unit: mL (US fl oz, Imp fl oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of oil drained from used compressor</td>
</tr>
<tr>
<td>110 (3.7, 3.9)</td>
</tr>
<tr>
<td>70 (2.4, 2.5)</td>
</tr>
</tbody>
</table>

(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)

- Thermal protector
  - 10 - 15
  - (1.0 - 1.5, 7 - 11)

Key

Magnet coil

Pulley

Magnet clutch assembly

Adjusting shim

Lock nut
  - 29 - 39 (3.0 - 4.0, 22 - 29)

Clutch disc

Center bolt
  - 9.1 - 11.8 (0.93 - 1.2, 6.7 - 8.7)

: N·m (kg-m, ft-lb)
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.
Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair .......................................................... HA-45
Symptom Chart ................................................................................................................................. HA-46
Preliminary Check ............................................................................................................................. HA-48

PRELIMINARY CHECK 1
(Intake door is not set at "FRESH" in DEF or FOOT mode.) ................................................................. HA-48

PRELIMINARY CHECK 2
(A/C does not blow cold air.) ............................................................................................................... HA-49

PRELIMINARY CHECK 3
(Magnet clutch does not engage in DEF mode.) ................................................................................ HA-50

PRELIMINARY CHECK 4
(Air outlet does not change.) .............................................................................................................. HA-51

PRELIMINARY CHECK 5
(Noise) ........................................................................................................................................... HA-52

Main Power Supply and Ground Circuit Check .................................................................................. HA-53
Harness Layout for A/C System .......................................................................................................... HA-55
Circuit Diagram for Quick Pin Point Check ....................................................................................... HA-56

Diagnostic Procedure 1
(SYMPTOM: Blower motor does not rotate.) .................................................................................... HA-57

Diagnostic Procedure 2
(SYMPTOM: Air outlet does not change.) ........................................................................................ HA-59

Diagnostic Procedure 3
(SYMPTOM: Intake door does not change in VENT, B/L or FOOT mode.) ........................................ HA-61

Diagnostic Procedure 4
(SYMPTOM: Magnet clutch does not engage with A/C switch and fan switch are ON.) ................. HA-62

Diagnostic Procedure 5
(SYMPTOM: Illumination or indicators of push control unit do not come on.) ............................... HA-66

Electrical Components Inspection ..................................................................................................... HA-70
How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW

CHECK IN

LISTEN TO CUSTOMER COMPLAINTS AND CONFIRM.

INVESTIGATE ITEMS YOU SHOULD CARRY OUT RELATED TO EACH SYMPTOM.

ELIMINATE GOOD SYSTEM(S)/PART(S).

CHECK MAIN POWER SUPPLY AND GROUND CIRCUITS.

ELIMINATE GOOD PART(S)/HARNESS(ES)/CONNECTOR(S) ELECTRICALLY.

Malfunctioning harness(es)/connector(s) Malfunctioning part(s)

INSPECT EACH COMPONENT.

REPAIR.

REPAIR/REPLACE.

FINAL CHECK

O.K.

CHECK OUT

- Diagnostic procedure(s) (See page HA-57 - 69.)
- Circuit diagram for quick pin point check (See page HA-56.)

Symptom Chart (See page HA-48 - 47.)

Preliminary Check (See page HA-48 - 52.)

Main Power/Supply and Ground Circuit Check (See page HA-53 - 54.)

Harness Layout for A/C System (See page HA-55.)

Electrical Components Inspection (See page HA-70 - 72.)
### TROUBLE DIAGNOSES

#### Symptom Chart

**DIAGNOSTIC TABLE**

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROCEDURE REFERENCE PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C does not blow cold air.</td>
<td>Preliminary check 1</td>
</tr>
<tr>
<td></td>
<td>Preliminary check 2</td>
</tr>
<tr>
<td></td>
<td>Preliminary check 3</td>
</tr>
<tr>
<td></td>
<td>Preliminary check 4</td>
</tr>
<tr>
<td></td>
<td>Preliminary check 5</td>
</tr>
<tr>
<td></td>
<td>Diagnostic procedure 1</td>
</tr>
<tr>
<td></td>
<td>Diagnostic procedure 2</td>
</tr>
<tr>
<td></td>
<td>Diagnostic procedure 3</td>
</tr>
<tr>
<td></td>
<td>Diagnostic procedure 4</td>
</tr>
<tr>
<td></td>
<td>Diagnostic procedure 5</td>
</tr>
<tr>
<td>Blower motor does not rotate.</td>
<td>Main Power Supply and Ground Circuit Check</td>
</tr>
<tr>
<td>Air outlet does not change.</td>
<td>HA-48</td>
</tr>
<tr>
<td>Intake door does not change in VENT, B/L or FOOT mode.</td>
<td>HA-49</td>
</tr>
<tr>
<td>Intake door is not set at &quot;FRESH&quot; in DEF or FOOT mode.</td>
<td>HA-50</td>
</tr>
<tr>
<td>Magnet clutch does not engage when A/C switch and fan switch are ON.</td>
<td>HA-51</td>
</tr>
<tr>
<td>Magnet clutch does not engage in DEF mode.</td>
<td>HA-57 - 58</td>
</tr>
<tr>
<td>Illumination or indicators of push control unit do not come on.</td>
<td>HA-61</td>
</tr>
<tr>
<td>Noise</td>
<td>HA-62 - 65</td>
</tr>
<tr>
<td></td>
<td>HA-66</td>
</tr>
<tr>
<td></td>
<td>HA-63</td>
</tr>
<tr>
<td></td>
<td>HA-64</td>
</tr>
<tr>
<td></td>
<td>HA-65</td>
</tr>
<tr>
<td></td>
<td>HA-53</td>
</tr>
<tr>
<td></td>
<td>HA-54</td>
</tr>
<tr>
<td></td>
<td>HA-55</td>
</tr>
</tbody>
</table>

1. The number means checking order.

O: As for checking order, refer to each flowchart. (It depends on malfunctioning portion.)
<table>
<thead>
<tr>
<th></th>
<th>Blower motor</th>
<th>Resistor</th>
<th>A/C switch</th>
<th>REC switch</th>
<th>VENT switch</th>
<th>B/L switch</th>
<th>FOOT switch</th>
<th>F/D switch</th>
<th>DEF switch</th>
<th>Fanswitch</th>
<th>Mode door motor</th>
<th>Intake door motor</th>
<th>A/C relay</th>
<th>Thermo control amp.</th>
<th>Dual-pressure switch</th>
<th>Compressor (Magnet clutch)</th>
<th>Compressor</th>
<th>Thermal protector</th>
<th>E.C.C.S. control unit</th>
<th>Illumination system</th>
<th>Knob illumination</th>
<th>Harness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push control unit</td>
<td>HA-70</td>
<td></td>
<td>HA-70</td>
<td>HA-70</td>
<td>HA-70</td>
<td>HA-71</td>
<td>HA-72</td>
<td>HA-72</td>
<td>HA-71</td>
<td>HA-71</td>
<td>HA-70</td>
<td>HA-70</td>
<td>HA-72</td>
<td>HA-71</td>
<td>HA-71</td>
<td>HA-71</td>
<td>HA-71</td>
<td>HA-72</td>
<td>HA-71</td>
<td>HA-71</td>
<td>HA-71</td>
<td>HA-71</td>
</tr>
</tbody>
</table>
PRELIMINARY CHECK 1

Intake door is set at "FRESH" in DEF or F/D mode.

Is intake door in "Fresh" position when REC switch is turned from ON to OFF at VENT, B/L or FOOT mode with ignition switch at ACC and fan speed at 4? (Can you hear air moving from the intake unit?)

- Yes
- No

   Is intake door in "REC" position when REC switch is turned from OFF to ON at VENT, B/L or FOOT mode with ignition switch at ACC and fan speed at 4? (Can you hear air moving from the intake unit?)

   - Yes
   - No

      Replace control amp. built-in push control unit.

   INSPECTION END

Go to Diagnostic Procedure 3.
PRELIMINARY CHECK 2
A/C does not blow cold air.

1. **Does air flow from vents?**
   - Condition:
     - Ignition switch, A/C switch, and fan switch are ON.
     - Mode switch is in VENT mode and temperature lever is in full cold position.
   - **Yes**: Go to Diagnostic Procedure 1.
   - **No**: Check compressor operation. Refer to MA section.

2. **Check compressor belt tension.**
   - **Adjust or replace compressor belt**
   - **O.K.**
   - **N.G.**
     - Check refrigerant. Connect manifold gauge then check system pressure.
     - **O.K.**
     - **N.G.**
       - Check for refrigerant leaks.
       - Go to Diagnostic Procedure 4

3. **Check refrigeration cycle pressure with manifold gauge connected.**
   - Refer to Performance Chart.
   - **N.G.**
   - **O.K.**
     - Check for evaporator coil freeze up.
     - Remove intake unit. Check if evaporator freezes.
     - **Freeze up**
       - **N.G.**
       - **O.K.**
     - **Does not freeze up**
       - Check evaporator outlet air temperature.
       - Refer to Performance Chart.
       - **N.G.**
       - Check thermo control amp. operation. Refer to Electrical Components Inspection.

4. **Check air mix door adjustment.**
   - Refer to DOOR CONTROL.
   - **O.K.**
   - **N.G.**
     - Check evaporator outlet air temperature.
     - Refer to Performance Chart.
     - Check thermo control amp. operation. Refer to Electrical Components Inspection.
PRELIMINARY CHECK 3

Magnet clutch does not engage in DEF mode.
- Perform PRELIMINARY CHECK 2 before referring to the following flow chart.

With engine running, does magnet clutch engage normally when A/C switch and fan switch are ON?

Yes
- Push A/C switch and turn A/C system OFF. Make sure that magnet clutch is disengaged.

With engine running, does magnet clutch engage normally when DEF switch and fan switch are ON?

No
- Replace control amp. built-in push control unit.

Yes
- INSPECTION END

Go to Diagnostic Procedure 4.
**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?

<table>
<thead>
<tr>
<th>Switch</th>
<th>Indicator illuminates</th>
<th>Air outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Mode 1]</td>
<td>![Indicator 1]</td>
<td>VENT</td>
</tr>
<tr>
<td>![Mode 2]</td>
<td>![Indicator 2]</td>
<td>FOOT &amp; VENT</td>
</tr>
<tr>
<td>![Mode 3]</td>
<td>![Indicator 3]</td>
<td>FOOT &amp; DEF</td>
</tr>
<tr>
<td>![Mode 4]</td>
<td>![Indicator 4]</td>
<td>FOOT &amp; DEF</td>
</tr>
<tr>
<td>![Mode 5]</td>
<td>![Indicator 5]</td>
<td>DEF</td>
</tr>
</tbody>
</table>

Air distribution ratios

<table>
<thead>
<tr>
<th>VENT</th>
<th>B/L</th>
<th>FOOT</th>
<th>F/D</th>
<th>DEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Vent]</td>
<td>![Blind]</td>
<td>![Foot]</td>
<td>![Face]</td>
<td>![Def]</td>
</tr>
</tbody>
</table>

![Graph](attachment:graph.png)

---

**Inspection End**
PRELIMINARY CHECK 5
Noise

Check where noise comes from.

- Expansion valve
  - Replace expansion valve.

- Compressor
  - Replace compressor.

- Refrigerant line
  - The line is fixed straight to the body.
    - Fix the line with rubber or some vibration absorbing material.

- Belt
  - The line is not fixed.
    - Fix the line tightly.

  - The belt vibration is intense.
    - Readjust belt tension. Refer to ENGINE MAINTENANCE in MA section.

  - Side of belt is worn out.
    - The pulley center does not match. Readjust the pulley center.
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.

<table>
<thead>
<tr>
<th>Voltmeter terminal</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>~</td>
</tr>
<tr>
<td>34</td>
<td>Body ground</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Ohmmeter terminal</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>~</td>
</tr>
<tr>
<td>13</td>
<td>Body ground</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Voltmeter terminal</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>Body ground</td>
</tr>
<tr>
<td></td>
<td>Approx. 12V</td>
</tr>
</tbody>
</table>

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.
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
- M61: Mode door motor
- M62: Push control unit
- M63: Fan switch
- M64: Thermo control amp.
- M65: Resistor
- M66: Blower motor
- M68: Intake door motor

Condenser fan motor (U.S.A. only)
Circuit Diagram for Quick Pin Point Check
Diagnostic Procedure 1

**SYMPTOM:** Blower motor does not rotate.

- Perform PRELIMINARY CHECK 2 before referring to the following flow chart.

---

**Check if blower motor rotates properly at each fan speed.**
Conduct check as per flow chart at left.

**A**

**CHECK POWER SUPPLY FOR BLOWER MOTOR.**
Disconnect blower motor harness connector.
Do approx. 12 volts exist between blower motor harness terminal No. ③ and body ground?

**B**

Check circuit continuity between blower motor harness terminal No. ④ and body ground.

**C**

**CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.**
Do approx. 12 volts exist between resistor harness terminal No. ⑤ and body ground?

---

**Note:**
If the result is N.G. after checking circuit continuity, repair harness or connector.
TROUBLE DIAGNOSES

Diagnostic Procedure 1 (Cont'd)

CHECK RESISTOR AFTER DISCONNECTING IT.  
(Refer to Electrical Components Inspection.)

O.K.  N.G.

Replace resistor.

Reconnect resistor harness connector.

CHECK FAN SWITCH CIRCUIT.  
Do approx. 12 volts exist between each fan switch harness terminal and body ground?

<table>
<thead>
<tr>
<th>Flow chart No.</th>
<th>Terminal No.</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Body ground Approx. 12V</td>
</tr>
</tbody>
</table>

O.K.  N.G.

Check circuit continuity between fan switch and resistor.

Replace fan switch.

CHECK FAN SWITCH AFTER DISCONNECTING IT.  
(Refer to Electrical Components Inspection.)

Check circuit continuity between fan switch harness terminal No. 23 and body ground.

O.K.

Replace blower motor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.
Diagnostic Procedure 2

SYMPTOM: Air outlet does not change.

- Perform PRELIMINARY CHECK 4 and Main Power Supply and Ground Circuit Check before referring to the following flow chart.

A

CHECK MODE DOOR MOTOR POSITION SWITCH.
1. Turn VENT switch ON with ignition switch at 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.

DisCONNECT MODE DOOR MOTOR HARNESS CONNECTOR.

B

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness terminal No. 22 and body ground?

O.K.

CHECK SIDE LINK.
Refer to DOOR CONTROL.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.
Diagnostic Procedure 2 (Cont'd)

Reconnect push control unit and mode door motor harness connectors.

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"?

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Mode door motor</th>
<th>Direction of linkage rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Mode door operation</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Stop</td>
<td>Stop</td>
</tr>
<tr>
<td>±</td>
<td>Stop</td>
<td></td>
</tr>
<tr>
<td>±</td>
<td>VENT → DEF</td>
<td>Clockwise</td>
</tr>
<tr>
<td>±</td>
<td>DEF → VENT</td>
<td>Counter-clockwise</td>
</tr>
</tbody>
</table>

N.G. Replace control amp. built-in push control unit.

O.K.
Replace mode door motor.
TROUBLE DIAGNOSES

Diagnostic Procedure 3

SYMPTOM: Intake door does not change in VENT, B/L or FOOT mode.
- Perform PRELIMINARY CHECK 1 and Main Power Supply and Ground Circuit Check before referring to the following flow chart.

A
CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR.
Disconnect intake door motor harness connector.
Do approx. 12 volts exist between intake door motor harness terminal No. ⑩ and body ground?

N.G. Check 10A fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K. Disconnect push control unit harness connector.

B
CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR.
Does continuity exist between intake door motor harness terminal No. ⑨ and body ground when REC switch is ON?
Does continuity exist between intake door motor harness terminal No. ⑪ and body ground when REC switch is OFF?

N.G. Disconnect push control unit harness connector.

Note: Check circuit continuity between push control unit harness terminal No. ⑨(⑪) and intake door motor harness terminal No. ⑨(⑪).

O.K. Replace control amp. built-in push control unit.

O.K. Replace intake door motor.

C
Push control unit connector (K5)

Intake door motor connector (K5)

Continuity should exist when test leads are connected as shown, it should not exist when test leads are reversed.

RHA414A

RHA415A

RHA898A

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.
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.

A

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
Do approx. 12 volts exist between compressor harness terminal No. @ and body ground?

N.G. (Go to next page.)

O.K.

B

CHECK THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Does continuity exist between thermal protector harness terminal No. $ and body ground?

N.G.

Replace thermal protector.

O.K.

Check magnet clutch coil.

O.K.

Replace magnet clutch.
Refer to COMPRESSOR — Model NVR 140S (ATSUGI make).
TROUBLE DIAGNOSES

Diagnostic Procedure 4 (Cont’d)

A
CHECK A/C RELAY OPERATION.
Do approx. 12 volts exist between A/C relay harness terminal No. 4 and body ground?

C
CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminal No. 2, 3 and body ground?

O.K.
Disconnect A/C relay harness connector.

D
Note
Check circuit continuity between A/C relay harness terminal No. 2 and compressor harness terminal No. 4.

CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK.
Refer to “Power Supply ROUTING” in EL section and A/C ELECTRICAL CIRCUIT.)

N.G.
CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminal No. 2, 3 and body ground?

O.K.
Reconnect A/C relay.

CHECK A/C RELAY AFTER DISCONNECTING IT. (Refer to Electrical Components Inspection.)

N.G.
Replace A/C relay.

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between E.C.C.S. control unit harness terminal No. 6 and body ground?

O.K.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

(Go to next page.)

HA-63
Diagnostic Procedure 4 (Cont'd)

B. Check circuit continuity between A/C relay harness terminal No. 4 and E.C.C.S. control unit harness terminal No. 4.

H. CHECK VOLTAGE FOR THERMO CONTROL AMP.
   Do approx. 8 to 9 volts exist between thermo control amp. harness terminal No. 44 and body ground?

J. CHECK POWER SUPPLY FOR THERMO CONTROL AMP.
   Go to Main Power Supply and Ground Circuit Check.

I. CHECK BODY GROUND CIRCUIT FOR THERMO CONTROL AMP.
   Disconnect thermo control amp. harness connector.
   Does continuity exist between thermo control amp. harness terminal No. 44 and body ground?

K. Replace thermo control amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.
TROUBLE DIAGNOSES

Diagnostic Procedure 4 (Cont’d)

L

CHECK PUSH CONTROL UNIT.
Does continuity exist between push control unit terminals No. ② and ③?

N.G. Replace control amp. built-in push control unit

O.K.

Disconnect dual-pressure switch.

M

Note

Check circuit continuity between dual-pressure switch harness terminal No. ② and push control unit harness terminal No. ③.

O.K.

CHECK DUAL-PRESSURE SWITCH
Does continuity exist between dual-pressure switch terminals?

N.G.

Replace dual-pressure switch.

O.K.

Disconnect fan switch harness connector.

N

Note

Check circuit continuity between dual-pressure switch harness terminal No. ② and fan switch harness terminal No. ③.

O.K.

CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Does continuity exist between fan switch harness terminal No. ③ and body ground?

O.K.

CHECK FAN SWITCH (Refer to Electrical Components Inspection.)

N.G.

Replace fan switch.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

HA-65
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:

<table>
<thead>
<tr>
<th>INCIDENTS</th>
<th>&quot;How to repair&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td>O</td>
<td>X</td>
</tr>
</tbody>
</table>

- "O": 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

CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illumination come on with ignition switch and lighting switch ON?

N.G. CHECK ILLUMINATION SYSTEM.
Refer to illumination/Wiring Diagram in EL section.

O.K. Turn ignition switch and lighting switch OFF.

A CHECK ILLUMINATION BULB.
Remove push control unit and disconnect harness connectors.
Remove illumination bulb(s) and check them.

N.G. Replace illumination bulb(s).
O.K. (Go to next page.)
TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)

A CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON. Do approx. 12 volts exist between push control unit harness terminal No. 15 and body ground?

N.G. CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM. Refer to Illuminint/Wiring Diagram in EL section.

O.K. NOTE

B CHECK BODY GROUND CIRCUIT FOR ILLUMINATION. Does continuity exist between push control unit harness terminal No. 16 and body ground?

O.K. Replace control amp. built-in push control unit.

C CHECK MAGNET CLUTCH OPERATION. Does magnet clutch operate normally when engine ON, A/C switch, fan switch are ON?

O.K. Go to Diagnostic Procedure 4.

A Check circuit continuity of L.E.D.

N.G. Replace control amp. built-in push control unit.

Note: If the result is N.G. after checking circuit continuity, repair harness or connector.
Diagnostic Procedure 5 (Cont’d)

DIAGNOSTIC PROCEDURE 5-3

A

Turn ignition switch and lighting switch OFF.

Disconnect push control unit harness connector.

CHECK POWER SUPPLY FOR PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. 14 and body ground?

N.G. -> Check 10A fuse at fuse block. (Refer to “POWER SUPPLY ROUTING” in EL section and A/C ELECTRICAL CIRCUIT.)

O.K. Note

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. 17 and body ground?

O.K. -> Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.
Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-4

Turn ignition switch and lighting switch OFF.

Disconnect push control unit harness connector.

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.

Does continuity exist between push control unit harness terminal No. 6 and body ground?

O.K.

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.
**Electrical Components Inspection**

**FAN SWITCH**
Check continuity between terminals at each switch position.

**BLOWER MOTOR**
Confirm smooth rotation of the blower motor.
- Ensure that there are no foreign particles inside the intake unit.

**BLOWER RESISTOR**
Check continuity between terminals.
Electrical Components Inspection (Cont'd)

A/C SWITCH

Check continuity between terminals at each switch position.

<table>
<thead>
<tr>
<th>Switch condition</th>
<th>Terminal No.</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C ON</td>
<td>1</td>
<td>Yes</td>
</tr>
<tr>
<td>DEF</td>
<td>2</td>
<td>Yes</td>
</tr>
<tr>
<td>ON</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OFF</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>AIR</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>HEATER</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>FAN</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>OFF</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>TEMP</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>FUSE</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>RELAY</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>WIRE</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

DUAL-PRESSURE SWITCH

<table>
<thead>
<tr>
<th>High-pressure side line pressure kPa (kg/cm², psi)</th>
<th>Operation</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreasing to 177 - 216 (1.8 - 2.2, 26 - 31)</td>
<td>Turn OFF</td>
<td>Does not exist</td>
</tr>
<tr>
<td>Increasing to 2,452 - 2,844 (25 - 29, 356 - 412)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increasing to 177 - 235 (1.8 - 2.4, 26 - 34)</td>
<td>Turn ON</td>
<td>Exists</td>
</tr>
<tr>
<td>Decreasing to 1,863 - 2,256 (19 - 23, 270 - 327)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THERMAL PROTECTOR

<table>
<thead>
<tr>
<th>Temperature of compressor °C (°F)</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing to approx. 135 - 145 (275 - 293)</td>
<td>Turn OFF</td>
</tr>
<tr>
<td>Decreasing to approx. 120 - 130 (248 - 266)</td>
<td>Turn ON</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Evaporator outlet air temperature °C (°F)</th>
<th>Thermo amp. operation</th>
<th>Tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreasing to 1.5 - 2.5 (35 - 37)</td>
<td>Turn OFF</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>Increasing to 3.0 - 4.0 (37 - 39)</td>
<td>Turn ON</td>
<td>Approx. 0V</td>
</tr>
</tbody>
</table>

A/C RELAY
Check circuit continuity between terminals by supplying 12 volts to coil side terminal of A/C relay.

THERMOSWITCH

<table>
<thead>
<tr>
<th>Water temperature °C (°F)</th>
<th>Operation</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreasing to 85 - 91 (185 - 196)</td>
<td>Turn OFF</td>
<td>Does not exist</td>
</tr>
<tr>
<td>Increasing to 92 - 98 (198 - 208)</td>
<td>Turn ON</td>
<td>Exists</td>
</tr>
</tbody>
</table>
General Specifications

<table>
<thead>
<tr>
<th>COMPRESSOR</th>
<th>LUBRICATION OIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>ENG</td>
</tr>
<tr>
<td>Type</td>
<td>Vane rotary</td>
</tr>
<tr>
<td>Displacement</td>
<td>140 (8.54)</td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>Clockwise (Viewed from drive end)</td>
</tr>
<tr>
<td>Drive belt</td>
<td>Poly V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>ATSUGI make NVR 140S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>SUNISO 6GS</td>
</tr>
<tr>
<td>Capacity</td>
<td>m³ (US fl oz, Imp fl oz)</td>
</tr>
<tr>
<td>Total in system</td>
<td>200 (6.8, 7.0)</td>
</tr>
<tr>
<td>Amount of oil which can be drained</td>
<td>Approx. 100 (3.4, 3.5)</td>
</tr>
<tr>
<td>Compressor (Service parts) charging amount</td>
<td>200 (6.8, 7.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REFRIGERANT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>R-12</td>
</tr>
<tr>
<td>Capacity kg (lb)</td>
<td>0.9 - 1.0 (2.0 - 2.2)</td>
</tr>
</tbody>
</table>

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).
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, ............ AT SECTION
POWER WINDOW AND AUTOMATIC SEAT BELT ........ BF SECTION
HEATER AND AIR CONDITIONER ........................................ MA SECTION
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]
**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.

<table>
<thead>
<tr>
<th></th>
<th>NORMAL OPEN RELAY</th>
<th>NORMAL CLOSED RELAY</th>
<th>MIXED TYPE RELAY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SW 1 &quot;OFF&quot;</strong></td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>Does not flow</td>
<td>Flows</td>
<td>Does not flow</td>
</tr>
<tr>
<td><strong>SW 1 &quot;ON&quot;</strong></td>
<td><img src="image4" alt="Diagram" /></td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>Flows</td>
<td>Does not flow</td>
<td>Flows</td>
</tr>
</tbody>
</table>

**TYPE OF STANDARDIZED RELAYS**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1M</td>
<td>1 Make</td>
</tr>
<tr>
<td>2M</td>
<td>2 Make</td>
</tr>
<tr>
<td>1T</td>
<td>1 Transfer</td>
</tr>
<tr>
<td>1M-1B</td>
<td>1 Make 1 Break</td>
</tr>
</tbody>
</table>

**SEL882H**
<table>
<thead>
<tr>
<th>Type</th>
<th>Outer view</th>
<th>Circuit</th>
<th>Connector symbol and connection</th>
<th>Case color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1T</td>
<td><img src="image1" alt="1T Image" /></td>
<td><img src="image2" alt="1T Circuit" /></td>
<td><img src="image3" alt="1T Connector" /></td>
<td>BLACK</td>
</tr>
<tr>
<td>1M</td>
<td><img src="image4" alt="1M Image" /></td>
<td><img src="image5" alt="1M Circuit" /></td>
<td><img src="image6" alt="1M Connector" /></td>
<td>BLUE</td>
</tr>
<tr>
<td>2M</td>
<td><img src="image7" alt="2M Image" /></td>
<td><img src="image8" alt="2M Circuit" /></td>
<td><img src="image9" alt="2M Connector" /></td>
<td>BROWN</td>
</tr>
<tr>
<td>1M-1B</td>
<td><img src="image10" alt="1M-1B Image" /></td>
<td><img src="image11" alt="1M-1B Circuit" /></td>
<td><img src="image12" alt="1M-1B Connector" /></td>
<td>GRAY</td>
</tr>
</tbody>
</table>
Fuse
a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
b. Use fuse of specified rating. Never use fuse of more than specified rating.
c. Do not install fuse in oblique direction; always insert it into fuse holder properly.
d. Remove fuse for clock if vehicle is not used for a long period of time.

Fusible Link
A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.
CAUTION:
a. If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.
b. Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.

FUSIBLE LINK VARIATION

<table>
<thead>
<tr>
<th>Color</th>
<th>Maximum amperage (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown</td>
<td>15</td>
</tr>
<tr>
<td>Green</td>
<td>20</td>
</tr>
<tr>
<td>Red</td>
<td>30</td>
</tr>
<tr>
<td>Black</td>
<td>35</td>
</tr>
<tr>
<td>Gray</td>
<td>40</td>
</tr>
</tbody>
</table>

*Temperature condition: Less than 80°C (176°F)
CAUTION:

a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
c. Never add distilled water through the hole used to check specific gravity.

How to Handle Battery

METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
  If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.

- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)

- Check the charge condition of the battery.
Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.
How to Handle Battery (Cont’d)

CHECKING ELECTROLYTE LEVEL

WARNING:
Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention. Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.

- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.

SULPHATION

When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates. Compared with a battery discharged under normal conditions, the current flow in a “sulphated” battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.

SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.
How to Handle Battery (Cont’d)

- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

2. Convert into specific gravity at 20°C (68°F).

Example:

- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.
VISUAL INSPECTION
- Check battery case for cracks or bends.
- Check battery terminals for damage.
- If the difference between the max. and min. electrolyte level in cells is within 10 mm (0.39 in), it is O.K.

O.K.

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

N.G.
Replace battery.

Below 1.100
SLOW CHARGE
Refer to "A: Slow Charge".

CAPACITY TEST
Refer to "Chart II".

O.K.
Ready for use
N.G.
Replace battery.

1.100 - 1.220
STANDARD CHARGE
Refer to "B: Standard Charge".

QUICK CHARGE
Refer to "C: Quick Charge".

CAPACITY TEST
Refer to "Chart II".

O.K.
N.G.
Ready for use
CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

O.K.
N.G.

Above 1.220
CAPACITY TEST
Refer to "Chart II".

O.K.
N.G.
Ready for use
- Mount battery again and check loose terminals. Also, check other related circuits.

QUICK CHARGE
Refer to "C: Quick Charge"
- Time required: 45 min.

CAPACITY TEST
Refer to "Chart II".

O.K.
N.G.
Ready for use
Replace battery.

RECHARGE
Refer to "C: Quick Charge"
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

CAPACITY TEST
Refer to "Chart II".

O.K.
N.G.
Ready for use
Replace battery.

* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.
BATTERY

Battery Test and Charging Chart (Cont’d)

Chart II

CAPACITY TEST

Test using battery checker.

Follow manufacturer's instructions to check and determine if battery is serviceable.

O.K. N.G.

Ready for use Go to next step.

Test using load tester.

Read load tester voltage when specified discharging current (Refer to Fig. 1.) flows through battery for 15 seconds.

Above 9.6 volts Below 9.6 volts

O.K. N.G.

Ready for use Go to next step.

Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

<table>
<thead>
<tr>
<th>Type</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28B19R(L)</td>
<td>90</td>
</tr>
<tr>
<td>34B19R(L)</td>
<td>99</td>
</tr>
<tr>
<td>46B24R(L)</td>
<td>135</td>
</tr>
<tr>
<td>56B24R(L)</td>
<td>135</td>
</tr>
<tr>
<td>50D23R(L)</td>
<td>150</td>
</tr>
<tr>
<td>55D23R(L)</td>
<td>180</td>
</tr>
<tr>
<td>65D26R(L)</td>
<td>195</td>
</tr>
<tr>
<td>80D26R(L)</td>
<td>195</td>
</tr>
<tr>
<td>75D31R(L)</td>
<td>210</td>
</tr>
<tr>
<td>95D31R(L)</td>
<td>240</td>
</tr>
<tr>
<td>95E41R(L)</td>
<td>300</td>
</tr>
<tr>
<td>130E41R(L)</td>
<td>330</td>
</tr>
</tbody>
</table>

EL-11
A: SLOW CHARGE

- Charge battery.
- Check charging voltage 30 minutes after starting the battery charge.

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

**Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)**

<table>
<thead>
<tr>
<th>BATTERY TYPE</th>
<th>CONVERTED SPECIFIC GRAVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1.100</td>
<td></td>
</tr>
<tr>
<td>28619R(L)</td>
<td>4.0 (A)</td>
</tr>
<tr>
<td>34819R(L)</td>
<td>5.0 (A)</td>
</tr>
<tr>
<td>48624R(L)</td>
<td>6.0 (A)</td>
</tr>
<tr>
<td>55824R(L)</td>
<td>7.0 (A)</td>
</tr>
<tr>
<td>65D23R(L)</td>
<td>8.0 (A)</td>
</tr>
<tr>
<td>75D23R(L)</td>
<td>9.0 (A)</td>
</tr>
<tr>
<td>80D26R(L)</td>
<td>10.0 (A)</td>
</tr>
<tr>
<td>130E41R(L)</td>
<td>14.0 (A)</td>
</tr>
</tbody>
</table>

**Fig. 3 ADDITIONAL CHARGE (Slow charge)**

<table>
<thead>
<tr>
<th>Below 1.150</th>
<th>1.150 - 1.200</th>
<th>1.200 - 1.240</th>
<th>Above 1.240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge for 5 hours at initial charging current setting.</td>
<td>Charge for 4 hours at initial charging current setting.</td>
<td>Charge for 2 hours at initial charging current setting.</td>
<td>Go to &quot;CAPACITY TEST&quot;.</td>
</tr>
</tbody>
</table>

**CAUTION:**

a. Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.

b. Keep battery away from open flame while it is being charged.

c. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.

d. If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
Battery Test and Charging Chart (Cont’d)

**8. STANDARD CHARGE**

Determine initial charging current from specific gravity, referring to Fig. 4.

Charge battery for 8 hours.

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

Conduct additional charge as per Fig. 5, if necessary.

Go to "CAPACITY TEST".

---

**Fig. 4 INITIAL CHARGING CURRENT SETTING**
(Standard charge)

<table>
<thead>
<tr>
<th>BATTERY TYPE</th>
<th>28819(L)</th>
<th>34819(L)</th>
<th>46924R(L)</th>
<th>55244R(L)</th>
<th>66244R(L)</th>
<th>85026R(L)</th>
<th>75D31R(L)</th>
<th>95D31R(L)</th>
<th>96E41R(L)</th>
<th>130E41R(L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONVERTED SPECIFIC GRAVITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.100 - 1.130</td>
<td>4.0 (A)</td>
<td>5.0 (A)</td>
<td>6.0 (A)</td>
<td>7.0 (A)</td>
<td>8.0 (A)</td>
<td>9.0 (A)</td>
<td>13.0 (A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.130 - 1.160</td>
<td>3.0 (A)</td>
<td>4.0 (A)</td>
<td>5.0 (A)</td>
<td>6.0 (A)</td>
<td>7.0 (A)</td>
<td>8.0 (A)</td>
<td>11.0 (A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.160 - 1.190</td>
<td>2.0 (A)</td>
<td>3.0 (A)</td>
<td>4.0 (A)</td>
<td>5.0 (A)</td>
<td>6.0 (A)</td>
<td>7.0 (A)</td>
<td>9.0 (A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.190 - 1.220</td>
<td>2.0 (A)</td>
<td>2.0 (A)</td>
<td>3.0 (A)</td>
<td>4.0 (A)</td>
<td>5.0 (A)</td>
<td>5.0 (A)</td>
<td>7.0 (A)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 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)**

<table>
<thead>
<tr>
<th>SPECIFIC GRAVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1.150</td>
</tr>
<tr>
<td>1.150 - 1.200</td>
</tr>
<tr>
<td>1.200 - 1.240</td>
</tr>
<tr>
<td>Above 1.240</td>
</tr>
</tbody>
</table>

- Charge for 3.5 hours at initial charging current setting.
- Charge for 2.5 hours at initial charging current setting.
- Charge for 1.5 hours at initial charging current setting.

Go to "CAPACITY TEST".

---

**CAUTION:**

a. Do not use standard charge method on a battery whose specific gravity is less than 1.100.

b. Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.

c. Keep battery away from open flame while it is being charged.

d. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.

e. If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
C: QUICK CHARGE

Determine initial charging current setting and charging time from specific gravity, referring to Fig. 6.

Charge battery

Go to "CAPACITY TEST"

---

**CAUTION:**

a. Do not use quick charge method on a battery whose specific gravity is less than 1.100.
b. Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
c. Keep battery away from open flame while it is being charged.
d. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
e. Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.
   If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
f. Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.

---

**Service Data and Specifications (S.D.S.)**

<table>
<thead>
<tr>
<th>Applied area</th>
<th>U.S.A.</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>55D23R</td>
<td>65D26R</td>
</tr>
<tr>
<td>Capacity</td>
<td>V-AH 12.60</td>
<td>12.65</td>
</tr>
</tbody>
</table>

---

**Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)**

<table>
<thead>
<tr>
<th>BATTERY TYPE</th>
<th>CONVERGED SPECIFIC GRAVITY</th>
<th>CURRENT (A)</th>
<th>CHARGING TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.100 - 1.130</td>
<td>10 (A)</td>
<td>2.5 hours</td>
</tr>
<tr>
<td></td>
<td>1.130 - 1.160</td>
<td>15 (A)</td>
<td>2.0 hours</td>
</tr>
<tr>
<td></td>
<td>1.160 - 1.190</td>
<td>20 (A)</td>
<td>1.5 hours</td>
</tr>
<tr>
<td></td>
<td>1.190 - 1.220</td>
<td>30 (A)</td>
<td>1.0 hours</td>
</tr>
<tr>
<td></td>
<td>Above 1.220</td>
<td>40 (A)</td>
<td>0.75 hours (45 min.)</td>
</tr>
</tbody>
</table>

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.
Engine does not start.

- **Does starter motor turn?**
  - No
  - **Check pinion roller clutch for damage. Replace if necessary.**
  - Check reduction gear, armature and gear shaft for damage. Replace if necessary.
  - **Check gear shaft turn?**
    - Yes
    - **No**
    - **Check pinion roller clutch for damage. Replace if necessary.**
    - Check reduction gear, armature and gear shaft for damage. Replace if necessary.
  - **Remove starter motor from engine.**
    - Does starter motor turn under no load by connecting battery terminal to M terminal of starter motor and battery terminal to starter motor body? **N.G.**
    - Yes
      - **Check magnetic switch contacts. Repair if necessary.**
    - No
      - Repair or replace starter motor.
  - **Check battery for charging condition and battery terminals for connections and corrosion.** **N.G.**
    - Repair or replace battery. Repair connections and corrosion of battery terminals.
    - Repair wiring or replace electrical units. Ignition switch. Clutch interlock switch or inhibitor switch. Starter relay. Connections.
    - Adjust dimension B. Check shift lever for deformation, return spring for fatigue and pinion for sliding condition. Correct meshing condition of pinion and ring gear. Replace if necessary.
    - Check armature assembly, field coil, and brush. Replace if necessary.
    - Check magnetic switch contacts. Repair if necessary.
    - Check item. Problem or corrective action
      - If any abnormality is found, immediately disconnect battery negative terminal.

- **Check battery for charging condition and battery terminals for connections and corrosion.** **O.K.**
  - **Check wiring of starting system.** O.K.
  - Can you hear magnetic switch of starter motor operating? **N.G.**
    - Repair or replace magnetic switch.
  - **Yes**
    - **Yes**
      - **N.G.**
      - Repair or replace ignition switch, starter relay or magnetic switch.
    - **O.K.**
      - **Repair or replace starter motor.**
  - **N.G. (Turns slowly.)**
    - **Does engine turn normally?**
      - **O.K.**
      - Check ignition system and fuel system.
      - **Does engine turn by replacing starter motor with a new one?**
        - Yes
          - Repair or replace starter motor.
        - **No**
          - Check inside of engine.
          - Repair or replace ignition switch, starter relay or magnetic switch.
      - **N.G.**
        - Check inside of engine.
    - **Check battery for charging condition and battery terminals for connections and corrosion.** **N.G.**
      - Repair or replace battery. Repair connections and corrosion of battery terminals.
      - Repair wiring or replace electrical units. Ignition switch. Clutch interlock switch or inhibitor switch. Starter relay. Connections.
      - Adjust dimension B. Check shift lever for deformation, return spring for fatigue and pinion for sliding condition. Correct meshing condition of pinion and ring gear. Replace if necessary.
      - Check armature assembly, field coil, and brush. Replace if necessary.
      - Check magnetic switch contacts. Repair if necessary.
Adjusting plate
Plate thickness:
0.25 (0.0098)
0.50 (0.0197)

Magnetic switch assembly

Planetary gear

Through-bolt
40 - 68
(4.1 - 6.9, 30 - 50)

Sleeve bearing

Shift lever

Packing

Plate

Shaft

Internal gear

Pinion assembly

Pinion stopper

Stopper clip

Bearings

Rear cover

Brush holder

Brush (-)

Armature

Yoke

Unit: mm (in)

N·m (kg·m, ft·lb)

High-temperature grease point
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 "Q" between the front edge of the pinion and the pinion stopper.

Clearance "Q":
Refer to S.D.S.

- Not in the specified value ... Adjust by adjusting plate.

Service Data and Specifications (S.D.S.)
STARTER

<table>
<thead>
<tr>
<th>Type</th>
<th>S114-619A</th>
<th>MITT72781</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HITACHI</td>
<td>MITSUBISHI</td>
</tr>
<tr>
<td></td>
<td>make</td>
<td>make</td>
</tr>
<tr>
<td>Reduction gear type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied model</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>System voltage</td>
<td>V</td>
<td>12</td>
</tr>
<tr>
<td>No-load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal voltage</td>
<td>V</td>
<td>11.0</td>
</tr>
<tr>
<td>Current</td>
<td>A</td>
<td>Less than 85</td>
</tr>
<tr>
<td>Revolution</td>
<td>rpm</td>
<td>More than 2,750</td>
</tr>
<tr>
<td>Minimum diameter of commutator</td>
<td>32.0 (1.260)</td>
<td>28.8 (1.134)</td>
</tr>
<tr>
<td>Minimum length of brush</td>
<td>mm (in)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.0 (0.433)</td>
<td>12.0 (0.472)</td>
</tr>
<tr>
<td>Brush spring tension</td>
<td>N (kg, lb)</td>
<td>(1.8 - 2.2, 4.0 - 4.9)</td>
</tr>
<tr>
<td>Clearance of bearing metal and armature shaft</td>
<td>mm (in)</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td>Clearance &quot;k&quot; between pinion front edge and pinion stopper</td>
<td>mm (in)</td>
<td>0.3 - 1.5</td>
</tr>
</tbody>
</table>
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.
*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.

1. Continuity test
   • No continuity ... Replace stator.
2. Ground test
  - Continuity exists. ... Replace stator.
CHARGING SYSTEM — Alternator —

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.

<table>
<thead>
<tr>
<th>Ohmmeter probes</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive (+)</td>
<td>Negative (−)</td>
</tr>
<tr>
<td>Diodes check (Positive side)</td>
<td></td>
</tr>
<tr>
<td>Positive diode plate</td>
<td>Diode terminals</td>
</tr>
<tr>
<td>Diode terminals</td>
<td>Positive diode plate</td>
</tr>
<tr>
<td>Diodes check (Negative side)</td>
<td></td>
</tr>
<tr>
<td>Negative diode plate</td>
<td>Diode terminals</td>
</tr>
<tr>
<td>Diode terminals</td>
<td>Negative diode plate</td>
</tr>
</tbody>
</table>

[HITACHI make]

[MITSUBISHI make]
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.
<table>
<thead>
<tr>
<th>Service Data and Specifications (S.D.S.)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATOR</td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>LR180-716</td>
</tr>
<tr>
<td>Applied model</td>
<td>All</td>
</tr>
<tr>
<td>Nominal rating</td>
<td>V-A 12.80</td>
</tr>
<tr>
<td>Ground polarity</td>
<td>Negative</td>
</tr>
<tr>
<td>Minimum revolution under no-load (When 13.5 volts is applied) rpm</td>
<td>Less than 960</td>
</tr>
<tr>
<td>Hot output current A/rpm</td>
<td>More than 22/1,300</td>
</tr>
<tr>
<td></td>
<td>More than 58/2,500</td>
</tr>
<tr>
<td></td>
<td>More than 77/5,000</td>
</tr>
<tr>
<td>Regulated output voltage V</td>
<td>14.1 - 14.7</td>
</tr>
<tr>
<td>Minimum length of brush mm (in)</td>
<td>6.0 (0.236)</td>
</tr>
<tr>
<td></td>
<td>8.0 (0.315)</td>
</tr>
<tr>
<td>Brush spring pressure N (g, oz)</td>
<td>1.471 - 3.334</td>
</tr>
<tr>
<td></td>
<td>(150 - 340, 5.29 - 11.99)</td>
</tr>
<tr>
<td></td>
<td>3.040 - 4.217</td>
</tr>
<tr>
<td></td>
<td>(310 - 430, 10.93 - 15.17)</td>
</tr>
<tr>
<td>Slip ring minimum outer diameter mm (in)</td>
<td>26.8 (1.066)</td>
</tr>
<tr>
<td></td>
<td>22.1 (0.870)</td>
</tr>
</tbody>
</table>
COMBINATION SWITCH

Check

Variable intermittent wiper switch

TURN SIGNAL

Wiper

OFF

INT

LO

HI

LIGHT

TURN SIGNAL

OFF

N

R

A

B

C

2nd

1st

OFF

L

For wiper switch

For A.S.C.D. and Horn

For lighting switch

LIGHTING SWITCH

WIPER SWITCH

INTERMITTENT WIPER VOLUME

HORN SWITCH

TURN SIGNAL SWITCH

SEL388L

EL-33
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.
Wiring Diagram
## HEADLAMP

### Description

### BASIC OPERATION

<table>
<thead>
<tr>
<th>Condition</th>
<th>Lighting switch</th>
<th>Retractor switch</th>
<th>C/O*</th>
<th>Headlamp motor</th>
<th>Headlamps</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF → 1ST</td>
<td>OFF</td>
<td>OFF</td>
<td></td>
<td>No operation</td>
<td>OFF</td>
</tr>
<tr>
<td>1ST → 2ND</td>
<td>OFF</td>
<td>OFF</td>
<td>[A]</td>
<td>Open</td>
<td>ON after headlamp motor reaches fully open position.</td>
</tr>
<tr>
<td>2ND → 1ST</td>
<td>OFF</td>
<td>OFF</td>
<td>[B]</td>
<td>Held to open position</td>
<td>OFF</td>
</tr>
<tr>
<td>1ST → OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>[C]</td>
<td>Closed</td>
<td>OFF</td>
</tr>
<tr>
<td>Momentarily turned to PASSING</td>
<td>OFF</td>
<td>OFF</td>
<td>[D]</td>
<td>Open</td>
<td>Momentarily ON after headlamp motor reaches fully open position, and go off.</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td></td>
<td></td>
<td>Open</td>
<td>OFF</td>
</tr>
</tbody>
</table>

*: Refer to CIRCUIT OPERATION.
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
[B] When lighting switch is switched from "1ST" → "OFF"
(While operating the headlamp motor to closed position)

[C] When lighting switch is switched to "PASSING"
C-1: While operating the headlamp motor to open position
C-2: After the headlamp reaches fully open position

[D] When retractor switch is turned ON
(While operating the headlamp motor to open position)
Headlamp motor
- Headlamp motor should be removed together with the headlamp bracket as an assembly.

Lid
- Lid can be removed after removing finisher only.

Headlamp motor should be removed together with the headlamp bracket as an assembly.

Headlamp
- Headlamp can be removed after removing finisher only.

Finisher

Headlamp bracket

Protector

SEL391L
**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.
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.
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:

a. Keep all tires inflated to correct pressures.
b. Place vehicle and tester on one and same flat surface.
c. See that there is no-load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).

- 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
Aiming Adjustment (Cont'd)
AIMER ADJUSTMENT MARK
When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

Example:

```
4H2V
```

- Horizontal side: 4
- Vertical side: 2
Clearance, License, Tail and Stop Lamps/Wiring Diagram

FASTBACK

EXTerior lamp
Front Fog Lamp/Wiring Diagram

BODY GROUND

FUSE AND FUSEABLE LINK

_FUSIBLE LINK (MAIN RELAY BOX)

BATTERY

USE AND FUSIBLE LINK (IN RELAY BOX)

DIODE

FRONT FOG LAMP (SUB-HARNESS)

FRONT FOG LAMP (SUB-HARNESS)

LIGHTING SWITCH

(ENGINE ROOM HARNESS)

Lighting Switch
Turn Signal and Hazard Warning Lamps/Wiring Diagram
Combination Flasher Unit Check

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

Bulb Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Wattage (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headlamp (Sealed)</td>
<td>65/35</td>
</tr>
<tr>
<td>Front clearance lamp</td>
<td>8</td>
</tr>
<tr>
<td>Front turn signal lamp</td>
<td>27</td>
</tr>
<tr>
<td>Front side marker lamp</td>
<td>3.8</td>
</tr>
<tr>
<td>Rear side marker lamp</td>
<td>3.8</td>
</tr>
<tr>
<td>Turn signal lamp</td>
<td>27</td>
</tr>
<tr>
<td>Stop/Tail lamp</td>
<td>27/8</td>
</tr>
<tr>
<td>Back-up lamp</td>
<td>27</td>
</tr>
<tr>
<td>License plate lamp</td>
<td>7.5</td>
</tr>
<tr>
<td>Interior lamp</td>
<td>10</td>
</tr>
<tr>
<td>Spot lamp</td>
<td>8</td>
</tr>
<tr>
<td>Trunk room lamp</td>
<td>3.4</td>
</tr>
<tr>
<td>Foot well lamp</td>
<td>3</td>
</tr>
<tr>
<td>Luggage compartment lamp</td>
<td>5</td>
</tr>
<tr>
<td>High-mounted stop lamp</td>
<td>18</td>
</tr>
</tbody>
</table>
Illumination/Wiring Diagram

- Battery
- Fuse Block
- Ignition Switch
- Head-up Display Control Unit
- Combination Meter
- Headlight Switch
- Glove Box Lamp
- Glove Box Lamp Switch
- Instrument Harness
- Main Harness
- Sub-Harness
- Time Control Unit
- Cassette Deck
- Radio
- CASSETTE DECK
- Push Control Unit
- Headlamp Switch
- Head-up Display Control Unit
- A.S.C.D. Switch
- Rear Wiper and Washer Switch
- Front Fog Lamp Switch
- Hazard Switch
- A/T Illumination
- Ashtray Illumination
- Engine Harness
- Fuse Block (Power Supply Circuit)

References:
- POWER SUPPLY ROUTING
- TIME CONTROL SYSTEM
- S.M.J. (Refer to last page (Foldout page).)
Interior Lamp/Wiring Diagram
NEEDLE TYPE

Combination Meter

"BRAKE" or "(CD)"

@: For California

SEL577M
**Inspection/Fuel Gauge and Water Temperature Gauge**

**INSPECTION START**

**CHECK POWER SOURCE.**
1) Turn ignition switch “ON”.
2) Check voltage between terminal A and ground.
   Battery voltage should exist.

**CHECK GAUGE OPERATION.**
1) Turn ignition switch “ON”.
2) Connect terminals B (Fuel), C (Temp.) and ground with wire for less than 10 seconds.
3) Check operation of gauge.
   Gauge should move smoothly to full scale.

**CHECK COMPONENT.**
Check gauge units and harness.
Refer to “Fuel Tank Gauge Unit Check” or “Thermal Transmitter Check”.

**INSPECTION END**

N.G. Repair or replace.

**Check the following items.**
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and fuse
4) Ignition switch

N.G. Repair or replace.
# Fuel Tank Gauge Unit Check
- For removal, refer to FE section.
- Check the resistance between terminals @ and @.

<table>
<thead>
<tr>
<th>Ohmmeter</th>
<th>Float position (mm in)</th>
<th>Resistance (Ω)</th>
<th>Fuel value (US gal, Imp gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>E</td>
<td>*1</td>
<td>Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*2</td>
<td>1/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*3</td>
<td>Empty</td>
</tr>
</tbody>
</table>

## Thermal Transmitter Check
Check the resistance between the terminals of thermal transmitter and body ground.

<table>
<thead>
<tr>
<th>Water temperature</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>60°C (140°F)</td>
<td>Approx. 70 - 90Ω</td>
</tr>
<tr>
<td>100°C (212°F)</td>
<td>Approx. 21 - 24Ω</td>
</tr>
</tbody>
</table>

## Oil Pressure Switch Check
Check the continuity between the terminals of oil pressure switch and body ground.

<table>
<thead>
<tr>
<th>Engine start</th>
<th>Oil pressure kPa (kg/cm², psi)</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Less than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

## 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 @ and @.

---

EL-60
WARNING LAMPS AND CHIME

Warning Lamps/Schematic

TIME CONTROL UNIT

SEAT BELT SWITCH

AUTOMATIC SEAT BELT CONTROL UNIT

ANTI-LOCK

A. B. S. CONTROL UNIT

CHECK ENGINE

E. C. C. S. CONTROL UNIT

OIL PRESSURE SWITCH

FUEL TANK GAUGE UNIT

WASHER FLUID LEVEL SWITCH

DOOR SWITCH (Driver side)

DOOR SWITCH (Passenger side)

BRAKE FLUID LEVEL SWITCH

PARKING BRAKE SWITCH

BULB CHECK RELAY

ALTERNATOR

IGNITION SWITCH

ON OR START

FUSE

FUSE

CHARGE

SEAT BELT SWITCH

US

CL

AL
**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**

**Description**

- Time control unit has the following functions.

<table>
<thead>
<tr>
<th>Item</th>
<th>Details of control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intermittent wiper control</td>
</tr>
<tr>
<td>2</td>
<td>Washer and wiper combination control</td>
</tr>
<tr>
<td>3</td>
<td>Illumination control</td>
</tr>
<tr>
<td>4</td>
<td>Light warning chime timer</td>
</tr>
<tr>
<td>5</td>
<td>Seat belt warning lamp timer</td>
</tr>
<tr>
<td>6</td>
<td>Seat belt warning chime timer</td>
</tr>
</tbody>
</table>

**OPERATING CONDITIONS**

<table>
<thead>
<tr>
<th>Input signal</th>
<th>Power source from battery</th>
<th>Ignition switch</th>
<th>Light switch</th>
<th>Wiper switch &quot;INT&quot;</th>
<th>Washer switch</th>
<th>Driver's side door switch</th>
<th>Seat belt switch</th>
<th>Illumination control switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>1</td>
<td>ON</td>
<td>ACC or ON</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermittent wiper control</td>
<td>2</td>
<td>ACC or ON</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washer and wiper combination control</td>
<td>12</td>
<td>ON</td>
<td>ACC or ON</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illumination control</td>
<td>11</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ON</td>
</tr>
<tr>
<td>Light warning chime timer</td>
<td>19</td>
<td>ON</td>
<td>OFF or ACC</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seat belt warning lamp timer</td>
<td>18</td>
<td>ON</td>
<td>OFF or ACC</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seat belt warning chime timer</td>
<td>19</td>
<td>ON</td>
<td>OFF or ACC</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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

<table>
<thead>
<tr>
<th>Symptom</th>
<th>DIAGNOSTIC PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiper &amp; washer</td>
<td></td>
</tr>
<tr>
<td>Intermittent wiper does not operate.</td>
<td>1</td>
</tr>
<tr>
<td>Intermittent time of wiper cannot be adjusted.</td>
<td>2</td>
</tr>
<tr>
<td>Wiper and washer activate individually but not in combination</td>
<td>3</td>
</tr>
<tr>
<td>Illumination</td>
<td></td>
</tr>
<tr>
<td>Illumination control system does not actuate.</td>
<td>4</td>
</tr>
<tr>
<td>Light warning chime does not activate.</td>
<td>5</td>
</tr>
<tr>
<td>Seat belt warning chime does not activate.</td>
<td>6</td>
</tr>
<tr>
<td>Seat belt warning lamp does not go off nor come on.</td>
<td>7</td>
</tr>
<tr>
<td>Ignition key warning chime does not activate.</td>
<td>8</td>
</tr>
<tr>
<td>Rear defogger</td>
<td></td>
</tr>
<tr>
<td>Rear defogger does not activate, or does not go off.</td>
<td>9</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Ohmmeter terminals</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+) ⑨ (-) Body ground</td>
<td>Yes</td>
</tr>
</tbody>
</table>

3. Connect voltmeter from harness side.
4. Measure voltage across terminal ⑫ and terminals ⑩, ④ or ⑨.

<table>
<thead>
<tr>
<th>Voltmeter terminals</th>
<th>Ignition switch position</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+) ⑨ ⑨ (OFF)</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>(+) ⑨ ⑩ (ACC)</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>(+) ⑨ ⑫ (ON)</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>(+) ⑩ ⑨ (OFF)</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>(+) ⑩ ⑩ (ACC)</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>(+) ⑩ ⑫ (ON)</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>(+) ⑫ ⑨ (OFF)</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>(+) ⑫ ⑩ (ACC)</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>(+) ⑫ ⑫ (ON)</td>
<td>Approx. 12V</td>
</tr>
</tbody>
</table>
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 ③.

Wiper switch — "INT"

Needle swings from 0 to 12V every 3 to 12 seconds.

Go to "Power Supply Circuit Check".

Check T.C.U. output for wiper relay circuit.

Check wiper relay. Refer to "WIPER AND WASHER".

Check harness for T.C.U. power supply circuit.

B WIPER SWITCH CIRCUIT CHECK
Check continuity between ② and ⑤.

Wiper switch — "INT"

Check wiper switch circuit check.

Replace T.C.U.

Check harness between T.C.U. and wiper switch.

Replace wiper switch.

Check harness between T.C.U. and wiper relay.

Replace wiper relay.

DIAGNOSTIC PROCEDURE-2
Intermittent time of wiper cannot be adjusted.

Measure resistance between ④ and ⑤ while turning intermittent wiper volume.

Intermittent wiper knob

0Ω at "S" position
Approx.
1 kΩ at "L" position SEL664L

Check intermittent wiper volume circuit.

Check intermittent wiper volume.

Check harness between T.C.U. and intermittent wiper volume.
Trouble-shooting (Cont’d)

**DIAGNOSTIC PROCEDURE-3**

Wiper and washer activate individually but not in combination.

- Check washer switch circuit.
  - O.K.
  - N.G. Check harness between T.C.U. and washer switch.

- Check T.C.U. output for wiper motor.
  - O.K.
  - N.G. Replace T.C.U.

- Replace wiper relay.

**DIAGNOSTIC PROCEDURE-4**

Illumination control system does not actuate.

- Check T.C.U. output for light switch circuit.
  - O.K.
  - N.G. Check harness between T.C.U. and light switch.

- Check illumination circuit.
  - O.K.
  - N.G. Check for loose harness connector.

- Check illumination control circuit.
  - O.K.
  - N.G. Check illumination control switch.

- Replace T.C.U.
Trouble-shooting (Cont'd)
DIAGNOSTIC PROCEDURE-5
Light warning chime does not activate.

Do other warning chimes activate?

N.G.

Go to "Power Supply Circuit Check".

N.G.

Check harness for T.C.U. power supply circuit.

O.K.

Check T.C.U. output for chime circuit.

O.K.

Go to "T.C.U. output for light switch circuit check".
(Refer to back page.)

N.G.

Check harness between T.C.U. and light switch.

O.K.

Replace T.C.U.

DIAGNOSTIC PROCEDURE-6
Seat belt warning chime does not activate.

Go to "Power Supply Circuit Check".

N.G.

Check harness for T.C.U. power supply circuit.

O.K.

Check T.C.U. output for chime circuit.

O.K.

Check chime, and harness between T.C.U. and chime.

N.G.

Check harness between T.C.U. and seat belt switch.

O.K.

Replace T.C.U.
T.C.U. OUTPUT FOR BELT WARNING LAMP
CIRCUIT CHECK
Measure voltage across @ and @ when
ignition switch is “ON”.

TIME CONTROL SYSTEM

Trouble-shooting (Cont’d)
DIAGNOSTIC PROCEDURE-7
Seat belt warning lamp does not go off nor comes on.

Go to “Power Supply Circuit Check”.

Check T.C.U. output for belt warning lamp circuit.
Voltmeter needle keeps swinging (approx. 0 ↔ 12V) for about 7 seconds after ignition switch is turned ON.

Check warning lamp, and harness between T.C.U. and warning lamp.

N.G. Check harness for T.C.U. power supply circuit.

O.K.

N.G. Replace T.C.U.

O.K.
**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 1 and 2 when driver's door is opened and closed.

- Approx. 12V when driver's side door is opened.

- Go to "Power Supply Circuit Check" if N.G.

**DRIVER'S DOOR SWITCH CIRCUIT CHECK**

Check continuity between 8 and 15.

- Driver's side door ... Open

- Check harness for T.C.U. power supply circuit.

**KEY SWITCH CIRCUIT CHECK**

Measure voltage across 10 and 15.

- Check key switch or harness.

- Check chime and harness between T.C.U. and chime.

- Check harness between T.C.U. and seat belt switch.

**O.K.**

- Check key switch circuit.

- Check T.C.U. output for chime circuit.

- Check driver's door switch circuit.

- Replace T.C.U.
T.C.U. OUTPUT FOR REAR DEFOGGER CIRCUIT CHECK
Measure voltage across @ and @ while operating rear defogger switch.

DEFOGGER SWITCH CIRCUIT CHECK
- Rear defogger switch "OFF": Except 0Ω
- Rear defogger switch "TIMER": 0Ω

Trouble-shooting (Cont'd)
DIAGNOSTIC PROCEDURE-9
Rear defogger does not activate, or does not go off.

Go to "Power Supply Circuit Check".
Check T.C.U. output for rear defogger circuit.
Check defogger switch circuit.
Replace T.C.U.

O.K.
O.K.
O.K.
N.G.
N.G.
N.G.
WIPER AND WASHER

Wiper Removal and Installation

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 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)
5. 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)

* All the diameters of these circles are less than 80 (3.15)

Unit: mm (in)

---

WIPER AND WASHER

Back door panel

Rear wiper motor

SEL413L

---

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)

5. 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)

---

* All the diameters of these circles are less than 80 (3.15)

Unit: mm (in)
Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

Washer Nozzle Adjustment
- Using Tool (J36126), adjust windshield washer nozzle to correct its spray pattern. Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle. This will prevent "rounding out" the small female square in the center of the nozzle.

Check Valve
- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.
Wiper Amplifier Check

1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal 8 and battery ground, wiper relay is normal.
**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.
Location of Antenna

Loosen the antenna to 2 N·m (0.2 kg·m, 1.4 ft·lb).

Main feeder cable

Window antenna

Radio Fuse Check

Radio
(For AM/FM electronic tuning)

Fuse (7.5A) SEL417L
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”.

EL-87
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

<table>
<thead>
<tr>
<th>Symptom</th>
<th>DIAGNOSTIC PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.S.C.D. control unit cannot be set properly.</td>
<td>1</td>
</tr>
<tr>
<td>Resume switch will not operate.</td>
<td>2</td>
</tr>
<tr>
<td>Cancel switch will not operate.</td>
<td>3</td>
</tr>
<tr>
<td>Engine hunts.</td>
<td>4</td>
</tr>
<tr>
<td>Large difference between set vehicle speed and actual speed.</td>
<td>5</td>
</tr>
<tr>
<td>Set speed cannot be cancelled.</td>
<td>6</td>
</tr>
<tr>
<td>A/T model only</td>
<td>7</td>
</tr>
<tr>
<td>• When A.S.C.D. is set while vehicle is operating in &quot;O.D.&quot; range, O.D. will be cancelled and shifting to O.D. cannot be made thereafter.</td>
<td></td>
</tr>
<tr>
<td>• 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.)</td>
<td></td>
</tr>
<tr>
<td>• O.D. will not be cancelled even if accelerator switch is turned &quot;ON&quot;.</td>
<td></td>
</tr>
</tbody>
</table>

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.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE-1

A.S.C.D. control unit cannot be set properly.

- Turn A.S.C.D. main switch to "OFF" and then "ON" to make sure indicator illuminates.
- Check power supply circuit for A.S.C.D. control unit.
- Check cut-off circuit for A.S.C.D. control unit.
- Check speed sensor circuit.
- Check actuator. Refer to "Actuator Check".
- Replace A.S.C.D. control unit.

O.K.

N.G.

Check indicator bulb, A.S.C.D., main switch and hold relay.

Check A.S.C.D. power supply harness.

Check A.S.C.D. cancel switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).

Check A.S.C.D. set switch and harness between control unit and set switch.

Check speed sensor and harness between A.S.C.D. control unit and speed sensor signal output terminal of combination meter.

Replace actuator.

Check power supply circuit for A.S.C.D. control unit.

Check cut-off circuit for A.S.C.D. control unit.


Check speed sensor circuit.

Check actuator. Refer to "Actuator Check".

Replace A.S.C.D. control unit.

POWER SUPPLY CIRCUIT CHECK
1. Turn A.S.C.D. main switch to "ON".
2. Check voltage between ④ and ③.

Voltage: Approx. 12V

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.

Voltage: Approx. 12V

SET SWITCH CIRCUIT CHECK
2. Check voltage between ② and ③.

Voltage: Approx. 12V

SPEED SENSOR CIRCUIT CHECK
1. Disconnect speed sensor from transmission.
2. Connect a voltmeter between ② and ③.
3. Slowly turn speed sensor by hand to make sure voltmeter pointer deflects.
   - Voltmeter pointer deflects twice per rotation of pinion.

Voltage: Approx. 0.5V
Trouble Diagnoses (Cont’d)

DIAGNOSTIC PROCEDURE-2
Resume switch will not operate.

Check resume switch circuit.

N.G. Check resume switch.

O.K.

Replace A.S.C.D. control unit.

---

DIAGNOSTIC PROCEDURE-3
Cancel switch will not operate.

Check cancel switch circuit.

N.G. Check cancel switch.

O.K.

Replace A.S.C.D. control unit.
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE-4

Engine hunts.

- Check vacuum hose for breakage, cracks or fracture.
  - O.K.
  - N.G. Repair or replace hose.

- Does A.S.C.D. wire move smoothly?
  - O.K.
  - N.G. Repair or replace wire.

- Go to "Actuator Check".
  - O.K.
  - N.G. Replace actuator.

Replace A.S.C.D. control unit.

DIAGNOSTIC PROCEDURE-5

Large difference between set vehicle speed and actual speed.

- Check A.S.C.D. wire and actuator move smoothly.
  - O.K.
  - N.G. Replace wire or actuator.

- Check vacuum hose for breakage, cracks or fracture.
  - O.K.
  - N.G. Repair or replace hose.

- Go to "Actuator Check".
  - O.K.
  - N.G. Replace actuator.

Replace A.S.C.D. control unit.
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE-6
Set speed cannot be canceled.

1. Check cut-off circuit.
   - **O.K.**
   - **N.G.** Check A.S.C.D. cancel switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).

2. Check stop lamp circuit.
   - **O.K.**
   - **N.G.** Check stop lamp switch and power supply harness.

3. Check actuator. Refer to "Actuator Check".
   - **O.K.**
   - **N.G.** Replace actuator.

   **Replace A.S.C.D. control unit**

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".

   - **O.K.**
   - **N.G.** Check harness between O.D. cancel solenoid, O.D. control switch and A.S.C.D. control unit.

   **Replace A.S.C.D. control unit**
**Actuator Check**

1. Disconnect connector of actuator from main harness.
2. Check actuator operations as shown.

- **Check actuator.**
  - O.K.
  - N.G. Replace actuator.

- **Check to see if motor starts when 12V D.C. is applied across 1 and 4.**
  - O.K.
  - N.G. Replace actuator.

- **Check to see if A.S.C.D. wire is pulled when 12V D.C. is applied across 1, 2, 3 and 4.**
  - O.K. (Wire is pulled.)
  - N.G. Replace actuator.

- **Check to see if A.S.C.D. wire returns to original position 50 to 60 seconds after disconnecting lead from 4.**
  - O.K. (Wire does not return.)
  - N.G. Replace actuator.

- **Disconnect lead from 1 to see if A.S.C.D. wire returns immediately.**
  - O.K. (Wire returns.)

Actuator is O.K.
LOCATION OF ELECTRICAL UNITS

Engine Compartment

- A.S.C.D. pump
- A.S.C.D. actuator
- Ignition coil
- Dropping resistor
- Wiper motor
- Fuse block
- Fuse and relay box A
- Interlock relay
- Daytime light control unit
- E.C.C.S. relay (Blue)
- Fuel pump relay (Blue)
- Headlamp retract relay-4 (Gray)
- Fuse block
- Fusible link
- Accessory relay-2 (Blue)
- A.S.C.D. hold relay (Blue)
- Air conditioner relay (U.S.A.: Brown, Canada: Blue)
- Front fog lamp relay (Blue)
- Headlamp retract relay-2 (Black)
- Headlamp retract relay-1 (Black)
- Headlamp retract relay-3 (Black)
- Horn relay

FRONT
Passenger Compartment

- Accessory relay-1 (Blue)
- Circuit breaker
- Ignition relay
- With power window: Brown
- Without power window: Blue
- Bulb check relay (Blue)
- Rear window defogger relay (Black)
- S.M.J.
- Fuse block
- E.C.C.S. control unit
- A.S.C.D. control unit
- A/T control unit
- Door lock timer
- Kickdown switch
- Combination flasher unit
- A.S.C.D. cancel switch
- Stop lamp switch
- Shift lock control unit
- Chime
- Headlamp timer
- Time control unit
- Automatic seat belt control unit
- Wiper motor
- Wiper amp.

 SEL421L

EL-98
HARNESS LAYOUT

Outline

Fastback

- Sun roof harness
- Room lamp harness
- Door harness R.H.
- Instrument harness
- Engine room harness
- Back door harness
- Rear wiper sub-harness
- Main harness
- Door harness L.H.
- Engine room harness no. 2
- E.F.I. harness

Coupe

- Sun roof harness
- Room lamp harness
- Door harness R.H.
- Instrument harness
- Engine room harness
- Main harness
- Door harness L.H.
- Engine room harness no. 2
- E.F.I. harness
mr-

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time control unit</td>
</tr>
<tr>
<td>2</td>
<td>Headlamp timer</td>
</tr>
<tr>
<td>3</td>
<td>Check connector</td>
</tr>
<tr>
<td>4</td>
<td>Warning chime</td>
</tr>
<tr>
<td>5</td>
<td>Fuse block</td>
</tr>
<tr>
<td>6</td>
<td>Accessory relay-1</td>
</tr>
<tr>
<td>7</td>
<td>Circuit breaker (Model with power window system)</td>
</tr>
<tr>
<td>8</td>
<td>Circuit breaker (For U.S.A.)</td>
</tr>
<tr>
<td>9</td>
<td>Ignition relay (Model with power window system)</td>
</tr>
<tr>
<td>10</td>
<td>Ignition relay (Model without power window system)</td>
</tr>
<tr>
<td>11</td>
<td>To engine room harness (Blue)</td>
</tr>
<tr>
<td>12</td>
<td>To engine room harness (Black)</td>
</tr>
<tr>
<td>13</td>
<td>Bulb check relay</td>
</tr>
<tr>
<td>14</td>
<td>Rear window defogger relay</td>
</tr>
<tr>
<td>15</td>
<td>A.S.C.D. clutch switch (M/T model with A.S.C.D.)</td>
</tr>
<tr>
<td>16</td>
<td>To door harness L.H.</td>
</tr>
<tr>
<td>17</td>
<td>To door harness R.H.</td>
</tr>
<tr>
<td>18</td>
<td>Driver side front limit switch (For U.S.A.)</td>
</tr>
<tr>
<td>19</td>
<td>Kickdown switch (A/T model)</td>
</tr>
<tr>
<td>20</td>
<td>A.S.C.D. cancel switch (Model with A.S.C.D.)</td>
</tr>
<tr>
<td>21</td>
<td>Stop lamp switch</td>
</tr>
<tr>
<td>22</td>
<td>A.S.C.D. main switch (Model with A.S.C.D.)</td>
</tr>
<tr>
<td>23</td>
<td>Headlamp retract switch</td>
</tr>
<tr>
<td>24</td>
<td>Illumination control switch</td>
</tr>
<tr>
<td>25</td>
<td>Front fog lamp switch</td>
</tr>
<tr>
<td>26</td>
<td>Shift lock control unit (A/T model)</td>
</tr>
<tr>
<td>27</td>
<td>Combination flasher unit</td>
</tr>
<tr>
<td>28</td>
<td>Mode door motor</td>
</tr>
<tr>
<td>29</td>
<td>Foot lamp L.H.</td>
</tr>
<tr>
<td>30</td>
<td>O.D. off indicator lamp (A/T model)</td>
</tr>
<tr>
<td>31</td>
<td>Rear wiper and washer switch</td>
</tr>
<tr>
<td>32</td>
<td>Rear window defogger switch</td>
</tr>
<tr>
<td>33</td>
<td>Hazard switch</td>
</tr>
<tr>
<td>34</td>
<td>Radio</td>
</tr>
<tr>
<td>35</td>
<td>Radio</td>
</tr>
<tr>
<td>36</td>
<td>Cassette deck</td>
</tr>
<tr>
<td>37</td>
<td>Cassette deck</td>
</tr>
<tr>
<td>38</td>
<td>Push control unit</td>
</tr>
<tr>
<td>39</td>
<td>Fan switch</td>
</tr>
<tr>
<td>40</td>
<td>Diode</td>
</tr>
<tr>
<td>41</td>
<td>To sub-harness (Blue)</td>
</tr>
<tr>
<td>42</td>
<td>To main harness (Blue)</td>
</tr>
<tr>
<td>43</td>
<td>Glove box lamp</td>
</tr>
<tr>
<td>44</td>
<td>Glove box lamp switch</td>
</tr>
<tr>
<td>45</td>
<td>Glovebox lamp switch</td>
</tr>
<tr>
<td>46</td>
<td>To sub-harness (Black)</td>
</tr>
<tr>
<td>47</td>
<td>To main harness (Black)</td>
</tr>
<tr>
<td>48</td>
<td>Glovebox lamp switch</td>
</tr>
<tr>
<td>49</td>
<td>Thermo control amplifier</td>
</tr>
<tr>
<td>50</td>
<td>Heater resistor</td>
</tr>
<tr>
<td>51</td>
<td>Blower motor</td>
</tr>
<tr>
<td>52</td>
<td>Foot lamp R.H.</td>
</tr>
<tr>
<td>53</td>
<td>To E.F.I. harness (Blue)</td>
</tr>
<tr>
<td>54</td>
<td>To door harness R.H. (Blue)</td>
</tr>
<tr>
<td>55</td>
<td>To door harness R.H. (Blue)</td>
</tr>
<tr>
<td>56</td>
<td>To room lamp harness (Blue)</td>
</tr>
<tr>
<td>57</td>
<td>Body ground</td>
</tr>
<tr>
<td>58</td>
<td>Intake door motor</td>
</tr>
<tr>
<td>59</td>
<td>To sub-harness (Blue)</td>
</tr>
<tr>
<td>60</td>
<td>To main harness (Blue)</td>
</tr>
<tr>
<td>61</td>
<td>Door lock timer</td>
</tr>
<tr>
<td>62</td>
<td>Washer warning lamp (Model with Anti-lock Braking System)</td>
</tr>
</tbody>
</table>

Diode (N42)

Retractor relay-4

Lighting switch → Headlamp timer

Front fog lamp switch → Lighting switch

Headlamp R.H. (High beam)

Brake warning lamp → Bulb check relay

Brake fluid level switch

Parking brake switch

Seat belt warning lamp → Time control unit

Seat belt switch
| 011 | Body ground |
| 012 | Lap belt buckle switch (For U.S.A.) |
| 013 | Seat belt switch (For Canada) |
| 014 | Ash tray illumination |
| 015 | Cigarette lighter |
| 016 | Door mirror control switch |
| 017 | Automatic seat belt control unit (For U.S.A.) |
| 018 | Parking brake switch |
| 019 | A/T device (A/T illumination and O/D. control switch) (A/T model) |
| 020 | Shift lock solenoid (A/T model) |
| 021 | Door switch L.H. |
| 022 | Automatic seat belt motor assembly L.H. (For U.S.A.) |
| 023 | Body ground (For U.S.A.) |
| 024 | Body ground |
| 025 | Rear speaker L.H. |
| 026 | Rear side marker lamp L.H. |
| 027 | Rear combination lamp L.H. |
| 028 | Rear combination lamp L.H. |
| 029 | Back-up lamp L.H. |
| 030 | Rear wiper amplifier |
| 031 | License lamp L.H. |
| 032 | License lamp R.H. |
| 033 | Body ground |
| 034 | Luggage room lamp switch |
| 035 | Back-up lamp R.H. |
| 036 | Luggage room lamp |
| 037 | Rear combination lamp R.H. |
| 038 | Rear combination lamp R.H. |
| 039 | Rear side marker lamp R.H. |
| 040 | Fuel tank gauge unit |
| 041 | Rear speaker R.H. |
| 042 | To back door harness 043 |
| 043 | To back door harness 051 |
| 044 | To back door harness 052 |
| 045 | Automatic seat belt motor assembly R.H. (For U.S.A.) |
| 046 | Door switch R.H. |
| 047 | A.B.S. control unit (For Anti-lock Braking System) |
| 048 | Body ground (For Anti-lock Braking System) |
| 049 | Rear sensor (For Anti-lock Braking System) |
| 0111 | Body ground |
| 0112 | Lap belt buckle switch (For U.S.A.) |
| 0113 | Seat belt switch (For Canada) |
| 0114 | Ash tray illumination |
| 0115 | Cigarette lighter |
| 0116 | Door mirror control switch |
| 0117 | Automatic seat belt control unit (For U.S.A.) |
| 0118 | Parking brake switch |
| 0119 | A/T device (A/T illumination and O.D. control switch) (A/T model) |
| 0120 | Shift lock solenoid (A/T model) |
| 0121 | Door switch L.H. |
| 0122 | Automatic seat belt motor assembly L.H. (For U.S.A) |
| 0123 | Body ground (For U.S.A.) |
| 0124 | Body ground |
| 0125 | Rear speaker L.H. |
| 0126 | Rear side marker lamp L.H. |
| 0127 | License lamp L.H. |
| 0128 | License lamp R.H. |
| 0129 | Body ground |
| 012A | Rear side marker lamp R.H. |
| 012B | Fuel tank gauge unit |
| 012C | Rear speaker R.H. |
| 012D | Automatic seat belt motor assembly R.H. (For U.S.A.) |
| 012E | Door switch R.H. |
| 012F | Trunk room lamp switch |
| 0130 | Trunk room lamp |
| 0131 | High-mounted stop lamp |
| 0132 | Rear window defogger |
| 0133 | Rear combination lamp L.H. |
| 0134 | Rear combination lamp R.H. |
| 0135 | Not used |
Instrument Harness

1) : To main harness (black)
2) : To main harness (white)
3) : Head-up display control unit
4) : Combination meter (Model with head-up display)
5) : Combination meter (Model without head-up display)
6) : Combination meter (Model with head-up display)
7) : Combination meter (Model without head-up display)
8) : Combination meter (Model without head-up display)
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Windshield wiper motor</td>
</tr>
<tr>
<td>02</td>
<td>A.S.C.D. actuator (Model without Anti-lock Braking System)</td>
</tr>
<tr>
<td>03</td>
<td>Rear washer motor</td>
</tr>
<tr>
<td>04</td>
<td>Front washer motor</td>
</tr>
<tr>
<td>05</td>
<td>Washer fluid level switch</td>
</tr>
<tr>
<td>06</td>
<td>To E.F.I. harness (White)</td>
</tr>
<tr>
<td>07</td>
<td>To E.F.I. harness (Brown)</td>
</tr>
<tr>
<td>08</td>
<td>To engine room harness no. 2 (M/T model)</td>
</tr>
<tr>
<td>09</td>
<td>Inhibitor switch (A/T model)</td>
</tr>
<tr>
<td>10</td>
<td>Revolution sensor (A/T model)</td>
</tr>
<tr>
<td>11</td>
<td>Inhibitor switch (A/T model) (Gray)</td>
</tr>
<tr>
<td>12</td>
<td>To front fog lamp sub-harness (A/T model) (Brown)</td>
</tr>
<tr>
<td>13</td>
<td>Relay box (Refer to page EL-97)</td>
</tr>
<tr>
<td>14</td>
<td>To engine room harness no. 2</td>
</tr>
<tr>
<td>15</td>
<td>To engine room harness no. 2</td>
</tr>
<tr>
<td>16</td>
<td>To engine room harness no. 2</td>
</tr>
<tr>
<td>17</td>
<td>Body ground</td>
</tr>
<tr>
<td>18</td>
<td>Low-pressure switch</td>
</tr>
<tr>
<td>19</td>
<td>Battery</td>
</tr>
<tr>
<td>20</td>
<td>Battery</td>
</tr>
<tr>
<td>21</td>
<td>Body ground</td>
</tr>
<tr>
<td>22</td>
<td>Clutch interlock relay (M/T model for U.S.A.)</td>
</tr>
<tr>
<td>23</td>
<td>Front side marker lamp R.H.</td>
</tr>
<tr>
<td>24</td>
<td>To front fog lamp sub-harness</td>
</tr>
<tr>
<td>25</td>
<td>Headlamp R.H.</td>
</tr>
<tr>
<td>26</td>
<td>Headlamp motor R.H.</td>
</tr>
<tr>
<td>27</td>
<td>Front combination lamp R.H.</td>
</tr>
<tr>
<td>28</td>
<td>Horn-high</td>
</tr>
<tr>
<td>29</td>
<td>Condenser fan motor</td>
</tr>
<tr>
<td>30</td>
<td>Horn-low</td>
</tr>
<tr>
<td>31</td>
<td>Headlamp motor L.H.</td>
</tr>
<tr>
<td>32</td>
<td>Headlamp L.H.</td>
</tr>
<tr>
<td>33</td>
<td>Front combination lamp L.H.</td>
</tr>
<tr>
<td>34</td>
<td>Front side marker lamp L.H.</td>
</tr>
<tr>
<td>35</td>
<td>Body ground</td>
</tr>
<tr>
<td>36</td>
<td>Relay box (Refer to page EL-97)</td>
</tr>
<tr>
<td>37</td>
<td>Dropping resistor (A/T model)</td>
</tr>
<tr>
<td>38</td>
<td>Compressor</td>
</tr>
<tr>
<td>39</td>
<td>A.I.V. control solenoid valve</td>
</tr>
<tr>
<td>40</td>
<td>Brake fluid level switch</td>
</tr>
<tr>
<td>41</td>
<td>Windshield wiper amplifier (Model without Anti-lock Braking System)</td>
</tr>
<tr>
<td>42</td>
<td>To engine room harness</td>
</tr>
<tr>
<td>43</td>
<td>Front fog lamp R.H.</td>
</tr>
<tr>
<td>44</td>
<td>Front fog lamp L.H.</td>
</tr>
<tr>
<td>45</td>
<td>Front wheel sensor L.H. (For Anti-lock Braking System)</td>
</tr>
<tr>
<td>46</td>
<td>Body ground (For Anti-lock Braking System)</td>
</tr>
<tr>
<td>47</td>
<td>Actuator (For Anti-lock Braking System)</td>
</tr>
<tr>
<td>48</td>
<td>Windshield wiper amplifier (Model with Anti-lock Braking System)</td>
</tr>
<tr>
<td>49</td>
<td>A.S.C.D. actuator (Model with Anti-lock Braking System)</td>
</tr>
</tbody>
</table>
Back Door Harness

- 0551: To main harness (White)
- 0504: To main harness (Brown)
- 0543: To main harness (Brown)
- 0544: To rear wiper sub-harness (White)
- 0545: To rear wiper sub-harness (Brown)
- 0551: To back door harness (White)
- 0552: To back door harness (Brown)
- 0553: Rear window defogger
- 0555: High-mounted stop lamp
- 0556: To rear wiper sub-harness (White)
- 0557: To rear wiper sub-harness (Brown)
- 0558: To back door harness (White)
- 0559: To back door harness (Brown)
- 0560: Rear window wiper motor
Room Lamp and Sun Roof Harness

- To room lamp harness
- Body ground
- Sun roof switch
- Slide relay - open
- Sun roof motor
- Safety relay
- Slide relay - close
- Safety limit switch

- To main harness
- Spot lamp (Model with sun roof)
- Interior lamp (Model with sun roof)
- Interior lamp (Fastback with sun roof)
- Interior lamp (Coupe with sun roof)
- Automatic seat belt front limit switch (For U.S.A.)
Door Harness

L.H.

- 01: To main harness
- 02: To main harness
- 03: Door speaker (Active speaker type)
- 04: Door speaker (Standard speaker type)
- 05: Door mirror motor
- 06: Power window regulator

R.H.

- 01: To main harness
- 02: To main harness
- 03: Door speaker (Active speaker type)
- 04: Door speaker (Standard speaker type)
- 05: Door mirror motor

- 07: Power window main switch
- 08: Power window amplifier
- 09: Door lock actuator
- 10: Door lock switch
- 11: Door latch switch (For U.S.A.)

SEL503L

SEL504L
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.

\[ 3 - 5 \text{ N}\cdot\text{m} \]
\[ (0.3 - 0.5 \text{ kg}\cdot\text{m}, 2.2 - 3.6 \text{ ft-lb}) \]

**CAUTION:**
Do not overtighten bolts, otherwise, they may be damaged.
SUPER MULTIPLE JUNCTION (S.M.J.)

Terminal Arrangement

MAIN HARNESS

ENGINE ROOM HARNESS

E.C.C.S. CONTROL UNIT

View from harness side
### INCH TO METRIC CONVERSION TABLE
(Rounded-off for automotive use)

<table>
<thead>
<tr>
<th>inches</th>
<th>mm</th>
<th>inches</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>.100</td>
<td>2.54</td>
<td>.610</td>
<td>15.49</td>
</tr>
<tr>
<td>.110</td>
<td>2.79</td>
<td>.620</td>
<td>15.75</td>
</tr>
<tr>
<td>.120</td>
<td>3.05</td>
<td>.630</td>
<td>16.00</td>
</tr>
<tr>
<td>.130</td>
<td>3.30</td>
<td>.640</td>
<td>16.26</td>
</tr>
<tr>
<td>.140</td>
<td>3.56</td>
<td>.650</td>
<td>16.51</td>
</tr>
<tr>
<td>.150</td>
<td>3.81</td>
<td>.660</td>
<td>16.76</td>
</tr>
<tr>
<td>.160</td>
<td>4.06</td>
<td>.670</td>
<td>17.02</td>
</tr>
<tr>
<td>.170</td>
<td>4.32</td>
<td>.680</td>
<td>17.27</td>
</tr>
<tr>
<td>.180</td>
<td>4.57</td>
<td>.690</td>
<td>17.53</td>
</tr>
<tr>
<td>.190</td>
<td>4.83</td>
<td>.700</td>
<td>17.78</td>
</tr>
<tr>
<td>.200</td>
<td>5.08</td>
<td>.710</td>
<td>18.03</td>
</tr>
<tr>
<td>.210</td>
<td>5.33</td>
<td>.720</td>
<td>18.29</td>
</tr>
<tr>
<td>.220</td>
<td>5.59</td>
<td>.730</td>
<td>18.54</td>
</tr>
<tr>
<td>.230</td>
<td>5.84</td>
<td>.740</td>
<td>18.80</td>
</tr>
<tr>
<td>.240</td>
<td>6.10</td>
<td>.750</td>
<td>19.05</td>
</tr>
<tr>
<td>.250</td>
<td>6.35</td>
<td>.760</td>
<td>19.30</td>
</tr>
<tr>
<td>.260</td>
<td>6.60</td>
<td>.770</td>
<td>19.56</td>
</tr>
<tr>
<td>.270</td>
<td>6.86</td>
<td>.780</td>
<td>19.81</td>
</tr>
<tr>
<td>.280</td>
<td>7.11</td>
<td>.790</td>
<td>20.07</td>
</tr>
<tr>
<td>.290</td>
<td>7.37</td>
<td>.800</td>
<td>20.32</td>
</tr>
<tr>
<td>.300</td>
<td>7.62</td>
<td>.810</td>
<td>20.57</td>
</tr>
<tr>
<td>.310</td>
<td>7.87</td>
<td>.820</td>
<td>20.83</td>
</tr>
<tr>
<td>.320</td>
<td>8.13</td>
<td>.830</td>
<td>21.08</td>
</tr>
<tr>
<td>.330</td>
<td>8.38</td>
<td>.840</td>
<td>21.34</td>
</tr>
<tr>
<td>.340</td>
<td>8.64</td>
<td>.850</td>
<td>21.59</td>
</tr>
<tr>
<td>.350</td>
<td>8.89</td>
<td>.860</td>
<td>21.84</td>
</tr>
<tr>
<td>.360</td>
<td>9.14</td>
<td>.870</td>
<td>22.10</td>
</tr>
<tr>
<td>.370</td>
<td>9.40</td>
<td>.880</td>
<td>22.35</td>
</tr>
<tr>
<td>.380</td>
<td>9.65</td>
<td>.890</td>
<td>22.61</td>
</tr>
<tr>
<td>.390</td>
<td>9.91</td>
<td>.900</td>
<td>22.86</td>
</tr>
<tr>
<td>.400</td>
<td>10.16</td>
<td>.910</td>
<td>23.11</td>
</tr>
<tr>
<td>.410</td>
<td>10.41</td>
<td>.920</td>
<td>23.37</td>
</tr>
<tr>
<td>.420</td>
<td>10.67</td>
<td>.930</td>
<td>23.62</td>
</tr>
<tr>
<td>.430</td>
<td>10.92</td>
<td>.940</td>
<td>23.88</td>
</tr>
<tr>
<td>.440</td>
<td>11.18</td>
<td>.950</td>
<td>24.11</td>
</tr>
<tr>
<td>.450</td>
<td>11.43</td>
<td>.960</td>
<td>24.38</td>
</tr>
<tr>
<td>.460</td>
<td>11.68</td>
<td>.970</td>
<td>24.64</td>
</tr>
<tr>
<td>.470</td>
<td>11.94</td>
<td>.980</td>
<td>24.89</td>
</tr>
<tr>
<td>.480</td>
<td>12.19</td>
<td>.990</td>
<td>25.15</td>
</tr>
<tr>
<td>.490</td>
<td>12.45</td>
<td>1.000</td>
<td>25.40</td>
</tr>
<tr>
<td>.500</td>
<td>12.70</td>
<td>2.000</td>
<td>50.80</td>
</tr>
<tr>
<td>.510</td>
<td>12.95</td>
<td>3.000</td>
<td>76.20</td>
</tr>
<tr>
<td>.520</td>
<td>13.21</td>
<td>4.000</td>
<td>101.60</td>
</tr>
<tr>
<td>.530</td>
<td>13.46</td>
<td>5.000</td>
<td>127.00</td>
</tr>
<tr>
<td>.540</td>
<td>13.72</td>
<td>6.000</td>
<td>152.40</td>
</tr>
<tr>
<td>.550</td>
<td>13.97</td>
<td>7.000</td>
<td>177.80</td>
</tr>
<tr>
<td>.560</td>
<td>14.22</td>
<td>8.000</td>
<td>203.20</td>
</tr>
<tr>
<td>.570</td>
<td>14.48</td>
<td>9.000</td>
<td>228.60</td>
</tr>
<tr>
<td>.580</td>
<td>14.73</td>
<td>10.000</td>
<td>254.00</td>
</tr>
<tr>
<td>.590</td>
<td>14.99</td>
<td>20.000</td>
<td>508.00</td>
</tr>
<tr>
<td>.600</td>
<td>15.24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### METRIC TO INCH CONVERSION TABLE
(Rounded-off for automotive use)

<table>
<thead>
<tr>
<th>mm</th>
<th>inches</th>
<th>mm</th>
<th>inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.0394</td>
<td>51</td>
<td>2.008</td>
</tr>
<tr>
<td>2</td>
<td>.079</td>
<td>52</td>
<td>2.047</td>
</tr>
<tr>
<td>3</td>
<td>.118</td>
<td>53</td>
<td>2.087</td>
</tr>
<tr>
<td>4</td>
<td>.157</td>
<td>54</td>
<td>2.126</td>
</tr>
<tr>
<td>5</td>
<td>.197</td>
<td>55</td>
<td>2.165</td>
</tr>
<tr>
<td>6</td>
<td>.236</td>
<td>56</td>
<td>2.205</td>
</tr>
<tr>
<td>7</td>
<td>.276</td>
<td>57</td>
<td>2.244</td>
</tr>
<tr>
<td>8</td>
<td>.315</td>
<td>58</td>
<td>2.283</td>
</tr>
<tr>
<td>9</td>
<td>.354</td>
<td>59</td>
<td>2.323</td>
</tr>
<tr>
<td>10</td>
<td>.394</td>
<td>60</td>
<td>2.362</td>
</tr>
<tr>
<td>11</td>
<td>.433</td>
<td>61</td>
<td>2.402</td>
</tr>
<tr>
<td>12</td>
<td>.472</td>
<td>62</td>
<td>2.441</td>
</tr>
<tr>
<td>13</td>
<td>.512</td>
<td>63</td>
<td>2.480</td>
</tr>
<tr>
<td>14</td>
<td>.551</td>
<td>64</td>
<td>2.520</td>
</tr>
<tr>
<td>15</td>
<td>.591</td>
<td>65</td>
<td>2.559</td>
</tr>
<tr>
<td>16</td>
<td>.630</td>
<td>66</td>
<td>2.598</td>
</tr>
<tr>
<td>17</td>
<td>.669</td>
<td>67</td>
<td>2.638</td>
</tr>
<tr>
<td>18</td>
<td>.709</td>
<td>68</td>
<td>2.677</td>
</tr>
<tr>
<td>19</td>
<td>.748</td>
<td>69</td>
<td>2.717</td>
</tr>
<tr>
<td>20</td>
<td>.787</td>
<td>70</td>
<td>2.756</td>
</tr>
<tr>
<td>21</td>
<td>.827</td>
<td>71</td>
<td>2.795</td>
</tr>
<tr>
<td>22</td>
<td>.866</td>
<td>72</td>
<td>2.835</td>
</tr>
<tr>
<td>23</td>
<td>.906</td>
<td>73</td>
<td>2.874</td>
</tr>
<tr>
<td>24</td>
<td>.945</td>
<td>74</td>
<td>2.913</td>
</tr>
<tr>
<td>25</td>
<td>.984</td>
<td>75</td>
<td>2.953</td>
</tr>
<tr>
<td>26</td>
<td>1.024</td>
<td>76</td>
<td>2.992</td>
</tr>
<tr>
<td>27</td>
<td>1.063</td>
<td>77</td>
<td>3.031</td>
</tr>
<tr>
<td>28</td>
<td>1.102</td>
<td>78</td>
<td>3.071</td>
</tr>
<tr>
<td>29</td>
<td>1.142</td>
<td>79</td>
<td>3.110</td>
</tr>
<tr>
<td>30</td>
<td>1.181</td>
<td>80</td>
<td>3.150</td>
</tr>
<tr>
<td>31</td>
<td>1.220</td>
<td>81</td>
<td>3.189</td>
</tr>
<tr>
<td>32</td>
<td>1.260</td>
<td>82</td>
<td>3.228</td>
</tr>
<tr>
<td>33</td>
<td>1.299</td>
<td>83</td>
<td>3.268</td>
</tr>
<tr>
<td>34</td>
<td>1.339</td>
<td>84</td>
<td>3.307</td>
</tr>
<tr>
<td>35</td>
<td>1.378</td>
<td>85</td>
<td>3.346</td>
</tr>
<tr>
<td>36</td>
<td>1.417</td>
<td>86</td>
<td>3.386</td>
</tr>
<tr>
<td>37</td>
<td>1.457</td>
<td>87</td>
<td>3.425</td>
</tr>
<tr>
<td>38</td>
<td>1.496</td>
<td>88</td>
<td>3.465</td>
</tr>
<tr>
<td>39</td>
<td>1.535</td>
<td>89</td>
<td>3.504</td>
</tr>
<tr>
<td>40</td>
<td>1.575</td>
<td>90</td>
<td>3.543</td>
</tr>
<tr>
<td>41</td>
<td>1.614</td>
<td>91</td>
<td>3.583</td>
</tr>
<tr>
<td>42</td>
<td>1.654</td>
<td>92</td>
<td>3.622</td>
</tr>
<tr>
<td>43</td>
<td>1.693</td>
<td>93</td>
<td>3.661</td>
</tr>
<tr>
<td>44</td>
<td>1.732</td>
<td>94</td>
<td>3.701</td>
</tr>
<tr>
<td>45</td>
<td>1.772</td>
<td>95</td>
<td>3.740</td>
</tr>
<tr>
<td>46</td>
<td>1.811</td>
<td>96</td>
<td>3.780</td>
</tr>
<tr>
<td>47</td>
<td>1.850</td>
<td>97</td>
<td>3.819</td>
</tr>
<tr>
<td>48</td>
<td>1.890</td>
<td>98</td>
<td>3.858</td>
</tr>
<tr>
<td>49</td>
<td>1.929</td>
<td>99</td>
<td>3.898</td>
</tr>
<tr>
<td>50</td>
<td>1.969</td>
<td>100</td>
<td>3.937</td>
</tr>
</tbody>
</table>
### ENGINE TUNE-UP DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine model</td>
<td></td>
<td>KA24E</td>
</tr>
<tr>
<td>Firing order</td>
<td></td>
<td>1-3-4-2</td>
</tr>
<tr>
<td>Idle speed</td>
<td>rpm</td>
<td>750-950</td>
</tr>
<tr>
<td>A/T in &quot;N&quot; position</td>
<td></td>
<td>750-950</td>
</tr>
<tr>
<td>Torque at 2,000 rpm (at idle speed)</td>
<td>N-m</td>
<td>147 - 216 (16.2 - 22.8 - 18.8 - 15.9)</td>
</tr>
</tbody>
</table>

### FRONT WHEEL BEARING

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel bearing lock nut</td>
<td></td>
<td>-178° - 216°</td>
</tr>
<tr>
<td>Tightening torque</td>
<td>N-m</td>
<td>0.03 (0.0012)</td>
</tr>
</tbody>
</table>

### REAR WHEEL ALIGNMENT (Unladen*)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camber</td>
<td>degree</td>
<td>-1°36' to -0°36'</td>
</tr>
<tr>
<td>Torsin</td>
<td>degree</td>
<td>1.5° - 12.5°</td>
</tr>
</tbody>
</table>

### FRONT WHEEL ALIGNMENT (Unladen*)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camber</td>
<td>degree</td>
<td>0° - 6°50'</td>
</tr>
<tr>
<td>Toe-in</td>
<td>mm (in)</td>
<td>0.3 - 2.3 (0.012 - 0.091)</td>
</tr>
<tr>
<td>Full turns</td>
<td>degree</td>
<td>1° - 6°9' (Total toe-in)</td>
</tr>
</tbody>
</table>

### REAR WHEEL BEARING

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel bearing lock nut</td>
<td></td>
<td>-178° - 216°</td>
</tr>
<tr>
<td>Tightening torque</td>
<td>N-m</td>
<td>225 - 314 (24 - 32 - 174 - 231)</td>
</tr>
</tbody>
</table>

### BRAKE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit: mm (in)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc brake Pad repair limit</td>
<td></td>
<td>20 (0.787)</td>
</tr>
<tr>
<td>Brake thickness</td>
<td>Front side</td>
<td>18.0 (0.706)</td>
</tr>
<tr>
<td></td>
<td>Rear side</td>
<td>8.0 (0.315)</td>
</tr>
<tr>
<td>Pedal free height</td>
<td></td>
<td>177 - 187 (6.97 - 7.36)</td>
</tr>
<tr>
<td>A/T model</td>
<td></td>
<td>186 - 196 (7.32 - 7.72)</td>
</tr>
<tr>
<td>Parking brake Number of notches*2</td>
<td></td>
<td>6 - 8</td>
</tr>
</tbody>
</table>

### CLUTCH PEDAL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit: mm (in)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedal height</td>
<td></td>
<td>166 - 196 (7.32 - 7.72)</td>
</tr>
<tr>
<td>Pedal free play</td>
<td></td>
<td>1 - 3 (0.04 - 0.12)</td>
</tr>
</tbody>
</table>

### REFINISH CAPACITIES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine model</td>
<td></td>
<td>KA24E</td>
</tr>
<tr>
<td>Fuel tank</td>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td>Coolant</td>
<td></td>
<td>0.7</td>
</tr>
<tr>
<td>Engine</td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td>Transmission</td>
<td></td>
<td>2.4</td>
</tr>
<tr>
<td>Differential carrier</td>
<td></td>
<td>8.3</td>
</tr>
<tr>
<td>Power steering system</td>
<td></td>
<td>1.3</td>
</tr>
<tr>
<td>Air conditioning system</td>
<td></td>
<td>0.9</td>
</tr>
</tbody>
</table>

---

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

Edition: August 1988
Printing: February 1989 (02)
Publication No. SM9E-0513U0
Printed in U.S.A.
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.

CONTENTS

Compression Pressure - Measurement ................................................. 2
- General Specifications .......................................................... 3

Engine and Emission Control Overall System
E.C.C.S. Component Parts Location .............................................. 4
System Diagram ........................................................................ 5
System Chart ............................................................................. 6
Circuit Diagram .......................................................................... 7

Engine and Emission Control Parts Description
Air Temperature Sensor .............................................................. 8

Engine and Emission Control System Description
Ignition Timing Control .............................................................. 9
Swirl Control Valve (S.C.V.) Control ............................................ 11
Fail-safe System ........................................................................ 12

Idle Speed/Ignition Timing/Idle Mixture Ratio Inspection ......... 13

Trouble Diagnoses
Self-diagnosis - Mode III (Self-diagnostic System) ............... 15
Diagnostic Procedure 8 ............................................................ 16
Diagnostic Procedure 24 ............................................................ 19
Electrical Components Inspection ............................................. 21
Service Data and Specifications ............................................... 23


*Vehicles with an Air Temperature Sensor on the air cleaner box have the modified engine.
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.

<table>
<thead>
<tr>
<th>Compression pressure:</th>
<th>kPa (kg/cm², psi)/rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1,206 (12.3, 175)/250</td>
</tr>
<tr>
<td>Minimum</td>
<td>1,010 (10.3, 146)/250</td>
</tr>
<tr>
<td>Difference limit</td>
<td>98 (1.0, 14)/250</td>
</tr>
</tbody>
</table>

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.
### General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine model</td>
<td>KA24E</td>
</tr>
<tr>
<td>Cylinder arrangement</td>
<td>4, in-line</td>
</tr>
<tr>
<td>Displacement</td>
<td>2389 cm³ (145.78 cu in)</td>
</tr>
<tr>
<td>Bore x stroke</td>
<td>89 x 96 mm (3.50 x 3.78 in)</td>
</tr>
<tr>
<td>Valve arrangement</td>
<td>O.H.C.</td>
</tr>
<tr>
<td>Firing order</td>
<td>1-3-4-2</td>
</tr>
<tr>
<td>Number of piston rings</td>
<td></td>
</tr>
<tr>
<td>Compression</td>
<td>2</td>
</tr>
<tr>
<td>Oil</td>
<td>1</td>
</tr>
<tr>
<td>Number of main bearings</td>
<td>5</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>8.6</td>
</tr>
</tbody>
</table>

### Compression pressure

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1206 kPa (12.3, 175) psi/250</td>
</tr>
<tr>
<td>Minimum</td>
<td>1010 kPa (10.3, 146) psi/250</td>
</tr>
<tr>
<td>Differential limit</td>
<td>98 kPa (1.0, 14) psi/250</td>
</tr>
</tbody>
</table>

Unit: kPa (kg/cm², psi)/rpm
E.C.C.S. Component Parts Location

- E.C.C.S. control unit
- E.C.C.S. relay
- Fuel pump relay
- Fuel pump
- Exhaust gas temperature sensor (For California model)
- E.G.R. control valve
- Pressure regulator
- Pressure regulator control solenoid valve
- I.A.A. unit
- Fuel filter
- Throttle sensor / Throttle valve switch
- Throttle chamber
- Ignition coil and power transistor
- Engine temperature sensor
- Injector
- Crank angle sensor
- E.G.R. control solenoid valve
- Exhaust gas sensor
- Air flow meter
- Air temperature sensor
Exhaust gas temperature sensor
(For California model)

E.G.R. control solenoid valve

Ignition switch

Power transistor

Ignition coil

Crank angle sensor built-in distributor
Neutral switch (M/T)
Inhibitor switch (A/T)

Transmission

Ignition coil

S.C.V. control solenoid valve

Engine temperature sensor

P.C.V. valve

Fuel pressure regulator

B.P.T. valve

Air regulator

Swirl control valve

Fuel pump

Exhaust gas sensor

Muffler

Catalyst

Vehicle speed sensor

Exhaust gas flow

Intake air flow
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.
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE

- Crank angle sensor → Engine speed and piston position
- Air flow meter → Amount of intake air
- Engine temperature sensor → Engine temperature
- Air temperature sensor → Intake air temperature
- Idle switch → Throttle valve idle position
- Throttle sensor → Throttle valve opening angle
- Neutral switch (M/T) → Neutral position
- Inhibitor switch (A/T) → Start signal
- Ignition switch → E.C.C.S. control unit → Power transistor
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.

\[
\begin{align*}
\text{e.g. } & \quad \text{N: 1,800 rpm, Tp: 1.50 msec} \\
& \quad \text{A °B.T.D.C.}
\end{align*}
\]

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

**INPUT/OUTPUT SIGNAL LINE**

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Signal Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle switch</td>
<td>Idle signal</td>
</tr>
<tr>
<td>Ignition switch</td>
<td>Start signal</td>
</tr>
<tr>
<td>Crank angle sensor</td>
<td>Engine speed</td>
</tr>
<tr>
<td>Engine temperature sensor</td>
<td>Engine temperature</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Idle switch</th>
<th>Water temperature</th>
<th>Engine rpm</th>
<th>Solenoid valve</th>
<th>S.C.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Above 35°C (95°F)</td>
<td>Below 1,800</td>
<td>ON</td>
<td>Close</td>
<td></td>
</tr>
<tr>
<td>Except above</td>
<td>Off</td>
<td>Open</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 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

<table>
<thead>
<tr>
<th>System</th>
<th>Fixed condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.G.R. control system</td>
<td>OFF</td>
</tr>
<tr>
<td>Idle speed control system</td>
<td>A duty ratio is fixed at the preprogrammed value.</td>
</tr>
<tr>
<td>Fuel injection control system</td>
<td>Fuel is shut off above 2,400 rpm. (Engine speed does not exceed 2,400 rpm.)</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Engine temperature decided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Just as ignition switch is turned ON or Start</td>
<td>20°C (68°F)</td>
</tr>
<tr>
<td>More than 6 minutes after ignition ON or Start</td>
<td>80°C (176°F)</td>
</tr>
<tr>
<td>Except as shown above</td>
<td>20°C – 80°C (68°F – 176°F)</td>
</tr>
<tr>
<td>(Depends on the time)</td>
<td></td>
</tr>
</tbody>
</table>

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

INSPECTION START

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

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

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

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

O.K. - N.G.

Check, correct or replace malfunctioning parts.

Does engine run smoothly?

Yes - No

Check and clean injectors, and replace injectors if necessary.

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

Check idle speed.

M/T: 700±50 rpm
A/T: 750±50 rpm (in "N" position)

O.K. - N.G.

Check ignition timing with a timing light.

15°±2° B.T.D.C.

O.K. - N.G.

Disconnect throttle sensor harness connector.

Ensure that engine speed is below 800 rpm.

O.K. - N.G.

Adjust idle speed to less than 800 rpm by turning idle speed adjusting screw.
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

Check ignition timing with a timing light.
15°±2° B.T.D.C.

O.K.  N.G.

Adjust ignition timing by turning distributor after loosening bolt which secures distributor.
15°±2° B.T.D.C.

Adjust idle speed by turning idle speed adjusting screw.
M/T: 650±50 rpm
A/T: 700±50 rpm (in “N” position)

Connect throttle sensor harness connector.

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

Make sure that inspection lamp (Green) on E.C.U. goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm under no-load.

O.K.  N.G.

Set the diagnosis mode of E.C.U. to mode II.
Check inspection lamps (Red and Green) on E.C.U. blink at 2,000 rpm.
They should blink simultaneously.

Yes  No

INSPECTION END
TRouble Diagnosis

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

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Detected items</th>
<th>California</th>
<th>Non-California</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Crank angle sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Air flow meter circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Engine temperature sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>14</td>
<td>Vehicle speed sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>21</td>
<td>Ignition signal missing in primary coil</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>31</td>
<td>E.C.U. (E.C.C.S. control unit)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>32</td>
<td>E.G.R. function</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>33</td>
<td>Exhaust gas sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>35</td>
<td>Exhaust gas temperature sensor circuit</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>41</td>
<td>Air temperature sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>43</td>
<td>Throttle sensor circuit</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>45</td>
<td>Injector leak</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>55</td>
<td>No malfunction in the above circuit</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

X: Available  -: Not available
Diagnostic Procedure 8
E.G.R. FUNCTION (Code No. 32) [Not self-diagnostic item (For non-California models)]

Component location
Diagnostic Procedure 8 (Cont’d)

**INSPECTION START**

A

CHECK E.G.R. CONTROL VALVE OPERATION.
1) Start engine and warm it up sufficiently.
2) Make sure E.G.R. control valve spring responds to your touch (use your fingers) and also when engine is raced.

B

Does not respond

CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Stop engine.
2) Disconnect vacuum hose connected to E.G.R. control valve and B.P.T. valve.
3) Start engine.
4) Make sure vacuum exists when racing engine.

C

N.G.

CHECK VACUUM HOSE.
1) Stop engine.
2) Check vacuum hose for clogging, cracks, and proper connections.

D

O.K.

CHECK E.C.U. OUTPUT SIGNAL (Solenoid side).
1) Start engine and warm it up sufficiently.
2) Check voltage between E.G.R. control solenoid valve harness connector terminal @ and ground.

E

N.G.

Check voltage between E.C.U. harness connector terminal 105 and ground.

<table>
<thead>
<tr>
<th>Engine condition</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle</td>
<td>Battery voltage</td>
</tr>
<tr>
<td>Racing</td>
<td>Temporarily drops to 0 - 1V</td>
</tr>
</tbody>
</table>

If N.G., check the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

Repair harness or connectors between terminals @ and 105.
**TROUBLE DIAGNOSES**

**Diagnostic Procedure 8 (Cont’d)**

**Test condition**

Drive vehicle under the following conditions with a suitable shift position.
- **Engine speed:** 3,200±400 rpm
- **Intake manifold vacuum:**
  - $-42.7:1;400$ rpm
  - $-12.60:1;60$ mmHg, $-12.60:1;2.36$ inHg

**Driving mode**

- A : Test condition
- B : 16 seconds or more
- C : Idling
- D : Time
- E : Vehicle driving
- F : Ignition switch: OFF

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.

**CHECK COMPONENT.**

1. Stop engine.
2. Check E.G.R. control solenoid valve. (See page EF & EC-149.)

**CHECK COMPONENT.**

Check E.G.R. control solenoid valve and B.P.T. valve.
(See page EF & EC-148.)

**For California**

Valve spring may be stuck. Clean if necessary. If this does not correct trouble, replace E.G.R. control valve.

**For non-California**

**CHECK COMPONENT.**

Valve spring may be stuck. Clean if necessary. If this does not correct trouble, replace E.G.R. control valve.

**INSPECTION END**

**Perform driving test under the following conditions.**

1. Warm up engine sufficiently.
2. Use test driving modes indicated in figure F.

**Make sure check engine light does not come “ON” during driving test.**

**Perform self-diagnosis and find malfunction code. According to displayed code No., perform diagnosis.**

**INSPECTION END**
Diagnostic Procedure 24
AIR TEMPERATURE SENSOR (Code No. 41)

Component location

Air temperature sensor
TROUBLE DIAGNOSES

Diagnostic Procedure 24 (Cont’d)

**INSPECTION START**

CHECK COMPONENTS.
Check air temperature sensor. (See page 20.)

A O.K.
CHECK GROUND CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check continuity between air temperature sensor terminal ⑤ and E.C.U. terminals ①, ②.
   Continuity should exist.

B O.K.
CHECK INPUT SIGNAL CIRCUIT.
Check continuity between terminals ⑤ and ⑩.
Continuity should exist.

Reinstall any part removed.

Erase the self-diagnosis memory.

Perform driving test and then perform self-diagnosis (Mode-III) again.

O.K.

INSPECTION END

N.G. 1) Repair harness or connectors between terminals ⑤ and ①, ②.
     2) Check engine ground.

N.G. Repair or replace harness or connectors between terminals ⑤ and ⑩.

     2) If N.G., recheck the E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Replace air temperature sensor.
### Electrical Components Inspection

**E.C.U. INPUT/OUTPUT SIGNAL INSPECTION**

<table>
<thead>
<tr>
<th>TERMINAL NO.</th>
<th>ITEM</th>
<th>CONDITION</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Air flow meter</td>
<td>Engine is running.</td>
<td>1.0 - 3.0V Output voltage varies with engine revolution.</td>
</tr>
<tr>
<td>18</td>
<td>Engine temperature sensor</td>
<td>Engine is running.</td>
<td>1.0 - 5.0V Output voltage varies with engine water temperature.</td>
</tr>
<tr>
<td>19</td>
<td>Exhaust gas sensor</td>
<td>After warming up sufficiently.</td>
<td>0 - Approximately 1.0V</td>
</tr>
<tr>
<td>20</td>
<td>Throttle sensor</td>
<td>Ignition switch “ON”</td>
<td>0.4 - Approximately 4V Output voltage varies with the throttle valve opening angle.</td>
</tr>
<tr>
<td>22</td>
<td>Crank angle sensor</td>
<td>Engine is running.</td>
<td>0.2 - 0.5V</td>
</tr>
<tr>
<td>26</td>
<td>Air temperature sensor</td>
<td>Ignition switch “ON”</td>
<td>1.0 - 1.5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air temperature is 20°C (68°F).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch “ON”</td>
<td>Approximately 0.3V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air temperature is 80°C (176°F).</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Throttle opening signal</td>
<td>Ignition switch “ON”</td>
<td>0.3 - Approximately 3V</td>
</tr>
<tr>
<td>31</td>
<td>Crank angle sensor</td>
<td>Engine is running.</td>
<td>2.0 - 3.0V</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>Do not run engine at high speed under no-load.</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Idle switch (side)</td>
<td>Ignition switch “ON”</td>
<td>Approximately 9 - 10V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Throttle valve: idle position</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch “ON”</td>
<td>0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Throttle valve: Any position except idle position</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Start signal</td>
<td>Cranking</td>
<td>8 - 12V</td>
</tr>
<tr>
<td>35</td>
<td>Neutral switch &amp; Inhibitor switch</td>
<td>Ignition switch “ON”</td>
<td>0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neutral/Parking</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignition switch “ON”</td>
<td>6 - 7V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Except the above gear position</td>
<td></td>
</tr>
</tbody>
</table>

*Data are reference values.*
**TROUBLE DIAGNOSES**

**Electrical Components Inspection (Cont’d)**

**AIR TEMPERATURE SENSOR**

Check air temperature sensor resistance.

<table>
<thead>
<tr>
<th>Temperature °C (°F)</th>
<th>Resistance kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 (68)</td>
<td>2.1 - 2.9</td>
</tr>
<tr>
<td>80 (176)</td>
<td>0.27 - 0.38</td>
</tr>
</tbody>
</table>

![Diagram of air temperature sensor](SEF2651)
### General Specifications

<table>
<thead>
<tr>
<th>IGNITION TIMING °B.T.D.C.</th>
<th>15±2</th>
</tr>
</thead>
</table>
| IDLE SPEED rpm | M/T 700±50  
A/T 750±50 (in "N" position) |

### Inspection and Adjustment

#### ENGINE TEMPERATURE SENSOR

<table>
<thead>
<tr>
<th>Temperature</th>
<th>20°C (68°F)</th>
<th>80°C (176°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermistor resistance kΩ</td>
<td>2.1 - 2.9</td>
<td>0.30 - 0.33</td>
</tr>
</tbody>
</table>

#### AIR TEMPERATURE SENSOR

<table>
<thead>
<tr>
<th>Temperature</th>
<th>20°C (68°F)</th>
<th>80°C (176°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance kΩ</td>
<td>2.1 - 2.9</td>
<td>0.27 - 0.38</td>
</tr>
</tbody>
</table>

#### IDLE SWITCH

| Engine speed when idle switch is changed from "OFF" to "ON" rpm | M/T 1,000±150 | A/T 1,000±150 (in "N" position) |

#### FUEL PRESSURE at idling

| Vacuum hose is connected | Approximately 226 (2.3, 33) |
| Vacuum hose is disconnected | Approximately 294 (3.0, 43) |

| Measuring point: between fuel filter and fuel pipe |

#### FUEL INJECTOR

| Coil resistance Ω | Approximately 10 - 15 |

#### AIR REGULATOR

| Resistance Ω | Approximately 75 |

#### EXHAUST GAS TEMPERATURE SENSOR

| Thermistor resistance kΩ | 85.3±8.53 |

| Temperature: 100°C (212°F) | |